The Chemours Company FC, LLC

2000 Cannonball Road

Pompton Lakes, NJ 07442

Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan

Pompton Lakes Works Site
Pompton Lakes, Passaic County, New Jersey
PI #007411

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Acronyms

bgs	below ground surface
Chemours	The Chemours Company FC, LLC
DGW PBR	Discharge to Groundwater Permit-by-Rule
Draft IRMWP	*Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan*
DT WP	*Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan*
DuPont	E.I. du Pont de Nemours and Company
EMA	Eastern Manufacturing Area
g/kg	grams per kilogram
GES	Groundwater & Environmental Services, Inc.
gpm	gallons per minute
HASP	health and safety plan
IRM	interim remedial measure
ISCO	in-situ chemical oxidation
JSA	job safety analysis
NJDEP	New Jersey Department of Environmental Protection
NOD	natural oxidant demand
ORP	oxidation reduction potential
PCE	tetrachloroethene
PLW	Pompton Lakes Works
PSA	project safety analysis
psi	pounds per square inch
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RFP	request for proposal
ROI	radius of influence
RTC	response to comments
SOD	soil oxidant demand
SOPs	standard operating procedures
TCE	trichloroethene
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

1 Introduction

This *Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan* (DT WP) was prepared for the Pompton Lakes Works (PLW) Site located at 2000 Cannonball Road in Pompton Lakes, Passaic County, New Jersey (Figure 1) which was formerly operated by the E. I. du Pont de Nemours and Company (DuPont). In 2015, DuPont transferred the PLW Site to The Chemours Company FC, LLC (Chemours).

An interim remedial measure (IRM) pilot study was proposed for the middle portion of the former Eastern Manufacturing Area (EMA [hereinafter referred to as the study area as depicted on Figure 2]) to reduce groundwater concentrations of Site-related volatile organic compounds (VOCs) (i.e., tetrachloroethene [PCE], trichloroethene [TCE], and related biodegradation products) discharging to Acid Brook surface water. Design testing will be completed within the study area to support the final design of the proposed IRM program. The data collected during the design testing will be utilized to confirm the design assumptions and allow adjustments to be made to the IRM approach.

1.1 Background

The *Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan* (Draft IRMWP) dated September 18, 2014, was prepared to present an in-situ chemical oxidation (ISCO) approach to address the groundwater discharge to Acid Brook within the study area. Information presented in the Draft IRMWP included:

- Summary of regulatory and investigation background for study area;
- IRM remedial action objective;
- Rationale for three proposed treatment areas (see Figure 2 of this DT WP) and aerial and vertical extents of treatment areas (see Table 1 of this DT WP);
- Evaluation of three potential remedial technologies (horizontal air sparge wells, ISCO, and soil mixing) and proposed implementation approach for each technology to address groundwater discharge to Acid Brook;
- Selection of technology to pilot study;
- Establishment of areas and intervals of treatment using technology; and
- Description of proposed IRM implementation and monitoring program.

Additional details on the items listed above as well as the anticipated permits and IRM schedule are presented in the Draft IRMWP.

Regulatory comments were provided on the Draft IRMWP by the U.S. Environmental Protection Agency (USEPA) and New Jersey Department of Environmental Protection (NJDEP) in a letter dated June 22, 2015 and a response to comments (RTC) was submitted on July 22, 2015 (Appendix A). USEPA and NJDEP did not request clarification or have additional comments on the July 22, 2015 RTC document. Select regulatory comments (USEPA comments 3, 6, 7, 8, and 9 and NJDEP comment 1) on the Draft IRMWP are addressed within this work plan. The remainder of regulatory comments on the Draft IRMWP will be addressed in the final IRMWP.

Upon completion and submittal of the RTC, a request for proposal (RFP) was prepared to select a vendor to implement the approach presented in the Draft IRMWP. The RFP

process was completed during the winter of 2015 and a vendor, Groundwater & Environmental Services, Inc. (GES), was selected to implement the IRM. The IRM will be completed in two phases, design testing (Phase I) and full-scale implementation (Phase II). This DT WP presents the selected vendor's approach to complete the design testing required to formalize the full-scale implementation of the ISCO IRM. A final IRMWP will be prepared to document the results of the design testing, present the final design of the IRM approach, and address regulatory comments (noted above) on the Draft IRMWP.

1.2 Purpose of Work Plan

The purpose of this DT WP is to present the design testing objective, summarize the design testing program and implementation plan, and provide the path forward for the IRM.

1.3 Work Plan Organization

Brief summaries of the remaining sections are presented below:

- Section 2: Design Testing Overview – This section provides an overview of the design testing program including the program objective.
- Section 3: Design Testing Implementation – This section presents the implementation of design testing including well installation, injection testing, process monitoring program, permits/approvals required to conduct the design testing, and how the data will be utilized.
- Section 4: Project Schedule and Path Forward – This section provides the anticipated project schedule and path forward for IRM implementation.
- Section 5: References – This section lists the references cited in the DT WP.

2 Design Testing Overview

This section provides an overview of the design testing program including the program objective.

2.1 Design Testing Objective

As a first step in the ISCO IRM program, the Draft IRMWP proposed design testing which consists of the injection of oxidant into representative locations within the treatment areas and conducting process monitoring. Design testing will be completed to verify the preliminary program design assumptions (e.g., radius of influence [ROI], oxidant distribution, injection spacing, and injection flow rates and pressures). The overall objective of the design testing is to collect the data required to finalize the approach for the full-scale ISCO IRM.

2.2 Design Testing Program

The program objective will be met through the collection of data resulting from the injection testing and process monitoring. The findings of the design testing will confirm the design assumptions regarding oxidant injection volumes/ROI and allow for adjustments to the approach. Additional details on the design testing program (e.g., design basis, process monitoring goal, and well spacing) are provided below.

2.2.1 Design Basis

The specific catalyzed hydrogen peroxide ISCO chemistry to be used is a combination of hydrogen peroxide and sodium persulfate. This dual oxidant approach combines the reactivity of hydrogen peroxide for the destruction of VOCs with the enhanced stability of sodium persulfate. Hydrogen peroxide catalyzed with persulfate tends to generate less heat and pressure than peroxide catalyzed with iron salts. In addition, post-injection monitoring typically shows that the oxidation reduction potential (ORP) remains elevated for longer periods with this catalyzed hydrogen peroxide approach.

The combination of hydrogen peroxide and sodium persulfate has several synergistic effects. First, hydroxyl radicals generated from hydrogen peroxide can initiate persulfate radical formation, and vice versa. Secondly, sodium persulfate may destruct a significant portion of the more susceptible contaminants, including natural oxidant demand (NOD), thus allowing the hydroxyl and sulfate radicals to destroy the more recalcitrant compounds. Finally, a combination of hydroxyl and sulfate radicals results in a multi-radical attack mechanism, yielding a higher efficiency in destroying contaminants.

The oxidant demand was estimated based on historical analytical data available in the adsorbed- and dissolved-phases to estimate the VOC mass for each treatment area for both the unsaturated and saturated zones. Based on the VOC mass estimates and accounting for an assumed NOD (also referred to as soil oxidant demand [SOD]), the oxidant volume per injection well was calculated. Approximately 2,200 pounds of sodium persulfate and 1,780 pounds of hydrogen peroxide will be injected during design testing. Table 2 provides a summary of the estimated injection volumes. The ROI is anticipated to be 15 feet with a target injection rate of 3 gallons per minute (gpm) per injection well.

A large portion of the total oxidant demand, and therefore injection volume, is driven by the assumed SOD. The peroxide-persulfate chemistry is less affected by SOD

compared to some other chemistries; however it is an area of uncertainty. The SOD assumed in the oxidant calculations was 0.5 grams per kilogram (g/kg) of non-contaminant oxidant demand based on the combination of hydrogen peroxide and sodium persulfate. The rate of reaction occurs faster with this coupled chemistry, compared to other methods of implementing persulfate (such as alkaline activation). The SOD becomes more relevant when the reaction process is longer. In order to better estimate the oxidant demand for future full-scale implementation, laboratory testing and analysis will be conducted for this parameter as described in Section 3.3.

2.2.2 Injection Testing

Injection testing will be completed within the treatment areas to verify the preliminary program design assumptions. Separate injection intervals are proposed to address shallow soil contamination from 0 to 6 feet below ground surface (bgs) (unsaturated zone) and soil and groundwater impacts from 6 to 16 feet bgs (saturated zone). Injection testing will consist of establishing one injection grid location for each treatment interval (0- to 6-foot and 6- to 16-foot treatment intervals), injecting the proposed representative volume of oxidant to remediate the grid, and conducting process monitoring. Due to the study area size and potential variations in subsurface conditions, injection testing will be repeated at several locations throughout treatment areas 1 through 3 (see Figure 2). Injection testing at multiple locations will provide additional confirmation of the injection approach.

The injection testing will require approximately one week to complete based on estimated travel times of oxidant from injection points to monitoring points, as well as the desired duration of monitoring to evaluate sustained injection area conditions.

2.2.3 Process Monitoring

Process monitoring will be conducted during injections for each treatment interval (0- to 6-foot and 6- to 16-foot treatment intervals) with the goal of collecting a sufficient volume of data to evaluate the effective ROI, oxidant distribution, and injection flow rates and pressures. Process monitoring wells will be installed at selected locations within the injection grid at specified distances from the injection points (i.e., 5 feet, 10 feet, 15 feet) with process monitoring conducted at each point to evaluate oxidant concentrations, pH, and other parameters demonstrating distribution of oxidant throughout the injection test area.

3 Design Testing Implementation

This section presents the implementation tasks and methods to be completed for the design testing including pre-mobilization activities, well installation, injection testing, and process monitoring program.

3.1 Pre-Mobilization Activities

Prior to the start of the design testing, a project safety analysis (PSA) will be completed and the required permits (drilling and Discharge to Groundwater Permit-by-Rule [DGW PBR]) will be acquired.

Project Safety Analysis

All work will be performed in accordance with the Site-specific health and safety plan (HASP), which will be modified to incorporate the activities of the design testing. A PSA will be completed prior to the implementation of the design testing. The PSA will allow the project team to gather and discuss the potential hazards that may be faced during the project and develop mitigation strategies, such as hazard elimination or engineering controls, to allow the project to be performed safely. The PSA process includes a plan of action discussion (i.e., project health and safety planning), preparation of the PSA document and addendum to the Site-specific HASP, and meeting to discuss the project, associated hazards, and proposed steps to mitigate or eliminate the hazards. The PSA will be documented on the Chemours PSA form.

Permitting

The following permits/approvals are anticipated for the design testing:

- Drilling/well permits – NJDEP drilling/well installation permits will be required for the design testing and secured as part of the pre-mobilization activities.
- DGW PBR – A DGW PBR (less than 180 days) will be required from NJDEP for the proposed design testing. A draft DGW PBR has been prepared and is included as Appendix B.

3.2 Well Installation

Due to the study area size and potential variations in subsurface conditions, injection testing will be conducted at several locations throughout treatment areas 1 through 3. As shown on Figure 2, five discrete test areas have been selected. Each test area will include one injection well and three process monitoring wells (with the exception of the test area in treatment area 3 which will only have two process monitoring wells due to its smaller size). A well construction table for the proposed network of wells is included as Table 3.

Injection Wells

Permanent wells will be used to facilitate the oxidant injection (as opposed to direct push points). The primary reason is to provide an efficient means to pre-wet the soil, while also providing more process control (versus direct push), and a well seal to reduce surface breakout during injection of fluids into the shallow zone.

Each of the five injection wells will be constructed as a nested well to provide a means of injecting into the unsaturated and saturated zones separately. Within a single borehole,

two 1-inch diameter Schedule 40 polyvinyl chloride (PVC) wells will be installed. The shallow well (unsaturated zone) will be screened from 2 to 6 feet bgs and the deeper well (saturated zone) will be screened from 7 to 16 feet bgs. The well screen will be 0.010 slot, and the seal between the two wells will be a Portland cement grout.

Process Monitoring Wells

Process monitoring wells will be installed at selected locations surrounding the injection well at specified distances from the injection point (i.e., 5 feet, 10 feet, and 15 feet). The process monitoring wells will be located at varying distances and directions from the injection well. This configuration will allow confirmation of the ROI and provide a means to understand the potential for preferential pathways. Each process monitoring well will be installed to a depth of 16 feet bgs and will consist of a 2-inch diameter Schedule 40 PVC with 0.020 slot well screen from 2 to 16 feet bgs.

