The Chemours Company
Buffalo Avenue & 26th Street
Building 35 – 4th Floor
Niagara Falls, NY 14302

(716) 278-5100t
chemours.com

March 30, 2017

Ms. Gloria Sosa
Western New York Remediation Section
New York Remediation Branch
Emergency and Remediation Response Division
U.S. EPA – Region II
290 Broadway, 20th Floor
New York, NY 10007-1866

Dear Ms. Sosa:

NECCO PARK 2016 ANNUAL REPORT

Enclosed are two copies of the *Remedial Action Post-Construction Monitoring 2016 Annual Report* for the Chemours Necco Park Hydraulic Controls System (HCS), Groundwater Treatment Facility (GWTF), and landfill cap.

This twelfth annual report for the Necco Park Remedy has been prepared pursuant to Administrative Order (AO) Index No. II CERCLA-98-0215 dated September 28, 1998, issued by United States Environmental Protection Agency (USEPA). This report describes hydraulic and chemistry monitoring conducted in 2016 as required by the *Long-Term Groundwater Monitoring Plan*, dated April 2005 for the DuPont Necco Park Site located in Niagara Falls, New York, and subsequent revisions (2010 and 2012).

Construction and start-up of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (O&M Plan). HCS system operation uptime for 2016 was 83.4%. Excluding scheduled downtime for planned maintenance, HCS uptime for 2016 was 96.3%. The groundwater elevations, geochemical results, and DNAPL monitoring indicate HCS continues to be effective at controlling source area groundwater at the Chemours Necco Park site.

Please call me at (716) 278-5496 if you have any questions or comments regarding this submittal.

Sincerely,

Chemours

Paul F. Mazierski
Project Director

Enc. 2016 Annual Report

cc: M. Hinton/NYSDEC
E. Felter/Parsons

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PARSONS

Remedial Action Post-Construction Monitoring
2016 Annual Report
NECCO Park
Niagara Falls, New York

Prepared for:

THE CHEMOURS FC LLC
CORPORATE REMEDIATION GROUP

Buffalo Avenue and 26th Street
Niagara Falls, NY 14302

Prepared by:

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

March 2017

Chemours PN 507637
Parsons PN 449124

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ACRONYMS

Acronym	Definition / Description
AOA	Analysis of Alternatives
BFBT	Blast-fractured bedrock trench
cis-DCE	cis-1,2-dichloroethene
CMMP	Cap Maintenance and Monitoring Plan
CRG	DuPont Corporate Remediation Group
CVOC	Chlorinated Volatile Organic Compounds
DDR	Data deliverable review
DNAPL	Dense non-aqueous phase liquid
DuPont	E. I. du Pont de Nemours and Company
gpm	Gallon(s) per minute
GWTF	Groundwater Treatment Facility
HCBD	Hexachlorobutadiene
HCS	Hydraulic controls system
HDPE	High-density polyethylene
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LTGMP	Long-Term Groundwater Monitoring Plan
MDL	Method detection limit
µg/l	Micrograms per liter
MNA	Monitored natural attenuation
MS	Matrix spike
MSD	Matrix spike duplicate
Necco Park	Chemours Necco Park Site
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and maintenance
PDI	Pre-design investigation
POTW	Publicly-owned treatment works
PQL	Practical quantitation limit
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance and Project Plan
RPD	Relative percent difference
SAMP	Sampling, Analysis, and Monitoring Plan
SAR	Source area report
SFR	Subsurface formation repair
SIU	Significant Industrial User
SOW	(Necco Park) Statement of Work
SVOC	Semi-volatile organic compound

Acronym	Definition / Description
TCE	Trichloroethene
TIC	Tentatively identified compound
TVOC	Total volatile organic compound
USEPA	United States Environmental Protection Agency
VC	Vinyl chloride
VOC	Volatile organic compound

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EXECUTIVE SUMMARY

This Remedial Action Post-Construction Monitoring 2016 Annual Report has been prepared pursuant to Administrative Order Index No. II-CERCLA-98-0215 issued by United States Environmental Protection Agency (USEPA) on September 28, 1998. This is the twelfth such report and describes hydraulic and chemistry monitoring conducted in 2016 at the Necco Park Site in Niagara Falls, New York. Monitoring activities were conducted in accordance with the agency approved Long-Term Groundwater Monitoring Plan (LTGMP) dated April 2005 (DuPont Corporate Remediation Group [CRG] 2005a), and subsequent agency approved revisions (USEPA, 2011, 2015, and 2016).

The Necco Park Remedial Action consists of an upgraded cap over the landfill and a groundwater hydraulic control system (HCS). The HCS includes a network of five groundwater recovery wells and a groundwater treatment facility (GWTF). Construction and startup of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (DuPont CRG 2005b). HCS system operation uptime for 2016 was 83.4%. Excluding scheduled downtime for planned maintenance, HCS uptime for 2016 was 96.3%. Summaries of system operations and hydraulic head data were previously provided to the USEPA and the New York State Department of Environmental Conservation in the 2016 Quarterly Data Packages (Parsons 2016a, 2016b, 2016c, and 2017). This Annual Report provides a detailed evaluation of system effectiveness with respect to the performance standards presented in the Necco Park Statement of Work.

Hydraulic monitoring data from 2016 show that, overall, the HCS has maintained hydraulic control of the source area in the A- through F-Zones. Improved hydraulic control in the upper bedrock in the western portion of the site began in fourth quarter 2008 when a combined blast-fractured bedrock trench and a new B/C-Zone recovery well (RW-11) were put into operation. Well RW-11 was installed to replace recovery well RW-10 which exhibited diminished hydraulic efficiency after startup in 2005.

Two rehabilitation events were completed in BC recovery wells during 2016 using high pressure jetting and vacuum technique developed with National Vacuum, Inc. during 2012-2013. The spring event (April 21- 23) and the Fall event (October 13 – 17) had a typical modest removal of sediments and maintenance of flow rate. The flow at RW-5 remains at an increased rate (approximately 3 – 6 gpm) from the Fall 2015 cleaning demonstrating that the significant improvement on well yield has been maintained.

In accordance with the LTGMP (DuPont CRG 2005a), annual groundwater sampling began in 2008 after three years of biannual sampling had been conducted. In 2010, a revised sampling program was accepted by USEPA to focus on key locations on an annual basis and intermittently (every 5 years) sample the original 2005 program. In 2012, USEPA agreed removal of AT wells from the program, sampling VOCs only in the treatment process, and other minor program changes (such as the elimination of drawdown maps annual reports). In 2015, USEPA approved to reductions in the DNAPL monitoring program. In 2016, the USEPA approved a request by Chemours CRG to end the requirement of 10% independent data validation of the groundwater data while QA/QC continues to included in-house data review. The original LTGMP and MNA programs were last completed in 2013 and are scheduled to be completed next in 2018, on the five year schedule.

In 2016, the refined LTGMP sampling program was conducted. The 2016 groundwater sampling results continue to show an overall decrease in concentrations of total volatile organic compounds (TVOCs) for all flow zones compared to historical results. The 2016 results indicate:

- Three of the four A-Zone wells sampled were below 3 micrograms per liter and the other well (137A), was 138.5 micrograms per liter.
- TVOC concentrations at key source area limit wells in the B and C zones, such as 137B,150B, 172B and 145C continue to have stable/decreased concentrations and/or declining trends.
- Decreasing or stable TVOC concentrations are apparent in the D/E/F zones at key source area limit wells such as 136F, 146E, and 146F. Two of the three of the F-zone wells sampled in 2016 resulted in the lowest TVOC concentration observed at the well locations.
- Overall, the TVOC concentrations are decreasing for all groundwater flow zones at the outer portions of the source area and in the downgradient far-field. In the few cases where there were increasing TVOC trends, the concentrations were within historical range or near the source area and/or near a recovery well.

DNAPL was monitored every month throughout 2016. As approved by the USEPA, a reduced list of wells was monitored monthly and semi-annually beginning in June 2015 with the full list of wells to be monitored once every two years (USEPA June 11, 2015 and USEPA August 12, 2015). No DNAPL was observed in any of the wells throughout 2016 and therefore, no DNAPL was removed. A total of 8,818 gallons of DNAPL has been removed since initiation of the recovery program in 1989.

The 2016 groundwater elevations, geochemical results and DNAPL monitoring indicate the HCS continues to be effective at controlling source area groundwater at the Chemours Necco Park site through 2016. Groundwater potentiometric contour maps depict a capture zone encompassing the source area in the B-, C-, D-, E- and F-Zones, and vertical gradient downward from the A to the B zone were maintained. Overall, the TVOC concentrations were decreasing for all groundwater flow zones in the source area and far-field. It is recommended that the long-term monitoring program continue in its current form, including the revisions from approved by the USEPA in 2011 and 2016.

Data on chlorinated ethenes in Necco Park is consistent with lines of evidence required for natural attenuation of contaminants (USEPA, Monitored Natural Attenuation Directive, 1999). Analytical results from 2016, such as concentrations of degradation products and geochemical conditions, continue to support the recommendation that MNA assessments be conducted every five years. The next MNA monitoring event is scheduled for 2018 and another full MNA analysis will be completed then.

1.0 INTRODUCTION

1.1 Site Location

The 24-acre Chemours Necco Park inactive industrial waste disposal site is located approximately 1.5 miles north of the Niagara River in a predominantly industrial area of Niagara Falls, New York (Figure 1-1).

1.2 Source Area Remedial Action Documentation and Reporting

The approved remedy for the Necco Park Site included construction of the Bedrock and Overburden Source Area Hydraulic Controls System (HCS) and the Landfill Cap Upgrade. Completion of the remedy and compliance with the performance standards described in the Statement of Work (SOW) are documented in the Remedial Action Report (DuPont Corporate Remediation Group [CRG] 2007). This 2016 Annual Report presents hydraulic and chemical monitoring results from the twelfth year of operation of the hydraulic controls. In addition, this 2016 Annual Report includes historical groundwater chemistry results for assessment of groundwater quality trends.

2.0 HCS OPERATIONS SUMMARY

The Necco Park groundwater Operations and Maintenance (O&M) Plan (DuPont CRG 2005b), in conjunction with vendor O&M Manuals, describes normal operation and shutdown procedures, emergency shutdown procedures, alarm conditions, trouble-shooting, and preventative maintenance procedures for the HCS and the Groundwater Treatment Facility (GWTF). This section of the report summarizes 2016 HCS operations.

2.1 Operational Summary

Operational information for the HCS is provided in the 2016 Quarterly Data Packages (Parsons 2016a, 2016b, 2016c, and 2017) and summarized in the table below.

Period	HCS Uptime (%)	HCS Uptime [excluding scheduled maintenance downtime] (%)	Groundwater Treated (Gallons)	DNAPL[1] Removed (Gallons)
1Q16	97.5	97.5	3,440,875	0
2Q16	74.4	97.1	3,723,706	0
3Q16	71.2	90.4	2,471,085	0
4Q16	90.5	100.0	3,086,585	0
2016 Total	**83.4**	**96.3**	**12,722,251**	**0**

[1] DNAPL – dense non-aqueous phase liquid

A summary of monthly groundwater quantities and uptime for each recovery well is provided in Table 2-1.

The HCS remained operational throughout 2016, averaging 83.4% total system uptime through December 31, 2016 with one significant scheduled maintenance outage described below. Excluding scheduled downtime for planned maintenance, HCS uptime for 2016 was 96.3% GWTF downtime was minimized by continuously monitoring operating conditions and implementing mechanical and procedural changes to the process equipment and the Honeywell Experion® PKS[1] (Process Knowledge System) process control system.

There was one significant reportable scheduled maintenance activity in 2016. Between June 15 and July 20 all pumping wells and the treatment system were shut down for inspection and internal coating repairs of process tanks. This included: treating water in all tanks to empty them, water-pressure cleaning the tanks, inspecting/testing, and recoating certain sections with Belzona™ epoxy coating. This work was completed under warranty of the coatings installed within the process tanks in 2015. Future visual inspections will be conducted annually, while formal mechanical tank integrity inspection and testing will continue on a 5-year schedule.

On six occasions in 2016, individual wells were down for greater than 48 hours. Four of the shutdowns were unscheduled and two were scheduled. The unscheduled well shutdowns included the shutdown of RW-5 from May 20 through 23 for 63 hours due to a restricted pump intake and impeller failure and the shutdown of RW-5 on three occasions due to buildup of solids on the pump impellers (August 13 through 15 for 49 hours, September 3 through 6 for 51 hours, and September 21 through 26 for 112 hours). The two scheduled well shutdowns included all of the recovery wells for the internal process tank coating inspection and repairs completed between June 15 through July 20 as mentioned above, as well as wells RW-4 (65 hours), RW-5 (173 hours), and RW-11 (166 hours) to complete well cleaning and maintenance between April 18 and 25. The following table summarizes HCS reportable downtime in 2016 by component malfunction and scheduled maintenance:

Reason	Contributing Downtime %	Comments
Process component malfunction	3.1%	Unexpected process-related downtime as a result of alarms and interlocks.
Scheduled maintenance shutdowns and system upgrades/inspections	11.7%	Routine inspections, interlock verification, preventative maintenance, equipment inspection and mechanical upgrades to process-related infrastructure.

HCS downtime is considered reportable when any recovery well is not operating for a period of more than 48 consecutive hours (DuPont letter to USEPA, January 27, 2012).

2.2 GWTF Process Sampling

In accordance with the Sampling, Analysis and Monitoring Plan (SAMP), quarterly process sampling is conducted to assess the effectiveness of the treatment system in removing volatile organic compounds (VOCs) from groundwater. Two influent samples are collected, one from the B/C-Zone influent tank and one from the D/E/F-Zone influent tank. One effluent sample is collected from the combined effluent tank. Beginning in 2012 and as approved by USEPA, these process samples are analyzed for VOCs only. Semi-volatile organic compound (SVOC) monitoring will be conducted as needed if significant changes occur to the hydraulic or chemical load observed during routine process monitoring or if there is a change in an operations condition (e.g. change in pump intake elevation). A summary of results for the process sampling conducted in 2016 is provided in Table 2-2.

2.3 Sewer Sampling Summary

A Significant Industrial User (SIU) permit with the City of Niagara Falls publicly-owned treatment works (POTW) regulates the treated groundwater effluent discharged from Necco Park. Results from the quarterly sampling conducted at the permitted discharge point (MS#1) are used to determine POTW compliance There were no exceedences of the permit limits in 2016.

2.4 Recovery Well Rehabilitations and Maintenance

Two well rehabilitation events were completed in 2016 and included BC wells RW-4, RW-5, and RW-11. The techniques include vacuum extraction and pressure water jetting developed with National Vacuum, Inc. This technique allows for safer removal of the sediments, improved pressure control, and allows larger quantities of water to be withdrawn at a high pumping rate (i.e. over-pumping). The technique has been refined and improved since implementation in 2012 and now includes higher pressure and lower volume. The spring event (April 21- 23) and the Fall event (October 13 – 17) had a typical modest removal of sediments and maintenance of flow rate. The flow at RW-5 remains at an increased rate (approximately 3 – 6 gpm) from the Fall 2015 cleaning demonstrating that the significant improvement on well yield has been maintained. This improvement resulted in increased mass removal and groundwater capture.

Well painting, labeling and protective casing repairs were performed in 2016 as part of continual site monitoring well maintenance. Three concrete pads around wells were replaced or repaired, 29 well casings were painted and/or re-labeled, one well casing was repaired, and a lock was replaced.

3.0 HCS PERFORMANCE

3.1 Hydraulic Head Monitoring

Potentiometric surface maps based on water level elevations are the primary evidence of groundwater control. Supporting lines of evidence are well hydrographs and groundwater chemistry changes. Sections 3.1 and 3.2 discuss the results of hydraulic head monitoring and the associated potentiometric maps and hydrographs. Section 3.3 discuses the groundwater chemistry.

Groundwater hydraulic head measurements are used to evaluate control of groundwater in the overburden and bedrock groundwater flow zones by the HCS at Necco Park. Monitoring and recovery well locations are shown in Figure 3-1. Depth-to-water measurements and measuring point elevation data are used to calculate the elevation of groundwater and to generate hydrographs that show groundwater elevation trends in individual monitoring wells (Table 3-1). Hydrographs and potentiometric surface-contour maps included in this report (Figures 3-8 and 3-10 through 3-14) were selected from maps prepared and presented in the 2016 Quarterly Data Packages.

3.2 Hydraulic Control Assessment

Assessment of hydraulic control is described for each relevant bedrock zone in the following sections.

3.2.1 A-Zone

The overburden materials comprising the A-Zone are generally characterized by high clay content and low hydraulic conductivity. Groundwater flow in the A-Zone is primarily downward to the more transmissive fractured bedrock, as expected in this low permeability formation.

The hydrographs in Figure 3-2 demonstrate the long-term drawdown from groundwater extraction in context of the seasonal variability. Decreases in water elevations are due to the combined effect of the impermeable landfill cap and continuous downgradient groundwater extraction from the recovery wells. The decreasing hydrographs represent long-term drawdown in an unconfined low-permeability unit and storage depletion. The water content of the unit continued to decrease by reductions in infiltration from the cap and groundwater recovery in the underlining water bearing unit (B Zone). While there are fluctuations in the hydrographs, the overall trend is a clear decrease in the water elevations compared to pre-startup. In a few cases, there is an increasing trend from the originally large drawdown observed, however, these remain well below static conditions (approximately 2 -3 feet).

Figures 3-8 and 3-9 present A-Zone potentiometric surface contours and vertical gradient maps. The potentiometric map demonstrated that the groundwater flow was toward the capture systems. The cones of depression surrounding recovery wells RW-5 and RW-11 are significant, ranging from 3 to 4 feet of closed contours in the A-Zone (Figure 3-8). The 2016 water levels in the area of RW-11 suggest the well rehabilitations have helped sustain a large cone of depression around this location in the A-Zone.

Vertical gradients were downward (negative) between the A/B-Zones as presented in Table 3-2 (2016 average gradients) and shown in Figure 3-9 (November 8, 2016 gradients). These gradients demonstrate that the predominate flow potential is downward; therefore the horizontal flow (i.e. to the south) is insignificant.

3.2.2 B and C Bedrock Water-Bearing Zones

Groundwater flow directions in the B-Zone and C-Zone were consistent throughout 2016 (Figure 3-10). Hydraulic controls in the B-Zone and C-Zone were maintained throughout 2016, which is attributable to high recovery well up time and well pumping rates. Additionally, long-term monitoring demonstrates the continuation of capture zone improvements in the area of RW-11. The improvements were the result of installation and maintenance of the BFBT and the hybrid recovery well RW-11. Increases in yield at RW-5 during the Fall of 2015 have been maintained as well as the increased capture zone.

B-Zone

Groundwater elevation hydrographs, along with potentiometric surface contour maps, illustrate the hydraulic effects of the HCS in the B-Zone. RW-4, RW-5 and RW-11 have induced inward (toward the recovery wells) hydraulic gradients over a large area (Figures 3-3 and 3-10), capturing site groundwater in the source area. Figure 3-3 is a plot of well hydrographs from B-Zone wells in the area near and surrounding RW-11. This plot demonstrates the improved effectiveness of capturing groundwater from installation of the BFBT and RW-11.

Primary evidence of groundwater control is observed in the potentiometric contour map provided in Figure 3-10. The contour map demonstrates large cones of depression established for each of the recovery wells. As mentioned in the well rehabilitation section above, after the Fall 2015 rehabilitation at RW-5 created significant improvements in flow and mass removal.

C-Zone

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the hydraulic effects of the HCS in the C-Zone (Figures 3-4 and 3-11). The C-Zone influence attributed to RW-4, RW-5, and RW-11 extends north to wells 115C, 123C, and 159C, and west to 136C. The southern extent of influence extends to well 137C and is obscured by the CECOS Landfills between the recovery wells and monitoring wells 150C, 160C and 168C. Beginning in 2008, hydraulic control in the C-Zone was improved significantly with the rehabilitation of RW-5 and the start-up of RW-11. The annual rehabilitations of these recovery wells is a preventative action taken prior to well loss; therefore, the effect is relatively small in the short-term scale of one year.

After the Fall 2015 rehabilitation at RW-5, significant improvements in flow and mass removal were observed including with a wider cone of depression in the C-zone. This resulted in a less pronounced depression immediately surrounding RW-5 in the C-zone maps (compared with previous years), however, transient water levels reported in the 1Q16 data package (Parsons, 2016c) demonstrate significant drawdown was still occurring. Plots provided the data package demonstrated that at a set point of raging from 563 to 565 in RW-5 resulted in drawdown of greater than 5 feet in the recovery well. Similarly, at 162C (approximately 70 feet east of RW-5) greater than 4 feet of drawdown was observed. This verified the large drawdown in the C-Zone as noted in the past reports. The set point at RW-5 was varied in 2016 to optimize flow with maintenance (cleaning of the pump from high solid aggregation) and a resulting level of approximately 563.5 to 564.0 was determined as optimal, under current conditions.

3.2.3 D, E, and F Bedrock Water-Bearing Zones

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the effectiveness of the HCS in maintaining hydraulic control in the D-, E-, and F-Zones (Figures 3-5 through 3-7 and 3-12 through 3-14). The hydrographs clearly indicate the initial and sustained drawdown of groundwater elevation in the recovery wells and the surrounding monitoring wells. Potentiometric maps demonstrate the consistent cone of depression and that associated hydraulic gradients were toward the recovery wells throughout 2016, indicating the HCS is effectively controlling groundwater migration. This is further demonstrated in the spatial relationship of the source area depiction and the flow patterns depicted in Figures 3-12 through 3-14.

3.3 Groundwater Chemistry Monitoring

3.3.1 Background

Extensive monitoring has been conducted at Necco Park dating back to the early 1980s. Monitoring includes (but is not limited to) pre-design investigations, remedial investigations, geologic investigation, analysis of remedial alternatives, and source area investigations. Groundwater monitoring continues to meet the following objectives as defined in the SOW:

- Monitor reductions in aqueous chemistry in zone-specific source area wells as a consequence of the hydraulic control from recovery well pumping;
- Monitor the far-field groundwater chemistry to determine if the recovery system is controlling off-site migration of chemical constituents associated with the Necco Park site;
- Monitor for the presence of DNAPL;
- Monitor natural attenuation and intrinsic bioremediation in the source area and far-field; and
- Continue to evaluate the overall effectiveness of the remedial action.

The first annual status report following completion of hydraulic control elements of the Necco Park remedy (2005 Annual Report) included an extensive discussion of the first monitoring results and how these results compared to source area criteria introduced in the 1995 Analysis of Alternatives (AOA) report (DuPont Environmental Remediation Services 1995). This 2016 report provides an update of groundwater chemistry trends in relation to the long-term remedy for groundwater as well as an update of data relevant to the Source Area Criteria. The Source Area Criteria are provided in Table 3-3, with the 2016 results and comparison to criteria provided in Tables 3-4 and 3-5.

Monitoring completed in 2016 represents the ninth year of annual sampling. In accordance with the Long-Term Groundwater Monitoring Plan (LTGMP) (DuPont CRG 2005a), chemical monitoring was conducted on a semi-annual basis during the first three years of system operation. Sampling has been annual since the beginning of the fourth year of system operation, with modifications to the number of wells sampled. In 2010, DuPont proposed to reduce the number of wells monitored annually based on existing data showing either very low concentrations or concentrations decreasing over time. USEPA agreed to the changes in a letter dated July 16, 2010, but required that the full list of wells be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends. The full list of wells was last sampled during the 2013 annual sampling event, and the full well list is scheduled to be sampled next in 2018. The list of wells used for long-term monitoring is included in Table 3-6. Figure 3-1 provides a well location map.

3.3.2 Sample Collection and Analysis

The annual sampling event was completed between August 18 and August 25, 2016. TestAmerica of Amherst, New York, completed sampling with oversight by Parsons for Chemours. Samples and associated quality assurance/quality control (QA/QC) samples were analyzed by TestAmerica Laboratories located in North Canton, Ohio.

As described in the Necco Park SAMP, groundwater sampling was conducted using USEPA low-flow sampling methodology and air-driven bladder pumps equipped with disposable Teflon© bladders. The pumps were fitted with dedicated Teflon©-lined high-density polyethylene (HDPE) tubing.

Samples were collected at 26 monitoring well locations during the 2016 annual event. The well locations are listed in Table 3-6. Analytical indicator parameters are listed in Table 3-7. Analytical results for the sampling event conducted in 2016 are provided as Appendix A. For reporting purposes, the results are discussed as total VOCs (TVOCs). This is consistent with historic reporting where TVOCs are indicator compounds used to assess groundwater contamination and trends over time. Results for the respective flow zones are discussed below.

3.3.3 Source Areas Delineation

The 2016 groundwater sampling results have been compared to the same historically employed criterion to evaluate source area limits. Consistent with the AOA, any location where DNAPL was observed at least once was included in the source area. Groundwater chemistry data for the 2016 sampling event was also compared to solubility criteria to evaluate source area extent. Consistent with previous assessments, these included effective solubility for a given compound and one percent of a given compound's pure-phase solubility.

Calculated solubility criteria for DNAPL compounds evaluated during this study are presented in Table 3-3. A comparison of 2005 through 2016 data to the effective solubility and one percent of pure-phase solubility criteria are provided in Tables 3-4 and 3-5, respectively. Refinement of the monitoring program reduced the number of well comparisons from 2010 through 2012 in Table 3-4.

A discussion of the source area results by flow zone is provided below. It should be noted that some of the wells which are within the source area are sampled in the 5 year cycle and are not sampled annually.

A-Zone

The A-Zone source area has been defined as the Necco Park property and a limited area south of the property line. The A-Zone source limits have not changed from those provided with the 100% design submittal. The 2016 sample results indicate no exceedance of the solubility criteria. There has been only one exceedance of the solubility criteria since long term monitoring began: the 2005 first round results for well D-11 reported HCBD above the one percent solubility criteria.

Semi-annual DNAPL observations conducted at A-Zone well location 131A in 2016 indicated that no DNAPL was present. The most recent DNAPL observation at an A-Zone well was at well 131A in May 2006. This well is located on the landfill.

Groundwater flow in the A-Zone is predominantly downward to the B-Zone. Therefore, hydraulic control of the upper bedrock groundwater flow will capture flow from the A-Zone. As discussed in Section 3.3, the installation of the BFBT and recovery well RW-11 (November 2008) enhanced the degree of A-Zone hydraulic control. Based on the results of the 2016 source area criteria and DNAPL monitoring, the system is effective in controlling the A-Zone source area.

B/C-Zone

The B/C-Zone source limits have not changed from those provided with the 100% design submittal. The results indicated no exceedances of the effective solubility criteria. However, the refined sampling program reduced the frequency of some of the wells that typically exceed the criteria. One B well (171B) that did exceed the criteria in the past, was part of the sampling program in 2016. This well was below the effective solubility criteria or laboratory detection level in 2016.

