



WEST VIRGINIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATEMENT OF BASIS

DuPont Washington Works

Washington, West Virginia
EPA ID No. WVD 04-587-5291

Prepared by
West Virginia Department of
Environmental Protection

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I. INTRODUCTION

The West Virginia Department of Environmental Protection (AGENCY) has prepared this Statement of Basis (SB) to solicit public comment on its proposed decision for the DuPont Washington Works (Facility) located in Washington, West Virginia. EPA's proposed remedy consists of requiring the Facility to maintain an inward gradient for groundwater so as to ensure that during a monitored natural attenuation process the contaminated groundwater underlying the Facility is captured and treated at the Facility wastewater treatment plant. The contaminated groundwater capture and treatment program will be maintained until such time that the Facility can demonstrate that the concentrations of constituents in the groundwater at the Facility are below Maximum Contaminant Levels (MCLs) or West Virginia Department of Environmental Protection (WVDEP) acceptable limits. The Facility will also be required to develop and maintain property restrictions known as Institutional Controls (ICs). This SB highlights key information relied upon by the AGENCY in making its proposed decision.

WVDEP is providing a 30-day public comment period on this SB. WVDEP may modify its proposed remedy based on comments received during this period. WVDEP will announce its selection of a final remedy for the Facility in a Final Decision and Response to Comments (Final Decision) after the public comment period has ended.

The Facility is subject to the Corrective Action (CA) Program under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, and the Hazardous and Solid Waste Amendments (HSWA) of 1984, 42 U.S.C. §§ 6901 et seq. (Corrective Action Program). The RCRA CA Program is designed to ensure that certain facilities subject to RCRA have investigated and cleaned up any releases of hazardous waste and hazardous constituents that have occurred at their property.

Information on the Corrective Action program as well as a fact sheet for the Facility can be found by navigating <http://www.epa.gov/reg3wcmd/correctiveaction.htm>.

The Administrative Record (AR) for the Facility contains all documents, including data and quality assurance information, on which WVDEP's proposed decision is based. See Section XV Public Participation, for information on how you may review the AR.

II. FACILITY LOCATION AND SETTING

The 1,200-acre facility is located along the Ohio River in Washington, West Virginia, Approximately seven miles southwest of Parkersburg, West Virginia (see Figure 1). The Site also includes Blennerhassett Island, located upstream of the plant in the Ohio River where one of several site groundwater extraction well fields is located. The site is located in an area of industrial and residential land use. Immediately adjacent to the western boundary of the site are the Sabic Plastics (formerly General Electric Plastics) plant and two industrial warehouses. The northern side of the site is bounded by the Ohio River, which flows from east to west. A heavily wooded and hilly 250-acre closed solid waste landfill (i.e., Local Landfill), owned by E.I. du Pont de Nemours and Company (DuPont), is located contiguous with the site on its southern boundary. The eastern side of the site is bounded by U. S. Route 50, Robert Byrd Highway. Residential areas are located within one mile on the southern, eastern, and western boundaries of the site.

III. FACILITY BACKGROUND

The land at the site was originally used for agricultural purposes. The initial manufacturing units constructed at the site were completed in 1948. Since the site opened it has expanded to include manufacturing of hundreds of products for the automotive and construction industries. The site has produced a variety of products including the following:

- Compounded engineering plastics
- Nylon molding pellets and filaments
- Acrylic molding compounds
- Polyvinyl butyral
- Acrylic resins
- Fluoropolymers
- Polyacetal products

Currently, the manufacturing operations reside on about 200 acres of the site and consist of 14 operating and service divisions that span nearly a mile along the Ohio River.

The Facility currently utilizes 20 wells pumping at an average of 4 million gallons of water per day. This pumping rate maintains an inward hydraulic gradient throughout the plant and due to the long term pumping has depressed the water table by over 26 feet in places. The inward gradient can be maintained at much lower pumping rates. The Facility replaces wells or augments the groundwater supply system as demand dictates. The USEPA and USACOE reviewed groundwater model utilized to evaluate well placement and to ensure that the hydraulic gradient captures site groundwater. The model is also used to evaluate the impact of pumping scenarios on the plume of impacted groundwater, with the goal of maintaining or reducing the footprint of the plume. It is conceivable that pumping rates at the plant will be reduced in the future, if plant processes change or process efficiencies are achieved. The groundwater flow model and groundwater measurements will continue to be utilized to monitor the Facility's hydraulic control of the site as the Facility's water demands change.

All Facility water discharges are regulated by the Facility's NPDES (National Pollutant Discharge Elimination System) permit, which is administered by the WVDEP, and requires location specific analyses and regulatory compliance limits.

IV. SOLID WASTE MANAGEMENT UNITS SUMMARY

The Dupont Washington Works facility is subject to a variety of federal and state environmental regulations. The Dupont Washington Works RCRA Corrective Action program is under the jurisdiction of the WVDEP through HSWA Permit Number WVD045875291.

A RCRA Facility Investigation (RFI) was conducted in 1998 and 1999 on four Solid waste Management Units (SWMUs) at DuPont Washington Works to satisfy requirements of its RCRA HSWA Permit. The investigation determined the nature and extent of waste constituent releases from these units into underlying soil; determined the rate of migration in groundwater

and other media; and evaluated potential impacts to human health and the environment from these releases. The RFI was approved by EPA Region III in February 2006. The Four SWMUs that were investigated during the RFI conducted in 1998 and 1999 included:

1. SWMU A-3, the Riverbank Landfill (RBL)
2. SWMU B-4 Anaerobic Digestion Ponds (ADP)
3. SWMU C-6, the Polyacetal Waste Incinerator (PWI)
4. SWMU H-14, the Burning Grounds (BG)

Based on the findings of the RFI, two of these SWMUs (SWMU A-3 and SWMU B-4) were carried forward into the Corrective Measures Study (CMS) because select volatile organic constituents (VOCs) and perfluorooctanoic acid (PFOA) released from these SWMUs exceeded appropriate groundwater and soil screening level criteria. Neither SWMU C-6 (PWI) nor SWMU H-14 (BG) was carried forward in the CMS because the RFI risk evaluation identified no complete exposure pathways for potential human or ecological receptors at these units.

V. SUMMARY OF ENVIRONMENTAL INVESTIGATIONS

For all environmental investigations, groundwater concentrations were screened against federal Maximum Contaminant Levels (MCLs) promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141, or EPA Region III Screening Levels (RSL) for tap water for chemicals for which there are no applicable MCL. Soil concentrations were screened against EPA RSLs for residential soil and industrial soil.

SWMU C-6, the Polyacetal Waste Incinerator (PWI)

The PWI consisted of two brick-lined pits which operated between 1959 and early 1990. Off-specification polyacetal polymer and non-hazardous solid waste packing materials were burned in the unit. By 1997, closure of the PWI was completed by removing the fire brick to a depth of approximately 2 feet below grade. Toxicity characteristic leaching procedure (TCLP) indicated that the brick was not RCRA hazardous and that the remaining subsurface brick lining the pit could be left in place. The pit was then backfilled with clean soil and covered with gravel. Currently, the area around the former PWI is covered with gravel, asphalt, and/or concrete. Surface soil total chromium results from samples collected at the PWI were within those measured for site background samples. The concentrations of total chromium measured are below the November 2013 EPA Regional Screening Levels (SLs) for Industrial Soil for trivalent chromium, but are above the SL for hexavalent chromium. Hexavalent chromium in soil, however, is expected to be reduced to trivalent chromium by organic matter (<http://www.epa.gov/iris/toxreviews/0144tr.pdf>).

