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

(716) 221-4723t
chemours.com

March 29, 2024

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

Dear Mr. May:

**NIAGARA PLANT GROUNDWATER REMEDIATION SYSTEM**
**2023 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 system operations and monitoring data collected in 2023. 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 2023. Decreasing concentration trends discussed in previous annual reports continued to be recognized in the overburden and bedrock water-bearing zones during 2023. 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 2023 PRR (Report.hw932013.2024-03.NIA_2023_Annual_PRR.pdf)

cc: Stan Radon/NYSDEC
Charlotte Bethoney/NYSDOH (elec.)
Johnathan Robinson/NYSDOH (elec.)
Chemours Records Retention (elec.)

# GROUNDWATER REMEDIATION SYSTEM PERIODIC REVIEW REPORT - 2023

## 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 122
Buffalo, NY 14202

March 2024

Chemours PN 507070
Parsons PN 453707

# Table of Contents



## 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 2023 calendar year. The Groundwater Remediation System 2023 Monitoring Annual Report (**Attachment 3**) is a detailed account of monitoring activities and conditions during 2023. 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 and redevelopment of the property, 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 asses 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<br><br>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 deacon of Reactive Metals Operations.<br><br>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. A fifth well pair (WPO-12 and WPT-12) was installed in 2023 to further evaluate hydraulic gradients in the eastern most part of the east plant.

# 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 31 years of operation. The GWRS 2023 operations are summarized below and support the remedy's performance, effectiveness, and protectiveness:

- System uptime was 99 percent for the 23 original pumping wells that are still in use.
- PW-37 uptime was 99 percent.
- PW-39 uptime was 99 percent.
- PW-43 uptime was 99 percent.
- Olin Production Well system uptime was 100% percent.
- Operation of BFBT pumping wells PW-37, PW-39, and PW-43 continued throughout 2023 along with a reduced number of the original 23 pumping wells, with improved capture at the Plant.
- Hydraulic control was exercised over 86 percent of the Plant area for 2023.
- Monitoring of dense non-aqueous phase liquid (DNAPL) conducted in 2023 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 BFBTs in 2005. In 2023, approximately 1.9 tons of organic compounds were removed from groundwater by the GWRS.

The Olin Production Well continued with a mass removal rate within the range of historical values, but with a noted increase from 2020 through 2023. The yearly estimated mass of organic compounds removed was between 1.0 and 1.2 tons between 2020 and 2023 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 2023. 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 2.9 tons of organic compounds in 2023.

## 3.2 Compliance with Remedial Objectives

Extensive water-level data collected over the 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. 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 2023, the hydraulic control in the A-zone overburden and bedrock was 86%. 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** (2023 Annual Report). Off-site COC migration from the West Plant area is controlled, confirming that the remedial objectives established in the ACO are met.

As reported in the 2021 and 2022 Annual Reports (Parsons, 2022, and Parsons 2023) a BFBT and associated pumping well PW-43 was installed in the East Plant and replaced low yielding Original Wells PW-28, -30, -32, and -34. This improvement to groundwater pumping continues to be evaluated for capture effectiveness and is further discussed Attachment 3.

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 2023, 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 2023 with locked fencing, 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 2023 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. Eighty-seven locations were sampled for COC concentrations during 2023. **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). As such, no quarterly reports were submitted in 2023.

# 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 2023 O&M activities are provided in **Attachment 3**. System uptime was 99 percent for the 23 original pumping wells that are still in use. PW-37 uptime was 99 percent, PW-39 uptime was 99 percent, and PW-43 uptime was 99 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 2023, 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 2023. The Plant remains an industrial use property with a secure fence and a 24-hour security system. There have been no significant changes in property use during 2023 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 98% in 2023, and the NYSDEC was notified of systems down-times as appropriate.  The Olin Production Well average rate was greater than 500 gpm in 2023. The remedial requirements are in compliance; therefore, no corrective measures are needed.

Extensive water-level and chemical data have been collected over 31 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 2023, the hydraulic control in the A-zone overburden and bedrock was approximately 86%, 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, 2003).

# 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.

______. 2009. DuPont Niagara Modified Operating Evaluation Report. August 6, 2009

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.

_____. 2008. M. Hinton. Correspondence RE: Removal of Wells from Sampling Program. July 7, 2008.

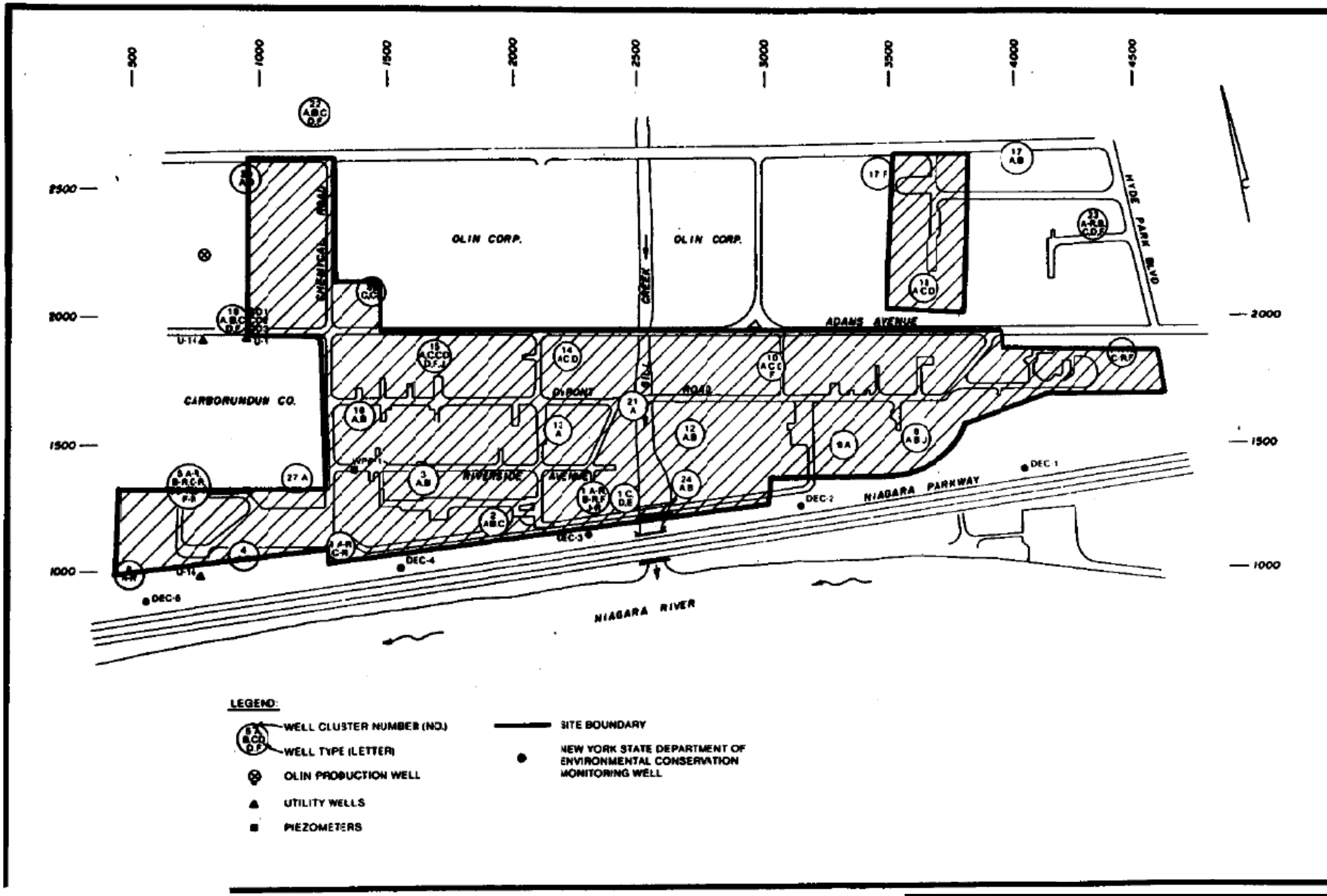
_____. 2011. M. Hinton. Correspondence RE: Proposal for Activated Carbon Utilization Study, April 24, 2011.

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

_____. 2023a. Groundwater Remediation System Periodic Review Report 2022, Chemours Niagara Plant. March 2023.

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

# FIGURES




# FIGURE 1

SITE BOUNDARIES MAP
Chemours NIAGARA PLANT SITE
NIAGARA FALLS, NY

**PARSONS**
40 La Riviere Dr., Suite 122 Buffalo, NY 14202

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


NIAGARA COUNTY, NEW YORK
DEPARTMENT OF REAL PROPERTY SERVICES



| Parcel ID | Owner |
|---|---|
| 159.16-1-3.1 | Chemours |
| 159.16-1-3.2 | Chemours |
| 159.15-1-19 | 2747 Buffalo Avenue LLC |
| 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 |

https://niagara-county.maps.arcgis.com/apps/webappviewer/index.html?id=b5be67cf0e05477e8f4ad3161ab51422

FIGURE 2

SITE PARCELS MAP
Chemours NIAGARA PLANT SITE
NIAGARA FALLS, NY

PARSONS
40 La Riviere Dr., Suite 122 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, 2022 to December 31, 2023

| | | 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.**

| | | YES | NO |
|---|---|---|---|
| 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 |
|---|---|---|
| **159.15-1-19 Lot A** | 2747 Buffalo Ave., LLC | |
| | | Monitoring Plan<br>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<br>O&M Plan |

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

| | | |
|---|---|---|
| **159.16-1-3.2** | The Chemours Company FL LLC | O&M Plan<br>Monitoring 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<br>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<br>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<br>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 |
|---|---|
| **159.15-1-19 Lot A** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Cover System<br>Groundwater Containment<br>Fencing/Access Control<br>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.

| | |
|---|---|
| **159.16-1-3.2** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>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.

| | |
|---|---|
| **159.16-1-4** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Groundwater Containment<br>Fencing/Access Control<br>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<br>Cover System<br>Groundwater Containment<br>Fencing/Access Control<br>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 877 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.

Paul F Mazierski 3/29/24

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 P.G. 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

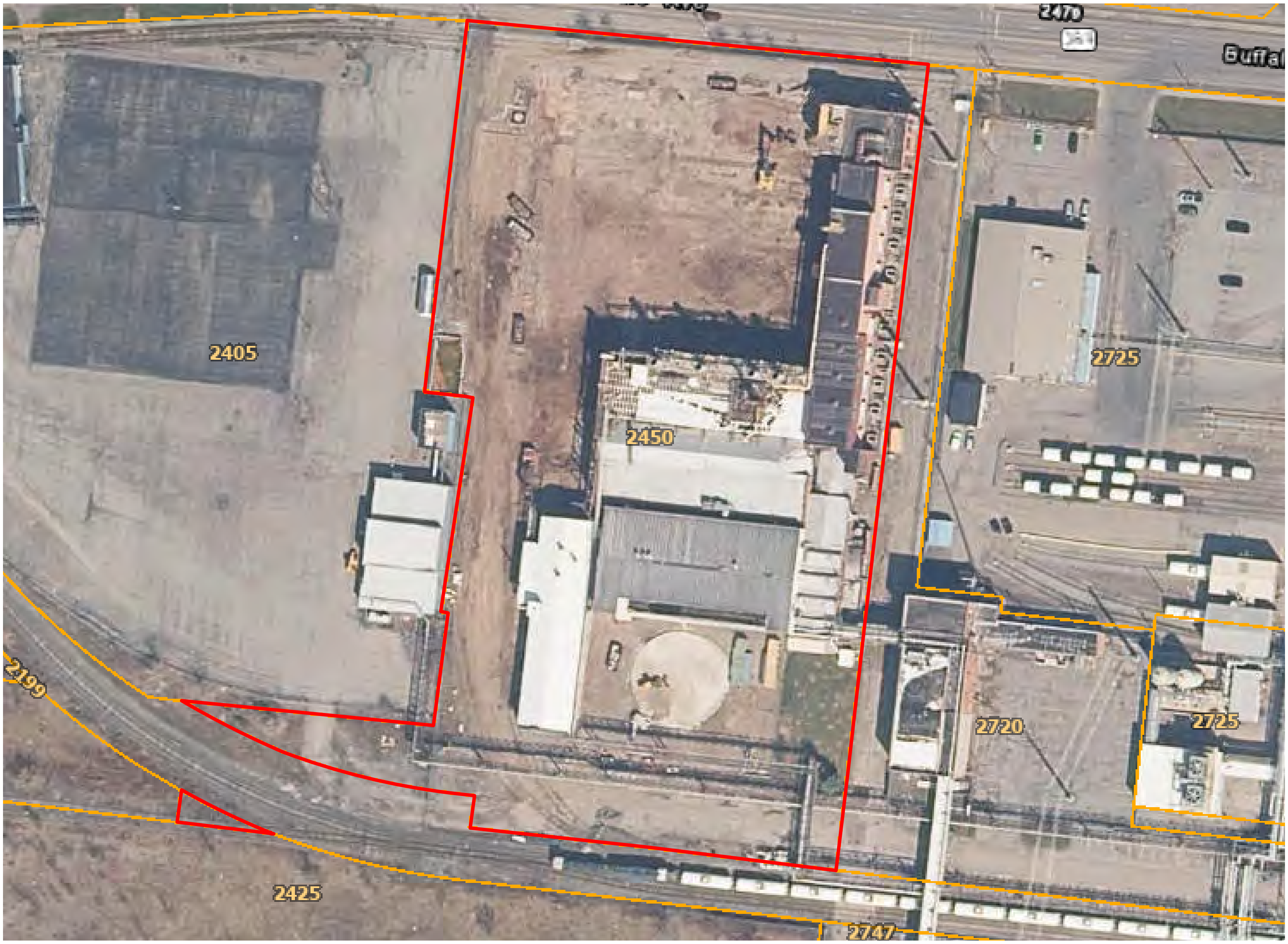
Stamp (Required for PE)

3/29/24

Date

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

N




0 0.03 0.07 0.13 mi

Report run date: February 26, 2024

## Parcel Report

**Information reflects Final Assessment Roll 2023**

**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:** 416,700

N


0 0.05 0.1 0.2 mi

Report run date: February 26, 2024

Parcel Report

**Information reflects Final Assessment Roll 2023**

**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:** 370,400

N


0 0.05 0.1 0.2 mi

Report run date: February 26, 2024

## Parcel Report

**Information reflects Final Assessment Roll 2023**

**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

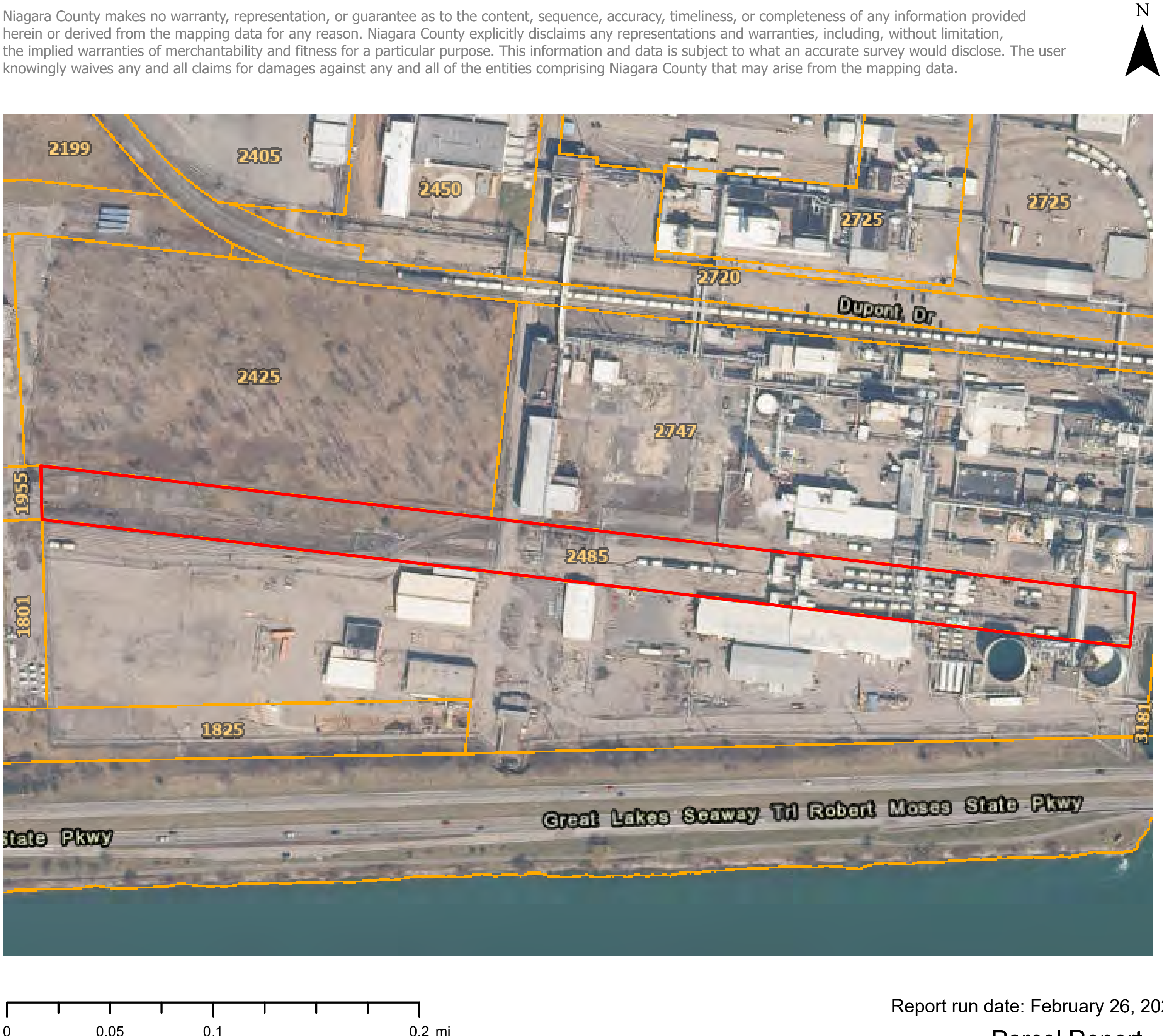
**Depth:** 0

**Year Built:** 0

**Land Assessed Value:** 5,000

**Acres (approx):** 3.13

**Full Market Value:** 18,500




Report run date: February 26, 2024

Parcel Report

**Information reflects Final Assessment Roll 2023**

**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:** 27,800

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.

N


0 0.05 0.1 0.2 mi

Report run date: February 26, 2024

Parcel Report

**Information reflects Final Assessment Roll 2023**

**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:** 22,200

N


0 0.05 0.1 0.2 mi

Report run date: February 26, 2024

## Parcel Report

**Information reflects Final Assessment Roll 2023**

**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

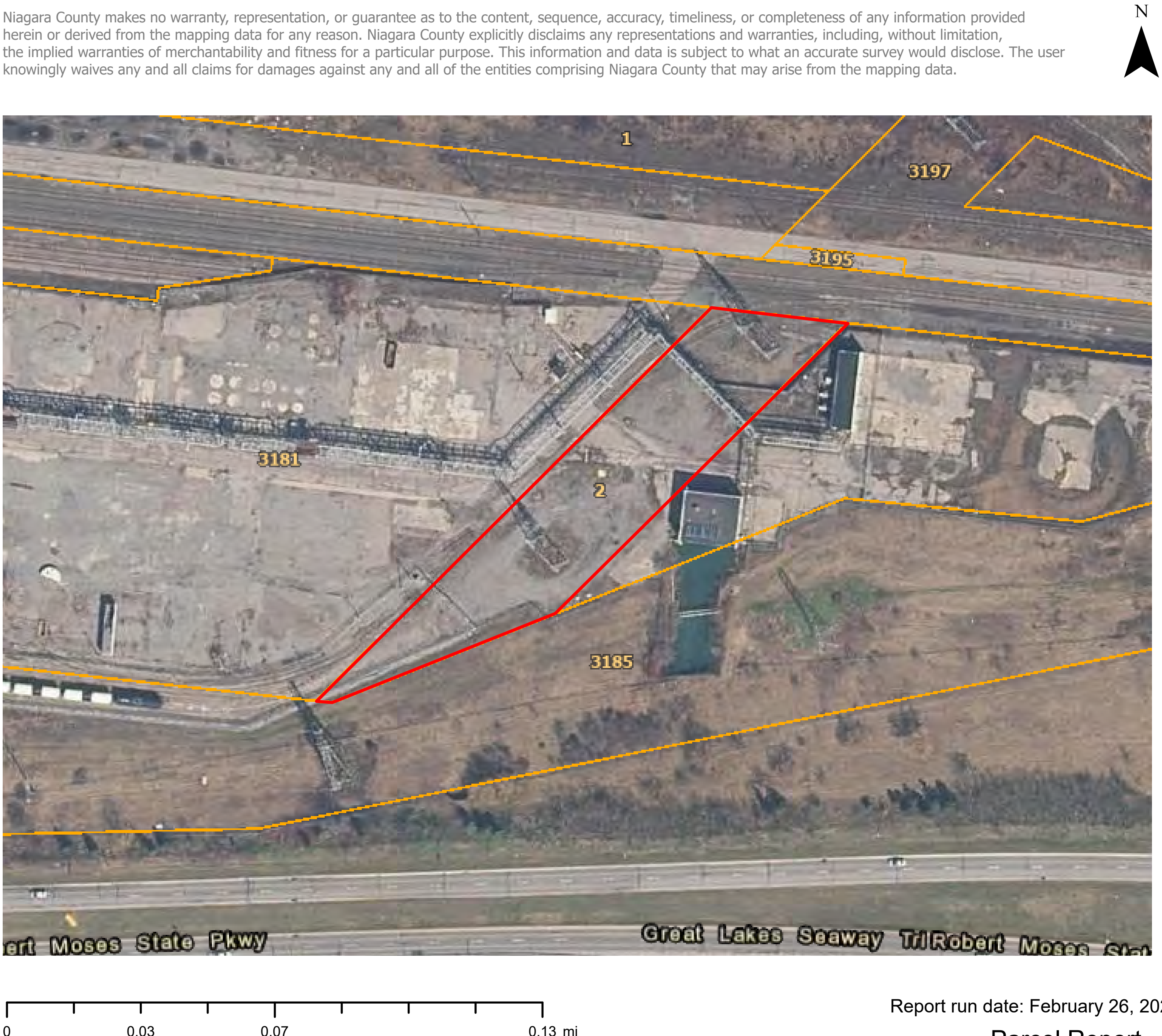
**Depth:** 0

**Year Built:** 0

**Land Assessed Value:** 20,500

**Acres (approx):** 16.98

**Full Market Value:** 149,100




Report run date: February 26, 2024

# Parcel Report

**Information reflects Final Assessment Roll 2023**

**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

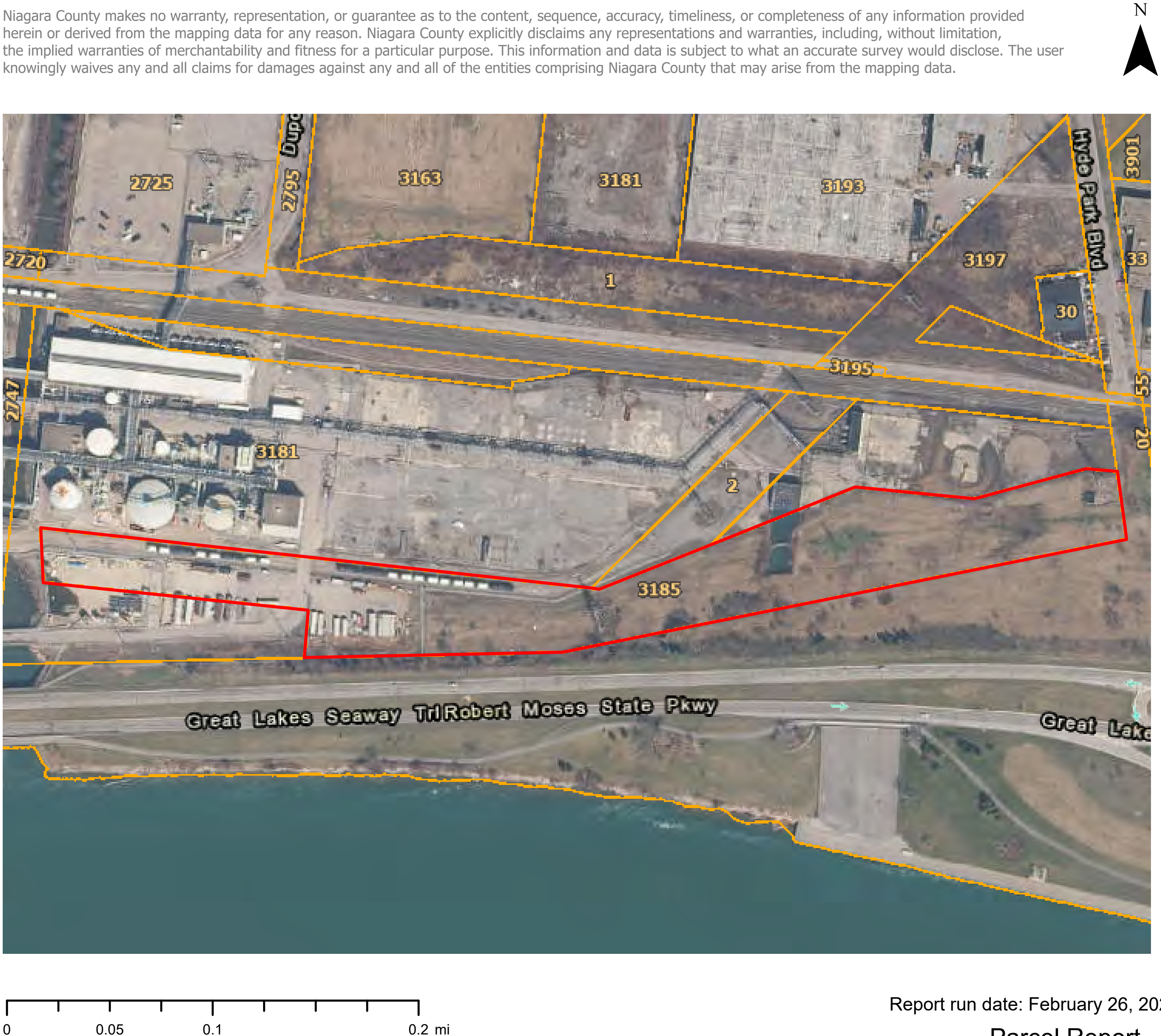
**Depth:** 0

**Year Built:** 0

**Land Assessed Value:** 16,833

**Acres (approx):** 1.06

**Full Market Value:** 31,200




Report run date: February 26, 2024

Parcel Report

**Information reflects Final Assessment Roll 2023**

**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

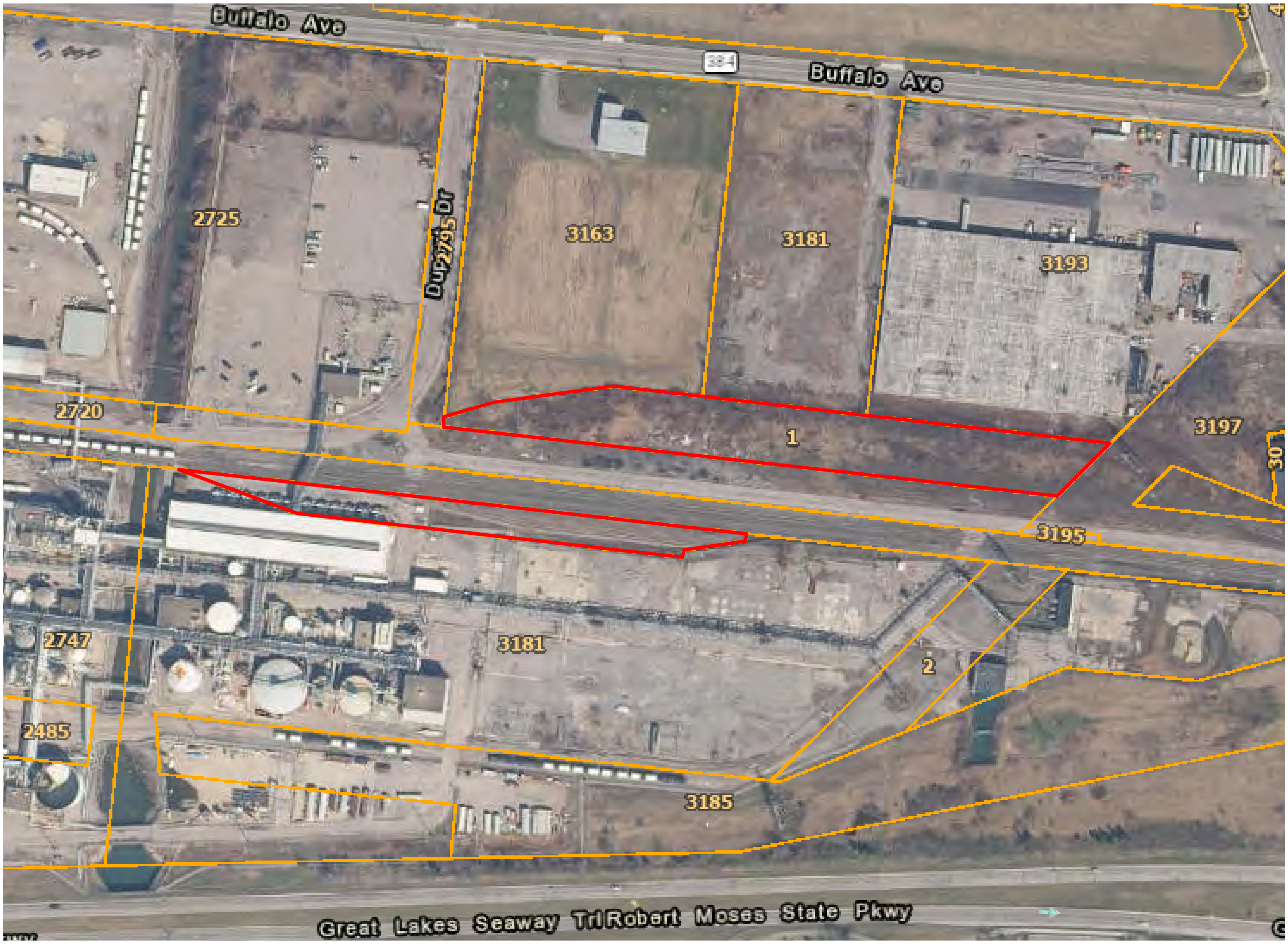
**Year Built:** 0

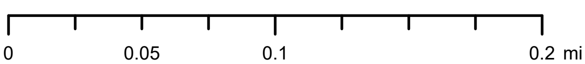
**Land Assessed Value:** 25,000

**Acres (approx):** 6.44

**Full Market Value:** 46,300

N




Report run date: February 26, 2024

## Parcel Report

**Information reflects Final Assessment Roll 2023**

**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:** 1,900

# ATTACHMENT 3
# GROUNDWATER REMEDIATION SYSTEM
# 2023 ANNUAL MONITORING REPORT

PARSONS

PARSONS

# Groundwater Remediation System 2023 Annual Monitoring Report

## 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 122
Buffalo, NY 14202

March 2024

Chemours PN 507070
Parsons PN 453706

# TABLE OF CONTENTS

## TABLES



## FIGURES

## APPENDICES

# ACRONYMS

| Acronym | Definition / Description |
|---|---|
| 4Q18 | Fourth quarter of 2018 |
| 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 2023 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 2023. Approximately 1.9 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 2023 was 99 percent for all pumping wells (the original 9 pumping wells, PW-37, PW-39 and PW-43). No unscheduled and one scheduled treatment system shutdown greater than 24 hours occurred during 2023. The scheduled shutdown, from July 23 to 26, 2023 for approximately 76.5 hours (with the wells shutdown for 45 hours) allowed for required annual maintenance and inspections of the treatment system. There were no scheduled or unscheduled pumping well shutdowns greater than 48 hours in 2023.

The quantitative evaluation of the GWRS hydraulic effectiveness presented in this report illustrates that inward gradients occur in approximately 86 percent of the entire Plant where total VOCs concentrations are observed in the A-Zone overburden and A-Zone bedrock.

The 2023 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. The water levels and capture system were evaluated throughout 2022 and 2023 in order to refine the effectiveness of the pumping from the BFBT. PW-43 is effective, and the pump 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, but less that 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 continued in 2023 to evaluate the effectiveness of PW-43 including additional piezometers installations in the East Plant (EPT-12 and EPO-12). An underground city water line was found to be leaking near the east end of the trench, likely limiting the ability to draw down head at this end of the trench. The leak was repaired in December and the hydraulic heads will continued to be monitored.

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.

Data from 2000 through 2023 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 2028), 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, no quarterly reports were submitted to the NYSDEC in 2023.

# 1.0 INTRODUCTION

This report summarizes 2023 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, As such, quarterly data packages were not submitted in 2023.

Operational data for 2023 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.

# 2.0 GWRS OPERATIONS AND IMPROVEMENTS SUMMARY FOR 2023

During 2023, the GWRS collected and pre-treated 11.0 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 2023 continues to be greater than the removal observed prior to the installation and start-up of the Blast Fractured Bedrock Trenches (BFBTs) in 2005 (**Figure 2-1**). Operations data from 1992 through 2023 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, GWRS uptime during 2023 was 99 percent for all pumping wells (the original 9 pumping wells, PW-37, PW-39 and PW-43).

Quarterly performance details for the GWRS, Olin Production Well, and Plant Outfall 023 during 2023 are summarized in the table below.

| Operational Statistics | 1Q23+ | 2Q23+ | 3Q23+ | 4Q23+ | 2023 Total+ |
|---|---|---|---|---|---|
| **GWRS** | | | | | |
| Original 9 Pumping Wells Uptime | 100% | 98.6% | 98.2% | 100% | **99.2%** |
| PW-37 Uptime | 100% | 99.8% | 98.0 % | 100% | **99.4%** |
| PW-39 Uptime | 100% | 99.8% | 96.7% | 100% | **99.1%** |
| PW-43 Uptime | 100% | 98.8% | 97.0% | 100% | **99.9%** |
| Total Gallons Pumped (millions) | 3.07 | 2.84 | 2.58 | 2.49 | **11.0** |
| Estimated Pounds of Organics Removed from Groundwater* | 946 | 964 | 992 | 909 | **3,811** |
| 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 | 0 | 1 | 1 | 1 | **3** |
| Pump Repairs Requiring > 48 Hours | 0 | 0 | 0 | 0 | **0** |
| **Olin System** | | | | | |
| Pumping System Uptime | 100% | 100% | 100% | 100% | **100%** |
| Estimated Pounds of Organics Treated | 516.3 | 412.8 | 491.4 | 515.7 | **1,936** |

| Operational Statistics | 1Q23+ | 2Q23+ | 3Q23+ | 4Q23+ | 2023 Total+ |
|---|---|---|---|---|---|
| **Outfall 023** | | | | | |
| Estimated Pounds of Organics Treated | 27 | 51 | 40 | 33 | **151** |
| **Total Estimated Pounds of Organics Removed / Treated** | 1,489 | 1,428 | 1,523 | 1,458 | **5,898** |

+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 5,898 pounds (2.95 tons) of organic compounds were removed and treated during 2023. 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 2023. 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 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 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 2023 that were greater than 24 hours. There was one scheduled treatment system shutdown. Between July 23 and July 26, 2023 the treatment system was shut down for approximately 76.5 hours (with the wells shutdown for 45 hours) to complete required annual maintenance and inspections of the treatment system including cleaning out solids from the scrubber tank, cleaning out the Regenerative Thermal Oxidizer (RTO) poppet chambers, cleaning out all three sumps associated with the groundwater treatment system, inspection of the scrubber condition, pH and conductivity probes, and inspection of the RTO metal shell thickness. There were no scheduled or unscheduled pumping well shutdowns greater than 48 hours in 2023. As appropriate, scheduled and unscheduled shutdowns would have been reported to the NYSDEC via email.

## 2.2 Air Emissions

Air emissions from the GWRS originate from two sources: (1) the stack downstream of the pre-treatment and 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 and constructed (at an off-site vendor facility - Amherst Stainless Fabrication Co. with design by Adwest Corp.) as a replacement in-kind for the existing unit. Based on previous observations and operations-based modifications to the existing RTO, design improvements were incorporated into the new RTO. The new RTO was installed in 1Q18 and 2Q18 with the system beginning operation with the new RTO 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 2023 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 of the carbon canister replacements during 2023:

| Date of Change-Out |
|---|
| 3/20/23 |
| 6/14/23 |
| 9/20/23 |
| 12/16/23 |

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 2023:

| Pump Replacements | | |
|---|---|---|
| **Pumping Well** | **Replacements** | **Quarter of Replacement** |
| PW-39 | 1 | 2Q23 |
| PW-35 | 1 | 3Q23 |
| PW-43 | 1 | 4Q23 |
| **Total** | **3** | |

## 2.4 Olin Production Well and Carbon Vessels

The Olin Production Well treatment system maintained 100% uptime during 2023. 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). This allows carbon in the unused vessels to be removed and replaced, ready to be placed online within an hour if necessary. Beginning in October 2023, based on discussions between Chemours and the carbon vendor, only two carbon vessels were placed online (instead of three vessels as had been done in the past). This is expected to increase carbon efficiency and reduce the volume of carbon needed to effectively operate the system. Eight carbon vessel change-outs were completed during 2023. The changes-outs on 3/15/2023 and 7/28/23 included three vessels and the change-out on 10/28/2023 included two vessels.

The discharge from the Olin Production Well treatment system is used as noncontact 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-5, -6, -7 | 3/15/23 |
| V-2, -3, -4 | 7/28/23 |
| V-5, -6 | 10/28/23 |

## 2.5 BFBT PW-43 and Piezometers Installations

As reported in the 2021 and 2022 Annual Reports (Parsons, 2022, and Parsons 2023) a BFBT and associated pumping well PW-43 was installed in the East Plant and replaced low yielding Original Wells PW-28, -30, -32, and -34. This improvement to groundwater pumping continues to be evaluated for capture effectiveness and is further discussed in the Section 3.1 of this report.

As part of the continued monitoring of PW-43 effectiveness, the hydraulic head monitoring network northeast of the East Plant BFBT was enhanced with additional piezometers. Two new hydraulic head piezometers (EPT-12 and EPO-12) were installed northeast of the East Plant BFBT in 2023. EPO-12 was installed just above the bedrock to a total depth of 11.5 feet and EPT-12 was installed into the top of rock with a rock socket to 13.5 feet, a 3 foot screen, and a total depth of 18 feet. Both wells were developed and surveyed. Boring logs and well construction diagrams are provided in **Appendix A**. Both of these observation wells were added to the quarterly groundwater monitoring list.

Relevant to groundwater capture east of PW-43 BFBT, a leak in an Olin subsurface city water line was identified in the area east of the East Plant BFBT. The leaking city water line appeared to be contributing to the localized water table and, in part, creating decreased groundwater capture effectiveness in this area. The leak was repaired by Olin on December 18, 2023 and transient water level monitoring (with transducers) will be used to further monitor groundwater elevations in 2024 (to the extent necessary). Additional details are provided in Section 3.1.3.

# 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 2023 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 program for 2023 represented the second 5-year monitoring event 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.

Water level measurements from the four quarters of 2023 are included in the 2023 PRR as **Attachment 4**.

### 3.1.1 Potentiometric Surface Maps

Quarterly potentiometric surface maps were generated from the groundwater level measurements. Quarterly potentiometric surface maps are included in A-Zone Overburden, A-Zone Bedrock, B-Zone Bedrock, C/CD-Zone Bedrock, and D-Zone Bedrock for 1Q23 in Figures 3-2 through 3-6, respectively; for 2Q23 in Figures 3-7 through 3-11, respectively; for 3Q23 in Figures 3-12 through 3-16, respectively; and for 4Q23 in Figures 3-17 through 3-21, 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 2023 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 total volatile organic compound (TVOC) isoconcentration contours for 3Q23 have been superimposed over potentiometric surface contours for the A-Zone overburden and A-Zone bedrock (August 31, 2023) and are presented in **Figures 3-22 and 3-23**, 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 3-22 and 3-23** 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 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, with areas potentially outside of the captures zone existing east of the BFBT for PW-43. 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 the PW-39 induces a groundwater capture zone in the southeast section of the west plant, providing groundwater capture in this area.

In general, hydraulic heads and gradients in the C/CD- and F-Zones 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. Groundwater elevations in the F-Zone are similar to those observed in previous reporting periods, with the direction of groundwater flow north to northwest in the West Plant and north to northeast in the East Plant, toward the FST/NYPA Intersection.

### 3.1.2 Hydraulic Control

**Figure 3-24** 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 Sodium Shop 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 2023 are presented in **Figures 3-25 through 3-32**. Results of the hydraulic effectiveness evaluations for 2023 are summarized in **Table 3-4**. Overall, there are typically slight changes in capture from year to year, sometimes increasing, sometimes decreasing, but generally in the +/- 5% 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 recent changes as part of the East Plant BFBT and PW-43 installation. 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 consistent with previous years, which together averaged 91 percent as well.

The East Plant overall effectiveness percentage was 79 percent for 2023. This is the lower than the previous years which averaged 94% .

The Plant-wide hydraulic effectiveness estimate for 2023 was 86 percent, which is lower than previous years which averaged 92%. The decreases in percent capture are associated with PW-43 installation and potentially less capture on the east end of the east plant. The following discussions detail the capture effectiveness and provide more analysis to potential mechanisms related to capture changes.

### 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 (in December 2021) and throughout 2022 and 2023, 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, through 1Q2023, suggested that additional piezometers may be necessary to identify capture in this area. As such, Chemours installed two new piezometers (EPO-12 and EPT-12) near the east end of the East Plant. EPO-12 was installed to the top of bedrock and EPT-12 was installed in the top of bedrock. Boring logs for EPO-12 and EPT-12 are included in **Appendix A**. These piezometers were strategically placed to assist in locating the stagnation point related to capture from the trench and downgradient piezometers EPO-5 and EPT-5.

During 2023, a potable city water line suppling Olin was identified to be leaking in the East Plant north of DuPont Rd. near former pumping well PW-34. This leak appeared to be of high flow rate as observed through ponding in the north side of the East Plant and geophysical testing. On December 18, 2023 Olin fixed the leak by excavating and repairing sections of the main and along a lateral valve. During the excavation a CRG representative was onsite and confirmed that the leak was significant and that the repair was made correctly. It is suspected that the leaking City water was contributing to lower capture along the eastern side of the east plant, and likely contributing to the groundwater mound observed in Figures 3-13 and 3-18, spatially coincident with the leak. Preliminary water level monitoring (including transient water levels collected with transducers) prior to and after fixing the leak indicates groundwater elevations are decreasing and capture is increasing. Further monitoring and analysis in 2024 will be used to update the capture understanding in the east end of the East Plant.

## 3.2 Groundwater Chemistry Monitoring

Groundwater sampling was conducted during 2023 in accordance with the monitoring schedule summarized in **Table 3-2**. Analytical parameters are summarized in **Table 3-3**. Analytical results for the 2023 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 sampled in 2023. These wells will next be sampled in 2028. 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 sampled in 2023. Wells 6AR and 27A are on a five-year sampling schedule and the next sampling event for these wells will occur in 2028.
- Dissolved barium was analyzed in samples from wells 5AR and 21A. Dissolved barium at 5AR and 21A was analyzed every other year but has been moved to the five-year program and the next sampling event for these wells will occur in 2028.

As opposed to typical passive diffusion sampling techniques, traditional purge and sample methods were used for the five year event completed in 2023. This was necessary due to the increased number of analytical parameters required during the five year event and the associated increased sample volume required.

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 2023 are consistent with past monitoring results, with the highest TVOC concentrations observed in mainly in four 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 3-2 and 3-3**, respectively. A summary of the 2023 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 PW-37 and PW-39 in 2005. In 2023, the GWRS removed approximately 3,811 pounds (1.9 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 noticed increase in late 2019 through 2023. The yearly estimated mass of organic compounds removed was 0.97 pounds in 2023 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 2023. 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.

The combined effect of the GWRS and the Olin Production Well resulted in the removal and treatment of approximately 5,898 pounds (2.9 tons) of organic compounds in 2023 (including Outfall 023). An estimated 145.5 tons of organic compounds have been collected and treated since the GWRS began continuous operation in 1992. **Figure 2-1** depicts the 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 2023.

## 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 23 of the 27 well locations in direct response to GWRS operation. These declines in TVOC concentrations indicate effective hydraulic control created by the GWRS over the 31 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 11,220 μg/l in 2023 (**Appendix C**). 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 there appears to be a decreasing trend. The 2023 results at this location are higher than the two previous sampling events where concentrations were less than 65,000 µg/l, this is expected to be a result of the variability of TVOC concentrations. The concentrations in on-site well 1AR3 (northeast of DEC-3R and PW-39) 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 decreased 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, supported by an observed decrease to 759,800 µg/L in 2023.

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 decreased to the lowest observed at this location (25.3 µg/L). The TVOC result in 2023 at 2A was 183 µg/l and aligns with the decline TVOC trend at this location. Well 3A (no TVOCs detected in 2023), 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 2023 TVOCs not detected result represents two years in a row of the lowest TVOC concentrations at this location.

West Plant well 16A has shown a decreasing trend in TVOC concentrations over time as well. Originally TVOCs were greater than 30,000 µg/l but decreased less than 1,000 µg/l the between 2015 and 2021. There was a slight increase in 2022 and 2023 to 2,185 however, the overall trend remains decreasing. At West Plant well 13A concentrations have remain significantly lower than early sampling having declined from greater than 100,000 µg/L to near or below 100 µg/L since 2000. West Plant well 15A decreased in to 340 µg/L in 2023.

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) and 2023 (3,366 µg/l) increased from the 2021 concentration (335.3 µg/l). THT and related compounds were the only VOCs detected at well 18A in 2022 and 2023. THT and related compounds chlorobenzene were the predominate compounds detected at 17A in 2023. Concentrations at 17A have demonstrated a downward trend since 2000.

East Plant well 24A, near Gill Creek, remains relatively low compared to concentrations in 1900s and the 2005-2012 period and degradation products VC and DCE are the main VOCs.

Well 20AR was not sampled between 1994 and 2017 due to a lack of water in the well. Between 2017 and 2022 TVOC concentrations ranged from 2.5 µg/l to 11 µg/l and in 2023 the concentrations were 3.4 µg/l.

At well 21A (near Gill Creek in the West Plant) 2021 and 2022 TVOCs were below the analytical detection limits and in 2023, TVOC concentrations were 59.7 µg/l, which remains significantly lower than early concentrations which were greater than 10,000 µg/L.

### 3.3.2 Bedrock Water-Bearing Zones

***B-Zone Bedrock***

B-Zone monitoring wells 1BR, 2B, 3B, 5BR, 8B, 12B, 14B, 16B, 19B, 20B, 23B, 24B, 25B, and 29B 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 14 of the 15 B-Zone wells in the five-year 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 seventeen years and less than 15 μg/l the last six years. In 2023, TVOC concentrations at well 5BR decreased to 3.4 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. Also, on the western side of the Site, TVOC concentrations in wells 16B and 19B have continued to decline. Decreases at these wells provide further evidence that the plume is controlled by the pumping systems and retracting that the outer edges of the plume. The lowest observed TVOC concentrations have been observed at well 16B the last three times the well had been sampled (2015, 2016, and 2018). Despite an increase in 2023 to 189,150 μg/l, well 16B continues to show an overall declining trend in TVOC concentrations. Future sampling will determine if the TVOC result in 2023 is anomalous or part of an increasing trend. Concentrations at this location have declined from over 100,000 μg/l in 1992 to 173 μg/l in 2018, representing a three orders of magnitude decline. TVOC concentrations at well 19B in 2023 (5.1 μg/l) were the lowest observed since 1998. TVOC concentrations at this well were 18,400 μg/l in 1995, representing a decrease of four orders of magnitude decrease in TVOC concentrations.

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 3,500 μg/l over the last fourteen years and 1,000 μg/l or less the last four years. West Plant well 14B has maintained consistent TVOC concentrations between 335,000 μg/l and 560,000 μg/l over the last 21 years except for a result in 2019 of 653,000 μg/l. The TVOC result at well 14B in 2023 (448,000 μg/l) was up slightly from the 2022 result but lower than the three previous years. Well 1BR in the southern part of the West Plant near Gill Creek, has demonstrated a declining trend in TVOCs with the last seventeen years below 200,000 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 2023, the concentration at 3B (554,200 μg/l ) was slightly higher than recent results but maintains a decreasing trend. Well 2B is between the BFBTs in the West Plant and has shown a decreasing trend from over 1,300,000 μg/l in 1994 with a TVOC concentration of 83,270 μg/l in 2023.

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 65,000 μg/l the last nineteen years. 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. An increase 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 2023, the TVOC concentration was 3,170.7 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 2023 TVOC result of 243,650 μg/L is consistent with TVOC concentrations prior to 2021. East Plant well 30B had a TVOC concentration of 6,141 μg/L, which was a decrease from the 2022 and 2021 results (10,942 μg/L and 58,519 μg/l, respectively). TVOC concentrations at 30B consist of THT and related compounds. East plant well 12B has demonstrated a decreasing trend with a high of over 190,000 μg/l in 1994 to 11,820 μg/l in 2023, which is slightly higher than the last few years but consistent with results from 2012 and earlier. Well 23B is northeast of the east plant and has demonstrated a declining trend over time. TVOC concentrations have declined from over 3,500 μg/l in the 1990s to less than 10 μg/l between 2005 and 2014, with the last four sampling events being below between 10 and 50 μg/l. Well 29B is in the northwest corner of the East Plant and demonstrates declining TVOC concentrations over time. In 2002 concentrations were over 5,500 μg/l and have decreased to under 250 μg/l the last six years with a 2023 result of 206.2 μg/l TVOCs.

With the abandonment of well 22B in 2022, well OBA-01B was sampled in 2023. The TVOCs concentrations at 22B was 24.6 μg/l. When additional analytical results for OBA-01B are available, the trend will be evaluated.

***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 increased 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 increase (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 and again in 2023 concentrations decreased slightly to 377 μg/L, again the lowest TVOC concentrations observed at 25C/CD for two years in a row. Despite the increases in concentrations identified, an overall decreasing trend in TVOC concentrations has been maintained.

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 increase at 129,200 μg/l but remained within the historic range. The 2020 through 2023 results (between 72,500 and 92,800 μg/l) were less than the 2019 result but remain above the 2016 through 2018 results. Downgradient well 18C shows an overall flat trend of TVOC concentrations over time. TVOC concentrations in 2022 and 2023 at 18C (55,365 and 63,515 µg/l, respectively) consisted mainly of THT. The 2022 and 2023 TVOC results are an increase compared to prior results which had been between 950 and 14,000 the previous ten years. Future sampling will determine if the results found in 2022 and 2023 anomalous or the beginning of an increasing trend. Well 22C has been sampled on the annual schedule but was abandon in 2021. OBA1-C was sampled in 2022 and 2023 with respective TVOC concentration results of 246,000 and 312,890 µg/l.

TVOC increases at West Plant wells 15CD, 19CD1, and 26CD were noted over the past recent years. At 15CD TVOCs increased from approximately 60,000 µg/l to greater than 240,000 µg/l starting in 2016 and TVOC concentrations continue to be greater than 240,000 µg/l through 2023. 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). Well 19CD1 TVOC concentrations returned to pre-2019 levels (4,800 µg/l) in 2023. 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.

Well 4CR (west of PW-37) has historically shown a wide range of TVOC concentrations and has shown a slight increasing trend over the years, however between 2018 and 2023 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. In 2023, TVOC concentrations were similar to the previous year (6,200 µg/l). Flow in in this area has been demonstrated to flow towards the Olin pumping well and is therefore within the capture zone.

Well 1C is in the southeast corner of the West Plant. TVOC concentrations at this location peaked at 551,000 µg/l in 1994 and ranged from 500 to 551,000 µg/l between 1992 and 2002. Between 2003 and 2018 TVOC concentrations decreased and were between 20 and 11,200 µg/l and then an increase was noted between 2019 and 2023 with concentrations ranging between 61,200 and 94,200 µg/l. A decreasing trend of TVOC concentration was maintained at well 1C.

East Plant monitoring well 7CR, located near the downgradient boundary of the Plant, continues to exhibit long-term declines in TVOC concentrations. TVOC concentrations are mainly attributed to the presence of THT. Wells 7CR had been relatively low in TVOC concentrations (less than 50 µg/l) between 2010 and 2018 but had an increase in 2023 of 857.8 µg/l. While this increase is not the highest observed at this location, it is consistent with TVOC concentrations found in the 1990's. The overall trend of TVOC concentrations at 7CR continued to be decreasing.

***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 2023 support these observations. Chemistry results from 2000 to 2023 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. In 2023, the TVOC concentration (357.5 µg/l) increased back to levels similar to 2019 and 2021. 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. In 2023, DCE, VC, and TCE were identified.

West Plant well 5DR is in the west yard. TVOC concentrations at this location between 1995 and 2018 ranged from 1.1 to less than 40 µg/l. In 2023, the TVOC concentration (850 µg/l) was similar to those observed prior to 1995. TVOC concentrations continue to maintain a decreasing trend at well 5DR. Future sampling will determine is this result is anomalous or is the beginning of an upward trend. In the northwestern corner of the West Plant, well 15D had a similar result in 2023. Previous TVOC concentration results had demonstrated a decreasing trend over time with results between 2011 and 2018 ranging from 1,100 and 3,400 µg/l. In 2023, the TVOC concentration increased to 21,090 µg/l, consistent with results between 1995 and 2000. Future sampling will determine if this result is anomalous or the beginning of a new trend.

***F-Zone Bedrock***

F-Zone wells show a dominant downward trend in TVOC concentrations at seven of the eight wells in the 5-year program (**Appendix C**). This decreasing trend in the F-Zone is evident in that seven of the eight wells are at or below TVOC concentrations of 1,862 µg/l, and only one well, 17F, remains elevated at 20,750 µg/l. Well 17F is north of the East Plant and has concentrations of mainly chlorobenzene and related compounds, 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. Results from the 2023 groundwater sampling event have been used to provide an update of MNA evaluation. Results of this evaluation are provided in **Appendix D**. The next full MNA sampling and analysis is scheduled for 2028.

Evidence complied during the past five years of the natural attenuation assessment are 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 is shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic bioremediation in the various fracture zones.

## 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 0.16 J µg/l and beta-BHC at 0.061 µg/l). Six VOC compounds were detected and included 1,1,2,2-tetrachloroethane (40 J µg/l), DCE (41 J µg/l), PCE (61 J µg/l), TCE (46 J µg/l), VC (2.1 µg/l), and chlorobenzene (1.1 µg/l). All semi-volatile organic compounds and PCB compounds were below detection limits. Downstream sample SW-2 has a reported TVOC concentration of 99.25 µg/l which included PCE at 28 µg/l, TCE at 30 µg/l, DCE at 22 µg/l, VC at 2.25 µg/l, and 1,1,2,2-tetrachloroethane at 40 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 2023 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 concentration at SW-2 (10.5 µg/l) return to levels consistent with results prior to 2021 and in 2023 TVOC concentrations were between the two previous years (99.25 µg/l).

## 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 2023, no silicone oil was observed in PW-20 and 14.0 gallons were recovered from PW-24. **Appendix C** provides tabulated summaries of the quarterly silicone oil recovery data. Silicone oil has never been observed at PW-22 since inspections began at this location in 3Q00. To date, 64 gallons and 2,188.0 gallons of Silicone Oil have been recovered from PW-20 and PW-24 respectively. A total of 2,252.0 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 32 years of operation. The 2023 GWRS operations are summarized as follows:

- System uptime was 99 percent for the 23 original pumping wells that are still in use.
- PW-37 uptime was 99 percent.
- PW-39 uptime was 99 percent.
- Olin Production Well system uptime was 100.0 percent.
- Operation of BFBT pumping wells PW-37 and PW-39 continued throughout 2023, 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 2023.
- Hydraulic control in A-Zone Overburden and the A-Zone Bedrock was exercised over 86 percent of the Plant's area for 2023.
- Approximately 2.9 tons of organic compounds were removed and treated during 2023. This includes the GWRS (1.9 tons), Olin system (1.0 tons), and outfall 023 (0.1 tons).
- DNAPL monitoring conducted in 2023 indicated no DNAPL was present at PW-39.

Extensive water-level data collected over 32 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 86 percent of the entire Plant in 2023 (A-Zone overburden and bedrock, East and West Plant).

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 and 2023, adjustments to head level within the well have continued. The water levels and capture system were evaluated throughout 2022 and 2023 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 2024 to evaluate the effectiveness of PW-43. This will include the additional piezometers installations completed in 2023 in the East Plant.

An estimated 145.5 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 2.9 tons of organic compounds removed and treated as part of the Plant's remediation efforts during 2023 equates to 2.0 percent of the total estimated organic compounds removed from groundwater since the system began operating.

## 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, utilizing data collected in 2023, 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 2028. 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 2023.

# 5.0 REFERENCES

Air Force Center for Engineering and the Environment. 2008. Technical Protocol for Enhanced Anaerobic Bioremediation using Permeable Mulch Biowalls and Bioreactors

DuPont CRG. 1999. Quality Assurance Project Plan: Groundwater Monitoring Program, DuPont Niagara Plant, Version 4.0. May.

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

_____. 2009. DuPont Niagara Modified Operating Evaluation Report. August 6.

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

_____. 2008. M. Hinton. Correspondence RE: Removal of Wells from Sampling Program. July 7.

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

_____. 2016. M. Hinton. Correspondence RE: Recommendations for Reduction of Long Term Groundwater Monitoring Program. December 9.

_____. 2019. B. Sadowski. Correspondence (email reply to letter dated January 25, 2019) RE: Niagara Plant - Groundwater Sampling Methods. March 19.

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

_____. 2023a. Groundwater Remediation System Annual Report 2022 Chemours Niagara Plant. March, 2023.

Woodward-Clyde Diamond. 1999. Niagara Plant Quality Assurance Project Plan.

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

# 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*** | | | | | | | | | | | | | | | |
| 9 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** | 2023** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***GWRS*** | | | | | | | | | | | | | | | | | |
| 9 Original Wells Uptime | 75% | 98% | 100% | 99% | 96% | 100% | 99% | 96% | 98% | 93% | 97% | 96% | 95% | 95% | 97% | 97% | 99% |
| PW-37 Uptime | 12% | 32% | 92% | 100% | 93% | 99% | 100% | 97% | 98% | 89% | 96% | 93% | 98% | 96% | 97% | 97% | 99% |
| PW-39 Uptime | 66% | 93% | 99% | 100% | 93% | 98% | 94% | 97% | 98% | 92% | 91% | 75% | 98% | 97% | 97% | 97% | 99% |
| 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% | 99% |
| 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 | 11.0 |
| 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 | 3,811 |
| Number of unscheduled system shutdowns | 3 | 0 | 0 | 1 | 4 | 1 | 1 | 1 | 0 | 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 | 1 |
| Pump Replacements | 5 | 10 | 11 | 7 | 3 | 3 | 3 | 3 | 3 | 5 | 4 | 3 | 6 | 4 | 1 | 3 | 3 |
| Pump Repairs Requiring > 48 Hours | 23 | 11 | 4 | 2 | 0 | 1 | 5 | 10 | 2 | 2 | 6 | 1 | 6 | 1 | 0 | 1 | 0 |
| ***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% | 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 | 1,936 |
| ***OUTFALL 023*** | | | | | | | | | | | | | | | | | |
| Estimated Pounds of Organics Treated | 326 | 544 | 699 | 224 | 355 | 303 | 337 | 355 | 241 | 398 | 570 | 498 | 191 | 126 | 200 | 146 | 151 |
| ***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 | 5,898 |

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, WPT-26, 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, EPO-10, EPT-10, EPO-11, EPT-11, EPO-12*, EPT-12* |
| ***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, PW-43 |
| ***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-01B, OBA-01C, PN-25 C/CD |
| ***Gill Creek Stilling Wells*** |
| GC-1, GC-2 |

* Well added to hydraulic monitoring program 2023
** 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]<br>PW-16, PW-18, PW-19, PW-20, PW-22, PW-24, PW-26, PW-35, PW-36, PW-37, PW-39, PW-43 | Every five years (next is 2028) |
| ***Utility wells***<br>U-1 | Annual |
| ***Outfall***<br>023 | Quarterly |
| ***Monitoring wells (A-Zone wells)***<br>1AR3, 2A, 3A, 6AR, 8A, 9AR, 13A, 14A, 15A, 16A, 17A, 18A, 20AR[5], 21A, 24A, 27A, 28A | Annual |
| ***Monitoring wells (A-Zone wells)***<br>4AR, 5AR, 7AR[4], 10A, 12A, 19A, 23AR | Every five years[5] (next in 2028) |
| ***Monitoring wells (B-Zone wells)***<br>1BR, 3B, 5BR, 8B, 14B, 20B, 24B, 25B, 29B, 30B | Annual |
| ***Monitoring wells (B-Zone wells)***<br>2B, 12B, 16B, 19B, 23B, OBA-01B | Every five years[5] (next in 2028) |
| ***Monitoring wells (C/CD-Zone wells)***<br>1C, 2C, 4CR, 12 C/CD, 15CD, 18C, 19CD1, 25C/CD, 26CD, OBA-01C | Annual |
| ***Monitoring wells (C/CD-Zone wells)***<br>5CDR, 7CR, 17B, 23C | Every five years[5] (next in 2028) |
| ***Monitoring wells (D-Zone wells)***<br>1D, 10D, 14D, 18D, 25D | Annual |
| ***Monitoring wells (D-Zone wells)***<br>5DR, 15D, 19D, 23D | Every five years[5] (next in 2028) |
| ***Monitoring wells ( F-Zone wells)***<br>15F, 17F, 23F, 25F | Annual |
| ***Monitoring wells ( F-Zone wells)***<br>1F, 5FR, 7FR, 10F | Every five years[5] (next in 2028) |
| ***DEC wells***<br>DEC-3R, DEC-4R | Annual |
| ***DEC wells***<br>DEC-5 | Every five years[5] (next in 2028) |

[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] Inactive 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 (correspondence dated June 15, 2011); Inactive pumping wells: PW-28, PW-30, PW-32, PW-34 are removed from the 5-year sampling program in 2023 as part of the installation and start-up of BFBT PW-43.

