Chemours™

The Chemours Company
P.O. Box 788
Lewiston, NY 14092

(716) 221-4723t
chemours.com

March 31, 2023

Mr. Stanly Radon
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Dear: Mr. Radon:

NIAGARA PLANT GROUNDWATER REMEDIATION SYSTEM
2022 PERIODIC REVIEW REPORT

Enclosed please find one copy of the Groundwater Remediation System (GWRS) Periodic Review Report (PRR) for The Chemours Niagara Plant pursuant to Order on Consent No. B9-0206-87-09. This report presents a summary of the system operations and monitoring data collected in 2022. The report demonstrates compliance with remedial objectives and includes affirmation of the site institutional and engineering controls. Chemours has followed the PRR guidance provided by the NYSDEC but included the detailed discussion and analysis as Attachment 3 which is similar to previously submitted “Annual” reports.

The overall effectiveness of the GWRS and Olin Production Well has been established for many years. Hydraulic control has been maintained, such that, remedial goals continued to be achieved in 2022. Decreasing concentration trends discussed in previous annual reports continued to be recognized in the overburden and bedrock water-bearing zones during 2022. The overall decreasing trend of TVOC concentrations in the West Plant and the East Plant is significant and likely attributed to the combined effects of the GWRS and Olin Production Well achieving hydraulic control of contaminant source areas and the gradual reduction in all areas through natural attenuation.

Please contact me at (716) 221-4723 if you have any questions or comments regarding this submittal.

Sincerely,

Chemours

Paul F. Mazierski
Project Director

Enc. NIAGARA 2022 PRR (Report.hw932013.2023-03.NIA_2022_Annual_PRR.pdf)

cc: Charlotte Bethoney/NYSDOH (elec.)
Dawn Hettrick/NYSDOH (elec.)
Chemours Records Retention (elec.)

PARSONS

GROUNDWATER REMEDIATION SYSTEM PERIODIC REVIEW REPORT - 2022

NIAGARA PLANT
NIAGARA FALLS, NEW YORK

Prepared for:

THE CHEMOURS COMPANY FC LLC
CORPORATE REMEDIATION GROUP

Buffalo Avenue and 26th Street
Niagara Falls, NY 14302

Prepared by:

PARSONS
40 La Riviere Drive, Suite 350
Buffalo, NY 14202

March 2023

Chemours PN 507070
Parsons PN 450328

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FIGURES

ATTACHMENTS

ACRONYMS

Acronym	Definition / Description
ACO	Administrative Consent Order
BFBT	Blast Fractured Bedrock Trench
CatOx	Catalytic Oxidizer
COC	Chemicals of concern
CRG	(Chemours) Corporate Remediation Group
DNAPL	Dense non-aqueous phase liquid
DuPont	E. I. du Pont de Nemours and Company
FST	Falls Street Tunnel
GAC	Granular activated carbon
gpm	Gallons per minute
GWRS	Groundwater Remediation System
lbs/Mgal	Pounds per million gallons
µg/l	Micrograms per liter
NECCO	Niagara Electrochemical Company
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
ºF	Degrees Fahrenheit
PCE	Tetrachloroethene
PRR	Periodic Review Report
QA/QC	Quality assurance/quality control
ROD	Record of Decision
RTO	Regenerative Thermal Oxidizer
SPDES	State Pollutant Discharge Elimination System
TOC	Total organic carbon
TVOC	Total volatile organic compounds
VOCs	Volatile organic compounds
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

1.1 Brief Summary of Site, Nature and Extent of Contamination, Remedial History

This Periodic Review Report (PRR) was prepared in response to a request from the New York State Department of Environmental Conservation's (NYSDEC) dated February 25, 2010. The PRR Institutional and Engineering Controls (IC/EC) Certification information (**Attachment 1**) has been revised.

Parcels that are considered in this PRR (**Attachment 2**) and the annual groundwater remediation system monitoring report (**Attachment 3**) are consistent with the parcels identified in the Administrative Order on Consent (ACO) No. B9-0206-87-09 (1989) and updates related to the sale of certain parcels. **Figure 1** presents the site property boundaries. This report covers the 2022 calendar year. The Groundwater Remediation System 2022 Monitoring Annual Report (**Attachment 3**) is a detailed account of monitoring activities and conditions during 2022. Since much of the information provided in the annual report is similar to that recommended for the PRR, **Attachment 3** will be referred to, where appropriate, to limit duplication.

The Niagara Plant (the "Plant") is located in Niagara Falls, New York, and bordered by Buffalo Avenue to the north and the Robert Moses Parkway to the south. **Figure 1** is the site property map and a site location map is provided in **Attachment 3**. The Plant has been in continuous operation since 1896 when the Niagara Electrochemical Company (NECCO) began the manufacture of metallic sodium there. At some point in time, the R&H Chemical Company acquired NECCO. E. I. du Pont de Nemours and Company (DuPont) acquired the Plant from the R&H Chemical Company in 1930. DuPont spun off its Performance Chemicals businesses into a new entity during 2Q15, The Chemours Company FC LLC (Chemours). This includes remediation obligations at a number of properties including the Niagara Plant Site. As of July 1, 2015, Chemours now exists as a completely separate and independent company.

In 1978, DuPont searched its records to determine possible waste disposal areas within the Plant and completed a survey that detailed information on production areas, time of use, process chemistry, and waste disposal practices. In the early 1980s, NYSDEC wells were installed downgradient of the Plant along the Robert Moses Parkway. Results from these wells initiated several subsurface investigations. To date, Chemours has completed more than 60 integrated studies of subsurface contamination or related conditions. Multiple remedial events have occurred at the Plant including the groundwater pump-and-treat systems that are the subject of this PRR.

The focus of the current remedial system is the hydraulic control of contamination in the overburden and bedrock groundwater. Groundwater at the Plant contains various constituents, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. In 1989, DuPont and the NYSDEC entered into an ACO (No. B9-0206-87-09). This ACO directed DuPont to take the necessary steps to mitigate the offsite migration of contaminated groundwater. The NYSDEC issued an Interim Record of Decision (ROD) in December 1989. The ROD included use of a groundwater pump-and-treat system to serve as the groundwater remedy. The remedy was completed in 1992 and included two hydraulic control components: one for the overburden groundwater and another for the bedrock groundwater. The two components are the Groundwater Remediation System (GWRS) and the Olin Production Well described below:

- The GWRS was designed to reduce the offsite migration of contaminants from the overburden and top of bedrock by pumping groundwater from collection wells. The water is then treated in a treatment facility built as part of the remedial action.
- Groundwater in the bedrock zones in the western plant area is controlled by the Olin Production Well. Water is treated by carbon absorption prior to use as non-contact cooling water by Olin and discharged to a State Pollutant Discharge Elimination System (SPDES) permitted outfall.

Between 1992 and the present, multiple improvements have been made to the collection system including: treatment system upgrades, adding pumping wells, and installing blast fractured bedrock trenches (BFBTs) with pumping wells. Section 2.3 provides details on the post-ROD remedy improvements.

In 2019, a Purchase and Sale Agreement was executed in with 2747 Buffalo Ave., LLC to sell certain parcels of the Chemours Niagara property (formally DuPont Niagara Plant Buffalo Ave and 26th Street, Niagara Falls NY), specifically Parcel 159.16-2-5 and a newly subdivided parcel referred to as New Lot A in Parcel 159.16-1-3 (see attached **Attachment 2** of this PRR). The notification of sale was included in the 2019 PRR. Site remediation responsibilities related to Order on Consent No. B9-0206-87-09 remain with Chemours. 2747 Buffalo Ave LLC is proceeding with demolition of large former manufacturing buildings, however Chemours has no involvement in these operations.

1.2 Recommendations

It is recommended that Chemours continues to operate under the current pumping scheme with a combination of BFBTs and conventional pumping wells for A-zone groundwater, Olin Production Well for bedrock zones in the west plant, and monitored natural attenuation in the east plant bedrock.

2.0 SITE OVERVIEW

The Plant site is located along the south side of Buffalo Avenue north of the Robert Moses Parkway in Niagara Falls, NY. Gill Creek intersects the Plant, and the Niagara River is to the south. The area is heavily industrialized with numerous chemical manufacturing plants and remedial sites. As stated in the ROD (issued by the NYSDEC in 1989), there are two separate operable units: overburden and bedrock. Both units are impacted with chemical of concern (COCs), primarily VOCs, SVOCs, and metals.

The basic remedial chronology and noteworthy remedial changes are provided below:

Niagara Plant Remedial Chronological Summary

DATE	ACTION
1978	Waste management practices and waste disposal areas are evaluated.
1980 – 1989	Targeted Initial Remedial Program (B-107 Area, Gill Creek and B-310 Area, West Yard capping, Adams Avenue sewer cutoff wall).
Late 1982/1983	NYSDEC wells installed along Robert Moses Parkway
1983-1988	Remedial Investigation (hydrogeologic and manmade passageways investigations, groundwater modeling)
1984-1988	Remedial Studies
September 1989	Administrative Order on Consent signed
January 1990	NYSDEC Record of Decision signed
1990/1991	GWRS Construction
October-December 1991	GWRS startup and prove-out
1992-present	Long-term operation and maintenance (O&M) of remedy
Chemours Niagara Plant Noteworthy Remedy Changes	
January 1, 1992	Continuous operation of remedy begins
1993	Interceptor trench installed between Staub Road and the railroad bridge on west bank of Gill Creek and added to the GWRS (PW-36).
1995	Pumping wells PW-10, PW-18, PW-19 deepened into A-Zone top-of-bedrock
1996	Continuous acid addition and pH adjustment system added to GWRS for control of calcium carbonate scaling
1996/1997	Pumping well level control upgrade and switch to on/off operation
2002-2005	BFBTs installed in SW Plant to enhance GWRS hydraulic control
2005	Air emissions controls (catalytic oxidizer [CatOx] and scrubber) added to pretreatment system to address increased load from BFBTs

Niagara Plant Remedial Chronological Summary

2007	GWRS overhaul completed: pretreatment technology changed from steam stripping to air stripping; replacement of the CatOx with a regenerative thermal oxidizer (RTO), majority of groundwater conveyance piping system and heat trace replaced; and installation of Honeywell Experion™ Process Knowledge System (PKS) for process control and storage of operations data.
October 2008	Initiation of the six-month test to assess hydraulic control of BFBTs without west header wells
3Q14 – 1Q15	Pumping well conveyance line upgrade project, including PW-36 converted to cascade program
July 1, 2015	Completion of spin-off from DuPont to The Chemours Company FC LLC (Chemours)
2016	A liner was installed in the 140,000-gallon equalization (EQ) tank. NYSDEC accepted revisions to the sampling program, such that, lower frequency parameters and wells are completed all on the same 5-year cycle.
2018	Chemours effectively completed shut down and decontamination of Reactive Metals Operations. The RTO was replaced with a new unit.
2021	BFBT installed in East Plant, operation of BFBT PW-43 began December 20, 2021.

2.1 Remedial Objective

As outlined in the ROD, the interim remedial system has the following basic remedial objectives:

<u>Plant Site Overburden</u>

- "Create a hydraulic barrier in the overburden (A-zone) that will reduce lateral off-plant contaminant migration by pumping groundwater from a line of 22 collection wells to a new water treatment facility."
- "Install and operate a new water treatment facility to strip and condense contaminants present in groundwater. Periodically, condensed organics will be shipped off-plant as hazardous waste."

<u>Plant Site Bedrock</u>

- "Off-site migration of contaminants from bedrock zones in the western plant area will continue to be controlled by pumping the Olin Production Well."
- "Water from the bedrock zone is treated by carbon adsorption, prior to use by Olin as non-contact cooling water, and then it is discharged to a SPDES permitted outfall." There is an agreement between Chemours and Olin that the Olin Production Well will be operated at an average of 500 gallons per minute (gpm).

2.2 Post-ROD Remedy Changes

Subsequent to the 1992 Gill Creek remediation, it was determined that increased capture was appropriate between pumping well PW-35 and Gill Creek. Therefore a sheet pile wall and interceptor trench, referred to as PW-36, were installed in this area.

After approximately seven years of performance review, DuPont recommended increasing the groundwater control in the southwest plant in the vicinity of Staub Road (Southwest Plant area). After evaluating several alternate technologies, BFBTs were selected to improve hydraulic control. In BFBTs, *in-situ* detonation of explosive charges are used to create fractures in the bedrock to enhance hydraulic conductivity. These enhanced hydraulic conductivities allow for more efficient and effective groundwater collection and hydraulic control than can be achieved using conventional single point groundwater pumping wells.

In 2002, a BFBT (PW-37) was installed just north of Staub Road, southwest of Building B-130. A second BFBT (PW-39) was installed in 2004 along Staub Road just west of Gill Creek. These two new wells were put into production in 2005. During and after the implementation of these BFBTs, various hydraulic tests were completed to determine the effectiveness of capturing the plume. The BFBTs proved to be a sufficient solution to improving groundwater capture at the Plant (DuPont 2006). The improvement was significant enough that a BFBT hydraulic test was started on October 1, 2008, to test the hydraulic effectiveness of PW-37 and PW-39 without West Plant wells PW-1 through PW-14, PW-16, and PW-35. A report summarizing the results of the test was submitted to the NYSDEC in the Modified Operations Evaluation Report (MOE) (DuPont 2009).

In 2021, a BFBT was installed in the East Plant (PW-43) south of Adams Avenue and north of PW-30 and PW-32. This BFBT is 250 feet in length and was installed in a manner similar to the existing BFBTs in the West Plant. Four piezometers were installed within the trench, two on the eastern side and two on the western side of the trench. PW-43 came online December 20, 2021. This BFBT replaced pumping wells PW-28, PW-30, PW-32, and PW-34.

Results of the BFBT tests indicated an improved performance in hydraulic control. The percent captured has increased due to the BFBTs, and there is an increase in drawdown in the areas with the highest concentrations of total VOCs. The MOE (2009) report concluded that the BFBTs achieved sufficient hydraulic control without pumping from West Plant wells PW-1 through PW-14, PW-16, and PW-35. Subsequent quarterly and annual reports further support the conclusions that the BFBTs provide sufficient control. NYSDEC responded to the 2009 MOE and the comments were addressed in an updated evaluation: MOE – 2013 Update Report (Parsons, 2013). In 2Q2013 pumping well PW-35 was re-commissioned and placed online to improve hydraulic control in the area near Gill Creek. Chemours is continuing operation of PW-16, PW-18, PW-19, PW-35, PW-36, PW-37, and PW-39 for groundwater control in the West Plant area.

3.0 EVALUATE REMEDY PERFORMANCE EFFECTIVENESS AND PROTECTIVENESS

3.1 Summary

Each year, the annual report provides details and demonstration of the performance, effectiveness, and protectiveness of the Niagara Plant remedy. The overall effectiveness of the GWRS and the Olin Production Well in controlling off-site groundwater flow has been demonstrated through hydraulic head and groundwater quality monitoring during 30 years of operation. The GWRS 2022 operations are summarized below and support the remedy's performance, effectiveness, and protectiveness:

- System uptime was 97 percent for the 23 original pumping wells that are still in use.
- PW-37 uptime was 97 percent.
- PW-39 uptime was 97 percent.
- PW-43 uptime was 96.7 percent.
- Olin Production Well system uptime was 100% percent.
- Operation of BFBT pumping wells PW-37, PW-39, and PW-43 continued throughout 2022 along with a reduced number of the original 23 pumping wells, with improved capture at the Plant.
- Hydraulic control was exercised over 89 percent of the Plant area for 2022.
- Monitoring of dense non-aqueous phase liquid (DNAPL) conducted in 2022 indicated no DNAPL was present at PW-39.

The GWRS has been effective in removing chemical mass from the subsurface groundwater by providing hydraulic control. Mass removal continues to be greater than before the installation and operation of the West Plant BFBTs in 2005. In 2022, approximately 2.2 tons of organic compounds were removed from groundwater by the GWRS. There was a clear increase in mass recovery rates after the installation of the BFBTs. By comparison, an average of 1.5 tons/year was removed from 2000 to 2005.

The Olin Production Well continued with a mass removal rate within the range of historical values, but with a noted increase from 2020 through 2022. The yearly estimated mass of organic compounds removed was 1.0 and 1.2 tons between 2020 and 2022 compared with an average mass removal of 0.59 tons/year from 2009 through 2019. A corollary increase in concentrations was observed in quarterly influent sampling in 4Q2019 and continued through 2022. This increase in concentrations and mass removal follows increases in upgradient C/CD monitoring wells indicating the Olin Production Well is acting as designed and capturing the migration of VOCs in this zone (see **Attachment 3** for more details).

The combined effect of the GWRS (including outfall 023) and the Olin Production Well resulted in the removal of approximately 3.3 tons of organic compounds in 2022.

3.2 Compliance with Remedial Objectives

Extensive water-level data collected over the 30 years of system operation have illustrated that hydraulic heads in both the A-Zone overburden and A-Zone bedrock are depressed in the vicinity of operating GWRS pumping wells. As a result, off-site groundwater flow has been reduced by hydraulic control, and COC concentrations are decreasing as the result of groundwater control. In 2022, the hydraulic control in the A-zone overburden and bedrock was 89%. The Olin Production Well was operational 100 percent of the year at average flow rates greater than 500 gpm. Hydraulic heads in the bedrock zone confirm the hydraulic effectiveness established by pumping this well, details are provided in **Attachment 3** (2022 Annual Report). Off-site COC migration from the West Plant area is controlled, confirming that the remedial objectives established in the ACO are met.

Groundwater from the GWRS pumping wells (A-Zone wells) is treated through stripping and discharged to the City of Niagara Falls Wastewater Treatment Plant. Water from the bedrock zone is treated by carbon adsorption prior to use by Olin as non-contact cooling water and is subsequently discharged to an SPDES permitted outfall. In 2022, these activities demonstrated compliance with the remedial objectives.

4.0 IC/EC PLAN COMPLIANCE PLAN REPORT

The IC/EC compliance plan is integrated into the O&M Plan, as detailed in the ACO (1989) and the ROD (1990), as well as given in Box 3 and Box 4 of the NYSDEC Institutional and Engineering Control Certificate (**Attachment 1**).

Box 4 of the NYSDEC Institutional and Engineering Control Certificate provides control descriptions for each of the properties associated with the Plant, as follows:

> Chemours Niagara Plant site is fenced and has a 24 hour security. The Plant has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. Remedial Action Consent Order (1989) signed September 22, 1989 and the Record of Decision issued December 1989.

The Plant controls remained the same in 2022 with a 24 hour security system, and a pump-and-treat system that discharges to the City of Niagara Falls POTW after pre-treatment. Therefore, the Plant remains in compliance with the site controls.

Further information regarding the IC/EC compliance is given in the O&M Compliance section of this PRR and in **Attachment 3**.

5.0 MONITORING PLAN REPORT

The overall monitoring plan is presented in Attachment A to the ACO (Woodward-Clyde 1989) and in the agency approved Quality Assurance Project Plan for groundwater monitoring at the Plant (DuPont 1999). The scope of the monitoring program is to document groundwater levels for evaluating hydraulic control of the pumping systems and to collect water samples (groundwater, surface water, and process) to analyze for COC concentrations.

Groundwater elevation monitoring and groundwater sampling were conducted during 2022 in accordance with the monitoring schedules presented in **Attachment 3**. Water level measurements and groundwater samples are taken to assess the effectiveness of the GWRS and Olin Production Well pumping systems in controlling groundwater flow. Approximately 180 water level locations were monitored each quarter to assess hydraulic control. Forty-eight locations were sampled for COC concentrations during 2022. **Attachment 3** provides data, discusses the monitoring program, and demonstrates compliance with the AOC monitoring scope.

In previous years, Chemours submitted quarterly data packages and an annual report (PRR) to the NYSDEC. After 1Q22, NYSDEC agreed that quarterly reports be eliminated, and all information be provided in the annual reports (PRRs). In 2022, the 1Q22 report document provided updated, detailed information related to effectiveness of the remedial program (Parsons 2021b). In future years, only the annual report (PRR) will be submitted to the NYSDEC.

6.0 OPERATIONS AND MAINTENANCE PLAN REPORT

The O&M plan is integrated into the operations and maintenance portion of the ACO (Woodward-Clyde 1989). The details of the O&M plan are summarized in three categories for overburden groundwater: (1) system start-up; (2) normal operations; and (3) temporary shutdowns. The system start-up applied to the early period of groundwater pumping and is therefore no longer applicable to the current system. In normal operations, “the level control will be set in each well as determined appropriate” (NYSDEC 1989). The appropriate level is dictated by achievement of the remedial goals for groundwater, which is reducing the offsite migration of COCs.

Temporary shutdowns of the overburden GWRS and the Olin Production Well are allowable under the ACO. Shutdowns of up to one week will have minimal impact, but reasonable efforts are made to limit the duration of scheduled and unscheduled downtime. Requirements in the O&M plan, including updates in 2012 (see **Attachment 3**) specify that the NYSDEC be immediately notified of periods of downtime longer than 48 hours for pumping well(s). Other scheduled and unscheduled treatment system downtime will be documented in the annual PRR reports. This minor change is justified by the GWRS equalization tank which has capacity to store several days of water from pumping well operation while treatment maintenance is performed. For bedrock groundwater, the Olin system is to operate at an average monthly flow rate of 500 gpm. Additionally, the NYSDEC is notified if there are changes in the status of the Olin system’s hydraulic control.

The system operated in compliance with the O&M plan during the period reported in this PRR. Details of the 2022 O&M activities are provided in **Attachment 3**. System uptime was 97 percent for the 23 original pumping wells that are still in use. PW-37 uptime was 97 percent, PW-39 uptime was 97 percent, and PW-43 was 96.7 percent. Olin Production Well system uptime was 100 percent. Operation of BFBT pumping wells PW-37, PW-39, and PW-43 continued along with a reduced number of the original 23 pumping wells throughout 2022, with improved capture at the Plant. The NYSDEC was notified of all applicable changes to the site remediation system.

Each year Chemours submits an annual report to the NYSDEC. This document provides updated information related to effectiveness of the remedial program.

7.0 PRR CONCLUSIONS

Conclusions

The requirements of the Plant ACO, ROD and subsequent correspondence with the NYSDEC (NYSDEC 2005, 2008, 2011, and 2016) were met during 2022. The Plant remains an industrial use property with a 24-hour security system. There have been no significant changes in property use during 2022 that would necessitate alteration of the remedy or constitute an unacceptable risk to people or the environment. Components of the O&M plan are in compliance with the ACO as demonstrated in this PRR and in **Attachment 3**. The average up-time for the GWRS, BFBTs and Olin well was greater than 97% in 2022, and the NYSDEC was notified of systems down-times as appropriate. The Olin Production Well average rate was greater than 500 gpm in 2022. The remedial requirements are in compliance; therefore, no corrective measures are needed.

Extensive water-level and chemical data have been collected over 30 years of system operation. These data have illustrated that the remedial objectives of the Plant are being attained. Off-site groundwater flow has been reduced by hydraulic control, and COC concentrations are decreasing as the result of groundwater control. In 2022, the hydraulic control in the A-zone overburden and bedrock was approximately 89%, and the Olin Production Well continued to meet the remedial objectives in the bedrock zones. The BFBTs continue to provide sufficient control in the West Plant as outlined in the MOE report (DuPont 2009) and the MOE 2013 Update Report (Parsons, 2013).

8.0 REFERENCES

DuPont Corporate Remediation Group (CRG). 1999. Quality Assurance Project Plan: Groundwater Monitoring Program, DuPont Niagara Plant, Version 4.0. May 1999.

_____. 2006. Results of BFBT Optimization Step Tests, correspondence to M. Hinton. December 21, 2006.

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New York State Department of Environmental Conservation (NYSDEC). 1989. Administrative Order on Consent No. B9-0206-87-09.

_____. 2005. M. Hinton. Correspondence RE: Catalytic Oxidizer Repair. November 23, 2005.

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_____. 2011. M. Hinton. Correspondence RE: Proposal for Activated Carbon Utilization Study, April 24, 2011.

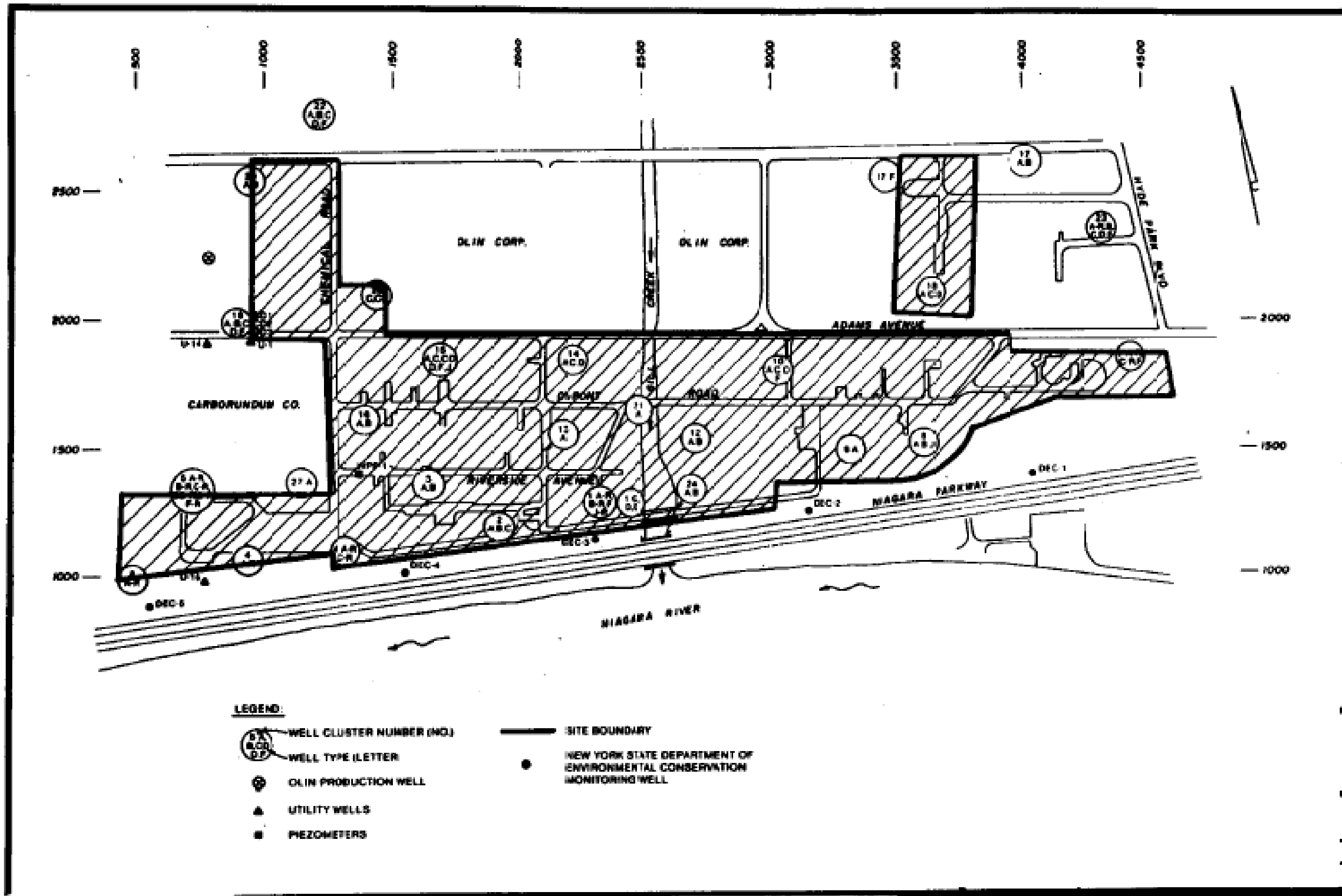
Parsons 2013. Blast Fractured Bedrock Trench Modified Operations Evaluation – 2013 Update. February, 2013.

_____. 2022a. Groundwater Remediation System Periodic Review Report 2021, Chemours Niagara Plant. March 2022.

_____. 2022b. Chemours Niagara Plant Groundwater Remediation System First Quarter 2022 Data Package. May, 2022.

Woodward-Clyde 1989. Final Report DuPont Niagara Falls Plant Interim Remedial Program, September 1989.

FIGURES

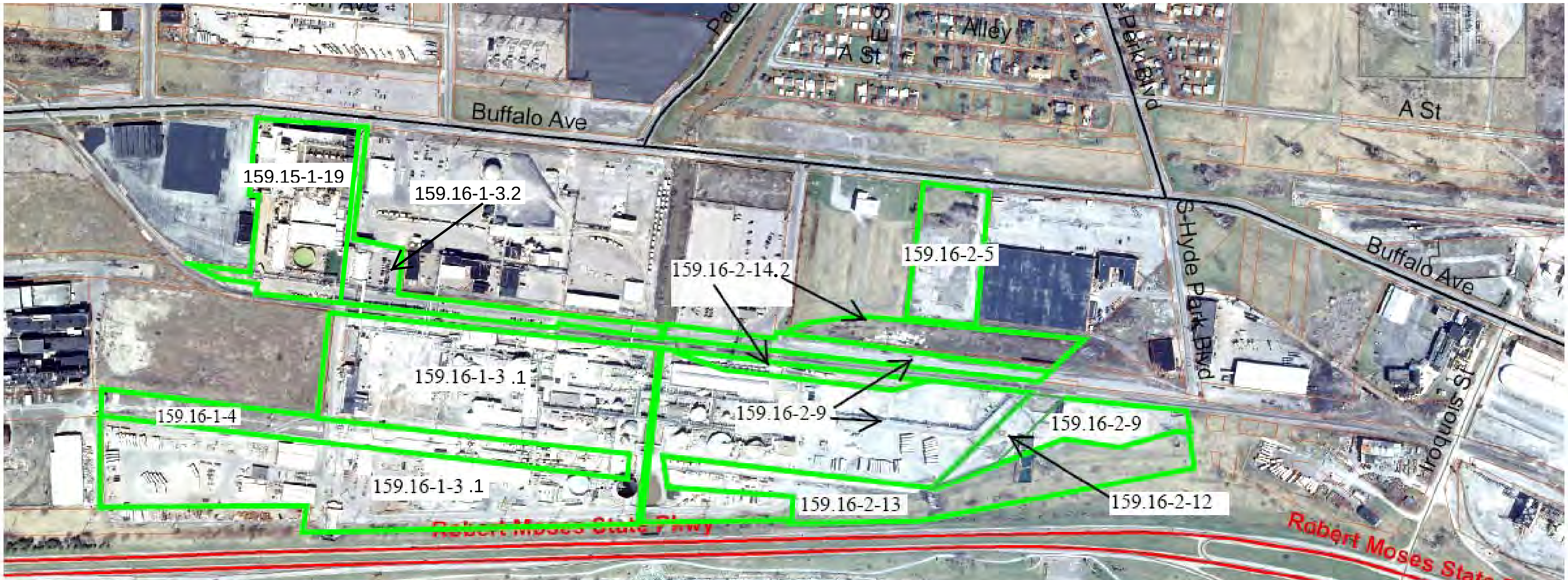


Source: Administrative Order on Consent No. B9-0206-87-09 (1989)

FIGURE 1

SITE BOUNDARIES MAP
CHEMOURS NIAGARA PLANT SITE
NIAGARA FALLS, NY

PARSONS
40 La Riviere Dr., Suite 350 Buffalo, NY 14202



0.3 | 0 | 0.14 | 0.3 Miles

Niagara County and its officials and employees assume no responsibility or legal liability for the accuracy, completeness, reliability, timeliness, or usefulness of any information provided. Tax parcel data was prepared for tax purposes only and is not to be reproduced or used for surveying or conveyancing.

NIAGARA COUNTY, NEW YORK
DEPARTMENT OF REAL PROPERTY SERVICES

Parcel ID	Owner
159.16-1-3 .1	Chemours
159.16-1-4	Chemours
159.16-2-5	2747 Buffalo Avenue LLC
159.16-2-9	Chemours
159.16-2-12	Niagara Mohawk
159.16-2-13	Chemours
159.16-2-14.2	Chemours
159.16-1-3.2	Chemours
159.15-1-19	2747 Buffalo Avenue LLC

Source: Niagara County Online Mapping System
http://gis2.erie.gov/GC/NiagaraCountyNY/PublicLaunchpage.aspx

FIGURE 2

SITE PARCELS MAP
CHEMOURS NIAGARA PLANT SITE
NIAGARA FALLS, NY

PARSONS
40 La Riviere Dr., Suite 350 Buffalo, NY 14202

ATTACHMENT 1
INSTITUTIONAL AND ENGINEERING CONTROLS
CERTIFICATION FORMS

Enclosure 1

Certification Instructions

I. Verification of Site Details (Box 1 and Box 2):

Answer the three questions in the Verification of Site Details Section. The Owner and/or Qualified Environmental Professional (QEP) may include handwritten changes and/or other supporting documentation, as necessary.

II. Certification of Institutional Controls/ Engineering Controls (IC/ECs)(Boxes 3, 4, and 5)

1.1.1. Review the listed IC/ECs, confirming that all existing controls are listed, and that all existing controls are still applicable. If there is a control that is no longer applicable the Owner / Remedial Party should petition the Department separately to request approval to remove the control.

2. In Box 5, complete certifications for all Plan components, as applicable, by checking the corresponding checkbox.

3. If you <u>cannot</u> certify "YES" for each Control listed in Box 3 & Box 4, sign and date the form in Box 5. Attach supporting documentation that explains why the **Certification** cannot be rendered, as well as a plan of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is completed.

If the Department concurs with the explanation, the proposed corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued by the Department's Project Manager. Once the corrective measures are complete, a new Periodic Review Report (with IC/EC Certification) must be submitted within 45 days to the Department. If the Department has any questions or concerns regarding the PRR and/or completion of the IC/EC Certification, the Project Manager will contact you.

III. IC/EC Certification by Signature (Box 6 and Box 7**):**

If you certified "YES" for each Control, please complete and sign the IC/EC Certifications page as follows:

- For the Institutional Controls on the use of the property, the certification statement in Box 6 shall be completed and may be made by the property owner or designated representative.

- For the Engineering Controls, the certification statement in Box 7 must be completed by a Professional Engineer or Qualified Environmental Professional, as noted on the form.

Enclosure 2
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. **932013**

Site Name Chemours Plant (former DuPont Plant Site)

Site Address: Buffalo Avenue Zip Code: 14302
City/Town: Niagara Falls
County: Niagara
Site Acreage: 52.000

Reporting Period: December 31, 2021 to December 31, 2022

	YES	NO
1. Is the information above correct?	☑	☐
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	☑
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	☑
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	☑
If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.		
5. Is the site currently undergoing development?	☐	☑

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below? Commercial and Industrial	☑	☐
7. Are all ICs in place and functioning as designed?	☑	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

_______________________________________ ______________
Signature of Owner, Remedial Party or Designated Representative Date

SITE NO. 932013 **Box 3**

Description of Institutional Controls

Parcel	Owner	Institutional Control
~~151.~~16-1-3.2	The Chemours Company FL LLC	
Correction the parcel is 159-		O&M Plan
		Monitoring Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.15-1-19 Lot A	2747 Buffalo Ave., LLC	
		Monitoring Plan O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-1-3.1	The Chemours Company FL LLC	
		Monitoring Plan O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-1-4	The Chemours Company FL LLC	
		Monitoring Plan O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-2-12	Niagara Mowhawk Power Corp.	
		Monitoring Plan O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-2-13	The Chemours Company FL LLC	
		Monitoring Plan O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-2-14.2	The Chemours Company FL LLC	

Monitoring Plan
O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

159.16-2-5 2747 Buffalo Ave., LLC

O&M Plan

Monitoring Plan

Remedial Action Consent Order signed September 22, 1989 and Record of Decision issued December 1989.

159.16-2-9 The Chemours Company FL LLC

Monitoring Plan
O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

Box 4

Description of Engineering Controls

Parcel | Engineering Control

151.16-1-3.2

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. Site has pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

159.15-1-19 Lot A

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

159.16-1-3.1

Groundwater Treatment System
Cover System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. Site has pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. The West Yard has a cover system.

159.16-1-4

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

Parcel	Engineering Control
The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.	
159.16-2-12	Groundwater Treatment System Groundwater Containment Fencing/Access Control Monitoring Wells
The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.	
159.16-2-13	Groundwater Treatment System Groundwater Containment Fencing/Access Control Monitoring Wells
The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.	
159.16-2-14.2	Groundwater Treatment System Groundwater Containment Fencing/Access Control Monitoring Wells
The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial permit.	
159.16-2-5	Groundwater Treatment System Groundwater Containment Fencing/Access Control Monitoring Wells
The site is fenced and has manned 24 hour security. The has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.	
159.16-2-9	Groundwater Treatment System Cover System Groundwater Containment Fencing/Access Control Monitoring Wells
The site is fenced and had manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. Note: Areas considered under the ACO(1989) are given in Figure 1. Where parcel extents are larger then the areal extent of the remedial action, the remedial controls may only apply to the area of the parcel that is within the remedial action delineation (Figure1).	

Box 5

Periodic Review Report (PRR) Certification Statements

1. I certify by checking "YES" below that:

a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the Engineering Control certification;

b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

YES	NO
☑	☐

2. For each Engineering control listed in Box 4, I certify by checking "YES" below that all of the following statements are true:

(a) The Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

(b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

(c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

(d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

(e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
☑	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

_______________________________________ ____________

Signature of Owner, Remedial Party or Designated Representative Date

IC CERTIFICATIONS
SITE NO. 932013

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I PAUL F MAZIERSKI at CHEMOURS CRG P.O. BOX 788 LEWISTON NY 14092.
print name / print business address

am certifying as REMEDIATION PROJECT DIRECTOR (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

[signature] 3/30/23

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification — Date

EC CERTIFICATIONS

Box 7

Qualified Environmental Professional Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law.

I James W Schuetz at 40 La Riviere Dr Suite 122, Buffalo NY 14202,
print name / print business address

am certifying as a Qualified Environmental Professional for the Chemours CRG
(Owner or Remedial Party)

Signature of Qualified Environmental Professional, for the Owner or Remedial Party, Rendering Certification

Stamp (Required for PE)

Date: 3/28/2023

Enclosure 3
Periodic Review Report (PRR) General Guidance

I. Executive Summary: (1/2-page or less)
   A. Provide a brief summary of site, nature and extent of contamination, and remedial history.
   B. Effectiveness of the Remedial Program - Provide overall conclusions regarding;
      1. progress made during the reporting period toward meeting the remedial objectives for the site
      2. the ultimate ability of the remedial program to achieve the remedial objectives for the site.
   C. Compliance
      1. Identify any areas of non-compliance regarding the major elements of the Site Management Plan (SMP, i.e., the Institutional/Engineering Control (IC/EC) Plan, the Monitoring Plan, and the Operation & Maintenance (O&M) Plan).
      2. Propose steps to be taken and a schedule to correct any areas of non-compliance.
   D. Recommendations
      1. recommend whether any changes to the SMP are needed
      2. recommend any changes to the frequency for submittal of PRRs (increase, decrease)
      3. recommend whether the requirements for discontinuing site management have been met.

II. Site Overview (one page or less)
   A. Describe the site location, boundaries (figure), significant features, surrounding area, and the nature and extent of contamination prior to site remediation.
   B. Describe the chronology of the main features of the remedial program for the site, the components of the selected remedy, cleanup goals, site closure criteria, and any significant changes to the selected remedy that have been made since remedy selection.

III. Evaluate Remedy Performance, Effectiveness, and Protectiveness
   Using tables, graphs, charts and bulleted text to the extent practicable, describe the effectiveness of the remedy in achieving the remedial goals for the site. Base findings, recommendations, and conclusions on objective data. Evaluations and should be presented simply and concisely.

IV. IC/EC Plan Compliance Report (if applicable)
   A. IC/EC Requirements and Compliance
      1. Describe each control, its objective, and how performance of the control is evaluated.
      2. Summarize the status of each goal (whether it is fully in place and its effectiveness).
      3. Corrective Measures: describe steps proposed to address any deficiencies in ICECs.
      4. Conclusions and recommendations for changes.
   B. IC/EC Certification
      1. The certification must be complete (even if there are IC/EC deficiencies), and certified by the appropriate party as set forth in a Department-approved certification form(s).

V. Monitoring Plan Compliance Report (if applicable)
   A. Components of the Monitoring Plan (tabular presentations preferred) - Describe the requirements of the monitoring plan by media (i.e., soil, groundwater, sediment, etc.) and by any remedial technologies being used at the site.
   B. Summary of Monitoring Completed During Reporting Period - Describe the monitoring tasks actually completed during this PRR reporting period. Tables and/or figures should be used to show all data.
   C. Comparisons with Remedial Objectives - Compare the results of all monitoring with the remedial objectives for the site. Include trend analyses where possible.
   D. Monitoring Deficiencies - Describe any ways in which monitoring did not fully comply with the monitoring plan.
   E. Conclusions and Recommendations for Changes - Provide overall conclusions regarding the monitoring completed and the resulting evaluations regarding remedial effectiveness.

VI. Operation & Maintenance (O&M) Plan Compliance Report (if applicable)
   A. Components of O&M Plan - Describe the requirements of the O&M plan including required activities, frequencies, recordkeeping, etc.
   B. Summary of O&M Completed During Reporting Period - Describe the O&M tasks actually completed

during this PRR reporting period.

C. Evaluation of Remedial Systems - Based upon the results of the O&M activities completed, evaluated the ability of each component of the remedy subject to O&M requirements to perform as designed/expected.

D. O&M Deficiencies - Identify any deficiencies in complying with the O&M plan during this PRR reporting period.

E. Conclusions and Recommendations for Improvements - Provide an overall conclusion regarding O&M for the site and identify any suggested improvements requiring changes in the O&M Plan.

VII. Overall PRR Conclusions and Recommendations

A. Compliance with SMP - For each component of the SMP (i.e., IC/EC, monitoring, O&M), summarize;
   1. whether all requirements of each plan were met during the reporting period
   2. any requirements not met
   3. proposed plans and a schedule for coming into full compliance.

B. Performance and Effectiveness of the Remedy - Based upon your evaluation of the components of the SMP, form conclusions about the performance of each component and the ability of the remedy to achieve the remedial objectives for the site.

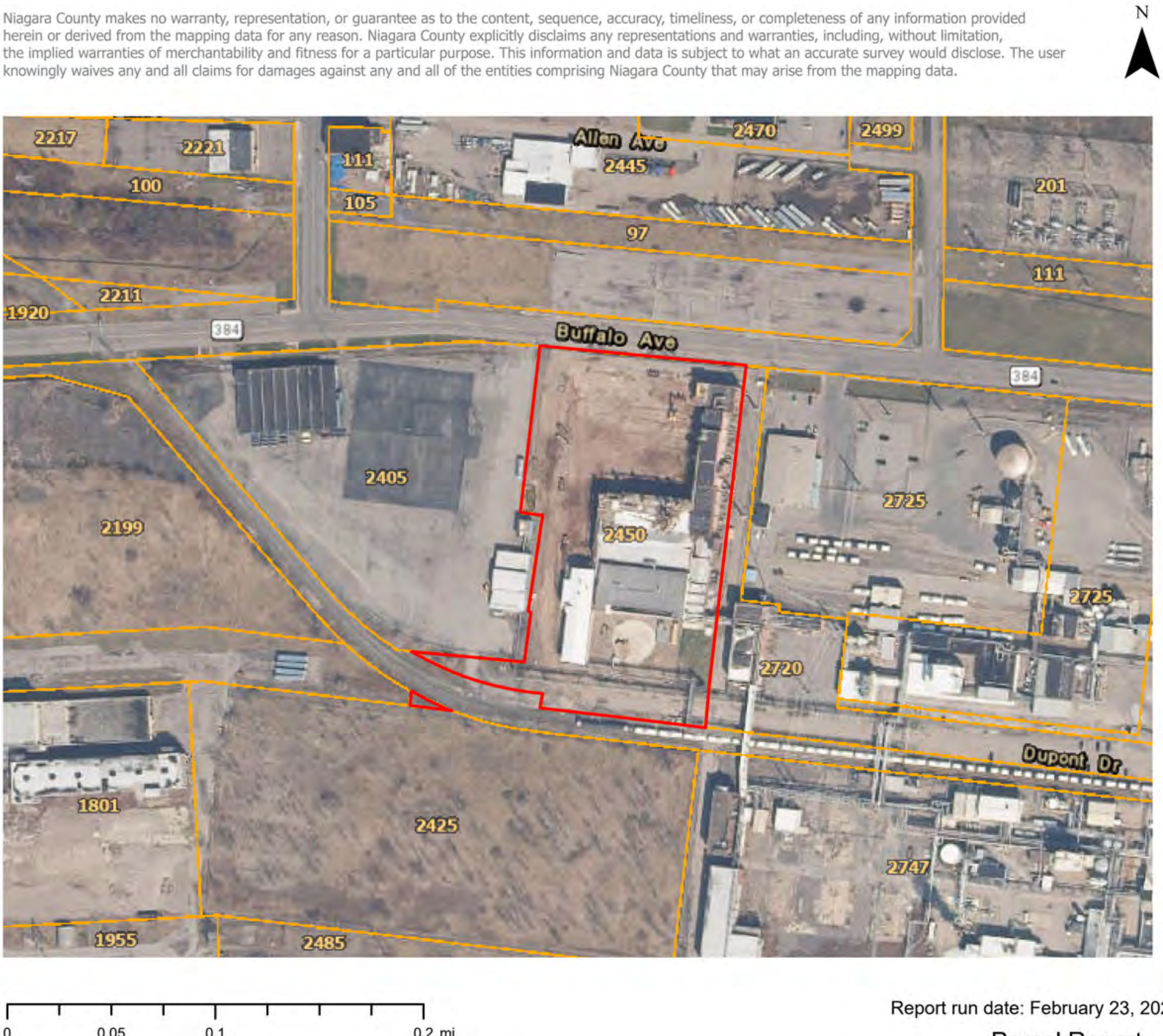
C. Future PRR Submittals
   1. Recommend, with supporting justification, whether the frequency of the submittal of PRRs should be changed (either increased or decreased).
   2. If the requirements for site closure have been achieved, contact the Departments Project Manager for the site to determine what, if any, additional documentation is needed to support a decision to discontinue site management.

VIII. Additional Guidance

Additional guidance regarding the preparation and submittal of an acceptable PRR can be obtained from the Departments Project Manager for the site.

ATTACHMENT 2
NIAGARA COUNTY ON-LINE MAPPING SYSTEM
PARCEL DETAIL REPORTS

Niagara County makes no warranty, representation, or guarantee as to the content, sequence, accuracy, timeliness, or completeness of any information provided herein or derived from the mapping data for any reason. Niagara County explicitly disclaims any representations and warranties, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. This information and data is subject to what an accurate survey would disclose. The user knowingly waives any and all claims for damages against any and all of the entities comprising Niagara County that may arise from the mapping data.



Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.15-1-19

Owner: 2747 Buffalo

Prcl Numb: 2450

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 714

Prop Code Description: Light industrial– manufacturing and processing

Front: 0

Sqft Living Area: 0

Total Assessed Value: 225,000

Depth: 0

Year Built: 0

Land Assessed Value: 23,000

Acres (approx): 5.76

Full Market Value: 362,900

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N

0 0.13 0.25 0.5 mi

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-1-3.1

Owner: The Chemours

Prcl Numb: 2747

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 714

Prop Code Description: Light industrial– manufacturing and processing

Front: 0

Sqft Living Area: 0

Total Assessed Value: 200,000

Depth: 0

Year Built: 0

Land Assessed Value: 50,000

Acres (approx): 24.80

Full Market Value: 322,600

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N

0 0.05 0.1 0.2 mi

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-1-3.2

Owner: The Chemours

Prcl Numb: 2720

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 464

Prop Code Description: Office building

Front: 0

Sqft Living Area: 0

Total Assessed Value: 10,000

Depth: 0

Year Built: 0

Land Assessed Value: 5,000

Acres (approx): 3.13

Full Market Value: 16,100

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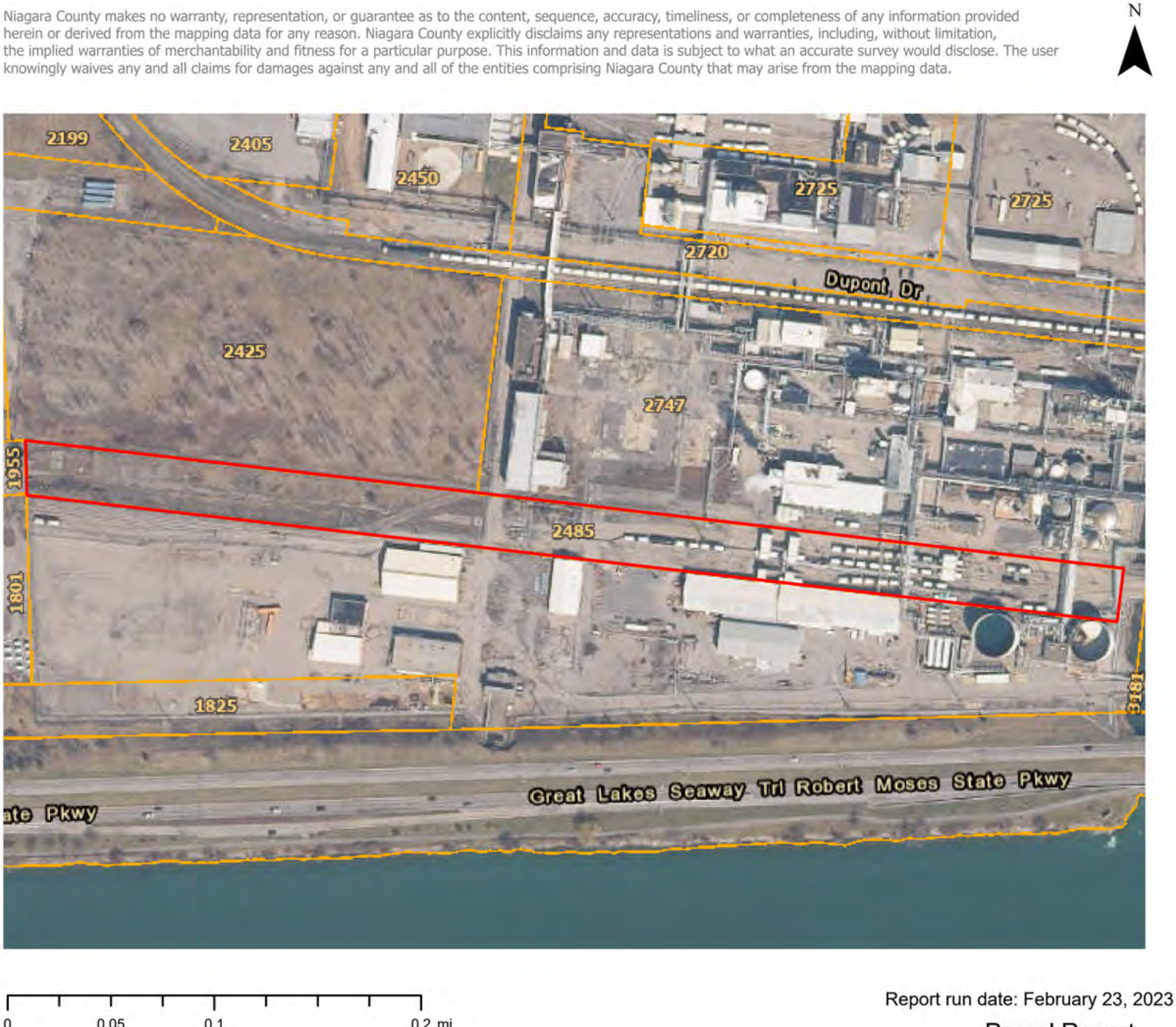

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-1-4

Owner: The Chemours

Prcl Numb: 2485

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 341

Prop Code Description: Industrial vacant land with minor improvements

Front: 0

Sqft Living Area: 0

Total Assessed Value: 15,000

Depth: 0

Year Built: 0

Land Assessed Value: 15,000

Acres (approx): 4.73

Full Market Value: 24,200

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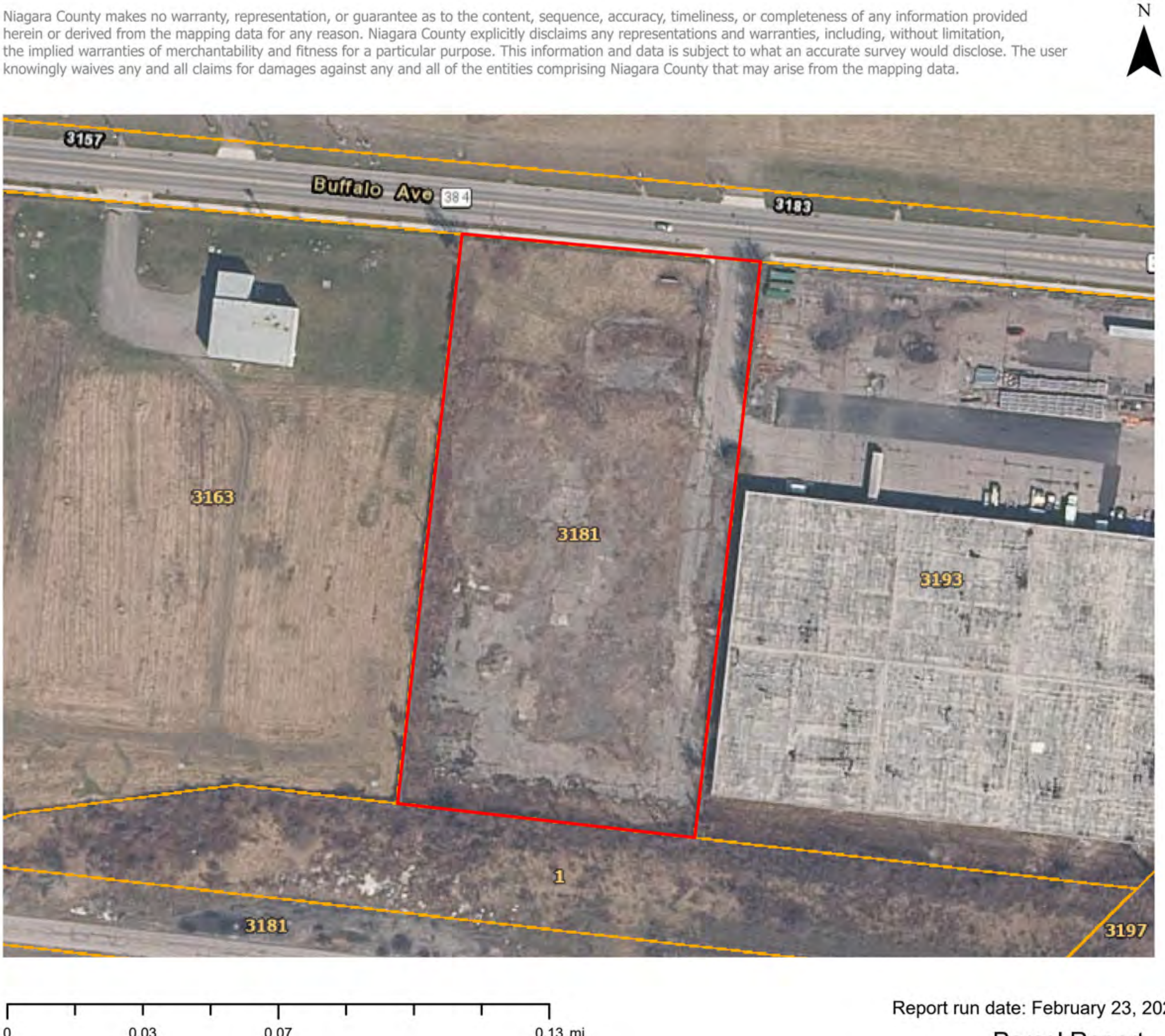

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-2-5

Owner: 2747 Buffalo

Prcl Numb: 3181

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 340

Prop Code Description: Vacant land located in industrial areas

Front: 328

Sqft Living Area: 0

Total Assessed Value: 12,000

Depth: 535

Year Built: 0

Land Assessed Value: 12,000

Acres (approx): 3.39

Full Market Value: 19,400

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N

0 0.05 0.1 0.2 mi

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-2-9

Owner: The Chemours

Prcl Numb: 3181

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 714

Prop Code Description: Light industrial– manufacturing and processing

Front: 0

Sqft Living Area: 0

Total Assessed Value: 80,500

Depth: 0

Year Built: 0

Land Assessed Value: 20,500

Acres (approx): 16.98

Full Market Value: 129,800

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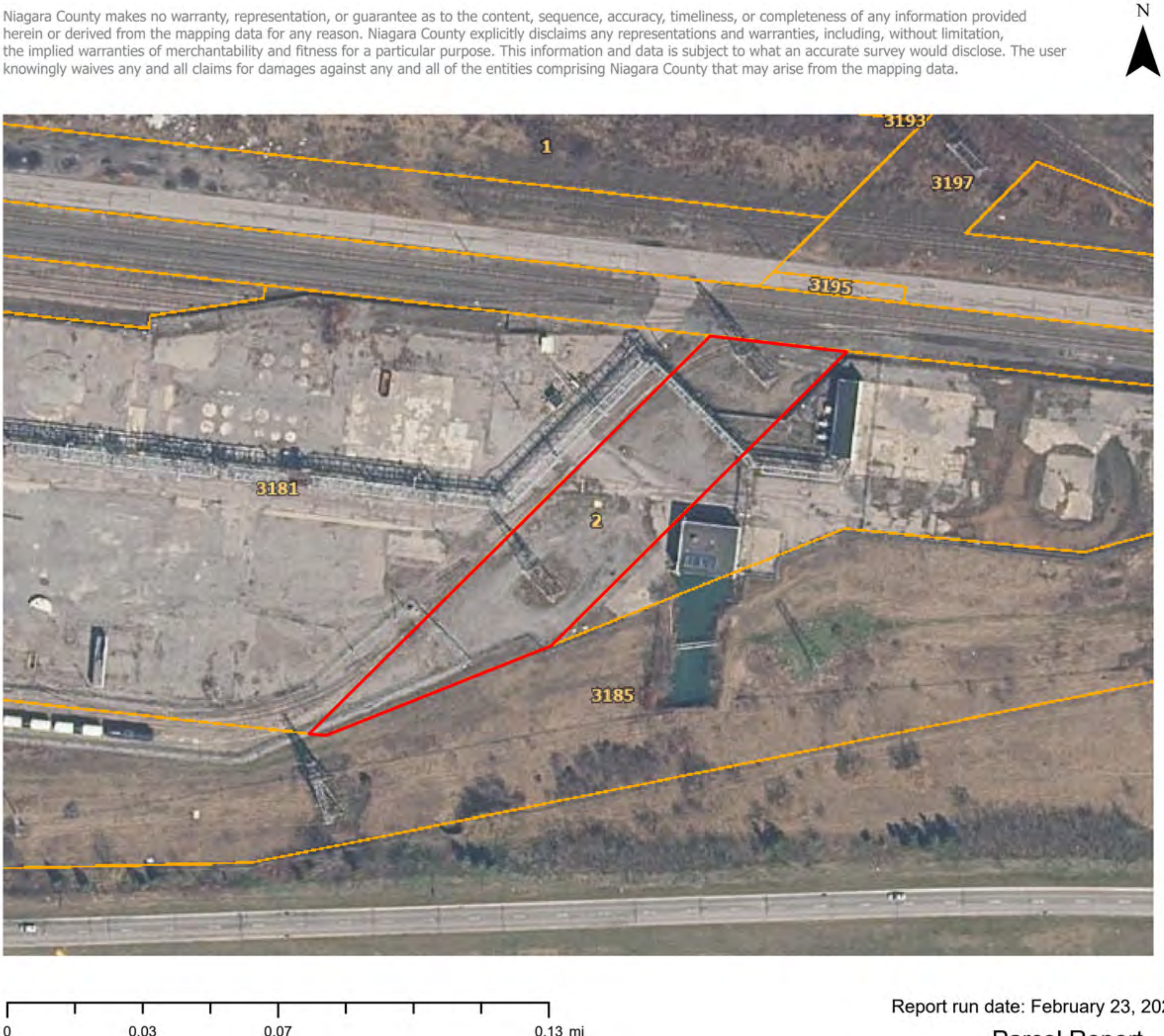

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-2-12

Owner: Niagara Mohawk

Prcl Numb: 2

Prcl Street: Adams Ave

Prcl Muni: Niagara Falls

Prop Code: 380

Prop Code Description: Public utility vacant land

Front: 0

Sqft Living Area: 0

Total Assessed Value: 16,833

Depth: 0

Year Built: 0

Land Assessed Value: 16,833

Acres (approx): 1.06

Full Market Value: 27,200

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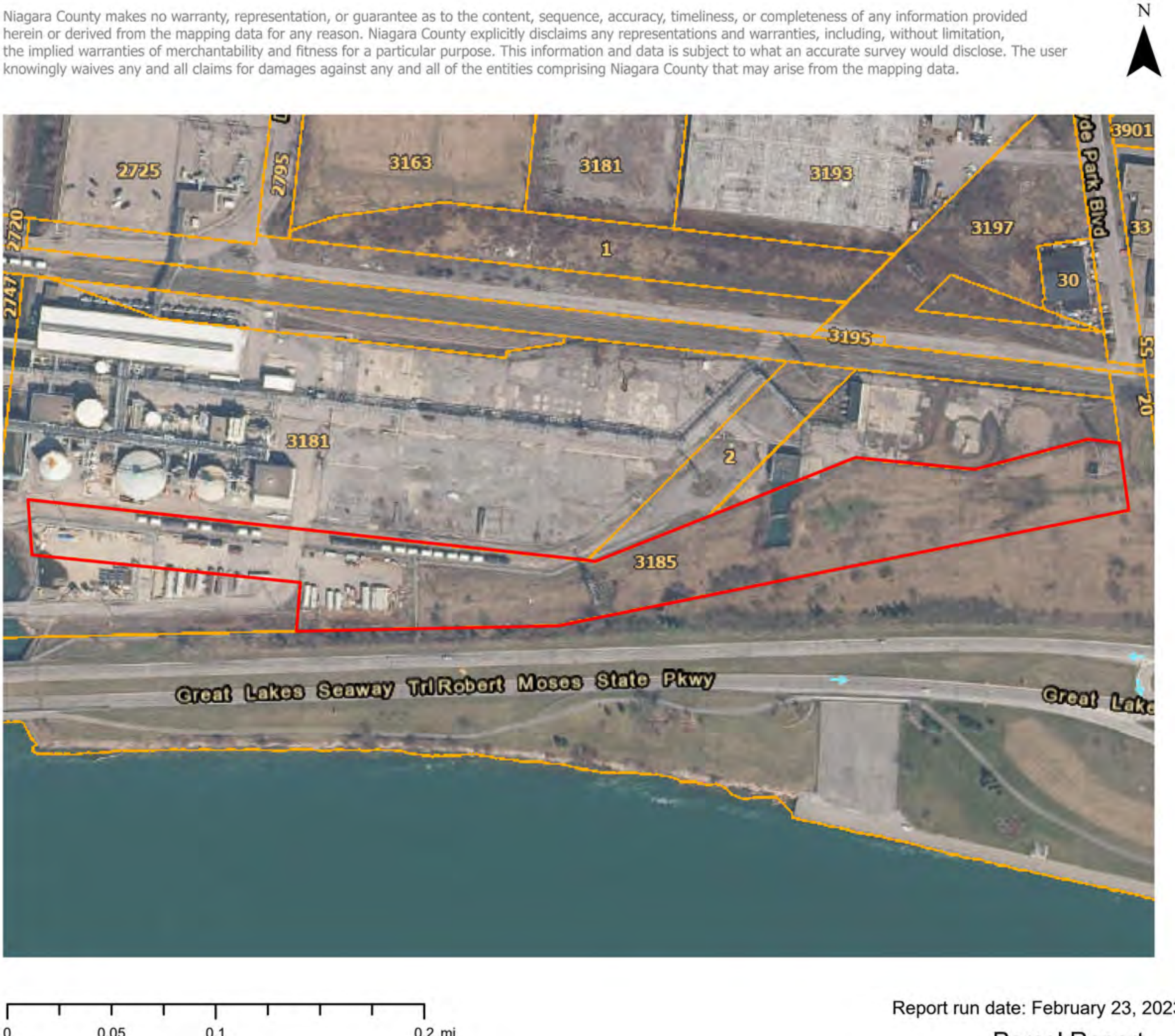

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-2-13

Owner: The Chemours

Prcl Numb: 3185

Prcl Street: Buffalo Ave

Prcl Muni: Niagara Falls

Prop Code: 464

Prop Code Description: Office building

Front: 0

Sqft Living Area: 0

Total Assessed Value: 25,000

Depth: 0

Year Built: 0

Land Assessed Value: 25,000

Acres (approx): 6.44

Full Market Value: 40,300

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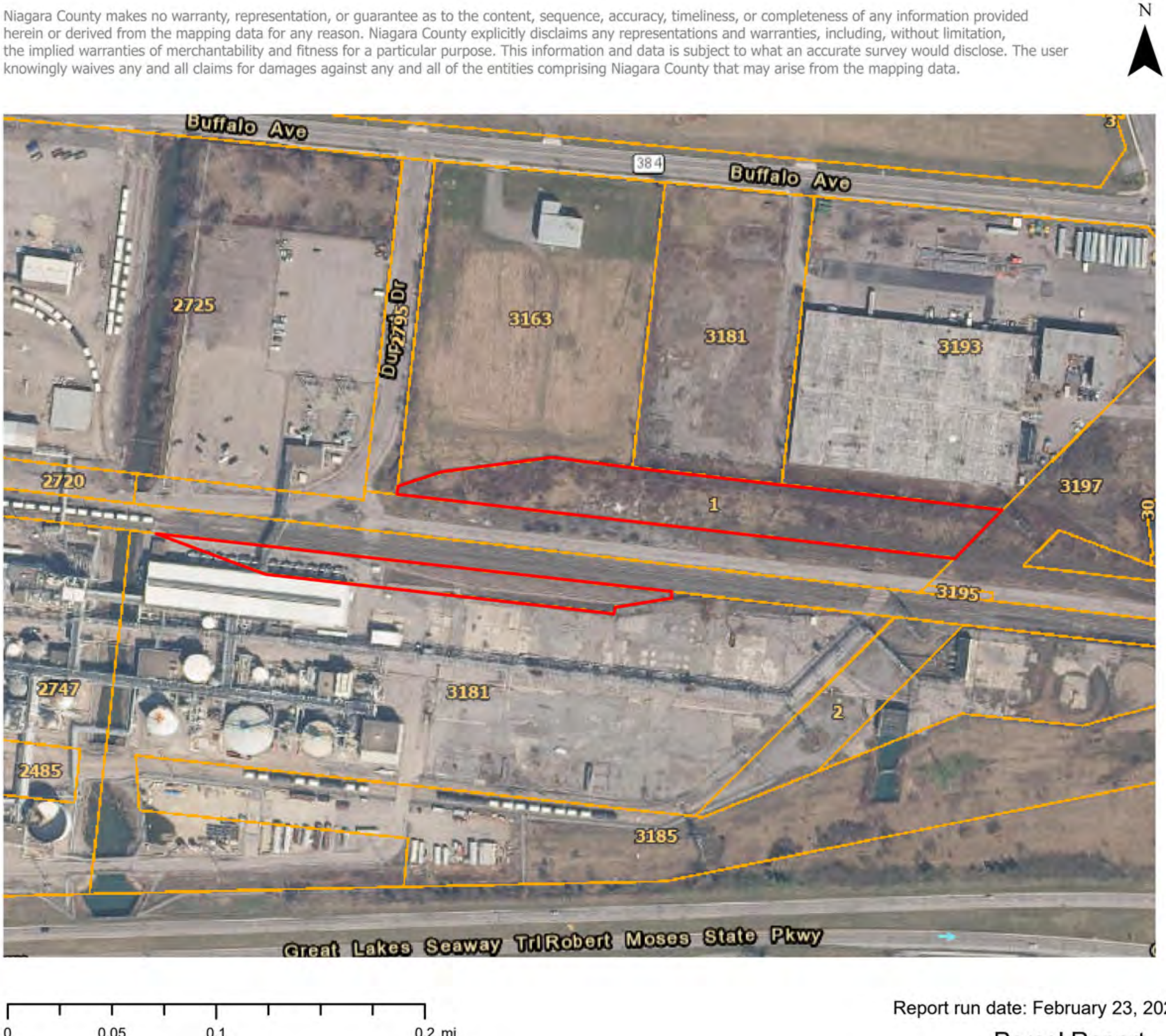

Report run date: February 23, 2023

Parcel Report

Information reflects Final Assessment Roll 2022

SBL: 159.16-2-14.2

Owner: The Chemours

Prcl Numb: 1

Prcl Street: Adams Ave

Prcl Muni: Niagara Falls

Prop Code: 341

Prop Code Description: Industrial vacant land with minor improvements

Front: 0

Sqft Living Area: 0

Total Assessed Value: 1,000

Depth: 0

Year Built: 0

Land Assessed Value: 1,000

Acres (approx): 3.18

Full Market Value: 1,600

ATTACHMENT 3
GROUNDWATER REMEDIATION SYSTEM
2022 ANNUAL MONITORING REPORT

PARSONS

Groundwater Remediation System 2022 Annual Monitoring Report

Chemours Niagara Plant
Niagara Falls, New York

Prepared for:

THE CHEMOURS COMPANY FC LLC
CORPORATE REMEDIATION GROUP

Buffalo Avenue and 26th Street
Niagara Falls, New York 14302

Prepared by:

PARSONS
40 La Riviere Drive, Suite 350
Buffalo, NY 14202

March 2023

Chemours PN 507070
Parsons PN 450326

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS

Acronym	Definition / Description
4Q21	Fourth quarter of 2021
ACO	Administrative Consent Order
BFBT	Blast Fractured Bedrock Trench
CatOx	Catalytic oxidizer
CRG	Corporate Remediation Group
DCE	Dichloroethene
DNAPL	Dense non-aqueous phase liquid
DuPont	E. I. du Pont de Nemours and Company
FST	Falls Street Tunnel
GAC	Granular activated carbon
GWRS	Groundwater Remediation System
μg/l	Micrograms per liter
MNA	Monitored natural attenuation
MOE	(BFBT) Modified Operations Evaluation
NYPA	New York Power Authority
NYSDEC	New York State Department of Environmental Conservation
PCE	Tetrachloroethene
QA/QC	Quality assurance/quality control
RTO	Regenerative Thermal Oxidizer
TCE	Trichloroethene
THT	Tetrahydrothiophene
TVOC	Total volatile organic compounds
VC	Vinyl chloride
VOCs	Volatile organic compounds
WWTP	(City of Niagara Falls) Wastewater Treatment Plant

EXECUTIVE SUMMARY

This report summarizes system operation and groundwater monitoring data collected during 2022 at the Chemours Niagara Plant (the Plant) for the Groundwater Remediation System (GWRS) and Olin Production Well. This report was prepared in accordance with the Interim Remediation Program for the Plant pursuant to an Administrative Consent Order (ACO) with the New York State Department of Environmental Conservation, Index Number B9-0206-87-09.

The Niagara GWRS and the Olin Production Well continued to operate per the requirements of the above-referenced ACO during 2022. Approximately 2.2 tons of volatile organic compounds (VOCs) were removed and treated by GWRS and approximately 1.0 tons of organic compounds were treated by the Olin Production Well.

GWRS uptime during 2022 was 97 percent for the original 23 pumping wells remaining, 97 percent for pumping well PW-37, and 97 percent for pumping well PW-39. No unscheduled treatment system shutdowns and one scheduled treatment system shutdown greater than 24 hours occurred during 2022. On July 24 the system was shut down for annual scheduled maintenance, and was restarted on August 1 (except for PW-39 which was restarted August 2), with a total system downtime of 193.5 hours (218.5 hours for PW-39). During this scheduled shutdown, the annual inspections and maintenance of the equalization tank infrastructure and its liner, caustic scrubber, and regenerative thermal oxidizer (RTO) was completed. All pumping wells were placed back online once the planned inspections and maintenance were completed. By making use of the 120,000-gallon working capacity of the equalization tank, pumping well downtime was minimized.

There were no scheduled pumping well shutdowns greater than 48 hours in 2022. There was one unscheduled pumping well downtime in 2022. PW-43 was down for 48.5 hours between February 21 and February 23 due to a power outage.

The quantitative evaluation of the GWRS hydraulic effectiveness presented in this report illustrates that inward gradients occur in approximately 89 percent of the entire Plant where total VOCs concentrations are observed in the A-Zone overburden and A-Zone bedrock.

The 2022 monitoring data reinforce the conclusions drawn during the BFBT Modified Operations Evaluations (MOE) provided in 2009 and updated in 2013. Since implementation of the modified operations, the West Plant pumping system has operated at more efficient pumping rates using fewer pumping wells, increased mass removal, and achieved equivalent or better hydraulic control. These results demonstrate the improved hydraulic effectiveness of BFBT pumping wells PW-37 and PW-39.

To improve capture in the East Plant, a BFBT was installed to replace select original East Plant pumping wells in September and October 2021. The pumping well was installed near the center of the trench and two piezometers were placed in the trench in the east end and two were placed in the west end. While PW-43 continued to operate, through 2022, adjustments to head level within the well have continued. The water levels and capture system were evaluated throughout 2022 in order to refine the effectiveness of the pumping from the BFBT. PW-43 is effective, and pumps has the ability to pump a higher flow rate than the vertical wells it replaced i.e. PW-28, PW-30, PW-32, and PW-34. Capture along most of the East Plant is similar to previous years, however the eastern portion of the East Plant represent an area where demonstration of capture is more challenging. Monitoring and evaluation of hydraulic head data will be continued in 2023 to evaluate the effectiveness of PW-43. This will include additional piezometers installations in East Plant.

While the overall hydraulic effectiveness of the GWRS and Olin Production Well systems have been established for many years, decreasing concentration trends also demonstrate the systems' effectiveness. Analytical results depict gradually reducing total VOC (TVOC) concentrations in the A-Zone overburden, A-Zone bedrock, and deeper bedrock water-bearing zones (B- through F-Zones). Declining TVOC concentrations are also attributed to gradual contaminant reduction through attenuation processes such as dispersion and biologic/abiotic degradation. The plant-wide groundwater chemistry in the deeper bedrock zones (D- and F-Zones) is dominated by degradation compounds. This indicates that source materials are naturally attenuating.

As approved by the NYSDEC in March of 2019, groundwater samples were collected using passive diffusion bags (PDBs). Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low; therefore, sampling results for samples collected with the PDBs are expected to be similar or slightly higher than the previous sampling method. Comparing historic analytical results to results from 2019 through 2022 showed that the new sampling method provides results that fit the trend of the historic results, although a few exceptions were identified.

Data from 2000 through 2022 continue to indicate that intrinsic bioremediation and natural attenuation of chlorinated hydrocarbon constituents in the East Plant area are actively maintaining either stable or shrinking bedrock groundwater plumes. Because no groundwater users are located in Niagara Falls between the Plant and the presumed discharge point for any plume (Falls Street Tunnel/New York Power Authority conduit drain), it is recommended that continued monitoring of natural attenuation in East Plant bedrock is appropriate. The frequency of the monitoring for specific monitored natural attenuation parameters (inorganic parameters, dissolved gases, total organic carbon, and alkalinity) will remain at once every five years (next monitored in 2023), concurrent with a detailed data evaluation to verify conditions have not changed. VOC data and field parameters will still be collected annually to monitor plume distribution and VOC attenuation.

On June 13, 2022 NYSDEC accepted Chemours proposal to no longer submit quarterly data packages as all relevant information is sufficiently detailed in the Annual PRR, in the form of tables summarizing flows and text describing downtime. As such, only the first quarter data package was submitted.

1.0 INTRODUCTION

This report summarizes 2022 system operation and groundwater monitoring data for the Chemours Company FC LLC (Chemours) Niagara Plant (the Plant) Groundwater Remediation System (GWRS) and Olin Production Well system. System performance and remedial effectiveness are also evaluated. This report was prepared in accordance with the Interim Remediation Program for the Plant pursuant to an Administrative Consent Order (ACO) with the New York State Department of Environmental Conservation (NYSDEC), Index Number B9-0206-87-09. The Plant location is shown in **Figure 1-1**.

On June 13, 2022 NYSDEC accepted Chemours proposal to no longer submit quarterly data packages as all relevant information is sufficiently detailed in the Annual PRR, in the form of tables summarizing flows and text describing downtime. As such, only the first quarter data package was submitted (Parsons 2022b).

Operational data for 2022 are summarized in Section 2.0. System performance monitoring data are presented and system effectiveness is discussed in Section 3.0. Conclusions and recommendations are presented in Section 4.0. References cited in this report are provided in Section 5.0.

A Purchase and Sale Agreement was executed in 2019 with 2747 Buffalo Ave., LLC to sell certain parcels of the Chemours Niagara property (formally DuPont Niagara Plant Buffalo Ave and 26th Street, Niagara Falls NY), specifically Parcel 159.16-2-5 and a newly subdivided parcel referred to as New Lot A in Parcel 159.16-1-3. Site remediation responsibilities related to Order on Consent no. B9-0206-87-09 will remain with Chemours. Attachment 2 of the 2019 PRR provided the previously issued notification of sale.

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2.0 GWRS OPERATIONS AND IMPROVEMENTS SUMMARY FOR 2022

During 2022, the GWRS collected and pre-treated 11.4 million gallons of groundwater prior to discharge to the City of Niagara Falls Wastewater Treatment Plant (WWTP). The quantity of organics removed from groundwater in 2022 continues to be greater than the removal observed prior to the installation and start-up of the West Plant Blast Fractured Bedrock Trenches (BFBTs) in 2005 (**Figure 2-1**). Operations data from 1992 through 2022 are summarized in **Table 2-1**.

Niagara Plant GWRS uptime (**Table 2-1**) includes calculated uptime for the original 23 pumping wells and BFBT pumping wells PW-37, PW-39, and PW-43. Uptime is calculated based on recorded water levels within each of the original pumping wells as they operate in an “on/off” sequence to maintain a consistent well level. Uptime for pumping wells PW-37, PW-39, and PW-43 is calculated using data derived from in-line flow meters and continuous groundwater elevation tracking. Each BFBT well is determined to be in operation when flow is demonstrated, and dynamic level setpoints are achieved. This method of calculating pumping well uptime represents operational conditions and provides a consistent indicator of the hydrogeological effectiveness of the pumping operation. According to this uptime determination, 2022 uptime was 97 percent for the original 23 pumping wells still in operation, 97 percent for pumping well PW-37, 97 percent for pumping well PW-39, and 97 percent for PW-43.

An assessment of the hydraulic effectiveness of operating the BFBTs was completed in 2009. Details were submitted to the NYSDEC (DuPont Corporate Remediation Group [CRG] 2009) with recommendations to continue operating the system using the BFBT pumping wells which continue to reduce the need to pump a number of aging original pumping wells. Comments on this report were received from the NYSDEC in July 2012, and DuPont submitted a revised and updated Modified Operation Evaluation (MOE) Report on February 27, 2013. The updated report included data generated since the report was initially submitted and lines of evidence beyond those that were included in the initial report. Pumping wells continue to operate under the MOE conditions and with effective capture.

Details of system operations data for the first quarter of 2022 was provided to NYSDEC in a quarterly data package (Parsons 2022b). Quarterly performance details for the GWRS, Olin Production Well, and Plant Outfall 023 during 2022 are summarized in the table below.

Operational Statistics	1Q22+	2Q22+	3Q22+	4Q22+	2022 Total+
GWRS					
Original 23 Pumping Wells Uptime	97.2%	99.7%	91.3%	99.7%	**97.0%**
PW-37 Uptime	97.6%	99.5%	91.2 %	99.9%	**97.0%**
PW-39 Uptime	97.8%	99.5%	90.8%	100.0%	**97.0%**
PW-43 Uptime	97.8%	100.0%	89.3%	99.9%	**96.7%**
Total Gallons Pumped (millions)	3.21	2.51	2.59	3.10	**11.42**
Estimated Pounds of Organics Removed from Groundwater*	1,047	1,184	1,095	1,172	**4,498**

Operational Statistics	1Q22+	2Q22+	3Q22+	4Q22+	2022 Total+
GWRS					
Number of Unscheduled System Shutdowns > 24 hours	0	0	0	0	**0**
Number of Scheduled System Shutdowns > 24 hours	0	0	1	0	**1**
Pump Replacements	1	1	1	0	**3**
Pump Repairs Requiring > 48 Hours	1	0	0	0	**0**
Olin System					
Pumping System Uptime	100.0%	100.0%	100.0%	100.0%	**100.0%**
Estimated Pounds of Organics Treated	530.6	458.6	462.6	582.7	**2,035**
Outfall 023					
Estimated Pounds of Organics Treated	49	44	23	30	**146**
Total Estimated Pounds of Organics Removed / Treated	1,627	1,687	1,581	1,784	**6,679**

+Excludes shutdown of wells PW-1 thru PW-12, PW-14 since 4Q08.
* Based on quarterly influent/effluent analyses.

In addition to the high uptimes discussed above, approximately 6,679 pounds (3.3 tons) of organic compounds were removed and treated during 2022. The annual total organics treated by the system (combined GWRS, Olin system, and Outfall 023) are shown **Figure 2-1**. The time series plot demonstrates the total removed organics between 1992 and 2022. Key observations are made:

- From 1992 to 2004, the annual mass removed decreased over time. This is typical of groundwater treatment systems as they are known to eventually reach asymptotical recovery levels.
- The mass removal rate significantly increased after 2004-2005 when the two West Plant BFBTs were being brought online. This demonstrates that the BFBTs are extracting more mass of volatile organic compounds (VOCs) than pumping from the west header wells was able to accomplish. The increase in mass has been sustained since the installation, indicating the BFBTs continue to be more effective at mass removal than the west header wells alone. There was no decrease in mass removal rates associated with turning west header wells off during the MOE.

These observations demonstrate the capture improvement of the West Plant BFBTs and the effectiveness of the GWRS.

2.1 System Shutdowns

Due to the ample capacity of the GWRS equalization tank, there were no unscheduled treatment system shutdowns in 2022 that were greater than 24 hours. There was one scheduled treatment system shutdown in the third quarter of 2022. On July 24 the system was shut down for annual scheduled maintenance, and was restarted on August 1, with a total downtime of 193.5 hours for the pumping wells, except for PW-39 which was down 217.5 hours. The treatment system was also down for 217.5 hours. During this shutdown, the annual inspections and maintenance of the equalization tank infrastructure and liner, caustic scrubber, and regenerative thermal oxidizer (RTO) was completed. By making use of the 120,000-gallon working capacity of the equalization tank, pumping well downtime was minimized. There was one unscheduled pumping well shutdowns greater than 48 hours and no scheduled pumping well shutdowns in 2022.

As appropriate, scheduled and unscheduled shutdowns were reported to the NYSDEC via email and documented in the quarterly data packages.

2.2 Air Emissions

Air emissions from the GWRS originate from two sources: (1) the stack downstream of the pre-treatment and Regenerative Thermal Oxidizer (RTO) systems, and (2) emissions vented during filling of the GWRS Equalization Tank. Activities associated with these two emission points are summarized below.

2.2.1 Regenerative Thermal Oxidizer

As described in correspondence between NYSDEC and DuPont (NYDEC 2008), the Catalytic Oxidizer System (CatOx) was replaced with the RTO in August 2008. The RTO destruction removal efficiencies are similar or better than those of the CatOx, with much greater uptime and without the expensive catalyst issues. As mentioned above the RTO installed in 2008 had reached the end of its useful life and was replaced in 2018.

The new RTO was designed (Adwest Corp) and constructed (Amherst Stainless Fabrication Co.) as a replacement in-kind for the existing unit with a number of operations-based improvements. The new RTO was installed in 1Q18 and 2Q18 and began operation on April 19, 2018.

2.2.2 Air Emission Contingency Plan

Groundwater pumped from the BFBTs led to increased VOC chemical loading to the GWRS pre-treatment system. Air emission modeling to assess substantive compliance with applicable New York State regulations required the installation of an off-gas treatment technology following the on-set of pumping from the BFBTs. The original modeling effort was conducted when the GWRS used steam stripping as the technology to remove VOCs from groundwater and a CatOx for off-gas treatment. In 2005, the NYSDEC requested that a contingency plan be prepared to allow continued pumping from select GWRS pumping wells even when the CatOx unit was not operational (NYSDEC 2005). The RTO replaced the CatOx in 2008, and the Air Emission Contingency Plan remained the same. Based on chemical loading to the pre-treatment system, implementing the contingency plan requires the shutdown of PW-37 to ensure that long-term air emission guidelines are achieved.

At no time during 2022 was the system operated in contingency mode.

2.2.3 Equalization Tank Vent

The equalization tank serves as the initial collection point for groundwater prior to pre-treatment. This tank is vented to the atmosphere through two 200-pound carbon canisters connected in series (Emission Point 88002). The following table summarizes dates for the lead carbon canister replacements during 2022:

Date of Change-Out
3/16/22
6/21/22
9/28/22
12/18/22

The quarterly canister replacement schedule was based on the pilot test completed from 2011 to 2013.

2.3 Pumping Wells

The following pump replacement occurred during 2022:

Pump Replacements		
Pumping Well	**Replacements**	**Quarter of Replacement**
PW-36	1	1Q22
PW-43	1	2Q22
PW-43	1	3Q22
Total	**3**	

2.4 Olin Production Well and Carbon Vessels

The Olin Production Well treatment system maintained 100% uptime during 2022. The pumping well was operated at an average monthly flow rate of greater than 500 gallons per minute.

Groundwater pumped from the production well is treated in six carbon vessels, each of which contains 20,000 pounds of granular activated carbon (GAC). The vessels in the system are separated into two banks of three vessels each, all in a parallel operational mode. The groundwater is treated through one bank at a time (that is, only three vessels are used in parallel). This allows carbon in the unused vessels to be removed and replaced, ready to be placed online within an hour if necessary. Twelve carbon vessel change-outs (four banks) were completed during 2022.

The discharge from the Olin Production Well treatment system is used as non-contact cooling water in Olin Corporation's industrial process. A summary of when the changed carbon was placed online is shown below.

Olin Carbon Vessel Dates Placed On-line	
V-2, -3, -4	2/24/22
V-5, -6, -7	5/16/22
V-2, -3, -4	8/29/22
V-5, -6, -7	11/29/22

2.5 East Plant BFBT Installation

To improve capture in the East Plant, a BFBT was installed to replace vertical pumping wells in September and October, 2021. The BFBT was installed along a 250-foot alignment. Boreholes along the alignment were drilled at 5-foot spacings, to a depth of five feet below the top of bedrock. Explosive charges were placed at the bottom of each borehole and filled to the surface with angular stemming stone to direct the blast energy laterally and minimize upward blast force. Between each borehole (explosive charge), an in-line blasting delay was used to create a controlled sequential blast. Blast vibration monitoring was conducted.

After completion of the BFBT, a new pumping well (PW-43) was installed in approximately the middle of the trench. Four 2-inch diameter piezometers were installed at the ends of each trench (within the trench). Two piezometers were installed in the A-Zone overburden and two were installed in the A-Zone bedrock.

After the BFBT and pumping well and piezometers were installed, AECOM completed pump installation into the pumping well. Piping the new BFBT pumping well to the treatment system, electrical connections, controls wiring, and head works were also completed by AECOM and their contractors. The BFBT well (PW-43) was placed online December 20, 2021 and remained online the remainder of 2021. Consistent with all other pumping wells, PW-43 program logic and operation is controlled by the Honeywell Experion™ PKS process control system. Operation of PW-43 and the BFBT replaces operation of vertical wells PW-28, PW-30, PW-32, and PW-34.

3.0 SYSTEM PERFORMANCE MONITORING

Water-level measurements and groundwater sampling are conducted to assess the effectiveness of the GWRS and Olin Production Well pumping systems in controlling groundwater flow. The 2022 groundwater elevation monitoring and chemistry sampling was conducted at locations in accordance with the monitoring schedules presented in **Tables 3-1 and 3-2**, respectively. Chemical monitoring analytical parameters are presented in **Table 3-3**. The groundwater monitoring well, pumping well, and piezometer plan is depicted on **Figure 3-1**. The first 5-year monitoring event per the revised sampling program accepted by NYSDEC (December 9, 2016), was completed in 2018. The next 5-year monitoring event is scheduled for 2023. In 2022, annual sampling was completed per the revised sampling program.

3.1 Groundwater Elevations Monitoring

Routine groundwater elevation measurements are the basis for determining the extent of physical control of groundwater flow in the overburden and bedrock flow zones. Water levels are measured quarterly and are used to generate potentiometric surface contour maps that show the aerial extent of hydraulic control. The data presentation facilitates determining both the spatial and temporal extents of hydraulic control for the Niagara Plant in all water-bearing zones of concern.

Quarterly groundwater-level measurements collected for the first quarter of 2022 was included in the quarterly data package submitted to NYSDEC (Parsons 2022b). After submittal of the first quarter 2022 report, the NYSDEC agreed (in a June 13, 2022 email) that quarterly reports for the site were no longer needed, and data could be submitted in the annual report. Water level measurements from 2Q22, 3Q22, and 4Q22 are included in the 2022 PRR as **Attachment 4**.

3.1.1 Potentiometric Surface Maps

Quarterly potentiometric surface maps were generated from the groundwater level measurements. The first quarter 2022 potentiometric surface maps were included in the quarterly data package submitted to NYSDEC (Parsons 2022b). After submittal of the first quarter 2022 report, the NYSDEC agreed that quarterly potentiometric surface maps could be submitted in the annual report. Quarterly potentiometric surface maps in zones A-Zone Overburden, A-Zone Bedrock, B-Zone Bedrock, C/CD-Zone Bedrock, and D-Zone Bedrock for 2Q22 in Figures 3-2 through 3-6, respectively; for 3Q22 in Figures 3-7 through 3-11, respectively; and for 4Q22 in Figures 3-12 through 3-16, respectively.

A-Zone Overburden and A-Zone Bedrock

This section discusses the potentiometric surface maps as related to volatile organic compound (TVOC) isoconcentration maps. These maps are used to understand groundwater flow patterns at the Plant and the GWRS effectiveness to contain Plant groundwater.

Water level monitoring data collected in the A-Zone Overburden and A-Zone Bedrock during all four quarters of 2022 were consistent with previous reporting periods. Hydraulic heads in both zones were depressed in the vicinity of operating pumping wells. This confirmed that an inward gradient has been maintained along a majority of the Plant property, and off-site groundwater flow has decreased during the operation of the GWRS. Hydraulic control is discussed in greater detail in Section 3.1.2 below.

A-Zone TVOC isoconcentration contours for 4Q22 have been superimposed over potentiometric surface contours for the A-Zone overburden and A-Zone bedrock (November 30, 2022) and are presented in **Figures 3-17 and 3-18**, respectively. Groundwater potentiometric surface and TVOC concentration contour maps illustrate the impact of the GWRS and its effectiveness in reducing off-site migration of chemical constituents. **Figures 3-17 and 3-18** both illustrate that the hydraulic cones-of-depression associated with GWRS pumping wells coincide with areas of moderate and high TVOC concentrations. Additionally, both figures illustrate the improved effectiveness of the GWRS with the addition of the two West Plant BFBTs as indicated by the geographic alignment of the areas of highest TVOC concentrations and the location of the BFBTs. This is supported by **Figure 2-1** which demonstrates an increase in mass removal after installation and operation of the BFBTs.

In the West Plant, inward gradients have developed toward the BFBT pumping wells (PW-37 and PW-39), toward the line of pumping wells PW-16, PW-18, and PW-19, and also toward PW-35, which was brought back online in 2Q13. In the East Plant, inward gradients have developed in the line of pumping wells from PW-20 (just east of Gill Creek) to the BFBT and associated PW-43 (in the eastern portion of the Plant). Potentiometric surface maps indicate that hydraulic control is achieved in a majority of the Plant. Hydraulic control is discussed in greater detail in Section 3.1.2.

Bedrock Water-Bearing Zone

Flow patterns remain similar to previous years in the East Plant B-Zone and lower zones. The B-Zone hydraulic gradients are generally to the north toward the groundwater pumping system located at the Solvent Chemical site (immediately north of EPO-6 and EPO-7) and the Falls Street Tunnel (FST), which is located approximately 1,400 feet north of the Plant. In the absence of active pumping, the dominant B-Zone flow gradients would be generally to the north. These gradients would be consistent with the fact that the Buffalo Avenue Sewer and FST act as horizontal drains to the upper bedrock. Pumping from PW-39 induces a groundwater capture zone in the southeast section of the West Plant, providing groundwater capture in this area.

Potentiometric surface maps for B, C/CD, and D Zones were previously reported in the 1Q22 quarterly data package (Parsons 2022b), and are provided in Figures 3-4 through 3-6 for 2Q22, in Figures 3-9 through 3-11 for 3Q22, and in Figures 3-14 through 3-16 for 4Q22. In general, hydraulic heads and gradients in the C/CD-Zone are also similar to those measured on previous dates. Groundwater flow in the C/CD-Zone is generally to the northwest toward the Olin Production Well in the West Plant and north/northeast in the East Plant toward the intersection of the FST and the New York Power Authority (NYPA) conduits (FST/NYPA Intersection). Groundwater flow in the D-Zone exhibited similar trends as those observed in previous reporting periods, with flow generally toward the north and northwest.

3.1.2 Hydraulic Control

Figure 3-19 depicts the total area of the Plant where the hydraulic effectiveness evaluation was conducted. The far eastern portion of the Plant (former Power House area), the West Yard, and former Sodium Shop parcel were not included in area calculations because the GWRS was not specifically designed to provide hydraulic control in these areas. Potentiometric surface contour maps for the A-Zone overburden and A-Zone bedrock illustrating the areas of hydraulic control for each quarter in 2022 are presented in **Figures 3-20** through **3-27**. Results of the hydraulic effectiveness evaluations for 2022 are summarized in **Table 3-4**. Overall, there are slight changes in capture from year to year, sometimes increasing, sometimes decreasing, but generally in the 1 to 2% range. The percent capture changes are likely due to subtle differences in the flow field and likely do not indicate a meaningful difference. The most notable changes are increases due to BFBTs in the West Plant and slight decreases in capture east of PW43. Changes will continue to be tracked over time to identify trends.

The A-Zone overall (overburden and bedrock) percentage of West Plant effectiveness was 91 percent, which was similar to the previous 8 years. This capture percentage is near the higher end of the typical capture effectiveness from 2000 to 2005 prior to installation of the BFBTs, which ranged from 88 to 91 percent. The capture in this area appears to be sensitive to well 3A which had relatively higher head in 2021, therefore it was inspected and was redeveloped in 2021. Well 3A was determined to be screened more shallow compared to other wells and piezometers and more representative of the A-Zone Overburden. As such well 3A was reassigned A-Zone Overburden and a new piezometers WPT-26 was installed in 3Q21. The result of more appropriately assigning 3A and WPT-26 to overburden and top of rock (respectively) was improved depiction of West Plant capture.

The East Plant overall effectiveness percentage was 86 percent for 2022. This is similar to the average value from 2011 through 2021 but is lower than the pre-2006 average of 91 percent.

The Plant-wide hydraulic effectiveness estimate for 2022 was 89 percent, which is slightly below estimates for 2006 through 2020 (91 to 94 percent).

3.1.3 East Plant BFBT Hydraulic Control Evaluation

Testing of the hydraulic effectiveness of BFBT PW-43 and associated BFBT continued after well start up and throughout 2022, using hydrographs, pumping rates, and potentiometric surface maps. Results indicate that pumping from PW-43 has a significant hydraulic influence throughout the East Plant. Additionally, the capture zone on the eastern end of the East Plant suggests addition pumping or monitoring may be necessary to identify capture in this area. Additional monitoring including installation of piezometers is recommended to further evaluate.

3.2 Groundwater Chemistry Monitoring

Groundwater sampling was conducted during 2022 in accordance with the monitoring schedule summarized in **Table 3-2**. Analytical parameters are summarized in **Table 3-3**. Analytical results for the 2022 annual sampling event are included in **Appendix B**. **Appendix B** also contains analytical results for the Gill Creek surface water sampling event. In accordance with the sampling program modifications implemented in 2006, 2011, and 2016, the following particulars to the sampling program were followed, in addition to the typical annual samples:

- In accordance with the five-year frequency, active pumping wells were not sampled in 2022. These wells will next be sampled in 2023. Inactive west header pumping wells (PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, and PW-14) were not sampled (as described in correspondence from DuPont to NYSDEC dated June 15, 2011).

- Wells 6AR and 27A were not sampled in 2022. Wells 6AR and 27A are on a five-year sampling schedule and the next sampling event for these wells will occur in 2023.

Dissolved barium was not analyzed in samples from wells 5AR and 21A. Dissolved barium analysis in samples from 5AR and 21A is on a five-year sampling schedule and will next be completed in 2023. As approved by the NYSDEC in March of 2019, groundwater samples were collected using passive diffusion bags (PDBs). PDBs are installed in the screened zone or adjacent to the fracture in the case of bedrock wells and left in the well for a minimum of two weeks. The PDBs are then withdrawn and used to fill the required sample bottles. Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low; therefore, sampling results for samples collected with the PDBs are expected to be similar or slightly higher than the previous sampling method.

Comparing historic analytical results to results from 2019 through 2022 showed that the new sampling method provides results that fit the trend of the historic results. A few exceptions were identified, that cannot be attributed to other mechanisms. Wells 1AR3 (2019, 2020, and 2022), 1C (2019 through 2022), 18C (2022), 19 C/CD1 (2019 through 2022), 10D (2019 through 2021), 25D (2019 through 2021), 17F (2020 and 2021), and 25F (2019 through 2021) had results higher than recent years.

Analytical data were reviewed in accordance with quality assurance/quality control (QA/QC) procedures described in the Niagara Plant Quality Assurance Project Plan (Woodward-Clyde Diamond 1999).

3.2.1 A-Zone Overburden and A-Zone Bedrock Results

A-Zone groundwater analytical results for 2022 are consistent with past monitoring results, with the highest TVOC concentrations observed mainly in three areas, two of which are located in the southern West Plant:

- Immediately west of Gill Creek near monitoring well 14A
- South of the Olin brine storage tanks (well 1AR3)
- East Plant well location 8A

The distribution of groundwater chemistry concentrations for the A-Zone overburden and A-Zone bedrock are shown in **Figures 3-17 and 3-18**, respectively. A summary of the 2022 TVOC results by zone from monitoring well sampling is presented below. Groundwater chemistry trends for all monitored zones are discussed in Section 3.3.

3.2.2 Chemical Mass Removal

As a consequence of providing hydraulic control, the GWRS has been effective in removing chemical mass from groundwater. Mass removal continues to be greater than before the installation and operation of the BFBTs in 2005 (BFBTs, PW-16, PW-18, PW-19, PW-35 and PW-36 in the West Plant). In 2022, the GWRS removed approximately 4,498 pounds (2.2 tons) of organic compounds from groundwater.

The Olin Production Well continued with a mass removal rate within the range of historical values, but with a noted increase in late 2019 and through 2022. The yearly estimated mass of organic compounds removed was 1.0 tons in 2022 compared with an average mass removal of 0.59 tons/year from 2009 – 2019. A corollary increase in concentrations was observed in quarterly influent sampling in 4Q2019 and continued through 2022. This increase in concentrations and mass removal follows increases in upgradient C/CD monitoring wells indicating the Olin Production Well is acting as designed and capturing the migration of VOCs in this zone (see **Attachment 3** for more details).

The combined effect of the GWRS and the Olin Production Well resulted in the removal and treatment of approximately 6,679 pounds (3.3 tons) of organic compounds in 2022 (including Outfall 023). An estimated 142.6 tons of organic compounds have been collected and treated since the GWRS began continuous operation in 1992. **Figure 2-1** depicts the of mass removal over time as a percent of total. The increase in mass removal rates decreased during the 1990's after initial start-up, but then significantly increased in 2006 likely due to startup of the West Plant BFBTs. This improved performance has been maintained from 2006 to 2022.

3.3 Groundwater Elevation and Chemistry Trends

An analysis of short-term and long-term groundwater chemistry trends has been completed to assess the effectiveness of the GWRS in reducing organic compound concentrations in groundwater through pumping for source control. This analysis used TVOC concentration data from monitoring wells and addressed trends in the A-Zone overburden, A-Zone bedrock, and bedrock water-bearing zones (i.e., B- through F-Zones). The evaluation also serves to identify locations where TVOC concentrations exhibit significant changes (generally, changes greater than an order of magnitude). TVOC concentration versus time plots for A-Zone overburden, A-Zone bedrock, and bedrock B- through F-Zone monitoring wells are presented in **Appendix C**.

Operation of the Olin Production Well and GWRS to control groundwater, supplemented by natural attenuation mechanisms, has resulted in an overall trend of declining TVOC concentrations in the overburden / top-of-bedrock, and bedrock fracture zones. In general, the West Plant, where the highest TVOC concentrations have historically been reported, exhibits the greatest decline in TVOC concentrations. This is consistent with the fact that operation of the Olin Production Well results in the direct hydraulic control in bedrock fractures zones beneath this area of the Plant. Natural attenuation processes also demonstrate that conditions remain favorable for natural attenuation of chlorinated hydrocarbons.

3.3.1 A-Zone Overburden and A-Zone Bedrock

The overall hydraulic effectiveness of the GWRS to gradually reduce TVOC concentrations in groundwater has been established for many years via the evaluation of TVOC concentration trends. While monitoring points exhibit some degree of scatter in TVOC concentration data over time, there is an overall trend of decreasing TVOC concentrations in A-Zone monitoring wells. Long-term TVOC concentrations have decreased in 14 of the 17 well locations in direct response to GWRS operation. These declines in TVOC concentrations indicate effective hydraulic control created by the GWRS over the 30 years of operation and source material depletion through dispersive and biodegradation processes. The hydraulic control remedy enhancement in the southern West Plant continues to show its effectiveness in removing chemical mass.

The greatest TVOC decline over time has occurred at southern West Plant well 28A (immediately south of BFBT PW-37) where TVOC concentrations have steadily decreased from 1,865,000 μg/l in 2000 to 5,610 μg/l in 2022 (**Appendix C**). TVOC

Concentrations have been below 10,000 μg/l since 2012. A similar declining TVOC trend is evident at nearby offsite well DEC-4R as shown in the TVOC trend plot for this well (**Appendix C**). Since activation of the BFBTs, the rate of decline in DEC-4R has appeared to increase, indicating an improved performance as a result of the BFBTs.

At well DEC-3R (south of PW-39 BFBT), sample results demonstrate significant variability in TVOC; however, the average 2022 concentration of 62,250 μg/l is appreciably lower than 1992 levels (greater than 2,000,000 μg/l), and the trend is decreasing. The concentrations in on-site well 1AR3 (northeast of DEC-3R and PW-39) (1,386,000 μg/l in 2022) had shown an increasing trend between 2010 and 2015 but significantly decrease in 2016 (50,900 μg/L) and again in 2017 (102.4 μg/L). TVOCs increased in 2018, 2019, and 2020 (compared to 2016 and 2017) but dropped in 2021 (426,000 μg/L) to lower than the prior three years and in the range that is typical for this location. The increase in 2022 to 1,386,000 μg/L is the highest observed at this location but may be a result of the variability observed at this location. Well 2A, which is between the two West Plant BFBTs, has had TVOCs declining since 2004 when concentrations were 25,790 μg/l to between 583 μg/l and 7,400 μg/l the between 2010 and 2021. In 2022 the TVOC concentration at well 2A dropped to the lowest observed at this location (25.3 μg/L). Well 3A (1.3 μg/l in 2022), which is north of PW-37, has had TVOC concentrations decline from in the 1,000's μg/l to being less than about 30 μg/l since 2009. The 2022 TVOC concentration of 1.3 μg/L is the lowest observed at this location.

West Plant well 16A has shown a decreasing trend in TVOC concentrations over time, starting out over 10,000 μg/l in the early 90's to under 1,000 μg/l the between 2015 and 2021 and under 200 μg/l the between 2019 and 2021. In 2022 the TVOC concentration up ticked slightly to 1,298.7 μg/L but the overall trend over time remains decreasing. The 2019 through 2021 TVOC results show an even greater decline in concentration when compared to the steady decline observed between the early 1990's and 2018. Other West Plant wells 13A and 14A have also demonstrated decreasing TVOC concentrations over time. In 2019 at West Plant well 15A a significantly higher result (36,800 μg/l) was found but in 2020 and 2022 (4,180, 4,550, and 3,200 μg/l, respectively) it appears that TVOC concentrations have returned to levels within the TVOC concentration range found before the 2019 spike.

Significant historical TVOC decreases have been observed in East Plant wells 8A and 9AR where TVOC concentrations are mainly attributed to the presence of THT. TVOC concentrations at these locations have been stable over the last 10 years and indicate an overall declining trend with time.

TVOC concentrations at well 18A in 2022 (1,651.9 μg/l) increased from the 2021 concentration (335.3 μg/l). The 2022 result was less than the single year increases that were observed in 2007 (4,190 μg/l), 2012 (2,920 μg/l), and 2016 (3,000 μg/l). THT and related compounds were the only VOCs detected at well 18A in 2022. THT and related compounds chlorobenzene were the predominate compounds detected at 17A in 2022. Concentrations at 17A have demonstrated a downward trend since 2000.

East Plant well 24A is near Gill Creek. TVOC concentrations at this location had been under 10,000 μg/l between 2013 and 2019 after observing a slight spike in 2012 of 79,500 μg/l and higher previous concentrations of up to 141,200 in 1992. The 2020 concentration of 15,508 μg/l was higher than the TVOC concentrations observed between 2013 and 2019 but lower than many of the previously observed concentrations.

