improvements (such as schools), and cost control through significantly reduced solid waste disposal costs, and a long-term disposal solution. The proposed project will be able to accomplish these goals while eliminating, avoiding, and/or mitigating potential negative impacts to the surrounding community. By completing the permitting process for all of the required operating permits, the Facility will have planned, designed and undergone regulatory review of proposed controls to adequately protect both human and environmental health and safety.

1.1 Introduction

The Green Ridge Recycling and Disposal Facility, LLC (Green Ridge) is seeking approval to construct and operate a privately-owned solid waste disposal facility (Facility) in Cumberland County (County), Virginia. The proposed sanitary landfill will provide an environmentally sound and responsible solid waste management solution, addressing the need for cost-effective disposal of non-hazardous solid waste. The siting, permitting and operations of the proposed Facility shall be in accordance with the *Virginia Solid Waste Management Regulations* (*VSWMR*), which are implemented and enforced by the Virginia Department of Environmental Quality (DEQ). This LIS has been prepared in accordance with 9 VAC 20-81-460 H and applicable Submission Instructions developed by the Virginia Department of Environmental Quality (DEQ).

This LIS is one piece of a larger application package for the Part A Permit submission (Attachment XVII of the Part A). Throughout this document, references will be made to Appendices, which will refer to material supplemental to this impact statement. References to Attachments shall refer to the overall Part A Permit submission package and its various sections that align with the submission instructions. Obtaining a permit for a solid waste management facility from the DEQ involves submitting the Part A Permit package, including a Notice of Intent that can be submitted prior or concurrently, and submitting a Part B Permit package subsequent to the Part A. The Part A Permit Application is intended to address requirements for general siting criteria (setback from public water supplies, parks and recreational areas, schools, homes, etc.) and demonstrate that the proposed Facility: is located in a geologically stable region; does not adversely impact rare, threatened or endangered species; and can be reasonably monitored for groundwater impacts between the proposed Disposal Unit Boundary and the overall Facility Boundary. The Part B Permit application pertains to the engineering related items and addresses the detailed design, operating plans, construction quality assurance plans, closure and post-closure plans, and financial assurance.

2.0 PURPOSE OF AND NEED FOR ACTION

The purpose of a Landfill Impact Statement (LIS) is to identify the potential environmental impacts to existing parks and recreation areas; wildlife management areas; critical habitat areas of endangered species as designated by applicable local, state, or federal agencies; public water supplies; marine resources; wetlands; historic sites; fish and wildlife; water quality and tourism that could result from the construction and operation of a proposed sanitary landfill. The potential impacts, or lack thereof, are discussed in further detail in Section 4.0, Affected Environments of The Selected Alternative.

3.0 ALTERNATIVES, INCLUDING THE SELECTED ALTERNATIVE

The following section outlines the actions taken and factors considered by County Waste of Virginia, LLC ("County Waste") and Green Ridge Recycling and Disposal, LLC ("Green Ridge") in evaluating alternative sites prior to choosing the one undergoing permitting. Green Ridge is a subsidiary of County Waste. County Waste initiated the planning for this project including alternative site evaluations, then passed the permitting to Green Ridge after Green Ridge was approved by the State Corporation Commission as an LLC on May 10, 2018.

In general, when considering the permitting of a new landfill there are three broad categories of alternatives that can be considered. They are:

- Alternative 1 – Take no action – Use existing capacity in other facilities;
- Alternative 2 – Purchase an already permitted landfill; or
- Alternative 3 – Permit a new landfill.

As set forth below, permitting a new landfill on the subject property is the best and only feasible option among the alternatives available.

All figures referenced in this discussion can be found in **Appendix LIS-1.**

3.1 Alternative 1 – No Action – Use Existing Capacity in Other Facilities

County Waste serves over 320,000 customers in Virginia. As part of this application, Green Ridge's Notice of Intent includes a detailed discussion demonstrating the need for a new landfill in Virginia. As explained in that discussion, a new landfill would not only protect County Waste's interests and those of its hundreds of thousands of customers, but would also ensure a competitive environment in the solid waste disposal industry in Virginia, helping to control future costs for local governments and other agencies and institutions, as well as Virginia businesses and residents generally. (Currently in Virginia, almost 88% of private landfill capacity is controlled by just two companies and that will likely increase to about 99% within the next six years.)

As also explained in Green Ridge's Demonstration of Need, less than 20 years of permitted landfill capacity exists in Virginia when waste streams are projected, the remaining life in existing facilities is evaluated, and the substantial future increase in out of state waste is accounted for.

In addition, the proposed landfill would provide much needed revenues to Cumberland County and drastically reduce its disposal costs.

Based on the need for additional landfill capacity in Virginia, the importance of County Waste's ability to serve its Virginia customers, and the advantages a landfill provides to Cumberland County, Alternative 1 was omitted from further consideration.

3.2 Alternative 2 – Purchase of an Already Permitted Landfill

County Waste first considered purchasing an existing permitted and operating landfill in Virginia. To that end, County Waste approached various landfill owners and considered multiple disposal facilities; however, confidentiality precludes identifying the specific landfills approached. Despite its efforts, County Waste could not find an operating landfill with sufficient remaining capacity that was suitable for purchase and would meet County Waste's long-term goals.

In addition to inquiring about currently operating landfills, County Waste contacted Republic Services, Inc. about purchasing its property in Cumberland County that was permitted by VDEQ as a sanitary landfill, but never constructed. **Figure 1** illustrates the location of the Republic Services site in relation to the Green Ridge site currently undergoing permitting, and **Figures 3A and 3B** provide additional details. During discussions, County Waste discovered that Republic would only sell its property with a restriction on the deed that would prohibit a landfill. Since initial discussions with Republic, the permit for that facility has been terminated.

Finally, purchasing an existing landfill would not address the overall projected lack of capacity in Virginia.

Based on the lack of available facilities, and the termination of the Republic permit, Alternative 2 was omitted from further consideration.

3.3 Alternative 3 – Permit A New Landfill

County Waste's hauling companies collect in excess of 3,200 tons per day of municipal solid waste in Virginia, which is mostly generated in Central and Southwest Virginia. County Waste is expanding, and anticipates that it may be collecting up to 5,000 tons of waste per day in projected growth plans as its network of collections continues to increase, further underscoring the need for additional disposal capacity. To reduce costs and better serve its Virginia customers, County Waste has determined that it needs to own a landfill to protect its interests and those of its customers. Without such a landfill, the waste collected by County Waste must be directed primarily to landfills owned by County Waste's competitors. County Waste would therefore not be able to control tipping fees and in turn could not control costs for its customers. Given the lack of competition in the market and the limited number of disposal facilities in the Commonwealth, private tipping fees will escalate significantly over the next ten years, to the detriment of local governments, businesses, and residents. Indeed, tipping fees have already begun to rise.

Given the duopoly that currently controls private landfills in Virginia and the projected decline in disposal capacity that County Waste predicts will occur, County Waste /Green Ridge began to search for a property on which to build a new landfill in Virginia. That process had two phases. The first phase was to identify a locality that would embrace the Facility; the second phase was to identify sites within an interested locality.

During its initial search over the course of several years to find a host locality, County Waste contacted multiple communities in locations suitable to receive waste from Central Virginia. Confidentiality precludes

identifying the specific localities approached. Ultimately, the search narrowed to Cumberland County for two reasons:

- First, the County had previously indicated its interest in a private landfill in the County (i.e., the Republic facility). The County had approved all the required zoning and a conditional use permit for a municipal solid waste facility, signed the local government certification required by DEQ, and executed a Host Agreement. (As indicated earlier, this landfill was permitted by DEQ but never constructed, and the permit has now been terminated.)

- Second, the County continued to be interested in a private landfill because it needed to replace the substantial revenues that would have resulted from the Republic facility, revenues upon which the County had depended in making substantial capital improvements. (Among other things, the County incurred tens of millions of dollars of debt to build a new high school in reliance on the receipt of the fees set forth in the Republic Host Agreement.) A new landfill would offset deficits in the County's annual budget, reduce the County's waste disposal costs, fund much needed capital projects and avoid the possible loss of public services to Cumberland residents because of County budget shortfalls and fiscal constraints.

Based on the continued interest of the Cumberland County Board of Supervisors, County Waste /Green Ridge considered four potential landfill sites in Cumberland County, only one of which was found to meet all necessary criteria. The sites considered reflected the goal of minimizing the landfill's impact on productive agricultural lands, potential development properties, residential properties, the environment and historic resources. The search in Cumberland began by identifying timberland and timber farms prevalent in the County. **Figure 1** illustrates the general location of the four sites in relation to the previously permitted Republic site.

A short description of each site follows.

3.4.1 Alternate 1: Old Buckingham Road (Route 13) (Figures 2A and 2B)

The Alternate 1 site is approximately 780± acres in size. Trucks accessing the site would travel west on Route 60 and most likely turn south onto Route 13. Access into the site would be directly from Route 13 and is approximately 3 miles from Route 60. The intersection of Route 13/Route 60 would need improvements. As an alternative, trucks could exit Route 60 further east onto Route 682 and then onto Route 13. A detailed evaluation, and discussions with VDOT made it apparent that both the intersection at Route 60 and the intersection at Route 13 would require significant upgrades if this site were selected.

The site is heavily dissected by streams with Little Guinea Creek running through the southern portion of the site. Because of this, significant wetlands are present in the southern part of the property.

A general overview of the potential historic resources on this site was completed by Browning and Associates. The report is contained in **Appendix LIS-2F**. The findings in that report indicate that the *"prehistoric potential for the three alternatives is much higher than for the chosen alternative (Green Ridge)*

due to the presence of watercourses that penetrate inland from larger water courses."……(Page 15) *"Combining the potential archaeological sites for each of the alternatives, Alt 1, Alt 2, Alt 3, all have a higher potential for the presence of archaeological sites based upon standard settlement models than the chosen alternative."* (Page 16)

As the smallest of the sites considered, it contains the least usable acreage.

Because of the limited development acreage, the presence of Little Guinea Creek, the need for significant road improvements, and extended truck travel along secondary routes, the site was eliminated from further consideration.

3.4.2 Alternate 2: West of Clinton (south of Route 601) – Frenchs Store Road (Figures 3A and 3B)

The Alternate 2 site is approximately 1089± acres in size. Trucks accessing the site would travel east on Route 60 and turn south from Route 60 into the site. The site has a limited boundary on Route 60, and access through this area would be directly across from Route 601. Additional property or an alternate access into the site would need to be considered. The site also abuts Route 654 (Frenchs Store Road) approximately 3,000± feet south of Clinton. Frenchs Store Road is almost immediately across from Pinegrove Road, and improvements at the intersection of Route 654 and Route 60 would be needed, but may not be possible given the location. There are also a number of homes along this stretch of Route 654.

Route 654 divides the property in the southern area, leaving approximately 15% - 20% of the site south of the road and unusable.

The site is dissected by streams (Mill Creek runs through the southern part of the property), and because of this, wetlands are present in the south part of the property just north of Route 654, removing further acreage from availability.

A general overview of the potential historic resources on this site was completed by Browning and Associates. The report is contained in **Appendix LIS-2F**. The findings in that report indicate that the *"prehistoric potential for the three alternatives is much higher than for the chosen alternative (Green Ridge) due to the presence of watercourses that penetrate inland from larger water courses."*…… (Page 15) *"Combining the potential archaeological sites for each of the alternatives, Alt 1, Alt 2, Alt 3, all have a higher potential for the presence of archaeological sites based upon standard settlement models than the chosen alternative."* (Page 16)

More usable acreage exists on this site than the Alternate 1 site. However, because of the difficulty with access to and from Route 60 or Route 654, limited setback from these roads for waste disposal, division of site by Mill Creek and Route 654, and the proximity to Clinton, the site was eliminated from further consideration.

3.4.3 Alternate 3: Guinea Mills (Figures 4A and 4B)

The Alternate 3 site is approximately 1,990± acres in size, but actual usable acreage is much smaller as discussed below. Trucks accessing the site would travel west on Route 60 and turn south from Route 60 onto Route 45 (Cumberland Road), then travel along Route 45 for approximately 4 miles to enter the site from Route 45 west of Guinea Mills. Route 60 at the intersection with Route 45 is divided and would probably require improvements for the additional truck traffic. Route 45 connects Route 60 to Farmville and is heavily trafficked. Thus, significant improvements would likely be needed at the entrance to the site.

The site is the furthest west of all the sites evaluated and is located near the Buckingham County line. Traffic from the east (the majority of the traffic) would travel through Cumberland Courthouse and past the primary entrance to the County schools.

The site is heavily dissected by streams. Significantly, the Willis River and its flood plain/wetlands divide the site in half. Access to the eastern half of the site would be as described above. Access to the western half of the site would require trucks to continue on Route 45 and to turn west on to Route 634. Further study of the bridge over the Willis River on Route 634 would be required to determine if it has the capacity for the volume of truck traffic, or if improvements would be needed. Route 634 divides the western side of the site in half, and there is a major utility corridor running north – south through this site as well. Because of the complications present in the western side of the property, only the eastern area is considered viable, but the eastern area is compromised by streams and has limited development area. In addition, development of the eastern half would push waste disposal closer to Route 45.

A general overview of the potential historic resources on this site was completed by Browning and Associates. The report is contained in **Appendix LIS-2F**. The findings in that report indicate that the *"prehistoric potential for the three alternatives is much higher than for the chosen alternative (Green Ridge) due to the presence of watercourses that penetrate inland from larger water courses."*…… (Page 15) *"Combining the potential archaeological sites for each of the alternatives, Alt 1, Alt 2, Alt 3, all have a higher potential for the presence of archaeological sites based upon standard settlement models than the chosen alternative."* (Page 16)

This site also has the potential for Willis River navigation structures (historic resources) and needs at least one bridge or ford. In addition, per the Browning report, this property has a *"very high probability of structures that were extant during the Civil War and thus possibly as early as the first round of land patents for the County."*

Because of the presence of the Willis River, the high probability of historic resources, the division of the site by various features, access, and the site's location on the western side of the County, the site was eliminated from further consideration.

3.5 Proposed Green Ridge Recycling and Disposal Facility Site (Figure 5)

The Green Ridge Recycling and Disposal Facility site is approximately 1,178 ± acres in size. The parcels combined for the site include American Timberland properties and some individual holdings. The site has been heavily timbered and disturbed historically.

Trucks accessing the site will travel west on Route 60 and, and immediately after crossing the Powhatan County Line, turn north onto a private road which will be constructed by Green Ridge. This road will be approximately 1 mile in length, thereby enabling the landfill to achieve separation from Route 60. Scales and infrastructure are to be located away from Route 60, to the south and east of Miller Lane, allowing for significant queuing space for traffic entering the site. Improvements at the intersection of this private road and Route 60 will be needed. VDOT has reviewed the traffic impact statement and conceptually agrees with the preliminary layout for the entrance.

The expected disposal unit will be approximately 4,200 feet from Route 60 (straight- line distance). Usable acreage for disposal is approximately 500 acres, or a little less than half the site, with sufficient room for buffers, internal roads, soil borrow areas, stormwater management, leachate handling and future active gas system installation in the remaining acreage.

The site is dissected by streams to a lesser extent than the other sites, with NWI wetlands identified in the northern area. Although wetland delineations have been performed on the proposed site, for consistency with comparison to the other alternate sites, only NWI information is illustrated on the mapping in Figure 5. The site is bounded on the north and northwest by Muddy Creek (and one of its unnamed tributaries). Muddy Creek ultimately flows into the James River over 5 miles northeast of the site. The site is bounded on the east by Miller Lane. Maple Swamp Creek is located on the far eastern side of Miller Lane.

Pinegrove Road and Miller Lane will require some re-alignment during development of the site. Re-alignment will require coordination with VDOT and Cumberland County. VDOT has indicated conceptual agreement with the realignments proposed.

As expected with any site of this size, some historic resources have been identified that will be addressed when developing the site. Phase 1A and Phase1B historic resource inventories have been completed, with some areas identified for further investigation. Per the Browning and Associates report, *"Combining the potential archaeological sites for each of the alternatives, Alt 1, Alt 2, Alt 3, all have a higher potential for the presence of archaeological sites based upon standard settlement models than the chosen alternative."* (Page 16). The Pine Grove School, a Rosenwald structure, is located to the west of the property on the western side of Pinegrove Road.

All sites considered had some residential properties located in their vicinity. At the Green Ridge Site, most properties with residences are located on the eastern side of the site along Miller Lane. Included in the Host Agreement with Cumberland County is a property value protection plan available for property owners of certain identified properties who believe they would be impacted by development of the landfill and who meet certain criteria outlined in the protection plan.

This site has the best access of the alternatives, the most usable disposal space, and sufficient acreage for infrastructure and support operations. It has the longest access road, which will allow sufficient queuing space for incoming vehicles and push the waste disposal operations away from Route 60.

As is typical for properties of the size needed for this landfill, all sites considered had wetlands and were dissected by streams, which is a function of the underlying geology. Design of the Green Ridge Facility includes minimal impact to streams; however, wetlands will not be directly impacted.

For the reasons identified above, this site was chosen for the Green Ridge Recycling and Disposal Facility.

4.0 AFFECTED ENVIRONMENTS OF THE SELECTED ALTERNATIVE

In accordance with 9 VAC 20-81-460 H, the purpose of the LIS is to document potential environmental impacts to the resources referenced in the regulations and in Section 4 of this report, within a 5-mile radius of the Facility. This section of the report evaluates resources, including parks and recreation areas, wildlife management areas, critical habitat areas of endangered species as designated by applicable local, state, or federal agencies, public water supplies, marine resources, wetlands, historic sites, fish and wildlife, water quality and tourism. In addition, appropriate state agencies were contacted to request their opinion on the impact of the Facility on the specific resources listed above. This section of the report also presents the findings of those agencies. Potential impacts (if any) and resolutions to each potential impact are discussed below. A five-mile radius map showing the resources is provided as **PTA Attachment IX-Figure 3- Regional Map**.

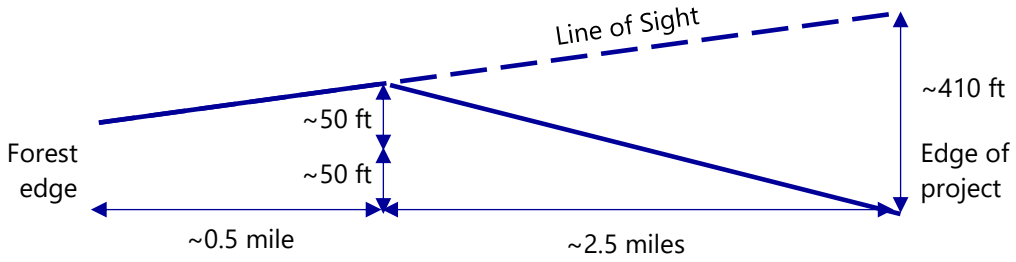
4.1 Parks and Recreation Areas

An online request for information services was submitted to the Department of Conservation and Recreation (DCR) for the project site, to identify surrounding Parks and Recreation areas within a two-mile radius. The response letter dated June 14, 2019 from DCR is included in **Appendix LIS-2A**. As stated in the letter, DCR reviewed the surrounding area and responded that there were no documented natural heritage resources within two miles of the project boundary, and that there are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity. An additional request was submitted to expand the area of interest to a 5-mile buffer around the site. The response from DCR is presented in **Appendix LIS-2A.**

As depicted on **PTA Attachment IX – Figure 2- Regional Map**, portions of the Cumberland State Forest fall within five miles of the project site. The Cumberland State Forest is managed by the Virginia Department of Forestry. The proposed project is not anticipated to have an impact on the forest. Below are four factors that were considered in evaluating the potential impacts that are typical concerns related to landfills, including visual, traffic, odor and vectors.

Visual: The edge of the forest is approximately three miles west of the proposed landfill site. State Route 45 is approximately 2.5 miles west of the site and loosely follows a ridgeline between the site and the forest. The elevation difference from the edge of the forest and the ridgeline is approximately 50 feet of rise according to the USGS 7.5' Topographic Quad, Whiteville. This same topo map indicates that there is at least 100 feet of fall from the ridgeline to the proposed base of the project. This change in elevation, the ridgeline, and the surrounding trees that make up the forest provide a visual buffer that is anticipated to eliminate any visual impact to the forest.

Based on the geometry explained above, a person standing at the edge of the forest, looking up at the ridge line toward the proposed project (provided conditions are conducive to seeing three miles), would be looking at a point that is approximately 410' above the existing grades in the area of the proposed facility. This assumes that the line of sight from the edge of the forest to the ridgeline is unimpeded by any trees. Below is a sketch depicting the geometry discussed herein.



Traffic: It is anticipated that most of the traffic related to the proposed site will come from the east. Since the forest is west of the site, impacts to the forest from landfill traffic are anticipated to be minimal along Route 60, with no detrimental impact anticipated on the local routes around and through the State Forest due to little to no new traffic in the area created as a result of this project.

Odor: Green Ridge, through its Host Agreement with Cumberland County, has pledged to not accept many common waste types that contribute to odors that can be emitted from a landfill. The materials that are deemed unacceptable at the Facility include sludge, fly ash, drywall, and material amounts of animal carcasses during a one-day period. Additional best management practices will be employed by the Facility to reduce and/or eliminate odors. These will include the installation and operation of a landfill gas extraction system, daily cover, the use of rain cover, and partial closure of completed disposal phases. The gas extraction system will harvest the gas, and use the gas to either produce electricity, or in an evaporator system designed to reduce the quantity of leachate that needs to be treated.

Vectors: Vectors (including rodents, birds, insects) will be managed through many of the same best management practices that are used to control odors. These will include the use of daily cover, minimizing the working face to the smallest size practical, employing rain covers, and partial closure of completed portions of the landfill. Green Ridge will also seek outside vendors to assist with pest management should a situation arise where this is necessary.

4.2 Wildlife Management Areas

Wildlife Management Areas in Virginia are managed by the Department of Games and Inland Fisheries (VDGIF).

Their website locator map: (https://www.dgif.virginia.gov/wp-content/uploads/wmalocator.pdf) shows that there are no wildlife management areas as managed by VDGIF in Cumberland County. A copy of that map is included in **Appendix LIS-2B**.

The United States Forest Service does not have any wildlife management areas in Cumberland County.

In addition, a Threatened and Endangered Species review was conducted by Koontz Bryant, Johnson Williams. Their Summary report (dated December 9, 2019) is presented in **Appendix LIS-2G.**

4.3 Public Water Supplies

Pursuant to the requirements of Code of Virginia §10. 1-1408.4.B.3 no new sanitary landfill shall be constructed within 3 miles upgradient of any existing surface water or groundwater public water supply (PWS) intake or reservoir (unless certain criteria, monitoring requirements, and design considerations are met). Under no circumstances will any new sanitary landfill be permitted within one mile of any public water supply system.

A "*public water supply*" or "*community water system*" (C) is defined in the Virginia Department of Health (VDH) regulations as serving more than 25 year-round residents, or having at least fifteen service connections. This is the type of water system commonly understood to be a "*public water system*".

Additionally, water systems serving the same population daily, but in a non-residential setting, (e.g. schools) are classified as a non-transient, non-community public water system (NTNC). Water systems serving a transient population in a non-residential setting (e.g. restaurant or campground) are classified as a transient, non-community public water system (NC). Standards for each of these three system types are different, with the highest standards set for the community water systems (C).

VDH records were searched for all three forms of public water systems in Cumberland and Powhatan counties. A list of the systems is included in **Appendix LIS-2C**. Goochland County was not included in the search because it is located more than five miles from the Green Ridge Facility boundary (regulatory requirement). Goochland County is also north of the James River, which is a presumed hydrologic divide and barrier to groundwater flow from areas south of the River.

In addition to the records search, a review of aerial photography on Google Earth was conducted, looking for evidence of land uses indicating a public water system. Following this aerial review, a windshield survey was completed along public roads within five miles of the Green Ridge Facility boundary.

A total of 28 public water systems within Cumberland and Powhatan counties were identified and plotted, to determine location and distance relative to the Facility's Waste Management Boundary (WMB). Per DEQ *Solid Waste Permitting Submission Instructions* (IV.D.3, and §9 VAC 20-81-120.C3,120.I, and 460.H.), all public water systems within five miles of the WMB are shown on **PTA Attachment IX- Figure 3 - Regional Map**. Based on this analysis, the Green Ridge Facility is not located upgradient of, nor within three miles of any public water systems.

The Virginia Department of Health - Central Office also conducted a similar review and confirmed these findings (see email in **Appendix LIS-2C**). **No public water systems are located within three miles of the Green Ridge Facility, and only one public system is located within a five-mile radius of the WMB.**

4.3.1 Public Water Systems Within Five Miles

Fairview Farm Events (PWSID# 4145170) is located on Ballsville Road in Powhatan, Virginia. The supply well is located 3.96 miles southeast of the closest point of the WMB, and 3.06 miles from the closest point of the Green Ridge Facility boundary (access road off Route 60). This is a transient, non-community system (NC - lowest level of regulation) with a groundwater source, a listed service population of 30, and a source capacity (Well No.1) of 5,760 gallons per day (gpd). However, the system only has a permitted flow capacity of 215 gpd, based on design factors.

