RCRA-05-2019-0003

Appendix C

Final Decision and Response to Comments
The Western Portion/Industrial Area of the
Former DuPont East Chicago Facility
July 18, 2018

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JUL 1 8 2018

REPLY TO THE ATTENTION OF

LU-16J

CERTIFIED MAIL: RETURN RECEIPTS REQUESTED

Mr. Richard Parrish, P.G.
Principle Manager
East Chicago Gateway Partners, LLC
81 Keyland Court
Bohemia, New York 11716
CERTIFIED MAIL: 7017 1450 0001 3747 9776

Mr. Sathya Yalvigi
Project Director
Corporate Remediation Group
The Chemours Company FC, LLC
10007 Market Street
Wilmington, Delaware 19899
CERTIFIED MAIL: 7017 1450 0001 3747 9813

RE: Final Decision and Response to Comments
The Western Portion/Industrial Area of the Former DuPont East Chicago Facility
East Chicago, Indiana
EPA ID: IND 005 174 354

Dear Mr. Parrish and Mr. Yalvigi:

Please find enclosed for your records a copy of the U.S. Environmental Protection Agency's Final Decision and Response to Comments for the Former DuPont East Chicago Facility. The Facility is located at 5215 Kennedy Avenue, East Chicago, Indiana.

EPA's selected remedy and final corrective measures for the Former DuPont Facility with respect to the facility conceptual model and remedial action objectives are summarized below and will be detailed in a Corrective Measures Implementation Plan which will be submitted for EPA approval.

- Control direct contact with contaminated soil by maintaining existing pavement and foundation barriers, and the installation and maintenance of a permeable soil cover.

- The excavation, treatment, and off-site disposal of soil with greater than 1,000 mg/kg arsenic from source areas to remove and stabilize a significant portion of the arsenic at the facility that is contaminating the groundwater. Modeling predicts that this removal will result in decreased arsenic concentrations in groundwater in the source areas and downgradient.

- The excavation and off-site disposal of lead contaminated soil in the Leased Area in addition to maintaining existing barriers such as asphalt (e.g., a parking lot) or concrete (e.g., buildings) to mitigate direct human contact, and achieve a residual target cancer risk of $1x10^{-5}$ and a lead exposure factor of less than 1.0.

- The in-situ treatment of soil below the water table within the source area excavations where saturated soil concentrations warrant treatment to further reduce the arsenic source to groundwater.

- Create enhanced microbial sulfate reduction injection treatment zones along the plume flow paths and a bio-barrier located near the river to intercept arsenic along the plumes and reduce or eliminate additional arsenic migration beyond northern and southern compliance points. The combination of source area remediation and treatment zones transecting plume flow paths is intended to rapidly reduce arsenic in groundwater, reduce the flux of arsenic to the bio-barriers thus extending their longevity, and to convert existing forms of arsenic in saturated soils into forms that do not continue to supply arsenic to groundwater.

- Proceed with final closure of the on-site solid waste landfill. The final closure effort should meet or exceed the Final Closure requirements of Title 329 of Indiana Administrative Code (IAC) Article 10 Rule 37 and shall include the following:

    1. Installation of a final cover that includes geocomposite layers, a drainage layer, and a vegetative cover per the closure requirements;
    2. Development and implementation of a groundwater monitoring plan; and
    3. Development of a post closure care plan in accordance with 329 IAC 10-38 and EPA requirements provided in 40 CFR Parts 264, 265, 270, and 271. These include design, monitoring and inspection requirements for the landfill as part of the closure and post-closure process.

- Submit for EPA approval a comprehensive Long-Term Monitoring and Maintenance Plan (LTMMP) that details the monitoring and maintenance activities that will be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the schedule for periodic physical and chemical monitoring of the closed 30-acre former landfill in the Open Area.

- Estimate and set aside financial assurance for necessary remediation including long-term operation monitoring and maintenance. This estimate will be greatly informed by the LTMMP that is described above. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB.

- Record, implement and maintain EPA-approved institutional controls developed in consultation with the Indiana Department of Environmental Management, to ensure protection of workers and ensure that the facility's land use remains consistent with the remedial endpoints and risk assessments. These restrictions will be embodied in a recorded environmental restrictive covenant and deed restriction that runs with the land and will be provided to the Indiana Department of Environmental Management's Institutional Controls Registry and Virtual File Cabinet.

- Maintain site access controls (such as fencing and signage) and implement health and safety plans at the facility, as necessary, to minimize unacceptable risk associated with human exposure to facility contaminants.

- Submit a Corrective Measures Implementation Plan which will detail the work plans, methods, and schedules for the implementation of the final corrective measures as outlined above.

If you have any questions, please contact Jennifer Dodds of my staff at 312-886-1484 or dodds.jennifer@epa.gov.

Sincerely,

Tinka G. Hyde

Tinka G. Hyde
Division Director
Land and Chemicals Division

ecc: Naeha Dixit, EPA
Mary Fulghum, EPA
Patricia McGee, DuPont
Bernie Reilly, Chemours
David Reiser, KLGates

Enclosure

FINAL DECISION AND RESPONSE TO COMMENTS

for

The Western Portion/Industrial Area of the Former DuPont East Chicago Facility
5215 Kennedy Avenue
East Chicago, Indiana
EPA ID: IND 005 174 354

I. INTRODUCTION

The U.S. Environmental Protection Agency (EPA), Region 5, is issuing this Final Decision and Response to Comments (FD/RC), which identifies the final remedy selected for the Western Portion/Industrial Area of the former E.I. DuPont Nemours (DuPont) chemical manufacturing facility located in East Chicago, Indiana, pursuant to the Resource Conservation and Recovery Act (RCRA) Section 3008(h). Included in this FD/RC is a summary of conditions found at the facility, EPA's selected remedy, EPA's public participation activities, EPA's Response to Comments (Attachment I), updated Index to the Administrative Record (Attachment II), and a copy of the November 2017 Statement of Basis (SB) (Attachment III).

II. FACILITY CONDITIONS AND PREVIOUS ACTIONS TAKEN

The former DuPont East Chicago facility is a former manufacturing facility located at 5215 Kennedy Avenue in East Chicago, Lake County, Indiana. The approximately 440-acre property is bounded to the south by the East Branch of the Grand Calumet River, to the east and north by residential and commercial areas, and to the west by industrial areas *(see Figure 1)*. In 1892, the Grasselli Corporation constructed a facility on the property to produce various chloride, ammonia, and zinc products and inorganic agricultural chemicals. The Grasselli development was restricted primarily to the western portion of the property where the land surface was initially leveled with soil, iron mill slag, and other materials. DuPont operated the facility for the Grasselli Corporation from 1927 through 1936, at which time DuPont acquired ownership. In 1948, DuPont began manufacturing organic chemicals at the facility, consisting primarily of trichlorofluoromethane or Freon® products. The wastes from those manufacturing processes included acids, boron, arsenic, chromium, lead, and antimony pentachloride. DuPont continued chemical production and hazardous waste storage and disposal activities on the property until 2000. DuPont also manufactured inorganic chemicals at the East Chicago facility, including sodium silicate and colloidal silica product, Ludox®. During the 1980s and 1990s, DuPont's East Chicago operations were reduced significantly. In 2000, DuPont sold its Ludox® business, its sole remaining East Chicago chemical manufacturing unit, to chemical manufacturer W.R. Grace (Grace). As part of the business transaction, DuPont also gave Grace a 99-year lease on the 30 acres of the land and buildings in the southwest corner of the DuPont property.

In June 1997, DuPont entered into a RCRA Corrective Action Order (Order) with EPA. In the Order, DuPont agreed among other things, to conduct a RCRA Facility Investigation (RFI) to

determine the nature and extent of any releases of hazardous waste or hazardous waste constituents at or from the East Chicago facility. The Order required DuPont to:

- Prepare initial environmental assessments;
- Develop Phase I (2002) and Phase II (2005) RFIs that included comprehensive evaluations of soil and groundwater conditions at the facility;
- Implement certain Interim Remedial Measures (IRM) to control or abate the release or potential release of hazardous wastes or hazardous constituents at or from the facility;
- Conduct a Corrective Measures Study (CMS) to identify and evaluate alternatives for the corrective action necessary to prevent or mitigate migration of contaminants; and
- Perform any other activities necessary to abate or evaluate actual or potential threats to human health or the environment resulting from the release or potential release of hazardouswaste or hazardous constituents from the facility.

In 2015, DuPont implemented a corporate restructuring that included the former DuPont East Chicago facility. On February 1, 2015, DuPont transferred title of the former DuPont East Chicago facility to Chemours Company FC LLC (Chemours), a newly-created, wholly-owned subsidiary of DuPont. On July 1, 2015, the spinoff of the former Chemours subsidiary was completed and DuPont and Chemours became two separate companies. Under the terms of the 1997 Order, however, the change in ownership status and corporate status did not alter DuPont's responsibility under the Order. On June 29, 2018, Chemours informed EPA that it had conveyed title to the former DuPont East Chicago facility and the Grace lease, to East Chicago Gateway Partners, LLC (Gateway) a property redevelopment firm.

DuPont's industrial operations at the East Chicago property were largely limited to its western portion. The southern section of the developed area was used for chemical manufacturing purposes, while the northwestern section and northeastern edge of this area were used for waste management. Most of the previously active manufacturing areas, however, have been decommissioned, and the production facilities have been removed. For the purposes of describing the hazardous waste investigations and proposed cleanup approaches, the former DuPont East Chicago facility has been divided into the following five areas (*see Figure 1*). Only three areas, the Redevelopment Area, the Open Area and the Leased Area are included in this FD/RC. As explained further below, EPA issued the Final Decision for the other two areas in 2014.

- Redevelopment Area: This area occupies approximately 155 acres and encompasses the former manufacturing areas located in the central and western portions of the property. The former manufacturing facilities have been removed. Future industrial and/or commercial use is planned for the Redevelopment Area. The Redevelopment Area is included in this FD/RC.

- Open Area: This former manufacturing and waste management area occupies approximately 50 acres and includes an approximately 30-acre former solid waste landfill (landfill) in the northeastern portion of the property. A vegetative grass cover is currently maintained over the landfill. The final landfill cover will incorporate native and pollinator friendly plant species. EPA and the property owner will coordinate with The

Nature Conservancy on this effort. The portion of the Open Area that is not part of the landfill has natural herbaceous/shrub cover regrowth with intermixed patches of shrubs and trees. The former manufacturing facilities have been removed. Aside from landfilling/landfill consolidation, currently no active future industrial and/or commercial use is planned for the Open Area. The Open Area is included in this FD/RC. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the FD and EPA's approval.

- Leased Area: Since 2000, Grace has leased this 30-acre active manufacturing area in the southeastern corner of the former DuPont East Chicago facility. Grace manufactures Ludox®, a colloidal silica product, and a sodium silicate solution. These products are used in x-ray film; photographic paper; pigments; nonslip coatings; low phosphate detergents; and metal castings for aerospace, medical, and recreational products. The Leased Area is included in this FD/RC.

- Natural Area: This undeveloped area occupies approximately 172 acres and contains globally rare dune and swale geomorphology and associated plant communities in the eastern portion of the former DuPont East Chicago facility. DuPont established the Natural Area by transferring a conservation easement to the Indiana Department of Natural Resources (IDNR) in accordance with a federal consent decree involving the natural resource damages and restoration of the Grand Calumet River. The Natural Area section of the former DuPont East Chicago facility is currently managed by The Nature Conservancy for habitat preservation and is anticipated to continue as such in the future. EPA issued the separate SB and a September 30, 2014 Final Decision that selected the Natural Area cleanup remedy. The Natural Area is not part of this FD/RC.

- Buffer Zone Area: The Buffer Zone area was included in the separate Natural Area SB and the September 30, 2014 Final Decision discussed in the previous paragraph. This area is located directly east of the Open Area and Redevelopment Area and separates these areas from the adjacent Natural Area. The Buffer Zone Area is a 200-foot-wide strip of land adjacent to the Natural Area that extends from the northern boundary to the southern boundary of the former DuPont East Chicago facility and occupies approximately 20 acres. The Natural Area Final Decision required the Buffer Zone vegetation and habitat to be managed appropriately to protect the Natural Area. The purpose of the Buffer Area is to provide additional protection to the Natural Area. The Buffer Zone Area is not part of this FD/RC.

RCRA Facility Investigation Results

From 2002 to 2005, DuPont conducted the RFI to fully characterize the nature and extent of contamination at the former DuPont East Chicago facility. Results from the RFI and other previous investigations indicate arsenic, lead, zinc, and cadmium are the primary Contaminants of Concern (COCs) in the site soil (from about 0 to 10 feet below ground surface [bgs]). Arsenic

is considered the primary COC in groundwater, based on its distribution and elevated concentrations.

In 2002, pursuant to the Order, as an IRM DuPont installed two 2,000-foot-long permeable reactive barrier (PRB) walls along the northern property boundary to passively treat concentrations of arsenic above the action level migrating off-site in groundwater. Following completion of the RFI and implementation of the PRB IRM, DuPont submitted an initial CMS and later a Supplemental CMS Investigation Work Plan to address data gaps. DuPont later revised the Supplemental CMS Investigation Work Plan and completed investigation activities in 2009 and 2010. During the spring and summer of 2012, DuPont performed a supplemental soil and groundwater investigation to further delineate groundwater plumes of arsenic originating from two main source areas. In addition, DuPont performed another IRM in the Buffer Zone Area that separates the former manufacturing and waste disposal areas from the Natural Area. DuPont performed this IRM to protect the Natural Area by decreasing potential contaminant migration via surface water runoff into sensitive habitat and by extending coverage of existing high-quality habitat to the Buffer Zone. DuPont has also conducted long-term performance monitoring of the Natural Area required by EPA's 2014 Final Decision for the Natural Area.

This former DuPont East Chicago facility was used for chemical manufacturing for over 100 years. To capture as much information about potential contaminants and releases as possible, the RFIs and IRMs involved extensive review of information about prior manufacturing activities and thousands of subsurface soil samples. Considering the length and numerous types of chemical manufacturing activities, however, it is possible some underground piping or other structure was not identified or encountered during this comprehensive investigation of the site. This possibility underscores the importance of imposing institutional controls on the use of the property to protect construction, utility, and maintenance workers.

III. SELECTED FINAL REMEDY

After careful review and consideration of all the public comments received throughout the SB public comment period and based on the comparative analysis of alternatives presented in the SB, EPA has selected the following remedy components for the Western Portion/Industrial Area of the former DuPont East Chicago facility.

- **Soil:** Across the facility, maintain existing pavement or other surface soil barriers, where pavement or other barrier is not present, install a permeable soil cover, excavate identified source area soil with off-site disposal, and stabilize saturated soils using in-situ stabilization (ISS) techniques.

- **Groundwater:** Perform in-situ chemical fixation (ISCF) via sulfate reduction injections and install a bio-wall trench along the southern property line upgradient of the Grand Calumet River to meet the Indiana Surface Water Quality Standard for the protection of aquatic life (0.148 mg/L) and also perform ISCF and install a bio-wall trench within the northern source areas of the facility to meet the EPA Drinking Water Standard MCL for arsenic (0.01 mg/L) at the northern property line.

The final corrective measures with respect to the facility conceptual site model and remedial action objectives are summarized as follows:

- Control direct contact with contaminated soil by maintaining existing pavement and foundation barriers in the Leased Area and by installing and maintaining a permeable soil cover in the Open Area and Redevelopment Area.

- Excavate, treat, and dispose off-site soil with concentrations greater than 1,000 milligrams per kilogram (mg/kg) arsenic from identified source areas to remove and stabilize a significant portion of the arsenic at the facility that is contaminating the groundwater. Modeling predicts that this removal will result in decreased arsenic concentrations in groundwater in the source areas and downgradient.

- Excavate and dispose off-site lead-contaminated soil in the Leased Area in addition to maintaining existing barriers such as asphalt (e.g., a parking lot) or concrete (e.g., buildings) to mitigate direct human contact, and achieve a residual target cancer risk of $1x10^{-5}$ and a lead exposure factor of less than 1.0.

- Treat soil in-situ present below the water table within the source area excavations where saturated soil concentrations warrant treatment to further reduce the arsenic source to groundwater.

- Create enhanced microbial sulfate reduction injection treatment zones along the plume flow paths and a bio-barrier located near the river to intercept arsenic along the plumes and reduce or eliminate additional arsenic migration beyond northern and southern compliance points. The combination of source area remediation and treatment zones transecting plume flow paths is intended to rapidly reduce arsenic in groundwater, reduce the flux of arsenic to the bio-barriers therefore extending their longevity, and to convert existing forms of arsenic in saturated soils into forms that do not allow arsenic to migrate off-site in groundwater.

- Proceed with final closure of the landfill. The final closure effort should meet or exceed the Final Closure requirements of Title 329 of Indiana Administrative Code (IAC) Article 10 Rule 37 and shall include the following:

    1. Installation of a final cover that includes geocomposite layers, a drainage layer, and a vegetative cover per the closure requirements;
    2. Development and implementation of a groundwater monitoring plan; and
    3. Development and implementation of a post-closure care plan in accordance with 329 IAC 10-38 and EPA requirements provided in 40 CFR Parts 264, 265, 270, and 271. These include design, monitoring and inspection requirements for the landfill as part of the closure and post-closure process.

- Implement long-term operation, monitoring and maintenance activities including long-term groundwater monitoring at the compliance points and periodic physical and chemical monitoring of the closed 30-acre former landfill in the Open Area.

- Estimate and set aside financial assurance for necessary remediation including long-term operation monitoring and maintenance. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB.

- Record, implement and maintain EPA-approved institutional controls developed in consultation with the Indiana Department of Environmental Management (IDEM), that will prohibit the installation of on-site drinking water supply wells, require permits for non-potable groundwater production wells, ensure protection of workers and ensure that the former DuPont East Chicago facility's land use remains consistent with the remedial endpoints and risk assessments. These restrictions will be embodied in a recorded environmental restrictive covenant and deed restriction that runs with the land and will be provided to IDEM's Institutional Controls Registry and Virtual File Cabinet.

- Maintain site access controls (such as fencing and signage), and implement health and safety plans at the former DuPont East Chicago facility, as necessary, to minimize unacceptable risk associated with human exposure to facility contaminants.

- Submit a Corrective Measures Implementation Work Plan that will include the work plans, methods, and schedules for the implementation of the final corrective measures as outlined above.

The combination of source area remediation via excavation, soil covers, and groundwater treatment will negate the potential for exposure and improve groundwater quality. The site owners must restrict site access by maintaining fencing and signs to deter trespassers, and must update the facility health and safety plans as needed to be protective of on-site workers. The site owners also must maintain institutional controls preventing changes in land use from the current industrial use. The final remedy is protective of human health and the environment.

Based on the comparative analysis of alternatives, EPA's proposed remedy in the SB consisted of the corrective measures in Alternative 4 (Soil: Soil covers, source area soil excavation, ISS of saturated soils and excavated soil treatment with on-site management; Groundwater: ISCF via sulfate reduction injections and a bio-wall trench located along the southern property line up gradient of the river and within the northern source areas of the facility). EPA is selecting Alternative 4, with a modification to the soil component, as the final remedy for the Western Portion/Industrial Area of the former DuPont East Chicago facility. Instead of on-site management of excavated soils as proposed in the SB, EPA is selecting a final remedy whereby excavated soils will be disposed of off-site.

In the CMS discussion of Technology Screening and Evaluation of Remediation Technologies for Contaminated Soils, EPA considered the alternative of off-site disposal for on-site soil contamination. *See* Administrative Record No. 53, Corrective Measures Study, March 2015, PARSONS. In the SB, EPA instead proposed the option of excavation and on-site consolidation

of contaminated soil in the SB because it would protect human health and the environment, it would not require transportation of soil through the community, and it was more cost-effective than off-site disposal.

During the public comment period, the community voiced concerns with treating and consolidating on-site and landfilling contaminated soils at the former DuPont East Chicago facility and a strong preference for the contaminated soils to be removed from the former DuPont facility. Commenters also noted that East Chicago is a minority and low-income community and due to historic heavy industries' manufacturing and disposal practices, it has been burdened with significant environmental challenges. Commenters also noted that excavation and off-site disposal would facilitate "green" redevelopment of the former DuPont East Chicago facility.

After receiving public comments, EPA reconsidered the proposed remedy in light of community concerns. The additional cost for the off-site disposal of the contaminated soil is $4 million, bringing the approximate total for the remediation to $26.6 million. EPA re-evaluated the relatively incremental increase in the cost for the cleanup of this large and complex facility and balanced it against the community acceptance and volume reduction criteria. EPA found that on balance, the off-site disposal option is equally, if not more, protective as the on-site disposal option proposed in the SB, and it will significantly and permanently reduce the volume of on-site contamination with a relatively incremental cost, may enhance redevelopment opportunities, and will provide for greater community acceptance of the selected remedy in an area with environmental justice concerns.

The final remedy provides the best balance among the alternatives presented in the SB with respect to the evaluation criteria described in the SB, including: 1) technical performance, reliability, implementability, and safety; 2) overall protection of human health and the environment; 4) short and long-term effectiveness; 5) cost; 6) and community and state acceptance.

IV. PUBLIC PARTICIPATION ACTIVITIES

A public comment period was held from November 27, 2017 through March 12, 2018. During the public comment period, the SB, Public Notice, and Administrative Record were available for public review in the Pastrick Branch of the East Chicago Public Library, 1008 W. Chicago Ave in East Chicago, Indiana; at the EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois; and at https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana. On November 15, 2017, over 760 Fact Sheets were mailed to the East Chicago Community presenting the proposed remedy for the Former DuPont East Chicago Facility, information on where to find the SB and related documents for review and comment, and details on the first public meeting to be held on January 10, 2018. On January 10, 2018 and March 6, 2018, public meetings were held at the Pastrick Branch of the East Chicago Public Library to present the SB and accept oral comments. Over 200 separate oral comments and written comments were made during the two public meetings or received by EPA. These comments were reviewed by EPA and are presented and responded to in Attachment 1. EPA is committed to continuing to offer opportunities for

meaningful public involvement related to the corrective action at the former DuPont East Chicago facility.

V. FUTURE ACTIONS

The following future actions, required as part of this FD/RC, are integral to the remedy implementation.

- Execute a RCRA 3008(h) corrective action order to implement the remedy.

- Submit for EPA approval a Corrective Measures Implementation Plan which will detail the work plans, methods, and schedules for the implementation of the final corrective measures as outlined above.

- Maintain site access controls such as fencing, and signage and implement health and safety plans at the former DuPont East Chicago facility, as necessary, to minimize unacceptable risk associated with human exposure to facility contaminants.

- Submit for EPA approval a comprehensive Long-Term Monitoring and Maintenance Plan (LTMMP) that details the monitoring and maintenance activities that will be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the plan for periodic physical and chemical monitoring of the closed 30-acre former landfill in the Open Area.

- Estimate and set aside financial assurance for completion of necessary remediation including long-term operation monitoring and maintenance. This estimate will be greatly informed by the LTMMP that is described above. Any future plan to further consolidate the landfill may require additional financial assurance and possible modifications to the SB.

- Record, implement and maintain EPA-approved institutional controls, developed in consultation with the Indiana Department of Environmental Management, that will prohibit the installation of on-site drinking water supply wells, require permits for non-potable groundwater production wells, ensure protection of workers and ensure that the former DuPont East Chicago facility's land use remains consistent with the remedial endpoints and risk assessments. These restrictions will be embodied in a recorded environmental restrictive covenant and deed restriction that runs with the land and will be provided to IDEM's Institutional Controls Registry and Virtual File Cabinet.

- Conduct five-year remedy reviews to update the Conceptual Site Model, evaluate remedy efficacy, update financial assurance timelines, and, if needed, make adjustments to the performance of the remedy.

V. ADMINISTRATIVE RECORD

The Administrative Record supporting the selected final remedy is available at the Pastrick Branch of the East Chicago Public Library, 1008 W. Chicago Avenue in East Chicago, Indiana, at the EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois and at https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana. Attachment II identifies all documents contained in the Administrative Record.

VI. DECLARATIONS

Based on the information in the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont East Chicago facility, EPA has determined that the selected remedy for the former DuPont East Chicago facility as detailed above is appropriate and protective of human health and the environment.

Tinka G. Hyde
Division Director
Land and Chemicals Division

July 18, 2018
Date

FIGURE I

LOCATION MAP

FINAL DECISION AND RESPONSE TO COMMENTS

The Western Portion/Industrial Area of the
Former DuPont East Chicago Facility
East Chicago, Indiana
EPA ID: IND 005 174 354

PARSONS

[illegible] Commercial Technology Group
10 S. Riverside Plaza
Chicago, IL

DUPONT

Figure
Natural Area Ridge and Swale Vegetation

Natural Area Evaluation and Management Plan
DuPont East Chicago Facility
East Chicago, Indiana

Current Easement Boundary
New Fence
Extended Buffer Zone (~23 acres)
Future GCR-SRP Shelf Wetlands

Plant Community Mapping
Swale (Wetland)
Dune/Ridge - Mesic Prairie
Dune/Ridge - Oak Barrens

River
Property Boundary

Prepared by: [illegible]	Date: [illegible]	DuPont Project [illegible]
Reviewed by: Carlos Victoria	Figure	PARSONS Proj 446650

ATTACHMENT I

EPA RESPONSE TO COMMENTS

FINAL DECISION AND RESPONSE TO COMMENTS

The Western Portion/Industrial Area of the
Former DuPont East Chicago Facility
East Chicago, Indiana
EPA ID: IND 005 174 354

EPA RESPONSE TO COMMENTS

The Western Portion/Industrial Area of the Former DuPont East Chicago Facility
EPA ID: IND 005 174 354

Overview

The EPA Statement of Basis (SB), containing the proposed remedy for the former DuPont East Chicago facility, was made available for public review and comment on November 27, 2017. Public meetings were held on January 10, 2018 and March 6, 2018 at the Pastrick Branch of the East Chicago Public Library to accept oral comments on the proposed remedy. The public comment period was held from November 27, 2018 through March 12, 2018. EPA received over 200 comments from those attending the public meetings and from mailings received into the Agency during the comment period. Comments were received from a variety of individuals and organizations, including: residential property owners; local community members; the Community Strategy Group; the Northwestern Pritzker School of Law Environmental Advocacy Clinic; the Duneland Sierra Club; and the Hoosier Environmental Council. Numerous letters of support were also received from local government officials, neighboring businesses and municipalities.

The purpose of this document is to provide responses to comments received during the public comment period. All comments received by EPA are summarized and responses are included below. The transcripts of the public meetings held on January 10, 2018 and March 6, 2018 are provided at https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana.

This Final Decision/Response to Comments (FD/RC) document does not repeat verbatim each individual comment. Rather, some of the comments are summarized, and, in the interest of clarity, some of the related comments are combined. The remainder of this FD/RC contains a summary of the comments received and EPA's responses to those comments.

This FD/RC also discusses future actions that will accompany the implementation of the selected remedy.

Comments and Responses

Comment #01: RCRA Permitting and Corrective Action

There were several comments and questions surrounding the status of the DuPont East Chicago facility's RCRA permit. Several commenters asked why EPA and IDEM did not require or issue a standard RCRA permit for the former DuPont East Chicago facility that reportedly "once was the world's largest" chemical and pesticide manufacturing facility. Another comment struggled to understand how the former DuPont East Chicago facility was regulated by a RCRA permit because DuPont had submitted and then withdrawn a RCRA hazardous waste treatment, storage

and disposal facility permit application. A commenter was confused by a determination by EPA in the 1980s that recommended "no further action" at the former DuPont East Chicago facility. Other comments asserted that DuPont/Chemours was currently operating an unregulated and unpermitted commercial solid waste treatment, storage, or disposal facility.

