

**DESCRIPTION OF CURRENT CONDITIONS
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
BLACKSBURG, VIRGINIA
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ADMINISTRATIVE ORDER ON CONSENT
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EXECUTIVE SUMMARY

Virginia Polytechnic Institute and State University (Virginia Tech) entered into an Administrative Order on Consent (Consent Order; Docket Number RCRA-03-2010-0396CA; Consent Order) with the United States Environmental Protection Agency, Region III (EPA) agreeing to the terms of the Consent Order including applicable modifications and revisions approved by both parties. The Consent Order was executed by EPA on September 29, 2010. This Description of Current Conditions was prepared by Virginia Tech with assistance from Draper Aden Associates, in accordance with the requirements of Section VI.B.1 of the Consent Order (Submission of Current Conditions Report).

This Current Conditions Report was prepared in general accordance with Task I - Description of Current Conditions in the RCRA Facility Investigation Scope of Work (generic EPA document) adjusted in scope and magnitude to reflect Virginia Tech's understanding of the EPA Project Coordinator's expectations for this Report, addresses the considerations in the Corrective Action Status Table for the facility updated by EPA on September 27, 2010, and is consistent with discussions between EPA and Virginia Tech (September 2010 – present).

The purpose of this report is to provide background and current environmental information pertinent to the facility, using data and information gathered during previous and/or ongoing environmental evaluations, investigations, interim measures and corrective action activities, and other relevant activities. The report identifies the nature and extents of impacts, if any, at the solid waste management units (SWMUs) and areas of concern (AOCs) identified at the facility. The report further presents environmental indicator assessments (accounting for the SWMUs and AOCs identified in this report) that include an evaluation of potential human exposures to impacted media at the facility, if any identified, as well as an assessment of migration control of known impacted groundwater from the facility.

Virginia Tech is not aware of any data gaps that would be required to be addressed under a future RCRA Facility Investigation (RFI). However some old historical documentation may not be available; in such cases Virginia Tech has addressed these documentation gaps through alternative documentation and/or alternative evidence. Where known impacts exist they are being addressed under Virginia Department of Environmental Quality (VDEQ) programs. Such impacts are being mitigated, remediated, monitored and/or controlled within the property boundaries. There are no known imminent threats or unacceptable risks to human health or the environment that Virginia Tech is aware of. Therefore, no interim measures are required or are being considered at this time.

Many of the SWMUs and AOCs identified on EPA's corrective action status table have been closed. Some SWMUs/AOCs were the result of accidents or mechanical failures and have been corrected and remediated to the satisfaction of VDEQ. Some SWMUs/AOCs are still open and are being managed under the direction of VDEQ. With the exception of those sites currently being managed under direction of VDEQ, Virginia Tech concludes that the remainder of the sites require no further action.

1.0 INTRODUCTION

1.1 PURPOSE

Virginia Polytechnic Institute and State University entered into an Administrative Order on Consent (Consent Order; Docket Number RCRA-03-2010-0396CA; Consent Order) with the United States Environmental Protection Agency, Region III agreeing to the terms of the Consent Order including applicable modifications and revisions approved by both parties. The Consent Order was executed by EPA on September 29, 2010. This Description of Current Conditions (Current Conditions Report, CCR) was prepared by Virginia Tech with assistance from Draper Aden Associates, in accordance with the requirements of Section VI.B.1 (Submission of Current Conditions Report). In accordance with the referenced section of the Consent Order, Virginia Tech is required to submit the Current Conditions Report within ninety (90) days of the effective date of the Consent Order. Accordingly, this Current Conditions Report is being submitted under the terms of this Consent Order.

The purpose of this report is to provide background and current environmental information pertinent to the facility, using data and information gathered during previous and/or ongoing environmental evaluations, investigations, interim measures and corrective action activities, and other relevant activities. The report identifies the nature and extents of impacts, if any, at the solid waste management units (SWMUs) and areas of concern (AOCs) identified at the facility. The report further presents environmental indicator assessments (accounting for the SWMUs and AOCs identified in this report) that include an evaluation of potential human exposures to impacted media at the facility, if any identified, as well as an assessment of migration control of known impacted groundwater from the facility.

1.2 BACKGROUND

In the early 2000s EPA requested Virginia Tech to participate in EPA's Vision 2020 program (EPA's Facility Lead Program). Virginia Tech did not formally commit to the Facility Lead program but informally agreed to participate in the process.

Virginia Tech through representatives of Environmental, Health and Safety Services (EHSS), met with representatives of the EPA, the VDEQ, as well as representatives from Tetra Tech EC, Inc. (Tetra Tech), an environmental consulting firm hired by the EPA. Tetra Tech conducted a review of both EPA and VDEQ files for pertinent information concerning SWMUs and AOCs prior to conducting a site visit of the Virginia Tech Campus. The EPA, VDEQ and Tetra Tech visited Virginia Tech on November 8, 2006 and were given a tour of the campus by representatives of Virginia Tech's EHSS department during which all the AOCs and SWMUs were visited. Subsequent to the site visit, Tetra Tech prepared a report of their findings in a Draft RCRA Site Visit Report dated April 2007. As this report contains the bulk of the information concerning the areas of interest discussed elsewhere in this report, the Tetra Tech report must be reviewed in conjunction with this report. In addition, this report summarizes information contained in other relevant reports and documentation that have been referenced and copies of which have been included in Appendix C of this report. That additional documentation must also be reviewed in conjunction with this report.

On September 23, 2010, EPA again visited Virginia Tech and visited all of the AOCs and SWMUs identified in the Tetra Tech report. As a result of the September 23, 2010 site visit, an updated corrective action status table describing EPA's updated understanding of the status of each SWMU and AOC was prepared. This report addresses the considerations identified in the updated correction action status table.

On September 29, 2010, EPA executed the consent order to enforce Virginia Tech's participation in the corrective action process as EPA deemed the voluntary process was insufficient to meet the program goals. Virginia Tech entered into an Administrative Order on Consent with the EPA agreeing to the terms of the Consent Order including applicable modifications and revisions approved by both parties.

1.3 PROCEDURE

This Current Conditions Report was prepared in accordance with the requirements of Section VI.B.1 of the Consent Order and in general accordance with Task I - Description of Current Conditions in the RCRA Facility Investigation Scope of Work (generic EPA document) adjusted in scope and magnitude to reflect Virginia Tech's understanding of the EPA Project Coordinator's expectations for this Report. The EPA Project Coordinator Ms. Jeanna Henry and a second EPA representative Ms. Barbara Smith visited the site on September 23, 2010 and reviewed the SWMUs and AOCs that EPA had previously identified in the Virginia Tech Corrective Action Status Table. The EPA Project Coordinator updated the table on September 27, 2010 based on the site visit and follow up discussions. The Current Conditions Report generally reflects the considerations in the updated table and is consistent with discussions between EPA and Virginia Tech (September 2010 – present).

2.0 FACILITY BACKGROUND

2.1 FACILITY LOCATION

The Virginia Tech campus is located in Blacksburg, Montgomery County, Virginia, 42 miles southwest of Roanoke, Virginia. The EHSS office is located at 459 Tech Center Drive in Blacksburg. A Site Location Map based on the USGS 7.5-minute Blacksburg, Virginia Topographic Quadrangle is presented as **Figure 1**. Site Location and facility maps based on aerial photographs for Blacksburg depicting the locations of all AOCs and SWMUs addressed in this report (with the exception of AOC 8) are presented as **Figures 2, 2c and 2d**. A Facility Map depicting the locations of the AOCs and SWMUs addressed in this report with the street names identified is presented as **Figure 2a**. Land use and zoning information for adjoining properties is presented on **Figure 2e**. Additional figures depicting the locations and additional details for most of the AOCs and SWMUs are also presented in this report and referenced in the following sections.

2.2 FACILITY DESCRIPTION

The Virginia Tech campus is located in a rural residential and agricultural area. Founded in 1872 as a land-grant college named Virginia Agricultural and Mechanical College, Virginia Tech is now a comprehensive, innovative research university with more than 100 campus buildings, a 2,600-acre main campus, off-campus educational facilities in six regions, and a 1,700-acre agriculture research farm near the main campus. The total number of on- and off-campus students is 28,500.

The university offers bachelor's degree programs through its seven undergraduate academic colleges: Agriculture and Life Sciences, Architecture and Urban Studies, Engineering, Liberal Arts and Human Sciences, Natural Resources, Pamplin College of Business, and Science. On the postgraduate level, the university offers masters and doctoral degree programs through the Graduate School and a professional degree from the Virginia-Maryland Regional College of Veterinary Medicine.

Through its many research programs, the facility studies innovations in agriculture, biotechnology, information and communication technology, transportation, energy management (including leadership in fuel-cell technology and power electronics), and a wide range of other engineering, scientific, social science, and creative fields. This research led to 87 disclosures, 17 patents, and 20 licenses in calendar year 2005.

The Virginia Tech Corporate Research Center (and Virginia Tech Airport) is located on 120 acres adjacent to the main campus; the center consists of 21 buildings housing more than 130 companies with approximately 1,900 employees. The Center also includes overflow research facilities for Virginia Tech.

The Virginia Tech Airport was formerly operated by Virginia Tech; the airport is now known as the Virginia Tech Montgomery Executive Airport as is operated by an authority comprised of

Virginia Tech, the Town of Blacksburg, and Montgomery County. Virginia Tech owns the airport property and assists with management of wastes generated by the facility.

2.3 FACILITY WASTE MANAGEMENT HISTORY

2.3.1 Wastes Generated by Facility

Due to its many research facilities, laboratories, physical plant, and supporting operations, the Virginia Tech campus generates hazardous waste. General refuse (solid waste) is also generated by Virginia Tech. Hazardous waste generated by Virginia Tech in 2005 (most recent data available) included the following:

- Gases - 0.2 tons
- Soil - 11.6 tons
- Inorganic liquid - 7.7 tons
- Labpacks - 4.8 tons
- Mixed media – 0.3 tons
- Organic liquid - 35.4 tons
- Organic solid - 6.9 tons

Virginia Tech also provided the following waste codes for wastes generated:

- D001 – ignitable
- D002 – corrosive
- D003 – reactive
- D004 – arsenic
- D005 – barium
- D006 – cadmium
- D007 – chromium
- D008 – lead
- D009 – mercury
- D010 – selenium
- D011 – silver
- D016 – 2,4-D acid
- D018 – benzene
- D019 – carbon tetrachloride
- D022 – chloroform
- D026 – cresol
- D035 – methyl ethyl ketone
- F002 – spent halogenated solvents
- F003 – spent non-halogenated solvents
- F004 – spent non-halogenated solvents
- F005 – spent non-halogenated solvents
- LABP – lab packs
- U019 – benzene
- U034 – trichloro-acetaldehyde (chloral)
- U117 – 1,1'-oxybis-(I) ethane
- U122 – formaldehyde
- U220 – methyl-benzene (toluene)
- U226 - 1,1,1-trichloro-ethane (methyl chloroform)

2.3.2 Facility Waste Treatment, Storage, and Disposal Practices

General refuse (solid waste) generated by Virginia Tech is compacted in six trash compactors or placed in approximately 45 dumpsters. Solid waste is transported off-site for disposal in a permitted solid waste landfill.

