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REPORT

Interim Remedial Measures Final Report for Operable Unit 3 Envirotek II Site

Technical Committee
Participating Potentially
Responsible Parties

Tonawanda, New York

January 2005
(Revised March 2005)

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

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Acronyms and Units of Measurement

1,1,1-TCA	1,1,1-tetrachloroethane
AOC	Administrative Order by Consent
BBL	Blasland, Bouck & Lee, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
C	Celsius
CA	chloroethane
COC	constituent of concern
CVOC	chlorinated volatile organic compounds
DCA	dichloroethane
DCE	dichloroethene
DO	dissolved oxygen
DOC	dissolved organic carbon
HAS	hollow-stem auger
IDW	investigation-derived waste
IRM	Interim Remedial Measures
mg/L	milligrams per liter
MMO	methane-monooxygenase
MS	matrix spike
MSD	matrix spike duplicate
mV	millivolts
NA	natural attenuation
ND	non-detect
NFA	no further action
NRW	Niagara River World, Inc.
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation-reduction potential
OU-3	Operable Unit 3
PCE	tetrachloroethene
PPE	personal protective equipment
PRP	Potentially Responsible Parties
PVC	polyvinyl chloride
QC	quality control
RASP	Remedial Action Sampling Plan
RCRA	Resource Conservation and Recovery Act
redox	oxidation-reduction
RI	remedial investigation
SDA	Still Discharge Area
STL	Severn Trent Laboratories, Inc.
SVOC	semivolatile organic compounds
TCE	trichloroethene
TOGS	Technical and Operational Guidance Series
TKN	total Kjeldahl nitrogen
TSDF	treatment, storage, and disposal facility
µg/L	micrograms per liter
USEPA	U.S. Environmental Protection Agency

VC	vinyl chloride
VOC	volatile organic compound
WTS	Waste Technology Services, Inc.

1. Introduction

1.1 General

Blasland, Bouck & Lee, Inc. (BBL) has prepared this *Interim Remedial Measures Natural Attenuation Evaluation Report for Operable Unit 3* (Report) to summarize the interim remedial measure (IRM) activities conducted for groundwater at Operable Unit 3 (OU-3) at the Envirotek II Superfund Site (site) located at 4000 River Road in the Town of Tonawanda, Erie County, New York (Figure 1-1 and 1-2). This report has been prepared on behalf of the Envirotek II Site Potentially Responsible Parties (PRP) Group implementing the Administrative Order by Consent (AOC), Index #B9-0407-92-05, that was issued by the New York State Department of Environmental Conservation (NYSDEC) on August 20, 1998. The OU-3 IRM-related activities were performed in accordance with the NYSDEC-approved *IRM Work Plan for OU-3* (Work Plan) (BBL, 2004b), which was approved by the NYSDEC in a letter dated March 24, 2004 (Appendix A). The objectives for the work in OU-3 were to:

- assess the current groundwater quality; and
- evaluate the viability of natural attenuation (NA) as an IRM for OU-3.

The IRM Work Plan for OU-3 included the following elements.

- Installation of a new monitoring well (ENV-3R) between existing Buildings 13 and 24, immediately downgradient of the former source area (Figure 1-2) and near the former location of monitoring well ENV-3.

- Sampling of groundwater from the monitoring well network at least once.

- Evaluation of NA data. BBL performed a review of historical groundwater data, as well as the more recent groundwater data to provide a detailed assessment of the remedial progress made by NA processes. The NA assessment included:

  - updating the United States Environmental Protection Agency's (USEPA's) scoring for evaluation of the potential for in situ biodegradation;

  - preparing groundwater concentration trend graphs;

  - evaluating the concentration trend of ratios of parent to daughter compounds;

  - comparing concentration data with NYSDEC Technical and Operational Guidance Series (TOGS);

  - evaluating concentration reduction trends along projected groundwater flow paths; and

  - assessing the potential applicability of the BIOCHLOR screening model for evaluation of potential biodegradation rates and NA life.

- Meeting with the NYSDEC and New York State Department of Health (NYSDOH) to discuss the preliminary findings of the OU-3 investigation and NA data and to determine the need for a second round of groundwater sampling.

- Preparation of a Groundwater Assessment and NA Evaluation Report for OU-3.

1.2 Site Location

The site consists of a 2.5-acre parcel of land located within the 50-acre Roblin Steel complex (NYSDEC Site #915056) at 4000 River Road in the Town of Tonawanda, Erie County, New York. A map identifying the approximate location of the Roblin Steel complex is presented on Figure 1-1. Figure 1-2 presents a site plan of the Roblin Steel complex, showing that it is in an industrialized area along River Road, and identifies the 2.5-acre Envirotek II site. The Roblin Steel complex (Figure 1-2), which is presently owned by Niagara River World, Inc. (NRW), is bounded on the west by the Niagara River, on the east by River Road, on the south by Marathon Oil, and on the north by a facility that was investigated and remediated by the NYSDEC (i.e., the River Road Site [NYSDEC Site #915031]).

1.3 Site History

The history of the site is interrelated with the history of the Roblin Steel complex, as the site was formerly leased from Roblin Steel for industrial use. Between August 1981 and June 1989, Envirotek Ltd. (Envirotek) operated a solvent recovery operation at the site located within the Roblin Steel property.

A review of the Roblin Steel property history indicates that industrial steel production activities have been associated with the property since the early 1900s. Prior to development of the property, a section of the Erie Canal along River Road was filled with unspecified materials. In addition, Rattlesnake Creek, which formerly ran through the Roblin Steel property, was backfilled with slag and other materials to bridge Rattlesnake Island with the main property. Because areas of the Roblin Steel property were located in seasonal floodplains, those low areas were filled with slag and other industrial debris to raise the site grade. The property was developed in the early 1900s for the production of steel by the Wickwire Spencer Steel Company (Wickwire). In 1945, the property was sold to the Colorado Fuel and Iron Corporation (Colorado F&I), which subsequently merged with Wickwire and was operated by Colorado F&I until it went bankrupt in 1963. In the mid- to late 1960s, Roblin Steel purchased the property and used it primarily for storage. Roblin Steel also subleased portions of the property to a number of other companies, including, but not limited to, Ascension Chemical, Rupp Rental, Freightways Transportation, Envirotek, and Booth Oil.

In 1984, the NYSDEC issued a Resource Conservation and Recovery Act (RCRA) Part B Permit to Envirotek to operate the site as a hazardous waste treatment, storage, and disposal facility (TSDF). After violations of this permit in 1985, including improper waste characterization, RCRA drum handling violations, and lack of insurance and financial assurance, Envirotek entered into an AOC with the NYSDEC that required a reduction of Envirotek's hazardous waste inventory.

In 1988, Envirotek submitted a *Facility Closure Plan* (Envirotek, 1988) to the NYSDEC to remove and dispose of all materials remaining onsite and to take measures to decontaminate the property. The NYSDEC's review determined that the *Facility Closure Plan* was unacceptable, citing inaccurate closure costs and the use of unqualified personnel to implement the closure as reasons for rejecting the *Facility Closure Plan*.

On February 2, 1989, Envirotek filed a petition under Chapter 11 of the Bankruptcy Code in the United States Bankruptcy Court of the Western District of New York. The current owner of the property, NRW, evicted Envirotek in June 1989, at which time Envirotek abandoned the facility. The NYSDEC formally revoked

Envirotek's RCRA Part B Permit to operate on November 16, 1989, on the basis of Envirotek's inability to develop an acceptable Facility Closure Plan.

Following abandonment of the site, the USEPA inspected the site and confirmed the presence of abandoned and unsecured drums and containers, pits containing hazardous substances, and contaminated process vessels and tanks. Preliminary analysis of some of the materials suggested that corrosive, air-reactive, and metal-contaminated wastes, as well as oils and waste solvents, were present onsite. Many of the materials located onsite were flammable, with some known to be either acutely or chronically toxic.

As a result, the USEPA notified former Envirotek customers of their potential liability at the site and requested the performance of a removal action to control site conditions. As a result, on May 14, 1990, the USEPA entered into an AOC with site respondents to perform a removal action at the site (Removal Action AOC). The site boundaries, as defined in this Removal Action AOC, included the property once leased by Envirotek and the southeast portion of the hangar-like building that contained the aforementioned pits, which was located adjacent to the property once leased by Envirotek.

Under the Removal Action AOC, several tasks were completed by the site PRP Group, including the following:

- Between June 1990 and November 1990, a removal action was implemented at the site that consisted of the characterization, removal, transportation, and offsite disposal of approximately 980 drums; 3,500 gallons of liquid wastes; 363 tons of solid wastes; and 146 lab pack containers, all of which had been stored in Buildings 13, 24, and 153.

- Between July 1990 and October 1990, a removal action was implemented at the site that consisted of the characterization, removal, transportation, and offsite disposal of waste materials that were formerly stored in Pits 1, 2, 3, 3A, 4, and 5; decontamination of the former pits; offsite transportation and disposal of decontamination water; and backfilling of the pits.

- Between June 1990 and January 1991, decontamination activities were performed at the site for a number of process vessels, tanks, buildings, and equipment.

- Between September 1990 and November 1990, BBL implemented a *Remedial Action Sampling Plan* (RASP) (BBL, 1990) at the site to identify areas onsite, other than the Still Discharge Area (SDA), at which spills or releases of chemical compounds may have occurred. The RASP also estimated the direction and rate of groundwater flow in the shallow overburden aquifer underlying the site, evaluated the nature of chemical compounds in groundwater that were associated with the former activities at the site, and provided a preliminary characterization of site conditions that would be the basis for evaluating whether further investigation and/or remediation of the site would be warranted. To accomplish these objectives, BBL performed a soil gas survey, installed and sampled site groundwater monitoring wells, analyzed groundwater samples for volatile organic compounds (VOCs), and collected soil samples from the SDA.

  The results of this investigation indicated the following:

  - The soil gas survey indicated elevated levels of VOCs in the area of the SDA and in an area to the west of Building 153.

  - The analytical results for the groundwater sampling indicated the presence of VOC-impacted groundwater associated with the site.

- The analytical results for the soil sampling indicated that there were elevated levels of chlorinated and aromatic VOCs and that the soils containing the highest level of VOCs were located in the vicinity of the SDA.

- Following implementation of the Remedial Action Sampling Plan (RASP) in 1990, BBL performed an evaluation of potential interim remedial alternatives for the SDA in March 1991.

- As a result of this evaluation, in May 1993, a removal action was implemented at the site that consisted of the removal of approximately 175 tons of impacted soil from the SDA. Soils with field headspace screening results greater than 1,000 units of total volatile organic vapors were removed from this area. A polyethylene sheet was placed over the remaining soils in the excavation, and clean fill was placed over the polyethylene sheet. A 12-inch-diameter production well located near the Power Building was also abandoned during this field activity.

Additionally, from 1999 to 2001, BBL conducted a remedial investigation (RI) at the site to assess the onsite surface and subsurface soil quality, offsite subsurface soil quality, site groundwater quality, and site geologic and hydrogeologic characteristics. The results of the RI for the site are presented in the *Remedial Investigation Report* (RI Report) (BBL, 2002). Based on the results of the RI, the Envirotek II Site PRP Group submitted recommendations to the NYSDEC including:

- implementing an IRM to remove the Boiler House ink waste for offsite disposal; removing soils containing elevated levels of VOCs from Waste Pit No. 6, decontaminating the pit, and backfilling the pit with clean backfill; and disposing of all solid, liquid, and personal protection equipment (PPE) generated during this IRM to an approved offsite disposal facility(ies);

- reducing the potential for migration of VOC constituents of concern (COCs) from source-area soils to the shallow overburden groundwater; and

- reducing the concentration of VOC COCs in shallow overburden groundwater associated with elevated VOC concentrations in source-area soils.

The first recommendation, which is defined as OU-1 and is related to the removal of ink waste in the Boiler House and VOC-impacted soil in Waste Pit No. 6, was implemented in April 2003 and is summarized in the *Interim Remedial Measures Final Report for OU-1* (IRM Final Report for OU-1) (BBL, June 2003). The IRM Final Report for OU-1 was reviewed and approved by the NYSDEC in No Further Action (NFA) letters dated November 5 and 19, 2003. The second recommendation, which is defined as OU-2 and is related to reducing the potential for migration of VOC COCs from source-area soils to the shallow overburden groundwater, was implemented in October 2003 and is summarized in the *Interim Remedial Measures Final Report for OU-2* (IRM Final Report for OU-2) (BBL, 2004a). Following review of the IRM Final Report for OU-2, the NYSDEC issued a NFA letter for OU-2 dated February 9, 2004. The third recommendation, which is defined as OU-3 and is related to reducing the concentration of VOC COCs in shallow overburden groundwater associated with elevated VOC concentrations in source-area soils, is addressed in detail in this report. One should note that implementation of the OU-2 IRM had an expected significant beneficial effect on OU-3 because more than 7,100 tons of impacted soil were removed as a potential future source of VOC COCs to groundwater.

1.4 Roles and Responsibilities

The OU-3 IRM activities were implemented at the site between April 14 and September 28, 2004. The Envirotek II Site PRP Group retained BBL to implement the Work Plan (BBL, 2004b). The subcontractors that were retained by BBL during the OU-3 IRM included the following:

- Nothnagle Drilling, Inc. (Nothnagle) of Scottsville, New York was used to install replacement monitoring well ENV-3R.
- Waste Technology Services, Inc. (WTS) of Niagara Falls, New York was used to provide transportation and offsite disposal services for solid waste materials-generated during well installation and groundwater sampling during implementation of the Work Plan.
- Severn Trent Laboratories, Inc. (STL) of Amherst, New York was used to perform offsite analytical testing for groundwater and waste disposal characterization samples.
- McIntosh and McIntosh, P.C. of Lockport, New York was used to perform the survey of newly installed monitoring well ENV-3R.

The OU-3 IRM activities for the site were managed and documented by BBL, with BBL providing representatives onsite for the duration of the project.

1.5 Report Organization

This report summarizes and documents the OU-3 IRM activities implemented by the Envirotek II Site PRP Group and has been organized into the following sections:

- **Section 1** – Introduction: Provides a brief overview of the OU-3 IRM scope of work and site background.
- **Section 2** – Summary of OU-3 IRM Field Activities: Summarizes the investigative activities performed at the site in 2004.
- **Section 3** – Summary of OU-3 IRM Results: Summarizes the results of the field investigative activities.
- **Section 4** – Natural Attenuation Evaluation: Summarizes the methods and results used to assess whether NA has occurred and whether NA is a viable alternative for completion of the IRM for OU-3.
- **Section 5** – Conclusions: Provides overall conclusions of work described within this report.
- **Section 6** – References: Provides references cited in this report.

2. OU-3 IRM Field Activities

2.1 Monitoring Well Installation and Development

On April 14, 2004, Nothnagle installed groundwater monitoring well ENV-3R under the supervision of a BBL field geologist. Monitoring well ENV-3R was installed to replace monitoring well ENV-3, which was removed on September 25, 2003 during the excavation performed during implementation of the IRM for OU-2.

The boring for ENV-3R was advanced to a depth of 18 feet below ground surface (bgs) using the hollow-stem auger (HSA) drilling technique. Soil samples were collected at 2-foot intervals during the boring process using a split spoon-sampler driven ahead of the augers. These samples were lithogically characterized. The boring log for the soil encountered during drilling for monitoring well ENV-3R is included as Appendix B.

Monitoring well ENV-3R was installed at the interface between fill material and underlying native clay, approximately 16 feet bgs. The well was constructed of 10 feet of Schedule 40, 0.01-inch slotted polyvinyl chloride (PVC) screen, and Schedule 40, flush-threaded PVC riser. The open borehole space below the well screen was backfilled with bentonite chips and capped with 0.5 feet of filter pack sand. The annular space between the borehole and the screen was filled through the HSAs with filter pack sand. Sand was placed to approximately 2 feet above the top of the screened interval, followed by a 2-foot-thick hydrated bentonite seal, capped with a concrete surface seal. At the surface, the well was completed as a flush-mounted well, secured by a locked expanding well plug, and surrounded by a road box within a 2- by 2-foot concrete pad. Monitoring well construction information is presented in the boring log for monitoring well ENV-3R (Appendix B).

Following installation, monitoring well ENV-3R was developed by pumping and surging, using a Waterra pump and surge block. Development continued until the well was observed to produce relatively clear, sediment-free water. Approximately 20 gallons of water were generated during the development process.

The drilling subcontractor constructed a decontamination pad and used a pressure washer to decontaminate the HSAs and all other down-hole equipment. Decontamination water was contained within the decontamination pad constructed at the site for this purpose.

2.2 Surveying

On September 28, 2004, the relative horizontal location and elevation of the top of monitoring well ENV-3R was surveyed by McIntosh & McIntosh, P.C., a New York State-licensed surveyor. The surveyor's report is presented as Appendix C.

2.3 Groundwater Sampling

On May 5, 2004, a BBL field geologist collected groundwater samples from eight monitoring wells (ENV-1, ENV-3R, ENV-4, ENV-7, ENV-8, ENV-9, GW-3, and GW-7) that define the OU-3 monitoring well network. On July 15, 2004, an additional, sample was collected from monitoring well ENV-3R. Based on discussions with NYSDEC representatives, and on behalf of the PRP Group, BBL agreed to sample groundwater from the monitoring well network a second time. The second full round of sampling was performed on September 28, 2004.

Groundwater samples were collected using the low-flow purging and sampling technique. Prior to sampling, each monitoring well was purged using a peristaltic pump and dedicated tubing until parameters of pH, conductance, dissolved oxygen (DO), temperature, and oxidation-reduction potential (ORP) had stabilized. Stabilization of these parameters provided an indication that water drawn from the well was representative of the groundwater in the surrounding formation. After the monitored parameters had stabilized, samples were collected with a disposable bailer. During both sampling events, BBL's field geologist collected several quality control (QC) samples including a trip blank, a field blank, a matrix spike (MS) and matrix spike duplicate (MSD), and a field duplicate. The MS/MSD samples were collected from monitoring well ENV-8 during the May 5, 2004 event and from monitoring well ENV-9 during the September 28, 2004 event. Field duplicate samples FD050504 and FD092804 were collected from monitoring well ENV-3R. Copies of groundwater sampling logs are presented in Appendix D.

Groundwater samples were sent to the STL facility in Amherst, New York, where they were analyzed for VOCs by USEPA Method 8260. The analytical results of these groundwater samples are presented and discussed in Section 3.

2.4 Investigation-Derived Wastes

Soil cuttings generated during the installation of ENV-3R were collected and placed in one 55-gallon drum. Monitoring well development water and decontamination water were contained within a second 55-gallon drum. Purge water generated during the May 5, 2004, July 17, 2004, and September 28, 2004 groundwater sampling events was placed into an additional 55-gallon drum.

Disposal characterization samples of drummed investigation derived waste (IDW) were analyzed on October 6, 2004 with results reported on October 20, 2004. On November 30, 2004, three drums of non-regulated IDW (two drums of water and one drum of soil) were transported offsite by Hazmat Environmental Group and disposed on December 1, 2004 at the CWM Chemical Services Facility located in Model City, New York.

3. OU-3 IRM Field Results

3.1 Groundwater Gauging and Assessment of Groundwater Flow

Table 3-1 presents groundwater gauging data for site monitoring wells from 1990 through the most recent gauging event (performed on September 28, 2004). Figures 3-1 and 3-2 illustrate groundwater elevation contours within the upper fill material based on data from the last two gauging events on May 5, 2004 and September 28, 2004, respectively. The interpreted direction of groundwater flow in May and September 2004 is consistent with interpretations from previous groundwater gauging events reported in the RI Report (BBL, 2002). That is, the groundwater flow has a radial component of flow, particularly on the eastern side of the site and a more unidirectional flow on the western side of the site when nearing the Niagara River. The radial component of flow on May 5, 2004 (Figure 3-1) was more pronounced than that observed on September 8, 2004. This variability is also consistent with previous observations in 1999 and 2001, as presented in the RI Report (BBL, 2002).

The groundwater gradients calculated between monitoring well ENV-1 and GW-5 was 0.042-feet/foot (ft/ft) on both May 5 and September 28, 2004. This represents a gradient slightly over 20% higher than that reported in the RI Report (BBL, 2002). However, gradient fluctuations of this magnitude are expected for sites like this one, which is near a river and, therefore, likely to be significantly influenced by river stage.

3.2 Groundwater Quality

Table 3-2 summarizes VOC and semivolatile organic compound (SVOC) data collected at the site from 1988 through the groundwater sampling event performed on September 28, 2004. Figures 3-3 and 3-4 provide isoconcentration plots illustrating the total VOC concentrations detected at each of the eight wells from the May 5 and September 28, 2004 sampling events, respectively. Figure 3-3 also presents the concentration data for the sample collected on July 15, 2004 from monitoring well ENV-3R. Laboratory reports and data review reports are presented in Appendix E.

Total VOC concentrations in groundwater have decreased significantly since the previous groundwater sampling event in 2001 as reported in the RI Report (BBL, 2002). The concentrations of total VOCs in groundwater in ENV-3R showed some variability, with concentrations ranging from a low of 0.084 milligrams per liter (mg/L) on July 15, 2004 to a high of 0.660 mg/L on September 28, 2004. VOC concentrations in groundwater from the other monitoring network wells were low and consistent between the two 2004 sampling events. Additional discussions of VOC concentration trends are presented in Section 4 of this report.

4. Natural Attenuation Evaluation

4.1 Objective and Overview

The objective of this NA evaluation was to assess the relative contributions of naturally occurring fate and transport processes associated with decreasing concentrations of principal COCs at several site groundwater monitoring locations and to determine whether NA is a viable method of remediation for OU-3. Fate and transport processes known to attenuate peak concentrations of COCs in groundwater include dispersion, dilution, sorption, abiotic degradation, and biodegradation. These NA processes result in decreasing COC mass or concentrations in groundwater with time and distance. NA is a significant process that reduces the concentration of COCs in groundwater at sites that have been impacted by VOCs.

The NA evaluation for the Envirotek site was based on appropriate USEPA guidance documents (USEPA, 1998; USEPA, 1999) that are based on a "multiple lines of evidence" approach, in which several different data types are used to independently determine the effectiveness of natural groundwater remediation. Three lines of evidence were considered for this evaluation:

- decreasing principal COC concentration trends with time and distance;
- changes in principal COC concentration ratios with time and distance; and
- geochemical conditions that indicate the presence of in situ biodegradation of site principal COCs.

Groundwater data collected during RI activities that focused on determining the nature, extent, and transport of dissolved VOC concentrations in site groundwater were used to support the first two lines of evidence. Site-specific groundwater geochemical data were collected, including measurements of dissolved gas concentrations, to support the third line of evidence. In situ biodegradation is an important NA process because it destroys COC mass.

The analytical database for the site includes groundwater monitoring data collected at site monitoring wells between 1990 and 2004, as well as groundwater samples collected at temporary monitoring locations hydraulically downgradient from the SDA/Source Area in 1999.

The remainder of this section consists of the following components:

- site conceptual model;
- NA evaluation methods and results; and
- conclusions.

4.2 Site Conceptual Model

The site conceptual model was thoroughly discussed in Sections 1 and 3 of the NYSDEC-approved RI Report (BBL, 2002). The site conceptual model is summarized below.

4.2.1 Sources and Chemicals of Concern

Envirotek operations occurred on only a limited portion of the Roblin Steel property, a facility historically used in steel-making operations. Generally, the Roblin Steel property appears to have been impacted by COCs associated with former operations associated with making steel, including inorganic chemicals and SVOCs. In the immediate site vicinity, residual hydrocarbons identified in vadose and saturated-zone soils are considered to be associated with former Roblin Steel operations. However, these residual hydrocarbons have appeared to commingle with the principal COCs at the site.

The SDA is considered to be the main source area associated with former Envirotek operations. Impacted media associated with releases at the SDA include soil and groundwater. A limited soil removal action performed at the SDA in 1992 resulted in the removal of approximately 175 tons of soil containing elevated levels of VOCs. Lower levels of VOC-impacted soil were identified in the Source Area adjacent to the SDA. In 2003, an additional 7,100 tons of soil were removed as part of the OU-2 IRM. This was expected to enhance any remedy chosen for OU-3.

As previously discussed, the principal COCs associated with Envirotek operations are VOCs, including chlorinated ethenes and ethanes, as well as some of the benzene, toluene, ethylbenzene, and xylene (BTEX) compounds. As mentioned above, residual petroleum hydrocarbons are also present within the SDA and Source Area, but these are considered to be associated with Roblin Steel operations. Principal COCs detected in soils associated with Envirotek operations include tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-tetrachloroethane (1,1,1-TCA), toluene, ethylbenzene, and xylene. Principal COCs detected in groundwater near the site include PCE, TCE, and 1,1,1-TCA and their associated degradation byproducts, including isomers of dichloroethene (DCE) and dichloroethane (DCA), vinyl chloride (VC), and chloroethane (CA).

4.2.2 Fate and Transport Processes for PCOCs in Groundwater

Fate and transport processes known to attenuate peak VOC concentrations in groundwater include a variety of physical, chemical, and biological processes. Physical fate and transport processes known to attenuate VOC concentrations in groundwater include mixing, dispersion, and sorption. Chemical (abiotic) fate and transport processes that destroy VOC mass in groundwater and result in decreasing VOC concentrations may include hydrolysis and dehydrohalogenation. Biological fate and transport processes that destroy VOC mass in groundwater and result in decreasing VOC concentrations include aerobic and anaerobic biodegradation reactions. Of all the fate and transport processes known to attenuate peak VOC concentrations in groundwater, abiotic and biologic degradation processes are of particular interest because they destroy VOC mass in situ.

BTEX compounds and chlorinated VOCs (CVOCs) can be biodegraded in situ in groundwater by naturally occurring aerobic and anaerobic microorganisms. BTEX compounds and certain CVOCs, such as DCE, DCA, VC, and CA, can be oxidized by certain aerobic and anaerobic microorganisms that directly use these chemicals as a source of organic carbon. During this process, innocuous byproducts such as carbon dioxide and chloride ions are formed. These metabolic processes require proper microorganisms, water, circum-neutral pH conditions, adequate temperature, a supply of electron acceptors or alternate electron acceptors, and nutrients. Degradation can occur under oxidizing or reducing geochemical conditions, via aerobic respiration, nitrate reduction, iron reduction, sulfate reduction, or methanogenesis. Degradation half-lives of organic chemicals subject to biological oxidation can range from days to years, depending on site-specific conditions.

CVOCs containing higher amounts of chlorine, including PCE, TCE, and 1,1,1-TCA, are biodegraded in situ in groundwater by naturally occurring anaerobic microorganisms that use these chemicals as electron acceptors in

a reaction called reductive dechlorination. During reductive dechlorination reactions, anaerobic microorganisms sequentially remove chloride ions from these chemicals and transfer electrons during other metabolic processes. The result is that intermediate byproducts such as DCE and DCA can be formed, which can be further biodegraded by reductive dechlorination or via aerobic or anaerobic oxidation. Reductive dechlorination of PCE and 1,1,1-TCA can be represented by the reactions:

PCE → TCE → 1,2-DCE → VC → Ethene and Ethane

1,1,1-TCA → 1,1-DCA → Ethane

Reductive dechlorination requires proper microorganisms, water, circum-neutral pH conditions, adequate temperature, reducing geochemical conditions, an alternative source of organic carbon such as natural organic matter, and nutrients. Reductive dechlorination occurs under reducing geochemical conditions and can be associated with oxidation-reduction (redox) processes such as iron reduction, sulfate reduction, and methanogenesis. Degradation half-lives of organic chemicals subject to reductive dechlorination can range from weeks to years, depending on site-specific conditions.

In addition, some chemicals such as PCE and TCE can be cometabolically biodegraded in situ in groundwater by naturally occurring microorganisms that metabolize other organic carbon sources and fortuitously degrade these COCs. For example, methanotrophic organisms express the methane-monooxygenase (MMO) enzyme to metabolize methane for food and growth. MMO quickly oxidizes PCE, TCE, and some other COCs, producing carbon dioxide and chloride ions as byproducts. Degradation half-lives of organic chemicals subject to cometabolic degradation can range from days to months.

Some principal COCs (1,1,1-TCA in particular) can be abiotically degraded in situ in groundwater by means of hydrolysis reactions. Hydrolysis is a naturally occurring reaction that can destroy organic chemicals by means of splitting water molecules. Hydrolysis of 1,1,1-TCA is a well-characterized reaction in groundwater, occurs fastest under reducing geochemical conditions, and has a half-life of approximately 2 years.

4.3 Methods

Multiple lines of evidence were evaluated as part of this NA evaluation, including:

- preliminary screening;
- time-series analysis of COC concentrations;
- evaluation of geochemical conditions; and
- evaluation of COC concentration ratios.

The following subsections describe the methods and results of these evaluations.

4.3.1 Preliminary Screening

A screening method adopted by the USEPA (1998) was used to preliminarily evaluate the potential for in situ biodegradation of dissolved CVOCs in site groundwater. The USEPA screening method is a scoring process in which points are assigned for various groundwater analytical data results, and is based on the fact that in situ biodegradation processes manifest themselves as changes in groundwater geochemistry. Using the USEPA scoring interpretation guidelines, scores less than 5 suggest inadequate evidence for in situ biodegradation of

CVOCs, scores from 6 to 14 suggest limited evidence for in situ biodegradation of CVOCs, scores from 15 to 20 indicate adequate evidence for in situ biodegradation of CVOCs, and scores greater than 20 indicate strong evidence for in situ biodegradation of CVOCs. This screening-level evaluation is useful because it is relatively straightforward, and, more importantly, it is objective and provides reproducible results. Potential drawbacks of the USEPA (1998) method are that it focuses on biodegradation reactions and ignores other NA processes, it attempts to simplify naturally complex phenomena, and it can lead to falsely negative conclusions (i.e., no NA potential). Where applicable, BBL has qualified these aspects of the screening method analysis.

During the April 2001 sampling event, groundwater samples were collected at five monitoring wells and analyzed for concentrations of in situ degradation indicator parameters in addition to principal COC concentrations (Table 4-1). As shown, the indicator parameters analyzed included total and dissolved iron, total and dissolved manganese, nitrate, nitrite, sulfate, sulfide, total Kjeldahl nitrogen (TKN), ammonia (as nitrogen), alkalinity, dissolved organic carbon, chloride, ethane, ethene, methane, oxygen, carbon dioxide, and nitrogen. The data were preliminarily screened using methods adopted by the USEPA (1998) and evaluated in detail for the presence of specific naturally occurring degradation processes.

Using the site-specific groundwater analytical data shown in Table 3-2 and Table 3-3, this scoring process was applied at those sampling locations where geochemical indicator parameters were measured (Table 4-1). These included monitoring well ENV-2, located within the SDA, and monitoring wells located hydraulically downgradient from the SDA/Source Area (ENV-3, ENV-4, and GW-7). Geochemical indicator parameters were also measured at upgradient well ENV-1, which exhibited evidence of reducing geochemical conditions (i.e., low DO, ORP, nondetectable nitrate, and elevated dissolved iron. As shown, the USEPA (1998) scoring system produced results ranging from 9 to 28, indicating strong evidence of in situ biodegradation of CVOCs in groundwater at some locations during the April 2001 sampling event (Table 4-2). All of the sampling locations evaluated showed at least limited evidence of in situ biodegradation in groundwater, with monitoring wells ENV-2 and ENV-3 indicating adequate and strong evidence for in situ biodegradation of CVOCs, respectively. The lower scores observed at hydraulically downgradient monitoring wells ENV-4 and GW-7 do not indicate a lack of in situ biodegradation of CVOCs, only a lack of current activity. The data are discussed in greater detail below.

4.3.2 Time-Series Analysis of COC Concentrations

Stability of the VOC plume in site groundwater was evaluated based on time-series analysis of COC concentrations. Groundwater VOC plumes can be shrinking, stable, or expanding with time; therefore, understanding plume stability is important from both a health-risk perspective and a remedial action perspective. Some shrinking or stable plumes may not pose a significant threat to receptors and would require only long-term monitoring with contingencies to be protective of human health and the environment, thus justifying an NA remedy. Conversely, some growing plumes may threaten potential receptors and warrant the use of engineering controls to mitigate risk. Therefore, evaluating the stability of the groundwater COC plume at this site is important when determining appropriate remedial strategies.

Figures 4-1, 4-2, and 4-3 provide a striking visual depiction of how the total VOC plume has been shrinking over time. This has been done by coloring the areas between index concentration contours to better visualize how those areas have either changed shape or disappeared. The contrast can be most easily seen when comparing Figure 4-1 with Figure 4-2. These two figures depict VOC concentrations in groundwater from September 1999 and May 5, 2004, respectively. The most notable contrast in these two figures is the relative shrinking of the green area (between the 0.1 and 0.01 mg/L concentration contours) on Figure 4-2 (May 5, 2004). In addition, the pink and beige, higher concentration areas (more than 10 mg/L and between 10 and 1

mg/L total VOCs, respectively) have disappeared on Figure 4-2. Figure 4-3 took the same presentation concept and applied it to the most recent data from September 28, 2004. The plume from May 5, 2004 and September 28, 2004 appear virtually identical, as would be expected for two sampling events so closely spaced in time. Appendix F also depicts graphical, qualitatively COC trends. Quantitative assessment of COC trends is discussed in subsequent sections of this report.

Plume stability was also evaluated using time series analyses (linear regression) of COC concentrations measured in groundwater samples collected at site monitoring wells. Generally, decreasing concentrations with time and distance from a source area are a good indicator of plume shrinkage, stable VOC concentrations with time and distance indicate plume stability, and increasing VOC concentrations with time and distance can indicate plume expansions. For sequentially decaying chemicals such as PCE, TCE, and 1,1,1-TCA, plume stability must be evaluated not only for these "parent" compounds, but also for their intermediate byproducts.

Although the database available for the site was deemed adequate to assess using models like BIOCHLOR, BBL concluded that a more straight-forward quantitative trend analysis was more appropriate as described in the following sections.

4.3.2.1 Linear Regression Analyses Methods

COC concentration trends were evaluated at select monitoring locations using graphical time-series plots and linear regression analyses of historical groundwater data. Use of linear regression analyses to evaluate time-series concentration trends is consistent with appropriate regulatory guidance documents (USEPA, 1998; USEPA, 1999). Site groundwater sampling events occurred in 1990, 1999, 2001, and 2004. This 14-year database of groundwater analytical results provides a reasonable basis for interpreting COC concentration trends

COCs and monitoring locations for linear regression analyses was selected as follows:

- The site groundwater analytical database was queried to identify all samples that had a COC that exceeded its regulatory criteria. Based on these criteria, 54 COC regulatory exceedances were identified at 14 monitoring locations.

- For the 54 identified exceedances, datasets of COC concentrations with time were assembled. From these datasets, a visual (qualitative) assessment was made to determine:

  - whether there were sufficient data to perform linear regression analyses;
  - whether the COC had already reached its remediation goal (i.e., cleanup criteria);
  - datasets showing a decreasing trend with time; and
  - datasets showing an increasing trend with time.

- Datasets for COCs with sufficient data that showed a qualitative decreasing trend with time were then selected for linear regression analysis.

Linear regression methods were used to estimate correlation coefficients (R^2) and NA rate constants (k) for COCs at select monitoring locations. This involved plotting the natural logarithm of COC concentrations over time. Standard statistical formulas were then used to estimate correlation coefficients and NA rate constants. In all cases where nondetect (ND) concentrations were used in computations, the concentration was assumed to be one-half the detection limit.

The correlation coefficient, or R^2, is a measure of how well a linear regression formula fits empirical data. R^2 values close to 1.0 are considered to be a good fit, while R^2 values below 0.6 are considered to be a poor fit. NA rate constants are defined as the slope of the linear regression line that best fits the empirical data. The NA rate constant includes the influence of all NA processes, including both biotic (i.e., biodegradation) and abiotic (i.e., hydrolysis, dilution, and dispersion) processes. COC half-lives in groundwater ($t_{1/2}$) were determined from the NA rate constant (k) as follows:

$$t_{1/2} = 0.693/k$$

4.3.2.2 Results

Results of the linear regression are presented in Appendix G and summarized in Table 4-3. As shown, 54 datasets were potentially available for linear regression analysis. Of these:

- 17 datasets (31%) showed decreasing COC trends with time;
- 1 dataset (2%) showed an increasing COC trend with time;
- 8 datasets (15%) had data that had an unacceptably low correlation coefficient. Because the correlation was poor, no conclusion could be drawn regarding data trends;
- 1 dataset (2%) had insufficient data to determine trend direction; and
- 27 datasets (50%) showed COCs had already met the remediation goals.

Based on these results, the 18 datasets that showed COC trends with time (i.e., datasets with acceptably high correlation coefficients) were selected for linear regression analyses. Correlation coefficients were estimated for 18 concentration time-series data sets using linear regression methods (Table 4-3). As shown, correlation coefficients for these datasets ranged from 0.60 to 1.00. This information indicates that all of these data sets displayed statistically significant trend with time. COC NA rates ranged from approximately 1.0E-03 to 1.0E-04 day^{-1}, with corresponding COC half-lives ranging from approximately 650 to 4,500 days.

4.3.2.3 Summary

Results of this analysis revealed the following:

- Fifty percent of historical COC detections above regulatory criteria have already been naturally remediated to below regulatory criteria.
- Thirty-one percent of historical COC detections show statistically significant decreasing trends with time, with half-lives ranging from about 650 to 4,500 days.
- Two percent of historical COC detections had insufficient data for trend analysis.
- Fifteen percent of historical COC detections had poor correlation coefficients and therefore no conclusions regarding trend directions could be made.

- Only one COC (1,2-dichloroethylene [1,2-DCE]) appeared to be increasing at only one monitoring location (ENV-3/3R). Care must be taken when interpreting these data because they are from two distinctly different monitoring wells, ENV-3 and its replacement, ENV-3R and, therefore, do not represent the same exact location.

4.4 Evaluation of Geochemical Conditions Conducive for Destruction of COCs in Groundwater

This section discusses the geochemical analytical results for site groundwater samples and their implications for NA of principal COCs. The dataset used for the evaluation of geochemical conditions was collected in April 2001. The indicator parameters are discussed in the context of oxidation-reduction redox reactions known to consume dissolved COCs in site groundwater, and include aerobic respiration, denitrification, iron reduction, manganese reduction, sulfate reduction, and methanogenesis. These redox reactions are mediated by naturally occurring microorganisms that require a sufficient supply of electron acceptors and electron donors, and generate metabolic byproducts during in situ biodegradation reactions. The geochemical data, which include indicator parameters of these conditions, are provided in Tables 4-1 and 4-4.

