REPORT

Focused Feasibility Study Report Envirotek II Site

Technical Committee
Participating Potentially Responsible Parties

Tonawanda, New York

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Acronyms

AOC	Administrative Order on Consent
AS	air sparging
BBL	Blasland, Bouck & Lee, Inc.
BHHE	Baseline Human Health Evaluation
BTEX	benzene, toluene, ethyl benzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
cm/sec	centimeters per second
CVOC	chlorinated volatile organic compounds
CWA	Clean Water Act
DCE	dichloroethene
DOT	Department of Transportation
FFS	Focused Feasibility Study
FS	Feasibility Study
FWIA	Fish and Wildlife Impact Analysis
gpm	gallons per minute
HASP	Health and Safety Plan
IHW	Inactive Hazardous Waste
IRM	Interim Remedial Measure
mg/L	milligrams per liter
MNA	monitored natural attenuation
NA	natural attenuation
NAPL	nonaqueous phase liquid
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NRW	Niagara River World, Inc.
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
OU	operable unit
PAH	polynuclear aromatic hydrocarbons
PCE	tetrachloroethene
PCOC	principal constituent(s) of concern
POTW	publicly owned treatment works
PPE	personal protective equipment
ppm	parts per million
PRP	Potentially Responsible Party(ies)
RAO	remedial action objectives
RASP	Remedial Action Sampling Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROI	radius of influence
ROD	Record of Decision
SCG	New York State Standards, Criteria, and Guidances

SDA	Still Discharge Area/Source Area
SPDES	State Pollutant Discharge Elimination System
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	To Be Considered
TCA	trichloroethane
TCE	trichloroethene
TOGS	Technical and Operational Guidance Series
μg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound

Executive Summary

This report details the results of the *Focused Feasibility Study Report* (FFS Report) for the Envirotek II Superfund Site (site) located at 4000 River Road in the Town of Tonawanda, Erie County, New York. The FFS Report was prepared in accordance with the Administrative Order on Consent, Index #B9-0407-92-05, between the Envirotek II Superfund Site Potentially Responsible Parties Group (PRP Group) and the New York State Department of Environmental Conservation (NYSDEC). The FFS Report was also completed in accordance with the NYSDEC-approved *Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan) (Blasland, Bouck & Lee, Inc. [BBL], 1999) and subsequent meetings held between the NYSDEC and BBL.

This FFS Report identifies and evaluates potential remedial alternatives for mitigating the principal constituents of concern (PCOCs) present in groundwater at the site associated with the former Still Discharge Area/Source Area (SDA) identified in the *Remedial Investigation Report* (RI Report) (BBL, 2002a). Past remedial activities at the site have included the completion of interim remedial measures (IRMs) identified as Operable Unit 1 (OU-1), OU-2, and OU-3. The completion of these IRMs accomplished the following:

- removal and offsite disposal of residual waste materials;
- removal of all PCOC source areas via offsite disposal of impacted soil;
- assessment of residual PCOC impacts in groundwater; and
- evaluation of monitored natural attenuation (MNA) as a viable option for remediation of any remaining PCOCs in site groundwater.

The RI Report established the following specific remedial action objectives (RAOs) for the site:

- Reduce the potential for migration of PCOCs that are associated with former Envirotek operations from SDA soil to the shallow groundwater; and
- Reduce the concentration of PCOCs in shallow overburden groundwater.

The completion of OU-1 and OU-2 achieved substantial progress in meeting the RAOs. Recent groundwater-quality data indicate that residual impacts are primarily limited to low-level (i.e., sub parts per million) chlorinated volatile organic compounds (CVOCs). With the completion of OU-3, it was concluded that the CVOC "plume" is shrinking and that the reductions in CVOC concentrations are attributed to natural attenuation processes occurring at the site. As a result, the FFS Report evaluated MNA, as well as several other alternatives, as viable remedies to achieve the remaining RAOs.

After screening and evaluating remedial technologies with the potential to satisfy the remaining RAOs (i.e. the reduction of residual PCOCs in groundwater), BBL identified the following remedial alternatives:

- No Further Action
- MNA;
- Chemical Oxidation with MNA; and
- Groundwater Extraction and Treatment.

The four remedial alternatives were further evaluated based on the following criteria:

- overall protection of human health and the environment;
- compliance with standards, criteria, and guidance;
- short-term impacts and effectiveness;
- long-term effectiveness and permanence;
- reduction in contaminant toxicity, mobility, or volume through treatment;
- implementability; and
- cost effectiveness.

Based on a detailed comparative evaluation, it was concluded that the MNA alternative was the most appropriate remedy to achieve the RAOs at the Envirotek site. This conclusion is strongly supported by the following factors:

- relative ease of implementation;

- proven ability to reduce the contaminant plume, while providing a mechanism for protecting potential sensitive receptors; and

- significant cost savings compared to the other alternatives.

1. Introduction

1.1 General

Blasland, Bouck & Lee, Inc. (BBL) has prepared this *Focused Feasibility Study Report* (FFS Report) on behalf of the Envirotek II Superfund Site Potentially Responsible Parties (PRP) Group for the Envirotek II Superfund Site (site) located at 4000 River Road in the Town of Tonawanda, Erie County, New York. A site location map is included as Figure 1. The FFS Report was prepared in accordance with the Administrative Order on Consent (AOC), Index #B9-0407-92-05, between the Envirotek II Superfund Site PRP Group and the New York State Department of Environmental Conservation (NYSDEC) and completed in accordance with the NYSDEC-approved *Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan) (BBL, 1999).

The FFS Report was developed based upon the results and conclusions presented in the NYSDEC-approved *Remedial Investigation Report* (RI Report) (BBL, 2002a) and the results of interim remedial measures (IRMs) that were described in the following reports:

- *Interim Remedial Measures Final Report for Operable Unit 1* (IRM Final Report for OU-1) (BBL, 2003b);
- *Interim Remedial Measures Final Report for Operable Unit 2* (IRM Final Report for OU-2) (BBL, 2004b); and
- *Interim Remedial Measures Final Report for Operable Unit 3* (IRM Final Report for OU-3) (BBL, 2005).

This FFS Report identifies and evaluates potential remedial alternatives for mitigating the principal constituents of concern (PCOCs) present in site groundwater associated with the Still Discharge Area/Source Area (SDA). These PCOCs included chlorinated volatile organic compounds (CVOCs) and benzene, toluene, ethyl benzene, and xylene (BTEX). This FFS Report was prepared in general conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); New York Codes, Rules, and Regulations (NYCRR) 375; the NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) No. 4030, *Remedial Action Selection at Inactive Hazardous Waste Disposal Sites* (September 1989, revised May 1990); the United States Environmental Protection Agency's (USEPA's) *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA* (USEPA, 1989); the *National Oil and Hazardous Substances Contingency Plan* (NCP); and other relevant federal and state guidance documents, as appropriate.

This FFS Report accomplishes the following:

- identifies potentially applicable New York State Standards, Criteria, and Guidances (SCG);
- defines remedial action objectives (RAOs);
- determines general response actions;
- identifies potential remedial alternatives;
- establishes the site areas subject to potential remediation;
- performs a comparative evaluation of remedial alternatives; and
- provides a recommended remedial alternative for site groundwater.

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 general location of the Roblin Steel complex is presented on Figure 1. Figure 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, 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 related to the history of the Roblin Steel complex, as the site was formerly leased from the owners of the Roblin Steel site for industrial use. Between August 1981 and June 1989, Envirotek Ltd. (Envirotek) operated a solvent recovery operation at the site, within the Roblin Steel property.

A review of 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. After violations of this permit in 1985, including improper waste characterization, RCRA drum handling violations, and a 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 the rejection.

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, and some were 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. 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 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 CVOCs and aromatic VOCs and that the soils containing the highest level of VOCs were located in the vicinity of the SDA.

- Following this investigation, 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, in 1999 and 2001, BBL conducted an 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 RI Report (BBL, 2002a). Based on the results of the RI, it was decided that the site be subdivided into three operable units (OUs), which could be addressed through a series of interim measures. The OUs were defined as follows.

- OU-1 – Waste;
- OU-2 – VOC-Impacted Soil; and
- OU-3 – Groundwater.

The following were recommended for each OU:

- OU-1 – implement an IRM to remove the Boiler House ink waste for offsite disposal; remove soils and other debris containing elevated levels of VOCs from Waste Pit No. 6, decontaminate the pit, and backfill the pit with clean backfill; and dispose of all solid, liquid, and personal protection equipment (PPE) generated during this IRM to approved offsite disposal facilities;

- OU-2 – reduce the potential for migration of PCOCs from SDA soils to the shallow overburden groundwater through implementation of a targeted soil removal IRM; and

- OU-3 – reduce the concentration of PCOCs in shallow overburden groundwater associated with elevated VOC concentrations in SDA soils via natural attenuation (NA) processes through a focused monitoring IRM.

The IRM for OU-1 was implemented in April 2003 and is summarized in the IRM Final Report for OU-1 (BBL, June 2003b). This report was reviewed and approved by the NYSDEC in a letter dated November 5, 2003 followed by a no further action (NFA) letter dated November 19, 2003.

The IRM for OU-2 was implemented in October 2003 and is summarized in the IRM Final Report for OU-2 (BBL, 2004b). With the completion of the IRM for OU-2, which resulted in the removal of more than 7,100 tons of VOC-impacted soil containing PCOCs within the saturated and unsaturated zones, all potential sources of PCOCs to groundwater were eliminated. Following review of the IRM Final Report for OU-2, the NYSDEC issued an NFA letter for OU-2 dated February 9, 2004

The IRM for OU-3, presented and assessed the NA of PCOCs in shallow groundwater that are present as a consequence of historical proximity to SDA soils containing PCOCs removed during the IRM for OU-2. NA processes have been ongoing for many years, as demonstrated by the results of two recent rounds of groundwater monitoring, one in May 2004 and the second in September 2004. This IRM is discussed in detail in the IRM Final Report for OU-3 (BBL, 2005).

1.4 Report Organization

Following this introduction, this FFS Report has been organized into the following sections:

- ***Section 2 – Previous Investigations*:** Provides a brief overview of the previous investigation activities performed at the site.
- ***Section 3 – Interim Remedial Measures*:** Provides a summary of the completed IRMs for OU-1, OU-2, and OU-3 and their effect on the FFS.
- ***Section 4 – Identification of General Response Actions*:** Provides a brief overview of the affected media of concern, establishes RAOs, and identifies general response actions which are available for evaluation.
- ***Section 5 – Identification and Screening of Remedial Technologies*:** Provides a brief overview of the remedial technologies identified for potential implementation at the site and evaluates each for technical effectiveness and implementability.
- ***Section 6 – Detailed Analysis of Alternatives*:** Presents a detailed analysis of the individual remedial technologies that passed screening criteria for potential implementation at the site.
- ***Section 7 – Comparative Analysis of Alternatives*:** Compares the potential performance of the remedial technologies that passed screening criteria for potential implementation at the site.

2. Previous Investigations

The following provides a brief summary of previous investigations performed at the site. A more detailed summary of these investigations may be found in the RI Report (BBL, 2002a). The general location of the site is included as Figure 1 for reference.

2.1 United States Environmental Protection Agency Investigations

The following subsections summarize the investigations performed in late 1990 by the USEPA.

2.1.1 Soil Sampling

From September through November 1990, the USEPA collected 24 soil samples from the Roblin Steel property to investigate alleged Envirotek operations and activities that may have impacted the Roblin Steel property. Analytical results indicated the presence of semi-volatile organic compounds (SVOCs), assumed to be related to historical Roblin Steel operations. The inorganic analytical results for these samples appeared to be consistent with those expected of background conditions for an industrial setting. Analytical results from one sample indicated the presence of elevated concentrations of VOCs. Due to the elevated VOC concentrations detected at this location, and allegations of field-spreading activities at the Roblin Steel complex by Envirotek personnel, the area in the vicinity of this sample was identified by the NYSDEC as a potential area of concern.

2.1.2 Groundwater Sampling

In December 1990, the USEPA collected groundwater samples from monitoring wells GW-1 through GW-7 for analysis of VOCs, SVOCs, and metals. Analytical results indicated trace concentrations of several VOCs in the sampled wells. However, groundwater VOC results from GW-2 and from GW-4 through GW-6 indicated that concentrations were below NYSDEC Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1): *Ambient Water Quality Standards and Guidance Values*. The highest detected concentration of total VOCs was found in GW-7, with 11 individual VOCs detected either at or above TOGS 1.1.1 water-quality standards. Analytical data from these monitoring well samples indicated that SVOCs were below TOGS 1.1.1 water-quality standards.

2.1.3 Sewer System Evaluation

In November 1990 and December 1990, the USEPA conducted smoke testing of the sewer line(s) in the vicinity of the former wastewater treatment plant, the Hangar Building, and Waste Pit No. 4. Results of the smoke test did not show a connection between a manhole located near the former wastewater treatment plant and Waste Pit No. 4. However, the smoke test did confirm a connection between two manholes; therefore, the USEPA collected two sediment samples from these manholes. The USEPA concluded from these investigations that the sewers did not represent a migration pathway from the site.

2.2 Removal Action Sampling Plan

In September and November 1990, BBL prepared and implemented a RASP. The work performed included a soil gas survey and groundwater and soil sampling. Additional information regarding performance of the RASP is provided below.

2.2.1 Soil Gas Survey

Soil gas samples were collected from 32 locations. Each soil gas sample was analyzed with a portable gas chromatograph to quantify concentrations of tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), and BTEX. Soil gas survey results indicated elevated levels of VOCs in the area of the SDA and in an area to the west of Building 153.

2.2.2 Soil Sampling

In October 1990, soil borings B-1 through B-6 were drilled and sampled within the SDA to characterize the extent of impacts associated with former still discharges. Results of the soil boring program indicated the presence of chlorinated and aromatic hydrocarbon compounds, including PCE, TCE, 1,1,1-TCA, toluene, and xylenes. The soils containing the highest levels of VOCs were located in the SDA. Analytical data indicated that the area of the surficial discharges from the SDA was located along a north-south sidewalk. Residual hydrocarbons were noted in soils within the SDA. Detectable SVOC concentrations, thought to be associated with the residual hydrocarbons observed in the sample, were reported in soil boring B-2.

2.2.3 Groundwater Sampling

In November 1990, monitoring wells ENV-1 through ENV-6 were installed. Within a few days following the installation of monitoring wells ENV-2 and ENV-3, a nonaqueous phase liquid (NAPL) was observed on the water-table surface with an approximate thickness of 0.3 foot at both locations. However, NAPL was not observed in any ENV-series wells during the later groundwater sampling program. Groundwater analytical results indicated the presence of dissolved-phase VOCs. SVOCs were not detected in any groundwater samples, with the exception of one collected from monitoring well ENV-2. Results of metal analyses indicated the presence of several metals above TOGS 1.1.1 water-quality standards; however, most of these elevated concentrations were also observed in a groundwater sample from the upgradient monitoring well, suggesting that they were related to the historical use of the site and surrounding area prior to Envirotek's involvement at the site and were unrelated to Envirotek's use of the site.

2.3 Supplemental Still Discharge Area Investigation

In May 1992, BBL performed a supplemental investigation of the SDA. This investigation included collecting subsurface soil and groundwater samples, installing a 6-inch well (RW-1) for use during a pumping test, performing a pumping test, and performing a soil vapor extraction (SVE) pilot test. More information regarding the supplemental investigation of the SDA is provided below.

2.3.1 Soil Sampling

Soil samples were collected from soil borings B-7 through B-20 for analysis of VOCs and SVOCs. Residual hydrocarbons were observed in soil samples from the top of the water table down to the top of the confining unit. Based on this assessment, the following conclusions were drawn:

- The presence of residual hydrocarbons within the saturated soil upgradient, as well as downgradient, of the SDA indicated that their presence was associated with the surrounding Roblin Steel complex and not related to former Envirotek operations;

- VOC analytical results indicated a relatively limited horizontal extent of the VOCs within the SDA; and

- SVOCs were observed at several locations.

2.3.2 Groundwater Sampling

Groundwater samples were collected from monitoring wells ENV-2 and ENV-3 and from recovery well RW-1 (two samples) for VOC and SVOC analyses. The VOC concentrations in ENV-2 and ENV-3 were similar to those reported for these wells following groundwater sampling performed in 1990. Trace concentrations of a few SVOCs were also present.

2.3.3 Pilot Testing

In May 1992, a 6-inch-diameter well, RW-1, was installed to the top of the silty clay confining layer in the area of the SDA, and an 8-hour pumping test was performed. Drawdown data from the recovery well indicated that a no- or low-flow boundary was present nearby, which resulted in a significantly increased rate of drawdown after several hundred minutes of pumping.

An SVE pilot test was conducted to evaluate the radius of extraction influence and to estimate the potential for VOC removal. Results of the SVE pilot test indicated that the radius of influence (ROI) was less than 10 feet and that low concentrations of VOCs were removed. It was concluded that SVE would not be an effective IRM without a much wider area of dewatering and the installation and operation of numerous additional SVE points.

2.4 Remedial Investigation

From August to October 1999 and again from March through June 2001, BBL performed a RI of the site in accordance with the NYSDEC-approved RI/FS Work Plan (BBL, 1999). The RI assessed the on-site surface and subsurface soil quality, offsite subsurface soil quality, site groundwater quality, and site geologic and hydrogeologic characteristics. BBL also performed a Fish and Wildlife Impact Analysis (FWIA) in accordance with Steps I, IIA, and IIB of the 1994 FWIA guidance prepared by the NYSDEC, as well as a Baseline Human Health Evaluation (BHHE) to assess potential human health risks associated with the site. The following summarizes the RI data and presents the findings relative to existing site geologic and hydrogeologic conditions used to determine potential impacts to human health and the environment.

2.4.1 Soil-Quality Investigation

Soil-quality data gathered during the RI consisted of onsite and offsite subsurface soil data and onsite surface soil data. Initial RI activities included the drilling of 27 soil borings and the excavation of three test pits. Upon completing the initial RI activities and reviewing the analytical data, it was determined that additional data was needed to complete the delineation of VOC-impacted soil within the SDA of the site. Therefore, BBL's *Preliminary Remedial Investigation Report* (Preliminary RI Report) (BBL, 2000) to the NYSDEC presented recommendations for collecting additional soil data. Subsequently, 20 additional soil borings were advanced and sampled to further delineate the limits of VOC-impacted soil in the SDA.

The soil investigation results are summarized as follows:

- **Background Samples** – Analysis of five background soil samples indicated levels of several SVOCs above their respective TAGM 4046 cleanup objectives. Therefore, it was determined that the background sampling locations did not completely represent facility conditions prior to commencement of steel-making operations.

- **USEPA Sample Point No. 5** – VOC analysis of test pit soil sample TP-3, installed in the approximate location of former USEPA Sample Point No. 5, indicated that concentrations were below TAGM 4046 values.

- **Waste Pit Nos. 1, 2, 3, and 3A** – Based upon previous USEPA removal action activities performed in Waste Pit Nos. 1, 2, 3, and 3A and subsurface conditions encountered during the RI boring activities, these pits were determined to be intact.

