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PHASE II INVESTIGATION REPORT DUPONT YERKES PLANT SITE NO. 915019

Prepared for:
E.I. du Pont de Nemours & Company,Inc.
Yerkes Plant
Sheridan Drive Station 8
Tonawanda, New York 14227
August 16, 1993

Woodward-Clyde

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PHASE II INVESTIGATION REPORT
DuPont Yerkes Plant
Tonawanda, New York
Site No. 915019

Dear Mr. Ervin:

Woodward-Clyde Consultants (WCC) is pleased to submit the Phase II Investigation Report for the DuPont Yerkes Plant. The investigation was conducted in accordance with the approved Work Plan, dated January 24, 1992, and its addendum, dated April 30, 1992.

If you have any questions or comments on the plan, please contact the undersigned. We appreciate the opportunity to work with DuPont on this project.

Sincerely,

Kelly R. McIntosh, P.E., P.HGW.
Associate

James F. Roetzer, Ph.D.
Senior Associate

KRM/JFR:jee

Yerph2.rep

[redacted]

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EXECUTIVE SUMMARY

E.I. du Pont de Nemours and Company (DuPont) and the New York State Department of Environmental Conservation (NYSDEC) have entered into an Order on Consent to perform a Phase II Investigation of ten landfilled areas at Du Pont's Yerkes Plant located in Tonawanda, New York. DuPont retained Woodward-Clyde Consultants (WCC) to conduct the investigation in accordance with the NYSDEC approved Phase II Investigation Work Plan (WCC, January 24, 1992) and its Addendum (WCC, April 30, 1992).

DuPont has reported disposal during a period from 1921 to 1978 of just over 91,400 tons of general waste and product waste in eight landfill areas at the Yerkes Plant Site. A majority of this waste was disposed of in an extensive topographic low and in six pits (12- to 30-feet deep) in the northeastern portion of the site. In addition, lesser quantities of wastes (including laboratory waste) from the Plant Research and Development Department were reported to have been landfilled at the two discrete on-site locations. The following materials were disposed of in the landfill areas (volume estimates provided by DuPont):

• cellulosic viscose, cellophane, rayon, and sponges	80,000 tons
• dry Corian™ wastes	5,000 tons
• wet Corian™ wastes	1,500 tons
• methyl methacrylate, methylene chloride, inert filler	1,500 tons
• polyvinyl alcohol film	100 tons
• Vexar™ netting	1,500 tons
• Tedlar™ with dimethylacetamide	1,000 tons
• Tedlar™ polyvinyl fluoride film	750 tons
• nylon shutters and water-based paint	75 tons
• laboratory waste	1 ton

A Phase I Investigation of the plant concluded that potential environmental impacts of the landfill areas could occur through migration of waste constituents to surface water, in particular to the Niagara River. Therefore, the Phase II Investigation was focused on characterization of the landfilled materials and on investigation of the two potential routes of migration of waste constituents to surface water: transport in shallow groundwater and transport in stormwater.

The overburden outside of the landfill areas at the plant consists, in descending order from ground surface, of: (1) 2 to 8 feet of coarse, hard fill materials, (2) 42 to 70 feet of lacustrine silty clay, and (3) 3 to 20 feet of a silt/clay till. Depth to bedrock varies from 62 to 82 feet across the site. Landfill areas are estimated to be underlain and surrounded by 18 to 70 feet of lacustrine clay. This low permeability clay (tested to be approximately 10^{-8} cm/sec) constitutes a barrier to migration of leachate generated in the landfill areas below the top of the surrounding clay.

The landfilled waste was generally found to contain relatively low levels of Target Compound List/Target Analyte List (TCL/TAL) chemicals. The exception was one of the R&D waste landfill areas, which contained material with elevated levels of TCL volatile organic chemicals and mercury. However, the volume of material impacted in this area was small and does not likely constitute a major potential source of groundwater contamination.

The groundwater investigation found no evidence that the site has resulted in groundwater contamination. Based on these findings, the Phase II Investigation concluded that the landfills do not pose a substantial potential for impacting surface water via leachate migration in groundwater.

1.0
INTRODUCTION

E.I. du Pont de Nemours & Company (DuPont) and the New York State Department of Environmental Conservation (NYSDEC) have entered into an Order on Consent to perform a Phase II Investigation of several landfilled areas at its Yerkes Plant. DuPont retained Woodward-Clyde Consultants (WCC) to conduct the investigation in accordance with the NYSDEC approved Phase II Investigation Work Plan (WCC, January 24, 1992) and its Addendum (WCC, April 30, 1992).

1.1 BACKGROUND PLANT HISTORY

The DuPont Yerkes Plant is located on River Road, southeast of New York State Thruway Route 190, in the Town of Tonawanda, Erie County, New York (Figure 1-1). The Plant is approximately 90 acres in area and is located in a highly industrialized section of Tonawanda. It is bounded on the northeast by Kenmore Avenue, on the northwest by properties owned by Trans American Properties Inc. and the New York State Thruway Authority, on the southwest by River Road and on the southeast by property owned by General Motors Corporation. The following products have been manufactured at the Plant since 1921:

• Rayon™	1921-1955
• cellophane	1924-1968
• Cel-O-Seal caps and bands	1931-1964
• cellulose sponge	1936-1951
• Cordura™ yarn	1941-1955
• polyethylene film	1951-1961
• Vexar™ netting	1959-1979
• Tedlar™ polyvinyl fluoride film	Since 1955

- Corian™ sheet and shape — Since 1968

Corian™ is produced as simulated marble sheets, sinks, and sink/countertop units.

DuPont has reported disposal during a period from 1921 to 1978 of just over 91,400 tons of general waste and product waste in eight landfill areas at the Yerkes Plant Site. The locations of the landfill areas are shown on Figure 1-2. In addition, lesser quantities of wastes (including laboratory waste) from the Plant Research and Development Department were landfilled at the two locations shown on Figure 1-2 (Units 9 and 10). A majority of the waste was disposed of in an extensive topographic low (Unit 8) and in six pits (12- to 30-feet-deep) in the northeastern portion of the Site (Units 1, 3, 4, 5, 6 and 7). The following materials were disposed of in the landfill areas identified in Figure 1-2:

• cellulosic viscose, cellophane, rayon, and sponges	80,000 tons
• dry Corian™ Wastes	5,000 tons
• wet Corian™ Wastes	1,500 tons
• methyl methacrylate, methylene chloride, inert filler	1,500 tons
• polyvinyl alcohol film	100 tons
• Vexar™ netting	1,500 tons
• Tedlar™ with dimethylacetamide	1,000 tons
• Tedlar™ polyvinyl fluoride film	750 tons
• nylon shutters and water-based paint	75 tons
• laboratory waste	

Landfill Area 8 was used primarily for the disposal of cellophane waste and has been inactive since 1978. A 10- to 12-acre parcel of land, including a large portion of Landfill Area 8, was sold to General Motors Corporation. It is now paved and used as a parking lot. Landfill Area 2 was used solely for Tedlar™ waste. Within the past few years, some of the disposal areas on DuPont property have been used for surficial disposal of coarse

demolition debris.

1.2 PREVIOUS INVESTIGATIONS

A Phase I Investigation of the site was conducted for NYSDEC by Ecology and Environmental Engineering, P.C. (E&E). The major conclusions of the Phase I Investigation are described below. The reader is referred to the Phase I Investigation Report (E&E, January 1990) for additional information concerning the plant operational history and environmental data collected prior to the current Phase II Investigation.

The Phase I Investigation Report indicates that relatively low levels of inorganics, some marginally in excess of drinking water standards, had been measured in groundwater samples from the monitoring wells installed by DuPont in 1979 within and adjacent to the landfill areas. The Phase I Report concludes that these levels may represent background conditions in this area. It also suggested that polyaromatic hydrocarbons (PAHs) found in soil samples may represent background conditions.

The Phase I Report also included a review of geologic and hydrogeologic data for the site. It concluded that the bedrock water-bearing zones were hydraulically isolated from the landfilled materials by low permeability lacustrine clay (tested to have a permeability of approximately 10^{-8} cm/sec).

The Phase I Report presented a preliminary application of the Hazard Ranking System (HRS). Under the HRS, three numerical scores are computed to express the site's relative risk for damage to the population and the environment. The three scores are:

- S_M reflects the potential for harm to humans or the environment from migration of a hazardous substance away from the facility by routes involving groundwater, surface water, or air. It is a composite of separate scores for each of the three routes (S_{GW} = groundwater route score, S_{SW} = surface

water route score, and S_A = air route score).

- S_{FE} reflects the potential for harm from substances that can explode or cause fires.

- S_{DC} reflects the potential for harm from direct contact with hazardous substances at the facility (i.e., no migration need be involved).

The preliminary HRS score presented in the Phase I Report was:

S_M = 24.99 (based on S_{GS} = 4.32; S_{SW} = 43.01; and S_A = 0)
S_{FE} = Not applicable
S_{DL} = 0

These scores indicate that potential surface water migration routes were considered to be of concern at the site, with minimal potential for exposure via potential air or groundwater routes. This Phase II Investigation, therefore, focusses on the potential for contaminant migration from the site to surface water, specifically the Niagara River. There are two potentially significant routes of migration to the Niagara River from the Yerkes Plant:

1. Migration in groundwater above the lacustrine clay, with eventual discharge to surface water

2. Stormwater runoff

The Phase II Investigation Work Plan (Work Plan) was developed to investigate these potential migration routes. The Work Plan also included additional investigations to characterize the chemical composition of the fill materials in the ten landfill areas.

1.3 OBJECTIVE

As presented in the Work Plan, the objective of this Phase II Investigation is to assess the nature of material placed in the landfill areas and to ascertain if contaminants are migrating from the plant property toward the Niagara River. The scope-of-work designed to achieve this objective is presented in the following section.

2.0
PHASE II INVESTIGATION

2.1 SCOPE-OF-WORK

As presented in the Work Plan, the Phase II Investigation for the DuPont Yerkes Plant consisted of the following investigative tasks:

- Installation and sampling of five perimeter overburden groundwater monitoring wells.
- Four quarterly rounds of groundwater hydraulic head measurements.
- Completion of a total of 31 soil borings within the landfilled areas shown on Figure 1-2. Composite samples of the landfilled materials were obtained for chemical analysis.
- Stormwater and catch basin sediment sampling.

Field activities were conducted in accordance with the NYSDEC approved Site Health and Safety Plan (HSP). Specific investigation methods are described below.

2.2 METHODS

2.2.1 Monitoring Well Installation

As discussed in the Work Plan, previous studies of the unconsolidated overburden deposits at the Yerkes Plant indicate that the surficial fill and/or alluvial deposits above the lacustrine clay, and the interface of the till and upper weathered bedrock (beneath

the clay) could be water-bearing zones. Because of the documented thickness of the clay layer and the lack of contamination found in previous sampling of deep overburden/upper bedrock wells installed at the site by DuPont in 1979, the Phase II Investigation focused on groundwater above the clay layer. A total of five new wells were installed at locations along the perimeter of the site as shown on Figure 2-1. Each well was screened to monitor shallow or perched groundwater in the surficial fill or alluvium deposits.

All drilling, excavation, cutting, and welding was performed in accordance with applicable Dupont Yerkes Plant Safety Guidelines and the HSP. All solid and liquid material generated during drilling activities were containerized for proper disposal by DuPont.

2.2.1.1 Materials Specifications

The following materials were used for the monitoring well installations:

- Well screen: 2-inch I.D. 10 slot threaded PVC screen
- Well riser: 2-inch I.D. Schedule 40 PVC riser pipe
- Sand pack: Jesse Morie sand No. 2 or equivalent (fine sand)
- Well seal: Bentonite pellets
- Grout mix for annular space: 94-pounds Type 1 Portland cement, 8-gallons of potable water, 5-pounds of powdered bentonite

2.2.1.2 Drilling Procedures and Well Construction

The five new monitoring wells were installed to monitor the shallow groundwater. Well completion diagrams are presented in Appendix A. Drilling logs are presented in Appendix B. The wells were installed through the fill and/or alluvium to a minimum of 2 feet into the lacustrine clay. Well installations were performed as follows:

1. The borehole was advanced through the overburden to a minimum of 2 feet below the lacustrine clay interface using hollow-stem augers with continuous split-spoon soil samples collected ahead of the auger flights for visual identification of overburden materials. Split-spoon soil samples were field screened using an Organic Vapor Analyzer (OVA).

2. Eight feet of 2-inch I.D. Schedule 40 riser with 10 feet of 10 slot threaded PVC screen was installed through the hollow stem auger to the bottom of the borehole.

3. Fine washed silica sand was placed from the bottom of the hole to 2 feet above the top of the screen. The augers were slowly removed as the sand was placed, keeping the bottom of the augers a minimum of 2 feet below the top of the sand. One foot of bentonite pellets was placed above the sand pack in the annular space inside the augers as the augers were pulled to 2 feet above the screen. Both the sand and bentonite pellets were lightly tamped as they were placed.

4. Before grouting the hole to the surface, the volume of the annular space to be grouted was estimated. Grout mixtures were circulated through the pump on the drill rig at a high speed.

5. The final section of the augers was then removed and the grout seal was topped

off. A protective casing was then installed with the grout seal at the surface elevated to divert surface water away from the monitoring well.

2.2.1.3 Well Development

Monitoring well development serves to remove fines from the sandpack and ensure turbid-free groundwater samples. Wells were developed with bailers as follows:

1. The bailers were decontaminated prior to use.

2. At least five well volumes were purged and the discharged water was monitored, each one-half to one well volume, for pH, conductivity, temperature, and turbidity.

3. The bailer was used periodically to surge the monitoring well to suspend fine-grained sediment during development.

4. All development water was transferred to a designated 55-gallon drum.

Due to the low hydraulic conductivity of the soil penetrated by these wells, well development had to be performed over a period of several days in order to remove sufficient volume. One well (DYF-2) was dry and therefore could not be developed.

2.2.1.4 Elevation Control

A survey was conducted after the completion of the drilling program to establish the elevations of all new monitoring wells. The ground surface elevation adjacent to the well casing and the top of the well casing (for groundwater measurement purposes) were determined at each well location. All measurements were made to the nearest 0.01 foot. The survey was tied into the existing plant coordinate grid system.

2.2.2 Soil Borings

As discussed in Section 1.2, a thick sequence of low permeability lacustrine silty clay and clay underlie the Yerkes Plant and constitute the base and walls for the excavated disposal pits. To assess soil conditions and waste materials present within and below the landfill areas, a minimum of two soil borings were advanced through the fill materials to the top of the lacustrine clay unit in each disposal area.

Borings were advanced using hollow-stem auger drilling techniques and split-spoon soil/waste samples were collected continuously ahead of the auger flights. Samples were visually described and classified in the field by a WCC geologist and screened for potential contamination using an organic vapor analyzer. Soil boring logs are presented in Appendix C.