4.4.1 General Environmental Conditions

General environmental conditions include groundwater pH, temperature, and buffering capacity. These conditions are indicated by site-specific measurements of pH, temperature, alkalinity, and redox potential, as discussed below.

Groundwater pH

The pH of site groundwater samples ranged from 6 to 12 standard units during the April 2001 sampling event (Table 4-4). Groundwater pH between 7 and 9 standard units is considered favorable for microbiologic growth. A pH value of 6 standard units is not of concern given the adequate buffering capacity of site groundwater indicated by alkalinity concentrations greater than 40 milligrams per liter (mg/L) (discussed below). A pH value of 6 likely indicates the presence of inorganic acids produced as intermediate byproducts during some of the oxidative biodegradation reactions. The high pH values (more than 9 standard units) observed in some site groundwater samples during the April 2001 sampling event are probably associated with elevated alkalinity.

Groundwater Temperature

Temperature of groundwater samples ranged from about 9 to 12 degrees Celsius (°C) across the site during the April 2001 sampling event (Table 4-4). Groundwater temperatures greater than 10°C are considered favorable for microbiologic growth. Seasonal fluctuations in groundwater temperature may influence the rate of NA processes.

Oxidation-Reduction Potential

ORP readings of site groundwater samples ranged from about -290 millivolts (mV) to 40 mV during the April 2001 sampling event (Table 4-4). This information indicates the presence of strongly reducing geochemical conditions in site groundwater at some sampling locations during this sampling event. This is important because it supports the presence of the anaerobic redox reactions discussed above. In particular, methanogenesis is

typically associated with ORP readings less than approximately -50 mV. Furthermore, reducing conditions are favorable for the hydrolysis reactions associated with the abiotic degradation of 1,1,1-TCA.

Alkalinity

Alkalinity can serve three roles in NA processes:

- It can be used as an alternate electron acceptor during methanogenesis, which is an anaerobic redox reaction associated with reductive dechlorination of CVOCs, as discussed below.
- It can indicate the presence of elevated carbon dioxide concentrations; carbon dioxide is a metabolic byproduct of a variety of redox reactions.
- It can provide buffering capacity to neutralize acids that may be produced as intermediate byproducts of in situ biodegradation of COCs in site groundwater.

Alkalinity of groundwater samples ranged from 40 mg/L to 430 mg/L (as calcium carbonate) during the April 2001 sampling event (Table 4-1). The alkalinity of groundwater sampled at SDA monitoring well ENV-2 (40 mg/L) was significantly lower than the alkalinity observed in the sample collected at upgradient monitoring well ENV-1 (430 mg/L). This observation suggests that alkalinity was being consumed in the SDA at the time of sampling, and it may indicate the presence of in situ biodegradation of principal COCs in site groundwater. Alkalinity concentrations across the site indicate that groundwater was sufficiently buffered at the time of sampling.

4.4.2 Electron Acceptor Availability

Microorganisms require electron acceptors to perform metabolic functions for cell growth. During redox reactions in which organic matter (e.g., benzene, DCE, VC) is oxidized, naturally occurring electron acceptors in groundwater may include oxygen, nitrate, ferric iron, manganic manganese (Mn+4), sulfate, and carbon dioxide. During reductive dechlorination reactions, naturally occurring microorganisms use chlorinated COCs as electron acceptors. This section evaluates the availability of oxygen, nitrate, and sulfate. The electron acceptors ferric iron and Mn+4 are relatively insoluble in groundwater, typically occur as solids, and are abundant in most soil types in New York, and are therefore assumed to be generally available in site groundwater for iron and manganese redox processes.

Dissolved Oxygen

Aerobic respiration is a biologically mediated redox reaction known to destroy organic chemicals in groundwater. During aerobic respiration, aerobic microorganisms use DO as an electron acceptor and dissolved organic chemicals as a source of carbon. Aerobes reduce molecular oxygen (O_2) and oxidize dissolved organic chemicals, resulting in the production of carbon dioxide and chloride ions. Because rain can contain DO concentrations up to 10 mg/L and is a primary source of DO in groundwater, DO concentrations measured at groundwater monitoring wells can be used to evaluate the presence and magnitude of aerobic respiration.

DO concentrations in site groundwater samples ranged from 0.28 mg/L to about 10 mg/L during the April 2001 sampling event (Table 4-4). The highest DO concentrations were observed in samples collected at downgradient monitoring wells. This observation indicates that DO may have been absent in background groundwater due to a hydraulically upgradient source of organic carbon, and it also was likely consumed in the

SDA/Source Area at the time of sampling. Given the widespread distribution of hydrocarbons at the Roblin Steel facility, low DO concentrations in upgradient groundwater are not surprising. This information suggests that oxygen is probably not a significant electron acceptor in site groundwater.

Nitrate

Nitrate is an indicator parameter for nitrate reduction, which is a biologically mediated redox reaction known to destroy organic chemicals in groundwater. During nitrate reduction reactions, denitrifying microorganisms use nitrate as an alternate electron acceptor and dissolved organic chemicals as a source of carbon. The denitrifiers reduce nitrate, forming ammonia and other reduced nitrogen species, and oxidize dissolved organic chemicals, resulting in the production of carbon dioxide and chloride ions (in the case of CVOCs). Based on this reaction, analysis of nitrate concentrations in groundwater samples can be used to evaluate the presence and magnitude of nitrate reduction in groundwater. This is accomplished using a background-comparison approach, whereby sample results collected at hydraulically downgradient areas are compared with background conditions. For example, if downgradient groundwater samples contain low or ND nitrate concentrations while upgradient, or background samples contain higher nitrate concentrations, this is evidence that nitrate reduction is occurring in site groundwater.

Nitrate concentrations in site groundwater samples were ND at all locations, except for 8.6 mg/L detected at sampling location ENV-4 during the April 2001 sampling event (Table 4-1). These data suggest that nitrate was available in groundwater for use as an alternate electron acceptor at the ENV-4 sampling location, but was generally not available elsewhere. This information suggests that nitrate is probably not a significant electron acceptor in site groundwater.

Sulfate

Sulfate reduction is a biologically mediated redox reaction known to destroy organic chemicals in groundwater. During sulfate reduction, sulfate-reducing microorganisms use sulfate as an alternate electron acceptor and dissolved organic chemicals as a source of carbon. Sulfate reducers reduce sulfate to sulfide species and oxidize dissolved organic chemicals, resulting in the production of carbon dioxide, chloride ions, and (possibly) sulfide gas. However, sulfide, the metabolic byproduct of sulfate reduction, may participate in a variety of geochemical precipitation reactions. Based on this information, analysis of groundwater samples for sulfate concentrations can be used, in some instances, to evaluate the presence of sulfate reduction using the background-comparison approach discussed above.

The sulfate data at the site were difficult to interpret because the background sulfate concentration was lower than site sulfate concentrations. This could be due to the presence of reductants upgradient of the site such as naturally occurring organic carbon (e.g., peat), pyrite, zero-valent iron, or other anthropogenic sources of carbon. This altering of the background geochemical conditions complicates interpreting some, but not necessarily all of the site-specific geochemical data.

An important point to note with regard to sulfate is that it is present in site groundwater at concentrations (from 19 mg/L to 560 mg/L during the April 2001 sampling event [Table 4-1]) that would allow it to be used by indigenous sulfate reducing bacteria as an alternate electron acceptor during oxidation-reduction reactions associated with in situ biodegradation of some site COCs. This information, therefore, suggests that sulfate is probably a significant electron acceptor in site groundwater.

4.4.3 Electron Donor Availability

Microorganisms known to reductively dechlorinate chlorinated COCs require an alternate supply of electron donors, such as naturally occurring or anthropogenic organic carbon, to perform metabolic functions for cell growth. During reductive dechlorination reactions, naturally occurring electron donors in groundwater can be indicated by concentrations of dissolved organic carbon and COCs such as the BTEX compounds, acetone, DCE and DCA isomers, VC, chloroethane, methane, ethane, and ethene.

Dissolved (or Soluble) Organic Carbon

Dissolved organic carbon (DOC) is a measure of the total organic carbon concentration in a sample, including COCs and naturally occurring organic matter. Some portion of the DOC in groundwater can be used as a source of carbon by most naturally occurring microorganisms, particularly those that reductively dechlorinate chlorinated COCs. This is important because sufficient DOC in groundwater is necessary to develop and maintain reducing geochemical conditions that are required for reductive dechlorination of CVOCs. Therefore, DOC is a "catch-all" indicator parameter for a variety of redox conditions. Metabolic byproducts of DOC oxidation include carbon dioxide and the various inorganic byproducts discussed above. DOC can also be converted to methane during methanogenesis, another important redox reaction for site principal COCs, as discussed below.

DOC concentrations in site groundwater samples ranged from about 7 mg/L to 22 mg/L during the April 2001 sampling event (Table 4-1), suggesting that there is a sufficient supply of DOC present at the locations sampled. The highest DOC concentration observed in the April 2001 data set was detected in a groundwater sample collected from downgradient monitoring well ENV-3 (60 mg/L).

Other Potential Electron Donors

We note that COCs such as BTEX, DCE, DCA, VC, and chloroethane, and other chemicals such as methane, ethane, and ethene were present at detectable concentrations in some groundwater samples collected at the site, and, therefore, these chemicals could potentially serve as electron donors in site groundwater during oxidation-reduction reactions associated with in situ biodegradation of some other site COCs.

4.4.4 Metabolic Byproducts

Naturally occurring microorganisms known to biodegrade COCs in situ in groundwater produce metabolic byproducts that can be detected using standard analytical techniques. The presence and distribution of such metabolic byproducts in groundwater can provide further evidence for in situ natural remediation of COCs in site groundwater.

Ammonia

Ammonia is a metabolic byproduct of nitrate reduction; therefore, by employing a background-comparison approach, it is possible to evaluate the presence and magnitude of nitrate reduction in site groundwater. Elevated ammonia concentrations measured at hydraulically downgradient groundwater samples (compared with upgradient samples) can be construed as evidence that nitrate reduction was occurring in site groundwater during the April 2001 sampling event.

Ammonia concentrations in site groundwater samples ranged from ND to 2.8 mg/L during the April 2001 sampling event (Table 4-1). The highest ammonia concentration was detected at downgradient monitoring well GW-7 (2.8 mg/L), where VOC concentrations were low or ND at the time of sampling, suggesting an inverse correlation at that time. This information indicates that nitrate reduction was occurring in site groundwater to some extent, and may have been associated with the low VOC concentrations in downgradient groundwater at that time.

Dissolved Iron

Iron reduction is a biologically mediated redox reaction known to destroy organic chemicals in groundwater. During iron reduction, iron-reducing microorganisms use ferric iron (Fe+3) as an alternate electron acceptor and dissolved organic chemicals as a source of carbon. Iron reducers reduce Fe+3, forming Fe+2, and oxidize dissolved organic chemicals, resulting in the production of carbon dioxide and chloride ions (in the case of CVOCs). Fe+3 species are relatively insoluble in groundwater and occur mainly as precipitates, or filterable particulates, while most Fe+2 species are soluble to some extent. Based on this information, analysis of filtered groundwater samples for iron concentrations can be used to evaluate the presence of dissolved iron and, therefore, the relative magnitude of iron reduction in groundwater. This is accomplished using the background-comparison approach discussed above.

Dissolved iron concentrations in site groundwater samples ranged from ND to 1.8 mg/L during the April 2001 sampling event (Table 4-1). The presence of dissolved iron in the groundwater sample collected at upgradient monitoring well ENV-1 (1.7 mg/L) indicates that iron reduction was occurring in background groundwater and that a source of organic carbon was available in background groundwater at the time of sampling. Since groundwater from monitoring well ENV-3 contained 1.8 mg/L of dissolved iron, iron reduction is likely an important in situ biodegradation process in groundwater at the site.

Dissolved Manganese

Similar to iron reduction, manganese reduction is a biologically mediated redox reaction known to destroy organic chemicals in groundwater. During manganese reduction, manganese-reducing microorganisms use Mn+4 as an alternate electron acceptor and dissolved organic chemicals as a source of carbon. Manganese reducers reduce Mn+4, forming Mn+2, and oxidize dissolved organic chemicals, resulting in the production of carbon dioxide and chloride ions (in the case of CVOCs). Mn+4 species are relatively insoluble in groundwater and occur as precipitates, or filterable particulates, while Mn+2 species are more readily dissolved. Based on this information, analysis of filtered groundwater samples for manganese concentrations can be used to evaluate the presence of dissolved manganese and, therefore, the magnitude of manganese reduction in groundwater. This is accomplished using the background-comparison approach discussed above.

Dissolved manganese concentrations in site groundwater samples ranged from ND to 2.8 mg/L during the April 2001 sampling event (Table 4-1). The presence of dissolved manganese in the groundwater sample collected at upgradient monitoring well ENV-1 (2.8 mg/L) indicates that manganese reduction was occurring in background groundwater at the time of sampling and that a source of organic carbon was available in background groundwater at that time. Since groundwater from monitoring well ENV-3 contained 0.25 mg/L of dissolved manganese, manganese reduction is likely an important in situ biodegradation process in groundwater at the site.

Sulfide

Sulfide (and related chemicals) is a metabolic byproduct of sulfate reduction; therefore, it is possible, at times, to evaluate the presence and magnitude of sulfate reduction in site groundwater using the background-comparison approach.

Sulfide concentrations were ND across the site groundwater samples collected in April 2001 (Table 4-1). It should be noted that dissolved sulfide readily participates in a variety of naturally occurring geochemical reactions which could render its concentration to be ND, including, but not limited to volatilization from groundwater into soil gas present within the vadose zone, reactions with metals that precipitate sulfide minerals (e.g., pyrite), and oxidation to produce oxidized sulfur species such as sulfate.

Because sulfide concentrations were ND, the occurrence or magnitude of sulfate reduction could not be determined.

Chloride

Chloride ions are a direct byproduct of the in situ biodegradation of CVOCs by both oxidative and reductive metabolic processes in groundwater. Therefore, if the background-comparison approach indicates increased chloride concentrations in groundwater hydraulically downgradient from an SDA/Source Area, and there are no other sources of chloride, this can be a direct indication for in situ biodegradation of CVOCs in site groundwater.

Chloride concentrations in site groundwater samples ranged from 6.6 mg/L to 59 mg/L during the April 2001 sampling event (Table 4-1). Chloride concentrations were highest in groundwater sampled at monitoring wells ENV-2 (59 mg/L) and ENV-3 (51 mg/L), which are located within and downgradient from the SDA/Source Area, respectively. Chloride concentrations were lowest in groundwater sampled at upgradient monitoring well ENV-1 (16 mg/L) and downgradient monitoring wells ENV-4 (6.6 mg/L) and GW-7 (9.5 mg/L).

Because the mass of chloride is conserved in groundwater (i.e., it does not volatilize, biodegrade, or form solid precipitates), the only possible transport processes that could account for this magnitude of concentration reduction are dispersion and/or dilution. This information is a clear indication that CVOCs were being destroyed in site groundwater at the time of sampling and also that peak PCOC concentrations were being attenuated by means of dispersion and dilution.

Dissolved Carbon Dioxide

As discussed above, dissolved carbon dioxide (DCO_2) is a metabolic byproduct of a variety of redox reactions known to consume dissolved organic chemicals in groundwater; therefore, elevated DCO_2 concentrations in downgradient groundwater samples can verify the presence of in situ biodegradation reactions at the site. In other words, DCO_2 is another "catch-all" indicator parameter for metabolic activity in groundwater. DCO_2 can also serve as an electron acceptor during methanogenesis, which is an important redox reaction that consumes organic carbon and is associated with reductive dechlorination of CVOCs. Therefore, depleted DCO_2 concentrations in downgradient groundwater samples (compared with upgradient samples) can indicate the presence of methanogenesis at the site.

DCO_2 concentrations in groundwater samples ranged from ND to 44 mg/L during the April 2001 sampling event (Table 4-1). The DCO_2 concentration in groundwater sampled in the SDA (ENV-2) (less than 0.60 mg/L) was two orders of magnitude or more lower than the background DCO_2 concentration measured in one sample from upgradient monitoring well ENV-1 (44 mg/L). This information indicates that carbon dioxide was being consumed in situ in groundwater in the SDA at the time of sampling and indicates that methanogenesis was occurring at that time.

Dissolved Nitrogen

Dissolved nitrogen (DN_2) is a byproduct of nitrate reduction; therefore, increased DN_2 concentrations in downgradient groundwater can indicate the presence of nitrate reduction in groundwater. DN_2 concentrations in groundwater at the site ranged from 19 mg/L to 21 mg/L during the April 2001 sampling event (Table 4-1). Because there was no discernable spatial trend in the DN_2 measurements, the occurrence and magnitude of nitrate reduction in site groundwater could not be determined.

Dissolved Methane

Methanogenesis is a biologically mediated redox reaction known to destroy organic chemicals in groundwater, and, importantly, it is strongly associated with reductive dechlorination of CVOCs. During methanogenesis, methanogenic microorganisms use carbon dioxide as an alternate electron acceptor and dissolved organic chemicals as a source of carbon. Methanogens reduce carbon dioxide to methane and oxidize dissolved organic chemicals, resulting in the production of methane and chloride ions. Based on this information, analysis of groundwater samples for methane concentrations can be used to evaluate the presence of methanogenesis using the background-comparison approach discussed above. Methane can be consumed by naturally occurring methanotrophic microorganisms.

Concentrations of dissolved methane in site groundwater samples ranged from 5.6 micrograms per liter (µg/L) to 850 µg/L during the April 2001 sampling event (Table 4-1). The highest dissolved methane concentration was observed in groundwater sampled at monitoring well ENV-3 (850 µg/L), which is hydraulically downgradient from the SDA. This trend indicates that methanogenesis was occurring in site groundwater at the ENV-3 sampling location at the time of sampling. It is also likely that naturally occurring methanotrophs were consuming some of the methane in groundwater near the SDA, which is important because methanotrophs can cometabolically degrade CVOCs in groundwater. Based on this information, it appears that methanogenesis is an important in situ biodegradation reaction occurring in site groundwater.

Dissolved Ethane and Ethene

Ethene and ethane are direct byproducts of the complete reductive dechlorination of CVOCs. In other words, in the absence of other ethene and ethane sources, elevated concentrations of ethene and ethane are direct evidence that naturally occurring microorganisms are completely stripping chloride ions off PCE, TCE, and 1,1,1-TCA molecules in site groundwater.

Dissolved ethane concentrations in site groundwater samples ranged from 0.1 µg/L to 48 µg/L during the April 2001 sampling event (Table 4-1). The highest dissolved ethane concentrations were observed in site groundwater sampled at downgradient monitoring wells (including ENV-2 [20 µg/L] and ENV-3 [48 µg/L]) and were approximately two orders of magnitude higher than dissolved ethane concentrations observed in background groundwater samples (ENV-1 [0.1 µg/L]). This observation is considered to be direct evidence that complete reductive dechlorination of CVOCs was occurring in site groundwater at some sampling locations at the time of sampling.

Dissolved ethene concentrations in site groundwater samples ranged from 0.1 µg/L to 94 µg/L during the April 2001 sampling event (Table 4-1). Similar to dissolved ethane concentrations, the highest dissolved ethene concentrations were observed in site groundwater sampled at downgradient monitoring wells (including ENV-2 [94 µg/L] and ENV-3 [4.5 µg/L]) and were also approximately two orders of magnitude higher than dissolved ethene concentrations observed in background groundwater samples (ENV-1 [0.1 µg/L]). This observation is also direct evidence for the complete reductive dechlorination of CVOCs in site groundwater at some sampling locations at the time of sampling.

4.4.5 Summary

In summary, the geochemical data revealed that:

- General environmental conditions were favorable for in situ biodegradation reactions in site groundwater at most locations.
- The likely primary electron acceptors available for in situ biodegradation reactions included Fe+3, Mn+4, sulfate, and/or carbon dioxide at most locations.
- Electron donors appear to have been sufficiently abundant to support reductive dechlorination reactions.
- The presence of elevated concentrations of metabolic byproducts including dissolved iron, dissolved manganese, and methane, confirms that iron reduction, manganese reduction, and methanogenesis were occurring.
- The presence of elevated concentrations of metabolic byproducts, including chloride, ethane, and ethene, confirms that reductive dechlorination of some chlorinated COCs was occurring.

4.5 Conclusions of the NA Assessment

The CVOCs PCE, TCE, and 1,1,1-TCA, are being reductively dechlorinated in situ in site groundwater by naturally occurring processes capable of complete dechlorination, and have already been remediated to regulatory guidance values at some sampling locations. This is demonstrated by the presence of strongly reducing conditions in site groundwater at some locations during the April 2001 sampling event, as well as elevated concentrations of intermediate and final byproducts, including methane, ethane, ethene, chloride, and carbon dioxide near and hydraulically downgradient from the SDA. In addition, the following conclusions can be drawn from the site data:

- Fifty percent of historical COC detections above regulatory criteria have already been naturally remediated to below regulatory criteria.
- Thirty-one percent of historical COC detections show statistically significant decreasing trends with time, with COC half-lives ranging from about 650 to 4,500 days.
- Only one COC (1,2-DCE) appeared to be increasing at only one monitoring location (ENV-3/3R). Care must be taken when interpreting these data because data are from two distinctly different monitoring wells, ENV-3 and its replacement, ENV-3R, and, therefore, do not represent the same exact location.
- Intermediate CVOC byproducts, including isomers of DCE, DCA, and VC, are present in groundwater samples. These compounds are readily biodegraded in groundwater by naturally occurring aerobic and anaerobic microorganisms.
- Plumes of CVOCs in groundwater at the site appear to be shrinking with time, as shown by these additional observations:

- Cis-1,2-dichloroethylene (cis-1,2-DCE) concentrations are decreasing with time and distance at monitoring wells located hydraulically downgradient from ENV-2, indicating that peak cis-1,2-DCE concentrations are attenuating with time and distance.

- Key groundwater CVOC concentrations decrease with distance hydraulically downgradient from the SDA.

- The occurrence of CA in groundwater sampled from ENV-3 provides strong evidence that reductive dechlorination of 1,1,1-TCA and 1,1-DCA is occurring in groundwater in the vicinity of ENV-3.

Based on this evaluation, NA appears to have been a significant process in degrading the principal COCs in groundwater at the site.

5. Conclusions

Based on the results of the groundwater gauging and sampling program and the evaluation of the historical occurrence and future viability of NA, the following can be concluded:

- Groundwater gradients and flow patterns observed on May 5 and September 28, 2004 were similar to those observed during previous assessments, including those described in the RI Report (BBL, 2002).
- The area of the total VOC plume has shrunk significantly over the period between September 1999 and May 2004.
- Evaluation of NA indicator parameters provides strong evidence that NA has been occurring at the site.
- The VOC plume will continue to shrink because:
  - a large percentage of CVOC source material has been removed during implementation of the OU-2 IRM. This includes removal of more than 7,000 cubic yards of soil from the SDA/Source area including 265 cubic yards of soil from the saturated zone above the clay confining layer; and
  - conditions are favorable for continued NA of the groundwater VOCs.
- The plume has not reached the Niagara River and, based on the implementation of the OU-2 IRM, as well as the evidence of a "shrinking plume" discussed in this report, the plume is not expected to reach the river in the future.
- Because the groundwater VOC plume has been shrinking, and it is expected that the plume will continue to shrink through NA mechanisms, NA is the logical remedy for the current OU-3 groundwater VOC plume.

6. References

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Tables

GROUNDWATER LEVEL MEASUREMENTS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Monitoring Point I.D.	Reference Point (RP) Elevation (ft.)	11/19/1990[3]		1/21/1991[3]		5/11/1992[3]		9/29/1999		4/18/2001		7/16/2001		5/5/2004		9/28/2004	
		Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)	Depth to Water from RP (ft.)	Groundwater Elevation (ft.)
GW-1[2]	575.77	6.63	570.17	6.15	570.65	6.26	570.54	--	--	7.05	568.72	7.47	568.30	6.15	569.62	6.37	569.4
GW-2	582.00	13.11	568.90	12.24	569.77	12.24	569.77	14.09	567.91	--	--	14.17	567.83	12.85	569.15	13.01	568.99
GW-3	579.00	9.86	568.59	8.72	569.73	8.87	569.58	11.17	567.83	--	--	10.69	568.31	8.62	570.38	8.79	570.21
GW-4	575.89	10.32	566.12	9.68	566.76	9.92	566.52	10.04	565.85	--	--	10.39	565.50	9.72	566.17	9.87	566.02
GW-5	573.39	8.43	565.79	7.86	566.36	8.18	566.04	6.93	566.46	--	--	7.6	565.79	6.93	566.46	7.16	566.23
GW-6	574.08	6.80	567.16	6.24	567.72	6.20	567.76	6.98	567.10	--	--	7.90	566.18	6.35	567.73	6.49	567.59
GW-7	581.96	12.35	569.61	11.48	570.48	11.58	570.38	13.32	568.64	12.19	569.77	13.07	568.89	11.78	570.18	11.93	570.03
ENV-1	579.46	6.58	572.91	5.96	573.53	6.41	573.08	6.92	570.54	7.17	572.29	8.95	570.51	7.1	572.36	7.29	572.17
ENV-2	582.94	11.89	571.05	11.19	571.75	11.26	571.68	12.95	569.99	11.99	570.95	12.84	570.10	Removed During Implementation of OU-2			
ENV-3	582.62	11.38	571.21	10.40	572.19	10.64	571.95	12.82	569.80	11.64	570.98	12.51	570.11	Removed During Implementation of OU-2			
ENV-3R	580.14	Installed 4/14/04															
ENV-4	582.60	12.14	570.41	10.61	571.94	10.67	571.88	14.11	568.49	12.23	570.37	13.68	568.92	8.98	571.16	9.12	571.02
ENV-5	581.48	10.95	570.43	9.50	571.88	9.48	571.90	12.97	568.51	11.07	570.41	12.51	568.97	11.21	571.39	11.39	571.21
ENV-6	582.05	13.40	568.63	10.21	571.82	10.19	571.84	13.96	568.09	11.65	570.40	13.53	568.52	10.05	571.43	10.31	571.17
ENV-7	582.74	--	--	--	--	--	--	--	--	12.38	570.36	13.24	569.50	10.62	571.43	10.84	571.21
ENV-8	583.11	--	--	--	--	--	--	--	--	11.53	571.58	13.40	569.71	12.1	570.64	12.26	570.48
ENV-9	583.65	--	--	--	--	--	--	--	--	13.00	570.65	13.89	569.76	12.15	570.96	12.37	570.74
ESI-7		--	--	--	--	--	--	--	--					12.7	570.95	12.93	570.72
ESI-8	580.06	--	--	--	--	--	--	11.77	568.29	--	--	11.21	568.85	12.42		12.56	
NW-1	578.92	--	--	--	--	--	--	9.35	569.57	--	--	9.60	569.32	8.82	571.24	8.97	571.09
NW-2	581.25	--	--	--	--	--	--	--	--	12.07	569.18	12.50	568.75	Could not locate		Could not locate	
NW-4	581.16	--	--	--	--	--	--	11.90	569.26	10.58	570.58	11.43	569.73	11.95	569.3	12.08	569.17
NW-5	581.58	--	--	--	--	--	--	10.40	571.18	--	--	10.82	570.76	10.28	570.88	10.36	570.8
ENV-10	579.63	--	--	--	--	--	--	--	--	12.77	566.86	13.85	565.78	9.01	572.57	9.32	572.26
ENV-10D	579.20	--	--	--	--	--	--	--	--	13.56	565.64	13.63	565.57	12.65	566.98	12.79	566.84
NR-1[1]	571.07	--	--	--	--	--	--	7.13	563.94	--	--	5.46	565.61	13.08	566.12	13.29	565.91
ENV-3R	580.14	Installed 4/14/04												5.35	565.72	5.61	565.46

Notes:

1 - Staff Gauge on sheet piling along Niagara River.
2 - GW-1 was repaired and retrofitted as a flush-mount well in April 2001.
3 - Data based upon site survey prior to October 1999.
Ground surface and reference point elevations based upon October 1999 and June 2000 site survey.
Monitoring wells GW-1 and ESI-7 were damaged and not useable during the 9/29/99 water-level measurement event.

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. / Sample Date	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	ENV-1					ENV-1D	ENV-2			ENV-3		
		11/19/1990	9/29/1999	4/18/2001	5/5/2004	9/28/2004	4/20/2001	11/19/1990	10/1/1999	4/18/2001	11/19/1990	10/1/1999	4/18/2001
Volatiles													
Acetone	**50**	--	**< 10**	**< 10**	**< 5**	**< 25**	***710 DJ***	***1,600***	***22 BJ***	**< 500**	--	**< 10**	**< 10**
Benzene	1	--	< 10	< 10	< 1	< 5	< 10	--	*2 J*	< 500	--	1 J	< 10
2-Butanone	50	--	< 10	< 10	< 1	< 25	2 J	--	< 10	< 500	--	< 10	< 10
Carbon Disulfide	NE / 60	--	< 10	< 10	< 1	< 5	< 10	--	< 10	< 500	--	< 10	< 10
Chlorobenzene	5	--	< 10	< 10	< 1	< 5	< 10	--	3 J	< 500	--	< 10	< 10
Chloroethane	5	--	< 10	< 10	< 1	< 5	< 10	--	< 10	< 500	*79*	*52*	*25*
Chloroform	7	--	< 10	< 10	< 1	< 5	< 10	--	< 10	< 500	--	< 10	< 10
1,1-Dichloroethane	5	--	< 10	< 10	< 1	< 5	< 10	***4,800***	***910 DJ***	***950***	***250***	***71***	***59***
1,2-Dichloroethane	5 / 0.6	--	< 10	< 10	< 1	< 5	< 10	***750***	***20***	< 500	--	< 10	< 10
1,1-Dichloroethene	5	--	< 10	< 10	< 1	< 5	< 10	***300***	***93***	***160 J***	--	< 10	< 10
cis-1,2-Dichloroethene	5	NA	NA	< 10	< 1	< 5	< 10	NA	NA	***54,000 D***	NA	NA	2 J
trans-1,2-Dichloroethene	5	NA	NA	< 10	< 1	< 5	< 10	NA	NA	< 500	NA	NA	< 10
1,2-Dichloroethene (total)	5	--	< 10	NA	NA	NA	NA	***46,000***	***26,000 D***	NA	--	< 10	NA
Ethyl Benzene	5	--	< 10	< 10	< 1	< 5	< 10	***840***	***170***	***280 J***	--	< 10	< 10
2-Hexanone	50	--	< 10	< 10	< 5	< 25	< 10	--	< 10	< 500	--	< 10	< 10
Methylene Chloride	5	--	< 10	< 10	< 2	3 J	< 10	***6,100***	***180***	***140 J***	--	2 J	< 10
4-Methyl-2-Pentanone	NE	--	< 10	< 10	< 5	< 25	< 10	--	< 10	< 500	82	< 10	2 J
Tetrachloroethene	5	--	< 10	< 10	< 1	< 5	< 10	***40,000***	***7,700 D***	***13,000 D***	--	< 10	*6 J*
Toluene	5	--	< 10	< 10	< 1	< 5	< 10	***8,600***	***2,400 D***	***2,300***	***11***	< 10	< 10
1,1,1-Trichloroethane	5	--	< 10	< 10	< 1	< 5	< 10	***21,000***	***2,500 D***	***4,000***	--	< 10	< 10
1,1,2-Trichloroethane	1	--	< 10	< 10	< 1	< 5	< 10	--	1 J	< 500	--	< 10	< 10
Trichloroethene	5	--	< 10	< 10	< 1	< 5	< 10	***29,000***	***7,300 D***	***6,500***	--	< 10	3 J
Vinyl Chloride	2	--	< 10	< 10	< 1	< 5	< 10	***3,400***	***790 DJ***	***680***	--	< 10	< 10
Xylenes (total)	5	--	< 10	< 10	< 3	< 15	< 10	***5,100***	***900 DJ***	***1,470 J***	***14***	< 10	< 10
Total VOCs	NE	--	--	--	--	3	712	167,490	48,991	83,480	436	126	97
Semivolatiles													
Acenaphthene	20	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Acenaphthylene	NE	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Benzoic Acid	NE	--	--	NA	NA	NA	NA	13	--	NA	--	--	NA
Bis (2-ethylhexyl) Phthalate	5	--	--	NA	NA	NA	NA	*25*	--	NA	--	--	NA
Butylbenzyl Phthalate	50	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Dibenzofuran	NE	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
1,2-Dichlorobenzene	4.7 / 3	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Diethyl Phthalate	50	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
2,4-Dimethylphenol	NE	--	--	NA	NA	NA	NA	15	--	NA	--	--	NA
Di-n-Butyl Phthalate	50	--	1 J	NA	NA	NA	NA	--	5 J	NA	--	4 J	NA
Di-n-Octyl Phthalate	50	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Fluorene	50	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Isophorone	50	--	--	NA	NA	NA	NA	10	--	NA	--	--	NA
2-Methylnaphthalene	NE	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
2-Methylphenol	NE	--	--	NA	NA	NA	NA	21	--	NA	--	--	NA
4-Methylphenol	NE	--	--	NA	NA	NA	NA	30	--	NA	--	--	NA
Naphthalene	10	--	--	NA	NA	NA	NA	*10*	--	NA	--	--	NA
Phenol	1 / NE	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA
Phenanthrene	50	--	--	NA	NA	NA	NA	--	--	NA	--	--	NA

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. / Sample Date	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	ENV-3R					ENV-4					ENV-5					ENV-6			ENV-7		
		5/5/2004	Duplicate FD050504	7/15/2004	9/28/2004	Duplicate FD092804	11/19/1990	9/30/1999	4/18/2001	5/5/2004	9/28/2004	11/19/1990	Duplicate	9/30/1999	4/20/2001	Duplicate FD41901	11/19/1990	9/30/1999	4/19/2001	4/19/2001	5/5/2004	9/28/2004
Volatiles																						
Acetone	**50**	**< 5**	**4 J**	--	**< 50**	**< 25**	--	**< 10**	**< 10**	**< 5**	**< 50**	--	--	**< 10**	**6 J**	**< 10**	--	**< 10**	**< 10**	16 J	**< 5**	< 25
Benzene	1	1	< 1	--	< 10	< 5	--	< 10	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
2-Butanone	50	< 1	< 1	--	< 50	< 25	--	< 10	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
Carbon Disulfide	NE / 60	< 1	< 1	--	< 10	< 5	--	< 10	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
Chlorobenzene	5	< 1	< 1	--	< 10	< 5	--	< 10	< 10	**< 1**	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
Chloroethane	5	< 1	< 1	--	< 10	< 5	--	< 10	< 10	**< 1**	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	**< 1**	< 5
Chloroform	7	< 1	< 1	--	< 10	< 5	--	< 10	< 10	**< 1**	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	**< 1**	< 5
1,1 Dichloroethane	5	***20***	***19***	***18***	***49***	***48***	--	2 J	< 10	**< 1**	< 10	***8***	***9***	2 J	< 10	< 10	--	< 10	< 10	< 25	**< 1**	< 5
1,2-Dichloroethane	5 / 0.6	***1***	***1***	--	***3 J***	***3 J***	--	**< 10**	**< 10**	**< 1**	**< 10**	--	--	< 10	< 10	< 10	--	< 10	< 10	3 J	2	< 5
1,1-Dichloroethene	5	1	1	--	< 10	3 J	--	< 10	**< 10**	**< 1**	**< 10**	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
cis-1,2-Dichloroethene	5	***120 D***	***140 D***	***32***	***370 D***	***580 D***	NA	NA	3 J	**< 1**	**< 10**	NA	NA	NA	***10***	***10***	NA	NA	< 10	***430***	***280 D***	***170***
trans-1,2-Dichloroethene	5	0.7 J	0.9 J	--	< 10	3 J	NA	NA	< 10	< 1	< 10	NA	NA	NA	4 J	4 J	NA	NA	< 10	4 J	3	< 5
1,2-Dichloroethene (total)	5	NA	NA	--	NA	NA	***110***	***85***	NA	NA	NA	***36***	***37***	***56***	NA	NA	--	***6 J***	NA	NA	NA	NA
Ethyl Benzene	5	2	2	--	< 10	2 J	***58***	***24***	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
2-Hexanone	50	< 5	< 5	--	< 50	< 25	--	< 10	< 10	< 5	< 50	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 5	< 25
Methylene Chloride	5	***0.8 J***	***0.8 J***	***6J***	***9 DJ***	3 J	--	< 10	< 10	< 2	***8 J***	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 5	< 25
4-Methyl-2-Pentanone	NE	**14**	**16**	--	**< 50**	**< 25**	110	< 10	< 10	< 5	< 50	--	--	< 10	< 10	< 10	-	< 10	< 10	< 25	< 5	< 25
Tetrachloroethene	5	***15***	***14***	***6***	3 J	4 J	--	< 10	< 10	0.3 J	< 10	--	--	< 10	< 10	< 10	--	< 10	2 J	3 J	4	3 J
Toluene	5	3	3	--	< 10	2 J	***760***	***9 J***	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
1,1,1-Trichloroethane	5	***2***	2	***4J***	**< 10**	< 5	--	< 10	**< 10**	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
1,1,2-Trichloroethane	1	< 1	< 1	--	< 10	< 5	--	< 10	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	< 25	< 1	< 5
Trichloroethene	5	***22***	***22***	***7***	***6 J***	***6***	***560***	***46***	3 J	1	< 10	--	--	***3 J***	2 J	1 J	--	2 J	< 10	***220***	***50 D***	***88***
Vinyl Chloride	2	***33 D***	***39 D***	***8***	***220 J***	***190***	--	***5 J***	< 10	< 1	< 10	--	--	< 10	< 10	< 10	--	< 10	< 10	***16 J***	***6***	< 5
Xylenes (total)	5	***18***	***16***	3J	< 30	***8 J***	***260***	***67***	< 10	< 3	< 30	--	--	< 10	< 10	< 10	--	< 10	< 10	< 28 J	< 3	< 15
Total VOCs	NE	253.5	274.7	84	660	852	1,858	238	6	1.3	8	44	46	61	22	15	-	8	2	720	346	264
Semivolatiles																						
Acenaphthene	20	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Acenaphthylene	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Benzoic Acid	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Bis (2-ethylhexyl) Phthalate	5	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Butylbenzyl Phthalate	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Dibenzofuran	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
1,2-Dichlorobenzene	4.7 / 3	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Diethyl Phthalate	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
2,4-Dimethylphenol	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Di-n-Butyl Phthalate	50	NA	NA	NA	NA	NA	--	1 J	NA	NA	NA	--	--	7 J	NA	NA	--	3 J	NA	NA	NA	NA
Di-n-Octyl Phthalate	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Fluorene	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Isophorone	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
2-Methylnaphthalene	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
2-Methylphenol	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
4-Methylphenol	NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Naphthalene	10	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Phenol	1 / NE	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA
Phenanthrene	50	NA	NA	NA	NA	NA	--	--	NA	NA	NA	--	--	--	NA	NA	--	--	NA	NA	NA	NA

