



VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

FINAL DECISION AND RESPONSE TO COMMENTS

BASF Corporation
Williamsburg, Virginia

EPA ID NO. VAD990710642

October 2020

Final Decision

The Virginia Department of Environmental Quality (DEQ) is issuing this Final Decision and Response to Comments (Final Decision) under the authority of 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. Sections 6901 and 6992k, regarding the remedy for the BASF Corporation Facility (Facility) located On U.S. Route 60 in Williamsburg, Virginia.

On September 5, 2020, DEQ issued a Statement of Basis (SB) in which it described its proposed remedy for the Facility. The SB is hereby incorporated in this Final Decision by reference and is included in the enclosed.

Public Comment Period

On September 5, 2020, a public notice for the SB was issued in the Virginia Gazette newspaper announcing a thirty (30)-day public comment period in which it requested comments from the public on the remedy proposed in the SB. A copy of the public notice and the SB was also placed on DEQ's webpage. In addition, BASF also mailed a copy of the notice to adjacent property owners and the locality. The public comment period ended on October 5, 2020.

Response to Comments

DEQ received no comments on its proposed remedy for the Facility. Consequently, DEQ's Final Remedy did not change from the remedy it proposed in the SB.

Final Remedy

The Final Remedy, the components of which are explained in detail in the SB, consists of the following: 1) the enrollment of additional parcels through the DEQ Voluntary Remediation program; 2) concurrence with a DEQ approved Long Term Stewardship Plan which includes a groundwater monitoring plan, Operations and Maintenance Manual (O&MM) and institutional and engineering control plan; and 3) implementation and compliance with land use controls in the form of a deed restriction or environmental covenant prepared in accordance with the Uniform Environmental Covenants Act, Title 10.1, Chapter 12.2, Sections 10.1-1238-10.1-1250 of the Code of Virginia.

Upon demonstration of completion of VRP requirements, DEQ will issue a Certificate of Satisfactory Completion (Certificate) for enrolled parcels and a Declaration of Restrictive Covenants to be recorded in the Clerk's Office of the Circuit Court of James City County, Virginia. The Certificate will, among other things, indicate that completion of remediation satisfies RCRA Corrective Action requirements applicable to the Facility. In the event the remedy is not implemented or completed using the VRP, DEQ reserves its right to compel implementation or completion of the remedy using other enforcement mechanisms, such as a Remedy Consent Order.

Declaration

Based on the Administrative Record compiled for Corrective Action at the BASF Corporation facility, DEQ has determined that the Final Remedy selected in this Final Decision and Response to Comments is protective of human health and the environment.



10/7/2020

Chris M. Evans, Director
Office of Remediation Programs
Virginia Department of Environmental Quality

Date

Enclosure: Statement of Basis, September 2020



VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

STATEMENT OF BASIS

BASF CORP

Williamsburg, Virginia

EPA ID NO. VAD990710642

September 2020

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1 INTRODUCTION

1.1 Facility Name

The Virginia Department of Environmental Quality (DEQ) has prepared this Statement of Basis (SB) for the BASF Corporation Facility located in Williamsburg, James City County, Virginia (hereinafter referred to as the Facility, Site, or “BASF”.) DEQ’s proposed decision generally consists of the following requirements which will be implemented through the Voluntary Remediation Program in which the majority of the site is currently enrolled: 1) concurrence with a DEQ approved Long Term Stewardship Plan which includes a groundwater monitoring plan, Operations and Maintenance Manual (O&MM) and institutional and engineering control plan, and 2) implementation and compliance with land use controls in the form of a deed restriction or environmental covenant prepared in accordance with the Uniform Environmental Covenants Act, Title 10.1, Chapter 12.2, Sections 10.1-1238-10.1-1250 of the Code of Virginia. This SB highlights key information relied upon by DEQ in making its proposed decision.

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 Corrective Action Program is designed to ensure that certain facilities subject to RCRA have investigated and cleaned up any releases of hazardous waste and waste constituents that have occurred at their site. Information on the Corrective Action Program can be found by navigating <https://www.epa.gov/hwcorrectiveactionsites/corrective-action-resources-specific-epas-region-3>.

The Administrative Record (AR) for the Facility contains all documents, including data and quality assurance information, on which DEQ’s proposed decision is based. See Section 9, Public Participation for more information on how the public can review the AR.

2 FACILITY BACKGROUND

2.1 Site Description

Since 1989, BASF has been investigating the contamination at the site under the authority and oversight of the EPA, work sharing oversight of Virginia’s Department of Environmental Quality (DEQ) Office of Hazardous Waste (OHW) and Office of Remediation Programs (ORP), and under the oversight and authority of the DEQ’s Voluntary Remediation Program (VRP) and DEQ’s State Water Control Board (SWCB). BASF entered into a VRP Agreement with the DEQ on June 24, 1997. In addition, specific parcels of the site, such as the former wastewater treatment plant and the main landfill area/dredge spoils area, have been initially addressed under the authority of DEQ’s SWCB under several Administrative Consent Orders. The last SWCB Consent Order was terminated on January 6, 2006, by the DEQ, as BASF had satisfied their obligations of the Orders.

The site-wide Corrective Action investigations and evaluations of the developed areas of the BASF site further established the nature and extent of contamination in all media and the rate of migration of contamination of groundwater from the developed portions of the site. The site-wide Corrective Action investigation and evaluation also incorporated a comprehensive risk assessment to evaluate potential risk to human health and the environment of all impacted media from the developed parcel areas.

The BASF, Williamsburg, Virginia site is located in James City County, Virginia approximately one mile west of the point where U.S. Route 60 passes through the community of Lee Hall (Figure 1). The site is bounded on the west by the James River, on the east by Wood Creek, and on the south by undeveloped land and wetlands. The site occupies approximately 620 acres; with historical manufacturing facilities limited to about 10 percent of the total site area.

The site was initially developed by Dow Chemical in 1958 for the production of acrylic fibers. BASF acquired the Site in 1978 and continued production of acrylic products until 1989, when Mann Industries (Mann) purchased the industrial portion of the facility. Mann maintained production of acrylic fibers until 1993, when Mann filed a Chapter 7 bankruptcy petition and the bankruptcy receiver transferred a lien against one of Mann’s parcels to BASF and sold two other parcels to Virginia Commonwealth Textiles (VCT). The production facility has been inactive since 1993 and has largely been dismantled. In 2000, VCT filed a Chapter 7 bankruptcy petition, and the two VCT properties were purchased by Truswood Properties, which later sold them to Colonial Penniman. In 2017, CNB Properties, Inc. acquired the two VCT properties. In 2004, BASF repurchased the portion of the manufacturing property covered by its lien associated with the Mann bankruptcy to control the remediation of the property, which has been underway since the 1990s. The remainder of the site continues to be owned by BASF and is presently being considered for redevelopment.

In 2017, Virginia Electric and Power Company, doing business as Dominion Virginia Power, began construction of approximately 7.4 miles of a new overhead 500-kilovolt (kV) electric transmission line from Dominion's existing 500-230 kV Surry Switching Station in Surry County to a new 500 kV-230 kV-115 kV Skiffes Creek Switching Station in James City County and approximately 20.2 miles of new 230-kV line (in the counties of James City and York and the City of Newport News) from the Skiffes Creek Switching Station to the company’s existing Whealton Substation, located in the City of Hampton. Approximately 3,400 feet of the 500-kV line has been constructed on and bisects BASF’s property, and an additional 5,280 feet passes along an existing right-of-way that originally serviced the facility. The width of the power line right-of-way is 150 feet.

During active operation, acrylic-based products manufactured at the facility included various types of fiberspun yarns and anti-static, non-filament yarns used in the production of carpets and other home products. The process used hydrogen peroxide to polymerize acrylonitrile to produce polyacrylonitrile. Acrylic fibers were produced from a solution of polyacrylonitrile and zinc chloride. Major chemicals used in the production process included acrylonitrile and zinc chloride. Other chemicals such as dyes were used in smaller quantities during manufacturing. For a ten-year period, acrylonitrile was polymerized with methyl methacrylate in the B-Plant. Bulk chemicals were stored in tanks and those used in smaller quantities were stored in drums located throughout the production areas. Chlorinated solvents (CVOs) were used during maintenance and analytical activities. The facility also housed several laboratories involved in research and development activities, technical product support, and quality control. Chemicals from the laboratories were routed to the Wastewater Treatment Plant (WWTP) for treatment via dedicated chemical sewer line.

BASF has segregated the Site into different areas based on the primary land use (i.e., developed or undeveloped) for the purpose of environmental investigation. These areas are summarized in Table 1 and illustrated in the attached Figure 2.

Table 1. Site Investigation Areas

Status	Area Identification	Description
Developed	Area 2	Truswood Property
	Area 3A	Office Area
	Area 3B	Maintenance Area
	Area 3C	Utilities Area
	Area 3C-1	Electrical Substation Area
	Area 3C-1	Manufacturing Area

Status	Area Identification	Description
	Area 4A	North Landfill Area (also referred to as Recreational Area Landfill)
	Area 4B	Main Landfill Area
	Area 4C	Waste Water Treatment Plant (WWTP) (originally referred to as 4a – WWTP Area)
Undeveloped	Area 1A	Recreation Area
	Area 1B	Wooded Area North and East of the WWTP
	Area 1C	Wooded Area Adjacent to the Million Gallon Tank and Riverfront Area
	Area 1D	Landfill Riverfront Area
	Area 1E	South of Landfill Area

2.2 Regulatory Background

Environmental activities have been conducted at the Site under multiple regulatory programs as summarized in the applicable sections below.

