
UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS

# Union Carbide Corporation - Institute Operations (Formerly: Bayer Cropscience LP)

# INSTITUTE, WEST VIRGINIA

# EPA ID NO. WVD005005509

June 2018

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## I. Introduction

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis (SB) to solicit public comment on its proposed remedy for the facility owned and operated by the Union Carbide Corporation (UCC) and located in Institute, West Virginia (Facility). EPA's proposed remedy for the Facility includes ongoing groundwater remediation, a Technical Impracticability waiver for a small area, engineering controls consisting of fencing and capping, land use controls limiting groundwater use and managing soil exposure, and a groundwater monitoring program.

The Facility is subject to EPA's Corrective Action (CA) Program under the Solid Waste Disposal Act, as amended, commonly referred to as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901, et seq. The CA Program requires that owners/operators of facilities subject to certain provisions of RCRA investigate and address releases of hazardous waste and hazardous constituents, usually in the form of soil or groundwater contamination, that have occurred at or from their properties. Although West Virginia is authorized for the CA Program under Section 3006 of RCRA, EPA issued the current Facility CA Permit (Federal CA Permit).

This document summarizes the information that can be found in the work plans and reports submitted by UCC to EPA pursuant to the Federal CA Permit during the Verification Investigation (VI), RCRA Facility Investigation (RFI), and Corrective Measures Study (CMS) processes. This document explains EPA's rationale for recommending the proposed remedies and includes the Administrative Record (AR) for the Facility that includes all documents, including data and quality assurance information, on which EPA's proposed remedy is based. See Section IX, Public Participation, for information on how you may review the AR.

Once all of the necessary public participation requirements are met and EPA selects a Final Remedy for the Facility, the West Virginia Department of Environmental Protection (WVDEP) will separately issue a draft CA Permit (State CA Permit) incorporating the Final Remedy selected by EPA. Once WVDEP's permit process is completed and the WVDEP issues a State CA Permit to the Facility, EPA's Final Remedy will be enforceable under the State CA Permit and EPA will terminate the Federal CA Permit.

EPA is providing a forty-five (45) day public comment period on this SB and the proposal to terminate the Federal CA Permit. EPA may modify its proposed remedy based on comments received during this period. EPA will announce its selection of a Final Remedy for the Facility in a Final Decision and Response to Comments (FDRTC) after the public comment period has ended.

Information on the Corrective Action Program as well as a fact sheet for the Facility can be found by navigating https://www.epa.gov/hwcorrectiveactionsites.

## II. Facility Background

### A. Site History

The Facility is in an industrial park adjacent to West Virginia Route 25 (WV 25) in Institute, West Virginia. The Facility is bounded on the south by the Kanawha River, to the

north, by WV 25, UCC Private Trucking Operations (PTO) to the west, and West Virginia State University (WVSU) to the east. Norfolk Southern (NS) rail lines traverse the Facility's main chemical plant area and the Waste Water Treatment Unit (WWTU) (Figure 1). The Facility is situated on approximately 443 acres and consists of two separate areas, the main chemical plant and the WWTU. The WWTU is separated from the chemical plant by approximately one-half mile by a transformer substation owned by Appalachian Power (APCO), aggregate dock, and undeveloped land. The undeveloped land, referred to herein as SWMU 19, historically referred to as the "Westside Landfill," is located on the land between the main chemical plant and the WWTU, and is not part of the RCRA Facility.

Most of the Facility land is bare ground covered by gravel, asphalt, and/or concrete, with few structures, little vegetation or exposed soil. Open areas where buildings and process areas formerly stood are covered with gravel. Industrial and manufacturing areas are surrounded by chain-link and barbed-wire fencing.

UCC owns the main chemical plant that provides shared services to Facility tenants (including Bayer Crop Science, Catalyst Refiners, Reagent Chemicals). Heavy industrial chemical manufacturing processes makeup much of the Facility, however a warehouse distribution center is also located onsite.

The main chemical plant began operations in 1943 as a synthetic rubber production plant during World War II and was owned by the federal government. UCC purchased and operated the Facility from 1947 to 1986. Rhone-Poulenc purchased the Facility in 1986 and became Aventis Crop Science in January 2000 and, subsequently, Bayer Crop Science in June 2002. The Facility was repurchased by UCC in 2015. The main chemical plant historically produced various hydrocarbon and agricultural products. UCC operations include the production of Acetone Derivatives, EO Catalyst, Glutaraldehyde, and Polyox. Various intermediary and final chemical products are also produced and/or stored at the Facility.

The WWTU is composed of current operating facilities, former operational ponds, and one SWMU described as follows:

- The active WWTU buildings and infrastructure;
- Six former ponds, also known as basins and biobasins, that are closed RCRA regulated units;
- Three additional former ponds that were not RCRA regulated and are closed; and
- SWMU 11, also known as the closed Chemfix landfill (originally identified as the WWTU Holding Pond).

Before 1957, waste from the Facility was either stored onsite or disposed of in landfills, including Goff Mountain Landfill (now owned and operated by Bayer Crop Science) and the neighboring PTO facility owned by UCC. The WWTU was first constructed in approximately 1963 and currently receives and treats process water generated at the Facility and from the PTO facility. RCRA waste is disposed offsite through certified waste management companies.

## B. Physical Setting

The topography of Kanawha County is typical of the maturely dissected unglaciated Appalachian Plateau, consisting of mazes of steep-sided valleys and narrow winding ridges. Flat areas, underlain by alluvium, exist along the river valleys. The Kanawha River flows generally northwestward across the central part of the county. The entire county is drained by the Kanawha River and its tributaries.

The Facility is within the Kanawha River floodplain at an elevation of approximately 600 feet above mean sea level (amsl). The Facility is in a relatively flat, low-lying area, partly because of onsite filling and grading activities conducted in the past to support industrial operations adjacent to the Kanawha River. North of WV 25 the topography becomes comparably steeper as the topography transitions from the floodplain to the bedrock hills. In general, the Facility border that abuts the Kanawha River consists of steep slopes covered by riprap. Part of the main chemical plant area and all the WWTU are located within the 500-year floodplain. The main chemical plant area is above the 100-year floodplain. The Kanawha River water level is controlled by dams above and below the Facility.

The Kanawha River acts as a discharge point for the entire alluvial sequence at the Facility. The lowest potentiometric heads are measured in the groundwater wells at the southern end of the Facility, adjacent to the River, approximately 8 feet higher than the mean stage for the Kanawha River (566 feet amsl). Recharge to the groundwater from the Kanawha River would not normally occur except during unusually high stages, such as flood events.

The uppermost portions of the soil column consist of a variable thickness of fill material placed at the Facility over the past 70-plus years to facilitate development. Fill materials consist primarily of a heterogeneous mix of natural soils that range in thickness from 0 to approximately 10 feet. Underlying the fill material are alluvial deposits associated with the Kanawha River. These deposits, which range in thickness from approximately 55 to 60 feet, are generally thickest near the River and thinner inland. These deposits generally consist of interbedded gravel, sand, silt, and clay. In general, deposits represent an overall “fining upwards” sequence with coarser material (sand and gravel) more prevalent at the base of the unit and fine-grained material (silt and clay) more prevalent at the top. Silt/clay generally predominate in the upper 20 to 35 feet along the Kanawha River and along the north-northeast boundary. Alluvial deposits begin to thin along the northern edge of the Facility where the bedrock steeply rises toward the uplands north of WV 25.

Groundwater is found within the shallow silty/clayey deposits and in the underlying coarser-grained sand and gravel deposits. Local areas of perched groundwater are present within portions of the silt/clay deposits. Perched groundwater has been identified near the southeast corner of the Facility. Groundwater within other portions of the silt/clay deposits may be continuous with the underlying coarser-grained alluvial aquifer system. The primary aquifer is present in the coarser-grained sand and gravel. The aquifer, which is continuous across the Facility, has historically been evaluated in two zones, shallow and deep. The shallow zone extends from the groundwater surface to approximately 30 feet below ground surface (bgs), and the deep zone extends from 30 feet bgs to the bedrock surface. There is little vertical hydraulic gradient within the coarser-grained aquifer materials; as such, the shallow and deeper portions of the aquifer system are interpreted as constituting a single hydrostratigraphic unit.

The coarser-grained alluvial aquifer is unconfined where the overlying silt/clay deposits are less than 15 to 20 feet thick, though locally it may be semiconfined if low-permeability clays are present, such as near the Kanawha River. Depth to groundwater in the coarser-grained alluvial aquifer averages approximately 16.5 feet bgs. Depth- to-groundwater data for wells completed in the localized perched groundwater zones atypically range from 5 to 15 feet bgs.

Groundwater within the alluvial aquifer generally flows toward the Kanawha River. Static groundwater elevations in the deeper alluvium ranged from approximately 568.4 to 585.8 feet amsl. The horizontal hydraulic gradient over much of the main chemical plant is relatively flat, as evidenced by the similarity in groundwater elevations (approximately 580 to 581.5 feet amsl), becoming steeper with proximity to the river. There is a component of southeasterly groundwater flow near the eastern property boundary. In the WWTU area, groundwater generally flows to the west-southwest. The alluvial aquifer is recharged primarily by infiltration from precipitation. There are few surface water features onsite; these are primarily shallow ditches that are above the aquifer and, therefore, likely serve as localized recharge areas. Although no bedrock wells have been installed, groundwater likely enters the alluvial aquifer from bedrock that is recharged in the adjacent upland areas. The alluvial aquifer discharges to the Kanawha River, although short-term flow reversals may occur during episodic flood events

### C. Environmental History and Assessment Overview

EPA Region 3 initiated RCRA CA permitting actions around November 1984 to identify and remediate onsite Solid Waste Management Units (SWMUs). EPA issued the Federal CA Permit in December 1990, effective January 22, 1991 to January 21, 2001, that was subsequently extended. The Permit initially identified 18 SWMUs requiring investigation, characterization and potentially, remediation. Subsequently, five additional SWMUs were identified by UCC and included as part of the VI. Multiple investigations and interim remedial measures (IMs) have been completed and documented through reports submitted to the EPA and the WVDEP.

All stages of the corrective action process for the SWMUs identified in the Permit and VI are completed. Table 1 lists the Permit-designated SWMUs, additional SWMUs added under the VI, and Areas of Concern (AOCs) added through the RFI, and/or CMS process. Two newly designated "Corrective Measures Study (CMS) Areas" (Areas A and B) that are comprised of multiple, contiguous areas of investigation, are depicted on Figures 2 and 3. Those Figures that also show the general location of each SWMU and AOC relative to the boundaries of the Permit.