Single composite samples of fill materials were obtained from each of nine of the ten landfill areas (Areas 1, 2, 3, 4, 5, 6, 7, 8, and 9). Two composite samples were obtained from Landfill Area 10 because OVA readings suggested the upper fill (0-6 feet) contained lower levels of volatile organic compounds than the lower fill (6-14 feet).

The composite soil samples were obtained from the fill, and particularly from waste materials (where present). The samples were analyzed for the Contract Laboratory Program (CLP) Target Compound List (TCL) and Target Analyte List (TAL). Based on the results of the TCL/TAL analyses, several soil samples were selected for Toxicity Characteristic Leaching Procedure (TCLP) analyses. The TCLP analyses were performed if the results of the TCL/TAL analyses (in mg/kg) exceeded the TCLP criteria (in mg/l) for hazardous waste determination by a factor of 20 or more for a given analyte. In accordance with Addendum 1 to the Work Plan, only the TCLP analytes meeting this criterion were analyzed.

2.2.3 Groundwater Sampling Procedures

Groundwater sampling techniques were performed in accordance with procedures outlined in the RCRA Groundwater Monitoring Technical Enforcement Document (TEGD). These procedures were followed to ensure sample representativeness and validity as well as to minimize sample contamination from outside sources. The following procedures were followed in the collection of groundwater samples:

1. The condition of the well to be sampled was examined, particularly with respect to the possibility of security breaches, tampering or well damage, and reported on the WCC Field Sampling Sheet.

2. The depth to water (DTW) and total well depth were measured and recorded on field sampling sheets. All measuring devices were decontaminated prior to use as described in Section 2.2.4.

3. The well was purged of a minimum of three well volumes (or to dryness) using dedicated decontaminated bailers. All purge water was containerized for proper disposal. During purging, water quality parameters (pH, turbidity, specific conductance and temperature) were monitored.

4. Wells were sampled using the dedicated bottom loading bailer. The bailer was lowered smoothly into the well to the middle of the screened interval.

5. The number and types of sample containers filled for each sample and all identification codes were recorded in the field log book and on the field sampling sheet. Appropriate preservatives were added, as necessary, according to NYSDEC ASP 9/89 protocols and samples were placed in shuttles with ice for transport to the laboratory.

2.2.4 Decontamination Procedures

All non-dedicated equipment used during well purging/sampling and soil sampling activities was thoroughly decontaminated prior to each use according to the following procedures:

1. Wash with non-phosphate detergent/potable water solution
2. Tap water rinse
3. Deionized water rinse
4. Rinse with methanol followed by hexane
5. Deionized water rinse
6. 10 percent nitric acid rinse
7. Deionized water rinse
8. Air dry

Sampling equipment was wrapped in aluminum foil (shiny side out) until ready for use. Any equipment not involved with sample acquisition efforts (i.e., equipment for hydraulic head monitoring) was decontaminated with a non-phosphate detergent solution wash and deionized water rinse. All fluids generated during decontamination were containerized for proper disposal by DuPont.

2.2.5 Stormwater and Catch Basin Sediment Sampling

As part of the stormwater management program for the Yerkes Plant, DuPont sampled stormwater and sediment from a catch basin located in the Tedlar Area (Figure 2-1) of the plant. This catch basin was selected for the following reasons:

1. It is located downgradient and collects runoff from the landfill areas

2. It is located along the traffic pattern for materials being brought into the plant

The catch basin sediment and stormwater samples were collected and analyzed by Recra Environmental, Inc., under contract to DuPont. Samples were collected in August 1993 and analyzed for the TCL/TAL in accordance with Addendum 1 to the Work Plan. The stormwater sample was collected during dry weather flow. The storm sewers will be sampled again during a precipitation event. This sampling is scheduled to be performed during August or September 1993, depending on rainfall. DuPont will forward the results to NYSDEC as an Addendum to this Phase II Investigation Report.

2.2.6 Analytical Program

Analytical services were provided by Recra Environmental, Incorporated of Amherst, New York. A summary of the number and type of samples collected and analyses performed is presented in Table 2-1. All newly installed monitoring wells were sampled once following development using the procedures outlined in Section 2.2.3. All collected groundwater samples were analyzed for the full CLP TCL and TAL and sulfate and chloride. The soil and groundwater TCL and TAL analyses were performed using New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP), December 1991 methods. Chloride and sulfate analyses were performed using Methods 325.3 and 375.4 ("Methods for Chemical Analysis of Water and Wastes,

USEPA 500/4-79-020", March 1983).

In accordance with the Work Plan and Addendum 1 to the Work Plan (April 30, 1992), some soil/fill samples were selected for Toxicity Characteristic Leaching Procedure (TCLP) on the basis of the reported concentrations of TCLP chemical parameters in the bulk sample analyses. The bulk sample analytical results were compared to TCLP regulatory limits as listed in 40 CFR Part 261.24. All samples for which TCLP chemical parameters were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding 20 times the TCLP regulatory limit (mg/l) were analyzed using TCLP methodology for the indicated parameters. The samples were collected in duplicate to allow for this contingency. In accordance with Addendum 1 to the Work Plan holding time limits were waived for these analyses.

2.3 QUALITY ASSURANCE/QUALITY CONTROL

The Quality Assurance/Quality Control (QA/QC) program for the DuPont Yerkes Phase II Investigation is presented in detail in the Work Plan. Briefly, the QA/QC program required the following:

1. Adherence to the field sampling decontamination and chain-of-custody procedures presented in the Work Plan.

2. Collection and analysis of QC samples (field blanks, field duplicates, rinsate blanks, trip blanks, and matrix spike/matrix spike duplicates (MS/MSD).

3. Adherence, by the contracted laboratory, to the QA/QC requirements specified under NYSDEC Analytical Services Protocol (ASP) Category B, September 1989 for the TCL/TAL analyses.

4. Analytical data validation of results (conducted by WCC).

Specific QA/QC acceptance criteria are discussed in the Data Validation Report, presented in Appendix D.

2.4 PROJECT TEAM

WCC personnel assignments for this project were as follows:

Project Manager:	Kelly R. McIntosh, P.E., P.HGW.
Responsible Professional:	James F. Roetzer, Ph.D.
Project Geologist:	Paul F. Mazierski/ Frank R. Garbe
Data Validation:	Anthony J. Misercola
Peer Review:	James F. Roetzer, Ph.D.

Resumes for each of these WCC personnel were included in the Work Plan.

3.0
PHYSICAL CHARACTERISTICS OF THE SITE

3.1 TOPOGRAPHY, SITE DRAINAGE AND HYDROLOGY

The DuPont Yerkes Plant Site occupies approximately 90 acres. The topography at the site is relatively flat. In general, the land slopes very gently from the northeast (elevation approximately 603 feet) toward the southwest (elevation approximately 588 feet). Surface runoff near the plant production areas drains to storm sewers which converge at a single catch basin. The undeveloped sections of the property, including the landfill areas have very little slope and are well vegetated. Infiltration and evapotranspiration likely limit the amount of runoff in these areas except during periods of sustained precipitation or snowmelt. The surrounding industrial area is generally flat lying with less than 1 percent slope.

The major surface water body in the area is the Niagara River, located approximately 600 feet southwest of the plant. The landfill areas are located in an area classified as Zone C based upon Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA, 1982). Zone C represents areas of minimal flooding.

3.2 GEOLOGY

The site is located within the Erie-Ontario Lowlands Physiographic Province of New York, which is characterized by a thick, gently dipping (southward at a rate of 20 to 50 feet per mile) sequence of rock formations, ranging from sandstones and shales to dolomites and limestones from the Silurian and Devonian Periods. The site overburden is underlain by shale and siltstone of the Camillus Formation. The Camillus Formation, a member of the Salina Group, is Late Silurian in age (420 million years before present)

and, in general, consists of light gray to gray shale and siltstone, with abundant thin to thick anhydride, gypsum, and salt beds. The surficial geology of the region has been largely controlled by the effects of Pleistocene glaciation. A majority of the moraines and tills of Erie County have been assigned to the Port Huron Glacial Substage (late Wisconsin), being deposited during the last 12,000 years.

Previous studies performed at the site, including geotechnical investigations and installation of the existing monitoring wells, have characterized the overburden stratigraphy (outside of the landfill areas) in descending order from ground surface as follows: (1) 2 to 8 feet of coarse, hard fill material, (2) 42 to 70 feet of lacustrine silty clay, and (3) 3 to 20 feet of a silt/clay till. Depth to the bedrock interface varies from 62 to 82 feet across the site.

3.3 HYDROGEOLOGY

There are no municipal wells within a 3-mile radius of the site (New York State Department of Health 1982). The entire area is serviced by the Niagara River and there are no known private water wells in use (ECDEP 1982).

Based upon the stratigraphy delineated in the previous investigations, and water level observations in soil borings and monitoring wells, the upper two potential groundwater-bearing zones at the site are: 1) surface deposits (alluvial or fill) above the lacustrine clay (overburden zone), and 2) clay/silt till interface with the upper bedrock (upper bedrock zone). These two zones are the focus of the groundwater flow characterization presented below.

3.3.1 Overburden Zone

Saturated conditions in fill or alluvium above the lacustrine clay were observed in most soil borings and monitoring wells. Four quarterly rounds of hydraulic head

measurements were obtained for all intact monitoring wells. Measurements were taken in September 1992, December 1992, March 1993, and June 1993. The hydraulic head data were used to prepare groundwater potentiometric surface maps for each quarterly monitoring event. Figures 3-1, 3-2, 3-3, and 3-4 present the potentiometric surface maps for the overburden zone. These maps are quite consistent and show very low hydraulic gradients in the landfill areas. A groundwater divide is indicated in the vicinity of MW-3S (approximately coincident with the boundary with General Motors). Groundwater flow across the DuPont property is toward the southwest.

3.3.2 Lacustrine Clay

As described above, the upper 2 to 8 feet of soil and fill materials is underlain by 42 to 70 feet of lacustrine clay. Permeability tests run by Empire Soils in 1980 on three undisturbed clay samples indicate very low permeabilities, ranging from 1.08×10^{-8} to 1.60×10^{-8} cm/second (Blas 1980). This low permeability clay confines the overburden zone from the upper bedrock zone.

3.3.3 Upper Bedrock Zone

There are five existing deep wells at the site which monitor the upper bedrock zone. These wells were installed in 1979 as part of a groundwater study. Figures 3-5, 3-6, 3-7, 3-8 present the potentiometric surface maps for the quarterly hydraulic head monitoring events. These maps show a general flow direction toward the Niagara River, except for September 1992, where a more northerly flow direction is indicated.

3.3.4 Lower Bedrock

Groundwater flow in the lower bedrock (Camillus Formation) was not investigated during this study. In general, groundwater flow in the Camillus Formation can occur through secondary openings such as fractures and solution cavities. However, the

Camillus Formation, in general, is not utilized for water supply because of high salinity and the general poor quality of groundwater obtained from wells.

3.4 SURROUNDING LAND USE

The DuPont Yerkes Plant is located on River road, southeast of New York State Thruway Route 190, in the Town of Tonawanda, Erie County, New York (Figure 1-1). The plant is approximately 90 acres in area and is located in a highly industrialized section of Tonawanda. It is bounded on the northeast by Kenmore Avenue, on the northwest by properties owned by Trans American Properties Inc. and the New York State Thruway Authority, on the southwest by River Road and the southeast by property owned by General Motors Corporation.

No residential properties bound the site, nor are there any residential properties downgradient of the site. The closest residential community is the Woodward Avenue West neighborhood located approximately 250 feet north (upgradient) of the northern corner of the plant property. The Edgar Avenue/Vulcan Street neighborhood lies approximately 1,200 feet southeast of the plant, on the other side of the General Motors Corporation.

Recreational activities that would take place in the vicinity are limited to boating and other water related activities on the Niagara River 600 feet southwest of the plant. In addition the riverwalk, a paved hiking and biking path following the river, lies on the opposite side of the New York State Thruway Route 190 from the plant.

4.0
ENVIRONMENTAL ASSESSMENT

This Section presents and interprets the results of the investigations described in Section 2.0. The results of the soil boring program are used to assess the presence of TCL/TAL chemicals within the landfilled material (Section 4.1). Hydraulic head and groundwater analytical data are used to evaluate the occurrence and potential for migration of TCL/TAL chemicals in groundwater in Section 4.2. Surface water and catch basin sediment analytical results are presented and interpreted in Section 4.3 with respect to potential transport of TCL/TAL chemicals in surface water runoff from the site. Appendix D presents the Data Validation Report for the soil/waste and groundwater samples analyzed.

4.1 CHARACTERIZATION OF LANDFILL AREAS

The ten landfill areas at the plant (shown on Figure 1-2) were investigated through soil borings and composite sampling of landfilled materials. The composite samples were selected to include waste materials found (such as Corian™ and Tedlar™). The composite sample selection was determined in the field by representatives of WCC and NYSDEC. Tables 4-1 through 4-4 present the results of TCL/TAL analyses of soil/waste samples. Samples selected for TCLP analyses are listed on Table 4-5 and the results of the TCLP analyses are summarized in Table 4-6. The individual landfills are considered separately below. In the descriptions that follow, sample observations and OVA measurements are discussed. This information is presented in detail in the soil boring logs presented in Appendix C.

4.1.1 Landfill Area 1

4.1.1.1 General Characteristics

Landfill Area 1 is located in the southern portion of the undeveloped land between the plant production buildings and Kenmore Avenue. It was excavated in 1960 to an estimated depth of 12 feet below ground surface (based on DuPont's 1979 estimate). It is roughly rectangular in shape, approximately 150 feet by 80 feet. Based on these dimensions, the landfill contains approximately 5,300 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and disposal waste (laboratory waste) and Corian™ waste which was not produced at the plant until 1968.

4.1.1.2 Materials Encountered

Two soil borings (SB-1A and SB-1B) were advanced in Landfill Area 1. Landfilled materials encountered included: gravel; brick fragments; clay; wood; dark gray fine sand; white, thin layered, synthetic material; tedlar; and cellophane. A septic odor from the borehole was also reported. OVA measurements off the split-spoon samples were 0 to 5 ppm.

The clay base was encountered at 16 feet BGS in SB-1A and at 8 feet below ground surface (BGS) in SB-1B, suggesting that the 12 feet estimate provided by DuPont may be more representative of the average depth of the landfill area. The nearest deep soil boring to Landfill Area 1 is 7D, located approximately 120 feet south of the area. Lacustrine clay was encountered in this boring from 6 to 48 feet BGS. Based on this, the thickness of the clay layer beneath Landfill Area 1 is estimated to be approximately

32 to 40 feet. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 1.

4.1.1.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-1A. Tables 4-1 through 4-4 present the analytical results for all detected compounds. Several TCL/TAL chemicals were detected. The highest concentration reported for volatile organic chemicals was 13J (estimated) mg/kg for carbon disulfide. No other volatiles were reported above 10 mg/kg. Semivolatile organics were also detected, with the highest concentrations reported for the polyaromatic hydrocarbon (PAH) compounds phenanthrene (15J (estimated) mg/kg), fluoranthene (14J mg/kg), and pyrene (11J mg/kg). No other semivolatiles were detected at concentrations above 10 mg/kg. Reported PAH concentrations were generally higher in the blind field duplicate of SB-1A. Only one pesticide/PCB compound was detected (PCB-1248 at 1.0 mg/kg). Several metals were detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 1, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 169 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 34.

