UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS

Former Hercules Facility

Courtland, VA

EPA ID: VAD 003 122 165

Prepared by

Office of Remediation

Land and Chemicals Division

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Section 1: Introduction

The United States Environmental Protection Agency (EPA) prepared this Statement of Basis (SB) to solicit public comment on its proposed remedy for the Former Hercules Facility (Facility or Site) located in Courtland, Virginia. The Facility was owned by Hercules, Incorporated (Hercules), and became a wholly owned subsidiary of Ashland Water Technologies in November 2008. In August 2014, the Facility was acquired by Solenis, LLC. Hercules retains financial responsibility for historic contamination at the Facility.

This SB highlights key information relied upon by EPA in proposing its remedy for the Facility. Hercules has conducted contaminant source removal activities at several units on the Facility. Where contamination remains on-site, EPA is proposing continued active groundwater treatment at the Vul-Cup Process Area and Monitored Natural Attenuation (MNA) and Long Term groundwater Monitoring (LTM) in other areas where groundwater contaminants remain above EPA's Correction Action Objectives (CAO). Also, a Vapor Control System will be installed in any building with vapor intrusion levels exceeding EPA's acceptable levels. Land and groundwater use restrictions will be maintained by institutional controls.

The Facility is subject to EPA's Corrective Action Program under the Solid Waste Disposal Act, as amended, commonly referred to as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Sections 6901 et seq. The Corrective Action Program's goal is to ensure that certain facilities subject to RCRA have investigated and cleaned up releases of hazardous waste and/or hazardous constituents that occurred at or from their property. The Commonwealth of Virginia is authorized to implement the Corrective Action Program under Section 3006 of RCRA, and as part of a workshare agreement with EPA, EPA is the lead Agency in overseeing the investigation and selecting a final remedy at the Facility.

EPA is providing thirty (30) days for public comment on this SB. Based on comments received during this period, EPA may modify its proposed remedy. EPA will announce its selection of a final remedy for the Facility in a Final Decision and Response to Comments document after the public comment period has ended.

EPA's Fact Sheet on the Facility is located at: http://www3.epa.gov/reg3wcmd/ca/va/webpages/vad003122165.html. Information on the Corrective Action program is located at: http://www3.epa.gov/reg3wcmd/ca/ca_program.htm.

The Administrative Record (AR) for the Facility contains all documents, including data and quality assurance information that EPA relied on in proposing the final remedy. Attachment B is the AR Index for the Facility. Public Participation information is provided in Section 9, below, of this SB for those interested in reviewing the AR.

Section 2: Facility Background

The Facility is located at 27123 Shady Brook Trail, Courtland, VA, 23873 in Southampton County, at the intersection of State Routes 650 and 671. Courtland is located approximately three miles southwest of the City of Franklin, VA. The Facility location is depicted in Figure 1.

The Facility consists of 120 acres, which includes 30 acres of developed land called the Main Plant Area where manufacturing takes place, and 90 acres of undeveloped land which includes two areas called the East and West Areas, respectively, as shown in Figure 2. There are two closed landfills at the Facility, one in the East Area and one in the West Area. The East and West Areas were used for disposing of wastes in the landfills and in waste pits and for wastewater sludge disposal. The East and West Areas are no longer used and the wastes were removed by Hercules as part of Interim Measures remediation activities, as discussed in Section 3.4., below.

The Nottoway River borders the West Area of the Facility, with a commercial freight railway along the southern border. A Dominion Power plant borders the East Area, and State Route 671 and a cemetery are along the northern border. Prior to Facility construction in 1956, the area was predominantly forests and farmland. Currently, the land around the Facility remains wooded with a few residences and a church located on State Route 650, the roadway dividing the Main Plant from the West Area. The location of the church is shown on Figure 1 as White Oak Springs Church.

The Main Plant currently consists of three manufacturing units: Pamolyn, Aquapel and Vul-Cup. The Pamolyn unit produces fatty acids, which are sold to other manufactures to make coatings, cosmetics, metalworking and building/construction materials among other products. The Aquapel unit produces a sizing agent used to make paper suitable for writing and printing, and the Vul-Cup unit produces an organic peroxide vulcanizing agent used in elastomers and plastics. Two earlier manufacturing units, the Rosin Size and Tall Oil Refining units, were discontinued in 1993 and 2008, respectively. The Tall Oil Refining process distilled a material extracted from tree pulp (tall oil) into rosin and fatty acids. The Rosin Size unit further processed tall oil rosin. Heat generation and wastewater treatment units support the Main Plant operations.

Section 3: Summary of Environmental Investigations

3.1 Corrective Action Regulatory History

In 1997, the Facility was permitted as a large quantity hazardous waste generator and a treatment, storage and disposal (TSD) Facility by Virginia's RCRA program. Hercules required a RCRA

Permit because Vul-Cup process wastewater (WW) contained trace organics with ignitability and corrosivity characteristics (D001/D002). The WW was incinerated in an on-site thermal oxidizer (hazardous waste incinerator), which was removed in 2001, with Clean Closure status given by Virginia in September 2002. In January 1992, the Virginia Department of Environmental Quality (VDEQ) approved, and the Facility subsequently implemented, a Corrective Action Plan (CAP) for product recovery and in 1993, a pump and treatment groundwater (GW) system in the Vul-Cup area. In 1995, VDEQ approved a revised CAP that required the GW system be replaced with biosparging treatment technology for the Vul-Cup GW.

In October 1999, EPA and Hercules entered into a RCRA Facility Lead Agreement (FLA). Under the 1999 FLA, Hercules agreed to conduct Corrective Action (CA) activities to characterize contaminant releases to soil, surface water, sediment and groundwater at the Facility and, if needed, to implement interim measures to protect human health and the environment from any releases. Specifically, Hercules performed the following Corrective Action activities: (1) Site-wide GW, soil and sediment sampling; (2) Residential well sampling; (3) Site-wide outfall sampling; (4) West Area Remedial Alternatives evaluation and interim measures; (5) Vul-Cup Source Investigations and GW remediation system evaluation/optimization; and (6) Route 671 Road Widening Interim Measures.

In October 2010, EPA and Hercules entered into a RCRA 3013 Consent Order. The Order required Hercules to complete a RCRA Facility Investigation (RFI) for four remaining Solid Waste Management Units or Areas of Concern (SWMUs/AOCs): (1) West Assembly Area; (2) Wastewater Treatment Plant Outfalls 201 and 002; (3) Heat Generation Area; and (4) Vul-Cup Area GW (see Section 3.2.1 for RFI discussion). The Order also required Hercules to complete a Corrective Measures Study (CMS) evaluating remedies for the entire Facility. Hercules submitted the *RFI* Report to EPA in 2013 and submitted the draft *CMS* for the Facility to EPA in July 2015. EPA approved the revised *RFI* Report on June 6, 2013 and conditionally approved/commented on the *CMS* in a letter dated November 3, 2015. In August 2016, Hercules submitted a *CMS Addendum* to address EPA's comments, and EPA approved the *CMS Addendum* in a letter to Hercules dated August 25, 2016.

