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March 29, 2013

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 2012 ANNUAL REPORT

Enclosed are two copies of the *Remedial Action Post-Construction Monitoring 2012 Annual Report* for the DuPont Necco Park Hydraulic Controls System (HCS), Groundwater Treatment Facility (GWTF), and landfill cap.

This eighth 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 2012 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). System operation uptime for 2012 was 92.9 %. Discounting scheduled maintenance shutdowns, system uptime for 2012 was 93.1 %.

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

Sincerely,

CORPORATE REMEDIATION GROUP

Paul F. Mazierski
Project Director

Enc. 2012 Annual Report

cc: M. Hinton/NYSDEC
E. Felter/Parsons
C. Luttrell/ DuPont

PARSONS

Remedial Action Post-Construction Monitoring
2012 Annual Report

DUPONT NECCO Park
Niagara Falls, New York

Prepared for:

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March 2013

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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
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	DuPont 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
TCE	Trichloroethene

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

EXECUTIVE SUMMARY

This Remedial Action Post-Construction Monitoring 2012 Annual Report has been prepared pursuant to Administrative Order Index No. II Comprehensive Environmental Response, Compensation and Liability Act (Superfund) -98-0215 issued by United States Environmental Protection Agency (USEPA) on September 28, 1998. This is the eighth such report and describes hydraulic and chemistry monitoring conducted in 2012 at the E. I. du Pont de Nemours and Company (DuPont) Necco Park Site in Niagara Falls, New York. Monitoring activities were conducted in accordance with the Long-Term Groundwater Monitoring Plan (LTGMP) dated April 2005 (DuPont Corporate Remediation Group [CRG] 2005a).

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). System operation uptime for 2012 was 92.9%. Discounting scheduled maintenance shutdowns, system uptime for 2012 was 93.1%. 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 2012 Quarterly Data Packages (Parsons 2012a, 2012b, 2012c, and 2013). 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 2012 show that, overall, the HCS has maintained hydraulic control of the source area. Improved hydraulic control in the upper bedrock in the western portion of the site began in fourth quarter 2008 when a 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 well rehabilitation events were completed in 2012: one in June and a second in September. RW-11 and RW-5 were included in both events, while RW-4 was rehabilitated in September for the first time since it was installed. New, improved rehabilitation methods using vacuum and low pressure washer technique were employed, allowing for more efficient removal of well sediments, and an inherently safer occupational health approach. Well yield significantly increased at RW-11 and RW-4. Rates were not significantly improved at RW-5; however, two feet of sediment was removed from the bottom of the well in June and a lesser amount in September.

In accordance with the LTGMP (DuPont CRG 2005a), annual groundwater sampling began in 2008 after three years of biannual (twice a year) sampling had been conducted. The monitored natural attenuation (MNA) event frequency and the number of sampling locations were reduced in 2010. In 2013, the MNA and 2005 LTGMP sampling programs will be conducted to as part of the 5-year program.

On January 27, 2012, USEPA formally accepted the following revisions to the program:

- Revised number of water levels
- Use of the AT-zone
- GWTF process monitoring reduction to volatile organic compounds only
- Revisions to the LTGMP text describing downtime reporting notification requirements
- Substitution of quarterly drawdown plots with hydrographs in the quarterly reports

- Usage of the two criteria of historic presence of dense non-aqueous phase liquid (DNAPL).

The 2012 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 2012 results indicate:

- With the exception of one near source area well (137A), TVOC concentrations for the A-Zone wells were below 4 micrograms per liter.
- TVOC concentrations at key source area limit wells in the B and C zones, such as 150B, 172B, and 168C, 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, 146F.
- Overall, the TVOC concentrations are decreasing for all groundwater flow zones in the source area and far-field. In the few the cases where there were increasing TVOC trends, the concentrations were within historical range or inside the source area near a recovery well.

DNAPL was monitored for every month throughout 2012. DNAPL was identified in May in RW-5, and 72 gallons were removed. A total of 8,627 gallons of DNAPL has been removed since initiation of the recovery program in 1989.

1.0 INTRODUCTION

1.1 Site Location

The 24-acre E. I. du Pont de Nemours and Company (DuPont) 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 2012 Annual Report presents hydraulic and chemical monitoring results from the eighth year of operation of the hydraulic controls. In addition, this 2012 Annual Report includes historical groundwater chemistry results for assessment of groundwater quality trends.

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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 2012 HCS operations.

2.1 Operational Summary

Operational information for the HCS is provided in the 2012 Quarterly Data Packages (Parsons 2012a, 2012b, 2012c, and 2013) and summarized in the table below.

	HCS Uptime (%)	HCS Uptime [excluding scheduled maintenance downtime] (%)	Groundwater Treated (Gallons)	DNAPL[1] Removed (Gallons)
1Q12	93.6	93.6	3,138,892	0
2Q12	94.3	94.3	3,926,572	72
3Q12	89.1	89.8	3,913,978	0
4Q12	94.6	94.6	4,248,337	0
2012 Total	**92.9**	**93.1**	**15,227,779**	**72**

[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 fully operational throughout 2012, averaging 92.9% total system uptime through December 31, 2012. GWTF downtime has been 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) operating system.

Reportable HCS downtime in 2012 resulted from the following scheduled maintenance, unscheduled maintenance, and upgrades:

- In February, RW-11 was off for 64.5 hours due to a local low pH interlock.
- In March, RW-5 and RW-11 were off for 72 hours due to a restriction in the common header causing a local low pH interlock.
- Between June 4 and 8, RW-11 was off for 101 hours to complete well maintenance activities.
- From June 23 to 25, RW-5 was off for 53 hours due to a low-low flow alarm.
- From June 29 to July 2, RW-11 was off for 61.5 hours due to a local low pH interlock.

- In July, RW-4, RW-5, and RW-11 were off for 56.5 hours due to an influent tank low pH interlock.
- Between August 31 and September 4, RW-5 was off for 55.5 hours due to a low flow alarm.

The following table summarizes HCS reportable downtime in 2012:

Reason	Contributing Downtime %	Comments
Process component malfunction	4.1%	Unexpected process-related downtime as a result of alarms and interlocks.
Scheduled maintenance shutdowns and system upgrades/inspections	1.1%	Routine inspections, interlock verification, preventative maintenance, equipment inspection and mechanical upgrades to process-related infrastructure.

Scheduled maintenance shutdowns are based on operating conditions and the necessity to take corrective or preventative action to mitigate the need for future, larger scale maintenance. These shutdowns occur routinely to inspect, repair, and/or upgrade process-related components to ensure long-term operational success. Efforts are employed to minimize downtime during planned maintenance shutdowns. Influent tank capacity is used while maintenance occurs to minimize recovery well downtime.

In December 2011, DuPont submitted a request to the United States Environmental Protection Agency (USEPA) to change the language in Section 9 of the O&M Plan that refers to how downtime is reported. As agreed to by the USEPA in a letter dated January 27, 2012, the language in the O&M Plan was revised to indicate that notification will be given to USEPA and the New York State Department of Environmental Conservation (NYSDEC) when any recovery well is not operating for a period of more than 48 consecutive hours.

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. The USEPA agreed to this change with the caveat that semi-volatile organic compound (SVOC) monitoring should resume if significant changes occur to the remedial system. In June 2012, samples were inadvertently also analyzed for SVOCs, total barium, dissolved barium, total cyanide, and sulfate. A summary of results for the process sampling conducted in 2012 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. The permit (SIU Permit No. 64) was renewed in May 2009 and is valid from May 1, 2009, to May 1, 2014.

There were no permit exceedances during the first three quarters of 2012. Two limit exceedances were reported in fourth quarter 2012 (4Q12): the daily maximum limit for hexachlorobutadiene (HCBD) and the annual average limit for hexachloroethane. As required by the permit, two additional samples for these compounds were taken within 30 days of the exceedance. Results of these additional samples were within the permit limits. The GWTF was operating within normal parameters during all sampling.

Since a similar exceedance event occurred in 2008 and there have been no changes to site conditions, a comprehensive statistical evaluation was conducted on 5 years of effluent data. As a result, DuPont requested and received increased permit limits for these two compounds.

Additionally in 4Q12, due to internal POTW requirements, hexachlorobenzene was added to the Necco Park POTW permit. All of these changes are reflected in the most recent permit modification dated January 31, 2013.

2.4 Recovery Well Rehabilitations and Maintenance

The first of two well rehabilitations event was completed between June 1 and June 8 and included recovery wells RW-5 and RW-11. While RW-5 has been rehabilitated annually, this was only the second year RW-11 has been rehabilitated since it was installed in 2008. New techniques were implemented for the rehabilitations, as described below.

During the June event, the recovery wells were rehabilitated using hydraulic techniques that involved vacuuming sediment accumulation in the bottom of each well and low pressure washing the well borehole and screen (or open borehole). The previous technique consisted of air sparging sediments from the bottom of the well and mechanically removing the material from the side walls with drilling-type tools and a drill rig. This new technique allowed for safer removal of the sediments, improved the pressure control, and allowed larger quantities of water to be withdrawn at a high pumping rate (i.e. over-pumping). At RW-5, the flow rates were similar before and after the event and similar to historical rates. However, two feet of sediment was removed from the bottom of the well. At RW-11, approximately 3 feet of sediment was removed from the bottom of the well. The flow rates after the rehabilitation were markedly improved from an average of approximately 5 gallons per minute (gpm) to approximately 9 gpm.

The second event was completed from September 4 through 7 and included wells RW-4, RW-5, and RW-11. This was the first time RW-4 had been rehabilitated since it was installed in 2001. During this event, the recovery wells were rehabilitated using similar methods to those used in June. At RW-4, the flow rates were improved by the rehabilitation from approximately 0.3 to 0.5 gpm prior to the rehabilitation event to approximately 1.3 to 1.8 gpm after the event, with the same well set point. At RW-5, the flow rates were similar before and after the event and similar to historical rates, while a nominal amount of sediment was removed from the bottom of the well. At RW-11, the well efficiency was improved by the rehabilitation, as observed by the similar pre- and post-rehabilitation flow rates (approximately 6 or 7 gpm) while using a higher well set point (the well was reverted to the typical set point after the rehabilitation).

Well painting, labeling and protective casing repairs were performed in 2012 as part of continual site monitoring well maintenance. Approximately 34 well casings were painted/re-labeled, eight well pads were replaced, and cracks were repaired in two well pads.

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. As described above and in correspondence between DuPont and USEPA (January 27, 2012), a revised list of water level measurements was instituted in 2012. Quarterly drawdown analysis plots were also replaced by hydrographs in 2012.

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. Long-term hydrographs for select wells and piezometers within each water-bearing zone are included as Figures 3-2 through 3-7.

These water level measurements are also used to generate potentiometric surface-contour maps, which depict groundwater elevation distribution for assessing flow directions and hydraulic gradients. These presentations are used to evaluate the extent and effectiveness of the HCS hydraulic control effect at Necco Park. Quarterly groundwater level measurements collected during 2012 were provided in the Quarterly Data Packages (Parsons 2012a, 2012b, 2012c, and 2013). Potentiometric surface-contour maps for the A-Zone (overburden), and bedrock zones B, C, D, E, and F were also included in the 2012 Quarterly Data Packages. A list of groundwater level monitoring locations is provided in Table 3-1.

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 2012 Quarterly Data Packages. Unless otherwise noted, a Kriging algorithm with a linear semi-variogram model and a slope of 1 was used as the standard method to interpolate groundwater elevations between wells.

3.2 Hydraulic Control Assessment

As described in the Post-Construction Monitoring 2008 Annual Report (DuPont CRG 2009), measures were taken in 2008 to improve B/C-Zone hydraulic control in the western portion of Necco Park. These measures included installation of a recovery well in a blast fractured bedrock trench (BFBT) and the replacement of Recovery Well RW-10 with RW-11. Assessment results indicate improved hydraulic control through the operation of recovery well RW-11. A detailed discussion of the hydraulic influence of well RW-11 was provided in the Post-Construction Monitoring 2008 Annual Report for the Site (DuPont CRG 2009).

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. The decreases in the water elevations are due to the combined effect of the impermeable landfill cap and continuous 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. In 2012, there was a notable variability within the year: the dry spring and summer caused significant reductions in elevation, which was then followed by an increase in the 4Q12 water levels after significant rains in the week prior to the monitoring event.

Figures 3-8 and 3-9 present A-Zone potentiometric surface contours and vertical gradient maps. The potentiometric map clearly shows the groundwater flow was toward the capture systems. The cone of depression surrounding recovery wells RW-5 and RW-11 are significant, ranging from 2 to 3 feet of closed contours in the A-Zone (Figure 3-2). The 2012 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 generally downward (negative) between the A/B-Zones as presented in Table 3-2 (2012 average gradients) and shown in Figure 3-9 (November 7, 2012, gradients).

3.2.2 B and C Bedrock Water-Bearing Zones

Groundwater flow directions in the B-Zone and C-zone were consistent throughout 2012 (Figure 3-10). Hydraulic controls in the B-Zone and C-Zone were maintained throughout 2012, 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 of the BFBT and the hybrid recovery well RW-11.

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. Water level reductions are initially noticed after start-up of RW-10, and then a further reduction is observed once RW-10 was replaced by RW-11. Wells near or in the trench area (201B ,PZ-B, 137B, and 111B) show significant decreases after the transition of groundwater recovery from RW-10 to RW-11. These changes in water levels are notable, not only due to the actual change in water level, but also in context to the set point of RW-11 compared with RW-10. The water level set-up for recovery in RW-11 has been maintained approximately five feet higher than RW-10 (Figure 3-3). Thus, the installation of the BFBT was of such hydraulic significance that lower water levels in and around the BFBT area are achieved even with a higher water level in the actual recovery well. This is due to the change in hydraulic conductivity of the rock formation resulting from the BFBT.

Evidence of groundwater control is also 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. The contour patterns related to the BFBT and RW-11 are relatively wider and shallower than those for RW-4 and RW-5 due to the increased transmissivity in and near the BFBT. The overlay of the source areas lines and the groundwater contours demonstrates that the HCS is hydraulically controlling the source areas.

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 Landfill 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. In 2012, RW-5 and RW-11 were rehabilitated twice and RW-4 was rehabilitated once (for the first time since installation). The rehabilitation of RW-5 is a preventative action taken prior to well loss; therefore, the effect is relatively small in the short-term scale of one year. The improvement in capture in the C-Zone near RW-11 is less significant, indicating the decreases in well yield were related more hydraulic connection to the B-Zone than the C-Zone. At RW-4, rehabilitation improved the flow rates from 0.3 to 0.5 gpm prior to the rehabilitation event to 1.3 to 1.8 gpm after the event, with the same well set point, increasing capture in the east side of the site.

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 associated hydraulic gradients were toward the recovery wells throughout 2012, 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
- Continue to evaluate the 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 2012 report provides an update of groundwater chemistry trends in relation to the long-term remedy for groundwater. Source area criteria are provided in Table 3-3, and results are provided in Tables 3-4 and 3-5.

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. Monitoring completed in 2012 represents the fifth year of annual sampling. Implementation of the long-term chemistry monitoring is discussed in Section 3.3.3. 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 is requiring that the full list of wells be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends. The list of wells used for long-term monitoring was prepared and is included Table 3-6. The monitoring well locations are shown in Figure 3-1.

3.3.2 Sample Collection and Analysis

In accordance with the LTGMP, annual groundwater sampling began in 2008 following three years of semi-annual sampling. Collection of groundwater samples from a reduced number of locations compared to the LTGMP began in 2010, as approved by the USEPA (July 2010). The annual sampling event was completed between August 13 and August 17, 2012. TestAmerica of Amherst, New York, completed sampling with oversight by Parsons for DuPont. 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. All monitoring wells were purged and sampled at flow rates between 100 and 600 milliliters per minute to minimize potential volatilization. Geochemical parameters (pH, temperature, dissolved oxygen, oxidation/reduction potential, specific conductivity, and turbidity) were recorded at 5-minute intervals throughout the entire purging period to determine when stabilization was achieved. Geochemical parameters were considered stable when all parameter values were within 10 percent of the previously recorded value, with the exception of plus or minus 0.2 units for pH.

Samples were collected at 26 monitoring well locations during the 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 2012 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

Original source area limits were included in the 1995 AOA Report (DuPont Environmental Remediation Services 1995). As described in the Final (100%) Design Report for Bedrock and Overburden Source Area Hydraulic Controls (DuPont CRG 2003), source area limits for the A-Zone, B/C-Zones, and D/E/F-Zones were reassessed using results from the 2000 baseline groundwater sampling event. Sample results from the baseline event, in conjunction with historical DNAPL observations, were used to estimate source area limits as provided in the Source Area Report (SAR) (DuPont CRG 2001). Source area limits presented in the report were used to determine Pre-Design Investigation (PDI) groundwater recovery well locations.

For the purposes of remedial design, the 2000 baseline and Phase 2 PDI groundwater sampling results were used to interpolate source area limits. One of the objectives of the Phase 2 PDI was to refine the southeast limits of the B/C-Zone source area based on Phase 1 PDI observations. Since refinement of the B/C-Zone source area required additional groundwater sampling and analysis, DuPont elected to include sampling of the lower bedrock to also refine the D/E/F-Zone source area limits. Pumping tests conducted during the PDIs and subsequent full-scale operation have shown that the HCS will achieve and maintain hydraulic control of flow-zone specific source areas defined in the 100% design submittal.

The 2012 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 2012 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.

Effective solubility is defined as the theoretical upper-level aqueous concentration of a constituent in groundwater in equilibrium with a mixed DNAPL. Effective solubility is equal to pure-phase solubility of a given constituent multiplied by the mole fraction of that component in DNAPL. Use of effective solubility criteria is believed to be more representative of sites with DNAPL that consist of relatively complex mixtures of organic compounds (Feenstra et al. 1991), such as those that are found at the Necco Park site. Calculated solubility criteria for DNAPL compounds evaluated during this study are presented in Table 3-3. A comparison of 2005 through 2012 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 wells in Tables 3-4 because most of these wells are in the source area and have exhibited little change over time.

Due to the qualitative nature of using the one percent pure phase solubility in a transient flow field, this solubility criteria was established to be used with other lines of evidence for determining source areas. The “observed DNAPL” criterion and effective solubility criteria identify source area wells absolutely. The 1% pure phase solubility criteria were never intended to have the same weighting as the other criteria. As noted in the November 17, 2011, meeting and associated correspondence between DuPont and the USEPA, the observed DNAPL criteria and the effective solubility criteria have the most merit than the 1% pure phase solubility. Meeting the one-percent criteria alone (for example) does not absolutely define a well as a source area well. While the one-percent “rule-of-thumb” may infer DNAPL presence, with more or less certainty depending on the strength of the overall data (Cohen and Mercer 1993), it does not identify the distance upgradient where the DNAPL is located. This is due to such elements as the complexities of groundwater transport and well location in reference to the plume centerline. The one percent “rule-of-thumb” should not be used in isolation to determine DNAPL presence (Kueper., B.H. et al. 2003); therefore, the original (and present) intension of the solubility criteria were to assist in determining source areas in conjunction with other converging lines of evidence.

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 will be sampled in the 3 to 5 year cycle and therefore 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 2012 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.

Monthly DNAPL observations conducted at A-Zone well locations in 2012 indicated no DNAPL present at the annual monitoring locations. 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. 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 2012 HCS monitoring, the system is effective in controlling the A-Zone source area.

B/C-Zone

The B-Zone source limits have not changed from those provided with the 100% design submittal. Results for the B-Zone wells indicated no exceedances of the effective solubility criteria.

The only two B/C-Zone wells in the annual program which exceeded the more conservative one percent criteria in 2012 were: 136B and 172B. 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, and increasing since 2005. 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.

The frequency of observed DNAPL in B/C-Zone wells has decreased over the course of the monitoring program. In 2012, the only B/C-Zone well where DNAPL was identified was RW-5. In 2Q12 72 gallons of DNAPL were removed from RW-5. At well 204C, installed in November 2008, trace DNAPL was observed each month in 2012. Trace DNAPL was found in 139C in the May and September monitoring events (monitored semi-annually).

Results of the source area monitoring suggest that operation of recovery wells RW-4, RW-5, and RW-11 has achieved and maintained hydraulic control of the B/C-Zone source area. Concentrations at well 136B (increasing but within historical range) will be monitored for continuation of the trend in this area, additionally wells 116B and 163B near 136B will be monitored in 2013 for comparison to previous years.

D/E/F-Zone

From the D/E/F wells sampled, there were no exceedances of the effective solubility. There was only one well in which groundwater concentrations exceeded the more conservative one percent pure-phase criteria: HCBD and trichloroethene (TCE) at well location 165E. This location is within the southwest limit of the D/E/F-Zone source area limit located adjacent to and upgradient of RW-9. Exceedance of the criteria at this location is consistent with the previous sampling results.

Monitoring conducted during 2012 confirms that the operation of recovery wells RW-8 and RW-9 has achieved and maintained hydraulic control of the D/E/F-Zone.

3.4 Groundwater Chemistry Results and Trends

An analysis of 2012 chemistry results and trends has been completed to assess the effectiveness of the HCS and the former extraction system in reducing organic compound concentrations in groundwater. This analysis used TVOC concentration data from monitoring wells to identify chemistry trends in the flow zone units. The evaluation also serves to identify locations where TVOC concentrations exhibit significant changes (generally, changes greater than an order of magnitude). Where applicable, historic TVOC data were used to assess long-term chemistry trends. TVOC concentration versus time plots for A-Zone overburden and bedrock B- through F-Zone monitoring wells are presented in Appendix B.

In general, operation of the HCS and the former 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 150 μg/l at these locations. Sampling results for well 137A (103.6 μg/l) represents the location of the highest reported A-Zone TVOCs. TVOC concentrations were below 4 μg/l for the three other A-zone wells that were sampled, wells 145A, 146AR, and 150A. Furthermore, individual concentrations of VOCs and SVOCs were below their respective NYSDEC groundwater standards, with the exception of pentachlorophenol in 146AR (2.3 μg/l compared to NYSDEC standard of 1 μg/l). The 2012 results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden.

Three of the four wells used to monitor A-Zone chemistry (145A, 146AR, and 150A) exhibit consistently low (<10 μg/l) TVOC concentrations without a discernable trend over the years that they have been sampled (Appendix B). At 145A, concentrations since 2006 have been less than 4 μg/l. Location 146AR has had concentrations below 7 μg/l since 2000. At 150A, concentrations have been below 1.2 μg/l. In 2012, the TVOC concentration of these three wells, located south of the landfill, ranged from 0.31 to 3.1 μg/l.

Closer to the landfill, well 137A has shown the greatest decline of the A-Zone wells with concentrations ranging close to 1,200 μg/l in 2005 to as low as 100.2 μg/l in 2009. A downward trend between 2005 and 2012 is evident at 137A, and may suggest groundwater extraction in the RW-10/RW-11 area has effectively treated groundwater in this location. The 2012 results are consistent with historical results in that they demonstrate an insignificant downgradient plume in the overburden.

B-Zone

Results from the eight LTGMP B-Zone wells indicate TVOC concentrations were generally below 5,000 μg/l; only two wells exceeded 5,000 μg/l. TVOC concentrations at two of the locations were below 160 μg/l. Five of the eight wells exhibit large 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. This trend is indicative of effective groundwater control, where source area concentrations are being captured by the extraction wells, thereby preventing downgradient transport of VOCs. These wells give supporting evidence to the demonstration hydraulic control in these areas. Additionally the concentrations suggest that there is an active natural attenuation component to the VOCs. 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 2012 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 below 10,000 μg/l for the last three years.

Far-field well 150B also demonstrates the effectiveness of the groundwater control system. Concentrations have decrease by greater than two orders of magnitude, since 2000. While TVOC levels were greater than 2,000 μg/l prior to 2005, concentrations steeply decreased to less than 1 μg/l in 2008 and have since increased slightly to 159.4 μg/l in 2012. Since 2007, the TVOCs values have ranged from ND to 159.4 μg/l. The most significant decreases began in 2005, immediately after completion of the remedy construction and system start-up. This decrease is likely attributed to the groundwater extraction system preventing impacted groundwater from flowing to well 150B, in addition to an active natural attenuation mechanism.