The supply well was completed on April 19, 2016 by Anderson Well Drilling and was constructed to a total depth of 423 feet, with 72 feet of PVC casing grouted to a depth of 50 feet. Pump testing results indicated a yield of 4.6 gpm after 24 hours of pumping, with a static water level of 22 feet. The VDH Engineering Description Sheet describing the water system, the well drilling log, and the pump testing results are included in **Appendix LIS-2C**.

The Green Ridge Facility is over three miles from, and *NOT upgradient* of the Fairview Farm Events public water system. Two natural drainage systems separate the Green Ridge Facility from the Fairview Farms Events water system: Maple Swamp Creek and Deep Creek, both serving as hydrologic divides and barriers to flow between the two sites. Topography indicates surface and groundwater flow at Fairview Farm Events is northward to Deep Creek, in the direction of the Green Ridge Facility. There will be no impact to this public water system from the Green Ridge Facility.

4.3.2 Additional Systems Worth Noting > 5 Miles

No other public water systems were identified within the five-mile radius of the WMB, however there are a few other water systems worth noting at this time, addressing in advance any potential questions or concerns that may arise during the permitting process.

Cozy Acres Campground (PWSID# 4145080) is located approximately 6 miles east of the Green Ridge Facility along Ridge Road in Powhatan, Virginia. One groundwater well supplies the system and is located 5.71 miles southeast of the closest point of the WMB. This is a transient non-community system (NC - lowest level of regulation) with a groundwater source, although there is no information available on the well construction. The VDH Engineering Description Sheet is included in **Appendix LIS-2C**. The design capacity is 5,700 gpd, serving 144 campsites (assumes two persons per site), a bathhouse and a trading post.

The Green Ridge Facility is over five miles from, and *NOT upgradient* of the Cozy Ares Campground public water system. Four natural drainage systems separate the Green Ridge Facility from the Cozy Acres Campground water system: Maple Swamp Creek, Deep Creek, Moore Creek and an unnamed tributary to Deep Creek. All of these drainages combine to provide a distinct hydraulic barrier to flow between these locations. Topography indicates surface and groundwater flow at Cozy Acres Campground is westerly to the unnamed tributary to Deep Creek, in the direction of the Green Ridge Facility. There will be no impact to this public water system from the Green Ridge Facility.

Cumberland County Water System (PWSID# 4049150) is located over 7 miles southwest of the WMB along US Route 60 in Cumberland Courthouse, Virginia. Due to its size and its status as a public community water system (C - highest level of regulation), it is worth noting here. The system is supplied by three groundwater wells ranging in depth from 264 to 678 feet, the closest of which is 7.38 miles southwest of the closest point of the WMB. This well is located on Foster Road, behind the Cumberland Courthouse. The system has a greensand filtration system, and a total demand of 185,800 gpd. More information is available about this water system in the VDH Engineering Description Sheet included in **Appendix LIS-2C**.

The Green Ridge Facility is over seven miles from, and *NOT upgradient* of the Cumberland County public water system. Several natural drainage systems separate the Green Ridge Facility from the Cumberland County water system. There will be no impact to this public water system from the Green Ridge Facility.

Lakeside Village (PWSID# 4049400) is located 6.97 miles to the northwest of the WMB along Trice Lake Road in Cumberland County, Virginia. This is a public community water system (C - highest level of regulation) and is supplied by groundwater. The Green Ridge Facility is over six miles from, and *NOT upgradient* of the Lakeside Village public water system.

Three significant natural drainage systems separate the Green Ridge Facility from the Lakeside Village water system: Muddy Creek, Davis Creek and the Willis River. There will be no impact to this public water system from the Green Ridge Facility.

Cartersville Estates Mobile Home Park is located 3.5 miles to the northwest of the WMB, along Cartersville Road (SR 45). From a regulatory perspective, this is not a public water system as it has fewer than 15 connections. VDH records do not list this as a public system, nor was it identified as a public water system by the VDH during their research. However, being a small community water system, it is worth noting in the permitting process. No detailed information was collected for this system, which appears to be groundwater based.

The Green Ridge Facility is over three miles from, and *NOT upgradient* of, the Cartersville Estates Mobile Home Park. Two significant natural drainage systems separate the Green Ridge Facility from the Cartersville MHP: Muddy Creek and Davis Creek. There will be no impact to this water system from the Green Ridge Facility.

Cobbs Creek Reservoir is a public community water system reservoir under construction approximately 11 miles northwest of the Green Ridge Facility. This is a surface water system, drawing water from the James River at a location approximately 11 miles upstream from the mouth of Muddy Creek, the main surface water body flowing adjacent to the Green Ridge Facility. Three major drainage systems separate the reservoir location from the Green Ridge Facility: Muddy Creek, Davis Creek and Willis River. The intake for this reservoir will not be impacted by the Green Ridge Facility.

4.4 Marine Resources

Marine resources are defined as "materials and attributes found in the ocean that are considered to have value." Cumberland County is in the Piedmont Physiographic Province of Virginia. Strictly speaking, marine resources will not be impacted by the project.

However, the Virginia Marine Resources Commission has jurisdiction over any encroachments in, on or over the beds of the bays, ocean, rivers, streams or creeks, which are the property of the Commonwealth. Accordingly permitting with VMRC will be required for the project. The Virginia Marine Resources Commission (VMRC) was contacted for their opinion of impacts from the proposed project. A response letter was received and is presented in **Appendix LIS-2D.** While the project site is within the jurisdictional areas of the VMRC, any impacts will be addressed during the Joint Permit Application process.

4.5 Wetlands

Koontz Bryant Johnson and Williams delineated all wetlands across the Facility and submitted their results to the Army Corps of Engineers on May 11, 2018 as part of a request for a Preliminary Jurisdictional Determination. This request and the delineation study is included in **Appendix LIS-2E**, along with the wetland delineation maps and the final Preliminary Jurisdictional Determination from the Army Corps on August 22, 2019.

Following delineation of wetlands across the Facility, project elements (disposal units, roads, etc.) were modified or eliminated to remove all direct impacts to wetlands.

4.6 Historic Sites

During 2018 and 2019, Browning and Associates, LTD completed a Phase 1 Cultural Resources Investigation of the Facility and surrounding areas. This included both a Phase 1A investigation (desktop and site walkover), as well as a Phase 1B investigation, (more detailed site investigations including over 2000 shovel

test pits, metal detecting, and sampling of artifacts). Their report is undergoing final review and will be submitted under separate cover.

A project review application was submitted to the Virginia Department of Historic Resources on June 23, 2019, **Appendix LIS-2F.**

An August 16, 2019 response from the VDHR was received and is also included in **Appendix LIS-2F**. The VDHR recommended the completion of a Phase 1 cultural resources survey, which has since been completed by Browning and Associates, and which will be submitted to the VDHR for their review.

4.7 Fish and Wildlife

Several Virginia agencies keep databases on fish and wildlife and threatened and endangered species. These include:

- Virginia Department of Conservation and Recreation – Division of Natural Heritage – Biotics Data System (natural resources and ecologically significant sites.) https://www.dcr.virginia.gov/natural-heritage/rare-species-com
- Virginia Department of Game and Inland Fisheries (vertebrates and invertebrates) https://www.dgif.virginia.gov/wp-content/uploads/virginia-threatened-endangered-species.pdf
- Virginia Department of Agriculture and Consumer Services (Plants and insects) https://www.vdacs.virginia.gov/plant-industry-services-endangered-species.shtml

Please see, *Threatened and Endangered Species Summary* **(Appendix LIS-2G)**, prepared by Koontz, Bryant, Johnson, Williams Group, May 24, 2019, for a more detailed summary of potential threatened and endangered species impacts.

A mussel survey was conducted by Daguna Consulting, LLC on May 25 and 26, 2019 at Muddy Creek and Maple Swamp Creek. Results of the survey concluded that Muddy Creek supports a low-density mussel population that is comprised of common species, and the tributaries to Muddy Creek from the Green Ridge property do not exhibit signs of suitable habitat for mussels. Additionally, Maple Swamp Creek and its tributaries did not exhibit any signs of habitation by native mussel species. The final report is provided in **Appendix LIS-2G**.

4.8 Water Quality

4.8.1 Surface Water

USGS quadrangle maps were used to identify surface water resources within five miles of the Facility. In addition, mapping of surface waters and wetlands within the site has occurred and that information is

available in **PTA Attachment XXII – Wetlands Demonstration**. The Virginia DEQ web site was used to obtain information on impaired surface waters.

Muddy Creek, a perennial stream flowing west to east across the northern portion of the site, is the main receiving water for the proposed Facility. Approximately 90% of the Disposal Unit is located within the Muddy Creek Basin. Muddy Creek discharges to the James River approximately 5.6 miles northeast of the Facility. There are approximately 10 miles of stream length along Muddy Creek between the Facility and the James River.

A small portion of the southeast corner of the Facility, as well as most of the access road portion of the Facility, drains into the Maple Swamp Creek basin. Maple Swamp Creek cuts across the access road route, and discharges to Muddy Creek approximately 0.6 miles downstream from and northeast of the Facility. Muddy Creek and Maple Swamp Creek, and their smaller tributaries, are the only surface water drainages that are direct receiving waters from the Facility.

Several other major surface water drainages that are not receiving waters for the Facility are located within five miles of the Facility. These include Davis Creek, located approximately 2.1 miles north-northwest of the Facility. Davis Creek flows northeasterly and discharges to Muddy Creek approximately 3.5 miles north-northeast of the Facility. Located northwest of the Facility at approximately 4.6 miles is Deep Run, a small drainage that also discharges to Muddy Creek just upstream from its mouth at the James River. Tributaries to the Willis River, the main stem of which is more than 5 miles from the Facility, are located approximately 3.5 miles northwest of the Facility. Approximately 2.5 miles south of the Facility, and on the opposite side of a major drainage divide, is Maxey Mill Creek, which discharges into Deep Creek at a location 2.9 miles southeast of the Facility. Deep Creek discharges to the James River at a location 7.6 miles to the northeast of the Facility.

Surface water resources within the 5-mile radius are shown on figure **LIS-2H-1 Surface Water Resources**. Streams that are classified as impaired resources are shown in red and yellow. Information on impaired surface water bodies was obtained from the DEQ 2018 Impaired Waters 303(d) data associated with the 2018 305(b)/303(d) Water Quality Assessment Integrated Report. Davis Creek is identified as an impaired water body along its entire 7.68 miles length, from its headwaters to its mouth at Muddy Creek, due to *Escherichia coli*. Muddy Creek is impaired through the 3.58 miles reach from its confluence with Davis Creek downstream to its mouth at the James River, due to dissolved oxygen.

4.8.2 Groundwater

Groundwater is utilized as a source of drinking water in the vicinity of the Facility. This is true throughout the Piedmont Province as well, including the area within the five-mile radius of regulatory concern. Information about public water systems is contained in previous section LIS- 4C. This section of the LIS focuses on groundwater as a resource utilized by private drinking water supplies.

Both the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** and well records (logs) for private water wells help to characterize and assess the potential impacts to this resource. Per the DEQ Solid Waste Permitting Submission Instructions IV.D.2, and §9 VAC 20-81-460.C., "all water supply wells, springs or intakes, both public and private", within 500 ft. of the Facility boundary are shown on **PTA Attachment IX-Figure 2 – Near Vicinity Map**. There are no known springs or public water supplies within this perimeter. Private wells exist within the 500-ft perimeter.

It should be noted that inconsistencies in GIS parcel maps, changes in ownership over the years since drilling, incomplete record keeping at the Virginia Department of Health (VDH), and a lack of reporting of logs (especially older wells), all contribute to inherent inaccuracies in locating water wells, and matching logs to a particular property. Through the permitting process, corrections and additional information about nearby water wells may emerge.

VDH was contacted for information about drinking water wells in the area **(Appendix LIS-2H)**. Logs for wells along Pinegrove Road and Miller Lane/Alder Lane were requested. Logs for wells along these roads provide useful information relevant to the analysis (even if that well is outside the 500-ft. perimeter around the Facility).

Well logs were also sought for homes along abutting portions of US Route 60, Blenheim Road, Mosby Lane, Lily Lane, Pine Cove Trail and Brown Road.

Tax parcels interior to and exterior to the Facility are shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map**, and were investigated for the presence of a water supply well. Although all tax parcels within the 500-ft. perimeter are shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map,** if the well is known or suspected to be outside the 500-ft. perimeter, it is not shown on the map. **LIS-2H - Table 1** shows a listing of tax parcels within this 500-ft. perimeter and the status of information relative to water supplies.

The locations of most private wells adjacent the site were obtained through a windshield survey, during which wells were visually identified and their locations recorded on field maps. For parcels where a well could not be visually verified (but a dwelling was present), a record review was conducted. Land records at the Cumberland County Courthouse were traced back to determine the original dwelling builder (and assumed original name on well drilling log and building permit). VDH records were searched for building permit plats showing well locations at the time of dwelling construction under the original owner. Lastly, to further aid in determining well locations, an unmanned aerial vehicle (drone) was used to fly selected areas around the site.

A total of forty-four (44) private drinking water wells (32 known, 12 assumed) were identified within the 500-ft. perimeter around the Facility boundary, **(PTA Attachment IX- Figure 2 – Near Vicinity Map)**. This includes the access road portion of the site, an area where there will be no landfilling. Assumed wells are those not directly observed, but assumed to exist based on the presence of a dwelling, information from building plats, or from drone footage. During the permitting process, it is anticipated that further clarification on assumed well locations and/or additional information on existing wells may emerge.

Well records (drillers logs) obtained from the VDH are not available for many of the wells near the site, however logs for 18 wells could be matched to particular parcels. The logs and associated VDH permit plats (where available) showing well locations, are included in **Appendix LIS-2H**. A summary of the information from the logs is contained in **LIS-2H - Table 1**. In the following sections, information from these logs is used to help characterize the resource, demonstrate how it is being used, and inform ways to monitor and protect it.

Examination of **PTA Attachment IX- Figure 2 – Near Vicinity Map** shows that the distribution of nearby water wells group into five main clusters as discussed below. All depths referred to in the following discussion are in feet below ground surface (bgs).

Cluster: Miller Lane/Alder Lane

Hydrogeology

Along Alder Lane, and Miller Lane north of Alder Lane, there are a total of 14 wells (9 observed, 5 assumed). Per the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**, and the Potentiometric Surface Maps **(PTA Attachment XV)**, the direction of groundwater flow in the vicinity of these wells is west, toward an unnamed tributary to Muddy Creek, which bisects the Facility into an eastern and western side. Groundwater flow is toward the Facility, which is located downgradient of these wells. No portion of the Facility is located upgradient of these wells. All wells in this area are at least 500 ft. from the waste management boundary. The closest well is more than 2500 ft. from the (waste) Disposal Unit, and the most northerly of this group of private wells is over 5000 ft. from the Disposal Unit.

Only the western side of the Facility will contain a Disposal Unit. The unnamed bisecting tributary provides protection to these wells as a hydraulic barrier (sink) that will redirect any groundwater flow from the Disposal Unit away from wells along Miller Lane.

At the northern end of this grouping of wells, groundwater flow is more northwesterly toward Muddy Creek (instead of the unnamed tributary).

Well ID #07-124-087 – Lot 45-A-2-G3 – 180 Miller Lane

There may be two wells on this lot (located more than 2500 ft. from the Disposal Unit), as there are two sets of information (see well logs in **Appendix LIS-2H)**; however, both wells have the same number assigned - 07-124-087. A well with a small diameter PVC casing was visually observed on the property, which likely corresponds to the log for a drilled well that was constructed on 11/2/2007 to a depth of 205 ft. and yielding 5 gallons per minute (gpm). Casing was installed to 36 ft., which was also noted as the depth to bedrock. The well was grouted with cement from 0 to 20 ft. Static water level was 25 ft. at the time of completion. No information was presented about the bedrock formation or the location of water bearing fractures.

A July 17, 2009 VDH Record of Inspection however indicates there is a well on this lot that is of large-diameter construction, (bored well-24 inch concrete casing) to a depth of 55.5 ft., and with a construction date of 11/17/2008. Static water level in this well when completed was 30 ft.

If both wells are in fact present, this would indicate capture of groundwater from two zones within the aquifer; one zone near the top of bedrock around 40-50 ft., captured by bored wells and concrete casings, and another zone in the deeper bedrock fracture system, tapped by rotary drilling and smaller diameter casings.

Well ID #07-124-151 – Lot 45-A-4 – 16 Alder Lane

A well was not visually observed on this parcel, only a tiny portion of which is within the 500-ft. perimeter. It is likely there is a well on this parcel based on the match of owner's name to parcel name, and a log for a well here with matching information. Although the tax parcel is within the 500-ft. perimeter, the well is likely not, and is not shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map**. The information from the well is nonetheless useful. The well was drilled on 5/28/2008 to a depth of 305 ft. and yields 2 to 3 gpm. Depth to bedrock is 60 ft. Casing was installed to this depth, and grouted with cement to 20 ft. Static water level when drilled was 40 ft. No information was presented on the log regarding depth of water bearing fractures.

Summary

Based on the limited information available, and other wells of similar construction visible on the windshield survey, there are two zones within the aquifer being utilized in this vicinity. One zone is in the saprolite just above unweathered bedrock, at depths ranging from 36 to 60 ft., and the other is in the solid crystalline bedrock to depths of 300 ft. Static water levels range from 25 to 40 ft. Well yields ranged from 3 to 5 gpm, however higher yields are possible in other wells nearby. This is a limited database, but consistent with other information from the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** on depth to bedrock and depth to static groundwater levels in the saprolite. Given the location upgradient from the Facility and more than 2500 ft. from the Disposal Unit, it is unlikely that wells in this area will be impacted.

Cluster: Access Road/Miller Lane

Hydrogeology

In the area where Miller Lane intersects the proposed access road entrance to the Waste Management Unit, there are currently 8 private drinking water wells, (2 observed, 6 assumed). Per the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**, and the Potentiometric Surface Maps **(PTA Attachment XV)**, groundwater flow in this area is complex due to a groundwater divide passing beneath the very sharp corner of Miller Lane. Most (>90%) of the approximately 1178 acre Facility drains northward to Muddy Creek; however, a small portion of the southeast corner of the Facility drains southeast to Maple Swamp Creek, see Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**. This area is where that divide in flow occurs.

Some wells may be within the Maple Swamp Creek (MSC) drainage system, others may not. The well on lot 44-A-23 is most likely within the MSC drainage system, and thus downgradient of the southeastern portion

of the Disposal Unit. Four other wells to the south of the proposed intersection of Miller Lane with the access road, (Tax Parcels 45-2-3-C; 45-2-3 E1 (two wells) and 45-3-3-E) could potentially be downgradient of a small portion of the Disposal Unit. The other three wells to the north of this intersection (Tax Parcels 45-2-1-A1 (two wells) and 45-A-8-A) are not likely to be downgradient of the Disposal Unit and more likely to be protected by the headwaters of the stream that bisects the Facility. All wells are more than 500 ft. from the WMB, and more than 700 ft. from the Disposal Unit boundary.

Particular emphasis should be given to this area when designing the groundwater monitoring program for the Facility. With permission of the owners, all private wells in this vicinity should be monitored/sampled routinely for water quality impacts, including pre-construction sampling.

Well ID #00-124-067 – Lot 44-A-23 – 60 Miller Lane

One of the observed wells (now owned by the Facility), is Well ID #00-124-067. This well is located downgradient from the southeast corner of the Disposal Unit and was completed on 8/16/01 to a total depth of 356 ft. Casing was installed to 52 ft., which was also noted as the depth to bedrock. The well does not appear to be grouted. Water bearing fractures were noted in the log at 60 ft. (1.5 -2 gpm) and 215 ft. (total yield of 4 gpm). Water zones are also noted on the log at 45 – 65 ft. and 205 – 225 ft. No information is given on static water level. This well obtains about half of its yield from a shallow groundwater zone located just below the saprolite and into the top of the bedrock surface at around 60 ft., and a deeper zone in the solid bedrock at around 215 ft.

Well ID# 04-124-068 - Lot 45-2-3-E – 62 Miller Lane

Well ID# 04-124-068 was drilled on 10/27/04**.** There are several properties listed under this owner in this vicinity. It is believed that this well is located on Tax Parcel 45-2-3-E. The locational coordinates on the log place it closer to this lot than any of the others listed under that owner. This well is 50 ft. deep, and bedrock is at 50 ft., similar to nearby Well ID #00-124-067. This is what is commonly called a 'bored well', meaning it is a large diameter well, constructed in the saprolite using concrete tiles. The water zone is listed at 30-35 ft., as is the static water level, indicating this is an unconfined aquifer. The bottom of the concrete casing is at 50 ft., and grouted from 20 ft. to the surface. Thus, the capture point for the well is between 30 and 50 ft. below ground. The yield is only 2 gpm. This well is in the Maple Swamp Creek drainage basin; however, it is not directly downgradient of the Disposal Unit.

Summary

Based on the limited information above, and other wells of similar construction visible on the windshield survey, there are two zones within the bedrock aquifer being utilized in this vicinity, adjacent to the Facility. One is in the saprolite just above un-weathered bedrock, at depths ranging from 50 -52 feet, and the other is in the solid crystalline bedrock at depths of over 200 feet. Static water level in the saprolite aquifer is 30 ft., the same as in the Miller Lane/Alder Lane saprolite well. Well yields ranged from 2 to 4 gpm; however, higher yields are possible in other nearby wells. This is a limited database, but consistent with other information from the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** on depth to bedrock and depth to static groundwater levels in the saprolite. Given the location of wells downgradient of the

Disposal Unit, and uncertainty relative to a groundwater divide, particular emphasis should be given to this area when designing the groundwater monitoring program for the Facility.

Cluster: Route 60 Facility Entrance

Hydrogeology
This area includes wells at homes along US Route 60 as well as nearby Mosby Lane, Lily Drive, Pine Cove Trail and Blenheim Road. There are 10 observed wells and 1 assumed well within 500 ft. of the Facility boundary. All of these wells are more than 3500 ft. away from and upgradient of the WMB and Disposal Unit, and separated from the Disposal Unit by Maple Swamp Creek, a hydraulic divide. It is highly unlikely that groundwater in this area will be impacted by disposal operations. Because this area is so far from the Disposal Unit, it is not included in the Hydrogeologic and Geotechnical Report (PTA Attachment XI). Several wells provide information on the groundwater resource in this vicinity.

Well ID #08-124-117 – Lot 45-1-36-A - 2379 Mosby Road
This is a drilled well completed on 6/02/10 to a total depth of 205 ft. Casing was installed to 94 ft., which was also noted as the depth to bedrock. The well was grouted to a depth of 20 ft. No information was noted on water bearing fractures. The total yield is 8 gpm. Static water level is 35 ft.

Well ID #02-124-062 – Lot 45-1-16 - 24 Lily Drive
Two wells were observed on this lot, one drilled well and one bored well. The drilled well was completed on 5/17/02 to a total depth of 200 ft. Bedrock was logged at 70 ft., and casing was installed to 75 ft. and grouted. Water bearing fractures were noted in the log as "most water" at 160-180 ft., with a total yield of 12 gpm. The static water level was 25 ft. at the time of completion, indicating confined conditions in this well, and suggesting the presence of a confining unit protecting the lower aquifer zone. No information is available for the bored well.

Well ID #02-124-159 – Lot 45-1-16-A - 118 Lily Drive
One drilled well was observed on this lot, completed on 4/22/03 to a total depth of 170 ft. and yielding 25 gpm. This well is on tax parcel 45-1-16-A; however, the log indicated it was drilled on parcel 45-1-16-B. There is no such parcel, and it is believed that this well is correctly located on lot 45-1-16-A. Casing was installed to 61 ft., but the log shows depth to bedrock at 65 ft. The well is grouted to 30 ft. Water bearing zones were noted in the log at 140-141 ft. and 155-156 ft. The static water level was 26 ft., indicating confined conditions in this well, and suggesting the presence of a confining unit protecting the lower portions of the aquifer.

Well ID #05-124-164 – Lot 45-A-15-A - 15 Anderson Highway
One bored well was observed on this lot, completed on 12/20/06 to a total depth of 45 ft. and yielding 3 gpm. The lot is within the 500-ft perimeter, but the well is not, and is not shown on **PTA Attachment IX-Figure 2 – Near Vicinity Map**. Large-diameter casing was installed to 45 ft; however, the log shows the depth to bedrock is unknown. The well is grouted to 20 ft. The water bearing zone was noted in the log

at 30-33 ft. Static water level is 17 ft. This is shallow saprolite well; however, "White Quartz" was noted at the bottom of the log, so it is likely that this well is completed near the bedrock surface.