3.3 Soil Sampling

Soil Buffering Capacity

The proposed approach of injecting a combined oxidant using hydrogen peroxide and sodium persulfate has the potential to lower the groundwater pH and, therefore, has a minimal potential to have a localized reduction of pH within Acid Brook. To mitigate this potential effect, the lowest effective oxidant concentrations (i.e., 10% persulfate and 8% peroxide) will be utilized whereas a typical injection may be at 20% persulfate and 17.5% peroxide. The pH will be monitored in locations adjacent to and within Acid Brook. It is anticipated that the natural buffering capacity of the Site soil will quickly raise the groundwater pH to baseline levels. Two soil samples will be collected and submitted for laboratory analysis for soil buffering capacity. This data will be used to confirm the assumption that Site soils have sufficient buffering capacity to return the groundwater pH to baseline levels.

Soil Oxidant Demand

During well installation, two soil samples will be collected from treatment area 1 and submitted for an SOD test; one from the unsaturated zone and one from the saturated zone. This test will measure the amount of oxidant consumed through oxidation of non-target soil organic species and naturally-occurring reduced metals. This data will be utilized in adjusting the oxidant demand estimates for full-scale implementation.

3.4 Unsaturated Zone Pre-Wetting

ISCO works more efficiently in the dissolved-phase. In order to remediate VOCs within the unsaturated zone with a liquid oxidant approach, the adsorbed VOCs must be transferred into the dissolved-phase. Injection testing includes pre-wetting the soil by injecting a volume of water equal to approximately 50% of a pore volume (assuming 6 feet of unsaturated soil) into the shallow injection wells prior to conducting ISCO injection. A pre-wetting injection flow rate of 5 gpm is assumed.

3.5 Oxidant Injection

Equipment

The fluids/chemicals to be used for the design testing include water supplied from the onsite fire hydrant, sodium persulfate, and hydrogen peroxide. Sodium persulfate will be

delivered to the Site as a dry powder then mixed and dissolved into the diluted hydrogen peroxide activator solution to generate a 10% persulfate solution prior to injecting. Hydrogen peroxide will be delivered to the Site in a 34% concentration and diluted down to 8%.

The injection equipment will be comprised of a mix tote (255-gallon), transfer/injection pump, flow meters/totalizers, and delivery hoses. Mixing will be achieved through a combination of paddle mixers, re-circulation, and agitation.

An electric or pneumatic chemically-compatible pump will be utilized for mixing and injection. Injections will be controlled and monitored with valves, flow meters, flow totalizers, and pressure indicators. PVC pressure-rated and chemically-compatible hosing will be used for all liquid chemical transfer. A stainless steel injection wellhead will be temporarily attached to the injection well.

On each day of injection, water will be added to each mix tank. Concentrated hydrogen peroxide will then be added to the mix tank to dilute to an 8% solution. The dry sodium persulfate will then be added to the diluted peroxide to generate a 10% persulfate solution. Once the persulfate is fully dissolved, the appropriate valves will be opened and the transfer pump will be used to inject the oxidant solution into the injection wells at the desired flow rate and pressure. Injection will occur under low pressure and is expected to be less than 50 pounds per square inch (psi). At the completion of the injection event, piping will be removed and all injection and monitoring wells secured.

Operation

The design testing will be implemented over five consecutive days. The following scope is representative of the proposed testing activities; however, Site conditions may warrant changes to daily activities. A health and safety tailgate meeting will be conducted prior to the start of work each day.

Day 1 – Treatment Area 1:

- Receive chemical deliveries;
- Connect fire hydrant and flow meter; and
- Begin injection of potable water into IW-1S – the total target injection volume is approximately 1,515 gallons of water.

Day 2 – Treatment Area 1:

- Collect baseline readings from PM-1, PM-2, and PM-3;
- Begin injection of potable water into IW-2S – the total target injection volume is approximately 1,515 gallons of water;
- Prepare persulfate and peroxide oxidant solution;
- Begin injection of oxidant solution into IW-1S – the total target injection volume is 202 gallons;
- Once the target volume has been reached, collect monitoring data;
- Begin injection of oxidant solution into IW-1D – the total target injection volume is 309 gallons; and

- Once the target volume has been reached, collect monitoring data.

Day 3 – Treatment Area 1:

- Collect baseline readings from PM-4, PM-5, and PM-6;
- Begin injection of potable water into IW-3S – the total target injection volume is approximately 1,515 gallons of water;
- Prepare persulfate and peroxide oxidant solution;
- Begin injection of oxidant solution into IW-2S – the total target injection volume is 202 gallons;
- Once the target volume has been reached, collect monitoring data;
- Begin injection of oxidant solution into IW-2D – the total target injection volume is 309 gallons; and
- Once the target volume has been reached, collect monitoring data.

Day 4 – Treatment Area 1 and 2:

- Collect baseline readings from PM-7, PM-8, and PM-9;
- Begin injection of potable water into IW-4S – the total target injection volume is approximately 1,515 gallons of water;
- Prepare persulfate and peroxide oxidant solution;
- Begin injection of oxidant solution into IW-3S – the total target injection volume is 202 gallons;
- Once the target volume has been reached, collect monitoring data;
- Begin injection of oxidant solution into IW-3D – the total target injection volume is 309 gallons;
- Once the target volume has been reached, collect monitoring data;
- Collect baseline readings from PM-10, PM-11, and PM-12;
- Once the target water volume has been reached, begin injection of oxidant solution into IW-4S – the total target injection volume is 188 gallons;
- Once the target volume has been reached, collect monitoring data;
- Begin injection of oxidant solution into IW-4D – the total target injection volume is 307 gallons; and
- Once the target volume has been reached, collect monitoring data.

Day 5 – Treatment Area 3:

- Begin injection of potable water into IW-5S – the total target injection volume is approximately 1,515 gallons of water;
- Prepare persulfate and peroxide oxidant solution;
- Once the target water volume has been reached, collect baseline readings from PM-13 and PM-14;

- Begin injection of oxidant solution into IW-5S – the total target injection volume is 411 gallons;
- Once the target volume has been reached, collect monitoring data;
- Begin injection of oxidant solution into IW-5D – the total target injection volume is 163 gallons; and
- Once the target volume has been reached, collect monitoring data.

3.6 Process Monitoring

To monitor the injection and subsurface response, the process monitoring wells located within each test area will be used. At a minimum, data will be collected before Site activity begins, once during injection, and after the completion of injection activity to evaluate changes. The following data will be collected:

- Oxidant presence (peroxide and persulfate);
- Depth to water from top of casing;
- Dissolved oxygen;
- pH;
- Temperature; and
- Oxidation reduction potential.

Oxidant testing will be conducted by using a bailer to remove a small volume of groundwater. The water will then be tested for hydrogen peroxide using field test strips. Periodically, a Chemetrics colorimetric test kit will also be used to determine the peroxide concentration. Persulfate will be monitored using field test kits. Geochemical monitoring data will utilize a multi-parameter water quality sensor. In addition, these parameters will be monitored within Acid Brook (when there is flowing water).

3.7 Quality Assurance

A quality system is utilized that operates through management processes and structures that assure that data or information collected are of the needed and expected quality for their desired use. The quality program consists of:

- Corporate quality management manual;
- Quality programs, tools, and policies and procedures; and
- A project-specific quality plan.

This approach allows for Site-specific refinements to quality objectives. Examples of quality program components are document and data control standards; health and safety policies, procedures, and job safety analyses (JSAs); standard operating procedures (SOPs); and engineering design controls and guidance.

Managing the overall project quality assurance/quality control (QA/QC) will be a primary responsibility of GES, who has performed similar QA/QC management on numerous similar projects. Training and clear direction are provided to ensure proper measurement and data collection are accomplished in the field. The GES Project Manager has a

thorough understanding of the scope of work and objectives of the project. The scope of work and project objectives are refined in detailed instructions to field staff that are conveyed by the work order system, which is accompanied by the necessary SOPs and JSAs. The Project Manager is then responsible for ensuring that all data measured and collected is reviewed and approved prior to being incorporated into a document, table, or plan. The Project Manager is also responsible for ensuring that all documents are reviewed and approved by the appropriate level staff.

Inspections

Field inspections will be performed to determine if injection, monitoring, and data management activities are in accordance with applicable SOPs. The Project Manager (or designated representative) will perform Site inspections during well installation and injection testing. Specific elements of the field inspection may include the following:

- Confirmation that correct procedures are utilized;
- Verification that field documentation is completed in a timely, thorough and accurate manner;
- Verification that forms and labels are filled out accurately and completely; and
- Inspection of equipment calibration procedures and documentation.

3.8 Design Testing Data

The results from the injection testing and process monitoring will be used to adjust the IRM injection program design (if required). A final IRMWP will be prepared to document the results of the design testing, present the final design and path forward for the IRM approach, and address regulatory comments on the Draft IRMWP.

4 Project Schedule and Path Forward

This section provides the anticipated project schedule and path forward for IRM implementation.

Project Schedule

A preliminary project schedule for design testing, data evaluation, and preparation of the final IRMWP is provided in Table 4. Milestones and critical path activities have been identified in bold and highlighted in blue on the schedule. Time frames for each activity are estimated. The following are estimated durations for the design testing, data evaluation, and final IRMWP:

- NJDEP Review and Approval of DGW PBR – Six weeks;
- Well Permit Applications – One week;
- PSA Preparation and Meeting – Two weeks;
- Well Installation – One week;
- Injection Testing – One week;
- Soil Oxidant Demand and Buffering Capacity Testing – Four weeks;
- Data Evaluation and Incorporation Into Final Design – Two months; and
- Prepare and Submit Final IRMWP – Three months.

Path Forward

Upon approval of the DT WP and the DGW PBR, the design testing program will begin. A final IRMWP will be prepared to document the results of the design testing, present the final design and path forward for the IRM approach, and address regulatory comments on the Draft IRMWP.

5 References

Chemours. July 2015. Response to Comments, NJDEP and USEPA Review of the *Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan.*

DuPont. February 2013. *Groundwater Characterization Report – Well 13 Area Along Acid Brook Response to Comments*.

O'Brien & Gere. September 2012. *Groundwater Characterization Report – Well 13 Area Along Acid Brook*.

O'Brien & Gere. April 2014. *2013 Supplemental Groundwater Investigation Report – Middle to Southern EMA*.

O'Brien & Gere. September 2014. *Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan*.

Tables

Table 1
Treatment Area Designation, Areal Extent, Perimeter, and IRM Rationale
Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan
Pompton Lakes Works
Pompton Lakes, New Jersey

Treatment Area Designation	Perimeter (feet)	Area (feet^2)	Treatment Interval (feet bgs)	General Soil Type	Treatment Rationale
Area 1	1,542	44,188	0 to 6 (unsaturated)	Silt (1 to 5 feet thick) with gravel, sand, and silty sand lenses	Site-related VOCs observed above NJDEP IGWSSL at sample locations 332-61, -67, -68, -71, -72, -341, -342, -344, and 69-1, -5, and -10.
			6 to 16 (saturated)	Fine sand with trace silt	Treatment area is based on Site-related VOC concentrations observed at sample locations HP-2, -5, -6, -8, -14, and HPIW-03 to -08, -10, -12, and -13. Treatment depth based on depth of Acid Brook and estimated groundwater depth that may discharge to Acid Brook.
Area 2	480	6,557	0 to 6 (unsaturated)	Silt (1 to 5 feet thick) underlain by fine to medium sand	Site-related VOCs observed above IGWSSL at sample locations 332-317 and 332-318.
			6 to 16 (saturated)	Fine to medium sand (5 to 10 feet thick) with trace silt	Treatment area is based on Site-related VOC concentrations observed at sample locations HP-1, -13, and HPIW-01. Treatment depth is based on depth of Acid Brook and estimated groundwater depth that may discharge to Acid Brook. Treatment depth may decrease to the north of HP-13 due to observation of shallower bedrock (approximately 10 feet bgs).
Area 3	140	821	0 to 6 (unsaturated)	Fine sand (4 feet thick) and silt (2 feet thick)	Site-related VOCs observed above IGWSSL at sample locations 332-249, -250, -251, -336, -337, -338, and -339.
			6 to 16 (saturated)	Medium to fine sand and silt	Treatment area is based on Site-related VOC concentrations observed in soils associated with AOCs 72, 143, and 144. Groundwater was not observed to be impacted adjacent to these AOCs; however treating this area should reduce the potential for future impacts.