A risk evaluation was conducted during the RFI to determine whether identified releases from the SWMUs were a potential concern for human health or the environment and whether further evaluation or action was warranted. For the PWI, potential concerns for human health were not identified. The presence of a gravel cover mitigates potential worker exposure to underlying soils. Potential exposure that may occur during intrusive activities would be managed

by institutional and administrative controls, such as using appropriate personal protective equipment (PPE) required as part of a health and safety plan (HASP) and plant permitting required for all intrusive activities established as part of site standard operating procedures (SOPs). With respect to potential ecological exposures, the RFI risk evaluation concluded that the PWI did not provide ecological habitat and that subsurface soil was not an exposure media of concern for ecological receptors. Because no complete exposure pathways were identified for human health or for ecological receptors at this SWMU, it was not carried forward in the CMS for this site and was recommended as no further action.

SWMU H-14, the Burning Grounds (BG)

The BG was used for open burning of plant trash and organic liquids between 1948 and 1965. Liquids burned included acrylic monomer slurries, polyvinyl butyral ink slurries, high boiling point liquid fluorocarbon compounds and solvents. Solid wastes included paper, trash, and plastics. Between 1974 and 1990, approximately 6,600 cubic feet of soil were excavated from the BG prior to additional construction in the area. Currently, all surfaces in the area of the BG are covered with gravel, asphalt, and/or concrete.

Comparison of the RFI surface and subsurface soils results to the November 2013 EPA Regional SLs for industrial soil did not indicate any exceedances. Comparison of groundwater results from the RFI to tap water SLs did show an exceedance of one VOC in one well [carbon tetrachloride at a concentration of 16 micrograms per liter ($\mu\text{g/L}$)]. This single exceedance is above the tap water SL ($0.39 \mu\text{g/L}$) and the Federal maximum contaminant limit (MCL) of $5 \mu\text{g/L}$. As with the PWI, complete exposure pathways were not identified for potential human receptors at the BG. Similarly, the risk evaluation conducted during the RFI concluded that the BG SWMU did not provide ecological habitat and subsurface soil was not an exposure media of concern for ecological receptors. Because no complete exposure pathways were identified for potential human or ecological receptors, this SWMU was not carried forward in the CMS.

SWMUs A-3 and B-4 – Riverbank Landfill and Anaerobic Digestion Ponds

Only two of the four SWMUs investigated in the RFI were carried forward in the CMS based on the findings of the 2006 EPA-approved RFI. These two SWMUs are the Riverbank Landfill (RBL; SWMU A-3) and the Anaerobic Digestion Ponds (ADP; SWMU B-4). These SWMUs are carried forward because select VOCs and PFOA released from these SWMUs exceed appropriate groundwater and soil screening level criteria. RBL and ADP are grouped together due to their proximity to one another, with the former ADP lying partially within the footprint of the RBL. Together, these two SWMUs are collectively referred to here as the RBL/ADPs SWMUs. The RBL/ADP SWMUs are approximately 4,500 feet long located along the northern sloping edge of the site and the lower terrace between the plant and the Ohio River. The RBL operated between 1948 and the late 1960s and received powerhouse ash, incineration ash, plastics, rubble, and plant solid waste. When landfill use stopped, the RBL was covered with 6 to 35 inches of soil and in some locations, by the expansion of production area buildings and the laying of pavement in the manufacturing areas. A seep collection/treatment system was constructed in the early 1990s at the base of the landfill to manage methylene chloride-impacted groundwater discharging at a seep. The source of this methylene chloride was not the landfill itself, but was a spill in a production area adjacent to the SWMU which migrated through the

landfill and discharged at the seep.

The ADP consisted of three digestion ponds co-located within the western portion of the RBL (see Figure 2). One of the ponds dates from the 1950s, and the two other ponds date from the 1970s. The ponds were used for the containment and treatment of aqueous waste from the fluoropolymer manufacturing process and were used through 1988. The ponds were of earthen construction, were approximately 6 feet deep, and had a combined estimated volume of 3 million gallons. There were no outfalls from the ponds. Consequently, the ponds were operated to not overflow. The aqueous waste was removed and shipped to another DuPont location for final treatment. In 1988, the ponds' contents, the upper few feet of clay liner, and pond-berm material were removed and disposed of off-site. The ponds area was then backfilled and capped with topsoil, and vegetated with grass.

During the Verification Investigation (VI; DuPont, 1992) and the RFI, DuPont determined that select VOCs had been released from the RBL to underlying soils and groundwater and that select VOCs and PFOA had been released from the ADP to underlying soils and groundwater as well. PFOA and the select VOCs were measured in soils and groundwater at concentrations that exceeded appropriate screening level criteria.

The conclusions of the RFI found that the RBL and ADPs SWMUs have released organic constituents to underlying soils. These organic constituents include 1,1,2-trichlorotrifluoroethane, carbon tetrachloride (CT), methylene chloride (MeCl), tetrachloroethene (PCE), trichloroethene (TCE) and ammonium perfluorooctanoate (APFO), commonly known as C-8 and historically known as (FC-143). These impacts tend to occur in subsurface, above the groundwater table, and are limited in aerial extent. In addition, with the exception of a single exceedance of MeCl, the concentrations of these organic constituents do not exceed EPA Region III industrial soil risk based concentrations (RBCs) or the West Virginia Department of Environmental Protection (WVDEP) C-8 Assessment of Toxicity Team (CATT) screening levels for APFO in soil. However, several RBL/ADP-derived organic constituents (MeCl, PCE, TCE, and APFO) were also detected in water quality samples from the underlying site aquifer in the vicinity of the RBL/ADP. While these organic constituents do exceed the EPA Region III tap-water screening criteria and the WVDEP CATT screening levels for APFO in water, groundwater in the underlying site aquifer migrates to and is contained by the onsite production wells.

A multi-media consent order (Order No. GWR-2001-019; Consent Order) was entered into between the West Virginia Department of Environmental Protection (WVDEP), the West Virginia Department of Health and Human Resources – Bureau for Public Health (WVDHHR-BPH) and DuPont on November 15, 2001. The Consent Order identified a series of requirements and tasks to be performed by the parties (WVDEP, WVDHHRBPH, and DuPont) in order to determine whether there has been an impact on human health and the environment as a result of releases of APFO (referred to as C-8 in the Consent Order) from DuPont operations at the Washington Works facility (including the RBL/ADPs) and the associated landfills. The Consent Order established the C-8 Groundwater Investigation Steering Team (GIST) to oversee investigations and activities that were conducted to assess the presence and extent of C-8 in drinking water, groundwater, and surface water at and around the facility and the associated landfills.

In addition, the Consent Order also established the C-8 Assessment of Toxicity Team (CATT). The CATT consisted of scientists from academia, government (including representatives from EPA Region III and EPA Headquarters), non-profit organizations, and industry. The CATT was assembled to assess the toxicity and risk to human health and the environment associated with exposure to C-8 releases from the DuPont activities. In a final report issued in August 2002, the CATT established the human health protective screening criteria for drinking water of 150 ug/l (WVDEP, 2002). In addition, as reflected in the August 2002 report, the CATT also established a C-8 screening criteria of 240 mg/kg for soils (WVDEP, 2002). The CATT also established an Aquatic Life Advisory Concentration for C-8 of 1,360 ug/l in October 2002 (Menzie-Cura & Associates, 2002).

Concentrations of APFO in the underlying soil are highest in the samples from the silt and clay of the Holocene overbank deposits. However, none of the concentrations measured exceeded the screening criteria of 240 mg/kg. In addition, APFO concentrations in water are also highest in groundwater from within the perched water in the area of the RBL/ADP. While these concentrations do exceed the two water criteria listed above, there are no receptors of the perched water. There is only one well that is screened in the site underlying aquifer that has had concentrations of APFO above the 150 ug/L drinking-water screening criteria. This well, Q04-MW02, is located within the RBL/ADPs and is located within about 700 feet of the Gallery Well. Groundwater in the area of this well flows towards the Gallery Well and is contained on-site.

