THIRD FIVE-YEAR REVIEW REPORT FOR DUPONT NECCO PARK LANDFILL SUPERFUND SITE NIAGARA COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York , New York

Pat Evangelista, Acting Director
Superfund & Emergency Management Division

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Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the third FYR for the Dupont Necco Park Landfill Superfund site. The triggering action for this statutory review is the completion date of the previous FYR, September 23, 2014. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one operable unit which will be addressed in this FYR.

The Dupont Necco Park Landfill Superfund site FYR was led by Gloria M. Sosa, EPA Remedial Project Manager (RPM). As of January 2019, Young Chang is the new lead EPA RPM for the site. Participants included included Kathryn Flynn (Hydrogeologist), Nick Mazziotta (Human Health Risk Assessor), Mindy Penzak (Ecological Risk Assessor) Michael J. Basile (Community Involvement Coordinator), and Pietro Mannino (Western New York Remediation Section Chief). The relevant entities such as the potentially responsible party (PRP) was notified of the initiation of the FYR. The review began on August 29, 2018.

<u>Site Background</u>

The 24-acre site is an inactive hazardous and industrial waste landfill located approximately 1.5 miles north of the Niagara River in the City of Niagara Falls and the Town of Niagara, Niagara County, New York. The site is located in an industrial area and is bounded on all sides by landfill disposal facilities and former manufacturing areas. Immediately north and east of the site lies the Newco solid waste landfill, an active Subtitle D facility owned by Republic Services. Immediately south of the site are three inactive hazardous waste landfill cells and a wastewater pre-treatment facility owned by CECOS International, Inc. (see *Figure 1*).

The site was used for the disposal of industrial and process wastes generated at the DuPont Niagara Plant from the mid-1930s until 1977. Wastes from the site have migrated in the overburden and bedrock underneath the landfill and now extend underneath the CECOS facility and a portion of the Allied Waste facility. Groundwater monitoring systems are currently in place at the CECOS and Allied Waste facilities, in accordance with state and federal regulations, to assure protection of human health and the environment as a result of operation of those facilities.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Dupont Necco Park site		
EPA ID: NYD980532162		
Region: 2	**State:** NY	**City/County:** Niagara County
SITE STATUS		
NPL Status: Non-NPL		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Pietro Mannino		
Author affiliation: EPA, Western New York Remediation Section Chief		
Review period: 7/15/2014 - 2/14/2019		
Date of site inspection: 10/24/2018		
Type of review: Statutory		
Review number: 3		
Triggering action date: 9/23/2014		
Due date *(five years after triggering action date)*: 9/23/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

A remedial investigation (RI) was conducted by DuPont, which included the sampling and analysis of all appropriate media, including air, soil vapor, soils, surface water, sediment and groundwater, in identified areas of potential environmental concern. The results of the RI were documented in the *Necco Park Investigation Report*, dated 1993 and approved by EPA in 1994. Several years of annual groundwater sampling and analytical testing was conducted at 38 monitoring wells on or near the site prior to the 1998 Record of Decision (ROD).

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with the contaminated media under current and potential future site uses. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site if no remedial action were taken. Some of the groundwater contamination from the site has the potential to enter the Niagara River and ultimately Lake Ontario, a source of drinking water.

The human health risk assessment identified contaminants of concern (COCs) for the site. These contaminants included: 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2-dichloroethane, hexachloroethene, 1,1-dichloroethylene, tetrachloroethylene (PCE), trichloroethylene (TCE), trans-1,2-dichloroethene, *cis*-1,2-dichloroethylene (*cis*-1,2-DCE), 4-methylphenol, carbon tetrachloride, chloroform, vinyl chloride (VC), hexachlorobenzene, hexachlorobutadiene, pentachlorophenol, phenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, barium, and cyanide. Potential exposures to site-related contaminants of concern were examined for the following media: groundwater, soils, sediments, surface water, air and biota. Of these media, the exposure to contaminated groundwater was considered for further quantitative analysis of potential health effects.

The baseline risk assessment quantitatively evaluated the health effects which could result from exposure to site contamination as a result of dermal contact, ingestion, and inhalation (e.g. from showering) of groundwater. Since groundwater in the bedrock moves in different directions in the various zones, and the levels of contaminants are different in each of these zones, separate risk estimates were developed for the following zones: A (overburden), B and C zones (upper bedrock); D, E and F zones (middle bedrock); and G zone (lower bedrock).