Notes:
AOC = area of concern
bgs = below ground surface
IGWSSL = Impact to Groundwater Soil Screening Level
NJDEP = New Jersey Department of Environmental Protection
VOCs = volatile organic compounds

Table 2
Summary of Injection Volumes for Design Testing
Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan
Pompton Lakes Works
Pompton Lakes, New Jersey

Treatment Area	Number of Test Injection Wells[1]	Volume of Pre-Wetting Water per Injection Well (gallons)	Total Volume of Pre-Wetting Water for Design Testing (gallons)	Mass of Sodium Persulfate per Injection Well (pounds)	Mass of Hydrogen Peroxide per Injection Well (pounds)	Volume of Oxidant Solution per Injection Well[2] (gallons)	Total Mass of Sodium Persulfate for Design Testing (pounds)	Total Mass of Hydrogen Peroxide for Design Testing (pounds)	Total Volume of Oxidant Solution for Design Testing[2] (gallons)
Area 1 - Unsaturated	3	1,515	4,545	171	138	202	512	414	605
Area 1 - Saturated				261	211	309	783	634	927
Area 2 - Unsaturated	1	1,515	1,515	159	128	188	159	128	188
Area 2 - Saturated				260	210	307	260	210	307
Area 3 - Unsaturated	1	1,515	1,515	358	281	411	358	281	411
Area 3 - Saturated				137	112	163	137	112	163
Total			**7,575**				**2,209**	**1,779**	**2,601**

1 - Each injection well is nested with a shallow point screened in the unsaturated zone and a deep point screened in the saturated zone.
2 - Oxidant solution is the mixture of dry persulfate added to 8% hydrogen peroxide to yield a 10% sodium persulfate solution.
Oxidant mass is in pounds on a 100% basis.

Table 3
Proposed Design Testing Well Construction
Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan
Pompton Lakes Works
Pompton Lakes, New Jersey

Well	Treatment Area	Total Depth (feet)	Casing Diameter (inches)	Top of Screen Depth (feet)	Screened Interval (feet)	Screen Length (feet)	Screen Size
IW-1S	1	6	1	2	2-6	4	0.01 slot
IW-1D	1	16	1	7	7-16	9	0.01 slot
IW-2S	1	6	1	2	2-6	4	0.01 slot
IW-2D	1	16	1	7	7-16	9	0.01 slot
IW-3S	1	6	1	2	2-6	4	0.01 slot
IW-3D	1	16	1	7	7-16	9	0.01 slot
IW-4S	2	6	1	2	2-6	4	0.01 slot
IW-4D	2	16	1	7	7-16	9	0.01 slot
IW-5S	3	6	1	2	2-6	4	0.01 slot
IW-5D	3	16	1	7	7-16	9	0.01 slot
PM-1	1	16	2	2	2-16	14	0.02 slot
PM-2	1	16	2	2	2-16	14	0.02 slot
PM-3	1	16	2	2	2-16	14	0.02 slot
PM-4	1	16	2	2	2-16	14	0.02 slot
PM-5	1	16	2	2	2-16	14	0.02 slot
PM-6	1	16	2	2	2-16	14	0.02 slot
PM-7	1	16	2	2	2-16	14	0.02 slot
PM-8	1	16	2	2	2-16	14	0.02 slot
PM-9	1	16	2	2	2-16	14	0.02 slot
PM-10	2	16	2	2	2-16	14	0.02 slot
PM-11	2	16	2	2	2-16	14	0.02 slot
PM-12	2	16	2	2	2-16	14	0.02 slot
PM-13	3	16	2	2	2-16	14	0.02 slot
PM-14	3	16	2	2	2-16	14	0.02 slot

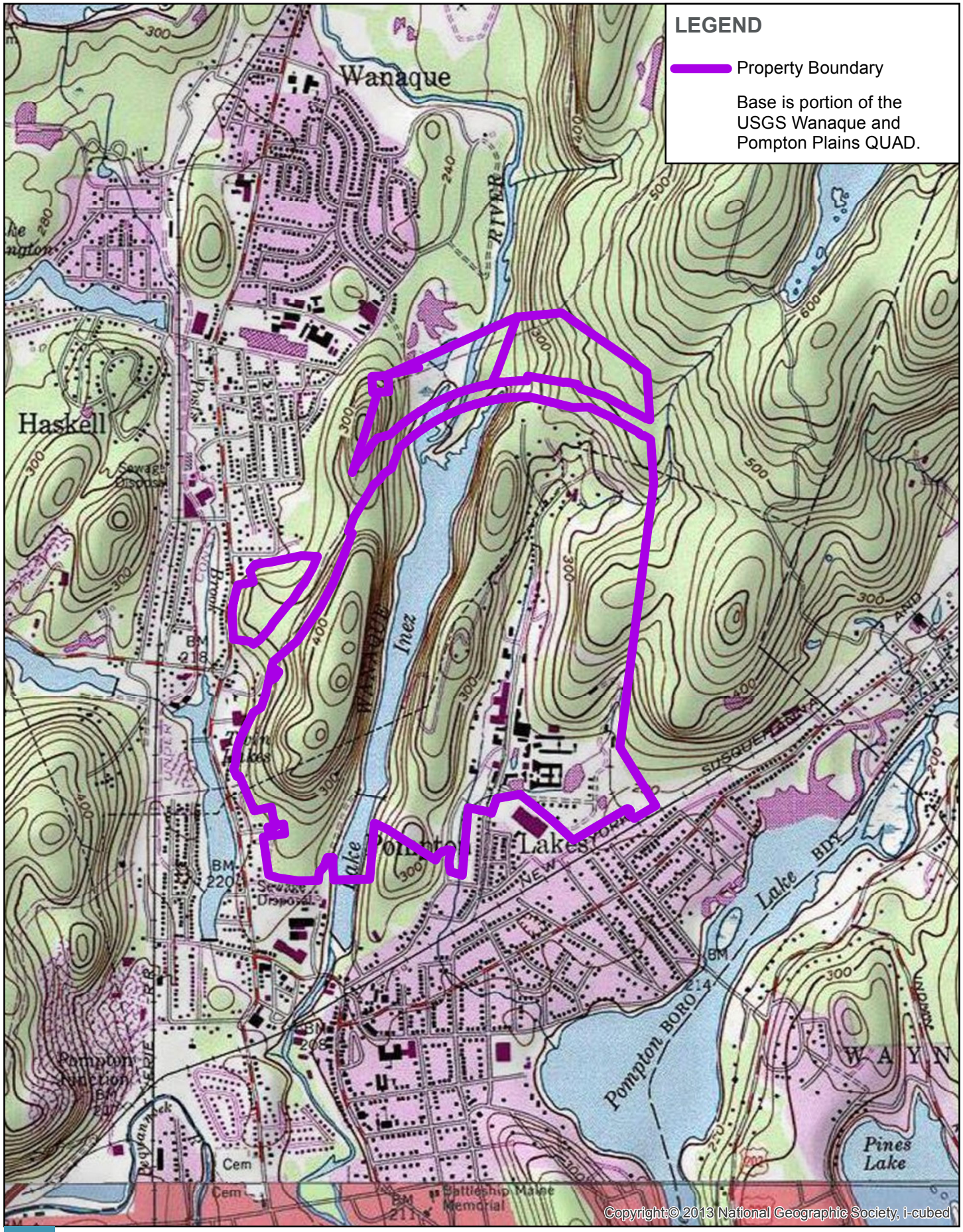
Notes:
Injection wells (IW) will be nested with a shallow (S) and a deep (D) point within one borehole.

Table 4
Preliminary Project Schedule
Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan
Pompton Lakes Works
Pompton Lakes, New Jersey

Design Testing Schedule	2016								2017			
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Submittal of Design Testing Work Plan to NJDEP and USEPA												
Receipt of Design Testing Work Plan and DGW PBR Regulatory Approval												
Design Testing												
Well Permitting												
Project Safety Analysis												
Design Testing (Well Installation, Soil Sampling, Injection Testing)												
Evaluate Data and Finalize Design												
Prepare Final IRMWP												
Submittal of Final IRMWP to NJDEP and USEPA												

Notes:
DGW PBR = Discharge to Groundwater Permit-by-Rule
IRMWP = Interim Remedial Measure Work Plan
NJDEP = New Jersey Department of Environmental Protection
USEPA = U.S. Environmental Protection Agency

Figures



0 0.125 0.25 0.5 Miles

SITE LOCATION MAP

POMPTON LAKES WORKS

FIGURE 1

DRAFT ONSITE GROUNDWATER INTERIM REMEDIAL MEASURE DESIGN TESTING WORK PLAN

PATH: I:\507969 - ONSITE GROUNDWATER RD\49986.DUPONT-ONSITE-G\DOCS\DWG\IRM DESIGN TESTING WP\FIGURE 1.MXD - USER: CWEAVER - DATE: 4/6/2016

I:\507969 - Onsite Groundwater RD\49986.Dupont-Onsite-G\Docs\DWG\IRM Desgin Testing WP\FIGURE 2.mxd

CEA-01/HPIW-09
SITE 5A
CEA-03
AOC 64
AOC 63
HPIW-02
AOC 167
CEA-09
AOC 65
HPIW-03
PM-2
HPIW-10
IW-1S/1D
AOC 189
PM-1
PM-3
HPIW-12
HPIW-04
HPIW-08
PM-5
IW-2S/2D
PM-4
HP-2
PM-6
CEA-02
AOC 69
HPIW-05
HPIW-11
HP-14
HPIW-13
HPIW-07
PM-7
HPIW-06
PM-8
IW-3S/3D
PM-9
TREATMENT AREA 1
HP-5
HP-6
HP-8
SITE 5
HP-10
HP-7
HP-9
HP-11
AOC 171
AOC 70
CEA-08BR
CEA-07BR
CEA-01BR
AOC 71
AOC 72
AOC 143
AOC 144
PM-13
IW-5S/5D
TREATMENT AREA 3
HP-12
PM-14
AOC 172
CEA-08
AOC 73
CEA-04
HPIW-01
AOC 68
AOC 66
HP-13
HP-1
PM-12
IW-4S/4D
PM-10
PM-11
TREATMENT AREA 2
13
CEA-GT
HP-4
HP-3
CEA-06
AOC 67
AOC 190
STUDY AREA
AOC 173
230
225
235
240
245
275
280
290
265
270
285

PLOTDATE: 06/23/15 9:00:12 AM CWEAVER

THIS DOCUMENT WAS DEVELOPED IN COLOR. REPOPRODUCTION IN B/W MAY NOT REPRESENT THE DATA AS INTENDED.

NOTES:
1. Sanitary sewer manholes are based on a survey conducted on 7/11/2012. Sanitary sewer lines have been adjusted to align with surveyed manholes.
2. Grab groundwater (HP) samples were collected during May/June 2012.
3. Grab groundwater (HPIW & CEA) samples were collected during August/October/November 2013.

Legend

- 2012 Investigation Location
- 2013 Investigation Location
- Manholes
- Monitoring Well
- Surface Water Sample (approximate and based on field measurements and photos provided by USEPA)
- StudyArea
- Storm Sewer
- Field Verified Sanitary Sewer
- Ground Surface Contour
- Bedrock Outcrop Line

AREA OF CONCERN DESIGNATION

- Interim Remedial Measure (IRM)
- No Further
- Remedial Investigation Completed
- Treatment
- Former Buildings
- Concrete Pad
- Unpaved Road
- Paved Road
- Design Testing Process Monitoring Well
- Design Testing Injection Well

IRM TREATMENT AREAS AND DESIGN TESTING LOCATIONS

POMPTON LAKES WORKS
DRAFT ONSITE GROUND WATER
INTERIM REMEDIAL MEASURE
DESIGN TESTING WORK PLAN
POMPTON LAKES, NEW JERSEY

0 20 40 80 120 160
Feet
1 inch = 30 feet

N

APRIL 2016
CHEMOURS 507969

FIGURE 2

Appendix A. Response to Comments, NJDEP and USEPA Review of the *Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan*

Response to Comments

NJDEP and USEPA Review
of the
Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan
(dated 18 September 2014)
Correspondence dated 22 June 2015

USEPA Comments

1. Section 3.2.1.1 – In the discussion regarding implementation on page 9, it is stated that the monitoring and maintenance is estimated to be a minimum 30 years. What is the basis for that estimate?

Response

The proposed design of the horizontal well presented in the Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan (IRMWP) would apply the technology as an engineering control. The proposed horizontal well system would provide localized treatment which would reduce mass within the lateral influence of the system, preventing volatile organic compounds (VOCs) in groundwater from reaching Acid Brook.

The groundwater and surface water within the study area would need to be monitored throughout the lifetime of the system to confirm VOCs were being prevented from discharging to the brook, and to determine an appropriate time to shut off the system. Based on the proposed application, an operational lifetime of 30 years was selected which is the typical operation and maintenance period used for estimating the cost incurred during the operational lifespan of an engineering control.

