FIFTH FIVE-YEAR REVIEW REPORT FOR E.I. DU PONT DE NEMOURS & CO., INC. (NEWPORT PIGMENT PLANT LANDFILL) SUPERFUND SITE NEW CASTLE COUNTY, DELAWARE

April 2020

Prepared by

U.S. Environmental Protection Agency
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Paul Leonard, Acting Director
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Date

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LIST OF ABBREVIATIONS AND ACRONYMS

ALM	Adult Lead Model
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CSM	Conceptual Site Model
DelDOT	Delaware Department of Transportation
DNREC	Delaware Department of Natural Resources and Environmental Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
HASP	Health and Safety Plan
HI	Hazard Index
HQ	Hazard Quotient
IC	Institutional Control
LTGM	Long-term Groundwater Monitoring
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
msl	Mean Sea Level
µg/L	Microgram per Liter
mg/kg	Milligram per Kilogram
mg/L	Milligram per Liter
NCP	National Contingency Plan
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PCE	Tetrachloroethene
pCi/L	Picocuries per Liter
ppb	Parts per Billion
ppm	Parts per Million
PRB	Permeable Reactive Barrier
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SG	Soil Gas
SWQS	Surface Water Quality Standard
TBC	To-be-considered Criteria
TCE	Trichloroethene
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use and Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy 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 pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill) Superfund Site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because 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 seven operable units (OUs) (Table 1). This FYR Report addresses all site OUs.

Table 1: Site OUs

OU[a, b]	Description
OU1	Ballpark, water line, groundwater monitoring (monitoring for thorium migration at the North Landfill and plume migration at the southern perimeter of the Site), Ciba Health and Safety Plan (HASP)
OU3	North Wetlands
OU4	North Landfill, including North Landfill vertical groundwater barrier wall
OU5	South Wetlands
OU6	South Landfill
OU7	Christina River
OU8	Plant area paving, Ciba vertical groundwater barrier wall, groundwater recovery and treatment

Notes:
a) OU2 no longer exists.
b) The Site's 1993 Record of Decision (ROD) did not designate OUs at the Site. The OU descriptions are from the Superfund Preliminary Close-Out Report, dated September 2002.

The EPA remedial project manager (RPM) led the FYR. Additional EPA participants included the site's hydrogeologist, biologist, toxicologist and community involvement coordinator (CIC). The Delaware Department of Natural Resources and Environmental Control (DNREC) project manager also participated in the review. Skeo provided EPA contractor support. BASF and the Chemours Company (Chemours), responsible parties, were notified of the initiation of the FYR.[1] The review began on July 23, 2019.

Site Background

The Site is located in Newport, New Castle County, Delaware. Various companies, including E.I. Du Pont De Nemours & Co., Inc. (DuPont) and Ciba Geigy (now BASF), manufactured paint pigments at the Site beginning in 1902. Historical operations also included the production of titanium metal, thoriated nickel, high purity silicon, chromium dioxide and other products. Decades of industrial waste disposal and plant operations contaminated soil, sediment, surface water and groundwater at the Site with heavy metals and chlorinated volatile organics.

The 120-acre Site is located in a mixed-use area (Figure 1). The Site spans both sides of the Christina River and includes several distinct areas (Figure 2). Site areas north of the river include an active BASF paint pigment manufacturing facility, the former Holly Run plant area, the North Landfill, the North Wetlands, the North

[1] Previous FYRs identified DuPont as a responsible party. DuPont separated its Performance Chemicals segment from the other businesses of DuPont on July 1, 2015. This created a new, independent, publicly-traded company named The Chemours Company (Chemours). Environmental liabilities were transferred to Chemours.

Drainageway and associated uplands. The Site also includes Ella Johnson Park (the former DuPont ballpark), which is located north of the BASF facility. Site areas south of the river include the South Landfill and South Wetlands. The Site also includes a 3-mile stretch of the Christina River. Chemours leases 5 acres of the South Landfill to Tangent Energy, which developed the land into a solar farm. Three pollinator meadows, with a total area of about a half-acre, are also located on the South Landfill.

Two major aquifers are present beneath the Site: the shallower Columbia Aquifer and the deeper Potomac Aquifer. A clay aquitard separates the Columbia and Potomac aquifers. Historic filling activities in the manufacturing areas created a surficial "construction fill zone" of mostly sand, gravel and clay that is partially saturated throughout the plant and landfill areas; the shallow water table lies within this fill zone.[2]

Fill-zone groundwater beneath the BASF plant flows from the northwest to the south and southeast and is intercepted by the groundwater collection trench installed along the shoreline at the plant (except for a small area to the far east). Groundwater in the Columbia Aquifer flows beneath the river in a southeasterly direction, except where the barrier wall was installed along the shoreline at the BASF plant. Groundwater in the Potomac Aquifer flows to the south. Groundwater at the Site is not used for drinking water or industrial purposes. The nearest public supply well is 1.5 miles southeast of the Site. The Christina River is used for recreational purposes, including fishing and boating. Future land use is anticipated to remain consistent with current land use.

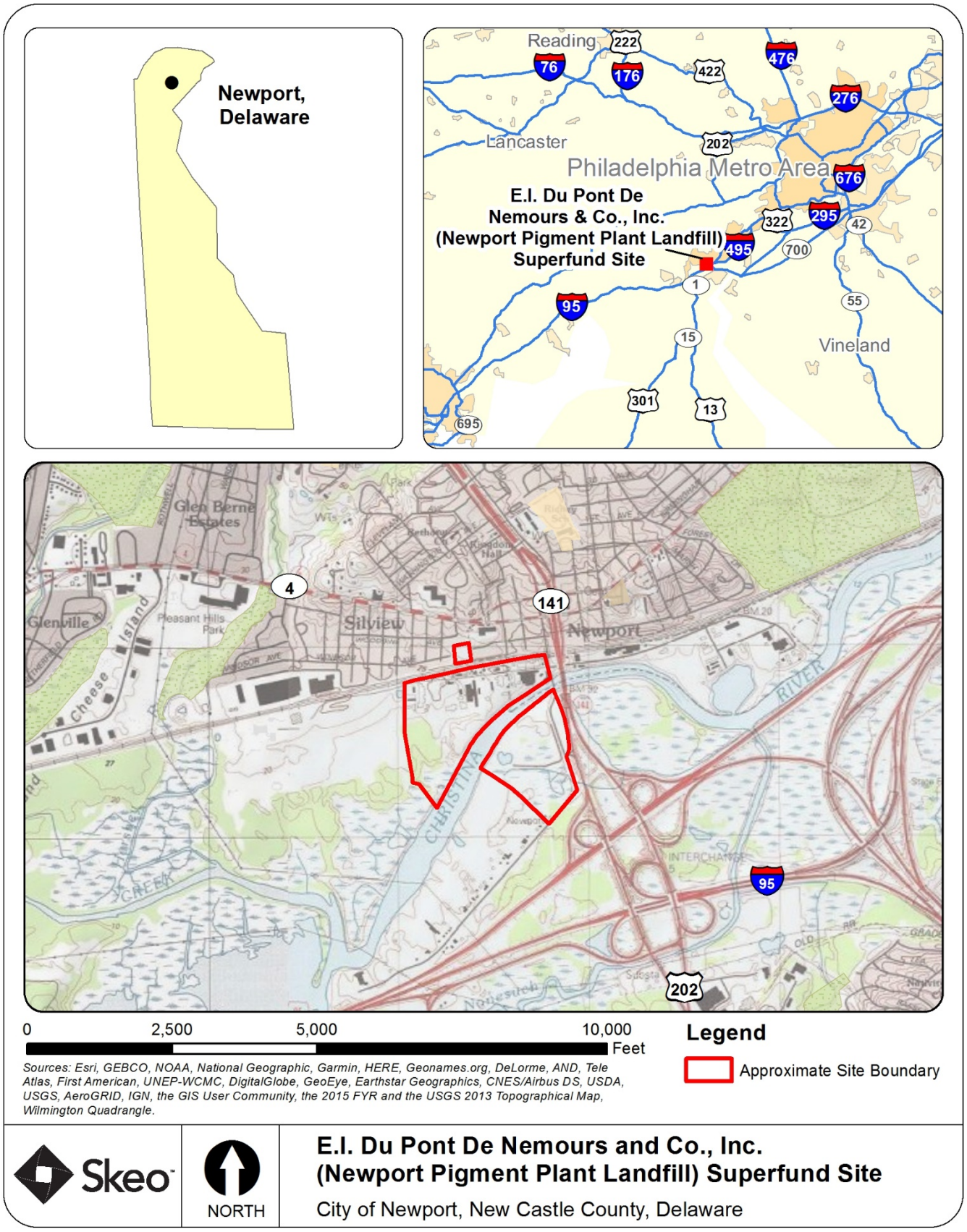
Appendix A provides a list of references used for this FYR. Appendix B provides a chronology of major site events. Appendix C provides a brief history of contamination at the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill)		
EPA ID: DED980555122		
Region: 3	**State:** DE	**City/County:** Newport / New Castle
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Anthony Iacobone, with additional support provided by Skeo		
Author affiliation: EPA Region 3		
Review period: 7/23/2019 – 4/14/2020		
Date of site inspection: 10/7/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 4/14/2015		
Due date *(five years after triggering action date)*: 4/14/2020		

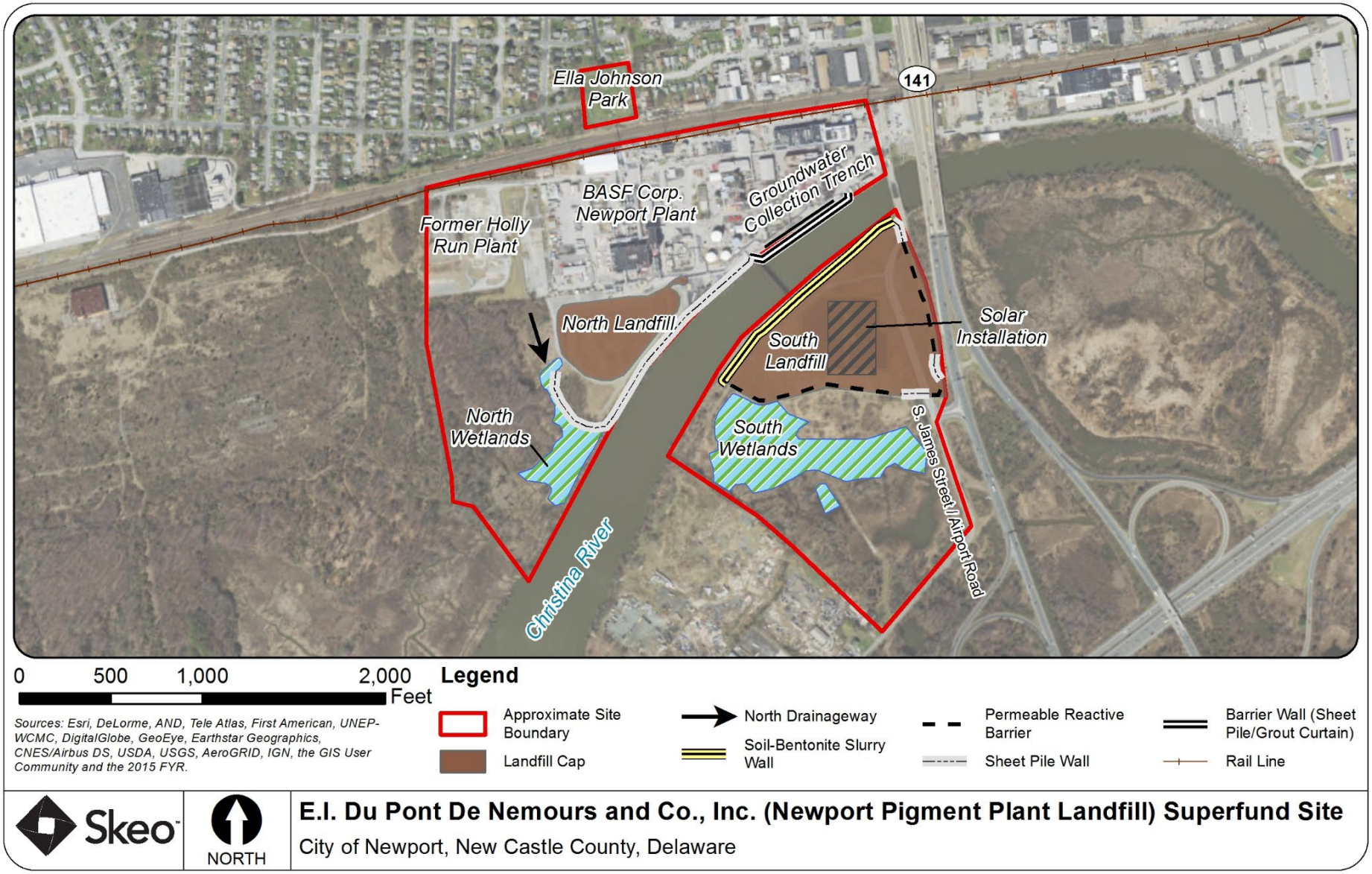
[2] The 2016 Updated Conceptual Site Model (CSM) Technical Memorandum provides geologic cross-sections of the Site.

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Figure 2: Detailed Site Map



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II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In the late 1970s and early 1980s, DNREC and DuPont found elevated levels of barium, cadmium, zinc, tetrachloroethene (PCE) and trichloroethene (TCE) in site groundwater. In August 1988, DuPont entered into an Administrative Order on Consent (AOC) with EPA to conduct a remedial investigation (RI) and feasibility study (FS). The RI identified heavy metals in soil, sediment, groundwater and surface water, and chlorinated volatile organics in fill zone and Columbia Aquifer groundwater and surface water. The RI documented contamination in the river and adjacent wetlands; some areas showed significant impacts to the ecosystem. The RI also determined that the South Landfill and soil underneath the plant area were sources of groundwater contamination. EPA listed the Site on the Superfund program's National Priorities List (NPL) in February 1990.

As part of the RI, DuPont conducted risk assessments to evaluate actual and potential threats to human health and the environment and documented the results in the March 1992 Human Health Evaluation and the August 1992 Environmental Evaluation. EPA determined that direct contact human health risks were unacceptable for a future construction worker and adolescent trespasser at the South Landfill; for a current maintenance worker at the North Landfill and the Holly Run plant; for a current maintenance worker and future construction worker at the Ciba-Geigy plant (now BASF plant); for a current recreational visitor in the ballpark; and for a hypothetical future resident drinking groundwater just off the South Landfill property. The Human Health Evaluation found contaminants that contributed most to human health risk were lead, vinyl chloride, arsenic, PCE, TCE, cobalt, zinc, cadmium and manganese. The Environmental Evaluation found that several areas of the North and South Wetlands and the Christina River warranted remediation based on review of sediment toxicity tests, benthic studies and sediment chemistry tests.

Response Actions

Removal Actions

In June 1993, EPA and DuPont entered into a removal consent order to address seepage of a heat transfer fluid, identified as Dowtherm®, into the Christina River. Response actions included deployment of oil-sorbing booms and installation of sheet piling along the river to address the seeps.

During the RI, Ciba-Geigy removed an underground storage tank that formerly stored diesel fuel and performed repairs on discharge piping to the Christina River. Cracks in the piping had been allowing groundwater infiltration, which was causing discharges of zinc in excess of Ciby-Geigy's National Pollutant Discharge Elimination System permit.

Remedy Selection

EPA selected a remedy for all areas of the Site in an August 1993 Record of Decision (ROD). EPA modified the remedy for the South Landfill with Explanations of Significant Differences (ESDs) issued in August 1995 and May 2001.

The 1993 ROD identified the following sitewide remedial action objectives (RAOs):

- Prevent exposure to contaminated groundwater.
- Prevent further migration of contaminated groundwater.
- Prevent exposure to contaminated soils.
- Prevent exposure to contaminated sediments.
- Prevent further degradation of the environment caused by the discharge of contaminated groundwater to the Christina River and to the wetlands adjacent to the North and South Landfills.

Table 2 summarizes the major components of the remedies selected in the 1993 ROD, as modified by the 1995 and 2001 ESDs, and the purpose of the remedial action for each site area designated in the ROD. The current division of the Site by OU differs slightly from the division by site area in the 1993 ROD.

Table 2: Remedy Components, by Site Area and OU

1993 ROD Site Area	OU	Remedial Action	Purpose of Remedial Action
Ballpark	OU1	• Excavation of soils above 500 parts per million (ppm) lead with disposal in the North Landfill.	• To prevent human exposure to elevated levels of lead.
Groundwater	OU1	• Long-term monitoring • Installation of a public water supply along Airport Road. • Establishment of a Groundwater Management Zone.	• To prevent human exposure to site-related contaminated groundwater. • To prevent further contamination of the Columbia and Potomac aquifers. • To protect the South Wetlands.
North Landfill (including the North Wetlands and the North Drainageway)	OU3 and OU4	• Capping of the landfill. • Wetlands remediation, restoration and monitoring. • Installation of a vertical barrier wall (sheet pile) down to the base of the Columbia Aquifer. • Groundwater recovery and treatment to control mounding behind the wall. • Institutional controls.	• To prevent continued releases of contaminants to the groundwater, which discharges to the river and the North Wetlands. • To clean up areas of unacceptable environmental impact in the North Wetlands. • To prevent exposure of plant and terrestrial life to contaminated soils.
South Landfill	OU6	• Capping of the landfill with a synthetic cap (including the riverbank, with the cap extending to the low mean tide elevation and then covering in armor stone). • Installation of a barrier system consisting of a low-permeability slurry wall along the Christina River and a permeable reactive barrier (PRB) wall around the remainder of the landfill (2001 ESD). • Berm removal and site security with fencing and thorny plants around the landfill and adjacent wetlands. • Fence and thorny plants to limit human access. • Institutional controls.	• To prevent continued releases of contaminants to the groundwater, which discharges to the river and the South Wetlands. • To prevent unacceptable human exposure to contaminated soils from the land.
South Wetlands	OU5	• Excavation, restoration and monitoring. • Maintenance of the tide gate. • Institutional controls.	• To prevent unacceptable impacts to environmental receptors.
Christina River	OU7	• Dredging and monitoring.	• To prevent unacceptable impacts to environmental receptors.
Ciba-Geigy (now BASF) and DuPont Holly Run Plants	OU8	• Installation of a vertical barrier wall along the Christina River at the Ciba-Geigy plant. • Paving of the rest of the ground within the contaminated plant areas. • Recovery and treatment of groundwater upgradient of the barrier wall. • Institutional controls, including a HASP that falls under OU1.	• To prevent continued releases of contaminants to the groundwater, which discharges to the river. • To prevent unacceptable human exposure to contaminated soils.

In the ROD, EPA invoked multiple applicable or relevant and appropriate requirement (ARAR) waivers as part of the remedy. EPA waived the federal maximum contaminant level (MCL) and non-zero maximum contaminant level goal (MCLG) ARARs in the Columbia and Potomac aquifers. EPA also waived the state of Delaware surface water quality standards (SWQSs) in the North and South Wetlands and SWQSs and federal ambient water

quality criteria (AWQC) in the Christina River. Appendix M provides EPA's rationale for the waivers, as presented in the 1993 ROD.

The ROD, ESDs and additional post-decision document memoranda documented performance standards for groundwater, surface water, sediment and soil at the Site. Table D-1 in Appendix D summarizes numeric performance criteria by OU and media.

Status of Implementation

EPA issued a Unilateral Administrative Order (UAO) on April 19, 1994, to potentially responsible parties (PRPs) DuPont and Ciba-Geigy, requiring them to implement the 1993 ROD. Pursuant to an agreement between the companies, DuPont, and now Chemours, has conducted almost all the work. Figure 2 shows the locations of major remedy components.

OU1 (ballpark, water line, groundwater monitoring [monitoring for thorium migration at the North Landfill and plume migration at the southern perimeter of the Site], Ciba Health and Safety Plan [HASP])

The remedial design for OU1 began in May 1994 and finished in December 1995. In 1994, Ciba Geigy spin-off company Ciba Specialty Chemicals prepared a HASP to ensure the protection of workers performing subsurface soil work at the plant. BASF updated the HASP when it took over operations at the facility.

In June 1995, DuPont excavated a 12-foot-by-10-foot area at the ballpark to a depth of 1 foot. DuPont removed about 4.5 cubic yards of lead-contaminated soil and disposed of it at the North Landfill, the area was subsequently sampled to confirm contaminated material was removed and then backfilled with clean soils. In 2003, DuPont donated the ballfield property to the town of Newport for use as Ella Johnson Park.

In December 1995, DuPont connected homes and businesses to the public water supply along Airport Road. Three of 11 private wells were abandoned at that time; however, there is no evidence to suggest that the remaining wells still exist. DuPont also developed a long-term groundwater monitoring (LTGM) program that began in early 1996. Long-term monitoring for thorium migration at the North Landfill and plume migration at the southern site perimeter continues as part of Well Cluster 2 and Well Cluster 1 monitoring, respectively. Recent monitoring results are discussed in the Data Review section of this FYR Report. Figure 4 shows the locations of monitoring wells in the current LTGM program.

OU3 (North Wetlands) and OU5 (South Wetlands)

The remedial design for OU3 and OU5 began in May 1994. The remedial design for OU3 finished in May 1997 and for OU5 in December 1997. The selected remedies for the North and South Wetlands were modified during the remedial design to enhance cleanup. EPA, DNREC and DuPont collaborated on design changes that included reducing the site-specific sediment cleanup criteria, excavating deeper, heavily contaminated sediments discovered during the remedial design, increasing the biodiversity of the wetland, and removing the berm at the South Wetlands. EPA documented the changes in three EPA post-decision document memoranda, dated August 1995, September 1996 and October 1996. Table D-1 in Appendix D lists the cleanup criteria for the wetlands.

Remedy construction for OU3 began in 1996 and finished in 1998. DuPont remediated 2.7 acres of wetlands by excavating 9,500 cubic yards of metals-contaminated sediments from the North Wetlands and the North Drainageway and disposing of it in the North Landfill.

Remedy construction for OU5 began in 1997 and finished in 1998. DuPont remediated 6.5 acres (wetlands and pond combined) by removing 37,000 cubic yards of contaminated sediments and rebuilding the wetlands. DuPont also created 1.7 additional acres of wetlands by removing 20,000 cubic yards of contaminated soil from a berm. DuPont disposed of all excavated soil and sediment in the South Landfill.

Wetlands monitoring and monitoring of the South Wetlands surface water are ongoing. Results are discussed in more detail in the Data Review section of this FYR Report. Figure 4 shows the current surface water monitoring locations.

OU4 (North Landfill, including North Landfill vertical groundwater barrier wall)

Remedial design for OU4 began in May 1994 and finished in June 1999. The North Landfill remedy included installation of a sheet pile wall along the Christina River shoreline, installation of a groundwater extraction system behind the wall to control local groundwater flow, consolidation of excavated North Wetlands sediments into the landfill, and installation of a multi-layer cap on the landfill. Buried drums of thoriated nickel were left in place in the landfill; a metal monument installed at the North Landfill marks the location of the material buried in the landfill. Capping finished by 2001.

In 2007, DuPont added a knee-wall concrete extension to the sheet pile wall along the North Wetlands and the North Drainageway to provide hydraulic control in this area. DuPont stopped pumping from the groundwater extraction system in 2012 during re-evaluation of the treatment system; the extraction wells remain off as no significant mounding or over-topping of the wall has been observed. Long-term monitoring at the North Landfill continues and includes monitoring of groundwater levels at the barrier wall and monitoring of radiological constituents in groundwater (Well Cluster 2 monitoring, addressed under OU1). The North Landfill and barrier wall appear to be operating as intended. Results are discussed in more detail in the Data Review section of this FYR Report.

OU6 (South Landfill)

The remedy selected for OU6 includes capping of the South Landfill and installation of a vertical barrier system around the landfill. Remedial design began in May 1994 and finished in September 2001. From December 2001 to August 2002, DuPont implemented the South Landfill remedy. DuPont installed a bentonite-based slurry wall parallel to the Christina River along the south side of the New Castle County sewer main that runs through the landfill. The slurry wall is keyed at least 3 feet into the underlying marsh clay. An 18-inch-thick permeable reactive barrier (PRB) (comprised of DelDOT mortar sand, gypsum, iron and magnesite at a weight ratio of 100:20:5:5) wall surrounded the rest of the landfill, except in areas where steel sheet pile was used along the road crossing.

DuPont capped the South Landfill using a clay liner and high-density polyethylene membrane (Figure 2). The membrane cap extended down the riverbank to the low mean tide line. DuPont then covered the riverbank with armor stone. South James Street/Basin Road serves as the cap for the portion of the landfill it covers. Long-term monitoring of the PRB wall and maintenance of the cap are ongoing. Figure 4 shows the well locations included in the long-term monitoring program at OU6.

OU7 (Christina River)

The selected remedy for the Christina River was dredging and monitoring. The remedial design began in May 1994 and finished in September 1998. During the remedial design, testing of the river identified areas of marginal contamination that were relatively small. Removing this additional sediment eliminated the need for the long-term monitoring program that was part of the ROD. As a result, EPA changed the site-specific sediment cleanup criteria for the Christina River (Table D-1 of Appendix D lists the specific cleanup criteria). The changes were documented in an August 1996 EPA memorandum.

Remedial activities for the Christina River began and finished in 1999. DuPont dredged 2.9 acres of the river contaminated with heavy metals, disposed of the sediments in the South Landfill and restored the dredged areas.[3]

[3] Approximate average concentrations of zinc, lead and cadmium in sediment after cleanup were 570 ppm, 46 ppm and 1.7 ppm, respectively, which are below the sediment cleanup criteria.

In 2003, the downstream restoration area was disturbed when DNREC cut a 10-foot-wide channel through one of the areas as part of an adjacent marsh restoration project. The third FYR raised this issue regarding a potential release of contaminants from this activity. As part of the fourth FYR in 2015, EPA re-evaluated this concern and reviewed the OU7 Remedial Action Completion Report. This review showed that the channel excavation was through an area of sediment that did not contain a significant enough contaminant mass to cause impacts upon dispersion. EPA does not believe that a significant release occurred from this activity and has not included this issue in this FYR Report.

OU8 (Plant area paving, Ciba vertical groundwater barrier wall, groundwater recovery and treatment)

The remedial design for OU8 began in May 1994 and finished in June 1999. The groundwater barrier wall consisted of a 612-foot length of steel sheet pile installed along the Ciba-Geigy (now BASF) plant riverfront in 1999 and a grout wall curtain installed behind the sheet pile in 2000. Figure 2 identifies this combination of elements as the barrier wall. In 2001 DuPont installed a 460-foot-long groundwater collection trench and a series of extraction wells behind the barrier wall to prevent mounding and ensure hydraulic control of groundwater. In 2004, DuPont replaced the original extraction wells with a larger, single sump pump installed in a newly constructed vault (EW-1) in the collection trench. Figure I-2 in Appendix I shows the location of EW-1. Groundwater extracted from EW-1 was treated at the former Holly Run groundwater treatment plant. In October 2014, DuPont and BASF agreed to treat extracted groundwater from EW-1 at BASF's wastewater treatment plant. BASF discharges treated effluent from the wastewater treatment plant to the city of Wilmington publicly owned treatment works, pursuant to a discharge permit. DuPont agreed to perform periodic analysis of EW-1 water to show that no contaminant levels would cause an exceedance of the BASF permit. Following tie-in of the EW-1 groundwater to BASF's system, Chemours demolished the Holly Run groundwater treatment plant. Foundations for the buildings remain. Demolition finished by March 2018.

The barrier wall and trench could not be extended along a 220-foot area at the southeast edge of the plant along the north bank of the river. EPA agreed that groundwater extraction was not needed in this area if there was no significant change in constituent concentrations in the Columbia Aquifer between the eastern end of the sheet pile wall and the eastern property boundary. DuPont added two Columbia Aquifer monitoring wells (EW-114 and EW-115) to the LTGM program to evaluate the effectiveness of the remedy in this area (Figure 4).With the exception of Copper, dissolved metal concentrations in EW-114 and EW-115 were below the state freshwater chronic criteria during this FYR period.

The OU8 remedy also included paving about 2.4 acres within the Ciba-Geigy (now BASF) plant and the former Holly Run plant. Paving took place in 2001. Excavation of soil from a small portion of the Holly Run plant also occurred. Contaminated soil was placed in the North Landfill prior to capping.

Institutional Control (IC) Review

The Site includes multiple parcels of land. Table 3 provides an overview of the parcels and current owners. Since the 2015 FYR, parcels previously owned by DuPont are now owned by The Chemours Company FC LLC. Ownership of all other parcels has not changed.

Table 3: Site Parcel Overview

Parcel Description	Parcel ID	Owner	Instrument ID
Ella Johnson Park	2000300111	Town of Newport	200302130020772
Former Holly Run Plant	0704730108	The Chemours Company FC LLC	201501300004550
North Wetlands and North Landfill	0704730117	The Chemours Company FC LLC	201501300004550
BASF Newport Plant	2000300110	Ciba Specialty Chemicals Corp	199612191954406
BASF Newport Plant	2000300108	Ciba Specialty Chemicals Corp	199701031011798
BASF Newport Plant	2000300109	Ciba Specialty Chemicals Corp	199701031011798
BASF Newport Plant	2000300083	Ciba Specialty Chemicals Corp	199701031011798
South Landfill and South Wetlands	1000800001	The Chemours Company FC LLC	201501300004550
Eastern part of South Landfill	No Parcel ID	State of Delaware	196103201567187

Parcel Description	Parcel ID	Owner	Instrument ID
Notes: Parcel information obtained from the New Castle County, Delaware website, accessed September 6, 2019: https://arcg.is/CD5XO for parcel maps and http://www3.nccde.org/parcel/search/default.aspx for parcel-specific data.			

Table E-1 in Appendix E summarizes institutional control requirements for each area of the Site and the status of the institutional controls. Figure 3 illustrates the land parcels with implemented institutional controls and those that are anticipated to be implemented in 2020.

A Declaration of Restrictions, recorded on April 17, 2003 (the 2003 Declaration), is in place for the former Holly Run plant, the South Landfill and South Wetlands parcels. The 2003 Declaration also addresses the North Landfill, but the parcel number for most of the North Landfill, 0704730117, is not properly identified in the 2003 Declaration. In addition, the 2003 Declaration did not include a prohibition against residential use of the North Landfill, as required by the ROD. The deed transferring property ownership from DuPont to The Chemours Company FC LLC, dated January 30, 2015, prohibits residential use of the North Landfill parcel. Chemours recently amended the 2003 Declaration to address items missing from the original document. EPA approved the draft final declaration on March 25, 2020, and informed Chemours it could sign and record the document.

EPA worked with BASF and the state of Delaware to develop institutional controls on the remaining site parcels requiring them. EPA sent a draft Declaration of Restrictions to BASF in January 2020. BASF is currently reviewing the draft document.

EPA also sent an informational letter to the Delaware Department of Transportation (DelDOT) on March 18, 2020. The informational letter explains the restrictions on the state-owned parcel and indicates that implementation of a recorded declaration can occur following completion of the nearby bridge construction. Once the construction is complete and a survey of the state-owned parcel is completed, DelDOT has agreed to record a Declaration of Restrictions on the property.

Institutional controls are not required for the Ella Johnson Park parcel because the parcel was cleaned up for UU/UE. DNREC is also working to designate the Site within a Groundwater Management Zone to restrict installation of drinking water wells, as required by the 1993 ROD.

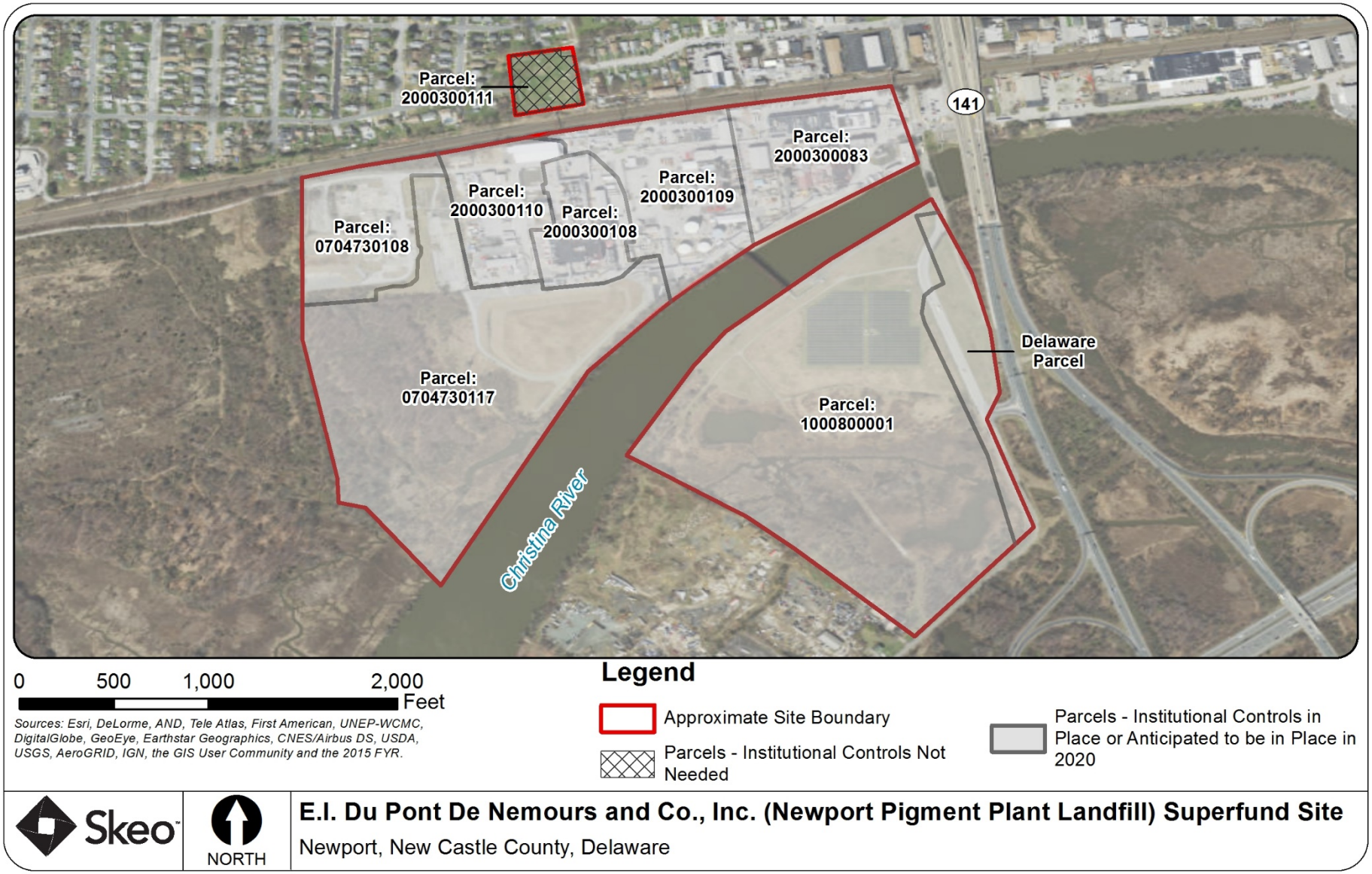
Systems Operations/Operation and Maintenance (O&M)

Chemours conducts O&M activities in accordance with EPA-approved O&M plans. Chemours regularly inspects the North and South Landfills and wetlands for signs of erosion, invasive species or other issues. Paved areas of the former Holly Run plant and active BASF plant undergo annual inspections and repair. Parts of the BASF plant are heavily traveled, and maintenance of the asphalt is an ongoing activity. Chemours also recently implemented annual inspections of building foundations in response to the vapor intrusion assessment at the Site that was performed in response to the 2015 FYR. The vapor intrusion assessment is discussed in additional detail in Section III, Progress Since the Previous Five-Year Review.

Chemours also implements a LTGM program, with results submitted to EPA in annual reports. Groundwater monitoring takes place biennially at perimeter monitoring wells (Well Cluster 1) for volatile organic compounds (VOCs) and metals, semi-annually for PRB wells at the South Landfill for metals, semi-annually and annually for wells EW-114 and EW-115, respectively, near the interceptor trench for VOCs and metals, and semi-annually at North Landfill wells (Well Cluster 2) for radionuclides. Chemours also conducts regular water level gauging at the barrier walls and interceptor trench to evaluate hydraulic control of these remedial components.

Surface water sampling at the South Wetlands occurs every five years at two pond locations (POND-01 and POND-02) and two river locations (RIVER-01 and RIVER-02), to monitor metals concentrations in support of the ARAR waiver. Surface water sampling for biphenyl also occurs every five years at two locations (SW-1 and SW-3) along the BASF plant riverbank, adjacent to the former seep. Refer to Figure 4 for monitoring locations. The Data Review section of this FYR Report evaluates data collected during long-term monitoring at the Site.