Only one parameter at one well in the B/C-Zone exceeded the more conservative one percent criteria in 2016 (172B). At 172B hexachlorobutadiene concentration was 48 ug/L which is above the 20 µg/L criteria. Exceedances of the one percent solubility criteria at well location 172B for HCBD represent the spatial limit of the B-Zone source area. As discussed in Section 3.5, TVOC concentrations have significantly decreased since 2002 at location 172B. While well 136B had exceeded the one percent solubility criteria from 2012 to 2014, the concentrations in 2015 and 2016 results were below the criteria. Historic exceedance of the one percent solubility criteria at well location 136B for tetrachloroethene represents the western edge of the limit of the B-Zone source area. TVOC concentrations have been between 1,000 micrograms per liter (µg/l) and 3,000 µg/l since 2001.

The frequency of observed DNAPL in B/C-Zone wells has decreased over the course of the monitoring program. In 2016, no DNAPL was observed during monthly or semi-annual DNAPL monitoring.

Results of the source area criteria analysis and DNAPL monitoring suggests that operation of recovery wells RW-4, RW-5, and RW-11 has achieved and maintained control of the B/C-Zone.

D/E/F-Zone

None of the ten wells sampled in 2016 exceeded the effective solubility criteria in the D/E/F wells. Additionally, none of the ten wells exceeded the more conservative one percent pure-phase criteria. In 2015, only one well in the D/E/F-Zone exceeded the one percent pure-phase criteria (HCBD at 165E). 165E is within the limit of the D/E/F-Zone source area and had exceeded the one percent pure-phase criteria since 2007. HCBD was below the analytical detection limits in 2016 (<5.1 ug/L) at 165E.

Source zone criteria comparison analysis conducted during 2016 confirms that the operation of recovery wells RW-8 and RW-9 has achieved and maintained source control of the D/E/F-Zone.

3.4 Groundwater Chemistry Results and Trends

An analysis of 2016 chemistry results and trends has been completed to assess the effectiveness of the HCS and previous groundwater pumping system in reducing organic compound concentrations in groundwater. TVOC concentrations versus time plots for A-Zone overburden and B- through F-Zone bedrock monitoring wells are presented in Appendix B.

In general, operation of the HCS and the previous groundwater recovery system, combined with the presence of the landfill cap and Subsurface Formation Repair (SFR), have contributed to an overall trend of declining TVOC concentrations in the A-Zone overburden and bedrock fractures zones. More recently, TVOC concentration decreases at several near source area and far-field wells are significant and coincide strongly with the onset of HCS operations in April 2005, thereby demonstrating the effectiveness of containments and remediation of site groundwater. Natural attenuation processes are also contributing to the reduction in chemical mass in the bedrock fracture zones.

A-Zone Overburden

Results from the four LTGMP A-Zone wells indicate TVOC concentrations are all below 140 μg/l at these locations. Sampling results for well 137A (138.5 μg/l) represents the location of the highest reported A-Zone TVOCs. Other well locations were substantially lower: 145A (1.01 μg/L), 146AR (2.57 μg/L), and 150A (0.27 μg/L). The 2016 results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden.

Three of the four annual wells used to monitor the A-Zone (145A, 146AR, and 150A) exhibit near consistently low (<5 μg/l) TVOC concentrations with no true discernable trend. These three wells have been less than 5 μg/l since 2006 or earlier.

B-Zone

Results from the eight LTGMP B-Zone wells indicate TVOC concentrations were consistent with previous years with decreases in TVOC over time, thereby demonstrating effective groundwater capture by the recovery wells (Appendix B).

Source area limit wells 171B and 172B show a continued overall TVOC declining trend. Well 171B has decreased nearly 3 orders of magnitude since 2002 to 353 μg/l, while 172B has decreased two orders of magnitude to 2,097 μg/l during a similar timeframe. Additionally, the concentrations suggest that there is an active natural attenuation component to the VOCs, as biogenic degradation compounds including cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) dominate TVOC results at these well locations. The trend towards increased degradation compounds coupled with an absence of source area constituents is evident at well location 171B based on the 2007 through 2016 VOC results. Additionally, well 145B, just outside the source area in the southeast corner, also provides evidence of hydraulic control as concentrations have decreased significantly. Concentrations were over 30,000 μg/l in 2006 and have decreased to 1,300 μg/l or lower for the last three years. The TVOC results in 2014 were the lowest observed at this location to date.

Far-field wells 146B and 150B also demonstrate the effectiveness of the groundwater control system. Concentrations have decreased by one order of magnitude at both wells since 2000.

C-Zone

Results from the four C-Zone wells indicate TVOC concentrations were below 80 μg/l; with the only exception 168C (12,080 μg/l), which is near the limits of source area. TVOC concentrations at two of the locations were below 25 μg/l.

Wells 145C and 168C delineate the C-Zone source area limit. At 145C, concentrations were the lowest on record in each of the last four years, after a marked decrease in 2013. At downgradient well 168C, the concentration is slightly decreasing over time, with a anomalous low concentration in 2007.

Wells 146C and 150C are downgradient of the source area under ambient groundwater flow conditions. TVOC concentrations at 146C were over 20-40 μg/l prior to 2006; however, the concentrations increased in 2014 and remained higher through 2016 (75.2 μg/l). This level of concentration remains much lower than source area levels, and concentrations are mainly attributed to DCE and VC, which are degradation products of TCE. At location 150C, TVOC result for 2013 and 2014 showed a marked increase to 463.3 and 2,352 μg/l (respectively), however the concentrations have decreased since to 108.2 μg/l in 2015 and 21.9 μg/l in 2016. The TVOC concentrations at 150C are also mostly degradation products.

D-Zone

Results from the four D-Zone wells indicate TVOC concentrations are generally low and/or declining over time at these monitoring locations.

Well 165D is within the D-Zone source area. In 2016, well 165D had a TVOC concentration of 6.1 μg/l, the lowest observed at this location. TVOC concentrations have been declining since the peak of approximately 1,600 μg/l in May 2006.

TVOC concentrations at far-field wells (136D, 145D, and 148D,) ranged from 5.23 μg/l (148D) to 1,814 μg/l (145D). At wells 136D and 145D, the concentrations have continued to decline from as high as 3,000 μg/l. In 2016, the TVOC concentration in well 136D have decreased to 130.2 μg/l – 127.2 μg/l (duplicate). At 145D, the 2016 TVOC concentration increased from the previous few years but maintains an overall decreasing trend. At far field well 148D, the concentrations remained low at 5.23 μg/l.

Consistent with previous long-term monitoring results, biogenic degradation compounds including cis-DCE and VC dominate TVOC results for wells136D, 145D, 148D, and 165D. Furthermore, monitoring has shown hydraulic control from the HCS extends beyond the D/E/F-Zone source area limits, and concentrations in D-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

E-Zone

Results from the three E-Zone wells (146E, 150E, and 165E) indicate TVOC concentrations of the two wells within the E-Zone source area (146E at 14,165 μg/l and 165E at 2,083 μg/l) and side gradient well 150E (1,436 μg/l) are consistent with previous results. All E-Zone groundwater monitoring locations are stable or on a declining trend. Degradation products including cis-DCE and VC dominate TVOC results for all the E-Zone wells. The presence of these degradation compounds is indicative of the occurrence of active natural attenuation processes.

Well 165E is a source area well and therefore the concentrations are high (tens of thousands µg/l). Well 165E has shown a year-to-year decrease over the last five years from 62,630 µg/l in 2011 to 2,083 µg/l in 2016, the lowest TVOC result historically observed at this location. Furthermore the well is located just upgradient of recovery well RW-9. Due to this location and active pumping at RW-9 concentrations were increasing between 2006 and 2011 as the plume is drawn towards, and captured by, the recovery well.

TVOC results for well 146E located, at the edge of the source area limits, have been trending lower, with concentrations typically over 10,000 µg/l prior to 2009 and between 3,500 and 6,300 µg/l between 2009 and 2014. In 2015 the TVOC concentration at 146E increased to 11,566 µg/l from 3,531 µg/l in 2014. 2016 TVOC concentrations increased again to 14,169 µg/l. Even with the TVOC increases observed the last two sampling events, the overall trend for TVOCs continues to be declining. Future analytical results will be evaluated to determine if this result is typical variability or is indicative of increasing TVOC concentrations. Well 150E is also located near, but outside, the source area limits has maintained initial decreases observed in 1996, with concentrations ranging from 6,590 µg/l (1996) to 338 µg/l (2015) and typically between 500 and 1,300 µg/l in recent years. In 2016 the TVOC concentration at 150E (1,436 µg/l) remained with the historically observed concentration range and below the early time period concentrations.

Groundwater concentrations in E-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

F-Zone

Results from the three F-Zone wells indicate TVOC concentrations ranged from 38.79 µg/L to 696 µg/l, and all three locations showed decreasing trends. Two of the three wells (146F and 150F) showed the historically lowest TVOC concentration observed at their location in 2016. At 146F this is the fifth year in a row that the historical low TVOC concentration has been observed. The decrease in the TVOC concentration between 2015 and 2016 was more substantial than the past few years (7,414 to 696 µg/l). Similar to the results from the E-Zone wells TVOC, results for all the F-Zone wells are dominated by biogenic degradation compounds cis-DCE and VC.

In 2016, TVOC concentrations at well 146F, at the edge of the F-Zone source area, were the lowest observed at this location to date and have decreased from a high of 36,700 µg/l in 2000 to 696 µg/l in 2016. TVOC concentrations at near source well 136F have also steadily declined since HCS startup from 8,348 µg/l (2005) to 38.79 µg/l (2016). TVOC concentrations at location 150F have shown a steady trend lower since 1998, with concentrations decreasing from initially over 4,500 µg/l to 417.5 µg/l in 2014, but increased to 1,793 µg/l in 2015. In 2016, TVOC concentrations returned to the declining trend observed prior to 2015 and the lowest TVOC concentration for 150F was observed (368 µg/l).

TVOC concentrations have apparently decreased at these F-Zone locations in response to the startup of the HCS, which indicates that the HCS is effectively controlling groundwater flow as designed.

3.5 Monitored Natural Attenuation (MNA) Assessment

Based on the 2013 MNA sampling results (discussed in the 2013 Annual Report) and USEPA approval (USEPA July 16, 2010), future MNA sampling is currently scheduled to be completed on a five year schedule. The next MNA sampling is scheduled to be completed in 2018. However, VOC and field parameter concentrations from 2016 generally indicate that MNA remains an active component in the source area and the far-field plume. For example, downgradient constituents are predominately degradation products (DCE and VC) and source area groundwater has remained anaerobic and likely sulfate reducing and or methanogenic.

3.6 DNAPL Monitoring and Recovery

As described in the LTGMP and the DNAPL Monitoring and Recovery Plan, monitoring for the occurrence of DNAPL has been conducted routinely at the Necco Park site since the early 1980s. An active recovery and monitoring program was instituted in 1989 to remove free-phase DNAPL from monitoring and groundwater recovery wells. The historically established monitoring program was modified based on results of the Pre-design Investigations. In 2015, the USEPA agreed to a request from Chemours to reduce the number of wells monitored monthly and semi-annually for DNAPL. However, the USEPA requested that once every two years, the full list of DNAPL wells are checked. The revised monitoring schedule began in June 2015. The 2016 monthly DNAPL monitoring results are summarized in Table 3-8.

In 2016, no DNAPL was identified during any of the monthly or semi-annual monitoring and therefore, no DNAPL was removed in 2016. A total of approximately 8,818 gallons of DNAPL have been recovered since the program was put in place.

3.7 Quality Control/Quality Assurance

The 2016 annual groundwater samples were submitted to TestAmerica Laboratories in North Canton, Ohio, for all chemical analyses. In accordance with the LTGMP and consistent with previous years, QA/QC procedures included in-house data review. In previous years, 10% independent validation of the data was completed by Environmental Standards, Inc., of Valley Forge, Pennsylvania. The 10% independent data validation was not completed in 2016. On July 30, 2015, Chemours proposed to eliminate the 10% validation based on 10 years of no instances when significant data qualification or rejection of data occurred as a result of findings from the 10% full validation that wasn't also identified by the 100% CDRP. The USEPA approved the proposed reduction in a letter dated October 19, 2016. All other provisions of the QAPP remain unchanged.

3.7.1 Sample Collection

All samples were collected in accordance with the scope and technical requirements defined in the project Work Plan and Quality Assurance Project Plan (DuPont CRG 2005c). Samples were submitted in five delivery groups received at the laboratories between August 18 and August 25, 2016. Based on laboratory receipt records, all samples were received in satisfactory condition, properly preserved, and within USEPA holding time and temperature requirements. Field QC samples collected during the sampling round included two field duplicate pairs, five daily equipment blank samples, and five trip blanks (volatile organics).

In-House Data Collection

The quality of the data set was evaluated by the AECOM Analytical Data Quality Management Group using the analytical results provided in hard-copy contract laboratory protocol-type data packages in conjunction with an automated data evaluation of the electronic data deliverables (the Chemours Data Review [DVM] process described below). The laboratory data packages presented a review of the QA/QC procedures conducted by the laboratory and included case narratives identifying any significant issues associated with sample receipt, preparation, and analysis.

The electronic data was processed through an automated program developed by Chemours, referred to as the DVM, where a series of checks were performed on the data, essentially resulting in a summary level validation. The data were evaluated against holding time criteria, checked for laboratory blank, equipment blank, and trip blank contamination, and assessed against the following:

- Matrix spike(MS)/matrix spike duplicate (MSD) recoveries
- Relative percent differences (RPDs) between MS/MSD samples
- Laboratory control sample (LCS)/control sample duplicate (LCSD) recoveries
- RPDs between LCS/LCSD
- RPDs between laboratory replicates
- Surrogate spike recoveries
- RPDs between field duplicate samples

The DVM also applied the following data qualifiers to analysis results, as warranted:

DEFAULT QUALIFIERS

Qualifier	Definition
B	Not detected substantially above the level reported in the laboratory or field blanks.
R	Unusable result. Analyte may or may not be present in the sample.
J	Analyte present. Reported value may not be accurate or precise.
UJ	Not detected. Reporting limit may not be accurate or precise.

All sample analyses were completed within the USEPA recommended holding times. The volatile organic trichloroethene was identified in the equipment blank collected August 23, 2016, resulting in B-qualification of the trichloroethene detection in 168B. The volatile compound methylene chloride was detected at trace level concentrations in several laboratory method blanks. Wells 146E, 136D (and its field duplicate), 145C, and 172B had methylene chloride concentrations in the same range as the blanks (less than ten times the analytical results for the blanks) and were B-qualified during the data review process. The matrix spike/matrix spike duplicate (MS/MSD) of the field duplicate associated with well 137D was recovered below the laboratory control limit for phenol. The positive detections of this analyte in BLIND4-D has been J qualified as estimated and may be biased low. Although not qualified during the data review process, the phenol detection in the "parent" sample 137B should also be considered estimated and may be biased low.

The semi-volatile analysis included a targeted tentatively identified compound reported as TIC 1. All positive results reported for TIC 1 should be considered estimated concentrations. The analytical results provide a total of 3-methylphenol and 4-methylphenol due to the inability of the laboratory instrumentation to separate the two under the chromatographic conditions used for sample analysis.

A number of samples required dilutions for analysis for volatiles and semi-volatiles, resulting in elevated reporting limits for the affected analytes. As a result of the dilutions, some volatile and semi-volatile surrogate recoveries could not be determined (diluted out) or were recovered outside the laboratory control window.

All analytes reported between the method detection limit (MDL) and practical quantitation limit (PQL) were J qualified as estimated concentrations.

Evaluation of the relative percent difference (RPD) between field duplicate pairs has been incorporated into the automated DVM process. The positive analyte detections in the two pairs of blind field duplicates were all less than the 30% RPD guidelines used for aqueous samples except for the 2,4,5-trichlorophenol detections in 136D.

All samples were collected in accordance with the scope and technical requirements defined in the project Work Plan and Quality Assurance Project Plan (DuPont CRG 2005c). Samples were submitted in five delivery groups received at the laboratories between August 19 and August 26, 2016. Based on laboratory receipt records, all samples were received in satisfactory condition, properly preserved, and within USEPA holding time and temperature requirements. Field QC samples collected during the sampling round included two field duplicate pairs, five daily equipment blank samples, and five trip blanks (volatile organics).

4.0 CAP MAINTENANCE

The cap was substantially completed in 2005, and all remedial items were completed by August 2006. A lawn maintenance contractor maintains both the landfill cap and ditch vegetation. Landfill cap maintenance activities are conducted in accordance with the Cap Maintenance and Monitoring Plan (CMMP). Results of the landfill cap maintenance inspection conducted on November 18, 2016 are provided in Appendix C. No leachate seeps or settlement was identified, and all aspects of the landfill that were inspected were found acceptable.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Hydraulic Control Effectiveness

5.1.1 Conclusions

The HCS continues to be effective at controlling source area groundwater at the Necco Park site. The following observations support this conclusion:

- Water levels in the A-Zone continue a long-term decreasing trend due to the in-place remedial measures including the impermeable landfill cap and groundwater pumping. The A-Zone is dewatering vertically from the hydraulic depression created by the HCS. This is evident in vertical gradients, drawdown calculations, and time series plots of water level elevations.
- Groundwater potentiometric contour maps depict a capture zone encompassing the source area in the B-, C-, D-, E- and F-Zones.

The addition of RW-11 continues to be an improvement in A-, B-, and C-Zone hydraulic control in the southwestern part of the site. Furthermore, increases in well yield at RW-5 in Fall 2015 increased capture in the A, B and C around this well.

5.1.2 Recommendations

Based on the site history, years of monitoring, and observations made in 2016, the following procedures are recommended:

- Continue to rehabilitate RW-4, RW-5, RW-11 on an semi-annual basis

5.2 Groundwater Chemistry Monitoring

5.2.1 Conclusions

The 2016 and historical chemistry monitoring results indicate the following:

- Overall, the TVOC concentrations are decreasing for all groundwater flow zones in the source area and far-field. In the very few locations where there were increasing trends of TVOC, the concentrations were within historical range or inside the source area near a recovery well.
- Analytical results for 2016 would not change the A-Zone and B/C-Zone source area limits as delineated in the SAR.
- Analytical results for 2016 (including well 146E) support the 2005 Annual Report conclusion of a reduced source area limit for the D/E/F-Zone as delineated in the SAR based on the analytical results from well 146E.
- Results from groundwater sampling events completed since HCS startup show that the HCS is effectively controlling zone-specific source areas.

5.2.2 Recommendations

The 2016 sampling results represent the 15th groundwater sampling event in the long-term monitoring program. It is recommended that the long-term monitoring program continue in its current form, including the revisions from 2010, 2011, and 2016.

5.3 MNA Conclusions and Recommendations

MNA sampling was not completed in 2016 as agreed to by the USEPA. The next sampling event for MNA monitoring is scheduled to be completed in 2018. Analytical results from 2016, such as concentrations of degradation products and geochemical conditions, continue to support the recommendation that MNA assessments be conducted every five years.

5.4 DNAPL Monitoring and Recovery

5.4.1 Conclusions

Results of the 2016 DNAPL monitoring and historical recovery efforts indicate the following:

- Monitoring for the presence of DNAPL was completed monthly during 2016.
- No DNAPL was identified in 2016 during any of the monthly or semi-annual monitoring; therefore no DNAPL was removed in 2016.
- Approximately 8,818 gallons of DNAPL have been recovered since the recovery program was initiated in 1989.
- As approved by the USEPA, a revised list of wells were monitored monthly and semi-annually beginning in June 2015. The full list of well previously checked for DNAPL will be monitored once every two years.

5.4.2 Recommendation

Continue DNAPL monitoring as revised and approved by the USEPA in 2015 and recover DNAPL where encountered.

5.5 Landfill Cap

5.5.1 Conclusions and Recommendations

With establishment of a continuous vegetative cover, the landfill cap construction is complete and is maintained in accordance with the CMMP. As discussed in the 2015 Annual Report, repairs to the liner were completed in 2015 at the two AT-Zone well abandonment locations (129AT and 191AT) that were through the cap. In 2016, no repairs to the landfill cap were necessary.

6.0 REFERENCES

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TABLES

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Table 2-1
HCS Recovery Well Performance Summary - 2016
Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

	B/C-ZONE						D/E/F-ZONE			
	RW-4		RW-5		RW-11		RW-8		RW-9	
	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°
January	32,090	98.84%	252,065	93.08%	221,774	98.79%	395,402	99.96%	230,120	99.96%
February	24,350	98.28%	212,925	94.55%	224,495	96.78%	376,862	97.97%	259,326	97.97%
March	19,433	89.03%	228,770	91.51%	227,653	94.14%	440,825	93.37%	339,062	93.36%
April	21,426	91.28%	190,268	64.99%	168,128	72.25%	442,937	96.71%	341,715	96.71%
May	23,811	95.38%	247,336	81.91%	238,087	95.58%	432,696	96.68%	287,872	96.68%
June	8,882	43.88%	101,941	43.68%	110,784	44.14%	210,628	50.83%	142,726	50.83%
July	10,390	34.18%	79,117	31.69%	84,043	34.10%	144,742	34.41%	109,789	34.30%
August	30,363	90.99%	243,211	80.13%	275,219	96.04%	434,261	96.12%	327,411	96.11%
September	13,841	93.47%	168,382	74.51%	190,322	86.90%	423,625	93.57%	333,388	93.57%
October	15,426	82.96%	149,655	74.50%	222,123	86.01%	438,862	91.71%	347,294	91.71%
November	15,331	89.65%	187,775	78.31%	204,119	83.24%	364,265	99.99%	209,179	100.00%
December	18,400	96.56%	209,416	86.40%	255,784	97.27%	403,347	99.61%	263,622	99.61%
2016 TOTAL / AVG.	233,743	83.7%	2,270,861	74.6%	2,422,531	82.1%	4,508,452	87.6%	3,191,504	87.6%
2015	274,254	77.0%	2,000,841	75.1%	1,668,783	77.4%	4,470,155	82.9%	3,563,902	82.8%
2014	290,476	95.7%	1,889,388	88.4%	2,155,520	91.6%	5,653,830	98.0%	4,301,449	98.1%
2013	433,801	92.5%	1,005,124	89.3%	3,367,369	84.4%	5,680,340	94.4%	5,250,524	93.8%
2012	475,401	94.9%	1,221,900	88.8%	3,538,799	85.4%	5,135,229	97.7%	4,774,110	97.7%
2011	115,439	90.7%	1,380,257	84.6%	2,772,890	85.8%	4,587,729	96.7%	4,763,517	97.1%
2010	144,749	90.3%	1,437,736	86.1%	3,327,973	86.0%	4,091,555	90.8%	4,772,745	90.6%
2009	106,849	93.7%	1,447,179	88.7%	5,585,699	90.8%	4,639,060	97.8%	4,397,025	97.6%
2008	103,262	90.9%	1,101,634	71.4%	1,149,746**	69.0%	3,680,999	96.9%	6,210,570	96.2%
2007	109,853	95.1%	1,391,339	83.6%	362,994*	92.6%	3,857,693	96.2%	5,506,023	95.9%
2006	92,358	90.0%	2,184,288	93.9%	701,579*	87.8%	4,581,348	95.0%	5,236,043	94.4%
2005	70,814	94.0%	1,966,338	93.0%	799,663*	95.0%	2,950,786	93.0%	3,881,318	93.0%

°Time taken for routine maintenance was not calculated as down-time

*RW-10

** RW-10 and RW-11 Combination

Table 2-2
GWTF Process Sampling Results - 2016

Remedial Acton Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

General Water Quality Analyte		B/C INFLUENT				D/E/F INFLUENT				COMBINED EFFLUENT			
		3/8/2016	6/7/2016	8/17/2016	11/17/2016	3/8/2016	6/7/2016	8/17/2016	11/17/2016	3/8/2016	6/7/2016	8/17/2016	11/17/2016
Field Parameters													
SPECIFIC CONDUCTANCE	μmhos/cm	7163	6704	7655	7199	4593	4356	4402	4291	1767	4700	4971	931
TEMPERATURE	°C	11.1	13	15.4	13.4	12	13.6	14.9	12.9	9.1	15.4	20.2	13.2
COLOR	ns	cloudy	cloudy	cloudy	gray tint	clear	none	clear	none	clear	none	clear	none
ODOR	ns	slight	strong	strong	slight	none	slight	slight	none	none	slight	slight	none
PH	std units	5.42	5.70	5.09	6.05	7.14	6.89	6.26	8.19	8.16	7.44	6.89	7.53
REDOX	mv	-29	-108	-102	-117	-251	-242	-211	-263	-163	-162	-150	-70
TURBIDITY	ntu	49.3	51.1	33.9	25.5	21.3	33.6	9.4	13.1	14	56.7	25.4	6.22
Volatile Organics													
1,1,2,2-TETRACHLOROETHANE	μg/l	3500	3500	3300	4200	1400	1300	980	1400	290	780	730	120
1,1,2-TRICHLOROETHANE	μg/l	2300	2600	3100	2900	2300	2200	2200	2100	170	320	520	39
1,1-DICHLOROETHENE	μg/l	830 J	780	590 J	530	330 J	330 J	310 J	280 J	<6.4	<23	<9	<0.9
1,2-DICHLOROETHANE	μg/l	540 J	550 J	610 J	530	180 J	210 J	160 J	160 J	11 J	21 J	33	2.6 J
CARBON TETRACHLORIDE	μg/l	6100	8200	8300	7600	1200	1100	1300	1100	<6.1	<22	<8.6	<1.2
CHLOROFORM	μg/l	14000	14000	16000	13000	3300	3300	3700	3000	60	66	160	21
CIS-1,2-DICHLOROETHENE	μg/l	12000	12000	13000	11000	11000	11000	11000	9000	96	70	270	8.6
METHYLENE CHLORIDE	μg/l	5000	5300	5100 B	4700	5100	5200	4400	4500	77	54	190	9.9 B
TETRACHLOROETHENE	μg/l	8500	9100	9100	9000	1100	930	1300	1000	6.2 J	<16	17 J	2 J
TRANS-1,2-DICHLOROETHENE	μg/l	550 J	560 J	540 J	480 J	720	740	720	650	<4.3	<15	<6	<0.97
TRICHLOROETHENE	μg/l	17000	18000	20000	16000	5500	5200	6400	4800	27	30 J	77	5.4
VINYL CHLORIDE	μg/l	2900	3000	3100	2700	2100	2100	1900	1700	<4.1	<15	<5.8	<1.5
TOTAL VOLATILES	μg/l	**73,220**	**77,590**	**82,740**	**72,640**	**34,230**	**33,610**	**34,370**	**29,690**	**737.2**	**1,341**	**1,997**	**208.5**

< and ND = Non detect at stated reporting limit
J= Analyte present. Reported value may not be precise.