Between 1986 and 2016, numerous environmental investigations were conducted at the Facility. IMs were completed during the 30-year period resulting in the closure of some SWMUs/AOCs as noted in Table 1. Additionally, the Facility was divided into eight (8) Exposure Units (EUs) for assessing risk to apportion environmental data according to geographical location, operational history, SWMU and AOC boundaries, existing CMS Areas, and soil sample locations, as shown in Figure 2 and documented in Table 2.

As part of those investigation, UCC took soil and groundwater samples at each EU and at the neighboring (offsite) APCO and WVSU properties. Groundwater concentrations were screened against federal maximum contaminant levels (MCLs) promulgated pursuant to Title 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141, or EPA

Regional Screening Levels (RSLs) for constituents for which no MCL is available. Soil concentrations were screened against EPA RSLs for industrial soil.

Sampling results from the 23 SWMUs identified in the VI demonstrated that the majority of the SWMUs contained constituents in soil and groundwater in concentrations generally less than EPA's existing or proposed action levels at that time. Six SWMUs were determined to need additional investigation. Those six SWMUs are located in the two general production areas at the Facility: (1) the methyl carbamate (MCB) and SEVIN® Manufacturing Area (SEVIN Area) (SWMUs 1, 7, 20, and 21) and (2) the ethylidene norbornene (ENB) manufacturing unit (SWMUs 18 and 22).

In general, metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were found present in groundwater at concentrations greater than screening levels at those two production areas. The highest dissolved groundwater concentrations generally occur adjacent to source areas associated with historical chemical process activities. However, concentrations requiring active groundwater remedies occur in a just a few areas at the Facility. Accordingly, IMs have been conducted at several source areas to address elevated groundwater concentrations, including the Former Fluorocarbon Area (currently referred to as CMS Area A) for chloroform, carbon tetrachloride, tetrachloroethene (PCE), and trichlorofluoromethane, and the HPH and Tank 1010 areas in CMS Area B for benzene (Figure 3).

## III. Summary of Environmental Investigations and Interim Measures

Contaminant delineation and remediation work was performed at the following five areas from 1996 through 2003: ENB North, ENB Central, and ENB South areas (targeting mainly PCE, carbon tetrachloride, and chloroform) and two locations in or near the SEVIN® Area (targeting benzene, chlorobenzene, toluene, and chloroform). The results of the remediation were summarized in a 2006 report submitted to EPA (Summary of Site Remediation, Key 2006). IMs have also been implemented at SWMU 1, SWMU 2/6, CMS Area A, CMS Area B including the HPH area and the Tank 1010 area, SWMU 11, and SWMU 7. These actions are discussed in more detail below.

### A. SEVIN® Manufacturing Area (SWMU 7 & 20)

SWMUs 7 and 20 are adjoining areas and were combined for remedy evaluation. SWMU 7 encompasses the former SEVIN® Area and the naphthylchloroformate (NCF) Tank Farm. In 2013, both areas were demolished. SWMU 20, "the Southside Loading Rack," is immediately south of SWMU 7 and was a 20-foot by 40-foot asphalt-covered concrete transfer station for tank trucks. The rack and other associated equipment were removed in December 2013. SWMU 20 is currently covered by gravel.

Initial remediation at the SEVIN® Area began in the first and second quarters of 1997and consisted of an Air Sparge (AS) and Soil Vapor Extraction (SVE) system. For approximately 2 years only the SVE portion of the system was operated, and only at partial capacity, because of the high concentration of toluene in the extracted vapors. A leaking toluene line was identified as a source of the elevated toluene and was repaired. Sparging at the SEVIN® Area was then added in September 2000. In December 2000, the SEVIN® Area was expanded to cover more of the toluene impact area, as determined through additional groundwater sampling. During the delineation of the SEVIN® Area, toluene concentrations were identified in a separate portion of

the SEVIN® Area known as the former NCF Tank Farm. A third AS/SVE system was installed in July 2000 to treat this area. Based on groundwater concentration data, remediation at both the SEVIN® Area and NCF Tank Farm was complete in the second quarter of 2002. Both systems continued to operate into the fourth quarter of 2002 and then were turned off. Currently, toluene is less than the screening level for groundwater wells in the area. The AS/SVE system at the SEVIN® Area was removed in August 2008.

In 2017, UCC excavated and disposed of soil in the southwest corner of SWMU 7 where naphthalene concentrations in surface and subsurface soil were driving non-cancer risk. A total of approximately 34 tons of naphthalene-impacted material was excavated from two separate 15-foot by 15-foot by 3-foot-deep excavation areas. Verifications samples collected along the sidewalls and base of each excavation indicated that naphthalene concentrations were below the risk-based cleanup criterion of 590 milligrams per kilogram (mg/kg).

**B. Former UCAR Landfill (SWMU 1)**

SWMU 1 is a former on-site landfill used for disposal of oil, tarry material, and possibly soluble hydrocarbons from a gas cracking unit that was used for rubber production in the 1940s and 1950s. SWMU 1 is currently a 1-acre, gravel-covered, level area crossed by a rail line. UCC competed initial excavation of surficial, tar-like oozes in 2003 on both the east and west sides of SWMU 1 to approximately 1-foot bgs. Approximately 80 tons of excavated material were removed and the area was backfilled with concrete and asphalt (in the roadway) and approximately 4-inches of gravel. Access restrictions were implemented and SWMU 1 was inspected weekly and tar removed as necessary. In 2017, UCC delineated and removed visible surficial tarry material in the former rail area east of SWMU 1, improved the gravel cover, and installed perimeter fencing around the SWMU. Test pits were excavated to delineate the extent of the tarry material, and UCC removed approximately 15 cubic yards of material. UCC subsequently filled the excavated area with clean gravel to bring the excavated area back to ground surface level to match the surrounding grade. UCC also installed a 6-foot-tall galvanized steel chain-link fence around the perimeter of SWMU 1 with two gates to allow railroad access through the area and a third gate to allow personnel and vehicle access. Signs were posted and locks were installed on the gates to limit access.

**C. No. 2 Ash Pond (SWMU 2) & No. 2 Fly Ash Landfill (SWMU 6)**

SWMUs 2 & 6 are addressed together because SWMU 6, the Ash Pond, was constructed over a portion of the 4-acre No. 2 Fly Ash Landfill. Landfilled materials include cinders, coal, glass, and black organic oil and sludge mixed with gravel and sand. Investigation activities and visual inspections had determined that the cover thickness over the No. 2 Fly Ash Landfill was inconsistent and in some areas less than 6 inches thick. The landfill cover at SWMUs 2 and 6 was repaired in August 2008 to address the issue of inconsistent cover thickness. The repairs were made to eroded areas of the clay cap to ensure the SWMUs were covered with a minimum 6 inches of clay and the disturbed areas were seeded. A UCC inspection conducted in spring 2009 determined that grass was not established in two large areas. UCC completed repairs to vegetation of the landfill cover, consisting of installing an additional 70 cubic yards of topsoil and reseeding and mulching these areas, in November 2009. The landfill cover is now established with grass.

**D. CMS Area A (SWMUs 18 and 22)**

CMS Area A includes SWMU 18, SWMU 22, the former fluorocarbon production unit,

and the three former ENB north, central, and south Areas (ENB Areas). Remediation at the ENB Areas began in the first quarter of 1996 with the installation and startup of an AS/SVE system at the ENB Central Area. Two additional AS/SVE systems were installed at the ENB South and ENB North Areas from December 1996 through May 1997. Two groundwater extraction wells were installed in the ENB North Area, and pumped during the fourth quarter of 1999. Pumping was discontinued after it was determined that continued operation did not significantly affect groundwater or vapor concentrations. In 2002 and 2003, chemical oxidation using a Fenton's reagent approach was pilot tested and a soy oil based co-metabolism was applied to the ENB North and ENB Central Areas. By the end of the third quarter of 2003, analytical data demonstrated significant reductions and elimination of target compounds in groundwater. Sampling at the ENB North area several months after the remediation system was turned off showed that little rebound had occurred.

The sources within CMS Area A are primarily related to the former fluorocarbon production unit that operated from 1958 to 1978. Raw chemicals used at the former fluorocarbon production unit included VOC compounds carbon tetrachloride, chloroform, and PCE. Final products included trichlorofluoromethane (TCFM) and dichlorodifluoromethane (DCFM). The fluorocarbon production process generated hydrochloric acid as a process waste, which also contained residual amounts of fluorocarbons, PCE, chloroform, and/or carbon tetrachloride, with final products including TCFM and DCFM.

Several soil and groundwater source areas associated with the former Fluorocarbon Plant were delineated in 2014. Remedial alternatives were evaluated and aerobic cometabolic biodegradation via cometabolite-enhanced biosparging was selected for active groundwater remediation. A biosparge system with SoyGold™ 5000 amendments was installed at two sub-areas (Area 3B and 3D) of the Facility in 2015 and began operating in late 2015. The biosparge system was expanded in 2016 to include two additional sub-areas with operation at one area beginning during late 2016 (Area 3C) and operation at the second subarea in early 2017 (Area 3A). Biosparging and groundwater monitoring continue.

**E. High Purity Hydrocarbon (HPH) Area**

The HPH Area is included in CMS Area B. Four 10,000 gallon Above Ground Storage Tanks (ASTs) were previously located there. The ASTs were installed before 1950 and removed between 2004 and 2008 and were reportedly used to store HPH fuel oil, process residue waste, and other constituents historically associated with the Facility. Benzene is the primary constituent of concern (COC) in the groundwater although toluene, ethylbenzene, xylenes, and naphthalene are detected.

An AS/SVE system was installed and began operating in March 2011. The SVE wells included pneumatic pumps to dewater the wells and facilitate vapor recovery. In October 2014, the AS/SVE system was shut down over the winter to prevent the aboveground groundwater extraction lines from freezing. The dewatering pumps were restarted in June 2015, and AS/SVE operations resumed in summer 2015. The dewatering pumps and SVE system were shut down again on October 30, 2015, for the winter. The AS wells remained in operation at low flow rates typical of biosparge systems. The system continued to operate in biosparge mode throughout 2016. The system was shut down in June 2017 to monitor concentration rebound. Petroleum hydrocarbon concentrations collected since indicate a decreasing trend within monitoring wells located downgradient of the treated area and additional monitoring data collected in 2017/2018

indicates that remediation has been very effective in removing constituent mass and reducing source area and downgradient groundwater concentrations. Concentrations of contaminants in shallow groundwater have been reduced by 99% and 82% at the source area and downgradient, respectively. Confirmation sampling of pore water in the Kanawha River in 2017 indicates that all VOC concentrations are below established pore water screening levels for ecological and human health.