Figure 3: Parcel Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site

III. PROGRESS SINCE THE PREVIOUS REVIEW

Table 4 includes the protectiveness determinations and statements from the 2015 FYR Report. Table 5 summarizes the issues and recommendations from the 2015 FYR Report and the status of those recommendations.

Table 4: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
OU1	Short-term Protective	The OU1 (ballpark, water line, Phase I groundwater monitoring, Ciba-Geigy health and safety plan, or HASP) remedy current protects human health and the environment. Exposure pathways between receptors and contaminated media are incomplete. Groundwater monitoring continues and HASPs are in place. For the remedy to be protective over the long term, the following actions need to be taken: Determine the need to collect additional data to define the extent of groundwater contamination off Site. Determine if discharge of groundwater at the Well Cluster 1 performance standards would impact surface water concentrations above aquatic ecological criteria.
OU3	Protective	The OU3 (North Wetlands) remedy is protective of human health and the environment. The remedial action removed contaminated sediments and restored the wetlands. An operation and maintenance program monitors the wetlands and controls invasive species.
OU4	Protectiveness Deferred	A protectiveness determination of the remedy at OU4 (North Landfill, including the groundwater barrier wall) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: Conduct additional investigation near the North Landfill barrier wall to determine if modifications are necessary (e.g., pumping from additional extraction wells) to maintain capture of groundwater. Conduct additional sampling at the North Wetlands (e.g., sediment, porewater, surface water and/or groundwater from appropriately sited locations) to determine impacts to the North Wetlands. The following additional action needs to be implemented to ensure long-term protectiveness of the remedy at OU4: Implement the ICs selected in the ROD and ESDs for the DuPont-owned parcel (0704730117) comprising the North Landfill. In addition, implement an IC prohibiting residential use of the North Landfill.
OU5	Protective	The OU5 (South Wetlands) remedy is protective of human health and the environment. The remedial action removed contaminated sediments and restored the wetlands. An O&M program monitors the wetlands, including surface water quality, and controls invasive species. ICs, in the form of the 2003 Declaration of Restrictions, are in place.
OU6	Protectiveness Deferred	A protectiveness determination of the remedy at OU6 (South Landfill) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: Provide documentation, which should include sediment, porewater, surface water and/or groundwater sample results from appropriately sited locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River. The following additional actions need to be implemented to ensure long-term protectiveness of the remedy at OU6: Determine if barium and manganese concentrations are site-related and if so, determine potential adverse effects and take action to reduce or eliminate these effaces, if necessary. This assessment should incorporate water level data from the South Wetlands and plume maps to show contaminant distribution. Develop metrics to ascertain the effectiveness of the PRB wall. Implement the ICs selected in the ROD and ESDs to restrict Site use and maintain the integrity of the remedies; work with DNREC and DelDOT to assist in determining the most appropriate method for implementing ICs for the DelDOT-owned portion of the South Landfill.
OU7	Protective	The OU7 (Christina River) remedy currently protects human health and the environment. The remedial action removed contaminated sediments and restored those areas of the river.

OU #	Protectiveness Determination	Protectiveness Statement
OU8	Protectiveness Deferred	A protectiveness determination of the remedy at OU8 (DuPont and Ciba-Geigy [now BASF] plants, Phase II groundwater monitoring) cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions: Conduct a capture zone analysis for the groundwater extraction/trench system, which uses both water level data and water velocity data, to ascertain the effectiveness of the system. This analysis should incorporate particle tracking to fully understand how the trench is capturing the groundwater. Conduct a comprehensive vapor intrusion investigation over the BASF Plant area to rule out vapor intrusion issues. To ensure long-term protectiveness of the remedy at OU8, establish a Delaware Groundwater Management Zone at the Site and within areas affected by Site groundwater contamination. Implement the ICs selected in the ROD and ESDs for the four Ciba Specialty Chemicals (BASF) parcels.
Sitewide	Protectiveness Deferred	Because a protectiveness determination of the remedies at OU4, OU6 and OU8 cannot be made at this time, a comprehensive Site protectiveness determination is also deferred until further information is obtained. Further information will be obtained by taking the following actions: Conduct additional investigation near the North Landfill barrier wall to determine if modifications are necessary (e.g., pumping from additional extraction wells) to maintain capture of groundwater. Conduct additional sampling at the North Wetlands (e.g., sediment, porewater, surface water and/or groundwater from appropriately sited locations) to determine impacts to the North Wetlands. Provide documentation, which could include sediment, porewater, surface water and/or groundwater sample results from appropriately sited locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River. Conduct a capture zone analysis for the groundwater extraction/trench system, which uses both water level data and water velocity data, to ascertain the effectiveness of the system. This analysis should incorporate particle tracking to fully understand how the trench is capturing the groundwater. Conduct a comprehensive VI Investigation over the BASF Plant area to rule out Vapor Intrusion Issues.

Table 5: Status of Recommendations from the 2015 FYR Report

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU4	The groundwater barrier wall at the North Landfill may not be providing complete hydraulic control near extraction wells EW-122 and EW-127; effects of stopping pumping are unknown. It is unclear if contaminated groundwater is moving towards the North Wetlands at potentially unacceptable levels.	Conduct additional investigation near the North Landfill barrier wall to determine if modifications are necessary (e.g., pumping from additional extraction wells) to maintain capture of groundwater. Conduct additional sampling at the North Wetlands (e.g., sediment, porewater, surface water and/or groundwater from appropriately sited locations) to determine impacts on the North Wetlands.	Completed	Chemours conducted a field investigation in 2015 in response to the issues and recommendations in the 2015 FYR Report. Chemours presented the results of the investigation in the January 2016 Updated Conceptual Site Model Technical Memorandum (Updated CSM Technical Memorandum). A summary of the investigations conducted at the Site in response to the 2015 FYR Report issues and recommendations is presented below this table.	1/14/2016
OU6	High barium and manganese concentrations were detected in groundwater at the South Landfill PRB wall. There are no metrics to ascertain the effectiveness of the PRB wall.	Determine potential adverse effects and take action to reduce or eliminate these effects, if necessary. This assessment should incorporate water level data from the South Wetlands and plume maps to show contaminant distribution. Develop and evaluate metrics to ascertain the effectiveness of the PRB wall.	Under Discussion	Chemours re-evaluated the CSM for the South Landfill and South Wetlands area and submitted the results to EPA in a December 16, 2019 Surface Water Protectiveness Re-assessment Technical Memorandum. The report does not clarify why the PRB is not 100% effective and whether it is protective. It is not clear how a bail test - in which it is noted measures permeability around a 2.5-foot radius at the Site - bolsters the claim that the PRB is working. Although a tidal study was performed, the results were deemed insignificant and exceptions noted during the highest point of the monthly cycle were dismissed. Additional preliminary issues with the 2019 CSM update are summarized after this table.	12/16/2019
OU6	There are no sampling data to demonstrate that contaminants are not entering the Christina River from portions of the South Landfill that extend beyond the barrier wall.	Provide documentation, which should include sediment, porewater, surface water and/or groundwater sample results from appropriately sited locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River.	Ongoing	Chemours re-evaluated the CSM for the South Landfill and South Wetlands area and submitted the results to EPA in a December 16, 2019 Technical Memorandum. The document does not demonstrate that contaminants are not entering the Christina River from portions of the South Landfill outside of the barrier wall. EPA reviewed the submittal and did not agree with the conclusions presented in the report. EPA recommends additional evaluation of the CSM for the South Landfill and South Wetlands.	Ongoing

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU8	The Site is not located within a Delaware Groundwater Management Zone to restrict installation of drinking water wells.	Establish a Delaware Groundwater Management Zone at the Site and within areas affected by site groundwater contamination.	Ongoing	EPA is working with the state of Delaware to address this issue.	Ongoing
OU8	The extraction trench may not be capturing contaminated groundwater on the eastern side of the BASF plant, in the vicinity of piezometer PZ-8F. Data presented in long-term groundwater monitoring reports do not demonstrate capture of groundwater.	Conduct a capture zone analysis for the groundwater extraction/trench system, which uses both water level data and water velocity data, to ascertain the effectiveness of the system. This analysis should incorporate particle tracking to fully understand how the trench is capturing the groundwater.	Considered But Not Implemented	Chemours did not conduct a capture zone analysis for the groundwater extraction/trench system at BASF. However, Chemours assessed the potential for contaminated groundwater on the eastern side of the BASF plant, in the vicinity of piezometer PZ-8F, to discharge to the river at potentially unacceptable levels. This area was believed to be outside the capture zone of the groundwater extraction/trench system. The 2016 CSM Tech Memo documented a re-assessment of potential Columbia groundwater discharge to the river using data from EW-114 and EW-115, and an assessment of potential fill-zone groundwater discharge to the river using data from PZ-8F. The assessments found that the predicted contribution of metals from the Columbia Aquifer to resulting river concentrations are less than four orders of magnitude of the chronic freshwater screening criteria, and the contribution from the fill-zone sand is less than three orders of magnitude. The assessments do not indicate a potential concern for unacceptable impact to surface water quality or sediment.	11/15/2016

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU8, OU6 and OU4	Institutional controls are not in place for the four Ciba Specialty Chemicals (BASF) parcels, the DelDOT parcel, and one DuPont-owned parcel (0704730117).	Implement the institutional controls selected in the ROD and ESDs to restrict site use and maintain the integrity of the remedies; work with DNREC and DelDOT to assist in determining the most appropriate method for implementing institutional controls for the DelDOT-owned portion of the South Landfill.	Ongoing	EPA worked with various entities to implement institutional controls for the BASF parcels, the Delaware-owned parcel and one Chemours-owned parcel (0704730117). EPA requested that Chemours amend and replace the 2003 Declaration to add parcel number 0704730117 and add other institutional controls that were missing based on the ROD and the 1995 and 2001 ESDs. Chemours drafted an Amended Declaration of Restrictions, which EPA approved on March 25, 2020. At that time, EPA informed Chemours it could sign and record the document. EPA also requested that BASF record a Declaration on the parcels it owns, reflecting the institutional controls in the ROD. BASF is currently reviewing the draft document. Finally, EPA requested that DelDOT record a Declaration on its portion of the Site that included the South Landfill's institutional controls from the ROD, as amended by the 1995 and 2001 ESDs. Due to the nearby bridge construction affecting the accuracy of a land survey, EPA sent an informational letter to DelDOT on March 18, 2020, explaining the restrictions on the parcel and indicating that recording of the Declaration could be delayed until construction is complete and a survey conducted. DelDOT agreed to record the Declaration of Restrictions.	Ongoing
OU8	The potential for vapor intrusion to indoor air has not been characterized using multiple lines of evidence.	Conduct a comprehensive vapor intrusion investigation over the BASF plant area to rule out vapor intrusion issues.	Completed	Chemours conducted a vapor intrusion investigation of the BASF plant areas in 2016, 2017 and 2018. The results are presented in the Vapor Intrusion Investigation Reports, the results of which are summarized following this table.	11/3/2017

In response to the issues and recommendations presented in the 2015 FYR Report, Chemours conducted additional investigations at the Site beginning in late 2015 and presented the findings in the January 2016 Updated Conceptual Site Model Technical Memorandum, 2016 to 2018 Vapor Intrusion Investigation Reports and the December 2019 South Landfill Site Conceptual Model Updated with Tidal Study and Surface Water Protectiveness Re-assessment Technical Memorandum.

2016 Updated CSM Technical Memorandum

Table F-1 in Appendix F summarizes the groundwater data collected during the 2015 supplemental sampling event. Figure F-1 in Appendix F shows the 2015 sample locations. Chemours concluded that the evaluation demonstrated effective hydraulic control of the groundwater from the BASF plant and North Landfill areas, and there is no potential for unacceptable impact to surface water or sediment quality at the eastern end of the Site near piezometer PZ-8F. The report also concluded that the data gathered during the investigation indicated that there is no component of groundwater flow discharge to the North Wetlands from the North Landfill. The data as illustrated on updated plume maps also verified that shallow groundwater VOCs are limited in extent and were generally not detected along the downgradient side of the North Landfill proximal to the Christina River. Figure F-2 and Figure F-3 in Appendix F are plume maps for PCE and chlorobenzene, respectively; these chemicals were detected at the highest concentrations in the fill-zone groundwater during the investigation. As shown in Figure F-2, PCE at MW-1A(F) was detected at 3,100 micrograms per liter (µg/L).

However, EPA does not concur with Chemours' conclusions. EPA is unable to determine if groundwater in this area of the Site is influenced by the groundwater collection trench at BASF, or if there is limited migration to the river due to the marsh sediments to the south. Additional assessment of PCE in groundwater at the former Holly Run plant area may be warranted.

2016 - 2018 Vapor Intrusion Investigations

2016

Chemours conducted a vapor intrusion investigation at the Site in February and March 2016 to determine if vapor intrusion pathways are complete at the Site, and if so, determine whether the pathway poses a potential risk to human health. Sub-slab soil gas, indoor air and ambient air samples were collected in locations where volatile constituents in shallow groundwater exceeded EPA's groundwater vapor intrusion screening levels (VISLs) for commercial/industrial land use. Exceedances of the groundwater VISLs were observed in locations associated with three former production areas: the Former CPC Production Area (East), the Former CPC Production Area (West) and the Former QA Production Area (Figure F-2, Appendix F). Groundwater flows to the southeast away from these locations toward the groundwater extraction system. No exceedances were observed along the eastern site boundary with James Street or the northern property boundary.

The investigation included a building inspection/survey, indoor air sampling at 13 buildings, ambient air sampling at three locations, and sub-slab soil gas sampling at nine buildings. VOCs were detected in sub-slab soil gas at multiple locations above the soil gas VISLs (SG VISLs) for commercial/industrial land use; PCE or TCE was detected in indoor air at three buildings or building clusters (Buildings A-100/A-103, A-500/A-51 and A-53) above indoor air VISLs, all of which are located in the Former CPC Production Area (East). Risk evaluation found that calculated risks were within or below EPA's acceptable risk range. The report stated that building conditions (thick slab foundations) appeared to effectively impede soil gas entry rates. The report recommended annual slab inspections to confirm building conditions (e.g., foundations, utilities, heating and ventilation systems, slab conditions) have not changed. Annual inspections have been implemented. EPA reviewed the Vapor Intrusion submittals and provided recommendations and comments which were implemented in the 2017 sampling.

2017

Chemours conducted additional vapor intrusion investigations at the Site in March 2017. Indoor air samples were collected at 13 buildings, in a manner consistent with the 2016 sampling event. Sub-slab soil gas and indoor air samples were also collected at an additional nine buildings. VOCs were detected in sub-slab soil gas at multiple

locations above the SG VISLs for commercial/industrial land use; benzene, PCE or TCE were detected in indoor air at two buildings in the Former CPC Production Area (East) (A-100 and A-53) above indoor air VISLs. Risk evaluation found that calculated risks were within or below EPA's acceptable risk range. EPA's toxicologist reviewed the 2017 report and noted that the report should discuss the potential for vapor migration north of buildings A-67/A-502, particularly to off-property locations. These buildings had significant sub-slab vapor concentrations, the extent of the vapors does not appear to be defined to the north, and there are off-property buildings within 200 feet to the north. Figure F-2 in Appendix F shows the locations of these buildings. EPA also stressed the importance of monitoring slab integrity at A620/630, A100/103, A501, A51/500, A67, A502, A27, A203, A10, A12, A22, A5 and A52, until sub-slab concentrations decrease below VISLs. It appears that significant vapors have accumulated beneath these slabs, but that the substantial slab thickness is preventing significant intrusion so far. These buildings are included in the annual inspections.

EPA also recommended continued monitoring or at least resampling at A100 and A14, and resampling in three to five years for A51, A500 and A53. Chemours also proposed to sample several buildings during the 2018 heating season: A10, A12, A5, A52, A67, A502, A73, A13 and A22.

2018

Chemours conducted additional vapor intrusion sampling in 2018. Follow-up sampling occurred during the 2018 heating season. Results were generally consistent with previous findings: several buildings had notable concentrations of VOCs in subslab vapors, but indoor air concentrations did not exceed levels of concern. These data were considered along with the previous data to conclude that the approach described below would be taken.

Slab maintenance and inspection would occur at the following buildings, to ensure that any subslab vapors would not migrate at significant levels into indoor spaces: A-610, A-620, A-630/635, A-203, A-103, A-501, A-100, A-500, A-51, A-53, A-67, A-502, A-27, A-10, A-12, A-22, A-5, A-52.

The following buildings would also be resampled 3-5 years from the 2018 sampling. These results should be available for inclusion in the sixth (2025) five-year review: A-620, A-103, A-501, A-100, A-500, A-51, A-53, A-14, A-27, A-12, A-5, A-52.

No further action was deemed necessary at buildings A-202, A-73, or A-13.

2019 South Landfill Site Conceptual Model Updated with Tidal Study and Surface Water Protectiveness Re-assessment Technical Memorandum

Chemours re-evaluated the CSM for the South Landfill and South Wetlands area and submitted the results to EPA in a December 16, 2019 technical memorandum. The technical memorandum included results of a month-long tidal study performed from March 26 through April 30, 2019 to determine the response of groundwater to tidal changes in the Christina River and the interaction of groundwater between PRB monitoring wells. Data from the study were used to update Chemours' understanding of groundwater flow into and out of the South Landfill and the effects of discharge of metals-contaminated groundwater to the South Wetlands. The technical memorandum also includes Chemours' proposed revised performance standards for the PRB point of compliance (POC) wells.

EPA is currently reviewing the technical memorandum and has considerable preliminary concerns with the document and its conclusions. Preliminary issues from EPA BTAG include use of criteria other than EPA Region 3 BTAG freshwater screening benchmarks for data evaluation; laboratory detection limits that exceed the EPA Region 3 BTAG screening benchmarks; lack of a data-supported assessment of sediment and lack of an assessment of transition zone organisms. EPA's Technical Support Group BTAG did not concur with Chemours' assessment that the PRB is currently protective of South Wetlands surface water.

The technical memorandum also includes a graph characterizing the barium and sulfate concentrations over time in PRB-9. The assessment concludes that PRB sulfate in PRB-9 "was depleted over approximately the first four years." This would seem to suggest that, unless the standards are changed, the PRB materials need to be refreshed

in order for the barium performance standards to be met. Other than identifying the specific sulfate issue with barium at PRB-9, the technical memorandum does not offer solutions for the PRB to meet current performance standards. EPA strongly disagrees with the proposal to reduce performance standards.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was published in the Delaware State News on December 22, 2019 (Appendix G). It stated that the FYR was underway and invited the public to submit any comments to EPA. The results of the review and the report will be made available at the Site's information repository, Kirkwood Public Library, located at 6000 Kirkwood Highway in Wilmington, Delaware 19808.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** The interviews are summarized below. Appendix H includes the completed interview forms.

The DNREC project manager noted that the project seems to have comprehensively addressed historical site contamination, and O&M measures in place ensure the continued protection of human health and the environment. The state also fully supports the use of the South Landfill for the solar panels and sees the installation as an example of efforts to promote increased investments in green and renewable energy. The DNREC representative is not aware of any complaints or inquiries about the Site from residents, and she is unaware of any changes to state laws that might affect the protectiveness of the Site's remedy. The DNREC project manager also noted that DNREC is working with EPA to create an appropriate Groundwater Management Zone for the Site and surrounding area.

The Chemours representative has a positive impression of remedial activities at the Site. The representative noted that the remedial activities are minimal due to the mature status of the Site. Effects on the community have been minimal. Positive contributions in place include the solar development and wildlife certification on the South Landfill.

A BASF representative noted that the remedial activities at the Site are well organized and effective, and the Site is being managed to minimize effects on the community. The representative feels well informed about the Site's activities and remedial progress. The representative was unaware of any complaints or inquiries from residents. The BASF representative likes that the Site is a certified wildlife habitat.

Data Review

Data reviewed for this FYR Report includes performance monitoring data for the following site areas, located at the Site perimeter (OU1), north of the Christina River (OU4 and OU8) and south of the Christina River (OU6):

- OU1 Perimeter (Well Cluster 1)
- OU4 North Landfill area
  - Radiological monitoring (Well Cluster 2)
  - Vertical barrier wall monitoring
- OU8 BASF (former Ciba Specialty Chemicals) Plant Area
  - Extraction trench monitoring
  - Riverbank biphenyl monitoring
- OU6 South Landfill area
  - South Landfill PRB monitoring
  - South Wetlands surface water monitoring

Hydrogeologic and water quality monitoring data for these areas were presented in the 2015 through 2018 LTGM reports prepared by Parsons, Chemours' O&M contractor. Figure 4 shows monitoring locations. Table D-1 in Appendix D summarizes the numeric performance standards for each area.

OU1 Perimeter (Well Cluster 1)

The perimeter monitoring program currently consists of biennial sampling of four Columbia Aquifer monitoring wells and one Potomac Aquifer monitoring well for select VOCs and metals. The same wells are also analyzed for barium, chromium, copper, lead, mercury and vanadium (Group B metals) every sixth year. The wells are located on the south side of the Christina River. ROD Section 7.3.2 requires use of health-based screening concentrations to assess whether migration of the site-related constituents warrants additional remedial measures. Chemours compares data from Well Cluster 1 wells to MCLs and EPA regional screening levels (RSLs) for tap water, based on a hazard quotient (HQ) of 1 for noncarcinogens, in the LTGM reports. EPA's toxicologist has requested that future data evaluation in the LTGM Reports use RSLs based on a HQ of 0.1 to account for possible additive effects for noncarcinogens.

Chemours sampled Well Cluster 1 wells in 2015 and 2017. Table I-1 in Appendix I summarizes data for Well Cluster 1 wells. The following wells exhibited at least one dissolved constituent concentration above MCLs and/or RSLs during this FYR period:

- RDMW-8C – cadmium, cobalt, manganese, zinc and PCE (exceedances in 2015 and 2017)
- RDMW-21C – cobalt and manganese (exceedances in 2015 and 2017); zinc (2015); cis-1,2-dichloroethene (2017)
- MW-24A – cobalt and manganese (exceedances in 2015 only)
- MW-25A – manganese (exceedances in 2015 and 2017)

Figure I-1 in Appendix I presents trend graphs for dissolved cobalt and dissolved manganese, the constituents detected most often above RSLs (there are no MCLs for these constituents). The historical and current data indicate that concentrations of site-related constituents in the Columbia Aquifer perimeter wells are generally stable or decreasing. Dissolved cadmium concentrations in RDMW-8C, detected greater than an order of magnitude above the MCL and RSL, have also remained consistent over many sampling rounds. Monitored constituents have not been detected above screening criteria in the Potomac Aquifer well (MW-6B) since 1999 for organics and since 2001 for metals. Groundwater is not used as a source of drinking water at or near the Site. However, it is unknown if there are potential ecological risks from discharge of impacted groundwater to sediment or surface water. The 2016 Updated CSM Technical Memorandum evaluated potential impacts to surface water from cadmium, lead and zinc detected in groundwater north of the river, but potential ecological impacts from the contaminants detected in the Well Cluster 1 wells south of the river have not been evaluated.

OU4 North Landfill Area

The monitoring program for the North Landfill area consists of semi-annual groundwater sampling for radiological constituents to ensure that no thorium has been released from the buried drums in the North Landfill. The monitoring program also includes periodic (monthly) collection of water elevation data to monitor the operational efficiency of the vertical barrier wall by verifying that potentially contaminated North Landfill groundwater does not migrate to the Christina River and North Wetlands.

North Landfill Radiological Monitoring (Well Cluster 2)

The 1993 ROD required semi-annual compliance monitoring for radiological constituents (thorium-232, radium-228 and gross alpha and gross beta radiation) at the North Landfill. The current radiological monitoring network includes RDMW-33C (Potomac Aquifer well), SM-3 (Columbia Aquifer well) and EW-111 (fill-zone well) (Figure 4). Although the North Landfill is considered as OU4, Well Cluster 2 monitoring falls under OU1.

The monitoring data are compared to established trigger levels[4] to determine if there is any significant concentration change that indicates that a potential significant release of thorium has occurred. Table I-2 in Appendix I presents a summary of analytical results. During this FYR period, method detection limits for several constituents exceeded trigger levels. Additional review of field or laboratory procedures should be conducted to determine if method detection limits can be lowered to below trigger levels. The following wells exhibited at least one constituent concentration above established trigger levels during this FYR period:

- EW-111 – radium-228 (exceedances in November 2015 and May 2018, and in the dissolved sample in November 2018)
- RDMW-33C – gross alpha (exceedance in May 2017), gross beta (exceedance in May 2017), radium-228 (exceedances in November 2015 and May 2017)
- SM-3 – radium-228 (exceedance in May 2018, although not in the duplicate)

The LTGM Report attributes the May 2017 exceedances in RDMW-33C to suspended particulates in the samples. All detected constituents in RDMW-33C were below trigger levels in 2018. Although concentrations vary from one sampling round to another, there appears to be no increasing concentrations or any indication of a release of thorium. EPA has previously had radiation data reviewed by Regional Radiation expert March Aquino who concluded that data appears to conform to previously-established quality assurance criteria. EPA will revisit this issue prior to the next FYR to confirm that this is still the case.

North Landfill Barrier Wall Monitoring

Chemours monitors water levels monthly in 28 wells and piezometers installed behind the North Landfill barrier wall (OU4) and conducts two sitewide synoptic groundwater level gauging events annually. Data are used to assess the extent of groundwater mounding behind the barrier wall, and the effectiveness of the barrier wall at preventing migration of contaminated groundwater to the river and North Wetlands. Figures I-2 and I-3 in Appendix I are the November 2018 potentiometric surface maps for the fill zone and Columbia Aquifer, respectively.

At the North Landfill, four piezometers (PZ-5 through PZ-8) are located directly behind and upgradient of the sheet pile wall and four piezometers (PZ-1 through PZ-4) are located along the knee-wall extension of the barrier wall, near the North Wetlands. Measured groundwater elevations in the piezometers do not exceed the height of the top of the barrier wall, indicating that groundwater does not overtop the barrier. PZ-4 was dry for most of 2017 and 2018. Figure I-4 and Figure I-5 in Appendix I present hydrographs of piezometers PZ-1 through PZ-8. These charts show groundwater elevations over time in comparison to the elevation of the barrier walls. No visual evidence of groundwater seepage beyond the barrier walls has been observed.

OU8 BASF (former Ciba Specialty Chemicals) Plant Area

[4] Please see Appendix D for a detailed explanation of trigger levels.

The long-term monitoring program at the BASF plant area includes monthly collection of water level data to verify the operational effectiveness of the groundwater collection trench. The data consist primarily of water levels measured in the three cleanout wells (CL-1, CL-2 and CL-3) and sump pump vault installed in the collection trench. Data from semi-annual site-wide groundwater level gauging events are also used to evaluate groundwater flow at the groundwater collection trench.

The monitoring program also includes semi-annual sampling of metals and three VOCs (PCE, TCE and vinyl chloride) at Columbia Aquifer wells EW-114 and EW-115. Wells EW-114 and EW-115 monitor constituent concentrations in the Columbia Aquifer groundwater beyond the north end of the collection trench and barrier wall. Beginning in 2018, EPA in consultation with DNREC approved Chemours reducing the sampling frequency at EW-115 to annual sampling.

Additional monitoring at the BASF plant area includes collection of river water samples for biphenyl along the north bank of the Christina River, to monitor the former Dowtherm® seep area.

Groundwater Collection Trench Monitoring

Figures I-2 and I-3 in Appendix I are the November 2018 potentiometric surface maps for the fill zone and Columbia Aquifer, respectively, for the northern side of the Site, including the BASF plant area. The LTGM reports indicate that the potentiometric surfaces for the fill zone and Columbia Aquifer exhibit an elongated depression in the potentiometric surface along the collection trench, indicating the trench is effective in removing the natural flux of groundwater behind the barrier wall. Hydrographs presented in the LTGM reports for four wells installed in the collection trench show that water levels are below the top of the barrier wall (Figure I-6 in Appendix I). Figure I-6 also shows that water levels in CL-2 and CL-3 have risen over 2 feet during this FYR period. If water levels continue to rise, additional measures to maintain control in the western half of the collection trench may be needed. The recent CSM update also demonstrated that there is little potential for unacceptable impact to surface water or sediment quality at the eastern end of the Site near piezometer PZ-8F.

DuPont added two Columbia Aquifer monitoring wells (EW-114 and EW-115) to the LTGM program to evaluate the effectiveness of the remedy in an area where the barrier wall and trench could not be extended. Detected concentrations in EW-114 and EW-115 are compared to established trigger levels as well as the state of Delaware freshwater chronic criteria, when available. Table I-3 presents summary tables of groundwater analytical data for EW-114 and EW-115.

Dissolved metal concentrations in EW-114 and EW-115 with the exception of copper, were below the state freshwater chronic criteria during this FYR period; however, dissolved copper concentrations in EW-114 exceeded its trigger level on four occasions and in EW-115 on two occasions during this FYR period. A trend graph for copper included in Appendix I (Figure I-7) shows that dissolved copper concentrations in EW-114 during this FYR period are slightly higher than concentrations detected during the previous FYR period (2011-2014). At EW-115, dissolved copper concentrations slightly exceeded its trigger level in May 2016 and May 2017, but dissolved copper was again below the trigger level in November 2017 and in May 2018.

Although total and dissolved arsenic were not detected in either EW-114 or EW-115, the detection limits for total and dissolved arsenic exceeded applicable trigger levels in both wells. Detection limits were below the state freshwater chronic criteria.

PCE and vinyl chloride were not detected or were detected at trace concentrations (below 0.5 µg/L) in EW-114 and EW-115 during this FYR period. TCE was consistently detected in both wells at 2 µg/L. The state has not established a freshwater chronic standard for TCE; however, detected concentrations of TCE were below the EPA Region III freshwater screening benchmark of 21 µg/L.

Riverbank Biphenyl Monitoring

The long-term monitoring program consisted of annual surface water sampling for biphenyl at SW-1 and SW-3 (Figure 4). Chemours did not collect samples in 2015 or 2016 but collected samples in 2017. In 2018, EPA approved a reduction in the sampling frequency to once every five years, concurrent with the FYR schedule.

Results for biphenyl have been consistently below 14 µg/L (the EPA Region 3 freshwater ecological screening benchmark for 1,1'-biphenyl), and there have been no detections since 2001. The results indicate that the vertical barrier wall is effectively preventing biphenyl seepage into the Christina River.

OU6 South Landfill Area

South Landfill PRB Monitoring

Groundwater level monitoring occurs twice a year at 29 PRB wells as part of the sitewide synoptic groundwater level gauging events. Groundwater gauging events during the FYR evaluation period found that, except for two locations (PRB-5 and PRB-7), groundwater flows outward through the PRB before flowing into the wetlands. At the PRB-5 and PRB-7 well clusters, groundwater flows inward through the PRB. The data presented in the LTGM reports indicate that this inward flow is likely due to an influx of off-site surface water from the Old Airport Road culvert and the wetlands/water channel.

The contaminant groundwater monitoring program at the South Landfill currently consists of semi-annual sampling of 29 PRB wells for metals. Eleven wells installed in the PRB (PRB-1 through PRB-11) monitor compliance with the performance standard specified in Section 3.8.5 of the 2001 ESD. Additional wells are installed inside the landfill and outside and downgradient of the landfill. Table D-1 in Appendix D summarizes the performance standards.

Manganese and barium consistently exceeded performance standards in the PRB compliance wells during this FYR period (the 2018 LTGM Report includes a complete summary of results). The LTGM reports do not present evidence to demonstrate that the PRB is working as intended. As shown in Table 6 below for the PRB-3 cluster, the manganese concentrations detected inside the PRB where treatment should be occurring (i.e., PRB-3) are higher than the concentrations detected in the wells installed inside the landfill (PRB-3U). Manganese concentrations in wells downgradient (PRB-3D and PRB-3DD) of the PRB are also higher than concentrations inside the PRB.

Table 6: Manganese Concentrations (µg/L) at PRB-3 Series Wells

Date	PRB -3U (Inside landfill)	PRB-3 (Inside PRB)	PRB-3D (Outside landfill)	PRB-3DD (Furthest downgradient well)	Manganese Treatment Standard
May 2015	859	**1,920**	**40,000**	**14,400**	1,000
November 2015	**1,030**	**1,550**	**29,100/30,800**	**11,300**	1,000
May 2016	**1,020**	**2,440**	**23,500**	**15,100**	1,000
November 2016	**1,080**	**2,180**	**29,800**	**10,300**	1,000
May 2017	**1,070**	**3,190**	**24,400**	**16,300**	1,000
November 2017	**1,200/1,160**	**2,870**	**23,100**	**9,640**	1,000
May 2018	**1,140**	**2,530**	**20,000**	**13,700**	1,000
November 2018	**1,130**	**2,480**	**17,200**	**9,080**	1,000

Notes:
Source: 2017 LTGM Report
Concentrations reported in µg/L.
Bold concentrations exceed the treatment standard.

Barium concentrations consistently exceeded the performance standard of 7,800 µg/L in compliance well PRB-9 and once at PRB-5 (13,300 µg/L). At PRB-9, the barium concentrations detected inside the PRB wall since November 2015 are similar to concentrations detected inside the landfill (PRB-9U), as shown in Table 7 below. Barium concentrations in this well have been increasing in recent years. However, barium concentrations at the first downgradient well outside the PRB (i.e., PRB-9D) remain below the treatment standard. Barium concentrations at the furthest downgradient well in the PRB-9 series consistently exceeded the treatment standard during this FYR period. Chemours submitted an update to the South Landfill CSM in December 2019. EPA's preliminary review of the 2019 technical memorandum has identified significant issues with the findings of the report, which are summarized in Section III of this FYR Report.

Table 7: Barium Concentrations (µg/L) at PRB-9 Series Wells

Date	PRB -9U (Inside landfill)	PRB-9 (Inside PRB)	PRB-9D (Outside landfill)	PRB-9DD (Furthest downgradient well)	Barium Treatment Standard
May 2015	**155,000**	**90,100**	67.6	**49,600**	7,800
November 2015	**104,000**	**106,000**	68.2	5,670	7,800
May 2016	**133,000**	**125,000**	82	**75,800**	7,800
November 2016	**89,900**	**86,700**	52	**63,000**	7,800
May 2017	**120,000**	**135,000**	93.4	**92,200**	7,800
November 2017	**140,000**	**108,000**	703	**69,200**	7,800
May 2018	**179,000**	**172,000**	130	**54,200**	7,800
November 2018	334*	**229,000**	260	**58,000**	7,800

Notes:
Source: 2017 and 2018 LTGM Reports
Concentrations reported in µg/L.
Bold concentrations exceed the treatment standard.
Higher of the primary and duplicate sample are reported, where applicable.
*Appears to be an anomaly.

Detected concentrations in compliance wells PRB-1, PRB-2, PRB-3, PRB-4, PRB-9, PRB-10 and PRB-11 also exceed the EPA Region 3 BTAG freshwater screening benchmarks for barium (4 µg/L), cadmium (0.25 µg/L), lead (2.5 µg/L), and manganese (100 µg/L). Detection limits for cadmium and lead exceeded the screening benchmarks; therefore, it is possible that those constituents reported as non-detect may actually exceed the screening benchmark.

Since barium and magnesium consistently exceed the 2001 ESD performance standards and EPA Region 3 BTAG freshwater screening benchmarks in several PRB wells, Chemours recently re-evaluated the CSM for the South Landfill and presented the findings in a technical memorandum submitted to EPA in December 2019. EPA is currently reviewing the revised CSM.

South Wetlands Surface Water Monitoring

The South Wetlands monitoring program consists of surface water sampling for metals at two pond locations adjacent to the South Landfill (POND-01 and POND-02) and two river locations (RIVER-01 and RIVER-02), where river water enters the South Wetlands through a culvert along James Street. Results are compared to the state acute freshwater criteria and, for barium and manganese, ROD performance standards. Sampling occurs every five years; the most recent sampling event took place in 2015.

Surface water results from the pond and river samples collected in 2015 were below the state freshwater acute criteria and ROD performance standards. For RIVER-02, the detected concentration of manganese was an order of magnitude lower than the concentration detected in 2010. Table I-4 in Appendix I summarizes current and historic South Wetlands sampling results.

Site Inspection

The Site inspection took place on October 7, 2019. In attendance were representatives from EPA, DNREC, Chemours, BASF, Parsons (Chemours' O&M contractor) and Skeo (EPA's FYR support contractor). The purpose of the site inspection was to observe current site conditions. A completed site inspection checklist and photographs from the site inspection are included in Appendices J and K, respectively.

Site inspection participants began with a safety orientation at the BASF security main gate and then proceeded to the former Holly Run plant area. The groundwater treatment plant building previously located in this area during the 2015 FYR site inspection was no longer present. Chemours representatives indicated the plant was dismantled in March 2018 following connection to the BASF industrial wastewater treatment plant.