Three B-zone wells (136B, 137B, and 168B) have no apparent decreasing trend but remain within historical ranges. At locations 136B and 168B (west and south of the source area, respectively), the TVOC concentrations are within the 2000 through 2012 ranges, but appear to be increasing when taking the entire monitoring range of 2005 through 2012. Future sampling monitoring results will indicate if these trends continue. At well 137B, along the southern source area boundary, there is no apparent increasing or decreasing trend.

C-Zone

Results from the four C-Zone wells indicate TVOC concentrations are consistent with previous long-term monitoring results. Two wells located outside the source area are below 15 μg/l, and two wells located inside the source area are over 13,000 μg/l.

Wells 146C and 150C are downgradient of the source area under ambient groundwater flow conditions, and therefore are key locations to understand groundwater flow with respect to the groundwater extraction system. Samples collected at 146C found TVOC concentrations over 20 μg/l prior to 2006; however, the concentrations decreased in 2006 and have remained below 15 μg/l. At location 150C, concentrations have decreased by 95% since sampling began, from near 250 μg/l to below 15 μg/l in 2010 and 2012. Steep declines in 150C and 146C are readily apparent in the 2005 through 2006 period. This suggests that the groundwater recovery system is capturing the source area plume and reducing downgradient concentrations.

Concentrations show no apparent trend at source area well 145C. Historically, this well has been used to define the C-Zone source area limit. The data demonstrate a large variability in TVOC concentrations, which makes trend determination difficult. Since this is a source area well, it is expected to take an extended period for concentrations to decline. No trend indicates a stable plume control of the source area.

At downgradient well 168C, the concentration initially decreased after 2005 start-up but later increased to a 10,000 to 15,000 μg/l range. The concentrations have been slightly decreasing again since 2010.

A marked decrease in TVOC concentration at well locations 145C and 146C was observed shortly after completion of the SFR in 1989 (not shown in the Appendix B TVOC trend plots). The SFR increased the capture zones of the former groundwater recovery wells and reduced off-site chemical migration. Based on the widespread drawdown observed since it began operation, it is expected that the HCS will further enhance the C-Zone capture zone.

TVOC trend plots for the declining C-Zone wells show an apparent relationship between HCS startup and decreasing TVOC concentrations. TVOC results for wells 146C, 150C and, to a minor degree 168C, illustrate that the hydraulic effects of the HCS extend to the southeastern portions of the source limits.

D-Zone

Results from the four D-Zone wells indicate TVOC concentrations are low and/or declining over time at these monitoring locations. Well 165D, within the source area, had TVOC concentrations of 12.6 μg/l, which have been declining since the peak of approximately 1600 μg/l in May 2006. TVOC concentrations outside the source area ranged from 4.29 µg/l (148D) to 1,537 µg/l (145D). At wells 136D and 145D, the concentrations have continued to decline since the original concentrations of approximately 3,000 µg/l. In 2012, the TVOC concentrations in wells 136D and 145D were approximately 760 and 1,540 µg/l, respectively. At far field well 148D, the concentrations remained low at approximately 4 µg/l and within the range of concentrations from 1996 to present. There is an upward trend in TVOC concentrations at 148D from 2000 to 2012, however, due to the low concentrations there is little meaning to the trend.

Consistent with previous long-term monitoring results, biogenic degradation compounds including cis-DCE and VC dominate TVOC results for wells 136D, 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 indicate TVOC concentrations were below 5,000 µg/l, with the exception of one well (165E at 57,550 µg/l). All three locations are on a declining trend. Degradation products including cis-DCE and VC dominate TVOC results for all the E-Zone wells. As discussed in Section 3.6, the presence of these degradation compounds is indicative of the occurrence of active natural attenuation processes.

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 4,700 and 6,300 µg/l for the last three years. Well 150E is located outside the source area limits, with concentrations ranging from 6,590 µg/l (1996) to 486 µg/l (2000) and typically between 500 and 1,300 µg/l in recent years. Although TVOC concentrations at this location in 2012 (989.63 µg/l) were slightly higher than in 2011, they were lower than the two years prior to 2011.

Well 165E is a source area well and has been on an increasing trend since 2006. The TVOC concentrations are now typically between 57,000 and 63,000 µg/l (2010 and 2012). This well is located within the source area and less 100 feet up-/side-gradient to RW-9. It is likely that the effectiveness of capture on the E-Zone at RW-5 is related to the increasing concentrations, as expected in this type of capture scenario.

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 650 µg/ to 12,713 µg/l, and all three locations showed decreasing trends. 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.

TVOC concentrations at near source well 136F have steadily declined since HCS startup from 8,348 µg/l in 2005 to 239 µg/l in 2008. While they increased slightly in 2009 to 674.9 µg/l, they then dropped further in 2010 to 171.5 µg/l, increasing slightly in 2011 to 215 µg/l, and decreasing again in 2012 to 175.5 µg/l. TVOC concentrations at location 150F have shown a fairly steady trend lower since 1998, with concentrations dropping from initially over 4,500 µg/l to near 569 µg/l in 2011, the lowest observed TVOC concentration at this location to date. In 2012, TVOC concentrations at 150F were up an insignificant amount from 2011 and were still lower than TVOC concentrations prior to 2011.

TVOC concentration trends for the F-Zone wells correlate to the startup of the HCS, as illustrated on the trend plots. TVOC concentrations have apparently decreased at these locations in response to the startup of the HCS. Groundwater concentrations in F-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

3.5 Monitored Natural Attenuation (MNA) Assessment

In 2010, DuPont submitted a request to the USEPA for modifications to the LTGMP. DuPont requested that the frequency of MNA sampling be reduced to every five years and that several wells be removed from the annual sampling list. The USEPA agreed (USEPA, July 16, 2010) to the reduction in the number of wells sampled annually, but required MNA monitoring to be completed next in 2013. The 2013 results will then be used to evaluate the feasibility of reducing to a five-year time frame for MNA sampling. Additionally, USEPA is requiring that all wells included in Table 3-12 of the 2009 Annual Report be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends.

The last formal MNA evaluation, which was presented in the 2009 Annual Report, provided a thorough discussion of MNA at Necco Park. The discussion included five pages of text and a full appendix of tables and figures (over 26 time series plots). The conclusion of the analysis was that site data strongly supports the interpretation that natural attenuation is actively degrading site compounds. This type of analysis was conducted annually from 2005 to 2008 with similar conclusions. Furthermore, Lee et al. (1993) also determined that natural attenuation is occurring at the site via biological anaerobic dechlorination. The report for the next MNA event in 2013 will be similar in depth to the study presented in the 2009 report.

The concentrations from 2012 generally indicate the MNA remains an active component in the source area and the far-field plume. The primary and secondary indicators of natural attenuation of chlorinate solvent in groundwater are: (1) decreasing concentrations of the primary (TCE) and secondary (DCE) compounds, and (2) geochemical indicators that the natural attenuation conditions are active at the site (USEPA 1998). Trends in concentrations (provided above) suggest that, overall, the plume is depicted as stable or decreasing in the far-field. Outside the source area, concentrations are decreasing over time, and constituents are predominately degradation products (DCE and VC) with lower concentrations of tetrachloroethene and TCE. Within the Source Area there are stoichiometrically elevated concentration of DCE and VC to suggest active natural attenuation processes, as well. Furthermore, the geochemical indicators demonstrated that the groundwater was strongly anaerobic (oxidation reduction potential ranging from -582 to -210) and likely sulfate reducing and or methanogenic (with a pH between 6 and 8 standard units). These are optimal ranges for natural attenuation.

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. A monitoring and recovery 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 PDIs. The 2012 monthly DNAPL monitoring results are summarized in Table 3-8.

In 2012, 72 gallons of DNAPL was recovered from RW-5 (30 gallons in May and 42 gallons in June). At well 204C, installed in November 2008, trace DNAPL was observed during each month in 2012. Trace DNAPL was found in 139C in the May and September monitoring events (monitored semi-annually). A total of approximately 8,627 gallons of DNAPL have been recovered since the program was put in place.

3.7 Quality Control/Quality Assurance

The 2011 annual groundwater samples were submitted to TestAmerica Laboratories in North Canton, Ohio, for all chemical analyses.

3.7.1 Sample Collection

The 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 14 and August 18, 2012. Based on laboratory receipt records, all samples were received in satisfactory condition and within USEPA holding time and temperature requirements (<4 degrees centigrade). 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 URS 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 DuPont Data Deliverable Review [DDR] 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 DuPont, referred to as the DDR, 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 DDR 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 target analytes barium and chloride were detected in the equipment blanks at low concentrations; most samples with concentrations in the same range were B qualified as unreliable detections. In addition, the semi-volatile analysis included a targeted tentatively identified compound (TIC1). This compound was also detected in the laboratory method blank analyzed with VH-172B and its field duplicate at approximately the same concentration. The positive results in both samples were B qualified. All positive results reported for TIC1 are estimated and have been J qualified.

The matrix spike associated with VH-136D and its field duplicate was recovered above the control limit window for the target volatile cis-1,2-DCE. The positive detections of this analyte in both samples were J qualified as estimated (possible high bias).

The chloride matrix spike associated with field samples VH-145A and VH-148D was recovered below the laboratory control window. The positive chloride detections in both samples were J qualified as estimated (possible low bias).

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

3.7.2 Independent Data Validation

In addition to the in-house evaluation, a minimum of 10% of the sample locations and associated field and laboratory QC samples were submitted for independent data validation by Environmental Standards, Inc., of Valley Forge, Pennsylvania. The wells were selected for validation based on their importance to the program (key perimeter wells) and include well locations VH-145C, VH-172B, VH-146E, VH-136D and associated QC samples, EQBLK1, and TRIP1. A copy of the Data Validation Summary report is included in Appendix C as an electronic file.

A number of validation qualifiers were applied to the samples due to a high MS recovery, quantitation of TIC results, and quantitation below the PQL. No sample results were qualified as unusable.

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 27, 2012, are provided in Appendix D. 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 DuPont 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 extraction. 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 and the associated B-Zone BFBT in 2008 has led to improved A-, B-, and C-Zone hydraulic control in the southwestern part of the site. The increases in flow zone transmissivities by *in-situ* blasting have resulted in an increase in recovery well pumping rates, an increase in the extent of hydraulic influence, and measureable drawdowns in distant wells. Water levels within and surrounding the BFBT at RW-11 decreased after the transition from RW-10 to RW-11. This is direct evidence of the increased capture zone resulting from installation of the BFBT. Between 2008 and 2009, there was also significant improvement in the hydraulic control of the A-Zone as shown in a comparison of previous to 2012 A-Zone potentiometric contours. This improvement, likely due to the BFBT, was maintained during 2012.

5.1.2 Recommendations

Based on the site history, years of monitoring, and observations made in 2012, the following recommendations are made:

- Continue to rehabilitate RW-5 on a semiannual basis
- Rehabilitate RW-4 and RW-11 on an as-needed basis
- Monitor RW-11 yield and total depth to develop an understanding of the proper maintenance schedule needed for this location
- Review and present options for continual or permanent rehabilitation or modification of RW-5

5.2 Groundwater Chemistry Monitoring

5.2.1 Conclusions

The 2012 and historical chemistry monitoring results indicate the following:

- Overall the TVOC concentrations were decreasing for all groundwater flow zones in the source area and far-field. In the few the cases, 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 2012 would not significantly change the A-Zone and B/C-Zone source area limits as delineated in the SAR.
- Analytical results for 2012 (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.
- Development and rehabilitation of RW-11 and RW-4 had a significant impact on well yield at Necco Park, and response was observed in the potentiometric surface around both locations.

5.2.2 Recommendations

The 2012 sampling results represent the 11th 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 and 2011. It is also recommended that the pre-2009 well sampling program, which is required to occur every 3 to 5 years, be scheduled with the 2013 MNA sampling event.

5.3 MNA Conclusions and Recommendations

As discussed above, MNA was not completed in 2012 as agreed to by the USEPA. The next sampling event for MNA monitoring is scheduled to be completed in 2013. Analytical results from 2012, 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 2012 DNAPL monitoring and historical recovery efforts indicate the following:

- Monitoring for the presence of DNAPL was completed monthly during 2012.
- A total of 72 gallons of DNAPL was removed from RW-5 in 2012.
- Approximately 8,627 gallons of DNAPL have been recovered since the recovery program was initiated in 1989.

5.4.2 Recommendation

Continue DNAPL monitoring 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 will be now be maintained in accordance with the CMMP.

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TABLES

Table 2-1
HCS Recovery Well Performance Summary - 2012
Remedial Action Post-Construction Monitoring - 2012 Annual Report
DuPont 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	8,109	97.3%	123,038	97.7%	336,679	89.2%	381,468	98.6%	282,831	98.5%
FEBRUARY	6,214	95.9%	109,694	93.6%	264,718	83.8%	351,141	96.5%	234,968	95.0%
MARCH	13,094	95.0%	103,837	87.0%	288,739	75.0%	381,174	100.0%	253,188	100.0%
APRIL	6,482	100.0%	104,992	95.0%	297,043	97.0%	415,973	100.0%	400,966	100.0%
MAY	9,300	93.9%	116,955	87.8%	301,641	92.1%	457,334	99.0%	489,570	100.0%
JUNE	9,549	98.0%	104,432	82.0%	269,917	75.0%	421,912	98.0%	438,166	98.0%
JULY	12,116	80.0%	92,953	73.0%	204,737	68.0%	422,436	93.4%	433,235	93.4%
AUGUST	8,871	98.9%	112,007	96.2%	357,191	91.0%	458,360	100.0%	461,797	100.0%
SEPTEMBER	67,431	94.6%	76,358	71.3%	276,461	80.0%	458,951	97.9%	471,074	97.9%
OCTOBER	103,805	89.3%	92,830	88.6%	235,717	84.0%	451,880	89.3%	466,149	89.3%
NOVEMBER	117,514	97.0%	93,506	94.0%	377,592	97.0%	465,469	100.0%	409,452	100.0%
DECEMBER	112,916	99.0%	91,298	99.0%	328,364	93.0%	469,131	100.0%	432,714	100.0%
TOTAL / AVG.	475,401	94.9%	1,221,900	88.8%	3,538,799	85.4%	5,135,229	97.7%	4,774,110	97.7%
2005	70,814	94.0%	1,966,338	93.0%	799,663*	95.0%	2,950,786	93.0%	3,881,318	93.0%
2006	92,358	90.0%	2,184,288	93.9%	701,579*	87.8%	4,581,348	95.0%	5,236,043	94.4%
2007	109,853	95.1%	1,391,339	83.6%	362,994*	92.6%	3,857,693	96.2%	5,506,023	95.9%
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%
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%
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%
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%

°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 - 2012

Remedial Acton Post-Construction Monitoring - 2012 Annual Report
DuPont Necco Park, Niagara Falls, New York

		B/C INFLUENT				D/E/F INFLUENT				COMBINED EFFLUENT			
Analyte		2/9/12	6/14/12	8/28/12	11/7/12	2/9/12	6/14/12	8/28/12	11/7/12	2/9/12	6/14/12	8/28/12	11/7/12
Field Parameters													
SPECIFIC CONDUCTANCE	µmhos/cm	9725	9250	10004	8352	4662	4095	4064	3913	6444	5504	5413	5506
TEMPERATURE	°C	10.4	14.6	15.9	12.5	11.6	14.6	15.2	11.3	10.9	16.4	18.7	11.8
COLOR	ns	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY	GREY	GREY	GREY	GREY/BLUE	GREY/BLUE	GREY/BLUE	GREY/BLUE
ODOR	ns	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	SLIGHT	SLIGHT	SLIGHT	Slight
PH	std units	5.84	5.13	5.73	5.44	6.86	6.69	6.97	6.68	6.57	6.8	6.89	7.53
REDOX	mv	-140	-120	-132	-102	-240	-251	-223	-216	12	-24	-91	-89
TURBIDITY	ntu	106	31.1	56.6	86.4	80.5	27.8	38.3	47.8	112	45.6	58.2	87.9
Volatile Organics													
1,1,2,2-TETRACHLOROETHANE	µg/l	2400	2500	4000	5800	1400	1200	1100	1400	1400	640 J	670	1300
1,1,2-TRICHLOROETHANE	µg/l	3100	3400	4400	3100	2200	2100	2100	2100	770	500	430	530
1,1-DICHLOROETHENE	µg/l	480	620	940	610	380	260	280	290	<0.76	0.59 J	<0.63	<0.95
1,2-DICHLOROETHANE	µg/l	540	470	530	390	310	160	120	150	36	32	22	26
CARBON TETRACHLORIDE	µg/l	2600	2400	3700	3300	1700	960	970	1300	2.9 J	3	2.1 J	7.4
CHLOROFORM	µg/l	18000	14000	20000	13000	4800	3000	3100	3500	250	160	130	130
CIS-1,2-DICHLOROETHENE	µg/l	5200	4700	6800	5500	12000	9300	11000	10000	170	130	130	140
METHYLENE CHLORIDE	µg/l	1800	2300	2900	2400	5200	4500	4500	5200	150	120	120	130
TETRACHLOROETHENE	µg/l	5700	5200	8900	6100	1400	940	980	1200	22	17	13	43
TRANS-1,2-DICHLOROETHENE	µg/l	330	390	500	420	830	590	590	670	2.7 J	2.4 J	2.2 J	2 J
TRICHLOROETHENE	µg/l	17000	15000	26000	15000	7000	5000	6600	5800	88	78	63	57
VINYL CHLORIDE	µg/l	1000	1200	2200	2300	1900	1800	2400	2200	0.97 J	0.87 J	1.2 J	<1.1
Other Organics													
2,4,5-TRICHLOROPHENOL	µg/l	NA	29 J	NA	NA	NA	410	NA	NA	NA	210	NA	NA
2,4,6-TRICHLOROPHENOL	µg/l	NA	<19	NA	NA	NA	170 J	NA	NA	NA	95	NA	NA
3 & 4 METHYLPHENOL	µg/l	NA	42 J	NA	NA	NA	16 J	NA	NA	NA	29 J	NA	NA
HEXACHLOROBENZENE	µg/l	NA	<2.4	NA	NA	NA	<1.9	NA	NA	NA	<0.95	NA	NA
HEXACHLOROBUTADIENE	µg/l	NA	320	NA	NA	NA	28 J	NA	NA	NA	52 J	NA	NA
HEXACHLOROETHANE	µg/l	NA	73 J	NA	NA	NA	<15	NA	NA	NA	<7.6	NA	NA
PENTACHLOROPHENOL	µg/l	NA	130 J	NA	NA	NA	870 J	NA	NA	NA	480	NA	NA
PHENOL	µg/l	NA	140 J	NA	NA	NA	38 J	NA	NA	NA	80 J	NA	NA
TIC 1	µg/l	NA	2600 J	NA	NA	NA	660 J	NA	NA	NA	880 J	NA	NA
Inorganics													
BARIUM, DISSOLVED	µg/l	NA	42000 J	NA	NA	NA	73 J	NA	NA	NA	400 J	NA	NA
BARIUM, TOTAL	µg/l	NA	100000 J	NA	NA	NA	49 J	NA	NA	NA	27000 J	NA	NA
SULFATE	µg/l	NA	3700 J	NA	NA	NA	810000	NA	NA	NA	430000	NA	NA
CYANIDE, TOTAL	µg/l	NA	380	NA	NA	NA	15	NA	NA	NA	330	NA	NA
TOTAL VOLATILES	µg/l	**58,150**	**52,180**	**80,870**	**57,920**	**39,120**	**29,810**	**33,740**	**33,810**	**2,893**	**1,684**	**1,584**	**2,365**

< and ND = Non detect at stated reporting limit
J= Analyte present. Reported value may not be precise.
UJ= Not detected. Reporting limit may not be accurate or precise.
NS= Not sampled
NA= Not applicable

Table 3-2
2012 Average A-Zone to B-Zone Vertical Gradients
Remedial Action Post-Construction Monitoring - 2012 Annual Report
DuPont Necco Park, Niagara Falls, New York

Well Pair		A	B	C	D	Vertical Gradtient[2,3] (B-A) / (C-D)
		2012 Average A-Zone Head	2012 Average B-Zone Head	A-Zone Mid-Point of Well Screen	B-Zone Fracture Elevation[1]	
111A	111B	572.01	570.82	573.94	561.80	-0.10
119A	119B	573.29	571.77	571.63	556.90	-0.10
129A	129B	573.19	569.32	570.10	557.80	-0.31
137A	137B	570.03	569.84	570.10	561.30	-0.02
145A	145B	570.78	568.93	564.19	546.30	-0.10
150A	150B	570.59	569.39	564.69	553.18	-0.10
159A	159B	577.15	572.95	580.62	562.90	-0.24
163A	163B	572.21	572.20	572.49	564.96	0.00
168A	168B	570.86	565.45	555.22	544.90	-0.52

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 - 2012 Annual Report
DuPont 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 2012 Annual Sampling

Remedial Action Post-Construction Monitoring - 2012 Annual Report
DuPont Necco Park, Niagara Falls, New York

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012
				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	<0.26
		Hexachlorobenzene	0.22	BC	4.0	31 J	3.4 J	NS	1.4 J	BC	< 0.4	< 2.5	<0.95	<0.095

BC: Below Criteria
NS: Not Sampled
Note: Only one well that in the current monitor program exceeds the effective solubility limit
"<" = compound not identified above the detection limit.