TABLE 3-1
Quarterly Hydaulic Monitoring Locations

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Zone	Well ID	Zone	Well ID	Zone
53	A	159B	B	203D	D
111A	A	160B	B	RW-8	D/E/F
117A	A	161B	B	RW-9	D/E/F
119A	A	163B	B	202D	D
123A	A	167B	B	129E	E
129A	A	168B	B	136E	E
131A	A	169B	B	142E	E
137A	A	170B	B	145E	E
139A	A	171B	B	146E	E
140A	A	172B	B	150E	E
145A	A	201B	B	163E	E
146AR	A	BZTW-1	B	164E	E
150A	A	BZTW-2	B	165E	F
159A	A	BZTW-4	B	202E	E
163A	A	D-23	B	203E	F
168A	A	PZ-B	B	112F	F
173A	A	D-10	B/C	123F	F
174A	A	D-14	B/C	129F	F
175A	A	RW-5	B/C	130F	F
176A	A	RW-4	B/C	136F	F
178A	A	RW-11	B/C	145F	F
179A	A	105C	C	146F	F
184A	A	115C	C	148F	F
185A	A	123C	C	150F	F
186A	A	129C	C	163F	F
187A	A	130C	C	164F	F
188A	A	136C	C	165F	F
189A	A	137C	C	202F	F
190A	A	138C	C	203F	F
191A	A	139C	C	130G	G
192A	A	141C	C	136G	G
193A	A	145C	C	141G	G
194A	A	146C	C	143G	G
D-9	A	149C	C	TRW-6	B/C
D-11	A	150C	C	TRW-7	B/C
RDB-3	A	151C	C		
RDB-5	A	159C	C		
D-13	A	160C	C		
PZ-A	A	161C	C		
168A	A	162C	C		
102B	B	168C	C		
111B	B	204C	C		
112B	B	105D	D		
116B	B	111D	D		
118B	B	115D	D		
119B	B	123D	D		
120B	B	129D	D		
123B	B	130D	D		
129B	B	136D	D		
130B	B	137D	D		
136B	B	139D	D		
137B	B	145D	D		
138B	B	148D	D		
139B	B	149D	D		
145B	B	158D	D		
146B	B	159D	D		
149B	B	163D	D		
150B	B	164D	D		
151B	B	165D	D		

Notes: 1. Well 204C installed in 2008 to replace 112C. Water levels began in 1Q09.
2. Piezometers PZ-A, PZ-B, and 168A installed in 2008.
3. All AT zone wells were eliminated from the hydraulic monitoring program on consent from USEPA letter dated 01/27/2012.

Table 3-2
2016 Average A-Zone to B-Zone Vertical Gradients
Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

		A	B	C	D	
Well Pair		**2015 Average A-Zone Head**	**2015 Average B-Zone Head**	**A-Zone Mid-Point of Well Screen**	**B-Zone Fracture Elevation[1]**	**Vertical Gradtient[2,3] (B-A) / (C-D)**
111A	111B	572.41	571.21	573.94	561.80	-0.10
119A	119B	573.63	572.31	571.63	556.90	-0.09
129A	129B	573.52	571.14	570.10	557.80	-0.19
137A	137B	571.77	571.38	570.10	561.30	-0.04
145A	145B	571.38	568.89	564.19	546.30	-0.14
150A	150B	571.46	570.55	564.69	553.18	-0.08
159A	159B	577.03	572.64	580.62	562.90	-0.25
163A	163B	572.69	572.67	572.49	564.96	0.00
168A	168B	570.88	567.23	555.22	544.90	-0.35

Notes:

1) A B-Zone fracture was not observed in the 145B borehole, therefore the midpoint of the open hole was used.
2) Unitless (ft/ft).
3) Negative values indicate a downward (from A-Zone to B-Zone) gradient.
4) Average gradients were used to better reflect typical vertical gradients at the site.

Table 3-3
DNAPL Components and Solubility Criteria Values

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

Contaminant	Mole Fraction in DNAPL (%)	Pure-Phase Solubility (µg/l)	One-Percent Pure-Phase Solubility (µg/l)	Effective Solubility (µg/l)
Hexachlorobutadiene	59	2,000	20	1,180
Hexachloroethane	9	50,000	500	4,500
Hexachlorobenzene	2	11	0.11	0.22
Carbon tetrachloride	5	800,000	8,000	40,000
Chloroform	1	8,000,000	80,000	80,000
Tetrachloroethene	3	150,000	1,500	4,500
1,1,2,2-Tetrachloroethane	5	2,900,000	29,000	145,000
Trichloroethene	4	1,100,000	11,000	44,000

Table 3-4

Effective Solubility Concentration Exceedances for DNAPL Compounds - 2005 through 2016 Annual Sampling

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012	2013	2014	2015
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event								
171B	B	Hexachlorobutadiene	1,180	2,100	BC	BC	BC	NS	BC	BC	BC	BC	BC	BC	BC	BC	BC
		Hexachlorobenzene	0.22	BC	4.0	31 J	3.4 J	NS	1.4 J	BC	< 0.4	< 2.5	<0.95	BC	BC	< 0.41	< 0.32
105C	C	Carbon Tetrachloride	40,000	NS	NS	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS
		Hexachlorobutadiene	1,180	1,700	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Chloroform	80,000	BC	180,000	NS	120,000	NS	90,000	82,000	BC	NS	NS	NS	100,000	NS	NS
		Tetrachloroethene	4,500	32,000	35,000	NS	36,000	NS	37,000 J	32,000	13,000	NS	NS	NS	24,000	NS	NS
		Trichloroethene	44,000	280,000	190,000	NS	190,000	NS	160,000	140,000	74,000	NS	NS	NS	190,000	NS	NS
136C	C	Tetrachloroethene	4,500	4,100	3,600	3,300	3,100	5,200	3,800	14,800	5,600	NS	NS	NS	5,300	NS	NS
137C	C	Tetrachloroethene	4,500	8,500	22,000	NS	7,900	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS
105D	D	Carbon Tetrachloride	40,000	150,000	83,000	NS	170,000	NS	190,000	BC	200,000	NS	NS	NS	360,000	NS	NS
		Chloroform	80,000	98,000	35,000	NS	80,000	NS	90,000	96,000	120,000	NS	NS	NS	160,000	NS	NS
		Tetrachloroethene	4,500	12,000	57,000	NS	11,000	NS	13,000 J	12,000	16,000	NS	NS	NS	22,000	NS	NS
		Trichloroethene	44,000	120,000	51,000	NS	110,000	NS	120,000	130,000	180,000	NS	NS	NS	250,000	NS	NS
137D	D	Tetrachloroethene	4,500	5,100	4,900	NS	BC	NS	7,200	5,300 J	4,700	NS	NS	NS	BC	NS	NS
		Trichloroethene	44,000	64,000	76,000	NS	BC	NS	91,000	70,000	76,000	NS	NS	NS	BC	NS	NS
		Hexachlorobenzene	0.22	3.0	11.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
139D	D	Hexachlorobutadiene	1,180	1,200	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

BC: Below Criteria
NS: Not Sampled
"<" = compound not identified above the detection limit.

Table 3-5

1% of Pure-Phase Solubility Concentration Exceedances for DNAPL Compounds - 2005 through 2016 Annual Sampling

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012	2013	2014	2015	2016
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event									
D-11	A	Hexachlorobutadiene	20	29	BC	BC	BC	BC	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS
136B	B	Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	1,500	1,600	BC	BC	2,000	1,500	1,500	BC	BC
139B	B	Tetrachloroethene	1,500	NS	NS	NS	2000 J	NS	4,600	3,100	3,200	NS	NS	NS	2,900	NS	NS	NS
		Hexachlorobutadiene	20	78	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		1,1,2,2-Tetrachlorethane	29000	NS	NS	NS	29,000	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS
171B	B	Hexachlorobutadiene	20	2,100	130	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
		Hexachlorobenzene	0.11	BC	4.0	3.1 J	3.4 J	BC	1.4 J	BC	< 0.4	< 0.5	<0.95	BC	BC	<0.41	<0.32	<0.41
172B	B	Hexachlorobutadiene	20	140	89	140 J	110	BC	110	54	170	210	20	130	45	120	53	48
		Tetrachloroethene	1,500	1,800	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
105C	C	Hexachlorobutadiene	20	1,700	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Carbon Tetrachloride	8,000	25,000	BC	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS
		Chloroform	80,000	250,000	180,000	NS	120,000	NS	90,000	82,000	BC	NS	NS	NS	100,000	NS	NS	NS
		Tetrachloroethene	1,500	32,000	35,000	NS	36,000	NS	37,000 J	32,000 J	13,000	NS	NS	NS	24,000	NS	NS	NS
		Trichloroethene	11,000	280,000	190,000	NS	190,000	NS	160,000	140,000	74,000	NS	NS	NS	190,000	NS	NS	NS
136C	C	Tetrachloroethene	1,500	4,100	3,600	3,300	3,100	5,200	3,800	4,800	5,600	NS	NS	NS	5,300	NS	NS	NS
137C	C	Tetrachloroethene	1,500	8,500	22,000	NS	7,900	NS	2,200	2,700	BC	NS	NS	NS	BC	NS	NS	NS
		Trichloroethene	11,000	BC	19,000	NS	16,000	NS	20,000	70,000	BC	NS	NS	NS	BC	NS	NS	NS
168C	C	Hexachlorobutadiene	20	330	64.0	54 J	NS	44 J	BC	BC	NS	<27	21 J	BC	BC	BC	BC	BC
105D	D	Hexachlorobutadiene	20	95.0	BC	NS	NS	NS	NS	NS	N/S	NS	NS	NS	NS	NS	NS	NS
		Carbon Tetrachloride	8,000	150,000	83,000	NS	170,000	NS	190,000	190,000	200,000	NS	NS	NS	360,000	NS	NS	NS
		Chloroform	80,000	98,000	BC	NS	80,000	NS	90,000	96,000	120,000	NS	NS	NS	160,000	NS	NS	NS
		Tetrachloroethene	1,500	12,000	5,700	NS	11,000	NS	13,000 J	12,000 J	16,000	NS	NS	NS	22,000	NS	NS	NS
		1,1,2,2-Tetrachlorethane	29,000	NS	NS	NS	88,000	NS	79,000	76,000	79,000	NS	NS	NS	100,000	NS	NS	NS
		Trichloroethene	11,000	120,000	51,000	NS	110,000	NS	120,000	130,000	180,000	NS	NS	NS	250,000	NS	NS	NS
137D	D	Tetrachloroethene	1,500	5,100	4,900	NS	BC	NS	7,200	5,300	4,700	NS	NS	NS	BC	NS	NS	NS
		Trichloroethene	11,000	64,000	76,000	NS	27,000	NS	91,000	70,000	76,000	NS	NS	NS	BC	NS	NS	NS
139D	D	Hexachlorobenzene	0.11	38.0	11.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Tetrachloroethene	1,500	1,900	BC	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS
165E	E	Hexachlorobutadiene	20	27.0	BC	32 J	46 J	BC	45 J	91 J	44 J	79 J	26 J	130 J	65 J	130 J	34 J	<5.1
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	2,000	BC	BC	BC	BC	BC	BC
		Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	11,000	12,000	12,000	BC	BC	BC	BC

BC: Below Criteria
NS: Not
"<" = compound not identified above the detection limit.

Table 3-6
Chemical Monitoring List
Long-Term Monitoring

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

MONITORING WELL	ZONE	MONITORING WELL	ZONE
137A	A	136D	D
145A	A	145D	D
146AR	A	148D	D
150A	A	165D	D
136B	B	146E	E
137B	B	150E	E
145B*	B	165E	E
146B	B	136F	F
150B	B	146F	F
168B	B	150F*	F
171B	B		
172B	B		
145C*	C		
146C*	C		
150C*	C		
168C	C		

*Well does not meet bedrock zone water bearing criteria ($k<10^{-4}$ cm/sec).

Table 3-7
Indicator Parameter List
Long-Term Groundwater Monitoring

Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park

Inorganic and General Water Quality Parameters	Volatile Organic Compounds	Semivolatile Organic Compounds
pH*	Vinyl chloride	Hexachloroethane
Specific conductivity*	1,1-dichloroethene	Hexachlorobutadiene
Temperature*	Trans-1,2-dichloroethene	Phenol
Turbidity*	Cis-1,2-dichloroethene	2,4,6-trichlorophenol
Dissolved oxygen *	Chloroform	2,4,5-trichlorophenol
Redox potential*	Carbon tetrachloride	Pentachlorophenol
Chloride	1,2-dichloroethane	Hexachlorobenzene
Dissolved barium	Trichloroethene	4-methlyphenol
	1,1,2-trichloroethane	TIC-1
	Tetrachloroethene	
	1,1,2,2-tetrachloroethane	

*Field parameter

Table 3-8
2016 DNAPL Recovery Summary
Remedial Action Post-Construction Monitoring - 2016 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	**Frequency**	**29-Jan**		**26-Feb**		**30-Mar**		**26-Apr**		**31-May**		**28-Jun**		**21-Jul**		**25-Aug**		**17-Sep**		**28-Oct**		**28-Nov**		**29-Dec**	
		FT	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**	**FT**	**GALS**
RW-4	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
RW-5	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
RW-11	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-161B	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-171B	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-129C	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-161C	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
204C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-131A	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-139C	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	

na - not applicable/not taken due to reduction in scope, approved by USEPA (June 11, 2015 and August 12, 2015)
GALS - gallons purged

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FIGURES

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PARSONS

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

Created by: JWS	Date: 03-29-11
Checked by: RBP	Date: 03-29-11
Approved by: DDT	Date: 03-29-11
Project Manager: DDT	Date: 03-29-11
Job number: 445356.02020	

FIGURE 1-1
SITE LOCATION MAP
NECCO PARK
NIAGARA FALLS, NY

U:/Necco/HydroGeo/Mapping/gis/Necco_Site_location_map.srf

PARSONS

40 LA RIVIERE DR., SUITE 350
BUFFALO, NY 14202
(716) 541-0752

Created by: JWS	Date: 02-27-12
Checked by: JWS	Date: 02-27-2012
Project Manager: Eric Felter	Date: 02-12-2012
Project Number: 445357.02023	

LEGEND

- ✚ 2010 REVISED CHEMICAL MONITORING
- ⬠ RECOVERY WELLS
- ✚ MONITORING WELL
- ┼┼┼ RAIL ROADS
- ▨ GROUT CURTAIN

FIGURE 3-1
WELL AND PIEZOMETER LOCATIONS
CHEMOURS NECCO PARK SITE
NIAGARA FALLS, NY

U:\Necco\hydrogeo\Maps\gis\basemap.mxd

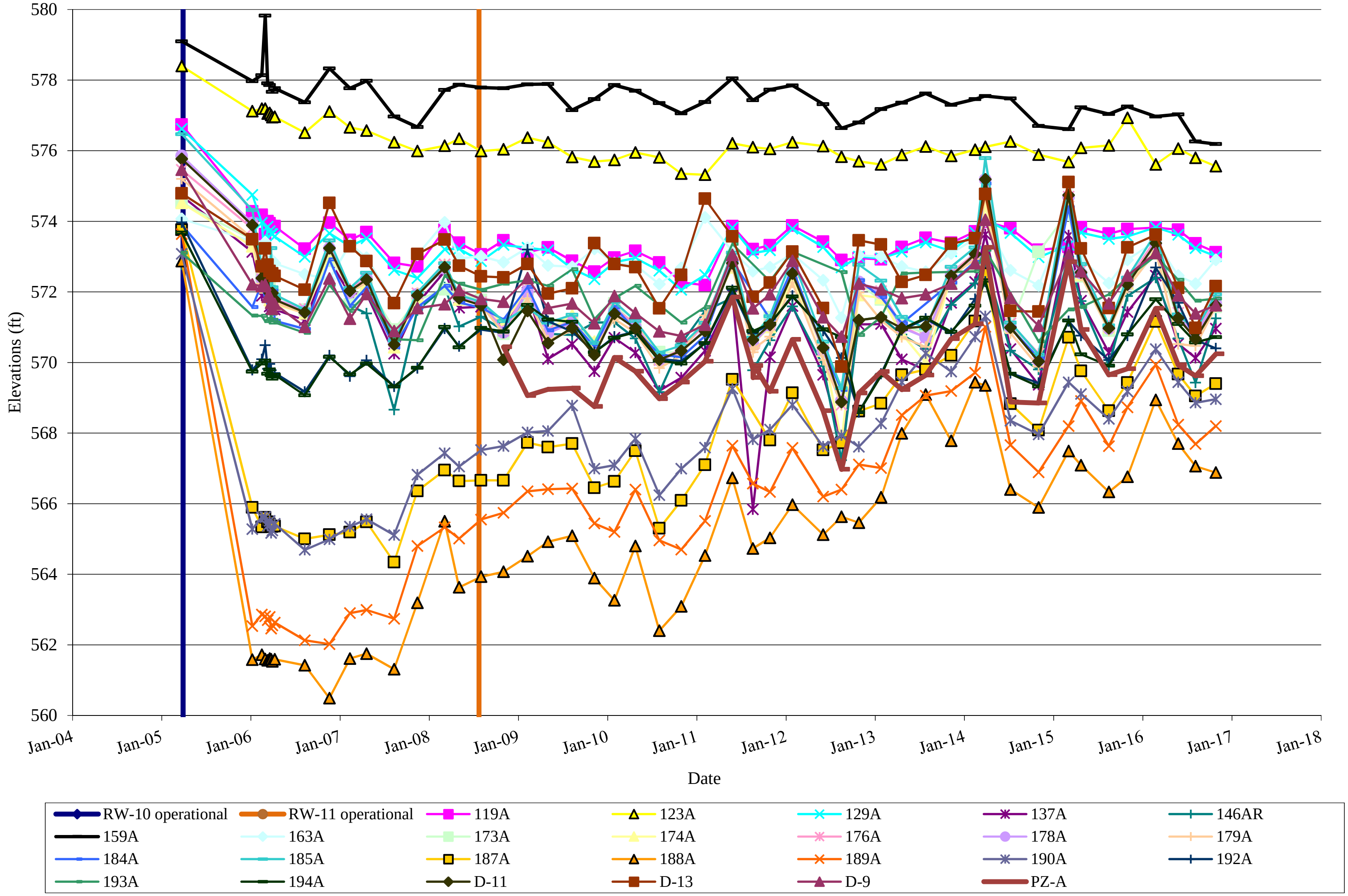


Figure 3-2
Select A-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2016
Chemours Necco Park

Necco 2016 A Zone Water Elev Trends.xlsx

Figure 3-3
Select B-Zone Monitoring Wells
Groundwater Elevations 2005 through 2016
Chemours Necco Park

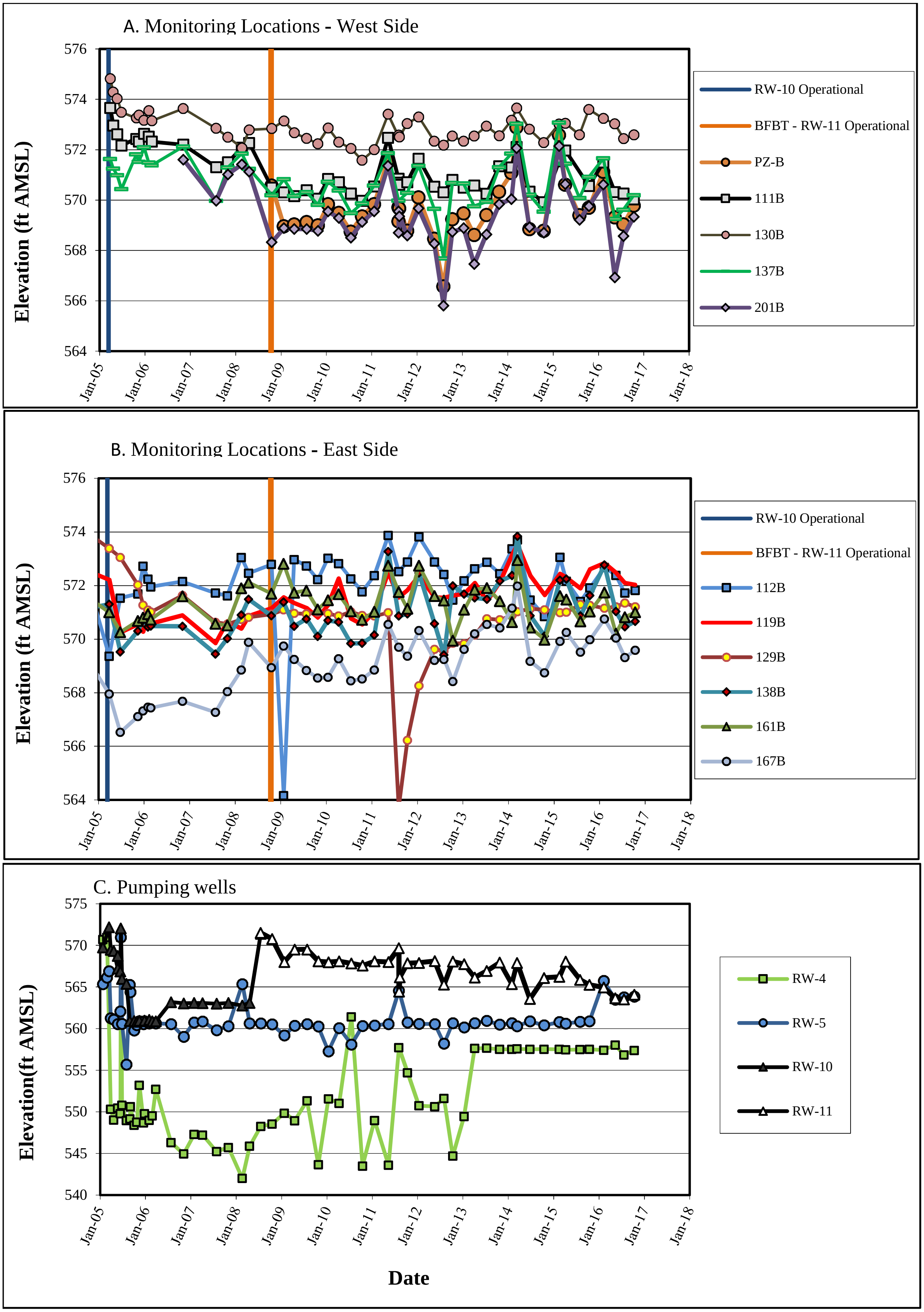
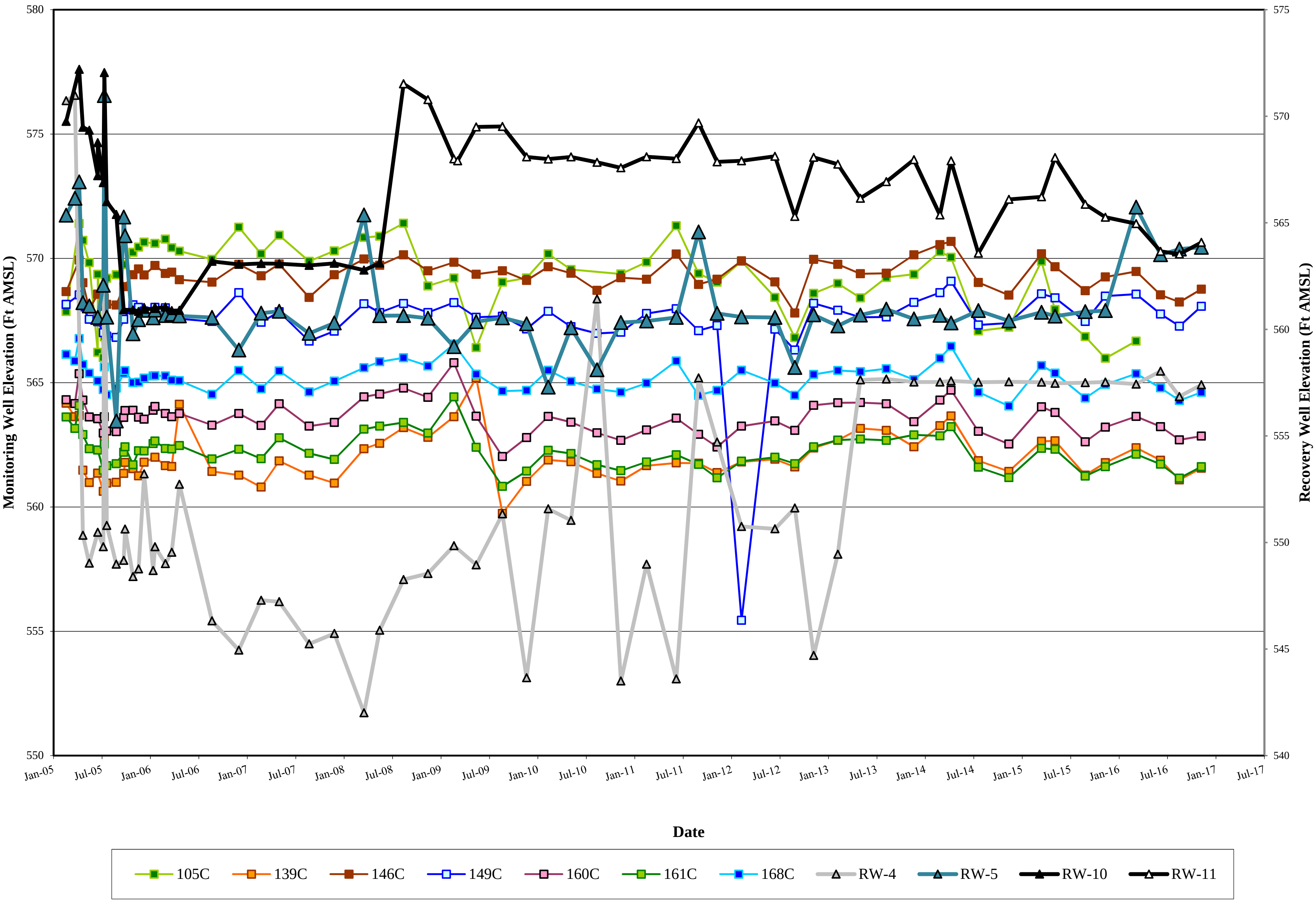
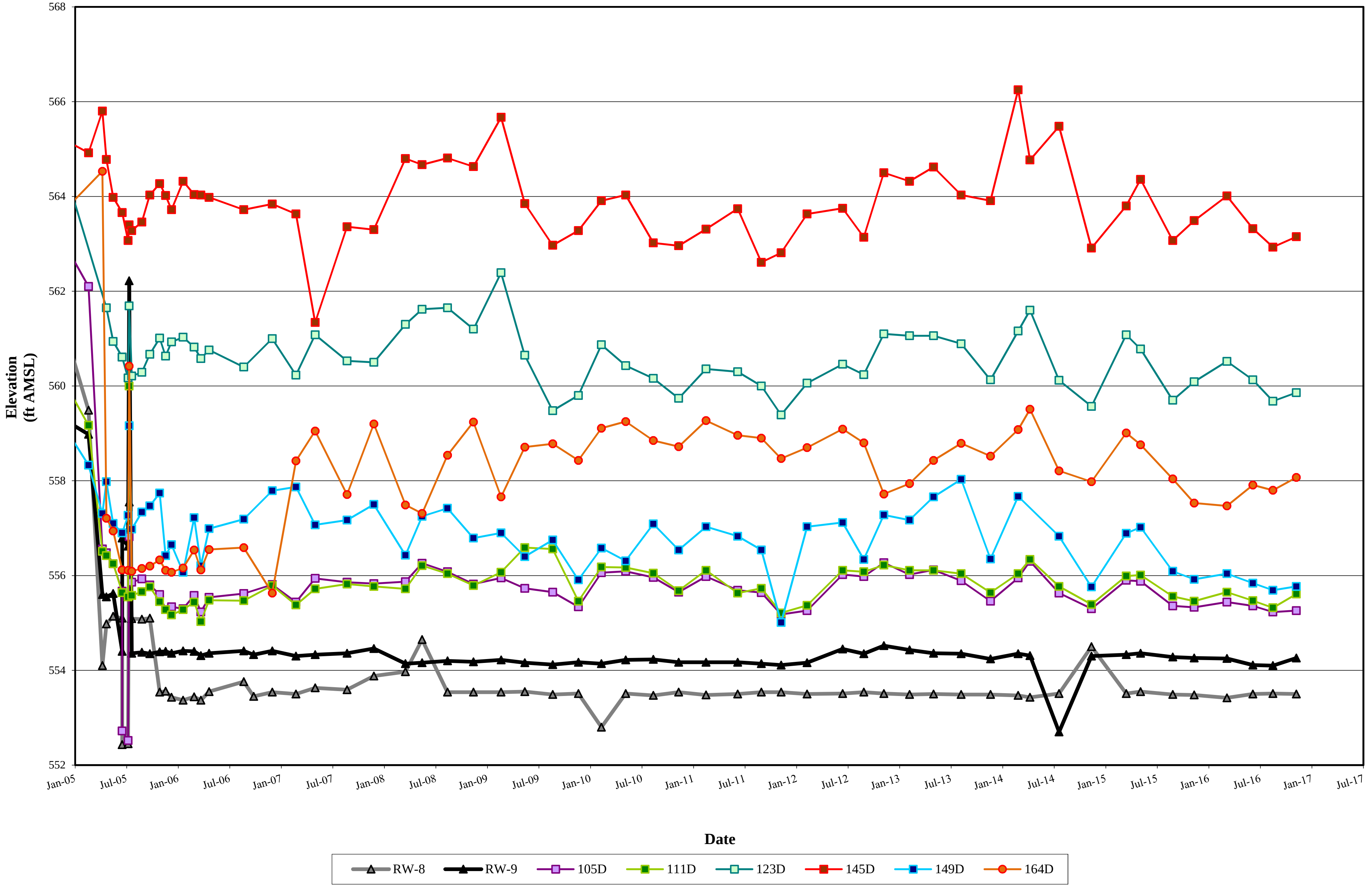