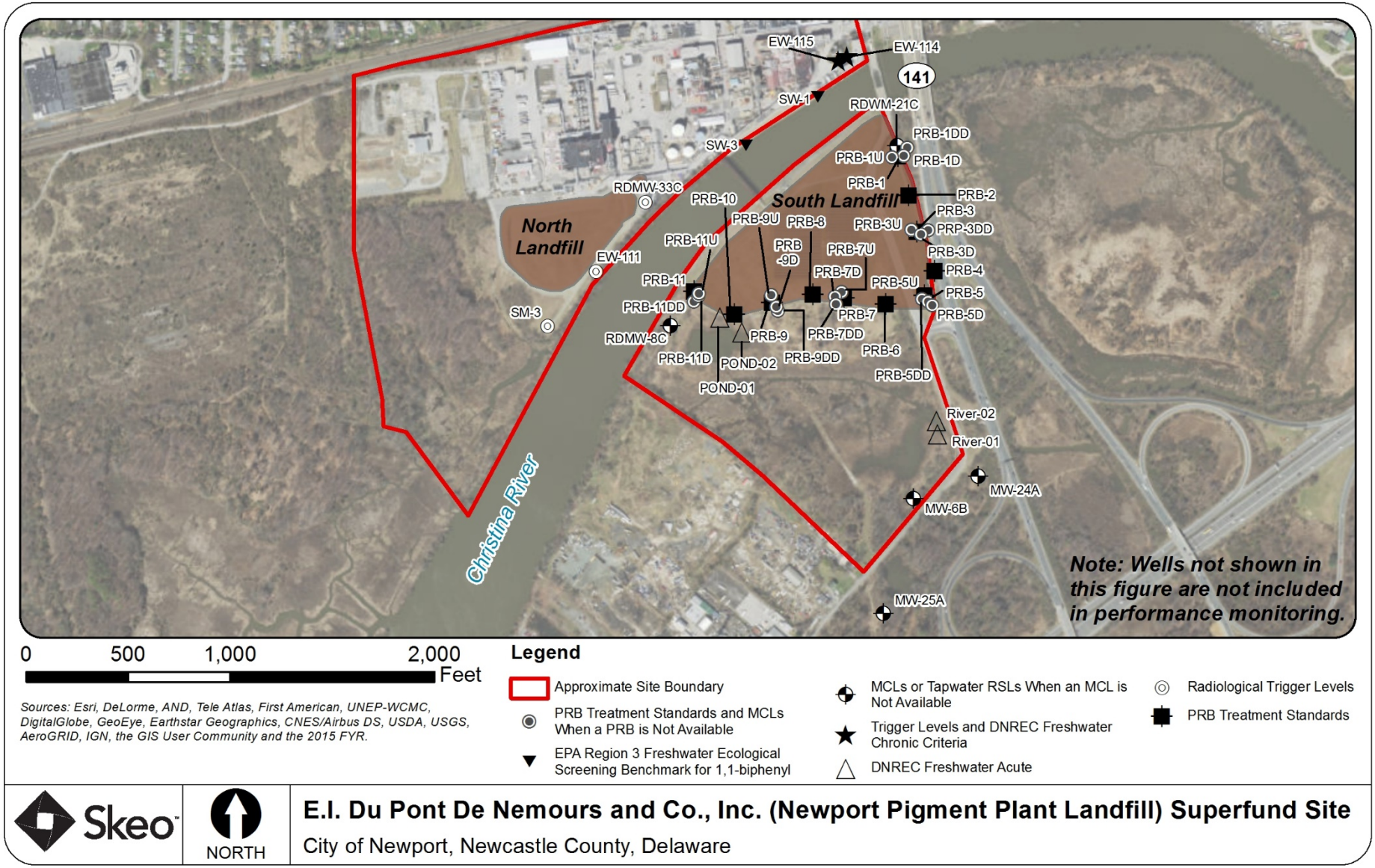
Site inspection participants observed relevant areas north of the Christina River, including the North Landfill, North Wetlands, Northern Drainageway, cement knee wall, the exterior of the BASF wastewater treatment plant, the groundwater collection trench area at BASF, and the sheet piling along the BASF riverfront. The North Landfill is well maintained and vegetated with no signs of erosion. The monument noting the presence of buried thorium at the landfill remains in place. No major issues of concern were noted at the landfill, wetland areas or BASF plant areas. Minor cracks in the pavement cover at the BASF facility were observed and should be addressed as part of regular maintenance.

Site inspection participants observed site areas on the south side of the Christina River. A fence and locked gate along South James Street/Airport Road restrict access to the South Landfill. No issues of concern were noted at the South Landfill or South Wetlands. The cap was vegetated with no signs of erosion. A solar array remains in place on the South Landfill. Site inspection participants observed pollinator habitat, bird boxes and small structures placed on site for animal habitat. Chemours representatives indicated that treatment for invasive species (phragmites) occurs as needed. Tentative plans are also in place to mow and replant the pollinator meadows in the spring.

Following the site inspection, Skeo representatives visited the site information repository, Kirkwood Public Library, located at 6000 Kirkwood Highway in Wilmington, Delaware. No site documents were available.

Skeo representatives also visited Ella Johnson Park (the former DuPont ballpark), accessed via West Ayer Street. The park includes fitness stations and a paved walking path. The park is well maintained.

Figure 4: Long-term Monitoring Locations and Associated Performance Standards



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site

V. TECHNICAL ASSESSMENT

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

Question A Summary:
Several portions of the remedy at the Site are functioning as intended by decision documents while more information is needed to make this determination for other remedies implemented at the Site. Institutional controls are in place or will be in place in the near-term to preserve the integrity of the landfill caps, prohibit unauthorized land use, and prevent exposure to on-site contaminated groundwater and soil. A discussion of remedy effectiveness for each OU follows.

OU1: Ballpark, water line, groundwater monitoring (monitoring for thorium migration at the North Landfill and plume migration at the southern perimeter of the Site), Ciba HASP

The remedies that fall under OU1 are functioning as intended. Excavation of lead-contaminated soil at the former DuPont ballpark removed contaminants from this area of the Site, allowing for redevelopment as a community park. The public water supply line installed along Airport Road provides clean drinking water for nearby residents and businesses. Monitoring for thorium migration at the North Landfill is ongoing. There are no data to suggest that a release of thorium has occurred; however, laboratory method detection limits for some of the monitored constituents exceeded trigger levels [5]during this FYR period. Additional review of field or laboratory procedures should be conducted to determine if method detection limits can be lowered to below trigger levels.

Results of groundwater monitoring at the southern perimeter of the Site demonstrate that concentrations of site-related constituents in the Columbia Aquifer perimeter wells are stable or decreasing, and there is no apparent migration from the north side of the river or migration to the Potomac Aquifer. Potential ecological risk associated with discharge of groundwater at the Well Cluster 1 wells, located on the south side of the river, has not been evaluated.

HASPs used by BASF and Chemours function as intended to ensure the protection of workers performing subsurface work at the Site.

The Site is not located within a Delaware Groundwater Management Zone, an institutional control required by the ROD. DNREC is working with EPA to implement this institutional control.

OU3, OU5 and OU7: North Wetlands, South Wetlands and Christina River

The remedies are functioning as intended by the decision documents. Cleanup included restoration of over 35 acres of wetlands and wildlife habitat. Wetlands success metrics were met within the first five years of post-restoration monitoring. Surface water results from 2015 from the South Wetlands pond were below the DNREC freshwater acute criteria. In 2012, DuPont received certification by the Wildlife Habitat Council for its successful implementation of a comprehensive wildlife habitat management program for the North Wetlands and South Wetlands. Chemours continues to maintain the certification.

Dredging of the Christina River removed about 11,000 cubic yards of contaminated sediments from the river and restored areas provide viable habitat.

Institutional controls for the North Wetlands and South Wetlands are in place and contained in the 2003 Declaration of Restrictions. Institutional controls for the Christina River were not required by site decision documents.

[5] See Appendix D for a detailed explanation of trigger levels.

OU4: North Landfill

Capping of the North Landfill successfully limits infiltration of rainwater to areas of highly contaminated soil and waste and prevents exposure to contaminants. The landfill is vegetated and well-maintained and an O&M plan is in place to ensure the landfill is maintained in the future. A monument noting the presence of buried thorium at the landfill also remains in place and is in good condition.

Periodic monitoring of groundwater levels at the North Landfill indicate that the groundwater barrier wall is effectively preventing migration of contaminated groundwater to the river and North Wetlands. Mounding behind the barrier wall has not been observed, even after the recovery wells were turned off in 2012. A 2015 investigation to update the Site's CSM demonstrated that shallow groundwater from the North Landfill is not discharging to the North Wetlands. The effectiveness of the barrier wall will continue to be monitored as part of the LTGM program. Monitoring for a release of thorium from the North Landfill will also continue as part of OU1. As noted in the evaluation of OU1, there are no data to suggest that a release of thorium has occurred, although there are sporadic exceedances of trigger levels that require continued monitoring. Additionally, laboratory method detection limits for some of the monitored constituents exceeded trigger levels during this FYR period and need to be reassessed.

Institutional controls for the North Landfill are in place and contained in the 2003 Declaration of Restrictions and in the 2015 deed transferring property ownership from DuPont to Chemours. Chemours recently amended the 2003 Declaration to address items missing from the original document. EPA approved the draft final declaration on March 25, 2020, and informed Chemours it could sign and record the document.

OU6: South Landfill

Capping of the South Landfill limits infiltration of rainwater and prevents exposure to contaminants. The surface cap also allowed for the successful installation of a solar array. The cap is well-maintained and inspected regularly, and an O&M plan is in place to ensure its continued maintenance.

As previously noted in the 2015 FYR Report, more information is needed to determine if the PRB and barrier walls at the South Landfill are functioning as intended by decision documents. Manganese and barium consistently exceed performance standards in PRB compliance wells. Elevated concentrations of manganese and barium are also detected downgradient of the landfill. Additionally, a portion of the South Landfill along the Christina River is located outside the barrier wall system. There are no sampling data to demonstrate that contaminants are not entering the Christina River from the portion of the South Landfill outside the barrier wall. Further assessment of the Christina River is needed to demonstrate that contaminants are not entering the river from the portion of the South Landfill between the barrier wall and the river at concentrations that could pose risk to ecological receptors.

Chemours re-evaluated the CSM for the South Landfill and South Wetlands area in 2019 and submitted the results to EPA in a December 16, 2019 technical memorandum. EPA's preliminary review has identified significant issues with the findings of the report. EPA strongly disagrees with Chemours' proposal to reduce the performance standards for the PRB wall; additional efforts are needed to bring the PRB wall into compliance. EPA will provide formal comments and recommendations to Chemours on the CSM in 2020.

The required institutional controls for the South Landfill have been implemented or are anticipated to be implemented in 2020. The 2003 Declaration of Restrictions addresses the portion of the landfill owned by Chemours. EPA sent an informational letter to DelDOT on March 18, 2020, explaining the restrictions on the state-owned parcel and indicating that recording of a Declaration or Restrictions could occur after the bridge construction is complete.

OU8: Plant Area paving, Ciba vertical groundwater barrier wall, groundwater recovery and treatment

Excavation of contaminated soil from the Holly Run plant area removed some contamination from this area of the Site. Paving of the Holly Run and BASF plants limits infiltration of rainwater to remaining areas of highly-contaminated soil. Inspections and regular maintenance of the paved areas continue. With the recent demolition of

the Holly Run groundwater treatment plant building, Chemours should expand the inspections to include the building foundations left in place at the Holly Run plant area.

Monitoring of water levels at the groundwater collection trench in the BASF trench area show that water levels within the trench are below the top of the barrier wall; however water levels in CL-2 and CL-3 have risen during this FYR period and should be carefully monitored to ensure water does not overtop the barrier wall. The recent CSM update demonstrated that there is no potential for unacceptable impact to surface water or sediment quality at the eastern end of the Site near piezometer PZ-8F, which is outside the influence of the recovery system. The barrier wall system at the BASF plant area is currently preventing discharge of contaminated water to the river.

Extracted groundwater is now routed to BASF's industrial wastewater treatment plant, a change that has occurred since the 2015 FYR. The treated effluent is meeting BASF's discharge requirements.

Several additional investigations have occurred within the BASF plant areas during this FYR period, including assessments of shallow VOC groundwater contamination and vapor intrusion. The groundwater investigation found that shallow groundwater VOCs were limited in extent and appear to remain within the Site boundaries. However, the extent of subsurface vapors to the north has not been determined. Overall, the data show that site-related VOCs have collected in subslab vapor, and in many cases are migrating into indoor air, although indoor air concentrations had not exceeded levels of concern at the time of sampling. The investigation identified elevated levels of PCE contamination on the former Holly Run plant area that may warrant further investigation. EPA also identified some buildings for which monitoring of the slab condition was recommended, and some buildings for which further sampling was recommended.

Institutional controls are in place for the former Holly Run plant parcel in the form of Chemours' 2003 Declaration of Restrictions. EPA has been working with BASF to implement institutional controls on the BASF-owned parcels. EPA sent a draft Declaration of Restrictions to BASF in January 2020. BASF is currently reviewing the draft document.

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

Question B Summary:

There have been significant changes in EPA's risk assessment guidance since the 1992 risk assessments. These include changes in basic methodology, dermal guidance, inhalation methodologies and exposure factors. The remedy components that involved clean fill, containment and institutional controls would not be expected to change. Appendix L includes a detailed evaluation of risks associated with numeric performance standards for each area of the Site. Appendix M includes an evaluation of ARARs.

The performance standards for each site area remain valid with the following additional findings:

- LTGM reports compare data from perimeter monitoring wells (Well Cluster 1) to MCLs and tapwater RSLs based on a cancer risk of 1×10^{-6} and noncancer HQ of 1. RSLs based on a noncancer HQ of 0.1 should be used to account for possible addictive effects for noncarcinogens. Note that the total risk standard for Well Cluster 1 is protective by definition.
- LTGM reports are using an outdated surface water ARAR for copper. The state freshwater acute and chronic criteria are now calculated using the EPA Biotic Ligand Model.
- EPA is continuing to re-evaluate goals for lead, as evidence accumulates that adverse health effects may be associated with lower exposures.

The potential for vapor intrusion to indoor air was not evaluated in the original risk assessments prepared prior to remedy selection. Due to the presence of VOCs in shallow groundwater beneath the BASF plant, multiple assessments of the vapor intrusion pathway have been conducted since 2012. Results of the most recent

assessments conducted between 2016 and 2018 found that sub-slab soil gas concentrations beneath several buildings of the plant were detected above soil gas VISLs; however, building conditions (thick slab foundations) appeared to effectively impede soil gas entry rates at the time of sampling. Risks calculated using indoor air results were within or below EPA's acceptable risk range. Annual inspections of building conditions (e.g., foundations, utilities, heating and ventilation systems, slab integrity) continue to monitor any changes that could affect the potential for vapor intrusion.

Chemours plans to conduct follow-up indoor air sampling in three to five years at the following 12 buildings: A-620, A-100, A-103, A-501, A-51, A-500, A53, A-5, A-12, A-14, A-27 and A-52. EPA strongly agrees that the proposed sampling be conducted prior to and in support of the next FYR in 2025. EPA also believes that homes within 200 feet to the North of the plant be included in the proposed sampling.

Additionally, if buildings are constructed on the former Holly Run plant area in the future, additional evaluation of the vapor intrusion pathway in this area will be necessary.

The RAOs selected in the 1993 ROD remain valid. The remedy is progressing as expected for most areas; however, as noted in Question A above, additional information is needed to determine if the South Landfill remedy is operating as intended to prevent continued releases of contaminants to groundwater, the river and South Wetlands.

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

DelDOT is planning to replace the James Street bridge over the Christina River, located adjacent to the Site. The South Landfill extends beneath South James Street and the current paved roadway serves as the cap in this area. It is currently unknown if bridge replacement activities will encroach on the South Landfill or disrupt Christina River restoration areas. If earthmoving activities for the bridge replacement extend onto the South Landfill, appropriate measures to ensure worker and public safety need to be implemented and the integrity of the cap needs to be maintained.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU3, OU4, OU5, OU7

Issues and Recommendations Identified in the FYR:

OU(s): OU1	**Issue Category: Other**			
	Issue: Potential ecological risk associated with discharge of groundwater at the Well Cluster 1 wells, located on the south side of the river, has not been evaluated.			
	Recommendation: Determine if discharge of groundwater at the Well Cluster 1 wells impacts surface water concentrations above aquatic ecological criteria.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**

No	Yes	PRP	EPA/State	4/14/2022

OU(s): OU1, OU6	**Issue Category: Monitoring**			
	Issue: Laboratory method detection limits exceeded trigger levels for the North Landfill radiological monitoring (Well Cluster 2) and EPA Region 3 BTAG freshwater screening benchmarks at the South Landfill.			
	Recommendation: Conduct a review of field or laboratory procedures to determine if method detection limits can be lowered to below performance standards at the North Landfill (Well Cluster 2) and South Landfill. Ensure that detection limits for all constituents in all OUs meet the performance standards for those areas.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	4/14/2022

OU(s): OU6	**Issue Category: Remedy Performance**			
	Issue: Barium and manganese concentrations continue to be detected in groundwater at the South Landfill PRB wall above performance standards and EPA Region 3 BTAG freshwater screening benchmarks. The evaluation of the PRB data in the LTGM reports and 2019 CSM update do not sufficiently demonstrate that the PRB is working effectively.			
	Recommendation: Evaluate the effectiveness of the PRB wall. The evaluation should be able to clearly demonstrate whether elevated barium and manganese concentrations are a result of PRB failure. If the PRB is found to not be functioning as intended, evaluate options to achieve the South Landfill RAOs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	4/14/2022

OU(s): OU6	**Issue Category: Remedy Performance**			
	Issue: A portion of the South Landfill along the Christina River is located outside the barrier wall system. There are no sampling data to demonstrate that contaminants are not entering the Christina River from the portion of the South Landfill outside the barrier wall.			
	Recommendation: Conduct an investigation, which should include sediment, porewater, surface water and/or groundwater sample results at appropriate sample locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	4/14/2022

OU(s): OU6	Issue Category: Other			
	Issue: The planned DelDOT bridge replacement project may affect the South Landfill cap on South James Street.			
	Recommendation: Work with DelDOT to determine if the bridge replacement project will affect the South Landfill. If it is found that the South Landfill may be impacted by construction activities, take necessary precautions to ensure worker and public safety and to maintain the integrity of the South Landfill cap in this area.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	4/14/2022

OU(s): OU8	Issue Category: Monitoring			
	Issue: Follow-up vapor intrusion sampling should be conducted prior to and in support of the 2025 FYR. The potential for vapor intrusion on the former Holly Run Plant parcel and the potential for vapor migration north of buildings A-67/A-502, particularly to off-property locations has not been addressed.			
	Recommendation: Conduct follow-up vapor intrusion sampling prior to and in support of the 2025 FYR. Determine if vapor intrusion could be a concern at the former Holly Run plant parcel if redevelopment occurs in the future as well as the potential for vapor migration north of buildings A-67/A-502, particularly to off-property locations whether there is vapor intrusion concern North of the plant.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	4/14/2025

OTHER FINDINGS

Several additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- Minor cracks in the pavement at the BASF plant area were observed during the FYR site inspection at the Site. The cracks should be repaired as part of long-term maintenance activities at the BASF plant area.
- Future data evaluation for Well Cluster 1 in the LTGM Reports should use RSLs based on an HQ of 0.1 to account for possible additive effects for noncarcinogens.
- Groundwater levels in trench wells CL-2 and CL-3 have risen during this FYR period and should continue to be monitored.
- Site documents were not available at the designated site repository. Site documents should be made available at the Kirkwood Public Library, located at 6000 Kirkwood Highway in Wilmington, Delaware.
- The timing of South Wetlands surface water sampling should be adjusted to better coincide with the FYR process. The long-term monitoring plan should be amended to ensure sampling in 2024 so results are available for inclusion in the 2025 FYR.
- The Site is not located within a Groundwater Management Zone to restrict installation of drinking water wells, as required by the 1993 ROD. EPA will work with the state of Delaware to implement a Groundwater Management Zone
- Finalize and record the Declarations of Restrictions for those remaining parcels requiring institutional controls

- EPA has previously had radiation data reviewed by Regional Radiation expert March Aquino who concluded that data appears to conform to previously-established quality assurance criteria. EPA will revisit this issue prior to the next FYR to confirm that this is still the case.

VII. PROTECTIVENESS STATEMENTS

OU1 Protectiveness Statement	
Operable Unit: OU1	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:

The OU1 (ballpark, water line, groundwater monitoring, Ciba HASP) remedy currently protects human health and the environment. Lead-contaminated soil was removed from the former DuPont ballpark and a public water line was installed to provide safe drinking water for nearby residents and businesses. Groundwater monitoring continues and HASPs are in place. There are no complete exposure pathways between contaminated media and human receptors. For the remedy to be protective over the long term, the following action should be implemented:

- Determine if discharge of groundwater at the Well Cluster 1 wells would impact surface water concentrations above aquatic ecological criteria.
- Conduct a review of field or laboratory procedures to determine if method detection limits can be lowered to below performance standards at the North Landfill (Well Cluster 2) and South Landfill. Ensure that detection limits for all constituents in all OUs meet the performance standards for those areas.

OU3 Protectiveness Statement	
Operable Unit: OU3	*Protectiveness Determination:* Protective

Protectiveness Statement:

The OU3 (North Wetlands) remedy is protective of human health and the environment. The remedial action removed contaminated sediments and restored the wetlands. An O&M program continues to monitor the wetlands and control invasive species.

OU4 Protectiveness Statement	
Operable Unit: OU4	*Protectiveness Determination:* Protective

Protectiveness Statement:

The OU4 remedy (North Landfill) is protective of human health and the environment. The North Landfill limits infiltration of rainwater and prevents exposure to contaminants. The barrier wall prevents discharge of contaminated groundwater to the Christina River and North Wetlands. Institutional controls and an O&M plan are in place.

OU5 Protectiveness Statement	
Operable Unit: OU5	*Protectiveness Determination:* Protective

Protectiveness Statement:
The OU5 (South Wetlands) remedy is protective of human health and the environment. The remedial action removed contaminated sediments and restored the wetlands. An O&M program continues to monitor the wetlands and control invasive species. Institutional controls are in place.

OU6 Protectiveness Statement

Operable Unit:	*Protectiveness Determination:*	*Planned Addendum Completion Date:*
OU6	Not Protective	4/14/2022

Protectiveness Statement:
The remedy at OU6 (South Landfill) is not protective at this time due to consistent exceedances of performance standards of Barium and Manganese. The following actions need to be taken:

- Conduct an investigation, which should include sediment, porewater, surface water and/or groundwater sample results at appropriate sample locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River.
- Evaluate the effectiveness of the PRB wall. The evaluation should be able to clearly demonstrate whether elevated barium and manganese concentrations are a result of PRB failure. If the PRB is found to not be functioning as intended, evaluate options to achieve the South Landfill RAOs.

It is expected that these actions will take about two years to complete, at which time a protectiveness determination for OU6 will be made.

OU7 Protectiveness Statement

Operable Unit:	*Protectiveness Determination:*
OU7	Protective

Protectiveness Statement:
The OU7 (Christina River) remedy is protective of human health and the environment. The remedial action removed contaminated sediments and restored those areas of the river.

OU8 Protectiveness Statement

Operable Unit:	*Protectiveness Determination:*
OU8	Short-term Protective

Protectiveness Statement:
The OU8 remedy (Plant Area paving, Ciba [now BASF] vertical groundwater barrier wall, groundwater recovery and treatment) is currently protective of human health and the environment. The barrier wall system, including groundwater extraction, is preventing contaminated groundwater from migrating to the Christina River at unacceptable levels. Recent assessments also demonstrated that any contaminated groundwater migrating beyond the barrier system to the east (near PZ-8F) is not causing unacceptable impacts to the river. Recent vapor intrusion assessments at the BASF plant found risks associated with this pathway to be within acceptable levels, however, continued sampling is required. Annual inspections continue to monitor the integrity of paved areas and building slabs to ensure conditions currently mitigating risks associated with vapor intrusion do not change. Institutional controls are in place or anticipated to be in place in 2020. For the remedy to be protective over the long term, the following action should be implemented:

- Conduct follow-up vapor intrusion sampling prior to and in support of the 2025 FYR. Determine if vapor intrusion could be a concern at the former Holly Run plant parcel if redevelopment occurs in the future.

Sitewide Protectiveness Statement	
Protectiveness Determination: Not Protective	*Planned Addendum Completion Date:* 4/14/2022

Protectiveness Statement:

The remedies for OU1, OU3, OU4, OU5, OU7 and OU8 are protective or currently protective. However, because OU6 remedy has been determined to be not protective, a comprehensive sitewide protectiveness determination is also not protective. Further information will be obtained by taking the following actions:

- Conduct an investigation, which should include sediment, porewater, surface water and/or groundwater sample results at appropriate sample locations, to demonstrate that there are no unacceptable releases from the South Landfill to the Christina River.
- Evaluate the effectiveness of the PRB wall. The evaluation should be able to clearly demonstrate whether elevated barium and manganese concentrations are a result of PRB failure. If the PRB is found to not be functioning as intended, evaluate options to achieve the South Landfill RAOs.

It is expected that these actions will take about two years to complete, at which time a sitewide protectiveness determination will be made.

VIII. NEXT REVIEW

The next FYR Report for the E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill) Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

2015 Long-Term Groundwater Monitoring Report, Newport Superfund Site. Prepared by Parsons. December 2016.

2016 Long-Term Groundwater Monitoring Report, Newport Superfund Site. Prepared by Parsons. November 2017.

2017 Long-Term Groundwater Monitoring Report, Newport Superfund Site. Prepared by Parsons. July 2018.

2018 Long-Term Groundwater Monitoring Report, Newport Superfund Site. Prepared by Parsons. November 2019.

BASF Corporation - Newport Site, Newport, Delaware General Health and Safety Plan for Hazardous Operations (HAZWOPER) and Soil Disturbance Work. Prepared by BASF. September 8, 2010.

Declaration of Restrictions, Tax Parcel Nos. 07-047.30-108 and 10-008.00-001. Prepared by Henry H. Silliman, III Esq., E.I. Du Pont De Nemours and Company. April 10, 2003.

Explanation of Significant Differences: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill). Prepared by U.S. EPA Region 3. August 19, 1995.

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Five-Year Review Report, E.I. DuPont, Newport Superfund Site, Newport, Delaware.
Prepared by U.S. EPA Region 3. March 31, 2000.

Fourth Five-Year Review for E.I Du Pont De Nemours and Co., Inc. (Newport Pigment Plant Landfill) Superfund Site, New Castle County, Delaware. Prepared by U.S. EPA Region 3. April 14, 2015.

Maintenance and Management Plan Newport North and South Landfills, Newport Superfund Site. Prepared by Parsons. October 2012.

Memorandum to DuPont-Newport Post-Decision Document File, North/South Wetlands ROD Modification. Prepared by Randy Sturgeon, Remedial Project Manager, U.S. EPA Region 3. September 30, 1996.

Memorandum to DuPont-Newport Post-Decision Document File, North/South Wetlands-Sediment Clean-up Criteria. Prepared by Randy Sturgeon, Remedial Project Manager, U.S. EPA Region 3. August 18, 1995.

Memorandum to File, Christina River Remedy Modifications, E.I. DuPont, Newport Superfund Site. Prepared by Randy Sturgeon, Remedial Project Manager, USEPA Region 3. August 5, 1996.

Quality Assurance Project Plan, Dupont Newport Superfund Site, Newport, Delaware. Prepared by Dupont. February 2006.

Record of Decision, E.I. Du Pont, Newport Superfund Site, New Castle County, Delaware. Prepared by U.S. EPA Region 3. August 26, 1993.

Second Five-Year Review Report, E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill) Superfund Site (a.k.a. DuPont-Newport Site), Newport, Delaware. Prepared by U.S. EPA Region 3. March 31, 2005.

State of Delaware Surface Water Quality Standards, as Amended. December 11, 2017. https://www.epa.gov/wqs-tech/water-quality-standards-regulations-delaware.

Technical Memorandum, Updated Conceptual Site Model at the Newport Superfund Site, New Castle County, Delaware (Administrative Record – January 2016). Prepared by Parsons. January 2016.

Third Five-Year Review Report, E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill) Superfund Site (a.k.a. DuPont-Newport Site), Newport, Delaware. Prepared by U.S. EPA Region 3. March 31, 2010.

Unilateral Administrative Order (EPA Docket No. 1II-94-21-DC). Issued by EPA to E.I. Du Pont De Nemours and Company and Ciba-Geigy Corporation. April 19, 1994.

Vapor Intrusion Investigation Report, Newport Superfund Site, New Castle County, Delaware. Prepared by AECOM. July 2016.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Chronology of Site Events

Event	Date
DuPont and Delaware DNREC discovered heavy metals and VOCs in site groundwater	Late 1970s
EPA proposed the Site for listing on the NPL	January 22, 1987
EPA and PRP DuPont entered into AOC requiring DuPont to conduct a RI and FS	August 12, 1988
PRP Ciba-Geigy completed an assessment for removal or abandonment of underground storage tanks	August 16, 1989
EPA listed the Site on the NPL	February 21, 1990
PRP completed human health and ecological risk assessments	March 18, 1992
EPA and DuPont entered into an AOC to address seepage of a heat transfer fluid (Dowtherm®) into the Christina River	June 10, 1993
PRPs completed the RI/FS; EPA issued the Site's ROD	August 26, 1993
EPA issued a UAO to PRPs DuPont and Ciba-Geigy to implement the ROD	April 19, 1994
EPA approved the remedial design for the ballpark excavation (OU1)	December 9, 1994
PRPs began and completed the ballpark excavation (OU1)	June 13, 1995
EPA issued an ESD to modify the remedy for the South Landfill (OU6)	August 16, 1995
PRPs completed a removal action to address seepage into the Christina River	September 28, 1995
EPA approved the remedial design for the Airport Road public water supply line (OU1)	September 29, 1995
PRPs completed the remedial action for the Airport Road public water supply line (OU1)	December 29, 1995
EPA approved the remedial design for the North Wetlands excavation; remedial action began (OU3)	May 14, 1997
EPA approved the remedial design for the South Wetlands excavation; remedial action began (OU5)	December 23, 1997
PRPs completed the remedial action for the North Wetlands (OU3)	June 30, 1998
EPA approved the remedial design for the Christina River remedy; RA began (OU7)	September 23, 1998
PRPs excavated the "concrete jungle" from the North Landfill and moved it to the main area of the North Landfill (OU4)	November 30, 1998
PRPs completed the remedial action for the South Wetlands (OU5)	December 30, 1998
PRPs began dredging the Christina River (OU7)	May 10, 1999
EPA approved the remedial design for OU8 (groundwater vertical barrier wall and extraction system)	June 8, 1999
EPA approved the remedial design for the North Landfill (OU4)	June 29, 1999
PRPs completed the installation of the North Landfill groundwater recovery wells (OU8)	August 20, 1999
PRPs completed dredging of the Christina River (OU7)	September 8, 1999
PRPs completed the remedial action for the Christina River (OU7)	February 18, 2000
EPA issued the Site's first FYR Report	March 31, 2000
PRPs began installation of the vertical barrier wall (OU8)	December 2, 2000
PRPs completed installation of the North Landfill extraction system	December 15, 2000
PRPs completed installation of the vertical barrier wall (OU8)	January 10, 2001
EPA issued a second ESD for the South Landfill (OU6)	May 18, 2001
PRPs began installation of the groundwater extraction trench (OU8)	July 23, 2001
PRPs completed installation of the groundwater extraction trench (OU8)	August 10, 2001
PRPs completed the final Remedial Action Report for the North Landfill cap and barrier wall (OU4)	September 10, 2001
PRPs completed the installation of the groundwater extraction trench well system (OU8)	September 21, 2001
EPA approved the South Landfill remedial design (OU6); extraction wells began operation (OU8)	September 28, 2001
PRPs completed the final Remedial Action Report for the Ciba Specialty Chemicals (formerly Ciba-Geigy, now BASF) and DuPont Holly Run plant areas (OU8)	November 2, 2001
PRPs completed the South Landfill slurry wall (OU6)	February 7, 2002
PRPs completed the PRB wall (OU6)	March 15, 2002
EPA issued the Preliminary Close-Out Report; the Site attained construction completion milestone	September 19, 2002
PRPs completed the final Remedial Action Report for the South Landfill (OU6)	March 17, 2003
DuPont donated the ballfield property to the town of Newport for use as Ella Johnson Park (OU1)	January 20, 2003

Event	Date
Institutional controls in the form of the Declaration of Restrictions were recorded with the county	April 17, 2003
PRPs rebuilt the groundwater extraction trench (OU8)	Spring 2004
EPA issued the Site's second FYR Report	March 31, 2005
EPA issued the Site's third FYR Report	March 31, 2010
Tangent Energy completed installation of solar panels on the South Landfill	December 2013
DuPont submitted a Technical Memorandum, Summary of the History, Remedial Actions and Long-Term Monitoring at the Newport Superfund Site, New Castle County, Delaware (Administrative Record – June 2014)	June 27, 2014
DuPont transferred ownership of its site parcels to Chemours	January 30, 2015
EPA issued the Site's fourth FYR Report	April 14, 2015
Chemours completed an updated CSM for the portion of the Site north of the river	January 2016
Chemours conducted vapor intrusion assessments at the BASF plant	2016 to 2017
Chemours demolished the Holly Run groundwater treatment plant after rerouting extracted groundwater to BASF's industrial wastewater treatment plant	March 2018
EPA worked with Chemours, BASF and DelDOT to draft Declarations of Restrictions for those remaining site parcels requiring them	January – April 2020

APPENDIX C – SITE BACKGROUND

In 1902, the Krebs Pigment & Color Corporation began producing a zinc-and-barium-based pigment called lithopone. In 1929, DuPont purchased the plant and produced lithopone and various other pigments and products, including red quinacridone pigment, high-purity silicon, thoriated nickel and chromium dioxide. During the 1970s, DuPont constructed the Holly Run plant to expand chromium dioxide production. Ciby-Geigy (later spin-off Ciba Specialty Chemicals or CibaSC) purchased the main pigment manufacturing facility in 1984. DuPont continued to operate the Holly Run plant, manufacturing chromium dioxide magnetic recording tape until 2000. BASF began operating the pigment manufacturing facility in 2009 when BASF acquired the Ciba businesses.

The Holly Run plant and the BASF plant were built on fill material placed over low-lying farmland. Most of the fill material underneath the BASF plant and a small area underneath the Holly Run plant is contaminated with heavy metals such as cadmium, lead, barium and zinc from former operations. This is a result of past disposal operations and poor raw material storage and handling practices.

As part of pigment plant operations (prior to Ciba-Geigy's and BASF's ownership), the North Landfill and South Landfill received waste and off-specification products. The North Landfill received wastes from 1902 to 1974. Plant records indicate that drums containing thorium-232/nickel alloy and processing materials were disposed of from 1961 to 1966 and are buried about 10 feet below the top surface of waste fill. The unlined South Landfill received large quantities of lithopone wastes, which were pumped through a pipe on the river bottom and discharged to a diked area in a wetland. The South Landfill operated from about 1902 to 1953.

A small portion of the employee ballpark (now Ella Johnson Park) became contaminated when operators used soil from the pigment plant to groom the field.