[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 quarterly process samples

[2] With approval from NYSDEC, dissolved barium required once per year at surface water sampling locations and once every 5 years on select groundwater samples

[3] Field measurement

## Table 3-4
## 2023 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, 1Q23 | 1,004,689 | 88% | 789,048 | 84% | 1,793,737 | 86% |
| A-Zone bedrock, 1Q23 | 1,115,271 | 98% | 680,467 | 73% | 1,795,738 | 86% |
| A-Zone overburden, 2Q23 | 1,038,785 | 91% | 796,962 | 85% | 1,835,747 | 88% |
| A-Zone bedrock, 2Q23 | 1,063,227 | 93% | 711,656 | 76% | 1,774,883 | 85% |
| A-Zone overburden, 3Q23 | 1,001,712 | 88% | 788,973 | 84% | 1,790,686 | 86% |
| A-Zone bedrock, 3Q23 | 1,083,514 | 95% | 689,455 | 74% | 1,772,969 | 85% |
| A-Zone overburden, 4Q23 | 969,299 | 85% | 802,710 | 86% | 1,772,009 | 85% |
| A-Zone bedrock, 4Q23 | 1,061,443 | 93% | 687,382 | 73% | 1,748,825 | 84% |
| A-Zone overburden average | 88% | | 85% | | 86% | |
| A-Zone bedrock average | 95% | | 74% | | 85% | |
| **A-Zone average** | **91%** | | **79%** | | **86%** | |

**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% |
| 2023 | 88% | 95% | 85% | 74% | 86% | 85% |

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

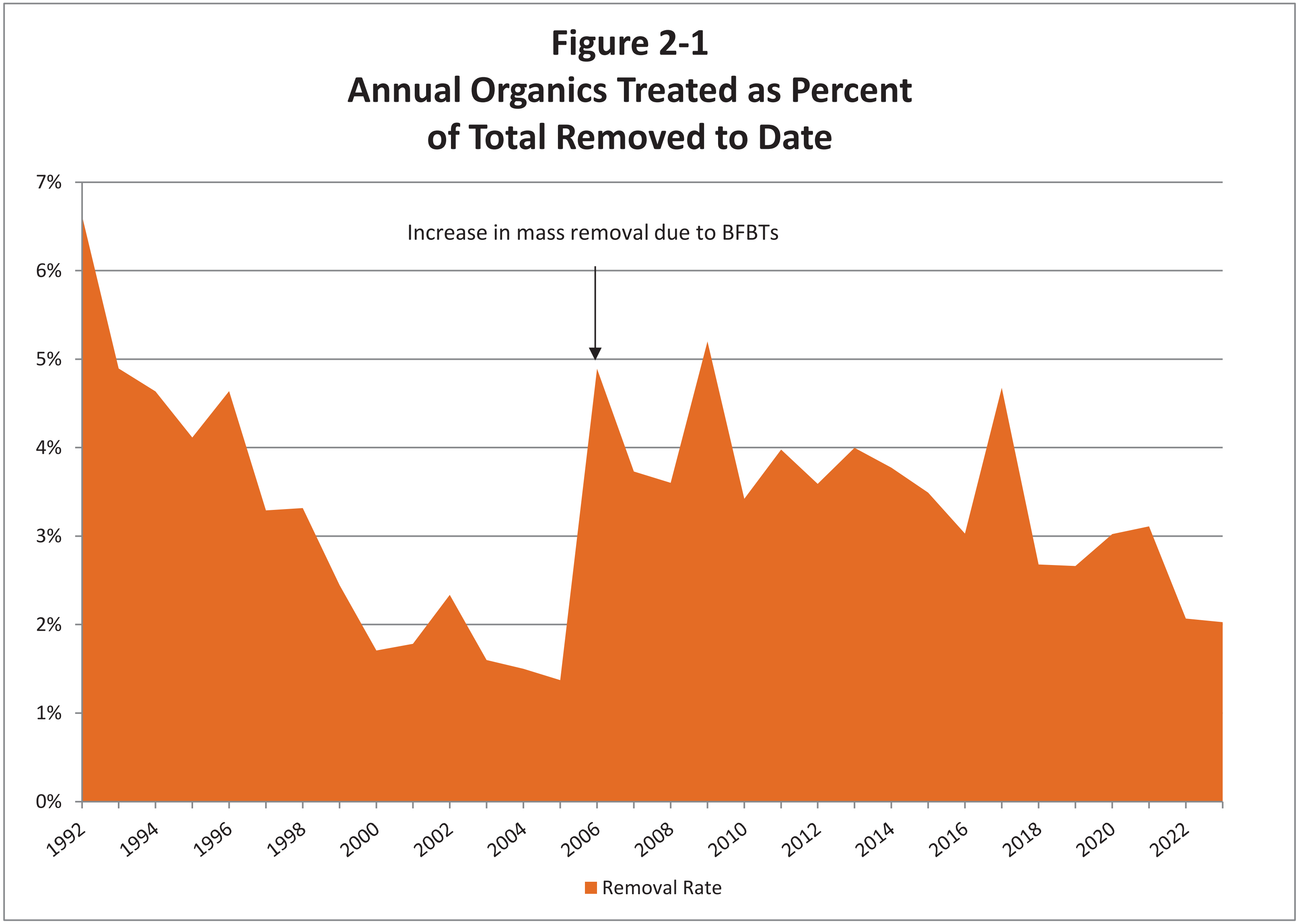

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 03-07-23 |
| Checked by: JWS | Date: 03-09-23 |
| Project Manager: EAF | Date: 03-09-23 |
| | |
| Job number: 453219.03000 | |

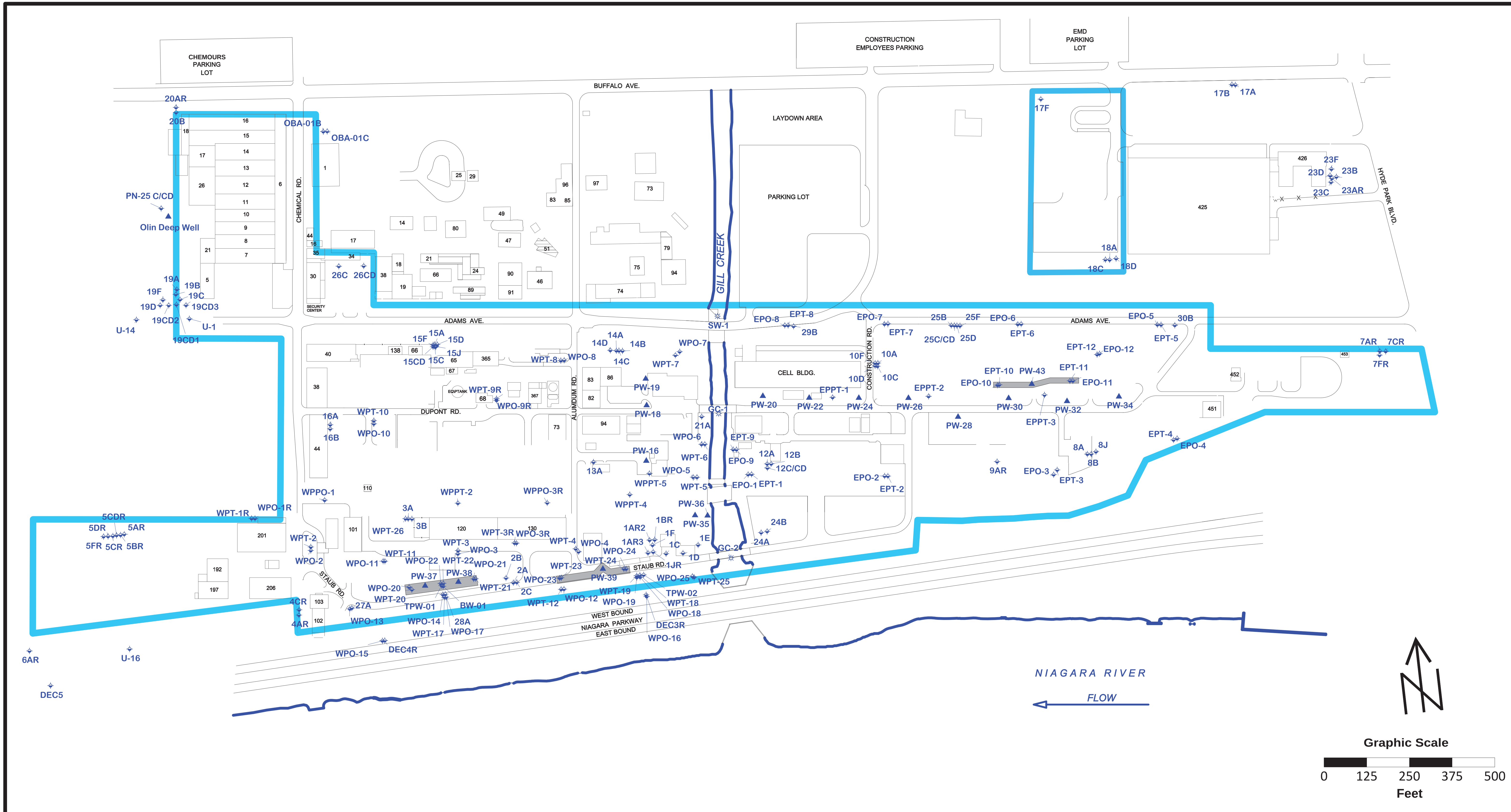
**FIGURE 1-1**
**SITE LOCATION MAP**
**CHEMOURS NIAGARA PLANT**
**NIAGARA FALLS, NY**

/Niagara/hydrogeo/mapping/Site_location_map.srf




PARSONS

\\NYBUF03FS01\Dupont\Niagara\NiaPlant\Reporting\Annual Reports\2023 PRR Annual Report\Att 3 - Annual Report\Figures\
Fig 2-1 2023.xlsx




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 2/21/24 |
| Checked by: JWS | Date: 2/22/24 |
| Project Manager: EAF | Date: 2/22/24 |
| | |

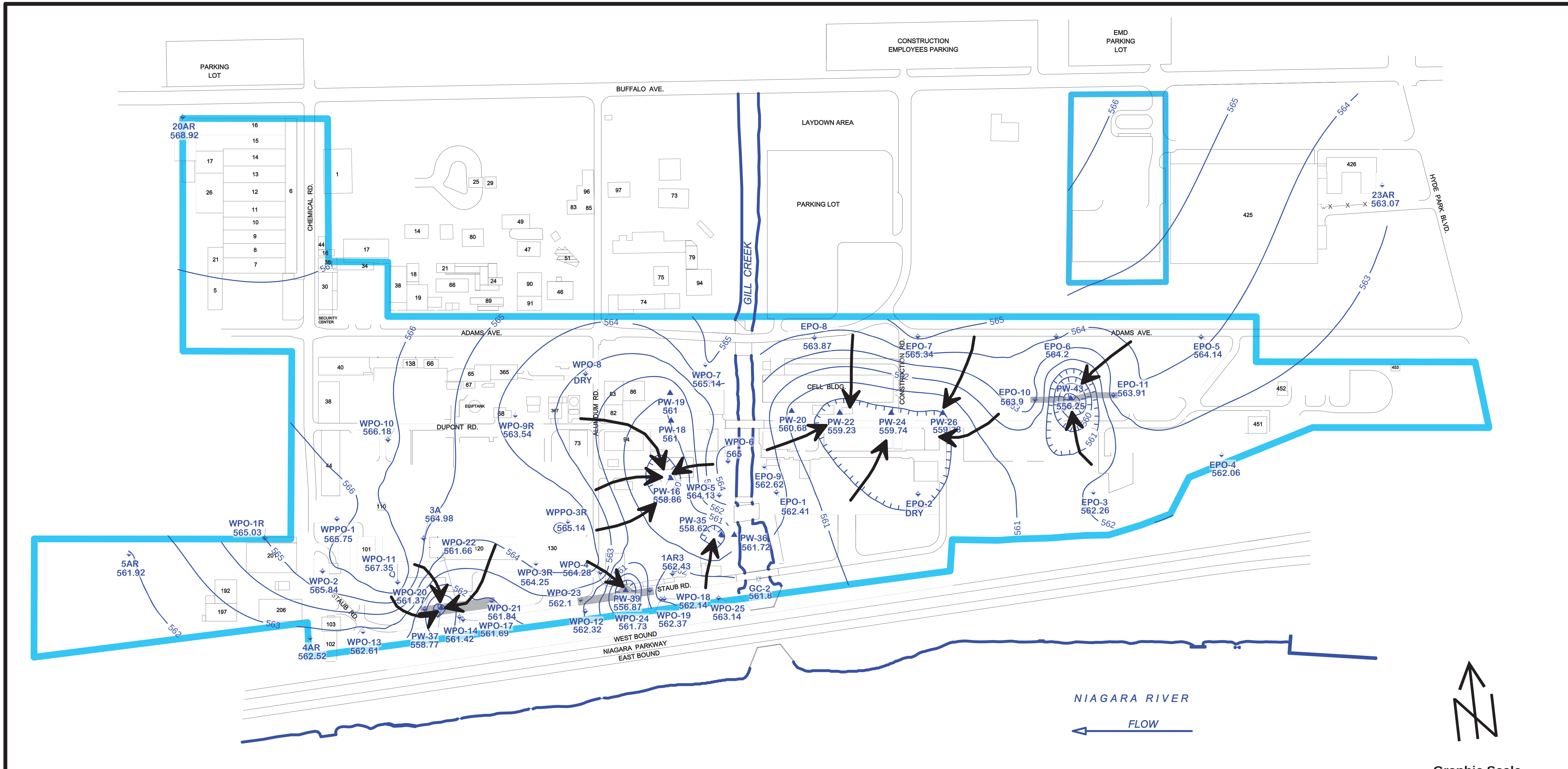
Job number: 453219.03000

## 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 2024.srf




Notes:

Wells EPO-2 and WPO-8 were dry on March 20, 2023.

Graphic Scale

0 125 250 375 500

Feet

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| Job number: 453219.03000 | |

**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

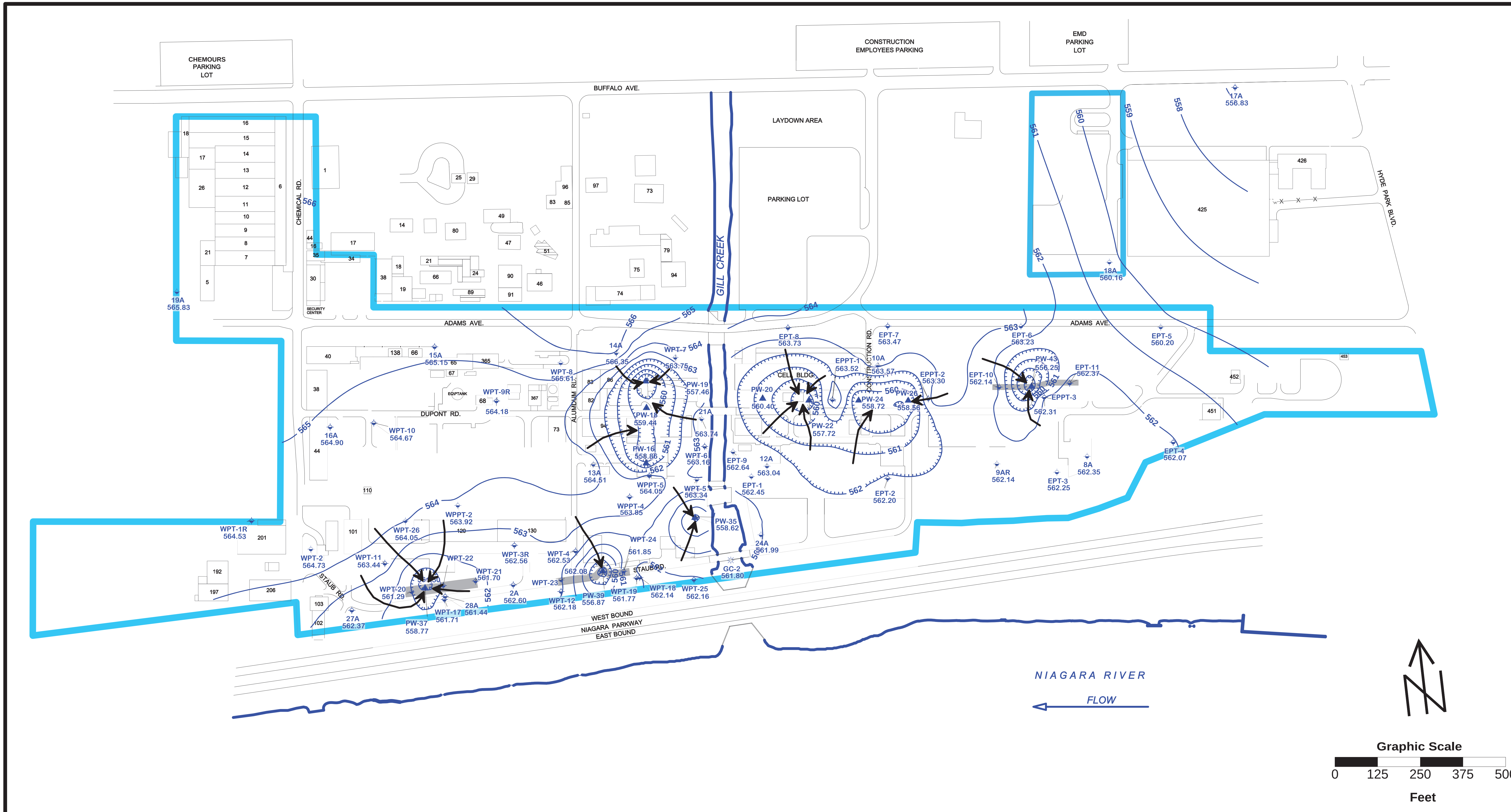
GROUNDWATER CONTOUR

GROUNDWATER CONTOUR DEPRESSION

561 GROUNDWATER CONTOUR ELEVATION

**FIGURE 3-2**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE OVERBURDEN - MARCH 20, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-03-20 NIA Contour Tool/2023-03-20-OBPZ.srf




PARSONS
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

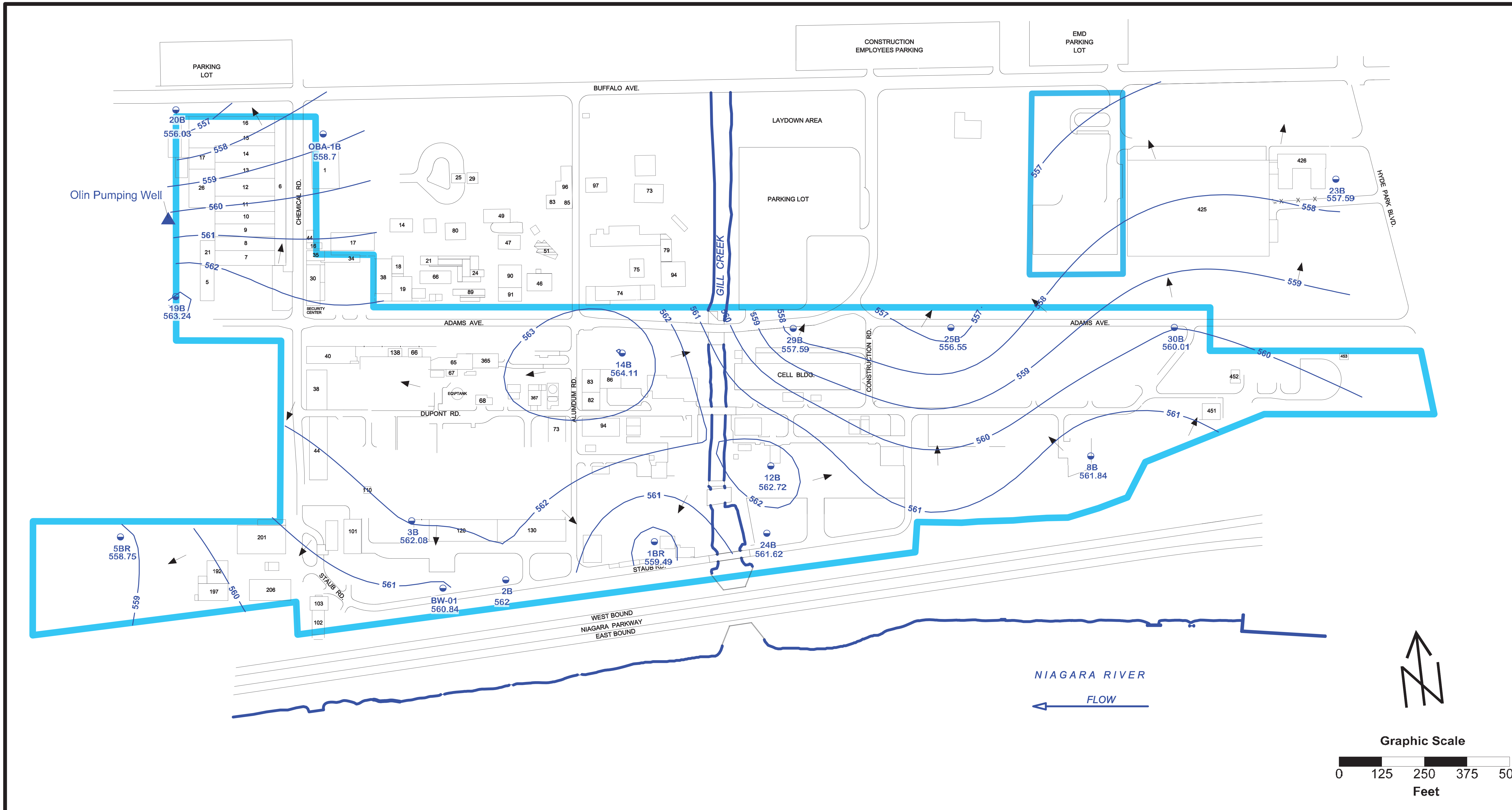
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-3**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE BEDROCK - MARCH 20, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-03-20 NIA Contour Tool\2023-03-20-BRPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |

Job number: 453219.03000

## LEGEND

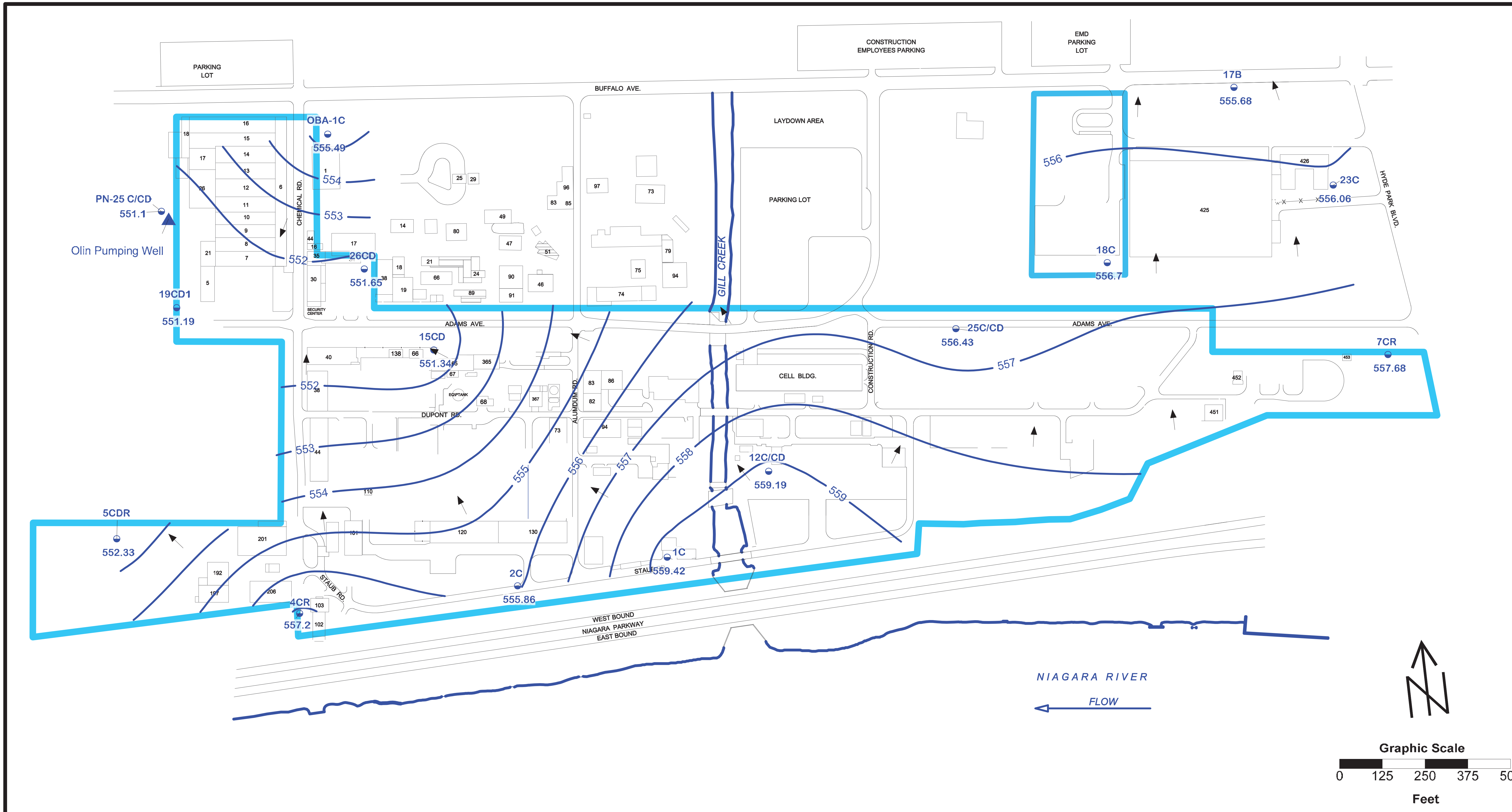
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 - MARCH 20, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-03-20 NIA Contour Tool\2023-03-20-BZPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| | |

Job number: 453219.03000

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

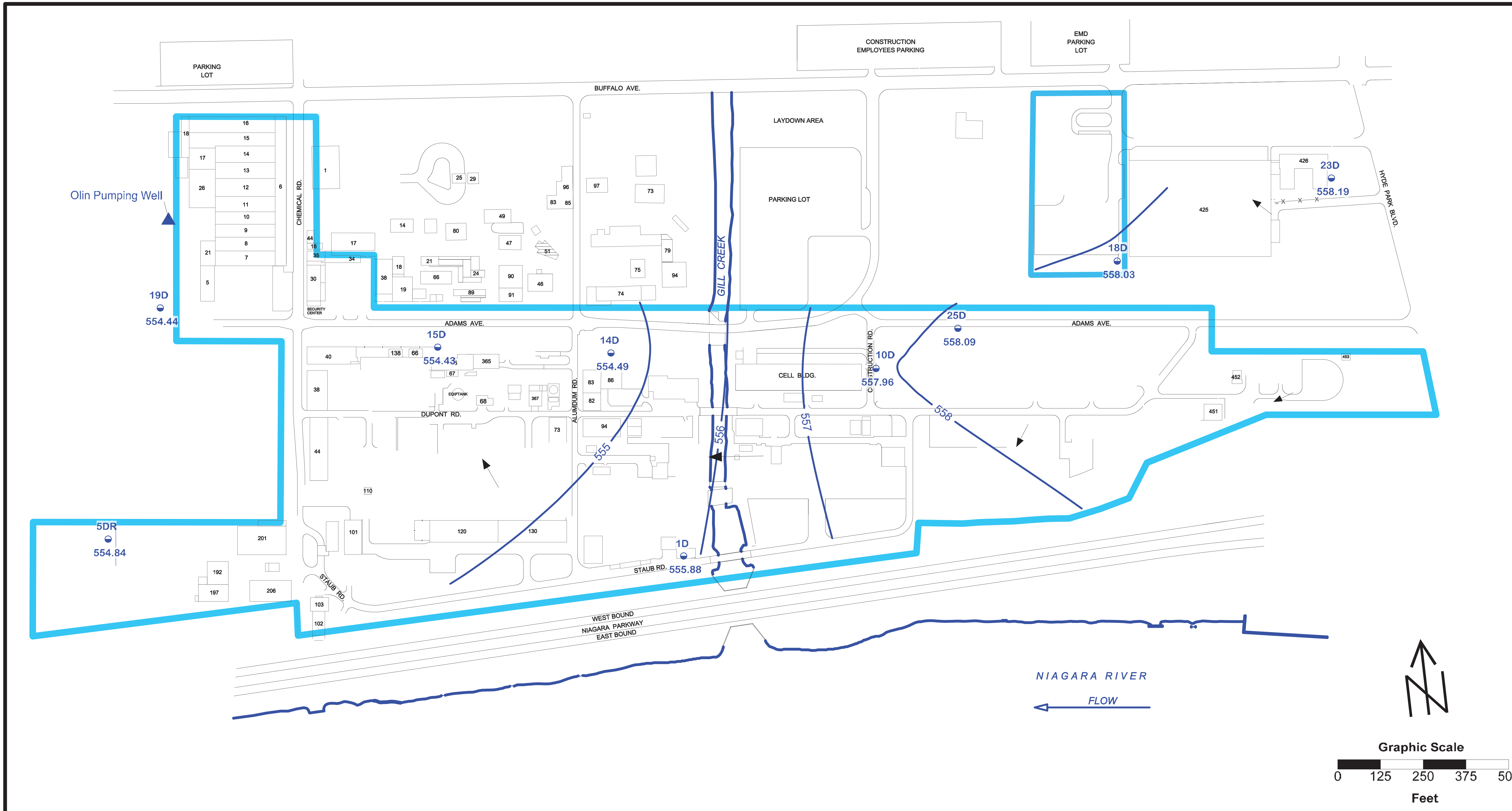
## CHEMOURS WELLS

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

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

**FIGURE 3-5**
**POTENTIOMETRIC SURFACE MAP**
**C/CD-ZONE BEDROCK - MARCH 20, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-03-20 NIA Contour Tool/2023-03-20-CZPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

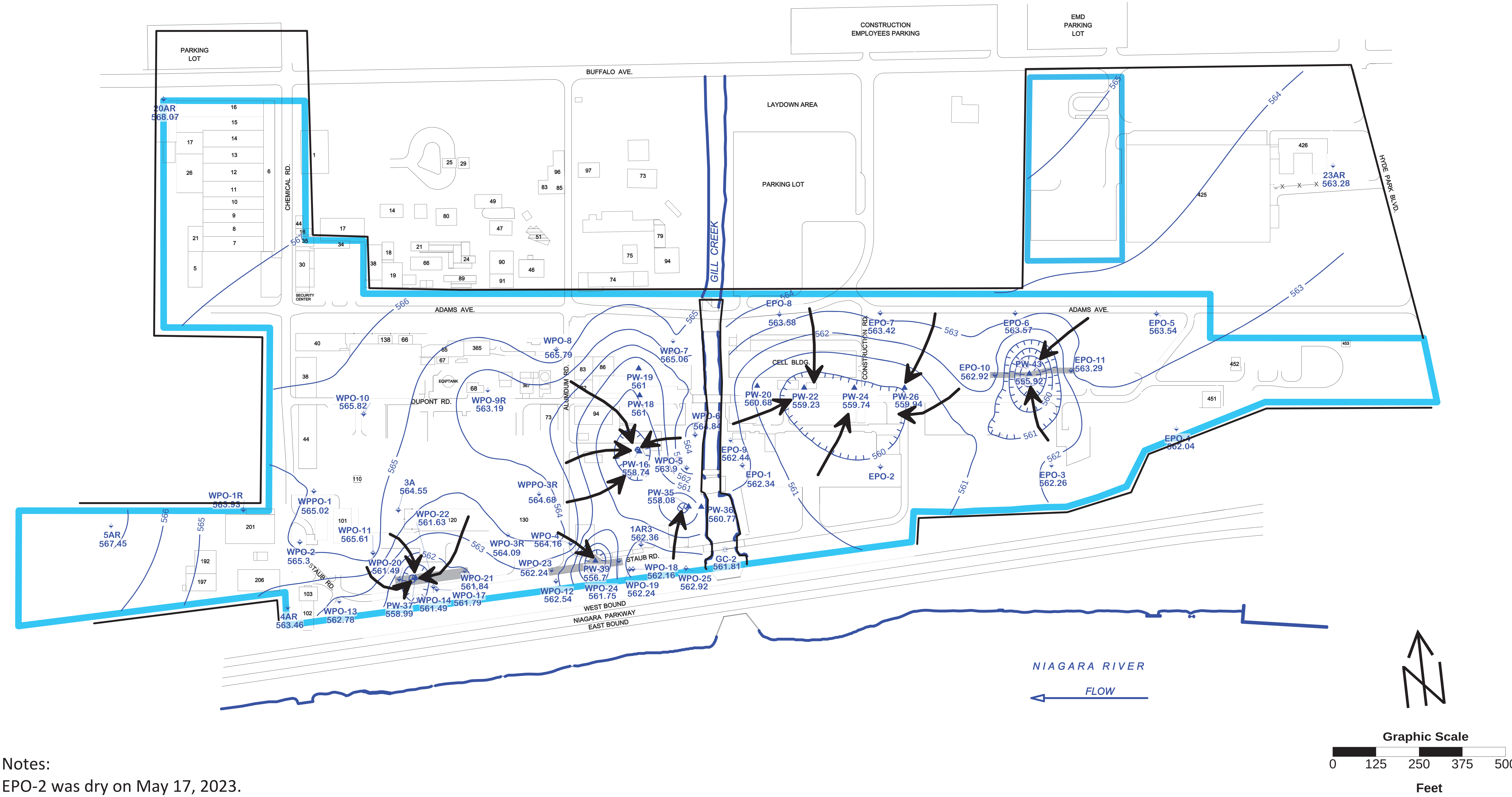
## CHEMOURS WELLS

- 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 - MARCH 20, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-03-20 NIA Contour Tool/2023-03-20-DZPZ.srf




Notes:
EPO-2 was dry on May 17, 2023.

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| Job number: 453219.03000 | |

## LEGEND

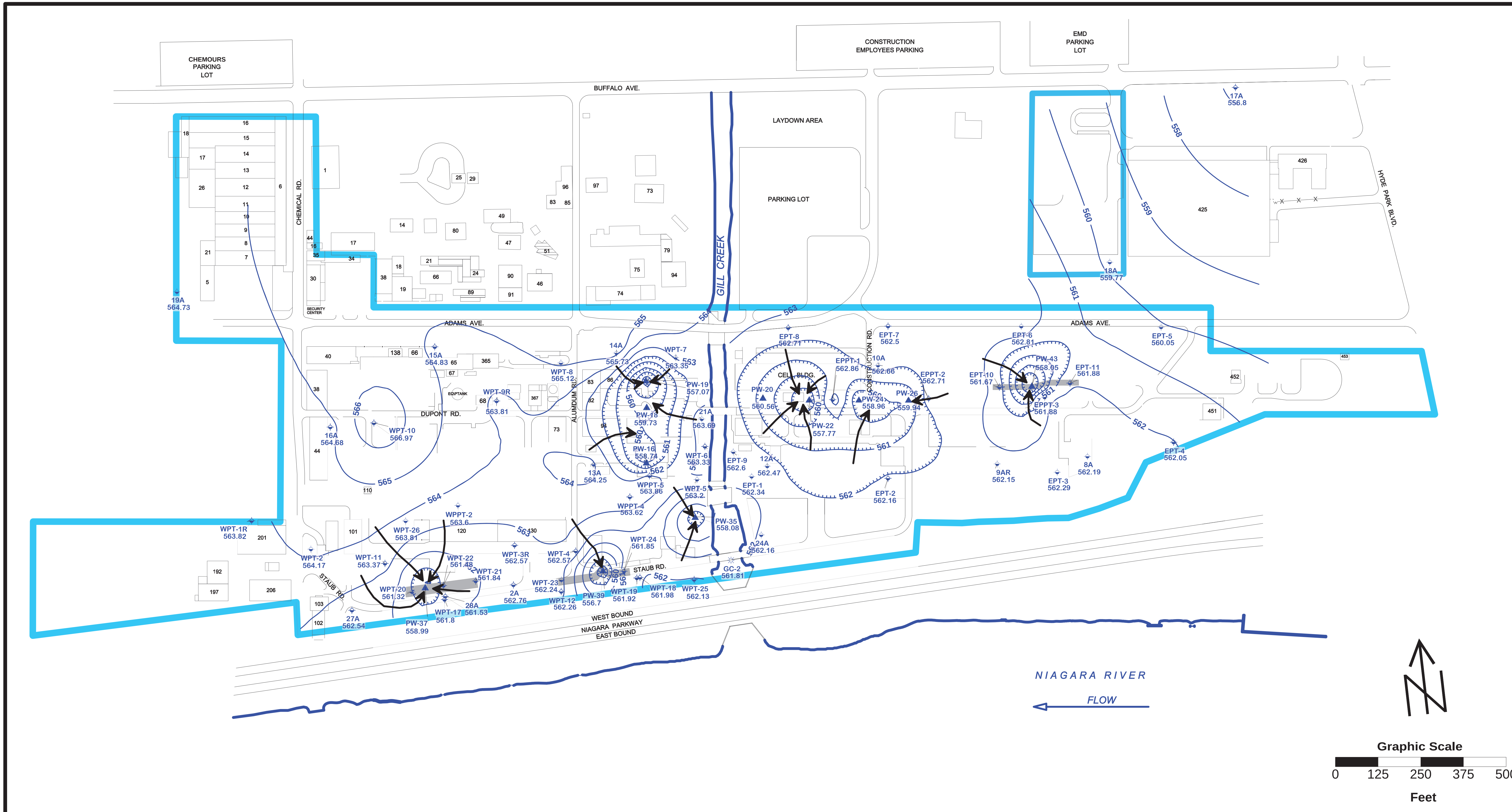
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-7**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE OVERBURDEN - MAY 17, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-05-17 NIA Contour Tool/2023-05-17-OBPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| Job number: 453219.03000 | |

## LEGEND

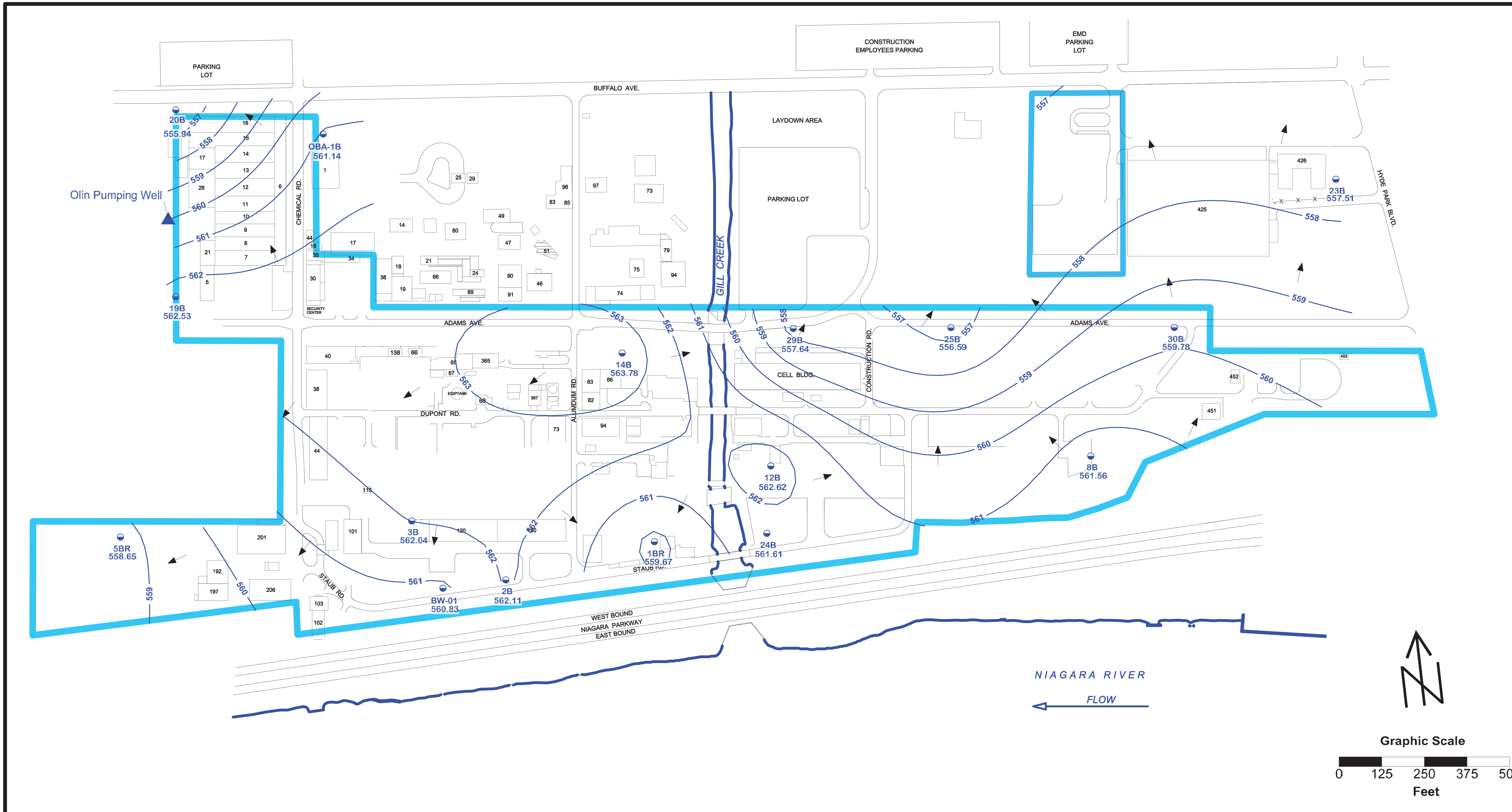
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-8
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - MAY 17, 2023
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-05-17 NIA Contour Tool/2023-05-17-BRPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | Date: |
|---|---|
| Created by: RBP | 6/22/2023 |
| Checked by: JWS | 6/26/2023 |
| Project Manager: EAF | 6/26/2023 |
| Job number: 453219.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

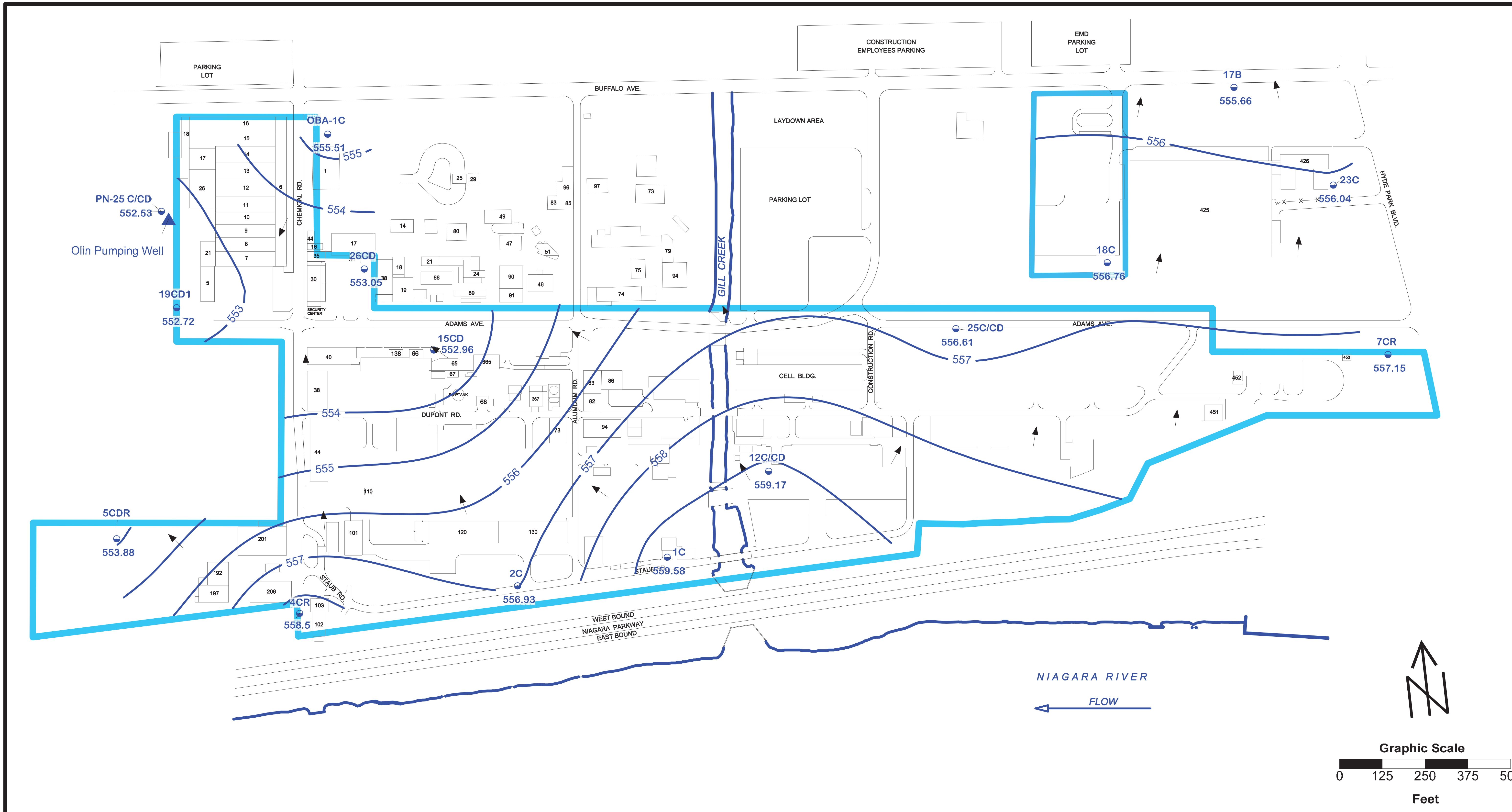
## CHEMOURS WELLS

- 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 - MAY 17, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-05-17 NIA Contour Tool\2023-05-17-BZPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| Job number: 453219.03000 | |

## LEGEND

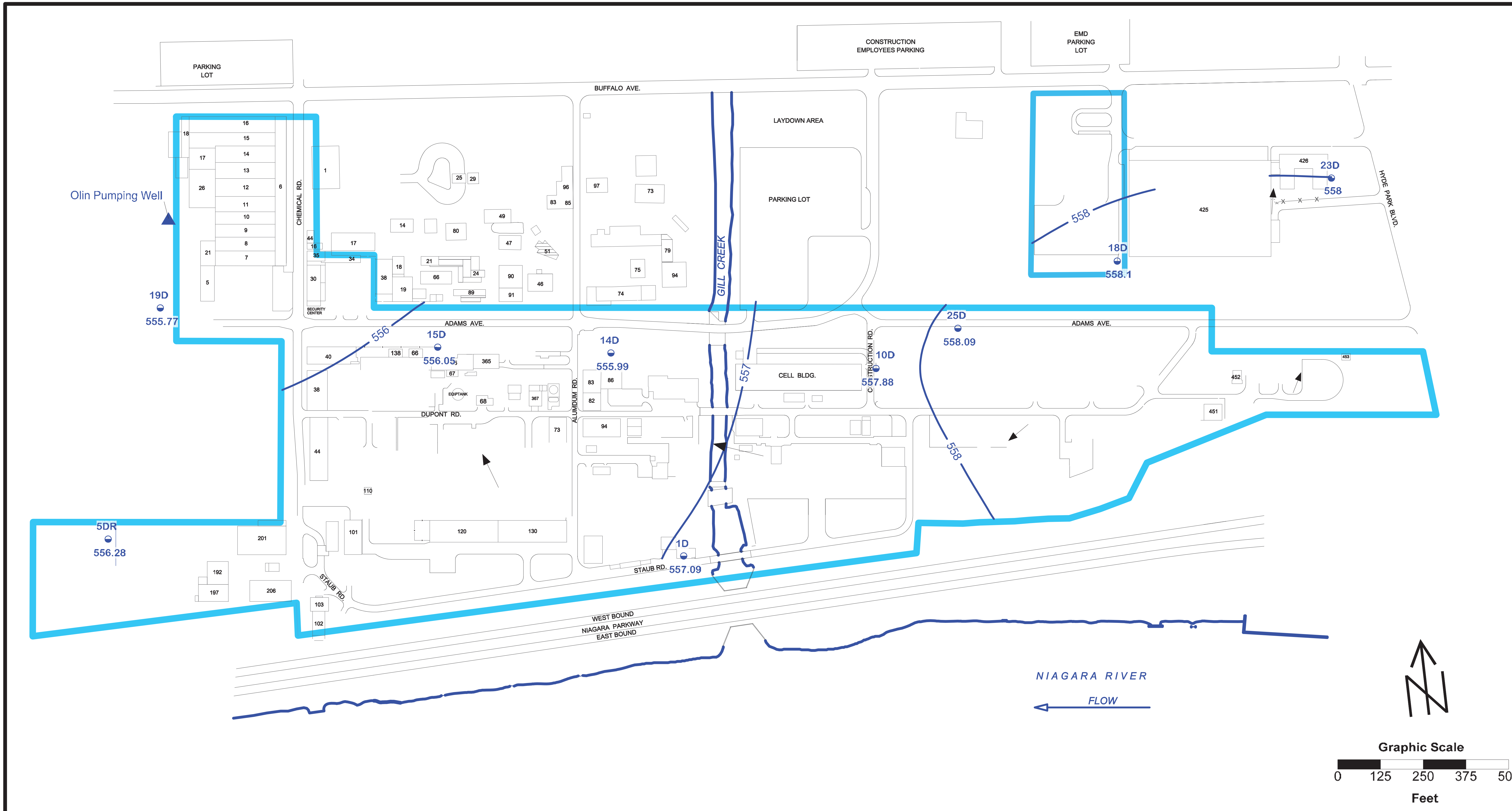
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 - MAY 17, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-05-17 NIA Contour Tool\2023-05-17-CZPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| | |
| Job number: 453219.03000 | |

## LEGEND

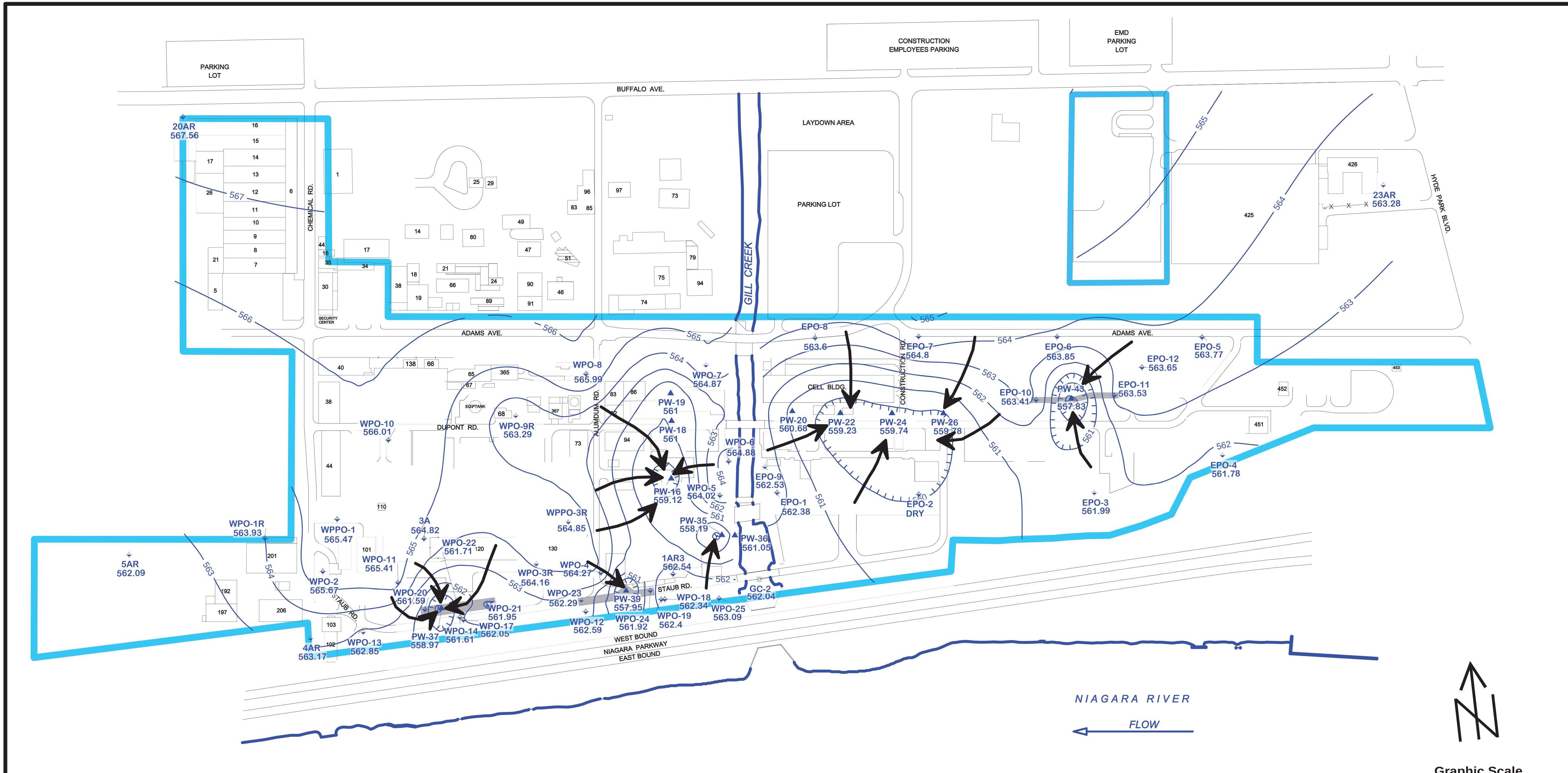
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 - MAY 17, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-05-17 NIA Contour Tool\2023-05-17-DZPZ.srf




Notes:

EPO-2 was dry on August 31, 2023.

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 10/27/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

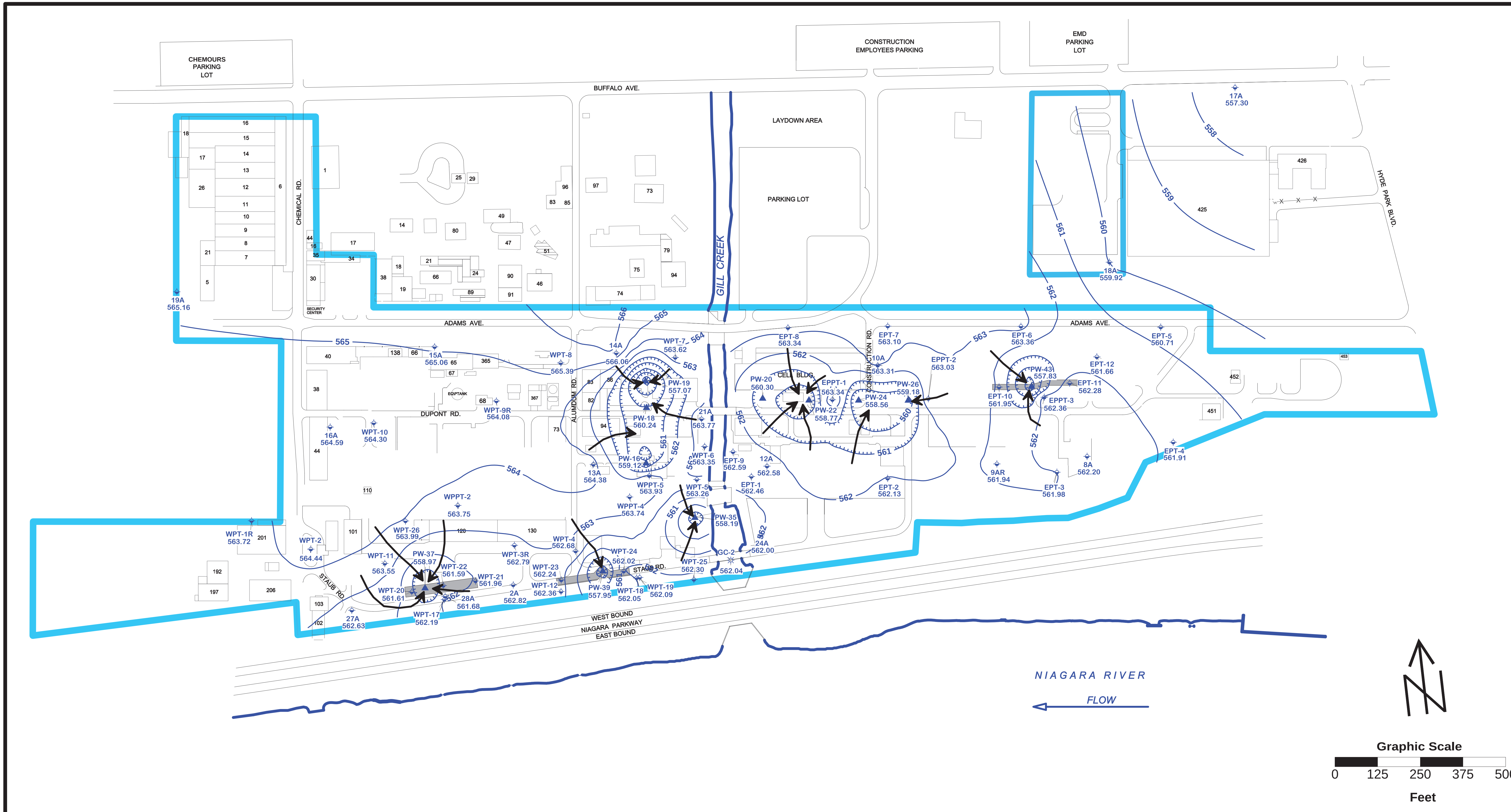
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-12**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE OVERBURDEN - AUGUST 31, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-08-31 NIA Contour Tool/2023-08-31-A-OBPZ.srf




| | | |
|---|---|---|
| **PARSONS**<br>40 La Riviere Dr, Suite 122<br>Buffalo, NY 14202<br>(716) 541-0730 | Created by: TCS | Date: 11/2/23 |
| | Checked by: JWS | Date: 11/8/23 |
| | Project Manager: EAF | Date: 11/8/23 |
| | Job number: 453219.03000 | |

## LEGEND

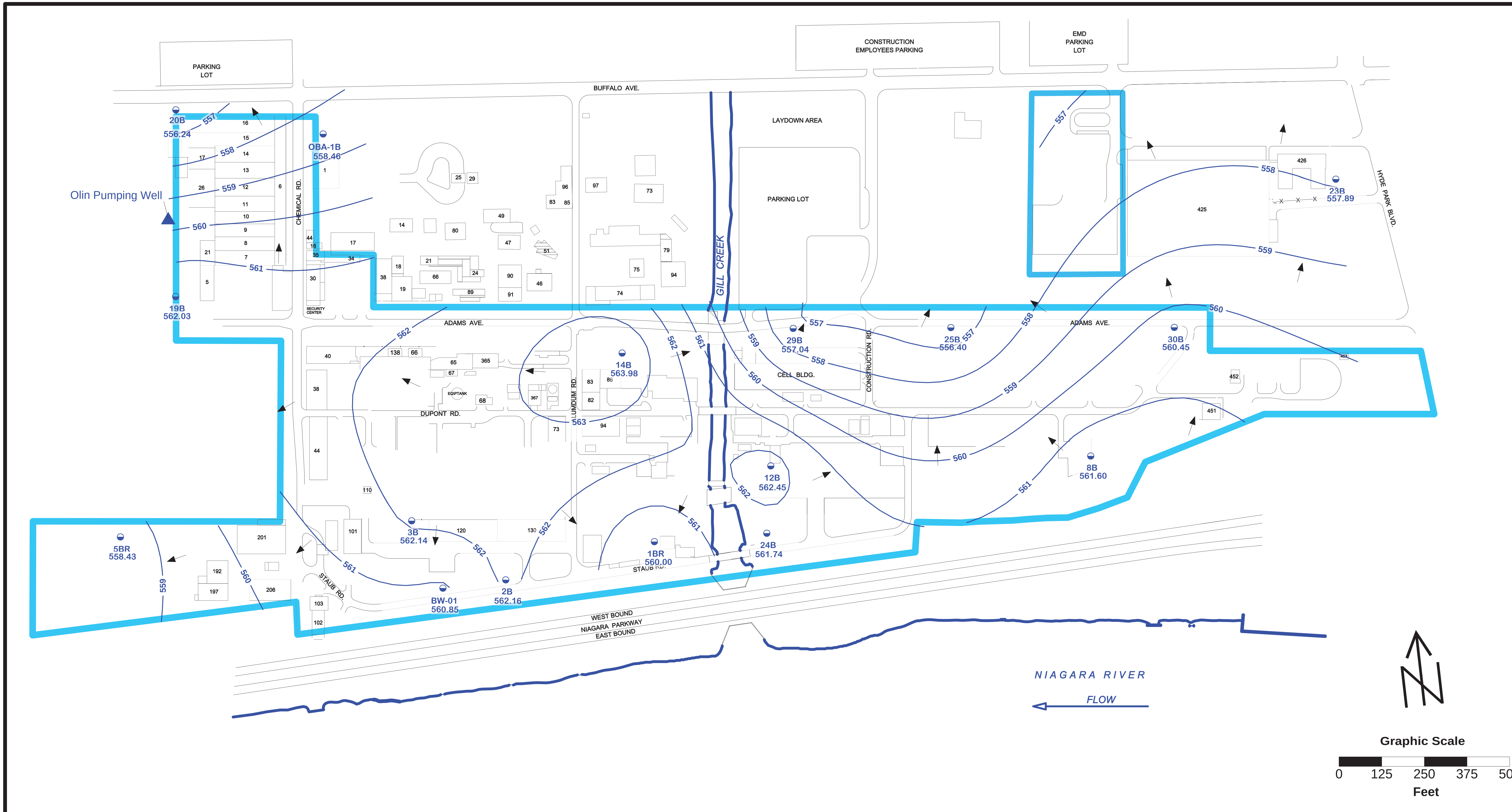
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-13**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE BEDROCK - AUGUST 31, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-08-31 NIA Contour Tool/2023-08-31-A-BRPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 11/01/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |

Job number: 453219.03000

## LEGEND

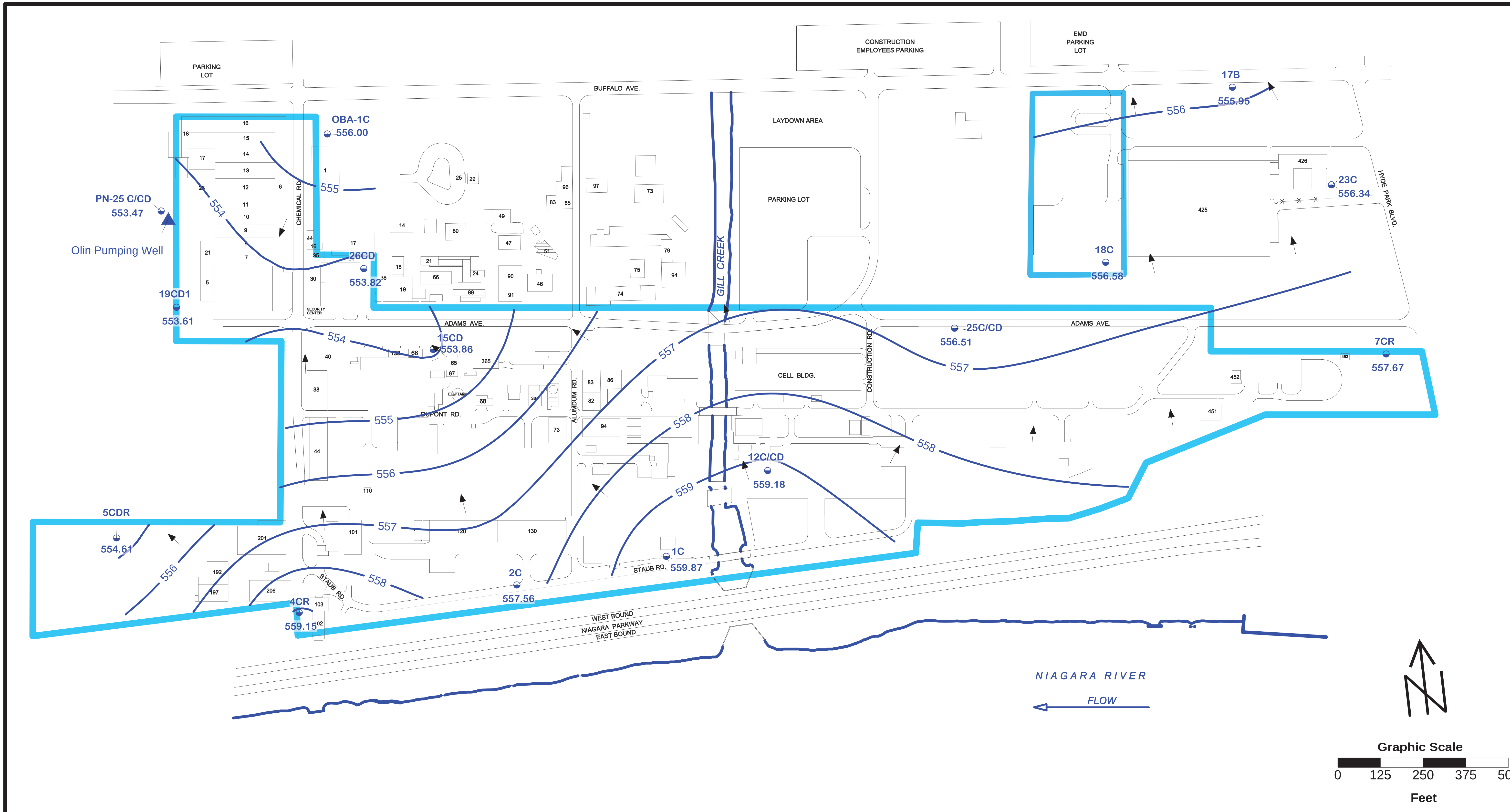
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 - AUGUST 31, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-08-31 NIA Contour Tool\2023-08-31-BZPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 11/01/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

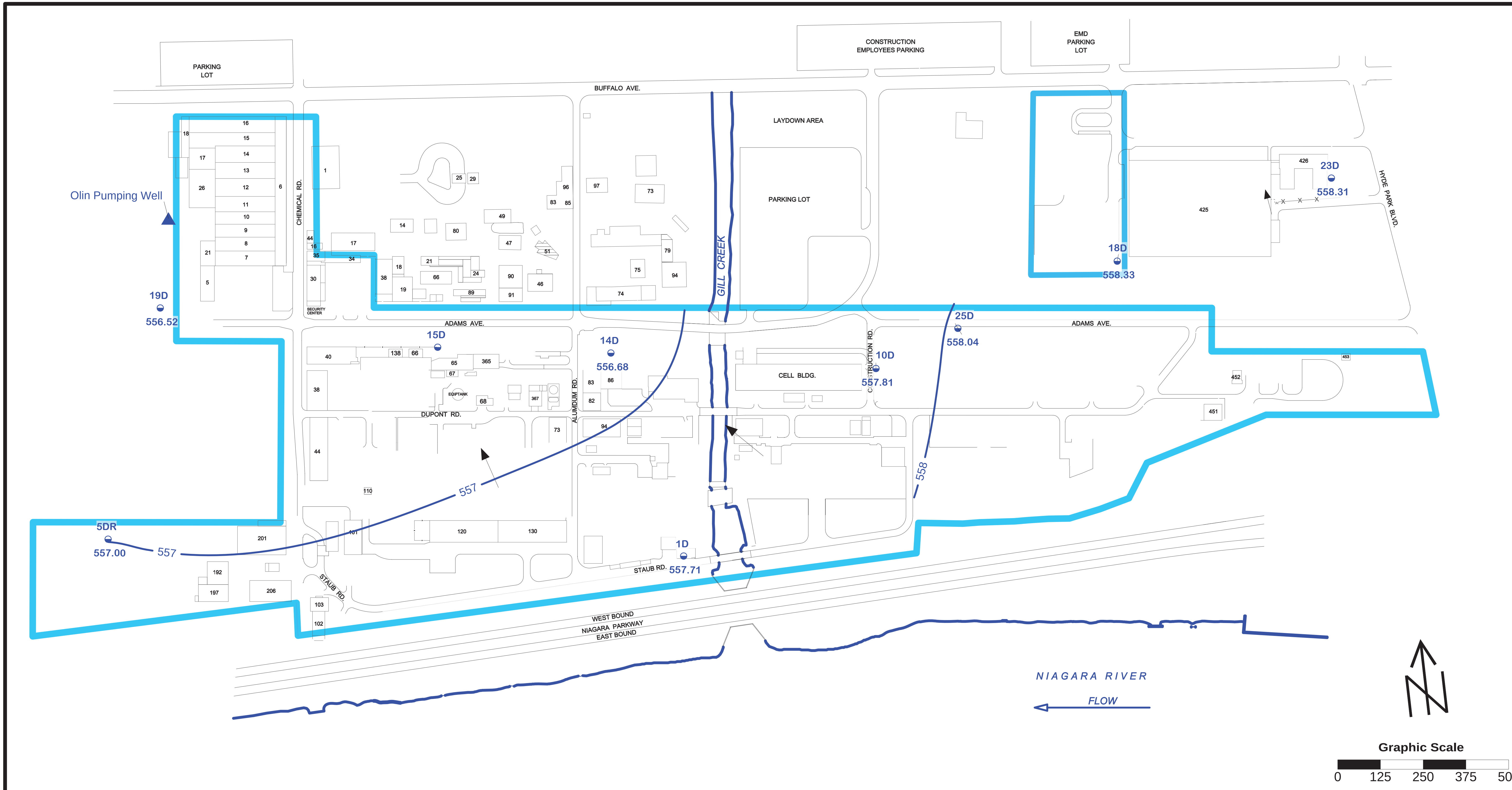
## CHEMOURS WELLS

- 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 - AUGUST 31, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-08-31 NIA Contour Tool\2023-08-31-CZPZ.srf




The water level for 15D was erroneously high and was not used in the contouring.

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 11/01/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

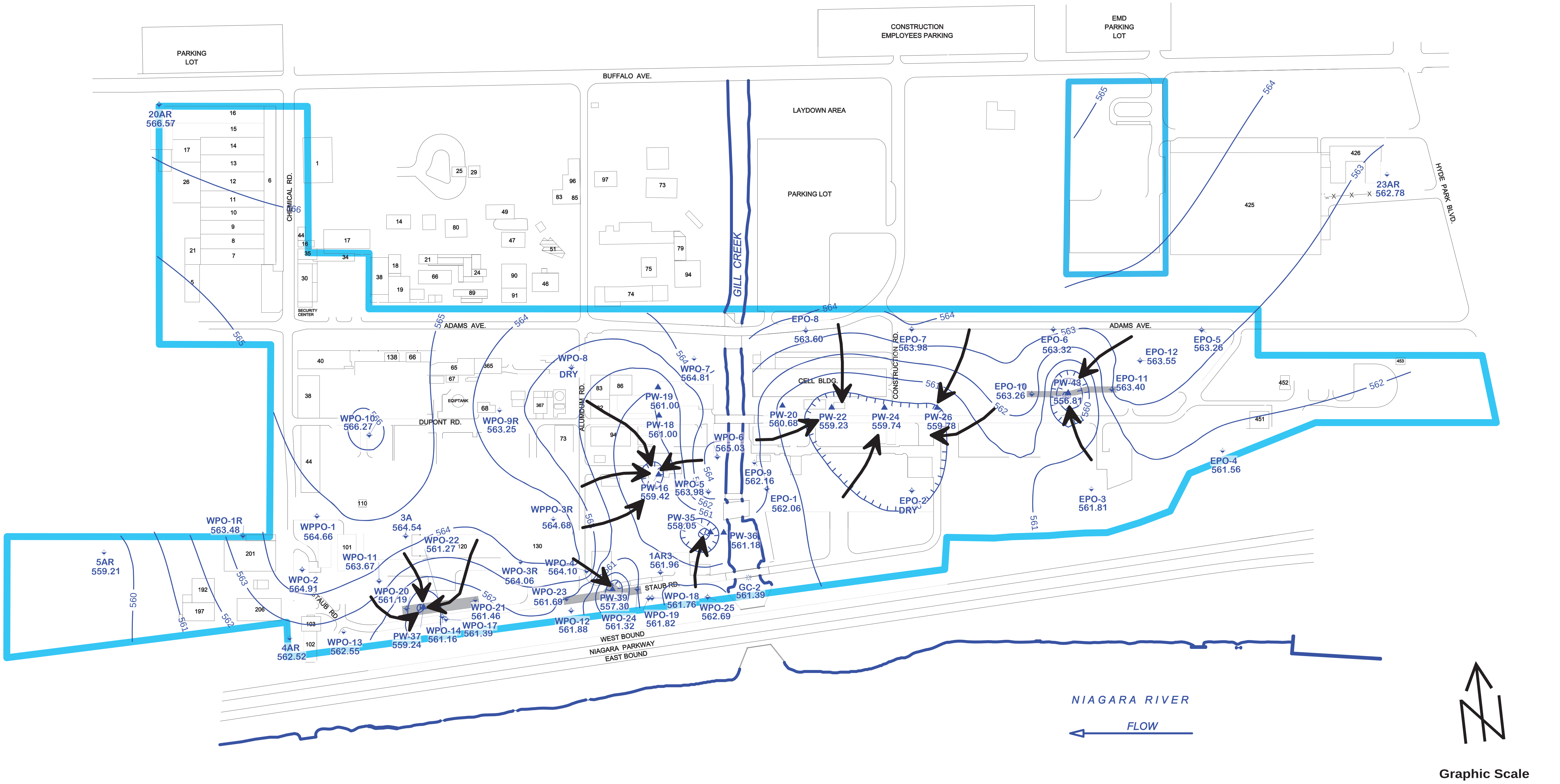
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

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

**FIGURE 3-16**
**POTENTIOMETRIC SURFACE MAP**
**D-ZONE BEDROCK - AUGUST 31, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-08-31 NIA Contour Tool\2023-08-31-DZPZ.srf




Notes:
EPO-2, EPT-1, WPO-8 were dry on November 07, 2023.