Well ID #17-124-071 – Lot 45-A-12-C - 6678 Blenheim Road
One drilled well was observed on this lot, completed on 1/27/18 to a total depth of 475 ft. and yielding 50 gpm. Casing was installed to 64 ft., and the log shows depth to bedrock at 50 ft. The well is grouted to 55 ft. with a cement/bentonite mix. Water bearing zones were not noted in the log. Static water level was 30 ft. at the time of completion. This lot is inside the 500-ft. perimeter; however, the well is not and thus not shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map**.

Summary
Based on the above information, and other wells of similar construction visible on the windshield survey, there are two water zones within the aquifer being utilized in this vicinity. One well is completed in the saprolite just above bedrock, at a depth of 45 ft. (in the one bored well with a log). The yield in the saprolite well was low (3 gpm) with a high static level (17 ft.). Other bored wells nearby are likely to show similar conditions.

Other wells in this vicinity are completed in the solid crystalline bedrock at depths ranging from 170 to 475 ft.; however, in three of the four drilled wells total depths ranged from 170 – 205 ft. It appears likely that adequate supplies of water are available from the crystalline bedrock within the first 200 ft. Water bearing zones (where noted) ranged from 140 to 180 ft. Static water levels in the crystalline aquifer ranged from 25 to 35 ft., and yields ranged from 8 to 50 gpm. Depths to bedrock ranged from 50 to 94 ft. This area appears to be deeper to bedrock and higher in yield than areas near Miller Lane. This information is consistent with that presented in the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** on depth to bedrock and depth to static groundwater levels in the saprolite.

Cluster: Pinegrove Road South

Hydrogeology
This is a group of homes located just to the south of the Facility, along Pinegrove Road. There are a total of 9 wells (8 observed and 1 assumed well) within the 500-ft. perimeter around the Facility. Per the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**, and the Potentiometric Surface Maps **(PTA Attachment XV)**, groundwater in this area flows north, away from these wells, and toward the Facility. All wells are upgradient of, and greater than 500 ft. from, the WMB and Disposal Unit.

Well ID #11-124-043 – Lot 44-A-32 - 79 Pinegrove Road
One drilled well was observed on this lot, completed on 6/21/11 to a total depth of 225 ft. and yielding 15 gpm. Casing was installed to 83 ft., and the log shows depth to bedrock at 81 ft. The well is grouted to 81 ft. with a cement/bentonite mix. Water bearing zones were not noted in the log. Static water level was 30 ft. at the time of completion.

Well ID #08-124-054 – Lot 44-2-7-A - 49 Pinegrove Road

This lot and well are outside of the 500-ft. perimeter around the Facility Boundary and were not field located, nor shown on the **PTA Attachment IX- Figure 2 – Near Vicinity Map**. However, based on information received from the VDH, the location can be identified as just south of the 500 ft. Facility perimeter. Only the VDH Record of Inspection was available, and not the actual driller's log. This is a drilled well, completed on 6/20/08 to a total depth of 181 ft. and yielding 20 gpm. Casing was installed to 55 ft. and the well was grouted to 20 ft. with bentonite. Water bearing zones are not noted on the inspection form, nor was the static water level.

Summary

Both drilled and bored wells were observed south of the Facility along Pinegrove Road and Liberty Lane, although only logs for drilled wells are available. Drilled wells (for which logs are available) are completed in the solid crystalline bedrock at depths ranging from 185 to 225 ft. It appears likely that adequate supplies of water are available from the crystalline bedrock within the first 200 ft. No information on water bearing zones is available. Static water level in the crystalline aquifer is 30 ft., and yields ranged from 15-20 gpm. Depths to bedrock ranged from 55 to 81 ft. This area appears to be deeper to bedrock and higher in yield than areas near Miller Lane. This is a limited database, but consistent with other information from the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** on depth to bedrock and depth to static groundwater levels.

Cluster: Pinegrove Road North

This area is along the northwest side of the Facility where Pinegrove Road exits the Facility in a northward direction. There are two observed wells in this area, one belonging to the Pinegrove Community Center (Tax Parcel 44-A-17), and the other belonging to Roosevelt Gregory (Tax Parcel 44-A-16). These wells are more than 500 ft. from the WMB, however, per the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**, and the Potentiometric Surface Maps **(PTA Attachment XV)**, they are located in a general downgradient direction relative to the Disposal Unit. It is recommended that these wells be monitored as part of the nearby private well monitoring program offered by Green Ridge. The Part B groundwater monitoring program should also include sentinel well(s) between the Disposal Unit and this area. There are no other wells in this immediate vicinity. Wells further north along Pinegrove Road are more than 500 ft. from the Facility, not downgradient, and separated from the Facility by Muddy Creek, a likely hydraulic barrier. Wells located on properties on Brown Road are also more than 500 ft. from the Facility, not downgradient, and separated from the Facility by an unnamed tributary to Muddy Creek. Both Muddy Creek and the unnamed tributary crossing Brown Road provide a hydraulic divide that will serve to direct flow from the Facility away from wells along Pinegrove Road north of Muddy Creek, and away from wells along Brown Road.

Downgradient of Facility

No Well ID-Pinegrove Community Center – Lot 44-A-17 - 267 Pinegrove Road

One drilled well was observed on this lot, completed on 11/27/91 to a total depth of 145 ft. and yielding 2.5 gpm. Casing was installed to 38 ft., and the log shows depth to bedrock at 36 ft. The well is grouted to

38 ft. with cement. Water bearing zones were not noted in the log. Static water level was at 28 ft. at the time of completion. Bedrock was described in the log as "white and grey type of rock". Overburden is described as "sandy and clay type soil", consistent with findings of the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)**, as is the depth to bedrock in this well.

Upgradient of Facility
Well ID #02-124-345 – Lot 44-1-22 - 302 Brown Road

A very small portion of this lot is within the 500-ft. perimeter but the dwelling and well are not. The well was not field located, nor is it shown on the **PTA Attachment IX- Figure 2 – Near Vicinity Map**. However, a well was completed on this lot on 3/14/02 to a total depth of 41 ft. and yielding 4 gpm. This is a large diameter bored well with concrete casing installed to 41 ft., and the log shows depth to bedrock at 41 ft. The well is grouted to 20 ft. The water bearing zone was at 23-24 ft. Static water level was 23 ft. at the time of completion, same as the encounter depth, indicating non-confining conditions as expected in the saprolite zone of the aquifer.

Upgradient of Facility
Well ID #01-124-012 – Lot 37-2-3 - 385 Pinegrove Road

This well is approximately 1500 ft. from and upgradient of the Facility Boundary, and thus is not shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map**. A large-diameter bored well was constructed on this lot on 4/6/01, to a total depth of 36 ft. and yielding 2 gpm. Casing was installed to 36 ft., (assumed to be to bedrock, although the log does not specify). The well is grouted to 20 ft. with concrete. The water bearing zone is 22-23 ft. The static water level was not noted on the log at the time of completion.

Upgradient of Facility
Well ID #05-124-019 – Lot 37-2-2 - 391 Pinegrove Road

This lot and well are approximately 1500 ft. from and upgradient of the Facility Boundary, and are not shown on **PTA Attachment IX- Figure 2 – Near Vicinity Map**. However, a well was completed on this lot on 4/25/05 to a total depth of 140 ft. and yielding 10 gpm. Casing was installed to 57 ft., and the log shows depth to bedrock at 56 ft. The well is grouted to 20 ft. with bentonite. Water bearing zones were not noted in the log. The static water level was 40 ft. at the time of completion.

Upgradient of Facility
Well ID #09-124-042 – Lot 37-A-63-B - 448 Pinegrove Road

A small portion of this lot lies within the 500-ft. perimeter; however, the house and well are upgradient of and approximately 1000 ft. from the Facility boundary. The well is not shown on **PTA Attachment IX-Figure 2 – Near Vicinity Map**; however, a well was completed on this lot on 11/8/11, to a total depth of 205 ft. and yielding 7 gpm. Casing was installed to 21 ft., and the log shows depth to bedrock at 21 ft. The well is grouted to 20 ft. with cement. Water bearing zones were not noted in the log. The static water level was 40 ft. at the time of completion.

Summary

Both drilled and bored wells are present north of the Facility along Pinegrove Road. Bored wells ranged from 36 to 41 ft., with yields of 2-4 gpm. Drilled wells (for which logs are available) are completed in the solid crystalline bedrock at depths ranging from 140 to 205 ft. It appears likely that adequate supplies of

water are available from the crystalline bedrock within the first 200 ft. No information on water bearing zones is available. Static water levels in the crystalline aquifer range from 28 to 40 ft., and yields ranged from 2.5 to 10 gpm. Depths to bedrock ranged from 21 to 56 ft. This is a limited database, but consistent with other information from the Hydrogeologic and Geotechnical Report **(PTA Attachment XI)** on depth to bedrock and depth to static groundwater levels.

4.8.3 Mitigating Potential Impacts

Surface Water
The project will not, by law, be permitted to impact applicable surface and/or groundwater resources. Sanitary landfills shall not:

- Cause a discharge of pollutants into Waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to the Virginia Pollutant Discharge Elimination System (VPDES) requirements and the Virginia Water Quality Standards (9 VAC 26-260).

- Cause the discharge of a non-point source of pollution to Water of the United States, including wetlands, that violates any requirements of an area-wide of statewide water quality management plan that has been approved under the Clean Water Act, as amended; or violates any requirements under the Virginia Water Quality Standards.

This includes preventing adverse impacts due primarily to stormwater run-on and runoff, and also to unauthorized discharge of leachate.

The site consists primarily of managed forestland, with deeply incised intermittent streams that discharge into Muddy Creek. Any streams within the Disposal Unit boundary will be mitigated as discussed in the Drainage Patterns/Flows section below. An approximate 300-foot natural wooded buffer will be maintained between the Disposal Unit boundary and Muddy Creek where practical. In addition, a minimum 100-foot buffer will be maintained on all streams outside the Disposal Unit boundary.

In the Part B Permit Application, an erosion and sediment control plan and stormwater management plan will be prepared to maintain compliance with the regulations. Implementation of these controls will minimize stormwater discharges to receiving streams and minimize the potential for secondary wetland impacts. The measure will also include run-on controls, such as diversion swales designed to prevent storm events of a certain size from coming onto the site, or at least active portions of the site. Stormwater erosion and sediment controls will include:

- adequately-sized gravity and pressure system conveyances,
- inlet/outlet and stream bed protection,
- sediment basins with appropriate outlet control structures,
- sediment traps such as silt fencing and rock filter berms,

- stilling basins and similar measures to reduce water velocity,
- seeding and mulching, and vegetated buffers, among others.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared as part of the VPDES permit requirements.

Groundwater

The Facility will not detrimentally alter or deplete groundwater supplies in the general area of the site. A majority of the 44 private drinking water supply wells identified within the vicinity of the site are upgradient of the Disposal Unit. There are two wells along Pinegrove Road, immediately north of the Facility, that are downgradient of the Disposal Unit. These wells should be monitored (once the owners grant permission). Additionally, there is at least one, and possibly as many as five private wells near the sharp corner of Miller Lane that are potentially downgradient of the Disposal Unit. These wells should be monitored (once the owners grant permission). In the Part B Permit Application, a groundwater monitoring program will be developed that will include an appropriate groundwater monitoring well network to monitor the Facility in accordance with regulatory requirements. There is more than adequate room on the site to develop a monitoring network between the Disposal Unit/WMB and the Facility Boundary. In addition, where given permission and where appropriate, other nearby drinking water supplies will be monitored. Mitigation of any impact caused by the Facility will be through the development of an alternate water supply.

Drainage Patterns / Flows

During construction and operation, the site drainage patterns will be altered to conform to the design of the Facility. Stormwater controls and best management practices will be designed and implemented in accordance with the VPDES permitting process to reduce potential impacts. Stormwater containment structures will be designed to a higher standard of care (a larger storm event) to provide additional management capacity. At completion, the project will not detrimentally alter general drainage patterns of the area, as the landfill will be situated along an existing ridge. There will be no primary impacts to wetlands from the landfill construction or operation. However, there will be impacts to streams located with the landfill footprint, and secondary impacts to wetlands and streams may be present. These secondary impacts will be determined by pre- and post-development drainage patterns and flows. Impacts to streams and wetlands will be mitigated by purchasing credits, as authorized by regulatory agencies.

Flood Plain

Per the Federal Insurance Administration Flood Insurance Rate Map for the site, no housing/structures will be placed within the 100-year flood hazard area near Muddy Creek. Additionally, none of the project structures will impede or redirect flood flows as the flood area is downstream of the site.

As mapped by the Federal Insurance Administration the Disposal Unit does not fall within the 100-year flood plain **(see Attachment PTA-XXI)**.

Flooding
Flippen Lake is located just east of the proposed Facility and has been evaluated with respect to inundation due to breach of the dams. The Disposal Unit will not be impacted by potential flooding caused by breach of the dams.

4.9 Tourism

In Cumberland County, one site was identified as having potential for tourism located within 5 miles of the proposed project: the Cumberland State Forest. Located within the State Forest is Bear Creek Lake State Park. The potential for impacts to the forest (and thus, the park) are discussed above in Section 4.1, Parks and Recreation Areas. A brochure as distributed by the Cumberland State Forest, and information about Bear Creek Lake State Park are provided in **Appendix LIS-2I**.

5.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVE

5.1 Overview

Green Ridge has worked diligently to inform the public on all aspects of the project. As indicated in Section 3.0 County Waste of Virginia considered multiple alternatives and after careful consideration and support from Cumberland County, determined that the current Green Ridge Recycling and Disposal Facility site meets the goals of both the County and County Waste of Virginia. The landfill will be regulated by a number of agencies. A list of regulations that will govern the landfill includes but is not limited to:

- EPA Subtitle D (40 CFR Parts 257 and 258)
- Virginia Waste Management Act (Title 10.1, Chapter 14)
- Virginia Solid Waste Management Regulations (9 VAC 20-81)
    - Siting restrictions
    - Landfill design
    - Construction
    - Operations
    - Closure and post closure care
    - Groundwater monitoring
    - Gas and odor management
    - Leachate management
    - Storm water management
- Financial Assurance (9 VAC 20-20-70)
- Permit action fees and annual fees (9 VAC 20-90)
- Planning Regulations (9 VAC 20-130)

- Operator training (10.1-1408.2)
- VPDES industrial activity stormwater permitting (9VAC 25-151)
- Storm water Regulations (9 VAC 25-870)
- Erosion control regulations (4 VAC 25-840)
- Air permitting – Minor new source review (9 VAC-5-80-6)
- Air permitting – Title V (9 VAC 5-80-1)
- Wetland permitting (9VAC25-210)
- Department of Historic Resources

Submission Instruction No. 1 in referencing PTA Attachment XVII: Landfill Impact Statement – Section V Environmental Consequences of Alternative, states the following: "*Discuss the environmental consequences of each of the alternatives presented in Section III of the LIS, such as loss of land used for forestry, agriculture or other purposes, wetlands and streams, if any, noise pollution, odor and traffic. Discuss how the environmental consequences of the alternatives will be mitigated by meeting the regulatory requirements of the Virginia Waste Management Act and the Solid Waste Management Regulations.*" Because Section 3.0 of the Landfill Impact Statement indicates that based on the goals and objectives of the County and County Waste, there are no other viable alternatives this section only addresses the chosen alternative.

Potential impacts from the Facility will be mitigated through appropriate design, proper operation, regulatory compliance and enforcement. A brief discussion of potential areas of impact at the Facility follows. The final design will carefully and thoughtfully consider and mitigate environmental consequences of the Facility and set up open communications with the County and the public to verify that mitigation efforts are in place and operating as planned. The County will employ a County Landfill Liaison who's duties will include monitoring and inspection of waste disposal practices at the Landfill and monitoring all requirements of the Host Agreement and zoning. (See Section 3.1 of the Host Agreement).

5.2 Loss of Forestry or Agricultural Land

The majority of the Green Ridge site was previously owned by American Timberland and heavily timbered. Approximately 400± acres were purchased from American Timberland. Historically the site was also farmed but not in recent history. While some timberland will be lost, the County has significant timber resources under management by American Timberland and other companies. The County's comprehensive plan indicates that as of 2006, the County had 119,000 acres of forestland or approximately 60% of the County's total land area. The Green Ridge site (if considered all forest in good condition – which is a conservative assumption) would constitute 1% of the forested land.

Green Ridge has pledged to maintain forested buffers around the facility boundary. The Host Agreement indicates a buffer of 100' to 200' depending on ownership of the adjacent property and its use. This buffer will be maintained as forest.

At the end of usage, the Facility will be maintained as green space. In addition, at the end of usage, Green Ridge will provide a minimum of 25 acres of land for public use.

5.3 Traffic Control

A traffic impact analysis was completed by Davenport and submitted to VDOT. It received approval from VDOT. (**PTA Attachment XVI**) In that analysis it was assumed that 80% of the regional waste hauling vehicles would access the facility between 6:00PM and 6:00AM, to reduce traffic on Route 60 during peak travel times. At the entrance, appropriate turn lanes, tapers, signage and lighting will be provided to meet VDOT standards. An entrance permit from VDOT is required.

The access road into the site off of Route 60 is approximately 1 mile long. This will allow sufficient queuing space for trucks and allow the trucks to exit Route 60 rapidly.

In addition, road relocations planned for Pine Grove Road and Miller Lane will be designed to improve traffic flow and safety along the relocated sections of the road.

All efforts with regards to traffic control will conform to VDOT requirements and in accordance with subsequent permit approvals in addition to requirements as may be set forth in the Host Agreement and Conditional Use Permit.

5.4 Wetland and Stream Mitigation

VSWMR 9VAC20-81-120.E.1 sets forth requirements relative to landfill development and wetlands as follows: *"New sanitary landfills and expansions of existing landfills, other than those impacting less than 2.0 acres of nontidal wetlands, shall not be constructed in any tidal wetland or nontidal wetland contiguous to any surface water body."* Significant detail has been given to wetland and stream mapping on the site. The ACOE has issued their preliminary jurisdictional approval **(PTA Attachment XXII)** While wetlands are present on the site, efforts have been taken to eliminate primary impacts to wetlands. (**PTA Attachment IX – Near Vicinity Map**). There will be impacts to streams and potentially secondary impacts to wetlands. Green Ridge must adhere to all regulatory requirements and all permitting requirements of the Army Corps of Engineers and Virginia Department of Environmental Quality (VWP) during the development of the site. Permitting is in progress and must address mitigation of impacts.

Mitigation will take the form of avoidance, potential off-site improvements and as needed, the purchase of credits.

Appropriate stormwater BMPs will be designed, permitted, and installed to protect wetlands and streams from impact. These BMPs will be approved and monitored by the appropriate regulatory agencies.

5.5 Stormwater

Stormwater on site will be managed under multiple regulatory agencies. Both the VDEQ – Land Protection and Revitalization Division (under the Sanitary Landfill Permit) and the VDEQ – Water Division (Individual Storm water Permit for Industrial Activities) will review and issue appropriate permits. Cumberland County must issue land disturbance permits for construction. Thus, Green Ridge will be bound with regulatory monitoring and reporting requirements as set forth by these agencies.

During construction and operation, the site drainage patterns will need to be altered to conform to the design of the Facility. Stormwater controls and best management practices will be designed and implemented in accordance with the VPDES permitting process to reduce potential impacts. Stormwater containment structures will be designed to a higher standard of care (a larger storm event) to provide additional management capacity.

At completion, the project will not detrimentally alter general drainage patterns of the area, as the landfill will be situated along an existing ridge.

5.6 Leachate

Leachate will be collected and disposed of in accordance with the Leachate Management Plan which will be submitted during the Part B application process. At this time, it is assumed that leachate will be collected from the landfill cell and pumped into a series of holding tanks. Appropriate backup power generation facilities will be provided. Leachate will be hauled from the site to a permitted wastewater treatment facility. The Part B application must provide evidence of approval for the leachate from the receiving facility. In the future, once sufficient tonnage has been landfilled, an evaporator system will be considered to reduce the volume of leachate that must be hauled off site. An evaporation system will require appropriate permitting with VDEQ including air permitting. At no time will untreated leachate be allowed to discharge off site.

5.7 Odor

Green Ridge has committed to excluding certain wastes from its operations which are known to be odor producing. Per the Host Agreement (Paragraph 1.2), the facility will not accept sludge or recycled/processed construction and demolition debris focusing on sheet rock. In addition, animal carcasses will be controlled and be approved by the County.

The Host Agreement specifically states the following under Section 1.20 relative to odor management: *"Green Ridge agrees to control odor at and around the Landfill property. As required by the Regulations, Green Ridge shall have an Odor Management Plan. To minimize odor, Green Ridge will not accept Sludge. The County shall be provided with a copy of this plan prior to submittal to VDEQ to review for adequacy in addressing complaints, including the timeliness of planned responses, and monitoring odor control activities. Any odor complaint shall be directed to the County and shall be immediately forwarded to VDEQ."*

In addition, Green Ridge has pledged to design and install an active gas system which will collect and burn landfill gas which will reduce not only greenhouse gas emissions but also manage odor.

5.8 Noise and Lighting

Noise and lighting impacts will be managed as outlined in the Host Agreement, Section 1.2.1 which states: *"Green Ridge shall take such steps as are necessary to prevent noise levels associated with operations on the site from exceeding 67 decibels (not including ambient noise) when measures at the property line of the landfill site (not including the normal sounds of trucks entering the site). Except for bird control, no external speakers shall be used at the Landfill. Except for the entrance lighting and lighting at intersections, any and all outside lighting shall be designed so that there is no more than 0.5 foot candles of ambient light conditions when measures at the landfill facility property line. "*

5.9 Summary

In summary, Green Ridge will act thoughtfully and responsibly to minimize impacts and to mitigate rapidly should an issue arise. The landfill operations will be overseen by the County's Landfill Liaison. Design and operational controls must be identified and outlined in detail in the Part B application which will allow public comment once the draft permit is prepared by DEQ. Nothing has been identified in the Part A application that could not be addressed adequately in the Part B.

6.0 COORDINATION

Several agencies were consulted during the process of the LIS and Part A preparation. A list of those agencies and contacts is provided in **APPENDIX LIS-3**.

7.0 LIST OF CONTRIBUTORS

Consultants and/or agencies that contributed in the preparation of this LIS are listed in **Appendix LIS-3**.

8.0 REFERENCES

Sources of information are cited at appropriate locations in the narrative. Consultants and/or agencies that contributed in the preparation of this LIS are listed in **Appendix LIS-3**.

