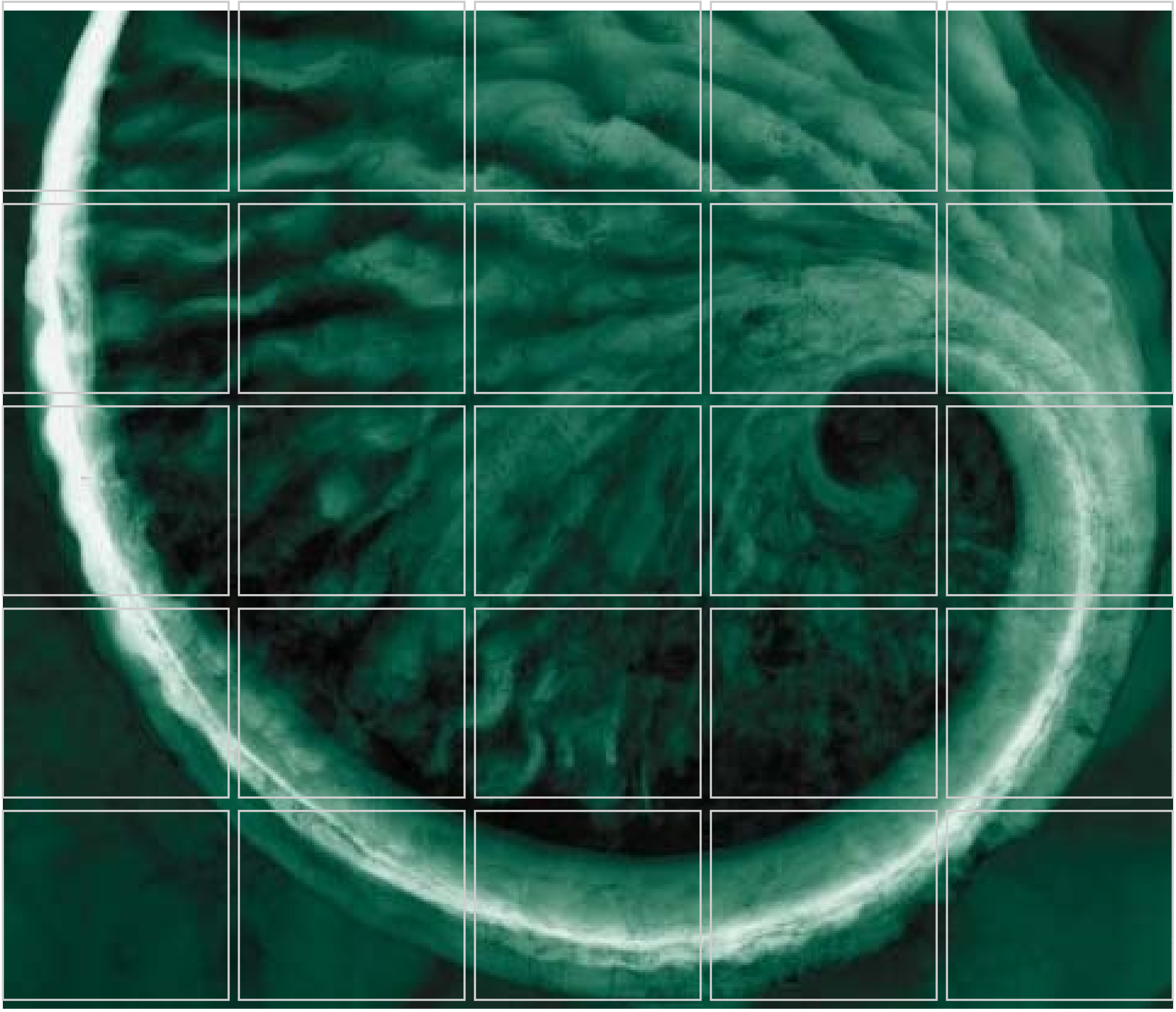


Sonoco Products Company

Focused Feasibility Study

Greif, Inc. Facility

Tonawanda, New York
NYSDEC VCP Number: V00334-9

ERM Project Number: 0051923

www.erm.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ABBREVIATIONS AND ACRONYMS

AOC	Areas of Concern
ARAR	Applicable or Relevant and Appropriate Requirements
ASP	Analytical Services Protocol
BCP	Brownfield Cleanup Program
BGS	Below Ground Surface
BFA	Background Fluorescence Study
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFM	Cubic Feet per Minute
CPI	Consumer Price Index
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
DCA	Dichloroethane
DCE	Dichloroethene
DGI	Data Gap Investigation
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DPE	Dual Phase Extraction
ERH	Electro Resistive Heating
ERM	Environmental Resources Management
ET-DSP™	Electro-Thermal Dynamic Stripping Process
F	Fahrenheit
FDSA	Former Drum Storage Area
FDT	Fluorescent Dye Tracing
FID	Flame Ionization Detector
FFS	Focused Feasibility Study
FS	Feasibility Study
GAC	Granular Activated Carbon
GC-FID	Gas Chromatography - Flame Ionization Detector
GPM	Gallons Per Minute
GWRAO	Ground Water Remedial Action Objective
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
LBS	Pounds
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	milligrams per kilogram (parts per million)
mg/l	milligrams per liter (parts per million)
ml	milliliters
MNA	Monitored Natural Attenuation
MW	Monitoring Well
NCP	National Contingency Plan
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health

NYSGS	New York State Geological Survey
O&M	Operation and Maintenance
OM&M	Operations, Maintenance, and Monitoring
ORP	Oxidation-Reduction Potential
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
PRAP	Proposed Remedial Action Plan
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RI	Remedial Investigation
RSCO	Recommended Soil Cleanup Objective
RW	Recovery Well
SC	Standards and Criteria
SCG	Standards, Criteria, and Guidance
SCO	Soil Clean-up Objectives
SAB	Staff Accounting Bulletin
SEC	Securities and Exchange Commission
SMP	Soil Management Plan
SMP	Site Management Plan
SRAO	Soil Remedial Action Objective
SSD	Sub-Slab Depressurizations
SVE	Soil Vacuum Extraction
SVOC	Semivolatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethene
TMB	Trimethylbenzene
TOGS	Technical Operations Guidance Series
TPH	Total Petroleum Hydrocarbons
μg/kg	micrograms per kilogram (parts per billion)
μg/L	micrograms per liter (parts per billion)
USEPA	United States Environmental Protection Agency
USGS	United Stated Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
VMP	Vapor Monitoring Points
VOC	Volatile Organic Compound
W.C.	Water Column

EXECUTIVE SUMMARY

As part of a Voluntary Cleanup Agreement (VCA) between Sonoco Products Company and the New York State Department of Environmental Conservation (NYSDEC), Environmental Resources Management (ERM), prepared this Focused Feasibility Study (FFS) Report for the Greif, Inc. (Greif) Facility located at 2122 Colvin Boulevard in the Town of Tonawanda, Erie County, New York (the Site). This FFS Report evaluates remedial alternatives for soil and ground water containing volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in two Site Areas of Concern (AOCs):

- the Varnish Pit Area, which includes the Short Truck Bay Area; and
- the Former Varnish Underground Storage Tank (UST) Area.

Three remedial alternatives were evaluated in this report based on ERM's review of available data and previous discussions with NYSDEC.

- *Alternative 1 – No Action.* Remedial Investigation/Feasibility Study guidance (USEPA, 1988) requires consideration of a No Action alternative. Under this alternative, no site modifications, remedial actions or monitoring would be implemented to prevent or eliminate human health and environmental risks.

- *Alternative 2 – Excavation and Off-Site Disposal of Soil and Monitored Natural Attenuation (MNA) of Ground Water*. This remedial alternative entails the excavation and off-Site disposal of grossly-affected soil in the Former Varnish UST Area, dense, non-aqueous phase liquid (DNAPL) recovery in the Varnish Pit Area, sub-slab depressurization (SSD) beneath a portion of the Site building, institutional controls, and MNA of affected ground water.

- *Alternative 3 – In-Situ Thermal Treatment of Grossly-Affected Soil and Monitored Natural Attenuation of Ground Water.* This remedial alternative entails In-Situ Thermal Treatment of grossly-affected soil in the Former Varnish UST Area, DNAPL recovery in the Varnish Pit Area, SSD beneath a portion of the Site building, institutional controls, and MNA of affected ground water.

Each alternative was evaluated for the remediation of Chemicals of Potential Concern (COPCs) identified for Site soil and ground water. A conceptual design for each alternative was developed for cost estimating purposes. A detailed analysis of the alternatives was subsequently performed in accordance with the document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988) and NYSDEC's Draft DER- 10 entitled

"Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2002). The criteria used for this evaluation included:

- overall protectiveness of human health and the environment;
- compliance with applicable compliance with Standards, Criteria and Guidance (SCGs);
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, or volume;
- short-term effectiveness;
- implementability; and
- reasonableness of cost.

The remedial alternatives were evaluated individually and against each other using the above criteria, and a preferred alternative was identified. With the exception of implementability and cost, Alternative 1, No Action, would not effectively comply with 6 of the 7 criteria outlined above. Alternatives 2 and 3 are equally protective of human health and the environment and equally address compliance with SCGs. Both alternatives are readily implementable and provide long term effectiveness essentially by eliminating source areas and monitoring natural attenuation processes. However, Alternative 3 is less obtrusive to ongoing manufacturing operations at the Site, has fewer short term impacts, and is less costly than Alternative 2. Therefore, the recommended alternative for the Site is Alternative 3, In-Situ Thermal Treatment with MNA.

1.0 INTRODUCTION

The Site is an active industrial Site used for the manufacture and processing of fiber drums and associated maintenance and administrative activities. Environmental activities are being performed at the Site pursuant to a VCA between Sonoco and NYSDEC. NYSDEC identified the Site as Voluntary Cleanup Program (VCP) Number V00334-9. This report contains the basic elements suggested for FFS reports as described in the United States Environmental Protection Agency (USEPA) document entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988) and the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002).

1.1 PURPOSE

The purpose of this FFS Report is to present relevant Site information, Site requirements, and an assessment of remedial action alternatives to form a basis for selecting a preferred remedial action needed to address affected site media to a degree consistent with the contemplated use of the Site. The primary objectives of the FFS Report are to:

- develop, screen, and evaluate remedial alternatives for addressing affected soil and ground water at the Site; and
- based on a detailed analysis of the alternatives, select a preferred remedial alternative that protects human health and the environment in a cost-effective manner.

This FFS Report begins with an overview of the Site and a summary of previous Site investigations, followed by the development, screening, and detailed analysis of remedial alternatives. The contents of the remaining sections are as follows.

- Section 2.0 discusses the exposure/risk assessment conducted for the Site soil and ground water.
- Section 3.0 identifies Areas of Concern and presents Remedial Action Objectives (RAOs) for the Site media (soil and ground water).
- Section 4.0 describes the screening process that was used to select remedial technologies for further detailed analysis.
- Section 5.0 presents the detailed analysis of remedial alternatives, which is based on FFS evaluation criteria recommended by USEPA and NYSDEC.
- Section 6.0 presents recommendations for remedial action.

- Section 7.0 lists references cited in this FFS Report.

1.2 *SITE BACKGROUND*

The Site consists of an industrial building located on approximately 25 acres in the Town of Tonawanda, Erie County, New York. The Site is located in a mixed industrial/commercial/residential area approximately one-quarter mile south of Highway I-290 (Figure 1-1). Adjoining properties are as follows:

- North – vacant land (including a former railroad siding and a wooded area) and residential apartments;
- South – a local park/sports fields (Walter M. Kenney Field) and land recently developed into commercial office space;
- East – Colvin Boulevard with single family/duplex homes further east; and
- West – a business park adjacent to a major railroad line formerly traversed by two railroad spurs into the Site.

Figure 1-2 presents a map showing general Site layout and the locations of selected Site features. The building is surrounded by paved parking areas, storage areas, and landscaped areas. The Site is currently used for the manufacture of fiber drums, equipment maintenance, and administrative activities. The north, west and east sides of the Site are fenced to restrict access. There are two main gates on the east side of the Site where employees and visitors routinely enter and an unused, old gate on the west side of the Site at the location of an old railroad spur into the Site.

Based on information provided by Grief and ERM's review of Site plans, the building at the Site was originally constructed in 1948. From 1948 to 1985 the Site was owned and operated by Continental Fiber Drum and Continental Can Corporation. Historical manufacturing operations at this time consisted of the production of fiber drums but also included production of the metal lids and rims used in the fiber drums.

Sonoco Products Company acquired the Fiber Drum Division in 1985. The major existing manufacturing operations reportedly continued generally unchanged until the early 1990s. In 1995, the varnishing and degreasing processes on the metal utilized to produce the lids and rims used in the fiber drums, was discontinued. Greif subsequently acquired the Site in May 1998. The Site continues to be used for the manufacture of fiber drums and associated products. Secondary operations include equipment maintenance and administrative activities.

Surface water bodies consist of a small pond on the property adjacent to the Site south of the Site. Site topography is relatively flat with an average elevation of approximately 586 feet above mean sea level. The Site is situated approximately 3.5 miles east of the Niagara River and 1.1 miles south of Ellicott Creek in the Erie-Ontario Lowlands physiographic province of western New York State. Topographic relief within one-half mile of the Site is minimal (approximately 15 feet).

Surficial geology in the vicinity of the Site was previously mapped by the New York State Geological Survey (NYSGS) as lacustrine silt and clay (Cadwell et al., 1988). These deposits consist predominantly of varved or laminated, calcareous silt and clay deposited in proglacial lakes with variable thickness up to 100 meters (approximately 328 feet). Bedrock in the vicinity of the Site consists predominantly of dolostones, shales, and evaporites of the Upper Silurian Salina Group based on mapping performed by NYSGS (Rickard and Fisher, 1970).

1.3 PROJECT BACKGROUND

ERM performed subsurface investigation at the Site with the overall objective to evaluate the nature and extent of soil and ground water potentially affected by Site activities. Greif purchased the Site from Sonoco in the spring of 1998. Environmental investigations initially were performed in connection with the purchase of the Site. The scope of work associated with subsurface investigations generally included installation of soil borings, ground water monitoring wells, and collection of soil and ground water samples for analysis of selected parameters at an approved environmental laboratory.

Several volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) of potential concern have been identified in Site soil and/or ground water. Environmental remediation activities are being performed at the Site pursuant to VCA Index Number B9-0574-00-03 between Sonoco and the NYSDEC. NYSDEC has identified the Site as VCP Number V00334-9. An outline of the history Site investigations, and Interim Remedial Measures conducted on Site are addressed in subsequent section of the report. A detailed account of the remedial activities are summarized in the Data Gap Investigation (DGI) Report dated December 2003 (ERM, 2003), DNAPL Recovery Interim Remedial Measure Report (ERM, 2005) and Interim Report- Soil Excavation Interim Remedial Measure (ERM, 2006).

1.4 HISTORICAL SITE INVESTIGATIONS

ERM performed subsurface investigation at the Site with the overall objective to evaluate the nature and extent of soil and ground water potentially affected by Site activities.

Several rounds of investigation have been conducted by ERM at the Site. Figure 1-3 presents a color-coded map showing the locations of all sampling points installed during the various investigative phases at the Site. Detailed descriptions of previous investigation activities are presented in the Work Plan for Remedial Investigation (ERM, 2000) and the Remedial Investigation (RI) Report (ERM, 2001). Subsequent portions of this section summarize previous investigation phases at the Site.

1.4.1 Phase II Investigation

The initial subsurface investigation at the Site performed by ERM was conducted in April 1998 and was designated the Phase II Investigation. The Phase II Investigation included the following main components:

- installation and sampling of seven soil borings using direct-push technology;
- installation and sampling of three temporary ground water monitoring wells;
- installation and sampling of three shallow soil borings using a hand auger;
- analysis of samples at an approved environmental laboratory for one or more parameters including VOCs, SVOCs, total petroleum hydrocarbons (TPH), and polychlorinated biphenyls (PCBs); and
- preparation of a report presenting the results of the Phase II investigation.

1.4.2 Phase III Investigation

ERM conducted a follow-up investigation at the Site in November and December 1998 to further evaluate the nature and extent of affected soil and ground water. This follow-up investigation was designated the Phase III investigation and focused on the areas of affected soil and ground water apparently concentrated near the southwestern portion of the building. The Phase III Investigation included the following main components:

- installation and sampling of 20 additional soil borings using direct-push and hollow-stem auger drilling technologies;

- installation and sampling of five permanent ground water monitoring wells and one temporary monitoring well inside the building;
- collection of water level data and ground water samples for laboratory analysis; and
- preparation of a report presenting the results of the Phase III investigation.

Data generated during the Phase II and Phase III investigations suggested that affected soil was limited predominantly to the southwestern portion of the Site beneath the main building in proximity to an abandoned varnish pit, the former varnish UST excavation, the Former Drum Storage Area (FDSA), and proximal to soil boring GB-10. Several VOCs were detected in soil samples collected from several soil borings installed at the Site during the Phase II and Phase III investigations. The predominant VOCs detected in Site soil include 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and xylenes. Several SVOCs were detected in soil samples in two areas: 1) the former northern railroad spur into the Site; and 2) south of the FDSA.

1.4.3 Remedial Investigation

An RI was performed by ERM in the summer of 2001. The RI Report (ERM, 2001) included the following main components:

- a passive soil vapor survey;
- characterization of soil types;
- bedrock cores collected;
- soil boring installations and soil sampling and analysis;
- investigation of subsurface utilities;
- sampling and analysis of ground water samples from existing monitoring wells;
- installation and sampling of new shallow overburden ground water monitoring wells;
- installation and sampling of new intermediate overburden ground water monitoring wells;
- installation of new deep overburden ground water monitoring wells;
- collection of a sample from a concrete vault south of the Former Drum Storage Area; and
- visual inspection of the varnish pit.

Soil

The RI report identified potentially elevated concentrations of VOCs in the following areas;

- the Former Varnish UST Area;

- the FDSA;
- near soil boring GB-10;
- near soil boring GB-14;
- the Short Truck Bay Area; and
- the Varnish Pit Area.

The RI report also identified SVOCs at concentrations above unrestricted use clean-up objectives in the following areas:

- the Long Truck Bay Area (i.e., near sample location HA-3)
- the Former Varnish UST Area;
- east of the varnish pit (soil boring GB-27); and
- along the north side of the access road to the western portion of the Site (soil borings GB-10 and GB-33).

SVOCs in the Short Truck Bay and the Long Truck Bay are associated with railroad tracks that formerly entered the facility. Remediation of construction-related materials is not contemplated in the VCA. Therefore, remediation of SVOCs in the Short Truck Bay Area and the Long Truck Bay Area at the Site is not contemplated.

Ground Water

Based on regional topography and the spatial distribution of major surface water features, regional ground water flow direction beneath the Site is expected to be towards the north-northwest. Significant variation in moisture content and permeability was observed in the overburden units at the Site. This suggests ground water will tend to flow towards and into the more permeable units (fill and coarser overburden units).

Three distinct saturated zones have been identified at the Site that appear to be transmissive relative to the clay and/or bedrock units:

- shallow overburden (water locally perched in fill on top of the uppermost silty clay unit);
- intermediate overburden (silty sand beneath the upper silty clay unit); and
- deep overburden (silty sand on top of bedrock).

Several monitoring wells were installed adjacent to one another to provide data useful for evaluation of vertical hydraulic gradient. Comparison of water levels in these well couplets indicates there is a downward hydraulic gradient between overburden zones at the Site.

VOCs were detected in shallow overburden ground water samples collected during the Phase II and Phase III investigations. Review of the laboratory analytical results for ground water samples collected during the Phase III and RI investigations suggested that VOCs were not detected in ground water samples collected from the intermediate overburden ground water zone.

VOCs and SVOCs were not detected in intermediate or deep overburden ground water at concentrations above ambient water quality standards and guidance values prior to the DGI. Additional investigation of intermediate overburden ground water during the DGI resulted in discovery of affected intermediate ground water in the vicinity of the varnish pit. These and other results of the DGI are presented in subsequent sections of this report.

1.4.4 Data Gap Investigation

The DGI summarized environmental data and findings associated with DGI activities conducted at the Site between October and December 2002. Data collected during the DGI have eliminated previously existing data gaps. Investigation of site subsurface utilities and site ground water during the DGI was completed in conformance with the NYSDEC-approved Work Plan for RI (ERM, 2000) and the Addendum to the Work Plan for RI – DGE (ERM, 2002) with minor modifications as authorized by NYSDEC representatives.

Geologic units encountered during installation of DGI soil borings are consistent with units previously encountered at the Site. Review of soil boring logs indicates that Site geology can be characterized as consisting of the following stratigraphic units in descending order from ground surface to depth.

- A fill unit consisting predominantly of brown to gray or black sand, vitreous slag-like or limestone-like gravel, and/or ash-like material with lesser amounts of silt or silty clay (typically 2-12 feet thick);
- An orange-brown to red-brown silty clay/clay unit consisting predominantly of clay and silt, locally mottled gray, with occasional, apparently discontinuous lenses of silt or sand (typically 10-32 feet thick);
- A silty sand unit consisting predominantly of dark reddish-brown silt and sand (typically 6-18 feet thick)
- A lower, dark yellowish-brown silty clay unit with apparently discontinuous lenses of silty or silty sand (typically 18-40 feet thick);
- A lower, dark grayish-brown sand unity, typically silty, locally gravelly (typically 12 to 24 feet thick); and

- Bedrock consisting of hard, micritic dolostone (a calcium-magnesium carbonate rock) with lesser amounts of nodular anhydrite (an anhydrous calcium sulfate mineral).

ERM installed three soil borings and seven monitoring wells to evaluate possible migration of VOCs away from the subsurface sanitary pipe. Incorporation of DGI data into results from the RI suggest that VOCs have migrated a limited distance from the varnish pit along the subsurface sanitary pipe, possibly as a result of vapor-phase migration in relatively permeable backfill outside the pipe. Results from soil boring indicate that migration of VOCs laterally away from the pipe is insignificant and that remedial activities should be focused along the length of the pipe.

Review of laboratory analytical data indicates the total VOC content of the product/water mixture collected during installation of monitoring wells is 674,500 mg/kg VOCs as measured by USEPA Method 8260. Assuming other VOCs are not present in the product/water sample suggests approximately 67.5 percent of the mass of the sample is DNAPL with the remaining 32.5 percent consisting of water. The observation of DNAPL in the sample combined with the high concentration of VOCs in the product sample indicates there is a pool of DNAPL in close proximity to the varnish pit. The apparent absence of DNAPL and decreasing concentrations of VOCs with depth during Flam Ionization Detector (FID) field screening suggests that the pool of DNAPL is present at the base of the fill unit and is largely being contained at the contact between the overlying fill unit and the underlying upper silty clay/clay unit.

Based on the findings in the DGI, the distribution of VOC-affected ground water at the Site indicates the primary source areas were the varnish pit, the former varnish UST, and the FDSA. VOCs have not migrated off site and have not migrated a significant distance away from the defined source areas. Therefore, ground water remedial efforts should be focused in and around these source areas. Based on observed concentrations, the majority of contaminant mass in ground water at the Site is present in shallow overburden ground water. Available data suggest that natural attenuation processes may be capable of completing remediation of shallow ground water once source areas have been addressed.

1.4.5 Additional Investigation Activities – MW-23

Ground water monitoring was initiated to assess possible migration of compounds of potential concern during the investigation phase of the VCP for the Site and to evaluate the current status of natural attenuation in Site ground water. The Site currently has 25 monitoring wells, six vapor monitoring wells and five recovery wells. Four of the recovery wells are currently used as extraction wells for DNAPL and affected ground water in the Varnish Pit Area as part of the on going DNAPL Recovery IRM. The Varnish Pit Area was identified as an area of concern in the DGI and is the primary source area of affected ground water on the Site (ERM, 2003).

ERM conducted static ground water level measurements in the vicinity of the Varnish Pit Area to monitor influence during pilot testing of the DNAPL recovery system in September 2005. ERM inspected monitoring well MW-23 on 9 September 2005 and discovered a measurable amount of separate-phase LNAPL and ground water level. The aqueous phase in well MW-23 has never been sampled and it was infrequently checked, because it had been historically a "dry" well. The finding of LNAPL in MW-23 was subsequently reported to Sonoco, Greif, and NYSDEC.

ERM inspected all Site wells for separate-phase liquids and started to frequently monitor interior wells to assess possible migration of separate-phase liquid on Site. No additional wells outside of the Varnish Pit Area were found to contain separate-phase liquids. ERM began to manually bail LNAPL and ground water from MW-23 on a weekly basis to bi-weekly basis starting on 11 November 2005 in an effort to monitor the recovery and recharge of liquids into the well. Ground water and LNAPL has continued to recharge into MW-23 to this date. As requested by NYSDEC, liquid levels in MW-23 have been presented in Monthly Progress Reports for the Varnish Pit Area since December 2005. The NYSDEC requested in July 2006 that an effort be made to investigate the source of ground water or water and LNAPL at MW-23.

ERM implemented a background fluorescence analysis (BFA) and fluorescent dye-tracing (FDT) investigation to evaluate ground water flow paths and velocities and to evaluate the potential source of ground water and LNAPL discovered in MW-23. Fluorescent dyes for tracing were selected based on BFA results. Dyes were placed into selected wells and trenches excavated specifically for FDT at the Site. Periodic ground water samples are being collected from targeted monitoring wells and analyzed for dye concentrations. The FDT will also allow an evaluation of the efficiency of the ongoing DNAPL Recovery IRM by tracing the ground water flow paths and accessing radius of influence from pumping. Preliminary FDT data suggests that the dye placed into VMP-2 in the Varnish Pit Area was detected in ground water samples collected from wells MW-23, MW-13, and MW-14. Preliminary data suggests a direct connection between affected ground water in the Varnish Pit Area and hydrologic downgradient monitoring wells, including well MW-23. This investigation is ongoing and the full results of the BFA/FDT investigation will be presented to NYSDEC in a report.

1.5 INTERIM REMEDIAL MEASURES

1.5.1 DNAPL Recovery IRM Pilot Test

ERM discovered the presence of a DNAPL pool in the vicinity of the Varnish Pit Area during performance of the DGI (ERM, 2003). The primary remedial objective of the DNAPL Recovery IRM was to facilitate protection of human health and the environment by addressing the source area through removal of DNAPL to the extent practicable. The IRM was designed primarily as a temporary or partial remedy for the Varnish Pit Area.

The IRM for this area consist of DNAPL recovery involving the installation of recovery wells for phased DNAPL recovery through several stages of pumping and/or vacuum-enhanced recovery. Three stainless steel recovery wells were installed in areas corresponding the subsurface structural lows as mapped on the top of the native silty clay/clay unit. Three vapor monitoring points were installed to provide vacuum data and liquid level measurements during DNAPL recovery pilot test operations. The pilot test consisted of five distinct phases or tests:

1. high vacuum dual-phase extraction;
2. DNAPL pumping;
3. ground water pumping;
4. simultaneous DNAPL and ground water pumping; and
5. low vacuum enhanced DNAPL recovery.

Figure 1-4 is a map showing static DNAPL contours in the Varnish Pit Area measured on 14 September 2004. Review of Figure 1-4 suggests that DNAPL was present in the subsurface in a pool that is centered around the varnish pit. This indicated that the likely source of DNAPL in the subsurface was most-likely from the varnish pit. The top of the DNAPL pool appeared to be mounded with the highest elevations on the south side of the pit. However, data was limited to the north and west of the pit. This geometry is comparable to the mapped geometry of ground water above the DNAPL. Figure 1-4 also shows that the lateral extent of DNAPL is greater than the limits of the varnish pit. The lack of DNAPL in wells VMP-1, MW-12, MW-13 and MW-14 suggested that the DNAPL had not migrated laterally to those locations.

1.5.2 DNAPL Recovery IRM

Following the pilot testing, ERM submitted the DNAPL Recovery IRM Pilot Test Report to the NYSDEC in May 2005 (ERM, 2005). ERM proposed DNAPL pumping approach as the IRM for the Varnish Pit Area. Upon NYSDEC approval, ERM installed two additional six-inch diameter stainless steel monitoring wells and three additional two-inch diameter stainless steel vapor monitoring points in the Varnish Pit Area. ERM constructed the DNAPL recovery system as outlined in a subsequent section of the report. The DNAPL recovery system relies on the gravity drainage of pore space and fractures in overlying fill unit proximal to the varnish pit, which semi-confined by the underlying upper silty clay/clay unit. The DNAPL recovery system was initially started to recover DNAPL only. The system was then adjusted to recover DNAPL and ground water during November 2005. In 17 months of operation the system recovered 700 gallons of DNAPL and 3,100 gallons of affected ground water. The system was enhanced to apply low vacuum to select recovery well. Pilot testing of the low vacuum enhancement to the system was initiated in March 2007. Final groundwater drawdown and final DNAPL drawdown test results are presented on Figures 1-5, 1-6, 1-7, 1-8, 1-9, 1-10 and 1-11. The low vacuum enhancement is discussed in detail in Section 1.5.2.2 of this report.

1.5.2.1 DNAPL Recovery System

ERM reviewed and assessed a variety of commercially available DNAPL pumping systems. Based on ERM's previous experience with DNAPL recovery systems and specifications provided by vendors, a variable-speed, low-flow metering pumps were selected and installed at each recovery wellhead. The pumps are capable of pumping between 10 milliliters (ml) to 500 ml per minute. The metering pump was chosen over other pumps based on its variable speed ability, self-priming dry run capability, corrosion-resistant wetted materials, and typically long period of low-maintenance operation.

A seven-day programmable timer was installed to control each DNAPL pump. Each pump was installed within a metallic sump drained into the recovery well to provide secondary containment at the wellhead. A well seal with a vapor-tight lock and drain check valve were placed within the well casing to contain DNAPL vapors within the well. The well seal also contain a two-inch diameter port with a sealed cap that are utilized for well access to measure and record liquid levels, and also accommodate soil vapor extraction piping. Piping from the DNAPL pump to the DNAPL storage is secondarily contained with corrosion resistant tubing installed within two-inch and four-inch diameter schedule 80 PVC pipe. The DNAPL storage container is equipped with a high-liquid level switch that shuts down the DNAPL product pumps when the storage container approaches no more than 90 percent of its nominal capacity. Major system components and the general layout of the liquid phase DNAPL recovery system are presented in Figure 1-12.

ERM conducted pilot testing with the system in August 2005, recovering 270 gallons of DNAPL. The system was set to collect total fluids in November 2005. The efficient operation and maintenance (O&M) of the DNAPL product recovery system has been routinely monitored. Information recorded and maintained during O&M has provided the data necessary to control and modify the system operation and provide data for determining system patters and DNAPL recovery trends. The summarized results are presented in Table 1-1 and Figure 1-13.

ERM initiated quarterly ground water sampling events at the Site in January 2006, following the completion of the Soil Excavation IRM of the Boring GB-10/ FDSA. During the initial sampling event in January 2006, ERM collected a complete round of liquid level measurements from all Site wells and Vapor Monitoring Points (VMP) prior to purging and sampling monitoring wells. ERM measured 4.6 feet of DNAPL in intermediate monitoring well MW-20, which is located within the Varnish Pit Area. ERM began to monitor and manually pump DNAPL from MW-20 and VMP-2 following the January 06 sampling event. ERM installed an automated recovery system on 1 June 2006. The recovery system on MW-20 followed the same design used to recover DNAPL from recovery wells in the Varnish Pit Area for the DNAPL Recovery IRM. The system is run off a separate electrical panel from the DNAPL Recovery IRM System and utilizes programmable timer to run the metering pump for 10-minutes daily. DNAPL is recovered to a 55- gallon drum equipped with a high level shut of switch. The automated recovery system has remained active and as of 31 May 2007, 8.3 gallons of DNAPL have been recovered.

1.5.2.2 Low Vacuum Enhancement of DNAPL Recovery IRM

At the request of the NYSDEC, ERM implemented low vacuum soil vapor extraction (SVE) at the recovery well proximal to the Varnish Pit Area as an IRM. ERM performed a comprehensive evaluation of off gas treatment options for the SVE. An innovative Vapor Condensation Technology was selected based on vendor specifications, efficiency and overall O&M costs.

ERM initiated construction for the implementation of low vacuum enhancement of the DNAPL recovery system in December 2006. A sub-slab trench was installed from the Varnish Pit Area to the southern wall of the facility. The trench utilizes a steel form with steel grates covers to house the associated piping. This allowed easy access to the piping for repairs or to change the configuration of the piping, if deemed necessary. Pipe from the facility to the remedial building, which houses the SVE system and off gas treatment were insulated and directly buried. Two four inch diameter PVC pipes run from the remedial building to the Varnish Pit Area and were manifolded to recovery wells (RW-1, RW-2, RW-4 and RW-5). Additional pipes were installed from the treatment building to the sub-slab trench and were capped just inside the facility. The extra piping can be used for future sub-slab depressurization (SSD) or to accommodate additional remedial efforts, if deemed appropriate. Figure 1-14 presents the piping layout from the Varnish Pit Area to the treatment building.

Construction of the remedial building was completed on 27 March 2007. ERM is utilizing the DNAPL and ground water recovery system discussed in Section 1.5.2.1, to effectively dewater the fill unit in the Varnish Pit Area to maximize the exposure of the vadose zone to the vacuum applied at the well head. The layout of the low vacuum SVE system and the vapor condensation off gas treatment equipment within the remedial building is presented as Figure 1-15. The following describes the SVE extraction and vapor condensation off gas treatment process:

- Soil gas is drawn from the recovery wells though piping and to the two skid mounted 30 horsepower air compressors equipped with 5 horsepower positive displacement blowers. Entrained liquid are separated at water knock out tanks. The system is capable of drawing 200 cubic feet per minute (CFM);
- Process vapor stream is compressed to 10 atmospheres by the compressor and then are cooled to approximately 95^{o} Fahrenheit (F) in the after-cooler units;
- Water vapor is removed from the process stream at the air-to-air heat exchanger;
- Gas and vapor steam temperature is reduced to approximately -20 ^{o} F in the refrigerated heat exchanger, where the majority of the chemical condensates and separates from the vapor stream. The liquid condensate is sent through an oil/water separated, which directs the chemical and water to appropriate storage containers. The remaining process vapor stream is sent to regenerative absorber, which removes additional chemical and water vapor and directs it back into the influent stream;
- The remaining air stream is directed two 350 lbs granular activated carbon (GAC) drums in series to polish VOCs from air stream prior to release to atmosphere.

The low vacuum enhancement of the DNAPL recovery system was initiated on 28 March 2007. ERM monitored the system efficiency and area of influence for six days after start up. ERM monitored VOC concentrations in the field utilizing a calibrated Photoionization Detector (PID) with an 11.8 eV lamp, collected temperature, relative humidity, vacuum and/or air flow readings from sample ports at the following location:

- Influent vapor stream- prior to any treatment;
- Pre-carbon- after vapor condensation, before GAC units;

- Mid-carbon- between the two GAC units in series;
- Effluent- post carbon polish.

A summary of the data collected from the referenced sample ports is presented as Table 1-2. The VOC field screening data collected during the Pilot Test is graphically summarized in Figure 1-16. ERM measured liquid levels and collected subsurface vacuum readings in all interior monitoring wells and vapor monitoring points (VMP). The vacuum data is summarized in Table 1-3. Subsurface vacuum data was mapped to evaluate the distribution of vacuum in the subsurface during the SVE start up (Figure 1-17). Review of Figure 1-17 suggests that an average vacuum influence of 0.05 inches water or greater occurred in a generally elliptical geometric oriented area of influence with its elongated axis trending northwest/ southeast through the Varnish Pit Area. Influence was estimated at distances ranging from 25 to 85 feet from the dual phase extraction (DPE) recovery wells within the Varnish Pit Area.

ERM collected 9 vapor samples and 1 aqueous condensate sample for laboratory analysis during the first six days of operation of the DPE. Samples were sent under proper chain of custody to a subcontracted laboratory for analysis for the Site specific VOC list. The laboratory data is summarized in Tables 1-4 and Table 1-5. The total VOC concentration of the extracted soil vapors during the Pilot Testing ranged between 544,500,000 ug/M^3 and 3,515,000 ug/M^3. The effluent concentrations ranged between 18,304 ug/M^3 one hour after start up, decreasing to 582 ug/ M^3 during the last day of Pilot Testing. The individual VOCs detected are consistent with VOCs detected in soil and ground water samples collected in the Varnish Pit Area, with majority of the mass being derived from 1,1,1- TCA and TCE.

ERM has continued operation of the DPE system, conducted routine O&M, and regularly inspected associated equipment and liquid storage containers since the start of the DPE on 28 March 2007. Through the 34th day of operation, the low vacuum soil vapor extraction enhancement system has recovered 127 gallons of DNAPL condensate (approximately 1,485 pounds) and 340 gallons of aqueous condensate.

As of 1 June 2007 a total of 896 gallons of DNAPL (10,474 pounds) and 4,709 gallon of aqueous phase liquid have been recovered from the combined of pumping and SVE. The DNAPL recovery data from pumping and SVE summarized and presented in Table 1-1 and Table 1-2, respectfully. A graphic summary of the DNAPL recovery during the DNAPL Recovery IRM is presented as Figure 1-13.

1.5.3 *Soil Excavation IRM of Soil Boring GB-10/Former Drum Storage Area*

Based on a VCA between Sonoco Products Company and the NYSDEC, ERM excavated VOC-affected soil located in the Soil Boring GB-10/FDSA at the Site. VOC-affected soil was excavated in substantial conformance with the IRM Work Plan approved by the NYSDEC on 13 August 2004 (NYSDEC 2004b).

Extensive remedial preparations were required to complete the NYSDEC-approved soil excavation IRM, including the installation of excavation controls to protect the structural integrity of the main facility building. Monitoring of the building structural components indicated that the installed excavation controls were successful in protecting the building from significant damage of subsidence. Previously unknown subsurface utilities, reportedly associated with a former water tower associated with the original fire protection system for the facility, were discovered and had to be removed prior to resuming the removal of grossly-affected soil. These previously unknown utilities acted as preferential pathways for migration of VOCs from the FDSA, resulting in a larger volume of grossly-affected soil than previously estimated.

The applicable remedial standard for the soil excavation IRM was removal of grossly-affected soil as evaluated in the field using the field screening approach outlined in the NYSDEC-approved IRM Work Plan (ERM, 2004a). A total of 1760.82 tons of grossly-affected soil was excavated and disposed off-Site as hazardous solid waste at a NYSDEC-permitted RCRA Subtitle C disposal facility. A small amount (5.99 tons) of non-hazardous solid surficial and vegetative debris from cleaning and grubbing operations was also transported and disposed off Site at a NYSDEC-permitted RCRA Subtitle D disposal facility. Significant volumes of ground water and some storm water entered the excavation and were managed as hazardous waste due to contact with grossly-affected hazardous soil waste. A total volume of 14,575 gallons of water were removed from the excavation and transported off Site for disposal at a permitted hazardous waste transportation, storage and disposal facility.

NYSDEC on-Site personnel approved the final extent of the remedial soil excavation in the field, indicating that the primary remedial goal of removal of grossly-affected soil was achieved to the satisfaction of NYSDEC. A confirmation soil sampling program was implemented to document remaining concentration of VOCs in soil in the GB-10/FSDA. Following completion of confirmation sampling activities and restoration of subsurface utilities, the excavated area was backfilled and compacted in one-foot lifts to its pre-existing grade with approved select structural fill or excavated clean soil as approved by NYSDEC, a New York-licensed Professional Engineer, and Grief personnel.

Laboratory analytical results from confirmation soil samples support the conclusion that the soil excavation IRM removed significant mass of VOCs from the GB-10/FSDA and are consistent with the conclusion that the soil excavation IRM successfully removed grossly-affected soil and achieved all applicable standards, criteria, and guidance established for this IRM as outlined in the NYSDEC-approved IRM Work Plan. Additional remediation of soil in the GB-10/FSDA is unwarranted based on relatively low remaining concentration of VOCs and the contemplated use of the property as defined in the VCA (restricted commercial).

Two new monitoring wells were installed in the GB-10/FSDA to evaluate ground water quality after completion of the soil IRM, and to provide updated data on ground water quality in the Varnish Pit Area.

2.0 SUMMARY OF REMEDIAL INVESTIGATION AND EXPOSURE ASSESSMENT

This Section discusses the exposure assessment conducted for the Site soil and ground water. The assessment presented below was included in the DGI Report (ERM, 2003). To assist in review of this information, a Conceptual Site Model for potential exposures (CSM) has also been prepared to visualize these mechanisms (Figure 2-1).

2.1 SOIL

Chemicals of potential concern in soil were determined in the Exposure Assessment by comparing the detected concentrations to the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 Recommended Soil Cleanup Objectives (RSCOs) (NYSDEC, 1994). At the time the exposure assessment was conducted, these were the applicable SCGs.[1] Comparison of the Site soil concentrations to the RSCOs indicates that 13 VOCs and seven SVOCs in Site soil exceeded the unrestricted use RSCOs. TAGM-4046 (NYSDEC, 1994) presents RSCOs for organic compounds for both direct contact with soil and for protection of ground water. The lower of these two values is the Site-specific RSCO. The Site-specific RSCO was used to screen VOCs and SVOCs of potential concern. The acceptable level for direct contact exposure is based on a residential exposure scenario, with children ages one to six ingesting soil. The acceptable level for protection of ground water is based on leaching of chemicals in soil to ground water where ground water concentrations must meet promulgated or proposed New York State ground water/drinking water quality standards. To further evaluate which chemicals may potentially pose a human health exposure via each of the above pathways at the Site, the maximum detected concentration of each of the chemicals of concern is compared to these two criteria. This comparison was conducted prior to the soil excavation IRM. Thus, this should be considered a conservative assessment as a significant amount of affected soil was removed during the Soil Excavation IRM.

Direct Contact with Soil

Applicable direct contact criteria for TCE, benzo(a)anthracene, and benzo(a)pyrene were each exceeded in at least one soil sample. As noted above, NYSDEC's direct contact TAGM 4046 RSCOs are based on incidental ingestion of soil by children in a residential setting. The Site is currently an active industrial Site that is fully fenced to restrict access to trespassers. Therefore, to evaluate potential risks to Site workers and

[1] As discussed further in Section 4.3, NYSDEC has subsequently approved soil cleanup objectives (SCOs) for various site uses.

visitors (the potential receptors of concern), maximum detected concentrations of the chemicals of concern in Site soil were also compared to criteria appropriate for commercial/industrial exposures. Region III of USEPA has established acceptable levels of chemicals in soil based on direct contact with soil by commercial/industrial workers in occupational settings risk-based concentrations (RBCs; USEPA, 2001). These values are presented for the chemicals whose concentrations exceed NYSDEC's residential direct contact criteria. There are no established criteria available to evaluate exposures to Site visitors. However, since the RBCs assume exposure occurs 250 days/year over a 25-year period, exposures to Site visitors will be significantly less. These results are discussed for each chemical below.

TCE was detected at a non-estimated concentration greater than the NYSDEC residential direct contact level of 64,000 μg/kg in soil samples GB-10 (1-2'), GB-10 (14-15'), GB-20 (11-12'), and MW-20 (13-14'). TCE was detected in excess of the USEPA RBC for industrial exposures (520,000 μg/kg) in one sample (GB-10, 1-2'). However, this area was removed during the Soil Excavation IRM and therefore this exceedance is no longer applicable/present at the Site.

Benzo(a)anthracene was detected at a non-estimated concentration greater than the NYSDEC residential direct contact level of 224 μg/kg in soil samples GB-1 (14-16'), GB-4 (10-12'), HA-3 (0-0.5'), HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3'). Benzo(a)anthracene was detected at a concentration greater than the USEPA RBC for industrial exposures (7800 μg/kg) in soil samples HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3'). Therefore, direct contact with subsurface soil in the vicinity of sample locations HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3') may represent a significant benzo(a)anthracene exposure pathway for Site workers.

Benzo(a)pyrene was detected at a non-estimated concentration greater than the NYSDEC residential direct contact level of 61 μg/kg in soil samples GB-1 (14-16'), GB-4 (10-12'), HA-3 (0-0.5'), HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3'). Benzo(a)pyrene was detected in excess of the USEPA RBC for industrial exposures (780 μg/kg) at GB-1 (14-16'), HA-3 (0-0.5'), HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3'). Therefore, direct contact with subsurface soil in the vicinity of samples GB-1 (14-16'), HA-3 (0-0.5'), HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3') may represent a significant benzo(a)pyrene exposure pathway for industrial workers.

<u>Volatilization of Chemicals in Soil to Indoor and Outdoor Air</u>

Thirteen of the chemicals of potential concern in soil are VOCs. Inhalation of VOCs by Site workers and visitors may represent a complete exposure pathway if volatilization of a significant mass of VOCs from soil to ambient air is occurring. Currently, the New York State Department of Health (NYSDOH) has developed screening levels related to the soil vapor intrusion pathway for TCE, PCE and 1,1,1-TCA. However, these screening levels are for soil gas and indoor air concentrations, not soil or ground water. However, based on the concentrations of VOC COPCs in soil and ground water beneath the Site buildings, there is a potential for this pathway to be present.

Leaching of Chemicals from Soil to Ground Water

Organic compounds present in soil at concentrations in excess of ground water protection criteria include all of the VOCs of potential concern (acetone, 2-butanone, 1,1-DCA, 1,1-DCE, 1,2-DCA, 1,2-DCE, ethylbenzene, PCE, toluene, 1,1,1-TCA, TCE, and xylene) and four of the SVOCs of potential concern (benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and naphthalene). The VOCs detected in soil in excess of the ground water protection criterion are also identified as chemicals of potential concern in ground water. Therefore, these 13 VOCs in soil may potentially affect ground water quality at the Site and are therefore further evaluated in Section 2.2.

None of the SVOCs that were detected at concentrations above the ground water protection criteria for soil were identified as chemicals of potential concern in Site ground water (none of the SVOCs were detected in any ground water samples). Therefore, leaching of SVOC chemicals of potential concern in soil to ground water does not appear to represent a human exposure pathway.

2.1.1 Summary of Soil Exposure Pathways

Under current conditions, direct contact with TCE, benzo(a)anthracene, and benzo(a)pyrene at a limited number of subsurface locations may represent a significant human exposure pathway for Site workers based on exceedances of contact criteria established for industrial settings by USEPA (the RBCs).

The detection of 13 volatile chemicals of potential concern in soil may allow a complete exposure pathway via volatilization from soil to ambient air and subsequent inhalation by Site workers and visitors. Sufficient information is not available to assess this exposure pathway using the NYSDOH screening matrix; therefore, this pathway was not evaluated further.

The detection of 13 volatile chemicals of potential concern in soil suggests the possibility that ground water quality may be negatively affected by leaching from soil. However, ground water is not used at the Site or proximal to the Site. Leaching of SVOCs from Site soil to ground water does not appear to be significant.

2.2 *GROUND WATER*

There are 22 VOCs that are considered chemicals of potential concern in Site ground water. These VOCs were detected at concentrations that are greater than NYSDEC's Class GA ambient ground water quality standards and guidance values (TOGS-1.1.1; NYSDEC, 1998). However, as noted above, ground water is not currently used for any purpose at the Site or in the vicinity of the Site. Therefore, the only potential exposure pathway for chemicals in Site ground water is volatilization to ambient air. As noted above, VOCs have not migrated off site. Volatilization of the volatile chemicals of potential concern from ground water to ambient air at the Site may represent a complete exposure pathway for Site workers and visitors via inhalation. Sufficient information is not available to assess this pathway using the SCGs; therefore, this pathway is not evaluated further.

2.3 *INTERPRETATION OF EXPOSURE ASSESSMENT*

A summary of potential human exposures to chemicals in soil and ground water via each pathway of potential concern is provided below.

Direct Contact with Soil

TCE, benzo(a)anthracene, and benzo(a)pyrene have been detected in one or more soil samples in excess of NYSDEC TAGM-4046 residential direct contact levels. However, the Site is presently used for commercial/ industrial purposes and the contemplated use in the VCA is "restricted commercial", not residential. Under current conditions, direct contact with these three compounds in soil at a limited number of subsurface locations may represent a significant human exposure pathway for Site workers based on detected concentrations in excess of benchmark levels established for industrial settings (RBCs).

Inhalation of Chemicals in Soil

Thirteen VOCs were identified as chemicals of potential concern in soil based on detected concentrations in excess of applicable TAGM 4046 RSCOs. Therefore, the detection of these chemicals in Site soil may result in a complete exposure pathway in some areas of the Site if volatilization of a significant mass from soil to ambient air occurs followed by subsequent inhalation by Site workers and visitors. There are no soil criteria based on inhalation exposures; therefore, this pathway was not evaluated further.

Leaching of Chemicals from Soil to Ground Water

Leaching of SVOCs from Site soil to ground water does not represent a complete exposure pathway. Leaching of volatile chemicals from Site soil to ground water may represent a complete exposure pathway for 13 VOCs of potential concern based on some detections in excess of NYSDEC soil impact to ground water concentrations and the presence of these chemicals in shallow Site ground water. The specific VOCs of potential concern for this pathway include acetone, 2-butanone, 1,1-DCA, 1,1-DCE, 1,2-DCA, 1,2-DCE, ethylbenzene, PCE, toluene, 1,1,1-TCA, TCE, and xylenes.

Ingestion of Ground Water and Direct Contact with Ground Water

Ground water at the Site and in the vicinity of the Site is not currently used for drinking water or any other potable purposes based on the results of the well search. Therefore, ingestion of ground water and direct contact with ground water do not represent complete exposure pathways for Site workers or visitors. Affected ground water has not migrated off site.

Inhalation of Chemicals from Ground Water

Chemicals of potential concern in ground water based on detected concentrations in excess ambient ground water quality standards and guidance values include 22 VOCs. Specific VOCs include acetone, benzene, 2-butanone, chloroethane, chloroform, cis- and trans-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,1-DCE, 1,2-DCE, ethylbenzene, methylene chloride, 4-methyl-2-pentanone, PCE, toluene, 1,1,1-TCA, 1,1,2-TCA, TCE, 1,2,4-TMB, vinyl chloride, and xylenes. The presence of these VOCs in on-site ground water may result in a complete exposure pathway if volatilization of a significant mass, escape from the subsurface, and subsequent inhalation by Site workers and visitors occurs. There are no ground water criteria based on inhalation exposures; therefore, this pathway was not evaluated further.

3.0 REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

This section presents the remedial goals and remedial action objectives (RAOs) established for the Site media of interest (i.e., soil and ground water).

Remedial goals are derived from the statute (i.e., Title 6, New York Code of Rules and Regulations [6NYCRR] Part 375) and NYSDEC guidance. The remedial goals for Voluntary Cleanup Program (VCP) Sites as set forth in the NYSDEC DER-10 (NYSDEC, 2002) are:

- to be protective of public health and the environment, given the intended use of the site; and

- to include removal or elimination, to the extent feasible, of identifiable source of contamination regardless of the presumed risk or intended use of the site.

Guidance on developing RAOs is provided in NYSDEC TAGM Number 4030 (NYSDEC, 1990) and examples of RAOs are also set forth in DER-10 (NYSDEC, 2002). The RAOs are media-specific targets that are aimed at protecting public health and the environment. In the case of protection of human health, RAOs usually reflect the concentration of a COPC and the potential exposure route. Protection may be achieved by reducing potential exposure (e.g., use restrictions, limiting access) as well as by reducing concentrations. RAOs, which are established for protection of environmental receptors, are usually intended to preserve or restore a resource. As such, environmental RAOs are set for a media of interest and a target concentration level.

Media that are candidates for remedial evaluation are identified based on the nature and extent of contamination and applicable or relevant and appropriate SCGs. As discussed in Section 3.3, potential Site media of interest are soil and ground water as identified during Phase II, Phase III, RI, and DGI investigation activities. As identified in 6 NYCRR 375-1.10(c)(1)(ii), SCGs are provided in NYSDEC guidance. The most recent NYSDEC guidance containing SCGs is draft DER-10 (NYSDEC, 2002). In addition to the SCGs listed in DER-10, an additional SCG will also be considered – the Brownfield Cleanup Program (BCP) soil cleanup levels.

In addition to SCGs, certain site-specific factors are considered when developing the RAOs for Site media of interest. These site-specific factors relate to the affected media, types of constituents and potential routes of exposure. The factors that were considered in developing RAOs are discussed in the following subsections according to the media evaluated.

3.1 IDENTIFICATION OF AREAS OF CONCERN

Six areas were identified as exhibiting soil concentrations in excess of TAGM-4046 RSCOs:

- the Varnish Pit Area;
- the Former Varnish UST Area;
- the Short Truck Bay Area;
- the Former Drum Storage Area;
- near soil boring GB-10; and
- near soil boring GB-14).

For remedial evaluation purposes, the Short Truck Bay Area will be combined with the Varnish Pit Area. The area near soil boring GB-14 does not contain grossly-affected soil based on review of the soil boring log for GB-14. Therefore, this area has been removed from further consideration as an area of concern based on the contemplated use for the Site (restricted commercial).

As discussed in Section 1.4, VOCs and SVOCs were identified in soil and ground water in the FSDA and Soil Boring GB-10 Area. As discussed in Section 1.5.3, pursuant to the VCA between Sonoco and the NYSDEC, a Soil Excavation IRM (ERM, 2006) was performed in October 2005 in these areas (See Figure 3-1) to address the affected soil. The Soil Excavation IRM was successful in removing grossly affected soil to the satisfaction of on-Site NYSDEC representatives. As shown in Table 3-1, post-excavation samples exhibited some VOC concentrations above the Site Specific Unrestricted RSCOs. However, these post-excavation concentrations are an order of magnitude lower than pre-IRM concentrations, thus demonstrating that the grossly contaminated soil in these areas has been addressed. Based on the IRM activities conducted and NYSDEC's agreement (Appendix B) that the soil in these AOCs have been adequately addressed, no further actions are needed in the FDSA and Soil Boring GB-10 Area.

Based on the above, two areas of concern (AOCs) remain for the Site:

- Varnish Pit Area\Short Truck Bay Area; and
- Former Varnish UST Area.

The extent of affected media in these AOCs is discussed in the following sections. The COPCs for the affected Site media (soil and ground water) in the remaining three AOCs are shown on Table 3-2. The following subsections provide a brief overview of the soil conditions in these AOCs. Ground water conditions are discussed in Section 3.3.4 on a Site-wide basis rather than an AOC basis. This FS report will evaluate the remedial needs for these two AOCs.

3.1.1 Former Varnish UST Area

The RI revealed that soils affected by VOCs associated with varnish are generally located between 12-16 feet bgs over most of the Former Varnish UST Area and at shallower depths (generally three to nine feet bgs) immediately adjacent to the west end of the building (i.e., near MW-10 and GT-2). These soils may be a continuing source of VOCs to adjacent soil and shallow overburden ground water in this area. The distribution of affected ground water at the Site is discussed in more detail in Section 3.3.3.

3.1.2 Varnish Pit Area

This AOC is located beneath the Site building in the area of a previously operational and partially underground varnish pit. Soil in the vicinity of the former varnish pit is primarily affected by TCE and 1,1,1-TCA at depths generally ranging from just below floor level to approximately 33 feet below the facility's main floor level. The most heavily-affected zone generally occurs between 6 to 22 feet below the facility's main floor level. This AOC is located inside the building where manufacturing operations are ongoing, resulting in significant logistical constraints on remedial activities.