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| Job number: 453219.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

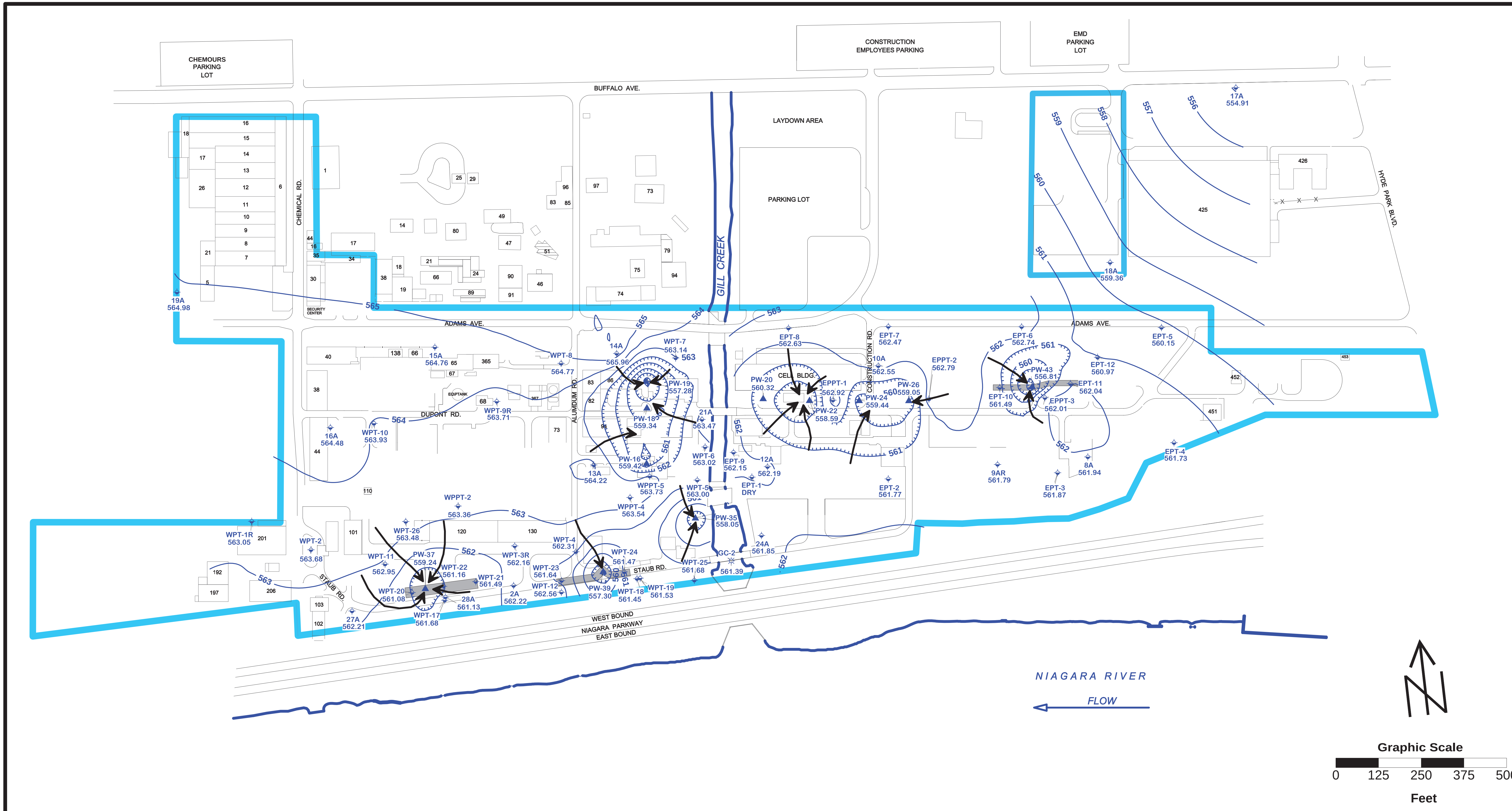
## CHEMOURS WELLS

- 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 3-17**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE OVERBURDEN - NOVEMBER 07, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-11-07 NIA Contour Tool/2023-11-07-A-OBPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| Job number: 453219.03000 | |

## LEGEND

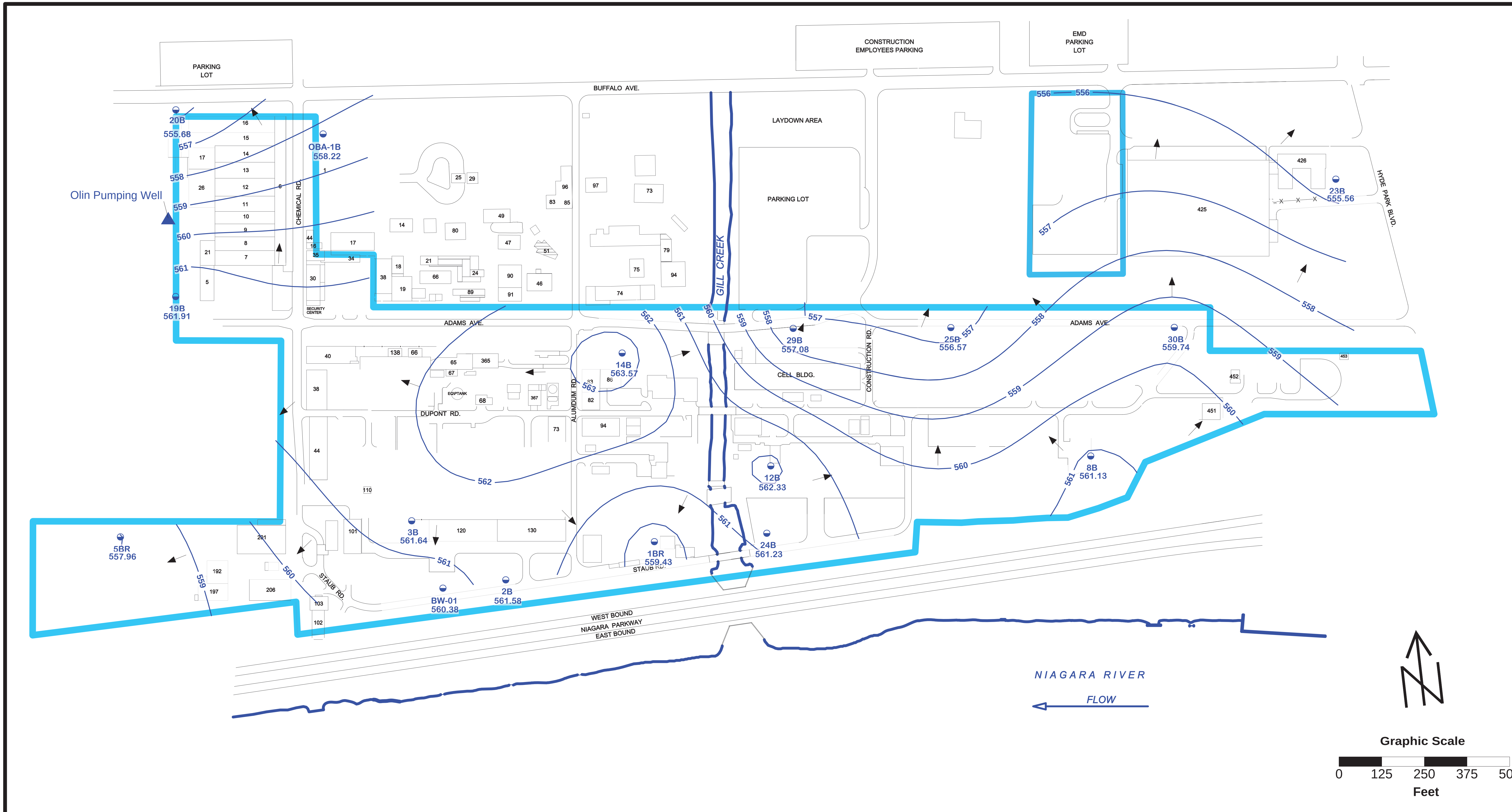
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-18
## POTENTIOMETRIC SURFACE MAP
## A-ZONE BEDROCK - NOVEMBER 07, 2023
## CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-11-07 NIA Contour Tool/2023-11-07-A-BRPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| Job number: 453219.03000 | |

## LEGEND

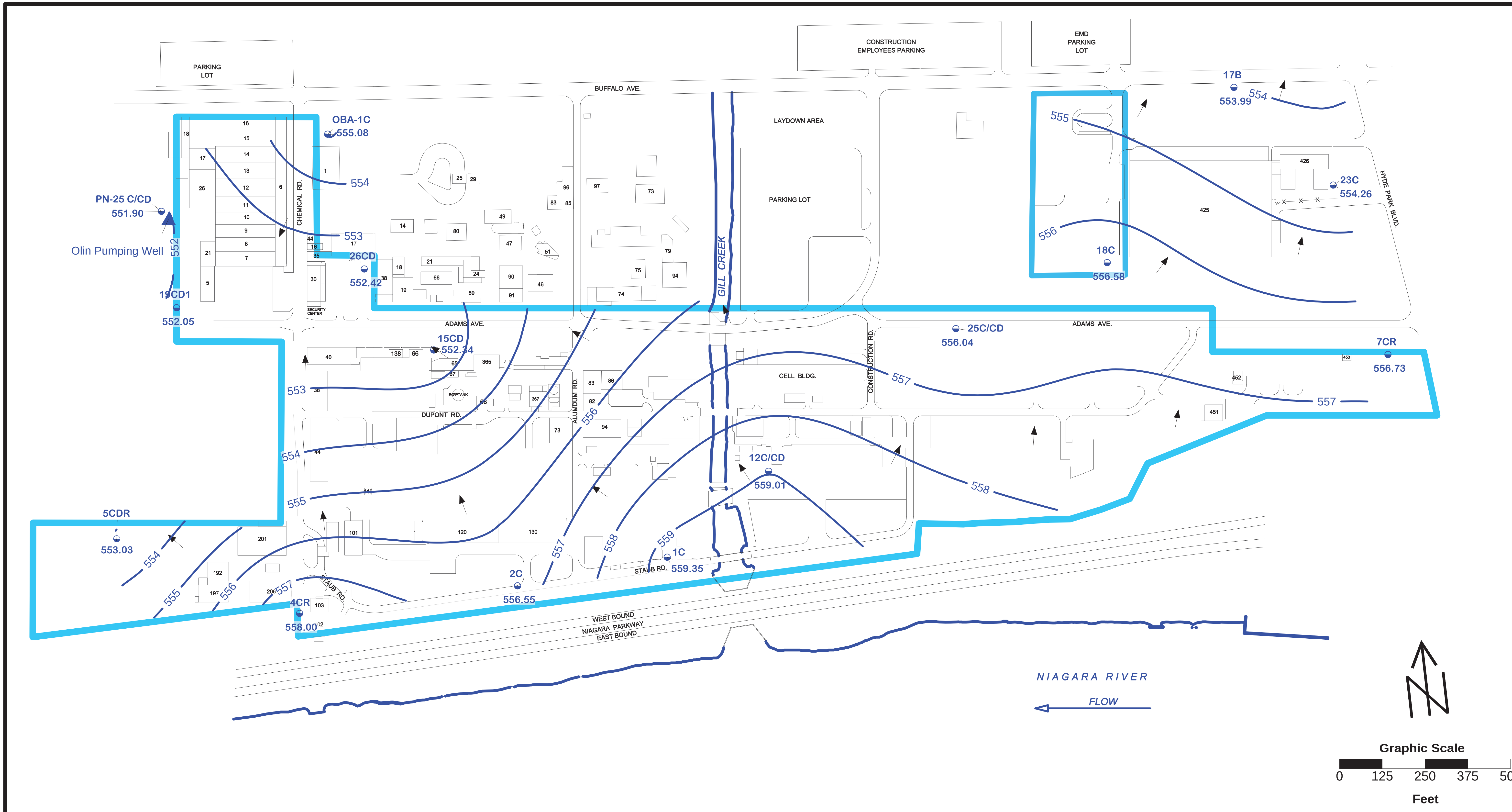
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

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

**FIGURE 3-19**
**POTENTIOMETRIC SURFACE MAP**
**B-ZONE BEDROCK - NOVEMBER 07, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-11-07 NIA Contour Tool/2023-11-07-BZPZ.srf




**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 11/01/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

BUILDING

ROAD

CHEMOURS PROPERTY BOUNDARY

SURFACE WATER

## CHEMOURS WELLS

1C WELL ID

PIEZOMETER

PUMPING WELL

MONITORING WELL

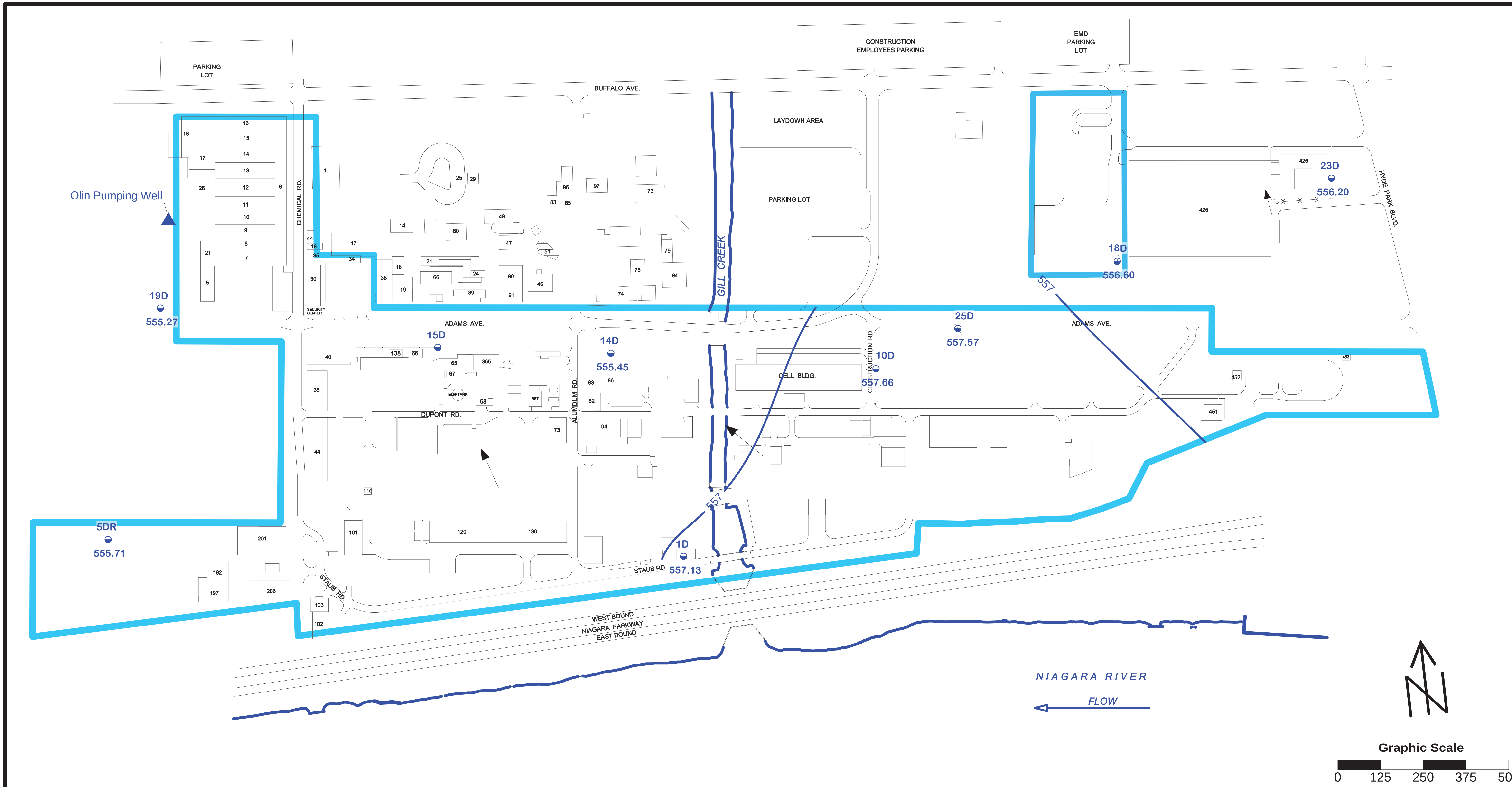
GROUNDWATER CONTOUR

GROUNDWATER CONTOUR DEPRESSION

558 GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-20
# POTENTIOMETRIC SURFACE MAP
# C/CD-ZONE BEDROCK - NOVEMBER, 2023
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-11-07 NIA Contour Tool\2023-11-07-CZPZ.srf




The water level for 15D was erroneously high and was not used in the contouring.

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| | |
| Job number: 453219.03000 | |

**LEGEND**

BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

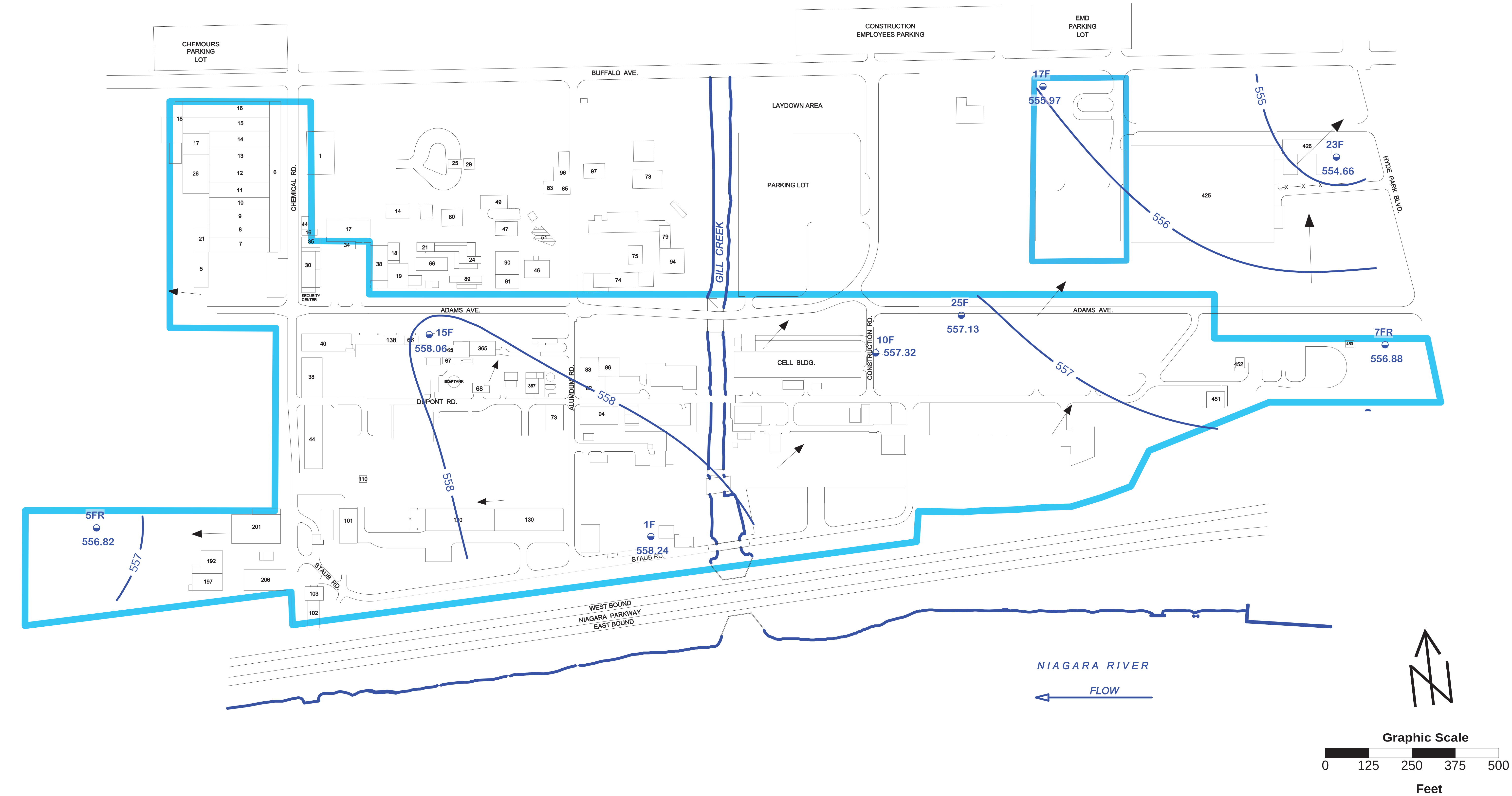
**CHEMOURS WELLS**

1D WELL ID
PIEZOMETER
PUMPING WELL
MONITORING WELL

GROUNDWATER CONTOUR
GROUNDWATER CONTOUR DEPRESSION
557 GROUNDWATER CONTOUR ELEVATION

**FIGURE 3-21**
**POTENTIOMETRIC SURFACE MAP**
**D-ZONE BEDROCK - NOVEMBER 07, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-11-07 NIA Contour Tool/2023-11-07-DZPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| Job number: 452457.03000 | |

## LEGEND

BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

## CHEMOURS WELLS

1AR3 WELL ID
PIEZOMETER
PUMPING WELL
MONITORING WELL

GROUNDWATER CONTOUR
GROUNDWATER CONTOUR DEPRESSION
561 GROUNDWATER CONTOUR ELEVATION

**FIGURE 3-22**
**POTENTIOMETRIC SURFACE MAP**
**F-ZONE BEDROCK - NOVEMBER 07, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-11-07 NIA Contour Tool\2023-11-07-FZPZ.srf


| | | |
|---|---|---|
| **PARSONS**<br>40 La Riviere Dr, Suite 122<br>Buffalo, NY 14202<br>(716) 541-0730 | Created by: TCS | Date: 2/13/2024 |
| | Checked by: JWS | Date: 3/29/2024 |
| | Project Manager: EAF | Date: 3/29/2024 |
| | 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 3-23**
**COMBINED POTENTIOMETRIC SURFACE MAP AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP**
**A-ZONE OVERBURDEN - 3Q2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

nybuf03fs01/Dupont/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/Annual Report Maps/2023 Annual Reportcontours/2023 Annual TVOC OBPZ New.srf


**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 2/7/2023 |
| Checked by: JWS | Date: 3/29/2024 |
| Project Manager: EAF | Date: 3/29/2024 |
| Job number: 453219.03000 | |

## LEGEND

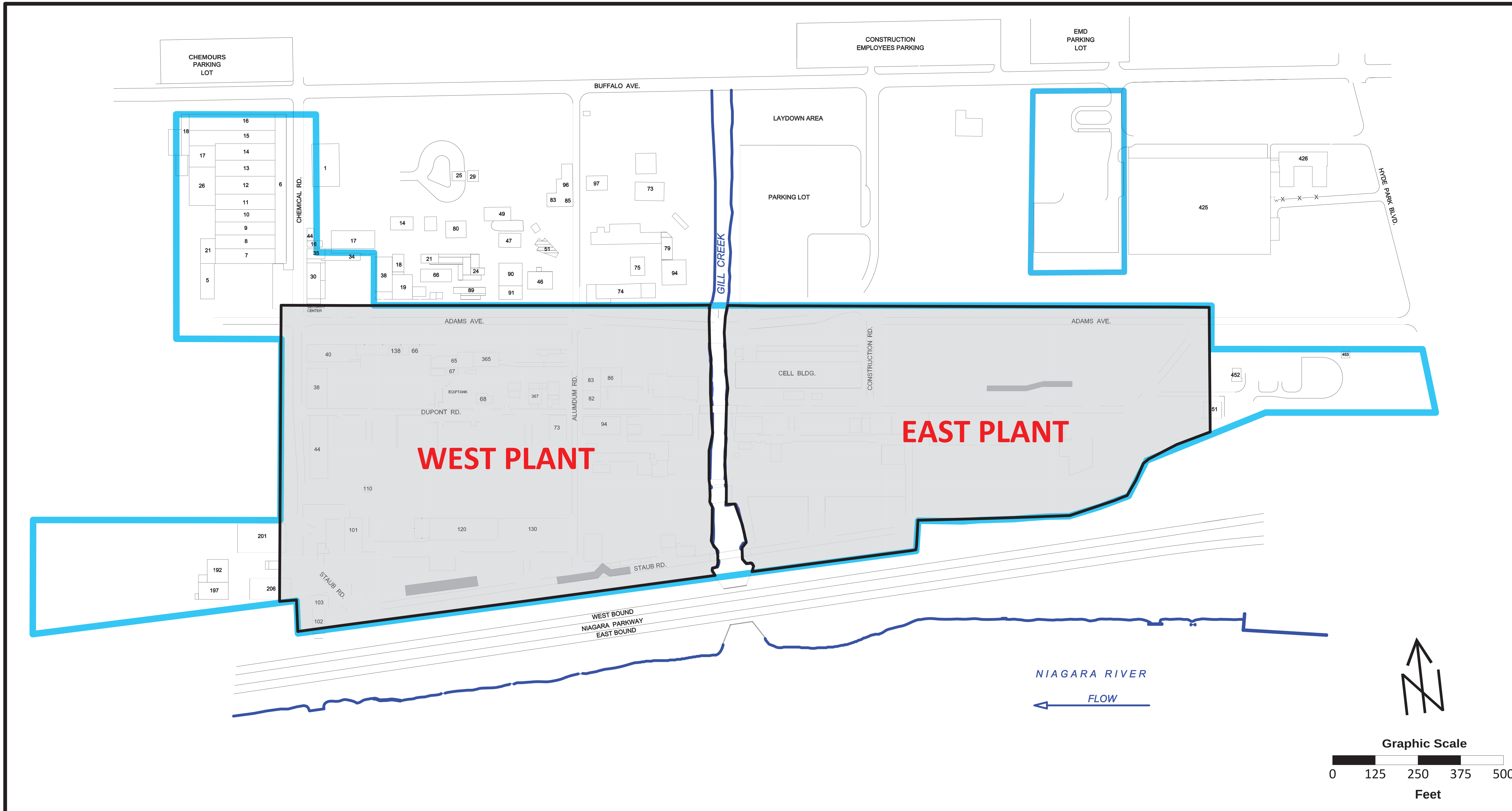
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 563 GROUNDWATER CONTOUR ELEVATION

## 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 3-24**
**COMBINED POTENTIOMETRIC SURFACE MAP AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP**
**A-ZONE BEDROCK - 3Q2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\nybuf03fs01\Dupont\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\Annual Report Maps\2023 Annual Report\2023 Annual TVOC A-BRPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

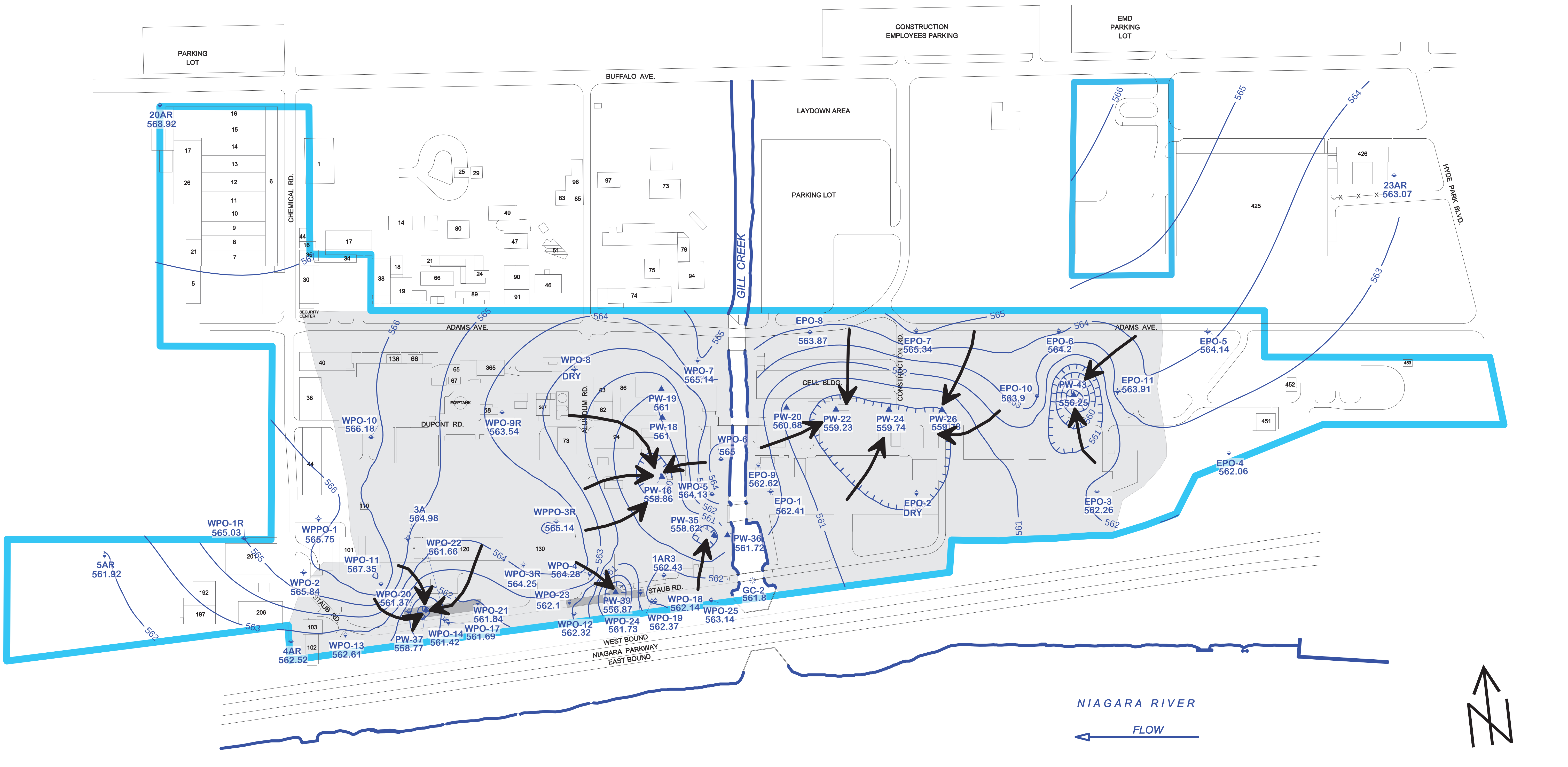
| | |
|---|---|
| Created by: RBP | Date: 02-06-23 |
| Checked by: JWS | Date: 02-07-23 |
| Project Manager: EAF | Date: 02-07-23 |
| Job number: 453219.03000 | |

## LEGEND

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

**FIGURE 3-25**
**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:

Wells EPO-2 and WPO-8 were dry on March 20, 2023.

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| Job number: 453219.03000 | |

## LEGEND

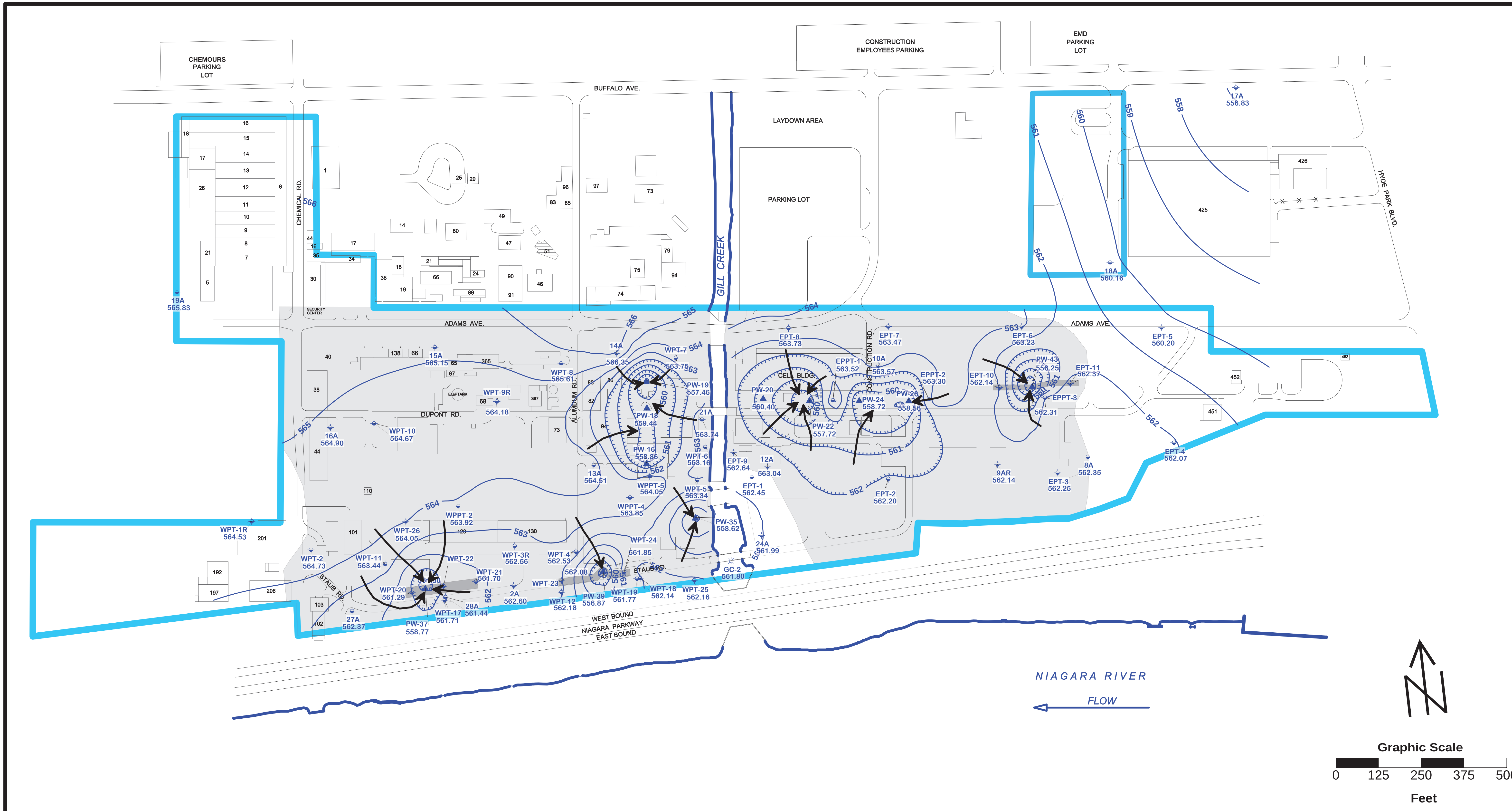
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-26**
**ESTIMATED AREA OF HYDRAULIC CONTROL**
**A-ZONE OVERBURDEN - 1Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-03-20 NIA Contour Tool\2023-03-20-OBPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 04/10/23 |
| Checked by: JWS | Date: 04/11/23 |
| Project Manager: EAF | Date: 04/11/23 |
| Job number: 453219.03000 | |

## LEGEND

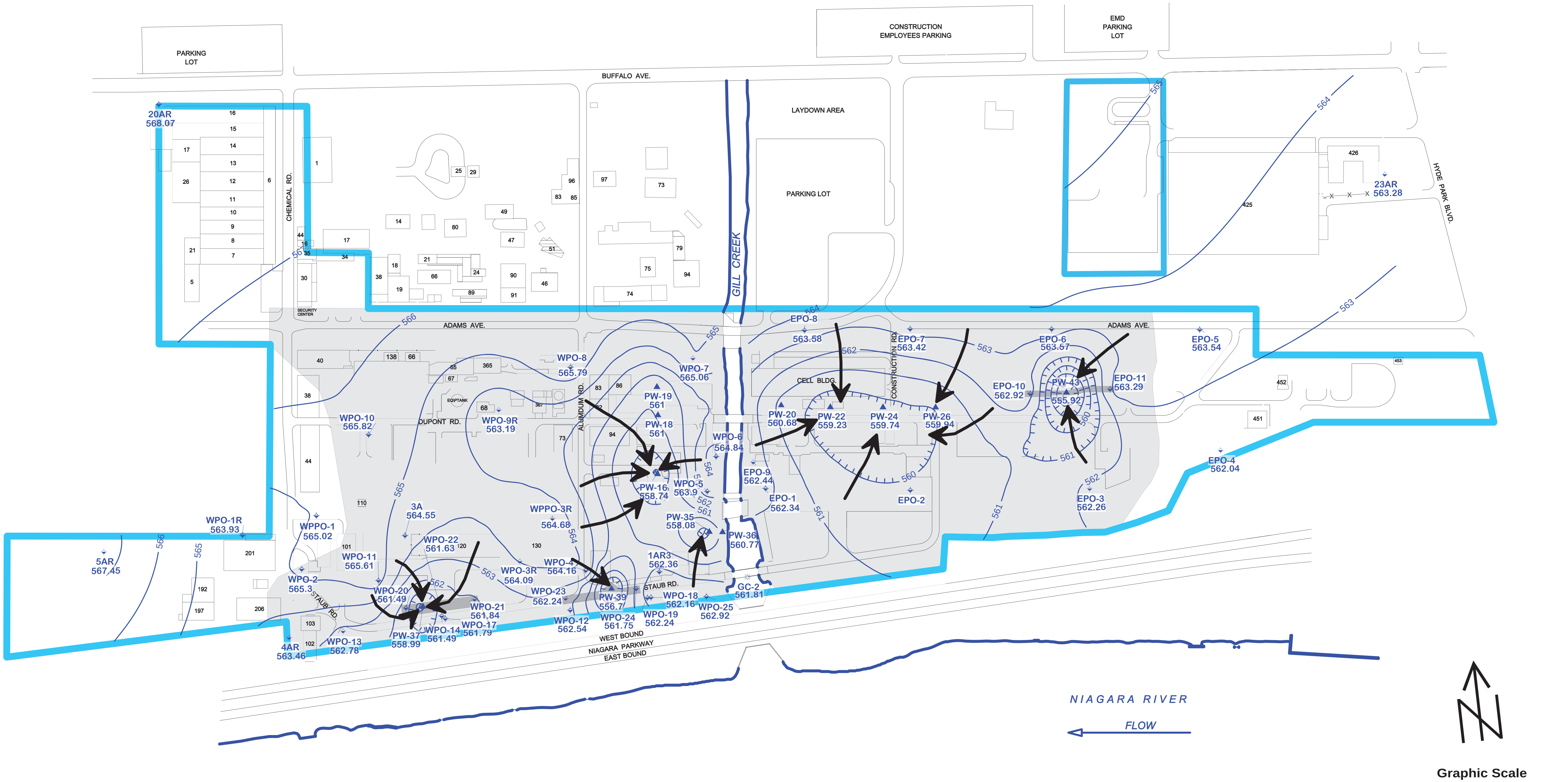
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 - 1Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-03-20 NIA Contour Tool\2023-03-20-BRPZ.srf




Notes:
EPO-2 was dry on May 17, 2023.

Graphic Scale

0 125 250 375 500

Feet

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| | |
| Job number: 453219.03000 | |

## LEGEND

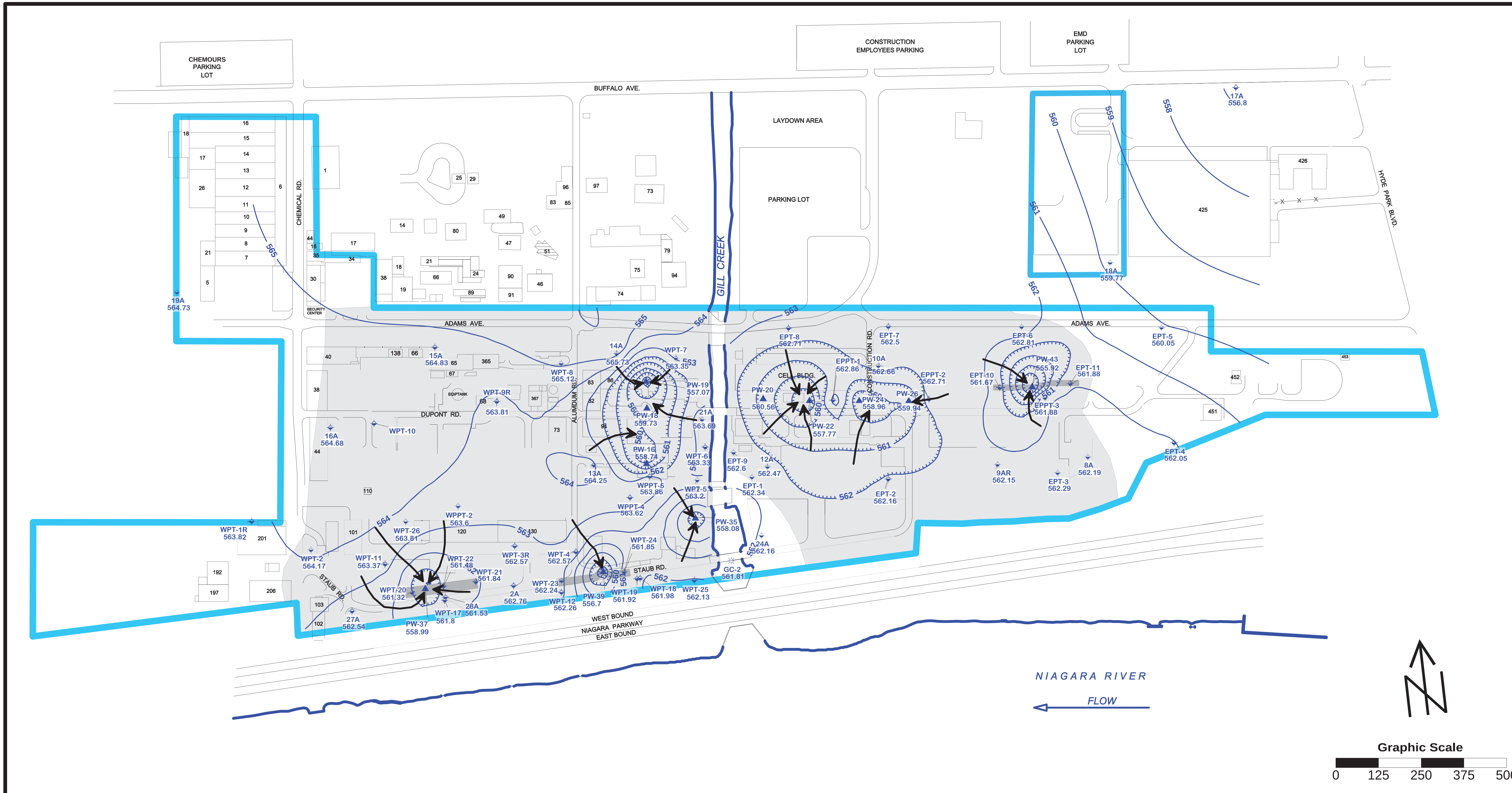
BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

## 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 3-28**
**ESTIMATED AREA OF HYDRAULIC CONTROL**
**A-ZONE OVERBURDEN - 2Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-05-17 NIA Contour Tool\2023-05-17-OBPZ.srf




WPT-10 was not used in contouring due to an anomalously high water level

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 6/22/2023 |
| Checked by: JWS | Date: 6/26/2023 |
| Project Manager: EAF | Date: 6/26/2023 |
| | |
| Job number: 453219.03000 | |

**LEGEND**

BUILDING
ROAD
CHEMOURS PROPERTY BOUNDARY
SURFACE WATER

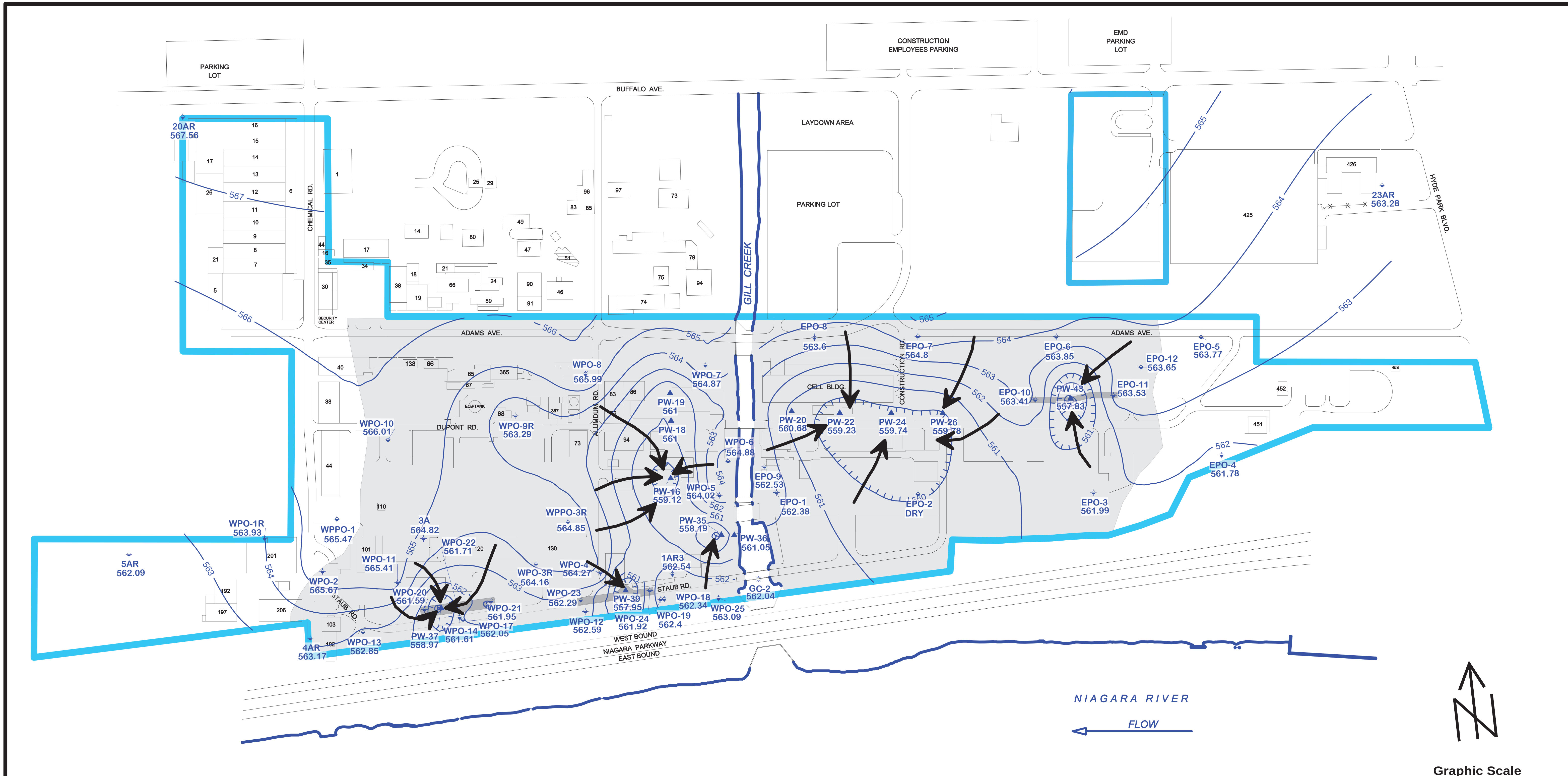
**CHEMOURS WELLS**

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 3-29**
**ESTIMATED AREA OF HYDRAULIC CONTROL**
**A-ZONE BEDROCK - 2Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-05-17 NIA Contour Tool\2023-05-17-BRPZ.srf




Notes:
EPO-2 was dry on August 31, 2023.

Graphic Scale
0 125 250 375 500
Feet

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 10/27/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| | |
| Job number: 453219.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

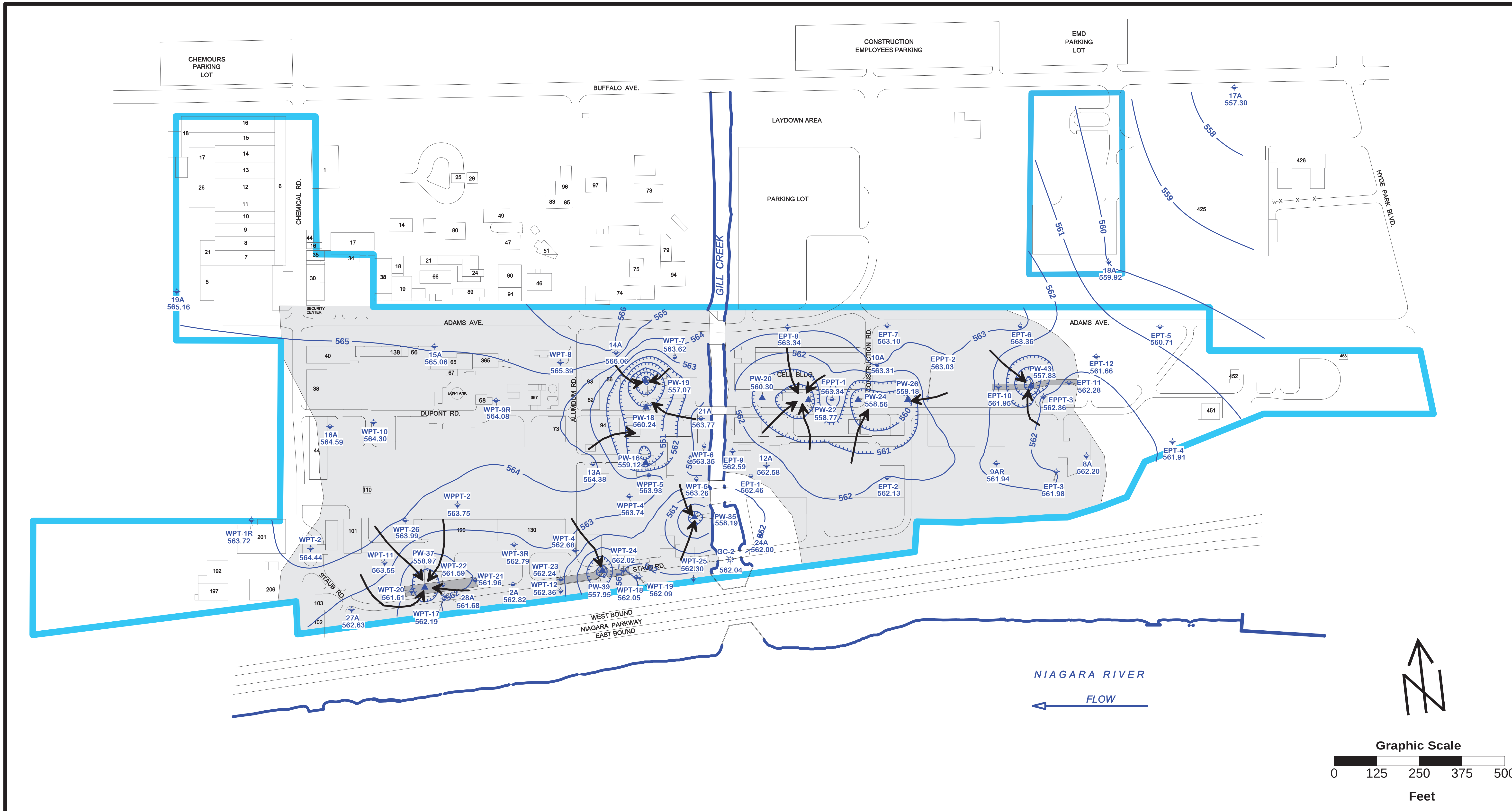
## CHEMOURS WELLS

- 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 3-30**
**ESTIMATED AREA OF HYDRAULIC CONTROL**
**A-ZONE OVERBURDEN - 3Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-08-31 NIA Contour Tool\2023-08-31-A-OBPZ.srf




**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 11/2/23 |
| Checked by: JWS | Date: 11/8/23 |
| Project Manager: EAF | Date: 11/8/23 |
| Job number: 453219.03000 | |

## LEGEND

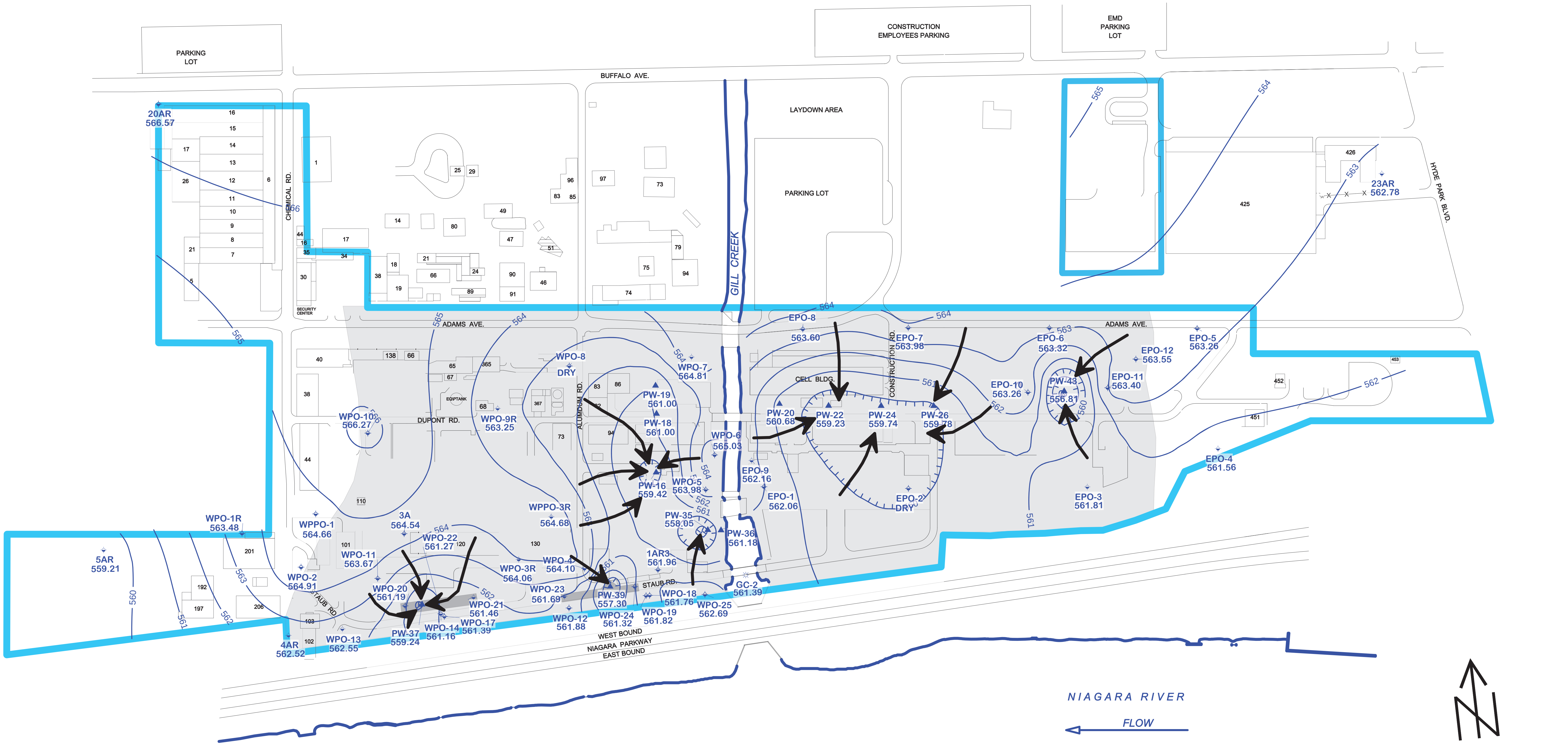
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## 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 3-31
# ESTIMATED AREA OF HYDRAULIC CONTROL
# A-ZONE BEDROCK - 3Q23
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-08-31 NIA Contour Tool/2023-08-31-A-BRPZ.srf




Notes:

EPO-2, EPT-1, WPO-8 were dry on November 07, 2023.

Graphic Scale

0 125 250 375 500

Feet

**PARSONS**

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| | |
| Job number: 453219.03000 | |

## 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

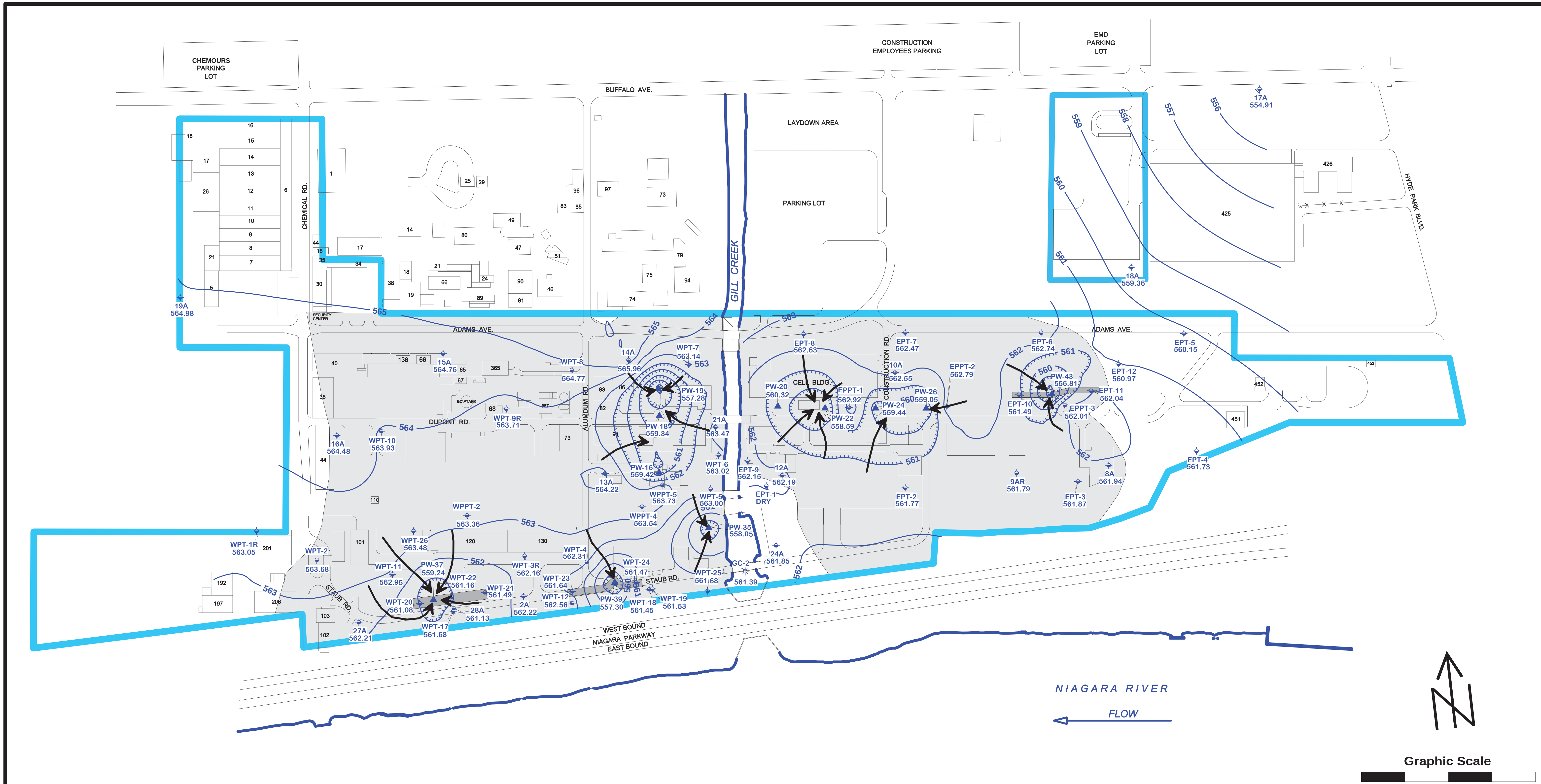
GROUNDWATER CONTOUR

GROUNDWATER CONTOUR DEPRESSION

561 GROUNDWATER CONTOUR ELEVATION

**FIGURE 3-32**
**ESTIMATED AREA OF HYDRAULIC CONTROL**
**A-ZONE OVERBURDEN - 4Q23**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

\\NYBUF03FS01\Dupont$\Niagara\NiaPlant\Hydrogeo\Hydro\GW_contours\2023-11-07 NIA Contour Tool\2023-11-07-A-OBPZ.srf




Test with 10 ft grid (original grid ~30 ft)

**PARSONS**
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: TCS | Date: 01/09/24 |
| Checked by: JWS | Date: 01/09/24 |
| Project Manager: EAF | Date: 01/09/24 |
| Job number: 453219.03000 | |

## 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 3-33**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE BEDROCK - NOVEMBER 07, 2023**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2023-11-07 NIA Contour Tool/2023-11-07-A-BRPZ.srf

# APPENDIX A
# BORING LOGS AND WELL COSTRUCTION DIAGRAMS

## DRILLING SUMMARY

**Geologist:**
Hannah Annunziata

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

**Rig Make/Model:**
CME-85

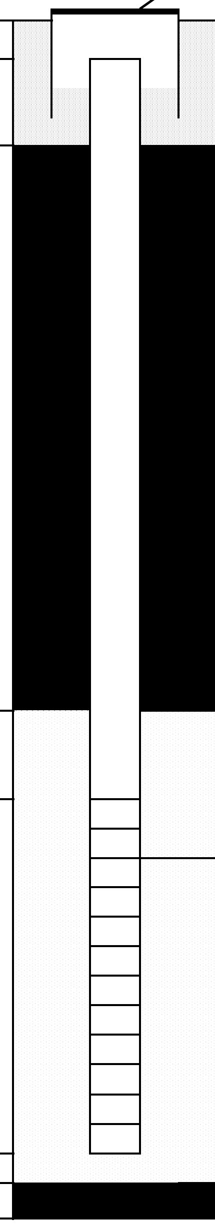
**Date:**
7/28/2023

Flush Mount Cap

Elevation ____ Ground Level

Elevation ____ Locking J-Plug

Top of Seal 2



PVC Casing
2 inch dia.
6.5 feet length

Elevations in Feet amsl
Depth in Feet Below Grade

Borehole Diameter
~10 inch dia.