APPENDIX D – NUMERIC PERFORMANCE STANDARDS

Table D-1: Numeric Performance Standards

OU	Area	Medium of Concern	Chemicals	Performance Standard	Units	Source of Performance Standard	Notes
OU1	Ballpark	Soil	Lead	500	ppm	ROD Section 1.1	Applied to ballpark excavation.
	Columbia Aquifer and Potomac Aquifer, South Side of Christina River (Well Cluster 1 Perimeter Wells)	Groundwater	Arsenic	10[a]	ppb	ROD Section 7.3.2; Quality Assurance Project Plan (QAPP), Newport Superfund Site, February 2006	ROD Section 7.3.2 requires that use of health-based screening concentrations to assess whether migration of the site-related constituents warrants additional remedial measures. None of the decision documents provides numeric values to be used as performance standards. The 2006 QAPP specified MCLs as performance standards. When an MCL is not available, the LTGM reports use the most current EPA RSL. Applies to wells RDMW-8C, RDMW-21C, MW-24A, MW-25A and MW-6B.
			Barium	2,000[a]	ppb		
			Beryllium	4[a]	ppb		
			Cadmium	5[a]	ppb		
			Chromium (total)	100[a]	ppb		
			Cobalt	6[b]	ppb		
			Copper	1,300[a]	ppb		
			Lead	15[a]	ppb		
			Manganese	430[b]	ppb		
			Mercury	2[a]	ppb		
			Nickel	390[b]	ppb		
			Vanadium	86[b]	ppb		
			Zinc	6,000[b]	ppb		
			cis-1,2-Dichloroethene	70[a]	ppb		
			PCE	5[a]	ppb		
			TCE	5[a]	ppb		
			Vinyl chloride	2[a]	ppb		
	Thorium Monitoring at the North Landfill (Well Cluster 2 Wells)	Groundwater	Gross alpha	Well Specific: SM-3 is 1.27; RDMW-33C is 35.06; EW-111 is 3.48	pCi/L	ROD Section 7.3.4; 2006 QAPP	Section 7.3.4 of the 1993 ROD states that the performance standard for thorium-232 and its daughter products and gross alpha and beta radiation is to monitor specific wells every six months to determine if a release is occurring. None of the decision documents provides numeric

OU	Area	Medium of Concern	Chemicals	Performance Standard	Units	Source of Performance Standard	Notes
			Gross beta	Well Specific: SM-3 is 12.24; RDMW-33C is 21.84; EW-111 is 43.7	pCi/L		values to be used as performance standards. To determine if a thorium release is occurring the LTGM uses trigger levels that were developed following the Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act (DNREC 1999) and as identified in Section 1.4.5 of the 2006 QAPP. The trigger levels represent baseline conditions and are used to measure any significant change from baseline to identify potential releases of thorium. Well-specific baseline concentrations for the radiological constituents were established based on the results of the first 10 consecutive sampling events. The source of the trigger values presented in the Performance Standards column is Table 1, Groundwater and Surface Water Numeric Performance Standards of DuPont's FYR Response, dated August 30, 2011. Applies to wells SM-3, RDMW-33C and EW-111.
			Radium-228	Well Specific: SM-3 is 0.61; RDMW-33C is 3.1; EW-111 is 0.68	pCi/L		
			Thorium-232	Well Specific: SM-3 is 0.39; RDMW-33C is 0.17; EW-111 is 0.28	pCi/L		
OU3	North Wetlands	Sediment	Cadmium	9.6	ppm	North and South Wetlands ROD Modifications. Memorandum from Randy Sturgeon to DuPont-Newport Post-Decision Document File. September 30, 1996.	No sediment sample locations are included in the current long-term monitoring program.
			Lead	660	ppm		
			Zinc	1,600	ppm		
OU5	South Wetlands	Surface Water	Arsenic	340[c]	ppb	ROD Section 4.1.5	Section 4.1.5 of the 1993 ROD required collection and analysis of surface water samples in areas outside the expected area of sediment remediation and specified that EPA does not
			Barium	7,800[d]	ppb		
			Cadmium	3.14 / 2.67[e]	ppb		

OU	Area	Medium of Concern	Chemicals	Performance Standard	Units	Source of Performance Standard	Notes
			Cobalt	NE	ppb		consider the "greater risk to human health and environment" ARAR waiver to be protective in areas where the dissolved concentration of a Site-related contaminant exceeds its respective acute surface water quality standard. During monitoring, concentrations are compared to DNREC Surface Water Quality Standards, Freshwater Acute Criteria (DNREC, 2017). Section 3.8.5 of the 2001 ESD also established Site-specific criteria, protective of ecological receptors, for barium (7,800 ppb) and manganese (1,000 ppb). Applies to surface water sampling locations Pond-01, Pond-02, River-01 and River-02.
			Copper	20.68 / 18[e, i]	ppb		
			Lead	106 / 88[e]	ppb		
			Manganese	1,000[d]	ppb		
			Nickel	689 / 599[e]	ppb		
			Zinc	173 / 150[e]	ppb		
		Sediment	Cadmium	35	ppm	North and South Wetlands ROD Modifications. Memorandum from Randy Sturgeon to DuPont-Newport Post-Decision Document File. September 30, 1996.	No sediment sample locations are included in current long-term monitoring program.
			Lead	670	ppm		
			Zinc	2,000	ppm		
OU6	South Landfill PRB Compliance Monitoring (Phase II Groundwater Monitoring)	Groundwater	Barium	7,800	ppb	2001 ESD Section 3.8.5	Monitoring of the OU6 remedy also falls under OU8 - Phase II groundwater monitoring (monitoring effectiveness of South Landfill treatment.) LTGM reports compare concentrations in PRB compliance wells to these performance standards. MCLs/RSLs are used for those chemicals for which no performance standard was established in the ESD. Applies to wells PRB-1 through PRB-11.
			Cadmium	4	ppb		
			Copper	18	ppb		
			Lead	15	ppb		
			Manganese	1,000	ppb		
			Nickel	730	ppb		
			Zinc	120	ppb		

OU	Area	Medium of Concern	Chemicals	Performance Standard	Units	Source of Performance Standard	Notes
OU7	Christina River	Sediment	Cadmium	20	ppm	Christina River ROD Modifications. Memorandum from Randy Sturgeon to DuPont-Newport Post-Decision Document File. August 5, 1996.	No current sediment sample locations included in long-term monitoring. The Christina River ROD Modifications Memorandum also specified apparent effects threshold values of zinc (1,600 ppm), lead (600 ppm) and cadmium (9.6 ppm). If COC concentrations in sediment increase significantly (i.e., above the apparent effects threshold values), further biological study may be needed.
			Lead	700	ppm		
			Zinc	3,000	ppm		
	Seeps on North Side of Christina River at BASF Plant	Seep	biphenyl	14[f]	ppb	LTGM reports	The requirement for riverbank monitoring of biphenyl was not identified in a decision document. DuPont initiated 1,1'-biphenyl (biphenyl) monitoring of the Christina River in 1995 to monitor seeps and later to verify the effectiveness of the seep control remedy. Surface water quality standards were applied to the riverbank seep monitoring because the end-point receptor of the biphenyl seepage is the Christina River. DNREC or EPA has not established freshwater surface water quality standards for biphenyl. In the absence of criteria, the EPA Region 3 freshwater ecological screening benchmark for biphenyl (14 µg/L) is used in LTGM reports. Applies to sample locations SW-1 and SW-2.
OU8	BASF Plant Area, Columbia Aquifer Collection Trench	Groundwater	Arsenic	150[g]	ppb	ROD Section 6.4.5, 2006 QAPP, LTGM reports	Performance standards associated with monitoring the effectiveness of the vertical barrier wall are found in Section 6.4.5 of the ROD; however, decision documents do not identify specific performance standard values except for barium (7,800 ppb) and manganese (1,000 ppb) (originally specified for the PRB monitoring in the 2001 ESD).
			Barium	7,800[d]	ppb		
			Cadmium	0.27[h]	ppb		
			Cobalt	NE	ppb		
			Copper	15.46[h,i]	ppb		

OU	Area	Medium of Concern	Chemicals	Performance Standard	Units	Source of Performance Standard	Notes
			Lead	2.96[h]	ppb		Performance standards included in the LTGM reports are the DNREC Surface Water Quality Standards, Freshwater Chronic Criteria (DNREC, 2017). In addition, the LTGM reports compare monitoring data to established well-specific trigger levels defined in Section 1.4.5 of the 2006 QAPP to determine if there is a significant change in constituent concentrations. Applies to wells EW-114 and EW-115.
			Manganese	1,000[d]	ppb		
			Nickel	59[h]	ppb		
			Zinc	134[h]	ppb		
			PCE	NE	ppb		
			TCE	NE	ppb		
			Vinyl chloride	NE	ppb		

Notes:

a) EPA MCLs, available at http://water.epa.gov/drink/contaminants/#List (accessed 9/6/19).

b) EPA May 2019 tapwater RSLs based on a carcinogenic risk of 1 x 10^{-6} and hazard index (HI) of 1, available at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm (accessed 9/6/19).

c) State of Delaware Surface Water Quality Standards Criteria for Protection of Aquatic Life; Freshwater Acute Criteria, verified in Title 7 of the Delaware Administrative Code, available at http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml (accessed 9/6/19).

d) 2001 ESD, Performance Standard 3.8.5.

e) State of Delaware Surface Water Quality Standards Criteria for Protection of Aquatic Life; Freshwater Acute Criteria, calculated using hardness measured during sampling in 2015. First value is for Pond samples (hardness = 158 milligrams per liter [mg/L]), second value is for River samples (hardness = 133.7 mg/L). Values listed are as presented in the 2017 LTGM Report.

f) EPA Region 3, Freshwater Screening Benchmark.

g) State of Delaware Surface Water Quality Standards Criteria for Protection of Aquatic Life; Freshwater Chronic Criteria, verified in Title 7 of the Delaware Administrative Code, available at http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml (accessed 9/6/19).

h) State of Delaware Surface Water Quality Standards Criteria for Protection of Aquatic Life; Freshwater Chronic Criteria, calculated using hardness measured during sampling in 2017 (hardness = 116 mg/L).

i) As of 2015, the state Freshwater Acute Criteria for copper is calculated using the EPA Biotic Ligand Model but Chemours continues to use the hardness-based on model since copper was generally non-detect or below method detection limits.

NE = no established value
ppb = parts per billion
ppm = parts per million
pCi/L = picocuries per liter

APPENDIX E – INSTITUTIONAL CONTROLS

Table E-1: Institutional Control (IC) Summary

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
OU4 (North Landfill)	Yes	Yes ROD Section 2.6.1 to Section 2.6.11	0704730117	• No excavation or construction, except as necessary to maintain the integrity and the level of protectiveness of the North Landfill cap, shall be allowed once the cap is installed. • No uses of the North Landfill shall be made which may impair the cap's integrity. Any change in land use following completion of the remedial action shall require the prior written approval of EPA, and/or its successors. • As long as buried thorium is present, the property owner(s), and its successors-in-interest, shall continuously maintain a metal monument placed on the North Landfill, said monument to be approved by EPA to warn of the presence of buried radioactive thorium-bearing material and to mark the specific locations(s) of the thorium-bearing material in the North Landfill. • The property owner(s), and its successors, shall notify EPA, and/or its successors, of its intent to convey any interest in the property described herein. Such conveyance shall not be made without the prior written approval of EPA, and/or its successors. No conveyance of title, easement, or other interest in the property shall be	Declaration of Restrictions, April 2003 Deed, January 2015 Amended Declaration of Restrictions (Anticipated recording in 2020)	The 2003 Declaration addresses the North Landfill, but the parcel number for the major portion of the North Landfill, 0704730117, is not properly identified in the 2003 Declaration, and thus does not appear in the chain of title for that parcel. The Declaration did not include a specific prohibition against residential use of the North Landfill, as required by the ROD. The 2015 deed transferring property ownership from DuPont to The Chemours Company FC, LLC, prohibits use of the property as a daycare or childcare facility or for residential purposes. The deed also gives notice to the public that there were past land disposal practices and releases and threats of

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
				consummated by the property owner(s), and its successors, without adequate and complete provision for continued maintenance and protection of the North Landfill cap. • The property owner(s), its successors and assigns, shall not at any time institute legal proceedings, by way of quiet title or otherwise, to remove or amend these ICs unless EPA, and/or its successors, has given the property owner(s), and/or its successors, advance written approval. • No drinking water wells shall be installed at the North Landfill. No industrial water production wells shall be installed in the Potomac Aquifer at the North Landfill. • The North Landfill shall not be used for residential purposes. • The North Landfill shall not be used for recreational purposes as long as thorium remains present in the landfill. • Once remediation at the North Landfill is completed and the vegetation is restored, the vegetation shall not be removed except for maintenance activities. • The restrictions on the use of the property shall be included in the deeds to the site property. The deeds to the affected property shall also be modified to give notice to the public of past land disposal and of the fact that releases and threats of releases of		releases of hazardous substances to the property. EPA worked with Chemours to draft an Amended Declaration of Restrictions to address the items missing from the 2003 Declaration. EPA approved the draft final Declaration on March 25, 2020, and informed Chemours it could sign and record the document.

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
				hazardous substances have affected their respective parcels. • Additional measures may be required to implement the ICs outlined above.		
OU5 (South Wetlands)	Yes	Yes ROD Section 4.4.1 to Section 4.4.3	1000800001	• No drinking water wells shall be installed in the South Wetlands area. No industrial water production wells shall be installed in the Potomac Aquifer in the South Wetlands area. • The above restriction applies to all the land between the South Landfill and Old Airport Road owned by DuPont and not just those areas classified as wetlands. These restrictions shall be included in the deeds to the site property. Deeds to the affected property shall be modified to give notice to the public of past land disposal and of the fact that releases and threats of releases of hazardous substances have affected the property. • Additional measures may be required to implement the institutional controls outlined above.	Declaration of Restrictions, April 2003 2015 Deed	The 2003 Declaration identifies the South Wetlands as the parcel of land shown in the plan titled "Limits of Disturbance" November 2002 and as a portion of tax parcel 1000800001. The 2015 deed transferring property ownership from DuPont to The Chemours Company FC, LLC gives notice to the public that there were past land disposal practices and releases and threats of releases of hazardous substances to the property.
OU6 (South Landfill)	Yes	Yes ROD Section 3.5.1 to Section 3.5.6, 2001 ESD Section 3.5.1 to Section 3.5.6	1000800001 and the state of Delaware parcel	• No excavation or construction that could affect the integrity or the level of protectiveness of the South Landfill cap, shall occur once the cap is installed. • The South Landfill shall not be used for residential purposes. • Once remediation at the South Landfill is completed and the vegetation is restored (in accordance with Performance Standard	Declaration of Restrictions, April 2003, for parcel 1000800001	The 2003 Declaration identifies the South Landfill as the parcel of land shown in the plan titled "Limits of Disturbance" November 2002 and as a portion of tax parcel 1000800001.

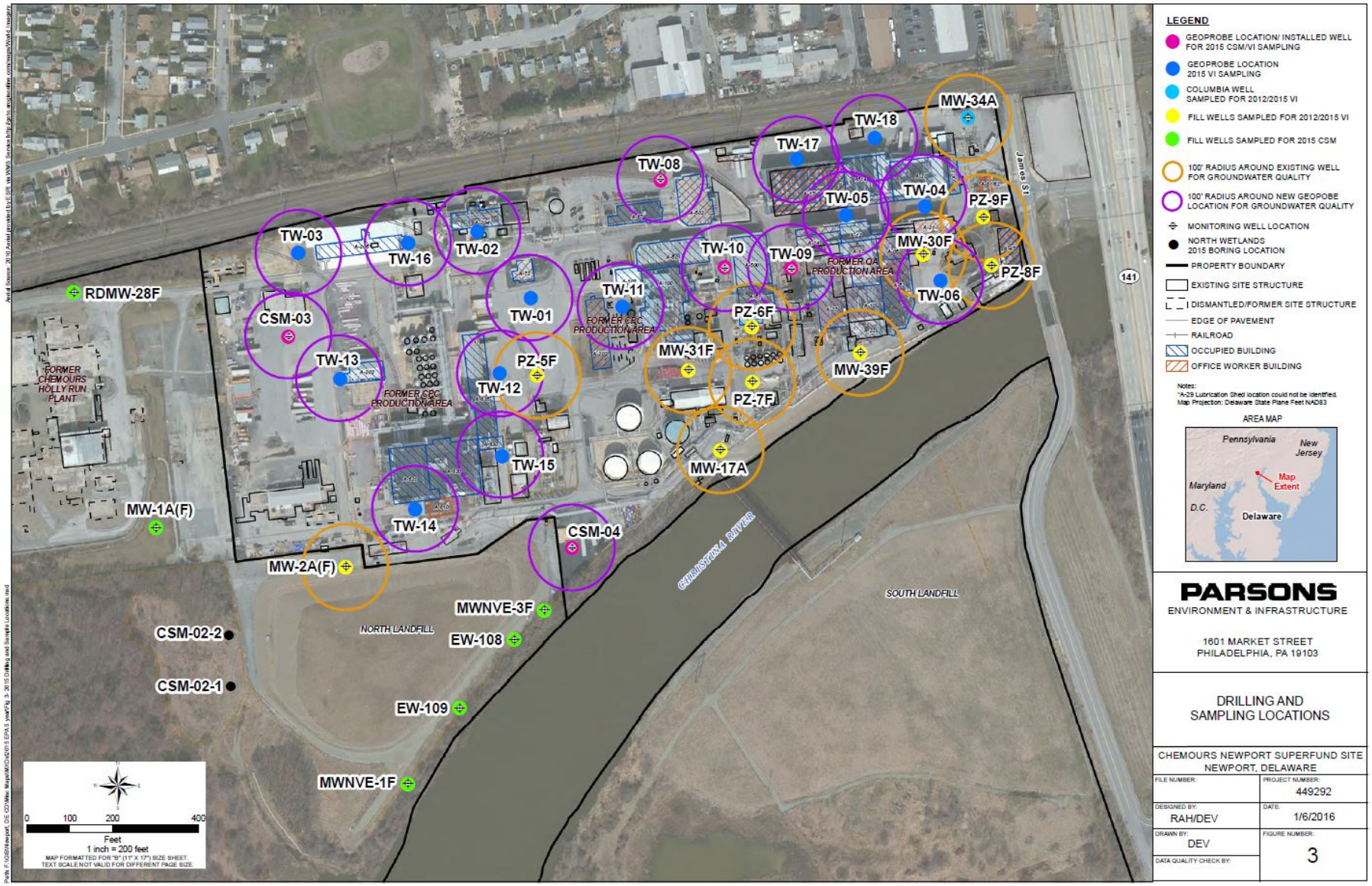
Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
				3.3.7), the vegetation shall not be removed except during maintenance activities of the landfill, utilities or roadway. • No drinking water wells shall be installed at the South Landfill. No industrial water production wells shall be installed in the Potomac Aquifer at the South Landfill. • The restrictions on the use of the property shall be included in the deeds to the site property. The deeds to the affected property shall also be modified to give notice to the public of past land disposal and of the fact that releases and threats of releases of hazardous substances have affected their respective parcels. • Additional measures may be required to implement the institutional controls outlined above.	2015 Deed for parcel 1000800001 Declaration of Restrictions for state-owned parcel (Anticipated in 2020 or following completion of bridge construction)	The 2015 deed transferring property ownership from DuPont to The Chemours Company FC, LLC, prohibits use of the property as a daycare or childcare facility or for residential purposes. The deed also gives notice to the public that there were past land disposal practices and releases and threats of releases of hazardous substances to the property. EPA sent an informational letter to DelDOT on March 18, 2020, explaining the restrictions on the state-owned parcel. As the letter states, once the construction of the bridge is complete and a survey of the parcel is completed, DelDOT has agreed to record a Declaration of Restrictions on the property.
OU8 (DuPont Holly Run and Ciba-Geigy Plants)	Yes	Yes ROD Section 6.2.1 to Section 6.2.8	0704730108, 2000300110, 2000300108, 2000300109, 2000300083	• The contaminated plant areas shall not be used for residential purposes. • No drinking water wells shall be installed at the contaminated plant areas. No water production wells shall be installed in the	Declaration of Restrictions, April 2003,	The 2003 Declaration identifies the Holly Run Plant Area as the parcel of land shown in the plan titled "Limits of Disturbance"

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
				Potomac Aquifer at the Ciba-Geigy Corporation Newport and DuPont Holly Run plants. • The pavement and/or building structures located at the site property shall be maintained in a manner which limits, to the maximum extent practicable, the infiltration of water. • The property owners, and/or their successors, shall notify EPA, and/or its successors, of their intent to convey any interest in the site property. Such conveyance shall not be made without the prior written approval of EPA, and/or its successors. No conveyance of title, easement, or other interest in the site property shall be consummated by the property owners, and/or their successors, without adequate and complete provision for continued maintenance of the property. • The property owners, and/or their successors, shall notify EPA, and/or its successors, of any substantial change to their present operations at the Site at least six months prior to the proposed change. • Any change in land use following completion of the remedial action shall require the prior written approval of EPA, and/or its successors. • The respective site owners shall modify the deeds to the affected site property to give notice to the public of the past land disposal	for parcel 0704730108 2015 Deed for parcel 0704730108 Declaration of Restrictions for the BASF parcels (Anticipated in 2020)	November 2002 and as a portion of tax parcel 0704730108. The 2015 deed prohibits use of the property as a daycare or childcare facility or for residential purposes. The deed also gives notice to the public that there were past land disposal practices and releases and threats of releases of hazardous substances to the property. EPA sent a draft Declaration of Restrictions to BASF in 2020. BASF is currently reviewing the document.

Media, Engineered Controls and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed?	ICs Called for in Decision Documents? (If yes, include decision document citation)	Impacted Parcel(s)	Decision Document Requirements	Title of IC Instrument Implemented and Date	Notes
				practices and of the fact that releases and threats of releases of hazardous substances have affected the property. • Additional measures may be required to implement the institutional controls outlined above.		
Site-wide Groundwater	Yes	Yes ROD Section 7.2.1	0704730117, 1000800001, 0704730108, 2000300110, 2000300108, 2000300109, 2000300083	The state shall establish and maintain a groundwater management zone in the area of the Site for as long as levels of contaminants remain that make the groundwater unsafe to drink. No drinking water wells shall be permitted to be drilled in areas where the contaminant levels make the groundwater unsafe to drink or where the pumping of the well threatens to spread the contamination.	A state-established Groundwater Management Zone is not in place; however, the 2003 Declaration restricts groundwater use at the North and South Landfills, the South Wetlands and the former Holly Run plant.	EPA is working with the state to implement this institutional control.

APPENDIX F – SUPPLEMENTAL INVESTIGATIONS CONDUCTED SINCE 2015 FYR

Figure F-1: 2015 Sampling Locations for CSM Update[6]



[6] *Source:* Figure 3 of the January 2016 Updated Conceptual Site Model Technical Memorandum.

Table F-1: Groundwater Analytical Results from the 2015 CSM Update[7]

			Location	CSM-03	CSM-04	PZ-8F	RDMW-28F	EW-108	EW-109	MWNVE-1F	MWNVE-3F	MW-17A	MW-1A(F)	MW-2A(F)	MW-30F	MW-31F	MW-34A
			Sample Date	4-Dec-15	3-Dec-15	30-Nov-15	4-Dec-15	3-Dec-15	3-Dec-15	3-Dec-15	3-Dec-15	1-Dec-15	3-Dec-15	3-Dec-15	30-Nov-15	1-Dec-15	3-Dec-15
			Purpose	CSM	CSM	CSM	CSM	CSM	CSM	CSM	CSM	VOC	VOC	VOC	VOC	VOC	VOC
			Screen Interval (feet bgs)	10--20	7--17	9--19	6--16	17--22	22--29	14--24	12--22	11--21	NA	5--15	9.3--13	19.9--24.8	7.2--16.8
			Well Depth (ft below TOC)	19.5	16.74	19.6	18	26	27.5	26.81	23.5	20.8	17.38	17.5	12.5	24	16.7
			Depth to Water (ft below TOC)	NA	16	2.35	9.79	20.31	22.37	23.01	19.61	12.14	8.08	4.49	3.89	13.11	9.35
			Pump Intake Depth (ft below TOC) or Sample Interval (ft bgs)	17.5	15.75	16.2	16	24	25.5	24.81	21.5	18.8	15.38	15.5	10.5	22	14.7
Parameter Name	Units	Filtered	Screening Criteria 1	Screening Criteria 2	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample
Volatile Organics			Com/Ind EPA VISLs	Occupational Based														
1,2-Dichlorobenzene	UG/L	no	1100		<1	<1	<1	<1	<1	<1	<1	<1	<2	14	<1	<1	<1
1,3-Dichlorobenzene	UG/L	no	NV		<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1
1,4-Dichlorobenzene	UG/L	no	11	NC	<1	<1	<1	<1	<1	<1	<1	<1	<2	2 J	<1	<1	<1
Benzene	UG/L	no	6.9	7020	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<2	<0.9	<0.9	<0.9	<0.9
Chlorobenzene	UG/L	no	170	303000	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<2	2 J	<0.8	<0.8	<0.8
cis-1,2 Dichloroethene	UG/L	no	NV		<1	<1	2 J	<1	<1	41	2 J	<1	<1	51	22	<1	<1	<1
Ethylbenzene	UG/L	no	15		<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<2	<0.8	<0.8	<0.8	<0.8
Tetrachloroethene	UG/L	no	24	225464	<1	<1	<1	<1	<1	<1	<1	1 J	<1	[3100]	[78]	<1	5	<1
Toluene	UG/L	no	8100		<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<2	<0.8	<0.8	<0.8	<0.8
trans-1,2-Dichloroethene	UG/L	no	NV		<1	<1	<1	<1	<1	3 J	<1	<1	<1	2 J	<1	<1	<1	<1
Trichloroethene	UG/L	no	2.2	637000	<1	<1	<1	<1	<1	<1	<1	<1	<1	[100]	[19]	<1	<1	<1
Vinyl Chloride	UG/L	no	2.5	2250	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<2	<2	<2	<2
Metals			DE FW Acute 2015 100 Hardness	DE FW Chronic 2015 100 Hardness														
Arsenic	ug/L	No	340	150	<7	39	<7	<7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	Yes	340	150	<7	12.7 J	<7	<7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	No	NV	NV	96.9	607	164	86.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	Yes	NV	NV	93.9	458	153	81.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	No	2.0137	0.246	<0.23	[3400]	[0.58]	[0.32 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	Yes	2.0137	0.246	<0.23	[3450]	[0.39 J]	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	No	569.76	74.1	<1.5	16.7	<1.5	<1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	Yes	569.76	74.1	<1.5	10.3 J	<1.5	<1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	No	NV	NV	<2.5	743	<2.5	<2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	Yes	NV	NV	<2.5	591	<2.5	4.5 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	No	64.581	2.52	0.38 B	[4050]	0.65 B	0.75 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	Yes	64.581	2.52	<0.13	[2790]	<0.13	<0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	No	NV	NV	128	36100	199	904	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	Yes	NV	NV	132	35500	92.6	695	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	No	117.18	118	4.9 B	[355000]	[582]	23.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	Yes	117.18	118	4.5 B	[349000]	[551]	24.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

No Occupied Structures within 100 feet | Structures within 100 feet

< not detected at the limit shown

J = estimated value above the MDL but below the PQL

B = compound deletected in the blank at a similar concentration

[ ] = above screening level

VI Screening levels derived using EPA's Vapor Intrusion Screening Level Calculator for Commercial/Industrial Land Use (March 2013 version), based on an excess cancer risk of 1x10?6 and a hazard quotient of 1.

Occupational based screening criteria is lower of OSHA PEL based and ACGIH based screening levels derived in URS September 2006 memorandum

[7] *Source:* Table 1 of the January 2016 Updated Conceptual Site Model Technical Memorandum.

			Location	MW-39F	MW-39F	PZ-5F	PZ-6F	PZ-7F	PZ-9F	TW-01	TW-02	TW-03	TW-04	TW-05	TW-06	TW-08	TW-09
			Sample Date	30-Nov-15	30-Nov-15	1-Dec-15	3-Dec-15	30-Nov-15	30-Nov-15	10-Nov-15	20-Nov-15	9-Nov-15	11-Nov-15	11-Nov-15	12-Nov-15	4-Dec-15	4-Dec-15
			Purpose	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC
			Screen Interval (feet bgs)	8.3--19.7	8.3--19.7	5--10	14--24	10--20	4--14	9--14	5--10	2--7	7--12	8--13	4--9	10--20	10--20
			Well Depth (ft below TOC)	19.6	19.6	9.7	23.7	19	15.9	14	10	7	12	13	9	18.5	19.5
			Depth to Water (ft below TOC)	9.21	9.21	3.82	13.53	11.29	5.61	NA	6	5	10	11.5	5	14.65	13.3
			Pump Intake Depth (ft below TOC) or Sample Interval (ft bgs)	17.6	17.6	7.7	21.7	17	11.9	9--14	5--10	2--7	7--12	8--13	4--9	16.5	17.5
Parameter Name	Units	Filtered	Screening Criteria 1	Screening Criteria 2	Regular Sample	Field Duplicate	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample
Volatile Organics			Com/Ind EPA VISLs	Occupational Based														
1,2-Dichlorobenzene	UG/L	no	1100		15	19	<1	150	[3200]	<1	<1	<1	<1	<1	<1	<1	<1	40 J
1,3-Dichlorobenzene	UG/L	no	NV		<1	<1	<1	2 J	25	<1	<1	<1	<1	<1	<1	<1	<1	3 J
1,4-Dichlorobenzene	UG/L	no	11	NC	2 J	3 J	<1	[33]	[340]	<1	<1	<1	<1	<1	<1	<1	<1	4 J
Benzene	UG/L	no	6.9	7020	<0.9	<0.9	<0.9	[38]	[19 J]	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Chlorobenzene	UG/L	no	170	303000	13	14	<0.8	[220]	[9400]	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	4 J
cis-1,2 Dichloroethene	UG/L	no	NV		<1	<1	1 J	6	23 J	<1	<1	<1	<1	<1	<1	11	<1	260
Ethylbenzene	UG/L	no	15		<0.8	<0.8	<0.8	<0.8	<4	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Tetrachloroethene	UG/L	no	24	225464	6	7	5	[26]	6 J	<1	10	<1	<1	3 J	<1	9	15	[920]
Toluene	UG/L	no	8100		<0.8	<0.8	<0.8	<0.8	<4	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
trans-1,2-Dichloroethene	UG/L	no	NV		<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	5
Trichloroethene	UG/L	no	2.2	637000	<1	<1	1 J	1 J	<5	<1	<1	<1	<1	<1	<1	2 J	1 J	[290]
Vinyl Chloride	UG/L	no	2.5	2250	<2	<2	<2	[4 J]	[25]	<2	<2	<2	<2	<2	<2	<2	<2	<2
Metals			DE FW Acute 2015 100 Hardness	DE FW Chronic 2015 100 Hardness														
Arsenic	ug/L	No	340	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	Yes	340	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	No	2.0137	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	Yes	2.0137	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	No	569.76	74.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	Yes	569.76	74.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	No	64.581	2.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	Yes	64.581	2.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	No	117.18	118	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	Yes	117.18	118	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

No Occupied Structures within 100 feet | Structures within 100 feet

< not detected at the limit shown

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B = compound deletected in the blank at a similar concentration

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VI Screening levels derived using EPA's Vapor Intrusion Screening Level Calculator for Commercial/Industrial Land Use (March 2013 version), based on an excess cancer risk of 1x10?6 and a hazard quotient of 1.

Occupational based screening criteria is lower of OSHA PEL based and ACGIH based screening levels derived in URS September 2006 memorandum

NV = No Value; NC = Not calculated previously

DE FW = Delaware Freshwater criteria

NA - Not applicable or not analyzed

			Location	TW-10	TW-10	TW-11	TW-12	TW-12	TW-13	TW-14	TW-15	TW-16	TW-17	TW-18
			Sample Date	4-Dec-15	4-Dec-15	16-Nov-15	16-Nov-15	16-Nov-15	9-Nov-15	9-Nov-15	16-Nov-15	18-Nov-15	30-Oct-15	10-Nov-15
			Purpose	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC	VOC
			Screen Interval (feet bgs)	10--20	7--17	11--16	3--8	3--8	5--10	0--5	2.5--7.5	10--15	19--24	5--10
			Well Depth (ft below TOC)	19.5	17.5	16	8	8	10	5	7.5	15	24	10
			Depth to Water (ft below TOC)	13.2	13.2	15	5	5	9	3	4.5	10	20	8
			Pump Intake Depth (ft below TOC) or Sample Interval (ft bgs)	17.5	17.5	11--16	3--8	3--8	5--10	0--5	2.5--7.5	10--15	19--24	5--10
Parameter Name	Units	Filtered	Screening Criteria 1	Screening Criteria 2	Regular Sample	Field Duplicate	Regular Sample	Regular Sample	Field Duplicate	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample	Regular Sample
Volatile Organics			Com/Ind EPA VISLs	Occupational Based											
1,2-Dichlorobenzene	UG/L	no	1100		120	130	<1	<1	<1	<1	7	<1	<1	<1	<1
1,3-Dichlorobenzene	UG/L	no	NV		35 J	34 J	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	UG/L	no	11	NC	[840]	[810]	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzene	UG/L	no	6.9	7020	[29 J]	[34 J]	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Chlorobenzene	UG/L	no	170	303000	[18000]	[18000]	<0.8	<0.8	<0.8	<0.8	8	<0.8	<0.8	<0.8	<0.8
cis-1,2 Dichloroethene	UG/L	no	NV		89	120	<1	29	30	<1	44	<1	<1	<1	<1
Ethylbenzene	UG/L	no	15		<8	<8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Tetrachloroethene	UG/L	no	24	225464	18 J	<10	4 J	[110 J]	[170 J]	5	[110]	[42 J]	<1	<1	3 J
Toluene	UG/L	no	8100		<8	<8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
trans-1,2-Dichloroethene	UG/L	no	NV		23 J	24 J	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	UG/L	no	2.2	637000	<10	<10	[3 J]	[27]	[36]	[7]	[20]	1 J	<1	<1	<1
Vinyl Chloride	UG/L	no	2.5	2250	[200 J]	[260 J]	<2	<2	2 J	<2	[24]	<2	<2	<2	<2
Metals			DE FW Acute 2015 100 Hardness	DE FW Chronic 2015 100 Hardness											
Arsenic	ug/L	No	340	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	Yes	340	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	No	2.0137	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	Yes	2.0137	0.246	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	No	569.76	74.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	Yes	569.76	74.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	No	64.581	2.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	ug/L	Yes	64.581	2.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	No	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	Yes	NV	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	No	117.18	118	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	Yes	117.18	118	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

No Occupied Structures within 100 feet | Structures within 100 feet

< not detected at the limit shown

J = estimated value above the MDL but below the PQL

B = compound deletected in the blank at a similar concentration

[ ] = above screening level

VI Screening levels derived using EPA's Vapor Intrusion Screening Level Calculator for Commercial/Industrial Land Use (March 2013 version), based on an excess cancer risk of 1x10?6 and a hazard quotient of 1.