Figure 3-4
Select C-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2016
Chemours Necco Park



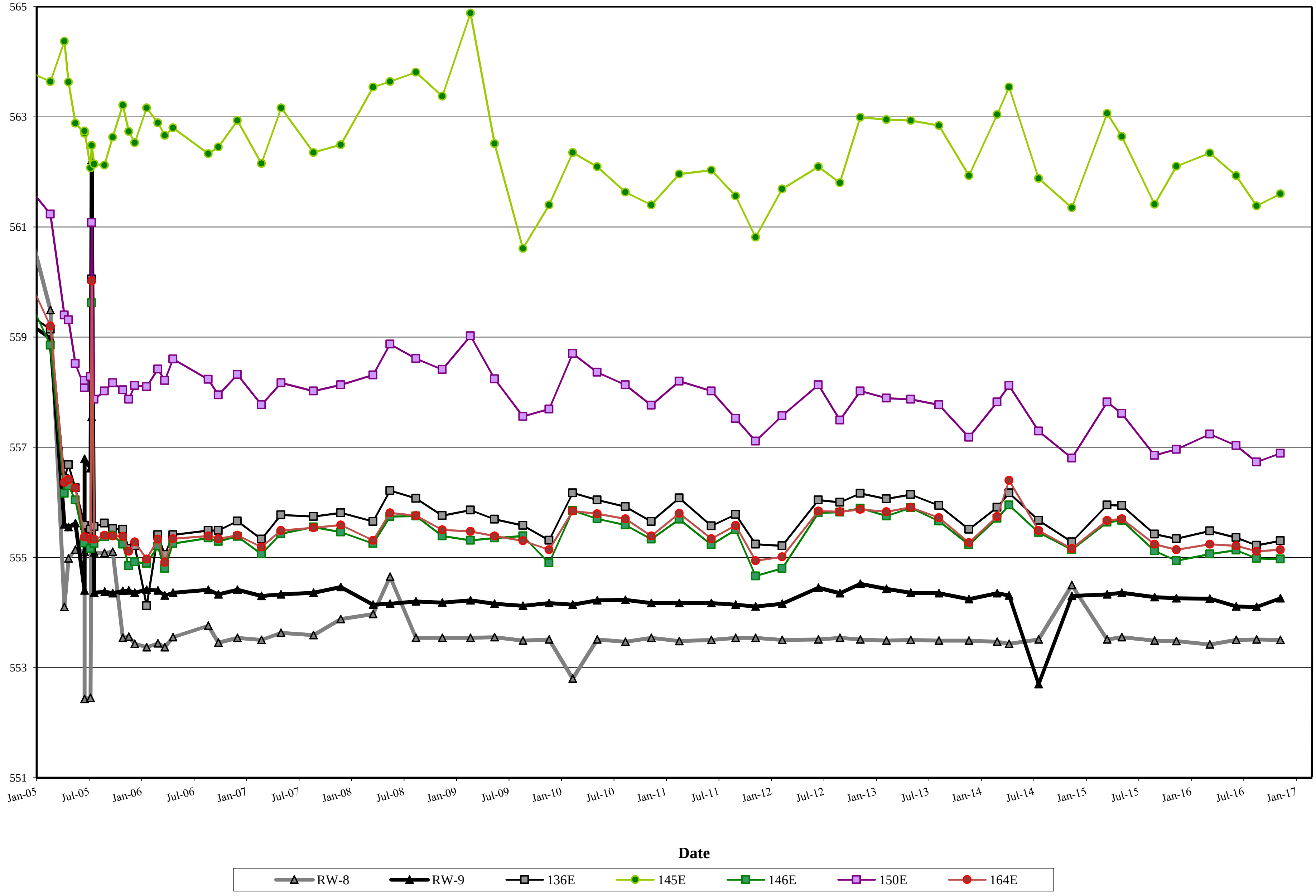
Necco 2016 C Zone Water Elev Trends.xlsx

Figure 3-5
Select D-Zone Monitoring Wells
Groundwater Elevations 2005 through 2016
Chemours Necco Park



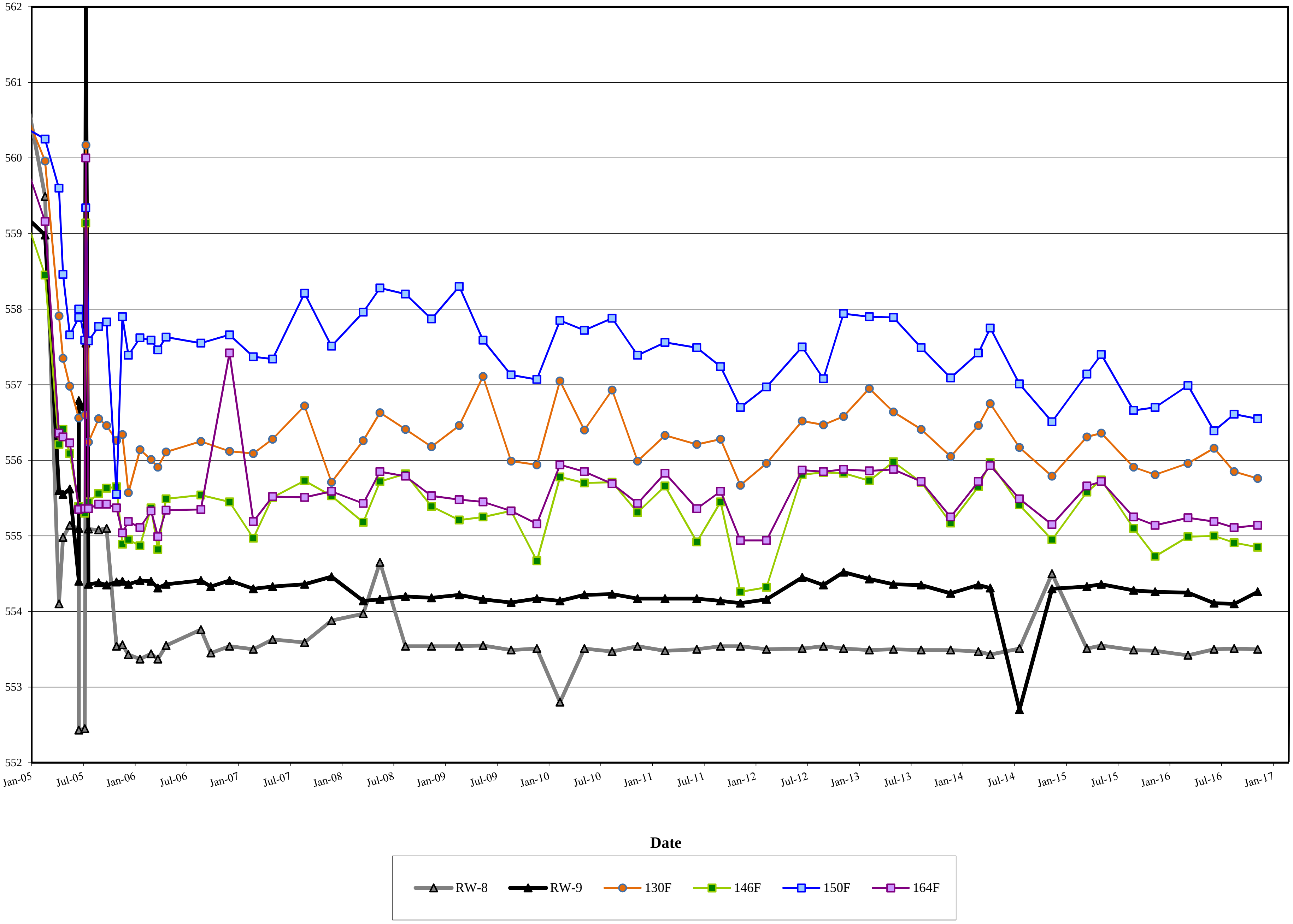
Necco 2016 D Zone Water Elev Trends.xlsx

Figure 3-6
Select E-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2016
Chemours Necco Park

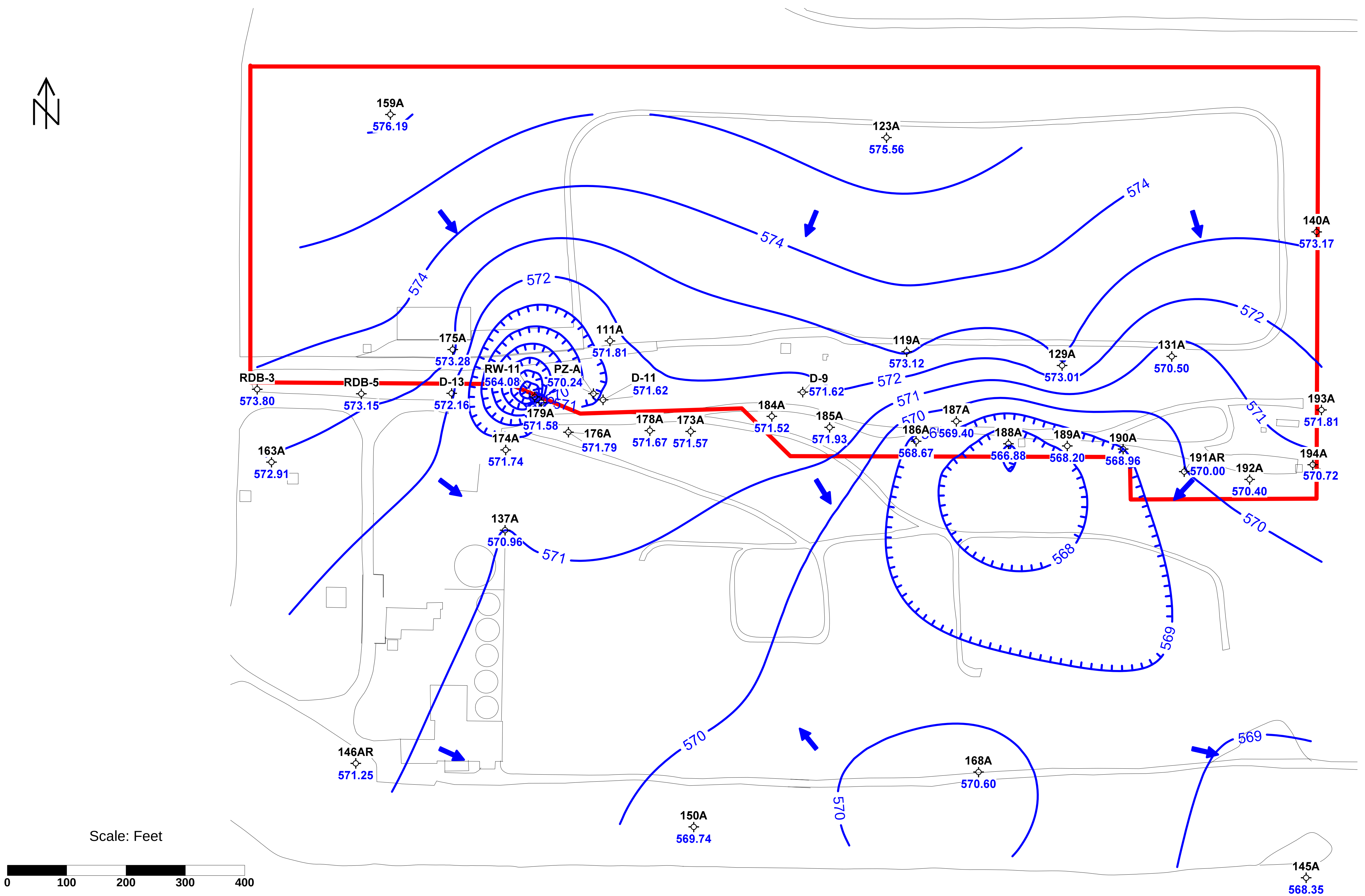


Necco 2016 E Zone Water Elev Trends.xlsx

Figure 3-7
Select F-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2016
Chemours Necco Park



Necco 2016 F Zone Water Elev Trends.xlsx



Contour Interval = 1 foot

Elevation datum feet AMSL

PARSONS

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

Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16

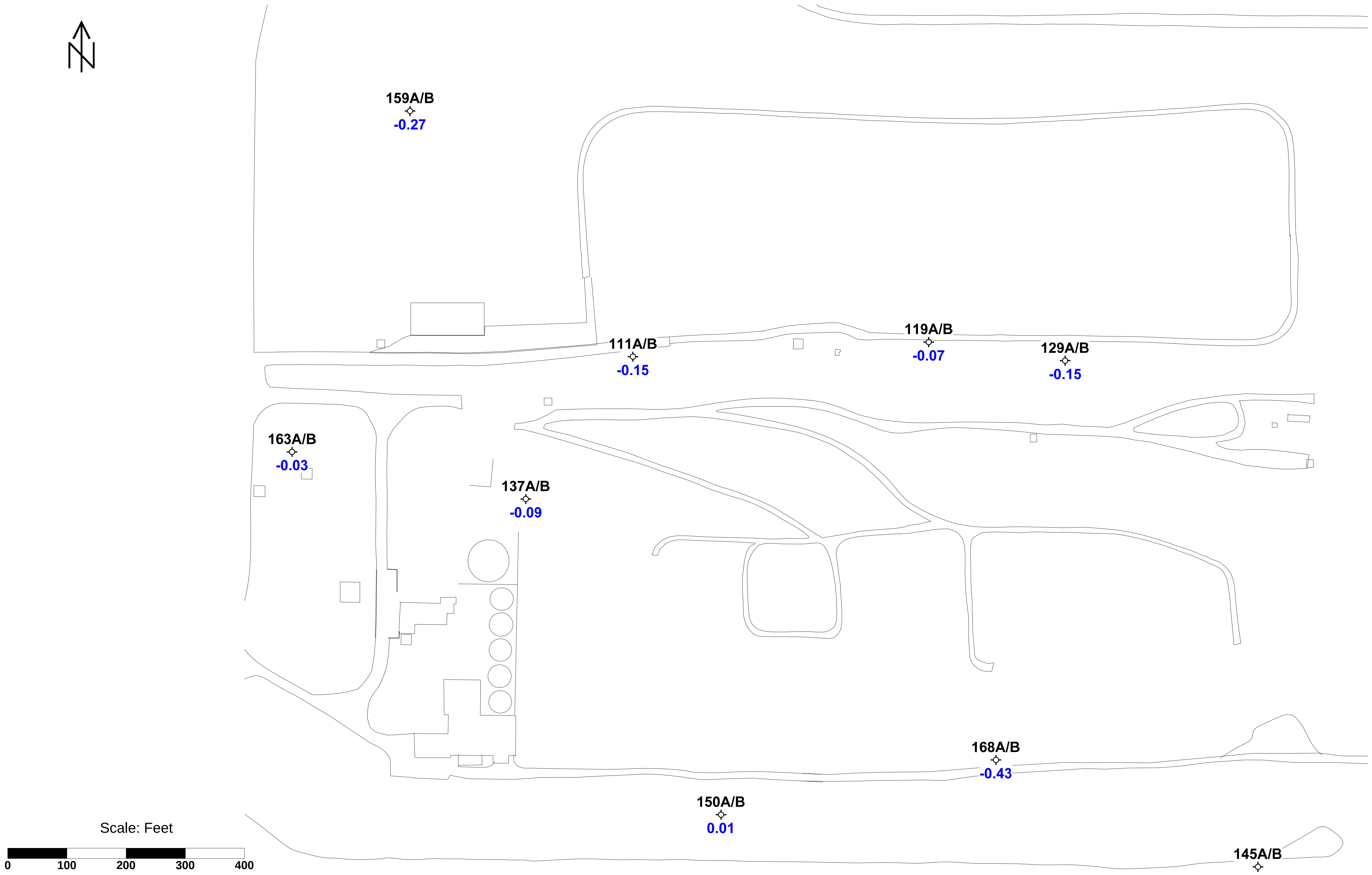
Job number: 449799.02020

LEGEND

3B	Well ID		Potentiometric Contour
⌖	Monitoring Well	▭	Structure
✦	Pumping Well		Road
		🟥	Source Area Extent

Figure 3-8
Potentiometric Surface Map
Chemours Necco Park: A-Zone
November 8, 2016

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2016-11-08 NEC Contour Tool/2016-11-08 - A PZ - F2.srf



Negative value indicates downward gradient

Elevation datum feet AMSL

PARSONS

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

Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16
Job number: 449799.02020	

LEGEND

150A/B **Well ID**

✧ **Monitoring Well**

◆ **Pumping Well**

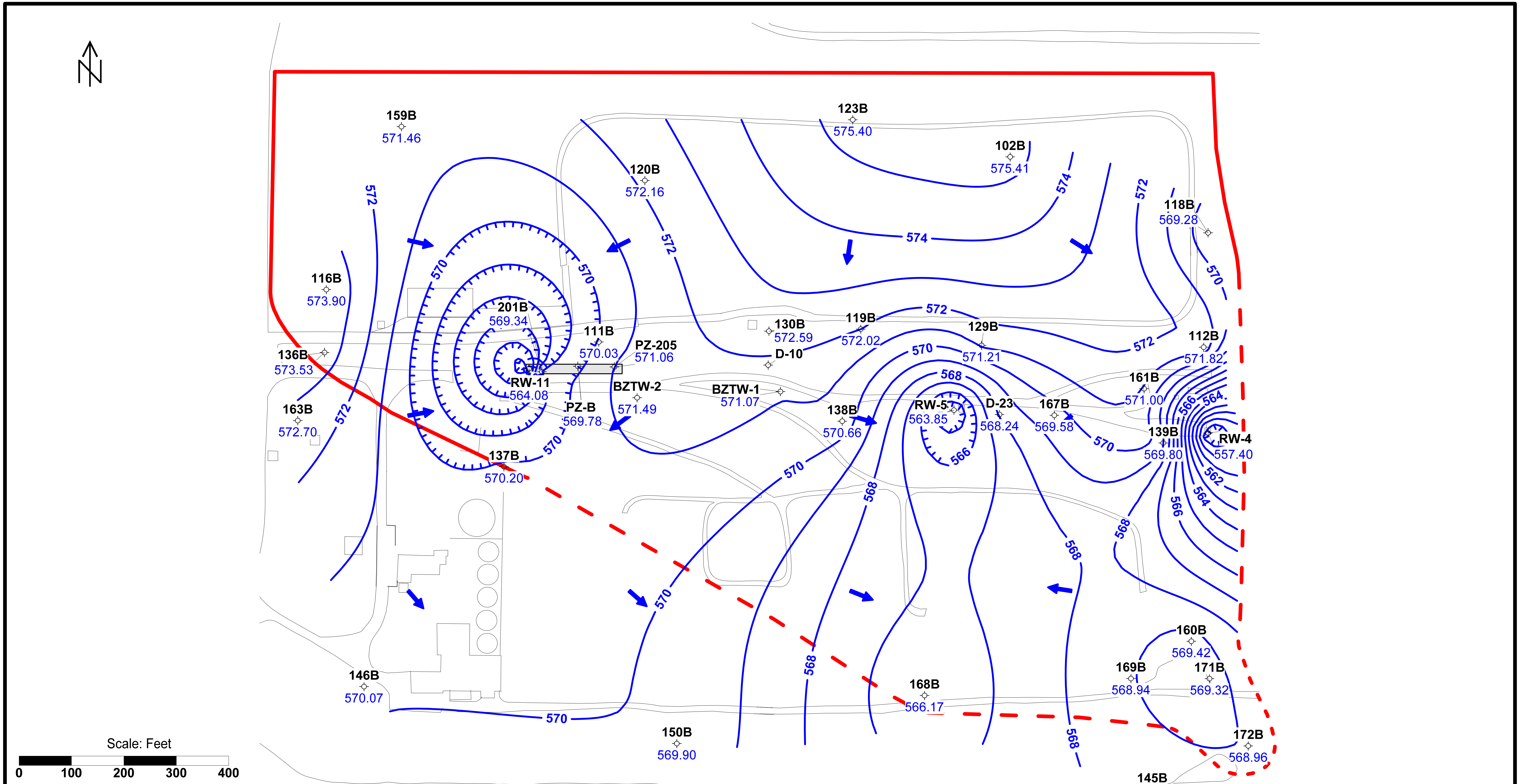
▭ **Structure**

Road

-0.15 **Vertical Hydraulic Gradient**

Figure 3-9
Vertical Gradient: A-Zone to B-Zone
Chemours Necco Park
November 8, 2016

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2016-11-08 NEC Contour Tool/2016-11-08 - ABvgrad - F3.srf



Contour interval = 1.0 foot
Elevation datum feet AMSL
Wells 149B and 151B are outside the area shown, but were used in the contouring.
Wells 170B, D-10, TRW-6, and TRW-7 were not used in the contouring.

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

Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16

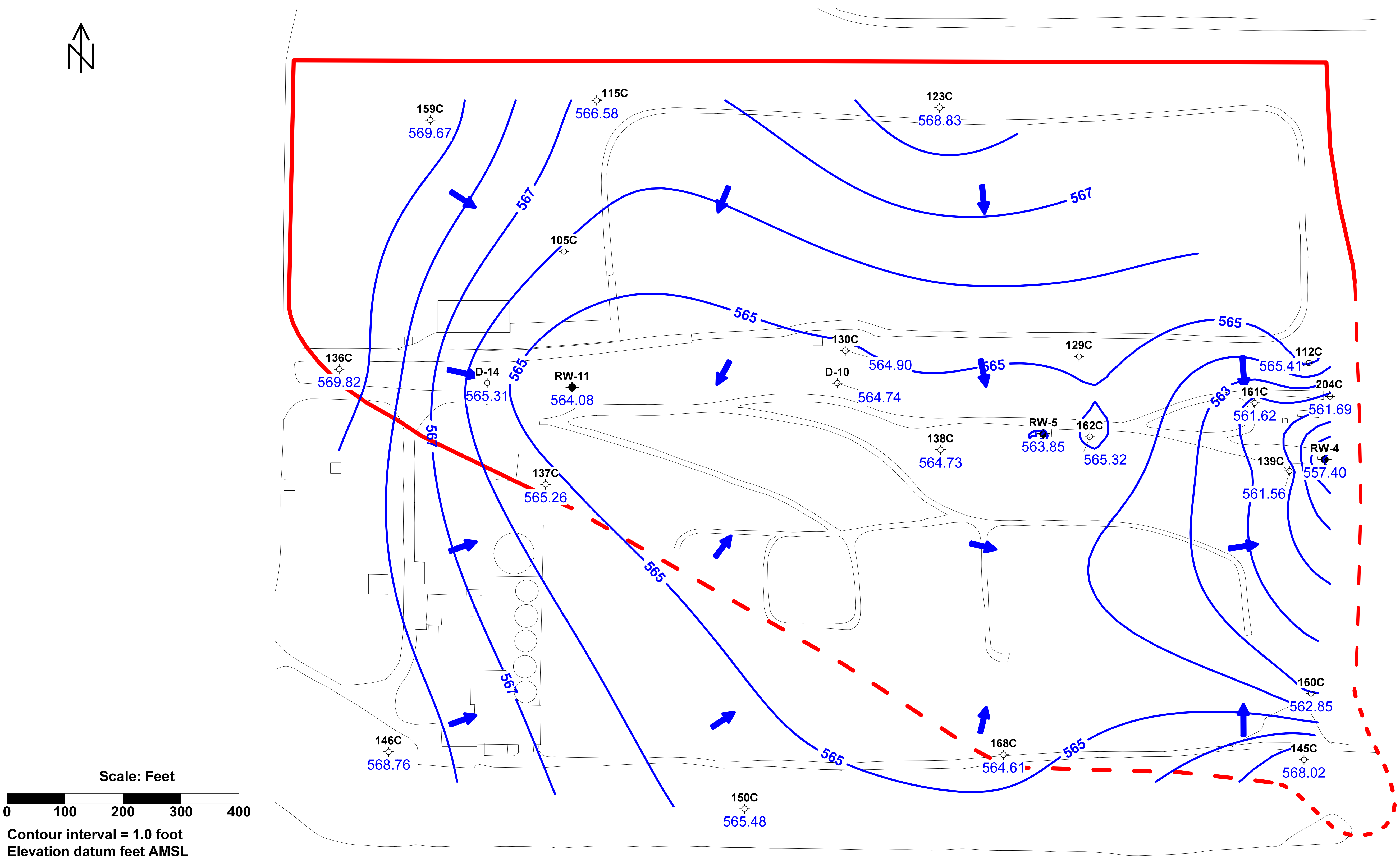
Job number: 449799.02020

LEGEND

3B	Well ID		Potentiometric Contour
⌖	Monitoring Well	▭	Structure
◆	Pumping Well		Road
	Source Area Extent	▨	Approximate Location of Bedrock Fractured Blast Trench

Figure 3-10
Potentiometric Surface Map
Chemours Necco Park: B-Zone
November 8, 2016

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2016-11-08 NEC Contour Tool/2016-11-08 - PZ B - F5.srf



Wells 149C and 151C are outside the area shown, but were used in the contouring.
The water level for 129C in November 2016 was erroneously high and was not used in the contouring.