The results of the TCLP analyses for lead of the duplicate sample of SB-1A provided to the laboratory was 0.003U mg/l (not detected at a detection limit of 0.003 mg/l). Based on this result, lead leaching to groundwater from Landfill Area 1 does not likely present an environmental concern.

The fill/waste in Landfill Area 1 is isolated by the underlying and surrounding low

permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.2 Landfill Area 2

4.1.2.1 General Characteristics

Landfill Area 2 is located in an undeveloped field west of the plant production facilities, just northeast of the Co-Generation Facility (Figure 1-2). It was excavated in 1962 to an estimated depth of 20 feet below ground surface (based on DuPont's estimate). It is roughly square in shape, approximately 250 feet on a side. Based on these dimensions, the landfill contains approximately 46,000 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing Tedlar Waste.

4.1.2.2 Materials Encountered

Three soil borings (SB-2A2, SB-2A3, and SB-2B1) were advanced into the fill at Landfill Area 2. An additional boring, SB-2A1 encountered natural clay at 4 feet BGS and was assumed to be outside the landfill area. Landfilled materials encountered in SB-2A2, SB-2A3, and SB-2B1 included: Tedlar™, clay, silt, dark gray sand, wood, and cinders. No odors from the borehole or samples were noted. Due to an equipment malfunction, OVA measurements were not obtained during these borings.

The clay base was encountered at 6 feet BGS in SB-2A2, 12 feet BGS in SB-2B1, and at 12 feet BGS in SB-2A3, suggesting that the 20 feet estimate for fill depth provided by DuPont may be too high or may represent a maximum depth of the landfill area. Therefore, the volume estimate presented above is likely to overestimate the actual waste volume. The nearest deep soil boring to Landfill Area 2 is B-5, located approximately 500 feet south of the area. Lacustrine clay was encountered in this boring

from 1 to 56 feet BGS. Based on this, the thickness of the clay layer beneath Landfill Area 2 is estimated to be approximately 36 to 44 feet. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 2.

4.1.2.3 Results of Chemical Analyses

WCC was not able to obtain sufficient Tedlar™ for analyses from the split-spoon samples because of low recovery. Therefore, a composite sample of Tedlar™ waste from SB-2A3 was obtained directly from the outside of the augers as they were removed.

TCL/TAL analyses were performed on this composite sample. Tables 4-1 through 4-4 present the analytical results for all detected compounds. No volatile organic chemicals were detected in the composite sample at levels above 1 mg/kg. Only one semivolatile compound was present above 1 mg/kg (bis(2-ethylhexyl)phthalate at 1.8 mg/kg). Only one pesticide/PCB compound was detected (PCB-1248 at 3.9 mg/kg). Several metals were detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 2, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 174 mg/kg, which exceeded it s regulatory limit of 5.0 mg/l by a factor of 35.

The results of the TCLP analyses for lead of the duplicate sample of SB-2A3 provided was 0.166 mg/l, well below the regulatory limit of 5.0 mg/l. Based on this result, lead leaching to groundwater from Landfill Area 2 does not likely present an environmental concern.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 2 does not likely pose an environmental concern. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.3 Landfill Area 3

4.1.3.1 General Characteristics

Landfill Area 3 is located in the southern portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). It was excavated in 1963 to an estimated depth of 30 feet below ground surface (based on DuPont's estimate). Based on these dimensions, the landfill contains approximately 76,000 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and disposal waste (laboratory waste).

4.1.3.2 Materials Encountered

Two soil borings (SB-3A and SB-3B) were advanced in Landfill Area 3. Landfilled materials encountered included: Tedlar™, Vexar™ netting, Corian™, dark gray sandy silt, clay, and building rubble. A septic odor from the borehole was also reported. OVA measurements off the split-spoon samples ranged from 0 to greater than 1,000 ppm. It is likely that the higher measurements are attributable to methane being detected by the OVA. Decomposed wood was found immediately below the spoon with the highest (500-1,000 ppm) reading.

The clay base was encountered at 20 feet BGS in SB-3A and at 18.4 feet BGS in SB-3B,

suggesting that the 30 feet estimate for depth of fill provided by DuPont may be too high or represent a maximum depth of the landfill area. Therefore, the volume estimate presented above is likely to be an overestimate. The nearest deep soil boring to Landfill Area 3 is 7D, located approximately 180 feet south of the area. Lacustrine clay was encountered in this boring from 6 to 48 feet BGS. Based on this, the thickness of the clay layer beneath Landfill Area 3 is estimated to be approximately 18 to 30 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 3.

4.1.3.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-3B. Tables 4-1 through 4-4 present the analytical results for all detected compounds. No TCL volatile organic chemicals were detected. Five TCL semivolatile compounds were detected at concentrations above 10 mg/kg. All were PAH compounds: naphthalene at 14J mg/kg, phenanthrene at 33J mg/kg, fluoranthene at 26J mg/kg, pyrene at 19J mg/kg, and benzo(a)anthracene at 16J mg/kg (J qualifier indicates the concentration is estimated). There were three pesticide/PCB compounds detected (gamma-BHC, endosulfan II and gamma-chlordane), all with estimated (J qualifier) concentrations below 0.003 mg/kg. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 3, no chemicals were detected above this level. Therefore, no TCLP analyses were required.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 3 is not likely to pose an environmental concern. The fill/waste is isolated by the

underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.4 Landfill Area 4

4.1.4.1 General Characteristics

Landfill Area 4 is located in the southern portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). It was excavated in 1974 to an estimated depth of 15 feet below ground surface (based on DuPont's estimate). It is roughly rectangular in shape, approximately 125 feet by 65 feet. Based on these dimensions, the landfill contains approximately 4,500 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and disposal waste (laboratory waste).

4.1.4.2 Materials Encountered

Two soil borings (SB-4A and SB-4B) were advanced in Landfill Area 4. Landfilled materials encountered included: Corian™, Tedlar™, Vexar™ netting, wood, dark gray sand, silt, and clay. OVA measurements off the split-spoon samples ranged from 0 to 10 ppm, with one reading of 40 ppm off of decomposed wood likely attributable to methane.

The clay base was encountered at 18.2 feet BGS in SB-4A and at 18 feet BGS in SB-4B, suggesting that the 15 feet estimate for depth of fill provided by DuPont may be representative of the average depth of the landfill area. The nearest deep soil boring to Landfill Area 4 is 7D, located approximately 75 feet north northeast of the area.

Lacustrine clay was encountered in this boring from 6 to 48 feet BGS. Based on this, the clay layer beneath Landfill Area 4 is estimated to be approximately 30 to 33 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 4.

4.1.4.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-4A. Tables 4-1 through 4-4 present the analytical results for all detected compounds. No TCL volatiles were detected in the sample at concentrations above 1 mg/kg. TCL semivolatiles detected above 10 mg/kg were pyrene at 14J mg/kg and butylbenzylphthalate at 28J mg/kg (J qualifier indicates concentration is estimated). Five pesticide/PCB compounds were detected: endosulfan II at 0.00049J mg/kg, 4,4'-DDT at 0.012J mg/kg, methoxychlor at 0.016J mg/kg, endrin aldehyde at 0.022 mg/kg, and alpha-chlordane at 0.0031J mg/kg. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 4, no chemicals were detected above this level. Therefore, no TCLP analyses were required.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 4 is not likely to pose an environmental concern. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.5 Landfill Area 5

4.1.5.1 General Characteristics

Landfill Area 5 is located in the southern portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). It was excavated in 1974 to an estimated depth of 15 feet below ground surface (based on DuPont's estimate). It is roughly rectangular in shape, approximately 200 feet by 100 feet. Based on these dimensions, the landfill would be estimated to contain approximately 11,000 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and development waste (laboratory waste).

4.1.5.2 Materials Encountered

Two soil borings (SB-5A and SB-5B) were advanced in Landfill Area 5. Landfilled materials encountered included: Tedlar™, Vexar™, netting, cellophane, building rubble, and reworked clay. A septic odor from the SB-5B borehole was also reported. OVA measurements from the split-spoon samples ranged from 0 to 7 ppm.

The clay base was encountered at 12 feet BGS in SB-5A and at 12 feet BGS in SB-5B, suggesting that the 15 feet estimate for depth of fill provided by DuPont may be more representative of the maximum than the average depth of the landfill area. Therefore, the volume estimate presented above is likely to be an overestimate. The nearest deep soil boring to Landfill Area 5 is 2D, located approximately 170 feet north of the area. Lacustrine clay was encountered in this boring to a depth of 55 feet BGS. Based on this, the clay layer beneath Landfill Area 1 is estimated to be approximately 40 to 43 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical

migration of groundwater from Landfill Area 5.

4.1.5.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-5A. Tables 4-1 through 4-4 present the analytical results for all detected compounds. One TCL volatile was detected in the sample at a concentration above 1 mg/kg (toluene at 1.1 mg/kg). One TCL semivolatile was detected in the sample at a concentration above 10 mg/kg (di-n-butylphthalate at 13J (estimated) mg/kg). One pesticide/PCB compound was detected (PCB-1254 at 0.72 mg/kg). Several TCL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 5, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 115 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 23.

The results of the TCLP analyses for lead of the duplicate sample of SB-5A provided to the laboratory was 0.003 U mg/l (not detected at a detection limit of 0.003 mg/l). Based on this result, lead leaching to groundwater from Landfill Area 5 does not present a significant environmental concern.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 5 is not likely to pose an environmental concern. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.6 Landfill Area 6

4.1.6.1 General Characteristics

Landfill Area 6 is located in the central portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). It was excavated in 1975 to an estimated depth of 15 feet below ground surface (based on DuPont's estimate). It is roughly rectangular in shape, approximately 200 feet by 100 feet. Based on these dimensions, the landfill would be estimate to contain approximately 11,000 cubic yards of fill and reworked soil.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and development waste (laboratory waste).

4.1.6.2 Materials Encountered

Two soil borings (SB-6A and SB-6B) were advanced in Landfill Area 6. Landfilled materials encountered included: Corian™, transparent film (polyvinylalcohol according to DuPont) and building rubble. A septic odor from the SB-6A borehole was also reported. OVA measurements of the split-spoon samples ranged from 0 to 70 ppm. Based on the septic odor, the elevated OVA measurements were likely attributable to methane evolution.

This landfill contained large blocks of Corian™ which were difficult to auger through and prevented penetration of the clay base at SB-6A. The clay base was encountered at 22 feet BGS in SB-6B, suggesting that the depth estimate of 15 feet provided by DuPont and the volume estimate presented above may be low. The nearest deep soil boring to Landfill Area 6 is 3D, located approximately 120 feet north northwest of the area. Lacustrine clay was encountered in this boring from 7 to 68 feet BGS. Based on this,

the clay layer beneath Landfill Area 6 is estimated to be approximately 46 to 53 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 6.

4.1.6.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-6B. Tables 4-1 through 4-4 present the analytical results for all detected compounds. No TCL volatile organic chemicals were detected above 1 mg/kg in the sample. Two TCL semivolatiles were detected above 10 mg/kg: butylbenzylphthalate (110 mg/kg) and bis(2-ethylhexyl)phthalate (170 mg/kg). Two pesticide/PCB compounds were detected: PCB-1248 at 0.18 mg/kg and PCB-1260 at 0.13J (estimated) mg/kg. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 6, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 197 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 39.

The results of the TCLP analyses for lead of the duplicate sample of SB-6B provided to the laboratory was 0.0653 mg/l, well below the regulatory limit of 5.0 mg/l. Based on this result, lead leaching to groundwater from Landfill Area 6 does not present a significant environmental concern.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 6 is not likely to pose an environmental concern. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of

leachate below the top of the surrounding clay.

4.1.7 Landfill Area 7

4.1.7.1 General Characteristics

Landfill Area 7 is located in the southwest portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). It was excavated in 1976 to an estimated depth of 15 feet below ground surface (based on DuPont's estimate). The landfill is roughly rectangular in shape, approximately 200 feet by 100 feet. Based on these dimensions, the landfill would be estimated to contain approximately 11,000 cubic yards of fill.

Landfill Area 7 has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and development waste (laboratory waste).

4.1.7.2 Materials Encountered

Two soil borings (SB-7A and SB-7B) were advanced in Landfill Area 7. Landfilled materials encountered included: Corian™, reworked dark grey clay and silt, transparent film (possibly polyvinylalcohol) and white fibrous woven material. A septic odor from the borehole was also reported. OVA measurements of the split-spoon samples ranged from 6 to 40 ppm. The septic odor suggests the higher readings were probably influenced by methane evolution.

This landfill contained large blocks of Corian™ which could not be augured through. This prevented penetration to the clay base at SB-7A. The clay base was encountered at 18.2 feet BGS in SB-7B, suggesting that the 15 feet estimate provided by DuPont and the volume estimate presented above may be low. The nearest deep soil boring to

Landfill Area 7 is 3D, located approximately 300 feet north of the area. Lacustrine clay was encountered in this boring from 7 to 68 feet BGS. Based on this, the clay layer beneath Landfill Area 7 is estimated to be approximately 50 to 53 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 7.

4.1.7.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-7B. Tabled 4-1 through 4-4 present the analytical results for all detected compounds. No TCL volatiles were detected in the sample at concentrations above 1 mg/kg. Two TCL semivolatiles were detected above 10 mg/kg: butylbenzylphthalate at 690 mg/kg and bis(2-ethylhexyl)phthalate at 180J (estimated) mg/kg. Three pesticide/PCB compounds were detected: PCB-1248 at 4.8 mg/kg, PCB-1254 at 0.59 mg/kg, and PCB-1260 at 0.4 mg/kg. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 7, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 178 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 36.

The results of the TCLP analyses for lead of the duplicate sample of SB-7B provided to the laboratory was 0.0043 mg/l, well below the regulatory limit of 5.0 mg/l. Based on this result, lead leaching to groundwater from Landfill Area 7 does not likely present an environmental concern.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill

Area 7 is not likely to pose an environmental concern. The fill/waste is isolated by the underly[illegible] surrounding low permeability clay which would inhibit migration of leacha[illegible]ted below the top of the surrounding clay.

4.1.8 [illegible] Area 8

4.1.8.1 General Characteristics

Landfill Area 8 encompasses most of the northeastern portion of the undeveloped land between the plant production buildings and Kenmore Avenue (Figure 1-2). This area was originally a topographic low. DuPont estimates that 4 to 5 feet of fill was placed on the ground surface throughout the low-lying area. Landfill Area 8 was not excavated.

Most of the landfill area is currently owned by General Motors Corporation. The area encompasses approximately 600,000 ft^2 (approximately 530,000 ft^2 on GM property and 70,000 ft^2 on DuPont property. Using a thickness of 4.5 feet, landfill Area 8 would be estimated to contain approximately 100,000 cubic yards of fill.