**F. Tank 1010 Area**

Tank 1010 Area is a 1.47-million-gallon (MG) AST that stored benzene for nearly 40 years (1943 through 1981) associated with the former styrene production unit at the Facility. Since 1981, the AST has been in service for the glycol process unit and is currently used for the storage of anti-freeze-grade ethylene glycol. Investigation activities completed at the Tank 1010 Area identified source concentrations of benzene in soil and groundwater north of Tank 1010 between the secondary containment area and the former piping trench historically used to transfer benzene from railcars to the tank. Analytical results from pore water samples collected from the sediment in the Kanawha River in the area where groundwater from Tank 1010 discharges to surface water showed that benzene and ethylbenzene were not detected and those compounds that were detected (toluene, xylenes, naphthalene) did not have concentrations exceeding the site-specific screening levels established to protect potential human and ecological receptors in Kanawha River surface water. Confirmation sampling of the pore water in the Kanawha River conducted during 2017 indicated that all VOC concentrations in pore water were below the established pore water screening levels for the Kanawha River.

Two in situ chemical oxidation (ISCO) injection events were implemented in the Tank 1010 Area. The first injection took place in late 2014 using CoolOxTM, a proprietary chemical oxidant, which was injected into the subsurface via direct-push methods. Following evaluation of monitoring data collected 30 and 90 days after the 2014 injection, additional soil samples were collected to support design of a second, focused application of CoolOxTM. The resulting design had a reduced target injection area with more compact injection boring spacing, using the same depth interval utilized in 2014. In December 2015, CoolOxTM was injected across an approximate 1,000-square-foot area from 10 to 20 feet bgs. Approximately 2,100 gallons of the reagent were injected into 90 borings spaced between 3 and 4 feet apart. Post-injection sampling results completed in March 2016 were submitted in the Summary of Interim Measure Implemented at the Tank 1010 Site Technical Memorandum. Results from the chemical oxidant injection as well as evaluation of other potential remedies at the Tank 1010 Area indicate that current conditions at the Facility (infrastructure, soil conditions, and access restrictions) make additional remediation impractical.

**G. Former Chemfix Landfill (SWMU 11)**

The former Chemfix Landfill was used for treatment and disposal of sludge from the WWTU and was constructed in the 1960s. The pond was constructed by excavating down to groundwater and emplacing a 1-foot thick clay liner at the bottom. Waste was placed in the Landfill until the top of the waste was a similar elevation as WV state highway 25. Landfill closure activities included solidifying the sludge with the addition of kiln dust, cement, and/or other material placed in the landfill, grading, capping, and a vegetative cover. The area was capped in the early 1980s, but it was concluded in 2013 that the cover did not meet cover thickness and permeability requirements to protect human health and the environment. An additional 12 inches of cover material (6 inches of clay and 6 inches of topsoil) were added to the

existing soil cover in late 2013. Details of the corrective action are detailed in a 2015 EPA-approved Construction Completion Report.

### H. Offsite Groundwater

Beginning in Spring of 2013, UCC began investigations along the eastern boundary of the Facility to determine if Facility-related VOCs and SVOCs had migrated from the Facility to beneath the adjacent WVSU property. A number of direct-push borings were advanced and samples were collected. Groundwater data showed that groundwater flow in the southwest corner of the WVSU property flowed to the southeast, toward the Kanawha River. Facility-related constituents likely migrated from the Facility to beneath the southwestern portion of the WVSU property. Three additional phases of investigation were conducted between 2014 and 2016. The objectives were to improve characterization of the groundwater flow direction, assess whether COPCs in groundwater were migrating at concentrations greater than screening levels, delineate the extent of COPCs in groundwater and determine whether vapor intrusion may be a significant pathway for COPCs. The investigation concluded that groundwater impacts on the WVSU property likely resulted from multiple sources, including the Facility. An apparent source area is located in the southeastern portion of the WVSU property (CH2M, 2016a).

### I. Human Health Risk Assessment (HHRA)

Applicable screening levels for defining Constituents of Potential Concern (COPCs) in soil were EPA RSLs for industrial soil. More than 95 percent of the main chemical plant is covered by buildings, gravel, asphalt, and gravel/ concrete with very little grass or exposed soil. Soil impacts are generally localized and associated with individual SWMUs and AOCs, which are managed as either landfills or waste-in-place areas.

Constituents detected in groundwater were compared to the following applicable screening levels (SLs):

- MCLs, where available;
- EPA RSLs for tap water use for analytes without an available MCL; and
- EPA vapor intrusion screening levels (VISLs), based on a commercial/industrial exposure scenario, a target cancer risk equal to $1x10^{-5}$, a non-cancer hazard quotient (HQ) equal to 1, and a site-specific, average groundwater temperature equal to 19 degrees Celsius.

The potential risk from groundwater was evaluated for current and future commercial/industrial, construction, and intrusive maintenance workers via direct contact (i.e., dermal and inhalation of volatiles) to groundwater less than 20 feet bgs. The HHRA concluded that there was not an unacceptable risk associated with direct contact. Soil gas, subslab soil vapor, and indoor air data were compared to applicable VISLs based on a commercial/industrial exposure scenario. COCs for the VI pathway were not identified based on the risk assessments and off-facility investigations, but VOCs identified as COCs in soil or groundwater are considered potential COCs for the VI pathway until remedies are complete.

The HHRA did not evaluate the risk associated with exposure to COPCs in groundwater via ingestion because the use of groundwater as a drinking water source is not a current or likely future exposure pathway. There are elevated concentrations of constituents in groundwater. A qualitative screening evaluation of groundwater demonstrated that metals, VOCs, and SVOCs

are present in groundwater at concentrations significantly greater than applicable screening levels. Several source areas at the Facility have implemented IMs to address the elevated groundwater concentrations.

Based on groundwater data and the qualitative screening, the following groundwater impacts are observed:

- Facility and NS property: COCs exceed screening levels, except SWMU 19 where arsenic, attributable to background, meets this criterion.
- WVSU Property: chloroform exceeds screening levels.
- APCO Property: COCs exceed screening levels.

Estimated human health risks for potentially complete exposure pathways for soil and shallow groundwater (less than 20 feet bgs, where applicable), expressed as ELCRs and non-cancer Hazard Indices (HI), are documented in various risk studies and reports. ELCRs were compared to a threshold of 1 $x10^{-4}$, the upper end of USEPA's risk management range of $1x10^{-6}$ to $1x10^{-4}$, and non-cancer HIs were evaluated against the threshold of 1 to assess the need for further action.

Human health risks were calculated for each EU excepting former landfill SWMUs that are closed with waste-in-place (SWMUs 1, 2/6, and 11) and therefore exposure pathways are incomplete due to existing engineering controls and (current or planned) institutional controls (ICs). Exposure scenarios and the associated EUs with risk estimates greater than thresholds are as follows:

- Construction workers exposed to subsurface soil (0 to 12 feet bgs) in EU-1; the HI of 2 is driven by elevated naphthalene concentrations;
- Construction workers exposed to subsurface soil (0 to 12 feet bgs) and intrusive maintenance workers exposed to deep soil (0 to 20 feet bgs) in EU-6; soils where the HIs are both equal to 2, driven by elevated benzene concentrations in the subsurface at CMS Area B.

### J. Ecological Risk Assessment

Risks were characterized for terrestrial and aquatic ecological receptors at the Facility based on HQs (direct contact exposure and food web modeling) with emphasis on the weight of evidence, such as conservatism of the Ecological Screening Level (ESL), EcoSSLs (Ecological Soil Screening Levels (EcoSSLs) for Silver, Office of Emergency and Remedial Response, October, 2006), National Oceanic and Atmospheric Administration (NOAA) values (NOAA, 1999), Oakridge National Laboratory (ORNL) values (Jones et al., 1997; Suter and Tao, 1996), and other screening values, the spatial extent of elevated HQs, background levels relative to site-related concentrations, and the quality of the available habitat.

The main chemical plant contains no natural terrestrial habitat. Greater than 95 percent of the approximately 350-acre area is covered by buildings, gravel, asphalt, and/or concrete. The remaining areas contain periodically mowed lawn.

Chain-link or barbed-wire fence surrounds areas of the Facility where there is industrial activity. The Facility border that abuts the Kanawha River consists of steep slopes covered by riprap. Some shrubs and trees of varying density and height have grown through the riprap. Within the main plant area, the occurrence of terrestrial receptors such as

mammals, birds, and reptiles is expected to be limited only to occasional transients; stationary populations of these receptors are not supported by Facility conditions.

During a 2012 site reconnaissance, the SWMU 19 area, located between the main chemical plant and the WWTU, was found to be forested/vegetated with ephemeral streams that could provide habitat.

EPA Region 3 Biological Technical Assistance Group (BTAG) freshwater sediment benchmarks were used to evaluate the effect of constituents detected in sediment in the Kanawha River on ecological receptors. Investigations into potential risks from site-related constituents in groundwater to the Kanawha River benthic community concluded that none of the COPCs was to be retained as a COC for sediment and that risk estimates are less than ecological thresholds.

Pore water samples were collected from the Kanawha River adjacent to the facility in 2009 and 2012 to evaluate whether COPCs in groundwater, including benzene from Tank 1010 Area, are discharging from groundwater to surface water. The pore water results indicated that Facility groundwater COCs are less than established ecological and human health screening levels for the Kanawha River, with a single exception: toluene was detected at one location adjacent to the HPH area that exceeded the respective screening value by 1.2 times the screening level.

In 2017 pore water sampling was conducted to confirm the findings of previous pore water sampling events and the results of the investigation indicated that pore water VOC concentrations were below the established pore water screening levels for the Kanawha River. VOCs in groundwater are not COCs for the Kanawha River.

There are no aquatic habitats in the main chemical plant portion of the Facility. The U.S. Fish and Wildlife Service has identified wetlands on and adjacent to the Facility, but these are not viable habitats and are often associated with ash ponds or other site features. The only aquatic habitats related to the Facility are the adjacent Kanawha River and standing water/ephemeral streams in the adjacent SWMU 19 Area. The Kanawha River is adjacent to the entire southern boundary of the Facility (approximately 0.75 mile long). The Kanawha River is a high-order stream in the Appalachian Plateau Province of the Kanawha-New River Basin.

Based upon information obtained from West Virginia Division of Natural Resources (WVDNR), there are no protected wilderness areas, wildlife refuges, wild and scenic rivers, wildlife management areas, or parks in the vicinity of the Facility. Based upon WVDNR records, there are no known occurrences of rare, threatened, or endangered species in the vicinity of the Facility. There is adequate information to conclude that adverse impacts to wildlife exposed to surface soil, surface water, and sediment are not considered likely at the Facility.