- **Waste Pit No. 5** – Analysis of soil samples collected from soil borings SB-02 through SB-05, installed adjacent to Waste Pit No. 5, indicated that VOC concentrations were below TAGM 4046 cleanup objectives and that some SVOCs and metals exceeded their respective TAGM 4046 values, but were comparable to levels previously documented for the Roblin Steel property.

- **Former Sewer Line** – Analysis of soil samples from test pits TP-1 and TP-2 indicated that VOC and SVOC concentrations were below TAGM 4046 cleanup objectives and that inorganic data were comparable to background Roblin Steel property concentrations.

- **SDA** – The following conclusions were drawn from results of investigations within the SDA.

  - The SDA was delineated by soil borings SB-01, SB-03, SB-05, SB-10, SB-11, SB-12, SB-15, SB-18, SB-19, SB-20, SB-21, SB-22, SB-24, SB-26, SB-28, and SB-29, based upon VOC analytical results below TAGM 4046 soil cleanup objectives.

  - The extent of impacted SDA soil is confined within the boundary of the site.

  - PCE, TCE, and xylenes were detected most frequently and typically exhibited the highest concentrations.

  - The SVOC concentrations from SDA soil samples are comparable to historical data associated with the Roblin Steel property.

- Results of the field tests used to assess the presence of NAPL were negative except at SB-25, where the NAPL floated, indicating that it was likely derived from a petroleum hydrocarbon or a mixture thereof, most likely attributed to former Roblin Steel operations.

- **Waste Pit Nos. 6 and 7** – Analysis of soil from Waste Pit No. 6 identified 10 VOCs at elevated concentrations; however, soil data (from SB-11, SB-15, SB-18, and SB-19) collected adjacent to this pit indicated that these PCOCs were being contained within the structure. VOC analytical data from Waste Pit No. 7 were below TAGM 4046 soil cleanup objectives.

- **Boiler House** – Toxicity Characteristic Leaching Procedure analytical results of the Boiler House waste sample indicated that only lead exceeded its RCRA toxicity characteristic level (i.e., waste code D008).

2.4.2 Groundwater-Quality Investigation

Groundwater samples were collected from the saturated fill materials located above the silty clay layer present across much of the Roblin Steel property. Upon completion of the initial RI activities, a review of groundwater analytical data identified inconsistencies among samples collected from monitoring wells versus samples collected from cone penetrometer points. Therefore, recommendations to collect additional groundwater data by installing and sampling three shallow and two deep monitoring wells was presented in the Preliminary RI Report (BBL, 2000). The groundwater investigation results from the RI Report (BBL, 2002a) are summarized below and include information developed during the sampling of monitoring wells, cone penetrometer points and former sewer line.

- **Monitoring Wells** – The following conclusions were drawn from results of sampling from site monitoring wells:

  - The VOC concentrations for groundwater from site monitoring wells typically showed decreasing trends in VOC concentrations from the initial sampling conducted in 1988 through the 1990, 1999, and 2001 groundwater sampling events.

  - VOC analysis for groundwater samples from upgradient monitoring wells ENV-1 (1999 and 2001), GW-2 (1999), NW-1 (1999), and NW-5 (1999), and downgradient monitoring wells ESI-8 (1999), GW-3 through GW-6 (1999), ENV-4 (2001), ENV-6 (2001), and NW-4 (2001) indicated that concentrations were below the TOGS 1.1.1 water-quality standards.

  - The area of elevated total VOC concentrations in groundwater (i.e., total VOCs greater than 10 parts per million [ppm]) was similar to the area of impacted soil delineated in the SDA. Therefore, it is apparent that the VOC-impacted groundwater is a direct result of the presence of VOCs in the SDA soils, with groundwater impacts limited to that specific area.

  - VOC concentrations in groundwater obtained in 2001 from monitoring wells ENV-7, ENV-8, and ENV-9 reported the presence of 1,1-dichloroethane, cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride (VC), and TCE above their respective TOGS 1.1.1 water-quality standards.

  - SVOCs were not detected above TOGS 1.1.1 water-quality standards, except for phenol. Phenol is a waste byproduct typically associated with steel-making operations and is likely associated with the former Roblin Steel facility and not the site.

- The concentrations of inorganics in groundwater samples from downgradient monitoring wells were either less than the inorganic concentrations in groundwater samples from upgradient monitoring wells or were lower than TOGS 1.1.1 water-quality standards.

- **Cone Penetrometer Points.** The following conclusions were drawn from results of sampling groundwater from cone penetrometer points:
  - Concentrations of VOCs in groundwater samples from cone penetrometer points CPT-1, CPT-2, CPT-4, CPT-5, CPT-7, and CPT-12 indicated concentrations below TOGS 1.1.1 water-quality standards.
  - Concentrations of SVOCs in groundwater samples from cone penetrometer points CPT-1, CPT-4, CPT-8, CPT-9, CPT-10, and CPT-12 indicated concentrations below TOGS 1.1.1 water-quality standards.
  - Concentrations of VOCs in groundwater samples from cone penetrometer points CPT-3, CPT-6, CPT-8 through CPT-11, and CPT-13 through CPT-18 indicated the presence of several PCOCs above their respective TOGS 1.1.1 water-quality standards.

- **Former Sewer Line** – Concentrations of VOCs from test pit groundwater samples indicated that VC and/or cis-1,2-DCE exceeded their respective TOGS 1.1.1 water-quality standards. Concentrations of SVOCs were below TOGS 1.1.1 water-quality standards.

2.4.3 Geologic and Hydrogeologic Conditions

The geologic and hydrogeologic conditions associated with the site and the Roblin Steel complex can be summarized as follows:

- The thickness of fill material ranged from 20 feet (ENV-2) to 4.5 feet (GW-1) and consisted primarily of sand and silt and lesser amounts of gravel, clay, bricks, concrete, cinders, glass, slag, steel, and wood. The heterogeneity of the fill material was supported by the variable hydraulic conductivities observed for monitoring wells screened in the fill, which ranged from 1×10^{-1} centimeters per second (cm/sec) to 1×10^{-5} cm/sec.

- The silty clay confining layer appeared to be continuous across the majority of the Roblin Steel complex, and its surface varied in elevation across the Roblin Steel complex, with data indicating the presence of a natural depression in the silty clay surface beneath the SDA. In addition, the thickness of the silty clay ranged from 8.3 feet to 11.9 feet.

- Vertical permeability testing on an undisturbed silty clay soil sample was reported at 2.5×10^{-7} cm/sec, indicating that movement through the silty clay is limited and proceeds at a very slow rate.

- Groundwater elevation contours of the shallow groundwater present within the fill (approximately 8 to 10 feet belowgrade) indicated that groundwater flow was influenced by the presence of subsurface structures and exhibited westerly radial flow patterns from the site. The most recent groundwater contour maps are included as Figures 3 and 4 and further discussed in Section 3.

2.4.4 Human Health and Ecological Conditions

The human health and ecological assessments performed during the RI included an NYSDEC FWIA (Steps I through IIB) and a BHHE. This assessment was completed prior to the successful removal of all impacted SDA soil from both the saturated and unsaturated zones during implementation of the IRM for OU-2. The results of the ecological and human health assessments are, therefore, applicable to only groundwater impacts, and are summarized as follows:

- Based on limited habitat availability, poor habitat quality, incomplete migration pathways of site-related PCOCs, and limited potential for exposure to site receptors, it was concluded that no further ecological assessment was required for the site.
- Based on the BHHE, groundwater is not considered a viable exposure point, and NFA to protect human health is required at the site.

Based on the IRMs completed subsequent to the BHHE (i.e., successful removal of the saturated and unsaturated VOC-impacted SDA [OU-2], overall decreases in the magnitude and areal extent of groundwater impacts; and the demonstration that NA processes are ongoing at the site [OU-3]), it is reasonably concluded that a higher degree of protection of human health and the environment has been realized.

2.5 Operable Unit 3 Investigations

BBL performed OU-3 IRM-related investigation activities in 2004 in accordance with the *Interim Remedial Measures Work Plan for Operable Unit 3* (IRM OU-3 Work Plan) (BBL, 2004), which was approved by the NYSDEC in a letter dated March 24, 2004. The primary purpose of OU-3 investigation activities was to determine the presence and to evaluate the performance of any NA processes. In the course of these activities, additional groundwater-quality data were obtained in addition to the several monitoring well sampling events that have been completed at select wells since 1999. A summary of these results can be found in Table 1.

The IRM Final Report for OU-3 (BBL, 2005) indicated that the PCOC plume has decreased significantly in concentration and areal extent since the 1999 sampling event, with recent groundwater-quality data indicating that the plume is continuing to shrink (Figures 5, 6, 7, 8, and 9). This IRM Final Report for OU-3 concluded that this reduction in PCOCs is attributed to NA processes that have been shown to be present at the site, which will likely continue to be enhanced following completion of OU-2 remedial activities (SDA removal). A more thorough discussion of the findings presented in the IRM Final Report for OU-3 is included in Section 3.3.

3. Interim Remedial Measures

On February 3, 2003, BBL, the NYSDEC, and the New York State Department of Health (NYSDOH) participated in a meeting to discuss the implementation of potential IRM activities at the site. BBL summarized the key points of this meeting and provided a project schedule in a letter to the NYSDEC dated February 14, 2003. In this letter, the concept of further classifying the site into additional OUs for soil and groundwater, as was done for OU-1, was discussed and approved by the NYSDEC.

Each OU was established so that the media in each unit could be managed independently and be more effectively addressed when the NYSDEC prepares the Proposed Remedial Action Plan and Record of Decision (ROD) for the site. A summary of IRM activities in each OU is discussed in the following sections.

3.1 Operable Unit 1

The OU-1 IRM activities were performed at the site in accordance with the AOC and the *Interim Remedial Measures Work Plan for Operable Unit 1* (IRM OU-1 Work Plan) (BBL, 2002b), which was approved by the NYSDEC in a letter dated November 21, 2002. The objectives established in the IRM OU-1 Work Plan consisted of the following:

- eliminate potential migration of VOCs contained in Waste Pit No. 6 materials into surrounding soil and groundwater; and
- eliminate the potential for direct human contact with the lead-contaminated Boiler House ink waste.

The OU-1 IRM activities, which were implemented in April and May 2003, consisted of the following activities:

- Excavation, decontamination, and backfilling with clean soil of Waste Pit No. 6, which formerly contained soil, liquid, and debris impacted with elevated levels of VOCs, as well as SVOCs and metals. Activities also included the transportation and offsite disposal of all materials removed from Waste Pit No. 6;
- Removal, transportation, and offsite disposal of lead-contaminated ink waste from the existing Boiler House building; and
- Consolidation and offsite disposal of investigation-derived waste materials, which included soil, liquid, and PPE generated during previous RI and FS field activities;

The OU-1 IRM activities were documented in the IRM Final Report for OU-1 (BBL, June 2003b), which was reviewed and approved by the NYSDEC in a letter dated November 5, 2003 with an NFA letter dated November 19, 2003.

3.2 Operable Unit 2

The OU-2 IRM activities were performed at the site in accordance with the AOC and the *Interim Remedial Measures Work Plan for Operable Unit 2* (IRM OU-2 Work Plan) (BBL, 2003a), which was conditionally

approved by the NYSDEC in a letter dated August 18, 2003, and approved following receipt of BBL's follow-up September 16, 2003 response letter.
The objectives established in the IRM OU-2 Work Plan were to:

- remove VOC-impacted soil from the former Envirotek operations area to, or approaching NYSDEC TAGM 4046 – Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives for VOCs); and

- eliminate the potential for migration of VOC PCOCs associated with former Envirotek operations from the SDA soil to shallow overburden groundwater, to enhance the restoration of groundwater through NA processes.

The OU-2 IRM activities, which were implemented in October 2003, consisted of the following activities:

- excavating VOC-impacted soils for appropriate management, which included reuse, where applicable, for backfilling excavated areas, or transportation and offsite disposal;

- managing remediation-generated debris and waste materials for transportation and offsite disposal at approved disposal facilities;

- collecting soil samples to provide sufficient analysis of impacted materials to determine the potential reuse of site soils for backfill. The established soil cleanup goal for the IRM was to meet or approach NYSDEC TAGM 4046 soil cleanup objectives for VOCs;

- collecting post-excavation soil samples to determine the final limits of excavation to meet the established soil cleanup goal for the IRM;

- monitoring for health and safety provisions during the performance of IRM activities; and

- backfilling excavated areas and restoring the site.

The OU-2 IRM activities were documented in the IRM Final Report for OU-2 (BBL, January 2004b). The NYSDEC issued a February 9, 2004 NFA letter following review of the IRM Final Report for OU-2.

3.3 Operable Unit 3

The OU-3 IRM-related activities were performed in accordance with the AOC NYSDEC-approved IRM OU-3 Work Plan (BBL, 2004a), which was approved by the NYSDEC in a letter dated March 24, 2004. The objectives for the work in OU-3 were to:

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

The OU-3 IRM activities, which were implemented between April and September 2004, consisted of the following activities:

- installing a new monitoring well (ENV-3R) between existing Buildings 13 and 24, immediately downgradient of the former SDA and near the former location of monitoring well ENV-3, which was removed during implementation of the IRM for OU-2;

- sampling groundwater from the monitoring well network;

- evaluating both historical data and the new groundwater data to provide a detailed assessment of the remedial progress made by NA processes, including:

  - updating the USEPA's scoring model for evaluation of the potential for in situ biodegradation,

  - preparing groundwater concentration trend graphs,

  - evaluating the trend of ratios of parent to daughter concentrations,

  - comparing VOC data with NYSDEC TOGS 1.1.1,

  - 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 expected duration of NA;

- meeting with the NYSDEC and NYSDOH to discuss the preliminary findings of the OU-3 investigation and NA data; and

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

OU-3 IRM activities were documented in the report entitled *Interim Remedial Measures Operable Unit 3 Assessment* (BBL, 2005), which was reviewed and approved by the NYSDEC in a letter dated March 9, 2005. Based on the results of the groundwater gauging and sampling program and the evaluation of the historical occurrence and viability of NA, the following conclusions were reached:

- 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, 2002a) (see Figures 3 and 4).

- The area of the total VOC plume shrank significantly over the period of September 1999 through September 2004 (see Figures 5 through 9).

- 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 VOC source material was removed during implementation of the OU-2 IRM; and

  - conditions are favorable for continued NA of the groundwater VOCs.

- The plume has not reached the Niagara River and 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 OU-3 groundwater VOC plume.

4. Identification of General Response Actions

This section presents the affected media of concern and identifies general response actions required for the remedial action. The general response actions have been developed based upon the type and extent of affected media; the types of PCOCs; and the RAOs, which are based upon reducing the potential health risks associated with the presence of PCOCs in groundwater at the site.

Soil quality at the site was impacted by former Envirotek and Roblin Steel operations. The primary PCOCs associated with former Envirotek operations include chlorinated and BTEX compounds, while the primary PCOCs associated with former Roblin Steel facility operations include polynuclear aromatic hydrocarbons (PAHs), other SVOCs and inorganics. In addition, a zone of residual petroleum hydrocarbon has been identified in the SDA that is thought to be associated with the former steel production activities at the Roblin Steel facility. The most elevated concentrations of VOCs had historically been detected in the SDA. The RI Report (BBL, 2002a) presents historical VOC soil exceedances of NYSDEC TAGM 4046 soil cleanup criteria, including data collected during the RI and FS waste characterization activities.

As discussed in Section 3. the potential issues associated with waste and soil media were addressed through the IRMs completed for OU-1 and OU-2, respectively. Therefore, these media are not considered further in this FFS Report.

4.1 Affected Media (Groundwater)

Groundwater quality at the site has been impacted by past Envirotek and Roblin Steel operations. The primary PCOCs associated with former Envirotek operations include CVOCs and BTEX compounds. Recent groundwater analyses indicate continued CVOC impacts exceeding the NYSDEC TOGS 1.1.1 water-quality criteria, with a shrinking plume since completion of the IRMs. The greatest CVOC groundwater impacts (ENV-3R) remaining at the site appear to be located along the immediate downgradient edge of the former SDA and source removal activities (OU-2).

Groundwater analyses for the BTEX PCOCs have not been detected at any significant concentrations since 1990 beyond the area excavated under the IRM for OU-2. The most recent monitoring well sampling event (September 28, 2004) did not indicate any detectable BTEX concentrations, with the exception of total xylenes at ENV-3R, which was reported at 8 micrograms per liter (μg/L) within a duplicate sample of this monitoring well. This concentration had a qualifier identifying the value as an estimate. The initial analysis of ENV-3R for that sampling event reported total xylenes as non-detectable (less than 30 μg/L), and the previous sampling event (July 15, 2004) for this location estimated total xylenes at 3 μg/L (Table 1). Given the lack of any significant BTEX impacts, it is proposed that BTEX be eliminated as PCOCs associated with this site, leaving CVOCs as the remaining PCOCs.

4.2 Remedial Action Objectives

RAOs are based upon media-specific and general requirements. Based on previous investigations at the site and following the completion of the approved IRMs, the current impact is limited only to the presence of CVOCs in groundwater. Therefore, the RAOs are based on the presence of CVOCs in groundwater above NYSDEC criteria. However, as indicated by the BHHE and Ecological Screening Evaluation performed as part of the RI for the site, which was performed prior to implementation of the IRMs, the presence of CVOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of potential receptors.

As established in the RI Report (BBL, 2002a), the RAOs for groundwater at the site are to:

- reduce the concentration of CVOCs in shallow overburden groundwater; and
- reduce the potential for migration of CVOCs, associated with the former Envirotek operations.

To the degree practicable, the longer-term remedial action goal for the site would be to attain the groundwater criteria established in NYSDEC TOGS 1.1.1.

4.3 General Response Actions

General response actions are media-specific actions that must be taken to satisfy the RAOs for the site. These actions are categorical approaches to remediation that comprise various technologies and process options and can include a range of potential remedial technologies, ranging from no action alternatives to full-scale, active remedial alternatives such as excavation with offsite disposal or onsite treatment and in situ remediation. Based on the above evaluation, the following sections provide the general response actions for groundwater that have been identified for those portions of the site containing levels of PCOCs in groundwater above appropriate NYSDEC criteria.

As established in the BHHE and the Ecological Risk Assessment (ERA), the presence of PCOCs in site and former Roblin Steel property groundwater is not considered to pose an unacceptable risk to human health or the environment because there are no completed exposure pathways. Therefore, the general response actions include only those activities designed to reduce PCOC concentrations in the shallow overburden groundwater, with a long-term objective of approaching NYSDEC groundwater criteria, to the degree practicable. This approach is also consistent with the established RAOs.

The general response actions include the following actions that, if implemented either in whole or in part, would meet the RAOs established for the site:

- **No Further Action** – No remediation; included as a baseline for comparison to other remedial alternatives identified for the site;

- **Monitored NA (MNA)** – A program to monitor groundwater to document the progress of NA in approaching the groundwater RAOs;

- **In Situ Treatment** – Implementation of air sparging (AS), permeable reactive barrier, chemical oxidation, or other equivalent technology to reduce concentrations of VOCs in groundwater.