The landfill has been classified by DuPont as containing General Waste, which could include any of the materials identified in Section 1.1, except for research and development waste (laboratory waste).

4.1.8.2 Materials Encountered

Two soil borings (SB-8A and SB-8B) were advanced in the portion of Landfill Area 8 on DuPont property. Landfilled materials encountered included: building rubble, cinders, Tedlar™, and dark grey fill. HNu measurements of the split-spoon sample ranged from 0 to 5 ppm.

The clay base was encountered at approximately 6 feet BGS in both SB-8A and SB-8B.

In both borings, the fill was present to a depth of 4 to 5 feet and was underlain by 1 to 2 feet of an organic muck or peat. Lacustrine clay underlied the organic soil at approximately 6 feet BGS. This suggests that the 4 to 5 feet estimate provided by DuPont may be representative of the average depth of the landfill area. The nearest deep soil boring to Landfill Area 8 is 4D, located approximately 100 feet north northwest of the area. Lacustrine clay was encountered in this boring to a depth of 77 feet BGS. Based on this, the clay layer beneath Landfill Area 8 is estimated to be approximately 71 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 8.

4.1.8.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from SB-8B. Tables 4-1 through 4-4 present the analytical results for all detected compounds. No TCL volatile organic chemicals were detected in the sample at concentrations above 1 mg/kg. TCL semivolatiles detected above 10 mg/kg were: fluoranthene at 12J mg/kg, pyrene at 29J mg/kg, chrysene at 11J (mg/kg) and benzo(a)pyrene at 12J mg/kg (J qualifier indicates estimated concentrations). Two pesticide/PCB compounds were detected: PCB-1248 at 0.36 mg/kg and PCB-1254 at 0.62 mg/kg. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 8, this condition was met for only one analyte -- lead. Lead was reported in the bulk sample at a concentration of 628 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 126.

The results of the TCLP analyses for lead of the duplicate sample of SB-8B provided to the laboratory was 0.550 mg/l, well below the regulatory limit of 5.0 mg/l. Based on this

result, lead leaching to groundwater from Landfill Area 8 does not likely present an environmental concern.

Based on the low concentrations of TCL/TAL chemicals detected, the fill in Landfill Area 8 is not likely to pose an environmental concern. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate generated below the top of the surrounding clay.

4.1.9 Landfill Area 9

4.1.9.1 General Characteristics

Landfill Area 9 is reported by DuPont to be a small research and development waste landfill located approximately 300 feet northeast of Landfill Area 2 (Figure 1-2). It was excavated in 1956 to an estimated depth of 10 feet below ground surface (based on DuPont's estimate). It is roughly square in shape, approximately 25 feet on a side. Based on these dimensions, the landfill would be estimated to contain approximately 230 cubic yards of fill and reworked soil.

4.1.9.2 Materials Encountered

Five soil borings, designated SB-9A, SB-9B, SB-9C, SB-9D, and SB-9E, were advanced in or in the vicinity of Landfill Area 9. Fill material was encountered in each boring. Fill materials observed included primarily building rubble with some slag, reworked clay, and dark grey fill. No evidence of glass or other laboratory waste as observed in any boring.

The clay base was encountered at the following depths:

Boring ID	Depth to Clay Base
SB-9A	6.3 feet
SB-9B	6.5 feet
SB-9C	5.4 feet
SB-9D	6.5 feet
SB-9E	6.5 feet

This suggests that the 10 feet depth estimated by DuPont is too high. The nearest deep soil boring to Landfill Area 9 is B-7, located approximately 450 feet southeast of the area. Lacustrine clay was encountered in this boring from 6 to 62 feet BGS. Based on this, the clay layer beneath Landfill Area 9 is estimated to be approximately 52 to 56 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 9.

4.1.9.3 Results of Chemical Analyses

TCL/TAL analyses were performed on a composite sample of waste material from four of the borings (sample designated as SB-9BCDE). Tables 4-1 through 4-4 presents the analytical results for all detected compounds. No TCL volatiles were detected in the sample above 0.1 mg/kg. No TCL semivolatiles were detected above 10 mg/kg in SB-9BCDE. However, in the blind field duplicate sample, the following semivolatiles were detected above 10 mg/kg: phenanthrene (14 mg/kg), fluoranthene (14 mg/kg), and pyrene (13 mg/kg). No pesticide/PCB compounds were detected. Several TAL metals were also detected, as shown on Table 4-4, at concentrations typical of urban soils.

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For Landfill Area 9, this condition was met for only one analyte -- lead. Lead

was reported in the bulk sample at a concentration of 148.2 mg/kg, which exceeded its regulatory limit of 5.0 mg/l by a factor of 30.

The results of the TCLP analyses for lead of the duplicate sample of SB-9ABCDE provided was 0.003 U mg/l (not detected at a detection limit of 0.003 mg/l). Based on this result, lead leaching to groundwater from Landfill Area 9 does not present a significant environmental concern.

No evidence of laboratory waste was encountered in any of the five borings in this area. The low concentrations of chemicals present in the composite sample from four borings located close to the suspected waste disposal area suggest that any horizontal migration of contaminants has been minimal. The landfilled material is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.1.10 Landfill Area 10

4.1.10.1 General Characteristics

Landfill Area 10 is a small research and development waste landfill located near the northeast end of the plant production buildings (Figure 1-2). It was excavated in 1957 to an estimated depth of 10 feet below ground surface (based on DuPont's estimate). It is roughly square in shape, approximately 25 feet on a side. Based on these dimensions, the landfill would be estimated to contain approximately 230 cubic yards of fill and reworked soil.

4.1.10.2 Materials Encountered

Eight soil borings, designated SB-10A, SB-10B, SB-10C, SB-10D, SB-10E, SB-10F, SB-10G, and SB-10H, were advanced in or in the vicinity of Landfill 10. The first seven

borings encountered primarily building rubble and reworked soil above the lacustrine clay and no evidence of laboratory waste was observed. Furthermore, there were no elevated OVA measurements from the first seven borings (range: 0 to 1.5 ppm). However, split-spoon samples from the eighth soil boring, SB-10H, contained glass fragments and fibers within the reworked clay. A strong odor was noted and OVA measurements were elevated (100 to greater than 1,000 ppm) from the samples from the 8 to 10 feet and 10 to 12 feet intervals. The OVA measurement taken off the clay (12.9 to 14 feet BGS) was 0 ppm, suggesting little vertical migration into the clay base has occurred.

The clay base was encountered at the following depths:

Boring ID	Depth to Clay Base
SB-10A	4 feet
SB-10B	4 feet
SB-10C	6 feet
SB-10D	Concrete slab at 0.5 feet
SB-10E	4 feet
SB-10F	4 feet
SB-10G	4 feet
SB-10H	12.9 feet

The nearest deep soil boring to Landfill Area 10 is 1D, located approximately 250 feet northeast of the area. Lacustrine clay was encountered in this boring to a depth of 62 feet BGS. Based on this, the clay layer beneath Landfill Area 10 is estimated to be approximately 49 feet in thickness. The clay layer, therefore, presents a low permeability barrier to vertical migration of groundwater from Landfill Area 10.

4.1.10.3 Results of Chemical Analyses

TCL/TAL analyses were performed on two composite samples of waste material from SB-10H. Sample SB-10H1 was a composite sample obtained from 2 to 6 feet BGS where the glass fragments and fibers were first encountered. Sample SB-10H2 was obtained from 8 to 14 feet BGS where the elevated OVA measurements were recorded. Tables 4-1 through 4-4 present the analytical results for all detected compounds.

The deeper sample (SB-10H2) contained much higher TCL/TAL concentrations than the upper sample (SB-10H1). TCL volatiles were not detected in SB-10H1 above 1 mg/kg. Several volatiles were detected in SB-10H2, with the maximum concentration of 3,800 mg/kg reported for toluene. No TCL semivolatiles were detected above 10 mg/kg in SB-10H1. TCL semivolatiles detected above 10 mg/kg in SB-10H2 were: phenol at 31E (estimated due to exceedance of calibration range) mg/kg, dimethylphthalate at 23E mg/kg, diethylphthalate at 370J (estimated) mg/kg, di-n-butylphthalate at 2,500 mg/kg, and bis(2-ethylhexyl)phthalate at 11E mg/kg. One pesticide/PCB compound was detected in SB-10H1: PCB-1254 at 3.4 mg/kg. Very low concentrations of six pesticide/PCB compounds were detected in SB-10H2: gamma BHC at 0.0014 J (estimated) mg/kg, heptachlor at 0.0049 mg/kg, endosulfan II at 0.0093 mg/kg, 4,4'-DDT at 0.010 mg/kg, endrin ketone at 0.020 mg/kg, and alpha-chlordane at 0.0037 mg/kg. TAL metals concentrations in both samples were in the typical range for urban soils except for mercury which was elevated (99.5 mg/kg in SB-10H1 and 4,010 mg/kg in SB-10H2).

Addendum 1 to the Work Plan states that TCLP analyses would be performed for any TCLP chemical parameters which were reported in the bulk sample analytical results at concentrations (mg/kg) exceeding the TCLP regulatory limit (mg/l) by a factor of more than 20. For sample SB-10H1, this condition was met for only one analyte -- mercury. Mercury was reported in the bulk sample at a concentration of 99.5 mg/kg, which exceeded its regulatory limit of 0.2 mg/l by a factor of 498.

For sample SB-10H2, five chemicals required the TCLP analyses:

Chemical	Bulk Concentration	TCLP Regulatory Limit	Exceedance Factor
Chloroform	250 mg/kg	6.0 mg/l	42
Trichloroethene	440 mg/kg	0.5 mg/l	880
Benzene	140 mg/kg	0.5 mg/l	280
Tetrachloroethene	2,600 mg/kg	0.7 mg/l	3,700
Mercury	4,010 mg/kg	0.2 mg/l	20,000

Although only four volatile organic chemicals met the criteria for TCLP analyses, the laboratory was instructed to analyze for the entire TCLP volatile fraction.

The results of the TCLP analyses of duplicate samples provided to the laboratory were:

Sample ID	Chemical	TCLP Concentration (mg/l)	TCLP Regulatory Limit[1] (mg/l)
SB-10H1	Mercury	0.0002U	0.2
SB-10H2	Vinyl chloride	0.031J	0.2
	1,1-Dichloroethene	0.033J	0.7
	Chloroform	6.2	6.0
	1,2-Dichloroethane	0.1U	0.5
	2-Butanone	3.1	200
	Carbon tetrachloride	0.1U	0.5
	Trichloroethene	7.9	0.5
	Benzene	2.7	0.5

Sample ID	Chemical	TCLP Concentration (mg/l)	TCLP Regulatory Limit[1] (mg/l)
SB-10H2	Tetrachloroethene	17.0	0.7
(continued)	Chlorobenzene	0.39	100
	Mercury	0.0037	0.2

Exceedance of the TCLP regulatory limit was limited to the four volatile organic chemicals which met the bulk sample concentration criteria for TCLP analysis in SB-10H2: chloroform, trichloroethene, benzene, and tetrachloroethene.

The observations (no evidence of laboratory waste) and the low OVA measurements during seven of the eight soil borings in Landfill Area 10 suggest that the area of laboratory waste disposal is small (probably less than the 25 feet by 25 feet area estimated by DuPont). TCL and mercury concentrations are elevated within this disposal area. However, the low OVA readings in the surrounding borings suggest that little horizontal migration of volatile organics has occurred. The contaminated material was found at depth, primarily from 8 to 14 feet, indicating it is surrounded by clay on the bottom and on the sides. The fill/waste is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate below the top of the surrounding clay.

4.2 GROUNDWATER QUALITY

Groundwater quality at the site was investigated through sampling of the five new shallow overburden wells (DYF-1, DYF-2, DYF-3, DYF-4, and DYF-5) located along the downgradient perimeter of the plant (see Figures 3-1 through 3-4). Samples were analyzed in accordance with the Work Plan for the TCL and TAL. The results of these analyses are presented in Table 4-7 (volatiles), 4-8 (semivolatiles), 4-9 (pesticide/PCBs), and 4-10 (TAL metals).

No TCL volatiles were detected in any samples. One TCL semivolatile was detected in one sample: bis(2-ethylhexyl)phthalate, reported at 10J (estimated) ug/l in monitoring well DYF-1. The presence of this chemical at low concentrations in monitoring wells is often attributable to leaching from PVC well casings or sampling equipment, or from laboratory contamination, and therefore is not indicative of groundwater contamination. No pesticide/PCB compounds were detected.

TAL metals results show no evidence of elevated contaminant levels relative to urban/industrial background. New York State Groundwater Quality Standards (NYSGQS) for Class GA groundwater were exceeded in more than one groundwater sample for three metals: iron, manganese, and sodium. There were only two exceedances of NYSGQS for the toxic metals, both occurring in DYF-3. One was a nominal exceedance for lead (26.5 ug/l in the sample versus a standard of 25 ug/l). The other was for silver (122 ug/l in the sample versus a standard of 50 ug/l). Both lead (17 ug/l) and silver (14 ug/l) were below NYSGQS in the blind duplicate sample from DYF-3 (Table 4-10).

The results of the groundwater sampling show that the plant has not significantly impacted shallow overburden groundwater quality at the downgradient plant perimeter.

4.3 STORMWATER AND SEDIMENT SAMPLING

Analytical results of the stormwater and sediment sampling were provided by DuPont and are presented in Appendix F. For the sediment sample, no volatile organic chemicals were present above detection limits. No semivolatile organic compounds were detected above 1 mg/kg and no pesticide/PCB compounds were present above detection limits. Metals concentrations were within typical ranges for urban/industrial drainageways.

No TCL volatiles, semivolatiles, or pesticide/PCB compounds were detected in the

sample of dry weather storm flow. TAL metals results were all below NYSGQS for Class A surface water except for iron (concentration of 4,800 ug/l versus a standard of 300 ug/l), which is likely to be naturally occurring in the soil.

These results suggest that the landfill areas have not impacted the water quality of dry weather storm sewer flow or sediment chemistry. A sampling of storm sewer flow during a precipitation event is scheduled for August or September 1993, depending on rainfall. The analytical results will be submitted to NYSDEC as an Addendum to this Phase II Investigation Report.

5.0
CONCLUSIONS

As described in Section 1.2, the Phase I Investigation Report for the DuPont Yerkes Plant (E&E, January 1990) indicated that potentially significant environmental impacts of the plant (in particular the 10 landfill areas) were limited to potential migration of landfilled constituents to the Niagara River. This Phase II Investigation focused on the two most likely potential pathways for contaminant migration to the Niagara River:

1. Migration in shallow groundwater (above the thick layer of lacustrine clay underlying the entire site)

2. Migration in stormwater runoff

The Phase II Investigation also characterized the materials present in the landfill areas and assessed the potential for leaching and migration of leached constituents. Conclusions of the Phase II Investigation are summarized below.