Release Assessment for the East Field and Chestnut Tree Plantation AOCs

In the third quarter of 2010, DuPont identified two new areas of concern (AOCs) at the DuPont Washington Works facility in Washington, West Virginia, where on-site disposal of C-8-bearing sludge had occurred. Available information regarding the on-site disposal indicated that in 1996 approximately 139 tons of bio-sludge from the Washington Works wastewater treatment plant were land-farmed at the site's East Field. It is estimated that the amount of C-8 in this sludge was less than one pound. Washington Works sanitary treatment plant sludge was also land-farmed at the on-site experimental chestnut tree plantation, a project of the plant employee's Wildlife Habitat Committee, in 1995 and 1996. No records could be found that would allow calculating how much C-8 would have been present in this material, but it is believed to be minor.

A work plan describing the proposed Release Assessment (RA) activities to investigate these two new AOCs was submitted to EPA on April 22, 2013 (URS,2013). The RA Work Plan was approved by EPA on May 22, 2013 and was implemented on June 10 through 12, 2013.

East Field AOC

Surface soil and subsurface soil were sampled at six locations within the East Field (see Figure 3). At four of these six locations, the subsurface soil contained slightly higher

concentrations than the surface soil. At the other two locations, the subsurface soil concentrations were either slightly lower or approximately equal to the surface concentrations.

The PFOA results for East Field soils ranged from 4.3 µg/kg to 71 µg/kg. Surficial soils collected from 0 to 0.5 feet bgs contained between 8.1 µg/kg and 30 µg/kg of PFOA. Subsurface soils collected at depths greater than 0.5 feet bgs contained between 4.3 µg/kg and 71 µg/kg with the subsurface soil sample collected below the possible biosolids observation containing 5 µg/kg of PFOA.

The highest PFOA measured in soil at the East Field, 71 µg/kg (measured in a subsurface soil sample at boring RA0613-EF6) is orders of magnitude below the residential (i.e., human ingestion) soil screening value of 16,000 µg/kg. Concentrations observed at the AOC were consistent with those observed in the site-specific background locations (5.5 µg/kg to 47 µg/kg).

Chestnut Tree Plantation AOC

At the Chestnut Tree Plantation, ten locations were sampled, and soil was sampled from two depths: a surface soil from 0 to 0.5 feet bgs and a subsurface soil (see Figure 4). No evidence of the land-application zone was identified at any of the locations. Therefore, subsurface soil was sampled and composited from the interval from 0.5 feet bgs to 2 feet bgs.

The PFOA results for Chestnut Tree Plantation soils ranged from 8.3 µg/kg to 41 µg/kg. Surficial soils (sampled from 0-0.5 feet bgs) contained between 8.8 µg/kg and 41 µg/kg of PFOA. Subsurface soils contained between 8.3 µg/kg and 31 µg/kg. Concentrations observed at this AOC were consistent with those observed in the site-specific background locations (5.5 µg/kg to 47 µg/kg).

At seven of the 10 locations, the surface and subsurface soil concentrations were approximately equal. At two of the remaining three locations, the surface soils contain slightly lower concentrations than the subsurface soils; and at the third location, the surface soil contained slightly higher concentration compared to the subsurface soil.

Similar to the East Field AOC, the highest PFOA measured in soil at the Chestnut Tree Plantation AOC, 41 µg/kg, is orders of magnitude below the residential (i.e., human ingestion) soil screening value of 16,000 µg/kg.

The following conclusions were made from the evaluation of PFOA results for surface soil and subsurface soil samples collected from the East Field and Chestnut Tree Plantation AOCs and from background locations at the Site:

- Ranges of PFOA results for surface soils are similar between the site-specific background locations and the two AOCs.
- Ranges of PFOA results for surface soils and subsurface soils are similar between the East Field and the Chestnut Tree Plantation AOCs.

- The highest PFOA measured in soil during this investigation, 71 µg/kg (measured in an East Field subsurface sample), is orders of magnitude below the residential (i.e., human ingestion) soil screening value of 16,000 µg/kg derived by EPA Region 4 (EPA, 2009).
- PFOA results observed at the AOCs are within or lower than the range of PFOA soil results measured in 1997-1998 during the RFI.

The results presented in the RA report show that PFOA concentrations within these two AOCs, in which land-farming of PFOA-bearing biosolids occurred, are essentially the same as in background locations at the site. As a result, no releases to underlying soils are indicated from the land-farming activities. In addition, the concentrations measured during this RA are orders of magnitude below the residential soil screening value. Therefore, there is no potential risk associated with possible exposure to these soils and no further action is warranted for these two AOCs.

VI. INTERIM MEASURES

DuPont agreed to perform the closure of the Riverbank Landfill (RBL) and the former Anaerobic Digestion Ponds (ADPs) Solid Waste Management Units (SWMUs) at the Facility as an Interim Remedial Measure (IRM).

The closure was performed to address essential elements of the site's Corrective Action Program, that is under the jurisdiction of the WVDEP through a Hazardous and Solid Waste Amendments (HSWA) Permit Number WVD045875291.

Construction activities were completed from September 2011 to December 2012. An IRM Completion Report documented that the remedy has been completed in accordance with the remedy design (DuPont, 2011) and applicable West Virginia Department of Environmental Protection (WVDEP) regulations. Specifically, the engineered cap system was designed and constructed to meet the intent of the performance requirements detailed in the WVDEP Title 33, Series 1, Solid Waste Management Rule (W. Va. Code §22-15-1) regulations for a Type F Industrial Landfill (WVDEP, 1996). Conformance with the substantive Solid Waste Management Rule requirements will serve to ensure the long-term performance of the constructed remedy.

The site RFI sampled the RBL and ADPs extensively. Borings advanced through the SWMUs determined that the majority of waste material in the RBL and ADPs SWMUs was placed above the shallow groundwater table and is unsaturated. However, isolated pockets of waste material were observed at depth near the perched water table along the river bank terrace in the western portion of the RBL.

The conclusions of the RFI found that the RBL SWMU, which includes the ADPs SWMUs, has released organic constituents to underlying soils. These organic constituents in soil exceeding screening criteria include 1,1,2-trichlorotrifluoroethane, carbon tetrachloride (CT), methylene chloride (MeCl), tetrachloroethene (PCE), trichloroethene (TCE), and APFO (commonly known as C-8 and historically known as FC-143). These impacts tend to occur in subsurface, above the groundwater table, and are limited in areal extent. In addition, with the exception of a single exceedance of MeCl, the concentrations of these organic constituents do not

exceed EPA Region 3 industrial soil risk-based concentrations (RBCs) or the WVDEP C-8 Assessment of Toxicity Team (CATT) screening levels for APFO in soil. However, several RBL/ADP-derived organic constituents (MeCl, PCE, TCE, and APFO) were also detected in water quality samples from the underlying site aquifer in the vicinity of the RBL/ADPs.

An Interim Remedial Measures Study (IRMS) was submitted to EPA in January 2008 (DuPont, 2008). The IRMS presented the evaluation of various potentially-applicable IRM alternatives to mitigate potential risks posed by the RBL/ADPs SWMUs. The IRMS concluded that an engineered cap system on the RBL slopes and over the ADPs with supplemental cover in the production area to be the best alternative for the closure of the SWMUs.

Several phases of test pit investigations were completed to identify the areal extent of waste within the RBL/ADPs SWMUs. A total of 87 test pits were excavated around the landfill perimeter. Three phases of test pits were performed to define the areal extent of waste.