PARSONS

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

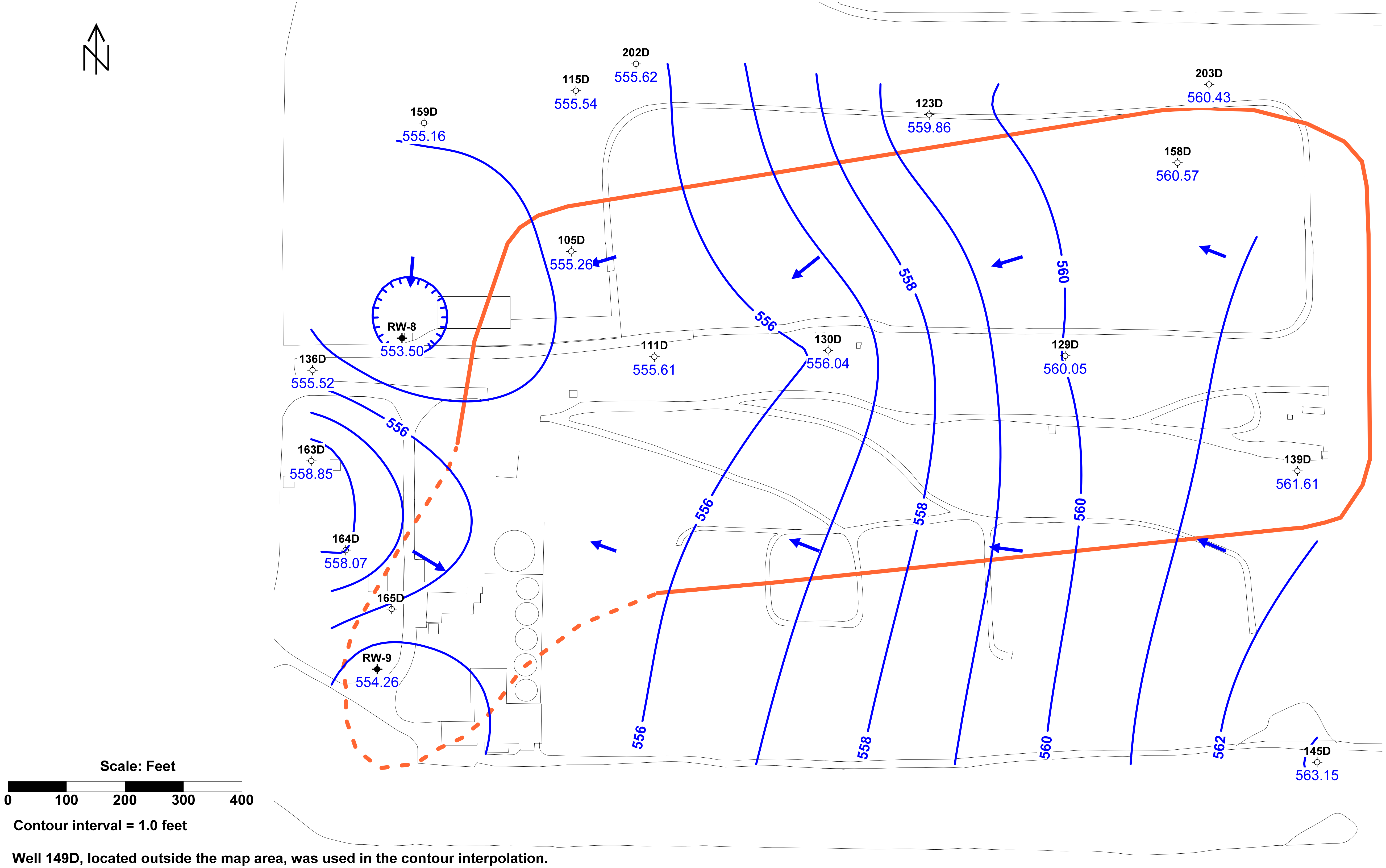
Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16
Job number: 449799.02020	

LEGEND

3B	Well ID	╱	Potentiometric Contour
⌖	Monitoring Well	▭	Structure
◆	Pumping Well	⌒	Road
- - - —	Source Area Extent		

Figure 3-11
Potentiometric Surface Map
Chemours Necco Park: C-Zone
November 8, 2016

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2016-11-08 NEC Contour Tool\2016-11-08 - PZ C - F7.srf



Contour interval = 1.0 feet

Well 149D, located outside the map area, was used in the contour interpolation.
Well 148D located downgradient was not used in the interpolation.
Well 165D was not used in the contour interpolation.

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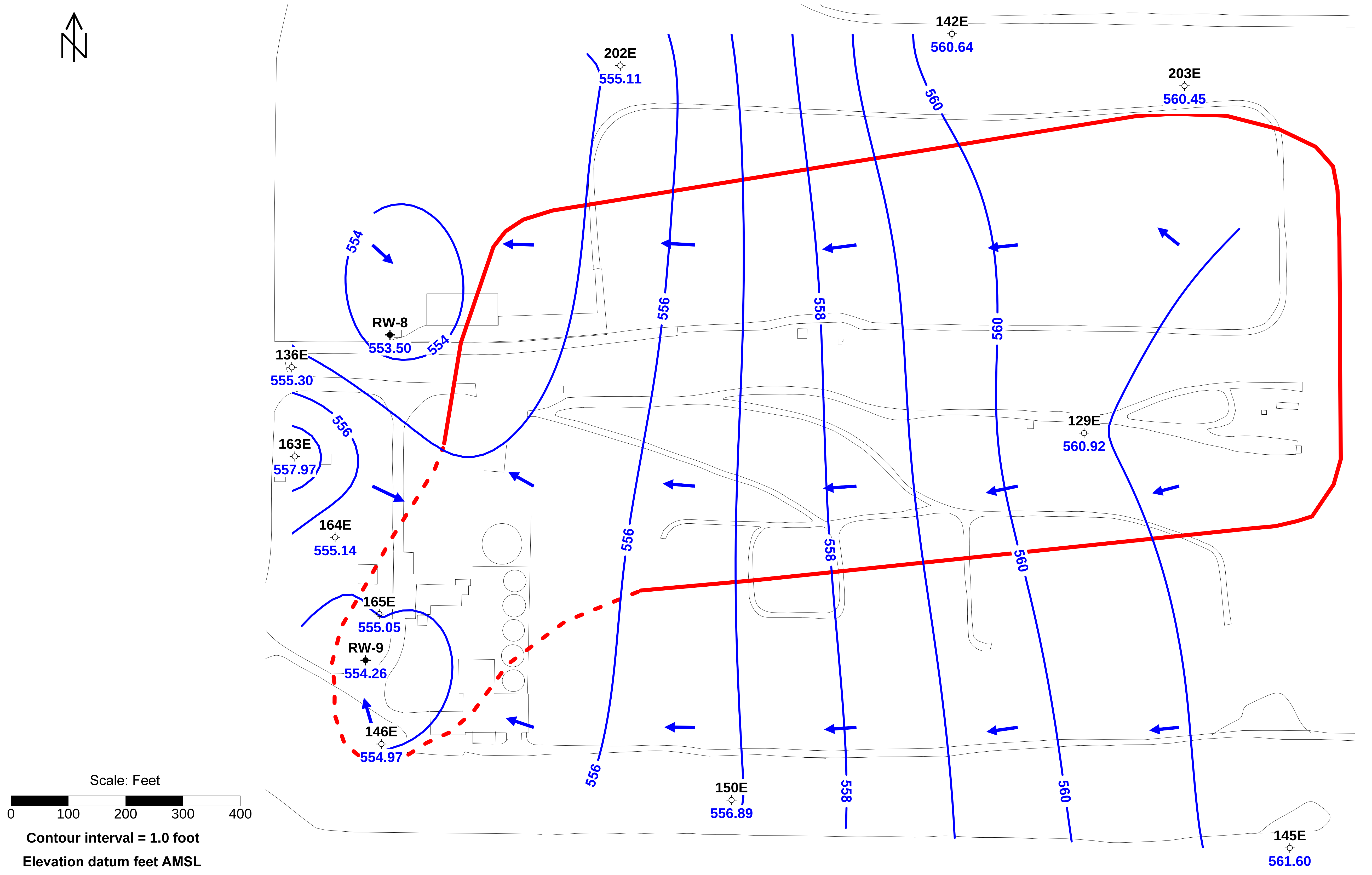
Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16
Job number: 449799.02020	

LEGEND

3B	Well ID		Potentiometric Contour
⌖	Monitoring Well	▭	Structure
✦	Pumping Well		Road
			Source Area Extent

Figure 3-12
Potentiometric Surface Map
Chemours Necco Park: D-Zone
November 8, 2016



Contour interval = 1.0 foot

Elevation datum feet AMSL

PARSONS

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(716) 541-0730

Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16
Job number: 449799.02020	

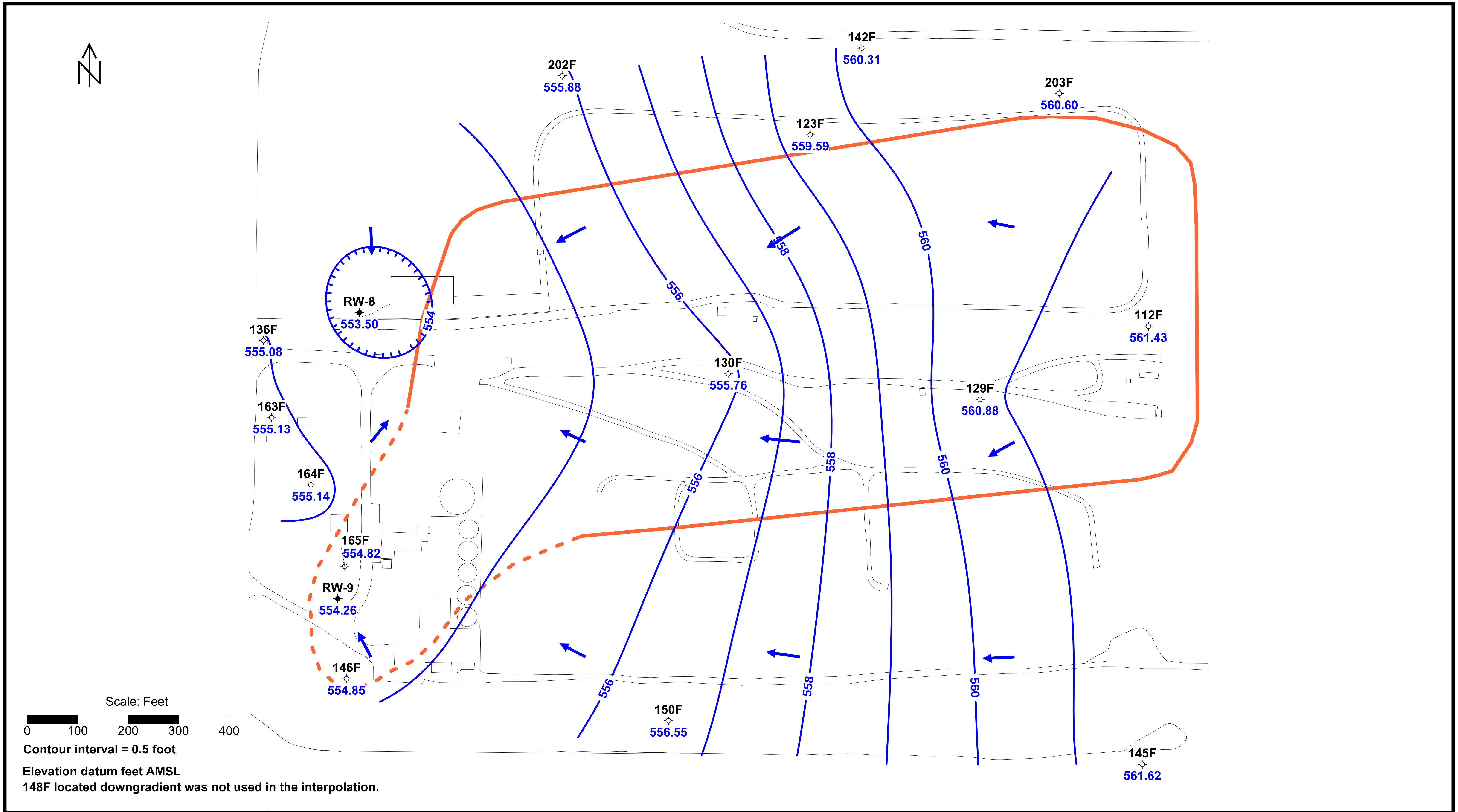
LEGEND

3B	**Well ID**		**Potentiometric Contour**
⌖	**Monitoring Well**	▭	**Structure**
✦	**Pumping Well**		**Road**

Source Area Extent

Figure 3-13
Potentiometric Surface Map
Chemours Necco Park: E-Zone
November 8, 2016

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2016-11-08 NEC Contour Tool/2016-11-08 - PZ E - F11.srf



Contour interval = 0.5 foot

Elevation datum feet AMSL
148F located downgradient was not used in the interpolation.

PARSONS

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

Created by: RBP	Date: 11-15-16
Checked by: JWS	Date: 11-28-16
Project Manager: EAF	Date: 11-28-16
Job number: 449799.02020	

LEGEND

3B	Well ID		Potentiometric Contour		Source Area Extent
⌖	Monitoring Well		Structure		
✦	Pumping Well		Road		

Figure 3-14
Potentiometric Surface Map
Chemours Necco Park: F-Zone
November 8, 2016

APPENDIX A
2016 ANNUAL GROUNDWATER SAMPLING RESULTS

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APPENDIX A
2016 Analytical Results - Monitoring Wells

	Location	137A	145A	146AR	150A	136B	137B	137B	145B	146B	150B	168B	171B	172B	145C
	Date	**08/23/2016**	**08/25/2016**	**08/24/2016**	**08/22/2016**	**08/25/2016**	**08/23/2016**	**08/23/2016**	**08/25/2016**	**08/24/2016**	**08/22/2016**	**08/23/2016**	**08/22/2016**	**08/18/2016**	**08/18/2016**
LabAnalyte	**Units**	**FS**	**FS**	**FS**	**FS**	**FS**	**FS**	**DUP**	**FS**	**FS**	**FS**	**FS**	**FS**	**FS**	**FS**
Field Parameter															
COLOR	**NONE**	NONE	Clear	Sl.tint	None	Brown	None	None	Clear	Clear	Sl tint	Slight	Sl. Tint	Sl tint	Sl black
DEPTH TO WATER	**Feet**	8.42	8.92	8.42	8.28	9.17	8.82	8.82	7.75	7.67	7.11	11.72	11.36	8.81	10.52
DISSOLVED OXYGEN	**MG/L**	0.38	2.8	0.15	1.06	0.34	0.54	0.54	0.57	0.23	0.65	0.08	2.94	0.9	0.26
ODOR	**NONE**	None	Slight	None	None	None	Slight	Slight	None	None	Slight	Slight	None	None	Slight
OXIDATION REDUCTION POTENTIAL	MV	-240	-111	-150	-23	-162	-263	-263	-136	-234	-283	-77	-142	-121	-241
PH	STD UNITS	9.98	7.83	8.33	7.59	7.55	10	10	8.39	9.57	8.83	7	7.11	7.12	7.72
SPECIFIC CONDUCTANCE	UMHOS/CM	4960	7170	1391	2190	2130	6910	6910	14330	913	2030	35200	15200	9740	2030
TEMPERATURE	DEGREES C	17.48	12.88	17.74	14.74	24.33	16.89	16.89	19.17	15.17	16.68	17.73	17.86	18.68	16.16
TURBIDITY QUANTITATIVE	NTU	4.82	2.37	3.64	1.7	38.4	2.14	2.14	6.58	1.81	1.28	1.8	5.84	5.7	17.9
Volatile Organics															
1,1,2,2-Tetrachloroethane	UG/L	<0.22	<0.22	<0.22	<0.22	<5.5	<0.55	<0.55	<5.5	<0.22	<1.1	<88	<2.2	45 J	<0.22
1,1,2-Trichloroethane	UG/L	<0.24	<0.24	<0.24	<0.24	<6	<0.6	<0.6	<6	<0.24	<1.2	<96	<2.4	<12	0.26 J
1,1-Dichloroethene	UG/L	5.6	<0.45	<0.45	<0.45	<11	9.8	8.9	<11	3.7	4.8 J	<180	<4.5	<23	<0.45
1,2-Dichloroethane	UG/L	1.4	<0.23	<0.23	<0.23	<5.8	3.7	3.4	<5.8	<0.23	<1.2	580	<2.3	<12	<0.23
Carbon Tetrachloride	UG/L	<0.43	<0.43	<0.43	<0.43	<11	<1.1	<1.1	<11	<0.43	<2.2	<170	<4.3	<22	<0.43
Chloroform	UG/L	1	<0.25	<0.25	<0.25	<6.3	<0.63	<0.63	18 J	<0.25	<1.3	<100	<2.5	42 J	<0.25
cis-1,2 Dichloroethene	UG/L	26	0.42 J	0.37 J	0.27 J	930	110	98	710	19	190	16000	110	1200	6.1
Methylene Chloride	UG/L	14	<0.33	<0.33	<0.33	<8.3	33	30	<8.3	<0.33	<1.7	5700	<3.3	20 B	0.64 B
Tetrachloroethene	UG/L	29	<0.31	<0.31	<0.31	510	65	60	<7.8	<0.31	13	<120	<3.1	120	0.31 J
trans-1,2-Dichloroethene	UG/L	2.5	<0.3	<0.3	<0.3	11 J	8.3	8	98	1.2	14	260 J	51	220	0.33 J
Trichloroethene	UG/L	42	<0.22	<0.22	<0.22	54	130	120	51	1.8	25	360 B	2.5 J	200	0.6 J
Vinyl Chloride	UG/L	17	0.59 J	2.2	<0.29	25	66	64	200	4.6	47	13000	190	270	2.9
Semivolatile Organics															
2,4,5-Trichlorophenol	UG/L	2.2 J	<0.29	0.47 J	<0.29	540	10	9.8	<0.3	22	31	<2.9	<1.4	<0.6	0.42 J
2,4,6-Trichlorophenol	UG/L	1.3 J	<0.23	<0.24	<0.23	58 J	2.1 J	2.1 J	<0.24	5.2 J	3.7 J	<2.3	<1.1	<0.48	<0.24
3- And 4- Methylphenol	UG/L	7.4 J	<0.76	<0.81	<0.76	<17	16 J	14 J	<0.81	3.4 J	11 J	130 J	<3.8	<1.6	<0.8
Hexachlorobenzene	UG/L	<0.081	<0.081	<0.086	<0.081	<1.8	<0.082	<0.084	<0.086	<0.081	<0.17	<0.81	<0.41	<0.17	<0.085
Hexachlorobutadiene	UG/L	1.9 J	<0.26	<0.27	<0.26	<5.7	1.7 J	1.4 J	<0.27	<0.26	<0.53	<2.6	1.5 J	48	<0.27
Hexachloroethane	UG/L	<0.18	<0.18	<0.19	<0.18	<4	<0.18	<0.19	<0.19	<0.18	<0.38	<1.8	<0.9	<0.38	<0.19
Pentachlorophenol	UG/L	1.6 J	<0.26	0.44 J	<0.26	560 J	7.6 J	4.8 J	<0.27	27 J	7.2 J	<2.6	<1.3	<0.54	<0.27
Phenol	UG/L	26	<0.57	<0.61	<0.57	<13	37	33 J	<0.61	<0.57	35	78 J	<2.9	<1.2	<0.6
Tentativley Identified Compound	UG/L	15 J	2.5 J	NS	NS	NS	38 J	30 J	21 J	2.2 J	37 J	7800 J	350 J	31 J	1.2 J
Inorganics															
Barium, dissolved	UG/L	2500	120 J	15 J	59 J	64 J	2700	2700	30 J	14 J	350	360	31 J	18 J	34 J
Chloride, total	UG/L	270000	2000000	310000	140000	220000	600000	610000	4800000	110000	540000	13000000	6400000	3100000	380000
Total VOCs		138.5	1.01	2.57	0.27	1530	425.8	392.3	1077	30.3	293.8	35540	353.5	2097	10.5

< Non detect at stated reporting limit. J Estimated concentration.
B Compound was found in the blank and sample. NS Not sampled

APPENDIX A
2016 Analytical Results - Monitoring Wells

	Location	146C	150C	168C	136D	136D	145D	148D	165D	146E	150E	165E	136F	146F	150F
	Date	08/24/2016	08/22/2016	08/23/2016	08/18/2016	08/18/2016	08/25/2016	08/25/2016	08/24/2016	08/18/2016	08/22/2016	08/24/2016	08/25/2016	08/24/2016	08/22/2016
LabAnalyte	Units	FS	FS	FS	FS	DUP	FS	FS	FS	FS	FS	FS	FS	FS	FS
Field Parameter															
COLOR	**NONE**	Sl. Black	None	Sl black	Clear	Clear	Sl.tint	Sl tint	Black tint	Sl black	Sl black	Sl. Tint	Clear	Sl. Tint	None
DEPTH TO WATER	**Feet**	9.13	11.36	16.83	25.08	25.08	15.34	11.09	15.77	21.18	21.31	22.63	25.21	21.41	20.43
DISSOLVED OXYGEN	**MG/L**	0.38	1.37	2.21	0.34	0.34	1.32	0.24	0.3	1.04	11.82	0.22	0.21	0.66	4.48
ODOR	**NONE**	None	None	Strong	None	None	None	None	None	Strong	Strong	None	None	Slight	None
OXIDATION REDUCTION POTENTIAL	MV	-162	-186	-257	-306	-306	-343	-242	-194	-297	-242	-344	-119	-283	-146
PH	STD UNITS	7.99	7.5	7.3	8.79	8.79	7.55	9.3	8.46	7.68	6.76	8.34	8.11	8.67	7.75
SPECIFIC CONDUCTANCE	UMHOS/CM	1540	6220	69900	823	823	30300	1338	1216	3840	18200	1294	937	3680	24500
TEMPERATURE	DEGREES C	16.62	14.83	15.55	14.21	14.21	19.27	17.42	16.8	13.28	13.07	12.98	16.48	12.53	13.6
TURBIDITY QUANTITATIVE	NTU	5.19	2.81	3.87	4.5	4.5	2.9	3.54	8.87	2.09	2.39	4.9	4.3	6.07	4.55
Volatile Organics															
1,1,2,2-Tetrachloroethane	UG/L	<0.29	<0.22	1300	<0.88	<1.1	<8.8	<0.22	<0.22	170 J	<2.8	<11	<0.22	<4.4	<2.8
1,1,2-Trichloroethane	UG/L	<0.32	<0.24	1400	<0.96	<1.2	<9.6	<0.24	<0.24	220 J	<3	57	<0.24	<4.8	<3
1,1-Dichloroethene	UG/L	4.9	<0.45	150	<1.8	<2.3	<18	<0.45	<0.45	<110	30	<23	<0.45	<9	<5.6
1,2-Dichloroethane	UG/L	<0.31	<0.23	130	2 J	2.1 J	14 J	<0.23	0.45 J	79 J	<2.9	26 J	2.8	6 J	<2.9
Carbon Tetrachloride	UG/L	<0.57	<0.43	470	<1.7	<2.2	<17	<0.43	<0.43	<110	<5.4	<22	<0.43	<8.6	<5.4
Chloroform	UG/L	<0.33	<0.25	770	<1	<1.3	<10	<0.25	<0.25	210 J	15	<13	<0.25	<5	<3.1
cis-1,2 Dichloroethene	UG/L	33	2.5	720	48	47	530	3.1	1.8	7100	780	1400	1.4	420	18
Methylene Chloride	UG/L	<0.44	<0.33	3300	1.4 B	1.8 B	360	<0.33	<0.33	570 B	33	270	<0.33	150	<4.1
Tetrachloroethene	UG/L	<0.41	<0.31	420	<1.2	<1.6	<12	0.63 J	<0.31	<78	<3.9	<16	0.7 J	<6.2	<3.9
trans-1,2-Dichloroethene	UG/L	9.6	15	170	2.9 J	3 J	<12	0.3 J	0.3 J	360	35	<15	1.2	<6	<3.8
Trichloroethene	UG/L	3.7	1.1	2900	2.3 J	2.1 J	<8.8	1.2	<0.22	230 J	23	<11	0.69 J	<4.4	<2.8
Vinyl Chloride	UG/L	24	3.3	350	75	73	910	<0.29	3.5	5800	520	330	32	120	350
Semivolatile Organics															
2,4,5-Trichlorophenol	UG/L	5.1 J	<0.29	<2.9	2.2 J	13 J	<1.1	0.62 J	36	1100	1.4 J	680	1.1 J	670	<1.4
2,4,6-Trichlorophenol	UG/L	7.1 J	<0.23	<2.3	0.67 J	1.4 J	<0.91	<0.23	3.6 J	170 J	0.96 J	33 J	0.88 J	<4.6	<1.1
3- And 4- Methylphenol	UG/L	1.1 J	<0.76	13 J	<0.76	<0.77	12 J	27	3.7 J	32 J	20 J	<15	<0.78	19 J	17 J
Hexachlorobenzene	UG/L	<0.088	<0.081	<0.81	<0.081	<0.082	<0.32	<0.081	<0.084	<2	<0.33	<1.6	<0.083	<1.6	<0.41
Hexachlorobutadiene	UG/L	0.29 J	<0.26	16 J	<0.26	<0.26	<1	<0.26	<0.26	12 J	<1.1	<5.1	<0.26	<5.1	<1.3
Hexachloroethane	UG/L	<0.2	<0.18	5.4 J	<0.18	<0.18	<0.72	<0.18	<0.19	<4.5	<0.75	<3.6	<0.18	<3.6	<0.9
Pentachlorophenol	UG/L	0.38 J	<0.26	<2.6	<0.26	0.61 J	<1	<0.26	<0.26	<6.4	<1.1	<5.1	<0.26	<5.1	<1.3
Phenol	UG/L	<0.62	<0.57	53 J	<0.57	<0.58	15 J	13	1.3 J	<14	140	<11	<0.58	35 J	70
Tentativley Identified Compound	UG/L	9.5 J	5.3 J	7300 J	3.7 J	11 J	1100 J	NS	7.3 J	390 J	1500 J	130 J	NS	750 J	2600 J
Inorganics															
Barium, dissolved	UG/L	30 J	19 J	280	49 J	50 J	710	33 J	12 J	63 J	61 J	29 J	14 J	24 J	57 J
Chloride, total	UG/L	180000	1300000	31000000	210000	210000	12000000	280000	360000	680000	6200000	390000	260000	1100000	9400000
Total VOCs		75.2	21.9	12080	130.2	127.2	1814	5.23	6.05	14169	1436	2083	38.79	696	368