The source for the aforementioned soil contamination appears to be the presence of a pool of DNAPL in the vicinity of the varnish pit and a pool of LNAPL in the vicinity of monitoring well MW-23, which ERM has directly connected to the Varnish Pit Area. The connection between the Varnish Pit Area and the area proximal to MW-23 have proven through the preliminary results of the FDT analysis and comparison of the C-C44 whole oil analytical "fingerprinting" data from free-phase product collected from MW-23 and the Varnish Pit Area, which were analyzed using a GC-FID.

As discussed in Section 1.5.2, recovery of DNAPL and LNAPL via the DPE IRM system is currently being conducted as an IRM. The purpose of this IRM is to minimize the potential for additional migration of DNAPL away from the Varnish Pit Area and also control soil vapor beneath the Site building.

3.2 IDENTIFICATION OF SCGS

The NCP establishes applicable or relevant and appropriate requirements (ARARs) and defines To Be Considered (TBC) information as other advisories, criteria or guidance. Additionally, the NCP acknowledges that proposed standards issued by federal or state agencies, while not meeting the definition of an ARAR, should also be considered in remedial decisions (NCP at 40 CFR 300.400(g)(3)). The preamble to the NCP states that TBCs are to be used on an "as appropriate" basis.

SCGs incorporate both the CERCLA concepts of ARARs and TBCs. They include promulgated requirements and non-promulgated guidance, which govern activities that may affect the environment. The standards and criteria are those cleanup standards, standards of control and other substantive requirements, criteria or limitations that are officially promulgated under federal or state law. Though guidance does not represent a legal requirement, it should be considered based on professional judgment when applicable to site conditions (NYSDEC, 2002).

Table 3-3 presents potential SCGs, which may govern remedial actions at the Site. This table lists: the citation; a description of the SCG; SCG type (i.e., chemical, action or location specific); and, reason the SCG is listed (e.g., remedy selection and/or remedial action) and how it applies to the remedy evaluation. Also, there is a TBC category identifying proposed SCGs that are also considered in the remedial alternative evaluation.

Certain SCGs are considered in the development of the Site media of interest RAOs. These SCGs are discussed in remedial requirements for the media of interest in the following sections. The relevance of the SCGs and TBCs to the remedial alternatives is discussed with the evaluation of each alternative in Section 5.0 (i.e., in the evaluation of the ability of each remedial action alternative to comply with the SCGs).

3.3 MEDIA OF INTEREST

Two environmental media were evaluated at the Site during the DGI and IRM activities and evaluated below as potential media of interest requiring RAOs: soil and ground water. The sampling results for these media are discussed in Sections 3.3.1 and 3.3.2.

COPCs for soil and ground water were conservatively identified based on detected concentrations in excess of NYSDEC TAGM 4046 RSCOs (NYSDEC, 1994). Table 3-2 presents the COPCs identified during the Site's remedial investigations (i.e., Phase II, Phase III, RI and DGI). However, it should be noted that the NYSDEC TAGM 4046 RSCOs are generally applied for remediation to "unrestricted" use; the contemplated use of the Site is "restricted commercial". Therefore, remediation of Site soil to the indicated RSCOs and remediation of ground water at the Site to class GA ground water quality standards would not be required to obtain a restricted commercial release under the VCA. Since the exposure/risk assessment was conducted, Part 375 Soil Cleanup Objectives (SCOs) have been proposed. These will be used to assess soil remedial needs.

The soil concentrations at the Site have been compared to two values to determine site remedial needs:

- the Track 1 Unrestricted Use SCOs for the Protection of Public Health (Part 375-3.8(a)) to assess areas where use restrictions will be needed; and
- the Track 2 Restricted Commercial SCOs for Protection of Public Health (Part 375-3.8(a)) to assess remedial needs for the Site soil.

3.3.1 Soil

The COPCs for the three AOCs are presented in Table 3-2.

3.3.1.1 VOCs

Table 3-4 presents a comparison of the VOCs detected in Site soil to the unrestricted and restricted commercial SCOs. Estimated analytical results are not compared against SCGs. As shown in Table 3-4 and summarized below, 13 VOCs were detected at concentrations in excess of their applicable Part 375 unrestricted soil standards and 2 VOCs were detected at concentrations in excess of their applicable restricted commercial soil standards. These are:

Compound	**Number of Samples Exhibiting Concentrations in Excess of Residential Soil Standards**	**Number of Samples Exhibiting Concentrations in Excess of Restricted Commercial Soil Standards**
Acetone	6	0
2-Butanone	1	0
cis-1,2-Dichloroethene	1	0
1,1-Dichloroethane	6	0
1,2-Dichloroethane	1	0
1,1-Dichloroethene	3	0
Ethylbenzene	2	0
Tetrachloroethene	1	0
Toluene	2	0
1,1,1-Trichloroethane	12	0
Trichloroethene	14	1
Vinyl Chloride	1	0
Xylenes (total)	6	1

Of the VOCs detected in Site soil, it is anticipated that xylenes, TCE, and 1,1,1-TCA will drive remediation activities. These VOCs were therefore selected for iso-concentration mapping, in concurrence with NYSDEC, to illustrate VOC distributions in Site soil. Figures 3-2 to Figure 3-4 present the distribution of these compounds (post IRM) in Site soil.

3.3.1.2 *SVOCs*

Table 3-5 presents a comparison of the SVOCs detected in Site soil to unrestricted and restricted commercial SCOs. Estimated analytical results are not compared against SCGs. As shown in this table, 5 SVOCs were detected at concentrations in excess of their unrestricted SCOs and no SVOCs were detected at concentrations in excess of their restricted commercial SCOs. They are:

Compound	**Number of Samples Exhibiting Concentrations in Excess of Residential Soil Standards**	**Number of Samples Exhibiting Concentrations in Excess of Restricted Commercial Soil Standards**
Benzo(a) anthracene	1	0
Benzo(b) fluoranthene	2	0
Benzo(a) pyrene	2	0
Chrysene	3	0
Naphthalene	1	0

3.3.1.3 *Metals*

Metals were not detected in Site soil in excess of the unrestricted and restricted commercial SCOs (3-6).

3.3.1.4 *Qualitative Exposure Assessment*

As discussed in Section 2.0, potential exposure pathways for Site soil are:

- Direct contact with soil,
- Volatilization of VOCs from Site soil with subsequent inhalation of indoor and outdoor air, and
- Leaching of chemicals from soil into ground water.

The potential for direct contact exposures was assessed by comparing the Site soil concentrations to soil by commercial/industrial workers in occupational settings (risk-based concentrations or RBCs; USEPA, 2001).

Under current conditions, direct contact with TCE in the Varnish Pit Area, benzo(a)anthracene in the vicinity of sample locations HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3'), and benzo(a)pyrene in the vicinity of samples GB-1 (14-16'), HA-3 (0-0.5'), HA-4 (1-3'), HA-7 (1-3'), and HA-8 (1-3') may represent a direct contact risk for Site workers based on exceedances of the direct contact criteria established for industrial settings by USEPA (the RBCs). Currently, the New York State Department of Health (NYSDOH) has developed screening levels related to the soil vapor intrusion pathway for TCE, PCE and 1,1,1-TCA. However, these screening levels are for soil gas and indoor air concentrations, not soil or ground water. However, based on the concentrations of VOC COPCs in soil and ground water beneath the Site buildings, there is a potential for this pathway to be present.

Of the VOC COPCs in ground water, 11 VOC COPCs were detected in Site ground water above class GA standards, which suggests the possibility that ground water quality may be negatively affected by leaching from soil. However, ground water is not used at the Site or proximal to the Site. Of the SVOCS COPCs in Site soil, none exceeded class GA standards. Thus, leaching of SVOCs from Site soil to ground water does not appear to be significant.

3.3.2 Remedial Action Objectives for Soil

Based on the evaluation discussed above and the draft NYSDEC guidance regarding development of RAOs in DER-10 (NYSDEC, 2002), the soil RAOs (SRAOs) for Site soil will be:

SRAO1 - Prevent ingestion, direct contact, and/or inhalation of/with soil that poses a risk to public health and the environment given the intended use of the Site;

SRAO2 - Prevent inhalation of or exposure from COPCs volatilizing from soil that poses a risk to public health and the environment given the intended use of the Site; and

SRAO3 - Prevent the potential for vapor intrusion into indoor air, if needed.

The following section discusses the extent of affected Site soil to which these RAOs would apply.

3.3.3 *Extent of Affected Soil*

The extent of affected soil was determined by comparing the soil concentrations to the unrestricted SCOs and restricted commercial SCOs. This comparison was presented in Tables 3-4, 3-5 and 3-6. In addition, the aerial extent of xylene, TCE and 1,1,1-TCA in Site soil is shown in Figures 3-2 to 3-4. These figures indicate exceedances of the unrestricted and restricted commercial SCOs. As shown in these figures, exceedances of the restricted commercial SCOs are very limited.

In addition to comparison to the unrestricted SCOs and restricted commercial SCOs, an assessment of grossly affected soil was also conducted. This was accomplished through evaluation of the analytical results, geology logs, field observations and field screening results. This information was then input into the EVS software program to illustrate the 3-D distribution of grossly affected Site soil. An EVS depiction of this information is provided in Appendix C. The estimated distribution of grossly-affected soil in the Former Varnish UST Area and the Varnish Pit Area is presented in Figure 3-5.

The approximate aerial extent of grossly affected soils is as follows:

- Former Varnish UST Area 3,200 square feet (ft^2)
- Varnish Pit Area 21,000 ft^2

The extent of grossly-affected soil was used to assess remedial needs at the Site.

3.3.4 *Ground Water*

DNAPL is present in the vicinity of the Varnish Pit Area in both shallow and intermediate monitoring wells. LNAPL is present in the vicinity of MW-23, which ERM has been directly connected to the Varnish Pit Area. The connection between the Varnish Pit Area and the area proximal to MW-23 have proven through the preliminary results of the FDT analysis and comparison of the C_1-C_{44} whole oil analytical "fingerprinting" data from free-phase product collected from MW-23 and the Varnish Pit Area, which were analyzed using a GC-FID.

Dissolved phase VOCs were detected in shallow and intermediate overburden ground water, in excess of the Class GA standards. VOCs were not detected in deep overburden ground water at concentrations in excess of the class GA standards.

The distribution of VOCs in Site ground water indicates the primary source areas were the Varnish Pit Area and the Former Varnish UST Area.

The NYSDEC-approved Soil Excavation IRM completed for the FDSA/Soil Boring GB-10 Area removed much of the contaminant mass in these areas. Removal of one of the identified source areas will expedite remediation of shallow ground water to concentrations consistent with the contemplated use of the Site (restricted commercial). Based on observed concentrations, the majority of contaminant mass in ground water at the Site is present in shallow overburden ground water.

SVOCs were not detected in Site ground water at concentrations in excess of the class GA standards during the DGI. SVOC were not included in the ground water sampling protocol outlined in the NYSDEC approved IRM Work Plan (ERM, 2004a). Therefore, SVOCs are not considered ground water COPCs and are not evaluated in this document for remedial action.

3.3.4.1 VOCs

Table 3-7 presents a summary of VOCs detected in Site ground water during the five quarterly sampling events between January 2006 and January 2007 as comparison to the Class GA ground water standards. As shown in this table, a total of 20 VOCs have been detected at concentrations in excess of their class GA ground water standards during the referenced sampling events; including the following:

- Benzene
- 2-butanone
- Chloroethane
- Chloroform
- 1,1- DCA;
- 1,2- DCA
- 1,1- DCE;
- cis-1,2-DCE;
- trans-1,2-DCE;
- ethylbenzene;
- methylene chloride;
- 4-Methyl-2-pentanone;
- 1,1,1- TCA;
- 1,1,2- TCA
- PCE
- toluene
- 1,2,4- Trimethylbenzene (TMB);
- TCE;
- vinyl chloride, and
- xylenes.

Field and laboratory analytical data relevant to the evaluation of natural attenuation processes in Site ground water was collected during the DGI and has been collected during quarterly ground water sampling events that were initiated in January 2006, following the completion of the soil excavation IRM of the FDSA/ Soil Boring GB-10. The data show evidence of natural attenuation of the chlorinated VOCs through reductive dechlorination. Chlorinated ethenes and ethanes such as TCE and 1, 1, 1-TCA attenuate through a number of mechanisms including adsorption, dispersion, volatilization and degradation. Mass loss of TCE and 1, 1, 1-TCA occurs through both biological and abiotic degradation pathways. For TCE and 1, 1, 1-TCA, biological degradation through reductive dechlorination is often the major degradation pathway. In reductive dechlorination, chlorine atoms are sequentially removed from chlorinated ethenes and ethanes with the production of lesser chlorinated daughter products:

TCE → cis-DCE → vinyl chloride → ethene

1, 1, 1-TCA → 1, 1-DCA → chloroethane → ethane

In addition to reductive dechlorination, the chlorinated daughter products (e.g., cis-DCE and 1,1-DCA) also biodegrade through other anaerobic and aerobic pathways, such as reductive oxidation and aerobic cometabolism. Vinyl chloride and chloroethane also biologically degrade aerobically. Abiotic degradation pathways are also important attenuation mechanisms. 1,1,1-TCA degrades abiotically to acetic acid and 1,1-DCE, and chloroethane hydrolyzes to non-chlorinated products. Metal-catalyzed reductive degradation pathways may also be important for TCE, 1,1-DCE and other chlorinated compounds.

Cis-1,2-DCE and 1,1-DCA, which are the initial chlorinated daughter products of the reductive dechlorination of TCE and 1,1,1-TCA, respectively, are present in significant concentrations in Site ground water. 1,1-DCE the and vinyl chloride are also present in Site ground water. The daughter products of the reductive dechlorination of TCE and 1,1,1-TCA have generally shown slight fluctuations through the first 6 rounds of quarterly sampling. There have been significant decreases in the concentrations of 1,1,1- TCA and TCE in MW-18 which can not be solely accredited to natural attenuation.

The ratios of chlorinated ethene biological daughter products to parent compounds have been consistently greater than a ratio of 1 or slightly below a ratio of 1 in MW-18, MW-12, MW-25 and MW-24. The ratios of chlorinated ethanes biological daughter products to parent compounds have consistently been greater than or equal to a ratio of 1 at the Site. Such ratios provide evidence that reductive dechlorination is slowly occurring in Site ground water.

Geochemical data indicate reducing conditions conducive to reductive dechlorination are generally present in ground water in both the shallow and intermediate zones. Oxidation reduction potential (ORP) measurements indicate that the conditions in both the shallow and intermediate ground water in the vicinity of the Varnish Pit are anaerobic and conducive to reductive dechlorination. In 6 rounds of quarterly sampling the ORP of ground water ranged between -130 and 212 mV in the shallow zone and -101 and -206 mV in the intermediate zone. Dissolved oxygen (DO) concentrations are higher than would be expected based on the ORP values and ranged between 0.00 and 6.38 mg/L during 6 rounds of quarterly sampling event. DO concentration may be higher than expected do to in-situ measurements and purging techniques employed during sampling. The other major electron acceptor, sulfate, continues to range from approximately 82 and 1960 mg/L in the shallow zone and 120 and 731 mg/L in the intermediate zone. Low concentration of ferrous iron, the product of the use of ferric iron as an electron acceptor, were detected in shallow ground water zone with concentrations ranging from 0.0 to 1.8 mg/l.

Data from the recent ground water sampling event shows evidence of continued natural attenuation of the chlorinated VOCs through reductive dechlorination. The relative stability of the reductive daughter products in the shallow hydrogeologic unit suggests that the reductive dechlorination is slow. The trend of the reductive daughter products is similar in the intermediate hydrogeologic unit. Table 3-8 compares DGI MNA ground water data with the first round of quarterly MNA ground water data. The MNA evaluation in the DGI report also utilized the Wiedemeier et al. (1996), scoring criteria which awarded awards points based on the concentration of each analyte in the most-affected ground water at the Site. The points are added to determine a total score. Table 3-9 presents a summary of the parameters used, calculated mean background concentrations for the parameters, the calculated mean concentrations in ground water, specific evaluation criteria from Wiedemeier et al. (1996), and the number of points awarded. MNA evaluations documented in the DGI Report and recent Quarterly Ground Water Sampling Event Reports suggests that natural attenuation processes may be capable of completing remediation of shallow and intermediate ground water once source areas have been addressed.

3.3.4.2 *Qualitative Exposure Assessment*

Ground water at the Site and in the vicinity of the Site is not currently used for drinking water or any other potable purposes based on the results of the well search. Therefore, ingestion of ground water and direct contact with ground water do not represent complete exposure pathways for Site workers or visitors. Affected ground water has not migrated off site.

Chemicals of potential concern in ground water based on detected concentrations in excess of the class GA ground water standards during the last two sampling events, October 2006 and January 2007, include 10 VOCs. Specific VOCs include:

- chloroethane
- chloroform
- 1,1- DCA;
- 1,1- DCE;
- cis-1,2-DCE;
- trans-1,2-DCE;
- methylene chloride;
- 1,1,1- TCA;
- TCE; and
- vinyl chloride.

The presence of these VOCs in on-site ground water may result in a complete exposure pathway if volatilization of a significant mass, escape from the subsurface, and subsequent inhalation by Site workers and visitors occurs.

3.3.5 Remedial Action Objectives for Ground Water

Based on the evaluation discussed above and the draft NYSDEC guidance regarding development of RAOs in DER-10 (NYSDEC, 2002), the RAOs for on-Site ground water are:

GWRAO1 - Prevent exposure to contaminated ground water that poses a risk to public health and the environment given the intended use of the Site;

GWRAO2 - Prevent or minimize further migration of the contaminant plume (plume containment); and

GWRAO3 - Prevent or minimize further migration of contaminants from source materials to ground water (source control).

3.3.6 Extent of Affected Ground Water

As discussed above, Site ground water exceeds Class GA standards for a number of VOCs. A depiction of Class GA exceedances for 1,1,1-TCA and TCE using the April and July 2006 sampling results is provided in Tables

3-6 to 3-9. In addition, an EVS depiction of this information is provided in Appendix C.

4.0 TECHNOLOGY SCREENING

This section screens a variety of remedial technologies that may be employed individually or in combination to achieve the RAOs for Site media of interest. Remedial technologies that pass the evaluation process are organized into remedial alternatives. The remedial action alternatives for the Site are then are presented and evaluated in detail in Section 5.0.

The remedial technologies considered for media of interest are general engineering approaches that would rely on ex-situ, in-situ or institutional/containment types of response actions that could meet one or more of the RAOs. The considered technologies were identified through a review of NYSDEC information, USEPA guidelines, relevant literature, off-Site conditions, and experience in developing feasibility studies and remedial action plans for similar types of environmental conditions.

The identified technologies underwent a screening against the following criteria: the ability to meet the RAOs, effectiveness, and implementability. Table 4-1 provides an evaluation of the potential remedial technologies screened for the Site. They are:

Type	**Technology/Control**
Institutional Controls	Access and Use Restrictions
Containment	Sub-Slab Depressurization (SSD)
In-Situ Treatment	In-Situ Thermal Treatment
Ex-Situ Treatment	Excavation and Off-Site Disposal
Natural Recovery	Monitored Natural Attenuation (MNA) of Off-Site Ground Water
Others	Ground Water Monitoring

Effectiveness considers how a technology would impact the Site in the short-term during its use and its ability to meet the RAOs in the long-term. Protection of human health and environment considers potential positive and adverse impacts that may result from the use of a particular technology. This evaluation incorporates elements of the NYSDEC guidance documents NYSDEC TAGM-4030 (NYSDEC, 1990) and the draft DER-10 (NYSDEC, 1990; NYSDEC, 2002) and the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

The evaluation of implementability focused on institutional aspects associated with use of the remedial technology, along with constructability and operation and maintenance (O&M) requirements.

These subcategories are consistent with the approach for remedial alternative evaluation in TAGM-4030. Institutional aspects involve permits or access approvals for on-site use, off-site work, and off-site treatment, storage and disposal services. Constructability, or technical feasibility, refers to the ability to construct, reliably operate and meet technical specifications or criteria, and the availability of specific equipment and technical specialty personnel to operate necessary process units.

The evaluation of effectiveness, implementability and ability to meet the RAOs further reduced the list of remedial technologies. Those exhibiting more favorable characteristics in the evaluated areas were carried forward. As shown in Table 4-1, all of the proposed remedial technologies for Site media of interest are carried forward for development of the remedial alternatives section.

5.0 IDENTIFICATION AND EVALUATION OF REMEDIAL ACTION TECHNOLOGIES AND PRELIMINARY REMEDIAL ACTION ALTERNATIVES

Using the seven criteria listed below, the remedial alternatives retained after the screening in Table 5-1 are fully described and evaluated in accordance with the NYSDEC Draft DER-10. The evaluative criteria are:

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

The first two criteria, overall protection of human health and the environment and compliance with SCGs, are considered threshold criteria. Consequently, there is an expectation that each selected remedial action alternative would achieve these two criteria.

The next five evaluation criteria are referred to as balancing criteria. They offer a basis to compare the remedial action alternatives as part of the decision-making process that results in a recommended remedial action alternative.

Descriptions of the Common Actions and remedial action alternatives are provided in Sections 5.1 through 5.4. An evaluation of each of the above criterion for the Common Actions and the remedial action alternatives is provided with the remedial action alternative descriptions.

The associated costs for the alternatives are conceptual design cost estimates. Changes in the quantities of the media requiring remediation (e.g., extent of soil and ground water affected areas), detailed engineering, as well as other factors not foreseen at the time this report was prepared, could increase costs by as much as 50 percent or decrease costs by as much as 30 percent, as defined in Section 5.2.3.7 of Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988). An inflation rate of two percent (2%) was used to determine future costs and an interest rate of seven percent (7%) was used to compute the present worth of all future costs. The inflation rate is consistent with the US Department of Labor Consumer Price Index (CPI) change between 2002 and 2003 (USDOL, 2003). The assumed interest rate, which corresponds to the current interest rate for a 30-year treasury bond, was selected to "produce an amount at which the environmental liability theoretically could be settled in an arm's length transaction with a third party, or if such a rate is not readily determinable, the discount should not exceed the interest rate on "risk-free" monetary assets with maturities comparable to the environmental liability" in accordance with the US Securities and Exchange Commission (SEC) Staff Accounting Bulletin (SAB) No. 92 (SEC, 1993). SAB No. 92 provides generally accepted accounting principles for estimating and reporting environmental liability.

The alternatives undergoing detailed evaluation are:

Alternative 1:	No Action
Alternative 2:	Excavation and Off-Site Disposal of Soil with Monitored Natural Attenuation (MNA) of Ground Water
Alternative 3:	In-Situ Thermal Treatment of Soil with MNA of Ground Water

5.1 COMMON ACTIONS

As discussed above, remedial action alternatives would be developed for Site soil and ground water. Common Actions have been developed that address one or more of these two media. Each of the remedial action alternatives evaluated in Sections 5.2 through 5.4, with the exception of No Action alternatives incorporates Common Actions. These Common Actions are designed to provide at least the minimum required protection of human health and the environment. However, most of the Common Actions discussed below include removal of COPCs from the Site, thus providing the maximum protection of human health and the environment. The Common Actions are:

Common Action C1:	Indoor Air Sampling and Sub-Slab Depressurization
Common Action C2:	Excavation and Off-Site Disposal of the GB-10/FDSA Soil (i.e., the Soil Excavation IRM)
Common Action C3:	Low Vacuum Enhancement of DNAPL Recovery Operations

5.1.1 Common Action No. 1: Indoor Air Sampling and Sub-Slab Depressurization

Air sampling will be conducted to evaluate the potential for indoor and off-site soil vapor impacts. This will entail collection and analysis of the following samples for VOCs:

- sub-slab soil gas samples;
- indoor air samples;

- soil gas samples at the property boundary; and
- outdoor, background air samples.

The details of the air sampling program will be provided in a subsequent work plan to the NYSDEC.

Soil and ground water beneath and in the vicinity of the Site's building are both potential sources of VOCs in soil gas beneath this building. Although some of the remedial alternatives considered would address these potential soil gas source areas, mitigation of the soil gas, which has already accumulated beneath the Site building, will be included as a Common Action. Thus, the sub-slab depressurization system (SSD) described here is for a permanent remedy.

The vacuum extraction component of the DPE IRM system is currently in operation at the Site (see Section 1.5.1 and 5.1.3). This system will serve as the SSD during operation of the DPE IRM. After the DPE IRM is completed, it is anticipated that the vacuum extraction points in use for the DPE system will be converted to a SSD system.

The SSD system will consist of the existing vertical and/or horizontal suction points installed through the floor slab. The suction points will be piped to externally-mounted vacuum blower(s) that will draw soil gas from beneath the building to an exhaust point(s) above the roof of the building. Minor cracks in the floor slab will also be sealed.

Data obtained from the DNAPL Pilot Test of the recently installed low vacuum system can be used to determine the optimum spacing of suction points, and the necessary vacuum blower size and quantity. For cost estimating purposes, it is assumed that a forty-foot spacing of suction points with an applied vacuum of four inches water column (w.c.) will generate a minimum vacuum of 0.004 inches w.c. across the entire building footprint. The anticipated in-line blower(s) should generate 10 cubic feet per minute (cfm) at four inches w.c. vacuum. It is anticipated that two vacuum blowers and six to ten suction points will be needed.

To create the suction points, a three to eight-inch hole will be cored through the floor slab, and a small void will be created by removing soil within the vicinity of the cored holed. A two to six-inch Schedule 40 PVC pipe will be inserted into the hole, and the space between the pipe and the floor will be sealed. In addition, horizontal piping (as shown on the two attached drawings) that has already been constructed and is in-place at the Site can be incorporated into the design.

The pipes will be run as inconspicuously as possible along floors, and ceilings, and will manifold together upstream of the inline vacuum blower(s). All appropriately sized vacuum equipment should be located inside the newly constructed treatment building to reduce the potential for vapors to be released into the Greif facility. The vacuum blower(s) exhaust will be delivered through an appropriately designed VOC off-gas treatment system. When the installation is complete, a pressure field extension test will be performed. This test is similar to a communication test in that several holes will be drilled through the floor slab when the system is operating and the vacuum response will be measured. The goal is to confirm that a minimum 0.004 inches w.c. vacuum extends across the building footprint. Please note that the existing horizontal piping system has been pressure tested to 20 psi and already has been verbally approved by the Region 9 NYSDEC Site Project manager.

Following installation, an Operations, Maintenance, and Monitoring (OM&M) Plan will be prepared for the SSD system, and the property owner will be instructed in the operation of the system. The SSD system will be visited monthly to collect field VOC measurements from the SSD outlet and ensure the proper operation of the SSD system. Vapor samples would also be collected on a semi-annual basis from the VOC off-gas treatment system and analyzed for a previously NYSDEC approved list of Site specific VOC analyses. Samples would be collected from sample collection points on the VOC off-gas treatment system. Operation of the SSD system is estimated to be 10-12 years, which may be shortened or lengthened based on remedial action results and monitoring. For cost estimation purposes, it has been assumed that SSD system would be operating 10 years following installation.

5.1.2 Common Action No. 2: Excavation and Off Site Disposal of the GB-10/FDSA Soil

As discussed in Section 1.5.3, pursuant to the VCA between Sonoco and the NYSDEC, a Soil Excavation IRM was performed on behalf of Sonoco at the FDSA and in and around Soil Boring GB-10 (See Figure 3-1). VOC-affected soils were excavated in substantial conformance with the IRM Work Plan approved by the NYSDEC in 2004. The applicable remedial standard for this soil excavation IRM was removal of grossly-affected soil as evaluated in the field using the field screening approach outlined in the NYSDEC-approved IRM Work Plan (ERM, 2004a). The Soil Excavation IRM was successful in removing grossly affected soil to the satisfaction of on-Site NYSDEC representatives (Appendix B).

5.1.3 Common Action No. 3: Low Vacuum Enhancement of DNAPL Recovery Operations

As discussed in Section 1.5.1, a DPE IRM is currently underway beneath the Site building. The purpose of this IRM is to remove DNAPL in the

Varnish Pit Area, the source of LNAPL in the vicinity of MW-23, and soil gas beneath the sub-slab vapors. A description of the DPE system as part of the DNAPL Recovery IRM Pilot Test was provided in Section 1.5.1.

As of the 1 June 2007, the DPE system has been operating for approximately nine weeks. During this time, approximately 148 gallons of concentrated product and 575 gallon of aqueous condensate have been recovered.

This Common Action would entail continued O&M of the DNAPL recovery system as described in Section 1.5.2.1. and it is anticipated that this system will be operated for an additional three to six months.

5.2 ALTERNATIVE 1: NO ACTION

5.2.1 Description

Section 300.430(e)(6) of the NCP recommends describing and evaluating a No Action Alternative as a measure of identifying the potential risks posed by a site if no remedial action were implemented. Pursuant to 6 NYCRR Part 375-1.10(c), a remedial program for a site listed on the Registry must not be inconsistent with the NCP. Accordingly, a No Action Alternative (Alternative 1) has been developed to fulfill the NCP requirement and is evaluated in this section.

Under this Alternative, no remedial actions would be implemented at the Site or within the Site. This alternative assumes that the IRMs were not conducted.

5.2.2 Evaluation

5.2.2.1 Protection of Human Health and Environment

Since this alternative would not include any remedial measures, this option would not be protective of human health and the environment.

5.2.2.2 Compliance with SCGs

A summary of the applicable SCGs is presented in Table 5-1. Since no remedial actions would be conducted under this alternative, none of the location-specific and a limited number of the action-specific SCGs are applicable to this alternative. The alternative would not comply with the applicable action- or chemical-specific SCGs.

Specifically, since it does not include DNAPL removal activity, it would not comply with the following DER-10 remedial goal for the Site "where an identifiable source of contamination exists at a site (i.e., DNAPL and LNAPL), it should be removed or eliminated to the extent feasible, regardless of the presumed risk or intended use of the site."

5.2.2.3 Long-Term Effectiveness and Permanence

Since this alternative does not provide for confirmation that natural attenuation of ground water continues to occur and does not provide for the removal of the DNAPL, it would not provide long-term effectiveness or permanence.

5.2.2.4 Reduction of Toxicity, Mobility or Volume

Through the biodegradation of chlorinated solvents that is currently occurring in shallow and intermediate ground water, this alternative would result in a decrease in the toxicity, mobility and volume of these chemicals in ground water. However, this alternative provides no means to confirm that natural attenuation will continue to occur and hence there is an overall reduction in VOC concentrations at this site. Furthermore, without DNAPL removal, reduction of toxicity, mobility and volume of contaminants would be limited. Therefore, there would be no reduction of toxicity, mobility or volume for chemicals in Site affected soil, ground water and DNAPL.

5.2.2.5 Short-Term Effectiveness

There are no short-term effects associated with this alternative since there are no actions included with this alternative.

5.2.2.6 Implementability

As there are no specific actions related to this alternative, it would be readily implemental.

5.2.2.7 Cost

There are no actions taken under this alternative. As such, there are no costs associated with the implementation of Alternative 1.

5.3 ALTERNATIVE 2: EXCAVATION AND OFF-SITE DISPOSAL OF SOIL WITH MONITORED NATURAL ATTENUATION

As previously discussed, the Site impacts include grossly affected soil in the Former Varnish UST Area and grossly affected soil with localized DNAPL and LNAPL in the Varnish Pit Area. This remedial alternative would entail excavation and off-site disposal of grossly affected soil in the

Former Varnish UST Area, DNAPL recovery for the varnish pit area, SSD beneath Site building and MNA of affected Site ground water.

5.3.1 Description

Alternative 2 includes the following remedial tasks and would incorporate the following Common Actions associated with soil discussed in Section 5.1:

- Site Preparation and Mobilization
- Excavation of Grossly Affected Soil in the Former Varnish UST Area
- Ambient Air Monitoring
- Transportation and Off-Site Disposal of Excavated Soil
- Backfill and Site Restoration
- Preparation and Implementation of a Site Management Plan (SMP)
- Common Action No.1
- Common Action No. 2
- Common Action No. 3
- MNA of Ground Water
- Institutional Controls

It is estimated that the time required to complete the excavation scenarios of Alternative 2 would range from three to six months following NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions and annual OM&M activities would continue beyond the six month timeframe.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C1, C2 and C3) were provided in Sections 5.1.1, 5.1.2 and 5.1.3 respectively. Evaluation of these common actions is included along with the other tasks of this alternative.

5.3.1.1 Site Preparation and Mobilization

Construction equipment would be mobilized to the Site. This equipment would be used to excavate affected materials in the Former Varnish UST area. Site preparation and mobilization would be conducted in the form of clearing/weeding, relocation of existing utilities and provision of temporary facilities and utilities, as needed; mobilization of equipment to the Site; set up of staging, stockpiling and dewatering areas (if needed); and set up of the decontamination area.

5.3.1.2 Excavation of Grossly Affected Soil in the Former Varnish UST Area

Due to the close proximity of load-bearing foundation walls in the proposed excavation areas, structural excavation controls will be required to protect the structural integrity of the foundation walls. It is envisioned that structural integrity protection will be provided by a combination of the following methods:

- installation of steel sheeting along excavation walls that are adjacent to the building's foundation walls; and
- excavation of cutback slopes on sides of the excavation that are not adjacent to the building's foundation walls or other features where protection of structural integrity is a consideration.

An ERM geologist will direct excavation of grossly-affected soil based on field evaluations and input from NYSDEC field personnel. A structural engineer will be consulted as appropriate regarding excavation near structures. Excavated soil will be examined in the field by an ERM geologist for visual and/or olfactory evidence of contamination, screened using a calibrated flame ionization detector (FID) or Photoionization Detector with an 11.4 eV or higher lamp (PID), and checked for the presence of separate-phase or residual-phase product using the soil/water agitation method. Two staging areas would be set up for the temporary storage of excavated materials within the work area: one for affected soil presumed hazardous wastes and one for presumed "clean" excavated material. Temporary staging areas would be constructed with a double layer of 6-mil polyethylene sheeting, and bermed on each side. Excavated materials would be deemed affected or "clean" based on field evaluation and segregated accordingly. Affected soil would be direct loaded or staged for transport and disposal off-site at a permitted facility. "Clean" excavated soil will be temporarily staged for characterization. ERM will collect samples of excavated "clean" soil to evaluate whether or not the material can be used as backfill.

ERM proposes to collect six confirmation soil samples from the Former Varnish UST Excavation to evaluate the effectiveness of the remedial soil excavation. ERM proposes to collect confirmation soil samples from the walls at an approximate depth of 12 feet bgs. Excavation floor samples will be collected from the floor at an estimated depth of approximately 17 feet bgs. However, actual confirmation soil sample locations and depths will be biased towards the areas that appear to contain the highest concentration of VOCs and/or SVOCs based on field evaluations by an ERM geologist.

Samples will be handled in conformance with the NYSDEC-approved Site-specific Quality Assurance Project Plan (QAPP; ERM, 2000) using proper chain of custody procedures and transported to the project laboratory for analysis. The project laboratory will be a NYSDOH-approved environmental laboratory certified to perform analyses using

NYSDEC's Analytical Services Protocol (ASP). Confirmation soil samples will be analyzed for the Site-specific COPCs.

5.3.1.3 *Ambient Air Monitoring*

ERM would implement Community Air Monitoring during intrusive activity as outlined in the site-specific Community Air Monitoring Plan (CAMP) which is an appendix in the NYSDEC approved IRM Work Plan (ERM, 2004a). The site-specific CAMP was developed in accordance with the NYSDOH Generic CAMP contained in Appendix 1A of the Draft DER-10 (NYSDEC, 2002). During intrusive activity, ERM will monitor concentration of particulates and VOCs in ambient air in the work zone and at the perimeter of the Site. Real-time VOC concentrations in ambient air would be measured using a calibrated PID or FID and particulate concentrations would be measured with a calibrated electronic aerosol monitor.

During excavation, dust and VOC control measures such as water or BioSolve®, a water based biosurfactant, will be applied on the limiting areas of soil to be disturbed would be used if perimeter action levels established in the CAMP are exceeded. The degree to which these measures would be used would depend on sustained particulate levels and VOC concentration in ambient air at the perimeter of the Site as determined through the implementation of the CAMP.

Preventative measures would be taken with staged soils to minimize migration of fugitive VOCs and particulate. Staged soil will be covered at the end of each work day and during moderate or heavy precipitation events. Staged soils would remain covered during intervals when there was no excavation of soils or loading of trucks for offsite transport and disposal.

The site-specific Health and Safety Plan (HASP) includes air monitoring for particulates and VOCs in the work and exclusion zones. This plan identifies the level of personal protective equipment (PPE) required for the work, action levels for the work and exclusion zones, and PPE upgrades and engineering controls that correspond to action level exceedances.

5.3.1.4 *Transportation and Off-Site Disposal*

Presumed hazardous soil would be live loaded or temporarily staged in a staging area to await loading into dump trailers for transport and disposal off Site at a NYSDEC-permitted facility. Ground water, surface water within the excavation areas and decontamination fluids will be pumped into an on-Site storage container for subsequent transport offsite to a permitted facility.

Excavated soil deemed "clean" will be staged and sampled for characterization purposes. Soil that does not meet the criteria to be used as backfill (i.e., the excavated soil contain compounds of potential concern at concentrations above unrestricted use SCOs) or is not approved by the NYSDEC will be evaluated on a case-by-case basis. Soil will be classified as non-hazardous or hazardous and subsequent transport offsite to a permitted facility. Construction related materials such as overlying asphalt, gravel and concrete classified as construction and demolition (C&D) debris will be transported of Site

5.3.1.5 Backfill and Site Restoration

Following soil removal and confirmatory sampling, the excavated areas would be backfilled and restored to their present grade. The excavation areas would be backfilled with approved fill from off-Site sources. In accordance with Draft DER-10, the source of fill material would be approved by the NYSDEC DER in advance, and bills of lading would be available for NYSDEC review (NYSDEC, 2002). Excavated soil that has been segregated and characterized as "clean" will be reuse as backfill in the excavation, following NYSDEC approval.

The excavated area at the former Varnish UST Area will be restored (topsoil, seeding or asphalt) to its pre-existing condition.

5.3.1.6 Preparation and Implementation of a SMP

Soil exhibiting chemicals at concentrations in excess of the restricted commercial SCOs would remain in the Varnish Pit Area and a barrier (concrete floor) would be maintained to prevent direct contact between Site occupants and the residual chemicals. In addition, a Soils Management Plan (SMP) would be prepared as part of the SMP and implemented to eliminate the potential for construction worker exposure to chemicals present in the Site soil remaining after the selected remedial action is implemented. The goals of the SMP would be to ensure that: (1) disturbance of any remaining Site soil be conducted in a manner that would protect construction workers; and (2) any disturbed soil would be properly managed.

This action would address a portion of the soil RAOs related to preventing direct contact with soil. This action would address direct contact with soil in Site areas that present soil exceedances including soils underneath the Long Truck Bay Area located in the Site building.

5.3.1.7 *Common Action No.1: Sub-slab Depressurization (SSD) Beneath the Building.*

Common Action No. 1 details are presented in Section 5.1.1. and associated costs are presented in Table 5-2.

5.3.1.8 *Common Action No.2: Excavation and Off Site Disposal of the GB-10/Former Drum Storage Area (i.e., previously conducted soil excavation IRM)*

Common Action No. 2 details are presented in Section 5.1.2

5.3.1.9 *Common Action No.3: Low Vacuum Enhancement of DNAPL Recovery Operations*

Common Action No. 3 details are presented in Section 5.1.3

5.3.1.10 *Monitored Natural Attenuation of Ground Water*

Once VOC mass has been removed by from the Former Varnish UST via excavation and Varnish Pit Area via the DNAPL Recovery IRM, natural attenuation processes will continue to reduce mass and achieve the closure goals. Under this remedial action, the currently on-going NYSDEC-approved quarterly ground water monitoring plan would continue to be implemented in the Site to evaluate the effectiveness of the remedial actions and of natural attenuation. Samples will be analyzed for Site specific VOCs and select natural attenuation parameters quarterly during 4 years and bi-annually thereafter as required (for cost estimation purposes the bi-annual monitoring will be conducting for 8 years).

Upon completion of each ground water sampling event a report presenting results for each sampling event will be submitted to the NYSDEC. The quarterly ground water monitoring report will also evaluate the effectiveness of the remedial actions and natural attenuation processes on ground water quality.

5.3.1.11 *Institutional Controls*

Under this alternative, Part 5 of the New York State Department of Health State Sanitary Code, which prevents installation of a private potable water supply well in areas that are served by a public water supply system, would continue to be enforced. This would prevent potable water consumption of affected Site ground water.

Institutional controls would be implemented to address the NYSDEC's requirement to issue a notice regarding chemicals present in Site soil above the Track 1 SCOs. This would include soil remaining throughout the Site exhibiting concentrations in excess of the Track 1 SCOs. The institutional controls would include the provision that a SMP be implemented. The SMP will include an O&M of any SSDs, ground water monitoring, maintenance of any engineering controls, and annual certification that the institutional controls are place and are effective. The SMP would specify the manner in which intrusive work can be done.

5.3.2 Evaluation

5.3.2.1 Protection of Human Health and Environment

This alternative would provide adequate protection of human health and the environment for the soil and ground water. The surface covers would prevent direct contact with soil at the Varnish Pit Area and the DNAPL Recovery IRM and SSD systems would address the potential inhalation risks posed by soil in this area. The excavation in the Former Varnish UST area will address direct contact and possible inhalation risks as grossly contaminated soils will be excavated in that area. With the removal of source areas through the removal of grossly contaminated soil and DNAPL removal, the source of ground water contamination would be removed and natural attenuation could proceed. Furthermore, because there are no ground water supply wells at the Site and inhalation risks posed by ground water are being addressed through SSD systems, this alternative would provide adequate protection of human health and environment for ground water.

5.3.2.2 Compliance with SCGs

A summary of the applicable SCGs for the soil and ground water is presented in Table 5-1. As shown in this table, this alternative would address the chemical-specific and action specific SCGs through soil covers, sub-slab depressurization systems, DPE recovery system, access and use restrictions and natural attenuation monitoring.

Specifically, since it includes IRM to remove DNAPL, it would comply with DER-10 remedial goal for the Site: "Where an identifiable source of contamination exists at a site (DNAPL and grossly contaminated soil), it should be removed or eliminated to the extent feasible, regardless of the presumed risk or intended use of the site".

5.3.2.3 *Long-Term Effectiveness and Permanence*

This alternative would be effective in the long term, and its continued effectiveness would be mandated through institutional controls and monitoring. This alternative provides for the maintenance of the existing covers, confirmation that the degradation of chlorinated VOCs continues to occur, and operation and maintenance of the SSD system.

5.3.2.4 *Reduction of Toxicity, Mobility or Volume*

Through natural attenuation, this alternative would result in a decrease in the toxicity, mobility and volume of the net chemicals in shallow ground water. This reduction would be confirmed via ground water monitoring. However, natural attenuation could result in short-term increase in toxicity due to the potential for generation of vinyl chloride. Additionally, the mass of individual VOCs could increase temporarily as natural attenuation progresses. Reduction in toxicity, mobility and volume of chemicals in the Site soil at the Former Varnish UST would occur through excavation and through the SSD and DPE system at the Varnish Pit Area.

5.3.2.5 *Short-Term Effectiveness*

Grossly affected soils at the Former Varnish UST area will be removed upon implementation of the soil excavation. Implementation of the DPE IRM is currently reducing DNAPL size in the Varnish Pit Area.

This alternative would require the largest degree of earthwork, particularly with respect to excavation and restoration. Consequently, it presents the greatest potential for short-term impacts to the community from construction activities and off-Site transport. Similarly, this alternative presents the greatest degree of potential impact to remedial contractors and would require ongoing protection during earthwork activities. Furthermore, since excavation stability poses significant safety concerns, structural excavation controls will be required to protect the structural integrity of the foundation walls and to address safety concerns.

The potential for a temporary increase of risk to the community and workers due to particulate emissions (dust) during soil excavation would be controlled, if needed, by the use of dust control measures, such as water or BioSolve®, a water based biosurfactant. The degree to which these measures would be used would depend upon particulate and VOC levels in ambient air as determined site-specific CAMP. Workers would also be protected by respirators (if needed) and protective clothing.

Potential short-term risks to the community would be posed by this alternative from transportation of excavated soil to off-Site landfill disposal facilities. Potential exposure of spilled material to the community and the environment along the transportation route, as well as truck related injuries and increased emissions from trucks would be potential concerns. Because approximately 100 to 130 truckloads would be required to transport excavated soil waste to an off-Site landfill disposal facility; there are significant potential short-term risks associated with the transportation of excavated materials from the Site to an off-Site landfill.

5.3.2.6 Implementability

The main components of this alternative (excavation and SSD installation) could be completed within six months of NYSDEC approval of the RD for this project. A similar excavation effort at the Former Drum Storage/GB-10 Area (ERM, 2005) was successfully implemented the Site. Common Action C3 is currently being implemented and Common Action C2 has been implemented as an IRM (ERM, 2006). Ground water monitoring, access and use restrictions, MNA monitoring and limited annual OM&M activities would continue beyond this time frame. All activities associated with this alternative are readily implementable.

5.3.2.7 Cost

Costs associated with Alternative 2 are presented in Table 5-3.

5.4 ALTERNATIVE 3: IN-SITU THERMAL TREATMENT OF SOIL WITH MONITORED NATURAL ATTENUATION

As previously discussed, the Site impacts include grossly affected soil in the Former Varnish UST Area and grossly affected soil with localized DNAPL and LNAPL in the Varnish Pit Area. This remedial alternative would entail In-Situ Thermal Treatment of the affected soil in the Former Varnish UST Area, DNAPL recovery for the varnish pit area, SSD beneath Site building and MNA of affected Site ground water.

5.4.1 Description

Alternative 3 includes the following remedial tasks and would incorporate the following Common Actions associated with soil discussed in Section 5.1:

- In Situ Thermal Treatment of Former Varnish UST soil
- Preparation and Implementation of a Site Management Plan (SMP)
- Common Action No.1
- Common Acton No. 2

- Common Action No. 3
- MNA of Ground Water
- Institutional Controls

It is estimated that the time required to complete the excavation scenarios of Alternative 3 would range from four to six months following NYSDEC approval of the Remedial Design for this Site. Ground water monitoring, access and use restrictions and annual OM&M activities would continue beyond the six month time frame.

Descriptions of the common actions considered for this alternative (i.e., Common Actions C1, C2 and C3) were provided in Sections 5.1.1, 5.1.2 and 5.1.3 respectively. Evaluation of these common actions is included along with the other tasks of this alternative.

5.4.1.1 In-Situ Thermal Treatment

This alternative would include in-situ thermal treatment of grossly affected soil in the Former Varnish UST Area. For costing purposes, we have assumed that Electro-Thermal Dynamic Stripping Process (ET-DSP™, provided McMillan-McGee Corporation) will be the in-situ thermal treatment technology used. The final in-situ thermal treatment technology will be selected during the remedial design phase.

The ET-DSP™ process uses three-phase power to heat the subsurface by delivering the electrical phases to the subsurface by vertical electrodes installed using standard drilling techniques. Because the electrodes are electrically out of phase with each other, electrical current flows from each electrode to all the other adjacent out of phase electrodes. It is the resistance of the subsurface soil to this current movement that causes heating.

As the soil temperature rises from ambient temperature to the boiling point of water, the following changes occur:

- increased contaminant solubility;
- decreased contaminant viscosity;
- increased contaminant vapor pressure; and
- boiling of the interstitial ground water and dissolved contaminants.

The changes allow a more rapid and complete recovery of the vapors using SVE. Once in the vadose zone, contaminant vapors are collected by conventional soil vapor extraction wells. A moisture separator may be needed to remove condensate prior to off-gas treatment.

Water circulation is necessary within the thermal treatment area to keep the resistivity of the subsurface low and reduce the power requirements for heating. To conduct circulation, ground water will be extracted, treated aboveground, and re-injected at each thermal electrode.

For this Site, ET-DSP™ heating would be applied across soil in the Former Varnish UST AOC to an estimated average depth of 20 feet bgs to produce a "hot plate" effect that would result in the vertical migration of steam upwards through the formation. This technology application would be an aggressive source treatment that is designed to produce a fast and complete recovery of VOCs and SVOCs in soil and ground water media of the aforementioned AOCs for ultimate destruction in aboveground treatment processes.

Conceptually, 15 ET-DSP™ electrodes spaced approximately 45 feet apart be placed throughout the Former Varnish UST AOC. Six ground water recirculation wells and six temperature sensor wells would also be installed. An off-gas collection and treatment system including piping, a vacuum extractor, a moisture separator, a condensate holding tank, and an off-gas treatment unit, would be located in an equipment compound. Operation of the ET-DSP™ system would continue until the mass recovery from the extraction wells reached a pre-determined goal. Time of cleanup would be approximately four to six months of active heating.

5.4.1.2 *Preparation and Implementation of a SMP*

Soil exhibiting chemicals at concentrations in excess of the restricted commercial SCOs would remain in the Varnish Pit Area and a barrier (concrete floor) would be maintained to prevent direct contact between Site occupants and the residual chemicals. In addition, a Soil Management Plan (SMP) would be prepared as part of the SMP and implemented to eliminate the potential for construction worker exposure to chemicals present in the Site soil remaining after the selected remedial action is implemented. The goals of the SMP would be to ensure that: (1) disturbance of any remaining Site soil be conducted in a manner that would protect construction workers; and (2) any disturbed soil would be properly managed.

This action would address a portion of the soil RAOs related to preventing direct contact with soil. This action would address direct contact with soil in Site areas that present soil exceedances including soils underneath the Long Truck Bay Area located in the Site building.

5.4.1.3 *Common Action No.1: Sub-slab Depressurization*

Additional detail regarding Common Action No. 1 is presented in Section 5.1.1.

5.4.1.4 *Common Action No.2: Previous IRMs*

Additional detail regarding Common Action No. 2 is presented in Section 5.1.2.

5.4.1.5 *Common Action No.3: DPE System*

Additional discussion regarding Common Action No. 3 details is presented in Section 5.1.3.

5.4.1.6 *Monitored Natural Attenuation of Ground Water*

Once VOC mass has been reduced from the Former Varnish UST Area and the Varnish Pit Area, natural attenuation processes will continue to reduce mass and achieve the closure goals. Under this remedial action, the currently on-going NYSDEC-approved quarterly ground water monitoring plan would continue to be implemented in the Site to evaluate the effectiveness of the remedial actions and of natural attenuation. Samples will be analyzed for Site specific VOCs and select natural attenuation parameters quarterly during 4 years and bi-annually thereafter as required (for cost estimation purposes the bi-annual monitoring will be conducting for 8 years).

Upon completion of each ground water sampling event a report presenting results for each sampling event will be submitted to the NYSDEC. The quarterly ground water monitoring report will also evaluate the effectiveness of the remedial actions and natural attenuation processes on ground water quality.

5.4.1.7 *Institutional Controls*

Under this alternative, Part 5 of the New York State Department of Health State Sanitary Code, which prevents installation of a private potable water supply well in areas that are served by a public water supply system, would continue to be enforced. This would prevent potable water consumption of affected Site ground water.

Institutional controls would be implemented to address the NYSDEC's requirement to issue a notice regarding chemicals present in Site soil above the Track 1 SCOs. This would include soil remaining throughout the Site exhibiting concentrations in excess of the Track 1 SCOs. The institutional controls would include the provision that a SMP be implemented. The SMP will include an O&M of the SSD, ground water monitoring, maintenance of any engineering controls, and annual certification that the institutional controls are place and are effective. The SMP would specify the manner in which intrusive work can be done.

5.4.2 *Evaluation*

5.4.2.1 *Overall Protection of Human Health and the Environment*

This alternative would provide adequate protection of human health and the environment for the soil, and ground water. The surface covers (concrete floor) would prevent direct contact with soil at the Varnish Pit Area and the SSD systems would address the potential inhalation risks posed by soil in this area. In Situ Thermal Treatment is expected to achieve protection of human health and the environment through the aggressive volatilization and boiling of the affected soils and ground water media at AOCs where this technology will be applied (Former Varnish UST Area). With the removal of source areas through the removal of grossly contaminated soil and DNAPL removal, the source of ground water contamination would be removed and natural attenuation could proceed. Furthermore, because there are no ground water supply wells at the Site and inhalation risks posed by ground water are being address through SSD systems, this alternative would provide adequate protection of human health and environment.

5.4.2.2 *Compliance with SCGs*

A summary of the applicable SCGs for the ground water and soil vapor is presented in Table 5-1. As shown in this table, this alternative would address the chemical-specific and action specific SCGs through sub-slab depressurization systems, DPE DNAPL recovery system, in-situ thermal treatment and natural attenuation monitoring.

Specifically, since it includes IRM to remove DNAPL at the Varnish Pit Area and in-situ thermal treatment at the Former Varnish UST Area, it would comply with DER-10 remedial goal for the Site of “eliminating source areas regardless of the intended use”, these source areas are the Varnish Pit Area DNAPL and the VOC-affected soil at the Former Varnish UST area.

5.4.2.3 *Long-Term Effectiveness and Permanence*

The application of this alternative should have a significant and permanent effect on the mass and concentration of VOCs at the Site.

In-situ thermal treatments such as Electro-Resistive Heating (ERH) have been successfully employed at several locations since 1995, including a 25-day demonstration for DOE's Savannah River site. PCE concentrations at this site were reduced in a 10-foot clay layer by up to 99%. ERH has also been deployed at Dover AFB in Delaware, Fort Richardson in Alaska, and at a former manufacturing plant in Skokie, Illinois. Results from the Fort Richardson site were positive, with approximately 90 percent removal of PCE and TCE over a 6-week period. ERH has also been deployed at the Interagency DNAPL Consortium Launch Complex 34 Demonstration site at Cape Canaveral, Florida. A static resistivity testing was conducted in two Site samples in July 2006 (see Appendix D), results from this analysis indicate that in-Situ thermal technologies can achieve high VOC mass removal percentages.

In addition to the vacuum enhanced DNAPL recovery system at the Varnish Pit Area and application of the thermal treatment at the Former Varnish UST Area, long term effectiveness would also be mandated through institutional controls and monitoring. This alternative provides for the maintenance of the existing covers, confirmation that the degradation of chlorinated VOCs continues to occur, and operation and maintenance of the SSD system.

5.4.2.4 Reduction in Toxicity, Mobility, or Volume

Alternative 3 will reduce the toxicity, mobility and volume of contamination through the mass removal of contaminants.

Implementation of the DNAPL Recovery IRM is currently reducing DNAPL pool size in the Varnish Pit Area and electrode heating is expected to achieve significant destruction of VOCs through the aggressive volatilization and boiling of the affected soils and ground water media at AOCs where this technology will be applied (Former Varnish UST Area).

A potential concern with the application of electrode heating is the potential for increased mobility of the contamination in the event of a power failure or equipment downtime. A condensate front is created along the propagating steam front created from the electro-thermal heating. A highly concentrated dissolved phase of PCE and TCE in the ground water can collect at this interface. A loss of heat in the formation can result in the condensate front collapsing and settling vertically back into the deeper soil matrix. The heating of the clays can also result in the downward migration of VOCs from beneath the active area of soil heating. An operations and management plan will be developed with the purpose of ensuring continuous operations and minimize the potential risks associated with power malfunction.