The results of the baseline risk assessment indicated that the current use of groundwater was not a risk since no one is believed to use the groundwater for domestic purposes. However, future potential carcinogenic and noncarcinogenic risks from ingestion, dermal contact, and inhalation of the groundwater were determined to be significant. Contaminants that attributred to these risks included carbon tetrachloride, chloroform, trichloroethane, *cis*-1,2-DCE, barium and 1,1,2-trichloroethane. As a result, the human-health risk assessment concluded that actual or threatened releases of hazardous substances from the site, if not addressed, may present a potential threat to public health, welfare, or the environment.

The ecological risk assessment was also conducted to evaluate the reasonable maximum environmental exposure. The ecological risk assessment considered all potential exposure media for ecological receptors, but only soil and groundwater media were assessed in detail. Risk characterization-measurement or estimation of both current and future adverse effects risks to ecological receptors was assessed quantitatively by modeling site groundwater contaminant concentrations reaching the area of the Niagara River at two locations: the Forebay Canal adjacent to the Robert Moses Power Plant and the Falls Street tunnel outlet to the river. The ecological risk assessment determined that the contaminated soils and groundwater attributable to the site alone currently do not pose an unacceptable ecological risk; future ecological impacts to the Niagara River may occur however, if remedial actions are not implemented.

Response Actions

Several response actions were implemented to mitigate the impact and spread of contamination. During 1978 and 1979, a clay cap was constructed over the 24-acre site. The final compacted cover consisted of a minimum of 18 inches of clay. The average cap thickness is approximately 24 inches. The cap is overlain by a 6-inch cover of topsoil and grass.

In 1982, two existing monitoring wells (D-12 and 52) were converted to recovery wells (RW-1 and RW-2) to control off-site migration of contaminated groundwater in the upper bedrock fracture zones (B and C zones). Extracted groundwater was pumped to the CECOS facility adjacent to the site where it was treated and discharged to the Niagara Falls POTW. Wells RW-1 and RW-2 have been used as recovery wells from 1982 to the present. To enhance the groundwater pumping system's effectiveness, a grout curtain, termed Subsurface Formation Repair (SFR), was constructed from July 1988 through September 1989. The SFR extends along the entire western and northern perimeter of the site property and to just over one-half of the eastern perimeter. The southern perimeter and southern portion of the eastern perimeter were left ungrouted due to the possible presence of dense non-aqueous phase liguid (DNAPL) and to allow for recovery of contamination that had migrated beyond the site property boundary. To reduce the potential for an upgradient increase in the water-table elevation in the overburden, the upper 10 feet of bedrock were not grouted on the northern perimeter. In 1992, a third recovery well, RW-3, was installed and began operation at the site. Well RW-3, set in the D, E and F zones and is located at the center of the southern site property line.

Remedy Selection

The Remedial Action Objectives (RAOs) for groundwater are the reduction of risks to human health associated with potential exposure to site-related compounds by: reducing the quantity of source materials (i.e., DNAPLs) to the extent practicable; controlling the migration of groundwater downgradient from the site and the source area; and attaining the groundwater cleanup criteria.

The RAO of attaining the groundwater cleanup criteria is only being applied to areas outside the source area (i.e., the far-field area). Because of the concentration of DNAPLs and contaminants in the soils and bedrock in the source area, and the complexities associated with remediation of DNAPLs in fractured bedrock, EPA does not anticipate that the RAOs can be achieved within the source area. Since waste materials are being left in place, and it is technically impracticable to achieve the RAOs for groundwater in areas where DNAPL has migrated, the applicable or relevant and appropriate requirements (ARARs) for groundwater are not expected to be met in the source area. EPA issued a technical impracticability waiver of groundwater ARARs in the source area in the 1998 ROD.

The RAOs for soils at the site are the protection of the groundwater quality, and ultimately human health, through reduction of the source materials (i.e., DNAPLs) to the extent practicable, as well as limiting exposure to surficial soil contaminants.

The remedy described in the September 1998 ROD addressed landfill soils and DNAPL in the soils and bedrock which represent continuing sources of contamination to the groundwater. The remedy requires long-term management to maintain the groundwater pump and treat systems and groundwater monitoring to determine the effectiveness of the containment measures in reducing contaminant concentrations in the far-field aquifer.