Table 3-5
2005 - 2012 Annual Sampling
1% of Pure-Phase Solubility Concentration Exceedances for DNAPL Compounds
DuPont Necco Park

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event					
136B	B	Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	1,500	1,600	BC	BC	2,000
171B	B	Hexachlorobutadiene	20	2,100	130	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
172B	B	Hexachlorobutadiene	20	140	89	140 J	110	BC	110	54	170	210	20	130
		Tetrachloroethene	1,500	1,800	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
168C	C	Hexachlorobutadiene	20	330	64.0	54 J	NS	44 J	BC	BC	NS	<27	21 J	BC
165E	E	Hexachlorobutadiene	20	27.0	BC	32 J	46 J	BC	45 J	91 J	44 J	79 J	26 J	130 J
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	2,000	BC	BC
		Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	11,000	12,000	12,000

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 - 2012 Annual Report
DuPont 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
DuPont 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

2012 DNAPL Recovery Summary

Remedial Action Post-Construction Monitoring - 2012 Annual Report
DuPont Necco Park, Niagara Falls, New York

Well ID	Frequency	23-Jan		9-Feb		9-Mar		13-Apr		31-May		7-Jun		14-Jun		6-Aug		28-Aug		10-Sep		15-Oct		7-Nov		19-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	FT	GALS
RW-4	Monthly	0.0		0.0		0.0		0.0		0.0		na		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		10.0	30.0	na	42.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0	
TRW-6	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
TRW-7	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
D-23	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-117A	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-123A	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-129A	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-129C	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-160B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-160C	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-161B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-161C	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-162C	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-190A	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-167B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-168B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-168C	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-169B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-170B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-171B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-172B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
PZ-A	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
PZ-B	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
204C	Monthly	trace		trace		trace		trace		trace		na		trace		trace		trace		trace		trace		trace		trace	
RW-11	Monthly	0.0		0.0		0.0		0.0		0.0		na		0.0		0.0		0.0		0.0		0.0		0.0		0.0	
VH-131A	Semi-annually	na		na		na		na		0.0		na		na		na		na		0.0		na		0.0		na	
VH-139A	Semi-annually	na		na		na		na		0.0		na		na		na		na		0.0		na		0.0		na	
VH-139C	Semi-annually	na		na		na		na		trace		na		na		na		na		trace		na		0.0		na	
CECOS52SR	Semi-annually	na		na		na		na		0.0		na		na		na		na		0.0		na		0.0		na	
CECOS18SR	Semi-annually	na		na		na		na		0.0		na		na		na		na		0.0		na		0.0		na	
CECOS-53	Semi-annually	na		na		na		na		0.0		na		na		na		na		0.0		na		0.0		na	

na - not applicable/not taken
GALS - gallons purged

FIGURES

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	

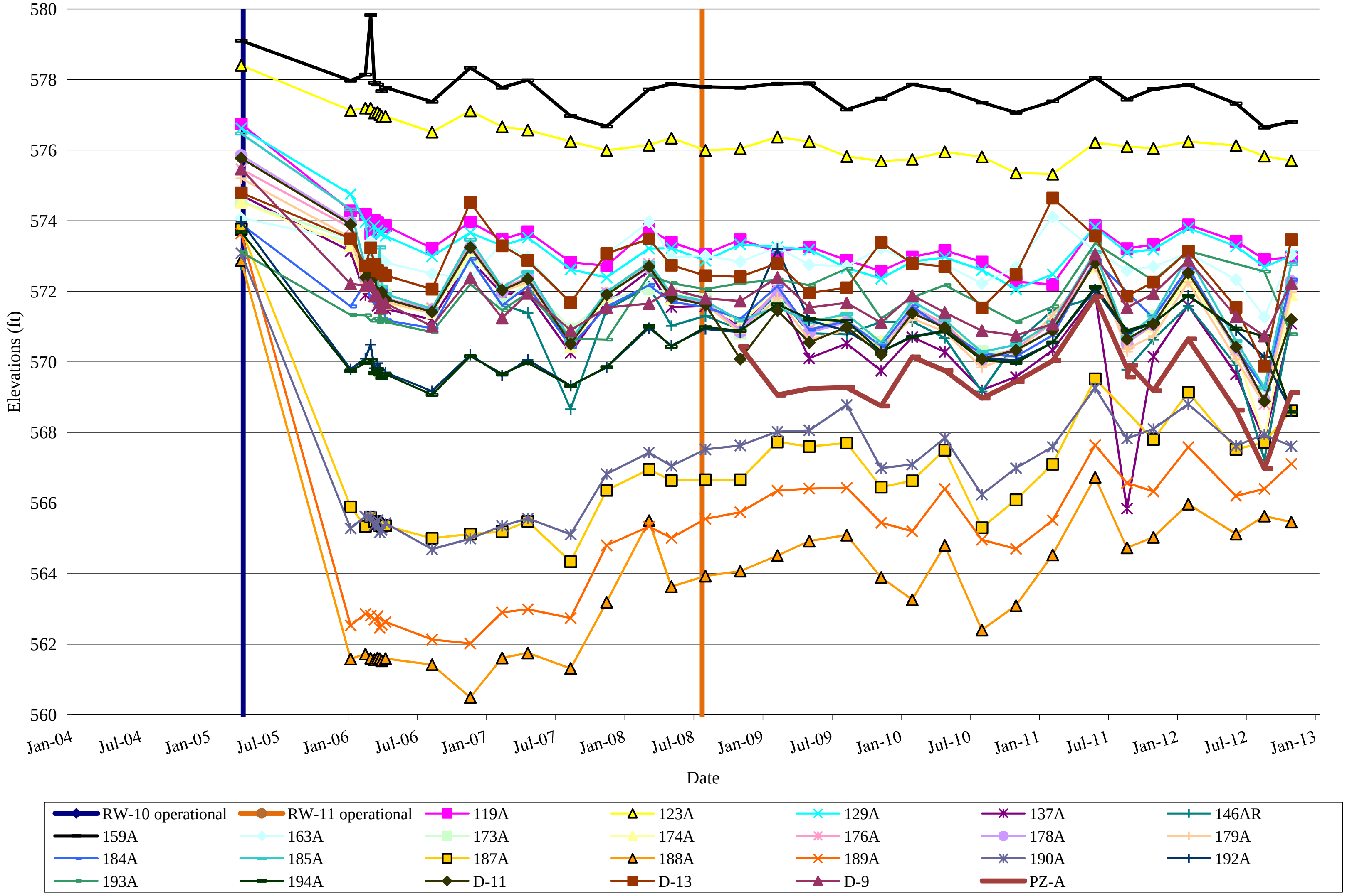
LEGEND

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

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

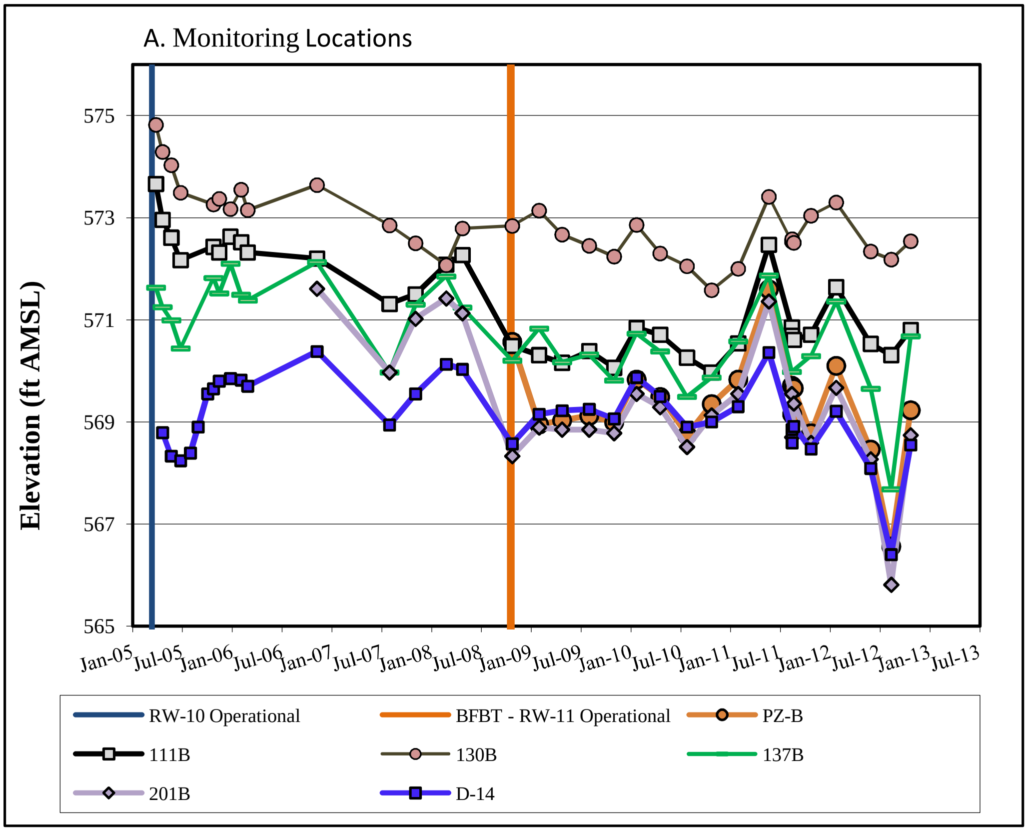
U:\Necco\hydrogeo\Maps\gis\basemap.mxd

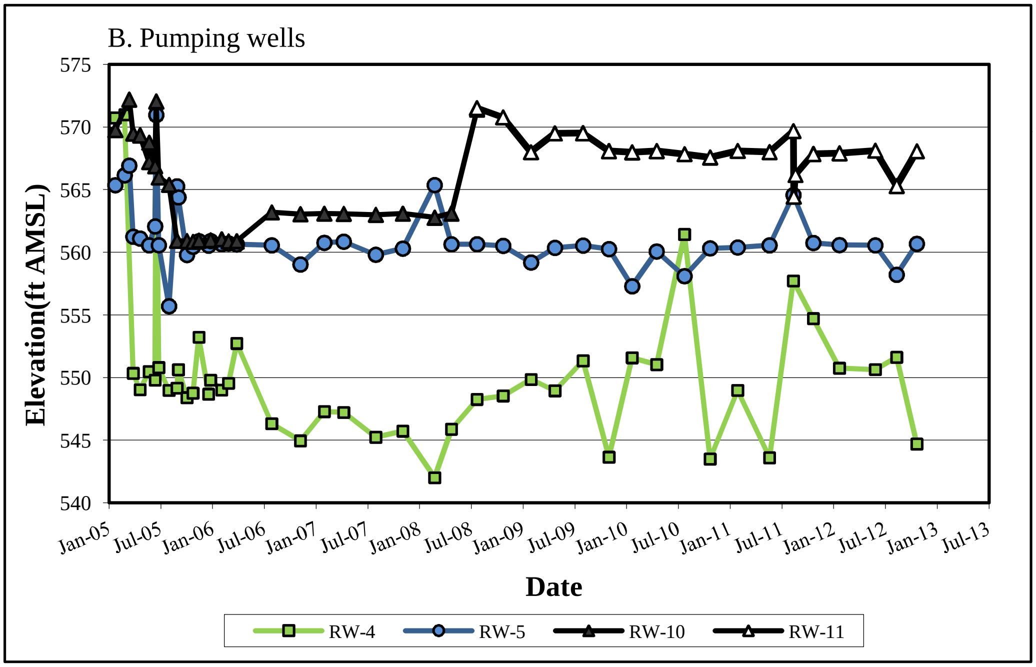
Figure 3-2
Select A-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2012
DuPont Necco Park



Necco 2012 A Zone Water Elev Trends.xlsx

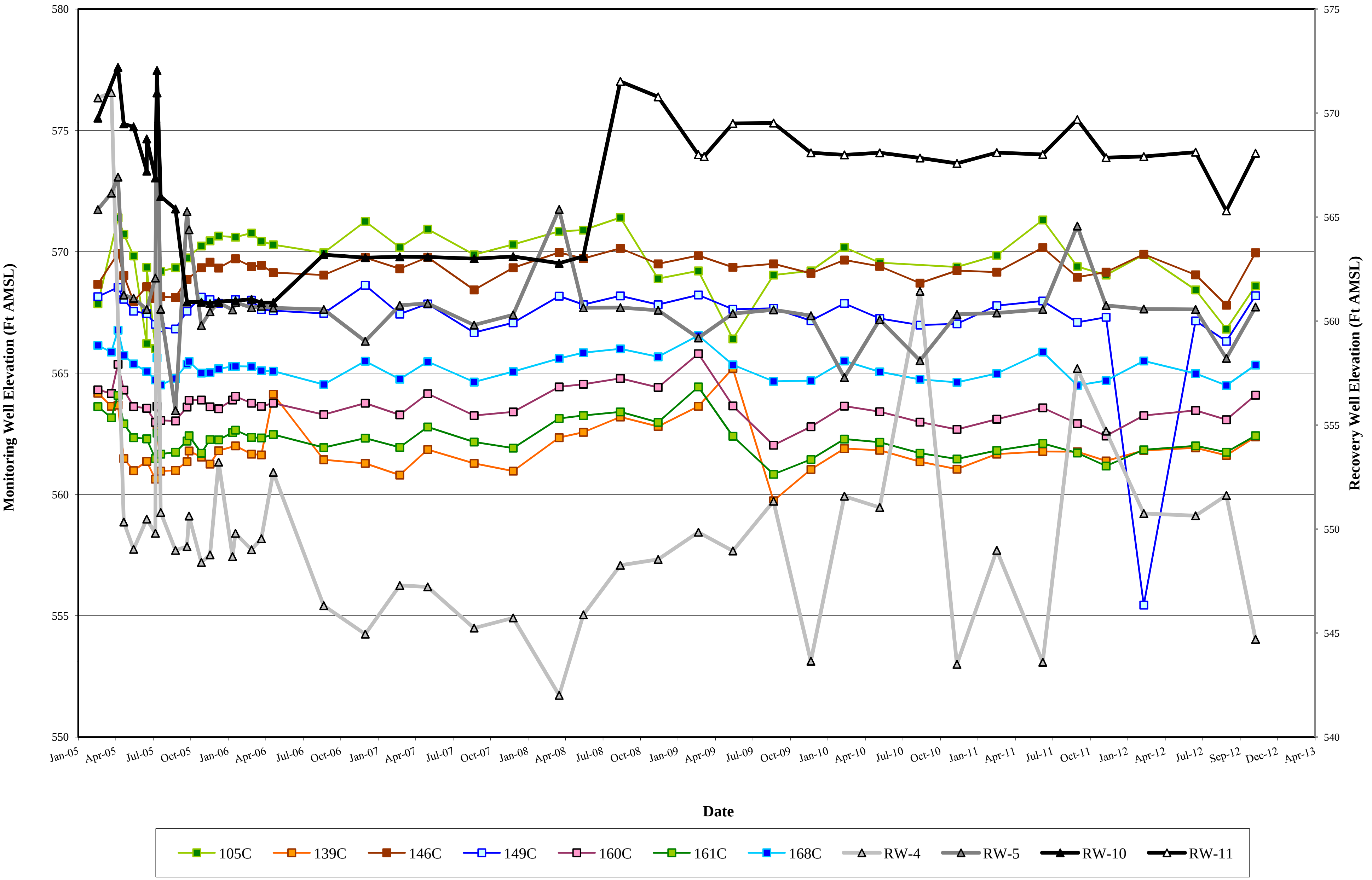
Figure 3-3
Select B-Zone Monitoring Wells
Groundwater Elevations 2005 through 2012


A. Monitoring Locations


B. Pumping wells

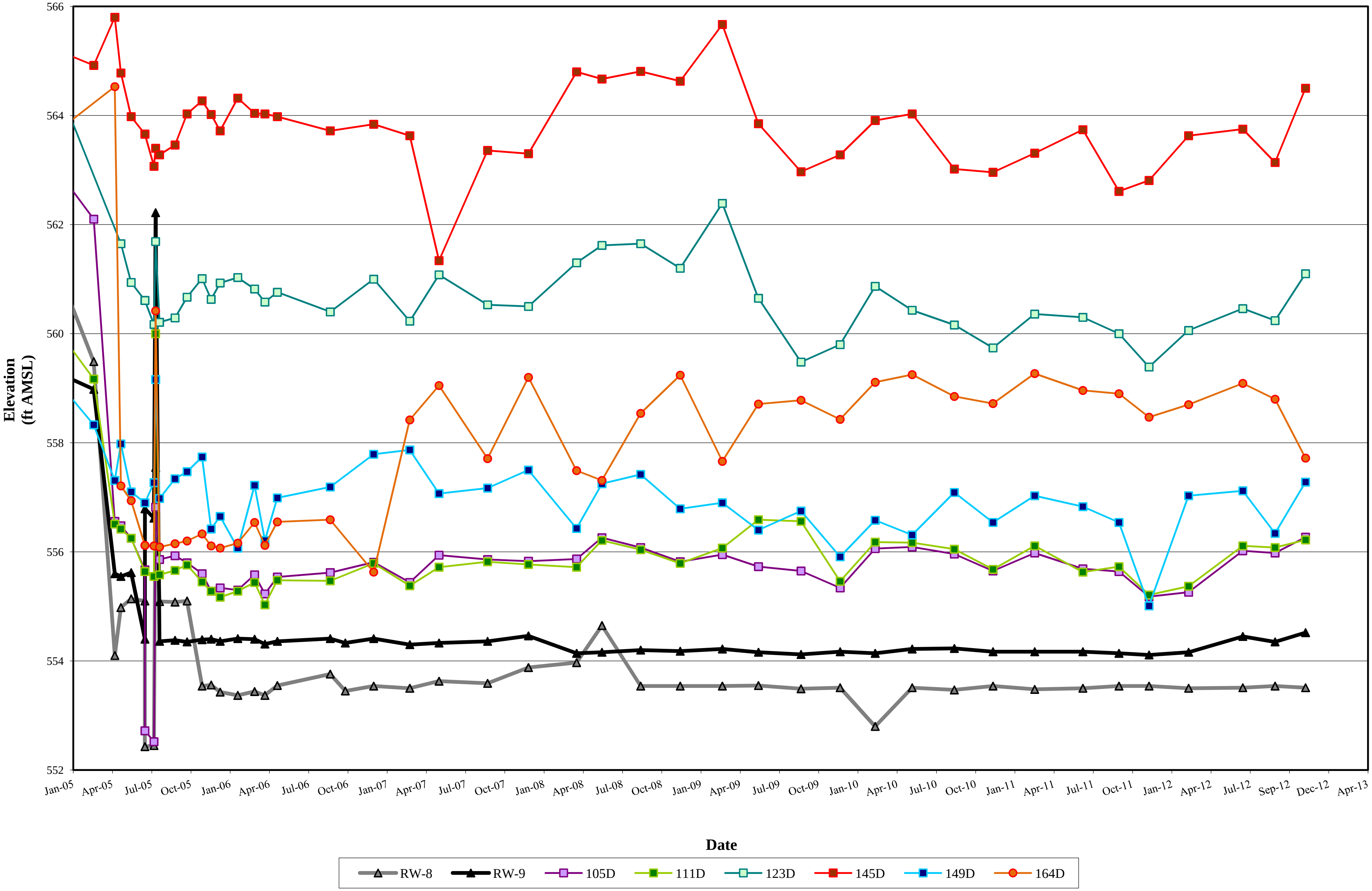
Necco 2012 B Zone Water Elev Trends.xlsx

Figure 3-4
Select C-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2012
DuPont Necco Park



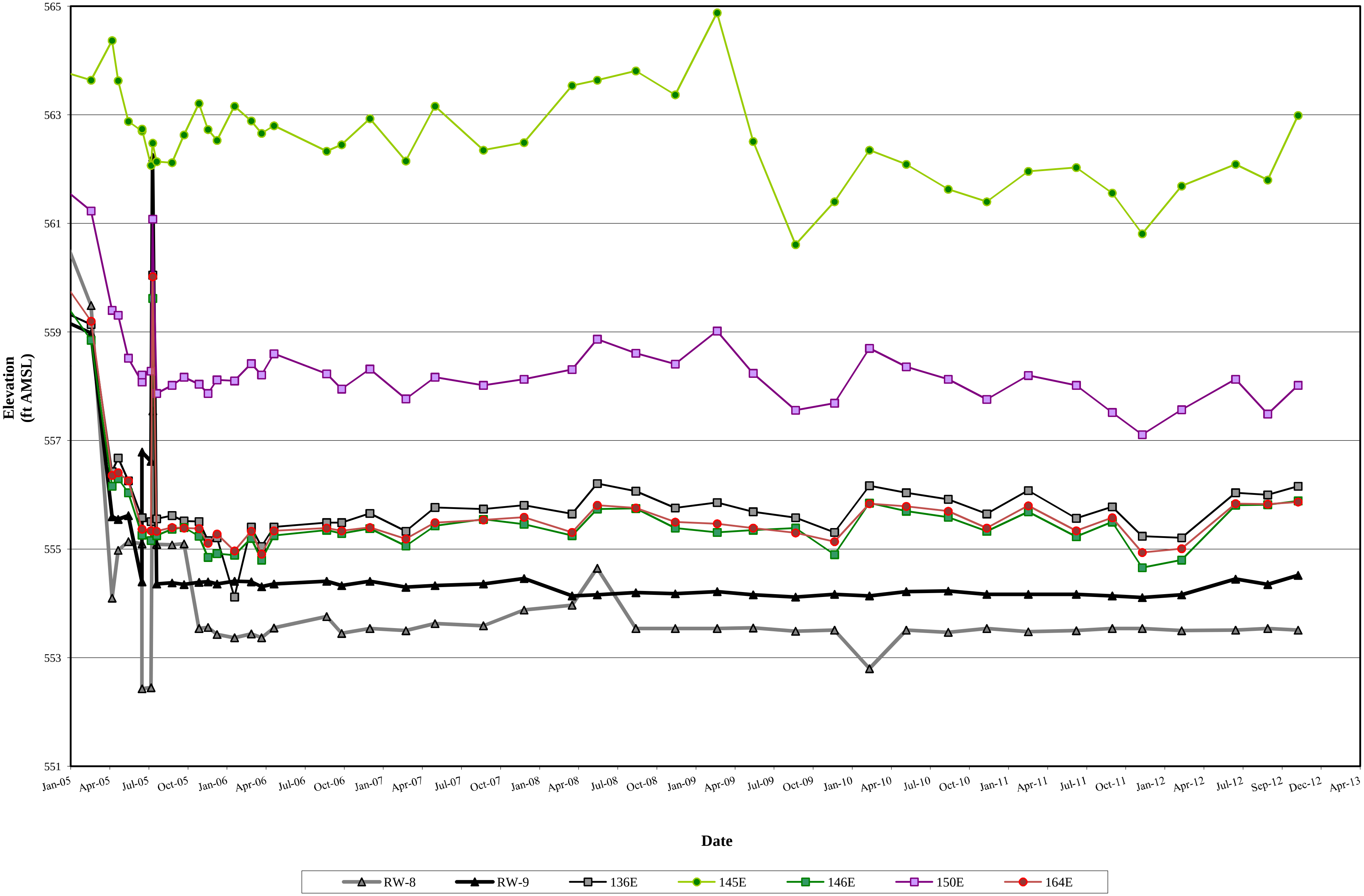
Necco 2012 C Zone Water Elev Trends.xlsx

Figure 3-5
Select D-Zone Monitoring Wells
Groundwater Elevations 2005 through 2012
DuPont Necco Park



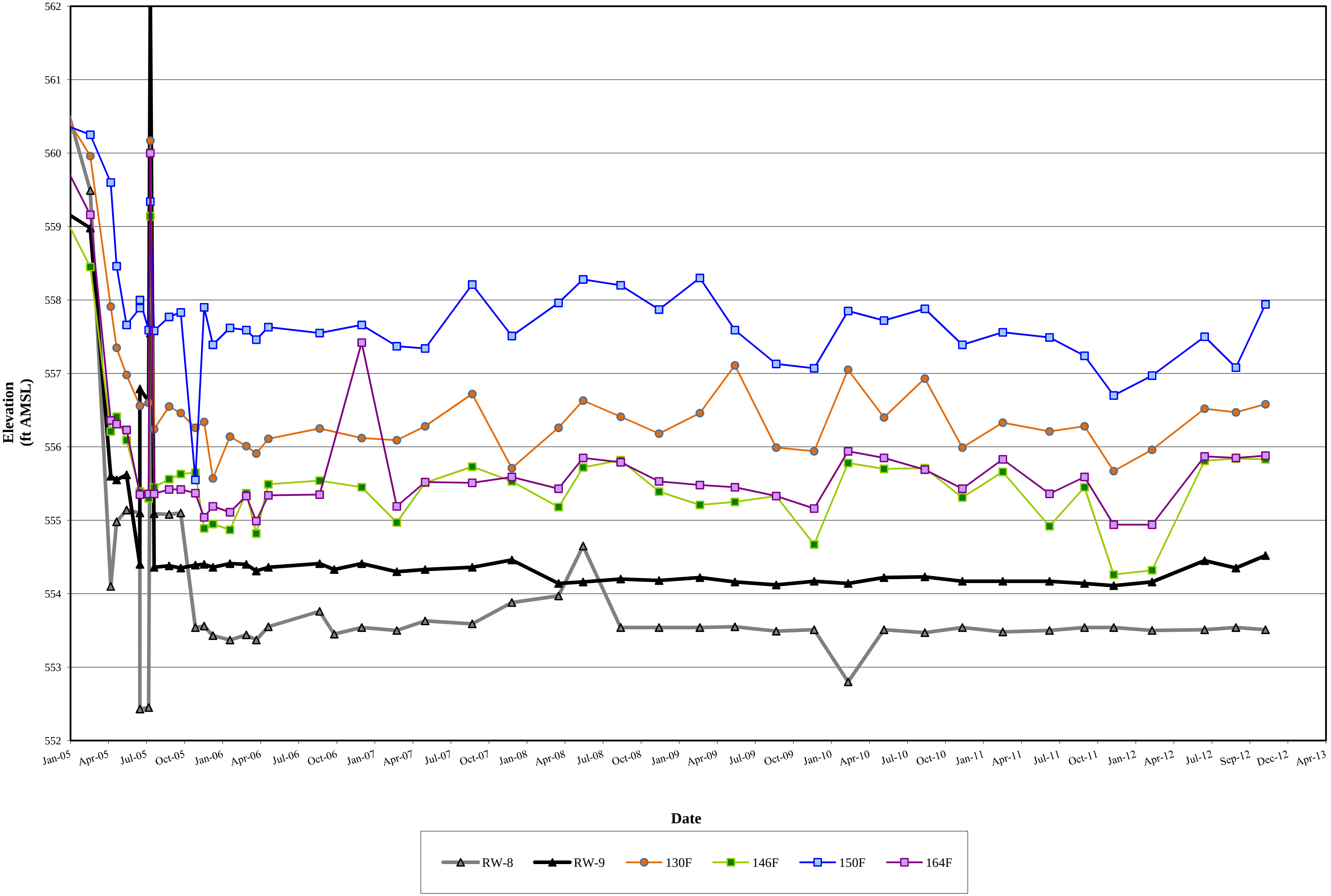
Necco 2012 D Zone Water Elev Trends.xlsx