Through natural attenuation, this alternative would result in a decrease in the toxicity, mobility and volume of the net chemicals in shallow ground water. This reduction would be confirmed via ground water monitoring. However, natural attenuation could result in short-term increase in toxicity due to the potential for generation of vinyl chloride. Additionally, the mass of individual VOCs could increase temporarily as natural attenuation progresses. Reduction in toxicity, mobility and volume of chemicals in the Site soil at the Former Varnish UST would occur through excavation and through the SSD and DPE system at the Varnish Pit Area.

5.4.2.5 Short-Term Effectiveness

ET-DSP™ will quickly and effectively remove the bulk of source contamination in the former varnish UST. The expected time for remediation is approximately 2 to 4 months. The ET-DSP™ provides several streams of real-time data for evaluating the process efficiency. This feedback allows the short term effectiveness to be improved early in the process.

The potential for a temporary increase of risk to the community and workers the operation of an electrode heating system in close proximity to an active facility poses some potential human health risks. However, proper engineering controls and safeguards can be built in to the equipment and protocols to prevent the chance of an accidental electrocution.

5.4.2.6 Implementability

Implementation of Alternative 3, specifically of the ET-DSP™ system Site could be limited by the availability of a vendor. However, comparable technologies are available in the marketplace and could be substituted.

The main components of this alternative (in-Site Thermal Treatment and SSD installation) may be completed within nine months of NYSDEC approval of the remedial design for this project. Common Action C3 is currently being implemented and Common Action C2 has been implemented as an IRM (ERM, 2006). Ground water monitoring, access and use restrictions, MNA monitoring and limited annual OM&M activities would continue beyond this time frame. All activities associated with this alternative are readily implementable.

5.4.2.7 Cost

Costs associated with Alternative 2 are presented in Table 5-4.

6.0 RECOMMENDATION

As discussed in Section 5.2 through 5.4, the remedial action alternatives are:

Alternative 1:	No Action
Alternative 2:	Excavation with Monitored Natural Attenuation (MNA)
Alternative 3:	In-Situ Thermal Treatment with MNA

Each alternative was evaluated against the seven criteria identified in NYSDEC guidance for the selection of remedial actions (NYSDEC, 1990; NYSDEC, 2002). The evaluation of the seven criteria provides the basis for identifying a preferred remedial alternative, which is presented in a proposed remedial action plan (PRAP) issued by NYSDEC following completion of the RI/FS. Once the RI/FS is finalized and the PRAP issued, the NCP and NYSDEC guidance (NYSDEC, 1990; NYSDEC, 2002) also provide for public review as part of a modifying criteria to evaluate community acceptance of the preferred remedial alternative.

With the exception of implementability and cost, Alternative 1 would not effectively comply with any of the criteria outlined above. Therefore, this alternative is dropped from further consideration.

The main difference between Alternative 2 and Alternative 3 is the technology selected to address grossly-affected soil at the former Varnish UST Area. Alternative 2 encompasses excavation and off-site disposal and Alternative 3 encompasses in-situ thermal treatment.

In terms of implementability and short term effectiveness, soil excavation requires a significant amount of earthwork, consequently, it presents the greatest potential for short-term impacts to the community from construction activities and off-Site transport and would require ongoing protection during earthwork. Thermal treatment implementation requires moderate amounts of earthwork but may have the potential for a temporary increase of risk to the community and workers due to operation of an electrode heating system at high voltage. A potential concern with the application of electrode heating is the potential for increased mobility of the contamination in the event of a power failure or equipment downtime. However, this technology may provide superior long-term effectiveness than excavation and reduce potential for residual contaminant permanence through aggressive volatilization of soil and ground water VOCs. Furthermore, wastes generated with in-situ thermal treatment are minimal, while excavation and off-Site disposal generates significant amounts of waste material that is moved/transported off-Site.

Following is a summary of the estimated costs for the three alternatives. The detailed cost estimates are provided in Tables 5-2 through 5-4.

No.	Remedial Action Alternative	Total Capital Costs	Total O&M NPV	Total NPV Cost
1	No Action	$0	$0	$0
2	Excavation and Off-Site Disposal of Soil with MNA of Ground Water	$5,100,276	$1,071,507	$6,171,782
3	In-Situ Thermal Treatment of Soil with MNA of Ground Water	$4,484,620	$1,071,507	$5,556,127

Alternative 2 and 3 are equally protective of human health and the environment, equally address compliance with SCGs, are readily implementable, and provide long term effectiveness by addressing source areas and facilitating natural attenuation processes. However, Alternative 3 is less disruptive to the site owner, has fewer short term impacts, and is less costly than Alternative 2. Therefore, the recommended alternative for addressing Site media is Alternative 3 (In-Situ Thermal Treatment of soil with Monitored Natural Attenuation of Ground Water).

7.0 REFERENCES

Cadwell, D.H., Connally, G.G., Fleisher, P.J., and Muller, E.H., 1988. Surficial Geologic Map of New York – Niagara Sheet. New York State Museum and Science Service Map and Chart Series Number 40, Albany, New York.

ERM, 2000. Work Plan for Remedial Investigation, 2122 Colvin Boulevard, Tonawanda, New York. NYSDEC VCP Number V00334-9, ERM Project Number D6711.00, June 2000.

ERM, 2001. Voluntary Remedial Investigation Report, Greif Bros. Site, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number D6714.00, 28 November 2001.

ERM, 2002. Addendum To The Work Plan For Remedial Investigation - Data Gap Investigation, Greif Bros. Site, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number D6714.00, 28 June 2002.

ERM, 2003. Data Gap Investigation Report, Greif Bros. Site, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number 0001242, December 2003.

ERM, 2004a. Interim Remedial Measure Work Plan – Greif Bros. Facility, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number 0016742, June 2004.

ERM, 2004b. Correspondence from ERM to NYSDEC providing a response to NYSDEC comments dated 2 July 2004 on the Interim Remedial Measure Work Plan (27 July 2004).

ERM 2005, DNAPL Recovery IRM Pilot Test Report, Greif Bros. Site, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number 0021621, May 2005.

ERM, 2006. Interim Report - Soil Excavation Interim Remedial Measure, Greif, Inc. Facility, 2122 Colvin Boulevard, Town of Tonawanda, Erie County, New York. NYSDEC VCP Number V00334-9, ERM Project Number 0017521, April 2006.

NYSDEC, 1990. Selection of Remedial Actions at Inactive Hazardous Waste Sites, Technical Administrative Guidance Memorandum #4030 (HWR-90-4030), Division of Environmental remediation, May 15, 1990.

NYSDEC, 1994. Determination of Soil Cleanup Objectives and Cleanup Levels. NYSDEC Division of Hazardous Waste Remediation Technical and Administrative Guidance Memorandum Number 4046, April 1994 (latest amendment 20 December 2000).

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Ground Water Effluent Limitations. NYSDEC Division of Water Technical and Operational Guidance Series Memorandum Number 1.1.1., June 1998 (latest amendment April 2000).

NYSDEC, 2002. DER-10, Draft Technical Guidance for Site Investigation and Remediation, Division of Environmental Remediation, December 2002.

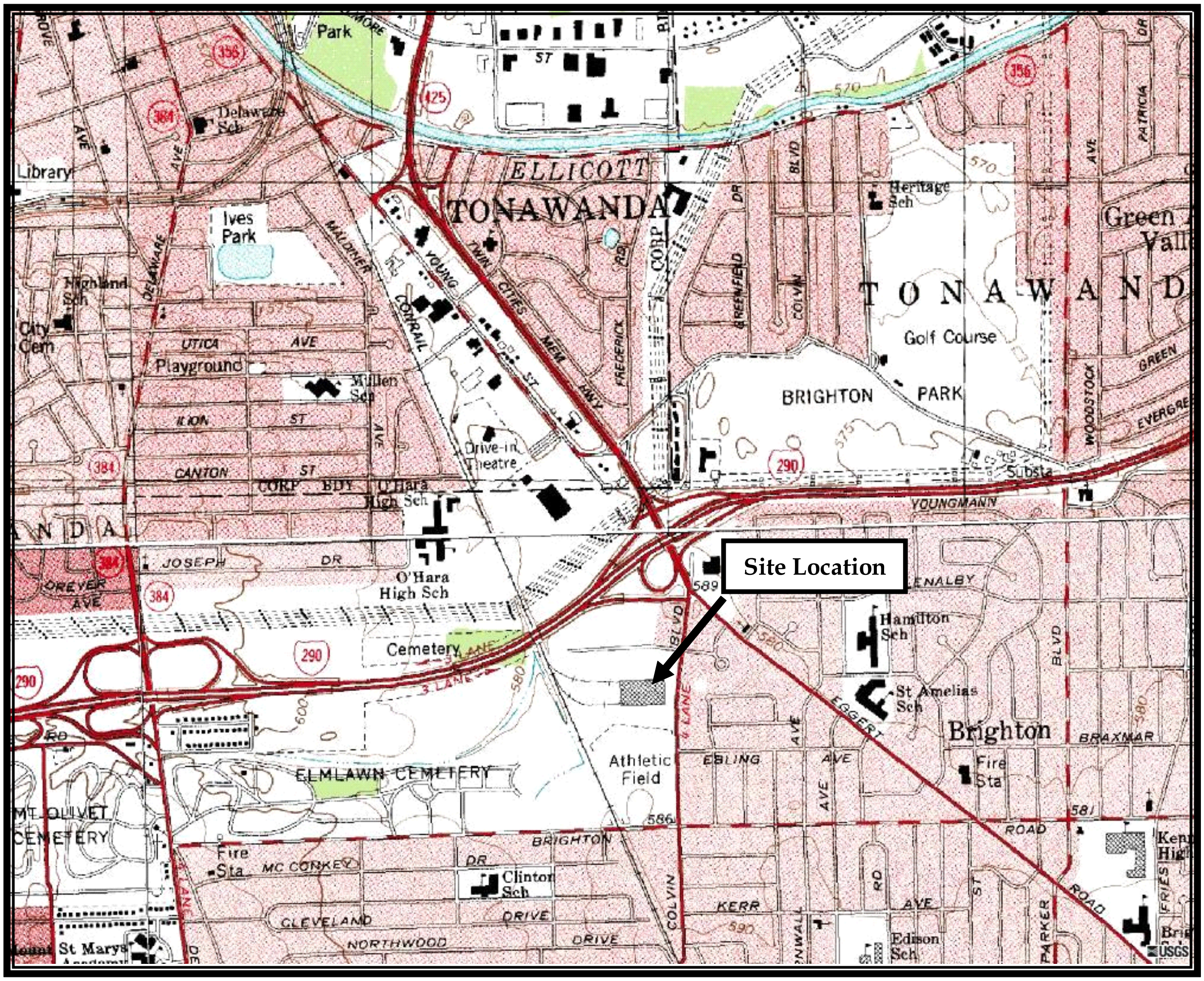
Rickard, L.V. and Fisher, D.W., 1970. Bedrock Geologic Map of New York – Niagara Sheet. New York State Museum and Science Service Map and Chart Series Number 15, Albany, New York.

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA/540/6-89/004, October 1988.

USEPA, 2001. USEPA Region III Risk-Based Concentration Table, 25 September 2001.

Wiedemeier, T.H., Swanson, M.A., Moutoux, D.E., Wilson, J.T., Kampbell, D.H., Hansen, J.E., and Haas, P., 1996. Overview of the technical protocol for natural attenuation of chlorinated aliphatic hydrocarbons in ground water under development for the U.S. Air Force Center for Environmental Excellence. Proceedings of the Symposium on Natural Attenuation of Chlorinated Organics in Ground Water, USEPA Document Number EPA/540/R-96/509, September 1996, pp. 37-61.

Figures



Buffalo NE Quadrangle
New York
7.5 Minute Series

SCALE 1 : 24,000

1 .5 0 1 MILE

CONTOUR INTERVAL 20 FEET

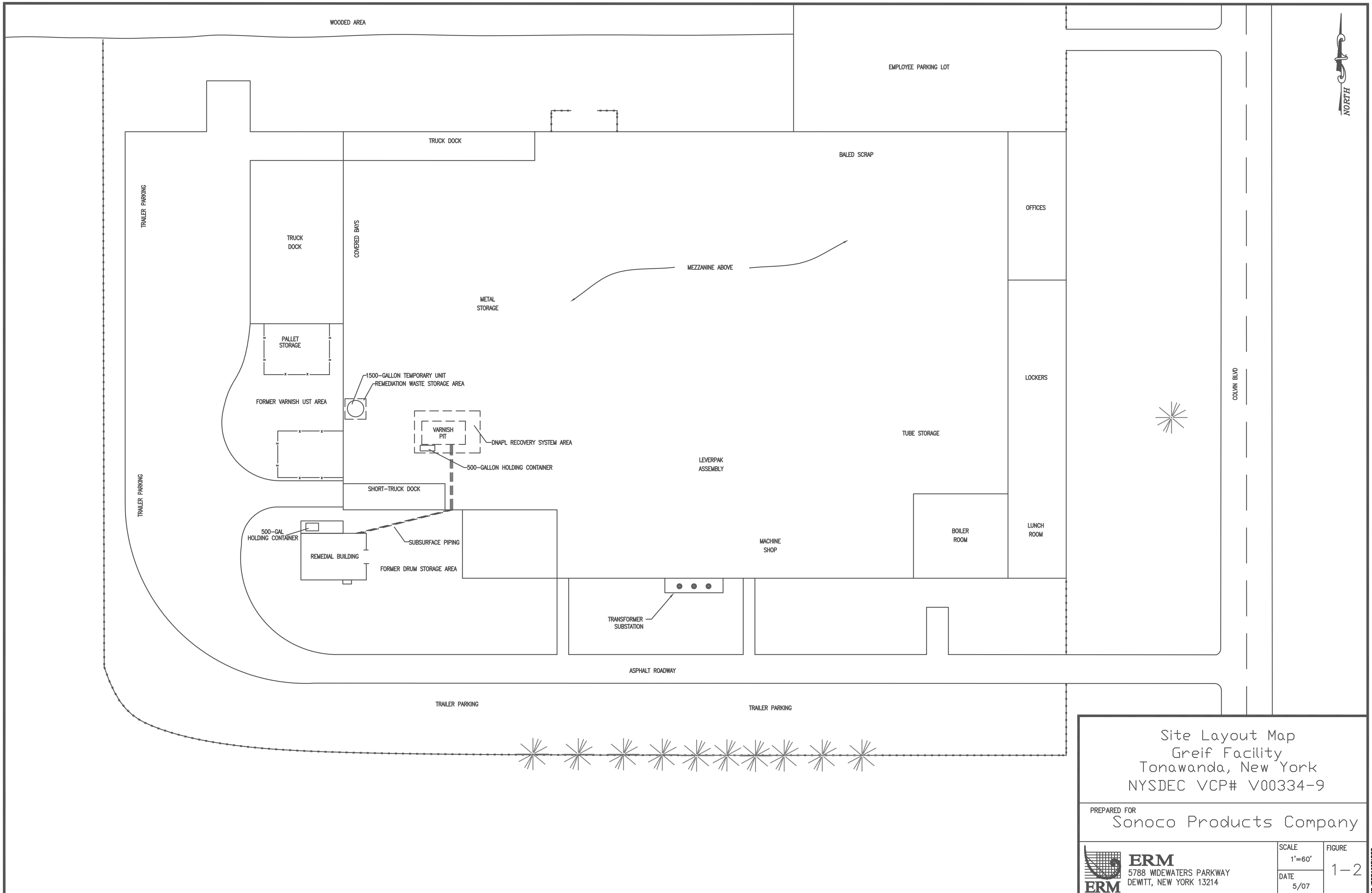
Site Location Map
Grief Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

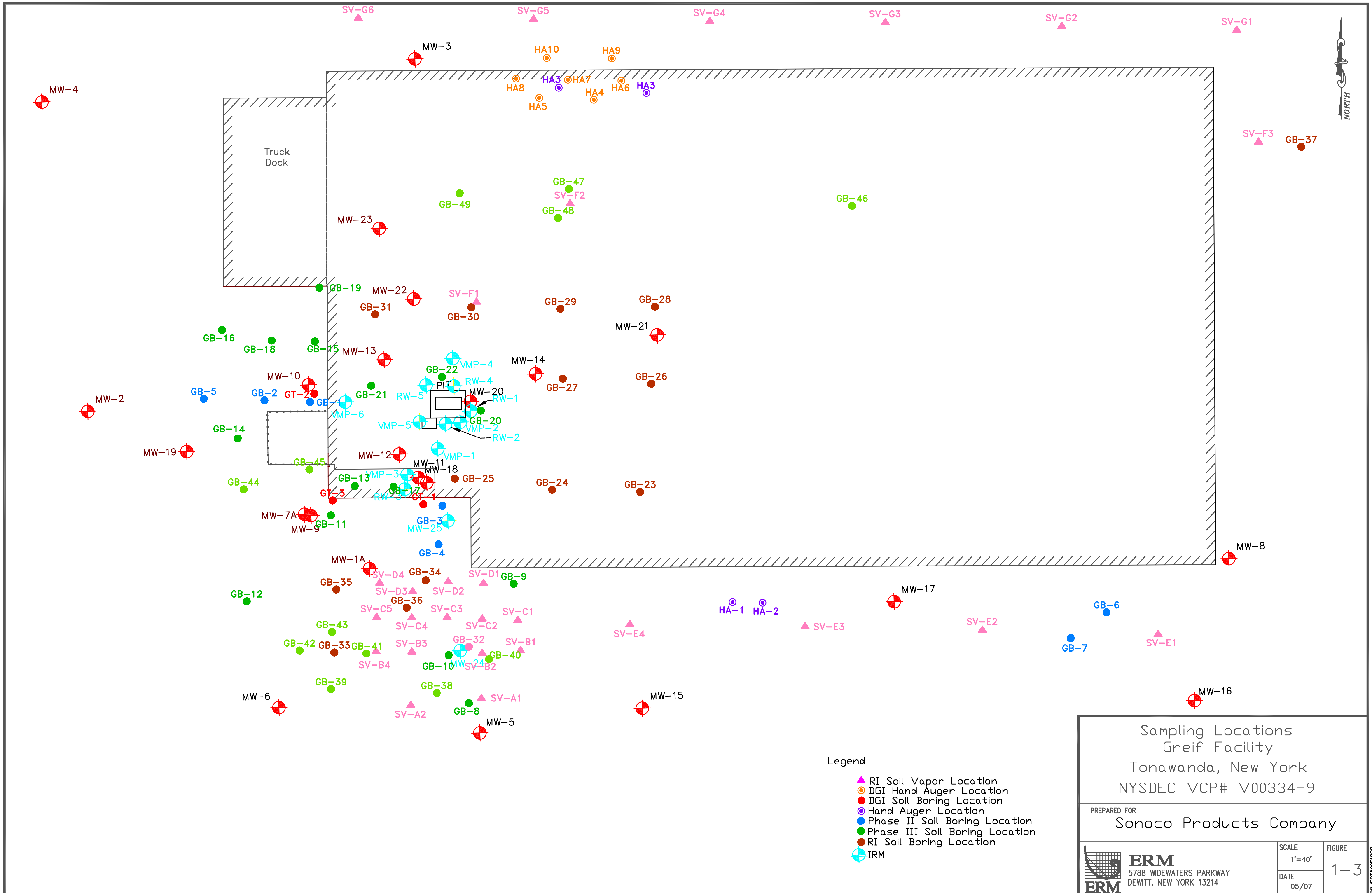
ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

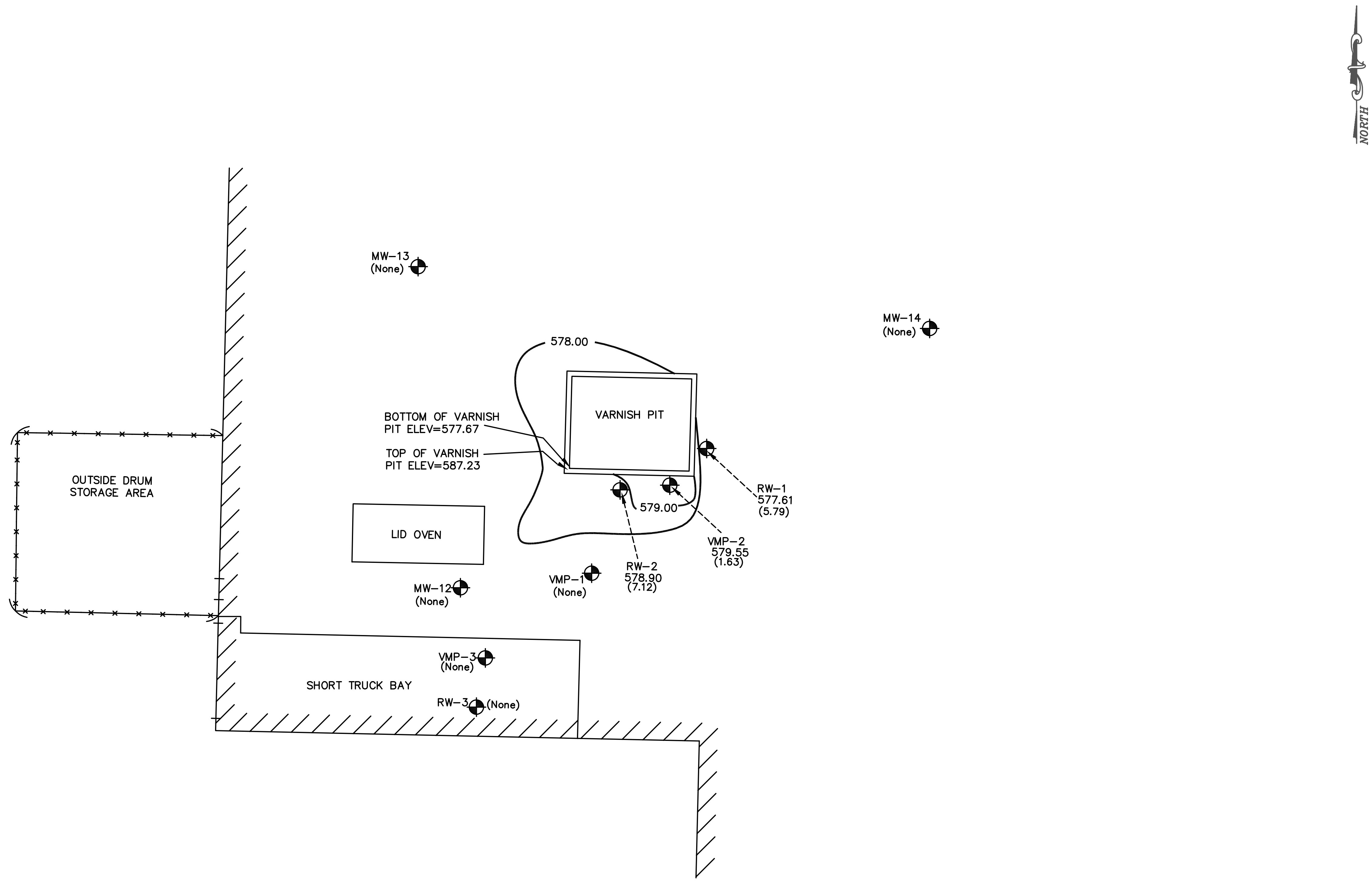
SCALE	FIGURE
NTS	1-1
DATE 5/07	

PROJECT#0051293



PROJECT#0051293


NORTH
SV-G6
SV-G5
SV-G4
SV-G3
SV-G2
SV-G1
MW-3
MW-4
HA10
HA9
HA8
HA3
HA7
HA6
HA3
HA4
HA5
Truck Dock
SV-F3
GB-37
GB-47
SV-F2
GB-48
GB-49
GB-46
MW-23
GB-19
MW-22
SV-F1
GB-29
GB-28
GB-31
GB-30
GB-16
GB-18
GB-15
MW-13
MW-21
VMP-4
MW-14
GB-22
GB-27
GB-26
MW-10
RW-4
PIT
MW-20
GB-5
GB-2
GT-2
GB-1
GB-21
RW-5
RW-1
MW-2
VMP-6
VMP-5
GB-20
VMP-2
RW-2
GB-14
MW-19
VMP-1
MW-12
GB-45
MW-11
MW-18
GB-44
GB-13
VMP-3
GB-25
GB-24
GB-23
GT-3
GB-17
RW-3
GT-1
MW-7A
GB-11
MW-9
GB-3
MW-25
GB-4
MW-8
MW-1A
SV-D4
GB-34
SV-D1
GB-9
GB-35
SV-D3
SV-D2
MW-17
GB-12
GB-36
SV-C5
SV-C3
SV-C1
HA-1
HA-2
GB-6
GB-43
SV-C4
SV-C2
SV-E4
SV-E3
SV-E2
GB-42
GB-33
GB-41
SV-B3
GB-32
SV-B1
GB-7
SV-E1
SV-B4
GB-10
MW-24
SV-B2
GB-40
GB-39
GB-38
MW-6
SV-A1
MW-15
MW-16
SV-A2
GB-8
MW-5
Legend
RI Soil Vapor Location
DGI Hand Auger Location
DGI Soil Boring Location
Hand Auger Location
Phase II Soil Boring Location
Phase III Soil Boring Location
RI Soil Boring Location
IRM
Sampling Locations
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9
PREPARED FOR
Sonoco Products Company
ERM
ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214
SCALE
1"=40'
DATE
05/07
FIGURE
1-3
PROJECT#0051293



LEGEND

VMP-3 Vapor Monitoring Point Location
Chain Link Fence
RW-1 Recovery Well Location
MW-12 Shallow Monitoring Well Location
578.00 DNAPL Contour (feet amsl)
574.15 DNAPL Elevation (feet amsl)
(7.12) Apparent DNAPL Thickness (feet)
NM Not Measured
(None) Drawdown Not Observed

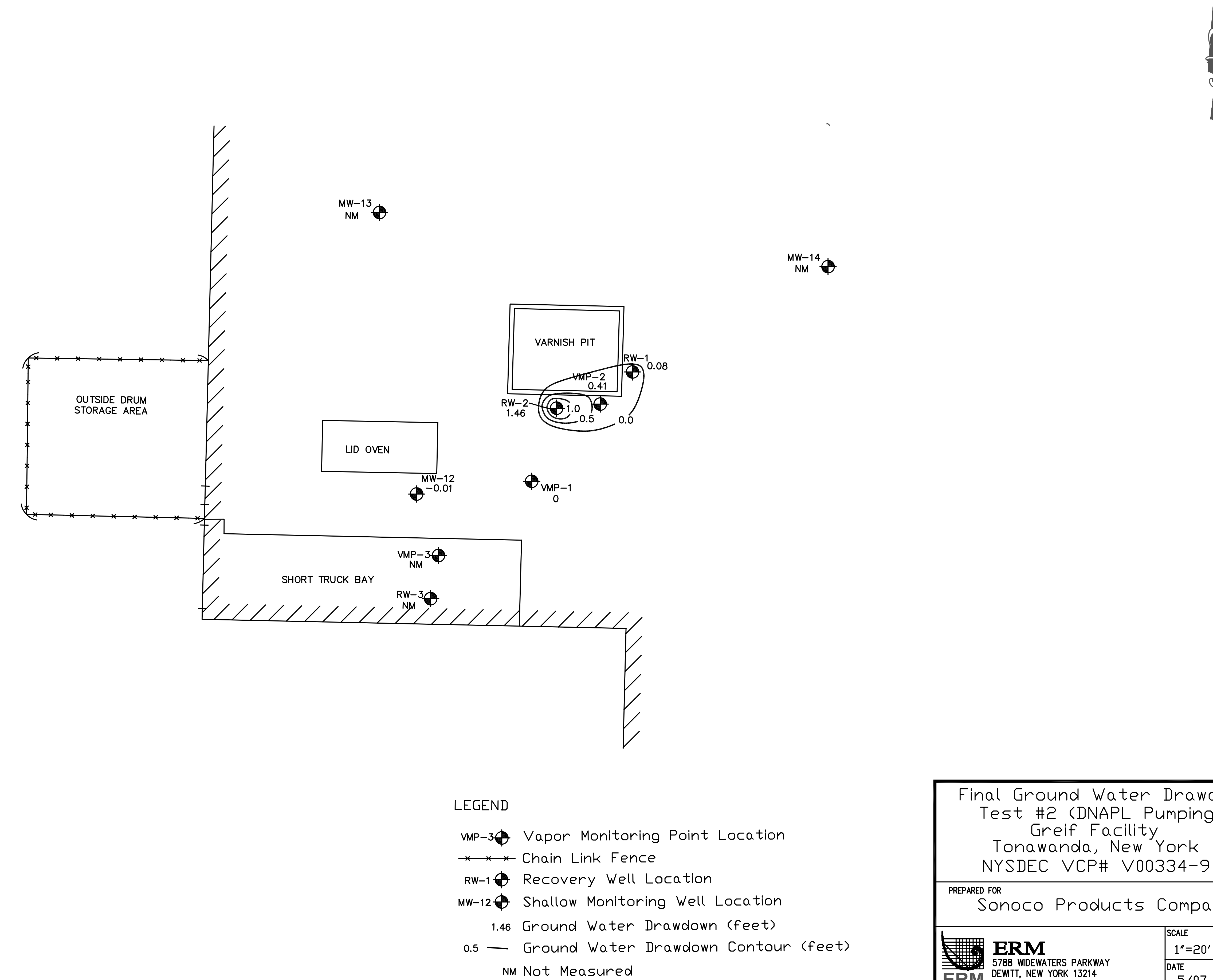
Static DNAPL Contours
14 September 2004
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=20'
DATE 5/07
FIGURE 1-4

PROJECT#0051293



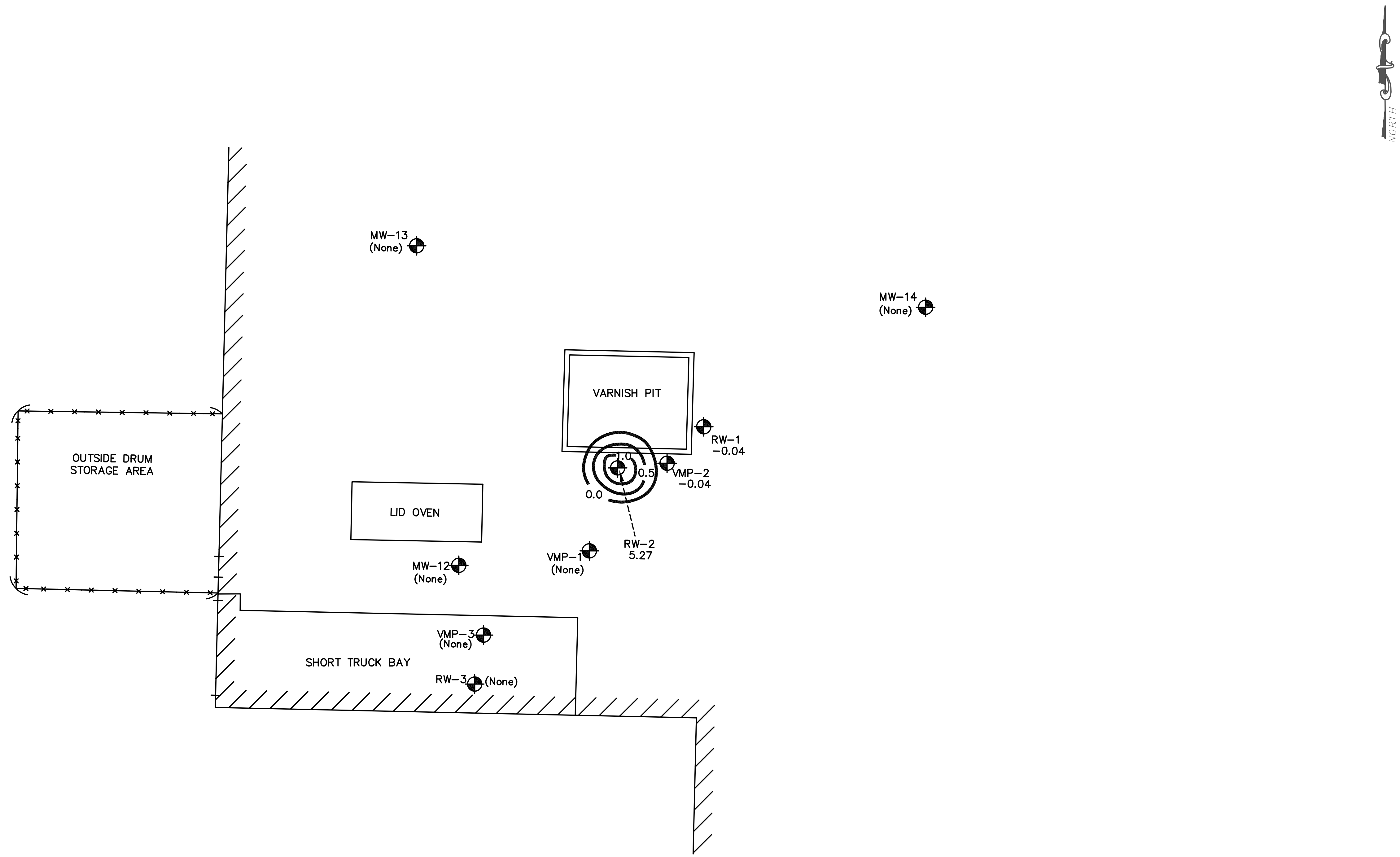
Final Ground Water Drawdown Test #2 (DNAPL Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	1-5
DATE 5/07	

PROJECT#0051293



LEGEND

VMP-3	Vapor Monitoring Point Location
	Chain Link Fence
RW-1	Recovery Well Location
MW-12	Shallow Monitoring Well Location
1.46	Ground Water Drawdown (feet)
0.5	Ground Water Drawdown Contour (feet)
NM	Not Measured

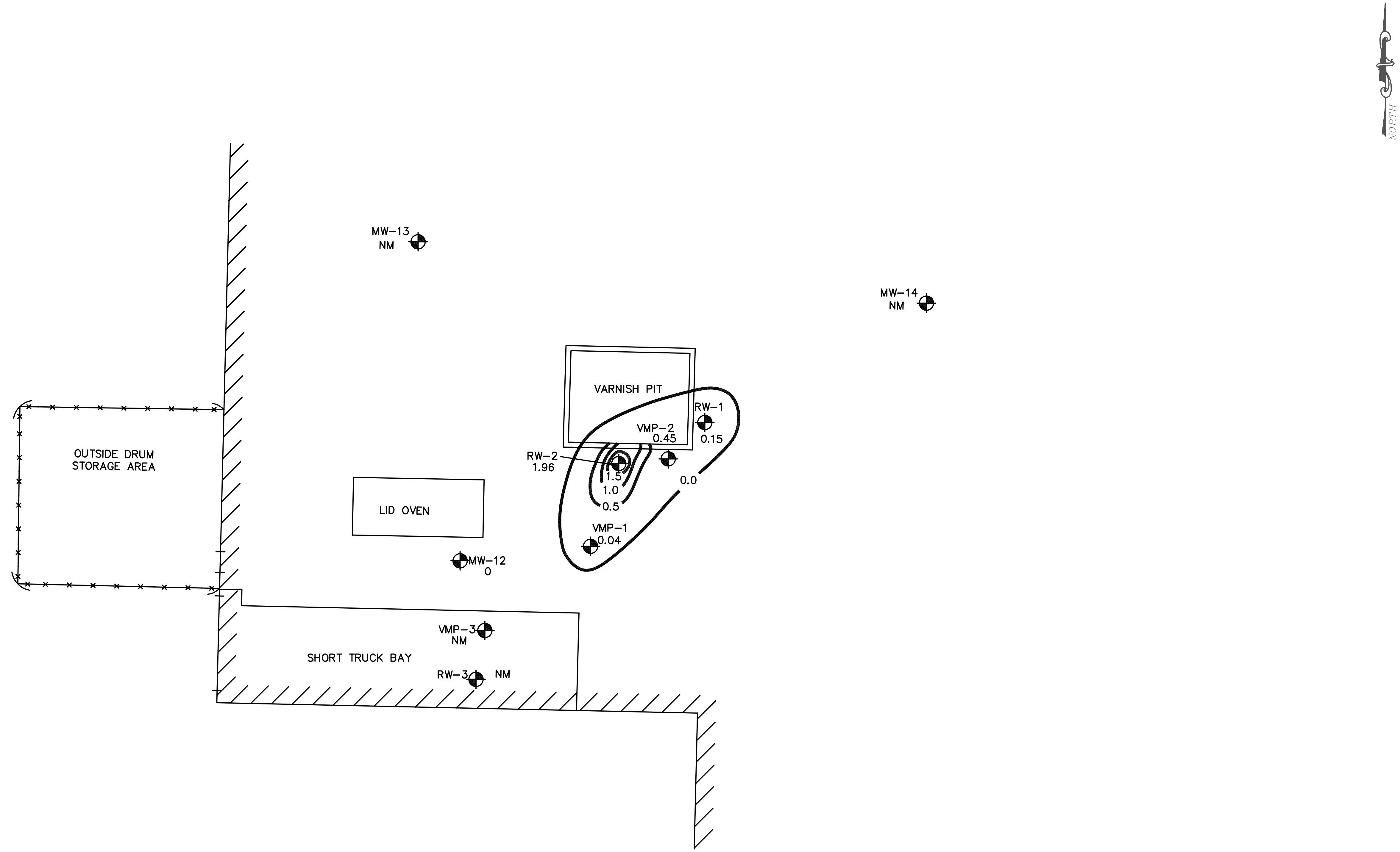
Final DNAPL Drawdown
Test #2 (DNAPL Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=20'
DATE 5/07
FIGURE 1-6

PROJECT#0051293



LEGEND

VMP-3 Vapor Monitoring Point Location
Chain Link Fence
RW-1 Recovery Well Location
MW-12 Shallow Monitoring Well Location
1.46 Ground Water Drawdown (feet)
0.5 Ground Water Drawdown Contour (feet)
NM Not Measured

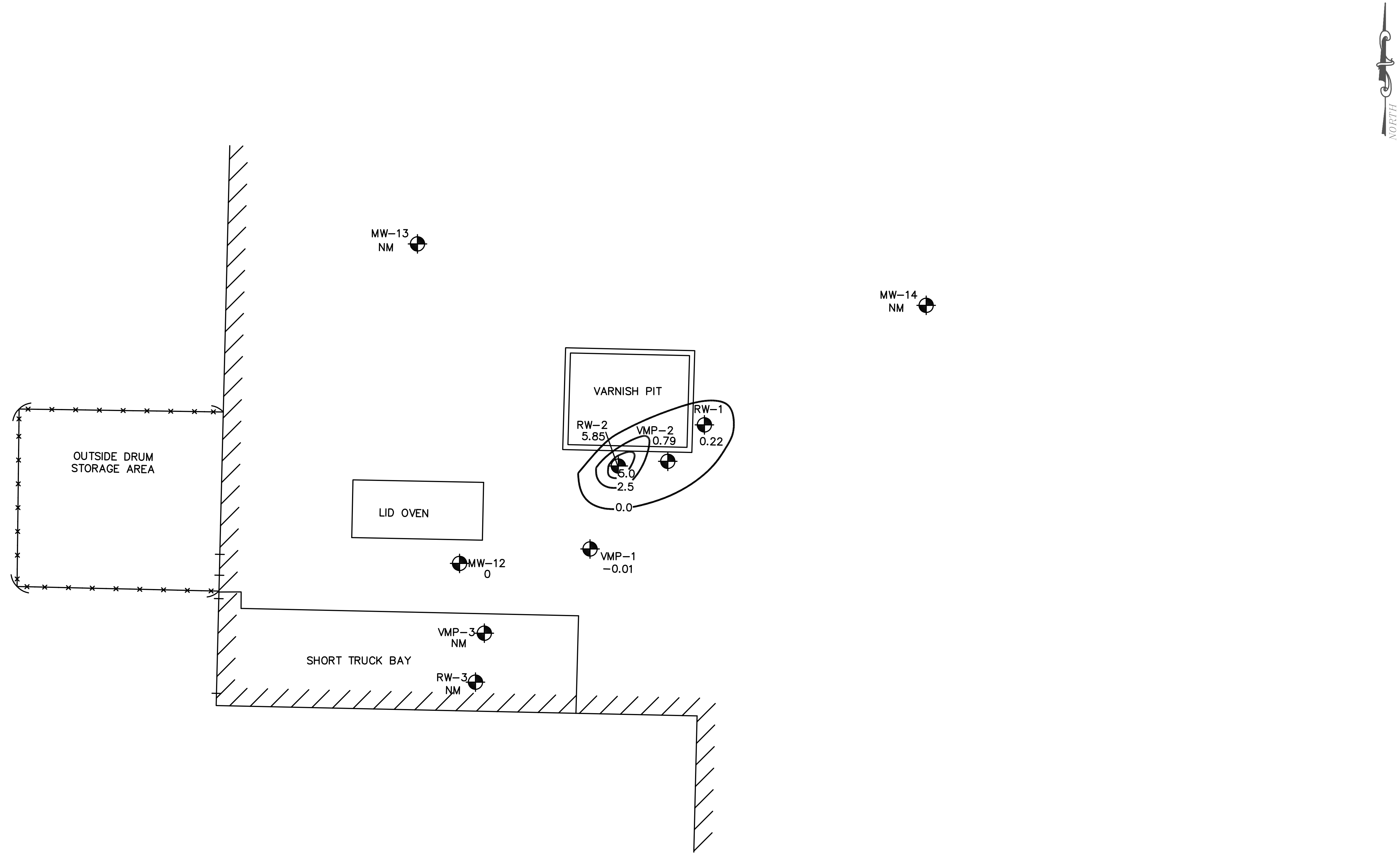
Final Ground Water Drawdown
Test #3 (Ground Water Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	1-7
DATE	
5/07	

PROJECT#0051293



LEGEND

- VMP-3 Vapor Monitoring Point Location
- Chain Link Fence
- RW-1 Recovery Well Location
- MW-12 Shallow Monitoring Well Location
- 1.46 Ground Water Drawdown (feet)
- 0.5 Ground Water Drawdown Contour (feet)
- NM Not Measured

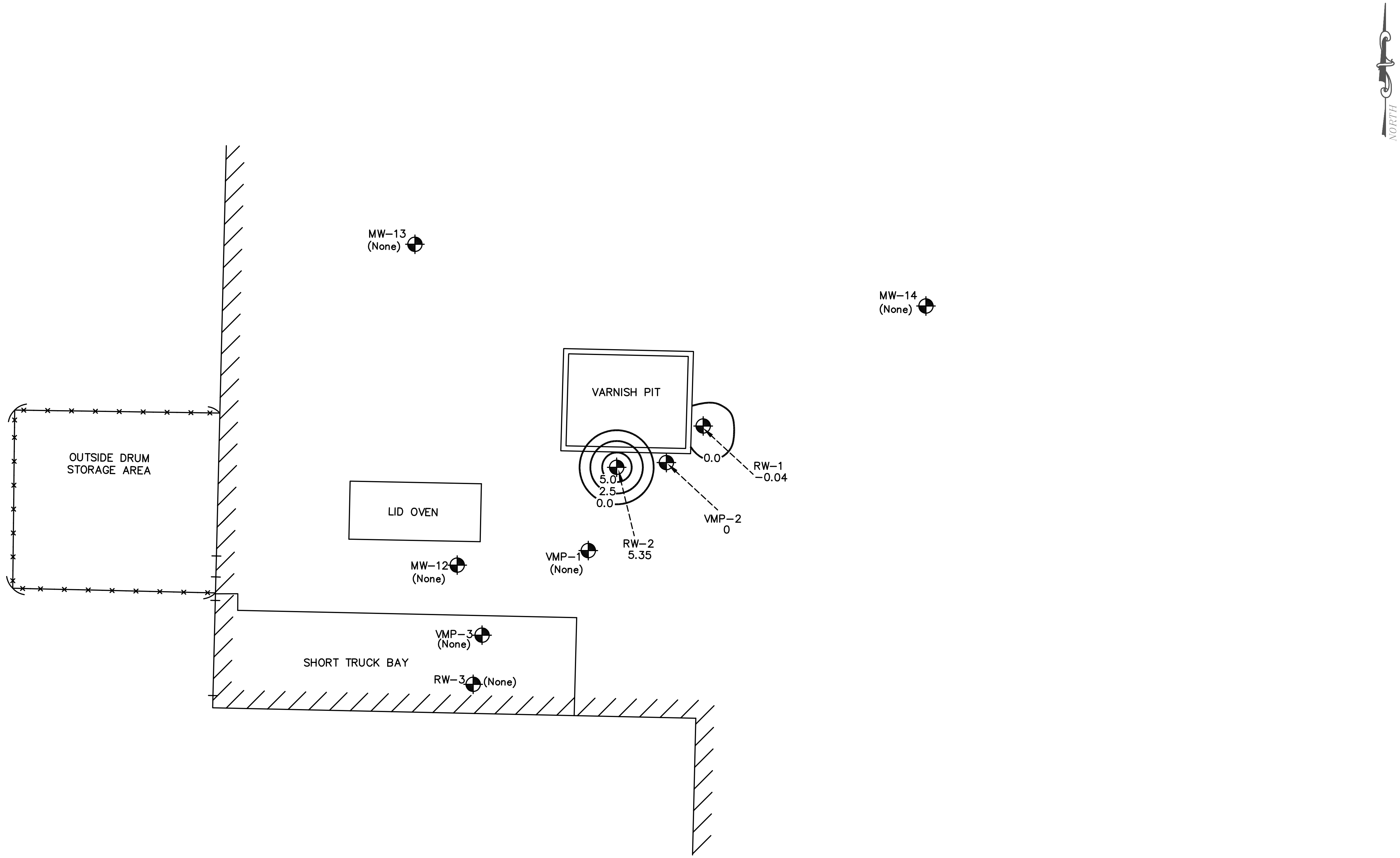
Final Ground Water Drawdown
Test #4 (Ground Water & DNAPL Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=20'
DATE 5/07
FIGURE 1-8

PROJECT#0051293



LEGEND

VMP-3	Vapor Monitoring Point Location
—x—x—x—	Chain Link Fence
RW-1	Recovery Well Location
MW-12	Shallow Monitoring Well Location
1.46	Ground Water Drawdown (feet)
0.5 —	Ground Water Drawdown Contour (feet)
NM	Not Measured

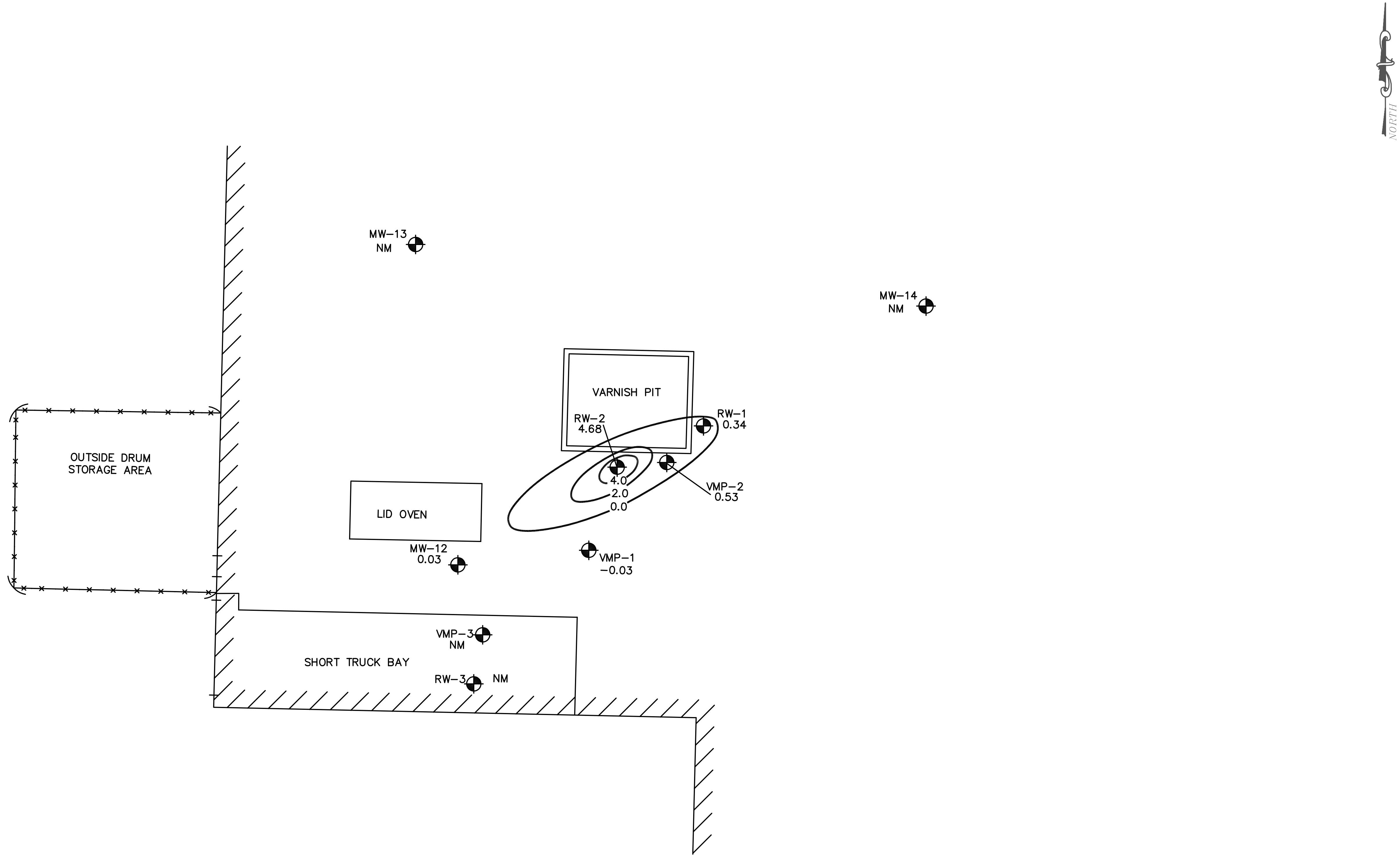
Final Ground Water Drawdown
Test #4 (Ground Water & DNAPL Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=20'
DATE 5/07
FIGURE 1-9

PROJECT#0051293



LEGEND

VMP-3 Vapor Monitoring Point Location

—x—x—x— Chain Link Fence

RW-1 Recovery Well Location

MW-12 Shallow Monitoring Well Location

1.46 Ground Water Drawdown (feet)

0.5 —— Ground Water Drawdown Contour (feet)

NM Not Measured

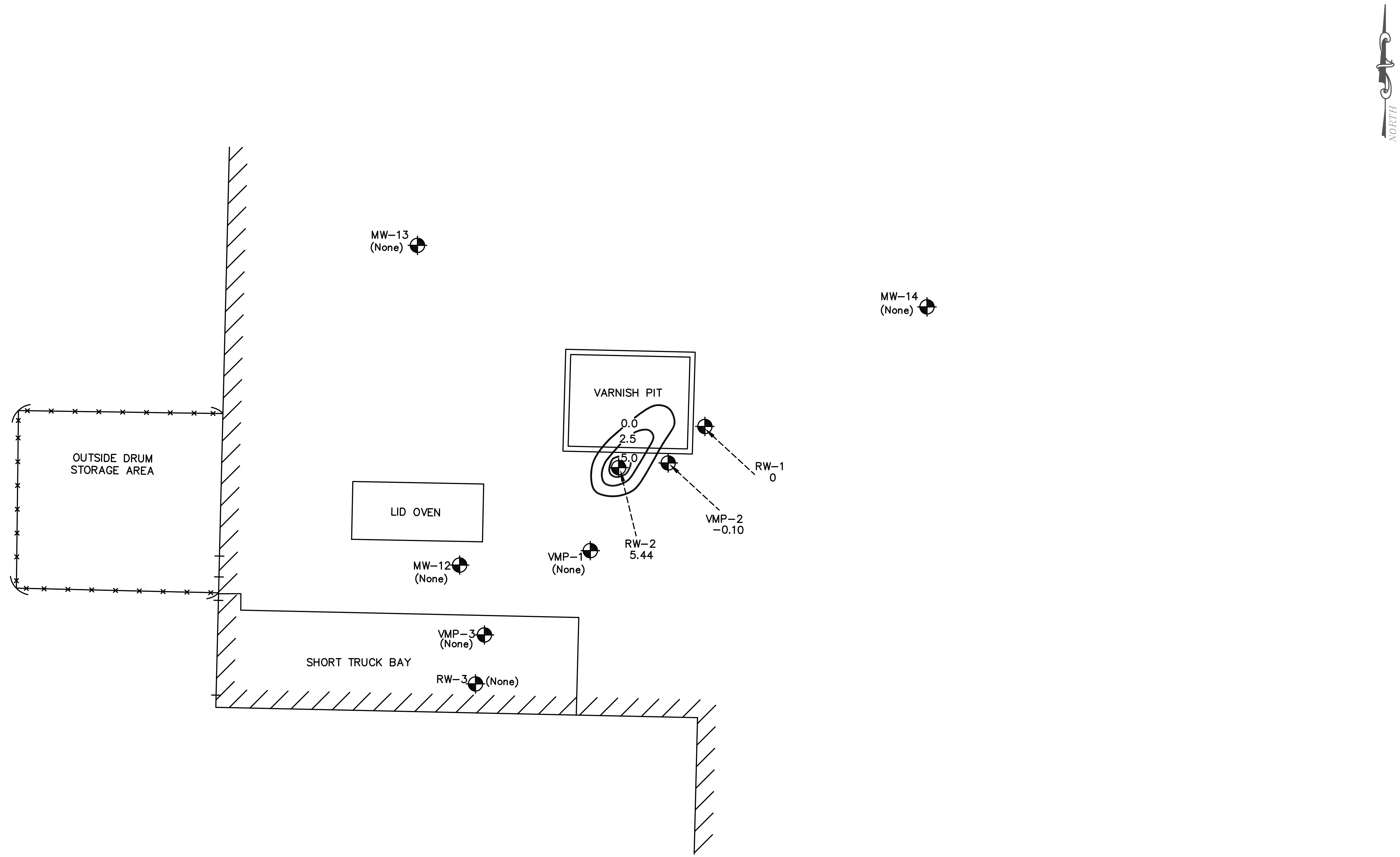
Final Ground Water Drawdown
Test #5 (Low-Vacuum Enhanced DNAPL
Extraction & Ground Water Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	1-10
DATE 5/07	

PROJECT#0051293



LEGEND

VMP-3	Vapor Monitoring Point Location
—x—x—	Chain Link Fence
RW-1	Recovery Well Location
MW-12	Shallow Monitoring Well Location
1.46	Ground Water Drawdown (feet)
0.5 —	Ground Water Drawdown Contour (feet)
NM	Not Measured

Final Ground Water Drawdown
Test #5 (Ground Water & DNAPL Pumping)
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

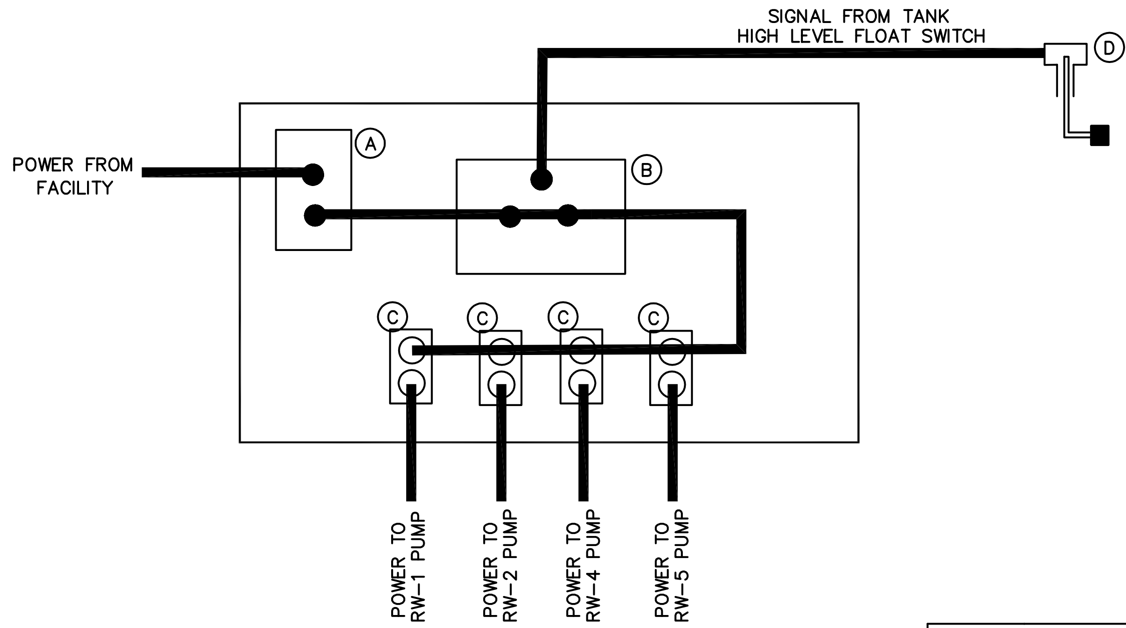
PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

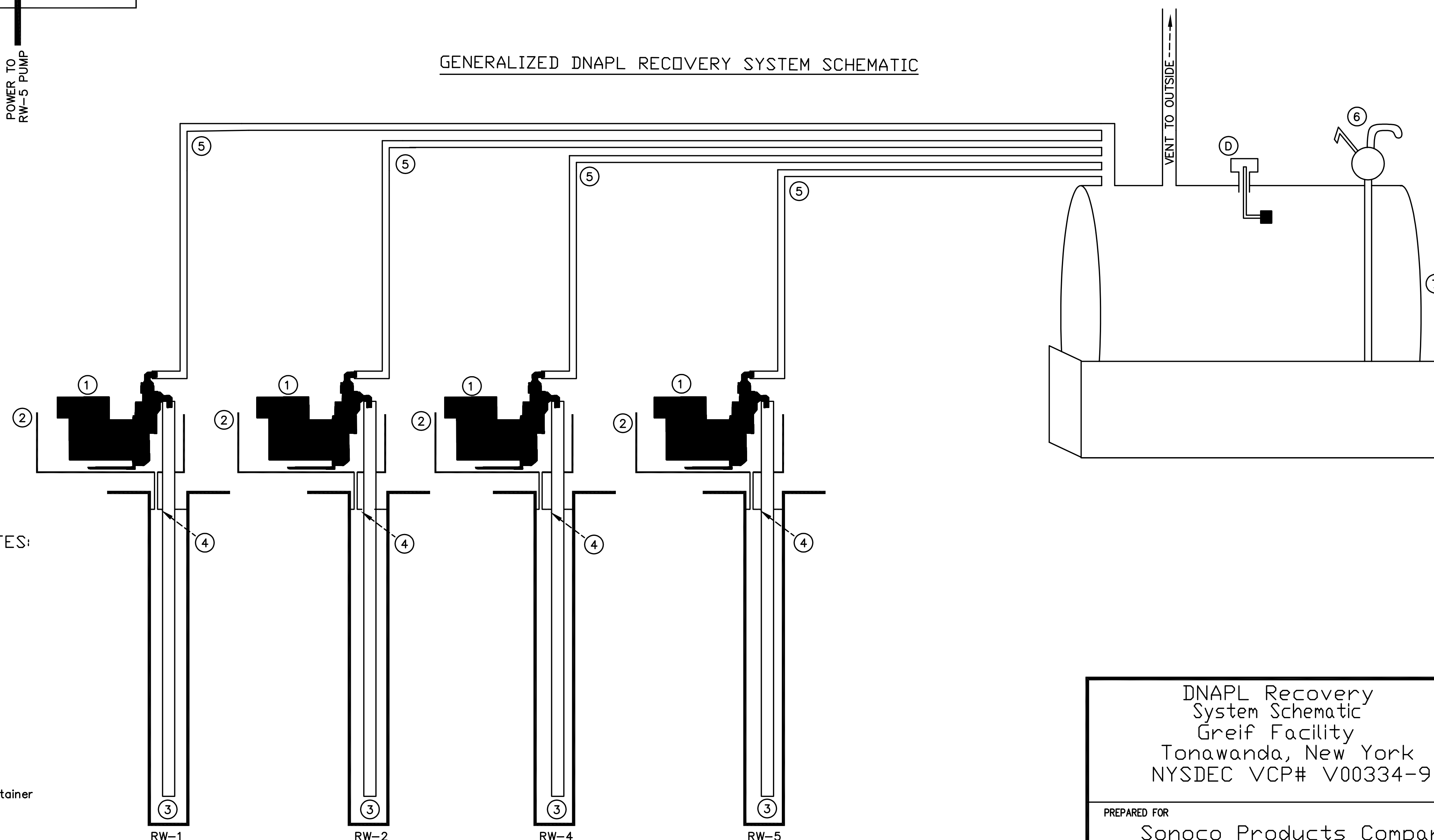
SCALE 1"=20'
DATE 5/07
FIGURE 1-11

PROJECT#0051293

GENERALIZED ELECTRICAL CONTROLS SCHEMATIC



GENERALIZED DNAPL RECOVERY SYSTEM SCHEMATIC



GENERALIZED ELECTRICAL NOTES:

- (A) Circut Breaker
- (B) Intrinsically Safe Liquid Level Relay Switch Control
- (C) Programmable Timer
- (D) High Liquid Level Switch

GENERALIZED DNAPL RECOVERY SYSTEM NOTES:

- (1) Dial-A-Flow Metering Pump
- (2) Secondary Containment with Drain into Recovery Well
- (3) Foot Valve
- (4) Well Seal with Vapor Lock and Drain Check Valve
- (5) Secondarily-Contained Piping
- (6) DNAPL Product Removal Pump
- (7) Secondarily-Contained 500-Gallon Steel Waste Storage Container

GENERAL NOTE: All DNAPL recovery system electrical and construction work shall follow applicable codes, regulations and standards.