Top of Sand Pack 5.5

Top of Screen 6.5

PVC Screen
2 inch dia.
5 feet length

Bottom of Screen 11.5
Top of Seal 11.5
Bottom of Borehole 11.8
(Top of Bedrock)

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-11.8' | Fill |

## WELL DESIGN

| *CASING MATERIAL* | | *SCREEN MATERIAL* | | *FILTER MATERIAL* | |
|---|---|---|---|---|---|
| **Surface:** | Flush Mount Road Box | **Type:** | Schedule 40 PVC | **Type:** | FilPro WG#0 sand |
| | | | | **Setting:** | 5.5-11.5' |
| **Monitor:** | PVC | **Slot Size:** | 0.020" | ***SEAL MATERIAL*** | |
| | | | | **Type 1:** | Bentonite chips |
| | | | | **Setting:** | 2-5.5' |
| | | | | **Type 1:** | |
| | | | | **Setting:** | |

***COMMENTS:***

***LEGEND***

Concrete

Bentonite Seal

Sand Pack

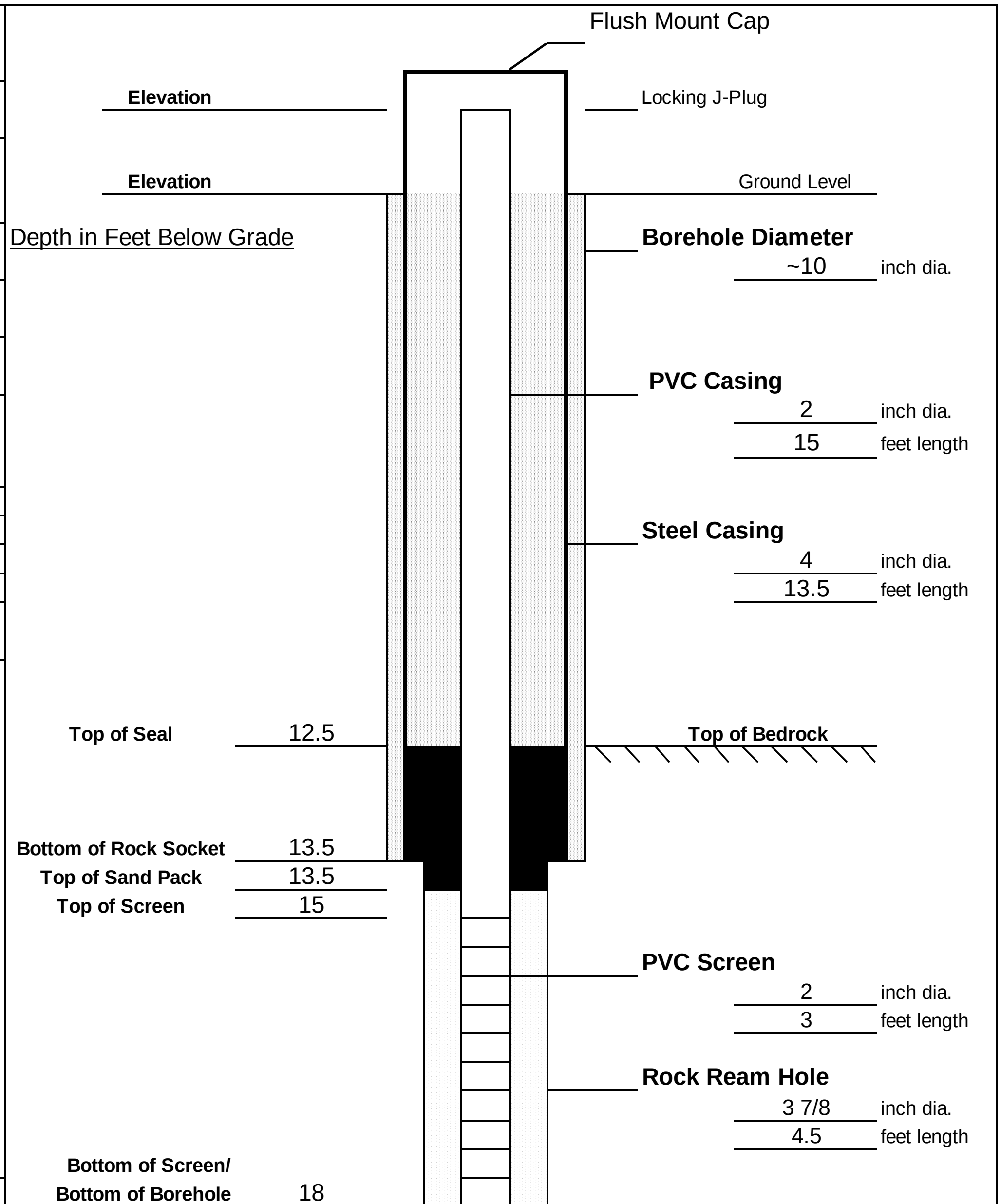
| **Client: Chemours** | **Location: Niagara East Plant** | **Project No.: 453219.07000** |
|---|---|---|
| ***Parsons*** | **OVERBURDEN PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: EPO-12** |

## DRILLING SUMMARY

**Geologist:** Hannah Annunziata
**Drilling Company:** Nothnagle Drilling Co.
**Driller:** Steve Loranty
**Rig Make/Model:** CME-85
**Date:** 7/28/2023

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| 0-3" | Asphalt |
| 3"-12.5' | Fill |
| 12.5' | Top of rock |
| 12.5-18' | Gray angular cuttings Lockport Dolomite |




## WELL DESIGN

| *CASING MATERIAL* | *SCREEN MATERIAL* | *FILTER MATERIAL* |
|---|---|---|
| **Surface:** Flush Mount Road Box | **Type:** Schedule 40 PVC | **Type:** FilPro WG#0 sand<br>**Setting:** 13.5-18' |
| **Monitor:** PVC | **Slot Size:** 0.020" | *SEAL MATERIAL*<br>**Type 1:** Bentonite chips<br>**Setting:** 12.5-13.5' |

***COMMENTS:***

***LEGEND***

Cement Grout
Bentonite Seal
Sand Pack

| | | |
|---|---|---|
| **Client: Chemours** | **Location: Niagara East Plant** | **Project No.: 453219.07000** |
| ***Parsons*** | **BEDROCK PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: EPT-12** |

# APPENDIX B
# 2023 ANALYTICAL RESULTS

PARSONS

**APPENDIX B**
**2023 Analytical Results - Monitoring Wells**

| | | Location | DEC-5 | DEC-3R | DEC-3R | DEC-4R | MW-10A | MW-10D | MW-10F | MW-12A | MW-12B | MW-12C/CD | MW-13A | MW-14A | MW-14B | MW-14D | MW-15A | MW-15CD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 10/04/2023 | 09/12/2023 | 09/12/2023 | 09/12/2023 | 10/02/2023 | 10/02/2023 | 10/03/2023 | 10/02/2023 | 10/02/2023 | 10/02/2023 | 10/02/2023 | 09/28/2023 | 09/28/2023 | 09/28/2023 | 09/21/2023 | 09/21/2023 |
| Method | Parameter | Units | FS | FS | DUP | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | clear | clear | clear | clear | yel-clear | clear | clear | gray | clear | clear | cloudy | light br | yel-clear | grey/clear | clear | clear |
| | DEPTH TO WATER | Feet | 22.98 | 12.69 | 12.69 | 13.79 | 9.77 | 9.55 | 9.68 | 10.55 | 10.76 | 13.6 | 10.63 | 9.09 | 13.4 | 16.22 | 4.33 | 14.97 |
| | DISSOLVED OXYGEN | MG/L | -- | 0 | 0 | 0.2 | 5.63 | 0 | 0 | 1 | 0 | 0 | 0.65 | 0 | 6.67 | 0.52 | 0 | 0 |
| | ODOR | NONE | none | none | none | none | none | mild | mild | none | none | none | none | none | none | none | weak | moderate |
| | OXIDATION REDUCTION POTENTIAL | MV | -- | 89 | 89 | 14 | -125 | -311 | -385 | -229 | -243 | -122 | -249 | -188 | -108 | -145 | -237 | -198 |
| | PH | STD UNITS | -- | 6.26 | 6.26 | 9.54 | 6.78 | 6.6 | 7.94 | 7.46 | 7.65 | 7.28 | 7.93 | 9.39 | 6.78 | 6.82 | 9.51 | 8.01 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | -- | 22000 | 22000 | 519 | 3120 | 5290 | 5.71 | 27900 | 46800 | 3160 | 2030 | 776 | 4880 | 6.17 | 2080 | 4040 |
| | TEMPERATURE | DEGREES C | -- | 13.45 | 13.45 | 14.83 | 20.43 | 17.82 | 13.99 | 18.14 | 16.01 | 14.1 | 19.71 | 16.01 | 18.59 | 15.66 | 16.4 | 12.35 |
| | TURBIDITY QUANTITATIVE | NTU | -- | 22.3 | 22.3 | 24.7 | 97.6 | 24.9 | 5.27 | 7.87 | 4.86 | 15.3 | 23.9 | 78.3 | 29.3 | 14.6 | 4.9 | 3.85 |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <1 | <4000 | 2800 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | 1500 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | <1 | 11000 | 11000 | 38 | <1 | 5600 | <40 | <1 | <250 | <2000 | <1 | <1000 | 14000 | <400 | <4 | 9600 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <1 | <4000 | <2000 | 1.5 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | 1700 | <400 | <4 | <400 |
| 8260D | 1,1-Dichloroethane | UG/L | <1 | <4000 | <2000 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | 1,1-Dichloroethene | UG/L | <1 | <4000 | 2300 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | 1400 | <400 | <4 | <400 |
| 8260D | 1,2-Dichlorobenzene | UG/L | <1 | <4000 | <2000 | 1.1 | 1.6 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | 1,4-Dichlorobenzene | UG/L | <1 | <4000 | <2000 | 17 | 3.7 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | 1,4-Dichlorobutane | UG/L | <1 | <4000 | <2000 | <1 | 3.2 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | Benzene | UG/L | <1 | <4000 | <2000 | 6.5 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | Carbon Tetrachloride | UG/L | <1 | <4000 | <2000 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | 830 |
| 8260D | Chlorobenzene | UG/L | <1 | <4000 | <2000 | 13 | 1.4 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | Chloroform | UG/L | <1 | 21000 | 20000 | 5 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | 7000 | <400 | 40 | 12000 |
| 8260D | cis-1,2 Dichloroethene | UG/L | <1 | 180000 | 160000 | 22 | 5.5 | 97000 | 42 | <1 | 2200 | 9500 | 20 | 19000 | 42000 | 20000 | 110 | 12000 |
| 8260D | Methyl Chloride | UG/L | <1 | <4000 | <2000 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | Methylene Chloride | UG/L | <5 | 100000 | 95000 | <5 | <5 | <20000 | <200 | <5 | <1300 | <10000 | <5 | <5000 | <5000 | <2000 | <20 | 3300 |
| 8260D | Tetrachloroethene | UG/L | <1 | 44000 | 44000 | 56 | <1 | <4000 | <40 | <1 | 2800 | 30000 | 1.9 | 52000 | 78000 | <400 | 27 | 83000 |
| 8260D | Tetrahydrothiophene | UG/L | <2 | <8000 | <4000 | <2 | <2 | <8000 | <80 | <2 | <500 | <4000 | <2 | <2000 | <2000 | <800 | <8 | <800 |
| 8260D | Toluene | UG/L | <1 | <4000 | <2000 | <1 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | <1000 | <400 | <4 | <400 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <1 | <4000 | 3000 | 3.9 | <1 | <4000 | <40 | <1 | <250 | <2000 | <1 | <1000 | 1000 | <400 | <4 | <400 |
| 8260D | Trichloroethene | UG/L | <1 | 710000 | 580000 | 55 | <1 | 17000 | <40 | <1 | 6400 | 33000 | 2.3 | 36000 | 300000 | <400 | 43 | 210000 |
| 8260D | Vinyl Chloride | UG/L | <1 | 21000 | 20000 | 5.8 | 13 | 14000 | 1600 | <1 | 420 | <2000 | 21 | 3700 | 3300 | 25000 | 120 | 770 |
| | Total VOCs | UG/L | 0 | 1087000 | 938100 | 224.8 | 28.4 | 133600 | 1642 | 0 | 11820 | 72500 | 45.2 | 110700 | 448400 | 45000 | 340 | 333000 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | <26 | <26 | -- | -- | -- | -- | -- | <10 | <27 | -- | <50 | <63 | -- | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | 6 | 7.7 | -- | -- | -- | -- | -- | 29 | 31 | -- | 280 | 170 | -- | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | <5.2 | <5.2 | -- | -- | -- | -- | -- | 4.5 | 120 | -- | 82 | 270 | -- | -- | -- |
| 8270E | Naphthalene | UG/L | -- | <1 | <1 | -- | -- | -- | -- | -- | <0.42 | <1.1 | -- | <2 | <2.5 | -- | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | 10 | 6.3 | 0.11 | -- | 2.3 | -- | -- | 15 | 160 | -- | <0.5 | -- | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | 1.6 | 1.3 | 0.26 | -- | <0.51 | -- | -- | <2.6 | <25 | -- | <0.5 | -- | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | <1 | <1 | 0.055 | -- | <25 | -- | -- | <2.6 | <25 | -- | <0.5 | -- | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | 1.2 | <1 | <0.053 | -- | 2.4 | -- | -- | 3.8 | 150 | -- | <0.5 | -- | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | <1 | <0.51 | <0.11 | -- | 0.15 | -- | -- | 5.1 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | <1 | <0.51 | <0.11 | -- | <0.1 | -- | -- | <2 | <20 | -- | <5 | -- | -- | -- | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | <0.01 | -- | -- | 0.014 | -- | 0.014 | 0.012 | 0.074 | 0.21 | 0.11 | 0.28 | 0.018 | 0.21 | 0.013 | 0.33 | 0.19 |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | 260 | 160 | -- | 210 | 160 | -- | -- | -- | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | 260 | 160 | -- | 210 | 160 | -- | -- | -- | -- | -- | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | 1000 | 1100 | -- | 22000 | 740 | -- | -- | -- | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | -- | 2.2 | -- | 7.8 | 3.1 | -- | -- | -- | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | 3.3 | <0.2 | -- | <0.2 | <0.2 | -- | -- | -- | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | <2 | <0.5 | -- | <10 | <1 | -- | -- | -- | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | 1800 | 1400 | -- | 3900 | 750 | -- | -- | -- | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | 8.9 | 27 | -- | <1 | <1 | -- | -- | -- | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | 1.9 | <1 | -- | 2.5 | 2 | -- | -- | -- | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | 22 | 18 | -- | 3.5 | 18 | -- | -- | -- | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | 33 | 450 | -- | 800 | 460 | -- | -- | -- | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | 1000 | 1200 | -- | 410 | 1500 | -- | -- | -- | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | 1 | <1 | -- | <1 | <1 | -- | -- | -- | -- | -- | -- |

< Non detect at stated reporting limit. J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

# APPENDIX B
## 2023 Analytical Results - Monitoring Wells

| | | Location | MW-15D | MW-15F | MW-16A | MW-16B | MW-17A | MW-17B | MW-17F | MW-18A | MW-18C | MW-18C | MW-18D | MW-19A | MW-19B | MW-19CD1 | MW-19D | MW-1AR3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/28/2023 | 09/21/2023 | 09/21/2023 | 09/25/2023 | 09/14/2023 | 09/14/2023 | 09/13/2023 | 09/13/2023 | 09/13/2023 | 09/13/2023 | 09/13/2023 | 09/19/2023 | 09/19/2023 | 09/19/2023 | 09/19/2023 | 09/25/2023 |
| Method | Parameter | Units | FS | FS | FS | FS | FS | FS | FS | FS | FS | DUP | FS | FS | FS | FS | FS | FS |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | clear | clear | clear | or-clear | gray | yellow | clear-gray | clear | clear | clear | clear | clear | clear | none | clear | clear |
| | DEPTH TO WATER | Feet | 9.64 | 9.85 | 12.58 | 18.21 | 16.12 | 16.27 | 14.7 | 11.09 | 14.01 | 14.01 | 11.6 | 9.9 | 12.99 | 19.78 | 16.57 | 10.19 |
| | DISSOLVED OXYGEN | MG/L | 0 | 16.97 | 0 | 1.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.16 |
| | ODOR | NONE | none | mild | none | slight | none | weak | weak | none | slight | slight | none | none | none | none | none | mild |
| | OXIDATION REDUCTION POTENTIAL | MV | -180 | -342 | -434 | -311 | -290 | -210 | -214 | -304 | -283 | -283 | -134 | -238 | -53 | -181 | 254 | -210 |
| | PH | STD UNITS | 8.28 | 7.1 | 11.27 | 10.64 | 9.32 | 7.48 | 7.37 | 7.79 | 6.91 | 6.91 | 6.99 | 8.95 | 7.67 | 8.11 | 2.93 | 6.28 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 9360 | 5260 | 3980 | 3820 | 2550 | 942 | 4.28 | 1130 | 1860 | 1860 | 440 | 758 | 814 | 545 | 233 | 19200 |
| | TEMPERATURE | DEGREES C | 15.35 | 14.96 | 15.4 | 14.86 | 13.98 | 13.2 | 11.14 | 13.38 | 12.44 | 12.44 | 12.33 | 14.81 | 14.95 | 12.57 | 14.04 | 16.53 |
| | TURBIDITY QUANTITATIVE | NTU | 6.84 | 9.76 | 1.27 | 5.8 | 11.5 | 23.2 | 49.6 | 9.03 | 5.1 | 5.1 | 24.8 | 5 | 13.1 | 6.5 | 3.09 | 18.5 |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | 2600 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <500 | <4 | <4 | 440 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | 10000 |
| 8260D | 1,1-Dichloroethane | UG/L | <500 | <4 | 11 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | 1,1-Dichloroethene | UG/L | <500 | <4 | <4 | 410 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | 1200 |
| 8260D | 1,2-Dichlorobenzene | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | 8400 | 18 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | 1,4-Dichlorobenzene | UG/L | <500 | <4 | <4 | <200 | <20 | 1.9 | 3600 | 62 | 430 | 420 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | 1,4-Dichlorobutane | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | <400 | 280 | 4300 | 4500 | <10 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Benzene | UG/L | <500 | 5.1 | 9.2 | <200 | <20 | <1 | 790 | 31 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Carbon Tetrachloride | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Chlorobenzene | UG/L | <500 | <4 | <4 | <200 | 48 | 6.1 | 7400 | 75 | 710 | 670 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Chloroform | UG/L | 16000 | <4 | <4 | 120000 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | 1200 | <1 | 25000 |
| 8260D | cis-1,2 Dichloroethene | UG/L | 890 | 520 | 260 | 1900 | <20 | 1.2 | <400 | <5 | <400 | <400 | 300 | 2.6 | 1.1 | 1100 | <1 | 120000 |
| 8260D | Methyl Chloride | UG/L | <500 | <4 | <4 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Methylene Chloride | UG/L | <2500 | <20 | <20 | 46000 | <100 | <5 | <2000 | <25 | <2000 | <2000 | <20 | <5 | <5 | <250 | <5 | 300000 |
| 8260D | Tetrachloroethene | UG/L | 2400 | 5.7 | 13 | 4400 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | 1.4 | 700 | <1 | 33000 |
| 8260D | Tetrahydrothiophene | UG/L | <1000 | <8 | <8 | <400 | 390 | 35 | <800 | 2900 | 58000 | 58000 | <20 | <2 | <2 | <100 | <2 | <2000 |
| 8260D | Toluene | UG/L | <500 | <4 | 24 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <500 | 25 | 12 | <200 | <20 | <1 | <400 | <5 | <400 | <400 | <4 | <1 | <1 | <50 | <1 | <1000 |
| 8260D | Trichloroethene | UG/L | 1800 | 5.8 | 1800 | 16000 | <20 | <1 | <400 | <5 | <400 | <400 | 4.5 | <1 | 2.6 | 1800 | <1 | 190000 |
| 8260D | Vinyl Chloride | UG/L | <500 | 1300 | 56 | <200 | <20 | <1 | 560 | <5 | <400 | <400 | 53 | 1.9 | <1 | <50 | <1 | 78000 |
| | Total VOCs | UG/L | 21090 | 1861.6 | 2185.2 | 189150 | 438 | 44.2 | 20750 | 3366 | 63440 | 63590 | 357.5 | 4.5 | 5.1 | 4800 | 0 | 759800 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | -- | <52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | -- | <10 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | -- | <10 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Naphthalene | UG/L | -- | -- | 290 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | 1.1 | <0.01 | 36 | 23 | 0.49 | 0.096 | <0.01 | 0.87 | 5.2 | 4.9 | <0.01 | <0.01 | -- | <0.01 | <0.01 | 0.031 |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | <5 | 84 | -- | 300 | 290 | 120 | -- | -- | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | <5 | 84 | -- | 300 | 290 | 120 | -- | -- | -- | -- | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | 74 | 760 | -- | 280 | 280 | 23 | -- | -- | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | 6.5 | 7.9 | -- | 3 | -- | 6 | -- | -- | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | <0.2 | <0.2 | -- | 2.4 | 2.3 | <0.2 | -- | -- | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | <0.5 | <0.5 | -- | <1 | <1 | <0.1 | -- | -- | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | 370 | 1500 | -- | 410 | 400 | 130 | -- | -- | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | 1.3 | 6.3 | -- | 22 | 25 | <1 | -- | -- | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | 1.3 | 2 | -- | 19 | 16 | 1.1 | -- | -- | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | 2.6 | 37 | -- | 53 | 53 | <1 | -- | -- | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | <1 | 510 | -- | 870 | 880 | 2.9 | -- | -- | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | 210 | 760 | -- | 1300 | 1300 | 89 | -- | -- | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | <1 | <1 | -- | 2.1 | 2.1 | <1 | -- | -- | -- | -- | -- |

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

B Not detected substantially above the level reported in the laboratory or field blanks.

UJ Undetected-estimated reporting.

## APPENDIX B
## 2023 Analytical Results - Monitoring Wells

| Method | Parameter | Location | MW-1BR | MW-1C | MW-1D | MW-1F | MW-20AR | MW-20B | MW-21A | MW-23AR | MW-23B | MW-23C | MW-23D | MW-23F | MW-24A | MW-24B | MW-24B | MW-25B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/25/2023 | 09/25/2023 | 09/25/2023 | 09/25/2023 | 09/20/2023 | 09/19/2023 | 10/03/2023 | 09/21/2023 | 09/20/2023 | 09/20/2023 | 09/20/2023 | 09/13/2023 | 09/27/2023 | 09/27/2023 | 09/27/2023 | 09/20/2023 |
| Method | Parameter | Units | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | DUP | FS |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | clear | clear | clear | clear | orange | clear | clear | clear | clear | clear | yel-clear | brw-clear | none | clear | clear | clear |
| | DEPTH TO WATER | Feet | 12.7 | 11.71 | 17.29 | 13.25 | 3.72 | 17.71 | 12.04 | 12.43 | 14.06 | 15.74 | 13.71 | 20.66 | 9.86 | 13.79 | 13.79 | 13.32 |
| | DISSOLVED OXYGEN | MG/L | 4.19 | 0.54 | 0 | 0 | -- | 0 | 1.17 | 10.15 | 0 | 0 | 0 | 0 | 0.37 | 0 | 0 | 0 |
| | ODOR | NONE | weak | none | slight | slight | strong | none | none | weak | none | none | mild | weak | none | none | none | strong |
| | OXIDATION REDUCTION POTENTIAL | MV | -177 | -106 | -386 | -345 | -- | 181 | -236 | -210 | 156 | 57 | -146 | -246 | -235 | -157 | -157 | -316 |
| | PH | STD UNITS | 7.27 | 7.05 | 8.85 | 12.22 | -- | 5.86 | 7.92 | 7.85 | -- | -- | 8.27 | 9.08 | 8.36 | 7.17 | 7.17 | 12.29 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 2940 | 2790 | 2600 | 6810 | -- | 12800 | 48700 | 1680 | 386 | 1500 | 278 | 3770 | 59900 | 20600 | 20600 | 1010 |
| | TEMPERATURE | DEGREES C | 17.97 | 18.95 | 16.21 | 14.29 | -- | 16.06 | 21.51 | 19.64 | 12.71 | 12.72 | 13.22 | 12.88 | 20.46 | 18.37 | 18.37 | 14.36 |
| | TURBIDITY QUANTITATIVE | NTU | 73.3 | 7.79 | 6.2 | 36.3 | -- | 2.52 | 200 | 46.9 | 16.6 | 8.07 | 60.5 | 93.7 | 3.76 | 20.3 | 20.3 | 2.17 |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | 3700 | 4300 | 130 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | 5600 | 5900 | <2 UJ |
| 8260D | 1,1,2-Trichloroethane | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | 1,1-Dichloroethane | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | 1,1-Dichloroethene | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | 1,2-Dichlorobenzene | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | 17 J |
| 8260D | 1,4-Dichlorobenzene | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | 40 J |
| 8260D | 1,4-Dichlorobutane | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | 13 | <1 | <4 | <1000 | <5000 | <5000 | 440 |
| 8260D | Benzene | UG/L | 2000 | <1000 | 49 | <33 | <1 | <10 | <1 | <1 | <1 | 32 | <1 | 5.1 | <1000 | <5000 | <5000 | 5.3 J |
| 8260D | Carbon Tetrachloride | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | Chlorobenzene | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | 3.3 | <1 | <4 | <1000 | <5000 | <5000 | 29 J |
| 8260D | Chloroform | UG/L | <2000 | 1300 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | cis-1,2 Dichloroethene | UG/L | 23000 | 10000 | 1600 | 280 | <1 | 280 | 28 | <1 | 14 | 11 | <1 | 8.5 | 13000 | 35000 | 36000 | <2 UJ |
| 8260D | Methyl Chloride | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | Methylene Chloride | UG/L | <10000 | <5000 | <200 | <170 | <5 | <50 | <5 | <5 | <5 | <5 | <5 | <20 | <5000 | <25000 | <25000 | <10 UJ |
| 8260D | Tetrachloroethene | UG/L | 18000 | 28000 | <40 | <33 | <1 | 17 | 2.9 | <1 | <1 | <1 | <1 | <4 | <1000 | 57000 | 61000 | <2 UJ |
| 8260D | Tetrahydrothiophene | UG/L | <4000 | <2000 | <80 | <67 | <2 | <20 | <2 | <2 | <2 | 44 | <2 | 130 | <2000 | <10000 | <10000 | 2700 |
| 8260D | Toluene | UG/L | <2000 | <1000 | <40 | <33 | <1 | <10 | <1 | <1 | <1 | <1 | <1 | <4 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | trans-1,2-Dichloroethene | UG/L | <2000 | <1000 | <40 | <33 | <1 | 11 | 3.1 | <1 | <1 | <1 | <1 | 6.6 | <1000 | <5000 | <5000 | <2 UJ |
| 8260D | Trichloroethene | UG/L | 110000 | 38000 | 1500 | 36 | 3.4 | 38 | 19 | <1 | 2.8 | <1 | <1 | <4 | 1400 | 130000 | 140000 | <2 UJ |
| 8260D | Vinyl Chloride | UG/L | <2000 | 1500 | 310 | 850 | <1 | 240 | 6.7 | <1 | <1 | 55 | <1 | 27 | 14000 | 7900 | 8900 | <2 UJ |
| | Total VOCs | UG/L | 156700 | 83100 | 3589 | 1166 | 3.4 | 586 | 59.7 | 0 | 16.8 | 158.3 | 0 | 177.2 | 28400 | 235500 | 251800 | 3231.3 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | <26 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <22 | <5 [U,H] | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | 23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 24 | 16 | -- |
| 8270E | Hexachloroethane | UG/L | -- | 22 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 120 J | 100 | -- |
| 8270E | Naphthalene | UG/L | -- | <1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.95 | 0.81 | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | 68 J | 21 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | 11 | 9.5 | -- |
| 8081B | beta-BHC | UG/L | 14 J | 1.7 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.71 | 13 | 11 | -- |
| 8081B | delta-BHC | UG/L | <4.8 | 3.4 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.4 | <4.9 | <5.3 | -- |
| 8081B | Lindane | UG/L | 51 | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <4.9 | <5.3 | -- |
| 8082A | PCB 1016 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| 8082A | PCB 1221 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| 8082A | PCB 1232 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| 8082A | PCB 1242 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| 8082A | PCB 1248 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | 3.4 | 4.5 | -- |
| 8082A | PCB 1254 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| 8082A | PCB 1260 | UG/L | <4.8 | <4.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.48 | <0.97 | <1.1 | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | 0.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | 0.02 | 0.34 | <0.01 | <0.01 | 0.021 | 0.014 | 0.48 | -- | <0.01 | -- | <0.01 | <0.01 | 0.74 | 1.5 | 1.3 | 0.17 |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | -- | 14 | -- | 120 | -- | 110 | 12 | -- | 320 | 320 | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | -- | 14 | -- | 120 | -- | 110 | 12 | -- | 320 | 320 | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | -- | 19000 | -- | 25 | -- | 16 | 740 | -- | 7400 | 7300 | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | -- | 54 | -- | 2.2 | -- | 24 | 19 | -- | 3.1 | 3.4 | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | -- | 9.9 | -- | <0.2 | -- | <0.2 | <0.2 | -- | 0.53 | 0.52 | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | -- | <5 | -- | <0.1 | -- | <0.1 | <0.5 | -- | <1 | <1 | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | -- | 610 | -- | 61 | -- | 37 | 1300 | -- | 660 | 670 | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | -- | 6.5 | -- | <1 | -- | <1 | 3.1 | -- | <1 | <1 | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | -- | 2.4 | -- | 1.1 | -- | <1 | 1.5 | -- | 26 | 27 | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | -- | 17 | -- | <1 | -- | <1 | 47 | -- | 9.1 | 7.9 | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | -- | 83 | -- | <1 | -- | <1 | 280 | -- | 1400 | 1300 | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | -- | 4800 | -- | <1 | -- | 8.1 | 1100 | -- | 560 | 480 | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | -- | 1.6 | -- | <1 | -- | <1 | 2.4 | -- | 1.3 | 1.3 | -- |

< Non detect at stated reporting limit. J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

# APPENDIX B
## 2023 Analytical Results - Monitoring Wells

| | | Location | MW-25B | MW-25C/CD | MW-25D | MW-25F | MW-26CD | MW-27A | MW-28A | MW-29B | MW-2A | MW-2B | MW-2C | MW-30B | MW-3A | MW-3B | MW-4AR | MW-4CR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/20/2023 | 09/20/2023 | 09/20/2023 | 09/20/2023 | 09/28/2023 | 09/27/2023 | 09/26/2023 | 09/15/2023 | 09/26/2023 | 09/26/2023 | 09/26/2023 | 09/15/2023 | 09/14/2023 | 09/14/2023 | 09/19/2023 | 09/18/2023 |
| Method | Parameter | Units | DUP | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | clear | yellow | clear | yel-clear | clear | murky | clear | clear | clear | clear | clear | clear | clear | yel-clear | clear | clear |
| | DEPTH TO WATER | Feet | 13.32 | 14.86 | 11.77 | 12.64 | 15.14 | 13.21 | 8.69 | 14.55 | 9.05 | 11.33 | 14.45 | 10.53 | 7.95 | 10.21 | 15.32 | 10.89 |
| | DISSOLVED OXYGEN | MG/L | 0 | 0 | 0 | 0 | 0 | 2.42 | 0.34 | 0 | 0 | 0 | 0.66 | 0 | 0 | 0 | 2.64 | 0 |
| | ODOR | NONE | strong | mild | none | strong | none | none | slight | weak | mild | mild | slight | weak | none | none | none | none |
| | OXIDATION REDUCTION POTENTIAL | MV | -316 | 206 | -276 | 67 | -121 | -223 | -134 | -193 | -253 | -137 | -172 | -331 | -291 | -62 | 68 | -285 |
| | PH | STD UNITS | 12.29 | 0 | 9.1 | 2.03 | 8.36 | 7.6 | 7.2 | 8.03 | 8.23 | 7.39 | 7.19 | 10.17 | 9.33 | 7.15 | 8.2 | 8.38 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 1010 | 6150 | 1420 | 4290 | 730 | 3150 | 1500 | 4540 | 1500 | 3820 | 2730 | 595 | 691 | 6650 | 8490 | 488 |
| | TEMPERATURE | DEGREES C | 14.36 | 13.81 | 13.46 | 16.28 | 13.93 | 17.1 | 16.79 | 16.92 | 14.01 | 15.28 | 15 | 14.92 | 18.36 | 15.47 | 13.91 | 15.3 |
| | TURBIDITY QUANTITATIVE | NTU | 2.17 | 110 | 18.7 | 17.4 | 11.3 | 15.4 | 10.9 | 3.23 | 4.5 | 32.1 | 3.8 | 11.1 | 9.91 | 39.1 | 33.1 | 29.7 |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | 250 | 10000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | 1,1-Dichloroethane | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | 1,1-Dichloroethene | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | 210 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | 1,2-Dichlorobenzene | UG/L | 18 | <10 | <40 | <40 | <1000 | <1 | <100 | 12 | <5 | <100 | <1000 | 22 | <1 | <2000 | <1 | <200 |
| 8260D | 1,4-Dichlorobenzene | UG/L | 42 | <10 | <40 | <40 | <1000 | <1 | <100 | 73 | 5.8 | <100 | <1000 | 53 | <1 | <2000 | <1 | <200 |
| 8260D | 1,4-Dichlorobutane | UG/L | 420 | <10 | <40 | <40 | <1000 | <1 | <100 | <4 | <5 | <100 | <1000 | 580 | <1 | <2000 | <1 | <200 |
| 8260D | Benzene | UG/L | <10 | 39 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | 110 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | Carbon Tetrachloride | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | 6100 | <1 | <200 |
| 8260D | Chlorobenzene | UG/L | 30 | 13 | <40 | <40 | <1000 | <1 | 110 | 110 | <5 | 260 | <1000 | 86 | <1 | <2000 | <1 | <200 |
| 8260D | Chloroform | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | 110 | <1000 | <10 | <1 | 400000 | <1 | <200 |
| 8260D | cis-1,2 Dichloroethene | UG/L | <10 | 71 | 1300 | 260 | 5200 | <1 | 4200 | 1 | 7.2 | 35000 | 8300 | <10 | <1 | 8100 | <1 | 6200 |
| 8260D | Methyl Chloride | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | Methylene Chloride | UG/L | <50 | <50 | <200 | <200 | <5000 | <5 | <500 | <5 | <25 | <500 | <5000 | <50 | <5 | 15000 | <5 | <1000 |
| 8260D | Tetrachloroethene | UG/L | <10 | <10 | <40 | <40 | 12000 | <1 | 2800 | <1 | <5 | 15000 | 95000 | <10 | <1 | 53000 | <1 | <200 |
| 8260D | Tetrahydrothiophene | UG/L | 2600 | 160 | 85 | <80 | <2000 | <2 | <200 | 8.3 | <10 | <200 | <2000 | 5400 | <2 | <4000 | <2 | <400 |
| 8260D | Toluene | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | <100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <10 | <10 | <40 | <40 | <1000 | <1 | <100 | <1 | <5 | 230 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| 8260D | Trichloroethene | UG/L | <10 | <10 | <40 | <40 | 23000 | <1 | 3300 | <1 | <5 | 28000 | 190000 | <10 | <1 | 72000 | <1 | <200 |
| 8260D | Vinyl Chloride | UG/L | <10 | 94 | 710 | 1400 | <1000 | <1 | 810 | 1.9 | 170 | 4100 | <1000 | <10 | <1 | <2000 | <1 | <200 |
| | Total VOCs | UG/L | 3110 | 377 | 2095 | 1660 | 40200 | 0 | 11220 | 206.2 | 183 | 83270 | 303300 | 6141 | 0 | 554200 | 0 | 6200 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | -- | -- | -- | <4.8 | -- | -- | -- | -- | -- | <50 | -- | -- | -- | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | -- | -- | -- | 19 | -- | -- | -- | -- | -- | <10 | -- | -- | -- | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | -- | -- | -- | 10 | -- | -- | -- | -- | -- | 28 | -- | -- | -- | -- | -- |
| 8270E | Naphthalene | UG/L | -- | -- | -- | -- | 0.23 | -- | -- | -- | -- | -- | <2 | -- | -- | -- | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | 79 J | 18 J | -- | -- | -- | -- | 0.23 |
| 8081B | beta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.8 J | 1.9 J | -- | -- | -- | -- | <0.05 |
| 8081B | delta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1 J | <1 | -- | -- | -- | -- | <0.05 |
| 8081B | Lindane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | 29 | 6.4 | -- | -- | -- | -- | 0.1 |
| 8082A | PCB 1016 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| 8082A | PCB 1221 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| 8082A | PCB 1232 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| 8082A | PCB 1242 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | 0.97 |
| 8082A | PCB 1248 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| 8082A | PCB 1254 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| 8082A | PCB 1260 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | <5.1 | -- | -- | -- | -- | <0.1 |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | 0.15 | <0.01 | <0.01 | <0.01 | <0.01 | 0.013 | 0.42 | 0.019 | 2.5 | -- | 0.077 | 1.8 | 1.2 | 16 | 55 | <0.01 |
| SM 2320 B | Alkalinity, total | MG/L | -- | 480 | 20 | 14 | -- | 260 | -- | 320 | -- | -- | -- | 160 | -- | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | 480 | 20 | 12 | -- | 260 | -- | 320 | -- | -- | -- | 160 | -- | -- | -- | -- |
| 300 | Chloride | MG/L | -- | 830 | 1700 | 860 | -- | 870 | -- | 970 | -- | -- | -- | 48 | -- | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | 18 | 13 | 19 | -- | 8.2 | -- | 0.6 | -- | -- | -- | 3.5 | -- | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | 0.57 | <0.2 | <0.2 | -- | <0.2 | -- | <0.2 | -- | -- | -- | 0.56 | -- | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | <0.5 | <0.1 | <0.5 | -- | <0.5 | -- | <0.5 R | -- | -- | -- | <0.5 R | -- | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | 2300 | 870 | 1300 | -- | 84 | -- | 560 | -- | -- | -- | 140 | -- | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | 1.7 | <1 | 9.3 | -- | <1 | -- | <1 | -- | -- | -- | 4.6 | -- | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | 2.4 | 1.5 | 3.7 | -- | 3.7 | -- | 4 | -- | -- | -- | 5 | -- | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | 5.6 | 10 | 37 | -- | 72 | -- | <1 | -- | -- | -- | 8 | -- | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | 25 | 33 | 340 | -- | <1 | -- | 7.5 | -- | -- | -- | <1 | -- | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | 1000 | 65 | 800 | -- | 140 | -- | 200 | -- | -- | -- | 320 | -- | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | <1 | 3.7 | 6.6 | -- | <1 | -- | <1 | -- | -- | -- | <1 | -- | -- | -- | -- |

< Non detect at stated reporting limit. J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

## APPENDIX B
## 2023 Analytical Results - Monitoring Wells

| | | Location | MW-5AR | MW-5BR | MW-5CDR | MW-5DR | MW-5FR | MW-6AR | MW-7AR | MW-7CR | MW-7FR | MW-8A | MW-8B | MW-9AR | MW-U-1 | OBA-01B | OBA-01C | PW-16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/19/2023 | 09/18/2023 | 09/18/2023 | 09/18/2023 | 09/18/2023 | 09/26/2023 | 09/28/2023 | 09/27/2023 | 09/27/2023 | 09/12/2023 | 09/14/2023 | 09/12/2023 | 09/20/2023 | 09/27/2023 | 09/27/2023 | 09/29/2023 |
| Method | Parameter | Units | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | -- | clear | clear | clear | none | blk-clear | clear | clear | clear | yellow | none | clear | -- | clear | clear | clear |
| | DEPTH TO WATER | Feet | -- | 16.52 | 20.49 | 18.07 | 16.39 | 15.09 | 15.33 | 13.23 | 13.3 | 9.91 | 9.83 | 10.31 | 16.59 | 14.05 | 18.49 | 15.08 |
| | DISSOLVED OXYGEN | MG/L | -- | 1.65 | 0 | 0 | 0 | 0 | 1.24 | 0.44 | 0 | 2.67 | 0 | 3.75 | -- | 3.77 | 0 | 2.2 |
| | ODOR | NONE | -- | none | none | none | none | none | none | none | slight | strong | strong | none | -- | none | none | weak |
| | OXIDATION REDUCTION POTENTIAL | MV | -- | -172 | -289 | -105 | -183 | -288 | -56 | -171 | -375 | 11 | -360 | 262 | -- | 69 | -149 | -139 |
| | PH | STD UNITS | -- | 8.65 | 9.25 | 7.59 | 9.65 | 8.46 | 7.31 | 7.51 | 7.43 | 7.93 | 7.65 | 6.55 | -- | 7.15 | 7.28 | 9.91 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | -- | 1.38 | 267 | 1880 | 392 | 1020 | 818 | 2150 | 4600 | 2670 | 2.64 | 3900 | -- | 16500 | 3220 | 1100 |
| | TEMPERATURE | DEGREES C | -- | 13 | 14.38 | 14.79 | 14.2 | 16.12 | 12.12 | 14.89 | 11.55 | 16.53 | 15.68 | 16.88 | -- | 18.29 | 15.92 | 22.42 |
| | TURBIDITY QUANTITATIVE | NTU | -- | 3.89 | 20.9 | 2.24 | 11.1 | 18.3 | 521 | 29.8 | 6.36 | 8.61 | 6.31 | 19.1 | -- | 19.3 | 37.5 | 17.7 |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | 770 | <20 |
| 8260D | 1,1-Dichloroethane | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | 1,1-Dichloroethene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | 940 | <20 |
| 8260D | 1,2-Dichlorobenzene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | 1,4-Dichlorobenzene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | 1,4-Dichlorobutane | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | 110 | <1 | 73000 | 19000 | 140 | <10 | <1 | <250 | <20 |
| 8260D | Benzene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | 1.5 | <2000 | <1000 | <1 | <10 | <1 | 740 | <20 |
| 8260D | Carbon Tetrachloride | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | Chlorobenzene | UG/L | <2 | 1.6 | <1 | <50 | <1 | <1 | <1 | 1.1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | Chloroform | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | 55000 | <20 |
| 8260D | cis-1,2 Dichloroethene | UG/L | <2 | <1 | <1 | 670 | <1 | <1 | 1.5 | 1.7 | 6.8 | <2000 | <1000 | 1.1 | 10 | 7 | 34000 | 360 |
| 8260D | Methyl Chloride | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | Methylene Chloride | UG/L | <10 | <5 | <5 | <250 | <5 | <5 | <5 | <5 | <5 | <10000 | <5000 | <5 | <50 | <5 | 7000 | <100 UJ |
| 8260D | Tetrachloroethene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | 7.8 | 33000 | 97 |
| 8260D | Tetrahydrothiophene | UG/L | <4 | <2 | <2 | <100 | <2 | <2 | <2 | 730 | 76 | 88000 | 39000 | 330 | <20 | <2 | <500 | <40 |
| 8260D | Toluene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <1 | <2000 | <1000 | <1 | <10 | <1 | <250 | <20 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | 8.6 | <2000 | 2000 | <1 | <10 | <1 | 480 | <20 |
| 8260D | Trichloroethene | UG/L | <2 | <1 | <1 | <50 | <1 | <1 | <1 | <1 | <2 | <2000 | <1000 | 3.8 | <10 | 9.8 | 180000 | 150 |
| 8260D | Vinyl Chloride | UG/L | <2 | 1.8 | <1 | 180 | 1.9 | <1 | <1 | 15 | 42 | <2000 | 1600 | <1 | <10 | <1 | 960 | 200 |
| | Total VOCs | UG/L | 0 | 3.4 | 0 | 850 | 1.9 | 0 | 1.5 | 857.8 | 134.9 | 161000 | 61600 | 474.9 | 10 | 24.6 | 312890 | 807 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <4.8 | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.96 | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.96 | -- | -- |
| 8270E | Naphthalene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.19 | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | <0.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | 0.17 | 0.047 | <0.01 | <0.01 | <0.01 | -- | -- | 0.012 | <0.01 | 2 | 1 | 0.33 | -- | <0.01 | 0.11 | -- |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | -- | -- | 80 | 180 | -- | 140 | -- | -- | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | -- | -- | 80 | 180 | -- | 140 | -- | -- | -- | -- | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | -- | -- | 58 | 730 | -- | 380 | -- | -- | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | -- | -- | 24 | 5.3 | -- | 2.1 | -- | -- | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | <0.2 | <0.2 | -- | 0.6 | -- | -- | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | -- | -- | <1 | <0.5 | -- | <1 | -- | -- | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | -- | -- | 1200 | 1600 | -- | 520 | -- | -- | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | -- | -- | <1 | 24 | -- | 22 | -- | -- | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | -- | -- | 1.3 | <1 | -- | 23 | -- | -- | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | -- | -- | 6.1 | 29 | -- | 56 | -- | -- | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | -- | -- | 7.9 | 240 | -- | 1200 | -- | -- | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | -- | -- | 130 | 960 | -- | 1600 | -- | -- | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | -- | -- | 3 | <1 | -- | 4.3 | -- | -- | -- | -- | -- |

< Non detect at stated reporting limit. J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

## APPENDIX B
## 2023 Analytical Results - Monitoring Wells

| Method | Parameter | Location | PW-18 | PW-19 | PW-20 | PW-22 | PW-24 | PW-26 | PW-35 | PW-36 | PW-37 | PW-39 | PW-43 | EB | EB2 | TB | TB | TB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/29/2023 | 09/12/2023 | 09/13/2023 | 09/14/2023 |
| | | Units | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | EB | EB | TB | TB | TB |
| | **Field Parameters** | | | | | | | | | | | | | | | | | |
| | COLOR | NONE | clear | brw-cloud | or-clear | yel-clear | brown | clear | or-clear | clear | clear | clear | clear | -- | -- | -- | -- | -- |
| | DEPTH TO WATER | Feet | 10.09 | 16.95 | 9.6 | 11.18 | 9.87 | 10.14 | 12.51 | 8.24 | 9.2 | 13.97 | 12.96 | -- | -- | -- | -- | -- |
| | DISSOLVED OXYGEN | MG/L | 4.41 | 5.63 | 2.49 | 4.82 | 4.89 | 4.56 | 3.05 | 4.29 | 4.43 | 4.35 | 5.97 | -- | -- | -- | -- | -- |
| | ODOR | NONE | none | moderate | none | none | none | none | none | none | none | weak | weak | -- | -- | -- | -- | -- |
| | OXIDATION REDUCTION POTENTIAL | MV | 25 | 60 | 22 | -26 | 58 | 43 | -38 | 266 | -79 | -93 | -10 | -- | -- | -- | -- | -- |
| | PH | STD UNITS | 7.8 | 7.32 | 8.11 | 7.94 | 7.94 | 7.84 | 7.22 | 6.95 | 7.21 | 7.21 | 7.7 | -- | -- | -- | -- | -- |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 1210 | 1130 | 9390 | 5780 | 3810 | 2330 | 26900 | 19500 | 3250 | 7600 | 895 | -- | -- | -- | -- | -- |
| | TEMPERATURE | DEGREES C | 23.06 | 19.02 | 22.86 | 18.67 | 20.54 | 19.38 | 19.12 | 17.95 | 17.13 | 16.51 | 19.37 | -- | -- | -- | -- | -- |
| | TURBIDITY QUANTITATIVE | NTU | 25 | >1000 | 97.7 | 46.4 | 735 | 23.6 | 24.1 | 42.9 | 8.69 | 2.94 | 3.48 | -- | -- | -- | -- | -- |
| | **Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | 6400 | 9100 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | 3000 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1-Dichloroethane | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1-Dichloroethene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,2-Dichlorobenzene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,4-Dichlorobenzene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,4-Dichlorobutane | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | 24 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Benzene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Carbon Tetrachloride | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Chlorobenzene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Chloroform | UG/L | <1000 | <1000 | 1.7 | <1 | <1 | 3.8 | <500 | 55 | 47000 | <2500 | 3.2 | <1 | <1 | <1 | <1 | <1 |
| 8260D | cis-1,2 Dichloroethene | UG/L | 12000 | 16000 | 31 | <1 | <1 | 120 | 6700 | 1700 | 9900 | 33000 | 11 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Methyl Chloride | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Methylene Chloride | UG/L | <5000 | <5000 | <5 UJ | <5 UJ | <5 UJ | <10 UJ | <2500 UJ | <250 | <10000 UJ | <13000 UJ | <5 UJ | <5 UJ | <5 UJ | <5 | <5 | <5 |
| 8260D | Tetrachloroethene | UG/L | 8200 | 11000 | <1 | <1 | <1 | 2.4 | 1100 | 360 | 3200 | 41000 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Tetrahydrothiophene | UG/L | <2000 | <2000 | <2 | <2 | <2 | <4 | <1000 | <100 | <4000 | <5000 | 28 | <2 | <2 | <2 | <2 | <2 |
| 8260D | Toluene | UG/L | <1000 | <1000 | <1 | <1 | <1 | <2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <1000 | <1000 | <1 | <1 | <1 | 2 | <500 | <50 | <2000 | <2500 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Trichloroethene | UG/L | 26000 | 35000 | 3.6 | <1 | <1 | 4.8 | 6500 | 880 | 17000 | 96000 | 4.5 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Vinyl Chloride | UG/L | <1000 | <1000 | <1 | <1 | <1 | 16 | 1600 | 240 | 2000 | 6300 | <1 | <1 | <1 | <1 | <1 | <1 |
| | Total VOCs | UG/L | 52600 | 71100 | 36.3 | 0 | 0 | 149 | 15900 | 3235 | 79100 | 179300 | 70.7 | 0 | 0 | 0 | 0 | 0 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <5 | <5.7 | -- | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.6 | <1.1 | -- | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1 | <1.1 | -- | -- | -- |
| 8270E | Naphthalene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.2 | <0.23 | -- | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.052 | <0.054 | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.052 | <0.054 | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <2.6 | <0.054 | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.052 | <0.054 | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 | <0.11 | -- | -- | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.2 | <0.2 | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.034 | <0.01 | -- | -- | -- |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <5 | <5 | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <5 | <5 | -- | -- | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.26 | <0.2 | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.2 | <0.2 | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <0.1 UJ | <0.1 UJ | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.8 | <1 | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | <1 | <1 | -- | -- | -- |

< Non detect at stated reporting limit.  J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

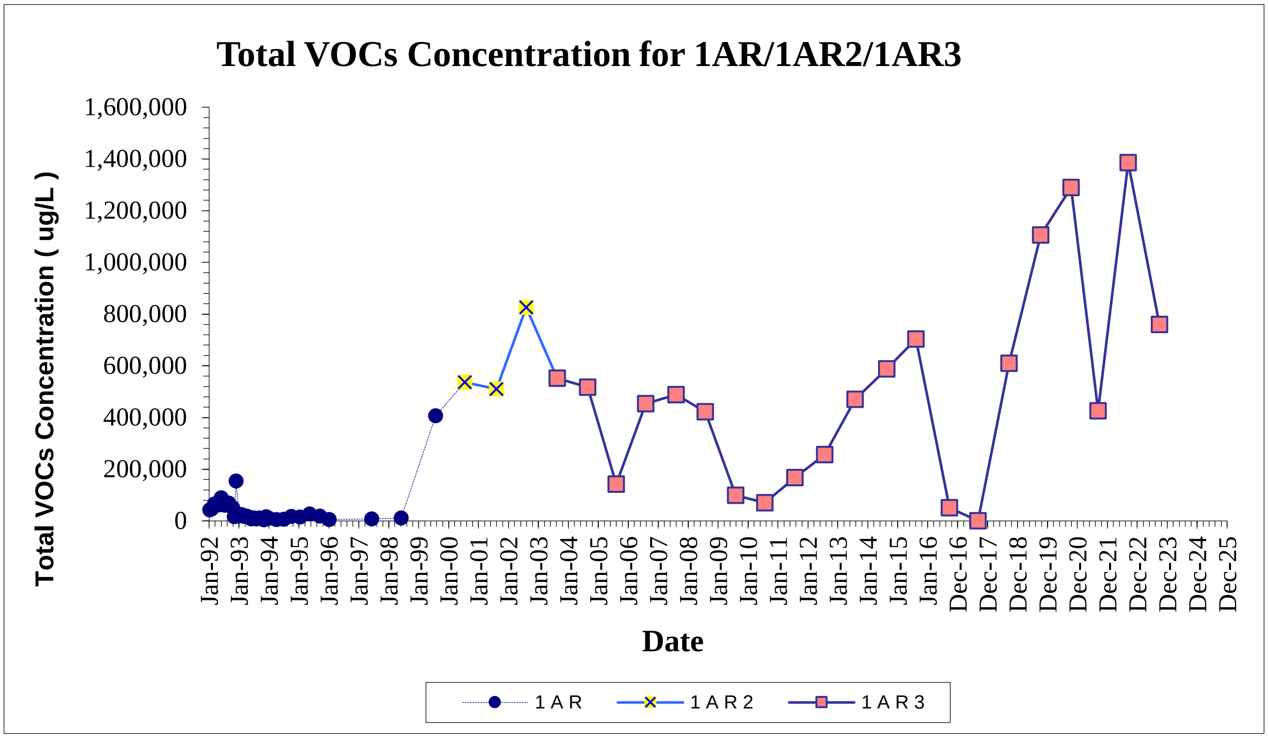
# APPENDIX B
## 2023 Analytical Results - Monitoring Wells

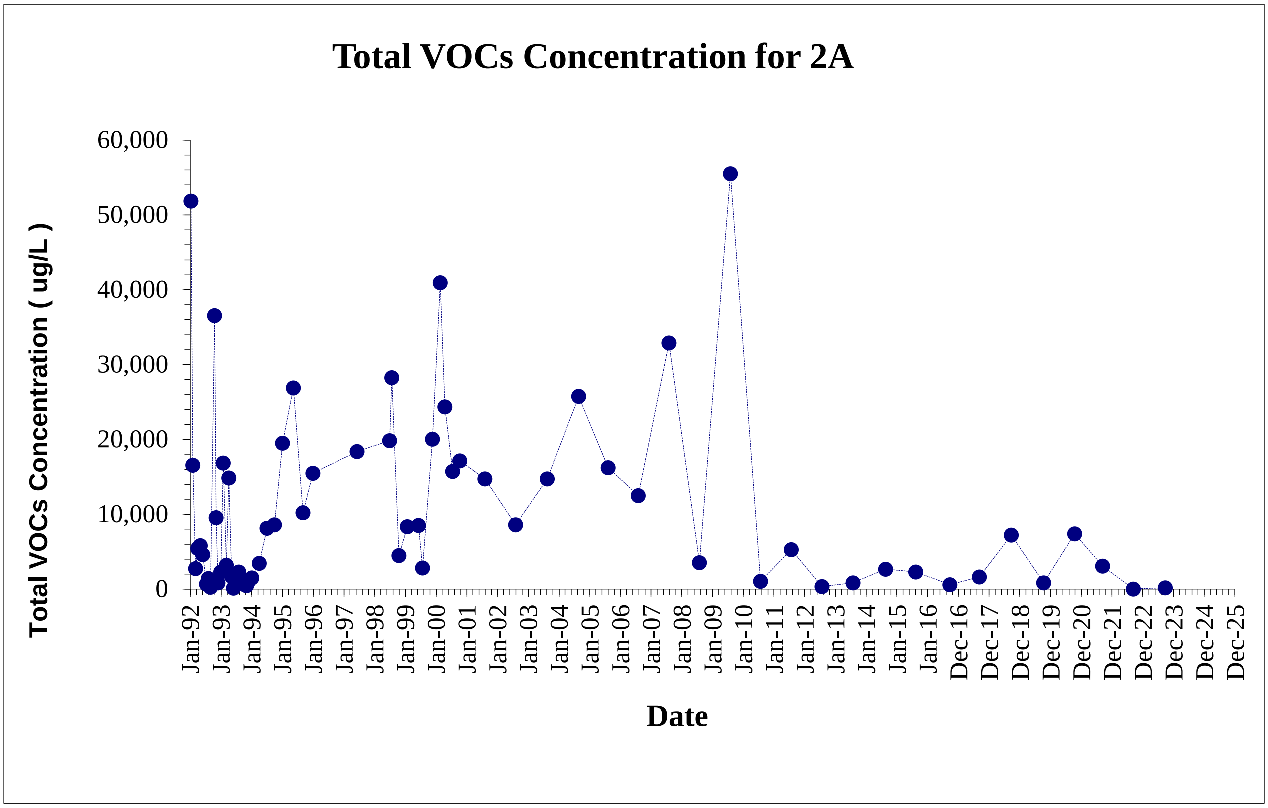
| | | Location | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | 09/15/2023 | 09/18/2023 | 09/19/2023 | 09/20/2023 | 09/21/2023 | 09/25/2023 | 09/26/2023 | 09/27/2023 | 09/28/2023 | 09/29/2023 | 10/02/2023 | 10/03/2023 | 10/04/2023 |
| Method | Parameter | Units | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB | TB |
| | **Field Parameters** | | | | | | | | | | | | | | |
| | COLOR | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | DEPTH TO WATER | Feet | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | DISSOLVED OXYGEN | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | ODOR | NONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | OXIDATION REDUCTION POTENTIAL | MV | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | PH | STD UNITS | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEMPERATURE | DEGREES C | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TURBIDITY QUANTITATIVE | NTU | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Volatile Organics** | | | | | | | | | | | | | | |
| 8260D | 1,1,1-Trichloroethane | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1,2,2-Tetrachloroethane | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1,2-Trichloroethane | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1-Dichloroethane | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,1-Dichloroethene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,2-Dichlorobenzene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,4-Dichlorobenzene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | 1,4-Dichlorobutane | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Benzene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Carbon Tetrachloride | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Chlorobenzene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Chloroform | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | cis-1,2 Dichloroethene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Methyl Chloride | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Methylene Chloride | UG/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 UJ | <5 | <5 | <5 |
| 8260D | Tetrachloroethene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Tetrahydrothiophene | UG/L | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| 8260D | Toluene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | trans-1,2-Dichloroethene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Trichloroethene | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 8260D | Vinyl Chloride | UG/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| | Total VOCs | UG/L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Semi-Volatile Organics** | | | | | | | | | | | | | | |
| 8270E | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Hexachlorobutadiene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Hexachloroethane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8270E | Naphthalene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Pesticides/PCBs** | | | | | | | | | | | | | | |
| 8081B | Alpha-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | **Inorganics/MNA** | | | | | | | | | | | | | | |
| 6010D | Barium, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SM 2320 B | Alkalinity, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SM 2320 B | Bicarbonate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 300 | Chloride | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 6010D | Iron, total | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 6010D | Iron, dissolved | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 300 | Nitrate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 300 | Sulfate | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4500-S2 F-2011 | Sulfide | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 5310 C-2000 | Total Organic Carbon | MG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RSK-175 | Ethane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RSK-175 | Ethene | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RSK-175 | Methane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RSK-175 | Propane | UG/L | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

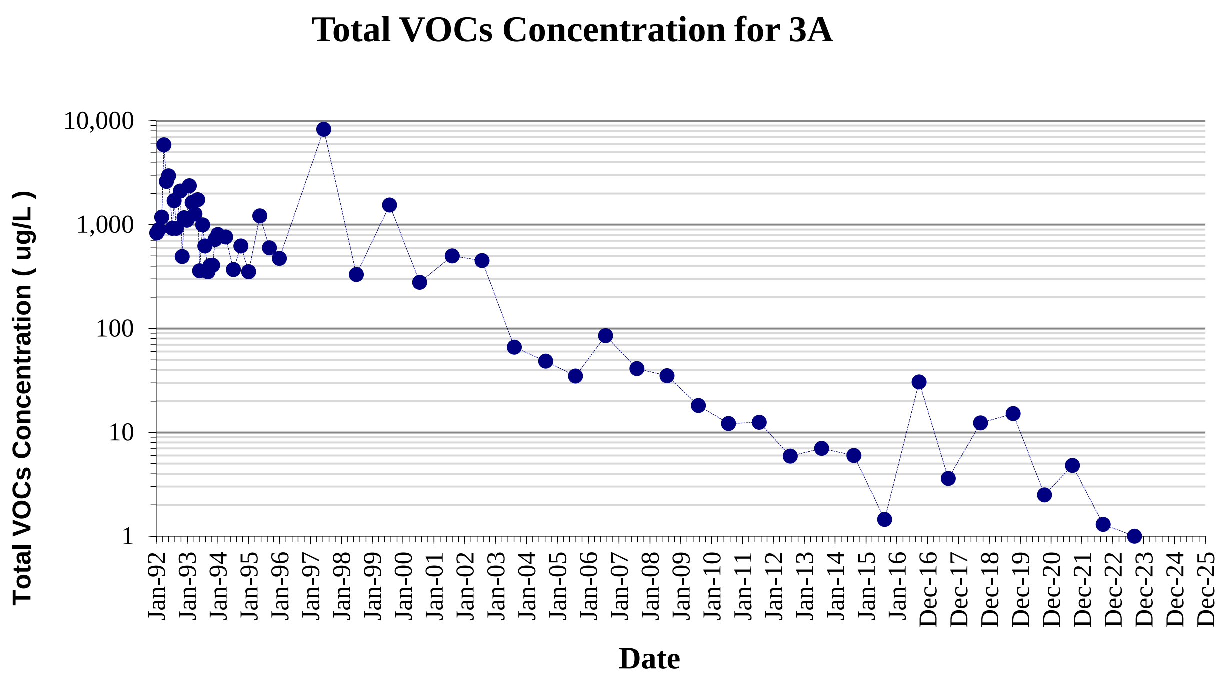
< Non detect at stated reporting limit.  J Estimated concentration.
B Not detected substantially above the level reported in the laboratory or field blanks.
UJ Undetected-estimated reporting.

# APPENDIX C
# TVOC CONCENTRATION TREND PLOTS

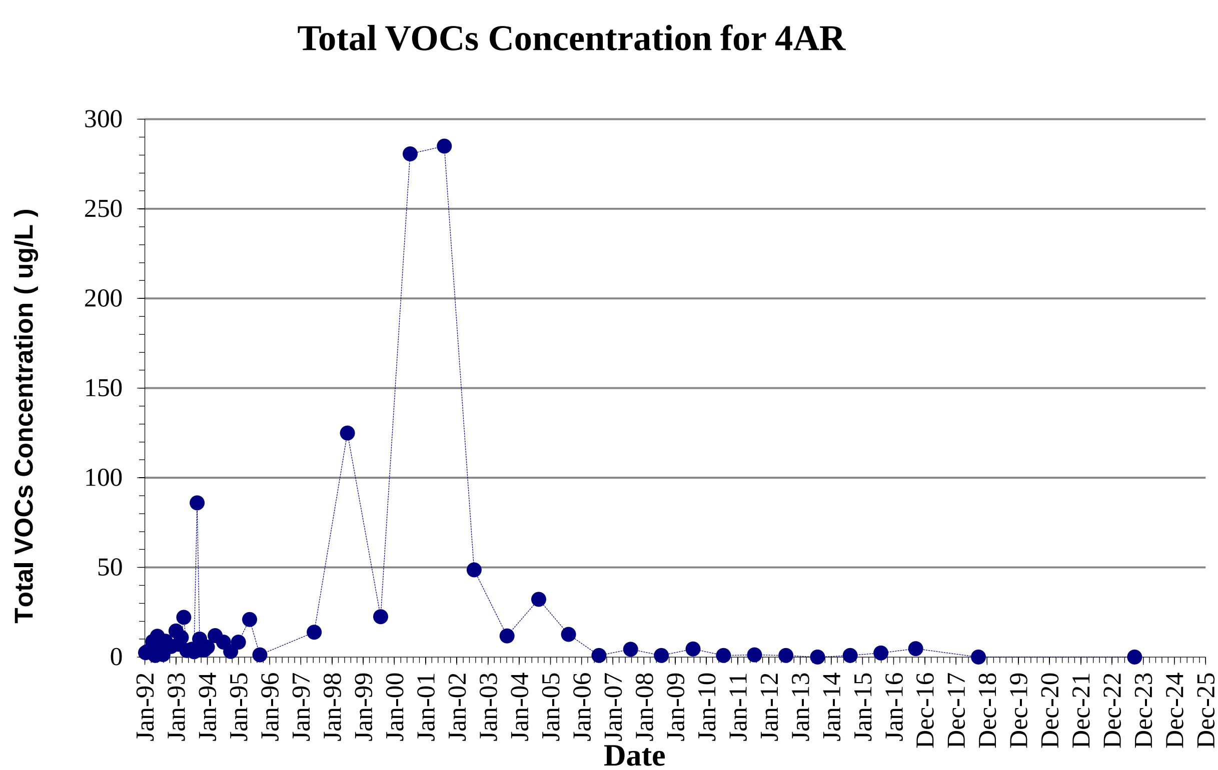
PARSONS

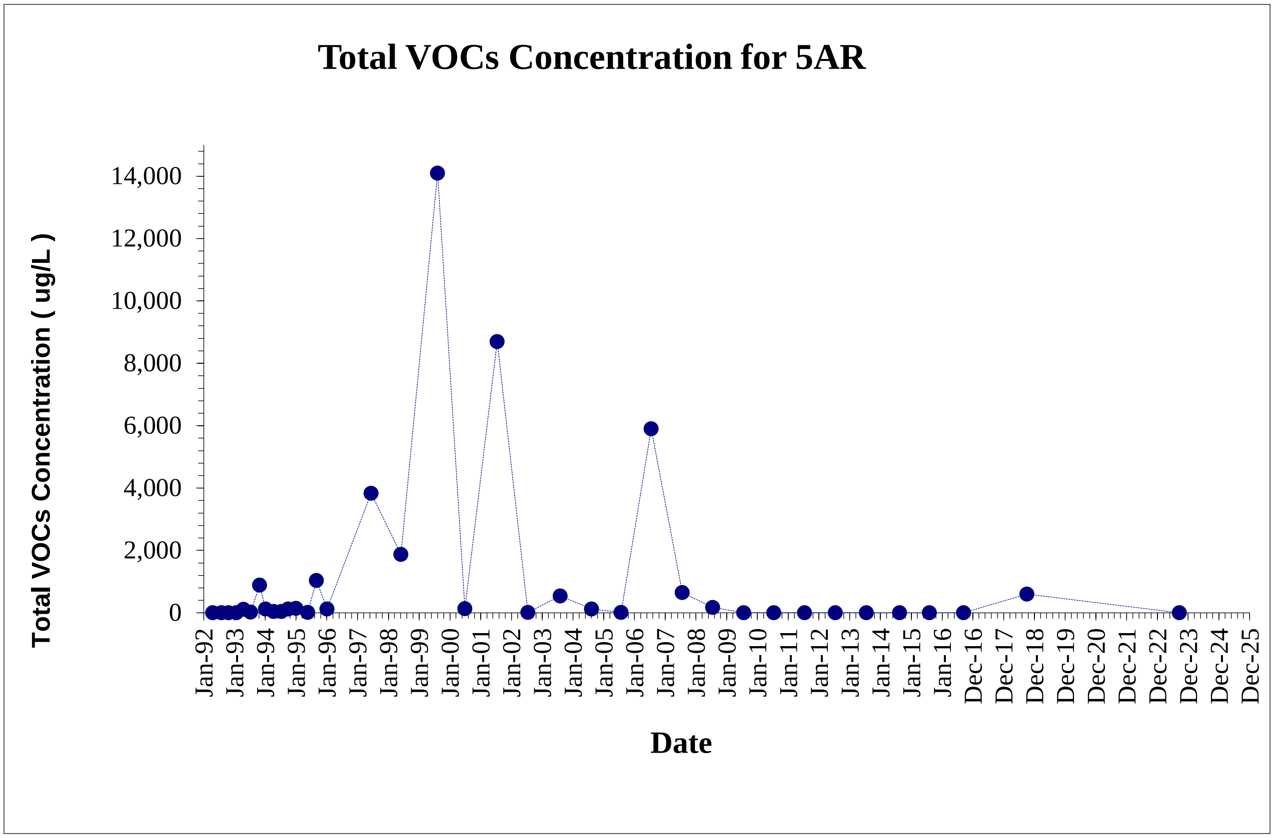

Total VOCs Concentration for 1AR/1AR2/1AR3
Total VOCs Concentration ( ug/L )
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
1AR
1AR2
1AR3

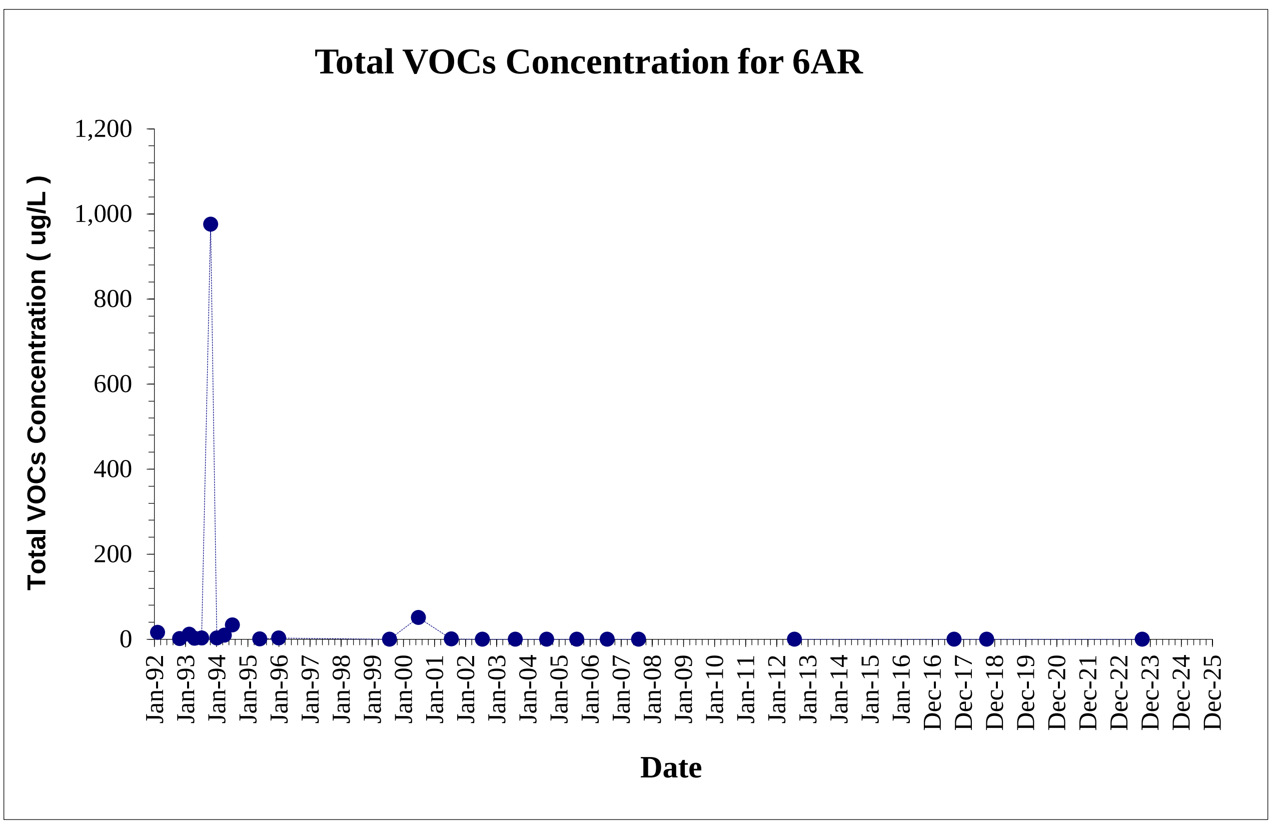

Total VOCs Concentration for 2A
Total VOCs Concentration ( ug/L )
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

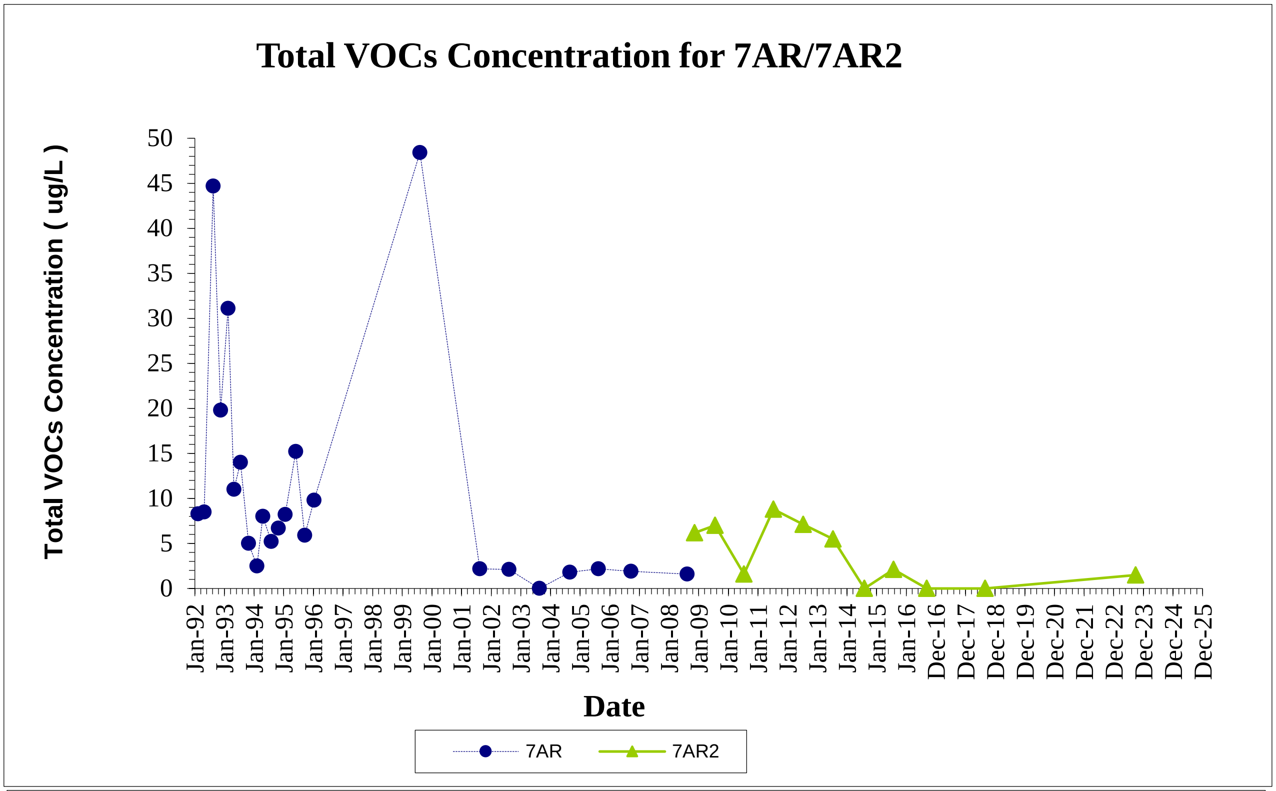


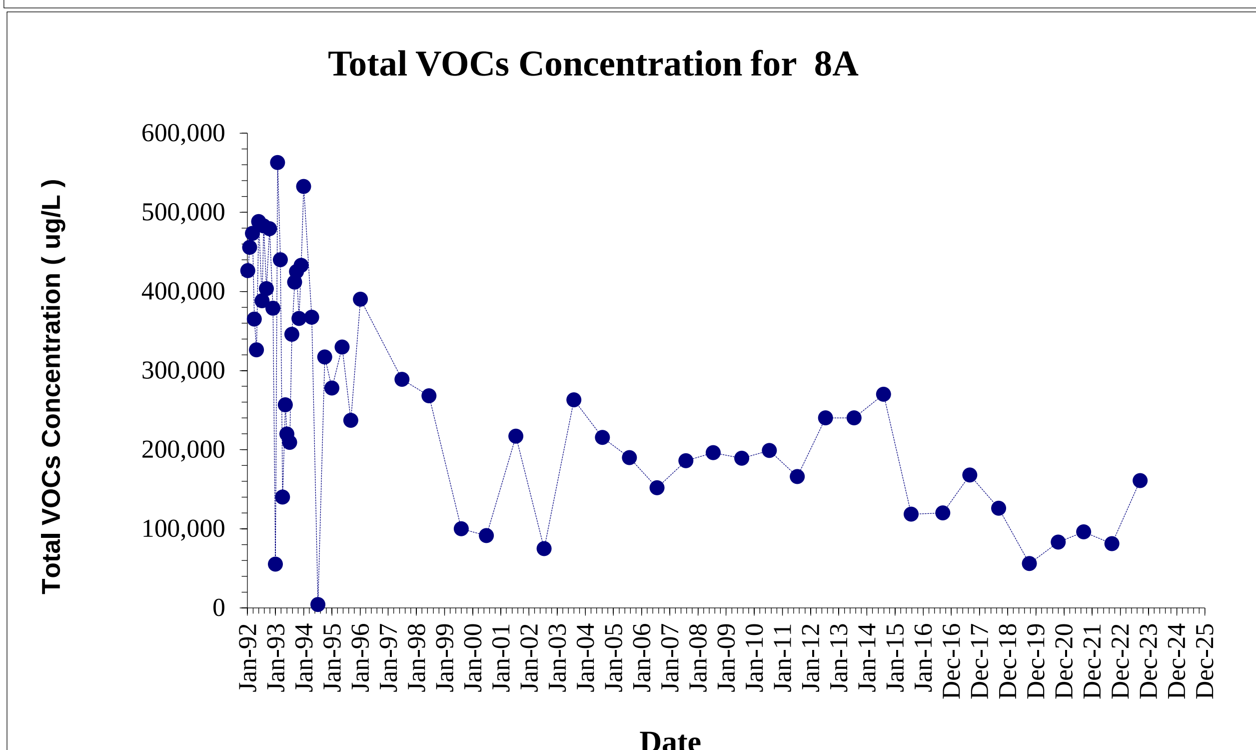

Analytical result for 2023 was non-detect but 1 was used in order to create plot.