2.2.1 State Water Control Board Consent Orders (Area 4C – Waste Water Treatment Plant)

Four Consent Orders have been associated with the former Waste Water Treatment Plant.

- October 31, 1988 Consent Order – required BASF to address discharge violations that were subject to the September 30, 1986 VPDES Permit No. VA0003654. The Consent Order required the cleanup of a spill of wastewater sludge and an environmental impact study of the sludge discharge on Wood Creek and Skiffes Creek.
- November 8, 1989 Consent Order – This Consent Order superseded the October 31, 1988 Consent Order and required the submittal of a corrective action plan and implementation schedule to properly close the surface impoundments and sludge lagoons. In addition, a water quality monitoring plan was required to be submitted to determine the effectiveness of the remedial action on the water quality of Tributary A, Wood Creek, and Skiffes Creek.
- July 8, 1998 Consent Order – This Consent Order superseded the November 8, 1989 Consent Order and, again, required the submittal of a corrective action plan and implementation schedule to properly close the surface impoundments and sludge lagoons. In addition, a water quality monitoring plan was required to be submitted to determine the effectiveness of the remedial action upon the water quality of Tributary A, Wood Creek, and Skiffes Creek.
- December 7, 2005 Consent Order – This Consent Order stated BASF was in compliance with the July 8, 1998 Consent Order and that the December 7, 2005 Consent Order superseded and cancelled the July 8, 1998 Order.

2.2.2 Voluntary Remediation Program (VRP)

The following parcels are enrolled in the Voluntary Remediation Program (VRP) through a 1997 VRP Agreement: Areas 1A, 1B, 1C, 1D, 1E, 3A, 3B, 3C, 3C-1 Electrical Substation Area, 3C-1 Manufacturing Area, and 4A.

In a letter dated September 17, 2004, VRP indicated that the site has met the unrestricted VRP requirements for soil in areas 1A, 1B, 1C, 1D, and 1E. DEQ indicated that Areas 3A, 3B, and 3C (including

both 3C-1 sub-areas) meet the VRP standards for industrial use. It should be noted that BASF further investigated the Area 3 parcels under CA oversight to meet residential use standards.

VRP indicated that unrestricted VRP Certificates could be issued for Areas 1A, 1C, and 1E when a property survey is recorded for these parcels. The remainder of the parcels were subject to clean-up objectives of the site-wide corrective action program and remained in the oversight of the CA program.

2.2.3 Virginia Pollutant Discharge Elimination System

A Virginia Pollutant Discharge Elimination System (VPDES) permit (Permit No. VA0003654) was issued for the site, requiring an annual groundwater monitoring program, which began in 1998. The groundwater monitoring program was merged with the CA program in 2014. Site-wide well locations are shown in Figure 3.

2.2.4 Site Wide Corrective Action

The Truswood Property (Area 2) is being managed under the DEQ RCRA Corrective Action Program in accordance with a Facility Lead Agreement signed in January 2005. The contiguous BASF owned property is subject to the CA objectives of this agreement.

Two of the undeveloped parcels (Areas 1C and 1E) received no further action status with respect to groundwater and soil from EPA and DEQ, while other parcels have received no further action status with respect to soil (Areas 1A, 1B, and 1D). EPA issued a Final Decision and Response to Comments Document (FDRTC) on October 10, 2008 with respect to these areas.

Since 2010, environmental activities in Area 4C have been conducted in accordance with the RCRA Corrective Action Program with oversight by the DEQ Office of Remediation Programs.

Additionally, portions of the site phase (Areas 2, 3A, and 3C- 1 Manufacturing Area) that have previously undergone active groundwater remediation are currently in a DEQ-approved monitored natural attenuation (MNA) program that require annual groundwater monitoring and reporting. The various groundwater monitoring programs were integrated into the VPDES 2013 Groundwater Monitoring Plan, which was subsequently updated in 2020.

2.3 Physical Setting and Site Geology

The site is located on the east bank of the James River in Williamsburg, Virginia. A tidal flat fringes the Wood Creek frontage along the eastern and southern borders of the site. The western shoreline along the James River forms a steep embankment that is subject to shoreline erosion.

The site covers approximately 620 acres with the Area 2, 3, and 4 parcels (developed areas) of the site occupying approximately 230 acres (Figure 2). Undeveloped portions of the site remain wooded. Topographic elevations range from approximately 5 to 30 feet above mean sea level (msl). The site operates under a Stormwater Pollution Prevention Plan to meet the requirements of its VPDES permit (Permit No. VA0003654).

The site geology consists of thick sequences of unconsolidated deposits that represent fluvial channel fills and marine terrace deposits from major streams and tributaries within the Mid-Atlantic Coastal Plain Province (Meng and Harsh 1988). The site is directly underlain by the Columbia formation to a

depth of approximately 30 to 40 feet below ground surface; followed by the Yorktown confining unit, which is approximately 30 feet thick at the site; followed by the Yorktown-Eastover aquifer, which is approximately 100 feet thick. Based on previous investigations, the top of the Yorktown confining unit occurs at an elevation of approximately 5 to 15 feet below msl and varies in thickness based on the topography; the top of the Yorktown-Eastover aquifer is reported to be at an elevation of 42 feet below msl.

The Columbia formation is the uppermost or water table zone beneath the site and is unconfined throughout its extent. Beneath the site, this water-bearing zone is composed of two hydrologic units that overlie the Yorktown confining unit – an interbedded silty sand unit and a basal sand unit. The basal sand water-bearing unit, which has only been identified beneath Area 3A, represents a zone of higher hydraulic conductivity composed of medium to coarse sand. The Yorktown confining unit hydraulically isolates the first water-bearing zone (Columbia formation) from lower aquifers.

The surficial groundwater system is characterized by two groundwater mounds located in Area 3C-1 and Area 4B, separated by the main tributaries (Tributaries A and B) of Wood Creek. In the northern portion of the site, groundwater in the silty sand unit moves radially away from a groundwater mound beneath the eastern portion of Area 3C-1 and discharges to the James River, Tributaries A and B to Wood Creek, the mouth of Grices Run, and Wood Creek. Groundwater movement beneath Area 3A is influenced by the basal sand unit that fills the depression in the surface of the Yorktown confining unit. The basal sand unit, a zone of higher hydraulic conductivity, represents a preferential flow pathway to the James River from the area near Baseline Road. In the southern portion of the site, groundwater in the silty sand unit moves radially away from a groundwater ridge along the western portion of Area 4B. Groundwater eventually discharges to the James River to the west and to Wood Creek to the east. In some portions of Area 4B, groundwater discharges either to Tributary B or the Constructed Treatment Wetlands (CTW) flowing into Wood Creek.

Hydraulic conductivity values determined for the Columbia formation across the site range from 0.07 to 12.9 feet per day. Bulk groundwater velocity estimates range from 17 to 82 feet per year (ft/year) in the silty sand unit and from 164 to 250 ft/year in the basal sand unit. Slower groundwater velocities (less than 30 ft/year) were observed in Area 3C-1 where the basal sand unit is absent.

3 SUMMARY OF ENVIRONMENTAL INVESTIGATION AND RISK ASSESSMENT

The Corrective Measures Study provides the remedial status of each of the site areas, key references, exposure pathways and receptors and is included in the AR. The following sections summarize the site areas and risk assessment results for areas other than areas 1C and 1E, which received no further action status with respect to groundwater and soil from EPA and DEQ, and Areas 1A, 1B, and 1D, which received no further action status with respect to soil in the EPA FDRTC document dated October 10, 2008.

3.1 Area 4B - Main Landfill Area/Area 1D (Groundwater)

The Main Landfill Area consists of a former landfill, which accepted general refuse, polymerization and fiber spinning wastes, and wastewater treatment sludge containing large amounts of zinc (as zinc hydroxide) between 1958 and 1980. The landfill was closed in November 1980. The area consists of an approximately 16-acre area of undisturbed hardwood forest and mixed shrub communities that surround the landfill to the west, north, northeast, and a small area to the south; the approximately 21-acre decommissioned landfill; and an approximately 16-acre Dredge Spoils Area (DSA) that was converted to a constructed treatment wetlands (CTW) in 1999. The DSA is a man-made, earthen-bermed marsh that contains dredged material from two dredging events from Wood Creek that were conducted by the U.S.

Army Corps of Engineers in the late 1960s and early 1970s for barge access (Geraghty and Miller 1981). The Main Landfill Area is bounded by the Unnamed Tributary B to the north, Wood Creek to the east, undeveloped parcel Area 1E – South of Landfill Area to the south, and undeveloped parcel Area 1D – Landfill Riverfront Area to the west.