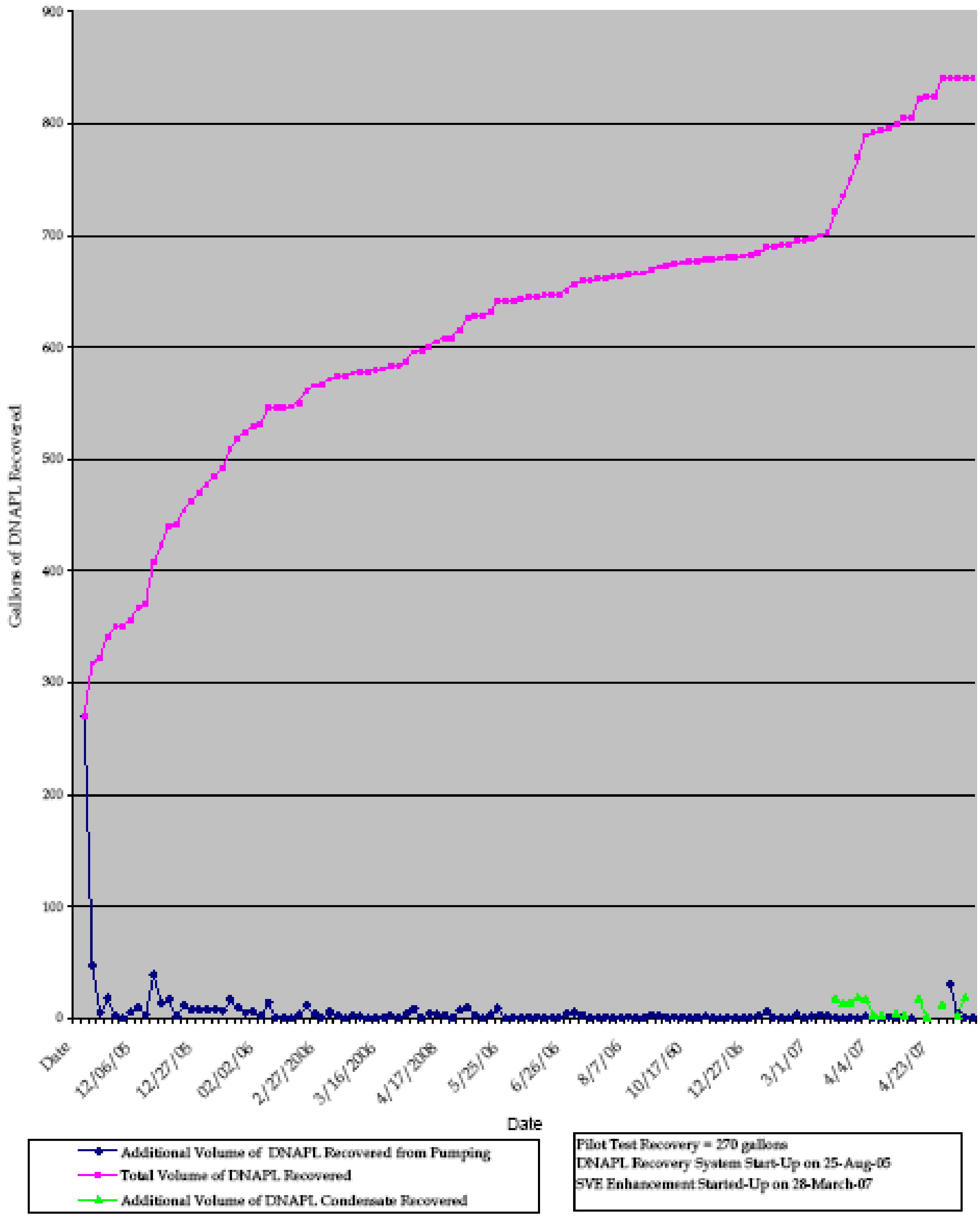
DNAPL Recovery
System Schematic
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	1-12
DATE 5/07	

PROJECT#0051293



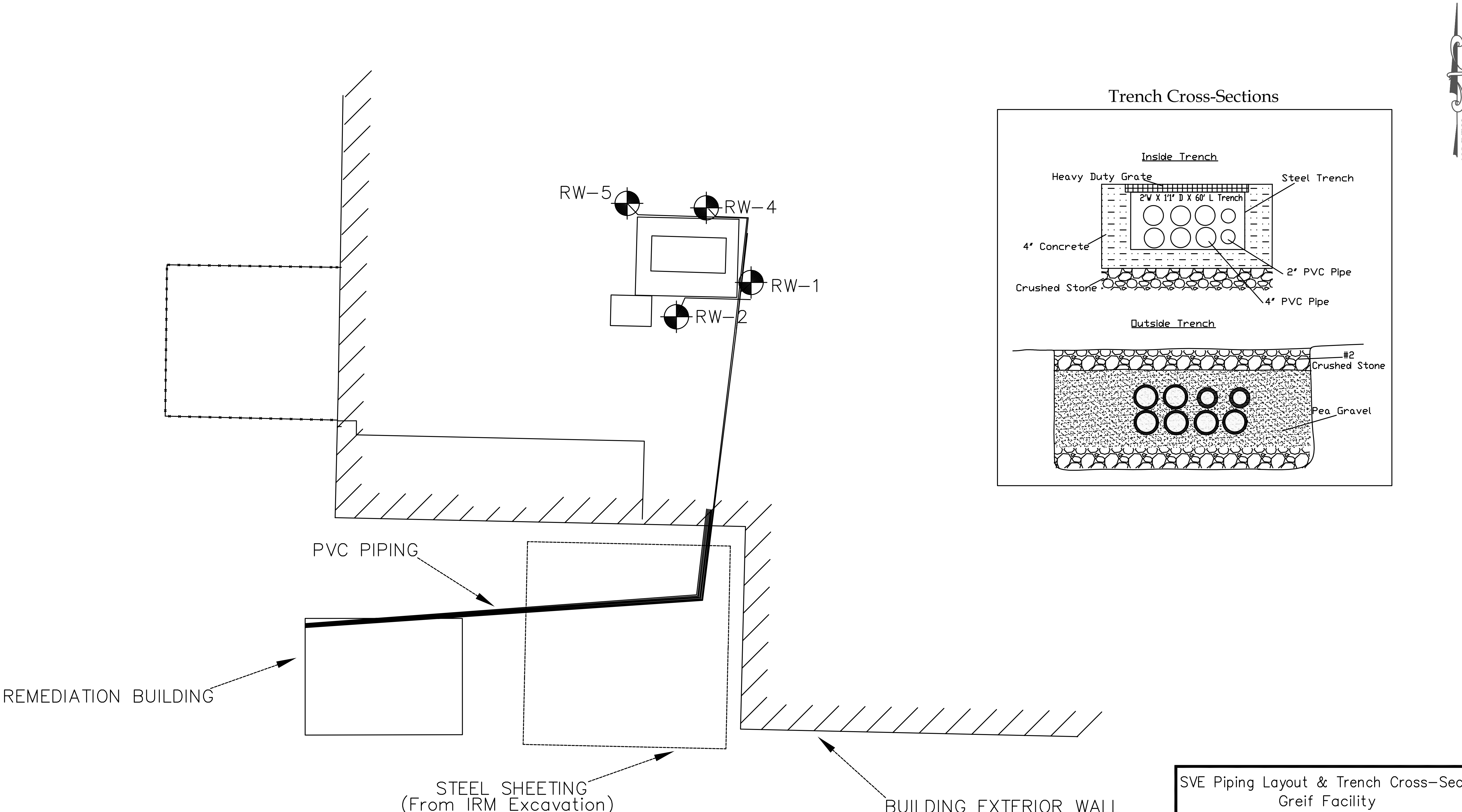
DNAPL Recovery Results
Grief Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
NTS	1-13
DATE 5/07	

PROJECT#0051293

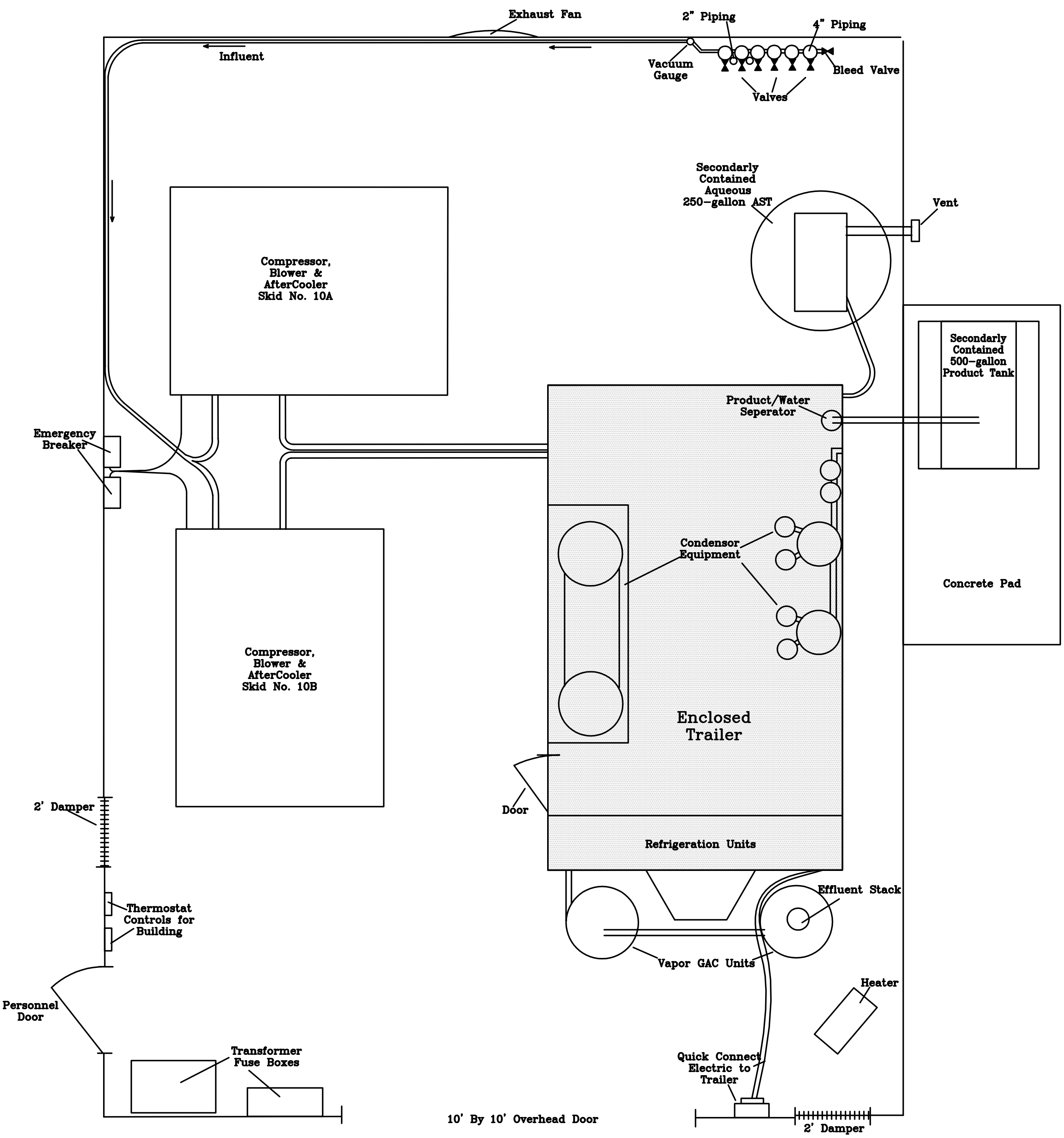


SVE Piping Layout & Trench Cross-Sections
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	1-14
DATE 4/07	



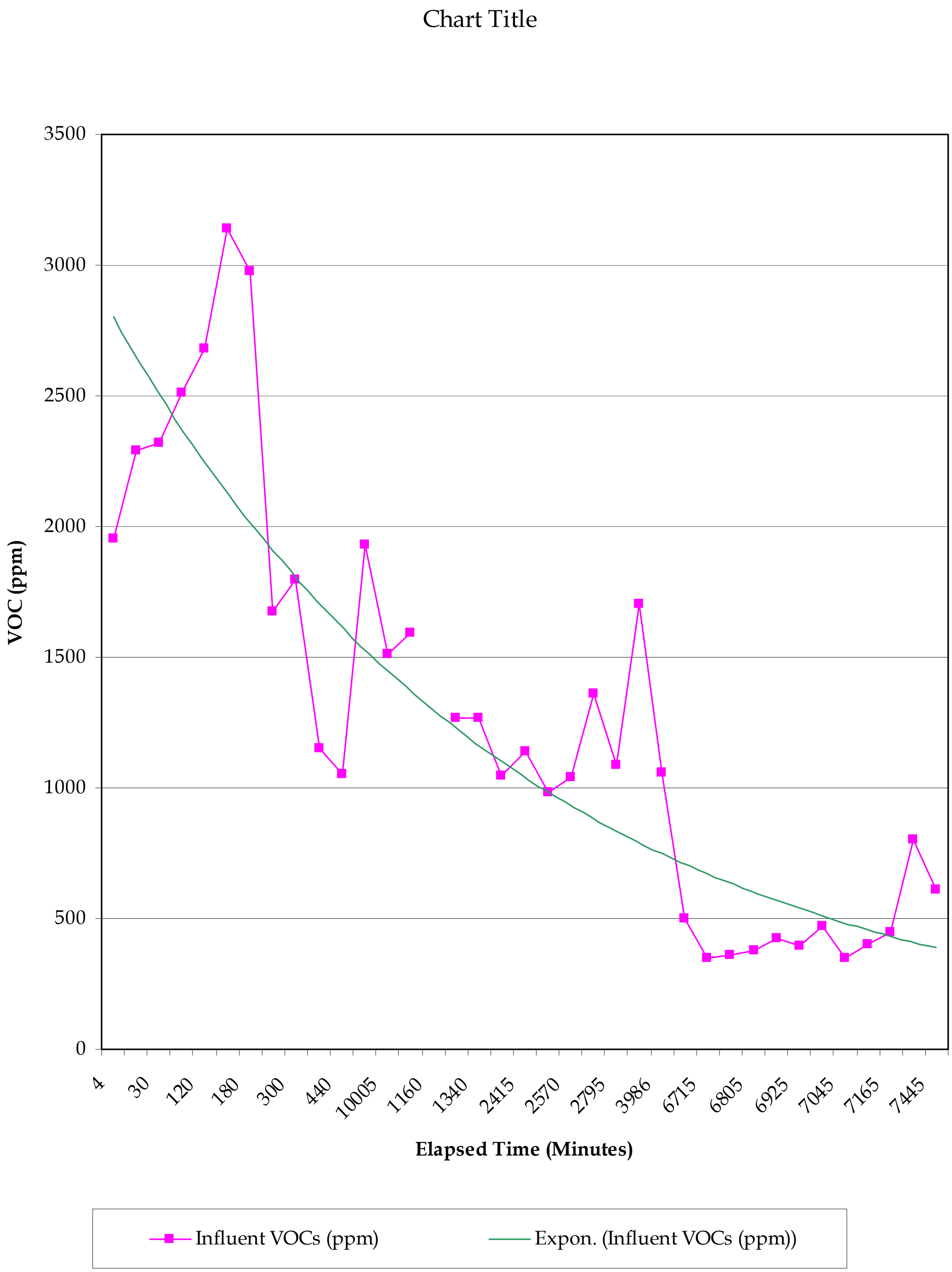
Remediation Building
Grief Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
NTS	1-15
DATE 5/07	

PROJECT#0051293



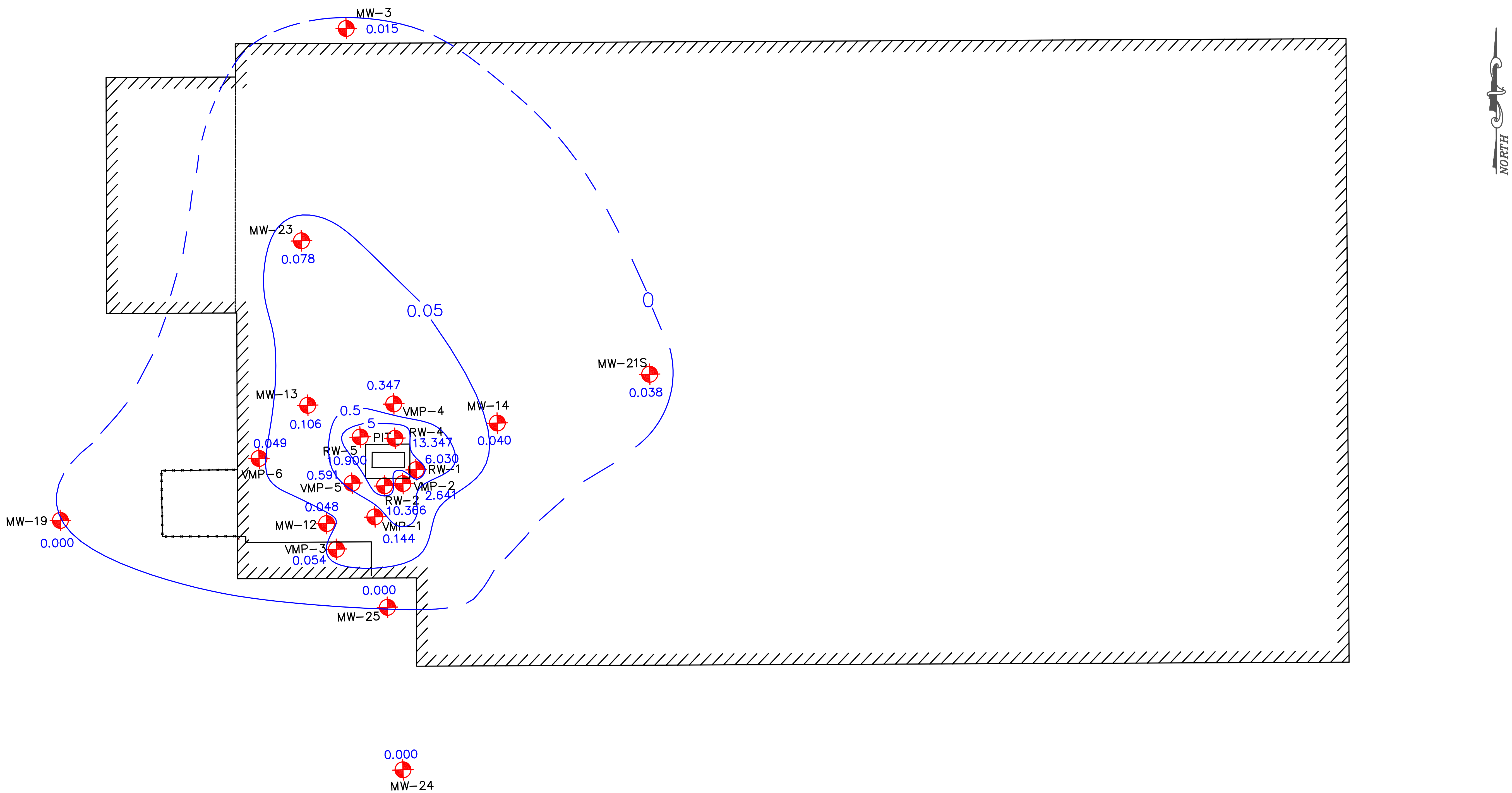
SVE Pilot Test VOC Field Screening
Grief Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
NTS	1-16
DATE 5/07	

PROJECT#0051293



LEGEND

VMP-3	Vapor Monitoring Point Location
RW-4	Recovery Well Location
MW-14	Shallow Monitoring Well Location
0.5	Vacuum Contour (Inches of Water)
0.078	Vacuum Measurement (Inches of Water)

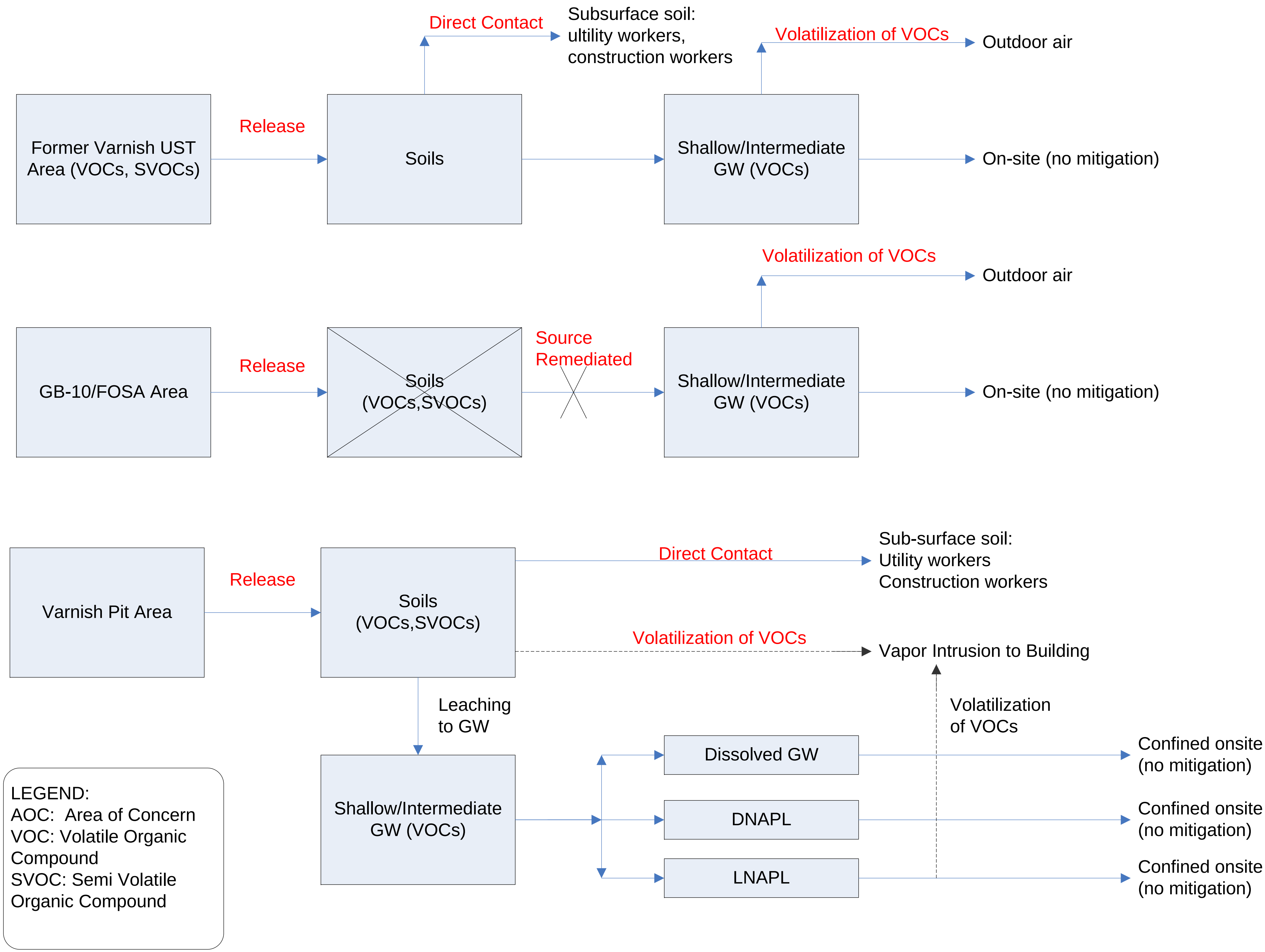
Shallow Monitoring Well
Average Vacuum Influence
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

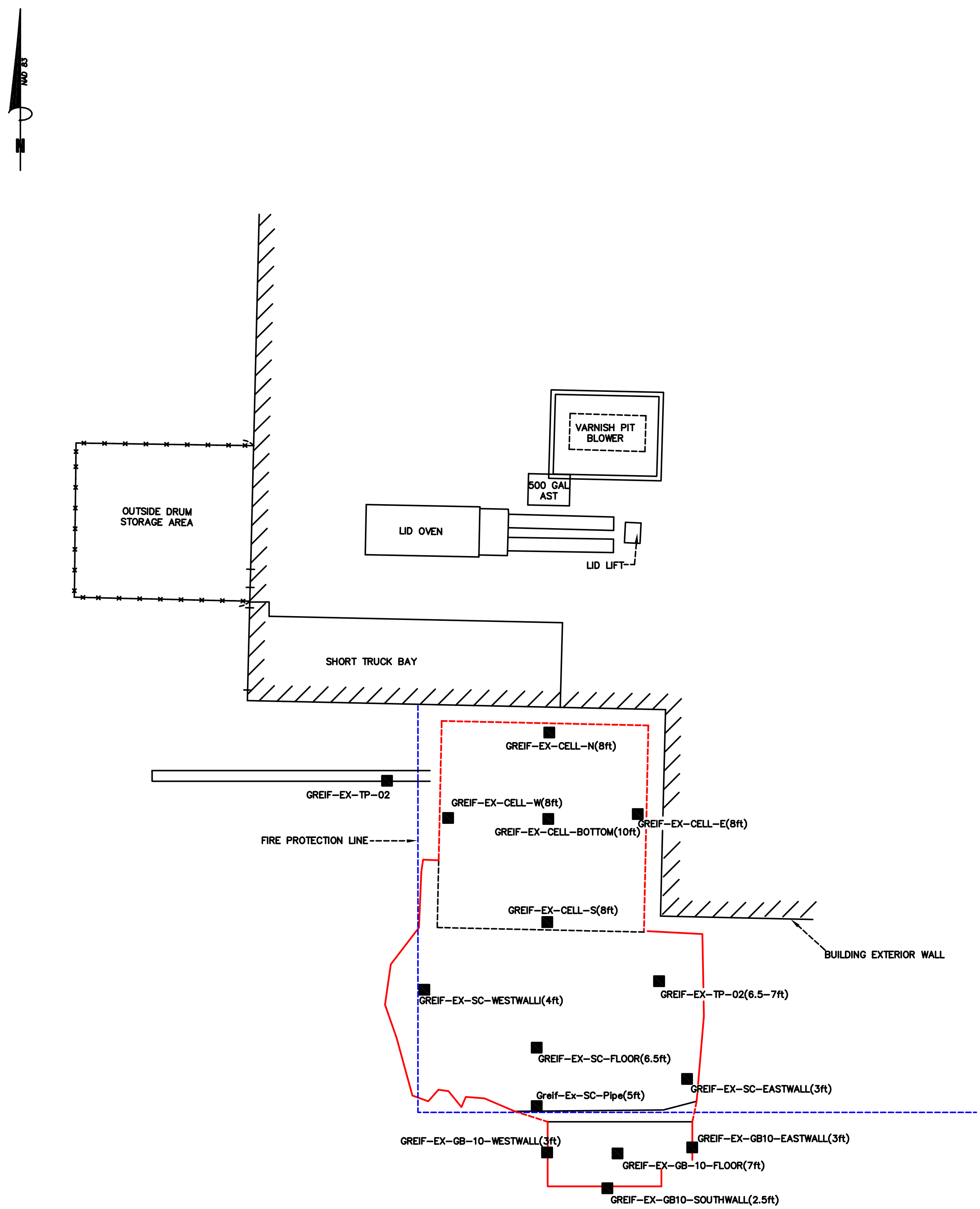
PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=40'
DATE 05/07
FIGURE 1-17

Figure 2-1 Conceptual Site Model
Greif Bros. Facility
Tonawanda, NY
P#0051923.04





LEGEND

- VMP-3 — VAPOR MONITORING POINT LOCATION
- CHAIN LINK FENCE
- RW-1 — RECOVERY WELL LOCATION
- MW-12 — MONITORING WELL LOCATION
- GREIF-EX-CELL-BOTTOM(10ft) — SOIL SAMLE LOCATION (SAMPLE DEPTH IN FEET BELOW GRADE SURFACE)
- STEEL SHEETING COFFERDAM
- SOIL IRM EXCAVATION LIMITS
- FIRE SUPPRESION LINE

Note: Base map obtained from WM. Schutt &Associates, P.C. survey drawings updated on 12 January 2006.

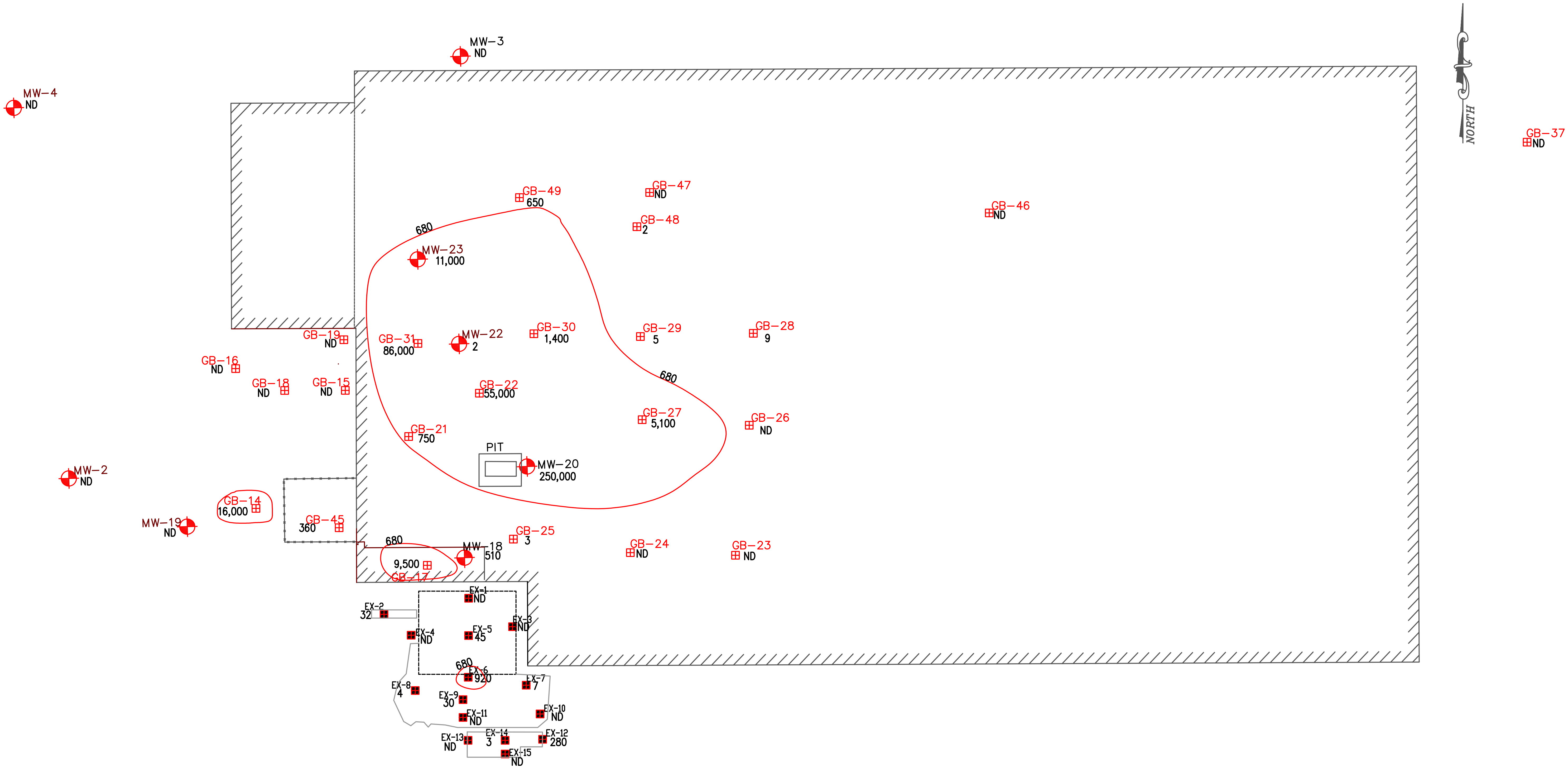
Extent of IRM Soil and Confirmation Sample Locations
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=20'	3-1
DATE 04/06	

PROJECT #0037934



Post IRM Soil Sample Reference

EX-1	Greif-EX-Cell-N(8ft)
EX-2	Greif-EX-TP-02(6.5-7)
EX-3	Greif-EX-Cell-E(8ft)
EX-4	Greif-EX-Cell-W(8ft)
EX-5	Greif-EX-Cell-Bottom(10ft)
EX-6	Greif-EX-Cell-S(8ft)
EX-7	Greif-EX-TP-01(6-7ft)
EX-8	Greif-EX-SC-WestWall(4ft)
EX-9	Greif-EX-SC-Floor(6.5ft)
EX-10	Greif-EX-SC-EastWall(3ft)
EX-11	Greif-EX-SC-Pipe(5ft)
EX-12	Greif-EX-GB-10-EastWall(3ft)
EX-13	Greif-EX-GB-10-WestWall(3ft)
EX-14	Greif-EX-GB-10-Floor(7ft)
EX-15	Greif-EX-GB10-SouthWall(2.5ft)

LEGEND

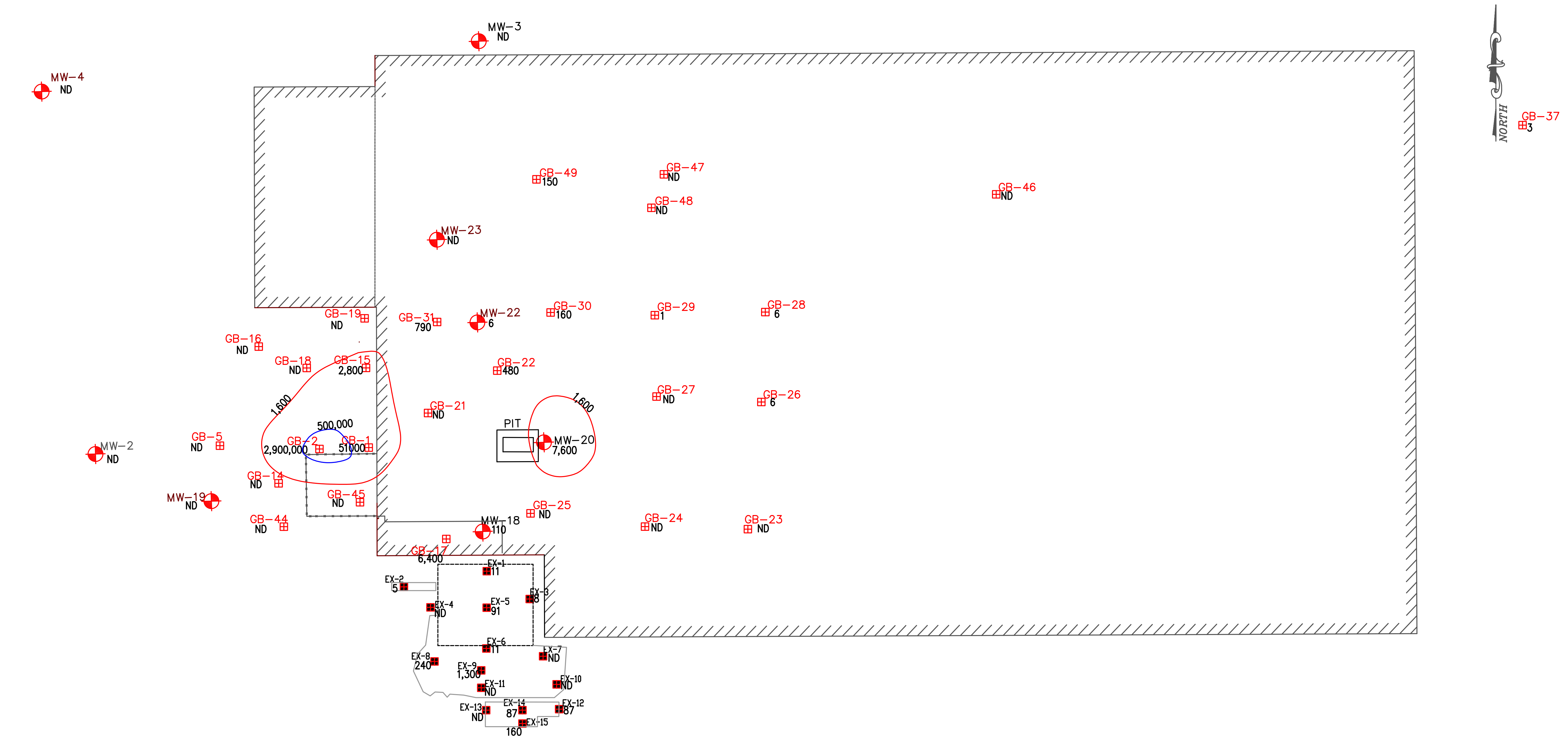
- VMP-3 — Well Location
- Post IRM Soil Excavation Samples
- GB-37 — Soil Borings
- Post IRM Soil Excavation
- Steel Sheeting Cofferdam
- 1,1,1-TCA Concentrations above 680 ug/Kg (Unrestricted SCO)
- 1,1,1-TCA Concentrations above 500,000 ug/Kg (Restricted Commercial SCO)

1,1,1-TCA Concentrations in Soil
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
1"=40'	3-2
DATE 4/07	



Post IRM Soil Sample Reference

EX-1-------------Greif-EX-Cell-N(8ft)
EX-2------------Greif-EX-TP-02(6.5-7)
EX-3-------------Greif-EX-Cell-E(8ft)
EX-4-------------Greif-EX-Cell-W(8ft)
EX-5--------Greif-EX-Cell-Bottom(10ft)
EX-6-------------Greif-EX-Cell-S(8ft)
EX-7-----------Greif-EX-TP-01(6-7ft)
EX-8-------Greif-EX-SC-WestWall(4ft)
EX-9---------Greif-EX-SC-Floor(6.5ft)
EX-10--------Greif-EX-SC-EastWall(3ft)
EX-11------------Greif-EX-SC-Pipe(5ft)
EX-12----Greif-EX-GB-10-EastWall(3ft)
EX-13----Greif-EX-GB-10-WestWall(3ft)
EX-14--------Greif-EX-GB-10-Floor(7ft)
EX-15---Greif-EX-GB10-SouthWall(2.5ft)

LEGEND

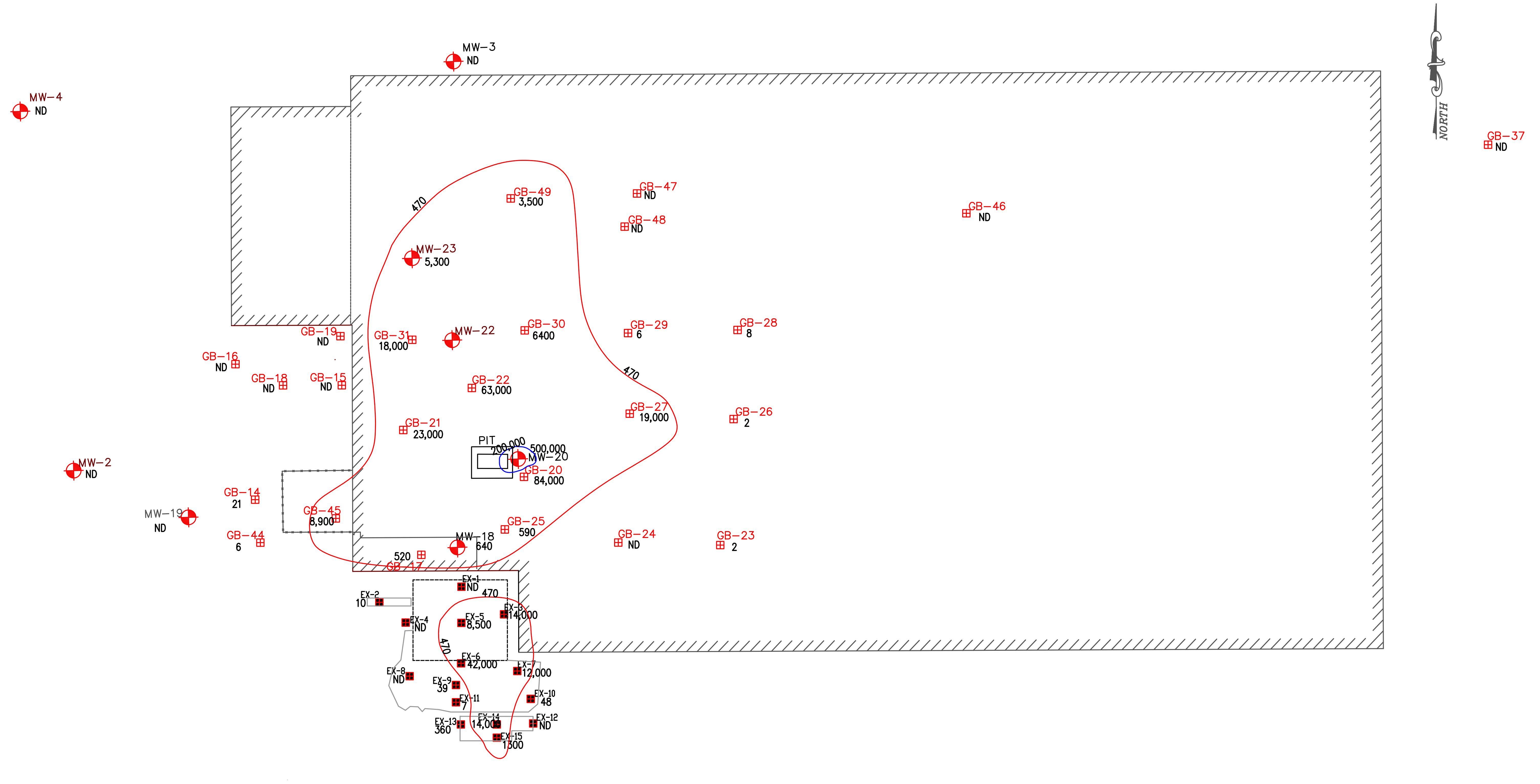
VMP-3 Well Location
Post IRM Soil Excavation Samples
GB-37 Soil Borings
Post IRM Soil Excavation
Steel Sheeting Cofferdam
Xylene Concentrations above 1600 ug/Kg (Unrestricted SCO)
Xylene Concentrations above 500,000 ug/Kg (Restricted Commercial SCO)

Xylene Concentrations in Soil
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=40'
DATE 4/07
FIGURE 3-3



Post IRM Soil Sample Reference

EX-1-------------Greif-EX-Cell-N(8ft)
EX-2------------Greif-EX-TP-02(6.5-7)
EX-3-------------Greif-EX-Cell-E(8ft)
EX-4-------------Greif-EX-Cell-W(8ft)
EX-5--------Greif-EX-Cell-Bottom(10ft)
EX-6-------------Greif-EX-Cell-S(8ft)
EX-7-----------Greif-EX-TP-01(6-7ft)
EX-8------Greif-EX-SC-WestWall(4ft)
EX-9---------Greif-EX-SC-Floor(6.5ft)
EX-10--------Greif-EX-SC-EastWall(3ft)
EX-11------------Greif-EX-SC-Pipe(5ft)
EX-12----Greif-EX-GB-10-EastWall(3ft)
EX-13----Greif-EX-GB-10-WestWall(3ft)
EX-14--------Greif-EX-GB-10-Floor(7ft)
EX-15---Greif-EX-GB10-SouthWall(2.5ft)

LEGEND

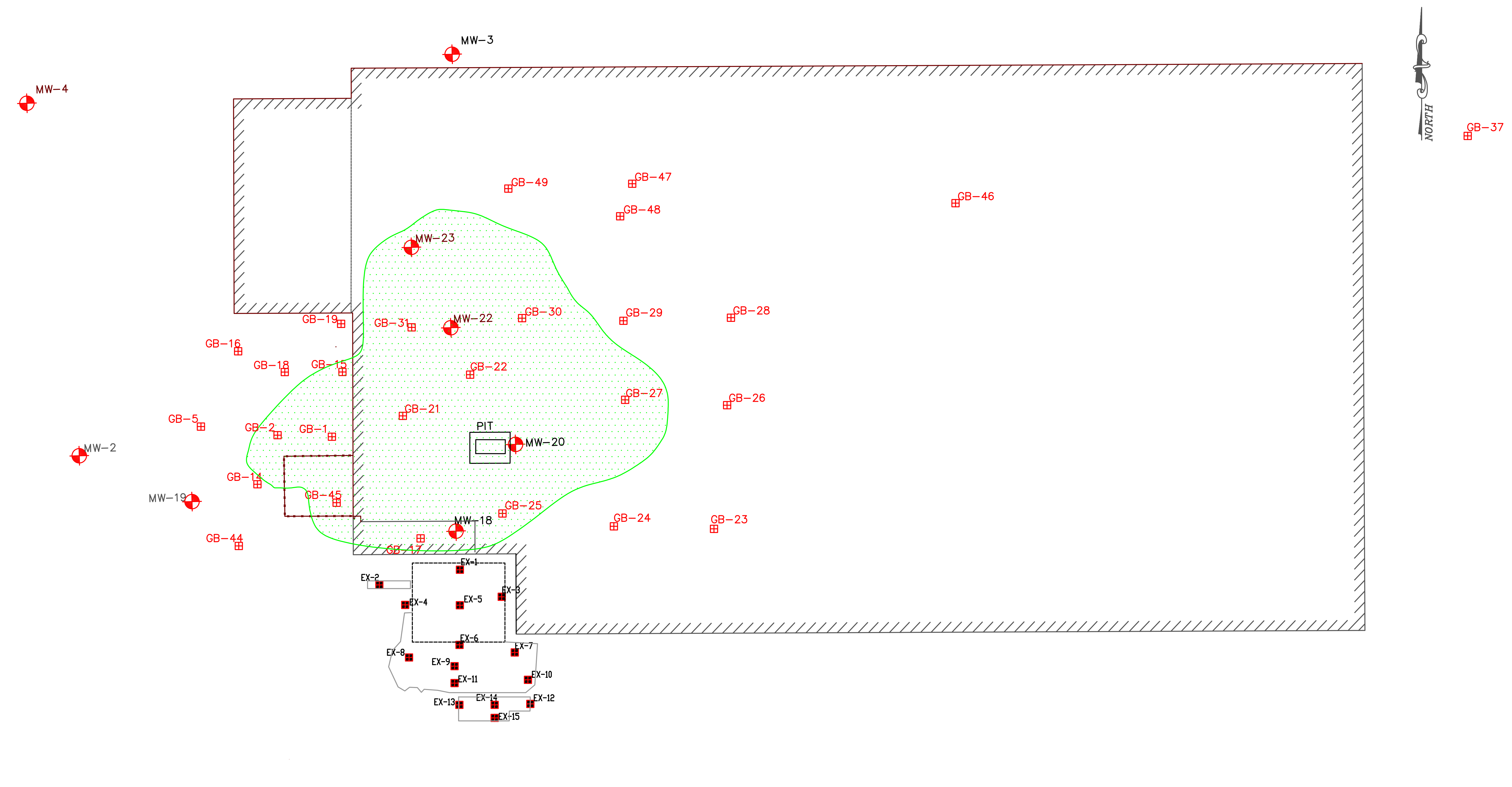
VMP-3 Well Location
Post IRM Soil Excavation Samples
GB-37 Soil Borings
Post IRM Soil Excavation
Steel Sheeting Cofferdam
TCE Concentrations above 470 ug/Kg (Unrestricted SCO)
TCE Concentrations above 200,000 ug/Kg (Restricted Commercial SCO)

TCE Concentrations in Soil
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1'=40'
DATE 4/07
FIGURE 3-4



LEGEND

VMP-3 Well Location

Post IRM Soil Excavation Samples

GB-37 Soil Borings

Steel Sheeting Cofferdam

Grossly Affected Soil

Estimated Extent of
Grossly Affected Soil
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

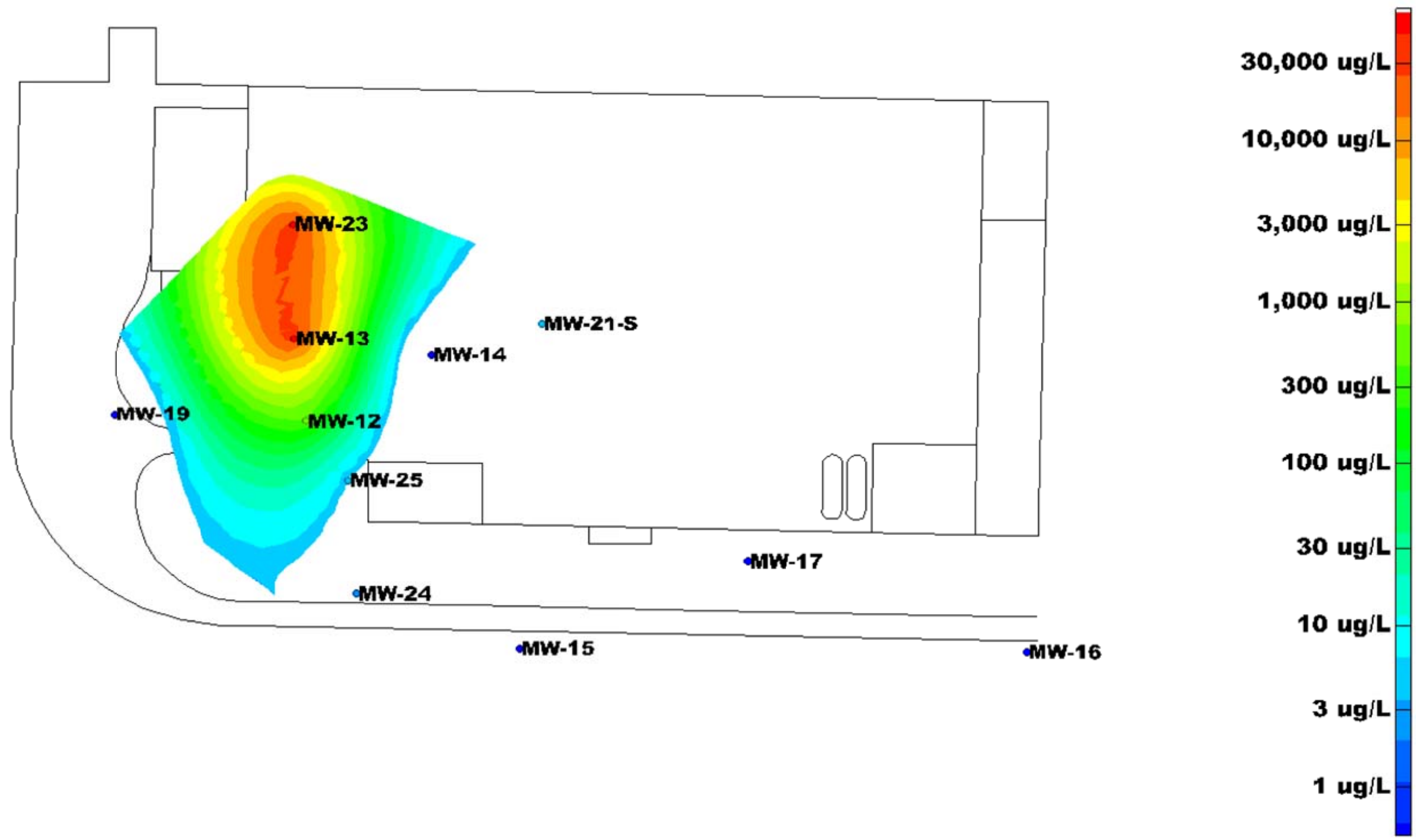
PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE 1"=40'

DATE 5/07

FIGURE 3-5



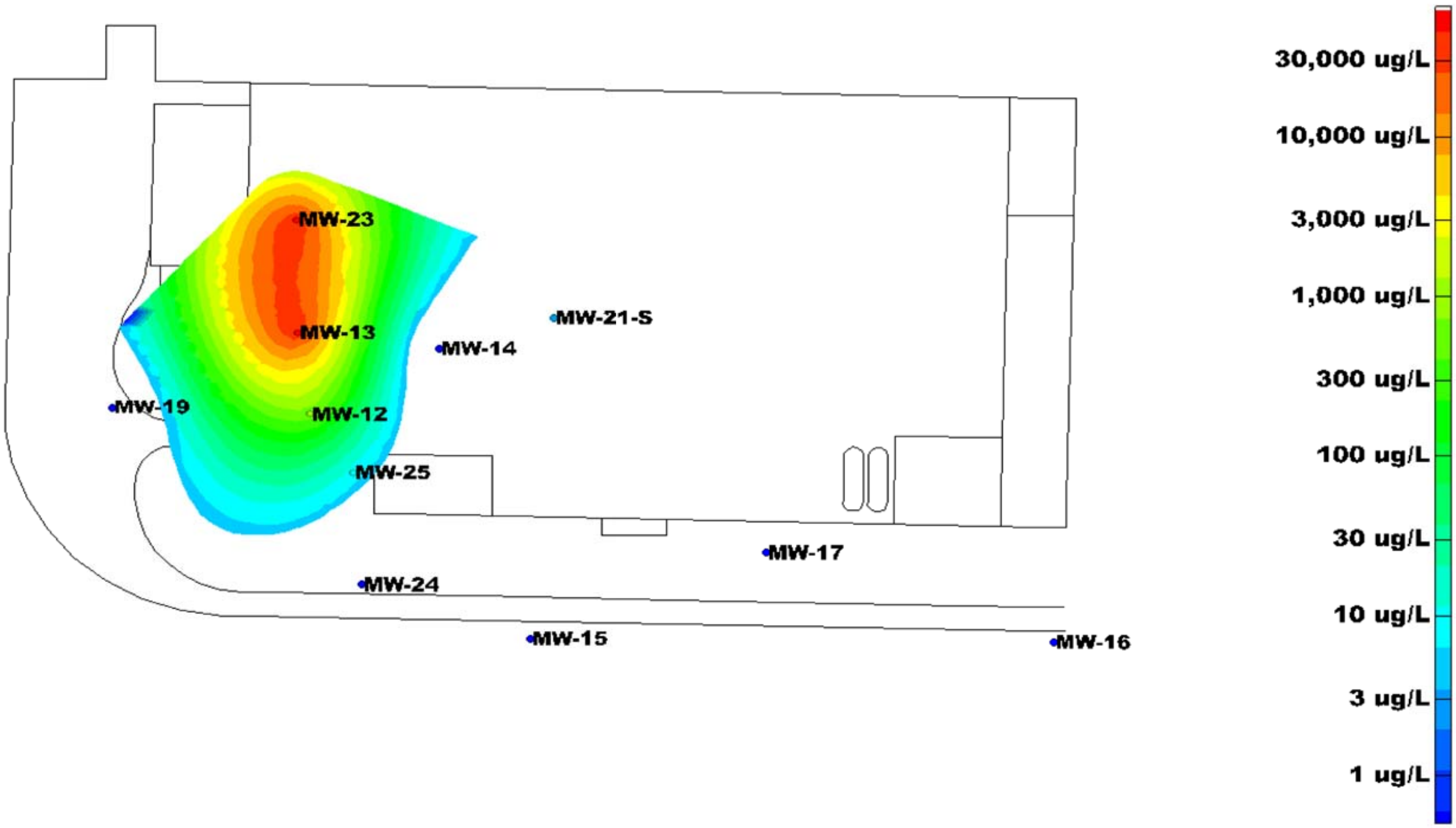
Note: A non-detect result was assumed for MW-15, MW-16, MW-17, and MW-19 as these wells were not sampled, and historical results indicate non-detection levels. Results from MW-13 were applied to MW-23 as this well was not sampled, and product has been observed.