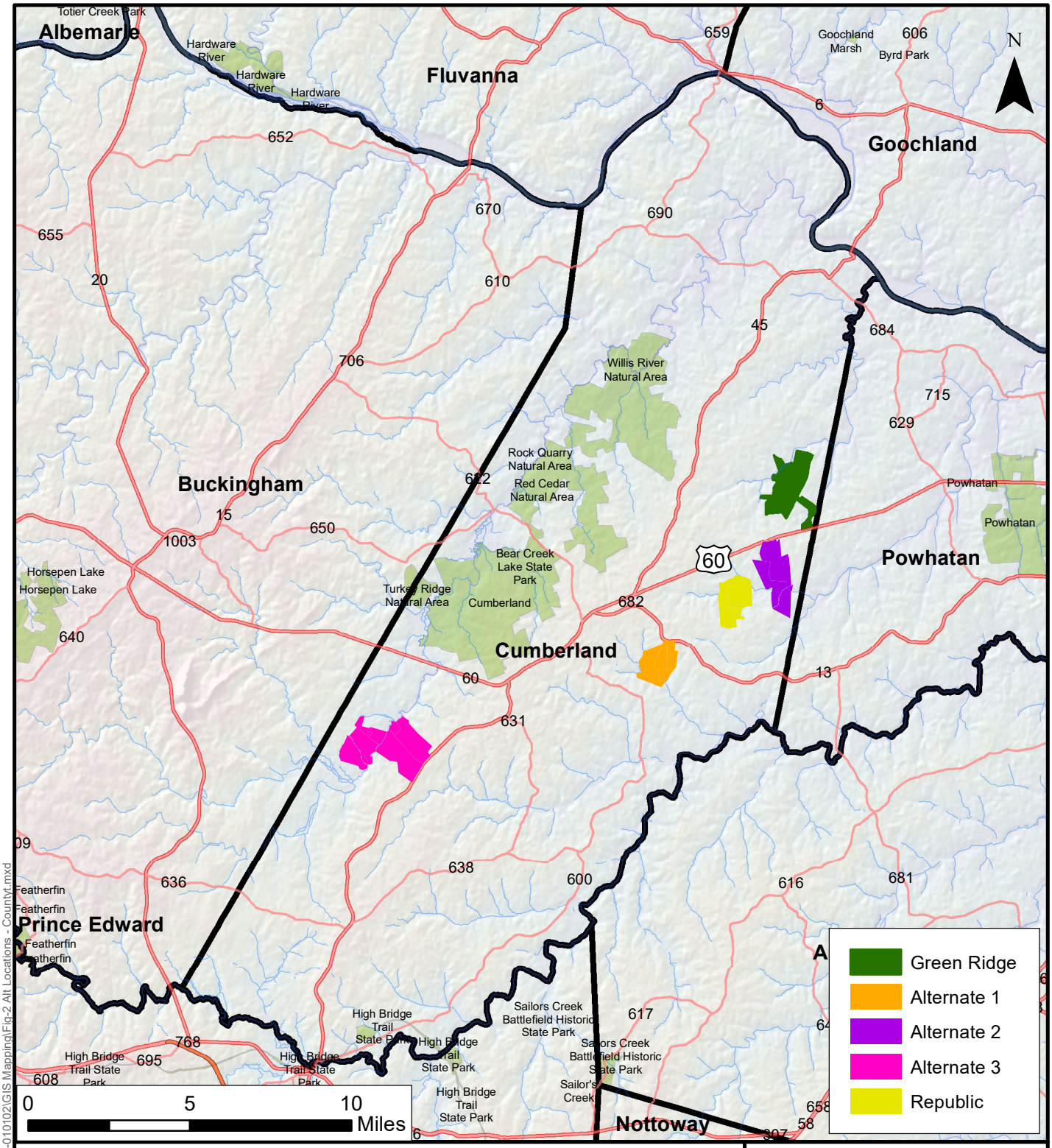
APPENDIX LIS-1

ALTERNATIVE SITES

Received by VMRC September 2, 2020 /blh

FIGURES

Received by VMRC September 2, 2020 /blh



Area Map
Alternate Sites

Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-030102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

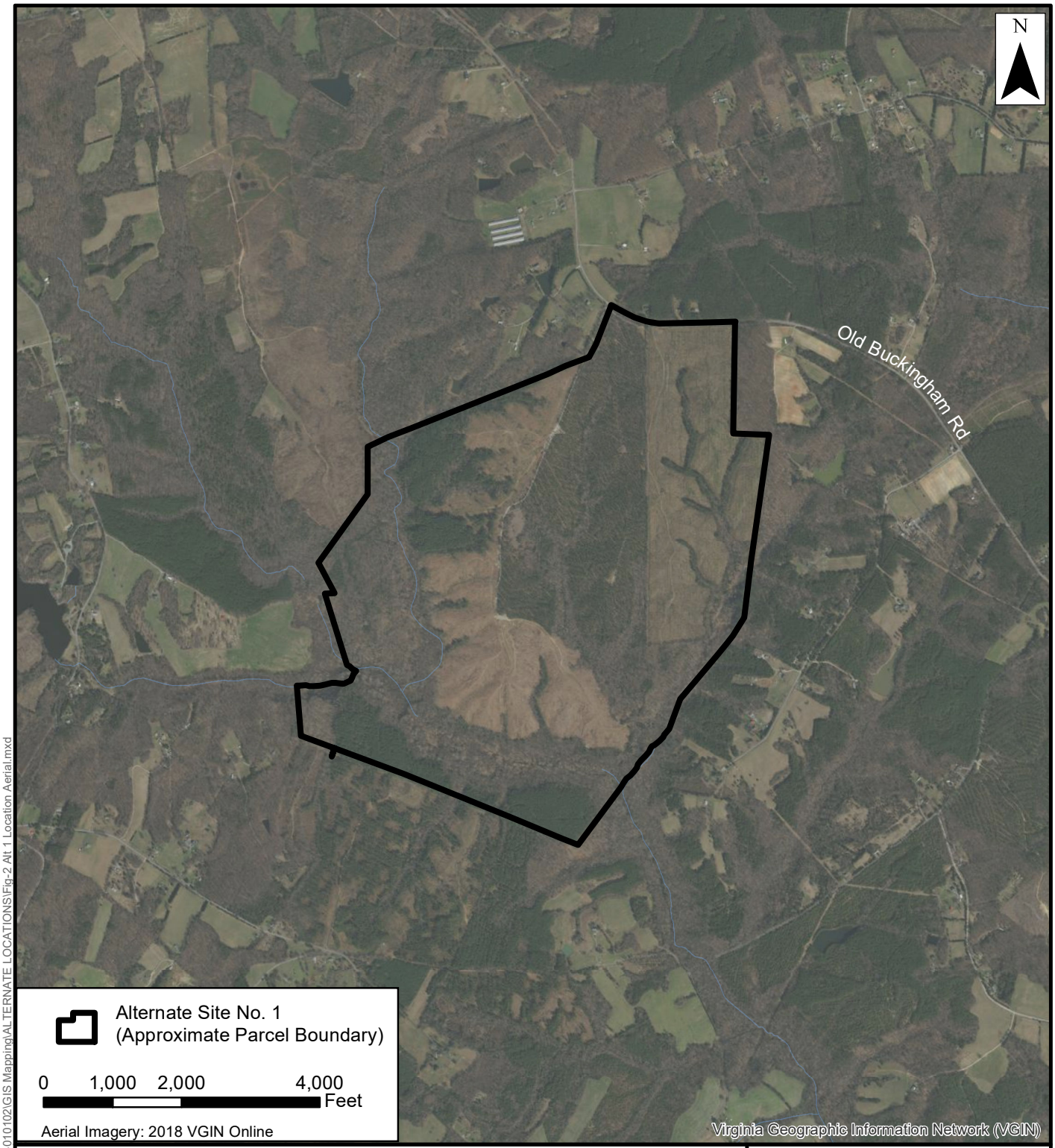
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
1

Path: P:\2018\18020100\18020117\18020117-010102\GIS Mapping\Fig-2 Alt Locations - County.mxd

Received by VMRC September 2, 2020 /blh



Site Location & Aerial Imagery

Alternate Site No. 1
Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

SCALE: 1" : 2000'

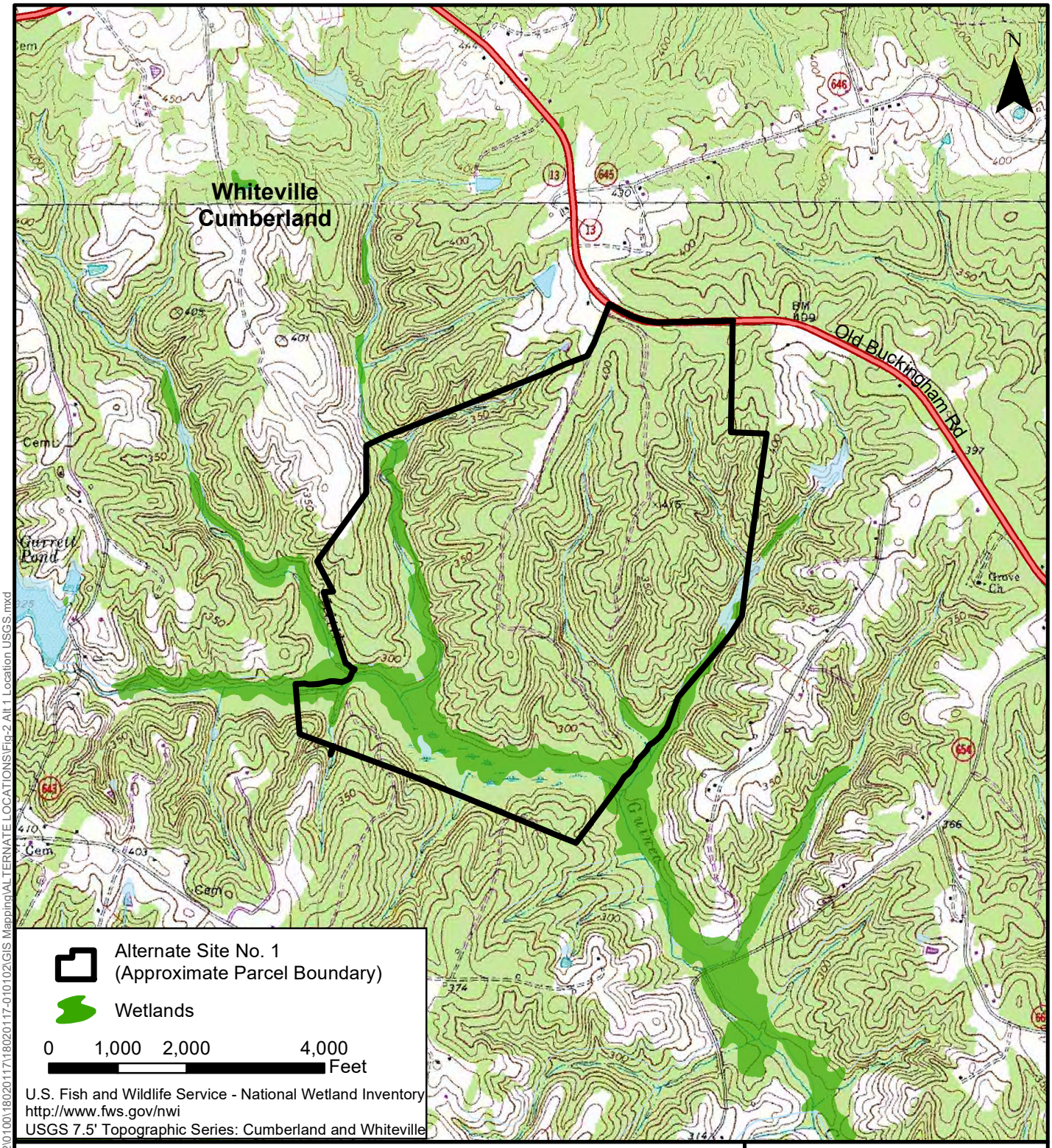
PROJECT: 18020117-030102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
2A

Path: P:\2018\1802\01\00\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-2 Alt 1 Location Aerial.mxd



Path: \\draperaden.net\daa\Projects\2018\18020100\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-2 Alt 1 Location USGS.mxd

Site Location & NWI Inventory

Alternate Site No. 1
Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

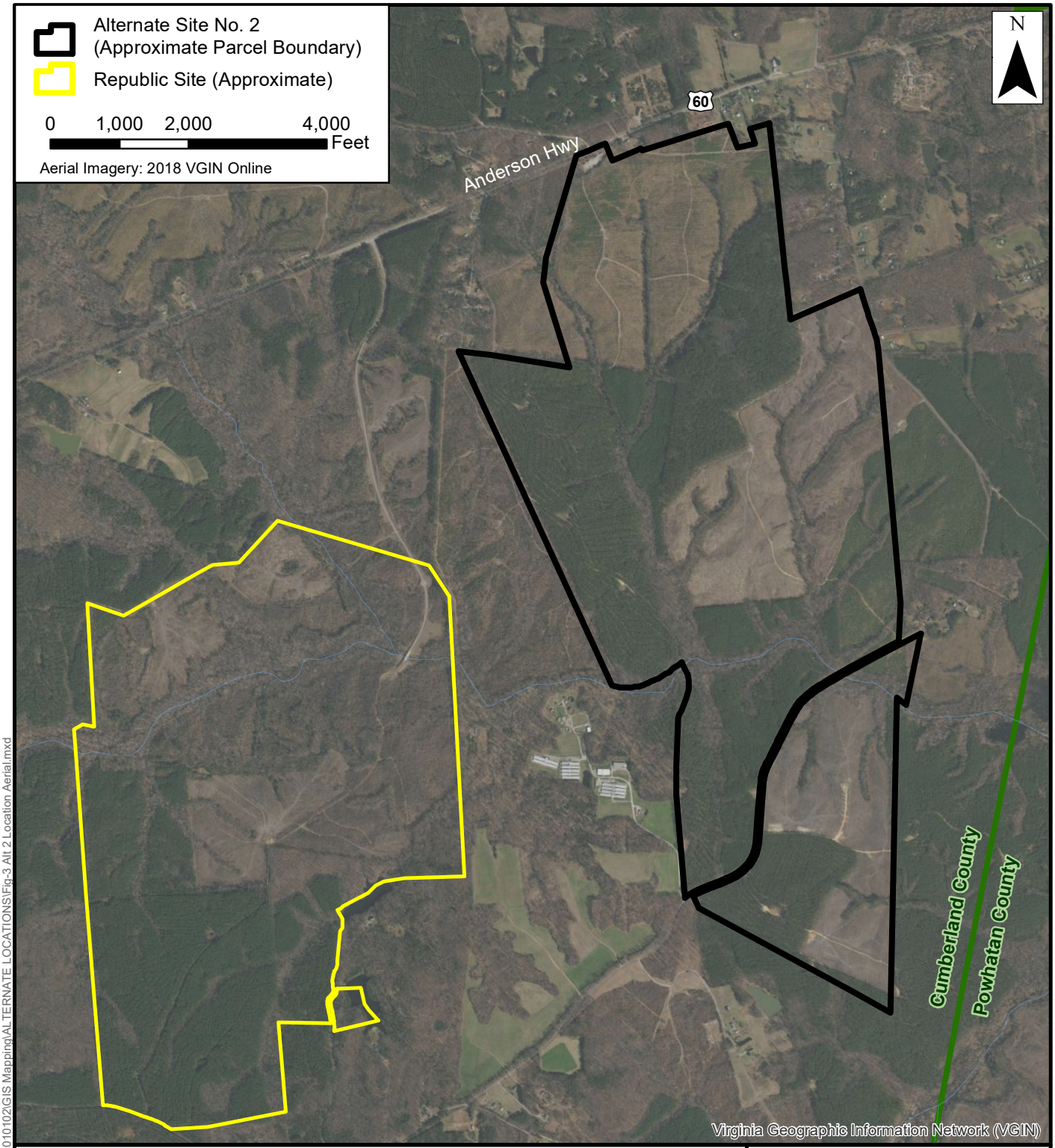
SCALE: 1" : 2000'

PROJECT: 18020117-030102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
2B



Site Location & Aerial Imagery

Alternate Site No. 2 and Republic Site
Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

SCALE: 1" : 2000'

PROJECT: 18020117-030102

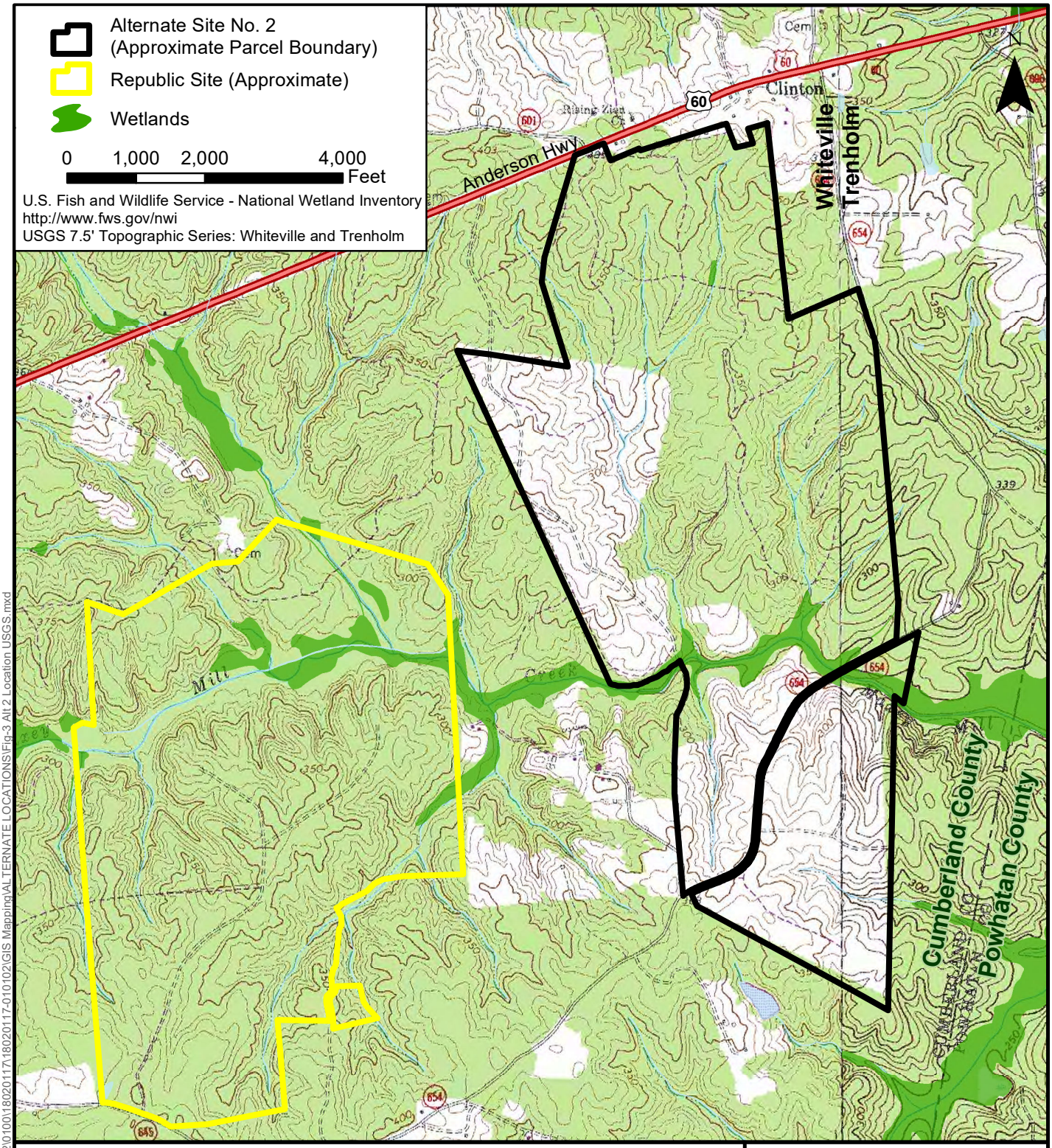
Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
3A

Path: P:\2018\18020\01000\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-3 Alt 2 Location Aerial.mxd

Received by VMRC September 2, 2020 /blh



Site Location & NWI Inventory

Alternate Site No. 2 and Republic Site
Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

SCALE: 1" : 2000'

PROJECT: 18020117-030102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

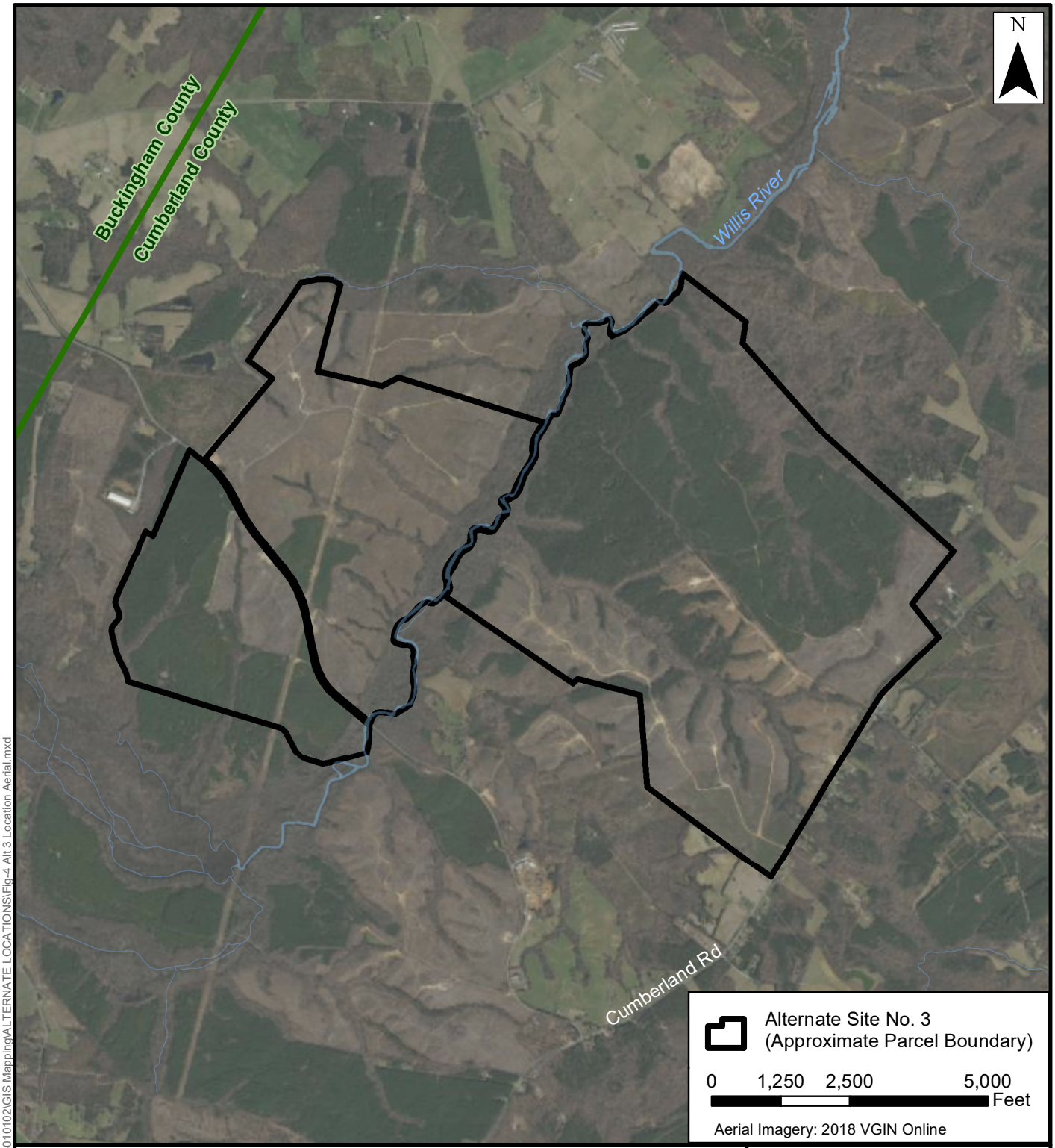
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
3B

Path: \\draperaden.net\daa\Projects\2018\18020100\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-3 Alt 2 Location USGS.mxd

Received by VMRC September 2, 2020 /blh



Site Location & Aerial Imagery

Alternate Site No. 3
Green Ridge Recycling and Disposal Facility LLC
Cumberland County, Virginia

SCALE: 1" : 2500'

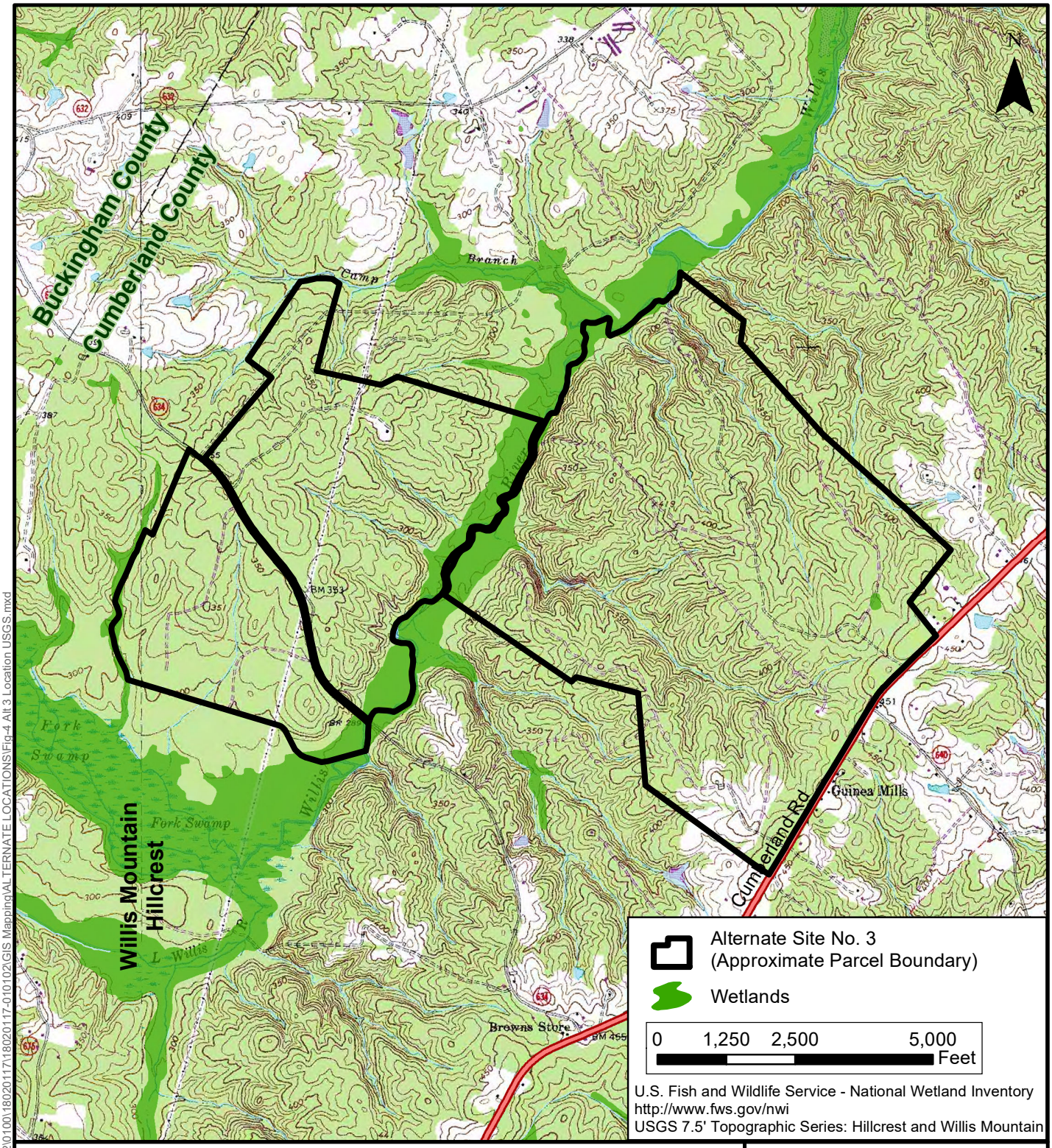
PROJECT: 18020117-030102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 8-10-19