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. / Sample Date	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	ENV-8			ENV-9			ENV-10D	GW-1		
		4/19/2001	5/5/2004	9/28/2004	4/19/2001	5/5/2004	9/28/2004	4/20/2001	9/28/1988	12/5/1990	4/19/2001
Volatiles											
Acetone	**50**	**31**	**< 25**	**< 50**	***1,200 DJ***	**< 5**	**< 25**	**29 J**	--	**12**	< 10
Benzene	1	< 10	< 5	< 10	< 10	< 1	< 5	< 10	***34***	***42***	***4 J***
2-Butanone	50	< 10	< 5	< 10	5 J	< 1	< 5	< 10	--	--	< 10
Carbon Disulfide	NE / 60	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chlorobenzene	5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chloroethane	5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chloroform	7	< 10	< 5	< 10	3 J	< 1	< 5	< 10	--	--	< 10
1,1-Dichloroethane	5	***7 J***	***5***	4 J	< 10	0.5 J	< 5	< 10	--	--	< 10
1,2-Dichloroethane	5 / 0.6	< 10	**< 5**	**< 10**	**< 10**	**< 1**	< 5	< 10	--	--	< 10
1,1 Dichloroethene	5	< 10	< 5	**< 10**	**< 10**	**< 1**	< 5	< 10	--	--	< 10
cis-1,2-Dichloroethene	5	***150***	***140***	***120***	**< 10**	0.6 J	< 5	< 10	NA	NA	< 10
trans-1,2-Dichloroethene	5	4 J	3 J	< 10	< 10	**< 1**	< 5	< 10	NA	NA	< 10
1,2-Dichloroethene (total)	5	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Ethyl Benzene	**5**	**< 10**	**< 5**	**< 10**	**2 J**	**< 1**	**< 5**	**< 10**	--	--	**< 10**
2-Hexanone	50	< 10	< 25	< 50	2 J	< 5	< 25	< 10	--	--	< 10
Methylene Chloride	5	**< 10**	**< 10**	**4 J**	**< 10**	**< 2**	**3 J**	**< 10**	***6 B***	--	**< 10**
4-Methyl-2-Pentanone	NE	11	< 25	< 50	10	< 5	< 25	< 10	--	--	< 10
Tetrachloroethene	5	3 J	3 J	3 J	< 10	< 1	< 5	< 10	--	--	< 10
Toluene	5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	0.9 J	0.8 J	< 10
1,1,1-Trichloroethane	**5**	**< 10**	**< 5**	**< 10**	**< 10**	**< 1**	**< 5**	**< 10**	--	--	**< 10**
1,1,2-Trichloroethane	1	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Trichloroethene	**5**	***12***	***14 J***	***12***	3 J	0.8 J	**< 5**	**< 10**	--	--	< 10
Vinyl Chloride	**2**	***3 J***	**< 5**	***10***	**< 10**	**< 1**	**< 5**	**< 10**	--	--	**< 10**
Xylenes (total)	**5**	--	**< 15**	**< 30**	***13 J***	**< 3**	**< 15**	**< 10**	--	--	**< 10**
Total VOCs	**NE**	221	165	153	1,238	1.9	3	29	40.9	54.8	4
Semivolatiles											
Acenaphthene	20	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Acenaphthylene	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Benzoic Acid	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Bis (2-ethylhexyl) Phthalate	5	NA	NA	NA	NA	NA	NA	NA	6 BJ	--	NA
Butylbenzyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Dibenzofuran	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
1,2-Dichlorobenzene	4.7 / 3	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Diethyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA
2,4-Dimethylphenol	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Di-n-Butyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	1 BJ	--	NA
Di-n-Octyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Fluorene	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Isophorone	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA
2-Methylnaphthalene	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
2-Methylphenol	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
4-Methylphenol	NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Naphthalene	10	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Phenol	1 / NE	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Phenanthrene	50	NA	NA	NA	NA	NA	NA	NA	--	--	NA

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. / Sample Date	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	GW-2				GW-3					GW-4			GW-5			GW-6		
		9/28/1988	12/5/1990	Duplicate	9/29/1999	9/28/1988	12/5/1990	9/29/1999	5/5/2004	9/28/2004	9/28/1988	12/5/1990	9/30/1999	9/28/1988	12/5/1990	9/30/1999	9/28/1988	12/5/1990	9/30/1999
Volatiles																			
Acetone	**50**	**--**	**12 J**	**26**	**< 10**	**--**	**20**	**< 10**	**< 5**	**< 10**	--	13	< 10	--	9 J	< 10	46 B	20	< 10
Benzene	1	--	--	--	< 10	6	2 J	1 J	< 1	< 2	3 J	0.9 J	1 J	3 J	--	< 10	2 J	0.7 J	< 10
2-Butanone	50	--	--	--	< 10	--	29	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Carbon Disulfide	NE / 60	--	5 J	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Chlorobenzene	5	--	--	--	< 10	--	--	**< 10**	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Chloroethane	5	--	--	--	< 10	--	--	**< 10**	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Chloroform	7	--	--	--	< 10	--	--	**< 10**	< 1	< 2	--	--	< 10	--	--	< 10	8 J	--	< 10
1,1-Dichloroethane	5	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
1,2-Dichloroethane	5 / 0.6	--	--	--	< 10	--	--	**< 10**	< 1	**< 2**	--	--	< 10	--	--	< 10	--	--	< 10
1,1-Dichloroethene	5	--	--	--	< 10	--	--	**< 10**	< 1	**< 2**	--	--	< 10	--	--	< 10	--	--	< 10
cis-1,2-Dichloroethene	5	NA	NA	NA	NA	NA	NA	NA	0.3 J	< 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	5	NA	NA	NA	NA	NA	NA	NA	< 1	< 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	5	--	--	--	< 10	--	--	< 10	NA	NA	--	--	< 10	--	--	< 10	--	--	< 10
Ethyl Benzene	5	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
2-Hexanone	50	--	--	--	< 10	--	--	< 10	< 5	< 10	--	--	< 10	--	--	< 10	--	--	< 10
Methylene Chloride	5	2 BJ	--	--	< 10	--	--	**< 10**	< 2	1 J	**18 B**	--	**< 10**	--	--	**< 10**	**31 B**	--	**< 10**
4-Methyl-2-Pentanone	NE	--	--	--	< 10	--	--	< 10	< 5	< 10	--	--	< 10	--	--	< 10	--	--	< 10
Tetrachloroethene	5	--	--	--	< 10	--	--	< 10	0.5 J	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Toluene	5	--	--	--	< 10	1 J	0.6 J	< 10	< 1	< 2	1 BJ	--	< 10	--	--	< 10	3 BJ	--	< 10
1,1,1-Trichloroethane	5	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
1,1,2-Trichloroethane	1	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Trichloroethene	5	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Vinyl Chloride	2	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 10
Xylenes (total)	5	--	--	--	< 10	2 J	--	< 10	< 3	< 6	--	--	< 10	--	--	< 10	--	--	< 10
Total VOCs	NE	2	17	26	--	9	51.6	1	0.8	1	22	13.9	1	7	10	--	90	20.7	--
Semivolatiles																			
Acenaphthene	20	--	--	--	< 11	1 J	--	< 10	NA	NA	2 J	--	< 10	--	--	< 11	0.7 J	--	< 10
Acenaphthylene	NE	--	--	--	< 11	0.5 J	--	< 10	NA	NA	0.6 J	--	< 10	--	--	< 11	--	--	< 10
Benzoic Acid	NE	--	--	--	NA	--	--	NA	NA	NA	--	--	NA	--	--	NA	--	--	NA
Bis (2-ethylhexyl) Phthalate	5	--	--	--	< 11	--	--	1 J	NA	NA	**7 J**	--	< 10	8 BJ	--	< 11	1 BJ	--	< 10
Butylbenzyl Phthalate	50	--	--	--	< 11	--	--	< 10	NA	NA	1 J	--	< 10	--	--	< 11	--	--	< 10
Dibenzofuran	NE	--	--	--	< 11	0.2 J	--	< 10	NA	NA	0.4 J	--	< 10	--	--	< 11	0.4 J	--	< 10
1,2-Dichlorobenzene	4.7 / 3	--	--	--	< 11	--	--	< 10	NA	NA	--	--	< 10	--	--	< 11	0.5 J	--	< 10
Diethyl Phthalate	50	--	--	--	< 11	0.1 J	--	< 10	NA	NA	0.2 BJ	--	< 10	--	--	< 11	--	--	< 10
2,4-Dimethylphenol	NE	--	--	--	< 11	--	--	< 10	NA	NA	--	--	< 10	--	--	< 11	--	--	< 10
Di-n-Butyl Phthalate	50	--	--	--	2 J	0.7 BJ	--	6 J	NA	NA	2 BJ	--	< 10	2 BJ	--	1 J	--	--	< 10
Di-n-Octyl Phthalate	50	--	--	--	< 11	0.2 BJ	--	< 10	NA	NA	--	--	< 10	--	--	< 11	--	--	< 10
Fluorene	50	--	--	--	< 11	0.3 J	--	< 10	NA	NA	0.9 J	--	< 10	--	--	< 11	0.3 J	--	< 10
Isophorone	50	--	--	--	< 11	--	--	< 10	NA	NA	--	--	< 10	--	--	< 11	--	--	< 10
2-Methylnaphthalene	NE	--	--	--	< 11	0.6 J	--	< 10	NA	NA	0.4 J	--	< 10	--	--	< 11	0.2 J	--	< 10
2-Methylphenol	NE	--	--	--	< 11	--	--	< 10	NA	NA	--	--	< 10	--	--	< 11	0.4 J	--	< 10
4-Methylphenol	NE	--	--	--	< 11	--	--	< 10	NA	NA	--	--	< 10	--	--	< 11	0.5 J	--	< 10
Naphthalene	10	--	3 J	--	< 11	51	3 J	5 J	NA	NA	6 J	--	2 J	--	--	< 11	0.5 J	--	< 10
Phenol	1 / NE	--	--	--	< 11	--	--	6 J	NA	NA	--	--	7 J	--	--	< 11	--	--	< 10
Phenanthrene	50	--	--	--	< 11	0.3 J	--	1 J	NA	NA	0.5 J	--	< 10	--	--	< 11	--	--	< 10

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. / Sample Date	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	GW-7							NW-1	NW-2	NW-4		NW-5	ESI-8	Trip Blank 1	Trip Blank 2	Trip Blank	Trip Blank	Trip Blank	Trip Blank
		9/28/1988	12/5/1990	9/30/1999	FD093099	4/19/2001	5/5/2004	9/28/2004	9/30/1999	4/19/2001	9/30/1999	4/19/2001	9/3/1999	9/29/1999	9/30/1999	10/1/1999	4/18/2001	4/20/2001	5/5/2004	9/28/2004
Volatiles																				
Acetone	**50**	***210 D***	***60***	**< 10**	**< 10**	**12**	**< 5**	**< 50**	**< 10**	**7 J**	**< 10**	**< 10**	**< 10**	**< 10**	1 BJ	2 BJ	< 10	< 10	< 5	< 5
Benzene	1	*2 J*	0.9 J	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
2-Butanone	50	*61*	--	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Carbon Disulfide	NE / 60	--	--	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	2 J	< 10	< 10	< 1	< 1
Chlorobenzene	5	--	--	< 10	< 10	< 10	< 1	< 10	**< 10**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Chloroethane	5	--	--	< 10	< 10	< 10	< 1	< 10	**< 10**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Chloroform	7	--	--	< 10	< 10	< 10	< 1	< 10	**< 10**	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
1,1-Dichloroethane	5	*11*	--	1 J	1 J	< 10	< 1	< 10	< 10	2 J	*8 J*	3 J	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
1,2-Dichloroethane	5 / 0.6	--	*4 J*	< 10	< 10	< 10	< 1	< 10	< 10	*2 J*	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
1,1-Dichloroethene	5	--	--	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
cis-1,2-Dichloroethene	5	NA	NA	NA	NA	*14*	5	5 J	NA	*16*	NA	5 J	NA	NA	NA	NA	< 10	< 10	< 1	< 1
trans-1,2-Dichloroethene	5	NA	NA	NA	NA	< 10	< 1	< 10	NA	< 10	NA	< 10	NA	NA	NA	NA	< 10	< 10	< 1	< 1
1,2-Dichloroethene (total)	5	*290 D*	*62*	*14*	*14*	NA	NA	NA	< 10	NA	*8 J*	NA	< 10	2 J	< 10	< 10	NA	NA	NA	NA
Ethyl Benzene	5	1 J	3 J	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
2-Hexanone	50	--	--	< 10	< 10	< 10	< 5	< 50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 5	< 5
Methylene Chloride	5	*41 B*	--	< 10	< 10	< 10	< 2	< 20	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 2	< 2
4-Methyl 2-Pentanone	NE	40	20	< 10	< 10	< 10	< 5	< 50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 5	< 5
Tetrachloroethene	5	*87*	*9 J*	3 J	4 J	*6 J*	2	< 10	< 10	< 10	2 J	4 J	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Toluene	5	*30 B*	*59*	< 10	< 10	1 J	1	< 10	< 10	< 10	< 10	< 10	< 10	1 J	< 10	< 10	< 10	< 10	< 1	< 1
1,1,1-Trichloroethane	5	--	--	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
1,1,2-Trichloroethane	1	--	--	< 10	< 10	< 10	< 1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Trichloroethene	5	*32*	*38*	1 J	1 J	2 J	1	< 10	< 10	< 10	1 J	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Vinyl Chloride	2	*8*	*3 J*	< 10	< 10	< 10	0.4 J	< 10	< 10	< 10	*9 J*	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 1	< 1
Xylenes (total)	5	7	*16*	< 10	< 10	< 10	< 3	< 30	< 10	< 10	< 10	< 10	< 10	--	< 10	< 10	< 10	< 10	< 3	< 3
Total VOCs	NE	820	272.9	19	20	35	9.4	5	--	27	28	12	--	3	1	4	--	--	--	--
Semivolatiles																				
Acenaphthene	20		--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NE	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NE	--	--	NA	NA	NA	NA	NA	< 10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis (2-ethylhexyl) Phthalate	5	6 BJ	--	< 10	< 10	NA	NA	NA	1 J	NA	< 11	NA	< 11	< 10	NA	NA	NA	NA	NA	NA
Butylbenzyl Phthalate	50	0.6 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NE	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	4.7 / 3	0.8 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate	50	0.2 BJ	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NE	0.5 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Di-n-Butyl Phthalate	50	2 BJ	--	< 10	< 10	NA	NA	NA	5 J	NA	*2 J*	NA	< 11	< 10	NA	NA	NA	NA	NA	NA
Di-n-Octyl Phthalate	50	0.2 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	< 10	NA	NA	NA	NA	NA	NA
Fluorene	50	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	< 10	NA	NA	NA	NA	NA	NA
Isophorone	50	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	< 10	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NE	0.2 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NE	1 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NE	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Naphthalene	10	-	2 J	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Phenol	1 / NE	--	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	50	0.4 J	--	< 10	< 10	NA	NA	NA	< 10	NA	< 11	NA	< 11	< 25	NA	NA	NA	NA	NA	NA

See end of table for notes

TABLE 3-2

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Notes:

Only compounds with detectable concentrations reported in table.
Volatile organic compound (VOC) and semivolatile organic compound (SVOC) concentrations reported in micrograms per liter (µg/L) or parts per billion (ppb).
1 : New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) 1.1.1: Ambient Water Quality Standards and Guidance Values (µg/L). Where two values are provided, the first represents pre-2004 values and the second represents revised values used for the 2004 data.
NE : NYSDEC TOGS 1.1.1 water quality standard not established.
Bolded and italicized concentration indicate exceedance of TOGS 1.1.1 criteria. Results qualified with a B, indicating blank contamination, are not used for characterization purposes, and not marked as exceedances.
-- : Not detected.
B : Analyte detected in associated blank, as well as in sample.
D : Compound identified in analysis at a secondary dilution factor.
J : Estimated concentration.
NA : Not analyzed.

GROUNDWATER ANALYTICAL DATA - INORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	NYSDEC	ENV-1		ENV-2		ENV-3		ENV-4		ENV-5			ENV-6	
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	11/19/1990	9/29/1999	11/19/1990	10/1/1999	11/19/1990	10/1/1999	11/19/1990	9/30/1999	11/19/1990		9/30/1999	11/19/1990	9/30/1999
Metals														
Aluminum	NE	20,900	22,300	84,500	7,370	29,200	7,720	133,000	15,000	77,000	70,700	14,000	31,300	**29,600**
Antimony	3	--	***7.4 JN***	5.4 B	< 2.9	15.1 BN	***4.7 JN***	14.2 BN	***61.9 JN***	16.9 B	--	< 2.9	12.9 B	***7.3 JN***
Arsenic	25	12.8 N	***42.1***	***27.8 NS***	8.4	15.6 N	9.7	41 BN	< 3.4	***35.6***	***33.1 N***	< 3.4	20 N	< 3.4
Barium	1,000	195 B	225	***1,120***	135	355	128	***1,590***	166	***1,010***	921	139	284	238
Beryllium	3	***21***	0.16	***43***	0.5	***56***	0.29	***71***	1.2	***18***	***18***	1.2	***8.0***	2.0
Cadmium	5	--	0.92	***9***	4.1	3 B	< 0.84	***8***	< 0.84	2 B	--	< 0.84	--	4.6
Calcium	NE	233,000	209,000 EJ	445,000	127,000 EJ	91,100	35,100 EJ	701,000	235,000 EJ	281,000	263,000	124,000 EJ	251,000	408,000 EJ
Chromium	50	***52***	38.2	***71***	10.8	***70***	19.5	***105***	21.2	***120***	***87***	16.2	***63***	***53.3***
Cobalt	NE	27 B	13.7	35 B	3.3	30 B	7.8	66	8.4	55	50	7.5	25 B	15.4
Copper	200	73 *	53.1	119 *	48.3	173 *	34.9	178 *	31.3	193 *	148 *	31.4	90 *	58.2
Iron	300	***54,800***	***57,500***	***101,000***	***8,240***	***159,000***	***39,900***	***127,000***	***14,800***	***98,100***	***95,300***	***15,900***	***58,500***	***33,400***
Lead	25	***53.1 NS***	***38.2***	***8,400 N***	***64.5***	***460 N***	***82.0***	220 BN	18.5	***89.6 N***	***90.2 N***	***43.2***	***52.4 N***	***37.1***
Magnesium	35,000	***41,900***	***38,000***	***54,600***	5,960	***40,200***	24,600	***145,000***	21,300	***89,300***	***83,700***	28,300	29,100	***48,800***
Manganese	300	***4,520***	***4,690***	***6,680***	***573***	***3,960***	***1,290***	***5,930***	***538***	***4,160***	***3,860***	***626***	***1,320***	***1,610***
Mercury	0.7	--	0.1	--	0.1	--	0.05	--	< 0.04	0.47	0.28	0.1	0.3	--
Nickel	100	94	46.1	97	10.8	90	20.6	***203***	25.7	***171***	***141***	22.5	90	48.2
Potassium	NE	7,750	9,450	10,100	7,260	17,200	11,700	24,500	19,500	20,900	21,400	21,900	32,500	39,400
Selenium	10	1 BNW	***12.7***	7.6 N+	***15.7***	1 BNW	6.5	13.5 BN	***25.2***	***14 N+***	9.9 NS	8.3	***17.5 NS***	***33.1***
Silver	50	--	< 1.3	--	< 1.3	--	< 1.3	--	< 1.3	--	--	< 1.3	--	< 1.3
Sodium	20,000	***21,200***	***23,700***	7,860	7,890	12,600	11,000	19,500	20,000	11,200	11,900	***27,200***	***24,000***	***25,300***
Thallium	0.5	--	< 5.1	--	< 5.1	--	< 5.1	--	< 5.1	--	--	< 5.1	--	< 5.1
Vanadium	NE	139	48.3	247	8.2	155	27.3	422	33.0	239	224	23.2	144	27.1
Zinc	2,000	249	143	1,360	***3,000***	401	83.5	743	80.1	501	486	93.6	280	159
Inorganics														
Cyanide	200	--	< 10	--	< 10	--	< 10	10.8 N	< 10	23.4 N	--	< 10	--	< 10

See end of table for notes

GROUNDWATER ANALYTICAL DATA - INORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	NYSDEC	GW-1		GW-2				GW-3			GW-4			GW-5		
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	9/28/1988	12/5/1990	9/28/1988	12/5/1990	Duplicate	9/29/1999	9/28/1988	12/5/1990	9/29/1999	9/28/1988	12/5/1990	9/30/1999	9/28/1988	12/5/1990	9/30/1999
Metals																
Aluminum	NE	9,190 *	1,990 J	930 *	719 J	131 B	6,590	1,060 *	1,020 J	52,900	1,520 *	13,400 J	37,300	304 *	799 J	8,470
Antimony	3	--	--	--	--	--	< 2.9	--	16.5 B	< 2.9	--	--	***13.9 JN***	--	--	< 2.9
Arsenic	25	--	--	--	--	--	< 3.4	--	--	15.1	--	7.7 B	***30.8***	8.1	***48.8***	***40.8***
Barium	1,000	205	128 B	90	109 BJ	389	190	--	53.6 B	368	--	403	510	180	275	184
Beryllium	3	--	--	--	--	--	< 0.12	--	--	***4.2***	--	1.8 B	2.2	--	--	0.29
Cadmium	5	--	--	--	--	--	< 0.84	--	--	2.5	--	4.1 B	2.8	--	--	< 0.84
Calcium	NE	145,000	104,000	137,000	118,000	122,000	196,000 EJ	192,000	186,000	277,000 EJ	105,000	142,000	230,000 EJ	119,000	103,000	70,400 EJ
Chromium	50	--	--	--	--	4.3 B	9.6	--	--	***62.2***	--	***77.1***	***67.7***	--	--	18.2
Cobalt	NE	--	--	--	--	--	4.3	--	--	35.0	--	13.9 B	27.9	--	--	9.2
Copper	200	20	66.3	8	5.9 B	26.4	24.3	--	8.8 B	102	--	109	159	--	7.9 B	27.6
Iron	300	***17,400***	***6,100***	***7,700***	***10,200 J***	***67,700***	***18,200***	120	***1,090***	***67,400***	***889***	***40,100***	***94,500***	***19,800***	***33,300***	***34,200***
Lead	25	16.1	4.6 J	--	10.8 J	22.4 J	17.3	--	6.6 B	***76.4***	5.8	***424***	***276***	--	3.5 J	14.2
Magnesium	35,000	***62,400***	***42,000***	25,500	20,000	18,600	***36,200***	--	389 B	27,000	300	12,600	24,200	17,400	14,500	12,500
Manganese	300	***862***	***531***	***757***	***638***	***759***	***1,260***	--	25.2	***1,730***	36	***1,910***	***3,130***	***997***	***437***	***552***
Mercury	0.7	0.2	--	--	--	--	< 0.04	--	--	0.17	--	0.22	0.26	--	--	< 0.04
Nickel	100	--	11.4 B	--	--	--	14.1	--	--	91	--	31.9 B	79.5	--	--	23.8
Potassium	NE	7,860	6,290	6,000	9,210 J	15,100	10,500	18,700	16,700	24,800	13,700	20,400	24,300	18,400	15,600	17,500
Selenium	10	--	--	--	--	--	4.8	--	4.0 BJ	***13.6***	--	--	***13.3***	--	--	7.5
Silver	50	--	--	--	--	--	< 1.3	--	--	< 1.3	--	--	< 1.3	--	--	< 1.3
Sodium	20,000	***87,300***	***89,100***	***34,800***	***22,700***	18,600	***43,600***	15,400	15,000	***25,500***	17,400	19,100	***20,800***	***33,300***	***47,000***	***52,400***
Thallium	0.5	--	--	--	--	--	< 5.1	--	--	< 5.1	--	--	< 5.1	--	--	< 5.1
Vanadium	NE	21	7.2 B	--	2.4 B	2.4 B	15.0	--	90.8	75.7	--	149	91.9	--	4.3 B	21.6
Zinc	2,000	97	32.8	--	26.1	43.7	61.4	15 *	20.7	298	18 *	459	548	21 *	22.6	87.6
Inorganics																
Cyanide	200	--	10	18	44	38	19.6	11	10	< 10	28	69	< 10	--	--	< 10

See end of table for notes

GROUNDWATER ANALYTICAL DATA - INORGANICS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	NYSDEC	GW-6			GW-7				NW-1	NW-4	NW-5	ESI-8
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	9/28/1988	12/5/1990	9/30/1999	9/28/1988	12/5/1990	9/30/1999	FD093099	9/30/1999	9/30/1999	9/3/1999	9/29/1999
Metals												
Aluminum	NE	600 *	373 J	2,640	720 *	5,790 J	744	1,240	4,540	36,500	2,690	5,560
Antimony	3	--	--	< 2.9	--	--	< 2.9	< 2.9	*3.9 JN*	*12.7 JN*	< 2.9	< 2.9
Arsenic	25	5.0	3.5 B	3.7	--	--	4.0	< 3.4	< 3.4	*33.7*	< 3.4	< 3.4
Barium	1,000	36	24.5 B	42.8	--	98 B	38.3	44.4	147	447	74.7	113
Beryllium	3	--	--	< 0.12	--	--	0.32	< 0.12	< 0.12	2.6	< 0.12	< 0.12
Cadmium	5	--	--	0.88	--	--	< 0.84	< 0.84	1.4	3.4	< 0.84	< 0.84
Calcium	NE	28,300	38,100	63,000 EJ	305,000	247,000	254,000 EJ	274,000 EJ	56,900 EJ	190,000 EJ	105,000 EJ	172,000 EJ
Chromium	50	--	--	7.5	--	--	2.0	2.2	*165*	*65.2*	7.3	9.1
Cobalt	NE	--	--	2.4	--	3.7 B	2.7	< 1.7	4.5	29.1	< 1.7	3.7
Copper	200	--	35.8	16.7	--	23.2 B	< 2.8	3.1	73.7	132	2.9	18.9
Iron	300	*691*	*997*	*6,080*	*391*	*6,300*	*918*	*1,040*	*29,400*	*94,300*	*3,400*	*6,870*
Lead	25	--	--	5.8	--	17.6 J	< 2.9	3.0	*79.5*	*238*	5.9	9.9
Magnesium	35,000	9,700	8,770	10,600	200	5,960	1,110	1,330	6,470	*40,500*	20,200	4,920
Manganese	300	49	108	213	13	256	27.6	34.0	*2,910*	*2,460*	115	268
Mercury	0.7	--	--	< 0.04	--	--	< 0.04	< 0.04	0.04	0.21	< 0.04	< 0.04
Nickel	100	--	--	6.5	--	16.1 B	1.6	1.9	19.8	*109*	3.9	12.5
Potassium	NE	17,900	10,100	7,330	26,700	31,600	29,300	28,600	4,250	11,300	9,670	21,100
Selenium	10	9.1	--	< 4.2	--	R	< 4.2	5.9	5.5	*60.5*	*15.1*	*10.9*
Silver	50	--	--	< 1.3	--	--	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Sodium	20,000	*28,300*	15,700	5,480	19,300	*20,500*	13,800	13,600	*20,800*	12,400	13,100	*20,200*
Thallium	0.5	--	--	< 5.1	--	--	*8.9*	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1
Vanadium	NE	--	2.4 B	7.8	--	8.9 B	21	2.9	72.4	91.5	7.1	10.6
Zinc	2,000	10	17.1 B	29.7	--	41.9	8.7	8.4	114	682	23.4	53.4
Inorganics												
Cyanide	200	--	10 J	< 10	12	--	< 10	< 10	< 10	< 10	< 10	14.4

Notes:

Only compounds with detectable concentrations reported in table.
Inorganic concentrations reported in micrograms per liter (µg/L).
1 : NYSDEC TOGS 1.1.1: Water Quality Standards and Guidance Values expressed in µg/L.
NE : NYSDEC TOGS 1.1.1 water quality standard not established.
Bolded and italicized concentration indicated exceedance of TOGS 1.1.1 criteria.
Results qualified with a B, indicating blank contamination, are not used for characterization purposes, and are not shown as exceeding TOGS 1.1.1 criteria.
-- : Not detected.
B : Analyte detected in associated blank, as well as in sample.
E : The reported value is estimated due to interference.
J : Estimated concentration.
N : Spiked sample recovery not within control limits.
R: Result rejected
S : The reported value was determined by the Method of Standard Additions (MSA).
W : Post-digestion spike out of control limits.
* : Duplicate analysis not within control limits
+ : Correlation coefficient for the MSA is less than 0.995.

TABLE 4-1

GEOCHEMICAL INDICATOR PARAMETERS IN GROUNDWATER
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D. Sample Date	ENV-1 4/18/2001	ENV-2 4/18/2001	ENV-3 4/18/2001	ENV-4 4/18/2001	GW-7 4/19/2001
Geochemical					
Alkalinity as $CaCO_3$	430	40	190	46	260
Ammonia as N	2.1	1.4	2.1	< 1.0	2.8
Chloride	16	59	51	6.6	9.5
Nitrate	< 0.10	< 0.10	< 0.10	8.6	< 0.10
Soluble Organic Carbon	7.2	8.8	31	22	7.0
Sulfate	19	250	60	560	430
Sulfide	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TKN as N	< 10	< 10	< 10	< 10	< 10
Metals					
Iron - Total	2.4	< 0.050	1.8	0.14	< 0.050
Iron - Dissolved	1.7	< 0.050	1.8	0.075	< 0.050
Manganese - Total	2.9	0.020	0.26	0.041	< 0.010
Manganese - Dissolved	2.8	0.027	0.25	0.040	< 0.010
Dissolved Gases					
Carbon Dioxide	44	< 0.60	5.7	0.99	< 0.60
Ethane[2]	100	20,000	48,000	350	730
Ethene[2]	100	94,000	4,500	180	510
Methane[1]	640	110	850	5.6	83
Nitrogen	19	20	21	19	19
Oxygen	0.86	0.87	0.98	6.0	1.6

Notes:

Concentrations are reported in milligrams per liter (mg/L) or parts per million (ppm).
(1) Concentrations reported in micrograms per liter (µg/L).
(2) Concentrations reported in nanograms per liter (ng/L).

TABLE 4-2

ANALYTICAL PARAMETERS AND WEIGHTING FOR PRELIMINARY SCREENING FOR ANAEROBIC BIODEGRADATION PROCESSES[1]
NATURAL ATTENUATION SCREENING EVALUATION
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Analysis	ENV-1 Concentration/Point Awarded		ENV-2 Concentration/Point Awarded		ENV-3 Concentration/Point Awarded		ENV-4 Concentration/Point Awarded		GW-7 Concentration/Point Awarded	
	mg/L		mg/L		mg/L		mg/L		mg/L	
Dissolved Oxygen (Field)	0.4	3	0.28	3	0.4	3	0.88	0	0.71	0
Nitrate	<0.10	2	<0.10	2	<0.10	2	8.6	0	<0.10	2
Iron II	2.4	3	<0.05	0	1.8	3	0.14	0	<0.050	0
Sulfate	19	2	250	0	60	0	560	0	430	0
Sulfide	<2.0	0	<2.0	3	<2.0	3	<2.0	3	<2.0	3
Methane	0.64	3	0.11	0	0.85	3	0.0056	0	0.0083	0
ORP	-93	2	-292	2	-182	2	-218	2	-322	2
pH	Between 5 & 9	0	Between 5 & 9	0	Between 5 & 9	0	Between 5 & 9	0	Between 5 & 9	0
TOC	7.2	0	8.8	0	31	2	22	2	7	0
Temp	<20 degrees C	0	<20 degrees C	0	<20 degrees C	0	<20 degrees C	0	<20 degrees C	0
Carbon Dioxide	44	0	<0.60	0	5.7	0	0.99	0	<0.60	0
Alkalinity	430	0	40	0	190	0	46	0	260	0
Chloride	16	0	59	2	51	2	6.6	0	9.5	0
BTEX	nd	0	4.05	2	nd	0	nd	0	0.001	2
PCE	nd	0	13	0	0.006	0	nd	0	0.006	0
TCE	nd	0	6.5	0[2]	0.003	0[2]	0.003	0[2]	0.002	0[2]
DCE	nd	0	54	2	0.002	2	0.003	2	0.014	2
VC	nd	0	0.68	2	nd	2	nd	0	0.25	0
1,1,1-TCA	nd	0	4	0	nd	0	nd	0	nd	0
DCA	nd	0	0.95	2	0.059	2	nd	0	nd	0
Ethene/Ethane	0.0001	0	0.114	3	0.0525	2	0.00053	0	0.00124	0
TOTAL POINTS		(3)		23		28		9		11
Screening Results		N/A		Strong Evidence		Strong Evidence		Limited Evidence[4]		Limited Evidence[4]

1 : Table taken from *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water*, United States Environmental Protection Agency (USEPA), Office of Research & Development, September 1998.

2 : Conservatively assumes trichloroethene (TCE) present as parent compound only. Based on presence of 1,2-dichlorothene (1,2-DCE), a fraction of TCE is present as a daughter product of tetrachloroethene (PCE) degradation. Presence of TCE as a daughter product would increase each score by two points.

3 : Scoring is not applicable since volatile organic compounds (VOCs) have not been detected (nd) in this well.

4 : Wells are located at the downgradient extent of the contaminant plume and, therefore, contain nondetectable levels of several constituents. No points are scored for vinyl chloride or dichloroethane (DCA) even though these constituents were detected upgradient and are, therefore, probably effectively degraded. Some low VOC levels may have impacted groundwater geochemistry to the extent that degradation via reductive dechlorination may not be the predominant process occurring. For example, D.O. levels in ENV-4 and GW7 are more than 0.5 milligrams per liter (mg/L) and, therefore, may be high enough to support aerobic degradation processes for vinyl chloride.

TABLE 4-3

NATURAL GROUNDWATER REMEDIATION RATE ANALYSIS SUMMARY TABLE
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Monitoring Well ID	Compound	Trend	Correlation Coefficient (R^2)	Half-Life (days)
ENV-7	DCA total	Decreasing	0.60	3039
	1,2 DCE total	Decreasing	0.80	1138
	TCE	Decreasing	0.86	554
	VC	Decreasing	0.78	724
GW-7	Acetone	Remediated	--	--
	Benzene	Remediated	--	--
	DCA total	Remediated	--	--
	1,2 DCE total	Decreasing	0.95	1125
	PCE	Remediated	--	--
	Toluene	Remediated	--	--
	TCE	Remediated	--	--
	VC	Remediated	--	--
	Xylenes total	Remediated	--	--
	2-butanone	Remediated	--	--
ENV-2	Acetone	Remediated	--	--
	DCA total	Decreasing	0.98	1403
	Ethylbenzene	Decreasing	0.81	1930
	PCE	Decreasing	0.81	1878
	Toluene	Decreasing	0.99	1909
	1,1,1 TCA	Decreasing	0.88	1354
	TCE	Decreasing	1.00	1715
	VC	Decreasing	1.00	1600
	Xylenes total	Decreasing	0.84	1737
	1,1 DCE	Decreasing	0.66	2974
ENV-3/3R	DCA total	Decreasing	0.83	1540
	1,2 DCE total	Increasing	0.70	--
	PCE	ID	--	--
	TCE	ID	--	--
	VC	ID	--	--
	Xylenes total	ID	--	--
ENV-4	TCE	Remediated	--	--
	1,2 DEC	Remediated	--	--
	Ethylbenzene	Remediated	--	--
	Toluene	Remediated	--	--
	Xylenes total	Remediated	--	--
	VC	Remediated	--	--
ENV-5	DCA total	ID	--	--
	1,2 DCE total	ID	--	--
	VC	ID	--	--
ENV-8	DCA total	Remediated	--	--
	1,2 DCE total	Decreasing	0.64	4651
	TCE	ID	--	--
	VC	ID	--	--
ENV-9	Acetone	Remediated	--	--
	Xylenes total	Remediated	--	--
GW-1	Benzene	Decreasing	0.94	1346
GW-3	Benzene	Remediated	--	--
GW-4	Benzene	Remediated	--	--
GW-5	Benzene	Remediated	--	--
GW-6	Benzene	Remediated	--	--
	Chloroethane	Remediated	--	--
NW-4	DCA total	Remediated	--	--
	1,2 DCE total	Remediated	--	--
	VC	Remediated	--	--

Notes:
DCA total = Sum of 1,1-dicholorethane and 1,2-dichloroethane isomers
1,2 DCE total = Sum of cis- and trans-1,2-dichloroethene isomers
TCE = Trichloroethene
VC = Vinyl Chloride
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-trichloroethane
1,1-DCE = 1,1-dichloroethene
ID = Insufficient Data
" -- " = not applicable
R^2 values are only shown for compounds with statistically signifigant trends (i.e. $R^2 > 0.6$).
Half-life values were only computed for compounds with values of $R^2 > 0.6$, and decreasing concnetrations

GROUNDWATER SAMPLING FIELD PARAMETERS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	ENV-1				ENV-1D	ENV-2		ENV-3	
Sample Date	9/29/1999	4/18/2001	5/5/2004	9/28/2004	4/20/2001	10/1/1999	4/18/2001	10/1/1999	4/18/2001
Parameter									
pH	6.67	7.13	7.06	7.29	12.11	--	10.06	8.16	7.82
Temperature (°C)	14.4	10.06	8.18	7.19	12.6	14.8	10.3	14.2	10.1
Specific Conductivity (mS/cm)	0.892	0.77	0.789	0.789	3.24	0.602	0.649	0.532	1.13
ORP (mV)	--	-93	67	77	-101	--	-292	--	-182
DO (mg/L)	--	0.44	9.65	0	3.91	--	0.28	--	0.4
Turbitity (NTU)	120	12.6	21.9	43.9	48.9	142	6.3	488	5.9
Purge Volume (Gallons)	7.5	--	3.5	3.5	9.42	4.2	--	4	--
Calculated Well Volume (Gallons)	2.48	--	2.77	2.74	3.13	1.37	--	1.33	--
Purge Method	Bailer	Master Flex Pump	Master Flex Pump	Master Flex Pump	Not Identified	Bailer	Master Flex Pump	Bailer	Master Flex Pump

Notes:
-- = Data Not Available
(1) Assumed purging method - not recorded on well sampling log.