The original limits of the Riverbank Landfill were determined based on a historical review of the business unit operations and from borings advanced during the RFI. Additional test pits performed during pre-design investigations visually identified waste material located outside the previous limits of the RBL

Limited waste material was observed outside the defined limits of the RBL. This material was designated for excavation and relocation during closure activities. During intermediate grading and consolidation activities, waste materials outside the limits of the RBL were excavated and consolidated within the proposed limits of the landfill.

In addition to the test pits around the landfill perimeter, six additional test pits were excavated in the areas where the RBL encroached on the Ohio River at the eastern end of the landfill. The test pits were excavated into this area to evaluate if the materials could be re-graded for reuse as intermediate fill under the geo-membrane liner. The test pits encountered primarily silty-clay and fly ash. No drums or debris were encountered in the test pits. This allowed the design team to include additional grading of the landfill material in this area, thereby creating more stable slopes and allowing additional room for construction.

The engineered cap system was designed and constructed to meet the intent of WVDEP requirements, while serving to protect human health and the environment. The cap system includes a multi-component geo-synthetic system that covers the RBL. In addition, there are individual designs for the various tie-ins at the top of slope along the plant areas.

The multi-component geo-synthetic cap consists of the following components (from top to bottom):

- A 6-inch layer of topsoil vegetated with a hardy, shallow-root, low-maintenance ground cover. The grassy vegetative cover will minimize soil erosion, and the shallow-root system will minimize the potential for puncture of the geomembrane liner.
- An 18-inch layer of general fill will provide a buffer zone above the geomembrane liner to reduce the potential for frost, root, weather, and varmint damage.
- A geo-composite drainage layer consisting of a geo-net “sandwiched” between two geo-textiles. This drainage layer will promote overall stability of the

overlying soil layers and the underlying geo-membrane. The top geo-textile layer prevents migration of fine soil particles from the above soil layer into the geo-net, thereby promoting drainage of the soil layer. The geo-net will capture and convey stormwater that infiltrates the soil layers into the stone termination and the stormwater swales. The lower geotextile will provide higher interface friction with the underlying geo-membrane.

- A geo-membrane 40-mil HDPE textured liner will provide a continuous barrier layer and minimizes water infiltration into the landfill materials.

VII. SITE-WIDE GROUNDWATER

The site is located on a series of Quaternary alluvial terraces. The majority of the site lies on the oldest Quaternary alluvial terrace, which is topographically flat and lies approximately 50 feet above the Ohio River, while the remains of younger terraces exist at lower elevations along the riverbank. Lithologies encountered at the site include Holocene overbank deposits, Quaternary alluvium and the underlying bedrock.

The Holocene overbank deposits consist of silt, sandy silt, clay, silty clay, and clayey silt and are approximately 35 feet thick near the riverbank and approximately 5 to 15 feet thick under the central portion of the site. The overbank deposits are absent in the western portion of the site. The Quaternary alluvium ranges approximately from 30 feet thick near the river up to 90 feet thick under the central portion of the site. The alluvium consists of coarsening downward, unconsolidated, poorly to well-sorted, sand, silts, clay, and gravel outwash deposits. The underlying Dunkard Series bedrock consists primarily of sandy shale, sandstone, and siltstone.

The alluvium is the underlying significant aquifer as defined by the West Virginia Solid Waste Management Regulations because it is the first upper most aquifer encountered which is laterally continuous under the entire site and is free flowing throughout the year. Groundwater elevations and flow directions in the alluvial aquifer on-site are strongly influenced by the Ohio River and by the pumping of on-site production wells.

Pumping of on-site production wells and well fields near and parallel to the river (primarily the Ranney Well, the DuPont-Lubeck Well Field, and the East Well Field) lowers the groundwater level at the site to below river stage. This lower level induces water from the river to flow into the alluvium toward the production wells, which replaces water pumped from storage in the aquifer and helps sustain the high-yield production wells. On-site groundwater flows toward production wells in the East Well Field on the eastern side of the site, and toward the Ranney Well from several directions within the western side of the site

Groundwater modeling and measured groundwater elevation data for 2011 show that the pumping of production wells at the site does not allow for off-site migration of groundwater within the site aquifer. However, the groundwater elevation map for 2003 demonstrates the possibility of some limited off-site migration of groundwater from the far northwestern corner of the site onto the adjacent Sabic Plastics facility because of production well pumping at that facility near the boundary with the DuPont site. In this area of the DuPont site, groundwater recharge is from the river, and there are no SWMUs located here that would impact groundwater

prior to any potential off-site migration. This limited off-site migration depicted in a 2003 map appears to have been eliminated prior to 2011, likely due to reductions in the pumping rates of Sabic production wells located near the site boundary. Groundwater flow in this portion of the site in 2011 is ultimately towards the Ranney Well. However, all hydrological studies performed at the site since 1990 have produced measured groundwater elevation maps that consistently depict hydraulic containment of SWMU related perfluorooctanic acid (PFOA) impacted groundwater within the alluvial aquifer.

Perched water zones exist within the overbank deposits near the riverbank that are not depicted on the groundwater elevation contour maps. Recharge for these perched zones comes from precipitation and from the river. Water in these perched zones flows into the underlying alluvial aquifer in response to the pumping of the on-site production wells. Based on the limited data available, there appears to be an upward gradient from groundwater in the bedrock underlying the Quaternary alluvium under the western two thirds of the site and a downward gradient under the eastern portion of the site. However, the groundwater model (DuPont, 2003) predicted an upward gradient from the bedrock to the overlying alluvial aquifer within most of the modeled domain, with the highest gradient predicted near pumping wells, again supporting no off-site migration of groundwater from the alluvial aquifer

During 2011, URS (on behalf of DuPont) sampled groundwater and measured groundwater elevations in multiple monitoring wells and production wells located on the site (DuPont, 2011). The groundwater was analyzed for PFOA and several VOCs identified during the VI and the RFI as SWMU-related constituents.

The PFOA and VOC analytical data from the 2011 investigation compared to the 1999 RFI results showed that concentrations have increased in some wells, while decreasing or staying constant in others. However, the results were consistent with the analytical data from the RFI that showed that wells located near the western end of RBL/ADP SWMUs had the highest concentrations of PFOA and VOCs at the site.

VIII. ENVIRONMENTAL INDICATORS

Under the Government Performance and Results Act (“GPRA”), EPA has set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental clean-up indicators for each facility: (1) Current Human Exposures Under Control, and (2) Migration of Contaminated Groundwater Under Control. The Facility met the EI for Current Human Exposures Under Control in September, 2003 and met the EI for Migration of Groundwater Under Control in April, 2004.

IX. CORRECTIVE MEASURES STUDY

The Corrective Measures Study (CMS) was conducted to identify and evaluate Corrective Measures alternatives for the Facility and recommended the best-balanced Corrective Measures alternative.

WVDEP acknowledges that an evaluation of multiple alternatives is not always necessary, particularly if a remedy decision can be determined based on previous investigations,

remedial actions and RCRA site characterization investigations. In this case, a review of several investigation reports that documented sources of contamination had been identified and remediated. Because of the aggressive approach taken by the Facility in addressing environmental problems through IMs and ICs, the only environmental concern to be addressed is site related groundwater contamination.

While the Conceptual Exposure Model (CEM) results show that there are no potentially complete pathways that are significant for potential receptors at the site, groundwater impacted from SWMU-related releases of PFOA and VOCs is an environmental medium at the site that requires on-going corrective action. This medium requires on-going corrective action because continued leaching of PFOA and VOCs from subsurface soils and perched water will continue to impact groundwater in the future at concentrations above the 0.4 ug/L Provisional Health Advisory for PFOA in drinking water established by EPA in 2009.