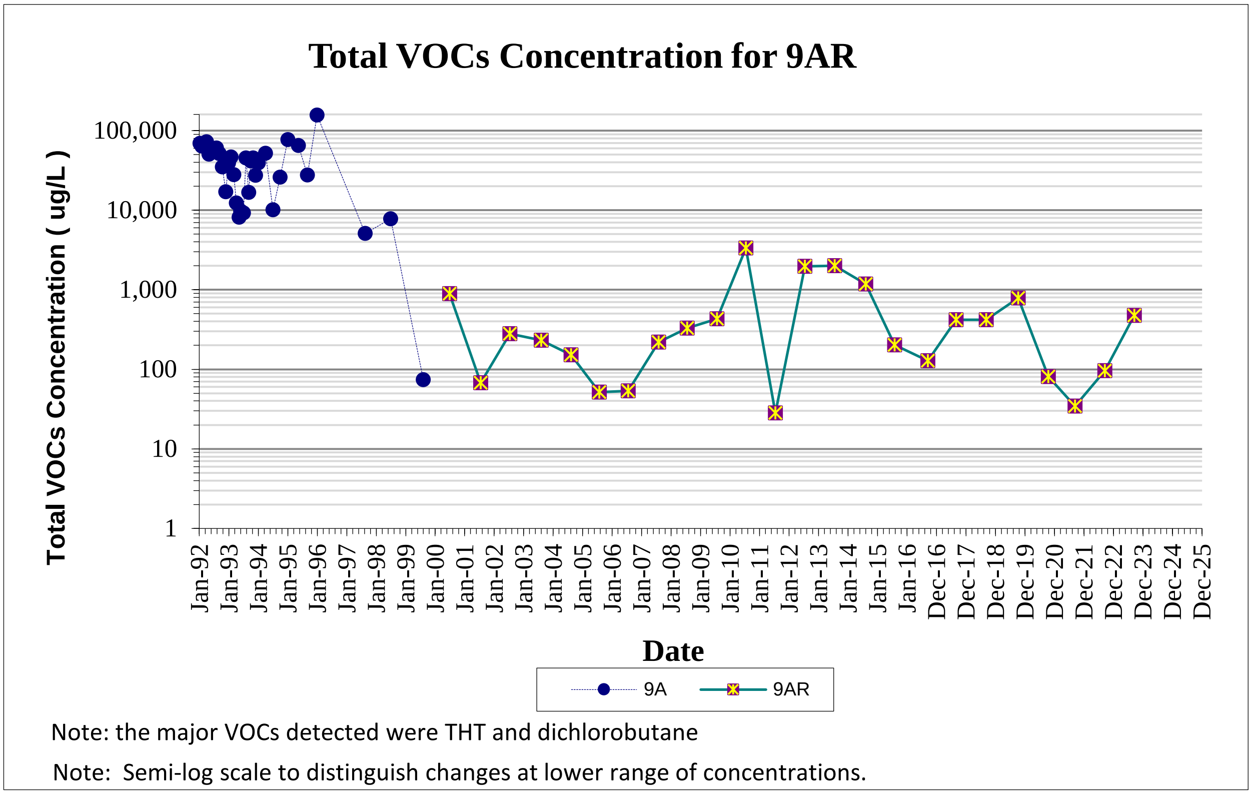

Total VOCs Concentration for 5AR
Total VOCs Concentration ( ug/L )
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

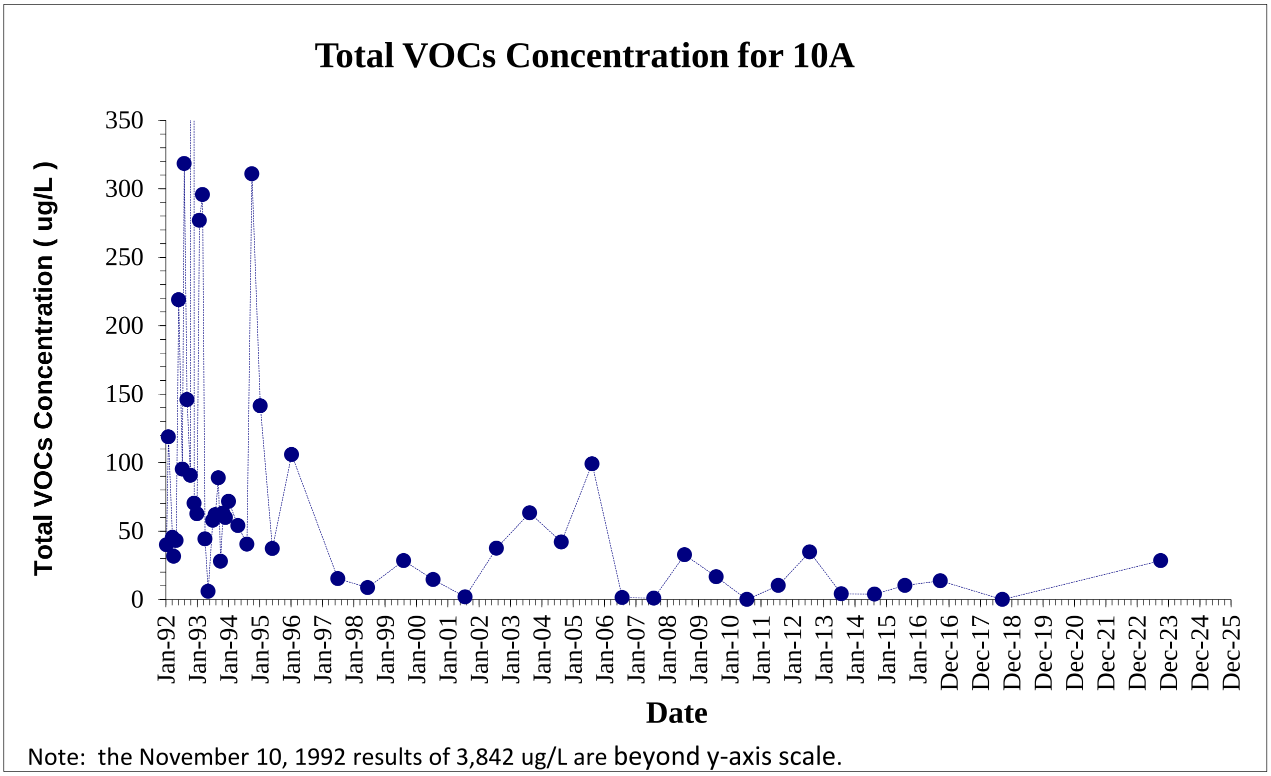

Total VOCs Concentration for 6AR
Total VOCs Concentration ( ug/L )
1,200
1,000
800
600
400
200
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

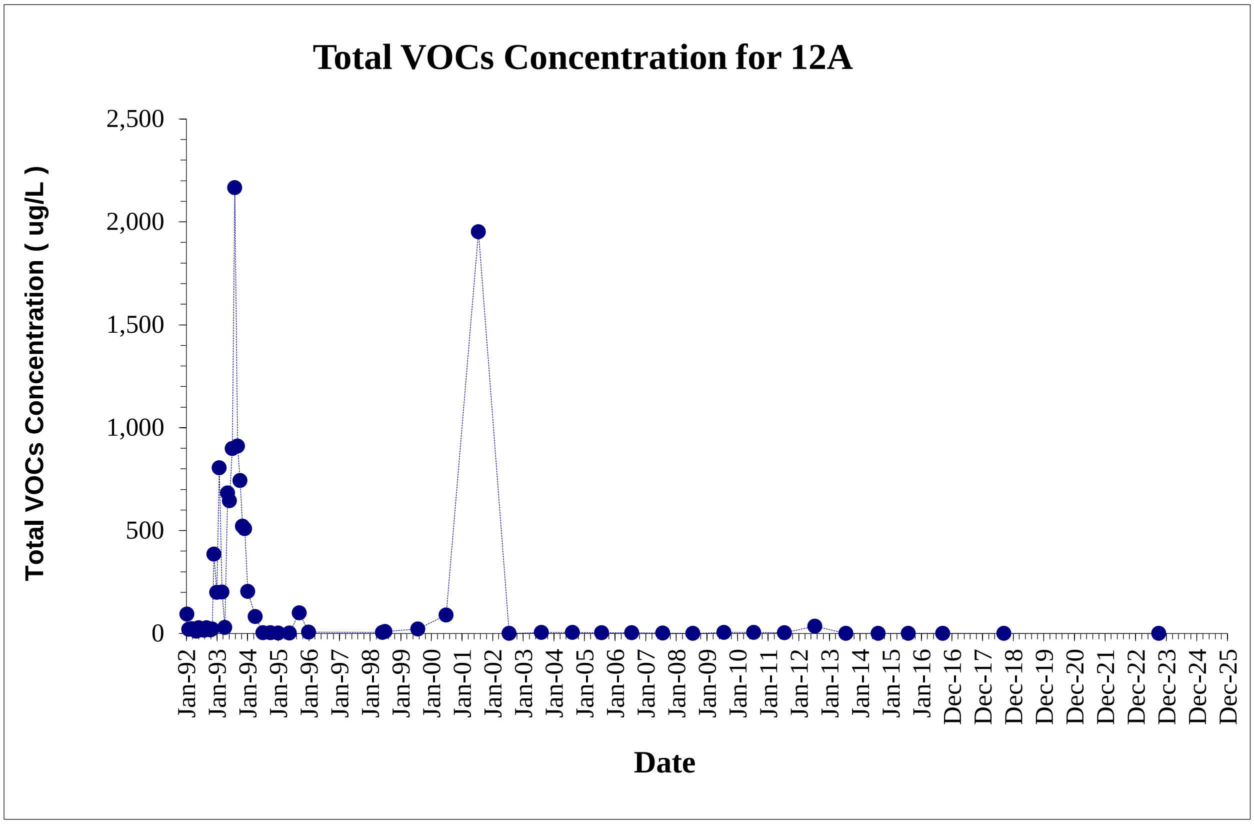


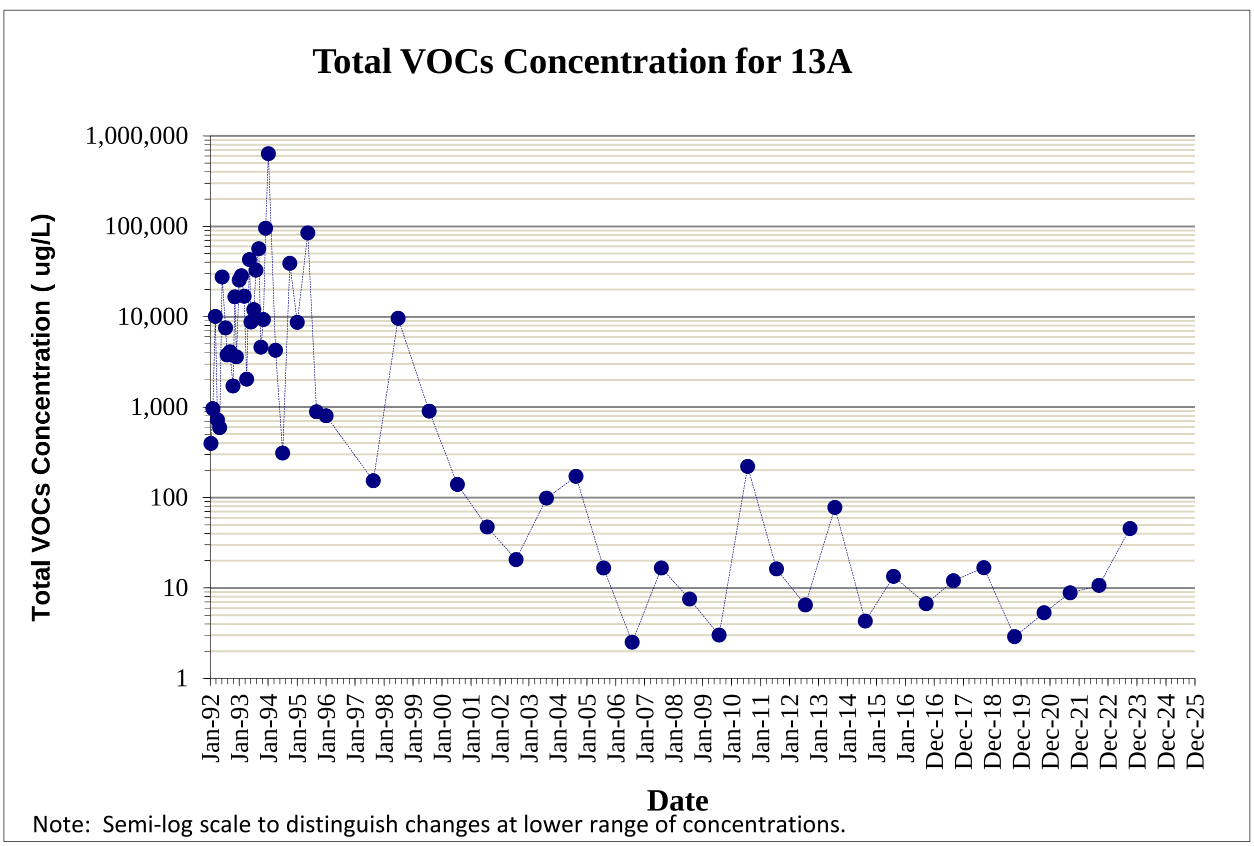



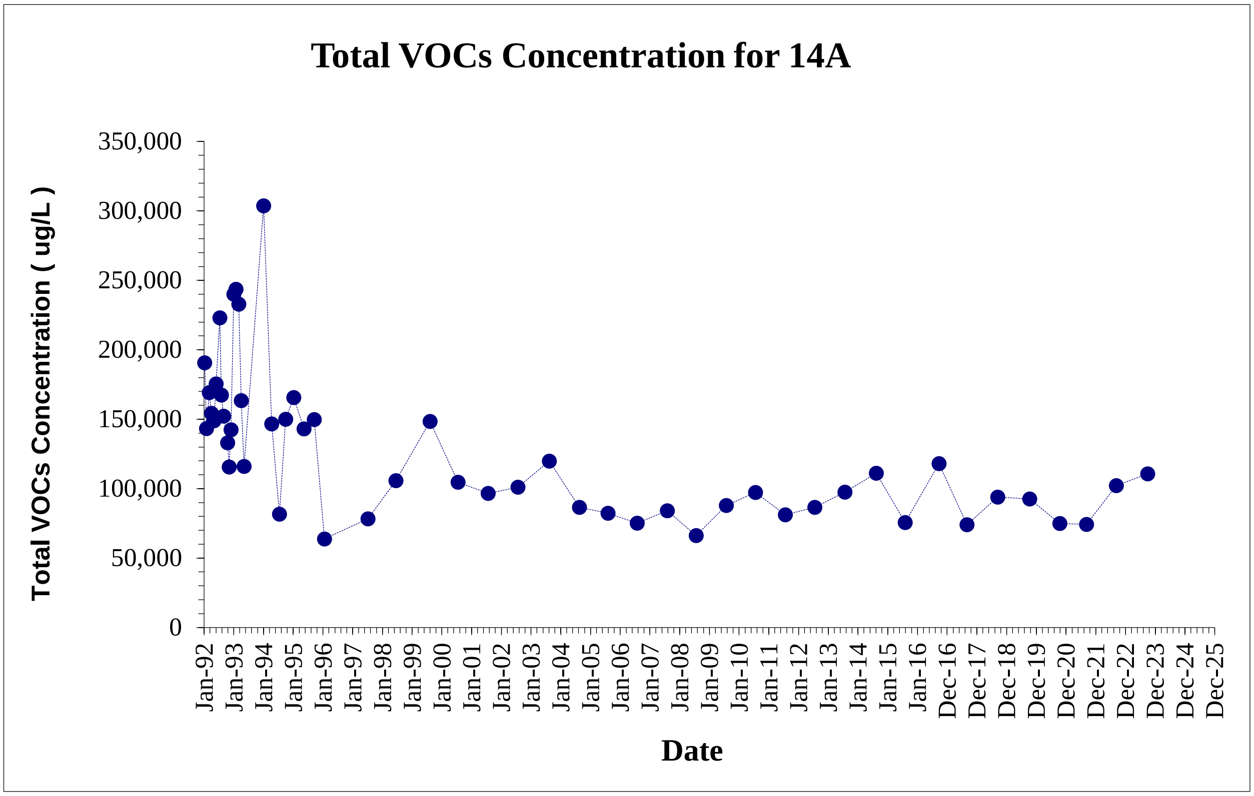

Note: the only detected VOCs were tetrahydrothiophene and 1,4-dichlorobutane

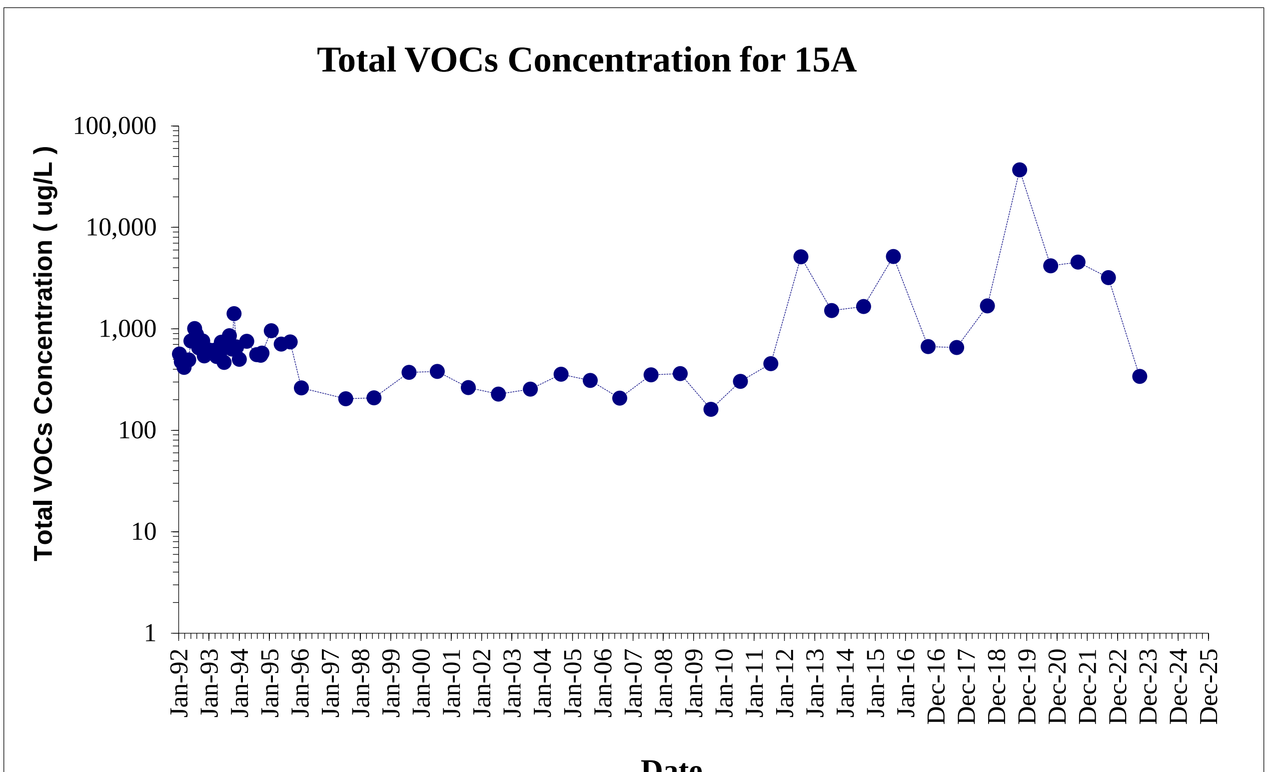

Total VOCs Concentration for 9AR
Total VOCs Concentration ( ug/L )
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
9A
9AR
Note: the major VOCs detected were THT and dichlorobutane
Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 10A
Total VOCs Concentration ( ug/L )
350
300
250
200
150
100
50
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
Dec-25
Date
Note: the November 10, 1992 results of 3,842 ug/L are beyond y-axis scale.

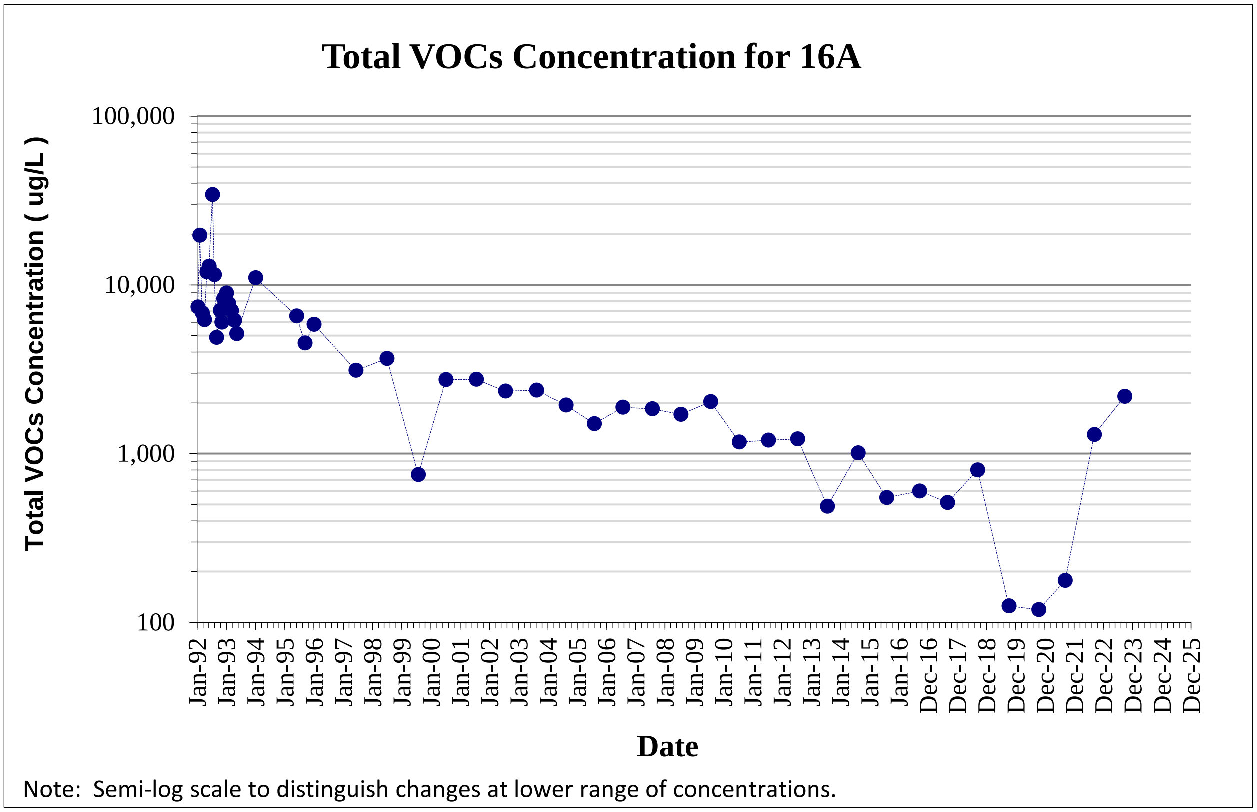

Total VOCs Concentration for 12A
Total VOCs Concentration ( ug/L )
2,500
2,000
1,500
1,000
500
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

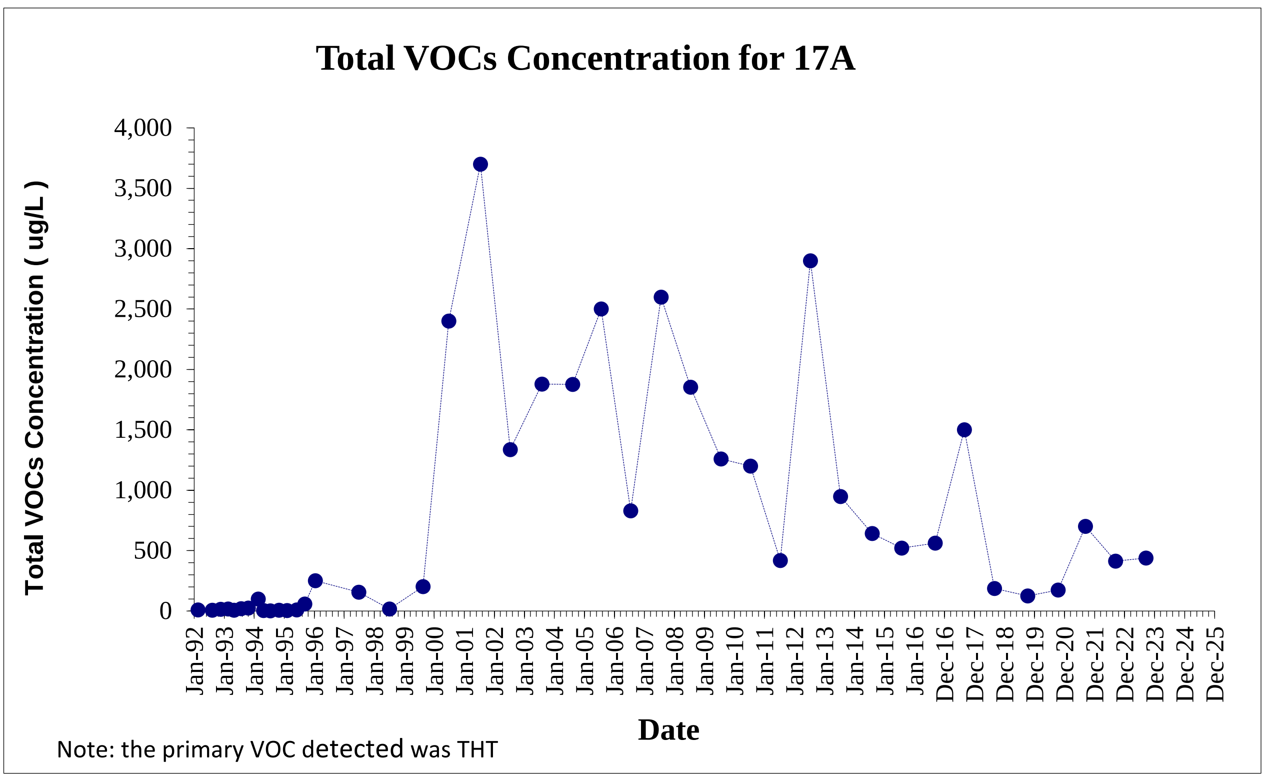

Total VOCs Concentration for 13A
Total VOCs Concentration ( ug/L)
1,000,000
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
Note: Semi-log scale to distinguish changes at lower range of concentrations.

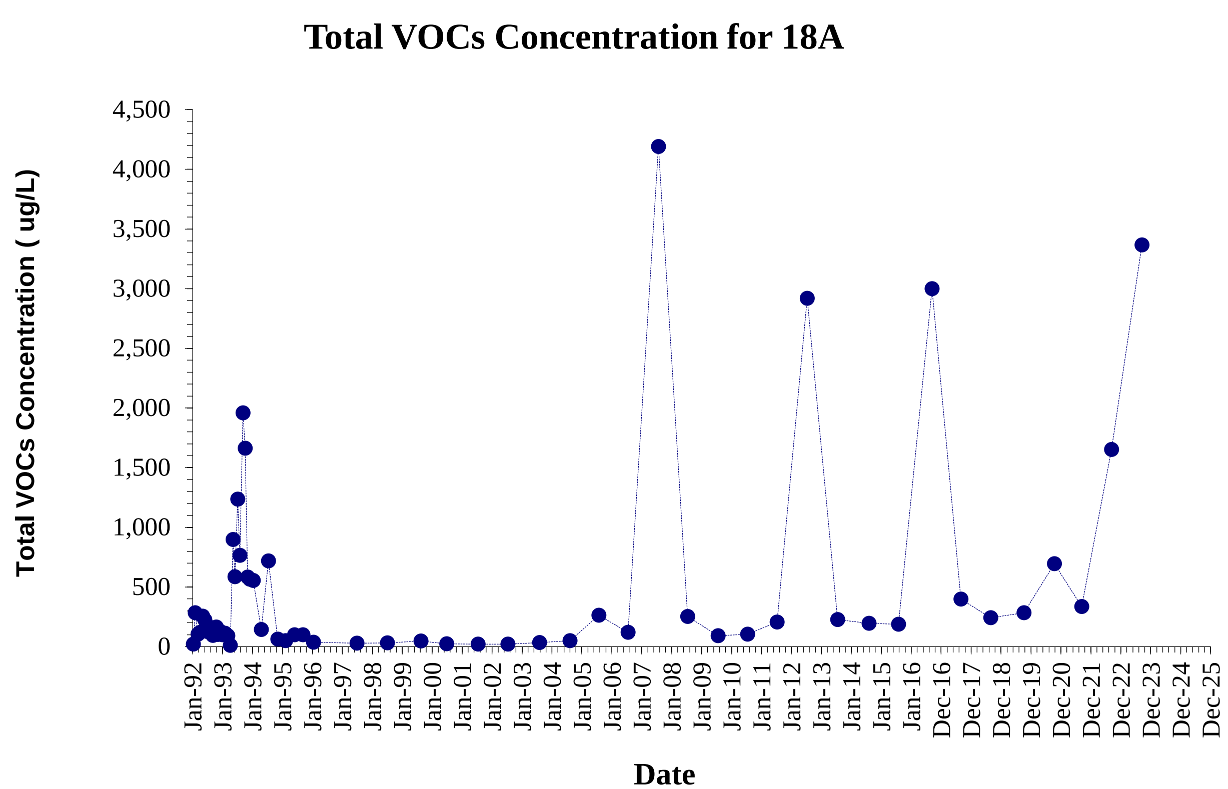


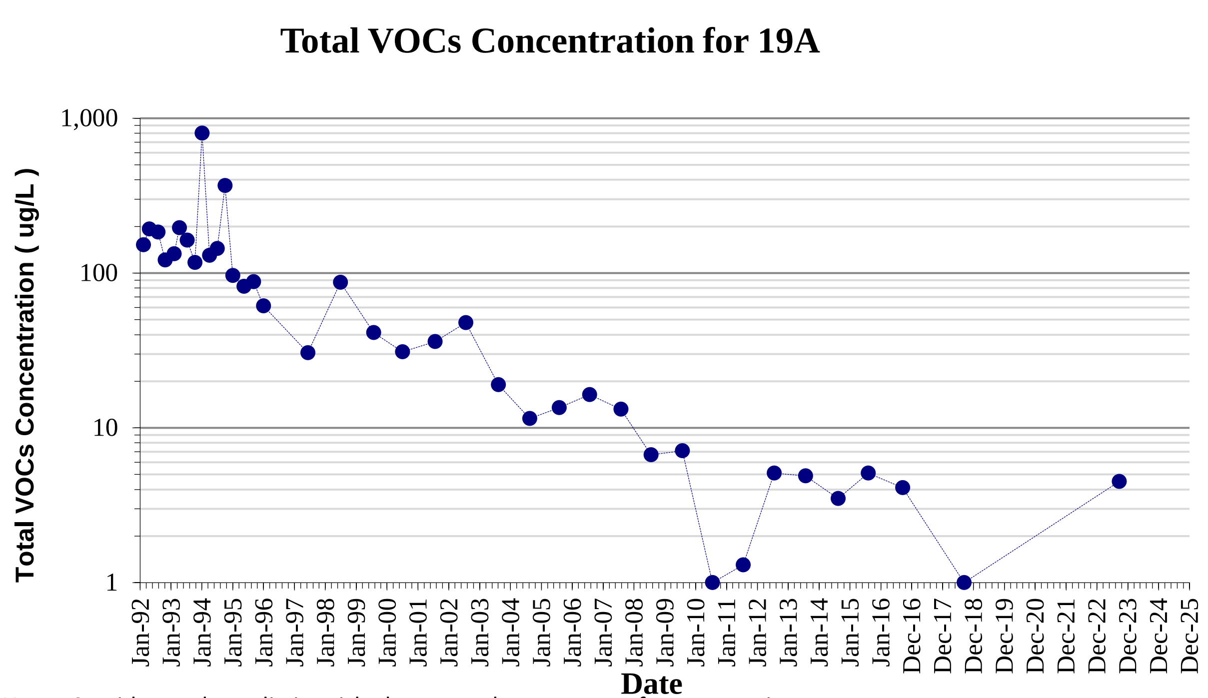

Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 16A
Total VOCs Concentration ( ug/L )
100,000
10,000
1,000
100
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
Dec-25
Date
Note: Semi-log scale to distinguish changes at lower range of concentrations.

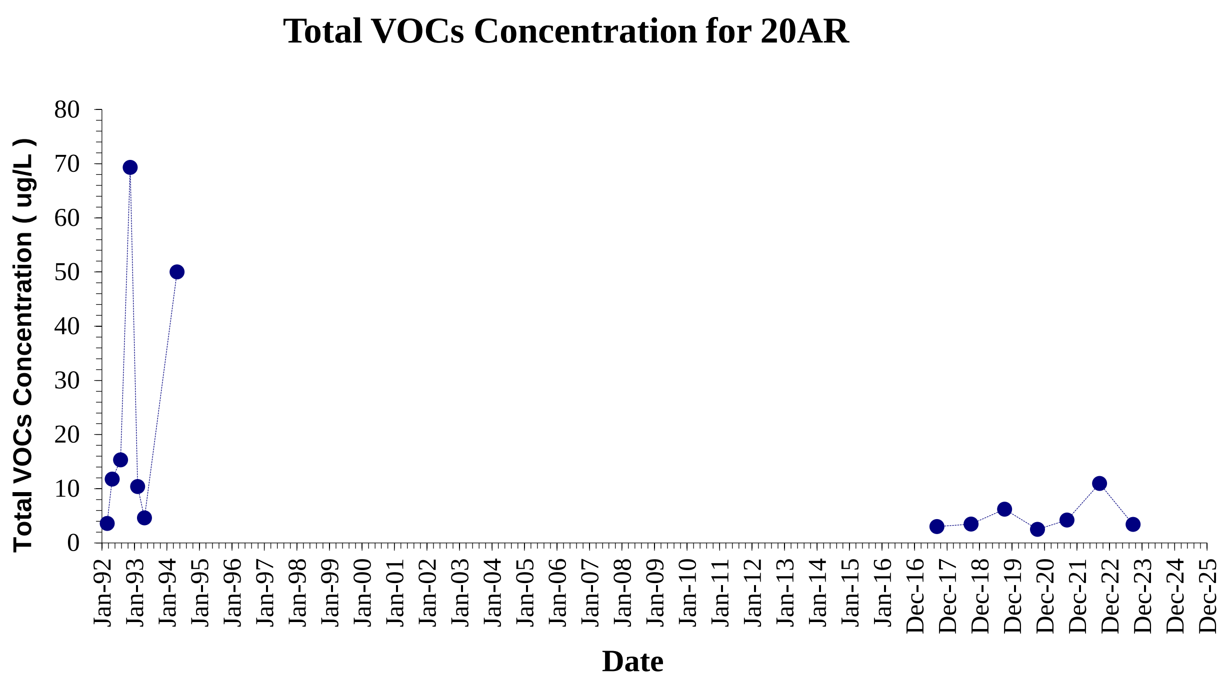

Total VOCs Concentration for 17A
Total VOCs Concentration ( ug/L )
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
Note: the primary VOC detected was THT



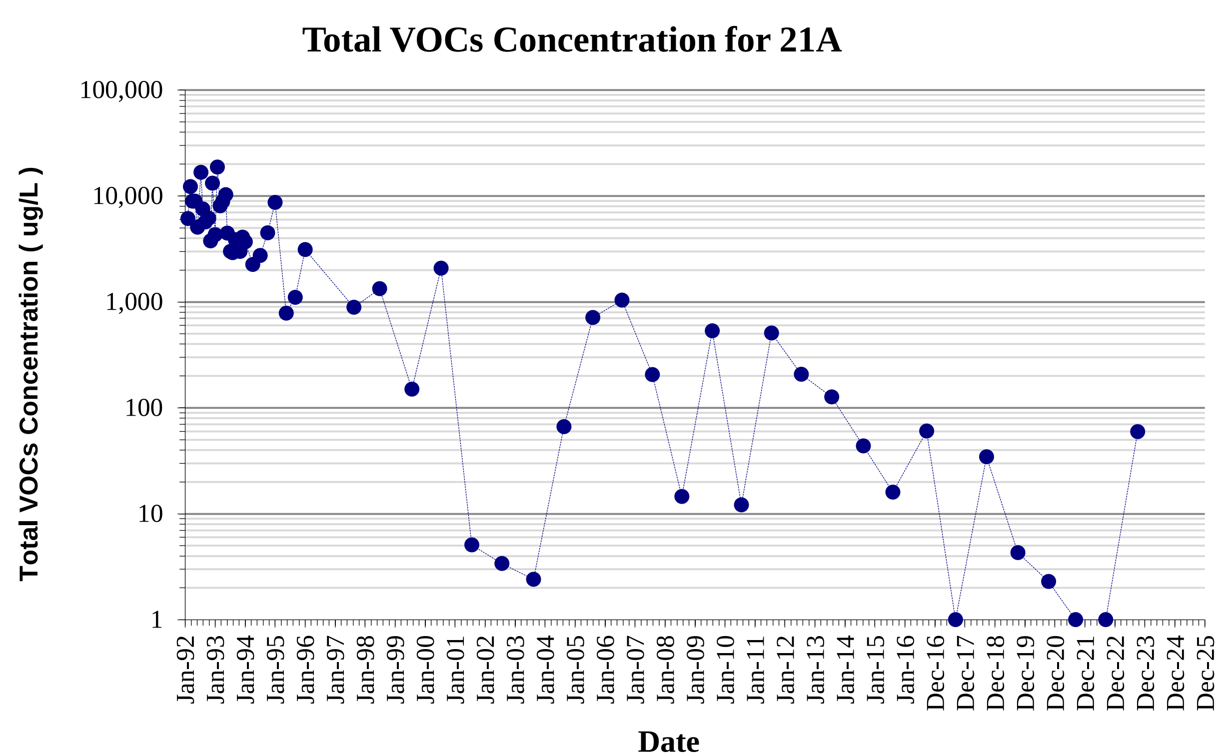
Note: The primary VOC detected was THT.



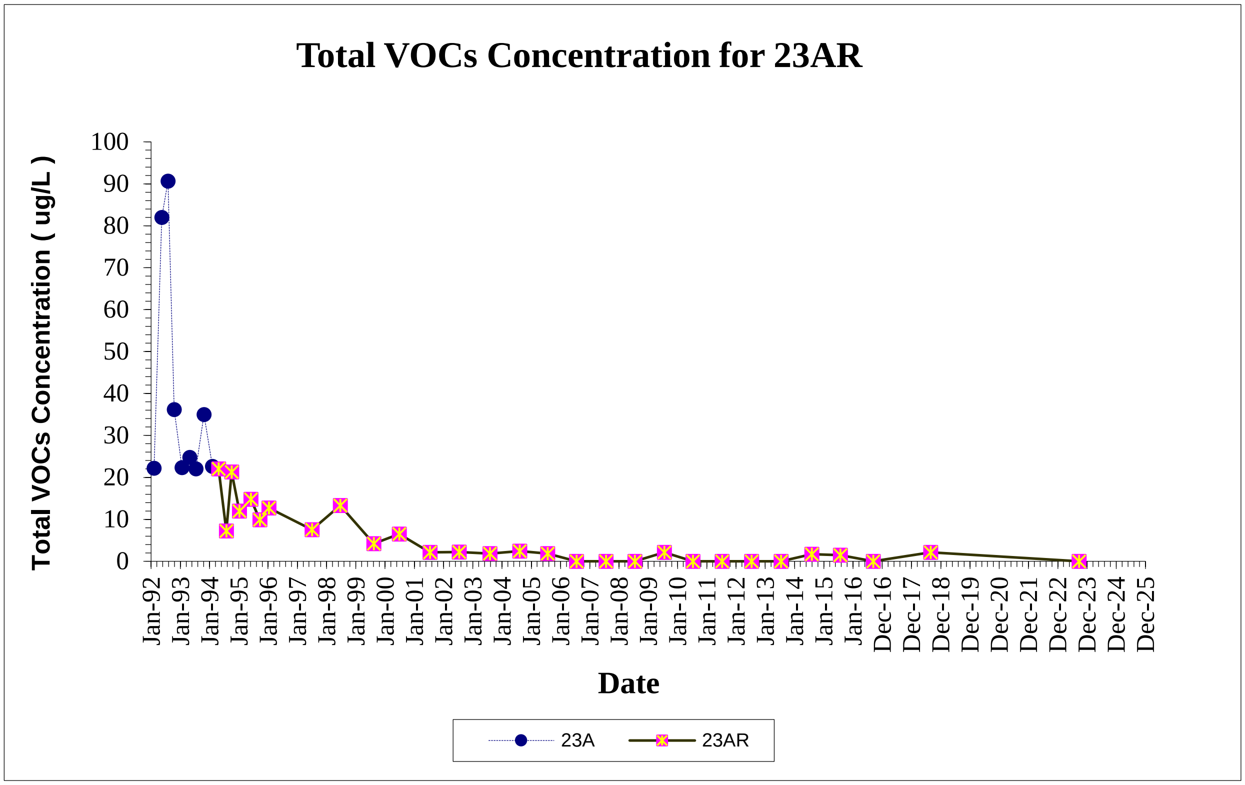
Note: Semi-log scale to distinguish changes at lower range of concentrations.
Nondetect values for 2010 and 2018 represented as 1.0 ug/L.

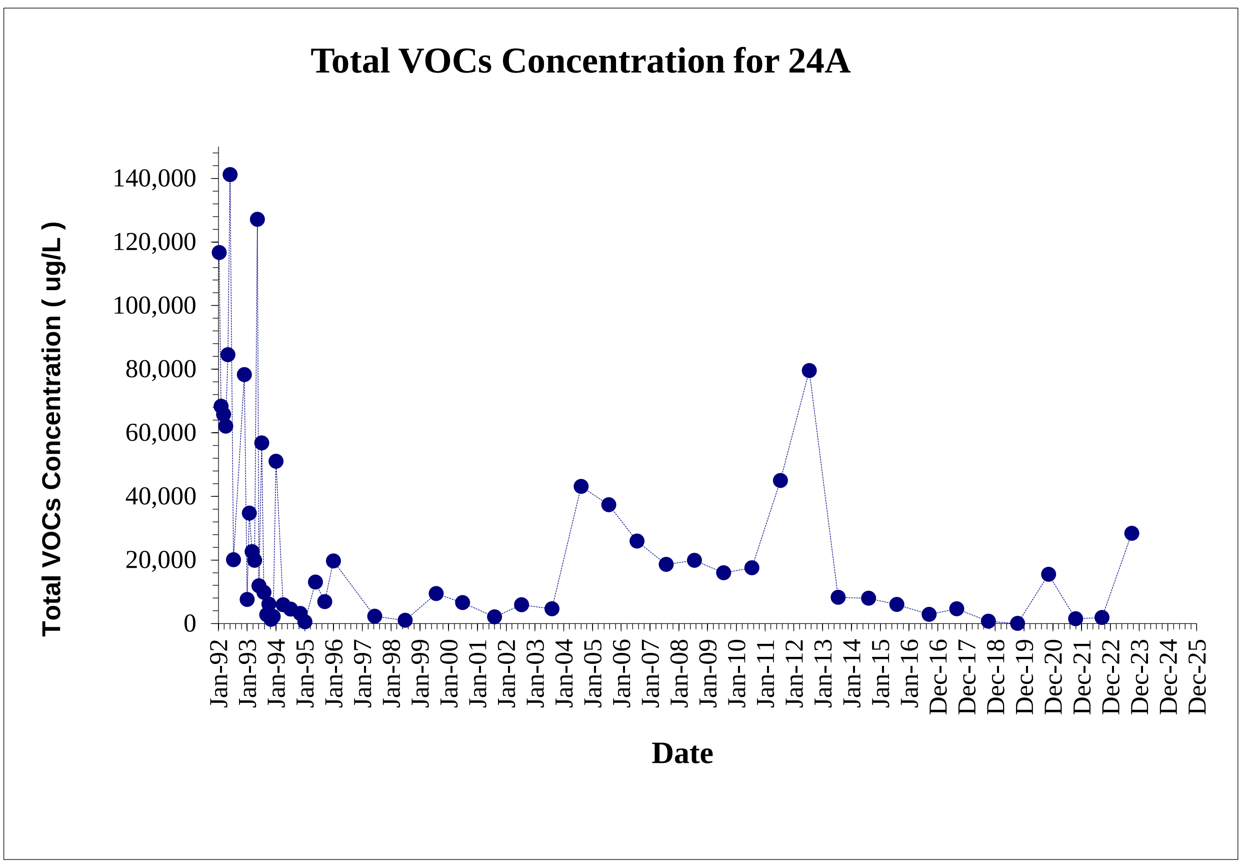


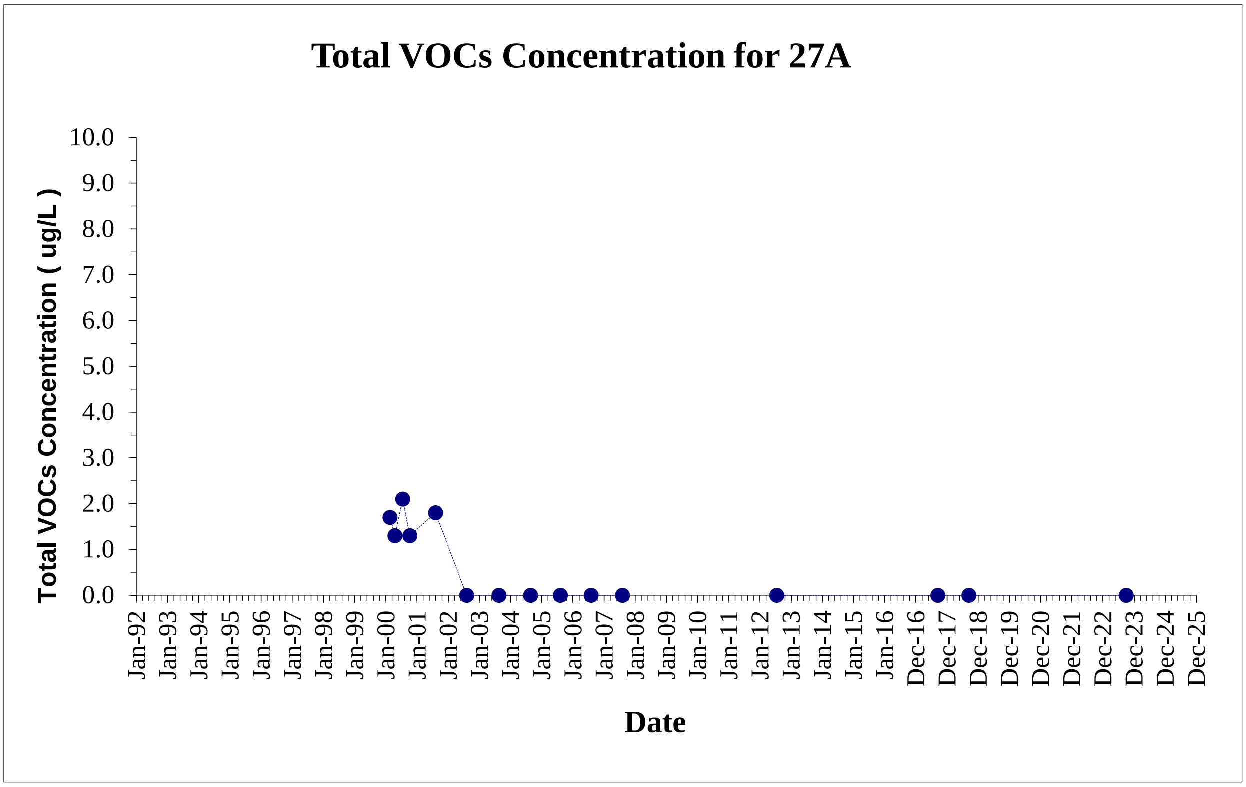

Note: Well was dry between 1994 and 2017.

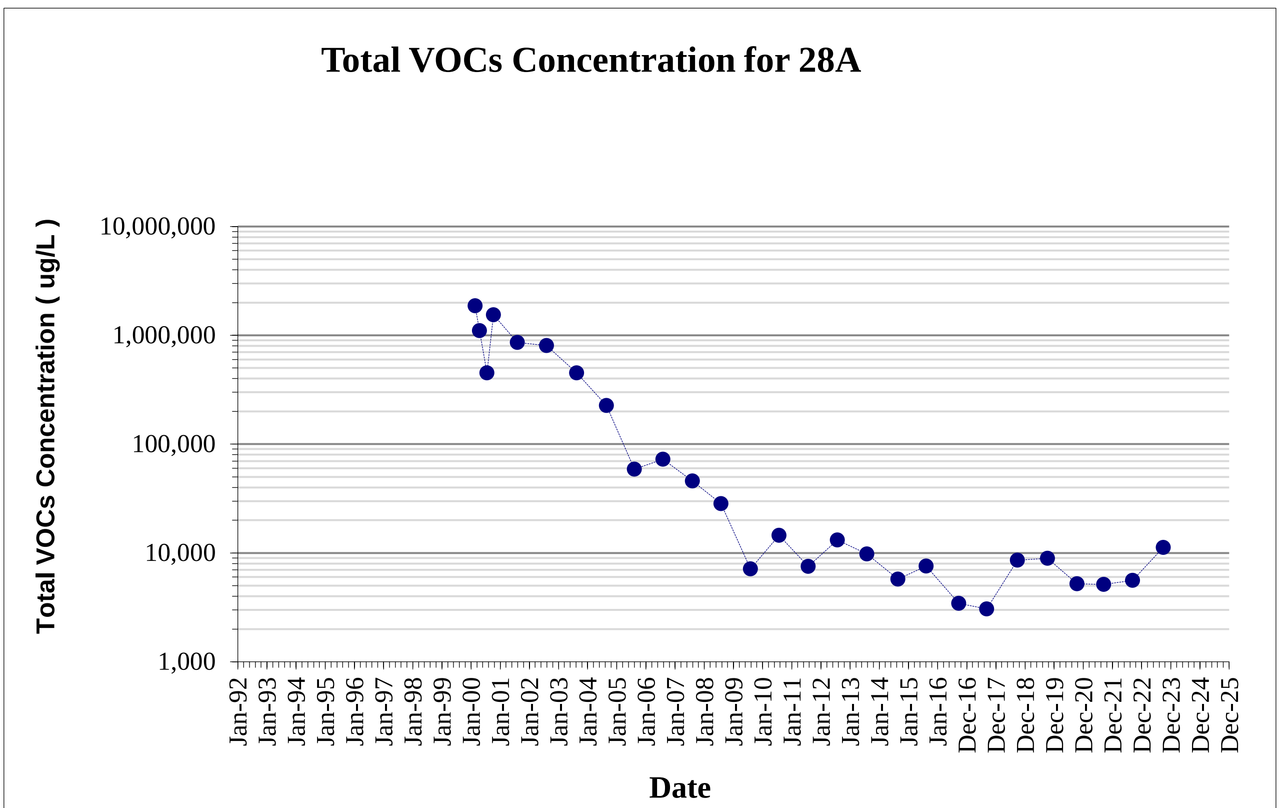



Note: Semi-log scale to distinguish changes at lower range of concentrations.

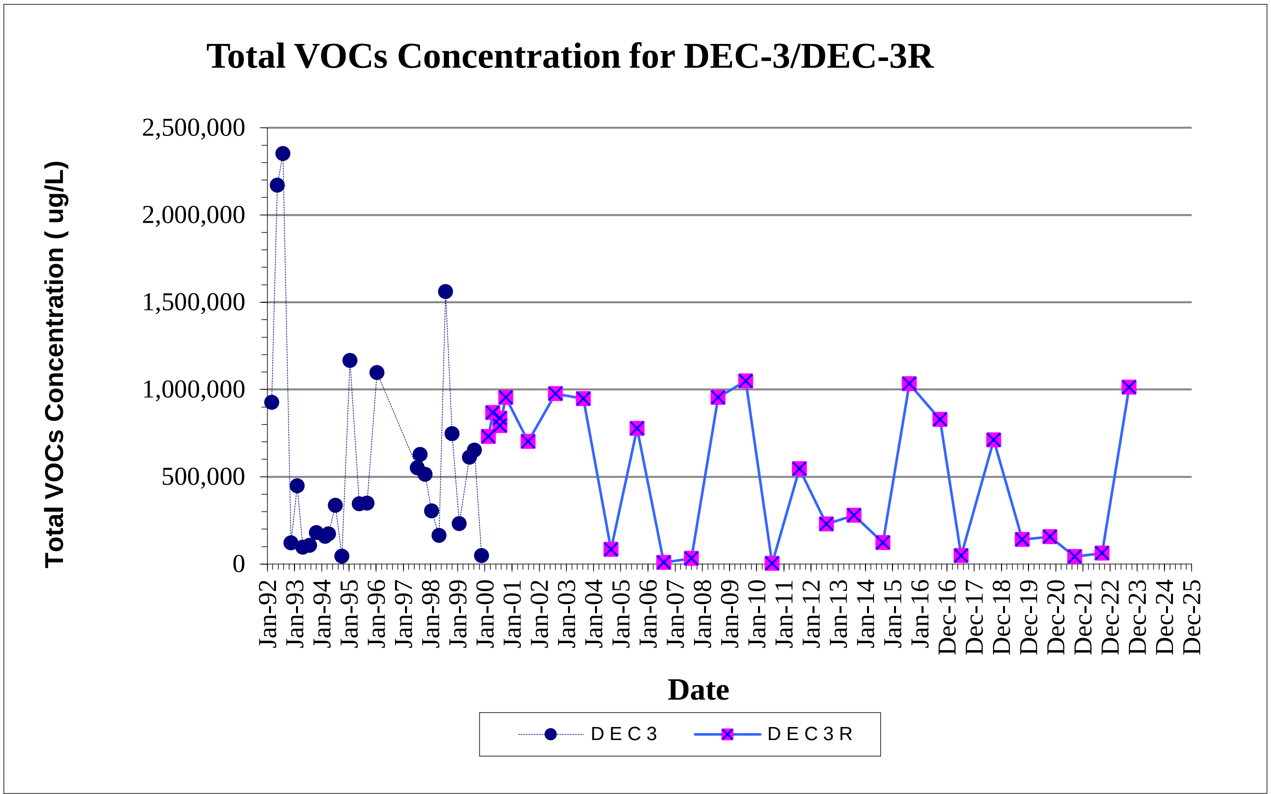

Total VOCs Concentration for 23AR
Total VOCs Concentration ( ug/L )
0
10
20
30
40
50
60
70
80
90
100
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
23A
23AR

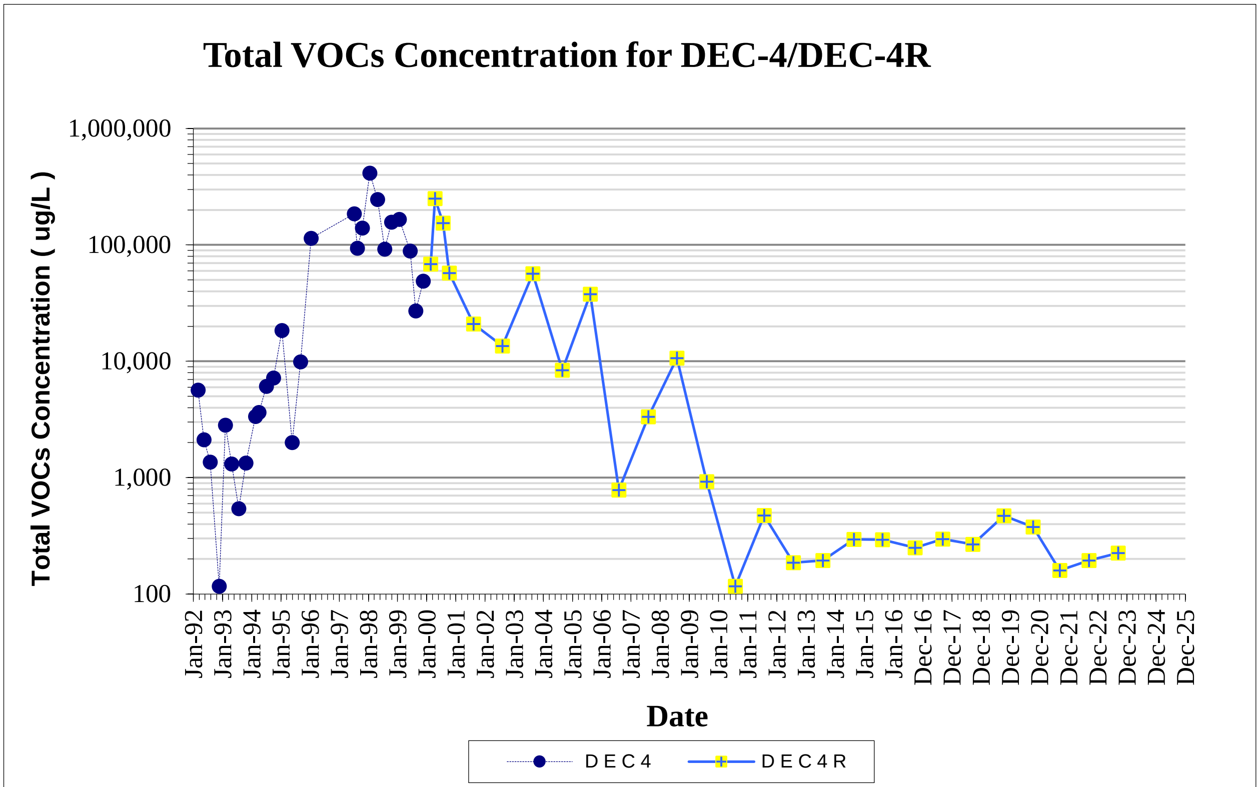

Total VOCs Concentration for 24A
Total VOCs Concentration ( ug/L )
0
20,000
40,000
60,000
80,000
100,000
120,000
140,000
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date



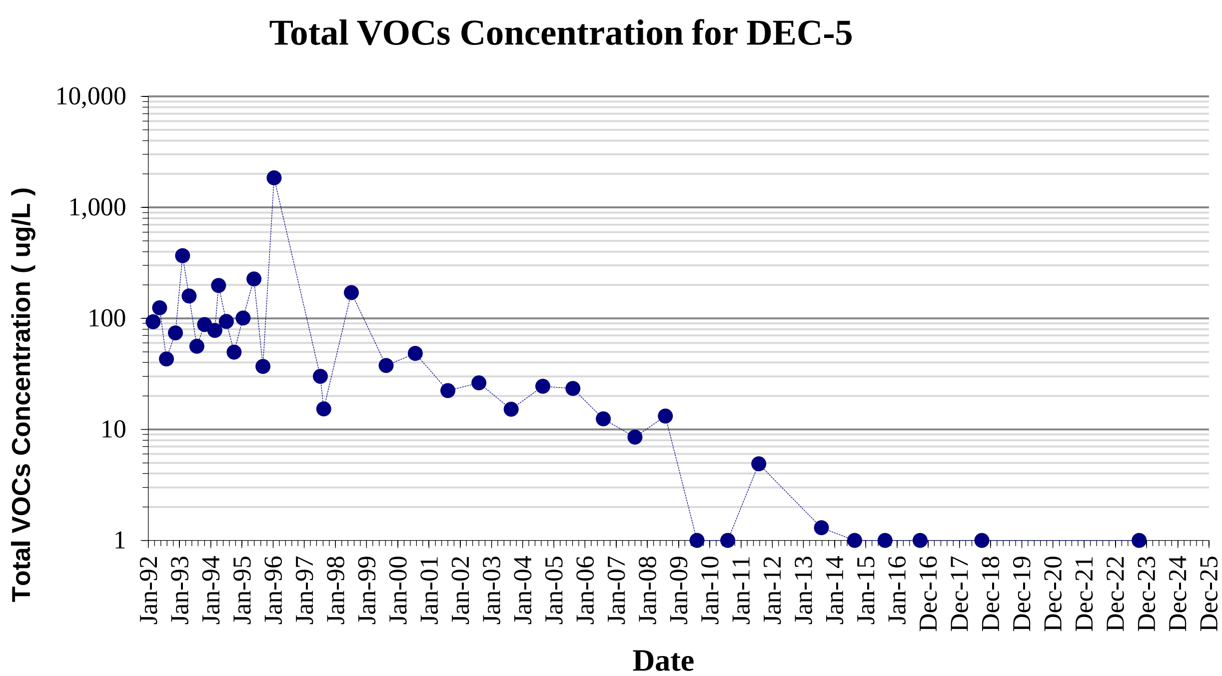




Note: Semi-log scale to distinguish changes at lower range of concentrations.