## IV. Corrective Action Objectives

For the SWMUs and AOCs evaluated the results of the site-specific HHRA show that COPCs in groundwater, surface water, soil, and sediment do not pose an unacceptable risk to human health or the environment under current and presumed future industrial land-use scenarios. There are specific risks of exposure to subsurface soils at the WWTU and CMS Area B. Potential human health carcinogenic risks are within the EPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, if the future land-use remains industrial. Potential risks associated with exposure to VI

from groundwater occurs on the Facility property and on the WVSU property outside the Facility property boundary and corrective action alternatives are evaluated herein. EPA has identified the following Corrective Action Objectives (CAO) for soils and groundwater at the Facility:

**1. Soils**

EPA's CAO for soil is to prevent human exposure to contaminant concentrations above the EPA allowable risk range of $1x10^{-4}$ to $1x10^{-6}$ and non-cancer HI of 1 for an industrial exposure scenario.

- Manage future Facility use to restrict residential land use within the property boundary.
- Manage exposure to in-situ waste remaining in SWMU 1, SWMUs 2 & 6, and SWMU 11 that poses a potential hazard.
- Prevent exposure to soils in EU-1 (WWTU) and EU-6 (Tank 1010) where COCs exceed the HI of 1.

**2. Groundwater**

EPA expects final remedies to return usable groundwater to its maximum beneficial use within a timeframe that is reasonable given the particular circumstances of the project. For projects where aquifers are either currently used for water supply or have the potential to be used for water supply, EPA will use drinking water standards, MCLs, the standard used during the screening process and the ultimate long-term objective for the Facility.

Technical impracticability (TI) for contaminated groundwater refers to a situation where achieving groundwater cleanup standards associated with final cleanup standards is not practicable from an engineering perspective. The term "engineering perspective" refers to factors such as feasibility, reliability, scale or magnitude of a project, and safety. EPA has determined that restoration of groundwater at Tank 1010 to MCLs is technically impracticable for the near future. ISCO pilot testing indicated that active treatment of the benzene source area is technically impracticable while Tank 1010 and adjoining infrastructure is present and in use. The results from the pilot indicated insignificant reductions in benzene concentrations in soil within the target treatment zone compared to the mass in the source area. The effectiveness of the injection event was limited by the clay content and heterogeneity of shallow soils present in the source area. As a result of the infrastructure limitations and site conditions present, no active remedies have been identified that can safely address impacted soil and groundwater beneath Tank 1010.

Results from annual groundwater monitoring and the 2017 pore water characterization support the conclusion that benzene is anaerobically degrading in the Tank 1010 Area and the associated Kanawha River pore water, and that no impacts to pore water are present above ecological or human health screening criteria.

Therefore, EPA's CAO for Facility-wide groundwater is to:

- Restore groundwater to drinking water standards, MCLs, everywhere but in the vicinity of Tank 1010.
- Minimize and/or manage exposure to groundwater until groundwater is restored to MCLs.
- Ensure that groundwater containing elevated concentrations of COCs will not impact

receptors (ecological or surface water) until groundwater is restored to MCLs.

- Eliminate potential future exposure to VI from groundwater.

## V. Proposed Remedy

The remedial technologies evaluated in the CMS and considered potentially capable of meeting the CAO goals for groundwater and soil at SWMUs and AOCs requiring remedies include:

- Land Use Controls – Facility-wide groundwater and vapor intrusion controls and soil (subsurface and movement) use restricions at designated SWMUs ;

- Monitored Natural Attenuation (MNA) – Long term groundwater monitoring following the technical protocols governing the natural degradation of contaminants;

- Containment, treatment, and disposal – Hydraulic containment by pump-and-treat to prevent further migration of groundwater, ex-situ treatment of contaminated groundwater and disposal;

- In-situ treatment – In-situ treatment of groundwater includes physical, chemical, and biological methods including ISCO, thermal treatment, air sparging, biosparging, soil vapor extraction, and aerobic co-metabolic enhanced biosparging;

- Removal & disposal – Excavation of contaminated soil for either on-site consolidation or off-site disposal of waste;

- Engineering Controls – Capping, consisting of the placement of impermeable materials in an engineered design to restrict contact and restrict infiltration of precipitation; fencing and signage.

EPA considered these alternatives and determined, that the following remedial technologies and use restrictions provide the best relative combination of attributes most likely to achieve CAOs for the facility:

1) Establishment of a TI zone for groundwater at Tank 1010 including a monitoring program assessing MNA of contaminated groundwater;

2) Facility-wide land (residential and soil use restriction) and groundwater use restrictions including VI controls both onsite and specific areas offsite (APCO and WVSU).

3) Engineering Controls consisting of capping, fencing and signage at SWMUs 1, 2 & 6, and 11.

4) Aerobic Co-Metabolic Bioremediation via Co-Metabolite Enhanced Biosparging for groundwater at CMS Area A.

### A. Tank 1010 – Establishment of a TI Zone with Long Term Monitoring of Monitored Natural Attenuation

Because of the constraints of access to the source area and highly elevated benzene contaminated soils, and the particular hydrogeological conditions at Tank 1010 Area, i.e., impermeable soil layers, EPA is proposing that ongoing groundwater monitoring, along with the establishment of a TI Zone is the remedy that represents the best balance of the criteria that EPA considers when selecting a remedy. This remedy will be protective of human health and the environment. In addition, ongoing natural attenuation will continue to degrade source area benzene thereby constraining the plume onsite. Discharges of contamination will not cause exceedances of the WVWQS of the Kanawha River or cause an unacceptable risk in the River.

The TI Zone is defined as groundwater within the area depicted on Figure 3 of this SB (Tank 1010 Area. UCC will be required to submit an annual report to EPA: 1) documenting that the groundwater plume is stable or decreasing; and 2) confirming the concentrations in wells along the Kanawha River do not exceed concentrations established in a Corrective Measures Implementation Plan (CMI) that would cause unacceptable risk to the River. The 2017 Pore Water Report has shown that the COCs in groundwater in the vicinity of Tank 1010 are effectively being addressed by natural attenuation and the extent of contamination in groundwater is not currently increasing. See Paragraph E of this Section, for a list of the use restrictions EPA proposes for the Facility.

### B. SWMUs 1, 2 & 6, and 11

The proposed remedies for SWMUs 1, 2, 6, and 11 include Institutional Controls as described previously restricting groundwater, residential use, and soil management and engineering controls previously implemented. Summarizing, SWMU 1 utilized spot-excavation and removal and/or covering of existing tar-like substance with offsite disposal at an approved waste disposal facility, backfilling with clean material, and installation of permanent fencing including restrictive signage. Maintenance of the fence, signage, and cover through a monitoring and reporting program to be prescribed in the CMI is an additional requirement for each of these SWMUs (1, 2, 6, and 11).

SWMUs 2 & 6, in addition to ICs, are to be maintained as a closed landfill. Construction of structures on the landfill is prohibited, or equivalent protection from direct contact must be proposed and written approval obtained from WVDEP and EPA. Maintenance will be required documented through regular monitoring and reporting.

SWMU 11 (and the closed WWTU units), in addition to ICs, will be maintained as a closed landfill. Maintenance will be required and documented through regular monitoring and reporting.

### C. CMS Area A

CMS Area A consists of subareas 3A, 3B, 3C, and 3D. UCC has conducted soil and groundwater remediation at CMS Area A as previously described (Section III.D). The most current and most successful technology implemented at this area is Aerobic Co-Metabolic Bioremediation via Co-Metabolite-Enhanced Biosparging. This technology is EPA's proposed remedy for CMS Area A.

### D. Site-wide Groundwater Monitoring

The EPA-approved site-wide groundwater monitoring program has been in place since 2011 and was updated with a revised program in 2014. The objectives of the site-wide program are to:

- Determine if concentrations in impacted areas are stable or decreasing;
- Monitor the perimeter of the Facility to ensure impacts remain onsite;
- Document improvement in water quality;
- Detect and respond to changes in Facility conditions; and
- Identify areas of the Facility where additional active remediation may be necessary.

If the metrics for any of the performance standards are not met, EPA will require a risk determination conducted on various pathways such as vapor intrusion and ecological impacts to surface water. If the condition does not result in risks greater than threshold levels, then monitoring will continue and the result will be noted in the annual compliance report.

If the groundwater conditions result in a potential risk above thresholds for human health or the environment, UCC will be required to notify EPA and WVDEP to determine how to address the risk.

### E. Facility Land and Groundwater Use Restrictions

Because COCs remain in the groundwater at the Facility above drinking water standards and in the soils above levels appropriate for residential use, EPA's proposed remedy requires land and groundwater use restrictions for activities that may result in exposure to those contaminants.

EPA is proposing the following land and groundwater use restrictions be implemented at the Facility including the portion of the NS property which traverses the Facility:

1) The use of the Facility property for any purposes other than nonresidential. The term nonresidential means any real property on which commercial, industrial, manufacturing or any other activity is done to further the development, manufacturing or distribution of goods and services, intermediate and final business activities, research and development, warehousing, shipping, transport, remanufacturing, stockpiling of raw materials, storage, repair and maintenance of commercial machinery and equipment, and solid waste management. The term nonresidential shall not include schools, day care centers, nursing homes, or other residential-style facilities or recreational areas;

2) All earth moving activities, including excavation, drilling and construction activities, at EU-1 including SWMU 11, SWMUs 1, 2 & 6, and Tank 1010 be conducted in compliance with Facility-specific health and safety protocols and an EPA-approved Soil Management Plan (that includes appropriate Personal Protective Equipment

requirements sufficient to meet EPA's acceptable risk and complies with all applicable OSHA requirements and practices to prevent off-site migration of soils;

3) Facility-wide access restrictions through the use and maintenance of fencing and controlled access (security gate);

4) Groundwater at the Facility, APCO and specific areas of WVSU shall not be used for any purpose other than to conduct the maintenance and monitoring activities required by EPA unless prior written consent is obtained from WVDEP and EPA; and

5) An EPA-approved vapor intrusion control system shall be installed in new structures constructed on the Facility property above the contaminated groundwater plume or within the 100-foot of the plume. The vapor intrusion system shall be operated in a structure until it is demonstrated to EPA that vapor intrusion of contaminants in such structure does not pose a threat to human health.

EPA proposes that the above listed land and groundwater use restrictions which EPA has determined are necessary to prevent human exposure to contaminants at, and from, the Facility be implemented through the State CA Permit and/or an Environmental Covenant pursuant to the West Virginia Environmental Covenant Act (West Virginia Code Chapter 22 § 22.B et. seq.).

**F. Offsite Use Restrictions**

Because groundwater contaminants from the Facility have impacted portions of neighboring properties above drinking water standards, EPA's proposed remedy requires use restrictions for activities that may result in exposure to those contaminants.