Hazardous waste generated by Virginia Tech is stored in various SWMUs pending transportation off-site for treatment and disposal at permitted facilities. Section 3 of this report describes both active and inactive (closed) SWMUs and AOCs identified by Virginia Tech, EPA, and VDEQ. The list of SWMUs and AOCs is summarized in **Table 1**. Maps of the facility, SWMUs and AOCs and where applicable groundwater/surface flow information, extents of impact and monitoring networks, are presented as **Figures** in this report, further referenced in the previous and following sections of the report. Representative photographs of the SWMUs and AOCs are provided in **Appendix B**.

Virginia Tech has approximately 1,000 satellite hazardous waste storage areas. Some of these satellite hazardous waste storage areas are addressed in Section 3 of this report; however, the majority of the satellite hazardous waste storage areas are not discussed in this Description of Current Conditions Report.

Until October 2010, Virginia Tech's main less than 90-day hazardous waste accumulation area was SWMU 8 (also referred to as 'the Hill') which is located on Ramble Road adjacent to the Virginia Tech Montgomery Executive Airport. SWMU 8 was used to store hazardous and non-hazardous waste. This unit began operation in 1995 and consists of a covered concrete pad, two waste storage buildings, and various storage areas for supplies. This former accumulation area is surrounded by a locked, barbed wire fence. Waste generated by the university was transported to this site from various accumulation areas, and shipped off-site to a treatment, storage, or disposal facility (TSDF) regulated under RCRA. Hazardous wastes were segregated by class and stored in the waste storage buildings. Non-regulated, petroleum, and electronic wastes were stored on the covered pad and within the fenced area as appropriate. Radiological waste materials are stored in a separate brick building.

Virginia Tech's new Materials Management Facility opened in October 2010; as a result, wastes that were stored at SWMU 8 are now stored at the new Materials Management Facility. Virginia Tech plans to close SWMU 8 in accordance with VDEQ requirements in the near future.

2.4 HYDROGEOLOGIC FRAMEWORK

Virginia Tech is located in the folded and faulted Valley and Ridge geologic and physiographic province of Virginia. The Valley and Ridge consists of folded and thrust-faulted Paleozoic sedimentary rocks ranging in age from Cambrian to Mississippian. Post-deformation weathering of these faulted and overturned Paleozoic rocks have resulted in the formation of resistant sandstone and dolomite ridges separated by valleys underlain by more easily eroded shale and limestone.

Based on mapping presented in the *Geology of the Blacksburg Quadrangle, Virginia* (Bartholomew and Lowry, 1979), Virginia Tech is located on a structural block called the Blacksburg Synform that was created by late Paleozoic movement. **Figure 2b** illustrates the Virginia Tech campus and associated properties plotted on the *Geology of the Blacksburg Quadrangle, Virginia* map; the locations of the AOCs and SWMUs addressed in this report are also presented on **Figure 2b**. The majority of Virginia Tech is underlain by Cambrian age carbonate and shale bedrock of the Rome and Elbrook formations. The Rome and Elbrook formations underlying Virginia Tech and its near vicinity are comprised primarily of phyllitic siliciclastics and dolomite. As shown on **Figure 2b**, areas located along Stroubles Creek and its tributaries are underlain by alluvial deposits consisting of stratified sand, silt, and clay with lenses of pebbles and cobbles; underlying bedrock geology in these areas is likely the Elbrook Formation. Additionally, limited areas of higher elevation in the southern portion of the Virginia Tech property are underlain by terrace deposits consisting of vein quartz and sandstone in an extremely weathered soil matrix; underlying bedrock geology in these areas is likely either the Elbrook Formation or the Rome Formation.

Based on subsurface investigations conducted at some of the SWMUs and AOCs at the facility, depth to groundwater in the uppermost aquifer in these areas varies from less than 10 feet below ground surface to more than 65 feet below ground surface. The uppermost aquifer resides in secondary porosity features including fractures, joints, and bedding planes in the underlying dolomite and shale bedrock. Typically, groundwater monitoring wells completed within the uppermost aquifer were advanced through overburden and into bedrock. Once bedrock was encountered, cuttings of dolomite and shale were dry and dusty until groundwater production was encountered. Typically, after the first indication of groundwater was observed, a minimal amount of standby time was required to allow the borehole to recharge with groundwater.

Portions of the Virginia Tech campus are located within the 100-year flood plain of Stroubles Creek. Stroubles Creek is a tributary of the New River, which flows north into the Kanawha River. The Kanawha flows into the Ohio River, which flows into the Mississippi River, which in turn discharges into the Gulf of Mexico. The headwaters of Stroubles Creek are natural springs that emerge in the northern portion of the Town of Blacksburg. The Stroubles Creek watershed (VAW-N22R) is a small sub-watershed measuring approximately 6,119 acres in size within the New River watershed in southwestern Virginia. The Virginia Tech Duck Pond is located within the Stroubles Creek watershed.

3.0 DESCRIPTION OF WASTE MANAGEMENT UNITS (SWMUs and AOCs)

3.1 SWMU 1 – FORMER PHYSICAL PLANT AREA

3.1.1 Unit Description and Background

SWMU 1 is located in the area between Cowgill Hall and the Perry Street Parking lot near Whittemore Hall and contains the area where the Bishop-Favro building currently stands (**Figures 3a, 3b, 3c and 3d**). On April 21, 1988, during the construction of a storm sewer line from Cowgill Hall to a sewer line near Perry Street, an excavation trench encountered an area of buried 5-gallon containers. Virginia Tech determined that the buried containers contained metal-based paints, tars, and oil. These materials were removed from the excavation trench and stored/stockpiled adjacent to the trench (north of Cowgill Hall) pending disposal.

Virginia Tech was required by VDEQ to prepare a Closure Plan for clean-closure of this area, which was designated as the ‘contaminated dirt pile’. Following removal of the contaminated dirt pile, sampling and analysis of soil beneath the pile area indicated that an additional 6-inches of soil needed to be removed. Approximately 380 tons of impacted soil were removed from the subsurface and transported off-site for disposal. The excavated area was backfilled with clean fill. Certification of clean closure in accordance with the Closure Plan was provided to Virginia Tech in correspondence dated February 24, 1993 from Dewberry & Davis (a consultant for Virginia Tech). On April 26, 1993, Virginia Tech transmitted that closure certification along with the facility’s closure certification (**Appendix C**) to the Virginia Department of Waste Management (precursor to the VDEQ).

The Tetra Tech report references a closure approval letter from VDEQ dated September 5, 1995. However upon research of VDEQ and EPA files this letter could not be located. VDEQ was requested to further research the State Library of Virginia’s Records Center for a copy of this letter. However, based on VDEQ’s email responses dated October 19, 2010 and November 8, 2010 (**Appendix C**) the facility’s Closure certifications provided on April 26, 1993 were deemed acceptable to VDEQ. VDEQ internal records and EPA records (RCRAInfo) confirm the clean closure of the facility. Copies of these documents are also included in **Appendix C**.

The materials removed from the excavation trench in April 1988 were believed to be discarded products used by the former campus physical plant. From 1935 to 1968, the former campus physical plant was located in this area and provided maintenance for university buildings and equipment. The former physical plant was comprised of various buildings along with material storage. In addition, a former quarry that supplied building stone used on campus during the early part of the 20th century was located adjacent to the former physical plant in the area behind Derring and Cowgill Halls. The former quarry is believed to have operated from 1899 to 1935. The former quarry reportedly was filled with water from 1935 until the late 1940’s, and was subsequently filled with soil and other fill material from the late 1940’s until 1952. The area of the former quarry is currently covered by asphalt, various buildings, and grassy areas.

Due to uncertainty regarding the methods by which the former quarry was filled as well as the waste handling procedures that were used at the former physical plant area, Virginia Tech voluntarily conducted an extensive site assessment of these areas. This site assessment was

completed by Dewberry & Davis in October 1993. This assessment included a subsurface and groundwater evaluation. The subsurface evaluation included magnetometry, ground penetrating radar, and soil and groundwater sampling. The results of the Dewberry & Davis assessment are included in **Appendix C**.

In 2002 Virginia Tech enrolled the former physical plant area (excluding the area of the closed contaminated dirt pile) in the VDEQ Voluntary Remediation Program (VRP). This was done to allow the development of the site for construction of academic buildings. Virginia Tech hired Engineering Consulting Services, Ltd. (ECS) to review the Dewberry & Davis report and to conduct an additional site characterization of the area prior to the construction of Bishop-Favro Hall. The results of the ECS study are included in **Appendix C**.

3.1.2 Nature and Extent of Impact, If Any

Soil samples collected in the area where hazardous materials were encountered in 1988 exhibited elevated concentrations of lead and arsenic. Soil sample CB-5 collected north of the modular buildings at a depth of 16 feet exhibited the highest concentrations of lead and arsenic; this sample consisted primarily of ash and cinders located at that depth. Concentrations of semi-volatile organic compounds associated with coal tars and coal combustion were also detected in the 1988 soil samples.

In 1993, Virginia Tech commissioned Dewberry & Davis to assess the former quarry and former physical plant area. This assessment included geophysical surveys as well as soil and groundwater sampling. The results of the Dewberry & Davis assessment are included in **Appendix C**. The geophysical surveys identified various anomalies, the largest of which coincided with the former quarry. Soil borings advanced in the former quarry and in the areas of geophysical anomalies encountered fill materials consisting of soil, organic soils, gravel, rock fragments, coal, ash, cinders, and debris (brick fragments, wood, concrete, glass, and metal).

Soil sample analytical results for the 1993 investigation indicated concentrations of various metals, volatile organic compounds (VOCs), and polynuclear aromatic hydrocarbons (PAHs). Some of the constituent concentrations detected in the soil samples were greater than the EPA Region III Risk-Based Concentrations (RBCs) for residential exposure or the EPA Soil Screening Levels (SSLs) for transfer from soil to groundwater; however, none of the detected concentrations were greater than the EPA Region III RBCs for commercial/industrial exposure or the EPA SSLs for transfer from soil to air.

As part of the 1993 investigation, groundwater samples were collected from seven groundwater monitoring wells and one hydraulic probe boring near the area where hazardous materials were encountered in 1988 and in the vicinity of the former physical plant/quarry area. The groundwater samples were analyzed for 138 priority pollutants; of these analytes, concentrations above the laboratory detection limits were reported for only nine metals and chloroform. It should be noted that chloroform was detected only in the upgradient wells (MW-1 and MW-6). Some of the detected metals concentrations were greater than their screening levels for residential exposure, but none of the detected concentrations were greater than their screening

levels for commercial/industrial exposure. The detected chloroform concentrations were less than the screening level for residential exposure.