5.1 LANDFILL CHARACTERIZATION

The ten landfill areas at the plant (Figure 1-2) were individually investigated through soil borings and analyses of soil/waste samples. Composite samples from the borings, which included waste materials present, were prepared as determined in the field by representatives of WCC and NYSDEC. The results of the chemical analyses performed showed that Landfill Areas 1, 2, 3, 4, 5, 6, 7, 8, and 9 contain fill with relatively low concentrations of TCL/TAL constituents. Polyaromatic hydrocarbons (PAH) compounds were the organic chemicals detected most frequently, with several reported concentrations above 10 ppm. However, these PAH concentrations are typical of urban and industrial fill as they are constituents of tars, asphalts, and other heavy petroleum

based products. The reported levels may represent the background concentrations in this industrial area.

In these nine landfills, lead was the only heavy metal detected at or above the total concentration used in this investigation to trigger Toxicity Characteristic Leaching Procedure (TCLP) testing (see Section 2.2.2). The TCLP results for lead were in all cases very low, indicating that it has a low potential for leaching and does not present a concern with respect to causing groundwater contamination. The total lead concentrations detected were generally typical for urban areas near busy highways such as I-190 (which borders the site).

The fill/waste in these nine landfill areas is underlain by 18 to 70 feet of low permeability lacustrine clay. Since the landfill areas were excavated into the clay (except for Landfill Area 8), the clay sides of the pits also present barriers to lateral migration of potential leachate constituents.

Based on the results of chemical analyses of waste and the presence of the clay beneath and surrounding the areas, the fill in Landfill Areas 1, 2, 3, 4, 5, 6, 7, 8, and 9 do not pose a significant potential for causing groundwater contamination, and therefore present no significant threat to surface water quality via the groundwater pathway.

Landfill Area 10 was reported by DuPont to contain laboratory waste. One boring in Landfill Area 10 did encounter glass fragments and other evidence of laboratory waste. Organic odors and high OVA measurements were recorded for samples from this boring. Two composite samples were prepared from this boring, one from the upper fill (2 to 6 feet BGS) and one from the lower fill (8 to 14 feet BGS). TCLP regulatory limits were exceeded for the lower sample for four chemicals: chloroform, trichloroethene, benzene, and tetrachloroethene. The upper sample had much lower chemical concentrations, with no detections of volatile organics and no semivolatile or pesticide/PCB detections above 10 mg/kg. Based on these findings, the laboratory waste

is primarily limited to the bottom of the former excavation, and is therefore surrounded on the bottom and sides by low permeability clay.

The observations and OVA measurements from the other seven borings showed no evidence of waste and no OVA measurements above 1.5 ppm. This suggests that the laboratory waste in Landfill Area 10 is localized to a small area (probably less than the 25 feet by 25 feet estimated by DuPont), and that little horizontal migration of volatile organic constituents has occurred. Furthermore, the split-spoon sample of native clay obtained immediately below the laboratory waste was screened with the OVA and no volatile organic vapors were detected, suggesting little penetration of volatile organic constituents into the clay layer has occurred. Based on these findings, the small volume of laboratory waste present is isolated by the underlying and surrounding low permeability clay which would inhibit migration of leachate generated below the top of the surrounding clay.

In general, based on the findings of the soil borings in the 10 landfill areas, the waste materials are isolated and do not constitute a significant potential source of groundwater contamination at the site, and therefore present no significant threat to surface water quality via the groundwater pathway. Based on the results of chemical analyses of soil samples, WCC recommends that no further investigation or action is required at Landfill Areas 1, 2, 3, 4, 5, 6, 7, 8, and 9. Some further investigation or monitoring should be considered for Landfill Area 10.

5.2 OVERBURDEN GROUNDWATER QUALITY

Groundwater quality above the lacustrine clay was investigated through sampling of five new overburden wells located along the downgradient perimeter of the site. Quarterly hydraulic head measurements from all existing wells confirmed the downgradient perimeter. There was only one detection of a TCL organic compound, bis(2-ethylhexyl)phthalate at 10J (estimated) ug/l. This level of bis(2-ethylhexyl)phthalate,

which is an ubiquitous component of plastics, is likely an artifact of the PVC well casing or a result of laboratory contamination. It is not indicative of site groundwater contamination. Metals concentrations were generally below New York State Groundwater Quality Standards for Class GA groundwater except for iron, manganese, and sodium. In addition, there was one minor exceedance for lead and one exceedance for silver, but both were below NYSGQS in the blind field duplicate sample. These low levels do not appear to be indicative of site contamination, but rather of background conditions in this unit, which is primarily urban/industrial fill placed above the clay.

5.3 STORMWATER

The results of the storm sewer water and catch basin sediment sampling showed no elevated levels of TCL/TAL chemicals, suggesting the landfill areas have not impacted the chemistry of dry weather storm sewer flow or sediment.

6.0
LIMITATIONS

WCC's work is in accordance with our understanding of professional practice and environmental standards existing at the time the work was performed. Professional judgements presented are based on our evaluation of technical information gathered and on our understanding of site conditions and site history. Our analyses, interpretations, and judgements rendered are consistent with professional standards of care and skill ordinarily exercised by the consulting community and reflect the degree of conservatism WCC deems proper for this project at this time. Methods are constantly changing and it is recognized that standards may subsequently change because of improvements in the state of the practice.

The information used for this investigation is presented in this report and includes boring logs, water level elevations, and soil and water quality analyses. Boring logs reflect subsurface conditions for the indicated locations and dates. WCC has endeavored to collect soil and water samples which are representative of site conditions. Soil and water quality samples, however, can only represent a small portion of the subsurface conditions in the area, both in volume and through time. The interpretations made in this report are based on the assumption that subsurface conditions do not deviate appreciably from those found during our field investigations.

7.0
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Tables

TABLE 2-1

SUMMARY OF SAMPLES COLLECTED AND ANALYSES PERFORMED
YERKES PHASE II INVESTIGATION

Sample Date	Sample ID	Matrix	Analyses Performed
8/10/92	SB-2A3	soil	TCL/TAL[1] metals, TCLP[2]
8/10/92	SB-8B	soil	TCL/TAL[1] metals, TCLP[2]
8/11/92	SB-1A	soil	TCL/TAL[1] metals, TCLP[2]
8/11/92	SB-1C (Dup. of SB-1A)	soil	TCL/TAL[1] metals, TCLP[2]
8/12/92	SB-5A	soil	TCL/TAL[1] metals, TCLP[2]
8/12/92	SB-7B	soil	TCL/TAL[1] metals, TCLP[2]
8/13/92	SB-3B	soil	TCL/TAL[1] metals
8/13/92	RBSB-1	water	TCL/TAL[1] metals
8/14/92	SB-6B	soil	TCL/TAL[1] metals, TCLP[2]
8/14/92	RBSB-2	water	TCL/TAL[1] metals
8/17/92	SB-4A	soil	TCL/TAL[1] metals
8/18/92	SB-9 BCDE	soil	TCL/TAL[1] metals, TCLP[2]
8/18/92	SB-9 FGHI (Dup. of SB-9BCDE)	soil	TCL/TAL[1] metals
8/18/92	SB-10H1	soil	TCL/TAL[1] metals, TCLP[2]
8/18/92	SB-10H2	soil	TCL/TAL[1] metals, TCLP[2]
9/2/92	DYF-1	water	TCL VOCs, TCL BNAs
9/2/92	DYF-3	water	TCL/TAL metals
9/2/92	QA-1 (Dup. of DYF-3)	water	TCL/TAL metals
9/2/92	DYF-4	water	TCL/TAL metals
9/2/92	DYF-5	water	TCL/TAL metals
9/2/92	Trip blank	water	TCL VOCs
4/1/93	DYF-1	water	TCL Pest/PCBs/TAL metals chloride, sulfate
4/1/93	DYF-2	water	TCL/TAL metals
8/5/93	Stormwater[3]	water	TCL/TAL metals
8/5/93	Sediment[4]	soil	TCL/TAL metals

(1) TCL/TAL - Target compound list/target analyte list
(2) Toxicity Characteristic Leaching Procedure (TCLP) analyses for selected analytes (see Table 4-5)
(3) Dry weather flow in storm sewer
(4) Sediment from catch basin

TABLE 4-1
DUPONT YERKES PHASE II
TCL VOLATILES ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-1A	SB-1A Duplicate	SB-2A3	SB-3B	SB-4A	SB-5A	SB-6B	SB-7B	SB-8B	RBSB-1
Date Sampled	8/11/92	08/11/92	08/10/92	8/13/92	8/17/92	8/12/92	8/14/92	8/12/92	8/10/92	8/13/92
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l
Volatiles										
vinyl chloride	55U	47U	23U	11U	13U	25J	13U	17U	14U	10U
methylene chloride	7J	47U	6J	11U	59	71U	48	21	14U	10U
acetone	4100	880	360	38U	140	270	180	140	48	12
carbon disulfide	13000J	650	23U	11U	13U	71U	13U	17U	14U	10U
1,1-dichloroethene	42J	100	23U	11U	13U	16J	13U	17U	14U	10U
1,2-dichloroethene (total)	55U	47U	23U	11U	13U	71U	13U	17U	14U	10U
chloroform	55U	5J	23U	11U	13U	71U	13U	17U	14U	1J
1,2-dichloroethane	55U	47U	23U	11U	13U	120	13U	17U	14U	10U
2-butanone	5500	4300	23U	11U	13U	500	13U	14J	14U	10U
1,1,1-trichlorethane	55U	47U	23U	11U	13U	71U	13U	17U	14U	10U
carbon tetrachloride	55U	47U	23U	11U	13U	71U	13U	17U	14U	10U
1,2-dichloropropane	55U	47U	23U	11U	13U	71U	13U	17U	14U	1J
trichloroethene	13J	75	23U	11U	1J	7J	13U	17U	2J	10U
1,1,2-trichloroethane	55U	47U	23U	11U	13U	10J	13U	17U	14U	10U
benzene	74	140	10J	11U	8J	110	3J	2J	13J	10U
4-methyl-2-pentanone	46J	24J	23U	11U	13U	48J	13U	17U	14U	10U
tetrachloroethene	55U	47U	23U	11U	13U	71U	13U	17U	3J	10U
1,1,2,2-tetrachloroethane	55U	47U	23U	11U	13U	71U	13U	17U	14U	10U
toluene	490	2800	28	11U	11J	1100	3J	17U	11J	10U
chlorobenzene	55U	47U	23U	11U	2J	7J	13U	17U	14U	10U
ethylbenzene	4J	9J	6J	11U	3J	27J	13U	17U	14U	10U
total xylenes	75	88	310	11U	8J	350	13U	17U	14U	10U

Notes:
E - Concentration exceeded the instrument's linear calibration range, and is considered an estimated value.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-1
DUPONT YERKES PHASE II
TCL VOLATILES ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	RBSB-2	SB-9BCDE	SB-9BCDE Duplicate	SB-10H1	SB-10H2
Date Sampled	8/14/92	8/18/92	8/18/92	8/18/92	8/18/92
Units	ug/l	ug/kg	ug/kg	ug/kg	ug/kg
Volatiles					
vinyl chloride	10U	13U	12U	11U	3300J
methylene chloride	10U	13U	12U	6J	35000
acetone	6J	52	52	22	94000
carbon disulfide	10U	13U	12U	11U	7300U
1,1-dichloroethene	10U	13U	12U	10J	2500J
1,2-dichloroethene (total)	10U	13U	12U	40	7600
chloroform	1J	13U	12U	240	250000
1,2-dichloroethane	10U	13U	12U	110	7300U
2-butanone	10U	13U	11J	11U	180000E
1,1,1-trichlorethane	10U	13U	12U	6J	7300U
carbon tetrachloride	10U	13U	12U	16	7300U
1,2-dichloropropane	1J	13U	12U	11U	7300U
trichloroethene	10U	13U	12U	560	440000
1,1,2-trichloroethane	10U	13U	12U	660	190000
benzene	10U	13U	12U	17	140000
4-methyl-2-pentanone	10U	13U	12U	11U	24000
tetrachloroethene	10U	13U	12U	410	2600000
1,1,2,2-tetrachloroethane	10U	13U	12U	270	360000
toluene	10U	13U	12U	550	3800000
chlorobenzene	10U	13U	12U	3J	32000
ethylbenzene	10U	13U	12U	7J	76000
total xylenes	10U	13U	12U	35	260000

Notes:
E - Concentration exceeded the instrument's linear calibration range, and is considered an estimated value.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-2
DUPONT YERKES PHASE II
TCL SEMIVOLATILES ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-1A	SB-1A Duplicate	SB-2A3	SB-3B	SB-4A	SB-5A
Date Sampled	8/11/92	08/11/92	8/10/92	8/13/92	8/17/92	8/12/92
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Semi-Volatiles						
phenol	310J	510	320J	430U	7700J	480U
1,4-dichlorobenzene	440UJ	430U	320U	430U	330U	480U
1,2-dichlorobenzene	440UJ	430U	320U	430U	330U	480U
2-methylphenol	63J	85J	320U	130J	330U	480U
4-methylphenol	130J	740	100J	300J	180J	480U
2,4-dimethylphenol	440UJ	84J	63J	270J	120J	480U
1,2,4-trichlorobenzene	440UJ	430U	320U	430U	250J	480U
naphthalene	2100J	18000J	74J	14000J	6400J	520
hexachlorobutadiene	440UJ	430U	320U	430U	330U	480U
4-chloro-3-methylphenol	440UJ	430U	320U	430U	330U	480U
2-methylnaphthalene	670J	2200	79J	6200J	2600	290J
2-chloronaphthalene	440UJ	430U	320U	430U	330U	480U
dimethyl phthalate	440UJ	430U	320U	430U	42J	480U
acenaphthylene	370J	890	320U	570	48J	480U
acenaphthene	1500J	20000J	30J	7700J	3100J	170J
dibenzofuran	1200J	13000J	28J	5400J	3000J	480U
diethylphthalate	440UJ	430U	320U	430U	460	480U
fluorene	1800J	24000J	42J	8400J	4100E	250J
n-nitrosodiphenylamine	440UJ	430U	320U	430U	300U	270J
phenanthrene	15000J	150000	290J	33000J	160J	1100
anthracene	2800J	42000J	64J	7300J	3900J	210J
carbazole	1400J	18000J	30J	3200J	360	130J
di-n-butylphthalate	810J	4700J	110J	430U	2500	13000J
fluoranthene	14000J	150000	310J	26000J	120J	910
pyrene	11000J	120000	280J	19000J	14000J	1200
butylbenzylphthalate	440UJ	430U	320U	150J	28000J	480U
benzo(a)anthracene	5700J	55000	100J	16000J	6600E	520
chrysene	6200J	67000	160J	1800	7700E	550
bis(2-ethylhexyl)phthalate	2600J	3200J	1800	5100J	5900E	2600
di-n-octyl phthalate	440UJ	430U	320U	430U	330U	480U
benzo(b)fluoranthene	6000J	65000	180J	7200J	8500E	560
benzo(k)fluoranthene	5400J	33000J	100J	2700J	3300E	330J
benzo(a)pyrene	5000J	52000	130J	5100J	3100E	480U
indeno(1,2,3-cd)pyrene	2000J	28000J	320U	1500	950	480U
dibenz(a,h)anthracene	400J	4900J	320U	450	390	480U
benzo(g,h,i)perylene	1200J	21000J	31J	1300	800	480U