EPA is proposing the following groundwater use restrictions be implemented at at the following locations where Facility related COC's have migrated:

1) WVSU –
    a. Contaminated groundwater shall not be used for any purpose other than to conduct the maintenance and monitoring activities required by EPA unless prior written consent is obtained from WVDEP and EPA.; and
    b. An EPA-approved vapor intrusion control system shall be installed in new structures constructed above the contaminated groundwater plume or within 100-foot of the plume. The vapor intrusion system shall be operated in a structure until it is demonstrated to EPA that vapor intrusion of contaminants in such structure does not pose a threat to human health.

2) APCO-
    a. Contaminated groundwater shall not be used for any purpose other than to conduct the maintenance and monitoring activities required by EPA unless prior written consent is obtained from WVDEP and EPA.

The above listed land and groundwater use restrictions which EPA has determined are

necessary to prevent human exposure to contaminants at, and from, the Facility may be implemented through an enforceable order or Environmental Covenant pursuant to the West Virginia Environmental Covenant Act (West Virginia Code Chapter 22 § 22.B et. seq.).

**G.** Corrective Measures Implementation Plan

UCC will be required to submit to WVDEP, for approval, a Corrective Measures Implementation (CMI) Plan for implementation of the corrective measures selected in the Final Remedy. Once WVDEP approves the CMI Plan it will be incorporated into and become enforceable under the State CA Permit. The CMI shall include at a minimum:

1) Tank 1010 TI monitoring and reporting

2) SWMUs 1, 2 & 6, and 11 monitoring and reporting

3) CMS Area A Bioremediation Operating and Maintenance Plan

4) Site-wide Groundwater Monitoring Plan

5) Institutional Controls (IC) Implementation plan - The IC Plan will establish the schedule and document the methods that will be used to record, implement and monitor compliance with the land and/or groundwater use restrictions, onsite and offsite, and ensure that they remain in place and effective and run with the land as appropriate

6) Soil Management Plan

If EPA determines that additional maintenance and monitoring activities, use restrictions, or other corrective actions are necessary to protect human health or the environment, EPA has the authority to require and enforce such additional corrective actions through an enforceable instrument, provided any necessary public participation requirements are met.

## VI. Evaluation of Proposed Remedy

This section provides a description of the criteria EPA used to evaluate the proposed remedies consistent with EPA guidance, "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule," 61 Federal Register 19431, May 1, 1996. The criteria are applied in two phases. In the first phase, EPA evaluates three decision threshold criteria as general goals. In the second phase, for remedies meeting the threshold criteria, EPA evaluates seven balancing criteria to determine which proposed remedy alternative provides the best relative combination of attributes.

### A. Threshold Criteria

**1. <u>Protect Human Health and the Environment</u>** - No unacceptable human health or population-level risks are present at the Facility; however, by implementing controls for land use, soil management, and restricting groundwater use, protection from potential unacceptable risks are ensured. The use of a Soil Management Plan for the Facility, and land disturbance

restrictions at SWMUs 1, 2& 6, and 11 in addition to the site-wide residential use restriction and groundwater use prohibition are equally protective and meet the criterion.

**2. Achieve Media Cleanup Objectives -** EPA's proposed remedies meet the cleanup objectives appropriate for current and reasonably anticipated future land use, which are risk-reduction. The objectives are to protect workers (future construction worker) from potential exposures to Facility-related soil or groundwater constituents at levels that may result in risks of adverse health effects. Given the controlled access, previously implemented IMs, ongoing groundwater remediation including MNA, and use restrictions described in Section V, the proposed remedy will attain soil and groundwater objectives. The use restrictions will eliminate current and future unacceptable exposures to both soil and groundwater.

**3. Control the Source of Releases** – The RCRA CA Program seeks to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment. Controlling the sources of contamination relates to the ability of the proposed remedy to reduce or eliminate, to the maximum extent practicable, further releases. Current site conditions demonstrate that there are no continuing sources in the CMS A Area. Closure of SWMUs 1, 2 & 6, and 11 with waste-in-place is the best alternative because other alternatives present risk of exposure to COPCs. Moreover, by implementing the usage and engineering controls, access to SWMUs 1, 2 & 6, and 11 will be eliminated thereby controlling the source. It has been demonstrated that contamination at CMS Area B is restricted to Tank 1010 and with current infrastructure practical access is restricted, therefore, this proposed TI Zone will remain contaminated.

### B. Balancing/Evaluation Criteria

**1. Long-Term Reliability and Effectiveness -** The proposed remedy will maintain protection of human health and the environment over time by controlling exposure to the hazardous constituents remaining in soils and groundwater. The long-term effectiveness is high, as use restrictions are readily implementable and easily maintained. Similarly, the proposed groundwater monitoring program is effective and reliable in the long term. Existing capping has been effective and will remain so in the long-term subject to proper maintenance. Given the historical, industrial uses of the Facility groundwater use restrictions are expected to continue in the long term.

**2. Reduction of Toxicity, Mobility, or Volume of Waste -** The implementation of groundwater remedies at HPH, SEVIN Area and CMS Area A has reduced toxicity, mobility, and the volume of groundwater COPCs. Similarly, excavation and capping reduces the mobility of contaminants at SWMUs 1, 2 & 6, and 11. The proposed remedy will not actively further reduce the toxicity, mobility, or volume of the remaining soil COPCs. Groundwater COPCs have generally demonstrated a stable or decreasing trend in concentrations with time and this trend is likely to continue.

**3. Short-Term Effectiveness -** EPA's proposed remedy does not involve any additional activities posing short-term risks to workers, residents, and the environment. The Facility is located in an industrial park; however, WVSU is immediately adjacent to the Facility to the east and some residences on adjoin WVSU property. EPA has determined that Facility-related contamination does not pose a risk to adjacent residents or onsite workers. There are existing

engineering control measures in place, and once the use restrictions and EPA-approved Facility-specific Soil Management Plan, are in place the proposed remedy's short-term effectiveness is high.

**4. Implementability -** EPA's proposed remedy is readily implementable. The remedy will be implemented using existing monitoring wells and biosparge wells. ICs are easily implemented under the State CA Permit or an Environmental Covenant. Access is already restricted. Some of the control measures included in the proposed remedy Facility-specific health and safety protocols and Soil Management Plan are easily implementable. The proposed control measures are compatible with current Facility uses and operations, and can be implemented, maintained, and monitored effectively with a well-designed control plan.

**5. Cost -** The major cost components for the proposed remedy include the continued implementation of a monitoring and reporting program, implementation and maintenance of control programs, and ongoing operation of the CMS Area A groundwater remedy. UCC will develop a cost estimate for the EPA-approved corrective measures for the Facility as part of the design for Corrective Measures Implementation and to provide a basis for demonstrating financial assurance compliance. Based on EPA's best professional judgment, the proposed remedy is cost effective for the Facility.

**6. Community Acceptance –** WVSU contacted EPA in April 2017 stating its intent to sue Dow Chemical Co., successor to UCC, for contaminated groundwater migrating onto the WVSU property from the Facility. Additionally, WVSU has expressed concerns about implementing use restrictions on its property and about EPA's remedy selection generally. Community acceptance of the proposed remedy will be evaluated based on comments received during the public comment period and will be described in EPA's Final Decision and Response to Comments.

**7. State/Support Agency Acceptance** - WVDEP has been involved throughout the Facility investigation process and will draft the State CA Permit once EPA issues a Final Decision. The proposed use restrictions included in the proposed remedy are generally recognized as commonly employed measures for long-term stewardship. Ultimately State/WVDEP support will be evaluated based on comments received during the public comment period.

## VII. 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 these indicators on September 15, 2003, and October 3, 2005, respectively. The environmental indicators are available at https://www.epa.gov/hwcorrectiveactionsites/documents-and-reports-about-union-carbide-corporation-institute-operations.

## VIII. Financial Assurance

UCC will be required under the State CA Permit to demonstrate and maintain financial assurance on an amount included in the CMI Plan for completion of the Final Remedy pursuant to the standards contained in Federal regulations 40 C.F.R. § 264.145 and 40 C.F.R. § 264.143.

## IX. Public Participation

Interested persons are invited to comment on EPA's proposed remedy. The public comment period will last thirty (30) calendar days from the date that notice of the start of the comment period is published in a local newspaper. Comments may be submitted by mail, fax, e-mail, or phone to Mr. Erich Weissbart at the address listed below.

A public hearing will be held upon request. Requests for a public hearing should be made to Mr. Erich Weissbart of the EPA Region III Office (410 305-2779). A hearing will not be scheduled unless one is requested.

EPA may modify the proposed remedy based on new information and/or public comments. Therefore, the public is encouraged to review the Administrative Record and to comment on the proposed remedy presented in this document.

The Administrative Record contains all the information considered by EPA for the proposed remedy at this Facility. The Administrative Record is available to the public for review and can be found at the following location:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Contact: Mr. Erich Weissbart (3LC10)
Phone: (410) 305-2779
Fax: (215) 814-3113
Email: weissbart.erich@epa.gov

Signature: _____ Date: 6.28.18

John Armstead, Director
Land and Chemicals Division
USEPA, Region III

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|---|---|
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| Table 1 | SWMU and AOC Status |
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| Figure 3 | Tank 1010 TI Area |

STATEMENT OF BASIS
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS


1. CH2M HILL (CH2M). 2005a. Supplemental RCRA Facility Investigation Report. Bayer CropScience Institute Facility, Institute Facility, Institute, West Virginia.

2. CH2M HILL (CH2M). 2005b. RCRA Facility Investigation Report for Solid Waste Management Units. Bayer CropScience Institute Facility, Institute Facility, Institute, West Virginia.

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4. CH2M HILL (CH2M). 2010a. TW-63A/TW-63B Source Area Investigation. Bayer CropScience Institute Facility Institute, West Virginia. Prepared for United Carbide Company. Internal Draft. February.