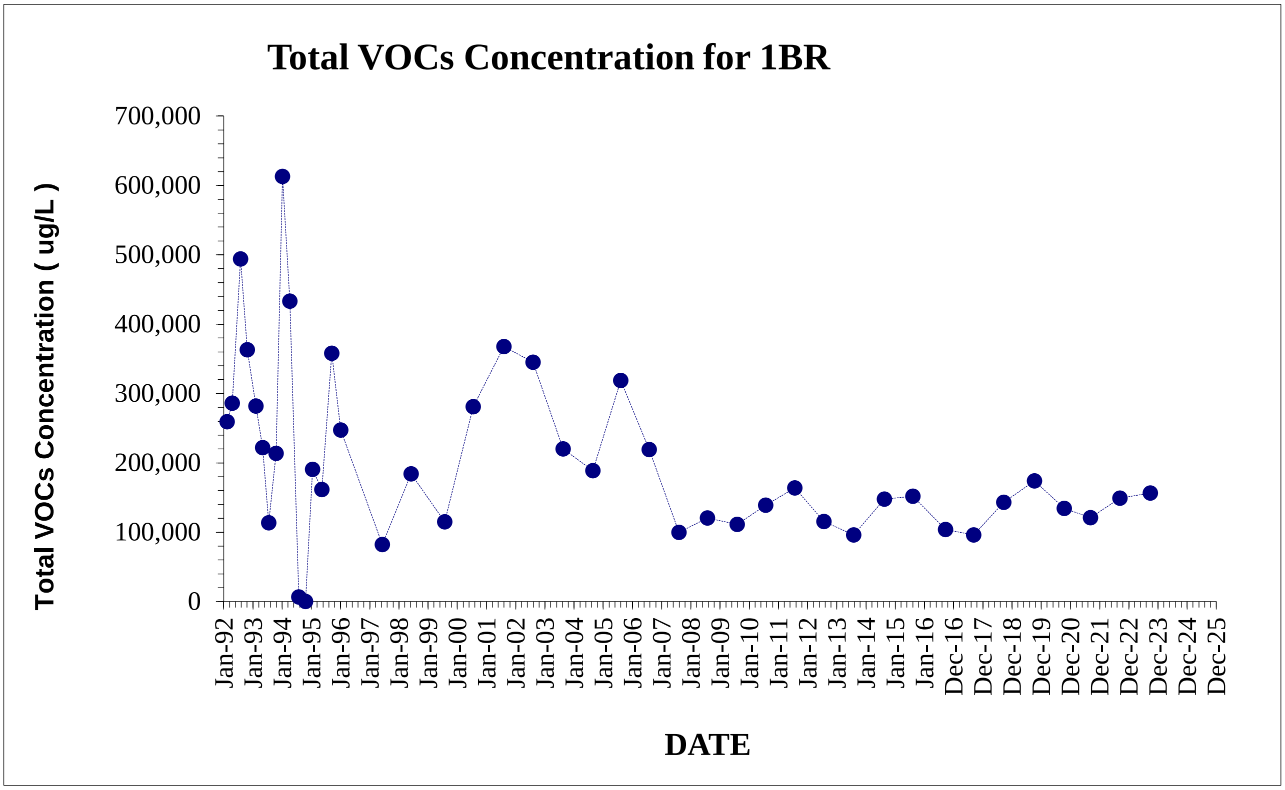


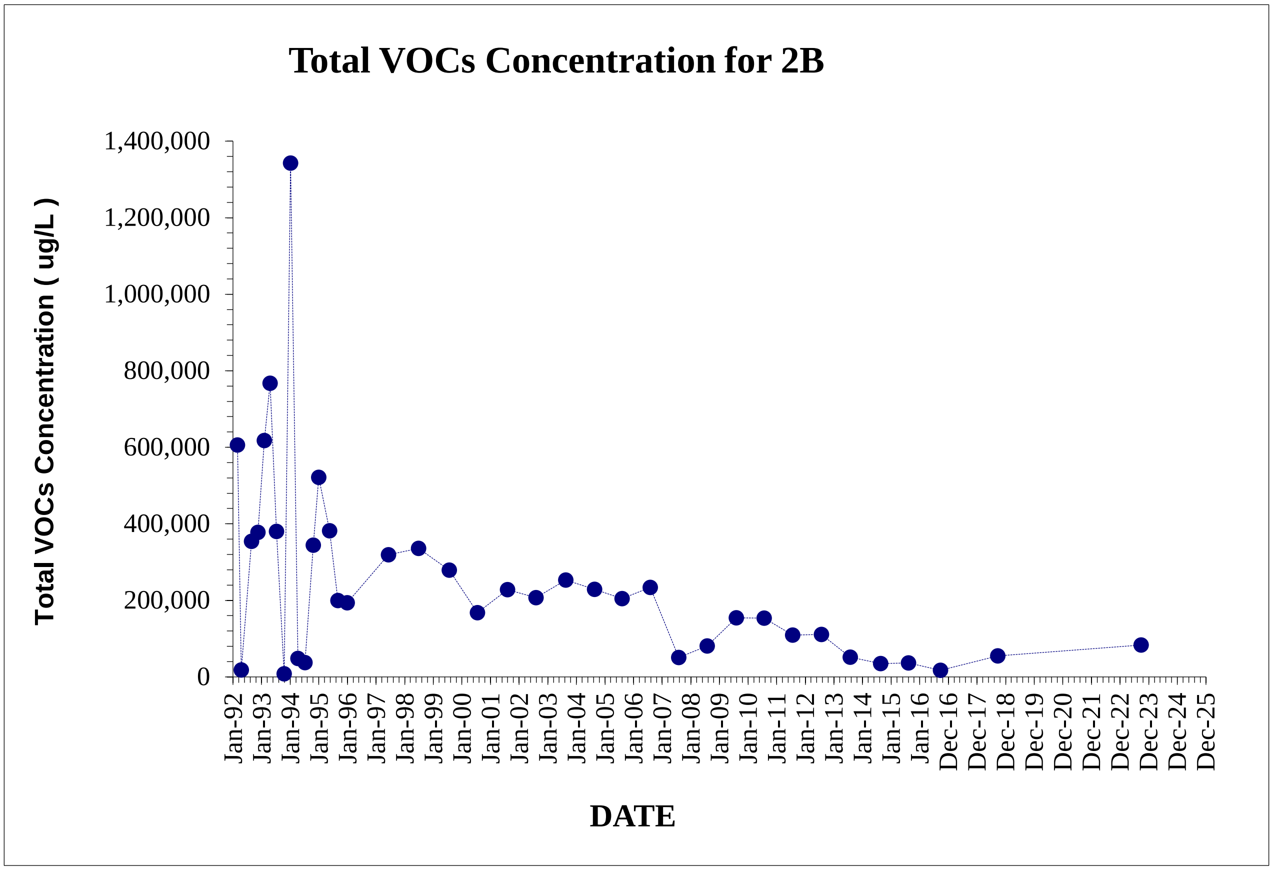



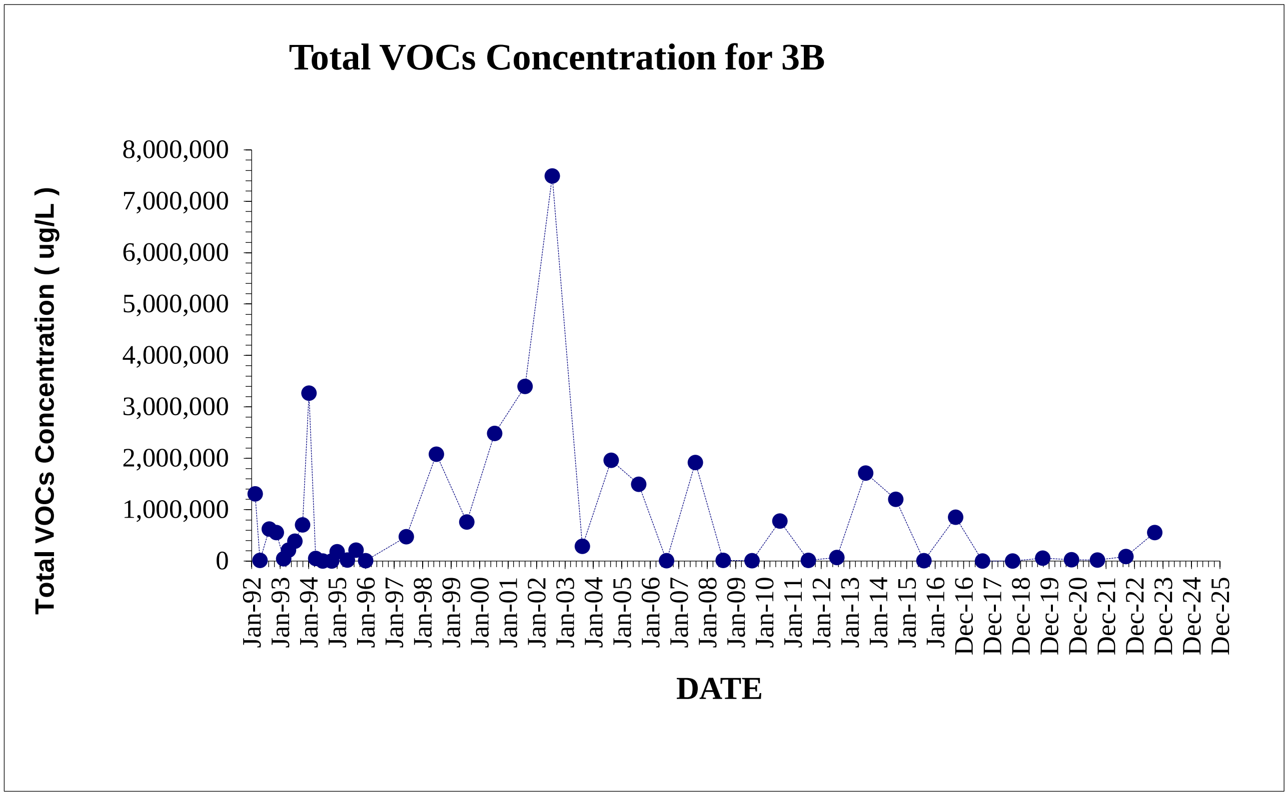

Note: Semi-log scale to distinguish changes at lower range of concentrations.

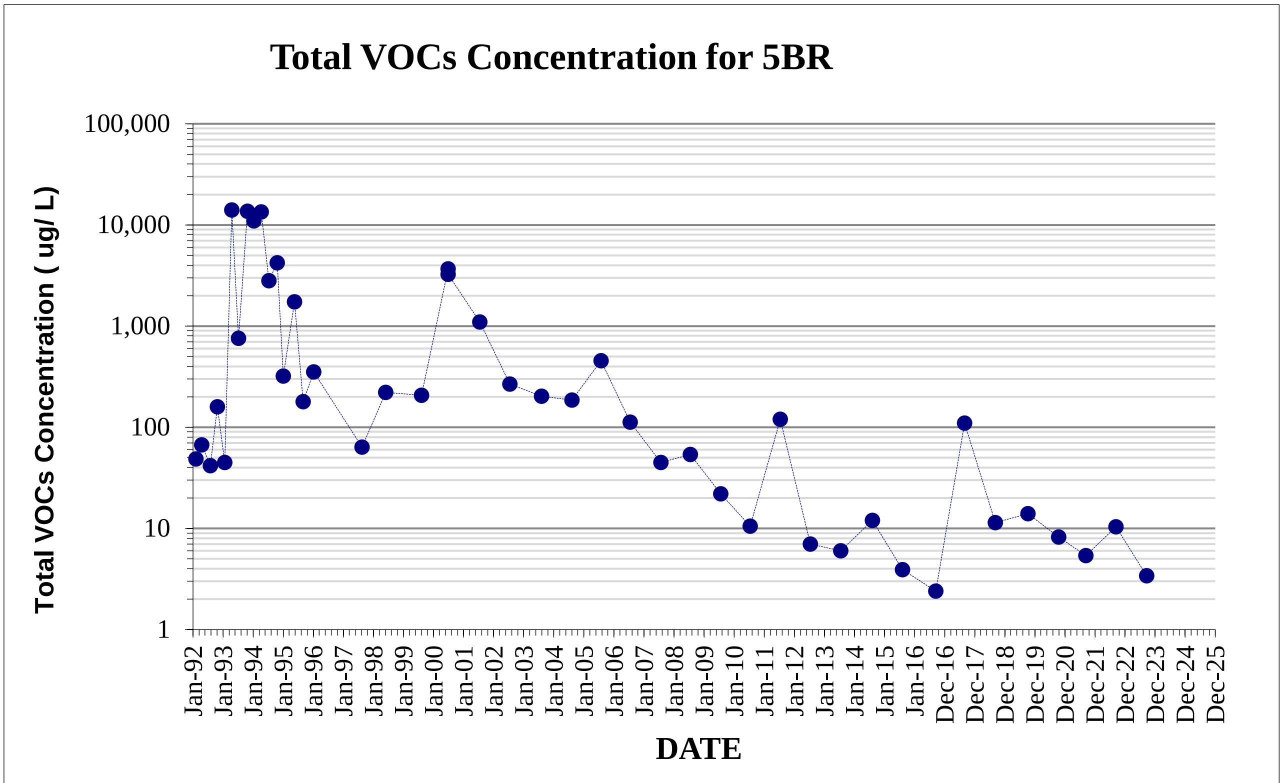



Note: 2009, 2014, 2015, 2016, 2018, and 2023 results were ND, but assigned a value of 1 for graphing purposes. Semi-log scale to distinguish changes at lower range of concentrations.

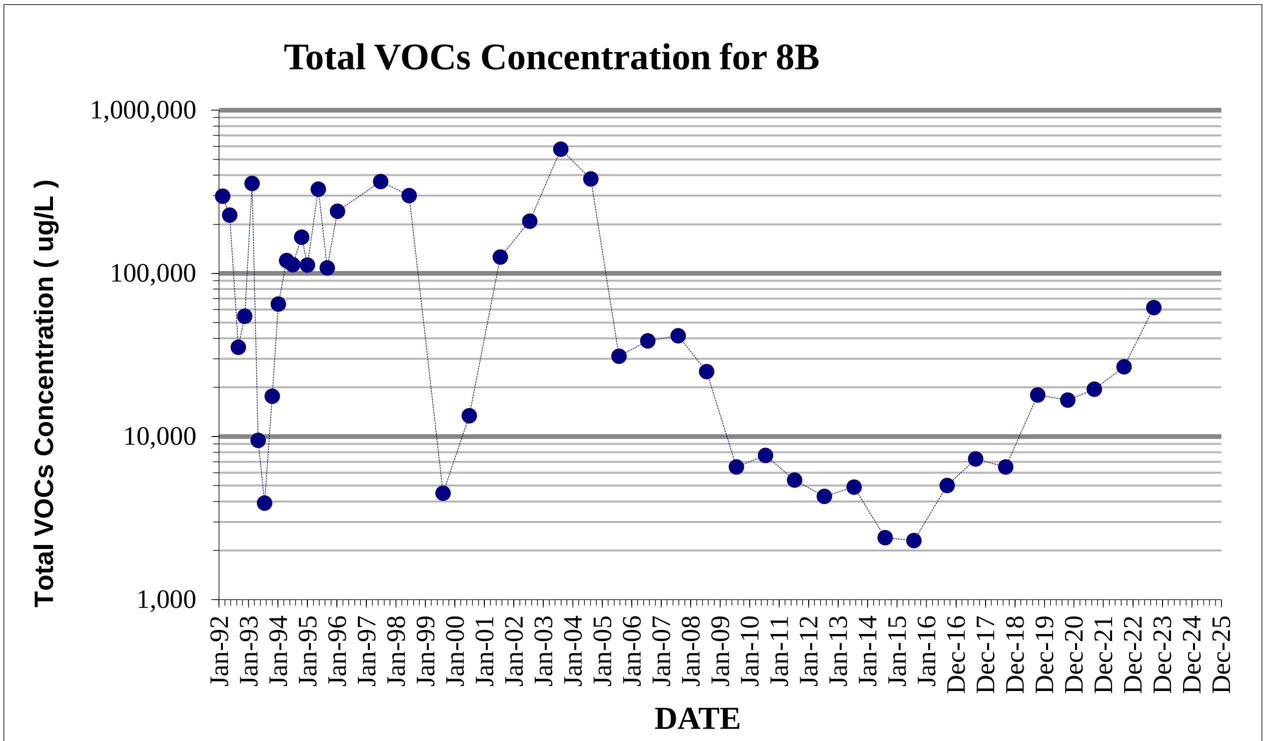

Total VOCs Concentration for 1BR
Total VOCs Concentration ( ug/L )
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24 Dec-25
DATE


Total VOCs Concentration for 2B
Total VOCs Concentration ( ug/L )
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 Dec-25
DATE

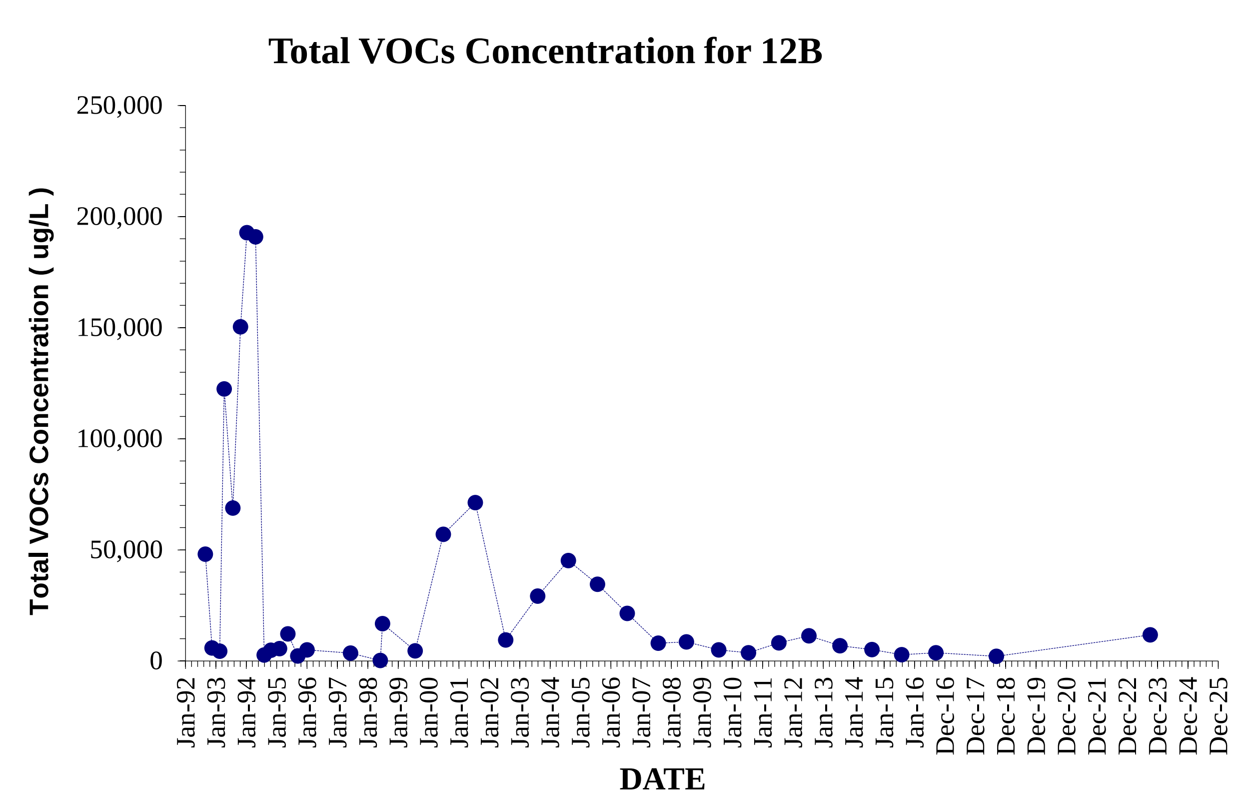


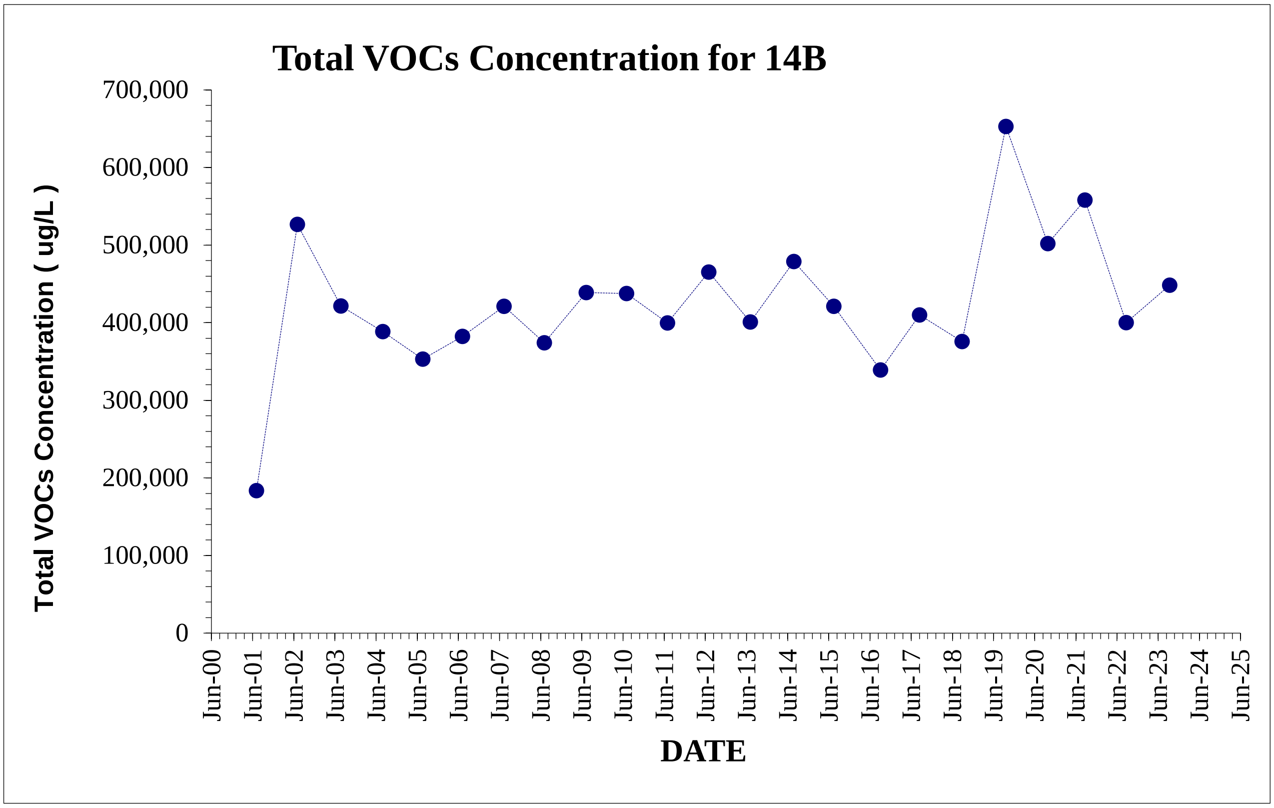



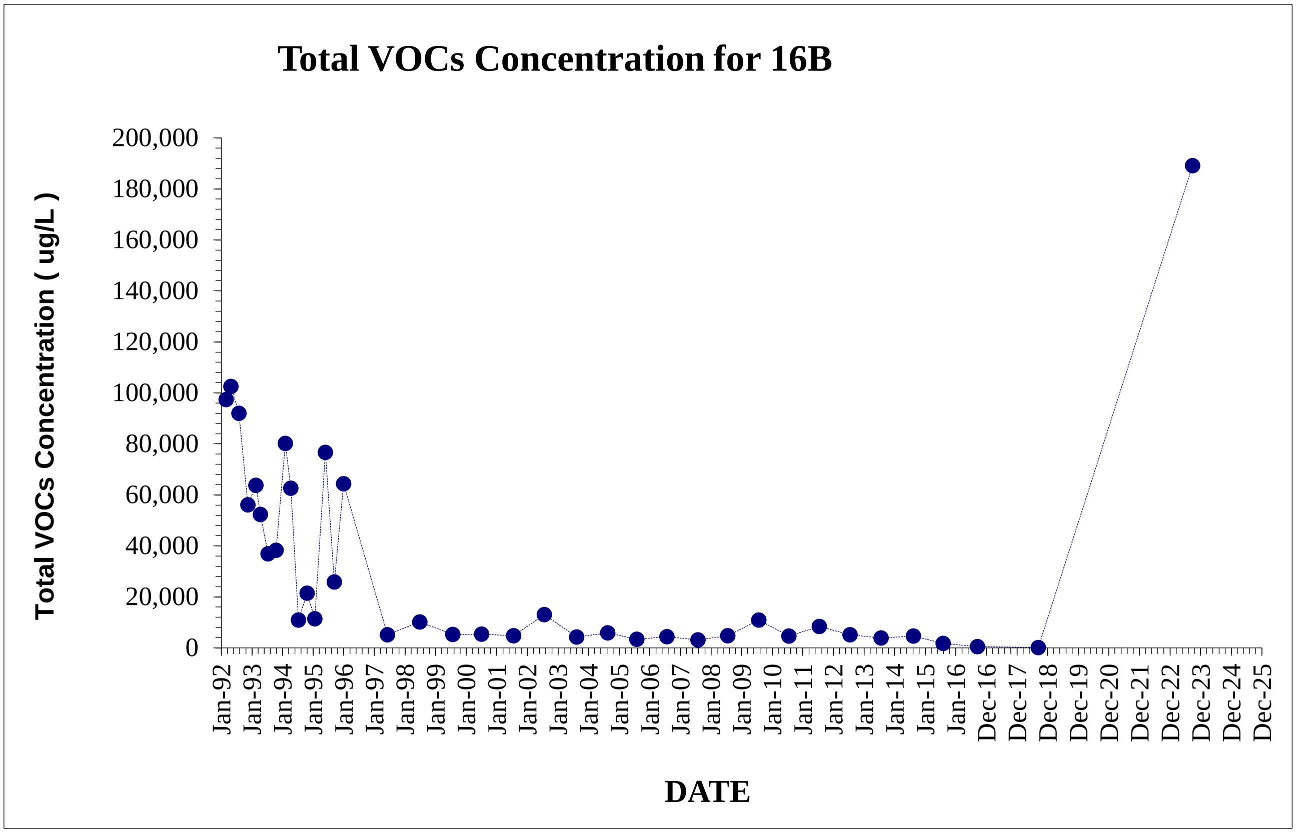

Note: Semi-log scale to distinguish changes at lower range of concentrations.

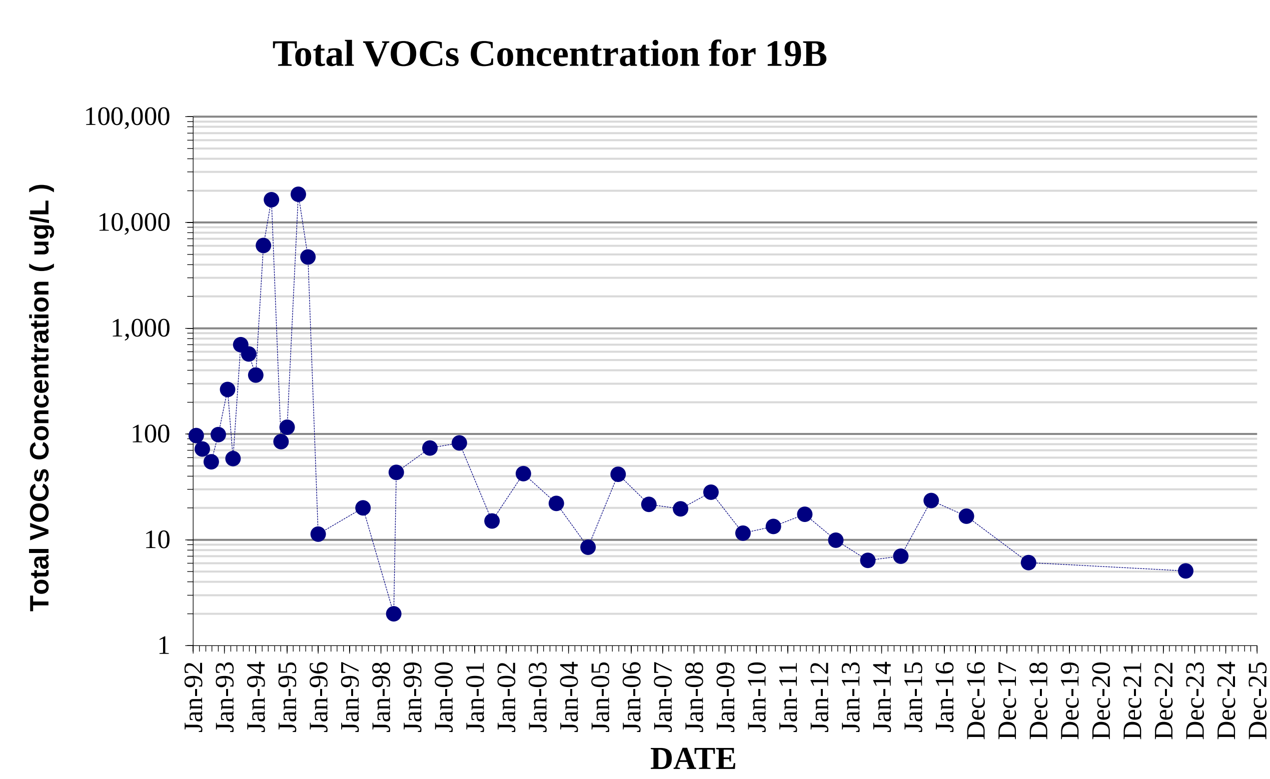



Note: Semi-log scale to distinguish changes at lower range of concentrations. THT is the main VOC.

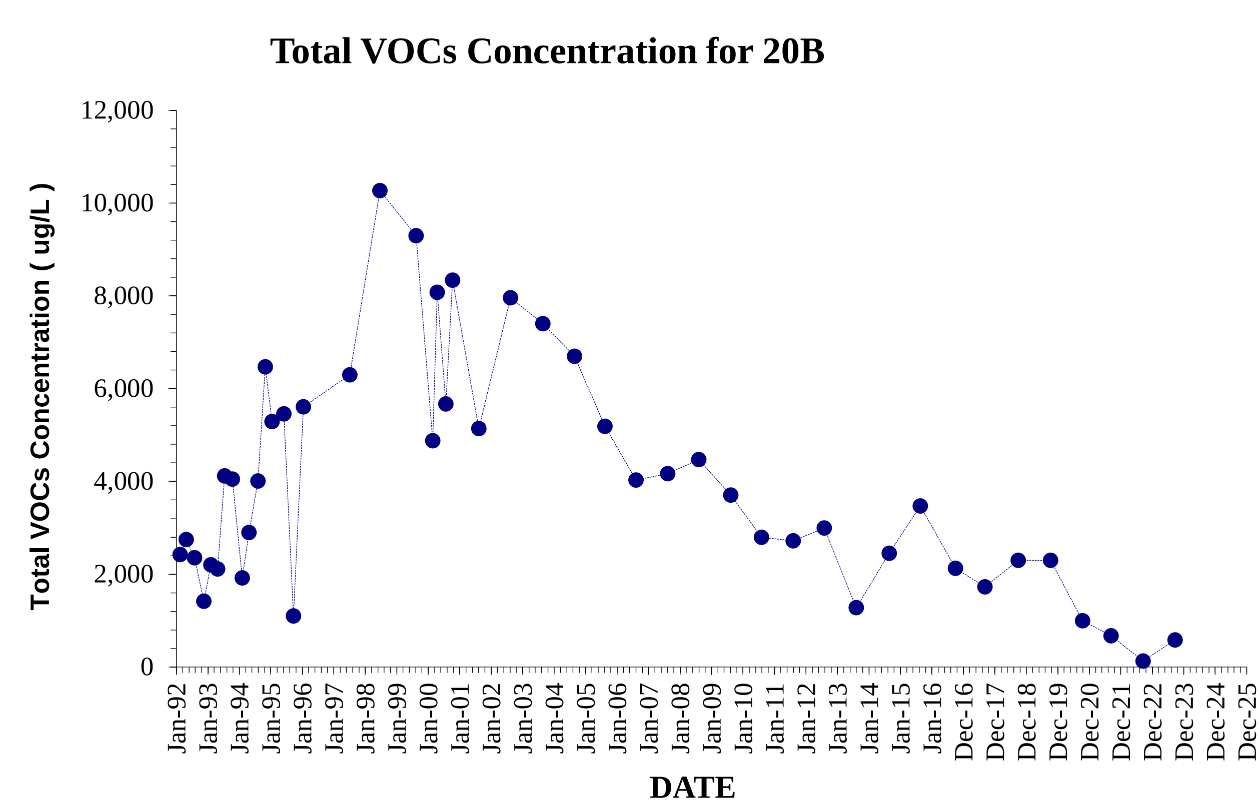



Total VOCs Concentration for 14B
Total VOCs Concentration ( ug/L )
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Jun-24
Jun-25
DATE

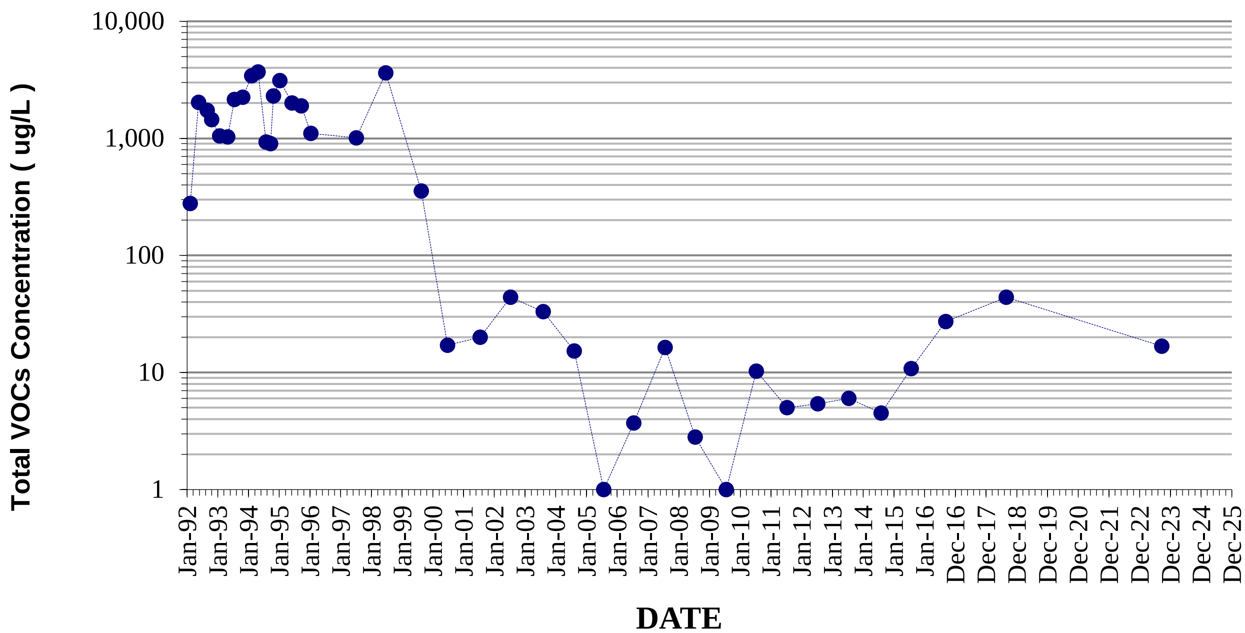

Total VOCs Concentration for 16B
Total VOCs Concentration ( ug/L )
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
DATE




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

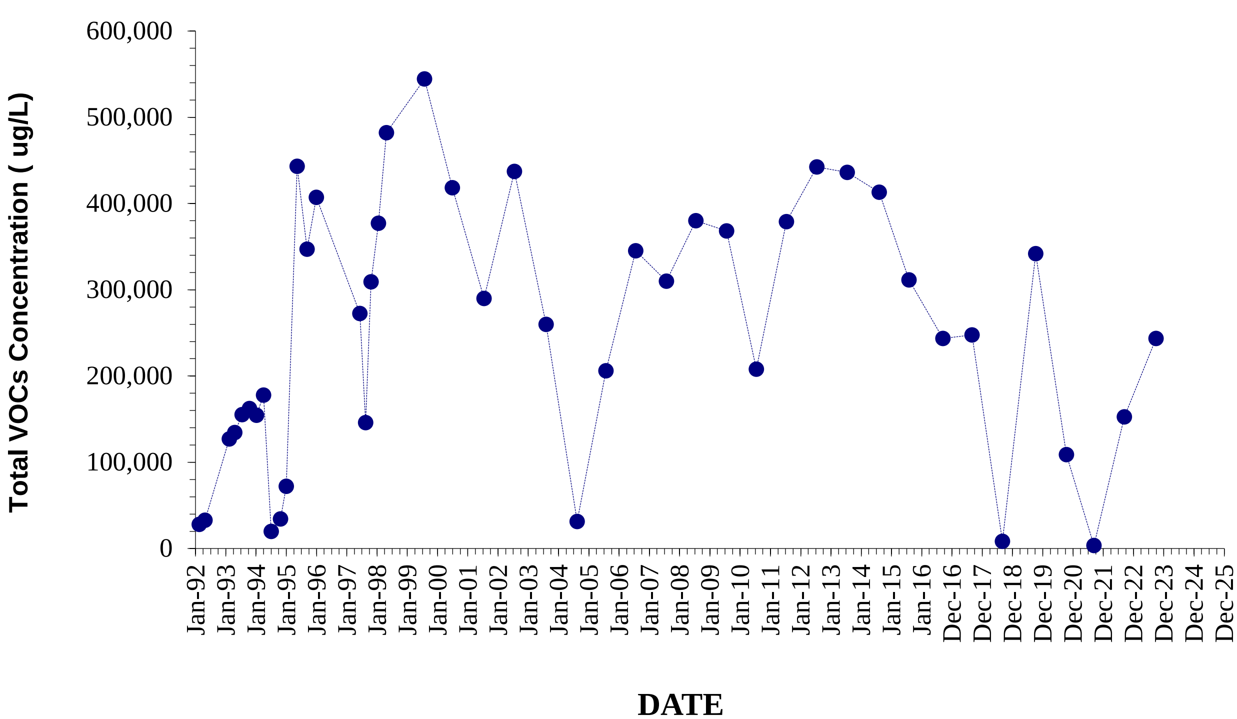


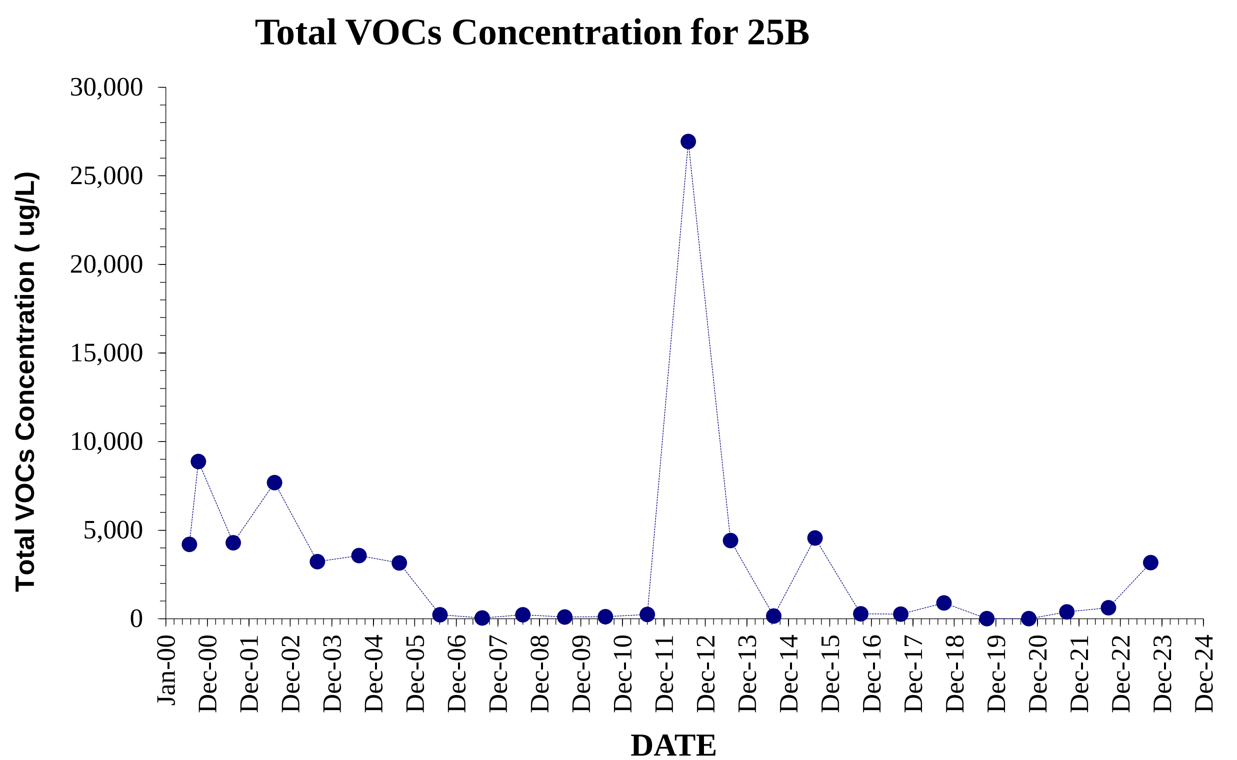
## Total VOCs Concentration for 23B



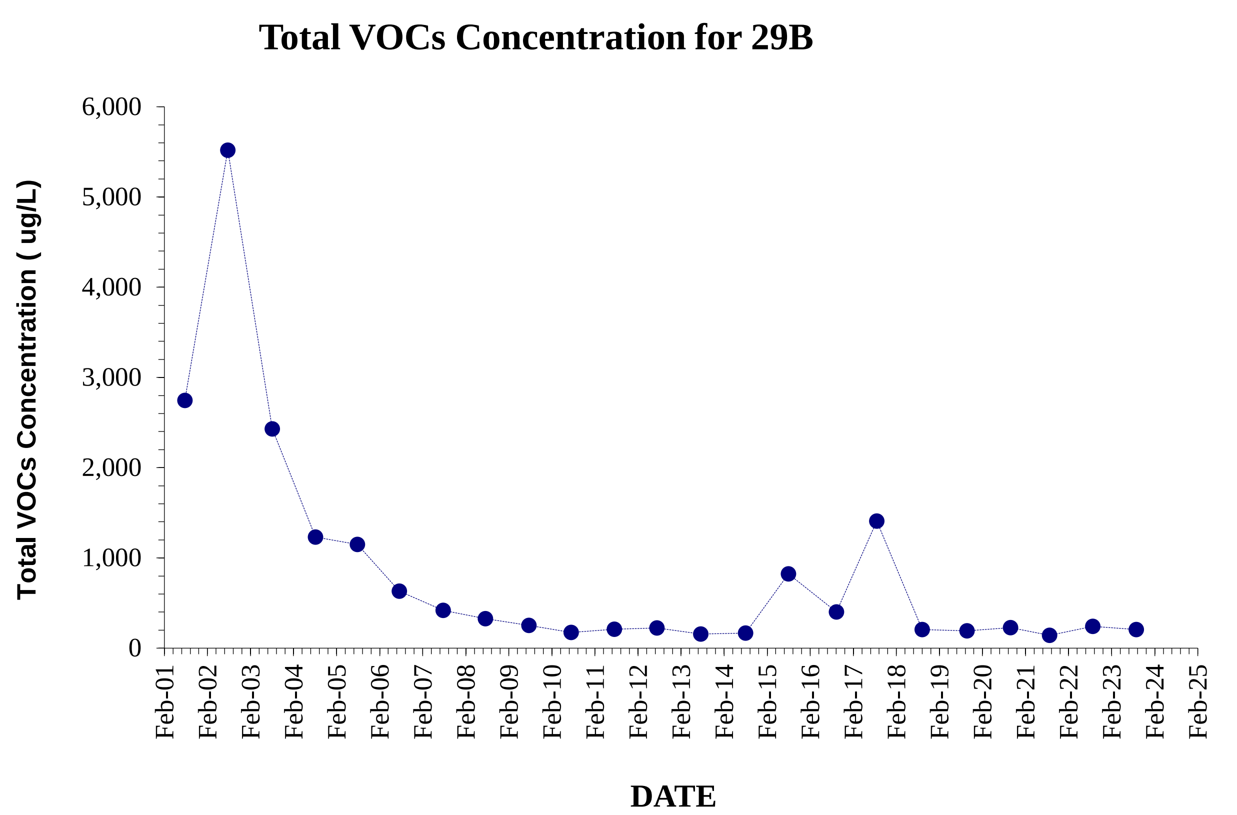

Note: Semi-log scale to distinguish changes at lower range of concentrations. 2009 VOC results were all ND, a value of 1 ug/L was given for graphing purposes

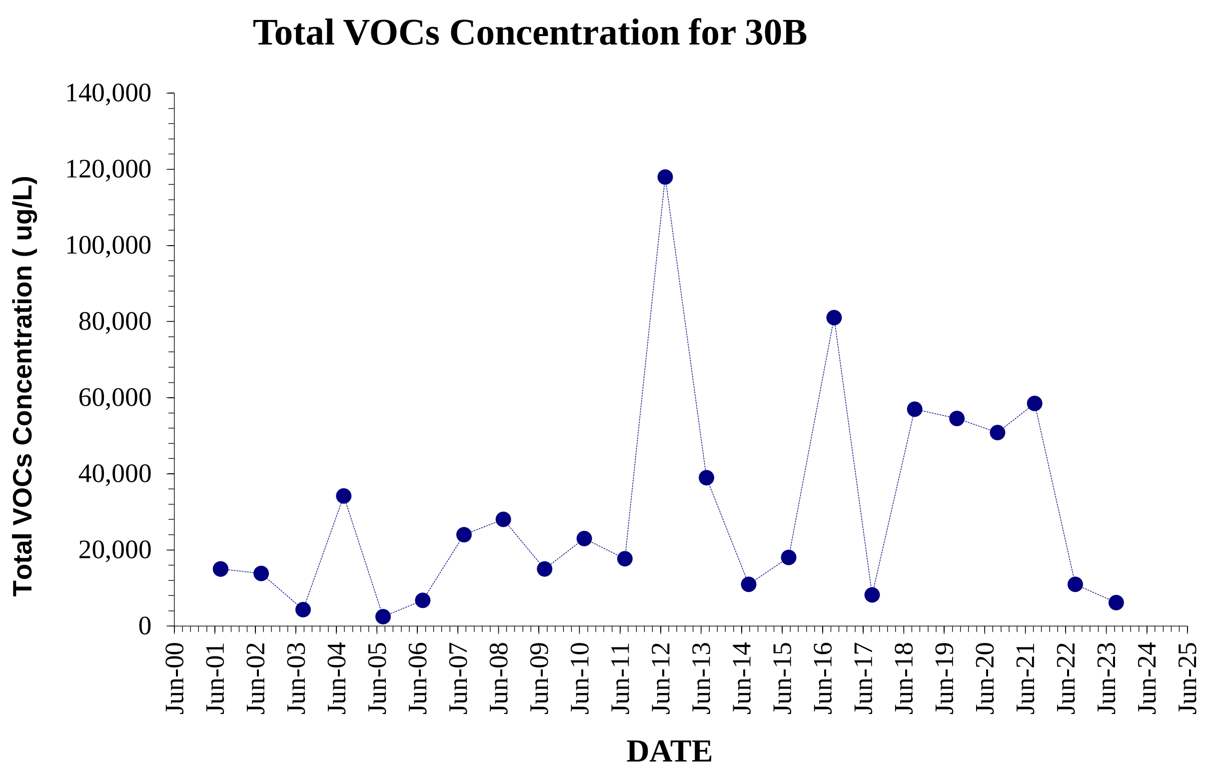
## Total VOCs Concentration for 24B



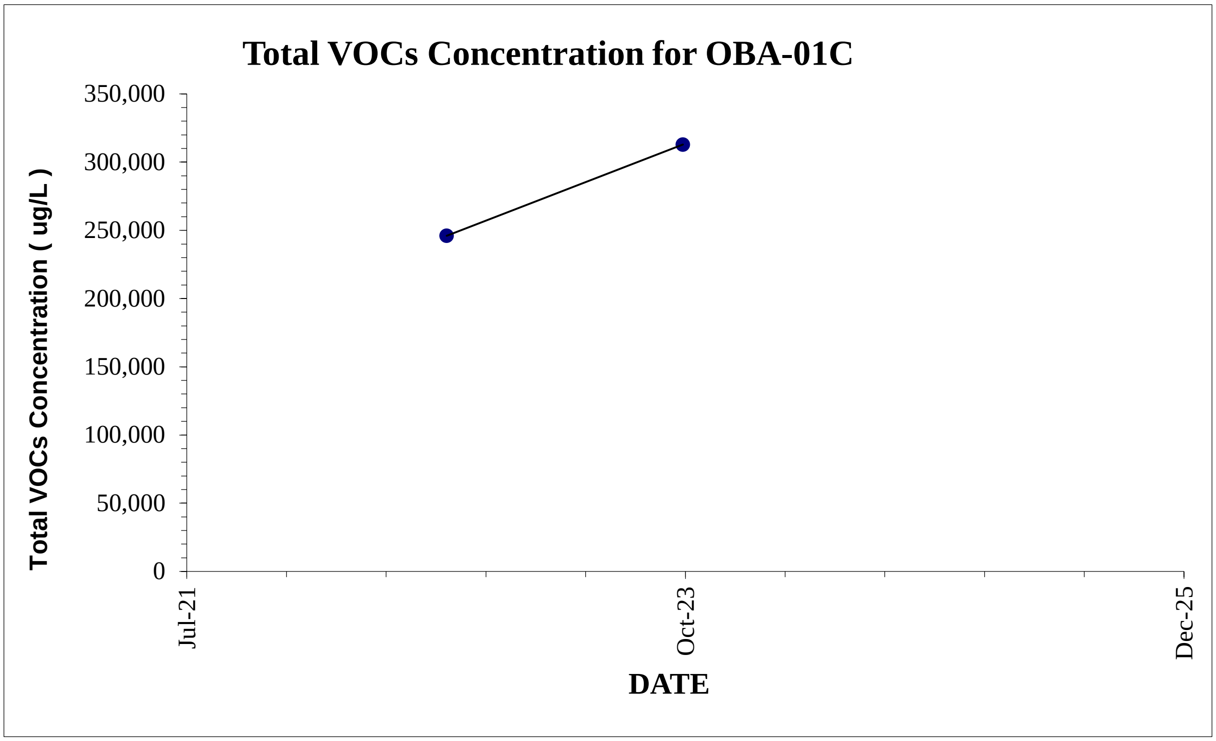


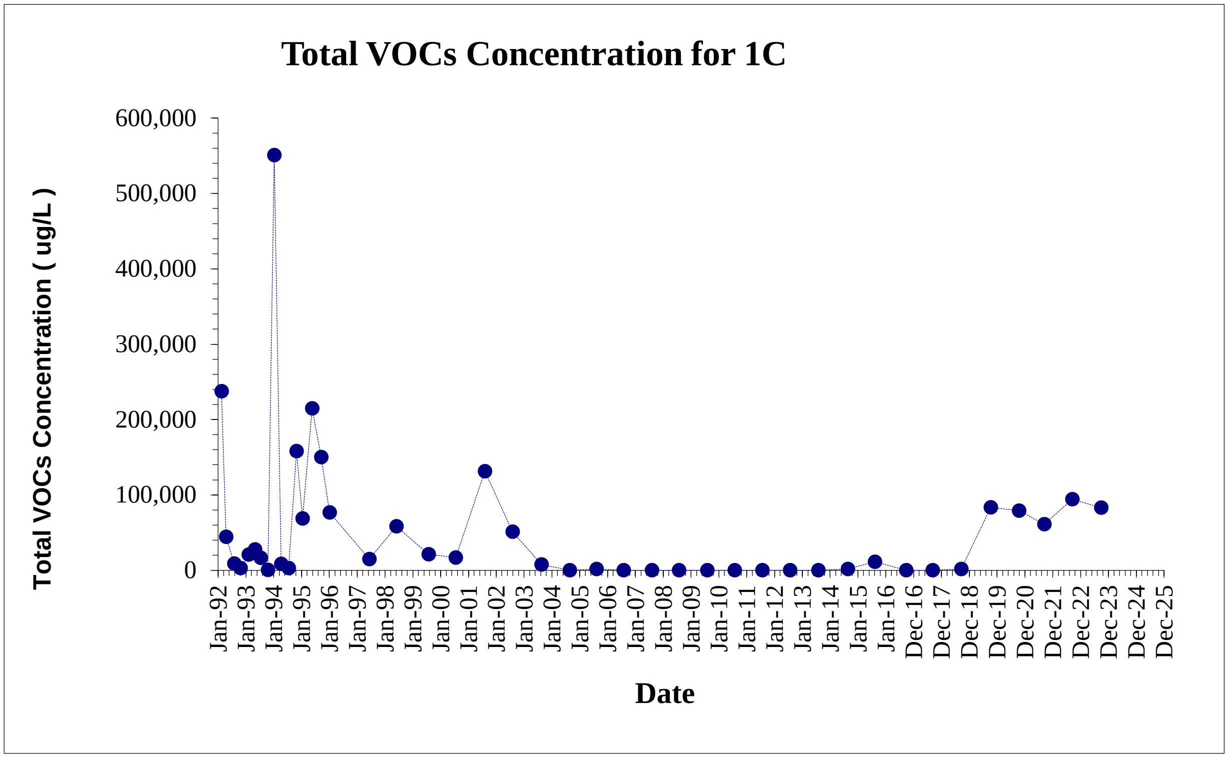

VOCs are predominantly chlorobenzene, THT, 1,2-dichlorobenzene, and 1,4-dichlorobenzene.

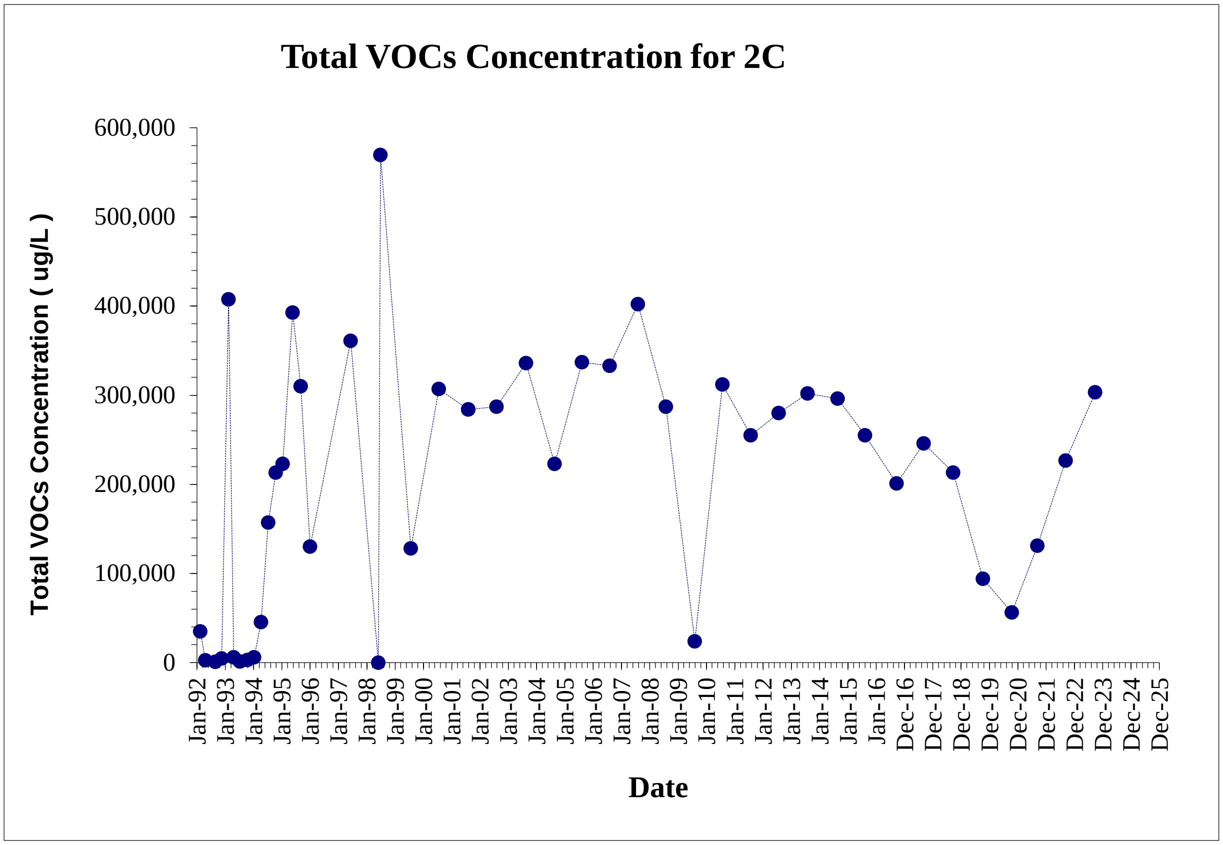


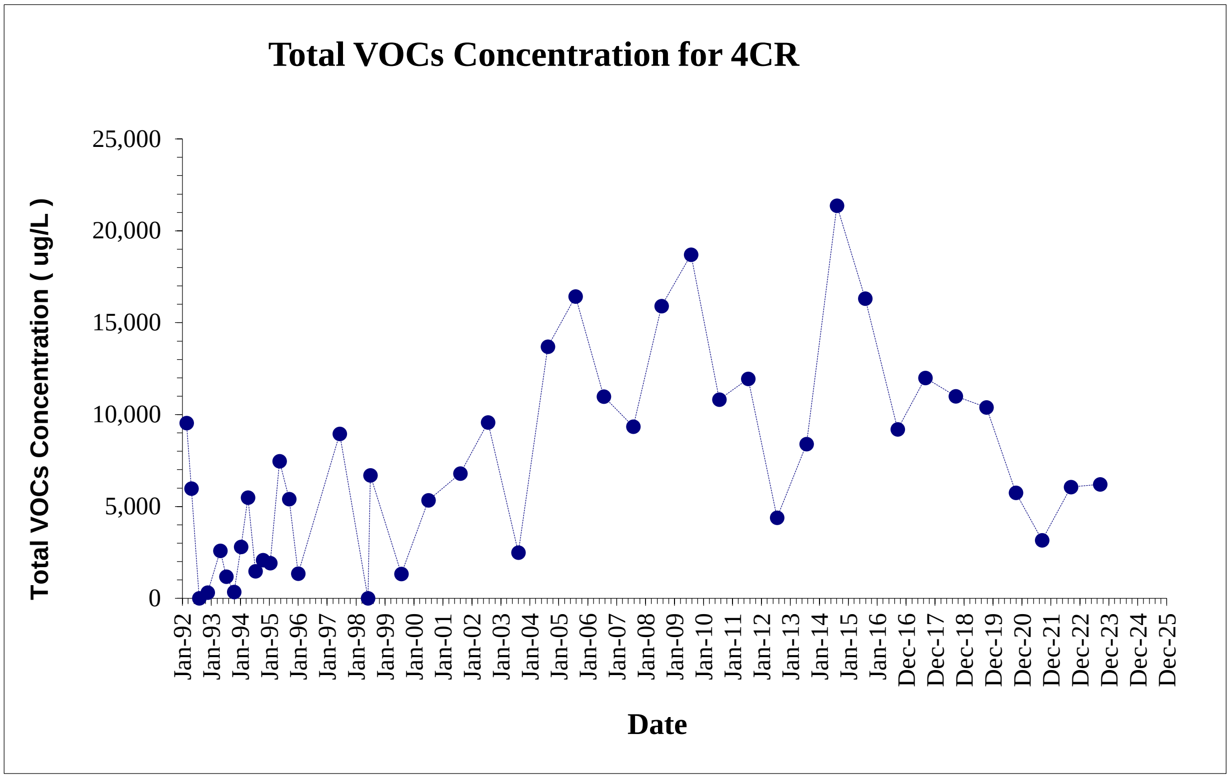


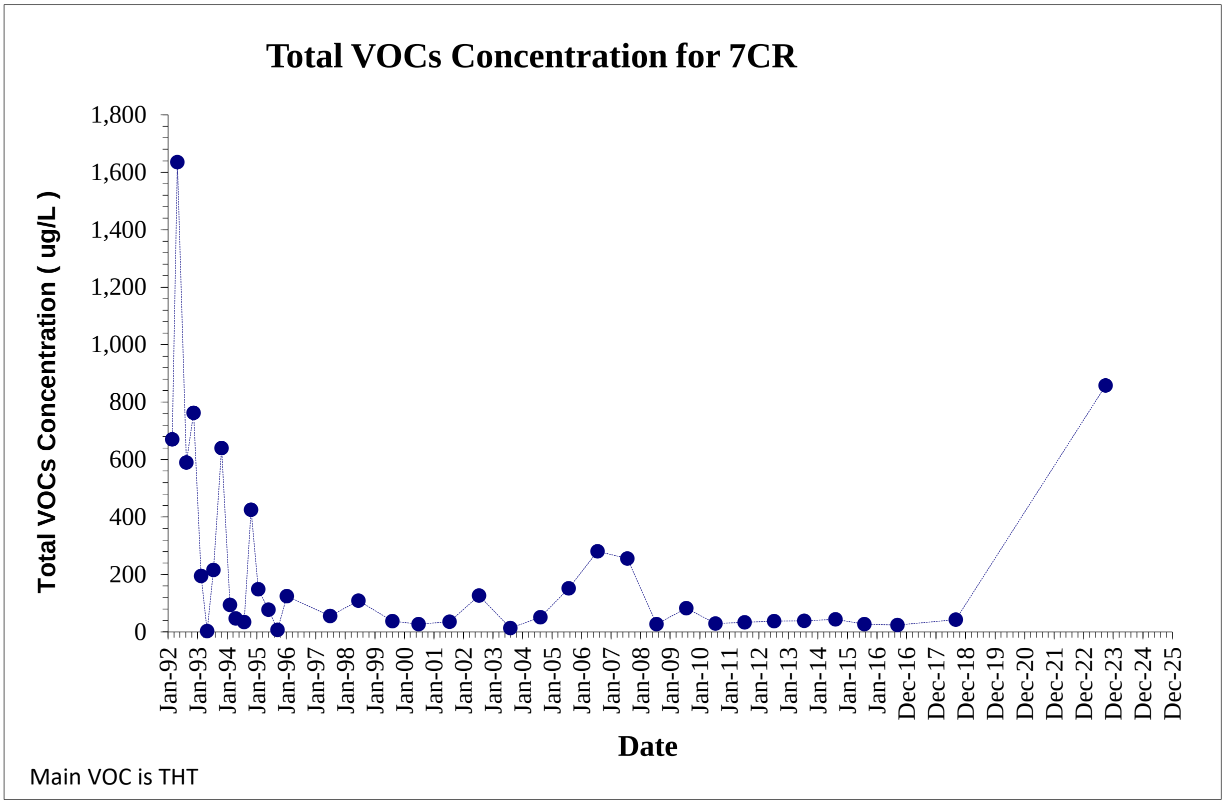

Note: VOCs are mainly THT.