In 2002, Virginia Tech enrolled the former physical plant area (excluding the area of the closed contaminated dirt pile) in the VDEQ VRP. Virginia Tech commissioned ECS to review the Dewberry & Davis report and to conduct an additional site characterization of the area prior to the construction of Bishop-Favro Hall. ECS advanced four soil borings in the vicinity of the proposed building site and collected soil samples for analysis for metals, VOCs, and PAHs. ECS also collected groundwater samples from monitoring wells MW-1, MW-3, MW-4, and MW-5 for analysis for metals, VOCs, and PAHs. The results of the ECS site characterization were consistent with the 1993 investigation performed by Dewberry & Davis. Groundwater flow conditions at the site based on data collected in 1993 and 2002 are depicted on **Figures 3e** and **3f**. The results of the ECS site characterization are also included in **Appendix C**.

3.1.3 Current Status of Unit

The former contaminated dirt pile is closed (no further action required) as described in the Tetra Tech report (Section 6.1). The Tetra Tech report refers to the September 5, 1995 letter from the VDEQ as the basis of obtaining closure for this site. This is incorrect; the correct reference should be the February 24, 1993 letter from Dewberry & Davis to Virginia Tech certifying closure in accordance with the Closure Plan. On April 26, 1993, Virginia Tech submitted the closure certifications to the Virginia Department of Waste Management.

The former contaminated dirt pile received approval of closure certification from the VDEQ. Any further development in the area of SWMU 1 (the former physical plant area and the former quarry area) will be managed under a materials management agreement between Virginia Tech and the VDEQ. This agreement states that any excavation in the area of SWMU 1 will be monitored by an independent third party auditor. Soils removed or disturbed will be examined by the auditor and clean soils may be disposed of where desired. Soils mixed with suspected contaminants will be set aside for sampling and analysis, and disposal decisions will be based upon those analytical results. The third party auditor will contact EHSS should any suspected impacts be found.

Based on the results of the 1993 and 2002 environmental investigations at SWMU 1, the fill materials in this area are well characterized (ECS, 2002, **Appendix C**). Some of the subsurface fill in this area consists of metal and non-metal materials (soil, organic soils, gravel, rock fragments, coal ash, cinder and various other debris such as sparse bricks, wood, concrete, glass and metal, likely former construction materials and debris. However no evidence of hazardous materials or hazardous waste was observed. However, any future excavation and development at SWMU 1 will be addressed as explained above under a materials management agreement between Virginia Tech and VDEQ. In addition, Virginia Tech has developed a Contingency Plan (ECS, 2002, **Appendix C**) to respond to unanticipated events of encountering of similar materials on future developmental activities at Virginia Tech. Should such situations arise, Virginia Tech will also closely coordinate follow up activities with VDEQ.

Virginia Tech has withdrawn the former physical plant area from the VRP due to procedures of the program which make it difficult for state agencies to participate in formal deed restriction processes. As part of establishment of institutional controls the VRP requires a deed restriction be placed on the property that describes the site prohibitions of use; however, Virginia Tech discovered that formal deed restrictions may not be feasible for this property, although other access and use limitations may be possible. Nevertheless, the entire university and surrounding area is supplied by a municipal water source, and groundwater from the site will not be used. Virginia Tech is examining alternative methods to formally document the prohibition of the use of groundwater from this area.

Of the seven monitoring wells that were part of the 1993 and 2002 site investigations, only two wells remain, i.e., MW-1 and MW-6. The other five wells were either inadvertently destroyed or paved over during construction activities in that area and could not be found. In November 2010, Virginia Tech conducted additional sampling and analysis of the two remaining monitoring wells, MW-1 and MW-6. The EPA Project Coordinator was informed of the proposed sampling and analysis on October 8, 2010, and at their request, a Sampling and Analysis Plan, dated October 11, 2010, was submitted for EPA review. The use of independent analytical laboratories selected by Virginia Tech was presented in the Sampling and Analysis Plan, and the laboratory analytical data were validated by an independent third-party. A copy of the final Sampling and Analysis Plan incorporating the EPA Project Coordinator's revisions (dated October 25, 2010 and further revised on October 27, 2010) is included in **Appendix C**.

Virginia Tech voluntarily chose to obtain current groundwater analytical data from wells MW-1 and MW-6 in support of the Description of Current Conditions for SWMU 1 and AOC 6. This work was not performed under a formal RFI Work Plan; as such, this work is not considered an Interim Measure as defined in the Consent Order.

The laboratory analytical results for the constituents detected in the November 1, 2010 groundwater samples from wells MW-1 and MW-6 are summarized in **Table 2**. **Table 2** also includes the historical laboratory analytical data for the constituents detected in groundwater during the 1993 and 2002 investigations. A comparison of the November 2010 results and the historical results with applicable regulatory standards for drinking water (EPA MCLs [and action levels for copper and lead], or EPA Region III RSLs for tap water for those constituents without MCLs) is included in **Table 2**. Of the extensive list of organic constituents tested for (VOCs, SVOCs including PAHs) tested for only five constituents were detected in the groundwater at MW-6 (none detected at MW-1) at very low concentrations. Four of the five detected constituents were observed at concentrations below 1 ppb. Chloroform was reported at 4.4 ppb, well less than its EPA MCL of 80 ppb (cumulative EPA MCL for trihalomethanes). As shown in **Table 2**, none of the constituents detected in the November 1, 2010 groundwater samples collected from wells MW-1 and MW-6 exhibited concentrations greater than their respective regulatory drinking water standards. Therefore, Virginia Tech concludes that there are no impacts to groundwater at SWMU 1/AOC 6 that exceed drinking water standards or that pose imminent threat to human health and the environment. Therefore, Virginia Tech concludes that no further action is required for this site.

3.2 SWMU 2 – SANITARY LANDFILL (VDEQ PERMIT 109) (CLOSED)

3.2.1 Unit Description and Background

SWMU 2 is a closed solid waste landfill located to the west of Route 460 Bypass and to the north of Prices Fork Road (**Figures 4a and 4b**). On May 30, 1973, the Virginia Department of Health issued Solid Waste Permit No. 109 for this approximately 4.5-acre unlined sanitary landfill (amended on July 7, 2005). A copy of the amended permit is included in **Appendix C**. During operation of the landfill, Virginia Tech disposed of general university waste within eight trenches that were constructed without a base liner or leachate collection system. Additionally, asbestos waste was emplaced within one well-defined section of the landfill. Waste was last placed in the landfill on June 30, 1989. The University's construction and operation of the landfill has been in accordance with applicable regulations. The university's solid waste is now transported off-site for disposal in a local permitted sanitary landfill.

Trenches 1 through 6 were closed prior to December 1988 with a soil cover. Landfill gas monitoring and groundwater detection monitoring were initiated at the facility in 1992. The VDEQ approved the Closure Plan for the landfill in January 1994, and the remainder of the facility (trenches 7 and 8) were closed in October 1994 with a soil cap. Copies of the permit and closure documentation are included in **Appendix C**.

Solid Waste Permit No. 109 was amended on June 14, 2002 to establish Groundwater Protection Standards (GPS) and to update the Groundwater Monitoring Program. On July 7, 2005, the permit was amended to establish a groundwater Corrective Action Program due to the detection of volatile organic compounds (VOCs) at concentrations greater than the GPS. The July 7, 2005 permit amendment defined the constituents of concern for groundwater corrective action as chloroethane and vinyl chloride. In correspondence dated November 19, 2010, Virginia Tech requested a minor permit amendment to remove chloroethane as a groundwater corrective action constituent of concern, and to add 1,1-dichloroethane to the list of constituents of concern.

3.2.2 Nature and Extent of Impact, If Any

The July 7, 2005 permit amendment defined the constituents of concern for groundwater corrective action as chloroethane and vinyl chloride. A map depicting groundwater flow conditions based on the potentiometric surface measured on May 10, 2010 is included as **Figure 4c**. Prior to establishment of the groundwater Corrective Action Program, chloroethane was detected in downgradient monitoring wells at concentrations greater than the VDEQ Alternate Concentration Limit (ACL), and vinyl chloride was detected in downgradient monitoring wells at concentrations greater than the EPA Maximum Contaminant Level (MCL). Isoconcentration maps for the constituents of concern are included as **Figures 4d, 4e and 4f**. The constituents of concern were not detected at concentrations greater than their respective GPS or laboratory quantitation limits (QLs) at the facility boundary; therefore, there was no evidence of uncontrolled migration of impacted groundwater beyond the facility boundary. As directed by the VDEQ, Virginia Tech implemented the groundwater Corrective Action Program consisting of monitored natural attenuation for the facility beginning in October 2005, which is ongoing. The Corrective Action groundwater monitoring well network consists of one

background/upgradient well (MW-1), four compliance wells (MW-2, MW-3, MW-4, and MW-11), one upgradient well that is monitored as a compliance well (MW-7), and two sentinel wells that are only monitored for the corrective action constituents of concern (MW-5 and MW-10). Please note that well MW-11 previously served as a sentinel well, and was reclassified as a compliance well following detection of 1,1-dichloroethane at a concentration greater than the revised GPS as discussed in the November 19, 2010 request for minor permit amendment. Additional observation wells at the landfill include MW-6, MW-8, and MW-9, which are used for the measurement of groundwater elevation only.

On January 27, 2009, the VDEQ issued revised default ACLs for a number of constituents. In correspondence dated July 6, 2009, the VDEQ indicated that the analytical results of all sampling events conducted after the January 27, 2009 effective date should be compared to the revised ACLs, where applicable (i.e., if the GPS for the constituent is based on the ACL). Following adoption of the revised VDEQ ACLs there were no longer any GPS exceedances for chloroethane, and the VDEQ removed chloroethane as a constituent of concern for groundwater corrective action in correspondence dated September 21, 2010. However, following adoption of the January 27, 2009 default VDEQ ACLs, 1,1-dichloroethane, cobalt (and arsenic above its EPA MCL based GPS) were detected in downgradient wells at concentrations greater than their revised GPS. Arsenic and cobalt were observed in their background concentrations attributable to their natural geological sources (soil and rock) and an alternate source demonstration showing that these constituents are not an indication of landfill solid waste impact has been submitted and is under VDEQ review. As a result, 1,1-dichloroethane was added as a constituent of concern for groundwater corrective action at the facility. An iso-concentration map for 1,1-dichloroethane is included as **Figure 4f**. Please note that 1,1-dichloroethane was not detected at the facility boundary at a concentration greater than the laboratory QL or the GPS; therefore, there is no evidence of uncontrolled migration of impacted groundwater beyond the facility boundary.

3.2.3 Current Status of Unit

SWMU 2 received closure from the VDEQ and is currently undergoing post-closure care activities in accordance with VDEQ regulations including landfill cap and custodial maintenance, addressing leachate issues, corrective action for groundwater via monitored natural attenuation and gas monitoring. This closed landfill is described in the Tetra Tech report (Section 6.2). Virginia Tech concludes that no further action is required other than the ongoing activities in accordance with VDEQ programs.

Summary tables providing current groundwater monitoring data for the facility are included (**Tables 3A, 3B and 3C**). A copy of the Annual Groundwater Monitoring Report for calendar year 2009 is included in **Appendix C**. Additionally, copies of the July 7, 2005 amended permit (which includes Corrective Action Permit Module XIV) and the November 19, 2010 request for a minor permit modification are included in **Appendix C**.