Response to Comment #01

This response addresses the related questions and concerns raised by commenters regarding RCRA permitting and regulation of the former DuPont East Chicago facility. To understand the RCRA permitting and corrective action process as applied to the former DuPont East Chicago facility, it may be helpful to review the history of RCRA regulation of that facility. As the comments note, the former DuPont East Chicago facility was a large, complex, facility that manufactured many types of chemicals for over 100 years. During the height of its operations, the former DuPont East Chicago facility produced dozens of chemicals and employed 2,000 persons. One product line that Dupont produced in East Chicago was sodium silicate and the colloidal silica product, Ludox®. In 1973, the Indiana Stream Pollution Control Board approved plans for the disposal of the sodium silicate and colloidal silica wastewater treatment plant sludge and IDEM later permitted the landfill as a restricted solid waste landfill. Yet, by the 1980s, DuPont's chemical manufacturing in East Chicago had been sharply reduced or shuttered. DuPont then dismantled and razed many of the former buildings at the plant. However, Dupont continued to produce sodium silicate and colloidal silica and dispose of its wastewater treatment sludges in the on-site solid waste landfill.

On August 19, 1980, as required by § 3010 of RCRA, DuPont notified EPA of its hazardous waste activity. In its initial RCRA notification dated August 19, 1980, DuPont submitted a "Part A" permit application and identified itself as a generator of solvents, ignitable wastes, and corrosive waste and as an owner/operator of a treatment, storage and/or disposal facility for hazardous waste. On November 3, 1980, DuPont submitted a hazardous waste permit application and identified itself as generating and storing ignitable and corrosive hazardous waste and hazardous wastes from non-specific sources. Then, on March 17, 1982, DuPont requested that its RCRA status be changed from a generator and storage facility to solely a generator and that EPA withdraw DuPont's earlier storage permit application.

Despite withdrawing its permit application, DuPont, as a former RCRA owner and operator, was and continues to be subject to RCRA corrective action cleanup requirements at the East Chicago facility. Any facility, such as the former DuPont East Chicago facility, that had or should have obtained "interim status" (a status conferred by operation of statute) is subject to RCRA's corrective action requirements.

In 1997, EPA issued a RCRA 3008(h) Corrective Action Order (Order) to DuPont. EPA's 1997 Order recognized "[Dupont] is the owner or operator of a Facility that has operated, is operating, should be, or should have been operating under interim status subject to § 3005(e) of RCRA, 42 U.S.C. § 6925 (e)." Pursuant to that Order, DuPont carried out the RCRA Facility Investigations (RFI), Corrective Measures Studies (CMS), and Interim Remedial Measures. Consequently, there has been no interruption in IDEM's or EPA's regulation of Dupont's generation, treatment, storage, and disposal of wastes at the East Chicago facility. The past 20 years of EPA-required investigations, interim remedial measures and studies, demonstrate that the Agency did "take

further action" and engaged in a long-standing, concerted commitment to comprehensively respond to the environmental challenges of this large and complex former chemical manufacturing facility.

In the Fall of 2017, EPA issued a SB for the Western Portion/Industrial Portion of the Former DuPont East Chicago Facility which detailed EPA's proposed remedy. Over the course of four months, EPA held two public meetings to answer questions and take the community's comments on the proposed remedy and gave the public the opportunity to submit comments at any point during the public comment period. Following consideration of and response to public comments on EPA's proposed remedy, and issuance of this final remedial decision, EPA anticipates that DuPont, Chemours, and the new property owner will enter into an agreement to undertake the RCRA-required cleanup work and implement institutional controls required by the final decision document for the Western Area/Industrial Portion of the former DuPont East Chicago facility.

EPA's RCRA corrective action program frequently manages contaminated waste on-site when appropriate and protective of human health and the environment. However, due to community concerns, as discussed in more detailed responses to Comments No. 2, 5 and 32 below, contaminated soils excavated during the implementation of the corrective action under the Final Decision will be disposed of off-site at an appropriate disposal facility.

Comment #02: Landfill Status, Consolidation of Contaminated Remediation Soils Within Area of Contamination, ARARs, Mixture Rule, Contained- In Rule, Land Disposal Restrictions, Minimum Technology Requirements; Off-Site Disposal of Remediation Wastes

Several commenters questioned the placement of contaminated soils excavated from areas on the former DuPont East Chicago facility into the on-site landfill existing within the Open Area. Commenters questioned how the Statement of Basis for the former DuPont East Chicago facility, its selected remedies, and on-site waste disposal practices complied with federal RCRA and State of Indiana laws and regulations including IDEM's Applicable or Relevant and Appropriate Requirements (ARARs) for the land disposal of solid and/or hazardous wastes.

A commenter asked how could EPA and IDEM allow the disposal of the former DuPont East Chicago facility's hazardous and toxic remediation waste in an unpermitted on-site landfill that could not meet the minimum technical requirements (MTR) under RCRA for the land disposal of solid wastes.

A commenter noted that "[t]he Mixture Rule provides that any mixture of a [RCRA] listed Hazardous Waste and a nonhazardous solid waste is itself a RCRA Hazardous Waste. The Derived–From Rule states that any waste derived from the treatment, storage, or disposal of a listed waste is deemed hazardous." Other comments also expressed similar concern that the current treatment of [listed hazardous wastes] wastes at the former DuPont East Chicago facility was simply diluting and/or buffering the wastes in order to pass the Toxicity Characteristic Leaching Procedure (TCLP) test to allow disposal of hazardous and toxic remediation wastes and such buffering or diluting would violate the Mixture Rule and Derived from Rule. Likewise, another commenter asked, how did the Statement of Basis for the former DuPont East Chicago

facility and its corrective action plans comply with RCRA's Land Disposal Restrictions (LDR), MTR the RCRA Mixture Rule, and/or the RCRA Derived-from Rule concerning the disposal of hazardous and toxic remediation wastes from the former DuPont East Chicago facility.

Response to Comment #02: In response to widespread community concerns regarding the volume of lead and arsenic contamination historically present in their community that came from a variety of industries including lead smelters, refineries, and other chemical manufacturers, EPA has determined that any contaminated soils excavated from the former DuPont East Chicago facility as part of this FD/RC, will be disposed of off-site at a waste facility permitted to accept such soils.

Further, to address comments and concerns about the existing 30-acre solid waste landfill, EPA explains in the following paragraphs how the landfill was managed and how it will be closed and monitored in accordance with state and federal RCRA requirements.

The entire former DuPont East Chicago facility, including the approximately 30-acre solid-waste landfill in the Open Area, is subject to the RCRA corrective action requirements under the current and future corrective action orders. DuPont's July 2015 Landfill Evaluation, Administrative Record No. 55, reported that the majority of wastes generated at the former DuPont East Chicago facility between 1893 and 1985 were landfilled in a rubble fill area located northeast of the manufacturing operations. Beginning in the 1970s, the dewatered solids associated with Ludox manufacturing that consisted mainly of calcium sulfate, silicates, calcium hydroxide, and calcium fluoride were disposed of in a diked area adjacent to the rubble fill area. These two areas later became the location of the on-site landfill.

In 1973, the Indiana Stream Pollution Control Board approved plans for the disposal of the Ludox wastewater treatment plant sludge and IDEM later permitted the landfill as a restricted solid waste landfill. Only remediation wastes that have neutralized or stabilized their hazardous constituents in situ, as required by RCRA, have been placed or consolidated in the landfill pursuant to previous RCRA corrective action work at the former DuPont East Chicago facility. The proper treatment of wastes under RCRA is not mere dilution or buffering but neutralization or stabilization of the hazardous constituents in the waste that significantly reduces the threat of release into the environment. According to EPA's Office of Superfund Remediation and Technology Innovation Contaminated Site Clean-Up Information Website, Clu-In, the term "solidification/stabilization" (S/S) refers to a general category of processes used to treat a wide variety of wastes, including solids and liquids. Solidification and stabilization are each distinct technologies, as described below:

- Solidification refers to processes that encapsulate a waste to form a solid material and/or coat the waste with low-permeability materials to restrict contaminant migration by decreasing the surface area exposed to leaching. Solidification can be accomplished by mechanical processes or by a chemical reaction between a waste and binding (solidifying) reagents, such as cement, kiln dust, or lime/fly ash (EPA 2000). The desired changes usually include an increase of the compressive strength, a decrease of permeability, and encapsulation of hazardous constituents (Wilk 2007).

- Stabilization refers to processes that involve chemical reactions that reduce the leachability of a waste. Stabilization chemically immobilizes hazardous materials or reduces their solubility through a chemical reaction. This process may or may not change the physical nature of the waste (EPA 2000). The desired changes for stabilization include converting contaminants into a less soluble, mobile, or toxic form (Wilk 2007).

Treatment reagents often both solidify and stabilize the contaminant matrix; hence, this treatment technology is frequently referred to as a solidification/stabilization process. For example, a treatment reagent such as cement can reduce the mobility of many metal contaminants by forming insoluble hydroxides, carbonates, and silicates with them (stabilization) as well as providing a solid encapsulation matrix to reduce leaching (solidification) (Wilk 2007). Also, in some S/S applications, a primarily stabilization reagent such as phosphate or organoclay can be used to enhance the ability of the binder to encapsulate the contaminants. At the former DuPont East Chicago facility, post treatment testing confirmed the treated soils met the TCLP limits.

EPA's 2010 *Superfund Remedy Report* (thirteenth edition) of treatment technologies used at Superfund sites states that, based on project data, ex situ S/S was used in 170 projects and in situ S/S in 41 projects for source control over the period 1982-2004. An additional 33 ex situ and 15 in situ S/S actions were identified in 2005-2008 decision documents. A number of the ex-situ S/S actions at National Priorities List (NPL) sites were conducted to stabilize contaminated soil prior to off-site disposal at a RCRA Subtitle D facility.

EPA's 2007 annual status report, *Treatment Technologies for Site Cleanup* (twelfth edition), breaks down the 207 S/S source treatment projects conducted during the period FY 1982-2005 by contaminant class treated: metals were treated in 180 projects, polycyclic aromatic hydrocarbons and other non-halogenated semivolatile organics in 35 projects, organic pesticides in 16 projects, PCBs in 35 projects, and other organic chemicals in 53 projects. Some cleanups addressed multiple contaminant types and the status report does not indicate whether they were primary or secondary targets of the S/S remedy

When appropriate and protective of human health and the environment, EPA's RCRA corrective action program may decide that on-site management of remediation wastes is suitable when the additional costs of off-site disposal are considered.

RCRA defines "remediation waste" as "all solid and hazardous wastes, and all media (including groundwater, surface water, soils, and sediments) and debris, that are managed for implementing cleanup." *See* 40 Code of Federal Regulations (CFR) § 260.10. This approach to remediation waste management is referred to as the Area of Contamination (AOC) policy. *See* OSWER Memorandum, Use of Area of Contamination Concept During RCRA Cleanups, March 13, 1995. The AOC policy allows a facility owner/operator with a large, contiguous area of contamination to consolidate and treat remediation waste from within the AOC into a single area or engineered unit. Thus, if historically contaminated soil is excavated and, if necessary, properly treated, and moved within the AOC, the remediation soil would not be considered "generated" or "placed," and neither the LDR or MTR requirements would apply. Site conditions and remediation waste at the former DuPont East Chicago facility met these criteria.

The AOC policy was spelled out in the preamble to the Superfund National Contingency Plan (55 FR 8758-8760, March 8, 1990). EPA explained that certain discrete areas of generally dispersed contamination called "Areas of Contamination" or "AOCs" could be equated to a RCRA landfill. Each AOC is delineated by the areal extent (or boundary) of contiguous contamination. Such contamination must be contiguous but may contain varying types and concentrations of hazardous substances. EPA has interpreted the term "land disposal" as defined under Section 3004(k) to include movement of hazardous waste into a unit, but not movement within the unit. 55 Fed. Reg. 8759, 8760 (March 8, 1990). As a result, movement of hazardous wastes within a land disposal unit ---for instance, the transfer of waste from one part of a hazardous waste disposal unit to another part of that unit --- would not be considered placement or land disposal under Section 3005 and thus would not trigger the RCRA land disposal restrictions or require a permit. See 55 Fed. Reg. 8760 (March 8, 1990) (earthmoving operations within a land disposal unit would not be subject to Subtitle C disposal requirements or permitting).

Although this AOC concept was initially presented in the context of the Superfund program, EPA guidance has long noted that it also applies equally to RCRA corrective action sites, cleanups under state law, and voluntary cleanups. *See* OSWER Memorandum, Use of Area of Contamination Concept During RCRA Cleanups, March 13, 1995. The AOC policy is particularly useful for consolidation of broad areas of contiguous units or areas of contaminated soil. Using the AOC policy, a RCRA facility owner/operator with a large contiguous area of soil contamination could consolidate waste within an AOC, when it is treated in situ (in place) or when it is left in place without triggering the RCRA Land Disposal Restrictions or minimum technology requirements. *See* OSWER Memorandum, Management of Remediation Waste Under RCRA, October 14. 1998.

The former DuPont East Chicago facility applied the AOC approach to the management of its remediation wastes generated as part of the cleanup in the Natural Area and Buffer Zone. Based on sampling and analysis, if concentrations of hazardous constituents in the excavated soil exceeded risk-based levels, then the soil was treated in situ, neutralized or stabilized, and consolidated with other AOC remediation wastes. Properly treated in situ and verified using TCLP analytical testing, the historical remediation wastes were not subject to the Mixture, Derived From, or Contained-In Rules. Following EPA AOC guidance, DuPont/Chemours consolidated the treated remediation wastes within the AOC and avoided RCRA hazardous waste land disposal restrictions and the minimum technology requirements for the landfill.

The AOC approach to management of remediation wastes was and is protective of human health and the environment because any historically disposed wastes that were excavated, were treated so that they no longer posed a threat of release, and consolidated in a managed disposal unit, and as required by the FD, now will be properly closed and monitored in accordance with RCRA regulations and applicable state requirements. The final closure effort is required to meet or exceed the Final Closure requirements of Title 329 of Indiana Administrative Code (IAC) Article 10 Rule 37 and include a final cover that includes geocomposite layers, a drainage layer, a vegetative cover, groundwater monitoring, and post-closure care in accordance with 329 IAC 10-38 and EPA requirements.

Further, as explained in the FD and in the response to Comment 5 below, EPA re-evaluated the balancing criteria for the disposal of contaminated soils excavated as required by the FD and determined that the additional cost of the off-site disposal was incremental when considering the size and complexity of the former DuPont East Chicago facility, the significant and permanent reduction in the volume of wastes on-site, and community acceptance, consistent with EPA's commitment to improve on-the-ground results for overburdened communities.

Comment #03: Metals Recycling and Reclamation
Several commenters suggested that the former DuPont East Chicago facility and the neighboring USS Lead Superfund Site both should be completely cleaned up through recycling and reclaiming valuable and strategic metals and chemicals (soil washing) including the proper treatment and disposal of any remaining residues.

Response to Comment #03: There is strong public interest in reclaiming heavy metals from soils in East Chicago. The USS Lead Site includes two former lead smelting facilities and other nearby industrial, commercial, municipal and residential properties. Lead and arsenic contamination are the primary contaminants at the USS Lead Site. While this FD/RC document addresses only the former DuPont East Chicago facility and not the USS Lead Superfund Site, EPA evaluated techniques for recycling and reclaiming metals at both facilities. There are several compelling reasons why EPA did not select soil washing as a cleanup technique at the former DuPont East Chicago facility.

Superfund noted in its response to comments contained in a Responsiveness Summary for the proposed Explanation of Significant Differences (ESD) for Zones 2 and 3 of Operable Unit 1 (OU1) at the USS Lead Site, that EPA has successfully implemented soil washing at only a small number of sites, due to technical difficulties and high costs associated with the technology. In fact, between 1982 and 2005, soil washing was only implemented at 6 out of 977 sites, and at only 2 out of 229 sites where heavy metals were the contaminant of concern. Further, soil washing is more effective with organic wastes; washing has only limited effectiveness for addressing lead in soil. Some sites initially selected soil washing as the primary remedy, only to determine during implementation that cleanup targets could not be achieved or that the costs were prohibitively high.

EPA Region 5's Superfund Division evaluated the likely effectiveness of the various metal mining remedial approaches for the soils found in East Chicago, Indiana. Given the similar soil types found throughout the area including the USS Lead Site and the former DuPont East Chicago facility, details of that evaluation and Technical Memorandum are summarized below.

See, Administrative Record No. 72, SulTRAC. Soil Washing Remedial Alternative Screening Technical Memorandum for USS Lead OU1 Zone 1 Site, East Chicago, Indiana. May 2018.

Soil washing is a water based process for scrubbing soils ex situ to remove various contaminants and minimize the volume of contaminated material. The basic process consists of mixing the contaminated soil with a fluid in a vessel to physically and/or chemically separate the contaminants from the bulk material. Due to the different characteristics of heavy metals and other pollutants, extracting solutions are typically introduced to the separation process. Several

options for chemical additions include: surfactants, organic acids, alkalis, complexants, and other solvents (CL: AIRE 2007).

To achieve efficient soil washing, it is recommended that the soil makeup contain predominately coarse material. Typically soil makeup containing more than 30% silt, clay, or organic matter will be inefficient in removing contaminants as clay and silts have a higher metal retaining capacity. Soil characterized from the former DuPont East Chicago facility ranges from 10 to 90% sand and 10 to 90% silt and clay depending on the depth of the sample. Due to the soil composition at the former DuPont East Chicago facility, the efficiency of contaminant removal is difficult to predict since the varying silt and clay composition may be inappropriate for soil washing.

When considering the type of applicable soil washing method, it is necessary to determine the association of the contaminant to the soil particle. Contaminants can be absorbed onto a preferred soil particle, separately dispersed alongside soil particles, coat pore walls, or contaminate the soil particle internally (CL:AIRE 2007). The characteristics of how the contaminant is attached to the soil particles is a major driving factor in determining cost and efficiency. Discrete contaminant particles form as individual particles separate from the soil and allow for an efficient soil washing process. However, contaminants that are chemically adsorbed onto the soil particle may require additional washing cycles and chemical agents.

Adsorption is the tendency of a chemical to bind to the surface of the soil particles via chemical reactions between the contaminant and the soil particle surface. Adsorption is quantified by the distribution coefficient (K_d), chemicals with higher K_d values are more likely to sorb onto soils and sediments while chemicals with lower $K_d$values are more likely to be mobilized by groundwater or surface waters. Lead has a high K_d value ranging from 1,950 to 10,760 which implies lead will adsorb tightly to the soil, thus making is difficult to achieve an efficient separation between lead and the soil particle (SulTRAC 2012a). However, arsenic has a K_d value ranging from 0.28 to 6.46 and has a higher aqueous solubility. This can be an issue regarding water treatment of the washing fluid; the treatment process will need to address the arsenic in the fluid which adds to the complexity and cost of treatment.

Surface soil chemistry conditions, like pH, is another key factor when determining the strength of sorption onto the soil particles. Sorption is greatest between inorganic cations, like lead, and soil with neutral or alkaline pH. Clays, metal oxides, and hydroxides have more negatively charged ions which bind to the positively charged ions such as lead. Previous lab analysis of soil samples taken from DuPont contain a pH range from 5.4 to 6.1.

Types of soil washing plants include permanent and mobile. Depending on cost and location, a mobile soil washing system may be more cost effective than a permanent plant which would have a higher capital cost. A large factor to consider when deciding between a permanent or mobile system is the amount of space available for a mobile plant; on average, a 20 ton per hour plant can be sited on approximately on half acre (Hubler and Metz). Given the potential redevelopment opportunities at the former DuPont East Chicago facility, construction of a permanent soil washing plant on-site does not seem preferable. Mobile soil washing plants are

more common since permanent soil washing plants have high associated transportation costs. Permanent soil washing plants are rare in the United States.

Physical separation is typically completed by dissolving or suspending contaminants in a wash solution with a reagent or concentrating the solids and removing the contaminants by attrition scrubbing. Successful physical separation is dependent on the type of contaminant association with the soil particle. Physical separation is favorable towards discrete contaminants comingled with the soil particles. Coarse and oversized material will be removed via screening, jigging, or hydrocycloning (Battelle 1991). To achieve particle size separation, water is introduced as the washing fluid and mixed with the contaminated soil; the slurry mixture is placed in a tumbling mixing vessel which separates the soil based on particle size (FRTR). Particle sizes that allow for the most efficient soil washing range from 0.25 to 2 mm. Surfactants may be added to prevent redeposition onto larger particles. Screens and hydraulic separators separate particles by size and specific gravity, effectively separating contaminants into a smaller volume that can be further treated (Attachment A). Gravity separation is effective in removing high or low specific gravity particles such as lead and arsenic when the COCs are dispersed separately throughout the soil. However, hydraulic classifiers are generally limited to the recovery of particles larger than 50 micrograms (um). Smaller particles remain in the recycled water and would require additional separation techniques such as filtration or flotation. (Battelle 1991).

A study performed by BESCORP tested the process efficiency for 2mm sand particles via physical separation. The removal efficiency after cycle 1 was 61% and required additional cycles. Two additional cycles were performed and the removal efficiencies were 91%, and 85%, respectively (EPA 1995). This implies several cycles may be required if physical separation is applied to DuPont which will decrease cost effectiveness.

Chemical separation removes the contaminants from the soil particle to the wash water. To ensure components of the soil are not dissolved with the contaminants, the pH of the water may be changed, chelating agents are added to solubilize the inorganic contaminants, and surfactants are added to solubilize hydrocarbons. A treatability base study would be required to determine the cost and efficiency of lead recovery. Like the physical separation process, water is introduced to the contaminated soil in addition to chelating agents, surfactants, organic acids, alkalis, or solvents depending on the contaminant. The chemical extractant is introduced to the contaminated soil in an extraction unit separate from the mixing unit.

Research has shown that Ethylenediaminetetraacetic acid (EDTA) and Hydrochloric acid (HCL) are effective acids for lead separation and can produce an 80% to 90% removal efficiency under proper conditions (Karithika 2016). However, the amount of cycles necessary to reach a high efficiency was not revealed in this study. An acceptable removal efficiency varies on the soil type, extractant concentration, and residence time and can depend on several cycles. The soil-extractant mixture is continuously pumped out of the mixing tank and the soil and extractant are separated by hydroclones. Once extraction is complete, the solids run through a rinse system to remove remaining acids and metals.

Precipitants and flocculent are introduced to the recycled extractant solution to remove the metals via settling and reform the acid and regenerate the solution (Attachment B) (FRTR). The

settled material may be processed further to retrieve lead and arsenic for repurpose. Due to the slag and lead-containing dust waste materials found on-site, efficient lead recovery for resale may be unachievable due to type of processed lead. Soil washing is not capable of retrieving lead from slag. Prior to backfilling with the processed soil, a soil neutralization process may be required to ensure the placed soil does not contain a low pH due to the soil washing process.

To accomplish efficient lead recovery from soil particles and slag, it would require an additional separation process such as a leaching. However, the alternative to retrieving lead from the settled material is disposal. Although soil washing is a volume reducing remedy, the process produces a concentrated contaminated sludge that will still require disposal. If the processed soil is to be re-used, residual acids in the treated soil must be neutralized prior to re-use. Once the project is complete, the water used in the soil washing system will need to be properly treated and disposed of; a specialized water treatment process would be implemented to address the chemical additives, which can be difficult and expensive. Although EDTA and HCl have been proven to act as an efficient chemical additive, there are concerns regarding the low biodegradability of EDTA, thus its high persistence in the environment. In addition, there have been concerns of the high acute toxic effect of HCl which also raises concern of the risk associated with improper groundwater treatment and disposal (Karthika 2016).

Although soil washing may be an effective ex situ remedial alternative, the soil washing technology is unsuitable as a remedial option for the former DuPont East Chicago facility. A mobile soil washing plant would need to be placed onsite since permanent soil washing plants are rare, would interfere with the potential reuse of the former DuPont East Chicago facility, and the cost of transportation would not be cost effective. Due to the bonding properties between the COCs and soil particles at DuPont, physical separation would not be effective on much of the contaminated soil. Chemical separation may be appropriate to achieve successful separation. However, chemical separation requires surfactants such as EDTA or HCl which can be costly and require additional water treatment for proper disposal. If the water treatment process is not performed properly, there may be increased health risk as EDTA and HCl have a low biodegradability and acute toxic characteristics. The silt content in DuPont soils and the tight adsorption properties of lead and arsenic increase the difficulty of achieving efficient soil washing rates may require several washing cycles, higher concentrations of chemical additives, and a more rigorous water treatment process. Given the concerns with effectiveness, cost, risks posed by soil washing treatment chemicals, and interference with reuse of the property, and potential delay compared to excavation and off-site disposal, EPA did not include soil washing as a component of the final remedy.

Comment #04: Remedy Protectiveness.

Several commenters questioned how the RCRA SB for the former DuPont East Chicago facility protects people and their surroundings from imminent threats posed by millions of tons of historic improper solid and hazardous waste disposal at the former DuPont East Chicago facility. Commenters have asked: "how does this SB for the DuPont facility and its selected remedies prevent future environmental contamination given that EPA has repeatedly stated that all containment strategies eventually fail?"

Response to Comment #04: EPA will ensure that the historic contaminants which remain at the former DuPont East Chicago facility following this RCRA corrective action cleanup will not cause future threats to human health and the environment. The remedy requires not only cleanup along with maintenance and monitoring, but also land and groundwater restrictions, and five-year remedy reviews that will prevent future threats from contamination. EPA is confident that this selected cleanup ensures that neither facility workers nor nearby residents will be exposed to these contaminants at levels that pose a health risk now or in the future.

As required by a 1997 Order, EPA required DuPont to conduct a comprehensive RCRA Facility Investigation (RFI), subject to EPA approval, at this large and complex facility. The RFI identified contaminants, contaminant concentrations, locations and migration patterns, as well as the underlying geology and hydrology. Using data from the RFI, EPA then established site specific cleanup objectives for contaminated soil and groundwater.

As part of the RCRA corrective action process, EPA established site specific media clean up objectives for the former DuPont East Chicago facility. These objectives were based on EPA guidance, public health and environmental criteria, information gathered during the RFI, and the requirements of any applicable state and federal statutes. Based on the results of the RFI, EPA identified, screened, and developed the alternative or alternatives for removal, containment, treatment, and/or other remediation of the contamination based on the media clean up objectives established for the corrective action at the former DuPont East Chicago facility. Technologies can be combined to form the overall corrective action alternative(s). The alternative or alternatives developed represent a workable number of option(s). These alternatives are screened against RCRA's threshold criteria which are:

1. protection of human health and the environment;
2. attainment of media cleanup objectives;
3. controlling the sources of contamination; and
4. comply with applicable standards for waste management.

Alternatives which do not meet these threshold criteria do not warrant further consideration. EPA then describes each corrective measure alternative that passes through the initial screening based on the threshold criteria and evaluates each corrective measure alternative and its components relative to the following evaluation/balancing criteria: long-term reliability and effectiveness; implementability (including community and state acceptance); short-term effectiveness; permanent reduction of waste toxicity, mobility and volume; cost and sustainability. The DuPont East Chicago facility's evaluation included both laboratory bench scale studies and on-site in the field pilot tests of the groundwater treatment technologies proposed. Adjustments were made to the proposed remedy based on those laboratory and on-site studies.

EPA is required to justify and recommend a corrective measures alternative based on an evaluation of the balancing criteria. This evaluation was done and the rationale for the proposed remedy was detailed in the SB document. After reviewing and considering all the comments received during the public comment period, EPA is now selecting the final corrective measures alternative to be implemented as detailed in this document. Containment, or on-site disposal of

on-site soils, was a part of the proposed remedy, however, EPA reevaluated the disposal options against the balancing criteria, the increased cost of off-site disposal in light of the overall size and complexity of the former DuPont East Chicago facility along with the permanent reduction in the volume of waste and numerous comments from the community. After weighing all of these factors, EPA has determined that off-site disposal of contaminated soil at an EPA-approved facility is the better disposal alternative.

Taking into consideration the data collected at the former DuPont East Chicago facility and years of careful evaluation, EPA believes that the selected remedy will protect the neighboring residents and the environment. Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont East Chicago facility, EPA has determined that the selected remedy for the former DuPont East Chicago facility is appropriate and protective of human health and the environment.

With respect to the long-term efficacy of the selected remedy, the FD requires long-term maintenance and monitoring as well as 5-year reviews to ensure that the remedy continues to protect the health of workers at the former DuPont East Chicago facility, residents of the adjacent neighborhood, and the environment.

Comment #05: Off-site Disposal of Contaminated Soils.
Several commenters expressed the preference for the off-site disposal of the excavated soils from the former Dupont East Chicago facility.