Figure 3-6
Select E-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2012
DuPont Necco Park

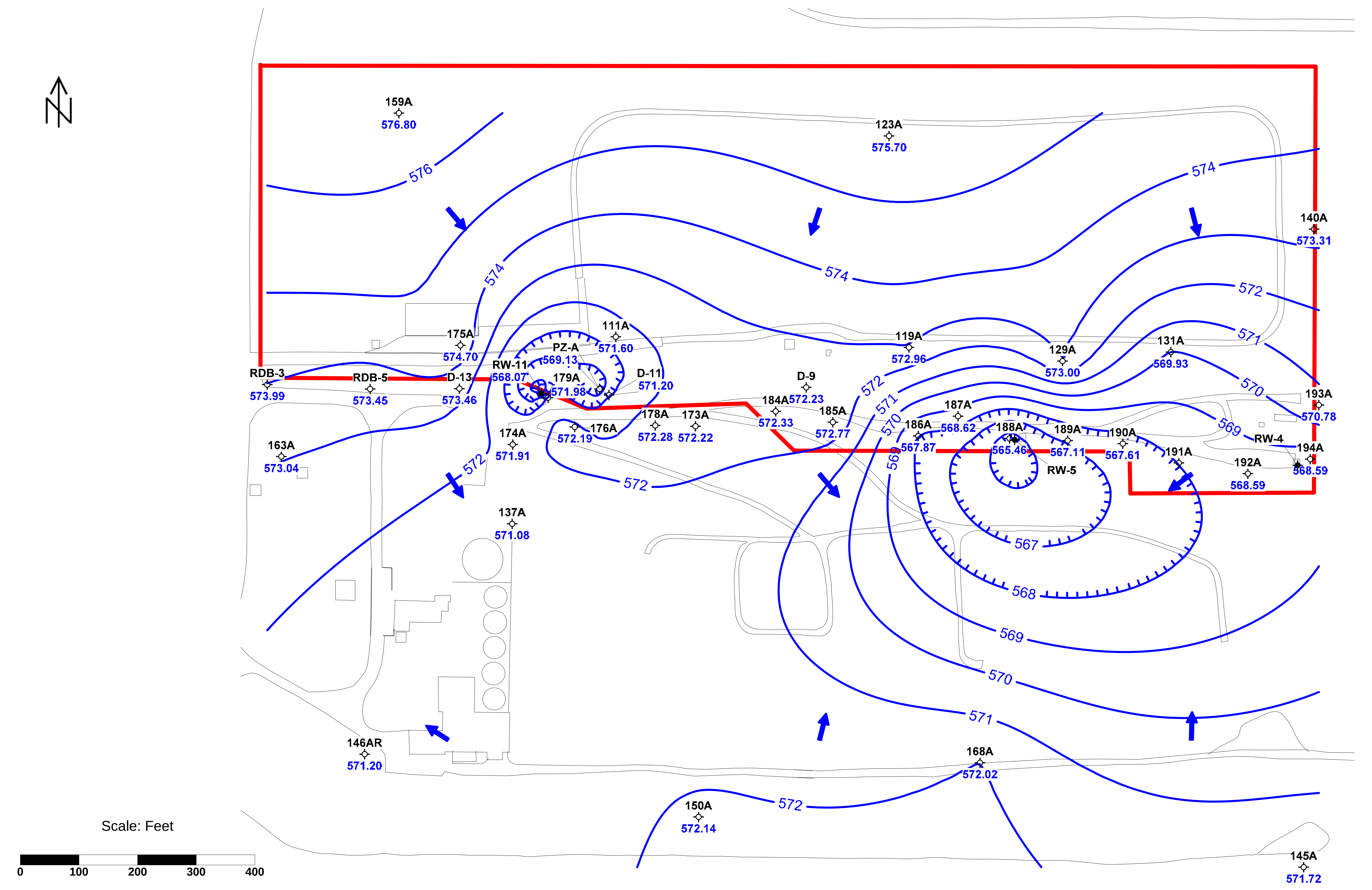


Necco 2012 E Zone Water Elev Trends.xlsx

Figure 3-7
Select F-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2012
DuPont Necco Park



Necco 2012 F Zone Water Elev Trends.xlsx



Contour Interval = 1 foot **Elevation datum feet AMSL** **191A was anonymously high and was not used in the contouring. This well is currently being evaluated for integrity**

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Buffalo, NY 14202
(716) 541-0730

Created by: RBP	Date: 01-03-13
Checked by: JWS	Date: 02-13-13
Project Manager: EAF	Date: 02-13-13

Job number: 447777.02000

LEGEND

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

Figure 3-8
Potentiometric Surface Map
DuPont Necco Park: A-Zone
November 07, 2012

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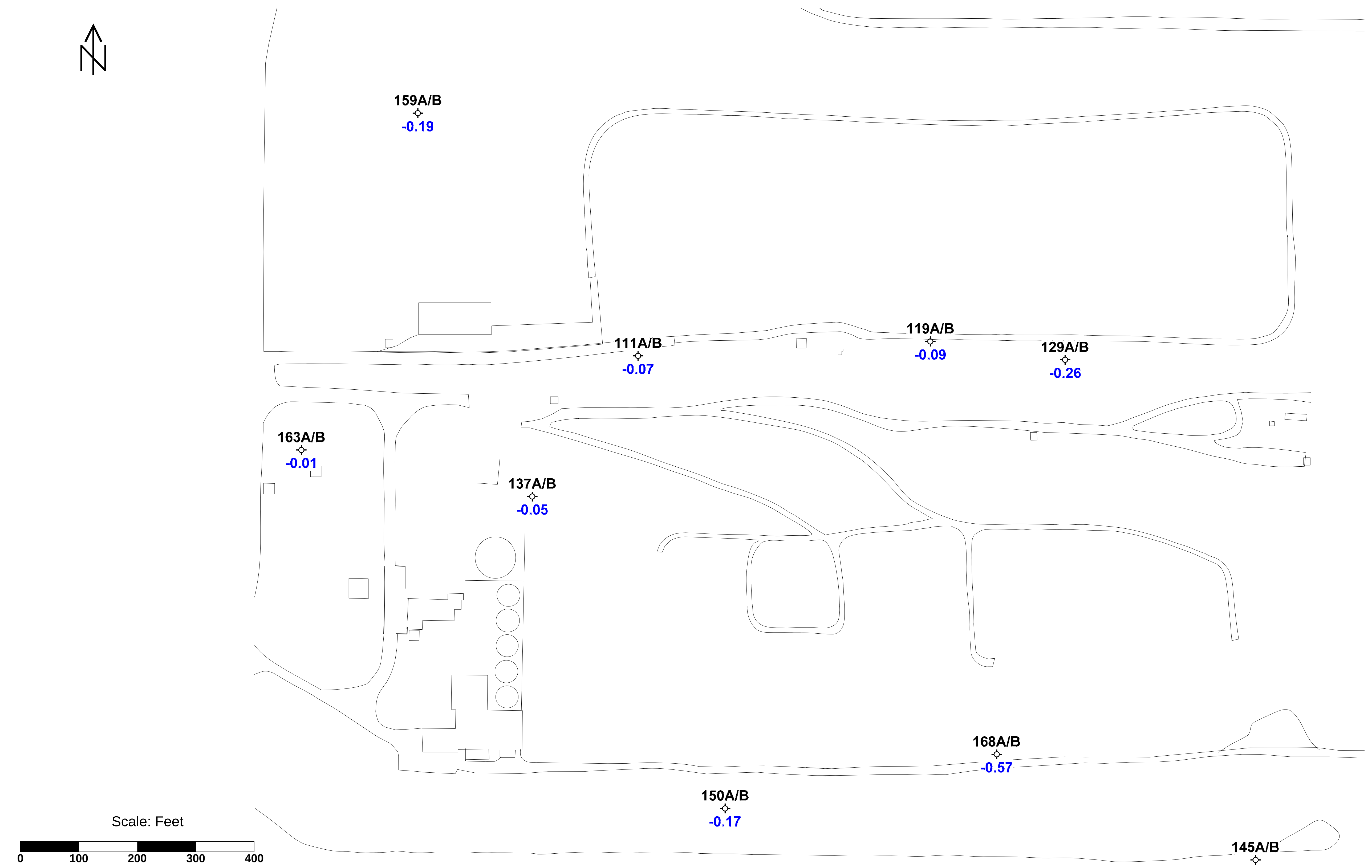

Negative value indicates downward gradient

Elevation datum feet AMSL

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Checked by: JWS	Date: 01-21-13
Project Manager: EAF	Date: 01-21-13
Job number: 445357.02023	

LEGEND

3B	**Well ID**		
✧	**Monitoring Well**		**Potentiometric Contour**
✦	**Pumping Well**		**Road**
☐	**Structure**		

Figure 3-9
Vertical Gradient: A-Zone to B-Zone
DuPont Necco Park
November 07, 2012

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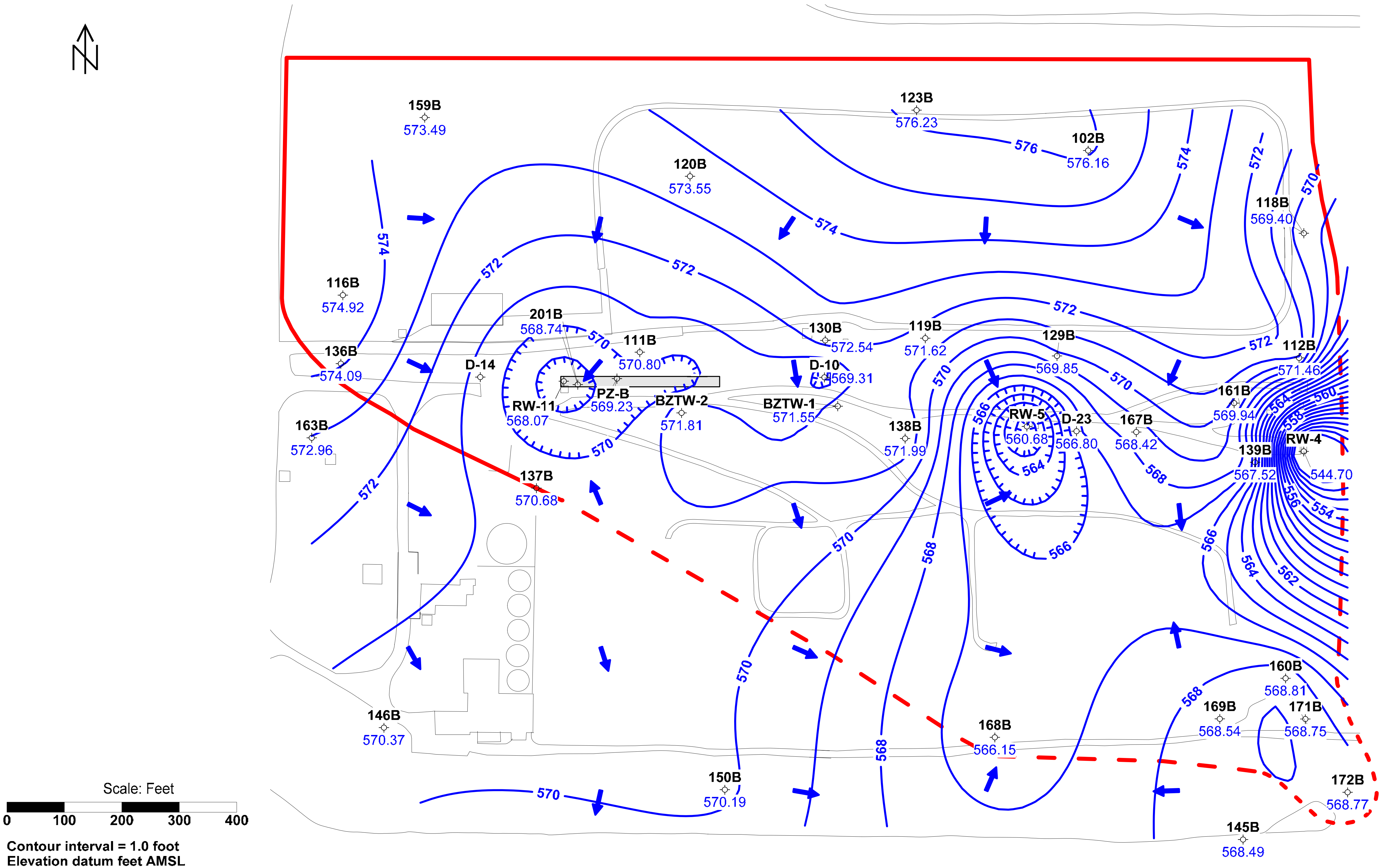

Contour interval = 1.0 foot
Elevation datum feet AMSL
Wells 149B and 151B are outside the area shown, but were used in the contouring.
Wells 170B, TRW-6, and TRW-7 were not used in the contouring.

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Project Manager: EAF	Date: 01-21-13

Job number: 445357.02023

LEGEND

3B	Well ID	Potentiometric Contour	Source Area Extent
⌖	Monitoring Well	Structure	Bedrock Fractured Blast Trench
✦	Pumping Well	Road	

Figure 3-10
Potentiometric Surface Map
DuPont Necco Park: B-Zone
November 07, 2012

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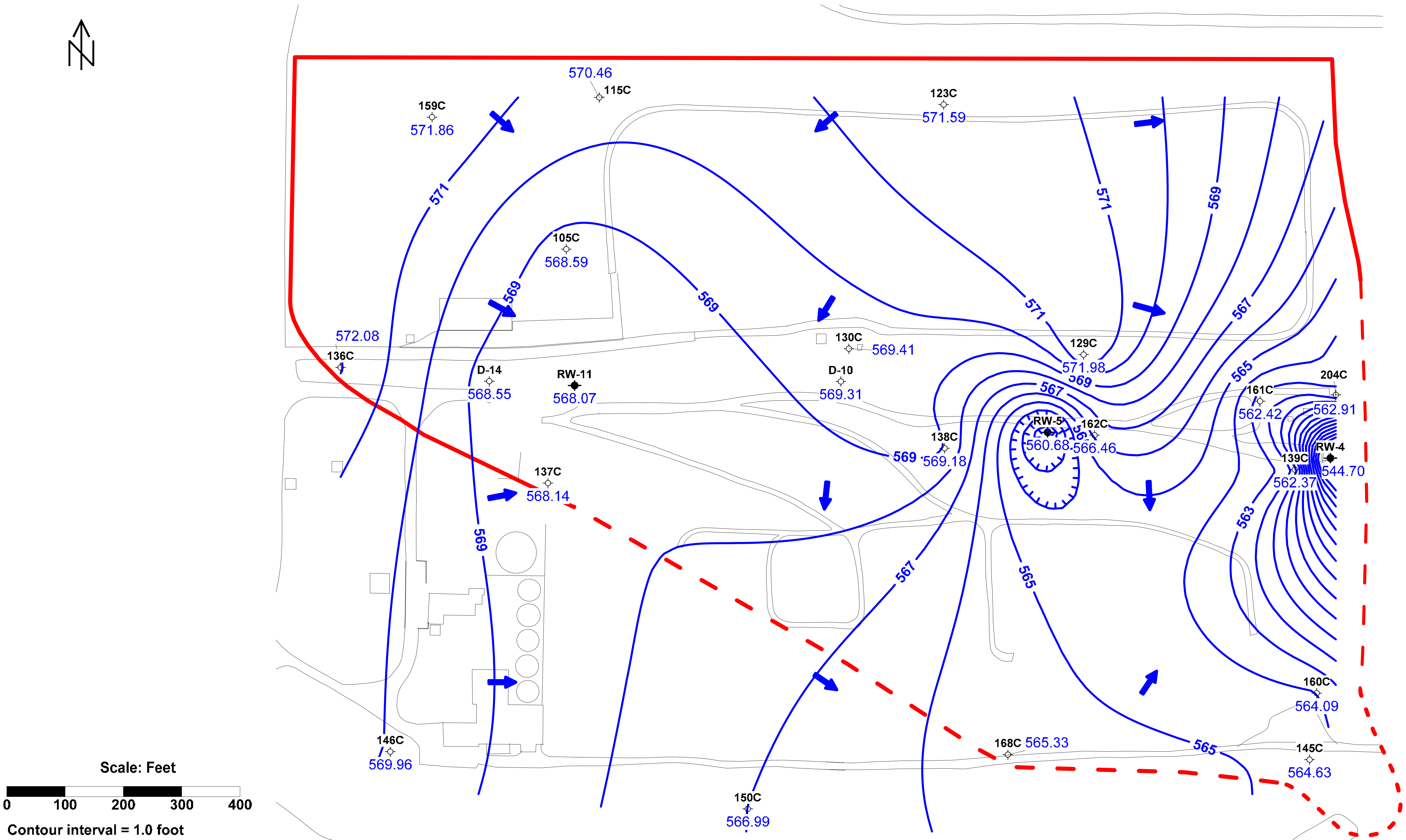

Contour interval = 1.0 foot

Elevation datum feet AMSL

Well 112C was not used in the contouring due to suspect casing.

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Project Manager: EAF	Date: 01-21-13

Job number: 445357.02023

LEGEND

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

Figure 3-11
Potentiometric Surface Map
DuPont Necco Park: C-Zone
November 07, 2012

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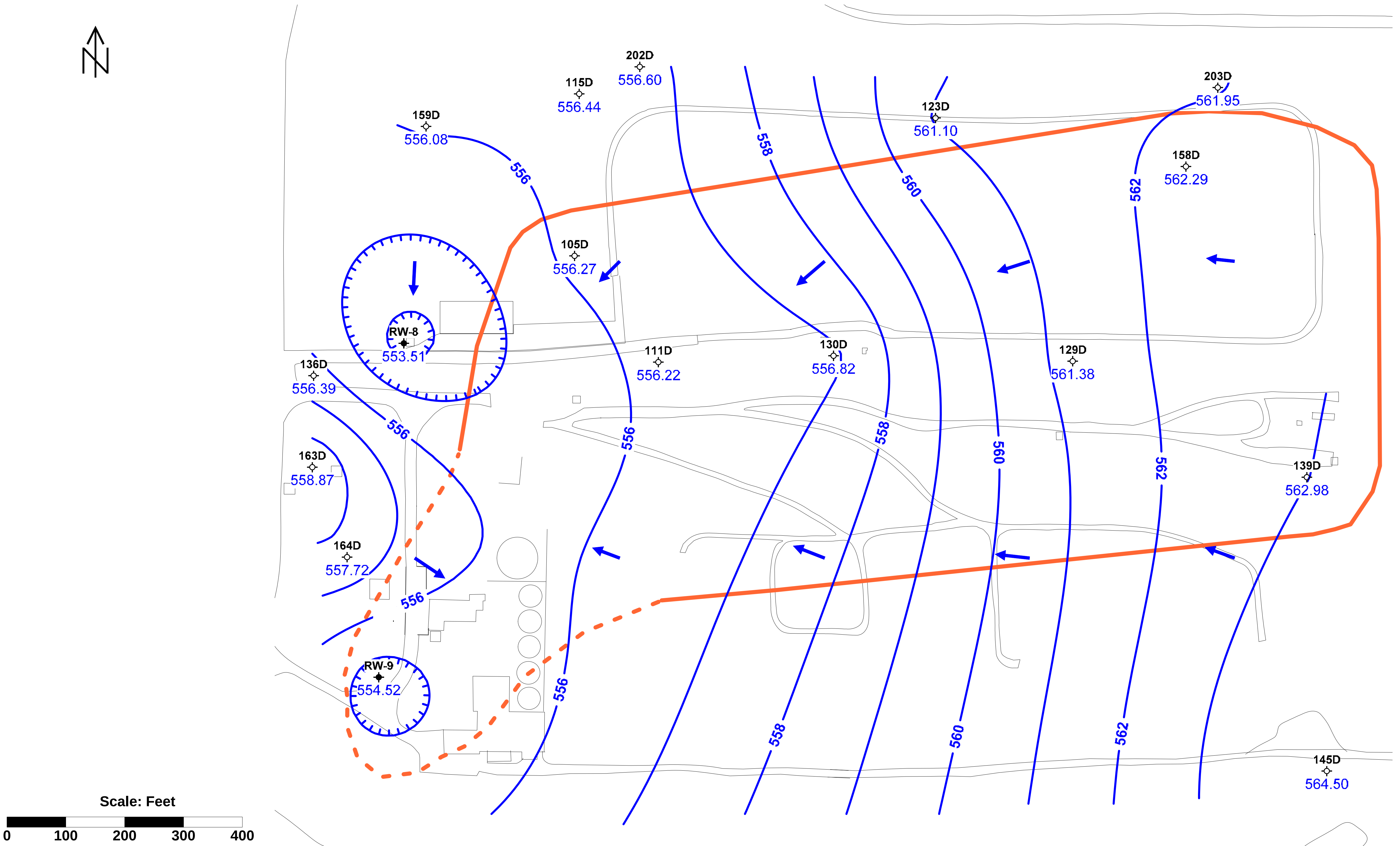

Contour interval = 1.0 feet
Elevation datum feet AMSL
Well 149D, located outside the map area, was used in the contour interpolation.
Well 148D located downgradient was not used in the interpolation.
Well 165D was not used in the contour interpolation.