3.2 Facility Corrective Action Investigation Summary:

3.2.1 Corrective Action RCRA Release Assessments and RCRA Facility Investigation

The *RCRA Facility Assessment* (*RFA*) Report, dated August 1991, identified 63 SWMUs and three AOCs at the Facility, and made recommendations for which SWMUs and AOCs needed further action. Hercules submitted a *Release Assessment Report* (*RA*) to EPA in March 1999 that identified 15 more SWMUs, for a total of 81 SWMUs. The *RA* included an evaluation of each SWMU and AOC for evidence of releases to the environment. The *RA* served as a Phase I *RFI* Report, under the FLA. Hercules continued further investigations of SWMUs/AOCs and in January 2002, submitted a *Release Assessment Addendum* (*RAA*) to EPA which served as a Phase II *RFI* Report. The *RAA* focused on the

SWMUs/AOCs identified in the *RA* as needing further investigation. The *RAA* Report recommended that of the 81 SWMUs identified, 64 needed no additional corrective action to protect human health and the environment and 17 SWMUs/AOCs required further investigation. The *RAA* Report recommendations were consistent with the *RFA* recommendations made in 1991.

The *RA* and *RAA* identified and delineated Facility releases, identified contaminants of concern and recommended that: (1) site-wide GW monitoring continue; (2) further investigation of potential sources of contamination in Vul-Cup and Heat Generation Areas be conducted; and (3) EPA proceed to remedy selection in the West Area. EPA approved the *RA* and *RAA* in June 2005.

In September 2012, a final *RFI* Report was submitted to EPA which detailed the investigations in the West Assembly Area, Wastewater Treatment Plant Outfall 201 and 002, Heat Generation Area and Vul-Cup Area GW as recommended in the *RFA, RA* and *RAA*. EPA approved the *RFI* Report on June 6, 2013. The findings of the *RA*, *RAA* and *RFI* and *CMS Addendum* Reports are discussed below.

3.3 Findings of Sitewide Investigations

1. Site Geology and Hydrogeology: The Facility is located in the flat lying coastal plain province of Virginia, at approximately 20 feet above mean sea level. The Facility is underlain by a fining upward sequence of unconsolidated sand, silt, clay and some peat, classified as part of the Columbia Group. On-site, the Columbia is overlain by engineered fill, consisting mostly of sand and gravel. Below the Columbia Group, at about 15 to 25 feet below the surface, lies the Yorktown Formation. This formation, also sand and silt, forms the first confining layer beneath the Facility.

Groundwater (GW) is encountered at four to eight feet below ground surface (bgs) and represents the unconfined aquifer or water table. A low permeability clay layer at 12 to 20 feet bgs acts as an aquitard to the downward movement of water and contaminants. Site-specific contaminants are limited to the shallow groundwater zone (Columbia), as confirmed by Site investigations. For potable water, the Facility relies on an on-site well drawing from 334 feet bgs. For process water, the Facility relies on GW wells with pumping zones hundreds of feet bgs, which are not impacted by Facility contamination.

2. Residential Well Sampling Results: In July 2003, the Facility submitted the revised *Residential Well Sampling Workplan* to EPA. EPA approved the *Workplan* in August 2003 and the subsequent *Residential Well Sampling Summary Letter Report* in October 2004. Hercules contacted GW well owners located within 0.5 miles of the Facility to request permission to sample the wells. Five residences, one church and two commercial/industrial properties relying on wells were located within the 0.5 mile radius. During a door to door survey, the Facility found that one well supplied two residences and the White Oak Springs Church. Another well was shared between two other residences and one well supplied the remaining residence.

The Facility sampled the three residential and two commercial/industrial wells. Results indicated that Facility contaminants were not impacting any of the off-site wells. One of the sampled commercial wells had low level semi-volatile organic compounds (sVOCs) detected at levels below lab method detection limits. The sVOCs, which generally are less mobile in GW, were most likely from heavy equipment emissions nearby their commercial operations. The residential well supplying two residences and the church were resampled in 2007 and 2010 at the owners' request. The resampling results showed no detections of Facility related chemicals and the few metals detected in the sample were within naturally occurring background levels for GW in the area. The off-site wells draw water in deeper zones beneath the shallow water table aquifer. Sampling results were shared with the well owners.

3. Soil and Sludge Sampling Results: Soil samples were collected from varying depths at the SWMUs/AOCs, biased towards locations where releases could have occurred or were suspected of occurring in the past. Because of shallow GW, soil samples were collected no deeper than 5 – 10 feet bgs. Soil samples were analyzed for volatile organic compounds (VOCs), sVOCs, metals and process specific analytes that were not on the RCRA Appendix IX lists. Soil results were screened against EPA's Risk Based Concentrations (RBCs). There were many detections of Site-related contaminants with few exceeding the residential RBCs screen. However, no contaminants in soil samples exceeded its RBCs for industrial use. Current and future use of the Facility property is expected to remain industrial. Some soil samples were analyzed for dioxin/furans and poly-chlorinated biphenyls (PCBs). While sampling results detected the presence of some dioxin congeners at two of the four locations sampled, all dioxin levels were below the RBCs for industrial use. PCBs were not detected.

Sludge and soil samples were collected from the West Area wastewater (WW) Lagoon, Sprayfield and Waste Pits for characterization in preparation for removal, as discussed under Section 3.4 (West Area Interim Measures), below. The unlined WW Lagoon contained about 1.5 million gallons of water with about two to three feet of sludge accumulated on the bottom. Composites of sludge and composites of soil beneath the WW Lagoon were sampled and analyzed for VOCs, sVOCs, tentatively identified compounds (TICs), metals and total petroleum hydrocarbons (TPH). Samples collected for VOCs were not composited. One sludge and one soil composite were analyzed for dioxins/furans. The sludge results were screened against RBCs for soil for comparison purposes. Constituents exceeding the industrial RBCs in sludge were1,2-dichloropropane (PDC), benzene and tetrachloroethylene, and in soil, only benzene. The sVOCs and TICs were detected at high levels, and were estimated due to laboratory dilution requirements. The sludge composite contained a dioxin/furan congener above the industrial RBC.

The Sprayfield paired sludge and soil samples were analyzed for VOCs, sVOCs, metals and TPH and a paired composite (one each for sludge and soil) was analyzed for dioxins/furans. No analytes were found that exceeded industrial RBCs.

4. Sitewide Outfall and Sediment Sampling: Figure 2 shows the locations of the Facility's outfall ditches/locations. Soil and sediment from outfalls 001, 002, 003 and 004 were analyzed for VOCs, sVOCs, metals and TICs. Outfalls 001, 003 and 004 showed no constituents exceeding residential RBCs. Outfall 002 is discussed below.

Outfall 002 receives discharges from the WW Treatment Plant, non-contact cooling water, effluent from Aquapel neutralization and stormwater runoff. Outfall 002 discharges are conveyed in a discharge conduit to the Nottoway River that borders the West Area. A sediment/soil sample collected from Outfall 002 in January 1998 showed only one sVOC exceeding its industrial RBC. Later, in November 1998, a spill from the neighboring Power Plant (adjacent the East Area) drained into the Facility's surface drainage system and discharged into Outfall 002. The Facility reported the spill to the Virginia Department of Environmental Quality (VDEQ) and described it as a soluble polymerized oil that created a hazy appearance in the water. An estimated 10 gallons of oil was released. In 2000, two years after the spill, two sediment/soil samples collected from Outfall 002 were analyzed. Five sVOCs exceeded industrial RBCs and ecological risk screening levels. Eleven years later, in 2011, six sediment samples were collected along the length of the discharge conduit. Results were compared to EPA sediment screening levels for ecological exposures and to probable effect concentrations for benthic organisms. One of the six samples exceeded EPA ecological screening levels for sVOCs, but none of the levels exceeded the probable effects level for benthic organisms. One sample analyzed for dioxin/furans exceeded EPA's RSL for industrial use for one congener, but was below the RSL in the duplicate sample. The congener distribution indicates a probable source from historic incinerator ash. The 2011 sampling showed that most of the effects of the 1998 spill had attenuated except for one sample showing sVOCs (mostly at estimated levels) that may reflect the former spill or runoff from paved surfaces.