Response to Comment #05: DuPont's CMS considered both off-site and on-site disposal of contaminated soils. As explained in Comment 4 above, EPA first evaluates cleanup alternatives using certain threshold criteria, including protection of human health and the environment, attainment of media cleanup standards, controlling the sources of releases, and complying with applicable standards for waste management. Both off-site and on-site contaminated soil disposal met those threshold criteria. Alternatives that successfully meet the threshold criteria are then evaluated against RCRA's balancing criteria. The balancing criteria include long-term effectiveness, permanent toxicity, mobility, or volume reduction, short-term effectiveness, implementability (community and state acceptance) cost and sustainability. When appropriate and protective of human health and the environment, EPA's RCRA corrective action program generally manages waste on-site. At the former DuPont East Chicago facility, EPA examined the disposal options against the balancing criteria and determined that the primary distinguishing criteria was cost-effectiveness. Consequently, in the SB, EPA chose on-site disposal of contaminated soils as the preferred cleanup alternative.

During the public comment period, the community voiced concerns with treating and consolidating contaminated soils at the facility and a strong preference for the contaminated soils to be removed from East Chicago, Indiana. Commenters also noted that East Chicago is a minority and low-income community and due to historic heavy industry manufacturing and disposal practices, it has been burdened with significant environmental challenges especially the residential neighborhood around the former DuPont East Chicago RCRA facility and the USS Lead Superfund Site. Following the public comment period, EPA requested Chemours to update the cost estimate for the contaminated soils off-site disposal option. Chemours estimated offsite

disposal would cost an additional $4 million dollars, bringing the estimated total for the former DuPont East Chicago facility remediation to $26.6 million. EPA re-evaluated the incremental increase in the cost for the cleanup of this large and complex facility and balanced it against the community acceptance and volume reduction criteria. EPA found that the off-site disposal option was the better alternative.

Comment #06: Property Ownership.
Who owns the former DuPont East Chicago facility?

Response to Comment #06: On June 29, 2018, Chemours conveyed to East Chicago Gateway Partners, LLC, (Gateway Partners) the entire 440 acres of property located at 5215 Kennedy Avenue, including the 30-acre portion of the property leased to Grace, in East Chicago, Indiana. Since that was a very recent transaction, it may be helpful to review the previous history of the facility ownership.

In 1892, the Grasselli Corporation owned the property and constructed a facility to produce various chloride, ammonia, and zinc products and inorganic agricultural chemicals. The Grasselli development was primarily restricted to the western portion of the property where the land surface was initially leveled with soil, iron mill slag, and other materials. DuPont operated the facility for the Grasselli Corporation from 1927 through 1936, at which time DuPont then acquired ownership. In 2000, as part of the sale of its Ludox® product manufacturing to Grace, DuPont leased to Grace a 30-acre area in the southeastern corner of the former DuPont East Chicago to facility. In 2015, DuPont implemented a corporate restructuring that included the DuPont East Chicago facility. On February 1, 2015, DuPont transferred title of the Dupont East Chicago facility to Chemours, then a newly-created, wholly-owned subsidiary of DuPont. Chemours became the title owner of the DuPont East Chicago facility. The transfer included the Leased Area in the southwest corner of the facility and the approximately 172-acre Natural Area in the eastern portion of the former DuPont East Chicago facility. On July 1, 2015, the spinoff of the former Chemours subsidiary was completed. DuPont and Chemours are now two separate companies.

The Natural Area portion of the property is currently managed by the Nature Conservancy (TNC) under a contract with the Indiana Department of Natural Resources, which holds a conservation easement for the 172-acre Natural Area.

Comment #07: Asbestos.
Why hasn't EPA and IDEM investigated asbestos contamination and remediation on and off the DuPont facility as part of this SB?

Response to Comment #07: EPA notes there is documentation that during the dismantlement of former manufacturing operations, DuPont identified asbestos containing materials and those materials were removed by asbestos contractors and disposed of off-site. However, to date, EPA has not identified any potential asbestos containing material related to the former industrial operations. If any such material is identified during work activities at the facility, EPA will take all measures to ensure an asbestos-containing material is appropriately handled and properly disposed.

Comment #08: Contaminants Screened.
Several commenters questioned the suite of contaminants of concern (COCs) that were sampled at the former DuPont East Chicago facility.

Response to Comment #08: As part of the RFI, RCRA corrective action facilities screen for contaminants using the CFR 40 Part 264 Appendix IX list of hazardous constituents and site-specific information provided to EPA. From sampling data collected at the former DuPont East Chicago facility and years of investigations and study including human health and ecological risk assessments, the main COCs for the former DuPont East Chicago facility were determined to be cadmium, lead, arsenic and zinc. COCs were determined and remedies selected based on those studies.

EPA and DuPont have been conducting a comprehensive RCRA investigation at this facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities.

Comment #09: Inadequate Community Involvement.
Several commenters suggested that the corrective action activities at the former DuPont East Chicago facility had no community involvement from actual members of the surrounding communities even though there is a Public Involvement Plan. How does this SB and its remedy selection and remedial actions for the DuPont facility comply with the rule of law including RCRA's and CERCLA's laws and regulations pertaining to public participation requirements?

Response to Comment #09: Although there is no regulatory requirement for public participation in corrective actions under RCRA § 3008(h) orders, EPA has issued two directives regarding public participation in RCRA § 3008(h) orders, and in January 2017, issued a RCRA Public Participation Manual. These directives recommend that corrective actions carried out pursuant to RCRA § 3008(h) orders include certain public participation activities, even though such activities are not required by statute.

EPA has included all the public participation activities recommended after the selection of a proposed remedy including:

- Writing a statement of basis explaining the proposed remedy;
- Providing public notice that a proposed remedy has been selected and the statement of basis is available (November 21, 2017 public notice);
- Providing a public comment period (ordinarily 30-45 days) on the proposed remedy (November 21, 2017 to March 12, 2018 - 112 actual days);
- Holding a public hearing if requested (EPA held two hearings - January 10, 2018 and March 6, 2018); and
- Writing a final decision and response to comments.

See, Directive 9901.3, Guidance for Public Involvement in RCRA Section § 3008(h) Actions (May 5, 1987); Directive 9902.6, RCRA Corrective Action Decision Documents: The Statement

of Basis and Response to Comments (April 29, 1991); and Resource Conservation and Recovery Act Public Participation Manual (January 11, 2017).

The 2003 Public Involvement Plan for the former DuPont facility applied to the RFI process. It stated that additional public participation activities may be added later as appropriate. Based on the East Chicago community's widespread interest in environmental cleanups affecting their neighborhoods, the RCRA Corrective Action program is currently working with Superfund to revise the USS Lead Superfund Site Community Involvement Plan (CIP) to include the former DuPont East Chicago facility. Furthermore, a manager from the RCRA Corrective Action program and the RCRA community involvement coordinator participated in community interviews that were held June 11-14, 2018, to update the CIP and to get feedback from the community on public participation activities held for the former DuPont East Chicago facility.

The EPA RCRA corrective action program has met or exceeded all public participation directives as they relate to the former DuPont East Chicago facility. These efforts have included direct mailings, fact sheets, and multiple public meetings specific to both this current SB and FD/RC as well as the 2014 SB and subsequent FD/RC for the Natural Area of the facility. Additionally, beginning in 2016, EPA RCRA corrective action staff have had a presence at numerous USS Lead informational meetings with the most recent meeting held on April 7, 2018.

To be clear, the FD/RC is not issued by EPA until all the public comments on the SB are reviewed, considered, and responded to as the comments may directly affect the final remedy. The Agency's detailed responses are formalized as part of the FD/RC document. EPA has a website dedicated to the former DuPont Facility, in addition to the local repository at the East Chicago library and the Region 5 Records Center, where current information is posted and historical documents can be accessed: https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana .

Additionally, Chemours has developed a website where the community can obtain up to date information on RCRA and Superfund activities at the facility: https://www.chemours.com/east-chicago-site/information-update/ .

Comment #10: Additional Off-Site Studies.
Why hasn't EPA and IDEM conducted studies in the Calumet Neighborhood, Hessville, and Gipson Woods to determine actual impacts to human health and ecological risks like chromosomal abnormalities and cytogenetic damage in surrounding communities near the DuPont facility similar to what was done at the Love Canal toxic waste site in Niagara Falls, N.Y. – the first Superfund Site?

Response to Comment #10: This FD/RC addresses the final remedy to be implemented at the former DuPont East Chicago RCRA facility. As such, any comments on other EPA sites or programs are beyond the scope of this document. EPA's Superfund Program is performing a remedial investigation of the groundwater in East Chicago which will determine, among other things, the nature and extent of contamination from the former DuPont East Chicago facility and if additional studies are necessary.

The RCRA investigation at this facility has generated data that were used in a human health and ecological risk assessment, and based on those analysis, EPA evaluated and used that information to select a remedy that is protective of the residents of the neighboring communities.

Comment #11: Availability of Facility Information to the Public.
Several commenters suggested that not all information, reports, and sampling analysis results, including any facility investigations and/or reports by DuPont or their contractors dating back to at least 1967, concerning the DuPont East Chicago, Indiana facility and/or USS Lead Superfund Site were available to the public. This additional information should be used to re-evaluate and review any decision-making concerning: site investigation, this SB, and any remedial actions including a comprehensive re-evaluation of previous studies and reports that lacked consideration of this information.

Response to Comment #11: The administrative record for the facility is available at https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana .

The administrative record serves an important purpose: it contains the information that explains why EPA conducted a particular action at a facility. In this matter, the administrative record reflects information collected across two decades. The administrative record helps inform the public of the Agency's actions, and often serves as a significant source of factual information. EPA has requested and received historical DuPont records through the RFI and information requests. EPA's final decision, consistent with Agency guidance, is based primarily on the more recent study of the former DuPont East Chicago facility as represented by the RFI. The administrative record, and the underlying documents contained in the record, support a cleanup decision and explain, if necessary, how different aspects of a cleanup fit together, what contaminants were found at a facility and how each contaminant may or may not have influenced the ultimate cleanup decision.

Comment #12: Prevention of Future Releases.
Several commenters asked how this SB for the DuPont facility and its selected remedies prevent future environmental contamination and protect human health and the environment from potential adverse effects of contaminated groundwater that is already off-site of the DuPont facility and are residential sumps a potential exposure pathway to that groundwater?

Response to Comment #12: EPA's selected remedy for the former DuPont facility includes a comprehensive groundwater treatment strategy that will prevent the continued off-site migration of contaminants in the groundwater. The RCRA corrective action program is coordinating with the Superfund program to address any potential off-site groundwater concerns, especially in the Riley Park community. The DuPont RCRA corrective action remedy decision addresses on-site groundwater contamination by intercepting and treating groundwater contaminants; the Superfund program will address off-site groundwater contamination.

At this time, EPA's Superfund Program is performing a remedial investigation of the groundwater in East Chicago which will determine the nature and extent of groundwater contamination from the boundary of the former DuPont East Chicago facility. In addition, Superfund plans to conduct a sump study similar to the sump test already performed as part of

the RCRA RFI. After the Superfund RI/FS, Superfund will issue a proposed plan to address any such contamination off-site..

The RCRA corrective action program reserves its RCRA authority to address any DuPont-related contamination that may have migrated offsite, if necessary in the future. The EPA RCRA corrective action and Superfund programs will continue to coordinate on the remedial investigation of the groundwater in East Chicago.

Comment #13: Groundwater Migration Rate.
At EPA's March 6, 2018 Public Meeting concerning this facility, Conor Neal, a geologist for EPA Region 5's Corrective Action program, stated that the migration rate for contaminated groundwater was 0.2 feet per day (ft/d). This is in direct conflict with the known characteristics of the Calumet Aquifer that has an average horizontal hydraulic conductivity of 60 ft/d and a range of 1 to 80 ft/d.

Why did EPA allow mischaracterization of the rate of migration for contaminates in the Calumet Aquifer from the DuPont facility?

How does EPA intend to correct the record concerning the average horizontal hydraulic conductivity of the Calumet aquifer?

Response to Comment #13: EPA did not mischaracterize the rate of migration for contaminated groundwater at the facility. As illustrated in the horizontal hydraulic conductivity equation, EPA provided an estimate for the groundwater velocity or the migration rate for contaminated groundwater (V), which is a function of the horizontal hydraulic conductivity (K), effective porosity (n), and hydraulic gradient (ΔL) ($V = K\frac{\Delta L}{n}$). As reported in the January 2018 Comprehensive Pilot Study Report, an estimated groundwater flow velocity of 0.2 feet per day (ft/d) was observed during both the north area injection well pilot test and the South Area pilot test. Additionally, the March 2013 groundwater evaluation at the facility calculated a groundwater flow velocity of 20 feet per year (0.05 ft/d) north of the groundwater divide and 70 feet per year (0.19 ft/d) south of the groundwater divide.

See, Administrative Record No. 66, Final Comprehensive Pilot Study Report. Chemours East Chicago Site, East Chicago, Indiana. PARSONS. January 2018.

Administrative Record No. 45, Groundwater Evaluation. DuPont East Chicago Site. East Chicago, Indiana. PARSONS. March 2013.

Comment #14: Solid Waste Management Units Hydraulic Connection to Groundwater.
Several commenters asked why this SB did not address the fact that several of DuPont facility's solid waste management units (SWMUs) have intermittent, recurring, or sustained hydraulic connection between the base of the SWMU and the Calumet Aquifer due to normal fluctuations in groundwater elevations – including seasonal high-water table levels?

Response to Comment #14: EPA's proposed remedy in the SB does address the hydraulic connection between soil contamination and the underlying aquifer. Several lines of evidence

were investigated to confirm that soils are leaching to groundwater and the proposed remedy will eliminate that pathway.

The RFI conducted between 1999 and 2004, with additional investigations during 2009 and 2010, identified soil arsenic contamination from the ground surface to the base of the sand aquifer 40 feet below ground surface (ft. bgs), but most arsenic contamination was found within the top 4 ft. bgs. A comparison of the locations where soil arsenic concentrations are elevated and where arsenic is found in groundwater confirms that soil leaching to groundwater is the reason for arsenic contamination found in groundwater. For example, SWMU 4 and the areas south of the PRB have soil concentrations of arsenic above 1,000 mg/kg and are the source areas for groundwater plumes above the cleanup goal of 0.01 mg/L for arsenic.

The U.S. Geological Survey (USGS) has maintained and collected groundwater elevation data from 4 monitoring wells on-site since 1985 (see website linked below and refer to USGS wells C-5, C-12, C-10, and D-66). Long term monitoring data indicate that groundwater has occasionally flooded the facility and saturated the entire soil column where contaminated soils are present, confirming the hydraulic connection between SWMUs with the groundwater aquifer.

To eliminate future soil contamination leaching to groundwater, unsaturated soils with arsenic concentrations above 1,000 mg/kg will be excavated and replaced with clean sand. EPA estimates that these excavations will remove nearly 50% of the mass of arsenic found on-site.

See, IDEM. Indiana Department of Environmental Management Groundwater Network. U.S. Geological Survey. U.S. Department of the Interior. https://groundwaterwatch.usgs.gov/netmapT4L1.asp?ncd=IDM.

Administrative Record No. 66, Final Comprehensive Pilot Study Report. Chemours East Chicago Site, East Chicago, Indiana. PARSONS. January 2018.

Comment #15: Reduction of Volume, Mobility, Toxicity of Wastes.
None of the remedial actions taken under this SB will reduce the long-term overall volume, mobility, and/or toxicity of persistent hazardous and toxic wastes such as elemental metals and persistent organic pollutants by separating, recovering, reclaiming, recycling, and/or treating and detoxifying residues to meet the intent and mandate the United States Congress established under Superfund Amendments and Reauthorization Act (SARA).

Response to Comment #15: The commenter references Superfund law. Although the former DuPont East Chicago facility is a RCRA facility, it is being cleaned up in a manner similar to a Superfund site. Both programs evaluate the efficacy of alternative cleanup approaches using certain criteria, including the reduction of toxicity, mobility, and volume of wastes. As further explained in the Response to Comment 5, following the public comment period in response to public concerns, EPA re-evaluated the RCRA balancing criteria as applied to the on-site and off-site disposal option. The Agency reconsidered the overall cost-effectiveness, permanent reduction of the volume of contaminated soil, and public acceptance of the alternatives and decided to modify the final remedy to select off-site disposal of contaminated soil excavated at the facility.

In addition, maintenance of the existing concrete and asphalt covers and the addition of other soil covers will inhibit mobility of the contaminated soils. Contrary to the commenter's views, the in-situ sulfate injection and biotrenching will further reduce the toxicity (detoxify) and concentration of groundwater contaminants, particularly arsenic by solidifying and stabilizing the contaminants, converting them into a less soluble, mobile or toxic form. If monitoring of the soil cover and groundwater indicate additional actions are needed for long-term protectiveness, then EPA will require additional work. Please see the response to Comment 3 above regarding soil washing and reclaiming or recycling metals from soils.

Comment #16: Permits for Groundwater Treatment.
Several commenters requested confirmation that the proper permits were in place for the use of PRBs, bio-wall trenches, and injections of substances into the Calumet Sand Aquifer as these all fit the EPA's definition of a Class V Injection Well and require permitting under the Safe Drinking Water Act (SDWA) and Underground Injection Control (UIC) Program.

Response to Comment #16: The former DuPont East Chicago facility had the proper work plan approvals and permits in place prior to the installation of the PRB and prior injections that took place as part of the on-site pilot testing; Class V UIC Permit IN – 089-5X26-00X1.

The selected remedy, including any UIC Wells, will not be implemented until this FD/RC is issued. Therefore, any new injection wells, trenches etc. proposed as part of the final remedy have not been implemented or constructed and appropriate permits have not yet been acquired. As part of overseeing the implementation of the selected remedy, EPA will require that all necessary permits are in place prior to the commencement of remedial work at the facility.

Comment #17: Dioxin Testing.
EPA and IDEM have not adequately tested for dioxin and dioxin-like compounds.

Response to Comment #17: As part of the RFI, facilities screen for contaminants based on the CFR 40 Part 264 Appendix IX list of hazardous constituents and facility-specific information provided to EPA. Here, the facility-specific information included responses to information requests regarding facility operations and DuPont concluded that dioxins were not expected to be present. Based on the risk assessment, the primary COCs for the DuPont facility were determined to be cadmium, lead, arsenic and zinc. These are the COCs that are contributing the most to the potential risk at the facility.

Comment #18: Point of Compliance.
Why hasn't EPA and IDEM required the point of compliance in meeting groundwater standards for monitoring wells at the DuPont Facility to be on the boundary of the Waste Management Unit as required under RCRA's laws and regulations?

Response to Comment #18: According to EPA Guidance, *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action for Facilities Subject to Corrective Action under Subtitle C of the Resource Conservation and Recovery Act,* EPA530-R-04-030 (April 2004), groundwater contamination subject to facility-wide RCRA corrective action may

have different goals than a singular RCRA regulated unit. EPA may consider the following factors when developing a facility-wide groundwater point of compliance: proximity of sources of contamination; technical practicability of achieving particular cleanup levels; vulnerability of the groundwater and its possible uses; and exposure and likelihood of exposure and similar considerations.

In general, the point of compliance for groundwater is where a facility should monitor groundwater quality and/or achieve specified cleanup levels to meet facility-specific goals. For the purpose of determining the effectiveness of the groundwater remedy, EPA determined the point of compliance at the former DuPont East Chicago facility to be the northern and southern property lines. Groundwater will need to meet the EPA Drinking Water Standard MCL for arsenic (0.01 mg/L) at the northern property line and the Indiana Surface Water Quality Standard for the protection of aquatic life (0.148 mg/L) at the southern property.

Integral components of EPA's selected groundwater remedy also includes: institutional controls which will be recorded, implemented, and maintained to prohibit the installation of on-site drinking water supply wells; a requirement for permits for non-potable groundwater production wells' and a requirement that all property owners implement health and safety plans to protect construction, utility, and maintenance works from exposure to contaminated groundwater. Therefore, the anticipated future permitted use of groundwater on-site will not include use as drinking water.

Although residents north of the facility are connected to the East Chicago public water supply and do not get potable water from any residential wells, the maximum beneficial use of groundwater off-site to the north is use as drinking water. As such, EPA established the point of compliance at the northern property boundary to protect against exposure to contaminated groundwater where it may be used as a drinking water source and set the MCL as the long-term cleanup goal.

The point of compliance for the southern property boundary is the river bank of the Grand Calumet River, since on-site groundwater will not be used as drinking water. Ecological and human direct contact exposure pathways were evaluated for contaminated groundwater discharging to surface water in the Grand Calumet River. Direct contact risks to human health were considered negligible. The only complete ecological exposure pathway to aquatic biota is through arsenic contaminated groundwater discharging to surface water. Therefore, to protect ecological receptors, the cleanup goal at the southern boundary is the Indiana Surface Water Quality Standard.

See, EPA530-R-04-030; April 2004 Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action for Facilities Subject to Corrective Action Under Subtitle C of the Resource Conservation and Recovery Act.

Comment #19: Historic Use of Calumet Aquifer for Drinking Water.
Why hasn't EPA and IDEM recognized the historic and current use of drinking water aquifers like the Calumet Aquifer in Northwest Indiana and provided the protections required under the

Safe Drinking Water Act and Underground Injection Control Program concerning the DuPont facility?

Response to Comment #19: On-site groundwater elevation data exists from USGS monitoring wells installed and measured since 1985. Fluctuations in the groundwater table are partially responsible for soil arsenic contamination leaching to groundwater at the facility.

The SB states that the overarching, long-term corrective action objectives for the facility include attainment of approved groundwater protection standards, which have been established as the arsenic Drinking Water Standard MCL (0.01 mg/L) at the northern property boundary and the arsenic Surface Water Quality Standard (0.148 mg/L) at the southern property boundary prior to discharge to the Grand Calumet River. These standards are consistent with EPA's goal of returning off-site groundwater to its maximum beneficial use to ensure protection of human health and the environment. EPA's groundwater restoration policy is set out in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at CFR § 300.430 (a)(1)(iii)(F):

> *EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the facility. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction.*

The groundwater restoration policy is cited in numerous EPA guidance documents, including the 1996 Advanced Notice of Proposed Rulemaking (ANPR) (61 Fed. Reg. 19432, 19448) explained below; the 2004 Handbook of Groundwater Protection and cleanup Policies for RCRA Corrective Action; and the June 26, 2009, Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration. The EPA policy to remediate groundwater to its maximum beneficial use is clear. It is also clear that where groundwater is a current or potential drinking water source, the Agency generally defines "maximum beneficial use" as attainment of the MCLs.

As integral components of EPA's selected groundwater remedy, institutional controls will be recorded, implemented, and maintained to prohibit the installation of on-site drinking water supply wells, permits for non-potable groundwater production wells will be required, and all property owners will be required to implement health and safety plans to protect construction, utility, and maintenance works from exposure to contaminated groundwater. Therefore, the anticipated future use of groundwater on-site will not include use as drinking water.

See, EPA530-R-04-030; April 2004 Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action for Facilities Subject to Corrective Action Under Subtitle C of the Resource Conservation and Recovery Act.

Comment #20: Abandoned Discharge Pipes.
DuPont's former chemical and pesticide manufacturing facilities and associated infrastructure includes 14,000 feet of abandoned process sewers, storm water discharges, and sanitary sewers. The commenter was concerned that these discrete conveyances for contaminated groundwater and hazardous and toxic wastes at the DuPont facility require NPDES permits under the Clean

Water Act for their point source discharges into the Calumet Aquifer, surface waters, and ultimately Lake Michigan.

Response to Comment #20: EPA and DuPont have been conducting a comprehensive RCRA investigation at this large and complex facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the proposed remedy will protect the residents of the neighboring communities. DuPont has reported that NPDES permit requirements were met while the facility was active.

Comment #21: Improper Waste Disposal.
DuPont shuttered most of the facility by 1986 and demolished the facility shortly thereafter. Since then DuPont has been quietly but consistently actively managing the facility by removing loads of toxic and hazardous waste and other contaminated media, and either transporting it off-site or reburying it on-site in dumps that were supposed to have undergone interim RCRA closure by October 1998.

Response to Comment #21: EPA and DuPont have been conducting a comprehensive RCRA investigation at this large and complex facility since 1997. EPA is not aware of any evidence of undocumented removal or burial of waste or waste contaminated media. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities. Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont facility, EPA has determined that the selected remedy for the former DuPont facility is appropriate and protective of human health and the environment.

Comment #22: Chemours' Continued Ability to Pay.
Several commenters were concerned that Chemours' debt load will allow them to file for bankruptcy or seek ways to minimize their environmental and legal obligations to area residents.

Response to Comment #22: As part of the future actions integral to implementation of implementation of the final remedy, EPA will require DuPont, Chemours and Gateway to submit for EPA approval a Long-Term Monitoring and Maintenance Plan (LTMMP) that details the monitoring and maintenance activities that will be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the plan for periodic physical and chemical monitoring of the closed landfill area.

Additionally, EPA will require DuPont, Chemours and Gateway to estimate and set aside financial assurance for necessary remediation costs including long-term operation monitoring and maintenance. This estimate will be greatly informed by the LTMMP that is described above. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB. The cost estimates will be updated on a regular basis and the required financial assurance will be adjusted if necessary.

Comment #23: Securing Funding for Cleanup.
Several commenters were concerned that EPA has not secured the necessary funding from DuPont/Chemours to clean up the facility permanently and that EPA seems satisfied to accommodate Chemours with redevelopment plans that will cover-up rather than cleanup the properties.

Response to Comment #23: The potential redevelopment at the former DuPont East Chicago facility has not influenced the remedy that EPA has selected. Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont facility, EPA has determined that the selected remedy for the former DuPont facility is appropriate and protective of human health and the environment. EPA's selected remedy will be implemented prior to or in conjunction with the potential redevelopment. The construction of a building on the property, for example, could not occur until the required soil excavations in that area took place and were verified to EPA's satisfaction. The suggestion that EPA would let redevelopment occur ahead of or in lieu of the prescribed cleanup and jeopardize human health or the environment is incorrect.

As part of the future actions integral to the implementation of the final remedy, EPA will require DuPont, Chemours and Gateway to submit for EPA approval a LTMMP that details the monitoring and maintenance activities that will be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the plan for periodic physical and chemical monitoring of the closed landfill area.

Additionally, EPA will require DuPont, Chemours and Gateway to estimate and set aside financial assurance for necessary remediation costs including long-term operation monitoring and maintenance. This estimate will be greatly informed by the LTMMP that is described above. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB. The cost estimates will be updated on a regular basis and the required financial assurance will be adjusted if necessary.

Comment #24: Several commenters suggested that the Natural Area and Buffer Zone portion of the DuPont East Chicago facility should be donated to the IDNR so it remains state property.

Response to Comment #24: This FD/RC and its SB refer to the Western Portion/Industrial Area of the former DuPont East Chicago facility and does not make decisions regarding the Natural Area or the Buffer Zone portions of the facility. The Natural Area and Buffer Zone portions of the facility were cleaned up following a separate FD that EPA issued in 2014. The IDNR Division of Natural Preserves holds a conservation easement on the 172-acre Natural Area. DuPont transferred a conservation easement of the Natural Area to IDNR as part of the settlement of the natural resource damage claim with the State of Indiana and Federal Natural Resource Trustees for the East Branch of the Grand Calumet River. The Nature Conservancy (TNC) has managed the Natural Area since 1999 and DuPont agreed to voluntarily fund restoration work at the facility through 2017. The Natural Area FD also required an EPA-approved environmental covenant with the Lake County Recorder of Deeds to restrict future land

use, access, groundwater use, and any excavation. The covenant must provide that the State or EPA may enforce its terms.

EPA notes that it did not receive any public comments on the 2014 Natural Area and Buffer Zone proposed remedy. However, EPA has been informed of the ongoing discussions between IDNR, The Nature Conservancy and Chemours regarding the potential transfer of the Natural Area property. No final decisions have been made on who ultimately will be the final holder of the conservation easement. All parties will continue to coordinate on this issue.