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Project Manager: EAF	Date: 01-21-13

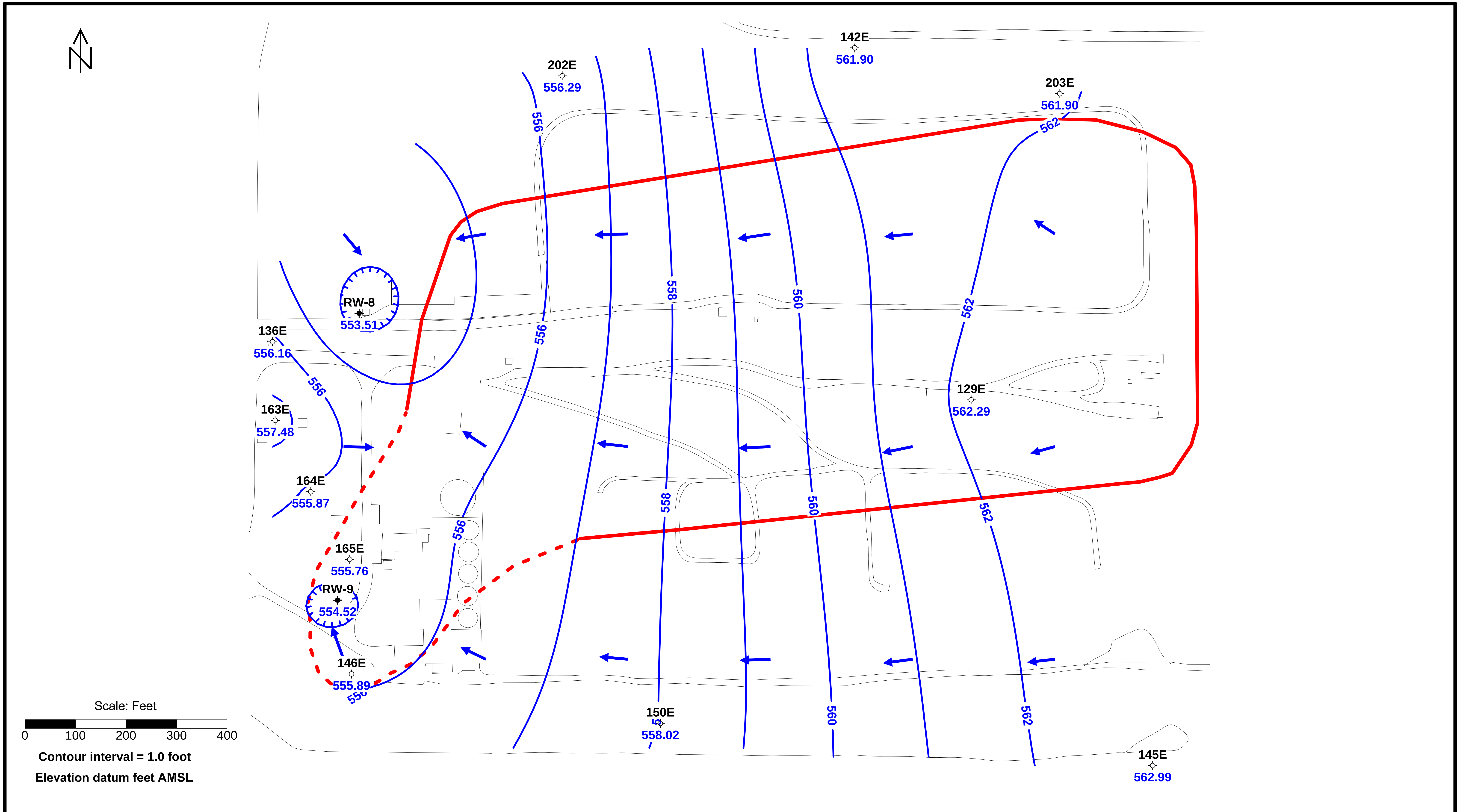
Job number: 445357.02023

LEGEND

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

Figure 3-12
Potentiometric Surface Map
DuPont Necco Park: D-Zone
November 07, 2012

Q:\Necco\HydroGeo\Hydro\GW_contours\2012-11-07 NEC Contour Tool\2012-11-07 - PZ D - F9.srf



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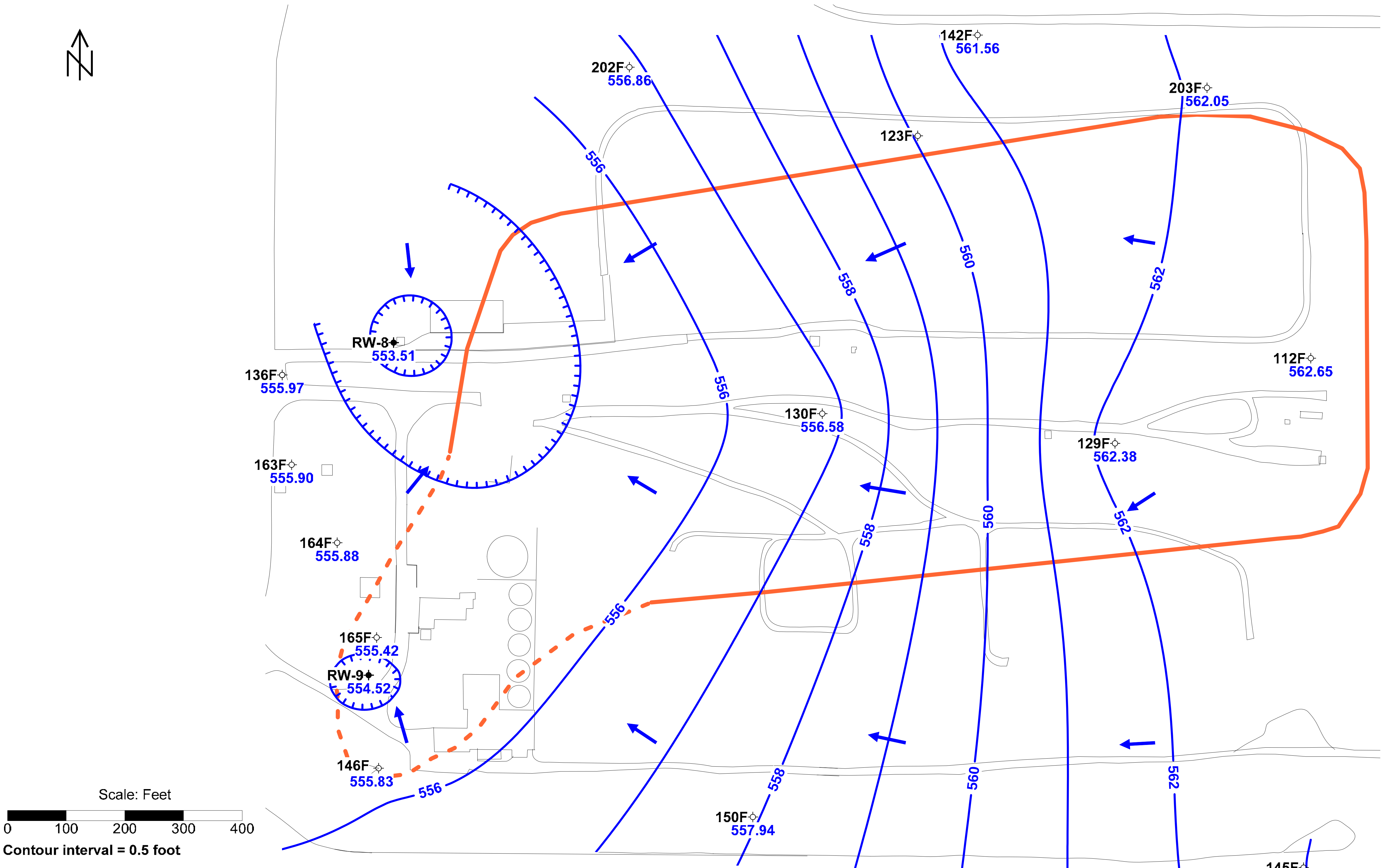
Checked by: JWS	Date: 01-21-13
Project Manager: EAF	Date: 01-21-13
Job number: 445357.02023	

LEGEND

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

Figure 3-13
Potentiometric Surface Map
DuPont Necco Park: E-Zone
November 07, 2012

Q:\Necco\HydroGeo\Hydro\GW_contours\2012-11-07 NEC Contour Tool\2012-11-07 - PZ E - F11.srf



Contour interval = 0.5 foot

Elevation datum feet AMSL

148F located downgradient was not used in the interpolation. 123F was anonymously high and not used in the contouring.

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Checked by: JWS	Date: 02-13-13
Project Manager: EAF	Date: 02-13-13

Job number: 447777.02000

LEGEND

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

Figure 3-14
Potentiometric Surface Map
DuPont Necco Park: F-Zone
November 07, 2012

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APPENDIX A
2012 ANNUAL GROUNDWATER SAMPLING RESULTS

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Appendix A
2012 Annual Groundwater Sampling Results - Necco Park

	Location	VH-137A	VH-145A	VH-146AR	VH-150A	VH-136B	VH-137B	VH-BLIND4	VH-145B	VH-146B	VH-150B
	Date	8/16/12	8/15/12	8/17/12	8/14/12	8/16/12	8/16/12	8/16/12	8/15/12	8/17/12	8/14/12
LabAnalyte	**Units**	FS	FS	FS	FS	FS	FS	DUP-VH-137B	FS	FS	FS
Field Parameters											
COLOR QUALITATIVE (FIELD)	NS	CLEAR	GREY	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	BLACK	CLEAR	GREY
DEPTH TO WATER FROM TOC	Feet	10.27	8.82	10.67	8.03	8.93	10.32	10.32	7.45	8.09	7.77
DISSOLVED OXYGEN (FIELD)	UG/L	230	490	520	830	220	340	310	1610	350	950
ODOR (FIELD)	NS	NONE	slight	slight	MODERATE	MODERATE	NONE	NONE	NONE	NONE	MODERATE
PH (FIELD)	STD UNITS	10.41	6.96	8.63	9.63	8.81	10.53	10.53	8.66	9.99	13.44
REDOX (FIELD)	MV	-352	-274	-452	-461	-245	-359	-360	-255	-582	-282
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	3070	8010	1328	1820	1870	6690	6681	14900	1022	2560
TEMPERATURE (FIELD)	DEGREES C	18.4	12.5	17.8	13.4	21.7	15.1	15.1	14	17.9	12.9
TURBIDITY QUANTITATIVE (FIELD)	NTU	10.97	64.8	12.39	2.29	9.86	7.27	7.25	5.08	5.83	9.95
Volatile Organics											
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.18	<0.18	<0.18	<0.18	<0.6	<0.18	<0.18	<2.3	<0.18	<0.18
1,1,2-TRICHLOROETHANE	UG/L	<0.27	<0.27	<0.27	<0.27	<0.9	<0.27	<0.27	30	<0.27	0.35 J
1,1-DICHLOROETHENE	UG/L	5.2	<0.19	0.22 J	<0.19	8.7	18	19	76	5.3	2.2
1,2-DICHLOROETHANE	UG/L	1.1	<0.22	<0.22	<0.22	<0.73	4.1	4.4	<2.8	<0.22	<0.22
CARBON TETRACHLORIDE	UG/L	<0.13	<0.13	<0.13	<0.13	<0.43	<0.13	<0.13	<1.6	<0.13	<0.13
CHLOROFORM	UG/L	0.68 J	<0.16	<0.16	<0.16	<0.53	3.5	4	74	<0.16	<0.16
CIS-1,2-DICHLOROETHENE	UG/L	20	1.4	0.26 J	0.31 J	420	110	100	3600	19	86
METHYLENE CHLORIDE	UG/L	10	<0.33	<0.33	<0.33	<1.1	43	47	120	<0.33	<0.33
TETRACHLOROETHENE	UG/L	18	<0.29	<0.29	<0.29	2000	95	94	20	<0.29	4.8
TRANS-1,2-DICHLOROETHENE	UG/L	2.6	<0.19	<0.19	<0.19	18	8.9	9.3	280	1.6	14
TRICHLOROETHENE	UG/L	34	0.6 J	<0.17	<0.17	480	180	180	740	1.7	14
VINYL CHLORIDE	UG/L	12	1.1	0.85 J	<0.22	17	64	68	430	5	38
Semivolatile Organics											
2,4,5-TRICHLOROPHENOL	UG/L	1.3 J	<0.29	0.32 J	<0.29	4200	250	200	1.3 J	19 J	22
2,4,6-TRICHLOROPHENOL	UG/L	<1.9	<0.76	1 J	<0.76	1400	100	79 J	<3	6.1 J	5.9 J
3 & 4 METHYLPHENOL	UG/L	8.4 J	<0.71	<0.71	<0.71	<89	33 J	29 J	8.6 J	4.5 J	12 J
HEXACHLOROBENZENE	UG/L	<0.24	<0.095	<0.095	<0.095	<12	<0.95	<0.95	<0.38	<0.38	<0.19
HEXACHLOROBUTADIENE	UG/L	<0.64	<0.26	<0.26	<0.26	<32	<2.6	<2.6	<1	<1	<0.51
HEXACHLOROETHANE	UG/L	<1.9	<0.76	<0.76	<0.76	<95	<7.6	<7.6	<3	<3	<1.5
PENTACHLOROPHENOL	UG/L	<5.7	<2.3	2.3 J	<2.3	12000	300 J	240 J	<9.1	37 J	<4.6
PHENOL	UG/L	78	<0.57	<0.57	<0.57	<71	200	170	4.1 J	2.7 J	47
TIC 01	UG/L	<NS J	<NS J	<NS J	<NS J	19 J	73 J	59 J	130 J	<NS J	49 J
Inorganics											
BARIUM, DISSOLVED	UG/L	2100	110 B	11 B	60 B	46 B	4300	4200	50 B	15 B	1700
CHLORIDE	UG/L	200000 B	2500000 J	300000	110000 B	170000 B	580000 B	600000 B	5600000	140000	570000 B
Total Volatiles	UG/L	104	3	1	0	2944	527	526	5370	33	159

< and ND = Non detect at stated reporting limit

Appendix A
2012 Annual Groundwater Sampling Results - Necco Park

	Location	VH-168B	VH-171B	VH-172B	VH-145C	VH-146C	VH-168C	VH-150C	VH-136D	VH-BLIND1	VH-148D
	Date	8/16/12	8/17/12	8/13/12	8/13/12	8/17/12	8/16/12	8/14/12	8/13/12	8/13/12	8/15/12
LabAnalyte	Units	FS	FS	FS	FS	FS	FS	FS	FS	DUP-VH-136D	FS
Field Parameters											
COLOR QUALITATIVE (FIELD)	NS	CLEAR	CLEAR	GREY	GREY	CLEAR	BLACK	CLEAR	GREY	GREY	BLACK
DEPTH TO WATER FROM TOC	Feet	11.79	10.18	7.51	13.76	8.92	15.36	13.35	24.54	24.54	10.78
DISSOLVED OXYGEN (FIELD)	UG/L	320	460	1010	480	340	840	550	210	200	810
ODOR (FIELD)	NS	NONE	MODERATE	slight	slight	NONE	MODERATE	STRONG	slight	slight	NONE
PH (FIELD)	STD UNITS	6.88	6.86	6.89	6.48	8.02	6.24	8.9	7.74	7.75	8.79
REDOX (FIELD)	MV	-349	-319	-253	-210	-318	-463	-524	-315	-315	-470
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	35500	14430	9390	65000	1429	57190	4800	899	900	919
TEMPERATURE (FIELD)	DEGREES C	15.4	19.9	13.1	16.3	15.8	15.8	14	17.9	17.9	16.1
TURBIDITY QUANTITATIVE (FIELD)	NTU	6.25	10.97	14.07	2.96	8.24	4.83	6.37	7.19	7	5.83
Volatile Organics											
1,1,2,2-TETRACHLOROETHANE	UG/L	18 J	<0.18	620	<6	<0.18	710	<0.18	0.5 J	0.43 J	<0.18
1,1,2-TRICHLOROETHANE	UG/L	1300	<0.27	31	98	<0.27	1700	<0.27	7.2	7.3	<0.27
1,1-DICHLOROETHENE	UG/L	520	0.67 J	6.9	80	0.56 J	250	1.3	6.1	6.7	<0.19
1,2-DICHLOROETHANE	UG/L	680	0.36 J	3.2	100	<0.22	150	<0.22	10	9.4	<0.22
CARBON TETRACHLORIDE	UG/L	<6.5	<0.13	40	<4.3	<0.13	460	<0.13	<0.16	<0.22	<0.13
CHLOROFORM	UG/L	57	<0.16	120	9.6 J	<0.16	810	<0.16	9.1	8.9	<0.16
CIS-1,2-DICHLOROETHENE	UG/L	19000	99	810	8600	3.8	2000	3	440	450 J	3.3
METHYLENE CHLORIDE	UG/L	21000	<0.33	27	2600	<0.33	3700	<0.33	<0.41	<0.55	<0.33
TETRACHLOROETHENE	UG/L	23 J	<0.29	360	<9.7	<0.29	300	0.53 J	0.66 J	0.55 J	0.35 J
TRANS-1,2-DICHLOROETHENE	UG/L	310	0.58 J	83	180	0.88 J	460	1.1	6.6	6	<0.19
TRICHLOROETHENE	UG/L	340	<0.17	290	52	0.94 J	2100	2	21	21	0.64 J
VINYL CHLORIDE	UG/L	16000	130	99	4800	2.8	780	2.9	230	280	<0.22
Semivolatile Organics											
2,4,5-TRICHLOROPHENOL	UG/L	<14	<0.29	<1.4	<2.9	<0.29	<14	4.9 J	14	8.6 J	<1.1
2,4,6-TRICHLOROPHENOL	UG/L	<38	<0.76	<3.8	<7.6	0.93 J	<38	1.3 J	2.9 J	1.9 J	<3
3 & 4 METHYLPHENOL	UG/L	210 J	<0.71	<3.6	110 J	<0.71	<36	<0.71	<0.71	<0.71	37 J
HEXACHLOROBENZENE	UG/L	<4.8	<0.095	<0.48	<0.95	<0.095	<4.8	<0.095	<0.095	<0.095	<0.38
HEXACHLOROBUTADIENE	UG/L	<13	<0.26	130	<2.6	0.46 J	<13	<0.26	<0.26	<0.26	<1
HEXACHLOROETHANE	UG/L	<38	<0.76	27 J	<7.6	<0.76	<38	<0.76	<0.76	<0.76	<3
PENTACHLOROPHENOL	UG/L	<110	<2.3	<11	<23	<2.3	<110	<2.3	4.8 J	<2.3	<9.1
PHENOL	UG/L	250 J	<0.57	<2.9	140	<0.57	160 J	1.2 J	<0.57	<0.57	100
TIC 01	UG/L	930 J	43 B	17 J	200 J	0.86 B	380 J	27 J	1.7 J	1.3 J	<NS J
Inorganics											
BARIUM, DISSOLVED	UG/L	330	31 B	22 B	260	31 B	250	64 B	63 U	65 U	50 B
CHLORIDE	UG/L	16000000	5100000	2700000 B	33000000	150000	17000000	990000 B	210000 B	210000 B	160000 J
Total Volatiles	UG/L	59248	231	2490	16520	9	13420	11	731	790	4

< and ND = Non detect at stated reporting limit

Appendix A
2012 Annual Groundwater Sampling Results - Necco Park

	Location	VH-145D	VH-165D	VH-136F	VH-146E	VH-150E	VH-165E	VH-146F	VH-150F	EQBLK-1
	Date	8/15/12	8/15/12	8/16/12	8/13/12	8/14/12	8/15/12	8/17/12	8/14/12	8/13/12
LabAnalyte	**Units**	FS	FS	FS	FS	FS	FS	FS	FS	EB
Field Parameters										
COLOR QUALITATIVE (FIELD)	NS	BLACK	CLEAR	GREY	BLACK	BLACK	BLACK	BLACK	CLEAR	NS
DEPTH TO WATER FROM TOC	Feet	13.43	13.57	24.55	20.5	18.55	22.02	20.52	21.2	NS
DISSOLVED OXYGEN (FIELD)	UG/L	620	470	420	460	1420	910	1340	480	NS
ODOR (FIELD)	NS	slight	NONE	slight	MODERATE	MODERATE	MODERATE	MODERATE	slight	NS
PH (FIELD)	STD UNITS	7.35	8.42	7.95	7.01	6.54	6.92	6.55	7.11	NS
REDOX (FIELD)	MV	-459	-425	-440	-488	-493	-441	-464	-292	NS
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	34200	1235	1390	3910	17500	3440	12070	25300	NS
TEMPERATURE (FIELD)	DEGREES C	18.4	14.1	14.7	14	15.2	12.7	13.1	13.1	NS
TURBIDITY QUANTITATIVE (FIELD)	NTU	17.9	13.1	11.82	4.87	4.19	5.87	5.44	5.9	NS
Volatile Organics										
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.45	<0.18	<0.18	2.6 J	<0.28	2300	9.8 J	<0.36	<0.18
1,1,2-TRICHLOROETHANE	UG/L	1.9 J	<0.27	<0.27	4.2 J	0.43 J	1800	99	<0.54	<0.27
1,1-DICHLOROETHENE	UG/L	4.7	0.62 J	1.6	240	6.8	380	360	0.92 J	<0.19
1,2-DICHLOROETHANE	UG/L	12	2.5	16	<1.5	<0.34	290	7.4 J	<0.44	<0.22
CARBON TETRACHLORIDE	UG/L	<0.33	<0.13	<0.13	<0.87	<0.2	860	<2.6	<0.26	<0.13
CHLOROFORM	UG/L	<0.4	<0.16	1.3	120	6.4	3600	68	<0.32	<0.16
CIS-1,2-DICHLOROETHENE	UG/L	410	2.1	5	1700	580	22000	8200	130	<0.17
METHYLENE CHLORIDE	UG/L	460	<0.33	<0.33	2.6 J	11	6000	300	15	<0.33
TETRACHLOROETHENE	UG/L	<0.73	<0.29	0.63 J	2.7 J	<0.45	1300	9.2 J	<0.58	<0.29
TRANS-1,2-DICHLOROETHENE	UG/L	8.1	1.3	7.2	170	14	620	630	0.57 J	<0.19
TRICHLOROETHENE	UG/L	<0.43	0.2 J	3.8	420	11	12000	230	<0.34	<0.17
VINYL CHLORIDE	UG/L	640	5.9	140	2100	360	6400	2800	480	<0.22
Semivolatile Organics										
2,4,5-TRICHLOROPHENOL	UG/L	<14	64	<0.29	11 J	<7.1	1100	140	<7.1	<0.29
2,4,6-TRICHLOROPHENOL	UG/L	<38	4 J	<0.76	8.4 J	<19	190 J	51 J	<19	<0.76
3 & 4 METHYLPHENOL	UG/L	<36	13 J	<0.71	12 J	22 J	56 J	57 J	28 J	<0.71
HEXACHLOROBENZENE	UG/L	<4.8	<0.38	<0.095	<0.38	<2.4	<3.8	<0.95	<2.4	<0.095
HEXACHLOROBUTADIENE	UG/L	<13	<1	<0.26	<1	<6.4	130 J	<2.6	<6.4	<0.26
HEXACHLOROETHANE	UG/L	<38	<3	<0.76	<3	<19	<30	<7.6	<19	<0.76
PENTACHLOROPHENOL	UG/L	<110	<9.1	<2.3	<9.1	<57	290 J	<23	<57	<2.3
PHENOL	UG/L	74 J	4.6 J	<0.57	<2.3	450	100 J	320	330	<0.57
TIC 01	UG/L	3200 J	70 J	<NS J	550 J	3800 J	1400 J	1600 J	4400 J	<NS J
Inorganics										
BARIUM, DISSOLVED	UG/L	320	19 B	49 B	31 U	61 B	290	33 B	69 B	35 J
CHLORIDE	UG/L	14000000	390000 B	240000 B	470000 B	5400000	840000 B	3700000	8800000	22000
Total Volatiles	UG/L	1537	13	176	4762	990	57550	12713	626	0

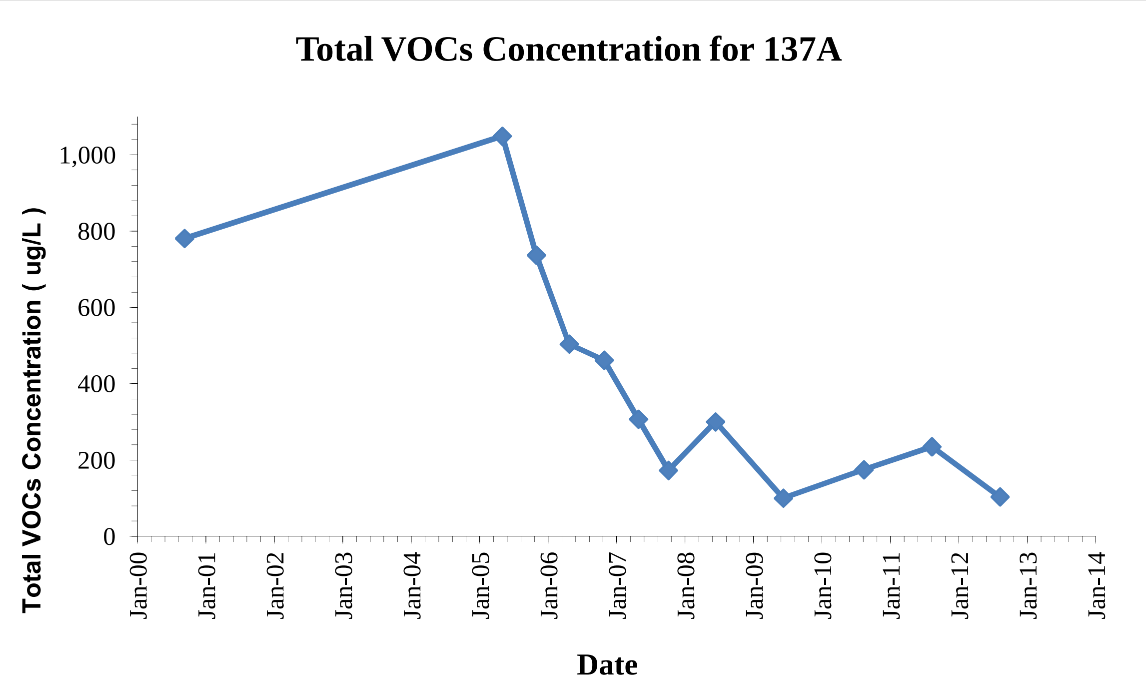
< and ND = Non detect at stated reporting limit