Outfall Ditch 005 conveys stormwater to a stream named Wills Gut located adjacent to the Vul-Cup area. In 1988 a release from the Vul-Cup area was discovered, and again in 1993 a seep with Vul-Cup chemicals was found in the stormwater ditch. Four soil and two sediment samples were collected from the Outfall Ditch 005 in May 1998. The soil and sediment samples contained VOCs, sVOCs and metals below the applicable industrial RBCs, except for two soil samples that exceed the industrial RBC for two sVOCs. In October 1998, Outfall 005 was upgraded when soil and bricks were removed. Post upgrade sampling results showed that sVOCs in the soil sample location had been remediated.

5. GW Sampling Results: To characterize Facility-wide GW, 46 GW monitoring wells (MWs) are currently monitored. All but three MWs were installed into the shallow water table aquifer in the Columbia Formation. Three deeper MWs were installed to a depth of approximately 100 feet bgs, into the Yorktown aquifer, below the confining units between the shallow Columbia and the deeper Yorktown aquifers. GW has been monitored since 1998, and stream samples since 1996 for Appendix IX VOCs, sVOCs, tentatively identified compounds (TICs), metals and in the Vul-cup area, total diesel range organics (DRO) are also monitored. Monitoring has document contaminant levels and their decline over time. GW monitoring is performed according to an EPA approved GW Sampling and

Analysis Plan. GW data is screened using National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs) promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141) and EPA RSLs. GW contaminant ranges are shown in Table 1 below, using the most recent data (2014).

Site related GW constituents are vertically confined to the shallow water table aquifer at depths less than 20 feet bgs. Monitoring of some GW wells has been discontinued as sampling results demonstrate downward trends in contaminant concentrations and clean-up goals (below MCLs or RSLs) are attained. Currently, GW is monitored Facility-wide every 15 months, with Vul-Cup wells sampled every 12 months, and selected wells sampled biannually.

GW contaminant levels have remained stable, have declined or exhibit no trend over time, as shown using the Mann-Kendell statistical analysis of the GW data set shown in Attachment A. Contaminant decline and stability can be attributed to: (1) the removal of contaminant sources in the East and West Areas; (2) active GW remediation in the Vul-Cup Area; (3) biochemical breakdown of contaminants through natural processes; and (4) dilution and dispersion. Overall, contaminant levels are declining (See Attachment A for trend analysis). A few contaminants show an increasing trend in a few wells; iron, manganese and vanadium in a few West Area wells, benzene and diphenyl either in a well in the Heat Generation Area, and benzene and PDC in two East Area wells. In the Vul-Cup area, trends show decreasing or stable contaminant levels. GW Reports have been submitted to EPA since 2004.

Table 1.
GW Contaminant Ranges by Facility Area in ug/L (2014 data)

Contaminant	MCL	RSL	Range
West Area			
1,1-dichloroethane	--	2.7	3.5 - 12
1,2-dichloropropane	5		5.7 - 22
benzene	5		5.6 – 8.7
tert-butyl alcohol	--	140[1]	34 – 12,000
iron	--	14,000	29,000 – 36,000
manganese	--	430	530 – 1,200
Main Plant			
1,2-dichloropropane	5		110
vanadium	--	86	770
Heat Generation			
biphenyl ether	--	680[2]	1,300
Vul-Cup			
1,2-dichloropropane	5	--	7 – 1,200 D
tert-butyl alcohol	--	140[1]	250 – 430,000 H
cumene	--	450	540 - 790

Contaminant	MCL	RSL	Range
naphthalene	--	0.17	19 - 23
naptha	--	0.15	0.17 – 3.9
iron	--	14,000	15,000
East Area			
1,2-dichloropropane	--	0.44	5.4 – 2,300
benzene	5		19
methyl tert butyl ether	--	14	3,000
tert-butyl alcohol	--	140[1]	190 – 13,000
iron	--	14,000	23,000 – 26,000
manganese	--	430	450 - 590

1 – Delaware screening level – no MCL or RSL established; 2 – EPA-3 calculation – no MCL or RSL established;
H – lab flag: sample prepped beyond holding time; D- lab flag: extract diluted for analysis.

6. Route 671 Road Widening Interim Measure: State Route 671 bounds the northern border of the Facility. In 2002, the Virginia Department of Transportation (VDOT) planned to add two lanes to the existing Route 671 and prepared an *Environmental Site Assessment Plan*, dated August 2002, to assess the right-of-way (ROW) along the Facility boundary for any soil and groundwater contamination. Hercules agreed to characterize the soil and groundwater, while VDOT would perform the necessary excavation, transportation and soil disposal. In November 2003, EPA approved the *Route 671 Widening Interim Measures Workplan*, which had been submitted to EPA by Hercules in July 2003. Seven soil and two GW samples were collected and analyzed. Hercules reported the results to EPA in a *Summary Letter Report* dated May 5, 2004. The results showed that Facility-related soil and GW did not exceed EPA RSLs within the proposed cut limits of the ROW, confirming that contamination had not moved north beyond Rte. 671. EPA approved the *Summary Letter Report* on October 5, 2004.

3.4 Summary of Interim or Remedial Activities

Prior to entering into the FLA, Hercules completed the following remedial activities as detailed in the *Construction Completion Report, Limited Remedial Activities*, dated March 1999: (1) Heat Generation Area contaminated soil removal; (2) Vul-Cup Area brick removal and outfall upgrade; (3) Vul-Cup product recovery and GW remediation using a pump and treatment system beginning in 1991; (4) West Area Wastewater Treatment Plant remediation; and (5) East Area waste removal and operation and maintenance activities at the former East Area Landfill. Also, under VDEQ oversight, the Vul-Cup Thermal Oxidizer was closed and Hercules received a Clean Closure letter under RCRA from VDEQ in September 2002. These interim measures are detailed below.

East Area Waste Removal and Improvements: In November 1999, the Facility completed remediation activities in the East Area. The objective of the activities were to remove the wastes from three Waste Pits (SWMUs 27, 28, 29) then fill, grade and seed the excavations and perform maintenance on the nearby permitted closed sanitary landfill (SWMU 45). The Waste Pits contained fatty acid chloride

wastes from the Aquapel Process neutralization basins. One of the Waste Pits was also used for drum and drum waste disposal. The three Waste Pits were approximately 5 feet deep, underlain by a natural clay layer with a soil covering on top. Approximately 2,500 tons of non-hazardous waste was excavated from the three Waste Pits and shipped off-site to a permitted Waste Management Facility in Waverly, VA. Prior to excavation, the waste was characterized and 1,2-dichloropropane (PDC) was the only site related contaminant exceeding EPA's 1998 industrial RBC. Consequently, the goal was to remove the source of PDC loading to GW in the East Area, which was conducted. In addition to waste removal, the Facility found and removed 441 scrap drum carcasses, and over 89 drums with Aquapel waste and 80 drums with liquids. The Aquapel waste drums contained the same non-hazardous waste found in the Waste Pits, and the drums with unknown liquids were tested and blended where possible. The Facility shipped 80 liquid containing drums off-site, with 53 of the 80 drums sent to an incinerator in Illinois (ONYX) and 27 drums to an ONYX Facility in Ohio where the liquids were disposed of by fuel blending. After completing the waste and drum removals, clean tested borrow soil was trucked in and mixed with uncontaminated site soil and placed in the empty Waste Pits. The soil was graded, hydro-seeded and mulched. Clean borrow soil from off-site was used to build up the soil cap on the former landfill (SWMU-45), which was graded, compacted, hydro-seeded and mulched to create desirable runoff characteristics. The waste and drum removal was completed in November 1999. The Facility submitted the *Report on East Area Improvements* in February 2006. EPA approved the *Report on East Area Improvements* in October 2006.