Comment #25: Residential Buffer Zone.
Why is there not a Buffer Zone for the residents? It is nice that there is one proposed for the Natural Area, but a buffer for the residents would be nice too.

Response to Comment #25: The Buffer Zone was incorporated into the overall remediation plan for the Natural Area in 2014. This Buffer Zone is located directly east of the Open and Redevelopment Areas in the industrial portion of the facility and separates these areas from the adjacent Natural Area. The Buffer Zone Area is a 200-foot-wide strip of land adjacent to the Natural Area that extends from the northern boundary to the southern boundary of the facility and occupies approximately 20 acres. Currently, there are no plans to move the fence line on the northern portion of the facility to create an additional buffer for the residential area.

Comment #26: DuPont Contaminants Effect on Birds Not Adequately Stndied.
The Indiana Nature Conservancy's agreement with DuPont did not require testing birds over a period of years at the Grand Calumet River, including Grand Calumet River Junctions East and West, Indiana Harbor Canal and Lake George branches to determine if DuPont affected bird reproduction or had other effects on the health of local and migrating birds.

Response to Comment #26: EPA and the former DuPont East Chicago facility have been conducting a comprehensive RCRA investigation at this facility since 1997 which has included both human health and ecological risk assessments. EPA coordinated very closely with The Nature Conservancy on the 2014 Natural Area FD as well as throughout the development of the 2017 SB for the Western Portion/Industrial Area of the former DuPont East Chicago facility. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities as well as the numerous ecological receptors likely to be found in the area.

Comment #27: CARE Committee Should Meet in Lake County.
Since DuPont is a party to the Grand Calumet River Trust Fund and is under the Remedial Action Plan for the [Great Lakes Water Quality Agreement] Grand Calumet River Area of Concern (AOC), the RAP's Citizens Advisory for the Remediation of the Environment (CARE) should relocate its meetings back in the AOC, to allow those living in Gary, Hammond, East Chicago and Whiting to participate in cleanup and restoration decisions. The monthly CARE meetings currently are located in Porter County not in Lake County.

Response to Comment #27: The Citizens Advisory for the Remediation of the Environment (CARE) advises IDEM on how to best implement the Remedial Action Plan (RAP) for

the Grand Calumet River Area of Concern. This request to move the CARE committee meetings to Lake County has been communicated to IDEM. The CARE meetings are not coordinated by EPA.

As the response to Comment No. 9 details, EPA has been committed to meaningful public involvement in East Chicago and the public's involvement in the RCRA corrective action process.

Comment #28: Coordinate RCRA and Superfund Public Meetings.
Several commenters requested that the RCRA and Superfund programs have their update meetings together and more closely coordinate on efforts in East Chicago.

Response to Comment #28: EPA's RCRA corrective action program, located in the Land and Chemicals Division, and the Superfund Division have coordinated and will continue to coordinate on matters related to the former DuPont East Chicago facility. Beginning in 2016, EPA RCRA corrective action staff have had a presence at numerous Superfund community meetings and plan to continue their attendance into the future. The RCRA corrective action program is coordinating with the Superfund program to address off-site groundwater concerns, especially in the Riley Park community. The selected remedy addresses on-site groundwater contamination by intercepting and treating groundwater contaminants; the Superfund program will address off-site groundwater contamination.

Comment #29: Increase Depth of Soil Removal.
A commenter suggested the 10 feet removal depth should be increased.

Response to Comment #29: Modeling completed as part of the CMS has demonstrated that removing 10 feet of soil would remove a substantial amount of the arsenic mass in the soil and would greatly reduce its role as an ongoing source to the groundwater. Increasing the depth of soil removal did not show a sufficient increased benefit so as to justify the additional cost.

Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont facility, EPA has determined that the selected remedy for the former DuPont facility is appropriate and protective of human health and the environment. EPA and the former DuPont East Chicago facility have been conducting a comprehensive RCRA investigation at this facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities.

Comment #30: Financial Compensation for Residents.
Several commenters inquired about financial compensation for the residents or if Chemours could purchase their homes.

Response to Comment #30: Neither RCRA nor CERCLA provide EPA with authority to seek compensation for residents or to compel DuPont or Chemours to purchase their homes. Under Section 9003(h)(5) of RCRA, the authority to temporarily or permanently relocate residents as may be necessary to protect human health is limited to corrective actions involving leaking

underground storage tanks and is not applicable to the cleanup of the former DuPont East Chicago facility. Also, Section 104j of CERCLA limits the acquisition of real property, which is necessary as part of a permanent relocation, to only that property that the President determines is "needed to conduct a remedial action ..." EPA does not have authority to acquire property for relocation under a CERCLA removal action (a short term, urgent or time sensitive type of cleanup). EPA can incorporate relocation into a CERCLA remedial action only when EPA has made a finding that relocation of residents is required to successfully conduct the remedial action.

In response to comments regarding permanent relocation within Zones 2 and 3 of the USS Lead Superfund Site, EPA provided a comprehensive response that may be helpful to repeat:

> "In summary, EPA has not included an assessment of permanent relocation because such a remedy at this site would be clearly inconsistent with EPA policy. Under EPA's Interim Policy on the Use of Permanent Relocation as Part of Superfund Remedial Actions, OSWER Directive 9355.0-71P (June 30, 1999), "EPA's preference is to address the risks posed by contamination by using well-designed methods of cleanup which allow people to remain safely in their homes and businesses." Permanent relocation is a rare and complicated remedy selected only under certain conditions, such as when (1) homes must be destroyed to effectively implement a remedy, (2) residences cannot be decontaminated to levels acceptable for human health, (3) the remedy would require unreasonable use restrictions, or (4) a necessary temporary relocation would exceed one year. None of these criteria are present at the site. Specifically: 1. EPA can safely implement the remedy around existing structures (which actually serve to cap contamination and prevent exposure). 2. EPA has sampling data indicating that it can effectively remediate interior dust contamination. 3. The use restrictions proposed in the ROD are not especially onerous and are consistent with EPA practice. 4. No residents have been temporarily relocated for more than a year. EPA is not considering permanent relocation because a simpler, effective, and less disruptive remedy, which EPA has extensive experience implementing, is available. In addition, there are a number of practical concerns that make permanent relocation a poor remedy choice for this site. First, there is no indication that there is widespread community interest in a permanent relocation. On the contrary, many residents of the West Calumet Housing Complex were unhappy about being forced to leave their homes. Second, permanent relocation would be extremely disruptive to the community. Permanent relocation would only be available to those properties that are still contaminated and would effectively hollow out the neighborhood, leaving a number of vacant properties behind. Further, large losses in population can affect the availability of various services to the community. The closure of the former Carrie Gosch Elementary School is the best example, but local groups and organizations that rely on a robust community would also suffer greatly.
>
> Finally, permanent relocation is neither a permanent solution nor less expensive because it does not address the contamination that would still remain at the site. The exception to the approach of remediating lead-contaminated soil while residents remain in place at a residential lead site is the Tar Creek Superfund Site in Ottawa County, Oklahoma. However, despite comparisons to that site made by some community members, the facts

at that site contrast strongly with the facts here. The Tar Creek site was part of a former mining area and extensive contamination waste resulting from those operations remained on site. For example, 200-foot-high piles of waste tailings ("chat") were scattered throughout the site, totaling over 31 million cubic yards of waste alone. Additional waste included chat bases, lead tailings, smelter waste, and airborne deposition of materials blown off from all of these sources.

Remediation of these wastes was anticipated to take place over the course of decades, with revenue generated from the sale of the chat defraying cleanup costs. Remediation was also anticipated to include substantial use restrictions, such as week-long barricading of streets and extensive shutdown of local utilities. Notwithstanding these conditions, EPA determined that the requirements imposed by the Uniform Relocation Act (URA) would result in considerable time and expense and in fact proposed an in-place, dig and haul remedy similar to the one at this site. It was not until Congress exempted the site from the URA that EPA opted to relocate the residents. [Footnotes omitted.]

By contrast, the estimated total volume of soils to be excavated from the Zones 2 and 3 is only 88,000 cubic yards. Excavation work in Zone 3 is largely expected to be completed by the end of the 2018 construction season, and excavation work in Zone 2 is expected to be completed by the end 2020. EPA does not anticipate extensive use restrictions at the USS Lead site comparable to those that would have been required at Tar Creek. Finally, the USS Lead site has not been exempted from complying with URA requirements, and even if it were, permanent relocation would still not be cost-effective. In summary, permanent relocation at the USS Lead site would be inconsistent with EPA policy and prior EPA practice and have serious negative consequences for the community."

Comment #31: Residential Monitoring Wells.
Several commenters requested the installation of monitoring wells in the adjacent residential area and a regular monitoring program to assess the effectiveness of the remedy as it is implemented.

Response to Comment #31: There is an extensive network of groundwater monitoring wells established on the former DuPont facility including monitoring wells located near the northern and southern boundary compliance points. These monitoring wells, and potentially others yet to be installed as part of the remedy implementation process, will be regularly monitored to assess the effectiveness of the remedy. Details on the monitoring wells, sampling frequency, contaminants sampled etc. will be provided to the Agency for approval as part of the LTMMP as required in the FD/RC. Any monitoring wells installed in the off-site neighborhood would currently take place under the authority of the Superfund program.

Comment #32: On-Site Management of Excavated Contaminated Soil/Landfill Integrity.
Assess more thoroughly whether the proposed plan's on-site management of any excavated contaminated soil is protective of human health and the environment including an assessment of the integrity of the existing landfill and the all contaminants present in the excavated soil.

Response to Comment #32: In July 2015, an assessment of the landfill was performed by Parsons for DuPont and it was determined that the addition of the treated on-site soils would not

be of concern to human health or the environment from a structural integrity perspective nor from a contaminant containment perspective.

See, Administrative Record No. 55, PARSONS. Landfill Evaluation Chemours East Chicago Site East Chicago, Indiana. July 2015.

However, as discussed above in Comment 5, after hearing public concerns, EPA reexamined the balancing criteria associated with the disposal options and determined that the off-site disposal of any soils excavated from the former DuPont East Chicago facility as part of this FD/RC was the better cleanup alternative.

Comment #33: Evaluate Air Exposure Pathway.
Evaluate more rigorously and explain the existing air pathway of exposure.

Response to Comment #33: An outdoor air monitoring study was conducted in 2010 to establish baseline conditions to evaluate dust monitoring and control measures during future remediation of soil. Air samples were collected at various locations of the property boundary and tested for suspended particles of arsenic, zinc, lead and cadmium. The detected levels of these constituents showed no unacceptable health risks (cancer risk range of 1x10-6 to 1x10-4 and total HI of less than 1) from exposure to outdoor air for potential residential receptors. The March 3, 2011 Technical Memorandum: Summary of Air Monitoring Results is available as part of the Administrative Record for the facility. The Administrative Record can be accessed through the RCRA corrective action former DuPont East Chicago facility webpage at:

https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana

A description of EPA's health protective risk target criteria is provided below:

EPA has developed a cancer risk range that it deems acceptable to protect the public. Cancer risk is often expressed as the maximum number of new cases of cancer projected to occur in a population due to exposure to the cancer-causing substance over a 70-year lifetime. EPA utilizes the acceptable exposure level, or "risk goal" defined within the National Contingency Plan (NCP) for enforcement and cleanup decisions. The NCP defines the acceptable excess upper lifetime cancer risk as generally a range between $1x10^{-6}$ to $1x10^{-4}$ for determining remediation goals. For example, a cancer risk of $1x10^{-6}$ (one in one million) means that in a population of one million people, not more than one additional person would be expected to develop cancer as a result of the exposure to the substance causing that risk.

A human health risk assessment was performed at the facility and the air pathway of exposure was deemed acceptable; no adverse risks were found. EPA, as it has it the past, will require the implementation of an air monitoring component as part of the health and safety plan submitted in conjunction with any remedy implementation plan.

Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont East Chicago facility, EPA has determined that the selected remedy for the former DuPont East Chicago facility is appropriate and protective of

human health and the environment. EPA and DuPont have been conducting a comprehensive RCRA investigation at this large and complex facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities.

Comment #34: Consider Air Emissions.
Several commenters requested EPA consider the air emissions associated with each proposed alternative.

Response to Comment #34: A human health risk assessment was performed at the former DuPont East Chicago facility and the air pathway of exposure was deemed acceptable; no adverse risks were found. EPA, as it has in the past, will require the implementation of an air monitoring component as part of the health and safety plan submitted in conjunction with any remedy implementation plan. A facility wide Health and Safety Plan will be required during implementation of the remedial action and during other activities such as construction or utility maintenance or other work that may expose or intrude upon contaminated soil.

Comment #35: Environmental Justice Not Addressed.
Several commenters raised the concern that the SB does not address environmental justice (EJ), throughout East Chicago.

Response to Comment #35: EPA considers Environmental Justice (EJ) as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Fair treatment means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.

Meaningful involvement means:

- People have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- The public's contribution can influence the regulatory agency's decision;
- Community concerns will be considered in the decision-making process; and
- Decision makers will seek out and facilitate the involvement of those potentially affected.

EPA considers East Chicago an environmental justice community. The East Chicago neighborhood, around the former DuPont East Chicago facility and the USS Lead Superfund Site, has been disproportionally overburdened by intense industrial activity dating back to the early 1900s. Chemical manufacturing, smelting, oil refining and other metal related processes dominated the activities in the area the early and mid-20th century. As a part of their activities, these area industries released contaminants, including lead and arsenic, EPA is working with East Chicago residents and community groups to address all of the environmental concerns in the area.

EPA has provided opportunities for meaningful involvement in the remedy decision by providing enhanced public participation for the statement of basis. As addressed in response to comment 9, EPA has held several public meetings, extended the public comment period for the Statement of Basis, and provided information in English and Spanish for residences, and had staff readily available to answer questions directly from the community. Furthermore, the community's concerns were considered in our final decision resulting in the off-site disposal of contaminated soil from the site to a properly permitted disposal facility. To further this effort, EPA is also working to improve collaboration between federal agencies and communities, and addressing environmental challenges in more effective, efficient, and sustainable ways. EPA's Water and Superfund Divisions have also worked closely with IDEM and the City of East Chicago to reduce lead in drinking water by supporting use of tap filters and replacement of lead service lines in the Riley Park neighborhood adjacent to the DuPont facility.

The EPA RCRA corrective action and Superfund programs have coordinated efforts to ensure that the East Chicago community has access to EPA's decision-making processes to have a healthy environment in which to live and work. The enhanced public participation in the decision-making process for the Final Decision reflects those efforts.

See, Administrative Record No. 61, Appendix I March 14, 2017, Action Memorandum 5th Amendment USS Lead Time Critical Removal Action.

Comment #36: Off-site Injuries.
More consideration should be given to ongoing offsite injuries.

Response to Comment #36: EPA Region 5's RCRA corrective action program, Superfund Division, and Water Division have coordinated and will continue to coordinate on health and environmental matters in East Chicago related to the former DuPont East Chicago facility and to the USS Lead Superfund Site. As noted in Response to Comment No. 35, there was a concentration of heavy industry in East Chicago from the late 1800s until the 1990s, including the former DuPont East Chicago facility. Region 5 has worked closely with IDEM, the Indiana Department of Public Health, the City of East Chicago Water Department and the U.S. Department of Housing and Urban Development to identify and minimize potential exposure to contaminants such as lead that are the result of historic industrial contamination and products such as lead paint and lead service lines. EPA is committed to protecting the health of this community and understands that to be most effective, EPA must include meaningful public participation in the decision-making process and work in concert with other public health agencies. Presently, lead and arsenic contaminated soil that may be associated with releases from the former DuPont East Chicago facility are being addressed by Superfund. Also, Superfund is conducting a comprehensive study of groundwater in the vicinity. However, RCRA corrective action investigations of the groundwater in the residential neighborhood have not identified a threat to human health. If the groundwater study identifies a threat to human health or the environment associated the former DuPont East Chicago facility, then EPA will take appropriate action under Superfund or RCRA or a combination of both authorities. EPA does not have the legal authority, however, to address any claims of personal injury allegedly resulting from contamination.

Comment #37: Vapor Intrusion Concerns.
Several commenters were concerned the vapor intrusion pathway was not being addressed.

Response to Comment #37: The vapor intrusion pathway was evaluated as part of the overall RFI at the DuPont facility and human health risk assessment performed across the facility. The potential for vapor intrusion risks in new buildings, as well as other engineering and institutional controls will be embodied in a recorded, EPA-approved environmental restrictive covenant and deed restriction that runs with the land and will be provided to IDEM's Institutional Controls Registry and Virtual File Cabinet. Vapor intrusion is associated with entry of vapors from subsurface to indoor due to volatilization of chemicals from contaminated water. The chemicals associated with volatilization (VOCs) were not found in high levels in the groundwater within the property boundary. The groundwater that migrates from the facility to residential area primarily contains elevated levels of arsenic. Therefore, vapor intrusion is not an issue for residents north of the facility boundary. A few VOCs were detected in soil within the facility. The soil exceedances will be addressed through engineering or institutional controls.

Comment #38: Insufficient Foundation for Green Reuse.
Several commenters suggested that the SB does not create a sufficient foundation for green reuse of the facility.

Response to Comment #38: The property owner can redevelop the property if it fits in the constraints of the local land use requirements and if the redevelopment is performed in a manner protective of human health and the environment. EPA will regulate activities that involve potential exposure to or excavation of contaminated soil. Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont facility, EPA has determined that the selected remedy for the former DuPont East Chicago facility is appropriate and protective of human health and the environment given industrial or commercial use. EPA's selected remedy will be implemented prior to or in conjunction with any potential redevelopment.

The City of East Chicago has currently zoned the property as industrial/commercial. EPA is required to set cleanup standards based on what it determines are the most likely future uses of the facility. "EPA recognizes the complexities associated with developing reasonably anticipated land use assumptions and the need for caution when basing remedial decisions on assumptions of future use; however, the Agency believes that non-residential land use assumptions are appropriate for many corrective action facilities" 61 Fed. Reg. 19452 (May 1, 1996). At this time, the most likely future uses at the facility would continue to be industrial or commercial. Compelling a cleanup to residential or recreational standards would be inconsistent with EPA RCRA and Superfund guidance and regulations.

Comment #39: DuPont Fence Concerns.
Several commenters had concerns with the current condition of the DuPont fence line and with the signage on the fence.

Response to Comment #39: The fence surrounding the former DuPont East Chicago facility meets the requirements of the 1997 RCRA corrective action order and EPA regulations. In direct

response to these comments, the signs on the DuPont property fence line have been updated to be consistent with requirements laid out in 40 CFR § 265.14. These new signs have been posted in both English and Spanish and have been placed every 70 feet along the fence line. Additionally, the main entrance gate was upgraded and the entrance road into the DuPont property was paved in direct response to prior community concerns regarding facility security and dust suppression. The FD further details specific requirements for monitoring and maintenance of the fence and signage.

Comment #40: Basement Sealing.
There was a request for basement sealing in 49th block within Zone 3 (Riley Park neighborhood) to prevent ground water infiltration.

Response to Comment #40: EPA's selected remedy for the former DuPont East Chicago facility includes a groundwater treatment strategy that will prevent the continued off-site migration of contaminants.

The EPA RCRA corrective action program is coordinating with the Superfund program to address off-site groundwater concerns, especially in the Riley Park community. The Superfund program has excavated the soils in the yards of many properties in the Riley Park neighborhood located immediately north of the DuPont facility. At this time, EPA's Superfund Program is performing a remedial investigation of the groundwater in East Chicago which will determine the nature and extent contamination from the former DuPont East Chicago facility and if additional studies are necessary. Neighborhood residents immediately north of the former DuPont East Chicago facility have raised concerns that their basements or yards may be contaminated by sump water. Three rounds of sump water sampling have shown that dermal contact and incidental ingestion of sump water do not pose a risk to residents.

After the RI/FS, EPA Superfund will issue a proposed plan to address any such contamination that threatens human health and the environment. The selected remedy addresses on-site groundwater contamination by intercepting and treating groundwater contaminants; the Superfund program will address off-site groundwater contamination. If EPA determines that the RCRA corrective action work at the former DuPont East Chicago facility is not protective, EPA will propose a plan that is protective. The RCRA corrective action program reserves its RCRA authority to address any DuPont-related contaminant that may have migrated offsite, if necessary in the future.

Comment #41: Need for Spanish Translator.
Several commenters requested a translator at the public meetings for the Spanish speaking members of the community as well as all written information to be provided in Spanish as well as English.

Response to Comment #41: EPA had a staff person available at each public meeting who could translate any information into Spanish if requested. Additionally, any materials mailed out to the community or otherwise made available to the community were printed in both English and Spanish.

Comment #42: Monitoring Well North of PRB Walls.
Are there any monitoring wells just north of the PRB walls to insure the safety of the residence or wildlife?

Response to Comment #42: There is an extensive network of groundwater monitoring wells established on the former DuPont East Chicago facility. This includes 18 wells on the northern property line or very near it. These include both shallow and deep wells. Additional monitoring wells may be added as part of the yet to be submitted Corrective Measures Implementation Plan.

Two 2000-foot-long PRBs were installed in 2002 as an interim measure to passively address concentrations of arsenic above the action level from migrating off-site in groundwater. The PRBs are nearing the end of their designed effectiveness therefore the PRBs are no longer being relied upon as a component of the remedy and were not discussed in the SB. No new improvements or adjustments are being made to the PRBs, rather, a comprehensive groundwater treatment approach is being utilized as part of the final remedy for the facility. The selected remedy addresses on-site groundwater contamination by intercepting and treating groundwater contaminants before they leave the facility.

Comment #43: The DuPont groundwater remediation should not he the responsibility of the USS Lead Site. Can you please explain why you feel the DuPont ground water contamination was shifted to the USS Lead Site and made part of the USS Lead clean up?

Response to Comment #43: This FD does not shift the responsibility for the former DuPont East Chicago facility's groundwater contamination to the USS Lead Superfund Site. This FD requires excavation of contaminated soils that are continuing to contaminate the groundwater beneath the former DuPont East Chicago facility. In addition, this FD requires treatment of the groundwater along the southern property line upgradient of the river and within the northern source areas of the former DuPont East Chicago facility. The groundwater treatments are intended to reduce the concentration and volume of contaminants in the groundwater before they leave the facility.

EPA's RCRA and Superfund programs have been coordinating efforts in East Chicago to ensure comprehensive investigations and cleanups and also to avoid unnecessary duplication of resources and work. The RCRA corrective action law was intended to regulate ongoing businesses like DuPont/Chemours. The Superfund law was intended to cleanup abandoned hazardous waste sites like the USS Lead Superfund Site which were contaminated by industries that no longer exist.

Both laws have similar approaches to contaminated facilities:

- investigate the types and extent of contamination,
- conduct interim cleanup actions to stop ongoing contaminant releases,
- identify alternatives that meet appropriate cleanup standards,
- evaluate effective cleanup approaches,
- propose a cleanup approach,
- respond to public comment, and
- make a final cleanup decision.

In 2017 and 2018, as part of the USS Lead Superfund Site cleanup activities, the Superfund program has been very active in the USS Lead Site residential areas and has excavated the soils in the yards of many properties in the Riley Park neighborhood located immediately north of the DuPont facility. Presently, as part of the USS Lead Superfund Site cleanup activities, EPA's Superfund program is performing exterior soil removal and interior arsenic and lead dust cleanups in the Riley Park neighborhood. Riley Park neighborhood residents have raised concerns that their basements or yards may be contaminated by sump water. Three rounds of sump water sampling have shown that dermal contact and incidental ingestion of sump water do not pose a risk to residents.

At this time, EPA's Superfund program is performing a remedial investigation of the groundwater in East Chicago which will determine the nature and extent of contamination from the DuPont and if additional studies are necessary. Presently, EPA anticipates that any off-site groundwater investigation and cleanup associated with DuPont will be managed by Superfund because Superfund is already conducting cleanup work in the neighborhood north of the DuPont facility. EPA will reserve its RCRA authority to require DuPont and Chemours to do more off-site cleanup and investigation, if needed.

Comment #44: Responsible Parties Conflict of Interest.
Several commenters had concerns that the responsible party has a clear conflict of interest in deciding what should be done at the facility they must pay to clean up; their goal, generally, will be to minimize their own costs, at the expense of the community.

Response to Comment #44: EPA acknowledges that responsible parties have a strong interest in cost-effective environmental cleanups. Under the RCRA corrective action program, the responsible party is most often the current owner of the property, which undertakes and pays for all the EPA-ordered remedial work. However, EPA has authority and oversight over all of the work to be performed to ensure protection of human health and the environment. EPA RCRA corrective action staff routinely utilize several internal experts in various fields to assist them in reviewing facility related workplans, protocols, data applicability, and data usage. Most importantly, EPA has review and approval authority over all facility related workplans, protocols, data applicability, and data usage. Under the usual terms of corrective action orders, if the responsible parties fail to begin, perform, or complete Work or major deliverables in a timely manner acceptable to EPA, EPA may impose stipulated penalties until the problem is corrected. The potential imposition of stipulated penalties is a counter balance to the responsible parties' interest in minimizing costs at the expense of the surrounding community. In addition, EPA has statutory authority to seek penalties and relief in federal district court with respect to a responsible party that fails to meet its corrective action obligations.

In short, although responsible parties may conduct much of the work at a corrective action facility, EPA maintains oversight of the work, including review and approvals, to ensure protection of human health and the environment. In addition, EPA, not the responsible party, selects the remedy. Finally, EPA has statutory authorities available to ensure corrective action obligations are met.

Comment #45: Why does the cleanup take so long?
The facility was identified as a problem area decades ago. Why is the cleanup not happening sooner?

Response to Comment #45: EPA and DuPont/Chemours have been conducting a comprehensive RCRA investigation at this facility since 1997. Numerous rounds of data collection and analysis, laboratory and on-site studies, as well as IRMs have taken place over the years. EPA used IRMs to protect human health and the environment while additional data gathering was undertaken to inform the cleanup alternatives for the facility that would be most appropriate and effective. For example, two 2000-foot-long PRBs were installed in 2002 as an interim measure to passively address concentrations of arsenic above the action level from migrating off-site in groundwater until a more permanent remedy could be developed. The Natural Area and Buffer Zone portion of the 440-acre facility was cleaned up under a separate decision back in 2014 while additional groundwater treatment technology studies were taking place on the industrial portion of the facility. It should be noted that there has been no interruption in IDEM's or EPA's regulation of Dupont's generation, treatment, storage, and disposal of wastes at the East Chicago facility. Taking into consideration the comprehensive data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities.

Comment #46: Give Residents Filters for Drinking Water.
Give all residents filters for their water – both for drinking and in their homes water supplies. The water they use for shower, washing, etc., puts their health at risk.

Response to Comment #46: This Final Decision addresses cleanup of contaminated soils and groundwater at the DuPont RCRA-regulated facility. It does not address the East Chicago public water supply. In the interest of providing accurate information to the commenter, however, EPA will describe several actions that various federal, state, and local environmental and health agencies are taking to reduce cumulative lead exposures in East Chicago.

First, EPA notes that groundwater is not the source of water for the East Chicago Public Water Supply. Instead, the City of East Chicago obtains its water from Lake Michigan, which is considered a high-quality source for drinking water. In addition, to reduce cumulative exposure to lead within the Superfund site residential areas, East Chicago and IDEM have provided filters to USS Lead Site residents and obtained funding to replace the lead service lines that typically are the homeowners' responsibility. Bathing and showering should be safe for adults and children, even if the water contains lead over EPA's action level. Human skin does not absorb lead in water. Also, to reduce the amount of lead in drinking water for all residents, East Chicago and IDEM are ensuring appropriate centralized corrosion control treatment has been installed, maintained and monitored. Sampling has demonstrated the orthophosphate added to East Chicago's centralized corrosion control treatment is present in the water distribution system and should inhibit the leaching of lead from lead containing materials, including lead service lines. To monitor health impacts on the residents, state and local authorities have instituted multiple blood lead level testing programs. To address lead that may exist in drinking water in public schools, the State and City are monitoring lead levels and where necessary, and are planning for the replacement of lead plumbing materials. For the most up to date information

concerning East Chicago's drinking water quality, you are encouraged to visit the East Chicago Water Department website [http://www.eastchicago.com/resources/Water-Quality-Report.pdf], contact the East Chicago Water Department or IDEM's Water Quality Branch [dwbmgr@idem.in.gov].