2. Section 3.2.1.2 – The proposed use of Geoprobe direct-push injections is suitable for this site due to the relatively shallow nature of the treatment zones, and the site lithology. It is recommended that the injections be conducted in a top-down manner, in which the oxidant is injected at progressively deeper depths while the borehole is being probed. The top-down injection approach is more likely to provide very precisely known injection locations/depths. A bottom-up approach would mean there is a possibility of short-circuiting downward.

Response

Comment noted. A request for proposal (RFP) is being prepared to select a vendor for implementation of the IRM. The selected vendor will prepare an implementation and operations plan (Operations Plan) that will provide their proposed implementation strategy and justification for their method of oxidant delivery (top-down or bottom-up). The Operations Plan will be submitted to the New Jersey Department of Environmental Protection (NJDEP) and U.S. Environmental Protection Agency (USEPA) as an attachment to the IRMWP for review and approval.

3. Section 3.2.1.2 – The IRM WP proposes process monitoring of in situ field parameters during oxidant injections, to evaluate effective radius of influence (ROI) and oxidant concentration and distribution. In general, it is recommended that the ROI and oxidant concentration and distribution determined by measurement of in situ field parameters during the process monitoring be considered estimations, as in situ field parameters are not considered direct measurements of oxidant presence and concentration. Monitoring hydrogen peroxide (as proposed in the IRM WP) would be a direct measurement and is recommended.

Response

Comment noted. As discussed in the response to USEPA Comment #2, an RFP is being prepared to select a vendor for implementation of the IRM. The selected vendor will prepare an Operations Plan that will provide their proposed process monitoring strategy, monitoring methods, and justification for parameters to be monitored.

4. Section 3.2.1.3 – Please clarify why sodium persulfate is preferred for the soil mixing alternative but not the ISCO alternative. Its rationale for selection as an oxidant for soil mixing (i.e., treats wider range of organic constituents, more stable/lasts longer in the subsurface, etc.) appears to be equally appropriate for ISCO.

Response

Modified Fenton's reagent (MFR) is preferred for ISCO because sodium persulfate requires an activating agent which reduces the volume of oxidant that can be injected into the subsurface due to pore space. Pore space is less of an issue to overcome with soil mixing because of the mixing and disturbance of the soil.

5. Section 4.2 – Consideration could be given to establishing a baseline against which to conduct the performance monitoring. The IRM WP proposes post-injection performance monitoring (appropriately), but does not mention a pre-injection baseline. The IRM WP states (p. 16) "*Performance monitoring will include the collection of soil and groundwater samples within the treatment areas with the goal of collecting a sufficient volume of data to assess the reduction in mass achieved.*" To best assess the reduction in contaminant mass achieved by the oxidant injections, it would appear necessary to have a baseline. If sufficient data currently exists to establish such a baseline, it should be mentioned in the "*detailed process monitoring plan... provided in the IRM WP Operations Plan that will be submitted as an addendum to this IRMWP*" or state that a pre-injection baseline sampling could be developed.

Response

A large volume of soil and groundwater data has been collected during the historic investigations within the study area. The following presents the number of soil and groundwater samples collected within the study area (see area as depicted on Figure 2 of the IRMWP):

- *Total soil samples collected for VOC analysis – 112*
  - *Treatment Area 1 – 53*
  - *Treatment Area 2 – 4*
  - *Treatment Area 3 – 19*
  - *Outside of Treatment Areas – 36*

- *Total groundwater samples collected for VOC analysis – 130*
  - *Treatment Area 1 – 27*
  - *Treatment Area 2 – 5*
  - *Treatment Area 3 – 1*
  - *Outside of Treatment Areas – 97*
    - *64 of these samples were collected from well 13 as part of sampling associated with the comprehensive groundwater monitoring program for the site.*

The sample locations and associated VOC data for the study area are presented in the 2013 Supplemental Groundwater Investigation Report – Middle to Southern EMA (2013 Investigation Report) drawings. Based on the volume of samples previously collected, baseline sampling is not proposed. The existing dataset will be used as the baseline for comparison with performance monitoring data. Additional data will not be collected unless the selected vendor requires information to formalize their design.

6. Section 4.5 – Please include the information regarding the need to request a variance from NJDEP to allow the temporary piezometers to remain installed for longer than 48 hours.

Response

The RFP will require bidders to indicate the type of proposed injection points (i.e., fixed location or direct push) and the timeframe the injection points will remain in the ground. If the selected vendor proposes to inject using temporary piezometers that will remain installed for longer than 48 hours, the vendor will need to request and obtain a variance prior to implementation. The variance will be submitted to NJDEP's Bureau of Water Allocation and Well Permitting for review.

7. General – Reference the Health & Safety Plan that will be prepared/utilized during the implementation of the pilot study.

Response

A Health and Safety Plan (HASP) will be included in the Operations Plan prepared by the selected vendor.

8. General – Reference the document that will provide the field sampling procedures to be utilized. If those procedures will be in the IRM WP Operations Plan, state such.

Response

The field sampling procedures proposed for injection and monitoring will be included in the Operations Plan prepared by the selected vendor.

9. General – Reference the document that will provide quality assurance/quality control procedures to be utilized. If those procedures will be in the IRM WP Operations Plan, state such.

Response

The quality assurance/quality control procedures will be included in the Operations Plan prepared by the selected vendor.

NJDEP Comments

1. Section 4.2.1 – Clarification should be provided that the variance required from NJDEP to allow temporary piezometers to remain installed for longer than 48 hours will need to be reviewed by NJDEP's Bureau of Water Allocation and Well Permitting. If the variance is not denied, DuPont should be prepared to obtain well permits for the temporary piezometers.

Response

See response to USEPA Comment #6.

2. Section 4.2.2 – NJDEP concurs with the use of ISCO injections, however it is not clearly stated what oxidant is being proposed. This section states that 'each process monitoring point will be monitored on a regular basis for process parameters including hydrogen peroxide". The proposed oxidant, along with the expected volume and strength, will need to be provided in a revised IRM WP and the formal Discharge to Ground Water Permit-By-Rule proposal.

Response

MFR was proposed as the oxidant in Section 3.2.1.2 within the technology evaluation of ISCO. The implementation section of the ISCO technology evaluation identifies MFR as the selected oxidant and why MFR was selected. Section 4 provides a general description of how the technology described in Section 3.2.1.2 will be implemented and references Section 3.2.1.2 in the introduction. Additionally, Section 4.1 references using MFR as the oxidant at the top of page 15.

As stated in the introduction for Section 4 of the IRMWP, the treatment approach presented is preliminary. The oxidant volume and strength proposed for the IRM are details that are specific

to a vendor's design and will be included in Operations Plan and the formal Discharge to Groundwater Permit-By-Rule proposal.

3. Appendix A – A memo prepared by URS for DuPont is included and describes the derivation of site-specific human health surface water screening levels to evaluate potential exposure (via incidental ingestion and dermal contact) in Acid Brook. DuPont is advised that NJDEP's Surface Water Quality Criteria (SWQC) must be used and that alternative screening levels or criteria for surface water cannot be accepted.

Response

NJDEP Surface Water Quality Criteria (SWQC) (N.J.A.C. 7:9B) for site-related VOCs, while generally applicable to freshwater non trout waterway (FW2 NT) streams, do not represent the most likely human health exposure scenario to evaluate the protectiveness of the IRM based on intermittent flow conditions in Acid Brook. Further clarification on the relevance of SWQC to human health exposure in Acid Brook, as presented in Appendix A, is provided below:

- *Water flow within the stream onsite is intermittent and dry for extended periods of the year, typically late summer to early fall. Based on low flow estimates from the U.S. Geological Survey (USGS) StreamStats (Version 3.0 Beta) application (Watson and McHugh, 2014), Acid Brook meets the regulatory definition of an intermittent stream (N.J.A.C. 7:9B-1.4) along its entire length prior to discharging to Pompton Lake[1], having minimum average seven consecutive day flows with a statistical recurrence of 10 years (MA7CD10) values of less than 0.1 cubic feet per second (cfs; See Attachment).*

- *The intermittent hydrology of Acid Brook is maintained by artificial flow sources, including storm water discharges, which supplement the limited natural base flow resulting from seasonal groundwater discharge.*

- *NJDEP Surface Water Quality Standards indicate that SWQC should be maintained in measurable natural flow immediately downstream of intermittent streams with insufficient flow to determine water quality [N.J.A.C. 7:9B-1.5(c)]. Therefore, SWQC are not applicable in Acid Brook at the site during periods when there is insufficient natural flow.*

- *NJDEP SWQC for site-related VOCs were derived for the protection of human health based on the combined exposure of the ingestion of fish and drinking water. However, these exposure pathways do not exist in Acid Brook under intermittent flow conditions due to the absence of edible-sized fish and a drinking water source.*

- *Pompton Lake is the first perennial surface water body immediately downstream of the intermittent Acid Brook. Therefore, NJDEP human health SWQS for site-related VOCs are not relevant to likely exposures in Acid Brook and should not be applicable until the intermittent Acid Brook discharges to Pompton Lake.*

[1] StreamStats Version 3.0 Beta estimates for low flow statistics were calculated for Acid Brook at Pompton Lakes Works and Acid Brook at the Lakeside Avenue Bridge prior to discharging to Pompton Lake (See Attachment).

- *Site-specific human health surface water screening levels (SLs) were derived in Appendix A to represent potential direct contact exposures when intermittent flow may be occurring at the site. The SLs are protective of future adult/child recreational uses that may result in exposure to site-related VOCs in surface water through incidental ingestion of and dermal contact with surface water while wading or at play in Acid Brook. Therefore, these SLs represent the most relevant screening levels to evaluate the protectiveness of the IRM on the basis of human health exposures.*

Based on the information presented above, it is proposed that the screening levels developed in Appendix A be used as a guide to evaluate the protectiveness of direct human contact to ensure that the IRM is protective of potential likely human exposure and, in accordance with N.J.A.C. 7:9B-1.5(c), the NJDEP Surface Water Quality Standards be maintained where measurable natural flow occurs immediately downstream of the intermittent stream.

Reference

Watson, K.M., and McHugh, A.R., 2014, Regional regression equations for the estimation of selected monthly low-flow duration and frequency statistics at ungaged sites on streams in New Jersey: U.S. Geological Survey Scientific Investigations Report 2014–5004, 59 p.

****

In closing, an RFP will be prepared to select a vendor for implementation of the IRM. The selected vendor will prepare and submit an Operations Plan as an attachment to the IRMWP for regulatory review and approval. The Operations Plan will provide the details of the IRM implementation (i.e., design, monitoring program, HASP, quality assurance/quality control) and will address the IRMWP comments provided by NJDEP and USEPA.

Chemours proposes to submit a revised IRMWP with the Operations Plan as an attachment after the vendor has been selected. The contract is anticipated to be awarded to the selected vendor in September 2015. Upon selection, the vendor shall prepare and submit a formal implementation schedule for regulatory review. The schedule shall include the timeframes for submittal of the IRMWP and Operation Plan, the anticipated sequence of the IRM, and proposed implementation duration.

Appendix B. Draft Discharge to Groundwater Permit-by-Rule Package

New Jersey Department of Environmental Protection
Site Remediation Program

DISCHARGE TO GROUND WATER (DGW) PERMIT-BY-RULE AUTHORIZATION REQUEST

☐ LSRP ☐ Subsurface Evaluator (UHOT)

Date Stamp (For Department use only)

SECTION A. SITE NAME AND LOCATION

Site Name: Pompton Lakes Works Site

AKAs: DuPont Pompton Lakes Works Site

Street Address: 2000 Cannonball Rd

Municipality: Pompton Lakes (*Township, Borough or City*)

County: Passaic Zip Code: 07442

Program Interest (PI) Number(s): 007411

Case Tracking Number(s) for this submission: _____

Municipal block(s) and lot(s) where the **proposed discharge(s)** would occur:

Block # 100 Lot #(s) 3 Block # _____ Lot #(s) _____

Block # _____ Lot #(s) _____ Block # _____ Lot #(s) _____

SECTION B. FEE AND DISCHARGE INFORMATION

DGW Proposal Review Fee $350.00
(Relevant fee will be submitted upon approval of this draft package.)