Previous best management practices and remedial actions undertaken since 1992 include the decommissioning of the discharge outfall from the DSA, conversion of the DSA to a CTW in 1999, and the installation of an engineered phyto-cover within the footprint of the landfill waste. A 3.2-acre pilot-scale phyto-cover was installed in 2002 and a 15-acre full-scale plot was installed in 2003. The phyto-cover, consisting of 18,500 total plantings of hybrid poplars and indigenous species, is designed to reduce the amount of direct recharge through the solid waste, sequester zinc in the root zone, and to reduce runoff to the CTW. The CTW is designed as a zero-discharge remedy to reduce zinc concentrations in the landfill leachate and associated groundwater that discharges to the CTW, where zinc is retained as an insoluble precipitate (zinc sulfide). Prior to 1998, water collected in the CTW was routed to the on-site WWTP for treatment and discharged via permitted Outfall 001. In 1998, BASF completed installation of a trunk interceptor line to a local publicly owned treatment works operated by the Hampton Roads Sanitation District for treatment and discharge of the pre-treated effluent from the CTW.

BASF completed the installation of a new discharge outfall from the CTW to Wood Creek (Outfall 014) in late December 2016, thereby minimizing the need to discharge to the publicly owned treatment works. As of April 1, 2018, Outfall 014 was approved and added to the VPDES permit by DEQ. In April 2015, BASF installed shallow piezometers along the shoreline of Area 1D – Landfill Riverfront Area, where the groundwater plume associated with Area 4B – Main Landfill was suspected of discharging to the James River, as part of a larger James River investigation. In Area 1D, the piezometers were dry during the April 2015 sampling event, suggesting there was no discharge to the shoreline in this area. A review of the geologic conditions in this area, which indicated that the surficial aquifer is not suspected of extending under the river, because the elevation of the bottom of the surficial aquifer is approximately equal to the shoreline elevation, also indicated there is no discharge to the shoreline in this area. The results of this work were documented in the James River Plume Discharge Assessment Report submitted to DEQ on January 26, 2016, with a no further action recommendation. DEQ responded on March 17, 2016, with a request for the collection of co-located surface water and sediment samples near the shoreline piezometers to validate the report findings. On May 11, 2017, DEQ provided further verbal input that the co-located surface water and sediment samples were not required for Area 1D. This communication was documented in the September 21, 2017 James River Work Plan letter and approved by DEQ on September 28, 2017. DEQ approved the final 2018 James River Investigation Report in May 2018, concluding that the groundwater to surface water discharge pathway does not appear to pose unacceptable risk to the benthic community in the James River; therefore, no further characterization or risk evaluation is required for this exposure pathway.

3.2 Area 4A - North Area Landfill

The North Landfill Area consists of a 14.4-acre parcel in the northern portion of the site containing a small landfill (1.4 acres in size), which received industrial waste from acrylic fibers operations between approximately 1958 and 1969. Approximately 12 inches of silty clay soil covered the waste material. The area surrounding the landfill is relatively flat and wooded on three sides, with an access road forming the boundary along the south. An engineered phyto-cover system (including an additional 12 inches of vegetative soil) was installed in 1999 to limit infiltration of rainwater and to minimize potential migration of groundwater from waste.

Some previous reports refer to the North Landfill as being located in Area 1A – Recreation Area. The North Landfill is located within Area 1A – Recreation Area. However, Area 1A was later subdivided to form Area

4A – North Landfill Area, as noted in the Corrective Action – Statement of Basis – Technical Support Document dated October 2008. Under the 2013 revision of the VPDES Groundwater Monitoring Plan, Area 4A – North Landfill Area sentinel well piezometer 01 was monitored for target constituents of potential concern (COPCs) (zinc and chloride). Based on the historical data for this area and per the DEQ-approved 2020 Groundwater Monitoring Plan, no further groundwater monitoring is required in this area.

3.3 Area 4C - WWTP/Utilities Area/Area 1B (Groundwater)

The WWTP operated between approximately 1958 through 2001, treating sanitary waste, process water, zinc-bearing stormwater, and leachate from the sludge lagoons and Main Landfill. Wastewater treatment consisted of chemical precipitation and sedimentation followed by biological oxidation using fixed film reactors. Treated effluent flowed through a 1-acre spill retention pond (i.e., Fire Pond) located in the Utilities Area prior to discharge to the Unnamed Tributary A of Wood Creek. Several aboveground storage tanks and building(s) were also historically located on the Utilities Area. Surface impoundments (SI) SI-1 and SI-4 were used as the primary industrial and sanitary wastewater equalization basins. SI-2 followed the primary clarifiers used for physical-chemical treatment of zinc. SI-3 followed the secondary clarifiers used for biological treatment. SI-5 was used primarily as a spill retention pond.

The Fire Pond was closed in 1998, while the impoundments and lagoons were closed between June 2001 and March 2002 in accordance with DEQ-approved plans. As part of closure activities, dredged sediments from the Fire Pond and excavated soils from SIs (SI-1 through SI-5) and excavated sludge from sludge lagoons (SL) SL-1 and SL-2 were consolidated into SL-3,-4, and-5, stabilized in place, and capped between June 2001 and March 2002. The boundary of the stabilization unit in the WWTP Area is shown on Figure 3. In September 2001, BASF permanently deactivated the WWTP when the lagoons and impoundments were closed.

In 2010, DEQ requested that a CMS be completed to select the final remedy for Area 4C. In response, BASF submitted and DEQ approved a Focused CMS Report for Area 4C that presented a remedy to address COPCs in groundwater – zinc and CVOCs (mainly 1,1-dichloroethene). After DEQ’s approval of the Focused CMS Report, implementation of the 2011 CMS remedy was postponed while discussions with Dominion Power took place regarding the location of a high-voltage power line near Area 4C that could affect the implementation and effectiveness of the 2011 CMS remedy. During the period from 2011 through 2018, additional investigations and ongoing monitoring were conducted within Area 4C and within the bordering Wood Creek and Skiffes Creek waterways (Eastern Tributary Network [ETN]). DEQ approved the ETN sediment and surface water investigation that concluded that there is no ecological risk associated with zinc to the benthic community. VOCs have been demonstrated to be either not present or present at concentrations below ecological screening values.

At a March 2015 meeting, DEQ requested that BASF submit a separate comprehensive report for Area 4C containing available data to support an updated conceptual site model and a re-evaluation of the remedial approach for Area 4C. BASF submitted to DEQ the August 30, 2019 Area 4C Conceptual Site Model Report, summarizing the additional investigation activities that occurred between 2011 and 2019 and presented a proposed groundwater remedial alternative of monitored natural attenuation.

The Area 4C Conceptual Site Model Report concluded that the WWTP closure effectively addressed the contaminant release mechanisms contributing to media impacts during active operations, including the following:

1. Infiltration through sludge or waste into site groundwater
2. Infiltration through impacted saturated soil into site groundwater
3. Discharge of treated effluent with residual zinc to Tributary A
4. Stormwater runoff to Tributary A

The elimination and/or significant reduction of these release mechanisms combined with natural attenuation processes has reduced the mass flux migrating toward Tributary A and resulted in the gradual improvement of groundwater quality conditions since completion of the WWTP closure activities. DEQ, in its September 19, 2019 letter, agreed that monitored natural attenuation, in addition to institutional controls, is protective of human health and the environment in Area 4C.

3.4 Areas 3A, 3B, and 3C - Office and Manufacturing Area

The Office Area is an approximately 32.2-acre parcel located in the northwestern portion of the site that was used for administrative offices, research laboratories, and technical support for finished goods. Chemicals used in the research laboratories were routed for disposal to an on-site treatment system via a dedicated chemical sewer line. The Manufacturing Area is a 22.8-acre parcel located east of the Office Area. During active operations, acrylic-based products were manufactured in this area, including the production of acrylic fibers from a solution of polyacrylonitrile and zinc chloride. Bulk chemicals were stored in tanks. Those used in smaller quantities were stored in drums located throughout the production areas. Chlorinated solvents were used during maintenance and analytical activity and were sent for recycling and reuse. The eastern portion of the dedicated chemical sewer line is located in the Manufacturing Area (Figure 2).

Three separate areas of elevated CVOC concentrations (i.e., plume centroids) were previously delineated in the Office and Manufacturing Areas. Beginning in 2004, in-situ reactive zones (IRZs), known as IRZ Areas 1, 2, and 3, were established in these plume centroid regions. CVOCs decrease with depth and are confined to the silty sand and basal sand units in IRZ Areas 1 and 2 and to the silty sand unit in IRZ Area 3 (the basal sand is absent in IRZ Area 3). The IRZs involved injecting a dilute carbon solution into permanent injection wells to serve as a food source to stimulate the indigenous microbial population and subsequent enhanced reductive dechlorination (ERD) of CVOCs. The planned 5-year groundwater remediation period concluded in March 2009. During this time, strongly reducing IRZs formed in the three treatment areas (IRZ Areas 1 through 3) and concentrations of tetrachloroethylene (PCE) and trichloroethylene (TCE) decreased to less than screening levels in the majority of well locations monitored routinely. Generally decreasing concentrations of transient daughter products (cis-1,2-dichloroethylene and vinyl chloride) and generation of final end products (ethene/ethane) were observed as a result of ERD processes.