X. CORRECTIVE ACTION OBJECTIVES

The following Corrective Action Objectives (CAOs) for the facility have been identified:

1. Soils

CAOs for Facility soils is the prevention of unacceptable human exposure to contaminated soils at all levels, with “unacceptable exposure” defined as carcinogenic risks $> 1 \times 10^{-6}$ and a Hazard Index for non-carcinogenic risks of > 1 , by requiring the compliance with and maintenance of land use restrictions at the Facility.

2. Groundwater

WVDEP’s Corrective Action Objectives are to prevent human exposure to contaminants in the groundwater and to capture contaminated groundwater through on-site pumping wells for treatment at the on-site treatment plant. On-site groundwater capture and treatment will continue until such time that concentrations of contaminants in groundwater are reduced to their respective MCLs.

XI. Proposed Decision

Introduction

WVDEP’s proposed remedy is comprised of a program of monitored natural attenuation in conjunction with the continued control, capture, and treatment of contaminated groundwater and the implementation of institutional controls (“ICs”).

1. Proposed Continued Institutional and/or Administrative Controls

ICs are non-engineered instruments, such as administrative and legal controls, that minimize the potential for human exposure to contamination and/or protect the integrity of the decision by limiting land or resource use. Under this proposed decision, some contaminants remain in the groundwater and soil at the Facility above

levels appropriate for residential uses. Because some contaminants remain in the soil and groundwater at the Facility at levels that exceed residential use, WVDEP's proposed decision requires the compliance with and maintenance of land and groundwater use restrictions. The ICs shall include, but not be limited to, the following land and groundwater use restrictions:

- a. Except for the production water that is already approved for treatment and use as potable water at the Facility, groundwater at the Facility shall not be used for any purpose other than 1) industrial use and non-contact cooling water; and 2) the operation, maintenance, and monitoring activities required by WVDEP and/or EPA, unless it is demonstrated to WVDEP, in consultation with EPA, that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and WVDEP, in consultation with EPA, provides prior written approval for such use;
- b. The Facility property shall not be used for residential purposes unless it is demonstrated to WVDEP, in consultation with EPA, that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy, and WVDEP, in consultation with EPA, provides prior written approval for such use;
- c. All earth moving activities, including excavation, drilling and construction activities, in the areas at the Facility where any contaminants remain in soils above EPA's Screening levels for non-residential use or groundwater above Federal MCLs/Tap Water RBCs, shall be prohibited unless it is demonstrated to WVDEP, in consultation with EPA, that such activity will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy, and WVDEP, in consultation with EPA, provides prior written approval for such use;
- d. The Property will not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedy;
- e. No new wells will be installed on Facility property unless it is demonstrated to WVDEP and EPA, that such wells are necessary to implement the final remedy and WVDEP provides prior written approval to install such wells;
- f. Owner agrees to provide WVDEP and EPA with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the Facility property or any portion thereof;
- g. Owner agrees to allow the WVDEP, EPA and/or their authorized agents and representatives, access to the Property to inspect and evaluate the continued effectiveness of the final remedy and if necessary, to conduct additional remediation to ensure the protection of the public health and safety and the environment based upon the final remedy to be selected by WVDEP in the Final

Decision and Response to Comments (FDRTC);

2. Proposed Monitored Natural Attenuation with Continued Production Well Pumping and Hydraulic Containment

a. GW monitoring and elevations

The facility is required to continue the production well pumping at 4 million gallons per day to provide hydraulic containment of the groundwater on-site, until such time that the GW CAO is met. The facility may request to WVDEP a change in the production water pumping rate provided that it demonstrates to WVDEP that at the new rates it maintains the hydraulic control of the on-site groundwater. The Facility will maintain a groundwater monitoring program to demonstrate that the inward gradient is maintained and that the contaminant mass is being reduced through natural attenuation.

b. GW treatment

The Facility will continue the groundwater capture and treatment program and when possible identify source areas of contamination and, where possible, apply a remediation technique to reduce the impacts of the source areas.

3. Ex-situ Treatment of Waste Process Water at the Wastewater Treatment Plant

The Facility is required to continue ex-situ treatment of waste process water at the WWTP at the site, until such time that concentrations of contaminants in the groundwater are reduced to their respective MCLs.

4 Treatment of Potable Water

The Facility is required to treat, for removal of PFOA and VOCs, the production well water that is intended to be used as potable water, until such time that concentrations of contaminants in the groundwater are reduced to their respective MCLs.

5. RBL/ADP Monitoring and Maintenance (M&M)

The Facility is required to monitor and maintain the RBL/ADP engineered cap system. The maintenance and monitoring is required to continue through the life of the Facility to maintain its effectiveness and protectiveness and to ensure the health and safety of site workers and to reduce the possibility of trespasser exposure to SWMU materials.

XII Implementation of Institutional Controls

WVDEP proposes to implement the land and groundwater use restrictions necessary to prevent human exposure to contaminants at the Facility through enforceable ICs, such as orders and/or an Environmental Covenant, pursuant to the West Virginia Uniform Environmental Covenants Act. If an Environmental Covenant is to be the institutional control mechanism, it will be recorded in the chain of title for the Facility property. The continuation of an existing groundwater monitoring program until groundwater clean-up standards are met will be enforceable through the final enforceable instrument, such as a permit, order, or an Environmental Covenant. If WVDEP determines that additional institutional controls or other corrective actions are necessary to protect human health or the environment, WVDEP has the authority to require and enforce such additional corrective action under that instrument.

XIII. EVALUATION OF WVDEP'S PROPOSED DECISION

This section provides a description of the criteria used to evaluate the proposed decision consistent with EPA guidance, "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule," 61 Fed. Reg. 19431, May 1, 1996. The criteria are applied in two phases. In the first phase, WVDEP evaluated three decision threshold criteria as general goals. In the second phase, for those remedies that meet the threshold criteria, WVDEP then evaluated seven balancing criteria.

1. Threshold Criteria

a. Protect Human Health and the Environment

Overall protection of human health and the environment addresses the ability of an alternative to eliminate, reduce or control threats to public health or the environment through institutional controls, engineering controls, removal or treatment.

EPA is proposing ICs to restrict land use to commercial or industrial purposes at the Facility. The implementation of existing and future ICs will prevent exposure to the site by limiting the ability of people to gain access to the site, thus preventing any exposure to humans. Institutional controls reduce the potential for human exposure by preventing land use that could result in exposure to impacted soil or groundwater.

With respect to groundwater, DuPont will continue production well pumping at current rates that results in hydraulic containment of groundwater. The captured groundwater will continue to be treated at the on-site waste water treatment plant. In addition, a groundwater monitoring plan will be developed to monitor groundwater quality and to ensure that the hydraulic containment is maintained.

The major interim measure completed at the RBL/ADP SWMUs in conjunction with the ICs will achieve the overall Remedial Action Objectives (RAOs) and will eliminate unacceptable risks to human health and the environment.

RAOs were developed in the IRMs for the RBL/ADPs SWMUs to assist in the selection of a remedial alternative that when implemented is protective of human

health and the environment and is consistent with the current and future use of the site.

Groundwater pumping and treating technology employed at the Facility has been a primary tool in effectively and reliably protecting public health and the environment.

With respect to Facility soils, all contaminated soil is either below the surface, covered with gravel or asphalt, and contained within Facility property. There is no direct exposure of industrial workers to subsurface soil under current land use, and direct exposure of construction / excavation workers is controlled by the existing Facility administrative controls, including the Facility-wide excavation permitting process, and appropriate health and safety plans. Land use restrictions are proposed in order to minimize the potential for human exposure to contamination.

b. Achieve Media Cleanup Objectives

EPA's proposed remedies meet the media cleanup objectives based on assumptions regarding current and reasonably anticipated land and water resource use(s). The remedy proposed in this SB is based on the current and future anticipated land use at the Facility as commercial or industrial. As such, industrial media cleanup objectives were selected and the majority of Facility soils contain contaminant concentrations that are below EPA's industrial soil RSLs. The Risk Assessment for the Facility concluded that there would be no risk associated with the soil as long as the Facility remains industrial.