In 2021 and 2022, TVOC concentrations at 24A (1,498 and 1,864 μg/l, respectively) returned to levels consistent with those observed between 2013 and 2019.

Well 20AR was not sampled between 1994 and 2017 due to a lack of water in the well. In 2017 through 2022, adequate water was available to be sampled and the historically lowest TVOC concentration at 20AR was observed in 2020 (2.5 μg/l). In 2021 and 2022, TVOC concentrations rose slightly from 2020 (4.2 and 11 μg/l, respectively) but remained within the recent range. Between 2017 and 2022 TVOC concentrations ranged from 2.5 μg/l to 11 μg/l compared to prior to 1994 when TVOC concentrations at 20AR were as high as 69 μg/l.

At well 21A (near Gill Creek in the West Plant) 2021 and 2022 TVOCs were below the analytical detection limits. TVOC concentrations at 21A show a decreasing trend and have been as high as 18,680 μg/l and were below 100 μg/l the previous nine years and less than 10 μg/l the last five out of six years.

3.3.2 Bedrock Water-Bearing Zones

B-Zone Bedrock

B-Zone monitoring wells 1BR, 3B, 5BR, 8B, 14B, 20B, 24B, 25B, 29B, and 30B continue to show a steady decline or stable TVOC concentrations. Decreases at well location 8B and other East Plant bedrock wells are attributed to natural attenuation processes as described in detail in Section 3.3.3. From an overall perspective, long-term TVOC concentration decreases have been observed at 8 of the 10 B-Zone wells in the annual monitoring program.

In the West Yard, near the western edge of the West Plant, TVOC concentrations in well 5BR were greater than 10,000 μg/l in the early to mid-1990s, but decreased during the remediation. The concentrations have been near and/or below 100 μg/l for the last sixteen years and less than 15 μg/l ten of the last eleven years. Between 2018 and 2021 TVOC concentrations at well 5BR decreased to between 5.4 and 14.0 μg/l, after concentrations increased to 110 μg/l in 2017. In 2016, the lowest concentration was observed to date (2.4 μg/l), representing a four orders of magnitude decline in concentration.

Well 20B, in the northwestern corner of the West Plant, has shown TVOCs decline from over 10,000 μg/l in 1998 to less than 2,500 μg/l over the last seven years and the lowest TVOC concentration to date was observed in 2020 (1,000 μg/l), again in 2021 (671 μg/l), and again in 2022 (130.0 μg/L). West Plant well 14B has maintained consistent TVOC concentrations between 335,000 μg/l and 500,000 μg/l between 2003 and 2018. The TVOC result at well 14B in 2019 (653,000 μg/l) was the highest observed at this location but the 2020 through 2022 results (502,000, 558,000, and 400,000 μg/l, respectively) were closer to the TVOC concentrations observed between 2003 and 2018. Well 1BR in the southern part of the West Plant near Gill Creek, has demonstrated a declining trend in TVOCs with the last sixteen years below 175,000 μg/l while TVOCs previously have been as high as over 600,000 μg/l. Well 3B is north of PW-37 in the West Plant and has demonstrated declining TVOCs from approximately year 2000. TVOC concentrations have been as high as 7,490,000 μg/l in 2002 and have been under 2,000,000 μg/l since that time. In 2022, the concentration at 3B was 87,900 μg/l. This represents a two orders of magnitude drop in TVOCs. West Plant well 29B has dropped from over 5,500 μg/l in 2002 to the lowest TVOC concentrations observed at this location in 2021 (142 μg/l). In

2022 TVOC concentrations increased slightly to 242 μg/L but a declining trend remains evident.

The most notable historical decrease in the East Plant is apparent at well location 8B, where TVOC concentrations are dominated by the presence of THT. Historical concentrations have exceeded 500,000 μg/l but have been less than 30,000 μg/l since 2007. Well 25B in the northern East Plant had TVOC concentrations in the early 2000's between 4,000 μg/l and 9,000 μg/l which declined to between 40 μg/l and 300 μg/l from 2006 to 2011. A spike was encountered in 2012 (26,940 μg/l) with TVOCs declining after this date. In 2019 and 2020 the lowest TVOC concentrations to date at 25B, 11.7 μg/l and not detected, respectively were found. In 2022, the average TVOC concentration was 626.5 μg/l which is consistent with TVOC concentrations found prior to 2019. TVOCs at 25B have been dominantly THT and related compounds. In 2021, East Plant well 24B which is near Gill Creek, had the lowest average TVOC concentration found at this location (3,430.5 μg/L). The 2022 average result of 152,785 μg/L is consistent with TVOC concentrations prior to 2021. East Plant well 30B had a TVOC concentration of 10,942 μg/L in 2022 which was a decrease from the 2021 result of 58,519 μg/l. TVOC concentrations at 30B consist of THT and related compounds.

C/CD-Zone Bedrock

An analysis of historical groundwater chemistry trends in the C/CD-Zone indicates an overall decline in TVOC concentrations, particularly in the East Plant. Some recent exceptions to this were observed and are noted below.

Well 25C/CD has shown a decreasing trend over time, but has shown some anomalously high readings. The TVOC concentration spiked in 2012 at 25C/CD (14,500 μg/l) but declined to below 3,000 μg/l between 2016 and 2018, with the lowest TVOC concentration at the time observed at 25C/CD occurring in 2016 (1,198 μg/l). Another spike (10,650 μg/l) was observed in 2019 and again in 2020 (15,760 μg/l). The TVOC concentration in 2021 (4,193 μg/l) returned to within the historic range. In 2022, the lowest TVOC concentration result (490 μg/L) was observed at this location. Despite the spikes in concentrations identified, an overall decreasing trend in TVOC concentrations has been maintained. Future monitoring will be used to help identify the reason for the difference.

Well 12C/CD is in the East Plant near Gill Creek and indicates a highly variable range and a decreasing trend overall. The 2016 TVOC concentration of 11,990 µg/l and the 2017 TVOC concentration of 8,300 μg/l represent the lowest TVOC concentrations observed at this location two years in a row. The 2019 TVOC concentration encountered a slight spike at 129,200 μg/l but remained within the historic range. The 2020 through 2022 results (92,800, 80,600, and 84,100 μg/l, respectively) were less than the 2019 result but remains above the 2016 through 2018 results. Downgradient well 18C continues to show a slight decreasing trend of TVOC concentrations. TVOC average concentrations in 2022 at 18C (55,365 µg/l) consisted mainly of THT. This 2022 TVOC result is a spike compared to prior results and future sampling will determine if the result is anomalous or the beginning of an increasing trend. Well 22C has been sampled on the annual schedule but was abandon in 2021. The intention was to sample Olin well OBA1-C however it was inadvertently not sampled. OBA1-C will begin annual sampling in 2023.

Long-term TVOC reductions in West Plant can be attributed to the effectiveness of the Olin Production Well in achieving hydraulic control in the West Plant and the gradual removal of chemical constituents via natural attenuation processes throughout the Plant.

TVOC increases at West Plant wells 15CD, 19CD1 and 26CD were noted over the past recent years. At 15CD TVOCs increased from approximately 10,000 µg/l to greater than 200,000 µg/l starting in 2016. Similar observations have occurred more recently at 19CD1 and 26CD (higher by approximately an order of magnitude in 2019 through 2022). Both of these wells are located immediately upgradient from the Olin Deep well, where higher influent concentrations were also observed (as described above). Given the sequence of these increases and the upgradient location of the monitoring wells relative to Olin Deep Well, it can be concluded that these increases are related to long term plume migration in the C/CD-Zone towards and captured by Olin Deep Well. Sampling in future years will help evaluate this plume migration.

Between 2019 and 2022, TVOCs at 15CD decreased from 2018 (368,000 µg/l) to between 240,000 µg/l and 287,000 µg/l. Well 4CR (west of PW-37) has historically shown a wide range of TVOC concentrations and has shown a potential and slight increasing trend over the years, however between 2018 and 2022 the concentrations were similar to those observed in 1992. In 2021, the TVOC concentration at 4CR (3,170 µg/l) was the lowest since 2003 and in 2022, TVOC concentrations increased slightly to 6,060 µg/l. Flow in in this area has been demonstrated to flow towards the Olin pumping well and is therefore within the capture zone.

D-Zone Bedrock

For years the TVOC data from the D-Zone wells have demonstrated declining or stabilizing TVOC indicating the plume is captured and/or retracting in this zone. Concentrations in 2022 support these observations. Chemistry results from 2000 to 2022 are dominated by degradation product such as DCE and VC which demonstrates the active natural attenuation in the D-Zone.

At East Plant well 18D, TVOC results have varied between approximately 25 µg/l and 550 µg/l and the overall trend is rather flat. The 2017 TVOC concentration at 18D was 27.9 µg/l, the lowest since 2003 and between 2016 and 2018 concentrations have been very similar with TVOC concentrations between 27.9 and 31.0 µg/l. Between 2019 and 2021 (between 330.2 µg/l and 348.0 µg/l) a slight increase was encountered but TVOCs were still within historic levels. In 2022, TVOCs decreased from the previous three years to 114 µg/l. TVOCs at this location have historically included DCE, THT, and VC, however, only DCE and VC were identified in 2017 and 2018. THT and related compounds were identified in between 2019 and 2021, along with DCE and VC. In 2022, only DCE and VC were the only compounds identified.

F-Zone Bedrock

F-Zone wells show a dominant downward trend in TVOC concentrations at three of the four wells in the annual program (**Appendix C**). This decreasing trend in the F-Zone is evident at well 15F which remains elevated at 266.6 µg/l but is lower than the 43,110 µg/l found in 1992. Well 15F is in the West Plant and has concentrations of mainly VC, benzene, DCE, and TCE, which have declined over time.

This general trend of declining TVOC concentrations in both the West and East Plants may be attributed to hydraulic control of the West Plant bedrock created by the Olin Production Well. Declining TVOC concentrations are also attributed to gradual contaminant reduction through attenuation processes such as dispersion, biodegradation and, potentially, abiotic degradation. The presence of degradation compounds, indicating attenuation of source materials, dominate groundwater chemistry plant-wide in the deeper bedrock zones (both the D- and the F-Zones).

3.3.3 East Plant Bedrock Monitoring

As described in the 2000, 2004, 2008, 2013, and 2018 annual reports, results of the monitored natural attenuation (MNA) assessment are strongly indicative of continued constituent attenuation through biodegradation and natural dispersive mechanisms in all the East Plant bedrock water-bearing zones. Stable or declining concentrations are a clear indication that any constituent plume is either stable or shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic bioremediation in the various fracture zones. The next full MNA sampling and analysis is scheduled for 2023.

3.4 Dense Non-Aqueous Phase Liquid (DNAPL) Monitoring

Weekly observations are made at pumping well PW-39 and are completed as part of routine maintenance inspections. DNAPL was last observed at PW-39 on November 9, 2006.

3.5 Gill Creek Surface Water Monitoring

Samples are collected from two locations in Gill Creek as shown in **Figure 3-1** (sample locations SW-1 and SW-2). The surface water samples collected during the annual well sampling events were analyzed for full list indicator parameters (see **Table 3-3**).

Sample SW-1, collected upstream of the Niagara Plant at the Adams Avenue Bridge had two pesticide detections (alpha-BHC at 0.15 µg/l and beta-BHC at 0.06 µg/l). Four VOC compounds were detected and included 1,1,2,2-tetrachloroethane (9.4 µg/l), DCE (6.6 µg/l), PCE (19 J µg/l), and TCE (20 J µg/l). All semi-volatile organic compounds and PCB compounds were below detection limits. Downstream sample SW-2 has a reported TVOC concentration of 10.5 µg/l which included PCE at 2.4 µg/l, TCE at 2.9 µg/l, DCE at 3.4 µg/l, and 1,1,2,2-tetrachloroethane at 1.8 µg/l. No pesticides, semi-volatile organic compounds, or PCBs were found. These results are consistent with the results from previous sampling events.

A review of the SW-2 data between 2000 and 2022 shows that the TVOC concentrations have been fluctuating between 1 µg/l and 179 µg/l. In 2021 the result at SW-2 was higher (317.3 µg/l). In 2022 the TVOC concentrations at SW-2 (10.5 µg/l) return to levels consistent with results prior to 2021. Future years will be evaluated to determine if TVOCs are increasing in Gill Creek or if this is an anomalous result.

3.6 Silicone Oil Remediation

Investigation and removal activities related to Silicone Oil Recovery have been conducted in accordance with the technical scope of work submitted on July 21, 1999 and approved by NYSDEC on August 26, 1999. During 2022, no silicone oil was observed in PW-20 and 20.5 gallons were recovered from PW-24. **Appendix C** provides tabulated summaries of the quarterly silicone oil recovery data (except for 1Q22 which was included in 1Q22 data package). Silicone oil has never been observed at PW-22 since inspections began at this location in 3Q00. To date, 64 gallons and 2,174.0 gallons of Silicone Oil have been recovered from PW-20 and PW-24 respectively. A total of 2,238.0 gallons of silicone oil have been removed from GWRS pumping wells since recovery began in June 1999.

4.0 CONCLUSIONS

4.1 GWRS Effectiveness

The overall effectiveness of the GWRS in controlling off-site groundwater flow has been demonstrated through hydraulic head and groundwater quality monitoring during 31 years of operation. The 2022 GWRS operations are summarized as follows:

- System uptime was 97.0 percent for the 23 original pumping wells that are still in use.
- A BFBT was installed in the East Plant, per the accepted work plan, in the Fall of 2021 and the new pumping well PW-43 was activated on December 20, 2021.
- PW-37 uptime was 97.0 percent.
- PW-39 uptime was 97.0 percent.
- PW-43 uptime was 96.7 percent.
- Olin Production Well system uptime was 100 percent.
- Operation of BFBT pumping wells PW-37 and PW-39 continued throughout 2022, along with a reduced number of the original 23 pumping wells.
- Continued improvements to the reliability of the pumping and pretreatment systems, including RTO replacement in 2018, has continued through 2022.
- Hydraulic control in A-Zone Overburden and the A-Zone Bedrock was exercised over 89 percent of the Plant's area for 2022.
- Approximately 3.3 tons of organic compounds were removed and treated during 2022. This includes the GWRS (2.2 tons), Olin system (1.0 tons), and outfall 023 (0.1 tons).
- DNAPL monitoring conducted in 2022 indicated no DNAPL was present at PW-39.

Extensive water-level data collected over 31 years of system operation have illustrated that hydraulic heads in both the A-Zone overburden and A-Zone bedrock are depressed in the vicinity of operating GWRS pumping wells. The resulting inward flow gradient that has developed in most areas of the Plant has decreased off-site groundwater flow. A quantitative evaluation of GWRS hydraulic effectiveness (first developed in 1995) indicates that groundwater capture was observed in approximately 89 percent of the entire Plant in 2022 (A-Zone overburden and bedrock, East and West Plant). Furthermore, in the West Plant (where a majority of contaminants are observed) groundwater capture was established in the A-Zone for approximately 91 percent of the area. Areas outside the capture in the West Plant are isolated to areas where concentrations are considerably lower than the remainder of the site. These results are similar or slightly improved relative to hydraulic effectiveness evaluation findings presented in historic reports prior to operation of the BFBTs. As such, these most recent findings reinforce the conclusions of the BFBT MOE (DuPont CRG 2009), the BFBT MOE – 2013 Update (Parsons, 2013).

To improve capture in the East Plant, a BFBT was installed to replace vertical pumping wells in September and October 2021. The pumping well was installed near the center of the trench and two piezometers were placed in the trench in the east end and two were placed in the west end. While PW-43 continued to operate, through 2022, adjustments to head level within the well have continued. The water levels and capture system were evaluated throughout 2022 in order to refine the effectiveness of the pumping from the BFBT. PW-43 is effective, and has the ability to pump a higher flow rate than the vertical wells it replaced i.e. PW-28, PW-30, PW-32, and PW-34. Capture along most of the east plant is similar to previous years, however the eastern end of the East Plant represent an area where capture is more difficult. Monitoring and evaluation of hydraulic head data will be continued in 2023 to evaluate the effectiveness of PW-43. This will include additional piezometers installations in East Plant.

An estimated 142.6 tons of organic compounds have been removed and treated as part of the Plant's remediation efforts since the GWRS began continuous operation in 1992. The estimated 3.3 tons of organic compounds removed and treated as part of the Plant's remediation efforts during 2022 equates to 2.3 percent of the total estimated organic compounds removed from groundwater since the system began operating.

As approved by the NYSDEC in March 2019, groundwater samples were collected using passive diffusion bags (PDBs). Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low. Comparing historic TVOC analytical results to results between 2019 and 2022 showed that the new sampling method provides results that fit the trend of the historic results. A few exceptions were identified in 2022. Wells 1C, 18C, 10D, 17F, and 25F had results higher than recent years which may be related to the PDBs. Furthermore 2A was trending lower than expected.

West Plant increases at 15CD, 19CD1, and 26CD were noted over the past recent years but appear to be related to long term migration of TVOC towards and captured by the Olin Deep Well.

4.2 East Plant Bedrock MNA

Prior evaluations have provided strong evidence that natural attenuation and intrinsic bioremediation are occurring in the subsurface and are a primary mechanism for removal of chlorinated hydrocarbons in the East Plant bedrock. Data were collected annually from 2001 through 2004 to monitor MNA progress in the East Plant bedrock and to confirm continued intrinsic bioremediation of the chlorinated hydrocarbon plume areas. Consistent with U.S. Environmental Protection Agency guidance, a five-year review of the data was completed following collection of the 2008, 2013, and 2018 annual data. The review provided herein, using data collected in 2021, confirmed that MNA processes, including intrinsic bioremediation of the chlorinated hydrocarbons, is still actively removing plume mass from the fractured bedrock system in the East Plant. Stable or declining concentrations indicate that any constituent plume is either stable or is shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic bioremediation in the various fracture zones.

There are no groundwater users located between the Plant and the presumed discharge point (FST/NYPA conduit drain) for any potential offsite plume. Therefore the periodic monitoring of natural attenuation parameters in East Plant bedrock is the appropriate course of action. MNA parameters are next scheduled to be monitored in 2023. VOC data and field parameters will still be collected annually to monitor plume distribution and VOC attenuation.

4.3 DNAPL Monitoring

The observation of DNAPL in pumping well PW-39 in April 2006 prompted a monitoring and recovery program. Approximately 118 gallons of DNAPL were removed from well PW-39 in 2006. Monitoring at nearby well locations completed in 2006 indicate that the DNAPL was limited to well PW-39. The last observation and recovery at PW-39 occurred on November 9, 2006. Based on the monitoring results compiled to date, DuPont proposed routine monitoring limited to pumping well PW-39 beginning in 2Q08. The frequency of DNAPL assessments will be determined by the monitoring results and is currently completed weekly. No DNAPL was found in PW-39 in 2022.

5.0 REFERENCES

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TABLES

Table 2-1
Historical System Operations Summary
Chemours Niagara Plant

OPERATIONS STATISTIC	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GWRS															
23 Original Wells Uptime	75%	76%	89%	93%	96%	97%	90%	71%	78%	86%	91%	79%	79%	64%	75%
PW-37 Uptime	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PW-39 Uptime	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PW-43 Uptime	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Gallons Pumped (millions)	NR	12.4	16.4	17.3	15.1	15.8	10.8	11.2	12.3	11.6	14.1	14.0	12.8	12.3	22.1
Estimated pounds of Organics Treated*	10,350	7,220	7,320	7,840	9,437	6,463	7,000	3,382	3,025	3,224	3,848	2,820	2,645	2,237	11,589
Number of unscheduled system shutdowns	10	5	2	3	0	0	2	7	8	3	3	1	4	6	4
Number of scheduled system shutdowns	2	2	2	1	1	1	1	2	2	2	2	3	2	3	3
Pump Replacements	26	63	43	40	21	11	7	6	16	13	22	14	17	24	17
Pump Repairs Requiring > 48 Hours	NR	NR	4	3	9	13	3	1	3	10	25	4	11	38	25
OLIN SYSTEM															
Pumping System Uptime	NR	NR	99.0%	98.7%	99.0%	99.5%	98.7%	89.6%	99.7%	100%	99.5%	100%	99%	100%	100%
Estimated Pounds of Organics Treated	5,470	3,580	3,527	2,378	2,240	1,887	1,392	1,696	1,214	1,185	1,374	1,124	1,042	1,066	1,096
OUTFALL 023															
Estimated Pounds of Organics Treated	2,055	2,417	1,672	899	850	542	569	1,529	376	406	1,091	379	370	405	531
TOTAL Organics All Sources															
Estimated Pounds of Organics Treated	17,875	13,217	12,519	11,117	12,527	8,892	8,961	6,607	4,615	4,815	6,313	4,323	4,057	3,708	13,216

NA: Not applicable.
NR: Not recorded in the past quarterly or annual reports.
* Includes estimated quantity of organics/water mixture shipped in 3Q98.
** The calculated uptime for the original 23 wells excludes wells repaced by BFBTs.

Table 2-1
Historical System Operations Summary
Chemours Niagara Plant

OPERATIONS STATISTIC	2007	2008**	2009**	2010**	2011**	2012**	2013**	2014**	2015**	2016**	2017**	2018**	2019**	2020**	2021**	2022**
GWRS																
23 Original Wells Uptime	75%	98%	100%	99%	96%	100%	99%	96%	98%	93%	97%	96%	95%	95%	97%	97%
PW-37 Uptime	12%	32%	92%	100%	93%	99%	100%	97%	98%	89%	96%	93%	98%	96%	97%	97%
PW-39 Uptime	66%	93%	99%	100%	93%	98%	94%	97%	98%	92%	91%	75%	98%	97%	97%	97%
PW-43 Uptime	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	97%
Total Gallons Pumped (millions)	13.3	9.5	11.8	9.1	10.7	11.9	13.4	12.3	11.9	10.1	16.5	10.6	12.9	9.5	9.9	11.4
Estimated pounds of Organics Treated*	8,678	7,932	12,128	7,854	9,004	8,254	9,416	8,567	7,995	6,629	10,815	5,794	5,635	5,689	5,846	4,498
Number of unscheduled system shutdowns	3	0	0	1	4	1	1	1	0	0	0	0	0	0	0	0
Number of scheduled system shutdowns	3	1	1	1	1	3	3	5	0	1	1	1	1	1	1	1
Pump Replacements	5	10	11	7	3	3	3	3	3	5	4	3	6	4	1	3
Pump Repairs Requiring > 48 Hours	23	11	4	2	0	1	5	10	2	2	6	1	6	1	0	1
OLIN SYSTEM																
Pumping System Uptime	99.9%	100%	100%	99.8%	100%	100%	100%	100%	100%	100%	100%	100%	98.8%	99.9%	100.0%	100.0%
Estimated Pounds of Organics Treated	1,068	1,257	1,222	1,167	1,386	1,137	1,043	1,269	1,197	1,152	1,245	947	1,363	2,347	2,355	2,035
OUTFALL 023																
Estimated Pounds of Organics Treated	326	544	699	224	355	303	337	355	241	398	570	498	191	126	200	146
TOTAL Organics All Sources																
Estimated Pounds of Organics Treated	10,072	9,733	14,049	9,245	10,745	9,695	10,796	10,191	9,433	8,179	12,630	7,239	7,189	8,162	8,401	6,679

NA: Not applicable.
NR: Not recorded in the past quarterly or annual reports.
* Includes estimated quantity of organics/water mixture shipped in 3Q98.
** The calculated uptime for the original 23 wells excludes wells repaced by BFBTs.

Table 3-1
Quarterly Groundwater Level Monitoring Locations
Chemours Niagara Plant

Monitoring Points
Piezometers
WPPO-1, WPPT-2, WPPO-3R, WPPT-4, WPPT-5, EPPT-1, EPPT-2, EPPT-3, WPO-1R, WPT-1R, WPO-2, WPT-2, WPO-3R, WPT-3R, WPO-4, WPT-4, WPO-5, WPT-5, WPO-6, WPT-6, WPO-7, WPT-7, WPO-8, WPT-8, WPO-9, WPT-9R, WPO-10, WPT-10, WPO-11, WPT-11, WPO-12, WPT-12, WPO-13, WPO-14, WPO-15, WPO-16, WPO-17, WPT-17, WPO-18, WPT-18, WPO-19, WPT-19, WPO-20, WPT-20, WPO-21, WPT-21, WPO-22, WPT-22, WPO-23, WPT-23, WPO-24, WPT-24, WPO-25, WPT-25, EPO-1, EPT-1, EPO-2, EPT-2, EPO-3, EPT-3, EPO-4 EPT-4, EPO-5, EPT-5, EPO-6, EPT-6, EPO-7, EPT-7, EPO-8, EPT-8, EPO-9, EPT-9
Pumping wells
PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, PW-14, PW-16, PW-18, PW-19, PW-20, PW-22, PW-24, PW-26, PW-28, PW-30, PW-32, PW-34, PW-35, PW-36, PW-37, PW-38, PW-39, TPW-01
Utility wells
U-1, U-14, U-16
Monitoring wells (A-Zone)
1AR3, 2A, 3A, 4AR, 5AR, 6AR, 7AR2, 8A, 9AR, 10A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 19A, 20AR, 21A, 23AR, 24A, 27A, 28A
Monitoring wells (B-Zone)
1BR, 2B, 3B, 5BR, 8B, 12B, 14B*, 16B, 19B, 20B, 23B, 24B, 25B, 29B, 30B, BW-01
Monitoring wells (C/CD-Zone)
1C, 2C, 4CR, 5CDR, 5CR, 7CR, 10C, 10CR, 12C/CD, 14C, 15C, 15CD, 17B, 18C, 19C, 19CD1, 19CD2, 23C, 25C/CD, 26C, 26CD
Monitoring wells (D-Zone)
1D, 5DR, 10D, 14D, 15D, 18D, 19D, 23D, 25D
Monitoring wells (F-Zone once every five years)
1F, 5FR, 7FR, 10F, 15F, 17F, 23F, 25F
DEC wells
DEC-3R, DEC-4R, DEC-5
Olin monitoring wells
OBA-10A, OBA-24A, OBA-24B, OBA-25A, OBA-25B, OBA-26A, OBA-26B, OBA-1B, OBA-1C
Gill Creek Stilling Wells
GC-1, GC-2 **

* Well added to hydraulic monitoring program in 1Q02.
** Gill Creek stilling well GC-2 installed in 2006.

Table 3-2
Groundwater Quality Monitoring Schedule
Chemours Niagara Plant

Monitoring Point	Sampling Frequency[1]
Olin GAC influent & effluent	Quarterly[2]
GWRS treatment influent & effluent	Quarterly[2]
Pumping wells [3] PW-16, PW-18, PW-19, PW-20, PW-22, PW-24, PW-26, PW-28, PW-30, PW-32, PW-34, PW-35, PW-36, PW-37, PW-39	Every five years (next is 2023)
Utility wells U-1	Annual
Outfall 023	Quarterly
Monitoring wells (A-Zone wells) 1AR3, 2A, 3A, 6AR, 8A, 9AR, 13A, 14A, 15A, 16A, 17A, 18A, 20AR[5], 21A, 24A, 27A, 28A	Annual
Monitoring wells (A-Zone wells) 4AR, 5AR, 7AR[4], 10A, 12A, 19A, 23AR	Every five years[5] (next in 2023)
Monitoring wells (B-Zone wells) 1BR, 3B, 5BR, 8B, 14B, 20B, 24B, 25B, 29B, 30B	Annual
Monitoring wells (B-Zone wells) 2B, 12B, 16B, 19B, 23B	Every five years[5] (next in 2023)
Monitoring wells (C/CD-Zone wells) 1C, 2C, 4CR, 12 C/CD, 15CD, 18C, 19CD1, 25C/CD, 26CD	Annual
Monitoring wells (C/CD-Zone wells) 5CDR, 7CR, 17B, 23C	Every five years[5] (next in 2023)
Monitoring wells (D-Zone wells) 1D, 10D, 14D, 18D, 25D	Annual
Monitoring wells (D-Zone wells) 5DR, 15D, 19D, 23D	Every five years[5] (next in 2023)
Monitoring wells (F-Zone wells) 15F, 17F, 23F, 25F	Annual
Monitoring wells (F-Zone wells) 1F, 5FR, 7FR, 10F	Every five years[5] (next in 2023)
DEC wells DEC-3R, DEC-4R	Annual
DEC wells DEC-5	Every five years[5] (next in 2023)

[1] All analyses for refined indicator parameters except as noted below.

[2] Samples to be analyzed for the refined indicator parameter list once during any given quarterly sampling event. Samples collected during the remaining quarterly events are analyzed for field parameters and volatile organics. See Table 3-3 for analytical parameters.

[3] In active pumping wells: PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, PW-14 are removed from the program, last sampling was 2011 (corresondance dated June 15, 2011)

[4] Well 7AR replaced in 2008.

[5]Per NYSDEC electronic response July 7, 2008 and letter dated December 8, 2016.

Table 3-3
Chemical Analysis Parameter List
Chemours Niagara Plant

Volatiles	Inorganics and Other Parameters
Benzene	
Carbon tetrachloride	Total cyanide[1]
Chlorobenzene	Soluble barium[2]
Chloroform	pH[3]
Chloromethane	Temperature[3]
1,2-dichlorobenzene	Specific conductivity[3]
1,4-dichlorobenzene	
1,4-dichlorobutane	**Base/Neutrals[1]**
1,1-dichloroethane	bis(2-ethylhexyl)phthalate
1,1-dichloroethene	Naphthalene
trans-1,2-dichloroethene	Hexachlorobutadiene
cis-1,2-dichloroethene	Hexachloroethane
Methylene chloride	
1,1,2,2-tetrachloroethane	**Pesticides/PCBs[1]**
Tetrachloroethene	alpha-BHC
Tetrahydrothiophene	beta-BHC
Toluene	delta-BHC
1,1,1-trichloroethane	gamma-BHC
1,1,2-trichloroethane	PCB-1016
Trichloroethene	PCB-1221
Vinyl chloride	PCB-1232
	PCB-1242
	PCB-1248
	PCB-1254
	PCB-1260

[1] Analyses required once per year for these parameters on select samples for the quaterly sampling program.

[2] With approval from NYSDEC, dissolved barium analysis for the annual event was modified in 2006. Sampling will continue at wells 5AR (5-year schedule) and 21A (annual schedule) for soluble barium analysis.

[3] Field measurement

Table 3-4
2022 Hydraulic Effectiveness Evaluation Results
A-Zone Overburden and A-Zone Bedrock
Chemours Niagara Plant

Aquifer Zone	WEST PLANT		EAST PLANT		ENTIRE PLANT	
	Area Hydraulically Controlled (ft^2)	Percent Captured	Area Hydraulically Controlled (ft^2)	Percent Captured	Area Hydraulically Controlled (ft^2)	Percent Captured
A-Zone overburden, 1Q22	990,537	87%	926,361	99%	1,916,898	92%
A-Zone bedrock, 1Q22	1,141,732	100%	726,780	78%	1,868,512	90%
A-Zone overburden, 2Q22	1,004,881	88%	904,306	96%	1,909,187	92%
A-Zone bedrock, 2Q22	1,088,586	95%	726,640	78%	1,815,227	87%
A-Zone overburden, 3Q22	988,326	87%	809,641	86%	1,797,967	86%
A-Zone bedrock, 3Q22	1,027,960	90%	732,209	78%	1,760,169	85%
A-Zone overburden, 4Q22	988,999	87%	886,027	95%	1,875,027	90%
A-Zone bedrock, 4Q22	1,094,395	96%	699,586	75%	1,793,981	86%
A-Zone overburden average	87%		94%		90%	
A-Zone bedrock average	95%		77%		87%	
A-Zone average	**91%**		**86%**		**89%**	

Based on Total Areas Below

Area of West Plant	1,141,732	sq ft.
Area of East Plant	937,140	sq ft.
Total Plant Area	2,078,871	sq ft.

Table 3-5
Historical Hydraulic Effectiveness Evaluation Results
Chemours Niagara Plant

Year	West Plant		East Plant		Entire Plant	
	A-Zone Overburden	A-Zone Bedrock	A-Zone Overburden	A-Zone Bedrock	A-Zone Overburden	A-Zone Bedrock
1997	95%	95%	82%	93%	89%	94%
1998	95%	95%	84%	93%	90%	94%
1999	91%	96%	85%	92%	88%	94%
2000	87%	91%	96%	95%	91%	93%
2001	89%	92%	94%	96%	90%	93%
2002	87%	89%	92%	92%	89%	90%
2003	88%	88%	92%	90%	90%	89%
2004	88%	89%	92%	89%	89%	89%
2005	88%	89%	92%	89%	90%	89%
Pre-2006 Average	90%	92%	90%	92%	90%	92%
2006	94%	96%	91%	89%	93%	93%
2007[1]	94%	97%	90%	92%	92%	95%
2008	93%	92%	96%	94%	94%	93%
2009	93%	91%	100%	91%	96%	91%
2010	89%	94%	99%	96%	94%	95%
2011	89%	93%	98%	96%	93%	94%
2012[2]	94%	93%	98%	93%	96%	93%
2013	89%	97%	99%	92%	94%	94%
2014	88%	97%	99%	90%	93%	94%
2015	91%	95%	98%	91%	94%	94%
2016	87%	93%	99%	97%	92%	95%
2017	90%	97%	100%	97%	95%	97%
2018	90%	94%	99%	92%	94%	93%
2019	89%	92%	99%	91%	93%	92%
2020	91%	83%	99%	95%	94%	88%
2021	89%	99%	99%	93%	94%	96%
2022	87%	95%	94%	77%	90%	87%

Notes:

1) Averages from 2007 do not include 4Q07 data. Reduced uptime in October, including a system shutdown related to the GWRS modification construction that extended into 2008, resulted in the 4Q07 monitoring event not being completed.

2) Average from 2012 excluded 1Q12 which was biased low due to anomalous flow patterns near

FIGURES

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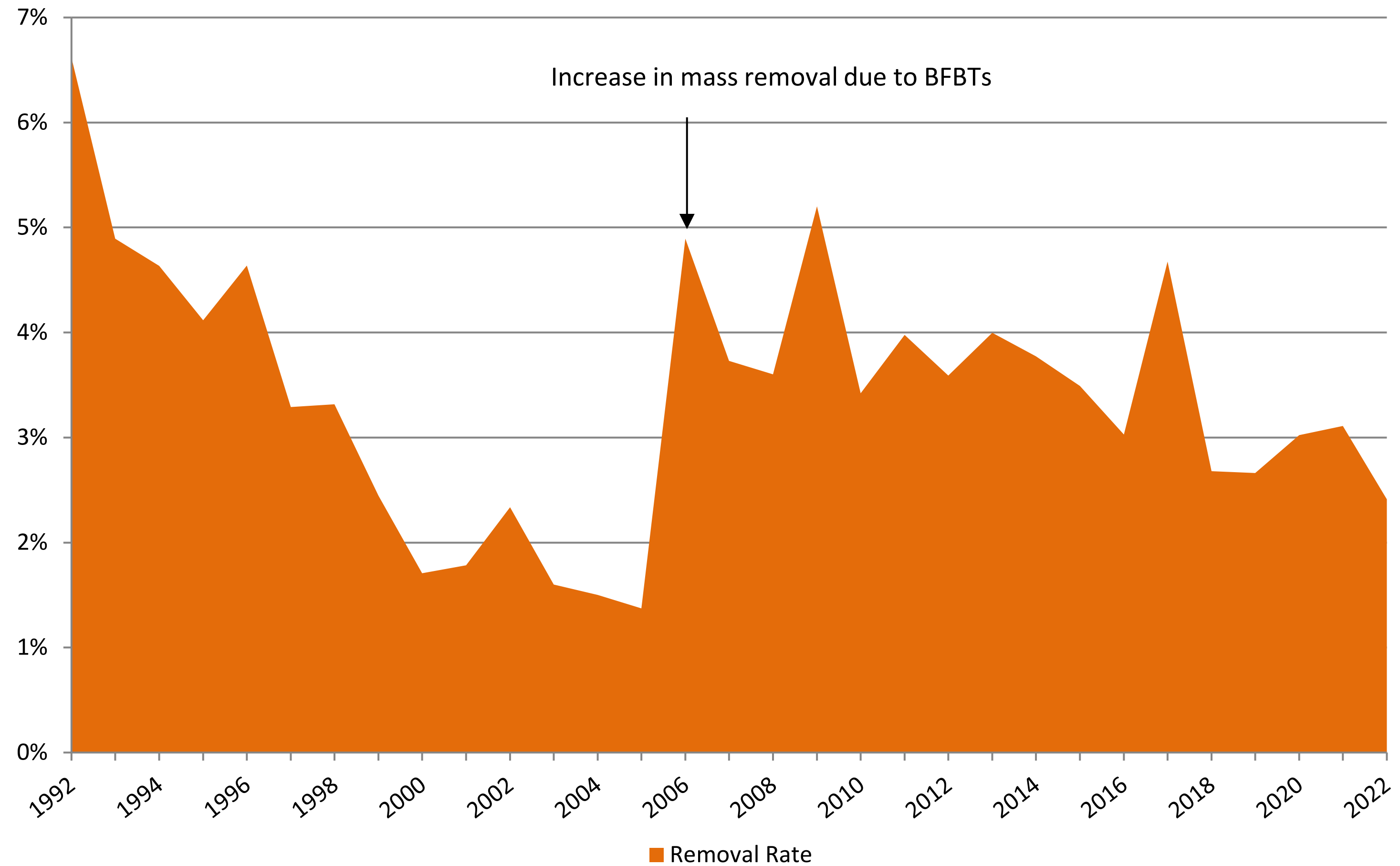
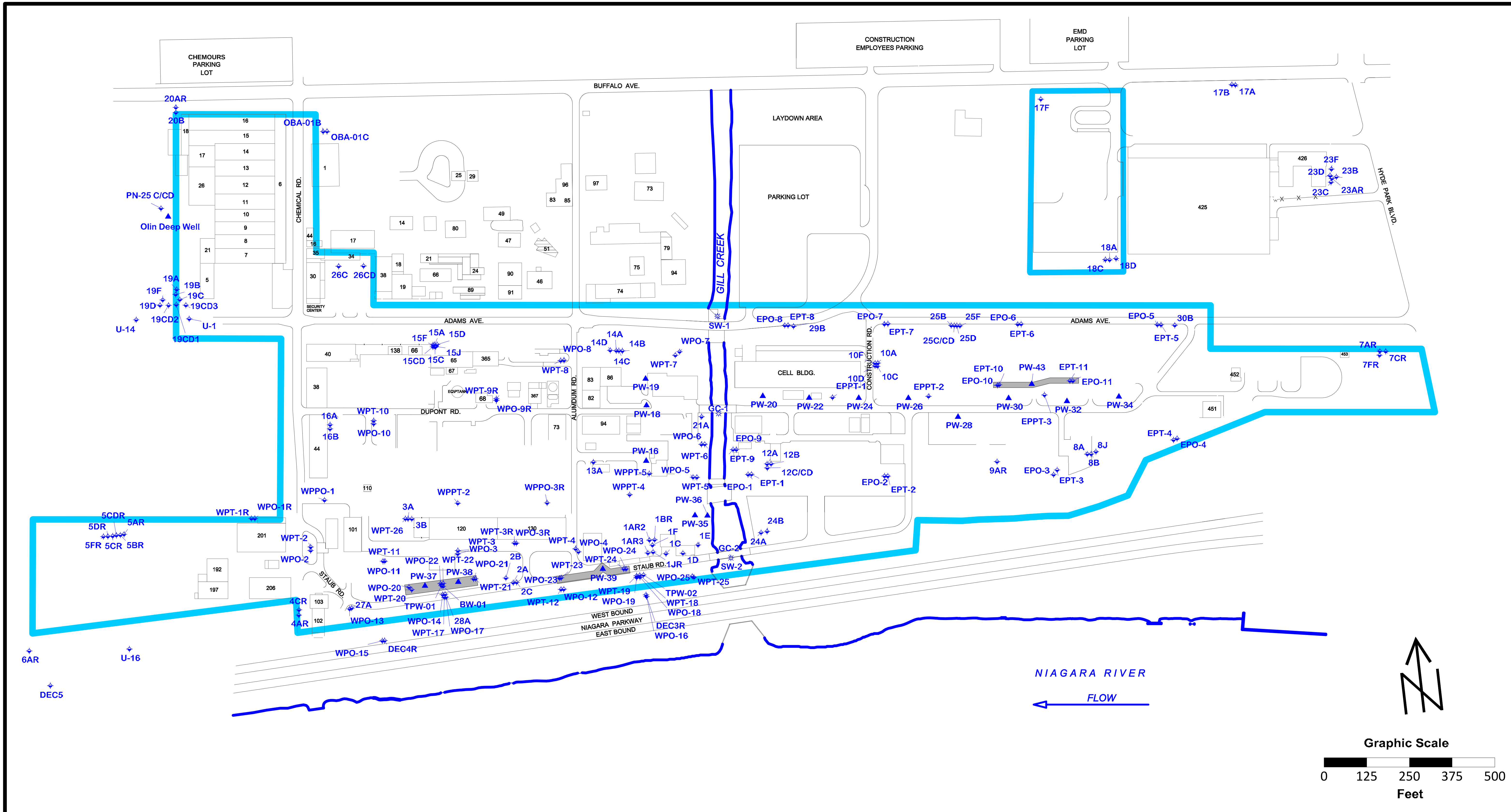
FIGURE 1-1
SITE LOCATION MAP
CHEMOURS NIAGARA PLANT
NIAGARA FALLS, NY

/Niagara/hydrogeo/mapping/Site_location_map.srf

Figure 2-1
Annual Organics Treated as Percent of Total Removed to Date





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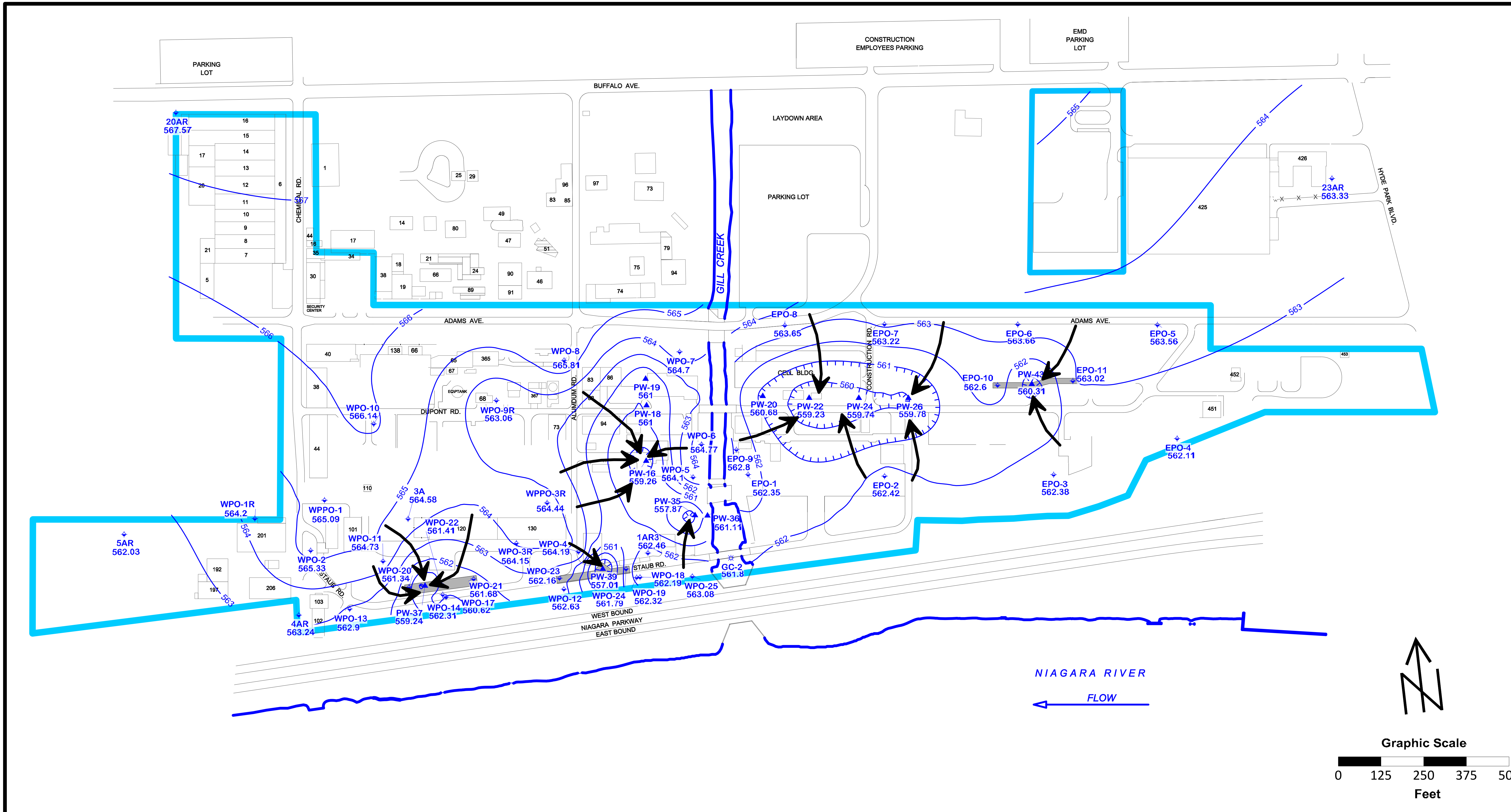
LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 1AR3 WELL ID
- MONITORING WELL
- PUMPING WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH

FIGURE 3-1
GROUNDWATER MONITORING WELL, PUMPING WELL AND PIEZOMETER PLAN
NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont/Niagara/NiaPlant/Hydrogeo/Well Network/Niagara Surfer Basemap/Niagara Surfer Basemap 2023.srf



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LEGEND

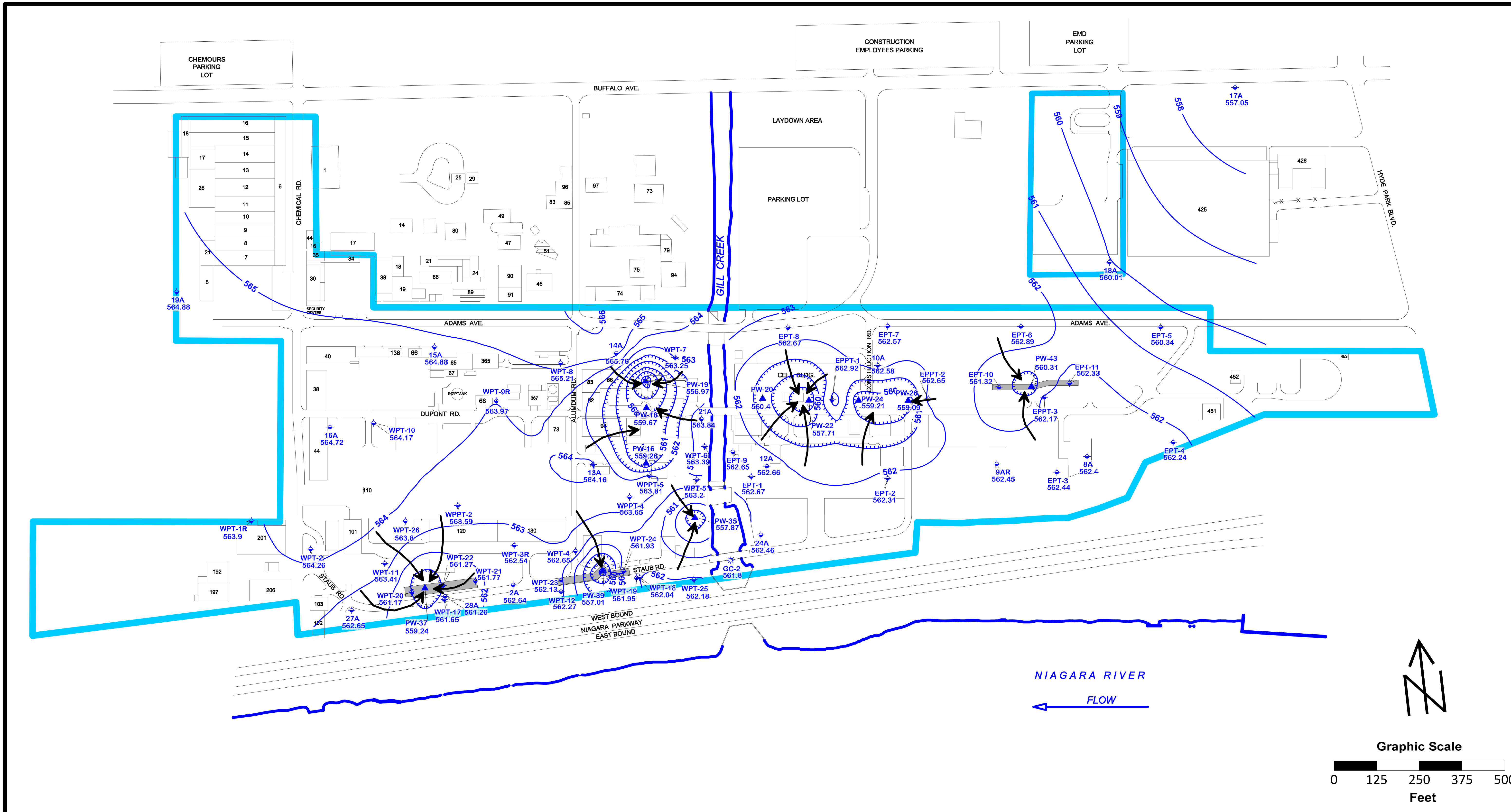
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-2
POTENTIOMETRIC SURFACE MAP
A-ZONE OVERBURDEN - MAY 18, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2022-05-18 NIA Contour Tool/2022-05-18-OBPZ.srf



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LEGEND

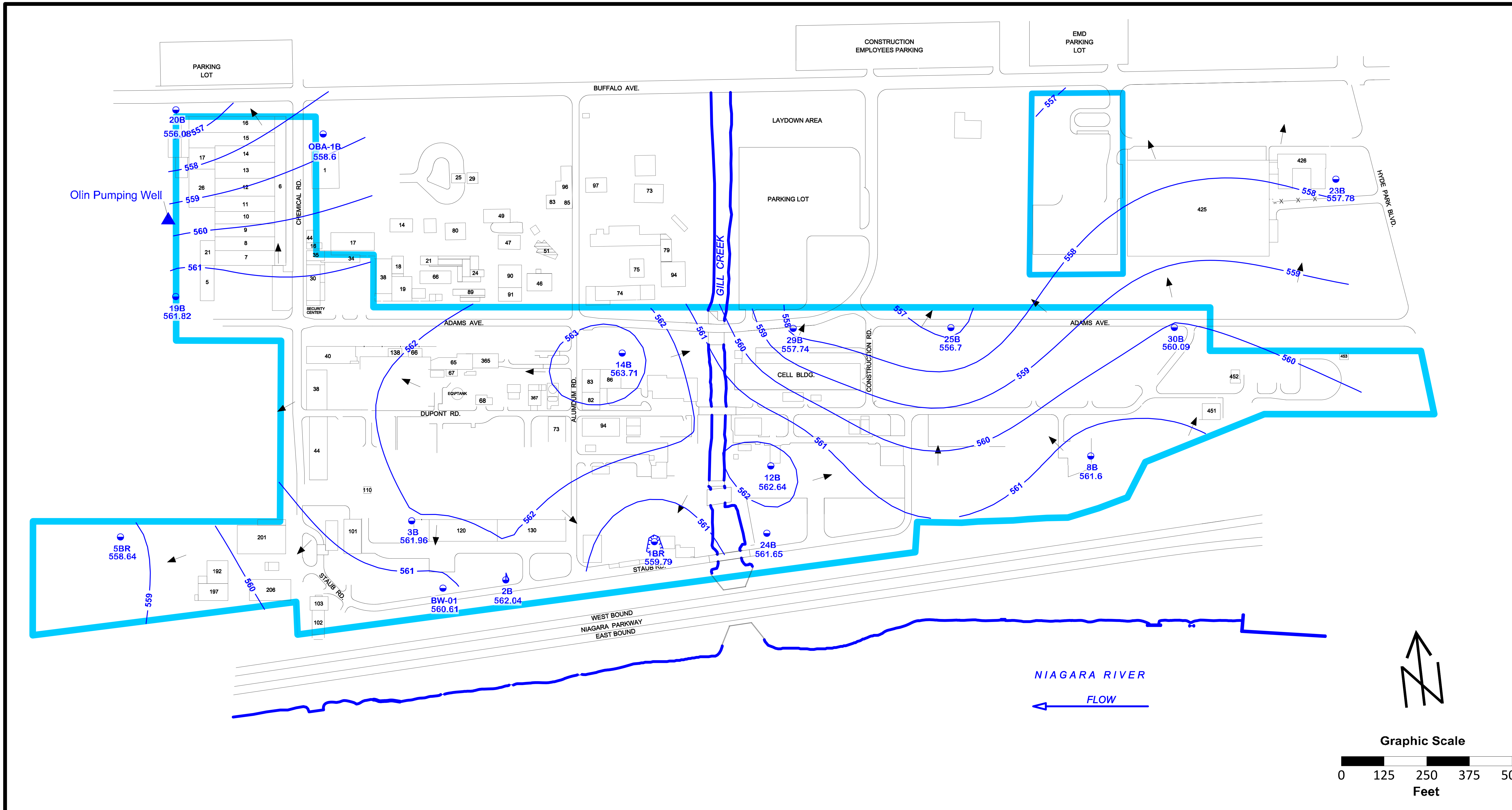
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-3
POTENTIOMETRIC SURFACE MAP
A-ZONE BEDROCK - MAY 18, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2022-05-18 NIA Contour Tool/2022-05-18-BRPZ.srf