West Area Interim Measures: In 2010, Hercules conducted source removals in the West Area. The West Area contained: waste sludge material in the wastewater holding Lagoon (SWMU 14); three Waste Pits (SWMUs 20, 21, 22); and Landfill Areas-3 and -4, all unlined. The West Area Waste Pits, Landfill Areas and Lagoon were investigated and characterization of the waste was included in the 2002 *RAA* Report. The waste was typically sludges of varying consistencies from former waste and wastewater treatment activities managed in the West Area. The Facility disposed of waste in the West and East Areas, prior to regulations requiring restrictions and permits. The West Area was and remains without public sewers. Before the wastewater treatment system was modernized, wastewater (WW) generated from the Tall Oil unit went through an oil/water separator, a neutralization tank, an equalization tank and then to the West Area equalization basin (SWMU-14 Lagoon). Hercules used an activated sludge treatment process and land applied the waste activated sludge on the West Area Sprayfield (SWMU-23 in the West Area) under a Virginia Pollutant Discharge Elimination System (VPDES) permit. Years earlier in 2003, use of the West Area Lagoon and Sprayfield was discontinued after the Facility upgraded its WW treatment system. The Lagoon contained an estimated 8,383 tons of sludge and 1.5 million gallons of water. The unlined Waste Pits and Landfill Areas 3 and 4 contained mostly semi-solid wastes/sludges. The Lagoon and Waste Pit and Landfill Areas 3 and 4 waste test results showed that the waste was non-hazardous.

The objective of the West Area Interim Measures was to remove the source material (wastes) and eliminate contaminant loading in West Area GW. The Facility dewatered the Lagoon and mixed a

sludge stablizer (Calciment®, a fly-ash based product) into the Lagoon sludge. The stabilized sludge was excavated and trucked off-site to a permitted landfill. Wastes from the Waste Pits did not need stabilization for removal and were removed directly along with contaminated non-hazardous soil from Landfill Area-4. A total of 16,808 tons of material was removed and disposed off-site. Lagoon water was treated on-site and discharged under VPDES permit to the Nottoway River. The West Area Sprayfield (SWMU-23) and a solid waste Landfill (SWMU-44) did not require remediation. Confirmation samples showed that remaining soil in the Lagoon was acceptable. The excavations were filled with clean fill and the West Area was regraded and seeded. On February 2011, the Facility submitted to EPA the *West Area Interim Measures Implementation Report*, dated January 2011, which was subsequently approved by EPA in March 2013.

Vul-Cup Groundwater Investigations and GW Remediation System: In June 1988, Facility personnel discovered a release to a storm drainage ditch in the Vul-Cup Process Area. An analysis of water from the drainage ditch determined the release was heptane and Fuel Oil #6. The Facility discovered that a 10,000 gallon aboveground storage tank (AST) containing Fuel Oil #6 had been overfilled, with an unknown quantity released. The heptane was attributed to leaking floor drains beneath the Process plant. In July 1988, the Facility closed the floor drains by filling them with concrete. In 1992, Hercules installed a recovery system to collect free product in GW and in 1993, added a GW pump and treatment system (PTS) with an air stripper. The majority of free product was removed in 1992. In November and December 1993, total petroleum hydrocarbons (TPH) increased in GW and were found seeping into a stormwater outfall ditch (Outfall 005) that discharges to a stream adjacent to Vul-Cup named Wills Gut. The Facility placed booms in the ditch and in Wills Gut Stream to capture the chemicals. Virginia approved the Facility Corrective Action Plan (CAP) for the GW treatment system, but a system evaluation in February 1995 showed that while heptane free product had been recovered, the levels of Vul-Cup and TPH constituents in GW persisted.

In August 1995, the Facility completed a *Biosparging Feasibility Study* which recommended that a biosparging system (BSS) replace the existing PTS. The CAP was modified and the BSS was constructed and began operation in 1996. The BSS consists of air injection wells installed into the water table whereby air is forced into the GW to increase oxygen levels. The oxygen and naturally occurring ammonia nitrogen promotes growth of bacteria which then metabolize the contaminants, reducing them to non-toxic compounds. In 1999, oversight of the Vul-Cup GW treatment was transferred from VDEQ to EPA as part of Corrective Action activities at the Facility. The BSS had been upgraded over the years by adding more injection points, a more powerful and reliable blower and in March 2014, a dedicated air compressor. The BSS operates 24 hours per day.

3.5 Human Health Risk Assessment (HHRA)

A HHRA was included in the *RAA* Report to assess potential future resident exposure to soil in the Main Plant Area. Exposure routes included dermal, ingestion and inhalation risk to children and

adults. Adult exposure for carcinogenic and non-carcinogenic health effects, known as the hazard quotient (HQ), fell within EPA's acceptable risk ranges (10^{-4} to 10^{-6} and HQ<1). For children, the cancer risk fell within EPA's acceptable risk, but with the HQ of 1.18, just exceeding the HQ limit of 1.

The likely future use of the Facility is industrial. The exposure to contaminated soil for adults and children in a residential setting is a theoretical scenario, assuming lifetime exposures. There is potential risk of exposure for utility/construction workers because of subsurface earth moving activities, however employees of the Facility are unlikely to encounter contaminated soil because the soil is covered with asphalt or grass. Surface and subsurface soil samples collected at the Facility very seldom exceeded an industrial RBC. These few exceedances were in areas where contaminated soils were removed. Because the West Area is within the 100 year floodplain of the Nottoway River, the Facility is not planning on developing this Area. There is little risk to potential or actual receptors.

The remaining risk is from consumption of contaminated groundwater by employees. As shown throughout the investigations, Site related GW constituents are vertically confined to the shallow water table aquifer at depths of less than 20 feet bgs. The shallow water table aquifer is not used for water supplies at the Facility or the off-Site neighborhood. The GW water well used to supply water to the Facility draws water from 334 feet bgs, below several confining units. There is little risk to potential or actual receptors.

3.6 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 both of these indicators for the total Facility in September 2004 and March 2011, respectively. The environmental indicator forms are linked to EPA's Fact Sheet for this Facility (see Section 1, above, for the web address).

Section 4: Corrective Measures Study

Hercules submitted a *Draft Corrective Measures Study* (*CMS*) to EPA dated July 2015, which evaluated Corrective Measure alternatives for GW and presented recommendations for the Main Plant Area, Heat Generation, Vul-Cup, and West and East Areas. After considering and evaluating several GW treatment technologies using EPA's threshold and balancing criteria, the following remedy for GW was proposed:

(1) Biosparging in the Vul-Cup area of the Main Plant, with long term monitoring (LTM); and

(2) Monitored natural attenuation (MNA) of Facility related GW constituents in the Main Plant Area, East and West Areas.

EPA approved the *CMS* with some comments and the Facility addressed these comments in a *CMS Addendum* submitted in August 2016. The *CMS Addendum* evaluated the potential for volatile vapor from contaminated GW to enter current and future structures. The Facility entered current GW data into EPA's vapor intrusion screening level (VISL) calculator for commercial settings. The VISL indicated a potential for vapor intrusion (VI) in two existing on-site buildings intended for human occupation. EPA approved the *CMS Addendum* in August 2016 and indoor air is listed under the Corrective Action Objectives, below.