Between 2015 and 2017, BASF performed a human health risk assessment (HHRA) for the Main Industrial Area, including the Office and Manufacturing Areas. The HHRA concluded the following:

1. Excess lifetime cancer risks and hazards from exposure to soil for all hypothetical receptors (i.e., resident, commercial/industrial worker, and construction and utility workers) are within or below DEQ target risk and hazard levels.
2. Potential excess lifetime cancer risks and noncancer hazards from potential exposure to vapors in indoor air for a hypothetical future resident and a hypothetical future commercial/industrial worker are within or below regulatory benchmarks.
3. Potential excess lifetime cancer risks and noncancer hazard of a hypothetical future resident from exposure to constituents in the Columbia Aquifer groundwater used as potable water are greater than both EPA and DEQ benchmarks.
4. Potential risk and hazard to a construction worker and a utility worker from exposure to groundwater are within or below regulatory benchmarks.
5. Total excess lifetime cancer risks for each receptor are within or below the acceptable risk range, while the noncancer hazards are at or below regulatory benchmarks.
6. The HHRA recommended no further action for soils or for vapor intrusion and that a deed restriction or environmental covenant be implemented at the site prohibiting groundwater use of

the Columbia Aquifer for purposes other than monitoring. DEQ approved the HHRA and its conclusions on October 19, 2017.

Between 2015 and 2017, BASF performed investigations of the groundwater to surface water discharge pathway downgradient of the Office and Manufacturing Area to the James River. Investigation results showed that, while some VOCs were detected in the sediments and surface water, they do not pose an unacceptable ecological risk and, therefore, no further investigation, monitoring, or remedial action along the James River shoreline associated with the former BASF facility was proposed in the 2018 James River Investigation Report. DEQ, in its letter of May 2, 2018, approved the report, noting that no further characterization or risk evaluation is required for this exposure pathway.

3.5 Area 2 -Truswood Area/Area 1A Groundwater

For the purposes of the discussion herein, the Truswood Area consists of the Truswood Property and a section of Area 1A – Recreation Area, located hydraulically downgradient of the Truswood Property. The Truswood Area is comprised of several buildings, parking lots, and wooded areas. Building 102 was formerly used for manufacturing of Lurex® (a reflective material that consisted of Mylar sheets coated with a color emulsion) from 1967 to 1972. Building 103 was formerly used for warehousing and materials storage. Building 105 was used as the Apparel Spun Yarn Plant from 1972 to 1989. Building 206 was used as the former Industrial Relations Administrative Office, and Building 235 was used as the former credit union. To the northeast, the Recreation Area bordered a marsh and property owned by the county (James City Development Authority).

BASF no longer owns the Truswood Property, and ownership has changed hands several times since the mid-1990s. Currently, the property is unoccupied and owned by CNB Properties, Inc. (Chesapeake Bank, Kilmarnock, Virginia). The Truswood Property is zoned for industrial purposes, and no potable use of groundwater is occurring.

A CVOC and 1,4-dioxane plume has been delineated on the Truswood Property that extends downgradient to the Recreation Area. The downgradient marsh serves as the headwaters for the Unnamed Tributary to Wood Creek and a discharge boundary for groundwater originating from the Truswood Property. No adverse impacts to ecological receptors in the marsh were identified based on hypothetical exposure to maximum groundwater concentrations detected during a supplemental groundwater investigation (conducted from 2008 to 2009) and maximum simulated groundwater concentrations at the point of discharge. An additional investigation was performed in the fall 2019 to further define the plume dimensions associated with the Truswood Area. Beginning in 2004, an IRZ was established in the developed portion of the Truswood Property. CVOCs decrease with depth and are confined to the silty sand unit. The IRZ involved injecting a dilute carbon solution into permanent injection wells to serve as a food source to stimulate the indigenous microbial population and subsequent ERD of CVOCs. The planned 5-year groundwater remediation period concluded in March 2009. During this time, strongly reducing conditions formed in the treatment area and concentrations of PCE and TCE decreased to less than screening levels in the majority of well locations monitored routinely. Generally decreasing concentrations of transient daughter products (cis-1,2-dichloroethylene and vinyl chloride) and generation of final end products (ethene/ethane) were observed as a result of ERD processes. IRZ influence from ERD groundwater remediation extends to the Truswood Property / Recreation Area boundary and has positively influenced the nature and extent of CVOC contamination. The Truswood Area transitioned to monitored natural attenuation in November 2009.

An HHRA to evaluate the potential future risks to human health and the environment associated with exposure to constituents detected in soil at the Area 2 – Truswood Property was prepared in 2008. Potential human exposures to COPCs in soil by future construction/utility workers, current and future site workers, and current and future adult and child residents were evaluated in this risk assessment. Exposure

pathways included ingestion, dermal contact, inhalation of particulates, inhalation of vapors in ambient air, and inhalation of volatile COPCs migrating to indoor air (site workers and adult and child residents). The calculated upperbound excess lifetime cancer risks were less than the DEQ benchmark of 1×10^{-6} for all of the potentially exposed populations with the following exception – the potential migration of vapors from subsurface soil gas into hypothetical future constructed buildings for commercial/industrial workers, adult residents, and child residents ranging from 3×10^{-6} to 5×10^{-6} , but at the low end of the EPA target risk range of 1×10^{-4} to 1×10^{-6} . With respect to non-cancer effects, none of the exposure pathways had calculated hazard indices greater than the benchmark of 1. Therefore, there were no adverse effects predicted for the non-cancer endpoints. An ecological risk assessment (ERA) for the Truswood property, consisting of both a screening-level ERA and the initial step of a baseline ER (BERA), was also performed in 2008. The ERA concluded that adverse impacts are not likely to occur for terrestrial ecological receptors exposed to constituents in the soil.

Subsequent to the submittal of the HHRA/ERA, DEQ requested additional risk-related evaluations, and BASF submitted a report regarding arsenic concentrations in soil. DEQ considered this evaluation and determined that soil at Area 2 met residential risk criteria for carcinogens and noncarcinogens, and that BASF was not required to take additional action regarding the soil in Area 2. During the period from 2011 through 2018, additional investigations and ongoing monitoring were conducted within the tributaries of the Wood Creek and Skiffes Creek waterways (ETN), including locations downgradient of Area 2. DEQ approved the ETN sediment and surface water investigation that concluded that there is no ecological risk associated with zinc to the benthic community. VOCs have been demonstrated to be either not present or present at concentrations below ecological screening values.

A DEQ-approved HHRA, performed in 2017, concluded that the sediments and surface water of the ETN (including Unnamed Tributary C, the downgradient receiving water body for Area 1A – Recreation Area) do not pose an unacceptable risk of adverse health effects to hypothetical human receptors now or in the future.

4 CORRECTIVE ACTION OBJECTIVES

4.1 Soil

DEQ has determined that corrective action objectives for soil for unrestricted use have been met with the exception of the following areas.

Areas 4B and 4C – It has been determined that industrial risk based screening levels are protective provided these areas are not used for residential purposes and exposure to contaminated soil is prevented by maintenance of engineering controls in accordance with a DEQ approved Long Term Stewardship Plan

Area 4A, 4B, and 4C – Exposure to in-situ subsurface waste will be controlled through conformance with a DEQ approved Soil Management Plan.

4.2 Groundwater

DEQ has determined that drinking water standards, namely Maximum Contaminant Levels (MCLs), or Tap-Water Regional Screening Levels (RSLs) or secondary MCLs for constituents that do not have an MCL for COCs in groundwater at the Facility are protective of human health and the environment. DEQ's Corrective Action Objectives for Facility groundwater are the following:

1. To control exposure to the hazardous constituents in the groundwater by requiring compliance with and maintenance of a groundwater use restriction at the Facility as long as drinking water standards are exceeded for COCs (as identified in Table 2).

2. To monitor stability and natural attenuation of concentrations of the following hazardous constituents in groundwater in accordance with a DEQ approved Long Term Stewardship Plan.