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Table 1 SWMU and AOC Status

*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| Number | Name | Status |
|---|---|---|
| **SWMU 1** | Former UCAR Landfill | The former 1-acre UCAR landfill, originally occupied by the toluene diisocyanate (TDI) unit, was used in the 1940s and 1950s for disposal of oil, tarry materials, and possibly soluble hydrocarbons from a gas cracking unit. The unit is now a gravel-covered, level area crossed by rail lines. Waste in place remains. Final remedy selection in CMS. |
| **SWMU 2 & 6** | No. 2 Ash Pond and Past No. 2 Fly Ash Landfill | The No. 2 Ash Pond was built on top of a section of the 4-acre No. 2 Fly Ash Landfill. A 2-foot thick grass-covered clay cap covers the landfill. The pond provided solids separation for coal ash fines prior to discharge to an NPDES outfall; however, the pond was decommissioned in late 2017/early 2018. Landfill materials include cinders, coal, glass, and black organic oil and sludge mixed with ordinary gravel and sand. Waste in place remains. Final remedy selection in CMS. |
| **SWMU 3** | Past Landfill/Coal Pile | No Further Action Determination[A] |
| **SWMU 4** | Past Landfill/Syngas Unit | TDI, toluene diamine, and other unit wastes may have been disposed of in a 100-foot by 50-foot by 10-foot-deep landfill. Most of the waste material was removed when the site was prepared for construction of the Syngas Unit. The unit was demolished in 2016. Final remedy selection in CMS. |
| **SWMU 5** | No. 1 Ash Pond | The pond was 110 feet by 160 feet and 10 feet deep, with a listed volume of 5,000 cubic yards and was in service from 1942 to 1985 to collect bottom ash (clinkers) from the #1 Powerhouse. Although periodically cleared of accumulated solids during operation, some residual amounts of these materials, designated non-hazardous in 1979 by the EPA Toxicity Test, may have remained. All other material placed in the pond was designated "clean" by analysis. Final remedy selection in CMS. |
| **SWMU 7 & 20** | SEVIN® Unit and Southside Loading Rack/SEVIN® Unit | SEVIN® Unit began operations in 1960. The Southside Loading Rack (SWMU 20) was composed of a 20-foot by 40-foot asphalt-covered concrete and/or asphalt residue transfer station for tank trucks. The SEVIN® Unit and Southside Loading Rack were two of six SWMUs within the facility originally designated as a high-priority. The SEVIN® Unit and Southside Loading Rack were demolished in December 2013. The area is currently covered by gravel. Soil impacts remain. Final remedy selection in CMS. |
| **SWMU 8** | Methanol Storage Tank 1518/Glycol Unit | No Further Action Determination[C] |
| **SWMU 9** | Past Residue Storage Tanks 1037 & 1038/ Naphthol and Acetone | A gravel area that had two 26,000-gallon aluminum tanks that were removed in 1990. Soil concentrations are below risk thresholds. Final remedy selection in CMS. |
| **SWMU 10** | Byproduct Fuels Tank 1885 – LARVIN® Unit | No Further Action Determination[C] |
| **SWMU 11** | Chemfix Area | The Chemfix area is approximately 6 acres in size and was used for disposal of sludge from the water treatment plant. Most sludge was "fixed" into a solid form with the addition of kiln dust, cement, and/or other material and then the area was capped. Waste capped with soil cover. Buried waste remains. Final remedy selection in CMS. |

Table 1. SWMU and AOC Status

*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| Number | Name | Status |
|---|---|---|
| **SWMU 12** | Wash Pad north of ENB Unit | No Further Action Determination[A,B] |
| **SWMU 13** | Hydroxyethyl cellulose (HEC) storage tank adjacent to former Building 87 | 10,000-gallon stainless steel tank located adjacent to former Building 87, which rested on a concrete foundation and was surrounded by a concrete dike. Tank was demolished and now area is covered with gravel and concrete.<br>Data from 1992, 2000, and 2002 indicated minimal metals impacts in subsurface soils but no impacts to groundwater, so a No Further Action Determination[B] assigned in 2003. Final remedy selection in CMS. |
| **SWMU 14** | Tank Station 106/Plant Laboratory | No Further Action Determination[C] |
| **SWMU 15** | Eastside Tank Car/Truck Cleaning Rack | Solvent materials were manufactured and shipped in the area served by the eastside rack. The tank car cleaning area consists of four parallel sections of track through a gravel-covered area. Tank truck cleaning is done on an asphalt pad immediately west of the railroad tracks. This is a tank cleaning area currently in service. Soil concentrations are below risk thresholds. Final remedy decision in CMS. |
| **SWMU 16 & 17** | Chemical Cleaning Building and Burn Area | SWMU 16 consists of the Chemical Cleaning Building (334), which is used for miscellaneous cleaning operations using solvents, including chlorinated solvents. SWMU 17 consists of a gravel area that had been used for burning flammable residues from metal parts and other materials. Building 334 is in service and the area designated as SWMU 17 is an open area covered by gravel and asphalt. Soil concentrations are below risk thresholds. Final remedy decision in CMS. |
| **SWMU 18 & 22** | 1700 Robb Station/ENB Unit and 1600 Robb Station/ENB Unit | SWMU 18 formerly consisted of a loading station where fluorocarbons were transferred from an overhead pipe rack to containers or trucks. SWMU 22 was a loading and unloading station from chemical transfer lines to tank trucks. Both SWMU 18 and 22 have since been demolished and removed. Soil and groundwater impacts remain. SWMUs are combined into the CMS Area A. Final remedy decision in CMS. |
| **SWMU 19** | Westside Landfill | The Westside Landfill was likely utilized between 1977 and 1992. Demolition wastes, primarily old metal equipment, plastic items, and dirt piles, have been placed on both sides of the entrance road to the current tenant access road. The entire area is approximately 24 acres in size and was fenced in the early 1990s to eliminate further use for disposal. Open area over-grown with vegetation, located between the two sections of the facility. Soil concentrations are below risk thresholds. Final remedy decision in CMS. |
| **SWMU 21** | Polyols Tank Car Rack | No Further Action Determination[A] |
| **SWMU 23** | Ethylene Oxide/BEHP Loading Rack | No Further Action Determination[C] |
| **AOC 1** | Construction Blasting Grit Area | No Further Action Determination[A] |
| **AOC 2** | Naphthalene Tank | During tank demolition in 1995, staining was observed and solidified naphthalene was present in the gravel within the concrete tank rings. Approximately 290 cubic yards of soil and gravel were excavated and removed. This unit is now an open area covered by gravel. Final remedy decision in CMS. |

Table 1. SWMU and AOC Status

*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| Number | Name | Status |
|---|---|---|
| **AOC 3** | Building 111 Blasting Grit | No Further Action Determination[B] |
| **AOC 4** | LARVIN® | No Further Action Determination[A] |

Notes:

A Union Carbide Corporation (UCC) February 2001. RFI Report (Stage III) Low Priority Solid Waste Management Units, Aventis CropScience USA, Institute, West Virginia.

B Kemron Environmental Services, Inc. (Kemron). June 2003. RFI Stage III Additional Investigation Low Priority Solid Waste Management Units.

C Key Environmental Inc. and CH2M HILL June 2006. Summary of Site Remediation for High Priority Areas at the Bayer Cropscience Site, Institute, West Virginia.

CMS = Corrective Measures Study
TDI = toluene diisocyanate
NPDES = National Pollutant Discharge Elimination System
USEPA = U.S. Environmental Protection Agency
SWMU = Solid Waste Management Unit
RSL = Regional Screening Level
CMS = Corrective Measures Study
ENB = ethylidene norbornene

Table 2. Exposure Unit, Solid Waste Management Unit, Area of Concern, and Corrective Measure Study Area Summary
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| | | | **Final Corrective Measure(s)** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Institutional Controls** | | | | | | |
| | **Description of Solid Waste Management Unit (SWMU), Area of Concern (AOC), or Corrective Measures Study (CMS) Area** | **Direct Contact Restrictions Due to Exceedance of Established Risk Thresholds(s)[a] and/or Subsurface Waste in Place** | **Industrial/Commercial Land Use Restriction** | **VI Restriction for New Building Construction (exposure to groundwater vapors)** | **Groundwater Use Restriction (no drinking or irrigation uses allowed)** | **Prohibit Offsite Soil Movement** | **Surface Soil Restriction (direct contact with surface soil 0 - 2 feet below ground surface)** | **Subsurface Earthwork Restriction (direct contact with subsurface soil at depths >2 feet)** | **Additional Corrective Measures** |
| **EU-1** | | • Subsurface soil – direct contact restriction applied across Exposure Unit (EU)-1 due to subsurface risk estimates above thresholds. | **X** | **X** | **X** | **X** | | **X** | |
| SWMU 11 | • Former Chemfix area (~6 acres) was used for sludge disposal from the water treatment plant.<br>• Most sludge was "fixed" into a solid form with the addition of kiln dust, cement, and/or other material, and the area was then capped.<br>• Buried waste remains in place; waste is capped with a soil cover. | • Surface soil – direct contact restriction applied for Solid Waste Management Unit (SWMU) 11 to mitigate cover disturbance.<br>• Subsurface soil – direct contact restriction applied for SWMU 11 due to waste-in-place. | | | | | X | | • Engineered soil cover already in place over SWMU 11.<br>• SWMU-11 will be managed in accordance with ICs appropriate for a former landfill. |
| Closed RCRA Ponds | • Six Resource Conservation and Recovery Act (RCRA)-closed ponds and three non-RCRA-closed ponds formerly associated with the wastewater treatment unit (WWTU), all in post-closure care.<br>• WWTU and the closed RCRA ponds and biobasins are managed under an RCRA Part B Operating Permit issued by the West Virginia Department of Environmental Protection (WVDEP) in 2008 and amended March 2014 to include a corrective action (CA) module; to be incorporated into WVDEP RCRA CA Permit once issued following Final Decision.<br>• Both the RCRA- and non-RCRA-closed ponds at the WWTU are in post-closure care. | | | | | | | | • Abandonment of existing groundwater recovery wells near former Biobasins 1 and 2. |
| **EU-2** | | | **X** | | | **X** | | | |
| SWMU 19 | • Former "Westside Landfill" (~1977 to 1992) used for storage of demolition wastes, including metal equipment, plastic items, and soil piles.<br>• Approximately 24 acres were fenced in the early 1990s to eliminate further storage; materials have been removed.<br>• Currently an open area overgrown with vegetation.<br>• Soil and groundwater concentrations are below industrial/commercial risk-based screening levels (RBSLs) or within the range of background concentrations. | | | | | | | | • No additional actions required. |
| **EU-3** | | | **X** | **X** | **X** | **X** | | | |
| SWMU 12 | • Wash pad north of ethylidene norbornene Unit | | | | | | | | • NFA. |
| *CMS Area A* | | | | | | | | | • Aerobic Co-Metabolic Bioremediation (ACB) via Co-Metabolite-Enhanced Biosparging. |
| SWMU 18 | • Former loading station where fluorocarbons were transferred from an overhead pipe rack to containers or trucks (demolished). | | | | | | | | |