The major components of the selected remedy as described in the ROD include the following:

- Containment of the source area by:
  - upgrading the existing cap to meet New York State Part 360, or equivalent standards;
  - using hydraulic measures in the overburden (A zone) to maintain an inward gradient within the source area or installing a physical barrier (e.g., slurry wall, sheet pile) on the southern, and portions of the eastern and western site boundaries; and
  - using hydraulic measures in the bedrock (B-F zones) to maintain an inward gradient within the source area and prevent the movement of contaminated groundwater beyond the source area boundary.

- Treatment of the extracted groundwater from the source area, either on-site or off-site, to achieve the appropriate discharge requirements. Currently, groundwater extracted from the site is treated at the adjacent CECOS wastewater treatment plant. Expansion of the CECOS facility would likely be required to accommodate the increased volume of water to be treated under this remedy. The need to either expand the CECOS facility, build an on-site facility, or utilize another off-site facility for groundwater treatment would be determined during the design.

- Collection of DNAPL in the Source Area by:
  - the utilization of the existing monitoring wells network;
  - the utilization of any groundwater recovery wells placed in the source area; and
  - the installation of additional dedicated DNAPL recovery well(s).

- Collected DNAPL would be disposed of off-site at an appropriate facility.

- Operation and maintenance (O&M) of the existing systems and the systems constructed under this selected remedy.

- Comprehensive monitoring to verify hydraulic control, identify DNAPL occurrence, demonstrate the effectiveness of the remedial measures, and assess the impact of such measures on far-field groundwater quality.

- Additional characterization of the site to assess whether natural attenuation would be effective in addressing far-field contamination.

- Development and implementation of institutional controls to restrict site access, the use of groundwater at the site, and control land use such that it is consistent with site conditions.

The cleanup levels for the site are identified in Appendix C.

<u>Status of Implementation</u>

Remedy Implementation

<u>Source Remediation</u>

According to the Source Area Report (SAR) of April 2001, source areas are defined by the distribution of monitoring wells in which DNAPL was observed at least once, or where the concentration of a VOC compound is observed at or above the level of its effective solubility (maximum aqueous concentration of a constituent in groundwater in equilibrium with a mixed DNAPL), or where the concentration of a VOC compound is observed at or above the level of one percent of its pure phase solubility. The extent of the source areas varies with the aquifer fracture zones. Source areas in the fracture zones B and C were larger and show more of an extension to the southeast than in zones A, D, E, and F.

Cap

DuPont completed the upgrade to the landfill cap in August 2006, including the installation of following components:

- Forty-mil linear-low density polyethylene geomembrane;
- Geosynthetic drainage composite on slopes greater than 12 percent;
- Cushioned geotextile fabric over the geomembrane;
- One-foot thick layer of barrier protection soil;
- Drainage stone layer; and
- Six-inch thick vegetative layer.

Hydraulic Containment

The Hydraulic Control System (HCS), consisting of a series of extraction wells and associated plumbing, was also upgraded. Groundwater extraction pumps were installed in the B/C zone wells RW-4, RW-5 and RW-10. Pumps were also installed in D/E/F-zone wells RW-8 and RW-9. The HCS system is operated to create an inward hydraulic gradient to ensure that contaminated groundwater is captured in the source area. The remedial design indicated that no additional wells were needed to control the A zone.

A groundwater treatment facility (GWTF) was built on-site to treat water extracted by the HCS. The effluent from the GWTF is discharged to the Niagara Falls Wastewater Treatment Plant. GWTF effluent samples are collected and analyzed to ensure that discharge parameters are met.

<u>IC Summary Table</u>

Table **1**: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater and soils	Yes	Yes	Allied Waste facility	Restrict site access, the use of groundwater at the site, and control land use such that it is consistent with site conditions.	Deed Notice, January 1999

Systems Operations/Operation & Maintenance

The HCS is operated in accordance with the EPA approved Operations and Maintenance Plan from 2005. Water levels are collected quarterly at approximately 150 wells. Potentiometric surface (level to which water rises in a well) contour maps are created from the water-level data to demonstrate hydraulic capture. Groundwater is sampled and analyzed annually to monitor the effectiveness of the HCS in reducing chemical concentrations within the source area. In addition, the far-field groundwater chemistry is monitored annually from more than 10 wells to determine if the HCS is controlling off-property migration of contaminants and that natural attenuation is occurring.