Shallow Wells Ground Water Concentration
April 2006 111-TCA Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
XX	3-6
DATE 5/07	



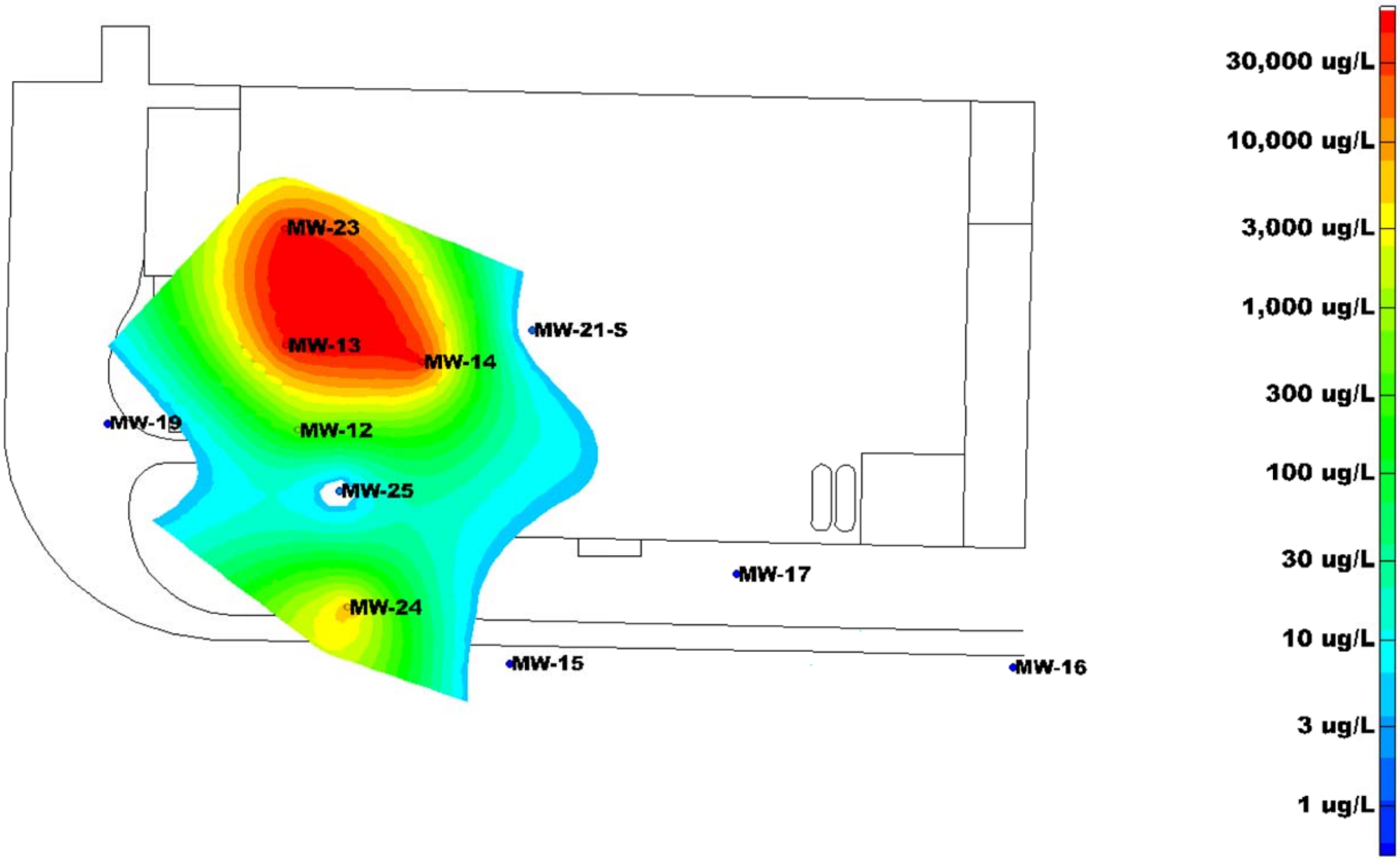
Note: A non-detect result was assumed for MW-15, MW-16, MW-17, and MW-19 as these wells were not sampled, and historical results indicate non-detection levels. Results from MW-13 were applied to MW-23 as this well was not sampled, and product has been observed.

Shallow Wells Ground Water Concentration
July 2006 111-TCA Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
xx	3-7
DATE 5/07	



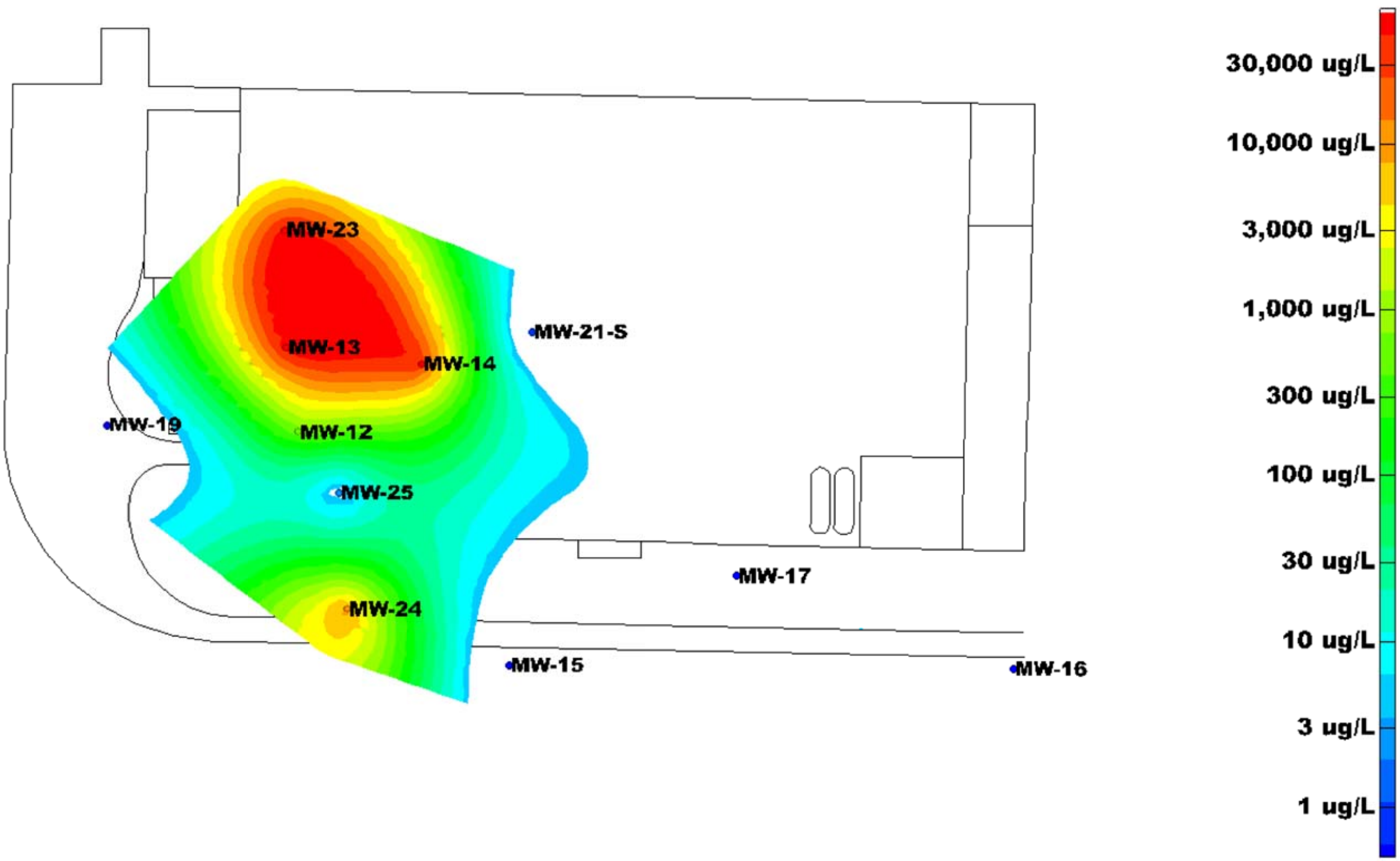
Note: A non-detect result was assumed for MW-15, MW-16, MW-17, and MW-19 as these wells were not sampled, and historical results indicate non-detection levels. Results from MW-13 were applied to MW-23 as this well was not sampled, and product has been observed.

Shallow Wells Ground Water Concentration
April 2006 TCE Concentrations > 5ppb
Greif Brothers Facility
Tonawanda, New York
NYSDEC VCP# V00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE: XX
DATE: 5/07
FIGURE: 3-8



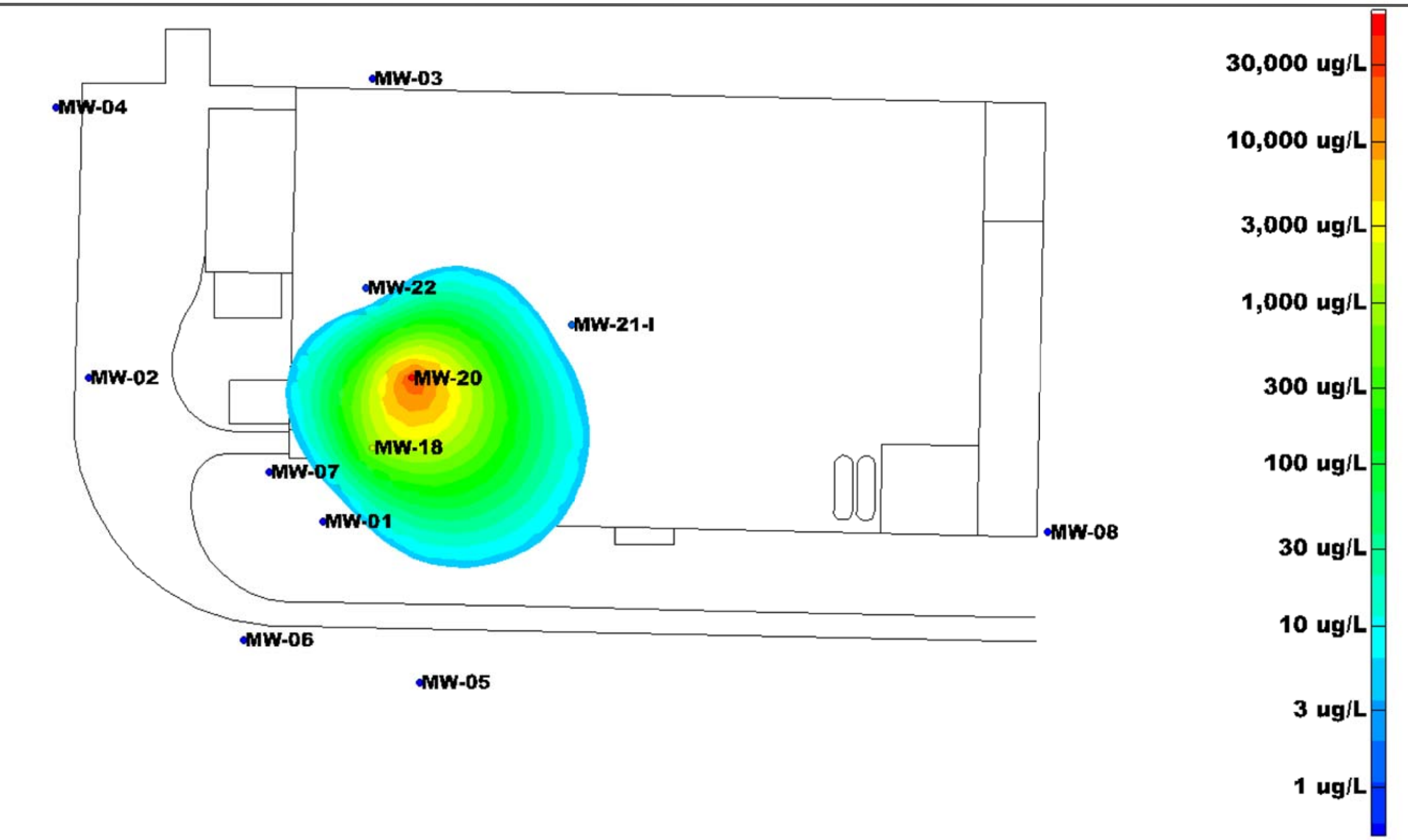
Note: A non-detect result was assumed for MW-15, MW-16, MW-17, and MW-19 as these wells were not sampled, and historical results indicate non-detection levels. Results from MW-13 were applied to MW-23 as this well was not sampled, and product has been observed.

Shallow Wells Ground Water Concentration
July 2006 TCE Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# 00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
XX	3-9
DATE	
5/07	



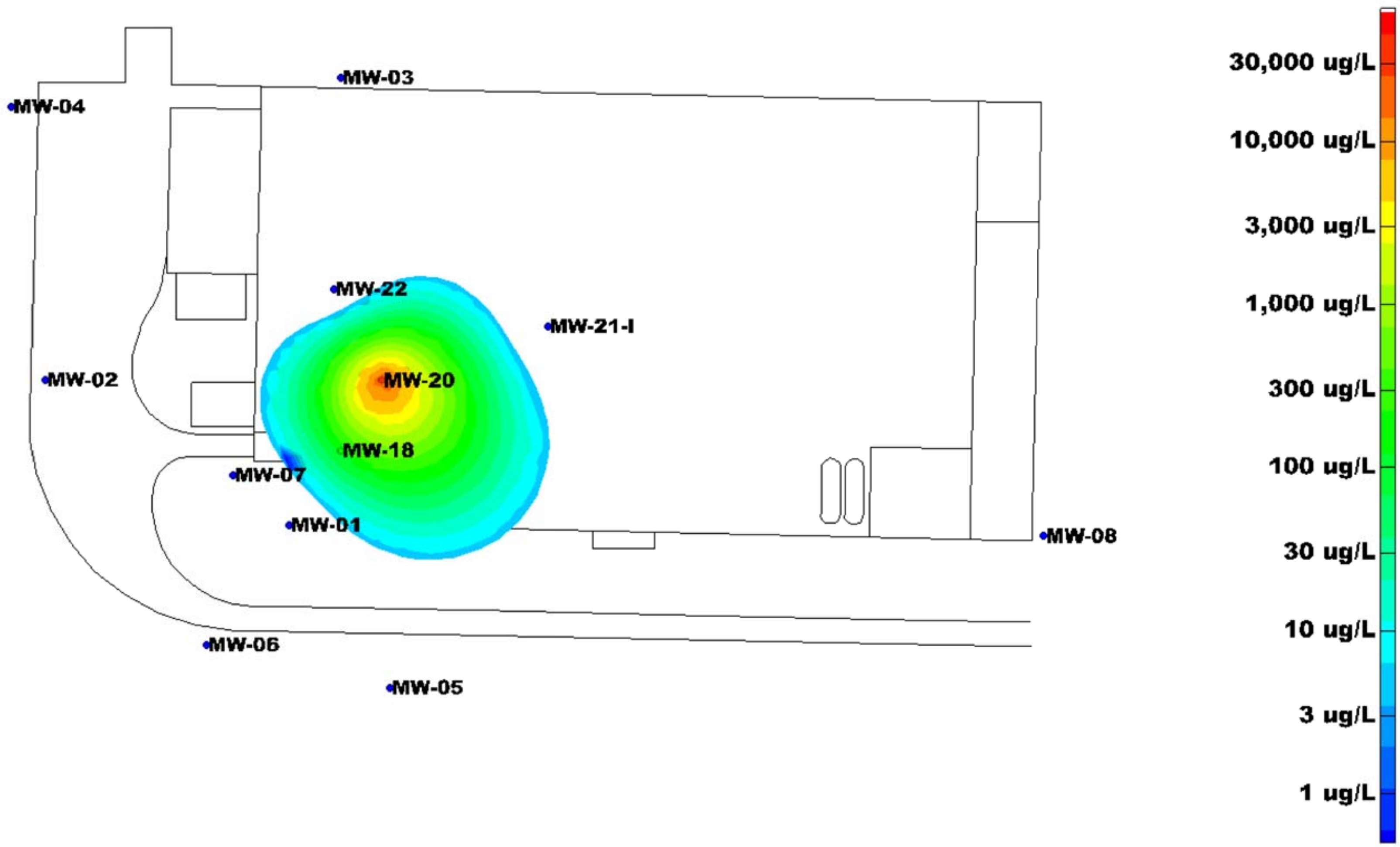
Note: A non-detect result was assumed for MW-01, MW-02, MW-03, MW-04, MW-05, MW-06, MW-07, MW-08 as these wells were not sampled, and historical results indicate non-detection levels. Results from Dec. 11, 2002 were applied to MW-20 as this well was not sampled.

Intermediate Wells Ground Water Concentration
April 2006 111-TCA Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# 00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
XX	3–10
DATE	
5/07	



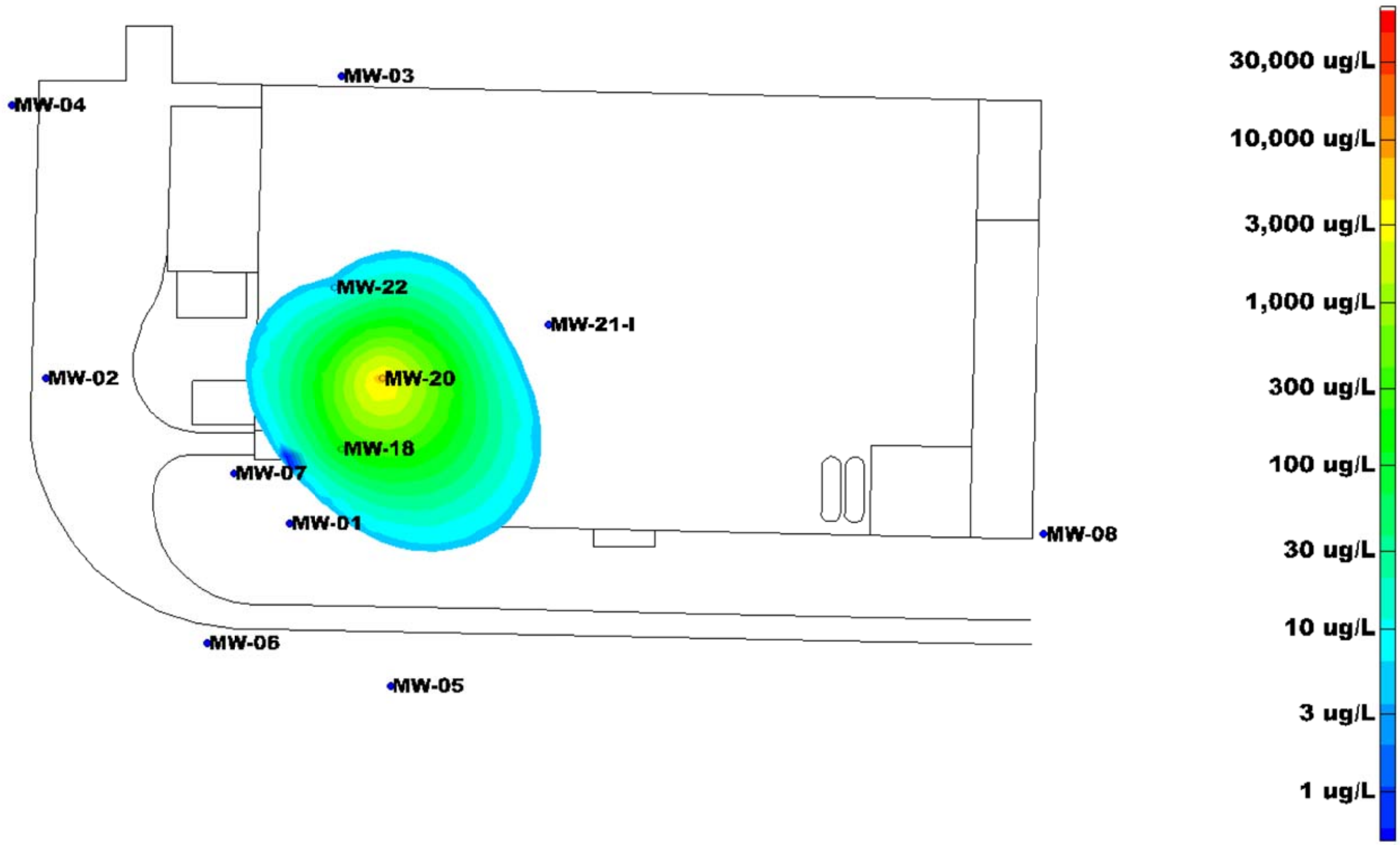
Note: A non-detect result was assumed for MW-01, MW-02, MW-03, MW-04, MW-05, MW-06, MW-07, MW-08 as these wells were not sampled, and historical results indicate non-detection levels. Results from Dec. 11, 2002 were applied to MW-20 as this well was not sampled.

Intermediate Wells Ground Water Concentration
July 2006 111-TCA Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# 00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
XX	3–11
DATE 5/07	



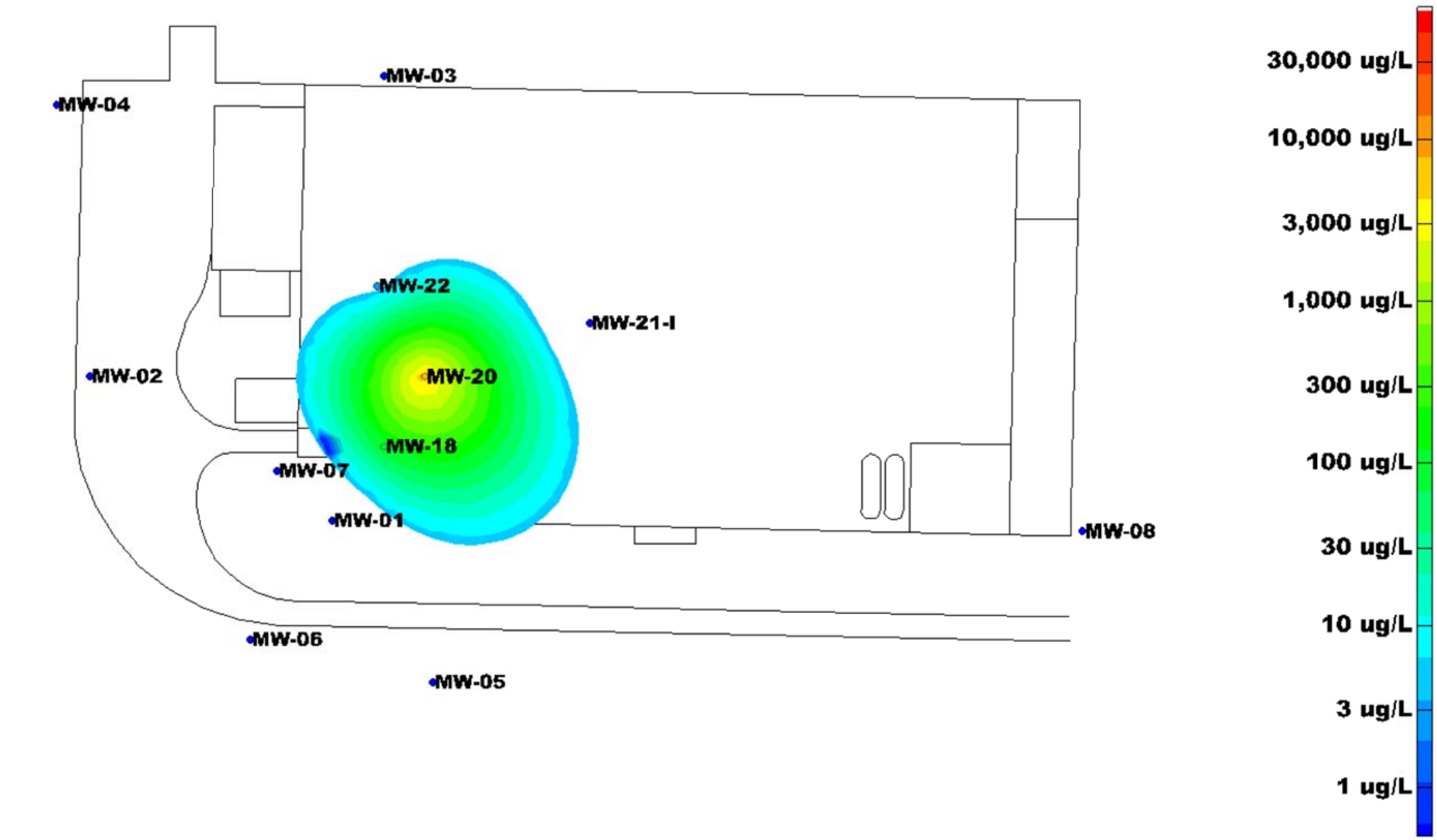
Note: A non-detect result was assumed for MW-01, MW-02, MW-03, MW-04, MW-05, MW-06, MW-07, MW-08 as these wells were not sampled, and historical results indicate non-detection levels. Results from Dec. 11, 2002 were applied to MW-20 as this well was not sampled.

Intermediate Wells Ground Water Concentration
April 2006 TCE Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# 00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE xx | FIGURE 3-12 | DATE 5/07



Note: A non-detect result was assumed for MW-01, MW-02, MW-03, MW-04, MW-05, MW-06, MW-07, MW-08 as these wells were not sampled, and historical results indicate non-detection levels. Results from Dec. 11, 2002 were applied to MW-20 as this well was not sampled.

Intermediate Wells Ground Water Concentration
July 2006 TCE Concentrations > 5ppb
Greif Facility
Tonawanda, New York
NYSDEC VCP# 00334-9

PREPARED FOR
Sonoco Products Company

ERM
5788 WIDEWATERS PARKWAY
DEWITT, NEW YORK 13214

SCALE	FIGURE
XX	3-13
DATE 5/07	

Tables

TABLE 1-1
SUMMARY OF DNAPL IRM RECOVERY RESULTS
LOW VACUUM ENHANCED DNAPL RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

	Volume Recovered (gallons)		RW-1 Thickness		RW-2 Thickness		RW-4 Thickness	
			(feet)		(feet)		(feet)	
Date	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**
Pilot Test	270.0	0.0	5.62	3.56	0.88	3.90	NI	NI
12-Sep-05	54.9	1.9	1.79	7.75	1.56	7.94	1.47	7.42
1-Nov-05	4.8	296.2	2.57	6.66	3.39	5.81	2.17	6.32
11-Nov-05	3.6	38.8	1.77	6.17	3.42	5.68	1.30	7.18
14-Nov-05	0.6	97.2	1.74	6.49	3.14	5.68	1.28	7.11
15-Nov-05	14.1	49.0	1.73	5.79	2.27	6.53	1.30	7.00
16-Nov-05	0.0	120.3	1.86	4.64	2.32	6.29	1.28	6.89
17-Nov-05	2.0	77.6	1.75	5.54	2.27	6.02	1.28	6.77
18-Nov-05	0.0	52.9	1.79	6.88	2.37	6.33	1.28	6.81
21-Nov-05	0.0	338.8	1.98	1.07	2.67	5.27	1.32	6.29
22-Nov-05	0.0	50.3	2.04	2.63	2.69	5.40	1.31	6.29
23-Nov-05	0.0	74.0	2.06	6.08	2.72	5.51	1.33	6.28
28-Nov-05	5.6	362.4	2.13	5.63	2.78	4.86	1.56	5.54
1-Dec-05	0.0	8.7	2.11	5.77	2.80	5.05	1.76	5.44
2-Dec-05	0.0	52.0	2.08	5.39	2.69	4.58	1.59	5.45
6-Dec-05	10.4	163.2	2.24	3.06	2.76	4.69	1.58	5.04
7-Dec-05	3.4	48.0	2.02	0.02	2.77	4.66	1.63	4.96
8-Dec-05	1.8	48.5	2.02	0.16	2.62	0.42	1.58	4.90
9-Dec-05	7.4	24.6	1.99	0.18	2.60	0.26	1.58	4.81
12-Dec-05	30.3	72.8	2.01	0.15	2.81	4.34	1.56	2.74
13-Dec-05	6.3	14.6	2.03	0.02	3.62	0.94	2.96	3.08
14-Dec-05	7.6	0.6	2.00	0.08	2.68	1.15	3.04	3.14
15-Dec-05	17.0	29.8	2.03	0.01	2.63	1.18	1.61	0.25
19-Dec-05	1.9	5.7	2.00	0.07	2.81	4.17	2.63	3.55
21-Dec-05	12.3	38.7	2.00	0.10	2.66	1.68	1.78	1.04
22-Dec-05	7.6	6.5	1.99	0.07	2.66	2.95	1.41	0.22
27-Dec-05	8.0	18.5	2.03	0.03	2.49	0.17	2.20	3.95
28-Dec-05	7.4	18.6	2.00	0.10	2.56	0.05	1.37	0.03
29-Dec-05	5.3	2.9	2.00	0.10	2.57	0.05	1.37	0.03
3-Jan-06	2.6	38.7	2.01	0.02	2.49	0.03	1.38	0.10
6-Jan-06	6.6	10.2	1.97	0.08	2.46	0.05	1.37	0.11
10-Jan-06	16.8	2.5	1.96	1.04	2.48	0.11	1.47	0.02
12-Jan-06	10.0	0.0	2.00	0.08	2.52	0.07	1.37	0.03
19-Jan-06	4.7	34.8	1.97	0.05	2.48	0.13	1.37	0.02
23-Jan-06	6.0	14.3	1.98	0.11	2.47	0.12	1.37	0.03
26-Jan-06	6.5	11.3	1.96	0.07	2.49	0.12	1.37	0.05
30-Jan-06	4.3	14.8	1.93	0.15	2.49	0.09	1.49	0.33
2-Feb-06	3.2	0.1	1.96	0.07	2.49	0.14	1.36	0.06
3-Feb-06	0.5	5.6	1.96	0.07	2.49	0.13	1.35	0.07
6-Feb-06	0.5	24.0	1.95	0.25	2.47	0.13	1.58	1.74

TABLE 1-1 (continued)
SUMMARY OF DNAPL IRM RECOVERY RESULTS
LOW VACUUM ENHANCED DNAPL RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

	Volume Recovered (gallons)		RW-1 Thickness (feet)		RW-2 Thickness (feet)		RW-4 Thickness (feet)	
Date	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**
9-Feb-06	3.5	18.9	1.94	0.07	2.47	0.12	1.34	0.06
13-Feb-06	7.2	9.8	1.95	0.08	2.53	0.08	1.36	0.04
16-Feb-06	3.9	8.6	1.96	0.07	2.50	0.42	1.35	0.07
20-Feb-06	4.0	12.8	1.92	0.11	2.49	1.62	1.34	0.14
27-Feb-06	5.3	13.2	1.93	0.10	2.51	4.41	1.35	0.05
3-Mar-06	2.6	32.0	1.93	0.17	2.42	0.16	1.35	0.03
7-Mar-06	2.6	21.6	1.94	0.09	2.42	0.08	1.35	0.10
10-Mar-06	0.0	5.8	1.94	0.01	2.43	0.05	1.36	0.11
13-Mar-06	1.4	12.2	1.93	0.17	2.38	0.18	1.35	0.04
16-Mar-06	0.7	12.3	1.94	0.08	2.39	0.19	1.35	0.05
20-Mar-06	2.4	11.7	1.48	0.06	2.02	0.20	1.05	2.33
23-Mar-06	4.0	16.2	1.46	0.14	1.99	0.17	0.82	0.03
30-Mar-06	4.9	15.7	1.46	0.07	1.96	0.23	0.80	0.07
3-Apr-06	3.5	31.3	1.46	0.12	1.96	0.18	0.80	0.04
7-Apr-06	4.8	15.5	1.46	0.07	1.96	0.20	0.81	0.04
11-Apr-06	4.0	6.9	1.46	0.13	1.96	0.20	0.80	0.04
13-Apr-06	2.2	7.9	1.47	0.12	1.96	0.18	0.80	0.02
17-Apr-06	1.1	21.4	1.45	0.08	1.96	0.23	0.80	0.08
21-Apr-06	3.2	13.7	1.44	0.14	1.96	0.16	0.80	0.02
28-Apr-06	4.3	21.9	1.46	0.07	2.01	0.07	0.80	0.10
9-May-06	10.2	32.8	1.46	0.04	1.99	0.19	0.80	0.05
11-May-06	2.4	9.4	1.46	0.13	2.04	0.12	0.80	0.05
16-May-06	3.7	13.1	1.44	0.10	2.00	0.20	0.80	0.08
19-May-06	2.6	11.2	1.46	0.07	2.01	0.19	0.80	0.08
23-May-06	2.6	13.1	1.45	0.13	1.97	0.15	0.80	0.05
25-May-06	4.0	4.4	NM	NM	NM	NM	NM	NM
1-Jun-06	0.5	19.5	1.46	0.09	2.04	0.04	0.80	0.03
6-Jun-06	1.4	1.8	1.46	0.08	2.06	0.10	0.79	0.03
8-Jun-06	1.0	16.8	1.46	0.09	2.05	0.10	0.78	0.07
12-Jun-06	1.0	13.0	1.45	0.10	2.00	0.19	0.80	0.05
15-Jun-06	0.6	12.6	1.43	0.10	2.10	0.08	0.79	0.05
19-Jun-06	0.6	12.4	1.43	0.15	2.06	0.12	0.80	0.02
23-Jun-06	0.6	11.0	1.46	0.07	0.96	0.12	0.80	0.04
26-Jun-06	3.9	5.4	0.10	0.03	1.96	1.60	0.31	1.23
30-Jun-06	5.9	16.0	0.00	0.08	0.36	2.30	0.00	0.00
3-Jul-06	2.9	9.6	0.06	0.10	0.24	1.74	0.28	1.38
17-Jul-06	1.0	8.5	0.06	2.18	0.30	6.64	0.55	5.55
25-Jul-06	1.0	18.6	0.06	1.68	0.34	6.64	0.58	5.52
27-Jul-06	1.0	28.8	0.00	0.08	0.36	6.62	0.58	0.00
31-Jul-06	1.0	40.4	0.00	0.08	0.23	3.63	0.65	2.63
3-Aug-06	1.0	20.2	NM	NM	NM	NM	NM	NM
7-Aug-06	1.0	19.1	0.00	0.10	0.23	0.52	0.00	0.20
11-Aug-06	1.1	12.4	0.00	0.16	0.24	1.50	0.00	0.09
14-Aug-06	0.0	5.0	0.00	0.30	0.25	3.72	0.00	0.12
25-Aug-06	3.2	32.2	NM	NM	NM	NM	NM	NM

TABLE 1-1 (continued)
SUMMARY OF DNAPL IRM RECOVERY RESULTS
LOW VACUUM ENHANCED DNAPL RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

	Volume Recovered (gallons)		RW-1 Thickness (feet)		RW-2 Thickness (feet)		RW-4 Thickness (feet)	
Date	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**	**DNAPL**	**Water**
6-Sep-06	2.4	71.4	0.00	4.29	0.31	0.37	0.03	0.15
15-Sep-06	1.4	29.1	0.00	5.50	0.35	0.30	0.00	0.31
22-Sep-06	1.2	12.9	0.00	6.32	0.34	0.31	0.00	0.26
28-Sep-06	1.2	38.8	0.00	0.07	0.35	0.35	0.00	2.01
4-Oct-06	0.0	21.6	0.06	0.01	0.32	0.31	0.28	3.90
10-Oct-06	0.0	24.6	0.05	0.04	0.34	0.16	0.00	0.19
17-Oct-06	0.6	26.3	0.07	0.09	0.35	0.22	0.00	0.08
24-Oct-06	0.6	25.6	0.00	0.14	0.38	0.22	0.00	1.98
2-Nov-06	1.7	28.5	0.00	0.78	0.37	2.49	0.00	1.45
7-Nov-06	0.6	18.9	0.08	0.89	0.10	3.80	0.00	0.19
17-Nov-06	0.4	38.9	0.08	2.38	0.00	0.25	0.00	0.10
20-Nov-06	0.7	18.9	NM	NM	NM	NM	NM	NM
28-Nov-06	0.6	26.0	0.00	0.08	0.00	0.88	0.00	0.18
15–Dec-06	0.4	25.9	NM	NM	NM	NM	NM	NM
27-Dec-06	0.4	12.5	0.00	2.59	0.00	6.98	0.00	6.11
9-Jan-07	1.9	111.8	0.00	0.40	0.00	0.14	0.00	0.14
19-Jan-07	6.0	45.9	0.07	0.00	0.00	0.32	0.00	0.09
23-Jan-07	0.6	2.5	0.07	0.03	0.00	0.10	0.09	0.05
31-Jan-07	1.0	30.7	0.00	0.10	0.00	4.04	0.00	0.87
6-Feb-07	0.0	12.5	NM	NM	NM	NM	NM	NM
16-Feb-07	3.8	42.8	0.00	0.08	0.00	4.66	0.00	0.28
23-Feb-07	0.6	7.6	0.00	1.72	0.00	4.33	0.00	0.94
1-Mar-07	1.5	37.7	0.00	0.19	0.00	1.87	0.00	0.54
8-Mar-07	2.9	62.1	NM	NM	NM	NM	NM	NM
16-Mar-07	2.4	40.6	NM	NM	NM	NM	NM	NM
28-Mar-07	1.0	27.7	0.00	0.10	0.00	0.58	0.00	0.48
29-Mar-07	0.0	29.6	NM	NM	NM	NM	NM	NM
30-Mar-07	0.6	18.0	NM	NM	NM	NM	NM	NM
2-Apr-07	0.0	0.0	NM	NM	NM	NM	NM	NM
3-Apr-07	2.2	35.9	NM	NM	NM	NM	NM	NM
4-Apr-07	0.2	11.3	NM	NM	NM	NM	NM	NM
5-Apr-07	0.0	8.4	NM	NM	NM	NM	NM	NM
9-Apr-07	1.2	27.6	NM	NM	NM	NM	NM	NM
11-Apr-07	0.6	10.1	NM	NM	NM	NM	NM	NM
17-Apr-07	1.5	24.5	NM	NM	NM	NM	NM	NM
18-Apr-07	0.0	16.8	0.00	0.09	0.00	0.15	0.00	0.00
TOTALS	**709.9**	**3989.6**						

TABLE 1-2
SUMMARY OF SYSTEM OPERATING PARAMETERS
LOW VACUUM ENHANCED DNAPL AND GROUND WATER RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

ELAPSED	Influent								Pre-Carbon				Mid- Carbon			Effluent		
TIME	Flow	Temp	RH	VOCs	Vac No. 1	Vac No. 1	Vac No. 2	Vac No. 2	Flow	Temp	RH	VOCs	Flow	Temp	VOCs	Flow	Temp	VOCs
(MINUTES)	(CFM)	(°F)	(%)	(ppm)	(in. Hg)	(in. H2O)	(in. Hg)	(in. H2O)	(PSI)	(°F)	(%)	(ppm)	(PSI)	(°F)	(ppm)	(PSI)	(°F)	(ppm)
4	250	52	NM	1952	0.93	12.64	0.94	12.78	0.00	44.0	NM	327.0	NM	42.0	5.7	0.00	40.0	4.3
15	190	51	48.7	2291	1.09	14.82	1.13	15.36	0.26	48.0	11.2	535.0	0.40	48.0	214.0	NM	NM	25.9
30	110	52	41.9	2319	0.57	7.75	0.51	6.93	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
60	150	59	34.7	2509	1.10	14.95	1.81	24.61	0.18	51.0	0.3	8.5	NM	NM	NM	NM	NM	NM
120	80	61	65.6	2679	0.20	2.72	0.41	5.57	0.00	54.0	0.9	3.7	0.38	52.0	2.7	0.00	44.0	2.3
150	80	61	24.5	3139	0.24	3.26	0.39	5.30	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
180	80	60	25.4	2979	0.23	3.13	0.82	11.15	0.00	54.0	0.5	3.9	0.40	42.0	3.0	0.00	43.0	3.1
240	80	62	27.1	1672	0.88	11.96	1.96	26.65	0.00	55.0	0.1	5.4	NM	NM	NM	0.00	44.0	4.6
300	NM	61	9.8	1798	0.79	10.74	1.16	15.77	0.00	57.0	0.2	0.0	0.39	61.0	2.3	0.00	53.0	2.6
360	80	62	83.8	1154	0.26	3.53	1.19	16.18	0.00	56.0	0.3	0.0	0.00	61.0	0.9	0.00	56.0	0.6
440	80	62	23.7	1052	0.88	11.96	1.75	23.79	0.00	58.0	0.1	0.0	NM	NM	NM	NM	NM	NM
945	80	62	35.9	1929	0.63	8.56	0.69	9.38	0.16	NM	4.4	8.1	0.56	55.0	0.4	0.00	52.0	3.5
10005	140	58	63.1	1512	1.29	17.54	0.99	13.46	0.18	55.0	3.5	2.6	NM	NM	NM	NM	NM	NM
1095	140	58	43.1	1592	1.21	16.45	0.63	8.56	0.22	49.0	2.4	1.2	0.51	49.0	0.0	0.00	44.0	0.0
1160	120	58	59.7	NM	0.68	9.24	0.76	10.33	0.19	49.0	0.9	0.7	0.49	49.0	0.3	0.00	44.0	0.1
1280	140	61	NM	1268	0.60	8.16	0.70	9.52	0.28	49	1.1	0.0	0.49	49.0	1.7	0.00	44.0	0.7
1340	140	60	23.0	1268	1.28	17.40	1.37	18.63	0.21	49	0.3	0.0	0.51	49.0	0.0	0.00	43.0	0.0
1380	140	61	63.7	1049	1.25	16.99	1.37	18.63	0.22	51	5.9	0.0	0.41	51.0	0.3	0.00	49.0	0.0
2415	150	55	48.5	1142	0.69	9.38	0.68	9.24	0.00	59	7.2	0.9	0.43	58	NM	0.00	53	1.2
2510	140	61	25.5	982	1.29	17.54	0.96	13.05	0.16	46	5.9	2.9	0.40	53	0.0	0.00	53	0.0
2570	140	61	47.3	1041	1.32	17.95	0.95	12.92	0.00	43	6.8	0.4	0.36	52	0.0	0.00	49	0.0
2665	140	61	41.6	1359	1.38	18.76	0.60	8.16	0.00	42	4.3	0.2	0.31	51	0.0	0.00	49	0.0
2795	130	59	51.2	1089	0.60	8.16	0.77	10.47	0.00	42	0.7	0.2	0.34	52	0.0	0.00	53	0.0
2955	120	61	51.7	1706	0.68	9.24	0.84	11.42	0.00	42	1.0	0.0	0.34	51	0.0	0.00	45	0.0
3986	140	56	32.1	1058	1.12	15.23	0.76	10.33	0.00	42	0.3	0.0	0.34	48	0.0	0.00	42	0.0
6590	140	61	37.1	498	0.68	9.24	1.12	15.23	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6715	140	61	49.7	347	0.36	4.89	0.58	7.89	0.22	52	0.9	2.2	0.00	59	0.2	0.00	54	0.0
6755	140	61	60.8	363	0.38	5.17	0.40	5.44	0.00	52	0	0.4	0.18	61	0.2	0.00	56	0
6805	140	59	63.7	378	0.51	6.93	0.48	6.53	0.00	52	0.4	0.6	0.00	59	0.4	0.00	56	0.8
6865	140	60	62.6	425	0.49	6.66	0.44	5.98	0.00	48	0	0.4	0.00	50	0.1	0.00	50	0.2
6925	140	59	62.3	398	1.15	15.63	0.78	10.60	0.00	42	0	0.3	0.00	48	0.0	0.00	45	0
6985	120	61	61.9	470	0.36	4.89	0.58	7.89	0.16	43	0	0.2	0.00	47	0.3	0.00	44	0.1
7045	75	60	61.2	351	0.32	4.35	0.38	5.17	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
7105	140	59	59.1	401	0.48	6.53	0.56	7.61	0.00	42	0.8	0.4	0.27	48	0.3	0.00	44	0.4
7165	140	60	57.3	448	1.18	16.04	0.96	13.05	0.18	40	0	0	0.00	50	0.0	0.00	44	0.2
7405	120	62	51.4	803	0.67	9.11	0.58	7.89	0.00	52	0.3	0.3	0.00	52	0.4	0.00	49	0.4
7445	140	61	64.6	610	1.25	16.99	0.61	8.29	0.18	48	0.6	0.6	0.16	49	0.4	0.00	46	0.4

<u>NOTES:</u>

Elapsed time = time elapsed from the start of the test, or 0.
Influent- combined vapor stream prior to compressors
Vac No.1- vacuum on 4 inch diameter pipe manifolded to RW-1 and RW-2
Vac No.2- vacuum on 4 inch diameter pipe manifolded to RW-4 and RW-5
Pre-carbon- process air sample port after vapor condensation, before GAC units;
Mid-Cardon- process air between the two 350 lbs GAC units
Effluent- process air post carbon polish.
NM = Not measured.