Discharge Type *(check all that apply)*

☐ Discharge of Recovered Ground Water
Will the discharge be a result of dewatering only? ..... ☐ Yes ☐ No
☒ Discharge that is part of an *In situ* Remediation
☐ Discharges other than those above *(see instructions for more information)*

Facility Type *(check all that apply)*

☒ Underground Injection Control (UIC) facility (i.e., any type of injection)
☐ Non-UIC (e.g., surface application) *(see instructions for more information)*

Attach a Discharge to Ground Water Proposal to this form *(see instructions)*

SECTION C. PUBLIC NOTICE PROVISIONS *(Does not apply to residential heating oil tank cases)*

Is the proposed discharge lasting greater than 180 days? ..... ☐ Yes ☒ No

If "Yes," attach a copy of the public notice written as you intend it to be published. *(see instructions)*

SECTION D. SITE USE AND GROUND WATER CLASSIFICATION

Current Site Use *(check all that apply)*

☒ Industrial
☐ Residential
☐ Commercial
☐ School or child care
☐ Other _____
☐ Agricultural
☐ Park or recreational use
☐ Vacant
☐ Government

Intended Future Site Use *(check all that apply)*

☒ Industrial
☐ Residential
☐ Commercial
☐ School or child care
☐ Park or recreational use
☐ Vacant
☐ Government
☐ Future site use unknown

What is the ground water classification for this site as per N.J.A.C. 7:9C? *(check all that apply)*

☐ Class I-A
☐ Class I-PL Pinelands Protection Area
☐ Class I-PL Pinelands Preservation Area
☒ Class II-A
☐ Class III-A
☐ Class III-B

SECTION E. RECEPTOR EVALUATION SUMMARY

Non-UHOT Cases

1. Have any of the following been identified on the site or within 200 feet of the site boundary?

   Check all that apply.

   ☒ Residences
   ☐ Child care facilities
   ☐ Public and private schools (K-12)
   ☒ Surface water
   ☒ Other occupied buildings
   ☒ Public parks and playgrounds

2. Did the well search conducted as a part of the receptor evaluation show any well use (potable, industrial, or irrigation)? ☐ Yes ☒ No

   If "Yes," indicate the type of use and approximate distance (closest occurrence) from site: *(Check all that apply)*

   ☐ Potable Distance from site: _____ feet

   ☐ Industrial Distance from site: _____ feet

   ☐ Irrigation Distance from site: _____ feet

3. Have any of these receptors been impacted? ☒ Yes ☐ No
   If "Yes," Do you have an NJDEP assigned Case Manager? ☒ Yes ☐ No

   If "Yes," please list the Case Manager: Mr. Anthony Cinque

UHOT Cases

1. Is ground water contamination above the Ground Water Remediation Standards? ☐ Yes ☐ No
   If "Yes," answer questions 2 and 3.
2. Has a potable well been identified within 100 feet of the contamination? ☐ Yes ☐ No
3. Have any potable wells been impacted? ☐ Yes ☐ No
   If "Yes," has the NJDEP been notified? ☐ Yes ☐ No

SECTION F. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: The Chemours Company FC, LLC

Representative First Name: Sheryl Representative Last Name: Telford

Title: Director, Environment, Health, Safety and Remediation

Telephone Number: (302) 773-2597 Ext.: _____ FAX: _____

Mailing Address: 2000 Cannonball Rd

City/Town: Pompton Lakes State: NJ Zip Code: 07442

Email Address: Sheryl.A.Telford@chemours.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: (Upon approval of this draft package, appropriate signature will be obtained.) Date: _____

Name/Title: Director, Environment, Health, Safety and Remediation

☒ Check this box if the person above is also the property owner of the site or their representative. If this person is not the site property owner, please ensure the site property owner's name and address is included in the DGW Proposal, and also indicate that the property owner has been informed about the proposed discharge.

SECTION G. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: _____

First Name: _____ Last Name: _____

Phone Number: _____ Ext: _____ Fax: _____

Mailing Address: _____

City/Town: _____ State: _____ Zip Code: _____

Email Address: _____

This statement shall be signed by the LSRP who is submitting this notification in accordance with SRRA Section 16 d. and Section 30 b.2.

I certify that I am a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C to conduct business in New Jersey. As the Licensed Site Remediation Professional of record for this remediation, I:

[SELECT ONE OR BOTH OF THE FOLLOWING AS APPLICABLE]:

☐ *directly oversaw and supervised all of the referenced remediation, and\or*

☐ *personally reviewed and accepted all of the referenced remediation presented herein.*

I believe that the information contained herein, and including all attached documents, is true, accurate and complete.

It is my independent professional judgment and opinion that the remediation conducted at this site, as reflected in this submission to the Department, conforms to, and is consistent with, the remediation requirements in N.J.S.A. 58:10C-14.

My conduct and decisions in this matter were made upon the exercise of reasonable care and diligence, and by applying the knowledge and skill ordinarily exercised by licensed site remediation professionals practicing in good standing, in accordance with N.J.S.A. 58:10C-16, in the State of New Jersey at the time I performed these professional services.

I am aware pursuant to N.J.S.A. 58:10C-17 that for purposely, knowingly or recklessly submitting false statement, representation or certification in any document or information submitted to the board or Department, etc., that there are significant civil, administrative and criminal penalties, including license revocation or suspension, fines and being punished by imprisonment for conviction of a crime of the third degree.

LSRP Signature: _____ Date: _____

LSRP Name/Title: _____

Company Name: _____

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

Not Applicable - Pompton Lakes Works is a non-LSRP Site.

SECTION G. SUBSURFACE EVALUATOR UST REPORT CERTIFICATION FORM

I certify under penalty of law that the work was performed under my oversight and I have reviewed the report and all attached documents, and the submitted information is true, accurate and complete in accordance with the requirements of N.J.A.C. 7:14B and N.J.A.C. 7:26E. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate or incomplete information including fines and/or imprisonment.

Name: _____ UST Cert. No.: _____

Firm: _____ Firm's UST Cert. Number: _____

Firm Address: _____

City/Town: _____ State: _____ Zip Code: _____

Phone Number: _____ Ext: _____ Fax: _____

Signature: _____ Date: _____

Completed forms should be sent to:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

Not applicable - Pompton Lakes Works is a non-UHOT Site.

New Jersey Department of Environmental Protection
Discharge to Groundwater Permit-by-Rule Authorization Request
Discharge to Groundwater Proposal
Interim Remedial Measure Design Testing
Pompton Lakes Works Site
Pompton Lakes, New Jersey
PI# 007411

April 2016

Introduction

This Discharge to Groundwater (DGW) proposal was prepared for the proposed interim remedial measure (IRM) pilot study design testing at the Pompton Lakes Works (PLW) Site. The Site is located at 2000 Cannonball Road in Pompton Lakes, Passaic County, New Jersey which was formerly operated by E. I. du Pont de Nemours and Company (DuPont). In 2015, DuPont transferred the PLW Site to The Chemours Company FC, LLC (Chemours).

An in-situ chemical oxidation (ISCO) IRM was proposed for the middle portion of the former Eastern Manufacturing Area (EMA [hereinafter referred to as the study area]) to reduce groundwater concentrations of Site-related volatile organic compounds (VOCs) (i.e., tetrachloroethene [PCE], trichloroethene [TCE], and related biodegradation products) discharging to Acid Brook surface water. Design testing will be completed within the study area to support the final design of the proposed IRM program. The data collected during the design testing will be utilized to confirm the design assumptions and allow adjustments to be made to the IRM approach.

A DGW permit-by-rule (PBR) less than 180 days is required for the design testing which consists of ISCO injection testing and process monitoring. As part of the DGW PBR, this DGW proposal has been prepared in accordance with N.J.A.C. 7:26E-5.6, N.J.A.C. 7:14A-7.5, and the New Jersey Department of Environmental Protection (NJDEP) DGW PBR Authorization Request Form to provide NJDEP with relevant information related to the DGW for design testing.

Study Area Background and Investigations

In November 2011 and February 2012, the U.S. Environmental Protection Agency (USEPA) collected surface water samples from Acid Brook within the EMA. Several Site-related VOCs (i.e., PCE, TCE, and related biodegradation products) were detected.

The detections of Site-related VOCs resulted in the completion of two groundwater investigations during May through June 2012 and August through November 2013. Hydrogeologic and groundwater quality information were collected to define the hydrogeologic conditions and the nature and extent of Site-related VOCs within the study area. The results of the 2012 and 2013 groundwater investigations were documented in the *Groundwater Characterization Report – Well 13 Area Along Acid Brook* (2012 Characterization Report) dated September 20, 2012 and the *2013 Supplemental Groundwater Investigation Report – Middle to Southern EMA* (2013 Investigation Report) dated April 25, 2014. The analytical results from the 2012 Characterization Report and 2013 Investigation Report are provided on Figure 1.

On June 28, 2014 USEPA/NJDEP provided comments on the 2013 Investigation Report and requested the preparation of an IRM work plan to address the groundwater discharge to Acid Brook. The *Draft Onsite Groundwater Interim Remedial Measure Pilot Study Work Plan* (Draft IRMWP), dated September 18, 2014, was prepared to present an ISCO approach to address the groundwater discharge to Acid Brook within the study area. Information presented in the Draft IRMWP included:

- Summary of regulatory and investigation background for study area;
- IRM remedial action objective;
- Rationale for three proposed treatment areas (see Figures 1 and 2) and aerial and vertical extents of treatment areas (see Table 1);
- Evaluation of three potential remedial technologies (horizontal air sparge wells, ISCO, and soil mixing) and proposed implementation approach for each technology to address groundwater discharge to Acid Brook;
- Selection of technology to pilot study;
- Establishment of areas and intervals of treatment using technology; and
- Description of proposed IRM implementation and monitoring program.

Additional details on the items listed above are presented in the Draft IRMWP.

Geology

The Site is situated within the Highlands Physiographic Province adjacent to the northwestern boundary of the Newark Basin. Bedrock beneath the Site consists of Precambrian gneiss and diabase. Previous studies show that two primary geologic units, crystalline bedrock and alluvial deposits (the Late Wisconsinan Glacial Delta Formation) consisting of colluviums and stratified glacial drift, underlie the Site. The crystalline bedrock is comprised of deformed and metamorphosed high-grade gneisses. The alluvial deposits are up to 170 feet thick. The texture of the alluvial deposits is a fining downward stratified glacial sequence which can generally be divided into three depositional types (shallow, intermediate, and deep).

The design testing will occur in the shallow alluvial depositional type which is comprised of fill, colluvium, and glacial deposits. These deposits are generally poorly sorted, coarse to medium-grained sand and gravel and may contain layers of very coarse-grained gravel. This shallow zone ranges from approximately 5 to 20 feet thick.

Hydrogeology

Groundwater level measurements from the piezometers and monitoring well 13 indicate shallow groundwater is observed within the study area at an approximate depth between 1.5 to 5 feet below ground surface (bgs). The water table is seasonally influenced and fluctuates in response to precipitation and infiltration. Groundwater flows in a south-southeast direction and is generally toward the location where Acid Brook bisects the study area.

Acid Brook is a small, shallow, non-navigable, intermittent water body. Observations of continuous flow (i.e., the potential for groundwater to discharge) were made in 2013 during the months of January through September. During dry weather months in 2013 (October through December), water was not flowing and only small areas of stagnant water existed in the stream bed.

PBR Scope of Work for ISCO IRM Design Testing

The Draft IRMWP proposed design testing which consists of the injection of oxidant into representative locations within the treatment areas and conducting process monitoring. Design

testing will be completed to verify the preliminary program design assumptions (e.g., radius of influence [ROI], oxidant distribution, injection spacing, and injection flow rates and pressures).

The overall objective of the design testing is to collect the data required to finalize the approach for the full scale ISCO IRM. The program objective will be met through the collection of data resulting from the injection testing and process monitoring. The findings of the design testing will confirm the design assumptions regarding oxidant injection volumes/ROI and allow for adjustments to the approach. Additional details on the design testing program are provided below.

Design Basis

The specific catalyzed hydrogen peroxide ISCO chemistry to be used is a combination of hydrogen peroxide and sodium persulfate. This dual oxidant approach combines the reactivity of hydrogen peroxide for the destruction of VOCs with the enhanced stability of sodium persulfate. Hydrogen peroxide catalyzed with persulfate tends to generate less heat and pressure than peroxide catalyzed with iron salts. In addition, post-injection monitoring typically shows that the oxidation reduction potential (ORP) remains elevated for longer periods with this catalyzed hydrogen peroxide approach.

The combination of hydrogen peroxide and sodium persulfate has several synergistic effects. First, hydroxyl radicals generated from hydrogen peroxide can initiate persulfate radical formation, and vice versa. Secondly, sodium persulfate may destruct a significant portion of the more susceptible contaminants, including natural oxidant demand (NOD), thus allowing the hydroxyl and sulfate radicals to destroy the more recalcitrant compounds. Finally, a combination of hydroxyl and sulfate radicals results in a multi-radical attack mechanism, yielding a higher efficiency in destroying contaminants.