GROUNDWATER SAMPLING FIELD PARAMETERS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	ENV-3R		ENV-4				ENV-5		ENV-6
Sample Date	5/5/2004	9/28/2004	9/30/1999	4/18/2001	5/5/2004	9/28/2004	9/30/1999	3/11/2001	4/19/2001
Parameter									
pH	6.31	6.3	9.52	8.89	6.13	6.2	8.84	8.31	8.38
Temperature (°C)	8.2	7.16	1.37	9.6	9.26	7.15	12.9	9.8	9.7
Specific Conductivity (mS/cm)	0.671	0.761	1.22	1.53	0.605	0.786	1.06	0.97	0.891
ORP (mV)	90	75	--	-218	0.46	131	--	-148	39
DO (mg/L)	1.81	0	--	0.88	0	0	--	8.94	7.95
Turbitity (NTU)	39.3	42.3	>1000	12.3	8.2	18.3	564	999	21.9
Purge Volume (Gallons)	3.5	3.5	4.2	--	3.5	3.5	5.55	6.5	5.56
Calculated Well Volume (Gallons)	1.11	1.09	1.41	--	1.87	1.85	1.85	2.17	1.85
Purge Method	Master Flex Pump	Master Flex Pump	Bailer	Master Flex Pump	Master Flex Pump	Master Flex Pump	Bailer	Bailer	Master Flex Pump

Notes:
-- = Data Not Available
(1) Assumed purging method - not recorded on well sampling log.

GROUNDWATER SAMPLING FIELD PARAMETERS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	ENV-7			ENV-8			ENV-9		
Sample Date	4/19/2001	5/5/2004	9/28/2004	4/19/2001	5/5/2004	9/28/2004	4/19/2001	5/5/2004	9/28/2004
Parameter									
pH	9.35	7.39	7.45	9.1	8.74	7.92	7.23	7.31	7.96
Temperature (°C)	9.4	8.51	7.19	10.2	8.63	7.21	10.5	8.03	7.19
Specific Conductivity (mS/cm)	109	0.978	0.747	1.27	1	0.839	2.45	0.941	0.96
ORP (mV)	-182	-51	117	-24	21	112	19	--	69
DO (mg/L)	10	0	0	8.66	0	0	9.15	0	0
Turbitity (NTU)	14.7	11.9	47.8	999	48.9	42.9	999	21.6	48.9
Purge Volume (Gallons)	2.17	2.37	3.5	2.8	2.37	3.5	2.35	2.37	3.5
Calculated Well Volume (Gallons)	0.726	0.803	0.777	0.935	0.857	0.822	0.785	0.856	0.869
Purge Method	Master Flex Pump	Master Flex Pump	Master Flex Pump	Bailer	Master Flex Pump	Master Flex Pump	Not Identified	Master Flex Pump	Master Flex Pump

Notes:
-- = Data Not Available
(1) Assumed purging method - not recorded on well sampling log.

GROUNDWATER SAMPLING FIELD PARAMETERS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	ENV-10D	GW-1	GW-2	GW-3			GW-4	GW-5	GW-6
Sample Date	4/20/2001	4/19/2001	9/29/1999	9/29/1999	5/5/2004	9/28/2004	9/30/1999	9/30/1999	9/30/1999
Parameter									
pH	7.07	6.25	6.85	11.24	7.15	7.31	10.89	7.06	7.67
Temperature (°C)	12.4	11.4	13.5	15	8.01	7.1	14.8	14.6	17.7
Specific Conductivity (mS/cm)	1.79	1.59	1.31	1.51	0.871	0.978	0.912	0.953	0.478
ORP (mV)	-88	-179	--	--	--	211	--	--	--
DO (mg/L)	7.46	10.47	--	--	0	0	--	--	--
Turbitity (NTU)	33.5	51.9	689	120	50.6	48.8	>1000	>1000	85
Purge Volume (Gallons)	20.06	7.84	9	4.8	3.5	3.5	3.6	6	6
Calculated Well Volume (Gallons)	6.68	2.615	2.82	1.54	1.95	1.92	1.15	1.8	1.74
Purge Method	Centrifugal Pump	Master Flex Pump	Bailer	Bailer	Master Flex Pump	Master Flex Pump	Bailer	Bailer	Bailer

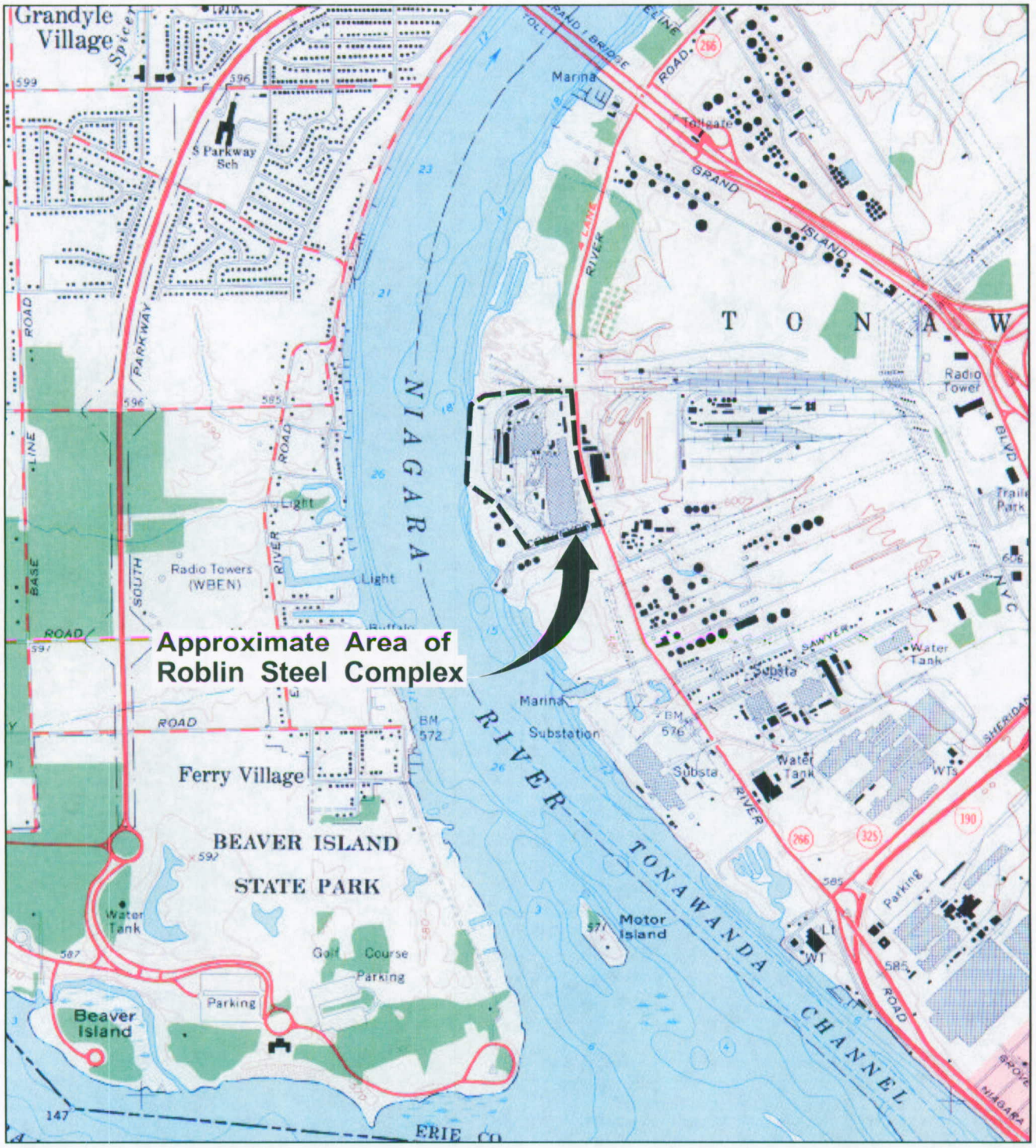
Notes:
-- = Data Not Available
(1) Assumed purging method - not recorded on well sampling log.

GROUNDWATER SAMPLING FIELD PARAMETERS
ENVIROTEK II SITE - OU-3 ASSESSMENT
TONAWANDA, NEW YORK

Sample I.D.	GW-7				NW-1	NW-2	NW-4		NW-5	ESI-8
Sample Date	9/30/1999	4/19/2001	5/5/2004	9/28/2004	4/19/2001	4/19/2001	9/30/1999	4/19/2001	9/29/1999	9/29/1999
Parameter										
pH	11.57	12.05	8.11	7.12	9.42	10.81	7.32	6.76	7.2	10.9
Temperature (°C)	13.5	9.6	8.01	7.23	23.3	9.7	13.9	9.1	16.3	15.6
Specific Conductivity (mS/cm)	2.333	2.18	2.01	0.982	0.384	0.926	1.08	0.795	0.806	1.17
ORP (mV)	--	3.21	--	101	--	-256	--	98	--	--
DO (mg/L)	--	0.7	0	0	--	5.59	--	8.56	--	--
Turbitity (NTU)	14	5.4	27.3	29.3	301	602	>1000	999	402	124
Purge Volume (Gallons)	3.75	--	2.37	3.5	3.75	4.14	4.5	4.7	3	3
Calculated Well Volume (Gallons)	1.01	--	1.25	1.22	1.27	1.38	1.32	1.57	0.55	0.8
Purge Method	Bailer	Master Flex Pump	Master Flex Pump	Master Flex Pump	Bailer	Bailer	Bailer	Not Idenitifed	Bailer	Bailer (1)

Notes:
-- = Data Not Available
(1) Assumed purging method - not recorded on well sampling log.

Figures



REFERENCE: BASE MAP SOURCE USGS 7.5 MINUTE QUAD. SERIES BUFFALO NW, NEW YORK, ONTARIO, 1965.

2000' 0 2000'

Approximate Scale: 1" = 2000'

AREA LOCATION

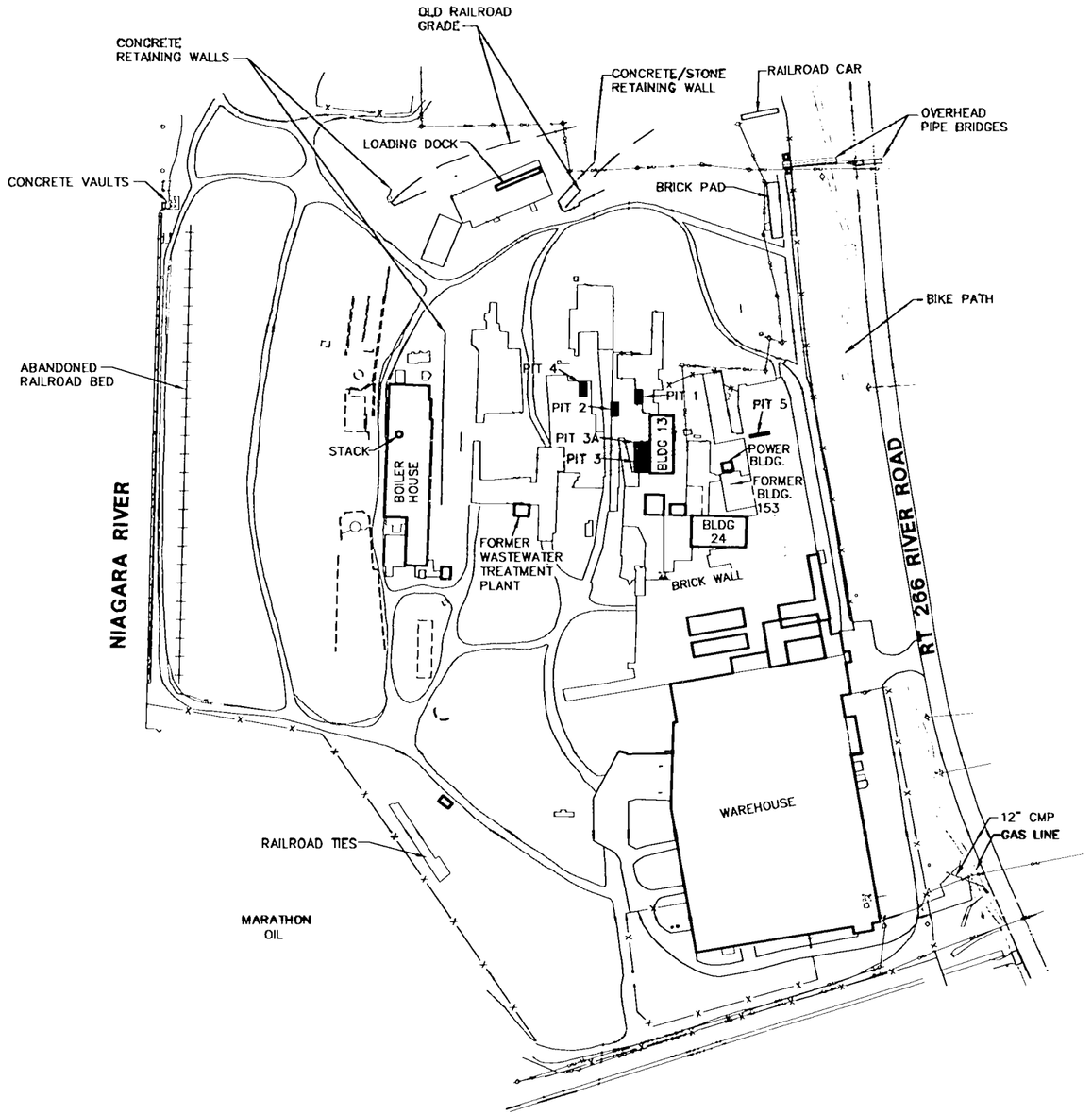
10/29/04 ROC-54-SLM SYR-D85-DJH
58002081/58002n01.cdr

ENVIROTEK II SITE
TONAWANDA NEW YORK
OU-3 IRM REPORT

SITE LOCATION MAP

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
1-1



LEGEND

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES

NOTE:

BASE MAP PREPARED FROM BLASLAND, BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.

0 300' 600'

GRAPHIC SCALE

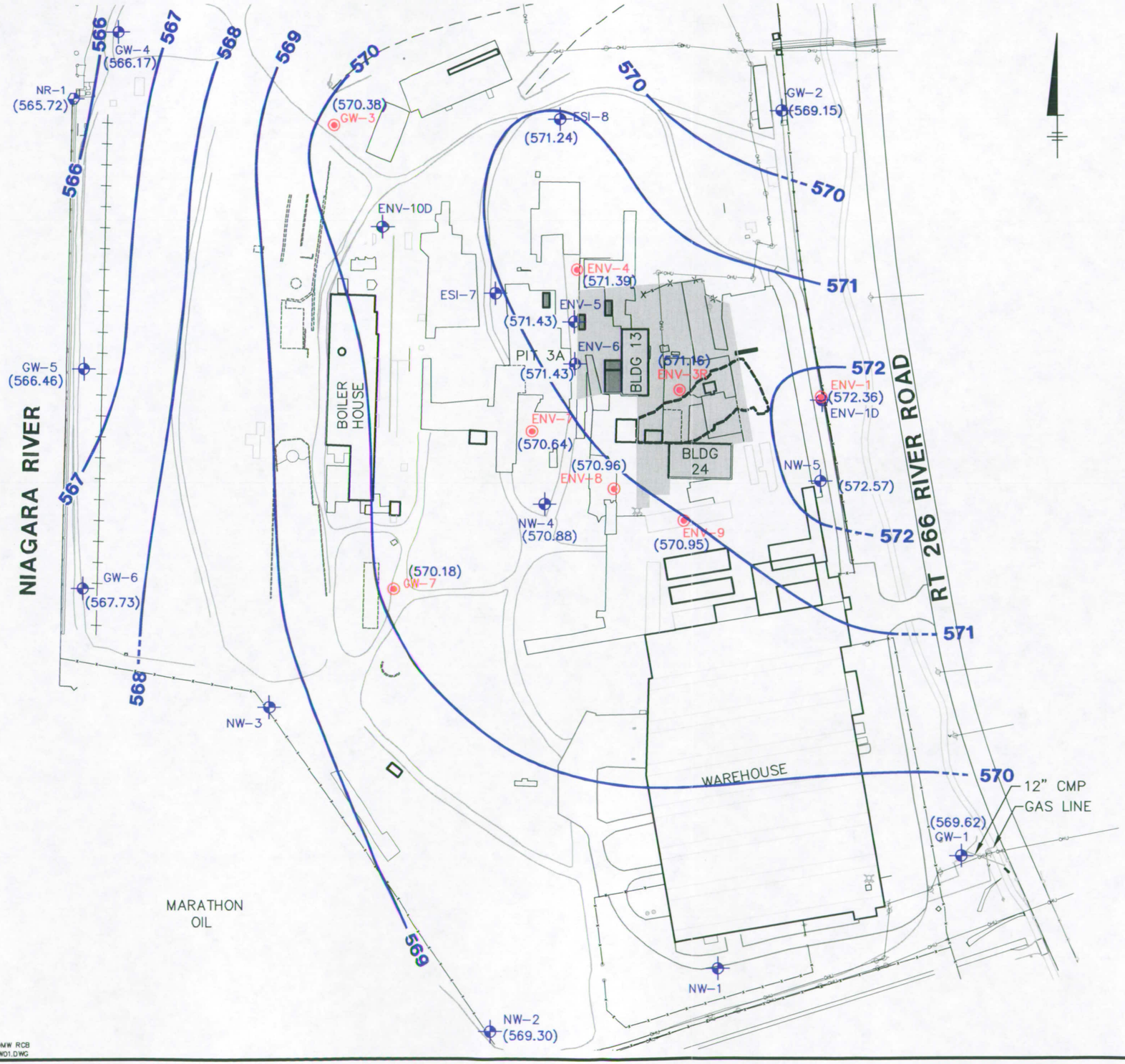
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

ROBLIN STEEL COMPLEX SITE PLAN

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE 1-2

X: 58002X03.DWG
L: ON=*;OFF=REF*,0,
P: PAGESET/PLT-BL
10/29/04 SYR- RCB
58002081/OU3IRM/58002B01.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-10D — MONITORING WELL
- NR-1 — STAFF GAUGE
- ENV-1 — SITE GROUNDWATER MONITORING NETWORK WELL
- FINAL LIMITS OF SDA SOIL EXCAVATION
- 569 — GROUNDWATER ELEVATION CONTOUR (FEET AMSL) (DASHED WHERE INFERRED)
- (572.57) — GROUNDWATER ELEVATION (FEET AMSL)

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

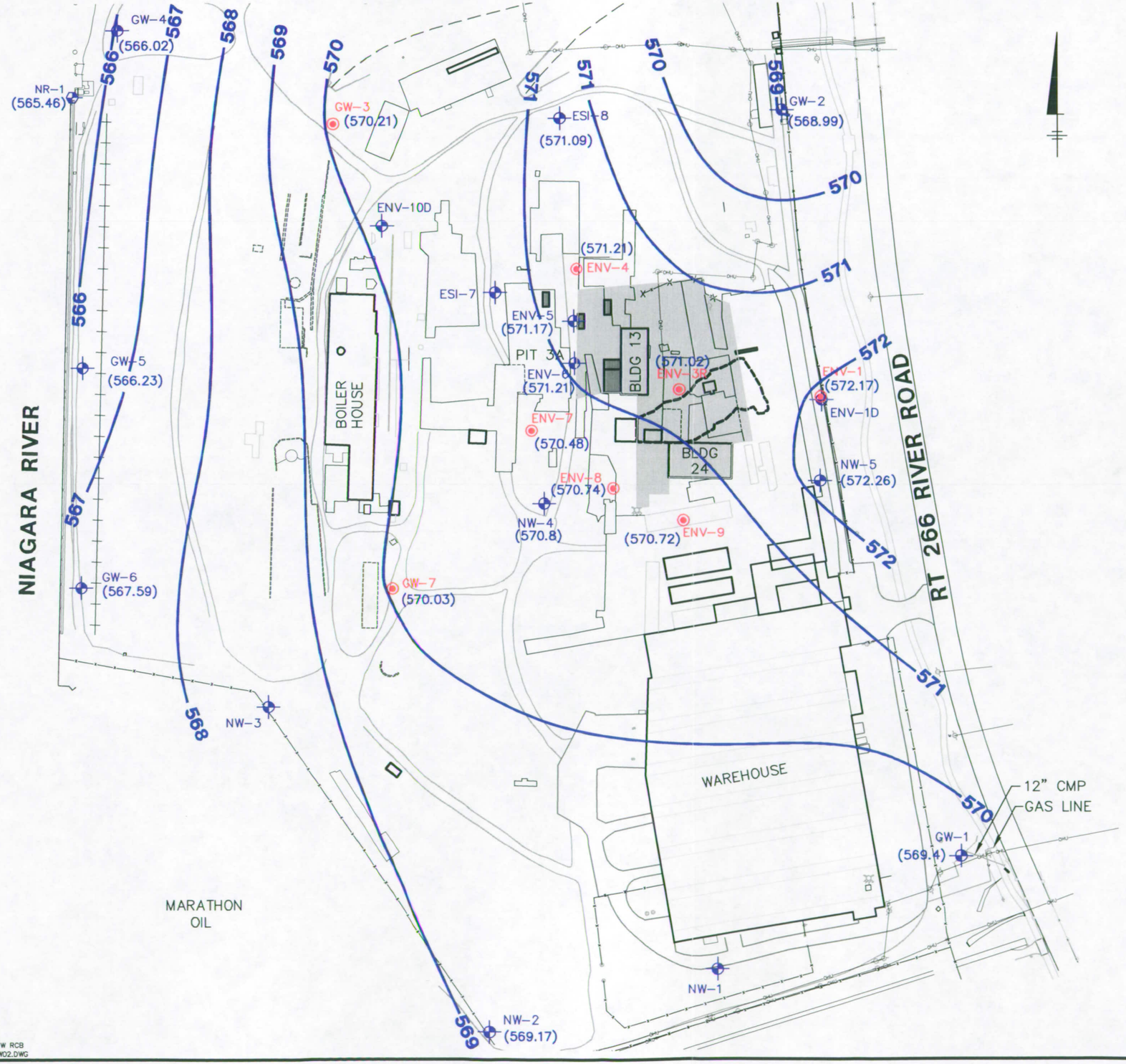
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

GROUNDWATER ELEVATION CONTOUR MAP MAY 5, 2004

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **3-1**

X: 58002X00, X02.DWG
L: ON=*;OFF=REF*
P: PAGESET/SYR-BL
10/29/04 SYR-85-PGL DMW RCB
58002091/OU3IRM/58002W01.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-10D — MONITORING WELL
- NR-1 — STAFF GAUGE
- ENV-1 — SITE GROUNDWATER MONITORING NETWORK WELL
- FINAL LIMITS OF SDA SOIL EXCAVATION
- 569 — GROUNDWATER ELEVATION CONTOUR (FEET AMSL) (DASHED WHERE INFERRED)
- (572.26) — GROUNDWATER ELEVATION (FEET AMSL)

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

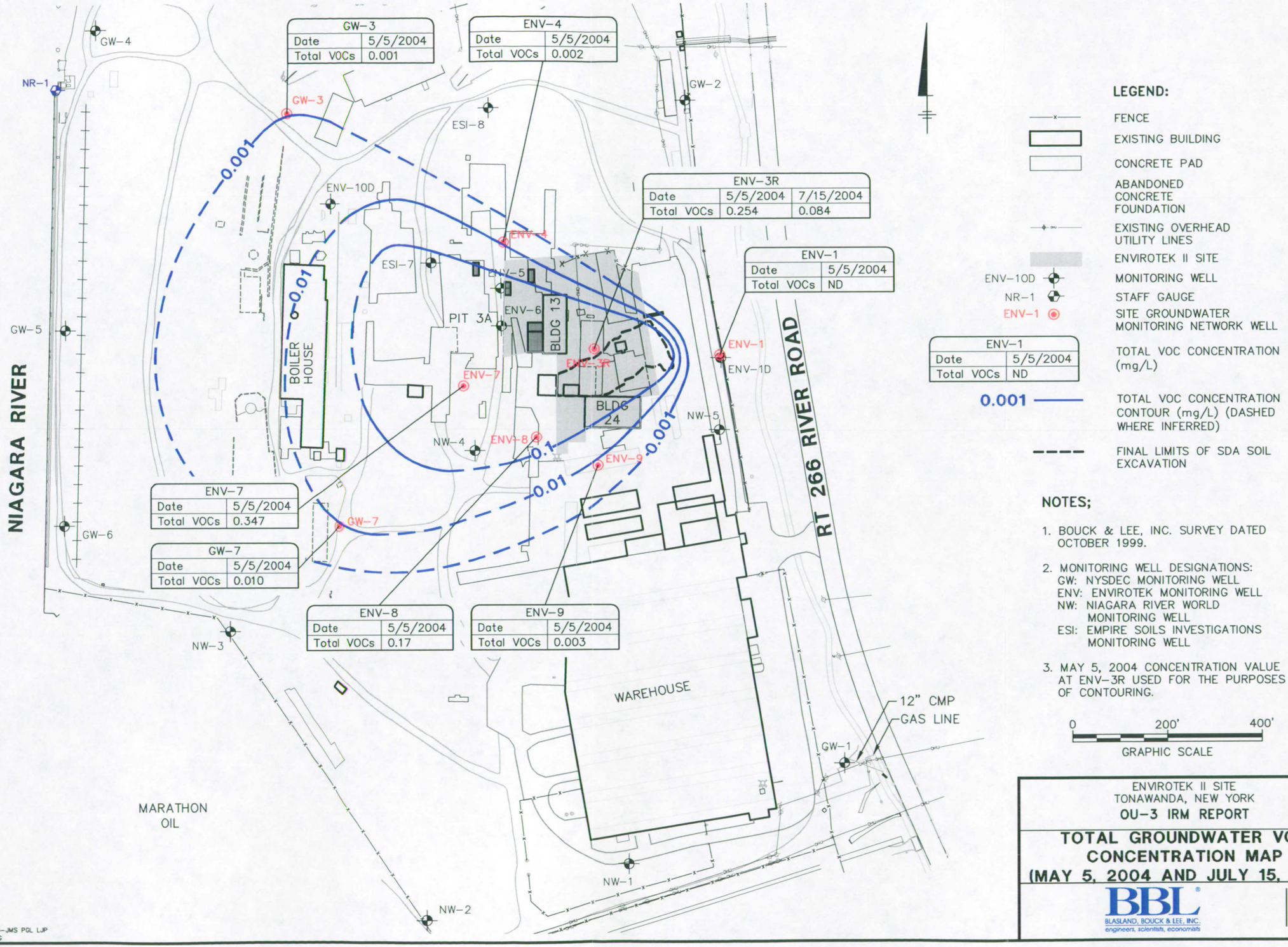
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 28, 2004

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **3-2**

X: 58002X00, X02.DWG
L: ON=*;OFF=REF*
P: PAGESET/SYR-BL
11/4/04 SYR-85-PGL DMW RCB
58002091/OU3IRM/58002W02.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-10D — MONITORING WELL
- NR-1 — STAFF GAUGE
- ENV-1 — SITE GROUNDWATER MONITORING NETWORK WELL
- ENV-1 / Date 5/5/2004 / Total VOCs ND — TOTAL VOC CONCENTRATION (mg/L)
- 0.001 — TOTAL VOC CONCENTRATION CONTOUR (mg/L) (DASHED WHERE INFERRED)
- FINAL LIMITS OF SDA SOIL EXCAVATION

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL
3. MAY 5, 2004 CONCENTRATION VALUE AT ENV-3R USED FOR THE PURPOSES OF CONTOURING.

0 200' 400'
GRAPHIC SCALE

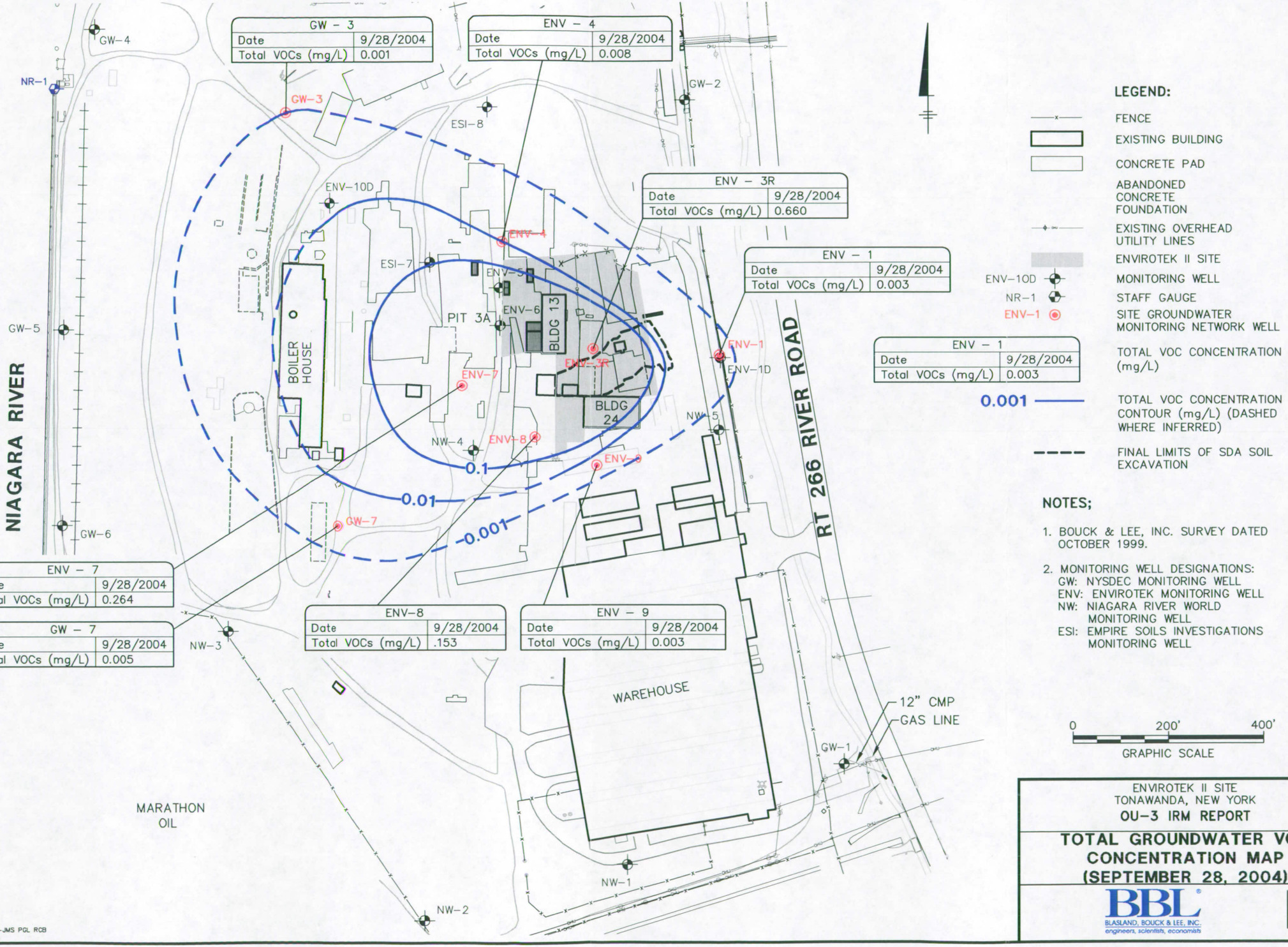
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (MAY 5, 2004 AND JULY 15, 2004)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **3-3**

X: 58002X00, X02.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
10/29/04 ROC-B5-SLM SYR-B5-JMS PGL LJP
58002091/0U3IRM/58002C01.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV–10D — MONITORING WELL
- NR–1 — STAFF GAUGE
- ENV–1 — SITE GROUNDWATER MONITORING NETWORK WELL
- ENV – 1 / Date 9/28/2004 / Total VOCs (mg/L) 0.003 — TOTAL VOC CONCENTRATION (mg/L)
- 0.001 — TOTAL VOC CONCENTRATION CONTOUR (mg/L) (DASHED WHERE INFERRED)
- FINAL LIMITS OF SDA SOIL EXCAVATION

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU–3 IRM REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (SEPTEMBER 28, 2004)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **3-4**

X: 58002X00, X02.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
10/29/04 ROC-85-SLM SYR-85-JMS PGL RCB
58002091/OU3IRM/58002C02.DWG

LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-1 — MONITORING WELL
- NR-1 — STAFF GAUGE
- FINAL LIMITS OF SDA SOIL EXCAVATION
- 0.10 — TOTAL VOC CONCENTRATION CONTOUR (mg/L) (DASHED WHERE INFERRED)
- (0.126) — TOTAL VOC CONCENTRATION (mg/L)
- >10 mg/L
- 10–1 mg/L
- 1–0.1 mg/L
- 0.1–0.01 mg/L
- 0.01–0.001 mg/L

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

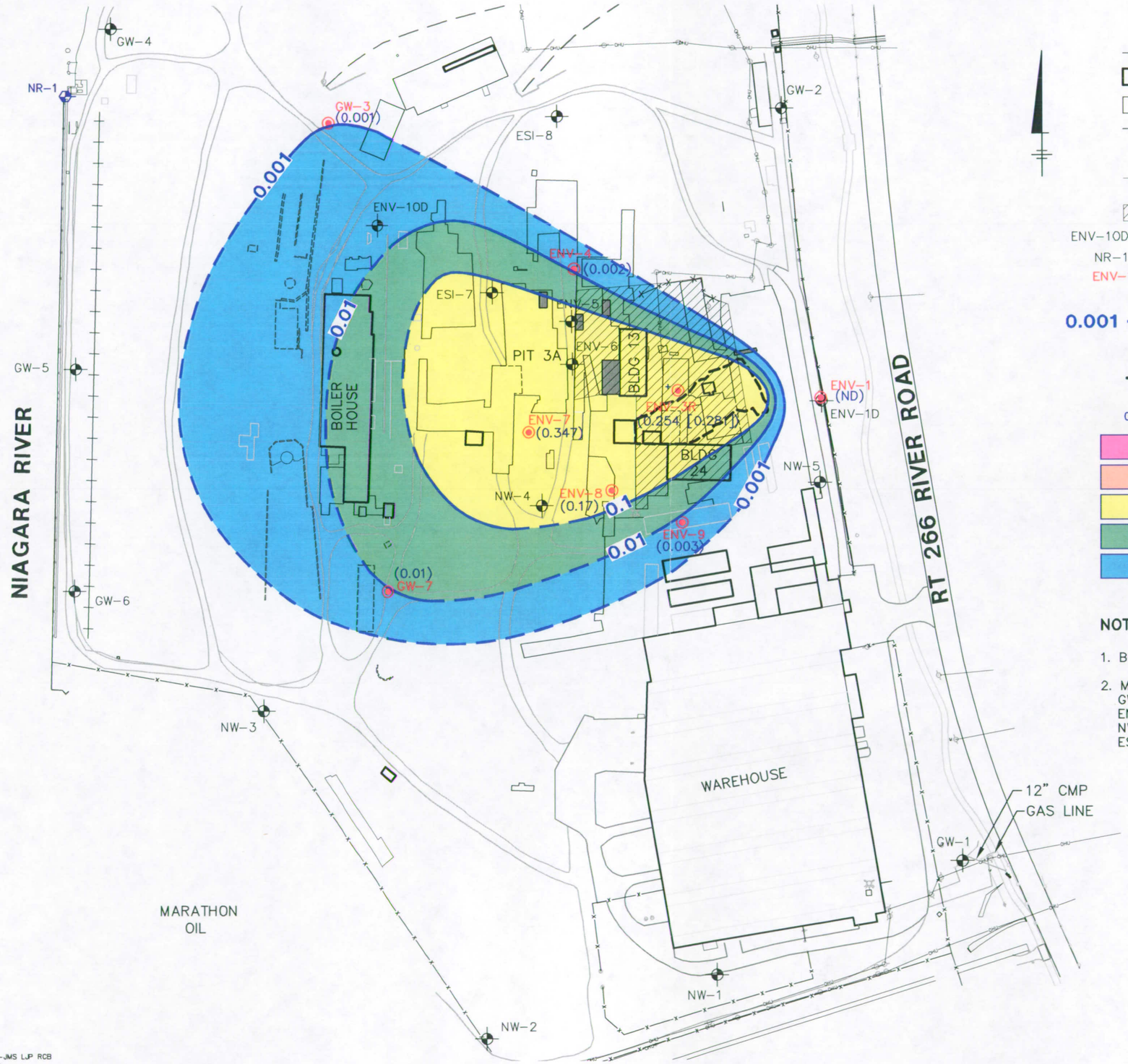
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

TOTAL GROUNDWATER VOC CONCENTRATION CONTOUR MAP (SEPTEMBER 1999)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **4-1**

X: 58002X00, X02.DWG
L: ON=*;OFF=REF*
P: PAGESET/SYR-BL1
10/29/04 ROC-85-SLM SYR-85-JMS, RCB
58002091/OU3IRM/58002C01.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-10D — MONITORING WELL
- NR-1 — STAFF GAUGE
- ENV-1 — SITE GROUNDWATER MONITORING NETWORK WELL
- 0.001 — TOTAL VOC CONCENTRATION CONTOUR (mg/L) (DASHED WHERE INFERRED)
- FINAL LIMITS OF SDA SOIL EXCAVATION
- 0.126 — TOTAL VOC CONCENTRATION (mg/L)
  - >10 mg/L
  - 10–1 mg/L
  - 1–0.1 mg/L
  - 0.1–0.01 mg/L
  - 0.01–0.001 mg/L

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

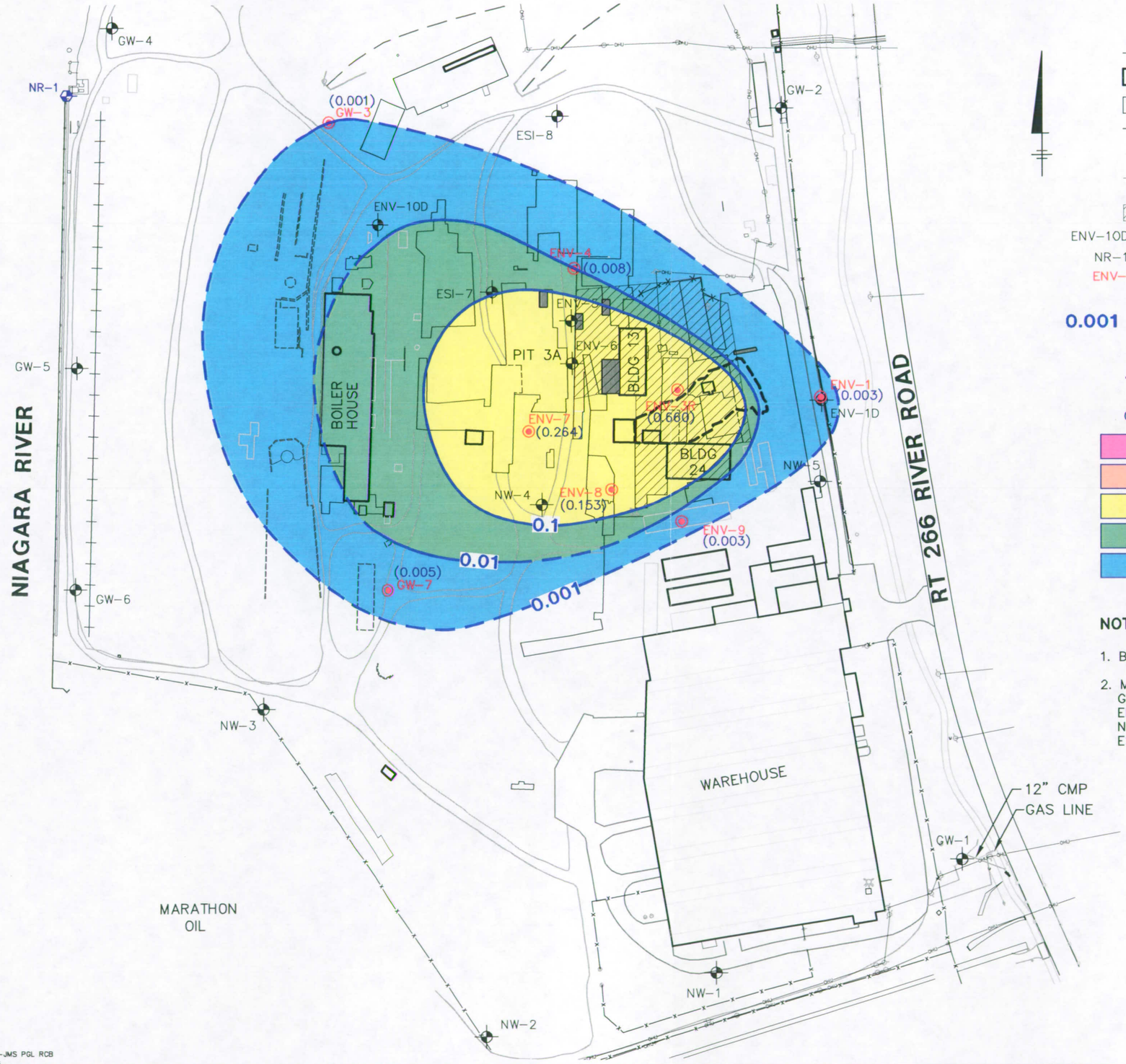
ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (MAY 5, 2004)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **4-2**

X: 58002X00, X01.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
10/29/04 ROC-85-SLM SYR-85-JMS LJP RCB
58002091/OU3IRM/58002B02.DWG



LEGEND:

- FENCE
- EXISTING BUILDING
- CONCRETE PAD
- ABANDONED CONCRETE FOUNDATION
- EXISTING OVERHEAD UTILITY LINES
- ENVIROTEK II SITE
- ENV-10D — MONITORING WELL
- NR-1 — STAFF GAUGE
- ENV-1 — SITE GROUNDWATER MONITORING NETWORK WELL
- 0.001 — TOTAL VOC CONCENTRATION CONTOUR (mg/L) (DASHED WHERE INFERRED)
- FINAL LIMITS OF SDA SOIL EXCAVATION
- 0.126 — TOTAL VOC CONCENTRATION (mg/L)
  - >10 mg/L
  - 10–1 mg/L
  - 1–0.1 mg/L
  - 0.1–0.01 mg/L
  - 0.01–0.001 mg/L

NOTES;

1. BOUCK & LEE, INC. SURVEY DATED OCTOBER 1999.
2. MONITORING WELL DESIGNATIONS:
   GW: NYSDEC MONITORING WELL
   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
   ESI: EMPIRE SOILS INVESTIGATIONS MONITORING WELL

0 200' 400'
GRAPHIC SCALE

ENVIROTEK II SITE
TONAWANDA, NEW YORK
OU-3 IRM REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (SEPTEMBER 28, 2004)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FIGURE **4-3**

X: 58002X00, X02.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
10/29/04 ROC-85-SLM SYR-85-JMS PGL RCB
58002091/OU3IRM/58002B03.DWG

Appendices

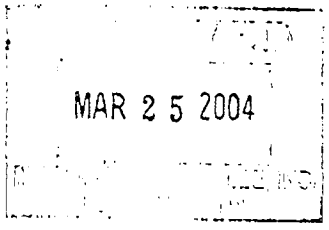
Appendix A

NYSDEC March 24, 2004 Approval Letter for IRM Work Plan for Operable Unit 3

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2999
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner



March 24, 2004

Mr. William B. Popham, Vice President
Blasland, Bouck & Lee, Inc.
155 Corporate Woods, Suite 150
Rochester, New York 14623-1465

Dear Mr. Popham:

IRM Work Plan for Operable Unit 3
Envirotek II - Roblin Steel Property
DEC Hazardous Waste Site No. 915056
Tonawanda (T), Erie Co.