TABLE 1-3
SUMMARY OF VACUUM MEASUREMENTS
LOW VACUUM ENHANCED DNAPL AND GROUND WATER RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

ELAPSED TIME (MINUTES)	MAGNEHELIC READINGS (inches H2O)																					
	RW-1	RW-2	RW-4	RW-5	VMP-1	VMP-2	VMP-3	VMP-4	VMP-5	VMP-6	MW-12	MW-13	MW-14	MW-18	MW-21S	MW-21I	MW-22	MW-23	MW-19	MW-24	MW-25	MW-3
22	10.33	8.43	15.50	14.95	0.10	2.40	NM	0.46	0.24	0.06	0.00	0.00	0.00	NM	NM	NM	NM	NM	NM	NM	NM	NM
103	8.16	NM	16.45	12.37	0.12	3.60	NM	0.26	0.60	0.03	0.01	0.00	0.01	NM	NM	NM	NM	NM	NM	NM	NM	NM
180	5.17	2.72	8.56	8.97	0.02	1.90	NM	0.10	0.08	0.02	0.01	0.00	0.00	NM	NM	NM	NM	NM	NM	NM	NM	NM
280	3.53	10.74	23.66	3.94	0.04	2.00	NM	0.30	0.30	0.05	0.03	0.25	0.00	NM	NM	NM	NM	NM	NM	NM	NM	NM
335	4.08	4.89	9.24	8.43	0.05	1.90	NM	0.23	0.20	0.02	0.03	0.15	0.00	NM	NM	NM	NM	NM	NM	NM	NM	NM
385	3.53	7.61	2.72	8.84	0.10	1.80	NM	0.35	0.28	0.05	0.02	0.35	0.01	NM	NM	NM	NM	NM	NM	NM	NM	NM
1010	13.05	8.56	19.03	17.13	NM	3.20	NM	NM	0.20	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
1045	NM	NM	NM	NM	0.14	NM	NM	0.30	NM	0.00	0.06	0.15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
1120	4.49	7.21	18.22	8.70	0.10	3.20	NM	0.48	0.50	0.00	0.04	0.25	0.02	NM	NM	NM	NM	NM	NM	NM	NM	NM
1250	6.80	18.22	8.16	7.89	0.20	3.40	NM	0.50	0.20	0.68 P	NM	0.05	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
1475	5.44	9.24	18.49	6.93	0.14	3.20	NM	0.26	0.40	0.03	0.06	0.05	0.02	NM	NM	NM	NM	NM	NM	NM	NM	NM
2505	3.53	8.84	18.76	12.64	0.245	3.10	NM	0.41	2.30	0.015	0.105	0.145	0.125	NM	NM	NM	NM	NM	NM	NM	NM	NM
2610	NM	NM	NM	NM	NM	NM	0.045	NM	NM	NM	NM	NM	NM	0.000	NM	NM	NM	0.105	NM	NM	NM	NM
2765	4.21	18.22	18.76	8.02	0.240	3.10	NM	0.30	2.10	0.195 p	0.095	0.175	0.135	NM	0.030	0.005	0.000	0.095	NM	NM	NM	NM
2975	6.93	9.11	8.84	7.89	0.110	1.50	0.055	0.34	0.60	0.300 p	0.100	0.095	0.035	NM	0.040	0.000	0.000	0.025	NM	NM	NM	NM
6453	5.98	8.43	14.27	14.68	0.185	2.80	0.025 p	0.46	0.48	0.012	0.035	0.020	0.080	0.045	0.035	0.005	0.055	0.075	0.000	NM	NM	NM
6705	4.89	8.56	9.11	14.68	0.235	3.10	NM	0.57	0.51	0.025 p	0.060	0.045	0.045	NM	NM	NM	NM	NM	NM	NM	NM	NM
6828	5.44	17.67	9.24	14.68	0.250	3.10	0.020	0.29	0.53	0.215	0.105	0.035	0.085	0.035	0.055	0.015	0.105	0.115	0.205 p	0.000	0.000	NM
7191	6.93	17.40	7.89	14.55	0.175	1.60	0.095	0.29	0.53	0.135	0.025	0.035	0.040	0.000	0.030	0.015	0.032	0.050	0.000	NM	NM	0.015
Average	**6.030**	**10.366**	**13.347**	**10.900**	**0.144**	**2.641**	**0.054**	**0.347**	**0.591**	**0.049**	**0.048**	**0.106**	**0.040**	**0.020**	**0.038**	**0.008**	**0.038**	**0.078**	**0.000**	**0.000**	**0.000**	**0.015**
Median	**5.438**	**8.701**	**14.275**	**8.973**	**0.135**	**3.100**	**0.050**	**0.300**	**0.480**	**0.025**	**0.037**	**0.050**	**0.020**	**0.018**	**0.035**	**0.005**	**0.032**	**0.085**	**0.000**	**0.000**	**0.000**	**0.015**
Maxium	**13.051**	**18.217**	**23.655**	**17.130**	**0.250**	**3.600**	**0.095**	**0.570**	**2.300**	**0.215**	**0.105**	**0.350**	**0.135**	**0.045**	**0.055**	**0.015**	**0.105**	**0.115**	**0.000**	**0.000**	**0.000**	**0.015**
Minium	**3.535**	**2.719**	**2.719**	**3.943**	**0.020**	**1.500**	**0.020**	**0.100**	**0.080**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.030**	**0.000**	**0.000**	**0.025**	**0.000**	**0.000**	**0.000**	**0.015**

NOTES:
Elapsed time = time elapsed from the start of the test, or 0.
NM- not measured
p- indicates there was a pressure in the well

TABLE 1-4
SUMMARY OF ANALYTICAL DATA - VAPOR
LOW VACUUM ENHANCED DNAPL AND GROUND WATER RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Sample Designation	**Inf (Day 1 18:05)**	**Inf (Day 1 00:25)**	**Inf (Day 2 17:05)**	**Inf (Day 3 18:40)**	**Inf (Day 6 18:05)**	**PRE C (DAY 1 00:15)**	**PRE C (DAY 6 17:55)**	**EFF (DAY 1 00:00)**	**EFF (DAY 6 17:45)**
Date Sampled	**3/28/2007 18:05**	**3/29/2007 0:25**	**3/29/2007 17:05**	**3/30/2007 18:40**	**4/2/2007 18:05**	**3/29/2007 0:15**	**4/2/2007 17:55**	**3/29/2007 0:00**	**4/2/2007 17:45**
VOCs (µg/M3)									
Acetone	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	0.7	1.2
Chloroethane	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	4,500,000	610,000	300,000	69,000	20,000	5.7	---	89	1.5
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	10,000,000	1,300,000	1,200,000	120,000	52,000	23	14	250	2.5
cis-1,2-Dichloroethene	---	---	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	3.7
Methylene chloride	---	---	---	---	---	---	4.5	---	5.9
4-Methyl-2-pentanone	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	26,000	50	2.1	---	2.8
Tetrachloroethene	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	38,000	57,000	---	2.1	64	3.1
1,1,1-Trichloroethane	460,000,000	82,000,000	32,000,000	6,000,000	2,500,000	650	14	12,000	250
1,1,2-Trichloroethane	---	---	---	---	---	---	---	---	---
Trichloroethene	70,000,000	33,000,000	11,000,000	2,800,000	860,000	280	17	5,900	280
1,2,4-Trimethylbenzene	---	---	---	---	---	---	---	---	1.5
Vinyl chloride	---	---	---	---	---	---	---	---	---
Xylene (total)	---	---	---	---	---	---	3.6	---	30
TOTAL VOCs	544,500,000	116,910,000	44,500,000	9,027,000	3,515,000	1,009	57.3	18,304	582
Field Screened (ppm)	2,509	1,052	1,049	1,706	418	2.6	0.0	2.2	0.0

NOTES:
- all analyte concentrations are reported in micrograms per cubic meter unless otherwise noted
-----: the compound was not detected at a concentration above the laboratory practical quantitation limit.
J = indicates an estimated value.
Hightlighted cells represent concentrations greater than the applicable standard or guidance value
Inf: Influent sample port
Eff: Effluent sample port
Pre C: Pre-carbon polish
NA- Not applicable

TABLE 1-5
SUMMARY OF ANALYTICAL DATA - AQUEOUS CONDENSATE
LOW VACUUM ENHANCED DNAPL AND GROUND WATER RECOVERY
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Sample Designation	**Aqueous**
Date Sampled	**4/2/2007 16:45**
VOCs (µg/L)	
Acetone	60,000
Benzene	---
2-Butanone	9,000
Chloroethane	---
Chloroform	400 J
1,1-Dichloroethane	26,000
1,2-Dichloroethane	2,200
1,1-Dichloroethene	14,000
cis-1,2-Dichloroethene	7,600
trans-1,2-Dichloroethene	---
Ethylbenzene	860
Methylene chloride	340 J
4-Methyl-2-pentanone	---
Methyl Ethyl Ketone	---
Tetrachloroethene	---
Toluene	420 J
1,1,1-Trichloroethane	690,000
1,1,2-Trichloroethane	---
Trichloroethene	540,000
1,2,4-Trimethylbenzene	---
Vinyl chloride	---
Xylene (total)	---
TOTAL VOCs	1,349,660

NOTES:
- all analyte concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted
----- = the compound was not detected at a concentration above the laboratory practical quantitation limit.
J = indicates an estimated value.
Hightlighted cells represent concentrations greater than the applicable standard or guidance value
NA- Not applicable

TABLE 3-1
PRE- AND POST-EXCAVATION IRM SOIL CONCENTRATIONS
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

COMPOUND OF POTENTIAL CONCERN (COPC)	PRE-IRM CONCENTRATIONS	POST-IRM CONCENTRATIONS	SITE-SPECIFIC UNRESTRICTED RSCOs
	(mg/kg or ppb)	(mg/kg or ppb)	(mg/kg or ppb)
VOCs			
Acetone	ND-160	ND-100	74
2-Butanone	ND-630	ND-18 J	152
1,1-DCA	ND-760	ND-200 D	101
1,2-DCA	ND-6	ND-14	47
1,1-DCE	ND-260	ND-86	219
1,2-DCE (total)	ND-48000	ND-4513	199 (1)
Ethylbenzene	ND-46000	ND-220	3713
PCE	ND-14	ND-73	935
Toluene	ND-380000	ND-90	1103
1,1,1-TCA	ND-17000	ND-45	513
TCE	ND-4000000	ND-14000	425
1,2,4-TMB	ND-29000	ND-44	8741
Xylenes	ND-280000	ND-1300	810
SVOCs			
Benzo(a)anthracene	ND-790	ND-220 J	224
Benzo(a)pyrene	ND-1100 J	ND-400 J	61
Benzo(b)fluoranthene	57 J-1300 J	ND-580 J	743
Benzo(k)fluoranthene	ND-400	ND-630 J	743
Chrysene	27 J-780	ND-200 J	270
Fluoranthene	ND-2100	ND-250 J	50000
Naphthalene	75 J-800 J	ND	8775

Notes:
(1) Trans only

TABLE 3-2
SOIL AND GROUND WATER CHEMICALS OF POTENTIAL CONCERN
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

	Soil	Ground Water
Volatiles	Acetone	Acetone
	2-Butanone	Benzene
	1,1-Dichloroethane	2-Butanone (MEK)
	1,2-Dichloroethane	Chloroethane
	1,1-Dichloroethene	Chloroform
	1,2-Dichloroethene	cis-1,2-Dichloroethene
	Ethylbenzene	1,1-Dichloroethane
	Tetrachloroethene	1,2-Dichloroethane
	Toluene	1,1-Dichloroethene
	1,1,1-Trichloroethane	1,2-Dichloroethene (Total)
	Trichloroethene	Ethylbenzene
	1,2,4-Trimethylbenzene	Methylene Chloride
	Xylene (total)	4-Methyl-2-pentanone
		Tetrachloroethene
		Toluene
		trans-1,2-Dichloroethene
		1,1,1-Trichloroethane
		1,1,2-Trichloroethane
		Trichloroethene
		1,2,4-Trimethylbenzene
		Vinyl chloride
		Xylene (total)
Semivolatiles	Benzo(a)anthracene	None
	Benzo(a)pyrene	
	Benzo(b)fluoranthene	
	Benzo(k)fluoranthene	
	Chrysene	
	Fluoranthene	
	Naphthalene	

TABLE 3-3
POTENTIAL NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)
GREIF FACILITY- TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

CITATION	*DESCRIPTION*	*TYPE*	*POTENTIAL APPLICABILITY TO DEVELOPING REMEDIAL ACTION OBJECTIVES*	*POTENTIAL APPLICABILITY TO EVALUATING REMEDIAL ACTION ALTERNATIVES*
STANDARDS AND CRITERIA (1)				
6 NYCRR Part 364	Waste Transporter Permits	Action	Not applicable	This standard would relate to alternatives that involve waste removal.
6 NYCRR Part 370 through 373	Hazardous Waste Management Regulations	Action, Chemical	This standard relates to identification of hazardous waste at the Site. This along with 6 NYCRR Part 375 would be used to asses remedial needs for hazardous waste at the Site.	This standard would relate to the characterization and management of hazardous waste at the Site. This would include characterization of excavated soil at the Site.
6 NYCRR Part 376	Land Disposal Restrictions	Action, Chemical	Not applicable.	This standard relates to the management of hazardous waste removed during remedial action.
6 NYCRR Part 375-3 6 NYCRR Part 375-6	Brownfield Cleanup Program and Soil Cleanup Objectives	Action, Chemical	This standard along with 6 NYCRR Part 370 to 373 would be used to asses remedial needs for hazardous waste at the Site.	This standard relates to all Site remedial activities (i.e. remedy selection and remedial action).
OSHA; 29 CFR 1910	Guidelines/Requirements for Workers at Hazardous Waste Sites (Subpart 120) and Standards for Air Contaminants (Subpart 1).	Action	Not applicable.	May relate to certain remedial action activities

TABLE 3-3 (continued)
POTENTIAL NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)
GREIF FACILITY- TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

CITATION	*DESCRIPTION*	*TYPE*	*POTENTIAL APPLICABILITY TO DEVELOPING REMEDIAL ACTION OBJECTIVES*	*POTENTIAL APPLICABILITY TO EVALUATING REMEDIAL ACTION ALTERNATIVES*
OSHA; 29 CFR 1926	Safety and Health Regulations for Construction	Action	Not applicable	May relate to certain remedial action activities.
Guidelines *(1)*				
TAGM HWR-94-4046	Determination of Soil Cleanup Objectives and Cleanup Levels	Chemical	Guidance is applicable for the development of remedial action objectives for Site soil.	Guidance is applicable for evaluating the effectiveness of a remedial alternative.
NYSDOH Community Air Monitoring Plan for Intrusive Activities	Requirements real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust)	Action, Chemical	Not Applicable.	Would relate to any intrusive remedial activities (soil excavation and disposal).
NYSDOH Guidance for Evaluating Soil Vapor Intrusion	Guidance in identifying and addressing existing and potential human exposures to contaminated subsurface vapors associated with known or suspected VOCs contamination	Action, Chemical	Not Applicable	Guidance would be applicable for remedial action alternatives for buildings above impacted areas.

TABLE 3-3 (continued)
POTENTIAL NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)
GREIF FACILITY- TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

CITATION	*DESCRIPTION*	*TYPE*	*POTENTIAL APPLICABILITY TO DEVELOPING REMEDIAL ACTION OBJECTIVES*	*POTENTIAL APPLICABILITY TO EVALUATING REMEDIAL ACTION ALTERNATIVES*
NYSDEC TOGS 1.1.1	Ambient Water Quality Standards and Guidance Values	Action, Chemical	Guidance would be applicable for development of remedial action objectives for Site ground water and indirectly relate to developing remedial action objectives for Site soil.	Guidance would be applicable for remedial action alternatives that involve work associated with Site ground water.
TO BE CONSIDERED (TBCS) (2)				
NYSDEC *Draft* DER-10	Technical Guidance for Site Investigation and Remediation	Action	Draft guidance relates to development of remedial action objectives.	Relates to all Site remedial action activities.
USEPA Region III Risk Based Concentration Tables (RBCs), Industrial/Commercial	Risk-based concentrations for contaminants in soil at industrial sites	Chemical	Not Applicable	Guidance would be applicable for remedial alternatives and activities that involve direct contact with Site media.

GLOSSARY OF ACRONYMS

CFR	Code of Federal Regulations
DER	Division of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Code of Rules and Regulations
OSHA	Occupational Safety and Health

TABLE 3-3 (continued)
POTENTIAL NEW YORK STATE STANDARDS, CRITERIA AND GUIDELINES (SCGs)
GREIF FACILITY- TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

SCG	Standards, Criteria and Guidance
TBC	To Be Considered Information
VOCs	Volatile Organic Compounds (VOCs)
USEPA	U. S. Environmental Protection Agency

Notes:

(1) Standards and Criteria were obtained from NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.

(2) Guidelines were obtained from NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.

(3) TBCs are defined in this report as regulations and guidance documents that are not identified NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.

TABLE 3-4
SUMMARY OF VOC CONCENTRATIONS IN SOIL
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

			Former Varnish UST Area						Former Drum Storage Area (FDSA)															
Sample Designation	**NYSDEC Unrestricted Residential SCO**	**NYSDEC Restricted Commercial SCO**	**GB-1**	**GB-1**	**GB-2**	**GB-14**	**GB-15**	**GB-15**	**GB-45**	**GB-9**	**GB- 10**	**GB-11**	**MW-1**	**GB-25**	**GB-25DL**	**GB-35**	**SC-FLR**	**SC-EWALL**	**SC-WWALL**	**SC-PIPE**	**GB-10-FLOOR**	**GB-10-WWAL**	**GB-10-EWALL**	**GB-10-SWALL**
Sample Depth			**14-16**	**20-24**	**12-16**	**13-14**	**6-7**	**14-15**	**12-14**	**4-5**	**14-15**	**13-15**	**9-11**	**9-10**	**9-10**	**16**	**6.5**	**3**	**4**	**5**	**7**	**3**	**3**	**2.5**
Date Sampled			**1998**	**1998**	**1998**	**1998**	**1998**	**1998**	**11/1/02**	**1998**	**1998**	**1998**	**1998**	**2001**	**2001**	**2001**	**12/8/05**	**12/8/05**	**12/8/05**	**12/12/05**	**12/12/05**	**12/15/05**	**12/15/05**	**12/15/05**
TCL VOCs (ug/kg)																								
Acetone	50	500000	----	----	----	ND	ND	ND	----	ND	ND	ND	ND	25 BJ	----	21 J	----	----	----	100	56	----	----	30 J
Acrolein	----	----	----	----	----	130	ND	ND	----	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----
Benzene	60	45000	----	----	----	----	----	----	----	----	----	----	----	2 J	----	----	----	----	----	----	----	----	----	----
2-Butanone	120	500000	----	----	----	ND	ND	ND	330 J	ND	ND	ND	ND	----	----	----	----	----	----	18 J	----	----	----	----
Carbon disulfide	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloroethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloroform	370	350000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cyclohexane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
cis-1,2-Dichloroethene	250	500000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	19	----	----	2 J	760 J	230	100	4500
Dibromochloromethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
1,1-Dichloroethane	270	240000	----	----	----	2600	ND	ND	----	ND	ND	ND	ND	95	----	----	200 D	----	----	53 J	15	3 J	3 J	77
1,2-Dichloroethane	10	30000	----	----	----	ND	ND	ND	----	ND	ND	ND	ND	1 J	----	----	14	----	----	----	----	----	----	----
1,1-Dichloroethene	330	500000	----	----	----	ND	ND	ND	----	ND	ND	ND	ND	12	----	----	86	----	----	----	5 J	----	----	20
1,2-Dichloroethene (Total)	----	----	----	----	----	ND	ND	ND	----	5 J	1300 J	ND	ND	970 E	260 DJ	----	----	----	----	----	----	----	----	----
trans-1,2-Dichloroethene	190	500000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	13
Ethylbenzene	1000	390000	12000	360 J	ND	ND	630	590	----	ND	2700	ND	ND	----	----	----	220	----	23	5 J	20	----	4 J	49
Isopropylbenzene	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Methylcyclohexane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5 BJ	----	----	----	----	----	----	----	----
Methylene chloride	50	500000	----	----	----	----	----	----	----	----	----	----	----	14 B	----	----	----	----	----	----	----	----	----	----
4-Methyl-2-pentanone	----	----	----	----	----	ND	ND	ND	----	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----
Styrene	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Tetrachloroethene	750	25000	----	----	----	ND	ND	ND	----	ND	3300	ND	ND	----	----	----	----	----	----	----	34	5 J	8	73
Toluene	700	500000	ND	ND	140000	ND	ND	ND	----	ND	2600	ND	ND	3 J	----	3 J	7	----	----	----	90	----	6	58
1,1,1-Trichloroethane	680	500000	----	----	----	16000	ND	ND	360 J	ND	ND	ND	ND	3 J	----	----	30	----	4 J	----	3 J	----	----	----
1,1,2-Trichloroethane	----	----	----	----	----	ND	ND	ND	----	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----
1,2,4-Trimethylbenzene	----	----	13000	750 J	1100000	ND	380	ND	----	ND	11000	ND	ND	----	----	----	----	----	11	7	23	----	14	44
Trichloroethane	----	----	----	----	----	ND	ND	ND	----	4 J	ND	ND	ND	----	----	----	----	----	----		----	----	----	----
Trichloroethene	470	200000	----	----	----	21	ND	ND	8900	ND	210000.0	ND	ND	1400 E	590 DJ	----	39	48	----	7	14000	360	280	13000
Trichlorofluoromethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vinyl Chloride	20	13000	----	----	----	----	----	----	----	----	----	----	----	61	----	----	----	----	----	----	----	----	----	----
Xylenes (total)	1600	500000	51000	ND	2300000.0	ND	520	2800	----	ND	22000	ND	ND	----	----	2 J	1300	----	240	----	87	----	25	160

NOTES:
VOC= Volatile Organic Compounds
B = For organics, indicates that the compound is found in the associated blank as well as the sample. For inorganics, indicates the concentration is less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
D= Indicates all compounds identified in an analysis at a secondary dilution factor.
E= Indicates compounds whose concentrations exceeded the calibration range of the GC/MS instrument for that specific analysis.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
ND= Non Detected
Black Highlighted cells indicate an exceedance of the NYSDEC Restricted Commercial SCO (analytes identified with "J" were not evaluated)
Orange Highlighted cells indicate exceedances of the NYSDEC Unrestricted Residential SCO (analytes identified with "J" were not evaluated)
--- Parameter was not analyzed for.

TABLE 3-4 (Continued)
SUMMARY OF VOC CONCENTRATIONS IN SOIL
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

			Varnish Pit Area (VPA)																											
Sample Designation	**NYSDEC Unrestricted Residential SCO**	**NYSDEC Restricted Commercial SCO**	**GB-17**	**GB-17**	**GB-19**	**GB-20**	**GB-20**	**GB-21**	**GB-22**	**GB-22**	**GB-23**	**GB-24**	**GB-24 RI**	**GB-26**	**GB-27**	**GB-27 DL**	**GB-28**	**GB-29**	**GB-30**	**GB-30 DL**	**GB-31**	**GB-47**	**GB-48**	**GB-49**	**MW-18**	**MW-18**	**MW-20**	**MW-20**	**MW-22**	**MW-23**
Sample Depth			**1-2**	**4-5**	**14-15**	**11-12**	**15-16**	**8-9**	**10-11**	**15-16**	**15**	**16**	**16**	**2**	**0-1**	**0-1**	**16**	**8-9**	**8-9**	**8-9**	**6-7**	**5-6**	**3-6**	**15-16**	**2-4**	**18-20**	**13-14**	**24-26**	**22-24**	**9-10**
Date Sampled			**1998**	**1998**	**1998**	**1998**	**1998**	**1998**	**1998**	**1998**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**2001**	**10/30/02**	**10/30/02**	**11/16/02**	**10/30/02**	**11/15/02**	**10/31/02**	**11/12/02**	**11/14/02**	**11/16/02**
TCL VOCs (ug/kg)																														
Acetone	50	500000	ND	ND	ND	ND	1100	110	7300	3100	42 B	67 B	29 BJ	26 BJ	----	----	39 B	18 BJ	1900 B E	4300 D	----	----	----	----	----	----	----	----	----	----
Acrolein	----	----	ND	ND	ND	ND	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Benzene	60	45000	----	----	----	----	----	----	----	----	----	----	----	2 J	----	----	7	2 J	----	----	----	----	----	----	----	----	----	----	----	----
2-Butanone	120	500000	ND	ND	ND	ND	250	ND	ND	ND	----	----	----	----	----	----	9 J	----	2400 E	1800 DJ	----	----	----	----	----	----	----	----	----	----
Carbon disulfide	----	----	----	----	----	----	----	----	----	----	----	----	2 J	----	4 J	----	----	----	----	----	----	----	----	----	2 J	----	----	----	----	----
Chloroethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloroform	370	350000	----	----	----	----	----	----	----	----	----	----	----	----	2 J	----	----	----	----	----	----	----	----	----	2 J	----	----	----	----	----
Cyclohexane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
cis-1,2-Dichloroethene	250	500000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	240	----	----	----	----	----
Dibromochloromethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4 J	----	----	2 J	----
1,1-Dichloroethane	270	240000	ND	170	ND	ND	260	210	2900	ND	----	----	----	----	160	310 DJ	----	4 J	590 E	----	----	----	----	760 J	170 J	----	4300 J	530 J	6 J	460 J
1,2-Dichloroethane	10	30000	ND	7	ND	ND	12	6 J	240 J	ND	----	----	----	----	----	----	----	----	240	180 DJ	----	----	----	----	8 J	----	----	----	----	----
1,1-Dichloroethene	330	500000	ND	24	ND	ND	350	220	650	ND	----	----	----	----	320 E	820 D	2 J	6	5800 E	----	----	----	----	20 J	140 J	----	11000 J	----	----	3500 J
1,2-Dichloroethene (Total)	----	----	ND	65	ND	ND	48	55	240 J	ND	----	----	----	----	6 J	----	----	750 E	----	----	----	----	----	----	----	----	----	----	----	----
trans-1,2-Dichloroethene	190	500000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Ethylbenzene	1000	390000	1400 J	24	ND	ND	17	ND	ND	ND	----	----	----	2 J	----	----	2 J	20	----	----	200 J	----	----	36 J	26	2 J	----	----	3 J	----
Isopropylbenzene	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	35 J	2 J	----	----	----	----	----
Methylcyclohexane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Methylene chloride	50	500000	----	----	----	----	----	----	----	----	8 B	13 B	7	9 B	7 B	170 DJ	9 B	8 B	12 B	----	----	5 J	4 J	----	----	----	----	----	----	----
4-Methyl-2-pentanone	----	----	ND	ND	ND	ND	10 J	ND	ND	ND	----	----	----	----	----	----	----	----	83	----	----	----	----	----	----	----	----	----	----	----
Styrene	----	----	----	----	----	----	----	----	----	----	----	----	----	1 J	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Tetrachloroethene	750	25000	ND	ND	ND	ND	5 J	ND	ND	ND	----	----	----	----	----	----	----	26	----	----	----	----	----	----	----	----	----	----	----	----
Toluene	700	500000	ND	ND	ND	ND	6 J	ND	ND	ND	----	2 J	----	9	----	----	7	2 J	25	----	----	----	----	13 J	2 J	5 J	----	----	5 J	----
1,1,1-Trichloroethane	680	500000	9500	990	ND	41000	3200	750	55000	2700	----	----	----	----	2000 E	5100 D	9	5 J	6300 E	1400 D	8600	----	2 J	650 J	510	2 J	250000 J	1000	2 J	11000 J
1,1,2-Trichloroethane	----	----	ND	10	ND	ND	ND	ND	ND	ND	----	----	----	----	----	----	----	----	74	----	----	----	----	----	7 J	----	----	----	----	----
1,2,4-Trimethylbenzene	----	----	10000	9	ND	ND	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Trichloroethane	----	----	ND	ND	ND	ND	ND	ND	ND	ND	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Trichloroethene	470	200000	900 J	520	ND	84000	20000	2300	63000	3400	2 J	----	----	2 J	5100 E	19000 D	8	6	7000 E	6400 D	18000	----	----	3500	640	1 J	500000	650 J	5 J	53000
Trichlorofluoromethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3 J	----	----	1 J	----
Vinyl Chloride	20	13000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Xylenes (total)	1600	500000	6400	99	ND	41000	75	ND	480	ND	----	----	----	6 J	----	----	6 J	1 J	81	160 D	790 J	----	----	150 J	110	4 J	7600 J	23 J	6 J	----

NOTES:
VOC= Volatile Organic Compounds
B = For organics, indicates that the compound is found in the associated blank as well as the sample. For inorganics, indicates the concentration is less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
D= Indicates all compounds identified in an analysis at a secondary dilution factor.
E= Indicates compounds whose concentrations exceeded the calibration range of the GC/MS instrument for that specific analysis.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
ND= Non Detected
Black Highlighted cells indicate an exceedance of the NYSDEC Restricted Commercial SCO (analytes identified with "J" were not evaluated)
Orange Highlighted cells indicate exceedances of the NYSDEC Unrestricted Residential SCO (analytes identified with "J" were not evaluated)
--- Parameter was not analyzed for.

TABLE 3-5
SUMMARY OF SVOC CONCENTRATIONS IN SOIL
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

			Former Underground Storage Tank (FUST)					Varnish Pit (VP)					Long Truck Bay Area								
SAMPLE DESIGNATION	**NYSDEC Unrestricted Residential SCO**	**NYSDEC Restricted Commercial SCO**	**GB-1**	**GB-2**	**GB-15**	**GB-15**	**GB-34**	**GB-17**	**GB-27**	**GB-30**	**MW-18**	**MW-20**	**HA-03**	**HA-04**	**HA-04**	**HA-05**	**HA-06**	**HA-07**	**HA-07**	**HA-08**	**HA-08**
SAMPLE DEPTH (feet)			**14-16**	**12-16**	**6-7**	**14-15**	**3**	**1-2**	**0-1**	**8-9**	**2-4**	**13-14**	**0-6**	**1-3**	**5-6**	**1-3**	**1-3**	**1-3**	**5-6**	**1-3**	**5-6**
Sample Date			**1998**	**1998**	**1998**	**1998**	**2001**	**1998**	**2001**	**2001**	**10/30/2002**	**10/31/2002**		**10/29/2002**	**10/29/2002**	**10/29/2002**	**10/29/2002**	**10/29/2002**	**10/29/2002**	**10/29/2002**	**10/29/2002**
TCL SVOCs (UG/KG)																					
Anthracene	100000[a]	500000[b]	1800	ND	ND	ND	----	330 J	25 J	----	----	----	820 J	12000 J	880 J	32 J	810 J	5700 J	16 J	4400 J	----
Acenaphthene	98000	500000[b]	840	ND	ND	ND	----	750	----	----	----	----	ND	780	----	----	----	----	----	----	----
Acenaphthylene	100000[a]	500000[b]	ND	ND	ND	ND	----	ND	----	----	----	----	810 J	8000	540 J	25 J	730 J	4000 J	16 J	3800 J	----
Benzo(a) anthracene	1000[c]	5600	2800	79 J	ND	ND	21 J	260 J	82 J	----	----	17 J	2900	22000	1600 J	110 J	3200 J	16000	62 J	15000	17 J
Benzo(b) fluoranthene	1000[c]	6000	3000	85 J	ND	ND	57 J	380	70 J	----	----	22 J	3500	27000	1300 J	130 J	2500 J	17000	56 J	17000	18 J
Benzo(g,h,l) prylene	100000[a]	500000[b]	1200	ND	ND	ND	----	85 J	----	----	----	----	1800 J	5800 J	380 J	46 J	1100 J	5600 J	23 J	6900	----
Benzo(k) fluoranthene	1700	5600	----	ND	ND	ND	----	120 J	46 J	----	----	----	1900 J	13000 J	1500 J	81 J	3000 J	9000 J	----	7800 J	----
Benzo(a) pyrene	1000[c]	1000[f]	2400	67 J	ND	ND	----	ND	62 J	----	----	----	2900	21000	1400 J	100 J	3000 J	15000	60 J	15000	17 J
Biphenyl	----	----	----	----	----	----	----	----	----	----	----	----	----	220 J	----	----	----	----	----	----	----
Bis(2-ethylhexyl) phthalate	----	----	100 J	ND	----	----	90 J	----	----	50 J	36 J	110 J	ND	----	----	----	----	----	----	----	----
Carbazole	----	----	2100	ND	----	----	----	----	----	----	----	----	ND	2000 J	150 J	----	----	810 J	----	400 J	----
Chrysene	590	56000	2600	34 J	ND	ND	27 J	590	84 J	----	----	20 J	3000	22000	1600 J	130 J	3000 J	16000	----	14000	----
Dibenzo(a,h)anthracene	330	560	330 J	ND	ND	ND	----	ND	----	----	----	----	ND	2600 J	130 J	16 J	420 J	2400 J	----	2900 J	----
Dibenzofuran	----	----	510	ND	----	----	----	----		----	----	----	ND	2700 J	130 J	17 J	----	1000 J	----	660 J	----
2,4-Dimethylphenol	----	----	----	----	----	----	62 J	----	----	----	----	----	----	----	----	----	----	----	----	----	----
3,3'-Dichlorobenzidine	----	----	----	----	----	----	----	----		----	----	----	----	----	----	----	----	180 J	----	----	----
Di-n-butyl phthalate	----	----	ND	79 J	----	----	----	----	130 BJ	----	----	----	ND	----	----	----	----	----	----	----	----
Di-n-octyl phthalate	----	----	----	----	----	----	----	----	----	44 J	11 J	----	----	----	----	----	----	----	----	----	----
Fluoranthene	100000[a]	500000[b]	6100	ND	ND	83	----	1700	150 J	----	12 J	27 J	8000	79000	5400	260 J	8000	37000	150 J	34000	45 J
Fluorene	100000[a]	500000[b]	840	180 J	ND	ND	----	970	----	----	----	----	ND	7900	440 J	15 J	320 J	3300 J	----	2100 J	----
Indeno(1,2,3-cd)pyrene	500[c]	5600	1300	ND	ND	ND	----	ND	----	----	----	----	1800 J	6400 J	390 J	42 J	1100 J	5700 J	22 J	6800 J	----
2-Methylnaphthalene	----	----	140 J	460	----	----	----	----	47 J	----	----	14 J	ND	740 J	----	40 J	----	----	----	----	----
2-Methylphenol	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Naphthalene	12000	500000[b]	480	19000	69 J	ND	75 J	510	18 J	----	21 J	19 J	ND	370 J	----	18 J	----	----	----	----	----
Phenanthrene	100000[a]	500000[b]	5400	150 J	ND	51	96 J	3200	180 J	----	16 J	35 J	3700	41000	4400	190 J	3700 J	23000	74 J	16000	21 J
Pyrene	100000[a]	500000[b]	5000	130 J	ND	72	54 J	1300	120 J	----	----	21 J	3900	40000	3400 J	190 J	5900 J	27000	120 J	26000	39 J

NOTES:

VOC= Volatile Organic Compounds
B = For organics, indicates that the compound is found in the associated blank as well as the sample. For inorganics, indicates the concentration is less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
D= Indicates all compounds identified in an analysis at a secondary dilution factor.
E= Indicates compounds whose concentrations exceeded the calibration range of the GC/MS instrument for that specific analysis.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
Black Highlighted cells indicate an exceedance of the NYSDEC Restricted Commercial SCO (analytes identified with "J" were not evaluated)
Orange Highlighted cells indicate exceedances of the NYSDEC Unrestricted Residential SCO (analytes identified with "J" were not evaluated)
ND= Non Detected
--- Parameter was not analyzed for.
- NA = not applicable
[a] = The SCOs for unrestricted use were capped at a maximum value of 100ppm, as discussed in the Technical Support Document.
[b]= For constituents where the calculated soil cleanup objective was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 value.
[c]= For constituents where the calculated soil cleanup objective was lower than background, the background is used as the Track 1 value.

TABLE 3-5 (Continued)
SUMMARY OF SVOC CONCENTRATIONS IN SOIL
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

			Former Drum Storage Area (FDSA)													
SAMPLE DESIGNATION	**NYSDEC Unrestricted Residential SCO**	**NYSDEC Restricted Commercial SCO**	**GB-4**	**GB-10**	**GB-33**	**GB-38**	**GB-38**	**GB-39**	**GB-39**	**GB-40**	**GB-40**	**GB-41**	**GB-41**	**GB-42**	**GB-42**	**GB-43**
SAMPLE DEPTH (feet)			**10-12**	**7-8**	**3**	**3-4**	**13-14**	**3-4**	**13-14**	**3-4**	**13-14**	**3-4**	**13-14**	**3-4**	**13-14**	**3-4**
Sample Date			**1998**	**1998**	**2001**	**11/1/02**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**	**11/1/2002**
TCL SVOCs (UG/KG)																
Anthracene	100000[a]	500000[b]	460	ND	240 J	----	----	----	----	----	----	----	----	----	----	----
Acenaphthene	98000	500000[b]	200 J	ND	----	----	----	----	----	----	----	----	----	----	----	----
Acenaphthylene	100000[a]	500000[b]	ND	ND	----	----	----	----	----	----	----	----	----	----	----	----
Benzo(a) anthracene	1000[c]	5600	790	ND	1100 J	----	----	160 J	1300 J	16 J	220 J	----	----	----	20 J	----
Benzo(b) fluoranthene	1000[c]	6000	1000	1300	1100 J	----	----	170 J	640 J	17 J	250 J	----	----	----	27 J	----
Benzo(g,h,l) prylene	100000[a]	500000[b]	330 J	ND	300 J	----	----	----	330 J	----	66 J	----	----	----	----	----
Benzo(k) fluoranthene	1700	5600	400	ND	----	----	----	----	----	----	----	----	----	----	----	----
Benzo(a) pyrene	1000[c]	1000[f]	750	1100	940 J	----	----	130 J	1000 J	13 J	200 J	----	----	----	19 J	----
Biphenyl	----	----	----	----	----	----	----	----	----	----	----	----	430 J	----	----	----
Bis(2-ethylhexyl) phthalate	----	----	110 J	----	----	21 J	----	----	----	----	----	23 J	12 J	28 J	25 J	14 J
Carbazole	----	----	850	----	----	----	----	----	----	----	----	----	----	----	----	----
Chrysene	590	56000	780	1400	1200 J	----	140 J	150 J	---- J	17 J	220 J	----	----	----	23 J	----
Dibenzo(a,h)anthracene	330	560	98 J	ND	86 J	----	----	----	140 J	----	----	----	----	----	----	----
Dibenzofuran	----	----	130 J	----	----	----	----	----	----	----	----	----	----	----	----	----
2,4-Dimethylphenol	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
3,3'-Dichlorobenzidine	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Di-n-butyl phthalate	----	----	ND	----	----	----	----	----	----	----	----	----	----	----	----	----
Di-n-octyl phthalate	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoranthene	100000[a]	500000[b]	2100	2000	2000	----	160 J	230 J	2200 J	16 J	240 J	----	----	----	29 J	----
Fluorene	100000[a]	500000[b]	230 J	ND		----	----	----	210 J	----	----	----	----	----	----	----
Indeno(1,2,3-cd)pyrene	500[c]	5600	340 J	ND	280 J	----	----	----	290 J	----	----	----	----	----	----	----
2-Methylnaphthalene	----	----	ND	----	----	----	----	----	----	----	----	----	----	----	----	----
2-Methylphenol	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Naphthalene	12000	500000[b]	80 J	800	----	----	----	----	----	----	----	----	----	----	----	----
Phenanthrene	100000[a]	500000[b]	1900	1300	870 J	----	----	140 J	1800 J	----	----	----	----	----	----	----
Pyrene	100000[a]	500000[b]	1600	2600	2500	----	190 J	280 J	2600 J	23 J	330 J	----	----	----	35 J	----

NOTES:
VOC= Volatile Organic Compounds
B = For organics, indicates that the compound is found in the associated blank as well as the sample. For inorganics, indicates the concentration is less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
D= Indicates all compounds identified in an analysis at a secondary dilution factor.
E= Indicates compounds whose concentrations exceeded the calibration range of the GC/MS instrument for that specific analysis.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
Black Highlighted cells indicate an exceedance of the NYSDEC Restricted Commercial SCO (analytes identified with "J" were not evaluated)
Orange Highlighted cells indicate exceedances of the NYSDEC Unrestricted Residential SCO (analytes identified with "J" were not evaluated)
ND= Non Detected
--- Parameter was not analyzed for.
- NA = not applicable
[a] = The SCOs for unrestricted use were capped at a maximum value of 100ppm, as discussed in the Technical Support Document.
[b]= For constituents where the calculated soil cleanup objective was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 value.
[c]= For constituents where the calculated soil cleanup objective was lower than background, the background is used as the Track 1 value.

TABLE 3-6
SUMMARY OF METAL CONCENTRATIONS IN SOIL
2001 REMEDIAL INVESTIGATION
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

SAMPLE DESIGNATION	NYSDEC Unrestricted Residential SCO	NYSDEC Restricted Commercial SCO	GB-27	GB-33	GB-35	GB-37	NYSDEC	EASTERN U.S.
SAMPLE DEPTH (feet)			0-1	3	16	3-4	RSCO	BACKGROUND
Sample Date			2001	2001	2001	2001		
TAL METALS (MG/KG)								
Aluminum	----	----	17700	17700	20400	20000	SB	33000
Arsenic	16[C]	16[f]	10	6	2	5	7.5 or SB	3-12
Barium	350[c]	400	155	125	145	133	300 or SB	15-600
Beryllium	14	590	4	1	1	1	0.16 or SB	0-1.75
Cadmium	2.5[c]	9.3	----	----	----	1	1 or SB	0.1-1
Calcium	----	----	128000	7260	46300	37400	SB	130-35000
Chromium	----	----	6	24	28	25	10 or SB	1.5-40
Cobalt	----	----	13	14	14	12	30 or SB	2.5-60
Copper	270	270	8	22	21	20	25 or SB	1-50
Iron	----	----	10100	28100	30400	28000	2000 or SB	2000-50000
Lead	400	1,000	----	13	11	9	SB	4-500
Magnesium	----	----	4500	8820	16000	12800	SB	100-5000
Manganese	2,000[c]	15,000	1170	746	553	594	SB	50-5000
Nickel	130	310	9	32	32	29	13 or SB	0.5-25
Potassium	----	----	1770	2180	4660	2890	SB	8500-43000
Sodium	----	----	512	136	254	128	SB	6000-8000
Vanadium	----	----	8	33	36	33	150 or SB	1-300
Zinc	2,200	890,000	11	69	66	61	20 or SB	9-50

NOTES:
----- = the analyte was not detected at a concentration above the reported method detection limit
- NYSDEC RSCO are recommended soil cleanup objectives or eastern U.S. background from NYSDEC TAGM-4046 Appendix A, Table 4
- SB = site background
C = For constituents where the calculated soil cleanup objective was lower than background, the background is used as the Track 1 Value.

TABLE 3-7
SUMMARY OF VOC CONCENTRATIONS IN GROUND WATER
QUARTERLY GROUND WATER MONITORING REPORT
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Sample Designation	MW-18					MW-21I					MW-22					MW-12					MW-13					NYSDEC
Ground Water Zone	Int					Int					Int					Shallow					Shallow					Std
Date Sampled	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	µg/l
VOCs (µg/L)																										
Acetone	----	----	---	----	----	----	----	----	4 J	----	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	50
Benzene	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	3.1	----	---	----	----	1
2-Butanone	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	95	----	---	----	----	5
Chloroethane	110	35 J	17 J	----	7.6	----	----	----	----	----	----	----	---	----	----	6.6	----	---	----	----	1.6	----	---	----	----	5
Chloroform	----	----	---	20	----	----	----	----	----	----	----	----	---	----	----	1	----	---		----	50	----	---		----	7
1,1-Dichloroethane	2,100	2,100	1,200	750	420	----	----	----	----	----	5.1	1.8	1.6	1.8	2.0	1,900	2,000	2,600	**2,000**	**2,900**	9,200	8,300	9,600	9,000	10,000	5
1,2-Dichloroethane	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	5.5	----	---	----	----	140 E	----	---	----	----	0.6
1,1-Dichloroethene	250	190	120	97	55	----	----	----	----	----	4		0.41 J	----	.41J	390	450	520	**450**	**540**	15,000	12,000	16,000	14,000	18,000	5
cis-1,2-Dichloroethene	490	360	240	170	100	----	----	----	----	----	----	0.78 J	---	----	----	1,900	2,200	3,200	**2,100**	**3,400**	9,700	9,800	10,000	9,600	10,000	5
trans-1,2-Dichloroethene	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	47	49	61	**37**	**62**	300 E	----	420 J	----	350J	5
Ethylbenzene	74	23 J	14 J	7.3 J	3.4J	----	----	----	----	----	----	----	---	----	----	0.5 J	----	---	----	----	19	----	---	----	----	5
Methylene chloride	----	----	15 J	14 B	5.4B	----	----	----	----	----	----	----	---	----	----	----	----	54	**34 B**	**65B**	18	----	510 J	990	1400B	5
4-Methyl-2-pentanone	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	10	----	---	----	----	NS
Tetrachloroethene	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	5.7	----	---	----	----	0.7
Toluene	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	16	----	---	----	----	5
1,1,1-Trichloroethane	37,000	820	160	38	16	----	1.6	----	1.9	----	1.5	0.89 J	---	----	.62J	160	400	660	**430**	**800**	37,000	34,000	41,000	35,000	41,000	5
1,1,2-Trichloroethane	----	----	---	----	----	----	----	----	----	----	----	----	---	----	----	270	----	---	----	----	7.2	----	---	----	----	5
Trichloroethene	280	180	110	64	38	0.84 J	0.66 J	----	0.55 J	----	12	6.6	3.5	3.5	3.4	----	420	640	**370**	**620**	63,000	54,000	61,000	58,000	58,000	5
1,2,4-Trimethylbenzene	65	----	12 J	8.2 J	4.0J	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	27	----	---	----	----	5
Vinyl chloride	180	100	80	40	25	----	----	----	----	----	----	----	---	----	----	350	140	56	**94**	**52**	86	----	---	----	----	2
Xylene (total)	260	74 J	42 J	26 J	9.2J	----	----	----	----	----	----	----	---	----	----	----	----	---	----	----	67	----	---	----	----	5

NOTES:

- all analyte concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted

----- = compound was not detected above the laboratory quantitation limit.

J = indicates an estimated value.

E = indicated that the concentration exceeds the calibration range of the instrument, and the compound was not identified in the analysis at secondary dilution factor.

*- Hightlighted cells represent an exceedance of standard.

NS- Not Specified

TABLE 3-7 (Continued)
SUMMARY OF VOLATILE ORGANIC COMPOUNDS DETECTIONS IN GROUND WATER-2006
QUARTERLY GROUND WATER MONITORING REPORT
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Sample Designation	MW-14					MW-21S					MW-24					MW-25					NYSDEC
Ground Water Zone	Shallow					Shallow					Shallow					Shallow					Std
Date Sampled	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/31/06	4/18/06	7/11/06	10/11/06	1/10/07	1/30/06	4/18/06	7/11/06	10/11/06	1/10/07	1/30/06	4/18/06	7/11/06	10/11/06	1/10/07	µg/l
VOCs (µg/L)																					
Acetone	----	----	---	----	----	----	----	---	4 J	----	----	----	---	----	----	----	----	---	----	----	50
Benzene	----	----	---	----	----	----	----	---	----	----	1.5	32	97	90	30J	----	----	1.1	----	----	1
2-Butanone	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	5
Chloroethane	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	1.6	0.72 J	0.40 J	----	.66J	5
Chloroform	----	----	---	----	----	----	----	---	----	----	3.8	----	---	----	----	----	----	---	----	----	7
1,1-Dichloroethane	2,800	2,600	2,500	2,300	2,400	0.57 J	----	---	----	----	----	30	---	58 J	42J	7.9	10	7.8	3.5	5.6	5
1,2-Dichloroethane	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	0.6
1,1-Dichloroethene	2,300	----	1,400	1,600	1,300	----	----	---	----	----	----	8.6	---	----	----	0.62 J	1.2	0.95 J	----	.92J	5
cis-1,2-Dichloroethene	240	530 J	---	----	250J	----	----	---	----	----	270	3,300	---	7100	3900	12	18	18	**20**	**25**	5
ans-1,2-Dichloroethene	----	----	---	----	----	----	----	---	----	----	1.3	12	---	----	25J	----	----	0.99 J	0.65 J	.91J	5
Ethylbenzene	----	----	---	----	----	----	----	---	----	----	----	2.8 J	---	----	61B	----	----	---	----	----	5
Methylene chloride	----	----	470 J	980	710B	----	----	---	----	----	----	2.9 J	---	100	----	----	----	---	----	----	5
4-Methyl-2-pentanone	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	NS
Tetrachloroethene	----	----	---	----	----	----	----	---	----	----	1.6	8	---	----	----	----	----	---	----	----	0.7
Toluene	----	----	---	----	----	----	----	---	----	----	1	12	---	----	----	----	----	---	----	----	5
1,1,1-Trichloroethane	120 J	----	---	----	----	5	4.5	3	1.9	----	0.79 J	2.2 J	---	----	----	11	4.8	9.5	0.58 J	.80J	5
1,1,2-Trichloroethane	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	----	----	---	----	----	5
Trichloroethene	66,000	52,000	45,000	46,000	41,000	12	1.6	0.91 J	0.55 J	----	430	6,700	---	9600	3800	1.5	2.1	3.1	----	3.9	5
1,2,4-Trimethylbenzene	----	----	---	----	----	----	----	---	----	----	0.56 J	2.2 J	---	----	----	----	----	---	2.5	----	5
Vinyl chloride	----	----	---	----	----	----	----	---	----	----	6.8	49	---	250	380	0.74 J	0.66 J	0.58 J	0.52 J	.82J	2
Xylene (total)	----	----	---	----	----	----	----	---	----	----	1.8 J	8.1 J	---	----	----	----	----	---	----	----	5

NOTES:

- all analyte concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted

----- = compound was not detected above the laboratory quantitation limit.

J = indicates an estimated value.

E = indicated that the concentration exceeds the calibration range of the instrument, and the compound was not identified in the analysis at secondary dilution factor.

*- Hightlighted cells represent an exceedance of standard.

NS- Not Specified

TABLE 3-8
SUMMARY OF NATURAL ATTENUATION DATA- GROUND WATER
SOIL INTERM REMEDIAL MEASURE REPORT
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Well Designation **Ground Water Zone** **Date Sampled**	**MW-18** **Int** **12/11/02**	**MW-18** **Int** **1/31/06**	**MW-20** **Int** **12/12/02**	**MW-21I** **Int** **12/12/02**	**MW-21I** **Int** **1/31/06**	**MW-22** **Int** **12/12/02**	**MW-22** **Int** **1/31/06**	**MW-12** **Shallow** **12/12/02**	**MW-12** **Shallow** **1/31/06**	**MW-13** **Shallow** **12/12/02**	**MW-13** **Shallow** **1/31/06**	**MW-14** **Shallow** **12/12/02**	**MW-14** **Shallow** **1/31/06**
CONTAMINANTS													
1,1,1-Trichloroethane	170 J	37,000	30,000 J	10 J	----	320 J	1.5	340 J	160	38000 J	37,000	----	120 J
Trichloroethene	16	280	6,600	6	0.84 J	78	12	410	----	46,000	63,000	46,000	66,000
Xylenes (Total)	----	260	----	----	----	----	----	----	----	----	67	----	----
DAUGHTER PRODUCTS													
Acetic Acid (mg/L)	----	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	----	110	----	----	----	----	----	0.01	6.6	----	1.6	----	----
Ethane	----	----	----	----	----	----	----	----	----	----	2.1	----	----
Ethene	----	1.4	----	----	----	----	----	----	3.4	----	12	----	1.7
Methane	----	1.6	----	2.2	4.3	2.6	5.6	12	52	110	840	----	2.2
1,1-Dichloroethane	11	2,100	820 J	----	----	40	5.1	2,700	1,900	6,400	9,200	2,400	2,800
1,1-Dichloroethene	18	250	350 J	----	----	7	4.0	480	390	14,000	15,000	1,800	2,300
cis-1,2-Dichloroethene	4	490	----	4,000	----	----	----	4,000	1,900	7,000	9,700	----	240
Vinyl Chloride	----	180		----	----	----	----	230 J	350	----	86	----	----
ELECTRON DONORS													
Iron, Ferrous (mg/L)	0.4	0.2	0.1	0.0	0.5	0.2	0.7	0.0	1.3	0.0	1.4	0.9 *	0.3
Manganese, manganous	47.3	NA	49.8	53.2	NA	62.4	NA	82.6	NA	857	NA	47.7	NA
Sulfide (mg/L)	----	----	----	----	----	----	----	----	2.4	----	----	----	----
ELECTRON ACCEPTORS													
Dissolved Oxygen (mg/L)	4.47	NM	3.0	1.16	0.00	0.09	0.00	0.98	3.02	1.01	4.44	1.81	1.63
Iron, Ferric (mg/L)	0.630	NA	0.98	2.300	NA	17.500	NA	1.130	NA	0.636	NA	*	NA
Manganese (total)	65.2	NA	92.5	168	NA	712	NA	73.2	NA	997	NA	60.4	NA
Nitrate (mg/L)	0.15 J	----	----	----	----	----	----	----	----	----	----	----	----
Sulfate (mg/L)	280	356	231	104	99.4	647 J	579	130	156	191	213	84.4	101
MISCELLANEOUS													
Alkalinity (as $CaCO_3$)													
Bicarbonate Alkalinity (mg/L)	530	77.7	594	382	448.0	445	396.0	742	750.0	1,040	637.0	488	519.0
Carbonate Alkalinity (mg/L)	----	24.7	----	----	----	----	----	----	----	----	----	----	----
Hydroxide Alkalinity (mg/L)	----	----	----	----	----	----	----	----	----	----	----	----	----
Free Carbon Dioxide	NA	NM	NA	NA	22	NA	12	NA	69	NA	178	NA	79
Dissolved Carbon Dioxide	----	NA	----	----	NA	----	NA	----	NA	----	NA	----	NA
Dissolved Organic Carbon (mg/L)	3.8	8.0	3.8	6.9	5.0	3.9	4.3	4.1	8.3	13.2	24.2	3.0	6.6
Total Organic Carbon (mg/L)	3.3	NA	3.5	7.1	NA	3.2	NA	4.0	NA	12.4	NA	2.8	NA
Ammonia (mg N/L)	0.34	NA	0.12	0.14	NA	0.23	NA	----	NA	----	NA	----	NA
pH (standard units)	7.98	NM	7.6	7.69	7.63	7.68	7.85	7.30	7.31	6.96	6.80	7.56	7.09
Temperature (degrees C)	15.4	NM	16.1	17.7	17.2	15.9	15.9	18.2	18.4	17.6	17.6	18.3	18.4
Total Dissolved Solids (mg/L)	1,280	932	1160	687	551	1,160	1,180	1,050	1,050	1,690	1,760	670	739
Total Hardness (mg/L)	760	428	901	604	384	1,280	624	819	699	1,560	1,390	495	514
OTHER CATIONS													
Calcium	65,800	NA	57,200	44,400	NA	66,000	NA	55,100	NA	195,000	NA	64,000	NA
Magnesium	165,000	NA	169,000	89,100	NA	150,000	NA	177,000	NA	269,000	NA	104,000	NA
Potassium	5,980	NA	5020 J	4,200 J	NA	5,560 J	NA	4050 J	NA	3,480 J	NA	4,080 J	NA
Sodium	151,000	NA	121,000 J	77,300 J	NA	126,000 J	NA	101,000 J	NA	53,800 J	NA	45,000 J	NA
OTHER ANIONS													
Chloride (mg/L)	26.1	NA	26.2	17.7	NA	39.8	NA	144	NA	514	NA	63.8	NA

NOTES:
- ---- = not detected at a concentration greater than the practical quantitation limit
- all analyte concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted
- mg/L = miligrams per liter

NM= Not measured or calculated due to failure of field equipment
Free Carbon Dioxide calculated using a Ion Chromatograpgic Method
Int= Intermediate Ground Water Zone
* - Ferrous iron result suspect due to validated total iron result; ferric iron not calculated

TABLE 3-9
SUMMARY OF NATURAL ATTENUATION SCREENING RESULTS
2006 SOIL IRM
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

PARAMETER	CONCENTRATION IN MOST	POINTS	SHALLOW GW ^	INTERMEDIATE GW ^^
	CONTAMINATED ZONE (MCZ)	POSSIBLE	Background	Background
	(Screening Guidelines)		Concentration in MCZ	Concentration in MCZ
			Points Awarded	**Points Awarded**
Alkalinity	> 2 times background	1	background = 438 mg/L *	background = 457 mg/L **
	level		MW-13 = 1,040 mg/L	MW-18 = 530 mg/L
			+1 Point	**+1 Point**
BTEX	> 0.1 mg/L	2	NA	NA
			GB-20 Xylenes = 1,600 ug/L	none detected
			+2 Points	NA
Carbon Dioxide	> 2 times background	1	NC	NC
	level		MW-12 = 69 mg/L ***	MW-21I = 16 mg/L ***
			+1 Point	**+1 Point**
Chloride	> 2 times background	2	background = 148 mg/L *	background = 125 mg/L **
	level		MW-13 = 514 mg/L	none above background
			+2 Points	NA
Chloroethane	Any Amount	2	NA	NA
			MW-12 = 14 ug/L	MW-18 = 110 ug/L
			+2 Points	**+2 Points**
Dichloroethene (cis isomer)	Any Amount	2	NA	NA
			MW-13 = 9,700 ug/L	MW-18 = 490 ug/L
			+2 Points	**+2 Points**
Dissolved Organic Carbon	> 20 mg/L	2	NA	NA
			MW-13 = 24.1 mg/L	none above 20 mg/L
			+2 Points	NA
Ethane/Ethylene	> 0.01 mg/L	2	NA	NA
	> 0.1 mg/L	3	MW-13 = 12 ug/L	none above 0.01 mg/L
			+1 Point	NA
Iron (II)	> 1 mg/L	3	NA	NA
			MW-12 = 1.4 mg/L	none above 1 mg/L
			+3 Point	NA
Methane	> 0.1 but ≤ 1 mg/L	2	NA	NA
	> 1 mg/L	3	MW-13 = 0.84 mg/L	none >0.1 mg/L
			+2 Points	NA
Nitrate	< 1 mg/L	2	NA	NA
			MW-12 <0.050 mg/L	MW-18 = 0.15 mg/L
			+2 Points	**+2 Points**

NOTES:

^ - MW-12, MW-13, MW-14 and GB-20 were wells within most contaminated zone (GW = ground water)

^^ - MW-18, MW-20, MW-21I, and MW-22 were wells within most contaminated zone (GW = ground water)

NA - not applicable

NC - cannot be calculated using the nomograph evaluation method due to high TDS

* - calculated by taking mean of MW-16, MW-17, and MW-19

** - calculated by taking mean of MW-2, MW-3, MW-4, MW-5, and MW-6

*** - based on an anomaly in calculated free carbon dioxide at these points in comparison to the other points using the nomograph evaluation method

TABLE 3-9 (Continued)
SUMMARY OF NATURAL ATTENUATION SCREENING RESULTS
2006 SOIL IRM
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0001242

PARAMETER	CONCENTRATION IN MOST	POINTS	SHALLOW GW ^	INTERMEDIATE GW ^^
	CONTAMINATED ZONE (MCZ)	POSSIBLE	Background	Background
	(Screening Guidelines)		Concentration in MCZ	Concentration in MCZ
			Points Awarded	**Points Awarded**
ORP	≥ -100 mV but < 50 mV	1	NA	NA
	< -100 mV	2	mean = -74 mV	mean = -108 mV
			+1 Point	**+2 Point**
Oxygen	< 0.5 mg/L	3	NA	NA
	>1 mg/L	-3	mean = 3 mg/L	mean = 0 mg/L
			- 3 Points	**+ 3 Points**
pH	NA	NA	NA	NA
	(yet must be in range of 5-9 for the		all in range of 5-9	all in range of 5-9
	reductive pathway to be tolerated)		NA	NA
Sulfate	< 20 mg/L	2	NA	NA
			none <20 mg/L	none <20 mg/L
			NA	NA
Sulfide	> 1 mg/L	3	NA	NA
			none >1 mg/L	none >1 mg/L
			NA	NA
Temperature	> 68 degrees F	1	NA	NA
			none >68 degrees F	none >68 degrees F
			NA	NA
Trichloroethene	Any Amount	2	NA	NA
			Material released	MW-18 = 280 ug/L
			NA	NA
Vinyl Chloride	Any Amount	2	NA	NA
			MW-12 = 230 ug/L	MW-18 = 180 ug/L
			+2 Points	**+2 Points**
Volatile fatty acids	> 0.1 mg/L	2	NA	NA
(Acetic Acid)			none detected	none detected
			NA	NA
TOTAL POINTS			**20 Points**	**15 Points**

NOTES:
^ - MW-12, MW-13, MW-14 and GB-20 were wells within most contaminated shallow zone (GW = ground water)
^^ - MW-18, MW-20, MW-21I, and MW-22 were wells within most contaminated intermediate zone (GW = ground water)
NA - not applicable
NC - cannot be calculated using the nomograph evaluation method due to high TDS
* - calculated by taking mean of MW-16, MW-17, and MW-19 (data from DGI Report, 2004)
** - calculated by taking mean of MW-2, MW-3, MW-4, MW-5, and MW-6 (data from DGI Report, 2004)
*** - based on an anomaly in calculated free carbon dioxide at these points in comparison to the other points using the nomograph evaluation method

TABLE 4-1
EVALUATION OF POTENTIAL REMEDIAL TECHNOLOGIES
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

TECHNOLOGY	DESCRIPTION	ABILITY TO MEET RAOs*	EFFECTIVENESS	IMPLEMENTABILITY	Technology Carried Forward?
Sub-Slab Depressurization	This technology involves the installation of subsurface piping to collect soil gas. The collected vapors are then transferred to the atmosphere through emission controls, if needed. The sub-slab depressurization system utilizes a blower and controls to create vacuum	This technology meets the following RAOs: SRAO3	Sub-slab depressurization is effective in collecting soil gas from beneath slabs. Systems of this type have been used for years to mitigate intrusion of radon gas into enclosed structures.	Due to the compact nature of these systems, installation and their use at the Site Building(currently in use) would be implementable as the first floor has enough space to fit the compact footprint required for SSD. Portions of the System Interim Remedial Measure can be used for this system.	Yes
Low Vacuum Enhanced, DNAPL Recovery	This technology involves the installation of a series of recovery wells or trenches. DNAPL pumping may be accomplished with one or two pumps. In the single pump confiuration, one pump withdraws both water and NAPL. The dual-pump configuration uses one pump located below the water table to remove ground water and a second located in the NAPL layer to recover NAPL. DNAPL recovery is augmented by application of low flow vacuum, which involves installation of an air compressor and associated piping and off-gas treatment.	This technology meet the following RAOs: SRAO2, SRAO 3, GWRAO1, GWRAO2, and GWRAO3	Low-vacuum enhancement is effective in augmenting free product recovery. This is a fll-scale technology that has been used for years in free product recovery. Aqueous and DNAPL wastes are stored and sent off-Site for disposal. Off-gas treatment is accomplished via a variety of applicable techniques.	This technology is currently being implemented as an IRM at the Site (Varnish Pit Area), with the use of vapor condensation and G-AC polishing for off-gas treatment.	Yes
Institutional Controls	This technology involves filing a deed restriction on the Site limiting the Site use to Commercial Use, creation of a Site Management Plan to guide future excavation activities where appropriate and remedial technology O&M activities. This technology would also rely on existing State Sanitary code restrictions for the installation of water supply wells in areas served by public water supply.	This technology meets the following RAOs: SRAO1 and GWRAO1	This technology would need to be used in conjunction with other technologies to be effective	This technology is readily implementable	Yes
Soil Excavation	This technology involves the excavation of the grossly affected soil identified in the Former Varnish UST Area. Soil excavation cannot be conducted to address affected soil beneath the Site building (Varnish Pit Area) as the facility is currently active.	This technology meets the following RAOs: SRAO1, SRAO2 and SRAO3	Based on the satisfactory results from the soil excavation IRM conducted at the GB-10/Former Storage Drum Area, soil excavation at the Former Varnish UST Area would also be an effective technology.	Soil excavation would require clearing of the area and mobilization of heavy equipment. There are no space constraints at the Site that prevent mobilization of heavy equipment. This technology can be implemented in the Former Varinish UST Area, although the excavation would be limited by the building wall and foundation. However, this technology would not be applicable to the Varnish Pit area as it would entail active excavation of a large area in an active building.	Yes
Monitored Natural Attenuation	Relies on natural processes to breakdown ground water contaminants. Natural attenuation processes include physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce mass, toxicity, mobility, volume or concentration of contaminants in ground water. These processes include biodegradation, dispersion, dilution, sorption, valatilization, and chemical or biological stabilization, transformation, or destruction of contaminants. Ground water samples are collected to track contaminants trends and breakdown byproducts to monitor progress of natural attenuation processes.	This technology meets the following RAOs: GWRAO1, and GWRAO2	Available quarterly monitoring data indicate that conditions for biodegradation of VOCs in shallow and intermediate overburden ground water are appropriate. Once the source areas (Former Varnish UST Area soil and Varnish Pit area DNAPL) have been addressed, natural attenuation processes will continue to reduce mass and may achieve the remedial goals.	MNA is readily implementable. Demonstration of MNA requires significant sampling frequency and parameters, which is currently underway at the site.	Yes
In-Situ Thermal Treatment	This technology mobilizes volatile chemicals through soil and ground water by applying heat. The heated chemicals are mobilized toward underground wells where they are collected and piped to the ground surface where they can be treated above ground by one of the many treatment methods available. Several in-situ thermal treatment technologies include steam injection forces or injects steam underground through wells drilled in the affected area hot water injection also (similar to steam injection except that hot water is injected through the wells instead of steam) electrical resistance heating (delivers an electric current underground through wells made of steel), and radio frequency heating (typically involves placing an antenna that emits radio waves in a well).	This technology meets the following RAOs: SRAO1-3, and GWRAO1-3	In-Situ thermal treatment technologies such as Electrical Resistance Heating (ERH) have been successfully employed at several locations in recent years achieving >90% reduction of VOC mass in short period of operation (4-6 months). Static Resistivity testing results using Site soil (i.e. bench-scale testing) indicate that ERH can effectively remove VOCs at the Former Varnish UST Area and the Varnish Pit Area (Appendix D).	In-Situ thermal Treatment would require moderate earthwork and mobilization of drilling equipment. There are no space constratints that prevent such work in the Former Varnish UST Area. This technology could be implemented in the Varnish Pit Area (inside the active building) only to a limited extent as it requires moderate disruption and earthwork (fundamentally drilling).	Yes

(*) **Soil RAOs**

SRAO1 - Prevent ingestion, direct contact, and/or inhalation of/with soil that exceeds applicable SCGs;
SRAO2 - Prevent inhalation of or exposure to COPCs volatilizing from soil that poses risk to public health and the environment given the intended use of the Site; and
SRAO3 - Prevent the potential for vapor intrusion into indoor air, if applicable.