Table 2. Corrective Action Objectives for COCs in Groundwater

Analyte	Units	Groundwater Screening Criteria	Basis
1,1,1-Trichloroethane	µg/L	200	MCL
1,1,2,2-Tetrachloroethane	µg/L	0.076	Tapwater
1,1,2-Trichloroethane	µg/L	5	MCL
1,1-Dichloroethane	µg/L	2.8	Tapwater
1,1-Dichloroethene	µg/L	7	MCL
1,2-Dichloroethane	µg/L	5	MCL
1,2-Dichloropropane	µg/L	5	MCL
1,4 Dioxane	µg/L	0.46	Tapwater
2-Butanone (Methyl Ethyl Ketone)	µg/L	5600	Tapwater
4-Methyl-2-Pentanone	µg/L	6300	Tapwater
Acetone	µg/L	14000	Tapwater
Benzene	µg/L	5	MCL
Bromodichloromethane	µg/L	80	MCL
Bromoform	µg/L	80	MCL
Bromomethane	µg/L	7.5	Tapwater
Carbon Disulfide	µg/L	810	Tapwater
Carbon Tetrachloride	µg/L	5	MCL
Chloride	mg/L	250	Secondary MCL
Chlorobenzene	µg/L	100	MCL
Chlorodibromomethane	µg/L	80	MCL
Chloroethane	µg/L	21000	Tapwater
Chloroform	µg/L	80	MCL
Chloromethane	µg/L	190	Tapwater
cis-1,2-Dichloroethene	µg/L	70	MCL
cis-1,3-Dichloropropene	µg/L	0.47	Tapwater
Dichloromethane	µg/L	5	MCL
Ethylbenzene	µg/L	700	MCL
Iron, Dissolved	mg/L	0.3	Secondary MCL
Methyl N-Butyl Ketone (2-Hexanone)	µg/L	38	Tapwater
Styrene (Monomer)	µg/L	100	MCL
Sulfate	mg/L	250	Secondary MCL
Tetrachloroethene	µg/L	5	MCL
Toluene	µg/L	1000	MCL

Analyte	Units	Groundwater Screening Criteria	Basis
Total Xylenes	µg/L	10000	MCL
trans-1,2-Dichloroethene	µg/L	100	MCL
1,3-Dichloropropene	µg/L	0.47	MCL
Trichloroethene	µg/L	5	MCL
Vinyl chloride	µg/L	2	MCL
Zinc	mg/L	5	Secondary MCL

Notes:

MCL: Maximum Contaminant Level (MCL) from United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) Table May 2020

Tapwater: Screening Level from EPA Regional Screening Levels (RSLs) Table May 2020

Secondary MCL: Screening Level from EPA Secondary Drinking Water Standards

5 SUMMARY OF PROPOSED REMEDY

Under this proposed remedy, DEQ is requiring the following actions:

1. Maintain existing engineering controls consisting of caps, phytocover in Area 4B - Main Landfill, and Constructed Treatment Wetlands (CTW) where contamination remains in the subsurface soils above site-specific risk-based levels established in the risk assessment in accordance with DEQ approved OM Plan, unless BASF proposes and VDEQ and EPA approve an alternative approach to engineering controls.
2. The Facility shall continue to monitor groundwater pursuant to an approved groundwater-monitoring plan, and any revisions thereto, until such time as it can be shown that the concentrations of hazardous constituents have met the corrective action objectives or until such time as it can be shown that the concentrations of hazardous constituents demonstrate a generally stable or decreasing trend.
3. Maintain compliance with land use restrictions and institutional controls.
 - a. Area 4B (Main Landfill Area) and Area 4C (former WWTP) shall not be used for residential purposes.
 - b. Columbia Aquifer groundwater at the property shall not be used for any purpose except to conduct the operation, maintenance, and monitoring activities required by EPA and the DEQ, unless it is demonstrated to EPA and DEQ that 1) such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected final remedy, and 2) EPA and DEQ provide prior written approval for such use.
 - c. No new wells shall be installed on the property in the Columbia aquifer unless EPA or DEQ provide prior written approval to install such wells.
 - d. Subsurface soil excavation at Area 4A – North Landfill Area, Area 4B – Main Landfill Area, and Area 4C – WWTP is prohibited except in conformance with an appropriate soil management plan that includes a health and safety plan.

In addition, the Facility owner shall provide a coordinate survey as well as a metes and bounds survey of the Facility boundary to DEQ. Mapping the extent of the land and groundwater use restrictions will allow for presentation in a publicly accessible mapping program.

6 IMPLEMENTATION

DEQ proposes to implement the remedy through the Virginia Voluntary Remediation Program (VRP). BASF will enroll Parcels 4B and 4C that are not currently enrolled in the Program and will make efforts to have the current owner of Area 2 –Truswood to enroll Area 2 into the VRP program. In the event that Area 2 is not enrolled in the VRP Program, BASF will prepare as a part of its Long Term Stewardship Plan, an IC and EC Plan that includes notifications and communications with the existing property owner regarding the use limitations. The Facility will submit off-site plume information to James City County to support enforcement of the Private Well Regulations notice. Per Virginia’s Private Well Regulations 12VAC 5-630-380, the notice will describe the nature and extent of contaminated groundwater located on the BASF owned and Area 2 Truswood property. A map will also be provided, and updated every five (5) years. A copy of the notice to the James City County Health Department and each update will be provided to DEQ.

Upon submittal of the Demonstration of Completion report, DEQ VRP will issue a Certification of Satisfactory Completion of Remediation (Certificate) and a Declaration of Restrictive Covenants. These documents are to be recorded in the Clerk’s Office the Circuit Court of James City County. The VRP Certificate(s) will, among other things, indicate that completion of remediation satisfies RCRA Corrective Action requirements applicable to the Facility. The Declaration of Restrictive Covenants will require compliance with engineering and institutional controls and adherence to the site-specific Long Term Stewardship Plan to include long-term groundwater monitoring. In lieu of the Declaration of Restrictive Covenant, BASF may pursue an environmental covenant under the Virginia Uniform Environmental Covenants Act, Title 10.1, Chapter 12.2, Sections 10.1-1238-10.1-1250 of the Code of Virginia.

In the event, the remedy is not implemented or maintained under the VRP, DEQ reserves its right to compel implementation or completion of the remedy using other enforcement mechanisms, such as a Remedy Consent Order. Therefore, DEQ does not anticipate any regulatory constraints in implementing its remedy.

7 EVALUATION OF DEQ’S PROPOSED DECISION

This section provides a description of the criteria DEQ used to evaluate the proposed decision for the BASF site, consistent with EPA guidance. The criteria are applied in two phases. In the first phase, DEQ evaluates three decision threshold criteria as general goals. In the second phase, DEQ then evaluates seven balancing criteria to determine if the proposed decision provides the best relative combination of attributes.

7.1 RCRA Threshold Criteria

7.1.1 Protect Human Health and the Environment

With respect to Facility soils, soils remaining in Areas 4A, 4B, and 4C above residential screening levels will be restricted from direct contact through recordation of land use restrictions. The site risk assessment has determined the remainder of the site is acceptable for residential use. With respect to Areas 4B and 4C uses, DEQ proposes to limit those areas to industrial use in order to minimize the potential for human exposure to contamination.

The BASF property is no longer in operation and groundwater is not in use for potable purposes. Future users of the site will be protected by a site-wide prohibition of use of the Columbia Aquifer for any purpose except to conduct the operation, maintenance, and monitoring activities required by EPA and DEQ.

Current site conditions do not pose an unacceptable risk to human or ecological receptors that cannot be addressed with institutional controls.

7.1.2 Achieve Media Cleanup Standards

Based on the results of investigations all known sources of contamination have been characterized. The completed interim measures (IMs) have addressed significant contamination including the source material. The proposed remedy includes institutional controls which protects human health and the environment from potential exposure to remaining hazardous constituents in groundwater, and in soil (Areas 4A, 4B, 4C). Site-wide groundwater monitoring will continue to be performed in accordance with a DEQ approved groundwater monitoring plan, with DEQ approved revisions as necessary. The use of institutional controls and monitored natural attenuation will minimize and/or manage exposure to groundwater containing concentrations greater than media cleanup standards as long as standards are exceeded.

7.1.3 Remediating the Source of Releases

In all proposed remedies, DEQ seeks to eliminate or reduce further releases of hazardous wastes and hazardous constituents that may pose a threat to human health and the environment. There are no remaining large, discrete sources of waste that have not been characterized from which constituents would be released to the environment. BASF will continue to monitor the groundwater plume for natural attenuation until it has been determined that cleanup objectives have been met.

7.2 RCRA Balancing/Evaluation Criteria

7.2.1 Long-Term Effectiveness

The completed IMs at the site have greatly reduced concentrations of contaminants of concern in soil and groundwater and remaining concentrations in soil meet the residential screening levels with the exception of Areas 4A, 4B, and 4C where use restrictions will prevent exposure to contaminants of concern.

DEQ anticipates that the land use and groundwater use restrictions will be implemented through an deed restriction or environmental covenant to be recorded in the chain of title for the Facility property. If the mechanism is to be an environmental covenant, the environmental covenant will run with the land and as such, will be enforceable by DEQ. In addition, the implemented groundwater monitoring program will continue until DEQ has determined that the groundwater corrective action objective has been met.

7.2.2 Toxicity, Mobility, and Volume Reduction

All known solid wastes have been removed and disposed of off-site and/or treated in-situ, and measures have been put in place to be protective of human health and the environment, leaving the majority of the site suitable for residential use. The goal for soils have been met through IMs. Future reduction of constituents of concern in groundwater is anticipated through natural attenuation.

7.2.3 Short-Term Effectiveness of Remedy and Potential Human Exposure

Current site conditions do not pose an unacceptable risk that cannot be addressed with institutional controls. DEQ anticipates that the land use and groundwater use restrictions will be fully implemented shortly after the issuance of the FDRTC and the Certificate from the Voluntary Remediation Program.

7.2.4 Implementability

DEQ's proposed remedy is readily implementable. DEQ has coordinated with EPA and BASF in this proposed remedy. DEQ proposes to implement the remedy through the enrollment of non-enrolled parcels into the DEQ Voluntary Remediation Program. BASF will subsequently submit necessary documentation to satisfy the "Demonstration of Completion" requirements to the VRP. BASF will then request a Certification of Satisfactory of Completion of Remediation (Certificate). The Certificate and Restrictive Covenant or Environmental Covenant pursuant to UECA will be recorded with the deed on the property. The Certificate and Covenant will require compliance with a DEQ approved Long Term Stewardship Plan to maintain institutional controls and will include the DEQ approved long term groundwater monitoring plan to assess natural attenuation of COCs in groundwater.