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LEGEND

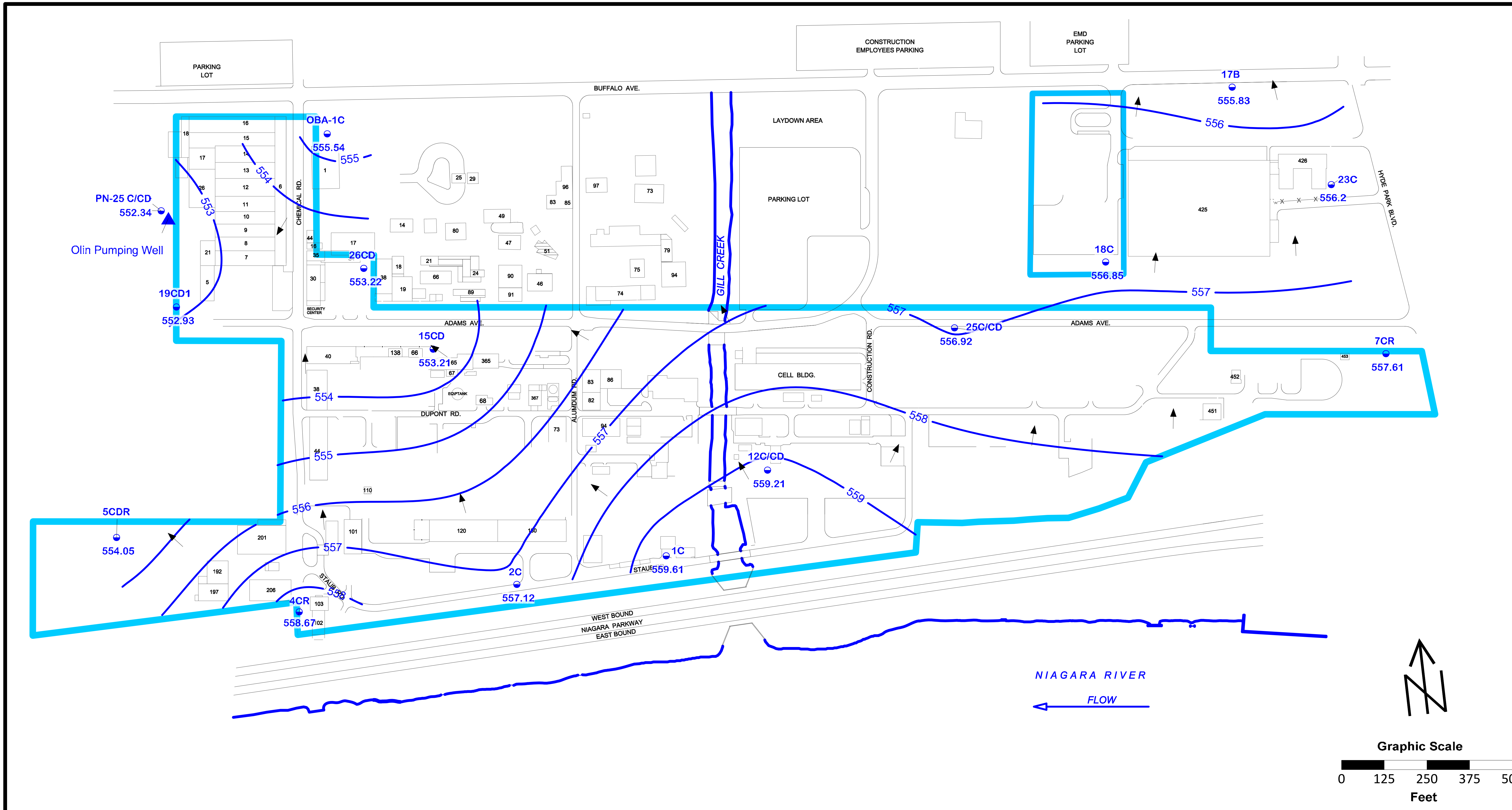
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1BR — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-4
POTENTIOMETRIC SURFACE MAP
B-ZONE BEDROCK - MAY 18, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2022-05-18 NIA Contour Tool/2022-05-18-BZPZ.srf



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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

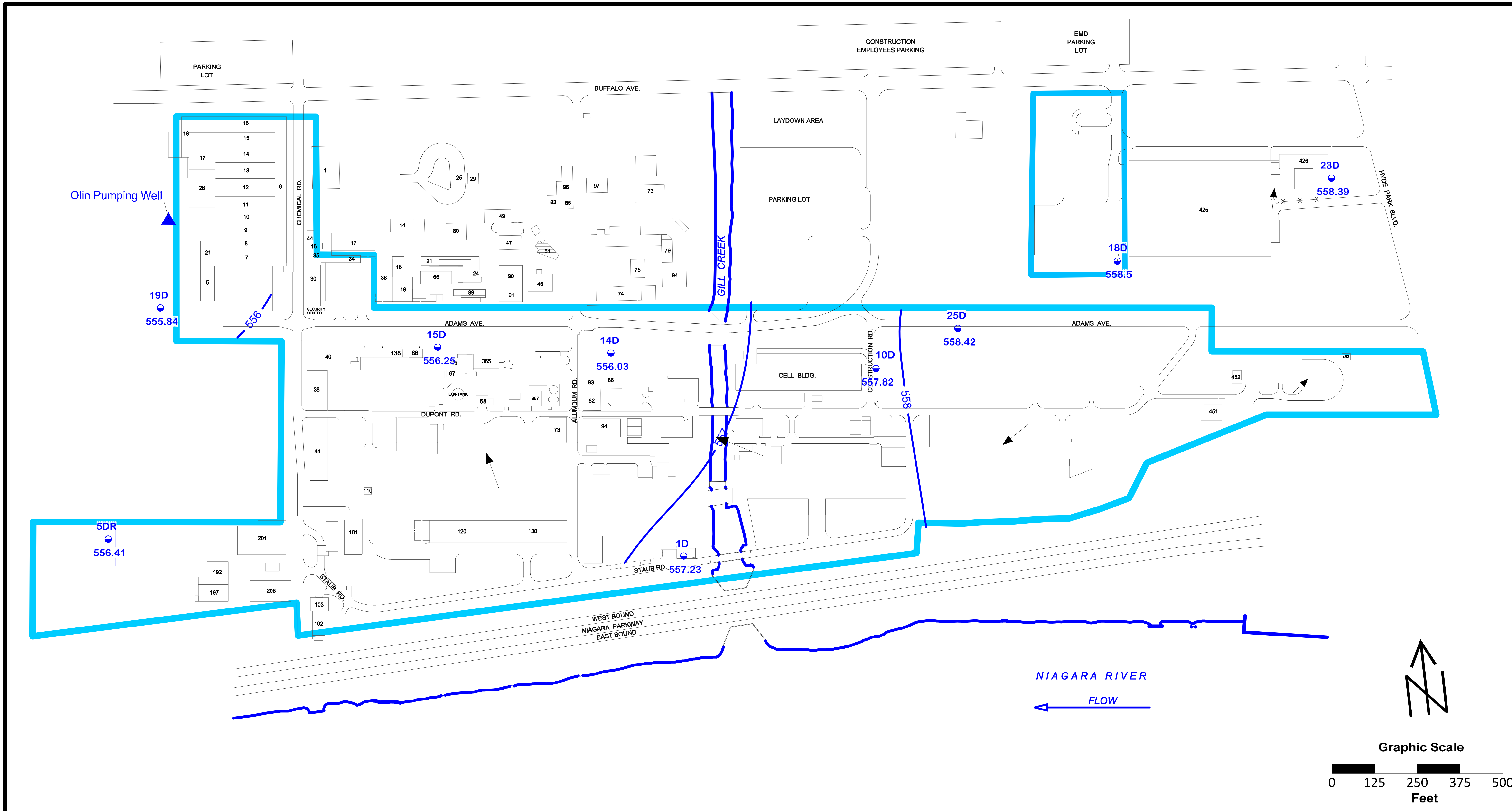
CHEMOURS WELLS

- 1C WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL

- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 558 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-5
POTENTIOMETRIC SURFACE MAP
C/CD-ZONE BEDROCK - MAY 18, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2022-05-18 NIA Contour Tool\2022-05-18-CZPZ.srf



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Job number: 452825.03000	

LEGEND

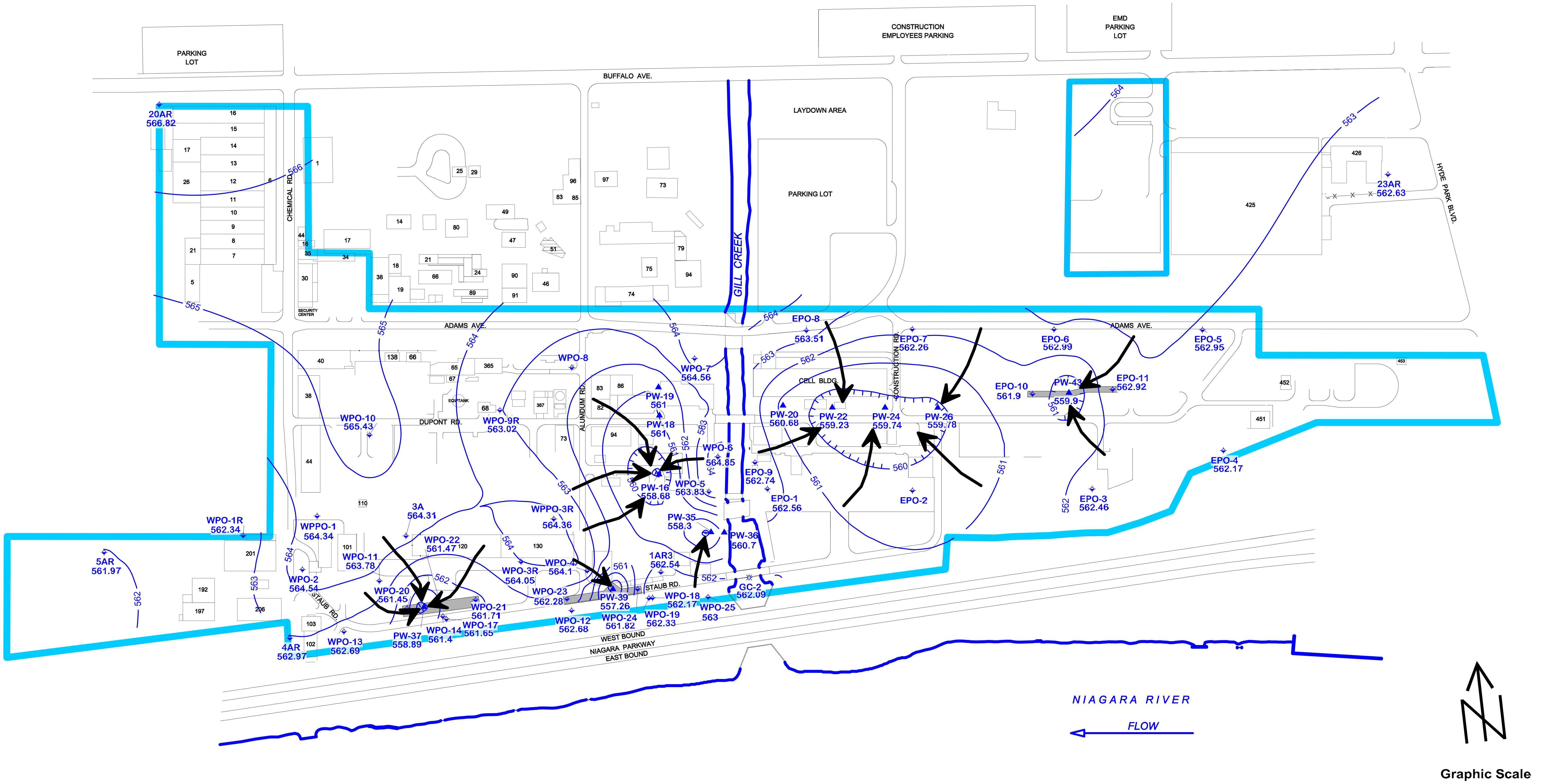
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1D — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 557 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-6
POTENTIOMETRIC SURFACE MAP
D-ZONE BEDROCK - MAY 18, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2022-05-18 NIA Contour Tool\2022-05-18-DZPZ.srf



Graphic Scale
0 125 250 375 500
Feet

Notes:
Wells EPO-2 and WPO-8 were dry on August 17, 2022.

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LEGEND

BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

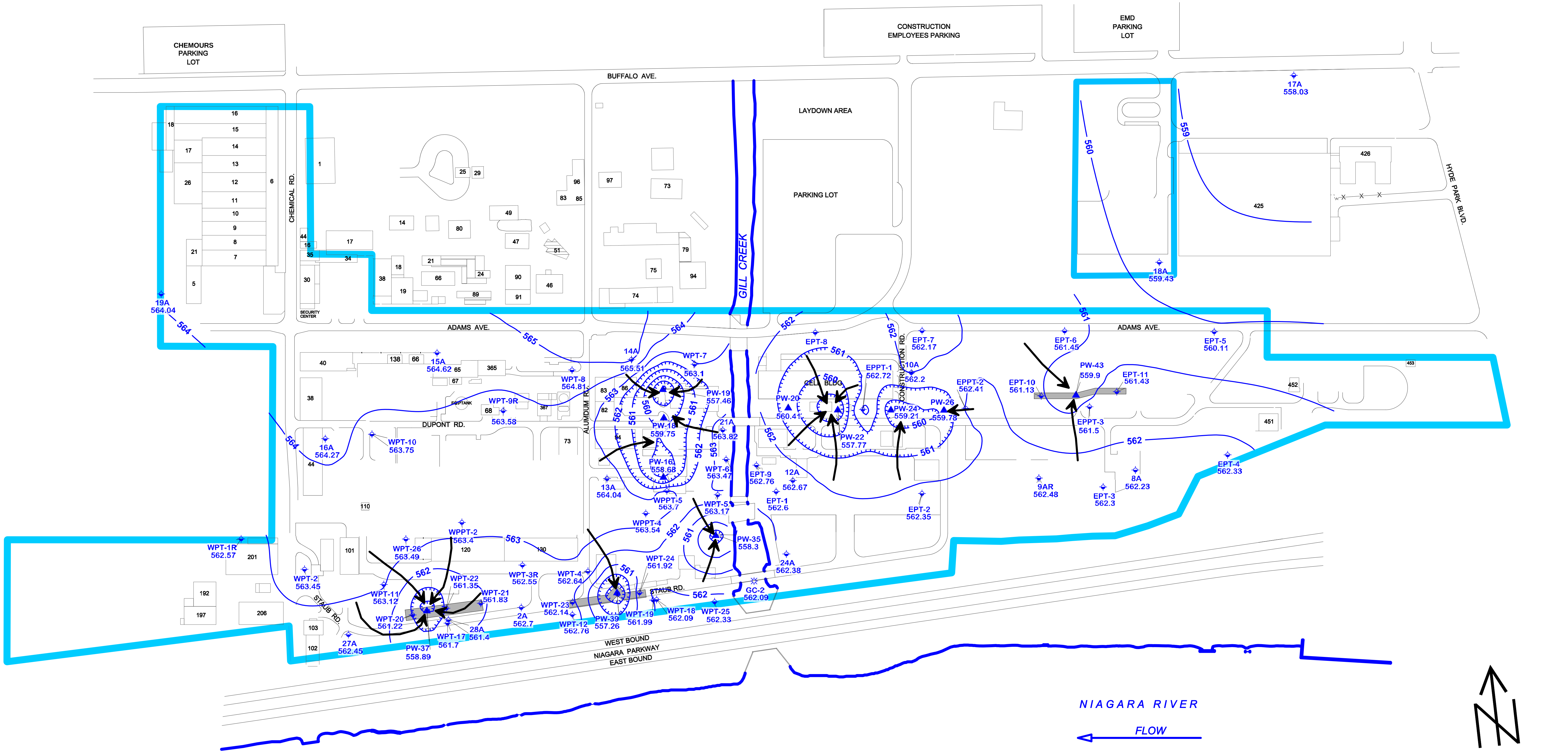
CHEMOURS WELLS

1AR3 WELL ID
PIEZOMETER
PUMPING WELL
MONITORING WELL
UNDERGROUND UTILITY WELL
GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

BLAST FRACTURED BEDROCK TRENCH
GROUNDWATER CONTOUR
GROUNDWATER CONTOUR DEPRESSION
561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-7
POTENTIOMETRIC SURFACE MAP
A-ZONE OVERBURDEN - AUGUST 17, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2022-08-17 NIA Contour Tool/2022-08-17-OBPZ.srf



Graphic Scale

0 125 250 375 500

Feet

Notes:

EPT-8 was dry on August 17, 2022.

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LEGEND

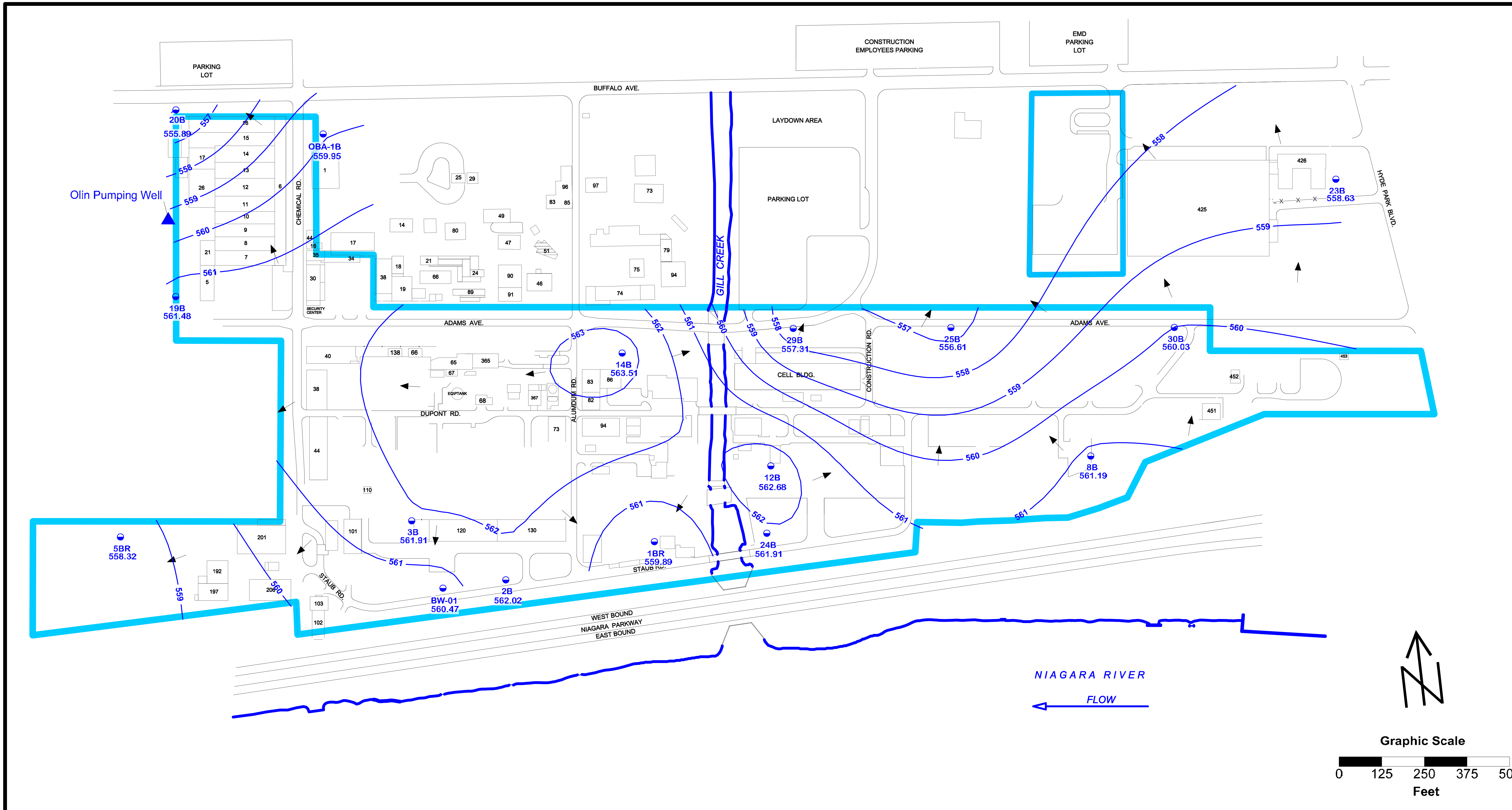
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-8
POTENTIOMETRIC SURFACE MAP
A-ZONE BEDROCK - AUGUST 17, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2022-08-17 NIA Contour Tool\2022-08-17-BRPZ.srf



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LEGEND

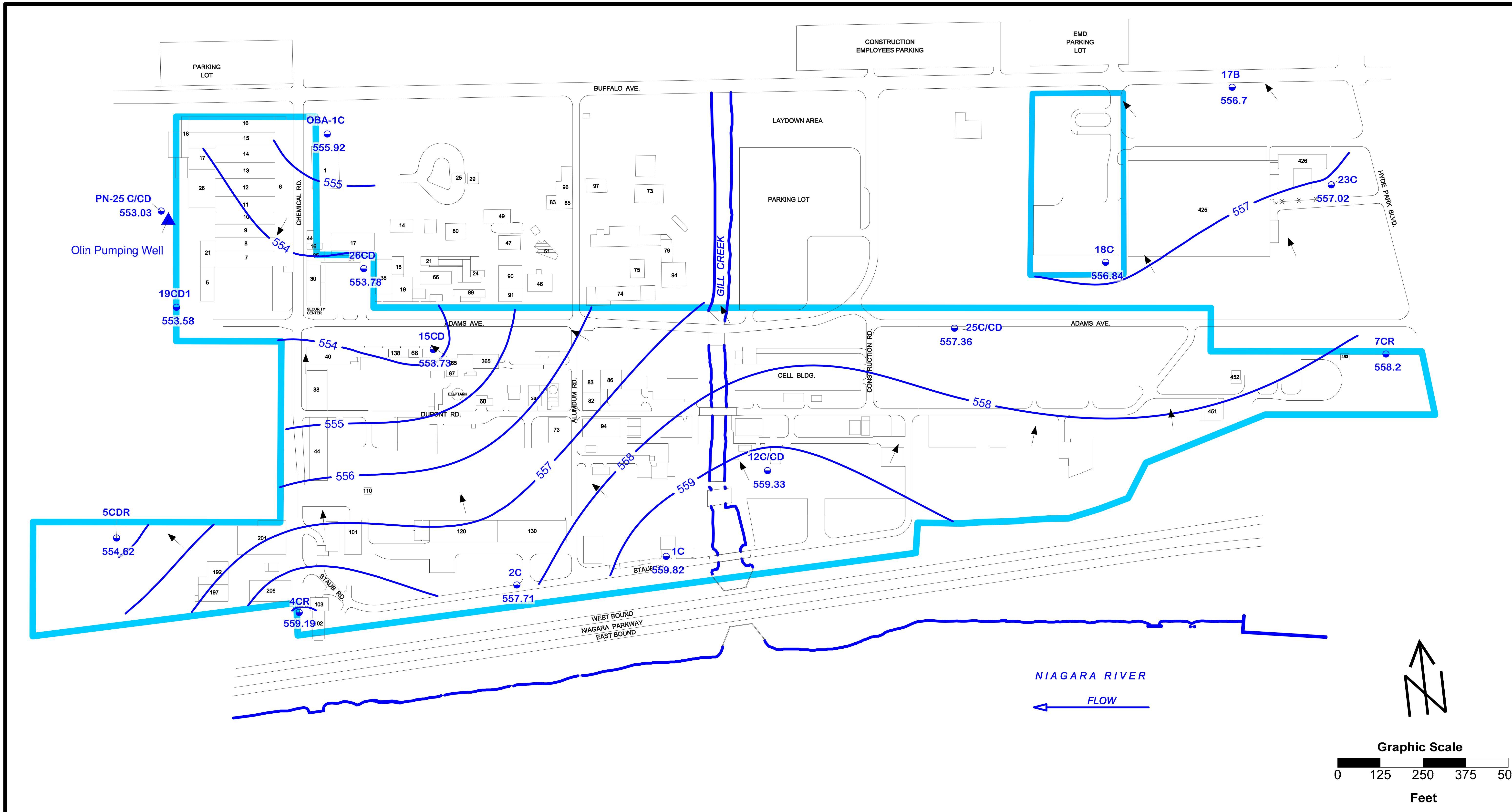
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1BR — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-9
POTENTIOMETRIC SURFACE MAP
B-ZONE BEDROCK - AUGUST 17, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2022-08-17 NIA Contour Tool\2022-08-17-BZPZ.srf



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Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1C — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 558 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-10
POTENTIOMETRIC SURFACE MAP
C/CD-ZONE BEDROCK - AUGUST 17, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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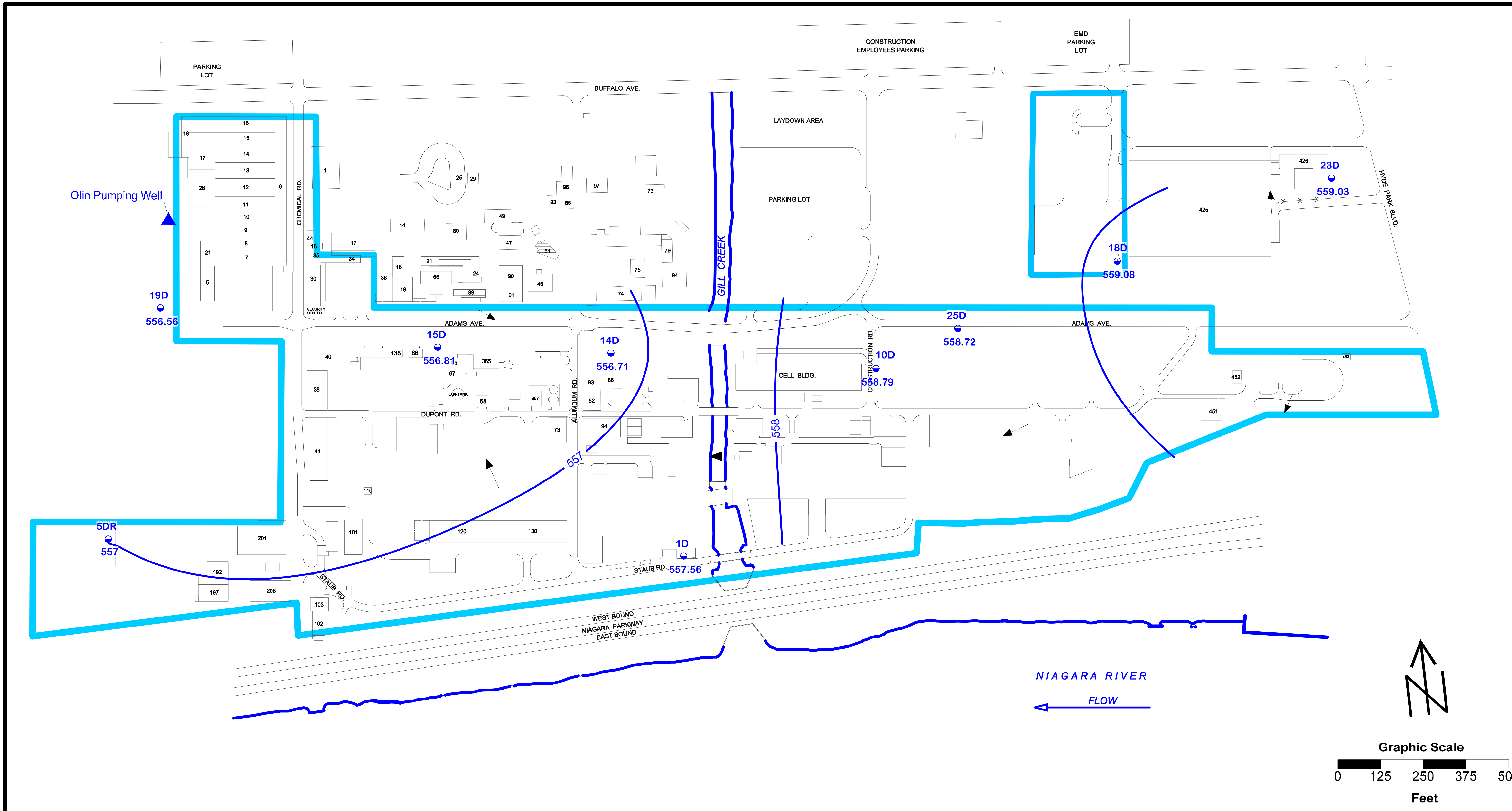

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Checked by: JWS	Date: 09/08/22
Project Manager: EAF	Date: 09/08/22
Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1D — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 557 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-11
POTENTIOMETRIC SURFACE MAP
D-ZONE BEDROCK - AUGUST 17, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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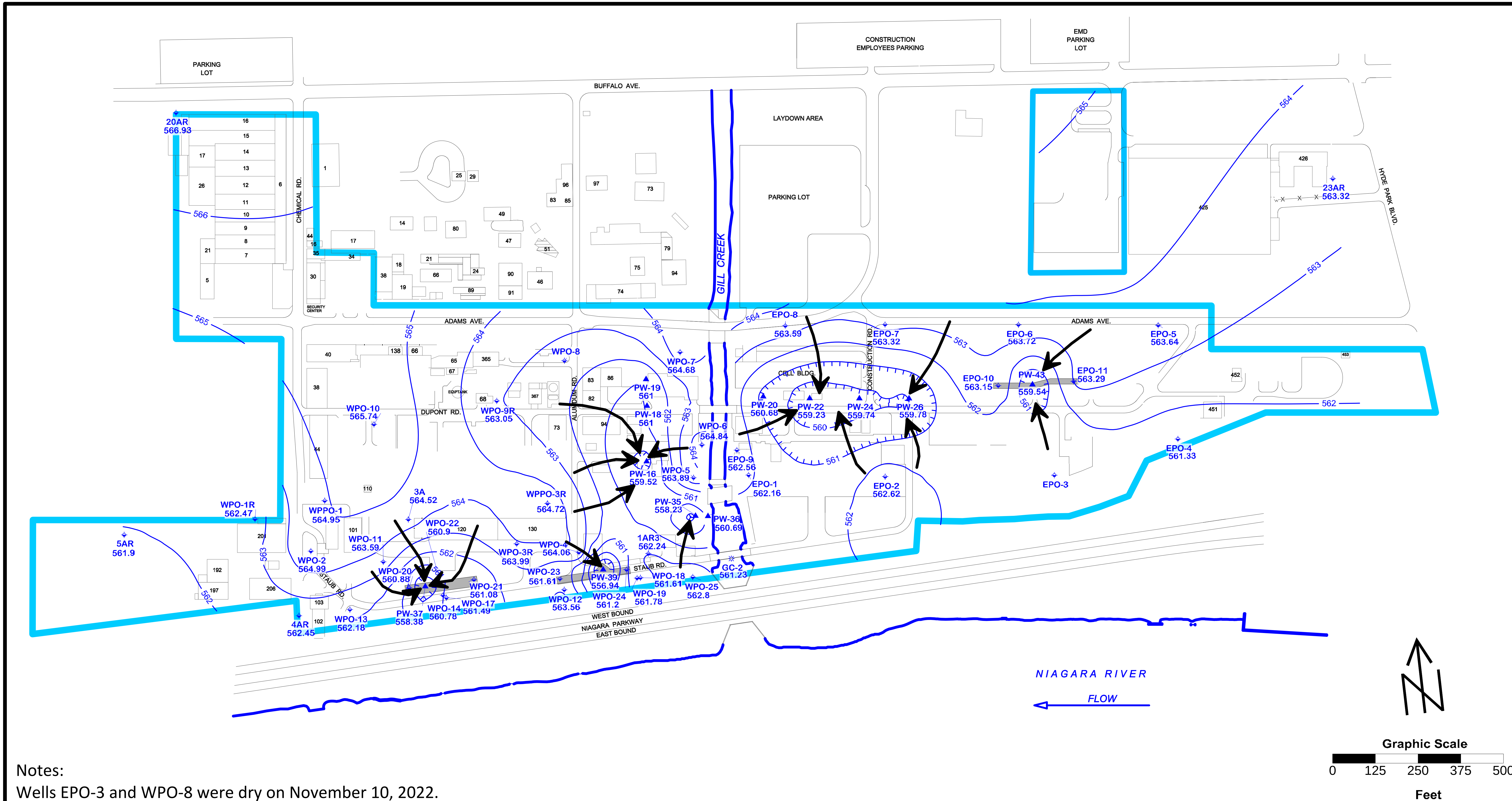

Notes:

Wells EPO-3 and WPO-8 were dry on November 10, 2022.

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-12
POTENTIOMETRIC SURFACE MAP
A-ZONE OVERBURDEN - NOVEMBER 10, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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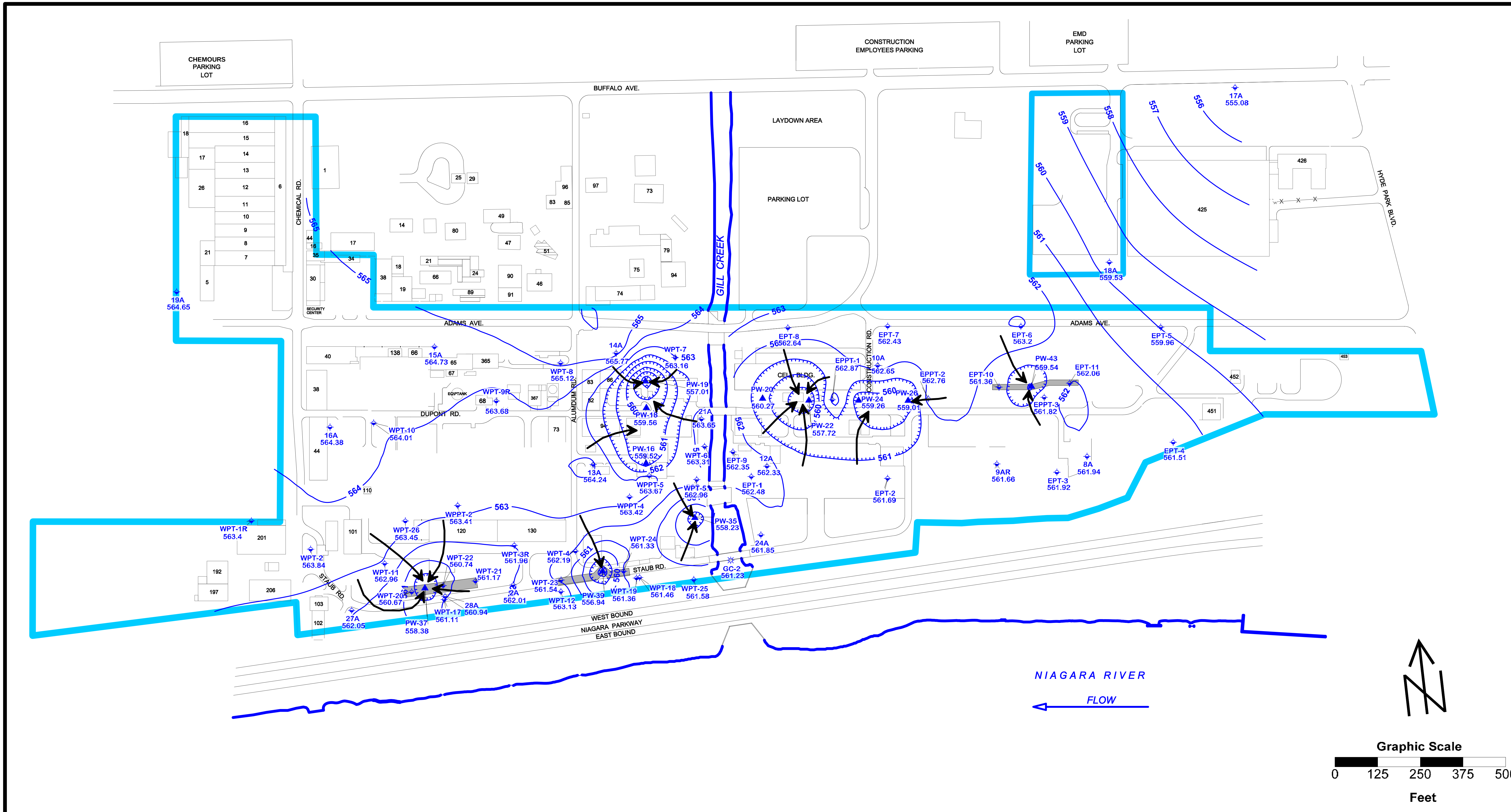

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-13
POTENTIOMETRIC SURFACE MAP
A-ZONE BEDROCK - NOVEMBER 10, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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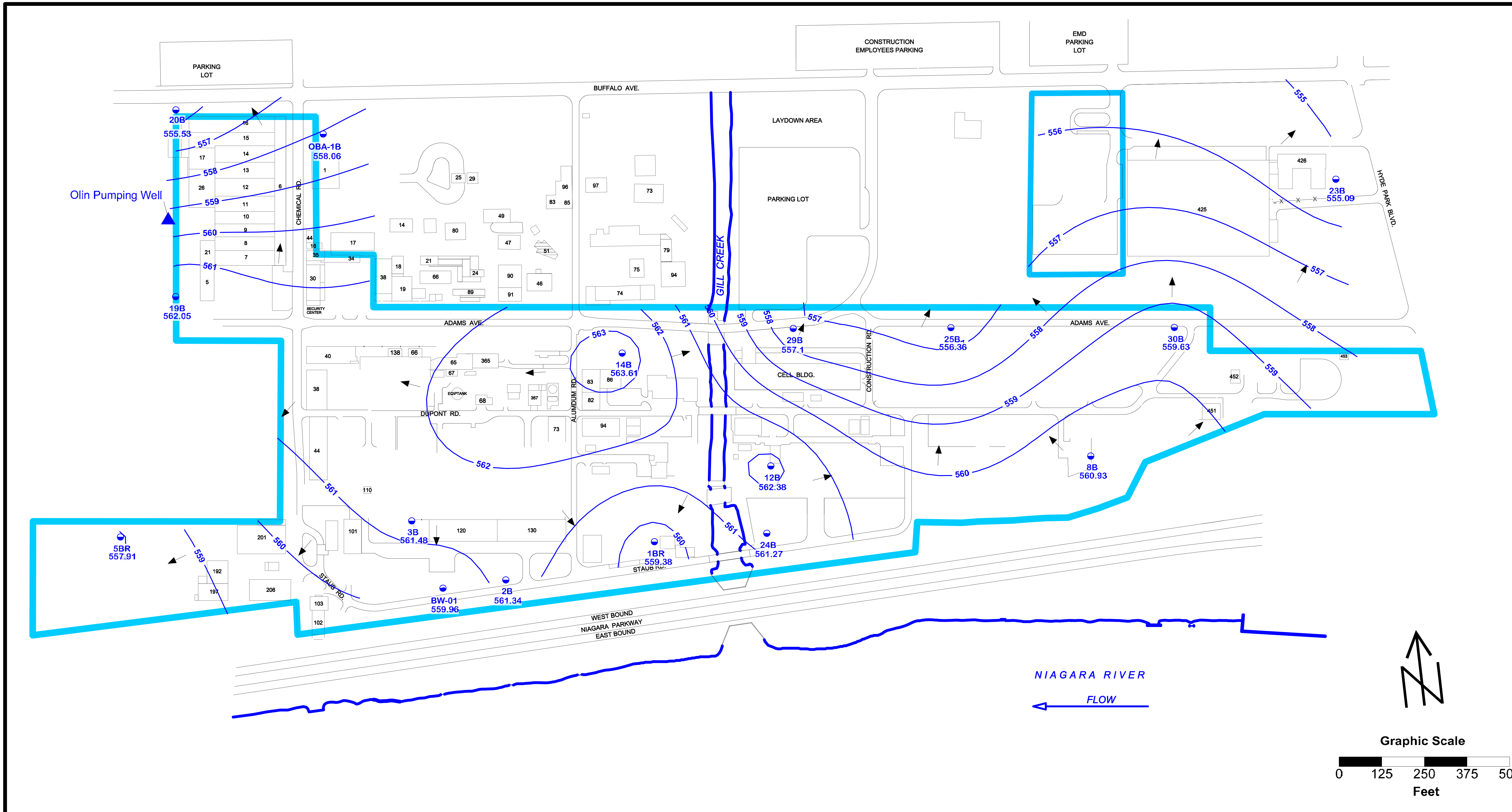

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1BR WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-14
POTENTIOMETRIC SURFACE MAP
B-ZONE BEDROCK - NOVEMBER 10, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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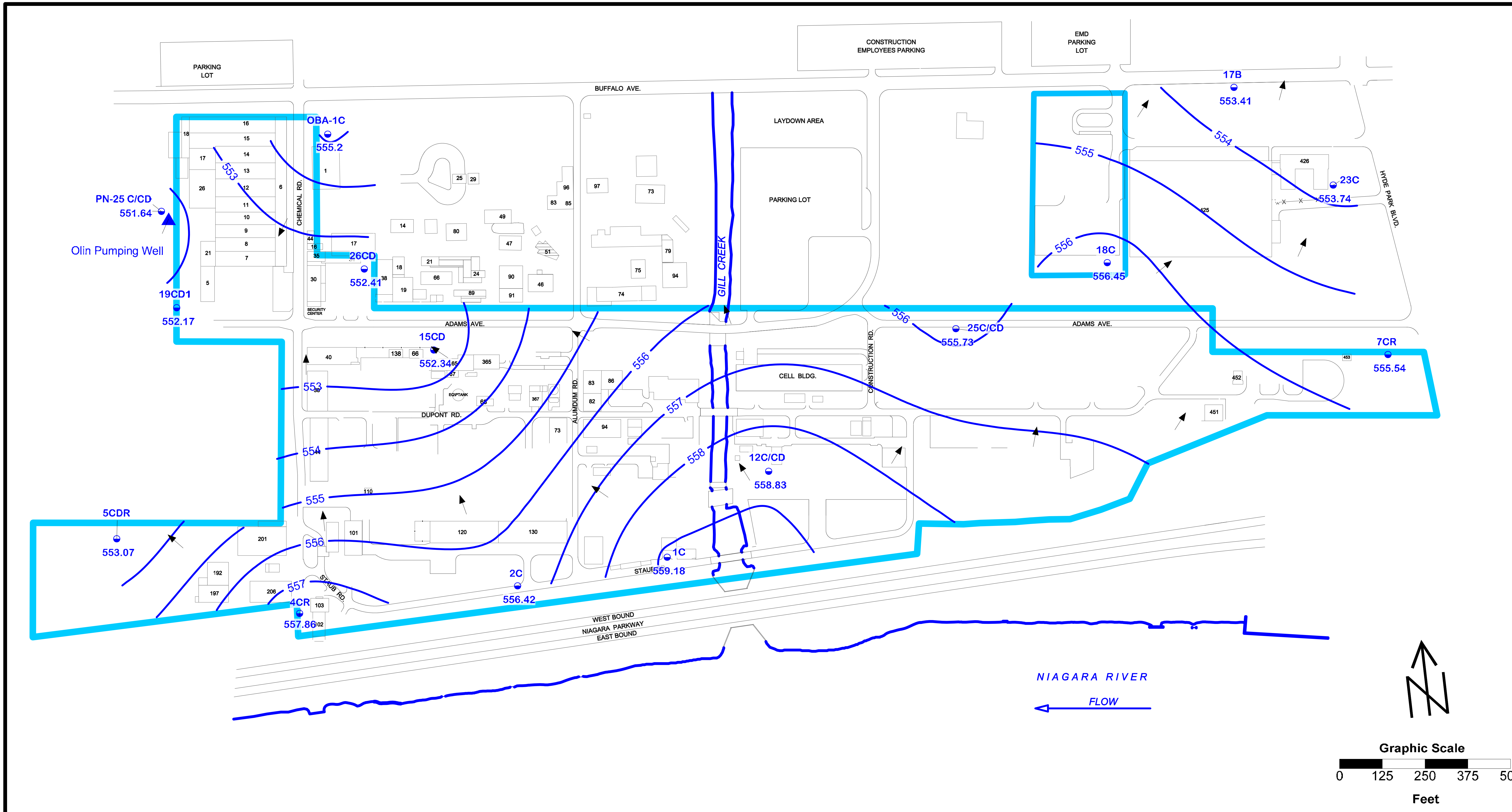

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Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1C WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL

- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 558 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-15
POTENTIOMETRIC SURFACE MAP
C/CD-ZONE BEDROCK - NOVEMBER 10, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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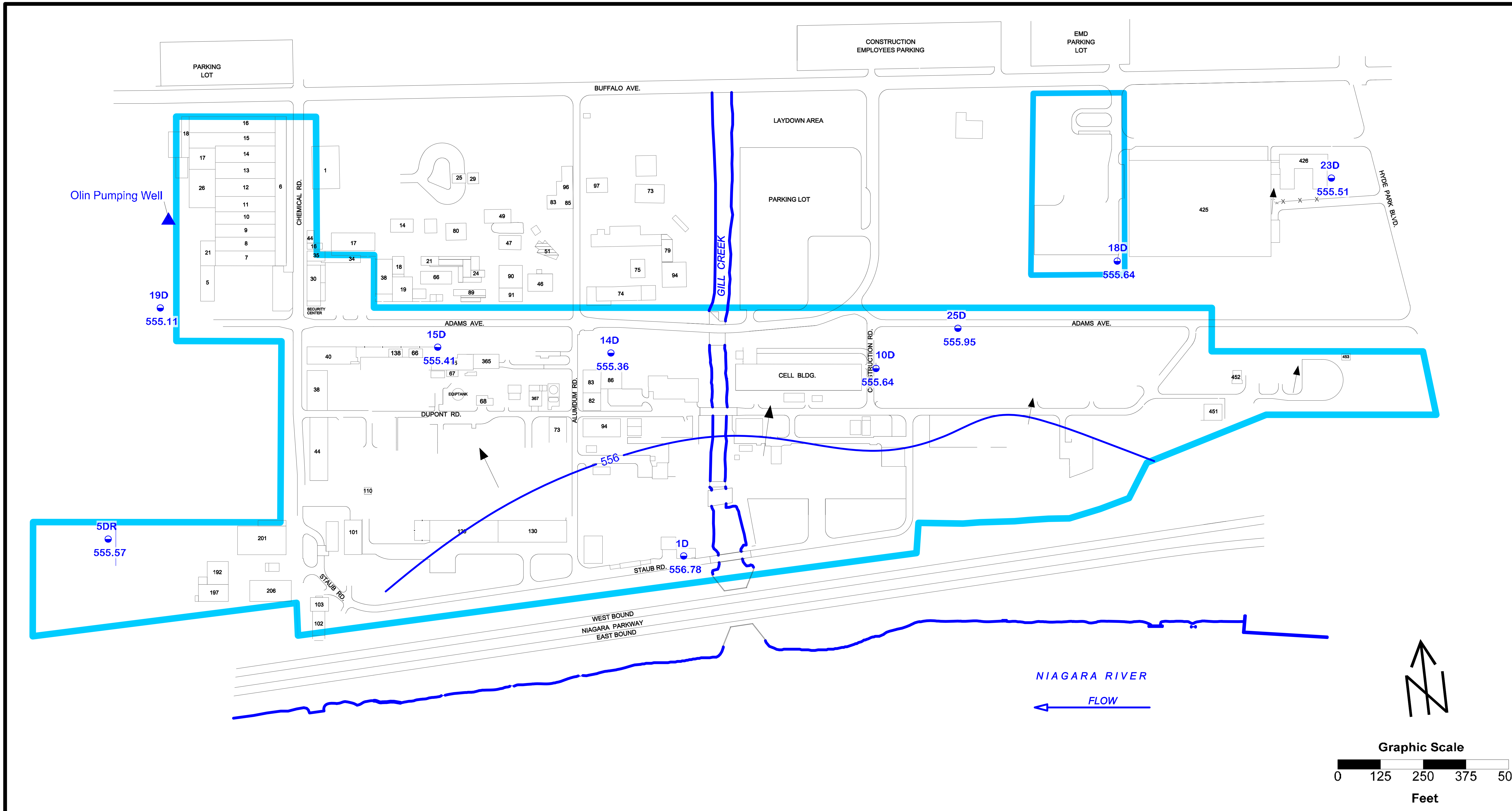

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LEGEND

BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

CHEMOURS WELLS

1D WELL ID
PIEZOMETER
PUMPING WELL
MONITORING WELL

GROUNDWATER CONTOUR
GROUNDWATER CONTOUR DEPRESSION
557 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-16
POTENTIOMETRIC SURFACE MAP
D-ZONE BEDROCK - NOVEMBER 10, 2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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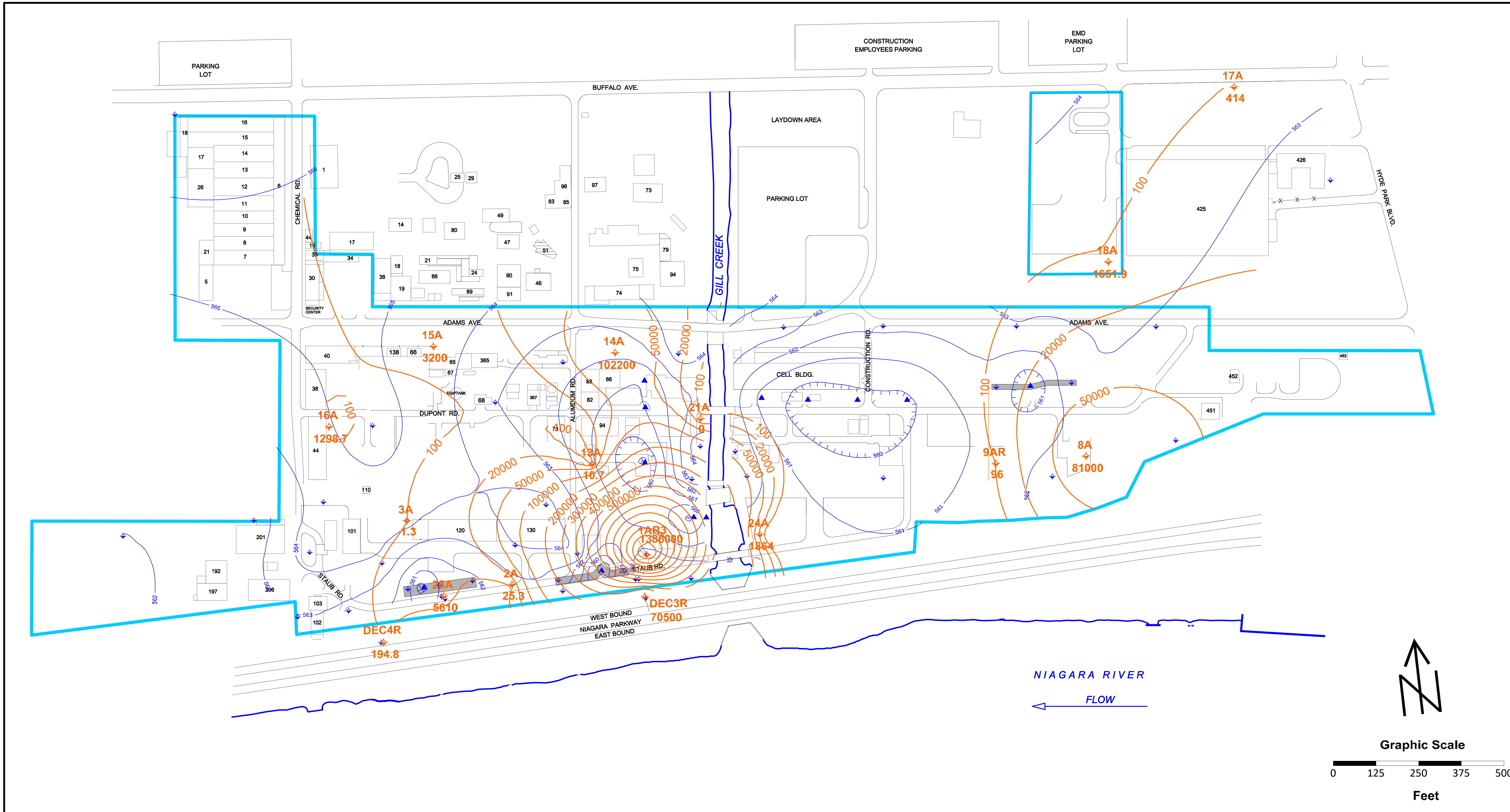