Section 5: Corrective Action Objectives (CAOs)

EPA's Corrective Action Objectives (CAOs) for the environmental media at the following:

1. Soil

EPA has determined that the EPA RSLs for Industrial Soils for direct contact with soils are protective of human health and the environment at this Facility provided that the Facility is not used for residential purposes. Therefore, EPA's Corrective Action Objective (CAO) for the Facility Soils is to attain (RSLs) for Industrial Soils and control exposure to the hazardous constituents remaining in soils by requiring the compliance with and maintenance of land use restrictions.

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 the National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs) promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act and codified at 40 CFR Part 141). Therefore, EPA's CAO for Facility GW is to attain MCLs.

3. Vapor Intrusion

The CAO for potential vapor intrusion for occupied buildings is to control human exposure and attain EPA's acceptable cancer risk range of 10^{-4} to 10^{-6} and the non-cancer risk (hazard quotient) of 1 or less.

Section 6: EPA's Proposed Remedy

EPA's proposed remedy for the Facility is a combination of Engineering Controls (ECs) and Institutional Controls (ICs). ECs include a variety of physical devices, barriers, and management practices that contain, reduce the source of, or prevent exposure to contamination. ICs are non-engineered instruments, such as administrative and legal controls, that minimize the potential for human exposure to contamination and/or protect the integrity of the decision by limiting land or resource use. Under this proposed remedy, some contaminants remain in the soil and groundwater at the Facility above levels appropriate for residential uses. Therefore, EPA's proposed remedy requires the compliance with and maintenance of land and groundwater use restrictions which will be implemented though ICs. ICs may be established through an enforceable mechanism such as an order, permit, or an environmental covenant pursuant to the Virginia Uniform Environmental Covenants Act, Title 10.1, Chapter 12.2, Sections 10.1- 1238-10.1-1250 of the Code of Virginia (Environmental Covenant). If the enforceable mechanism selected were to be an environmental covenant, it would be recorded with the Facility's property records.

EPA's proposed remedy for the Facility consists of the following components:

1. Soil:

Based on the results of the HHRA and the implementation of the East and West Area Interim Measures, there are currently no unacceptable risk to human health and the environment via soil for the present and reasonable anticipated industrial use of the Facility property. Because contaminants will remain in the Facility soils above levels appropriate for residential uses, the proposed remedy for soils is implementation and maintenance of a land use restriction that prohibit using the Facility property for residential purposes unless it is demonstrated to EPA, that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy, and EPA provides prior written approval for such use.

2. Groundwater

EPA's proposed GW remedy for the Facility consists of: (a) active GW treatment in the Vul-Cup Area using bio-sparge technology until MCLs are achieved; (b) natural attenuation with continued monitoring until MCLs are achieved in other areas of the Facility and (c) groundwater use restrictions to prevent exposure to contaminants while contaminant levels remain above MCLs. Monitoring will be performed in conformance with an EPA-approved GW monitoring plan.

3. Vapor Intrusion

EPA's proposed remedy for vapor intrusion is the installation and maintenance of a vapor control

system, the design of which shall be submitted to EPA for review and approval, in the two existing on-site buildings referred to in Section 4 above. In addition, a vapor intrusion control system shall be installed in any new structures constructed above the contaminated GW plume or within 100 feet of the perimeter of the contaminated GW plume, unless is demonstrated to EPA that vapor intrusion does not pose unacceptable risk to human health and EPA provides written approval that no vapor control system is needed.

4. Institutional Controls

The ICs shall include the following land and groundwater use restrictions:

a. The Facility property shall not be used for any purposes other than industrial unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment and EPA provides prior written approval for such use;

b. Shallow groundwater at the Facility shall not be used for any purpose other than operation, maintenance, and monitoring activities required by EPA, unless it is demonstrated to EPA, that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy, and EPA provides prior written approval for such use;

c. No new wells will be installed on Facility property unless it is demonstrated to EPA that such wells are necessary to implement the selected remedy and EPA provides prior written approval to install such wells;

d. Compliance with the EPA approved groundwater monitoring plan;

e. Compliance with the EPA approved Vul-Cup Operating & Maintenance Plan; and

f. Compliance with the EPA approved Vapor Control system Operating & Maintenance Plan.

5. Outfalls and Stream:

Because outfall sediment, soil and surface water, including the Will's Gut stream, does not present unacceptable risk to human health or ecological receptors, EPA is proposing a remedy of Corrective Action Complete without Controls for the outfalls and the Will's Gut stream.

6. Other Requirements

In addition, the Facility shall provide EPA with a coordinate survey of Facility boundaries. Mapping the extent of the land and groundwater use restrictions will allow for presentation in a publically accessible mapping utility such as Google Earth or Google Maps.

EPA, VDEQ and/or their authorized agents and representatives, shall have access to the Facility property to inspect and evaluate the continued effectiveness of the final remedy and if necessary, to conduct additional remediation to ensure the protection of the public health and safety and the environment upon the final remedy selection in the Final Decision and Response to Comments (FDRTC).

Section 7: Evaluation of EPA's Proposed Remedy

This section describes the criteria EPA used to evaluate the proposed remedy consistent with EPA guidance. The evaluation is in two phases. For the first phase, EPA evaluates the proposed remedy using three 'threshold' decision criteria as general goals. In the second phase, for remedies that meet the threshold criteria, EPA then evaluates the remaining proposed remedies using seven balancing criteria (see Table 2 below).

Table 2	
Threshold Criteria	Evaluation
1) Protect human health and the environment	The primary risks posed to human health and the environment by exposure to Facility contaminants are related to potential: (1) ingestion of contaminated GW; and (2) inhalation of volatile vapors in indoor air from contaminated GW beneath structures. The proposed remedy consists of (1) achieving MCLs by active treatment and MNA; (2) restricting Facility property to non-residential use; (2) providing vapor control systems in any new structures constructed over or near GW plumes with volatile contaminants; as necessary and (3) restricting use of the shallow GW aquifer for potable use until GW clean-up goals are attained.
2) Achieve media cleanup objectives	Soil investigations showed that Facility related contaminants were not found at levels exceeding industrial RSLs and future land use is expected to remain industrial. GW contaminants were found in the shallow water table aquifer, vertically confined to that layer. Generally, GW contaminant levels have declined in most instances, with plumes delineated and stable. Contaminant declines in GW can be attributed to removals of sludge/waste from Waste Pits and the West Area Lagoon, thereby removing contaminant loading to GW, and to natural attenuation of GW contaminants from biochemical break down, dilution, and dispersion. The proposed GW remedy includes active GW treatment in the Vul-Cup Area and monitoring attenuation of GW constituents in other Facility areas, and is expected to achieve media clean-up objectives in 10 to 20 years.

	The potential for the occurrence of vapor intrusion will also diminish as volatile GW levels diminish.
3) Remediating the Source of Releases	In all proposed remedies, EPA seeks to eliminate or reduce further releases of any remaining hazardous wastes and hazardous constituents from the Facility posing an unacceptable risk to human health and the environment. The Facility removed contaminated soil from the Heat Generation Area, and waste stored in the Waste Pits in the East and West Areas, and sludge stored in the West Area Lagoon. The removal of these sources removed contaminant loading to GW and eliminated exposure risks to workers and trespassers.
Balancing Criteria	Evaluation
4) Long-term effectiveness	EPA's proposed remedy will maintain protection of human health and the environment over time by reducing Site-related GW contaminants through active treatment (Vul-Cup), attenuation and by controlling exposure to any hazardous constituents that may remain in the groundwater. EPA's proposed remedy requires active treatment and MNA and the compliance with and maintenance of a groundwater use restriction for the shallow water table aquifer.
5) Reduction of toxicity, mobility, or volume of the Hazardous Constituents	The removal of wastes stored in the Waste Pits in the East and West Areas and sludge removed from the Lagoon in the West Area reduced the volume of non-hazardous contaminants and source of GW contaminant loading. Active GW treatment in the Vul-Cup area continues to reduce volume and mobility of GW contaminants in the Main Plant Area.
6) Short-term effectiveness	Waste removal from the East and West Areas has been completed, therefore, short term human exposure to waste has been eliminated.
7) Implementability	Most of the elements in the proposed remedy are already being implemented. EPA proposes to implement GW and land use restrictions through an order, permit or an environmental covenant.
8) Cost	EPA's proposed remedy is estimated to cost the Facility approximately $60,000 per year for 18 years.
9) Community Acceptance	EPA will evaluate community acceptance of the proposed remedy by reviewing any comments submitted to EPA during the public comment period, which may include a public meeting, if requested. Responses to comments and any subsequent modifications to the proposed remedy will be written and included in the Final Decision and Response to Comments.
10) District/Agency Acceptance	VDEQ reviewed this SB and concurred with the proposed remedy.