7.2.5 Cost Effectiveness

The Facility has already incurred the majority of the costs associated with remedial action at the site with the completion of various Interim Measures Remedial Actions. The estimated costs for the proposed final remedy and groundwater monitoring are reasonable in relation to the risk reduction provided to human health and the environment and in accordance with the future use of the land.

7.2.6 Community Acceptance

DEQ will evaluate community acceptance of the proposed remedy during the public comment period, and it will be described in the FDRTC.

7.2.7 Support Agency Acceptance

DEQ has solicited EPA input and involvement throughout the investigation process at the Facility. EPA is reviewing DEQ's proposed remedy for the Facility and will comment or concur during the public comment period.

8 ENVIRONMENTAL INDICATORS

EPA sets national goals to measure progress toward meeting the nation's major environmental goals. For Corrective Action, EPA evaluates two key environmental indicators for each Facility: (1) current human exposures under control and (2) migration of contaminated groundwater under control. DEQ determined that the Facility met these indicators on September 30, 2003 and September 27, 2004, respectively.

9 PUBLIC PARTICIPATION

Before DEQ makes a final decision on its proposed final remedy for the Facility, the public may participate in the decision selection process by reviewing this SB and documents contained in the Administrative Record for the Facility. The Administrative Record contains all information considered by DEQ in reaching this proposed decision. Interested parties are encouraged to review the Administrative Record and comment on DEQ's proposed decision. For additional information regarding the proposed remedy, please contact Ms. Tara Mason at (804) 698-4018 or tara.mason@deq.virginia.gov.

The public comment period will last thirty (30) calendar days from the date notice of DEQ's proposed final remedy is published in a local newspaper. Notices will be sent to the adjacent property owners and to the local government, James City County. Comments may be submitted by mail or email to Ms. Mason at the address listed below.

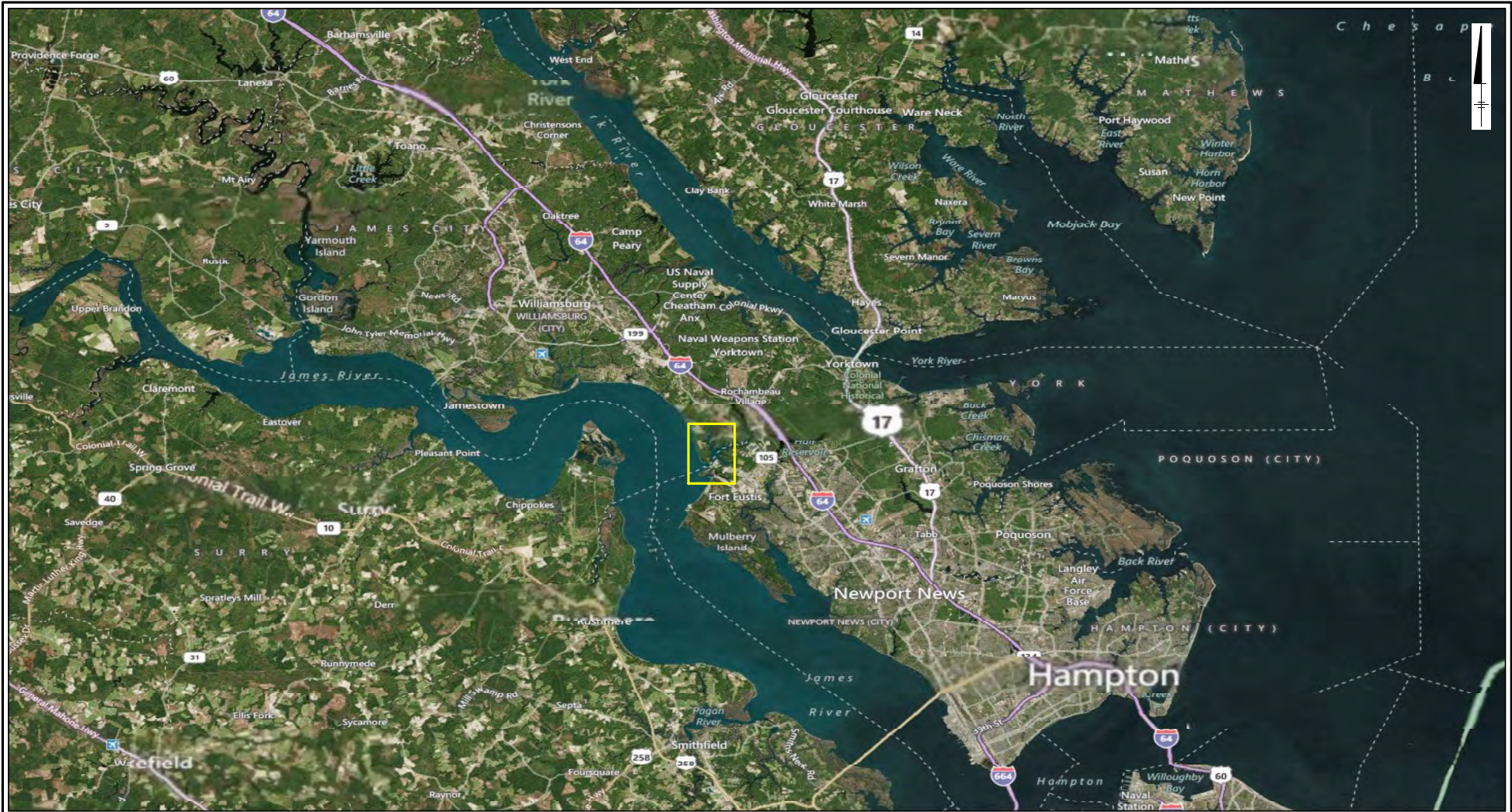
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400
P.O. Box 1400

Richmond, VA 23218
Contact: Ms. Tara Mason
Phone: (804) 698-4018
Email: tara.mason@deq.virginia.gov

DEQ will make a final decision after considering all comments, consistent with applicable RCRA requirements, regulations, and guidance. If the decision is substantially unchanged from the one in this Statement of Basis, DEQ will issue a final decision and inform all persons who submitted written comments or requested notice of DEQ's final determination. If the final decision is significantly different from the one proposed, DEQ will issue a public notice explaining the new decision and will reopen the comment period.


Attachments

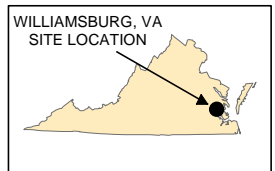
Figure 1 - General Site Location



CITY: MPLS DIV:GROUP: MPLS DB:MG LD: AD
 Path: G:\GIS\Projects\BASF - Williamsburg\Map\20130422.mxd

LEGEND:

 STUDY AREA

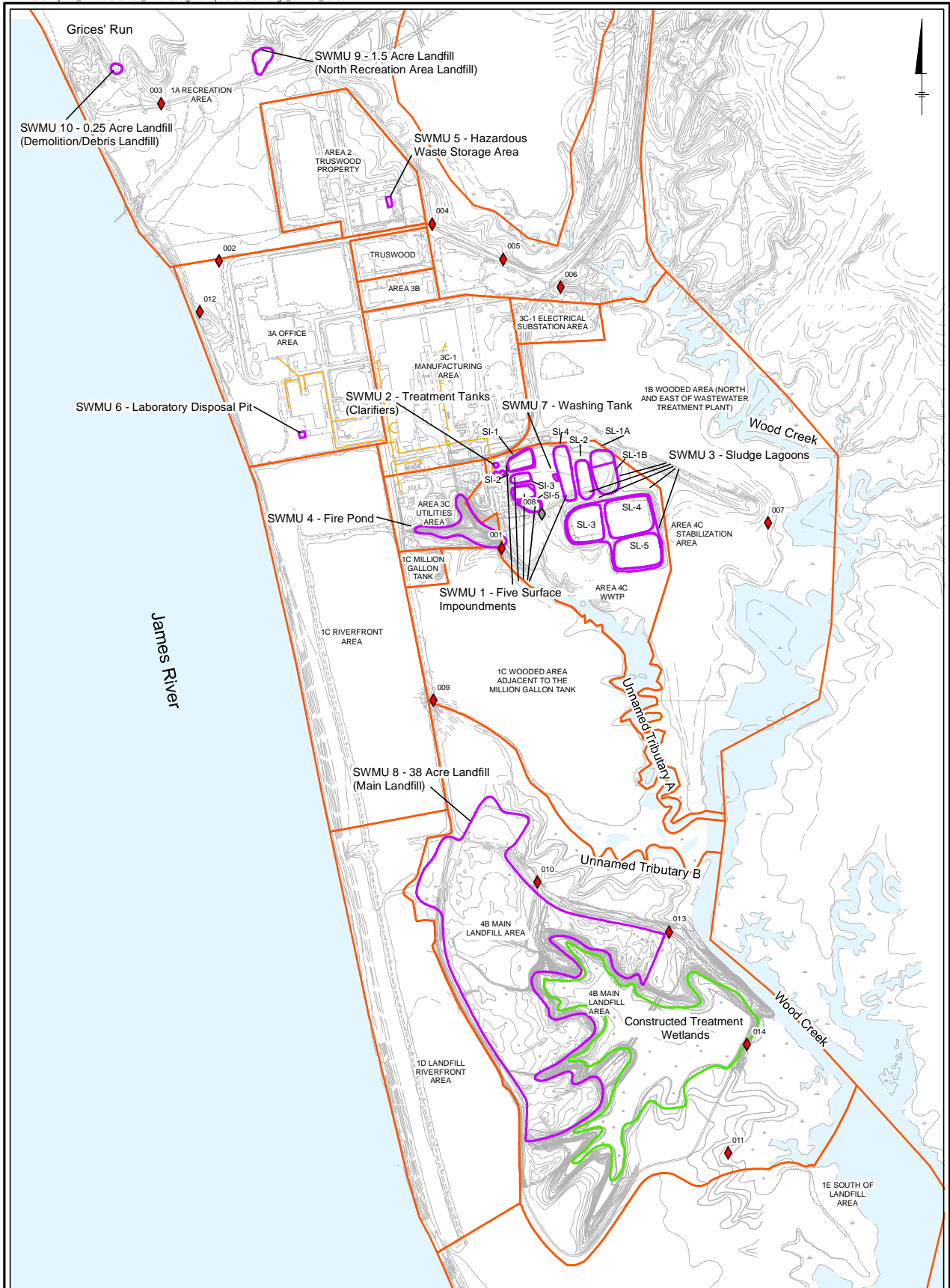


NOTES:

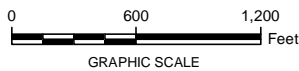
IMAGERY ACCESSED THROUGH BING MAPS AERIAL VIA ARCGIS ONLINE LAYER PACKAGES BY ESRI (12/1/2010) (C)
 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS ACCESSED ON 4/22/2013 THROUGH ARCGIS 10.

BASF CORPORATION WILLIAMSBURG, VIRGINIA	
GENERAL SITE LOCATION	
	FIGURE 1

Figure 2 – Detailed Site Location



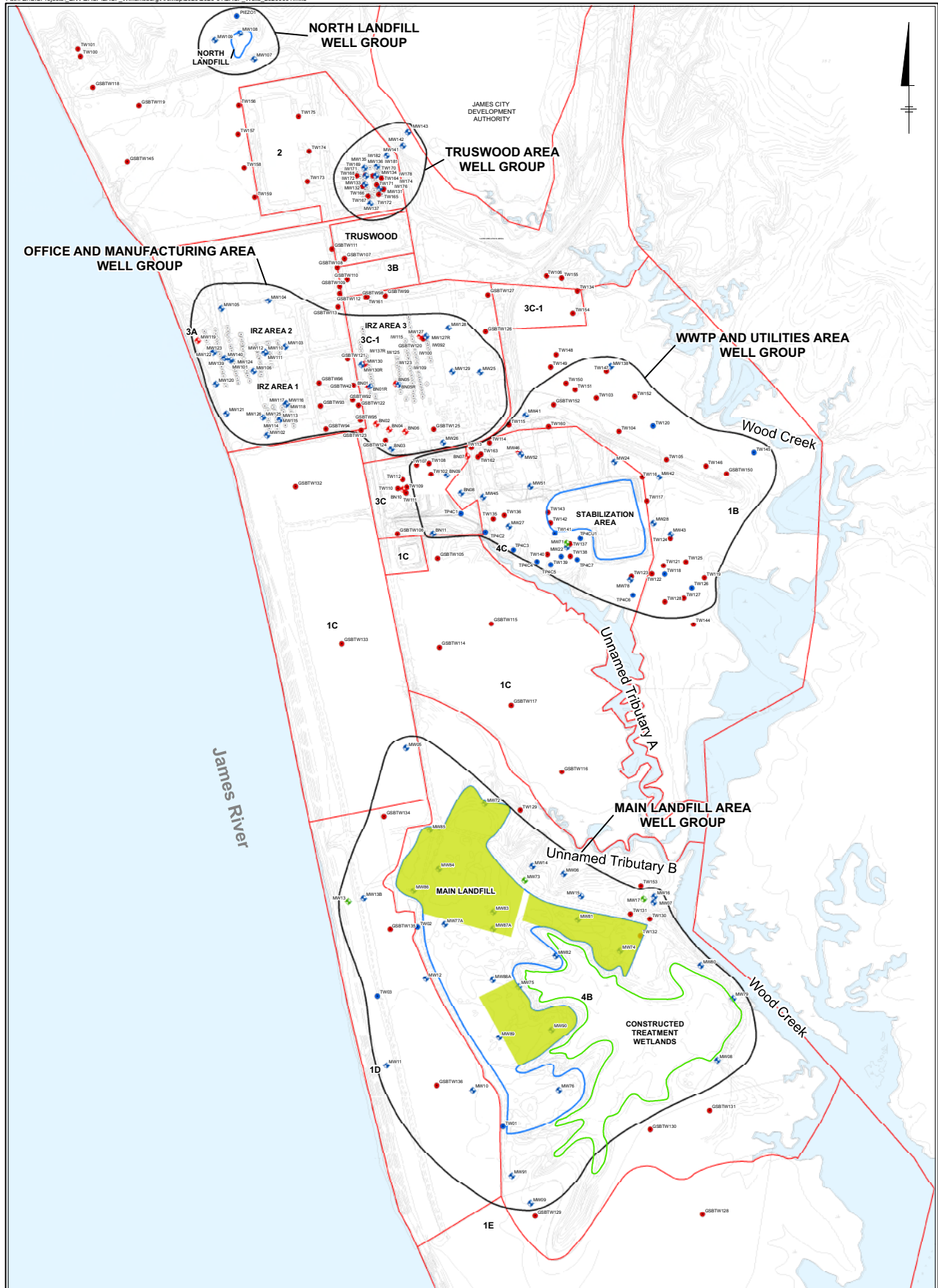
- LEGEND:**
- ◆ Outfall Location
 - ◇ Outfall Location - Closed
 - Constructed Treatment Wetland
 - Chemical Sewer
 - BASF Area Boundary
 - SWMU Boundary



BASF CORPORATION
 WILLIAMSBURG, VIRGINIA

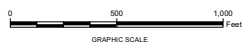
DETAILED SITE LOCATION

Figure 3 – Site-Wide Well Locations



- Legend**
- Monitoring Wells**
 - Monitoring Well - Columbia Formation
 - Monitoring Well - Yorktown Formation
 - Former Monitoring Well Location
 - Inactive Injection Well
 - Area Boundary Line**
 - Constructed Treatment Wetland**
 - Landfill or Stabilization Area Boundary**

- Temporary Monitoring Wells**
 - Temporary Monitoring Well - Columbia Formation
 - Former Temporary Monitoring Well Location
 - Phyto-cover



BASF CORPORATION
 WILLIAMSBURG, VIRGINIA

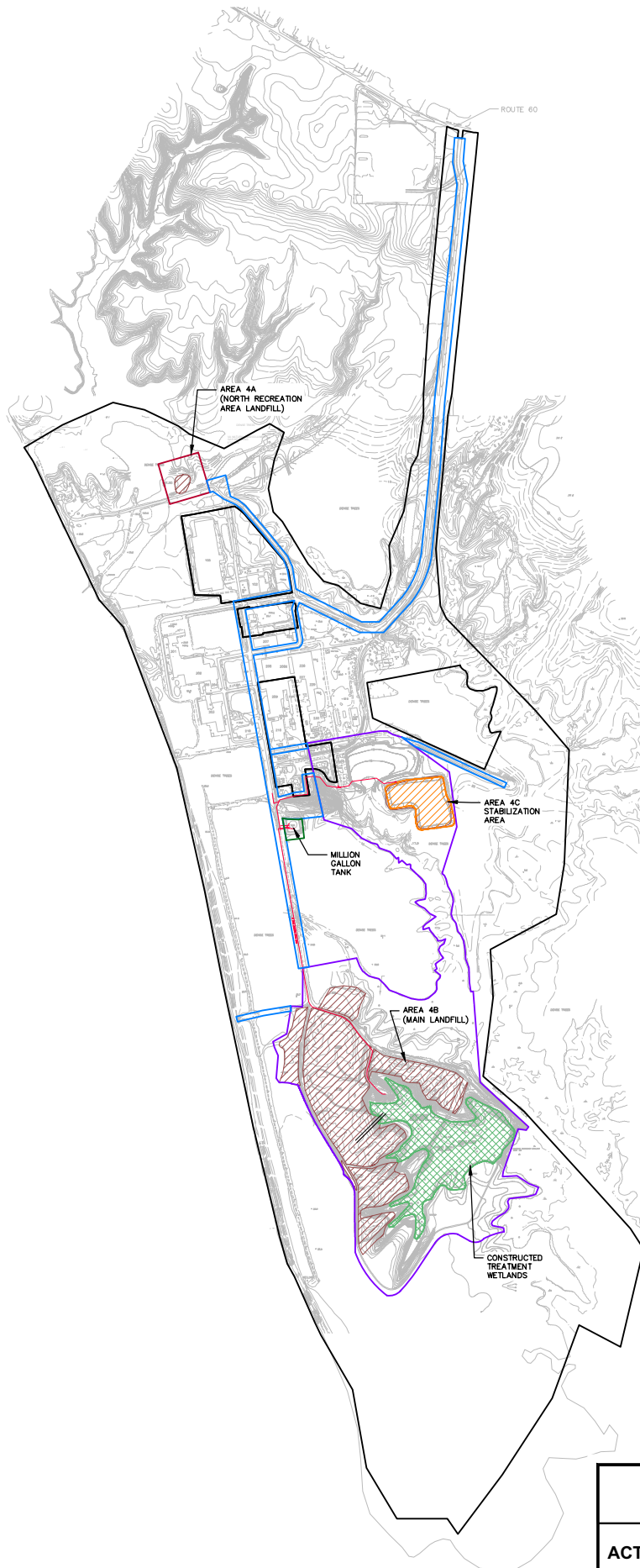
SITE-WIDE WELL LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3