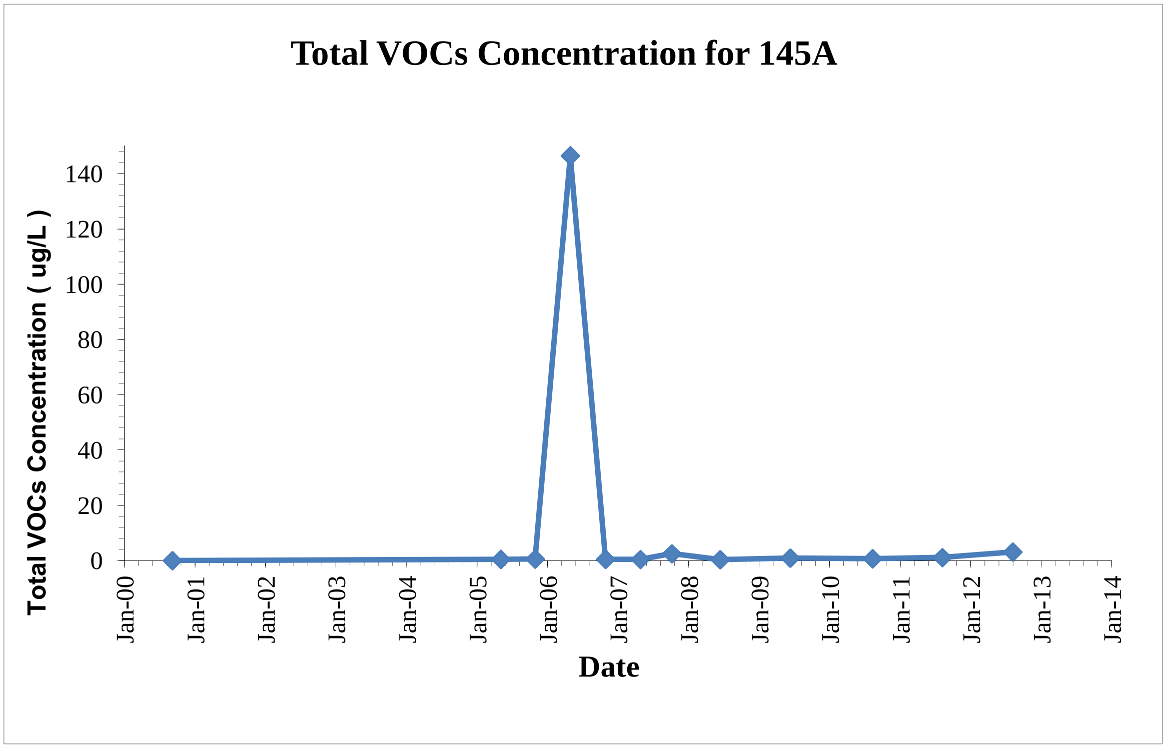
Appendix A
2012 Annual Groundwater Sampling Results - Necco Park

	Location	EQBLK-2	EQBLK-3	EQBLK-4	EQBLK-5	TBLK-1	TBLK2	TBLK3	TBLK4	TBLK5
	Date	8/14/12	8/15/12	8/16/12	8/17/12	8/13/12	8/14/12	8/15/12	8/16/12	8/17/12
LabAnalyte	**Units**	EB	EB	EB	EB	TB	TB	TB	TB	TB
Field Parameters										
COLOR QUALITATIVE (FIELD)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DEPTH TO WATER FROM TOC	Feet	NS	NS	NS	NS	NS	NS	NS	NS	NS
DISSOLVED OXYGEN (FIELD)	UG/L	NS	NS	NS	NS	NS	NS	NS	NS	NS
ODOR (FIELD)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
PH (FIELD)	STD UNITS	NS	NS	NS	NS	NS	NS	NS	NS	NS
REDOX (FIELD)	MV	NS	NS	NS	NS	NS	NS	NS	NS	NS
SPECIFIC CONDUCTANCE (FIELD)	UMHOS/CM	NS	NS	NS	NS	NS	NS	NS	NS	NS
TEMPERATURE (FIELD)	DEGREES C	NS	NS	NS	NS	NS	NS	NS	NS	NS
TURBIDITY QUANTITATIVE (FIELD)	NTU	NS	NS	NS	NS	NS	NS	NS	NS	NS
Volatile Organics										
1,1,2,2-TETRACHLOROETHANE	UG/L	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
1,1,2-TRICHLOROETHANE	UG/L	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27	<0.27
1,1-DICHLOROETHENE	UG/L	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
1,2-DICHLOROETHANE	UG/L	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
CARBON TETRACHLORIDE	UG/L	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
CHLOROFORM	UG/L	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
CIS-1,2-DICHLOROETHENE	UG/L	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
METHYLENE CHLORIDE	UG/L	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
TETRACHLOROETHENE	UG/L	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29	<0.29
TRANS-1,2-DICHLOROETHENE	UG/L	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
TRICHLOROETHENE	UG/L	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
VINYL CHLORIDE	UG/L	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22	<0.22
Semivolatile Organics										
2,4,5-TRICHLOROPHENOL	UG/L	<0.29	<0.29	<0.29	<0.29	NS	NS	NS	NS	NS
2,4,6-TRICHLOROPHENOL	UG/L	<0.76	<0.76	<0.76	<0.76	NS	NS	NS	NS	NS
3 & 4 METHYLPHENOL	UG/L	<0.71	<0.71	<0.71	<0.71	NS	NS	NS	NS	NS
HEXACHLOROBENZENE	UG/L	<0.095	<0.095	<0.095	<0.095	NS	NS	NS	NS	NS
HEXACHLOROBUTADIENE	UG/L	<0.26	<0.26	<0.26	<0.26	NS	NS	NS	NS	NS
HEXACHLOROETHANE	UG/L	<0.76	<0.76	<0.76	<0.76	NS	NS	NS	NS	NS
PENTACHLOROPHENOL	UG/L	<2.3	<2.3	<2.3	<2.3	NS	NS	NS	NS	NS
PHENOL	UG/L	<0.57	<0.57	<0.57	<0.57	NS	NS	NS	NS	NS
TIC 01	UG/L	<NS J	<NS J	<NS J	<NS J	NS	NS	NS	NS	NS
Inorganics										
BARIUM, DISSOLVED	UG/L	33 J	34 J	34 J	32 J	NS	NS	NS	NS	NS
CHLORIDE	UG/L	20000 J	20000 J	20000	<100	NS	NS	NS	NS	NS
Total Volatiles	UG/L	0	0	0	0	0	0	0	0	0

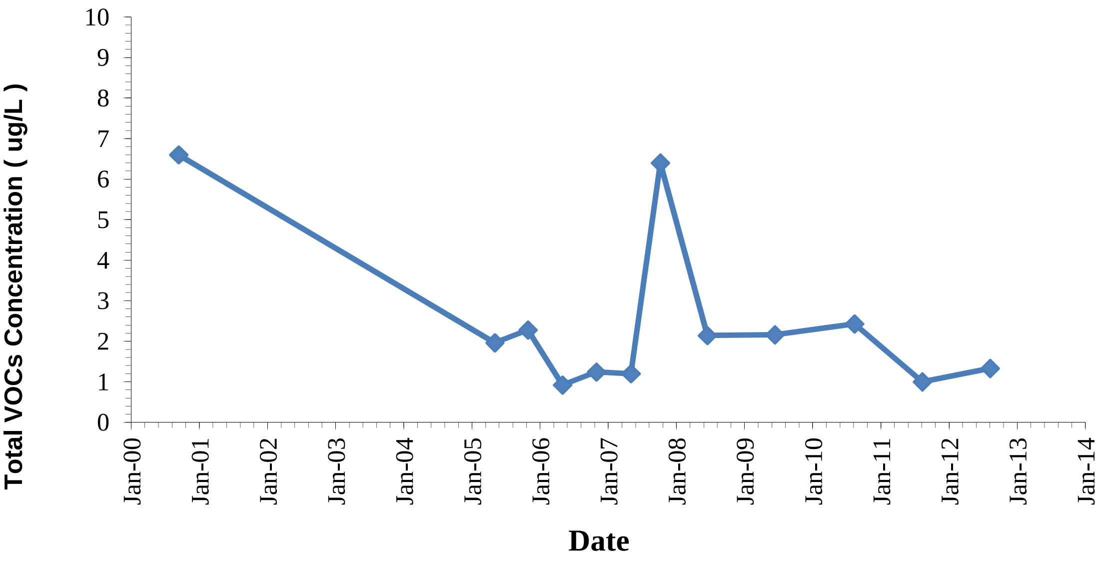
< and ND = Non detect at stated reporting limit

APPENDIX B
TVOC TREND PLOTS

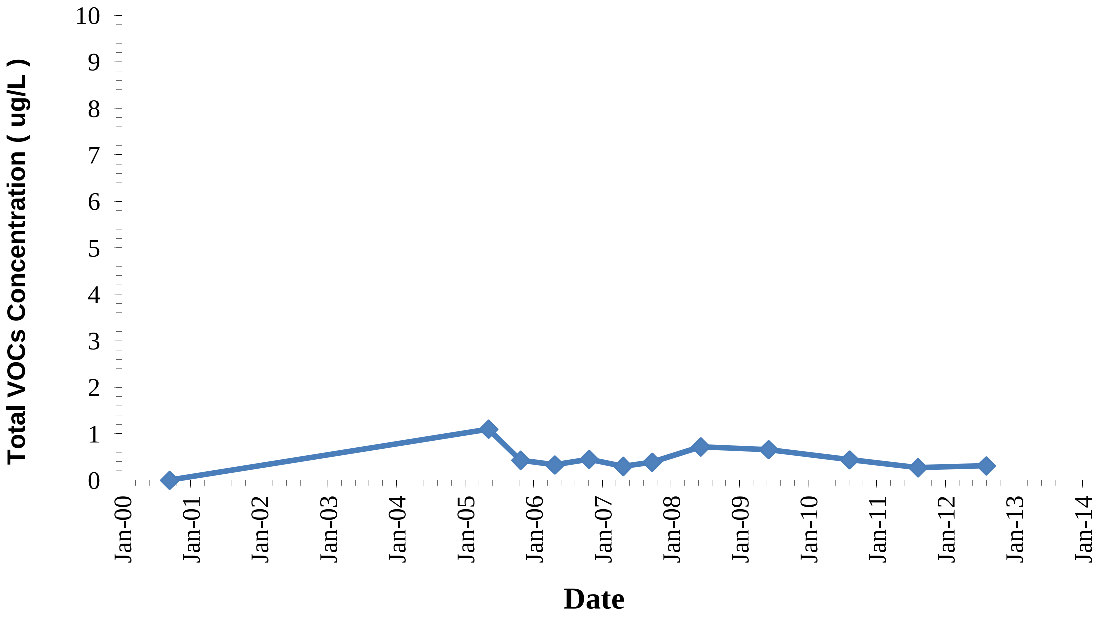

Total VOCs Concentration for 137A
Total VOCs Concentration (ug/L)
1,000
800
600
400
200
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date

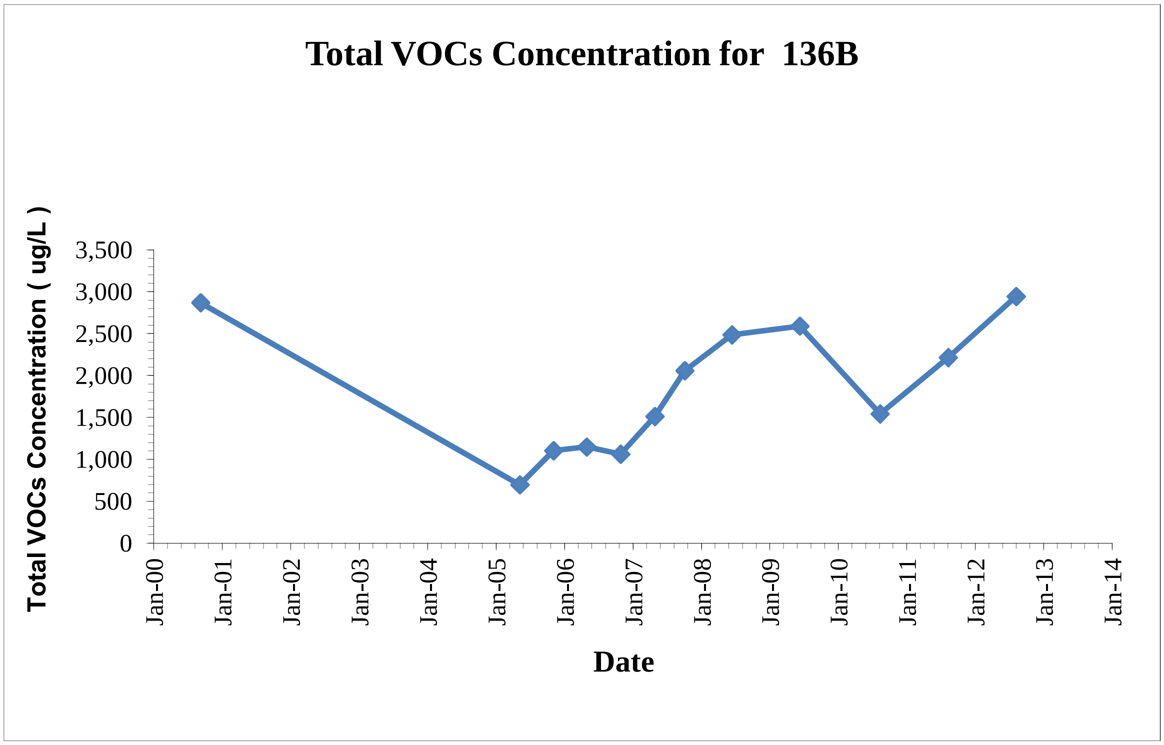

Total VOCs Concentration for 145A
Total VOCs Concentration (ug/L)
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date

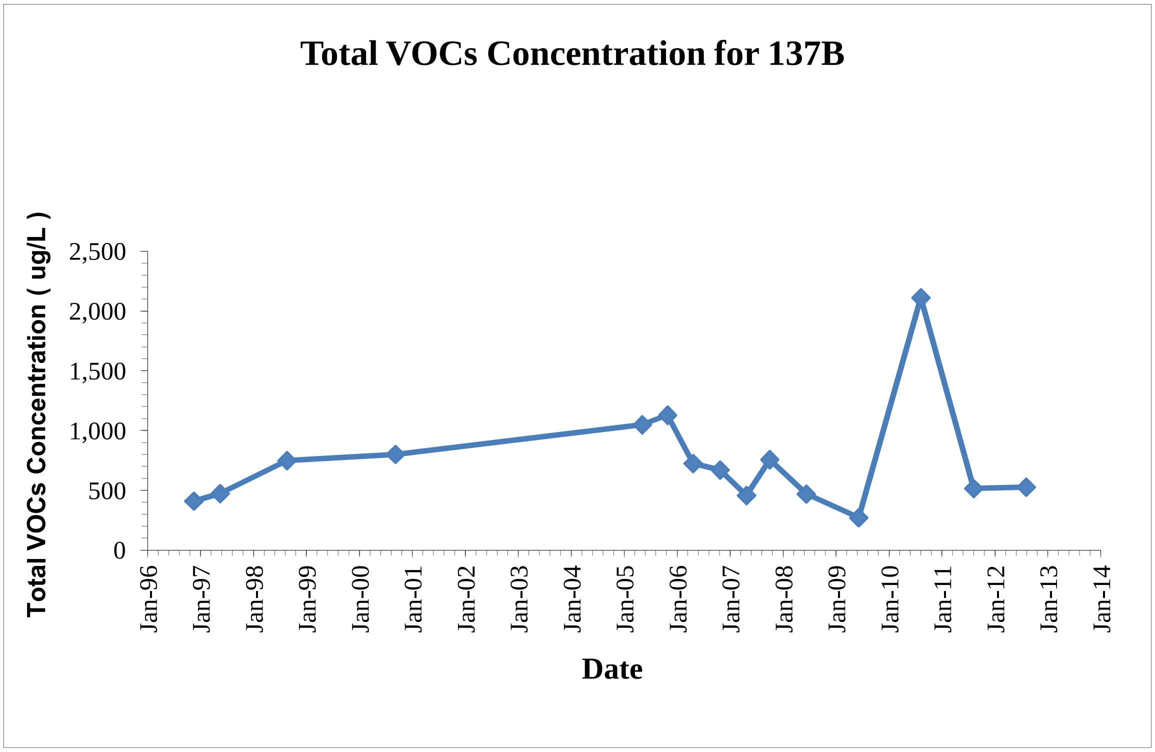
Total VOCs Concentration for 146AR

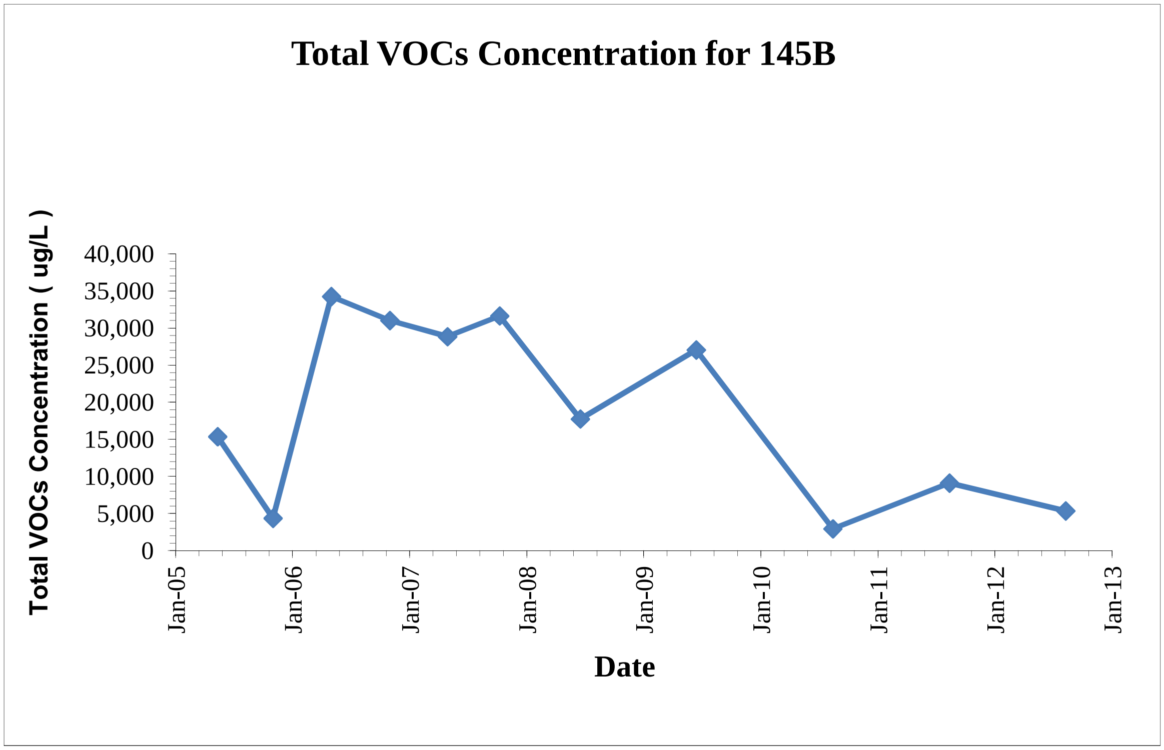


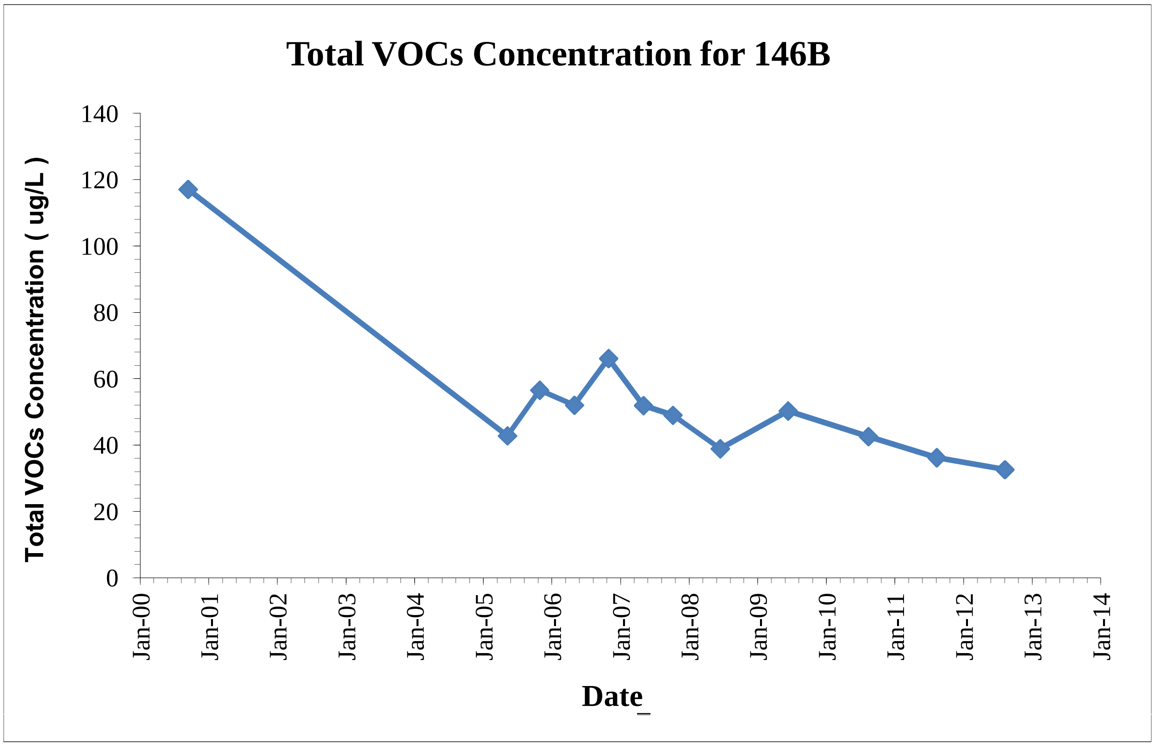
Total VOCs Concentration for 150A



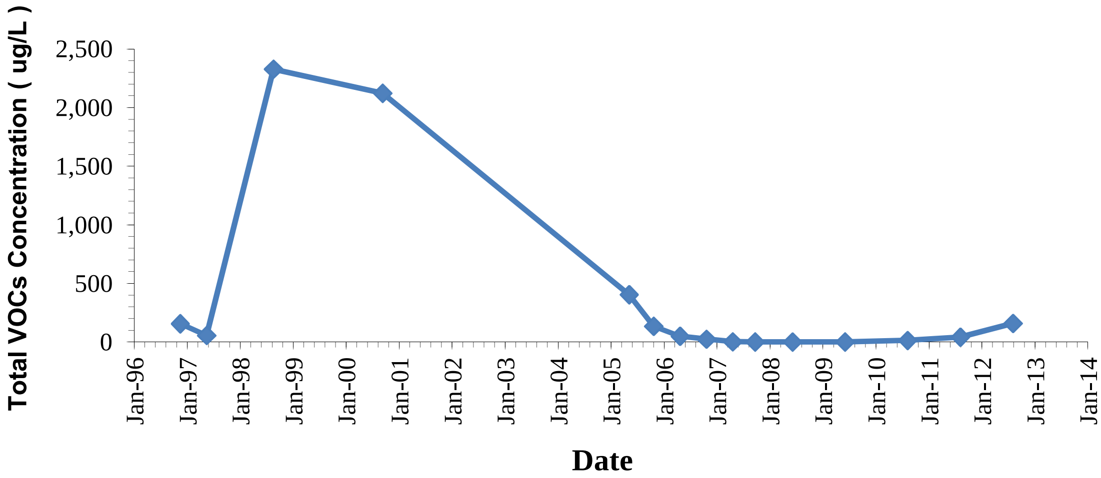

Total VOCs Concentration for 136B
Total VOCs Concentration (ug/L)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date