With respect to groundwater, EPA's selected remedy for the former DuPont East Chicago facility includes a groundwater treatment strategy that will prevent the off-site migration of contaminants. As an Interim Corrective Measure, in 2002 DuPont installed permeable reactive barriers to reduce the concentration of arsenic in groundwater moving toward the Riley Park neighborhood. The selected remedy, includes injected chemical fixation and installation of a bio-wall trench to treat groundwater within the source areas on the north end of the facility. EPA determined the groundwater will be treated to meet the EPA Drinking Water Standard Maximum Concentration Level (MCL) for arsenic (0.01 mg/L) at the northern property line.

The Superfund program has excavated the soils in the yards of many properties in the Riley Park neighborhood located immediately north of the former DuPont East Chicago facility. Neighborhood residents immediately north of the DuPont facility have raised concerns that their basements or yards may be contaminated by sump water. The EPA RCRA corrective action program is coordinating with the Superfund program to address off-site groundwater concerns, especially in the Riley Park community. Three rounds of sump water sampling have shown that dermal contact and incidental ingestion of sump water do not pose a risk to residents.

At this time, EPA's Superfund program is performing a remedial investigation of the groundwater in East Chicago which will determine, among other things, if and to what extent groundwater contamination presents a potential threat to human health and the environment in the residential areas. Monitoring wells are slated to be installed across the residential neighborhoods in the USS Lead Site in the Fall of 2018. If an immediate threat is identified, EPA will take appropriate action under Superfund and/or RCRA authority. After the Superfund RI/FS is completed, EPA Superfund will issue a proposed plan to address any such contamination that threatens long-term human health and the environment. If EPA determines that the groundwater cleanup work at the former DuPont East Chicago facility is not protective, EPA will propose a plan that is protective. In sum, the DuPont RCRA corrective action remedy decision addresses the on-site groundwater contamination by intercepting and treating groundwater contaminants; the Superfund program will address off-site groundwater contamination.

Comment #47: Groundwater Treatment Inadequate.
Groundwater treatment must be more than just "chemical fixation via sulfate reduction." See National Institutes of Health articles of 8/22/11 and 11/15/14 below.

Response to Comment 47: EPA has selected a comprehensive remediation strategy for the former DuPont East Chicago facility. Chemical fixation via sulfate reduction is only part of the remedy for the treatment of arsenic in groundwater. Soil removal is part of the groundwater remedy as areas with high arsenic concentrations in the soil are serving as ongoing sources of groundwater contamination. Excavation of these soils with high arsenic concentrations will significantly reduce the amount of arsenic contaminating the groundwater and the chemical

fixation of the arsenic already in the groundwater will prevent its continued migration off-site. Based on the information in the SB, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont East Chicago facility, EPA has determined that the selected remedy for the former DuPont facility is appropriate and protective of human health and the environment.

Comment #48: Adequacy of Monitoring.
Several commenters had concerns with the long-term monitoring and maintenance plan and were concerned that the only monitoring required were the "five-year remedy reviews".

Response to Comment #48: As part of the future actions integral to the final remedy implementation, EPA will require, for EPA approval, a LTMMP that details the monitoring and maintenance activities that to be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the plan for periodic physical and chemical monitoring of the closed landfill area. The monitoring that will be required will help EPA determine if the remedy was implemented properly, if it is performing as EPA intended, and if any adjustments need to be made. Those monitoring events will take place at a much more frequent basis than every five years. The five-year remedy reviews are a formal check point for the Agency to review all the monitoring data and other relevant information collected and make a formal decision on the performance of the remedy.

Comment #49: Climate Change Impact on Remedies.
Several commenters questioned the role climate change could have on the remedies selected by EPA.

Response to Comment #49: Climate change is considered when evaluating the long-term effectiveness of any component of the remedy. As part of the RCRA corrective action process, EPA establishes facility specific media clean up objectives for the facility. These objectives are based on EPA guidance, public health and environmental criteria, information gathered during the RFI, and the requirements of any applicable Federal statutes. Based on the results of the RFI, EPA identifies, screens, and develops the alternative or alternatives for removal, containment, treatment, and/or other remediation of the contamination based on the media clean up objectives established for the corrective action at the facility. Technologies can be combined to form the overall corrective action alternative(s). The alternative or alternatives developed represent a workable number of option(s). These alternatives are screened against RCRA's threshold criteria which are:

1. protection of human health and the environment;
2. attainment of media clean up objectives;
3. controlling the sources; and
4. comply with applicable standards for waste management.

Alternatives which do not meet these threshold criteria do not warrant further consideration. EPA then describes each corrective measures alternative that passes through the initial screening based on the threshold criteria and evaluates each corrective measures alternative and its

components relative to the following evaluation/balancing criteria: long-term effectiveness; implementability; short-term effectiveness; toxicity, mobility and volume reduction; community acceptance; state acceptance; sustainability and cost. Climate change is considered when evaluating the long-term effectiveness of any component of the proposed remedy.

Part of that evaluation at the former DuPont East Chicago facility included both laboratory bench scale studies and on-site in the field pilot tests of the groundwater treatment technologies proposed. Adjustments were made to the proposed remedy based on those laboratory and on-site studies.

EPA is required to justify and recommend a corrective measures alternative based on an evaluation of the balancing criteria. This evaluation was done and the rationale for the proposed remedy was detailed in the SB document. After reviewing and considering all of the comments received throughout the public comment period, EPA is now selecting the final corrective measures alternative to be implemented as detailed in the FD document.

EPA and DuPont have been conducting a comprehensive RCRA investigation at this facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities.

Comment #50: Bioaccumulation and Biogmanification Not Considered.
For pollutants which bioaccumulate and/or biomagnify, this simply means that toxic effects in the biota (including most importantly people) will simply be delayed not eliminated. Why does the EPA ignore or sidestep this reality?

Response to Comment #50: As part of the RCRA corrective action process, EPA establishes site specific media clean up objectives for the facility. These objectives are based on facility specific conceptual site model which takes in to consideration the fate and transport of the released chemical constituents as they migrate through various media of concern. Toxicity of a chemical of concern is associated with its bioconcentration or biomagnification effects on the food chain. Accordingly, the cleanup objective for surface water and sediment is developed to protect the ecological and human receptors. The sediment contamination in the river adjacent to the Dupont facility was remediated through the Grand Calumet River Area of Concern cleanup activities undertaken through the Great Lakes National Program Office in 2014. The most protective cleanup levels were employed to ensure that residual contamination in the sediment do not pose ecological or human health risk.

Comment #51: Why Are Pollution Levels in Human Health Risk Assessment So Low?
Earlier reports, some generated by DuPont itself in 1967 and 1998, just to list two of the many available, showed shockingly high levels of pollution and more diverse lists of pollutants. How is it that the levels in the human health risk assessment are between 10 and 100 times lower than in reports generated in 1998?

Response to Comment #51: The human health risk assessment (HHRA) evaluates the frequency and magnitude of human exposures that may occur as a consequence of contact with the contaminated medium, both now and in the future. When cleanup decisions are made, EPA

uses risk assessments to characterize the nature and magnitude of health risks to humans (e.g., residents, workers, recreational visitors) and ecological receptors (e.g., fish, wildlife) from chemical contaminants and other stressors, that may be present in the environment. The Conceptual Site Model (CSM) is an important component of the HHRA which takes in to account the nature and extent of contamination, fate and transport processes and the potential for human exposure to contaminated media. Since cumulative risk is calculated for an individual receptor such as a worker or resident, chemicals that migrated from the primarily release area over time (i.e., from shallow soil to deeper soil layers, groundwater, surface water or sediment precipitation or surface runoff) are accounted for while characterizing risk. Risk management decisions followed by cleanup actions focus on achieving acceptable cumulative risk for carcinogens as well as non-cancer-causing chemicals.

Comment #52: EPA Unresponsive to Previous Comments and Questions
One commenter was concerned that EPA had not submitted any response to most of their previous comments and questions.

Response to Comment #52: EPA RCRA corrective action staff was given a set of comments/ information to consider as part of a September 16, 2017 Superfund USS Lead Site informational meeting. The comments were presented as information to consider as we moved through the remedy selection process. Additionally, as this was not a formal public meeting and there was no document out for public comment at that time, EPA was not under any requirement to formally respond to questions or comments made at that session. However, prior to the issuance of this FD/RC, EPA received numerous phone calls from community members sharing questions and concerns. In most cases, EPA was able to immediately respond to those questions or quickly followed up with the appropriate information. EPA was not provided the respondents January 9, 2018 comments until the March 6, 2018 meeting. At that time both sets of comments were shared with EPA. EPA is responding to those comments as part of this FD/RC.

Comment #53: EPA Does Not Understand Bioimplications.
Several comments suggested that EPA has not shown an understanding of the bioimplications of the remedial proposal.

Response to Comment #53: EPA does not believe it is necessary to determine the specific species participating in the arsenic sequestration process that will be enhanced as part of the final remedy. Since 220 sulfate reducing bacteria (SRB) are known to exist, and they have a universal presence in the subsurface in both aerobic and anaerobic conditions (Gibson, 1990), EPA believes that remedy performance monitoring for indicators that sulfate reduction, iron sulfide formation, and a decrease in dissolved arsenic concentrations is occurring will provide more informative data about remedy performance and success than a DNA assay of the microbial population.

Performance monitoring will focus on characterizing the processes that will sequester arsenic, which only partially includes a SRB-mediated biotransformation, to confirm remedy success rather than a study of the specific species or genera involved in the biotransformation. To better understand the processes involved in the sequestration of arsenic and how it will be monitored, a description of the process is described below.

The objective of enhanced microbial sulfate sequestration is to decrease dissolved arsenic concentrations in groundwater by creating the conditions necessary to form insoluble iron sulfides through sulfate reduction, which will then lead to arsenic adsorption or co-precipitation with those iron sulfides. Site-specific investigations show that iron reducing conditions currently exist in groundwater based on low dissolved oxygen, the near absence of nitrate, very low dissolved methane, low or non-detect sulfide concentrations, and elevated iron (II). Since arsenic contamination found in soil is primarily associated with iron (III) hydroxides (as well as sulfides, carbonates, and organics), reduction of arsenic-bound iron (III) minerals to the more soluble iron (II) resulting from site conditions is the primary reason for high dissolved arsenic concentrations at the facility.

To sequester arsenic with insoluble iron sulfide minerals, groundwater must be made further reducing through the injection of a carbon amendment, in this case sodium lactate. Sodium lactate injections will induce a metabolic reaction with the SRBs, in which carbon is the electron donor, sulfate is the terminal electron acceptor, and sulfide is a metabolic byproduct (Barton and Tomei, 1995). Sulfide and iron (II) will bind to form an iron monosulfide (FeS, mineral name mackinawite) and co-precipitate with arsenic (Wilkin), removing it from groundwater. This process was confirmed during pilot tests with the formation of black and gray solids, as well as sulfide odors and a decrease in arsenic concentrations in groundwater samples. Co-precipitation or adsorption of arsenic onto mackinawite or pyrite (FeS_2) will produce amorphous forms of the minerals arsenopyrite, orpiment, and realgar, which are insoluble/sparingly soluble.

Based on the processes that are expected to occur after injection of sodium lactate, performance monitoring will include groundwater analysis of total arsenic to measure how much arsenic is removed from solution and confirm compliance with EPA's cleanup goals; total iron for interpreting groundwater redox conditions and ensuring iron sulfide precipitation; total organic carbon to ensure enough carbon is in the system to maintain sulfate-reducing conditions; sulfate for interpreting groundwater redox conditions and to ensure enough sulfate is available as an electron acceptor in the metabolic reaction; and sulfide (sum of H_2S, HS^-, and $S^=$) for interpreting groundwater redox conditions and ensuring iron sulfide precipitation.

See. Administrative Record No. 13, Barton LL, Tomei FA. Characteristics and activities of sulfate-reducing bacteria. In: Barton LL, editor. Sulfate Reducing Bacteria.Springer-Verlag; New York: 1995. pp. 1–32.

Administrative Record No. 68, Final Comprehensive Pilot Study Report. Chemours East Chicago Site, East Chicago, Indiana. PARSONS. January 2018.

Administrative Record No.7, Gibson, G.R. Physiology and ecology of the sulphate-reducing bacteria. Journal of Applied Microbiology. 1990. Issue 69, pages 769-797.

Administrative Record No.74, Wilkin, R.T. Iron sulfide-arsenite interactions: adsorption behavior onto iron monosulfides and controls on arsenic accumulation in pyrite. https://wwwbrr.cr.usgs.gov/projects/GWC_chemtherm/FinalAbsPDF/wilkin.pdf

Comment #54: Installed Permeable Reactive Barriers.
Several commenters had questions surrounding the PRBs that are in place near the northern property boundary of the facility.

Response to Comment #54: Two 2000-foot-long PRBs were installed in 2002 as an interim measure to passively address concentrations of arsenic above the action level from migrating off-site in groundwater. The PRBs are nearing the end of their designed effectiveness, therefore, the PRBs are no longer being relied upon as a component of the remedy and were not discussed in the SB. No new improvements or adjustments are being made to the PRBs rather, a comprehensive groundwater treatment approach is being utilized as part of the final remedy for the facility. The selected remedy addresses on-site facility groundwater contamination by intercepting and treating groundwater contaminants before they exit the facility.

Comment #55: Identify the End Point Sulfides.
No attempt has been made to identify the end point sulfides, their location in the system, their concentration, crystal size and uniformity etc., these are all critical for the long-term stability of the arsenic insolubility which impacts the safety of your system vis a vis the people of the region. No measure of the threshold interferences in crystal formation which would impact the long-term stability of your solution.

Response to Comment #55: Arsenic sequestration is expected to occur through co-precipitation and adsorption with iron sulfide minerals mackinawite and pyrite, forming amorphous minerals of arsenopyrite, orpiment, or realgar at the mineral surfaces or within the crystal lattice. The formation of iron sulfides was observed during pilot injection tests with corresponding decreases in arsenic concentrations and development of sulfate-reducing groundwater redox conditions. Long-term monitoring of redox conditions and arsenic concentrations in groundwater as part of the required LTMMP will provide information about groundwater redox stability and remedy performance.

See, Administrative Record No. 66, Final Comprehensive Pilot Study Report. Chemours East Chicago Site, East Chicago, Indiana. PARSONS. January 2018.

Comment #56: DuPont Should Pay More for More Cleanup.
Several commenters were concerned that Region 5 EPA is not making DuPont pay enough to effectively perform the cleanup.

Response to Comment #56: EPA does not adjust the extent of cleanup work and associated costs upwards or downwards based upon a RCRA facility's responsibility for the contamination or its ability to pay. EPA relies upon the corrective action process to select cleanups that will protect human health and the environment from releases of hazardous waste constituents at or from RCRA-regulated facilities. The process is designed to lead the Agency to identify and implement a protective cleanup. It begins with an exhaustive investigation. As required by a 1997 Order, EPA required DuPont to conduct a comprehensive RFI, subject to EPA approval, at the facility. The RFI identified contaminants, contaminant concentrations, locations and migration patterns, as well as the underlying geology and hydrology. Using data from the RFI

and supplemental investigations, EPA then established site-specific cleanup objectives for contaminated soil and groundwater.

In the next step of the process, DuPont prepared a CMS that identified all the potential remedies for the soil and groundwater and evaluated them to determine if the potential remedy met RCRA's "threshold criteria." The threshold criteria evaluation is an especially critical because if a potential remedy fails to satisfy the threshold criteria, that remedy is rejected. DuPont's cleanup alternatives were screened against RCRA's threshold criteria which are:

1. protection of human health and the enviromnent;
2. attainment of media (soil and groundwater) cleanup objectives; and
3. controlling the sources of contamination.

Only proposed cleanup alternatives which met these threshold criteria were given further consideration. The DuPont facility cleanup alternatives that passed the threshold criteria were then evaluated against the RCRA "balancing criteria." The balancing criteria evaluated each corrective measure alternative and its components to the following balancing criteria: long-term effectiveness; implementability (including community and state acceptance); short-term effectiveness; toxicity, mobility and volume reduction; sustainability; and cost. Cost is a balancing factor but it is not the definitive factor but one of several balancing factors.

The proposed remedy described in the SB– which met the necessary threshold criteria and was balanced against other cleanup alternatives - was estimated to cost $22.6 million. However, in consideration of public comments, EPA re-evaluated the balancing criteria. To conduct that re-evaluation, EPA requested an updated cost estimate of the off-site disposal costs. Chemours' updated estimate indicated off-site disposal would cost approximately $4 million more than on-site disposal. EPA then reconsidered the balancing criteria, in light of the volume reduction, community acceptance, and cost. EPA's reevaluation resulted in the selection of the off-site disposal option that is reflected in the revised cost estimate of approximately $26.6 million, an increase of over $4 million.

The cost of the selected cleanup alternative for a RCRA facility is the result of the process of investigation, identification of site-specific cleanup objectives, development of cleanup alternatives and evaluation of cleanup alternatives. EPA does not increase of decrease the extent of work and associated costs based upon a facility's ability to pay or responsibility for the contamination. The corrective action process is not a punitive process but a process to identify and implement a protective remedy for the facility workers, the community and the environment.

Comment #57: Only 50% of Arsenic Contamination to be Removed.
Several commenters were concerned that the most protective alternative still only removes approximately 50% of the arsenic load from the soil.

Response to Comment #57: The RFI conducted in 1999-2004, and additional investigations in 2009-2010 identified soil arsenic contamination from the ground surface to the base of the sand aquifer 40 feet below ground surface (ft. bgs), but most arsenic contamination was found within the top 4 ft. bgs. A comparison of the locations where soil arsenic concentrations are elevated

and where arsenic is found in groundwater confirms that soil leaching to groundwater is the reason for arsenic contamination found in groundwater. For example, SWMU 4 and the areas south of the PRB have soil concentrations of arsenic above 1,000 mg/kg and are the source areas for groundwater plumes above the cleanup goal of 0.01 mg/L for arsenic.

Modeling completed as part of the CMS has demonstrated that removing 10 feet of soil would remove a substantial amount of the arsenic mass in the soil and would greatly reduce its role as an ongoing source to the groundwater. There will be no direct human exposure to arsenic contaminated soils and future potential exposures will be prevented through stringent restrictive covenants and other institutional controls. Increasing the depth of soil removal did not show a sufficient benefit so as to justify the additional cost. EPA and DuPont/Chemours have been conducting a comprehensive RCRA investigation at this facility since 1997. Taking into consideration the data collected at the facility and years of study, EPA believes that the selected remedy will protect the residents of the neighboring communities. Based on the information in the Statement of Basis, the FD/RC and the Administrative Record compiled for this corrective action decision at the former DuPont East Chicago facility, EPA has determined that the selected remedy for the former DuPont East Chicago facility is appropriate and protective of human health and the environment.

Comment #58: Groundwater Under Control?
One commenter inquired about an EPA document that states that "the groundwater is under control" when we are discussing the groundwater migrating into the Residential Area or the Grand Calumet River?

Response to Comment #58: The document that is being referred to here is the Groundwater Environmental Indicator (EI) document, also referred to as the EI 750. The RCRA corrective action program is required by Congress to document whether groundwater contamination and migration is under control through the groundwater EI document. The groundwater EI is a short-term goal within the RCRA corrective action program and is designed to quickly assess facility conditions to ensure protection of human health while a more thorough investigation and understanding of the facility is undertaken. The regulatory limits that must be met to get a "yes" groundwater is under control determination, are different than those that would ultimately be required under a final cleanup. It is a snapshot in time and not meant to be a final determination of groundwater quality, contamination, or migration at the facility.

Comment #59: Landfills Leak.
A comment noted that "[n]o matter how well you line a landfill, it's going to leak. Even if it's a regulated landfill, double lined for toxic waste, its eventually going to leak. "

Response to Comment #59: As detailed in the FD, part of the remedy selected by EPA includes the final closure of the on-site solid waste landfill. The final closure effort should meet or exceed the Final Closure requirements of Title 329 of Indiana Administrative Code (IAC) Article 10 Rule 37 and shall include the following:

1. Installation of a final cover that includes geocomposite layers, a drainage layer, and a vegetative cover per the closure requirements

2. Development and implementation of a groundwater monitoring plan
3. Development of a post closure care plan in accordance with 329 IAC 10-38 and EPA requirements provided in 40 CFR Parts 264, 265, 270, and 271. These include design, monitoring and inspection requirements for the landfill as part of the closure and post closure process.

DuPont, Chemours and Gateway Partners must also submit for EPA approval a comprehensive LTMMP that details the monitoring and maintenance activities that will be performed after the implementation of EPA's selected remedy. This LTMMP must include details on the long-term monitoring of the groundwater at both compliance points and the plan for periodic physical and chemical monitoring of the closed landfill area. The responsible parties must also estimate and set aside financial assurance for necessary remediation including long-term operation monitoring and maintenance. This estimate will be greatly informed by the LTMMP that is described above. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the remedy.

Comment #60: Include DuPont in USS Superfund Site OU
EPA must include DuPont in OU-2 as part of the Superfund Site within 90 days from today. EPA cannot enforce a true cleanup in OU-1 or OU-2 if the criteria standards are different for each.

Response to Comment #60: OU-1 and OU-2 are part of the USS Lead Superfund Site activities that are occurring in East Chicago, Indiana. Superfund actions are not a part of this RCRA decision document. The selected remedy is based upon, in part, the current and projected future use of the facility as commercial and or industrial property and will be protective of human health and the environment both on-site and off-site.

Comment #61: Training and Hiring East Chicago Residents.
Given that there will be long term operations, maintenance and monitoring at the facility, is EPA going to mandate that East Chicago residents are hired/trained as they were with the lead situation in Zones 1, 2 and 3?

Response to Comment #61: The Superfund Job Training Initiative (SuperJTI) program that was implemented at the USS Lead Superfund Site combined extensive classroom instruction with hands-on training for the participants. The SuperJTI participants graduated with the technical skills to work on a broad range of construction projects, other environmental remediation projects and cleanup projects at Superfund sites. Several of the graduates were hired to work on the USS Lead Site and related projects but EPA did not mandate either EPA or private party contractors to train or hire the SuperJTI graduates. EPA's contracting procedures and ethics rules do not allow the agency to direct work towards a specific company or group of people. Federal regulation at 5 CFR § 2635.702(c) provides:

> An employee shall not use or permit the use of his Government position or title or any authority associated with his public office to endorse any product, service or enterprise except:
> (1) In furtherance of statutory authority to promote products, services or enterprises; or

(2) As a result of documentation of compliance with agency requirements or standards or as the result of recognition for achievement given under an agency program of recognition for accomplishment in support of the agency's mission.

Another potential resource for job training is EPA's Environmental Work Force and Job Training Program that is supported by EPA's Brownfields and Land Revitalization efforts. This program supports recruitment, training and placement of unemployed and underemployed people, including low-income residents in solid and hazardous waste-impacted communities, with the skills needed to obtain full-time, sustainable employment in solid and hazardous waste cleanup, wastewater treatment, chemical safety, and the environmental field generally. This program promotes the facilitation of activities related to assessment, cleanup or preparation of contaminated sites, including brownfields and Superfund sites, for reuse, while simultaneously building a local workforce with the skills needed to perform remediation work that are supportive of environmental protection and environmental health and safety. Eligible applicants include local governments, non-profit groups, and educational institutions. The website with contact information and information about success applicants and projects is: https://www.epa.gov/tribal-lands/environmental-workforce-development-and-job-training-program

EPA also has a web page that explains EPA's contracting opportunities: https://www.epa.gov/contracts. Also see EPA's webpage for Resources for Small Businesses: https://www.epa.gov/resources-small-businesses.

EPA will provide information on these and other opportunities and resources at future public events in East Chicago.

Comment #62: Distrust of EPA.
Several commenters expressed a lack of trust in the EPA and worry that when the cleanup is done, the community will not be protected and the contamination will continue.

Response to Comment #62: It is EPA's mission to protect human health and the environment in every community. EPA takes community concerns seriously.

At large, complex cleanup sites, there may be significant competing interests among community residents, regulated industry, interest groups, and federal, state and local governments which may in turn generate mistrust. In addition, the science itself can be difficult. Environmental science, risk assessment, environmental engineering, and cleanup technologies are complex and require sophisticated knowledge of biology, chemistry, engineering, epidemiology and other disciplines that most people do not regularly encounter in their daily lives. The nature of the complex information means all entities involved (EPA, industries, media and public) must continually strive for the best possible communication.

The RFI, CMS, and numerous technical memorandums have provided comprehensive quality data pertaining to the contaminants present at the facility. EPA has announced the proposed cleanup in local newspapers and media, describing the proposed cleanup plans in mailings to over 700 interested people in the community, met frequently with community members in East Chicago and participated in several public meetings in 2017 and 2018. EPA has endeavored to

provide the most relevant and accurate information to the community and to promptly correct any errors in communication.

EPA has strived to earn the trust of the public by incorporating public participation in the agency's cleanup decisions. A recurring plea from the East Chicago community at public meetings was to remove historic contamination from their midst. In response to that request, EPA reevaluated its proposal to require on-site treatment and disposal of contaminated soils excavated during the cleanup process. EPA has determined that, for this community, having reconsidered remedy evaluation criteria, any contaminated soils excavated to implement this cleanup must be disposed of off-site.

As the community is aware, however, not all contaminated soils will be excavated and disposed of off-site. Contaminated soils that are not excavated and remain on-site, however, will be adequately covered and maintained to prevent exposure or dispersal. The existing solid-waste landfill will be closed in accordance with state and federal requirements and monitored to ensure that no contaminants present a threat to on-site workers or the nearby Riley Park neighborhood. EPA's remedy will require monitoring while the cleanup is being implemented and after the implementation is completed to ensure that in the future the community will always be protected.

Comment #63: Backflow Prevention and Public Water System.
What is the status of any cross connections or backflow prevention between the former DuPont East Chicago facility's main water service lines and the public water system in East Chicago, Indiana?

Response to Comment #63: As explained at a Superfund and Water Division public meeting in East Chicago in August 2017, the public water supply mains lines are run under positive pressure, so it is unlikely that groundwater could seep into water lines if that concern prompted this comment.

According to the 2016 Edition of the IDEM's Cross Connection Control and Backflow Prevention Manual, there are several Indiana Administrative Codes that govern cross connection control and backflow, including codes administered by the Indiana State Department of Health and IDEM.

See Administrative Record No. 56 or the following link for more information:
https://www.in.gov/idem/cleanwater/files/ccc_backflow_prev_manual.pdf

Comment #64: Reasons DuPont Investigated Facility Prior to EPA and IDEM
What does DuPont know that EPA and/or the public don't know about the East Chicago facility including the reason they were investigating the facility before EPA and IDEM even existed?

Response to Comment #64: EPA will not speculate as to what it does not know. EPA does not know the reason DuPont may have investigated the facility before EPA and IDEM existed. DuPont noted in their April 29, 1980 response to an EPA request for information that "... the East Chicago plant was established in 1892 and therefore has a long history of operation. Many of the products that were made during those 88 years are no longer being manufactured. Waste disposal practices have changed over that span of years such that it is difficult if not impossible

to find any records or persons with knowledge of many of the old defunct operations. As part of the Congressional Questionnaire of the House Subcommittee on Oversight and Investigations East Chicago submitted information about waste disposal since 1950." EPA considered information supplied by DuPont during the RFI and as well as responses to information requests from EPA and a Congressional questionnaire dating to the 1970s.

Comment #65: Statements of Support
EPA received numerous statements of support for the remedial work at the facility from local citizens, local municipalities and governments, non-governmental organizations and community groups.

Response to Comment #65: EPA acknowledges and appreciates the support and is committed to continuing to serve this community by ensuring protection of human health and the environment.

Comment #66: EPA's RCRA Authority to Request Information
EPA can request information from anyone who generates, stores, treats, transports, disposes of, or otherwise handles or has handled hazardous waste, relating to such waste. EPA can inspect, sample, and have access to and copy all records relating to such waste. If someone does not comply with such a request, EPA can seek penalties of up to $37,500 for each day of noncompliance." RCRA Section 3007, (42 U.S.C. Section 6927)

Response to Comment #66: EPA acknowledges this comment and notes that DuPont has responded timely to multiple requests for information regarding the former DuPont East Chicago facility under a variety of EPA authorities including Clean Water Act, RCRA and Superfund.