< Non detect at stated reporting limit. J Estimated concentration.
B Compound was found in the blank and sample. NS Not sampled

APPENDIX A
2016 Analytical Results - Monitoring Wells

	Location	**EB**	**EB**	**EB**	**EB**	**EB**	**TB**	**TB**	**TB**	**TB**	**TB**
	Date	**08/18/2016**	**08/22/2016**	**08/23/2016**	**08/24/2016**	**08/25/2016**	**08/18/2016**	**08/22/2016**	**08/23/2016**	**08/24/2016**	**08/25/2016**
LabAnalyte	**Units**	**EB**	**EB**	**EB**	**EB**	**EB**	**TB**	**TB**	**TB**	**TB**	**TB**
Field Parameter											
COLOR	**NONE**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DEPTH TO WATER	**Feet**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DISSOLVED OXYGEN	**MG/L**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
ODOR	**NONE**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
OXIDATION REDUCTION POTENTIAL	MV	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
PH	STD UNITS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SPECIFIC CONDUCTANCE	UMHOS/CM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TEMPERATURE	DEGREES C	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TURBIDITY QUANTITATIVE	NTU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Volatile Organics											
1,1,2,2-Tetrachloroethane	UG/L	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
1,1,2-Trichloroethane	UG/L	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
1,1-Dichloroethene	UG/L	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
1,2-Dichloroethane	UG/L	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23	<0.23
Carbon Tetrachloride	UG/L	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43
Chloroform	UG/L	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
cis-1,2 Dichloroethene	UG/L	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
Methylene Chloride	UG/L	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Tetrachloroethene	UG/L	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31	<0.31
trans-1,2-Dichloroethene	UG/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Trichloroethene	UG/L	<0.22	<0.22	0.38 J	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
Vinyl Chloride	UG/L	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29
Semivolatile Organics											
2,4,5-Trichlorophenol	UG/L	<0.3	<0.29	<0.29	<0.29	<0.29	NS	NS	NS	NS	NS
2,4,6-Trichlorophenol	UG/L	<0.24	<0.23	<0.23	<0.23	<0.23	NS	NS	NS	NS	NS
3- And 4- Methylphenol	UG/L	<0.8	<0.76	<0.76	<0.76	<0.76	NS	NS	NS	NS	NS
Hexachlorobenzene	UG/L	<0.085	<0.081	<0.081	<0.081	<0.081	NS	NS	NS	NS	NS
Hexachlorobutadiene	UG/L	<0.27	<0.26	<0.26	<0.26	<0.26	NS	NS	NS	NS	NS
Hexachloroethane	UG/L	<0.19	<0.18	<0.18	<0.18	<0.18	NS	NS	NS	NS	NS
Pentachlorophenol	UG/L	<0.27	<0.26	<0.26	<0.26	<0.26	NS	NS	NS	NS	NS
Phenol	UG/L	<0.6	<0.57	<0.57	<0.57	<0.57	NS	NS	NS	NS	NS
Tentativley Identified Compound	UG/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Inorganics											
Barium, dissolved	UG/L	<2.4	<2.4	<2.4	<2.4	<2.4	NS	NS	NS	NS	NS
Chloride, total	UG/L	<410	<410	<410	<410	<410	NS	NS	NS	NS	NS
Total VOCs		0	0	0.38	0	0	0	0	0	0	0

< Non detect at stated reporting limit. J Estimated concentration.
B Compound was found in the blank and sample. NS Not sampled

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APPENDIX B
TVOC TREND PLOTS

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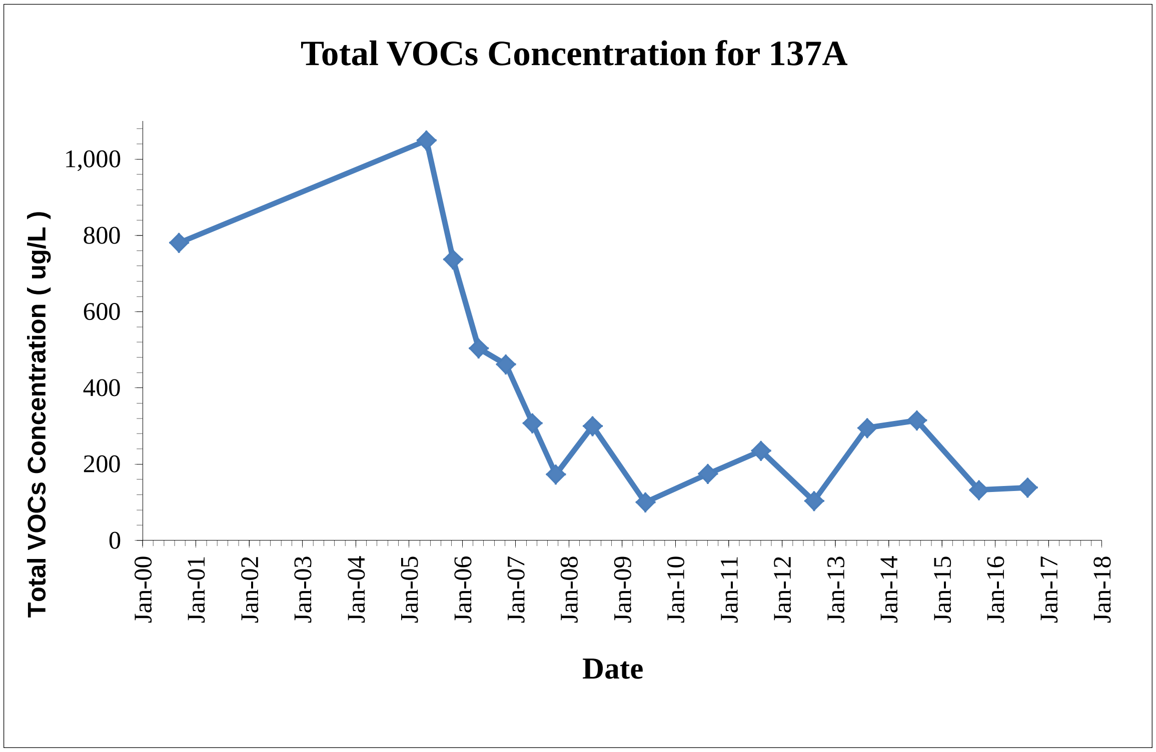
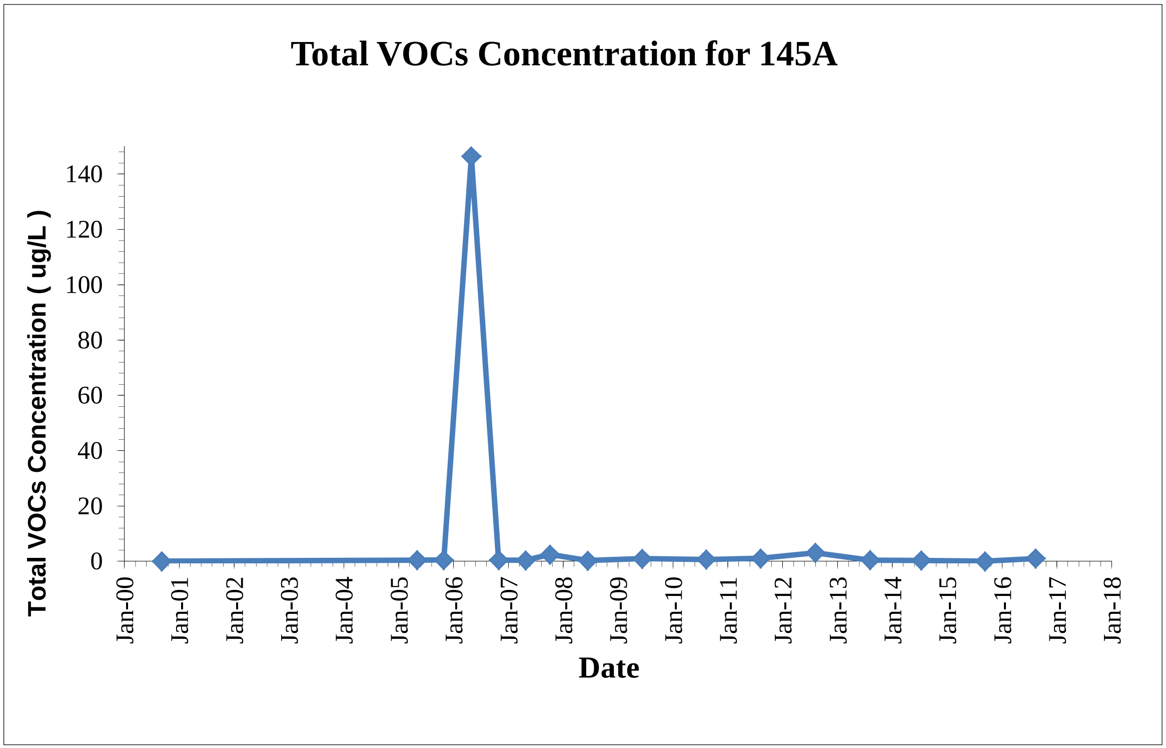
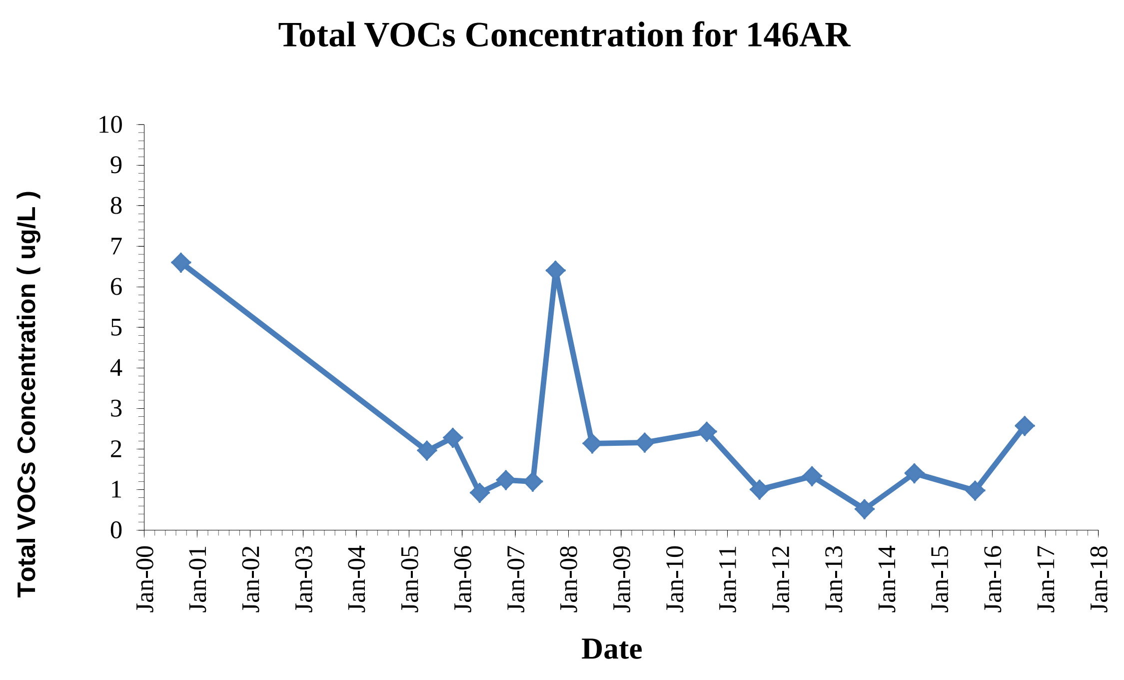
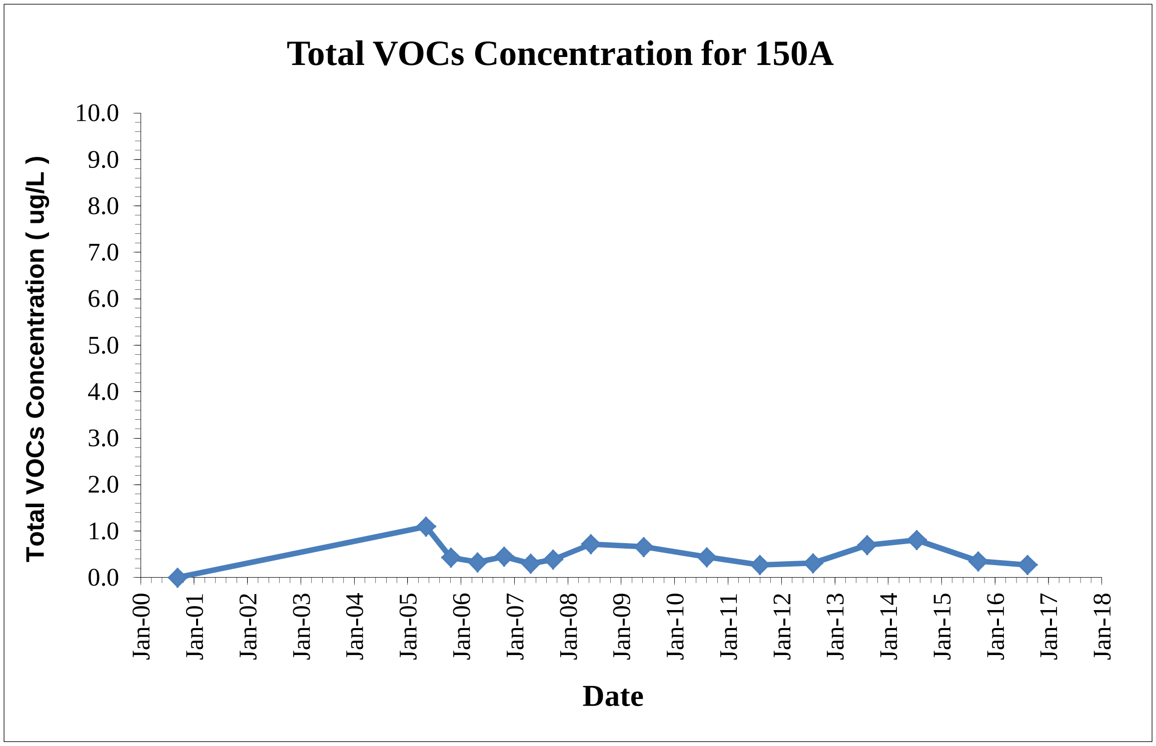
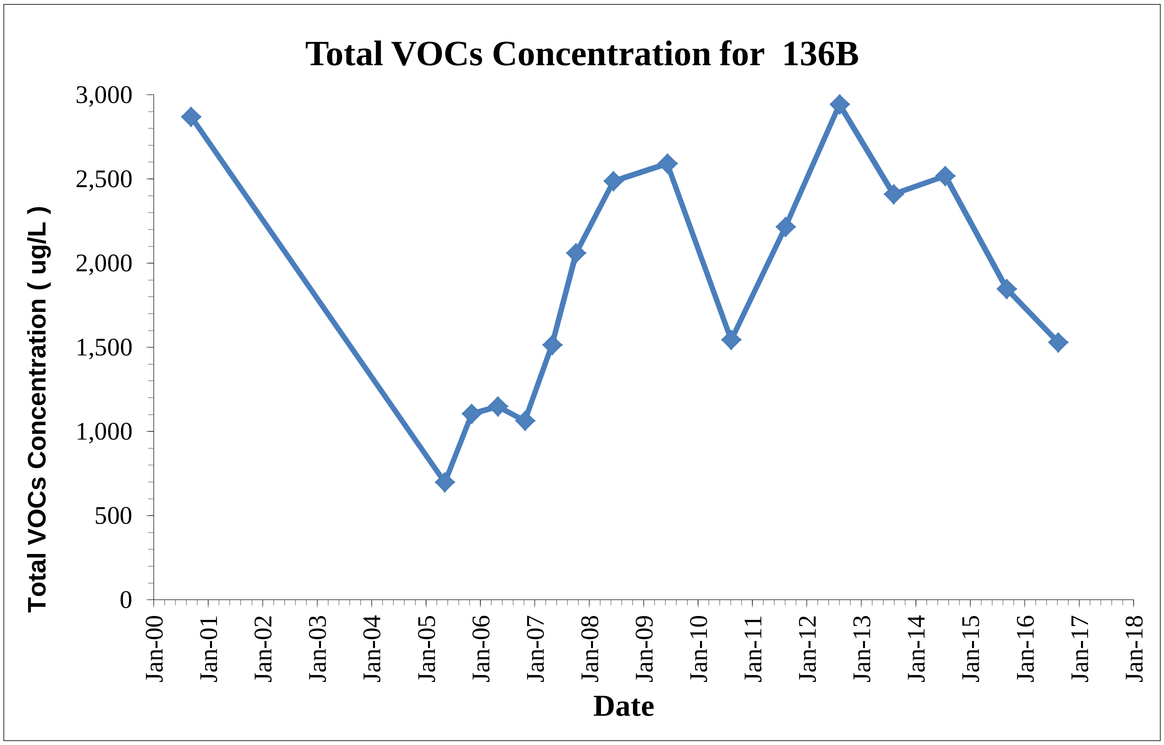
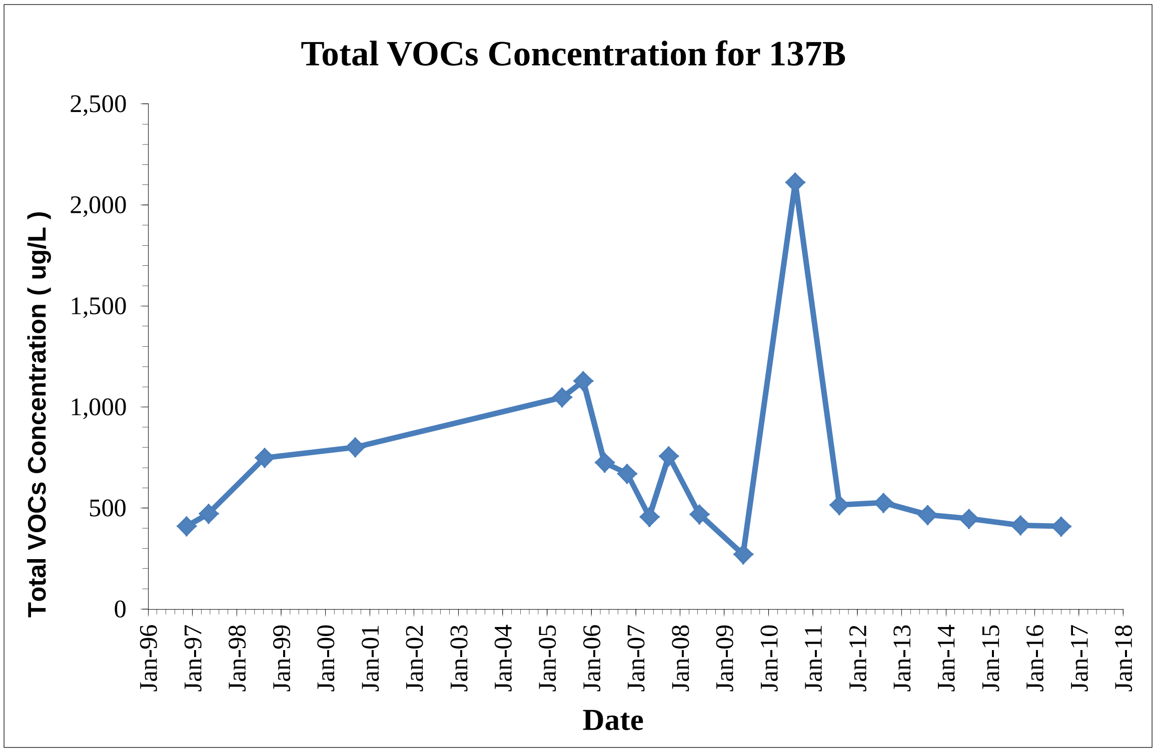

Total VOCs Concentration for 137A
Total VOCs Concentration (ug/L)
1,000
800
600
400
200
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

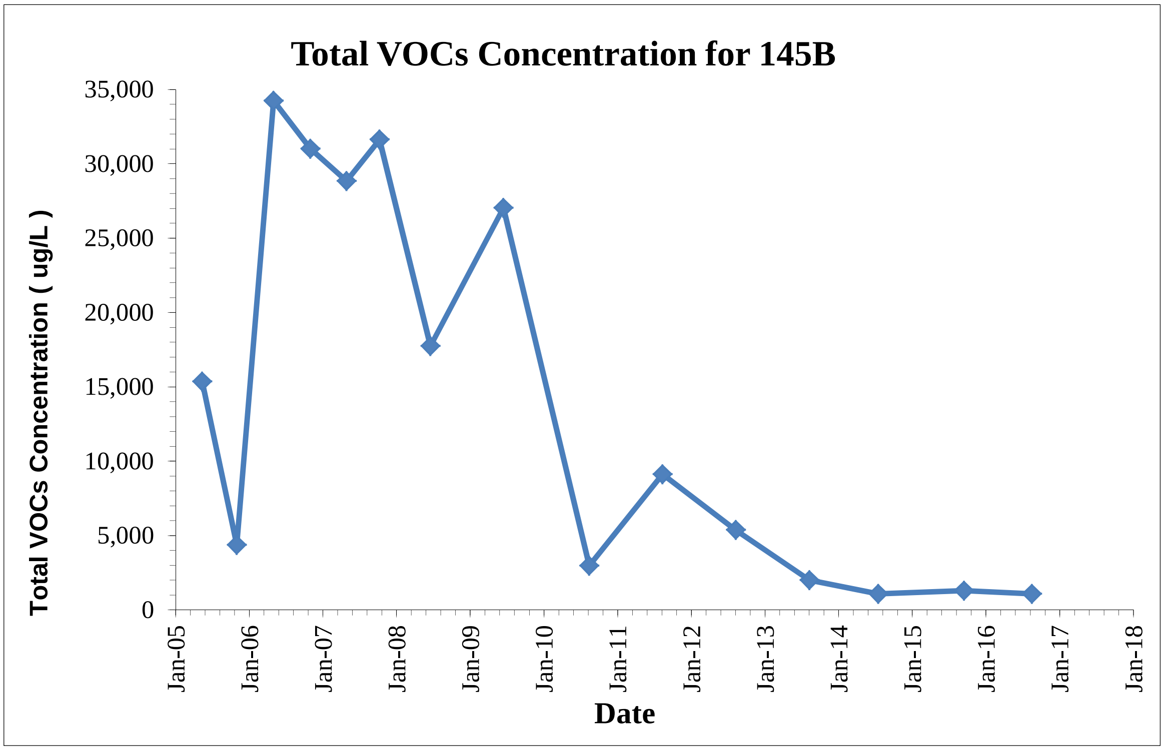

Total VOCs Concentration for 145A
Total VOCs Concentration (ug/L)
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

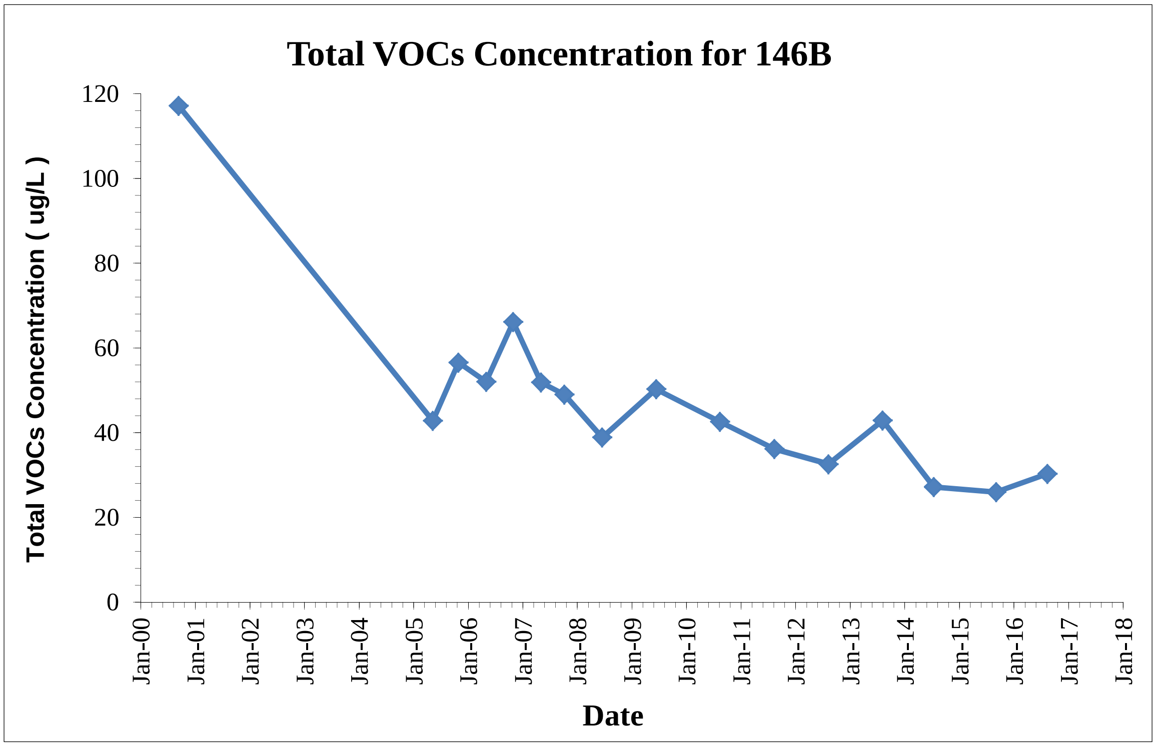

Total VOCs Concentration for 146AR
Total VOCs Concentration (ug/L)
10
9
8
7
6
5
4
3
2
1
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