The New York State Departments of Health (DOH) and Environmental Conservation (DEC) have completed a detailed review of the IRM Work Plan for Operable 3 and find it acceptable. This letter, therefore, transmits formal Department approval of the IRM Work Plan for Operable Unit 3 dated March 16, 2004.

Since the Department would like to provide oversight during the proposed well installation and sampling program, please provide at least 10 days notice prior to initiating this work. Should you have any comments or questions concerning this letter, please feel free to contact me at (716) 851-7220.

Sincerely yours,

Glenn M May

Glenn M. May
Engineering Geologist I

GMM/tml

cc: Mr. Daniel King, NYSDEC, Region 9
Mr. Matthew Forcucci, NYSDOH, Buffalo

letter.hw.915056.2004-03-24.OU3WorkPlanApproval.pdf

Appendix B

Boring/Well Construction Log – ENV-3R

BBL®
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engineers, scientists, economists

Date Start/Finish: 04/14/04 - 04/14/04
Drilling Company: Northnagle Drilling
Driller's Name: Kevin Bush
Drilling Method: HSA
Bit Size:
Sampler Size:
Rig Type:

Northing: N - 1,087,032.0
Easting: E - 1,053,660.4
Casing Elevation: 580.44
Riser Elevation: 580.14
Borehole Depth: 18 feet
Surface Elevation: 580.44

Geologist: Michael Arlaukas

Well/Boring ID: ENV-3R

Client: Envirotek

Location: Tonawanda, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description
0	0							Concrete
		S-1		0.9'				FILL, consisting of dark brown to black f-m sand, some rock fragments, little black cinders gray slag; dry
		S-2		0.7'				FILL, consisting of gray rock fragments and little red and white brick fragments; dry
5	-5	S-3		1.7'				FILL, consisting of dark brown m-c sand, some gray/black slag, little broken rock fragments; dry
								FILL, black vf sand and silt; dry
		S-4		1.6'				FILL, consisting of dark brown m-c sand, some gray/black slag, little broken rock fragments; dry FILL, consisting of dark brown f-m sand, some slag and concrete fragments, trace orange silt sized material; most; suflur odor present
		S-5		-				FILL, consisting of brown to dark gray m-c slag, trace rock fragments; moist 8'-9' bgs, wet 9'-10' bgs
10	-10	S-6		1.7'				FILL, consisting of dark brown m-c sand sized slag, some f-m sand sized slag, trace coarse gravel sized slag; wet; sheen present on water
		S-7		1.6'				Same as above
15	-15	S-8		1.5'				FILL, consisting of dark m-c sand sized slag, some f-m sized slag, trace coarse gravel sized slag; wet; brown silty clay with faint organic odor present at tip of spoon
		S-9		2.0'				Brown; SILTY CLAY; wet

Well/Boring Construction

- 24" diameter concrete surface pad (0.0' - 1.8' bgs)
- Hydrated bentonite seal (1.8' - 3.9' bgs)
- 2" diameter, Schedule 40, flush thread PVC riser (0.2' - 6.0' bgs)
- ØØN Sand (3.9' - 16.6' bgs)
- 2" diameter, Schedule 40, 0.01-inch slotted PVC screen (6.0' - 16.0' bgs)
- Bentonite chips (16.6' - 18.0' bgs)

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Remarks: NA: Not Applicable / WH: Weight of Hammer

Appendix C

Surveyor's Report

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

McINTOSH & McINTOSH, P.C.
CONSULTING ENGINEERS, LAND SURVEYORS, PLANNERS
NEW YORK • MAINE • PENNSYLVANIA • VERMONT • CONNECTICUT
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Principal Office: 429 Pine Street, P.O. Box 490 Lockport, New York 14095
716 - 433-2535 BUFFALO, N.Y.
716 - 434-8138 625-8360
FAX # 716-433-2827

September 29, 2004

Mr. Mark B. Hanish, P.G.
Sr. Geologist/Project Manger
Blasland, Bouck & Lee, Inc.
600 Waterfront Drive
Pittsburgh, PA 15222-4741

Re: Surveying Services for
Well at Envirotek Site
Tonawanda, New York

Dear Mark:

Pursuant to our letter of agreement dated September 29, 2004 regarding the above referenced site, please see the following for well (ENV-3R).

N. - 1,087,032.0
E. - 1,053,660.4
Top of 3" PVC casing 580.14
Top of 8" casing - 580.44
Ground Elevation - 580.44

If you have any questions or require any additional information, please do not hesitate to contact me.

Yours truly,

John E. McIntosh III, L.S.
Director of Operations

JEMIII:hen

B8L-ENVI.WPD

Appendix D

Groundwater Sampling Logs

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arleuckse

Job Number: 13048.002

Weather: @ 65°F SUNNY

Well ID: ENV-1

Date: MAY 5, 2004

Time In: 0630 Time Out: 0920

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	24.44		
Water Table Depth	(feet)	7.10		

check where appropriate

Well Type: Flushmount [X] Stick-Up [ ]

Well Locked: Yes [X] No [ ]

Measuring Point Marked: Yes [X] No [ ]

Well Diameter: 1" [ ] 2" [X] Other: ____

WELL WATER INFORMATION

Length of Water Column:	(feet)	17.34 ft
Volume of Water in Well:	(gal)	2.77 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 mins
Total Volume Removed:	(gal)	3.598

Conversion Factors				
gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.65	1.5
1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft				

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTUs	10%		10 mV

SAMPLING INFORMATION

Analytes:

VOC's (3 - 40 mL vials) [X]

Sample ID: ENV-1

Sample Time: 0930

MS/MSD: Yes [ ] No [X]

Duplicate: Yes [ ] No [X]

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer	[ ]	Grundfos Pump	[ ]	MasterFlex	[X]	[ ]
Tubing Used:	Dedicated	[X]	Decontam	[ ]			
Sampling Method	Bailer	[X]	Grundfos Pump	[ ]	MasterFlex	[ ]	[ ]
Did well go dry?	Yes	[ ]	No	[X]			

Water Quality Meter Type: Horiba U-22

Time / Parameter	0845 Initial	0850	0855	0900	0905	0910	0915	0920	0925
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft TIC)	7.26	7.26	7.26	7.26	7.26	7.26	7.26	7.26	7.26
pH	7.35	7.31	7.29	7.06	7.05	7.03	7.06	7.07	7.06
Conductance (mS/cm)	0.793	0.792	0.791	0.789	0.789	0.789	0.789	0.789	0.789
Turbidity (NTUs)	76.3	71.2	69.3	74.5	51.2	63.9	26.3	22.3	21.9
DO (mg/L)	9.61	9.62	9.63	9.64	9.65	9.64	9.65	9.65	9.65
Temp (°C)	8.23	8.23	8.19	8.19	8.19	8.19	8.18	8.18	8.18
ORP (mV)	+31	+36	+38	+41	+46	+56	+61	+63	+67

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was

Shipped Via: [ ] Federal Express Other: Blasland, Bouck & Lee, Inc.

[ ] shipped day of sampling [ ] sent on 5/6/04

Chain of Custody Signed by: [signature]

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arlauckas

Job Number: 13048.002

Weather: @65°F SUNNY

Well ID: ENV-3R

Date: MAY 5, 2004

Time In: 0950 Time Out: 1035

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	15.94		
Water Table Depth	(feet)	8.98		

check where appropriate

Well Type: Flushmount [X] Stick-Up [ ]

Well Locked: Yes [X] No [ ]

Measuring Point Marked: Yes [X] No [ ]

Well Diameter: 1" [ ] 2" [X] Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	6.96ft
Volume of Water in Well:	(gal)	1.11 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 min
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors				
gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analytes:

VOCs (3 - 40 mL Vials) [X]

Sample ID: ENV-3R

Sample Time: 1045

MS/MSD: Yes [ ] No [X]

Duplicate: Yes [X] No [ ]

Duplicate ID: FD050504

Total Bottles: 6

EVACUATION INFORMATION

Evacuation Method:	Bailer	[ ]	Grunfos Pump	[ ]	MasterFlex	[X]	[ ]
Tubing Used:	Dedicated	[X]	Decanned	[ ]			
Sampling Method	Bailer	[X]	Grunfos Pump	[ ]	MasterFlex	[ ]	[ ]
Did well go dry?	Yes	[ ]	No	[X]			

Water Quality Meter Type: Horiba U-22

Time / Parameter	0950 Initial	0955	1000	1005	1010	1015	1020	1025	1030
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10,500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	9.03	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15
pH	6.23	6.31	6.33	6.33	6.31	6.29	6.31	6.31	6.31
Conductance (mS/cm)	0.715	0.689	0.645	0.651	0.658	0.661	0.663	0.669	0.671
Turbidity (NTU's)	169.0	60.8	62.3	51.9	46.3	52.3	47.3	41.9	39.3
DO (mg/L)	9.39	7.22	6.86	5.36	2.92	3.56	1.89	1.87	1.81
Temp (°C)	8.20	8.20	8.19	8.19	8.20	8.20	8.20	8.20	8.20
ORP (mV)	116	113	105	106	100	97	95	93	90

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* NEW WELL REPLACEMENT OF THE FORMER ENV-3

- FIELD DUPLICATE = FD050504

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was [ ] shipped day of sampling

Shipped Via: [ ] Federal Express Other: Blasland, Bouck & Lee, Inc. [ ] sent on 5/6/04

Chain of Custody Signed By: Michael R. Arlauckas

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arbuckle

Job Number: 19048.002

Weather: 265°F SUNNY

Well ID: ENV-4

Date: MAY 5, 2004

Time In: ~~1300~~ 1055 Time Out: 1210

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	22.95		
Water Table Depth	(feet)	11.21		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other ____

WELL WATER INFORMATION

Length of Water Column:	(feet)	11.74
Volume of Water in Well:	(gal)	1.87 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min)	45 min
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors				
gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.094	0.16	0.66	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	2.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-4

Sample Time: 1205

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer	☐	Grundfos Pump	☐	MasterFlex	☒	☐
Tubing Used:	Dedicated	☒	Decorned	☐			
Sampling Method:	Bailer	☒	Grundfos Pump	☐	MasterFlex	☐	☐
Did well go dry?	Yes	☐	No	☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1105 Initial	1110	1115	1120	1125	1130	1135	1140	1145
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10,500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft, TIC)	12.79	13.15	13.21	13.21	13.21	13.21	13.21	13.21	13.21
pH	5.88	6.33	6.25	6.19	6.10	6.10	6.21	6.11	6.13
Conductance (mS/cm)	0.734	0.642	0.631	0.615	0.611	0.603	0.605	0.603	0.605
Turbidity (NTU's)	85.6	33.5	31.6	79.6	74.3	19.2	12.6	11.3	9.2
DO (mg/L)	13.36	8.35	8.26	3.11	0.00	0.00	0.00	0.00	0.00
Temp (°C)	9.26	9.24	9.26	9.26	9.31	9.26	9.26	9.26	9.26
ORP (mv)	155	117	109	100	91	76	68	59	42

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* CLOUDY FLOW THRU CELL @ 1125 (TURBIDITY INCREASE)

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped day of sampling ☐ sent on 5/6/04

Shipped Via: ☐ Federal Express Other: Blasland, Bouck & Lee, Inc

Chain of Custody Completed

Envirotek II Site, Tonawanda, New York

Low-Flow Samplimg Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arbuckles

Job Number: 13048.002

Weather:

Well ID: ENV-7

Date: MAY 5 2004

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	17.12		
Water Table Depth	(feet)	12.10		

check where appropriate

Well Type: Flushmount ☐ Stick Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other

WELL WATER INFORMATION

Length of Water Column:	(feet)	5.02 ft
Volume of Water in Well:	(gal)	0.803
Pumping Rate of Pump:	(mL/min)	200 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	48
Total Volume Removed:	(gal)	2.37 gal

Conversion Factors				
gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.66	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-7

Sample Time: 1310

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex	☒ ____ ☐	
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method	Bailer ☒	Grundfos Pump ☐	MasterFlex	☐ ____ ☐	
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1225 Initial	1230	1235	1240	1245	1250	1255	1300	1305
Volume Purged (gal)	0	1000	2000	3000	4000	5000	6000	7000	8000
Purge Rate (mL/min)	200	200	200	200	200	200	200	200	200
Depth to Water (ft. TIC)	12.68	12.79	13.01	13.05	13.05	13.05	13.05	13.05	13.05
pH	7.38	7.41	7.41	7.45	7.39	7.39	7.39	7.39	7.39
Conductance (mS/cm)	1.031	1.001	.967	.976	.976	.978	.978	.978	.978
Turbidity (NTU's)	329	189	76.9	53.1	23.6	21.1	15.5	12.3	11.9
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	9.37	8.61	8.53	8.52	8.52	8.52	8.51	8.51	8.51
ORP (mV)	-53	-51	-56	-56	-51	-48	-51	-48	-51

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

@ 1235 CLEANED FLOW THRU CELL

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped day of sampling

Shipped Via: ☐ Federal Express Other: Blasland, Bouck & Lee, Inc. ☐ sent on 5/6/04

Chain of Custody Signed By:

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Antzoulas

Job Number: 13046.002

Weather: @65°F SUNNY

Well ID: ENV-8

Date: MAR 5, 2004

Time In: 1400 Time Out: 1455

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	17.51		
Water Table Depth	(feet)	12.15		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	5.36ft
Volume of Water in Well:	(gal)	0.857
Pumping Rate of Pump:	(mL/min)	200 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	46 min
Total Volume Removed:	(gal)	2.379AL

Conversion Factors

gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.034	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

Unit Stability

pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-8

Sample Time: 1450

MS/MSD: Yes ☒ No ☐

Duplicate: Yes ☐ No ☐

Duplicate ID: —

Total Bottles: 9

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grunfos Pump ☐	MasterFlex ☒		☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method	Bailer ☒	Grunfos Pump ☐	MasterFlex ☐		☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1405 Initial	1410	1415	1420	1425	1430	1435	1440	1445
Volume Purged (gal)	0	1000	2000	3000	4000	5000	6000	7000	8000
Purge Rate (mL/min)	200	200	200	200	200	200	200	200	200
Depth to Water (ft TIC)	12.63	13.25	14.01	14.08	14.08	14.08	14.08	14.08	14.08
pH	8.67	8.71	8.69	8.71	8.81	8.73	8.74	8.73	8.74
Conductance (mS/cm)	1.301	1.291	1.291	1.000	1.000	1.000	1.000	1.000	1.000
Turbidity (NTUs)	35.6	71.9	69.9	72.3	56.1	43.6	37.9	46.7	48.9
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	9.31	8.65	8.61	8.63	8.63	8.63	8.63	8.63	8.63
ORP (mV)	-31	-29	-19	-5	0	0	+6	+13	+21

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

MS/MSD TAKEN AT THIS WELL

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☒ shipped day of sampling

Shipped Via: ☐ Federal Express Other: Blasland, Bouck & Lee, Inc sent on 3/6/04

Chain of Custody Sealed

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

3/98

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Artsuckas

Well ID: ENV-9

Job Number: 13049.002

Date: March 5, 2007

Weather: 265°F SUNNY

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	18.05		
Water Table Depth	(feet)	12.70		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other ____

WELL WATER INFORMATION

Length of Water Column:	(feet)	5.35 ft
Volume of Water in Well:	(gal)	0.856
Pumping Rate of Pump:	(mL/min)	200 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 min
Total Volume Removed:	(gal)	2.379 gal

Conversion Factors				
gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.66	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

Unit Stability					
pH	Cond.	Turb.	DO	Temp	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	5.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-9

Sample Time: 1635

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	____	☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1550 Initial	1555	1600	1605	1610	1615	1620	1625	1630
Volume Purged (gal)	0	1000	2000	3000	4000	5000	6000	7000	8000
Purge Rate (mL/min)	200	200	200	200	200	200	200	200	200
Depth to Water (ft. TIC)	13.61	14.52	15.01	15.21	15.11	15.11	15.11	15.11	15.11
pH	7.21	7.23	7.25	7.31	7.31	7.31	7.31	7.31	7.31
Conductance (mS/cm)	0.869	0.931	0.937	0.939	0.941	0.941	0.941	0.941	0.941
Turbidity (NTUs)	35.6	41.6	41.6	56.7	49.6	48.1	41.5	39.7	21.6
DO (mg/L)	5.63	4.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.69	8.03	8.03	8.03	8.03	8.03	8.03	8.03	8.03
ORP (mV)	—	—	—	—	—	—	—	—	—

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

- FIELD BLANK FB050504 WAS OPENED DURING THE SAMPLING OF THIS WELL - EXPOSED TO THE AIR

- ORP (MV) NOT WORKING PROPERLY

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped during sampling

Shipped Via: ☐ Federal Express Other: Blasland, Bouck & Lee, Inc. ☐ sent on 5/6/07

Signature of person relinquishing

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arruckas

Job Number: 13048.002

Weather: @70F SUNNY

Well ID: GW-3

Date: MAY 5, 2004

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	20.55		
Water Table Depth	(feet)	8.62		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other ____

WELL WATER INFORMATION

Length of Water Column:	(feet)	12.23ft
Volume of Water in Well:	(gal)	1.95
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	
Minutes of Pumping:	(min)	45 min
Total Volume Removed:	(gal)	3.5 GAL

Conversion Factors				
gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

YSI Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.03%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Sample ID: GW-3

Sample Time: 1935

MS/MSD: Yes ☐ No ☐

Duplicate: Yes ☐ No ☐

Duplicate ID: ____

Total Bottles: ____

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	____	☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	____	☐
Did well go dry?	Yes ☐	No ☐			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1655 (initial)	1900	1905	1910	1915	1920	1915	1920	1925
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10,500	12,000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft TIC)	8.68	8.71	8.72	8.73	8.69	8.69	8.69	8.69	8.69
pH	7.35	7.21	7.19	7.03	7.11	7.16	7.15	7.15	7.15
Conductance (mS/cm)	0.861	0.861	0.862	0.871	0.876	0.869	0.869	0.871	0.871
Turbidity (NTUs)	121	119.0	81.3	79.6	76.1	50.2	49.9	50.1	50.6
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	8.01	8.06	8.01	8.02	8.01	8.01	8.01	8.01	8.01
ORP (mV)	—	—	—	—	—	—	—	—	—

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* REMOVED @ 2.5 GALLONS PRIOR TO INITIAL READING — VERY TURBID

ORP ~~PROBE~~ PROBE NOT WORKING

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped day of sampling

Shipped Via ☐ Federal Express Other: Blasland, Bouck & Lee, Inc ☐ sent on 5/6/04

Chain of Custody Signed by: [signature]

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Antsuckas

Job Number: 12048.003

Weather: 90°F SUNNY

Well ID: GW-7

Date: MAY 5 2004

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	19.61		
Water Table Depth	(feet)	11.78		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	7.83ft
Volume of Water in Well:	(gal)	1.25 gal
Pumping Rate of Pump:	(mL/min)	200 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 min
Total Volume Removed:	(gal)	2.37 gal

Conversion Factors				
gallons per feet of water column	1" ID	2" ID	4" ID	6" ID
	0.05	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analytes:

VOC's (3 - 40 mL Vials) ☒

Sample ID: GW-7

Sample Time: 1820

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	_____	☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method:	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	_____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1730 Initial	1735	1740	1745	1750	1755	1800	1805	1810
Volume Purged (gal)	0	1000	2000	3000	4000	5000	6000	7000	8000
Purge Rate (mL/min)	200	200	200	200	200	200	200	200	200
Depth to Water (ft. TIC)	11.96	12.05	12.21	12.41	12.42	12.39	12.38	12.38	12.38
pH	8.11	8.13	8.11	8.11	8.11	8.13	8.11	8.11	8.11
Conductance (mS/cm)	2.113	1.999	2.013	2.001	1.996	2.003	2.011	2.013	2.010
Turbidity (NTU's)	221	139	61.9	35.2	34.1	27.6	27.6	27.5	27.3
DO (mg/L)	0.00	1.31	0.00	1.32	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.96	8.01	8.00	7.99	7.99	8.00	8.01	8.01	8.01
ORP (mV)	—	—	—	—	—	—	—	—	—

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* ORP PROBE NOT WORKING

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped same day ☐ sent on 5/6/04

Shipped Via ☐ Federal Express Other: Blasland, Bouck & Lee, Inc.

Chain of Custody Signed

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

SUBJECT	PROJ. NO.	BY	DATE	SHEET
ENVIROTEK II SITE			5/5/04	

CALCS. BY _____ ; DATE _____ CHECKED BY _____ ; DATE _____

WATER LEVELS

TOR = TOP OF RISER (PVC)

	WATER LEVEL (TOR)	TOTAL DEPTH (TOR)
ENV-1	7.10	24.44
ENV-1D	12.65	31.0
ENV-3R	8.98	15.94
ENV-9	12.70	18.05
ENV-8	12.15	17.51
GW-3	8.62	20.85
GW-4	9.72	17.29
ENV-10D	13.08	54.25
GW-5	6.93	18.21
GW-6	6.85	17.90
NR-1	5.35	
ESI-8	8.82	17.0
ENV-4	11.21	22.95
ESI-7	12.42	15.71
ENV-7	12.10	17.12
ENV-5	10.05	24.51
ENV-6	10.62	23.20
NW-4	10.28	19.78
NW-3	GONE	— BROKEN AT GRADE
GW-1	6.15	23.19
NW-1	DID NOT FIND	
NW-2	11.95	12.30
GW-7	11.78	19.61
GW-2	12.85	32.0
NW-5	9.01	18.80

REFERENCE POINT = 570.43

Envirotek II Site, Tonawanda, New York — Low-Flow Sampling Program

Site — Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Artsuckas
Job Number: 18048.002
Weather: 65°F LIGHT RAIN OVERCAST

Well ID: ENV-5R
Date: JULY 15TH 2004
Time In: 0750 Time Out: 0900

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	15.94		
Water Table Depth	(feet)	9.01		

check where appropriate

Well Type:	Flushmount	☒	Stick-Up	☐
Well Locked:	Yes	☒	No	☐
Measuring Point Marked:	Yes	☐	No	☒
Well Diameter:	1" ☐	2" ☒	Other:	

WELL WATER INFORMATION

Length of Water Column:	(feet)	6.93 ft
Volume of Water in Well:	(gal)	1.11 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 min
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors				
Gallons per foot of water column:	1" ID: 0.041	2" ID: 0.16	4" ID: 0.65	6" ID: 1.5
1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft				

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analytes:
VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-5R
Sample Time: 0850
MS/MSD: Yes ☐ No ☒
Duplicate: Yes ☐ No ☒
Duplicate ID: —
Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer	☐	Grundfos Pump	☐	MasterFlex	☒	☐
Tubing Used:	Dedicated	☒	Decanted	☐			
Sampling Method:	Bailer	☒	Grundfos Pump	☐	MasterFlex	☐	☐
Did well go dry?	Yes	☐	No	☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	0800 (INITIAL)	0805	0810	0815	0820	0825	0830	0835	0840
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10,500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft, TIC)	9.16	9.22	9.22	9.22	9.22	9.22	9.22	9.22	9.22
pH	6.35	6.38	6.36	6.31	6.34	6.34	6.34	6.34	6.34
Conductivity (mS/cm)	0.759	0.739	0.721	0.705	0.711	0.703	0.707	0.703	0.705
Turbidity (NTU's)	210	176	98.2	78.3	69.1	54.3	50.1	49.3	48.6
DO (mg/L)	6.35	4.79	3.64	2.21	0.00	0.00	1.36	1.31	1.29
Temp (°C)	8.10	8.11	8.11	8.11	8.11	8.11	8.10	8.11	8.11
ORP (mV)	132	127	121	115	109	97	91	86	71

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory: Severn Trent Laboratories - Buffalo, New York — Sample was ☐ shipped day of sampling
Shipped Via: ☐ Federal Express Other: Blasland, Bouck & Lee, Inc. — ☐ sent on 7/15/04

Chain of Custody Signature

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arlauckas

Well ID: ENV-8

Job Number: 13048.002

Date: SEPTEMBER 28th 2004

Weather: ~75°F SUNNY WINDY @ 10 mph

Time In: Time Out:

WELL INFORMATION (record from top of riser casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	17.51		
Water Table Depth	(feet)	12.37		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	5.14 ft
Volume of Water in Well:	(gal)	0.822 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min)	45 min
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors				
gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.096	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-8

Sample Time: 1555

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 2

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	_____	☐
Tubing Used:	Dedicated ☒	Decanted ☐			
Sampling Method:	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	_____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time	1430 (Initial)	1435	1440	1445	1450	1515	1520	1525	1530
Parameter									
Volume Purged (gal)	0	1500	3000	4800	6000	7500	9000	10,800	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	12.41	12.42	12.41	12.41	12.41	12.41	12.41	12.41	12.41
pH	8.31	8.09	8.02	7.96	7.92	7.91	7.92	7.93	7.92
Conductance (mS/cm)	0.861	0.856	0.849	0.831	0.835	0.836	0.851	0.846	0.859
Turbidity (NTUs)	96.3	82.1	71.3	56.3	69.3	57.2	48.6	41.3	42.9
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (C)	7.21	7.19	7.21	7.19	7.19	7.32	7.19	7.21	7.21
ORP (mV)	86	91	102	105	111	105	107	109	112

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* BATTERY WENT DEAD — PUMP STOPPED WORKING.
— WILL USE THE OTHER

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was ☐ shipped as of sampling

Shipped Via: ☐ Federal Express Other: Prestano, Brouck & Lee, Inc. ☐ sent on 9/29/04

Chain of Custody Signed By:

Envirotek II Site, Tonawanda, New York — Low-Flow Sampling Program

Site — Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arbuckle — Well ID: GNU-9
Job Number: 13046.002 — Date: SEPTEMBER 28, 2004
Weather: 75°F SUNNY BREEZY — Time In: — Time Out:

WELL INFORMATION (record from top of lower casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	18.05		
Water Table Depth	(feet)	12.93		

check where applicable

Well Type: Flushmount ☐ Stick Up ☒
Well Locked: Yes ☒ No ☐
Measuring Point Marked: Yes ☒ No ☐
Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	5.12 ft
Volume of Water in Well:	(gal)	0.819 gal
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	0.08 GPM
Minutes of Pumping:	(min)	95 MIN
Total Volume Removed:	(gal)	3.5 gal.

Conversion Factors

gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.004	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

Use Buddy

pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTUs	10%		10 mV

SAMPLING INFORMATION

Analyses:
VOCs (3 - 40 mL Vials) ☒
Sample ID: GNU-9
Sample Time: 1445
MS/MSD: Yes ☒ No ☐
Duplicate: Yes ☐ No ☐
Duplicate ID:
Total Bottles: 6

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒		☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐		☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1410 Initial	1415	1420	1435	1440	1445	1450	1455	1500
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10500	12000
Pump Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft TIC)	13.02	13.03	13.03	13.03	13.02	13.03	13.03	13.02	13.03
pH	8.56	8.57	8.39	8.02	7.96	7.93	7.95	7.95	7.96
Conductance (mS/cm)	0.956	0.951	0.958	0.961	0.962	0.963	0.961	0.962	0.960
Turbidity (NTUs)	83.2	79.6	61.3	56.9	52.3	48.9	46.9	47.3	48.9
DO (mg/L)	1.21	0.96	0.95	0.32	0.20	0.11	0.00	0.00	0.00
Temp (°C)	7.23	7.21	7.19	7.18	7.19	7.19	7.18	7.19	7.19
ORP (mV)	56	59	51	63	60	63	65	71	69

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

* FUSE BLEW ON PUMP 1420 - 1435

Laboratory: Severn Trent Laboratories - Buffalo, New York — Samples was ☐ shipped on / or sent on 9/29/04
Shipped Via: ☐ Federal Express Other Blanchard, Bouck & Lee Inc. — Chain of Custody Completed ☐

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arrauckas

Job Number: 13046.002

Weather: @ 70°F SUNNY SLIGHT BREEZE

Well ID: GW-7

Date: SEPTEMBER 28, 2004

Time In:

Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

		TIC	TOC	BGS
Well Depth	(feet)	19.61		
Water Table Depth	(feet)	11.93		

check where appropriate

Well Type: Flushmount ☐ Stick-Up ☒

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	7.68
Volume of Water in Well:	(gal)	1.22
Pumping Rate of Pump:	(mL/min)	300 mL/min
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min)	45 min
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors

gallons per foot	1" ID	2" ID	4" ID	6" ID
of water column	0.04	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Stability

pH	Cond	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

☐

☐

☐

☐

☐

Sample ID: GW-7

Sample Time: 1330

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☐

Duplicate ID: —

Total Bottles: 2

EVACUATION INFORMATION

Evacuation Method: Bailer ☐ Grundfos Pump ☐ MasterFlex ☒ ________ ☐

Tubing Used: Dedicated ☒ Dedicated ☐

Sampling Method: Bailer ☒ Grundfos Pump ☐ MasterFlex ☐ ________ ☐

Did well go dry? Yes ☐ No ☒

Water Quality Meter Type: Horiba U-22

Time / Parameter	1205 Initial	1210	1215	1220	1225	1230	1235	1300	1305
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft, TIC)	12.11	12.10	12.11	12.09	12.10	12.10	12.10	12.10	12.10
pH	7.21	7.06	7.11	7.11	7.12	7.11	7.11	7.12	7.12
Conductance (mS/cm)	0.976	0.971	0.977	0.981	0.983	0.982	0.984	0.984	0.982
Turbidity (NTU's)	71.6	56.9	51.3	48.1	39.3	26.9	27.5	31.2	29.3
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.23	7.23	7.23	7.21	7.21	7.56	7.21	7.23	7.23
ORP (mV)	~~7.23~~ 123	121	119	115	107	106	103	104	101

Comments/Notes

USEPA SW-864 Method 8260B - Volatile Organic Compounds (VOCs)

* HORIBA BATTERIES - WENT DEAD @ 25 MINUTES AFTER PUMPING / PURGING

Laboratory: Severn Trent Laboratories - Buffalo, New York

Sample was ☐ shipped ☐ sent on 9/28/04

Shipped Via: ☐ Federal Express Other: Benchmark Bouck & Lee, Inc.