(*) **Ground water RAOs**

GWRAO1 - Prevent exposure to contaminated groundwater that poses risk to public health and the environment given the intended use of the Site;
GWRAO2 - Prevent or minimize further migration of the contaminant plume (plume containment).
GWRAO3 - Prevent or minimize further migration of contaminants from source materials to ground water (source control).

TABLE 5-1
EVALUATION OF COMPLIANCE WITH STANDARDS, CRITERIA, AND GUIDELINES
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

CITATION	DESCRIPTION	TYPE	ALTERNATIVES			MANNER OF COMPLIANCE
			1	2	3	
STANDARDS AND CRITERIA (1)						
6 NYCRR Part 364	Waste Transporter Permits	Action	--	✓	✓	Alternatives 1, and 2 would include removal of Site soil and DNAPL that is a listed hazardous waste or a potentially characteristic hazardous waste. Under these alternatives, any hazardous waste generated would be transported using permitted hazardous waste transporters. All wastes will be properly contained during transport so as to prevent leaking, blowing or any other type of discharge into the environment. All hazardous waste shipments would be manifested in compliance with all applicable requirements of NYCRR Part 372. No listed hazardous waste or a potentially characteristic hazardous waste would be generated under Alternatives 1.
6 NYCRR Part 370 through 373	Hazardous Waste Management Regulations	Action, Chemical	--	✓	✓	As noted above, hazardous and potentially hazardous waste is present at the Site in the form of soil and DNAPL. Under Alternatives 1 and 2, hazardous waste would be removed. All removed hazardous waste would be managed under regulations for generator notification, identification, and manifesting. This SCG would not apply to alternatives that do not remove hazardous waste.No listed hazardous waste or a potentially characteristic hazardous waste would be generated under Alternatives 1.
6 NYCRR Part 376	Land Disposal Restrictions	Action, Chemical	--	✓	✓	As noted above, hazardous and potentially hazardous waste is present at the Site in the form of soil and DNAPL. Under Alternatives 2 and 3 hazardous waste would be removed. If feasible, all characteristic hazardous waste would be treated on-site to meet the applicable universal treatment standards prior to off-site land disposal. No listed hazardous waste or a potentially characteristic hazardous waste would be generated under Alternatives 1.
6 NYCRR Part 375-3,6	Brownfield Cleanup Program and Soil Cleanup Objectives	Action, Chemical	NC	✓	✓	Alternative 2 and 3 comply with this standard as both alternatives include remedial technologies that will be protective of the human health and enviroment. In both alternatives the selection of a remedy will take into account the current, intended, and reasonably anticipated future land uses of the site and its surroundings. Track 1 Unrestricted Soil Cleanup Objectives will be used to assess areas where restrictions will be used and Track 2 Restricted Commercial Soil Cleanup Objectives will be used to assess remedial needs for Site soil. Alternative 1 would not be protective of the human health and the environment.
OSHA; 29 CFR 1910	Guidelines/Requirements for Workers at Hazardous Waste Sites (Subpart 120) and Standards for Air Contaminants (Subpart 1).	Action	--	✓	✓	All alternatives will include preparation and implementation of a HASP that will address the requirement of this regulation.
OSHA; 29 CFR 1926	Safety and Health Regulations for Construction	Action	--	✓	✓	The HASP prepared for the alternatives will include provisions for construction safety.
Guidelines (1)						
TAGM HWR-94-4046	Determination of Soil Cleanup Objectives and Cleanup Levels	Chemical	NC	✓	✓	This guidance document will be used to evaluate the effectiveness of remedial actions, to identify excavated soils that may be used as backfill in Alternative 2, and to indetify source areas, however, since the clean-up objective for soil is to removal grossly contaminated soil, compliance with this guideline as it relates to soil clean-up objectives would not be applicable to Alternative 2 and 3.
NYSDOH Community Air Monitoring Plan for Intrusive Activities	Requirements real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust)	Action, Chemical	--	✓	✓	Air monitoring conducted during intrusive activities will address the requirements of this document. Fugitive dust and particulate suppression controls will be employed, if necessary.
NYSDOH Guidance for Evaluating Soil Vapor Intrusion	Guidance in identifying and addressing existing and potential human exposures to contaminated subsurface vapors associated with known or suspected VOCs contamination	Action, Chemical	NC	✓	✓	Alternatives 2 and 3 include an air monitoring program to assess and monitor potential for vapor intrusion and incorporate operation of a sub-slab depressurization system to address potential harmful vapors emanating from site soil inside the building.
NYSDEC TOGS 1.1.1	Ambient Water Quality Standards and Guidance Values	Action, Chemical	NC	✓	✓	Alternative 2 and 3 comply with this guideline as both alternatives include technologies that address all groundwater RAOs by addressing source removal and monitoring of natural attenuation processes.
To Be Considered (TBCs) (2)						
NYSDEC *Draft* DER-10	Technical Guidance for Site Investigation and Remediation	Action	NC	✓	✓	Development of remedial goals, objectives and alternatives conducted in accordance with this draft document, remedial design and O&M would address the requirements of this document once finalized.
EPA Region III Risk Based Concentration Tables (RBCs), Industrial/Commercial	Risk-based concentrations for contaminants in soil at industrial sites	Chemical	NC	✓	✓	Alternatives 2 and 3 incorporate a Site Management Plan. Thi guidance will be considered in the development of the Site Management Plan. Alternative 1 does not encompass a Site Management Plan.

Notes:

Alternatives
1: No Action
2: Excavation and Off-Site Disposal, SSD System, DNAPL DPE system and MNA
3: In-Situ Thermal Treatment, SSD System, DNAPL DPE system and MNA

(1) Standards and Criteria were obtained from NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.
(2) Guidance were obtained from NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.
(3) TBCs are defined in this report as regulations and guidance documents that are not identified NYSDEC Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 2002.
✓ Alternative complies with this SCG.
NC Alternative does not comply with this SCG.
PC Alternative partially complies with this SCG. See manner of compliance column and FS text for additional detail.
-- SCG is not applicable to this alternative.

GLOSSARY OF ACRONYMS

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Code of Rules and Regulations
OSHA	Occupational Safety and Health
SCG	Standards, Criteria and Guidance
TBC	To Be Considered Information
USEPA	U. S. Environmental Protection Agency
DER	Division of Environmental Remediation

TABLE 5-2
COMMON ACTION NO. 1 - AIR MONITORING PROGRAM AND
SUBSLAB DEPRESURIZATION (SSD)
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

ITEM	Units	Unit Cost	Quantity	Cost	Ref
CAPITAL COSTS					
Equipment Purchasing: Blower sensors, gauges, carbon drums	ls	$ 70,000	1	$ 70,000	1
Piping, connections, floor penetrations/seals	ls	$ 35,000	1	$ 35,000	1
Contractor Labor and Expenses	ls	$ 40,000	1	$ 40,000	1
Indoor Air Sampling Program Work Plan Preparation	ls	$ 15,000	1	$ 15,000	1
Indoor Air Sampling	ls	$ 25,000	1	$ 25,000	1
Subtotal Common Action Capital Costs				$ 185,000	
Project Management (8%)				$ 14,800	
Mobilization/demobilization (10%)				$ 9,250	
Construction Management (10%)				$ 18,500	
Design and Reporting (15%)				$ 27,750	
Contingency (15%)				$ 27,750	
Total Common Action No. 1 Capital Cost				**$ 283,050**	
LONG TERM COST					
SSD Operation and Maintenance and Air Monitoring (annual costs)					
Equipment parts and manpower maintenance	yr	$ 30,000	1	$ 30,000	1
Electrical usage	yr	$ 10,000	1	$ 10,000	1
Annual Air Monitoring	yr	$ 20,000	1	$ 20,000	2
Off-gas treatment changeout and disposal	yr	$ 7,000	1	$ 7,000	1
Annual Operation and Maintenance Cost				**$ 67,000**	
Operation and Maintenance Cost Present Value (10 yr, 2% inflation, 7% discount rate)				**$ 517,356**	

Notes
1 ERM estimate based on prior experience with comparable tasks
2 Assuming two (2) indoor air sample, one (1) background air sample, two (2) soil gas property boundary samples, two (2) subslab soil gas samples and two (2) off-gas treatment air samples

TABLE 5-3
REMEDIAL ACTION ALTERNATIVE 2 - EXCAVATION AND OFF SITE DISPOSAL OF SOIL
WITH MONITORED NATURAL ATTENUATION OF GROUND WATER
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Item Description	Units		Unit Cost	Quantity		Cost	Ref
PREVIOUSLY INCURRED COSTS (IRMs)							9
Common Acton No. 2 - Excavation IRM	ls	$	1,168,812	1	$	1,168,812	8
Common Action No. 3 - DNAPL Recovery Sytem IRM	ls	$	425,000	1	$	425,000	8,11
CAPITAL COSTS							
Excavation of Impacted Soil in the Former Varnish UST Area							
Insurance	ls	$	12,650	1	$	12,650	1
Confirmatory Sampling - Soil	samples	$	292	10	$	2,915	1
Confirmatory Sampling - Water	samples	$	292	5	$	1,458	1
Install Excavation Controls	ls	$	314,105	1	$	314,105	1
Structural Eng. Oversight	hr	$	715	90	$	64,350	1
Excavation ("Clean" Soil)	CY	$	33	800	$	26,400	3
Excavation (Affected Soil)	CY	$	39	1285	$	49,473	3
Loading (Affected Soil)	CY	$	12	1285	$	14,842	3
Dewatering	gal	$	138	80	$	11,000	1
Temp. Services	ls	$	24,200	1	$	24,200	1
Seed & Straw	sf	$	0	12000	$	4,620	1
Health & Safety	hr	$	165	90	$	14,850	2
Expenses, Surveying, Equipment Rental	ls	$	121,092	1	$	121,092	1
Transportation and Off-Site Disposal of Excavated Soil							
Insurance	ls	$	11,000	1	$	11,000	1
10,000-gallon Frac Cont.	ls	$	3,960	1	$	3,960	1
Lab - Soil	samples	$	292	10	$	2,915	1
Lab - Ground Water	samples	$	292	5	$	1,460	1
Liquid T&D	gal	$	0.72	30000	$	21,450	1
Haz Soil T&D	tons	$	209.00	1500	$	313,500	3
Non-Haz Soil T&D	tons	$	57	500	$	28,600	3
Backfill and Site Restoration	ls	$	39,600	1	$	39,600	1
Preparation of Site Management Plan (SMP)	ls	$	15,000	1	$	15,000	2
Common Action No.1 - SSD	ls	$	283,050	1	$	283,050	4
Common Action No. 3 - DNAPL Recovery Sytem IRM				1			
Additional DNAPL Recovery	ls	$	1,020,762	1	$	1,020,762	10
Institutional Controls (Deed Restriction)	ls	$	15,000	1	$	15,000	2
				Grand Total	$	2,418,251	
				Mobilization/Demobilization (5%)	$	120,913	5
				Project Management (6%)	$	145,095	5
				Remedial Design (12%)	$	290,190	5
				Construction Management (8%)	$	193,460	5
				Reporting (4%)	$	96,730	5
				Contingency (10%)	$	241,825	5
				Total Remedial Action Capital Costs	***$***	***5,100,276***	

TABLE 5-3 (Continued)
REMEDIAL ACTION ALTERNATIVE 2 - EXCAVATION AND OFF SITE DISPOSAL OF SOIL
WITH MONITORED NATURAL ATTENUATION OF GROUDWATER
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

LONG TERM O&M COSTS							
SSD Operation and Maintenance and Air Monitoring (annual costs)							
Equipment parts and manpower maintenance	yr	$	30,000	1	$	30,000	2
Electrical usage	yr	$	10,000	1	$	10,000	2
Air Monitoring	yr	$	20,000	1	$	20,000	6
Off-gas treatment changeout and disposal	yr	$	7,000	1	$	7,000	2
Annual SSD O&M Costs					$	67,000	
Operation and Maintenance Cost Present Value (10 yr, 2% inflation, 7% discount rate)					**$**	**517,356**	
Maintain Engineering Controls	ls	$	38,609	1	**$**	**38,609**	2
Deed restriction certification, negotiations, meetings during 10 years from 2007, $5,000 per year, 2% inflation rate, 7% discount rate)							
Site Management Plan Implementation	ls	$	19,174	1	**$**	**19,174**	2
Prepare and conduct SMP work in Year 3, and 12 ($15,000 Year 3 efforst, $10,000 for subsequent efforts, 2% inflation, 7% discount rate)							
Ground Water Sampling and Reporting (Monitoring Natural Attenuation, MNA)							
Quarterly monitoring and reporting for 4 years.Analysis of Site COPC parameters, natural attenuation parameters and ethene, ethane, methane annually ($80,000 per year, 2% inflation, 7% dicount rate)	ls	$	283,676	1	$	283,676	7
Annual monitoring subsequently for 8 years for Site COPC parameters, and natural attenuation parameters ($40,000 per year, 2% inflation, 7% dicount rate)	ls	$	212,692	1	$	212,692	7
Subtotal MNA Present Value					**$**	**496,368**	
Total Present Value of Long Term Operation and Maintenance Costs					***$***	***1,071,507***	
TOTAL PRESENT WORTH OF COSTS					**$**	**6,171,782**	

Notes:
1 Estimate based on previous Site IRM excavation at the GB-10/Former Drum Storage Area (of similar characteristics)
2 ERM estimate based on prior experience with comparable tasks
3 Estimated grossly affected soil and "clean" soil excavation volume based EVS visualization software, historic soil boring data and prior excavation Site experience
4 See Table 6-2 Common Action No. 1 - SSD System Cost Breakdown
5 Recommended Percentages for Technical Services (USEPA, 2000)
6 Assuming two (2) indoor air sample, one (1) background air sample, two (2) soil gas property boundary samples, two (2) subslab soil gas samples and two (2) off-gas treatment air samples
7 One round of sampling includes sampling of 10 monitoring wells, average of $600 dollars per analytical sample, $4,000 in equipment rental, $5,000 in man power sampling and $5,000 for MNA evaluation and reporting
8 Approximate costs incurred through 30 May 2007. Portion of the Remedial Alternative already completed per the approved IRM (GB-10/FDSA excavation, and enhanced DPE system DNAPL extraction)
9 Incurred costs will not be used to calculate EPA recommended percentage based technical services amounts
10 Includes O&M costs , review and analysis of system performance, and decommissioning.
11 Costs incurred to date include project management, installation of Recovery Wells and Monitoring Wells, DNAPL Recovery Test Pilot, Pilot Test Report and DNAPL Recovery

TABLE 5-4
REMEDIAL ACTION ALTERNATIVE 3 - IN-SITU THERMAL TREATMENT OF SOIL WITH MONITORED NATURAL ATTENUATION OF GROUND WATER
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Item Description	Units	Unit Cost	Quantity	Cost	Ref
PREVIOUSLY INCURRED COSTS (IRMs)					10
Common Acton No. 2 - Excavation IRM	ls	$ 1,168,812	1	$ 1,168,812	8
Common Action No. 3 - DNAPL Recovery Sytem IRM	ls	$ 425,000	1	$ 425,000	8,12
			Total IRM Incurred Costs	$ 1,593,812	
CAPITAL COSTS					
In-Situ Thermal Treatment (ET-DSP) Cost Elements					
Insurance	ls	$ 12,650	1	$ 12,650	2
Confirmatory Sampling - Soil	samples	$ 292	10	$ 2,915	2
Confirmatory Sampling - Water	samples	$ 292	5	$ 1,458	2
Vendor Modeling and Remedial Design	ls	$ 10,385	1	$ 10,385	1
Acceptenace Testing	ls	$ 5,480	1	$ 5,480	1
Permitting	ls	$ 5,750	1	$ 5,750	1
System Installation	ls	$ 181,426	1	$ 181,426	1
Drilling - Electrodes	ft	$ 58	271	$ 15,583	1
Drilling - Extraction Wells	ft	$ 75	128	$ 9,568	1
Drilling - Sensor Wells	ft	$ 52	128	$ 6,624	1
Energy	kWh	$ 0	475000	$ 43,700	1
Operation and Maintenance	ls	$ 52,406	1	$ 52,406	1
Install DPE/MPE System	ls	$ 57,500	1	$ 57,500	1
Operation (5 months)	ls/month	$ 5,750	5	$ 28,750	1
Waste Disposal	ls	$ 5,750	1	$ 5,750	1
Site Restoration	ls	$ 10,000	1	$ 10,000	2
Health & Safety	hr	$ 200	90	$ 18,000	2
Health & Safety Expenses	ls	$ 5,000	1	$ 5,000	2
Preparation of Site Management Plan (SMP)	ls	$ 15,000	1	$ 15,000	2
Common Action No.1 - SSD	ls	$ 221,850	1	$ 283,050	2,4
Common Action No. 3 - DNAPL Recovery Sytem IRM					
Additional DNAPL Recovery	ls	$ 1,020,762	1	$ 1,020,762	11
Institutional Controls (Deed Restriction)	ls	$ 15,000	1	$ 15,000	2
			Grand Total	$ 1,806,755	
			Mobilization/Demobilization (5%)	$ 90,338	
			Project Management (6%)	$ 108,405	
			Remedial Design (12%)	$ 216,811	
			Construction Management (8%)	$ 144,540	
			Reporting (4%)	$ 72,270	
			Contingency (25%)	$ 451,689	9
			Total Remedial Action Capital Costs	***$ 4,484,620***	

TABLE 5-4 (Continued)
REMEDIAL ACTION ALTERNATIVE 3 - IN-SITU THERMAL TREATMENT OF SOIL WITH MONITORED NATURAL ATTENUATION OF GROUND WATER
GREIF FACILITY - TONAWANDA, NEW YORK
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

LONG TERM O&M COSTS							
SSD Operation and Maintenance and Air Monitoring (annual costs)							
Equipment parts and manpower maintenance	yr	$	30,000	1	$	30,000	2
Electrical usage	yr	$	10,000	1	$	10,000	2
Air Monitoring	yr	$	20,000	1	$	20,000	6
Off-gas treatment changeout and disposal	yr	$	7,000	1	$	7,000	2
Annual SSD O&M Costs					$	67,000	
Operation and Maintenance Cost Present Value (10 yr, 2% inflation, 7% discount rate)					**$**	**517,356**	
Maintain Engineering Controls	ls	$	38,609	1	**$**	**38,609**	2
Deed restriction certification, negotiations, meetings during 10 years from 2007, $5,000 per year, 2% inflation rate, 7% discount rate)							
Site Management Plan Implementation	ls	$	19,174	1	**$**	**19,174**	2
Prepare and conduct SMP work in Year 3, and 12 ($15,000 Year 3 efforst, $10,000 for subsequent efforts, 2% inflation, 7% discount rate)							
Ground Water Sampling and Reporting (Monitoring Natural Attenuation, MNA)							
Quarterly monitoring and reporting for 4 years.Analysis of Site COPC parameters, natural attenuation parameters and ethene, ethane, methane annually ($80,000 per year, 2% inflation, 7% dicount rate)	ls	$	283,676	1	$	283,676	7
Annual monitoring subsequently for 8 years for Site COPC parameters, and natural attenuation parameters ($40,000 per year, 2% inflation, 7% dicount rate)	ls	$	212,692	1	$	212,692	7
Subtotal MNA Present Value					**$**	**496,368**	
Total Present Value of Long Term Operation and Maintenance Costs					***$***	***1,071,507***	
TOTAL PRESENT WORTH OF COSTS					**$**	**5,556,127**	

Notes:
1 Estimate based on In-Situ Thermal Technology (ET-DSP) proposal provided by McMillan McGee for the Former Varnish UST Area
2 ERM estimate based on prior experience with comparable tasks.
4 See Table 6-2 Common Action No. 1 - SSD System Cost Breakdown
5 Recommended Percentages for Technical Services (USEPA, 2000)
6 Assuming two (2) indoor air samples, one (1) background air sample, two (2) soil gas property boundary samples, two (2) subslab soil gas samples and two (2) off-gas treatment air samples
7 One round of sampling includes sampling of 10 monitoring wells, average of $600 dollars per analytical sample, $4,000 in equipment rental, $5,000 in man power sampling and $5,000 for MNA evaluation and reporting
8 Actual costs incurred through 26 February 2006. Portion of the Remedial Alternative already completed per the approved IRM (GB-10/FDSA excavation, and enhanced DPE system DNAPL extraction)
9 Contingency estimated at 25% to cover costs for implementation of either ET-DSP, RFH, ERH or comparable technologies
10 Incurred costs will not be used to calculate EPA recommended percentage based technical services amounts
11 Includes O&M costs , review and analysis of system performance, and decommissioning.
12 Costs incurred to date include project management, installation of Recovery Wells and Monitoring Wells, DNAPL Recovery Test Pilot, Pilot Test Report and DNAPL Recovery

Appendix A
Exposure Assessment Tables

APPENDIX A, TABLE 1
COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO VARIOUS SOIL CLEANUP CRITERIA
GREIF BROS. FACILITY - TONAWANDA, NY
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

VOLATILE ORGANICS	**Maximum Concentration (ug/kg)**	**GW Protection Criteria (ug/kg)**	**NYSDEC Residential Contact Criteria (ug/kg)**	**Industrial Direct Contact Criteria (1) (ug/kg)**
Acetone	7300	**74**	8000000	-
2-Butanone	2400	**152**	4000000	-
1,1-Dichloroethane	4300	**101**	NA	-
1,2-Dichloroethane	240	**47**	7700	-
1,1-Dichloroethene	11000	**219**	12000	-
1,2-Dichloroethene (Total)	48000	**199**	2000000	-
Ethylbenzene	46000	**3713**	8000000	-
Tetrachloroethene	19000	**935**	14000	-
Toluene	380000	**1013**	20000000	-
1,1,1-Trichloroethane	250000	**513**	7000000	-
Trichloroethene	4000000	**425**	**64000**	**520000**
1,2,4-Trimethylbenzene	1100000	**8741**	NA	**-**
Xylenes (total)	2900000	**810**	200000000	-
SEMI-VOLATILE ORGANICS				
Benzo(a)anthracene	22000	**3000**	**224**	**7800**
Benzo(a)pyrene	21000	**11000**	**61**	**780**
Benzo(b)fluoranthene	27000	**1361**	NA	-
Benzo(k)fluoranthene	13000	**1361**	NA	-
Chrysene	22000	**495**	NA	-
Fluoranthene	79000	**50000**	3000000	-
Naphthalene	19000	**16088**	300000	-

NOTES:

- ug/kg = micrograms per kilogram
- NA = None available
- **bold type and pattern indicates the maximum detected concentration exceeds the criterion**
- (1) Source: USEPA Region III RBCs (USEPA, 2001); listed for compounds that exceed residential criteria.

APPENDIX A, TABLE 2
VOCs DETECTED IN GROUND WATER
GREIF BROS. FACILITY - TONAWANDA, NY
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

CHEMICAL	MAXIMUM DETECTED CONCENTRATION	NYSDEC STANDARD OR GUIDANCE VALUE*
Units (ug/l)		
Acetone	**3300**	50
Benzene	**620**	1
2-Butanone (MEK)	**1700**	50
Carbon disulfide	10	60
Chloroethane	**1300**	5
Chloroform	**190**	7
cis-1,2-Dichloroethene	**7000**	5
1,1-Dichloroethane	**8300**	5
1,2-Dichloroethane	**960**	0.6
1,1-Dichloroethene	**25000**	5
1,2-Dichloroethene (Total)	**3000**	5
Ethylbenzene	**2100**	5
Methylene Chloride	**19**	5
4-Methyl-2-pentanone	**130**	50
Styrene	54J	5
Tetrachloroethene	**71**	5
Toluene	**8200**	5
trans-1,2-Dichloroethene	**84**	5
1,1,1-Trichloroethane	**220000**	5
1,1,2-Trichloroethane	**150**	1
Trichloroethene	**210000**	5
1,2,4-Trimethylbenzene	**1200**	5
Vinyl chloride	**550**	2
Xylenes (total)	**9100**	5

NOTES:

- ug/l = micrograms per liter
- White font in black background indicates exceedance of NYSDEC Standards or Guidance Values
- * From NYSDEC Division of Water Technical and Operational Guidance Series Memorandum 1.1.1

Appendix B
NYSDEC Correspondence

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

Denise M. Sheehan
Commissioner

Project No. 0017521
Order Name "CORRESPONDENCE"
Sent by (JSF)

December 27, 2005

Mr. Peter H. Gruene
Palmetto Environmental Management Solutions, LLC
1421 Winyah Way
Hartsville, South Carolina 29550

Dear Mr. Gruene:

Greif Bros. Facility Site #V-00334-9
Soil Excavation Interim Remedial Measure
Substantial Completion
Soil Boring GB-10/Former Drum Storage Area
Town of Tonawanda, Erie County

The New York State Department of Environmental Conservation (NYSDEC) staff along with representatives of your consultant ERM and contractor Pinto Construction performed a final site inspection on December 22, 2005. This inspection determined that the Soil Boring GB-10/Former Drum Storage Area phase of the approved IRM work plan has been substantially completed. The following items were identified as required to complete this phase of the IRM:

- Restoration of disturbed areas to the satisfaction of Greif Bros, and

- Installation of the groundwater monitoring well(s) as indicated in the approved work plan.

This substantial completion determination applies solely to the Soil Boring GB-10/Former Drum storage area phase of the approved work plan. The Varnish Pit/Short Truck Bay IRM DNAPL recovery phase is still ongoing and completion of this phase of the approved IRM work plan is dependent on the DNAPL recovery progress. The third IRM area, Former Varnish UST , was removed from the approved IRM work plan and will be evaluated as part of the feasibility study for the site.

Therefore, in accordance with Section 6 of the approved work plan, an IRM Report documenting the work performed in completing the Soil Boring GB-10/Former Drum Storage Area phase shall be prepared and identified as an interim report. The information regarding the Varnish Pit/Short truck Bay DNAPL phase shall be added to the IRM Report after the DNAPL and vapor phase removal are determined to be complete.

This Interim IRM Report for the Soil Boring GB-10/Former Drum Storage Area shall be submitted no later than March 31, 2006.

If you have any questions, please contact me at (716)851-7220.

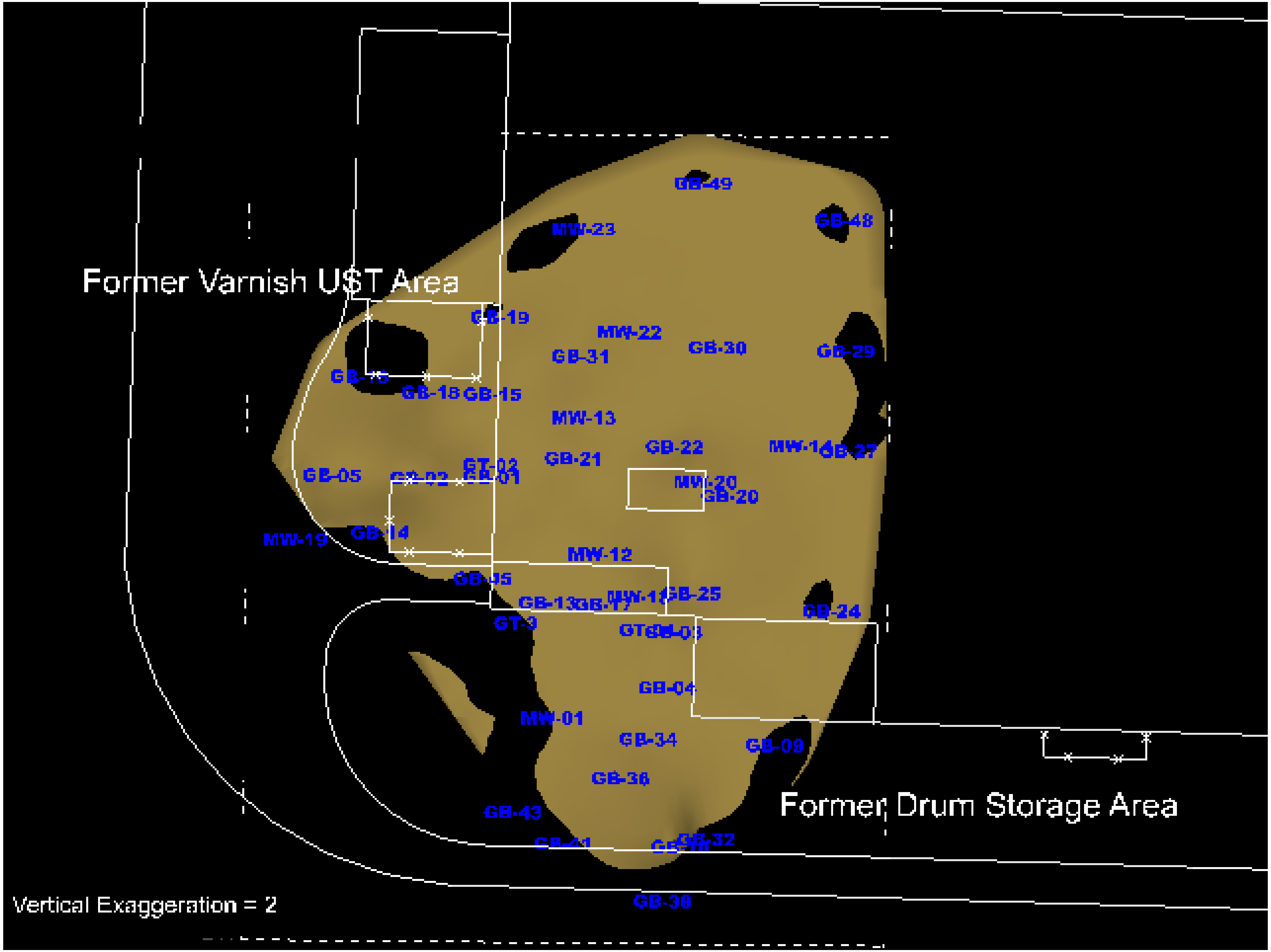
Sincerely,

Michael J. Hinton P.E.
Division of Environmental Remediation

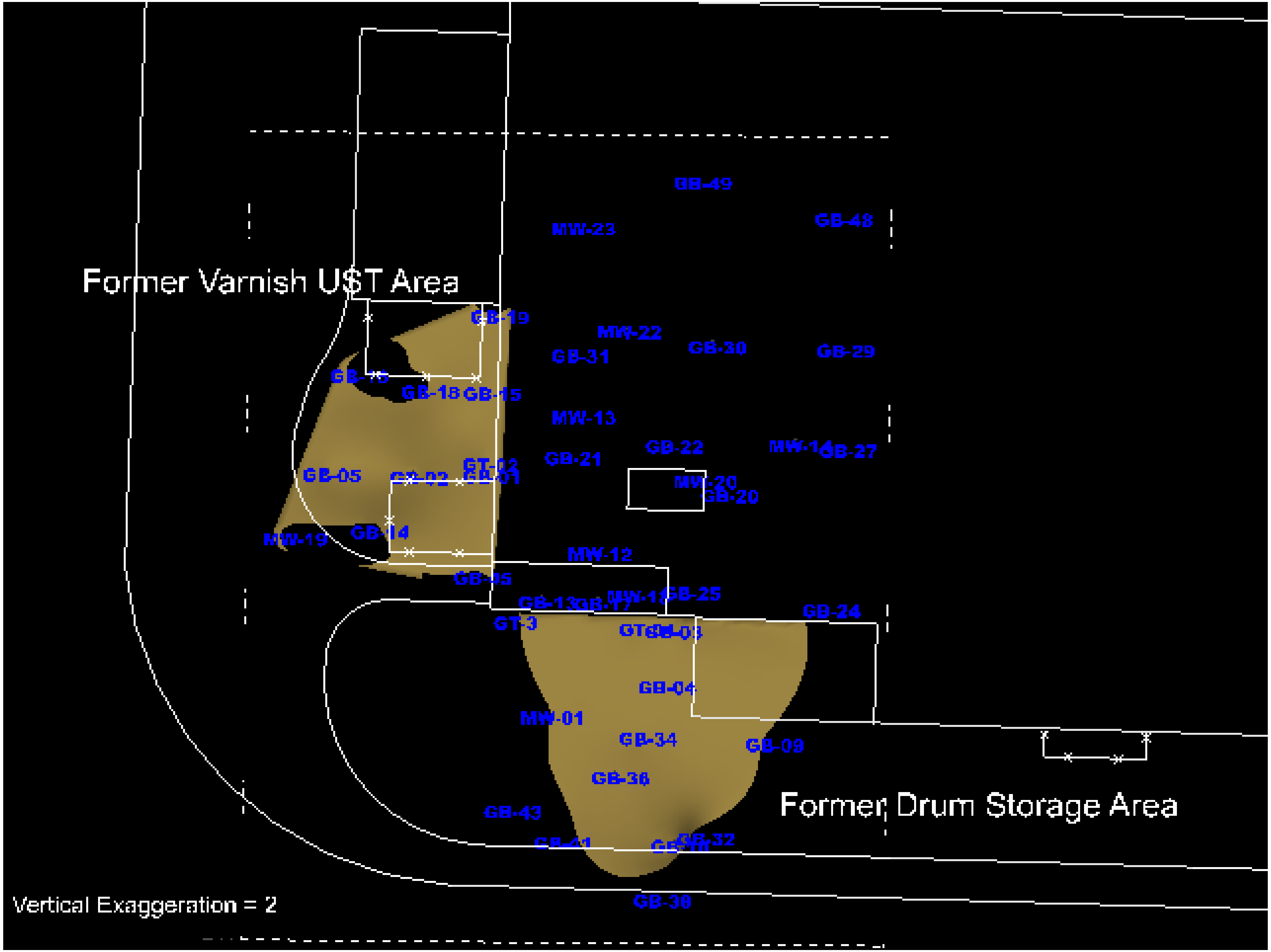
//ms

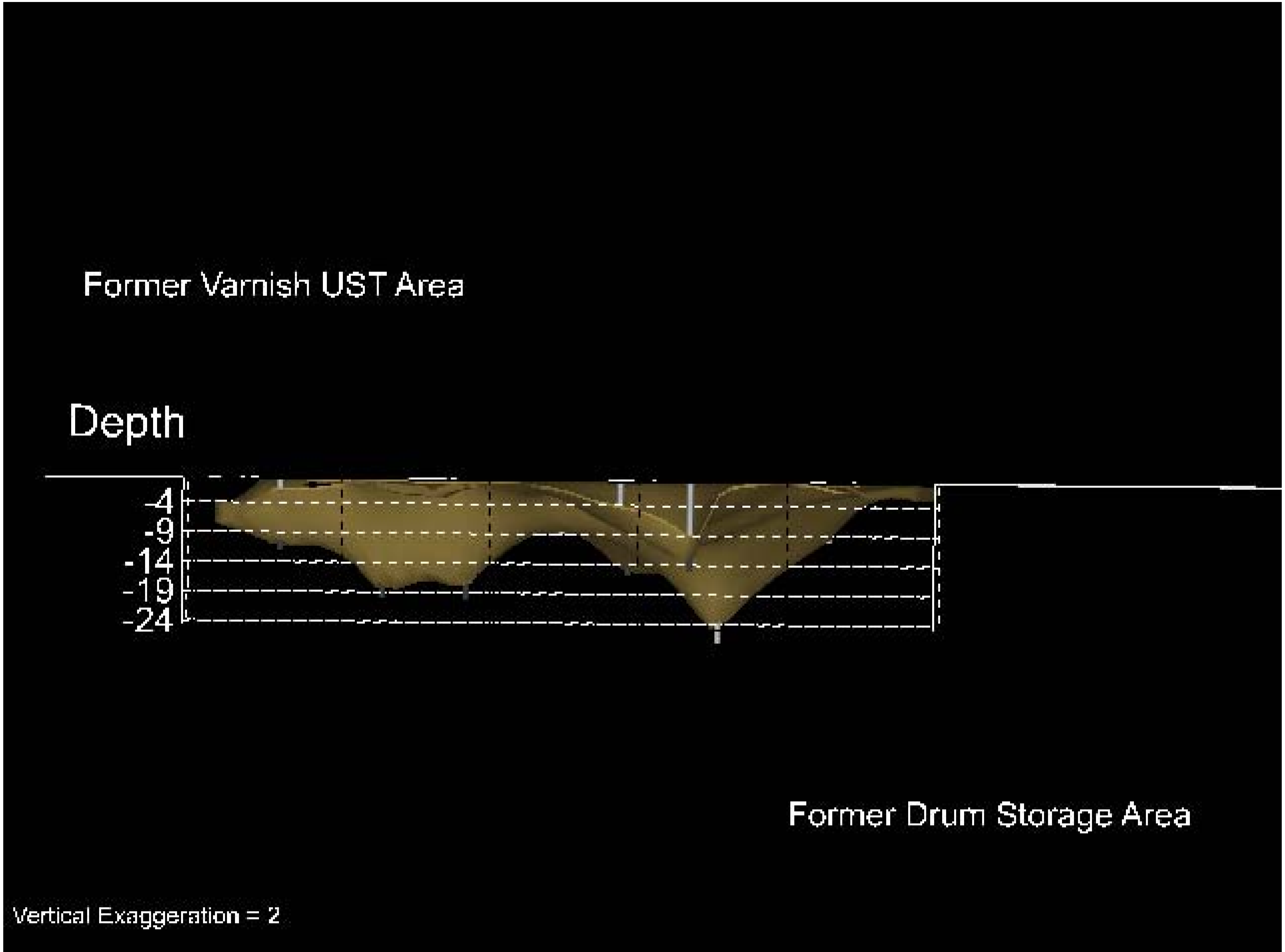
cc: Mr. Gregory Sutton, Division of Environmental Remediation
Mr. Joseph Ryan, Esq., Division of Environmental Enforcement
Mr. Matthew Forcucci, New York State Department of Health
Mr. Mark VanValkenburg, New York State Department of Health
Mr. Jon Fox, Environmental Resources Management
Mr. Robert Powell, Sonoco Products Company

Appendix C
EVS Depictions

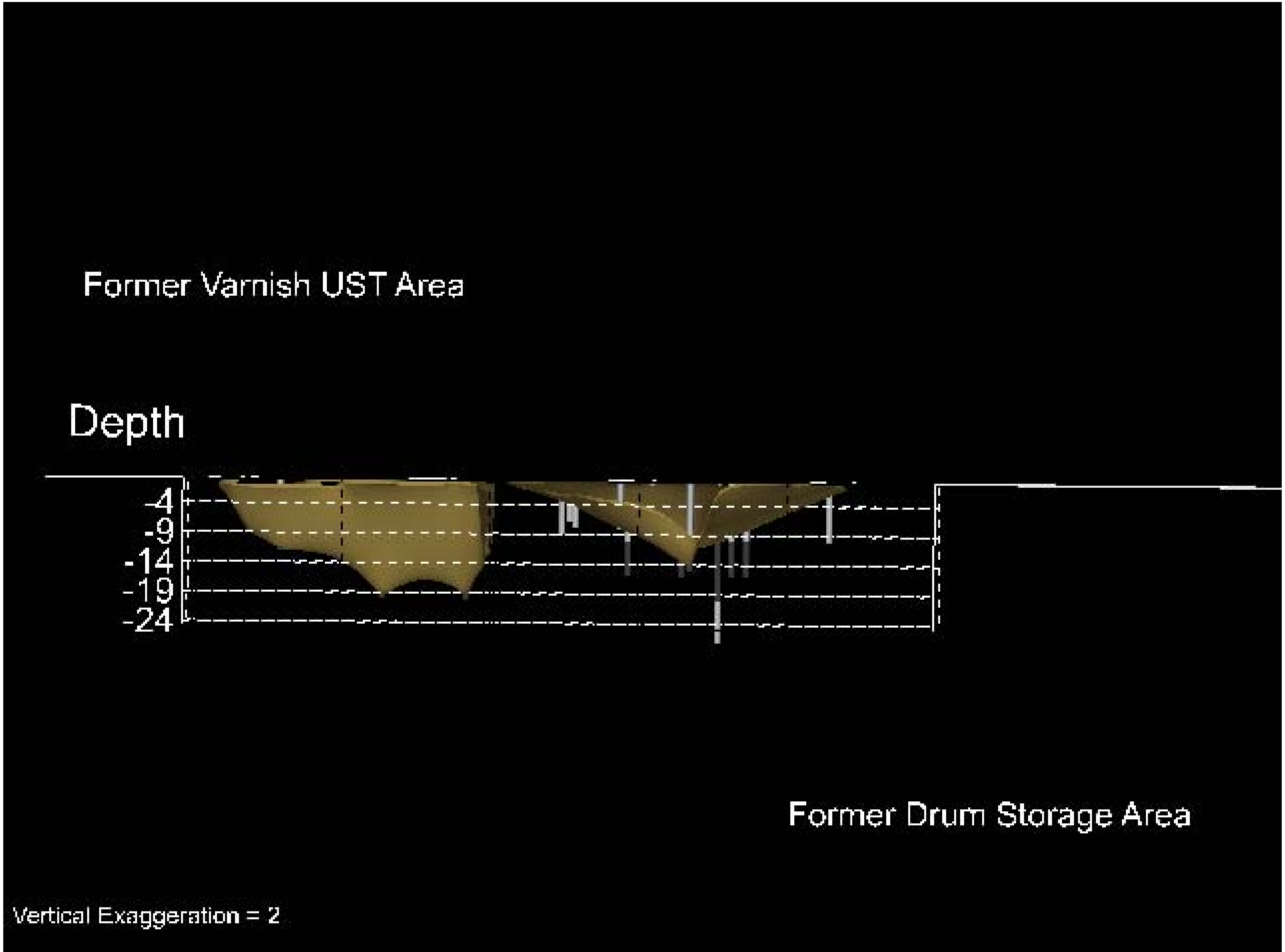


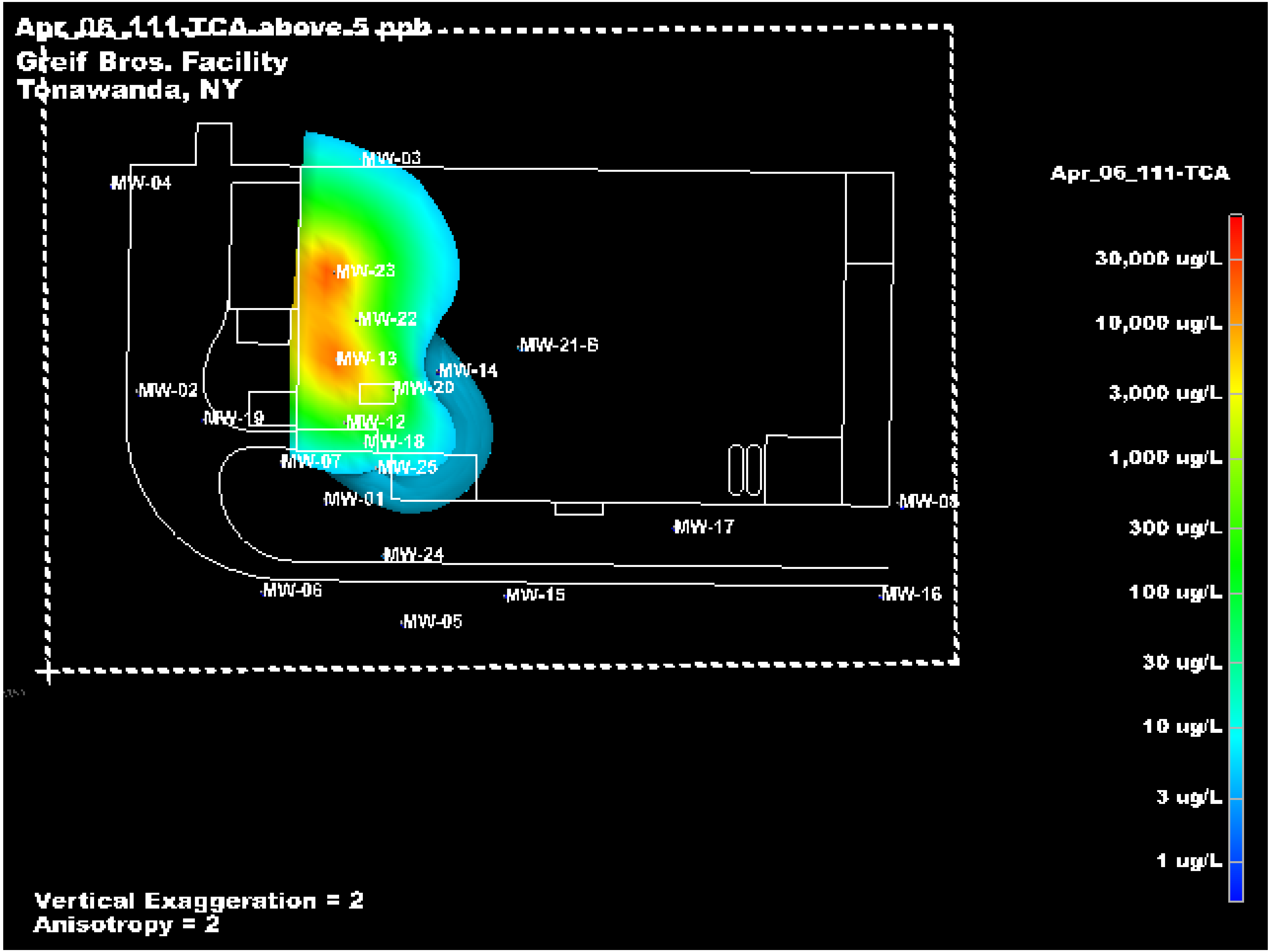
6/8/2007 1:22:57 PM


Former Varnish UST Area
Former Drum Storage Area
Vertical Exaggeration = 2
GB-49
GB-48
MW-23
GB-19
MW-22
GB-30
GB-29
GB-31
GB-18
GB-15
MW-13
GB-22
MW-14
GB-27
GB-21
GB-05
MW-20
GB-20
MW-19
GB-14
MW-12
GB-25
GB-24
GT-3
GB-04
MW-01
GB-34
GB-09
GB-43
GB-32
GB-38