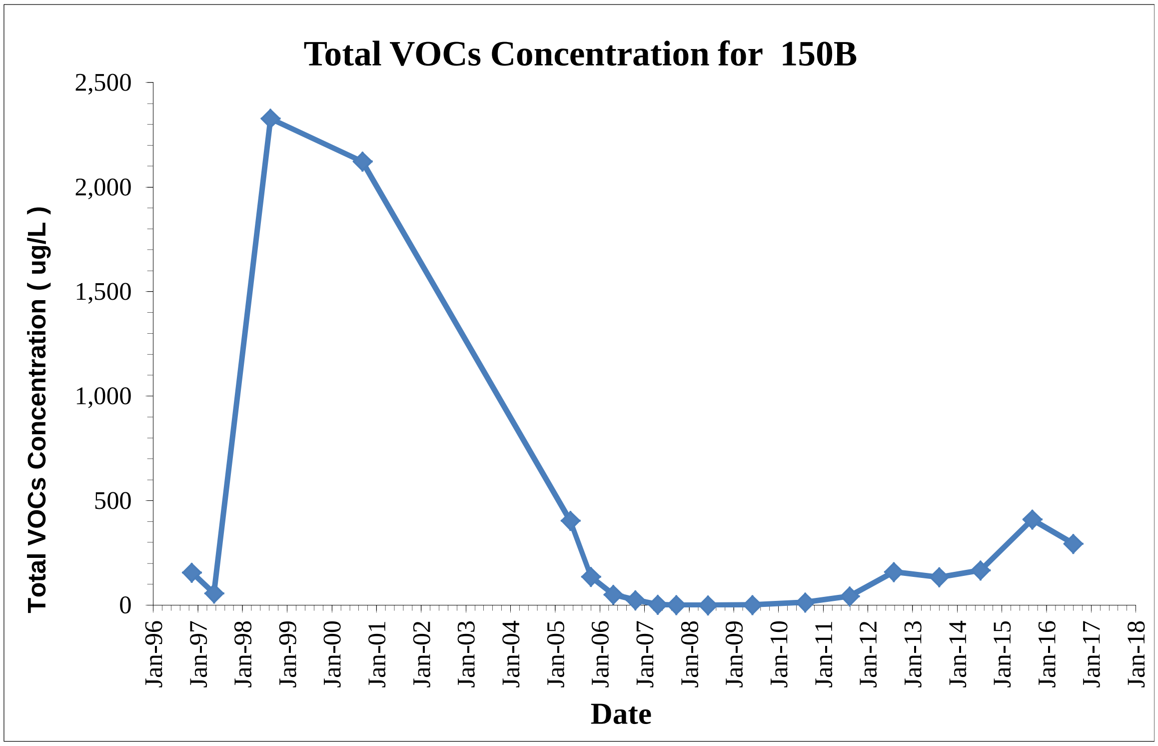

Total VOCs Concentration for 150A
Total VOCs Concentration (ug/L)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

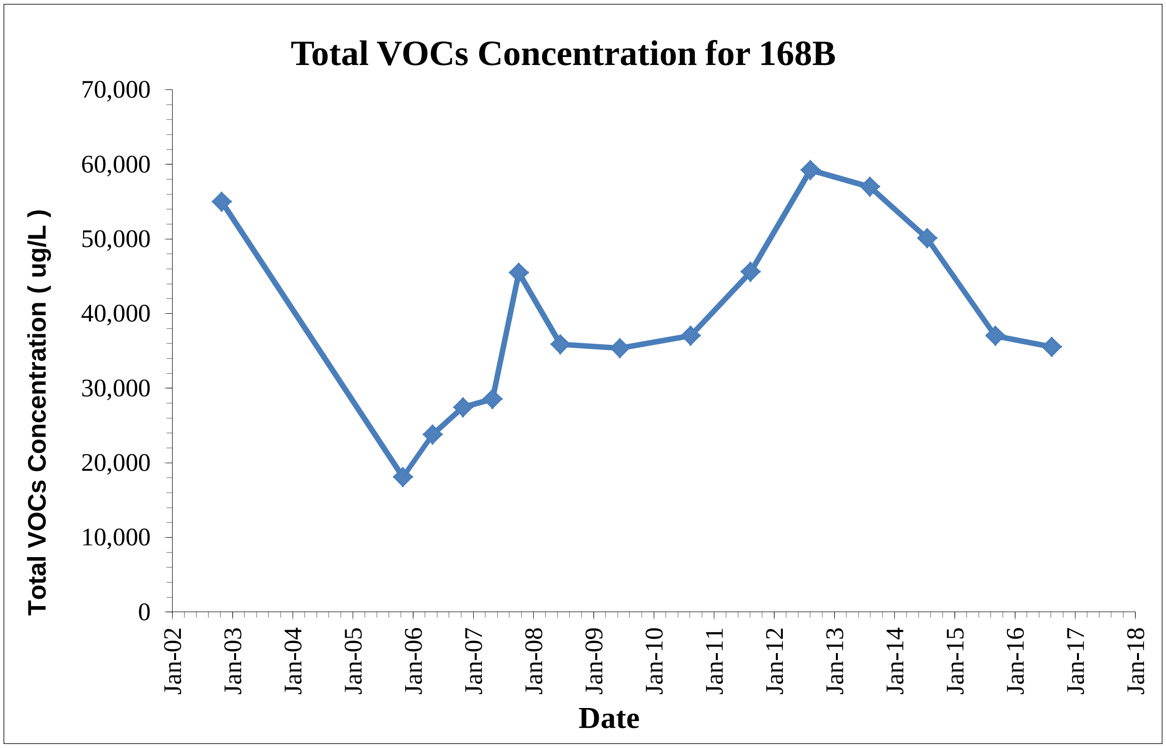

Total VOCs Concentration for 136B
Total VOCs Concentration (ug/L)
3,000
2,500
2,000
1,500
1,000
500
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

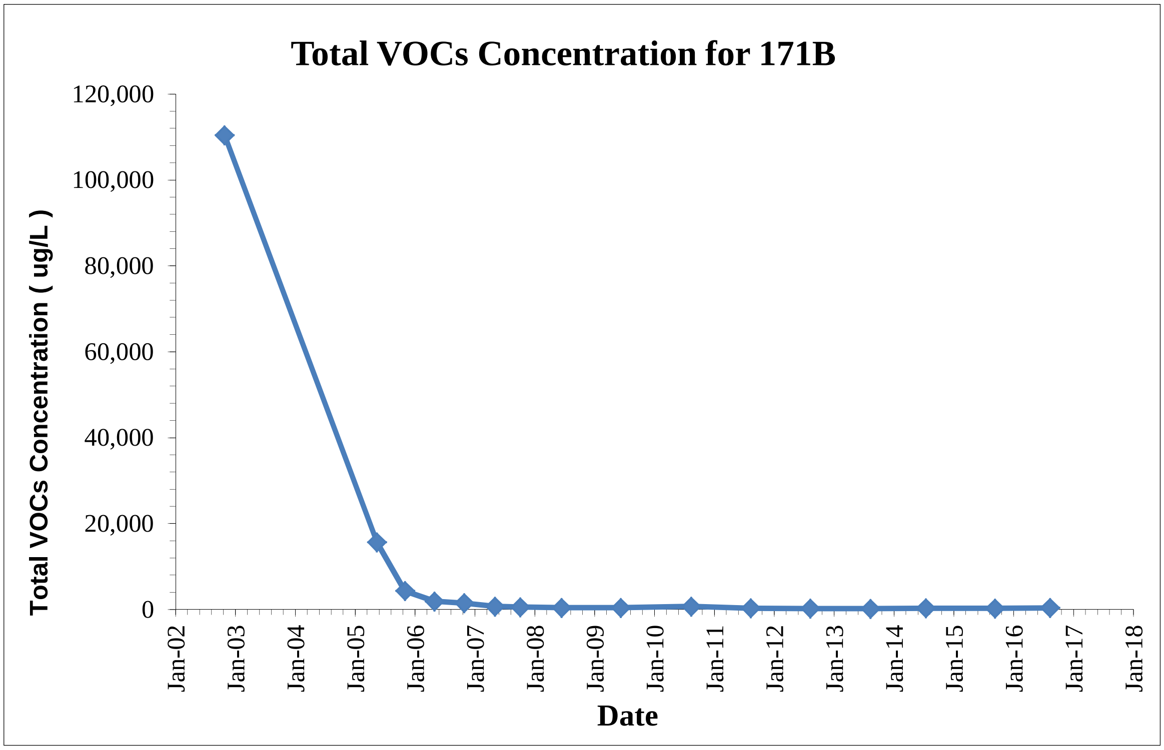

Total VOCs Concentration for 137B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

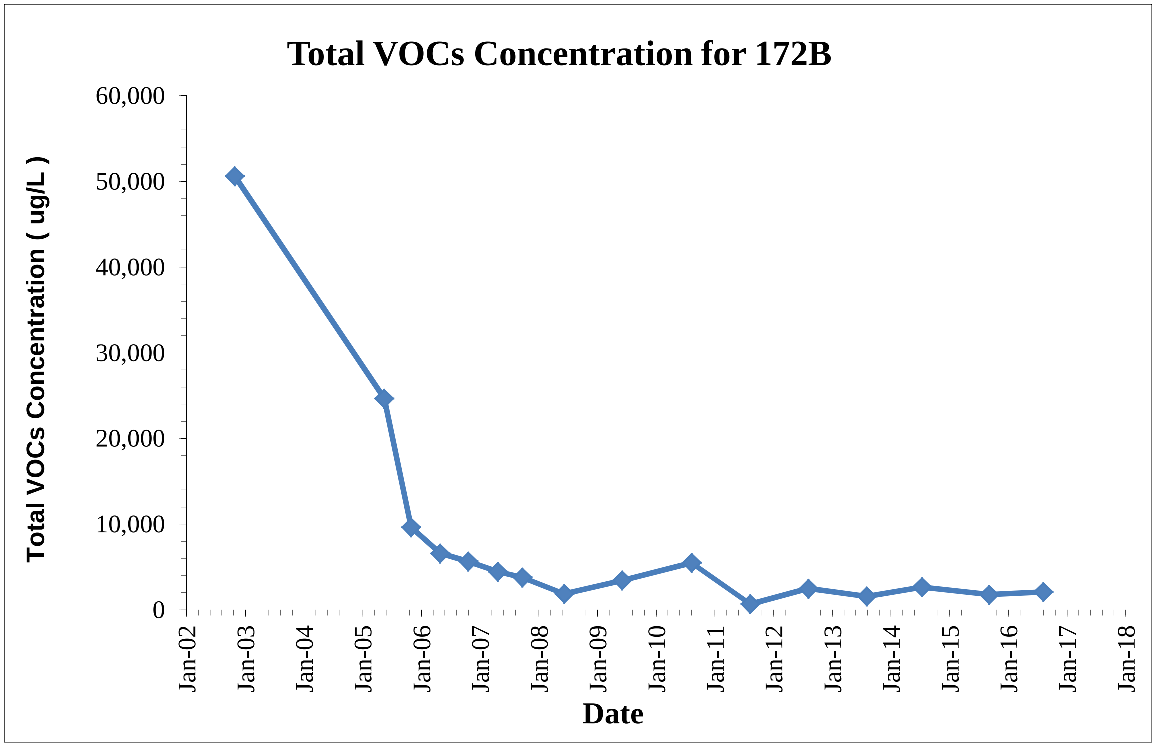

Total VOCs Concentration for 145B
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

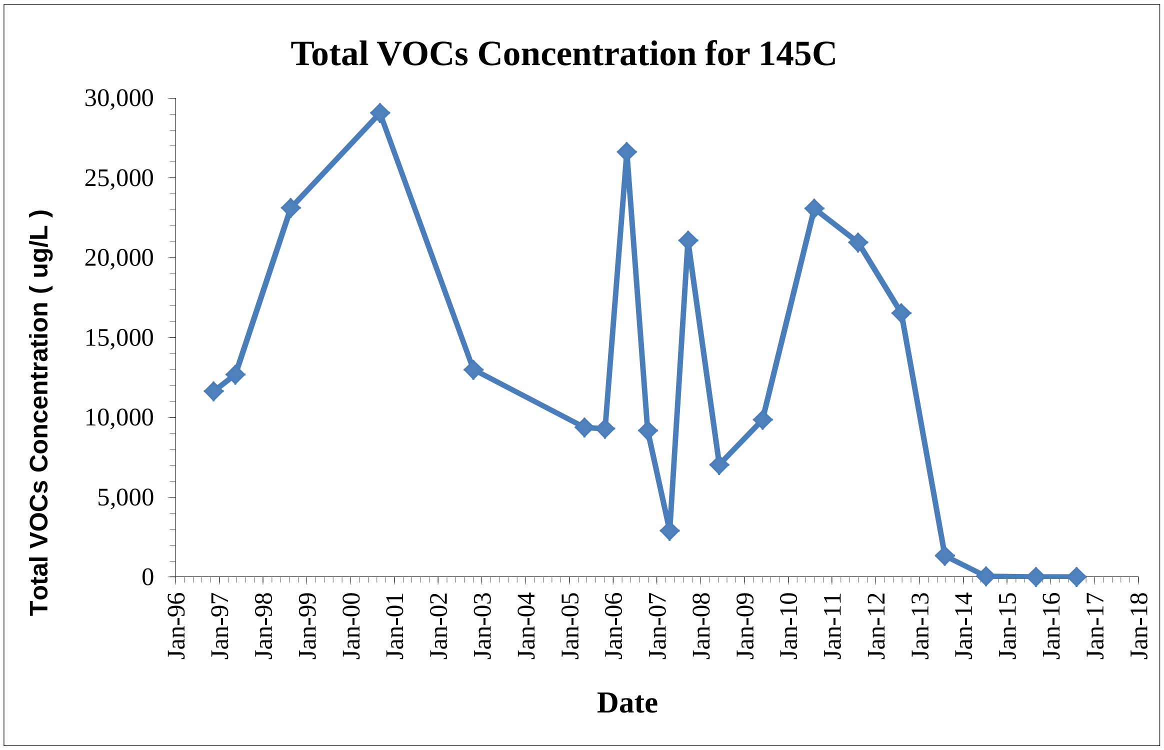

Total VOCs Concentration for 146B
Total VOCs Concentration (ug/L)
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

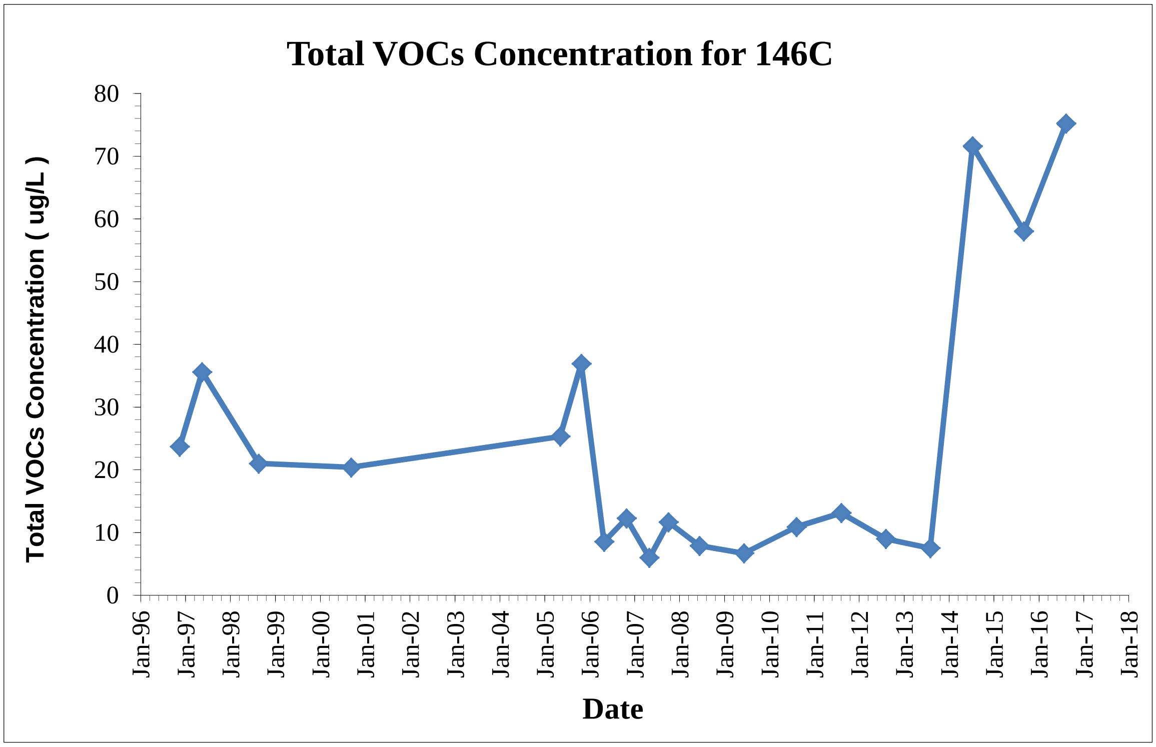

Total VOCs Concentration for 150B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

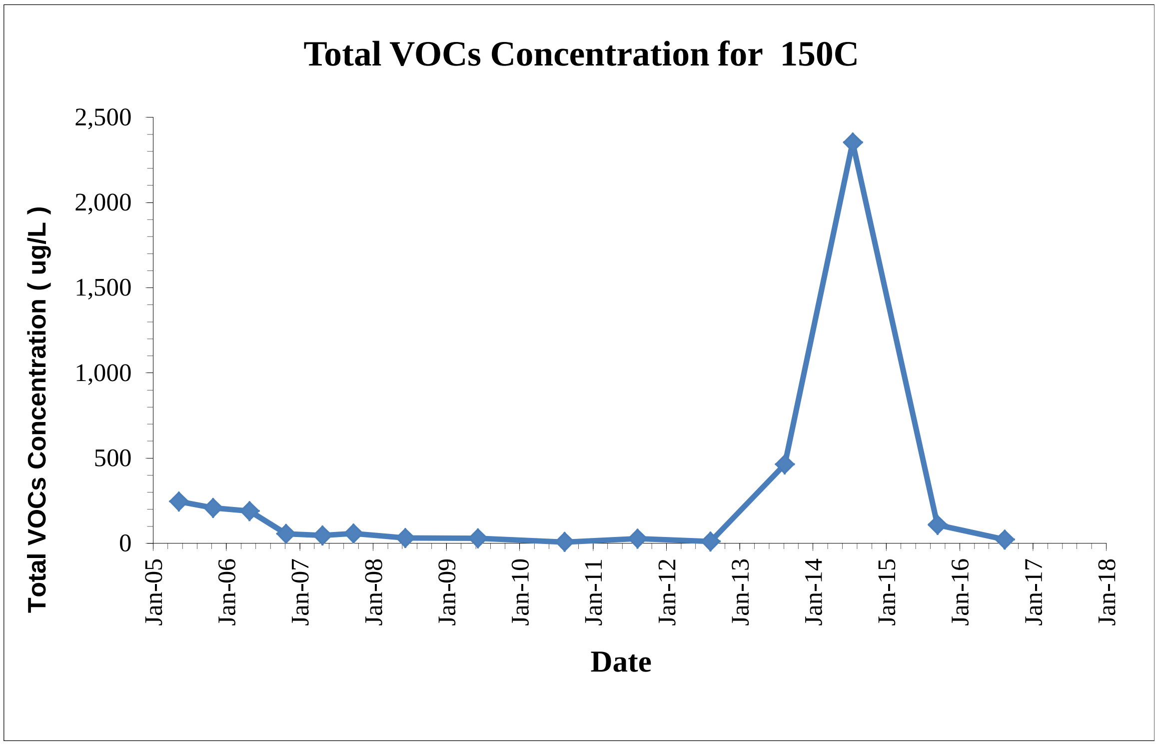

Total VOCs Concentration for 168B
Total VOCs Concentration (ug/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

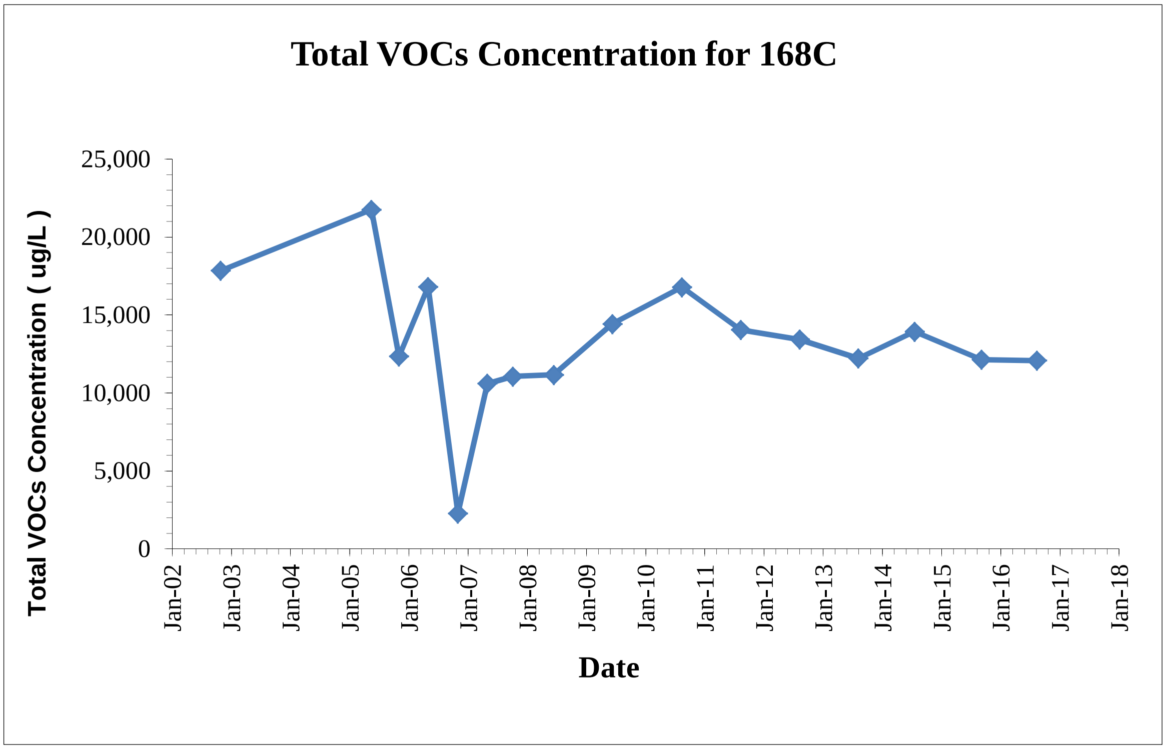

Total VOCs Concentration for 171B
Total VOCs Concentration (ug/L)
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date


Total VOCs Concentration for 172B
Total VOCs Concentration (ug/L)
60,000
50,000
40,000
30,000
20,000
10,000
0
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
Jan-17
Jan-18
Date

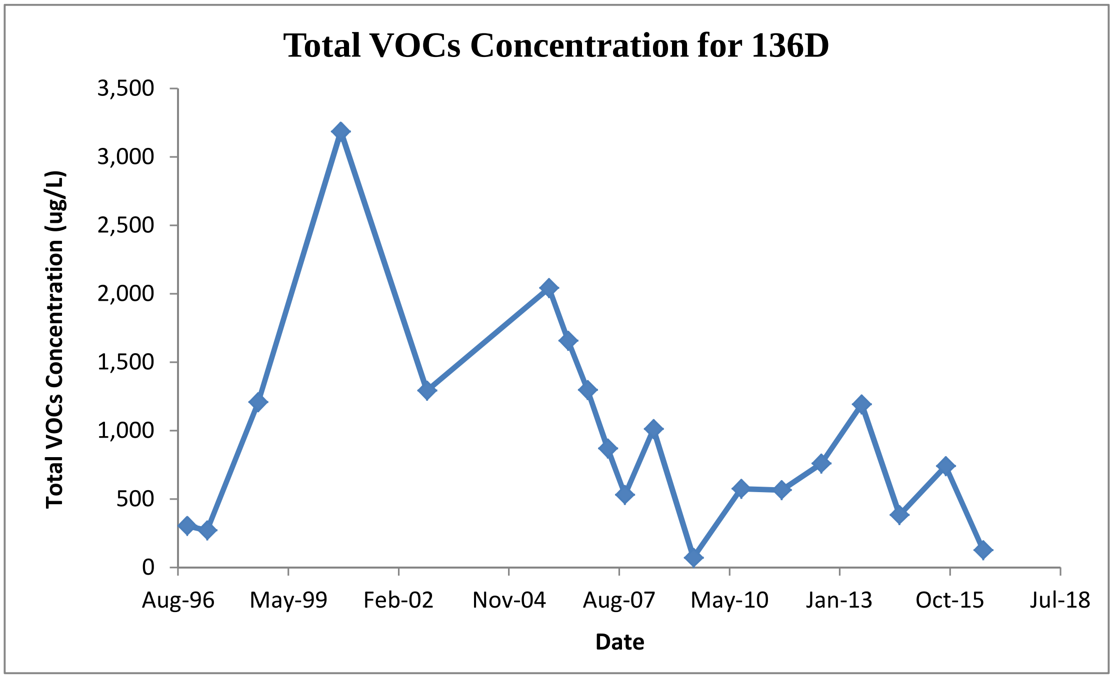

Total VOCs Concentration for 145C
Total VOCs Concentration (ug/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