Chain of Custody Signed By: [signature]

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Event

S/le

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arriaudeas

Well ID: ENV-7

Job Number: 15046.002

Date: SEPTEMBER 28, 2004

Weather: @ 70°F SUNNY SLIGHT BREEZE

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at minimum)

check where appropriate

		TIC	TOC	BGS
Well Depth	(feet)	17.12		
Water Table Depth	(feet)	12.26		

Well Type: Flushmount ☒ Stick-Up ☐

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other

WELL WATER INFORMATION

Length of Water Column:	(feet)	4.86
Volume of Water in Well:	(gal)	0.777
Pumping Rate of Pump:	(mL/min)	300 mL/MIN
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min)	45 MIN
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors				
gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.041	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

Use Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL vials) ☒

Sample ID: ENV-7

Sample Time: 1320

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 2

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	____	☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method:	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time	1200 (Initial)	1205	1210	1215	1220	1225	1230	1235	1240
Parameter									
Volume Purged (gal)	0	1500	3000	4500	6000	7500	9000	10500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	12.33	12.35	12.41	12.41	12.39	12.39	12.39	12.39	12.39
pH	7.56	7.51	7.56	7.53	7.49	7.46	7.45	7.45	7.45
Conductance (mS/cm)	0.759	0.761	0.748	0.743	0.741	0.746	0.741	0.746	0.747
Turbidity (NTU's)	56.3	51.9	49.6	48.7	46.9	47.3	45.6	46.3	47.8
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.19	7.21	7.19	7.19	7.19	7.18	7.19	7.19	7.19
ORP (mV)	97	102	105	109	111	112	115	114	117

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was shipped day of sampling ☐

Shipped Via: ☐ Federal Express Other Blasland, Bouck & Lee, Inc. sent on 9/29/04

Chain of Custody Signed By: Michael R. Arriaudeas

Envirotek II Site, Tonawanda, New York — Low-Flow Sampling Program

Site — Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arguckas — Well ID: GW-3

Job Number: 13046.002 — Date:

Weather: @80°F SUNNY @ SLIGHT BREEZE — Time In: — Time Out:

WELL INFORMATION (record from top of riser casing at maximum)

		TIC	TOC	BGS
Well Depth	(feet)	20.85'		
Water Table Depth	(feet)	8.79		

(check where appropriate)

Well Type: Flushmount [ ] Stick-Up [X]

Well Locked: Yes [X] No [ ]

Measuring Point Marked: Yes [X] No [ ]

Well Diameter: 1" [ ] 2" [X] Other: —

WELL WATER INFORMATION

Length of Water Column:	(feet)	12.06
Volume of Water in Well:	(gal)	1.92
Pumping Rate of Pump:	(mL/min)	300 mL/MIN
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 MIN
Total Volume Removed:	(gal)	3.5 GAL

Conversion Factors

gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.04	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft

Unit Stability

pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	<50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOCs (3 - 40 mL vials) [X]

Sample ID: GW-3

Sample Time: 1135

MS/MSD: Yes [ ] No [X]

Duplicate: Yes [ ] No [X]

Duplicate ID: —

Total Bottles: 2

EVACUATION INFORMATION

Evacuation Method:	Bailer [ ]	Grundfos Pump [ ]	MasterFlex [X]	_____ [ ]	
Tubing Used:	Dedicated [X]	Decontinued [ ]			
Sampling Method:	Bailer [X]	Grundfos Pump [ ]	MasterFlex [ ]	_____ [ ]	
Did well go dry?	Yes [ ]	No [X]			

Water Quality Meter Type: Horiba U-22

Time / Parameter	1040 Initial	1045	1050	1055	1100	1105	1110	1115	1120
Volume Purged (gal)	0	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	8.84	8.86	8.86	8.86	8.86	8.85	8.85	8.85	8.85
pH	7.46	7.45	7.39	7.35	7.35	7.31	7.31	7.34	7.31
Conductance (mS/cm)	1.01	1.016	0.996	0.981	0.973	0.978	0.976	0.977	0.978
Turbidity (NTU's)	126.0	112.0	96.9	83.1	71.6	54.9	49.9	47.6	48.8
DO (mg/L)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.09	7.05	7.05	7.10	7.11	7.11	7.09	7.10	7.10
ORP (mV)	235	227	219	209	209	211	208	209	211

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory: Severn Trent Laboratories - Buffalo, New York — Sample was shipped day of sampling

Shipped Via: [ ] Federal Express Other: Borsens, Boyce & Lee, Inc. — sent on 9/29/97

Chain of Custody Signed By:

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arbuckles

Well ID: ENV-4

Job Number: 13045.002

Date: SEPTEMBER 28, 2004

Weather: 70°F SUNNY - SLIGHT BREEZE

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at notch/rim)

		TIC	TOC	BGS
Well Depth	(feet)	22.95		
Water Table Depth	(feet)	11.39		

check where appropriate

Well Type: Flushmount ☐ Stick-up ☒

Well Locked: Yes ☐ No ☒

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	11.56
Volume of Water in Well:	(gal)	1.85
Pumping Rate of Pump:	(mL/min)	300 mL/MIN
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min)	45 MIN
Total Volume Removed:	(gal)	3.5 GAL

Conversion Factors				
Gallons per foot of water column:	1" ID	2" ID	4" ID	6" ID
	0.041	0.16	0.65	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Use Stability					
pH	Cond.	Turb.	DO	Temp	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.00%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL Vials) ☒

Sample ID: ENV-4

Sample Time: 1125

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 2

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	_____	☐
Tubing Used:	Dedicated ☒	Decontam ☐			
Sampling Method:	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	_____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time	1040	1045	1050	1055	1100	1105	1110	1115	1120
Parameter	(Initial)								
Volume Pumped (gal)	0	1500	3000	4500	6000	7500	9000	10,500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	11.51	11.52	11.51	11.50	11.50	11.49	11.50	11.50	11.49
pH	6.03	6.08	6.11	6.16	6.17	6.18	6.19	6.18	6.20
Conductance (mS/cm)	0.789	0.781	0.786	0.786	0.786	0.786	0.786	0.786	0.786
Turbidity (NTU's)	76.3	56.1	49.2	42.6	39.3	21.5	19.5	17.6	18.3
DO (mg/L)	5.31	2.39	1.61	0.00	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.19	7.15	7.15	7.15	7.15	7.15	7.15	7.15	7.15
ORP (mV)	142	139	137	136	134	133	132	132	131

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory Shipped Via: Severn Trent Laboratories - Buffalo, New York ☐ Federal Express Other: Blasland, Bouck & Lee, Inc.

Sample was shipped on 9/29/04 sent on

Original Signed Sampler

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Anguckas

Well ID: ENV-3R

Job Number: 13048.002

Date: SEPTEMBER 28, 2004

Weather: C 70°F SUNNY - SLIGHT BREEZE

Time In: Time Out:

WELL INFORMATION (record from top of inner casing at min/mum)

		TIC	TOC	BGS
Well Depth	(feet)	15.94		
Water Table Depth	(feet)	9.12		

check where appropriate

Well Type: Flushmount [X] Stick-Up [ ]

Well Locked: Yes [X] No [ ]

Measuring Point Marked: Yes [X] No [ ]

Well Diameter: 1" [ ] 2" [X] Other:

WELL WATER INFORMATION

Length of Water Column:	(feet)	6.82
Volume of Water in Well:	(gal)	1.09
Pumping Rate of Pump:	(mL/min)	300 mL/MIN
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45 MIN
Total Volume Removed:	(gal)	3.5 gal

Conversion Factors

gallons per foot of water column	1" ID	2" ID	4" ID	6" ID
	0.034	0.16	0.66	1.5

1 gal = 3.785 L = 3785 mL = 0.1337 cubic ft.

Unit Sheet

pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	1.30%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analytes:

VOC's (3 - 40 mL vials) [X]

Sample ID: ENV-3R

Sample Time: 0950

MS/MSD: Yes [ ] No [ ]

Duplicate: Yes [X] No [ ]

Duplicate ID: FD092804

Total Bottles: 4

EVACUATION INFORMATION

Evacuation Method:	Bailer [ ]	Grundfos Pump [ ]	MasterFlex [X]	____	[ ]
Tubing Used:	Dedicated [X]	Decanned [ ]			
Sampling Method:	Bailer [X]	Grundfos Pump [ ]	MasterFlex [ ]	____	[ ]
Did well go dry?	Yes [ ]	No [X]			

Water Quality Meter Type: Horiba U-22

Time	0855 (Initial)	0900	0905	0910	0915	0920	0925	0930	0935
Parameter									
Volume Purged (gal)	0	1800	3000	4800	6000	7800	9000	10800	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	9.26	9.27	9.28	9.28	9.28	9.28	9.28	9.28	9.28
pH	6.37	6.35	6.31	6.29	6.30	6.31	6.30	6.30	6.30
Conductance (mS/cm)	0.796	0.784	0.779	0.764	0.761	0764	0.761	0.761	0.761
Turbidity (NTU's)	201.0	327.0	139.0	101.0	64.2	46.9	37.2	39.6	42.3
DO (mg/L)	8.56	3.59	1.95	0.76	0.32	0.00	0.00	0.00	0.00
Temp (°C)	7.25	7.19	7.15	7.15	7.15	7.16	7.16	7.16	7.16
ORP (mV)	109	101	92	87	84	79	76	77	75

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

- FIELD DUPLICATE TAKEN - FD092804

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was [ ] shipped out on sampling

Shipped Via: [ ] Federal Express Other Burgland Couch & Lee, Inc. sent on 9/29/04

Name of Courier Signature

Envirotek II Site, Tonawanda, New York

Low-Flow Sampling Program

Site

Event

GROUNDWATER SAMPLING PROGRAM

Sampling Personnel: Michael R. Arlauckas

Well ID: ENV-1

Job Number: 13048.002

Date: SEPTEMBER 28TH 2000

Weather: C 70°F SUNNY SLIGHT BREEZE

Time In: Time Out:

WELL INFORMATION (record from top of riser casing at minimum)

check where appropriate

		TIC	TOC	BGS
Well Depth	(feet)	24.45		
Water Table Depth	(feet)	9.29		

Well Type: Flushmount ☒ Stickup ☐

Well Locked: Yes ☒ No ☐

Measuring Point Marked: Yes ☒ No ☐

Well Diameter: 1" ☐ 2" ☒ Other: ___

WELL WATER INFORMATION

Length of Water Column:	(feet)	17.16
Volume of Water in Well:	(gal)	2.74
Pumping Rate of Pump:	(mL/min)	300 mL/MIN
Pumping Rate of Pump:	(GPM)	—
Minutes of Pumping:	(min.)	45
Total Volume Removed:	(gal)	3.5 GAL

Conversion Factors				
gallons per foot	1" ID	2" ID	4" ID	6" ID
of water column:	0.041	0.16	0.65	1.5

1 gal = 3.785 L 3078 mL = 0.1337 cubic ft.

Use Stability					
pH	Cond.	Turb.	DO	Temp.	ORP
+/-	+/-	< 50	+/-	+/-	+/-
0.1	3.0%	NTU's	10%		10 mV

SAMPLING INFORMATION

Analyses:

VOC's (3 - 40 mL Vials) ☒

Sample ID: ENV-1

Sample Time: 0945

MS/MSD: Yes ☐ No ☒

Duplicate: Yes ☐ No ☒

Duplicate ID: —

Total Bottles: 3

EVACUATION INFORMATION

Evacuation Method:	Bailer ☐	Grundfos Pump ☐	MasterFlex ☒	_____	☐
Tubing Used:	Dedicated ☒	Decanned ☐			
Sampling Method:	Bailer ☒	Grundfos Pump ☐	MasterFlex ☐	_____	☐
Did well go dry?	Yes ☐	No ☒			

Water Quality Meter Type: Horiba U-22

Time	0845 initial	0850	0855	0900	0905	0910	0915	0920	0925
Parameter									
Volume Purged (mL)	0	1500	3000	4500	6000	7500	9000	10500	12000
Purge Rate (mL/min)	300	300	300	300	300	300	300	300	300
Depth to Water (ft. TIC)	7.35	7.37	7.35	7.35	7.35	7.35	7.35	7.35	7.35
pH	7.46	7.42	7.39	7.31	7.31	7.29	7.29	7.29	7.29
Conductance (mS/cm)	0.801	0.799	0.793	0.791	0.792	0.791	0.789	0.790	0.989
Turbidity (NTUs)	83.6	73.2	62.9	54.2	51.3	48.6	47.5	42.3	43.9
DO (mg/L)	2.71	1.61	0.93	0.21	0.00	0.00	0.00	0.00	0.00
Temp (°C)	7.25	7.21	7.19	7.19	7.19	7.18	7.18	7.19	7.19
ORP (mV)	+56	+61	+66	+73	+71	+72	+75	+76	+77

Comments/Notes

USEPA SW-846 Method 8260B - Volatile Organic Compounds (VOCs)

Laboratory: Severn Trent Laboratories - Buffalo, New York Sample was shipped day of sampling

Shipped Via: ☐ Federal Express Other Blasland, Bouck & Lee, Inc. ☐ sent on 9/29/00

Name of Person Sampled By: Michael R. Arlauckas

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

SUBJECT	PROJ. NO.	BY	DATE	SHEET
ENVIROTECH III SITE	5800.2	WMA	9/20/94	1/1

CALCS. BY _____ ; DATE _____ CHECKED BY _____ ; DATE _____

	WATER LEVELS — TOR (TOP OF PVC RISER)	
✓	ENV-1	7.29
✓	ENV-1D	12.79
✓	ENV-3R	9.12
✓	ENV-9	12.93
✓	ENV-8	12.37
✓	GW-3	8.99
✓	GW-4	9.87
✓	ENV-10D	13.29
✓	GW-5	7.16
✓	GW-6	6.49
	NR-1 (570.43)	5.61
✓	ESI-8	8.97
✓	ENV-4	11.39
✓	ESI-7	12.56
✓	ENV-7	12.26
✓	ENV-5	10.31
✓	ENV-6	10.84
✓	NW-4	10.36
✓	NW-3	* GONE *
✓	GW-1	6.37
✓	NW-1	* DID NOT FIND *
✓	NW-2	12.08
✓	GW-7	11.93
✓	GW-2	13.01
✓	NW-5	9.32

Appendix E

Laboratory Reports and Data Review Reports

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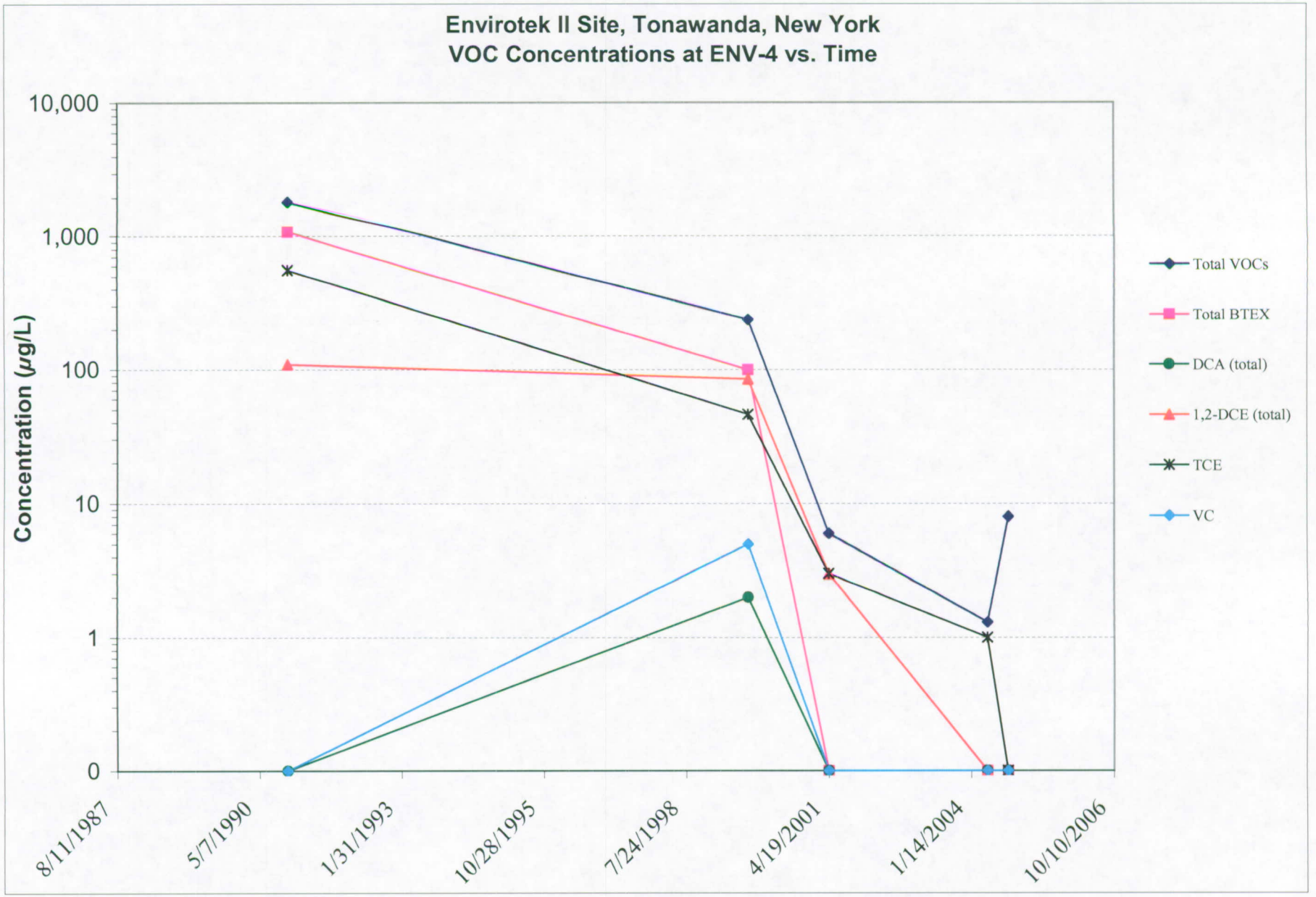
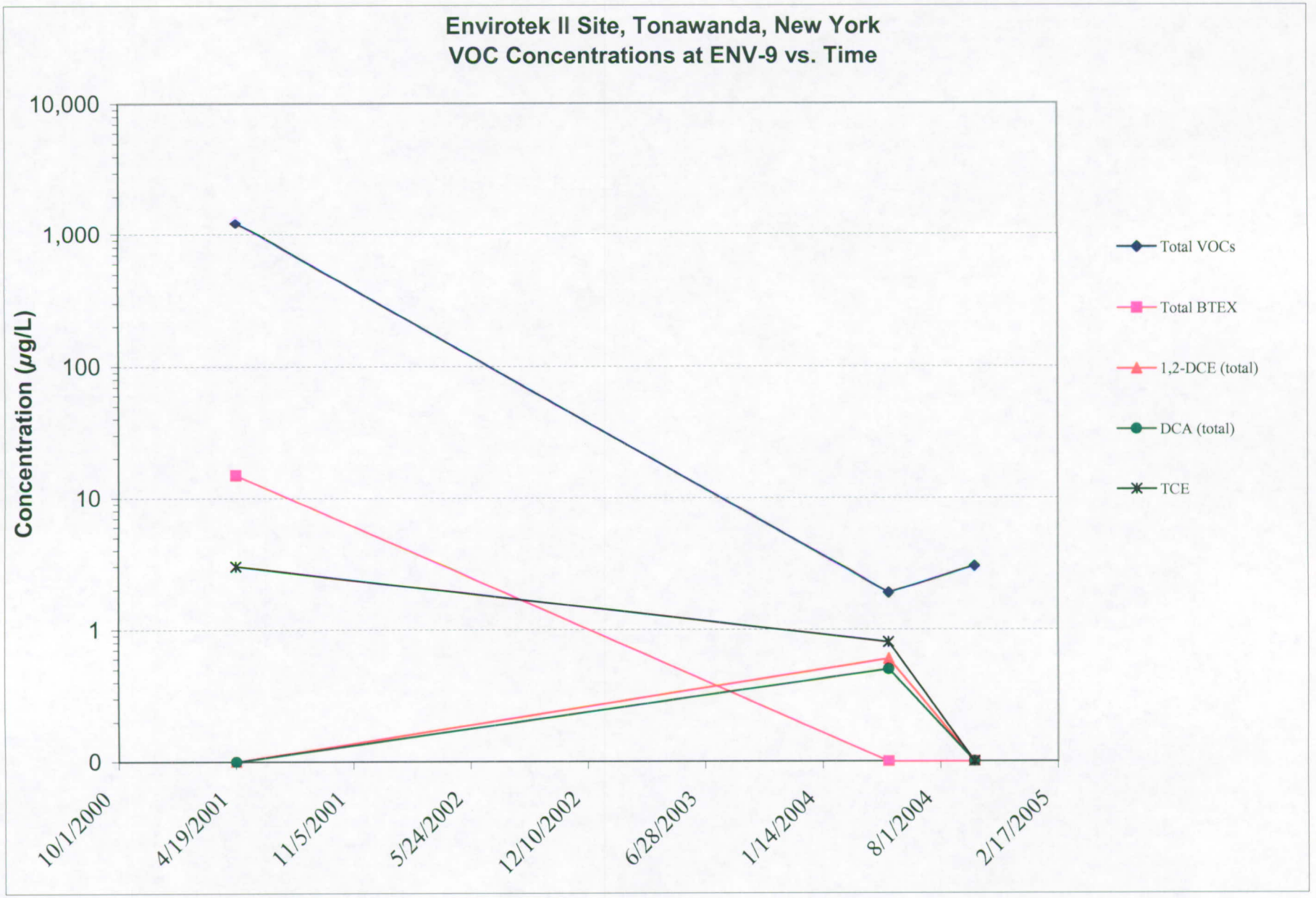
engineers, scientists, economists

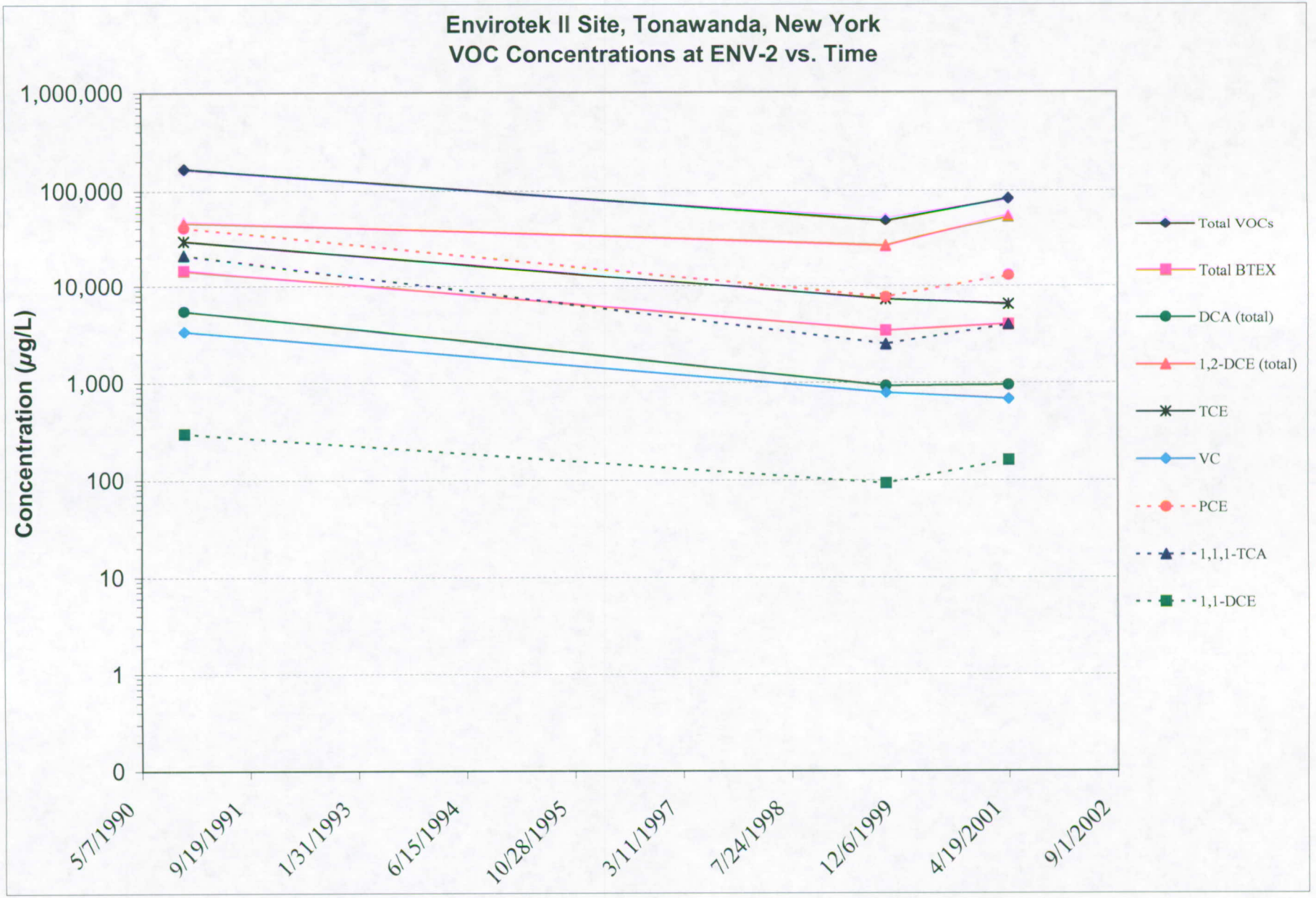
Appendix F

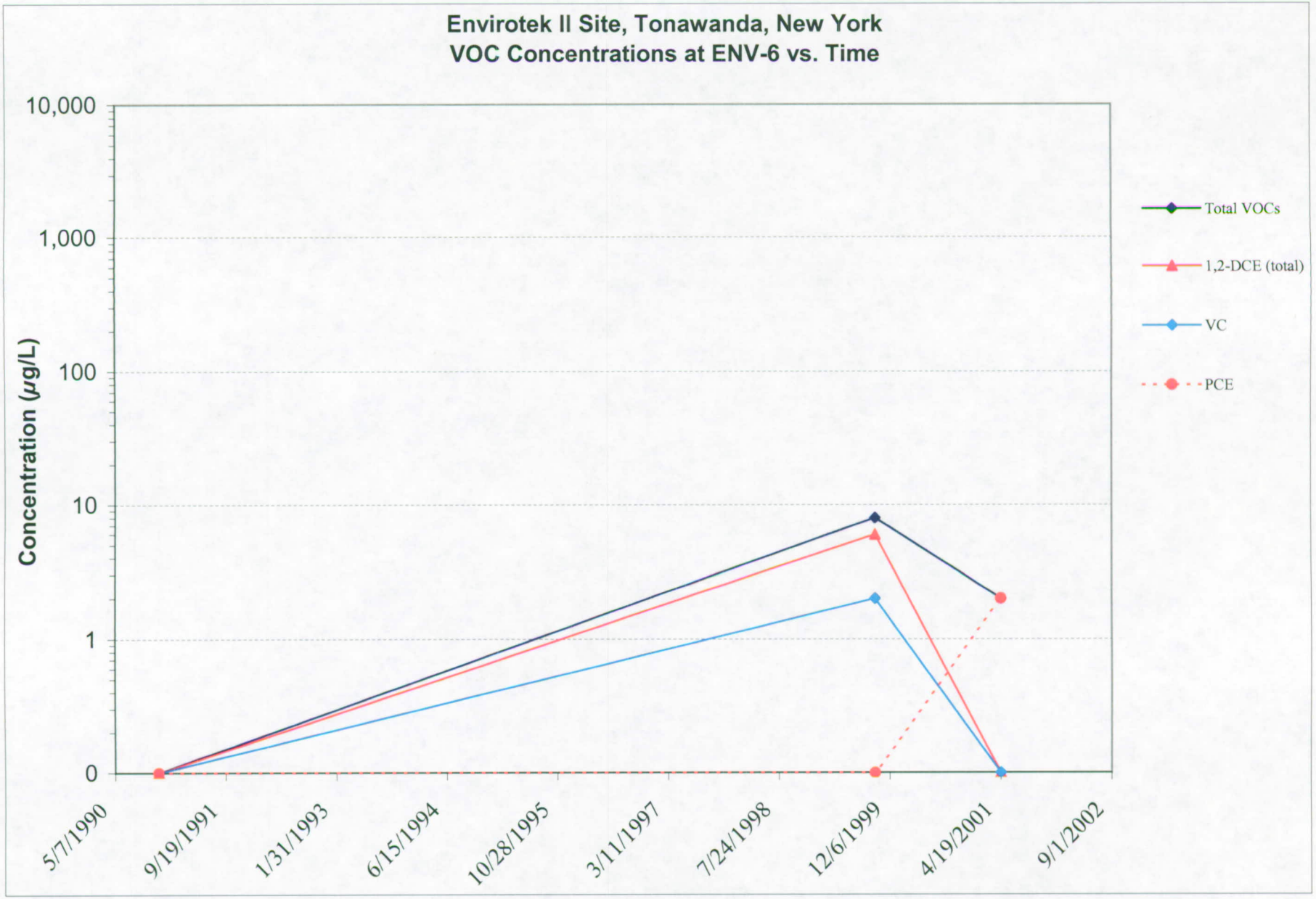
VOC Trend Graphs

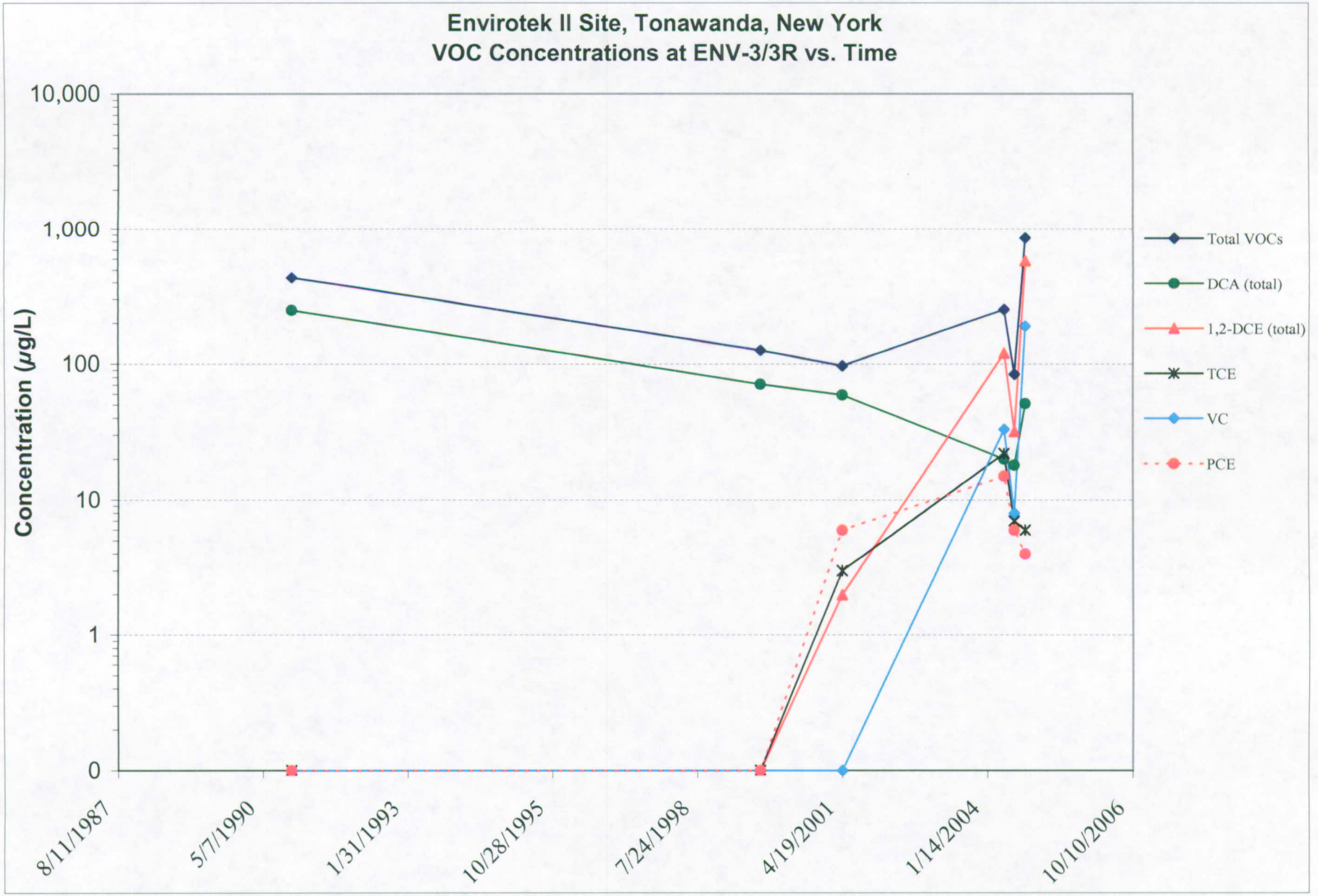
BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists


Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-4 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
Total VOCs
Total BTEX
DCA (total)
1,2-DCE (total)
TCE
VC


Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-9 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
10/1/2000
4/19/2001
11/5/2001
5/24/2002
12/10/2002
6/28/2003
1/14/2004
8/1/2004
2/17/2005
Total VOCs
Total BTEX
1,2-DCE (total)
DCA (total)
TCE

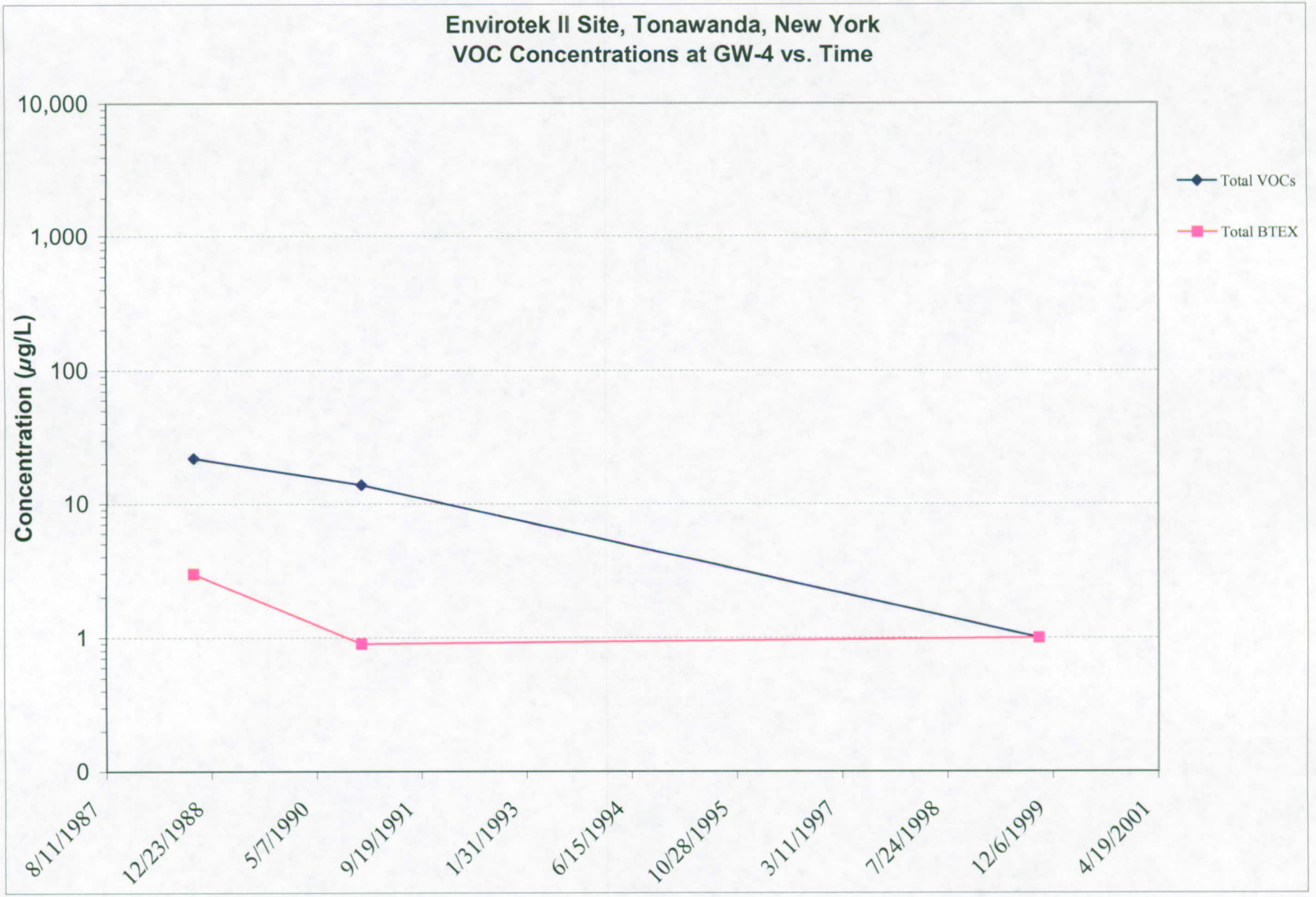

Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-2 vs. Time
Concentration (µg/L)
1,000,000
100,000
10,000
1,000
100
10
1
0
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
9/1/2002
Total VOCs
Total BTEX
DCA (total)
1,2-DCE (total)
TCE
VC
PCE
1,1,1-TCA
1,1-DCE

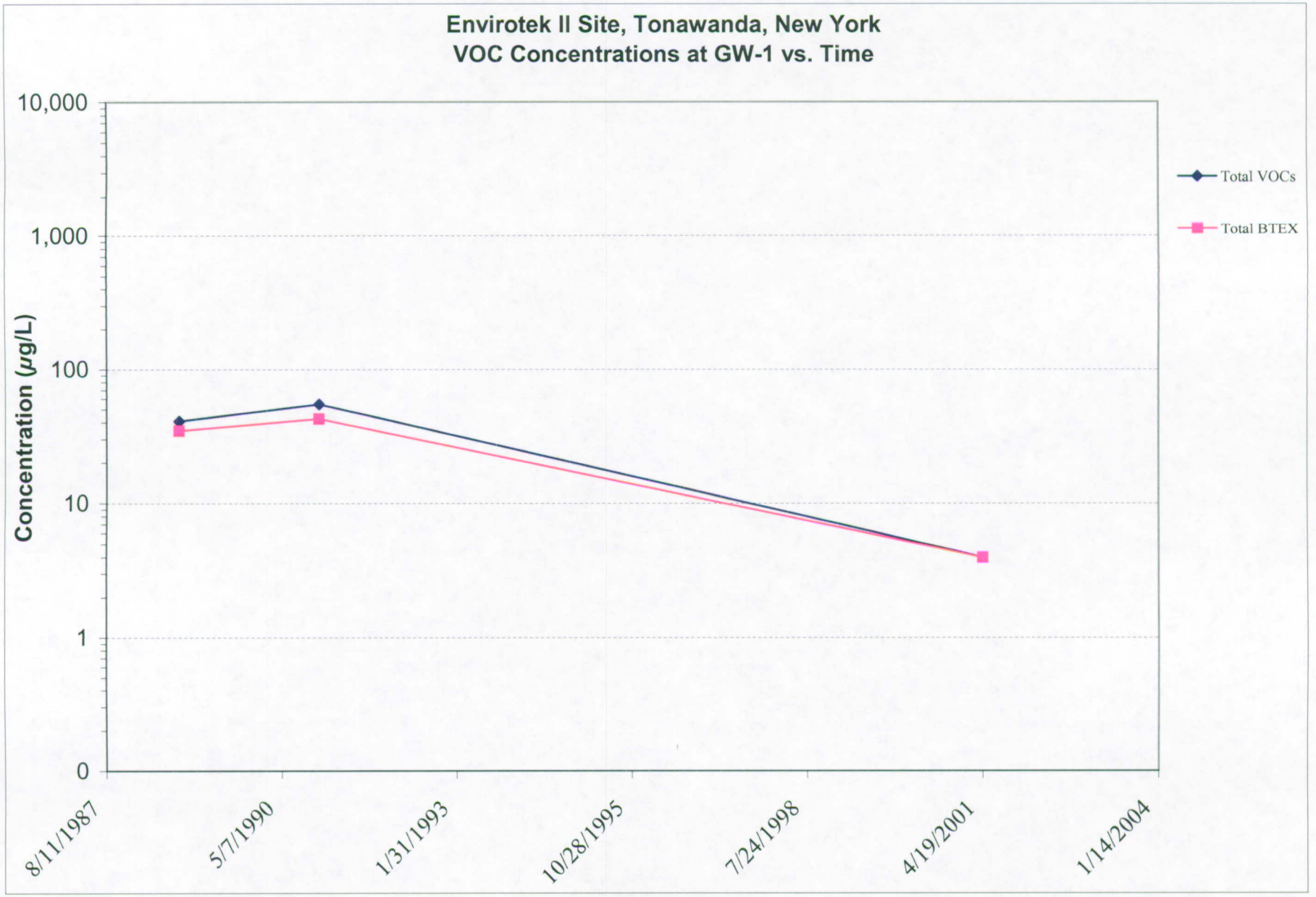

Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-6 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
9/1/2002
Total VOCs
1,2-DCE (total)
VC
PCE