Comment #67: Plumes of Contaminated Groundwater Migrating Off-Site.
Parsons' [Chemour's contractor] conceptual cross section diagrams for the north area near the PRB and the south area near SWMU 4 both show huge plumes of contaminated groundwater migrating offsite.

Response to Comment #67: EPA acknowledges this comment. Key components of EPA's selected remedy are the excavation of contaminated soil that serves as an ongoing source to the contaminated groundwater plumes and in-situ fixation and treatment of both plumes.

Comment #68: The DuPont Facility Located on Unsuitable Hydrogeologic Conditions
The entire former DuPont East Chicago, Indiana RCRA corrective action facility is located upon unsuitable hydrogeologic conditions that include highly permeable and chemically inert quartz sand soils and its associated local water table aquifer that is 40% permeable. The Calumet aquifer is also made up of quartz sand and is hydraulically connected to the dynamic levels of the and Grand Calumet River and Lake Michigan.

Response to Comment #68: EPA acknowledges this comment and agrees that the hydrogeologic conditions at the former DuPont East Chicago facility are complex. However, extensive laboratory and field tests indicate that soil removal coupled with in situ treatment will, within a reasonable time period, bring the groundwater waters plume to drinking water standards

at the northern boundary point of compliance near the Riley Park neighborhood and to surface water discharge standards at the southern boundary where the groundwater discharges to the Grand Calumet River.

Comment #69: Reportable Quantities Exceeded by Releases to Environment
Certainly, the magnitude of multitude releases that have taken place and are currently ongoing at the DuPont facility more than exceed the reportable quantities for listed hazardous substances under applicable statutes and regulations.

Response to Comment #69: EPA acknowledges this comment.

Comment #70: Listed Hazardous Wastes and Land Disposal Restrictions
Several chemical compounds known to have been used, produced, and/or released at the DuPont facility over its 105 years of manufacturing and as a current consequence are legally listed hazardous substances. Some of these listed hazardous substances are also legally listed hazardous wastes that are banned from land disposal under EPA's Land Disposal Restrictions (LDRs).

Response to Comment #70: EPA acknowledges this comment and addressed the LDRs in the discussion of EPA's Area of Contamination policy presented in Response to Comment #2.

Comment #71: Supplemental Information
One commenter provided EPA with supplemental information that generally discussed the importance of implementing permanent remedies to clean up hazardous waste sites and using technologies, including recycling, that reduce the toxicity, mobility, or volume of cleanup wastes.

Response to Comment #71: EPA appreciates the supplemental information and considered that information as part of its review of the comments received. Responses to Comments No. 2, 3, 5, 12, 15, 57, and 59 include discussions of various topics contained in the supplemental information.

Comment #72: Calumet Aquifer Usage
The contention that the Calumet Aquifer is not in use is completely false. CH2M Hill studies and State records show wells in use for domestic, commercial and industrial purposes for water supply.

Response to Comment #72:
EPA acknowledges this comment. EPA did not contend that the Calumet Aquifer was not used for any purpose. EPA stated that the groundwater leaving the former DuPont East Chicago facility is not being used as a drinking water source. This information has been verified most recently by a Superfund groundwater survey in East Chicago which looked at groundwater usage in the Riley Park neighborhood. The Superfund survey confirmed that no one is using the groundwater as a drinking water source.

See, Administrative Record No. 73, J. Dodds. Email re: DuPont, July 2018.

Comment #73: Calumet Aquifer Protection
Calumet sand aquifer should be a primary aquifer afforded the top level of protection.

Response to Comment #73: EPA acknowledges this comment.

Comment #74: Administrative Record Difficult to Access
One commenter noted that the original Administrative Record did not contain all the documents listed in the Administrative Record Index and that it was extremely difficult to access.

Response to Comment #74: EPA acknowledges the electronic disks containing the original Administrative Record placed at the Pastrick Branch of the East Chicago Public Library in November 2017, included several documents that were hundreds of pages long. Embedded within those huge documents were several documents in the Administrative Record. As soon as EPA became aware of the difficulty accessing these documents, EPA began efforts to correct the electronic files in the Pastrick Branch of the East Chicago Pubic Library. Also, EPA made the Administrative Record available electronically on January 5 and then, on January 10, 2018 it was supplemented. The corrected, supplemented AR was shared with the community at the first public meeting held on January 10, 2018. EPA announced at the January 10 initial meeting that the comment period had been extended to March 12, 2018 and that another public meeting would be held on March 6, 2018. As a result, the public had full access to the AR both at the local Pastrick Branch library and online for a minimum of 62 days with an additional public meeting.

ATTACHMENT II

ADMINISTRATIVE RECORD INDEX

FINAL DECISION AND RESPONSE TO COMMENTS

The Western Portion/Industrial Area of the
Former DuPont East Chicago Facility
East Chicago, Indiana
EPA ID: IND 005 174 354

ADMINISTRATIVE RECORD
FOR THE
FINAL DECISION AND RESPONSE TO COMMENTS
WESTERN PORTION/INDUSTRIAL AREA
EPA ID NO: IND 005 174 354
DUPONT FACILITY
EAST CHICAGO, LAKE COUNTY, INDIANA

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
001 Dupont SB West Industrial Area (508906)	7/20/73	Sixsmith, J, T., DuPont	Hert, O., IN Stream Pollution Control Board	Letter re: Request for Approval of Application for Water Pollution Abatement Program	7
002 Dupont SB West Industrial Area (508908)	4/29/80	Sixsmith, J, T., DuPont	Gardebring, S., U.S. EPA	Response to Information Request	62
003 Dupont SB West Industrial Area (941990)	7/31/81	U.S. EPA	File	3005€ RCRA Operation of Hazardous Waste Facilities by O/O Who have failed to Achieve Interim Status	20
004 Dupont SB West Industrial Area (941991)	12/4/81	Muno, W., U.S. EPA	File	Letter re: Final Determination - E. I. DuPont East Chicago, Indiana	5
005 Dupont SB West Industrial Area (941995)	5/5/87	U.S. EPA	File	Guidance for Public Involvement in RCRA Section 3008 (H) Actions	6

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	006 Dupont SB West Industrial Area (938054)	2/1/90	CH2M Hill	File	Phase I Groundwater Assessment	246
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	007 Dupont SB West Industrial Area (941390)	7/23/90	Gibson, G. R.	Public	Physiology and Ecology of the Sulphate-Reducing Bacteria	29
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	008 Dupont SB West Industrial Area (941986)	2/1/91	U.S. EPA	File	Guidance on RCRA Corrective Action Decision Documents - The Statement of Bases Final Decision and Response to Comments	56
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	009 Dupont SB West Industrial Area (938055)	8/1/91	CH2M Hill	File	Phase II Groundwater Assessment	832
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	010 Dupont SB West Industrial Area (297592)	12/10/91	Malek, J., U.S. EPA	Distribution List	Distribution Memo and DuPont 104e Response	13
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	011 Dupont SB West Industrial Area (936233)	1/1/92	CH2M Hill	DuPont	Phase III Unsaturated Soil and Groundwater Quality Data (Referenced as Phase III Groundwater Report or Phase III Groundwater Assessment)	370
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	012 Dupont SB West Industrial Area (516356)	9/23/93	DuPont	U.S. EPA	DuPont/East Chicago RCRA Information Request	55
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	13 Dupont SB West Industrial Area (941389)	1/1/95	Barton, L.	File	Biotechnology Handbooks Characteristics and Activities of Sulfate - Reducing Bacteria	348
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17	014 Dupont SB West Industrial Area (941989)	3/13/96	Shapiro, M., U.S. EPA	Luftig, C., and Clifford. J., U.S. EPA	Memo re: Use of the Area of Contamination (AOC) Concept During Cleanups	23
31	015 Dupont SB West Industrial Area (941993)	5/1/96	Authenticated U.S. Government Information GPO	Public	Corrective Action for Releases From Solid Waste Management Units at Hazardous Waste Management Facilities Advanced Notice of Proposed Rulemaking	33
32	016 Dupont SB West Industrial Area (938056)	6/17/97	U.S. EPA	File	RCRA Corrective Action Order for the DuPont East Chicago Facility is Effective	82
33	017 Dupont SB West Industrial Area (941975)	6/26/97	U.S. EPA	DuPont	Administrative Order on Consent (AOC) - Attachment I - Sediment and Wetlands Investigation Plan	8
34	018 Dupont SB West Industrial Area (941976)	6/26/97	U.S. EPA	DuPont	Administrative Order on Consent (AOC) - Attachment II - Scope of Work for a RCRA Facility Investigation	31
35	019 Dupont SB West Industrial Area (941977)	6/26/97	U.S. EPA	DuPont	Administrative Order on Consent (AOC) - Attachment II Appendix A - Interim Measures Scope of Work	17
36	020 Dupont SB West Industrial Area (941978)	6/26/97	U.S. EPA	DuPont	Administrative Order on Consent (AOC) - Attachment III - Scope of Work for a Corrective Measures Study	19
37	021 Dupont SB West Industrial Area (941979)	6/26/97	U.S. EPA	DuPont	Administrative Order on Consent (AOC) - Attachment IV - Model Quality Assurance Project Plan	130
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	024 Dupont SB West Industrial Area (938057)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 1	141
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	025 Dupont SB West Industrial Area (938058)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 2: Book 1	1018
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	026 Dupont SB West Industrial Area (938059)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 2: Book 2 (1 of 2)	737
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ATTACHMENT III

US EPA STATEMENT OF BASIS

FINAL DECISION AND RESPONSE TO COMMENTS

The Western Portion/Industrial Area of the
Former DuPont East Chicago Facility
East Chicago, Indiana
EPA ID: IND 005 174 354

STATEMENT OF BASIS
U.S. ENVIRONMENTAL PROTECTION AGENCY

DuPont East Chicago Facility
Western Portion/Industrial Area
East Chicago, Indiana

EPA ID: IND 005 174 354

November 2017

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Acronyms List - Defined Terms

ACE ---------- U.S. Army Corps of Engineers

AOC ---------- Area of Contamination

CAO ---------- Corrective Action Objective(s)

CFR ---------- Code of Federal Regulations

CMS ---------- Corrective Measures Study

COC ---------- Constituent(s) of Concern

Conceptual Site Model--Establishes the complete pathways that will be evaluated in the risk assessment

EPA ---------- U.S. Environmental Protection Agency

ERA ---------- Ecological Risk Assessment

FWS ---------- U.S. Fish and Wildlife Service

HI ---------- Hazard Index: The sum of two or more hazard quotients for multiple substances and/or multiple exposure pathways

HQ ---------- Hazard Quotient: The ratio of a single substance exposure level over a specified period to a reference dose for that substance derived from a similar exposure period

IDEM ---------- Indiana Department of Environmental Management

IDNR ---------- Indiana Department of Natural Resources

In-Situ Stabilization -- Contaminant treated in place by chemical, microbe, or gas injection

IRM ---------- Interim Remedial Measures

MCL ---------- Maximum Contaminant Levels are EPA's Safe Drinking Water Act standards that limit the amount of a substance allowed in public water systems.

MNA ---------- Monitored Natural Attenuation

OM&M ---------- Operations, Maintenance and Monitoring

RBRC ---------- Risk-Based Reference Concentration

RCRA ---------- Resource Conservation and Recovery Act, 42 U.S.C. §2001 *et seq.*

RFI ---------- RCRA Facility Investigation

SWMU ---------- Solid Waste Management Unit

SB ---------- Statement of Basis

TNC ---------- The Nature Conservancy

TRV ---------- Toxicity Reference Value

UNITS OF MEASUREMENT

Soil Concentrations:

ppm - part per million
ppb - part per billion

Chemical concentrations in soil are reported as parts per million (ppm) or parts per billion (ppb). Parts per million and parts per billion may be converted from one to the other using this relationship: 1 part per million = 1,000 parts per billion. For soil, 1 ppm = 1 mg/kg of contaminant in soil, and 1 ppb = 1 ug/kg.

Water Concentrations:

mg/L- milligrams per liter
ug/L - micrograms per liter

Chemical concentrations in water are reported as milligrams (mg) (parts per million) or micrograms (ug) (parts per billion) per volume of liter of water (l).

Parts per million and parts per billion may be converted from one to the other using this relationship: 1 part per million = 1,000 parts per billion. For water, 1 ppm = approximately 1 mg/L of contaminant in water, and 1 ppb = 1 ug/l.

Statement of Basis for the Proposed Remedy at the Western Portion of the DuPont East Chicago Facility Located in East Chicago, Indiana

INTRODUCTION

This Statement of Basis (SB) presents the proposed remedy to address contaminated soil and groundwater located in the western portion of the former E.I. DuPont Nemours (DuPont) chemical manufacturing facility in East Chicago, Indiana (*see Figure 1 for land use at DuPont East Chicago Facility*). The entire DuPont East Chicago facility is approximately 440 acres. This SB focuses on the 265-acre western portion of the facility that contains an existing solid waste landfill surrounded by open land, the former industrial property available for redevelopment, and leased industrial property. The eastern portion contains the 172-acre Natural Area and adjacent 23-acre Buffer Zone. This SB does not address the eastern portion of the facility containing the Natural and Buffer Zone Areas, which were handled under a separate EPA-issued 2013 corrective action decision document and a long-term monitoring program.

This SB is issued by the U.S Environmental Protection Agency (EPA) as part of its public participation responsibilities under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §2001 *et seq*. This SB summarizes the investigations and the potential remedial alternatives evaluated for the western portion of the DuPont facility. This information can be found in greater detail in plans and reports contained in the RCRA Administrative Record for the DuPont East Chicago Facility – Western Portion. An Index to the Administrative Record is attached.

EPA encourages the public to review these documents to gain a more comprehensive understanding of the RCRA corrective action activities to be conducted at the western portion of the DuPont facility. EPA will select a final remedy after a 30-day public comment period and consideration of all substantive public comments. EPA may modify the proposed remedy or select another remedy based on new information or public comments.

The Administrative Record supporting this proposed remedy is available at the East Chicago Public Library, 1008 W. Chicago Avenue, East Chicago, Indiana 46312 and the EPA, Region 5 Record Center (7th Floor), 77 West Jackson Boulevard, Chicago, Illinois 60604.

EPA PROPOSED REMEDY

Results from a RCRA Facility Investigation (RFI), conducted from 2002 to 2005, and other previous investigations conducted by DuPont indicate arsenic, lead, zinc, and cadmium are the primary constituents of concern (COCs) in the soil (from about 0 to 10 feet below ground surface [bgs]). Arsenic is considered the primary COC in groundwater at the facility, due to its widespread presence in the soil and groundwater at elevated concentrations.

Based on a comparative analysis of alternatives, EPA proposes the following remedy for public comment to address contaminated soil and groundwater at the western portion of the DuPont East Chicago facility.

- *Soil: Soil covers and on-site landfill.*

  Across the facility, maintain existing pavement or other surface soil barriers (e.g., parking lots or building foundations) and where pavement or other barrier is not present, install a 1-foot-thick permeable soil cover to mitigate direct human contact to achieve a residual target cancer risk of one additional cancer case out of 100,000 people (expressed exponentially as 1×10^{-5}). Install a 2-foot-thick soil cover where needed to reduce potential ecological risks (see Figure 2). Where highly contaminated soil may be a source of groundwater contamination, excavate such "source areas" (~ 61,780 cubic yards) and then backfill the excavations with clean soil. The excavations and backfill will extend to the depth of the saturated zone (where the soil is saturated with groundwater) to remove a significant fraction (close to 50%) of the arsenic mass at the facility. Removing this mass of contamination will negate the potential for human exposure where concentrations are highest, and reduce arsenic leaching to groundwater. The excavated soils would be treated and disposed of in the on-site solid waste landfill.

  In the southwest corner of the facility which DuPont leased to the chemical manufacturers, W.R. Grace and Co. and Grace Davison, EPA proposes to excavate ~ 14,000 cubic yards of lead-contaminated surface soils. In addition, other existing pavement or barriers (e.g., parking lots or building foundations) will be maintained. These actions will mitigate direct human contact to achieve a residual target cancer risk of 1×10^{-5} and a lead Hazard Index exposure factor of less than 1.0 over portions of the leased property, referred to in the document as the "Leased Area." The excavated soil would be treated and disposed of in the on-site solid waste landfill. Deeper saturated soil with elevated arsenic concentrations at the bottom of the excavations would be treated by mixing with in-situ stabilization treatments.

- *Groundwater: Two types of treatment: In-situ chemical fixation (ISCF) via enhanced microbial sulfate reduction injections and a bio-wall trench.*

  An enhanced sulfate reduction bio-barrier comprised of a trench backfilled with materials required to stimulate microbial sulfate reduction and chemically trap arsenic near the Grand Calumet River will be used to significantly reduce or eliminate arsenic migration

beyond the southern property boundary. Enhanced microbial sulfate reduction injection treatment zones transecting the northern and southern arsenic plumes will intercept and sequester arsenic migrating in groundwater to more rapidly reduce arsenic concentrations and extend the life of the bio-barrier.

- *Institutional Controls: Record, implement and maintain EPA-approved institutional controls to ensure the facility's land use remains consistent with the remedial endpoints and risk assessments.*

  This facility must record, implement and maintain institutional controls that prohibit non-industrial uses of the property inconsistent with the exposure assumptions that the risk assessments were based upon, prohibit the installation of on-site drinking water supply wells, require maintenance of paved and soil barriers, maintain and install security fences, require permits for non-potable groundwater production wells, and require all property owners to implement health and safety plans to protect construction, utility and maintenance workers from exposure to contaminated soils or groundwater, require notice of the potential presence of underground pipe and other obstructions, and require notice to any future owners, developers or tenants of the potential for vapor intrusion risks in new buildings. These restrictions will be embodied in a recorded, EPA-approved environmental restrictive covenant and deed restriction that runs with the land and will be provided to IDEM's Institutional Controls Registry and Virtual File Cabinet.

- *Financial Assurance: Provide funds to complete the remedy including long-term OM&M.*

  The total estimated cost of EPA's proposed remedy is approximately $22.68 million. Financial assurance is required to ensure that the proposed remedy can be implemented over its expected lifetime, with an expected minimum of 30 years. The facility owner and/or Chemours and/or DuPont will provide an updated cost estimate for implementation of the final remedy to EPA for approval pursuant to 40 CFR §§ 264.142 and 264.144, including the construction and long-term operation, maintenance, and monitoring (OM&M) activities. Upon EPA approval of the updated cost estimate, the current facility owner, Chemours, and/or the former owner of the facility, DuPont shall provide financial assurance using the option(s) allowed in 40 CFR § 264.143 and § 264.145.

- *Five-Year Remedy Reviews*:

  Implemented to update the Conceptual Site Model, evaluate remedy efficacy, update Financial Assurance timelines, and make adjustments if needed.

- *Enter into a corrective action implementation order to ensure compliance with the final clean up decision.*

FACILITY BACKGROUND

The DuPont East Chicago facility is a former manufacturing facility located at 5215 Kennedy Avenue in East Chicago, Lake County, Indiana. The approximately 440-acre property is bounded to the south by the East Branch of the Grand Calumet River, to the east and north by residential and commercial areas, and to the west by industrial areas *(see Figure 1)*. In 1892, the Grasselli Corporation constructed a facility to produce various chloride, ammonia, and zinc products and inorganic agricultural chemicals. The Grasselli development was primarily restricted to the western portion of the property where the land surface was initially leveled with soil, iron mill slag, and other materials. E.I. du Pont Nemours and Company (DuPont) operated the facility for the Grasselli Corporation from 1927 through 1936, at which time DuPont then acquired ownership. In 1948, DuPont began manufacturing organic chemicals, consisting primarily of trichlorofluoromethane or Freon® products. The wastes from those processes included acids, boron, arsenic, chromium, lead, and antimony pentachloride. DuPont continued chemical production and hazardous waste storage and disposal activities. In 1980, DuPont applied for a RCRA Large Quantity Generator permit to generate and store RCRA-regulated hazardous wastes at its East Chicago facility. DuPont also manufactured inorganic chemicals at the facility, including sodium silicate and colloidal silica. During the 1980's and 1990's, DuPont's East Chicago operations contracted significantly. Then, in 2000, DuPont transferred the last of its chemical manufacturing operations at the East Chicago facility to W.R. Grace, another chemical company who had leased property at the DuPont facility.

In June 1997, DuPont entered into a RCRA Corrective Action Order (Order) with EPA. A comprehensive evaluation of soil and groundwater conditions at the facility was performed as part of the RCRA corrective action process. In the Order, DuPont agreed among other things, to conduct a RFI to determine the nature and extent of any releases of hazardous waste and/or hazardous waste constituents at or from the facility. The Order also required DuPont to implement certain Interim Measures and conduct a Corrective Measures Study (CMS) to identify and evaluate alternatives for the corrective action necessary to prevent or mitigate migration of contaminants. Subsequent investigations included the preparation of initial environmental site assessments and development of the Phase I (2002) and Phase II (2005) RFIs. This facility was used for chemical manufacturing for over 100 years. The RFI's and Interim Measures involved extensive review of information about prior manufacturing activities and thousands of subsurface soil samples. Given the length and extent of manufacturing activities, however, it is possible some underground piping was not identified or encountered. This possibility underscores the importance of the institutional controls on the use of the property to protect construction, utility, and maintenance workers.

In 2015, DuPont implemented a corporate restructuring that included the DuPont East Chicago facility. On February 1, 2015, DuPont transferred title of the East Chicago facility to Chemours Company FC LLC (Chemours), then a newly-created, wholly-owned subsidiary of DuPont. On July 1, 2015, the spinoff of the former Chemours subsidiary was completed. DuPont and Chemours are now two separate companies. Chemours is the current title owner of the DuPont East Chicago facility including the Leased Area, in the southwest corner of facility.

DuPont's development of the East Chicago property was largely limited to its western portion. The southern section of the developed area was used for chemical manufacturing purposes, while the northwestern section and northeastern edge of the western portion were used for waste management. Most of the previously active manufacturing areas, however, have been decommissioned, and the production facilities have been removed. For the purposes of describing the hazardous waste investigations and proposed cleanup approaches, the DuPont East Chicago facility has been divided into the following five areas (*see Figure 1*):

- Redevelopment Area: This area occupies approximately 155 acres and encompasses the former manufacturing areas located in the central and western portions of the property. The former manufacturing facilities have been removed. Future industrial and/or commercial use is planned for the Redevelopment Area. The Redevelopment Area is included in this SB.

- Open Area: This former manufacturing and waste management area occupies approximately 50 acres and includes an approximately 30-acre existing solid waste landfill. A vegetative grass cover is currently maintained over the landfill. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB. The portion of the Open Area that is not part of the landfill has natural herbaceous/shrub cover regrowth, with intermixed patches of shrubs and trees. Natural re-vegetation with an emphasis on native and pollinator-friendly species is encouraged in the Open Area and should be chosen in coordination with The Nature Conservancy. The former manufacturing facilities have been removed. Aside from landfilling/landfill consolidation, currently no active future industrial and/or commercial use is planned for the Open Area. The Open Area is included in this SB.

- Leased Area: DuPont has leased this 30-acre active manufacturing area to W.R. Grace & Co. and Grace Davison since early 2000, but Chemours maintains ownership. The leased facility manufactures a colloidal silica product (Ludox®) and a sodium silicate solution. These products are used in x-ray film; photographic paper; pigments; nonslip coatings; low phosphate detergents; and metal castings for aerospace, medical, and recreational products. The Leased Area is included in this SB.

- Buffer Zone Area: This area is located directly east of the Open and Redevelopment Areas and separates these areas from the adjacent Natural Area. The Buffer Zone Area is a 200-foot-wide strip of land that extends across the width of the property, occupying approximately 20 acres. The purpose of the Buffer Area is to provide additional protection to the Natural Area. Vegetation and habitat will be managed appropriately to maintain the buffer zone. The Buffer Zone area was included in a separate SB and a final decision document that was issued by EPA on September 30, 2014. Therefore, the Buffer Zone Area is not part of this SB.

- Natural Area: This undeveloped Natural Area occupies approximately 172 acres and contains original plains/dunes geomorphology and associated plant communities. DuPont established the Natural Area by transferring a conservation easement to the Indiana

Department of Natural Resources (IDNR) in accordance with a federal consent decree involving the restoration of the Grand Calumet River. The Natural Area section of the facility is currently managed by The Nature Conservancy for habitat preservation and is anticipated to continue as such in the future. The Natural Area was included in a separate SB and a final decision document that was issued by EPA on September 30, 2014, therefore, the Natural Area is not part of this SB.
See: https://www3.epa.gov/region5/cleanup/rcra/dupont/pdfs/sta-basis-2014.pdf

RCRA Facility Investigation Results

From 2002 to 2005, DuPont conducted the RFI to fully characterize the nature and extent of contamination at the DuPont East Chicago facility. Results from the RFI and other previous investigations indicate arsenic, lead, zinc, and cadmium are the primary COCs in the soil (from about 0 to 10 feet below ground surface [bgs]). Arsenic is considered the primary COC in groundwater, based on its widespread distribution and elevated concentrations.

In 2002, as an Interim Remedial Measure, DuPont installed two (2) 2,000-foot-long permeable reactive barrier (PRB) walls along the northern property boundary to passively treat concentrations of arsenic above the action level migrating off-site in groundwater. Completion of the RFI and an Interim Remedial Measure led to the preparation of an initial CMS and later a Supplemental CMS Investigation Work Plan to address additional data gaps. The Supplemental CMS Investigation Work Plan was later revised and investigation activities were completed in 2009 and 2010. During the spring and summer of 2012, a supplemental soil and groundwater investigation was performed to delineate groundwater plumes of arsenic originating from two main source areas. In addition, another Interim Remedial Measure was performed in the Buffer Zone Area that separates the former manufacturing and waste disposal areas from the Natural Area to protect the Natural Area by decreasing potential contaminant migration via surface water runoff into sensitive habitat and by extending coverage of existing high-quality habitat to the Buffer Zone. Long-term performance monitoring of the Natural Area is ongoing as part of EPA's final corrective action remedy.

SUMMARY OF FACILITY RISKS

(See Figures 2 and 3 for areas exceeding risk criteria and areas requiring remediation)

Soil

Human Health Risk: The Human Health Risk Assessment (HHRA) results indicate that arsenic, lead, zinc, and cadmium are the primary COCs in soil (from about 0 to 5 feet below ground surface [bgs]) across the facility. Cancer risk is expressed as a theoretical probability, which can be thought of in terms of additional cancer cases where *everyone* in a population would get the same dose of the same chemical *every* day over their entire 70-year lifetime. For example, a cancer risk of one in one million means that in a population of one million people, not more than one additional person would be expected to develop cancer as a result of the exposure to the substance causing that risk. The "acceptable" health risk values for carcinogens used by EPA

substance causing that risk. The "acceptable" health risk values for carcinogens used by EPA ranges from one person in one million (expressed exponentially as 1×10^{-6}) to one hundred per million (1×10^{-4}) or, expressed differently, one in ten thousand persons. At this facility, the appropriate benchmark for evaluated cancer risk estimates in soil was determined to be 1×10^{-5} (one additional cancer in 10,000 persons) cancer risk.

If the contaminants are noncancerous but could cause other health problems, then a hazard index quotient is used. To be acceptable to the EPA, the Hazard Index (HI) quotient for all contaminants must be less than one (<1.0). The Hazard Index is the ratio of the concentration of a contaminant to its human health screening value. On-site receptors, which include construction workers, utility workers, redevelopment workers, industrial workers, landscapers, trespassers, and restoration workers, were evaluated for exposure to soil, the primary medium of interest, along with groundwater, the other medium of interest. Further, as part of the Superfund investigation of the nearby USS Lead site, EPA has investigated lead and arsenic contamination in the residential areas north of the DuPont facility and certain responsible parties are currently undertaking EPA-ordered cleanup actions in those neighborhoods. For more information on the USS Lead Site Superfund cleanup activities see: https://www.epa.gov/uss-lead-superfund-site.