To manage groundwater impacted from SWMU-related releases of PFOA and VOCs and to ensure the ongoing protectiveness of human health and the environment, DuPont will continue production well pumping at current pumping rates which results in hydraulic containment of groundwater on-site. However, if in the future, DuPont identifies a different means by which groundwater impacted from SWMU-related releases of PFOA and VOCs can be managed to maintain protectiveness of human health and the environment (other than pumping production wells to maintain hydraulic control), DuPont will provide this information to WVDEP. If appropriate, and if approved by WVDEP, DuPont may then use those means to manage SWMU-related releases to groundwater. DuPont will continue ex-situ treatment of waste process water at the WWTP at the site. DuPont will also continue GAC treatment for removal of PFOA and VOCs from production well water used as a potable water source at the Facility.

The RBL/ADP engineered cap system requires maintenance and monitoring. The ongoing maintenance and monitoring will continue through the life of the final remedy to maintain its effectiveness to ensure the health and safety of site workers and to reduce the possibility of trespasser exposure to SWMU materials.

c. Remediating the Source of Releases

In all proposed remedies, WVDEP seeks to eliminate or reduce further releases of hazardous wastes and hazardous constituents that may pose a threat to human health and the environment. The actions taken by DuPont at the Washington Works Facility has met this objective.

When the RBL and ADP SWMUs were operational, leaching of PFOA and VOC containing materials to the underlying soils occurred. Once in the underlying soils, the PFOA and VOCs leached with precipitation to perched water bodies located within the clays and silty clays of the overbank deposits. With the completion of the engineered cap system and its associated components, infiltration of surface water is significantly reduced resulting in a significant reduction in the potential for leaching. However, PFOA and VOCs that leached to the underlying perched water bodies and clays and silty clays will continue to be leached to the underlying aquifer, but at a reduced rate. DuPont will continue to capture and treat contaminated groundwater from their Facility and continue to protect human health and the environment.

2. Balancing/Evaluation Criteria

a. Long-Term Effectiveness

The potential for direct contact with impacted subsurface soil and groundwater has been controlled by the administrative and site controls currently in place. Additional administrative controls in the form of an environmental covenant under the West Virginia Uniform Environmental Covenants Act [UECA; West Virginia Code Chapter 22 (Environmental Resources) Article 22B] are proposed to provide for the continuation of existing measures.

To manage groundwater impacted from SWMU-related releases of PFOA and VOCs and to ensure the ongoing protectiveness of human health and the environment, DuPont proposes to continue production well pumping at current pumping rates which results in hydraulic containment of groundwater on-site. Furthermore, DuPont will develop a groundwater monitoring program to ensure hydraulic containment is working and contaminant concentrations are decreasing over time through natural attenuation.

b. Reduction of Toxicity, Mobility, or Volume of the Hazardous Constituents

The reduction of toxicity, mobility and volume of hazardous constituents will continue by natural attenuation at the Facility. Reduction of contaminants will be accomplished by the engineered cap placed on the RBL/ADP SWMU and will be verified by the results of the GWMP. Mobility of contaminants will continue to be controlled through the pump and treat program.

c. Short-Term Effectiveness

The proposed remedy does not involve any activities, such as construction or excavation that would pose short-term risks to workers, residents, and the environment. EPA anticipates that the land use restrictions and the on-going groundwater programs will be fully implemented shortly after the issuance of the Final Decision and Response to Comments. A groundwater monitoring program is already in place and will be updated to accommodate the work completed at the RBL/ADP SWMU.

d. Implementation

The proposed decision is readily implementable. Groundwater monitoring is already in place and operational and will be modified in accordance with WVDEP requirements. WVDEP does not anticipate any regulatory constraints in implementing its proposed remedy. WVDEP proposes to implement the institutional controls through an enforceable mechanism such as an Environmental Covenant.

e. Cost-Effectiveness

The proposed decision is cost effective. The significant costs associated with this proposed remedy was the capping of the River Bank Landfill that was completed as an interim measure in 2012. The costs for the maintenance of the RBL Cap and for the continuation of groundwater monitoring are estimated to be around \$30,000 per year. The costs to record an environmental covenant in the chain of title to the Facility property are minimal. The costs associated with issuing an order are also minimal.

e. Community Acceptance

WVDEP will evaluate Community acceptance of the proposed decision during the public comment period, and it will be described in the FDRTC.

f. Federal/Support Agency Acceptance

EPA has reviewed and concurred with the proposed remedy for the Facility. Furthermore, WVDEP has solicited EPA input and involvement throughout the investigation process at the Facility.

XIV. FINANCIAL ASSURANCE

WVDEP will require the Facility to provide assurances of financial responsibility for completing the Remedy. Financial Assurance details for RCRA CA will be incorporated into the WVDEP-issued RCRA Permit after the Final Remedy is approved.

XV. PUBLIC PARTICIPATION

Before WVDEP makes a final decision on its proposal for the Facility, the public may participate in the decision selection process by reviewing this SB and documents contained in the Administrative Record (AR) for the Facility. The AR contains all information considered by WVDEP in reaching this proposed decision and is available for public review during normal business hours at:

West Virginia Department of Environmental Protection
601 57th St. S.E.
Charleston, WV 25304

Interested parties are encouraged to review the AR and comment on WVDEP's proposed decision. The public comment period will last thirty (30) calendar days from the date that notice is published in a local newspaper. Comments may be submitted by mail, fax, or e-mail to the WVDEP RCRA Corrective Action Program Manager at the address listed below.

A public meeting will be held upon request. Requests for a public meeting should be made to:

Mr. Charles Armstead
RCRA Corrective Action Program Manager
West Virginia Department of Environmental Protection
601 57th Street
Charleston, WV 25301
Office: (304) 926-0499 ext. 1130
Fax: (304) 926-0457
E-mail: charles.w.armstead@wv.gov

WVDEP will respond to all relevant comments received during the comment period. If WVDEP determines that new information warrant a modification to the proposed decision, WVDEP will modify the proposed decision or select other alternatives based on such new information and/or public comments. WVDEP will announce its final decision and explain the rationale for any changes in a document entitled the Final Decision and Response to Comments (FDRTC). All persons who comment on this proposed decision will receive a copy of the FDRTC. Others may obtain a copy by contacting the RCRA Corrective Action Program Manager at the address listed above.