Table 2. Exposure Unit, Solid Waste Management Unit, Area of Concern, and Corrective Measure Study Area Summary
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| | | | Final Corrective Measure(s) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Institutional Controls | | | | | | |
| | **Description of Solid Waste Management Unit (SWMU), Area of Concern (AOC), or Corrective Measures Study (CMS) Area** | **Direct Contact Restrictions Due to Exceedance of Established Risk Thresholds(s)[a] and/or Subsurface Waste in Place** | **Industrial/Commercial Land Use Restriction** | **VI Restriction for New Building Construction (exposure to groundwater vapors)** | **Groundwater Use Restriction (no drinking or irrigation uses allowed)** | **Prohibit Offsite Soil Movement** | **Surface Soil Restriction (direct contact with surface soil 0 - 2 feet below ground surface)** | **Subsurface Earthwork Restriction (direct contact with subsurface soil at depths >2 feet)** | **Additional Corrective Measures** |
| | • Soil concentrations are below industrial/commercial RBSLs. | | | | | | | | • Post-shutdown groundwater monitoring to determine concentration trends; if statistically significant increasing concentrations of constituents of concern (COCs) are observed, indicating a continuing source present in the vadose zone, an evaluation will be conducted to determine the feasibility and effectiveness of implementing a targeted soil remedy in order to meet the site-specific remedial action objective (RAO). |
| SWMU 22 | • Former loading and unloading station from chemical transfer lines to tank trucks.<br>• Soil concentrations are below industrial/commercial RBSLs. | | | | | | | | |
| Former Fluorocarbon Area | • Former fluorocarbon production unit (1958 to 1978) where carbon tetrachloride, chloroform, and tetrachloroethene (PCE) were used as raw chemicals; final products included trichlorofluoromethane (TCFM) and dichlorodifluoromethane (DCFM).<br>• Production process generated waste hydrochloric acid that contained residual fluorocarbons, PCE, chloroform, and/or carbon tetrachloride.<br>• Soil concentrations are below industrial/commercial RBSLs. | | | | | | | | |
| AOC 3 | • Building 111 Blasting Grit. | | | | | | | | • NFA |
| **EU-4** | | | | **X** | **X** | **X** | | | |
| SWMU 5 | • Former fly ash landfill where the majority of waste has been removed.<br>• Soil concentrations do not exceed industrial/commercial RBSLs. | | | | | | | | • No additional actions required. |
| SWMU 8 | • Methanol Storage Tank 1518 / Glycol Unit. | | | | | | | | • NFA. |
| SWMU 10 | • Byproduct Fuels Tank 1885 – LARVIN® Unit. | | | | | | | | • NFA. |
| AOC 4 | • The LARVIN® structure located south of Building 178. | | | | | | | | • NFA. |
| **EU-5** | | | | **X** | **X** | **X** | | | |
| SWMUs 2 and 6 | • Waste remains in place within this “No. 2 Ash Pond” built on top of a section of the 4-acre “No. 2 Fly Ash Landfill.”<br>• A minimum 6-inch clay cap (laboratory permeability = approximately 3- to 4 x $10^{-8}$ centimeters per second) covered with soil and established vegetation.<br>• The pond provides solids separation for coal ash fines prior to discharge to a National Pollutant Discharge Elimination System (NPDES) outfall.<br>• Landfill materials include cinders, coal, glass, and black organic oil, and sludge mixed with ordinary gravel and sand. | • Surface soil direct contact restriction applied for SWMUs 2 and 6 to mitigate cover disturbance.<br>• Subsurface soil – direct contact restriction applied for SWMUs 2 and 6 due to waste-in-place. | | | | | **X** | **X** | • The SWMU will be managed in accordance with institutional controls (ICs) appropriate for a former landfill.<br>• The pond is currently being closed as part of the facility ownership change; the residual material is being removed from the pond and disposed offsite; the pond will be backfilled with native material (from the walls) and additional fill to be consistent with the landfill cover. |
| SWMU 4 | • Formerly a landfill where toluene diisocyanate (TDI), toluene diamine, and other unit wastes may have been disposed.<br>• Waste materials are believed to have been removed prior to construction of the synthetic gas unit (that has since been demolished).<br>• Soil concentrations are below risk thresholds. | **X** **X** | | | | | | | • No additional actions required. |

Table 2. Exposure Unit, Solid Waste Management Unit, Area of Concern, and Corrective Measure Study Area Summary
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| | | | **Final Corrective Measure(s)** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Institutional Controls** | | | | | | |
| | **Description of Solid Waste Management Unit (SWMU), Area of Concern (AOC), or Corrective Measures Study (CMS) Area** | **Direct Contact Restrictions Due to Exceedance of Established Risk Thresholds(s)[a] and/or Subsurface Waste in Place** | **Industrial/Commercial Land Use Restriction** | **VI Restriction for New Building Construction (exposure to groundwater vapors)** | **Groundwater Use Restriction (no drinking or irrigation uses allowed)** | **Prohibit Offsite Soil Movement** | **Surface Soil Restriction (direct contact with surface soil 0 - 2 feet below ground surface)** | **Subsurface Earthwork Restriction (direct contact with subsurface soil at depths >2 feet)** | **Additional Corrective Measures** |
| SWMU 16 | • Chemical Cleaning Building (#334) actively being used for miscellaneous cleaning operations using solvents and chlorinated solvents.<br>• Soil concentrations are below risk thresholds. | | | | | | | | • No additional actions required. |
| SWMU 17 | • Gravel area that had been used for burning flammable residues from metal parts and other materials.<br>• Soil concentrations are below risk thresholds. | | | | | | | | • No additional actions required. |
| **EU-6** | | | | **X** | **X** | **X** | | | |
| SWMU 9 | • Residue Aluminum Storage Tanks 1037 & 1038 / Naphthol and Acetone (26,000 gallons each) that sat on a gravel area and were removed in 1990.<br>• Soil concentrations are below risk thresholds. | | | | | | | | • No additional actions required. |
| SWMU 14 | • Tank Station 106/Plant Laboratory. | | | | | | | | • NFA. |
| SWMU 23 | • Ethylene Oxide/BEHP Loading Rack. | | | | | | | | • NFA. |
| *CMS Area B* | | • Subsurface soil – direct contact restriction applied across Corrective Measure Study (CMS) Area B due to risks above thresholds (except under the Norfolk Southern mainline railroad tracks right-of-way where there were no operations) | | | | | | **X** | |
| Tank 1010 Area (Included in CMS Area B) | • A 1.47-million-gallon aboveground storage tank (AST) currently used to store anti-freeze-grade ethylene glycol (since 1981); previously stored benzene (1943 to 1981) associated with the former styrene production units.<br>• Includes former rail unloading area north of the AST that included a former pipe trench.<br>• In situ chemical oxidation (ISCO) injections were completed in the former rail unloading area in 2014 and 2015 to address benzene concentrations in source area soils and groundwater; results indicate an overall reduction in benzene concentrations in groundwater but limited effectiveness for soil impacts.<br>• Soil concentrations exceed risk thresholds; however, technically impracticable to address due to existing infrastructure. | **X** | | | | | | | • No active remedy at this time due to technical impracticability; however, if future operating conditions change and Tank 1010 is no longer utilized as part of an active chemical unit, then additional evaluation will be completed to determine if remediation remains technically impracticable or if remediation may be implemented to permanently remove or remediate benzene-impacted soils. |
| High Purity Hydrocarbon (HPH) Area (Included in CMS Area B) | • Four 10,000-gallon ASTs formerly used to store high-purity hydrocarbon (HPH) fuel oil, process residue waste, and other constituents. | | | | | | | | • Continued operation of the AS/SVE until the RAOs and the remedial operational goals are met as evidenced by monitoring results. |

Table 2. Exposure Unit, Solid Waste Management Unit, Area of Concern, and Corrective Measure Study Area Summary
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| | | | Final Corrective Measure(s) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Institutional Controls | | | | | | |
| | **Description of Solid Waste Management Unit (SWMU), Area of Concern (AOC), or Corrective Measures Study (CMS) Area** | **Direct Contact Restrictions Due to Exceedance of Established Risk Thresholds(s)[a] and/or Subsurface Waste in Place** | **Industrial/Commercial Land Use Restriction** | **VI Restriction for New Building Construction (exposure to groundwater vapors)** | **Groundwater Use Restriction (no drinking or irrigation uses allowed)** | **Prohibit Offsite Soil Movement** | **Surface Soil Restriction (direct contact with surface soil 0 - 2 feet below ground surface)** | **Subsurface Earthwork Restriction (direct contact with subsurface soil at depths >2 feet)** | **Additional Corrective Measures** |
| | • Air sparge/soil vapor extraction (AS/SVE) activated in 2011 to address benzene, toluene, ethylbenzene, xylenes, and naphthalene in shallow soils and groundwater. | | | | | | | | |
| **EU-7** | | | | **X** | **X** | **X** | | | |
| SWMU 1 | • Former 1-acre UCAR landfill, originally occupied by the toluene diisocyanate (TDI) unit.<br>• Oil, tarry materials, and possibly soluble hydrocarbons from a gas cracking unit disposed of here in the 1940s and 1950s; now a gravel-covered, level area crossed by a rail line.<br>• Waste remains in place, with "seeps" of a black, tar-like substance that historically surface.<br>• Interim removal of the tar-like substance has been completed over time starting in 2003. | • Surface soil direct contact restriction applied across SWMU 1 to mitigate cover disturbance.<br>• Subsurface soil direct contact restriction applied across SWMU 1 due to subsurface waste-in-place material.<br>**X** | | | | | **X** | **X** | • The SWMU will be managed in accordance with ICs appropriate for a former landfill.<br>• Continued, focused removal of tar-like substances (hot-spot excavation and removal, and/or covering of with offsite disposal at an approved waste disposal facility; backfilling with clean material).<br>• Installation of permanent fencing and improvement of existing signage. |
| SWMU 3 | • Past Landfill/Coal Pile. | | | | | | | | • NFA. |
| SWMU 7 (includes SEVIN® and NCF Areas) | • Former SEVIN® production unit (demolished in 2013).<br>• Interim remedy (AS/SVE) completed in 2002 after reduction of more than 99 percent of the toluene concentration.<br>• Soil concentrations in the southwest corner of SWMU 7 are above risk thresholds. | • Surface and subsurface soil risk thresholds exceeded, but Corrective Measure hot-spot removal planned. | | | | | ** | ** | • Removal of an area of surface and subsurface naphthalene concentrations from the southwest corner that exceed industrial/commercial RBSLs.<br>• Document sampling results, delineation efforts, and excavation in a construction completion report. |
| SWMU 20 | • Former Southside Loading Rack for the SEVIN® Unit (demolished in 2013).<br>• The Southside Loading Rack (SWMU 20) was composed of a 20-foot by 40-foot asphalt-covered concrete and/or asphalt residue transfer station for tank trucks, and was demolished in 2013.<br>• Soil concentrations are below risk thresholds. | | | | | | | | • No additional actions required. |
| SWMU 21 | • Polyols Tank Car Rack. | | | | | | | | • NFA. |
| AOC 1 | • Construction Blasting Grit Area. | | | | | | | | • NFA. |
| AOC 2 | • Former naphthalene tank demolished in 1995.<br>• Gravel in the area beneath former tank contained solidified naphthalene and staining.<br>• Approximately 290 cubic yards of soil and gravel were excavated and removed.<br>• Soil concentrations are below risk thresholds. | | | | | | | | • No additional actions required. |