The HCS has been operating successfully at the site; the system is online better than 91 percent of the time each year since it became operational. The GWTF has also been operating successfully. DuPont has minimized its downtime by continuously monitoring its operating conditions and accordingly making adjustments to the process or operating systems. The GWTF is online about 91.6 percent of the time. DuPont extracted approximately 15.6 million gallons (Mgal) of groundwater in 2017 which were treated at the GWTF. In 2017, no DNAPL was identified during any of the monthly, semi-annual, or biennial monitoring and therefore, no DNAPL was removed in 2017. A total of approximately 8,818 gallons of DNAPL have been recovered since the program was put in place.

Improved hydraulic control in the upper bedrock in the western portion of the site began in fourth quarter 2008 when a combined blast-fractured bedrock trench and a new B/C-Zone recovery well (RW-11) were put into operation. Well RW-11 was installed to replace recovery well RW-10 which exhibited diminished hydraulic efficiency after startup in 2005.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

III. PROGRESS SINCE THE LAST REVIEW

Table 2: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy is protective of human health and the environment.
Sitewide	Protective	The implemented remedy for the site is protective of human health and the environment.

There were no issues and recommendations identified in the last FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2018, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 42 Superfund sites in New York and New Jersey, including the Dupont Necco Park site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2019-five-year-reviews. In addition to this notification, a public notice was made available by posting on the City of Niagara Falls municipal website a public notice titled “U.S. Environmental Protection Agency Reviews Cleanup at the DuPont Necco Park Site,” on 10/9/2018, stating that there was a FYR and inviting the public to submit any comments to the U.S. EPA. The results of the review and the report will be made available at the Site information repository located at the EPA Western New York Public Information Office, 86 Exchange Place, Buffalo, New York. The FYR will also be uploaded to www.epa.gov/superfund/dupont-necco-park.

During the FYR process, no interviews were conducted.

Data Review

The monitoring program verifies hydraulic control in the source area, identifies DNAPL occurrence, evaluates groundwater quality trends within the source area and in the far-field (area outside of the source area), and demonstrates the effectiveness of recovery. Since 2008, a network of 26 wells is sampled annually for groundwater quality (following the initial start-up period when sampling occurred biannually). In 2009 and 2013, 20 additional wells were also sampled for added coverage and to evaluate natural attenuation parameters. The groundwater chemistry data is also used to evaluate the extent of the source areas using the Source Area Report solubility criteria. Source area and far field monitoring well locations can be found in Figure 1.

Hydraulic monitoring data for the last FYR period indicates that the HCS has consistently maintained control of the source areas in the overburden A zone and the bedrock fracture zones B through F. Piezometric surface maps show significant drawdown relative to the five extraction wells for each zone, indicating that most groundwater within the established source area limits is hydraulically contained. The A zone (overburden) appears to show significant dewatering and rapid response as a result of extraction wells RW-5 and Rw-11. Hydraulic control is also maintained in the B zone of the shallow bedrock, where extraction wells RW-11, RW-5, and RW-4 exert the greatest influence within this zone. Similarly, hydraulic control is maintained in the C zone, due to the effects of extraction wells RW-4 and RW-5 near the east end of the landfill. Water-level data in wells screened through bedrock fracture zones D, E, and F also indicate containment due to the effects of extraction wells RW-8 and RW-9 near the west end of the landfill.

No significant migration of contaminants was detected in the overburden. Water-quality results from A-zone wells located in the far-field (146AR, 150A, and 145A) indicate that VOC concentrations were low or not detected.

In 2014, 2016, and 2017, no DNAPL was observed in any of the recovery wells and no DNAPL was removed. There were 68 gallons of DNAPL removed in 2015. The volume of recovered DNAPL has decreased since the previous FYR period, when the average was 83 gallons per year.

A more detailed evaluation of VOC levels and trends derived from analysis of groundwater samples in the 26-well network follows:

<u>A zone</u>

Results from the four LTGMP A-Zone wells indicate TVOC concentrations are all below 1 µg/l, except for well 137A. Sampling results for well 137A (243.2 µg/l) represents the location of the highest reported A-Zone TVOCs. Other well locations were substantially lower: 145A (0.34 µg/L), 146AR (not detected), and 150A (0.63 µg/L). The result of no detected VOCs at well 146AR is the lowest result observed at this location. The 2017 results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden. Three of the four annual wells used to monitor the A-Zone (145A, 146AR, and 150A) exhibit near consistently low (<5 µg/l) TVOC concentrations with no true discernable trend. TVOC concentrations at these three wells have been less than 5 µg/l since 2006 or earlier.