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Job number: 453219.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 563 GROUNDWATER CONTOUR ELEVATION

CHEMOURS WELLS

- 1AR3 WELL ID
- WELL/PIEZOMETER - TVOC SAMPLE
- WELL/PIEZOMETER - WATER LEVEL
- PUMPING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- TVOC ISOCONCENTRATION CONTOUR (ug/L)
- GROUNDWATER CONTOUR DEPRESSION
- 100000 TVOC CONTOUR CONCENTRATION (ug/L)

FIGURE 3-17
COMBINED POTENTIOMETRIC SURFACE MAP AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP
A-ZONE OVERBURDEN - 3Q2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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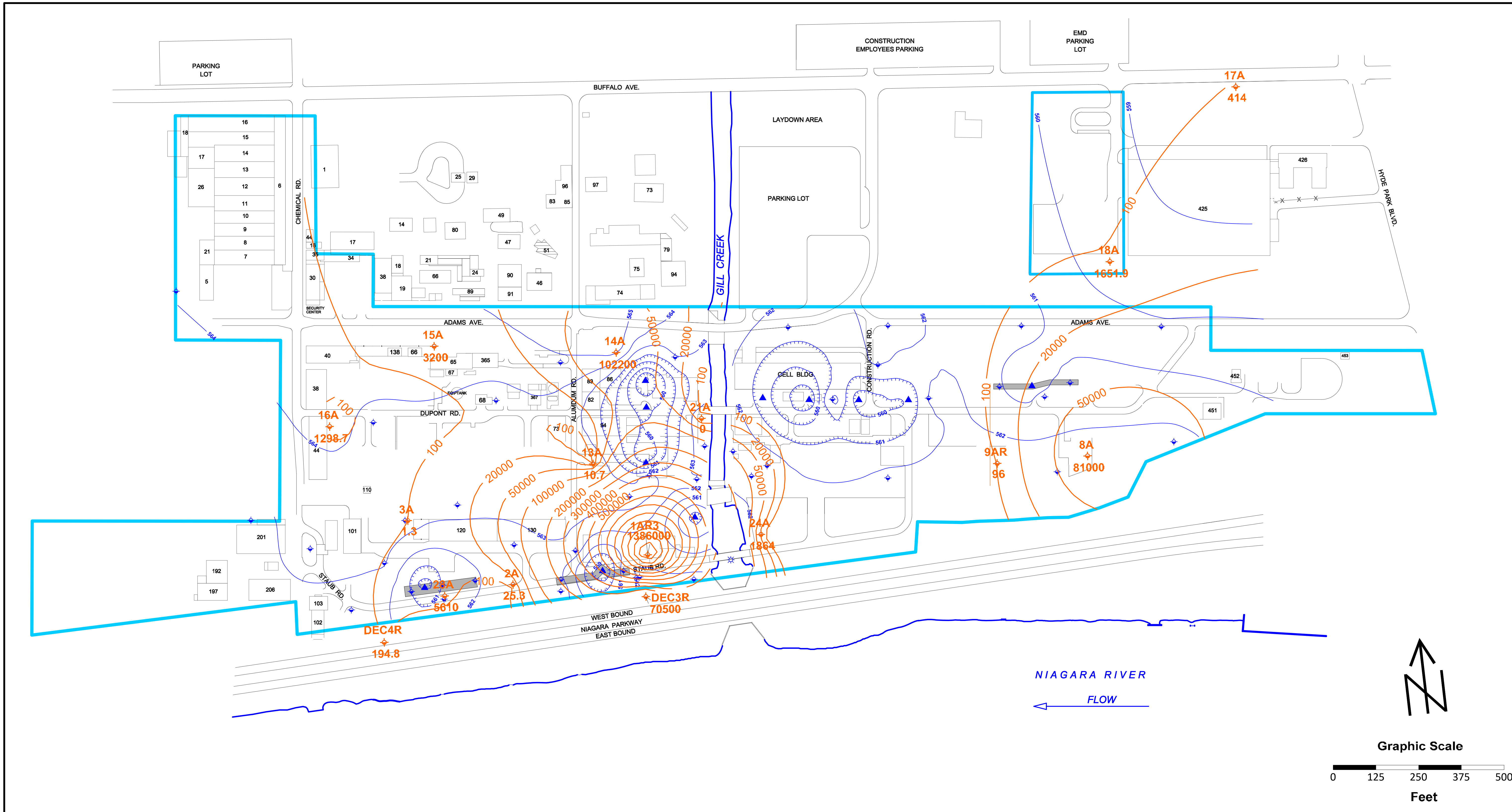

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 563 GROUNDWATER CONTOUR ELEVATION

CHEMOURS WELLS

- 1AR3 WELL ID
- WELL/PIEZOMETER - TVOC SAMPLE
- WELL/PIEZOMETER - WATER LEVEL
- PUMPING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- TVOC ISOCONCENTRATION CONTOUR (ug/L)
- GROUNDWATER CONTOUR DEPRESSION
- 100000 TVOC CONTOUR CONCENTRATION (ug/L)

FIGURE 3-18
COMBINED POTENTIOMETRIC SURFACE MAP AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP
A-ZONE BEDROCK - 3Q2022
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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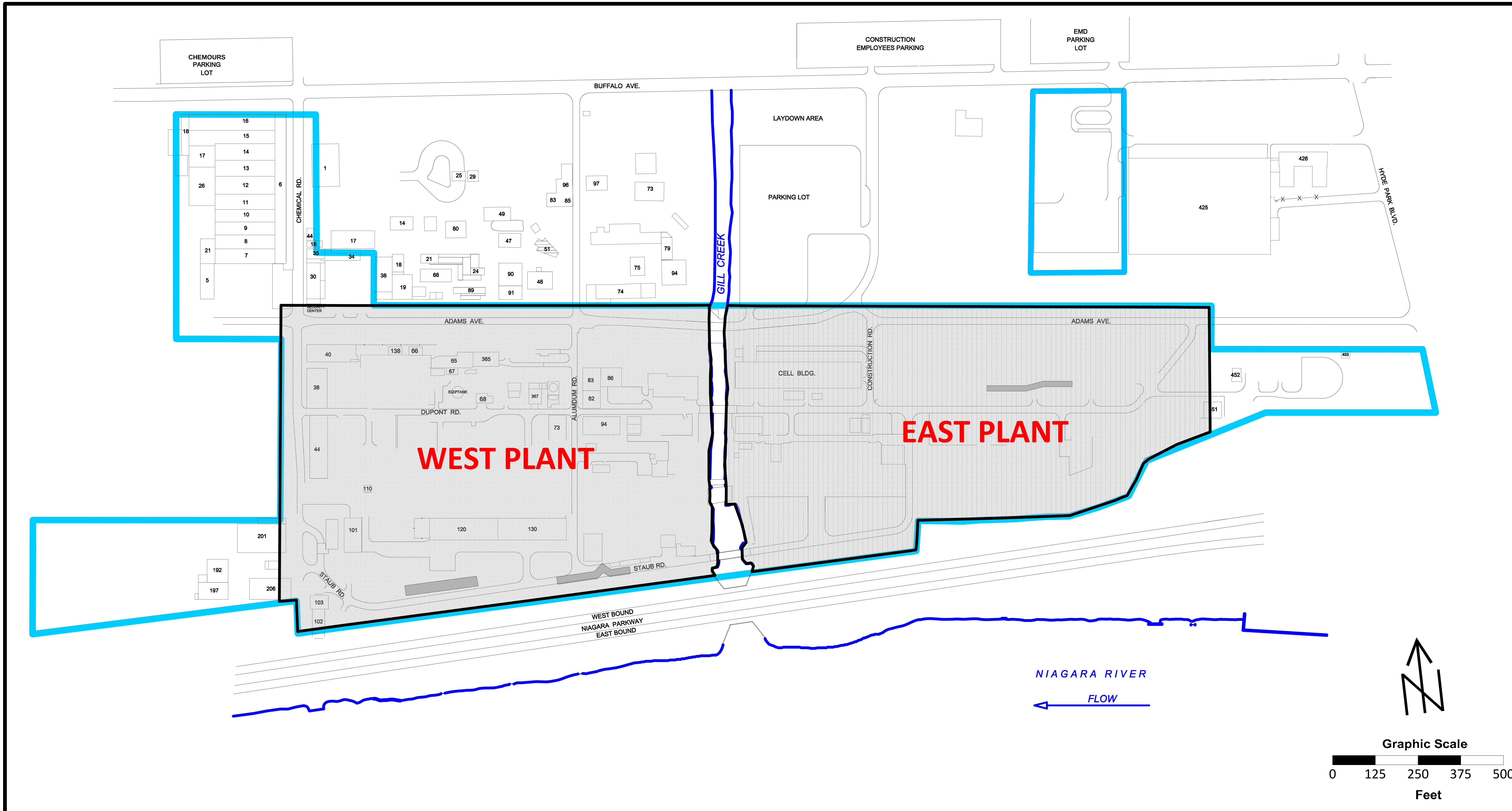

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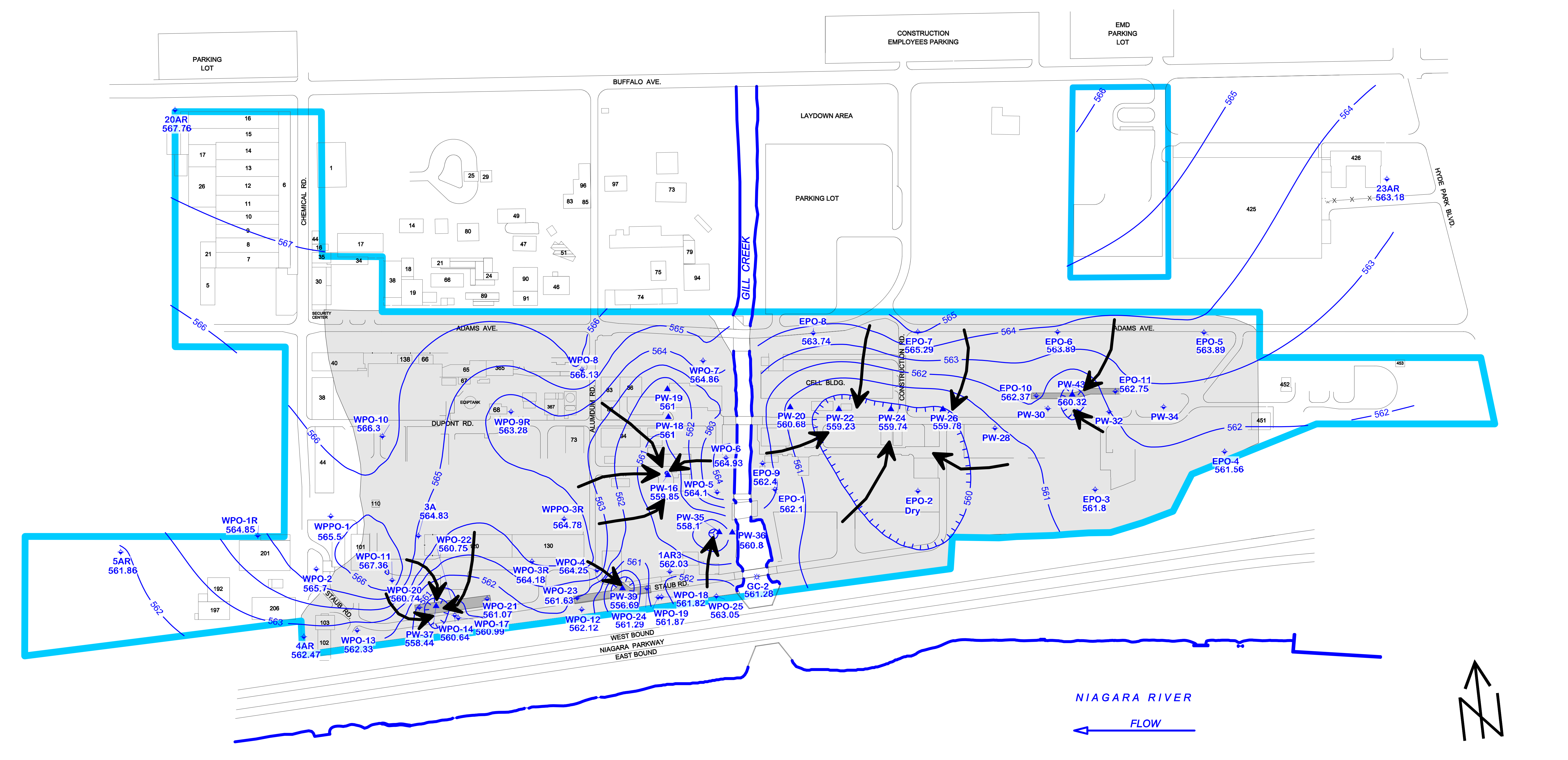
Job number: 453219.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- BLAST FRACTURED BEDROCK TRENCH
- AREA OF HYDRAULIC EVALUATION

FIGURE 3-19
AREA OF NIAGARA PLANT WHERE HYDRAULIC EFFECTIVENESS EVALUATION IS CONDUCTED
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2022 Annual Report/2022 Hydraulic Control Figures/FIG 3-4-Area of Hydraulic Effectiveness.srf



Notes:

Well EPO-2 was dry on March 10, 2022. This location was not used in the contouring.

Pumping wells PW-28, PW-30, PW-32, and PW-34 were taken offline in 4Q2021. Water levels collected from them were not used in the contouring.

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-20
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE OVERBURDEN - 1Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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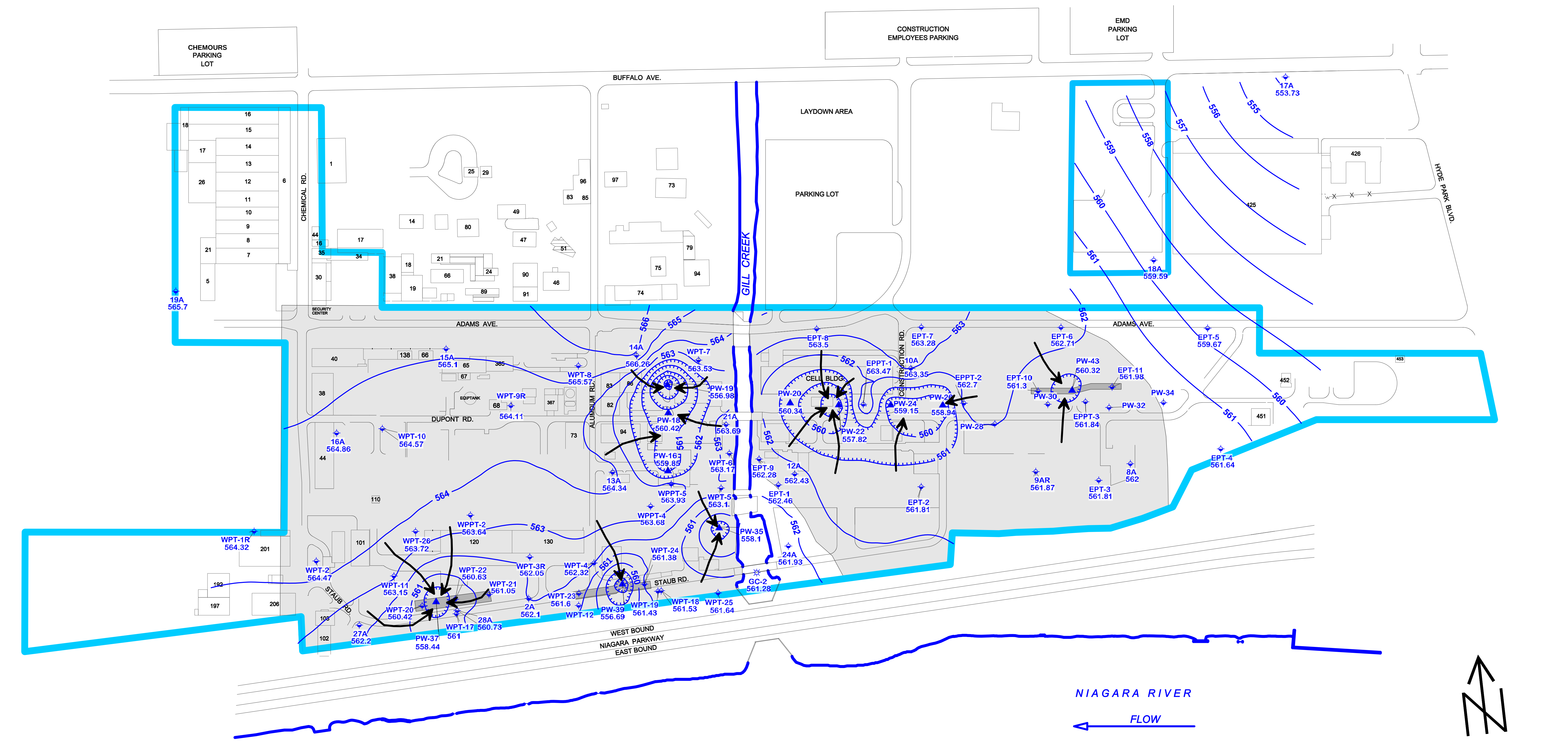

Notes:

Well WPT-12 was dry on March 10, 2022.

Pumping wells PW-28, PW-30, PW-32, and PW-34 were taken offline in 4Q2021. Water levels collected from them were not used in the contouring.

Graphic Scale

0 125 250 375 500

Feet

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Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-21
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE BEDROCK - 1Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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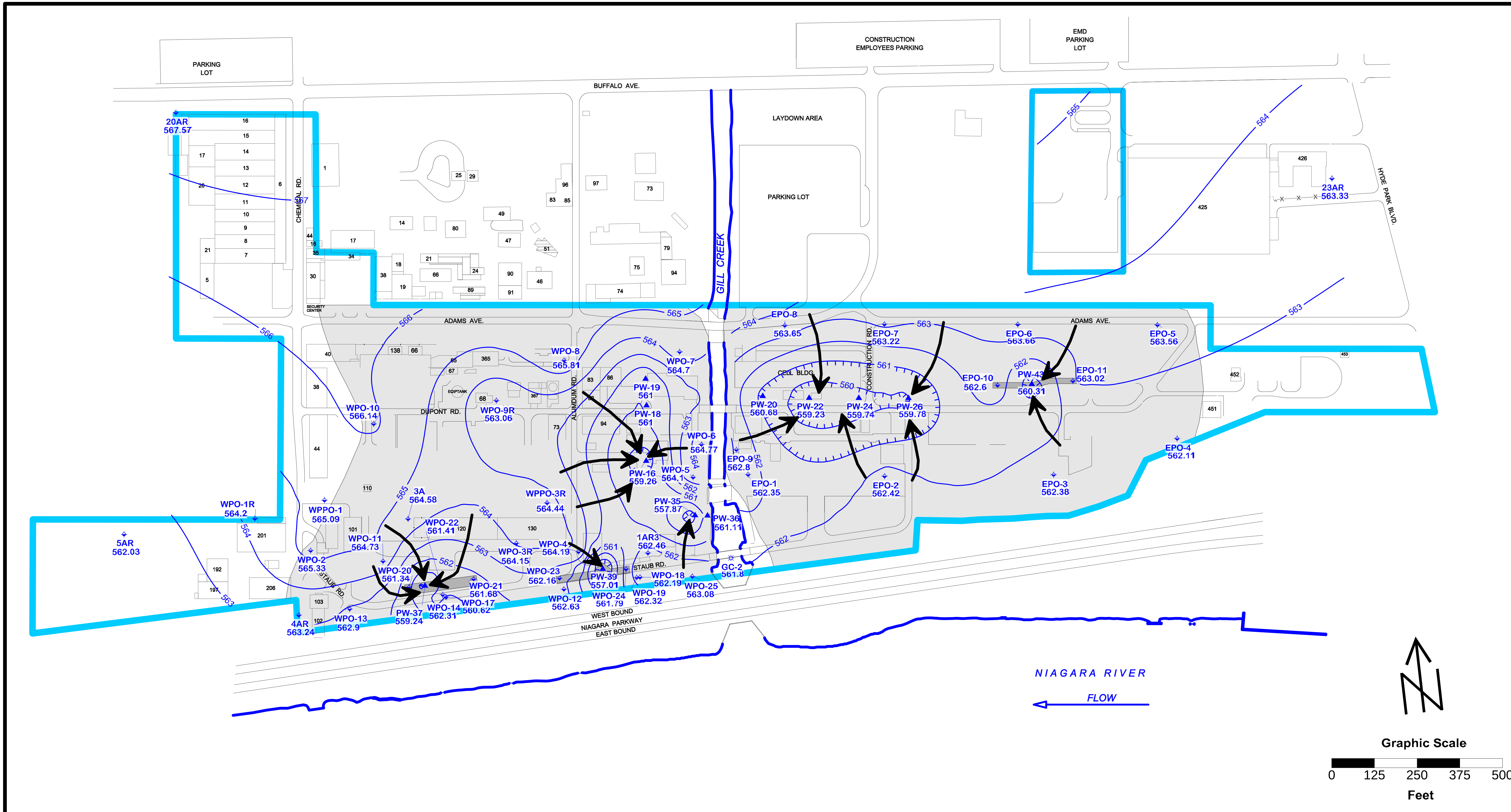

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-22
ESTIMATED AREA OF HYDRAULIC CONTROL A-ZONE OVERBURDEN - 2Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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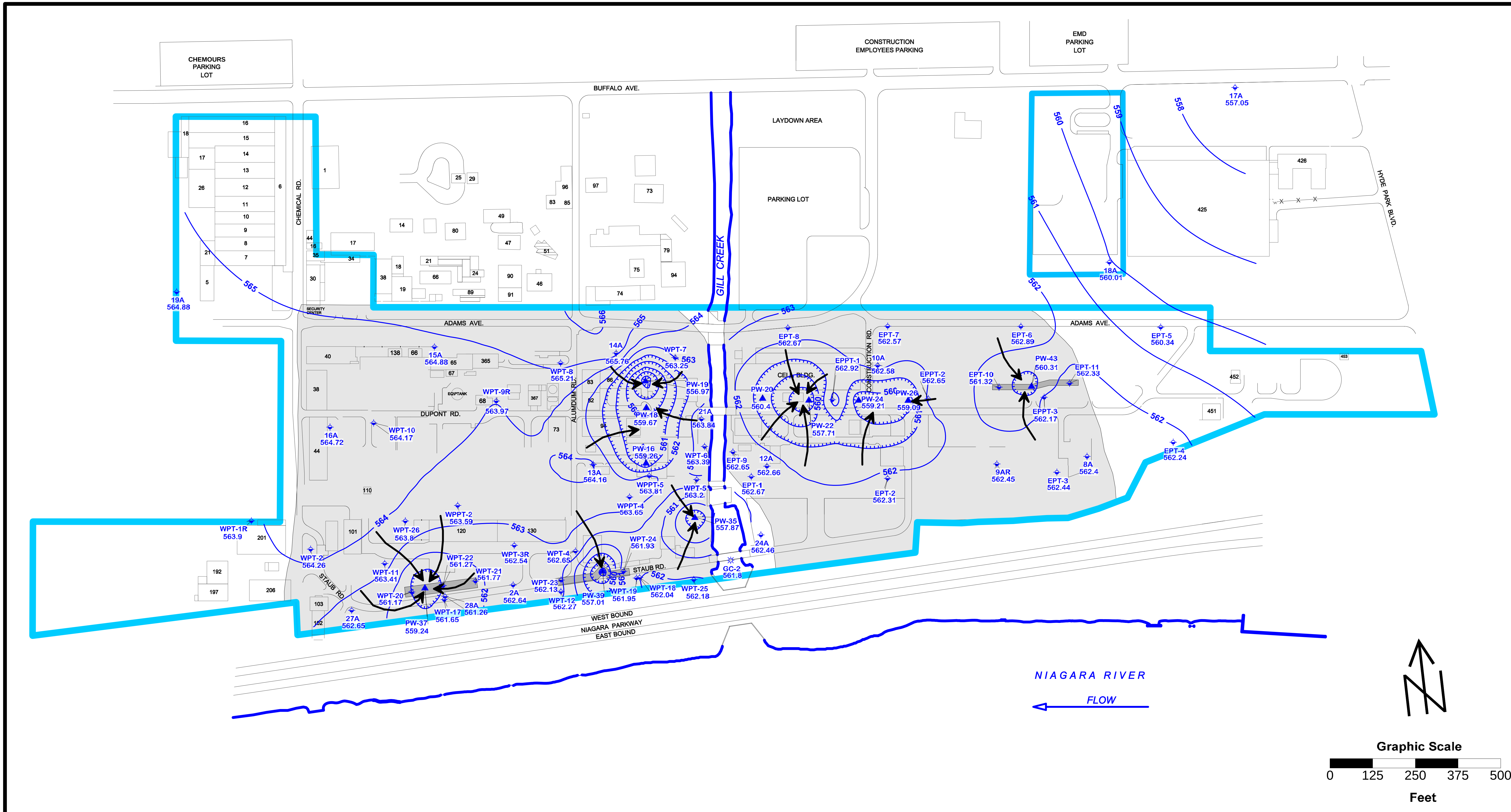

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(716) 541-0730	Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-23
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE BEDROCK - 2Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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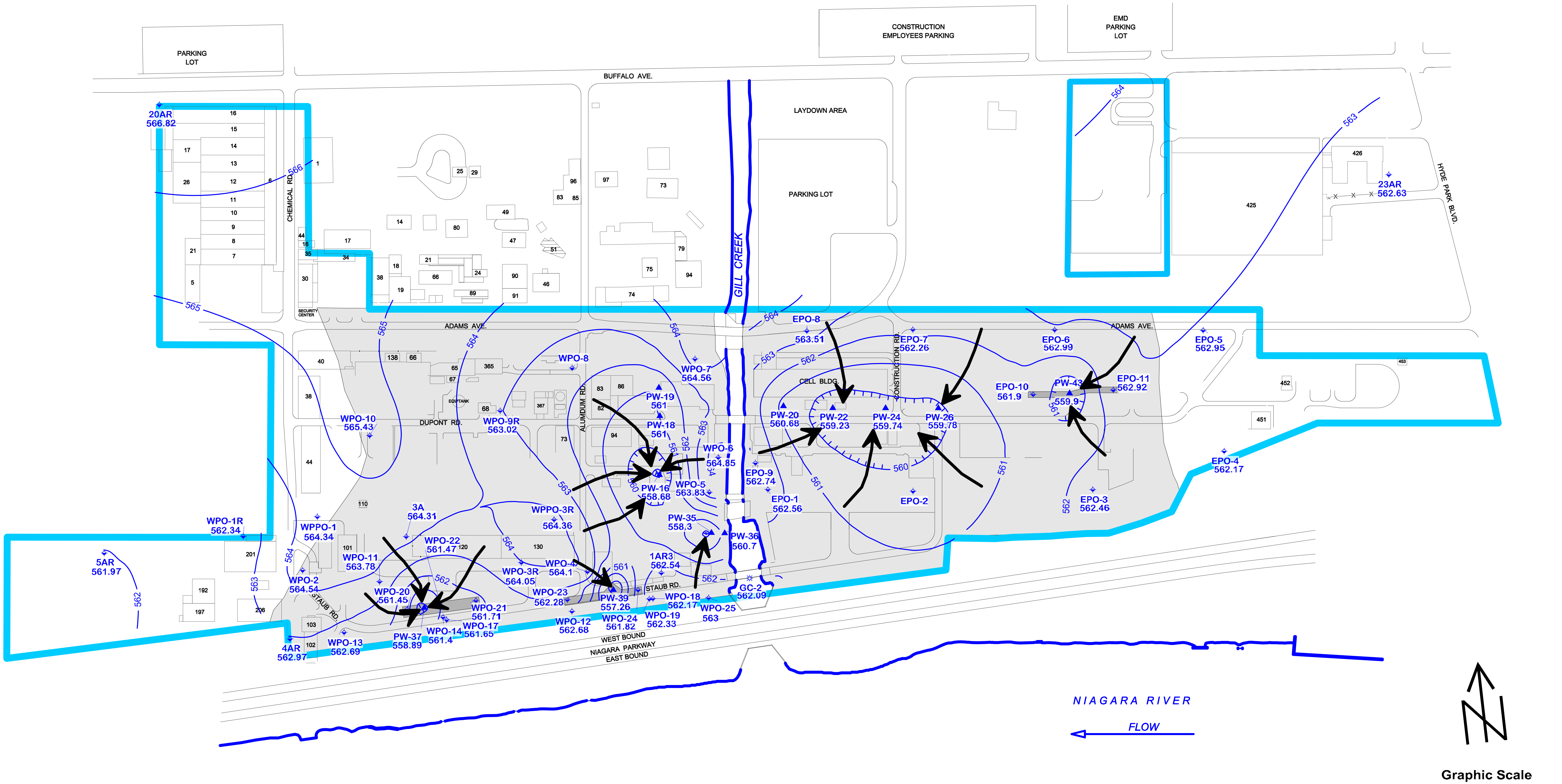

Notes:
Wells EPO-2 and WPO-8 were dry on August 17, 2022.

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-24
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE OVERBURDEN - 3Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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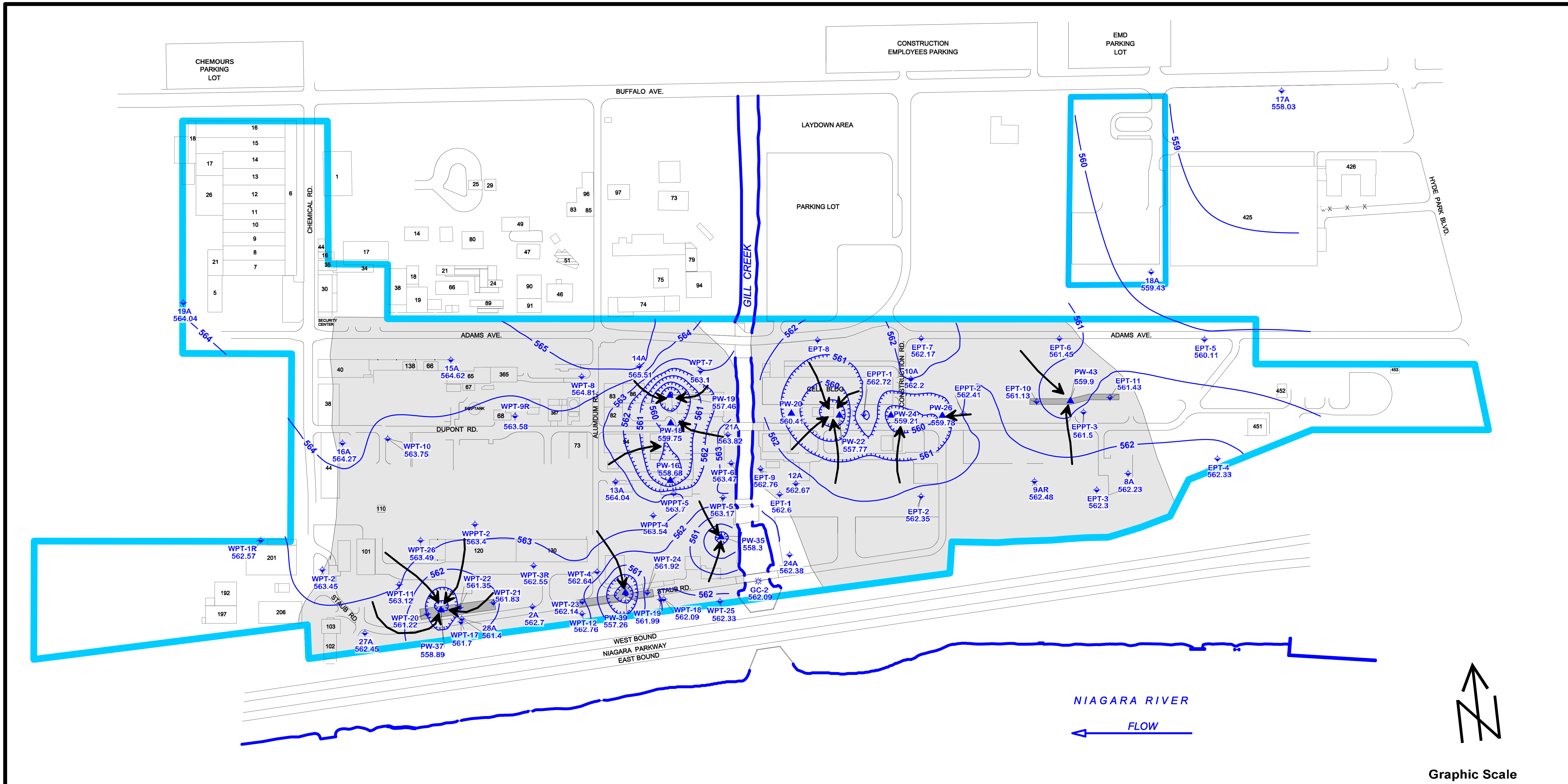

Notes:

EPT-8 was dry on August 17, 2022.

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Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-25
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE BEDROCK - 3Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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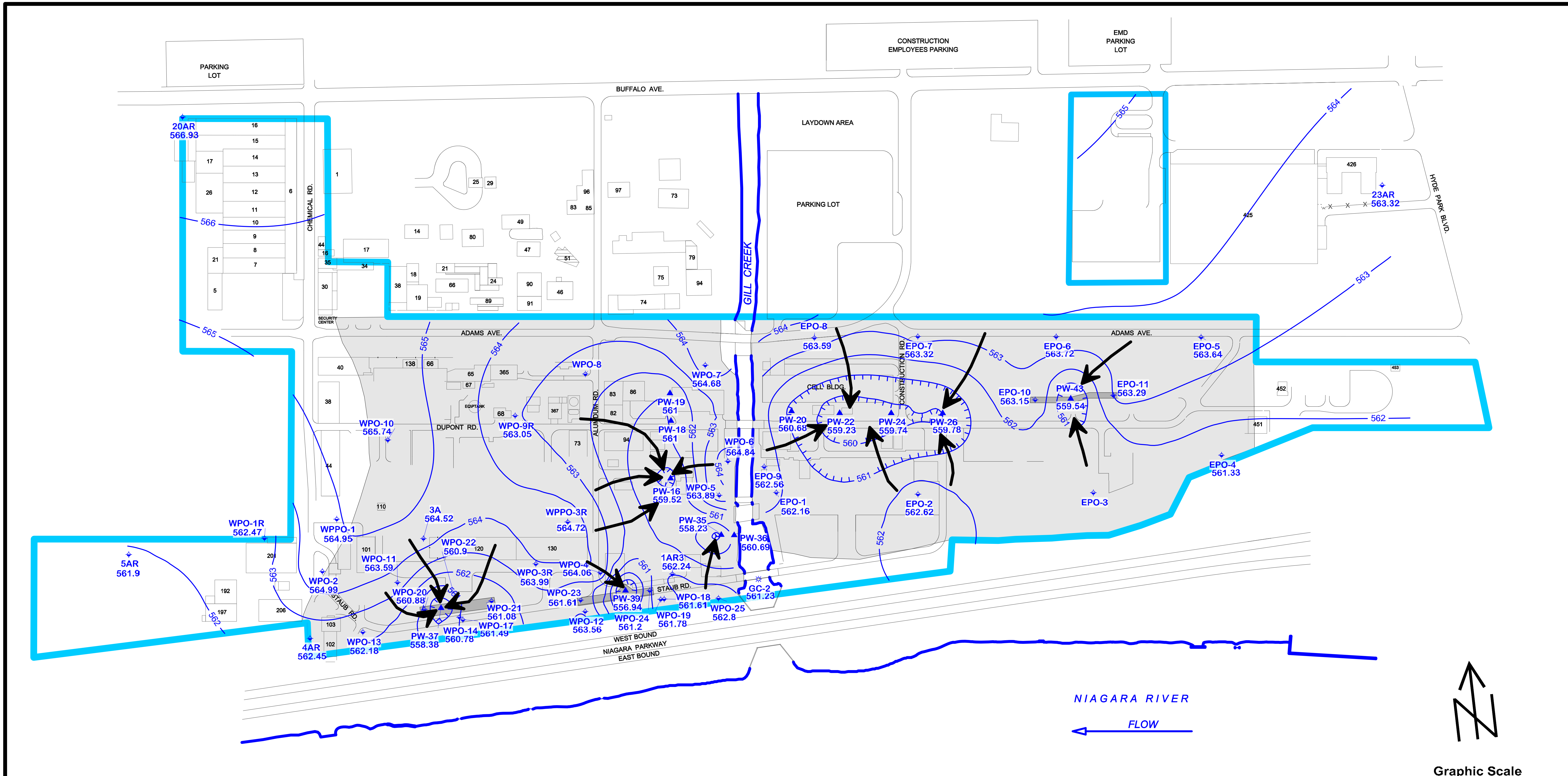

Notes:

Wells EPO-3 and WPO-8 were dry on November 10, 2022.

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LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

FIGURE 3-26
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE OVERBURDEN - 4Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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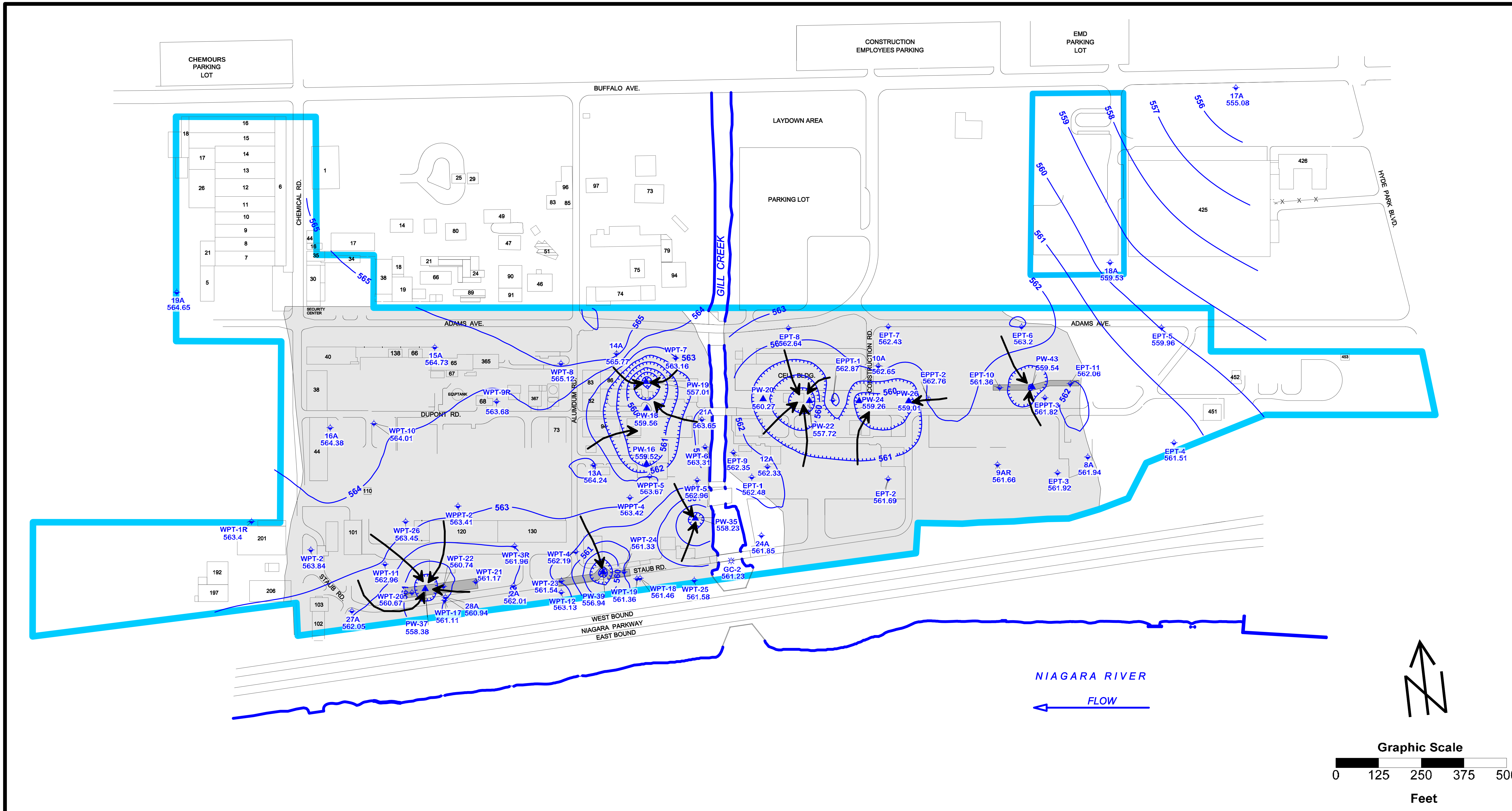

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Job number: 452825.03000	

LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

FIGURE 3-27
ESTIMATED AREA OF HYDRAULIC CONTROL
A-ZONE BEDROCK - 4Q22
CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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APPENDIX A
2022 ANALYTICAL RESULTS

PARSONS

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location Date Units	DEC-3R 09/12/2022 FS	DEC-3R 09/12/2022 DUP	DEC-4R 09/12/2022 FS	MW-10D 09/08/2022 FS	MW-12C/CD 09/09/2022 FS	MW-13A 09/08/2022 FS	MW-14A 09/09/2022 FS	MW-14B 09/09/2022 FS	MW-14D 09/09/2022 FS	MW-15A 09/08/2022 FS	MW-15CD 09/08/2022 FS	MW-15F 09/08/2022 FS
	Field Parameters													
	COLOR	NONE	clear	clear	clear	none	none	none	clear	clear	none	none	none	none
	DEPTH TO WATER	Feet	12.02	12.02	13.39	9.69	13.46	8.68	6.35	8.4	15.96	3.56	14.83	9.32
	ODOR	NONE	none	none	none	weak	none	none	weak	moderate	weak	none	none	none
	OXIDATION REDUCTION POTENTIAL	MV	225.8	225.8	241.2	126	284.3	61.3	265	265	205.2	187.5	262.2	93.1
	PH	STD UNITS	4.57	4.57	4.59	4.28	4.19	7.23	4.03	--	4.47	4.79	3.63	3.13
	SPECIFIC CONDUCTANCE	UMHOS/CM	19	19	26	21	47	121	8	120	75	9	8	7
	TEMPERATURE	DEGREES C	22.20	22.20	20.00	19.00	21.60	22.5	22.70	22.10	21.70	20.30	15.90	15.90
	TURBIDITY QUANTITATIVE	NTU	0.84	0.84	1.9	1.65	1.11	8.11	1.35	1.33	2.8	2.19	1.8	1.31
	Volatile Organics													
8260C	1,1,1-Trichloroethane	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,1,2,2-Tetrachloroethane	UG/L	4700 J	<2000	44	11000	2100	<1	<1000	15000	<400	<100	15000	<4
8260C	1,1,2-Trichloroethane	UG/L	<1000	<2000	1.5	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,1-Dichloroethane	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,1-Dichloroethene	UG/L	1200	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,2-Dichlorobenzene	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,4-Dichlorobenzene	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	1,4-Dichlorobutane	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	Benzene	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	43
8260C	Carbon Tetrachloride	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	Chlorobenzene	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	Chloroform	UG/L	4900 J	<2000	6.4	<4000	<2000	<1	<1000	31000	<400	1500	32000	<4
8260C	cis-1,2 Dichloroethene	UG/L	50000	54000	24	100000	10000	1.7	19000	47000	17000	750	26000	10
8260C	Methyl Chloride	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	Methylene Chloride	UG/L	<20000	<10000	<5	<20000	<10000	<5	<5000	<50000	<2000	<500	<20000	<20
8260C	Tetrachloroethene	UG/L	4500 J	<2000	52	<4000	35000	2.7	35000	27000	<400	<100	34000	<4
8260C	Tetrahydrothiophene	UG/L	<2000	<4000	<2	<8000	<4000	<2	<2000	<20000	<800	<200	<8000	<8
8260C	Toluene	UG/L	<1000	<2000	<1	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	<4
8260C	trans-1,2-Dichloroethene	UG/L	1900	<2000	3.9	<4000	<2000	<1	<1000	<10000	<400	<100	<4000	56
8260C	Trichloroethene	UG/L	<4000	<2000	63	48000	37000	1.5	46000	280000	<400	190	180000	7.6
8260C	Vinyl Chloride	UG/L	3300 J	<2000	<1	14000	<2000	4.8	2200	<10000	31000	760	<4000	150
	Total VOCs	UG/L	70500	54000	194.8	173000	84100	10.7	102200	400000	48000	3200	287000	266.6
	Inorganics													
9012B	Cyanide, total	MG/L	--	--	--	--	0.13	0.031	--	0.035	--	0.44	--	--

< Non detect at stated reporting limit. J Estimated concentration.

APPENDIX A
2022 Analytical Results - Monitoring Wells

		Location	MW-16A	MW-17A	MW-17F	MW-18A	MW-18C	MW-18C	MW-18D	MW-19CD1	MW-1AR3	MW-1BR	MW-1C	MW-1D
		Date	09/08/2022	09/08/2022	09/08/2022	09/08/2022	09/08/2022	09/08/2022	09/08/2022	09/13/2022	09/09/2022	09/12/2022	09/12/2022	09/12/2022
Method	Parameter Name	Units	FS	FS	FS	FS	FS	DUP	FS	FS	FS	FS	FS	FS
	Field Parameters													
	COLOR	NONE	none	clear	clear	clear	clear	clear	clear	yellow	yellow	clear	clear	clear
	DEPTH TO WATER	Feet	7.88	14.29	11.82	11.09	13.92	13.92	12.1	19.74	9.26	11.29	11.51	14.4
	ODOR	NONE	none	moderate	weak	moderate	strong	strong	weak	weak	moderate	none	none	none
	OXIDATION REDUCTION POTENTIAL	MV	70.3	106.7	79.1	159.3	95.2	95.2	197.8	74.6	213.8	187.7	126.7	107.1
	PH	STD UNITS	8.2	5.4	4.5	4.38	4.04	4.04	4.63	4.73	3.23	4.57	4.84	5.22
	SPECIFIC CONDUCTANCE	UMHOS/CM	8	12	69	8	24	24	6	33	26	17	22	97
	TEMPERATURE	DEGREES C	18.60	19.00	18.90	20.50	20.10	20.10	16.80	13.00	23.00	19.30	20.40	17.70
	TURBIDITY QUANTITATIVE	NTU	1.5	1.83	1.23	1.51	0.97	0.97	0.96	1.44	0.98	0.65	0.44	0.6
	Volatile Organics													
8260C	1,1,1-Trichloroethane	UG/L	<4	<20	<400	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	1,1,2,2-Tetrachloroethane	UG/L	<4	<20	<400	<5	<400	<400	<4	1500	<10000	4100	3700	180
8260C	1,1,2-Trichloroethane	UG/L	<4	<20	<400	<5	<400	<400	<4	1100	23000	<2000	<1000	<40
8260C	1,1-Dichloroethane	UG/L	12	<20	<400	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	1,1-Dichloroethene	UG/L	<4	<20	<400	<5	<400	<400	<4	960	<10000	<2000	<1000	<40
8260C	1,2-Dichlorobenzene	UG/L	<4	<20	7000	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	1,4-Dichlorobenzene	UG/L	<4	<20	3100	9.9	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	1,4-Dichlorobutane	UG/L	<4	<20	<400	78	6000 J	3600 J	<4	<250	<10000	<2000	<1000	<40
8260C	Benzene	UG/L	8.2	<20	970	25	<400	<400	<4	740	<10000	2100	<1000	43
8260C	Carbon Tetrachloride	UG/L	<4	<20	<400	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	Chlorobenzene	UG/L	<4	34	9100	39	690	440	<4	<250	<10000	<2000	<1000	<40
8260C	Chloroform	UG/L	<4	<20	<400	<5	<400	<400	<4	82000	75000	<2000	<1000	<40
8260C	cis-1,2 Dichloroethene	UG/L	210	<20	<400	<5	<400	<400	80	34000	130000	24000	15000	2400
8260C	Methyl Chloride	UG/L	<4	<20	<400	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	Methylene Chloride	UG/L	<20	<100	<2000	<25	<2000	<2000	<20	7300	780000	<10000	<5000	<200
8260C	Tetrachloroethene	UG/L	<4	<20	<400	<5	<400	<400	<4	7000	14000	9100	30000	<40
8260C	Tetrahydrothiophene	UG/L	<8	380	<800	1500	39000 J	61000 J	<8	<500	<20000	<4000	<2000	<80
8260C	Toluene	UG/L	14	<20	<400	<5	<400	<400	<4	<250	<10000	<2000	<1000	<40
8260C	trans-1,2-Dichloroethene	UG/L	8.5	<20	<400	<5	<400	<400	<4	390	<10000	<2000	<1000	62
8260C	Trichloroethene	UG/L	1000	<20	<400	<5	<400	<400	<4	120000	320000	110000	43000	1200
8260C	Vinyl Chloride	UG/L	46	<20	430	<5	<400	<400	34	750	44000	<2000	2500	330
	Total VOCs	UG/L	1298.7	414	20600	1651.9	45690	65040	114	255740	1386000	149300	94200	4215
	Inorganics													
9012B	Cyanide, total	MG/L	45	0.12	--	0.29	4.3	3.8	--	--	0.087	0.026	0.31	<0.01

< Non detect at stated reporting limit. J Estimated concentration.

APPENDIX A
2022 Analytical Results - Monitoring Wells

		Location	MW-20AR	MW-20B	MW-21A	MW-23F	MW-24A	MW-24B	MW-24B	MW-25B	MW-25B	MW-25C/CD	MW-25D	MW-25F
		Date	09/09/2022	09/13/2022	09/08/2022	09/08/2022	09/13/2022	09/09/2022	09/09/2022	09/12/2022	09/12/2022	09/12/2022	09/12/2022	09/12/2022
Method	**Parameter Name**	**Units**	**FS**	**FS**	**FS**	**FS**	**FS**	**FS**	**DUP**	**FS**	**DUP**	**FS**	**FS**	**FS**
	Field Parameters													
	COLOR	NONE	weak	clear	clear	clear	clear	none	none	clear	clear	clear	clear	clear
	DEPTH TO WATER	Feet	3.78	13.96	9.6	15.08	10.26	10.68	10.68	13.08	13.08	13.56	11.8	12.28
	ODOR	NONE	none	none	none	weak	none	none	none	none	none	none	none	none
	OXIDATION REDUCTION POTENTIAL	MV	92.7	147.3	148.6	80.4	-47	246.7	246.7	204.4	204.4	209.2	54	6
	PH	STD UNITS	8.26	6.71	5.30	7.37	7.31	4.09	4.09	4.5	4.50	3.90	3.41	4.33
	SPECIFIC CONDUCTANCE	UMHOS/CM	2990	481	9	63	7020	100	100	93.0	93	51	14	11
	TEMPERATURE	DEGREES C	24.30	16.2	21.60	16.7	20.04	28.10	28.10	30.20	30.20	21.90	18.40	16.9
	TURBIDITY QUANTITATIVE	NTU	>1000	1.86	1.22	0	1.12	1.62	1.62	1.30	1.3	1.05	1.17	0.77
	Volatile Organics													
8260C	1,1,1-Trichloroethane	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,1,2,2-Tetrachloroethane	UG/L	<1	<4	<1	<4	<20	4700 J	<200	<2	<2	<4	<400	<40
8260C	1,1,2-Trichloroethane	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,1-Dichloroethane	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,1-Dichloroethene	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,2-Dichlorobenzene	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,4-Dichlorobenzene	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	1,4-Dichlorobutane	UG/L	<1	<4	<1	<4	<20	<1000	<200	21	22	<4	<400	<40
8260C	Benzene	UG/L	<1	<4	<1	5.6	<20	<1000	<200	<2	<2	91	<400	<40
8260C	Carbon Tetrachloride	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	Chlorobenzene	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	11	<400	<40
8260C	Chloroform	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	cis-1,2 Dichloroethene	UG/L	<1	100	<1	7.1	1100	50000	57000 J	<2	<2	75	17000	62
8260C	Methyl Chloride	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	Methylene Chloride	UG/L	<5	<20	<5	<20	<100	<5000	<1000	<10	<10	<20	<2000	<200
8260C	Tetrachloroethene	UG/L	<1	<4	<1	<4	120	48000 J	720 J	<2	<2	<4	<400	<40
8260C	Tetrahydrothiophene	UG/L	<2	<8	<2	86	<40	<2000	<400	610	600	220	<800	<80
8260C	Toluene	UG/L	<1	<4	<1	<4	<20	<1000	<200	<2	<2	<4	<400	<40
8260C	trans-1,2-Dichloroethene	UG/L	<1	14	<1	11	34	<1000	250 J	<2	<2	<4	<400	<40
8260C	Trichloroethene	UG/L	11	16	<1	<4	160	120000 J	2900 J	<2	<2	<4	<400	<40
8260C	Vinyl Chloride	UG/L	<1	<4	<1	18	450	12000	10000 J	<2	<2	93	10000	1100
	Total VOCs	UG/L	11	130	0	127.7	1864	234700	70870	631	622	490	27000	1162
	Inorganics													
9012B	Cyanide, total	MG/L	<0.01	0.027	0.039	--	0.32	0.73 J	0.27 J	0.018	0.011	0.01	--	--

< Non detect at stated reporting limit. J Estimated concentration.