Table 2. Exposure Unit, Solid Waste Management Unit, Area of Concern, and Corrective Measure Study Area Summary
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

| | | | **Final Corrective Measure(s)** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | **Institutional Controls** | | | | | | |
| | **Description of Solid Waste Management Unit (SWMU), Area of Concern (AOC), or Corrective Measures Study (CMS) Area** | **Direct Contact Restrictions Due to Exceedance of Established Risk Thresholds(s)[a] and/or Subsurface Waste in Place** | **Industrial/Commercial Land Use Restriction** | **VI Restriction for New Building Construction (exposure to groundwater vapors)** | **Groundwater Use Restriction (no drinking or irrigation uses allowed)** | **Prohibit Offsite Soil Movement** | **Surface Soil Restriction (direct contact with surface soil 0 - 2 feet below ground surface)** | **Subsurface Earthwork Restriction (direct contact with subsurface soil at depths >2 feet)** | **Additional Corrective Measures** |
| **EU-8** | | | | **X** | **X** | **X** | | | |
| SWMU 13 | • 10,000-gallon hydroxyethyl cellulose (HEC) storage tank adjacent to former Building 87, which rested on a concrete foundation and was surrounded by a concrete dike.<br>• Tank was demolished and area is now covered with gravel and concrete.<br>• Lead concentrations in subsurface soil samples from northeast corner of SWMU 13 exceed the USEPA Regional Screening Level (RSL) for Industrial Soil. | • Subsurface soil – direct contact restriction applied across SWMU 13 due to risks above thresholds. | | | | | | **X** | • No additional actions required. |
| SWMU 15 | • Eastside Tank Car/Truck Cleaning Rack - solvent materials were manufactured and shipped in the area.<br>• Tank car cleaning area consists of four parallel sections of railroad track through a gravel-covered area.<br>• Tank car cleaning is currently in service and is completed on an asphalt pad immediately west of the railroad tracks.<br>• Soil concentrations are below risk thresholds. | **X** | | | | | | | • No additional actions required. |

Grey shading indicates the SWMU was screened out from further action prior to the Corrective Measures Proposal (CMP).

[a] Established risk thresholds based on continued non-residential land use, an excess lifetime cancer risk greater than $1 \times 10^{-4}$, or a hazard index greater than 1.

X = This IC will be applied to the relevant EU, AOC, or SWMU.

** = No restrictions required, because corrective action for hot-spot removal is planned.

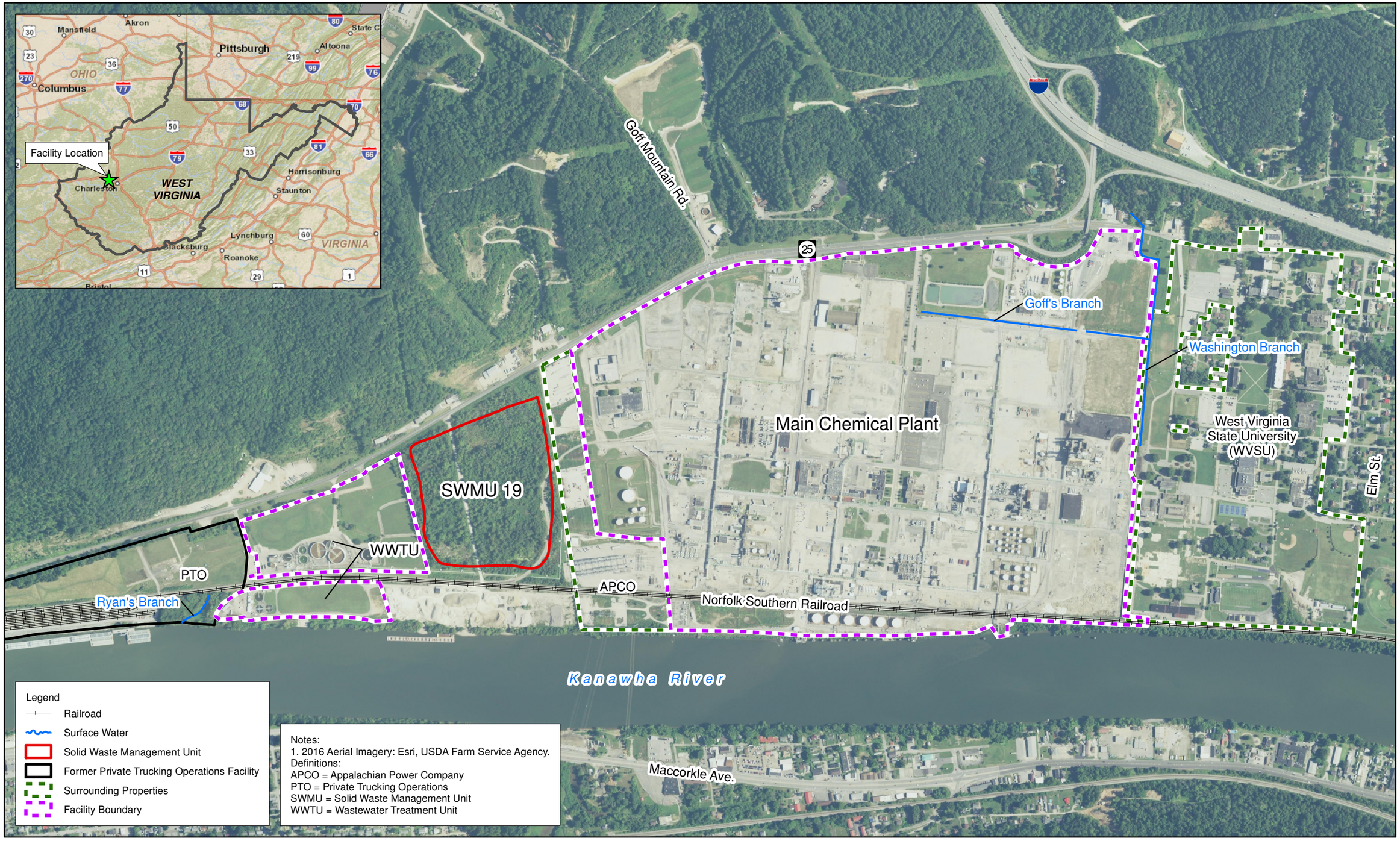


**Figure 1**
Facility Location and Neighboring Properties Map
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

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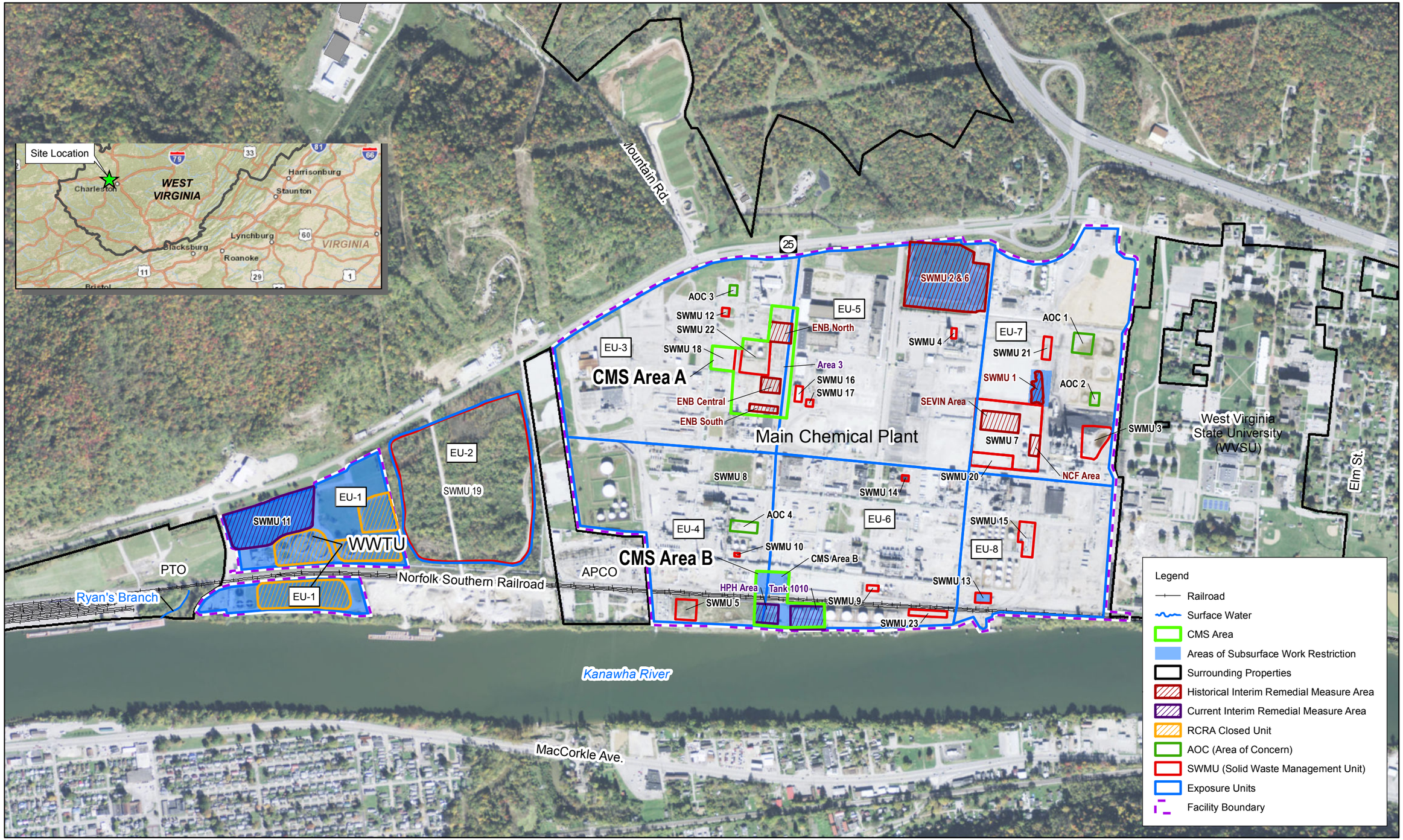


**Figure 2**
Areas of Subsurface Work Restriction
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

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Figure 3
Tank 1010 Technical Impracticability Location Map
*Union Carbide Corporation Institute Facility*
*Institute, West Virginia*

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