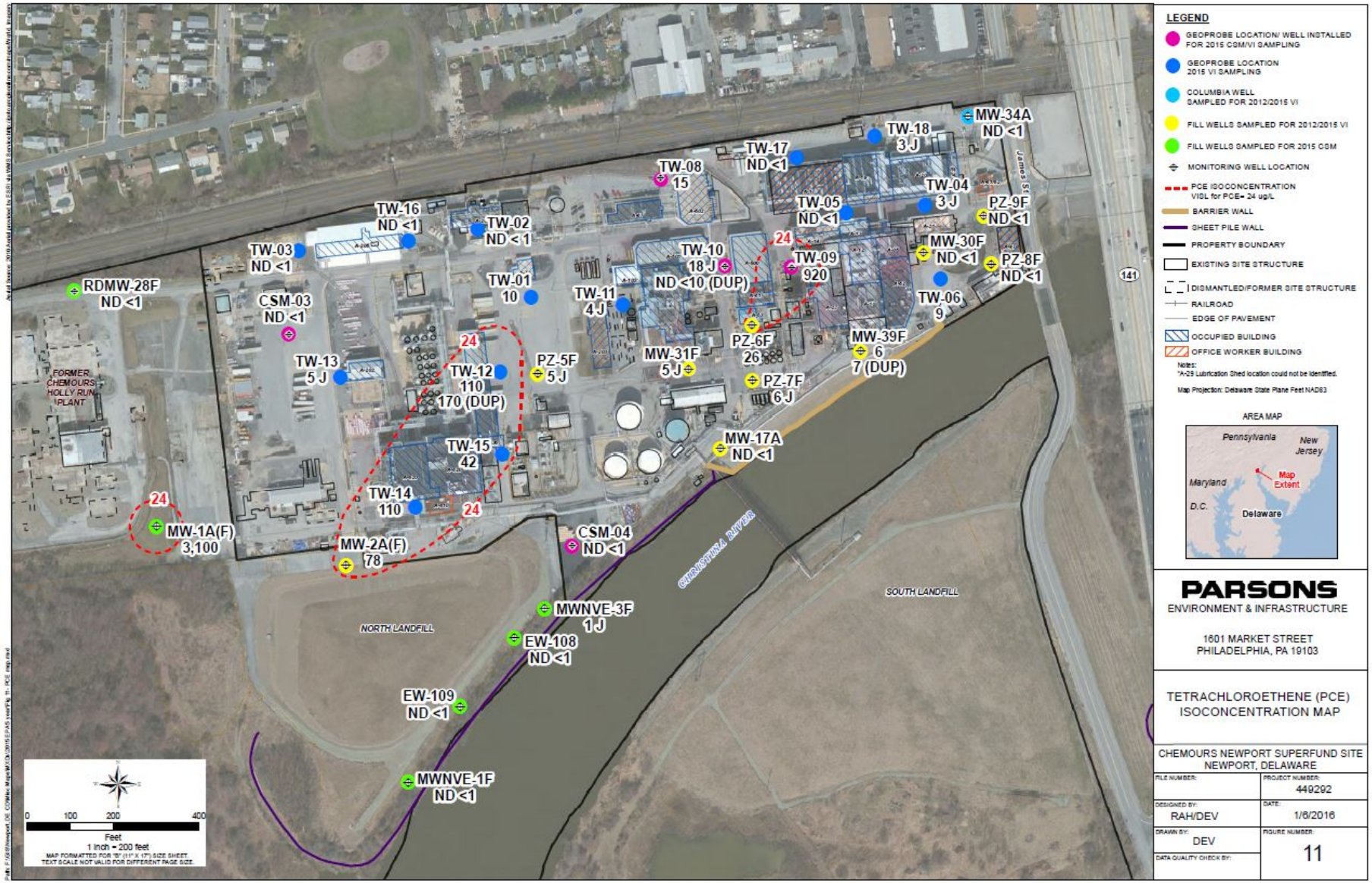
Occupational based screening criteria is lower of OSHA PEL based and ACGIH based screening levels derived in URS September 2006 memorandum

NV = No Value; NC = Not calculated previously

DE FW = Delaware Freshwater criteria

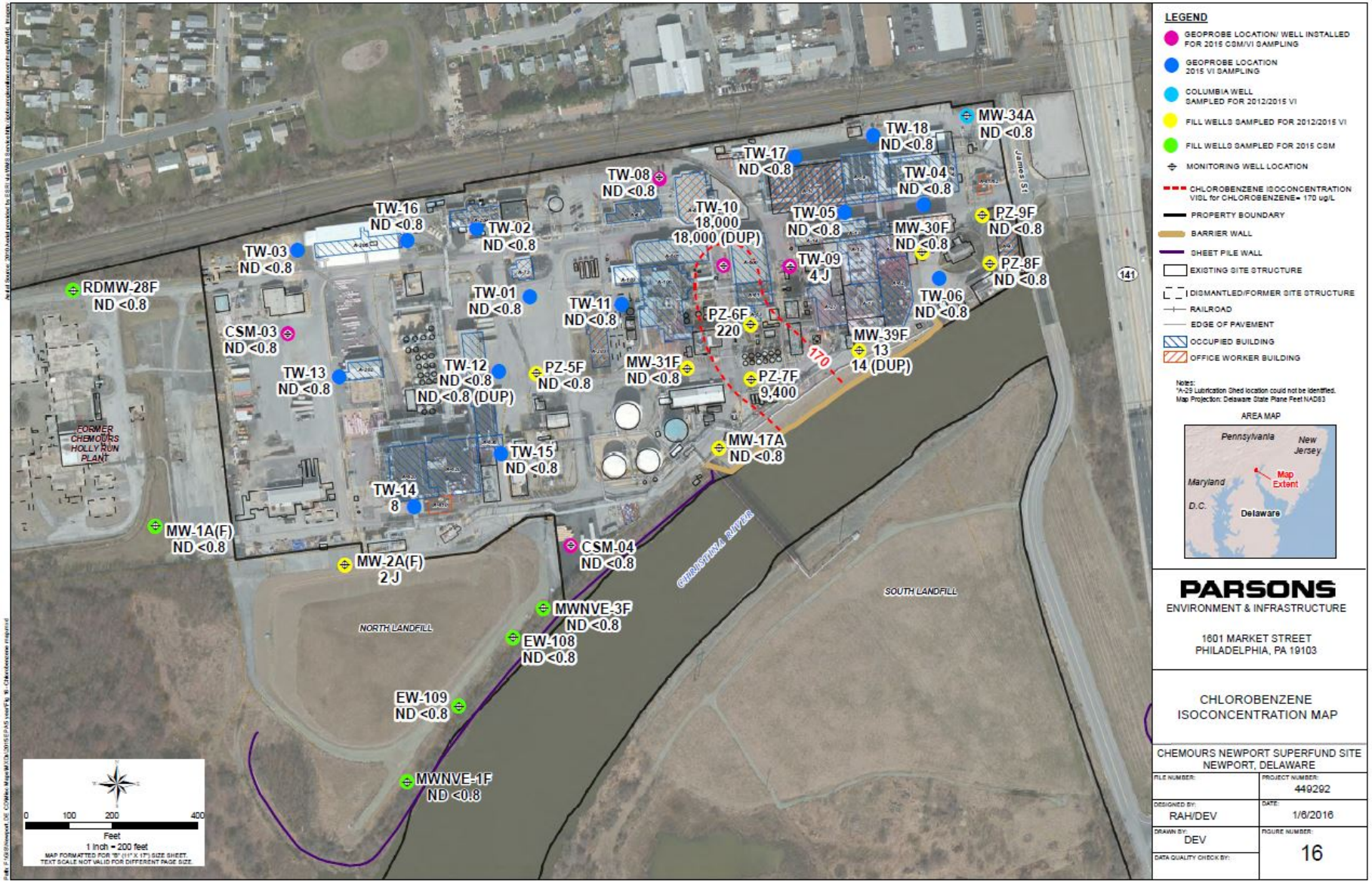
NA - Not applicable or not analyzed

Figure F-2: 2015 PCE Isoconcentration Map – Fill Zone[8]



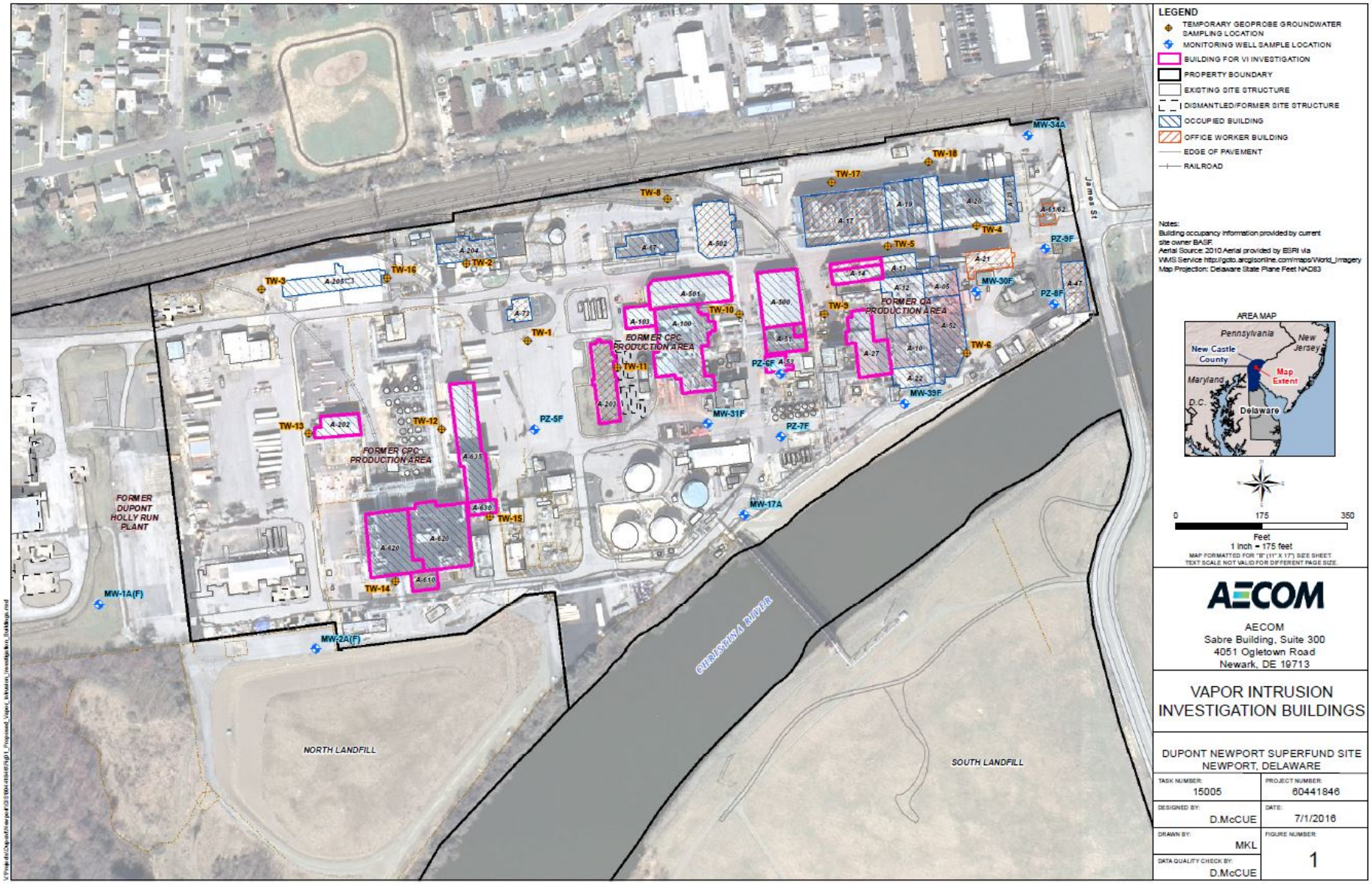
[8] *Source:* Figure 11 of the January 2016 Updated Conceptual Site Model Technical Memorandum.

Figure F-3: 2015 Chlorobenzene Isoconcentration Map – Fill Zone[9]



[9] *Source:* Figure 16 of the January 2016 Updated Conceptual Site Model Technical Memorandum.

Figure F-4: 2016 Vapor Intrusion Investigation Buildings[10]



[10] *Source:* Figure 1 of the 2016 Vapor Intrusion Investigation Report.

APPENDIX G – PUBLIC NOTICE

APPENDIX H – INTERVIEW FORMS

E.I. DU PONT DE NEMOURS & CO., INC. (NEWPORT PIGMENT PLANT LANDFILL) SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill)	
EPA ID: DED980555122	
Interviewer name: Anthony Iacobone	**Interviewer affiliation:** EPA
Subject name: Lindsay Hall	**Subject affiliation:** DNREC
Subject contact information: phone: (302) 395-2600; email: lindsay.hall@delaware.gov	
Interview date: October 17, 2019	**Interview time:** N/A
Interview location: N/A	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: State Agency	

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The project seems to have comprehensively addressed historical site contamination. The O&M measures taken to maintain the continued integrity of the remedies have ensured the continued protection of human health and the environment on and surrounding the Site. The state fully supports the use of the South Landfill to site the solar panels and touted the installation as an example of efforts to promote increased investments in green and renewable energy.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Based on observations during the FYR site visit on October 7, 2019, I believe that the remedy is performing accordingly and remains protective of human health and the environment.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   No.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   On January 11, 2018, I received a voice mail message from an employee from New Castle County's Department of Land Use. Apparently, a company was seeking a permit to do demolition on the Site, and they shared the requirement to leave the building foundation in place in order to maintain the protectiveness of the remedy. She wished to confirm and to obtain more specifics on the site considerations and requirements prior to the issuance of the permit. I returned the call and left her a voice mail with the contact information for the EPA RPM.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   Implementation of a deed restriction/environmental covenant on the parcel believed to be owned by DelDOT is outstanding due to the absence of an associated tax parcel denotation. As a complimentary option, DNREC's Division of Waste and Hazardous Substances and Division of Water have an instrument called a Groundwater Management Zone. A Groundwater Management Zone can be used to ensure that any well permit applications submitted to the Division of Water within a Zone delineated based on groundwater contamination from a hazardous substance release, is reviewed jointly with the Division of Waste and Hazardous Substances to determine the appropriate response to the permit request (e.g., approval contingent on special construction of wells to ensure that contamination is not transferred between aquifers). DNREC will work with EPA to create an appropriate Groundwater Management Zone for the Site and surrounding area.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No.

9. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

   Yes.

E.I. DU PONT DE NEMOURS & CO., INC. (NEWPORT PIGMENT PLANT LANDFILL) SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill)	
EPA ID: DED980555122	
Interviewer name: Anthony Iacobone	**Interviewer affiliation:** EPA
Subject name: Timothy P. Love	**Subject affiliation:** BASF
Subject contact information: phone: 302-992-1204	
Interview date: 10/9/2019	**Interview time:** N/A
Interview location: N/A	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Potentially Responsible Party (PRP)	

1. What is your overall impression of the remedial activities at the Site?

   Well organized and effective.

2. What have been the effects of the Site on the surrounding community, if any?

   Site has been managed to minimize any effects on the community.

3. What is your assessment of the current performance of the remedy in place at the Site?

   Effectively controlling the materials needing control.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   No.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future?

   Yes.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Like the fact that the Site is a certified wildlife habitat.

7. Do you consent to have your name included along with your responses to this questionnaire in the FYR Report?

   Yes.

E.I. DU PONT DE NEMOURS & CO., INC. (NEWPORT PIGMENT PLANT LANDFILL) SUPERFUND SITE FIVE-YEAR REVIEW INTERVIEW FORM	
Site Name: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill)	
EPA ID: DED980555122	
Interviewer name:	**Interviewer affiliation:**
Subject name: Sebastian Harrison	**Subject affiliation: Chemours PD**
Subject contact information: Sebastian.P.Harrison@chemours.com	
Interview date: 11/12/2019	**Interview time:** N/A
Interview location: N/A	
Interview format (circle one): In Person Phone Mail (Email) Other:	
Interview category: Potentially Responsible Party (PRP)	

1. What is your overall impression of the remedial activities at the Site? Remedial activities are minimal due to the mature nature of the site and my overall impression is positive.

2. What have been the effects of this Site on the surrounding community, if any? Fairly minimal due to the site location, but the solar development on the S LF and WHC certification are key positive contributions.

3. What is your assessment of the current performance of the remedy in place at the Site? The remedy is protective of people and the environment.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup? None that I recall in my tenure.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might EPA convey site-related information in the future? Yes.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy? None, except those discussed with the RTM.

7. Do you consent to have your name included along with your responses to this questionnaire in the FYR report? Yes.

APPENDIX I – DATA REVIEW SUPPORTING DOCUMENTATION

Table I-1: Well Cluster 1 Monitoring Results[11]

Analyte	units	May 2018 MCL	May 2018 RSL	RDMW-8C 9/13/2005	RDMW-8C 11/19/07	RDMW-8C 11/18/2009	RDMW-8C 11/15/2011	RDMW-8C 11/13/2013	RDMW-8C 11/11/2015	RDMW-8C 11/9/2017	RDMW-8C (DUP) 11/9/2017
VOCs											
TETRACHLOROETHENE	ug/l	5	11	22	22	16	7	8	12	10	10
TRICHLOROETHENE	ug/l	5	0.49	4 J	4 J	3 J	2 J	2 J	2 J	2	2
cis 1,2-DICHLOROETHENE	ug/l	70	36	--	--	--	--	ND (1)	ND (1)	0.5 J	0.5 J
VINYL CHLORIDE	ug/l	2	0.019	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	--	ND <0.5	ND <0.5
Total Metals											
ARSENIC	ug/l	--	--	ND (9.3)	ND (10)	ND (7.2)	10.7 J	ND (6.8)	ND (7)	ND <9.6	ND <9.6
BARIUM	ug/l	--	--	27.6 J	34.3	29.9 B	1210	41	--	33.5	34.3
CADMIUM	ug/l	--	--	256	243	221	269	206	221	176	168
CHROMIUM	ug/l	--	--	6.5 B	Group B	Group B	203	Group B	Group B	ND <3.3	ND <3.3
COBALT	ug/l	--	--	153	137	120	166	100	97.6	85.1	85.6
COPPER	ug/l	--	--	3.7 J	ND (2.2)	12.2	95.1	ND (2.7)	--	ND <4	ND <4
LEAD	ug/l	--	--	ND (8.4)	1.5	0.71 B	64.8	0.82 J	--	0.47 J	0.47 J
MANGANESE	ug/l	--	--	4090	3830	3360	3810	2880	2720	2370	2380
MERCURY	ug/l	--	--	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	ND <0.05	ND <0.05
NICKEL	ug/l	--	--	147	147	133	272	114	114	104	104
VANADIUM	ug/l	--	--	6.6	Group B	Group B	367	Group B	Group B	3.6 J	4.2 J
ZINC	ug/l	--	--	47400	43800	39200	42300	34500	35400	30900	29900
Dissolved Metals											
ARSENIC	ug/l	10	0.052	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND <9.6	ND <9.6
BARIUM	ug/l	2000	3800	22.6	28.2	25.4 B	25.3	29.1	--	31.4	29.5
CADMIUM	ug/l	5	9.2	270	251	205	239	198	212	175	178
CHROMIUM	ug/l	100	--	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	ND <3.3	ND <3.3
COBALT	ug/l	--	6	158	145	120	122	101	97.3	86	82.8
COPPER	ug/l	1300	800	ND (1.8)	ND (2.2)	13.5	6.6 J	ND (2.7)	--	ND <4	ND <4
LEAD	ug/l	15	15	ND (8.4)	0.85 J	0.21 B	3.9 B	ND (0.085)	--	0.21 J	0.18 J
MANGANESE	ug/l	--	430	4310	3840	3290	3250	2830	2740	2400	2320
MERCURY	ug/l	2	0.63	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	ND <0.05	ND <0.05
NICKEL	ug/l	--	390	155	142	126	130	115	115	104	101
VANADIUM	ug/l	--	86	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	2.6 J	ND <1.6
ZINC	ug/l	--	6000	41900	40100	37700	37600	34900	33000	32900	31200

NOTES:

Highlighted cells indicate: (dissolved) detection above the Federal Maximum Contaminant Level (MCL) as of May 2018, or above the Regional Screening Level (RSL) for Tap Water if there is no MCL.

RSL Risk-Based Concentrations were used if no MCL exists for that analyte

"Group B" analytes (chromium, mercury and vanadium) were not analyzed all events

J = Result quantified as estimated value greater than MDL and less than PQL

ND = Non detect at stated reporting limit

[11] *Source:* Appendix A-3 of the 2017 Long-term Groundwater Monitoring Report, dated July 2018.

Analyte	units	May 2018 MCL	May 2018 RSL	RDMW-21C 9/13/2005	RDMW-21C 11/19/07	RDMW-21C 11/18/2009	RDMW-21C 11/15/2011	RDMW-21C 11/13/2013	RDMW-21C (DUP) 11/13/2013	RDMW-21C 11/11/2015	RDMW-21C 11/9/2017
VOCs											
TETRACHLOROETHENE	ug/l	5	11	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
TRICHLOROETHENE	ug/l	5	0.49	3 J	6	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
cis 1,2-DICHLOROETHENE	ug/l	70	36	--	--	--	--	31	32	36	37
VINYL CHLORIDE	ug/l	2	0.019	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	--	ND <0.5
Total Metals											
ARSENIC	ug/l	--	--	15.0 J	ND (10)	ND (7.2)	ND (5.1)	9.7 J	9.4 J	ND (7)	ND <9.6
BARIUM	ug/l	--	--	60.6 J	137	68.7 B	82.8	45.2	43.1	--	70.3
CADMIUM	ug/l	--	--	ND (.97)	ND (0.9)	ND (0.2)	0.84 B	0.54	0.59	0.76	0.3 J
CHROMIUM	ug/l	--	--	11.9 B	Group B	Group B	1.4 J	Group B	Group B	Group B	ND <3.3
COBALT	ug/l	--	--	103	11.1	61.7	40.9	66.3	67	51.4	22.6
COPPER	ug/l	--	--	5.2 J	ND (2.2)	ND (2.7)	1.3 B	ND (2.7)	ND (2.7)	--	ND <4
LEAD	ug/l	--	--	ND (8.4)	ND (0.047)	ND (0.05)	4.3 B	0.088 J	0.10 J	--	ND <0.11
MANGANESE	ug/l	--	--	4210	2490	2840	2430	2650	2600	2390	1700
MERCURY	ug/l	--	--	ND (0.062)	Group B	Group B	0.096 B	Group B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	--	33.4 B	7.2 J	15.5	8.4 J	11	11	13.8	5.1 J
VANADIUM	ug/l	--	--	5.5	Group B	Group B	ND (0.96)	Group B	Group B	Group B	ND <1.6
ZINC	ug/l	--	--	28200	2700	9470	7710	12900	12600	10900	3850
Dissolved Metals											
ARSENIC	ug/l	10	0.052	ND (9.3)	ND (10)	10.3 J	ND (5.1)	9.7 J	8.9 J	ND (7)	ND <9.6
BARIUM	ug/l	2000	3800	42	133	65 B	74.9	39.1	39.7	--	67.7
CADMIUM	ug/l	5	9.2	ND (.97)	ND (0.9)	ND (0.2)	0.3 B	ND (0.23)	ND (0.23)	ND (0.23)	ND <0.15
CHROMIUM	ug/l	100	--	ND (4.8)	Group B	Group B	1.1 J	Group B	Group B	Group B	ND <3.3
COBALT	ug/l	--	6	88	14.4	63.4	40.9	63.6	62.4	47	22.8
COPPER	ug/l	1300	800	ND (1.8)	ND (2.2)	ND (2.7)	3 B	ND (2.7)	ND (2.7)	--	ND <4
LEAD	ug/l	15	15	ND (8.4)	ND (0.047)	0.062 B	3.8 B	ND (0.085)	ND (0.085)	--	ND <0.11
MANGANESE	ug/l	--	430	3700	2510	2880	2450	2470	2460	2230	1690
MERCURY	ug/l	2	0.63	ND (0.062)	Group B	Group B	0.096 B	Group B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	390	23.7 B	ND (5.6)	12.6	8.8 J	10	10.2	10.9	4.2 J
VANADIUM	ug/l	--	86	2.2 B	Group B	Group B	ND (0.96)	Group B	Group B	Group B	ND <1.6
ZINC	ug/l	--	6000	14900	2460	10100	6130	10600	10200	7230	3760

NOTES:

Highlighted cells indicate: (dissolved) detection above the Federal Maximum Contaminant Level (MCL) as of May 2018, or above the Regional Screening Level (RSL) for Tap Water if there is no MCL.

RSL Risk-Based Concentrations were used if no MCL exists for that analyte

"Group B" analytes (chromium, mercury and vanadium) were not analyzed all events

J = Result quantified as estimated value greater than MDL and less than PQL

ND = Non detect at stated reporting limit

B - Analyte concentration is not significantly greater than detected in an associated method blank

-- = Analyte not reported

Analyte	units	May 2018 MCL	May 2018 RSL	MW-24A 11/28/2001	MW-24A 11/24/2003	MW-24A 9/13/2005	MW-24A 11/19/2007	MW-24A 11/18/2009	MW-24A 11/15/2011	MW-24A 11/14/2013	MW-24A 11/10/2015	MW-24A (DUP) 11/10/2015	MW-24A 11/10/2017
VOCs													
TETRACHLOROETHENE	ug/l	5	11	--	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
TRICHLOROETHENE	ug/l	5	0.49	--	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
cis 1,2-DICHLOROETHENE	ug/l	70	36	--	--	--	--	--	--	ND (1)	ND (1)	ND (1)	ND <0.5
VINYL CHLORIDE	ug/l	2	0.019	--	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	--	--	ND <0.5
Total Metals													
ARSENIC	ug/l	--	--	ND (1.4)	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND (7)	ND <9.6
BARIUM	ug/l	--	--	172	268	490 J	512	332	267	345	--	--	326
CADMIUM	ug/l	--	--	1.2 J	1.3 J	ND (.97)	ND (0.9)	0.34 J	ND (0.2)	0.6	0.51	0.63	0.32 J
CHROMIUM	ug/l	--	--	Group B	Group B	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	Group B	ND <3.3
COBALT	ug/l	--	--	67.7	29.5	7.5	6.2	3.6 J	3.4 J	9.6	9.7	10.3	5.5
COPPER	ug/l	--	--	8.5 J	11.2 B	5.3 J	4 J	ND (2.7)	2 B	ND (2.7)	--	--	ND <4
LEAD	ug/l	--	--	4.4	ND (9.3)	ND (8.4)	0.9 J	0.28 B	0.1 B	0.27 J	--	--	1
MANGANESE	ug/l	--	--	2460	1750	577	394	237	170	558	687	716	396
MERCURY	ug/l	--	--	Group B	Group B	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	--	12.7 J	24.1	16.2 B	10.5	3.9 J	3.2 J	9.2 J	8.1 J	8.5 J	5.5 J
VANADIUM	ug/l	--	--	Group B	Group B	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	Group B	ND <1.6
ZINC	ug/l	--	--	59.6	81.8 B	27.4 B	16.7 B	19.6 B	3.8 J	23.6	22	21.4	12.4 J
Dissolved Metals													
ARSENIC	ug/l	10	0.052	ND (1.4)	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND (7)	ND <9.6
BARIUM	ug/l	2000	3800	123	234	495	507	344	273	331	--	--	329
CADMIUM	ug/l	5	9.2	0.87 J	.95 J	1.3 J	1.2 J	0.26 J	ND (0.2)	0.51	0.63	0.68	0.4 J
CHROMIUM	ug/l	100	--	Group B	Group B	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	Group B	ND <3.3
COBALT	ug/l	--	6	32.1 J	12.0 J	ND (1.5)	2.5 J	ND (2.1)	ND (0.62)	8.2	6.1	7.4	2.5 J
COPPER	ug/l	1300	800	ND (2.4)	5.6 B	4.5 J	3.5 J	6.1 J	3.4 B	ND (2.7)	--	--	ND <4
LEAD	ug/l	15	15	ND (1.8)	ND (9.3)	ND (8.4)	0.2 J	0.1 B	ND (0.08)	ND (0.085)	--	--	0.33 J
MANGANESE	ug/l	--	430	1140	1080	395	116	66.3	33.7	485	472	509	293
MERCURY	ug/l	2	0.63	Group B	Group B	ND (0.062)	Group B	Group B	0.098 B	Group B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	390	6.7 J	16.5	17.5 B	9.3 J	4.7 J	2.7 J	11	8.6 J	8.6 J	5.5 J
VANADIUM	ug/l	--	86	Group B	Group B	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	Group B	ND <1.6
ZINC	ug/l	--	6000	44	62.5 B	32.8 B	13.4 B	12.4 B	5.9 J	24.9	20.1	19.3 J	10.2 J

NOTES:

Highlighted cells indicate: (dissolved) detection above the Federal Maximum Contaminant Level (MCL) as of May 2018, or above the Regional Screening Level (RSL) for Tap Water if there is no MCL.

RSL Risk-Based Concentrations were used if no MCL exists for that analyte

"Group B" analytes (chromium, mercury and vanadium) were not analyzed all events

J = Result quantified as estimated value greater than MDL and less than PQL

ND = Non detect at stated reporting limit

B - Analyte concentration is not significantly greater than detected in an associated method blank

-- = Analyte not reported

Analyte	units	May 2018 MCL	May 2018 RSL	MW-25A 11/28/2001	MW-25A 11/25/2003	MW-25A 9/14/2005	MW-25A 11/19/07	MW-25A 11/18/2009	MW-25A 11/15/2011	MW-25A 11/14/2013	MW-25A 11/11/2015	MW-25A 11/10/2017
VOCs												
TETRACHLOROETHENE	ug/l	5	11	--	4 J	1 J	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
TRICHLOROETHENE	ug/l	5	0.49	--	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
cis 1,2-DICHLOROETHENE	ug/l	70	36	--	--	--	--	--	--	ND (1)	ND (1)	ND <0.5
VINYL CHLORIDE	ug/l	2	0.019	--	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	--	ND <0.5
Total Metals												
ARSENIC	ug/l	--	--	1.7 J	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND <9.6
BARIUM	ug/l	--	--	87.0 J	121 B	64.4 J	43.3	68.2 B	22.4	37.2	--	42.3
CADMIUM	ug/l	--	--	ND (.64) U	1.2 J	ND (.97)	ND (0.9)	0.32 J	ND (0.2)	ND (0.23)	ND (0.23	0.19 J
CHROMIUM	ug/l	--	--	Group B	Group B	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	ND <3.3
COBALT	ug/l	--	--	6.4 J	3.1 J	3.3 B	2.7 J	2.6 J	2.8 J	2.1 J	2.2 J	1.8 J
COPPER	ug/l	--	--	9.3 J	4.0 J	5.3 B	ND (2.2)	ND (2.7)	1.1 B	ND (2.7)	--	ND <4
LEAD	ug/l	--	--	3.4	ND (9.3)	ND (8.4)	0.61 J	0.08 B	0.088 B	ND (0.085)	--	ND <0.11
MANGANESE	ug/l	--	--	2160	3680	2550	1910	2850	796	1070	1260	1260
MERCURY	ug/l	--	--	Group B	Group B	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	--	13.9 J	ND (3.8)	ND (5.8)	ND (5.6)	3.2 J	2.1 J	2.4 J	2.6 J	ND <4
VANADIUM	ug/l	--	--	Group B	Group B	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	ND <1.6
ZINC	ug/l	--	--	75.7	19.9 B	14.4 B	10.3 B	ND (8.1)	ND (3.2)	2.9 B	ND (3.9)	ND <6.5
Dissolved Metals												
ARSENIC	ug/l	10	0.052	ND (1.4)	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND <9.6
BARIUM	ug/l	2000	3800	60.1 J	115 B	61.8	37	69.2 B	20.4	35.1	--	33.3
CADMIUM	ug/l	5	9.2	0.67 J	ND (0.87)	ND (0.97)	ND (0.9)	0.32 J	ND (0.2)	ND (0.23)	0.26 J	ND <0.15
CHROMIUM	ug/l	100	--	Group B	Group B	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	ND <3.3
COBALT	ug/l	--	6	4.0 J	4.4 J	ND (1.5)	3.9 J	2.4 J	2.5 J	2.1 J	1.4 J	ND <1.7
COPPER	ug/l	1300	800	ND (2.4)	3.6 J	ND (1.8)	ND (2.2)	5.3 J	2.9 B	ND (2.7)	--	ND <4
LEAD	ug/l	15	15	ND (1.8)	ND (9.3	ND (8.4)	0.38 J	0.068 B	0.12 B	ND (0.085)	--	ND <0.11
MANGANESE	ug/l	--	430	2050	3840	2510	1660	2890	559	914	958	839
MERCURY	ug/l	2	0.63	Group B	Group B	ND (0.062)	Group B	Group B	0.1 B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	390	7.8 J	3.8 J	7.2 B	ND (5.6)	2.8 J	2.9 J	5.5 J	2.6 J	ND <4
VANADIUM	ug/l	--	86	Group B	Group B	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	ND <1.6
ZINC	ug/l	--	6000	68.4	25.7 B	18.7 B	ND (8.1)	ND (8.1)	5.2 J	6.8 J	ND (3)	ND <6.5

NOTES:

Highlighted cells indicate: (dissolved) detection above the Federal Maximum Contaminant Level (MCL) as of May 2018, or above the Regional Screening Level (RSL) for Tap Water if there is no MCL.

RSL Risk-Based Concentrations were used if no MCL exists for that analyte

"Group B" analytes (chromium, mercury and vanadium) were not analyzed all events

J = Result quantified as estimated value greater than MDL and less than PQL

ND = Non detect at stated reporting limit

B - Analyte concentration is not significantly greater than detected in an associated method blank

-- = Analyte not reported

Analyte	units	May 2018 MCL	May 2018 RSL	MW-6B 11/28/2001	MW-6B 11/24/2003	MW-6B 9/13/2005	MW-6B 11/19/2007	MW-6B 11/18/2009	MW-6B 11/15/2011	MW-6B 11/14/2013	MW-6B 11/10/2015	MW-6B 11/10/2017
VOCs												
TETRACHLOROETHENE	ug/l	5	11	ND (1.)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
TRICHLOROETHENE	ug/l	5	0.49	ND (1.)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND <0.5
cis 1,2-DICHLOROETHENE	ug/l	70	36	--	--	--	--	--	--	ND (1)	ND (1)	ND <0.5
VINYL CHLORIDE	ug/l	2	0.019	ND (1.)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	--	ND <0.5
Total Metals												
ARSENIC	ug/l	--	--	1.4 J	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND <9.6
BARIUM	ug/l	--	--	44.8 J	31.5 B	33.8 J	26.9	27.5 B	38.7	25.6	--	16.8
CADMIUM	ug/l	--	--	ND (0.64)	ND (.87)	ND (.97)	ND (0.9)	ND (0.2)	ND (0.2)	ND (0.23)	ND (0.23)	ND <0.15
CHROMIUM	ug/l	--	--	Group B	Group B	5.7 B	Group B	Group B	1.2 J	Group B	Group B	ND <3.3
COBALT	ug/l	--	--	ND (1.8) U	ND (1.6)	ND (1.5)	ND (2.1)	ND (2.1)	ND (0.62)	ND (1.3)	ND (0.9)	ND <1.7
COPPER	ug/l	--	--	8.7 J	ND (2.1)	5.0 J	ND (2.2)	ND (2.7)	3.8 B	ND (2.7)	--	ND <4
LEAD	ug/l	--	--	3.3	ND (9.3)	ND (8.4)	0.63 J	1.3	1 B	0.37 J	--	0.3 J
MANGANESE	ug/l	--	--	66.7	38.5	120	27.2	60.1	94.7	41.1	79.5	17.3
MERCURY	ug/l	--	--	Group B	Group B	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	--	5.5 J	ND (3.8)	ND (5.8)	ND (5.6)	2.3 J	2.6 J	1.6 J	2.3 J	ND <4
VANADIUM	ug/l	--	--	Group B	Group B	4.2 B	Group B	Group B	ND (0.96)	Group B	Group B	ND <1.6
ZINC	ug/l	--	--	30.8	12.6 B	21.9 B	14 B	20.9 B	8.8 J	6.7 B	5.6 J	ND <6.5
Dissolved Metals												
ARSENIC	ug/l	10	0.052	19.3	ND (4.9)	ND (9.3)	ND (10)	ND (7.2)	ND (5.1)	ND (6.8)	ND (7)	ND <9.6
BARIUM	ug/l	2000	3800	18.1 J	18.2 B	23.8	17.5	18.8 B	32.7	24	--	15.7
CADMIUM	ug/l	5	9.2	ND (0.64)	ND (.87)	ND (.97)	ND (0.9)	ND (0.2)	ND (0.2)	ND (0.23)	ND (0.23)	ND <0.15
CHROMIUM	ug/l	100	--	Group B	Group B	ND (4.8)	Group B	Group B	ND (1.1)	Group B	Group B	ND <3.3
COBALT	ug/l	--	6	ND (1.8)	ND (1.6)	ND (1.5)	ND (2.1)	ND (2.1)	ND (0.62)	ND (1.3)	ND (0.9)	ND <1.7
COPPER	ug/l	1300	800	ND (2.4)	ND (2.1)	ND (1.8)	ND (2.2)	3.8 J	2.5 B	ND (2.7)	--	ND <4
LEAD	ug/l	15	15	2.2 J	ND (9.3)	ND (8.4)	ND (0.047)	0.058 B	ND (0.08)	ND (0.085)	--	ND <0.11
MANGANESE	ug/l	--	430	39.3	34.8	76.2	4.8 J	51.7	84.1	36.5	70.5	5.5
MERCURY	ug/l	2	0.63	Group B	Group B	ND (0.062)	Group B	Group B	0.11 B	Group B	Group B	ND <0.05
NICKEL	ug/l	--	390	ND (2.3)	ND (3.8)	ND (5.8)	ND (5.6)	ND (1.8)	1.2 J	ND (1.5)	2.6 J	ND <4
VANADIUM	ug/l	--	86	Group B	Group B	ND (1.0)	Group B	Group B	ND (0.96)	Group B	Group B	ND <1.6
ZINC	ug/l	--	6000	12.8 J	8.5 B	10.3 B	ND (8.1)	9.3 B	4.4 J	5.6 J	5.3 J	ND <6.5

NOTES:

Highlighted cells indicate: (dissolved) detection above the Federal Maximum Contaminant Level (MCL) as of May 2018, or above the Regional Screening Level (RSL) for Tap Water if there is no MCL.