Ecological Risk: Exposure to surface soil (0 to 2 feet bgs) was evaluated for direct exposure of plant and soil invertebrates and dietary exposure of nine representative wildlife species as part of an ecological risk assessment (ERA). Wildlife exposure was calculated as a daily dose based upon the COCs concentration in food items estimated from soil concentration using empirical soil-to-biota transfer factors. Hazard Quotients (HQs) were calculated as the ratio of exposure concentrations and reference values indicative of potential adverse effects. HQs greater than 1.0 are indicative of a potential ecological risk. Overall, a number of metals in surface soil (particularly antimony, arsenic, cadmium, chromium, copper, lead, selenium, vanadium and zinc) were identified as having a potential for adverse effects on ecological receptors.

Groundwater

Description: Arsenic is the primary COC in groundwater based upon its widespread distribution and elevated concentrations. Elevated arsenic concentrations in shallow groundwater (> 1 milligrams per liter [mg/L]) are present in two potential source areas (a former insecticide land disposal area designated as Solid Waste Management Unit 4 (SWMU 4) and another area south of a PRB installed as an interim remedial measure in 2002) where elevated soil arsenic concentrations are present and extend below the water table. Based on these spatial relationships, arsenic is likely leaching from shallow soil to groundwater in both the SWMU 4 and PRB areas. Dissolved arsenic has migrated with groundwater and partitioned with saturated soil beneath the water table along two arsenic plumes as described below:

1. An east-west trending groundwater divide resulting from a groundwater mound runs through the facility. On the north side of the divide, groundwater flows north toward Riley Park, a residential neighborhood. Elevated arsenic concentrations are present in shallow groundwater to the south of the PRB extending towards the northern property boundary where it is present in deep groundwater. Riley Park residents are connected to the East

Chicago public water supply and do not get potable water from any residential wells. Previous RCRA investigations found no unacceptable risks to the Riley Park residents from exposure to groundwater in sumps. Further, as part of the investigation of the USS Lead Superfund site, EPA is investigating the groundwater north of the DuPont facility and, if necessary to protect human health and the environment, will take or require a responsible party to take appropriate response actions.

2. On the south side of the groundwater mound, groundwater flows south towards the Grand Calumet River where it discharges. Elevated arsenic concentrations, immediately south of the divide, are present in shallow groundwater within the SWMU 4 source area extending south towards the River where elevated arsenic is present in deep groundwater.

Human Health Risk: Direct contact with groundwater was evaluated in the HHRA. The complete human exposure pathways that were evaluated were construction, utility, maintenance and redevelopment workers contacting groundwater COCs during site activities. The maximum contaminant levels (MCLs) are proposed as the cleanup goal for the COCs present in groundwater for the Northern facility boundary. The MCLs are standards that are set by EPA for drinking water quality. The MCL is the legal threshold limit on the amount of a substance that is allowed in public water systems under the Safe Drinking Water Act. The Indiana Surface Water Quality Standards for the protection of aquatic life, applicable to the Great Lakes, are proposed as the cleanup goals for the southern facility boundary.

Ecological Risk: Groundwater quality was characterized using data from seven monitoring wells located along the East Branch Grand Calumet River within the former industrial portion of the facility. Two exposure scenarios were evaluated, one for an aquatic organism exposure to groundwater taking into accouut an estimated in-stream mixing, and a second scenario for exposure to groundwater prior to mixing with stream water. Based on in-stream concentrations, all calculated hazard quotients (HQs) were less than 1.0, indicating that no adverse effects on water column organisms would be expected following groundwater in-stream mixing. In contrast, calculated HQs were greater than 1.0 for a number of metals when undiluted groundwater values are used as exposure concentrations.

Therefore, the only complete ecological exposure pathway to aquatic biota, including at the groundwater/surface water interface, is through arsenic contaminated groundwater discharging to the Grand Calumet River.

Surface Water

Human Health Risks: Direct contact with surface water was evaluated and risks to human health were considered negligible due to the concentrations detected along with ephemeral nature of the water accumulation areas and their small size.

Ecological Risks: Amphibian species were used as an indicator of potential adverse effects on semi-aquatic organisms in four small water accumulation areas seasonally present within the East Chicago facility. Based on maximum water concentrations and amphibian toxicity data,

possible exception of manganese and zinc in some of those areas. The potential for adverse effects was qualified as low for these two COCs because of the ephemeral nature of the water accumulation areas, their size (typically less than 0.1 acre), and location within formerly developed, low-quality habitat areas.

SCOPE OF CORRECTIVE ACTION

Corrective measures are necessary at the DuPont East Chicago facility to address potential risks associated with metals contamination present in soil and groundwater. The HHRA and baseline ecological risk assessment (ERA) determined that:

Potential Human Health Risks

- Based on the current and future land use for the western portion of the DuPont facility, receptors potentially exposed to groundwater are construction, utility, maintenance and redevelopment workers who may incidentally ingest or have dermal contact with constituents in groundwater during excavation work.
- Existing data show that the levels of volatile organic compounds (VOCs) are not of concern at this time, but the potential for vapor intrusion exists in portions of the Redevelopment Area if new buildings are constructed where volatile constituents are present in soil or groundwater.
- The primary potential exposure route for facility workers is direct contact with arsenic, lead, antimony, thallium, and cadmium contaminated soils.

Potential Ecological Risks

- The migration of arsenic-contaminated groundwater into the Grand Calumet River is a potential exposure route to aquatic biota including at the groundwater/surface water interface.
- The primary potential exposure route for ecological receptors is direct contact with arsenic, lead, antimony, thallium, cadmium, barium, chromium, cobalt, copper, manganese, selenium, silver, vanadium, and zinc contaminated soils.

The overarching corrective action objectives (objectives) for the facility include:

- Protection of human health, based on current and reasonably anticipated land uses;
- Attainment of approved groundwater protection standards;
- Controlling the source of release(s) so as to reduce or eliminate, to the maximum extent practical, further releases of COCs into the environment that may further pose a threat to human health or the environment;
- Compliance with appropriate and relevant standards; and
- Use of best management practices of EPA's Green Remediation concepts to reduce the demands placed on the environment.

For soils, short- and long-term cleanup goals have been developed based on the protection of human health and the environment. These goals include potential future use, long-term goals of reducing contamination and soil concentrations at the facility, and preventing COCs releases

from soil to groundwater. These goals are summarized below:

- Minimize direct contact exposure to surficial soils;
- Achieve 1×10^{-5} residual risk from direct contact with soils, and a noncancer Hazard Index <1 across entire redevelopment area;
- Achieve a lead exposure factor of less than 1.0 in the Leased Area to reduce residual risk from direct contact with soils; and
- Remediate identified soil-to-groundwater source areas with arsenic >1,000 milligrams per kilogram (mg/kg) in the northern and southern portions of the facility to remove a significant fraction (close to 50%) of the arsenic mass to reduce arsenic leaching to groundwater.

For groundwater, cleanup goals have been identified based on potential future facility uses and the long-term goals of reducing contamination and groundwater concentrations at facility boundaries. These goals are summarized below.

- **Short Term** (~ 1-5 years)
  - Mitigate potential groundwater contribution/influence on the water quality in the Grand Calumet River.
  - Demonstrate measurable groundwater quality improvement close to source areas and monitor for arsenic reductions at the property boundaries.
- **Long Term** (5 + years)
  - Meet the Drinking Water Standard MCL for arsenic (0.01 mg/L) at the northern property boundary and the Surface Water Quality Standard (0.148 mg/L) at the southern property boundary near the point of discharge to the Grand Calumet River.

SUMMARY OF POTENTIAL REMEDIAL ALTERNATIVES

(See Table 1 for the Comparative Analysis of Corrective Measures Alternatives)

The five potential remedial alternatives evaluated to address contaminated soil and groundwater are presented below. These alternatives are discussed in more detail in the March 2015 CMS. The five potential remedial alternatives are:

Alternative 1: Existing (Baseline) Measures. Monitoring and institutional controls.

Alternative 2: Monitoring and institutional controls with a permeable soil cover.

Alternative 3:

- **Soil**: Permeable soil cover.
- **Groundwater**: ISCF via enhanced microbial sulfate reduction injections and bio-wall(s) trenches. Excavated soil treatment with on-site management.

Alternative 4:

- **Soil:** Permeable soil cover, source area soil excavation, in-situ stabilization of saturated soils and excavated soil treatment with on-site management.
- **Groundwater:** ISCF via enhanced microbial sulfate reduction injections and bio-wall(s) trenches.

Alternative 5:

- **Soil:** Permeable soil cover, source area soil excavation, in-situ stabilization of saturated soils, and excavated soil treatment with on-site management.
- **Groundwater:** Extraction with treatment and filtration (i.e., pump and treat).

EVALUATION OF THE POTENTIAL REMEDIAL ALTERNATIVES AND THE EPA PROPOSED REMEDY

Threshold criteria for evaluating remedial alternatives include protection of human health and the environment, attainment of media cleanup standards, controlling the sources of releases, and complying with applicable standards for waste management. Alternatives that successfully meet the threshold criteria are then evaluated against balancing criteria. Balancing criteria include long-term reliability and effectiveness, reduction in the toxicity, mobility or volume of wastes, short-term effectiveness, implementability, cost, and sustainability.

Alternative 1. Baseline Measures

This alternative includes groundwater monitoring and maintaining institutional controls including industrial or commercial zoning, security guards, intrusive activity permits, and recorded environmental covenant restrictions to prohibit non-industrial uses, to prevent the installation of on-site drinking water supply wells in the future, and to require notification of any future developers of the potential for vapor intrusion risks in new buildings. Should future construction or maintenance activities require disturbance of the soil, disposal of any soils must meet all hazardous waste management requirements and all remedial and construction staff must wear personal protective equipment. In addition, five-year remedy reviews will be implemented to update the Conceptual Site Model, evaluate remedy efficacy, update the Financial Assurance timeline and make adjustments if needed. Currently, the facility has a security fence and access is permitted only through a single manned security gate. Groundwater monitoring and maintenance of the above controls are expected to be required for a minimum of 30 years.

Protective of Human Health and the Environment

Alternative 1 would not comply with the CAOs established for the protection of human health and the environment. This baseline alternative would allow contamination to remain in place and have no effect on arsenic mass, concentrations, or mobility within soil and groundwater. Residual risk to human health and the environment under future conditions would remain unchanged under this alternative with the exception of the above additional controls.

Attain Media Cleanup Standards
Contaminated soil and groundwater that currently exceeds cleanup standards would remain under Alternative 1.

Control the Sources of Release
No source area treatment or remediation would be performed under Alternative 1. This alternative does not include any measures to mitigate arsenic contaminated groundwater.

Comply with Any Applicable Standards for Management of Wastes
No waste would be managed under Alternative 1.

Long-term Reliability and Effectiveness
Alternative 1 would not entail any active removal, treatment, or containment technologies. Natural attenuation is not effective for arsenic at this facility. Arsenic would continue to migrate beyond compliance points.

Reduction in Toxicity, Mobility, or Volume of Wastes
Since contaminated soil and groundwater would remain in place and untreated under Alternative 1, no reduction in toxicity, mobility, or volume of waste would occur other than that which would result from natural attenuation.

Costs
The estimated cost for implementing Alternative 1, including annual monitoring and maintaining administrative and institutional controls for 30 years is $1.54M.

Sustainability
No remedial action would be taken under this alternative; therefore, sustainability is not applicable.

Alternative 2. Monitoring and Institutional Controls with a Permeable Soil Cover
This alternative expands on the baseline alternative by installing a 1-foot-thick permeable soil cover in addition to other barriers such as asphalt (e.g., a parking lot) or concrete (e.g., building foundations) over much of the Redevelopment Area to mitigate direct human contact to achieve a target cancer risk of $1x10^{-5}$ with a 2-foot-thick permeable ecological risk soil cover in the unfenced portion of the Redevelopment Area. A total of 164,400 cubic yards (CY) of soil cover may be required. A permeable soil cover would help mitigate the potential for changing the redox conditions. The soil cover would be monitored and maintained to prevent erosion. This alternative includes the long-term monitoring with institutional and administrative controls detailed for Alternative 1.

Protective of Human Health and the Environment
A permeable cover would significantly reduce the potential for human and ecological contact with contaminated soils. This alternative would allow contamination to remain in place and have no effect on the contaminant mass within soil and groundwater. This alternative would not accelerate restoration of groundwater and would not meet the CAO of preventing arsenic

migration to surface water. Alternative 2 would therefore not comply with the CAOs identified in Section 3, established for the protection of human health and the environment.

Attain Media Cleanup Standards
Arsenic contaminated groundwater that currently exceeds cleanup goals would remain under Alternative 2.

Control the Sources of Release
No source area treatment or remediation would be performed under Alternative 2. This alternative does not include measures to improve groundwater quality.

Comply with Any Applicable Standards for Management of Wastes
No waste would be managed under Alternative 2.

Long-term Reliability and Effectiveness
Alternative 2 would not entail any active removal, treatment, or containment technologies. Arsenic mass coupled with the slow leaching of arsenic will maintain arsenic in groundwater above CAOs for long periods of time. Therefore, this alternative would not be reliable or effective in the long term.

Reduction in Toxicity, Mobility, or Volume of Wastes
Since contaminated soil and groundwater would remain in place and untreated under Alternative 2, no reduction in toxicity, mobility, or volume of waste would occur other than that which would result from natural attenuation.

Short-Term Effectiveness
Alternative 2 would not be effective in the short term because it would not comply with the short-term CAOs identified in Section 3, established for the protection of human health and the environment.

Implementability
Installation of a soil cover could easily be implemented at the facility.

Cost
The estimated cost for implementing Alternative 2, including annual monitoring for 30 years and maintaining administrative and institutional controls for 30 years is $9.17M.

Sustainability
In terms of sustainability, Alternative 2 has the following advantages over Alternative 1:

- No remediation-generated waste, reduced potential for cross-media transfer of contaminants, and reduced risk of on-site worker exposure to contaminants with soil cover;
- Less environmental intrusion and smaller treatment-process footprints on the environment, and
- Potentially lower remediation costs compared to aggressive treatment technologies.

When compared to aggressive treatment systems, the potential disadvantages of Alternative 2 include:

- Continued contamination migration or renewed contaminant mobility caused by hydrologic or geochemical changes;
- Longer periods needed to achieve remediation objectives, and more extensive performance monitoring (with associated energy consumption);
- Longer-term institutional controls to ensure long-term protectiveness; and
- More public outreach to gain acceptance.

Alternative 3. Soil: Permeable Cover; Groundwater: In-situ Chemical Fixation via Sulfate Reduction Injections and a Bio-Wall Trench

This alternative includes a soil cover to mitigate direct contact with contaminated surface soil as detailed and evaluated to be effective in Alternative 2. Groundwater is treated in Alternative 3 by enhanced microbial sulfate reduction injections and a bio-wall to sequester arsenic in place.

Protective of Human Health and the Environment

This alternative is protective of human health and the enviromnent. A soil cover would negate the risk for direct contact with contaminated soil. Groundwater treatment, using enhanced microbial sulfate reduction implemented along the plume flow paths would accelerate restoration of the aquifer. Groundwater treatment at the northern and southern property lines with enhanced sulfate reduction would improve groundwater quality at compliance points.

Attain Media Cleanup Standards

Groundwater treatment using enhanced microbial sulfate reduction can meet the cleanup goals for groundwater based on site-specific laboratory treatability test results and on-site pilot tests.

Control the Sources of Release

In this alternative, source areas are not remediated to reduce arsenic leaching into groundwater. However, enhanced microbial sulfate reduction implemented in the saturated zone would intercept arsenic migrating from source areas.

Comply with Any Applicable Standards for Management of Wastes

This alternative will comply with all applicable standards for waste management for implementation of groundwater treatment. Soil removed during implementation of the bio-wall would be treated and managed in the on-site landfill. All waste streams would be analyzed and disposed in compliance with specified waste management standards and in accordance with federal, state, and local regulations. No waste would be managed with the installation of the soil cover.

Long-term Reliability and Effectiveness

Not remediating source areas soils (> 1,000 mg/kg arsenic) would place increased demand on groundwater arsenic treatment zones over the long-term and increase the risk of exceeding the capacity of the treatment zones to sequester arsenic.

Reduction in Toxicity, Mobility, or Volume of Wastes
The total quantity of arsenic is not decreased in this alternative. Enhanced microbial sulfate reduction injections and bio-walls in the saturated zone would reduce arsenic mobility and accelerate restoration of groundwater quality along the plumes.

Short-Term Effectiveness
Soil cover and/or building foundations would result in the immediate protection of human and ecological receptors from direct contact with contaminated soil. A sulfate reduction bio-wall near the southern property line would result in rapid improvement of groundwater quality at compliance points.

Implementability
All of the individual technologies of this alternative can be implemented with standard techniques and equipment.

Cost
The estimated cost for implementing Alternative 3, including annual monitoring for 30 years, maintaining administrative and institutional controls for 30 years, installing the soil cover, and groundwater treatment is $14.86M.

Sustainability
The sustainability of Alternative 3 addresses the separate component of source area removal with on-site treatment and disposal. The ISCF groundwater treatment occurring within the facility relies on naturally-occurring microorganisms to consume and break down chemical contaminants through metabolic processes. This phenomenon has been well-documented and is effective in addressing COCs. ISCF incorporates several key elements of sustainable remediation:

- Eliminates transfer of contamination present in other approaches;
- Uses natural processes, thereby minimizing human intervention and excessive energy use;
- Is safe, reduces environmental stress, minimizes ground disturbances;
- Reduces construction, materials used, and waste generated; and
- Can be effectively used as the primary treatment method or in conjunction with other remediation approaches in a very cost-effective manner.

The natural processes that drive ISCF can be enhanced to increase the effectiveness and reduce time required to meet cleanup objectives by:

- Adjusting/optimizing in-situ conditions through addition/manipulation of nutrients and introduction of additional microbes; and
- Providing a sustainable remedial alternative, reducing air emissions associated with conventional pump-and-treat systems.

Alternative 4. Soil: Permeable Cover and Source Area Soil Excavation, In-Situ Stabilization of Saturated Soil, and Excavated Soil Treatment with On-site Management; Groundwater: In-situ Chemical Fixation via Sulfate Reduction Injections and a Bio-Wall Trench

This alternative includes the same soil cover and sulfate reduction injections and bio-wall trench developed for Alternative 3. Alternative 4 expands on Alternative 3 by excavating arsenic source areas (with treatment and on-site management in the landfill) to decrease the source of arsenic to groundwater. Based on the arsenic fate and transport conceptual model and modeling results, source area remediation to reduce arsenic leaching into groundwater coupled with in-situ groundwater treatment is most likely to achieve short- and long-term goals. The removal of soil containing arsenic at concentrations greater than 1,000 mg/kg is predicted to result in decreased arsenic concentrations in groundwater and decreased arsenic loading to groundwater treatment zones as described below. Alternative 4 also includes the excavation of approximately 14,000 cubic yards of lead-contaminated surface soils over portions of the Leased Area for on-site management. The addition of other barriers such as asphalt (e.g., a parking lot) or concrete (e.g., building foundations) mitigate direct human contact to achieve a residual target cancer risk of $1x10^{-5}$ and a lead exposure factor of less than 1.0 over portions of the Leased Area. Because the soil cover and groundwater treatment approach in Alternative 4 is the same as Alternative 3, these components are not discussed further below. However, it is important to recognize that excavations in the source area will result in the removal of the highest concentrations of arsenic-contaminated soils to depths of greater than 4 feet bgs. This reduces the overall risk of direct contact where concentrations are highest. This, in combination with facility security, fencing, and institutional controls, reduces reliance on the soil cover to mitigate contact with contaminated surface soil.

Protective of Human Health and the Environment

This alternative is considered protective of human health and the environment. The combination of source area remediation, soil cover, and groundwater treatment would significantly reduce the potential for exposure and improve groundwater quality.

Attainment of Media Cleanup Standards

This alternative is intended to meet all of the CAOs including cleanup goals.

Control the Sources of Release

SWMU 4 source area; less than 50% in the PRB area) and a significant amount of lead-contaminated soil would be removed, treated, and managed in the on-site landfill. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB. Saturated soil at depths too deep to excavate would be treated by mixing with an arsenic treatment media and/or cement. Enhanced microbial sulfate reduction injections in the saturated zone immediately downgradient of the source areas and along the arsenic plumes would intercept arsenic migrating from remaining sources.

Comply with Any Applicable Standards for Management of Wastes

This alternative complies with all applicable standards for waste management for implementation of groundwater and soil treatments. All waste would be analyzed and disposed in compliance

with specified waste management standards and in accordance with federal, state, and local regulations. For the on-site disposal option, it is anticipated that soils contaminated above hazardous Subtitle C characteristic criteria (per 40 CFR 261.24) will be treated in accordance with the RCRA area of contamination policy and placed on the surface of the existing solid waste landfill. The contaminated soil would be covered with two feet of compacted clay.

Long-term Reliability and Effectiveness

The combination of source area remediation and enhanced microbial sulfate reduction is intended to increase long-term reliability and effectiveness by significantly decreasing arsenic flux to the groundwater treatment zones at the northern and southern property lines. Enhanced microbial sulfate reduction will likely result in the fixation of arsenic to permanent forms. The soil cover is expected to mitigate the exposure routes for all soil COCs, and would be monitored and maintained to prevent erosion.

Reduction in Toxicity, Mobility, or Volume of Wastes

The combination of soil cover, source area remediation, and groundwater treatment will result in reductions in toxicity, mobility, and volume of wastes. The soil cover will immediately reduce the potential for direct contact with surface soil. A significant amount of the arsenic mass and co-located COCs in soil at the facility would be removed with the source area excavations. Treatment of the excavated soil with arsenic stabilization agents prior to management in the on-site landfill reduces the potential for arsenic mobility. Model simulations indicate that removal of soil containing greater than 1,000 mg/kg arsenic will reduce leaching to groundwater resulting in decreases arsenic concentrations in groundwater near the source areas expanding downgradient. In-situ stabilization (ISS) treatment of saturated soil at the bottom of the excavations will further decrease arsenic mobility in the source areas. Sulfate reduction injections near source areas would be used to prevent or limit arsenic migration from remaining sources of arsenic and result in the sequestration of arsenic in stable forms. Sulfate reduction bio-walls installed near compliance points would prevent off-site migration. Another advantage of the sulfate reduction approach is that other metals, such as zinc, cadmium, and lead, should remain immobilized because of their affinity for sulfide sequestration as observed in the laboratory treatability study and on-site pilot tests.

Short-Term Effectiveness

Source soil removal, soil cover, and/or building foundations would result in the immediate protection of human health and ecological direct contact with contaminated soil. Modeling results indicate that source area soil remediation will result in short-term decreases in arsenic concentrations in groundwater at the source areas, and over time (4-5 years), at the Grand Calumet River. Groundwater treatment zones (sulfate reduction injections and bio-walls) near the northern and southern property lines are intended to result in rapid improvement of groundwater quality at compliance points.

Implementability

All of the individual technologies utilized as part of Alternative 4 can be implemented with standard techniques and equipment. Phased implementation is required for optimizing the full-scale design of this alternative.

Cost

The estimated cost for this alternative, including annual monitoring for 30 years, maintaining administrative and institutional controls for 30 years, source removal and installing the soil cover, and groundwater treatment is $22.68M.

Sustainability

The sustainability of Alternative 4 addresses the separate component from the previous alternatives of source area removal with on-site treatment and disposal. The source removal and on-site management of contaminated soil occurring within the facility relies on heavy equipment, manpower, and other significant resources. Source removal technology may provide a few key elements of sustainable remediation:

- Eliminates transfer of contamination off-site, which reduces emissions and potential additional resources for managing accidental releases;
- Use heavy equipment with cleaner fuels such as ultra-low sulfur diesel; and
- Modify field operations through combined activity schedules as well as reducing equipment idle.

Alternative 5. Soil: Permeable Cover and Source Area Soil Excavation, In-Situ Stabilization of Saturated Soil, and Excavated Soil Treatment with On-site Management; Groundwater: Pump and Treat

This alternative includes the same soil cover and excavation of arsenic source areas (with treatment and on-site management in the landfill) to decrease the source of arsenic to groundwater as Alternative 4. Alternative 5 includes groundwater extraction at the property and treatment (pump and treat) with a greensand filtration unit. Treated groundwater is discharged to surface waters.

Protective of Human Health and the Environment

This alternative is considered protective of human health and the environment. The combination of source area remediation, soil cover, and groundwater treatment would eventually reduce the potential for exposure and improve groundwater quality. Groundwater remediation approaches have historically employed groundwater extraction and ex-situ treatment (i.e., pump-and-treat). Unfortunately, pump-and-treat alone may not significantly improve groundwater quality, even over time. The limited performance of most pump-and-treat systems stems largely from the inability to significantly clean the groundwater because of the ongoing source of arsenic coming from its presence in the soil.

Attainment of Media Cleanup Standards

This alternative is intended to meet all of the CAOs, including cleanup goals. However, the combination of long-term arsenic desorption from saturated soil and the low arsenic cleanup goal at the northern property line would result in exceptionally long periods of groundwater extraction and post-extraction treatment - potentially even after source removal. Model results predict that removal of SWMU 4 source soils would result in decreased arsenic concentrations downgradient, but long periods of time would be required to achieve the 0.148 mg/L arsenic cleanup goal at the river.

Control the Sources of Release
A significant quantity of the arsenic at the facility (approximately 50% of the arsenic in the SWMU 4 source area; less than 50% in the PRB area) would be removed, treated, and disposed of in the on-site solid waste landfill. As in Alternative 4, saturated soil at depths too deep to excavate would be treated by mixing with an arsenic treatment media and/or cement. Extraction of contaminated groundwater along the arsenic plumes would intercept arsenic migrating from remaining sources.

Comply with Any Applicable Standards for Management of Wastes
This alternative will comply with all applicable standards for waste management for implementation of groundwater and soil treatments. All wastes would be analyzed and disposed in compliance with specified waste management standards and in accordance with federal, state, and local regulations. For the on-site disposal option, it is anticipated that soils contaminated above hazardous Subtitle C characteristic criteria (per 40 CFR 261.24) will be treated in accordance with the RCRA area of contamination policy and placed on the surface of the former landfill. The contaminated soil disposed of in the onsite solid waste landfill would be covered with two feet of compacted clay. Extracted groundwater would be treated to surface water discharge criteria into the Grand Calumet River (i.e., arsenic at or below 148 mg/L). Treatment sludge residues are anticipated to be hazardous and are expected to be managed as hazardous waste and in accordance with applicable RCRA requirements and disposed of off-site.

Long-term Reliability and Effectiveness
The combination of source area remediation and groundwater pump-and-treat is intended to increase long-term reliability and effectiveness by containment of contaminated groundwater treatment zones at the northern and southern property lines. The existing pavement cover and additional soil cover is expected to mitigate the exposure routes for all soil COCs, and both would be monitored and maintained to prevent erosion. With groundwater recovery, the low hydraulic gradient and fluctuating water levels may result in flow reversals from the river to groundwater. A groundwater extraction system near the river may result in the collection and treatment of large volumes of river water.

Reduction in Toxicity, Mobility, or Volume of Wastes
The combination of existing pavement cover, added soil covers, source area remediation, and groundwater treatment will result in reductions in toxicity, mobility, and volume of wastes. The existing pavement cover and additional soil cover will immediately reduce the potential for direct contact with surface soil. A significant amount of the arsenic mass and co-located soil COCs at the facility would be removed with the source area excavations. Treatment of the excavated soil with arsenic stabilization agents prior to management in the on-site landfill reduces the potential for arsenic mobility. Model simulations indicate that removal of soil containing greater than 1,000 mg/kg arsenic will reduce leaching into groundwater and decrease downgradient expansion of arsenic concentrations in groundwater near the source areas over time. ISS treatment of saturated soil at the bottom of the excavations will further decrease arsenic mobility in the source areas. Groundwater pump and treatment systems installed near compliance points would prevent off-site migration.