The oxidant demand was estimated based on historical analytical data available in the adsorbed- and dissolved-phases to estimate the VOC mass for each treatment area for both the unsaturated and saturated zones. Based on the VOC mass estimates and accounting for an assumed NOD (also referred to as soil oxidant demand [SOD]), the oxidant volume per injection well was calculated. Approximately 2,200 pounds of sodium persulfate and 1,780 pounds of hydrogen peroxide will be injected during design testing. Table 2 provides a summary of the estimated injection volumes. The ROI is anticipated to be 15 feet with a target injection rate of 3 gallons per minute (gpm) per injection well.

A large portion of the total oxidant demand, and therefore injection volume, is driven by the assumed SOD. The peroxide-persulfate chemistry is less affected by SOD compared to some other chemistries; however it is an area of uncertainty. The SOD assumed in the oxidant calculations was 0.5 grams per kilogram (g/kg) of non-contaminant oxidant demand based on the combination of hydrogen peroxide and sodium persulfate. The rate of reaction occurs faster with this coupled chemistry, compared to other methods of implementing persulfate (such as alkaline activation). The SOD becomes more relevant when the reaction process is longer. In order to better estimate the oxidant demand for future full scale implementation, laboratory testing and analysis will be conducted for this parameter during design testing.

Injection Testing

Injection testing will be completed within the treatment areas to verify the preliminary program design assumptions. Separate injection intervals are proposed to address shallow soil contamination from 0 to 6 feet bgs (unsaturated zone) and soil and groundwater impacts from 6 to 16 feet bgs (saturated zone). Injection testing will consist of establishing one injection grid location for each treatment interval (0- to 6-foot and 6- to 16-foot treatment intervals), injecting the proposed representative volume of oxidant to remediate the grid, and conducting process monitoring.

Due to the study area size and potential variations in subsurface conditions, injection testing will be repeated at several locations throughout treatment areas 1 through 3. Injection testing at multiple locations will provide additional confirmation of the injection approach. As shown on Figure 2, five discrete test areas have been selected. Each test area will include one injection well and three process monitoring wells (with the exception of the test area in treatment area 3, which will only have two process monitoring wells due to its smaller size). Permanent wells will be used to facilitate the oxidant injection (as opposed to direct push points). The primary reason is to provide an efficient means to pre-wet the soil, while also providing more process control (versus direct push), and a well seal to reduce surface breakout during injection of fluids into the shallow zone. A well construction table for the proposed network of wells is included as Table 3.

ISCO works more efficiently in the dissolved-phase. In order to remediate VOCs within the unsaturated zone with a liquid oxidant approach, the adsorbed VOCs must be transferred into the dissolved-phase. Injection testing includes pre-wetting the soil by injecting a volume of water equal to approximately 50% of a pore volume (assuming 6 feet of unsaturated soil) into the shallow injection wells prior to conducting ISCO injection. A pre-wetting injection flow rate of 5 gpm is assumed.

The fluids/chemicals to be used for the design testing include water supplied from the onsite fire hydrant, sodium persulfate, and hydrogen peroxide. Sodium persulfate will be delivered to the Site as a dry powder then mixed and dissolved into the diluted hydrogen peroxide activator solution to generate a 10% persulfate solution prior to injecting. Hydrogen peroxide will be delivered to the Site in a 34% concentration and diluted down to 8%.

The injection equipment will be comprised of a mix tote (255-gallon), transfer/injection pump, flow meters/totalizers, and delivery hoses. Mixing will be achieved through a combination of paddle mixers, re-circulation, and agitation.

An electric or pneumatic chemically-compatible pump will be utilized for mixing and injection. Injections will be controlled and monitored with valves, flow meters, flow totalizers, and pressure indicators. PVC pressure-rated and chemically-compatible hose will be used for all liquid chemical transfer. A stainless steel injection wellhead will be temporarily attached to the injection well.

On each day of injection, water will be added to each mix tank. Concentrated hydrogen peroxide will then be added to the mix tank to dilute to an 8% solution. The dry sodium persulfate will then be added to the diluted peroxide to generate a 10% persulfate solution. Once the persulfate is fully dissolved, the appropriate valves will be opened and transfer pump used to inject the oxidant solution into the injection wells at the desired flow rate and pressure. Injection will occur under low pressure and is expected to be less than 50 pounds per square inch (psi). At the completion of the event, piping will be removed and all injection and monitoring wells secured.

The injection testing will require approximately one week to complete based on estimated travel times of oxidant from injection points to monitoring points, as well as the desired duration of monitoring to evaluate sustained injection area conditions.

Process Monitoring

Process monitoring will be conducted during injections for each treatment interval (0- to 6-foot and 6- to 16-foot treatment intervals) with the goal of collecting a sufficient volume of data to evaluate the effective ROI, oxidant distribution, and injection flow rates and pressures. Process monitoring wells will be installed at selected locations within the injection grid at specified distances from the injection points (i.e., 5 feet, 10 feet, 15 feet) with process monitoring conducted at each point to evaluate oxidant concentrations, pH, and other parameters demonstrating distribution of oxidant throughout

the injection test area. At a minimum, data will be collected before Site activity begins, once during injection, and after the completion of injection activity to evaluate changes. The following data will be collected:

- Oxidant presence (peroxide and persulfate);
- Depth to water from top of casing;
- Dissolved oxygen;
- pH;
- Temperature; and
- ORP.

Oxidant testing will be conducted by using a bailer to remove a small volume of groundwater. The water will then be tested for hydrogen peroxide using field test strips. Periodically, a Chemetrics colorimetric test kit will also be used to determine the peroxide concentration. Persulfate will be monitored using field test kits. Geochemical monitoring data will utilize a multi-parameter water quality sensor. In addition, these parameters will be monitored within Acid Brook (when there is flowing water).

Reporting

The results from the injection testing and process monitoring will be used to adjust the IRM injection program design (if required). A final IRMWP will be prepared to document the results of the design testing, present the final design and path forward for the IRM approach, and address regulatory comments on the Draft IRMWP.

Schedule of Pilot Testing

The PBR is requested to begin on the day that injection testing fluids are first introduced (discharged) into the subsurface and not on the date when the discharge approval letter is issued by NJDEP or received by Chemours. A record of the date discharging begins will be made in the field operation log and NJDEP will be notified within 24 hours of that first discharge day.

Table 1
Treatment Area Designation, Areal Extent, Perimeter, and IRM Rationale
Draft Onsite Groundwater Interim Remedial Measure Design Testing Work Plan
Pompton Lakes Works
Pompton Lakes, New Jersey

Treatment Area Designation	Perimeter (feet)	Area (feet^2)	Treatment Interval (feet bgs)	General Soil Type	Treatment Rationale
Area 1	1,542	44,188	0 to 6 (unsaturated)	Silt (1 to 5 feet thick) with gravel, sand, and silty sand lenses	Site-related VOCs observed above NJDEP IGWSSL at sample locations 332-61, -67, -68, -71, -72, -341, -342, -344, and 69-1, -5, and -10.
			6 to 16 (saturated)	Fine sand with trace silt	Treatment area is based on Site-related VOC concentrations observed at sample locations HP-2, -5, -6, -8, -14, and HPIW-03 to -08, -10, -12, and -13. Treatment depth based on depth of Acid Brook and estimated groundwater depth that may discharge to Acid Brook.
Area 2	480	6,557	0 to 6 (unsaturated)	Silt (1 to 5 feet thick) underlain by fine to medium sand	Site-related VOCs observed above IGWSSL at sample locations 332-317 and 332-318.
			6 to 16 (saturated)	Fine to medium sand (5 to 10 feet thick) with trace silt	Treatment area is based on Site-related VOC concentrations observed at sample locations HP-1, -13, and HPIW-01. Treatment depth is based on depth of Acid Brook and estimated groundwater depth that may discharge to Acid Brook. Treatment depth may decrease to the north of HP-13 due to observation of shallower bedrock (approximately 10 feet bgs).
Area 3	140	821	0 to 6 (unsaturated)	Fine sand (4 feet thick) and silt (2 feet thick)	Site-related VOCs observed above IGWSSL at sample locations 332-249, -250, -251, -336, -337, -338, and -339.
			6 to 16 (saturated)	Medium to fine sand and silt	Treatment area is based on Site-related VOC concentrations observed in soils associated with AOCs 72, 143, and 144. Groundwater was not observed to be impacted adjacent to these AOCs; however treating this area should reduce the potential for future impacts.

Notes:
AOC = area of concern
bgs = below ground surface
IGWSSL = Impact to Groundwater Soil Screening Level
NJDEP = New Jersey Department of Environmental Protection
VOCs = volatile organic compounds

Table 2
Summary of Injection Volumes for Design Testing
NJDEP Discharge to Groundwater Permit-by-Rule Authorization Request
Discharge to Groundwater Proposal
Pompton Lakes Works
Pompton Lakes, New Jersey

Treatment Area	Number of Test Injection Wells[1]	Volume of Pre-Wetting Water per Injection Well (gallons)	Total Volume of Pre-Wetting Water for Design Testing (gallons)	Mass of Sodium Persulfate per Injection Well (pounds)	Mass of Hydrogen Peroxide per Injection Well (pounds)	Volume of Oxidant Solution per Injection Well[2] (gallons)	Total Mass of Sodium Persulfate for Design Testing (pounds)	Total Mass of Hydrogen Peroxide for Design Testing (pounds)	Total Volume of Oxidant Solution for Design Testing[2] (gallons)
Area 1 - Unsaturated	3	1,515	4,545	171	138	202	512	414	605
Area 1 - Saturated				261	211	309	783	634	927
Area 2 - Unsaturated	1	1,515	1,515	159	128	188	159	128	188
Area 2 - Saturated				260	210	307	260	210	307
Area 3 - Unsaturated	1	1,515	1,515	358	281	411	358	281	411
Area 3 - Saturated				137	112	163	137	112	163
Total			**7,575**				**2,209**	**1,779**	**2,601**

1 - Each injection well is nested with a shallow point screened in the unsaturated zone and a deep point screened in the saturated zone.
2 - Oxidant solution is the mixture of dry persulfate added to 8% hydrogen peroxide to yield a 10% sodium persulfate solution.
Oxidant mass is in pounds on a 100% basis.

Table 3
Proposed Design Testing Well Construction
NJDEP Discharge to Groundwater Permit-by-Rule Authorization Request
Discharge to Groundwater Proposal
Pompton Lakes Works
Pompton Lakes, New Jersey

Well	Treatment Area	Total Depth (feet)	Casing Diameter (inches)	Top of Screen Depth (feet)	Screened Interval (feet)	Screen Length (feet)	Screen Size
IW-1S	1	6	1	2	2-6	4	0.01 slot
IW-1D	1	16	1	7	7-16	9	0.01 slot
IW-2S	1	6	1	2	2-6	4	0.01 slot
IW-2D	1	16	1	7	7-16	9	0.01 slot
IW-3S	1	6	1	2	2-6	4	0.01 slot
IW-3D	1	16	1	7	7-16	9	0.01 slot
IW-4S	2	6	1	2	2-6	4	0.01 slot
IW-4D	2	16	1	7	7-16	9	0.01 slot
IW-5S	3	6	1	2	2-6	4	0.01 slot
IW-5D	3	16	1	7	7-16	9	0.01 slot
PM-1	1	16	2	2	2-16	14	0.02 slot
PM-2	1	16	2	2	2-16	14	0.02 slot
PM-3	1	16	2	2	2-16	14	0.02 slot
PM-4	1	16	2	2	2-16	14	0.02 slot
PM-5	1	16	2	2	2-16	14	0.02 slot
PM-6	1	16	2	2	2-16	14	0.02 slot
PM-7	1	16	2	2	2-16	14	0.02 slot
PM-8	1	16	2	2	2-16	14	0.02 slot
PM-9	1	16	2	2	2-16	14	0.02 slot
PM-10	2	16	2	2	2-16	14	0.02 slot
PM-11	2	16	2	2	2-16	14	0.02 slot
PM-12	2	16	2	2	2-16	14	0.02 slot
PM-13	3	16	2	2	2-16	14	0.02 slot
PM-14	3	16	2	2	2-16	14	0.02 slot

Notes:
Injection wells (IW) will be nested with a shallow (S) and a deep (D) point within one borehole.