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
Date

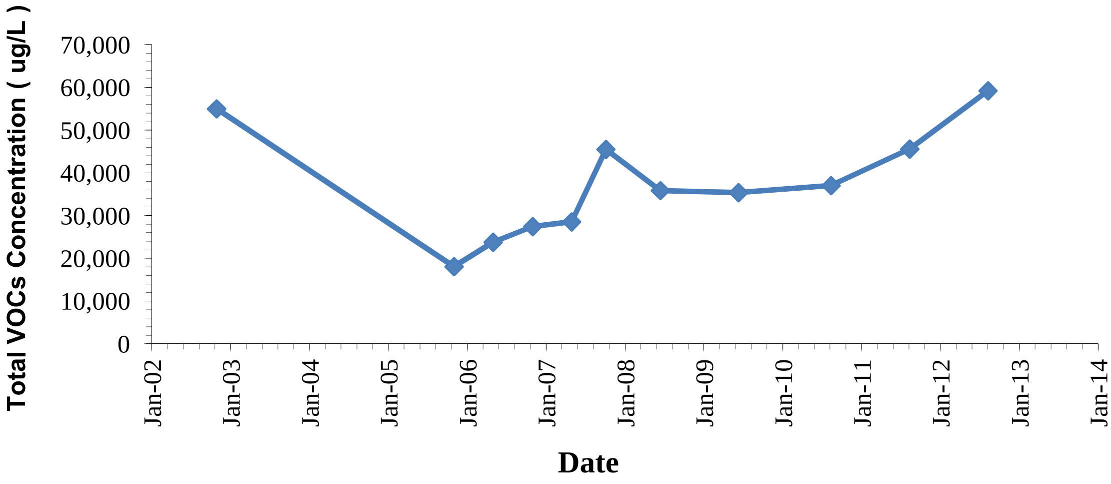

Total VOCs Concentration for 145B
Total VOCs Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

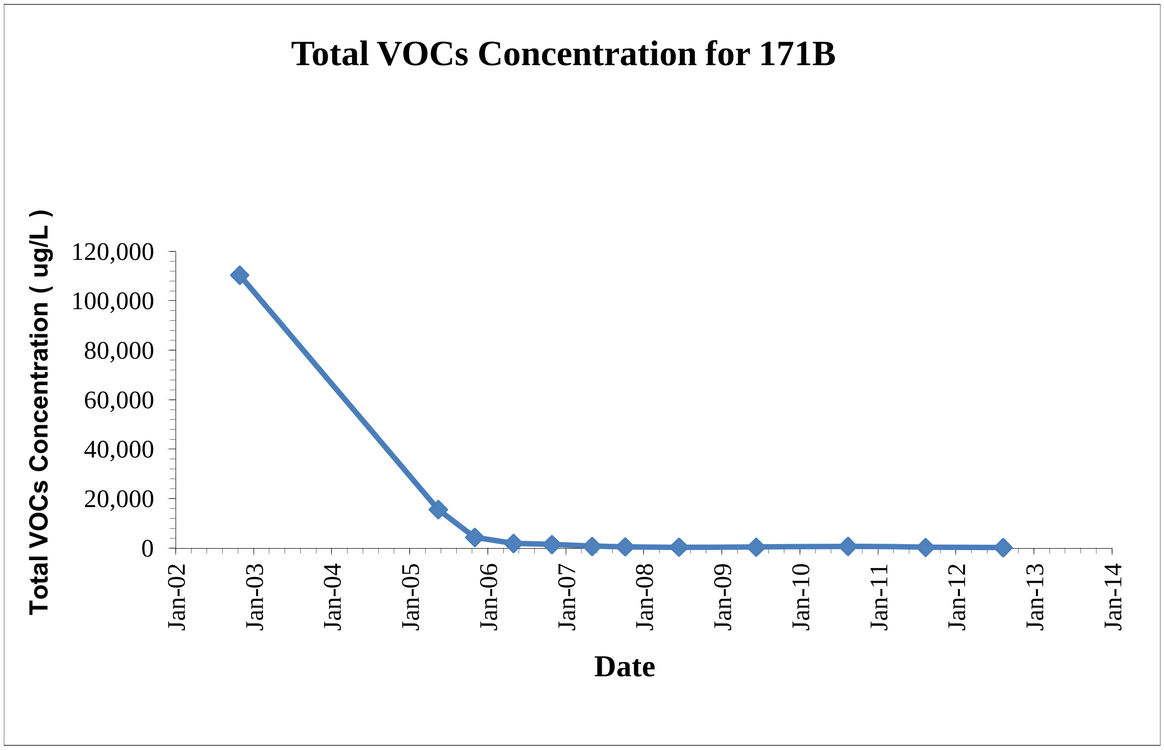

Total VOCs Concentration for 146B
Total VOCs Concentration (ug/L)
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date_

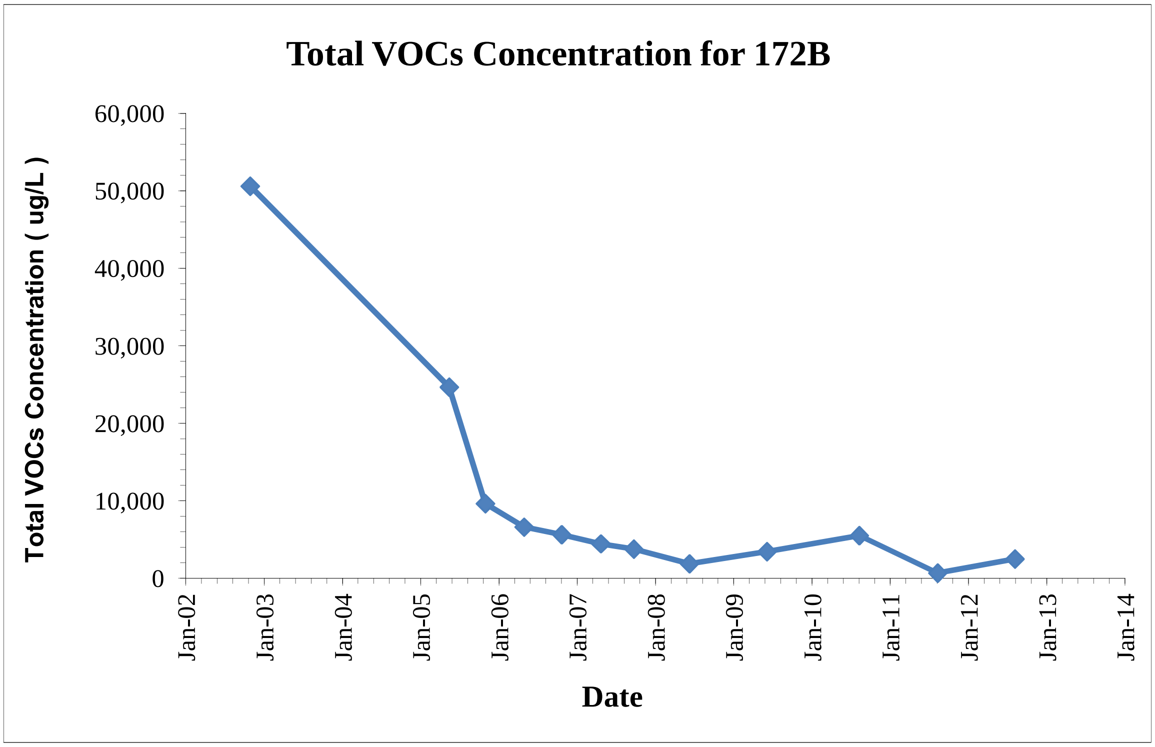
Total VOCs Concentration for 150B

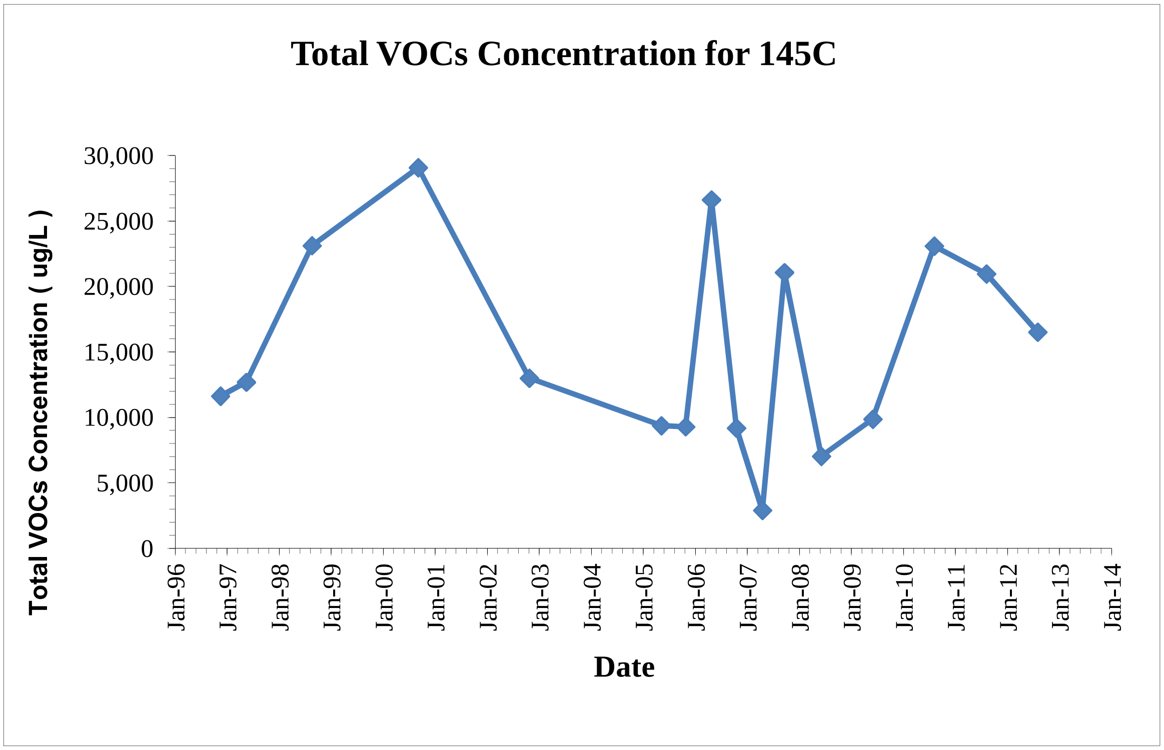


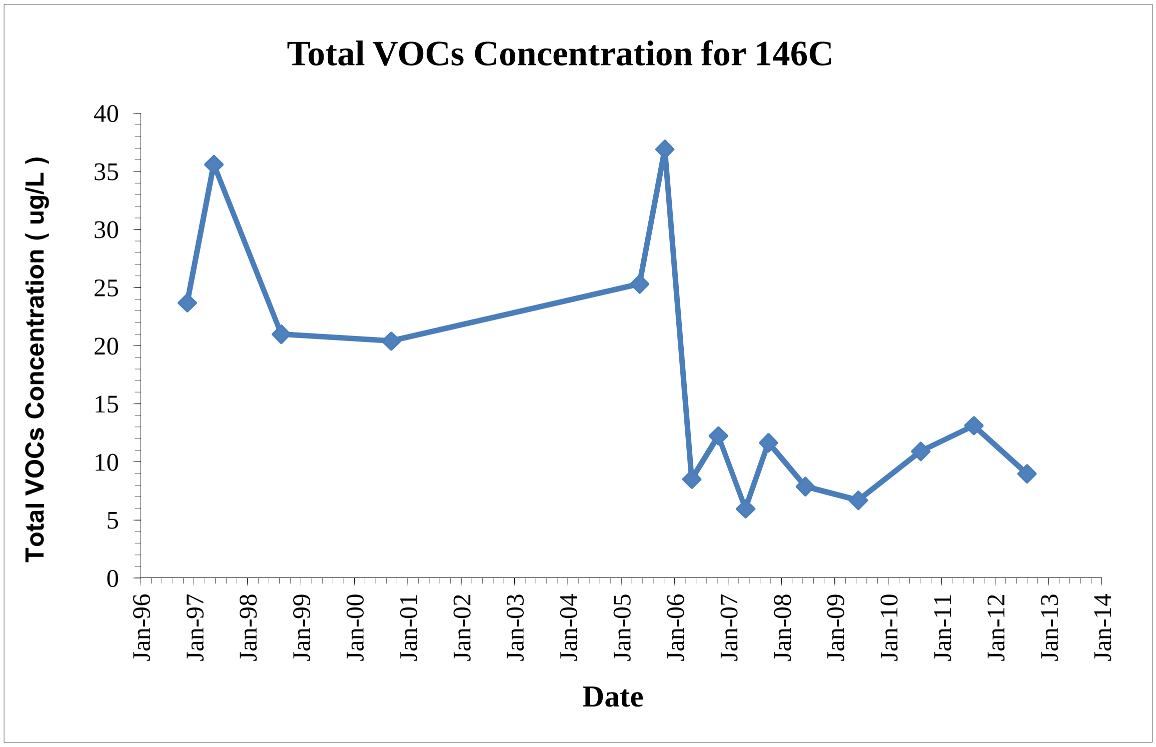
Total VOCs Concentration for 168B

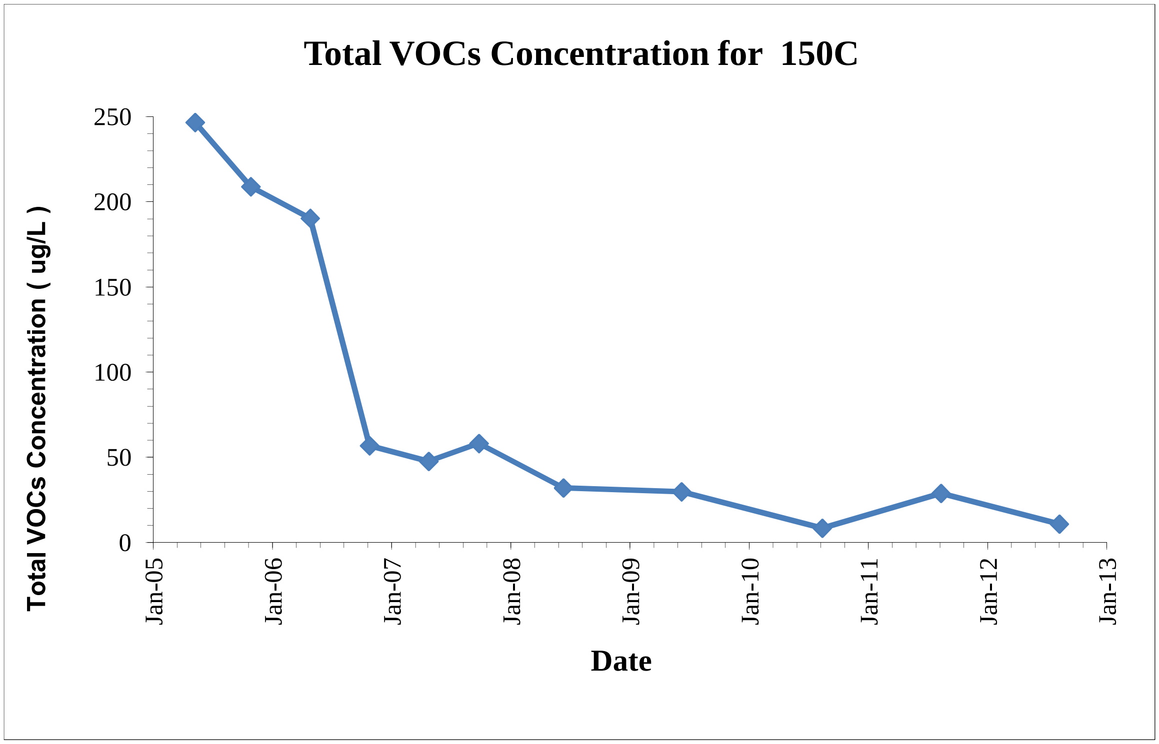


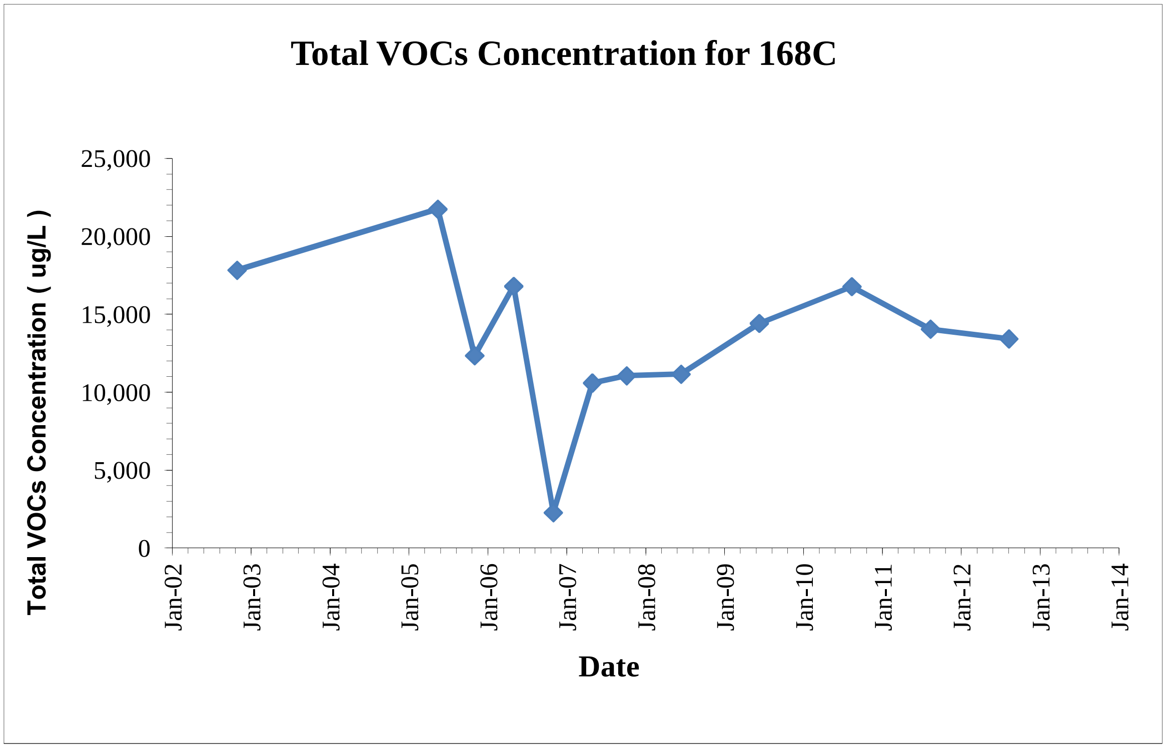

Total VOCs Concentration for 171B
Total VOCs Concentration (ug/L)
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date


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
Date

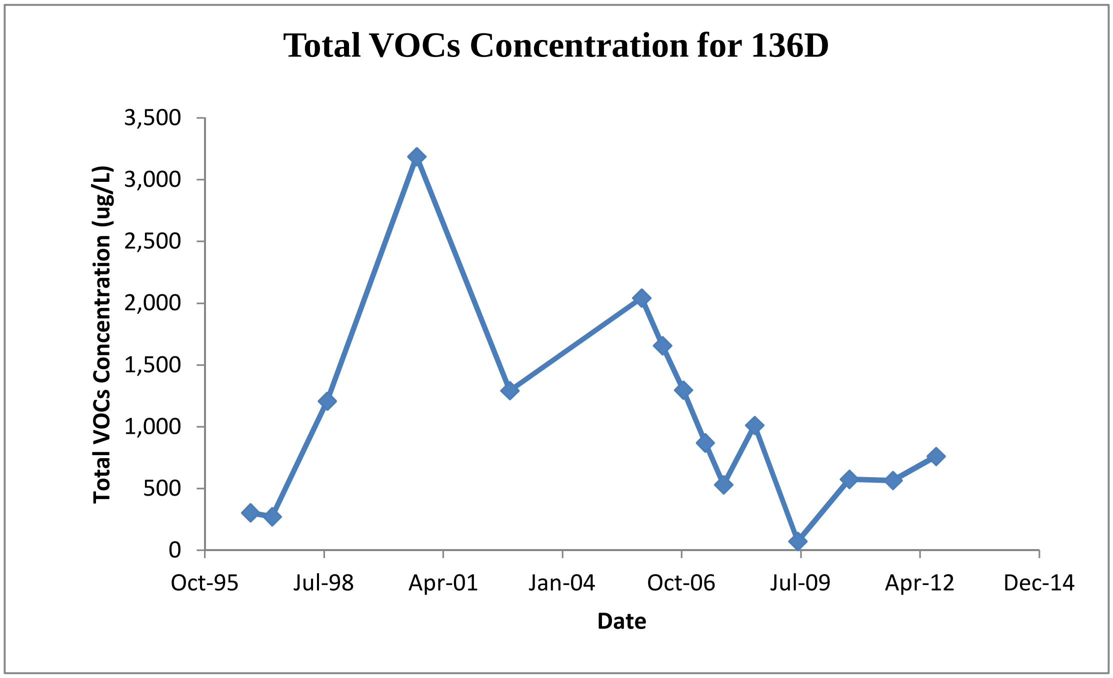

Total VOCs Concentration for 145C
Total VOCs Concentration (ug/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date

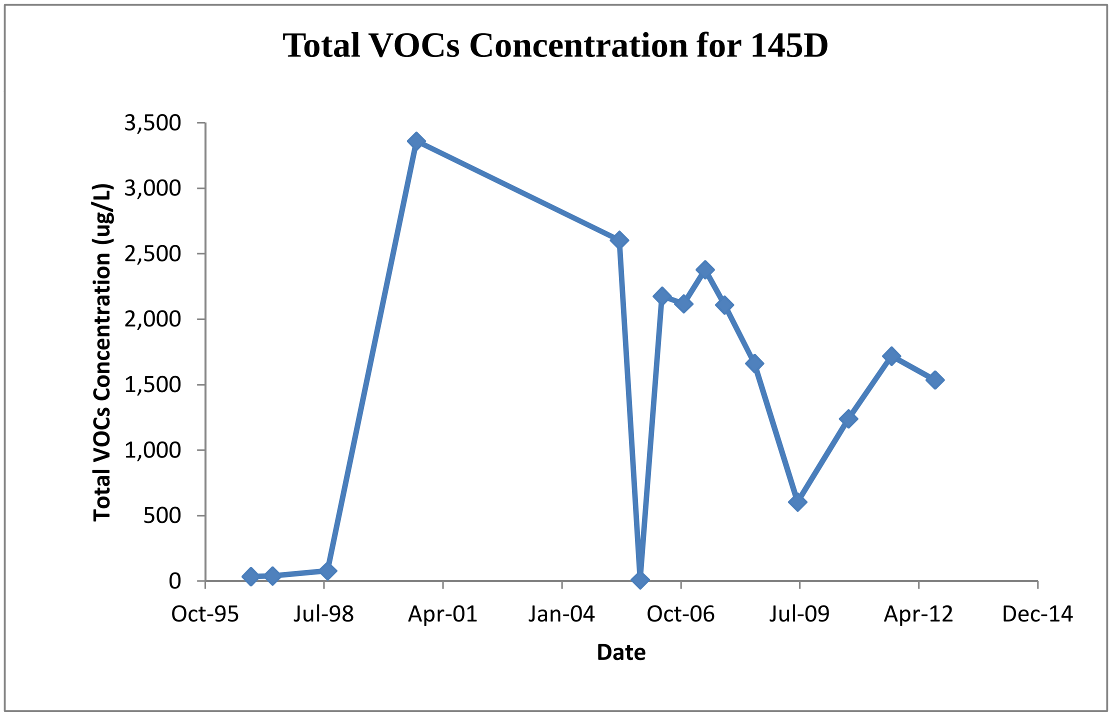

Total VOCs Concentration for 146C
Total VOCs Concentration (ug/L)
40
35
30
25
20
15
10
5
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date