RSL Risk-Based Concentrations were used if no MCL exists for that analyte

"Group B" analytes (chromium, mercury and vanadium) were not analyzed all events

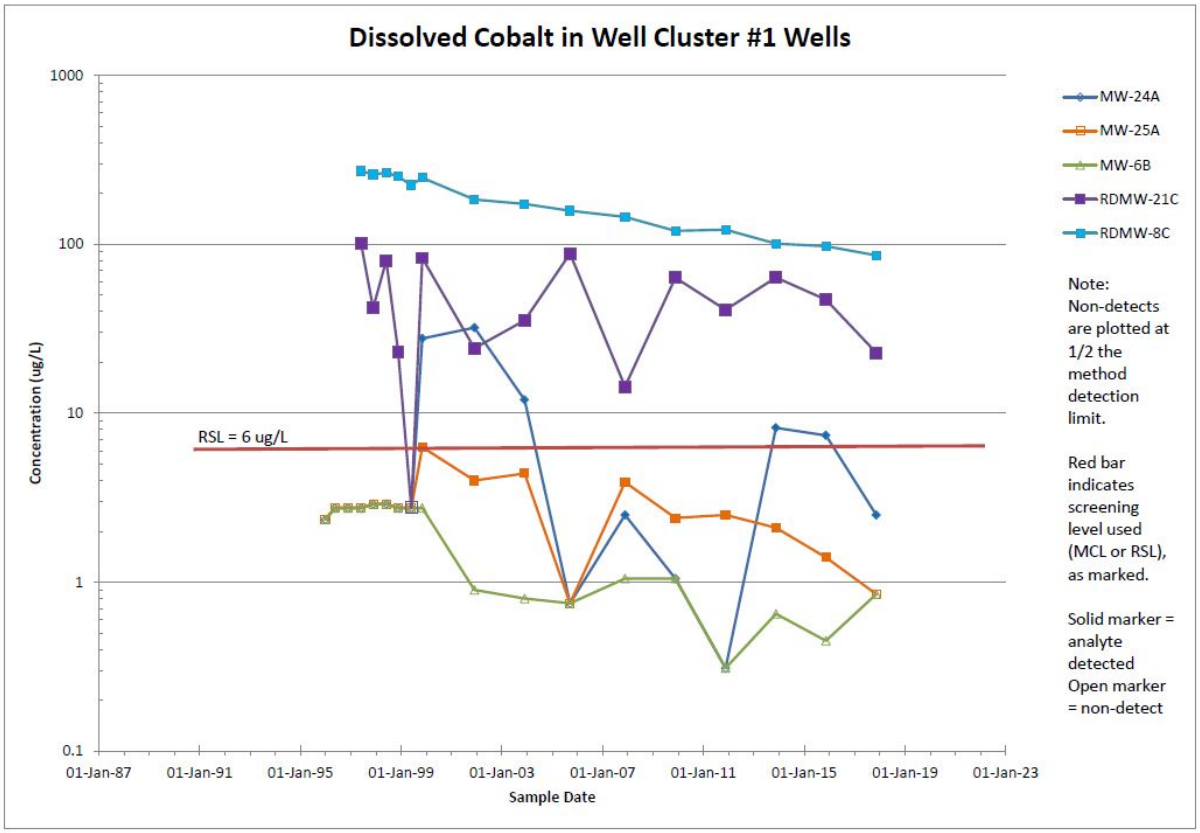
J = Result quantified as estimated value greater than MDL and less than PQL

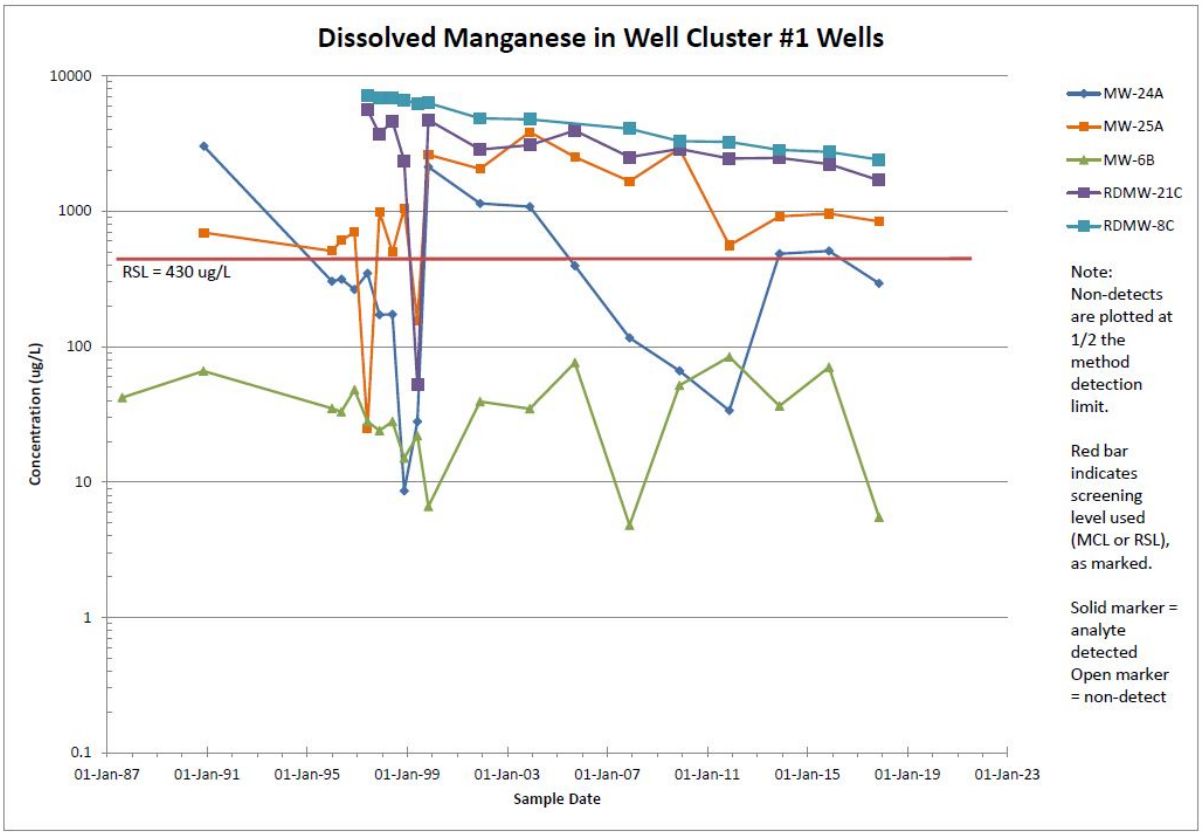
ND = Non detect at stated reporting limit

B - Analyte concentration is not significantly greater than detected in an associated method blank

-- = Analyte not reported

Figure I-1: Select Well Cluster 1 Trend Charts[12]





[12] *Source:* Appendix A-4 of the 2017 Long-term Groundwater Monitoring Report, dated July 2018.

Table I-2: Well Cluster 2 Radiological Monitoring Results[13]

EW-111								
Sample Date	Gross Alpha (pCi/L)		Gross Beta (pCi/L)		Radium-228 (pCi/L)		Thorium-232 (pCi/L)	
Baseline Min	<2.06		18.3		<0.411		<0.108	
Baseline Max	<6.83		39.4		<0.854		<0.619	
Baseline Avg	2.06		31		0.37		0.13	
Standard Deviation	0.71		6.4		0.16		0.21	
Trigger Level	3.48		43.7		0.68		0.28	
Baseline Data	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
5/5/05	<5.08	<7.39	20.3	23.1	<0.721	<0.839	<0.243	<0.159
9/14/05	<2.06	<3.23	38.2	37.7	<0.772	<0.497	<0.248	<0.192
3/2/06	<6.05	<2.76	32.5	28.4	<0.672	<0.71	<0.554	<0.281
3/2/06 - DUP	<3.57	3.83 J	30.4	29.8	<0.652	<0.609	<0.145	<0.187
5/4/06	<6.83	<2.84	39.4	32.4	<0.534	<0.611	<0.619	<0.270
8/8/06	<5.20	<2.70	33.4	20.7	<0.421	<0.544	<0.247	<0.211
8/8/06 - DUP	<2.66	<3.22	25.1	23.9	<0.411	<0.470	<0.198	<0.251
11/20/06	<2.29	<2.78	<2.85	<2.57	0.672 J	<0.442	<0.184	<0.182
11/20/06 - DUP	<2.80	<2.74	3.54 J	<3.76	0.629 J	<0.435	<0.327	<0.207
2/13/07	<4.26	<4.74	35.8	33.2	<0.854	<0.555	<0.230	<0.183
2/13/07 - DUP	<4.94	<3.13	38.7	29.9	0.862 J	<0.715	<0.236	<0.153
5/8/07	<3.07	<3.00	30.5	32.5 J	<0.597	<0.626	<0.156	<0.198
8/20/07	<4.79	<4.88	25.7	26 J	<0.594	<0.625	<0.295	<0.222
8/20/07 - DUP	<4.79	<4.81	30.3	34.1 J	<0.625	<0.658	<0.187	<0.217
11/16/07	<3.52	<3.30	32.1	30.9	<0.812	<0.650	<0.108	<0.268
2/12/08	-	-	34.1	33.8	-	-	-	-
2/12/08 - DUP	-	-	18.3 J	25.9 J	-	-	-	-
Monitoring Data								
2/12/08	<3	<3	-	-	<0.476	0.393 J	***<0.525***	<0.537
2/12/08 - DUP	<3	<3	-	-	<0.504	<0.554	***<0.393***	<0.437
5/23/08	<3	<3	**48.4**	57.3	<0.624	0.929 J	***<0.633***	<0.429
8/12/08	***<4.49***	<6.50	32.8	39.4	<0.629	<0.767	<0.217	<0.535
8/12/08 (DUP)	***<8.48***	<5.24	30	33	<0.609	<0.578	***<0.343***	<0.432
11/25/08	<3	<3	29.4	31.3	***0.785 J***	<0.570	***<0.360***	<0.663
5/15/09	***<3.94***	<4.41	32.9	32.6	***1.44 J***	1.86 J	***<0.459***	<0.414
11/17/09	***<3.64***	<4.96	34.1	24.7	***<1.26***	1.86 J	***<0.466***	<0.408
5/3/10	***<5***	<5	27.2	31.8	***<3***	<3	***<1***	<1
11/5/10	***<5***	<5	14.6	16.2	***<3***	<3	***<1***	<1
5/24/11	***<5***	<5	35.2	38.7	***<3***	<3	***<1***	<1
11/16/11	***<5***	<5	21.4 B	15.7 B	***<3***	<3	***<1***	<1
5/30/12	<0.408	<0.54	25.8	28.2	<0.315	<0.452	<0.048	<0.099
11/15/12	<1.25	<1.58	26.7	27.8	<0.655	<0.585	<0.095	<0.106
5/8/2013	<0.995	<0.894	26.3	24.8	***<0.740***	<0.752	<0.126	<0.125
11/6/2013	<2.83	<2.99	33.8	33.3	***<0.872***	<0.9	<0.094	<0.083
5/13/2014	<2.78	<2.56	21.2 J	24.1 J	<0.630	<0.696	<0.217	<0.235
11/19/2014	<2.93	<2.84	24.8	24.7	<0.598	<0.622	<0.143	<0.138
5/14/2015	2.05	<1.95	18.2	17.7	***<0.749***	<0.668	<0.096	<0.059
11/12/2015	<2.92	<2.94	24.4	26.3	**0.882**	0.651	<0.112	<0.045
5/11/2016	<2.95	<2.99	26.4	27.8	***<0.787***	<0.734	<0.168	<0.14
11/9/2016	***<4.01***	<3.89	33.9	26.9	***<0.812***	<1.07	<0.164	<0.195
5/17/2017	***<5.79***	<5.04	17	26.2	<0.624	<0.742	<0.141	<0.158
11/8/2017	***<6.96***	<10.5	23.6	13.4	***<0.962***	<0.89	<0.185	<0.13
5/9/2018	<1.05	<0.996	24.7	24.4	**0.898**	**0.851 B**	<0	<0
11/14/2018	<2.55	<2.19	24.6	23	<0.413	**0.886**	<0.02	<0.018

Notes

x.xx Value exceeds the established Trigger Level

xxx Detection limit above Trigger Level

< = Parameter not detected at stated reporting limit.

B - Analyte concentration is not significantly greater than detected in an associated method blank

J - Estimated value; result falls between the method detection limit (MDL) and the practical quantitation limit (PQL)

Concentration is reported as "<" MDL when the raw result is qualified with a "U"

Shaded area indicates outlier value, not used in calculations

1/2 Detection limit used in calculation of Baseline Average and Trigger Level

Trigger Level is established as the baseline average plus 2 standard deviations

[13] *Source:* Appendix B-3, 2018 Long-term Groundwater Monitoring Report, dated November 2019.

SM-3								
Sample Date	**Gross Alpha (pCi/L)**		**Gross Beta (pCi/L)**		**Radium-228 (pCi/L)**		**Thorium-232 (pCi/L)**	
Baseline Min	<0.690		5.85		<0.260		<0.075	
Baseline Max	<2		12		<1.0		0.64	
Baseline Average	0.762		8.87		0.332		0.125	
Standard Deviation	0.254		1.69		0.139		0.131	
Trigger Level	**1.269**		**12.24**		**0.61**		**0.387**	
Monitoring Data	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
5/3/10	***<5***	<5	5.23	5.64	***<3***	<3	***<1***	<1
5/3/10 - DUP	***<5***	<5	7.63	4.6 J	***<3***	<3	***<1***	<1
11/5/10	***<5***	<5	3.96 J	6.13	***<3***	<3	***<1***	<1
11/5/10 - DUP	***<5***	<5	<5	<5	***2.35 J***	<3	***<1***	<1
5/24/11	***<5***	<5	5.18	6.52	<3	<3	***<1***	<1
11/16/11	***<5***	<5	4.65 B	6.82 B	<3	<3	***<1***	<1
11/16/2011 - DUP	***<5***	<5	4.2 B	5.25 B	**1.8 B**	1.57 B	***<1***	<1
5/30/12	<0.959	<0.951	4.04	4.16	<0.363	0.432	<0.053	<0.046
5/30/2012 - DUP	<0.889	<0.582	2.67	<0.597	<0.4	0.468	<0.053	<0.086
11/15/12	<0.697	<0.779	3.72	3.45	<0.603	<0.604	<0.106	<0.063
11/15/12 - DUP	<0.668	<0.866	2.76	3.08	<0.592	<0.605	<0.166	<0.111
5/8/2013	***<1.91***	<2.91	5.54	4.14	***<0.792***	<0.725	<0.065	<0.071
5/8/2013 - DUP	***<2.79***	<1.71	4.02	4.09	***<0.702***	<0.752	<0.131	<0.156
11/6/2013	***<2.46***	<2.76	3.37	3.18	<0.502	<0.604	<0.072	<0.112
11/6/13 - DUP	***<2.79***	<2.97	3.4	<1.80	***<0.699***	<0.62	<0.070	<0.110
5/13/2014	**<2.95**	<2.20	3.28	4.30	**<0.718**	<0.685	<0.112	<0.063
5/13/14 - DUP	**<2.98**	<2.02	5.04	3.90	**<0.828**	<0.611	<0.138	<0.126
11/19/2014	<1.11	<1.20	3.07	2.54	<0.556	1.01	<0.162	<0.119
11/19/14 - DUP	<0.905	<1.06	2.85	2.88	<0.535	<0.553	<0.082	<0.101
5/14/2015	<0.687	<0.827	5.15 J	5.06	<0.808	<0.651	<0.064	<0.018
5/14/15 - DUP	**<2.89**	<2.36	4.04 J	4.21	<0.891	<0.692	<0.094	<0.135
11/12/2015	**<2.32**	<2.75	3.96	1.68	<0.60	1.1	<0.08	<0.066
11/12/15 - DUP	**<2.33**	<2.26	2.74	3.29	**0.641**	0.921	<0.03	<0.028
5/11/2016	***<2.05***	<1.62	5.24	3.75	<0.548	<0.66	<0.125	<0.159
5/11/2016 - DUP	***<1.83***	<1.81	4.46	3.83	<0.576	<0.614	<0.105	<0.161
11/9/2016	***<2.59***	<2.87	2.96	3.65	***<1.01***	<0.654	<0.14	<0.151
11/9/2016 - DUP	***<2.94***	<2.85	3.29	2.97	***<0.742***	<0.779	<0.142	0.078
5/17/2017	***<1.68***	<1.58	3.82	3.46	<0.542	<0.793	<0.184	<0.161
5/17/2017 -DUP	***<1.61***	<2.94	6.39	<3.14	***<0.658***	<0.642	<0.158	<0.14
11/8/2017	***<1.91***	<1.87	4.53	2.67	***<0.954***	<0.854	<0.081	<0.077
11/8/2017 - DUP	***<1.84***	<2.89	3.35	6.29	***<0.809***	<0.834	<0.134	<0.177
5/9/2018	<0.009	<0.014	4.75	4.09	**1.06**	<0.287	<0.017	<-0.006
5/9/2018 - DUP	<0.138	<0.214	4.77	4.47	<0.219	<0.268	<-0.006	<-0.006
11/14/2018	<0.212	0.931	2.57	2.55	<0.312	<0.266	0.034	0.038 B
11/14/2018 - DUP	<0.535	<-0.355	2.55	2.81	<0.359	<0.314	0.042	<0.025

Notes

x.xx Value exceeds the established Trigger Level

xxx Detection limit above Trigger Level

< = Parameter not detected at stated reporting limit.

B - Analyte concentration is not significantly greater than detected in an associated method blank

J - Estimated value; result falls between the method detection limit (MDL) and the practical quantitation limit (PQL)

Concentration is reported as "<" MDL when the raw result is qualified with a "U"

1/2 Detection limit used in calculation of Baseline Average and Trigger Level

Trigger Level is established as the baseline average plus 2 standard deviations

RDMW-33C								
Sample Date	**Gross Alpha (pCi/L)**		**Gross Beta (pCi/L)**		**Radium-228 (pCi/L)**		**Thorium-232 (pCi/L)**	
Baseline Min	0.847		2.47		0.608		<0.0972	
Baseline Max	39.2		21.4		3.58		<0.320	
Baseline Average	9.39		9.06		1.42		0.1	
Standard Deviation	12.84		6.39		0.84		0.035	
Trigger Level	**35.06**		**21.84**		**3.10**		**0.17**	
Baseline Data	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**	**Total**	**Dissolved**
5/30/97	1.29	-	2.47	-	0.88	-	0.056	-
11/21/97	0.847	-	<2.75	-	0.608	-	<0.0972	-
5/27/98	1.21	-	3.91	-	0.77	-	<0.214	-
11/18/98	3	-	8.46	-	1.19	-	<0.175	-
5/28/99	12.5	-	9.12	-	1.15	-	<0.226	-
11/4/99	<1.82	-	15	-	1.31	-	<0.222	-
5/31/00	<1.88	-	4.71	-	1.32	-	<0.215	-
12/7/00	10.7	-	9.42	-	1.55	-	<0.320	-
5/21/01	23.3	-	14.7	-	3.58	-	<0.229	-
11/27/01	39.2	-	21.4	-	1.80 J	-	<0.260	-
Monitoring Data								
5/22/02	6.62	-	5.47	-	3.07	-	***<0.328***	-
11/25/02	**53**	-	**32.1**	-	2.05 J	-	***<0.381***	-
5/28/03	11.5	-	8.54	-	1.18	-	**1.17**	-
11/25/03	4.9 J	<2.23	<4.04	4.72 J	2.55 J	1.99 J	***<0.423***	<0.396
5/20/04	3.57 J	2.05	3.62 J	4.26 J	2.56 B	1.54 B	<0.0404	-0.0134
12/8/04	3.3 J	<3.08	3.63 J	<2.44	1.92	0.916 J	0.090 J	<0.717
5/5/05	5.49	6.88	<7.85	<6.58	2.6 B	1.7 B	***<0.329***	<0.249
9/12/05	<3.59	<2.28	<4.57	<4.28	1.52	1.59	***<0.346***	<0.110
5/4/06	2.11	<2.87	5.76	7.86	1.09	1.31	***<0.507***	<0.250
12/5/06	<4.26	<3.28	5.28	3.27 J	<0.798	<0.791	***<0.178***	<0.239
5/8/07	1.52 J	2.66 J	6.99	3.14 J	1.81	1.49	<0.124	<0.232
11/16/07	<1.17	1.21 J	3.8 J	4.08 J	2.39	1.4	***<0.279***	<0.208
5/27/08	3.42	13.1	4.95	7.45	1.99	1.82	<0.167	<0.092
11/25/08	18.5	<2.17	15.1	3.72 J	**3.31**	1.67	***<0.449***	<0.523
5/15/09	**42.3**	3.96 J	21.3	9.24	**3.31**	3.45 J	***<0.242***	<0.339
11/17/09	5.3	<4.7	6.1	5.21	2.99 J	<1.93	***<0.443***	<0.260
5/3/10	14.4	2.45 J	13.5	4.64 J	2.68 J	<3	***<1***	<1
11/5/10	23	<5	13.6	<5	1.89 J	1.91 J	***<1***	<1
5/24/11	<5	<5	<5	<5	<3	2.67 B	**<1**	<1
11/16/11	17.7 B	<5	9.66 B	6.21 B	**3.38 B**	<3	**<1**	<1
5/30/12	7.78	3.81	2.93	2.1	2.26	0.5	<0.044	<0.05
11/13/12	5.26	3.3	5.27	3.35	1.72	1.97	***<0.281***	<0.071
5/8/13	8.49	6.76	5.54	3.95	1.94	1.02	<0.125	<0.069
11/6/13	**202**	6	**43.8**	5.3	1.89	1.28	0.113	<0.138
5/13/14	15.9	6.12	5.17	5.25	1.59	1.10	<0.113	<0.119
11/19/14	4.03	<1.06	3.54	2.75	2.37	<0.620	<0.116	<0.127
5/14/15	8.82	2.21	6.54	2.03	2.02	1.51	<0.019	<0.017
11/12/15	10.1	1.26	6.89	3.78	**4.18**	1.61	<0.08	<0.072
05/11/2016	3.28	3.77	4.42	4.00	1.87	1.89	<0.113	<0.125
11/09/2016	2.32	<1.78	5.30	4.70	1.10	1.11	<0.075	<0.131
05/17/2017	**71.30**	0.13	**22.30**	2.86	**4.68**	1.82	<0.129	<0.147
11/08/2017	16.60	5.37	8.16	6.41	2.30	1.21	<0.154	<0.125
05/09/2018	4.69	<-0.48	5.06	3.16	2.43	2.01	<0.017	<0.007
11/13/2018	12.80	5.75	4.78	3.27	1.67	1.87	0.046 B	0.036

Notes

x.xx Value exceeds the established Trigger Level

xxx Detection limit above Trigger Level

< = Parameter not detected at stated reporting limit.

B - Analyte concentration is not significantly greater than detected in an associated method blank

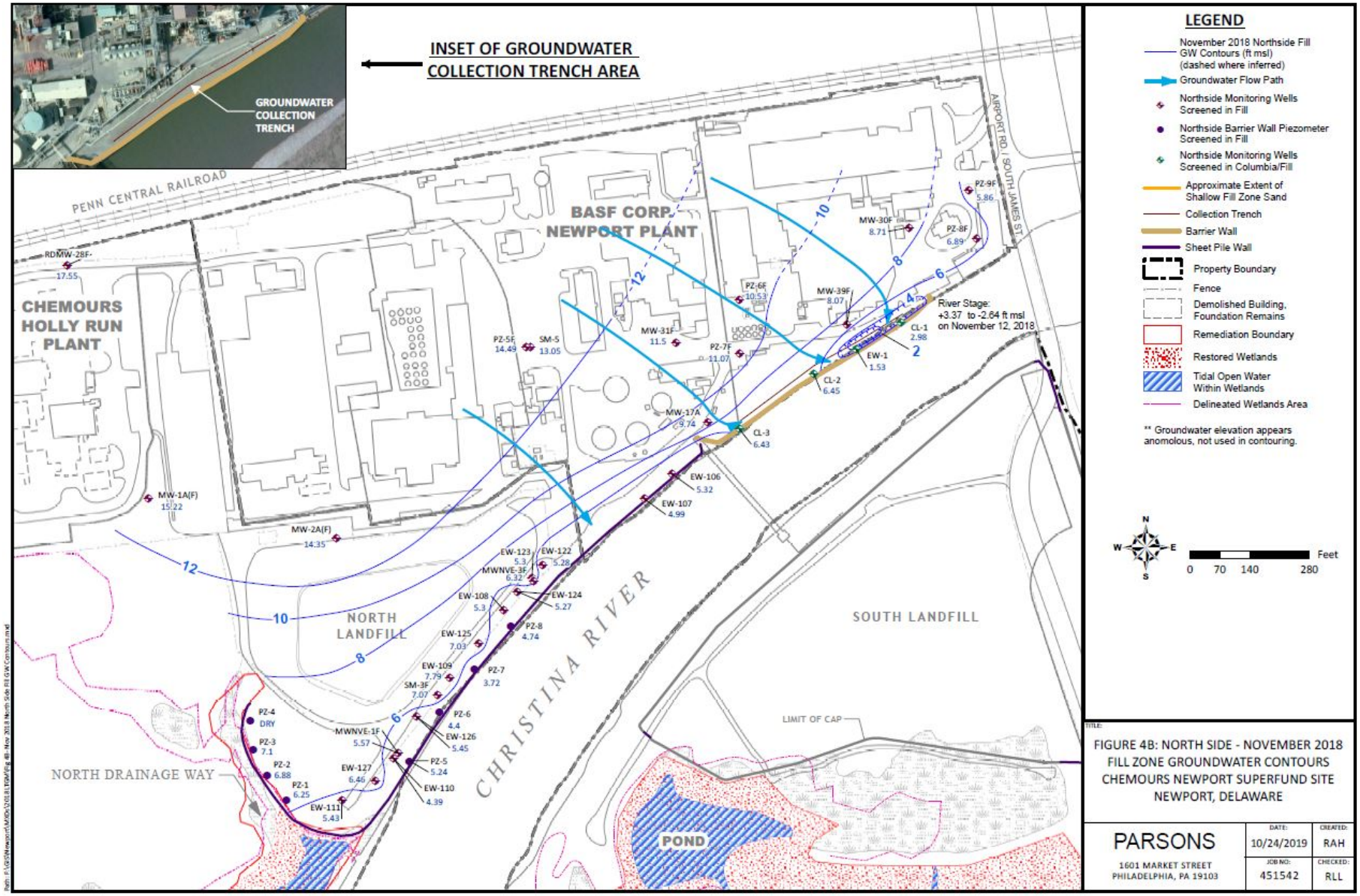
J - Estimated value; result falls between the method detection limit (MDL) and the practical quantitation limit (PQL)

Concentration is reported as "<" MDL when the raw result is qualified with a "U"

1/2 Detection limit used in calculation of Baseline Average and Trigger Level

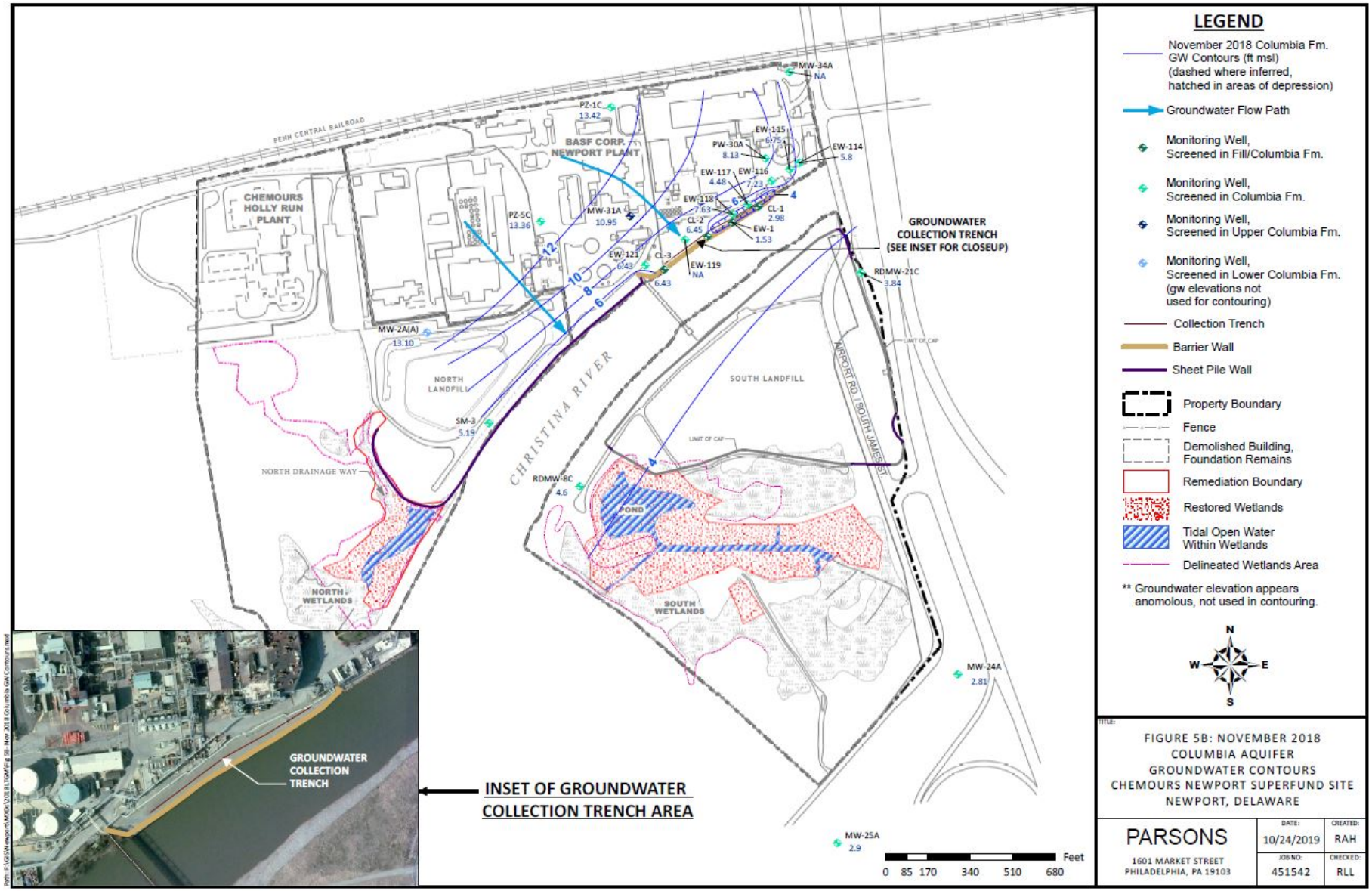
Trigger Level is established as the baseline average plus 2 standard deviations

Figure I-2: North Side Fill Zone Groundwater Contours – November 2018[14]



[14] *Source:* Figure 4B, 2018 Long-term Groundwater Monitoring Report, dated November 2019.

Figure I-3: Columbia Aquifer Groundwater Contours – November 2018[15]



[15] *Source:* Figure 5B, 2018 Long-term Groundwater Monitoring Report, dated November 2019.

Figure I-4: North Landfill Hydrograph

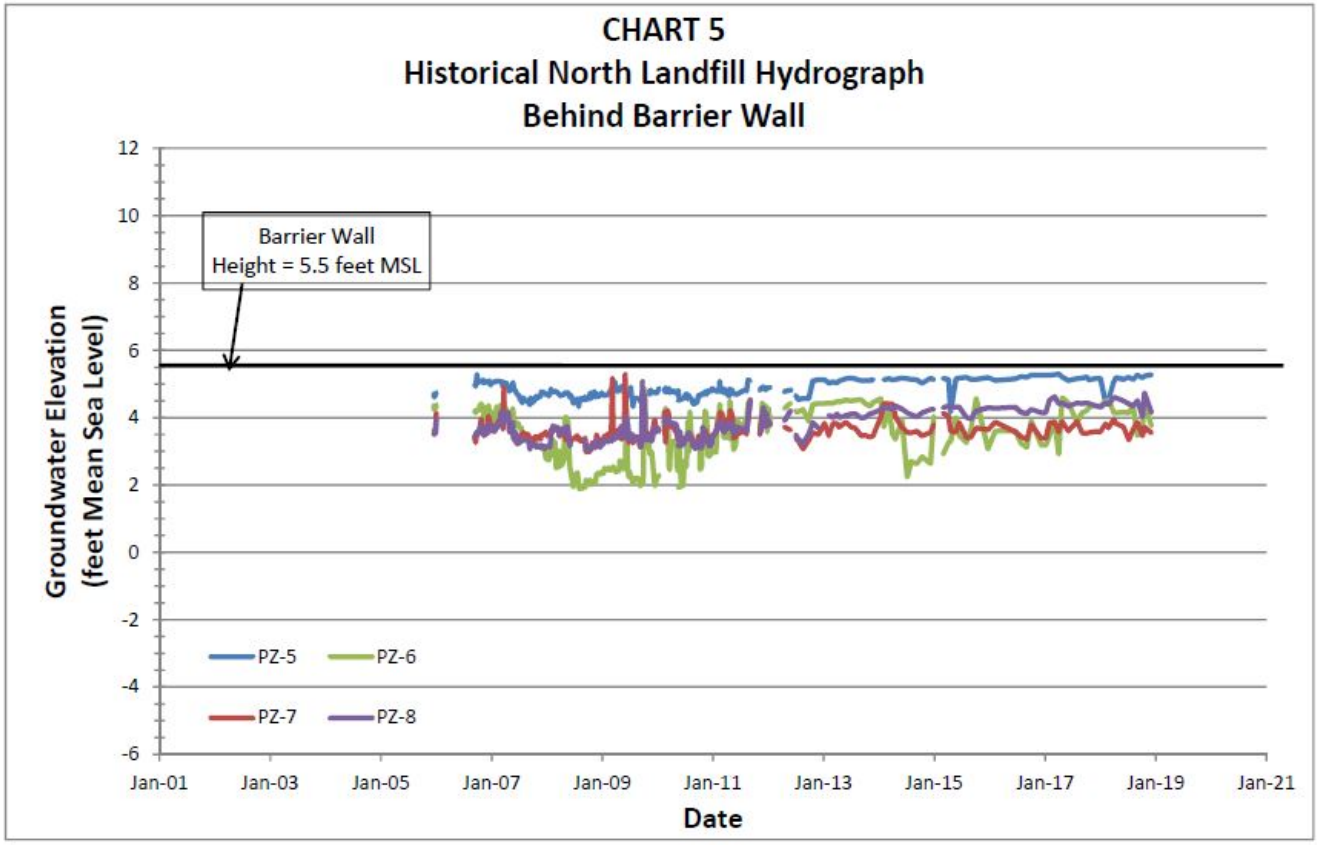


Figure I-5: North Landfill Hydrograph – Behind Knee Wall

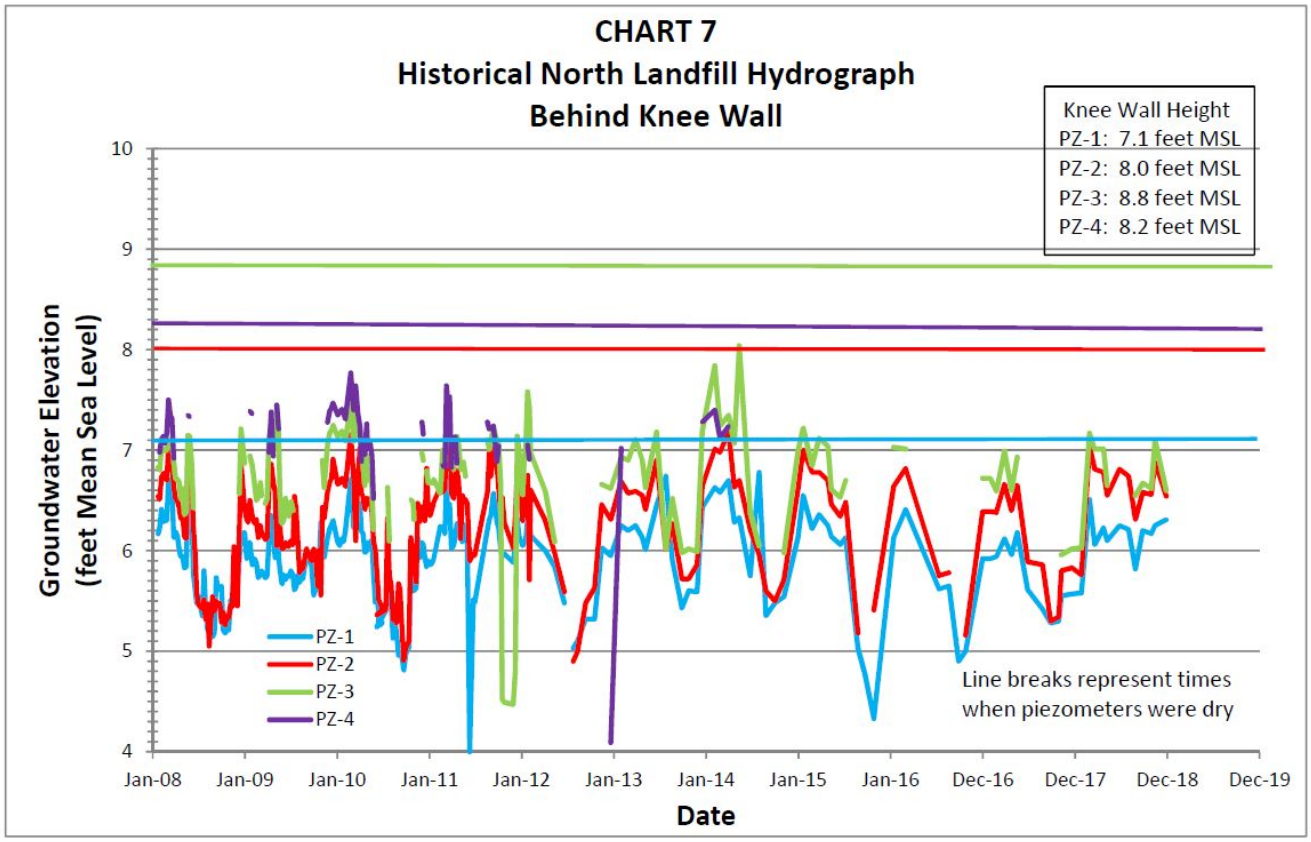


Table I-3: Trench Monitoring Results[16]