FIGURE
4A

Path: P:\2018\1802\01\00\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-4 Alt 3 Location Aerial.mxd



Site Location & NWI Inventory

Alternate Site No. 3
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1" : 2500'

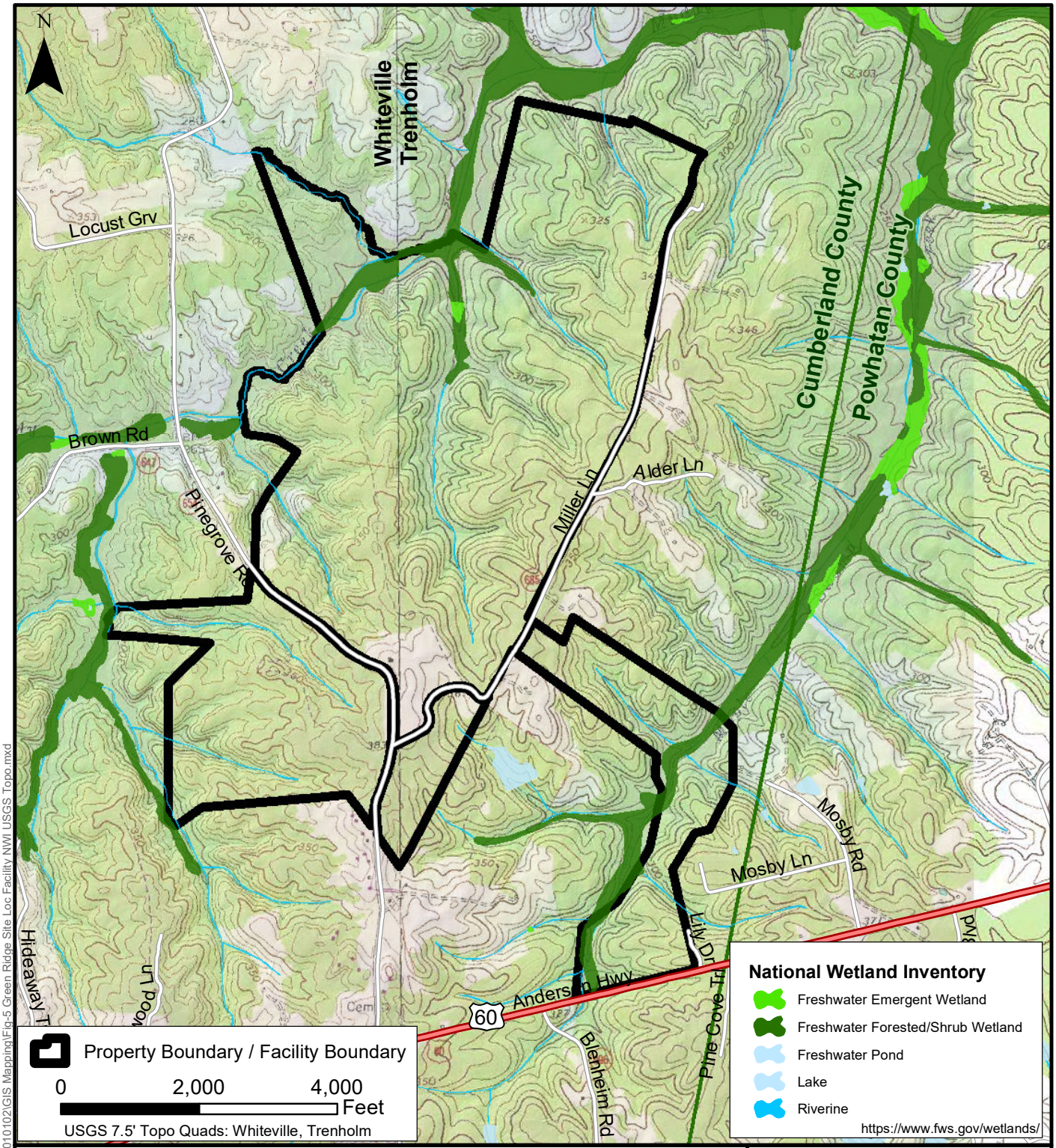
PROJECT: 18020117-010102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: WMD
CHECKED: LPK
DATE: 7-1-19

FIGURE
4B

Path: \\draperaden.net\daa\Projects\2018\18020100\18020117\18020117-010102\GIS Mapping\ALTERNATE LOCATIONS\Fig-4 Alt 3 Location USGS.mxd



Site Location and NWI Map

Green Ridge
Recycling and Disposal Facility
Cumberland Co., Virginia

SCALE: 1" = 2000'

PROJECT: 18020117-010102

Draper Aden Associates
Engineering ◆ Surveying ◆ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Raleigh, NC
Fayetteville, NC
Northern Virginia
Virginia Beach, VA

DESIGNED: LPK
DRAWN: SMF
CHECKED: KEB
DATE: 11-21-19

FIGURE 5

Path: P:\2018\1802\0100\18020117\18020117-010102\GIS Mapping\Fig-5 Green Ridge Site Loc Facility NWI USGS Topo.mxd

Received by VMRC September 2, 2020 /blh

TABLES

TABLE 1 – SITING REQUIREMENTS

Received by VMRC September 2, 2020 /blh

Table 1 – Siting Requirements (9 VAC 20-81-120)

A. Floodplains	No new landfill shall be sited in a 100-year floodplain.
B. Stable Areas.	New landfills shall be sited in geologically stable areas where adequate foundation support for the structural components of the landfill exists. At a minimum, factors to be considered when determining stable areas shall include: 1. Onsite or local soil conditions that may result in differential settling and subsequent failure of structural components or containment structures; and 2. Onsite or local geological or manmade features or events that may result in sudden or non-sudden events and subsequent failure of structural components or containment structures.
C. Restrictions (distances are to be measured in the horizontal plane)	1. No disposal unit or leachate storage unit shall be closer than: a. 200 feet from any residence, school, daycare center, hospital, nursing home, or recreational park area in existence at the time of application; b. 100 feet from any perennial stream or river; c. 50 feet from the facility boundary; d. 500 feet from any well, spring, or other groundwater source of drinking water in existence at the time of application; and e. 1,000 feet from the nearest edge of the right-of-way of any interstate or primary highway or 500 feet from the nearest edge of the right-of-way of any other highway or city street, except the following: (1) Units that are screened by natural objects, plantings, fences, or other means so as to minimize the visibility from the main-traveled way of the highway or city street, or otherwise removed from sight; (2) Units that are located in areas that are zoned for industrial use under authority of state law or in un-zoned industrial areas as determined by the Commonwealth Transportation Board; or (3) Units that are not visible from the main-traveled way of the highway or city street. 2. No new landfill shall be constructed in any park or recreational area, wildlife management area, or area designated by the federal or state agency as the critical habitat of any endangered species.

Received by VMRC September 2, 2020 /blh

Table 1 – Siting Requirements (9 VAC 20-81-120)

	3. Sanitary landfills. a. No new sanitary landfill area shall be constructed: (1) Within a one-mile upgradient of any existing surface or groundwater public water supply intake or reservoir; (2) Within three miles upgradient of any existing surface or groundwater public water supply intake or reservoir except as allowed under the provisions of § 10.1-1408.4 B 3 of the Code of Virginia; (3) In any area vulnerable to flooding resulting from dam failures; (4) Over a sinkhole or less than 100 feet over a solution cavern associated with karst topography; or (5) Over a fault that has had displacement in Holocene time. b. No new sanitary landfill or expansion of an existing sanitary landfill shall be constructed: (1) Within 200 feet of a fault that has had displacement in Holocene time unless the owner or operator demonstrates to the director that an alternative setback distance of less than 200 feet will prevent damage to the structural integrity of the facility and will be protective of human health and the environment; or (2) Within seismic impact zones, unless the owner or operator demonstrates to the director that all containment structures, including liners, leachate collection systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.
D. Groundwater	1. No new facility shall be located in areas where groundwater monitoring cannot be conducted in accordance with 9VAC20-81-250 unless this requirement is suspended by the director pursuant to subdivision A 1 c of that section. Factors to be considered in determining whether or not a site can be monitored shall include: a. Ability to characterize the direction of groundwater flow within the uppermost aquifer; b. Ability to characterize and define any releases from the landfill so as to determine what corrective actions are necessary; and c. Ability to perform corrective action as necessary.

Received by VMRC September 2, 2020 /blh

Table 1 – Siting Requirements (9 VAC 20-81-120)

E. Wetlands	1. Sanitary landfills. a. New sanitary landfills and expansions of existing landfills, other than those impacting less than 2.0 acres of nontidal wetlands, shall not be constructed in any tidal wetland or nontidal wetland contiguous to any surface water body. b. After July 1, 1999, construction at existing permitted facilities (allowed under the provisions of § 10.1-1408.5) only will be allowed with approvals under the provisions of 9VAC25-210. In addition, the demonstration noted in subdivision 3 of this subsection must be made by the owner or operator to the director. 2. New CDD or industrial landfills and expansions of existing CDD or industrial landfills shall not be located in wetlands, unless the owner or operator can make the demonstration noted in subdivision 3 of this subsection. 3. Demonstration. a. Where applicable under § 404 of the Clean Water Act or § 62.1-44.15:5 of the Code of Virginia, the presumption is clearly rebutted that a practicable alternative to the proposed landfill exists that does not involve wetlands; b. The construction and operation of the landfill will not: (1) Cause or contribute to violations of any applicable water quality standard; (2) Violate any applicable toxic effluent standard or prohibition under § 307 of the Clean Water Act; (3) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and (4) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary; c. The landfill will not cause or contribute to significant degradation of wetlands. The owner or operator shall demonstrate the integrity of the landfill and its ability to protect ecological resources by addressing the following factors: (1) Erosion, stability, and migration potential of native wetland soils, muds, and deposits used to support the landfill;

Received by VMRC September 2, 2020 /blh

Table 1 – Siting Requirements (9 VAC 20-81-120)

	(2) Erosion, stability, and migration potential of dredged and fill materials used to support the landfill; (3) The volume and chemical nature of the waste managed in the landfill; (4) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of the solid waste; (5) The potential effects of catastrophic release of waste to the wetland and the resulting impacts on the environment; and (6) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are protected; d. To the extent required under § 404 of the Clean Water Act or applicable Virginia wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by subdivision 3 of this subsection, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of manmade wetlands); e. Information is available to enable the department to make a reasonable determination with respect to these demonstrations.
F. Limiting Site Characteristics	1. Certain site characteristics may prevent approval or require substantial limitations on the site use or require incorporation of sound engineering controls. Such site characteristics shall be identified and an explanation of precautions necessary to assure compliance with the provisions of this chapter shall be provided. Examples include, but are not limited to: a. Excessive slopes (greater than 33%); b. Lack of readily available cover materials on site, or lack of a firm commitment for adequate cover material from a borrow site; c. Springs, seeps, or other groundwater intrusion into the site; d. The presence of gas, water, sewage, or electrical or other transmission lines under the site; or e. The prior existence on the site of an open dump, unpermitted landfill, lagoon, or similar unit, even if such a unit is closed, will be considered a defect in the site unless the proposed unit can be isolated from the defect by the

Received by VMRC September 2, 2020 /blh

Table 1 – Siting Requirements (9 VAC 20-81-120)

	nature of the unit design and the groundwater for the proposed unit can be effectively monitored.
G. Specific Site Conditions	Specific site conditions may be considered in approving an exemption of a site from the following: 1. The limiting site characteristics in subsection F of this section for all landfills; and 2. The groundwater monitoring in subsection D of this section for CDD and industrial landfills.
H. Leachate	Acceptable landfill sites shall allow for adequate area and terrain for management of leachate.
I. Airport Safety	1. Owners or operators of all sanitary landfills that are located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used by only piston-type aircraft shall demonstrate that the units are designed and operated so that the landfill does not pose a bird hazard to aircraft. 2. Owners or operators proposing to site new sanitary landfill and expansions of an existing landfill within a five-mile radius of any airport runway end used by turbojet or piston-type aircraft shall notify the affected airport and the Federal Aviation Administration (FAA). Owners and operators should also be aware that 49 USC § 44718(d), restricts the establishment of landfills within six miles of public airports under certain conditions. Provisions for exemptions from this law also exist.
J. CDD Landfills in Strip Mine Pits	For CDD landfills located in strip mine pits, all coal seams and coal outcrops shall be isolated from solid waste materials by a minimum of five feet of natural or compacted soils with a hydraulic conductivity equal to or less than 1x10-7 cm/sec.
Statutory Authority § 10.1-1402 of the Code of Virginia; 42 USC § 6941 et seq.; 40 CFR Part 258.	
Historical Notes Derived from Volume 27, Issue 12, eff. March 16, 2011.	

Received by VMRC September 2, 2020 /blh

IV. Avoidance and Minimization

Section 4.2 Project Area and Design Evolution – The enclosed report discusses the evolution of the project design over time and how this evolution allowed for the avoidance and/or minimization of wetland impacts on site. While wetlands were the primary consideration during avoidance and minimization efforts, historical resources were also taken into consideration during site layout and design. A series of drawings are included that show the progress of the site layout.

Received by VMRC September 2, 2020 /blh

EVOLUTION OF PROJECT DESIGN

Original Schematic Design: In 2017 multiple contiguous parcels within Cumberland County were identified as potential land for the proposed Green Ridge Recycling and Disposal Facility, LLC based upon early site analysis of multiple locations around the region. As described herein, the parcels were chosen based upon their suitability over other sites with respect to access, environmental impact, community impact, and financial feasibility. Upon identification of these parcels, Koontz Bryant Johnson Williams PC was retained to complete a field delineation of jurisdictional wetlands and waters of the US within the proposed project boundaries. Simultaneously, Draper-Aden Associates and County Waste developed a preliminary layout for the facility. This layout was based upon preliminary mapping resources available with regard to environmental features, topography, access, and ultimately the need of the facility to function. This original proposed layout is illustrated on the following schematic.

Upon the completion of the wetland/waters delineation and survey location, members of the design and development teams met to discuss conflicts between the layout and onsite environmental features. Current state regulations with regard to wetland impacts and solid waste disposal facilities were also consulted during this review. At that time, it was determined that the original proposed layout would impact greater than 2 acres of jurisdictional wetlands. This level of impact was in violation of current state regulations. Therefore, in an effort to reduce wetland and stream impacts at the proposed site, a new concept layout was proposed and is illustrated on the attached schematic. This revised layout included the reduction in the limits of the Western waste disposal area and a realignment of the site access road. This revision to the layout allowed for a reduction in wetland and stream impacts as summarized below.

Original Design	**Wetland Impact: 2.957 Acres**	**Stream Impacts: 25,344 Linear Feet**
Second Design	**Wetland Impact: 1.36 Acres**	**Stream Impacts: 21,901 Linear Feet**
Reduction of Impact	**1.597 Acres**	**3443 Linear Feet**

Second Schematic Design: Upon completion of the modified schematic plan, a meeting was conducted with regulators from the Virginia Department of Environmental Quality and the US Army Corps of Engineers to discuss the work completed thus far. At this time, the field confirmation of the wetland and waters limits had been completed by the Corps and a Jurisdictional Determination was pending. The meeting and review focused on the reduction in wetland impacts to comply with state regulations, the overall quantity of stream impacts, and the determination process of secondary impacts. At this meeting the methodology for secondary impact determination was agreed upon as it related to proposed stormwater basin discharges from the proposed fill areas. Based upon this information, new estimated stream and wetland impact totals were developed. The design and development teams reviewed these new totals in conjunction with the layout. At that time, the project owner decided to remove the

Received by VMRC September 2, 2020 /blh

Eastern Fill Area from the project. Additionally, further adjustments were made to the access road alignment and the realignment of Pinegrove Road. All of these major adjustments were completed in an effort to drastically reduce the total of wetland and stream impacts from the overall project. Once the drastic changes had been completed to the layout, the stormwater and grading plans were developed so that secondary impacts could be calculated. Information provided from the design engineer was overlain on the wetland map to develop final impact totals.

Current Schematic Design: The current design now reflects the removal of the Eastern Fill Area to avoid large portions of stream and wetland impacts; the realignment of the access roadway to eliminate remaining wetland impacts; and the realignment of Pinegrove Road to minimize stream impacts. The total wetland impact progression from original design to the currently proposed plan is below.

Original Design	**Wetland Impact: 2.957 Acres**	**Stream Impacts: 25,344 Linear Feet**
Second Design	**Wetland Impact: 1.36 Acres**	**Stream Impacts: 21,901 Linear Feet**
Current Design	**Wetland Impact: 0.00 Acres**	**Stream Impacts: 10,951 Linear Feet**
Reduction of Impact	**2.957 Acres**	**14,393 Linear Feet**

Through careful redesign of the facility and emphasis placed upon preserving environmentally sensitive areas, wetlands, and streams, the overall wetland impacts were reduced by 100% and the overall stream impacts were reduced by 43%.

Received by VMRC September 2, 2020 /blh

V. ENVIRONMENTAL JUSTICE

The enclosed report, prepared by Mangum Economics, details the standard population demographics within the immediate area surrounding the Green Ridge Facility in comparison with the wider areas of Cumberland County and the state of Virginia. In addition, a letter from the County of Cumberland titled "Economic Justice for Cumberland County Virginia" and dated July 14, 2020 is enclosed for consideration.

Received by VMRC September 2, 2020 /blh

JUNE 16, 2020

GREEN RIDGE
RECYCLING AND DISPOSAL FACILITY

STANDARD DEMOGRAPHICS FOR THE AREAS AROUND THE GREEN RIDGE PROJECT IN CUMBERLAND COUNTY, VIRGINIA

PREPARED BY

MANGUM economics

4201 DOMINION BOULEVARD, SUITE 114
GLEN ALLEN, VIRGINIA 23060
804-346-8446
MANGUMECONOMICS.COM

Received by VMRC September 2, 2020 /blh

About Mangum Economics, LLC

Mangum Economics, LLC is a Richmond, Virginia based firm that specializes in producing objective economic, quantitative, and qualitative analysis in support of strategic decision making. Much of our recent work relates to Renewable Energy (solar and wind), IT & Telecom Infrastructure (data centers, terrestrial and subsea fiber), and Economic Development. Examples of typical studies include:

POLICY ANALYSIS

Identify the intended and, more importantly, unintended consequences of proposed legislation and other policy initiatives.

ECONOMIC IMPACT ASSESSMENTS AND RETURN ON INVESTMENT ANALYSES

Measure the economic contribution that businesses and other enterprises make to their localities.

WORKFORCE ANALYSIS

Project the demand for, and supply of, qualified workers.

CLUSTER ANALYSIS

Use occupation and industry clusters to illuminate regional workforce and industry strengths and identify connections between the two.

The Mangum Economics Team

David Zorn, Ph.D.
Economist

A. Fletcher Mangum, Ph.D.
Founder and CEO

Martina Arel, M.B.A.
Researcher and Economic Development Specialist

Executive Summary

This report provides demographic data on the areas immediately surrounding the proposed Green Ridge Recycling and Disposal Facility in Cumberland County, Virginia. We compared data on areas within a 1-mile, 2.2-mile, 4.2 mile, and 6.2-mile radius of the facility to demographic data for Cumberland and Powhatan Counties, and Virginia statewide data. Our approach is consistent with guidance from the US Environmental Protection Agency on collecting data for environmental justice issues. We used high quality data from the US Census Bureau and data from a widely used demographics firm.

We found that there are more than 5 times as many people per square mile living in the state of Virginia overall than there are living within 6.2 miles of the facility. That means that the location of the proposed facility is in one of the least densely populated areas in the state. Overall, the percentage of racial minorities living within 6.2 miles of the proposed facility is about the same as the percentage living within the state of Virginia. And the median household income of people living within 6.2 miles of proposed facility is more than 30 percent higher than in rural Virginia, overall ($52,948 vs $40,153).

Based on high-quality census data, the area within 6.2 miles of the proposed Green Ridge Recycling and Disposal Facility in Cumberland County has a minority concentration that mirrors that of the overall state of Virginia and that is lower than Cumberland County. People living within 6.2 miles of Green Ridge have a higher median household income than people living in Cumberland County overall and higher than people living in the rural localities in Virginia overall.

The area within 6.2 miles of the proposed Green Ridge facility would appear to be suitable for a facility that is best suited to an area with a low population density. Given that Cumberland County currently and for at least the last several years has a higher unemployment rate than neighboring Powhatan County and the state of Virginia as a whole, the facility would also be suitable to provide jobs for local residents and reliable tax revenue for Cumberland County.

Background

Woods Rogers PLC retained Mangum Economics for a demographics assessment of the area around the proposed Green Ridge Recycling and Disposal Facility, LLC ("Green Ridge") in Cumberland County, Virginia.

THE PROPOSED GREEN RIDGE RECYCLING AND DISPOSAL FACILITY

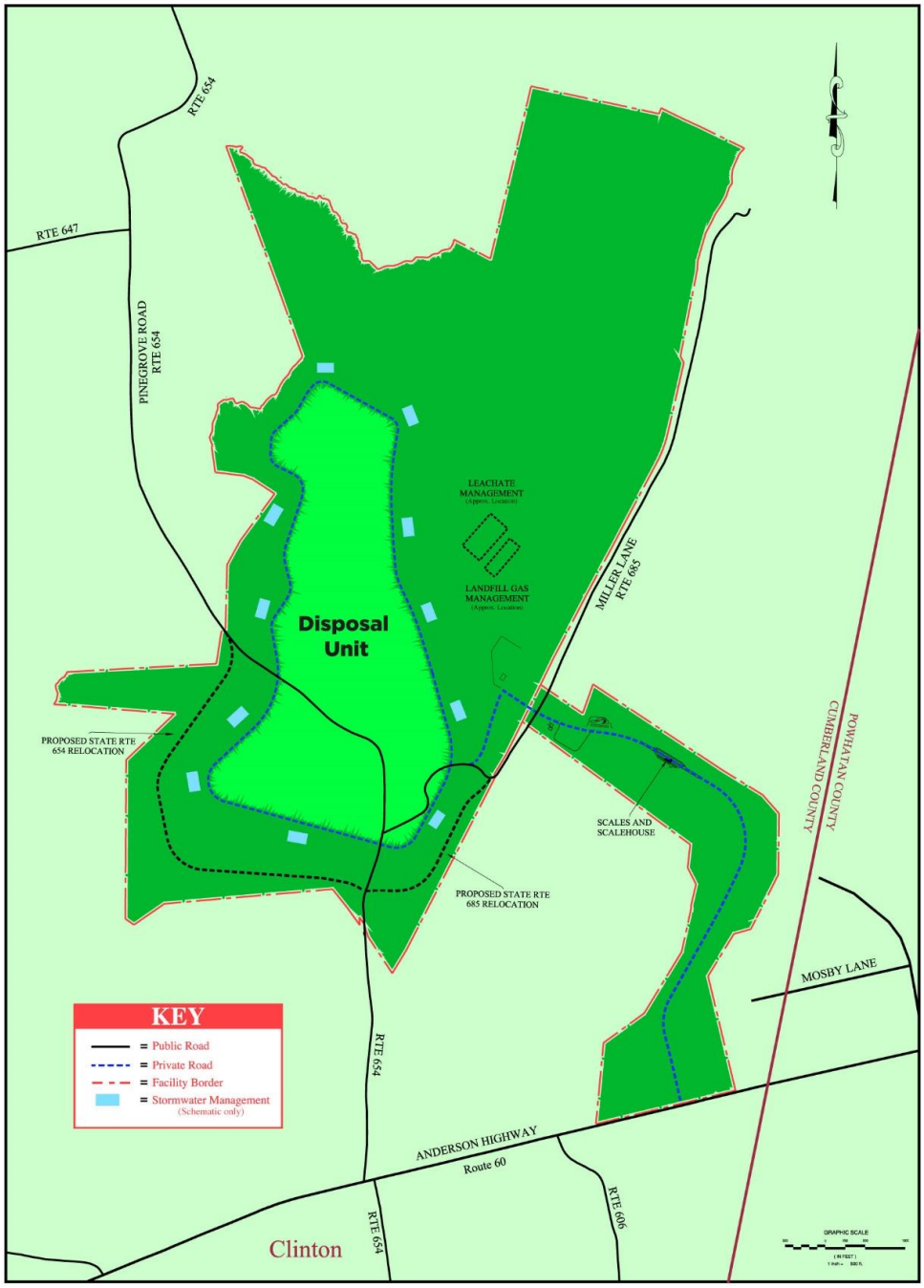
Green Ridge is a proposed recycling and waste management facility in Cumberland County, Virginia. As reflected in Figure 1, Green Ridge would be located in Cumberland County just west of the boundary between Cumberland and Powhatan counties and just north of US Highway 60. The entire facility would occupy a total of 1,200 acres, including a recycling center and an approximately 240-acre disposal area. Green Ridge has been designed to minimize the impact on the surrounding area. According to Green Ridge, only 37 homes are located within one-half mile of the disposal area.