I:\507969 - Onsite Groundwater RD\49986.Dupont-Onsite-G\Docs\DWG\PBR 2016\FIGURE 1.mxd

Location ID	CEA-09	CEA-09
Sample Depth (ft bgs)	12.0-16.0	22.0-26.0
Analyte		
1,1,1-TCA	<0.1 U	0.5 J
1,1-DCA	<0.1 U	0.3 J
1,1-DCE	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U
VC	<0.1 U	<0.1 U
CIS-1,2-DCE	<0.1 U	<0.1 U
PCE	<0.1 U	<0.1 U
TCE	<0.1 U	<0.1 U

Location ID	HPIW-03	HPIW-03	HPIW-03-D
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0	14.5-16.0
Analyte			Duplicate
1,1,1-TCA	<20 U	<0.1 U	<0.1 U
1,1-DCA	<20 U	<0.1 U	<0.1 U
1,1-DCE	***26 J***	<0.1 U	<0.1 U
1,2-DCA	<20 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<20 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	96 J	<0.1 U	<0.1 U
VC	***2,700***	0.2 J	0.3 J
CIS-1,2-DCE	***22,000***	3.7	4.4
PCE	***16,000***	***2.3***	***2.7***
TCE	***6,400***	***1.9***	***2.4***

Location ID	CEA-01/HPIW-09	CEA-01/HPIW-09	CEA-01/HPIW-09
Sample Depth (ft bgs)	12.0-16.0	22.0-26.0	33.0-37.0
Analyte			
1,1,1-TCA	<0.1 U	0.1 J	<0.1 U
1,1-DCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCE	0.1 J	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.6	<0.1 U	<0.1 U
VC	<0.1 U	<0.1 U	<0.1 U
CIS-1,2-DCE	***74***	2.7	3.9
PCE	<0.1 U	***2.3***	***3.7***
TCE	***1.9***	***58***	***160***

Location ID	SITE5A-SW-01	SITE5A-SW-02	SITE5A-SW-03
Sample Depth (ft bgs)	--	--	--
Analyte			
1,1,1-TCA	0.50 U	0.50 U	0.50 U
1,1-DCA	0.50 U	0.50 U	0.50 U
1,1-DCE	0.50 U	0.50 U	0.50 U
1,2-DCA	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	0.50 U	0.50 U	0.50 U
TRANS-1,2-DCE	0.50 U	0.50 U	0.50 U
VC	0.50 UJ	0.50 UJ	0.50 UJ
CIS-1,2-DCE	0.50 U	0.50 U	0.50 U
PCE	0.50 UJ	0.50 UJ	0.50 UJ
TCE	0.50 U	0.50 U	0.50 U

Location ID	HPIW-10
Sample Depth (ft bgs)	12.0-16.0
Analyte	
1,1,1-TCA	<0.1 U
1,1-DCA	<0.1 U
1,1-DCE	<0.1 U
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	0.1 J
VC	<0.1 U
CIS-1,2-DCE	0.1 J
PCE	<0.1 U
TCE	0.1 J

Location ID	HPIW-02	HPIW-02
Sample Depth (ft bgs)	6.0-7.5	13.0-14.5
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	1.1	<0.1 U
1,1-DCE	0.4 J	0.1 J
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	0.1 J
VC	<0.1 U	<0.1 U
CIS-1,2-DCE	0.4 J	4.5
PCE	<0.1 U	***5.5***
TCE	0.2 J	***97***

Location ID	CEA-03	CEA-03	CEA-03
Sample Depth (ft bgs)	12.0-16.0	24.5-28.5	37.0-41.0
Analyte			
1,1,1-TCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCE	0.5 J	0.4 J	0.2 J
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.5	1.6	<0.1 U
VC	<0.1 U	<0.1 U	<0.1 U
CIS-1,2-DCE	41	***110***	3.3
PCE	***2.2***	***1.9***	***6.2***
TCE	***66***	***52***	***100***

Location ID	CEA-04
Sample Depth (ft bgs)	6.0-10.0
Analyte	
1,1,1-TCA	2.9
1,1-DCA	<0.1 U
1,1-DCE	<0.1 U
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	<0.1 U
VC	<0.1 U
CIS-1,2-DCE	<0.1 U
PCE	0.3 J
TCE	<0.1 U

Location ID	HPIW-01
Sample Depth (ft bgs)	8.0-9.5
Analyte	
1,1,1-TCA	3.4
1,1-DCA	0.1 J
1,1-DCE	<0.1 U
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	<0.1 U
VC	<0.1 U
CIS-1,2-DCE	<0.1 U
PCE	***80***
TCE	<0.1 U

Location ID	HPIW-04	HPIW-04
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<2.0 U	<0.1 U
1,1-DCA	2.4 J	<0.1 U
1,1-DCE	***4.5 J***	0.2 J
1,2-DCA	<2.0 U	<0.1 U
Carbon Tetrachloride	<2.0 U	<0.1 U
TRANS-1,2-DCE	22	0.3 J
VC	***6.2 J***	***3.2***
CIS-1,2-DCE	***1,300***	54
PCE	***790***	***38***
TCE	***990***	***37***

Location ID	HP-13	HP-13
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	3.5	***56***
1,1-DCA	0.4 J	<0.5 U
1,1-DCE	1	<0.5 U
1,2-DCA	<0.1 U	<0.5 U
Carbon Tetrachloride	<0.1 U	<0.5 U
TRANS-1,2-DCE	0.4 J	<0.5 U
VC	***1.4***	<0.5 U
CIS-1,2-DCE	33	<0.5 U
PCE	***23***	***450***
TCE	***58***	***4.0***

Location ID	HPIW-12	HPIW-12	HPIW-12-D
Sample Depth (ft bgs)	12.0-16.0	24.0-28.0	24.0-28.0
Analyte			Duplicate
1,1,1-TCA	<0.1 U	0.2 J	0.2 J
1,1-DCA	0.2 J	0.3 J	0.3 J
1,1-DCE	0.2 J	0.4 J	0.4 J
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.3 J	<0.1 U	<0.1 U
VC	***2.1***	<0.1 U	<0.1 U
CIS-1,2-DCE	31	<0.1 U	<0.1 U
PCE	***6***	0.1 J	0.2 J
TCE	***7.3***	<0.1 U	<0.1 U

Location ID	HPIW-08	HPIW-08
Sample Depth (ft bgs)	5.5-7.0	12.5-14.0
Analyte		
1,1,1-TCA	0.1 J	<0.1 U
1,1-DCA	0.3 J	1.2
1,1-DCE	<0.1 U	0.2 J
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	1.2
VC	***1.1***	***6.4***
CIS-1,2-DCE	4.8	***87***
PCE	***1.2***	***36***
TCE	0.7	***44***

Location ID	HP-2	HP-2
Sample Depth (ft bgs)	7.6-9.1	14.5-16.0
Analyte		
1,1,1-TCA	0.4 J	<0.1 U
1,1-DCA	0.7	1.1
1,1-DCE	0.2 J	***1.5***
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	1.1	1.8
VC	***1.4***	***4.3***
CIS-1,2-DCE	29	***88***
PCE	***14***	***17***
TCE	***15***	***39***

Location ID	CEA-02	CEA-02	CEA-02
Sample Depth (ft bgs)	12.0-16.0	24.0-28.0	40.0-44.0
Analyte			
1,1,1-TCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCE	<0.1 U	0.1 J	<0.1 U
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U	<0.1 U
VC	<0.1 U	<0.1 U	<0.1 U
CIS-1,2-DCE	0.7	0.2 J	<0.1 U
PCE	0.1 J	0.8	<0.1 U
TCE	0.4 J	0.3 J	***1.7***

Location ID	HPIW-11
Sample Depth (ft bgs)	24.0-28.0
Analyte	
1,1,1-TCA	19
1,1-DCA	0.2 J
1,1-DCE	***1.5***
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	0.1 J
VC	<0.1 U
CIS-1,2-DCE	4.9
PCE	***12***
TCE	***140***

Location ID	HP-1	HP-1
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	1.7	0.9
1,1-DCA	0.9	<0.1 U
1,1-DCE	***2.0***	0.4 J
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	1.4	0.2 J
VC	***9.7***	0.1 J
CIS-1,2-DCE	62	7.0
PCE	***1.8***	***23***
TCE	***1.4***	***120***

Location ID	HPIW-13
Sample Depth (ft bgs)	12.0-16.0
Analyte	
1,1,1-TCA	0.1 J
1,1-DCA	0.2 J
1,1-DCE	0.1 J
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	0.2 J
VC	0.5 J
CIS-1,2-DCE	18
PCE	***5.2***
TCE	***6.1***

Location ID	HP-14	HP-14
Sample Depth (ft bgs)	5.5-7.0	12.5-14.0
Analyte		
1,1,1-TCA	0.3 J	<0.2 U
1,1-DCA	1.3	1.0
1,1-DCE	0.4 J	***1.4***
1,2-DCA	<0.1 U	<0.2 U
Carbon Tetrachloride	<0.1 U	<0.2 U
TRANS-1,2-DCE	0.8	3.4
VC	***2.9***	***15***
CIS-1,2-DCE	63	***200***
PCE	***33***	***150***
TCE	***35***	***180***

Location ID	HPIW-07	HPIW-07
Sample Depth (ft bgs)	5.5-7.0	12.5-14.0
Analyte		
1,1,1-TCA	1.4	<1.0 U
1,1-DCA	3.9	1.3 J
1,1-DCE	0.2 J	***3.1 J***
1,2-DCA	<0.1 U	<1.0 U
Carbon Tetrachloride	<0.1 U	<1.0 U
TRANS-1,2-DCE	0.3 J	12.0
VC	***2.5***	***19***
CIS-1,2-DCE	42	***890***
PCE	***22***	***810***
TCE	***11***	***800***

Location ID	CEA-06
Sample Depth (ft bgs)	25.0-29.0
Analyte	
1,1,1-TCA	0.3 J
1,1-DCA	<0.1 U
1,1-DCE	<0.1 U
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	<0.1 U
VC	<0.1 U
CIS-1,2-DCE	<0.1 U
PCE	***7.8***
TCE	<0.1 U

Location ID	HP-5	HP-5
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	1.4	6.3
1,1-DCE	***2.4***	***3.2***
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	4.4	7.8
VC	***2.3***	***24***
CIS-1,2-DCE	***140***	***360***
PCE	***63***	***4.2***
TCE	***61***	***9.3***

Location ID	HPIW-06	HPIW-06
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	0.7	<0.1 U
1,1-DCA	6.0	1.0
1,1-DCE	***1.5***	0.6
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	1	6.6
VC	***5.3***	***17***
CIS-1,2-DCE	***78***	***170***
PCE	***75***	<0.1 U
TCE	***46***	***4.0***

Location ID	HP-3	HP-3
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	<0.1 U	<0.1 U
1,1-DCE	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U
VC	<0.1 U	<0.1 U
CIS-1,2-DCE	<0.1 U	<0.1 U
PCE	<0.1 U	<0.1 U
TCE	<0.1 U	<0.1 U

Location ID	HPIW-05	HPIW-05
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<1.0 U	<0.1 U
1,1-DCA	5.4	0.1 J
1,1-DCE	<1.0 U	0.2 J
1,2-DCA	<1.0 U	<0.1 U
Carbon Tetrachloride	<1.0 U	<0.1 U
TRANS-1,2-DCE	3.5 J	0.3 J
VC	***46***	***1.9***
CIS-1,2-DCE	***620***	24
PCE	***14***	***17***
TCE	***9.7***	***32***

Location ID	HP-8	HP-8
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	0.3 J	0.6
1,1-DCE	<0.1 U	1
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	0.3 J
VC	0.2 J	***3.3***
CIS-1,2-DCE	9.4	44
PCE	0.6	0.2 J
TCE	***1.1***	***2.1***

Location ID	Well 13	Well 13
Sample Depth (ft bgs)	23.82-25.32	23.82-25.32
Analyte		
1,1,1-TCA	<1.0 U	<1.0 U
1,1-DCA	6.8	1.7 J
1,1-DCE	***12***	***3.1 J***
1,2-DCA	<1.0 U	<1.0 U
Carbon Tetrachloride	<1.0 U	<1.0 U
TRANS-1,2-DCE	12	4.4 J
VC	***65***	***61***
CIS-1,2-DCE	***2,100***	***620***
PCE	***470***	***6.4***
TCE	***690***	***8.3***

Location ID	HP-10	HP-10	HP-10
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0	14.5-16.0
Analyte			Duplicate
1,1,1-TCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCA	<0.1 U	<0.1 U	<0.1 U
1,1-DCE	<0.1 U	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U	<0.1 U
VC	<0.1 U	<0.1 U	<0.1 U
CIS-1,2-DCE	<0.1 U	<0.1 U	<0.1 U
PCE	<0.1 U	<0.1 U	<0.1 U
TCE	<0.1 U	<0.1 U	<0.1 U