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location	MW-26CD	MW-28A	MW-29B	MW-2A	MW-2C	MW-30B	MW-3A	MW-3B	MW-4CR	MW-5BR	MW-8A	MW-8B
		Date	09/13/2022	09/09/2022	09/12/2022	09/09/2022	09/09/2022	09/12/2022	09/09/2022	09/09/2022	09/09/2022	09/09/2022	09/12/2022	09/12/2022
		Units	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	Field Parameters													
	COLOR	NONE	clear	none	clear	none	none	clear	clear	clear	none	clear	clear	clear
	DEPTH TO WATER	Feet	15.12	8.82	14.12	8.99	14.09	10.88	7.67	10.11	10.7	16.29	9.29	10.17
	ODOR	NONE	none	none	none	none	weak	none	none	weak	none	weak	weak	weak
	OXIDATION REDUCTION POTENTIAL	MV	62.1	128.6	181	150.7	217.5	65.8	191.1	196.6	130.5	52.2	192.3	174.9
	PH	STD UNITS	4.33	5.16	4.10	5.03	4.0	4.46	4.52	4.0	5.12	5.78	4.25	4.80
	SPECIFIC CONDUCTANCE	UMHOS/CM	20	27	17	30	6	43	61	4	52	82	18	2
	TEMPERATURE	DEGREES C	15.8	25.6	20.00	22.70	20.70	19.90	25.20	20.50	22.00	22.10	23.9	19.50
	TURBIDITY QUANTITATIVE	NTU	0.91	1.33	1.46	1.16	1.87	1.49	1.61	1.55	4.78	30.2	1.16	1.2
	Volatile Organics													
8260C	1,1,1-Trichloroethane	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	1,1,2,2-Tetrachloroethane	UG/L	460	<100	<4	<1	10000	<40	<1	<500	310	<1	<2000	<40
8260C	1,1,2-Trichloroethane	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	1,1-Dichloroethane	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	1,1-Dichloroethene	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	100
8260C	1,2-Dichlorobenzene	UG/L	<100	<100	12	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	1,4-Dichlorobenzene	UG/L	<100	<100	80	<1	<1000	42	<1	<500	<100	<1	<2000	<40
8260C	1,4-Dichlorobutane	UG/L	<100	<100	<4	<1	<1000	780	<1	<500	<100	<1	<2000	2400
8260C	Benzene	UG/L	<100	<100	<4	1.3	<1000	<40	<1	<500	<100	<1	<2000	140
8260C	Carbon Tetrachloride	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	Chlorobenzene	UG/L	<100	<100	150	2.4	<1000	120	<1	<500	<100	1.6	<2000	<40
8260C	Chloroform	UG/L	820	<100	<4	<1	<1000	<40	<1	72000	<100	<1	<2000	<40
8260C	cis-1,2 Dichloroethene	UG/L	2200	5100	<4	4	7600	<40	<1	1100	1800	2.3	<2000	50
8260C	Methyl Chloride	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	<40
8260C	Methylene Chloride	UG/L	<500	<500	<20	<5	<5000	<200	<5	7100	<500	<5	<10000	<200
8260C	Tetrachloroethene	UG/L	2100	<100	<4	<1	59000	<40	<1	1600	550	<1	<2000	<40
8260C	Tetrahydrothiophene	UG/L	<200	<200	<8	<2	<2000	10000	<2	<1000	<200	<2	81000	22000
8260C	Toluene	UG/L	<100	<100	<4	<1	<1000	<40	<1	<500	<100	<1	<2000	110
8260C	trans-1,2-Dichloroethene	UG/L	<100	<100	<4	1.8	<1000	<40	<1	<500	<100	<1	<2000	1200
8260C	Trichloroethene	UG/L	5800	<100	<4	1.8	150000	<40	<1	6100	3400	<1	<2000	<40
8260C	Vinyl Chloride	UG/L	300	510	<4	14	<1000	<40	1.3	<500	<100	6.5	<2000	800
	Total VOCs	UG/L	11680	5610	242	25.3	226600	10942	1.3	87900	6060	10.4	81000	26800
	Inorganics													
9012B	Cyanide, total	MG/L	--	0.041	0.011	0.84	0.13	1.4	0.096	0.036	<0.01	--	0.53	1.1

< Non detect at stated reporting limit. J Estimated concentration.

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location Date Units	MW-9AR 09/12/2022 FS	MW-U-1 09/13/2022 FS	OBA-1C 09/13/2022 FS	TB 09/08/2022 TB	TB 09/09/2022 FS	TB 09/12/2022 TB	TB 09/13/2022 TB
	Field Parameters								
	COLOR	NONE	clear	clear	clear	--	--	--	--
	DEPTH TO WATER	Feet	10.35	12.42	18.53	--	--	--	--
	ODOR	NONE	none	none	none	--	--	--	--
	OXIDATION REDUCTION POTENTIAL	MV	233.5	227.7	-109	--	--	--	--
	PH	STD UNITS	4.37	14.90	6.66	--	--	--	--
	SPECIFIC CONDUCTANCE	UMHOS/CM	18	7	3400	--	--	--	--
	TEMPERATURE	DEGREES C	22.40	16.6	18.86	--	--	--	--
	TURBIDITY QUANTITATIVE	NTU	1.17	0.96	7.65	--	--	--	--
	Volatile Organics								
8260C	1,1,1-Trichloroethane	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,1,2,2-Tetrachloroethane	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,1,2-Trichloroethane	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,1-Dichloroethane	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,1-Dichloroethene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,2-Dichlorobenzene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,4-Dichlorobenzene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	1,4-Dichlorobutane	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Benzene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Carbon Tetrachloride	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Chlorobenzene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Chloroform	UG/L	<1	<1.7	46000	<1	<1	<1	<1
8260C	cis-1,2 Dichloroethene	UG/L	<1	66	29000	<1	<1	<1	<1
8260C	Methyl Chloride	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Methylene Chloride	UG/L	<5	<8.4	<10000	<5	<5	<5	<5
8260C	Tetrachloroethene	UG/L	<1	<1.7	31000	<1	<1	<1	<1
8260C	Tetrahydrothiophene	UG/L	96	<3.3	<4000	<2	<2	<2	<2
8260C	Toluene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	trans-1,2-Dichloroethene	UG/L	<1	<1.7	<2000	<1	<1	<1	<1
8260C	Trichloroethene	UG/L	<1	<1.7	140000	<1	<1	<1	<1
8260C	Vinyl Chloride	UG/L	<1	38	<2000	<1	<1	<1	<1
	Total VOCs	UG/L	96	104	246000	0	0	0	0
	Inorganics								
9012B	Cyanide, total	MG/L	0.18	<0.01	0.15	--	--	--	--

< Non detect at stated reporting limit. J Estimated concentration.

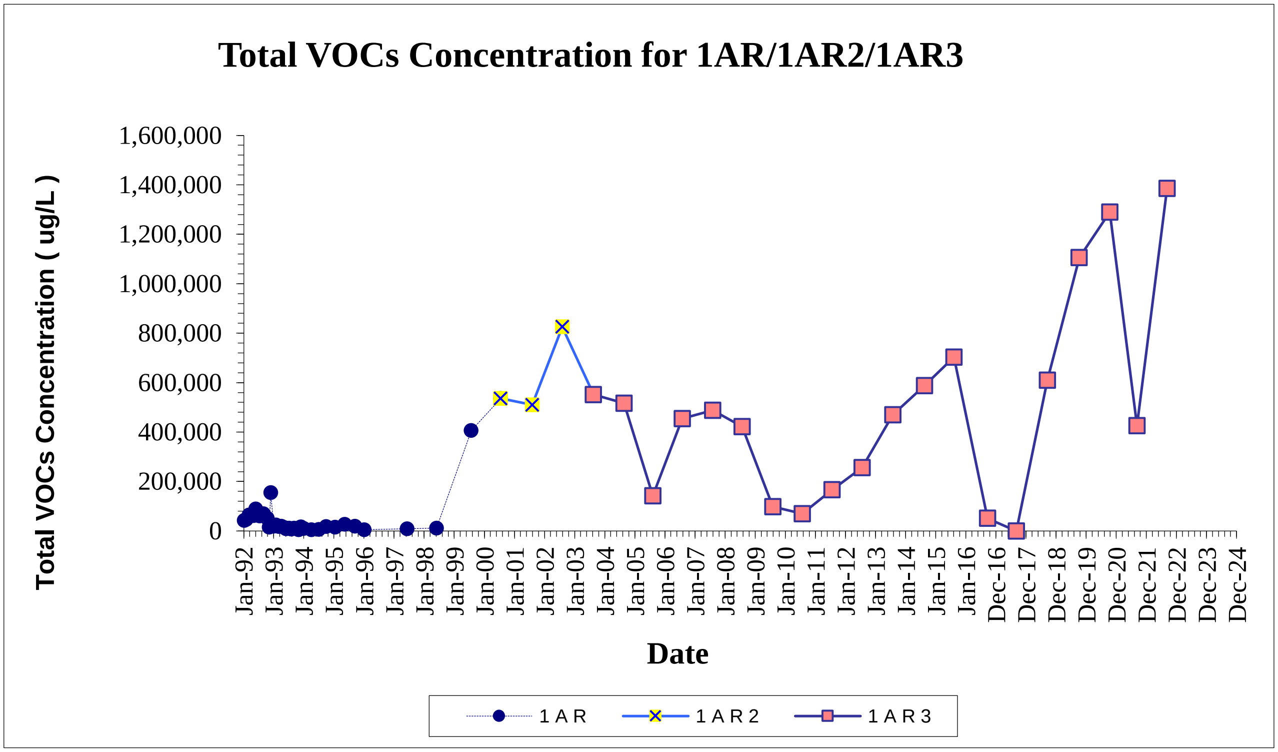
APPENDIX A
2022 Analytical Results - Surface Water

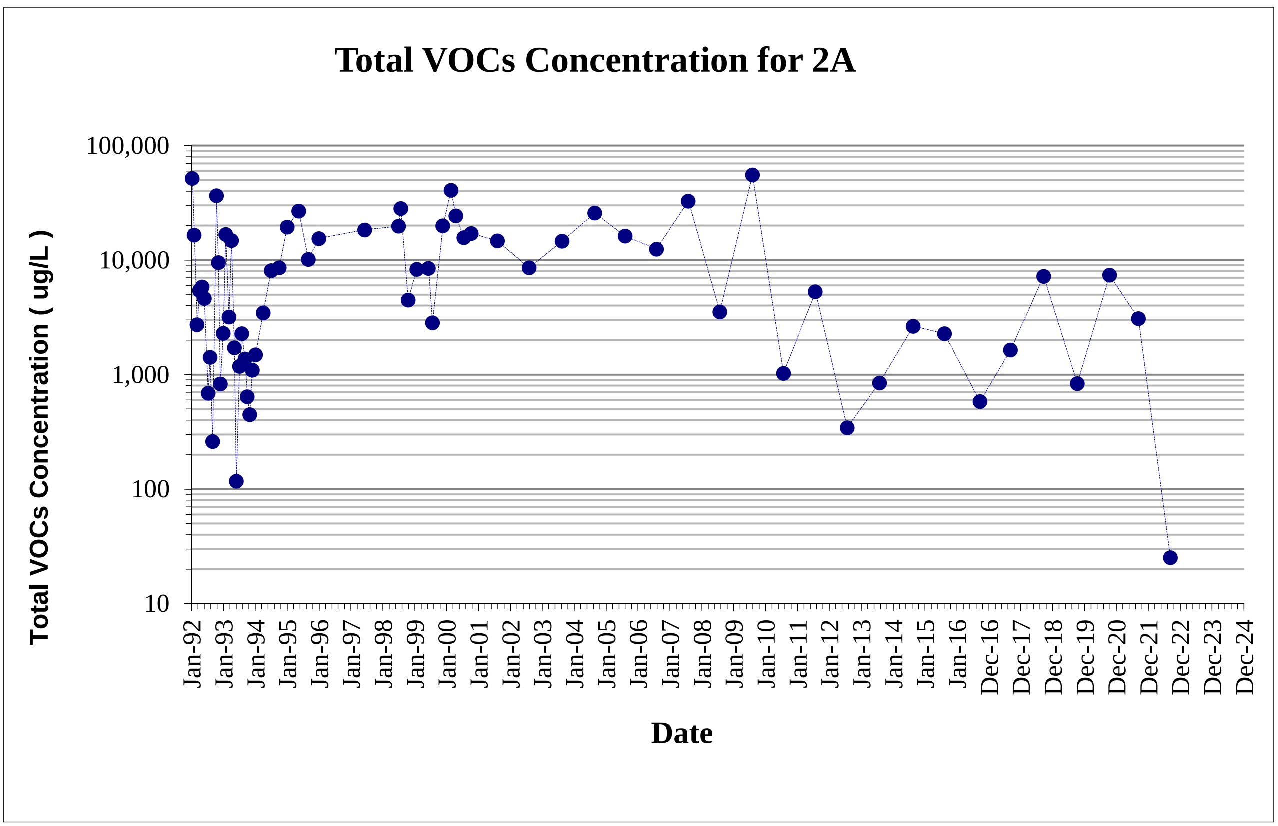
Method	Parameter Name	Location Date Units	SW-1 09/08/2022 FS	SW-2 09/07/2022 FS	SW-2 09/07/2022 DUP	EB 09/08/2022 EB	TB 09/07/2022 TB	TB 09/08/2022 TB
	Field Parameters							
	DISSOLVED OXYGEN	MG/L	3.34	7.76	7.76			
	ORP	MV	216	18	18			
	PH	STD UNITS	7.61	6.3	6.3			
	SPECIFIC CONDUCTANCE	UMHOS/CM	1010.000	307	307			
	TEMPERATURE	DEGREES C	21.1	22.92	22.92			
	TURBIDITY QUALITATIVE	NTU	9.9	2.88	2.88			
	Volatile Organics							
8260C	1,1,1-Trichloroethane	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,1,2,2-Tetrachloroethane	UG/L	9.4	1.8	1.9	<1.0	<1.0	<1.0
8260C	1,1,2-Trichloroethane	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,1-Dichloroethane	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,1-Dichloroethene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,2-Dichlorobenzene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,4-Dichlorobenzene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	1,4-Dichlorobutane	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Benzene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Carbon Tetrachloride	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Chlorobenzene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Chloroform	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	cis-1,2 Dichloroethene	UG/L	6.6	3.4	3.6	<1.0	<1.0	<1.0
8260C	Methyl Chloride	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Methylene Chloride	UG/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
8260C	Tetrachloroethene	UG/L	19 J	2.4	2.5	<1.0	<1.0	<1.0
8260C	Tetrahydrothiophene	UG/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
8260C	Toluene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	trans-1,2-Dichloroethene	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8260C	Trichloroethene	UG/L	20 J	2.9	3.2	<1.0	<1.0	<1.0
8260C	Vinyl Chloride	UG/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Total VOCs	UG/L	55	10.5	11.2	0	0	0
	Semi-Volatile Organics							
8270D	Bis(2-Ethylhexyl)Phthalate	UG/L	<6.0	<6.0	<6.0	<6.2		
8270D	Hexachlorobutadiene	UG/L	<10	<10	<10	<10		
8270D	Hexachloroethane	UG/L	<10	<10	<10	<10		
8270D	Naphthalene	UG/L	<10	<10	<10	<10		
	Pesticides/PCBs							
8081B	Alpha-BHC	UG/L	0.15	<0.051	<0.051	<0.051		
8081B	beta-BHC	UG/L	0.06	<0.051	<0.051	<0.051		
8081B	delta-BHC	UG/L	<0.048	<0.051	<0.051	<0.051		
8081B	Lindane	UG/L	<0.048	<0.051	<0.051	<0.051		
8082A	PCB 1016	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1221	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1232	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1242	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1248	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1254	UG/L	<0.096	<0.10	<0.10	<0.10		
8082A	PCB 1260	UG/L	<0.096	<0.10	<0.10	<0.10		
	Inorganics							
6010C	Barium, dissolved	UG/L	<200	<200	<200	<200		
9012B	Cyanide, total	UG/L	<10	<10	<10	<10		

< Non detect at stated reporting limit. J Estimated concentration.

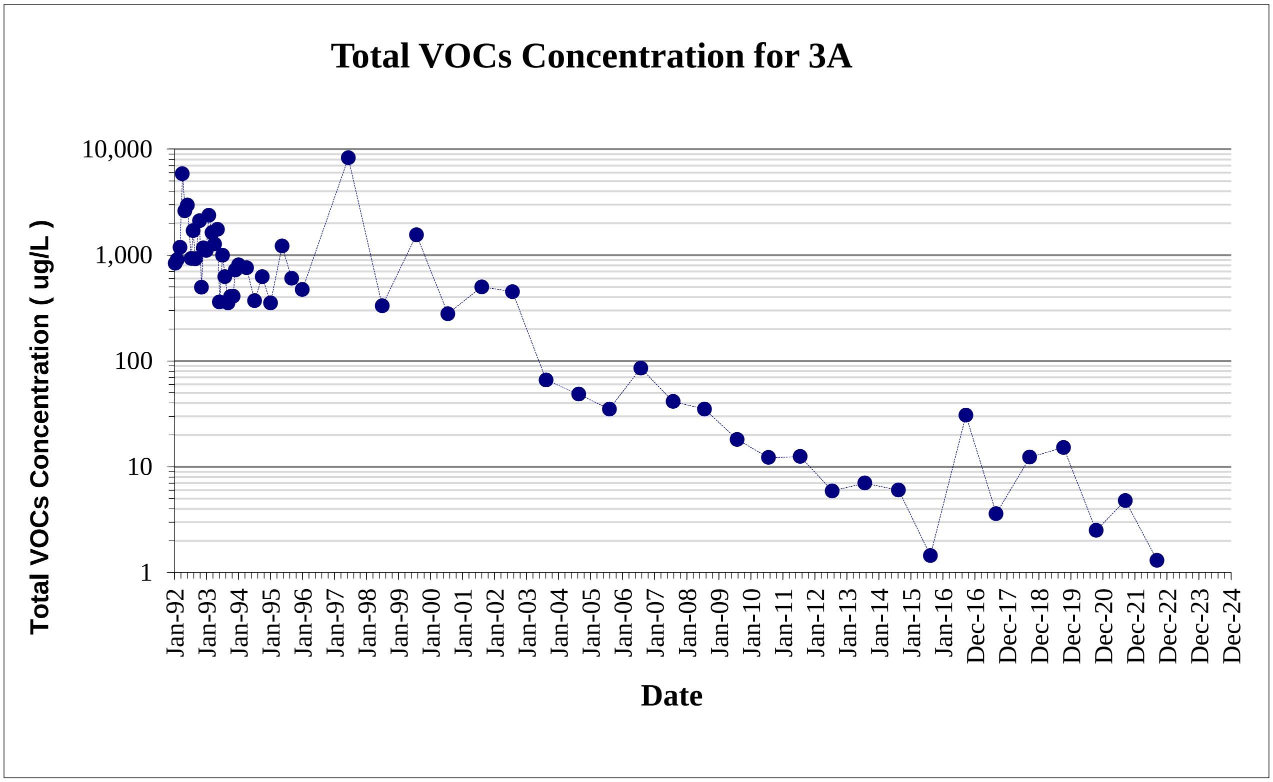
APPENDIX B
TVOC CONCENTRATION TREND PLOTS

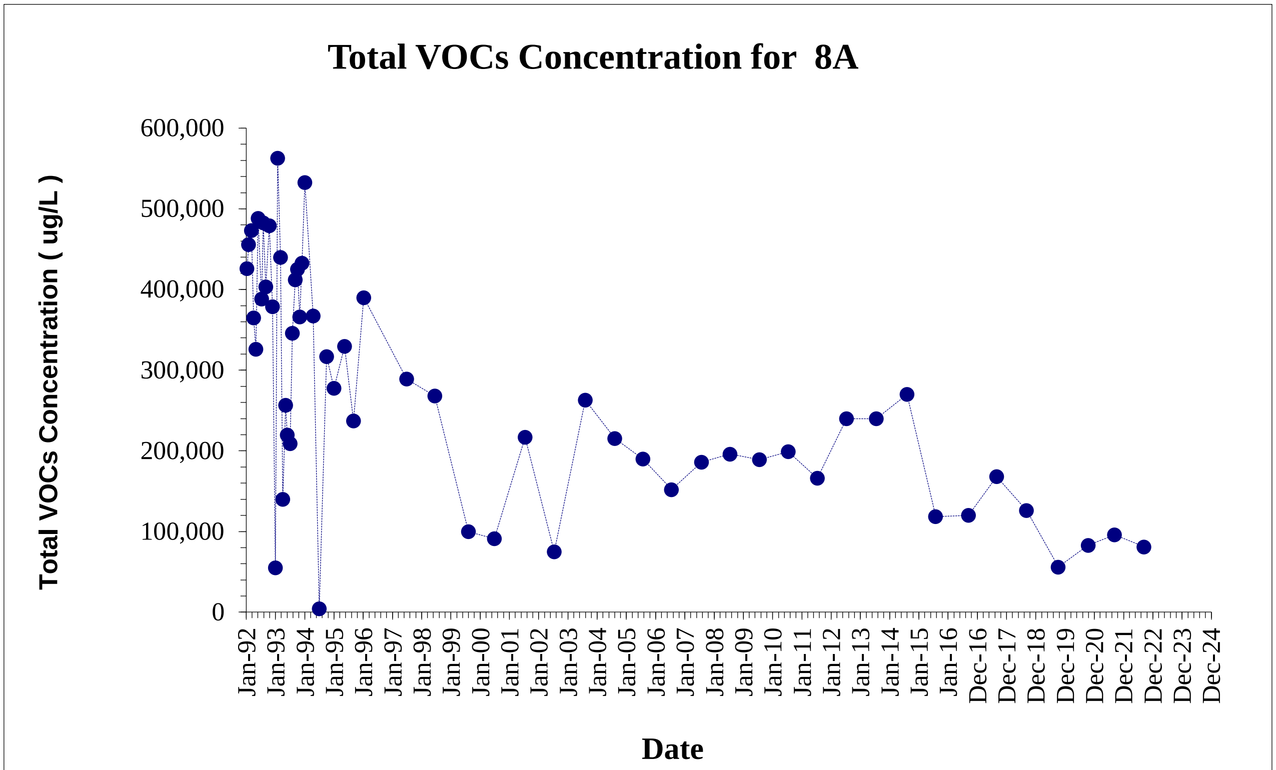
PARSONS


Total VOCs Concentration for 1AR/1AR2/1AR3
Total VOCs Concentration (ug/L)
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
Date
1AR
1AR2
1AR3

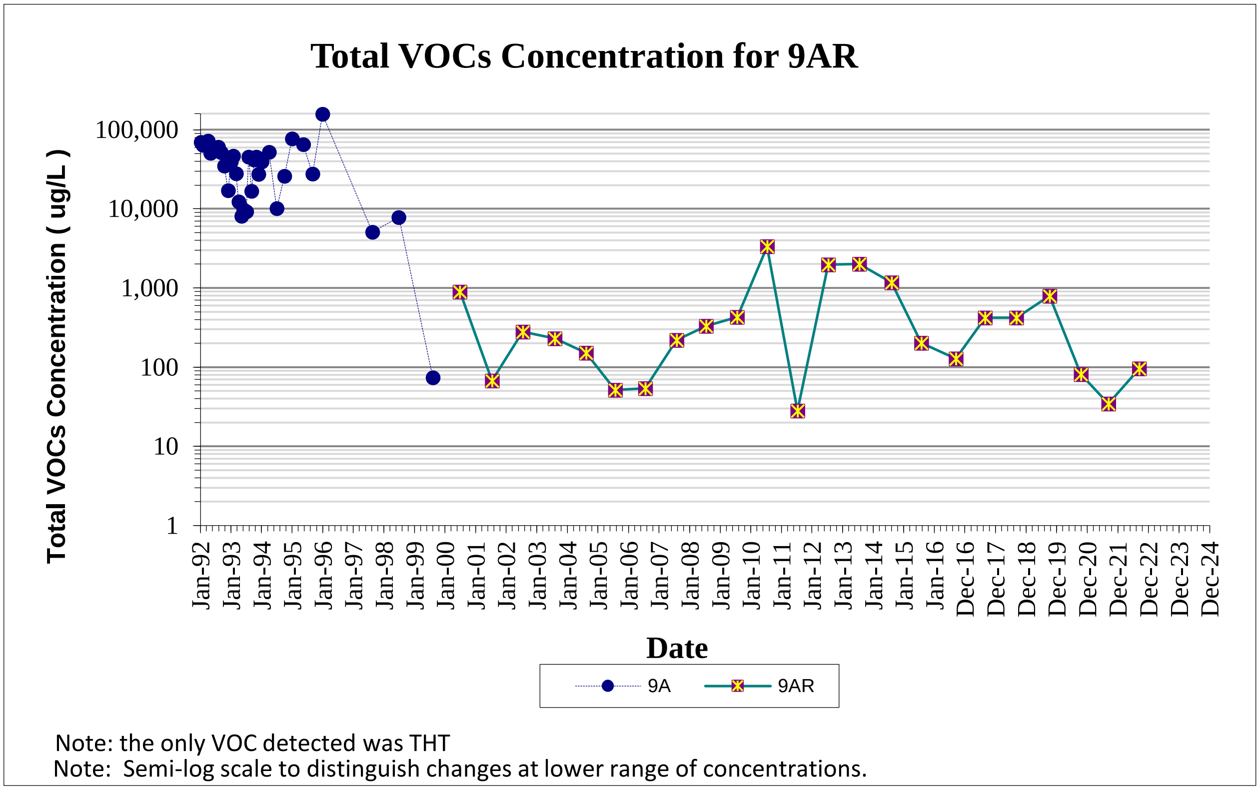

Total VOCs Concentration for 2A
Total VOCs Concentration (ug/L)
100,000
10,000
1,000
100
10
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
Date

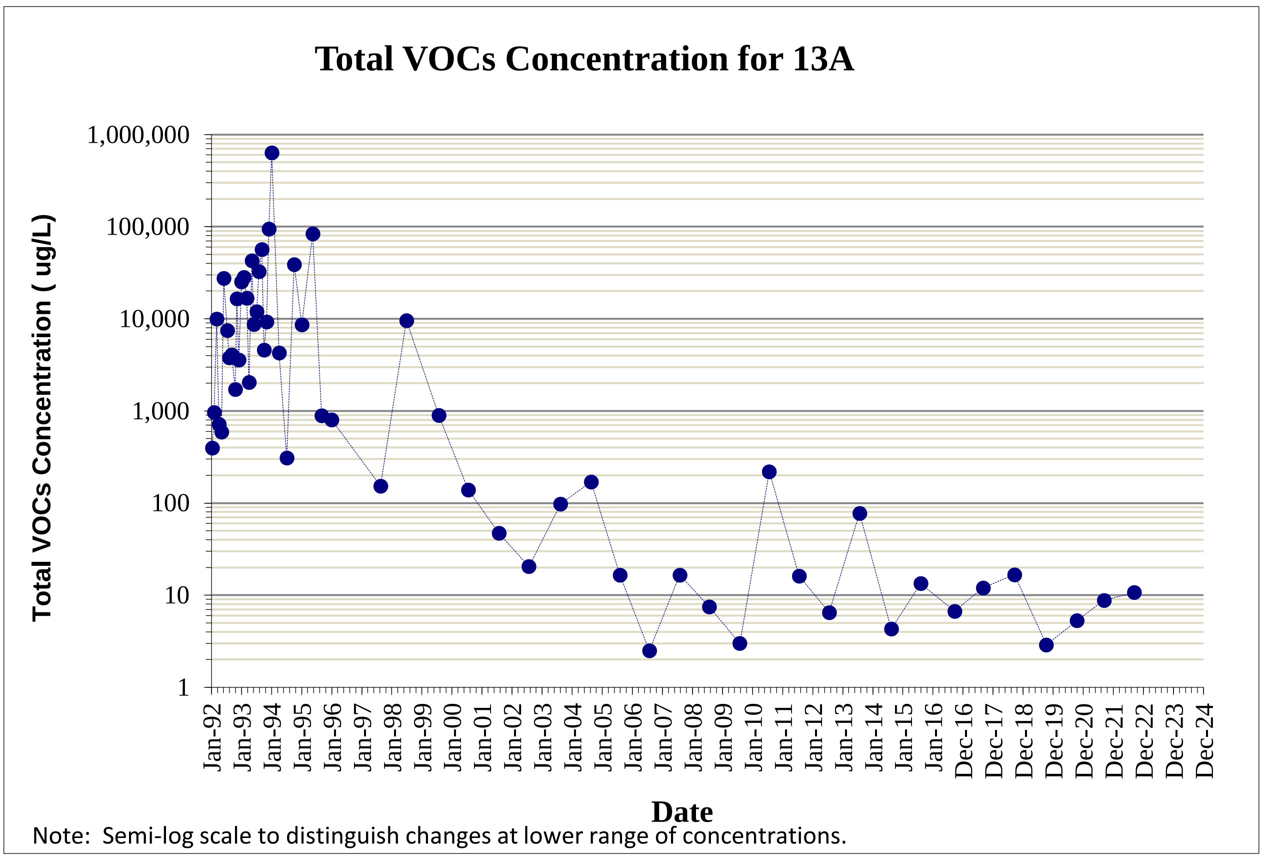
Appendix B
A-Zone TVOC Graphs

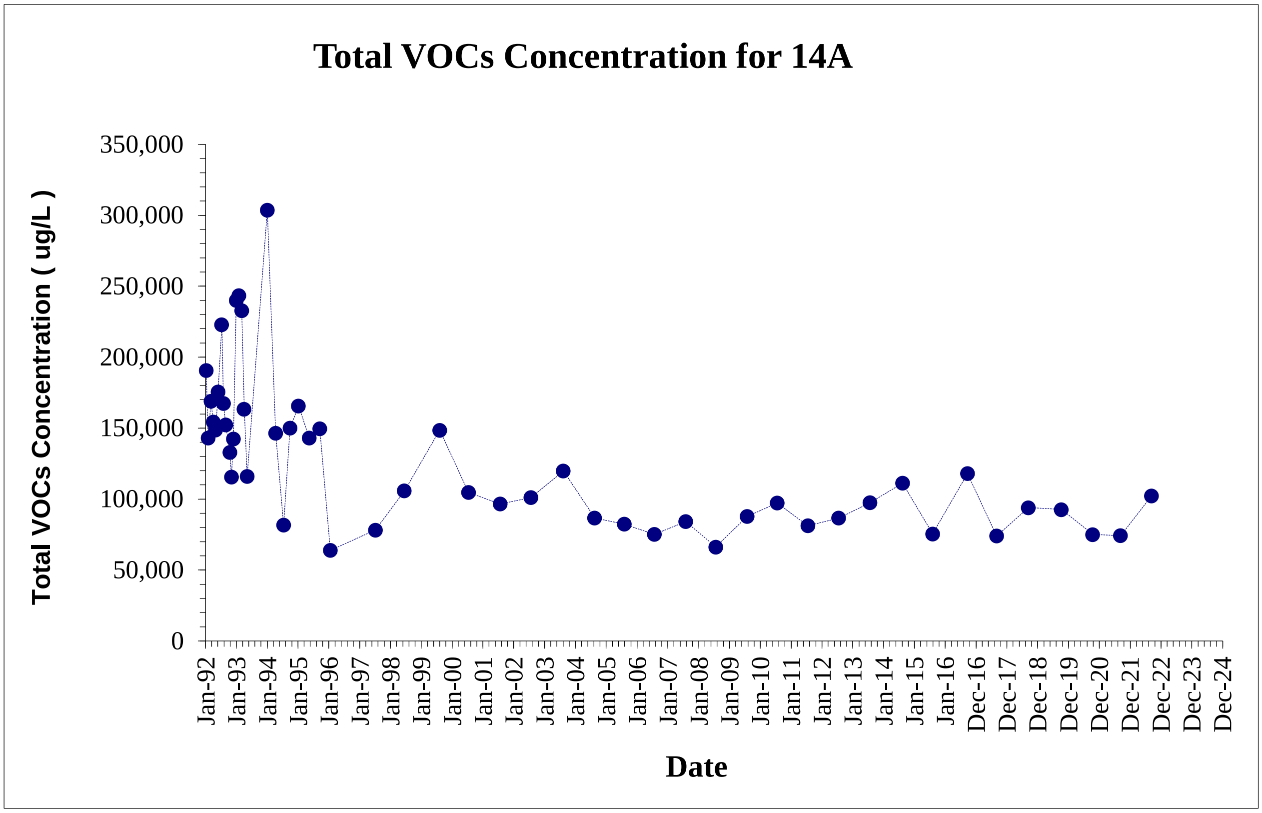


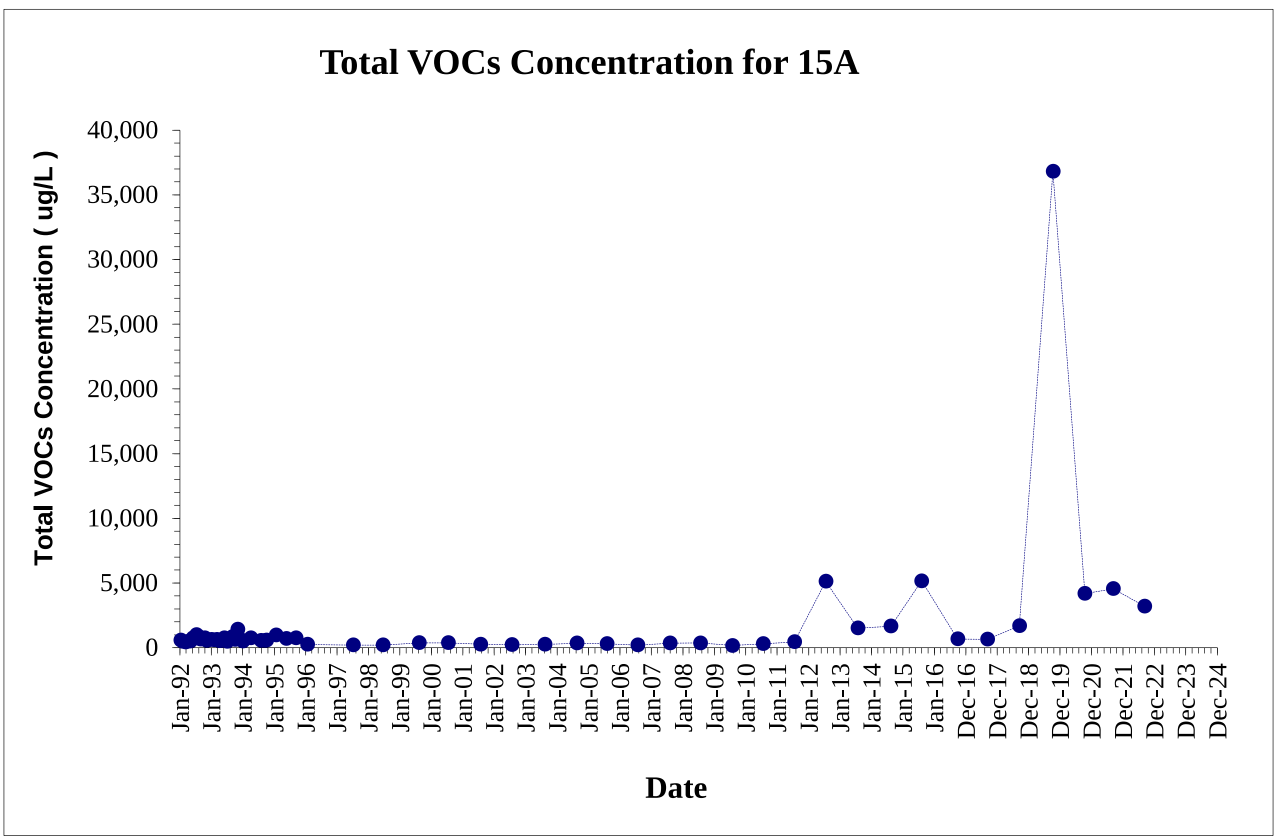


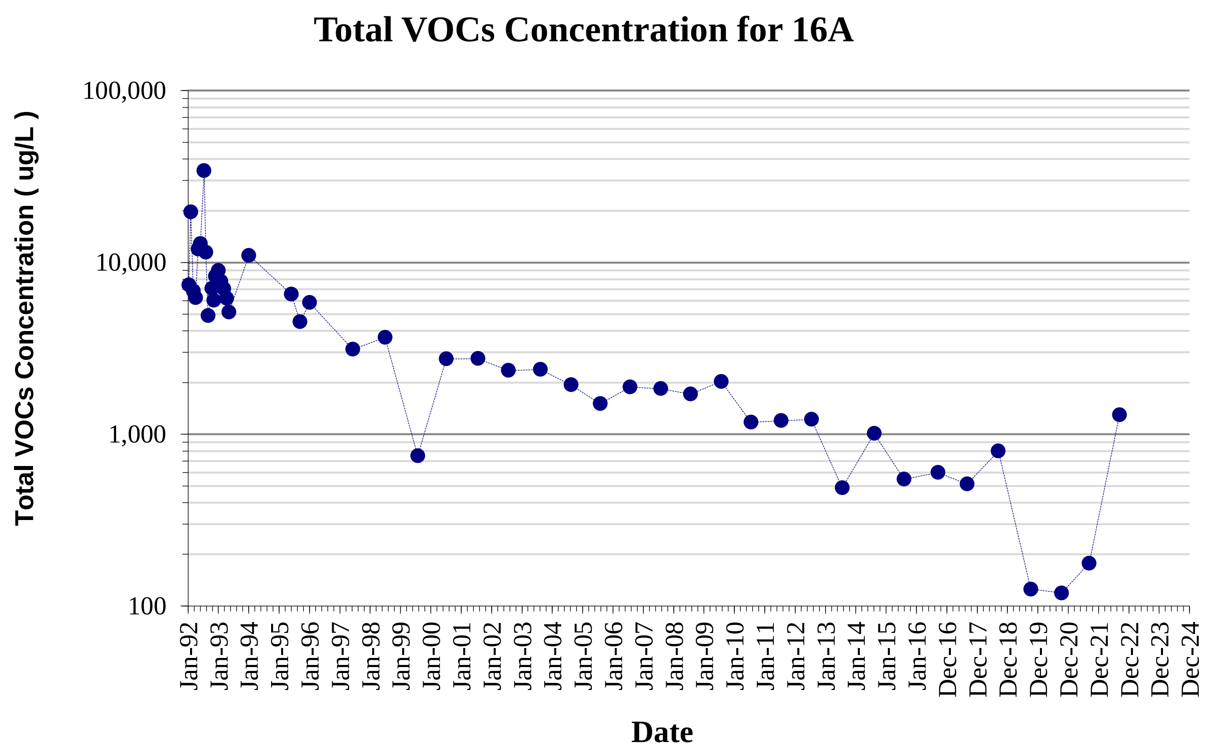
Note: the only detected VOC was tetrahydrothiophene


Total VOCs Concentration for 9AR
Total VOCs Concentration (ug/L)
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date
9A
9AR
Note: the only VOC detected was THT
Note: Semi-log scale to distinguish changes at lower range of concentrations.

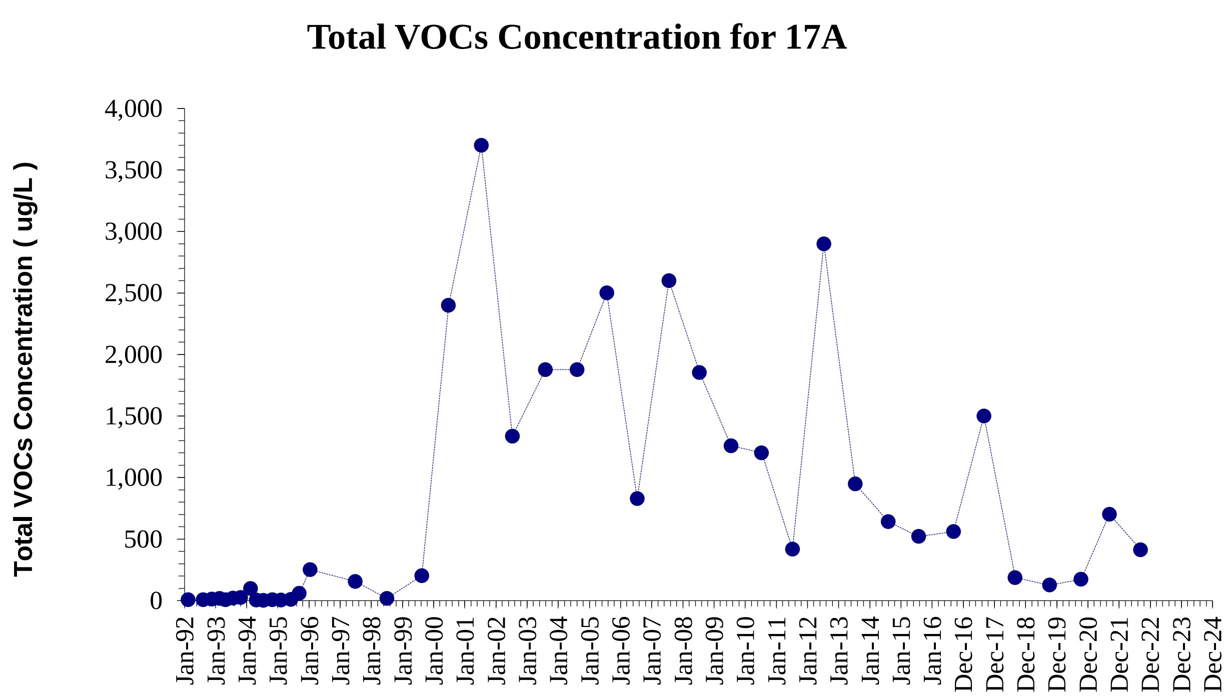

Total VOCs Concentration for 13A
Total VOCs Concentration (ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date
Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 14A
Total VOCs Concentration (ug/L)
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date

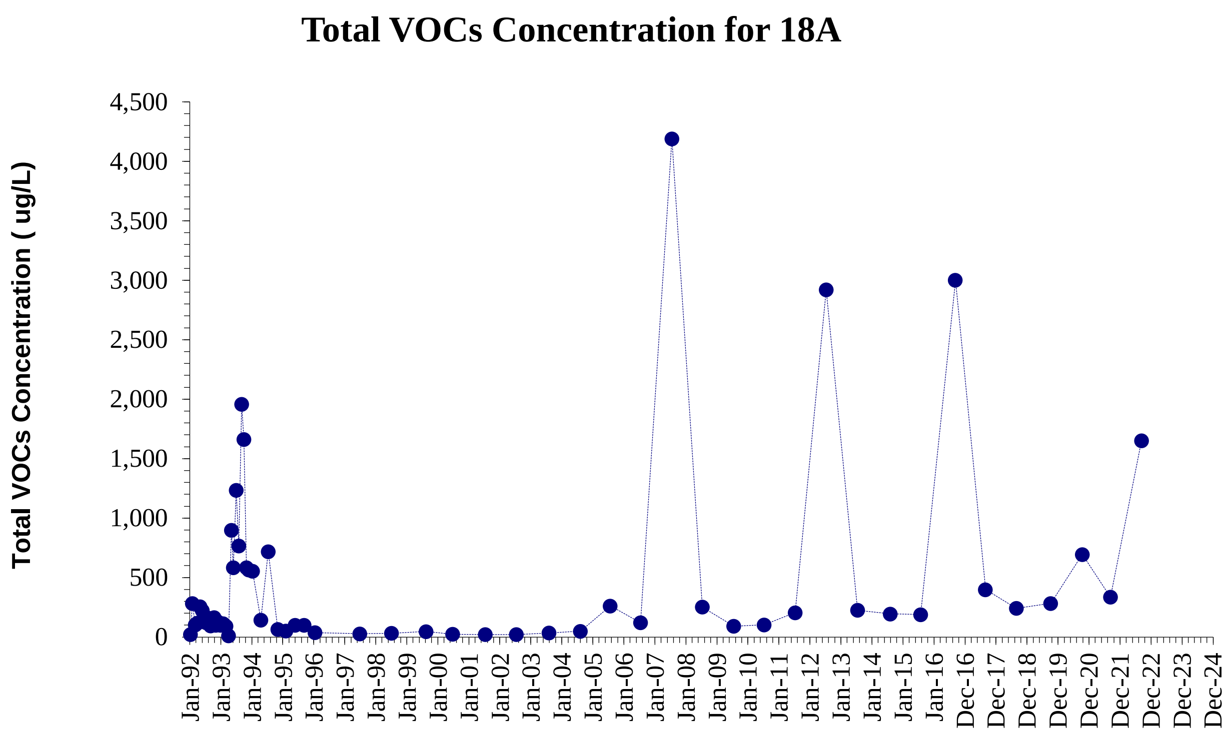

Total VOCs Concentration for 15A
Total VOCs Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date



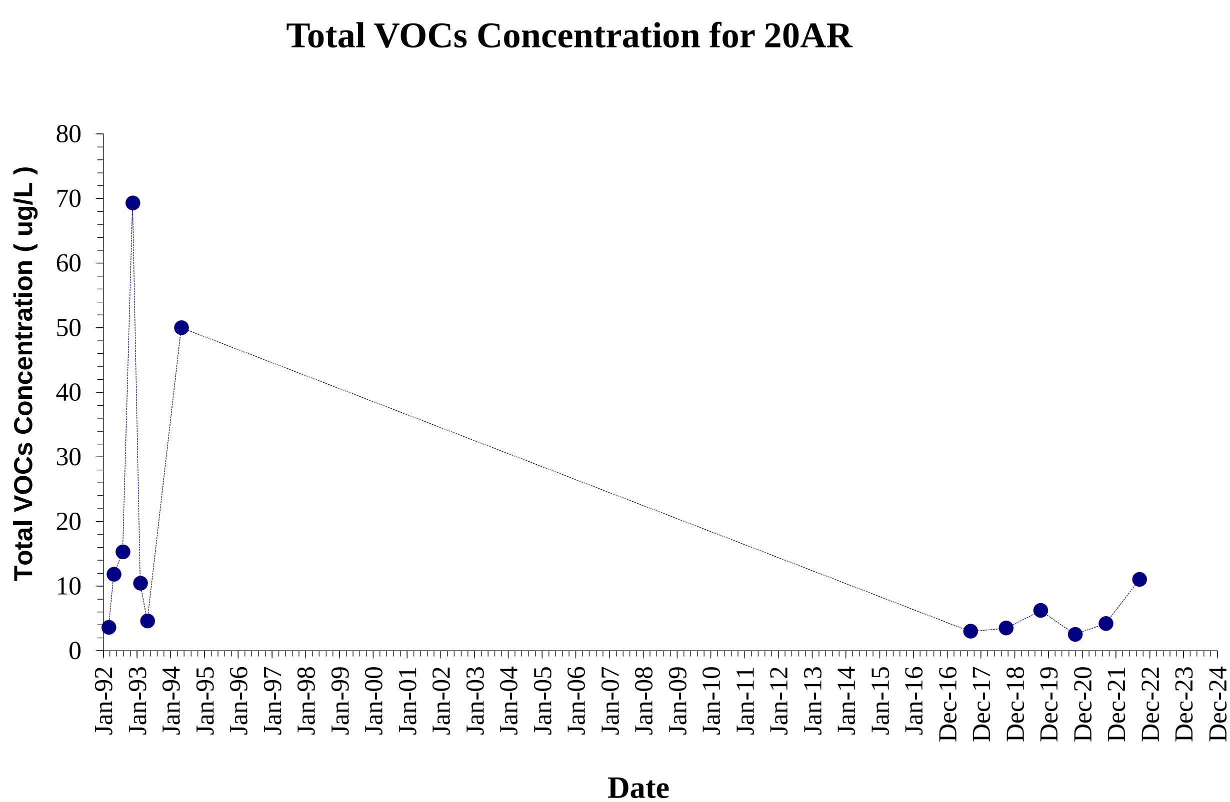
Note: Semi-log scale to distinguish changes at lower range of concentrations.