Appendix C-3 Data Tables
Trench Monitoring
Long-Term GW Monitoring
Newport Superfund Site, Newport, Delaware

Well ID	EW-114	Metals (ug/L)									VOCs (ug/L)		
Date	Sample Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	PCE	TCE	Vinyl Chloride
Screening Criteria: DNREC Surface Water Quality Dissolved Standards, Freshwater Chronic-2017		150	7800(1)	0.273*	NE	15.46*	2.96*	1000(1)	59.0*	134*	NE	NE	NE
Trigger Level	**Dissolved**	**6.5**	**165**	**1.6**	**5.2**	**10.1**	**7.0**	**72.4**	**246**	**96.7**	**NE**	**NE**	**NE**
Baseline Data													
10/14/99	Dissolved	<10	120	<1.7	<5.5	NS	<1.9	NS	5.7J	61	NS	NS	NS
9/27/04	Dissolved	<4.7	76.3	<0.76	4.9 J	10.5	<10	21	12	103	NS	NS	NS
11/22/04	Dissolved	<4.7	102	<0.76	5.4 B	12.2 B	<10	40.4	52.3	80.1	NS	NS	NS
5/5/05	Dissolved	<9.3	87	<0.97	4.0 JB	6.4 J	<8.4	29.5	28.4	67.6 B	NS	NS	NS
9/14/05	Dissolved	<9.3	89.8	<0.97	2.6 J	6.7 B	<8.4	33.4	48.5	65.4 B	NS	NS	NS
5/4/06	Dissolved	<9.3	89.5	<0.97	2.4 J	4.8 J	<8.4	30.3	31.5	52.6	NS	NS	NS
11/21/06	Dissolved	<10	78.9	1.7 J	3.7 J	4.7 J	<6.9	28.3	14.8	51.3	NS	NS	NS
5/3/07	Dissolved	<10	85.2	<0.91 R	3.2 J	4.3 J	0.085 J	28.9	32.1	52.6	NS	NS	NS
11/16/07	Dissolved	<10	186	<0.9	4 J	3.8 J	<0.047	80.6	322	65.8	NS	NS	NS
5/22/08	Dissolved	<10.2	90.5	<2	2.7 J	<2.7	<0.05	31.9	34.2	52.4	NS	NS	NS
11/25/08	Dissolved			<2 J	4.7 J	6.1 J		53.1		63.9			
5/14/09	Dissolved				3.4 J	6.9 J				51.8			
11/17/09	Dissolved					4.1							
Monitoring Data													
11/25/08	Dissolved	***<10***	109				0.2 J		134		NS	NS	NS
5/14/09	Dissolved	***<10***	84.8	***<2 J***			0.15 J	31.9	34.3		NS	NS	NS
11/17/09	Dissolved	***<7.2***	94.6	0.64	<2.1		0.18	2.8	26.3	***1610***	NS	NS	NS
5/4/10	Dissolved	***<7.2***	90	0.61	<2.1	<2.7	0.95 B	5 J	21.8	***1560***	NS	NS	NS
11/1/10	Dissolved	***<9.8***	128	0.53	<2.3	<2.7	0.087 B	23.8	30.2	***1220***	NS	NS	NS
5/24/11	Dissolved	***<9.8***	84.7	0.21 J	3.5 J	4.1 J	0.28 B	24.6	15.2	***97.5***	NS	NS	NS
11/8/11	Dissolved	<5.1	76.6	0.32 J	3.8 J	9.4 J	0.21 J	35.9	25.7	43.9 J	NS	NS	NS
5/24/12	Dissolved	<5.1	76.7	<0.2	3.9 J	8.3 J	0.16 J	34.0	13.8	35.3	NS	NS	NS
11/14/12	Dissolved	***<6.8***	75.1	0.19 J	3.8 J	8.5 J	0.085 J	34.7	8.9 J	33.7	NS	NS	NS
5/7/13	Dissolved	***<6.8***	90.8	<0.23	4.0 J	7.4 J	0.098 J	36.6	22.3	36	NS	NS	NS
11/5/13	Dissolved	***<6.8***	87	<0.23	3.5 J	9.4 J	0.12 J	38	29.5 J	45.7	NS	NS	NS
5/13/2014	Dissolved	***<6.8***	86	<0.23	3.9 J	8.4 J	0.16 J	36.8	18.6	35.6	NS	NS	NS
11/18/2014	Dissolved	***<7.2***	73.8	0.19 J	2.9 J	7.6 J	<0.082	22.2 J	10.4	28.9	NS	NS	NS
5/12/2015	Dissolved	***<7.2***	88.1 J	0.17 J	3.8 J	***10.4***	0.17 J	38.8 J	20.4	36.8	NS	NS	NS
11/9/2015	Dissolved	***<7***	81.7	<0.23	4.6 J	9.4 J	<0.13	37.8	9.6 J	29	NS	NS	NS
5/10/2016	Dissolved	***<7.8***	89.3	0.32 J	4.5 B	***12.1 J***	<0.13	38.1	21.0	42.8 J	NS	NS	NS
11/8/2016	Dissolved	***<9.7***	81.3	<0.19	4.1 J	***12.5***	0.12 J	34.8	10.5	26.2	NS	NS	NS
5/16/2017	Dissolved	***<9.7***	92.8	0.2 J	4.6 J	***12.4***	0.1 J	42	28.6	38.7	NS	NS	NS
11/8/2017	Dissolved	***<9.6***	84.8	<0.15	4.5 J	9.1 J	<0.11	39.1	12.7	29.1	NS	NS	NS
5/8/2018	Dissolved	***<9.6***	95.4	0.24 J	4.9 J	7.4 J	0.16 J	40.5	26.5	32.6	NS	NS	NS
11/13/2018	Dissolved	***<16***	90.3	<0.15	2.7 J	10 J	<1.1	27.1	13.2	29.4	NS	NS	NS

[16] *Source:* 2018 Long-term Groundwater Monitoring Report, dated November 2019.

Appendix C-3 Data Tables
Trench Monitoring
Long-Term GW Monitoring
Newport Superfund Site, Newport, Delaware

Well ID	EW-114	Metals (ug/L)									VOCs (ug/L)		
Date	Sample Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	PCE	TCE	Vinyl Chloride
Screening Criteria: DNREC Surface Water Quality Dissolved Standards, Freshwater Chronic-2017		150	7800(1)	0.273*	NE	15.46*	2.96*	1000(1)	59.0*	134*	NE	NE	NE
Trigger Level	**Dissolved**	**6.5**	**165**	**1.6**	**5.2**	**10.1**	**7.0**	**72.4**	**246**	**96.7**	**NE**	**NE**	**NE**
Baseline Data													
10/14/99	Total	<10	150	<1.7	<5.5	NS	<1.9	NS	8.2 J	69	NS	NS	NS
9/27/04	Total	<4.7	79	<0.76	3.7 J	8.5 J	<10	26.3	13.2	101	<1	6	<2
11/22/04	Total	6.0 J	123	<0.76	6.9 B	11.7 B	<10	55.4	103	85.7	<1	5 J	<2
5/5/05	Total	<9.3	88.3	<0.97	4.5 JB	8.1 J	<8.4	31.6	30.3	65.3 B	<1	5 J	<2
9/14/05	Total	<9.3	88.3	<0.97	3.7 J	9.9 B	<8.4	35.5	53	62.1 B	<1	5	<2
5/4/06	Total	<9.3	87.9	<0.97	2.5 J	5.2 J	<8.4	30.2	32.2	51.2	<1	4 J	<2
11/21/06	Total	<10	76.1	<0.91	4.7 J	5.6 J	<6.9	29	14	47.5	<1	4 J	<2
5/3/07	Total	<10	89.2	<0.91 R	3.3 J	6 J	0.28 J	30.6	33	55.1	<1	3 J	<2
11/16/07	Total	<10	187	<0.9	4.6 J	5.7 J	0.28 J	80.8	325	67.6	<1	4 J	<2
5/22/08	Total	<10.2	94	<2	2.5 J	<2.7	0.44 J	30.6	34.2	52.7	<1	3 J	<2
Monitoring Data													
11/25/08	Total	***<10***	109	***<2 J***	5.1	6.9 J	0.33 J	50.5	125	64.9	<1	4 J	<2
5/14/09	Total	***<10***	90	***<2***	3.2 J	6.6 J	0.21 J	***78.8***	33.6	55.3	<1	3 J	<2
11/17/2009**	Total	***<7.2***	105	0.87	***43.8***	4.9	4.8	***601***	33.1	***1700***	<1	3	<2
5/4/2010**	Total	***<7.2***	104	0.95	***10.4***	4.6 J	4 J	***115 J***	28.5	***1750***	<1	3 J	<2
11/1/2010**	Total	***<9.8***	137	0.6	***6.5***	3.3 J	1.8	***89.2***	33.8	***1330***	<1	2 J	<2
5/24/11	Total	***<9.8***	83.6	0.29 J	3.4 J	4.5 J	0.5 B	25	14.5	95.2	<1	4 J	<2
11/8/11	Total	<5.1	77.4	0.35 J	3.9 J	8.3 J	0.17 J	35.6	24.6	40.3 J	<1	4 J	<2
5/24/12	Total	<5.1	77.9	<0.2	3.8 J	7.2 J	0.17 J	33.7	12.4	32.6	<1	4 J	<2
11/14/12	Total	<6.8	75.6	0.81	3.5 J	7.1 J	0.087 J	35.2	8.6 J	34.1	<1	3 J	<2
5/7/13	Total	<6.8	94.1	0.23 J	4.2 J	6.7 J	0.13 J	36.9	21.9	35	<1	3 J	<2
11/5/13	Total	<6.8	88.5	<0.23	3.5 J	7.7 J	0.13 J	36.7	25.7 J	45	<1	3 J	<2
5/13/2014	Total	<6.8	87.5	0.26 J	3.8 J	6.5 J	0.23 J	37.1	18.7	36.1	<1	3 J	<2
11/18/2014	Total	***<7.2***	72.9	0.17 J	2.7 J	7.3 J	0.088 J	20.0 J	10.1	27.3	<1	2 J	<2
5/12/2015	Total	***<7.2***	88.4 J	0.21 J	3.7 J	8.4 J	0.14 J	40 J	20.6	38	<1	2 J	<2
11/9/2015	Total	***<7***	81.6	<0.23	4.5 J	8.9 J	<0.13	37.4	9.1 J	28	<1	2 J	<2
5/10/2016	Total	***<7.8***	88.2	<0.20	4.7 B	8.3 J	<0.13	37.8	19.1	36.0 J	<0.5	2	<0.5
11/8/2016	Total	***<9.7***	83.2	<0.19	4.2 J	9.3 J	<0.090	35.7	10.4	26.3	<0.5	2	<0.5
5/16/2017	Total	***<9.7***	92.8	0.25 J	5	9.9 J	0.26 J	50.9	27.6	35.6	<0.5	2	<0.5
11/8/2017	Total	***<9.6***	84.8	0.23 J	4.9 J	9.6 J	<0.11	39.5	11.2	30	<0.5	2	<0.5
5/8/2018	Total	***<9.6***	95.9	0.2 J	***5.3***	7.8 J	0.83 J	40.7	25.3	32.5	<0.5	2	<0.5
11/13/2018	Total	***<16***	90.8	0.28 J	4 J	9 J	<1.1	29.7	11.9	27.5	0.2 J	2	<0.3

Notes

Shaded area indicates concentration exceeds the screening criteria for 201 dissolved results only.
Sampling event not used in trigger level calculation.

Bold and italics indicates that the sample result exceeds the calculated trigger level.

< = Parameter not detected at stated reporting limit

J - Estimated value. Result falls between the method detection limit (MDL) and the practical quantitation limit (PQL).

B - Analyte concentration is not significantlDissolvedgreater than detected in an associated method blank.

NS - Not Sampled, NE - No Criteria Established, R - Unusable Result

(1) - Criteria is Performance Standard

* Calculated based on hardness (as CaCO3) of 116 mg/L.

** Results from these events are believed to be associated with adjacent monitoring well PZ-8F instead of EW-114; data is considered suspect.

Appendix C-3 Data Tables
Trench Monitoring
Long-Term GW Monitoring
Newport Superfund Site, Newport, Delaware

Well ID	EW-115	Metals (ug/L)									VOCs (ug/L)		
Date	Sample Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	PCE	TCE	Vinyl Chloride
Screening Criteria: DNREC Surface Water Quality Standards, Freshwater Chronic-2017		150	7800(1)	0.273*	NE	15.46*	2.96*	1000(1)	59.0*	134*	NE	NE	NE
Trigger Level	**Dissolved**	**8.0**	**363**	**1.0**	**6.9**	**9.2**	**7.1**	**99.4**	**88.8**	**34.9**	**NE**	**NE**	**NE**
Baseline Data													
10/11/99	Dissolved	<1.0	460	<1.7	6.8 J	NS	<1.9	NS	<5.4	20.8 J	NS	NS	NS
9/27/04	Dissolved	7.1 J	86.9	<0.76	5.1	5.4 J	<10	48	6.0 J	26.8 B	NS	NS	NS
11/22/04	Dissolved	<4.7	127	<0.76	9.1 B	9.6 JB	<10	106	107	44.8 B	NS	NS	NS
5/5/05	Dissolved	<9.3	121	<0.76	5.7 B	6.2 J	<8.4	70.7	50.8	23.2 B	NS	NS	NS
9/14/2005	Dissolved	<9.3	60.7	<0.76	4.3 J	5.3 B	<8.4	69.2	14.8	24.8 B	NS	NS	NS
5/4/06	Dissolved	<9.3	59.7	<0.97	3.9 J	5.2 J	<8.4	67.5	10.0 J	19.3	NS	NS	NS
11/21/06	Dissolved	<10.0	67.3	<0.91	5.0	3.5 J	<6.9	68.8	24.6	15.4 J	NS	NS	NS
5/3/07	Dissolved	<10.0	59.1	<0.91	5.8	5.8 J	<0.047	68.2	6.7 J	13 J	NS	NS	NS
11/16/07	Dissolved	<10.0	60.3	<0.9	5.7	6.3 J	<0.047	75.6	13.2	19.4 J	NS	NS	NS
5/22/08	Dissolved	<10.2	55	<2	3.4 J	<2.7	<0.05	60.8	8 J	14.4 J	NS	NS	NS
11/25/08	Dissolved				4.6 J	3.6 J		67.7		13 J			
5/14/09	Dissolved				4.7 J	4.3 J				10.8 J			
11/17/09	Dissolved					9				40.1			
5/4/10	Dissolved									16.1 J			
Monitoring Data													
11/25/08	Dissolved	***<10***	55.2	***<2 J***			0.08 J		10.1		NS	NS	NS
5/14/09	Dissolved	***<10***	53.5	***<2 J***			<0.05	60	9.5 J		NS	NS	NS
11/17/09	Dissolved	<7.2	57.7	<0.2	5		0.46	70.5	16.4		NS	NS	NS
5/4/10	Dissolved	<7.2	56.5	0.2 J	4.9 J	5.9 J	1.3 B	61.9	9.4 J		NS	NS	NS
11/1/10	Dissolved	***<9.8***	58.4	<0.2	4.6 J	6.8 J	0.17 B	63.9	11.7	18.5 J	NS	NS	NS
5/16/11	Dissolved	***<9.8***	59.5	0.21 J	4.8 J	3.2 J	0.15 J	64.2	9.7 J	14.7 J	NS	NS	NS
11/8/11	Dissolved	<5.1	58.2	<0.2	5.4	7.3 J	0.13 J	63.7	12.5	19 J	NS	NS	NS
5/24/12	Dissolved	<5.1	58.8	<0.2	5.5	5.6 J	<0.08	62.8	11.2	17.9 J	NS	NS	NS
11/14/12	Dissolved	<6.8	62.8	0.12 J	5.2	7.1 J	0.087 J	69.3	11	17.6 J	NS	NS	NS
5/7/13	Dissolved	<6.8	61.6	<0.23	5.7	4.7 J	0.10 J	62.4	10.9	15.9 J	NS	NS	NS
11/5/13	Dissolved	<6.8	62.3	<0.23	4.8 J	4.7 J	0.13 J	65.4	11.9	27.5	NS	NS	NS
5/13/2014	Dissolved	<6.8	64.5	<0.23	5.3	6.2 J	<0.085	65.4	12.4	19.7 J	NS	NS	NS
11/18/2014	Dissolved	<7.2	66.6	<0.17	4.8 J	3.8 J	0.084 J	52.6	18.0	17.7 J	NS	NS	NS
5/12/2015	Dissolved	<7.2	66.1 J	<0.17	5.1	6.5 J	<0.082	65.8 J	11.9	17.8 J	NS	NS	NS
5/10/2016	Dissolved	<7.8	71.7	<0.20	6.3	***10.6 J***	<0.13	66.3	11.9	24.7 J	NS	NS	NS
5/16/2017	Dissolved	***<9.7***	75.4	<0.19	6.3	***10.4***	<0.09	66.8	12.6	22.8	NS	NS	NS
11/8/2017	Dissolved	***<9.6***	98.3	<0.15	5.9	6.3 J	0.68 J	71.3	14.8	16.9 J	NS	NS	NS
5/8/2018	Dissolved	***<9.6***	76.8	<0.15	6.2	5.8 J	0.14 J	64.3	13.2	17.7 J	NS	NS	NS

Appendix C-3 Data Tables
Trench Monitoring
Long-Term GW Monitoring
Newport Superfund Site, Newport, Delaware

Well ID	EW-115	Metals (ug/L)									VOCs (ug/L)		
Date	Sample Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	PCE	TCE	Vinyl Chloride
Screening Criteria: DNREC Surface Water Quality Standards, Freshwater Chronic-2017		150	7800(1)	0.273*	NE	15.46*	2.96*	1000(1)	59.0*	134*	NE	NE	NE
Trigger Level	**Dissolved**	**8.0**	**363**	**1.0**	**6.9**	**9.2**	**7.1**	**99.4**	**88.8**	**34.9**	**NE**	**NE**	**NE**
Baseline Data													
10/11/99	Total	<1.0	500	<1.7	7.6 J	NS	<1.9	NS	<5.4	23.5 J	NS	NS	NS
9/27/04	Total	<4.7	87.3	0.81 J	4.4 J	4.7 J	<10	45.5	5.2 J	14.3 JB	2 J	6	<2
11/22/04	Total	<4.7	194	<0.76	10.3 B	16.1 B	<10	129	161	37.3 B	<1	5 J	<2
5/5/05	Total	<9.3	171	<0.97	7.2 B	12.2	<8.4	79.8	55.9	<26	<1	6	<2
9/14/2005	Total	<9.3	64	<0.97	4.5 J	11.7 B	<8.4	71	14.9	27.5 B	<1	6	<2
5/4/06	Total	<9.3	65.8	<0.97	4.3 J	10.9	<8.4	68.6	10.2	20.5	<1	4 J	<2
11/21/06	Total	<10.0	68.0	0.97 J	5.5	3.9 J	<6.9	68.8	27.1	14	<1	5	<2
5/3/07	Total	<10	54.3	<0.91 R	5.2	3.5 J	0.55 J	63.7	8.8 J	14.1 J	<1	5	<2
11/16/07	Total	<10	63.1	<0.9	<2.1	3.2 J	0.43 J	75.6	6.1 J	14.2 J	<1	5	<2
5/22/08	Total	<10.2	55.8	<2	4.9 J	<2.7	0.36 J	63.8	8.1 J	11.7 J	<1	3 J	<2
Monitoring Data													
11/25/08	Total	***<10***	56.4	***<2 J***	4.7 J	4.3 J	0.79 J	69	9.7 J	13.4 J	<1	5	<2
5/14/09	Total	***<10***	54.8	***<2***	4.9 J	6 J	0.26 J	62.6	9.3 J	11 J	<1	4 J	<2
11/17/09	Total	<7.2	59.6	<0.2	5.2	***11.1***	0.84	74.2	17.6	45.3	<1	4	<2
5/4/10	Total	<7.2	56.8	<0.2	4.9 J	6.2 J	1.5 B	61.8	9.4 J	14.1 J	<1	4 J	<2
11/1/10	Total	***<9.8***	63.4	<0.2	4.9 J	8.3 J	0.63 J	65.5	12.5	20.7	<1	4 J	<2
5/16/11	Total	***<9.8***	60.3	0.21 J	5	<2.7	0.09 J	65.1	9.9 J	14 J	<1	4 J	<2
11/8/11	Total	<5.1	60	0.21 J	5.5	4.9 J	0.24 J	66.6	11.8	14.9 J	<1	3 J	<2
5/24/12	Total	<5.1	60.7	<0.2	5.7	4.6 J	<0.08	64.7	10.2	14.4 J	<1	4 J	<2
11/14/12	Total	<6.8	61.8	0.25 J	5.3	5.7 J	0.13 J	6.66	11.6	15.4 J	<1	3 J	<2
5/7/13	Total	<6.8	62	<0.23	5.5	3.9 J	2.8	63.2	9.7 J	14.9 J	<1	3 J	<2
11/5/13	Total	<6.8	63.8	<0.23	5.4	4.7 J	0.11 J	69.5	11.9	18.6 J	<1	3 J	<2
5/13/2014	Total	<6.8	63.2	<0.23	5.6	3.9 J	0.25 J	66.5	11.0	16.0 J	<1	2 J	<3
11/18/2014	Total	<7.2	67.8	<0.17	5.8	5.4 J	0.66 J	60.2	17.5	19.2 J	<1	2 J	<2
5/12/2015	Total	<7.2	67 J	<0.17	5.4	6.1 J	0.11 J	65.5 J	11.5	18 J	<1	2 J	<2
5/10/2016	Total	<7.8	72.5	0.23 J	6.5	5.8 J	<0.13	66.9	11.6	16.0 J	<0.5	2	<0.5
5/16/2017	Total	***<9.7***	93.7	<0.19	5.9	6.8 J	0.99 J	69	13	18.2 J	<0.5	2	<0.5
11/8/2017	Total	***<9.6***	133	0.19 J	5.7	8.6 J	2	71.4	14.6	16.3 J	<0.5	2	<0.5
5/8/2018	Total	***<9.6***	78.5	0.22 J	6.1	<4	0.28 J	65.6	12.8	17.7 J	<0.5	2	<0.5

Notes

Shaded area indicates concentration exceeds the screening criteria for 2017 dissolved results only.
Sampling event not used in trigger level calculation.

Bold and italics indicates that the sample result exceeds the calculated trigger level.

< = Parameter not detected at stated reporting limit

J - Estimated value. Result falls between the method detection limit (MDL) and the practical quantitation limit (PQL).

B - Analyte concentration is not significantly greater than detected in an associated method blank.

NS - Not Sampled, NE - No Criteria Established, R - Unusable Result

(1) - Criteria is Performance Standard

* Calculated based on average hardness (as CaCO3) of 116 mg/L.

PCE - Tetrachloroethene, TCE - Trichloroethene

Figure I-6: BASF Plant Hydrograph

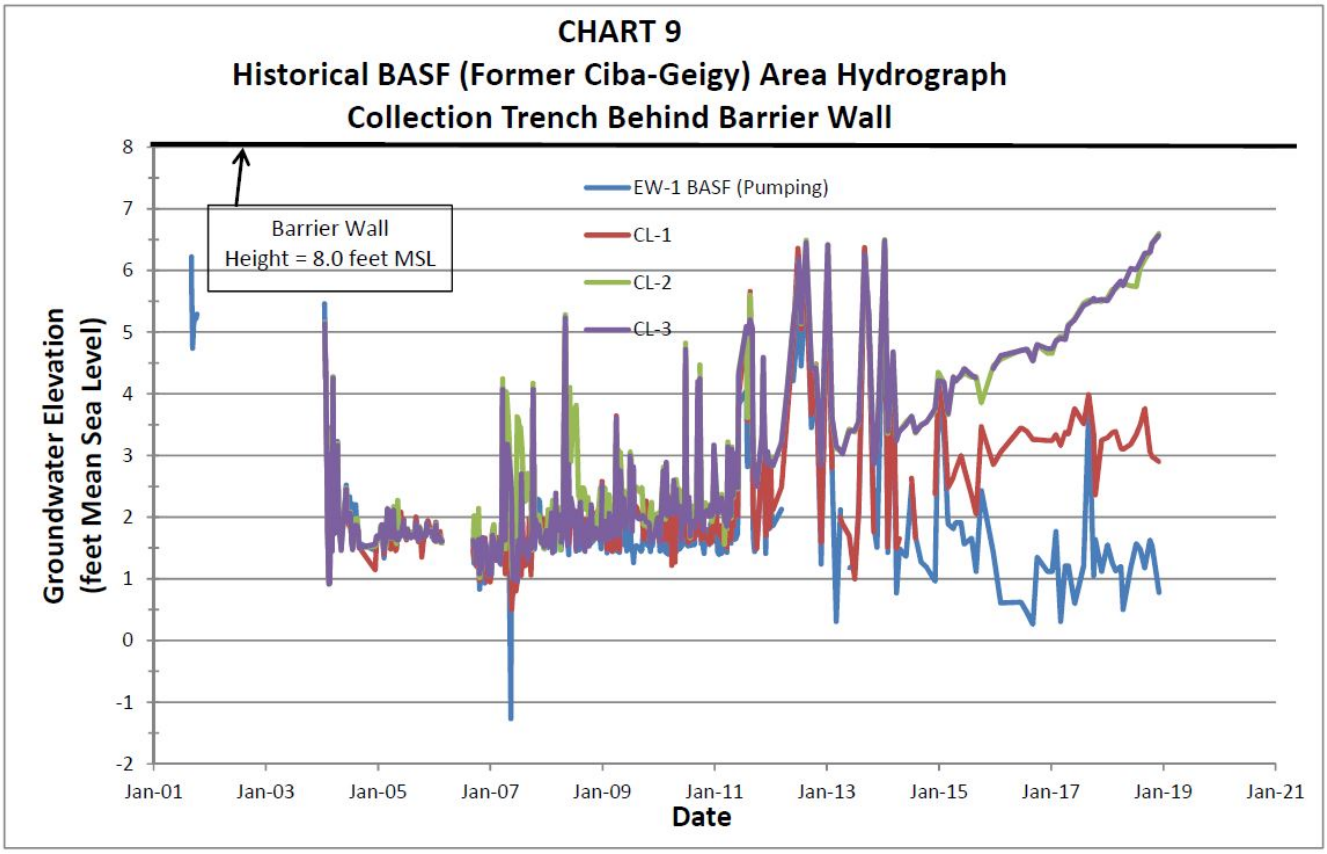
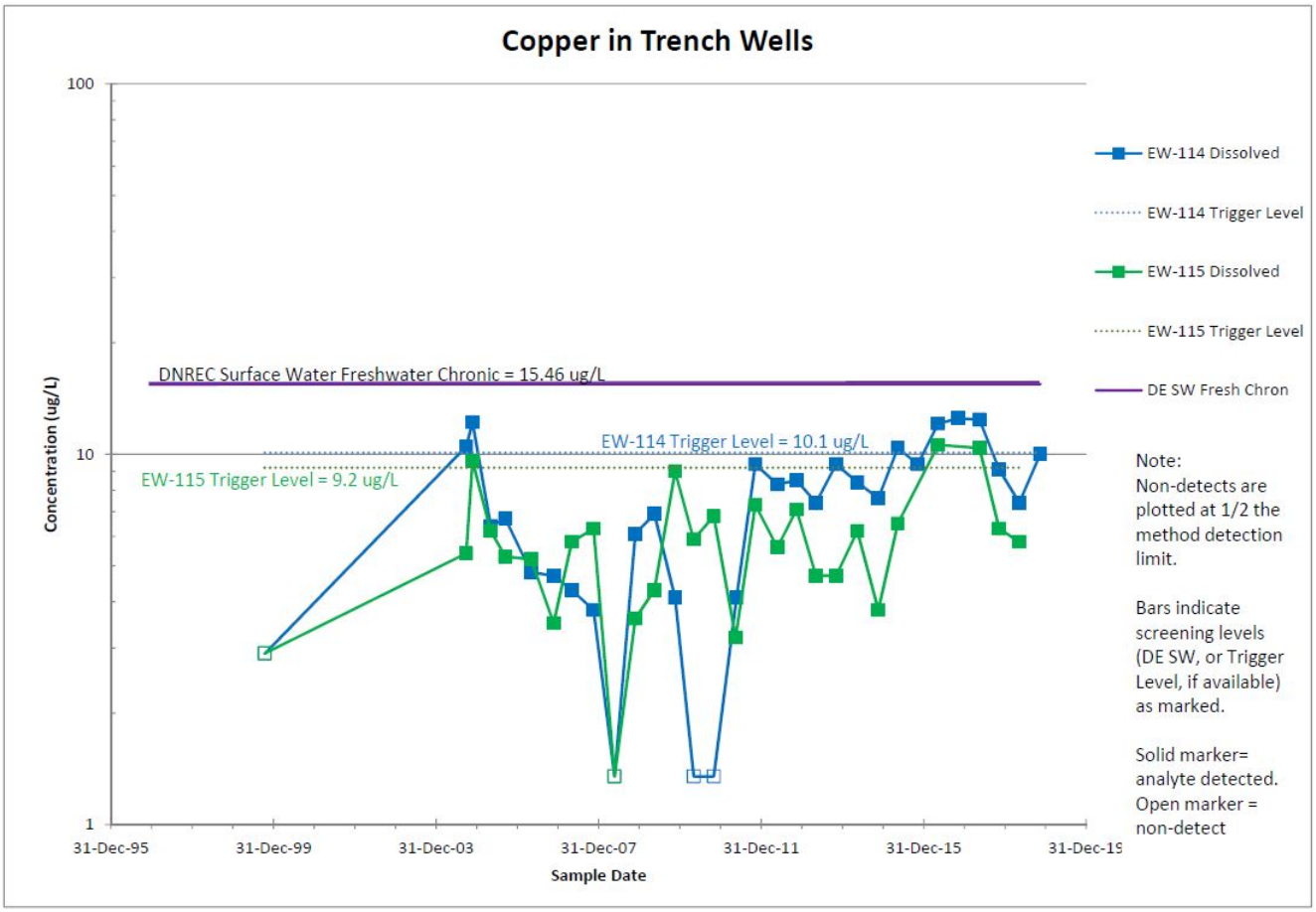


Figure I-7: Copper in Wells EW-114 and EW-115[17]



[17] *Source:* 2018 Long-term Groundwater Monitoring Report, dated November 2019.

Table I-4: South Wetlands Monitoring Results

			Metals (ug/L)									General Chemistry (mg/L)
Date	Sample	Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Total Hardness
*Screening Criteria: DNREC Freshwater Acute Criteria August 2015			340	7800^	3.14*	NE	20.68*	105.87*	1000^	689.49*	172.65*	NE
9/21/05	POND01	Dissolved	NS	324	<0.97	NS	<1.8	<8.4	8.9	<5.8	<5.3	N/A
8/23/07	POND01	Dissolved	NS	170	<0.9	NS	<2.2	0.19 J	37.5 J	<5.6	<8.1	N/A
11/2/10	POND01	Dissolved	<9.8	177	<0.2	<2.3	<2.7	<0.052	46.6	<3	<8.1	N/A
11/17/15	POND01	Dissolved	<7	117	<0.23	<0.9	11.3 J	0.24 J	299	<1.3	<3.9	N/A
9/21/05	POND01-DUP	Dissolved	NS	332	<0.97	NS	<1.8	<8.4	9.1	<5.8	<5.3	N/A
8/23/07	POND01-DUP	Dissolved	NS	154	<0.9	NS	<2.2	0.1 J	18.6 J	<5.6	<8.1	N/A
9/21/05	POND02	Dissolved	NS	298	<0.97	NS	<1.8	<8.4	2.3 B	<5.8	<5.3	N/A
8/23/07	POND02	Dissolved	NS	122	<0.9	NS	<2.2	0.058 J	4 J	<5.6	<8.1	N/A
11/2/10	POND02	Dissolved	<9.8	192	<0.2	<2.3	<2.7	<0.052	281	<3	<8.1	N/A
11/17/15	POND02	Dissolved	<7	118	<0.23	<0.9	<2.5	0.17 J	327	2.6 J	<3.9	N/A
9/21/05	POND01	Total	NS	444	1.5 J	NS	5.8 J	13.6 J	1070 J	6.4 J	134	215
8/23/07	POND01	Total	NS	242	2.2 J	NS	4.9 J	9.6 J	215	7.2 J	161 J	101 J
11/2/10	POND01	Total	<9.8	191	<0.2	<2.3	<2.7	1.7	90.4	<3	14.3 J	120
11/17/15	POND01	Total	<7	259	1.6	0.99 J	8.1 B	16	889	4.8 J	169	142 J
9/21/05	POND01-DUP	Total	NS	414	1.3 J	NS	4.7 J	9.7 J	737 J	<5.8	95.5	202
8/23/07	POND01-DUP	Total	NS	250	2.5 J	NS	3.8 J	10 J	230	<5.6	167 J	109 J
9/21/05	POND02	Total	NS	412	<0.97	NS	2.6 J	<8.4	1240 J	<5.8	78.9	265
8/23/07	POND02	Total	NS	188	<0.9	NS	<2.2	1.7 J	776	<5.6	24.5 J	82.8 J
11/2/10	POND02	Total	<9.8	207	<0.2	<2.3	<2.7	1.4	308	<3	13.4 J	129
11/17/15	POND02	Total	<7	143	<0.23	<0.9	3 B	1.3	308	1.5 J	15 J	174 J

Notes

Shaded area indicates concentration exceeds the screening criteria for 2015 results only.

J - Estimated Value. Result falls between the method detection limit (MDL) and the practical quantitation limit.

B - Analyte concentration is not significantly greater than detected in an associated method blank.

NS - Not sampled

NE - No Criteria Established.

N/A - Not applicable

* Calculated based on average hardness (as CaCO3) of the 2015 pond samples POND01 and POND02 (158.0 mg/L)

^ ROD Performance Standard 3.8.5

			Metals (ug/L)									General Chemistry (mg/L)
Date	Sample	Type	Arsenic	Barium	Cadmium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Total Hardness
*Screening Criteria: DNREC Freshwater Acute Criteria August 2015			340	7800^	2.67*	NE	17.66*	88.45*	1000^	598.52*	149.84*	NE
9/21/05	RIVER01	Dissolved	NS	101	<0.97	NS	2.1 J	<8.4	198	<5.8	11.9 B	N/A
8/23/07	RIVER01	Dissolved	NS	58.4	<0.9	NS	<2.2	0.16 J	82.3 J	<5.6	<8.1	N/A
11/2/10	RIVER01	Dissolved	<9.8	153	<0.2	<2.3	<2.7	0.089 J	448	<3	<8.1	N/A
11/17/15	RIVER01	Dissolved	<7	72.7	<0.23	<0.9	3.1 J	0.34 J	112	1.5 J	7.7 J	N/A
11/2/10	RIVER01-DUP	Dissolved	<9.8	150	<0.2	<2.3	<2.7	0.11 J	434	<3	<8.1	N/A
11/17/15	RIVER01-DUP	Dissolved	<7	73	<0.23	<0.9	<2.5	0.22 J	118	<1.3	6.2 J	N/A
9/21/05	RIVER02	Dissolved	NS	102	<0.97	NS	1.9 J	<8.4	190	<5.8	12.9 B	N/A
8/23/07	RIVER02	Dissolved	NS	58.9	<0.9	NS	<2.2	0.14 J	78 J	<5.6	<8.1	N/A
11/2/10	RIVER02	Dissolved	<9.8	189	<0.2	<2.3	<2.7	<0.052	1270	<3	<8.1	N/A
11/17/15	RIVER02	Dissolved	<7	71.3	<0.23	<0.9	<2.5	0.23 J	119	<1.3	6.4 J	N/A
9/21/05	RIVER01	Total	NS	114	<0.97	NS	2.1 J	<8.4	221 J	<5.8	18.3 B	206
8/23/07	RIVER01	Total	NS	162	<0.9	NS	4.5 J	6.5 J	168	<5.6	46 J	103 J
11/2/10	RIVER01	Total	<9.8	240	<0.2	<2.3	2.8 J	6.3	518	<3	26.6	120
11/17/15	RIVER01	Total	<7	144	<0.23	<0.9	3.6 B	3.7	154	1.9 J	30.4	130 J
11/2/10	RIVER01-DUP	Total	<9.8	270	0.3 J	<2.3	5 J	13.9	612	<3	54.1	NS
11/17/15	RIVER01-DUP	Total	<7	146	<0.23	<0.9	3.3 B	3.6	150	1.5 J	31.9	134 J
9/21/05	RIVER02	Total	NS	119	<0.97	NS	2.5 J	<8.4	208 J	<5.8	24.4 B	174
8/23/07	RIVER02	Total	NS	101	<0.9	NS	4.2 J	3.6 J	131	<5.6	27.6 J	89.2 J
11/2/10	RIVER02	Total	<9.8	368	1.3	2.7 J	14.5	29.3	1540	5.4 J	199	125
11/17/15	RIVER02	Total	<7	130	<0.23	<0.9	4.9 B	3.6	152	2 J	27.4	137 J

Notes

Shaded area indicates concentration exceeds the screening criteria for 2015 results only.