The facility is planned to have, at a minimum, 200-foot wide buffers between properties that are adjacent to the facility and the facility perimeter (with the exception of the entrance road). In order to minimize any odor from the facility, it will not accept wastewater treatment sludge or reprocessed sheetrock. The facility will have operating procedures to reduce noise, dust, and light coming from it.

Access to the facility will be by a new private mile-long road connecting to US Highway 60. To minimize the impact of traffic in the area, traffic flow will be controlled around the facility, and Green Ridge will use rumble strips to keep mud off of nearby roadways.

Figure 1 shows the conceptual design of the facility and its general location.

Figure 1. Conceptual Drawing of the Proposed Green Ridge Recycling and Disposal Facility[1]



[1] This figure is a schematic and not meant to portray all landfill support operations. Final design will be completed later in the permitting process. https://greenridgeva.com/project-description.html

DEMOGRAPHIC DATA SOURCES

For this demographic assessment, we used methods consistent with guidance from the US Environmental Protection Agency (EPA) on environmental justice issues included in its *Toolkit for Assessing Potential Allegations of Environmental Injustice*.[2] EPA advises the following criteria be applied when collecting and reporting statistics used for environmental justice purposes.[3]

1. Criterion 1: Policy Relevance -- Each Environmental Justice Indicator should:
   - Provide a representative picture of the conditions within a community, pressures on the community, and the government's responses to those pressures;
   - Provide a basis for comparison between various geographic units of analyses: states, cities, counties, census blocks, or census tracts;
   - Be applicable to local and regional environmental and/or public health issues of national significance;
   - Have a threshold or reference value against which to compare it, so that users are able to assess the significance of the values associated with it; and
   - Be simple, easy to interpret, and able to show trends over time.

2. Criterion 2: Analytical Soundness -- Each Environmental Justice Indicator should:
   - Be well-founded in technical, empirical, theoretical, and scientific terms;
   - Be based on national standards and consensus about its validity as a measuring tool;
   - Lend itself to being linked to computer modeling and forecasting; and
   - Lend itself to being incorporated into data information systems.

3. Criterion 3: Measurability -- The data required to support each Environmental Justice Indicator should be:
   - Quantifiable, verifiable, and time-specific;
   - Readily available or made available at a reasonable cost/benefit ratio;
   - Adequately documented and of known quantity; and
   - Updated at regular intervals in accordance with reliable research procedures.

Demographic data from the US Census Bureau and demographic statistics based on the data provided by it meet all of those criteria. The Census Bureau is one of the agencies of the U.S. Federal Statistical System that produces data about Americans. The decennial census counts every person living in the United States using mail, phone, web-based, and door-to-door survey methods. The Bureau's annual American Community Survey is the premier source for detailed population and housing information in the United States. It is an ongoing survey that is conducted every month of every year sent to about 2 percent of the mailing addresses in the country. The survey collects information on many topics including, population, race, education, occupation, and housing.

[2] US Environmental Protection Agency, *Toolkit for Assessing Potential Allegations of Environmental Injustice*. November 2004.
[3] US Environmental Protection Agency, *Toolkit for Assessing Potential Allegations of Environmental Injustice*. p. 27.

Information provided by the US Census Bureau is subject to the accuracy and reliability standards of the Information Quality Act. The Bureau meets a high standard of scientific integrity by following a common set of professional standards and operational practices designed to ensure the quality, integrity, and credibility of the data that it collects and reports. The Bureau also follows the guidance of the National Research Council of the National Academies on principles and practices necessary for federal agencies to produce statistical data that is relevant, credible, trustworthy, and independent of political influence. Since 2002, the Bureau has had an established procedure to allow anyone to seek correction of any of the information that it puts out.

Except where specifically noted, all of the information in this report for the years 2012 through 2017 is taken from the decennial census or the American Community Survey of the US Census Bureau.

We also report demographic data for 2018 and 2019, in order to provide the most up-to-date demographic estimates available. Data from the 2018 and 2019 American Community Survey has not yet been released by the US Census Bureau. For those years, we use data from the demographics firm, GeoLytics.

Since 1996, GeoLytics has published detailed demographic and geographic data based on data from the US Census Bureau. The company is a leading provider of census, demographic, and geographic data for academic and business researchers working in libraries, real estate, insurance, healthcare, in hundreds of universities across the country, and in federal, state, and local governments. GeoLytics makes estimates and projections of demographic statistics up to the most recent full calendar year based on the data from the US Census Bureau's most recent decennial census (2010) and data from all of the American Community surveys from that decennial census to the results most recently released in 2018 for the year 2017. Estimates and projections are based on complex modeling systems designed to forecast the current composition of the U.S. population, based on multiple inputs. The GeoLytics data also allows researchers to estimate demographic statistics within a given radius from a geographic point.

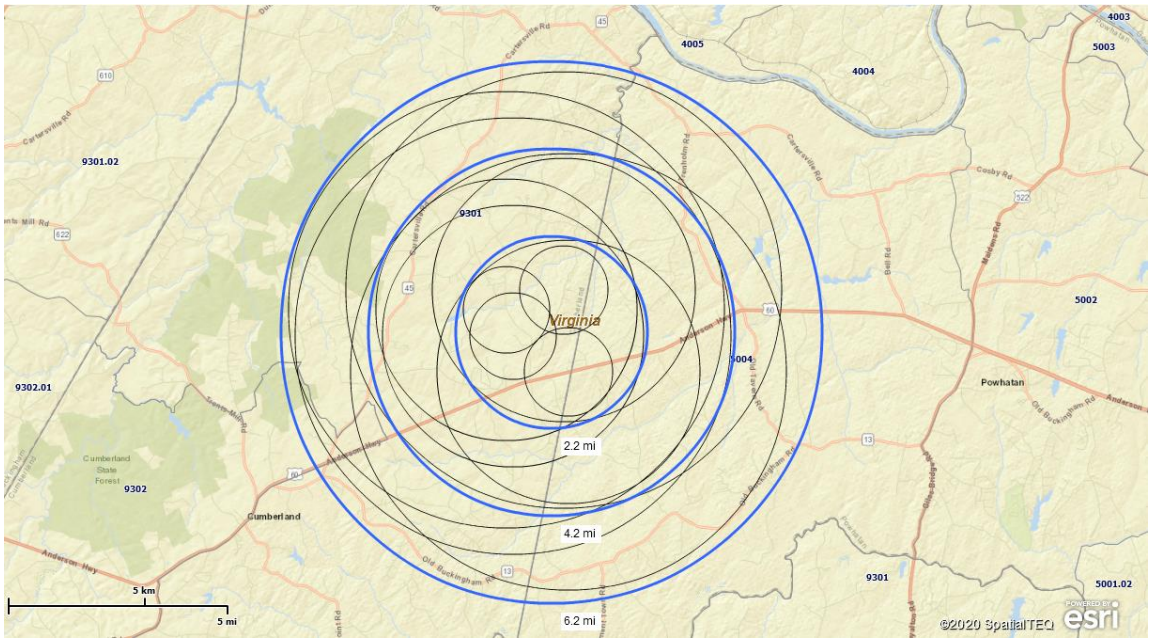
THE AREAS OF STUDY

In this report, we provide demographic statistics for areas 1-mile, 3-miles, and 5-miles out from the general edges of the Green Ridge facility property. For comparison, we also provide the same data for the counties of Cumberland and Powhatan, Virginia; and for the state of Virginia as a whole.

Because of the size of the Green Ridge facility, a circle with a 1-mile radius around the center of the facility would not include all residents living one mile or less from the property's boundary. Therefore, in addition to analyzing the demographics within a 1-mile radius of the approximate center of the facility, we also marked circles with a 1-mile radius from the general area of the 4 corners of the facility. Then, using a point nearest the center of the intersection of those 1-mile radius circles we marked a circle that would encompass all of them completely. The radius of that circle was 2.2 miles. We did the same for 3-mile and 5-mile radius circles at the corners of the facility. The circles that encompassed those circles had 4.2-mile and 6.2-mile radii. In this way, all of the people living within 1, 3, and 5 miles of the nearest

part of the facility are included in our demographic statistics. The people within these circles are the most affected by the proposed facility. Figure 2 illustrates the 1-mile, 3-mile, and 5-mile radius circles centered at the four corners of the facility boundary (in black) as well as the 2.2-mile, 4.2-mile, and 6.2-mile radius circles centered from the approximate center of the facility (in blue).

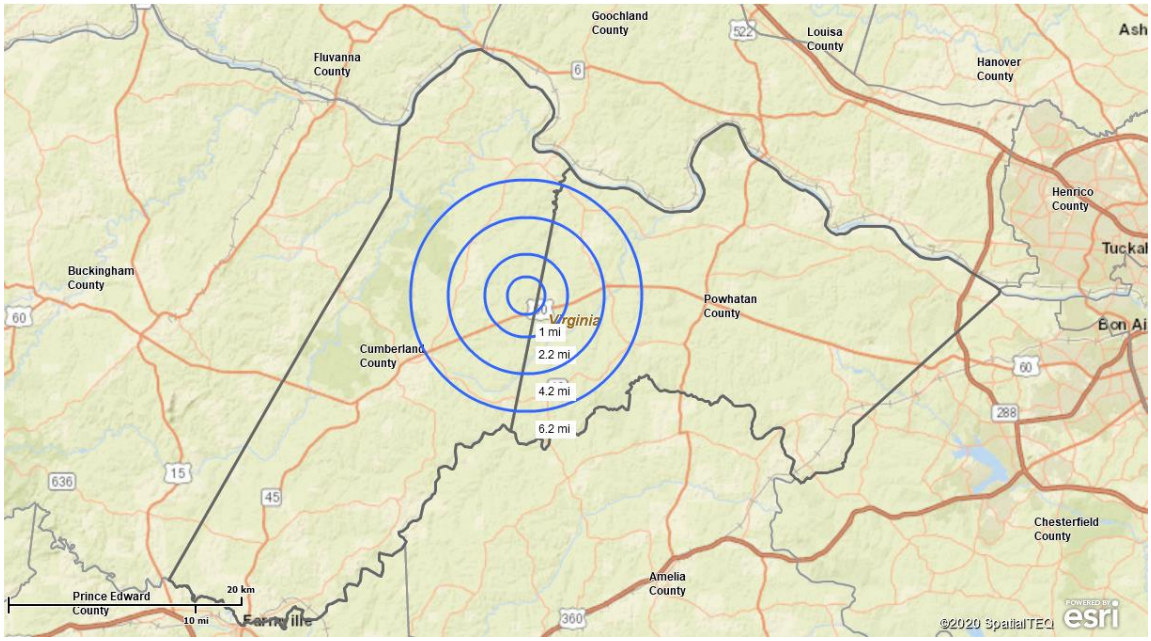
Figure 2. Identification of Areas Most Affected by the Proposed Green Ridge Facility[4]



[4] Map source: Mapbusinessonline.com.

Figure 3 shows how the areas that are most affected (indicated by the blue circles) fit in relation to the borders of Cumberland and Powhatan County (indicated by the dark grey boundary lines).

Figure 3. Areas Most Affected by the Proposed Green Ridge Facility in Relation to County Boundaries[5]



Current Demographics of the Areas Around Green Ridge

The people living within each of the 1-, 2.2-, 4.2-, and 6.2-mile radius circles around the proposed Green Ridge facility are those who might possibly be affected by the facility. Beyond that, we provide demographics on residents of Cumberland and Powhatan counties in Virginia for the purpose of comparison. Current data (2019) provided by GeoLytics includes basic demographic data – population, household, income, race, employment, and housing data. Table 1 reports the basic demographic data for the areas within 1, 2.2, 4.2, and 6.2 miles of the proposed Green Ridge Facility.

[5] Map source: Mapbusinessonline.com.

Table 1. 2019 Demographics for the Area Immediately Surrounding Green Ridge[6]

	1-Mile Radius	2.2-Mile Radius	4.2-Mile Radius	6.2-Mile Radius
Population	124	641	2,366	5,004
Density (population/square mile)	39.77	42.38	43.00	41.78
Households	46	237	873	1,854
Average household size (number of people)	2.68	2.70	2.71	2.70
Median household income‡	$52,699	$54,614	$54,520	$52,948
Race: White	99 (80%)	517 (81%)	1,923 (81%)	4,018 (80%)
Race: Black	24 (19%)	116 (18%)	417 (18%)	927 (19%)
Race: American Indian or Alaska Native	0	1 (<1%)	3 (<1%)	6 (<1%)
Race: Asian	0	0	0	0
Race: Pacific Islander	0	0	0	0
Race: Other	1 (1%)	6 (1%)	24 (1%)	53 (1%)
Education: Graduated high school*	53 (59%)	284 (62%)	1,087 (63%)	2,341 (64%)
Education: Graduated college*	11 (12%)	54 (12%)	198 (12%)	408 (11%)
Employment status: Employed	55 (95%)	291 (96%)	1,083 (96%)	2,309 (96%)
Employment status: Unemployed	3 (5%)	12 (4%)	42 (4%)	86 (4%)
Total Housing units	62	310	1,137	2,454
Housing units: Owner occupied	40 (65%)	209 (67%)	775 (68%)	1,654 (67%)
Housing units: Renter occupied	6 (10%)	28 (9%)	98 (9%)	200 (8%)
Median monthly rent	$814	$866	$863	$896
Median housing value	$146,566	$158,535	$163,511	$174,120

* Percentages for education are as a percent of adults aged 20 and over.

‡ Overall median household income in the rural localities of Virginia was $40,153 in 2019.

Remember that a 4.2-mile and 6.2-mile radius from the central area of the facility is needed in order to include all of the people who live 3 miles and 5 miles from the edge of the facility. These statistics show that the people who live 1 mile or less from Green Ridge are very similar to those who live 3 miles and 5 miles or less from the edge of the facility. That is seen in the fact that the population density, average household size, median household income, racial make-up, rate of employment is very similar within all of the radii. There are some differences across the areas (for example, in high school graduation rate and median housing value) that are normal for data. These variations indicate that the data is real and not simulated by an algorithm.

Table 2 shows how the populations differ within the 1-mile and 6.2-mile radii on either side of the Cumberland-Powhatan county line. The 1-mile radius is almost completely within Cumberland County, while the other radii include parts of Powhatan County. The Powhatan County population that is within the radii is significantly more white than for the state of Virginia as a whole.

[6] Data source: GeoLytics.

Table 2. 2019 Demographics for the Cumberland and Powhatan Areas Closest to Green Ridge[7]

	1-Mile Radius Cumberland†	1-Mile Radius Powhatan†	6.2-Mile Radius Cumberland†	6.2-Mile Radius Powhatan†
Population	103	21	2,299	2,705
Density (population/square mile)	37.7	52.78	34.03	51.67
Households	38	8	873	981
Average household size (number of people)	2.68	2.71	2.63	2.76
Median household income‡	$50,775	$66,308	$40,460	$62,229
Race: White	83 (81%)	16 (76%)	1,737 (76%)	2,281 (84%)
Race: Black	19 (19%)	5 (24%)	545 (24%)	382 (14%)
Race: American Indian or Alaska Native	0	0	0	6 (<1%)
Race: Asian	0	0	0	0
Race: Pacific Islander	0	0	0	0
Race: Other	1 (1%)	0	17 (1%)	36 (1%)
Education: Graduated high school*	42 (59%)	11 (85%)	952 (58%)	1,389 (69%)
Education: Graduated college*	9 (13%)	2 (15%)	187 (11%)	221 (11%)
Employment status: Employed	45 (94%)	10 (100%)	1,028 (95%)	1,281 (97%)
Employment status: Unemployed	3 (6%)	0	52 (5%)	34 (3%)
Total Housing units	52	10	1,260	1,194
Housing units: Owner occupied	33 (63%)	7 (63%)	760 (60%)	894 (75%)
Housing units: Renter occupied	5 (10%)	1 (10%)	113 (9%)	87 (7%)
Median monthly rent	$785	$1,028	$780	$1,052
Median housing value	$138,439	$181,487	$138,689	$177,851

* Percentages for education are as a percent of adults aged 20 and over.

† Percentages may not sum to 100% because of rounding.

‡ Overall median household income in the rural localities of Virginia was $40,153 in 2019.

We can compare the demographics of the area nearest to the proposed facility with those of wider areas around the facility – in Cumberland and Powhatan counties, and in the overall state of Virginia. Table 3 shows the demographics of those areas.

[7] Data source: GeoLytics.

Table 3. Demographics for the Wider Areas Around Green Ridge[8]

	Cumberland County	Powhatan County	Virginia
Population	9,520	28,895	8,718,906
Density (population/square mile)	32.00	111.05	220.84
Households	3,764	9,861	3,305,367
Average household size (number of people)	2.52	2.71	2.56
Median household income	$45,328	$78,004	$62,729
Race: White	6,564 (69%)	25,603 (89%)	5,929,845 (68%)
Race: Black	2,872 (30%)	2,938 (10%)	1,672,970 (19%)
Race: American Indian or Alaska Native	2 (<1%)	11 (<1%)	9,283 (<1%)
Race: Asian	0	32 (<1%)	487,398 (6%)
Race: Pacific Islander	0	0	1,336 (<1%)
Race: Other	82 (1%)	311 (1%)	618,074 (7%)
Education: Graduated high school*	4,139 (60%)	16,452 (74%)	4,757,114 (75%)
Education: Graduated college*	772 (11%)	4,019 (18%)	1,812,097 (29%)
Employment status: Employed	4,426 (95%)	14,077 (97%)	4,236,582 (97%)
Employment status: Unemployed	225 (5%)	367 (3%)	144,295 (3%)
Total Housing units	5,803	12,305	3,926,519
Housing units: Owner occupied	3,137 (54%)	9,299 (76%)	2,259,458 (58%)
Housing units: Renter occupied	627 (11%)	562 (5%)	1,045,909 (27%)
Median monthly rent	$790	$1,382	$1,277
Median housing value	$139,570	$194,338	$162,361

* Percentages for education are as a percent of adults aged 20 and over.

Comparing the demographics of the area within 6.2 miles of Green Ridge with the broader areas reveals some differences. The area within 6.2 miles of Green Ridge has fewer people per square mile than Powhatan County and Virginia, statewide. The percentage of black residents in the area within 6.2 miles of Green Ridge is approximately equal to that of the statewide population in Virginia. The areas within a few miles of Green Ridge have a higher median household income than Cumberland County, but lower than Powhatan County and Virginia, statewide.

[8] Data source: GeoLytics.

Demographic Trends of the Areas Around Green Ridge

Trends in demographic data are useful to look for emerging changes in demographic patterns and for anomalies that may suggest that the data is unreliable. The graphs below show the trends in the data for the major statistics of interest. The specific measures were chosen so as to keep them comparable across the different geographies. For example, instead of showing population trends that are very dependent on the size of the area in square miles, we show trends in population density (residents per square mile) that is comparable regardless of the number of square miles of the area. Because the square mileage of an area stays the same over time, any increase in population density can only be caused by an increase in population. Figures 4 through 7 on the following pages show the trends in population density, median household income, the percentage of non-white, minorities, and adult unemployment.

Figure 4 shows the trends in population density (residents per square mile) from 2012 through 2019. As the chart makes clear, population density (and therefore population) in all of the areas around the proposed Green Ridge facility has been very stable and increasing slightly over the last seven years. The chart also clearly shows that Powhatan County has more than twice as many residents per square mile than the area immediately surrounding Green Ridge. The state of Virginia overall is more than 5 times as densely populated as the areas within 6.2 miles of Green Ridge.

Figure 5 shows the trends in median household income. Notably, median household income within 6.2 miles of Green Ridge has declined while in the other areas it has remained stable or increased. Though the median income in Cumberland County has risen since 2016, it is significantly below the median income in Powhatan County and in Virginia, overall.

Figure 6 shows the trends in the percent of the population that is non-white, minority. Across all of the areas the non-white, minority population has declined since 2012. Over the last several years, the racial mix in Cumberland County has changed from having a greater proportion of non-white, minorities than Virginia overall, to being very close to the overall state proportion. The percentage of non-white, minority people living within 6.2 miles of Green Ridge has remained relatively stable over the last several years at a level that is significantly less than the statewide average.

Figure 7 shows the trends in unemployment. In all areas, unemployment has declined significantly since about 2013, 2014, or 2015. Unemployment in Cumberland County is still much higher than the statewide average and unemployment in neighboring Powhatan County.

Figure 4. Population Density in Areas Relevant to the Proposed Green Ridge Facility[9]

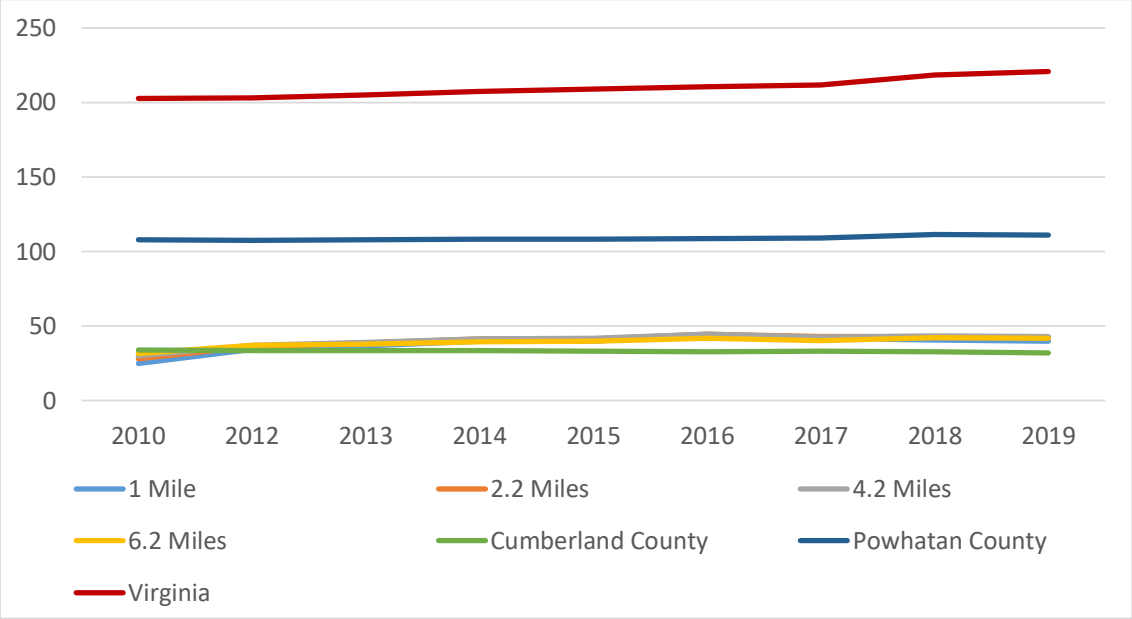
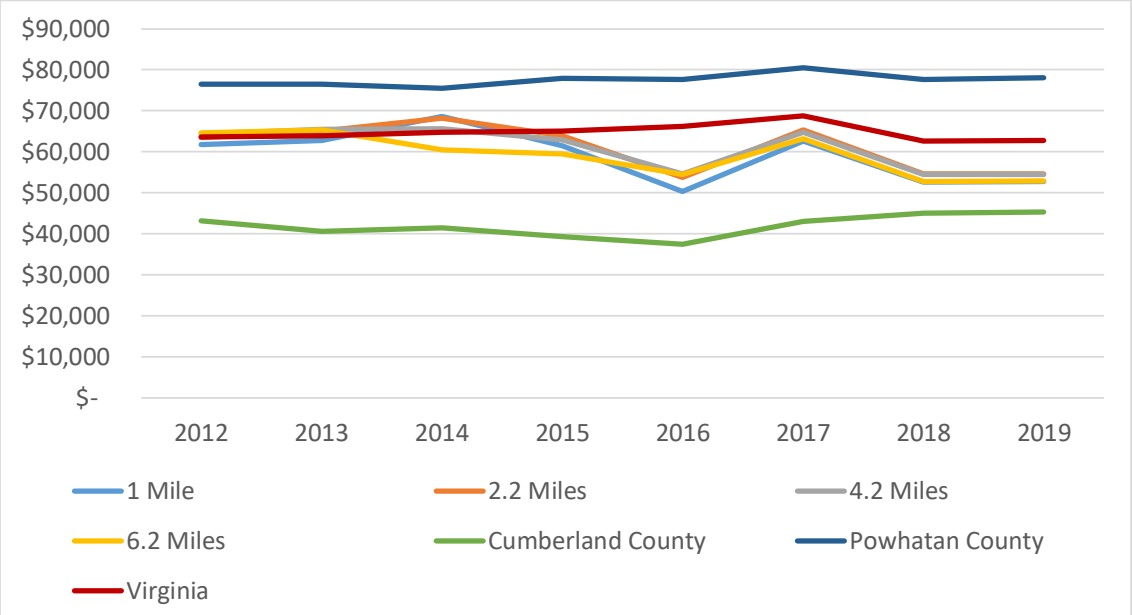


Figure 5. Median Household Income in Areas Relevant to the Proposed Green Ridge Facility[10]



[9] Data source: US Census Bureau and GeoLytics.
[10] Data source: US Census Bureau and GeoLytics.