Notes:
E - Concentration exceeded the instrument's linear calibration range, and is considered an estimated value.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-2
DUPONT YERKES PHASE II
TCL SEMIVOLATILES ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-6B	SB-7B	SB-8B	RBSB-1	RBSB-2	SB-9BCDE	SB-9BCDE Duplicate
Date Sampled	8/14/92	8/12/92	8/10/92	8/13/92	9/2/92	8/18/92	8/18/92
Units	ug/kg	ug/kg	ug/kg	ug/l	ug/l	ug/kg	ug/kg
Semi-Volatiles							
phenol	420U	400U	460U	10U	10U	390U	390U
1,4-dichlorobenzene	420U	400U	170J	10U	10U	390U	390U
1,2-dichlorobenzene	420U	400U	460U	10U	10U	390U	390U
2-methylphenol	420U	400U	460U	10U	10U	390U	390U
4-methylphenol	420U	400U	300J	10U	10U	390U	390U
2,4-dimethylphenol	29J	400U	460U	10U	10U	390U	390U
1,2,4-trichlorobenzene	420U	400U	460U	10U	10U	390U	390U
naphthalene	55J	71J	1000	10U	10U	390U	610
hexachlorobutadiene	420U	400U	460U	10U	10U	390U	390U
4-chloro-3-methylphenol	420U	400U	460U	10U	10U	390U	390U
2-methylnaphthalene	65J	94J	820	10U	10U	390U	430
2-chloronaphthalene	420U	400U	460U	10U	10U	390U	390U
dimethyl phthalate	420U	400U	460U	10U	10U	390U	390U
acenaphthylene	14J	400U	130J	10U	10U	390U	390U
acenaphthene	21J	400U	850	10U	10U	110J	2600
dibenzofuran	23J	44J	950	10U	10U	70J	1300
diethylphthalate	420U	400U	460U	10U	10U	390U	390U
fluorene	26J	55J	1400	10U	10U	110J	2000
n-nitrosodiphenylamine	420J	400U	460U	10U	10U	390U	390U
phenanthrene	190J	370J	9800J	10U	10U	910	14000
anthracene	46J	400U	3100J	10U	10U	290J	4900
carbazole	22J	400U	1300	10U	10U	85J	1400
di-n-butylphthalate	300J	540	5800J	10U	10U	390U	390U
fluoranthene	260J	460	12000J	10U	10U	1500	14000
pyrene	330J	410	29000J	10U	10U	1400	13000
butylbenzylphthalate	110000	690000	460U	0.8J	10U	390U	390U
benzo(a)anthracene	420U	250J	9900J	10U	10U	940	9100
chrysene	260J	230J	11000J	10U	10U	1000	8000
bis(2-ethylhexyl)phthalate	170000	180000J	3700J	10U	10U	2000	940
di-n-octyl phthalate	520	1200	460U	10U	10U	390U	390U
benzo(b)fluoranthene	340J	400U	3500	10U	10U	980	8300
benzo(k)fluoranthene	180J	350J	9300J	10U	10U	430	4700
benzo(a)pyrene	220J	180J	12000J	10U	10U	680	3000J
indeno(1,2,3-cd)pyrene	420U	86J	460U	10U	10U	180J	1200
dibenz(a,h)anthracene	420U	20J	460U	10U	10U	64J	55J
benzo(g,h,i)perylene	70J	51J	460U	10U	10U	200J	1200

Notes:

E - Concentration exceeded the instrument's linear calibration range, and is considered an estimated value.

J - Associated value is estimated.

U - Non-detected at the stated detection limit.

TABLE 4-2
DUPONT YERKES PHASE II
TCL SEMIVOLATILES ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-10H1	SB-10H2
Date Sampled	8/18/92	8/18/92
Units	ug/kg	ug/kg
Semi-Volatiles		
phenol	380U	31000E
1,4-dichlorobenzene	380U	1000U
1,2-dichlorobenzene	380U	230J
2-methylphenol	380U	1000000U
4-methylphenol	380U	580J
2,4-dimethylphenol	380U	1000000U
1,2,4-trichlorobenzene	380U	81J
naphthalene	750	490J
hexachlorobutadiene	380U	67J
4-chloro-3-methylphenol	380U	1000000U
2-methylnaphthalene	960	110J
2-chloronaphthalene	380U	540J
dimethyl phthalate	43J	23000E
acenaphthylene	380U	1000U
acenaphthene	200J	1000U
dibenzofuran	350J	1000U
diethylphthalate	70J	370000J
fluorene	250J	1000U
n-nitrosodiphenylamine	380U	1000U
phenanthrene	2400	150J
anthracene	360J	120J
carbazole	260J	1000U
di-n-butylphthalate	140J	2500000
fluoranthene	2100	1000U
pyrene	2600	1000U
butylbenzylphthalate	49J	1500
benzo(a)anthracene	1700	1000U
chrysene	1900	1000U
bis(2-ethylhexyl)phthalate	1800J	11000E
di-n-octyl phthalate	380U	1000U
benzo(b)fluoranthene	2600	1000U
benzo(k)fluoranthene	860	1000U
benzo(a)pyrene	1200	1000U
indeno(1,2,3-cd)pyrene	230J	1000U
dibenz(a,h)anthracene	380U	1000U
benzo(g,h,i)perylene	250J	1000U

Notes:
E - Concentration exceeded the instrument's linear calibration range, and is considered an estimated value.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-3
DUPONT YERKES PHASE II
TCL PESTICIDES/PCBS ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-1A	SB-1A Duplicate	SB-2A3	SB-3B	SB-4A	SB-5A	SB-6B	SB-7B	SB-8B	RBSB-1
Date Sampled	8/11/92	08/11/92	08/10/92	08/13/92	8/17/92	8/12/92	8/14/92	8/12/92	8/10/92	8/13/92
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/l
Pesticides/PCBs										
gamma-BHC	23U	22U	3.4U	2.4J	6.8U	25U	8.7U	21U	12U	0.050U
heptachlor	23U	22U	3.4U	9.1UJ	6.8UR	25U	8.7U	21U	12U	0.050U
endosulfan II	44U	43U	6.6U	2.7J	4.9J	48U	17U	40U	23U	0.10U
4,4'-DDD	44U	43U	6.6U	18UJ	13U	48U	17U	40U	23U	0.10U
4,4'-DDT	44U	43U	6.6U	18UJ	12J	48U	17U	40U	23U	0.10U
methoxychlor	230U	220U	34U	91UJ	16J	250U	87U	210U	120U	0.50U
endrin ketone	44U	43U	6.6U	18UJ	13U	48U	17U	40U	23U	0.10U
endrin aldehyde	44U	43U	6.6U	18UJ	22	48U	17U	40U	23U	0.10U
alpha-chlordane	23U	22U	3.4U	9.1UJ	3.1J	25U	8.7U	21U	12U	0.050U
gamma-chlordane	23U	22U	3.4U	2.0J	6.8U	25U	8.7U	21U	12U	0.050U
Aroclor 1242	440U	430U	66U	180UJ	130U	480U	170U	4800	230U	1.0U
Aroclor 1248	1000	720	3900	180UJ	130U	480U	180	400U	360	1.0U
Aroclor 1254	440U	430U	66U	180UJ	130U	720	170U	590	620	1.0U
Aroclor 1260	440U	430U	66U	180UJ	130U	480U	130J	400	230U	1.0U

Notes:
J - Associated value is estimated.
U - Non-detected at the stated detection limit.
R - Associated value is unusable.

TABLE 4-3
DUPONT YERKES PHASE II
TCL PESTICIDES/PCBS ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	RBSB-2	SB-9BCDE	SB-9BCDE Duplicate	SB-10H1	SB-10H2
Date Sampled	8/14/92	8/18/92	8/18/92	8/18/92	8/18/92
Units	ug/l	ug/kg	ug/kg	ug/kg	ug/kg
Pesticides/PCBs					
gamma-BHC	0.050U	2.0U	2.1U	20U	1.4J
heptachlor	0.050U	2.0U	2.1U	20U	4.9
endosulfan II	0.10U	4.0U	4.0U	39U	9.3
4,4'-DDD	0.10U	4.0U	0.88J	39U	5.1U
4,4'-DDT	0.10U	4.0U	4.0U	39U	10
methoxychlor	0.50U	20U	21U	200U	26U
endrin ketone	0.10U	4.0U	4.0U	39U	20
endrin aldehyde	0.10U	4.0U	4.0U	39U	5.1U
alpha-chlordane	0.050U	2.0U	2.1U	20U	3.7
gamma-chlordane	0.050U	2.0U	2.1U	20U	2.6U
Aroclor 1242	1.0U	40U	40U	390U	51U
Aroclor 1248	1.0U	40U	40U	390U	51U
Aroclor 1254	1.0U	40U	40U	3700J	51U
Aroclor 1260	1.0U	40U	40U	390U	51U

Notes:
J - Associated value is estimated.
U - Non-detected at the stated detection limit.
R - Associated value is unusable.

TABLE 4-4
DUPONT YERKES PHASE II
TAL METALS ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	SB-1A	SB-1A Duplicate	SB-2A3	SB-3B	SB-4A	SB-5A	SB-6B	SB-7B	SB-8B	RBSB-1
Date Sampled	8/11/92	08/11/92	08/10/92	08/13/92	8/17/92	8/12/92	8/14/92	8/12/92	8/10/92	8/13/92
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/l
TAL Metals										
Aluminum	10400	11300	7400	7850	2820J	9960	12300	21400	15700	60.0U
Antimony	1.3U	2.2B	2.4U	1.2U	1.3U	1.4B	1.3U	3.3B	1.8B	5.0U
Arsenic	13.3	10.8	6.8	8.1	24.6J	4.3	6.3	23.3	27.8	5.0U
Barium	136	240	76.6	165	27.2B	180	87.3	304	385	50.0U
Beryllium	1.2U	1.3U	2.4U	1.2U	1.2U	1.4U	1.3U	1.8U	1.5U	5.0U
Cadmium	1.2U	1.3U	2.4U	1.2U	1.2U	1.4U	1.3U	1.8U	1.5U	5.0U
Calcium	23300	46800	21000	54300	10400J	32900	120000	27300	14100	760B
Chromium	22.4	35.6	55.5	15.5	3.4J	18.7	18.6	31.4	45.4	10.0U
Cobalt	10.8B	9.3B	9.6U	9.4B	4.9UJ	7.1B	6.6B	14.0B	14.8	20.0U
Copper	62.3	163	83.3	43.1	9.6J	59.7	29.2	50.6	155	10.0U
Iron	26900	35100	33200	17600	6250J	19700	15800	37700	48800	105
Lead	169	334	174	53.4	54.2J	115	197	178	628	55.9
Magnesium	7770	8520	4780	16000	2070J	7530	44300	7610	3740	400U
Manganese	432	903	968	536	125J	594	580	695	504	10.0U
Mercury	0.84	0.23	0.46	0.22	0.12UJ	0.58	0.21	0.23	1.9	0.20U
Nickel	28	35.2	37.5	33.9	7.4U	23.5	12.4	31.5	40.9	30.0U
Potassium	1740	1560	1250B	1180B	229B	1170B	961B	1800	1820	600U
Selenium	1.3	1.4U	2.4U	1.2U	1.3U	1.4U	1.3U	1.8U	1.5U	5.0U
Silver	0.10B	1.5B	0.58B	0.07U	0.21B	0.09U	0.08U	0.18B	0.23B	0.30U
Sodium	3560	3550	2110B	1090B	1310	2610	1330	1530B	1570	877B
Thallium	1.3U	1.4U	2.4U	1.2U	1.3U	1.4U	1.3U	1.8U	1.5U	5.0U
Vanadium	24.7	20	14.5B	65.6	4.9U	19.2	16.7	38.1	41.7	20.0U
Zinc	181	516	632	112	44.6J	152	123	265	736	20

Notes:
B - Analyte detected above the instrument detection limit but below the contract required detection limit.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-4
DUPONT YERKES PHASE II
TAL METALS ANALYSES FOR SOIL/WASTE SAMPLES

Sample I.D.	RBSB-2	SB-9BCDE	SB-9BCDE Duplicate	SB-10H1	SB-10H2
Date Sampled	8/14/92	8/18/92	8/18/92	8/18/92	8/18/92
Units	ug/l	mg/kg	mg/kg	mg/kg	mg/kg
TAL Metals					
Aluminum	60.0U	11600	14800	5890	11300
Antimony	5.0U	64.6	63.6	90.4	59.5
Arsenic	5.0U	5.9	5.4	60.6	15.4
Barium	50.0U	133	116	240	137
Beryllium	5.0U	1.3U	1.3U	1.2U	1.5U
Cadmium	5.0U	1.3U	1.3U	1.2U	11.6
Calcium	625B	118000	58900	17100	35300
Chromium	10.0U	19.7	23.7	25.3	63.5
Cobalt	20.0U	9.0B	12.1B	4.7U	12.0B
Copper	10.0U	27.2	26.9	30.3	1340
Iron	36.6B	21000	24400	83100	22400
Lead	59.7	148	22.3	63.2	94.4
Magnesium	400U	54700	19600	2650	10300
Manganese	10.0U	1060	631	268	494
Mercury	0.20U	0.12U	0.11U	99.5	4010
Nickel	30.0U	33.6	33.5	7.1U	29.4
Potassium	600U	1640	2660	1770	1640
Selenium	5.0U	1.3U	1.2U	4.9	1.6U
Silver	0.30U	2.7U	2.6U	2.4U	54.5
Sodium	819B	617B	582B	641B	660B
Thallium	5.0U	1.3U	1.2U	7.5	1.6U
Vanadium	20.0U	21.4	27.8	45.0B	23
Zinc	20.0U	155	92.8	95.6	283

Notes:
B - Analyte detected above the instrument detection limit but below the contract
E - Concentration exceeded the instrument's linear calibration range, and is cons
J - Associated value is estimated.
U - Non-detected at the stated detection limit.
R - Associated value is unusable.

TABLE 4-5

SAMPLES REQUIRING TCLP ANALYSES BASED ON TCL/TAL RESULTS EXCEEDING THE TCLP REGULATORY LEVEL BY A FACTOR OF 20 OR MORE DU PONT YERKES PHASE II INVESTIGATION

Sample ID	Chemical	Total Concentration (mg/kg)	TCLP Regulatory Limit[1] (mg/l)	Exceedance Factor[2]
Volatile Fraction:				
SB-10H2	Chloroform	250	6.0	42
	Trichloroethylene	440	0.5	880
	Benzene	140	0.5	280
	Tetrachloroethylene	2,600	0.7	3,700
Metals:				
SB-1A	Lead	169	5.0	34
SB-1A Dup	Lead	334	5.0	67
SB-2A-3	Lead	174	5.0	35
SB-5A	Lead	115	5.0	23
SB-6B	Lead	197	5.0	39
SB-7B	Lead	178	5.0	36
SB-8B	Lead	628	5.0	126
SB-9BCDE	Lead	148.2	5.0	30
SB-10H1	Mercury	99.5	0.2	498
SB-10H2	Mercury	4,010	0.2	20,000

(1) 40 CFR Part 261.24
(2) Total concentration in mg/kg divided by the TCLP Regulatory Limit in mg/l.