3.3 SWMU 3 – INCINERATOR (CLOSED)

3.3.1 Unit Description and Background

SWMU 3 is a closed pathological incinerator located to the west of Route 460 Bypass and to the north of Prices Fork Road, adjacent to SWMU 2 (**Figures 4a and 4b**). A solid waste permit (VDEQ Permit No. 185) for this incinerator was issued to Virginia Tech on April 30, 1975. A closure notification to VDEQ was provided by Virginia Tech on October 3, 2003. A Closure Plan for the unit was approved by VDEQ on April 17, 2003, and Virginia Tech submitted a closure certificate to the VDEQ on February 24, 2004 confirming that closure was complete. VDEQ conducted a closure inspection on March 3, 2004. Correspondence dated April 5, 2004 from the VDEQ to Virginia Tech indicated that the SWMU had been closed in accordance with the approved Closure Plan. Copies of the above referenced Closure Plan, closure notification, closure certification and VDEQ approval of closure are included in **Appendix C**. Virginia Tech subsequently dismantled the incinerator equipment, which was removed from the building and transported off-site for disposal.

3.3.2 Nature and Extent of Impact, If Any

There are no known impacts associated with the closed incinerator. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.3.3 Current Status of Unit

The incinerator received closure from the VDEQ and the equipment has been removed. This closed incinerator is described in the Tetra Tech report (Section 6.3). Virginia Tech concludes that no further action is required for this site.

3.4 SWMU 4 – SANITARY LANDFILL (VDEQ PERMIT 248) (CLOSED)

3.4.1 Unit Description and Background

SWMU 4 is a closed sanitary landfill located at the site of the current Virginia Tech Montgomery County Executive Airport on Ramble Road. Virginia Tech owns the property and formerly operated the Virginia Tech Airport at this site. The exact location of the three-acre site is unknown and may have been incorrectly reported in the Tetra Tech report as located between the old and new terminal buildings under an area that was recently paved. According to the permit, the location of the landfill is at the west-end of the east-west runway. **Figures 2, 2a, 2b, 2d and 2e** identify SWMU 4 at its presumed location based on the permit description.

On June 16, 1978, the Virginia Department of Health issued Solid Waste Permit No. 248 for this landfill. A copy of the permit is included in **Appendix C**. The landfill was permitted for receipt of institutional fly ash only, presumably from the coal-fired Power Plant (SWMU 14). According to anecdotal information the landfill was rarely used. The landfill was closed by the

Virginia Department of Waste Management (DWM) prior to 1988; however, Virginia Tech could find no formal documentation regarding its closure.

3.4.2 Nature and Extent of Impact, If Any

No evidence of a spill or release has been observed at the presumed area of the unit; no known documentation of environmental impacts at the unit exists.

During construction of a new apron for the airport, an area of black material was uncovered. Examination of this material determined that it was coal ash. The ash was left in place and the area was paved over with asphalt. Virginia Tech presumes this ash was left over from the original construction of the old hanger, which was constructed from cinder blocks that were formed on-site.

3.4.3 Current Status of Unit

Virginia Tech was unable to find any records of construction, plans, inspections, or closure documentation other than the Virginia Department of Health permit. However, only coal ash was disposed of on-site, and the material was used as construction fill; therefore, a Solid Waste Permit likely was not required in the first place. Since this material was used as construction fill, which is allowed under current VSWMR, Virginia Tech concludes that no further action is required for this site.

3.5 SWMU 5 – ASBESTOS WASTE AWAITING DISPOSAL

3.5.1 Unit Description and Background

During maintenance and renovation projects, small amounts of asbestos wastes are created from removal of pipe insulation and floor tile. These wastes are packaged according to the regulations and taken to the asbestos waste storage trailer located on Tech Center Drive. Once the trailer contains a sufficient quantity of material, it is transported and disposed in accordance with applicable regulations at a permitted asbestos landfill, typically the HAM Sanitary Landfill located in Peterstown, West Virginia.

3.5.2 Nature and Extent of Impact, If Any

There are no known impacts associated with this asbestos waste storage trailer. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.5.3 Current Status of Unit

This unit is in use and is described in the Tetra Tech report (Section 6.5). Virginia Tech concludes that no further action is required for this site.

3.6 SWMU 6 – DAIRY SCIENCE LAGOONS

3.6.1 Unit Description and Background

The Virginia Tech Dairy Science Center is located at the intersection of Southgate Drive and the Route 460 Bypass (**Figures 5a and 5b**). The Dairy Science Center maintains the university's dairy herd. A feed lot, milking center, offices, feed storage, barn, and other associated buildings are part of the Center. Manure from the feed lot and barn is conveyed by water to manure lagoons located at the Center. SWMU 6 currently consists of three concrete-lined lagoons that collect animal waste, and a fourth unlined lagoon that collects storm water. Historically, there were two unlined lagoons.

3.6.2 Nature and Extent of Impact, If Any

In February 1994, the existing unlined manure lagoon filled to the point of overflowing during a period of wet weather. A Virginia Tech employee installed a siphon hose to remove the water and manure mixture to prevent overflowing and possible breaching of the lagoon. An anonymous call was placed to the regional VDEQ office, which triggered an inspection at the site. During this inspection it was discovered that the siphon hose was discharging to a tributary of Stroubles Creek. A series of actions following this inspection are summarized below:

- The siphon hose was removed to stop the discharge.
- The lagoon was partially emptied by pumping and hauling the effluent to the local sewage treatment facility.
- The remaining manure was field applied using subsurface injection.
- VDEQ issued a Notice of Violation (NOV) to Virginia Tech on April 8, 1994.
- Analysis of the material that was siphoned from the manure lagoon indicated that human waste was included in the material.
- An investigation of the restrooms and sinks at the Dairy Science Center revealed they discharged to the manure lagoon (unknown to Virginia Tech).
- The restrooms were immediately closed and portable toilets were installed on-site.
- The downspouts from the building roofs were re-routed to keep clean storm water out of the manure lagoons.
- Virginia Tech developed and VDEQ issued a Virginia Pollution Abatement (VPA) Permit on March 10, 1995, which specifies how manure is managed and land applied. Current permit dated November 16, 2004 is attached (**Appendix C**).
- A new sanitary sewer line was constructed at the Dairy Center; the restrooms were connected to the new sanitary sewer line and reopened.
- A new concrete-lined manure lagoon was constructed.

In the time subsequent to the February 1994 release, the occasional spill has occurred at this site due to equipment malfunctions. All spills have been reported and resolved to the satisfaction of the VDEQ.

3.6.3 Current Status of Unit

The Dairy Science Center lagoons are currently in use and are described in the Tetra Tech report (Section 6.6). The management of manure from the dairy facility is authorized by General Permit Number VPG100013, a copy of which is included in Appendix C. All manure from the Dairy Science Center is collected in the concrete-line lagoons and the unlined lagoon was converted to a storm water management pond. The third concrete lagoon was constructed to handle wastes from an expansion of the dairy facility.

Following the 1994 release, land application practices were changed from the pumping system to subsurface injection managed under the University Nutrient Management Plan under the VPA Permit.

The Dairy Science Center lagoons are managed under VDEQ oversight. Virginia Tech concludes that no further action is required for this unit.

3.7 SWMU 7 – FORMER HAZARDOUS WASTE LESS THAN 90-DAY ACCUMULATION AREA-MAINTENANCE BUILDING

3.7.1 Unit Description and Background

SWMU 7 was a less than 90-day accumulation area located at the Sterrett Center Maintenance Complex (**Figures 6a and 6b**) and was used to store hazardous waste from maintenance activities. This unit consisted of an exterior concrete pad surrounded by a wire fence and stored approximately twenty 55-gallon drums of lead waste and paint debris.

3.7.2 Nature and Extent of Impact, If Any

The drums were removed by a hazardous materials contractor for disposal. There are no known impacts associated with this area. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.7.3 Current Status of Unit

This site has been closed by transferring the waste to the current less than 90 day accumulation area (SWMU 8). The concrete pad and wire fence were removed and disposed of as solid waste. The adjacent maintenance facility was expanded and now occupies the site of the former accumulation area. The notification letter to VDEQ (dated April 26, 1993) is included in **Appendix C**. The former drum storage area is now occupied by an expansion of a maintenance building.

This area has been closed and is described in the Tetra Tech report (Section 6.7). No leaks or spills occurred that this unit. Virginia Tech concludes that no further action is required for this unit.

3.8 SWMU 8 – FORMER HAZARDOUS WASTE <90-DAY ACCUMULATION AREA – ADJACENT TO AIRPORT

3.8.1 Unit Description and Background

This SWMU was Virginia Tech's main less than 90-day accumulation area located on Ramble Road (**Figures 7a and 7b**) and was used to store hazardous and nonhazardous waste. This unit began operation in 1995 and consisted of a covered concrete pad, two waste storage buildings, and various storage areas for supplies. This former accumulation area is surrounded by a locked, barbed wire fence. Waste generated by the university was transported to this site from various accumulation areas, and shipped off-site to a TSDf regulated under RCRA. Hazardous wastes were segregated by class and stored in the waste storage buildings. Non-regulated, petroleum, and electronic wastes were stored on the covered pad and within the fenced area as appropriate. Radiological waste materials were stored in a separate brick building.

3.8.2 Nature and Extent of Impact, If Any

To date, no major spills, leaks, or releases have occurred at this site. Minor releases (petroleum) at the site have been contained and cleaned up. No other evidence of an undocumented spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.8.3 Current Status of Unit

This unit is described in the Tetra Tech report (Section 6.8). Virginia Tech's new Materials Management Facility opened in October 2010; as a result, wastes that were stored at SWMU 8 are now stored at the new Materials Management Facility. Virginia Tech plans to close this area in accordance with VDEQ requirements in the near future.

3.9 SWMU 9 – HAZARDOUS WASTE <90 DAY ACCUMULATION AREA – ROOM 15 OF DAVIDSON HALL

3.9.1 Unit Description and Background

SWMU 9 is currently a less than 90-day hazardous waste accumulation area located in Room 15 in Davidson Hall. The unit is a waste accumulation area with secondary containment located in the basement of Davidson Hall. Wastes are stored in metal cabinets, on open metal shelves, on the floor, and in covered bins pending transport to Virginia Tech's Materials Management Facility.

A very small portion of this SWMU was deemed to be an unpermitted TSDf by the VDEQ and formally closed in 1996 (these events are discussed under SWMU 10, below). At no time was a release in this area observed. The remainder of SWMU 9 is currently in use.

3.9.2 Nature and Extent of Impact, If Any

There are no known impacts associated with this area. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.9.3 Current Status of Unit

This area is currently in use. Current procedures for the management of the activities at this area are under EHSS and VDEQ oversight. Virginia Tech concludes that current actions are adequate for this unit and the no further action is required.