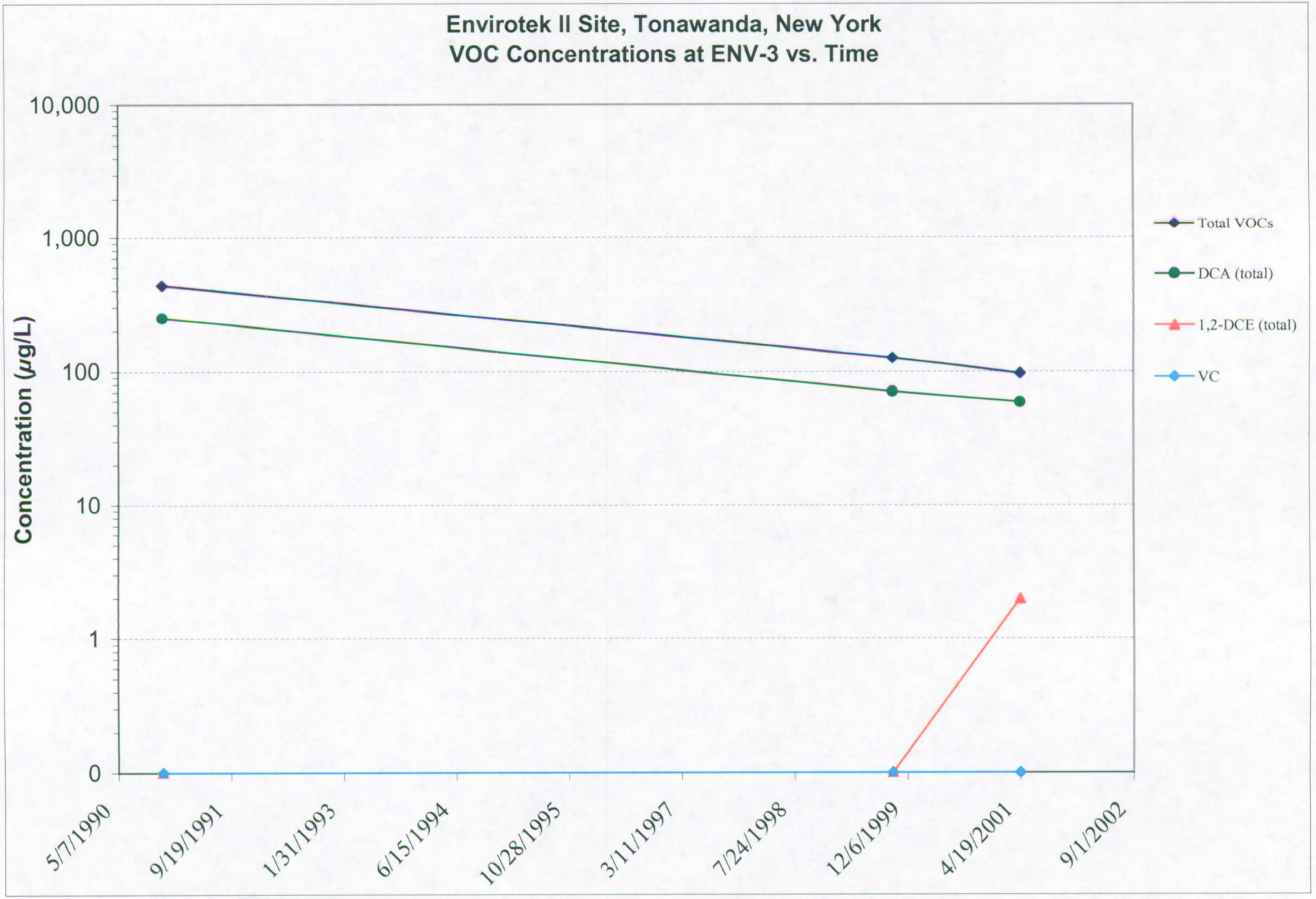

Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-3/3R vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
Total VOCs
DCA (total)
1,2-DCE (total)
TCE
VC
PCE

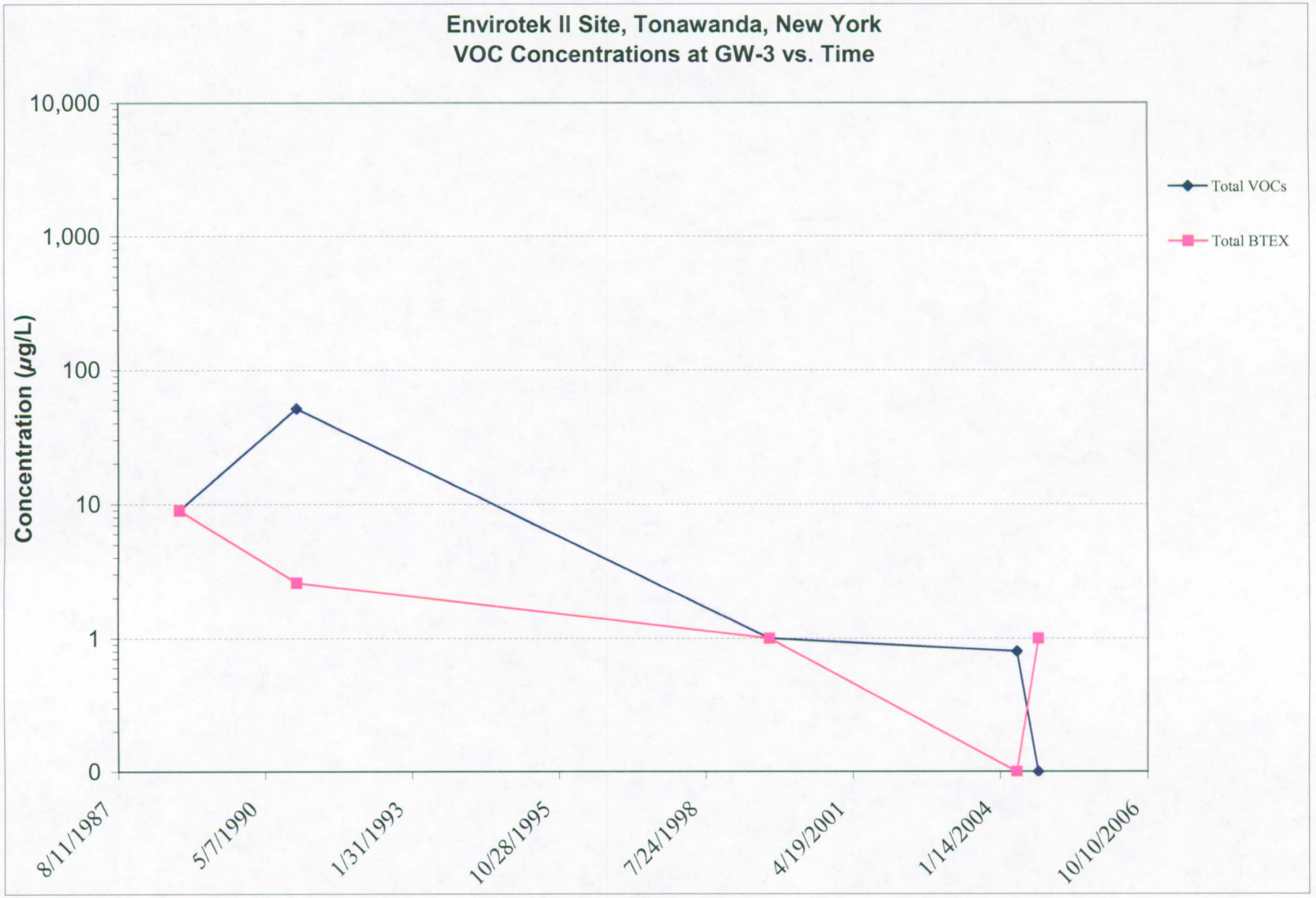

Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-6 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
12/23/1988
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
Total VOCs
Total BTEX

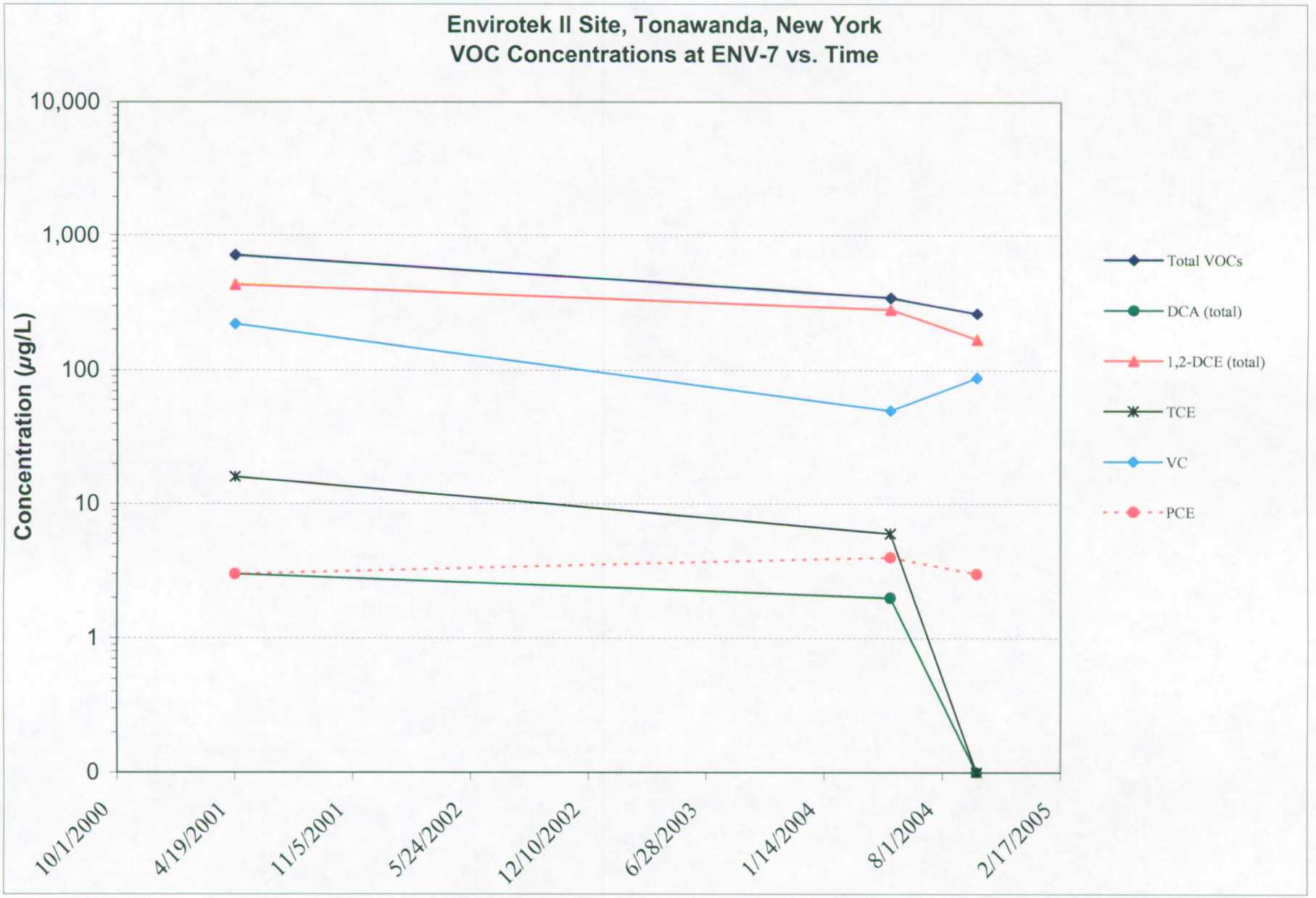

Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-5 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
12/23/1988
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
Total VOCs
Total BTEX

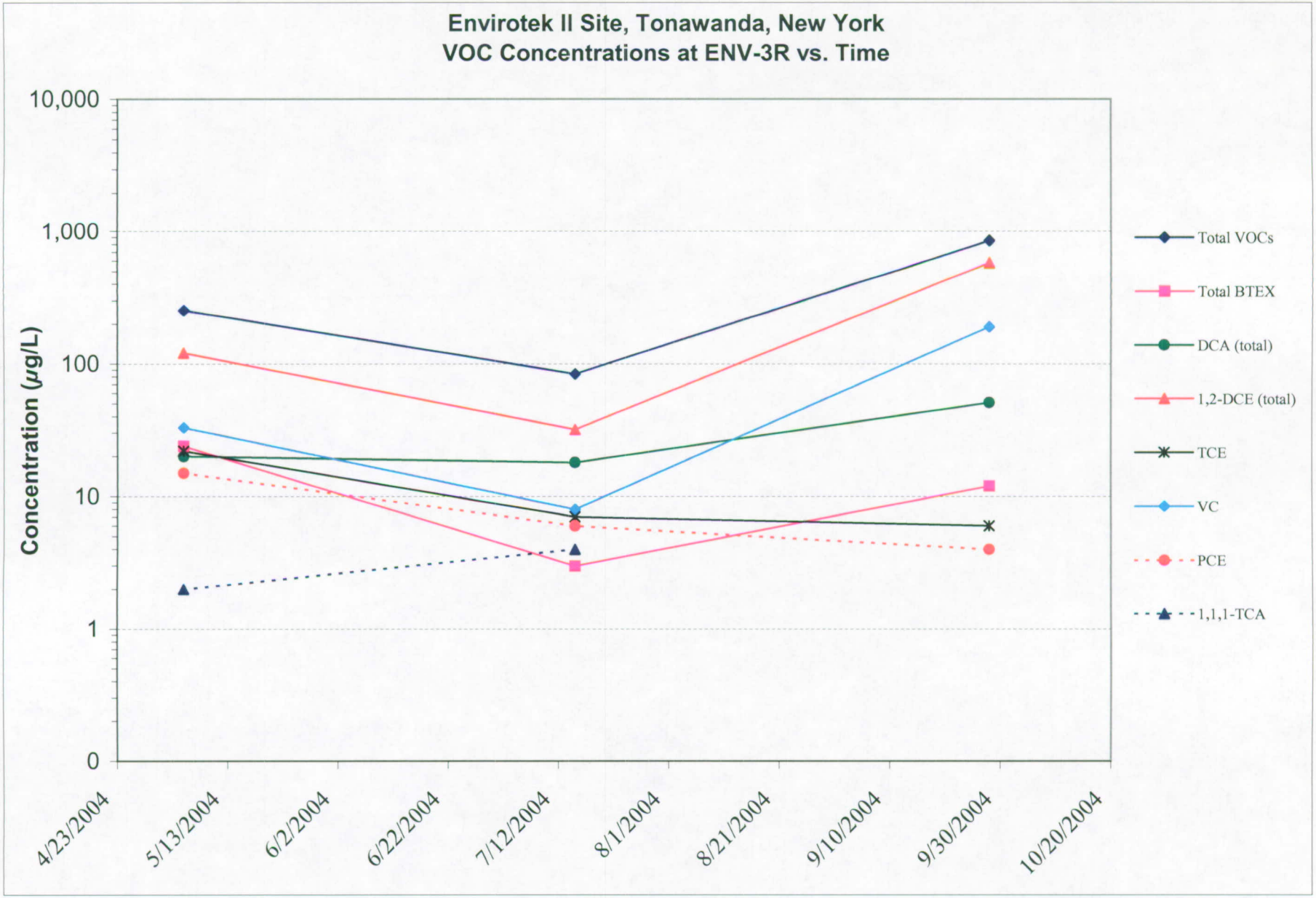

Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-4 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
12/23/1988
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
Total VOCs
Total BTEX

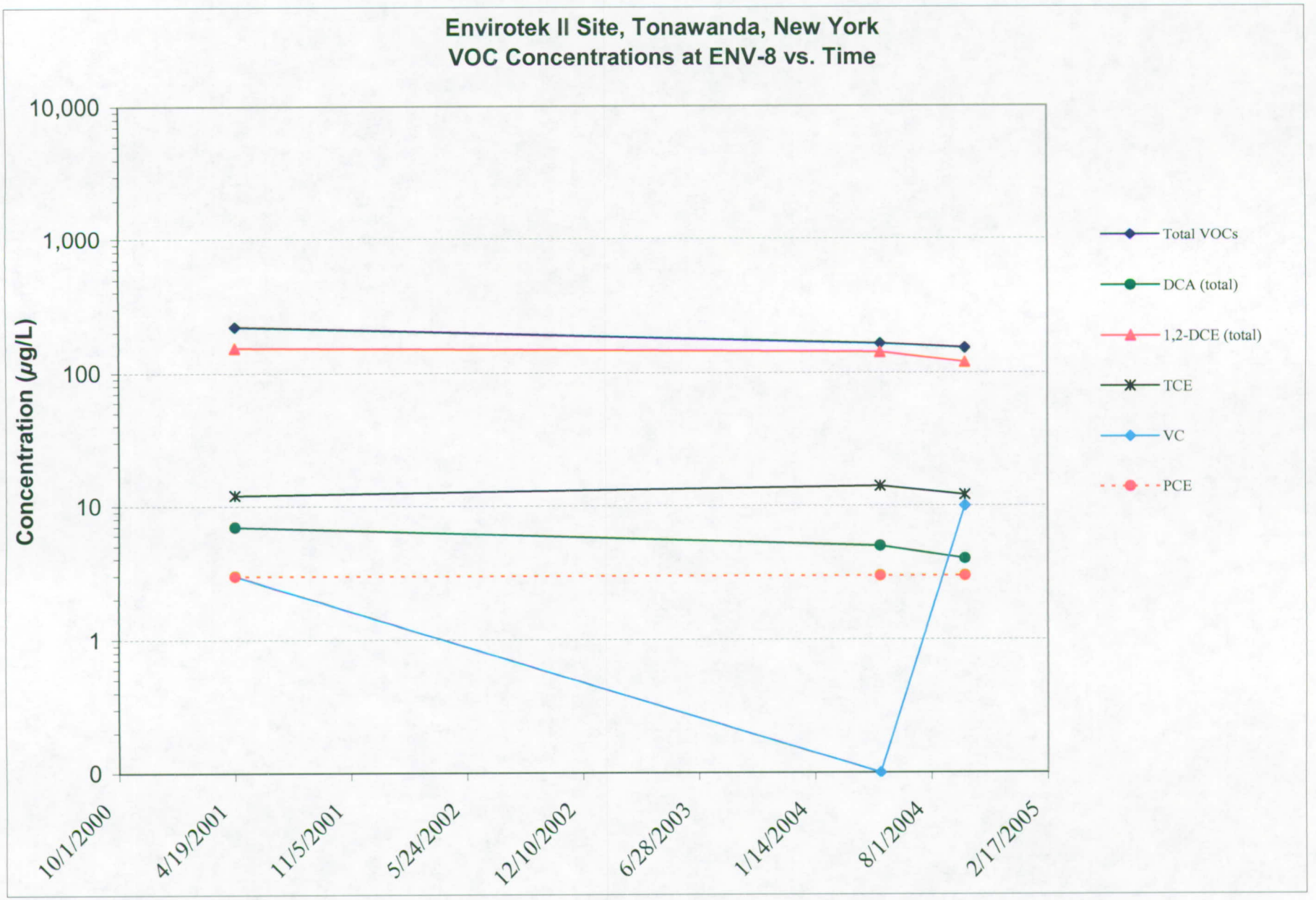

Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-1 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
Total VOCs
Total BTEX

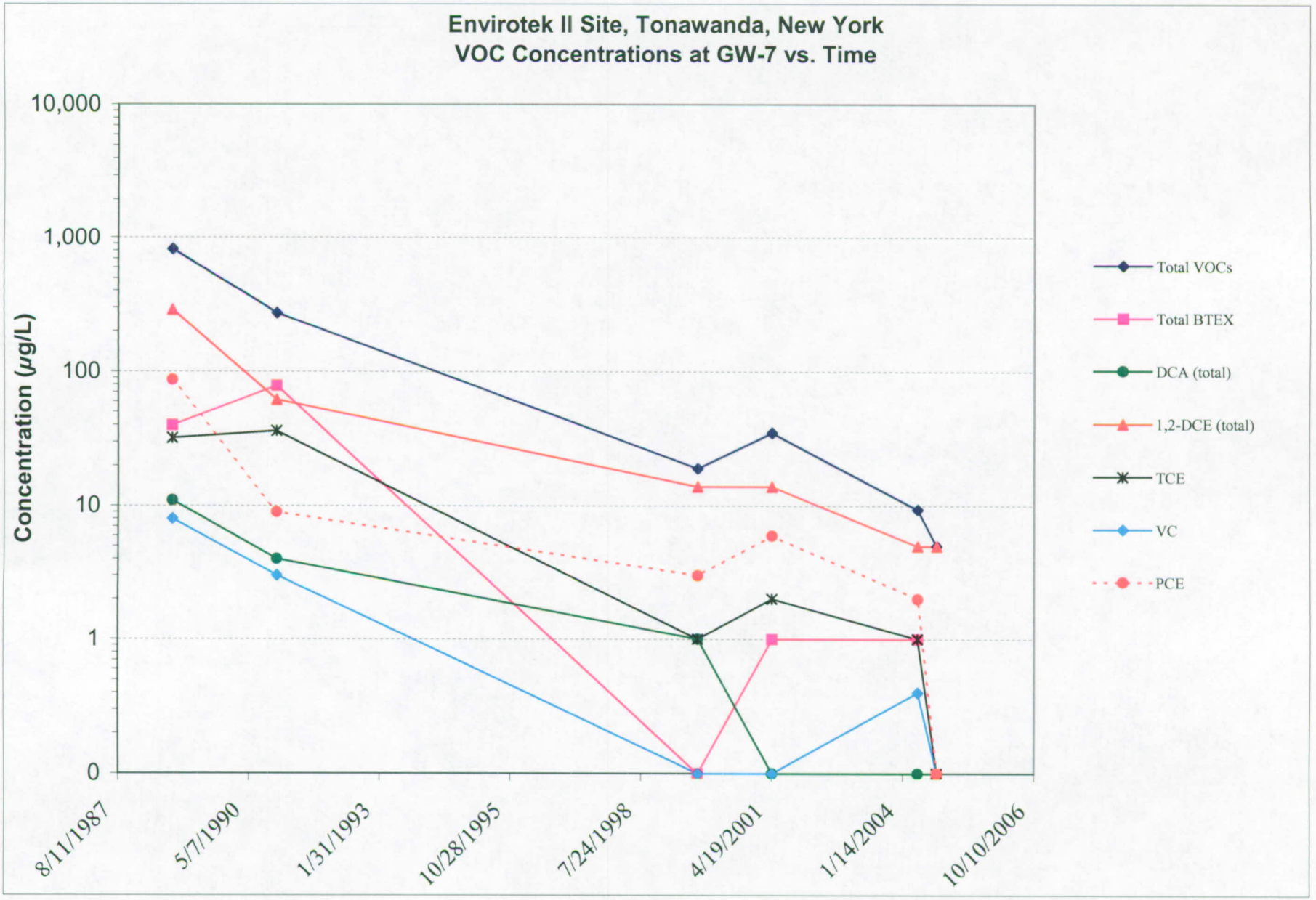

Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-3 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
9/1/2002
Total VOCs
DCA (total)
1,2-DCE (total)
VC

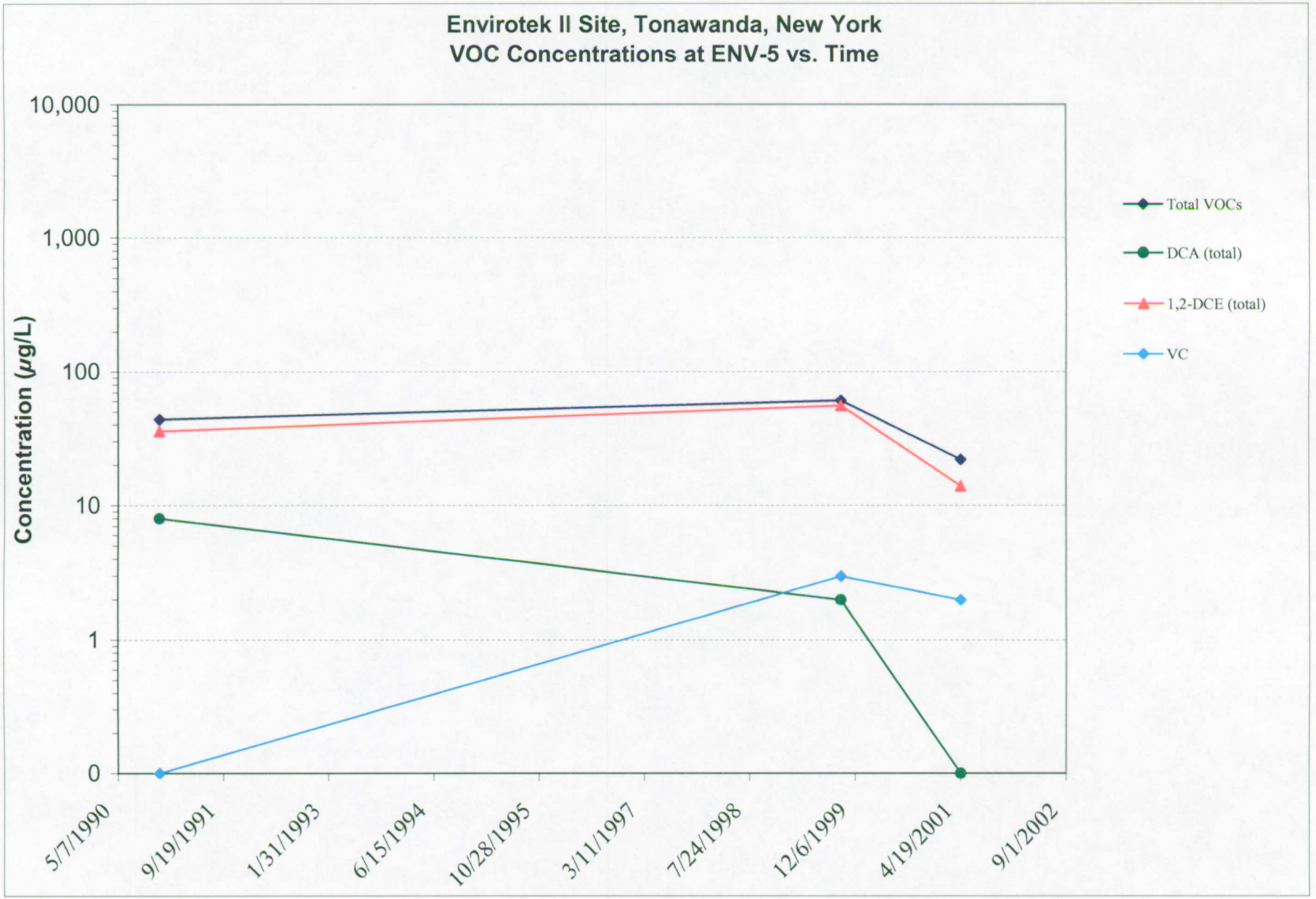

Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-3 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
Total VOCs
Total BTEX

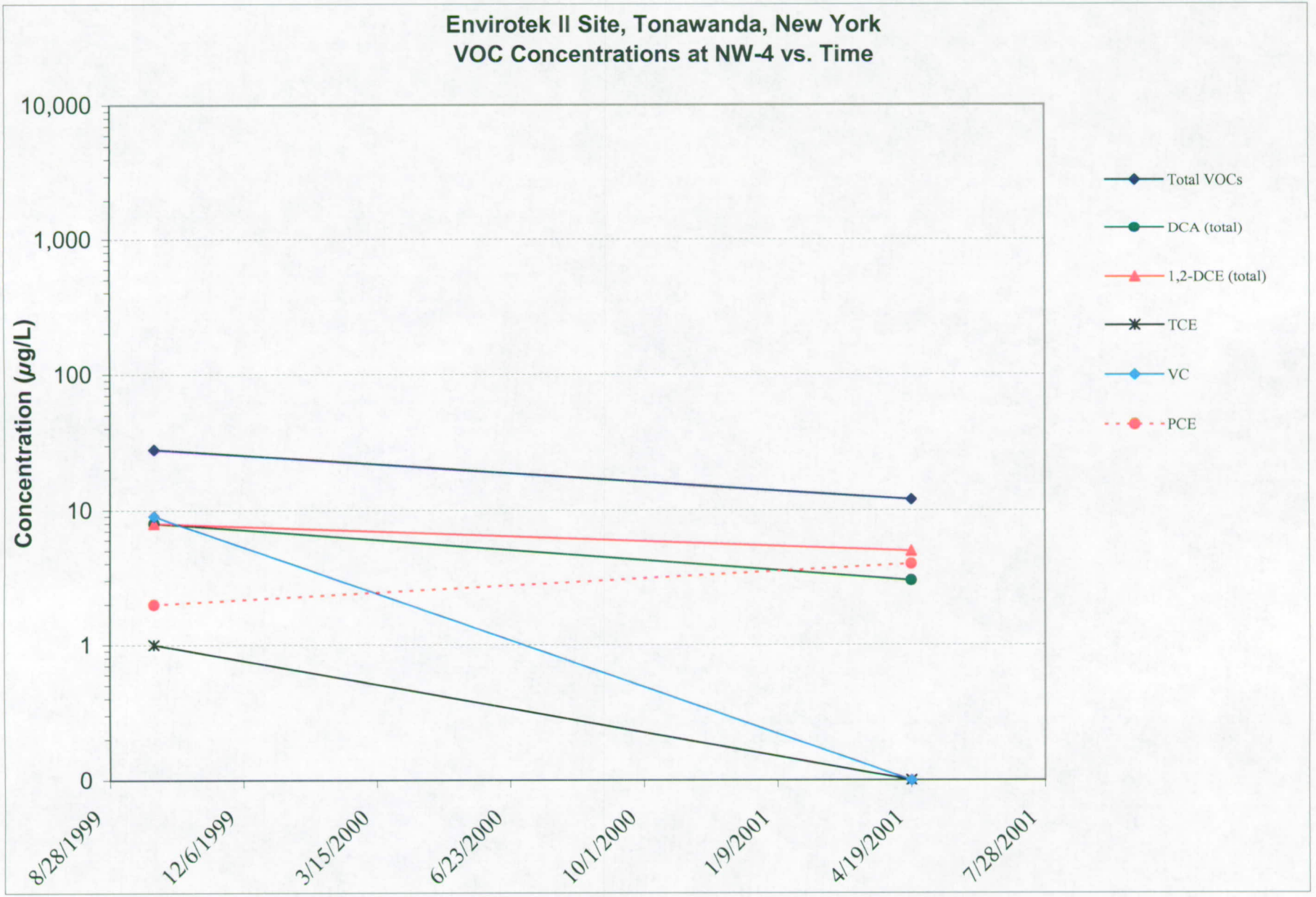

Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-7 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
10/1/2000
4/19/2001
11/5/2001
5/24/2002
12/10/2002
6/28/2003
1/14/2004
8/1/2004
2/17/2005
Total VOCs
DCA (total)
1,2-DCE (total)
TCE
VC
PCE


Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-3R vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
4/23/2004
5/13/2004
6/2/2004
6/22/2004
7/12/2004
8/1/2004
8/21/2004
9/10/2004
9/30/2004
10/20/2004
Total VOCs
Total BTEX
DCA (total)
1,2-DCE (total)
TCE
VC
PCE
1,1,1-TCA


Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-8 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
10/1/2000
4/19/2001
11/5/2001
5/24/2002
12/10/2002
6/28/2003
1/14/2004
8/1/2004
2/17/2005
Total VOCs
DCA (total)
1,2-DCE (total)
TCE
VC
PCE


Envirotek II Site, Tonawanda, New York
VOC Concentrations at GW-7 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/11/1987
5/7/1990
1/31/1993
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
Total VOCs
Total BTEX
DCA (total)
1,2-DCE (total)
TCE
VC
PCE


Envirotek II Site, Tonawanda, New York
VOC Concentrations at ENV-5 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
5/7/1990
9/19/1991
1/31/1993
6/15/1994
10/28/1995
3/11/1997
7/24/1998
12/6/1999
4/19/2001
9/1/2002
Total VOCs
DCA (total)
1,2-DCE (total)
VC


Envirotek II Site, Tonawanda, New York
VOC Concentrations at NW-4 vs. Time
Concentration (µg/L)
10,000
1,000
100
10
1
0
8/28/1999
12/6/1999
3/15/2000
6/23/2000
10/1/2000
1/9/2001
4/19/2001
7/28/2001
Total VOCs
DCA (total)
1,2-DCE (total)
TCE
VC
PCE

Appendix G

Natural Groundwater Remediation Rate Analysis

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engineers, scientists, economists

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

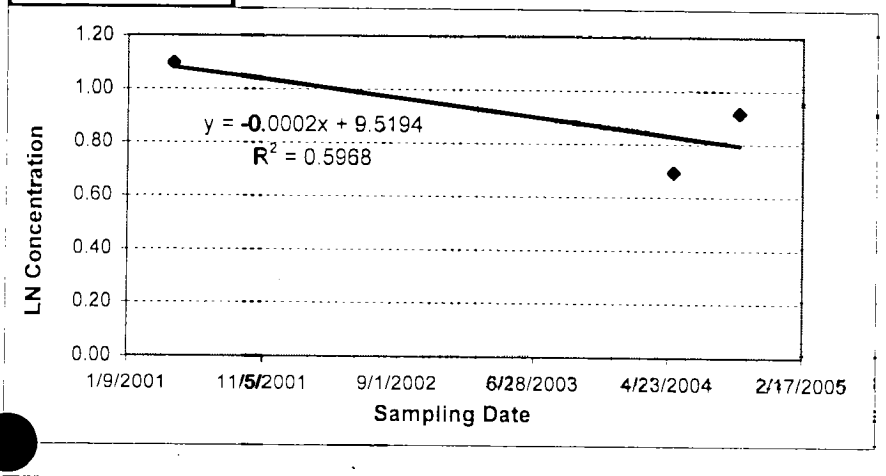
Sample Information

Sample Location ENV-7
Chemical Dichloroethane (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	3	1.10
5/5/2004	2	0.69
9/28/2004	ND (5)	0.92

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	2.28E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.60	0.44
Half-Life in Groundwater ($t_{1/2}$) =	3039	days

NOTES

Nondetected values taken at one-half the detection limit.
NYSDEC TOGS 1,1-DCA = 5 µg/L, 1,2-DCA = 0.6 µg/L, no standard for DCA total

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

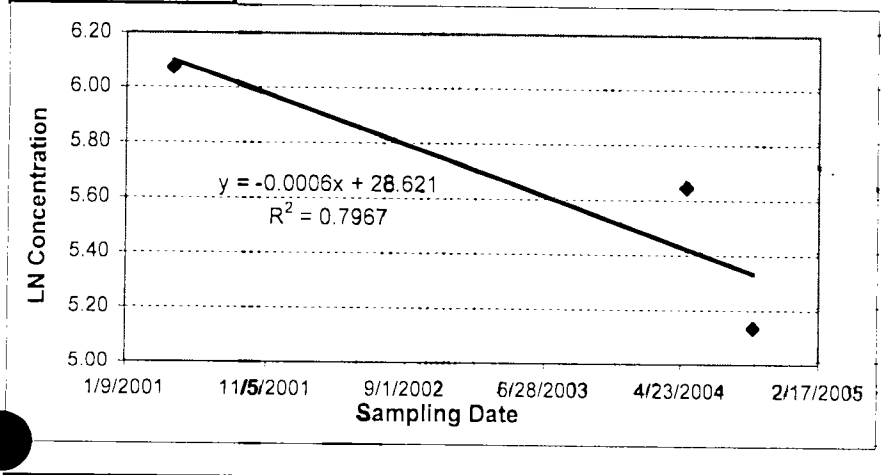
Sample Information

Sample Location ENV-7
Chemical 1,2 Dichloroethene (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	434	6.07
5/5/2004	283	5.65
9/28/2004	170	5.14

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	6.09E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.80	0.3
Half-Life in Groundwater ($t_{1/2}$) =	1138	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

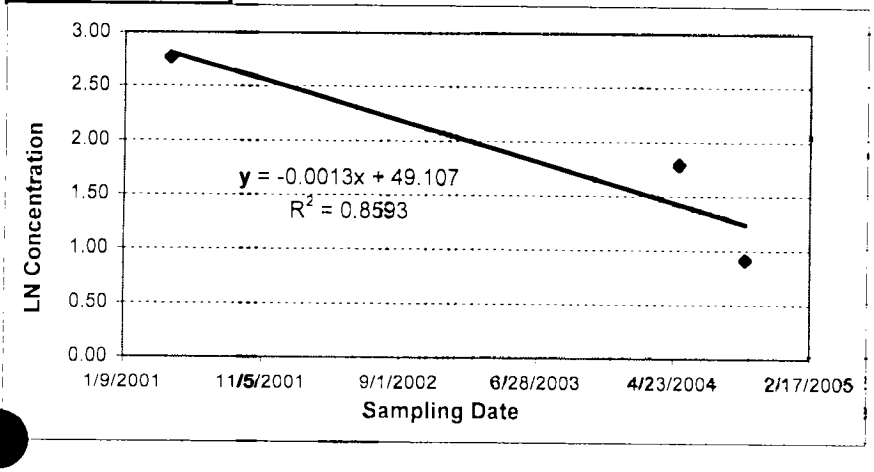
Sample Information

Sample Location ENV-7
Chemical Trichloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	16	2.77
5/5/2004	6	1.79
9/28/2004	ND (5)	0.92

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.25E-03	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.86	0.24
Half-Life in Groundwater ($t_{1/2}$) =	554	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

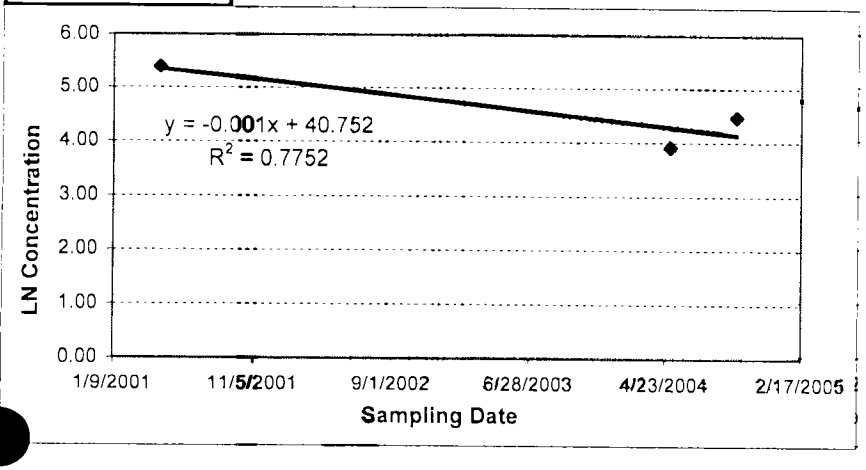
Sample Information

Sample Location ENV-7
Chemical Vinyl Chloride

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	220	5.39
5/5/2004	50	3.91
9/28/2004	88	4.48

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	9.57E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.78	0.31
Half-Life in Groundwater ($t_{1/2}$) =	724	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