TABLE 4-6

TOXICITY CHARACTERISTIC LEACHING PROCEDURE ANALYTICAL RESULTS
DU PONT YERKES PHASE II INVESTIGATION

Sample ID	Chemical	TCLP Concentration (mg/l)	TCLP Regulatory Limit[1] (mg/l)
Volatile Fraction:			
SB-10H2	Vinyl chloride	0.031J	0.2
	1,1-Dichloroethene	0.033J	0.7
	Chloroform	6.2	6.0
	1,2-Dichloroethane	0.1U	0.5
	2-Butanone	3.1	200
	Carbon tetrachloride	0.1U	0.5
	Trichloroethene	7.9	0.5
	Benzene	2.7	0.5
	Tetrachloroethene	17.0	0.7
	Chlorobenzene	0.39	100
Metals:			
SB-1A	Lead	0.003U	5.0
SB-2A-3	Lead	0.166	5.0
SB-5A	Lead	0.003U	5.0
SB-6B	Lead	0.0653	5.0
SB-7B	Lead	0.0043	5.0
SB-8B	Lead	0.550	5.0
SB-9BCDE	Lead	0.003U	5.0
SB-10H1	Mercury	0.0002U	0.2
SB-10H2	Mercury	0.0037	0.2

Notes:

(1)	40 CFR Part 261.24
U	Non-detected at the stated detection limit
J	Estimated value

TABLE 4-7
DUPONT YERKES PHASE II
TCL VOLATILES ANALYSES FOR WATER SAMPLES

Sample I.D.	DYF-1	DYF-2	DYF-3	DYF-3 Dup.	DYF-4	DYF-5	Trip blank	Trip blank
Date Sampled	9/2/92	4/1/93	9/2/92	9/2/92	9/2/92	9/2/92	9/2/92	4/1/93
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Volatiles								
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U
methylene chloride	10U	10U	10U	10U	10U	10U	10U	10U
acetone	10U	10U	10U	10U	10U	10U	10U	10U
carbon disulfide	10U	10U	10U	10U	10U	10U	10U	10U
1,1-dichloroethene	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	10U	10U	10U	10U	10U	10U	10U	10U
chloroform	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethane	10U	10U	10U	10U	10U	10U	10U	10U
2-butanone	10U	10U	10U	10U	10U	10U	10U	10U
1,1,1-trichlorethane	10U	10U	10U	10U	10U	10U	10U	10U
carbon tetrachloride	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloropropane	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	10U	10U	10U	10U	10U	10U	10U	10U
1,1,2-trichloroethane	10U	10U	10U	10U	10U	10U	10U	10U
benzene	10U	10U	10U	10U	10U	10U	10U	10U
4-methyl-2-pentanone	10U	10U	10U	10U	10U	10U	10U	10U
tetrachloroethene	10U	10U	10U	10U	10U	10U	10U	10U
1,1,2,2-tetrachloroethane	10U	10U	10U	10U	10U	10U	10U	10U
toluene	10U	10U	10U	10U	10U	10U	10U	10U
chlorobenzene	10U	10U	10U	10U	10U	10U	10U	10U
ethylbenzene	10U	10U	10U	10U	10U	10U	10U	10U
total xylenes	10U	10U	10U	10U	10U	10U	10U	10U

Note:
U - Non-detected at the stated detection limit.

TABLE 4-8
DUPONT YERKES PHASE II
TCL SEMIVOLATILES ANALYSES FOR WATER SAMPLES

Sample I.D.	DYF-1	DYF-2	DYF-3	DYF-3 Duplicate	DYF-4	DYF-5
Date Sampled	9/2/92	4/1/93	9/2/92	9/2/92	9/2/92	9/2/92
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Semi-Volatiles						
phenol	14U	11U	10U	10U	10U	10U
1,4-dichlorobenzene	14U	11U	10U	10U	10U	10U
1,2-dichlorobenzene	14U	11U	10U	10U	10U	10U
2-methylphenol	14U	11U	10U	10U	10U	10U
4-methylphenol	14U	11U	10U	10U	10U	10U
2,4-dimethylphenol	14U	11U	10U	10U	10U	10U
1,2,4-trichlorobenzene	14U	11U	10U	10U	10U	10U
naphthalene	14U	11U	10U	10U	10U	10U
hexachlorobutadiene	14U	11U	10U	10U	10U	10U
4-chloro-3-methylphenol	14U	11U	10U	10U	10U	10U
2-methylnaphthalene	14U	11U	10U	10U	10U	10U
2-chloronaphthalene	14U	11U	10U	10U	10U	10U
dimethyl phthalate	14U	11U	10U	10U	10U	10U
acenaphthylene	14U	11U	10U	10U	10U	10U
acenaphthene	14U	11U	10U	10U	10U	10U
dibenzofuran	14U	11U	10U	10U	10U	10U
diethylphthalate	14U	11U	10U	10U	10U	10U
fluorene	14U	11U	10U	10U	10U	10U
n-nitrosodiphenylamine	14U	11U	10U	10U	10U	10U
phenanthrene	14U	11U	10U	10U	10U	10U
anthracene	14U	11U	10U	10U	10U	10U
carbazole	14U	11U	10U	10U	10U	10U
di-n-butylphthalate	14U	11U	10U	10U	10U	10U
fluoranthene	14U	11U	10U	10U	10U	10U
pyrene	14U	11U	10U	10U	10U	10U
butylbenzylphthalate	14U	11U	10U	10U	10U	10U
benzo(a)anthracene	14U	11U	10U	10U	10U	10U
chrysene	14U	11U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10J	2BJ	10U	10U	10U	10U
di-n-octyl phthalate	14U	11U	10U	10U	10U	10U
benzo(b)fluoranthene	14U	11U	10U	10U	10U	10U
benzo(k)fluoranthene	14U	11U	10U	10U	10U	10U
benzo(a)pyrene	14U	11U	10U	10U	10U	10U
indeno(1,2,3-cd)pyrene	14U	11U	10U	10U	10U	10U
dibenz(a,h)anthracene	14U	11U	10U	10U	10U	10U
benzo(g,h,i)perylene	14U	11U	10U	10U	10U	10U

Notes:

B - Analyte detected above the instrument detection limit but below the contract required detection limit.

J - Associated value is estimated.

U - Non-detected at the stated detection limit.

TABLE 4-9
DUPONT YERKES PHASE II
TCL PESTICIDES/PCBS ANALYSES FOR WATER SAMPLES

Sample I.D.	DYF-1	DYF-2	DYF-3	DYF-3 Duplicate	DYF-4	DYF-5
Date Sampled	4/1/93	4/1/93	9/2/92	9/2/92	9/2/92	9/2/92
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Pesticides/PCBs						
gamma-BHC	0.050U	0.056U	0.051UJ	0.050UJ	0.050U	0.056U
heptachlor	0.050U	0.056U	0.051UJ	0.050UJ	0.050U	0.056U
endosulfan II	0.10U	0.11U	0.10UJ	0.10UJ	0.10U	0.11U
4,4'-DDD	0.10U	0.11U	0.10UJ	0.10UJ	0.10U	0.11U
4,4'-DDT	0.10U	0.11U	0.10UJ	0.10UJ	0.10U	0.11U
methoxychlor	0.50U	0.56U	0.51UJ	0.50UJ	0.50U	0.56U
endrin ketone	0.10U	0.11U	0.10UJ	0.10UJ	0.10U	0.11U
endrin aldehyde	0.10U	0.11U	0.10UJ	0.10UJ	0.10U	0.11U
alpha-chlordane	0.050U	0.056U	0.051UJ	0.050UJ	0.050U	0.056U
gamma-chlordane	0.050U	0.056U	0.051UJ	0.050UJ	0.050U	0.056U
Aroclor 1242	1.0U	1.1U	1.0UJ	1.0UJ	1.0U	1.1U
Aroclor 1248	1.0U	1.1U	1.0UJ	1.0UJ	1.0U	1.1U
Aroclor 1254	1.0U	1.1U	1.0UJ	1.0UJ	1.0U	1.1U
Aroclor 1260	1.0U	1.1U	1.0UJ	1.0UJ	1.0U	1.1U
Chloride	195 mg/l	156 mg/l	116 mg/l	144 mg/l	22.0 mg/l	24.2 mg/l
Sulfate	5200 mg/l	1140 mg/l	413 mg/l	418 mg/l	3520 mg/l	800 mg/l

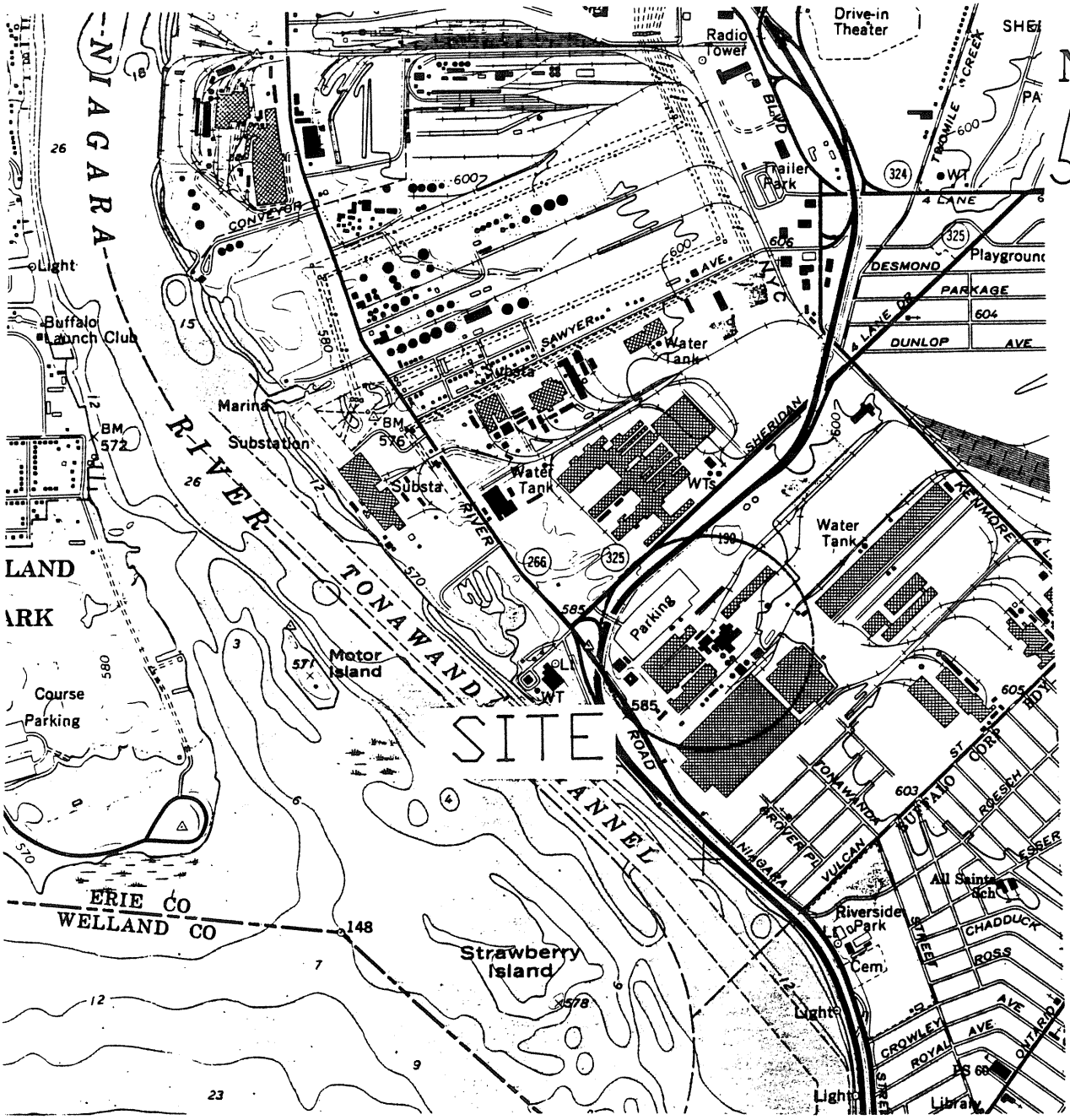
Notes:
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

TABLE 4-10
DUPONT YERKES PHASE II
TAL METALS ANALYSES FOR WATER SAMPLES

Sample I.D.	DYF-1	DYF-2	DYF-3	DYF-3 Duplicate	DYF-4	DYF-5
Date Sampled	4/1/93	4/1/93	9/2/92	9/2/92	9/2/92	9/2/92
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
TAL Metals						
Aluminum	1550	1940	10800	14200	810	480
Antimony	5.0U	5.0U	10.0U	100U	10.0U	10.0U
Arsenic	4.0U	4.0U	5.0U	5.0U	5.0U	5.0U
Barium	53.6B	43.6B	126B	151B	50.0U	65.0B
Beryllium	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U
Cadmium	0.40B	0.70B	5.0U	5.0U	5.0U	5.0U
Calcium	186000	89300	132000	146000	260000	338000
Chromium	10.0U	10.0U	26	30	30	18
Cobalt	20.0U	20.0U	20.0U	20.0U	20.0U	20.0U
Copper	10	10.8B	18.0B	19.0B	10.0U	21.0B
Iron	4650	6110	15600	20300	1280	1480
Lead	3.0U	4	26.5	17	6	20.1
Magnesium	832000	349000	192000	20200	668000	61000
Manganese	151	307	594	716	310	560
Mercury	0.20U	0.20U	0.20U	0.20U	0.20U	0.20U
Nickel	30.0U	30.0U	51	38.0U	30.0U	30.0U
Potassium	14600	9000	11400	12100	17800	12700
Selenium	40.0U	4.0U	5.0U	5.0U	5.0U	5.0U
Silver	0.20U	0.20U	122	14	54	32.0J
Sodium	405000	168000	51300	51900	232000	85400
Thallium	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U
Vanadium	20.0U	20.0U	20.0B	34.0B	20.0U	20.0U
Zinc	127	35.1	88	88	54	90.0J

Notes:
B - Analyte detected above the instrument detection limit but below the contract required detection limit.
J - Associated value is estimated.
U - Non-detected at the stated detection limit.