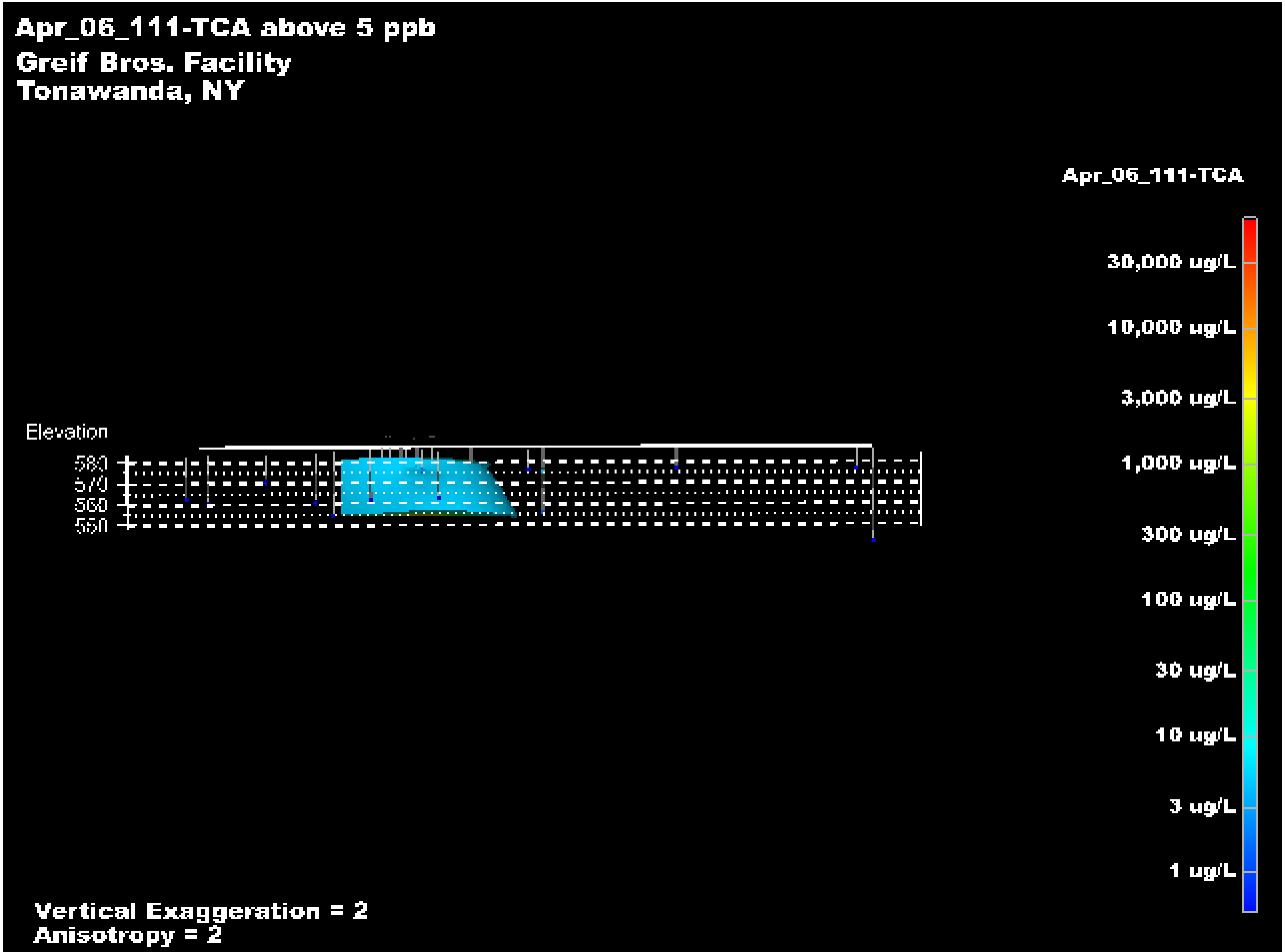


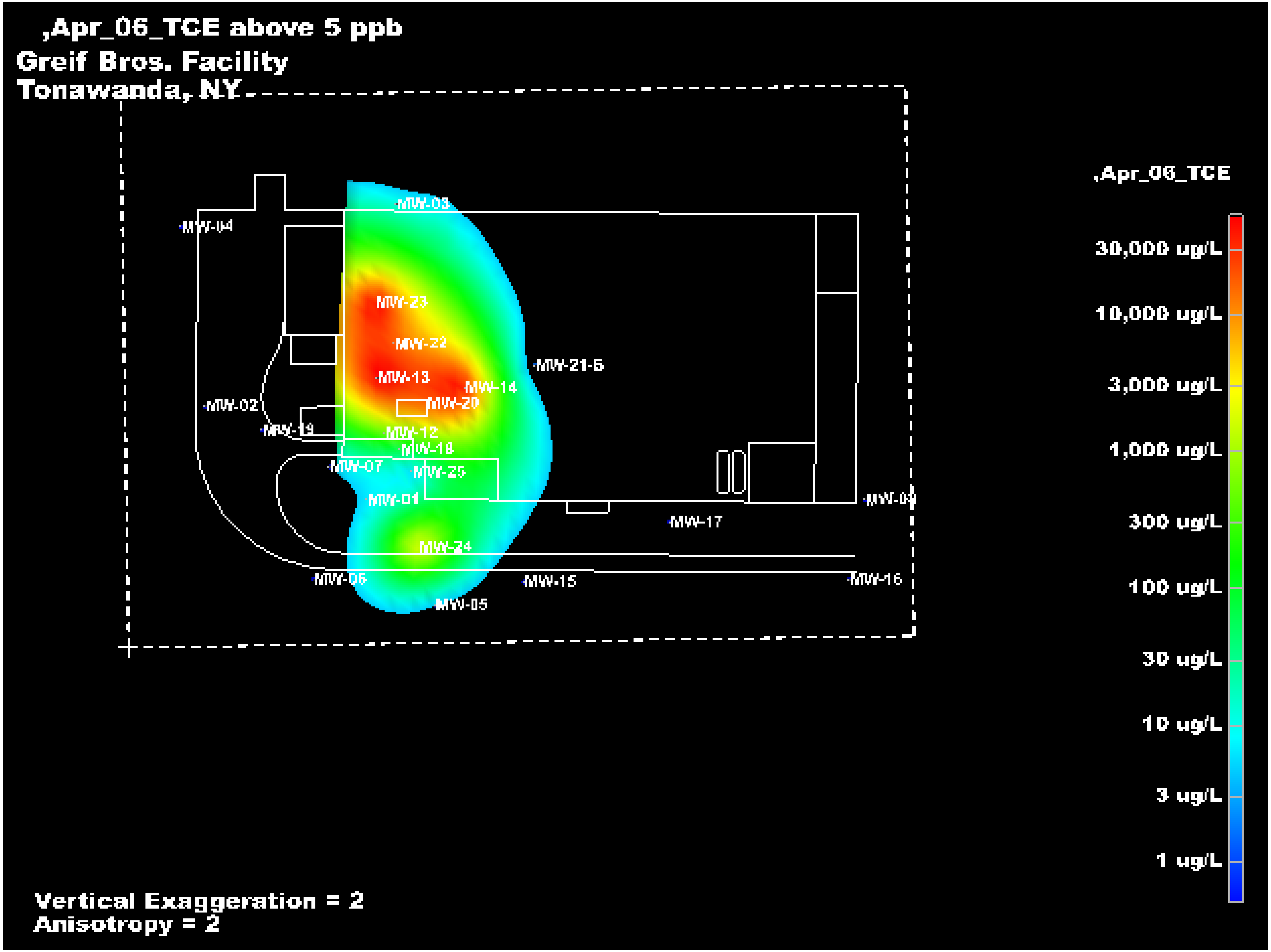
6/8/2007 1:25:15 PM


Former Varnish UST Area
Depth
-4
-9
-14
-19
-24
Former Drum Storage Area
Vertical Exaggeration = 2

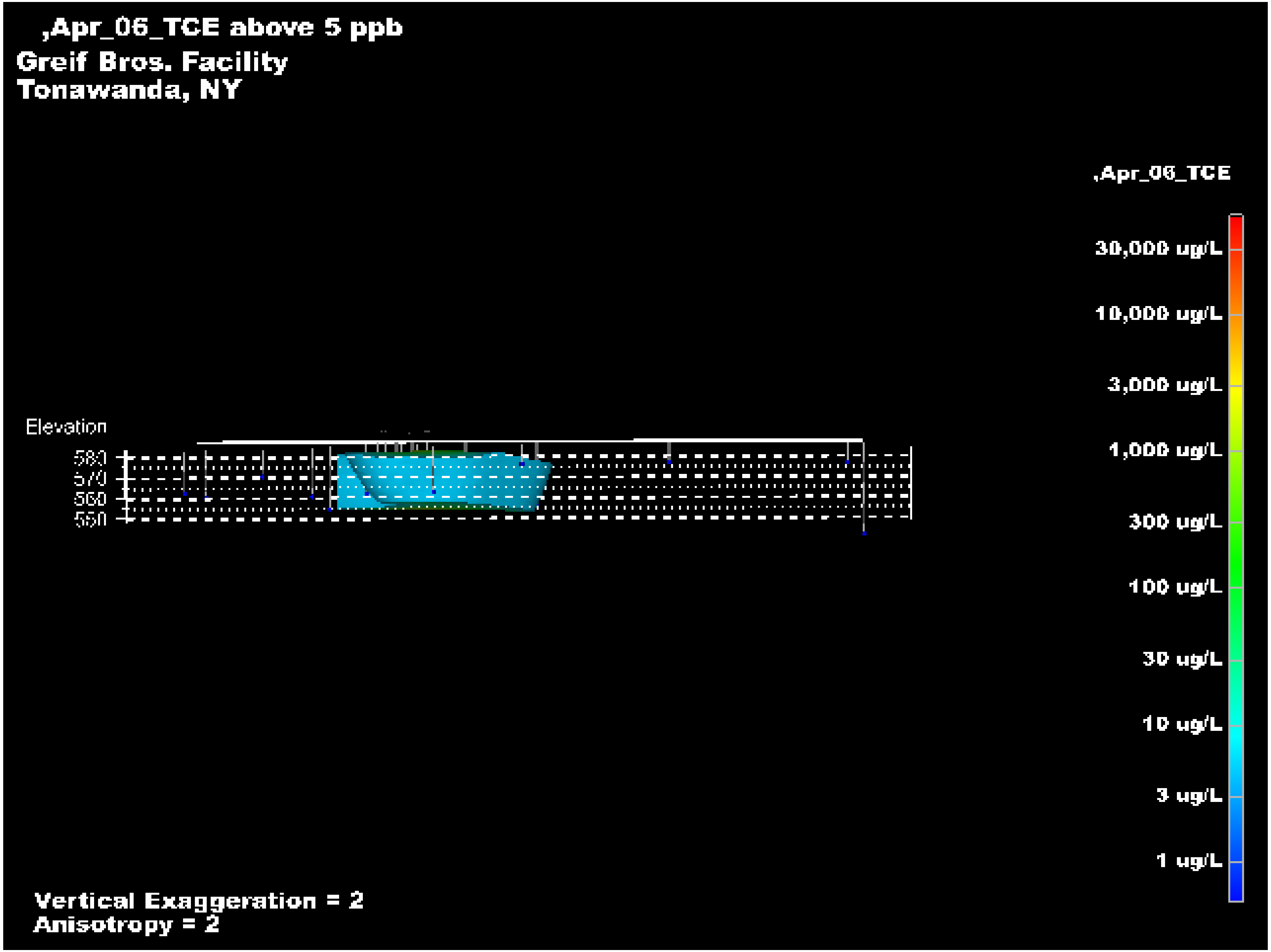


6/8/2007 1:08:02 PM

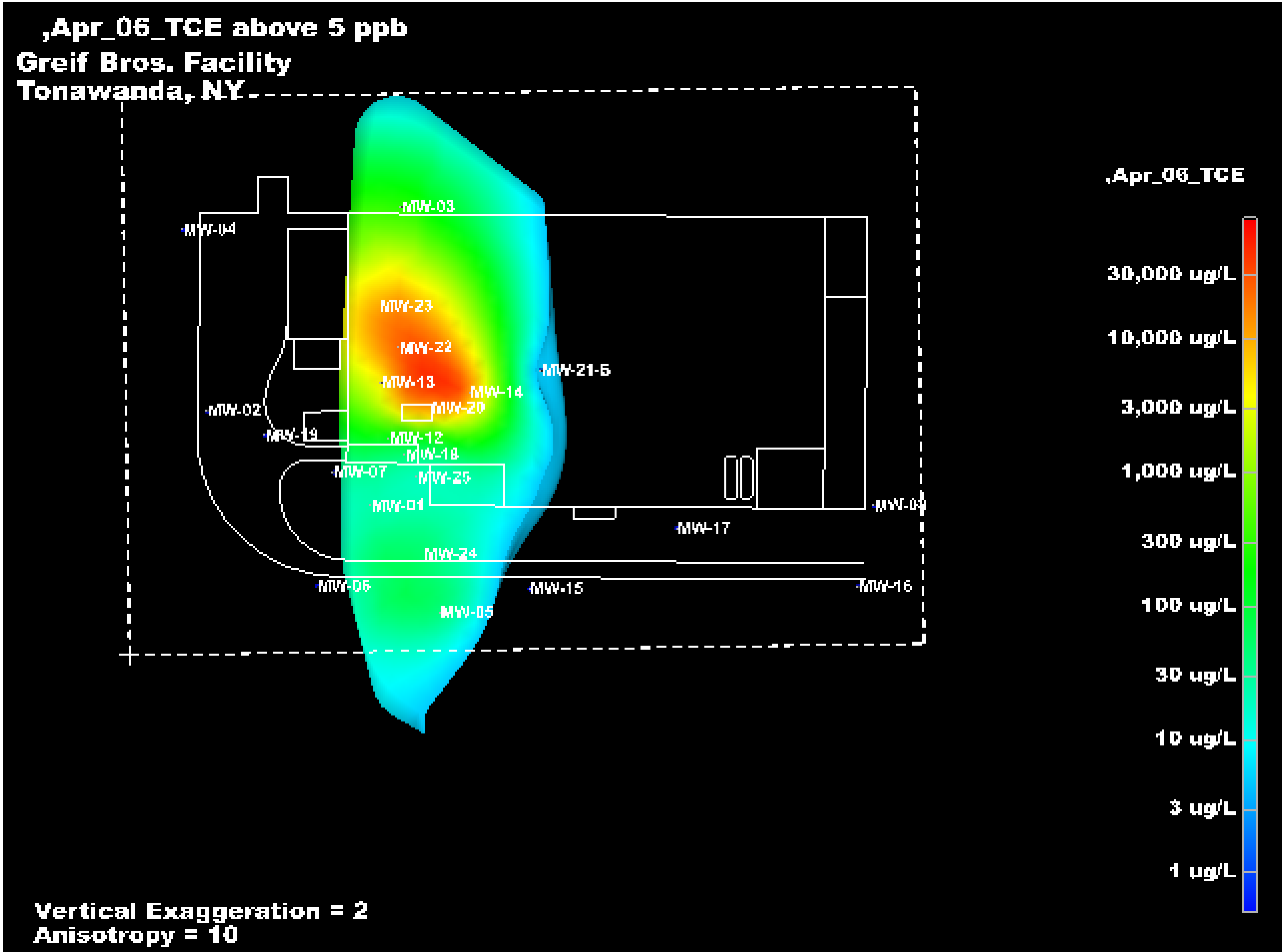

Apr_06_111-TCA above 5 ppb
Greif Bros. Facility
Tonawanda, NY
Apr_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Elevation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy = 2



6/8/2007 1:12:03 PM

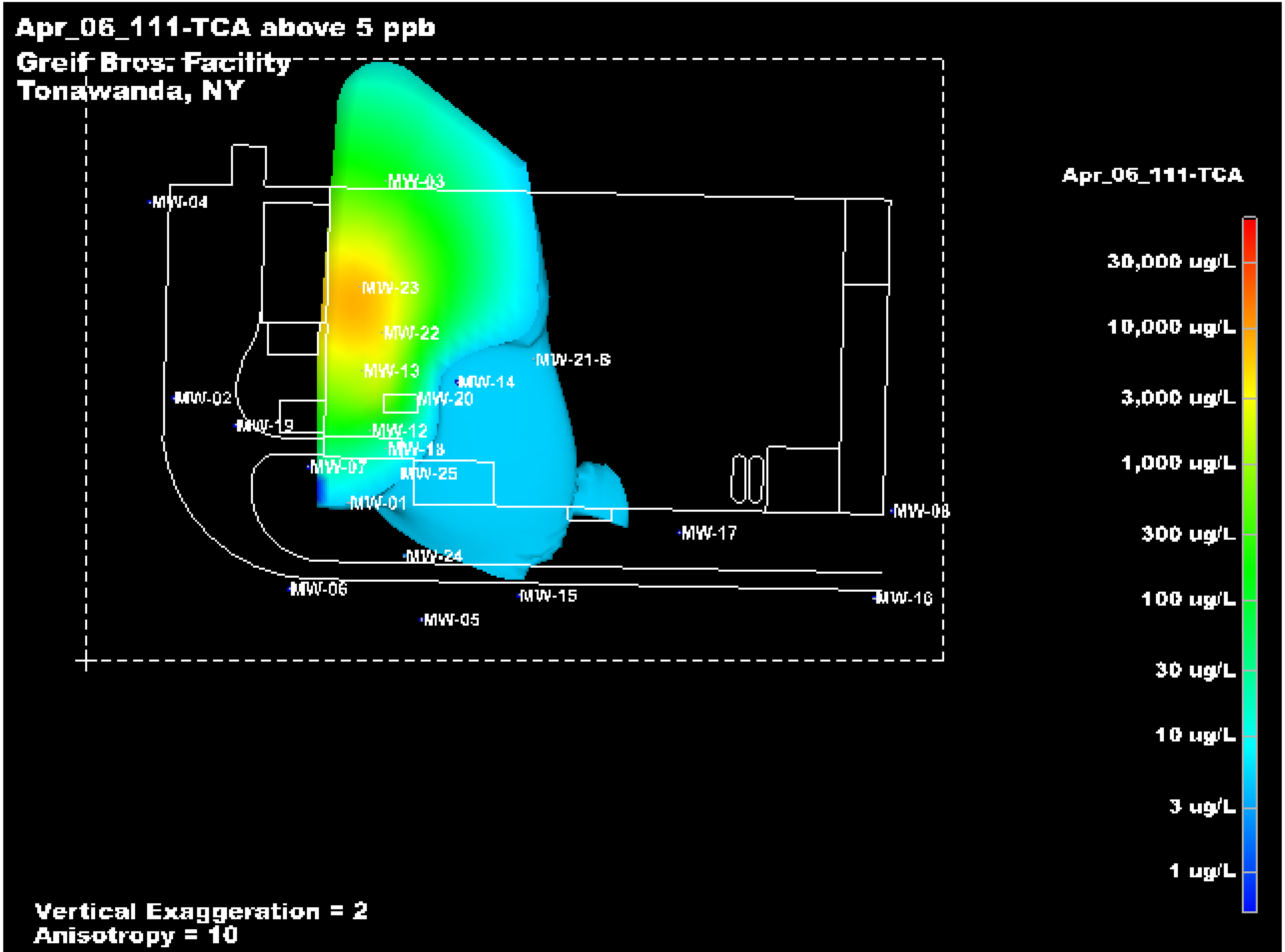


,Apr_06_TCE above 5 ppb
Greif Bros. Facility
Tonawanda, NY
,Apr_06_TCE
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Elevation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy = 2

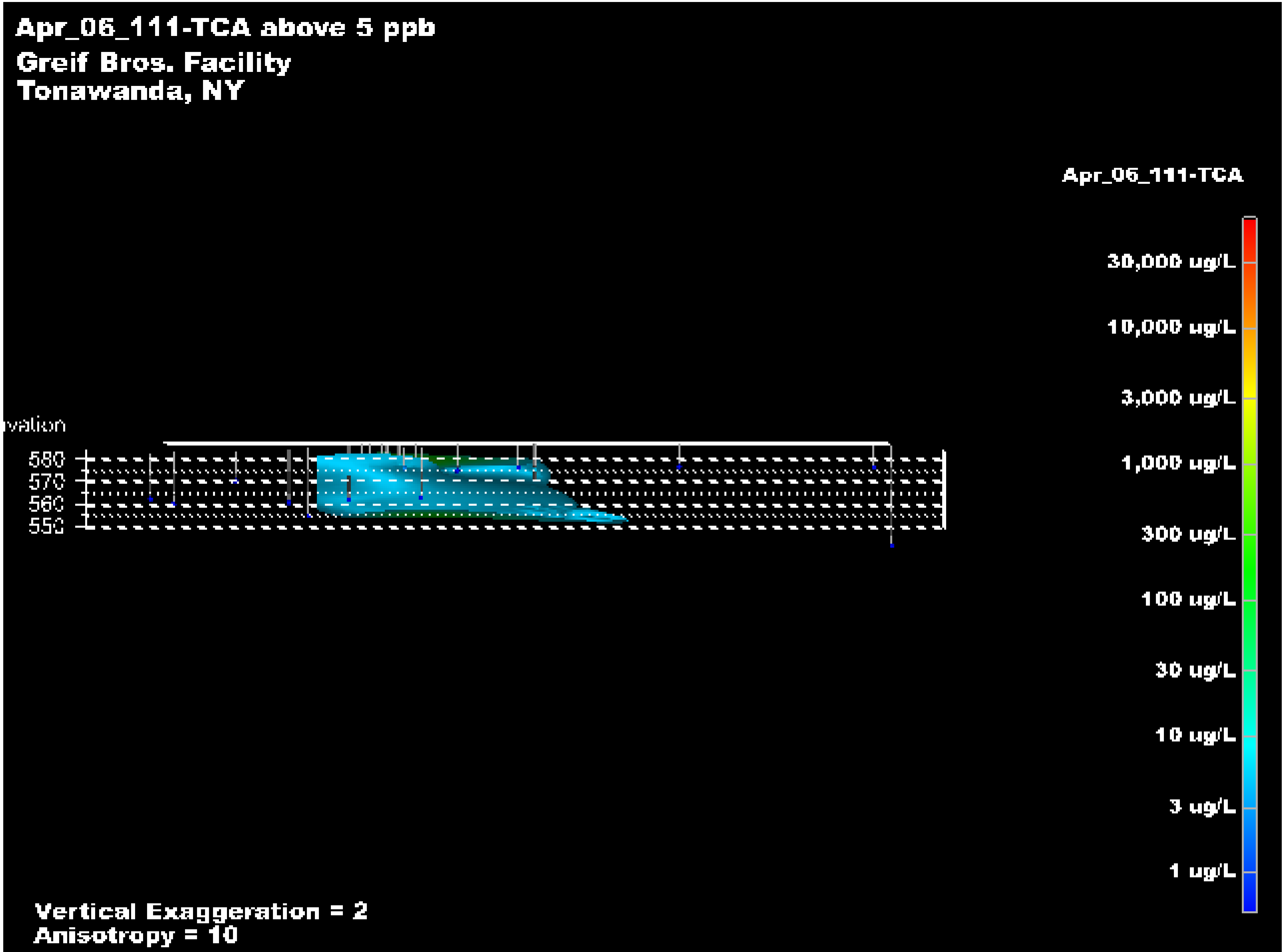


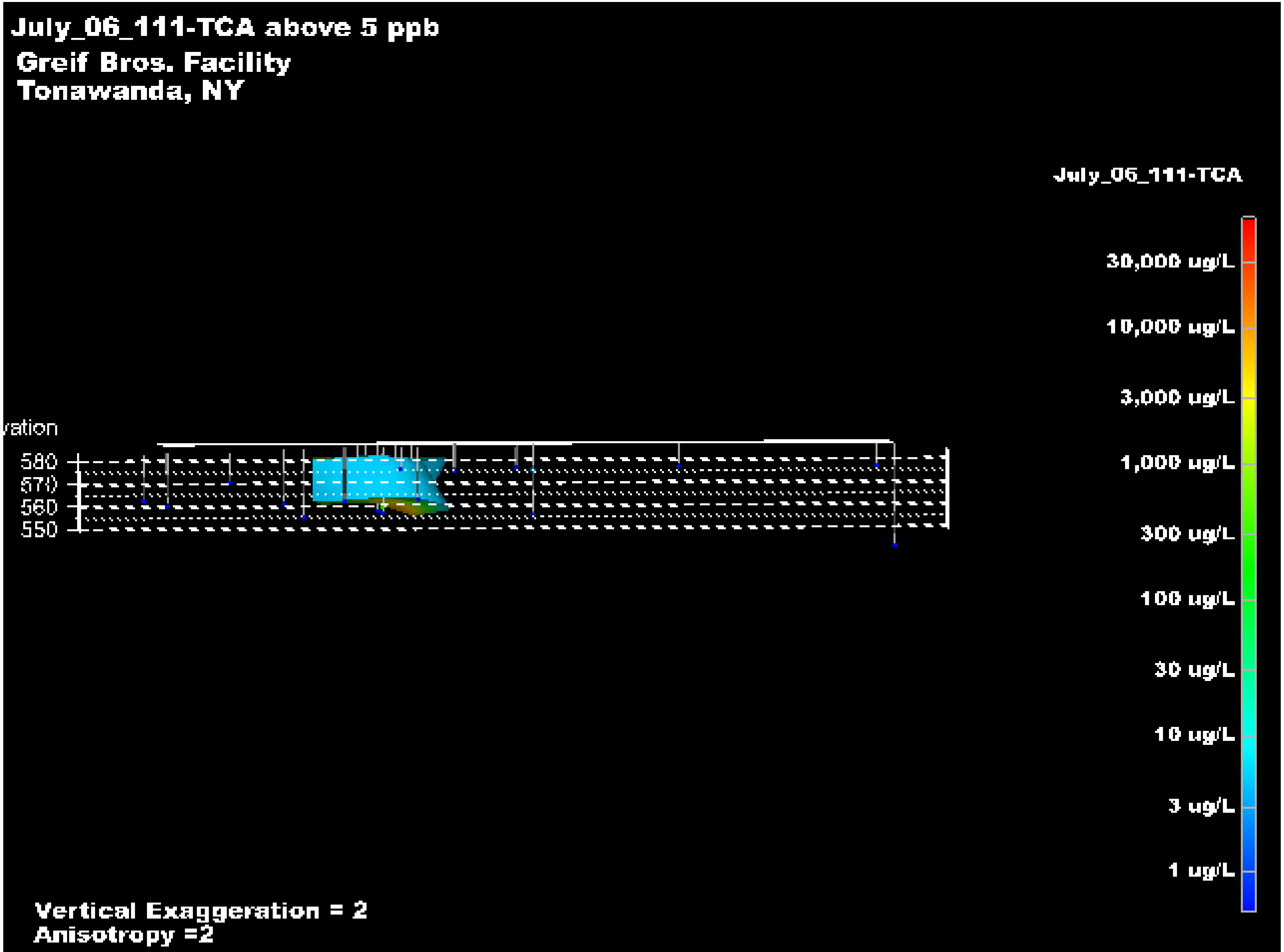
6/8/2007 1:13:10 PM

,Apr_06_TCE above 5 ppb
Greif Bros. Facility
Tonawanda, NY
,Apr_06_TCE
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Elevation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy = 10

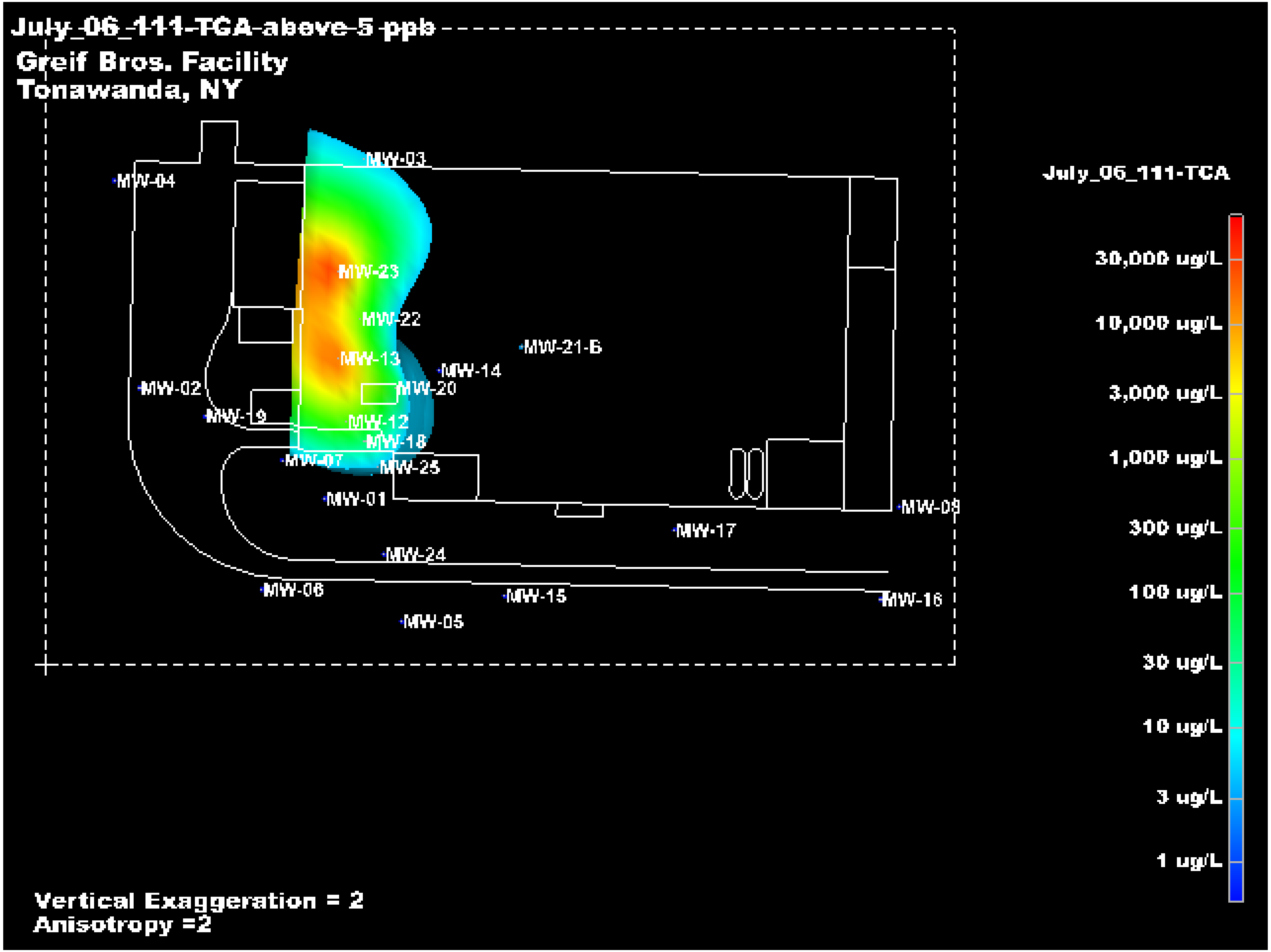


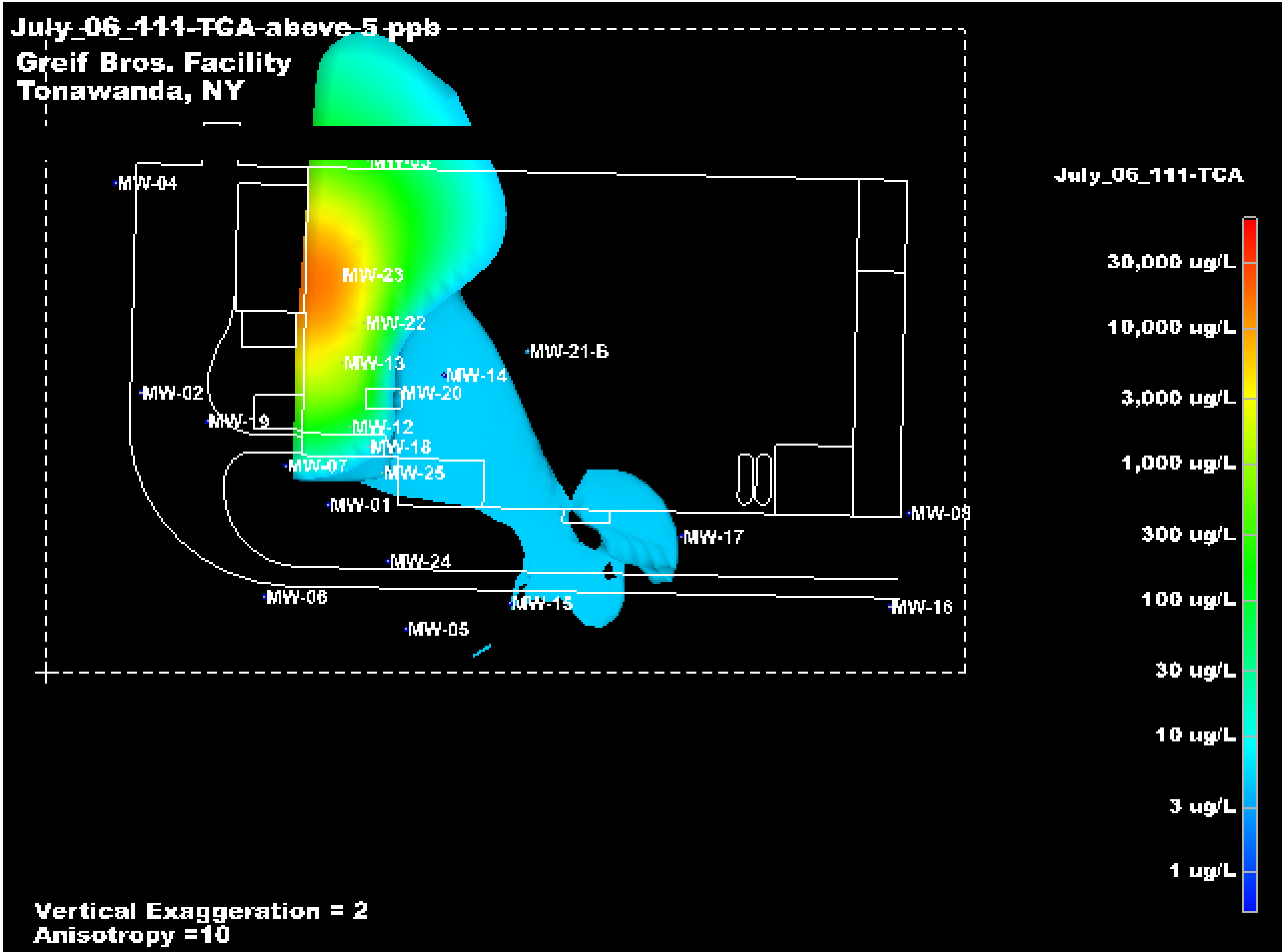
6/8/2007 1:03:09 PM

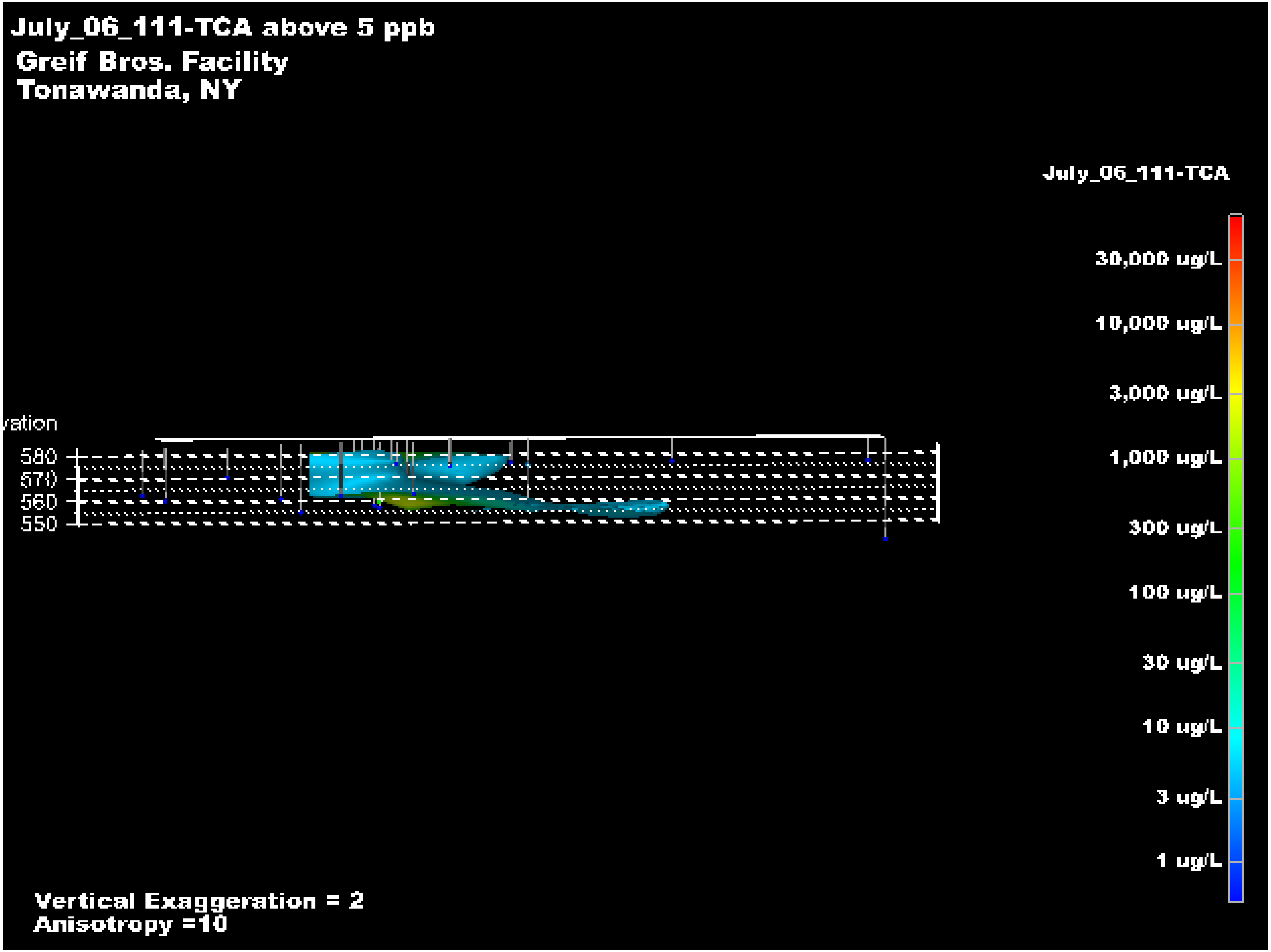

Apr_06_111-TCA above 5 ppb
Greif Bros. Facility
Tonawanda, NY
Apr_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
vation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy = 10

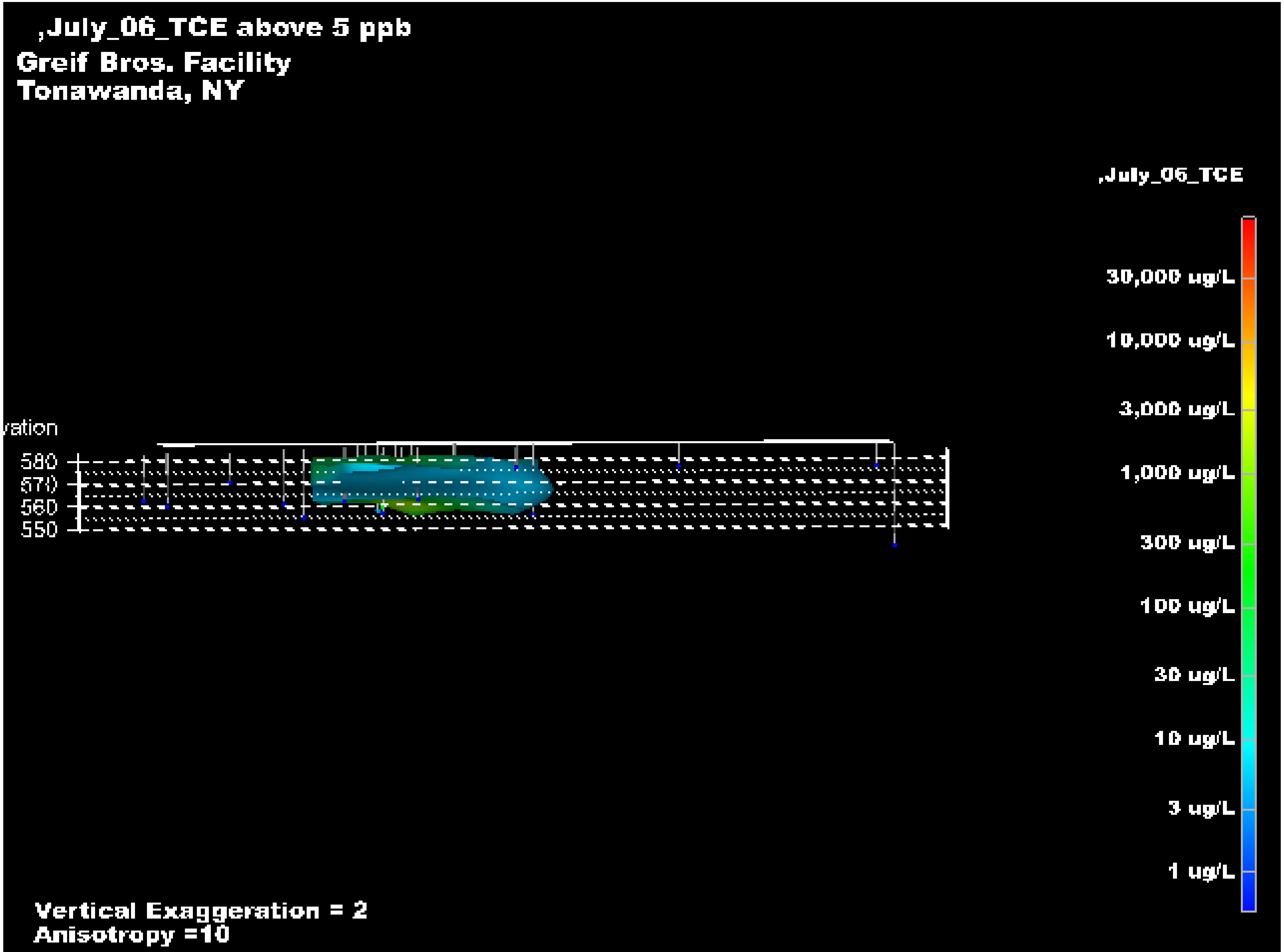


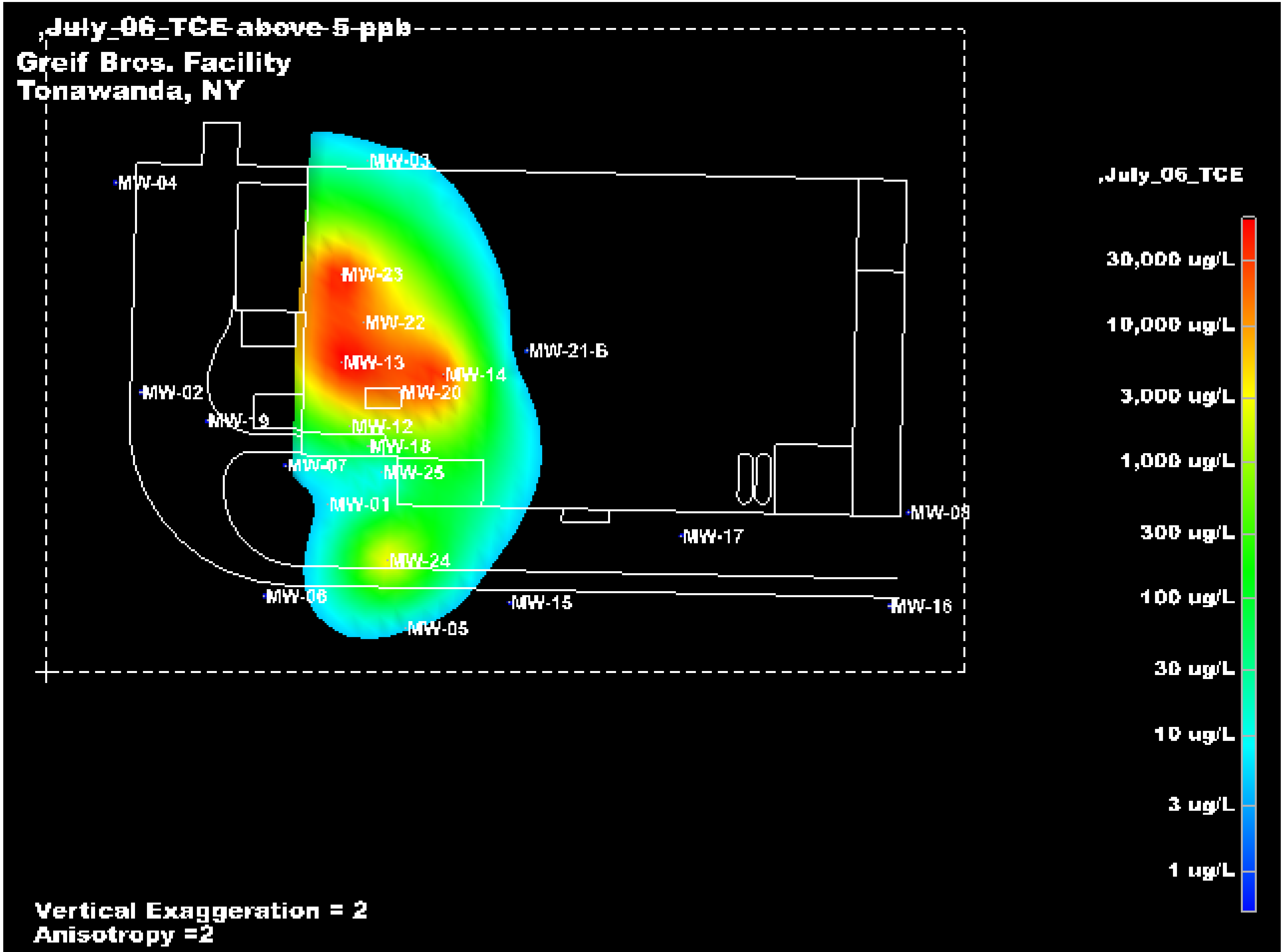
July_06_111-TCA above 5 ppb
Greif Bros. Facility
Tonawanda, NY
July_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
vation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy =2


July_06_111-TCA-above-5 ppb
Greif Bros. Facility
Tonawanda, NY
MW-03
MW-04
MW-23
MW-22
MW-21-B
MW-13
MW-14
MW-02
MW-20
MW-19
MW-12
MW-18
MW-07
MW-25
MW-01
MW-08
MW-17
MW-24
MW-06
MW-15
MW-16
MW-05
July_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Vertical Exaggeration = 2
Anisotropy =2

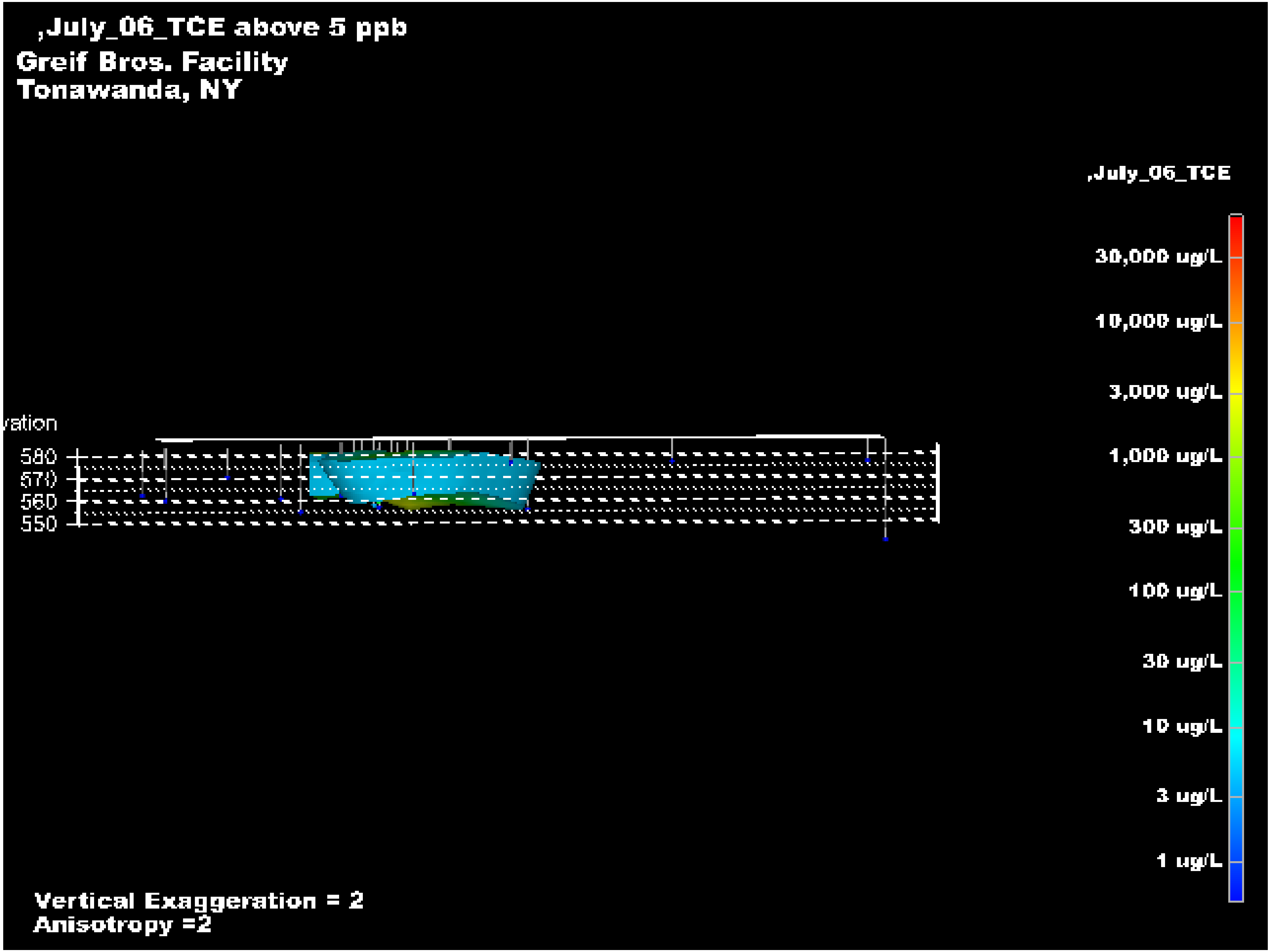

July_06_111-TCA-above-5 ppb
Greif Bros. Facility
Tonawanda, NY
MW-04
MW-23
MW-22
MW-21-B
MW-13
MW-14
MW-02
MW-20
MW-19
MW-12
MW-18
MW-07
MW-25
MW-01
MW-09
MW-17
MW-24
MW-06
MW-15
MW-16
MW-05
July_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Vertical Exaggeration = 2
Anisotropy =10


July_06_111-TCA above 5 ppb
Greif Bros. Facility
Tonawanda, NY
July_06_111-TCA
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
vation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy =10

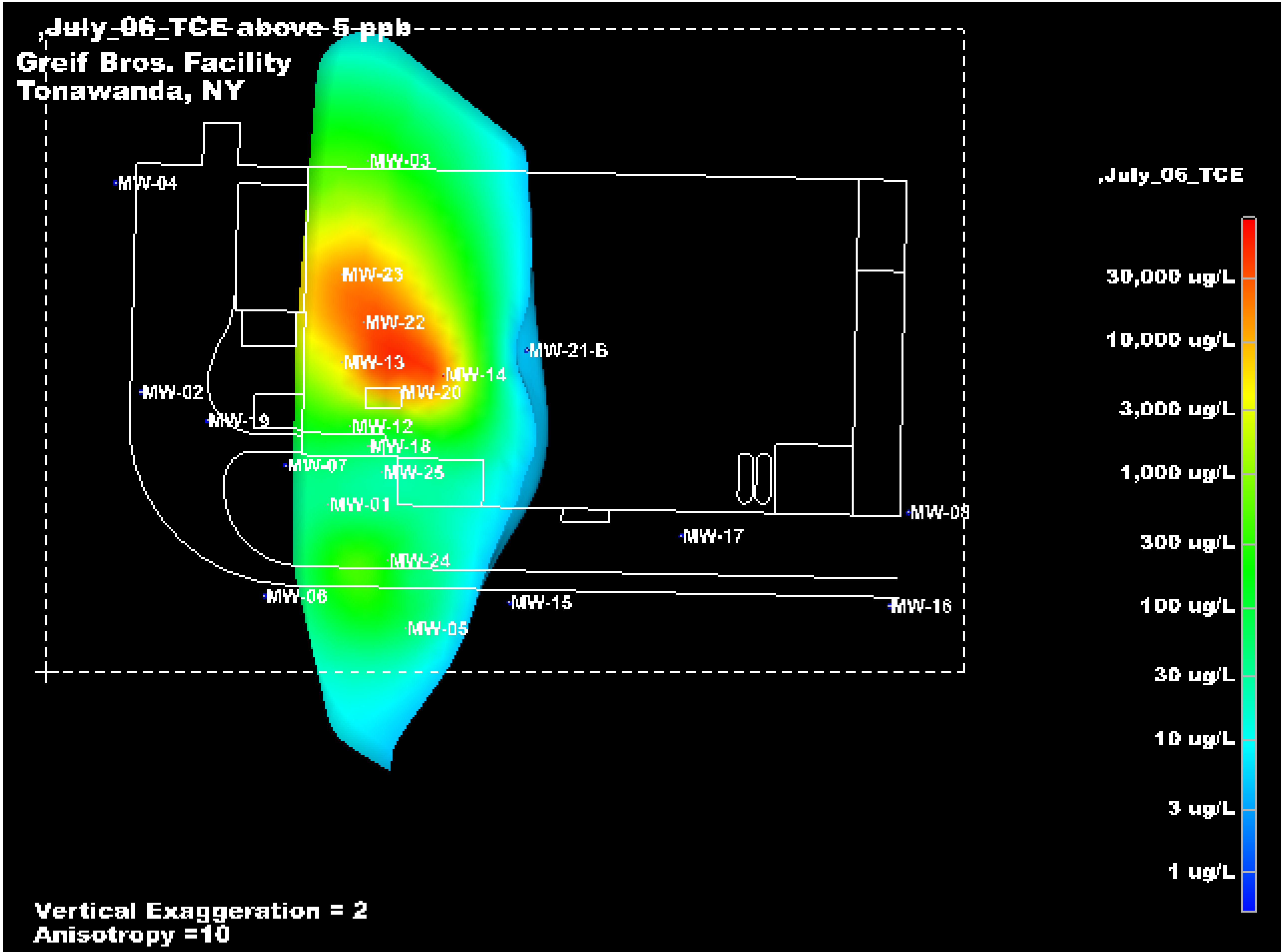

,July_06_TCE above 5 ppb
Greif Bros. Facility
Tonawanda, NY
vation
580
570
560
550
,July_06_TCE
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
Vertical Exaggeration = 2
Anisotropy =10



6/8/2007 1:17:14 PM



,July_06_TCE above 5 ppb
Greif Bros. Facility
Tonawanda, NY
,July_06_TCE
30,000 ug/L
10,000 ug/L
3,000 ug/L
1,000 ug/L
300 ug/L
100 ug/L
30 ug/L
10 ug/L
3 ug/L
1 ug/L
vation
580
570
560
550
Vertical Exaggeration = 2
Anisotropy =2



6/8/2007 1:16:28 PM

Appendix D
Static Resistivity Testing Results

APPENDIX D
STATIC RESISTIVITY TESTING SUMMARY
GREIF BROS. FACILITY - TONAWANDA, NY
NYSDEC VCP NUMBER V00334-9
ERM PROJECT NUMBER 0051923

Technician: Scott McKean

ERB-1	29.65	Former Varnish UST Area (Outside E. side of warehouse)
ERB-2	34.54	Varnish Pit (Inside warehouse, SE corner)

Well Name	Depth	P	Description
ERB-1	0	**1357.27**	Topsoil (Dessicated - not representative)
ERB-1	2	**28.33**	Fine sand and silt, moist
ERB-1	4	**48.70**	Fine sand and silt with clay, moist
ERB-1	6	**30.86**	Fine sand and silt with clay, moist
ERB-1	8	**32.64**	Fine sand and silt with clay, wet
ERB-1	10	**21.46**	Fine sand and silt with clay, wet
ERB-1	12	**15.93**	Wet clay
ERB-2	0	**28.59**	Silt and medium/coarse sand, wet
ERB-2	2	**55.94**	Silt and medium sand, moist
ERB-2	4	**83.35**	Silt and medium/coarse sand with gravel, wet
ERB-2	6	**46.58**	Silt and fine/medium sand, wet
ERB-2	8	**9.14**	Silt and fine/medium sand, wet
ERB-2	10	**5.03**	Clay and silt with coarse sand, moist
ERB-2	12	**7.20**	Clay with silt and coarse sand, moist

Depth	P
2.00	42.14
4.00	66.03
6.00	38.72
8.00	20.89
10.00	13.25
12.00	11.57