Date:

Interim Director, Division of Land Restoration
WV Department of Environmental Protection

APPENDIX A

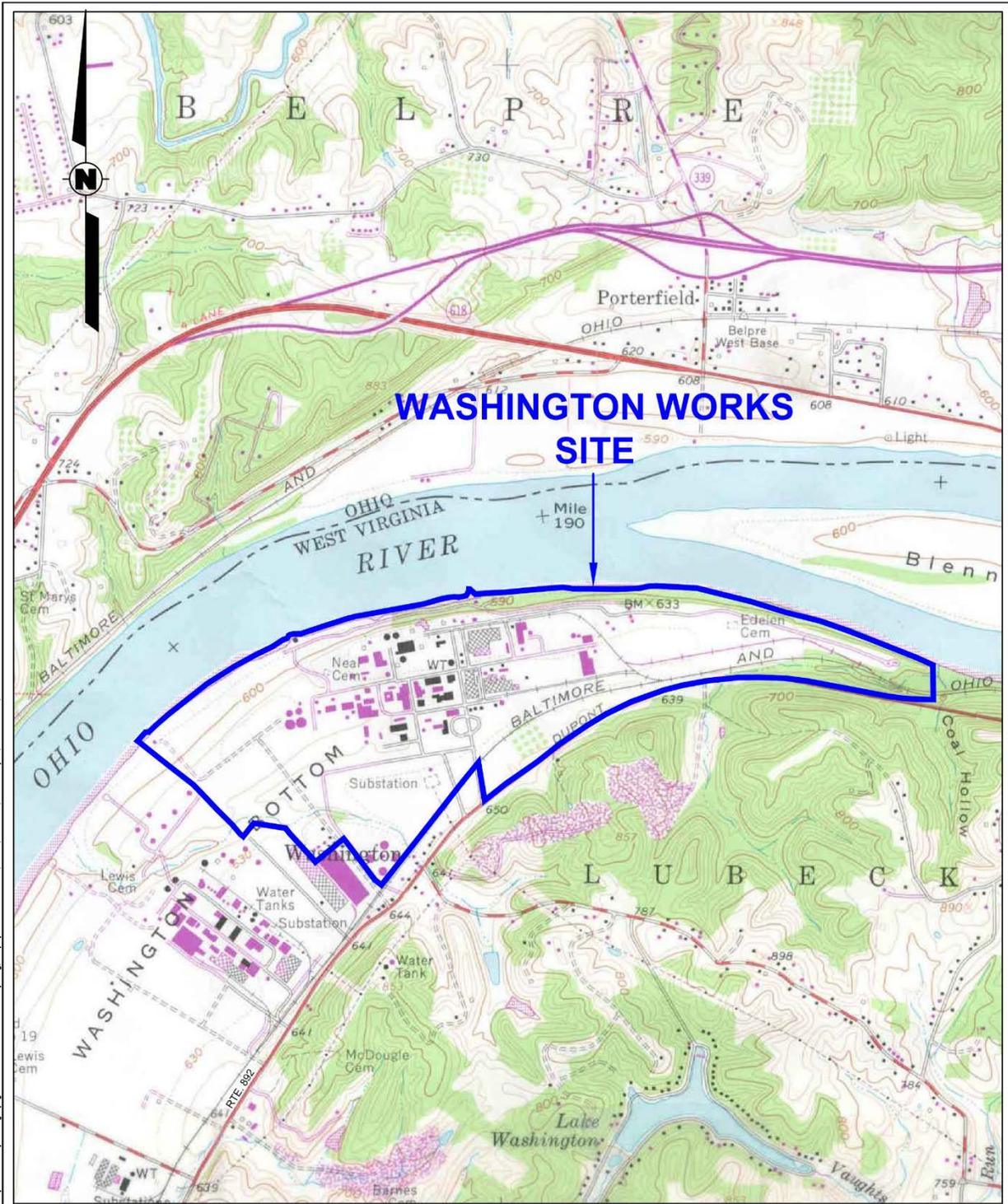
ADMINISTRATIVE RECORD INDEX

1. RCRA Facility Investigation Report DuPont Washington Works. Corporate Remediation Group. June 30, 1999.
2. Release Assessment for the East Field and Chestnut Tree Plantation AOCs, DuPont Washington Works, Washington, West Virginia, September 2013.
3. Riverbank Landfill IRM Completion Report, DuPont Washington Works Site, Washington, West Virginia, December 2013.
4. Corrective Measures Study Report, DuPont Washington Works Site (Revised October 16, 2014).

APPENDIX B

FIGURES

FIGURE 1



V:\Projects\DuPont\Washington Works\con\18986404\drawings\Figure 1 - Site Location Map.dwg, 11/8/2013 11:18 AM, Little, David E., PDP95.pc3, User:2787, 1'-0" = 1'-0"



Source: MAP TAKEN FROM THE LUBECK, WV
USGS QUADRANGLE



URS Corporation
4051 Ogetown Road, Suite 300
Newark, Delaware 19713

SITE LOCATION MAP

DuPont Washington Works
Washington, West Virginia

SCALE Not to Scale	DESIGNED K. Davis	DRAWN D. Littel	CAD FILE NO. 18986404
DATE 11/8/13	CHECKED M. Houliaday	APPROVED	FIGURE 1