3.10 SWMU 10 – FOUR <90 DAY HAZARDOUS WASTE ACCUMULATION AREAS

3.10.1 Unit Description and Background

SWMU 10 consists of four less than 90-day hazardous waste accumulation areas in the following locations:

- Room 13-A, Health and Safety Building (formerly referred to as HWMU 1) – a flammable storage cabinet used to store mercury and flammable materials; in use from pre-January 1992 until January 1994.
- Room 15, Basement of Davidson Hall (formerly referred to as HWMU 2) – three metal cabinets, one set of open-face metal shelves, and an area of concrete floor under a 4-ft by 4-ft wooden table; in use from November 1991 until at least 1996.
- Room 4, Basement of Randolph Hall (formerly referred to as HWMU 3) – an approximately 14-ft by 18-ft section of cement floor; dates of use unknown.
- Part of the Insecticide and Fungicide Storage Building, Glade Road Plant Pathology Facility (formerly referred to as HWMU 4) – six metal shelves used to store various pesticides; in use for six years, however time period unknown.

The subject areas in Room 15 of Davidson Hall and Room 4 of Randolph Hall were used for the accumulation of the following wastes:

- D001 – ignitable
- D002 – corrosive
- D004 – arsenic
- D007 – chromium
- D008 – lead
- D019 – carbon tetrachloride
- D022 – chloroform
- F002 – spent halogenated solvents
- F003 – spent non-halogenated solvents
- F005 – spent non-halogenated solvents

During a routine inspection by the VDEQ, it was found that several waste containers located in the <90-day accumulation areas listed above had passed the 90-day accumulation time limit. VDEQ deemed these areas to be an unpermitted TSDF and required a closure plan to be developed and implemented. The final closure plan was approved by the VDEQ in correspondence dated November 15, 1996. Virginia Tech implemented the closure plan and the subject portion of this SWMU received closure from the VDEQ in correspondence dated June 8, 1999. Copies of the closure plan and closure documentation are included in **Appendix C**.

3.10.2 Nature and Extent of Impact, If Any

There are no known impacts associated with Room 13-A of the Health and Safety Building, Room 15 of Davidson Hall, or the subject portion of the Insecticide and Fungicide Storage Building for the Glade Road Plant Pathology Facility. No evidence of a spill or release has been observed at these areas; no known documentation of environmental impacts at the areas exists.

In 1991, a release of hazardous materials reportedly occurred in Room 4 of Randolph Hall when a 5-gallon container of a mixture of kerosene/crude oil, water, sand, and sodium dodecyl butane sulfonate (surfactant) leaked. This release was cleaned up by Virginia Tech personnel.

3.10.3 Current Status of Unit

In a letter to Virginia Tech dated June 8, 1999 (**Appendix C**), the VDEQ stated that these areas had met the closure performance standards and were formally closed. These areas are described in the Tetra Tech report (Sections 6.9 and 6.10). Virginia Tech concludes that no further action is required for SWMU 10.

3.11 SWMU 11 – SATELLITE HAZARDOUS WASTE ACCUMULATION AREAS

3.11.1 Unit Description and Background

Virginia Tech maintains over 1,000 research laboratories located across the campus and each one is potentially a satellite accumulation area. Operation of laboratories or other areas that used chemicals are governed by the Chemical Safety Program:

(http://www.ehss.vt.edu/programs/hazardous_chemical_management.php).

Procedures for the proper management of hazardous materials can be found:

(http://www.ehss.vt.edu/programs/waste_chemical.php).

These areas are regularly inspected by EHSS for safety and compliance.

The following areas are also included in this SWMU (VDEQ and EPA files contained information regarding these locations specifically):

- Davidson Hall – Chemistry Laboratories; Satellite Hazardous Waste Collection Point (formerly referred to as HWMU 7)
- Derring Hall – Chemistry and Biology Laboratories; Satellite Hazardous Waste Collection Points (formerly referred to as HWMU 8)

- Hahn Hall – Chemistry Laboratories; Satellite Hazardous Waste Collection Points (formerly referred to as HWMU 9)
- Norris Hall – Environmental Engineering Laboratory; Satellite Hazardous Waste Collection Point (formerly referred to as HWMU 10)
- Randolph Hall – Chemical Engineering Laboratories; Satellite Hazardous Waste Collection Points (formerly referred to as HWMU 11)

3.11.2 Nature and Extent of Impact, If Any

There are no known impacts associated with these satellite hazardous waste accumulations areas. No evidence of a spill or release has been observed at these units; no known documentation of environmental impacts at the units exists.

3.11.3 Current Status of Unit

These points are currently in use. Any spills that occur are cleaned up as necessary. All satellite hazardous waste accumulation areas are located within buildings. Therefore, no potential exposure to soil is expected. As research, teaching, and university operations change over time, these collection points are constantly changing. Current procedures for the management of the activities at these points are under EHSS and VDEQ oversight and Virginia Tech concludes that current actions are adequate for these points and that no further action is required.

3.12 SWMU 12 –STERRETT FACILITIES COMPLEX BAY 3 <90 DAY HW ACCUMULATION AREA

3.12.1 Unit Description and Background

Virginia Tech has a paint shop in the Sterrett Facilities Complex which is referred to as Bay 3 (Figures 6a and 6b). EHSS provides a flammable storage cabinet in which all paint and solvent waste is placed for weekly pickup by EHSS personnel.

3.12.2 Nature and Extent of Impact, If Any

There are no known impacts associated with the Sterrett Facilities Complex Bay 3 <90 Day Hazardous Waste Accumulation Area. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.12.3 Current Status of Unit

The Sterrett Facilities Complex Bay 3 <90 Day Hazardous Waste Accumulation Area is in use and is described in the Tetra Tech report (Section 6.12). Any minor spills that occur are cleaned up as necessary. No uncontrolled releases from this accumulation area have been recorded. Weekly inspections of this area are performed and documented. Current procedures for the management of the activities at this area are under VDEQ oversight and Virginia Tech concludes that current actions are adequate for this area and that no further action is required.

3.13 SWMU 13 – STERRETT FACILITIES COMPLEX BUILDINGS AND GROUNDS - FORMER <90 DAY ACCUMULATION AREA

3.13.1 Unit Description and Background

EHSS previously provided a drum to the Buildings and Grounds for disposal of waste paint. That practice has been discontinued and EHSS now provides a flammable storage cabinet in which all paint and solvent waste is placed for weekly pickup by EHSS personnel; this process is described in Section 3.12.

3.13.2 Nature and Extent of Impact, If Any

There are no known impacts associated with the Sterrett Facilities Complex Buildings and Grounds – Former <90 Day Accumulation Area (**Figure 6a and 6b**). No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.13.3 Current Status of Unit

The current operation is described in Section 3.12 of this report. The former operation, which is no longer in use, is described in the Tetra Tech report (Section 6.13). Current procedures for the management of the activities at these points are under EHSS and VDEQ oversight and Virginia Tech concludes that current actions are adequate for these points and that no further action is required.

3.14 SWMU 14 – POWER PLANT

3.14.1 Unit Description and Background

Virginia Tech operates a Title V-permitted Power Plant (central heating facility) that generates steam for heating the majority of the buildings on campus (**Figure 8a and 8b**). The Power Plant was constructed in the 1920's, and consists of two coal fired boilers and three natural gas boilers, with fuel oil as a backup fuel source (stored in two underground concrete vaults). Ash from the Power Plant is sent to a local sanitary landfill for use as alternate daily cover. The Power Plant burns approximately 42,000 tons of coal per year, which is delivered via rail to an offsite location and then trucked to the Power Plant.

The coal at the Power Plant is stored in a coal yard adjacent to the facility. Storm water runoff from the coal pile at the power plant is directed to a drop inlet which leads to a sedimentation tank (SWMU 15, discussed in Section 3.15 below). Virginia Tech monitors and addresses storm water discharges in accordance with the facility VPDES storm water discharge permit.

3.14.2 Nature and Extent of Impact, If Any

Previous petroleum releases at the Power Plant are discussed in Section 3.23 and Section 3.26 (AOC 2 and AOC 5, respectively) of this report.

3.14.3 Current Status of Unit

The Power Plant is in use and is described in the Tetra Tech report (Section 6.14). Any spills that occur are cleaned up as necessary. The Power Plant is regulated by the VDEQ for air emissions and for storm water discharges and any petroleum releases. Virginia Tech concludes that current VDEQ regulatory oversight is adequate for this area and that no further action is required.

3.15 SWMU 15 – SEDIMENTATION TANK AT COAL YARD

3.15.1 Unit Description and Background

Storm water runoff from the coal pile at the power plant is directed to a drop inlet which leads to a sedimentation tank (**Figures 8a and 8b**). Coal fines settle out and are periodically removed and transported off-site for disposal at a local sanitary landfill. The storm water is then processed through two sand filters which remove additional fines. The sand filters are cleaned as needed. The storm water is then directed to the sanitary sewer by a special agreement between Virginia Tech and the sanitation authority.

3.15.2 Nature and Extent of Impact, If Any

There are no known impacts associated with the sedimentation tank at the coal yard. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.15.3 Current Status of Unit

The sedimentation tank at the coal yard is in use and is described in the Tetra Tech report (Section 6.15). Virginia Tech concludes that current actions are adequate for this area and that no further action is required.

3.16 SWMU 16 – PARTS WASHERS IN MAINTENANCE SHOPS

3.16.1 Unit Description and Background

Nine parts washers are used in various maintenance shops on campus, including the Motor Pool Building (representative location-Motor Pool, **Figures 6a and 6b**). All of the parts washers are provided by EHSS and are serviced by Crystal Clean, who collects the used solvent for recycling. Crystal Clean sells the used solvent to a bulking plant in Ohio where it is then incorporated into roofing material.

3.16.2 Nature and Extent of Impact, If Any

There are no known impacts associated with the parts washers in the maintenance shops. No evidence of a spill or release has been observed at these units; no known documentation of environmental impacts at the units exists.

3.16.3 Current Status of Unit

The parts washers in the maintenance shops are in use and are described in the Tetra Tech report (Section 6.16). Virginia Tech concludes that current actions are adequate for this equipment and that no further action is required.

3.17 SWMU 17 – BOX TRAILER FOR UNIVERSAL WASTES

3.17.1 Unit Description and Background

Virginia Tech collects spent fluorescent tubes and ballasts from various locations and takes them to a box trailer for storage (**Figures 4a and 4b**). The box trailer is currently located behind the closed incinerator building (SWMU 3). The spent fluorescent tubes and ballasts are transported off-site by a permitted universal waste handler to their facility for recycling. Southeast Recycling Technologies, Inc., of Johnson City Tennessee, is the university's current vendor for processing fluorescent tubes and ballasts.

3.17.2 Nature and Extent of Impact, If Any

There is no known impact associated with this site. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.17.3 Current Status of Unit

The box trailer for universal waste storage is in use and is described in the Tetra Tech report (Section 6.17). Current procedures for the management of the activities for this location are under EHSS and VDEQ oversight and Virginia Tech concludes that current actions are adequate for these points and that no further action is required.

3.18 SWMU 18 – HYDRAULIC TRASH COMPACTORS

3.18.1 Unit Description and Background

Approximately six hydraulic trash compactors are in use on the Virginia Tech campus.

3.18.2 Nature and Extent of Impact, If Any

Two small releases of hydraulic oils onto concrete or asphalt paving have occurred from trash compactors' hydraulic lines being accidentally broken. Both releases were contained and cleaned up immediately.