Figure 6. Non-white Minority Populations in Areas Relevant to the Proposed Green Ridge Facility[11]

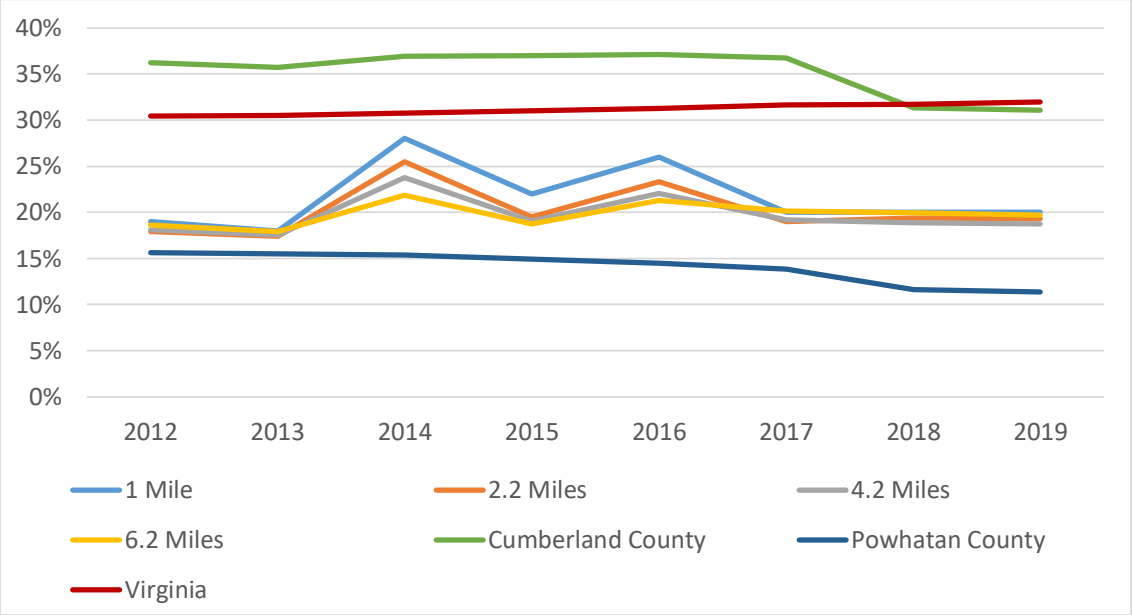
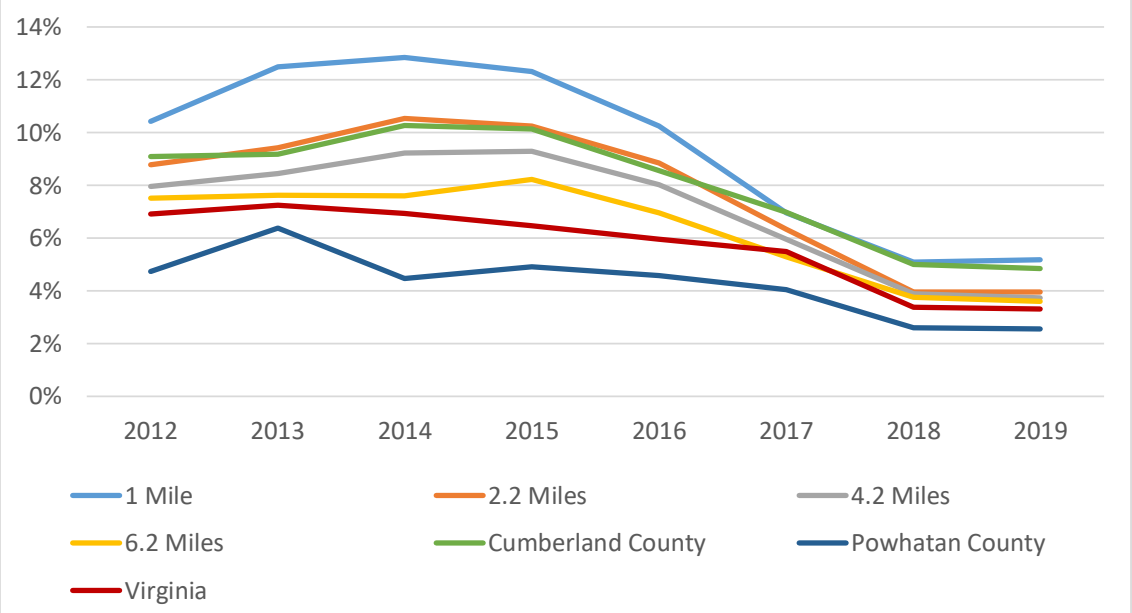


Figure 7. Unemployment in Areas Relevant to the Proposed Green Ridge Facility[12]



[11] Data source: US Census Bureau and GeoLytics.
[12] Data source: US Census Bureau and GeoLytics.

Conclusion

This report provides demographic data on the areas immediately surrounding the proposed Green Ridge Recycling and Disposal Facility in Cumberland County. We compared data on areas within a 1-mile, 2.2-mile, 4.2-mile, and 6.2-mile radius of the facility to demographic data for Cumberland and Powhatan Counties, and Virginia statewide data. Our approach is consistent with guidance from the US Environmental Protection Agency on collecting data for environmental justice issues. We used high quality data from the US Census Bureau and data from a widely used demographics firm.

Among the people living within 6.2 miles of the proposed Green Ridge facility, the main difference is that Powhatan County residents are significantly more likely to be white, have more education, and have higher median household income.

There are also significant differences between the people living a few miles of the proposed facility and the populations of Cumberland or Powhatan county or the statewide population of Virginia. Fewer people per square mile live in the area within 6.2 miles of Green Ridge than in Virginia overall and in Powhatan County; however, the area within 6.2 miles of Green Ridge is more densely populated (more residents per square mile) than in Cumberland County overall. Overall, the state of Virginia is more than 5 times more densely populated than the area immediately surrounding Green Ridge.

The population within 6.2 miles of Green Ridge has a significantly higher percentage of white residents than all of the comparative areas, except for Powhatan County which has a significantly higher percentage of white residents than all of the areas discussed in this report. The percentage of black residents within 6.2 miles of Green Ridge is approximately equal to that of the statewide population in Virginia. Moreover, the percentage of black residents within each of the radii immediately surrounding Green Ridge (18% - 19%) is significantly lower than in Cumberland County as a whole (30%). Additionally, the percentage of black residents within the 6.2-mile radius in Powhatan County (14%) is significantly lower than in the state as a whole (19%). The area immediately surrounding Green Ridge has a higher median household income than Cumberland County, but lower than Powhatan County and Virginia, statewide. In comparison to rural localities in Virginia, the residents living within the 6.2 miles of Green Ridge have a much higher median household income than Virginia rural residents.

We also reported on demographic trends in the areas from 2012 through 2019. Population density in of the areas around the proposed Green Ridge facility has been increasing slightly over the last seven years. Median household income within 6.2 miles of Green Ridge has declined while in the other areas it has remained stable or increased. Though median incomes in Cumberland County have risen since 2016, they are significantly below median incomes in Powhatan County and in Virginia, overall. Across all of the areas, the non-white, minority population has declined since 2012. Over the last several years, the racial mix in Cumberland County has changed from having a greater proportion of non-white, minorities than Virginia overall, to being very close to the overall state proportion. The percentage of non-white, minority people living within 6.2 miles of Green Ridge has remained relatively stable over the last

several years at a level that is significantly less than the statewide average. While, in all areas unemployment has declined significantly since about 2013, 2014, or 2015, unemployment in Cumberland County is still notably higher than the statewide average or unemployment in neighboring Powhatan County.

Based on high-quality census data, the area within 6.2 miles of the proposed Green Ridge Recycling and Disposal Facility in Cumberland County has a minority concentration that mirrors that of the overall state of Virginia and that is lower than Cumberland County. People living within 6.2 miles of Green Ridge have a higher median household income than people living in Cumberland County overall and higher than people living in the rural localities in Virginia overall.

The area within 6.2 miles of the proposed Green Ridge facility would appear to be suitable for a facility that is best suited to an area with a low population density. Given that Cumberland County currently and for at least the last several years has a higher unemployment rate than neighboring Powhatan County and the state of Virginia as a whole, the facility would also be suitable to provide jobs for local residents and reliable tax revenue for Cumberland County.

AUGUST 6, 2020

GREEN RIDGE

RECYCLING AND DISPOSAL FACILITY

ADDENDUM TO STANDARD DEMOGRAPHICS FOR THE AREAS AROUND THE GREEN RIDGE PROJECT IN CUMBERLAND COUNTY, VIRGINIA

PREPARED BY

MANGUM economics

4201 DOMINION BOULEVARD, SUITE 114
GLEN ALLEN, VIRGINIA 23060
804-346-8446
MANGUMECONOMICS.COM

Received by VMRC September 2, 2020 /blh

About Mangum Economics, LLC

Mangum Economics, LLC is a Richmond, Virginia based firm that specializes in producing objective economic, quantitative, and qualitative analysis in support of strategic decision making. Much of our recent work relates to Renewable Energy (solar and wind), IT & Telecom Infrastructure (data centers, terrestrial and subsea fiber), and Economic Development. Examples of typical studies include:

POLICY ANALYSIS

Identify the intended and, more importantly, unintended consequences of proposed legislation and other policy initiatives.

ECONOMIC IMPACT ASSESSMENTS AND RETURN ON INVESTMENT ANALYSES

Measure the economic contribution that businesses and other enterprises make to their localities.

WORKFORCE ANALYSIS

Project the demand for, and supply of, qualified workers.

CLUSTER ANALYSIS

Use occupation and industry clusters to illuminate regional workforce and industry strengths and identify connections between the two.

The Mangum Economics Team

David Zorn, Ph.D.
Economist

A. Fletcher Mangum, Ph.D.
Founder and CEO

Martina Arel, M.B.A.
Researcher and Economic Development Specialist

Addendum

Magnum Economics was asked to include additional information in its demographic report dated June 16, 2020 relating to the Green Ridge Recycling and Disposal Facility. As the June report reflects, the median income for those households within the geographic areas analyzed is substantially above the State's median household income for rural localities. We were asked to also add data reflecting the percentages of households that are at or below the poverty level within the report's identified radii. This addendum provides that information.[1]

The 2020 Poverty Guidelines for the 48 Contiguous States and the District of Columbia indicate that for a family/household of three people, the poverty level is $21,720.[2] The average household size in the areas analyzed in our demographic report ranges between two to three people. The closest Census category for household income that would include all of the households below the 2020 poverty level is $20,000 to $24,999. Therefore, we have provided in this addendum the number and percentage of households with total household income below $25,000 as a measure of the number of households below or near the poverty line. Doing this will somewhat overstate the percentage of households at or below the poverty line. So, this approach provides a worst case scenario in terms of the percentage of households at or below the poverty line. It also represents the most conservative approach, because it helps ensure that the percentages of households at or below poverty line are not underestimated, while also including households that are close to the poverty line, albeit slightly above it.

As reflected in the tables below, in 2019, approximately 33 percent of all households in Virginia's rural localities have household income below $25,000. The percentage of households in Cumberland County as a whole mirrors that 33 percent, almost exactly. More significantly, and as Table 1 shows, the percentages of households with incomes below $25,000 within 1 mile, 2.2 miles, 4.2 miles, and 6.2 miles of the Green Ridge facility are significantly below the State percentage, as well as the percentage in Cumberland County as a whole. This is true even when excluding households in the more affluent Powhatan County and only including Cumberland County households. Thus, the Green Ridge facility will be located in the part of Cumberland County that is less poor than Cumberland County as a whole. It will also be located near the much more affluent Powhatan County, where poverty rates are substantially below the statewide average.

Table 1 reports the number and percentage of households with household income below $25,000 for the areas within 1, 2.2, 4.2, and 6.2 miles of the proposed Green Ridge Facility.

---

[1] In this addendum, we have also updated the median income for rural localities in Virginia, to be consistent with the Weldon Cooper Center's 2019 revision of the Virginia localities in metropolitan statistical areas. Rural localities are all those not included in metropolitan statistical areas. Localities in micropolitan statistical areas are considered rural, including the counties of Dickenson, Henry, Pittsylvania, Tazewell, and Wise, and the cities of Danville, Martinsville, and Norton. After including those localities to our analysis, the median rural household income in Virginia decreases from our original figure of $40,153 to $39,458.

[2] Department of Health and Human Services, "Annual Update of the HHS Poverty Guidelines," 85 *Federal Register* 3060, January 17, 2020.

Table 1. 2019 Households with Income under $25,000 for the Areas Immediately Surrounding Green Ridge[3]

	1-Mile Radius	2.2-Mile Radius	4.2-Mile Radius	6.2-Mile Radius
Households with household income under $25,000	10 (22%)	53 (22%)	204 (23%)	475 (26%)

Table 2 shows the number and percentage of households with household income below $25,000 within the 1-mile and 6.2-mile radii on either side of the Cumberland-Powhatan county line. The 1-mile radius is mostly within Cumberland County, while the other radii include parts of Powhatan County.

Table 2. 2019 Households with Income under $25,000 for the Cumberland and Powhatan Areas Closest to Green Ridge[4]

	1-Mile Radius Cumberland	1-Mile Radius Powhatan	6.2-Mile Radius Cumberland	6.2-Mile Radius Powhatan
Households with household income under $25,000	9 (24%)	1 (13%)	261 (30%)	216 (22%)

Table 3 shows the number and percentage of households with household income below $25,000 in Cumberland and Powhatan counties, and in the overall state of Virginia.

Table 3. 2019 Households with Income under $25,000 for the Wider Areas Around Green Ridge[5]

	Cumberland County	Powhatan County	Rural Localities in Virginia	Virginia, Statewide
Households with household income under $25,000	1,245 (33%)	1,397 (14%)	137,110 (33%)	601,571 (18%)

[3] Data source: GeoLytics.
[4] Data source: GeoLytics.
[5] Data source: GeoLytics.

County of Cumberland Virginia

1 Courthouse Circle | P.O. Box 110
Cumberland. Virginia 23040
Telephone 804 492 3800
Facsimile 804 492 9224
info@cumberlandcounty.virginia.gov
www.cumberlandcounty.virginia.gov

Economic Justice for Cumberland County Virginia

July 14, 2020

Cumberland County is rich in history and a wonderful place to raise a family. However, its citizens do not have the luxury of having industry and retail in our county as our neighbors in Powhatan, Goochland, Fluvanna, Buckingham, Amelia, and Prince Edward. The prospects for working adults in this county are zero. We have no opportunities for our children if they work hard, study hard, and graduate with good grades from High School and hopefully university. I repeat, there are zero job opportunities. We rely solely on property taxes in order to finance our county. We do not have the funds to support the services that are needed.

We are seeking-out businesses and industry to offset the economic burden on our citizens. Right now, if our residents want a good paying full-time job, they have to travel up to a hundred miles round trip to reach a place of employment. We have residents that do not have a way to reach these jobs.

Our neighbors in Powhatan are trying to stop Cumberland County from offering Economic Opportunity and Economic Justice to our citizens. We do not understand why they are out to hinder the ability for people in Cumberland County to make a living.

The most disturbing aspect of this interference of Cumberland's economic growth, is that a Virginia Senator from the 10th district representing not Cumberland County, but Powhatan County has introduced bills to obstruct the ability of Cumberland to determine its own path. Senator Hashmi continues to attempt to sabotage the process and derail Cumberland's economic future. Senator Hashmi has not bothered to reach out to Cumberland County. The question is why does she champion the special interest groups rather than fight for economic justice for Cumberland residents?

The industries and businesses that we bring to Cumberland County should not be denied or accepted because of the grace of Powhatan County. We are an independent county, a proud county, and we have a right, we have the obligation, to give our citizens opportunities to make a living. Powhatan County, and many of the activist from outside that county are trying to prevent Cumberland citizens from prospering. This is a clear violation of the rights of the citizens of Cumberland. The citizens of Cumberland are demanding Economic Justice. We have to have the freedom to develop industry in our county as we see fit. We don't have the luxury of wealthy residents, retail, and industry that our neighboring county has. We are struggling from nothing to build economic opportunity. We have recently attracted industry to the county. The first in 12 years. Braven Enviromental's decision to come to Cumberland was partially because of the decision to bring Green Ridge to Cumberland County. Green Ridge will bring 120 million dollars in desperately needed revenue to this county. Without the revenue brought in by Green Ridge, we will struggle to have level funding equal to where we are today.

To have another county decide whether Cumberland County will prosper or suffer is not justice. We have the right to determine our own future and prosper. We need these industries. Without them, we will go into insolvency, and we demand Economic Justice. We are asking that Powhatan County cease from trying to obstruct Cumberland County from seeking a prosperous future.

Received by VMRC September 2, 2020 /blh

It seems like a very simple conversation, but somehow, they have gotten the ear of state representatives. And we appeal to these representatives. Allow us to provide an economic environment where our citizens can make a living.

In a self-determining business environment, Cumberland residents can attain Economic Justice and Social Justice by improving their standard of living. To prevent this is unconscionable and inexcusable. We cannot understand that there would be an argument against giving people the opportunity for prosperity. But that is what Powhatan County is attempting to do, stifle growth in Cumberland County. This is outrageous.

To give you a sense of how strong-armed these activists are being, a Powhatan resident involved with CCLA (the group opposing the Green Ridge Project) said that they would lie, cheat, and steal to stop us from moving forward with our economic plan. A recent letter Addressed to DEQ and Karen Carmack (Supervisor for Powhatan County) referring to former Supervisors that voted for the project said the following…

"The landowners need to make examples of these people to avoid emboldening other minor officials. A tree, three ropes, a winch, and a sign should do it."

These words threatening a lynching to anyone is completely unacceptable. This type of threatening language intimidates supporters of the project from speaking out in favor. These threats will not be tolerated and should be prosecuted.

The elected officials of Powhatan County are improperly trying to impose their will on a less affluent adjoining county. This is unforgivable, and this needs to stop. Powhatan County should worry about Powhatan County. Cumberland County has the right to determine our own future. To deny that is to deny Economic and Social Justice for people of all ages in Cumberland County.

Best Regards,
Cumberland County Board of Supervisors

Brian Stanley, Chairman
District 1

Gene Brooks
District 5

Ron Tavernier
District 2

Robert Saunders, Jr.
District 5

Eurika Tyree, Vice-Chairman
District 3

VI. HISTORICAL RESOURCES SUMMARY

The following report was prepared by Browning and Associates, LLD for Green Ridge Recycling and Disposal Facility, LLC. The report includes the findings of their Phase I cultural resources study whose purpose it was to identify any areas that may be restricted from any future development.

Received by VMRC September 2, 2020 /blh

Green Ridge

Phase I Cultural Resources Investigation
Cumberland County, Virginia

Prepared By:
J. Craig Rose, M.A. & Lyle Browning, M.A., RPA
Browning & Associates, LTD.
138 Scoggins Creek Trail
Hartfield, Virginia 23071

Prepared For:
Green Ridge Recycling and Disposal Facility, LLC
2230 Deer Grove Road
Midlothian, Virginia 23112

Received by VMRC September 2, 2020 /blh

ABSTRACT

A Phase I cultural resources survey was conducted on the ±1,178 acre Green Ridge property, located north of the village of Clinton, in Cumberland County, Virginia. The work was carried out between September 2018 and June 2019 by Browning & Associates, LTD of Hartfield, Virginia for Green Ridge Recycling and Disposal Facility, LLC of Midlothian, Virginia. The proposed landfill will include a waste disposal area that at maximum capacity will rise to approximately 690 feet above mean sea level.

Viewshed analysis was conducted to assess the visual impact to recorded architectural resources and archaeological resources within five miles of the project area and for all historic structures (greater than 50 years in age) within one mile of the project. Recommendations are provided for the fifteen historic standing structures from which the waste disposal area will be visible.

Historic Standing Structures with a View of the Green Ridge Facility at Maximum Capacity

DHR ID	Site Name	Site Type	Recommendation
024-0082	Locust Grove	Domestic Farmstead	No Additional Work
024-0085	Melrose	Domestic Farmstead	Mitigation of Visual Impacts, Dependent Upon Eligibility
024-0118	Bruners Store	Commercial Building	Mitigation of Visual Impacts, Dependent Upon Eligibility
024-0217	Dwelling	Dwelling	No Additional Work
024-0222	Vacant Dwelling	Dwelling	No Additional Work
024-0225	Barn	Domestic Farmstead	No Additional Work
024-0238	Rising Sun Church	Church	No Additional Work
024-0240	Vacant Dwelling	Dwelling	Mitigation of Visual Impacts, Dependent Upon Eligibility
024-0252	Greenfield Farm	Domestic Farmstead	No Additional Work
024-5078	Vacant Dwelling	Dwelling	Mitigation of Visual Impacts, Dependent Upon Eligibility
024-5079	Dwelling	Dwelling	No Additional Work
024-5082	Pine Grove School	School	M.O.A. for Mitigation of Adverse Indirect Effects
024-5120	Dwelling	Dwelling	No Additional Work
0272-0104	Brown Farm	Domestic Farmstead	No Additional Work
072-0205	Dwelling	Dwelling	No Additional Work

The archaeological investigation of 687 acres to be impacted by proposed construction activities resulted in the discovery of ten archaeological sites (44CM0135, 44CM0136, 44CM0137, 44CM0138, 44CM0139, 44CM0140, 44CM0141, 44CM0144, 44CM0145, and 44CM0146) and one probable African American cemetery (44CM0134). No historic structures were identified in the project area. With the exception of 44CM0137; which was heavily disturbed; all sites exhibited a high degree of stratigraphic integrity. Avoidance or Phase II evaluations are recommended for all remaining sites, except 44CM0136, recommended for Phase III mitigation.

Site 44CM0136 is located in the central portion of the waste disposal area and includes the remains of a domestic complex potentially dating the second half o the eighteenth century. Historic records suggest the dwelling at Site 44CM0136, known as the Moved House/Jeffries Site, may have been known as “Edgemont”, home of James McLaurine and birthplace of Confederate army cavalry battalion commander, John Singleton Mosby. Historic records and a local informant indicate the dwelling was dismantled and relocated in the late twentieth century, but the remainder of historic deposits appear to be intact with a high degree of integrity.

A cemetery identification survey was conducted concurrently with the archaeological survey. Deeds of sale for one of the parcels included in the Hobson property mention a reservation of burial and visitation rights, but do not specifically reference the location of the family cemetery and its exact location within the 55 acre parcel is not known. The topsoil was mechanically removed from approximately one acre in what was thought to be the most likely cemetery location, but no evidence was found of the burial site. Archaeological monitoring of ground disturbing activities in the suspected cemetery location is recommended.

Received by VMRC September 2, 2020 /blh

Cultural Resources Identified within the Green Ridge Property

DHR ID	Site Name	Site Type	Recommendation
44CM0134	Cemetery	Cemetery	Avoidance or Cemetery Delineation & Burial Relocation Survey
44CM0135	Reverend's Still	Illegal Distillery	Avoidance or Phase II Evaluation
44CM0136	Jeffrey Site	Domestic Farmstead	Phase III Data Recovery Excavations
44CM0137	Frog Site	Single Dwelling	No Additional Work
44CM0138	Chimney in the Field	Single Dwelling	Avoidance or Phase II Evaluation
44CM0139	Hobson Site	Single Dwelling	Avoidance or Phase II Evaluation
44CM0140	Ammoynet Farmstead	Domestic Farmstead	Avoidance or Phase I Survey
44CM0141	Jesse Parker Farmstead	Domestic Farmstead	Avoidance or Phase II Evaluation
44CM0144	Rockpile	Domestic Farmstead	Avoidance or Phase II Evaluation
44CM0145	Hobson Ridge	Domestic Farmstead	Avoidance or Phase II Evaluation
44CM0146	Jones House	Domestic Farmstead	Avoidance or Phase II Evaluation
N/A	Hobson Cemetery (Unconfirmed)	Suspected Cemetery	Anticipatory Burial Relocation Permit and Archaeological Monitoring of Ground Disturbance in Suspected Location

TABLE OF CONTENTS

List of Figures

List of Tables

INTRODUCTION

Browning & Associates of Hartfield, Virginia conducted a Phase I cultural resources survey of the ±1,178 acre Green Ridge property (*surveys by Highmark Engineering dated May 24, 2018, March 4, 2019, April 17, 2019 and per boundary survey by Draper Aden Associates dated March 29, 2019*) between September 2018 and June 2019 (Figure 1). The property lies north of US 60 (Anderson Highway) immediately west of the Powhatan/Cumberland County boundary, near the community of Clinton in Cumberland County, Virginia. The property is bisected by Pinegrove Road and Miller Lane which roughly follow the western and eastern project boundaries, respectively. To the north, the property is bound by Muddy Creek (Figure 2).