Section 8: Financial Assurance

EPA has evaluated whether financial assurance for corrective action is necessary to implement EPA's proposed remedy at the Facility. The estimated costs for the proposed implementation of institutional controls and the GW monitoring is estimated to be $60,000 per year for a duration of 10 to 20 years. This cost estimate is below EPA's financial assurance threshold, therefore, financial assurance is not required.

Section 9: Public Participation

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

A public meeting will be held upon request. Requests for a public meeting should be made to Barbara Smith at the address listed below. A meeting will not be scheduled unless one is requested.

The Administrative Record contains all the information considered by EPA for the proposed remedy at this Facility. The Administrative Record is available at the following location:

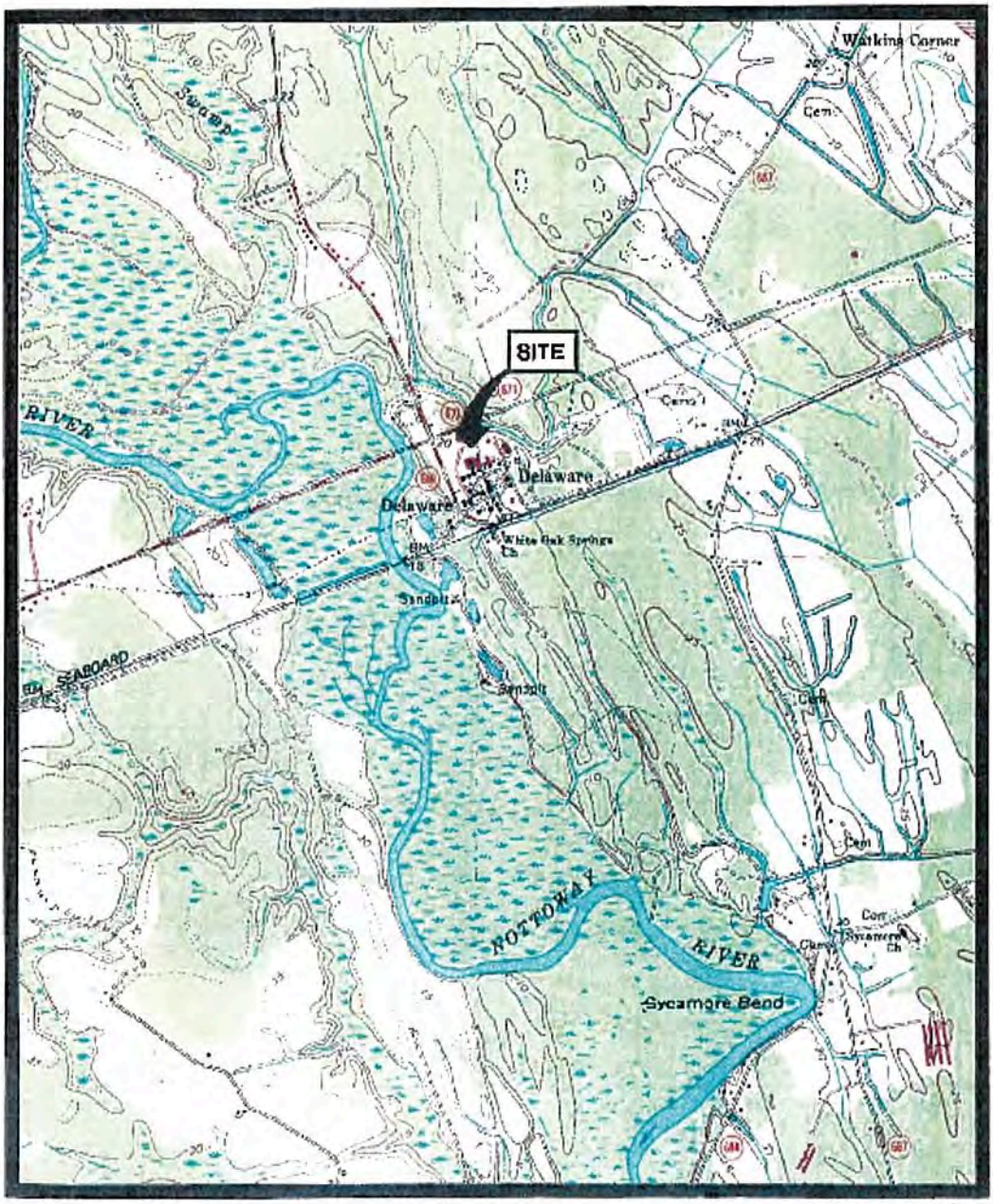
U.S. EPA Region III
1650 Arch Street (3LC20)
Philadelphia, PA 19103

Contact: Barbara Smith
Phone: (215) 814-5786
Fax: (215) 814-3113
Email: Smith.Barbara@epa.gov

Section 10: Signature

Date: 9.22.16

John A. Armstead, Director
Land and Chemicals Division
US EPA, Region III



Prepared by:

MARSHALL MILLER & ASSOCIATES

4001A0 07/19/02

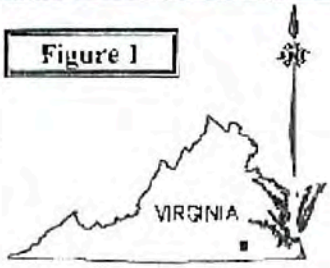
ROUTE 671 – HERCULES SAMPLING
SOUTHAMPTON COUNTY, VIRGINIA

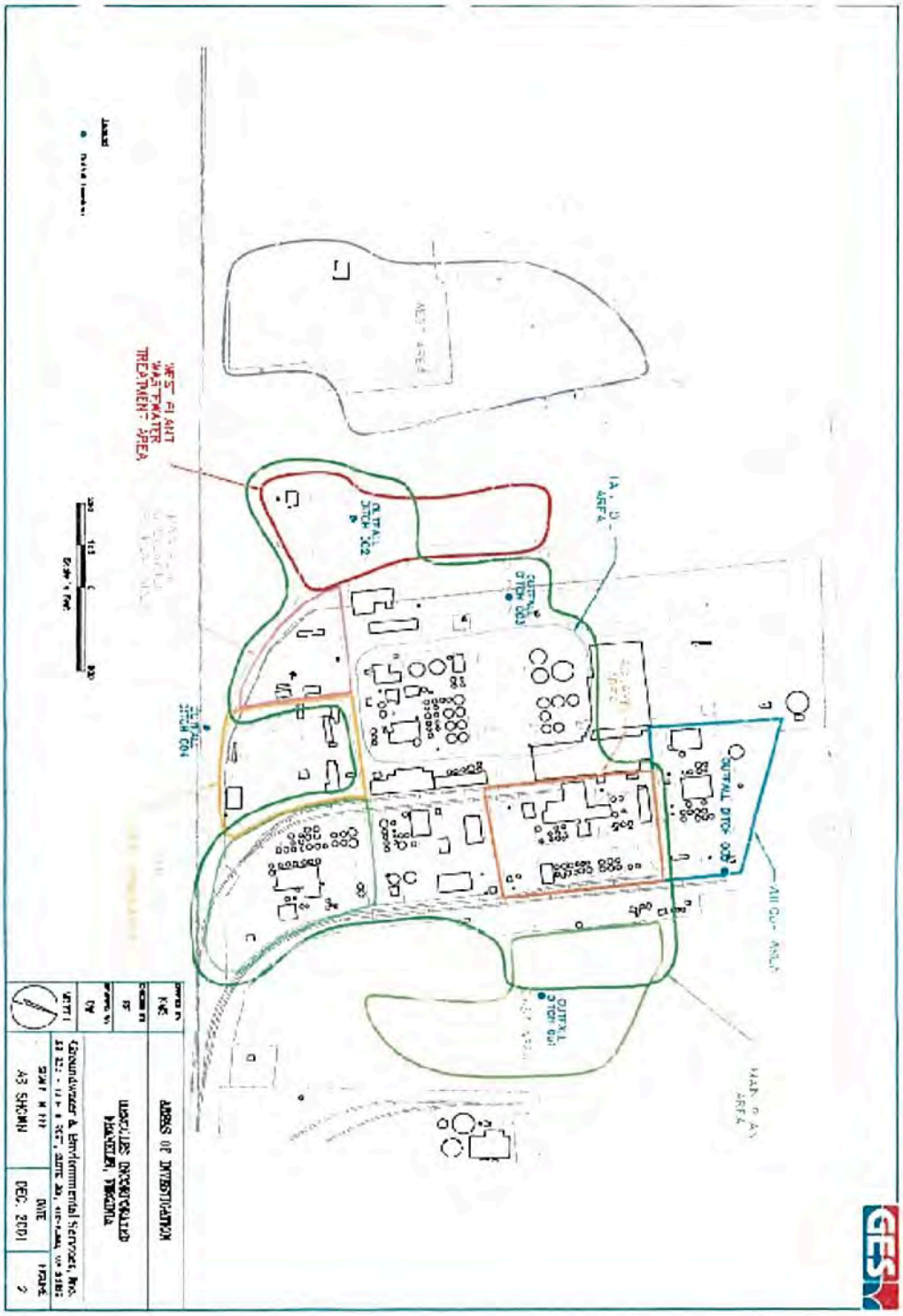
2,000' 0 2,000'

SCALE 1:24,000

VICINITY MAP

Figure 1




AREAS OF INVESTIGATION
HERCULES INCORPORATED
KENVIL, VIRGINIA
DATE
DEC. 2001
AS SHOWN
2

Attachment A

Mann-Kendall Analysis Results Summary
Historical Groundwater Data
Hercules Incorporated
Franklin, VA

Analyte	VOCs			SVOCs				TPH-DRO	Metals			
Well ID	Benzene	1,2 Dichloropropane (PDC)	Isopropylbenzene (Cumene)	Biphenyl	Diphenyl Ether	m&p cresol	Tert-Butyl alcohol (TBA)	TPH-DRO	Arsenic	Iron	Manganese	Vanadium
West Area												
WA-1	Stable	--	--	--	--	ND	Stable	--	ND	--	No Trend	--
WA-2	--	--	--	--	--	--	Stable	--	--	**Increasing**	**Increasing**	--
WA-3	--	--	--	--	--	--	**Decreasing**	--	--	Decreasing	Decreasing	--
BOW-4	--	--	--	--	--	--	Stable	--	--	--	--	--
GWMW-1	--	--	--	--	--	--	No Trend	--	--	--	--	--
GWMW-3	--	--	--	--	--	--	--	--	--	**Increasing**	No Trend	--
GWMW-4	--	--	--	--	--	--	--	--	--	No Trend	No Trend	--
LAG-1R*	--	--	--	--	--	--	--	--	--	--	--	--
LAG-2R*	--	--	--	--	--	--	--	--	--	--	--	--
MW-1	--	--	--	--	--	--	--	--	--	**Increasing**	No Trend	--
MW-3	--	--	--	--	--	--	--	--	--	Stable	Stable	--
Main Plant (Aquapel Process Area)												
AMW-10	--	--	--	No Trend	--	--	--	--	--	Stable	--	--
AMW-13R*	--	--	--	--	--	--	--	--	--	--	--	--
Main Plant (Pamolyn Process Area)												
PG2P2	--	--	--	--	--	--	--	--	--	--	--	--
FR-MW-F8	--	--	--	Decreasing	--	--	--	--	--	--	--	--
Main Plant (Tall Oil Storage and Process Area)												
FR-MW-F3	--	ND	--	--	--	--	--	--	--	--	--	--
Main Plant (Wastewater Treatment Plant)												
10P7	No Trend	--	--	--	--	--	--	--	--	--	No Trend	--
Main Plant (West Assembly Area)												
WA1P1	--	--	--	--	--	--	--	--	--	--	--	**Increasing**
Heat Generation Area												
PG1P3	**Increasing**	--	--	ND	**Increasing**	--	Stable	--	--	--	No Trend	--
PG1P4	--	Stable	--	Decreasing	Decreasing	--	--	--	--	Decreasing	--	--
PG1P6	--	--	--	Decreasing	Decreasing	--	--	--	--	--	--	--

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Franklin, VA

Analyte	VOCs			SVOCs				TPH-DRO	Metals			
Well ID	Benzene	1,2 Dichloropropane (PDC)	Isopropylbenzene (Cumene)	Biphenyl	Diphenyl Ether	m&p cresol	Tert-Butyl alcohol (TBA)	TPH-DRO	Arsenic	Iron	Manganese	Vanadium
Vulcup Area												
V1	ND	ND	--	--	--	--	Decreasing	No Trend	--	--	--	--
V2	Decreasing	ND	Decreasing	--	--	--	Stable	Decreasing	--	--	--	--
V3	ND	--	NA	--	--	--	No Trend	Stable	--	NA	--	--
V4	--	ND	NA	--	--	--	Stable	Decreasing	--	NA	--	--
V5	--	--	Stable	--	--	--	No Trend	Decreasing	--	--	--	--
V6	--	ND	Stable	--	--	--	Stable	No Trend	--	--	--	--
V7	--	--	NA	--	--	--	NA	No Trend	--	--	--	--
V8	--	--	NA	--	--	--	No Trend	No Trend	--	--	--	--
V9	--	ND	NA	--	--	--	Stable	Stable	--	NA	--	--
V10	Decreasing	ND	Decreasing	--	--	--	Stable	No Trend	--	--	--	--
2P1	--	ND	--	--	--	--	Decreasing	Decreasing	--	--	--	--
VC3P1	Stable	--	Stable	--	--	--	Stable	Stable	--	--	--	--
VC3P1R	--	--	--	--	--	--	Stable	Stable	--	--	--	--
VC3P2	--	--	--	--	--	--	No Trend	Decreasing	--	--	--	--
VC3P3	--	--	--	--	--	--	Stable	Stable	--	--	--	--
VC3P3 (VS-1)	--	--	--	--	--	--	Stable	No Trend	--	--	--	--
VC3P4	--	ND	Decreasing	--	--	--	No Trend	Stable	--	--	--	--
VMW-1	--	--	NA	--	--	--	Stable	Stable	--	--	--	--
VMW-2	ND	ND	NA	--	--	--	Stable	Decreasing	--	NA	--	--
VMW-3	--	--	--	--	--	--	Stable	Decreasing	--	--	--	--
VMW-4	--	ND	--	--	--	--	Stable	Stable	--	--	--	--
VMW-5	--	ND	No Trend	--	--	--	NA	Stable	--	--	--	--
VMW-7	--	ND	--	--	--	--	No Trend	No Trend	--	NA	--	--
VMW-8	--	--	Stable	--	--	--	Stable	No Trend	--	NA	--	--
VMW-9	--	--	Stable	--	--	--	Stable	No Trend	--	NA	--	--
BGMW-5	ND	ND	--	--	--	--	--	NA	--	--	--	--