- **Groundwater Extraction and Treatment** – Installation of a slurry wall or sheet piling, pump and treat system, or other equivalent technology to contain impacted groundwater; and

Source removal was completed under the IRMs completed for OU-1 and OU-2 and, therefore, will not be considered as a general response action going forward. Applicable remedial technologies and process options for each of the general response actions are identified and screened in Section 5.

4.4 Extent of Remediation

The remedial action will address PCOC-impacted groundwater with CVOC concentrations exceeding NYSDEC TOGS 1.1.1 water-quality standards.

4.4.1 Groundwater Delineation

The extent of PCOCs in groundwater was initially detailed in the RI Report (BBL, 2002a) and supplemented by data reported in the IRM Final Report for OU-3 (BBL, 2005). Delineation of groundwater impacted by Envirotek-related activities is best defined by analytical results from groundwater sampling events performed in May, July, and September 2004. Select monitoring wells were sampled during these sampling events, as approved by the NYSDEC. The 2004 sampling events indicated groundwater VOC concentrations less than or equal to the TOGS 1.1.1 values at upgradient well ENV-1 and at downgradient wells ENV-9, GW-3, and GW-7. During this same period, monitoring wells ENV-3R, ENV-4 (only for methylene chloride at 8 µg/L), ENV-7, and ENV-8 reported CVOCs exceeding the TOGS 1.1.1. Biological breakdown ("daughter") products of PCE and TCE have also been identified in these same wells (ENV-3R, ENV-7, and ENV-8) (Table 1).

During 2004, Groundwater PCOC concentrations were observed to decrease dramatically from the former SDA to nearby, downgradient monitoring wells, with outlying downgradient and upgradient monitoring wells reporting no significant impacts. This data indicates that the PCOC plume is shrinking and that the current, localized, residual PCOC impacts are the direct result of residual contamination caused by the former SDA operations.

4.4.2 Areal Extent and Volumes

The IRM Final Report for OU-3 (BBL, 2005) depicted total groundwater VOC isoconcentration gradients from groundwater-quality data obtained in September 1999 and in May, July, and September 2004 (Figures 5 through 9). The 2004 data represent groundwater-quality conditions following removal of source soil; both 2004 isoconcentration plots depict similar plume and isoconcentration gradient positioning. Therefore, for the purposes of this FFS Report, the most current (September 2004) groundwater-quality and isoconcentration data will be used for areal extent and volume calculations.

The areal extent of total VOCs (principally CVOCs) that exceeded 0.1 milligrams per liter (mg/L) is approximated at 4.8 acres. This area also approximates the areal extent where VOCs exceed the TOGS 1.1.1 criteria.

For the volume calculation, impacts to groundwater are limited to the shallow groundwater table that overlies the highly impermeable silty clay layer. The average saturated zone thickness of this shallow water table within the September 2004 0.1 mg/L isoconcentration gradient (as gauged on September 28, 2004) is approximately 5 feet. Using this thickness, a plume area of 4.8 acres, and an estimated porosity of 0.3, the total volume of impacted groundwater having PCOCs exceeding the TOGS 1.1.1 groundwater-quality standards and guidance is estimated at approximately 314,000 cubic feet.

4.5 Identification of New York State Standards, Criteria, and Guidances

This section presents a discussion of potential SCG that must be considered throughout the identification, screening, and evaluation of remedial alternatives during the FFS.

4.5.1 Potential New York State Standards, Criteria, and Guidances

SCG are promulgated and non-promulgated requirements that govern environmental and public health matters, particularly during the investigation and remediation of a site. For the purposes of this FFS Report, Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) designations utilized under the Federal CERCLA program are also covered under the SCG designation. SCG include cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a NYSDEC Inactive Hazardous Waste (IHW) site. SCG also include those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not legally applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a New York State IHW site, address problems or situations sufficiently similar to those encountered at an IHW site that their use is well suited to the particular site or actions at the site.

TBCs are non-promulgated advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential SCG. Along with SCG, TBCs may be used to develop the remedial action limits necessary to protect human health and the environment.

The NYSDEC categorizes SCG as chemical-specific, location-specific, or action-specific. These SCG categories are described below; a summary of typical, potentially applicable SCG is included in Table 2.

4.5.2 Potential Chemical-Specific New York State Standards, Criteria, and Guidances

Chemical-specific SCG are usually health- or risk-based values that may define acceptable exposure levels and, therefore, may be used in establishing remediation goals. In general, chemical-specific SCG are set for a single chemical or a closely related group of chemicals. A preliminary listing of potential chemical-specific SCG is included in Table 2.

4.5.3 Potential Location-Specific New York State Standards, Criteria, and Guidances

Location-specific SCG are restrictions placed on the concentrations of hazardous substances or the conduct of activities solely because they are in specific areas. Examples of areas that would potentially be affected by federal and state location-specific SCG include wetlands, floodplains, or navigable waters.

No surface-water bodies or wetlands are present onsite, and the site is not located within a 100-year flood plain. Based on this review, potential location-specific SCG were not identified as being applicable for the site.

4.5.4 Potential Action-Specific New York State Standards, Criteria, and Guidances

Action-specific SCG are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements generally focus on actions taken to remediate, handle, treat, transport, or dispose of hazardous wastes. These action-specific requirements do not, alone, determine the remedial alternative; rather, they indicate how a selected alternative must be achieved. The general types of potential action-specific SCG that may be applied to the site are briefly described below.

The Clean Water Act (CWA) requires that any point source discharge to waters of the United States meet all applicable requirements under the National Pollutant Discharge Elimination System (NPDES) program, in New York State the State Pollutant Discharge Elimination System (SPDES). These requirements would apply if the remedial alternatives evaluated during the FFS involve point source discharges to the Niagara River. The CWA Pretreatment Regulations state that all discharges to a publicly owned treatment works (POTW) must be treated to prevent interference with operation of the POTW, pass-through of pollutants, and violations of local limits. These regulations would be an SCG if the remedial alternatives for the site include discharges to a POTW.

Various requirements under the Clean Air Act would also be potential SCG if the remedial alternatives to be evaluated as part of the FFS involve air emissions. The National Ambient Air Quality Standards set maximum primary and secondary 24-hour concentrations for six criteria pollutants in the ambient air.

The RCRA facility standards address the design, facility operations, manifesting and record keeping, treatment, disposal, groundwater monitoring, and closure for certain types of waste management facilities.

Ambient Water Quality Criteria have been developed under the CWA as guidelines for the protection of freshwater aquatic life and human health, based on ingestion of water and fish consumption. These standards would be used to develop effluent discharge limits for those alternatives that require discharges to the Niagara River.

A preliminary listing of potential action-specific SCG is included in Table 2. These SCG will be revised and refined throughout the development of the FFS. The final SCG will be used in the detailed analysis of the effectiveness of remedial alternatives and will be factored into the development of performance standards to be included in the ROD for the site.

5. Identifying and Screening of Remedial Technologies

5.1 General

This section presents several potential remedial technologies that may be applicable to the general response actions identified in Section 4.3, and evaluates each for technical effectiveness and implementability. Those technologies that are retained for evaluation are assembled into remedial alternatives and then analyzed in detail in Section 6.

The technologies evaluated below include those designed to address groundwater, which is the only remaining medium, which impacts exceeding RAOs at the site, as discussed in Section 4.1. The technologies include a range of alternatives, all of which are evaluated for the potential effectiveness and implementability in meeting the RAOs identified for groundwater. This screening provides an initial evaluation of potentially effective remedial technologies, based on current site conditions, and the current status and level of experience for each technology (i.e., "proven" versus "innovative" technologies). The elimination of any technologies at this stage is not meant to entirely preclude their future use, provided that they later demonstrate that they can meet the required RAOs.

Criteria for screening remedial technologies and process options are based on selecting remedial actions that, in whole or in part, result in a reduction in the toxicity, mobility, or volume of PCOCs.

The evaluation of process options for effectiveness and implementability focuses on the following criteria:

- potential effectiveness in handling the estimated areas or volumes of adversely impacted groundwater;
- potential for meeting the site-specific RAOs;
- potential for impacts to human health and the environment during construction and implementation;
- estimated level of success of the option and its reliability when applied to the conditions at the site; and
- cost-effectiveness of the remedial option.

5.2 Technology Screening for Groundwater

The potentially applicable groundwater control/treatment process options include those associated with MNA, in situ treatment, groundwater extraction, and treatment (containment). Many of the alternatives discussed can be implemented as stand-alone remedies (i.e., hydraulic containment) or in conjunction with other remedial process options in support of another remedy. Where applicable, the potential applications for a specific remedial technology (either as a stand-alone remedy or as a component of a remedy) are discussed in the following subsections.

5.2.1 No Further Action

The No Further Action alternative is a general requirement of the FS process and is provided to serve as a baseline for comparison with other alternatives. Under the No Further Action alternative, no remedial techniques are used to treat the PCOCs. The groundwater would be allowed to remain in its current condition, with no monitoring or tracking of the fate and transport of the PCOCs. This alternative would leave the site in its present condition and would not provide additional environmental protection. The No Further Action alternative will be carried forward in the detailed analysis.

Effectiveness

The No Further Action alternative does not present a treatment remedy or containment technology to address or monitor the PCOCs present in the groundwater that exceed the RAOs at the site. However, no complete exposure pathways related to PCOCs were identified in the RI Report for the site given the current and foreseeable future conditions of the site. Unforeseen changes, however, in site conditions could alter existing conditions; therefore, the need to monitor future groundwater quality conditions may be a concern.

Implementability

The No Further Action alternative is technically feasible and could easily be implemented at the site.

Screening Conclusion

For comparison purposes, the No Further Action alternative will be considered as a baseline alternative during the evaluation of remedial alternatives.

5.2.2 Monitored Natural Attenuation

The completion of the IRM for OU-3 concluded that NA is a major contributor to the remediation of PCOCs in groundwater at the site, resulting in the significant reduction in the overall extent of the PCOC groundwater plume at the site. The MNA alternative would continue to rely on the in situ biological conditions present and documented at the site for treatment of the PCOCs. Specifically, reductive dechlorination processes will continue to break down the CVOC parent and daughter products present at the site over time. Periodic groundwater-quality monitoring would be a component of this alternative, thus providing a mechanism to track the plume and to gauge the effectiveness of MNA.

Effectiveness

The MNA alternative does not involve any active treatment or containment technologies; however, this is an active, ongoing process and the PCOCs present in the saturated zone will continue to be biodegraded in groundwater via natural degradation pathways. As discussed in the IRM Final Report for OU-3 (BBL, 2005), NA is well documented and has resulted in significant plume shrinkage. The findings of the IRM Final Report for OU-3 also substantiate that the NA processes are capable of complete dechlorination of the PCOCs and that they are occurring throughout the plume area. The completion of the source removal activities (OU-2) has and will continue to enhance the effectiveness of MNA, resulting in continued reductions in PCOCs. MNA as a stand-alone remedy has been shown to be an effective means of approaching regulatory cleanup goals, particularly at sites where source areas have already been remediated and groundwater is not intended to be used, as is the case for the Envirotek site.

Implementability

The MNA alternative is technically feasible, has been proven to be occurring at the site and, therefore, can continue to be implemented at the site.

Screening Conclusion

This alternative has been shown to be effective at reducing the PCOCs in groundwater, as well as providing a degree of protection of human health and the environment via periodic groundwater quality monitoring, and could continue to be implemented at the site; therefore, this alternative will be retained for further evaluation.

5.2.3 In Situ Treatment

The In Situ Treatment general response action includes two primary options: 1) a combination of AS/SVE and 2) chemical oxidation. These options were chosen based on their demonstrated ability to reduce contaminants in groundwater that have similar characteristics to those observed at this site. Each of these remedial options has been evaluated based on their ability to effectively achieve the RAOs, as summarized below.

5.2.3.1 Air Sparging/Soil Vapor Extraction with Monitored Natural Attenuation

This alternative involves the injection of pressurized air into the saturated zone via porous injection points and/or laterals. Upon injection, air bubbles would be expected to traverse horizontally and vertically through the shallow aquifer. This action causes VOCs in groundwater to be partitioned into the vapor phase or, in essence, "stripped" out of the groundwater. VOCs released to the vapor phase are then transferred to the unsaturated zone and recovered by an SVE system. The SVE system is necessary to ultimately recover VOCs stripped out of the groundwater in order to prevent the contaminants from re-entering the dissolved phase via contact with vertically migrating surface-water infiltration and condensing of the vapors into the liquid phase. Additionally, the main remedial mechanism of the AS system would produce vapor-phase CVOCs, thereby, necessitating the use of an SVE system to control any possible vapor migration to aboveground receptors. Additionally, this alternative includes the ongoing MNA processes discussed in Section 5.2.2.

Effectiveness

AS/SVE systems are an effective means for removing CVOCs from groundwater. However, as previously discussed, the heterogeneous nature of the soils may form preferential pathways through the saturated and unsaturated zones, and limiting the distribution and associated effectiveness of not only AS, but also of the SVE systems. The shallow groundwater table will also limit the effectiveness of the AS system by limiting the potential ROI associated with each injection point/lateral. Typically, the effectiveness of an AS system is directly related to the ROI experienced at the point of injection. The ROI is dependent not only on soil characteristics, but also on the thickness of the water column that the air bubbles will eventually travel through before reaching the unsaturated zone. Increased contact time between the injected air bubbles and the impacted groundwater increases the transfer of contaminants and the effectiveness of AS. The presence of the silty clay layer underlying the thin groundwater table across the site would greatly reduce the allowable depth of any injection points or laterals, thus creating a shallow water column for the AS system to work in, resulting in limited effectiveness.

The efficiency of an SVE system at this site will be primarily determined by the ROI of each extraction point. An SVE pilot test conducted in May 1992 indicated that the ROI specific to this site is expected to be less than 10 feet and that the removal of VOCs was generally unsuccessful. This was primarily attributed to the short-circuiting effect of air permeating through the ground surface in the SDA. To increase the ROI, a surface seal would be required.

The remedial effectiveness of AS is also dependent on the ability of the contaminants targeted for remediation to be "stripped" from the groundwater. While VOCs are "strippable," past investigations at this site indicate that non-PCOC contaminants, consisting of semivolatile PAHs, are present within the area targeted for remediation. These semivolatile contaminants, which may be mixed and co-eluted with the PCOCs within the area targeted for remediation to some degree, are not readily strippable; therefore, the effectiveness of AS is questionable.

Finally, the introduction of air (i.e., oxygen) into the groundwater may alter or inhibit the natural anaerobic conditions that have been shown to be producing significant PCOC reductions in OU-3 at the site via various NA processes.

Implementability

AS can readily be implemented at the site. However, as previously discussed, the removal of volatilized PCOCs from the groundwater would require installing and operating an SVE system. It would be necessary that AS, as well as the SVE system, take into account the heterogeneous nature of the soil and fill materials and the limited thickness of the saturated zone through the performance of a pilot study. The pilot study would evaluate the effective spacing of sparge points to provide coverage of the targeted area. Installation of a less-permeable cover system to enhance the effectiveness of the SVE system would also be necessary because premature short-circuiting of the SVE to the surface has previously been demonstrated as a significant concern.

An additional concern is that the use of AS may tend to mound the groundwater at the point of injection and radially to some degree. With the presence of preferential pathways, there exists the potential that this mounding could cause movement of the groundwater plume through these pathways that could go undetected with the current or even an expanded network of monitoring wells.

Screening Conclusion

Based on the heterogeneity and large range of conductivity in site soils, a pilot study would be necessary to determine the density and spacing of sparge points and extraction points. The effectiveness of AS is also highly questionable due to the low volatility of the PCOCs as a result of their mixing with semivolatile, non-PCOC contaminants. Additionally, AS will potentially counteract the anaerobic conditions present in site groundwater and could limit the effectiveness of the various NA processes that have resulted in marked reductions in the PCOCs. For these reasons, this technology is not retained for further evaluation.

5.2.3.2 Chemical Oxidation with Monitored Natural Attenuation

In situ chemical oxidation would consist of directly injecting slurry-containing oxidizing agents within or just above the saturated zone of the plume area. A representative chemical oxidation system has been selected and would employ the use of Fenton's chemistry (iron catalyst), in conjunction with hydrogen peroxide under acidified conditions to produce hydroxyl radicals. These radicals have an intense oxidation potential and would be able to degrade dissolved-phase VOCs. Additionally, this alternative includes the ongoing MNA processes discussed in Section 5.2.2.

Effectiveness

Chemical oxidation systems can be an effective means of reducing CVOC mass within the saturated zone. Similar to other in situ remedies, the effectiveness of this technology is a function of subsurface soil homogeneity, site hydrogeology, groundwater chemistry, and contaminant distribution. As discussed in previous sections, the site soils have been determined to be heterogeneous in nature and would likely result in the formation of preferential pathways within the subsurface, potentially limiting the distribution and associated effectiveness of chemical oxidation applications. As a result, sitewide application of chemical oxidation would likely require a closely spaced network of injection and monitoring points, as well as the completion of a pilot-scale test.

This site is also impacted with contaminants other than the PCOCs being addressed in this FFS Report. These non-PCOC contaminants, which are related to historical use of the site and not related to site activities conducted by Envirotek, are expected to adversely affect the performance of this alternative by "using" or "scavenging" some of the oxidizing agents, thus decreasing their availability to react with the target PCOCs at the site.

Through the course of applying chemical oxidation to the subsurface, an increase in dissolved oxygen may be a side effect resulting from the breakdown of reagents. This may alter the natural anaerobic conditions present at the site, which are realizing significant PCOC reductions via NA, causing these reactions to slow or cease entirely. The introduction of chemical oxidation reagents can also cause a biological sterilization of the affected area to some degree, where microorganisms, such as those attributed to a portion of the NA processes currently at work at the site, would not survive.

Implementability

Chemical oxidation can be implemented at the site; however, this remedy is typically more suited for the remediation of significantly higher contaminant concentrations than those recently shown to exist at the site. Current data indicate that only low, residual concentrations of PCOCs remain within the groundwater at the site (total CVOCs less than 1 ppm).

Remediation via chemical oxidation would require a pilot study within the affected saturated zone prior to full-scale implementation in order to gain real-time data crucial to the full-scale implementation of chemical oxidation. Another primary consideration is the heterogeneity and wide-ranging hydraulic conductivity of the saturated soils at the site, which, due to the likelihood of channeling, will likely require more injection points at a relatively tighter spacing than would normally be the case.

The use of most chemical oxidation reagents must be closely monitored and controlled, as some of them (e.g. hydrogen peroxide) can result in violent reactions with elevated temperatures and pressures. These reactions may result in the formation of preferential pathways that could lead to the undesirable and potential movement of the groundwater plume.

In addition, the site was originally developed for steel manufacturing and has undergone many phases of development that may potentially have contributed to unknown subsurface conditions and barriers, further creating a concern over the successful distribution of the chemical oxidation reagents. Observations of debris during soil boring work and the determination that barrier conditions exist as a result of the past recovery well pump tests support this concern.

Screening Conclusion

This Chemical Oxidation alternative could serve to reduce PCOCs with proper distribution and sufficient applications, with limited anticipated adverse impacts to sensitive receptors. Therefore, this technology is retained for further evaluation.