Figures



From U.S.G.S. Buffalo NW, N.Y.–Ont. Quadrangle
NW/4 Buffalo 15'
N4252.5–W7852.5/7.5

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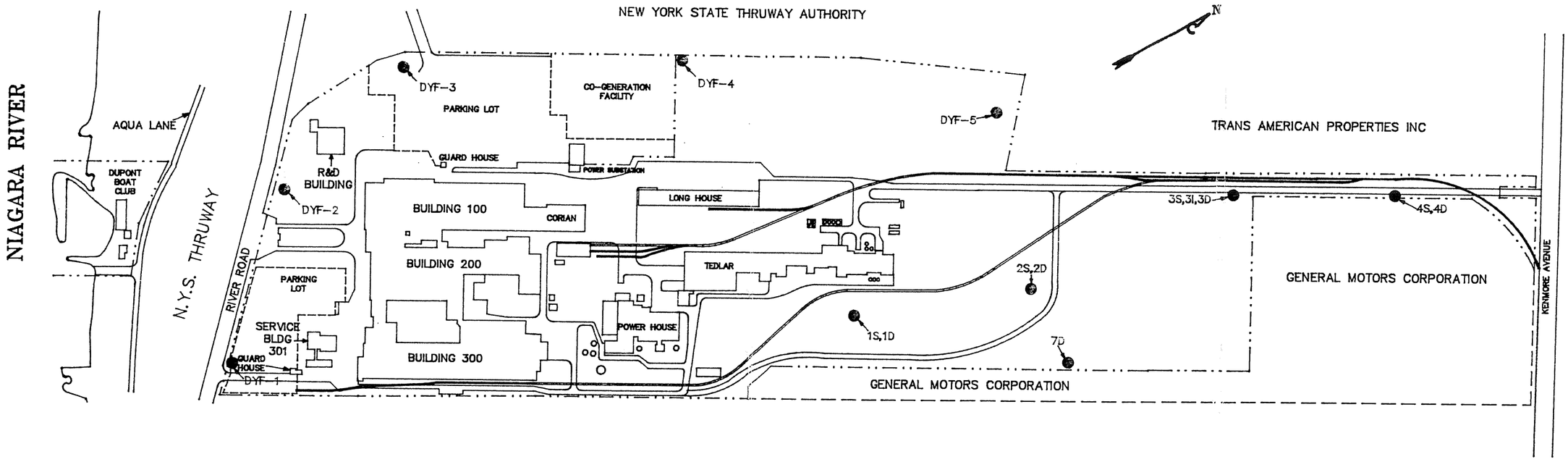
SITE LOCATION MAP

Job No.: 92C2284–1	Drawing No.	Date: 7–07–93
Checked by: KRM	Rev. No.:	
Scale: 1"=2000'		Figure 1–1



LEGEND

- PROPERTY BOUNDARY/FENCE LINE
- OLD PROPERTY BOUNDARY
- FENCE LINE
- DYF-3 PHASE II MONITORING WELL LOCATION
- 1S,1D PREVIOUS MONITORING WELL LOCATION

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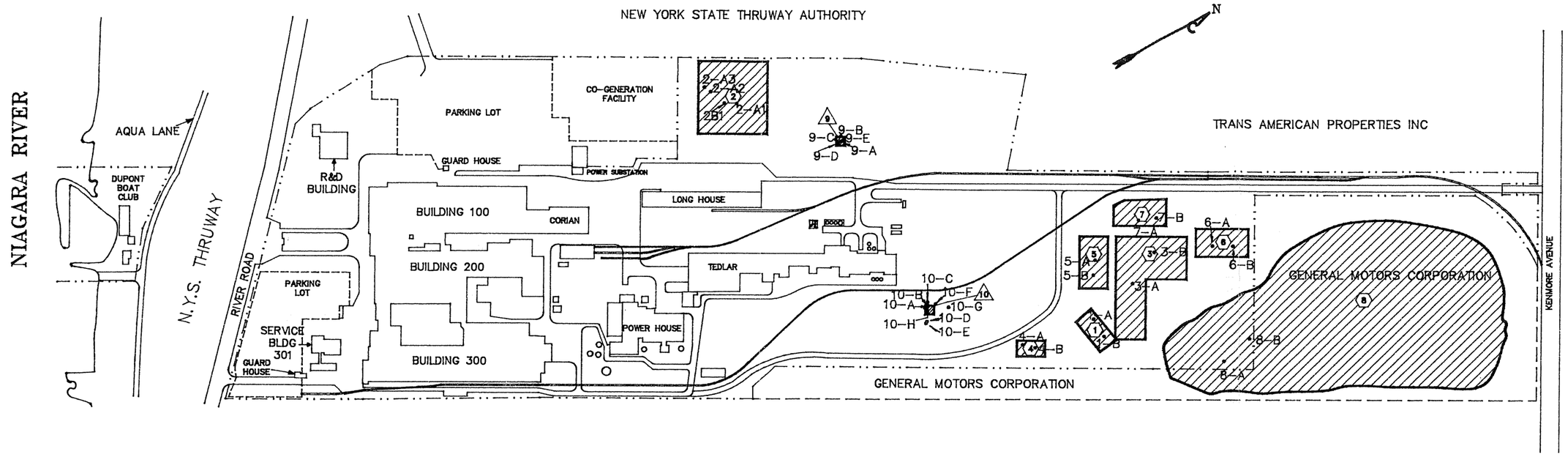
MONITORING WELL LOCATION PLAN

Job No.: 80C2331-1	Drawing No.	Date: 7-07-93
Checked by: KRM	Rev. No.:	Figure 2-1
Scale: 0' 200' 400' 600'		



LEGEND

- PROPERTY BOUNDARY/FENCE LINE
- OLD PROPERTY BOUNDARY
- FENCE LINE
- 4 — PHASE II MONITORING WELL LOCATION
- 4-A — SOIL BORING
  PREVIOUS MONITORING WELL LOCATION

UNIT	WASTE CLASSIFICATION	APPROXIMATE LENGTH	APPROXIMATE WIDTH	APPROXIMATE DEPTH	DATE EXCAVATED
1	GENERAL WASTE	150'	80'	12'	1960
2	TEDLAR WASTE	250'	250'	20'	1962
3	GENERAL WASTE	380/160'	110/265'	30'	1963
4	GENERAL WASTE	125'	65'	15'	3/74
5	GENERAL WASTE	200'	100'	15'	10/74
6	GENERAL WASTE	200'	100'	15'	10/75
7	GENERAL WASTE	200'	100'	15'	10/76
8	GENERAL WASTE	ORIGINALLY A TOPOGRAPHIC LOW – NO EXCAVATION FILLED 4' TO 5' AND COVERED			
9	R&D WASTE	25'	25'	10'	1956
10	R&D WASTE	25'	25'	10'	1957

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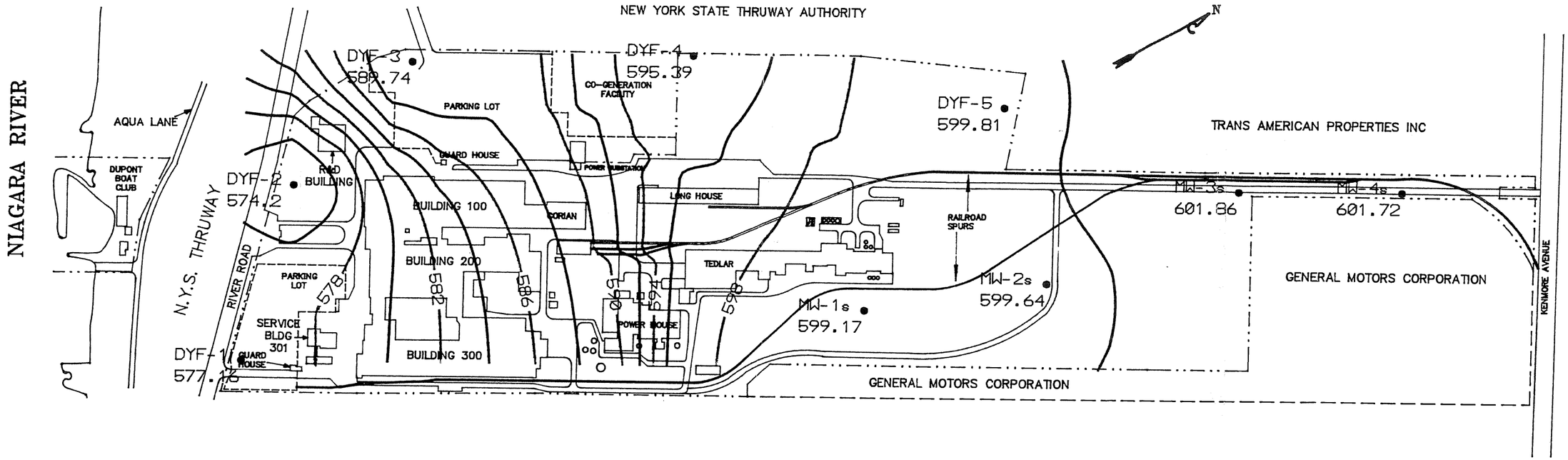
LOCATION OF LANDFILL AREAS AND SOIL BORINGS

Job No.: 90C2331-1	Drawing No.	Date: 7-07-93
Checked by: KRM	Rev. No.:	
Scale: 0' 200' 400' 600'		Figure 1-2



LEGEND

—·—·— PROPERTY BOUNDARY/FENCE LINE

— — — — OLD PROPERTY BOUNDARY

---------- FENCE LINE

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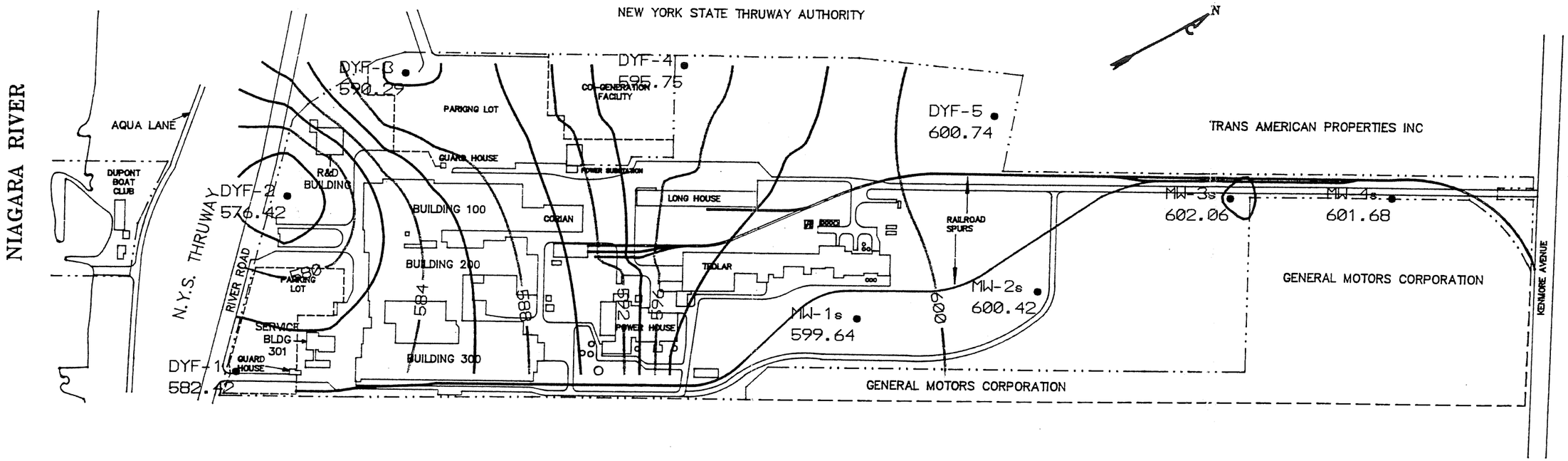
POTENTIOMETRIC SURFACE CONTOUR MAP
OVERBURDEN ZONE
SEPTEMBER 1992

Job No.: 90C2331-1	Drawing No.	Date: 5-7-93
Checked by: KRM	Rev. No.:	
Scale: 0' 200' 400' 600'		Figure 3-1



LEGEND

—·—·— PROPERTY BOUNDARY/FENCE LINE

— — — — OLD PROPERTY BOUNDARY

---------- FENCE LINE

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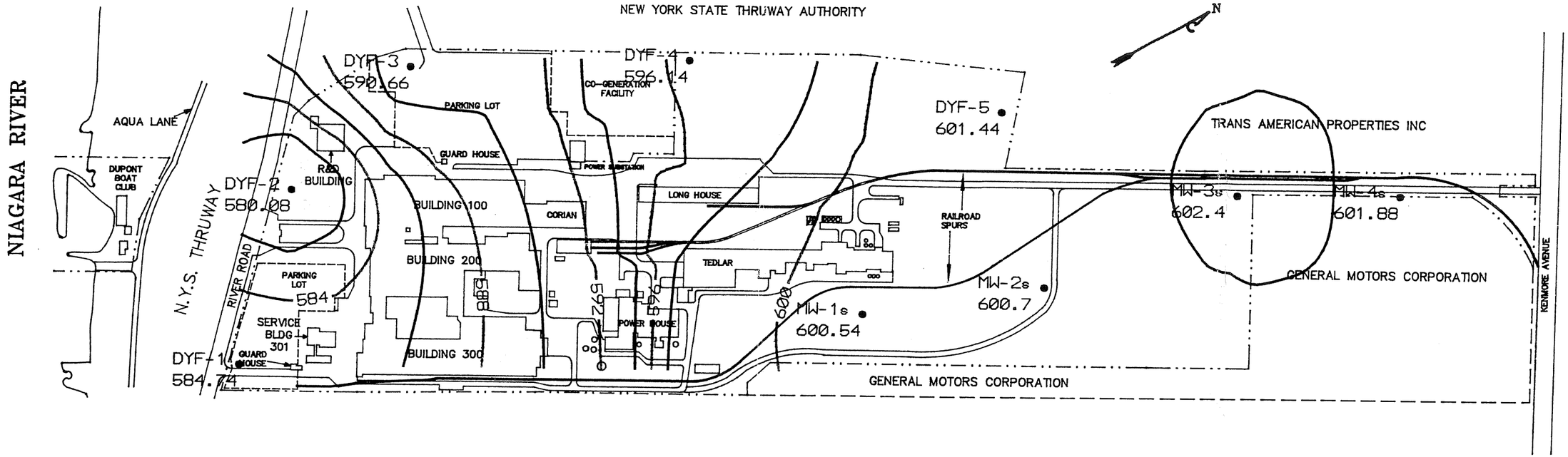
POTENTIOMETRIC SURFACE CONTOUR MAP
OVERBURDEN ZONE
DECEMBER 1992

Job No.: 90C2331-1	Drawing No.	Date: 5-7-93
Checked by: KRM	Rev. No.:	
Scale: 0' 200' 400' 600'		Figure 3-2



LEGEND

—·—·— PROPERTY BOUNDARY/FENCE LINE

— — — — OLD PROPERTY BOUNDARY

---------- FENCE LINE

E.I. du Pont de Nemours and Company Inc.
Yerkes Facility: Tonawanda, New York
Phase II Investigation

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POTENTIOMETRIC SURFACE CONTOUR MAP
OVERBURDEN ZONE
MARCH 1993

Job No.: 90C2331-1	Drawing No.	Date: 5-7-93
Checked by: KRM	Rev. No.:	Figure 3-3
Scale: 0' 200' 400' 600'		