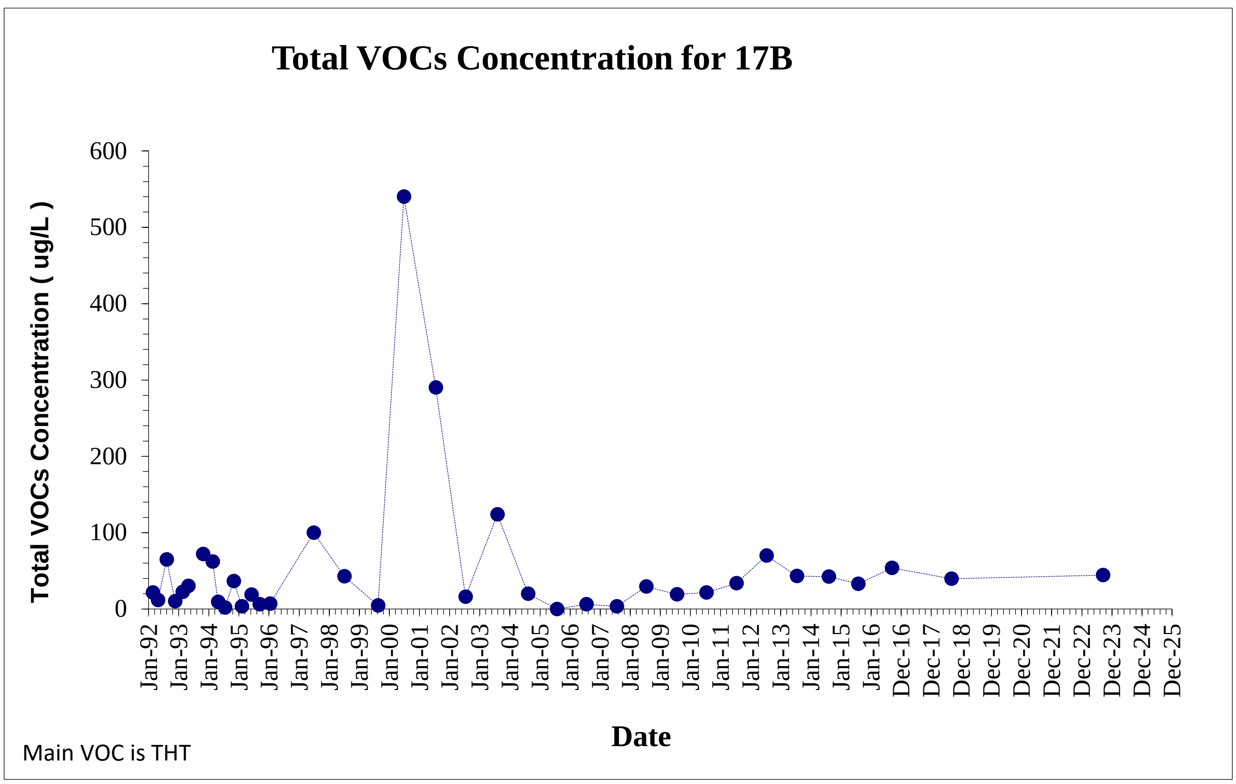

Total VOCs Concentration for OBA-01C
Total VOCs Concentration ( ug/L )
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Jul-21
Oct-23
Dec-25
DATE

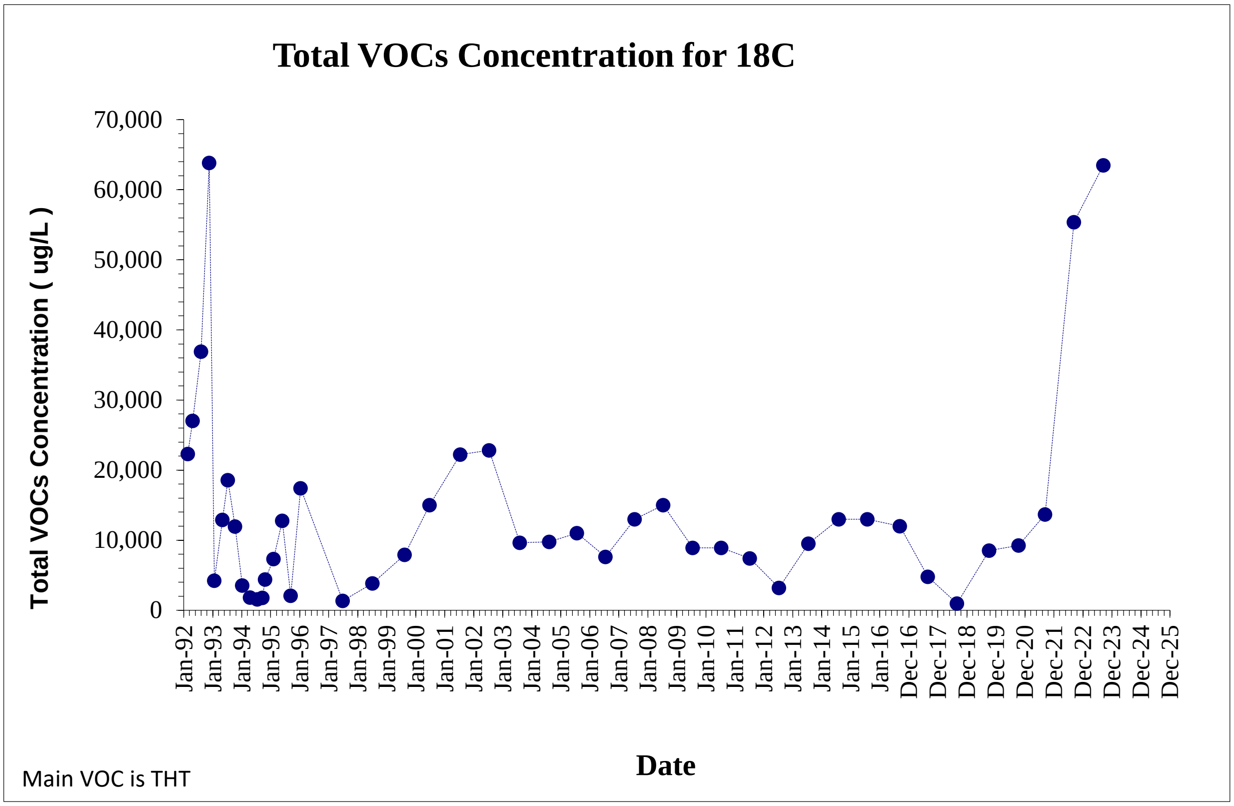

Total VOCs Concentration for 1C
Total VOCs Concentration ( ug/L )
600,000
500,000
400,000
300,000
200,000
100,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24 Dec-25
Date

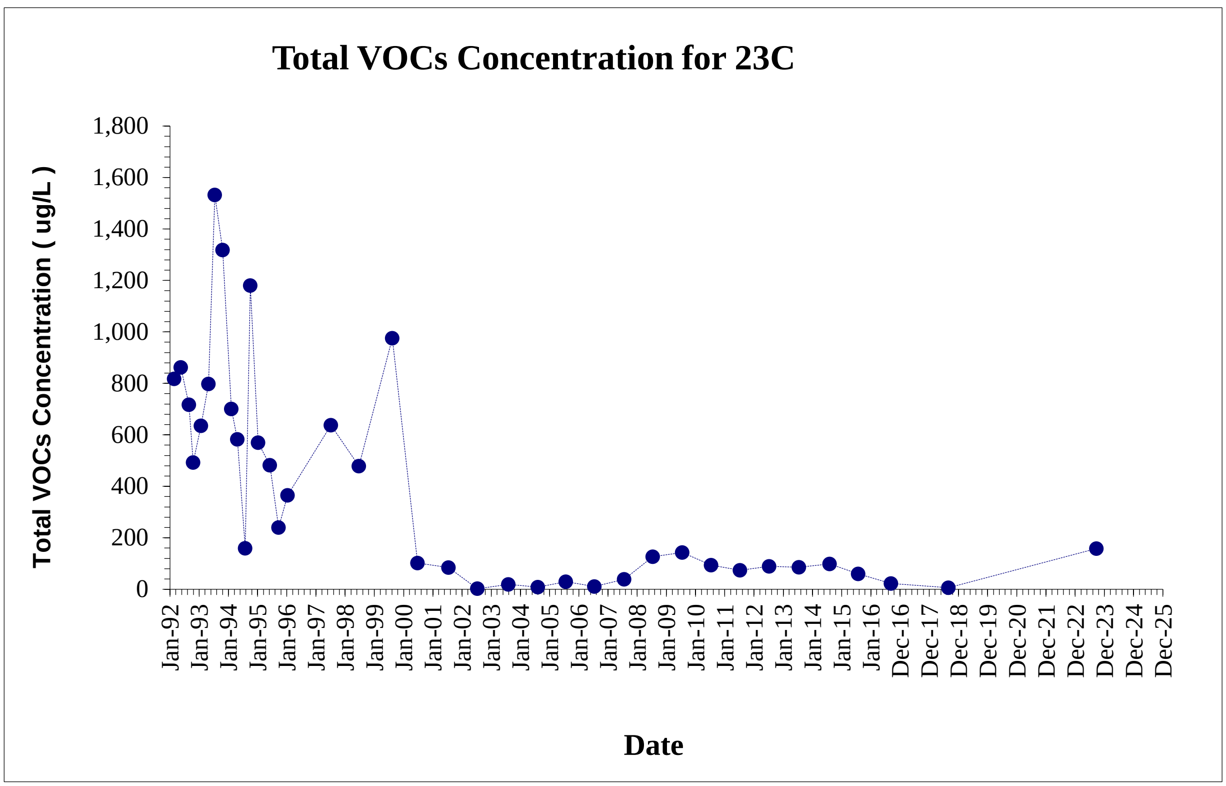

Total VOCs Concentration for 2C
Total VOCs Concentration ( ug/L )
600,000
500,000
400,000
300,000
200,000
100,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

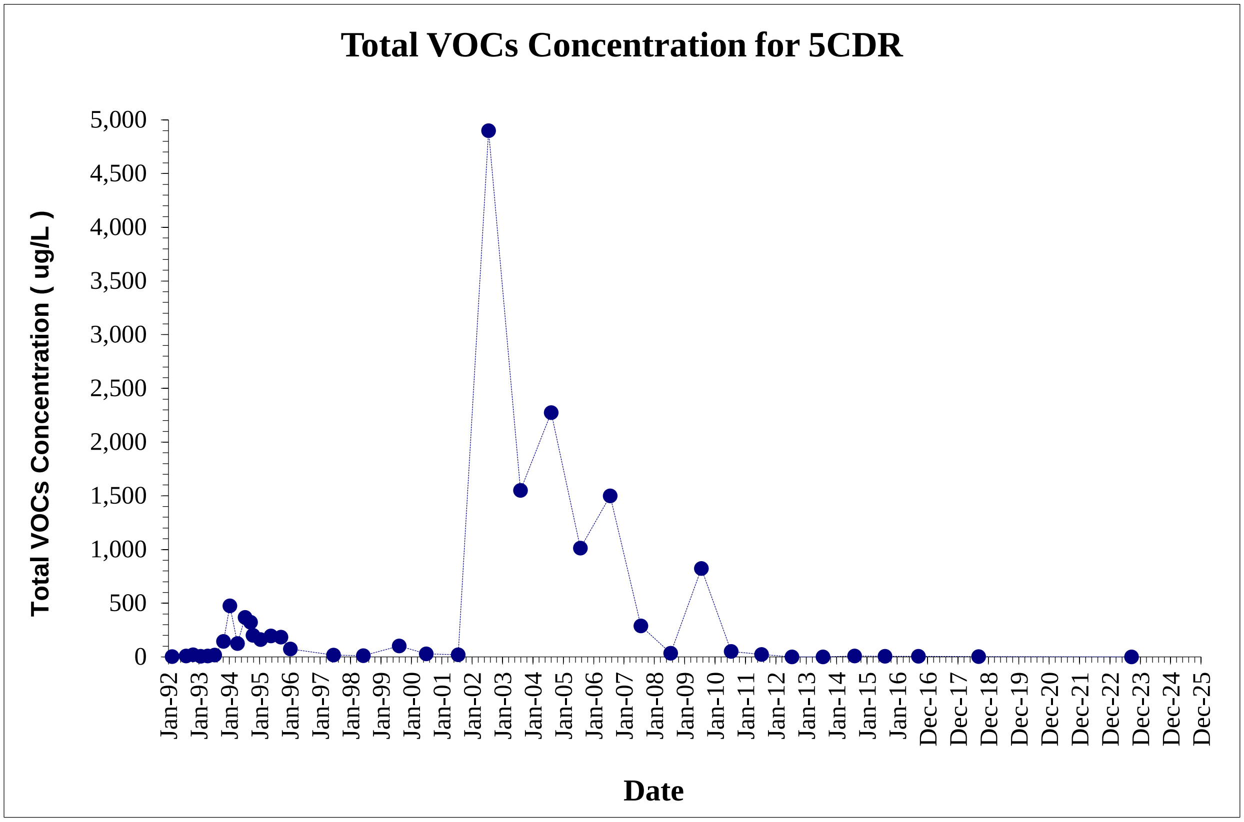

Total VOCs Concentration for 4CR
Total VOCs Concentration ( ug/L )
25,000
20,000
15,000
10,000
5,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19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

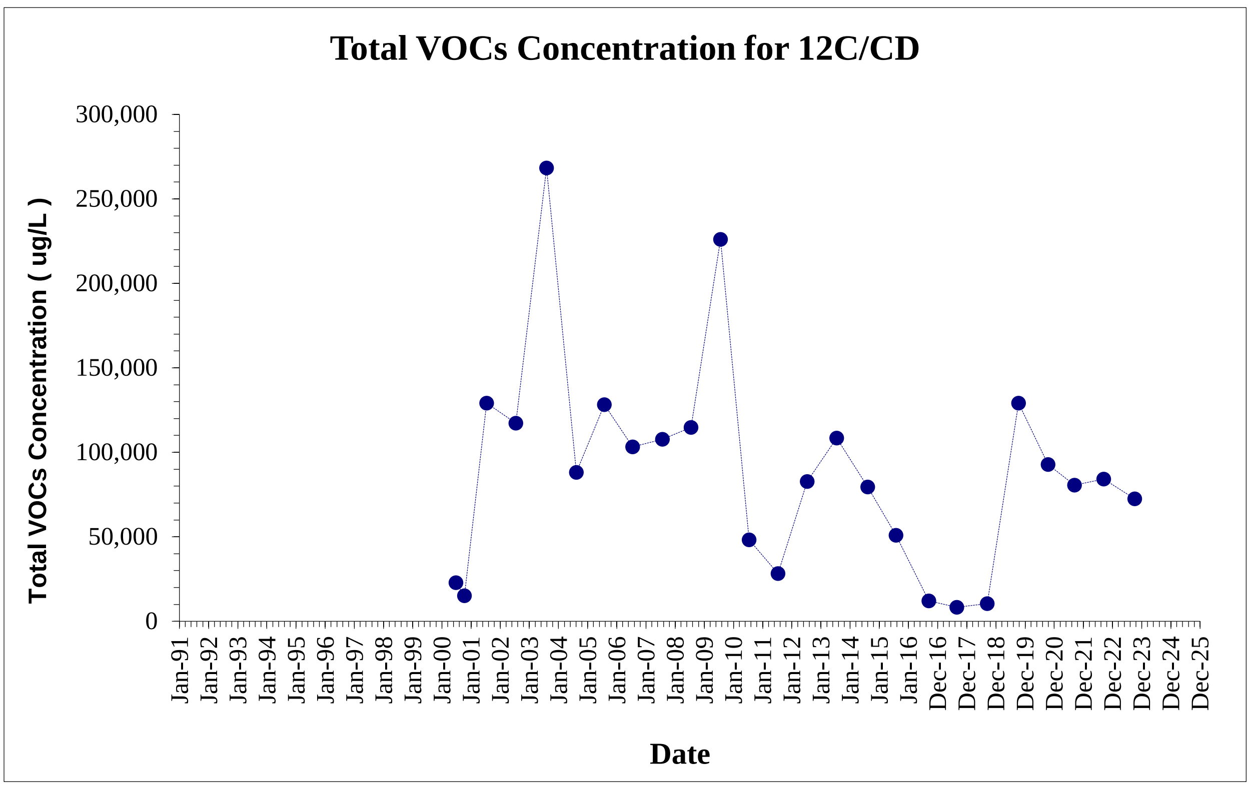

Total VOCs Concentration for 7CR
Total VOCs Concentration ( ug/L )
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date
Main VOC is THT

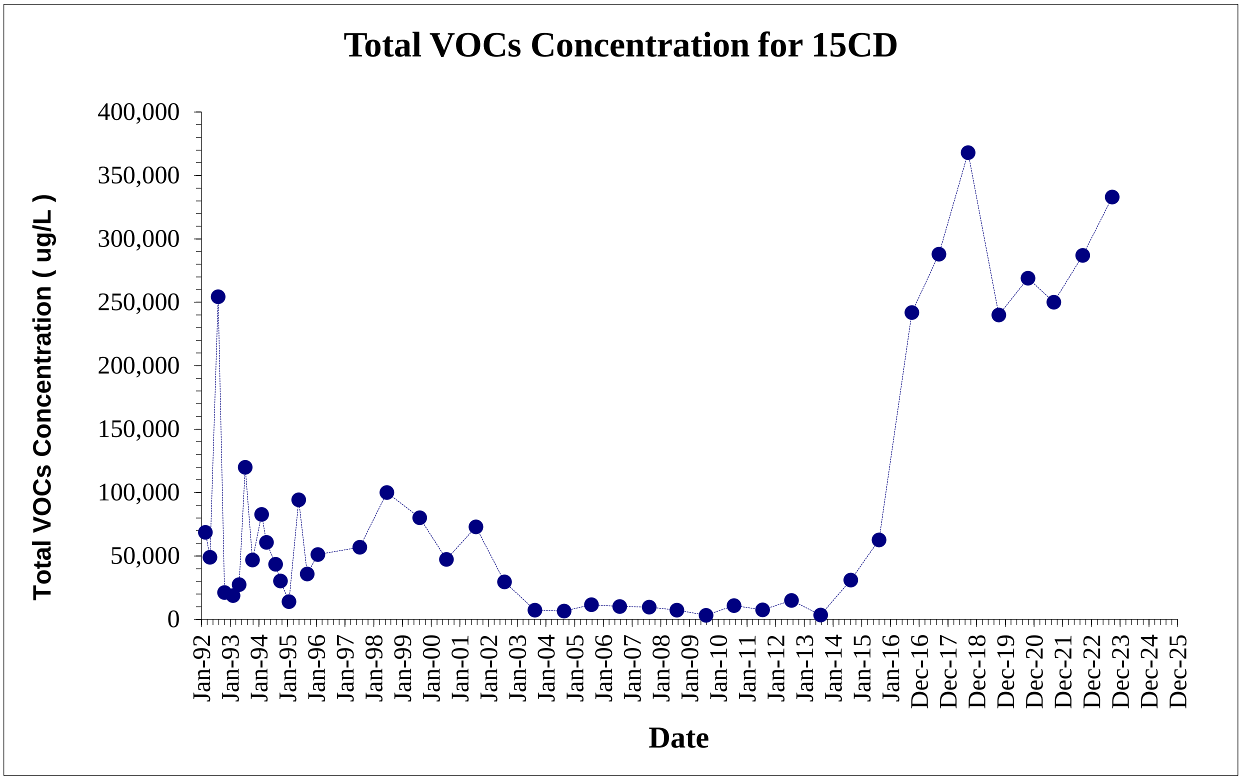

Total VOCs Concentration for 17B
Total VOCs Concentration ( ug/L )
600
500
400
300
200
100
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Main VOC is THT
Date

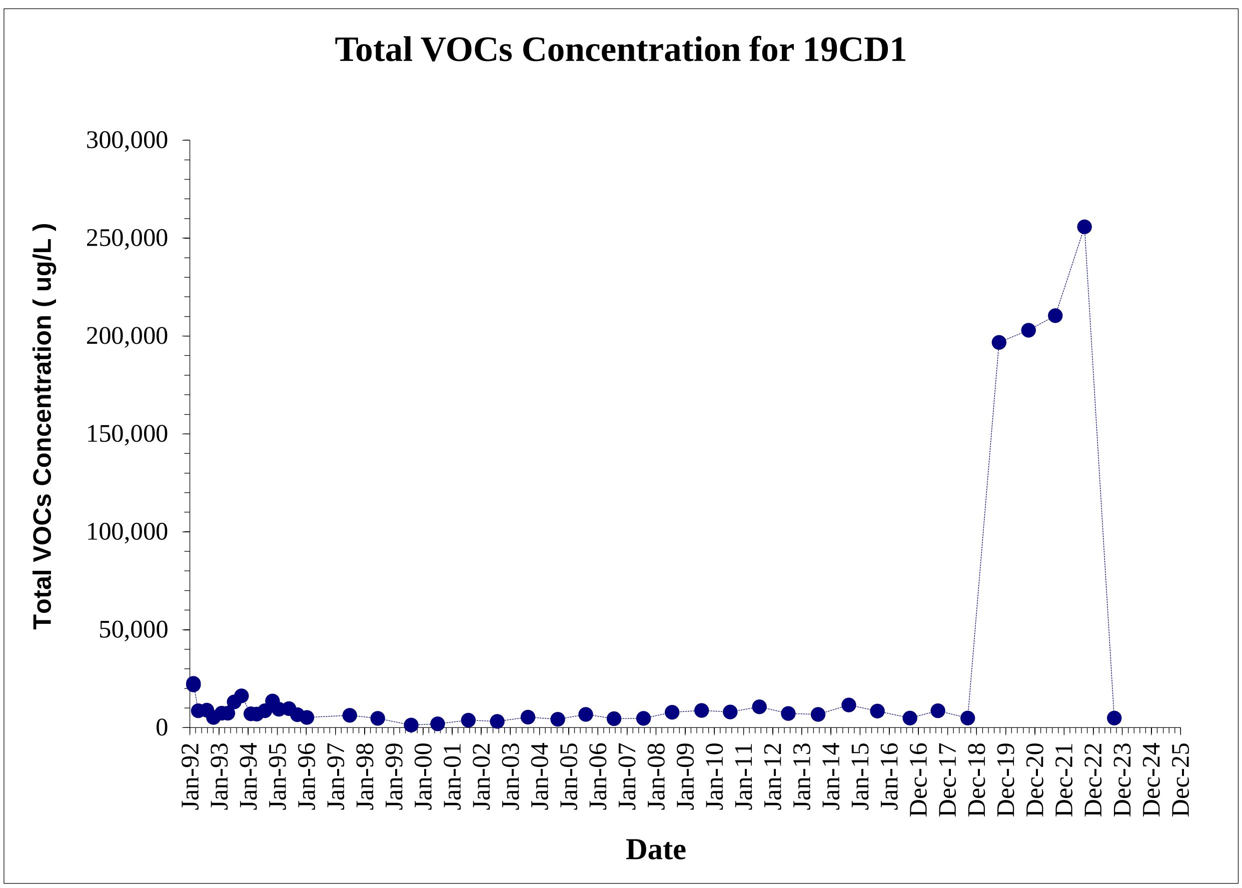

Total VOCs Concentration for 18C
Total VOCs Concentration ( ug/L )
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24 Dec-25
Date
Main VOC is THT


Total VOCs Concentration for 23C
Total VOCs Concentration ( ug/L )
1,800
1,600
1,400
1,200
1,000
800
600
400
200
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 Dec-25
Date

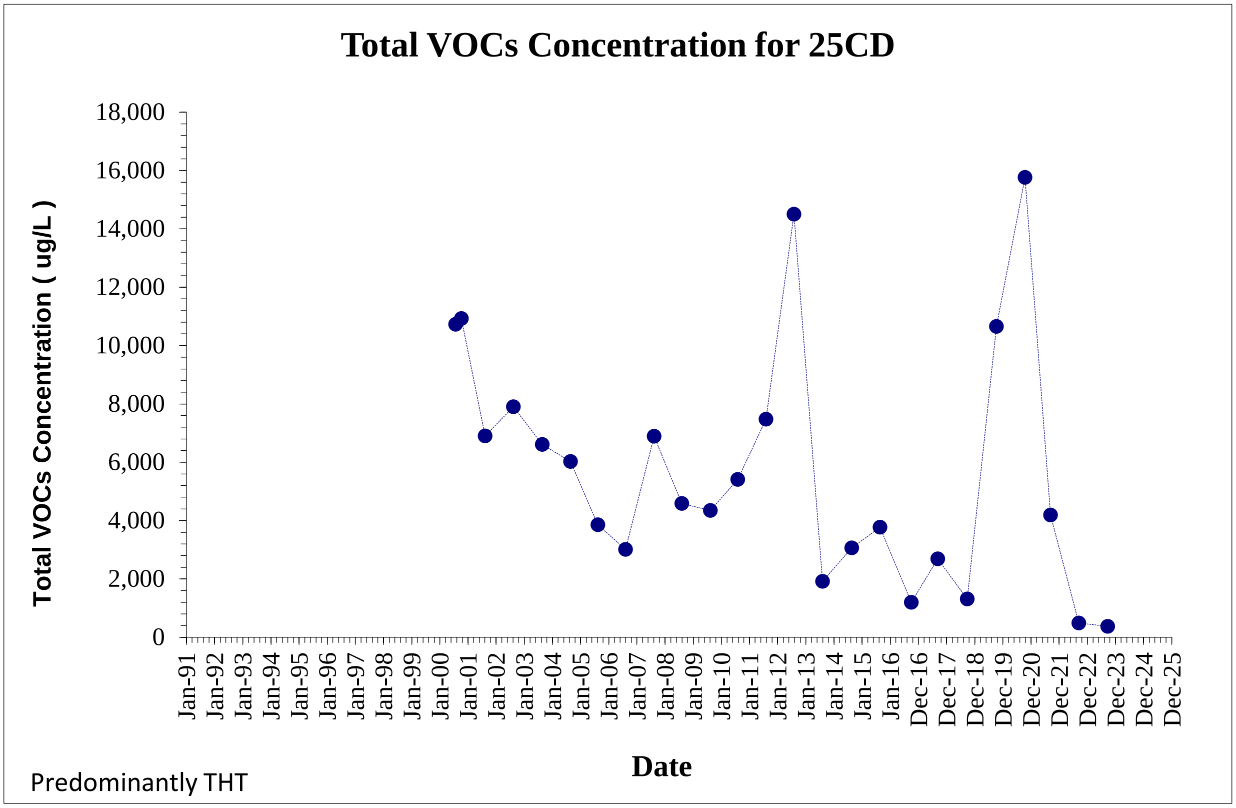

Total VOCs Concentration for 5CDR
Total VOCs Concentration ( ug/L )
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

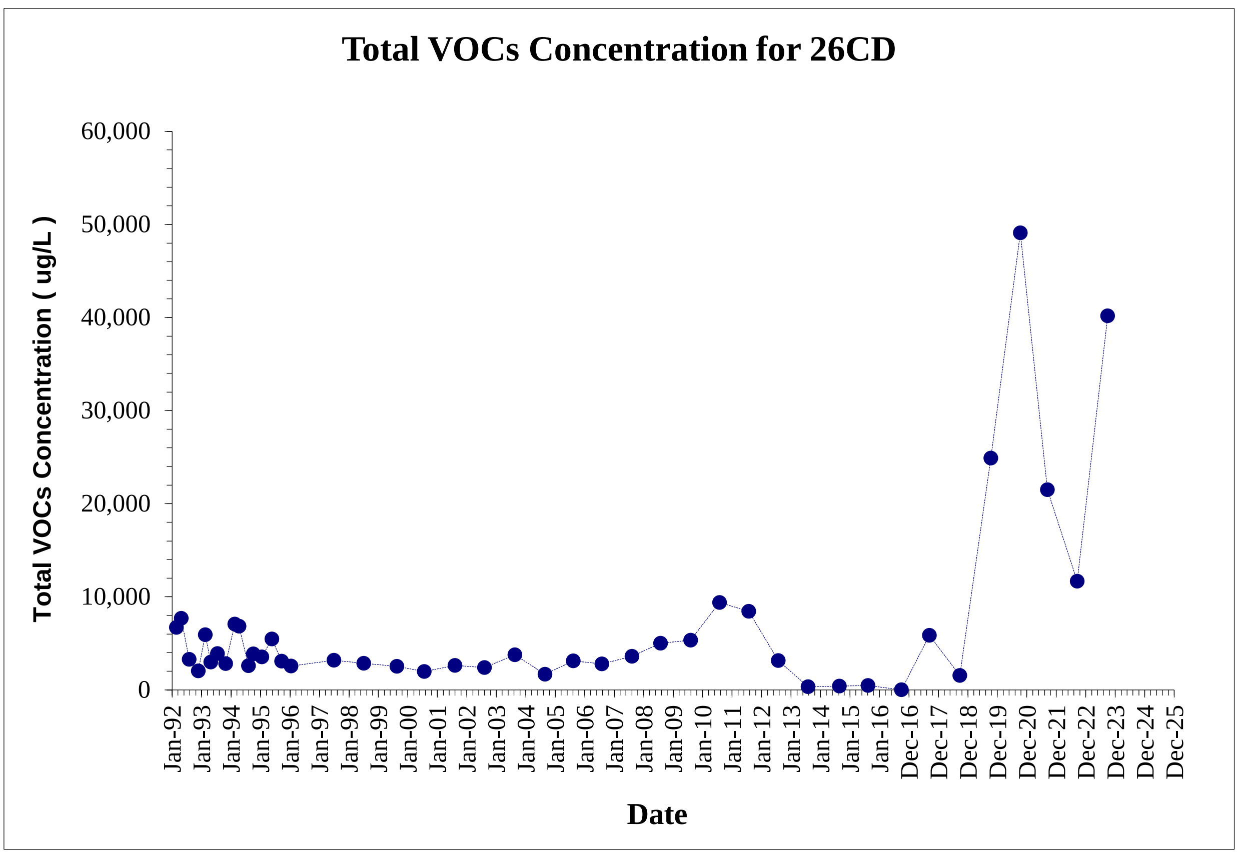

Total VOCs Concentration for 12C/CD
Total VOCs Concentration ( ug/L )
300,000
250,000
200,000
150,000
100,000
50,000
0
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date


Total VOCs Concentration for 15CD
Total VOCs Concentration ( ug/L )
400,000
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
Dec-25
Date

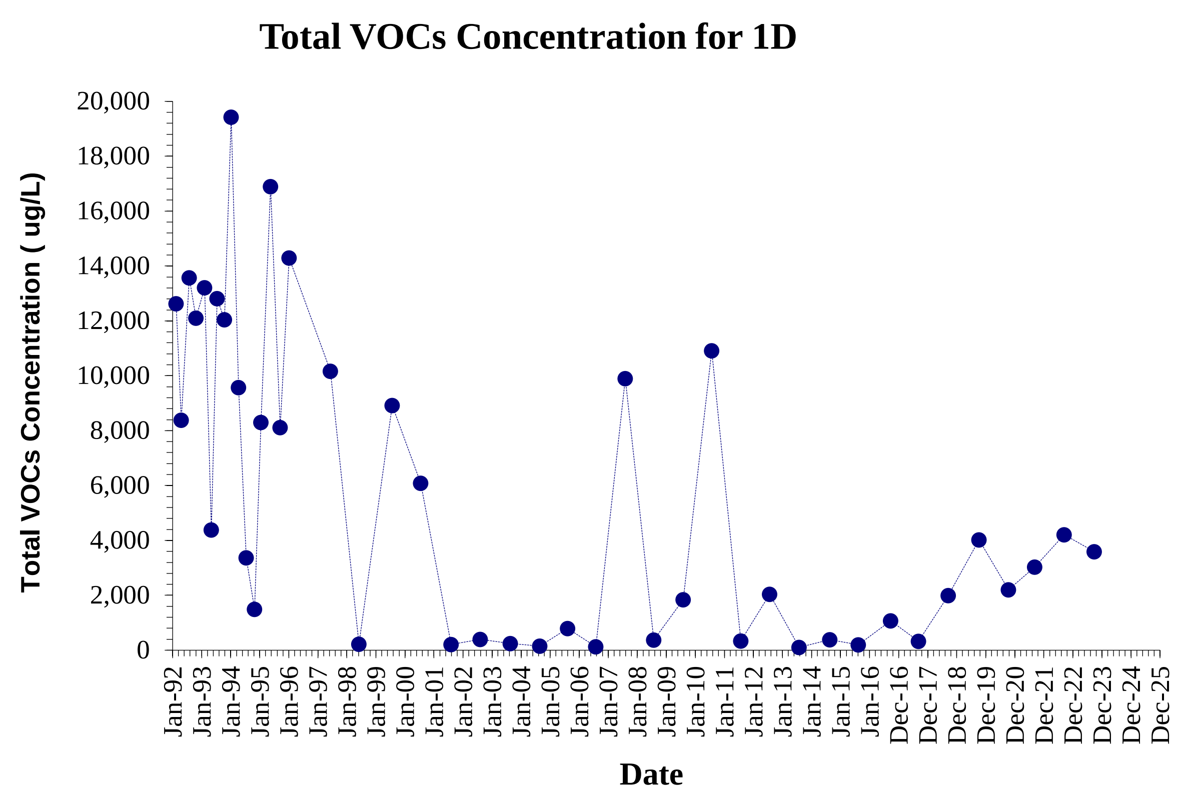

Total VOCs Concentration for 19CD1
Total VOCs Concentration ( ug/L )
300,000
250,000
200,000
150,000
100,000
50,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

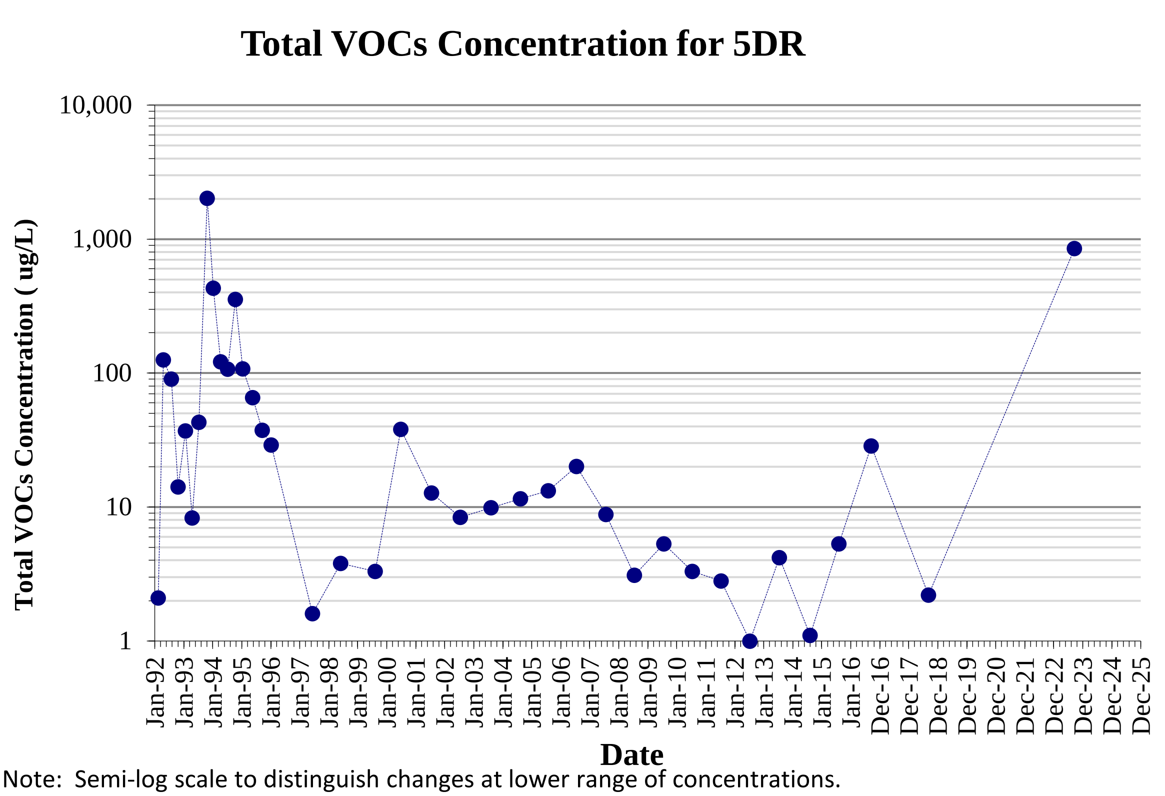
**Appendix B**
**CD-Zone TVOC Graphs**



## Appendix B
## D-Zone TVOC Graphs



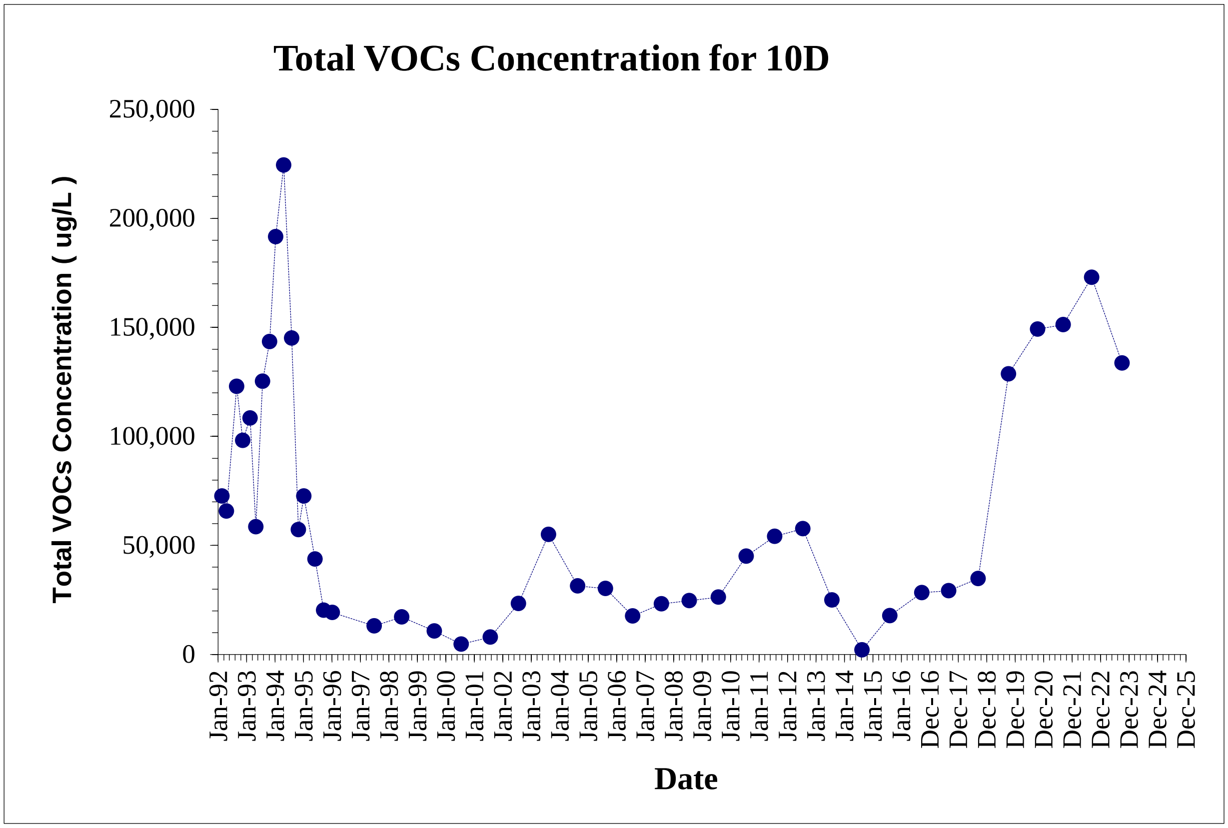



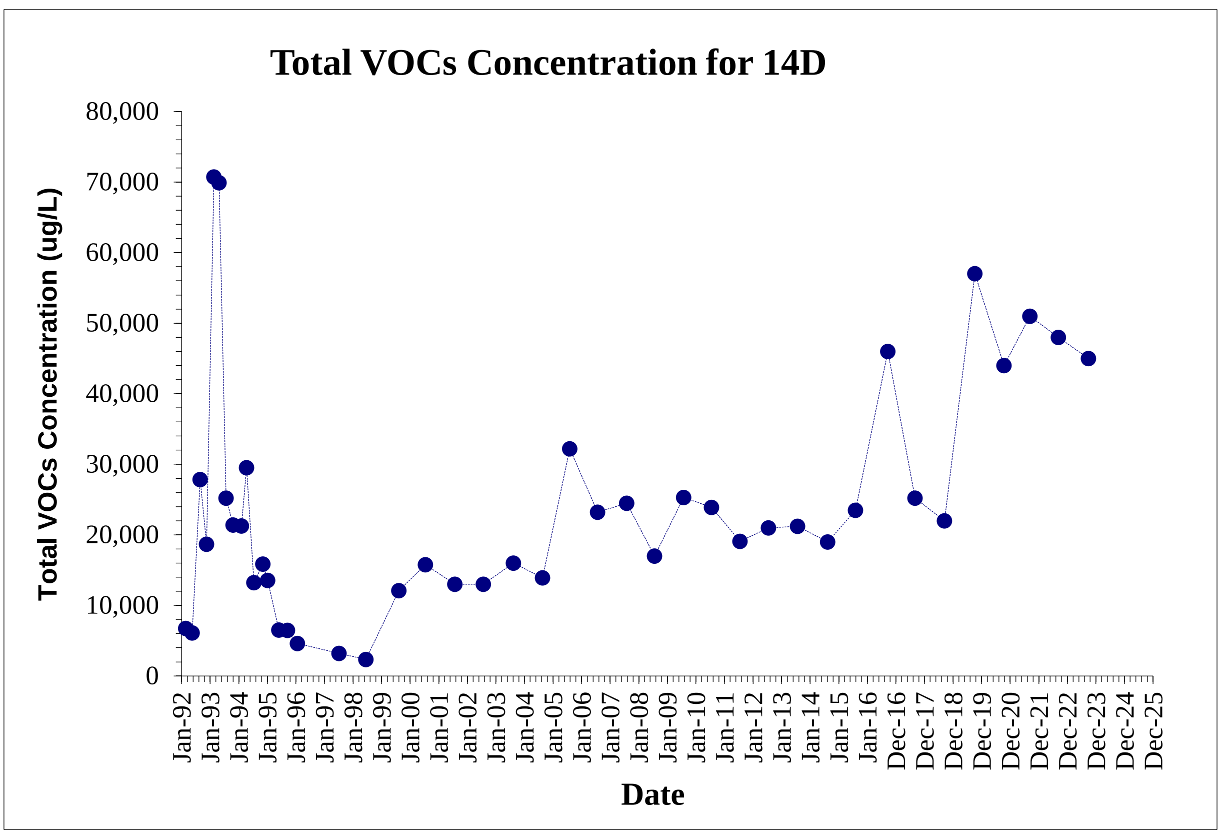

Note: Semi-log scale to distinguish changes at lower range of concentrations.
Nondetected value for 2012 represented as 1.0 ug/L.



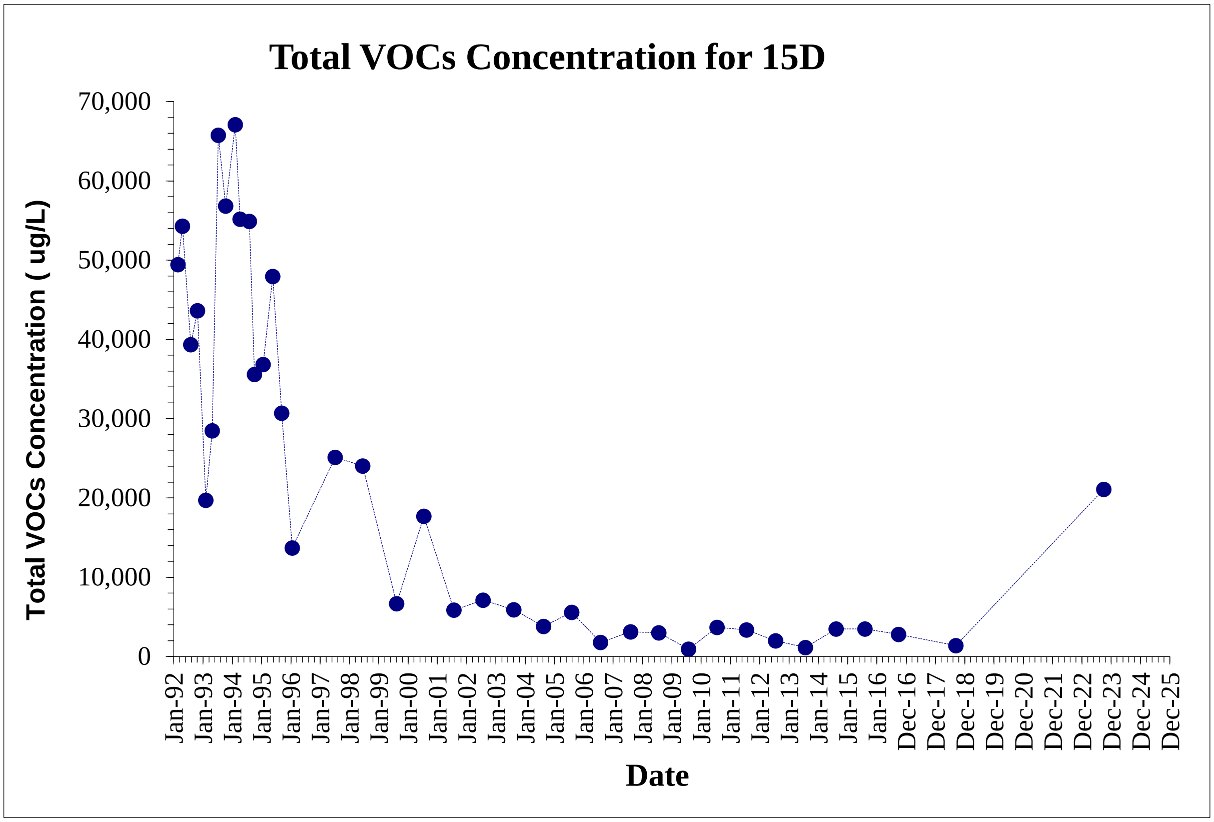
\.. PRR Annual Report\Attachment 3 GWRS Annual Rpt\Appendices\
Appendix B - TVOC plots\2023 D - TVOC GRAPHS.xlsx

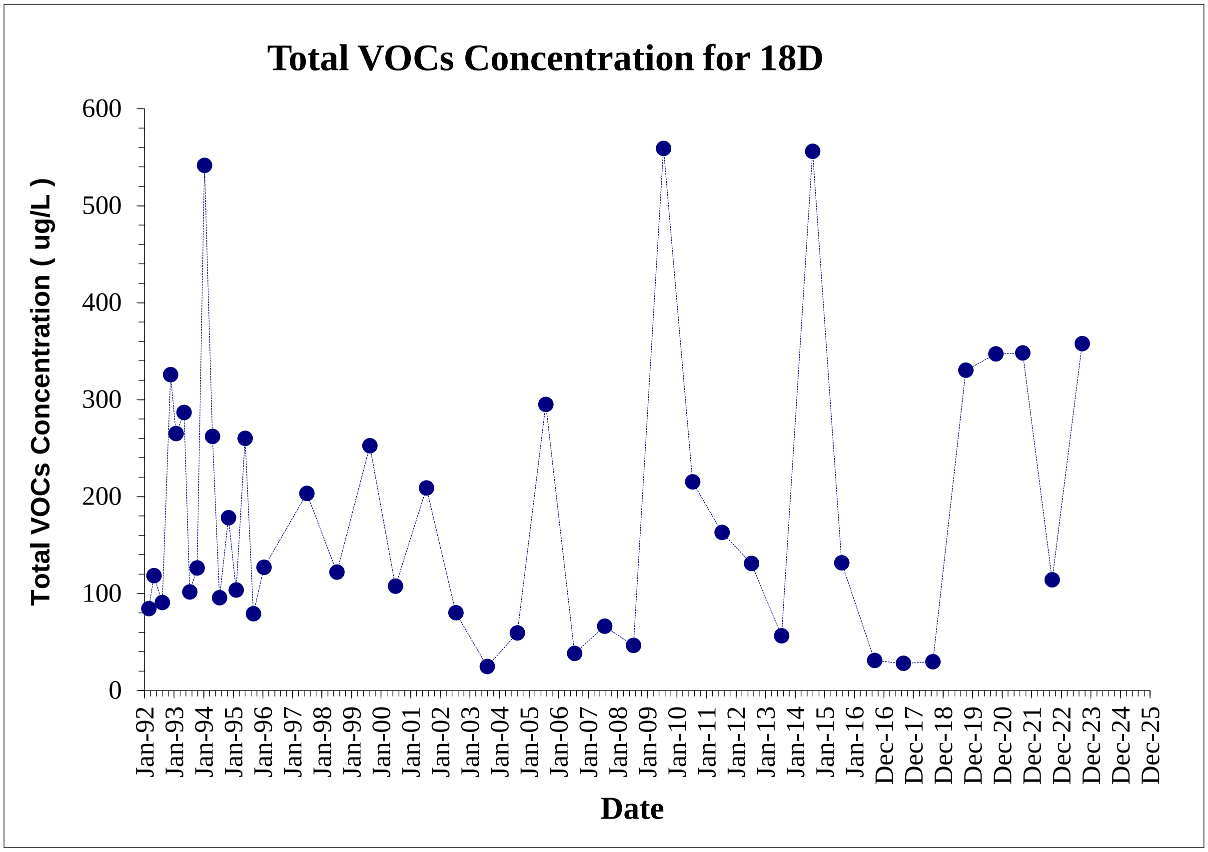
**Appendix B**
**D-Zone TVOC Graphs**



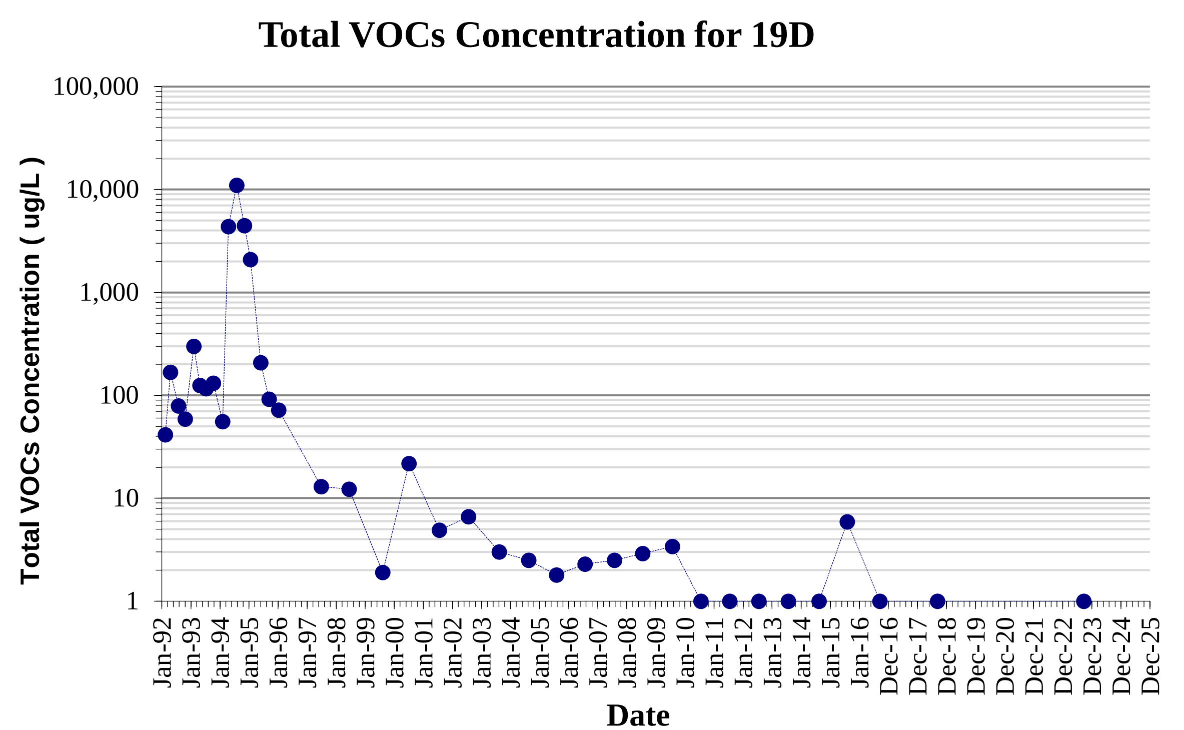



**Appendix B**
**D-Zone TVOC Graphs**

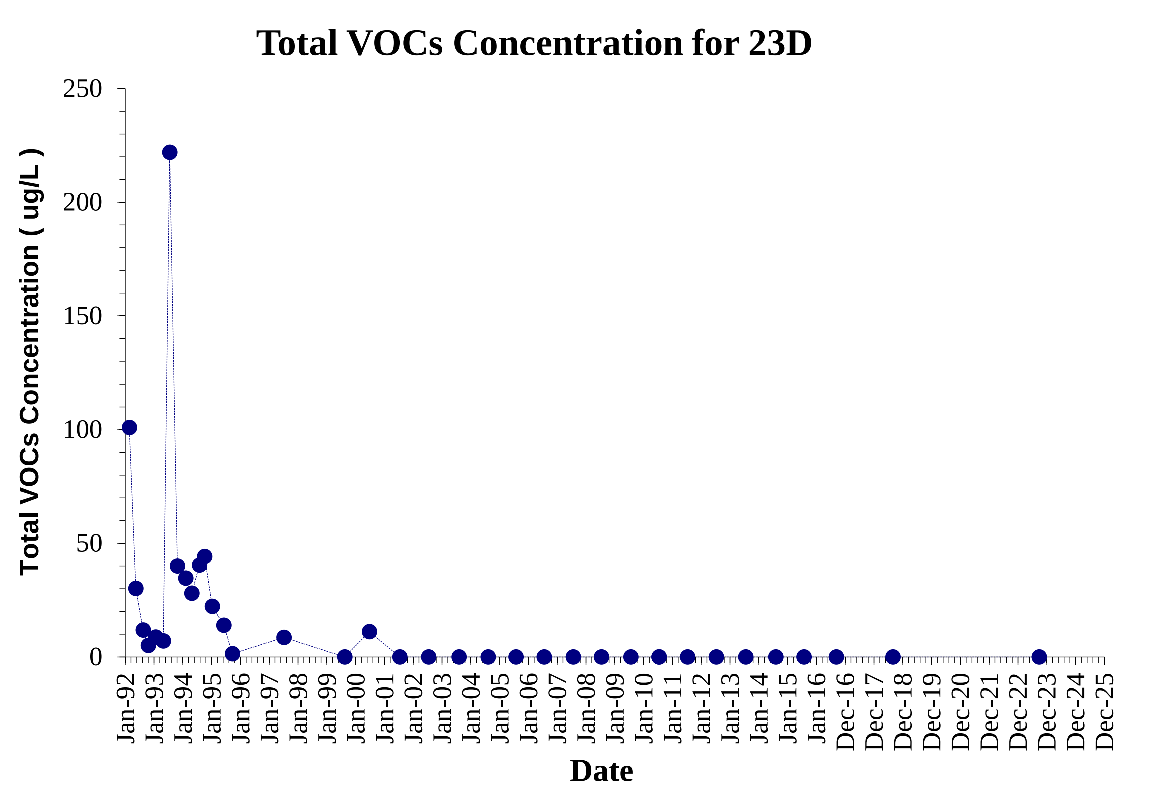


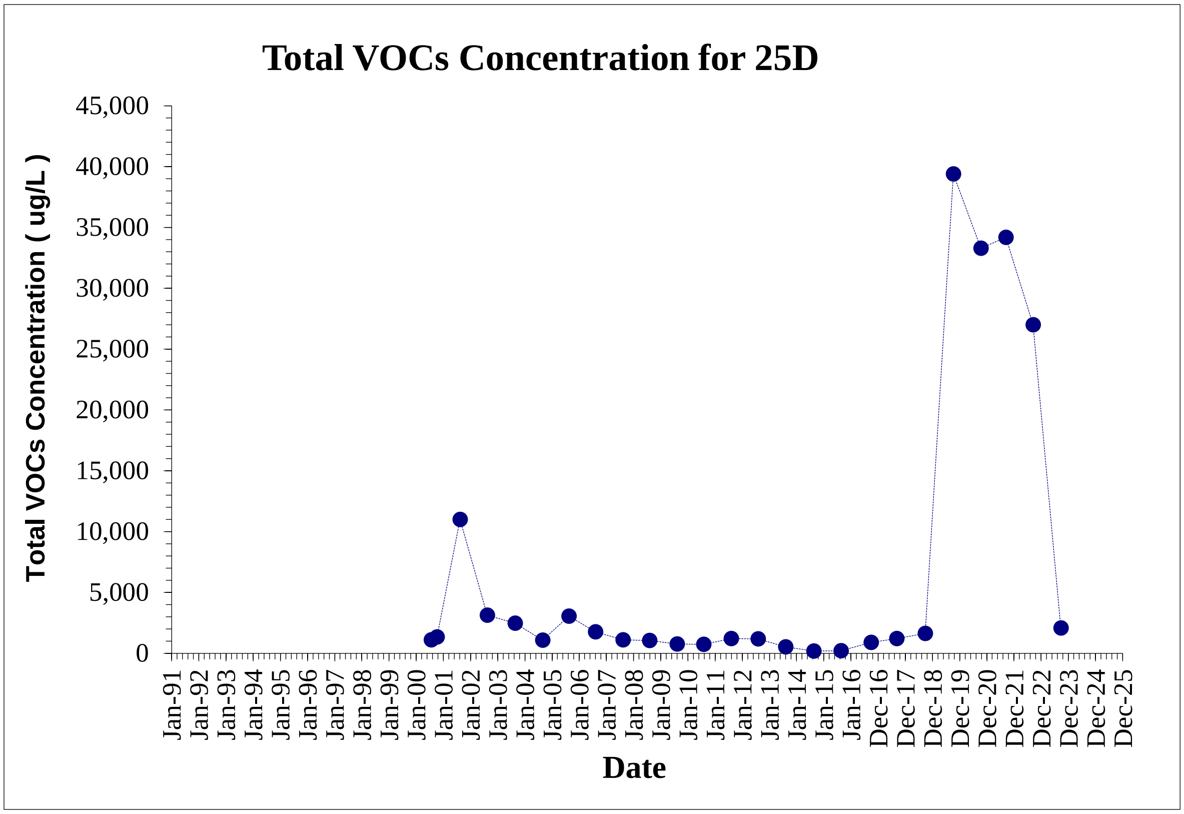



**Appendix B**
**D-Zone TVOC Graphs**

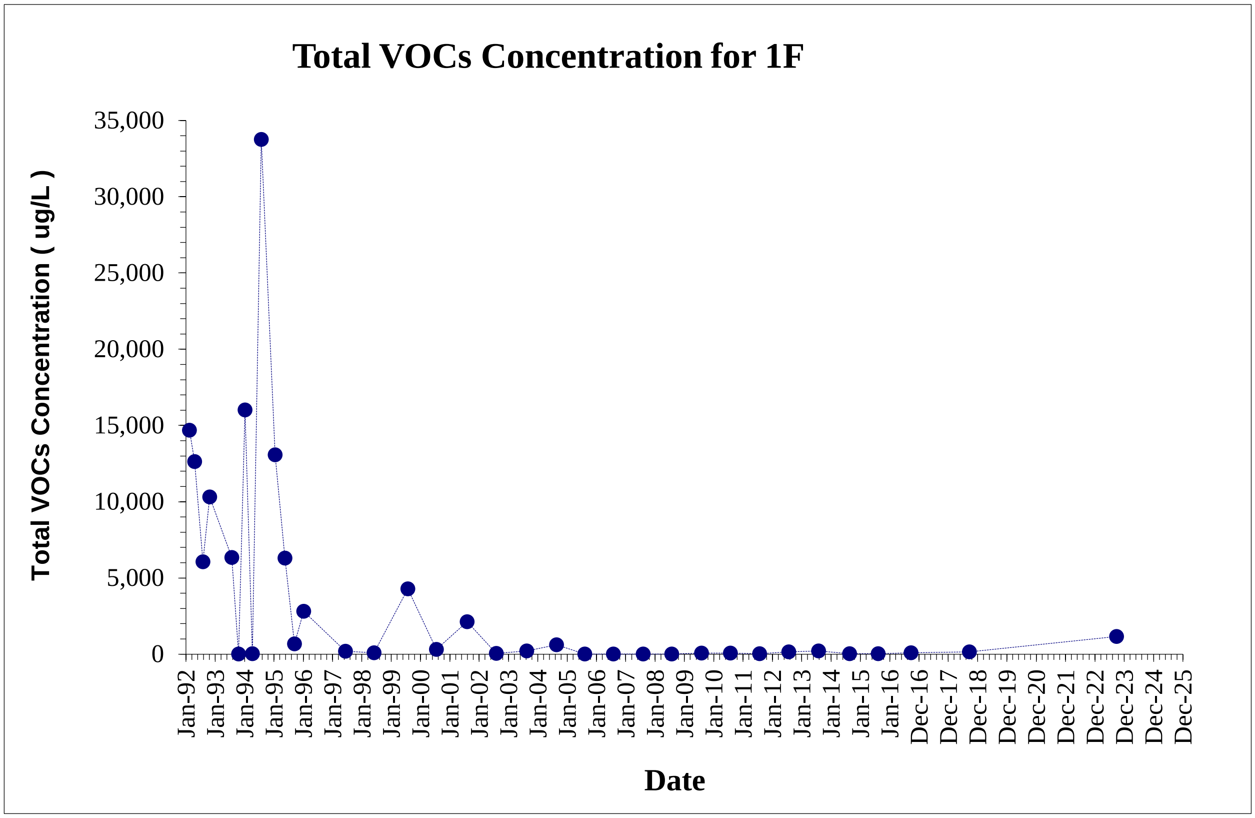


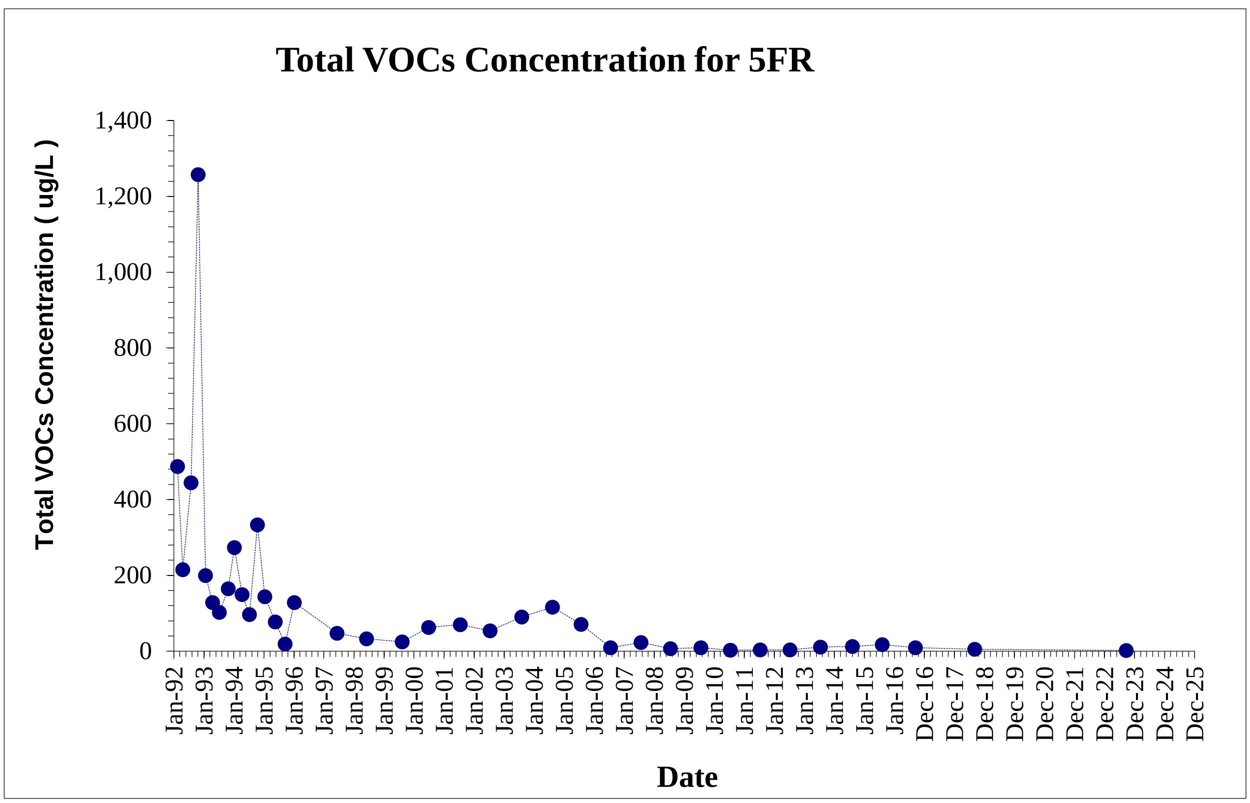

Note: Semi-log scale to distinguish changes at lower range of concentrations.
Nondetected values for 2010, 2011, 2012, 2013, 2014, 2016, 2018, and 2023 represented as 1.0 ug/L.