5.2.4 Groundwater Extraction and Treatment with Monitored Natural Attenuation

This alternative involves implementation of a groundwater hydraulic containment system at the site. For representative purposes, this would consist of a groundwater recovery and treatment system to maintain hydraulic control of the plume area at the site with the resulting extracted groundwater being either containerized and shipped for offsite disposal and treatment, or treated onsite with final discharge to the local POTW or to the Niagara River via a SPDES permit. Potential recovery systems include vertical recovery wells, horizontal trenches, and/or horizontal wells. Periodic groundwater-quality and system performance monitoring would be conducted to maximize the system's effectiveness and to monitor the reduction of the PCOC plume. Additionally, this alternative includes the ongoing MNA processes discussed in Section 5.2.2.

Effectiveness

A groundwater recovery system would provide recovery of the low-level PCOCs within the captured groundwater, and provide active control of the plume. However, both historical and current groundwater-quality data suggest that the plume is shrinking, making additional plume management controls unnecessary. Groundwater pump-down tests were conducted as part of the RI (1992), which resulted in the determination that boundary conditions exist within the target zone/area that would significantly impact the effectiveness of groundwater recovery efforts. In addition, hydrogeologic data generated in previous investigations and pump-down tests presented in past reports indicate that the shallow aquifer exhibits significant ranges in hydraulic conductivity (1.0×10^{-1} cm/sec to 1.6×10^{-5} cm/sec), most likely due to the dissimilar fill materials ubiquitous across the site. These data indicate that there are preferential pathways for the movement of groundwater in the soil and fill zone and that channeling of a groundwater recovery system would likely occur. Furthermore, the low concentrations of PCOCs that this technology is anticipated to recover would not likely result in any significant contaminant mass reduction over and above the NA processes that would be taking place concurrently with this alternative.

Implementability

The design and configuration of a groundwater recovery system would be a function of the most effective means of withdrawal with respect to hydraulic efficiency and cost from those areas exhibiting RAO exceedances. Potential recovery systems include vertical recovery wells, horizontal trenches, or horizontal wells, all of which are readily implementable. However, based on the surface structures, subsurface debris, and layout of the Roblin Steel property, horizontal trenches or horizontal wells would not be technically practical, thus requiring the installation of conventional vertical recovery wells. The final implementation of a groundwater recovery system would have to take into account the limiting factors discussed previously (e.g., boundary conditions and potential preferential pathways), and would likely result in system modifications and/or expansions to overcome these.

Screening Conclusion

It is not anticipated that this alternative will significantly reduce the concentration of PCOCs in groundwater at the site over and above the NA processes that would be taking place concurrently with that alternative. The heterogeneous nature of the subsurface soils at the site would greatly impact the implementability and ultimate effectiveness of this remedy. In addition, an assessment of the plume and ongoing NA processes concluded that the dissolved PCOC plume at the site is shrinking, with the most significant exceedances in the RAOs limited to an area immediately downgradient of the former SDA within the interior of the site. However, this technology is well demonstrated to provide an additional level of surety that the plume will remain contained and, therefore, this alternative will be retained for further analysis.

5.3 Alternative Screening Results

Four remedial alternatives were identified as being potentially feasible for addressing the PCOCs present at the site. The alternatives were screened based on anticipated effectiveness and implementability with respect to the current site conditions. Based on the screening results, the following remedial alternatives to remediate PCOCs within site groundwater are retained for detailed evaluation:

- No Further Action;
- MNA;
- Chemical Oxidation with MNA; and
- Groundwater Extraction and Treatment with MNA.

6. Detailed Analysis of Alternatives

6.1 General

In this section, the remedial alternatives are described and analyzed in greater detail. The purpose of the detailed analysis is to assess the ability of each remedial alternative to meet the evaluation criteria described in Section 6.2 below. The results of this detailed analysis of the remedial alternatives will be used to aid in recommending the appropriate remedial alternative for implementation at the site.

6.2 Evaluation Criteria

The detailed analysis presented below has been prepared in general accordance with the NCP, as well as NYSDEC TAGM 4030. The detailed analysis assesses the considered alternatives against each of the following evaluation criteria:

- overall protection of human health and the environment;
- compliance with SCG;
- short-term effectiveness;
- long-term effectiveness and permanence;
- reduction in contaminant toxicity, mobility, or volume;
- implementability; and
- cost-effectiveness.

Each of the evaluation criteria are described in following subsections.

6.2.1 Overall Protection of Human Health and the Environment

This evaluation of the remedial alternative assesses whether or not the alternative provides adequate protection of human health and the environment. The overall evaluation relies on the assessments conducted under other evaluation criteria, including long- and short-term effectiveness and compliance with SCG.

6.2.2 Compliance with New York State Standards, Criteria, and Guidances

This criterion evaluates the remedial alternative's ability to comply with SCG. The following items are considered during the evaluation of the remedial alternative:

- compliance with chemical-specific SCG;
- compliance with location-specific SCG; and
- compliance with action-specific SCG.

6.2.3 Short-Term Impacts and Effectiveness

The short-term impacts and effectiveness of the remedial alternative is evaluated relative to its effects on human health and the environment during implementation. Evaluating the alternative with respect to short-term effectiveness considers the following:

- short-term exposures that might be posed to the community during implementation of the alternative;
- potential impacts to onsite workers during the remedial actions, and the effectiveness and reliability of protective measures;
- potential environmental impacts of the remedial action and the effectiveness of mitigation measures to be used during implementation; and
- amount of time necessary to implement the remediation.

6.2.4 Long-Term Effectiveness and Permanence

Each remedial alternative is evaluated relative to its long-term effectiveness and permanence by considering the risks that may remain after completing the remedial alternative. The following factors will be assessed:

- environmental impacts remaining from untreated waste or treatment residuals at the completion of the remedial alternative;
- adequacy and reliability of engineering and/or institutional controls (if any) that will be used to manage treatment residuals or remaining untreated waste; and
- ability to meet the RAOs.

6.2.5 Reduction of Contaminant Toxicity, Mobility, or Volume through Removal or Treatment

This evaluation criterion addresses the degree to which remedial actions will permanently or significantly reduce the toxicity, mobility, or volume of the PCOCs at the site through treatment or removal. The evaluation focuses on the following factors:

- treatment process and amount of materials to be removed or treated;
- anticipated ability of the removal or treatment process to reduce the toxicity, mobility, or volume of PCOCs in the SDA and other site media;
- nature and quantity of treatment residuals that will remain after removal or treatment;
- relative amount of PCOCs that will be destroyed, treated, or recycled;
- degree to which the treatment is irreversible; and

- degree to which removal or treatment reduces inherent hazards posed by principal threats at the site.

6.2.6 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing the remedial alternative, including the availability of the various services and materials required for implementation. The following factors are considered during the implementability evaluation:

- *Technical Feasibility* – This factor refers to the relative ease of implementing or completing the remedial alternative, based on site-specific constraints. In addition, the constructability, operational reliability, and ease with which the effectiveness of the remedial action can be monitored are considered.

- *Administrative Feasibility* – This factor refers to the ease of acquiring, and the time required to obtain, approvals and permits (if necessary).

- *Availability of Services and Materials* – This factor refers to the ability to acquire the necessary equipment, materials, and skilled services/labor to perform the remedial alternative.

6.2.7 Cost-Effectiveness

This evaluation criterion refers to the total cost to implement the remedial alternative. The total cost of each alternative represents the sum of the direct capital costs (e.g., materials, equipment), indirect capital costs (e.g., engineering, project management, permitting), operation and maintenance costs, and contingency factors. These costs are estimated with expected accuracies of -30% to +50%, in accordance with the *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA* (USEPA, 1988) and the *Technical and Administrative Guidance Memorandum (TAGM) 4030* (NYSDEC, 1990). The cost analysis uses a discount rate of 7% in the present worth analyses, as recommended in *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (USEPA Document #540-R-00-002) (USEPA 2000). The cost estimates are developed to aid in the comparison of the remedial alternatives. For this evaluation, a 30% contingency factor is included to cover unforeseen costs incurred during implementation of the chemical oxidation and groundwater extraction alternatives due to the dynamics and level of effort associated with each of these remedies, while a 20% contingency factor is used for the MNA alternative to account for possible additional work because this alternative has a lower potential for unforeseen costs based on the level of effort to implement. Remedial cost estimates for Alternatives 2, 3, and 4 are included as Tables 3, 4, and 5, respectively. No cost table for Alternative 1 has been prepared, because there is no cost associated with it.

6.3 Detailed Analysis of the Remedial Alternatives

This section presents the detailed evaluation of each alternative presented in Section 5.3. Each alternative is evaluated against the criteria listed in Section 6.2. In applying the criteria, a judgment is made with regard to the degree by which each evaluation criterion is met, resulting in the assignment of a low, medium, or high rating for each alternative.

6.3.1 Alternative 1 – No Further Action

This alternative does not involve any onsite activities (i.e., active remedial and site monitoring activities). As such, there are no implementation requirements or handling of hazardous or nonhazardous materials associated with this alternative.

6.3.1.1 Overall Protection of Human Health and the Environment

This alternative is generally not considered to be protective of human health and the environment. Concentrations of PCOCs have been detected in the groundwater exceeding the RAOs. Under this alternative, there would be no monitoring and/or tracking of the PCOCs to assess any potential threat to ecological and human receptors through future direct contact until RAOs are eventually reached via ongoing NA processes. However, the BHHE and Ecological Screening Evaluation performed as part of the RI for the site indicated that the presence of CVOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of any exposure pathways.

6.3.1.2 Compliance with New York State Standards, Criteria, and Guidances

There are no location-specific SCG for this alternative. Chemical-specific SCG currently include the NYSDEC TOGS 1.1.1, Ambient Water Quality Standards, which are currently exceeded based on groundwater sampling performed at the site. Although NA processes will continue to reduce PCOCs under this alternative, the lack of any future PCOC monitoring in groundwater or employment of engineering/institutional controls may not meet available guidance

Action-specific SCG for this alternative are not applicable because there would not be any site work with this alternative.

This alternative is rated low for compliance with SCG.

6.3.1.3 Short-Term Impacts and Effectiveness

Since no remedial construction activities are required to implement this alternative, there are no associated short-term risks to onsite workers. This alternative is rated high for short-term effectiveness.

6.3.1.4 Long-Term Effectiveness and Permanence

No remedial activities or site monitoring would be implemented to address the PCOC in groundwater with this alternative. However, because NA processes are documented to be occurring at the site, it is anticipated that the RAOs will be met over time with this alternative. This alternative is, therefore, rated as moderate for long-term effectiveness and permanence.

6.3.1.5 Reduction in Contaminant Toxicity, Mobility, or Volume

Under this alternative, it is anticipated that there would be a reduction in toxicity, mobility, and volume of PCOCs at the site over time. The NA processes presented in OU-3 are expected to continue to reduce the PCOCs in groundwater, despite the lack of any actions under this alternative. Therefore, this alternative is rated high for reduction in contaminant toxicity, mobility, and volume.

6.3.1.6 Implementability

The No Further Action alternative is easily implemented and is rated high for implementability.

6.3.1.7 Cost-Effectiveness

There is no cost to implement the No Further Action alternative.

6.3.2 Alternative 2 – Monitored Natural Attenuation

MNA relies on the continuance of the biodegradation processes within the site groundwater, discussed in IRM Final Report for OU-3 (BBL, 2005), to achieve RAOs over time. Periodic groundwater-quality monitoring would be conducted with this alternative to document and track the reductions in contaminants and any potential movement of the plume. Implementation requirements are relatively few given the nature of the remedial aspect of the alternative and the existence of a network of monitoring wells that has been used in the recent past.

6.3.2.1 Overall Protection of Human Health and the Environment

This alternative utilizes the ongoing, in situ NA processes in groundwater, which are capable of complete reduction of the PCOCs, as documented with the completion of OU-3. Recent groundwater-quality data indicate that the remaining PCOCs at the site are at low levels, with reductions expected to decrease over time via NA. It has been noted that the BHHE and Ecological Screening Evaluation performed as part of the RI for the site indicated that the presence of CVOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of any exposure pathways. Therefore, this alternative is considered to have a high rating for overall protection of human health and the environment.

6.3.2.2 Compliance with New York State Standards, Criteria, and Guidances

No location-specific SCG have been identified. Chemical-specific SCG currently include low-level exceedances in the NYSDEC TOGS 1.1.1, Ambient Water Quality Standards. However, it is anticipated that this chemical-specific SCG will be eliminated as PCOC reductions continue to occur over time via NA processes. This is supported by the findings of the IRM Final Report for OU-3 (BBL, 2005).

Action-specific SCG for this alternative would encompass Occupational Safety and Health Administration (OSHA) regulations for work performed at the site during monitoring activities. These regulations would include general industry standards (29 Code of Federal Regulations [CFR] 1910), safety and health standards (29 CFR 1926), and record-keeping, reporting, and related regulations (29 CFR 1904). Compliance with the OSHA guidelines would be achieved by following a site-specific Health and Safety Plan (HASP). Disposal of wastewater generated during the periodic groundwater sampling events would be minimal and would involve compliance with applicable Department of Transportation (DOT) placarding and handling, and RCRA standards. This alternative is rated high for compliance with SCG.

6.3.2.3 Short-Term Impacts and Effectiveness

The potential risks to public health and the environment are limited to the periodic site monitoring and groundwater sampling activities that would be conducted with this alternative. Site workers (remedial and other personnel) could potentially be exposed to PCOCs through volatilization and dermal contact during the sampling of monitoring wells and the handling and storage of wastewater generated as a result of those activities. Mitigation measures would include the use of appropriate protective clothing and respiratory protection, if necessary, and the use of adequate decontamination procedures. These controls would be presented in a site-specific HASP. The short-term effectiveness of this alternative is considered high.

6.3.2.4 Long-Term Effectiveness and Permanence

This alternative utilizes the naturally occurring degradation processes that have been shown to be occurring at the site, as discussed in the IRM Final Report for OU-3 (BBL, 2005), to reduce the mass of PCOCs in groundwater. It is anticipated that, upon reaching the RAOs, these same processes will continue. Therefore, the magnitude of long-term effectiveness and permanence is considered high.

6.3.2.5 Reduction in Contaminant Toxicity, Mobility, or Volume

The evaluation of NA completed under OU-3 concluded that this alternative has been a significant process in the degradation of PCOCs in groundwater at the site, resulting in the current low-level PCOCs in groundwater, and that it is anticipated that NA processes will accomplish continued reduction of the PCOCs over time. This alternative is rated high for reduction in contaminant toxicity, mobility, and volume.

6.3.2.6 Implementability

This alternative is readily implemented at the site, as is evidenced by its ongoing occurrence. This alternative is rated high for implementability.

6.3.2.7 Cost-Effectiveness

The MNA alternative has been estimated at $153,200 (Table 3), based on a present worth value in 2005 dollars. This cost estimate is based on a 5-year monitoring period, and includes the preparation of an Operation and Maintenance Plan. Groundwater samples will be collected and analyzed annually to monitor the NA, and an Annual Report will be prepared and submitted at the end of each year to document NA at the site. This cost estimate does not include any cost for monitoring well installation because it is assumed that eight existing monitoring wells at the site would be utilized. Costs associated with well decommissioning have not been included, because the NYSDEC has expressed an interest in obtaining ownership of all monitoring wells upon completion of this alternative.

6.3.3 Alternative 3 – Chemical Oxidation with Monitored Natural Attenuation

In situ chemical oxidation would consist of directly injecting a slurry containing oxidizing agents within the saturated zone of the plume area. A bench-scale laboratory study followed by a pilot-scale study of this alternative would be completed to determine the efficacy of this remedy and to obtain data to design a full-scale system. Given the heterogeneous nature of the soils within the target area, a closely spaced network of temporary injection points would likely be required. Conceptually, the pilot- and full-scale implementation of this alternative would require 15 and 100 temporary injection points, respectively. The pilot program would involve two rounds of injections, while the sitewide application would involve a single injection, larger volume event at each point. As a component of the pilot study, 10 monitoring wells would be installed radially from the pilot-study injection points to obtain real-time data for designing the full-scale application. The pilot-study monitoring wells would be sampled prior to, between, and subsequent to the two pilot-study injection events.

It is anticipated that the pilot-study and full-scale applications would be completed within 2 years, with PCOC groundwater-quality monitoring for MNA being conducted for 5 years. NA processes would be required to further reduce the PCOCs to RAO levels. Based on a request of NYSDEC, the monitoring wells would be relinquished to the state.

6.3.3.1 Overall Protection of Human Health and the Environment

This remedy would result in the destruction of PCOCs in groundwater and would leave innocuous compounds as a result of the in situ chemical reactions, with reductions achieved in a relatively short period of time. It is suspected that the RAOs could be satisfied within a relatively short time frame using this alternative. Therefore, this alternative is considered to have a high rating for overall protection of human health and the environment.

6.3.3.2 Compliance with New York State Standards, Criteria, and Guidances

No location-specific SCG have been identified. Chemical-specific SCG currently include low-level exceedances in the NYSDEC TOGS 1.1.1, Ambient Water Quality Standards. However, it is anticipated that the chemical-specific SCG would be eliminated with the reduction of PCOCs in groundwater that would be accomplished through the implementation of this alternative. This alternative would involve the introduction of one or more select chemical compounds into the subsurface.

Action-specific SCG for this alternative would encompass OSHA regulations for activities performed at the site during implementation and site monitoring. These regulations would include general industry standards (29 CFR 1910), safety and health standards (29 CFR 1926), and record-keeping, reporting, and related regulations (29 CFR 1904). Compliance with the OSHA guidelines would be achieved by following a site-specific HASP. Possible permitting requirements and SPDES may pertain to the underground injections associated with this alternative. Wastes generated during the implementation would entail compliance with DOT placarding and handling, and RCRA standards. This alternative is rated high for compliance with SCG.

6.3.3.3 Short-Term Impacts and Effectiveness

The potential risks to public health and the environment include the installation of the injection points, the injection of chemical reagents, and the periodic site monitoring and groundwater sampling activities that would be conducted with this alternative. Site workers (remedial and other personnel) could potentially be exposed to PCOCs and treatment chemicals through inhalation and dermal contact during the injection activities, the sampling of monitoring wells, the handling and storage of chemicals, and the operation and maintenance of the remedial systems. Mitigation measures would include the use of appropriate protective clothing and respiratory protection, if necessary; the use of adequate decontamination procedures, and the proper storage, handling, and disposal of generated wastes. These controls would be presented in a site-specific HASP.

The results of the BHHE concluded that the presence of the PCOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of potential receptors. Therefore, the PCOCs in site groundwater that would be present until the RAOs are met would not be a concern.

This remedy entails the treatment of contaminants within the subsurface; therefore, neither the transfer of contaminants to the air or other media, nor the handling/discharging of contaminated groundwater would be necessary. The short-term effectiveness of this alternative is considered high.

6.3.3.4 Long-Term Effectiveness and Permanence

This technology relies on the rapid break-down of PCOCs into innocuous compounds. Therefore, the magnitude of long-term effectiveness and permanence is considered high.