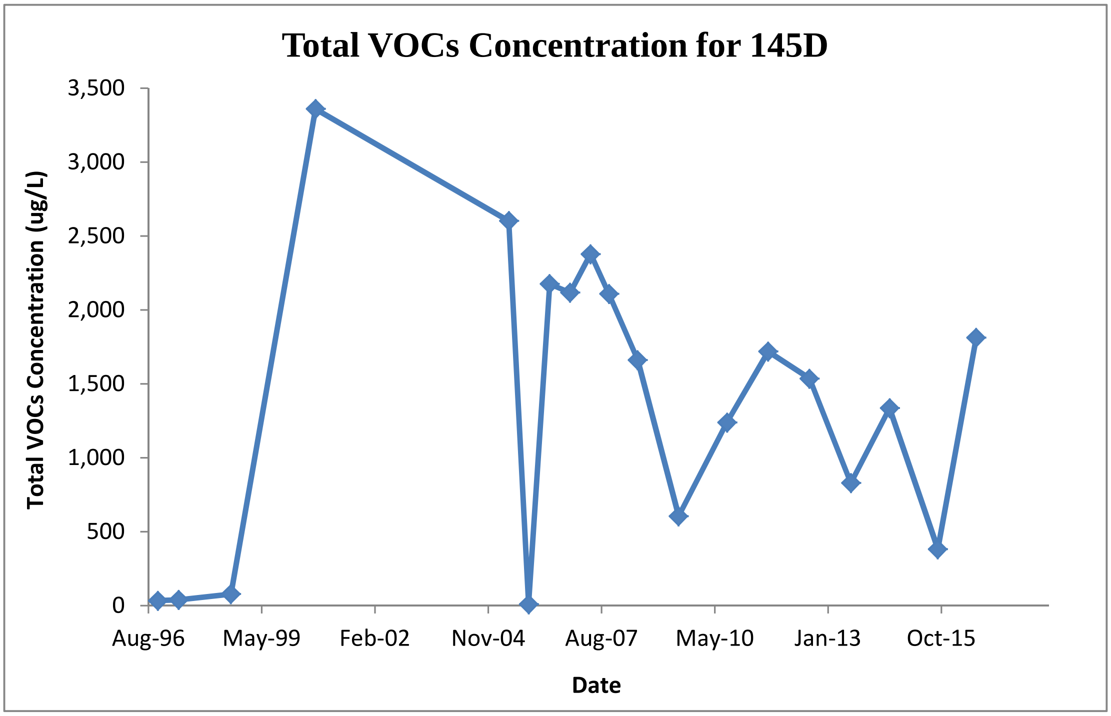

Total VOCs Concentration for 146C
Total VOCs Concentration (ug/L)
80
70
60
50
40
30
20
10
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date


Total VOCs Concentration for 150C
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

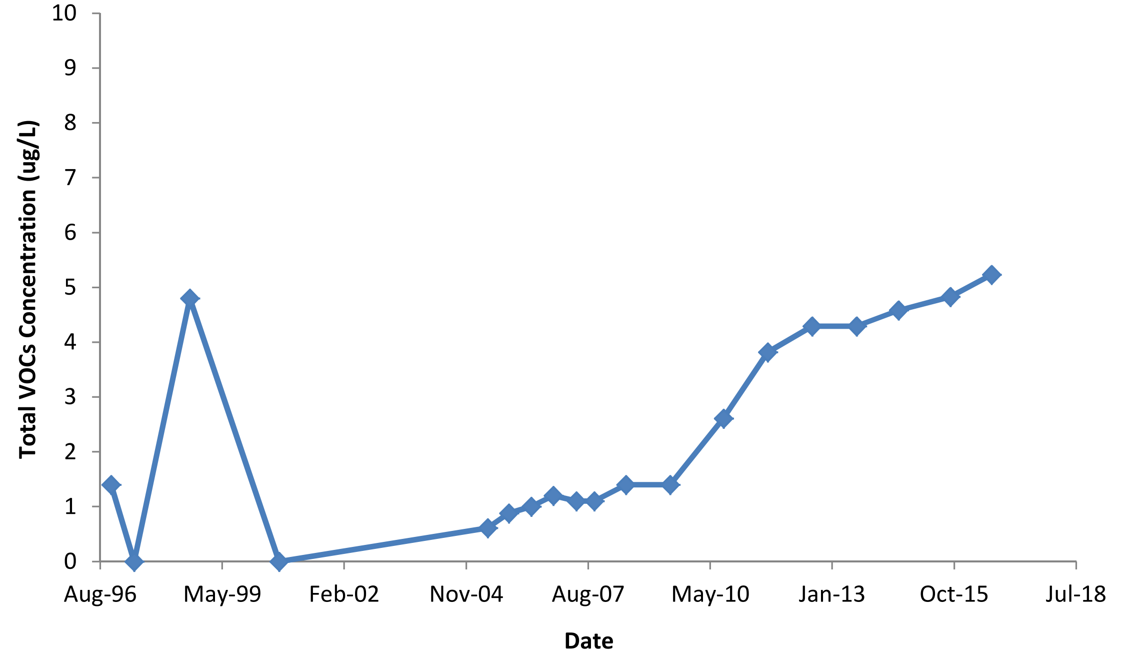

Total VOCs Concentration for 168C
Total VOCs Concentration (ug/L)
25,000
20,000
15,000
10,000
5,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Date

Appendix B
D-Zone TVOC Graphs

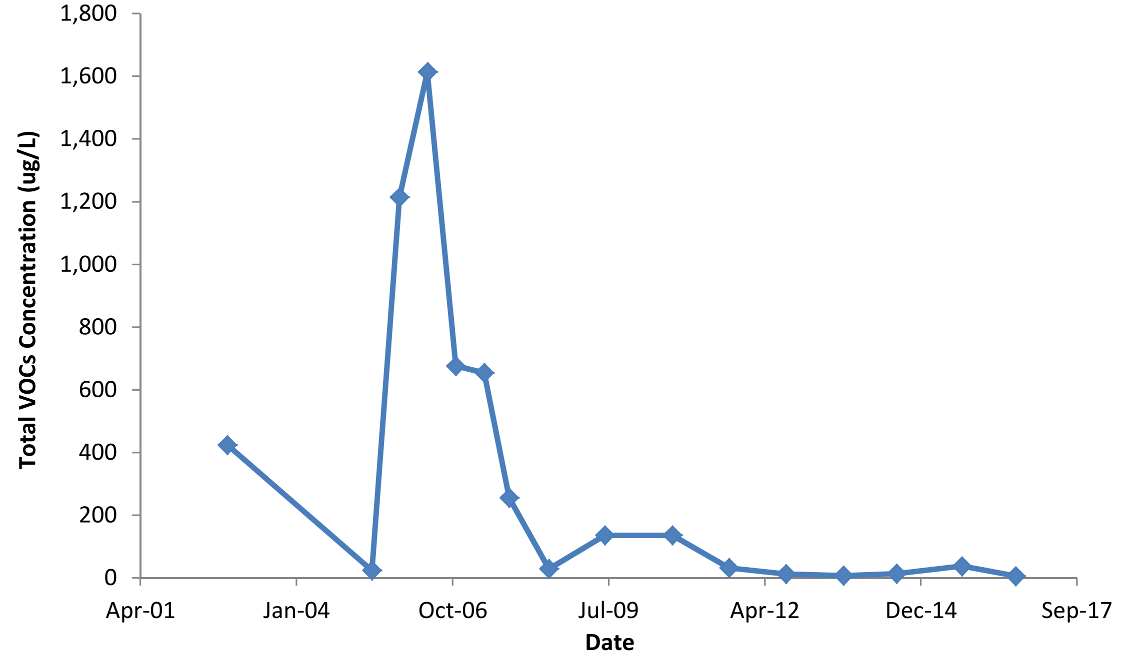


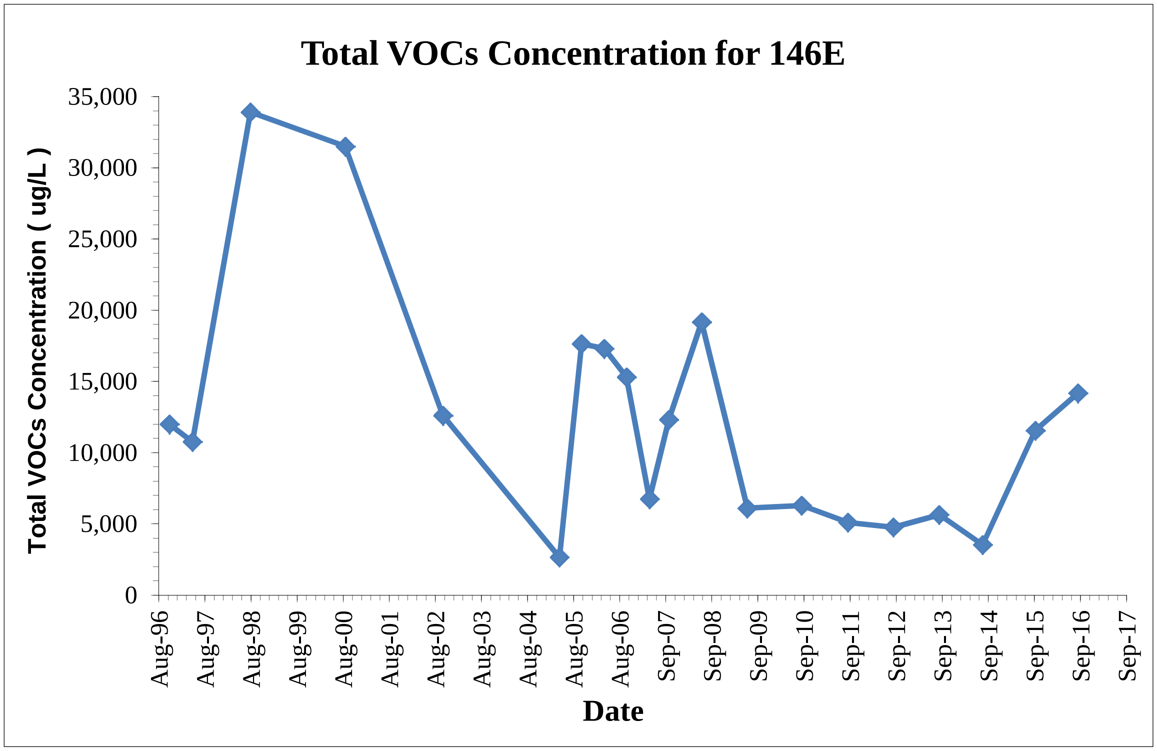


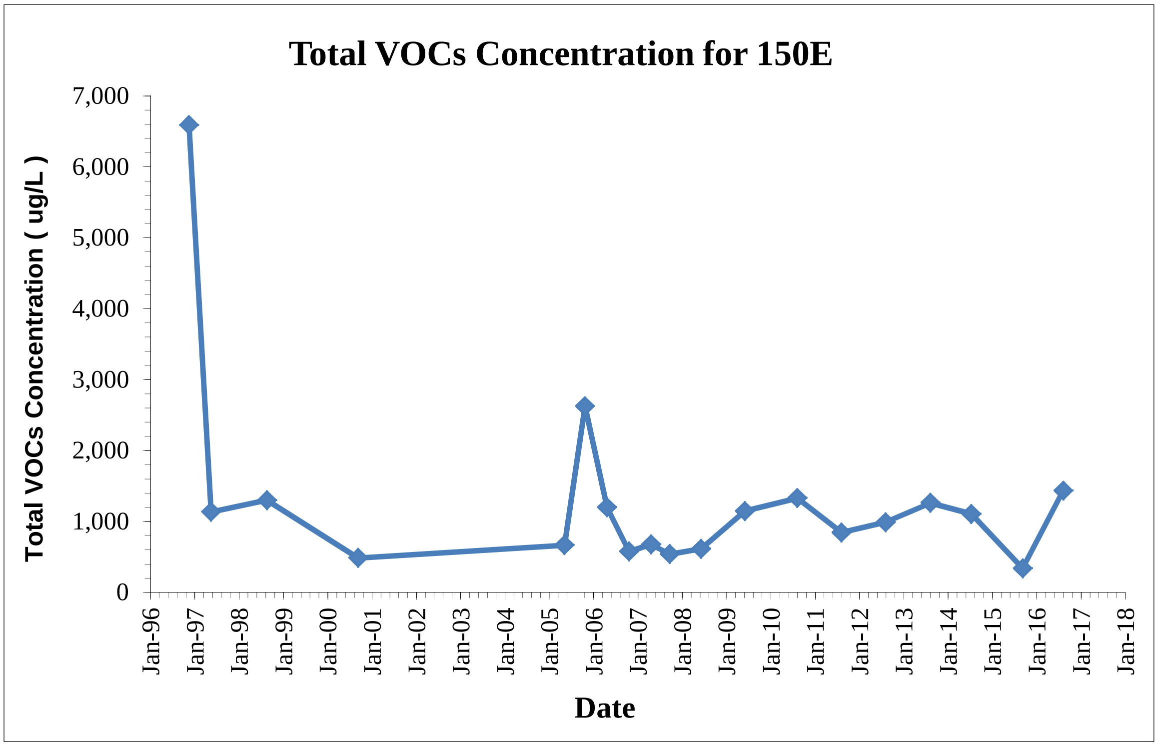
Total VOCs Concentration for 148D

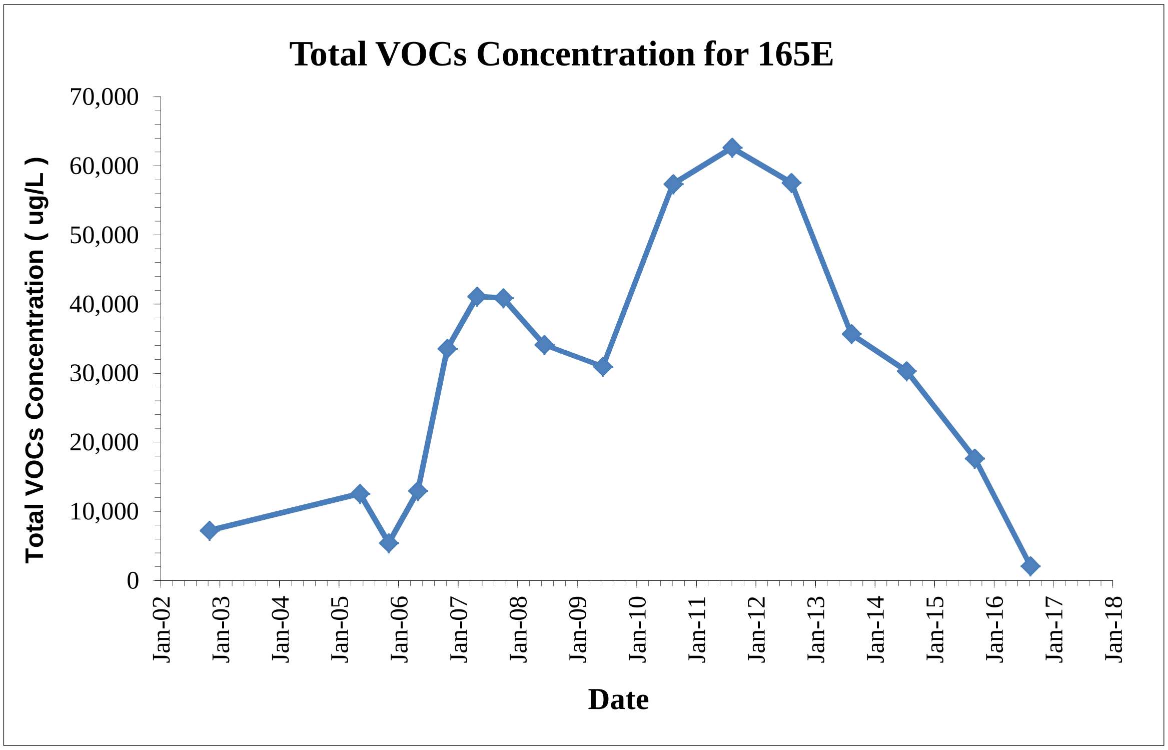


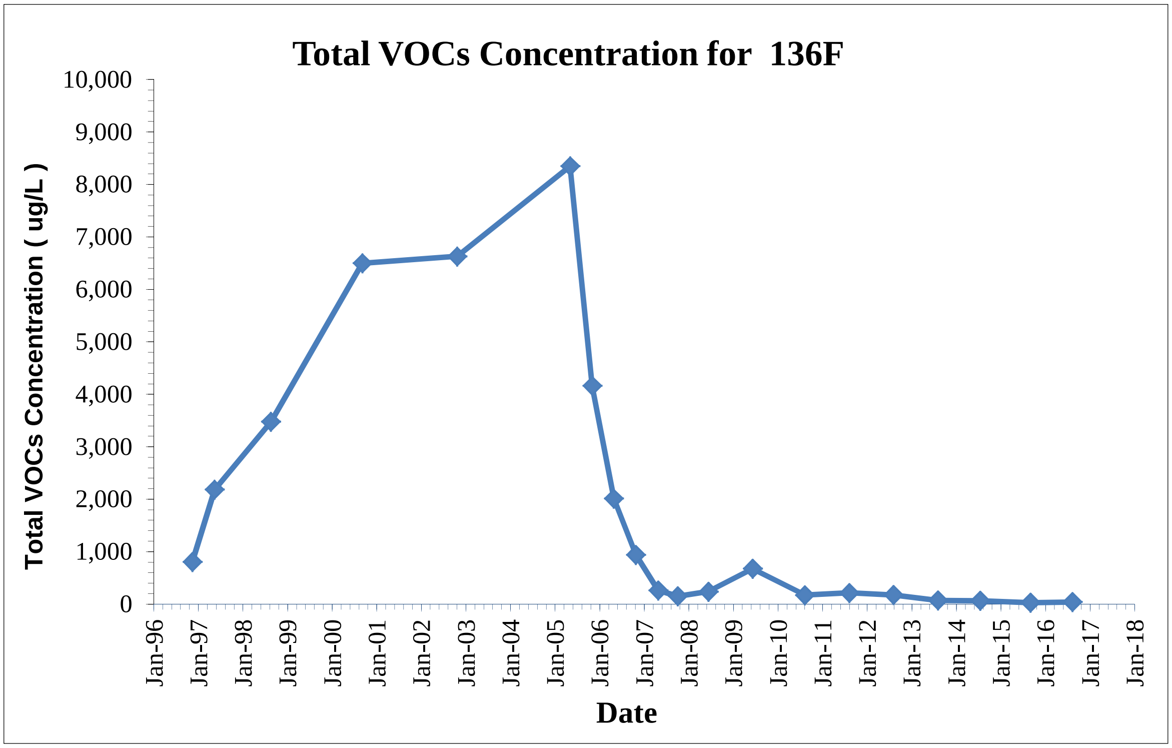
Total VOCs Concentration for 165D

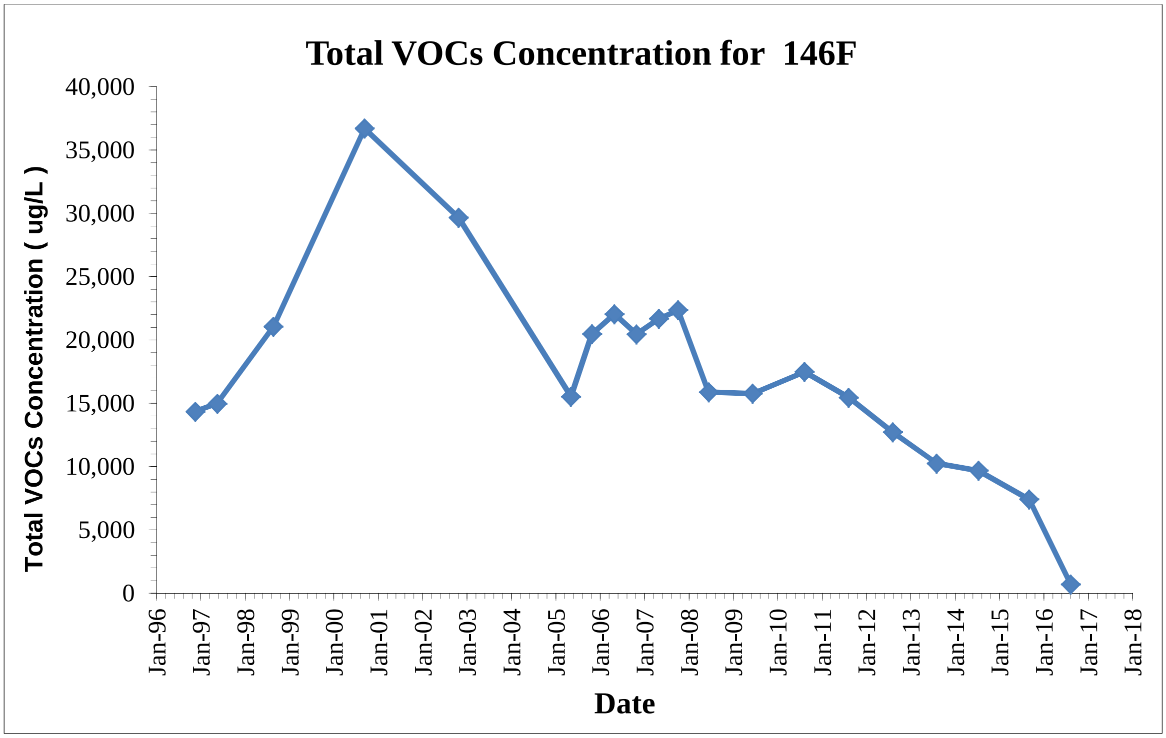


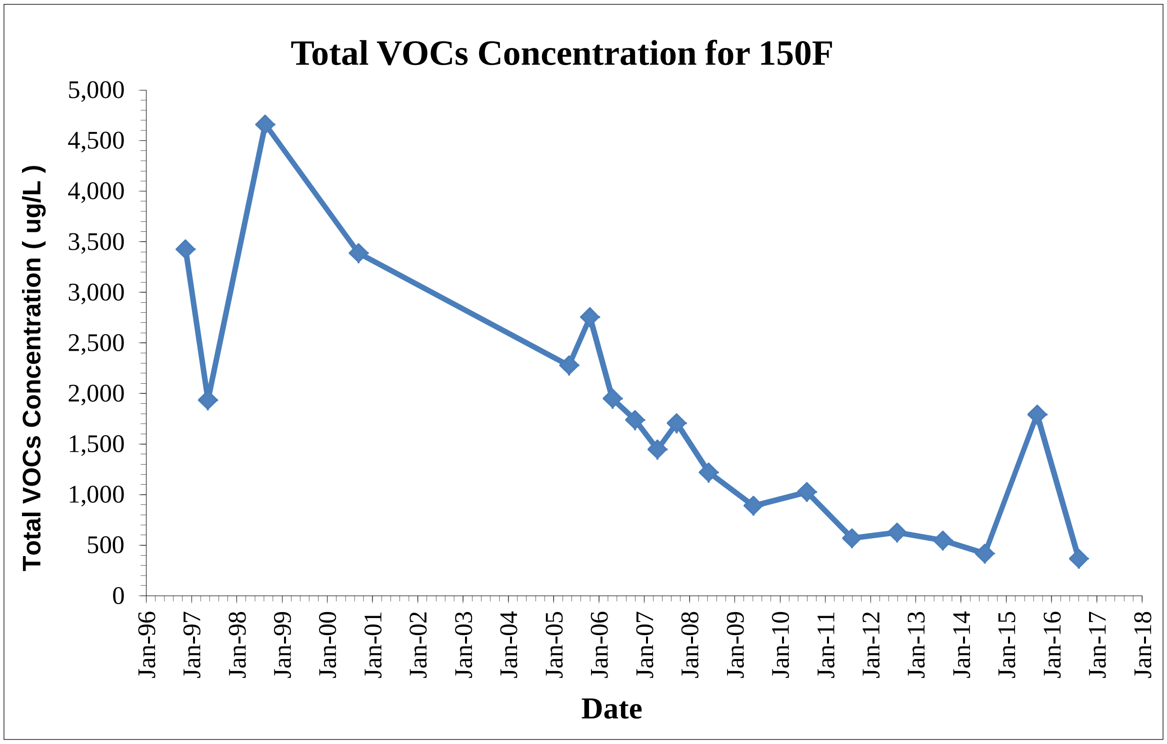

Total VOCs Concentration for 146E
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Aug-96
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Date


Total VOCs Concentration for 150E
Total VOCs Concentration (ug/L)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
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
Jan-17
Jan-18
Date


Total VOCs Concentration for 165E
Total VOCs Concentration (ug/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
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
Jan-17
Jan-18
Date


Total VOCs Concentration for 136F
Total VOCs Concentration (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
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
Jan-17
Jan-18
Date


Total VOCs Concentration for 146F
Total VOCs Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
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
Jan-17
Jan-18
Date


Total VOCs Concentration for 150F
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-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
Jan-17
Jan-18
Date

APPENDIX C

LANDFILL CAP INSPECTION RESULTS (NOVEMBER 2016)

EXHIBIT A
CAP AND SURFACE WATER DRAINAGE
INSPECTION CHECKLIST
NECCO PARK

DATE: 11-18-16
INSPECTOR: Gerald Shepard
WITNESSES: Not Required

EMERGENCY CONTACT: Timothy Pezzino
Phone # (716)-278-5170

CONDITION: (Check) (Not Acceptable or Not Present require comments below)

	Acceptable	Not Acceptable	Present	Not Present	Remarks
1) Vegetative Cover, Ditches, Culverts	X				
a) Sediment Build-Up/Debris	X				
b) Pooling or Ponding	X				
c) Slope Integrity	X				
d) Overall Adequacy	X				
e) Culvert Condition	X				
2) Access Roads	X				
3) Landfill Cover System					
a) Erosion Damage	X				
b) Leachate Seeps				X	
c) Settlement				X	
d) Stone Aprons	X				
e) Vegetation	X				
f) Animal Burrows			X		
4) Slope Stability					
a) Landfill Top Soil	X				
b) Landfill Side Slope	X				
5) Gas Vents	X				
6) Monitoring Wells	X				

COMMENTS:

DESCRIPTION OF CONDITION: 3B) No Leachate Seeps Present
3c) No settling on LandFill or Side Slopes
3F) Very small Mice + Mole Burrows on landFill Cap and Side Slopes

DESCRIPTION OF CONCERN:

DESCRIPTION OF REMEDY:

Continued to next page

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE
MAINTENANCE CHECKLIST
NECCO PARK

DATE: 11-18-16
INSPECTOR: Gerald Shepard
WITNESSES: Not Required

EMERGENCY CONTACT: Timothy Pezzino

Phone # (716) 278-5170

Maintenance Performed (Check)	Item	Performed by:	Remarks
	1) Vegetative Cover:		
	a) Seeding		
	b) Fertilizing		
	c) Topsoil Replaced		
	d) Removal of Undesirable Vegetation		
	2) Drainage Ditches		
	a) Sediment Removal		
	b) Fill		
	c) Regrading		
	d) Stone Apron Repair		
	e) Vegetative Cover Placement		
	f) Liner Replacement		
	3) Access Road		
	a) Excavation		
	b) Fill		
	c) Grading		
	d) Stone Paving		
	4) Landfill Cap		
	a) Excavation		
	b) Cover Materials		
	- topsoil		
	- barrier protection layer		
	- drainage composite		
	- geomembrane		
	- geotextile		
	c) Testing		
	d) Barrier Protection Layer		
X	e) Vegetative Cover	Contractor-Mocon	Aug-2016
	5) Gas Vents		
	- Pipes		
	- Bedding and Adjacent Media		
	6) Other		

DESCRIPTION OF MAINTENANCE ACTIVITIES: 4E) Brush hogged And Line trimmed LandFill Cap, side Slopes, And Ditch August 30 2016

Continued to next page

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE
MAINTENANCE CHECKLIST
NECCO PARK

DESCRIPTION OF MAINTENANCE ACTIVITIES: ______________________________

Continued to next page