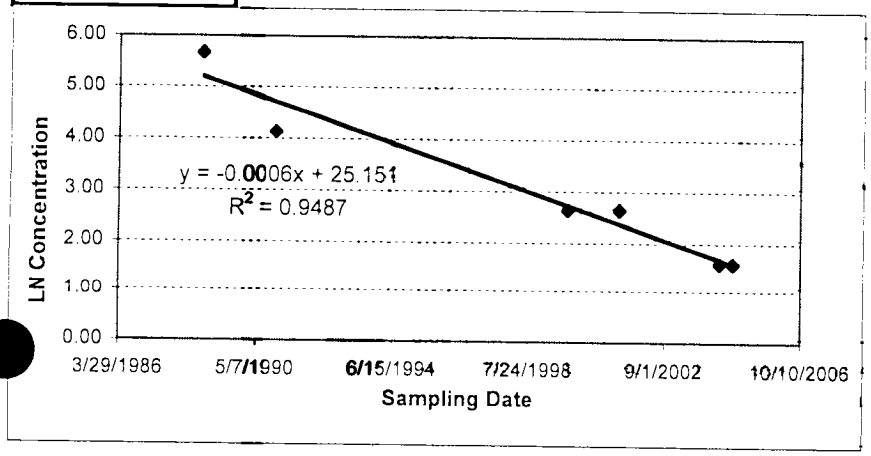
Sample Information

Sample Location GW-7
Chemical 1,2,-Dichloroethene (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
9/28/1988	290	5.67
12/5/1990	62	4.13
9/30/1999	14	2.64
4/19/2001	14	2.64
5/5/2004	5	1.61
9/28/2004	5	1.61

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	6.16E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.95	0.001
Half-Life in Groundwater ($t_{1/2}$) =	1125	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

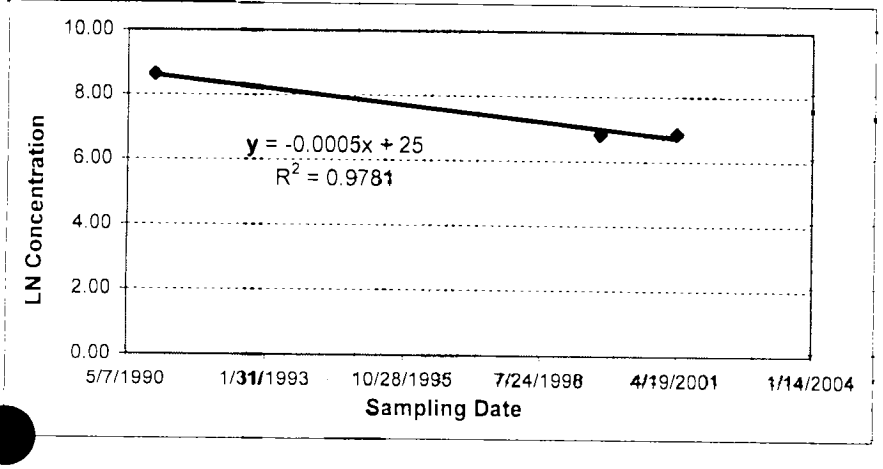
Sample Information

Sample Location ENV-2
Chemical Dichloroethane (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	5550	8.62
10/1/1999	930	6.84
4/18/2001	950	6.86

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	4.94E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.98	0.09
Half-Life in Groundwater ($t_{1/2}$) =	1403	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

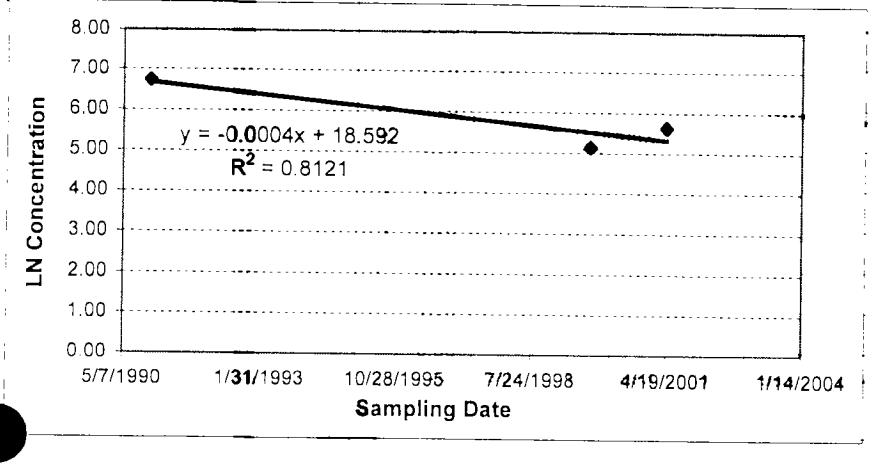
Sample Information

Sample Location ENV-2
Chemical Ethylbenzene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	840	6.73
10/1/1999	170	5.14
4/18/2001	280	5.63

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	3.59E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.81	0.29
Half-Life in Groundwater ($t_{1/2}$) =	1930	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

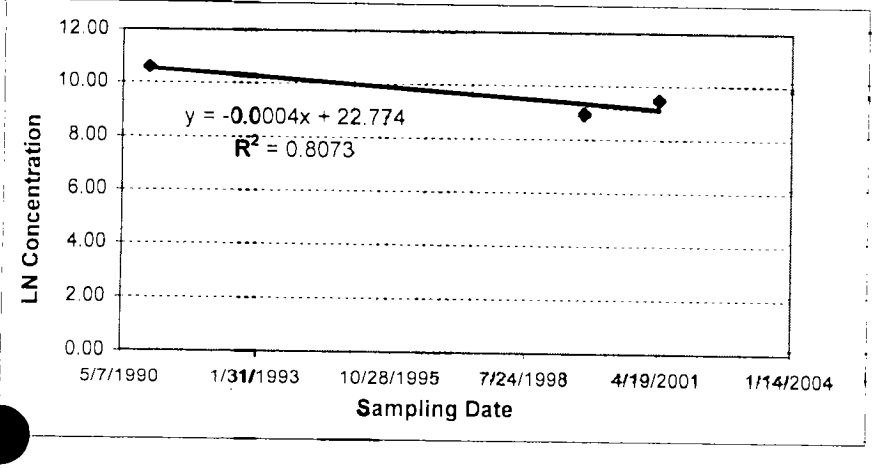
Sample Information

Sample Location ENV-2
Chemical Tetrachloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	40000	10.60
10/1/1999	7700	8.95
4/18/2001	13000	9.47

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	3.69E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.81	0.29
Half-Life in Groundwater ($t_{1/2}$) =	1878	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

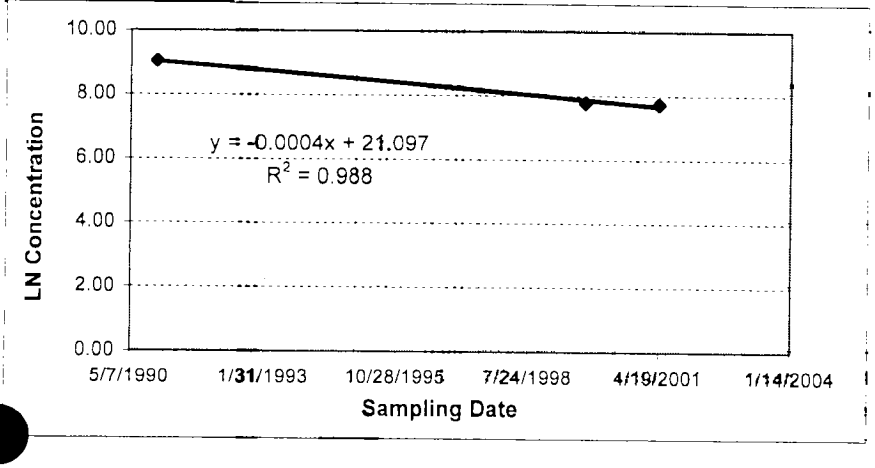
Sample Information

Sample Location ENV-2
Chemical Toluene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	8600	9.06
10/1/1999	2400	7.78
4/18/2001	2300	7.74

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	3.63E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.99	0.07
Half-Life in Groundwater ($t_{1/2}$) =	1909	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

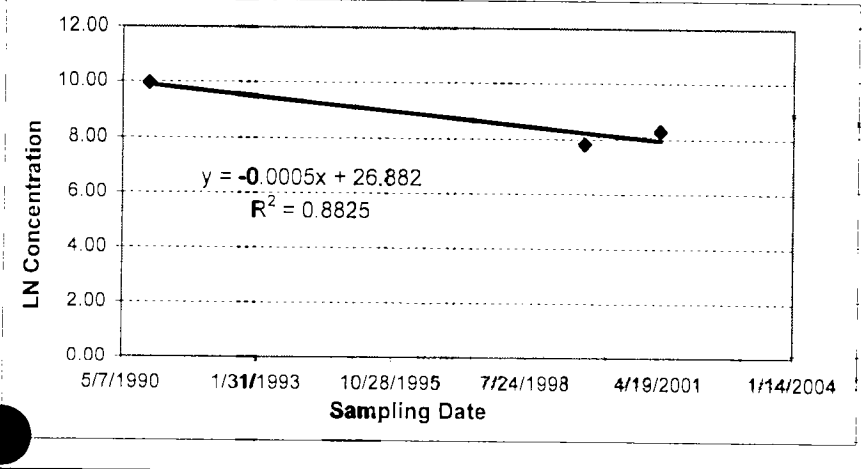
Sample Information

Sample Location ENV-2
Chemical 1,1,1-Trichloroethane

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	21000	9.95
10/1/1999	2500	7.82
4/18/2001	4000	8.29

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	5.12E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.88	0.22
Half-Life in Groundwater ($t_{1/2}$) =	1354	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

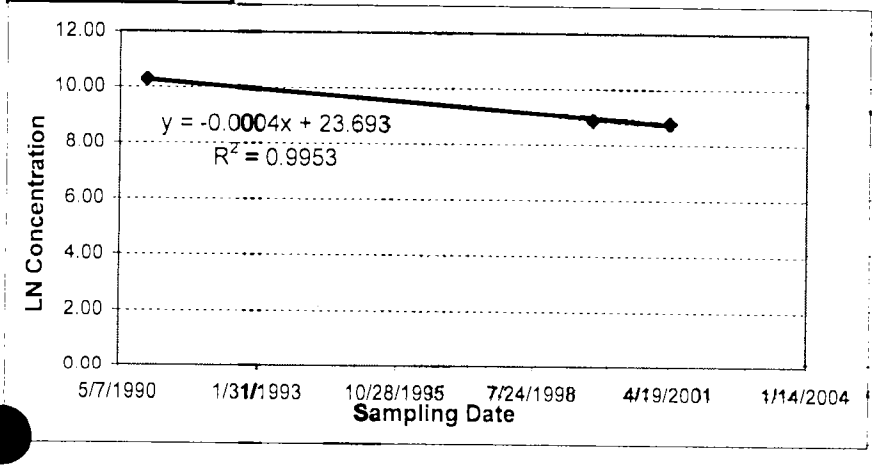
Sample Information

Sample Location ENV-2
Chemical Trichloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	29000	10.28
10/1/1999	7300	8.90
4/18/2001	6500	8.78

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	4.04E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	1.00	0.04
Half-Life in Groundwater ($t_{1/2}$) =	1715	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

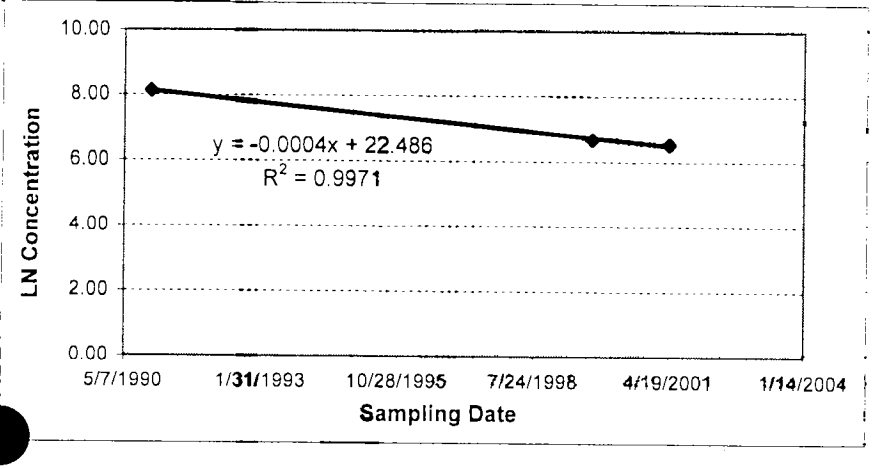
Sample Information

Sample Location ENV-2
Chemical Vinyl Chloride

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	3400	8.13
10/1/1999	790	6.67
4/18/2001	680	6.52

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	4.33E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	1.00	0.03
Half-Life in Groundwater ($t_{1/2}$) =	1600	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

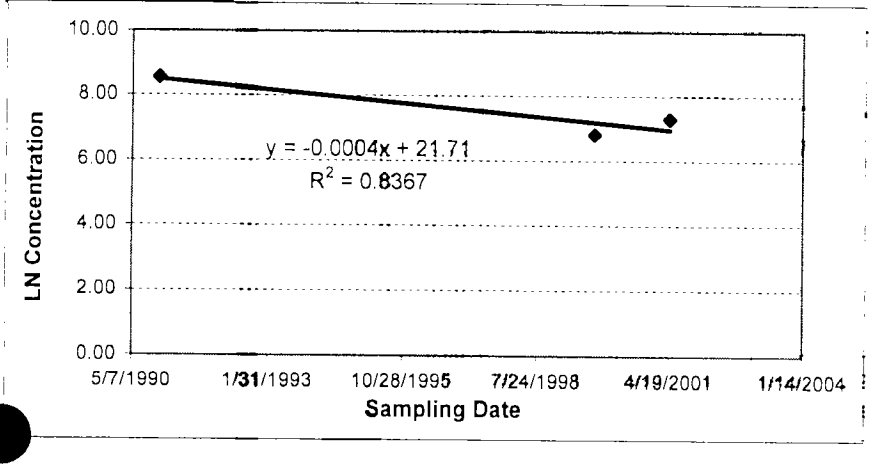
Sample Information

Sample Location ENV-2
Chemical Xylenes (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	5100	8.54
10/1/1999	900	6.80
4/18/2001	1470	7.29

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	3.99E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.84	0.26
Half-Life in Groundwater ($t_{1/2}$) =	1737	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

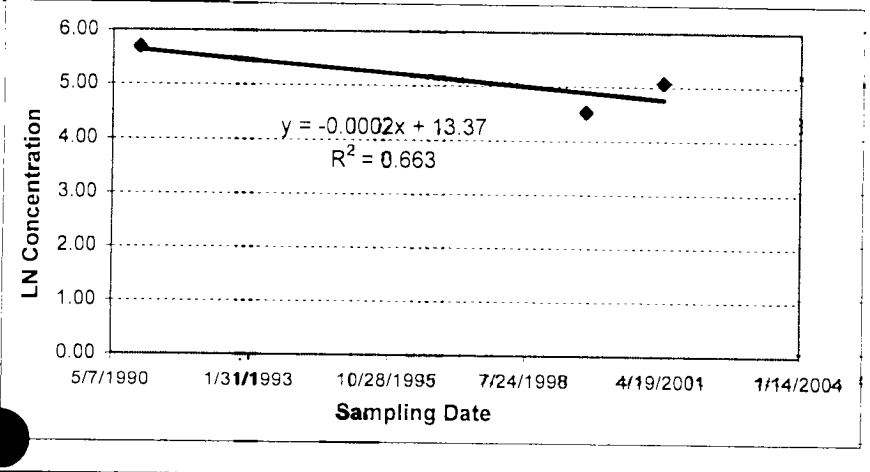
Sample Information

Sample Location ENV-2
Chemical 1,1-Dichloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	300	5.70
10/1/1999	93	4.53
4/18/2001	160	5.08

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	2.33E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.66	0.39
Half-Life in Groundwater ($t_{1/2}$) =	2974	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

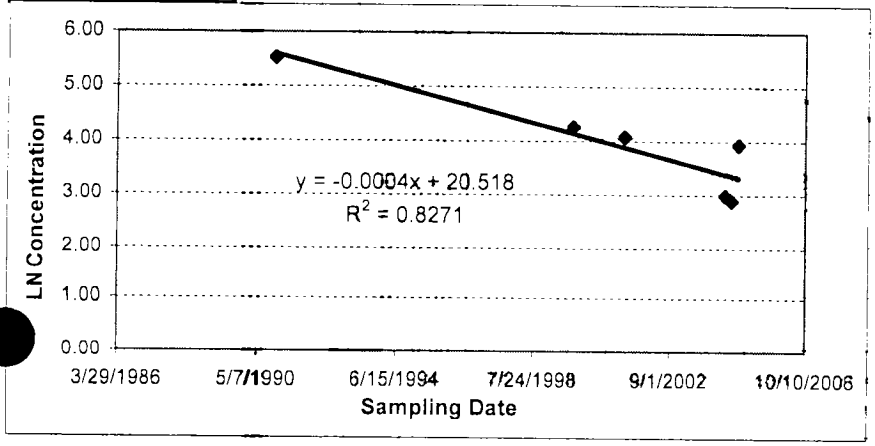
Sample Information

Sample Location ENV-3/3R
Chemical Dichloroethane (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	250	5.52
10/1/1999	71	4.26
4/18/2001	59	4.08
5/5/2004	20	3.00
7/15/2004	18	2.89
9/28/2004	51	3.93

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	4.50E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.83	0.01
Half-Life in Groundwater ($t_{1/2}$) =	1540	days

NOTES

Nondetected values taken at one-half the detection limit.
NYSDEC TOGS 1,1-DCA = 5 µg/L, 1,2-DCA = 0.6 µg/L, no standard for DCA total

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

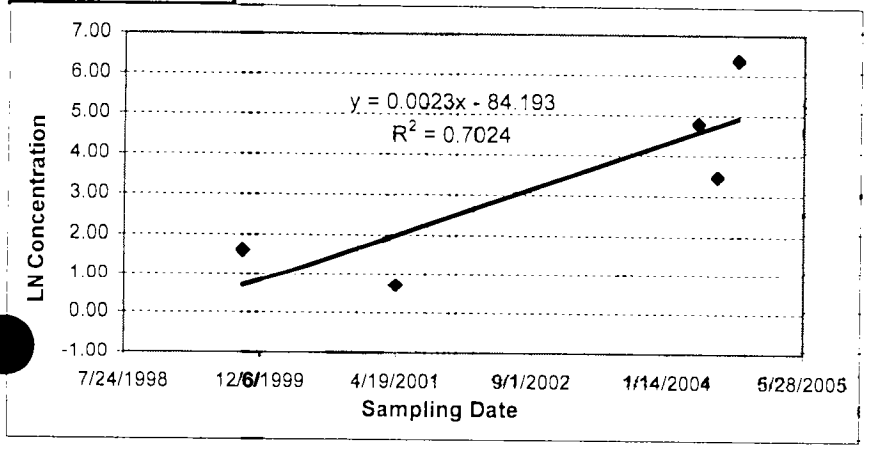
Sample Information

Sample Location ENV-3/3R
Chemical 1,2-Dichloroethene (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	ND*	NA
10/1/1999	ND (10)	1.61
4/18/2001	2	0.69
5/5/2004	120.7	4.79
7/15/2004	32	3.47
9/28/2004	583	6.37

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	NA	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.70	0.08
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Non-detected values taken at one-half the detection limit.
ND* = Data point not used in analysis because detection limit not available

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NA = Not Applicable
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

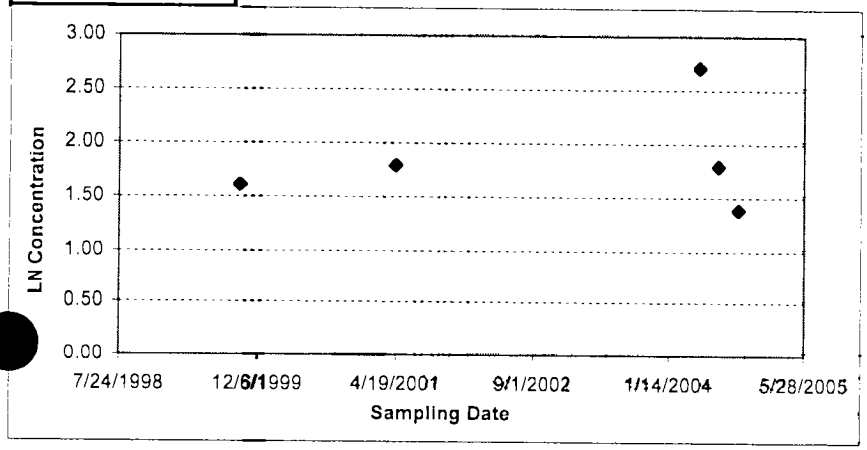
Sample Information

Sample Location ENV-3/3R
Chemical Tetrachloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	ND*	NA
10/1/1999	ND (10)	1.61
4/18/2001	6	1.79
5/5/2004	15	2.71
7/15/2004	6	1.79
9/28/2004	4	1.39

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.51E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.06	0.69
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.
ND* = Data point not used in analysis because detection limit not available

ABBREVIATIONS

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LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NA = Not Applicable
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

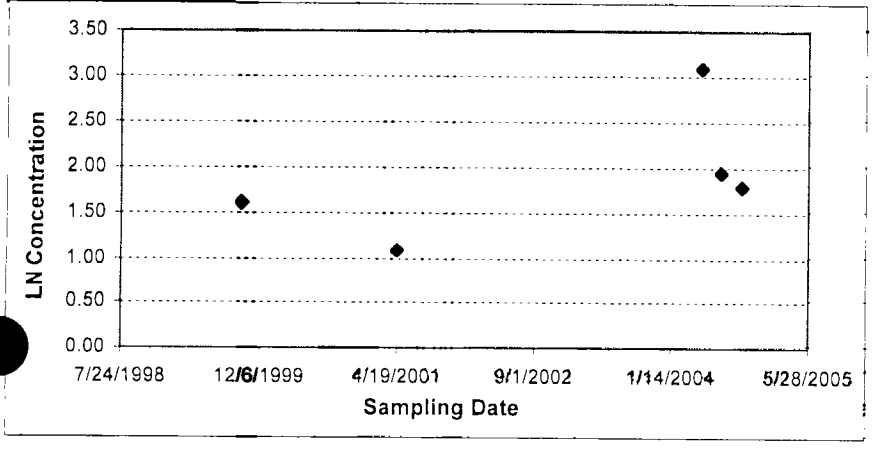
Sample Information

Sample Location ENV-3/3R
Chemical Trichloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	ND*	NA
10/1/1999	ND (10)	1.61
4/18/2001	3	1.10
5/5/2004	22	3.09
7/15/2004	7	1.95
9/28/2004	6	1.79

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	5.03E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.32	0.32
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.
ND* = Data point not used in analysis because detection limit not available

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NA = Not Applicable
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

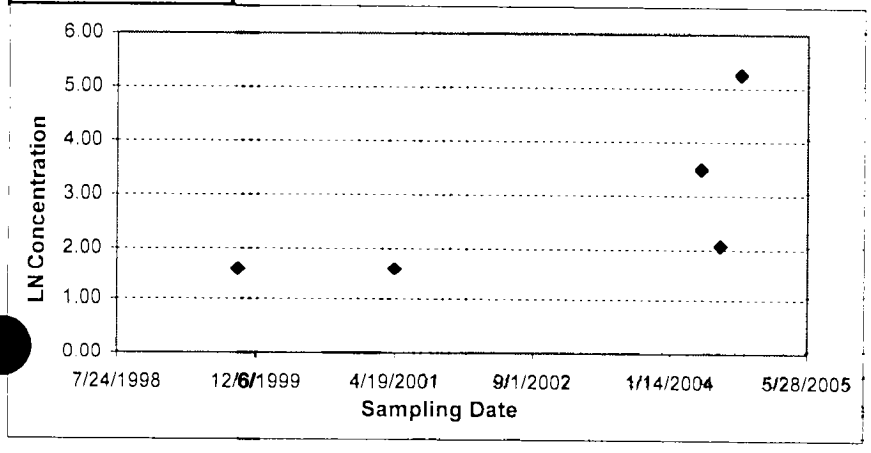
Sample Information

Sample Location ENV-3/3R
Chemical Vinyl Chloride

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	ND*	NA
10/1/1999	ND (10)	1.61
4/18/2001	ND (10)	1.61
5/5/2004	33	3.50
7/15/2004	8	2.08
9/28/2004	190	5.25

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.32E-03	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.49	0.19
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.
ND* = Data point not used in analysis because detection limit not available

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NA = Not Applicable
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

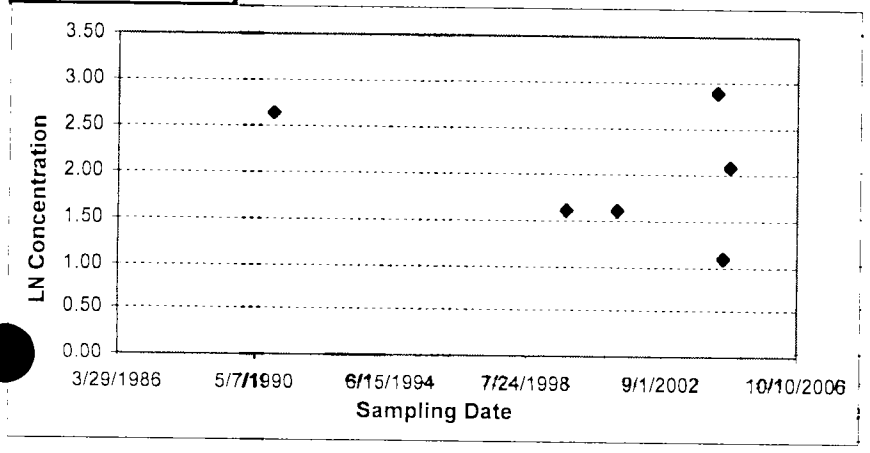
Sample Information

Sample Location ENV-3/3R
Chemical Xylenes

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	14	2.64
10/1/1999	ND (10)	1.61
4/18/2001	ND (10)	1.61
5/5/2004	18	2.89
7/15/2004	3	1.10
9/28/2004	8	2.08

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.16E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.11	0.52
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

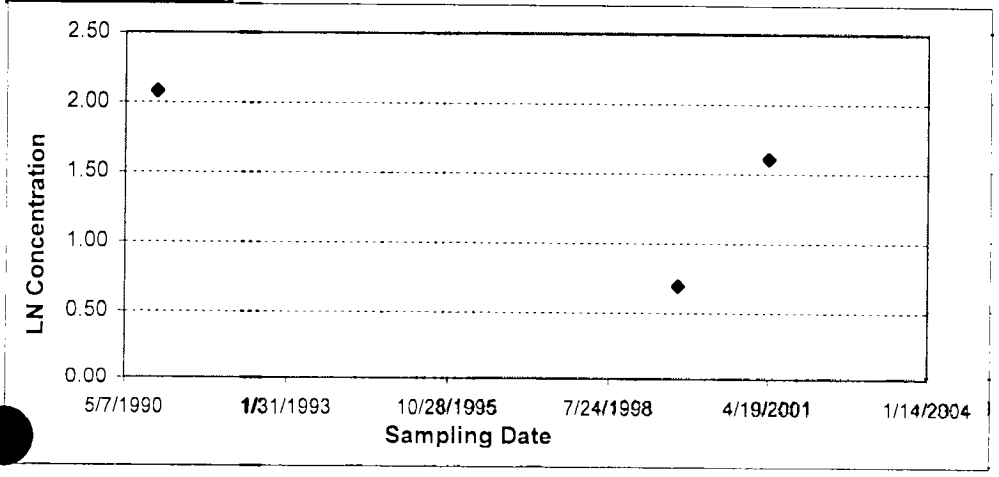
Sample Information

Sample Location ENV-5
Chemical Dichloroethane (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	8	2.08
9/30/1999	2	0.69
4/20/2001	ND (10)	1.61

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	2.28E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.44	0.54
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.
NYSDEC TOGS 1,1-DCA = 5 ug/L, 1,2-DCA = 0.6 ug/L, no standard for DCA total

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

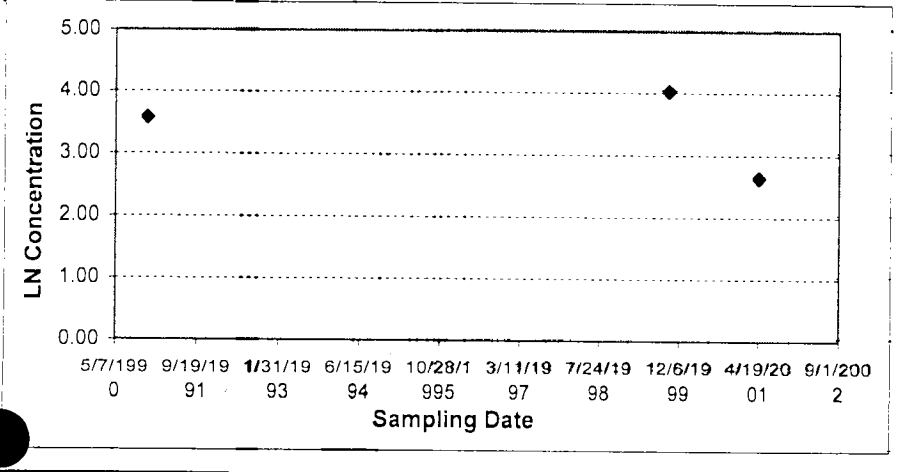
Sample Information

Sample Location ENV-5
Chemical 1,2-Dichloroethene (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	36	3.58
9/30/1999	56	4.03
4/20/2001	14	2.64

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.17E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.11	0.78
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

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LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

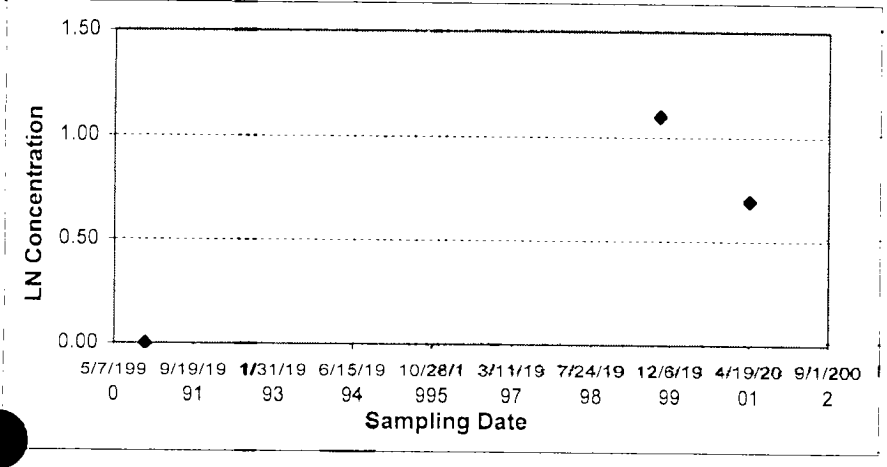
Sample Information

Sample Location ENV-5
Chemical Vinyl Chloride

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
11/19/1990	ND*	NA
9/30/1999	3	1.10
4/20/2001	2	0.69

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	NA	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	NA*	NA
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

*Insufficient number of data points to complete analysis

NOTES

Nondetected values taken at one-half the detection limit.
ND* = Data point not used in analysis because detection limit not available

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithum
ND = Analyte was not detected. Detection limit in parentheses.
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

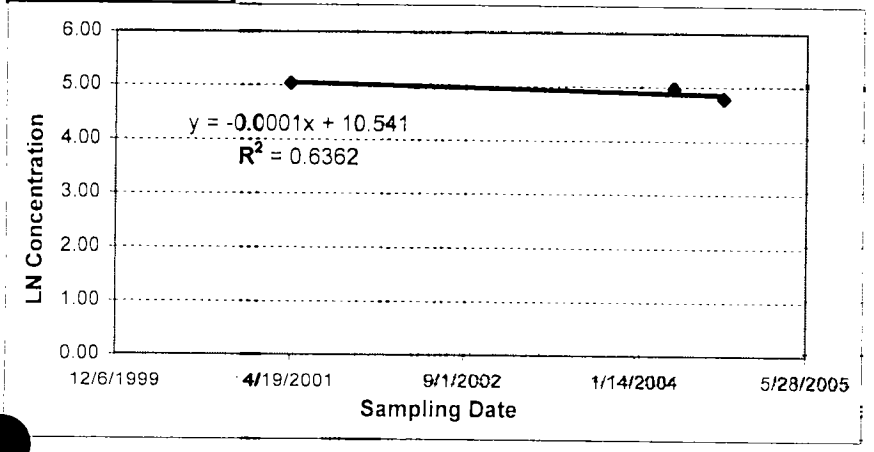
Sample Information

Sample Location ENV-8
Chemical 1,2 Dichlorothene (total)

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	154	5.04
5/5/2004	143	4.96
9/28/2004	120	4.79

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	1.49E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.64	0.41
Half-Life in Groundwater ($t_{1/2}$) =	4651	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

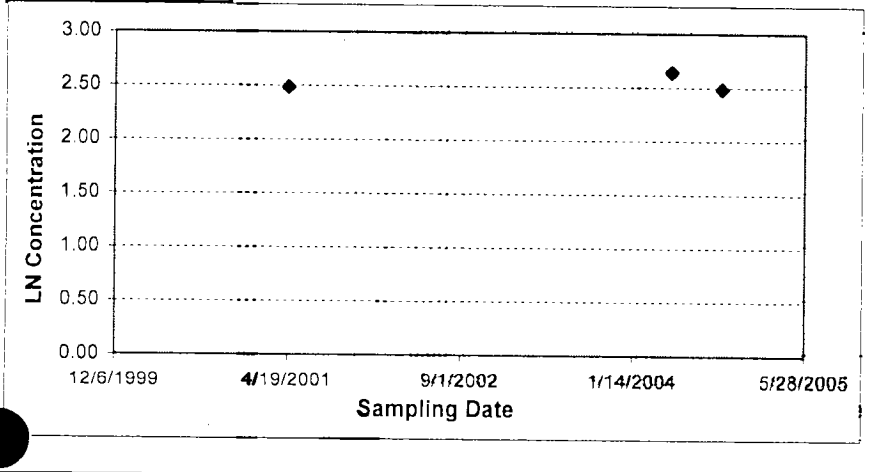
Sample Information

Sample Location ENV-8
Chemical Trichloroethene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	12	2.48
5/5/2004	14	2.64
9/28/2004	12	2.48

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	5.24E-05	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.16	0.73
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

µg/L = micrograms per liter
LN = Natural Logarithm
ND = Analyte was not detected. Detection limit in parentheses.
NA = Not Applicable
NYSDEC TOGS = New York State Department of Environmental Conservation Technical and Operational Guidance Series 1.1.1: Ambient Water

Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

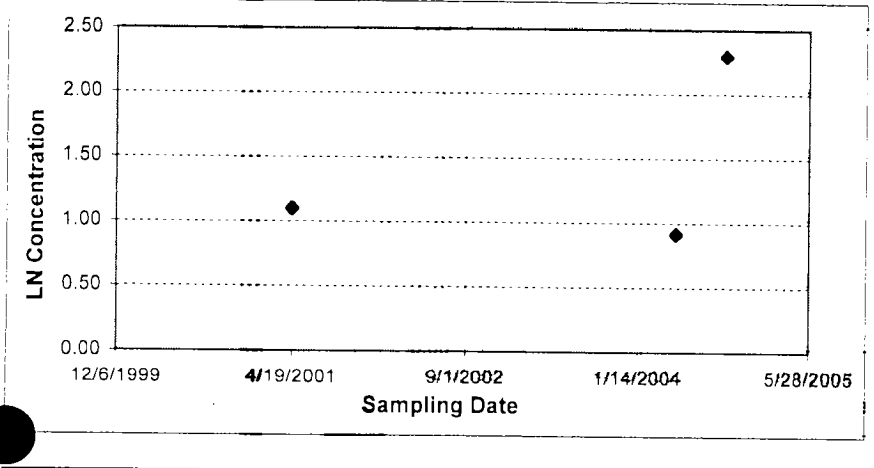
Sample Information

Sample Location ENV-8
Chemical Vinyl Chloride

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
4/19/2001	3	1.10
5/5/2004	ND (5)	0.92
9/28/2004	10	2.30

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	5.33E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.24	0.68
Half-Life in Groundwater ($t_{1/2}$) =	NA	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

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NA = Not Applicable
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Appendix G
Natural Groundwater Remediation Rate Analysis
Envirotek II Site
Tonawanda, New York

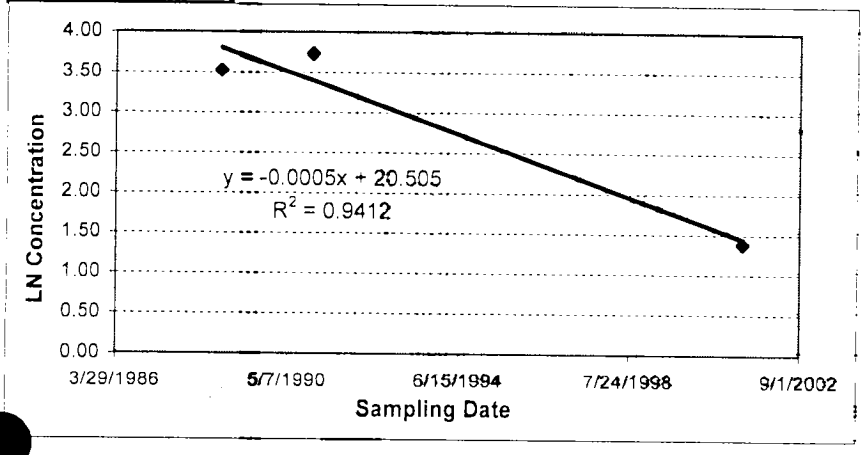
Sample Information

Sample Location GW-1
Chemical Benzene

DATA

Sampling Date	Concentration (µg/L)	LN Concentration
9/28/1988	34	3.53
12/5/1990	42	3.74
4/19/2001	4	1.39

X - Y PLOT



RESULTS

Natural Attenuation Rate Constant (k) =	5.15E-04	$days^{-1}$
Correlation Coefficient (R^2) and p-Value =	0.94	0.16
Half-Life in Groundwater ($t_{1/2}$) =	1346	days

NOTES

Nondetected values taken at one-half the detection limit.

ABBREVIATIONS

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