FIGURE 2

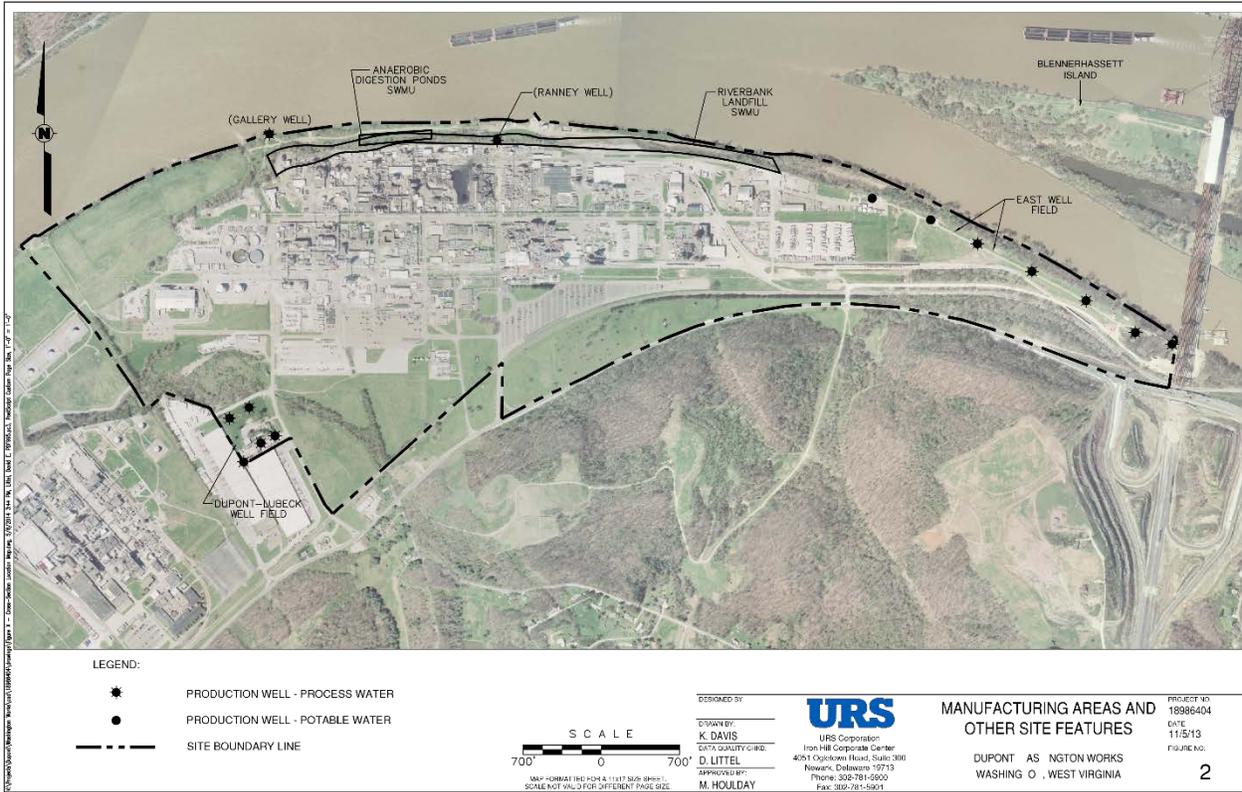
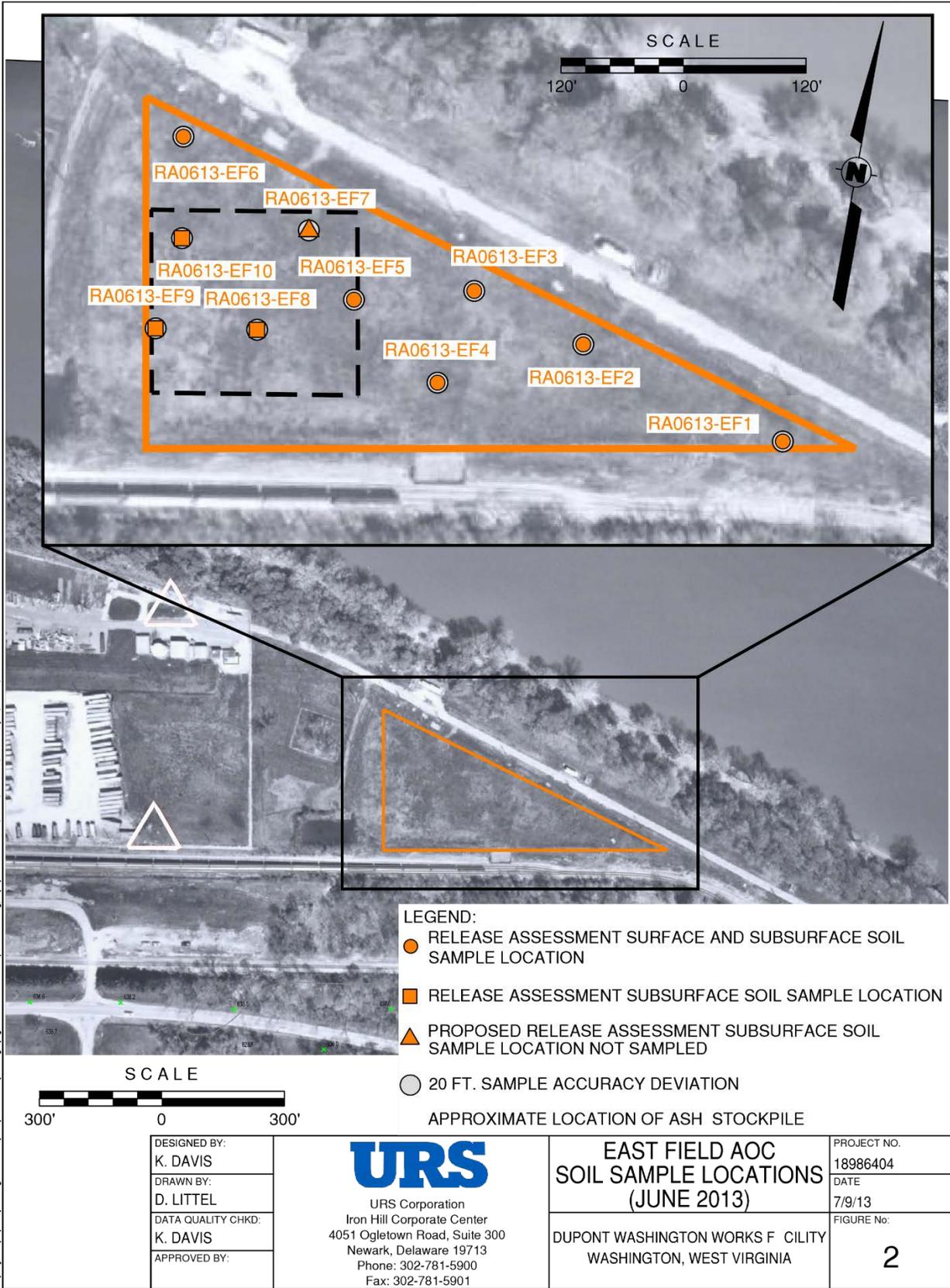
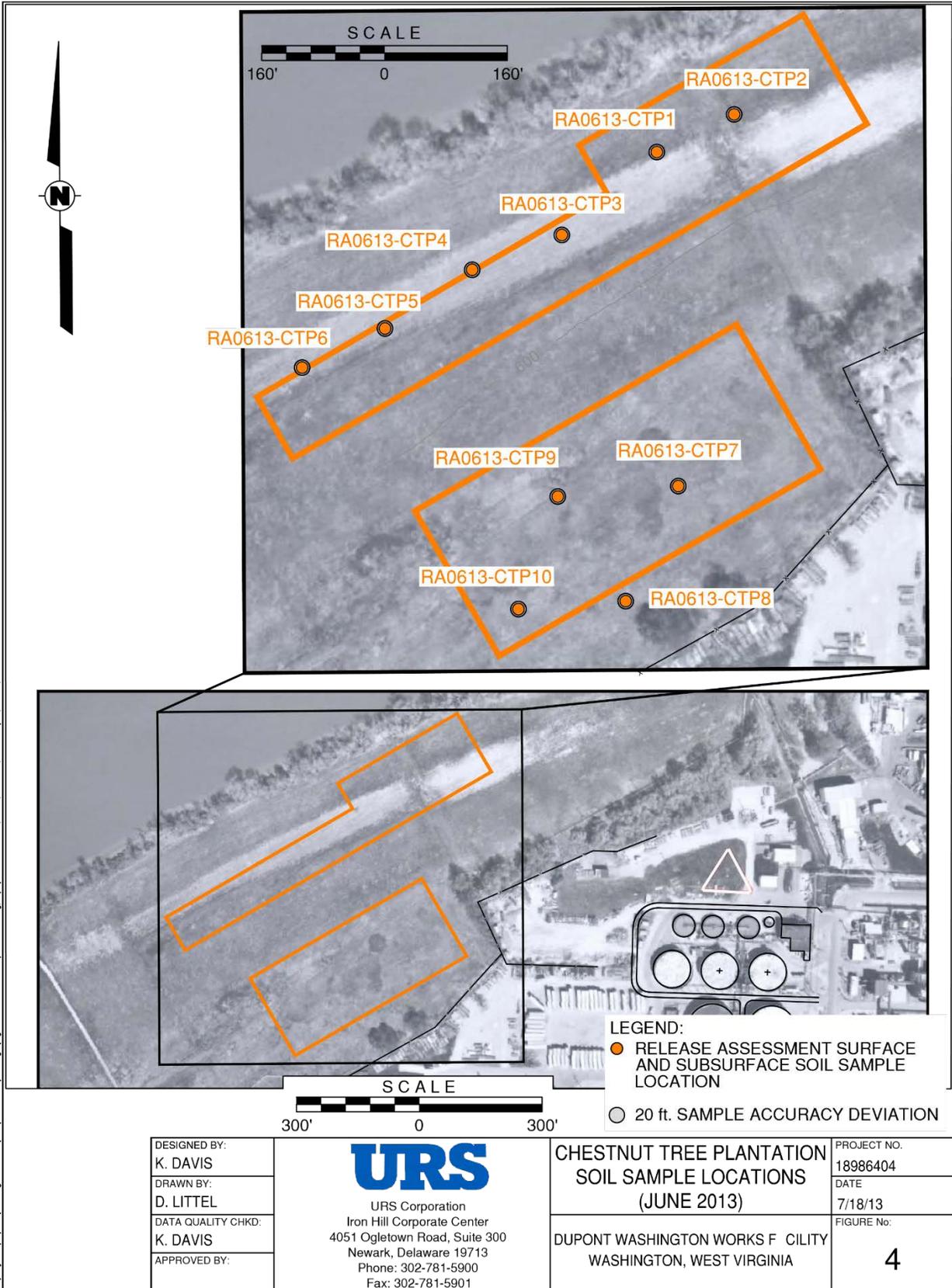


FIGURE 3



V:\Projects\Dupont\Washington Works\Coord\18986404\Drawings\Figure 2 2005 Aerial photo rev.dwg, 8/6/2013 8:39 AM, Littell, David E. PDP955.pcx, Letter, 1:1

FIGURE 4



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