B zone

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

Source area limit wells 171B and 172B show a continued overall TVOC declining trend. Well 171B has decreased nearly three orders of magnitude since 2002 to 122 µg/l, while 172B has decreased two orders of magnitude to 2,164 µg/l during a similar timeframe. Additionally, the concentrations suggest that there is an active natural attenuation component to the VOCs, as biogenic degradation compounds including *cis*-1,2-DCE and 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 2017 VOC results. Additionally, well 145B, just outside the source area in the southeast corner, also provides evidence of hydraulic control as concentrations have decreased significantly. Concentrations were over 30,000 µg/l in 2006 and have decreased to 1,500 µg/l or lower. The TVOC results in 2014 were the lowest observed at this location to date.

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

C zone

Results from the four C-Zone wells indicate TVOC concentrations were below 80 ug/l; with the only exception 168C (10,383 ug/l), which is located near the limits of source area. TVOC concentrations at two of the locations were below 20 ug/l.

Wells 145C and 168C delineate the C-Zone source area limit. At 145C, concentrations were the lowest on record in each of the last five years, after a marked decrease in 2013. At downgradient well 168C, the concentration is slightly decreasing over time, with an anomalously low concentration in 2007. The 2017 result of 10,383 ug/l is the lowest since 2007.

Wells 146C and 150C are downgradient of the source area under ambient groundwater flow conditions. TVOC concentrations at 146C were over 20-40 ug/l prior to 2006; however, the concentrations increased in 2014 and remained higher through 2017 (75.9 ug/l). This level of concentration remains much lower than source area levels, and concentrations are mainly attributed to DCE and VC, which are degradation products of TCE. At location 150C, TVOC result for 2013 and 2014 showed a marked increase to 463.3 and 2,352 ug/l (respectively), however the concentrations have decreased since to 108.2 ug/l in 2015, 21.9 ug/l in 2016, and 15.4 ug/l in 2017. The TVOC concentrations at 150C are also mostly degradation products.

D zone

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

Well 165D is within the D-Zone source area. In 2017, well 165D had a TVOC concentration of 17.81 µg/l. TVOC concentrations have been declining since the peak of approximately 1,600 µg/l in May 2006. From 2011 through 2017, TVOC concentrations have been under 40 µg/l.

TVOC concentrations at far-field wells (136D, 145D, and 148D,) ranged from 4.38 µg/l (148D) to 638.2 µg/l (136D). At wells 136D and 145D, the concentrations have continued to decline from as high as 3,000 µg/l. In 2017, the TVOC concentration in well 136D have decreased to 638.2 µg/l – 618.1 µg/l (duplicate). At 145D, the 2017 TVOC concentration (454.2 µg/l) decreased from the previous year and maintains a strong overall decreasing trend. At far field well 148D, the concentrations remained low at 4.38 µg/l.

Consistent with previous long-term monitoring results, biogenic degradation compounds including *cis*-1,2-DCE and VC dominate TVOC results for wells 136D, 145D, 148D, and 165D. Concentrations in D-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

E zone

Results from the three E-Zone wells (146E, 150E, and 165E) indicate TVOC concentrations of the two wells within the E-Zone source area (146E at 8,634 µg/l and 165E at 25,180 µg/l) and side gradient well 150E (1,255 µg/l) are consistent with previous results. All E-Zone groundwater monitoring locations are stable or on a declining trend. Degradation products including *cis*-1,2-DCE and VC dominate TVOC results for all the E-Zone wells. The presence of these degradation compounds is indicative of the occurrence of active natural attenuation processes.

Well 165E, a source area well, had shown a year-to-year decrease over the last six years from 62,630 µg/l in 2011 to 2,083 µg/l in 2016, the lowest TVOC result historically observed at this location, but increased in 2017 to 25,180 µg/l. Furthermore, the well is located just upgradient of recovery well RW-9.