6.3.3.5 Reduction in Contaminant Toxicity, Mobility, or Volume through Treatment

The use of this remedy would reduce the mass of PCOCs within the groundwater; thus toxicity, mobility, and volume are also reduced.

6.3.3.6 Implementability

Chemical oxidation followed by MNA can be implemented at the site. The remedy utilizes specialized and generally patented processes or applications that require contractors capable of providing, and qualified to provide, these services. The use of most chemical oxidation reagents must be closely monitored and controlled because some of them (e.g. hydrogen peroxide) can result in intense and sometimes violent reactions. Permitting may be required for the injection of the chemical agents. Certain areas of the site within the targeted plume area may have limited accessibility both at the surface (e.g., buildings/structures, concrete slabs/structures) and within the subsurface (e.g., buried debris). Another primary consideration, based on the heterogeneity and wide-ranging hydraulic conductivity at the site, is that a significant number of injection points at relatively tight spacing would be required to adequately cover the area targeted for treatment, resulting in high capital and operation and maintenance costs. Therefore, the implementability of this alternative is rated as moderate.

6.3.3.7 Cost-Effectiveness

The implementation of a chemical oxidation and MNA program has been estimated at $873,000 (Table 4), on a present worth value in 2005 dollars. The cost estimate for this program at the site would include a pilot-scale study followed by full-scale, in situ implementation. The pilot-scale study would include two rounds of chemical oxidation applications at 15 temporary, direct-push injection points located within a localized area of the plume. Ten new monitoring wells would be installed in the immediate vicinity of the pilot-scale study area, with sampling and analysis conducted before, between, and after the two injection events in order to gauge the effectiveness of the treatment and to provide full-scale design parameters.

The full-scale implementation would include 100 temporary, direct-push injections over the entire footprint of the plume. For the full-scale implementation, eight of the existing monitoring wells would be sampled and analyzed before and after the injection event. The cost estimate also includes the sampling and analysis of eight existing monitoring wells for MNA for a period of 5 years following the full-scale implementation, as well as the preparation of Remedial Action and Operation and Maintenance Work Plans, Progress Reports, and a Remedial Action Report. Additional costs include project management and regulatory interfacing, onsite supervision, injection point installations, and waste disposal. Costs associated with well decommissioning have not been included because the NYSDEC has expressed an interest in obtaining ownership of all monitoring wells upon completion of this alternative.

6.3.4 Alternative 4 – Groundwater Extraction and Treatment

Containment of the PCOC plume would be accomplished via groundwater recovery in this alternative. Conceptual site modeling for the containment of the targeted plume area has indicated that three large-diameter recovery wells with estimated pumping rates ranging from 1 to 2 gallons per minute (gpm) would provide hydraulic control and containment of the plume area currently exhibiting RAO exceedances. The recovered groundwater would be pumped to an onsite treatment building, where it would be treated to below applicable water-quality standards, with final discharge to the local sanitary sewer system or to the Niagara River. For the purposes of this evaluation, it is assumed that containment would be required until groundwater standards are met, with the duration of continued groundwater recovery operations estimated at 30 years. It should be noted that the remedial benefits of this alternative would be enhanced by the NA mechanisms occurring simultaneously with the groundwater recovery activities. Upon reaching the RAOs, if technically practicable, remedial and monitoring activities would cease, and the monitoring wells would be relinquished to the NYSDEC based on their interest in retaining them. All recovery wells would be properly decommissioned.

6.3.4.1 Overall Protection of Human Health and the Environment

This alternative provides containment of the PCOC plume via groundwater recovery. The implementation of this alternative would provide an additional degree of protection against possible future migration of the PCOC plume beyond its current area. However, the need for any such protection is questionable based on site groundwater-quality data that indicate that the plume is shrinking. This alternative is considered to have a high rating for overall protection of human health and the environment.

6.3.4.2 Compliance with New York State Standards, Criteria, and Guidances

No location-specific SCG have been identified. Chemical-specific SCG currently include low-level exceedances in the NYSDEC TOGS 1.1.1, Ambient Water Quality Standards. However, it is anticipated that the chemical-specific SCG would be eliminated with the reduction of PCOCs in groundwater that would be accomplished through the implementation of this alternative. The implementation of this alternative would result in the discharge of potentially impacted air and groundwater to the environment. Controls would be placed on these effluent streams, such as treatment and periodic monitoring, and permits would be required for both air emissions and surface-water discharges.

Action-specific SCG for this alternative would encompass OSHA regulations for activities performed at the site during implementation and site monitoring. These regulations would include general industry standards (29 CFR 1910), safety and health standards (29 CFR 1926), and record-keeping, reporting, and related regulations (29 CFR 1904). Compliance with the OSHA guidelines would be achieved by following a site-specific HASP. Wastes generated during implementation would entail compliance with DOT placarding and handling, and RCRA standards. This alternative is rated high for compliance with SCG.

6.3.4.3 Short-Term Impacts and Effectiveness

The results of the BHHE indicated that the presence of the PCOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of any exposure pathways. The potential risks to public health and the environment related to the implementation of this alternative, include the periodic site and system monitoring and groundwater sampling activities. Site workers (remedial and other personnel) could potentially be exposed to PCOCs and treatment chemicals through inhalation and dermal contact during the sampling of monitoring wells and the operation and maintenance of the remedial systems. Mitigation measures would include the use of appropriate protective clothing and respiratory protection, if necessary; the use of adequate decontamination procedures, and the proper storage, handling, and disposal of generated wastes. These controls would be outlined in a site-specific HASP.

Air and surface-water discharges would be conducted with this alternative, creating concerns regarding the protection of the public and the environment. These discharges would be permitted, and controls (e.g. treatment, monitoring, and sampling) would be instituted to minimize any risks. The short-term effectiveness of this alternative is rated high.

6.3.4.4 Long-Term Effectiveness and Permanence

This alternative as a stand-alone remedy would involve the long-term operation of the system, and, even with proper design and operation, it may never achieve RAOs given the heterogeneous subsurface conditions and the system's own inherent limitations. This alternative's primary function would be to achieve containment of the plume, and it would not likely result in any significant direct PCOC reductions. However, as discussed previously, the ongoing NA processes would be ongoing during the implementation of this alternative, thus resulting in the permanent reduction of PCOCs in groundwater. In addition, groundwater recovery would continue to be implemented until RAOs are met or until such time that the performance of the system does not justify sustained operation. Therefore, this alternative is considered to have a high degree of long-term effectiveness and permanence, with consideration of the underlying effects that NA has on this remedy.

6.3.4.5 Reduction in Contaminant Toxicity, Mobility, or Volume through Removal or Treatment

It is anticipated that containment via groundwater recovery would significantly decrease any potential for migration of the plume while the system is in operation. Upon shutdown of this system, hydraulic control would be lost, and the mobility of any remaining PCOCs would increase. However, the system would not be shut down until RAOs are met; therefore, the increased mobility of any remaining PCOCs would not be a concern.

Considering the NA activities that would be at work at the site during the operation of the groundwater recovery system, it is expected that the reduction in PCOCs at the site would be significant. The reduction in contaminant volume, mobility, and toxicity is considered high for this alternative given the assumption that NA will also be at work during this remedy's implementation.

6.3.4.6 Implementability

Containment of the targeted plume area is feasible at this site. Conceptual site modeling of a groundwater recovery system indicated that three recovery wells pumping at 2 gpm would provide an adequate capture zone. These design parameters would be readily achievable, and the site is accessible for implementation. However, data collected during past pump-down tests indicated that boundary conditions exist within the saturated zone, as well as a significant range of hydraulic conductivity, which will likely reduce the performance of this remedy. This alternative has been given a moderate rating with respect to implementability.

6.3.4.7 Cost-Effectiveness

The cost of long-term containment of the targeted plume has been estimated at $1,491,000 (Table 5) on present worth value in 2005 dollars. The cost estimate for the long-term containment of the plume includes the installation of three groundwater recovery wells and a treatment system consisting of a filtration system; three granular activated carbon units connected in series; and the necessary pumps, controls, equipment housing, electrical hookups, and piping network to handle and treat the recovered groundwater. The cost estimate also includes the preparation of Remedial Action and Operation and Maintenance Work Plans, Progress Reports, and a Remedial Action Report. Additional costs include engineering, project management and regulatory interface, onsite supervision, recovery well and system installations, groundwater sampling and analyses, waste disposal, system removal, and periodic equipment replacement costs.

Costs associated with groundwater sampling and analyses have been calculated for eight existing monitoring wells at the site annually for a period of 30 years. The cost also includes acquiring the necessary discharge permit, and costs for the monthly sampling and reporting that would likely be required for the discharge of the treated groundwater to the municipal sanitary sewer or to the Niagara River. Costs associated with decommissioning the three recovery wells have been included; however, no costs for decommissioning the monitoring wells have been included because the NYSDEC has expressed an interest in obtaining ownership of all monitoring wells upon completion of remedial efforts.

7. Comparative Analysis of Alternatives

7.1 General

The purpose of this analysis is to compare the relative performance of the remedial alternatives for site groundwater under each of the evaluation criteria presented in Section 6.2. This comparative analysis is designed to identify the advantages and disadvantages of each alternative relative to one another and to highlight the key tradeoffs for decision making.

7.2 Site Remedial Alternatives

As determined through the screening and detailed analysis of remedial technologies, the following alternatives are compared below with a comparative summary presented in Table 6.

- Alternative 1 – No Further Action;
- Alternative 2 – MNA;
- Alternative 3 – Chemical Oxidation with MNA; and
- Alternative 4 – Groundwater Extraction and Treatment.

7.2.1 Overall Protection of Human Health and the Environment

Each alternative offers a high degree of protection of human health and the environment, with the exception of Alternative 1 (No Further Action). Alternative 1 does not provide any additional protection for the site and therefore has a low rating for this criterion. Alternatives 2, 3, and 4 each involve the reduction of PCOCs in groundwater at the site and implement measures to monitor and track the groundwater quality. As such, they each have a high rating for the overall protection of human health and the environment.

Based on conclusions presented in the IRM Final Report for OU-3 (BBL, 2005), MNA appears to have accomplished significant reductions in PCOCs in groundwater at the site, and some areas have already achieved RAOs. Furthermore, the BHHE indicated that the presence of CVOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of any exposure pathways. Therefore, additional remedial measures, above and beyond MNA, do not provide any additional protection of human health and the environment.

7.2.2 Compliance with New York State Standards, Criteria, and Guidances

No location-specific SCG have been identified for any of the alternatives. Chemical-specific SCG for each alternative include current exceedances in the NYSDEC TOGS 1.1.1, Ambient Water Quality Standards, demonstrated by the most recent groundwater-quality data (BBL, 2005). However, it is expected that reductions in PCOCs will occur within variable time frames for all alternatives. Because Alternative 1 (No Action) does not include any additional provisions, compliance with the RAOs cannot be determined. Therefore, Alternative 1 (No Further Action) has the lowest compliance rating with respect to this issue. Alternative 2 (MNA) has no additional chemical-specific SCG associated with it, while Alternatives 3 (Chemical Oxidation with MNA) and

4 (Groundwater Extraction and Treatment) do have additional, minor concerns with respect to this issue (e.g. permitting requirements).

Action-specific SCG are non-existent with Alternative 1 (No Further Action). The remaining alternatives each have very similar action-specific compliance issues; however, these issues are expected to be minimal and easily addressed through the implementation of a site-specific HASP and procedural controls.

Therefore, Alternative 1 (No Further Action) has the lowest degree of compliance with SCG, while the remaining alternatives all have high ratings with respect to this criterion.

7.2.3 Short-Term Impacts and Effectiveness

All four alternatives have a high rating for short-term effectiveness. Alternatives 2 (MNA), 3 (Chemical Oxidation with MNA), and 4 (Groundwater Extraction and Treatment) have limited issues with respect to this criterion that could be readily addressed through procedural controls and the implementation of a HASP.

7.2.4 Long-Term Effectiveness and Permanence

As previously discussed, it is anticipated that the NA mechanisms currently in place at the site will continue to reduce the remaining PCOCs in groundwater with the implementation of either Alternative 1 (No Further Action) or Alternative 2 (MNA). However, periodic groundwater quality monitoring will provide data to substantiate the anticipated continued PCOC reductions, thus facilitating a higher degree of surety that future, unforeseen potential threats to sensitive receptors would be detected. Therefore, the Alternative 2 (MNA) has a more desirable long-term effectiveness and permanence than the No Further Action alternative and, therefore, carries a higher rating for this criterion.

Alternative 3 (Chemical Oxidation with MNA) would result in the reduction of contaminants to innocuous by-products in a relatively short period of time. Alternative 4 (Groundwater Extraction and Treatment) in and of itself is not anticipated to significantly reduce PCOCs in groundwater; however, it is anticipated that NA processes would take place concurrently with the implementation of a containment system, thus realizing significant PCOC reductions. Therefore, Alternatives 3 and 4 also have high ratings for this criterion.

7.2.5 Reduction of Contaminant Toxicity, Mobility, or Volume

All four alternatives would result in the reduction of PCOCs in groundwater and are rated high for this criterion. It is anticipated that Alternative 3 (Chemical Oxidation with MNA) would achieve the RAOs much more quickly than the remaining alternatives. However, as concluded in the IRM Final Report for OU-3 (BBL, 2005), Alternative 2 (MNA) is capable of reducing the PCOCs in groundwater to meet the RAOs, although over a longer time period than Alternative 3 (Chemical Oxidation with MNA).

7.2.6 Implementability

Alternative 1 (No Further Action) and Alternative 2 (MNA) are readily implementable and thus, rated high for implementability. Alternative 2 (MNA) will require the completion of limited future site activities in the form of short-term, periodic groundwater sampling. Alternative 3 (Chemical Oxidation with MNA) would involve the completion of several temporary injection points, as well as possibly several injections and, due to surface and subsurface structures/obstacles, some difficulties may be encountered during the implementation of this remedy. Boundary conditions, as well as varying hydraulic conductivity indicated by past groundwater pump testing likely will significantly affect the implementability of Alternative 4 (Groundwater Extraction and Treatment) by interfering with its ability to achieve and maintain hydraulic control. Therefore, Alternatives 3 (Chemical Oxidation with MNA) and 4 (Groundwater Extraction and Treatment) are rated lower than Alternatives 1 (No Further Action) and 2 (MNA) with respect to implementability.

7.2.7 Cost-Effectiveness

Alternative 1 (No Further Action) carries no cost because no future activities would be conducted at the site. Alternative 3 (Chemical Oxidation with MNA) and Alternative 4 (Groundwater Extraction and Treatment) each require the completion of substantial remedial measures and onsite activities, and have significantly higher costs associated with their implementation compared to the other alternatives. Alternative 2 (MNA) has the lowest projected cost, other than Alternative 1 (No Further Action) because it utilizes the ongoing natural biodegradation processes to remediate the PCOCs and eventually achieve the RAOs.

7.2.8 Alternatives Comparative Analysis Summary

Based on this FFS review, Alternative 2 (MNA) has been selected as the preferred groundwater remedy for the following reasons:

- MNA is readily implementable and utilizes the ongoing in situ degradation processes that have been shown to be capable of complete reductions in PCOCs. Reductions in contaminant levels to below regulatory guidance values have already been achieved at some sampling points. Remedial measures in addition to or in lieu of the MNA alternative do not appear to be warranted based on the findings of the IRM Final Report for OU-3 (BBL, 2005) (e.g., a shrinking plume and reductions in PCOCs).

- The BHHE and Ecological Screening Evaluation performed as part of the RI for the site indicated that the presence of CVOCs in groundwater does not pose an unacceptable level of risk given the current and reasonably anticipated future use of the site, as well as the lack of potential receptors. The MNA alternative provides protection against this threat through the monitoring of groundwater-quality conditions until RAOs are met.

- Alternative 3 (Chemical Oxidation with MNA) is likely to achieve RAOs in the shortest amount of time. However, its implementation costs are the highest, by far, of the four alternatives. The presence of non-PCOC contaminants in groundwater and heterogeneous soils within the area targeted for remediation calls into question the effectiveness that this remedy would have at achieving RAOs at the site. In addition, the evaluation of this alternative indicates that its use is not warranted given its high cost and the current conditions and remedial status of the site (i.e., source areas have been remediated, and PCOCs in groundwater are decreasing).

- Alternative 4 (Groundwater Extraction and Treatment) also has a significantly higher implementation cost than MNA. The effectiveness of this alternative is also questionable given the difficulties that are anticipated with its implementation. By itself, this remedy is not expected to effect significant reductions in PCOC concentrations in groundwater given the limitations of the technology. The NA processes that would be occurring in conjunction with the containment remedy would likely accomplish the majority of any PCOC reductions.

- Although the MNA alternative has a higher cost than the No Further Action alternative, the MNA alternative is a cost-effective remedy that would not only result in the continued reduction of residual PCOCs in groundwater, but would also provide the data through monitoring of groundwater, which would verify the continued reduction of PCOCs at the site.

8. References

BBL. 1999. *Remedial Investigation/Feasibility Study Work Plan.*

BBL. 2000 *Preliminary Remedial Investigation Report.*

BBL. 2002a. *Remedial Investigation Report.*

BBL. 2002b. *Interim Remedial Measures Work Plan for Operable Unit 1* (November).

BBL. 2003a. *Interim Remedial Measures Work Plan for Operable Unit 2* (April).