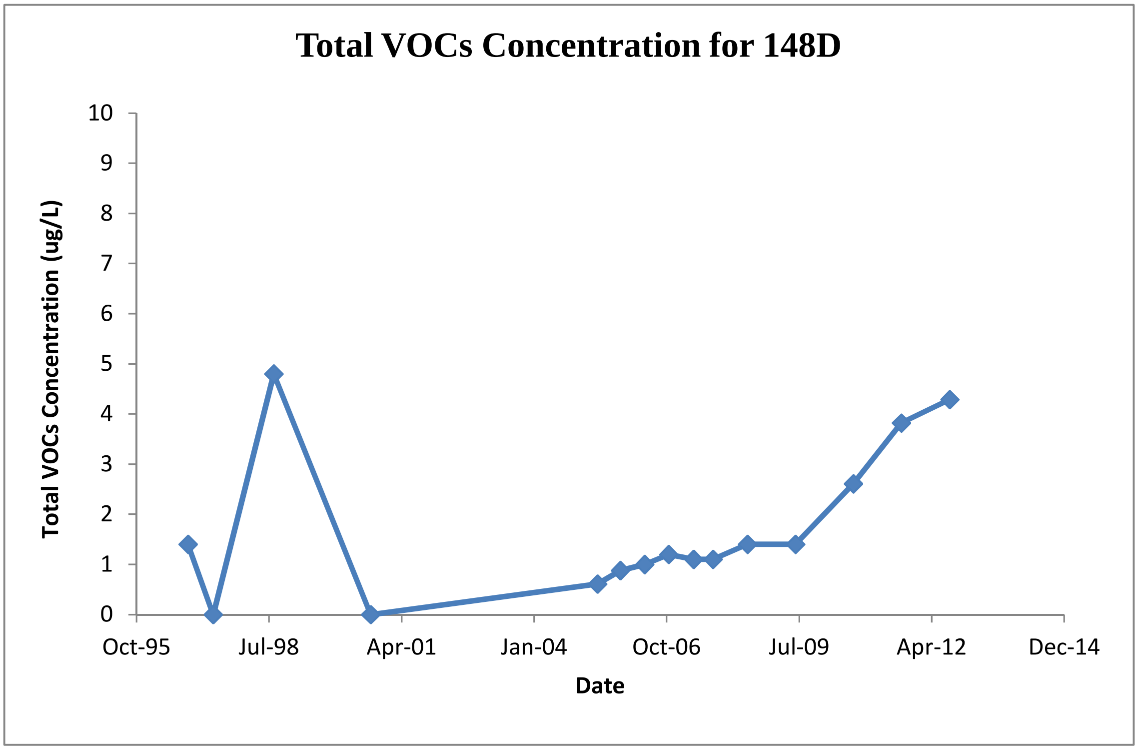

Total VOCs Concentration for 150C
Total VOCs Concentration (ug/L)
250
200
150
100
50
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Date

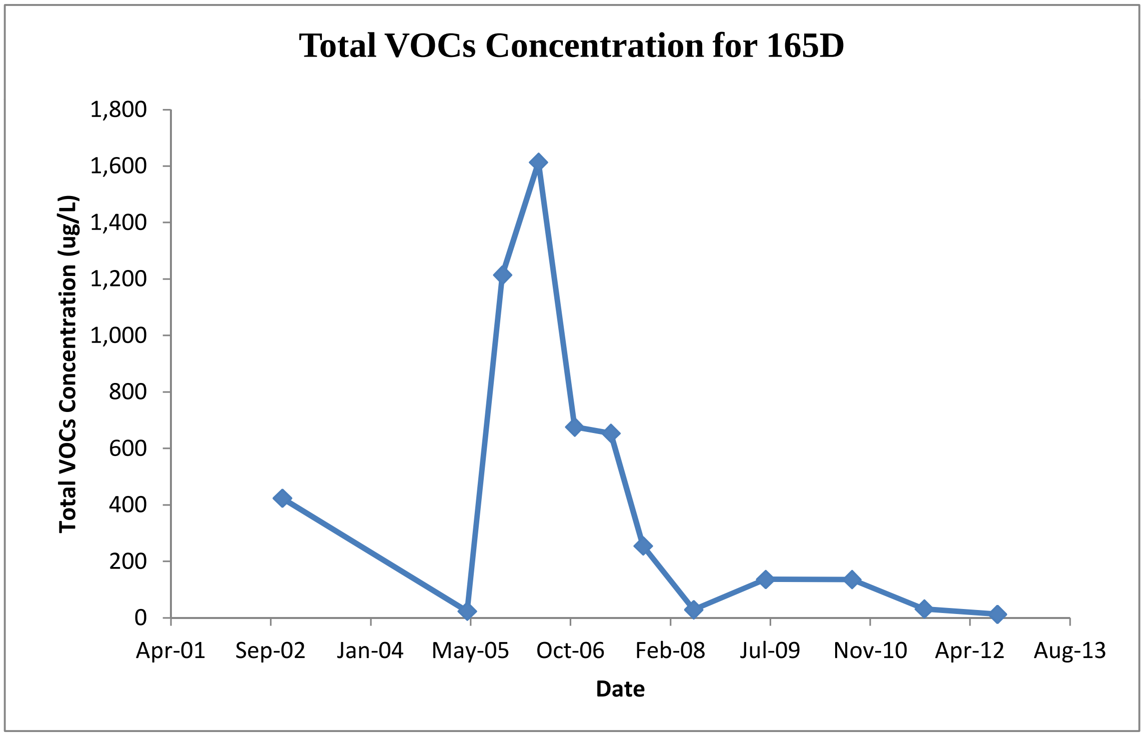

Total VOCs Concentration for 168C
Total VOCs Concentration (ug/L)
25,000
20,000
15,000
10,000
5,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Date

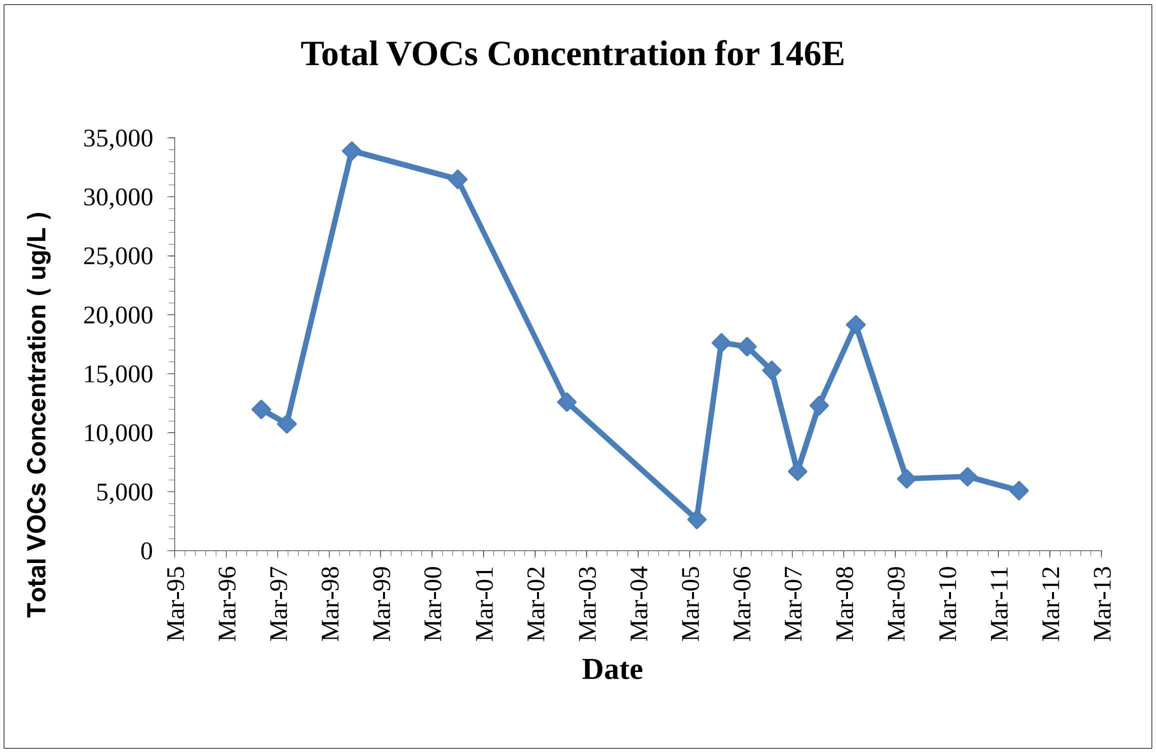
Appendix B
D-Zone TVOC Graphs

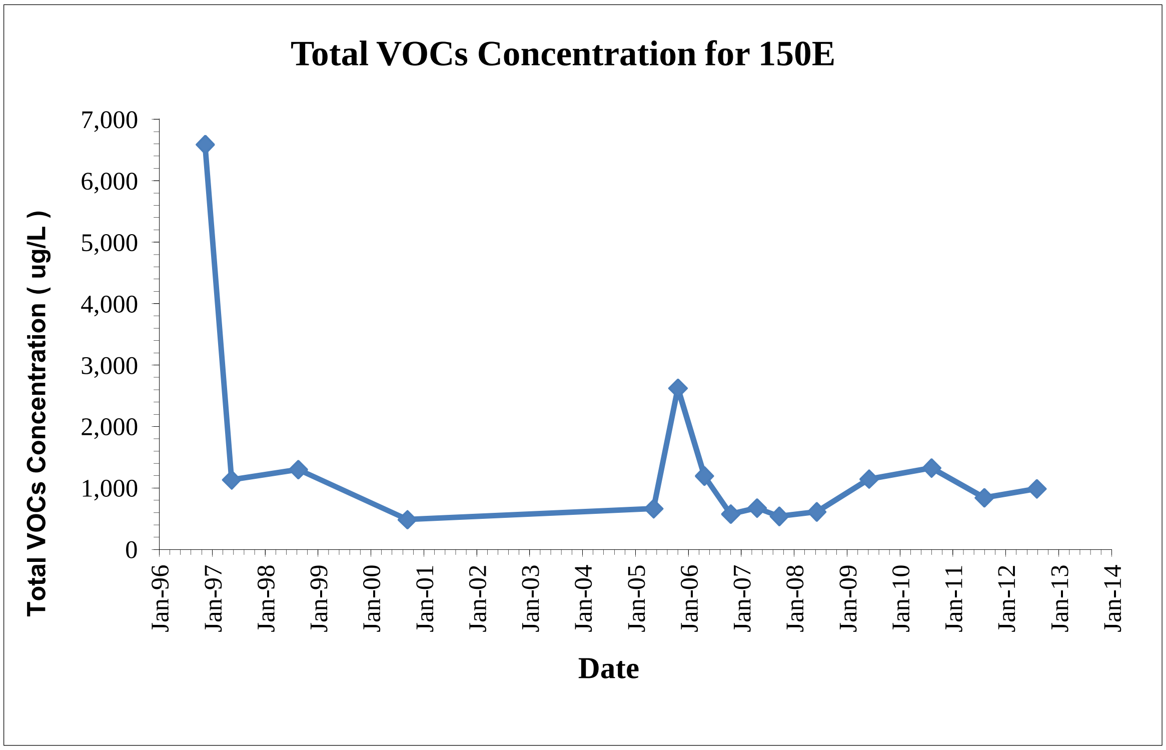


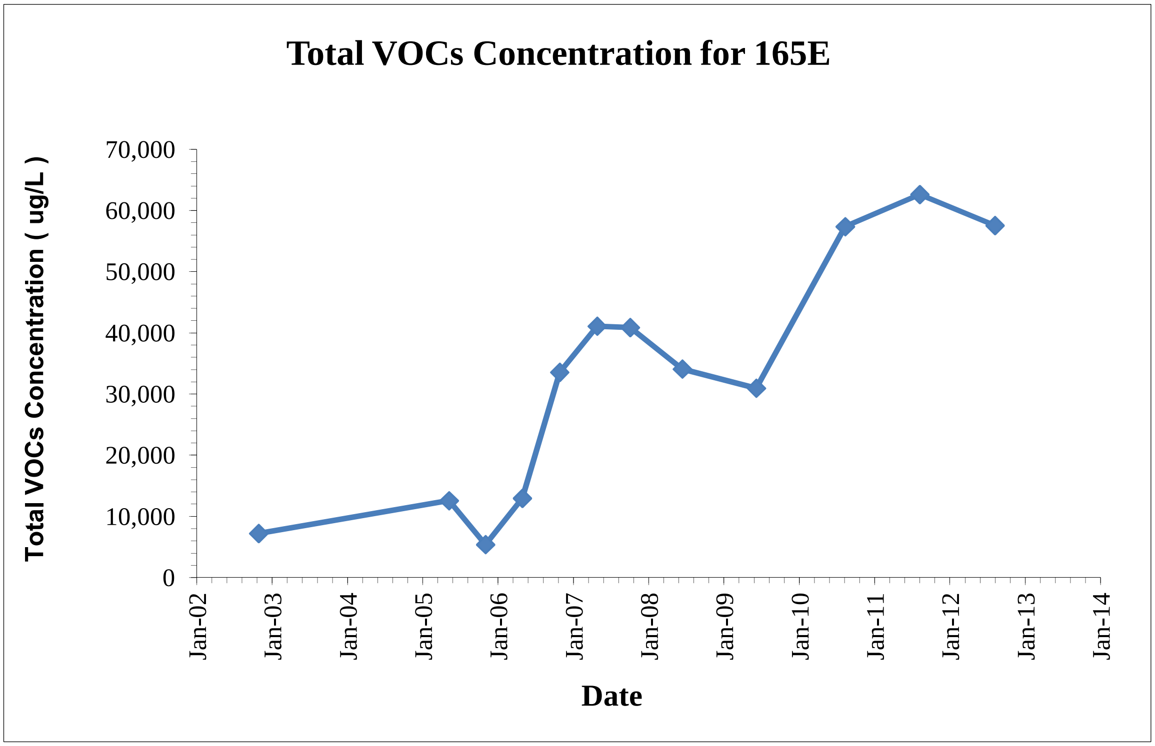


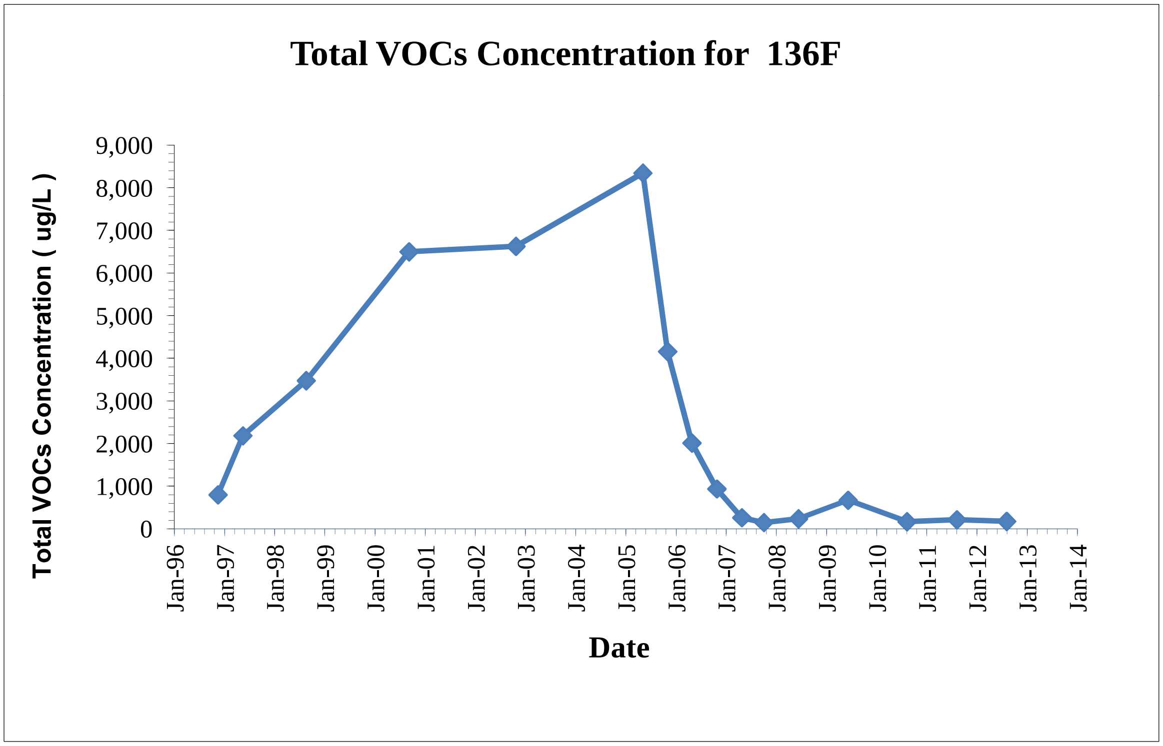

Total VOCs Concentration for 148D
Total VOCs Concentration (ug/L)
10
9
8
7
6
5
4
3
2
1
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Date

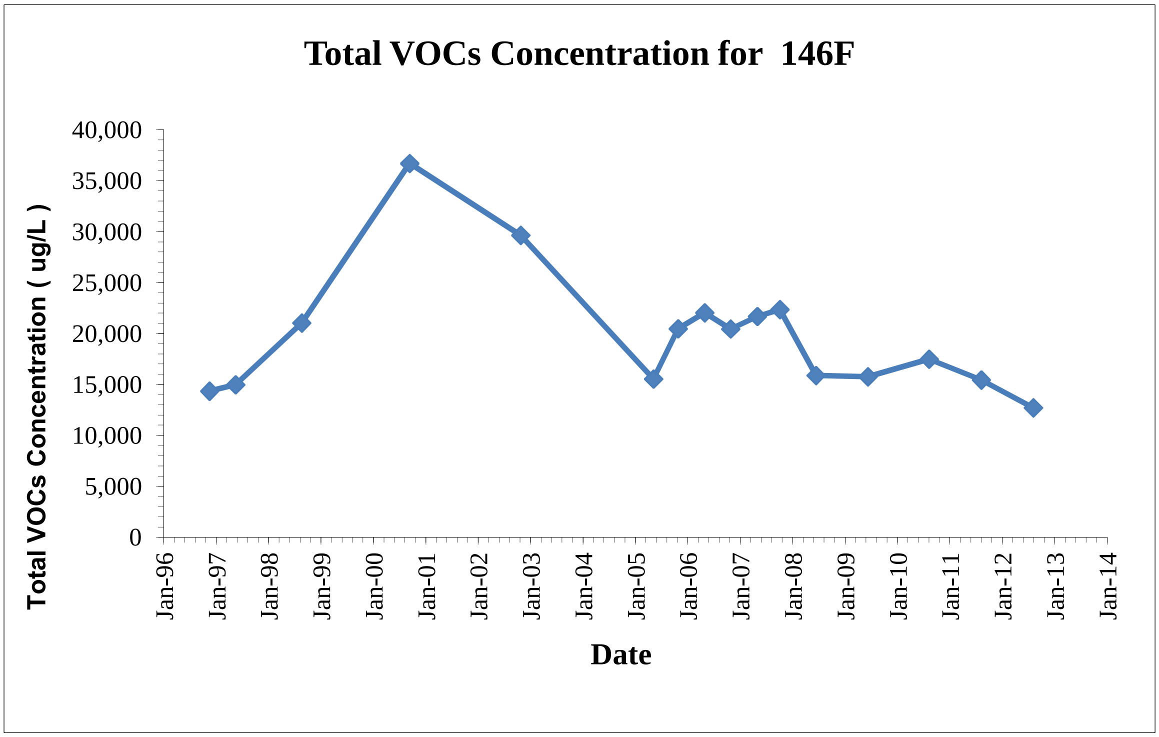

Total VOCs Concentration for 165D
Total VOCs Concentration (ug/L)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Apr-01
Sep-02
Jan-04
May-05
Oct-06
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
Date

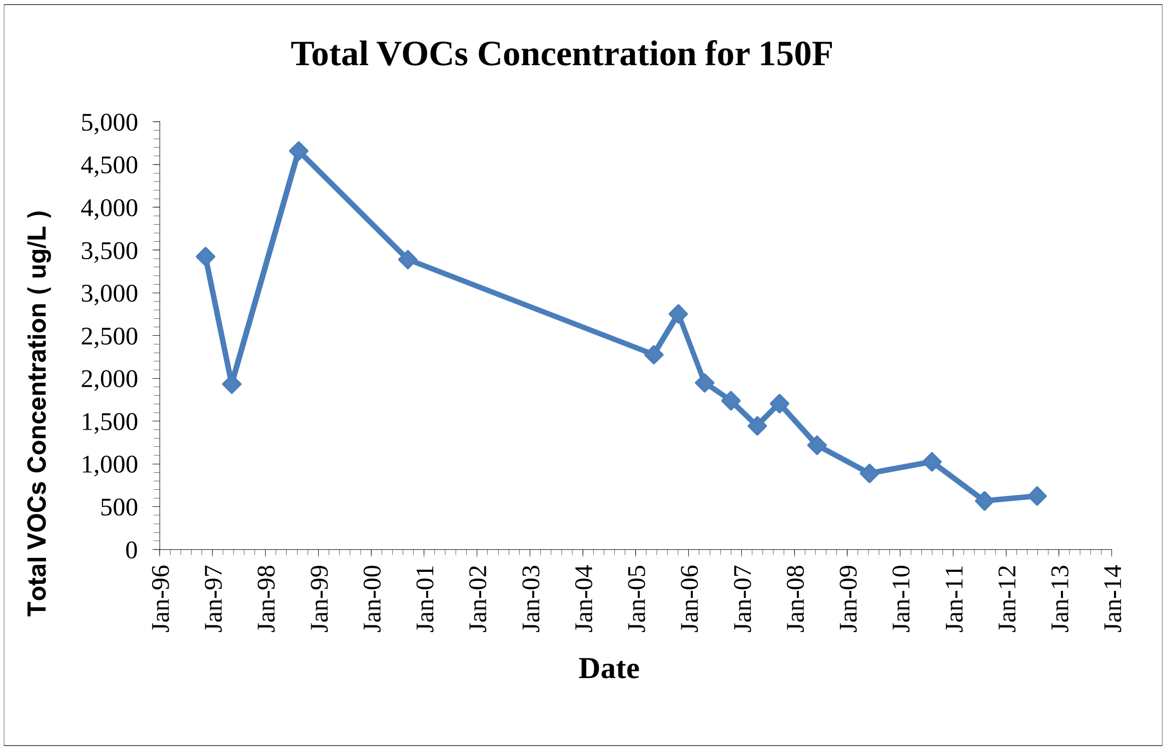

Total VOCs Concentration for 146E
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Mar-08
Mar-09
Mar-10
Mar-11
Mar-12
Mar-13
Date


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
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
Date


Total VOCs Concentration for 136F
Total VOCs Concentration (ug/L)
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
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
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
Date

APPENDIX C
DATA VALIDATION SUMMARY
LABORATORY REPORTS (CD ONLY)

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APPENDIX D
LANDFILL CAP INSPECTION RESULTS
(NOVEMBER 2012)

EXHIBIT A
CAP AND SURFACE WATER DRAINAGE
INSPECTION CHECKLIST
NECCO PARK

DATE: 11-27-2012
INSPECTOR: Gerald Shepard
WITNESSES:

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 present.

DESCRIPTION OF CONCERN:

DESCRIPTION OF REMEDY:

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE
MAINTENANCE CHECKLIST
NECCO PARK

DATE: 11-27-2012
INSPECTOR: Gerald Shepard
WITNESSES:

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	Mowcon/contractor	
	5) Gas Vents		
	- Pipes		
	- Bedding and Adjacent Media		
	6) Other		

DESCRIPTION OF MAINTENANCE ACTIVITIES: Brush Hogged + Line trimmed entire Landfill + Perimeter ditch. October 11, 2012