TVOC results for well 146E located, at the edge of the source area limits, have been trending lower, with concentrations typically over 10,000 ug/l prior to 2009 and between 3,500 and 6,300 µg/l between 2009 and 2014. In 2015 the TVOC concentration at 146E increased to 11,566 µg/l from 3,531 µg/l in 2014. 2016 TVOC concentrations increased again at 146E to 14,169 µg/l. The 2017 TVOC result of 8,634 µg/l is lower than the last two years and shows a move in the direction of the TVOC concentrations observed between 2009 and 2014 at well 146E. Even with the TVOC increases observed the in the 2015 and 2016 sampling events, the overall trend for TVOCs continues to be declining. Future analytical results will be evaluated to determine if this result is typical variability or is indicative of increasing TVOC concentrations. Well 150E is also located near, but outside, the source area limits and has maintained initial decreases observed in 1996, with concentrations ranging from 6,590 µg/l (1996) to 338 µg/l (2015) and typically between 500 and 1,300 µg/l in recent years. In 2017 the TVOC concentration at 150E (1,255 µg/l) remained within the historically observed concentration range and below the early time period concentrations.

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

F zone

Results from the three F-Zone wells indicate TVOC concentrations ranged from 16.9 µg/L to 8,470 µg/l, and all three locations showed decreasing trends. In 2017, two of the three wells (136F and 150F) showed the historically lowest TVOC concentration observed at their location. At 136F this is the third time in four years that the historical low TVOC concentration has been observed. VOC concentrations at near source well 136F have also steadily declined since HCS startup from 8,348 µg/l (2005) to 16.9 µg/l (2017). At well 146F, a substantial decrease in the TVOC concentration between 2015 and 2016 was observed that was greater than the previous few years (7,414 to 696 µg/l), however concentrations returned to near 2015 levels in 2017 (8,470 µg/l). Similar to the results from the E-Zone wells TVOC, results for all the F-Zone wells are dominated by biogenic degradation compounds *cis*-1,2-DCE and VC.

TVOC concentrations at location 150F have shown a steady trend lower since 1998, with concentrations decreasing from initially over 4,500 µg/l to 417.5 µg/l in 2014, but increased to 1,793 µg/l in 2015. In 2016 and 2017, TVOC concentrations returned to the declining trend observed prior to 2015 and the lowest TVOC concentrations for 150F were observed (368 and 297.9 µg/l). At 150F this is the fourth time in five years that the historical low TVOC concentration has been observed.

TVOC concentrations have apparently decreased at these F-Zone locations in response to the startup of the HCS.

Natural Attenuation

At the Dupont Necco Park site, the source area control is preventing contaminants from migrating into the far-field which allows natural attenuation to decrease concentrations and retract the plume. In the first eight years of source area control the downgradient and side gradient VOCs have decreased an average of 65 percent, which is considerable for recalcitrant compounds such as chlorinated solvents. This is supported by the scoring method in EPA's *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water* (1998), in which, the combined average score was 21 points, for B/C and D/E/F natural attenuation locations for 2009. In 2013, these zones scored an average of 21 points, not including wells near or below maximum contaminant levels (MCLs). For the side and downgradient wells only, the average score was 20 points. Both sets of wells indicate that there is strong evidence for anaerobic biodegradation of chlorinated organics.

Based on the 2013 monitored natural attenuation (MNA) sampling results and USEPA approval (USEPA July 16, 2010), future MNA sampling is currently scheduled to be completed on a five-year schedule. MNA sampling was conducted in 2018; the results will be available in the 2018 annual report. However, VOC and field parameter concentrations from 2017 generally indicate that MNA remains an active component in the source area and the far-field plume. For example, downgradient constituents are predominately degradation products (DCE and VC) and source area groundwater has remained anaerobic and likely sulfate reducing and or methanogenic.

Site Inspection

The inspection of the Site was conducted on October 31, 2018. In attendance were Gloria M. Sosa, EPA RPM, Paul F. Mazierski of DuPont, Tim J. Pezzino of URS, and James Schuetz of Parsons. The purpose of the inspection was to assess the protectiveness of the remedy. The site conditions have not changed since the last FYR. Landfill cap maintenance activities are conducted in accordance with the Cap Maintenance and Monitoring Plan. During the most recent inspection, no leachate seeps or settlement were identified, and all aspects of the landfill that were inspected were found acceptable. No activities are occurring which may impact the integrity of the cap. The GWTF is being well maintained. The EPA RPM did not observe any problems or deviations from the ongoing O&M activities being implemented at the site.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

The remedy at the DuPont Necco Park site is functioning as intended by the decision documents.

The September 1998 ROD calls for the following: implementation of a HCS in overburden and bedrock flow zones, a GWTF, DNAPL collection in the source area, an upgrade to the landfill cap, and a monitoring program for wells in source area and far-field areas. The remedial action is necessary to address the RAOs for the site, which are to establish hydraulic control of contaminated groundwater within the source area and to prevent off-site migration, as well as eliminate exposure. Remediation of DNAPL, contaminated soils, bedrock, and groundwater within the source area of site was considered technically impracticable. Consequently, the ROD waived federal and state drinking water standards for groundwater in the source area.