3.18.3 Current Status of Unit

The hydraulic trash compactors are currently in use and are described in the Tetra Tech report (Section 6.18). Virginia Tech concludes that current actions are adequate for this equipment and no further action is required.

3.19 SWMU 19 – ANIMAL CARCASS RENDERING

3.19.1 Unit Description and Background

Virginia Tech formerly operated an animal carcass rendering unit near the Veterinary Medicine complex (**Figures 9a and 9b**). This unit is located at the Veterinary Hospital on the Virginia Tech campus, but is no longer in operation. The unit was used to render animal carcasses from the hospital or other animal related areas on campus. The liquids from the unit were discharged to the sanitary sewer and the rendered solid material was transported off-site for disposal in a local sanitary landfill. The materials formerly processed at the facility are now transported off-site for disposal in a local sanitary landfill. This facility is no longer in use and is described in the Tetra Tech report (Section 6.19).

3.19.2 Nature and Extent of Impact, If Any

There is no known impact associated with this unit. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.19.3 Current Status of Unit

The animal carcass rendering unit is no longer in operation. This unit is described in the Tetra Tech report (Section 6.19). Virginia Tech concludes that current actions are adequate for this facility and no further action is required.

3.20 SWMU 20 – Regulated Medical Waste Storage Shed

3.20.1 Unit Description and Background

Virginia Tech collects regulated medical waste packaged in storage containers from various locations on campus, primarily from the Veterinary Medicine complex. This waste includes animal and human waste (blood, fluids, etc.), medical devices, and sharps. The containers are stored in a storage shed (**Figures 9a and 9b**) located behind the Veterinary Hospital prior to being transported off-site by a permitted regulated medical waste treatment and disposal

company. Sci-Med Waste Systems, Inc., of Roanoke, Virginia is the university's current vendor for processing regulated medical waste.

3.20.2 Nature and Extent of Impact, If Any

There is no known impact associated with this site. No evidence of a spill or release has been observed at the unit; no known documentation of environmental impacts at the unit exists.

3.20.3 Current Status of Unit

The Regulated Medical Waste Storage Shed is in use and is described in the Tetra Tech report (Section 6.20). Current procedures for the management of the activities for this location are under EHSS and VDEQ oversight and Virginia Tech concludes that current actions are adequate and that no further action is required.

3.21 SWMU 21 – MASS BURN FACILITY

3.21.1 Unit Description and Background

Prior to the permitting and operation of the sanitary landfill (SWMU 2), Virginia Tech operated a mass burn incinerator (**Figures 4a and 4b**). The incinerator was located in the incinerator building (SWMU 3). Solid waste from campus was transported to the unit for incineration. The ash from the incinerator was likely disposed of on-site in one of the trenches later incorporated into SWMU 2. No records of operation of the mass burn facility exist; the location and operation of this unit is based on an examination of the remaining structure.

3.21.2 Nature and Extent of Impact, If Any

As the exact operation of this facility is unknown, the nature and extent of impact is uncertain. However no evidence of surface water or groundwater impacts in the vicinity of the likely area of this facility has been observed. Also, Virginia Tech has owned the entire landfill property including the former mass burn area (a very small portion of the entire property) for decades. No portion of the land has been sold or transferred, with the exception of a small portion that is occupied by an electrical substation. Virginia Tech assumes that any ash from the mass burn facility was buried on-site, most likely in an area encompassed by the sanitary landfill. The entire landfill site is now closed and is in post-closure care.

3.21.3 Current Status of Unit

The unit stopped operating and was dismantled, most likely in the mid 1970's when changes in air pollution regulations forced these types of facilities out of operation. Virginia Tech concludes that current procedures for the management of the activities at this area are under VDEQ oversight. Virginia Tech concludes that current actions are adequate for this area and that no further action is required.

3.22 AOC 1 – VIRGINIA TECH AIRPORT

3.22.1 Unit Description and Background

A release occurred from an aboveground fuel storage tank at the Virginia Tech Airport (**Figures 10a and 10b**). Material beneath the tank consisted of clay containment and a clay earthen berm.

A fuel tank at the Virginia Tech Airport was cleaned by a Virginia Tech contractor. On May 2, 1994 following the completion of cleaning activities, the tank was filled with approximately 8,400 gallons of aviation fuel; no problems were noted later that day. On the morning of May 3, 1994, an airport employee discovered a leak at one of the manholes used to enter the tank. The Fire Department and VDEQ were notified of the release. The VDEQ issued Pollution Complaint Number 1994-3737 (PC No. 1994-3737) in response to the release. Virginia Tech employees diverted the fuel into small containers and then emptied them into 55-gallon drums. The flow of product was slowed by tightening bolts and wrapping rubber material around the seal of the manhole. A secondary containment structure was also constructed to capture the fuel. The leak was eventually stopped by the application of putty around the manhole seal.

3.22.2 Nature and Extent of Impact, If Any

Using the small containers emptied into 55-gallon drums as well as the secondary containment structure, Virginia Tech employees transferred 1,000 gallons of fuel to an airport tanker truck. An emergency response contractor removed the remainder of the fuel from the tank. Soil borings were advanced to locate pools of missing product. Approximately 500 gallons of fuel were recovered from the ground. It is estimated that a total of approximately 2,400 gallons of fuel were released from the tank. Soil was removed and minor groundwater impacts were noted. No surface water impacts occurred. The VDEQ issued Pollution Complaint Number 1994-3737 (PC No. 1994-3737) in response to the release. A copy of the associated Initial Abatement Measures and Site Characterization Report dated August 25, 1994 is also included in **Appendix C**.

3.22.3 Current Status of Unit

In a letter to Virginia Tech dated November 18, 1994 (**Appendix C**), the VDEQ stated that no further action was required under the Leaking Underground Storage Tank (LUST) Program. The November 1994 letter indicated that no free product existed, no groundwater users or surface water bodies were located in 1,000 feet of the release, and only minor concentrations of dissolved contaminants existed at the site; as a result PC No. 1994-3737 was closed by the VDEQ.

The groundwater monitoring wells associated with AOC-1 are now closed. This facility is in use and this event is described in the Tetra Tech report (Section 6.21). This incident was the result of human error and has been remediated to the satisfaction of the VDEQ. Virginia Tech concludes that no further action is required.

3.23 AOC 2 – 1995 FUEL OIL RELEASE FROM POWER PLANT

3.23.1 Unit Description and Background

On June 18, 1995, Virginia Tech Police were notified of an oil sheen on the Duck Pond. The material producing the sheen was traced back to the Power Plant storm water outfall at the retention pond. An investigation by Power Plant personnel revealed the source of the product was the backup heating system, which utilized No. 6 Fuel Oil (No.6 fuel oil was replaced with No.2 fuel oil in July 2002). A coal elevator pit in the Power Plant had filled with oil due to a leak in the fuel supply line. A storm water drain which led to the storm sewer system allowed the release of the material.

3.23.2 Nature and Extent of Impact, If Any

Approximately 1,400 gallons of fuel oil was spilled; however, the majority of the fuel was contained in the coal elevator pit. A minimal impact to the Duck Pond (a sheen) was discovered and remediated immediately.

3.23.3 Current Status of Unit

This incident was the result of a mechanical failure and has been repaired and the effects have been remediated. This facility is in use and this event is described in the Tetra Tech report (Section 6.22). A copy of the associated Initial Abatement Measures Report dated July 1995 including the associated letter of transmittal dated July 11, 1995 is included in **Appendix C**. A copy of the VDEQ closure and no further action letter was not available in Virginia Tech records and the VDEQ records. However a copy of an email from VDEQ in response to Virginia Tech's inquiry, dated November 19, 2010, documenting that associated VDEQ documentation has been destroyed due to VDEQ's 5 year retention schedule which has passed for this document, but confirming that VDEQ closed this pollution complaint on July 14, 1995, is included in **Appendix C**. Virginia Tech concludes that no further action is required.

3.24 AOC 3 – DUCK POND/STROUBLES CREEK

3.24.1 Unit Description and Background

Stroubles Creek is a tributary of the New River, which flows north into the Kanawha River. The Kanawha flows into the Ohio River, which flows into the Mississippi River, which in turn discharges into the Gulf of Mexico. The Stroubles Creek watershed (VAW-N22R) is a small sub-watershed measuring approximately 6,119 acres in size within the New River watershed in southwestern Virginia. The Virginia Tech Duck Pond is located within the Stroubles Creek watershed.

The headwaters of Stroubles Creek are natural springs that emerge in the northern portion of the Town of Blacksburg. The Stroubles Creek bed consists of alluvial floodplain deposits of stratified unconsolidated sand, silt, and clay with layers and lenses of pebbles and cobbles. Historical development near Stroubles Creek resulted in alteration and physical disturbance to

the natural stream course. In addition, the current Duck Pond is fed by two major branches of Stroubles Creek and was created in the 1930s by erecting a dam along the creek. A portion of the waterway is transported through an underground piping system that extends under numerous buildings and roadways in the Town of Blacksburg and through the Virginia Tech campus.

Due to the topography of the Blacksburg area, the Duck Pond on the Virginia Tech campus receives waters from storm water sewers and runoff from streets and properties throughout the town of Blacksburg (including the Virginia Tech campus). Stroubles Creek also receives runoff from various parts of Blacksburg.

According to a 2003 Total Maximum Daily Load (TMDL) Report prepared by VDEQ, biological monitoring of Stroubles Creek conducted over a period of five years indicated that the water body did not support the “general standard” of water quality in Virginia. Stroubles Creek is on the TMDL list for impaired waters and water bodies.

3.24.2 Nature and Extent of Impact, If Any

Numerous geese and other waterfowl frequent the Duck Pond, which contributes to elevated *E. coli* concentrations at the pond. Minor releases on Virginia Tech’s campus that have reached the Duck Pond have been addressed immediately. Most of the releases from Virginia Tech have been contained, at the source, thereby reducing the impact to the Duck Pond. The Duck Pond has also received minor releases from offsite properties in the Town of Blacksburg. The responsible parties, with Virginia Tech input, have addressed these incidents.

Stroubles Creek is listed as an impaired waterway for biological activity due to non-point source activities such as agriculture, storm-water runoff, and erosion. The impaired stream segment on Stroubles Creek, as delineated by the VDEQ, extends from the outlet of the Duck Pond to the confluence of Wall Branch to the west.

3.24.3 Current Status of Unit

Virginia Tech and VDEQ have initiated corrective measures for Stroubles Creek, including monitoring and construction of water quality ponds. In addition, the Town of Blacksburg’s Creek Valley Overlay District protects the riparian corridors which are most susceptible to soil erosion and runoff along Stroubles Creek (Blacksburg Comprehensive Plan, 2006). A TMDL Implementation Plan for the Upper Stroubles Creek Watershed was approved by VDEQ on May 24, 2006. The TMDL Plan may be accessed for review and use at the following VDEQ website: <http://www.deq.virginia.gov/tmdl/apptmdls/newrvr/stroub.pdf>.