Short-Term Effectiveness
Soil removal, soil covers, existing pavement and/or building foundations would result in the immediate protection of human health and ecological direct contact with contaminated soil. Modeling results indicate that source area soil remediation will result in short-term decreases in arsenic concentrations in groundwater at the source areas, and over time (4 to 5 years), at the Grand Calumet River. However, model simulations indicate that, even after removal of contaminated soils in the source areas, the long-term groundwater CAOs would not be achieved for a very long period of time (more than 100 years). The limited groundwater flow caused by low hydraulic gradient and limited drainage area contributes to this slow depuration of arsenic. Also, there is a substantial amount of arsenic adsorbed to solids in the saturated zone between the source areas and compliance points; as source levels fell, it would slowly desorb and buffer arsenic concentrations above the cleanup goals. This implies that if groundwater extraction and treatment and discharge (pump-and-treat) were selected as the general response action, this process would need to continue indefinitely. While groundwater extraction and treatment is a well-established technology, the cost and potential for failure both increase due to the relative inefficiency of the process.

Implementability
All of the individual technologies of this alternative can be implemented with standard techniques and equipment.

Cost
The estimated cost for Alternative 5, including annual monitoring, maintaining administrative and institutional controls for 30 years, source removal and installing a soil cover, and operating a groundwater pump-and-treat system is $35.02M.

Sustainability
Alternative 5 does not use green remediation best management practices because of the significant resources used in the groundwater extraction and treatment.

EPA Proposed Remedy
Based on the comparative analysis of alternatives presented above, the recommended corrective measure based on the available information is **Alternative 4:**

- **Soil:** Permeable soil cover, source area soil excavation, ISS of saturated soils and excavated soil treatment with on-site management.

- **Groundwater**: ISCF via sulfate reduction injections and a bio-wall trench located along the southern property line upgradient of the river and within the northern source areas of the facility.

The recommended corrective measures with respect to the site conceptual model and remedial action objectives are summarized as follows:

- Control direct contact with contaminated soil by maintaining existing pavement and foundation barriers, installation and maintenance of a permeable soil cover.

- The excavation, treatment, and on-site management of soil with greater than 1,000 mg/kg arsenic from source areas removes and stabilizes a significant portion of the arsenic at the Facility (approximately 50% of the arsenic in the SWMU 4 source area; less than 50% in the PRB area) that is contributing arsenic to groundwater. Modeling predicts that this removal will result in decreased arsenic concentrations in groundwater in the source areas and downgradient.

- The excavation, treatment, and on-site management of lead contaminated soil in the Leased Area in addition to other barriers such as asphalt (e.g., a parking lot) or concrete (e.g., buildings) mitigates direct human contact, and achieves a residual target cancer risk of 1×10^{-5} and a lead exposure factor of less than 1.0.

- In-situ treatment of soil below the water table within the source area excavations where saturated soil concentrations warrant treatment will further reduce the arsenic source to groundwater.

- Enhanced sulfate reduction injection treatment zones along the plume flow paths and a bio-barrier located near the river will intercept arsenic along the plumes and reduce or eliminate additional arsenic migration beyond compliance points. The combination of source area remediation and treatment zones transecting plume flow paths will significantly reduce arsenic migration to the bio-barrier and sulfate reduction injection treatment zone located at the southern and northern property lines, respectively.

- Enhanced microbial sulfate reduction injections to treat the saturated zone extending from the SWMU 4 and northern sources to the compliance points. This is intended to rapidly reduce arsenic in groundwater, reduce the flux of arsenic to the bio-barriers to extend their longevity, and to convert existing forms of arsenic in saturated soils into forms that do not continue to supply arsenic to groundwater.

- Estimate and set aside financial assurance for necessary remediation including long-term OM&M. Any future plans to further consolidate the landfill may require additional financial assurance and possible modifications to the SB.

- Record, implement and maintain EPA-approved institutional controls to ensure protection of workers and ensure that the facility's land use remains consistent with the remedial endpoints and risk assessments. These restrictions will be embodied in a recorded environmental restrictive covenant and deed restriction that runs with the land and will be provided to IDEM's Institutional Controls Registry and Virtual File Cabinet.

- Timely issue a corrective action implementation order to assure compliance with the SB.

The combination of source area remediation via excavation, a soil cover, and groundwater treatment would negate potential for exposure and improve groundwater quality. This alternative is therefore considered protective of human health and the environment.

The recommended corrective measures address the corrective action objectives:

Soil

- Minimize direct contact exposure to surficial soils
- Achieve $1x10^{-5}$ residual risk from direct contact with soils
- Achieve a noncancer Hazard Index<1 across entire redevelopment area
- Remediate identified soil-to-groundwater source areas of arsenic >1,000 mg/kg
- Remediate identified soil source areas of lead to an exposure factor of less than 1.0.

Groundwater

- Short Term (~ 1 to 5 years)
    - Demonstrate measurable groundwater quality improvement close to source areas and monitor for arsenic reductions at the property boundaries
- Long Term (5+ years)
    - Meet the Drinking Water Standard MCL for arsenic (0.01 mg/L or lower) at the northern property boundary and the Surface Water Quality Standard (0.148 mg/L or lower) at the southern property boundary by the river
    - Mitigate potential groundwater contribution/influence on the water quality into the Grand Calumet River

Based on information currently available, EPA's proposed remedy provides balance with respect to the standards described above. EPA believes that the proposed remedy is protective of human health and the environment, and will effectively control human and environmental exposure to contaminants in soil and groundwater. All applicable standards regarding surface water protection, worker protection, and onsite/offsite waste management will be addressed and complied with during implementation of the remedy.

PUBLIC PARTICIPATION

EPA seeks input from the local community on its proposed remedy to address contaminated soil and groundwater at the DuPont East Chicago facility. There will be a 30-day comment period for the public to participate in selecting the final remedy. EPA will schedule a public meeting to answer questions and accept comments. The Administrative Record supporting this SB is available online at https://www.epa.gov/in/hazardous-waste-cleanup-dupont-facility-east-chicago-indiana and at the following locations:

East Chicago Public Library
1008 W. Chicago Avenue
East Chicago, Indiana 46312

and

EPA Region 5
RCRA Records Center
77 West Jackson Boulevard, 7th Floor
Chicago, Illinois 60604-3590
(312) 886-0902
Hours: Mon-Fri, 9:00 a.m. - 4:00 p.m.

After consideration of public comments on the proposed remedy, EPA will select a final remedy and document its selection in a Final Decision and Response to Comments. In addition, EPA will summarize public comments and provide responses. The Final Decision and Response to comments will be drafted at the conclusion of the public comment period and incorporated into the Administrative Record.

To request information on the public comment period for the proposed remedy at the DuPont facility, please contact:

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To send written comments or request technical information, please contact:

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ADMINISTRATIVE RECORD (REVISED JANUARY 2018)
FOR THE

WESTERN PORTION/INDUSTRIAL AREA
EPA ID NO: IND 005 174 354

STATEMENT OF BASIS

DU PONT FACILITY
EAST CHICAGO, LAKE COUNTY, INDIANA

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
001 Dupont SB West Industrial Area (938054)	2/1/90	CH2M Hill	File	Phase I Groundwater Assessment	246
002 Dupont SB West Industrial Area (938055)	8/1/91	CH2M Hill	File	Phase II Groundwater Assessment	832
003 Dupont SB West Industrial Area (938056)	1/1/92	CH2M Hill	DuPont	Phase III Unsaturated Soil and Groundwater Quality Data (Also referenced as Phase III Groundwater Report or Phase III Groundwater Assessment)	370
004 Dupont SB West Industrial Area (936233)	6/17/97	U.S. EPA	File	RCRA Corrective Action Order for the DuPont East Chicago Facility (Agreed Order on Consent, Du Pont East Chicago, IN, EPA Docket No. 5-RCRA-'97-007)	82
005 Dupont SB West Industrial Area (938057)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 1	141
006 Dupont SB West Industrial Area (938058)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 2: Book 1	1018

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007 Dupont SB West Industrial Area (938059)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 2: Book 2	668
008 Dupont SB West Industrial Area (938078)	10/1/97	DuPont	CH2M	Current Conditions Report for the DuPont East Chicago Facility Vol. 2: Book 2	737
009 Dupont SB West Industrial Area (938060)	10/1/02	DuPont	File	Final Phase I RFI Report	511
010 Dupont SB West Industrial Area (938061)	4/1/04	DuPont	File	Phase II RFI Report	518
011 Dupont SB West Industrial Area (938062)	12/1/04	DuPont	File	Current Human Exposure Under Control (CA725)	423
012 Dupont SB West Industrial Area (938063)	2/1/05	DuPont	File	Migration of Contaminated Groundwater Under Control (CA750)	182
013 Dupont SB West Industrial Area (938064)	10/1/06	DuPont	File	Corrective Measures Study	331
014 Dupont SB West Industrial Area (938065)	8/1/07	DuPont	File	Supplemental Corrective Measures Investigation Work Plan	37

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
015 Dupont SB West Industrial Area (938077)	10/15/09	Parsons	DuPont	Sampling Plan - Revised CMS	76
016 Dupont SB West Industrial Area (938066)	3/3/11	Parsons	Yalvigi, S., DuPont	Technical Memorandum: Summary of Air Monitoring Results	29
017 Dupont SB West Industrial Area (938067)	7/1/11	Parsons	DuPont	Screening Level Ecological Risk Assessment	32
018 Dupont SB West Industrial Area (938068)	2/1/12	Pioneer Technologies Corporation	DuPont	Human Health Risk Assessment	582
019 Dupont SB West Industrial Area (938074)	3/1/13	Parsons	DuPont	Groundwater Evaluation	3287
020 Dupont SB West Industrial Area (938069)	5/1/13	Parsons	DuPont	Baseline Ecological Risk Assessment	189
021 Dupont SB West Industrial Area (938070)	7/1/13	Parsons	DuPont	Natural Area Evaluation, Risk Assessment and Monitoring Plan	292
022 Dupont SB West Industrial Area (938052)	9/13/13	Parsons	File	Technical Memorandum: Focused Remedial Technology Screening Update	19
023 Dupont SB West Industrial Area (938050)	7/1/14	CH2M Hill & Parsons	E.I. Du Pont De Numours and Company	Bench-Scale Study Report	141

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
024 Dupont SB West Industrial Area (938072)	9/30/14	Cisneros, J., U.S.EPA	Guerriero, M., U.S. EPA	Final Decision Document for the DuPont Facility Area and Buffer Zone	17
025 Dupont SB West Industrial Area (938071)	11/1/14	Parsons	DuPont	Final Pilot Test Work Plan	67
026 Dupont SB West Industrial Area (938051)	1/20/15	Parsons	File	Technical Memorandum Off Site Soil Investigation. Railroad Right-of Way	199
027 Dupont SB West Industrial Area (938073)	3/1/15	Parsons	DuPont	Corrective Measures Study	150
028 Dupont SB West Industrial Area (938049)	6/1/15	Parsons	The Chemours Company FC, LLC	Interim Remedial Measures 2015 Excavations and Soil Treatment Work Plan	45
029 Dupont SB West Industrial Area (938075)	10/1/16	Parsons	The Chemours Company FC, LLC	Addendum to Corrective Measures Study for Grace Parcel	320
030 Dupont SB West Industrial Area (938076)	12/1/16	Parsons	The Chemours Company FC, LLC	Interim Remedial Measures Completion Report	6821

U.S. ENVIRONMENTAL PROTECTION AGENCY
LCD

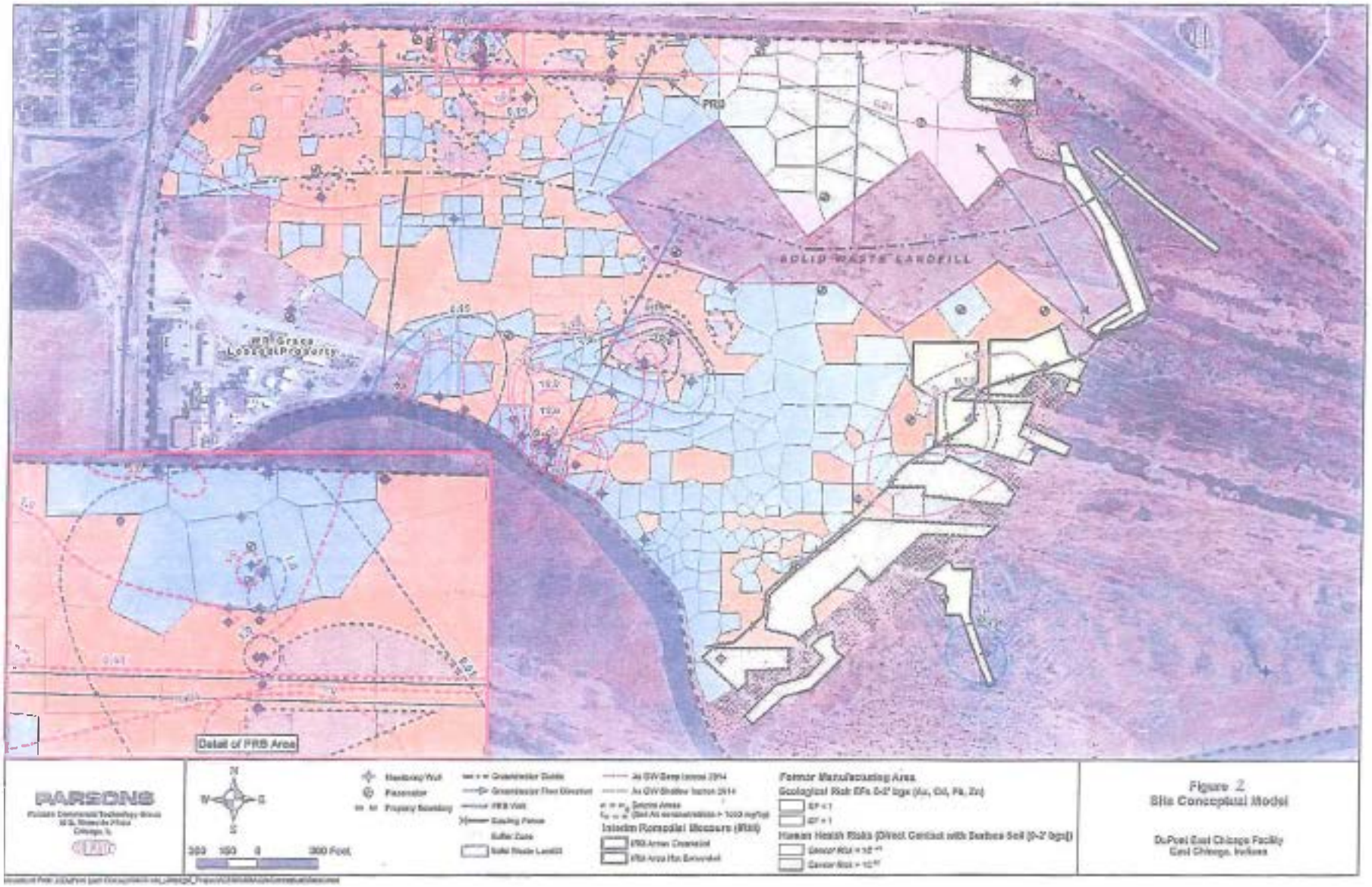
ADMINISTRATIVE RECORD
STATEMENT OF BASIS
DU PONT EI DE NEMOURS & CO SITE
EAST CHICAGO, LAKE COUNTY, INDIANA

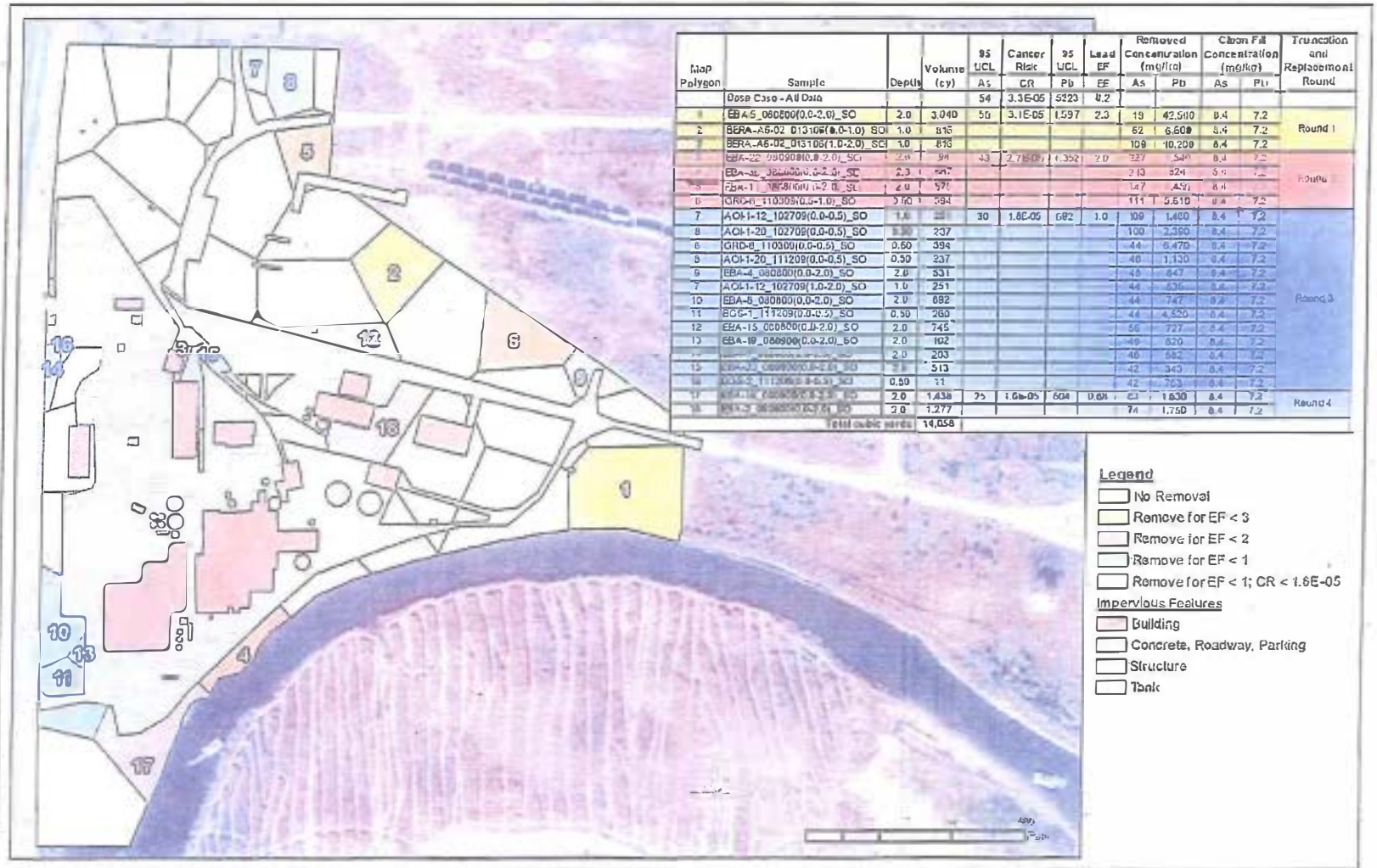
SUPPLEMENT
JANUARY 2018
SEMS ID: 936236

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	936235	12/8/04	U.S. EPA	File	CRL Review of Region 5 Dupont Soil and Sump Pump Data	13
2	516309	1/20/05	U.S. EPA	File	Sump Pump Sampling Transmittal Letters to Residents (Redacted)	10
3	516308	8/21/07	East Chicago, City of	U.S. EPA	East Chicago Sanitary District Letter and Lab Data to EPA (Redacted)	19
4	936234	1/5/18	U.S. EPA	File	Administrative Record Index (Revised January 2018)	4

Figures


OPEN AREA LANDFILL
~52 acres
FORMER WASTE LANDFILL
LEASED AREA
~20 acres
REDEVELOPMENT AREA
~133 acres
BUFFER ZONE
NATURAL AREA
~172 acres
N
0 100 200 300 400 600 Feet
PARSONS
Figure 1
Natural Area Ridge and Swale Vegetation
Natural Area Evaluation and Management Plan
DuPont East Chicago Facility
East Chicago, Indiana
Current Disposal Boundary
River Fence
Estimated Buffer Zone (~33 acres)
Future GCR-ERP Sand Wetlands
Plant Community Mapping
Swale (Wetland)
Dune/Ridge - Upland Prairie
Dune/Ridge - Oak Savanna
River
Property Boundary


PRB
SOLID WASTE LANDFILL
W.R. Grace Lodestar Property
Detail of PRB Area
PARSONS
N
W
E
S
300 150 0 300 Feet
Monitoring Well
Piezometer
Property Boundary
PRB Wall
Former Manufacturing Area
Ecological Risk EPs 0-2' bgs (As, Cd, Pb, Zn)
Human Health Risks (Direct Contact with Surface Soil (0-2' bgs))
Figure 2
Site Conceptual Model
DuPont East Chicago Facility
East Chicago, Indiana



Map Polygon	Sample	Depth	Volume (cy)	95 UCL As	Cancer Risk CR	95 UCL Pb	Lead EF	Removed Concentration (mg/kg) As	Removed Concentration (mg/kg) Pb	Clean Fill Concentration (mg/kg) As	Clean Fill Concentration (mg/kg) Pb	Truncation and Replacement Round
	Base Case - All Data			54	3.3E-05	5223	8.2					
1	EBA-5_060800(0.0-2.0)_SO	2.0	3,040	50	3.1E-05	1,597	2.3	19	42,500	8.4	7.2	Round 1
2	BERA-A6-02_013106(0.0-1.0)_SO	1.0	816					62	6,600	8.4	7.2	
	BERA-A6-02_013106(1.0-2.0)_SO	1.0	816					109	10,200	8.4	7.2	
	EBA-22_060900(0.0-2.0)_SO	2.0	94	43	2.7E-05	1,352	2.0	327	540	8.4	7.2	Round 2
	EBA-3[illegible]	2.0	507					213	524	8.4	7.2	
	EBA-1[illegible]	2.0	571					147	4,470	8.4		
6	GRID-6_110309(0.0-1.0)_SO	0.50	394					111	5,610	8.4	7.2	
7	AOI-1-12_102709(0.0-0.5)_SO	1.0	[illegible]	30	1.6E-05	682	1.0	109	1,400	8.4	7.2	Round 3
8	AOI-1-20_102709(0.0-0.5)_SO	0.50	237					100	2,390	8.4	7.2	
9	GRID-8_110309(0.0-0.5)_SO	0.50	394					44	6,470	8.4	7.2	
8	AOI-1-20_111209(0.0-0.5)_SO	0.50	237					46	1,130	8.4	7.2	
9	EBA-4_060800(0.0-2.0)_SO	2.0	331					45	847	8.4	7.2	
7	AOI-1-12_102709(1.0-2.0)_SO	1.0	251					44	536	8.4	7.2	
10	EBA-8_060800(0.0-2.0)_SO	2.0	682					44	747	8.4	7.2	
11	BGG-1_111209(0.0-0.5)_SO	0.50	260					44	4,520	8.4	7.2	
12	EBA-15_060800(0.0-2.0)_SO	2.0	745					56	727	8.4	7.2	
13	EBA-19_060900(0.0-2.0)_SO	2.0	102					49	820	8.4	7.2	
	[illegible]	2.0	203					46	582	8.4	7.2	
15	EBA-12_060900(0.0-2.0)_SO	2.0	513					42	345	8.4	7.2	
16	BGG-2_111209(0.0-0.5)_SO	0.50	71					42	263	8.4	7.2	
17	EBA-16_060800(0.0-2.0)_SO	2.0	1,438	25	1.6E-05	604	0.84	63	1,630	8.4	7.2	Round 4
18	EBA-2_060800(0.0-2.0)_SO	2.0	1,277					74	1,750	8.4	7.2	
	Total cubic yards		14,058									

PIONEER TECHNOLOGIES CORPORATION

Excavation Evaluation
Grace Property
East Chicago Site

Figure 3

Table

Table 1
Comparative Analysis of Corrective Measures Alternatives

Corrective Measures Alternative	STANDARDS: Overall Protection of Human Health and the Environment	STANDARDS: Source Control	STANDARDS: Control the source(s) of releases to reduce or eliminate further releases	STANDARDS: Comply with applicable standards for waste management	STANDARDS: Long-Term Effectiveness and Permanence	STANDARDS: Reduction of TMV of Wastes	OTHER FACTORS: Short-Term Effectiveness	OTHER FACTORS: Implementability	OTHER FACTORS: Present Worth
1 [illegible]	[illegible]	Does not achieve CAO	Does not control leaching to groundwater or arsenic migration	No waste would be managed	Not effective	[illegible]	Not effective	[illegible]	[illegible]
2 Monitoring and Institutional Controls with a Permeable Soil Cover	Not protective of human health and environment	Does not achieve CAO	Does not control leaching to groundwater or arsenic migration	No waste would be managed	Not effective Leaching of arsenic to groundwater will sustain concentrations above CAOs for a very long period of time Arsenic migration at compliance points is not controlled Residual risk to human health is low because cover will prevent contact with impacted soil and groundwater is not used on-site or in the surrounding area for drinking water	Does nothing to reduce TMV beyond natural processes which are not effective at the Site	Not effective for groundwater	Readily implementable (uses well established technologies)	$9,170,600
3 Soil: Permeable Cover Groundwater: In-situ chemical fixation (ISCF) via sulfate reduction injections and a bio-wall trench	Protective of human health and environment	Achieves current and future CAO	Intercepts arsenic migrating from source areas but does not eliminate or remediate the source areas	Yes, complies with applicable standards for waste management	Questionable Absence of source area soil remediation results in high demand for treating arsenic in the saturated zone and increased duration required to maintain arsenic treatment in the saturated zone.	Reduces TMV in groundwater and saturated soil through treatment	Immediately reduces or eliminates the potential for human and ecological contact with impacted soil. Rapid restoration of groundwater quality at compliance points with improving groundwater quality along the plume overtime.	*Soil Cover*: Readily implementable (uses well established technologies) *ISCF*: Readily implemented	$14,362,760

Table 5 (*continued*)
Comparative Analysis of Corrective Measures Alternatives

Corrective Measure Alternative	Overall Protection of Human Health and the Environment	STANDARDS: Attain Media Cleanup Standards	STANDARDS: Control the Sources of Releases to Minimize Further Releases	STANDARDS: Comply with Standards for Management of Wastes	STANDARDS: Effectiveness	OTHER FACTORS: Reduction of TMV through Treatment	OTHER FACTORS: Short-Term Effectiveness	OTHER FACTORS: Implementability	Total Present Worth Value (1)
4 Soil: Permeable soil cover and source area soil excavation with on site management Groundwater: In-situ chemical fixation (ISCF) via sulfate reduction injections and a bio-wall trench	Protective of human health and environment	Achieves current and future CAO.	Removes contaminated soil in source areas and treats groundwater migrating from the source areas	Yes, complies with applicable standards for waste management	Effective over long-term. Source area excavations reduce arsenic migration to groundwater treatment zones.	Reduces TMV through: 1) removal and treatment of soil from the source areas, 2) application of a soil cover mitigates direct contact, and 3) source area excavations and 4) groundwater treatment reduces concentrations and mobility in groundwater.	Immediately reduces or eliminates the potential for human and ecological contact with impacted soil Eventual restoration of groundwater quality at compliance points with improving groundwater quality along the plume oververy long period of time.	Individual technologies can be readily implemented.	$22,683,527
5 Soil: Permeable soil cover and source area soil excavation with on-site management Groundwater: recovery through extraction wells and treatment of extracted groundwater with ion exchange resins and filtration followed by discharge to surface waters	Protective of human health and environment	Achieves current and future CAOs for soil. Unlikely to achieve long term groundwater clean-up goals	Removes contaminated soil in source areas	Yes, complies with applicable standards for waste management	Unlikely to achieve long-term groundwater clean-up goals but off site migration is controlled. Minimally multiple decades of groundwater extraction required.	Reduces TMV through: 1) removal and treatment of soil from the source areas, 2) application of a soil cover mitigates direct contact, 3) source area excavations, and 4) off-site migration of impacted groundwater is prevented	Immediately reduces or eliminates the potential for human and ecological contact with impacted soil Improved groundwater quality at compliance points is predicted.	Individual technologies can be readily implemented.	$35,019,000

N/A not applicable
(1) Details of the cost estimates are provided in Appendix A. - CMS