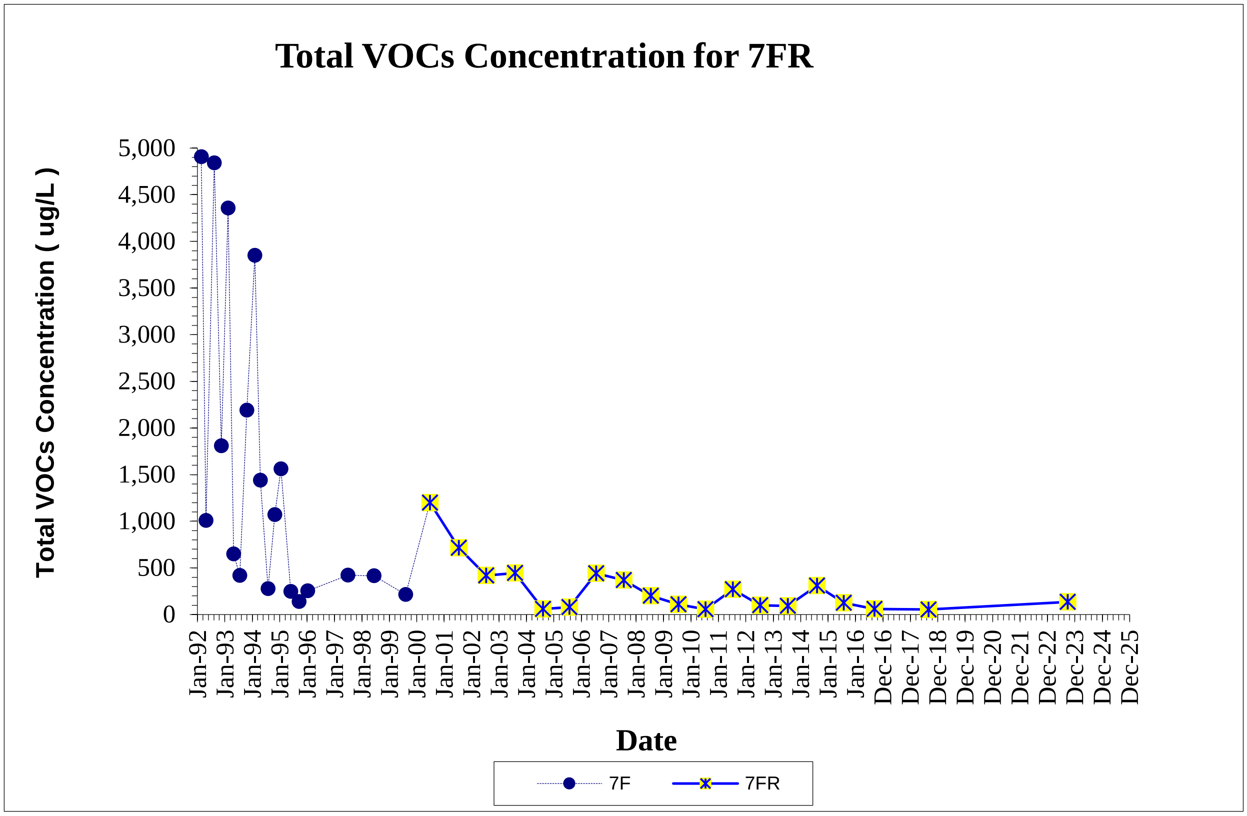


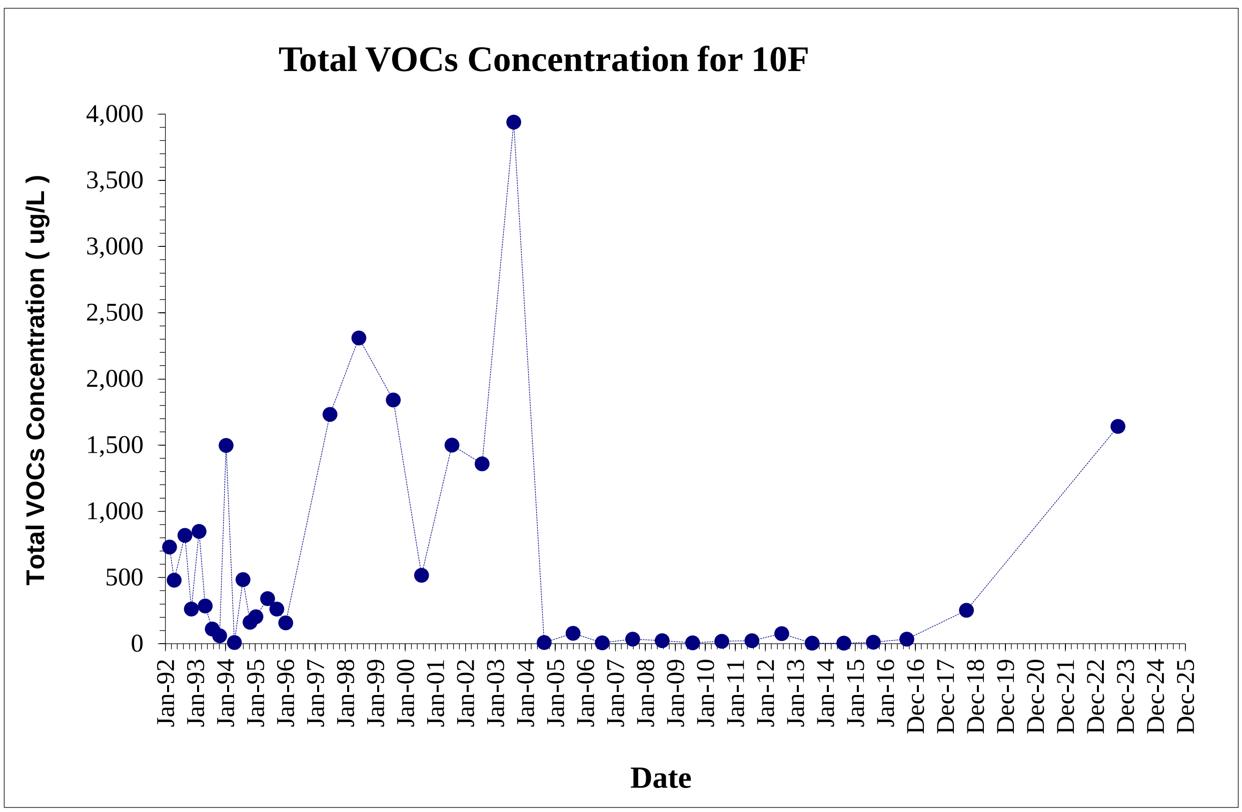

Total VOCs Concentration for 25D
Total VOCs Concentration ( ug/L )
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Dec-24
Dec-25
Date

**Appendix B**
**F-Zone TVOC Graphs**

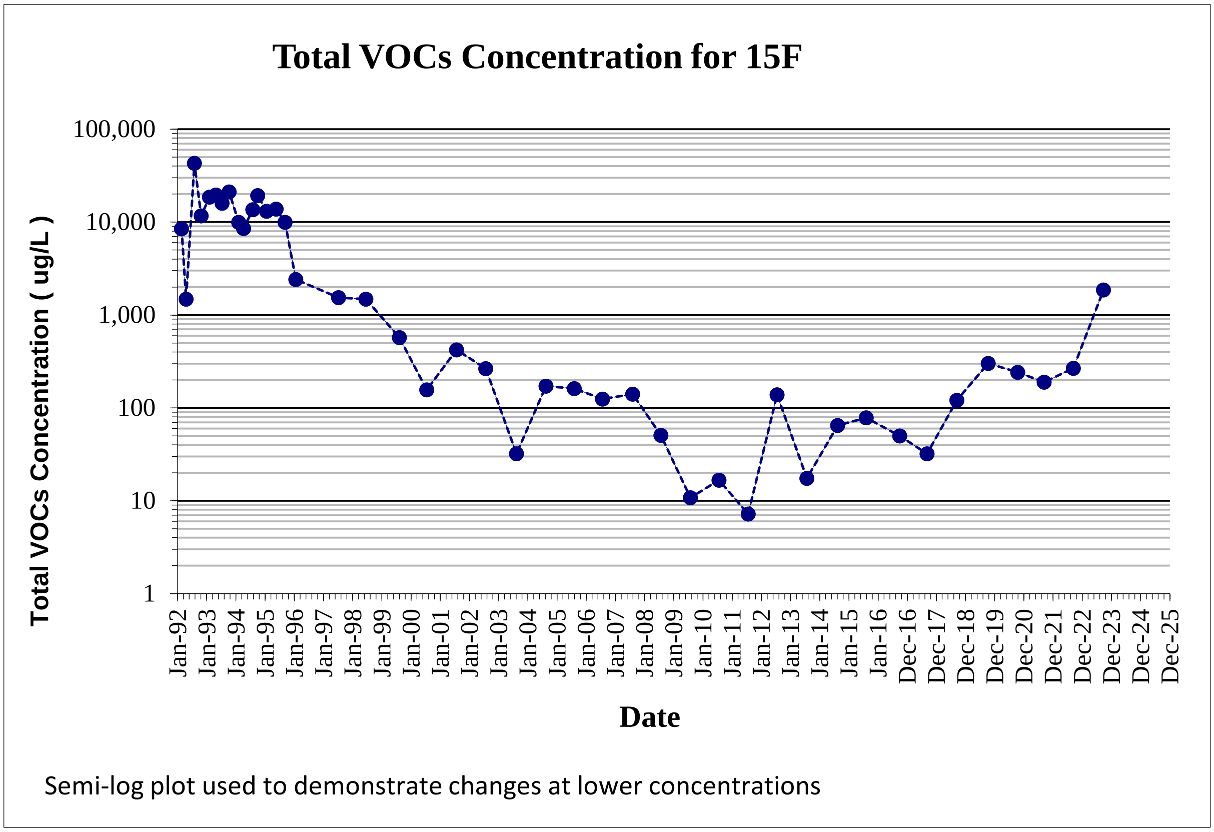


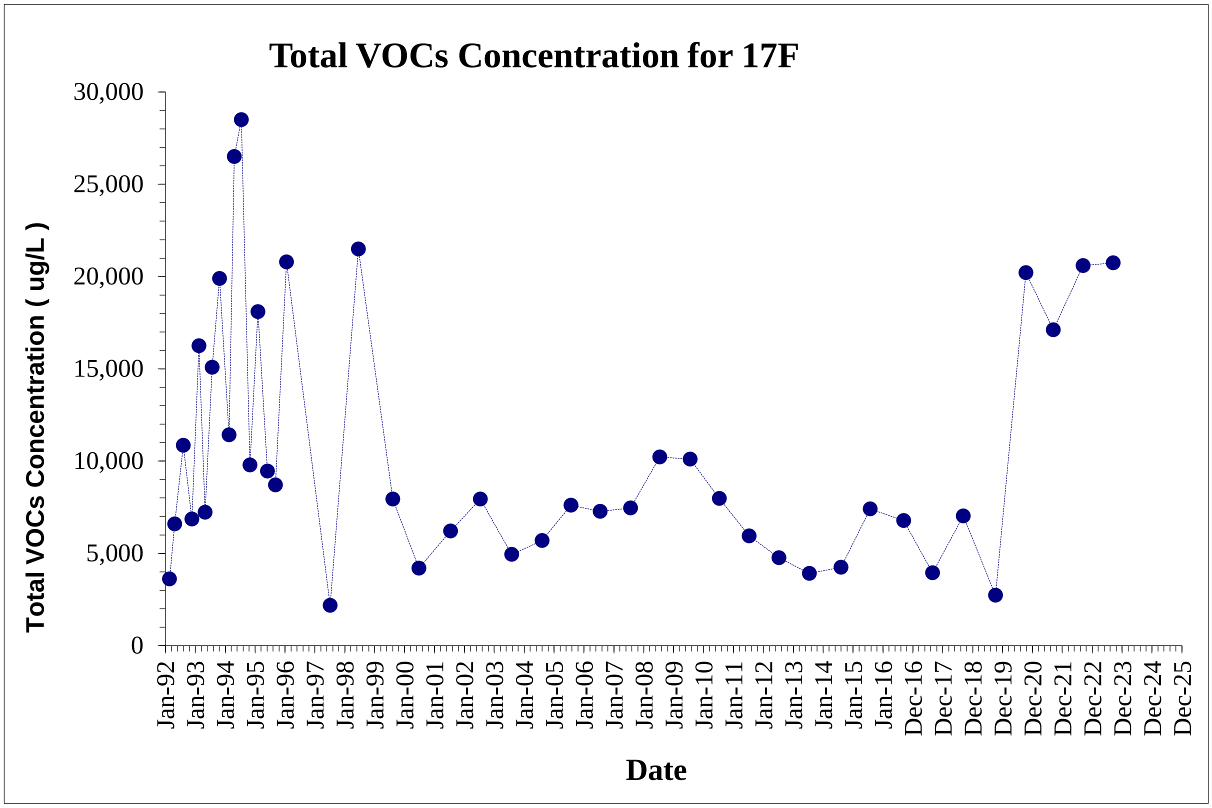



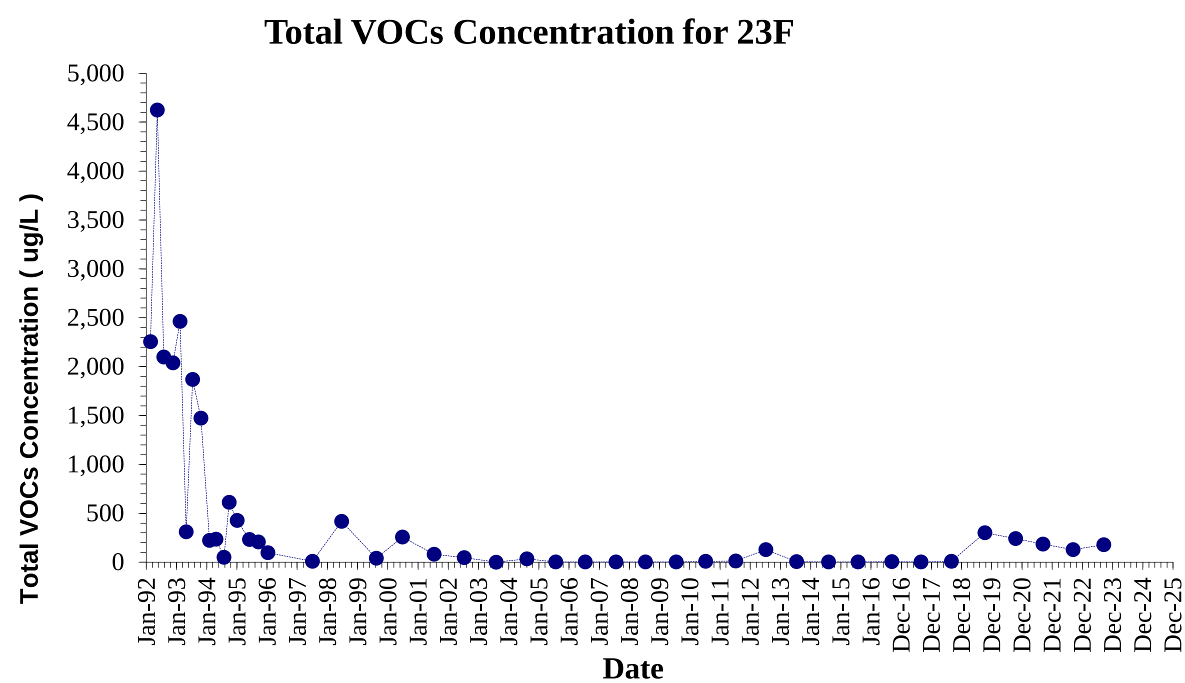

Total VOCs Concentration for 7FR
Total VOCs Concentration ( ug/L )
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Dec-16 Dec-17 Dec-18 Dec-19 Dec-20 Dec-21 Dec-22 Dec-23 Dec-24 Dec-25
Date
7F
7FR


Total VOCs Concentration for 10F
Total VOCs Concentration ( ug/L )
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
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 Dec-25
Date

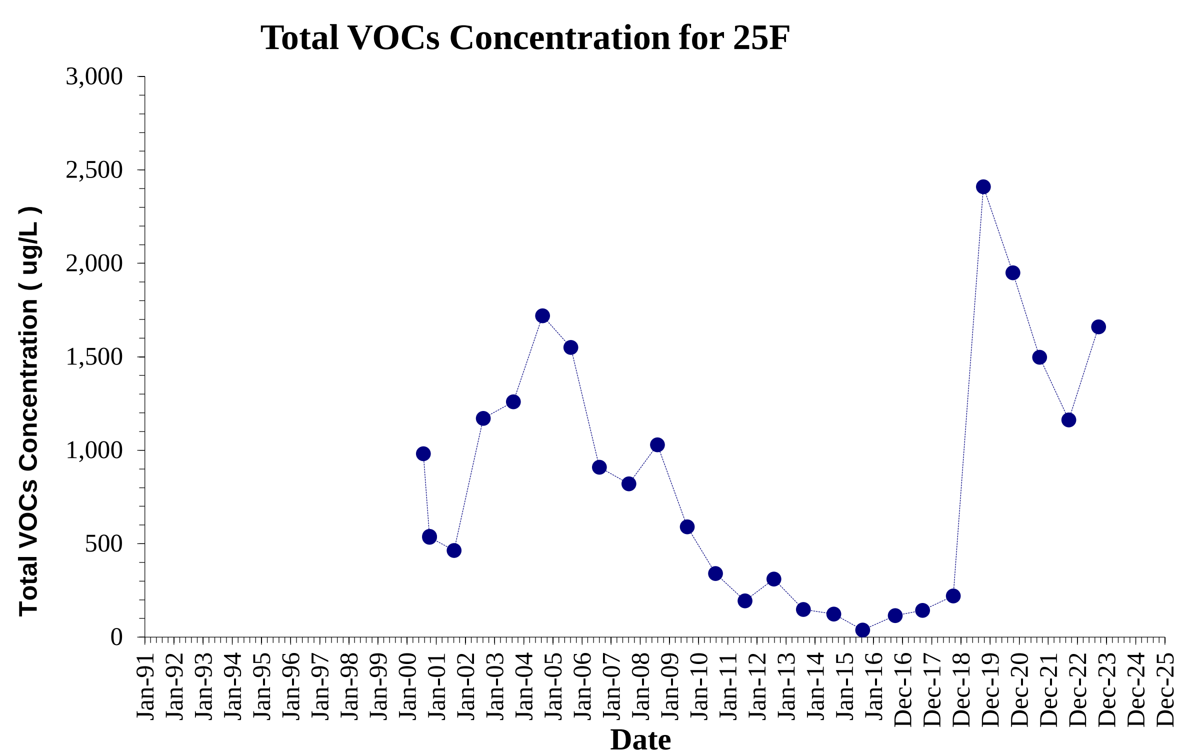
**Appendix B**
**F-Zone TVOC Graphs**






Semi-log plot used to demonstrate changes at lower concentrations. THT main VOC detected.
2003 TVOCs were actually below detection limits and 1 ug/L was used for graphing purposes



# APPENDIX D
# EAST PLANT NATURAL ATTENUATION MONITORING

PARSONS

# APPENDIX D – EAST PLANT NATURAL ATTENUATION MONITORING

# FOR CHEMOURS NIAGARA PLANT NIAGARA FALLS, NY

# TABLE OF CONTENTS



## TABLES

# 1.0 NATURAL ATTENUATION

Biodegradation of hydrocarbons, particularly chlorinated solvents or "chlorocarbon" compounds, has been well documented in theory and practice. Natural attenuation (including intrinsic bioremediation) has been recognized by both scientists and regulatory agencies as a cost-effective method to control and mitigate subsurface contaminants in soil and groundwater. The three lines of evidence used to determine whether natural attenuation (or intrinsic bioremediation) is occurring (Weidermeier, et.al., 1996), are as follows:

- Chlorocarbon loss at field scale downgradient of the source
- Geochemical indicators of attenuation, and
- Microbial indicators of attenuation

In 2000 an initial study was conducted using the three lines of evidence approach discussed above with groundwater data from the East Plant bedrock north and east of well cluster 24. The objective of this analysis was to define the presence and extent of natural attenuation of chlorocarbon compounds in the bedrock water-bearing fracture zones. Based on this analysis, the data indicated that natural attenuation (including intrinsic bioremediation) of the chlorinated solvent plume was occurring at the site.

In 2004, a five-year review of the MNA processes demonstrated these were still active at the East Plant. Groundwater results for the 2008 and 2013 sampling events were used to provide an update on the MNA processes in the East Plant bedrock.

## 1.1 Natural Attenuation Background

The science and research regarding natural attenuation has been long established, to the extent that Monitored Natural Attenuation has been a recognized remedial technology for decades. Chlorocarbon biodegradation may occur via several microbial pathways including mineralization, cometabolism, or microbial reductive dehalogenation (dehalorespiration). The higher chlorocarbons (i.e., PCE) are degraded primarily via sequential anaerobic (i.e., no oxygen) reduction. During this anaerobic process, chlorinated solvents serve as electron acceptors where chloride atoms are sequentially replaced with hydrogen, eventually forming a totally non-chlorinated end product. Other organic substrates, such as indigenous or man-made hydrocarbon materials (TOC), and hydrogen serve as the electron donors required to fuel the degradation (Gossett and Zinder, 1996). An example of this microbial process is the sequential dechlorination of PCE through TCE, cDCE, and VC, to the final dehalogenated end product ethene under anerobic conditions.

Under aerobic conditions the lower chlorinated species (i.e., TCE, DCE, and VC) may be cometabolized (oxygenated) in the presence of a hydrocarbon such as methane, propane, toluene, ethene, or ethane or may be directly oxidized (DCE and VC only) to carbon dioxide and chloride ion (Davis, 1990; RTDF, 1996).

## 1.2 B-Zone Bedrock Biodegradation Analysis

Groundwater data from the 2023 monitoring event were analyzed using the lines of evidence approach to demonstrate continued MNA within the B-Zone. Indicators of intrinsic bioremediation and natural attenuation along the bedrock zone flow paths include loss of cVOC mass, the presence of biogenic daughter products (TCE, cDCE, VC, and ethene), elevated chloride ion, and geochemical conditions conducive to intrinsic biodegradation such as low redox potential (Eh), elevated dissolved iron, and methane.

### Demonstrated Chlorocarbon Mass Loss

Total VOC data from the East Plant wells in the B-Zone are shown on Table C-1. TVOC concentrations are primarily composed of PCE, TCE and their degradation products in the western portions of the East Plant (wells 12B, 23B and 24B) and tetrahydrothiophene in the eastern and northwestern portions of the East Plant (wells 8B, 25B, 29B and 30B). The B-Zone wells demonstrate generally declining concentrations with time, with the exception of 24B. Well 24B has concentrations of cVOCs ranging above 100,000 µg/L. In contrast, the TVOC concentrations downgradient from 24B at well 12B has continued to decrease significantly since 2000, dropping 76% percent. Concentrations at 12B increased from 2018 to 2023, but the overall, the cVOC trend is still decreasing. TVOC concentrations downgradient from 24B at well 29B increased from 2013 to 2018, but remained stable from 2018 to 2023. However, at 29B concentrations remain low, dropping 90 percent. Analysis of the total chlorocarbon millimolar concentrations in wells 24B, 12B, and 29B indicated that the total molar mass decreases along the flow path and in time:

| | 24B | 12B | 29B |
|---|---|---|---|
| 2000 millimoles cVOC | 3.2 | 0.4 | 0.02 |
| 2004 millimoles cVOC | 0.33 | 0.32 | 0.01 |
| 2008 millimoles cVOC | 2.96 | 0.068 | 0.0025 |
| 2013 millimoles cVOC | 3.47 | 0.054 | 0.0012 |
| 2018 millimoles cVOC | 0.078 | 0.016 | 0.0017 |
| 2023 millimoles cVOC | 1.85 | 0.095 | 0.0017 |

Previous MNA analyses observed stable or declining tetrahydrothiophene (THT) trends in the east side of the east plant. In 2023, 30B showed an order of magnitude decrease in THT, but both 8B and 25B had an order of magnitude increase in THT concentration. Well 8B concentrations have been increasing since 2013, from 4,900 µg/L to 39,000 µg/L. Although THT decreased in 25B from 2013 to 2018, overall the concentration trend is increasing from 2008 to 2023, from 31 µg/L to 2,700 µg/L. From 2008 to 2018 concentrations of tetrahydrothiophene in 30B remained variable, but decreased an order of magnitude in 2023. Farther to the east, TVOC in well 23B increased slightly from 6 µg/L to 44 µg/L in 2018, but decreased in 2023 to below the detection limit.

### Organic Geochemical Indicators

Total volatile chlorocarbon spatial data and specific chlorocarbon isomer data at East Plant locations provide evidence that attenuation and biological degradation mechanisms are present in the investigation area. In the eastern region of the B-Zone bedrock, loss of cVOC mass along the flowpath is dramatically demonstrated by the near complete degradation of PCE and TCE from the high concentration area at 24B and downgradient along the flowpath to 12B and 29B. DCE and VC concentrations also decrease in mass with distance from the high concentration area. Evidence of sequential reductive dechlorination and degradation by-products along the flowpath is provided by the observed measurements of TCE, DCE, VC, and ethene/ethane at all three monitoring points. The molar ratios of biogenic daughter products to PCE in 2023 were calculated (or ratio to TCE, cisDCE, or VC if parent compounds were below detectable levels), and the ratios were compared to the analysis completed in 2000, 2004, 2008, 2013, and 2018. In well 12B, the ratios indicate increasing proportions of daughter products over time compared to the parent compound PCE. In well 24B, the ratios indicate significant proportions of daughter product TCE compared to the parent compound PCE, although the ratios of other daughter products (cDCE, VC, and ethene) are smaller here compared to the downgradient locations. In 29B, the ratios indicate significant proportions of daughter products VC and ethene compared to cDCE, with a ratio of 25.9 millimoles of ethene to 1 millimole of cDCE, representing significant full dechlorination to the end product. Elevated chloride concentrations above backgrounds concentrations at all three monitoring points also provide further evidence for PCE dehalogenation in this fracture zone. These data indicate that the plume is actively bioattenuating and is significantly decreasing in the downgradient direction as shown below.

| | PCE | TCE | CDCE | VC | Ethene |
|---|---|---|---|---|---|
| **24B** | | | | | |
| 2000 Ratio to PCE | 1 | 6.5 | 2.9 | 1.5 | 0.1 |
| 2004 Ratio to PCE | 1 | 1.2 | 23.4 | 4.1 | 0.8 |
| 2008 Ratio to PCE | 1 | 5.2 | 1.4 | 0.5 | 0.06 |
| 2013 Ratio to PCE | 1 | 3.6 | 0.9 | 0.1 | 0.005 |
| 2018 Ratio to cDCE | Bdl | Bdl | 1 | 0.15 | 0.18 |
| 2023 Ratio to PCE | 1 | 2.9 | 1.1 | 0.37 | 0.036 |
| **12B** | | | | | |
| 2000 Ratio to PCE | 1 | 1.9 | 0.5 | 0.1 | 0.01 |
| 2004 Ratio to PCE | 1 | 2.3 | 0.6 | Bdl | 0.1 |
| 2008 Ratio to PCE | 1 | 1.1 | 0.9 | 0.3 | 0.7 |
| 2013 Ratio to PCE | 1 | 1.1 | 0.6 | 0.3 | 0.8 |
| 2018 Ratio to PCE | 1 | 1.83 | 0.77 | 0.34 | 2.31 |
| 2023 Ratio to PCE | 1 | 2.9 | 1.3 | 0.40 | 1.7 |
| **29B** | | | | | |
| 2000 Ratio to PCE | 1 | 15.3 | 7.3 | 0.9 | 0.2 |
| 2004 Ratio to TCE | Bdl | 1 | 9.4 | 2.2 | 0.2 |
| 2008 Ratio to VC | Bdl | Bdl | Bdl | 1 | Bdl |
| 2013 Ratio to PCE | Bdl | Bdl | Bdl | Bdl | Bdl |
| 2018 Ratio to VC | Bdl | Bdl | Bdl | 1 | 8.39 |
| 2023 Ratio to cDCE | Bdl | Bdl | 1 | 2.9 | 25.9 |

Note: Bdl = Below detection limit

Ethene and ethane sampling were conducted to assess the extent of PCE/TCE reductive dechlorination due to biodegradation. Ethene (the terminal endpoint for reductive dechlorination) can be converted to ethane by some methanogenic microorganisms, therefore the combined measurement of ethene + ethane is sometimes a better measurement of the extent of PCE/TCE bioattenuation. The 2023 sampling results detected ethene and ethane concentrations in all B-Zone wells evaluated for MNA containing elevated cVOCs, suggesting that reductive dechlorination is proceeding to the terminal endpoint.

### Inorganic Geochemical Indicators

Additional groundwater parameters used to monitor geochemical trends are summarized on Table C-1. Reduction-oxidation potential (redox) and the terminal electron acceptors, nitrate, iron, and sulfate are typically measured during bioattenuation investigations to evaluate which microbial metabolic processes (i.e. sulfate reduction, nitrate reduction, etc.) may be occurring within the flow fractures. Redox measurements that are below zero (negative) indicate reducing / anaerobic conditions which are consistent with iron reducing and sulfate reducing environments. It should be noted that redox measurements are highly sensitive to measurement technique, and any small, entrained air bubbles would dramatically impact the measured redox potential. These results are consistent with the past bioattenuation analyses, supporting favorable conditions for reductive dechlorination of PCE and TCE throughout the majority of the B-Zone.

Nitrate concentrations measured in 2023 were all below detection limit. Reductive dechlorination of chlorinated ethenes is uncommon under nitrate reducing conditions, therefore, the absence of nitrate does not impact the evaluation for reductive dechlorination. Dissolved ferrous iron concentrations remain elevated in some locations, ranging from 0.56 mg/L to 1 mg/L in the impacted plume regions. Ferrous iron concentrations are below detectable levels at wells 12B, 23B and 29B in the downgradient regions of the fracture zone. The measured concentrations suggest that iron and sulfate reduction is occurring, indicating a reducing environment. The highest measured iron concentrations are coincident with the plume source area near 12B. It is possible that the dissolved iron concentrations in the downgradient plume areas are impacted by formation of iron sulfide precipitates due to sulfate reduction. The 2023 data are consistent with the 2000, 2004, 2008, 2013, and 2018 analyses, indicating there is sufficient iron to serve as an alternative electron acceptor to foster anaerobic microbial dechlorination activity (Lovely, et. al., 1994). Additionally, all wells included in the MNA analysis have high concentrations of sulfate, ranging from 61 to 3900 mg/L. This concentrations indicate that there are favorable sulfate reducing conditions. Furthermore the creation of iron sulfides in a sulfate reducing area can create the appropriate biogeochemical conditions to degrade CVOCs in pathways other than sequential microbial dechlorination (AFCEE, 2008). Additionally, oxidation reduction potential (ORP) indicated highly reducing conditions ranging from -157 to-360 in wells 8B, 12B, 24B, 25B, 29B, and 30B. Only 23B had a positive ORP, indicating oxidating conditions.

Methane levels were detected throughout the B-Zone groundwater at concentrations ranging from 200 µg/l to 1,600 µg/l. Slightly elevated levels are found throughout the study area indicating somewhat methanogenic conditions are apparent, although methane was below the detection limit in well 23B. Microbial dechlorination of aqueous phase chlorocarbons can be favored under both sulfate reducing and methanogenic aquifer conditions.

TOC is a measure of the total organic carbon that may be available to microbes as a carbon source. TOC concentrations measured during the 2023 sampling event ranged from 1.1 mg/L at 23B to 26 mg/L at 24B. The source of this TOC is believed to be anthropogenic in nature, being derived from past plant operations at the site. TOC is elevated in the source area near well 24B and decreases in the downgradient direction, although TOC is also elevated near 8B, with a concentration of 23 mg/L. This indicates that organic carbon substrate is found in areas coincident with elevated chlorocarbon levels and is likely being consumed by microorganisms while during the process of reductive dechlorination.

Specific conductivity, pH, and temperature are routinely measured to determine the representativeness of groundwater samples and to provide gross evaluations of aquifer homogeneity. The specific conductivity ranged from 2.64 to 46800 μS/cm, pH of the 2023 groundwater samples ranged from 7.2 to 12.3 SU, and the temperature ranged from 12.71° C to 18.4° C. These ranges in values are favorable for growth of most microbiological communities.

## 1.3 C/CD-Zone Bedrock Biodegradation Analysis

Groundwater data from the 2023 monitoring event were analyzed using the lines of evidence approach to demonstrate continued MNA within the C/CD-Zone. Indicators of intrinsic bioremediation include the presence of biogenic daughter products (TCE, cDCE, VC, and ethene), chloride ion, and geochemical conditions conducive to intrinsic biodegradation such as low redox potential (Eh), elevated dissolved iron, and methane.

### Demonstrated Chlorocarbon Mass Loss

Total VOC data from the East Plant wells in the C/CD-Zone are shown on Table C-2. TVOC concentrations at well locations, 25C/CD, 18C, and 17B (C well although names indicates otherwise) are primarily composed of tetrahydrothiophene; whereas, TVOC at well 12C/CD is primarily PCE biodegradation products, and well 23C contains similar amounts of both types of contamination. Well 7CR is mostly uncontaminated, with only low levels of vinyl chloride, tetrahydrothiophene, and 1,4-dichlorobutane.

Concentrations at 25C/CD, 18C, and 17B all have demonstrated slight decreases over the long term, but are generally within historical range. Well 12C/CD has decreased from the year 2000. Wells 7C/CR and 23C have shown significant decrease since the early 1990s.

### Organic Geochemical Indicators

The molar ratios of biogenic daughter products to PCE from 2023 were compared to the analysis completed in 2000, 2003, 2008, 2013 and 2018. The ratios remain slightly elevated relative to the parent PCE compound and have decreased since the earlier analysis in 2003. Additionally, the daughter product concentrations of cDCE and Ethene are present, which provides continued evidence of reductive dechlorination. In particular, elevated chloride concentrations above backgrounds concentrations continue to be observed at well 12C/CD, indicating significant dechlorination activity.

| MW 12C/CD | PCE | TCE | CDCE | VC | Ethene |
|---|---|---|---|---|---|
| 2000 Ratio to PCE | 1 | 3.9 | 1.9 | 1.0 | 0.15 |
| 2003 Ratio to PCE | 1 | 8.3 | 29.4 | 1.2 | 0.8 |
| 2008 Ratio to PCE | 1 | 2.2 | 0.86 | 0.2 | 0.1 |
| 2013 Ratio to PCE | 1 | 2.3 | 1.8 | 0.1 | 0.1 |
| 2018 Ratio to PCE | 1 | Bdl | 2.78 | Bdl | 0.25 |
| 2023 Ratio to PCE | 1 | 1.4 | 0.54 | Bdl | 0.09 |

Note: Bdl = Below detection limit

The 2023 sampling results detected ethene and ethane concentrations throughout the C/CD-Zone where cVOCs are elevated, suggesting that reductive dechlorination is proceeding to the terminal endpoint. Ethene is generally enriched in the presence of elevated chlorocarbon compounds and occurs at 460 μg/l in the vicinity of well 12C/CD, which also contains biogenic daughter products of PCE biodegradation, particularly TCE, cDCE and ethene. Ethene is a light gas for which there is no groundwater standard, is rapidly metabolized by indigenous microbes in the ambient subsurface environment and does not tend to accumulate.

### Inorganic Geochemical Indicators

Additional groundwater parameters used to monitor geochemical trends are summarized on Table C-2. Wells 7CR, 12C/CD, 17B, and 18C had negative redox measurements which support favorable conditions for reductive dichlorination. Other locations had slightly aerobic conditions.

Nitrate concentrations measured in 2023 are all below the detection limit, consistent with the previous years. Dissolved ferrous iron concentrations remain elevated in the PCE plume area, at 0.57 mg/L 25C/CD, respectively. Ferrous iron concentrations are below detectable levels at wells 7CR, 12C/CD, 17B, and 18C. These measured concentrations suggest that iron reduction may be occurring. Sulfate concentrations are high in all of the C wells, ranging from 370 mg/L to 2,300 mg/L. This is likely the result of sulfate reduction in this area of the east plant.

Methane levels were detected at concentrations ranging from 11 μg/L to 1,500 μg/L throughout the east plant C/CD-Zone indicating that methanogenic conditions are occurring. Microbial dechlorination of aqueous phase chlorocarbons can be favored under both sulfate reducing and methanogenic conditions.

TOC concentrations measured during the 2023 sampling event ranged from 1.3 mg/L (17B & 7CR) to 19 mg/L (18C).

Specific conductivity, pH, and temperature are routinely measured to determine the representativeness of groundwater samples and to provide gross evaluations of aquifer homogeneity. The pH of the 2023 groundwater samples ranged from 6.91 to 7.51, which is favorable for growth of most microbiological communities. Note that the pH probe broke during sampling at 23C and 25C/CD, and pH measurements were unable to be collected at these locations. The temperature of the 2023 groundwater samples ranged from 12.4° C to 14.9° C. These ranges in values are favorable for growth of most microbiological communities.

## 1.4 D-Zone Bedrock Biodegradation Analysis

Groundwater data from the 2023 monitoring event were analyzed using the lines of evidence approach to demonstrate continued MNA within the D-Zone, in a similar fashion as above.

### Demonstrated Chlorocarbon Mass Loss

Total VOC data from the East Plant wells in the D-Zone are shown on Table C-3. Most wells show TVOC trends that have generally been declining or stable since 2000, with slight TVOC increases in 2023 in well 10D. Consistent with the 2004, 2008, 2013, and 2018 observations, well 23D, a peripheral D-Zone well, indicated no detectable TVOCs in 2023. This well decreased to low concentrations during the early-1990's from as high as approximately 220 μg/L and has remained low since the mid-1990s. PCE is below detectable levels in wells 10D, 18D, 23D, and 25D, while TCE is below detectable levels in all wells except 10D and 18D (17,000 μg/L and 4.5 μg/L, respectively, in 2023). TVOC in well 10D and 18D is composed of TCE and daughter products cDCE, and VC. TVOC in well 25D is composed of mainly cDCE and VC, with a little THT.

### Organic Geochemical Indicators

In the eastern region of the D-Zone, loss of cVOC mass is very dramatically demonstrated by the complete degradation of PCE throughout the bedrock fracture zone. While well 10D still contains the highest level of cVOCs, in 2023, the TVOC mass is in the form of the daughter products and not PCE.

The molar ratios of the PCE biogenic daughter products were calculated relative to TCE concentrations, because current PCE levels were below detectable levels, and CDCE, as a comparison to the 2008, 2013, and 2018 ratios to CDCE. The ratios were compared to the analyses completed in 2000, 2004, 2008, 2013, and 2018. The ratios of ethene to TCE and cDCE are low, but the ratio of cDCE to TCE and VC to TCE are high. The change in ratio calculation from comparison to PCE in 2000, TCE in 2004, then CDCE in 2008 and 2013 were caused by the decreases in primary coupled PCE and TCE, substantiating the observation that natural attenuation is occurring. While an increase in TCE is seen in 2018 and 2023, high ratios of CDCE by comparison indicate that the plume is actively bioattenuating and is removing significant PCE and TCE mass in the D-Zone bedrock.

| MW 10D | PCE | TCE | CDCE | VC | Ethene |
|---|---|---|---|---|---|
| 2000 Ratio to PCE | 1 | 26.8 | 5.9 | 2.2 | 3.3 |
| 2004 Ratio to TCE | ~ | 1 | 59.5 | 2.8 | 1.2 |
| 2004 Ratio to CDCE | ~ | ~ | 1 | 0.05 | 0.02 |
| 2008 Ratio to CDCE | ~ | ~ | 1 | 0.1 | 0.03 |
| 2013 Ratio to CDCE | ~ | ~ | 1 | 0.4 | 0.01 |
| 2018 Ratio to TCE | ~ | 1 | 3.35 | 0.24 | 0.01 |
| 2018 Ratio to CDCE | ~ | ~ | 1 | 0.07 | 0.03 |
| 2023 Ratio to TCE | ~ | 1 | 7.7 | 1.7 | 0.01 |
| 2023 Ratio to CDCE | ~ | ~ | 1 | .22 | 0.001 |

Ethene and ethane are present in the study area and are generally enriched in the presence of elevated chlorocarbon compounds, although concentrations in 2023 dropped an order of magnitude. Ethene occurs at 33 μg/l in the vicinity of well 10D, which also shows all of the biogenic daughter products of PCE biodegradation. Ethene is also present at 33 μg/l in well 25D. Ethene is rapidly metabolized by indigenous microbes in the ambient subsurface environment, which explains lower levels of ethene, relative to the concentrations of the chlorinated ethenes. The persistence of ethene and ethane demonstrate the continued microbial dechlorination activity caused by MNA.

### Inorganic Geochemical Indicators

Additional groundwater parameters used to monitor geochemical trends are summarized on Table C-3.

Redox measurements for wells 10D, 18D, 23D, and 25D are -311 mV, -134 mV, -146, and -276 mV (respectively). This indicates that the conditions are strongly anaerobic. This indicates stronger reducing conditions relative to 2018 where conditions in some wells were slightly aerobic. This indicates that the geochemical conditions are suitable for sustaining microbial reductive dechlorination.

Nitrate concentrations measured in 2023 remained below detection (less than 0.5 mg/L), and ferrous iron concentrations measured in 2023 were mostly below detection limits of 0.2 mg/L to 3.3 mg/L in 10D. Depletion of these ions indicated groundwater is in a state of sulfate reduction, which is an anaerobic state. Due to high naturally occurring sulfate, depletion of sulfate in the D zone has not occurred. It is possible that the depleted dissolved iron concentrations in the region may have formed iron sulfide precipitates due to the sulfate reduction in the fracture zone. The formation of iron sulfates may cause a higher rate of degradation through biogeochemical processes.

Methane detections ranged from a high of 1000 µg/l in well 10D to below the detection limit of 1 µg/l in well 18D and 23D farther to the northeast. Under such conditions, microbial dechlorination of aqueous phase chlorocarbons is favored.

Specific conductivity, pH, and temperature are routinely measured to determine the representativeness of groundwater samples and to provide gross evaluations of aquifer homogeneity. The pH of the 2023 groundwater samples ranged from 6.60 to 9.10, the temperature ranged from 12.3° C to 17.8° C. TOC concentrations measured during the 2023 sampling event ranged from below detection in 23D to 1.9 mg/L in 10D.

In general the 2023 data are consistent with the previous analyses, indicating geochemical conditions compatible with anaerobic microbial dechlorination activity, especially in the higher concentration areas onsite, such as 10D. As expected, where the concentrations of CVOCs are low the MNA is less robust.

## 1.5 F-Zone Bedrock Biodegradation Analysis

Groundwater data from the 2023 annual monitoring events were analyzed using the lines of evidence approach to demonstrate continued MNA within the F-Zone bedrock, as was above.

### Demonstrated Chlorocarbon Mass Loss

As with the other bedrock zones, several key wells in the F-Zone (7FR, 10F, 17F, 23F, and 25F) display reduced TVOC levels compared to historical values. The TVOC levels in these wells remained consistent with the values seen in previous years.

### Organic Geochemical Indicators

Total VOC data from the East Plant wells in the F-Zone is shown in Table C-4. At locations 10F, 17F and 25F the TVOC concentrations have remained somewhat elevated (1,642 µg/L, 20,750 µg/L, and 1,660 µg/L, respectively, in 2023). Although TVOC concentrations have remained somewhat elevated, in 10F and 25F, all of the mass is in the form of daughter products, and there is accumulation of ethene in these locations, indicating that microbial reductive dechlorination is occurring.

Well 17F contains the highest concentrations of TVOCs, primarily chlorobenzenes and benzene (total aromatics: 20,190 µg/L), but also includes VC (560 µg/l). The chlorobenzenes can be dechlorinated through reductive dechlorination, resulting in accumulation of benzene, which can degrade anaerobically under sulfate reducing conditions, although not as quickly as under aerobic conditions. The data in well 17F show accumulation of both ethane and benzene dechlorination end-products.

At well 10F, detections of VOCs included PCE daughter-products cDCE (42 µg/L) and VC (1,600 µg/L). At well 23F, detections of VOCs included tetrahydrothiophene (130 µg/L in 2023), benzene (5.1 µg/L), and PCE daughter-products cDCE (8.5 µg/L), tDCE (6.6 µg/L), and VC (27 µg/L). TVOC concentrations at well 25F were PCE degradation products cDCE and VC (260 and 1400 µg/L, respectively). At well 7FR, low levels of VOCs were detected, in the form of tetrahydrothiophene (45 µg/L), benzene (1.5 µg/L), and PCE daughter-products cDCE (6.8 µg/L), tDCE (8.6 µg/L), and VC (42 µg/L).

Elevated chloride concentrations above background concentrations continue to be observed within the F-Zone wells. These data are consistent with results reported in previous years and provides further indication that the microbial dechlorination of aqueous phase chlorocarbons is favored and occurring in the F-Zone near wells 7FR, 10F, 17F, 23F and 25F.

Ethene and ethane are present at high levels in the study area and is generally enriched in the presence of elevated chlorocarbon compounds. Ethene occurs at 510 µg/l in the vicinity of well 17F, which also shows the biogenic daughter products of cDCE and VC. Ethane is also present throughout the study area, ranging from 240 µg/L in 7FR to 510 µg/L in 17F in 2023. Throughout the F-zone, there are low levels of cVOCs, with most of the PCE mostly converted to end-product ethene or the smallest chlorinated daughter product, VC. In several locations, there are more millimoles of ethene than there are of PCE and it's DPs, including 17F (18 mM ethene, 8.9 mM of VC), 23F (10 mM ethene, 0.09mM cDCE and 0.43 mM VC), and 7FR (8.5 mM ethene, and 0.07 mM cDCE and 0.67 mM VC). The presence of ethene at such levels indicates sustained microbial dechlorination activity.

### Inorganic Geochemical Indicators

Redox measurements for F-Zone wells ranged from -385 to -214 mV, indicating strongly reducing conditions. 25F had anomalous field parameters, as the probe could not be properly calibrated due to a damaged pH probe, and will not be considered for this evaluation. Redox measurements are highly sensitive to measurement technique, and any small, entrained air bubbles would dramatically impact the measured redox potential.

Nitrate concentrations measured in 2023 were non-detect. Dissolved ferrous iron concentrations were below detection limits of 0.2 mg/L in all wells. All wells have elevated sulfate concentrations, ranging from 1,300 mg/L to 1,600 mg/L. These levels are strong indicators of active anaerobic activity and highly reducing conditions. The presence of sulfate suggests that sulfate reduction is occurring. It is possible that the dissolved iron concentrations in the region near wells 7FR and 10F are being impacted by formation of iron sulfide precipitates due to the sulfate reduction in the fracture zone. Elevated methane (760 – 1,200 µg/L) concentrations were detected in all F-Zone wells. The 2023 data are consistent with the previous analyses, indicating geochemical conditions compatible with anaerobic microbial dechlorination activity.

Specific conductivity, pH, and temperature are routinely measured to determine the representativeness of groundwater samples and to provide gross evaluations of aquifer homogeneity. As mentioned above, 25F will not be considered for this analysis due to issues with the probe noted at time of sampling. The pH of the 2023 groundwater samples ranged from 7.37 to 9.08, and the temperature ranged from 11.1° C to 16.3° C. The values suggest favorable conditions for growth of most microbiological communities. TOC concentrations ranged from non-detect at 10F and 7FR to 3.7 mg/L at 25F.

## 1.6 Microbial Evidence for Intrinsic Bioattenuation

The original 2000 natural attenuation analysis used genetic identification (16S rRNA genetic probes) of microbial communities in the East Plant groundwater monitoring wells to confirm the presence of *Dehalococcoides* family microbes in key site wells. This microbe has been shown in the literature to reductively dehalogenate PCE and other related chlorinated solvents to ethene. Positive results were found in numerous wells, including wells 24B and 8B, 17CR and 18C, 18D, and 17F indicating the presence of the dehalogenating microbes within the fractured bedrock groundwater flow regime. Results of the sampling were presented in the 2000 Annual Report (DuPont, 2000). Repeating these tests during the 2008, 2013, 2018, and 2023 MNA review was not required to further establish microbial evidence for intrinsic bioremediation in the various bedrock zones beneath the East Plant area.

# 2.0 MNA CONCLUSIONS

The original 2000 evaluation provided strong evidence that natural attenuation and intrinsic bioremediation were occurring in the subsurface and are a primary mechanism for removal of chlorocarbon mass in the East Plant bedrock. Data was collected annually from 2001 through 2004 to monitor the progress of the MNA processes in the East Plant bedrock and to confirm continued intrinsic bioremediation of the chlorocarbon plume areas. Consistent with EPA guidance, a five-year review of the data was completed following collection of the 2004 annual data. This review confirmed that MNA processes, including intrinsic bioremediation of the chlorocarbons, is still actively removing plume mass from the fractured bedrock system. This 2023 report serves as a fifth five-year review of the MNA process.

TVOC and cVOC concentrations for most B through F-Zone bedrock wells in the East Plant area have displayed stable to decreasing concentration trends in most wells since long term groundwater monitoring was initiated in 1992 following GWRS start-up. Loss of cVOC mass is very dramatically demonstrated by the significant degradation of PCE and TCE from wells 8B, 25B, 29B, 30B, 7CR, 17B, 18C, 23C, 25C/CD, 23D, 25D, 18D, 7FR, 10F, 17F, 23F, and 25F during the 2023 monitoring period compared to earlier years (2000 and 2004). Near complete attenuation of TVOCs at well clusters 23 and 7 at the eastern plume boundary indicate the plumes have further decreased over time. The presence of biogenic daughter products (TCE, cDCE, VC, ethene) and geochemical conditions indicate natural attenuation processes are degrading the PCE constituents throughout all the bedrock zones. This is confirmed by molar ratios of TCE, cDCE, VC, and ethene to PCE which show enrichment of these compounds relative to the parent PCE concentrations, indicating active biodegradation.

Finally, 16S rRNA genetic identification of in-situ microorganisms conducted during the original 2000 analysis confirmed the presence of the dehalogenating *Dehalococcoides* family microbes in key East Plant area wells. Results from these analyses provide biological evidence for intrinsic bioremediation within the East Plant bedrock fracture zones. This microbe has been shown in the literature to reductively dehalogenate PCE and other related chlorinated solvents.

Evidence complied during the past five years of the natural attenuation 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 is shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic bioremediation in the various fracture zones.

### 2.1.1 Recommendations

Data from 2000 through 2023 continue to indicate that intrinsic bioremediation and natural attenuation of chlorocarbon constituents in the East Plant area are actively maintaining either stable or shrinking groundwater plumes. As there are no groundwater users in Niagara Falls located between the Plant and the presumed discharge point for any plume (Falls Street Tunnel/NYPA conduit drain) it is recommended that continued monitoring of natural attenuation in East Plant bedrock is appropriate.

The frequency of the monitoring for specific MNA parameters (inorganic parameters, dissolved gases, TOC, alkalinity) may remain at once every 5 years concurrent with a detailed evaluation of the data to verify conditions have not changed.  VOC data and field parameters would still be collected annually to monitor plume distribution and VOC attenuation.

# TABLES

Table C-1
B-Zone Natural Attenuation Evaluation Data
Chemours Niagara

| Analyte | | MW-12B 10/02/2023 | MW-23B 09/20/2023 | MW-24B 09/27/2023 | MW-25B 9/20/2023 | MW-29B 09/15/2023 | MW-30B 09/15/2023 | MW-8B 9/14/2023 |
|---|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | | |
| COLOR | NONE | clear | clear | clear | clear | clear | clear | none |
| ODOR | NONE | none | none | none | strong | weak | weak | strong |
| OXIDATION REDUCTION POTENTIAL | MV | -243 | 156 | -157 | -316 | -193.0 | -331 | -360 |
| PH | STD UNITS | 7.65 | -- | 7.2 | 12.3 | 8.03 | 10.2 | 7.65 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 46800 | 386 | 20600 | 1010 | 4540 | 595 | 2.64 |
| TEMPERATURE | DEGREES C | 16.0 | 12.71 | 18.4 | 14.4 | 16.9 | 14.9 | 15.7 |
| TURBIDITY QUANTITATIVE | NTU | 4.9 | 16.6 | 20.3 | 2.2 | 3.2 | 11.10 | 6.3 |
| **Volatile Organics** | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| 1,1,2,2-TETRACHLOROETHANE | UG/L | <250 | <1 | 5600 | <2 UJ | <1 | <10 | <1000 |
| 1,1,2-TRICHLOROETHANE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| 1,1-DICHLOROETHANE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| 1,1-DICHLOROETHENE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| 1,2-DICHLOROBENZENE | UG/L | <250 | <1 | <5000 | 17 J | 12 | 22 | <1000 |
| 1,4-DICHLOROBENZENE | UG/L | <250 | <1 | <5000 | 40 J | 73 | 53 | <1000 |
| 1,4-DICHLOROBUTANE | UG/L | <250 | <1 | <5000 | 440 | <4 | 580 | 19000 |
| BENZENE | UG/L | <250 | <1 | <5000 | 5.3 J | <1 | <10 | <1000 |
| CARBON TETRACHLORIDE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| CHLOROBENZENE | UG/L | <250 | <1 | <5000 | 29 J | 110 | 86 | <1000 |
| CHLOROFORM | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| CIS-1,2 DICHLOROETHENE | UG/L | 2200 | 14 | 35000 | <2 UJ | 1 | <10 | <1000 |
| METHYL CHLORIDE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| METHYLENE CHLORIDE | UG/L | <1300 | <5 | <25000 | <10 UJ | <5 | <50 | <5000 |
| TETRACHLOROETHYLENE | UG/L | 2800 | <1 | 57000 | <2 UJ | <1 | <10 | <1000 |
| TETRAHYDROTHIOPHENE | UG/L | <500 | <2 | <10000 | 2700 | 8.3 | 5400 | 39000 |
| TOLUENE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | <1000 |
| TRANS-1,2-DICHLOROETHENE | UG/L | <250 | <1 | <5000 | <2 UJ | <1 | <10 | 2000 |
| TRICHLOROETHENE | UG/L | 6400 | 2.8 | 130000 | <2 UJ | <1 | <10 | <1000 |
| VINYL CHLORIDE | UG/L | 420 | <1 | 7900 | <2 UJ | 1.9 | <10 | 1600 |
| **Inorganics / other** | | | | | | | | |
| ALKALINITY, TOTAL | MG/L | 210 | 120 | 320 | -- | 320 | 160 | 140 |
| BARIUM, DISSOLVED | MG/L | -- | -- | -- | -- | -- | -- | -- |
| TOTAL ORGANIC CARBON | MG/L | 2.5 | 1.1 | 26 | -- | 4 | 5 | 23 |
| CHLORIDE | MG/L | 22000 | 25 | 7400 | -- | 970 | 48 | 380 |
| CYANIDE | MG/L | 0.21 | <0.01 | 1.5 | 0.17 | 0.019 | 1.8 | 1 |
| IRON, DISSOLVED | MG/L | <0.2 | <0.2 | 1 | -- | <0.2 | 0.56 | 0.6 |
| NITRATE | MG/L | <10 | <0.1 | <1 | -- | <0.5 R | <0.5 R | <1 |
| SULFATE | MG/L | 3900 | 61 | 660 | -- | 560 | 140 | 520 |
| SULFIDE | MG/L | <1 | <1 | <1 | -- | <1 | 4.6 | 22 |
| **Gases** | | | | | | | | |
| ETHANE | UG/L | 3.5 | <1 | 9.1 | -- | <1 | 8 | 56 |
| ETHENE | UG/L | 800 | <1 | 1400 | -- | 7.5 | <1 | 1200 |
| METHANE | UG/L | 410 | <1 | 560 | -- | 200 | 320 | 1600 |
| PROPANE | UG/L | <1 | <1 | 1.3 | -- | <1 | <1 | 4.3 |

< and ND = Non detect at stated reporting limit

Table C-2
C/CD-Zone Natural Attenuation Evaluation Data
DuPont Niagara

| Analyte | | MW-12C/CD 10/02/2023 | MW-17B 09/14/2023 | MW-18C 09/13/2023 | MW-23C 09/20/2023 | MW-25C/CD 09/20/2023 | MW-7CR 09/27/2023 |
|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | |
| COLOR | NONE | clear | yellow | clear | clear | yellow | clear |
| ODOR | NONE | none | weak | slight | none | mild | none |
| OXIDATION REDUCTION POTENTIAL | MV | -122 | -210 | -283 | 57 | 206 | -171 |
| PH | STD UNITS | 7.28 | 7.48 | 6.91 | -- | 0.00 | 7.51 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 3160 | 942 | 1860 | 1500 | 6150 | 2150 |
| TEMPERATURE | DEGREES C | 14.1 | 13.2 | 12.4 | 12.72 | 13.8 | 14.9 |
| TURBIDITY QUANTITATIVE | NTU | 15.3 | 23.2 | 5.1 | 8.07 | 110.0 | 29.8 |
| **Volatile Organics** | | | | | | | |
| 1,1,1-TRICHLOROETHANE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,1,2,2-TETRACHLOROETHANE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,1,2-TRICHLOROETHANE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,1-DICHLOROETHANE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,1-DICHLOROETHENE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,2-DICHLOROBENZENE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| 1,4-DICHLOROBENZENE | UG/L | <2000 | 1.9 | 430 | <1 | <10 | <1 |
| 1,4-DICHLOROBUTANE | UG/L | <2000 | <1 | 4300 | 13 | <10 | 110 |
| BENZENE | UG/L | <2000 | <1 | <400 | 32 | 39 | <1 |
| CARBON TETRACHLORIDE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| CHLOROBENZENE | UG/L | <2000 | 6.1 | 710 | 3.3 | 13 | 1.1 |
| CHLOROFORM | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| CIS-1,2 DICHLOROETHENE | UG/L | 9500 | 1.2 | <400 | 11 | 71 | 1.7 |
| METHYL CHLORIDE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| METHYLENE CHLORIDE | UG/L | <10000 | <5 | <2000 | <5 | <50 | <5 |
| TETRACHLOROETHYLENE | UG/L | 30000 | <1 | <400 | <1 | <10 | <1 |
| TETRAHYDROTHIOPHENE | UG/L | <4000 | 35 | 58000 | 44 | 160 | 730 |
| TOLUENE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| TRANS-1,2-DICHLOROETHENE | UG/L | <2000 | <1 | <400 | <1 | <10 | <1 |
| TRICHLOROETHENE | UG/L | 33000 | <1 | <400 | <1 | <10 | <1 |
| VINYL CHLORIDE | UG/L | <2000 | <1 | <400 | 55 | 94 | 15 |
| **Inorganics / other** | | | | | | | |
| ALKALINITY, TOTAL | MG/L | 160 | <5 | 300 | -- | 480 | 80 |
| BARIUM, DISSOLVED | MG/L | -- | -- | -- | -- | -- | -- |
| TOTAL ORGANIC CARBON | MG/L | 2 | 1.3 | 19 | -- | 2.4 | 1.3 |
| CHLORIDE | MG/L | 740 | 74 | 280 | -- | 830 | 58 |
| CYANIDE | MG/L | 0.11 | 0.096 | 5.2 | -- | <0.01 | 0.012 |
| IRON, DISSOLVED | MG/L | <0.2 | <0.2 | -- | -- | 0.57 | <0.2 |
| NITRATE | MG/L | <1 | <0.5 | <1 | -- | <0.5 | <1 |
| SULFATE | MG/L | 750 | 370 | 410 | -- | 2300 | 1200 |
| SULFIDE | MG/L | <1 | 1.3 | 22 | -- | 1.7 | <1 |
| **Gases** | | 0 | 0 | 0 | 0 | 0 | 0 |
| ETHANE | UG/L | 18 | 2.6 | 53 | -- | 5.6 | 6.1 |
| ETHENE | UG/L | 460 | <1 | 870 | -- | 25 | 7.9 |
| METHANE | UG/L | 1500 | 210 | 1300 | -- | 1000 | 130 |
| PROPANE | UG/L | <1 | <1 | 2.1 | -- | <1 | 3 |

< and ND = Non detect at stated reporting limit

Table C-3
D-Zone Natural Attenuation Evaluation Data
DuPont Niagara

| Analyte | | MW-10D 10/02/2023 | MW-18D 09/13/2023 | MW-23D 09/20/2023 | MW-25D 09/20/2023 |
|---|---|---|---|---|---|
| **Field Parameters** | | | | | |
| COLOR | NONE | clear | clear | yel-clear | clear |
| DISSOLVED OXYGEN | MG/L | 0 | 0 | 0 | 0 |
| ODOR | NONE | mild | none | mild | none |
| OXIDATION REDUCTION POTENTIAL | MV | -311 | -134 | -146 | -276 |
| PH | STD UNITS | 6.60 | 6.99 | 8.27 | 9.10 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 5290 | 440 | 278 | 1420 |
| TEMPERATURE | DEGREES C | 17.8 | 12.3 | 13.22 | 13.5 |
| TURBIDITY QUANTITATIVE | NTU | 24.9 | 24.8 | 60.5 | 18.7 |
| **Volatile Organics** | | | | | |
| 1,1,1-TRICHLOROETHANE | UG/L | <4000 | <4 | <1 | <40 |
| 1,1,2,2-TETRACHLOROETHANE | UG/L | 5600 | <4 | <1 | <40 |
| 1,1,2-TRICHLOROETHANE | UG/L | <4000 | <4 | <1 | <40 |
| 1,1-DICHLOROETHANE | UG/L | <4000 | <4 | <1 | <40 |
| 1,1-DICHLOROETHENE | UG/L | <4000 | <4 | <1 | <40 |
| 1,2-DICHLOROBENZENE | UG/L | <4000 | <4 | <1 | <40 |
| 1,4-DICHLOROBENZENE | UG/L | <4000 | <4 | <1 | <40 |
| 1,4-DICHLOROBUTANE | UG/L | <4000 | <10 | <1 | <40 |
| BENZENE | UG/L | <4000 | <4 | <1 | <40 |
| CARBON TETRACHLORIDE | UG/L | <4000 | <4 | <1 | <40 |
| CHLOROBENZENE | UG/L | <4000 | <4 | <1 | <40 |
| CHLOROFORM | UG/L | <4000 | <4 | <1 | <40 |
| CIS-1,2 DICHLOROETHENE | UG/L | 97000 | 300 | <1 | 1300 |
| METHYL CHLORIDE | UG/L | <4000 | <4 | <1 | <40 |
| METHYLENE CHLORIDE | UG/L | <20000 | <20 | <5 | <200 |
| TETRACHLOROETHYLENE | UG/L | <4000 | <4 | <1 | <40 |
| TETRAHYDROTHIOPHENE | UG/L | <8000 | <20 | <2 | 85 |
| TOLUENE | UG/L | <4000 | <4 | <1 | <40 |
| TRANS-1,2-DICHLOROETHENE | UG/L | <4000 | <4 | <1 | <40 |
| TRICHLOROETHENE | UG/L | 17000 | 4.5 | <1 | <40 |
| VINYL CHLORIDE | UG/L | 14000 | 53 | <1 | 710 |
| **Inorganics / other** | | | | | |
| ALKALINITY, TOTAL | MG/L | 260 | 120 | 110 | 20 |
| BARIUM, DISSOLVED | MG/L | -- | -- | -- | -- |
| TOTAL ORGANIC CARBON | MG/L | 1.9 | 1.1 | <1 | 1.5 |
| CHLORIDE | MG/L | 1000 | 23 | 16 | 1700 |
| CYANIDE | MG/L | 0.014 | <0.01 | <0.01 | <0.01 |
| IRON, DISSOLVED | MG/L | 3.3 | <0.2 | <0.2 | <0.2 |
| NITRATE | MG/L | <2 | <0.1 | <0.1 | <0.1 |
| SULFATE | MG/L | 1800 | 130 | 37 | 870 |
| SULFIDE | MG/L | 8.9 | <1 | <1 | <1 |
| **Gases** | | 0 | 0 | 0 | 0 |
| ETHANE | UG/L | 22 | <1 | <1 | 10 |
| ETHENE | UG/L | 33 | 2.9 | <1 | 33 |
| METHANE | UG/L | 1000 | 89 | 8.1 | 65 |
| PROPANE | UG/L | 1 | <1 | <1 | 3.7 |

< and ND = Non detect at stated reporting limit

Table C-4
F-Zone Natural Attenuation Evaluation Data
DuPont Niagara

| Analyte | Sample ID / Date | MW-10F | MW-17F | MW-23F | MW-25F | MW-7FR |
|---|---|---|---|---|---|---|
| | | 10/03/2023 | 13-Sep-23 | 09/13/2023 | 09/20/2023 | 09/27/2023 |
| **Field Parameters** | | | | | | |
| COLOR | NONE | clear | clear-gray | brw-clear | yel-clear | clear |
| DISSOLVED OXYGEN | MG/L | 0 | 0 | 0 | 0 | 0 |
| ODOR | NONE | mild | weak | weak | strong | slight |
| OXIDATION REDUCTION POTENTIAL | MV | -385 | -214 | -246 | 67 | -375 |
| PH | STD UNITS | 7.94 | 7.37 | 9.08 | 2.03 | 7.43 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 6 | 4.28 | 3770 | 4290 | 4600 |
| TEMPERATURE | DEGREES C | 14.0 | 11.1 | 12.9 | 16.3 | 11.6 |
| TURBIDITY QUANTITATIVE | NTU | 5.3 | 49.6 | 93.7 | 17.4 | 6.4 |
| **Volatile Organics** | | | | | | |
| 1,1,1-TRICHLOROETHANE | UG/L | <40 | <400 | <4 | <40 | <1 |
| 1,1,2,2-TETRACHLOROETHANE | UG/L | <40 | <400 | <4 | <40 | <1 |
| 1,1,2-TRICHLOROETHANE | UG/L | <40 | <400 | <4 | <40 | <1 |
| 1,1-DICHLOROETHANE | UG/L | <40 | <400 | <4 | <40 | <1 |
| 1,1-DICHLOROETHENE | UG/L | <40 | <400 | <4 | <40 | <1 |
| 1,2-DICHLOROBENZENE | UG/L | <40 | 8400 | <4 | <40 | <1 |
| 1,4-DICHLOROBENZENE | UG/L | <40 | 3600 | <4 | <40 | <1 |
| 1,4-DICHLOROBUTANE | UG/L | <40 | <400 | <4 | <40 | <1 |
| BENZENE | UG/L | <40 | 790 | 5.1 | <40 | 1.5 |
| CARBON TETRACHLORIDE | UG/L | <40 | <400 | <4 | <40 | <1 |
| CHLOROBENZENE | UG/L | <40 | 7400 | <4 | <40 | <1 |
| CHLOROFORM | UG/L | <40 | <400 | <4 | <40 | <1 |
| CIS-1,2 DICHLOROETHENE | UG/L | 42 | <400 | 8.5 | 260 | 6.8 |
| METHYL CHLORIDE | UG/L | <40 | <400 | <4 | <40 | <1 |
| METHYLENE CHLORIDE | UG/L | <200 | <2000 | <20 | <200 | <5 |
| TETRACHLOROETHYLENE | UG/L | <40 | <400 | <4 | <40 | <1 |
| TETRAHYDROTHIOPHENE | UG/L | <80 | <800 | 130 | <80 | 76 |
| TOLUENE | UG/L | <40 | <400 | <4 | <40 | <1 |
| TRANS-1,2-DICHLOROETHENE | UG/L | <40 | <400 | 6.6 | <40 | 8.6 |
| TRICHLOROETHENE | UG/L | <40 | <400 | <4 | <40 | <2 |
| VINYL CHLORIDE | UG/L | 1600 | 560 | 27 | 1400 | 42 |
| **Inorganics / other** | | | | | | |
| ALKALINITY, TOTAL | MG/L | 160 | 84 | 12 | 14 | 180 |
| BARIUM, DISSOLVED | MG/L | -- | -- | -- | -- | -- |
| TOTAL ORGANIC CARBON | MG/L | <1 | 2 | 1.5 | 3.7 | <1 |
| CHLORIDE | MG/L | 1100 | 760 | 740 | 860 | 730 |
| CYANIDE | MG/L | 0.012 | <0.01 | <0.01 | <0.01 | <0.01 |
| IRON, DISSOLVED | MG/L | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| NITRATE | MG/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| SULFATE | MG/L | 1400 | 1500 | 1300 | 1300 | 1600 |
| SULFIDE | MG/L | 27 | 6.3 | 3.1 | 9.3 | 24 |
| **Gases** | | 0 | 0 | 0 | 0 | 0 |
| ETHANE | UG/L | 18 | 37 | 47 | 37 | 29 |
| ETHENE | UG/L | 450 | 510 | 280 | 340 | 240 |
| METHANE | UG/L | 1200 | 760 | 1100 | 800 | 960 |
| PROPANE | UG/L | <1 | <1 | 2.4 | 6.6 | <1 |

< and ND = Non detect at stated reporting limit

# APPENDIX E
# QUARTERLY SILICONE OIL REMEDIATION TABLES

PARSONS

# TABLE 1
## Silicone Oil Recovery Summary - 1Q2023
## 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 | | | 2174.0 |
| 01/09/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.0 |
| 01/17/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.0 |
| 01/23/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.0 |
| 01/30/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,174.5 |
| 02/08/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.5 |
| 02/13/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.5 |
| 02/21/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,174.5 |
| 02/27/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,175.0 |
| 03/07/23 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,176.5 |
| 03/13/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,176.5 |
| 02/20/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,176.5 |
| 03/27/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,176.5 |
| **1Q23 Totals** | **0.0** | **0.0** | **64.0** | **0.0** | **2.5** | **2,176.5** |

| | | |
|---|---|---|
| **TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999:** | **2,240.5** | **GALLONS** |
| **comments**: | None | |

**TABLE 2**
**Silicone Oil Recovery Summary - 2Q2023**
**Niagara Plant**
**Niagara Falls, NY**

| DATE | PW-20 | | | PW-24 | | |
|---|---|---|---|---|---|---|
| | PRODUCT THICKNESS (FT) | AMOUNT RECOVERED (GALLONS) | CUMULATIVE TOTAL (GALLONS) | PRODUCT THICKNESS (FT) | AMOUNT RECOVERED (GALLONS) | CUMULATIVE TOTAL (GALLONS) |
| | | | 64.0 | | | 2176.5 |
| 04/03/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,177.0 |
| 04/10/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,177.5 |
| 04/18/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,177.5 |
| 04/25/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,178.0 |
| 05/01/23 | 0.0 | 0.0 | 64.0 | 0.0 | 1.0 | 2,179.0 |
| 05/08/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,179.5 |
| 05/15/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,180.0 |
| 05/22/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,180.5 |
| 05/30/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,181.0 |
| 06/05/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,181.5 |
| 06/12/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,182.0 |
| 06/19/23 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,183.5 |
| 06/26/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,183.5 |
| | | | | | | 2,183.5 |
| **2Q23 Totals** | **0.0** | **0.0** | **64.0** | **0.0** | **7.0** | **2,183.5** |

**TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999:** **2,247.5** **GALLONS**

**comments**:

# TABLE 3
## Silicone Oil Recovery Summary - 3Q2023
## 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** | | | **2183.5** |
| **07/03/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2183.5** |
| **07/10/23** | 0.0 | 0.0 | **64.0** | 0.0 | 1.0 | **2184.5** |
| **07/17/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2184.5** |
| **07/24/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.5 | **2185.0** |
| **07/31/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.5 | **2185.5** |
| **08/07/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2185.5** |
| **08/14/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2185.5** |
| **08/24/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.5 | **2186.0** |
| **08/31/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2186.0** |
| **09/05/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2186.0** |
| **09/11/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.5 | **2186.5** |
| **09/18/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2186.5** |
| **09/25/23** | 0.0 | 0.0 | **64.0** | 0.0 | 0.0 | **2186.5** |
| **3Q23 Totals** | **0.0** | **0.0** | **64.0** | **0.0** | **3.0** | **2,186.5** |

**TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999: 2,250.5 GALLONS**

**comments**:

**TABLE 4**
**Silicone Oil Recovery Summary - 4Q2023**
**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 | | | 2186.5 |
| 10/06/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,186.5 |
| 10/09/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,186.5 |
| 10/16/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,186.5 |
| 10/23/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,187.0 |
| 10/31/23 | 0.0 | 0.0 | 84.0 | 0.0 | 0.0 | 2,187.0 |
| 11/06/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,187.5 |
| 11/13/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,187.5 |
| 11/20/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,187.5 |
| 11/27/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,187.5 |
| 12/04/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,187.5 |
| 12/12/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.5 | 2,188.0 |
| 12/18/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,188.0 |
| 12/26/23 | 0.0 | 0.0 | 64.0 | 0.0 | 0.0 | 2,188.0 |
| **4Q23 Totals** | **0.0** | **0.0** | **64.0** | **0.0** | **1.5** | **2,188.0** |

**TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999: 2,252.0 GALLONS**

**comments**: NONE