The Duck Pond and Stroubles Creek are monitored by the VDEQ for water quality under the TMDL program. Virginia Tech has dredged the Duck Pond twice over the years to remove excess silt that has accumulated in the pond. An aeration fountain was installed at the pond but was found to be ineffective and its use was discontinued. Virginia Tech installed a boom attachment system at the Duck Pond so that booms can be deployed quickly to contain a release at the pond. Accidental releases to the Duck Pond and Stroubles Creek are contained and remediated should they occur.

The Duck Pond and Stroubles Creek are in use and are described in the Tetra Tech report (Section 6.23). Virginia Tech concludes that current management of these areas is appropriate and that no further action is required.

3.25 AOC 4 – HYDRAULIC FLUID RELEASE FROM WIND TUNNEL

3.25.1 Unit Description and Background

In February 1994, hydraulic fluid was released from the Wind Tunnel due to a mechanical failure (**Figures 11a and 11b**). The release occurred during a significant storm (a 10-year rain event), which washed some of the hydraulic fluid into the storm sewers and eventually to the Duck Pond. The VDEQ issued Pollution Complaint Number 1994-1796 (PC No. 1994-1796) in response to the release.

3.25.2 Nature and Extent of Impact, If Any

Approximately 600 gallons of hydraulic fluid were released from the Wind Tunnel during the February 1994 rain event. Most of the released material was contained at the source.

3.25.3 Current Status of Unit

In a letter to Virginia Tech dated October 25, 1994, the VDEQ stated that no further action was required to address the release. The October 1994 letter (**Appendix C**) indicated that acceptable abatement measures were achieved; as a result PC No. 1994-1796 was closed by the VDEQ. A copy of the associated Initial Abatement Measures Report dated February 1994 is also included in **Appendix C**.

This incident was the result of a mechanical failure and has been repaired and the effects have been remediated. This facility is in use and this event is described in the Tetra Tech report (Section 6.24). Virginia Tech concludes that no further action is required.

3.26 AOC 5 – 2002 VT POWER PLANT FUEL RELEASE

3.26.1 Unit Description and Background

The Virginia Tech Power Plant USTs consist of two 137,000-gallon cast-in-place concrete vaults (**Figures 8a and 8b**). The USTs were constructed in 1973, and each measures 50 feet long by 40 feet wide by 13 feet high. The tanks share a common center wall. The long axis of the tank system is parallel to Turner Street. The USTs stored No. 6 fuel oil, which was used to operate the boilers in the Power Plant, until the boilers were shifted to use No. 2 fuel oil. The USTs were retrofitted to store No. 2 fuel oil in July 2002.

On December 6, 2002, the VDEQ received notification of a subsurface petroleum release at the Power Plant. The release was detected following the installation of early release detection vent wells (VW-1 and VW-2) for the two USTs. Upon receipt of the release notification, the VDEQ

generated Pollution Complaint Number 2003-2053N (PC No. 2003-2053N) for the site. In correspondence dated December 13, 2002, VDEQ requested Virginia Tech conduct a site risk and remediation assessment for the release and submit a Site Check/Limited Site Characterization Report (SC/LSCR).

In May 2003, Draper Aden Associates collected samples from six borings for TPH-DRO analysis. Based on the results of the SC/LSCR sampling, additional sub-surface investigation was conducted in March 2004. The SC/LSCR presenting this work was submitted to VDEQ in June 2004. Further remedial activities and environmental monitoring is ongoing at the site in accordance with VDEQ regulations.

3.26.2 Nature and Extent of Impact, If Any

Soil sample analytical results and observations made by Draper Aden Associates personnel during vent well installation in December 2002 and site characterization activities in May 2003 indicated that the petroleum impact at the Virginia Tech Power Plant UST site appeared to be limited to the soil depth interval of 12-18 feet below ground surface in the vicinity of vent well VW-1 and soil borings B-1, B-2, and B-4. Based on these observations, the petroleum impact was estimated to cover an area of approximately 670 square feet. As the petroleum impact appeared to be limited to soils at a depth of 12-18 feet below ground surface, the volume of petroleum-impacted soil was estimated to be approximately 108 cubic yards, overlain by approximately 298 cubic yards of non-impacted soil.

In March 2004, approximately 143 tons of impacted soil adjacent to the eastern wall of the UST was removed and transported to an off-site treatment facility for disposal. Further excavation beyond the northwest corner of the tank wall was prohibited due to the close proximity to a buried utility line. A 16-inch diameter monitoring and recovery sump was placed in the excavation and backfilled to facilitate further product recovery. The perforation in the UST was located and temporarily repaired by Virginia Tech, thereby eliminating the source of product along the west wall. Current product levels in the UST remain below the point of repair.

Virginia Tech estimates that less than 100 gallons of petroleum was released. Vent well VW-1 has exhibited a maximum of approximately one inch of free product on the water table (depth of perched groundwater is approximately 10 to 15 feet below ground surface at this location; true groundwater aquifer is in the bedrock and is not believed to be impacted based on the results of site characterization). Petroleum was never observed in vent well VW-2; however, vent well VW-2 was paved over and destroyed. Only a petroleum sheen has been observed in the sump.

3.26.3 Current Status of Unit

As directed by the VDEQ in a letter dated February 17, 2010, and subsequent correspondence dated March 18, 2010, the Virginia Tech Power Plant is required to gauge both the sump and vent well VW-1 monthly; sample both VW-1 and VT Drain #1 (the downgradient recipient of the UST footer drain) quarterly; and submit a quarterly report of these activities. **Table 4** summarizes the observed product and water levels at the monitoring locations at the site. The

latest quarterly report was submitted to the VDEQ on December 1, 2010. Copies of the last two post-SCR reports and referenced correspondence are provided in **Appendix C**.

Activities to remediate this fuel release are ongoing and actively overseen by the VDEQ. This facility is in use and this event is described in the Tetra Tech report (Section 6.25). Virginia Tech concludes that no further action is required other than that required by VDEQ.

3.27 AOC 6 – MW-6 – UPGRADIENT WELL AT SWMU 1

AOC 6 is associated with SWMU 1 and is discussed in Section 3.1 of this report.

3.28 AOC 7 – Airport with a 3,000-ft Runway

3.28.1 Unit Description and Background

The Virginia Tech Airport (**Figures 10a and 10b**) was formerly operated by Virginia Tech; the airport is now known as the Virginia Tech Montgomery Executive Airport and is operated by an authority comprised of Virginia Tech, the Town of Blacksburg, and Montgomery County. Virginia Tech owns the airport property and assists with management of wastes generated by the facility.

3.28.2 Nature and Extent of Impact, If Any

AOC 1 is located at the Virginia Tech Airport. In May 1994 a release occurred from an aboveground fuel storage tank as described in Section 3.22 (AOC 1). The release was remediated to the satisfaction of the VDEQ and the site was closed in correspondence from the VDEQ dated November 18, 1994.

3.28.3 Current Status of Unit

The airport is currently operating and all wastes are managed by Virginia Tech. This site is regularly inspected by the VDEQ. Virginia Tech concludes that current management of this area is appropriate and that no further action is required.

3.29 AOC 8 – REMOTE DETONATION SITE

3.29.1 Unit Description and Background

An emergency permit was issued by VDEQ in February 1987 to detonate old peroxides and ethers that were found in some laboratories. The materials were deemed too dangerous to transport to a waste disposal facility. The Virginia state police transported the waste to an offsite facility and detonated the materials. Virginia Tech has no records of the location of the site.

3.29.2 Nature and Extent of Impact, If Any

Any chemicals were destroyed in the detonation; therefore, there is no known impact associated with this site.

3.29.3 Current Status of Unit

Virginia Tech has no records of the location of the site. Virginia Tech requested VDEQ for review of their records; no records were located by VDEQ (VDEQ email included in **Appendix C**). Any chemicals would have been destroyed in the detonation. Virginia Tech concludes that no further action is required.

4.0 DESCRIPTION OF MIGRATION AND EXPOSURE PATHWAYS FOR KNOWN PAST OR CURRENT IMPACTS, RISKS, AND EXPOSURE PATHWAY CONTROLS AND MIGRATION CONTROLS INSTITUTED AT THE FACILITY

Potential migration and human exposure pathways, risks to human health and exposure pathway controls and migration controls for known past or current releases at some of the SWMUs and AOCs discussed in this report are identified in the individual sections discussed in Section 3. Additional general discussion is provided below.

4.1 AIR

Virginia Tech operates a Power Plant, which generates steam for heating the majority of the campus. Several thousand people live on campus and in the areas surrounding the campus. The town of Blacksburg, Virginia has a population of approximately 41,000 according to the Town of Blacksburg website. The closest private residence to the campus (using the Power Plant as a reference point) is located approximately 400 feet to the north. The closest dormitory is located approximately 270 feet east of the Power Plant. The stack height at the Power Plant is 156 feet.

Landfill decomposition gases continue to be monitored and addressed at SWMU 2 (Closed Landfill, VDEQ Permit No. 109) in accordance with VDEQ regulations.

Based on previous investigations and conclusions from those investigations, concentrations of volatile organic target constituents at SWMU 1 and AOC 1 are at such low levels (following completion of remedial and closure work) that unacceptable human exposure to vapors is unlikely. Vapor migration and unacceptable human exposure is not a known concern at the Power Plant UST, AOC 5, based on its physical setting, geological and hydrogeological characteristics. No known vapor migrations potential exists at the other SWMUs and AOCs other than the hazardous waste storage locations (discussed below).

The greatest current hazard for a release of a hazardous material to air would be from a release of hazardous chemicals and waste or incompatible materials from the storage areas. This scenario is unlikely as hazardous chemicals and waste are stored in containers and drums of appropriate integrity. Applicable regulatory and health and safety requirements are followed in chemical and waste storage at the facility. Additionally, the volumes of hazardous waste kept in the storage areas, along with the amount of time they are stored, make the likelihood of a significant hazardous vapor or release low. In October 2010 Virginia Tech opened its state of the art materials management facility which now serves as its main less than 90-day hazardous waste storage area. This further reduces the likelihood of uncontrolled air emissions from hazardous waste storage at Virginia Tech.

No uncontrolled/unpermitted air emissions at Virginia Tech have been observed or documented. In conclusion, uncontrolled migration of chemical constituents through vapors nor unacceptable human exposure to impacted vapors or harmful gases are not known to exist at this facility. While the possibility exists, the potential for uncontrolled release or migration of harmful vapors and gases from the SWMUs and AOCs identified at the facility are low. Where required air

emissions control measures exist, and air monitoring and/or remediation is ongoing. No further action is required.

4.2 SOIL

Three releases are known to have impacted the soil at Virginia Tech; all have been remediated to the satisfaction of VDEQ. Impacted soils were replaced with clean fill in each case. Historic construction debris discovered during storm water line installation was removed and disposed offsite in accordance with the regulations and replaced with clean fill (SWMU 1, discussed in Section 3.1). Soil impacted by a release of aviation fuel at the Virginia Tech Airport was remediated in accordance with VDEQ regulations (AOC 1, discussed in Section 3.22). Soil impacted by a petroleum release at the underground storage tank vault near the Power Plant was removed and disposed offsite in accordance with the regulations and replaced with clean fill and/or remediated in accordance with VDEQ regulations (AOC 5, discussed in Section 3.26). Other minor soil impacts from other small/minor spills have also been addressed to the satisfaction of VDEQ in accordance with applicable regulations.