Location ID	HP-9	HP-9
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	0.5 J	0.6
1,1-DCE	0.2 J	0.8
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U
VC	0.5	***2.4***
CIS-1,2-DCE	14	32
PCE	***6.0***	<0.1 U
TCE	***3.8***	<0.1 U

Location ID	HP-4	HP-4	HP-4	HP-4
Sample Depth (ft bgs)	5.5-7.0	12.5-14.0	24.10-25.6	24.10-25.6
Analyte				Duplicate
1,1,1-TCA	<0.1 U	<0.1 U	<2.0 U	<2.0 U
1,1-DCA	<0.1 U	<0.1 U	***89***	***93***
1,1-DCE	<0.1 U	<0.1 U	***21***	***20***
1,2-DCA	<0.1 U	<0.1 U	<2.0 U	<2.0 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<2.0 U	<2.0 U
TRANS-1,2-DCE	<0.1 U	<0.1 U	8.5 J	7.9 J
VC	<0.1 U	<0.1 U	***92***	***99***
CIS-1,2-DCE	<0.1 U	<0.1 U	***1,800***	***1,600***
PCE	<0.1 U	<0.1 U	***910***	***780***
TCE	<0.1 U	<0.1 U	***1,500***	***1,400***

Location ID	HP-11	HP-11
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.1 U
1,1-DCA	0.8	2.0
1,1-DCE	0.3 J	0.5
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.4 J	0.2 J
VC	***5.9***	***11***
CIS-1,2-DCE	13	36
PCE	***31***	***25***
TCE	***15***	***13***

Location ID	SITE5-SW-01	SITE5-SW-02	SITE5-SW-03
Sample Depth (ft bgs)	--	--	--
Analyte			
1,1,1-TCA	2	2	1.9
1,1-DCA	0.50 U	0.50 U	0.50 U
1,1-DCE	0.50 U	0.50 U	0.50 U
1,2-DCA	0.50 U	0.50 U	0.50 U
Carbon Tetrachloride	0.50 U	0.50 U	0.50 U
TRANS-1,2-DCE	0.50 U	0.50 U	0.50 U
VC	0.82	0.50 UJ	***1.3***
CIS-1,2-DCE	6.6	4.3	8.6
PCE	***10***	***7.2***	***9.9***
TCE	***2.2***	***1.8***	***2.2***

Location ID	CEA-08	CEA-08	CEA-08
Sample Depth (ft bgs)	12.0-16.0	23.0-27.0	50.0-54.0
Analyte			
1,1,1-TCA	<0.1 U	<0.1 U	0.4 J
1,1-DCA	0.8	<0.1 U	0.3 J
1,1-DCE	0.2 J	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.1 J	<0.1 U	<0.1 U
VC	***1.4***	0.9	<0.1 U
CIS-1,2-DCE	3.5	<0.1 U	<0.1 U
PCE	***1.6***	<0.1 U	<0.1 U
TCE	***2.6***	<0.1 U	0.1 J

Location ID	HP-7	HP-7
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	<0.1 U	<0.2 U
1,1-DCA	0.9	0.6 J
1,1-DCE	***1.3***	***1.5***
1,2-DCA	<0.1 U	<0.2 U
Carbon Tetrachloride	<0.1 U	<0.2 U
TRANS-1,2-DCE	1.6	3.4
VC	***4.1***	***7.2***
CIS-1,2-DCE	70	***160***
PCE	***120***	***340***
TCE	***72***	***190***

Location ID	HP-6	HP-6
Sample Depth (ft bgs)	7.5-9.0	14.5-16.0
Analyte		
1,1,1-TCA	0.1 J	<0.1 U
1,1-DCA	4.8	0.3 J
1,1-DCE	***1.8***	0.7
1,2-DCA	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U
TRANS-1,2-DCE	1	2.9
VC	***3.6***	***7.5***
CIS-1,2-DCE	***110***	***110***
PCE	***75***	***170***
TCE	***49***	***97***

Location ID	CEA-07	CEA-07	CEA-07
Sample Depth (ft bgs)	12.0-16.0	22.0-26.0	30.0-34.0
Analyte			
1,1,1-TCA	0.2 J	0.2 J	0.2 J
1,1-DCA	0.2 J	0.1 J	<0.1 U
1,1-DCE	<0.1 U	<0.1 U	<0.1 U
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	<0.1 U	<0.1 U	<0.1 U
TRANS-1,2-DCE	0.2 J	<0.1 U	<0.1 U
VC	0.3 J	<0.1 U	<0.1 U
CIS-1,2-DCE	1.2	<0.1 U	0.4 J
PCE	<0.1 U	***2***	***8.1***
TCE	0.6	0.2 J	0.5

Location ID	HP-12
Sample Depth (ft bgs)	7.5-9.0
Analyte	
1,1,1-TCA	<0.1 U
1,1-DCA	0.1 J
1,1-DCE	<0.1 U
1,2-DCA	<0.1 U
Carbon Tetrachloride	<0.1 U
TRANS-1,2-DCE	<0.1 U
VC	0.3 J
CIS-1,2-DCE	2.7
PCE	0.5 J
TCE	0.4 J

Location ID	CEA-05	CEA-05	CEA-05
Sample Depth (ft bgs)	12.0-16.0	22.5-26.5	48.0-52.0
Analyte			
1,1,1-TCA	0.1 J	0.1 J	<0.1 U
1,1-DCA	<0.1 U	1.1	0.6
1,1-DCE	<0.1 U	<0.1 U	0.2 J
1,2-DCA	<0.1 U	<0.1 U	<0.1 U
Carbon Tetrachloride	0.2 J	<0.1 U	<0.1 U
TRANS-1,2-DCE	<0.1 U	<0.1 U	0.7
VC	<0.1 U	0.3 J	***5.5***
CIS-1,2-DCE	1.3	5.5	18
PCE	***8.2***	***4.8***	<0.1 U
TCE	***2.7***	***5.7***	0.1 J

SITE 5A
CEA-01/HPIW-09
CEA-03
AOC 64
AOC 63
HPIW-02
AOC 167
CEA-09
AOC 65
AOC 189
HPIW-10
HPIW-03
HPIW-12
HPIW-04
HPIW-08
CEA-02
AOC 69
HPIW-05
HPIW-13
HPIW-07
HPIW-06
HPIW-01
AOC 68
AOC 66
HP-13
HP-2
HP-1
HPIW-11
HP-14
TREATMENT AREA 1
TREATMENT AREA 2
HP-5
HP-6
HP-8
HP-10
HP-7
HP-9
HP-11
HP-4
HP-3
CEA-GT
CEA-06
AOC 190
CEA-04
CEA-07BR
AOC 171
AOC 70
CEA-08BR
AOC 71
CEA-01BR
AOC 173
AOC 72
AOC 143
TREATMENT AREA 3
AOC 144
HP-12
AOC 172
CEA-08
AOC 73
AOC 74 IRM
AOC 168
AOC 168
AOC 168
CEA-07
AOC 169
AOC 170
AOC 78
AOC 79
AOC 174
AOC 176
CEA-05
AOC 80/81
AOC 82
30

THIS DOCUMENT WAS DEVELOPED IN COLOR. REPOPRODUCTION IN B/W MAY NOT REPRESENT THE DATA AS INTENDED.

PLOTDATE: 04/29/16 2:19:22 PM CWEAVER

NOTES:
1. Sanitary sewer manholes are based on a survey conducted on 7/11/2012. Sanitary sewer lines have been adjusted to align with surveyed manholes.
2. Well 13 was sampled on May 23rd and November 21st of 2013 .
3. Grab groundwater (HP) samples were collected during May/June 2012.
4. Grab groundwater (HPIW & CEA) samples were collected during August/October/November 2013.
5. All sample depths listed are in feet below ground surface (ft bgs).
6. All concentrations are in micrograms per liter (ug/l).
7. PCE = tetrachloroethene
8. TCE = trichloroethene
9. CIS-1,2-DCE = cis-1,2-dichloroethene
10. TRANS-1,2-DCE = trans-1,2-dichloroethene
11. 1,1,1-TCA = 1,1,1-trichloroethane
12. 1,1-DCA = 1,1-dichloroethane
13. 1,1-DCE = 1,1-dichloroethene
14. 1,2-DCA = 1,2-dichloroethane
15. VC = vinyl chloride
16. < 0.01 U = not detected at reported detection limit
17. J = estimated value
18. Bold and italicized concentrations exceed the New Jersey Groundwater Quality Standards (NJGWQS).
19. Chembox data outlined in blue is related to the treatment depth interval of 0 to 16 ft bgs for the study area.

ANALYTE	NJ GWQS
1,1,1-TCA	30
1,1-DCA	50
1,1-DCE	1
1,2-DCA	2
Carbon Tetrachloride	1
TRANS-1,2-DCE	100
VC	1
CIS-1,2-DCE	70
PCE	1
TCE	1

Legend

- 2012 Investigation Location
- 2013 Investigation Location
- Manholes
- Monitoring Well
- Surface Water Sample (approximate and based on field measurements and photos provided by USEPA)
- Storm Sewer
- Field Verified Sanitary Sewer
- Ground Surface Contour
- Bedrock Outcrop Line

AREA OF CONCERN DESIGNATION
- Interim Remedial Measure (IRM)
- No Further Action
- Remedial Investigation Completed

- Treatment Areas
- Former Buildings
- Concrete Pad
- Unpaved Road
- Paved Road

GROUNDWATER AND SURFACE WATER SAMPLING RESULTS WITH TREATMENT AREAS

POMPTON LAKES WORKS
NJDEP DISCHARGE TO GROUNDWATER
PERMIT-BY-RULE AUTHORIZATION REQUEST
DISCHARGE TO GROUNDWATER PROPOSAL
POMPTON LAKES, NEW JERSEY

0 20 40 80 120 160
Feet

1 inch = 40 feet

FIGURE 1

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APRIL 2016
CHEMOURS 507969

I:\507969 - Onsite Groundwater RD\49986.Dupont-Onsite-G\Docs\DWG\IRM Desgin Testing WP\FIGURE 2.mxd

CEA-01/HPIW-09
SITE 5A
CEA-03
AOC 64
AOC 63
HPIW-02
AOC 167
CEA-09
AOC 65
HPIW-03
PM-2
HPIW-10
IW-1S/1D
AOC 189
PM-1
PM-3
HPIW-12
HPIW-04
HPIW-08
PM-5
IW-2S/2D
PM-4
HP-2
PM-6
AOC 69
CEA-02
HPIW-05
HPIW-11
HP-14
HPIW-13
HPIW-07
PM-7
HPIW-06
PM-8
IW-3S/3D
HP-5
TREATMENT AREA 1
PM-9
HP-6
HP-8
SITE 5
HP-10
HP-7
HP-9
HP-11
AOC 171
AOC 70
CEA-08BR
CEA-07BR
AOC 71
CEA-01BR
AOC 72
AOC 143
PM-13
IW-5S/5D
TREATMENT AREA 3
AOC 144
HP-12
PM-14
AOC 172
CEA-08
AOC 73
CEA-04
HPIW-01
AOC 68
AOC 66
HP-13
HP-1
PM-12
IW-4S/4D
PM-10
PM-11
TREATMENT AREA 2
13
CEA-GT
HP-4
HP-3
CEA-06
AOC 67
AOC 190
STUDY AREA
AOC 173
230
225
240
235
245
275
280
290
265
270
285

NOTES:
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3. Grab groundwater (HPIW & CEA) samples were collected during August/October/November 2013.

PLOTDATE: 04/29/16 10:27:19 AM MMISIASZ

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Legend

- 2012 Investigation Location
- 2013 Investigation Location
- Manholes
- Monitoring Well
- Surface Water Sample (approximate and based on field measurements and photos provided by USEPA)
- StudyArea
- Storm Sewer
- Field Verified Sanitary Sewer
- Ground Surface Contour
- Bedrock Outcrop Line

AREA OF CONCERN DESIGNATION

- Interim Remedial Measure (IRM)
- No Further Action
- Remedial Investigation Completed
- Treatment Areas
- Former Buildings
- Concrete Pad
- Unpaved Road
- Paved Road
- Design Testing Process Monitoring Well
- Design Testing Injection Well

IRM TREATMENT AREAS AND DESIGN TESTING LOCATIONS

POMPTON LAKES WORKS
NJDEP DISCHARGE TO GROUNDWATER
PERMIT-BY-RULE AUTHORIZATION REQUEST
DISCHARGE TO GROUNDWATER PROPOSAL
POMPTON LAKES, NEW JERSEY

0 20 40 80 120 160
Feet

1 inch = 30 feet

N

FIGURE 2

APRIL 2016
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