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Mann-Kendall Analysis Results Summary
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Hercules Incorporated
Franklin, VA

Analyte	VOCs			SVOCs				TPH-DRO	Metals			
Well ID	Benzene	1,2 Dichloropropane (PDC)	Isopropylbenzene (Cumene)	Biphenyl	Diphenyl Ether	m&p cresol	Tert-Butyl alcohol (TBA)	TPH-DRO	Arsenic	Iron	Manganese	Vanadium
East Area (Aquapel Waste Pits)												
28P2	Increasing	--	--	--	--	--	Stable	--	--	--	--	--
29P3R	--	No Trend	Stable	--	--	--	Stable	--	--	Stable	Decreasing	--
29P4R	--	Decreasing	--	--	--	--	Stable	--	--	--	--	--
East Area (Waste Lagoons)												
30P1	--	--	--	--	--	--	--	--	Stable	Decreasing	--	--
30P2	--	--	--	--	--	--	No Trend	--	--	Decreasing	--	--
30P3	--	--	--	--	--	--	--	--	--	Stable	--	--
East Area (Sanitary Landfill)												
45P1R	--	Increasing	--	--	--	--	Decreasing	--	--	No Trend	No Trend	--
45P3R	--	--	--	--	--	--	No Trend	--	--	No Trend	--	--
45P5R	--	--	--	--	--	--	--	--	--	--	Increasing	--

Notes:

(*) Indicates replacement wells installed in 2013; only one (1) data set available

(--) Indicates that for the given well, that analyte has not been detected at levels exceeding the MCL or non-adjusted Tapwater RSL for at least four consecutive sampling events

NA = Mann-Kendall analysis not conducted due to insufficient data set, with fewer than four data points

ND = Mann-Kendall analysis not conducted due to data set including >20% non-detects

Attachment B

Administrative Record Index

1991, August; *RCRA Facility Assessment (RFA)*, EPA.

1995, February; *Site Characterization Report* [Vul-Cup Area], Weston.

1995, August; *Bio-Sparging Feasibility Report* [Vul-Cup], Weston.

1998, January; *Release Assessment Workplan*, ERM.

1998, July; *Results of Vul-Cup Process Area Bio-Sparging System Evaluation*, ERM.

1998, November; *Amended Corrective Action Plan for Vul-Cup Process Area*, ERM.

1999, March; *Release Assessment Report*, ERM.

1999, June; *East Area Improvements Construction Workplan*, ERM.

1999, September; EPA letter to Hercules – Corrective Action Facility Lead invitation.

1999, October; Hercules acceptance letter to EPA – Hercules Facility Lead.

2000, February; *Release Assessment Addendum Work Plan*, ERM.

2001, July; *John Zink Thermal Oxidizer Closure Report*, GES.

2002, January; *Release Assessment Addendum*, GES.

2002, September; VDEQ letter to Hercules - JZ Thermal Oxidizer Clean Closure Letter.

2003, March; *Quality Assurance Project Plan (QAPP)*, GES.

2003, May; EPA approval letter to Hercules – *QAPP*.

2003, July; *Groundwater Sampling and Analysis Plan (GWSAP)*, GES.

2003, July; *Residential Well Sampling Workplan*, GES.

2003, July; *Route 671 Widening Interim Measures Workplan*, GES.

2003, August; EPA approval letter to Hercules - *Residential Well Sampling Workplan.*

2004, January; EPA approval letter to Hercules – *GWSAP.*

2004, May; *Route 671 Widening Interim Measures Summary Letter Report*, GES.

2004, May; *Residential Well Sampling Summary Letter Report*, GES.

2004, September; *Human Health Environmental Indicator Determination*, GES. EPA approval September 2004.

2004, October; EPA approval letter to Hercules - *Route 671 Widening* and *Residential Well Sampling Summary Letter Reports.*

2004, December; *Outfall Sampling and Analysis Plan*, GES.

2006, February; *East Area Improvement Report*, GES.

2006, June; *Outfall Sampling and Investigation Report*, GES.

2006, October; EPA approval letter to Hercules - *East Area Improvement Report.*

2007, March; *Vul-Cup Site Investigation Report*. GES.

2007, June; EPA approval letter to Hercules - *East Area Improvement Report.*

2008, March; *Vul-Cup Process Area Source Investigation Workplan*, GES.

2008, April; EPA approval letter to Hercules - *Vul-Cup Process Area Source Investigation Workplan.*

2008, April; *West Area Remedial Alternatives Evaluation Report*, GES.

2008, June; EPA approval letter to Hercules - *West Area Remedial Alternatives Evaluation Report.*

2009, February; [*West Area*] *Interim Measures Implementation (IMI) Workplan*, GES.

2009, April; EPA approval letter to Hercules – *IMI Workplan.*

2009, July; *Vul-Cup Area Source Investigation Report.* GES.

2010, March; *Workplan for Additional West Area Characterization and Revision 1*, GES.

2010, March; EPA approval letter to Hercules - *Workplan for Additional West Area Characterization, Revision 1.*

2010, April; EPA approval of *Vul-Cup Area Source Investigation Report.*

2010, October; *Administrative Order on Consent under RCRA Section 3013*, Hercules respondent.

2010, October; *Description of Current of Current Conditions*, GES.

2011, January; *Well Sample Analytical Results Table, Vision Church International,* GES.

2011, January; EPA letter to Vision Church International–Water Sampling Results from 2003 and 2007.

2011, February; EPA approval letter to Hercules – *West Area Interim Measures Implementation Report.*

2011, March; *Vul-Cup Remediation System Evaluation & Optimization Report*, GES.

2011, July; *RFI Workplan for West Assembly Area, Heat Generation Area, and Discharge Conduit*, GES.

2012, March; *Vul-Cup Bio-Sparge Remediation System Operation, Maintenance & Monitoring Plan*, GES.

2012, April; *Vul-Cup Construction Completion*, GES.

2012, September; *Draft RFI Summary Report*, GES.

2012, October; EPA approval letter to Hercules - *Vul-Cup Area Source Investigation Report* and *Vul-Cup Remediation System Evaluation & Optimization Report* and *Vul-Cup Construction Completion.*

2012, November; EPA letter to Hercules – Comments on *Draft RFI Summary Report.*

2013, January; GES letter to EPA – Response to EPA Comments on *Draft RFI Summary Report.*

2013, April; *Final RFI Summary Report*, GES.

2013, June; EPA approval letter to Hercules - *Final RFI Summary Report*.

2014, December; *Vul-Cup Bio-Sparge Remediation System Operation, Maintenance & Monitoring Plan Update*, GES.

2015, July; *Draft Corrective Measures Study Report*, GES.

2015, November; EPA comment/conditional approval of *Draft Corrective Measures Study Report*.

2000 – 2009 – Facility Lead Annual Reports from Hercules to EPA.

2004 – 2016 – Groundwater Monitoring Reports from Hercules to EPA.

2016, August – Corrective Measures Study Report, Addendum No. 01.