All hazardous chemicals and wastes currently stored at the facility are stored in areas that are provided with an impermeable surface (concrete or asphalt) and most have secondary containment. The chemicals and wastes are also stored in containers and drums of appropriate integrity, and the volumes of hazardous chemicals and waste kept at the facility, along with the amount of time they are stored, make a release to soil unlikely. Applicable regulatory and health and safety requirements are followed in chemical and waste storage at the facility. In October 2010 Virginia Tech opened its state of the art materials management facility which now serves as its main less than 90-day hazardous waste storage area. This further reduces the likelihood of uncontrolled spill from hazardous waste storage at Virginia Tech.

In conclusion, Virginia Tech is not aware of any soil impacts that have not been addressed in accordance with the regulations to the satisfaction of VDEQ or that exceed applicable regulatory threshold criteria based on site use conditions and risk of exposure. Minor subsurface soil impacts may exist at SWMU 1 however the results of the previous studies completed in 1993 and 2002 indicate that the observed concentrations of target constituents were below the applicable risk-based concentrations based on the site use conditions and lack of risk of exposure. While the possibility exists, the potential for spills and releases that may cause soil impacts from the SWMUs and AOCs identified at the facility are low due to the appropriate preventative measures in place to address such spills and releases. Should any such spills however occur, Virginia Tech has the personnel, equipment, material and processes in place to address them in accordance with applicable regulations. No further action is required at this time.

4.3 SURFACE WATER

Due to the topography of the Blacksburg Area, the Duck Pond on the Virginia Tech campus receives waters from storm water sewers and runoff from streets and properties throughout the Town of Blacksburg (including the Virginia Tech campus). Two branches of Stroubles Creek flow through parts of the Virginia Tech campus and drain into the Duck Pond, which is located on the western edge of campus. Portions of the Virginia Tech campus are located within the

100-year floodplain of Stroubles Creek. Stroubles Creek continues on from the Duck Pond to the New River, which is located approximately 5.5 miles from the campus.

Stroubles Creek is listed as an impaired waterway for biological activity due to non-point source activities such as agriculture, storm-water runoff, and erosion. The impaired stream segment on Stroubles Creek, as delineated by the VDEQ, extends from the outlet of the Duck Pond to the confluence of Wall Branch to the west.

Several minor releases to surface water have occurred over the years at Virginia Tech; each of which has been properly addressed, including the following:

- 1994 Release of manure, restroom waste, and storm water discharge to Stroubles Creek – release was ceased and no impacts to the Stroubles Creek were documented (SWMU 6, discussed in Section 3.6).
- 1994 Hydraulic Fluid Release from Wind Tunnel – approximately 600 gallons of hydraulic fluid was released into storm sewers, some of which eventually reached the Duck Pond. Most of the material was contained at the source (AOC 4, discussed in Section 3.25).
- 1995 Petroleum Release from the Power Plant – 1,400 gallons of fuel oil released from the Power Plant, causing a sheen on the Duck Pond, and was remediated. Most of the material was contained at the source (AOC 2, discussed in Section 3.23).
- 2002 Petroleum Release from the VT Power Plant – Less than 100 gallons of fuel was released from a hole in a concrete fuel vault. The fuel level has been lowered to keep it below the hole. Remedial activities and monitoring are ongoing in accordance with VDEQ regulations (AOC 5, discussed in Section 3.26).

Numerous geese and other waterfowl also frequent the Duck Pond, which contributes to elevated *E. coli* concentrations at the pond. Minor releases on Virginia Tech's campus that have reached the Duck Pond have been addressed immediately. Most of the releases from Virginia Tech have been contained for the most part at the source, thereby reducing the impact to the Duck Pond. The Duck Pond has also received minor releases from offsite properties in the town of Blacksburg. The responsible parties, with Virginia Tech input, have addressed these incidents (AOC 3, discussed in Section 3.24).

Virginia Tech and VDEQ have initiated corrective measures for Stroubles Creek, including monitoring and construction of water quality ponds. In addition, the Town of Blacksburg's Creek Valley Overlay District protects the riparian corridors which are most susceptible to soil erosion and runoff along Stroubles Creek (Blacksburg Comprehensive Plan, 2006). A TMDL Implementation Plan for the Upper Stroubles Creek Watershed was approved by VDEQ on May 24, 2006. The TMDL Plan may be accessed for review and use at the following VDEQ website: <http://www.deq.virginia.gov/tmdl/apptmdls/newrvr/stroub.pdf>.

The Duck Pond and Stroubles Creek are monitored by the VDEQ for water quality under the TMDL program. Virginia Tech has dredged the Duck Pond twice over the years to remove excess silt that has accumulated in the pond. An aeration fountain was installed at the pond but was found to be ineffective and its use was discontinued. Virginia Tech installed a boom

attachment system at the Duck Pond so that booms can be deployed quickly to contain a release at the pond. Accidental releases to the Duck Pond and Stroubles Creek are contained and remediated should they occur.

All hazardous chemicals and wastes are currently stored inside Virginia Tech buildings or are stored in secondary containment with an impermeable surface (concrete or asphalt). The chemicals and wastes are also stored in containers and drums of appropriate integrity, and the volumes of hazardous chemicals and waste kept at the facility, along with the amount of time they are stored, make an uncontrolled release to surface water unlikely. Applicable regulatory and health and safety requirements are followed in chemical and waste storage at the facility. In October 2010 Virginia Tech opened its state of the art materials management facility which now serves as its main less than 90-day hazardous waste storage area. This further reduces the likelihood of uncontrolled spills from hazardous waste storage at Virginia Tech.

In conclusion, Virginia Tech is not aware of any surface water impacts that have not been addressed in accordance with the regulations to the satisfaction of VDEQ. While the possibility exists, the potential for spills and releases that may cause surface water impacts from the SWMUs and AOCs identified at the facility are low due to the appropriate preventative measures in place to address such spills and releases. Should any such spills however occur, Virginia Tech has the personnel, equipment, material and processes in place to address them in accordance with applicable regulations. No further action is required at this time.

4.4 GROUNDWATER

Several minor releases of petroleum products have occurred over the years at Virginia Tech; each of which has been properly addressed.

The following SWMUs and AOCs are known to have impacted groundwater at Virginia Tech:

- SWMU 1 – Former Physical Plant Area, discussed in Section 3.1.
- SWMU 2 – Closed Sanitary Landfill (VDEQ Permit No. 109), discussed in Section 3.2.
- AOC 1 – Virginia Tech Airport, discussed in Section 3.22.
- AOC 5 – 2002 VT Power Plant Fuel Release, discussed in Section 3.26.

The groundwater impacts at the units listed above have been remediated to the satisfaction of the VDEQ (SWMU 1 and AOC 1), or are currently undergoing corrective action under active VDEQ oversight (SWMU 2 and AOC 5). Minor groundwater impacts continue to exist at SWMU 1; however the observed chemical concentrations in groundwater are below EPA MCLs (for constituents with primary MCLs) or EPA Region 3 RSLs (for constituents without MCLs).

Groundwater is not currently used as a potable or irrigation water supply at Virginia Tech; potable water is supplied to the site and the surrounding area by the Blacksburg-Christiansburg-VPI Water Authority and withdrawn from the New River (intake is located approximately 5 to 6 miles from the Virginia Tech campus). The closest part of the New River is located approximately 5.5 miles from the Virginia Tech campus (center of campus – Drill Field).

All hazardous chemicals and wastes are currently stored inside Virginia Tech buildings or are stored in secondary containment with an impermeable surface (concrete or asphalt). The chemicals and wastes are also stored in containers and drums of appropriate integrity, and the volumes of hazardous chemicals and waste kept at the facility, along with the amount of time they are stored, make an uncontrolled release to groundwater unlikely. Applicable regulatory and health and safety requirements are followed in chemical and waste storage at the facility. In October 2010 Virginia Tech opened its state of the art materials management facility which now serves as its main less than 90-day hazardous waste storage area. This further reduces the likelihood of uncontrolled spills from hazardous waste storage at Virginia Tech.

In conclusion, Virginia Tech is not aware of any groundwater water impacts that have not been addressed or continue to be addressed in accordance with the regulations to the satisfaction of VDEQ. Based on site use conditions (no groundwater use at Virginia Tech), no permanent exposure pathways exist. Based on site use conditions and site hydrogeology no uncontrolled temporary exposure pathways are known to exist or are likely in future. Where groundwater concentrations exceed applicable regulatory threshold criteria, remedial action and environmental monitoring is ongoing. No further action is required at this time.

4.5 SITE ACCESS

Virginia Tech employs a nationally accredited police force and a parking services department, which requires parking permits for all employees, students, and visitors. Areas where hazardous materials are stored are locked or have restricted access.

5.0 ENVIRONMENTAL INDICATOR ASSESSMENT

5.1 HUMAN EXPOSURE

Environmental Indicator (EI) form CA-725 was completed in accordance with EPA guidance based on data and current conditions known to date, and is included in **Appendix A** of this report. As described in Sections 3 and 4 of this report Virginia Tech makes a “YE” (Current Human Exposures Under Control) determination to Question 6 of the form, i.e., a positive “Current Human Exposures Under Control” EI determination indicating that as far as the facility is aware there are no “unacceptable” human exposures to “contamination” (i.e., no known human exposure to contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all “contamination” subject to RCRA corrective action at or from the identified facility), as these terms are defined in Form CA-725.

5.2 GROUNDWATER MIGRATION

Environmental Indicator (EI) form CA-750 was completed in accordance with EPA guidance based on data and current conditions known to date, and is included in **Appendix A** of this report. As described in Sections 3 and 4 of this report Virginia Tech makes a “YE” (Migration of Contaminated Groundwater Under Control) determination to Question 8 of the form, i.e., a positive “Migration of Contaminated Groundwater Under Control” EI determination indicating that as far as the facility is aware migration of “contaminated” groundwater has stabilized, and that monitoring will be conducted to confirm that “contaminated groundwater” remains within the original “area of contaminated groundwater or within property boundaries” (for all groundwater “contamination” subject to RCRA corrective action at or from the identified facility), as these terms are defined in Form CA-750.

6.0 IMPLEMENTATION OF INTERIM MEASURES

Based on the current conditions for the SWMUs and AOCs presented in this report, there are no known uncontrolled nor unacceptable risks to human health and/or the environment. Therefore, there are no interim measures that require implementation associated with this report. However, when required in the past, remedial/corrective measures and monitoring activities have been implemented and completed in accordance with VDEQ programs as described in previous sections. Where required corrective action and associated monitoring is ongoing and impacts are being addressed such as at SWMU 2 and AOC 5, in accordance with VDEQ programs.

7.0 DATA GAPS

Virginia Tech is not aware of any data gaps that would be required to be addressed under a future RCRA Facility Investigation (RFI). However some old historical documentation may not be available; in such cases Virginia Tech has addressed these documentation gaps through alternative documentation and/or alternative evidence. Where known impacts exist that require further action they are being addressed under VDEQ programs. Such impacts are being mitigated, remediated, monitored and/or controlled at the property boundaries.