J - Estimated Value. Result falls between the method detection limit (MDL) and the practical quantitation limit.

B - Analyte concentration is not significantly greater than detected in an associated method blank.

NS - Not sampled

NE - No Criteria Established.

N/A - Not applicable

* Calculated based on average hardness (as CaCO3) of the 2015 river samples RIVER01 and RIVER02 (133.67mg/L)

^ ROD Performance Standard 3.8.5

APPENDIX J – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: E.I. Du Pont De Nemours & Co., Inc. (Newport Pigment Plant Landfill)	**Date of Inspection:** 10/07/2019
Location and Region: Newport, DE; Region 3	**EPA ID:** DED980555122
Agency, Office or Company Leading the Five-Year Review: EPA Region 3	**Weather/Temperature:** Cloudy/Low 70s

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: PRB wall at South Landfill
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ (Name) _____ (Affiliation) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by email Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ (Name) _____ (Affiliation) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone : _____
   Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency DNREC
   Contact Lindsay Hall (Name) Project Manager (Title) 10/17/2019 (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: See completed interview form in Appendix H.

   Agency _____
   Contact _____Name _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☒ Up to date ☐ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☒ Effluent discharge*	☒ Readily available	☐ Up to date	☐ N/A
☐ Waste disposal	☐ Readily available	☐ Up to date	☐ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☐ N/A

Remarks: Chemours has an agreement in place with BASF for BASF to accept extracted groundwater at its on-site industrial wastewater treatment plant. BASF has an industrial wastewater treatment permit (outside of the CERLCA action).

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Chemours submits annual long-term monitoring reports to EPA.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☐ N/A
☒ Water (effluent)*	☐ Readily available	☐ Up to date	☒ N/A

Remarks: Extracted groundwater is treated at BASF's industrial wastewater treatment plant. BASF meets its discharge requirements.

10. **Daily Access/Security Logs** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: All visitors must stop at the BASF security post.

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☐ PRP in-house ☒ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: A chainlink fence surrounds the South Landfill.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs posted for buried thorium at North Landfill; no trespassing signs posted along the banks of the Christina River.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): self-reporting

Frequency: During regular site visits

Responsible party/agency: Chemours/EPA

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☒ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

Parcel-specific institutional controls have been implemented or are anticipated to be finalized in 2020; however, a Delaware Groundwater Management Zone still needs to be implemented.

2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A

Remarks: A Delaware Groundwater Management Zone is still needed. EPA worked with Chemours, BASF and DelDOT to draft Declarations of Restrictions. The Declarations are anticipated to be finalized in 2020.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: The Holly Run groundwater treatment plant has been dismantled.

3. **Land Use Changes Off Site** ☐ N/A

Remarks: Work on the bridge replacement over the Christina River immediately east of the BASF plant is underway.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: The site is well maintained.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☒ Cover properly established
	☒ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: _____		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Area extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Area extent: _____
	☐ Ponding	☐ Location shown on site map	Area extent: _____
	☐ Seeps	☐ Location shown on site map	Area extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Area extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Area extent: _____		
	Remarks: _____		
B. Benches		☐ Applicable ☒ N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
C. Letdown Channels		☐ Applicable ☒ N/A	

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type:_____ Area extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Area extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on site map Area extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Area extent: _____
   Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☒ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A
   Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☒ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☒ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident

Area extent: See FYR Report figures Depth: Varies

Remarks: _____

2. **Performance Monitoring** Type of monitoring: Water level monitoring

☐ Performance not monitored

Frequency: Varies; weekly to monthly ☐ Evidence of breaching

Head differential: See the Data Review section of this FYR Report.

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☒ Good condition ☒ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: EW-1 is the only remaining extraction well.

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☒ Good condition ☐ Needs maintenance

Remarks: Now connected to BASF's treatment system.

3. **Spare Parts and Equipment**

☒ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☒ Applicable* ☐ N/A

*Extracted groundwater is treated at the BASF industrial wastewater treatment plant. Treatment technologies are specific to BASF's industrial waste.

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Physical features associated with the PRB remedy include monitoring wells. Wells observed during the site inspection were in good condition. Monitoring data for the PRB remedy is submitted in the annual LTGM reports.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

Excavation of lead-impacted soil at the former DuPont ballpark removed contaminants from the area, allowing for redevelopment as a public park. The public water supply line installed along Airport Road provides drinking water for nearby residences and businesses. Cleanups at the North Wetlands, South Wetlands and Christina River are also functioning as intended and now these areas provide habitat for wildlife. The North and South Landfills limit infiltration of rainfall and prevent exposure to contaminants and waste. The vertical barrier walls and extraction well minimize migration of contaminated groundwater to the Christina River and wetlands. However, there is concern that the PRB wall may not be operating as intended. Additional details are included in Question A of this FYR Report. Institutional controls are in place or have been drafted for the site parcels; however a state Groundwater Management Zone needs to be implemented.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

None at this time. However, Chemours has proposed a reduction in the sampling schedule for the LTGM program. EPA is evaluating the proposal.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

It is unclear if the PRB wall is functioning as intended.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Chemours has proposed a reduction in the sampling schedule for the LTGM program. EPA is evaluating the proposal to determine if a reduction in the sampling schedule at various site areas is appropriate.

Site Inspection Participants:
Anthony Iacobone, EPA
Cathleen Kennedy, EPA
Lindsay Hall, DNREC
Paul Will, DNREC
Sebastian Harrison, Chemours
Craig Bartlett, Chemours
Brian Ambrose, Chemours
Tim Love, BASF
Dana Vitek, Parsons (PRP contractor)
Ann Logue, Parsons (PRP contractor)
Jill Billus, Skeo (EPA FYR support contractor)
Ali Cattani, Skeo (EPA FYR support contractor)

APPENDIX K – SITE INSPECTION PHOTOS - OCTOBER 7, 2019

North Landfill

North Landfill with perimeter rip-rap lined drainage channel

Warning sign in place for buried drums of thorium at North Landfill


Northern Wetlands

North Drainageway

Cement knee wall at North Landfill with piezometer in background

Extraction well EW-1 at BASF plant area

Christina River with South Landfill in the background

Extraction trench cleanout CL-3 in the BASF plant area

South Landfill

Solar array on South Landfill

Pollinator meadow on South Landfill with animal shelter in place

Stabilized bank along South Landfill

No trespassing notice along riverbank near South Landfill

Birdhouse near South Landfill

South Landfill on DelDOT property east of South James Street

APPENDIX L – RISK EVALUATION OF CURRENT PERFORMANCE STANDARDS AND ROD CLEANUP GOALS

This appendix provides a summary of the evaluations conducted to determine whether the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of remedy selection remain valid.

Changes in Standards

Have standards identified in the ROD been revised and does this call into question the protectiveness of the remedy? Do newly promulgated standards call into question the protectiveness of the remedy? Have To-be-considered criteria (TBCs) used in selecting cleanup levels at the site changed, and could this affect the protectiveness of the remedy?

Decision documents and multiple memos to the file developed performance standards for groundwater, surface water, sediment and soil remedies to achieve at the Site. This FYR Report summarizes the current performance standards for these media for each component of the remedy to ensure the performance standards remain valid. This summary updates the assessment presented in the 2015 FYR Report. Table D-1 in Appendix D summarizes numeric performance criteria by OU. Figure 4 presents the performance standards that apply to specific sampling locations currently included in long-term monitoring.

Perimeter Monitoring – Well Cluster 1: Well Cluster 1 wells are monitored under the LTGM program to verify that concentrations of organics and metals migrating southward in the Columbia Aquifer from the north side of the river do not exceed human health risk-based action levels at the Site's hydraulically downgradient perimeter.

Section 7.3.2 of the 1993 ROD requires that health-based screening concentrations be used to assess whether migration of site-related constituents warrants additional remedial measures. None of the decision documents provides numeric values to be used as performance standards. The values evaluated in this FYR are those that were used in the February 2006 Quality Assurance Project Plan (QAPP) and LTGM reports that reflect the intent of the performance standard in ROD Section 7.3.2, which states that the levels of site-related contaminants meet the 1 $x10^{-6}$ cancer risk or noncancer hazard index (HI) threshold of 1. The performance standard in ROD Section 7.3.2 did not address the protection of ecological receptors.

According to the LTGM reports, data from Well Cluster 1 wells are screened using federal MCLs. When an MCL is not available, the most current EPA RSLs for tap water are used. Shown in Table L-1, the performance standards for arsenic and vinyl chloride individually exceed a cancer risk of 1 x 10^{-4}, the upper bound of EPA's risk management range. In addition, arsenic, copper, cis-1,2-dichloroethene and TCE exceed EPA's noncancer HI of 1. Furthermore, chemicals with individual HQs less than 1 can have addictive effects for an HI above 1. For this reason, as noted earlier in this report, EPA's toxicology has required that future data evaluation in the LTGM reports use RSLs based on an HQ of 0.1 to account for possible additive effects for noncarcinogens. These results indicate that LTGM data should consider cumulative effects when evaluating the protectiveness of the remedy.

In sum, the MCLs are still current. The risk-based component of the remedy can be complex since chemicals may have additive effects, and toxicity factors are updated more frequently than MCLs. Therefore, when the remedy consistently attains MCLs, Well Cluster 1 can be evaluated to ensure that risk-based standards are met at that time. The use of a total risk standard makes this portion of the remedy protective by definition.

Table L-1: Risk Evaluation of Current Performance Standards at Well Cluster 1

COC	Current Performance Standard (µg/L)[a]	May 2019 EPA Tap Water RSL[c] (µg/L)		Relative Risk at Performance Standard	
		Risk-based 1 x 10^{-6}	Noncancer HQ=1	Risk	HI
Arsenic	10	0.052	6	**1.9 x 10^{-4}**	**1.7**
Barium	2,000	--	3,800	--	0.5
Beryllium	4	--	25	--	0.2
Cadmium	5	--	9.2	--	0.5
Chromium (total)	100	--[d]	--	--	--
Cobalt	6[b]	--	6	--	1.0
Copper	1,300	--	800	--	**1.6**
Lead	15	--	15	--	--[e]
Manganese	430[b]	--	430	--	1.0
Mercury	2	--	5.7	--	0.4
Nickel	390[b]	--	390	--	1.0
Vanadium	86[b]	--	86	--	1.0
Zinc	6,000[b]	--	6000	--	1.0
cis-1,2-Dichloroethene	70	--	36	--	**1.9**
Tetrachloroethene	5	11	41	4.6 x 10^{-7}	0.1
Trichloroethene	5	0.49	2.8	1.0 x 10^{-5}	**1.8**
Vinyl chloride	2	0.019	44	**1.1 x 10^{-4}**	0.1
			Total	**3.1 x 10^{-4}**	**14**

Notes:

a) Value as listed in the 2017 LTGM Report. Performance standards are MCLs unless otherwise noted.

b) MCL not available; therefore, the May 2019 RSLs were used to represent the lower of the 1 x 10^{-6} cancer risk or noncancer hazard level of 1.0 as stipulated in performance standard 7.3.2 of the 1993 ROD for chemicals without MCLs (cobalt, manganese, nickel, vanadium and zinc).

c) Tap water RSL obtained from EPA's May 2019 revisions to the RSL table located at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

d) While this review is underway, EPA's Integrated Risk Information System still states that, for oral exposure, the carcinogenicity "cannot be determined."

e) EPA has no consensus on carcinogenic or noncarcinogenic toxicity values for inorganic lead, so it is not possible to calculate RSLs. For water, EPA recommends comparing to 15 µg/L (the EPA Action Level in water).

-- = RSL value not established.

bold = cancer risk exceeds 1 x 10^{-4} or the HI exceeds 1.0.

South Landfill PRB Compliance Wells: The 1995 ESD listed the performance standard criteria for the 11 PRB compliance wells (PRB-1 through PRB-11). The 1995 ESD described the treatment criteria as representing "the lower of either the acute ambient water quality criteria (AWQC) or a level generally acceptable to drink." The1995 ESD did not specify which of the two criteria was used as the treatment criterion for an individual contaminant. The Administrative Record was reviewed and a 1995 document explained that the criteria for barium is three times the EPA Region 3 Risk-based Concentration.[18] A 2001 technical document further explained how the treatment criteria were protective of surface water by multiplying the treatment criteria by a surface water protection factor; this factor was derived from groundwater and tidal flow and used to determine the contribution of the treatment system to the surface water system.[19] The incremental contribution from the treatment system was then compared to the

[18] Proposal for South Landfill Treatment, prepared by Dupont Environmental Remediation Services, March 15, 1995.

[19] Protectiveness Assessment South Landfill PRB Remedy, prepared by Dupont Engineering, May 17, 2001.

National Recommended Water Quality Criteria for continuous exposure (e.g., chronic exposure) as published in Federal Register 68358 on December 10, 1998. To conservatively evaluate the validity of the treatment standards, the standards were updated by identifying the more stringent value between the current drinking water standard (or RSLs in absence of a drinking water standard) and BTAG freshwater screening benchmarks. The lower value was then adjusted using the surface water protection factor of 5 x 10^{-7} and the result compared to the EPA BTAG screening benchmark. As shown in Table L-2, the incremental contribution of contamination to surface water is well below the BTAG freshwater screening benchmarks based on current drinking water standards and BTAG screening benchmarks.

Table L-2: Risk Evaluation of Treatment Standards for PRB Compliance Wells

COC	Treatment Standards for PRB Compliance Wells[a] (µg/L)	Current BTAG Benchmarks[b] (µg/L)	Current MCL or RSL[c] (µg/L)	Lower of MCL/RSL and BTAG Benchmark	Incremental Contribution (µg/L)	Is Adjusted Standard > BTAG Benchmark?
Barium	7,800	4	2,000 (MCL)	4	0.000002	No
Cadmium	4 (AWQC)	0.25*	5 (MCL)	0.25	0.0000001	No
Copper	18 (AWQC)	9*	1,300 (MCL)	9	0.000005	No
Lead	15 (DW)	2.5*	15 (MCL)	2.5	0.000001	No
Manganese	1,000	120	430 (RSL)	120	0.00006	No
Nickel	730	52*	390 (RSL)	52	0.00003	No
Zinc	120 (AWQS)	120*	6,000 (RSL)	120	0.00006	No

Notes:

a) Values from 1995 ESD.

b) BTAG criteria available at https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf, accessed 11/4/2019; cadmium, copper, lead, nickel and zinc benchmarks are hardness dependent (hardness = 100).

c) MCLs available at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations, accessed 11/4/2019; May 2019 RSLs available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables, accessed 11/4/2019.

* Based on a hardness of 100 mg/L of calcium carbonate.

South Wetlands Surface Water: Section 4.1.5 of the 1993 ROD required collection and analysis of surface water samples in areas outside the expected area of sediment remediation. EPA does not consider the "greater risk to human health and environment" ARAR waiver to be protective where the dissolved concentration of a site-related contaminant exceeds its respective state acute SWQS. EPA added surface water monitoring to the LTGM program in 2005 to evaluate the continued protectiveness of the South Landfill area remedy. Surface water sampling is performed every five years to verify that site-related metal concentrations remain below state acute SWQS so that the "greater risk to human health and the environment" ARAR waiver for the underlying Columbia Aquifer from the ROD remains acceptable. The specific numeric values for surface water criteria have not been listed in a decision document, but the LTGM reports list the State acute SWQS used for data evaluation. As discussed in Appendix M, these surface water criteria are current and valid.

North Landfill Monitoring – Well Cluster 2: The 1993 ROD did not provide specific numeric values to be used as trigger values as performance standards for monitoring at Well Cluster 2. Section 7.3.4 of the 1993 ROD states that the performance standard for thorium-232 and its daughter products and gross alpha

and beta radiation is to monitor specific wells every six months to determine if a release is occurring. In order to determine if a thorium release is occurring the LTGM uses trigger levels developed following the Remediation Standards Guidance under the Delaware Hazardous Substance Cleanup Act (DNREC 1999) and as identified in Section 1.4.5 of the 2006 QAPP. The trigger levels represent baseline conditions and are used to measure any significant change from baseline to identify potential releases of thorium. The trigger levels remain valid for use in monitoring a release from this area. Note, however, that the alpha radiation trigger level in RDMW-33C exceeds the alpha radiation MCL of 15 pCi/L.

BASF Plant Area (Collection Trench) Monitoring**:** Two wells in the Columbia Aquifer, EW-114 and EW-115, are monitored semi-annually for select metals and VOCs to determine if there are any significant changes in constituent concentrations and to determine if the remedy remains protective of water quality in the river. Except for barium and manganese, numeric criteria have not been established in a decision document for the constituents monitored at EW-114 and EW-115. The Christina River is the end-point receptor for potential migration of constituents from the BASF plant area, therefore the LTGM data are compared to the DNREC Surface Water Quality Standards, Freshwater Chronic Criteria. The LTGM reports also compare the monitoring data to the established trigger levels defined in Section 1.4.5 of the 2006 QAPP to determine if there is a significant change in constituent concentrations.

The specific numeric values for surface water criteria have not been listed in a decision document, but the LTGM reports list the DNREC Surface Water Quality Standards, Freshwater Chronic Criteria used for data evaluation. As discussed in Appendix M, these surface water criteria are current and valid.

Riverbank Monitoring: Decision documents did not require riverbank monitoring of 1,1'-biphenyl (biphenyl); however, DuPont initiated biphenyl monitoring of the Christina River in 1995 to monitor seeps and later to verify the effectiveness of the seep control remedy. Surface water quality standards were applied to the riverbank seep monitoring because the end-point receptor of the biphenyl seepage is the Christina River. Neither DNREC nor EPA have not established freshwater surface water quality standards for biphenyl. In the absence of criteria, the EPA Region 3 freshwater ecological screening benchmark for biphenyl (14 µg/L) was used. This value has not changed since the previous FYR.

The Christina River is not used for drinking water but is used for recreation. To evaluate if the cleanup goal of 14 µg/L is also protective of human receptors, EPA's RSL calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) was used to develop a recreational RSL for biphenyl using the same recreational exposure assumptions as used in the 1992 HHRA for the Christina River to include an exposure frequency of 39 days/year; 3 hours/event; 1 event/day, resulting in a 1×10^{-6} risk-based RSL of 25.8 µg/L. The performance standard of 14 µg/L is more stringent and remains valid for evaluating both human and ecological protectiveness.

Soil Cleanup Goal for the Ballpark: The ROD-established cleanup goal for lead in soil at the ballpark was 500 milligrams per kilogram (mg/kg). Despite changes in risk assessment methods and toxicity values, the remedy remains protective at the ballpark where remediation targeted a localized area of lead contamination. As part of this FYR, the exposure concentrations of chemicals detected in soil at the ballpark were compared to the May 2019 RSLs to determine if remediation of the localized lead area was also protective of other chemicals of potential concern. As shown in Table L-3 below, for a recreational exposure, the cancer risk for all COPCs is within EPA's risk management range of 1×10^{-6} to 1×10^{-4}; the noncancer HI is below the threshold of 1. Although the current RSL for lead of 400 mg/kg is more stringent than the cleanup goal of 500 mg/kg, the post remediation exposure concentration remaining at the ballpark was determined to be 189 mg/kg, which is below the more stringent RSL.[5] In 2016 EPA issued a memorandum about lead that acknowledged that lead may be of concern even at lower concentrations than previously identified. However, 189 mg/kg is still expected to be associated with the range of targeted blood lead values discussed in the December 22, 2016 memo "Updated Scientific

Considerations for Lead in Soil Cleanups." This information supports that the cleanup goals for the ballpark remain valid.

Table L-3: Risk Evaluation of Ballpark Residual Soil Contamination

Detected Chemical	Concentration (95% UCL)[a] (mg/kg)	May 2019 EPA Residential RSL[b]		Ballpark Risk Evaluation[c]	
		Risk-based 1×10^{-6}	Noncancer HQ=1	Risk	HI
Aluminum, Total	15,489	--	77,000	--	0.02
Antimony, Total	4.33	--	31	--	0.02
Arsenic, Total	3.95	0.68	35	6×10^{-7}	0.01
Barium, Total	1,764	--	15,000	--	0.01
Beryllium, Total	2.12	1,600	160	1×10^{-10}	0.001
Butyl Benzyl Phthalate	0.76	290	13,000	3×10^{-10}	0.00001
Cadmium, Total	7.85	2,100	71	4×10^{-10}	0.01
Calcium, Total	12,584	--	--	--	--
Chromium, Total	30	0.3[d]	16[d]	1×10^{-5}[d]	0.2[d]
Cobalt, Total	10	420	23	3×10^{-9}	0.05
Copper, Total	60	--	3,100	--	0.002
Iron, Total	20,709	--	55,000	--	0.04
Lead, Total	109	--	400	--	--
Magnesium, Total	5,175	--	--	--	--
Manganese, Total	847	--	1800	--	0.05
Mercury, Total	0.16	--	11	--	0.002
Nickel, Total	17	15,000	1,500	1×10^{-10}	0.001
Potassium, Total	2,417	--	--	--	--
Sodium, Total	243	--	--	--	--
Vanadium, Total	48	--	390	--	0.01
Zinc, Total	735	--	23,000	--	0.004
			Totals	1×10^{-5}	0.4

Notes:

a) 95 percent upper confidence limit (UCL) from Table 2-7 in 1992 HHRA.

b) May 2019 RSLs available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables, accessed 11/5/2019.

c) Ballpark risk and noncancer HI estimates:

- Cancer risk = (exposure concentration(1×10^{-6})/RSL)(adjustment factor).
- HI = (exposure concentration/RSL)(adjustment factor).
- Adjustment factor = recreational exposure frequency/residential exposure frequency or 39 days/year recreational ballpark exposure as per the 1992 HHRA versus a residential exposure frequency of 350 days/year or 0.11.

d) Conservative assumption of hexavalent chromium.

-- = RSL not available

UCL = upper concentration limit

Sediment Cleanup Goals for the North and South Wetlands and the Christina River: The final cleanup goals developed for sediment for the protection of ecological receptors in the 1993 ROD and memos reflecting updates to the ROD were compared to EPA's residential RSLs to determine if the cleanup goals are also protective of human receptors. As shown in Table L-4, the sediment cleanup goals for cadmium and zinc are below the conservative residential RSLs and therefore, remain protective of human exposure. The RSL for lead is lower than the sediment cleanup goals for lead. It should be noted that the actual mean confirmation concentrations of these metals (cadmium 1.7 mg/kg; lead 46 mg/kg; and zinc 570 mg/kg) were well below the residential soil screening levels.

Table L-4: Comparison of Sediment Cleanup Goals to EPA's 2019 Residential RSLs

Area	Cadmium (mg/kg)		Lead (mg/kg)		Zinc (mg/kg)	
	Cleanup Goal	RSL[a]	Cleanup Goal	RSL[a]	Cleanup Goal	RSL[a]
North Wetland[b]	9.6	71	660	400	1,600	23,000
South Wetland[b]	35		670		2,000	
Christina River[c]	20		700		3,000	

Notes:

a) May 2019 EPA RSLs for residential exposure, available at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables, accessed 11/5/2019.

b) Source of cleanup goals is the North and South Wetlands ROD Modifications. Memorandum from Randy Sturgeon to DuPont-Newport Post-Decision Document File. September 30, 1996.

c) Source of the cleanup goals is the Christina River ROD Modifications. Memorandum from Randy Sturgeon to DuPont-Newport Post-Decision Document File. August 5, 1996.

To further evaluate the lead cleanup goals, the 2015 FYR Report included derivation of a target acceptable lead concentration using EPA's Preliminary Remediation Goal (PRG) calculator in the EPA Adult Lead Model (ALM).[20,21] The ALM was used because residential exposure to wetland and river sediments is not realistic for a young child. The 2015 evaluation found that the sediment cleanup goals for lead were protective at that time.

In 2017, EPA updated the default baseline blood lead (PbB_o) concentration and default geometric standard deviation input parameters of the ALM based on PbB data from the National Health and Nutrition Examination Survey, 2009 to 2014.[22] Therefore, the ALM was re-run for this FYR using the updated input parameters and other default exposure assumptions (Table L-5). Based on this analysis, the sediment cleanup goals for lead remain protective of human health. The lead sediment cleanup goals are lower than the calculated PRG.

Table L-5: ALM PRG Derivation

Variable	Description of Variable	Units	Input
$PbB_{fetal,\ 0.95}$	Target PbB in fetus (e.g., 2-8 µg/dL)	µg/dL	5
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	µg/dL	0.6
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S,\ D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,\ D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,\ D}$	Averaging time (same for soil and dust)	days/yr	365
PRG in soil for no more than 5% probability that fetal PbB exceeds target PbB		**mg/kg**	**1,050**

[20] Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil [EPA-540-R-03-001, OSWER Directive #9285.7-54]; January 2003, originally published December 1996.

[21] Update to Preliminary Remediation Goals (PRGs) calculation spreadsheet in the EPA ALM, Updated June 21, 2009.

[22] Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Concentration and Geometric Standard Deviation Parameters, OLEM Directive 9285.6-56, May 17, 2017.

Changes in Exposure Pathways

Has land use or expected land use on or near the site changed? Have human health or ecological routes of exposure or receptors been newly identified or changed in a way that could affect the protectiveness of the remedy? Are there newly identified contaminants or contaminant sources? Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents? Have physical site conditions or the understanding of these conditions changed in a way that could affect the protectiveness of the remedy?

Land use at the Site has not changed. The Site is still an active manufacturing facility. Chemours recently demolished the groundwater treatment plant on the former Holly Run parcel, but the foundations of buildings remain. Chemours has no current plans to redevelop the parcel.

DelDOT is planning to replace the James Street bridge over the Christina River, located adjacent to the Site. The South Landfill extends beneath South James Street and the current paved roadway serves as the cap in this area. It is currently unknown if bridge replacement activities will encroach on the South Landfill. If earthmoving activities for the bridge replacement extend onto the South Landfill, appropriate measures to ensure worker and public safety need to be implemented and the integrity of the cap needs to be maintained.

The potential for vapor intrusion to indoor air was a pathway not evaluated in the original risk assessments. Chemours recently conducted vapor intrusion assessments at the Site to evaluate this pathway. The results are discussed in previous sections of this FYR report.

Changes in Toxicity and Other Contaminant Characteristics

Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy? Have other contaminant characteristics changed in a way that could affect the protectiveness of the remedy?

Toxicity factors have changed since the ROD and ESDs were issued. The relevant uncertainties involving final cleanup standards were included above, as part of the "Changes in Standards and TBCs" discussion.

Changes in Risk Assessment Methods

Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?

There have been significant changes in EPA's risk assessment guidance since the original risk assessment was performed. These include changes in basic methodology, dermal guidance, inhalation methodologies, and exposure factors. The remedy components that involved clean fill, containment and institutional controls would not be expected to change. Uncertainties involving the risks associated with final cleanup standards were included above, as part of the "Changes in Standards and TBCs" discussion.

Expected Progress Toward Meeting RAOs

Is the remedy progressing as expected?

Most of the remedies selected are progressing as expected. EPA has noted concerns with the effectiveness of the PRB wall at the South Landfill, which is addressed elsewhere in this FYR Report. EPA has compiled a list of issues and recommendations in Section VI to better determine protectiveness at the Site.

APPENDIX M – ARARS REVIEW

Groundwater ARARs

Site decision documents identify the MCL and MCLG ARARs established under the Safe Drinking Water Act as chemical-specific ARARs for the Site. However, in the 2003 ROD, EPA invoked the "greater risk to human health and the environment" ARAR waiver for the groundwater remedy because it was determined that compliance with the ARAR will cause greater risk to human health and the environment than non-compliance. In doing so, EPA waived the MCLs and non-zero MCLG ARARs in the Columbia and Potomac aquifers.

Page 87 of the 2003 ROD provides the following rationale for waiving the MCLs and MCLGs in the Potomac Aquifer:

> *EPA has concluded that the "greater risk to human health and the environment" waiver should be invoked in this case. Active remediation in the Potomac aquifer will cause the groundwater upgradient of the hydraulic barrier (underneath the waste management area) to become more contaminated since the pumping will cause a reversal of the natural upward flow of the ground water into the Columbia aquifer and will pull more highly contaminated ground water down into the Potomac aquifer (which is how the Potomac aquifer originally became contaminated). EPA does not expect the contaminant plume in the Potomac aquifer to expand. To date, the plume has exhibited limited migration potential due most likely to anions in the natural ground water combining with the heavy metals and precipitating them out of solution. Also, the selected remedy for the other areas of the Site will greatly decrease, if not eliminate, contaminant migration from the Columbia aquifer to the Potomac aquifer (i.e., the source of contamination to the Potomac will be greatly reduced, if not actually eliminated).*

Pages 87 and 88 of the 2003 ROD provide the following rationale for waiving MCLs and MCLGs in the Columbia Aquifer:

> *Active remediation in the Columbia aquifer may cause the Columbia aquifer to become more contaminated because pumping may cause the wetland area to become a recharge area for ground water instead of a discharge area for ground water. If the Columbia ground water is recharged from the surface water in the wetlands, higher levels of contamination may be introduced into the ground water by the washing of contaminants from the sediments. As with the Potomac aquifer, EPA does not expect the plume in the Columbia aquifer to spread since the sources will be controlled. Also, in the Columbia aquifer, ground water generally flows toward the Christina River, thus keeping the plume from expanding.*
>
> *As a result, EPA has determined that compliance with MCL and non-zero MCLG ground water ARARs will cause a greater harm to human health and the environment than non-compliance and invokes the "greater harm to human health or the environment" ARAR waiver.*

The 2003 ROD also specifies that if EPA determines through monitoring that the migration rate in either the Columbia or Potomac Aquifers is larger or different than expected and that, if left uncontrolled, the plume would pose a greater threat to human health or the environment, appropriate remedial measures beyond those called for in the ROD may be necessary.

Therefore, MCLs remain part of the performance standards for Well Cluster 1 monitoring.

Soil ARARs

Site decision documents did not identify chemical-specific soil ARARs.

Surface Water ARARs

Site decision documents identify state SWQSs and federal AWQCs as chemical-specific ARARs for surface water at the Site. However, EPA waived the state SWQSs in the North Wetlands, the South Wetlands and the Christina River. EPA also waived the federal AWQCs for the Christina River. For both the North Wetlands and Christina River, background sources of contamination prevent site remedial measures from attaining the ARARs; therefore, EPA invoked the "technical impracticability" ARAR waiver. The 1993 ROD stated for the South Wetlands, substantially more sediments would have to be dredged than appears necessary to protect the wetlands and stripping the complete South Wetlands just to attain surface water quality standards would cause more harm than good. Thus, EPA invoked the "greater risk to human health and the environment waiver" for the South Wetlands.

To make sure there are not areas of the South Wetlands where SWQSs are so extreme that the ARAR waivers are no longer protective, the waiver only applies as long as the dissolved concentration of a site-related contaminant stays below its respective acute SWQS. As shown in Table M-1, the freshwater acute criteria used since the previous FYR have not changed except for copper. The freshwater acute criterion for copper is now calculated using the EPA Biotic Ligand Model. The LTGM reports have noted the change to the copper standard, but Chemours has not run the model yet. Due to the low detections of copper detected in South Wetlands samples, this change is not likely to call into current protectiveness of the remedy. However, Chemours should begin using the updated standard in its data evaluation.

Table M-1: Previous and Current Freshwater Acute Criteria – South Wetlands

COC	2014 Freshwater Acute Criteria[a] (µg/L)	2019 Freshwater Acute Criteria[b] (µg/L)	ARAR Change?
Arsenic	340	340	No
Barium	--[c]	--[c]	No
Cadmium	(1.136672-LN(hardness)* 0.041838) * EXP(1.0166*LN (hardness)-3.924)	(1.136672-LN(hardness)* 0.041838) * EXP(1.0166*LN (hardness)-3.924)	No
Cobalt	--[d]	--[d]	No
Copper	0.96 *EXP(0.9422*LN (hardness)-1.7)	Freshwater criteria calculated using the EPA Biotic Ligand Model	Yes
Lead	(1.46203-LN(hardness) *0.145712)* EXP(1.273*LN (hardness)-1.460)	(1.46203-LN(hardness) *0.145712)* EXP(1.273*LN (hardness)-1.460)	No
Manganese	--[c]	--[c]	No
Nickel	0.998*EXP(0.8460*LN (hardness)+2.255)	0.998*EXP(0.8460*LN (hardness)+2.255)	No
Zinc	0.978*EXP(0.8473*LN (hardness)+0.884)	0.978*EXP(0.8473*LN (hardness)+0.884)	No
Tetrachloroethylene	--[d]	--[d]	No
Trichloroethylene	--[d]	--[d]	No
Vinyl chloride	--[d]	--[d]	No

COC	2014 Freshwater Acute Criteria[a] (µg/L)	2019 Freshwater Acute Criteria[b] (µg/L)	ARAR Change?
Notes: a) ARARs as presented in the 2015 FYR Report. b) 2019 ARARs from Title 7 of the Delaware Administrative Code, available at http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml (accessed 11/5/19). c) ROD-established performance standard of 7,800 µg/L for barium and 1,000 µg/L for manganese. d) Criterion not established for the contaminant. LN = natural log base e EXP = e = 2.71828 Hardness is expressed as mg/L as $CaCO_3$.			

LTGM reports also compare groundwater data from wells EW-114 and EW-115 at the BASF collection trench area to DNREC Surface Water Quality Standards, Freshwater Chronic Criteria. These criteria are used in the assessment because the Christina River is the end-point receptor for potential migration of constituents from the BASF plant area. To evaluate whether the most recent standards are being used, Table M-2 of this FYR Report compares the Freshwater Chronic Criteria from the 2017 LTGM report to current standards. As shown in Table M-2, the freshwater chronic criteria for copper has changed. The chronic SWQS for copper is now calculated using the EPA Biotic Ligand Model.

Table M-2: Previous and Current Freshwater Chronic Criteria – Wells EW-114 and EW-115

COC	2017 Freshwater Chronic Criteria[a] (µg/L)	2019 Freshwater Chronic Criteria[b] (µg/L)	ARAR Change?
Arsenic	150	150	No
Barium	--[c]	--[c]	No
Cadmium	(1.101672-LN(hardness)* 0.041838) * EXP(0.7409*LN (hardness)-4.719)	(1.101672-LN(hardness)* 0.041838) * EXP(0.7409*LN (hardness)-4.719)	No
Cobalt	--[d]		No
Copper	0.96 *EXP(0.8545*LN (hardness)-1.702)	Freshwater criteria calculated using the EPA Biotic Ligand Model	Yes
Lead	(1.46203-LN(hardness) *0.145712)* EXP(1.273*LN (hardness)-4.705)	(1.46203-LN(hardness) *0.145712)* EXP(1.273*LN (hardness)-4.705)	No
Manganese	--[c]	--[c]	No
Nickel	0.997*EXP(0.8460*LN (hardness)+0.0584)	0.997*EXP(0.8460*LN (hardness)+0.0584)	No
Zinc	0.986*EXP(0.8473*LN (hardness)+0.884)	0.986*EXP(0.8473*LN (hardness)+0.884)	No
Tetrachloroethylene	--[d]	--[d]	No
Trichloroethylene	--[d]	--[d]	No
Vinyl chloride	--[d]	--[d]	No
Notes: a) ARARs as presented in the 2017 LTGM Report. b) 2019 ARARs from Title 7 of the Delaware Administrative Code available at http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml (accessed 11/5/19). c) ROD-established performance standard of 7,800 µg/L for barium and 1,000 µg/L for manganese. d) Criterion not established for the contaminant. LN = natural log base e EXP = e = 2.71828 Hardness is expressed as mg/L as $CaCO_3$.			