Note: the primary VOC detected was THT

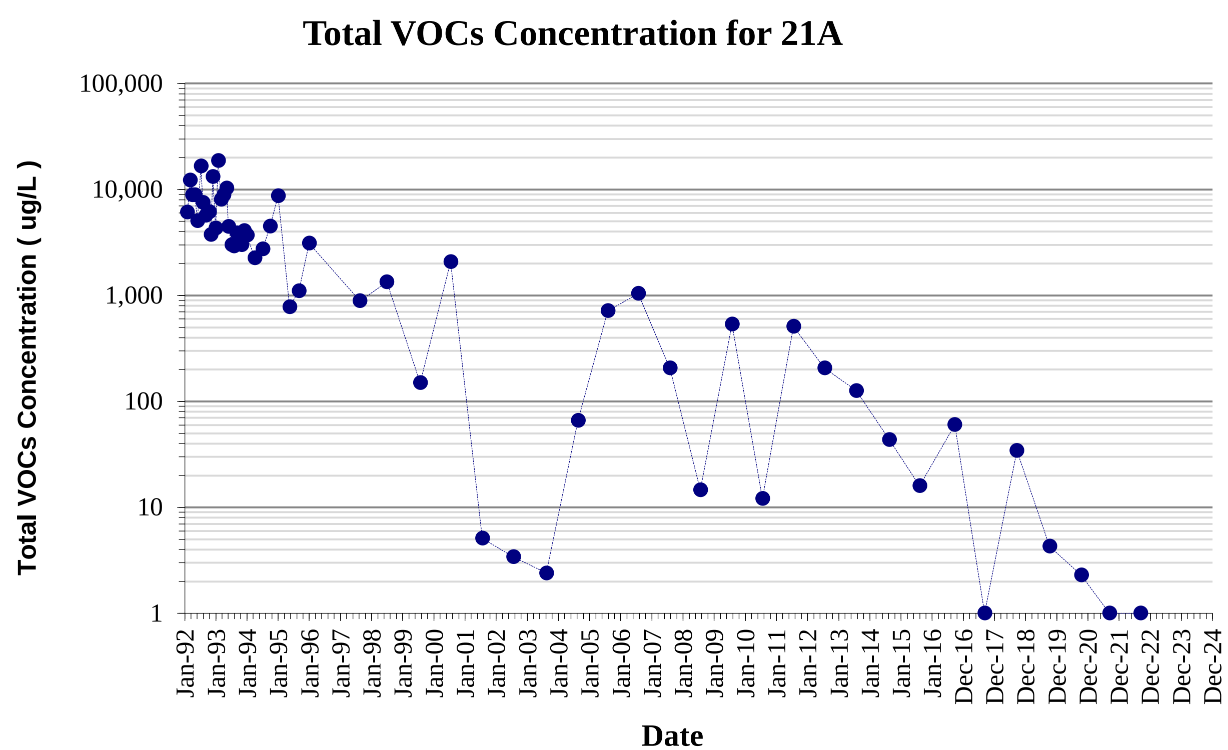


Note: the primary VOC detected was THT

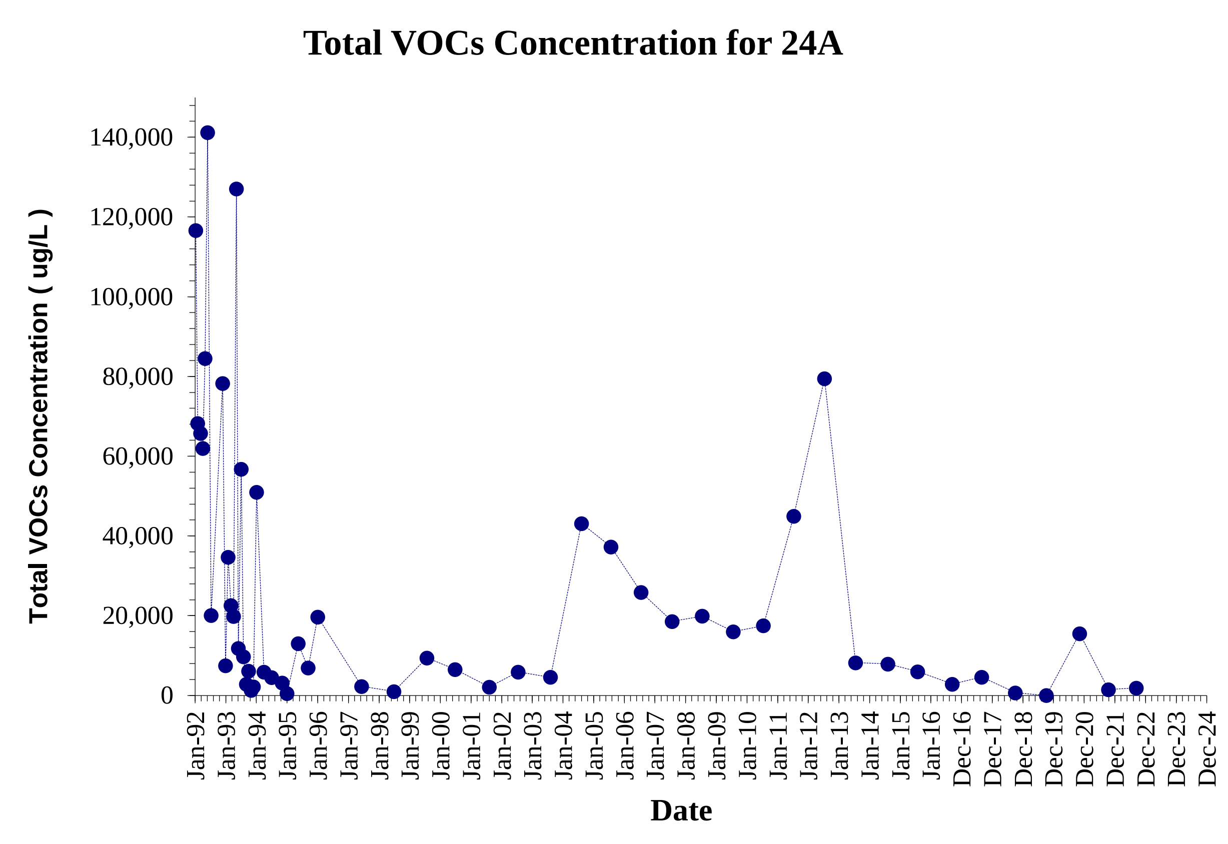


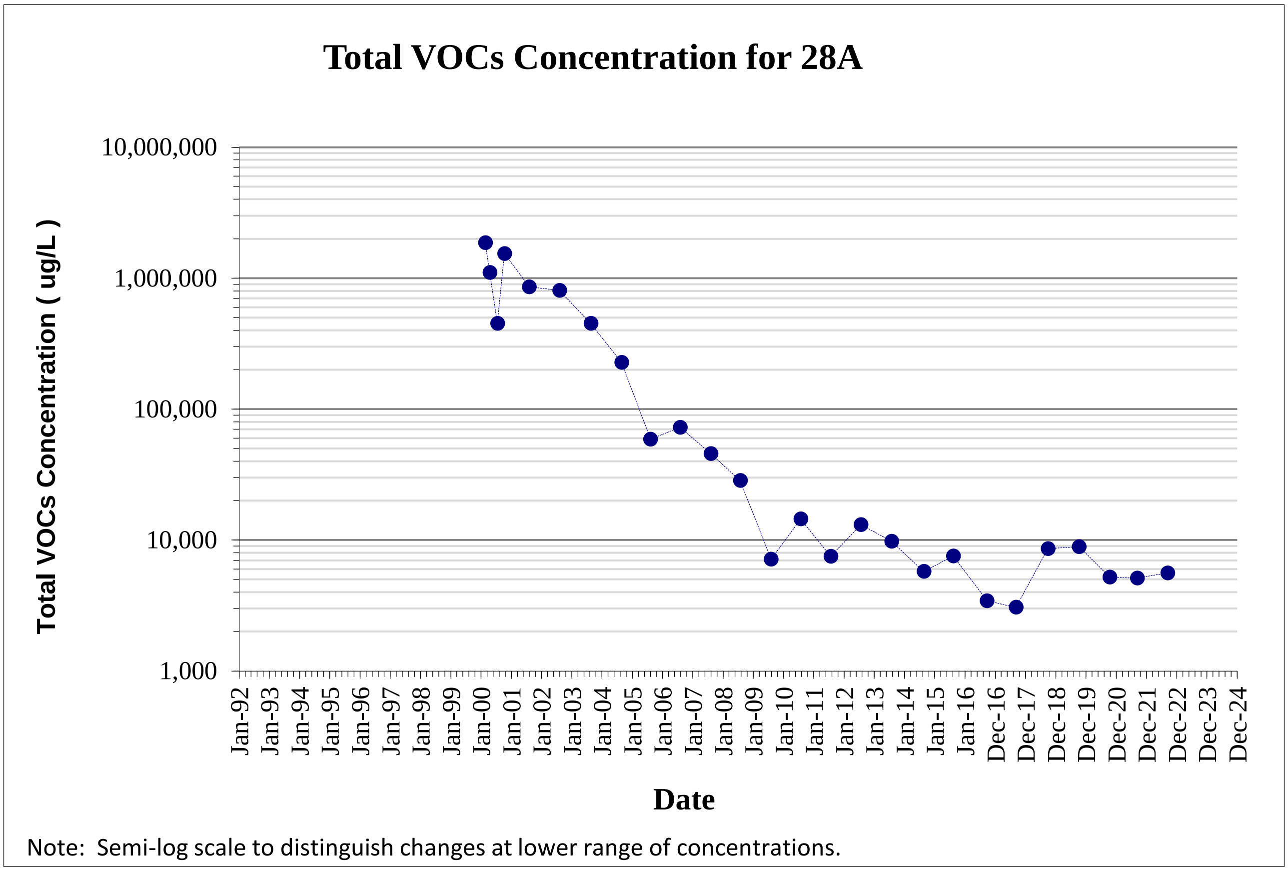
Note: Well has been dry since 1994.

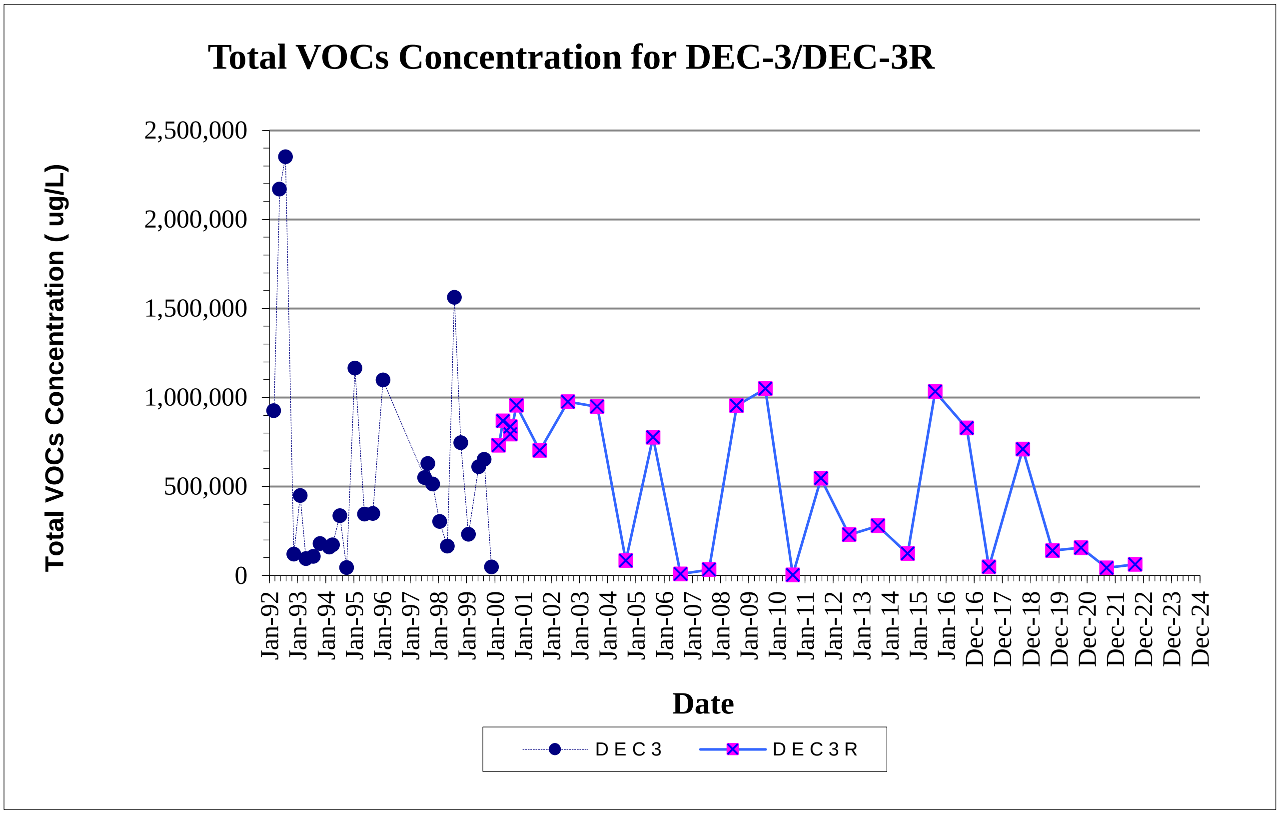
Appendix B
A-Zone TVOC Graphs

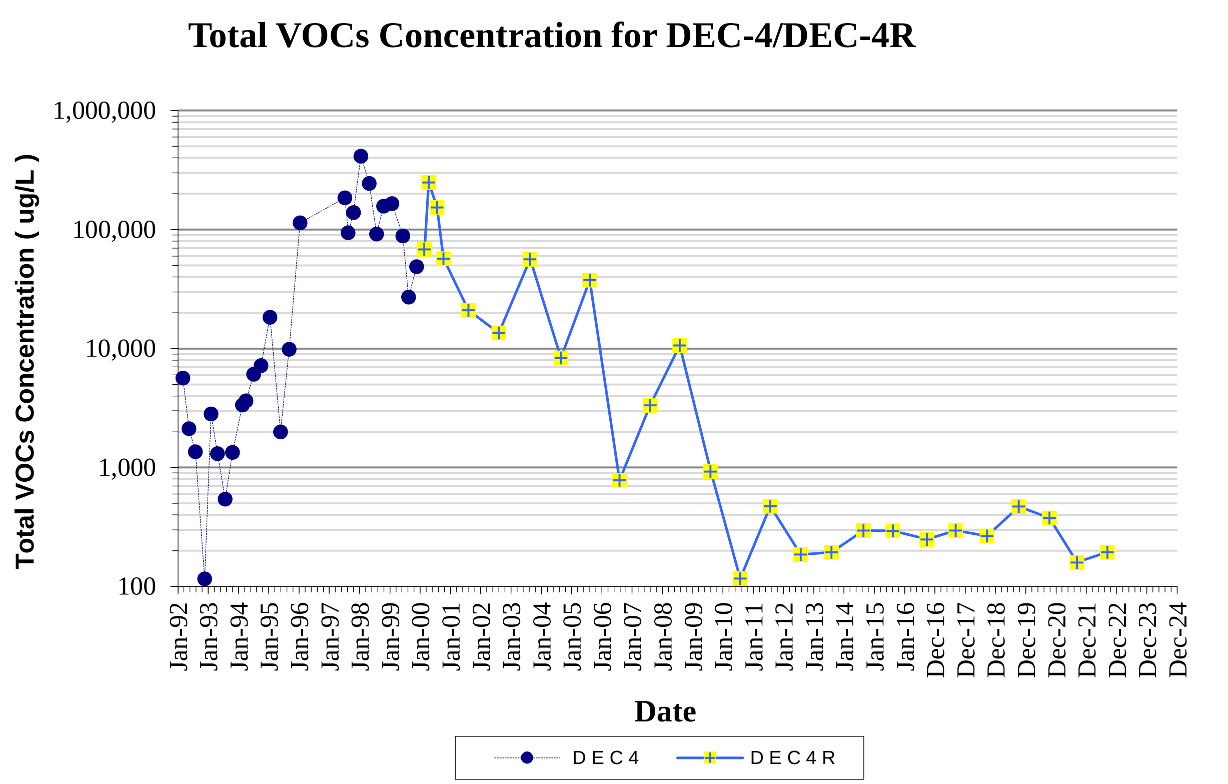


Note: Semi-log scale to distinguish changes at lower range of concentrations.

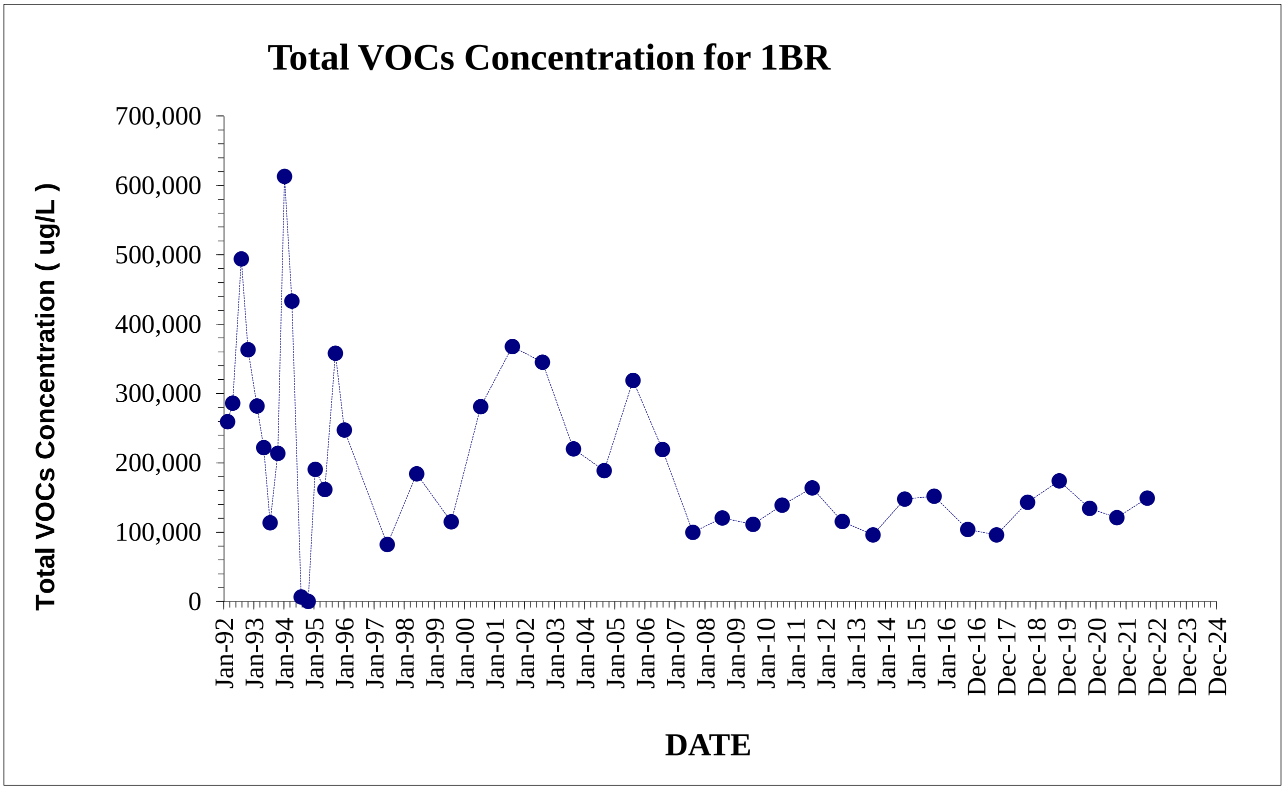


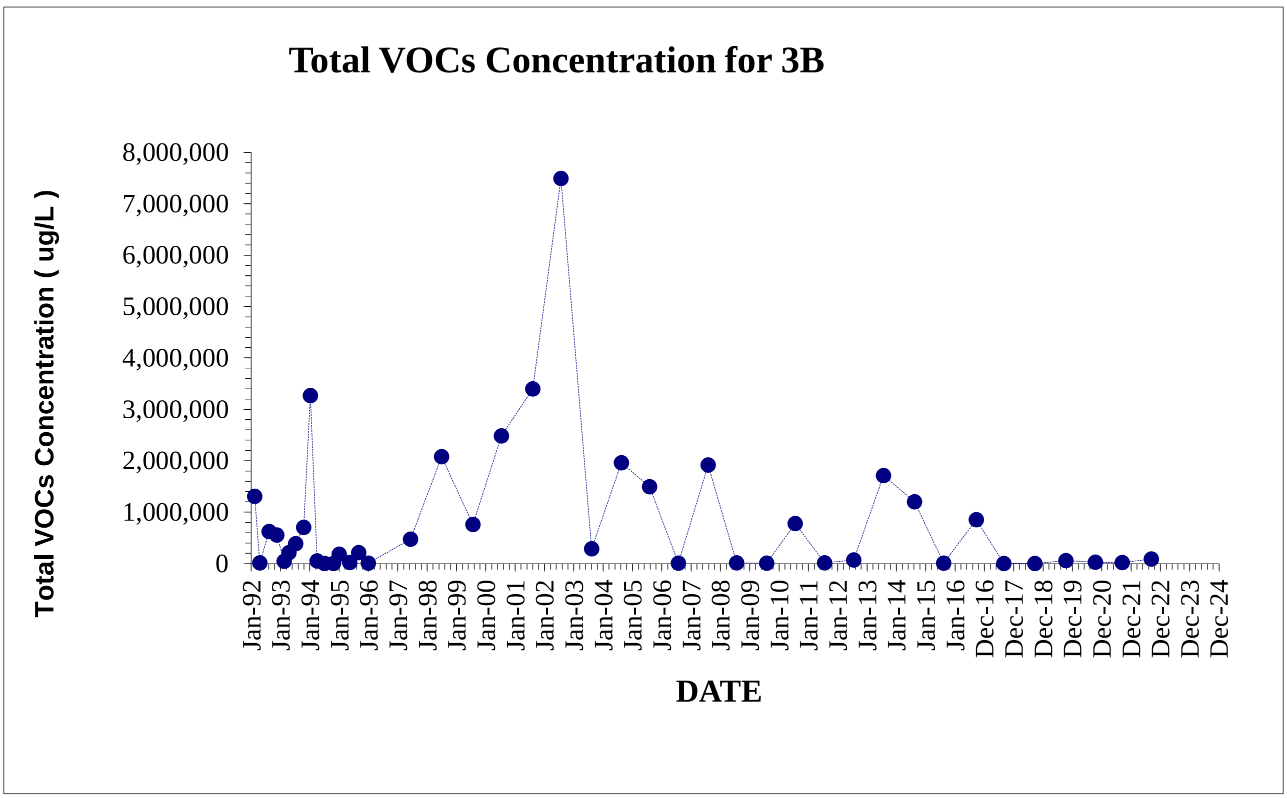

Total VOCs Concentration for 28A
10,000,000
1,000,000
100,000
10,000
1,000
Total VOCs Concentration (ug/L)
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
Date
Note: Semi-log scale to distinguish changes at lower range of concentrations.

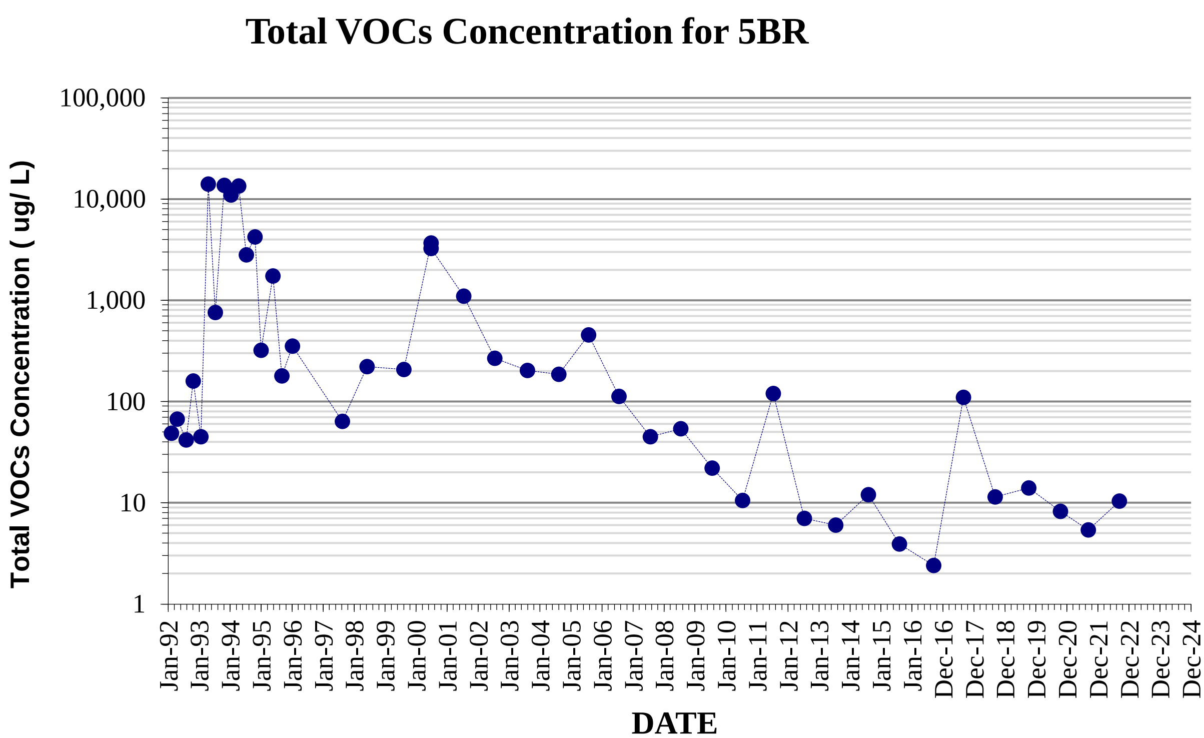

Total VOCs Concentration for DEC-3/DEC-3R
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Total VOCs Concentration (ug/L)
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
Date
DEC3
DEC3R



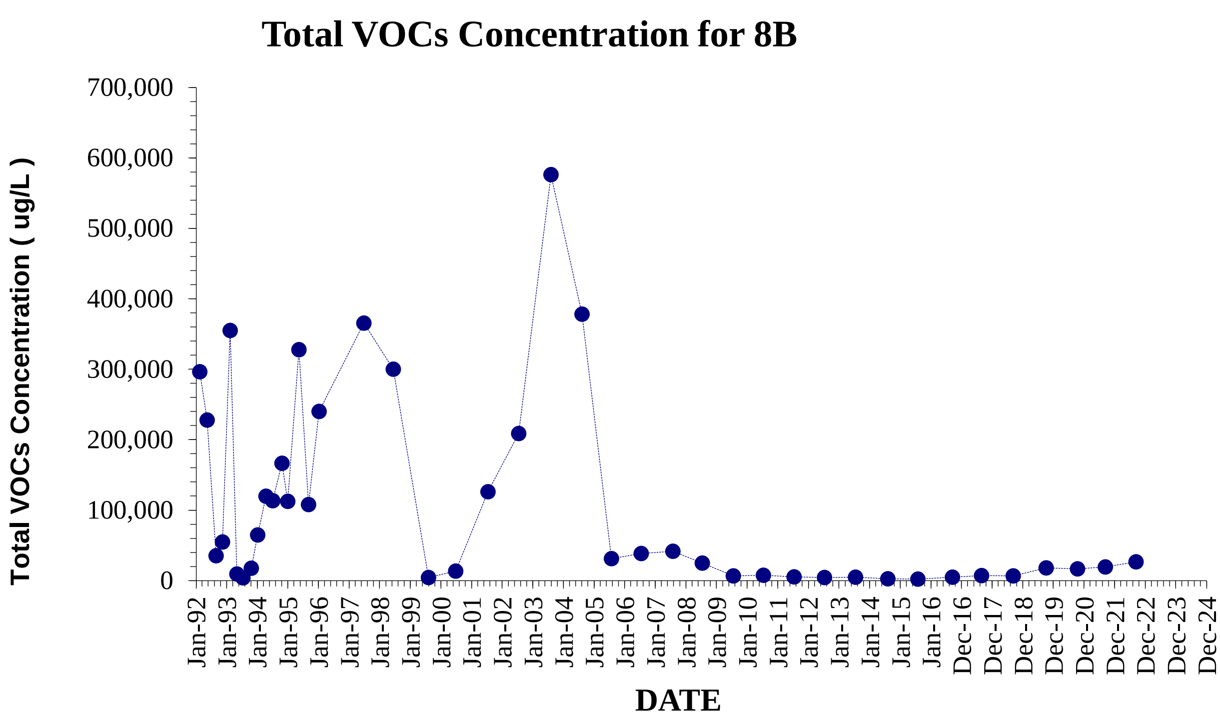
Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 1BR
Total VOCs Concentration (ug/L)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
DATE

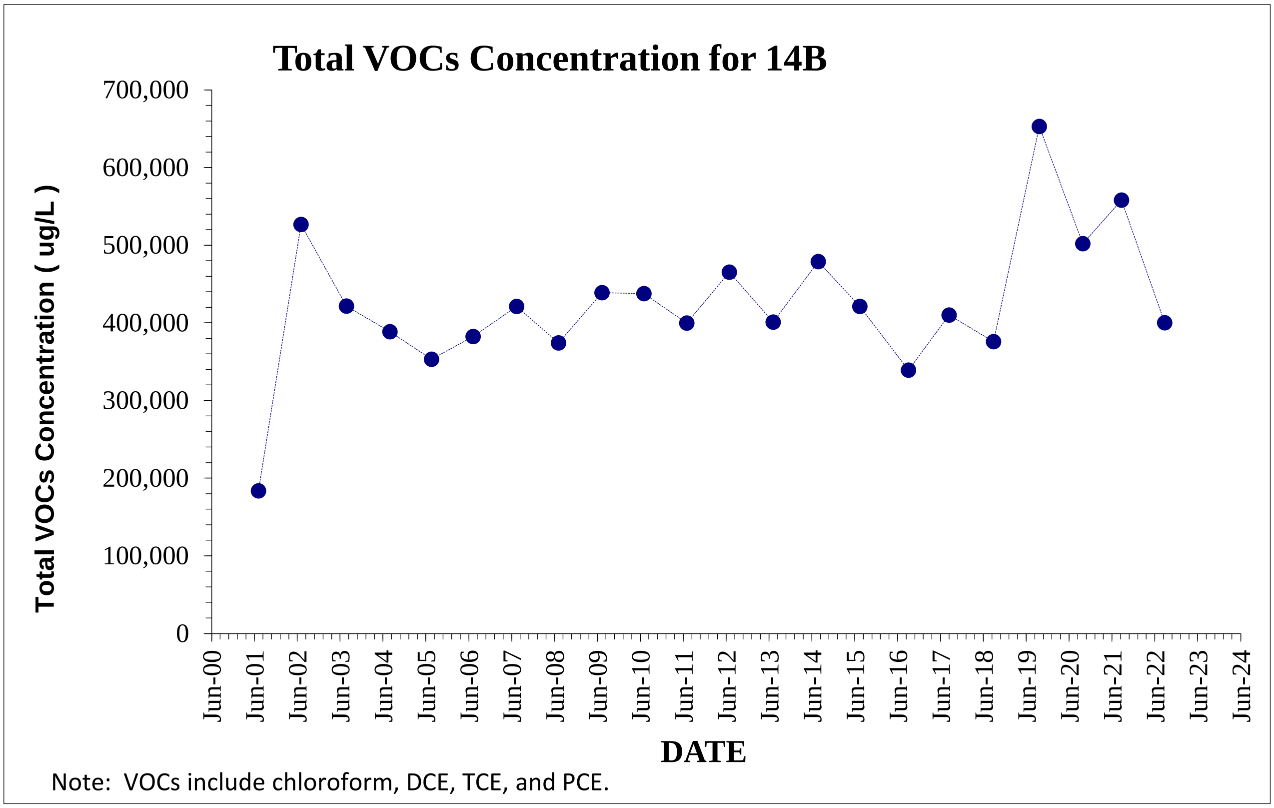

Total VOCs Concentration for 3B
Total VOCs Concentration (ug/L)
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
DATE

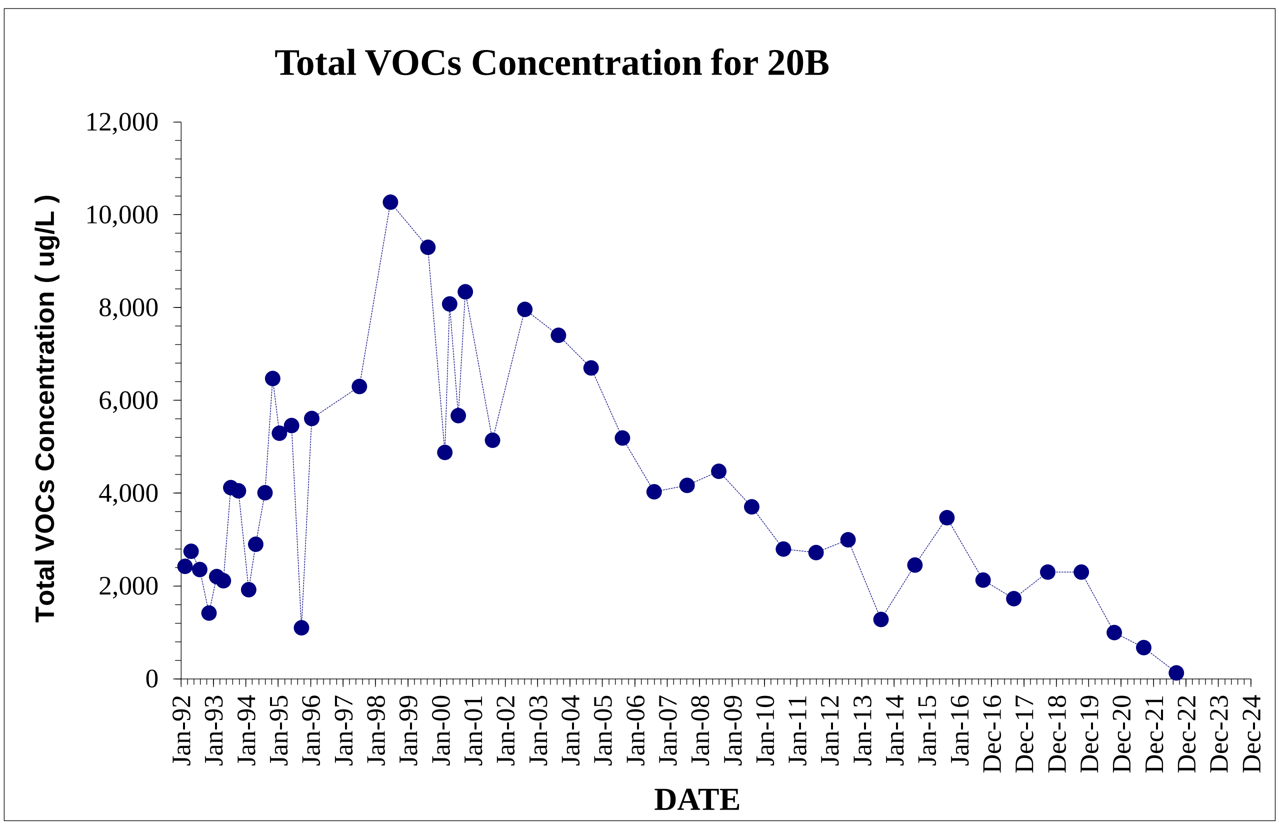


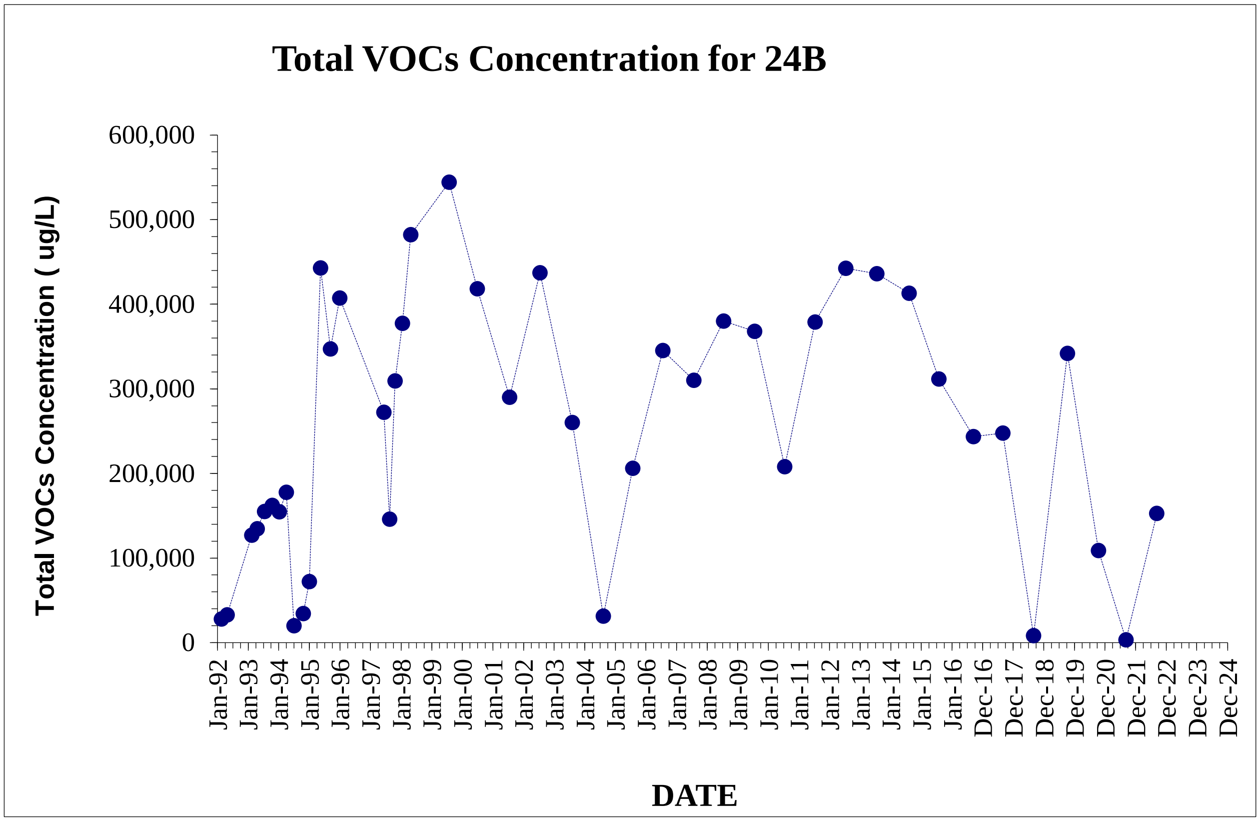
Note: Semi-log scale to distinguish changes at lower range of concentrations.

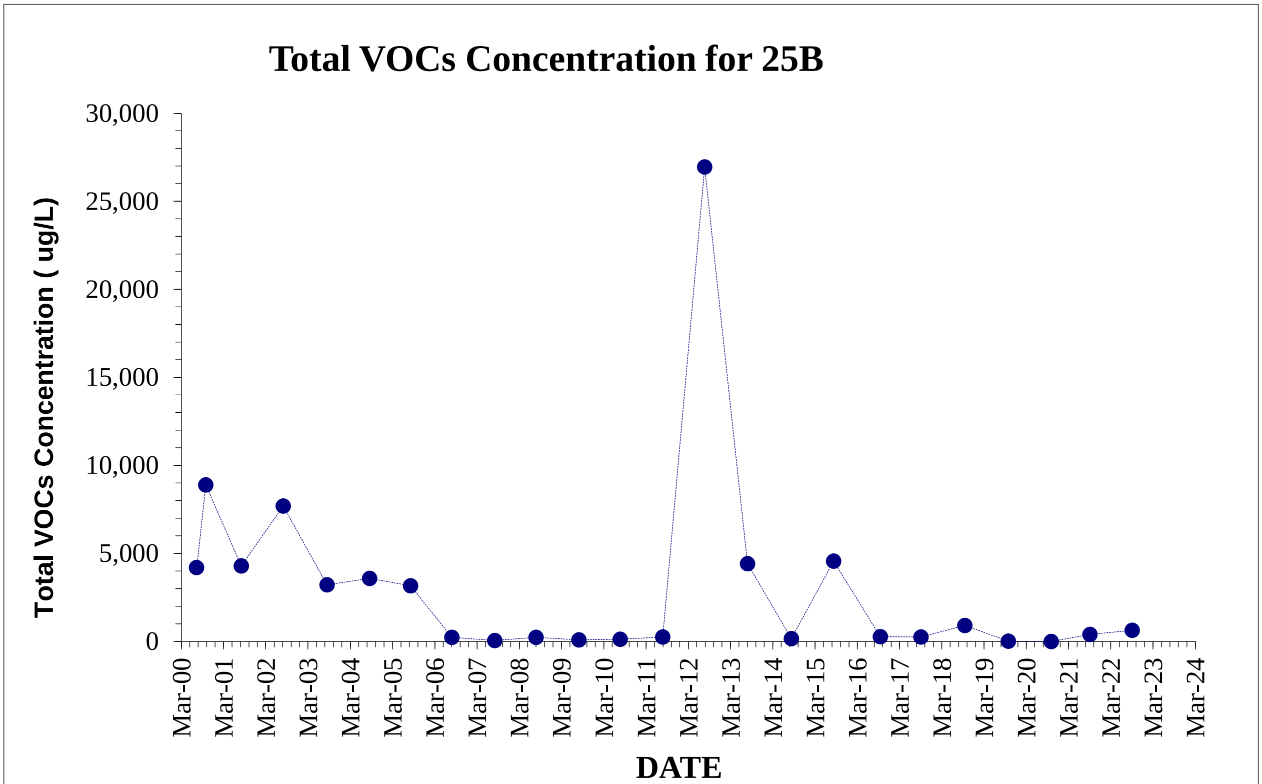


Note: Semi-log scale to distinguish changes at lower range of concentrations. THT is the main VOC.

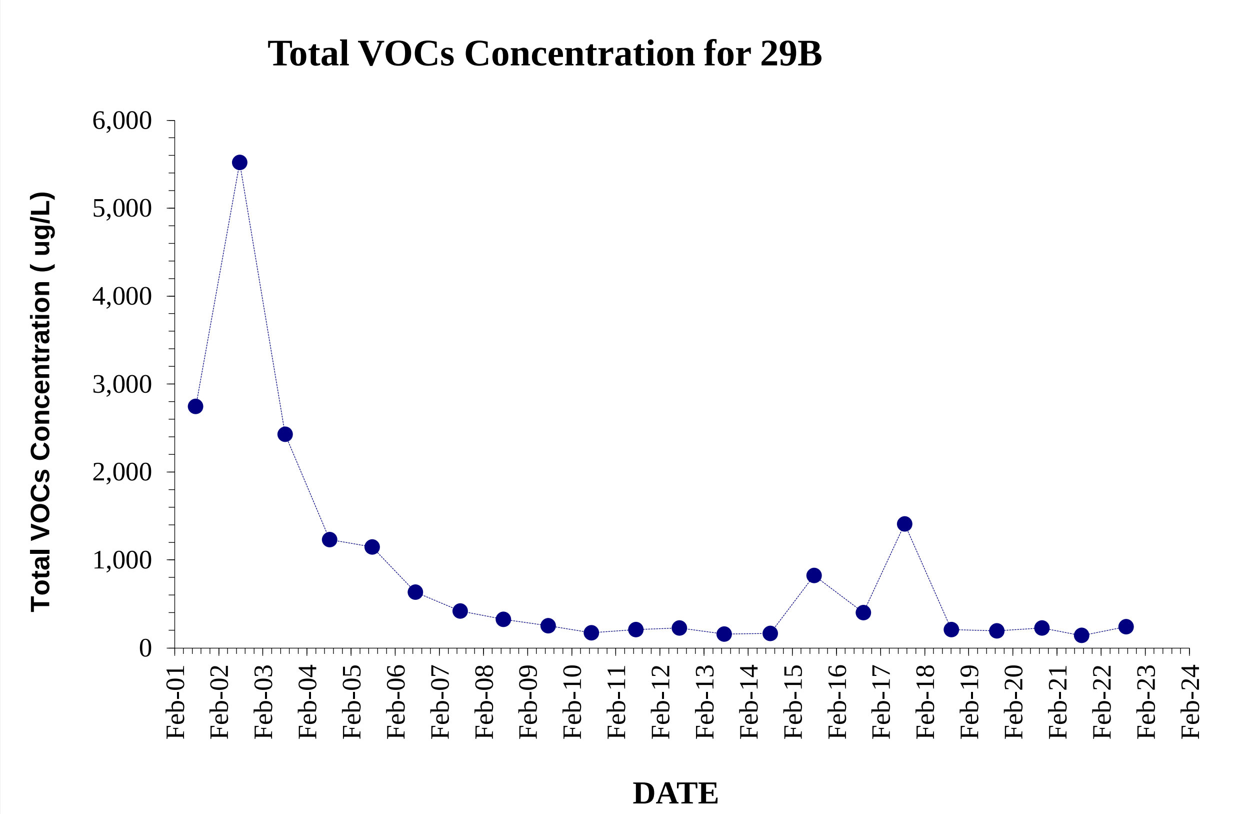

Total VOCs Concentration for 14B
Total VOCs Concentration (ug/L)
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jun-00 Jun-01 Jun-02 Jun-03 Jun-04 Jun-05 Jun-06 Jun-07 Jun-08 Jun-09 Jun-10 Jun-11 Jun-12 Jun-13 Jun-14 Jun-15 Jun-16 Jun-17 Jun-18 Jun-19 Jun-20 Jun-21 Jun-22 Jun-23 Jun-24
DATE
Note: VOCs include chloroform, DCE, TCE, and PCE.

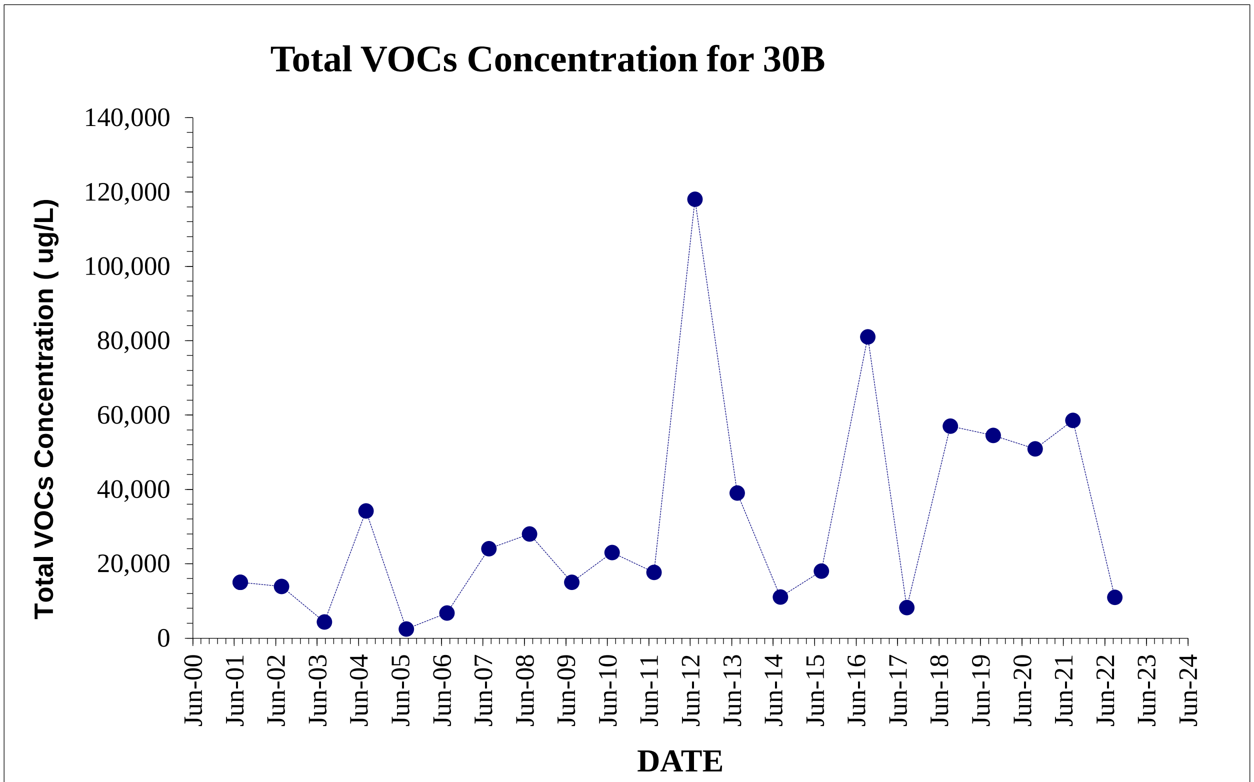

Total VOCs Concentration for 20B
Total VOCs Concentration (ug/L)
12,000
10,000
8,000
6,000
4,000
2,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24
DATE





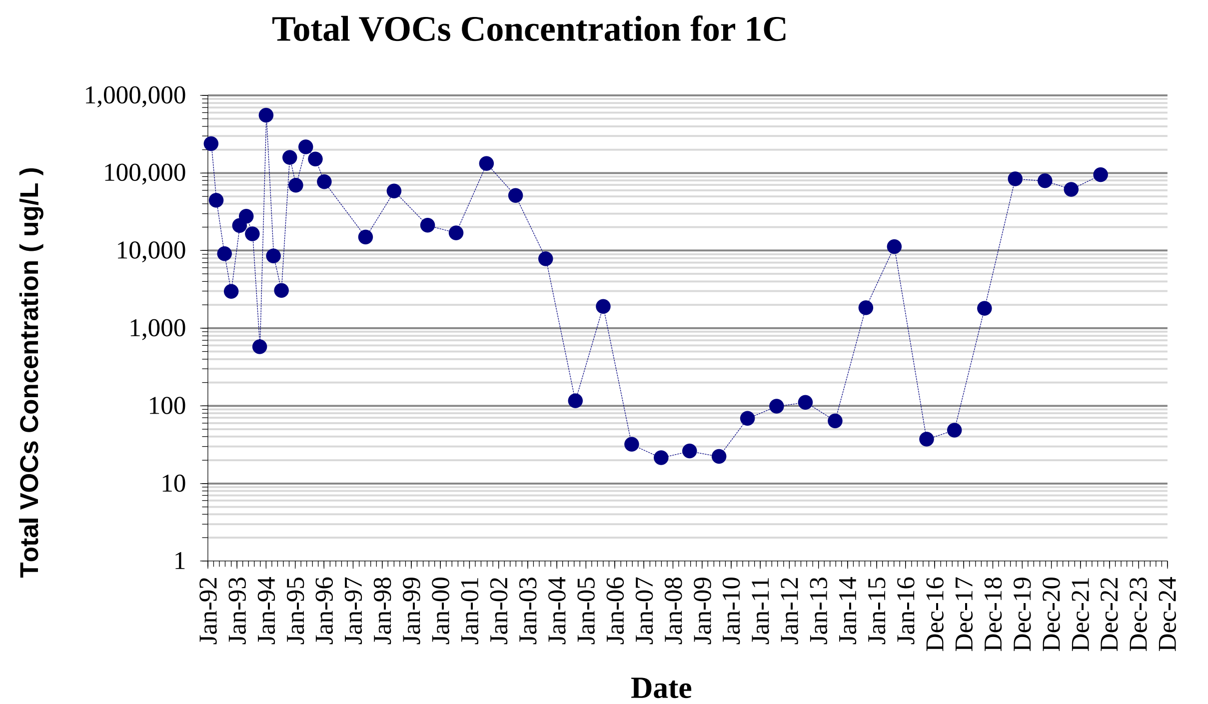
VOCs are predominantly THT.



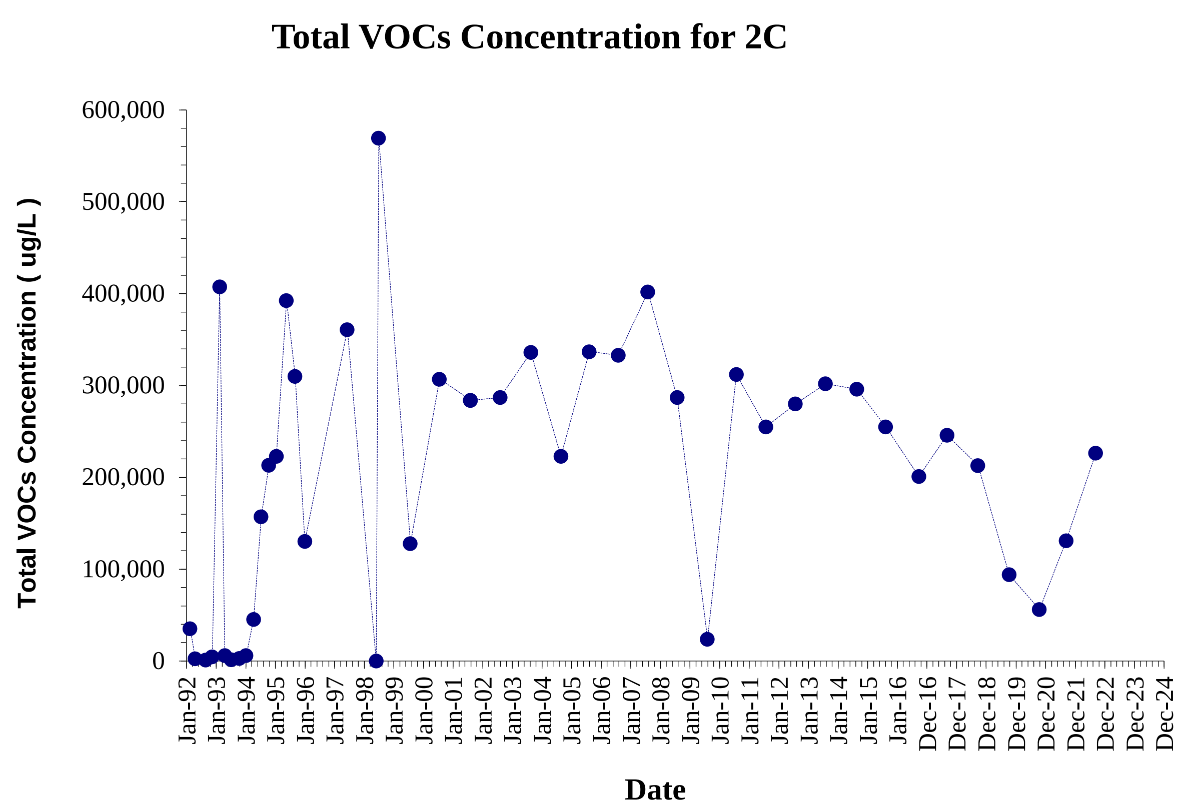


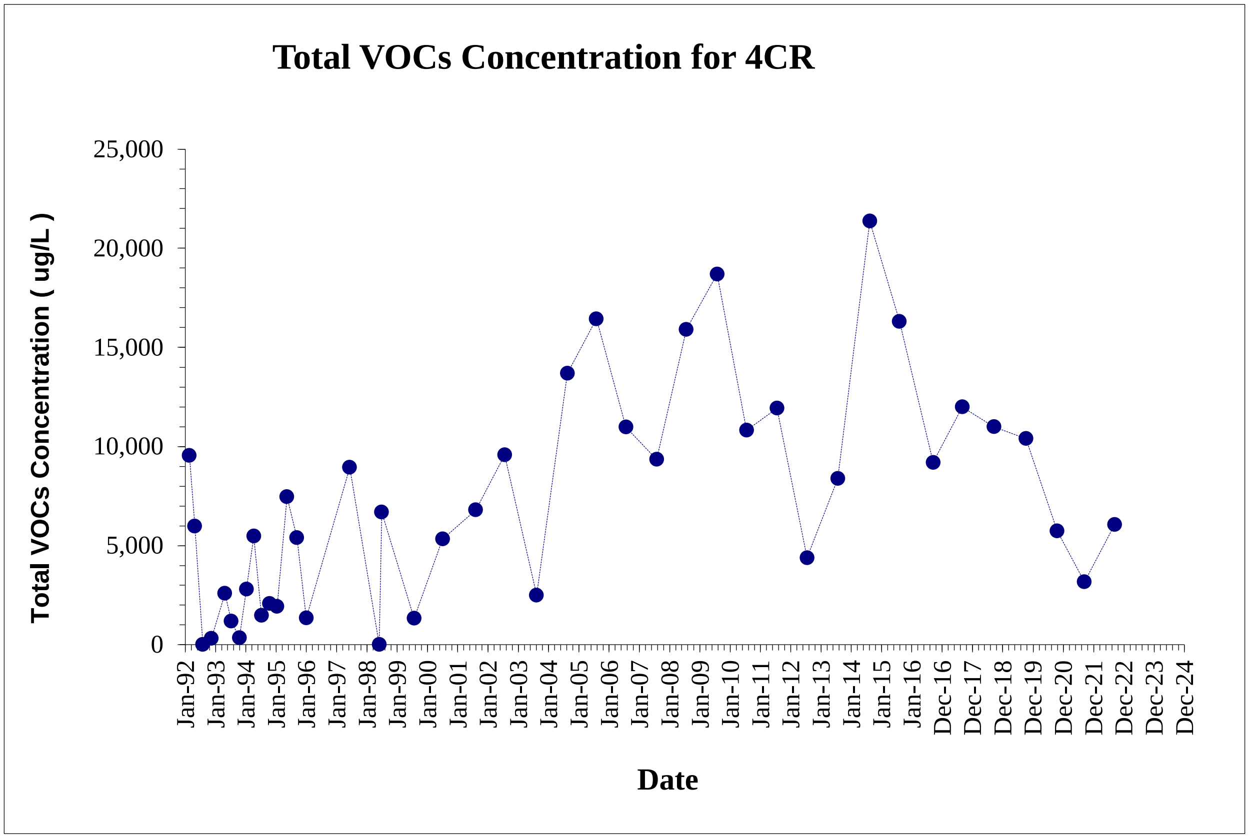
Note: VOCs are mainly THT.