BBL. 2003b. *Interim Remedial Measures Final Report for Operable Unit 1.*

BBL. 2004a. *Interim Remedial Measures Work Plan for Operable Unit 3.*

BBL. 2004b. *Interim Remedial Measures Final Report for Operable Unit 2.*

BBL. 2005. *Interim Remedial Measures Final Report for Operable Unit 3 (March).*

NYSDEC. 1989. Technical and Administrative Guidance Memorandum (TAGM) No. 4030, *Remedial Action Selection at Inactive Hazardous Waste Disposal Sites* (September 1989, revised May 1990);

USEPA. 1988. Guidance *for Conducting Remedial Investigation and Feasibility Studies under CERCLA.*

USEPA. 1989. *Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA.*

USEPA. 1987 *The National Oil and Hazardous Substances Contingency Plan.*

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

Sample I.D.	NYSDEC	ENV-1					ENV-1D	ENV-2			ENV-3		
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	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	19	--	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 - FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

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

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

Sample I.D.	NYSDEC	ENV-7			ENV-8			ENV-9			ENV-10D	GW-1		
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	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	4/20/2001	9/28/1988	12/5/1990	4/19/2001
Volatiles														
Acetone	50	16 J	< 5	< 25	31	< 25	< 50	***1,200 DJ***	< 5	< 25	29 J	--	12	< 10
Benzene	1	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	***34***	***42***	***4 J***
2-Butanone	50	< 25	< 1	< 5	< 10	< 5	< 10	5 J	< 1	< 5	< 10	--	--	< 10
Carbon Disulfide	NE / 60	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chlorobenzene	5	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chloroethane	5	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Chloroform	7	< 25	< 1	< 5	< 10	< 5	< 10	3 J	< 1	< 5	< 10	--	--	< 10
1,1-Dichloroethane	5	3 J	2	< 5	***7 J***	***5***	4 J	< 10	0.5 J	< 5	< 10	--	--	< 10
1,2-Dichloroethane	5 / 0.6	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
1,1-Dichloroethene	5	< 25	1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
cis-1,2-Dichloroethene	5	***430***	***280 D***	***170***	***150***	***140***	***120***	< 10	0.6 J	< 5	< 10	NA	NA	< 10
trans-1,2-Dichloroethene	5	4 J	3	< 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	NA	NA	--	--	NA
Ethyl Benzene	5	< 25	< 1	< 5	< 10	< 5	< 10	2 J	< 1	< 5	< 10	--	--	< 10
2-Hexanone	50	< 25	< 5	< 25	< 10	< 25	< 50	2 J	< 5	< 25	< 10	--	--	< 10
Methylene Chloride	5	< 25	< 2	3 J	< 10	< 10	4 J	< 10	< 2	3 J	< 10	***6 B***	--	< 10
4-Methyl-2-Pentanone	NE	< 25	< 5	< 25	11	< 25	< 50	10	< 5	< 25	< 10	--	--	< 10
Tetrachloroethene	5	3 J	4	3 J	3 J	3 J	3 J	< 10	< 1	< 5	< 10	--	--	< 10
Toluene	5	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	0.9 J	0.8 J	< 10
1,1,1-Trichloroethane	5	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
1,1,2-Trichloroethane	1	< 25	< 1	< 5	< 10	< 5	< 10	< 10	< 1	< 5	< 10	--	--	< 10
Trichloroethene	5	***16 J***	***6***	< 5	***12***	***14 J***	***12***	3 J	0.8 J	< 5	< 10	--	--	< 10
Vinyl Chloride	2	***220***	***50 D***	***88***	***3 J***	< 5	***10***	< 10	< 1	< 5	< 10	--	--	< 10
Xylenes (total)	5	< 28 J	< 3	< 15	--	< 15	< 30	***13 J***	< 3	< 15	< 10	--	--	< 10
Total VOCs	NE	720	346	264	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	NA	NA	--	--	NA
Acenaphthylene	NE	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
Bis (2-ethylhexyl) Phthalate	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6 BJ	--	NA
Butylbenzyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Dibenzofuran	NE	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
Diethyl Phthalate	50	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
Di-n-Butyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 BJ	--	NA
Di-n-Octyl Phthalate	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Fluorene	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	NA
Isophorone	50	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
2-Methylphenol	NE	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
Naphthalene	10	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
Phenanthrene	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--	--	NA

See end of table for notes

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - FOCUSED FEASIBILITY STUDY REPORT
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Sample I.D.	NYSDEC TOGS 1.1.1 Water Quality Standards[1]	GW-2				GW-3					GW-4			GW-5			GW-6		
Sample Date		9/28/1988	12/5/1990	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	***8 J***	--	< 10
Chloroform	7	--	--	--	< 10	--	--	< 10	< 1	< 2	--	--	< 10	--	--	< 10	--	--	< 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	4 J	1 J	< 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 - FOCUSED FEASIBILITY STUDY REPORT
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Sample I.D.	NYSDEC	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
Sample Date	TOGS 1.1.1 Water Quality Standards[1]	9/28/1988	12/5/1990	9/30/1999		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
					FD093099															
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***	***36***	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	NA	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 1

GROUNDWATER ANALYTICAL DATA - ORGANICS
ENVIROTEK II SITE - FOCUSED FEASIBILITY STUDY REPORT
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.

TABLE 2
TYPICAL STANDARDS, CRITERIA, AND GUIDANCE
FOCUSED FEASIBLITY STUDY
ENVIROTEK II SITE, TONAWANDA, NEW YORK

TITLE	STANDARD (S)/ GUIDANCE (G)	REQUIREMENTS
Air Guide 1: Guidelines for the Control of Toxic Ambient Air Contaminants	G	Control of toxic air contaminants. Screening analysis for ambient air impacts. Toxicity classifications. Ambient standards – short-term/annual.
6 New York Codes, Rules, and Regulations (NYCRR) Part 200 (200.6): General Provisions	S	Prohibits contravention of ambient air quality standards or causes air pollution.
6 NYCRR Part 201: Permits and Certificates; 3/31/93	S	Prohibits construction/operation without permit/certificate.
6 NYCRR Part 211 (211.1): General Prohibitions	S	Prohibits emissions that are injurious to human, plant, or animal life or cause a nuisance.
6 NYCRR Part 212: General Process Emission Sources	S	Establishes control requirements.
6 NYCRR Part 257: Air Quality Standards	S	Applicable air quality standards.
(TAGM)Technical and Administrative Guidance Memorandum HWR-89-4031: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites; October 27, 1989	G	Dust suppression during Interim Remedial Measure/Remedial Action (IRM/RA).
TAGM HWR-92-4046: Determination of Soil Cleanup Objectives and Cleanup Levels; January 24, 1994	G	Soil cleanup goals.
Analytical Services Protocols (ASP); 11/91	G	Analytical procedures.
(TOGS)Technical and Operational Guidance Series 1.1.2: Groundwater Effluent Limitations; August 1994	G	Guidance for developing effluent limits for groundwater.
TOGS 1.1.1: Ambient Water Quality Standards and Guidance Values; June 1998	G	Compilation of ambient water quality standards and guidance values.
STARS Memo #1: Petroleum-Contaminated Soil Guidance Policy	G	Guidance for gasoline and fuel oil contaminated soil.

TABLE 2
TYPICAL STANDARDS, CRITERIA, AND GUIDANCE
FOCUSED FEASIBLITY STUDY
ENVIROTEK II SITE, TONAWANDA, NEW YORK

TITLE	STANDARD (S)/ GUIDANCE (G)	REQUIREMENTS
6 NYCRR Part 702-15(a), (b), (c), (d), and (e)	S	Empowers New York State Department of Environmental Conservation (NYSDEC) to apply and enforce guidance where there is no Promulgated Standard.
6 NYCRR Part 700-705: NYSDEC Water Quality Regulations for Surface Waters and Groundwater	S	700 – Definitions, Samples, and Tests. 701 – Classifications of Surface Waters and Groundwaters. 702 – Derivation and Use of Standards and Guidance Values. 703 – Surface-Water and Groundwater Quality Standards and Groundwater Effluent Standards.
6 NYCRR Part 364: Waste Transporter Permits	S	Regulates collection, transport, and delivery of regulated waste.
6 NYCRR Part 360: Solid Waste Management Facilities	S	Solid waste management facility requirements. Landfill closures. C&D landfill requirements. Used oil, medical waste, etc.
6 NYCRR Part 370: Hazardous Waste Management System, General	S	Definitions of terms and general standards applicable to 6 NYCRR Parts 370-374 and 376.
6 NYCRR Part 371: Identification and Listing of Hazardous Wastes	S	Hazardous waste determinations.
6 NYCRR Part 372: Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	S	Manifest system and record keeping; certain management standards.
6 NYCRR Part 376: Land Disposal Restrictions	S	Identifies hazardous waste restricted from land disposal.
6 NYCRR Subpart 373-1: Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements	S	Hazardous waste permitting requirements, includes substantive requirements.
6 NYCRR Subpart 373-2: Final Status Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities	S	Hazardous waste management standards (e.g., contingency plan, releases from solid waste management units, closure/postclosure, container/management, tank management, surface impoundments, waste piles, landfills, incinerators).

TABLE 2
TYPICAL STANDARDS, CRITERIA, AND GUIDANCE
FOCUSED FEASIBLITY STUDY
ENVIROTEK II SITE, TONAWANDA, NEW YORK

TITLE	STANDARD (S)/ GUIDANCE (G)	REQUIREMENTS
6 NYCRR Part 373-3: Interim Status Standards for Owners and Operators of Hazardous Waste Facilities	S	Similar to 6 NYCRR Part 373-2.
6 NYCRR Part 375: Inactive Hazardous Waste Disposal Sites	S	Compilation of standards associated with the identification investigation and remediation of inactive hazardous waste disposal sites.
29 Code of Federal Regulations (CRF) Part 1910.120 - Hazardous Waste Operations and Emergency Response	S	Health and safety.
United States Department of Transportation Placarding and Handling (49 CFR 171, 172)	S	Specifies transportation and handling requirements for hazardous waste.

TABLE 3

ENVIROTEK II SITE FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

REMEDIAL COST ESTIMATE - ALTERNATIVE 2
MONITORED NATURAL ATTENUATION

Item #	Item	Unit	Unit Cost	Quantity/Year	Cost/Year	Year Incurred	Years Incurred	Cost	Present Value
	Direct Capital Costs								
	None				$0	0	1	$0	$0
					Subtotal, Direct Capital Costs			$0	$0
	Indirect Capital Costs								
1	Operation and Maintenance Work Plan	LS	$17,000	1	$17,000	0	1	$17,000	$17,000
2	Annual Reports	EA	$10,000	1	$10,000	1 through 5	5	$50,000	$41,000
3	Project Management and Regulatory Interfacing	LS	$6,000	1	$6,000	1 through 5	5	$30,000	$24,600
					Subtotal, Indirect Capital Costs			$97,000	$82,600
	Operation and Maintenance Costs								
4	Groundwater Sampling	EA	$8,000	1	$8,000	1 through 5	5	$40,000	$32,800
5	Laboratory Analyses	EA	$2,000	1	$2,000	1 through 5	5	$10,000	$8,200
6	Waste Disposal	EA	$1,000	1	$1,000	1 through 5	5	$5,000	$4,100
					Subtotal, Operation and Maintenance Costs			$55,000	$45,100
	Contingencies (20% of Capital and Operation and Maintenance Costs)				**Subtotal, Contingencies**			$30,400	$25,540
							TOTAL COSTS	**$182,400**	**$153,240**
							TOTAL COSTS ROUNDED TO	**$182,400**	**$153,200**

Notes:
Item #5 is based on 12 samples (eight wells, plus one field duplicate, one trip blank, one matrix spike/matrix spike duplicate) plus $500/event for NA parameters.
Item #6 is based on one drum of nonhazardous purge water generated per sampling event and includes onsite time for drum pickup.
A discount factor of 7% was used for Present Value calculations as per United States Environmental Protection Agency 540-R-00-002.
The estimate assumes that no further actions are required at the end of year 5.

TABLE 4

ENVIROTEK II SITE FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

REMEDIAL COST ESTIMATE - ALTERNATIVE 3
CHEMICAL OXIDATION WITH MNA

Item #	Item	Unit	Unit Cost	Quantity/Year	Cost/Year	Year Incurred	Years Incurred	Cost	Present Value
	Direct Capital Costs								
	Pilot Scale Study								
1	Pilot Scale Study	LS	$50,000	1	$50,000	0	1	$50,000	$50,000
2	Direct Push Rig and Operator	LS	$17,000	1	$17,000	0	1	$17,000	$17,000
3	Well Installation	LS	$20,000	1	$20,000	0	1	$20,000	$20,000
4	Waste Disposal - Well Installation	LS	$2,000	1	$2,000	0	1	$2,000	$2,000
5	Waste Disposal - Groundwater Sampling	EA	$1,000	3	$3,000	0	1	$3,000	$3,000
6	Laboratory Analyses	LS	$2,100	3	$6,300	0	1	$6,300	$6,300
	Full Scale In Situ Implementation								
7	Full Scale In Situ Implementation	LS	$250,000	1	$250,000	0	1	$250,000	$250,000
8	Direct Push Rig and Operator	LS	$50,000	1	$50,000	0	1	$50,000	$50,000
9	Waste Disposal - Groundwater Sampling	EA	$1,000	2	$2,000	0	1	$2,000	$2,000
10	Laboratory Analyses	EA	$1,800	2	$3,600	0	1	$3,600	$3,600
					Subtotal, Direct Capital Costs			$403,900	$403,900
	Indirect Capital Costs								
11	Remedial Action Work Plan	LS	$30,000	1	$30,000	0	1	$30,000	$30,000
12	Permitting (SPDES)	LS	$2,500	1	$2,500	0	1	$2,500	$2,500
13	O&M Work Plan	LS	$17,000	1	$17,000	0	1	$17,000	$17,000
	Pilot Scale Study								
14	Oversight of Well Installation	LS	$5,000	1	$5,000	0	1	$5,000	$5,000
15	Oversight of Pilot Scale Implementation	LS	$14,000	1	$14,000	0	1	$14,000	$14,000
16	Groundwater Sampling	LS	$5,000	3	$15,000	0	1	$15,000	$15,000
	Full Scale In-Situ Implementation								
17	Oversight of Full Scale Implementation	LS	$50,000	1	$50,000	0	1	$50,000	$50,000
18	Groundwater Sampling	EA	$5,000	2	$10,000	0	2	$10,000	$10,000
19	Annual Progress Reports	EA	$10,000	1	$10,000	1 through 5	5	$50,000	$41,000
20	Project Management and Regulatory Interfacing	EA	$6,000	1	$6,000	1 through 5	5	$30,000	$24,600
21	Remedial Action Report	LS	$15,000	1	$15,000	2	1	$15,000	$13,100
					Subtotal, Indirect Capital Costs			$238,500	$222,200
	Operation and Maintenance								
22	Groundwater Sampling	EA	$8,000	1	$8,000	1 through 5	5	$40,000	$32,800
23	Laboratory Analyses	EA	$2,000	1	$2,000	1 through 5	5	$10,000	$8,200
24	Waste Disposal	EA	$1,000	1	$1,000	1 through 5	5	$5,000	$4,100
					Subtotal, Operation and Maintenance Implementation			$55,000	$45,100
	Contingencies (30% of Capital and Operation and Maintenance Costs)					**Subtotal, Contingencies**		$209,220	$201,360
							TOTAL COSTS	**$906,620**	**$872,560**
							TOTAL COSTS ROUNDED TO	**$907,000**	**$873,000**

Notes:
Items #1 and #2 are based on two 10-day events, with 15 injections per event. Estimate provided by chemical oxidation vendor.
Item #3 is based on installation of ten 2-inch polyvinyl chloride wells to monitor pilot scale study.
Item #4 is based on estimated disposal of 10 drums of soil and one drum of decon water (all nonhazardous) generated during well installation.
Items #5, 9, and 24 are based on disposing of one drum of nonhazardous purge water that is generated during each sampling event and includes onsite time for drum pickup.
Item #6 is based on laboratory analyses of 14 samples (10 new wells plus quality assurance/quality control [QA/QC]).
Items #7 and #8 are based on two 20-day events with 100 injections each event. Estimate provided by chemical oxidation vendor.
Items #10 and #23 are based on laboratory analyses of 12 samples (eight existing wells plus QA/QC).
Item #16 is based on BBL providing one 2-person team, to use 2- to 12-hour days to sample the 10 wells to monitor the pilot scale study before, between, and after the two applications.
Item #18 is based on BBL providing one 2-person team, to use 2- to 12-hour days to sample the eight wells to monitor the full scale study before and after the injection event.
A discount factor of 7% was used for Present Value calculations as per United States Environmental Protection Agency 540-R-00-002.
The estimate assumes that no further actions are required at the end of year 5.

TABLE 5

ENVIROTEK II SITE FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

REMEDIAL COST ESTIMATE - ALTERNATIVE 4
GROUNDWATER EXTRACTION AND TREATMENT

Item #	Item	Unit	Unit Cost	Quantity/Year	Cost/Year	Year Incurred	Years Incurred	Cost	Present Value
	Direct Capital Costs								
1	Well Installation	LS	$47,750	1	$47,750	0	1	$47,750	$47,750
2	Treatment Building	LS	$50,000	1	$50,000	0	1	$50,000	$50,000
3	Treatment System	LS	$125,000	1	$125,000	0	1	$125,000	$125,000
						Subtotal, Direct Capital Costs		$222,750	$222,750
	Indirect Capital Costs								
4	Remedial Action Work Plan	LS	$30,000	1	$30,000	0	1	$30,000	$30,000
5	Engineering	LS	$30,000	1	$30,000	0	1	$30,000	$30,000
6	Operation and Maintenance Work Plan	LS	$17,000	1	$17,000	0	1	$17,000	$17,000
7	Permitting	LS	$2,500	1	$2,500	0	1	$2,500	$2,500
8	Annual Progress Reports	EA	$10,000	1	$10,000	1 through 30	30	$300,000	$124,100
9	Monthly Sewer Discharge Reporting	EA	$750	12	$9,000	1 through 30	30	$270,000	$111,700
10	Project Management and Regulatory Interfacing	LS	$6,000	1	$6,000	1 through 30	30	$180,000	$74,500
11	Remedial Action Report	LS	$15,000	1	$15,000	30	1	$15,000	$1,971
						Subtotal, Indirect Capital Costs		$844,500	$391,771
	Operations and Maintenance Costs								
12	Carbon Vessel Change-out	EA	$2,000	1	$2,000	1 through 30	30	$60,000	$24,800
13	SPDES Permit Sampling	EA	$500	12	$6,000	1 through 30	30	$180,000	$74,500
14	SPDES Permit Lab Analyses	EA	$1,050	12	$12,600	1 through 30	30	$378,000	$156,400
15	Groundwater Sampling	EA	$8,000	1	$8,000	1 through 30	30	$240,000	$99,300
16	Laboratory Analyses	EA	$2,000	1	$2,000	1 through 30	30	$60,000	$24,800
17	Well Decommissioning	EA	$1,800	3	$5,400	30	1	$5,400	$709
18	Waste Disposal	EA	$1,000	1	$1,000	1 through 30	30	$30,000	$12,400
19	Electricity Usage	EA	$4,000	1	$4,000	1 through 30	30	$120,000	$49,600
20	Sewer Discharge Fee	EA	$6,500	1	$6,500	1 through 30	30	$195,000	$80,700
21	System Removal	EA	$8,000	1	$8,000	30	1	$8,000	$1,051
22	Pump and Misc. Equipment Replacement	EA	$4,000	1 per 5 years	N/A	5, 10, 15, 20, 25		$20,000	$8,106
						Subtotal, Operation and Maintenance Costs		$1,296,400	$532,366
	Contingencies (30% of Capital and Operation and Maintenance Costs)					**Subtotal, Contingencies**		$709,095	$344,066
						TOTAL COSTS		**$3,072,745**	**$1,490,953**
						TOTAL COSTS ROUNDED TO		**$3,073,000**	**$1,491,000**