The landfill cap was upgraded to comply with the New York State 6 NYCRR Part 360 design standard. All cap landfill construction activities were completed in August 2006. The cap is maintained and is in good repair. The cap area has been seeded over and permanent vegetation has been established over the entire site. Institutional controls have been imposed to restrict site access and use of groundwater, and to control land use.

The HCS has been effectively controlling groundwater flow in the overburden and in fracture zones of the bedrock. The system consists of five groundwater recovery wells, a recovery trench, and a treatment facility that operates in accord with the established Operation & Maintenance Plan. The SFR was also put in place in the north, east, and west sections of the landfill and is designed to maintain an inward flow gradient in the source area in flow zones within bedrock, and to prevent movement of contaminated groundwater beyond source area boundaries. The control system commenced operations in 2005. The treated extracted water is regulated by a Significant Industrial User (SIU) permit with the Niagara Falls POTW. The GWTF discharge at the site is sampled quarterly to verify compliance with the SIU permit. DNAPL is collected in select wells in the Source Area using existing monitoring wells or dedicated DNAPL recovery wells.

A monitoring program was established to verify hydraulic control, identify DNAPL occurrence, demonstrate effectiveness of recovery, and evaluate groundwater quality in the far-field (area outside of the source area). Overall, water-levels compared to baseline levels and drawdown data indicate that groundwater in the source area is contained. The overburden aquifer appears to show dewatering and good response to extraction. Hydraulic depression is also maintained in the B zone of the shallow bedrock. Water-level data in wells screened through fracture zones C, D, E, and F also indicate that containment performance is favorable in these zones.

An assessment of groundwater monitoring from the past five years indicates an overall decrease in VOCs for groundwater in the far-field area and the source areas. No significant off-site migration of contaminant was detected in the overburden. Decreasing or stable trends were observed in the D, E, and F zones in the source area. The volume of DNAPL observed and recovered has significantly decreased in this period and no DNAPL was removed in 2014, 2016, and 2017.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site over the past five years that would affect the protectiveness of the selected remedy. The landfill cap is intact and contaminated material is not available for contact. Groundwater is not available for drinking since the area is served by a public supply. During the RI, it was noted that contaminated groundwater was migrating via man-made channels associated with the Robert Moses Power Project and impacting the Niagara River. Because of on-site containment, significant contributions of site-related contaminants to the off-site groundwater and the Niagara River are not expected.

The exposure assumptions and the toxicity values that were used to estimate the potential risk and hazards to human health followed the general risk assessment practice at the time the risk assessment was performed in 1993. Although the risk assessment process has been updated since this time and specific parameters and toxicity values may have changed, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid.

The RAO for the source area groundwater was to reduce risks associated with potential exposure. This has been accomplished by preventing off-site migration. The RAO for the far-field area was to comply with groundwater ARARS established in the September 1998 ROD, which include New York State Groundwater Quality Standards and Federal MCLs. These cleanup goals remain valid. Although analysis of the data from far-field wells show that concentrations in some wells currently exceed these cleanup goals, continued operation of the groundwater containment system, along with natural attenuation, will likely result in continued decreases in concentrations into the next five-year period.

Vapor Intrusion

Vapor intrusion was qualitatively evaluated in the 1993 risk assessment: “Available data indicate that given the shallow water table and the levels of volatiles detected in downgradient wells, volatilization of contaminants and infiltration to in [sic] building spaces cannot be ruled out. The magnitude of risk cannot be determined at present. However, risks may be increased in the future in the event that current remediation efforts at the site are discontinued (TRC, *Final Risk Assessment* (1993), p. 4-42).” The 2009 FYR identified a recommendation to perform a more thorough vapor intrusion investigation. In 2013, DuPont conducted a vapor intrusion screening evaluation of the far-field area. The conclusion of that effort was that vapor intrusion would not be a concern for any downgradient buildings because the wells in zone A (the shallowest groundwater zone) are largely clean, both because of continued treatment and containment of the source area and because of a predominantly downward gradient in this zone.