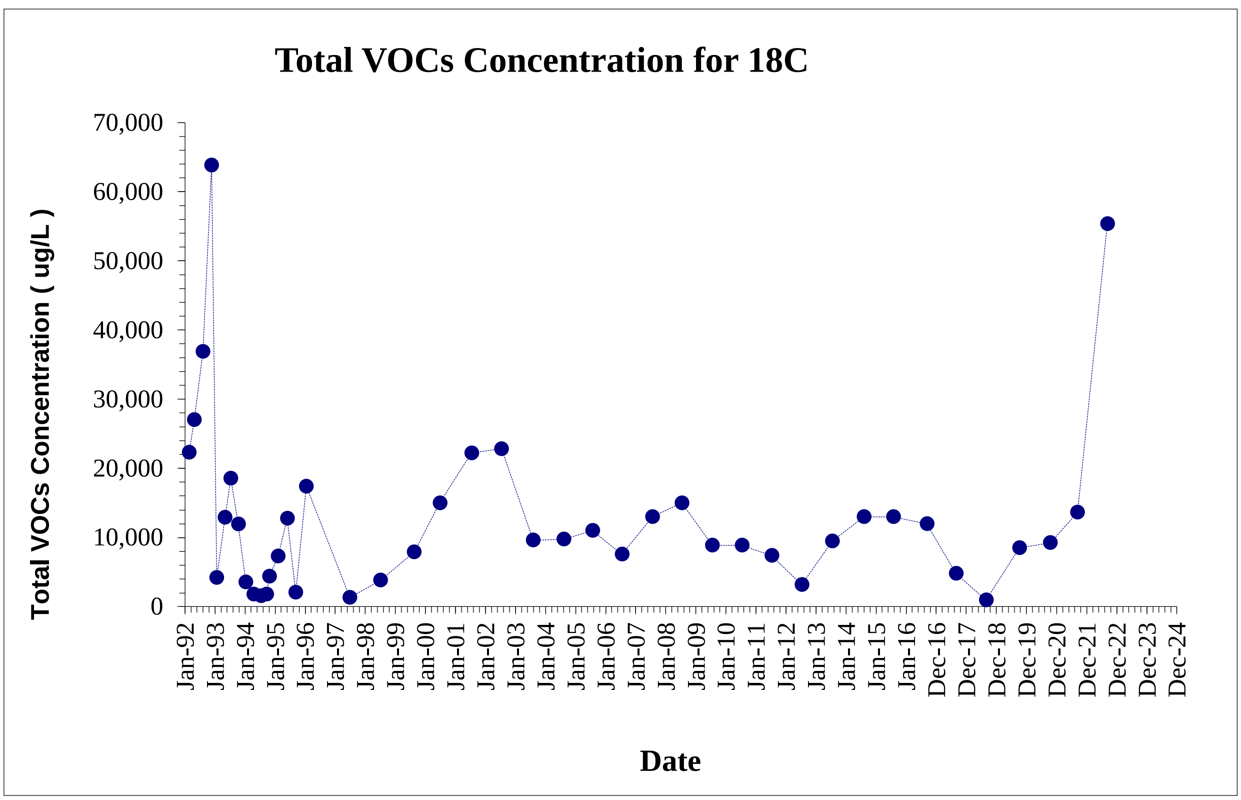
Appendix B
C-Zone TVOC Graphs



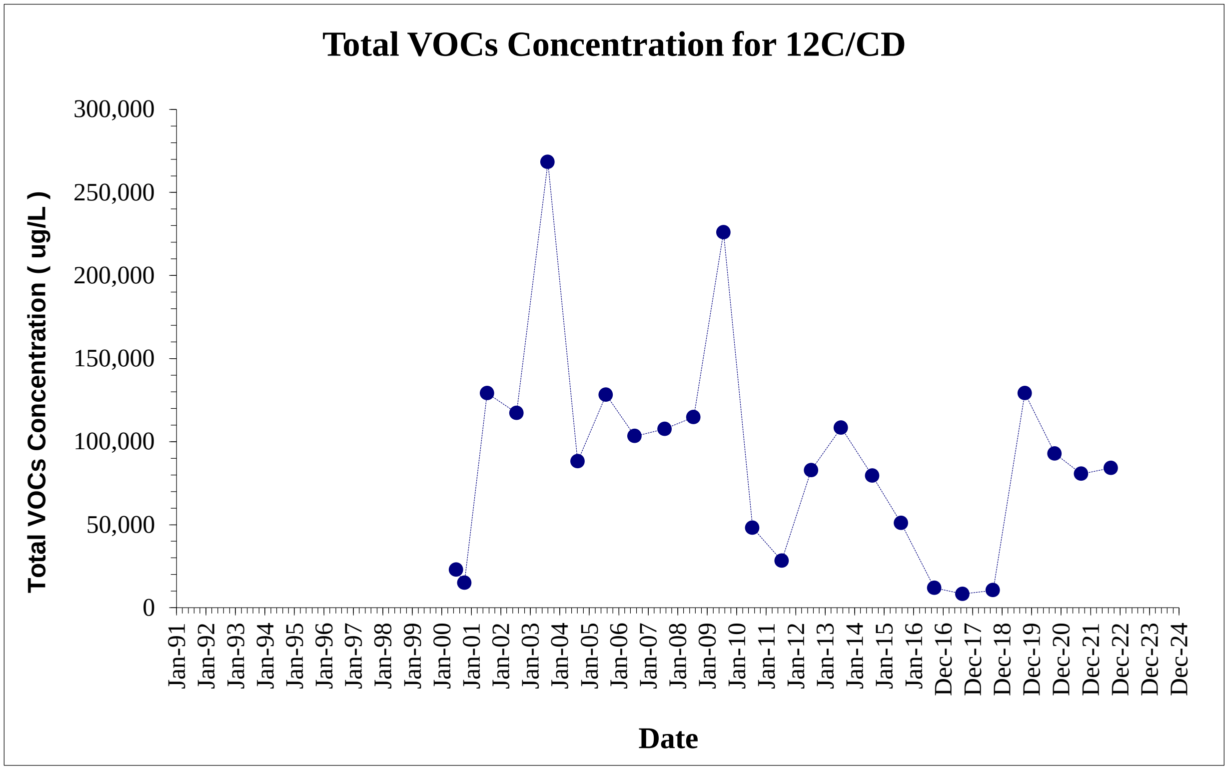
Note: Semi-log scale to distinguish changes at lower range of concentrations.

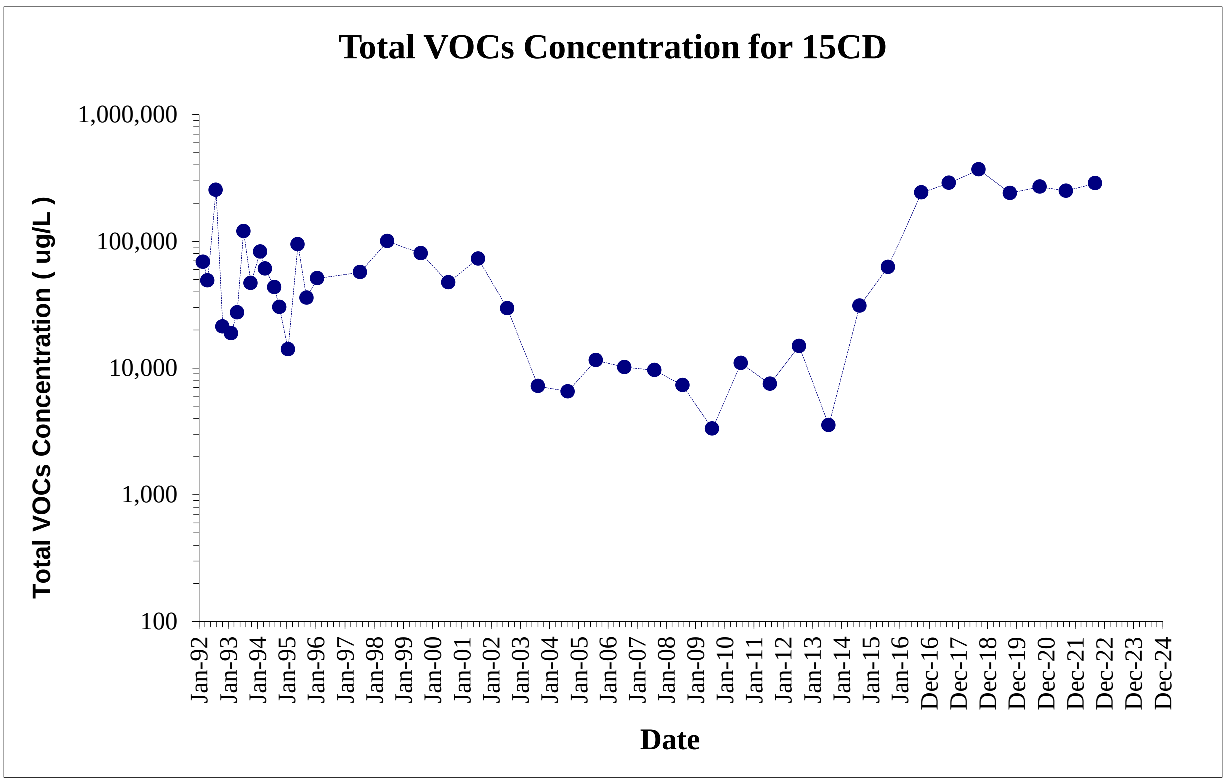



Total VOCs Concentration for 4CR
25,000
20,000
15,000
10,000
5,000
0
Total VOCs Concentration (ug/L)
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date

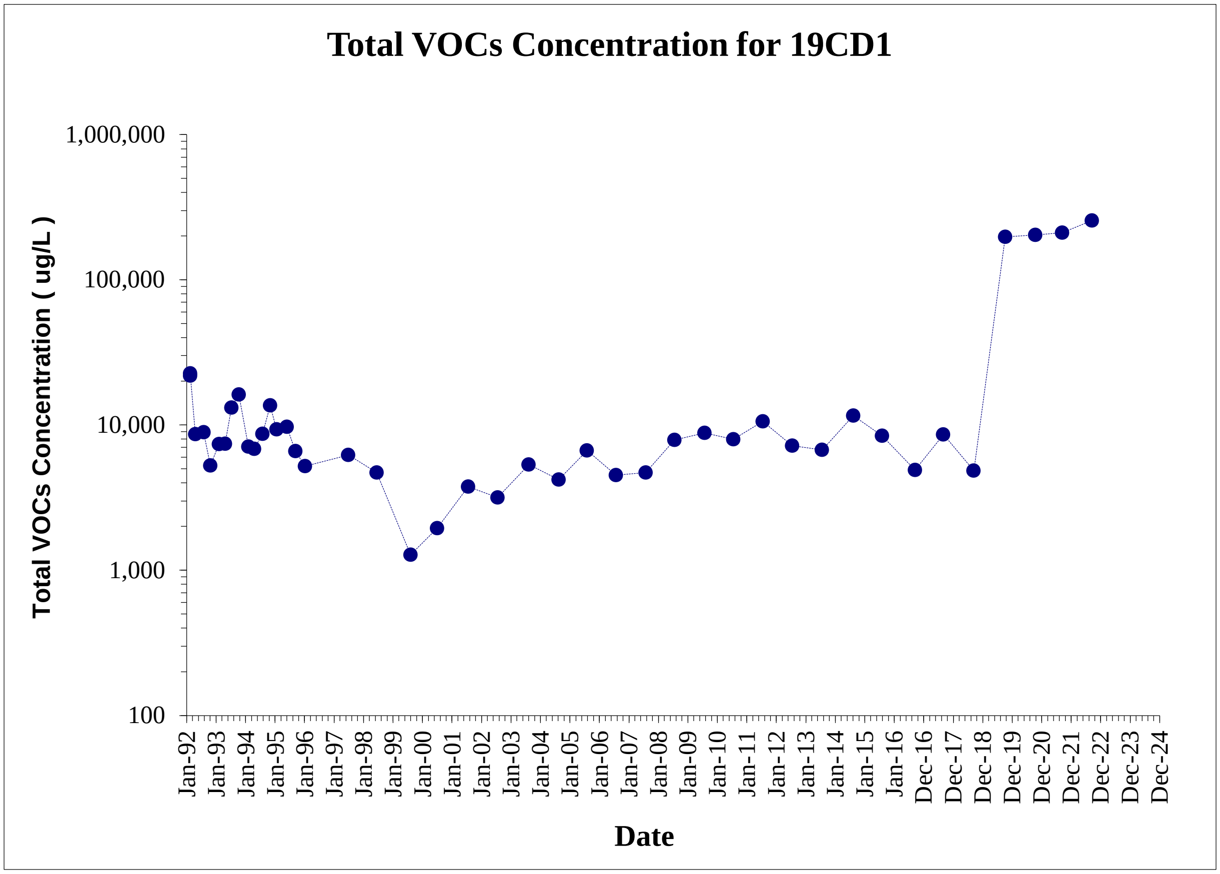

Total VOCs Concentration for 18C
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Total VOCs Concentration (ug/L)
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date

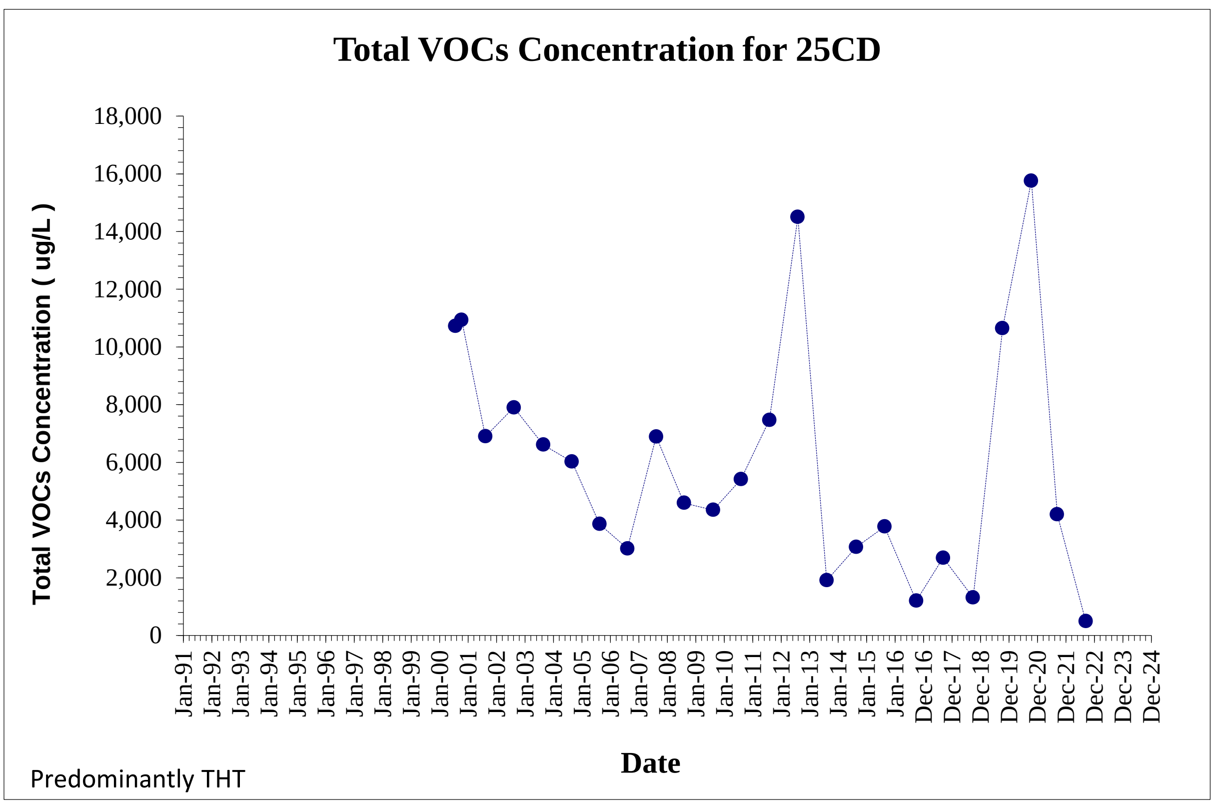
Appendix B
CD-Zone TVOC Graphs

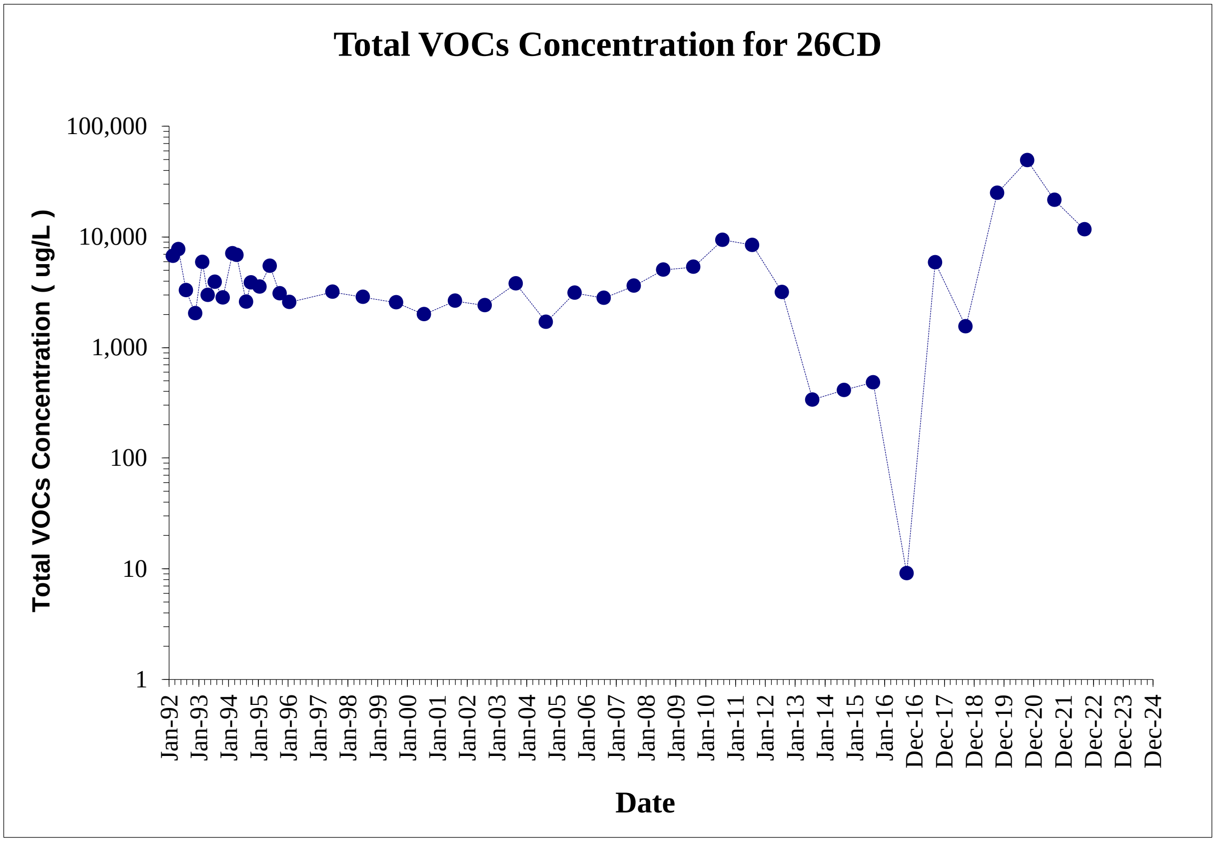




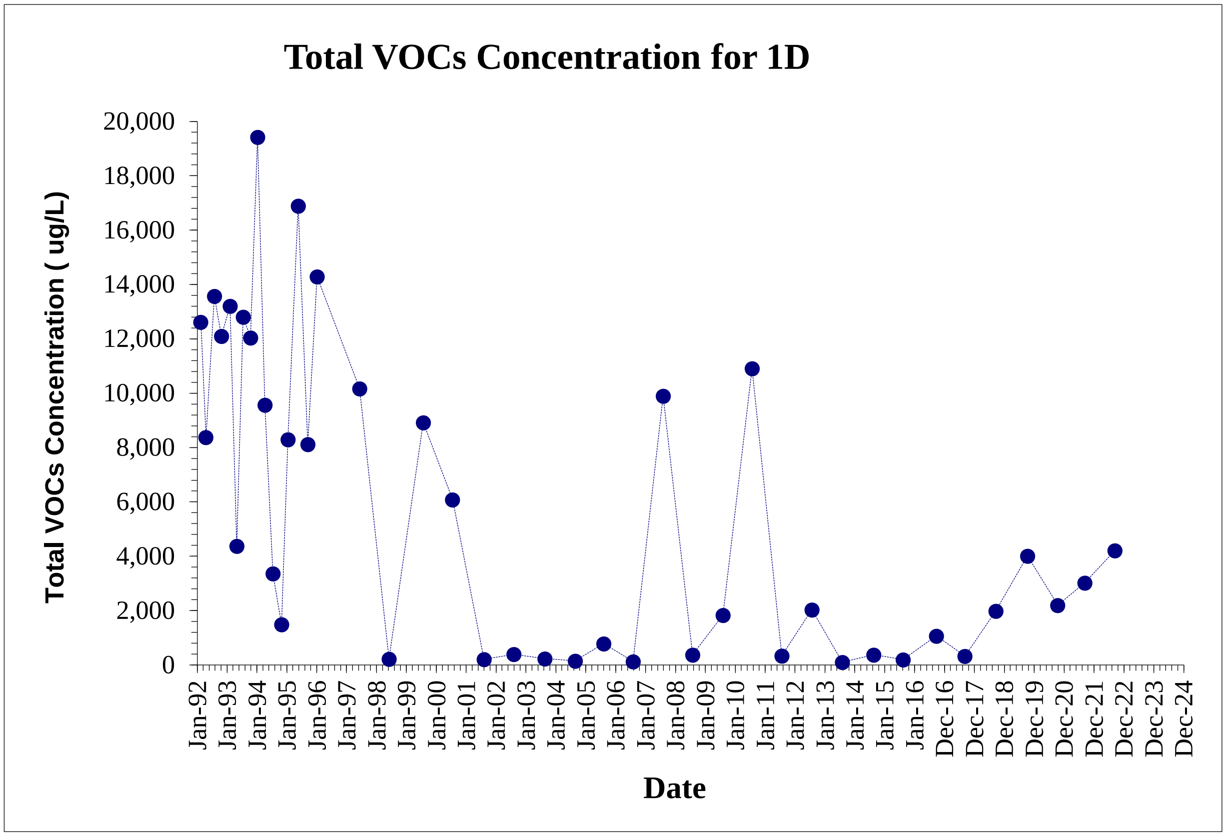
Appendix B
CD-Zone TVOC Graphs

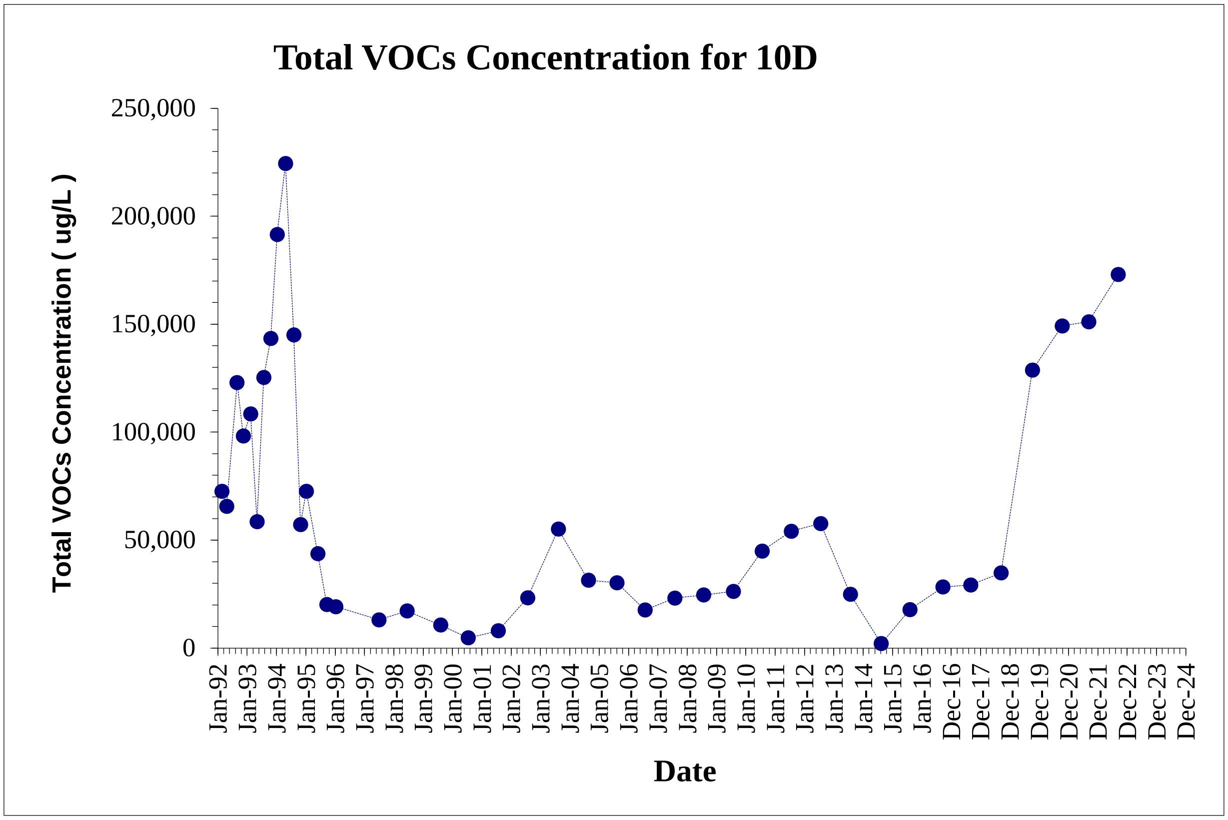




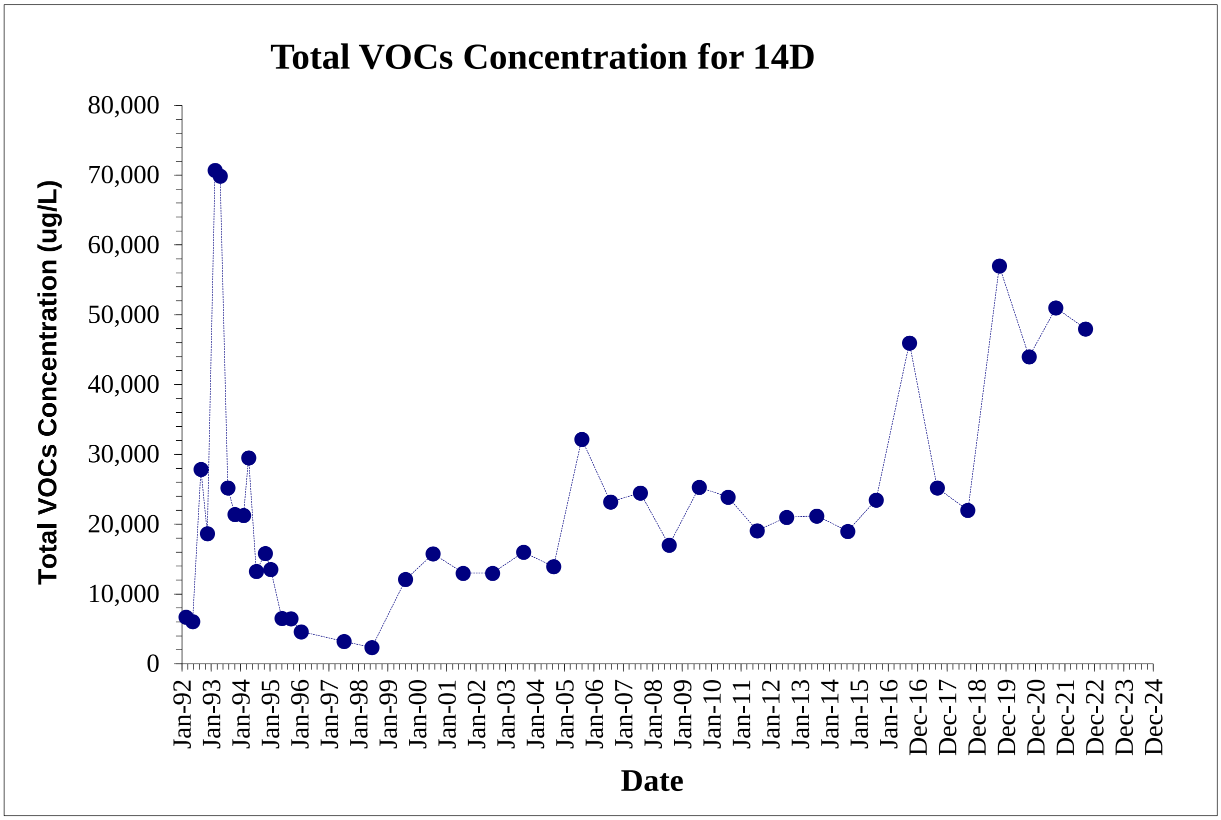

Total VOCs Concentration for 26CD
Total VOCs Concentration (ug/L)
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Date

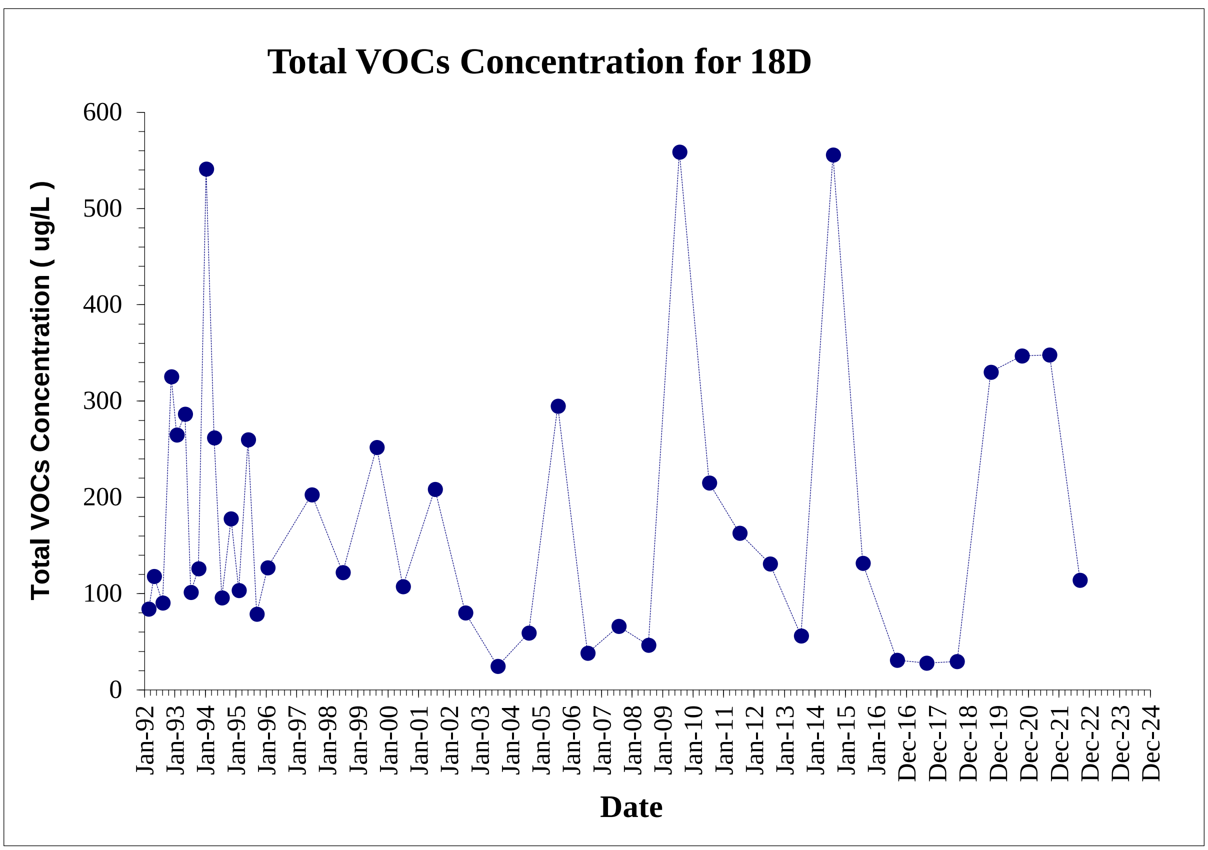
Appendix B
D-Zone TVOC Graphs



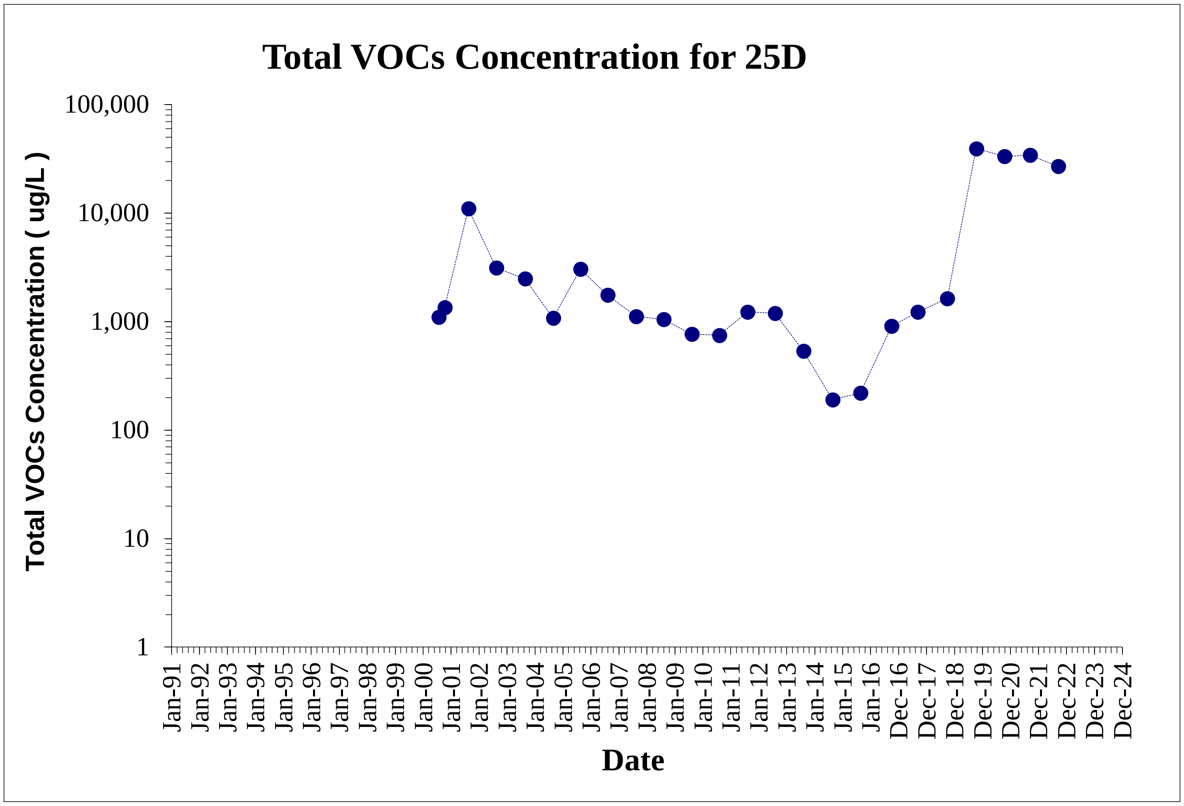


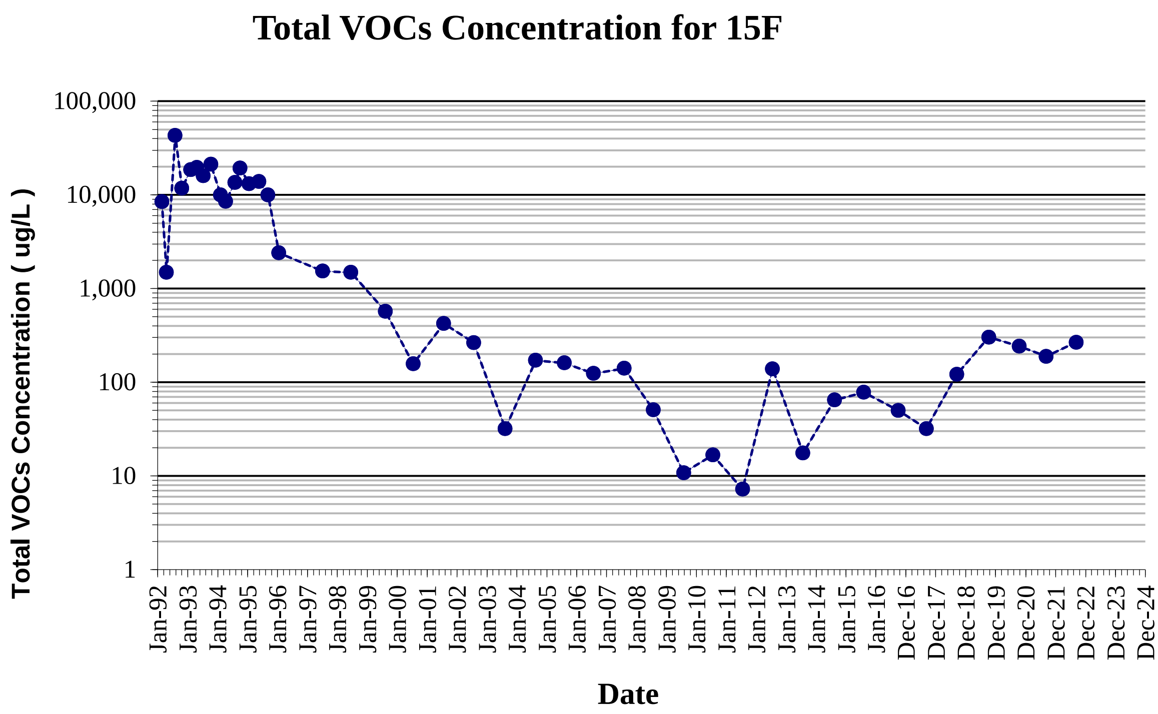
Appendix B
D-Zone TVOC Graphs



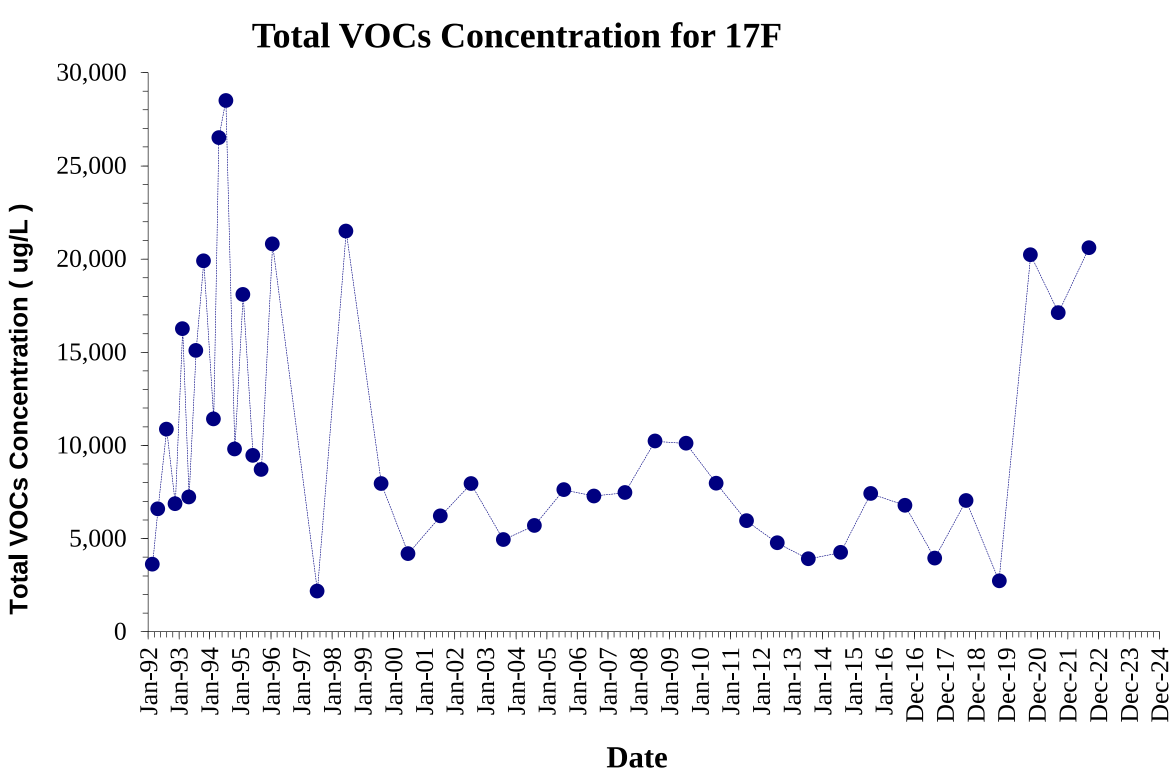


Appendix B
D-Zone TVOC Graphs

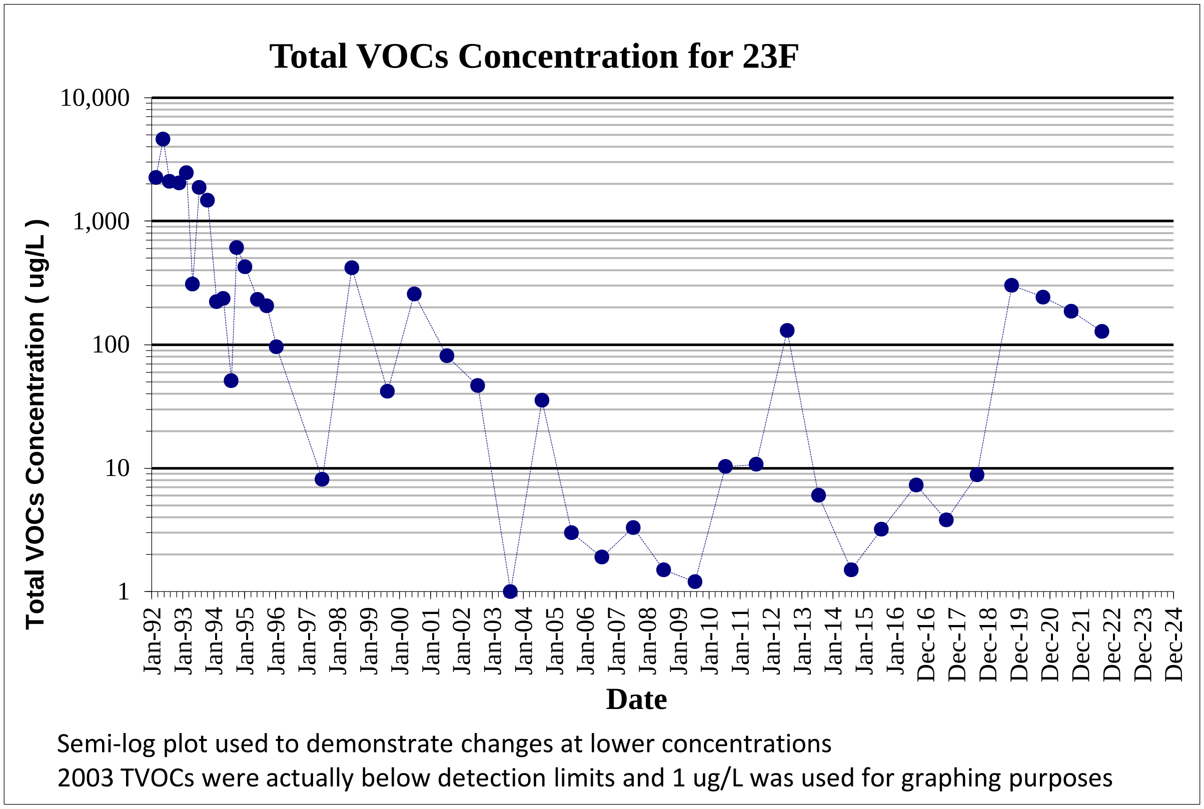


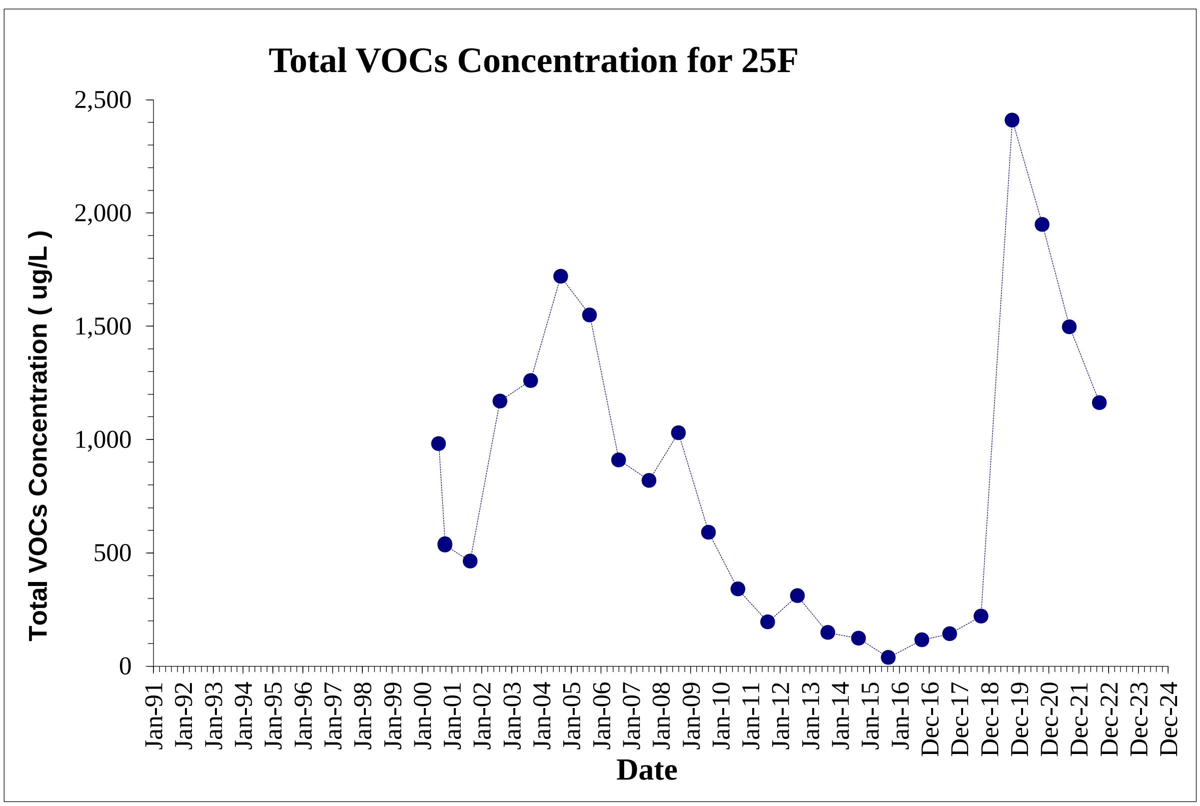


Semi-log plot used to demonstrate changes at lower concentrations



Appendix B
F-Zone TVOC Graphs





APPENDIX C
QUARTERLY SILICON OIL REMEDIATION TABLES

PARSONS

TABLE 1
Silicone Oil Recovery Summary - 2Q2022
Niagara Plant
Niagara Falls, NY

DATE	PW-20 PRODUCT THICKNESS (FT)	PW-20 AMOUNT RECOVERED (GALLONS)	PW-20 CUMULATIVE TOTAL (GALLONS)	PW-24 PRODUCT THICKNESS (FT)	PW-24 AMOUNT RECOVERED (GALLONS)	PW-24 CUMULATIVE TOTAL (GALLONS)
			64.0			2160.0
04/04/22	0.0	0.0	64.0	0.0	1.5	2,161.5
04/11/22	0.0	0.0	64.0	0.0	0.5	2,162.0
04/18/22	0.0	0.0	64.0	0.0	1.5	2,163.5
04/25/22	0.0	0.0	64.0	0.0	1.0	2,164.5
05/02/22	0.0	0.0	64.0	0.0	0.0	2,164.5
05/11/22	0.0	0.0	64.0	0.0	0.0	2,164.5
05/16/22	0.0	0.0	64.0	0.0	0.0	2,164.5
05/23/22	0.0	0.0	64.0	0.0	2.0	2,166.5
05/31/22	0.0	0.0	64.0	0.0	2.0	2,168.5
06/08/22	0.0	0.0	64.0	0.0	0.5	2,169.0
06/13/22	0.0	0.0	64.0	0.0	0.0	2,169.0
06/20/22	0.0	0.0	64.0	0.0	0.0	2,169.0
06/27/22	0.0	0.0	64.0	0.0	0.0	2,169.0
2Q22 Totals	**0.0**	**0.0**	**64.0**	**0.0**	**9.0**	**2,169.0**
TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999:					**2,233.0**	**GALLONS**
comments:						

TABLE 1
Silicone Oil Recovery Summary - 3Q2022
Niagara Plant
Niagara Falls, NY

DATE	PW-20 PRODUCT THICKNESS (FT)	PW-20 AMOUNT RECOVERED (GALLONS)	PW-20 CUMULATIVE TOTAL (GALLONS)	PW-24 PRODUCT THICKNESS (FT)	PW-24 AMOUNT RECOVERED (GALLONS)	PW-24 CUMULATIVE TOTAL (GALLONS)
			64.0			2169.0
07/05/22	0.0	0.0	64.0	0.0	0.0	2,169.0
07/11/22	0.0	0.0	64.0	0.0	0.0	2,169.0
07/18/22	0.0	0.0	64.0	0.0	0.5	2,169.5
07/25/22	0.0	0.0	64.0	0.0	0.0	2,169.5
08/03/22	0.0	0.0	64.0	0.0	1.0	2,170.5
08/08/22	0.0	0.0	64.0	0.0	0.0	2,170.5
08/18/22	0.0	0.0	64.0	0.0	0.0	2,170.5
08/24/22	0.0	0.0	64.0	0.0	0.0	2,170.5
08/30/22	0.0	0.0	64.0	0.0	0.5	2,171.0
09/06/22	0.0	0.0	64.0	0.0	0.5	2,171.5
09/13/22	0.0	0.0	64.0	0.0	0.0	2,171.5
09/26/22	0.0	0.0	64.0	0.0	0.0	2,171.5
3Q22 Totals	**0.0**	**0.0**	64.0	**0.0**	**2.5**	**2,171.5**

TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999: 2,235.5 GALLONS

comments:

TABLE 1
Silicone Oil Recovery Summary - 4Q2022
Niagara Plant
Niagara Falls, NY

DATE	PW-20 PRODUCT THICKNESS (FT)	PW-20 AMOUNT RECOVERED (GALLONS)	PW-20 CUMULATIVE TOTAL (GALLONS)	PW-24 PRODUCT THICKNESS (FT)	PW-24 AMOUNT RECOVERED (GALLONS)	PW-24 CUMULATIVE TOTAL (GALLONS)
			64.0			2171.5
10/03/22	0.0	0.0	64.0	0.0	0.0	2,171.5
10/10/22	0.0	0.0	64.0	0.0	0.0	2,171.5
10/17/22	0.0	0.0	64.0	0.0	0.0	2,171.5
10/24/22	0.0	0.0	64.0	0.0	0.5	2,172.0
11/01/22	0.0	0.0	64.0	0.0	0.5	2,172.5
11/07/22	0.0	0.0	64.0	0.0	0.0	2,172.5
11/14/22	0.0	0.0	64.0	0.0	0.5	2,173.0
11/21/22	0.0	0.0	64.0	0.0	0.5	2,173.5
11/28/22	0.0	0.0	64.0	0.0	0.0	2,173.5
12/05/22	0.0	0.0	64.0	0.0	0.0	2,173.5
12/15/22	0.0	0.0	64.0	0.0	0.0	2,173.5
12/19/22	0.0	0.0	64.0	0.0	0.0	2,173.5
12/21/22	0.0	0.0	64.0	0.0	0.0	2,173.5
12/27/22	0.0	0.0	64.0	0.0	0.5	2,174.0
4Q22 Totals	**0.0**	**0.0**	**64.0**	**0.0**	**2.5**	**2,174.0**

TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999: 2,238.0 GALLONS

comments: 12/21/2022: Removed Drum # 2021-12-16-1 from service containing 22 Gal.oil. Replaced with new Drum.