Figure 4 – Activity and Use
Limitation Areas

XREFS: IMAGES: PROJECTNAME: ---

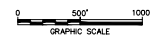


LEGEND:

- ACCESS EASEMENTS
- INSTITUTIONAL CONTROL RESTRICTING SUBSURFACE DISTURBANCE (SOIL MANAGEMENT PLAN AND HEALTH & SAFETY PLAN) AND PROHIBITING RESIDENTIAL LAND USE
- INSTITUTIONAL CONTROL RESTRICTING SUBSURFACE DISTURBANCE (SOIL MANAGEMENT PLAN AND HEALTH & SAFETY PLAN)
- EXISTING SITE FEATURE
- PARCEL BOUNDARY
- AREA 4C STABILIZATION AREA
- LANDFILL
- CONSTRUCTED TREATMENT WETLANDS
- PIPING FEATURE
- ACCESS EASEMENT FOR MILLION GALLON TANK

NOTES:

1. PARCEL BOUNDARIES WERE OBTAINED FROM GIS SHAPEFILES PROVIDED BY JAMES CITY COUNTY. PER JAMES CITY COUNTY, THESE DATA ARE NEITHER LEGALLY RECORDED NOR A SURVEY AND ARE NOT INTENDED TO BE USED AS SUCH. THE INFORMATION DISPLAYED IS A COMPILATION OF RECORDS, INFORMATION, AND DATA OBTAINED FROM VARIOUS SOURCES, AND JAMES CITY COUNTY IS NOT RESPONSIBLE FOR ITS ACCURACY OR HOW CURRENT IT MAY BE. IF DISCREPANCIES ARE FOUND, PLEASE CONTACT THE REAL ESTATE ASSESSMENT DIVISION OF JAMES CITY COUNTY, MAPPING/GIS SECTION. JAMES CITY COUNTY MAKES EVERY REASONABLE EFFORT TO INSURE THE ACCURACY OF THE DATA SET. WITHIN THE URBAN AREAS OF THE COUNTY WE STRIVE TO HAVE A PLUS OR MINUS 9 FOOT ACCURACY. OUT IN THE RURAL AREAS, WHERE SOMETIMES WE DO NOT HAVE ANY RECENTLY RECORDED PLATS, THE ACCURACY COULD GO HIGHER TO ALMOST A PLUS OR MINUS 20 FEET.
2. THE EXTERNAL LEASE HOLD BOUNDARIES AND FEE INTEREST TO BE CONVEYED AREAS WERE ADJUSTED TO MATCH THE JAMES CITY COUNTY PARCEL BOUNDARIES. NOTE THAT THE ACTUAL SURVEYED BOUNDARIES MAY NOT MATCH THE JAMES CITY COUNTY PARCEL BOUNDARIES AS DEPICTED.



BASF CORPORATION
 WILLIAMSBURG, VIRGINIA

ACTIVITY AND USE LIMITATION AREAS



FIGURE

4

Administrative Record Index

BASF Williamsburg, VA Statement of Basis August 2020

1. DEQ, 1988. Consent Special Order. November 4.
2. DEQ, 1989. A Special Order Issued to the BASF Corporation. November 8.
3. Versar, 1989. Final RCRA Facility Assessment Report. Prepared for EPA. BASF Corporation. Williamsburg, Virginia. March 28.
4. O'Brien & Gere, 1995. Site Characterization Bldgs. 201-203. April.
5. O'Brien & Gere, 1996. Site Characterization Former Mann Property. April.
6. Roux, 1996. Recreation Area Landfill Characterization Report. December 19.
7. Roux, 1997a. James River Metals Flux Investigation Report. January 31.
8. Roux, 1997b. North Tributary Metals Flux Investigation Report. June 2.
9. DEQ, 1997. Participation in the Virginia Voluntary Remediation Program for the BASF Corporation Site in Williamsburg, Virginia. June 24.
10. BASF, 1998. Fire Pond Dewatering/Sediment Removal Project. November 13.
11. O'Brien & Gere, 1998. Fire Pond Sediment Removal Project. BASF Corporation. Williamsburg, Virginia. August 17.
12. EPA, 1998. Closure of Surface Impoundments 1, 2, 3, 4, & 5, Sludge Lagoons 1A, 1B, 2, 3, 4, & 5 as well as the Fire Pond. August 7.
13. DEQ, 1998a. Firepond. June 12.
14. DEQ, 1998b. Consent Order. July 8.
15. DEQ, 1998c. Firepond Sediment Removal Project Workplan. August 19.
16. Arcadis, 1999. Photo-cover System Feasibility Analysis, North Landfill Area. March 15.
17. BASF, 1999. Special Order Results Dredge Spoils Area, Wood Creek and the Closed Landfill. February 9.
18. DEQ, 1999. Recreation Area Landfill. June 10.
19. Remedial Engineering, 2000. Fire Pond Removal Project Completion Report. January 7.
20. EnviroAssessment, 2001. Phase I & II Environmental Site Assessment of Former Virginia Commonwealth Textiles Plant. December 4.
21. Roux, 2001. Site Characterization Report. Islandia, New York. June.
22. DEQ, 2001. Approval of Lagoon and Surface Impoundment Closure Plan. April 23.
23. Arcadis, 2003a. Development of a Groundwater Flow and Solute Transport Model. 17 October.
24. Arcadis, 2003b. Groundwater Remediation Plan. BASF Corporation. Williamsburg, Virginia. September 15.
25. Arcadis, 2003c. Remedial Action Work Plan – PCB Soil Removal. September 15.
26. Arcadis, 2003d. Site-Wide Soil Risk Assessment. September 15.
27. Arcadis, 2003e. Supplemental Soil Investigation Report. September 15.
28. Arcadis, 2003f. Site Characterization Report, Area 2 – Truswood Property. December 4.
29. de maximis, inc., 2003. Final Closure Report for BASF Corporation (Volumes 1 through 5). February 5.
30. Roux, 2003a. Area 1E South of Landfill Closure Report Revised), Volumes I & II. July 11.
31. Roux, 2003b. Area 1C Riverfront and Wooded Area Adjacent to the Million-gallon Tank Closure Report (Revised), Volumes I & II. August 1.
32. Roux, 2003c. Area 1A Recreation Area Closure Report (Revised), Volumes I & II. August 7.
33. Roux, 2003d. Area 1D Landfill Riverfront Area Closure Report (Revised), Volumes I & II. October 2.
34. Roux, 2003e. Area 1B Wooded Area North and East of the WWTP Closure Report (Revised), Volume I & II. December 23.

35. DEQ, 2003. Comments on BASF Recreation Area Closure Reports by Area (1A, 1B, 1C, 1D, and 1E). February 11.
36. Arcadis, 2004a. Corrective Action Plan Area 2 – Truswood Property, Williamsburg, Virginia. October 13.
37. Arcadis, 2004b. Remedial Action Work Plan Addendum – PAH and Mercury Soil Removal. January 16.
38. Arcadis, 2004c. Soil Removal Certification Report. June 8.
39. EPA, 2004. Facility Lead Corrective Action Agreement. September 23.
40. DEQ, 2004. Assessment and Remediation of Soil Issues. September 17.
41. Arcadis, 2005a. 2003 Operation & Maintenance Report - North Landfill Phyto-Cover. BASF Corporation. Williamsburg, Virginia. June 17.
42. Arcadis, 2005b. Sub-Slab Soil Investigation Report. February 4.
43. DEQ, 2006a. Case Closure Memorandum. January 6.
44. DEQ, 2006b. Special Order by Consent effective December 7, 2005. January 6.
45. Arcadis, 2008a. Corrective Action Plan Response to Comments Area 2 – Truswood Property. Williamsburg, Virginia. March.
46. Arcadis, 2008b. Corrective Action Plan Addendum – Subsurface Investigation and Risk Evaluation Area 2. July 16.
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48. EPA, 2008. Corrective Action – Statement of Basis – Technical Support Document. BASF, Williamsburg, Virginia. EPA I.D. No. VAD990710642. March 12.
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