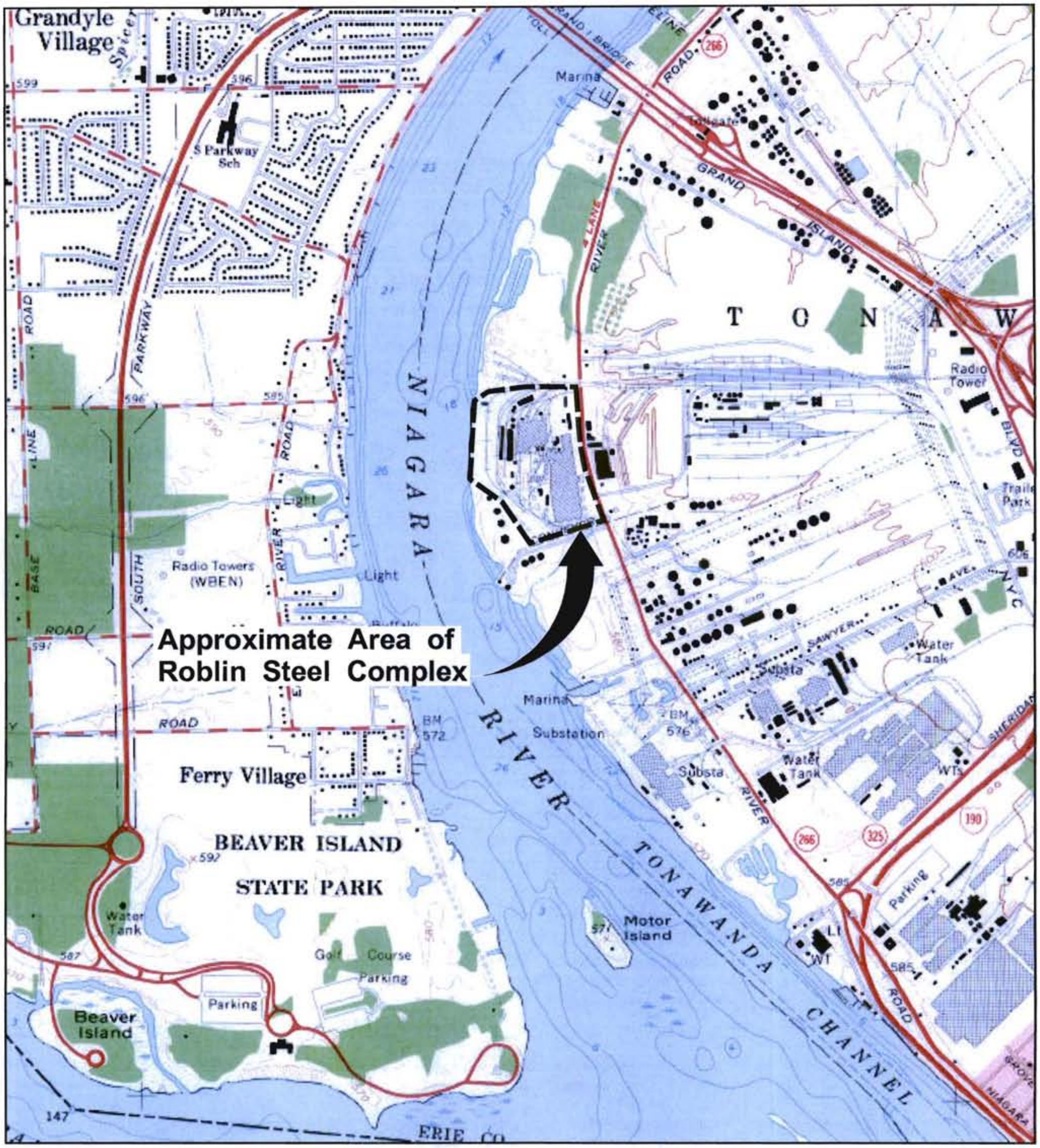
Notes:
Item #1 is based on three stainless steel recovery wells and includes oversight, consumables, and disposal of waste.
Item #3 includes liquid phase carbon vessels, filtration equipment, plumbing, electrical, controls, trenching, site restoration, and labor.
Item #5 includes the design and installation supervision of the system.
Item #7 includes all costs associated with permitting for this project.
Item #12 is based on replacing two carbon drums per year, plus misc. consumables.
Item #13 is based on one person plus vehicle for 5 hours per event. SPDES sampling to consist of pre-, mid-, and post-carbon sample points each month.
Item #14 is based on laboratory analyses of seven samples (three monitoring points, plus quality assurance/quality control [QA/QC]) monthly sampling and reporting.
Item #16 is based on 12 samples (eight wells, plus QA/QC).
Item #17 is based on decommissioning the three recovery wells.
Item #18 is based on disposing of one drum of nonhazardous purge water that is generated during each sampling event and includes onsite time for drum pickup.
Item #19 is based on an electrical cost of $0.14 per Kwhr.
Item #20 is based on a fee of $4 per 1,000 gallons discharged to the sewers.
Item #21 includes removal of the equipment, electrical drop, disposal of carbon vessels and remaining groundwater w/in the system, and disconnection of all underground piping (no removal).
Item #22 assumes replacement of all three pumps, level controls, and minor miscellaneous equipment once every 5 years.
N/A - Not Applicable
No salvage value is included in the cost estimate as there will likely not be any due to the age of the equipment upon discontinuing its use.
A discount factor of 7% was used for Present Value calculations as per United States Environmental Protection Agency 540-R-00-002.
The estimate assumes that no further actions are required at the end of year 30.

TABLE 6

ENVIROTEK II SITE FOCUSED FEASIBILITY STUDY REPORT
TONAWANDA, NEW YORK

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance with Standards, Criteria, and Guidances	Short-term Impacts and Effectiveness	Long-term Effectiveness and Permanence	Reduction in Contaminant Toxicity, Mobility, or Volume	Implementability	Estimated Total Cost, Including Long-Term Monitoring (Present Worth)
Alternative 1: No Further Action	Low Rating No groundwater quality monitoring component.	Low Rating Water quality standards presently exceeded – lacks monitoring to track groundwater quality.	High Rating No site activities to be conducted and natural attenuation (NA) processes at work.	Moderate Rating NA processes at work, but no provisions to monitor progress.	High Rating NA processes are predicted to continue to reduce plume size and concentrations.	High Rating No site activities to be conducted.	$0
Alternative 2: Monitored Natural Attenuation	High Rating Groundwater quality monitoring would be conducted while NA mechanisms reduce principal constituents of concerns (PCOCs) in groundwater.	High Rating Water quality standards presently exceeded – groundwater quality monitored until remedial action objectives (RAOs) achieved. Procedural controls to address remaining issues.	High Rating Limited, controlled site activities. NA processes at work.	High Rating NA processes at work with groundwater quality monitoring.	High Rating Monitored NA processes are predicted to continue to reduce plume size and concentrations.	High Rating NA processes are already presently occurring (e.g. OU-3). No significant site disturbance needed.	$153,200
Alternative 3: Chemical Oxidation with MNA	High Rating Destruction of PCOCs in a relatively short time period with groundwater quality monitoring.	High Rating Water quality standards presently exceeded – groundwater quality monitored until RAOs achieved. Procedural controls and permits to address remaining issues.	High Rating Procedural controls to protect workers/public. No transfer of contaminants to air or water discharges.	High Rating Rapid breakdown of PCOCs to innocuous compounds.	High Rating Reduction of contaminant mass in short time, thus reducing groundwater plume.	Moderate Rating Technically feasible. Surface structures and subsurface obstructions may limit accessibility and predicted effectiveness to some degree.	$873,000
Alternative 4: Groundwater Extraction and Treatment	High Rating Groundwater plume would be contained until RAOs are met.	High Rating Water quality standards presently exceeded – groundwater quality monitored until RAOs achieved. Procedural controls and permits to address remaining issues.	High Rating Procedural controls to protect workers/public.	High Rating NA processes would be at work in concert with groundwater recovery.	High Rating Plume containment achieved, while groundwater recovery and NA reduce the groundwater plume.	Moderate Rating Technically feasible with little accessibility issues. Boundary conditions and varying hydraulic conductivities may limit performance.	$1,491,000



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

ENVIROTEK II SITE
TONAWANDA NEW YORK

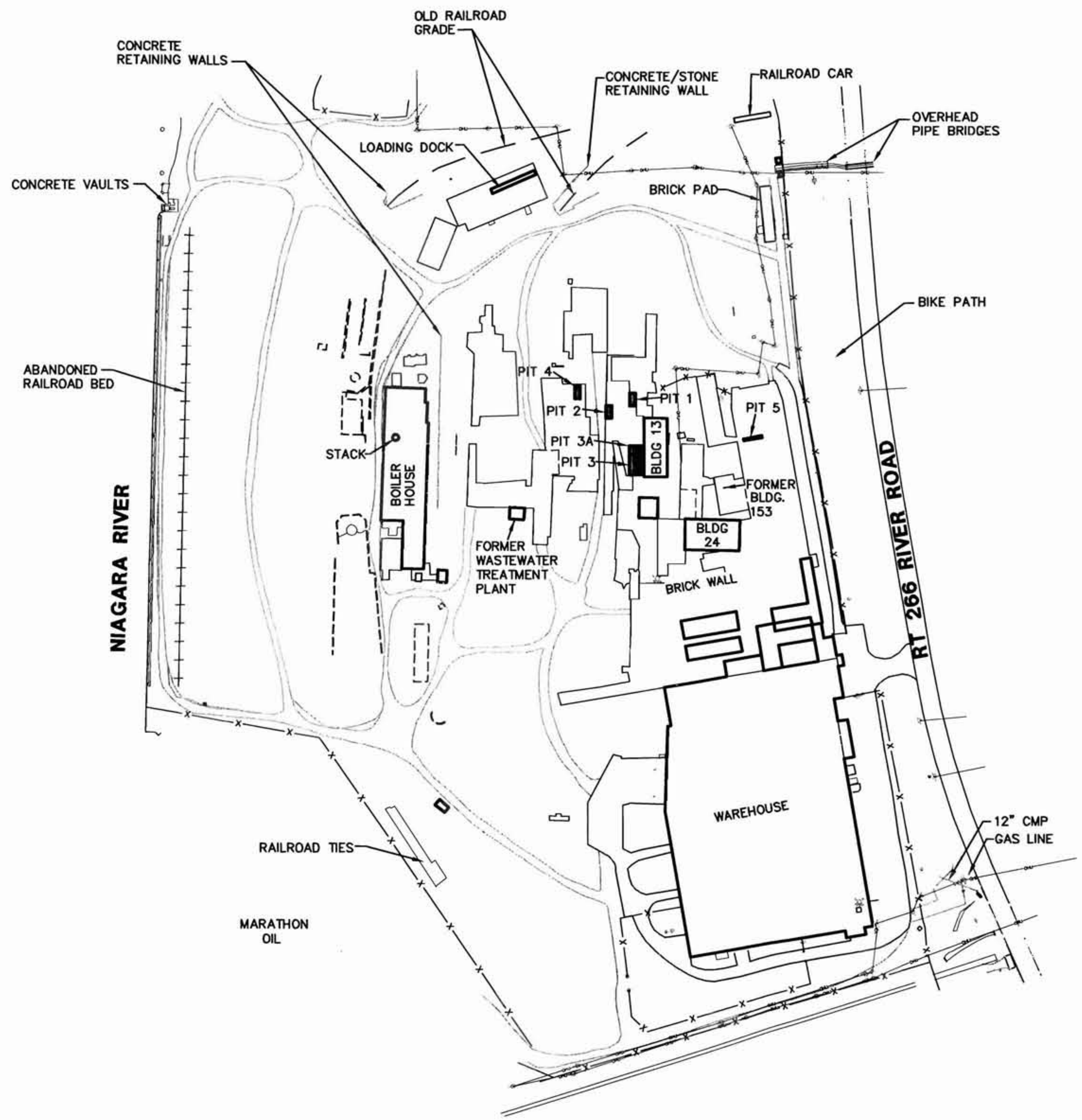
FOCUSED FEASIBILITY STUDY REPORT

SITE LOCATION MAP

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

FIGURE 1

03/10/05 SYR-D85-DJH
58002092/58002n01.cdr



LEGEND

—x—	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

X: 58002X03.DWG
L: ON=*;OFF=REF*,0,
P: PAGESET/PLT-BL
1/18/05 SYR- RCB
58002081/OU3IRM/58002B01.DWG

ENVIROTEK II SITE
TONAWANDA, NEW YORK
FOCUSED FEASIBILITY STUDY REPORT

ROBLIN STEEL COMPLEX SITE PLAN

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engineers, scientists, economists

FIGURE
2

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

X: 58002X00, X02.DWG
L: ON=*;OFF=REF*
P: PAGESET/SYR-BL
1/18/05 SYR-85-PGL DMW RCB
58002091/OU3IRM/58002W01.DWG

ENVIROTEK II SITE
TONAWANDA, NEW YORK
FOCUSED FEASIBILITY STUDY REPORT

GROUNDWATER ELEVATION CONTOUR MAP
MAY 5, 2004

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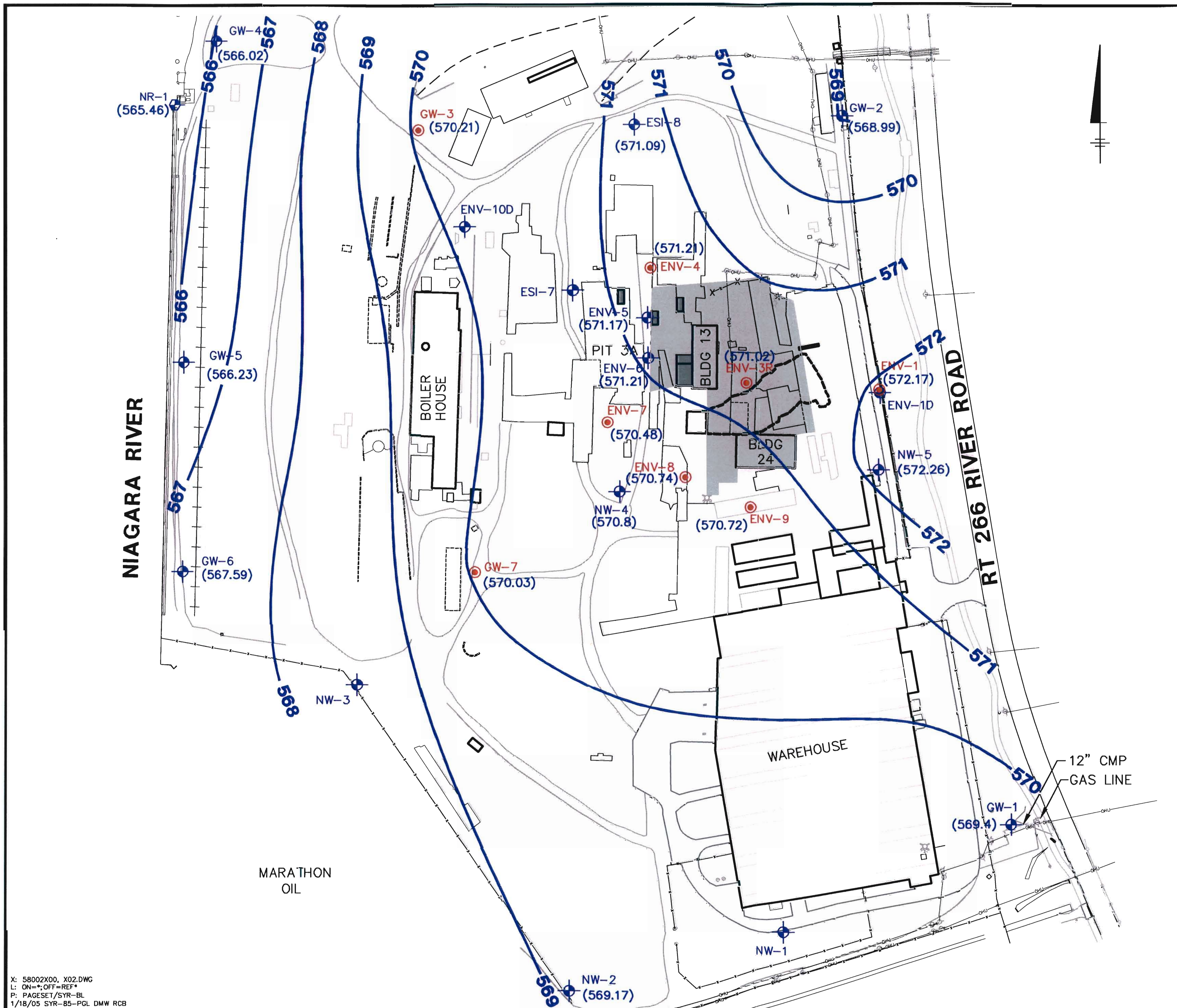
FIGURE
3



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P: PAGESET/SYR-BL
1/18/05 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
- 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
FOCUSED FEASIBILITY STUDY REPORT

GROUNDWATER ELEVATION CONTOUR MAP
SEPTEMBER 28, 2004

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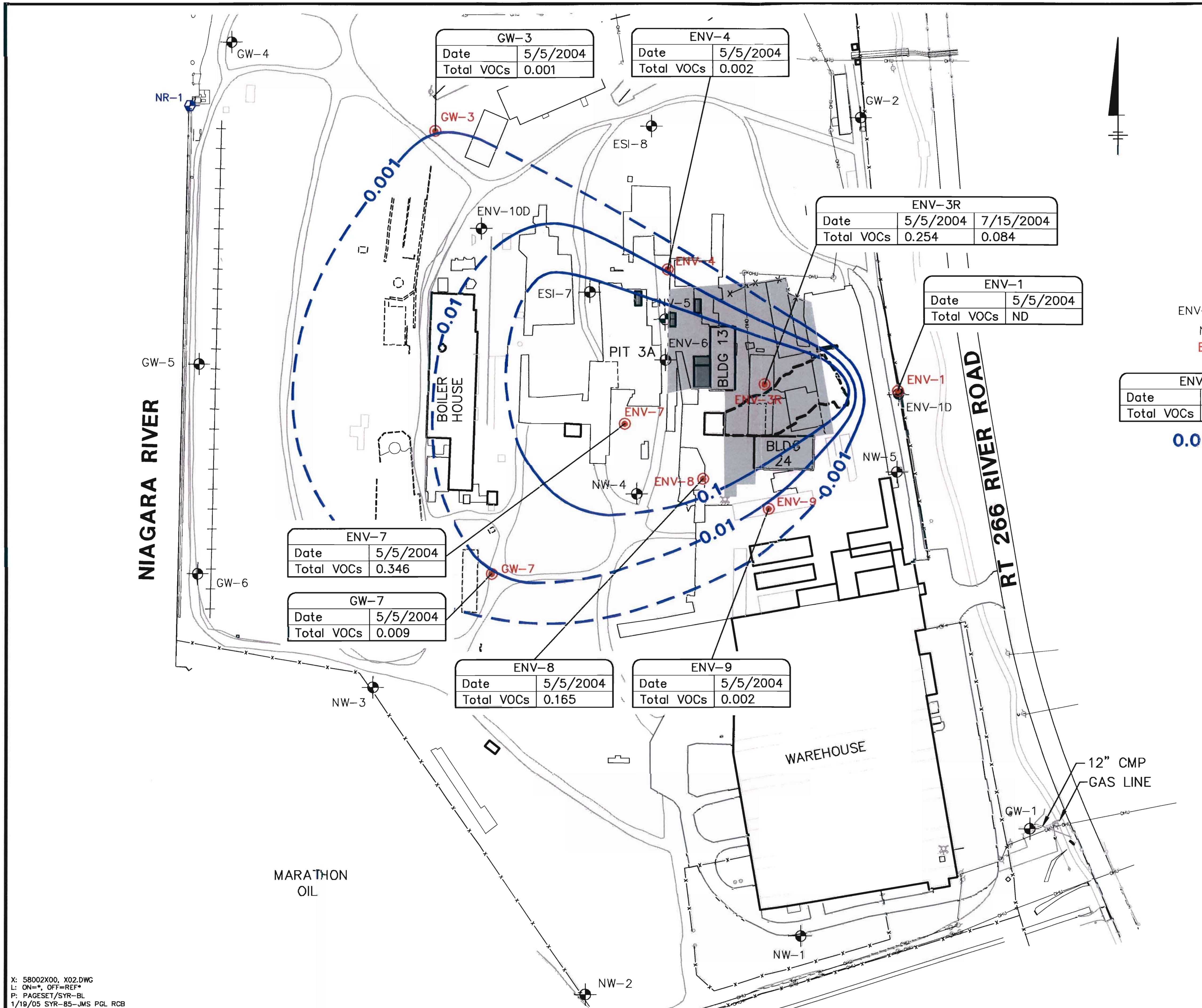
FIGURE
4