To evaluate whether these conditions have changed, results from the Zone A monitoring wells sampled during this FYR period were compared to EPA Vapor Intrusion Screening Levels (VISLs) within groundwater. The VISLs evaluated were based on commercial exposures given the industrial use of the area surrounding the site as well as a target cancer risk of 1 $x10^{-6}$ and hazard index of 1. The results from only one shallow well (137A) exceeded the VISLs for TCE and vinyl chloride with concentrations of 63 ug/L and 38 ug/L, respectively, during the most recent sampling event in 2017. These results are consistent with those identified during the 2013 vapor intrusion screening evaluation. This well is, however, located near the CECOS treatment facility where TCE and vinyl chloride-containing waste water is processed. Concentrations within the other shallow wells sampled do not exceed commercial groundwater VISLs. Therefore, the conclusions derived from the 2013 vapor intrusion screening evaluation remain valid.

There is currently no ecological habitat at the site and there are no discharges to the Niagara River; therefore, there are no current exposures to ecological receptors.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: 01	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The implemented remedy is protective of human health and the environment		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The implemented remedy for the site is protective of human health and the environment	

VIII. NEXT REVIEW

The next FYR report for the Dupont Necco Park Superfund site is required five years from the completion date of this review.

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: 443557.02023	

LEGEND

- 2010 REVISED CHEMICAL MONITORING
- RECOVERY WELLS
- MONITORING WELL
- RAIL ROADS
- GROUT CURTAIN

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

APPENDIX A – REFERENCE LIST

Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
Record of Decision, EPA	09/1998
Vapor Intrusion and Far-Field Monitored Natural Attenuation Analysis, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	12/2013
2014 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/2015
2015 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/2016
2016 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/2017
2017 Annual Report, Parsons for the E. I. du Pont de Nemours and Company Corporate Remediation Group	03/2018

APPENDIX B – Site Geology/Hydrology

The Lockport Dolomite is characterized by horizontal and vertical fractures through which groundwater flows generally toward the Niagara Gorge and the lower Niagara River. The aquifers underlying the site have been classified as class GA groundwaters, a source of potable water supply. The site hydrogeology can be generalized by seven units relevant to site remediation. The A zone refers to saturated overburden and the B, C, D, E, F and G zones refer to identified Lockport Formation bedding-plane fracture zones which act as separate water-bearing units.

The Niagara River downstream of Niagara Falls receives discharge from the bedrock groundwater flow system. The Niagara River upstream of Niagara Falls acts as a groundwater recharge area. However, studies demonstrate that the New York Power Authority (NYPA) conduits and several sewers/tunnels act as regional groundwater sinks. Groundwater entering the conduit drainage system near the site may flow either to the south where a portion infiltrates the Falls Street tunnel where these structures intersect, or to the north where the water may eventually discharge to the Forebay Canal through bedrock fractures. The dry weather flow of the Falls Street tunnel discharges to the Niagara Falls Publicly Owned Treatment Works (POTW), where the effluent is treated.

Groundwater in the overburden, defined as the A zone, tends to flow vertically downward to the more transmissive bedrock units.

Groundwater in the B and C zones generally flows to the south in areas beyond the radius of influence of the operational recovery well system. Although the Falls Street tunnel is located southwest of the site and flow in the study area is to the south, the hydraulic influence of the Falls Street tunnel may extend some distance east of the Falls Street tunnel/John Street sewer intersection. Therefore, although insufficient information is available to determine the exact flow path, a portion of B and C zone groundwater ultimately discharges to the Falls Street tunnel.

Groundwater in the D, E and F zones generally flows in a westerly direction toward the NYPA power conduits. This groundwater is intercepted by the conduit drain system.

The piezometric map for the G zone generally indicates that hydraulic gradients are low. The primary flow direction appears to be west/northwest toward the groundwater discharge boundary at the NYPA conduits.

APPENDIX C – Remediation Goals

Remediation Goals			
SOIL (all concentrations in µg/kg)			
Contaminants of Concern	**Soil - Protection of Groundwater**	**Human Health Risk**	**Remediation Goals**
cis-1,2-Dichloroethylene	500	-	500
Tetrachloroethylene	1,000	100,000	1,000
Trichloroethylene	500	-	500
Vinyl chloride	500	-	500
GROUNDWATER (all concentrations in µg/L)			
	National Primary Drinking Water Standards (Federal MCLs)		**Remediation Goals**
cis-1,2-Dichloroethylene	70		70
Tetrachloroethene	5		5
Trichloroethene	5		5
Vinyl chloride	2		2