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:
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   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
FOCUSED FEASIBILITY STUDY REPORT

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

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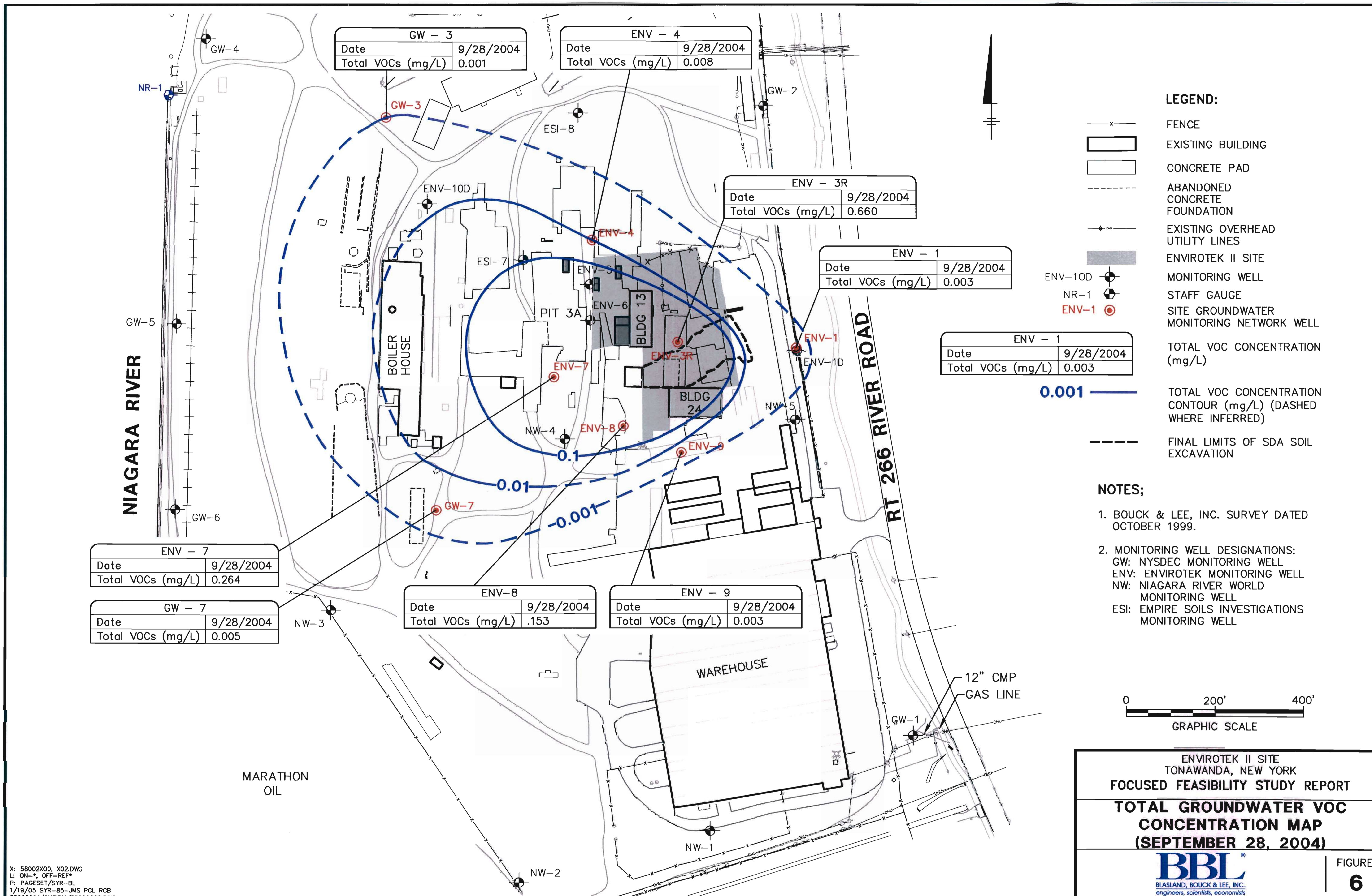
FIGURE 5


GW – 3
Date 9/28/2004
Total VOCs (mg/L) 0.001
ENV – 4
Date 9/28/2004
Total VOCs (mg/L) 0.008
ENV – 3R
Date 9/28/2004
Total VOCs (mg/L) 0.660
ENV – 1
Date 9/28/2004
Total VOCs (mg/L) 0.003
ENV – 7
Date 9/28/2004
Total VOCs (mg/L) 0.264
GW – 7
Date 9/28/2004
Total VOCs (mg/L) 0.005
ENV–8
Date 9/28/2004
Total VOCs (mg/L) .153
ENV – 9
Date 9/28/2004
Total VOCs (mg/L) 0.003
GW–4
NR–1
GW–3
ESI–8
GW–2
ENV–10D
ENV–4
ESI–7
ENV–5
ENV–6
PIT 3A
BLDG 13
ENV–3R
ENV–7
ENV–1
ENV–1D
BLDG 24
NW–5
NW–4
ENV–8
ENV–9
GW–5
BOILER HOUSE
NIAGARA RIVER
RT 266 RIVER ROAD
0.1
0.01
0.001
GW–7
GW–6
NW–3
WAREHOUSE
12" CMP
GAS LINE
GW–1
MARATHON OIL
NW–1
NW–2
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:
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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
FOCUSED FEASIBILITY STUDY REPORT
TOTAL GROUNDWATER VOC CONCENTRATION MAP (SEPTEMBER 28, 2004)
BBL
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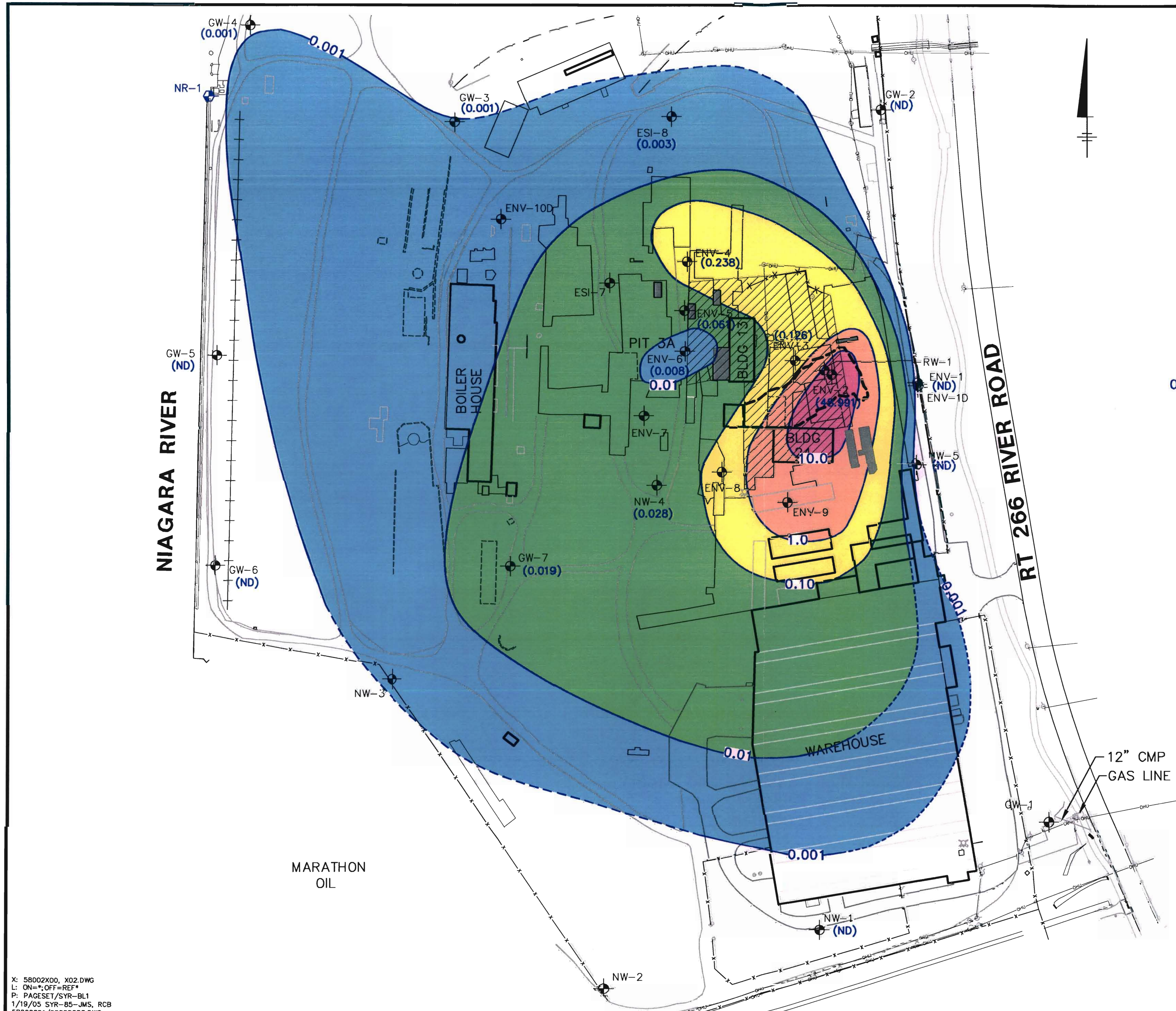
FIGURE
6
X: 58002X00, X02.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
1/19/05 SYR-85-JMS PGL RCB
58002091/OU3IRM/58002C02.DWG



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)
- (0.003) 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:
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   ENV: ENVIROTEK MONITORING WELL
   NW: NIAGARA RIVER WORLD MONITORING WELL
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0 200' 400'
GRAPHIC SCALE

ENVIROTEK II SITE
TONAWANDA, NEW YORK
FOCUSED FEASIBILITY STUDY REPORT

TOTAL GROUNDWATER VOC CONCENTRATION CONTOUR MAP (SEPTEMBER 1999)

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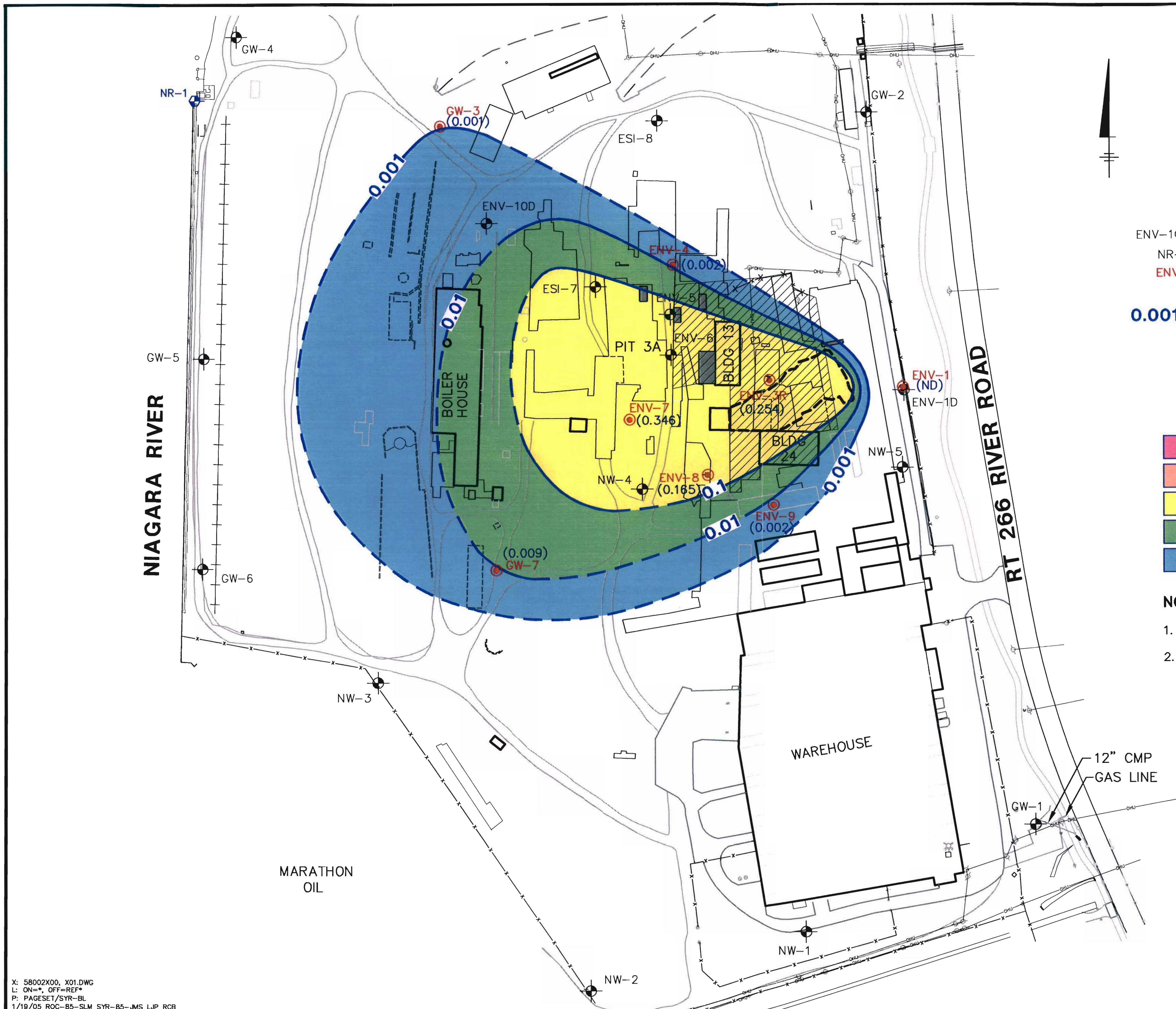
FIGURE
7



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
- (0.165) 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.
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0 200' 400'
GRAPHIC SCALE

X: 58002X00, X01.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
1/19/05 ROC-B5-SLM SYR-B5-JMS LJP RCB
58002091/OU3IRM/58002B02.DWG

ENVIROTEK II SITE
TONAWANDA, NEW YORK
FOCUSED FEASIBILITY STUDY REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (MAY 5, 2004)

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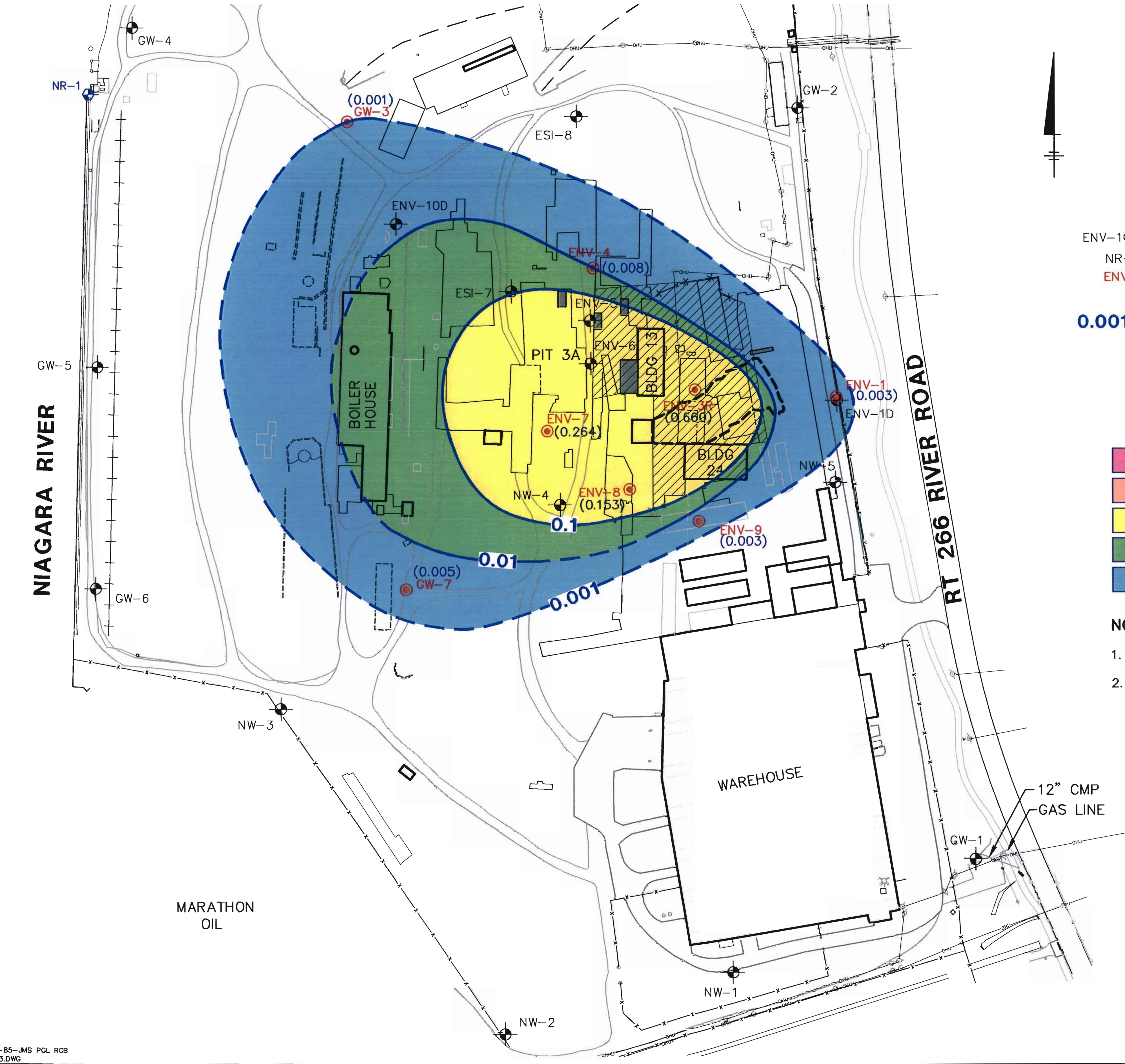
FIGURE
8



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
- (0.264) — 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'
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X: 58002X00, X02.DWG
L: ON=*, OFF=REF*
P: PAGESET/SYR-BL
1/19/05 ROC-B5-SLM SYR-B5-JMS PGL RCB
58002091/OU3IRM/58002B03.DWG

ENVIROTEK II SITE
TONAWANDA, NEW YORK
FOCUSED FEASIBILITY STUDY REPORT

TOTAL GROUNDWATER VOC CONCENTRATION MAP (SEPTEMBER 28, 2004)

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FIGURE
9