The proposed project includes construction of a commercial landfill originally comprised of two waste disposal areas; a western cell including ±300 acres and an eastern cell including ±200 acres. However, since the completion of the cultural resources investigation described in this report the eastern cell has been removed from the permit application. Upon completion of the landfill in about 30 years, the remaining disposal area will rise to approximately 690 feet above mean sea level. Pinegrove Road and Miller Lane will also require partial reorientation and a separate access road will be built connecting the landfill to US 60.

The proposed project will require permits from the Army Corps of Engineers for impacts to wetlands, and as such is subject to Section 106 review. The investigation described in this report was conducted for Green Ridge Recycling and Disposal Facility, LLC in anticipation of a request for a Phase I archaeological investigation from the Virginia Department of Historic Resources.

Lyle Browning, M.A., RPA served as the Principal Investigator for the Phase IA survey of the property. Craig Rose, M.A. served as Principal Investigator for the Phase IB survey and was the primary author of this report. Field investigations were carried out by Jorge Quintana, Emery Bencini, Mike Johnson, Steve Rann, and C. Niel Manson under the supervision of Craig Rose and Lyle Browning. Finds were analyzed and cataloged by Craig Rose and Mike Johnson in Clinton, Virginia. Artifacts and the original copies of field notes and maps will be submitted to the Virginia Department of Historic Resources at the conclusion of this investigation.

All aspects of this investigation conformed to guidelines established in *Section 106 of the National Historic Preservation Act of 1966, as amended*, the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* (Childs et al. 2000) and the requirements outlined by the Virginia Department of Historic Resources (DHR) in *Guidelines for Conducting Historic Resources Survey in Virginia* (Department of Historic Resources 2017).

PROJECT ALTERNATIVES

Section 106 has implementation regulations under the Code of Federal Regulation, Title 36, Part 800 (36CFR800). In that regulatory framework, a project should identify reasonable alternatives to the proposed project area in the event that one or more of the alternatives are shown to be problematic. The reasons for a determination are based upon investigation of alternatives AND upon the weighing of the various factors that have an effect upon the undertaking. Three such alternative areas were identified for the proposed Green Ridge project. Archival research was used to establish the potential for cultural resources and concluded that the original, proposed project location, described in this report, was least likely to impact potentially significant cultural resources. The results of this analysis are described in "Cultural Resources Evaluation: 3 Alternatives to the Chosen Alternative at the Proposed Green Ridge Landfill, Cumberland County, Virginia" included as Appendix 1.

Received by VMRC September 2, 2020 /blh

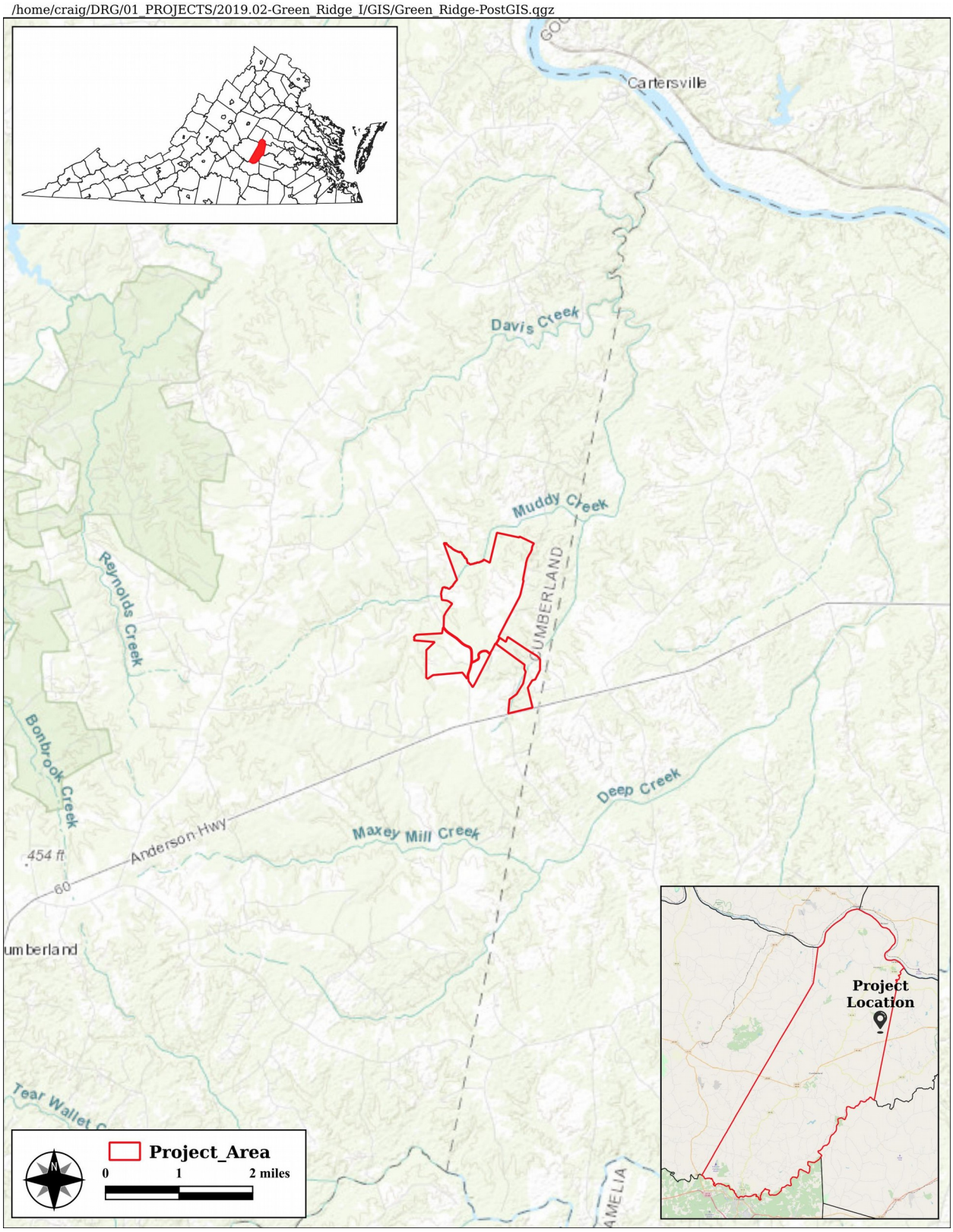


Figure 1: Overview of project area on ESRI Topo World map.

Received by VMRC September 2, 2020 /blh

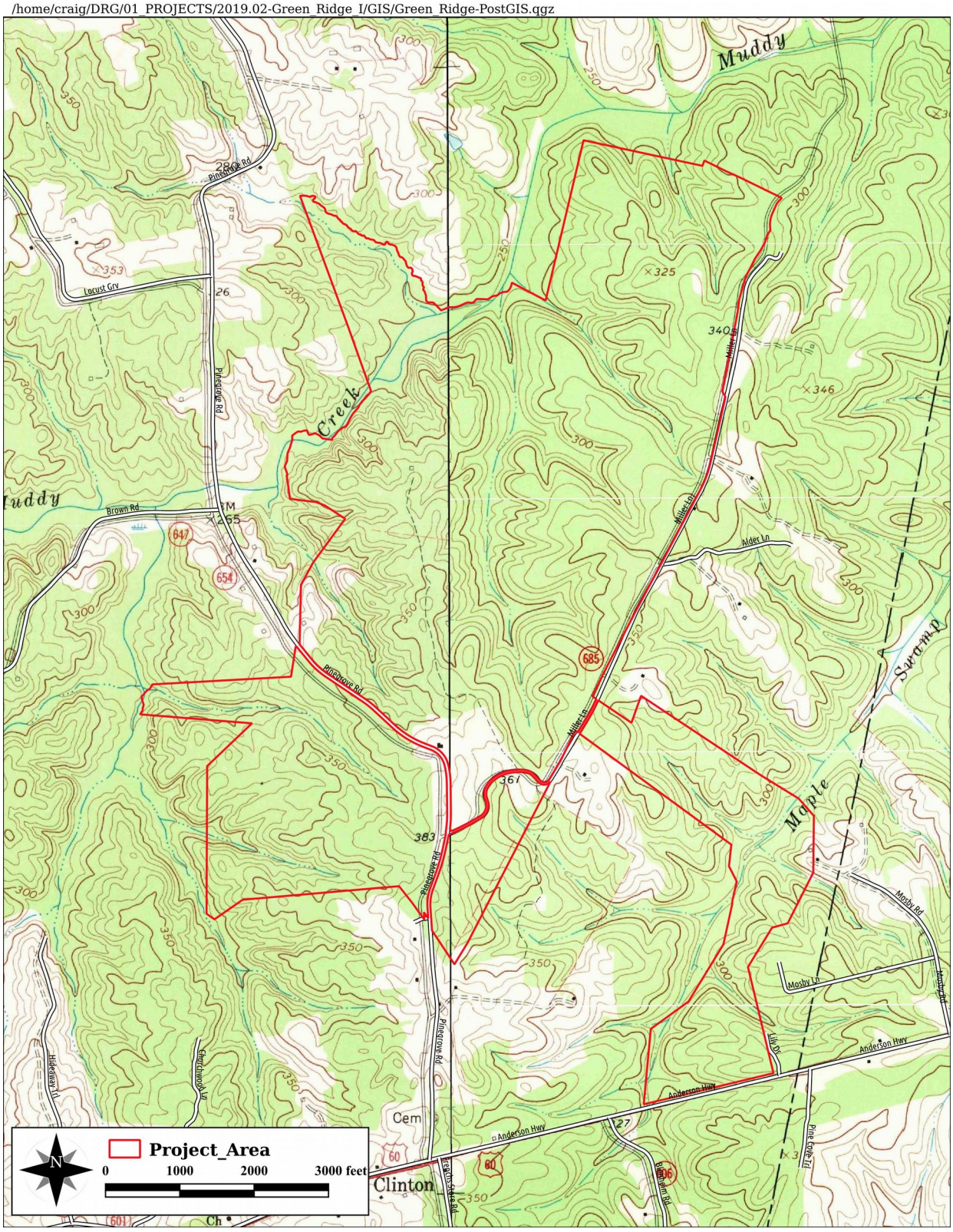


Figure 2: Location of the project area on the 1969 USGS Trenholm and Whiteville 24K quadrangles..

GEOGRAPHIC SETTING

The project area lies within the Outer Piedmont sub province of the Piedmont physiographic region of Virginia (Bailey 1999). Bound by the Blue Ridge Mountains to the west and the Fall Line to the east, the Piedmont Province is the largest in Virginia, and is characterized by gently rolling topography and deeply weathered bedrock overlain with a 7 to 70 foot thick layer of saprolite, with elevations ranging between 1,000 feet above mean sea level (a.m.s.l.) along its western boundary and 160 feet a.m.s.l. near the Fall Line (Radford University 2014). Monadnocks, or isolated hills, such as Willis Mountain, approximately 20 miles southwest of the project area, are formed from more resistant geologic deposits, and are scattered throughout the Piedmont region (National Park Service 2017). The Piedmont exhibits a dendritic, or vein-like drainage pattern with watercourses that generally flow in a southeasterly direction (Radford University 2014).

The subject property includes ridge fingers, erosion spurs, and steep ravines around the perimeter of a broad upland ridge, bound by Muddy Creek to the northwest and Maple Swamp Creek to the southeast. Drainage is provided by unnamed, intermittent tributaries to both creeks. Maple Swamp Creek empties into Muddy Creek about three-quarters of a mile northeast of the project area. Muddy Creek drains into the James River about five and a half miles north of the project area, downstream from the town of Cartersville.

Elevations in Cumberland County range from 200 to 500 feet above mean sea level (a.m.s.l.) (Reber et al. 2007). Within the project area, elevations range from 240 feet a.m.s.l. in the wetlands surrounding Muddy Creek along the northern project boundary to 380 feet a.m.s.l. near the intersection of Pinegrove Road and Miller Lane, in the southern portion of the project (see Figure 2). Ridge tops are dissected by steeply incised, eroded drainage channels, some with slopes in excess of twenty-five percent.

Vegetation within the project area is typical of most areas of the Piedmont and has been heavily altered by anthropogenic activities, including agriculture and logging. At the time of survey, the vast majority of the project was wooded and surface visibility was limited. In the northern half of the property, planted pine forests are common; while in the southern portion of the project, some areas of mature deciduous forest exist and are principally comprised of oak (*Quercus sp.*) and hickory (*Carya sp.*) in upland areas, and beech (*Fagus sp.*) and Poplar (*Lirodendron sp.*) in ravines. Recently clearcut or 10± year old clearcut secondary forests were also encountered throughout the property.

The project area has a temperate, humid climate with average temperatures that range from 38 degrees to 75 degrees Fahrenheit, with temperature extremes ranging from 12 degrees in the winter to 102 degrees in the summer. Average annual precipitation is around 45 inches with highest levels occurring from late spring through summer. At the time of this investigation, temperatures and rainfall totals were seasonable.

RESEARCH DESIGN

The objective of this investigation was to identify locations within the project area that contain cultural resources and to provide a preliminary assessment of their research potential. Research methods included archival research, historic map projection, visual inspection of the project area, and systematic shovel test pit excavation in portions of the property suspected to have an increased potential to contain subsurface cultural deposits. Metal detection of low density historic artifact scatters was also performed.

Documentary Research

During the initial stage of this investigation, DHR's Virginia Cultural Resource Information System (V-CRIS) was queried to identify the types of archaeological sites and architectural resources recorded in the project vicinity. The query results and aerial photographs of the project vicinity were incorporated into a project GIS, used to identify portions of the project area with an increased likelihood to contain historic cultural resources, or "high probability areas." Throughout the investigation, official histories, USDA Soil Survey reports, archaeological reports, and scholarly literature databases were consulted to provide a context for the interpretation of prehistoric and historic cultural resources that might be discovered during the field investigation.

Fieldwork

The field methodology included visual inspection and systematic shovel testing. Tree falls, erosional surfaces, or otherwise exposed ground surfaces observed during the survey were inspected for surface artifacts. The results of the visual inspection and historic map and aerial review were used to define high, medium, and low probability areas within the project area. Shovel test pits were excavated at 50 foot intervals in areas deemed to have an increased potential to contain cultural deposits. Areas that were poorly drained or exhibited excessive slopes or signs of modern disturbance were visually inspected, but were not subject to subsurface testing.

A total of 2,042 shovel test pits (STPs) were excavated along a 50-foot grid within the project area to establish the presence or absence of cultural materials and to assess stratigraphic integrity. Four "radial" STPs were excavated at 25-foot intervals around each positive pit to refine horizontal site boundaries, except where radial pits fell between other positive pits or fell in areas that were otherwise considered not testable. STPs measured at least 15 inches in diameter and were excavated by natural soil horizon/cultural layer to sterile subsoil. All soil was sifted through 1/4-inch mesh screen and each pit was backfilled and stabilized before moving to the next STP. Soil colors were classified using the Munsell Soil Color Chart and soil textures were described using the USDA soil texture triangle. Traditional pedological classifications (A, E, B, etc.) were used to describe natural soil horizons. "Ap" was used in specific reference to the plow zone, or plowed soil horizons. The term "Fill" was used to describe cultural layers. Layer designations were defined by identifiable changes in soil color, texture, and inclusions, and cultural content.

In locations where visual inspection suggested a high probability for archaeological resources and the STP survey produced little or no evidence of historic occupation, a metal detector survey was employed to establish the presence or absence of subsurface deposits and/or to refine horizontal site boundaries. Such surveys were carried out at the discretion of the field supervisor. Metal detection survey areas were defined by the supervisor based on environmental conditions, including changes in vegetation, topography, and any observed surface indications of cultural activity, such as stone piles possibly indicative of chimney bases or possible cellar holes. Metal detection survey areas were cleared of surface vegetation using a string trimmer with metal blade and were divided into 25 foot squares. One hundred percent of each square was metal detected and all metal detector strikes were mapped with the exception of high density scatters, which were horizontally defined and noted on field maps. Once mapped, a representative, random sample of metal detector strikes were excavated to provide a sample of the metal artifacts contained within the site. Non-metal artifacts encountered during the excavation of the metal detector strikes were also retained and included within the site inventory.

Laboratory

Artifacts were inventoried, analyzed, and curated at the field house in Clinton, Virginia in compliance with the Virginia Department of Historic Resources' State Collection Management Standards (2017). Artifacts are currently stored in a climate controlled facility on the Green Ridge property and will be turned over to the Virginia Department of Historic Resources for permanent curation at the conclusion of this investigation.

Artifacts were classified using a system modeled after the Method of Abstracting the Carolina Artifact Pattern employed by Stanley South in Method and Theory in Historical Archaeology (South 1977), expanded to allow for the classification of prehistoric artifacts and those dating to more modern time periods. Historic artifacts were classified into South's Groups (Kitchen, Bone, Architectural, Furniture, Arms, Clothing, Personal, and Activities) and Classes, and were further sorted by material type, vessel type, decorations, and method of manufacture, where definable. Prehistoric artifact were sorted based on material type, artifact type, and recognized classifications, such as ceramic type or stone tool type. Other informative characteristics were also recorded, including temper, decorative motif, and morphology.

Artifacts were grouped by provenience, soil layer, and artifact type and each artifact group was assigned an accession number comprised of the site trinomial (44CM0145) or location ID for isolated finds (Loc1), unit type/number (STP1001), soil layer (F1 for Fill 1), excavation level (L1), and artifact number (ex. 44CM0145.STP1001.F1.L1.1).

Artifact information was cataloged in a PostGIS database extender for the PostgreSQL Database Management System and is included in the project GIS. The resultant database is geographically enabled, allowing seamless distribution of artifact attributes and location information.

HISTORIC CONTEXT: GEOGRAPHY AND CULTURE

In *Guidelines for Conducting Historic Resources Survey in Virginia* (Department of Historic Resources 2017), DHR outlines a framework in which cultural resources are grouped into historic contexts; defined by common geographic areas, cultural themes, and chronological periods. Historic contexts provide the foundation for researchers to interpret and evaluate cultural resources based on the concept of representativeness.

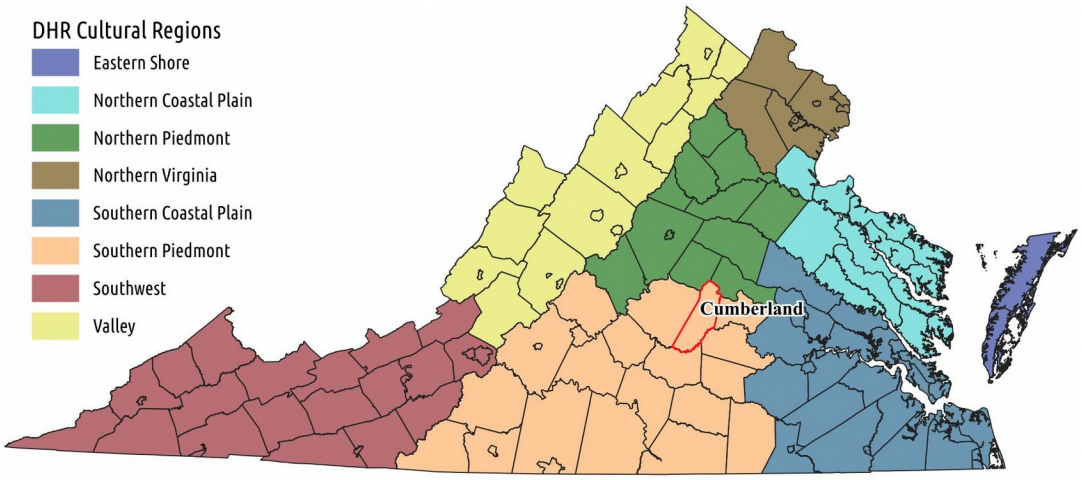


Figure 3: Virginia Department of Historic Resources' Cultural Regions

Regional Differences

DHR divides the State's physiographic provinces into eight cultural regions, based on settlement patterns, historical development, and cultural distinctions. These regions include Northern Virginia, the Northern Coastal Plain, the Southern Coastal Plain, the Eastern Shore, the Northern Piedmont, the Southern Piedmont, the Valley, and the Southwest (Department of Historic Resources 2017) (Figure 3). The current project area falls within the Southern Piedmont region located south of the James River and north of the Virginia-North Carolina boundary.

Thematic Contexts

Thematic contexts, or cultural themes, are used to group associated human activities and may or may not be confined to specific geographic locations or time periods. DHR identifies eighteen thematic contexts that are further divided into "associated property types".

- Subsistence/Agriculture
- Military/Defense
- Recreation/Arts
- Technology/Engineering
- Ethnicity/Immigration
- Commerce/Trade
- Domestic
- Education
- Religion
- Funerary
- Landscape
- Social
- Health Care/Medicine
- Government/Law/Politics
- Industry/Processing/Extraction
- Settlement Patterns
- Transportation/Communication
- Architecture/Landscape Architecture/Community Planning

Thematic contexts intentionally overlap and are intended to generate a broader context for the interpretation and evaluation of site-specific data. The eighteen themes defined by DHR and their associated property types form a comprehensive set of research fields that help standardize the classification of Virginia's cultural materials and although they are not restricted to a particular time period or region, they are both regionally and temporally distinct. By standardizing the classification of resources, thematic contexts allow researchers and planners to identify and implement preservation priorities within the planning process.

Cultural Periods

DHR divides the history of Virginia into eleven cultural periods (Paleo-Indian, Archaic, Woodland, Settlement to Society, Colony to Nation, Early National, Antebellum, Civil War, Reconstruction and Growth, World War I to World War II, and The New Dominion) based on identifiable changes to cultural themes documented in the archaeological and written record.

Paleo-Indian (10000 B.C. – 8000 B.C.)

The Paleo-Indian period coincided with the Late Glacial period when sea levels were approximately 230 feet below current levels (Anderson et al. 1996). A changing climate affected the environment during the Paleo-Indian period. Warmer temperatures and increased rainfall in the Mid-Atlantic region led to a transition from boreal forest to mixed conifer-northern hardwood forest and some deciduous forest (Boyd 1989). Although warmer than the preceding period, the general climate was approximately 10-15°C colder and 20-50% drier than at present (Conners 1986; Kelly and Todd 1988; Boyd 1989). Many species of megafauna became extinct impacting human subsistence patterns, although it is debatable whether their extinction affected Paleo-Indians in the Virginia region.

Archaeological remains indicate the earliest inhabitants of Virginia led a nomadic lifestyle with transient settlements, hunter-gatherer subsistence patterns, and archaeological material culture primarily consisting of fluted points. Settlements likely consisted of basecamps located near lithic quarries and reduction sites, and/or food procurement sites (Gardner 1977; McCary 1976). Although Reid (Reid 1997) estimates the Virginia region had a low population of 1,500 by the end of the Paleo-Indian period, the accuracy of such estimates are challenging given the scarcity

of archaeological data. Research by McCary (McCary 1976) and Turner (Turner III 1989) suggest Paleo populations were highest in the southern Piedmont and Coastal Plain regions of Virginia with a close correlation between site locations and desirable lithic resources and oak-hickory forests.

The Clovis fluted projectile point is recognized as an identifying characteristic of a Paleo-Indian site. The Virginia region contains fluted points along with other Paleo-Indian components such as the Folsom and Dalton-Hardaway projectile points, unifacial scrapers, gravers, knives, and occasional bone and antler implements (Gardner 1989). Virginia has relatively few well-preserved Paleo-Indian sites due to the age of sites and sparse population density in the region (Department of Historic Resources 2017).

A majority of Paleo-Indian artifacts, including Clovis, Cumberland, and Dalton projectile points, have been recovered throughout the Piedmont and Coastal Plain; however, five counties in the Ridge and Valley physiographic region contain relatively large quantities of fluted points. The Flint Hill Complex, located southwest of Front Royal on the south fork of the Shenandoah River, and a concentration of fluted points noted by McCary (McCary 1976) near Saltville, approximately 100 miles southwest of the project area in the Southwest Cultural Region of Virginia (Turner III 1989). Bottoms (Bottoms 1969) Michlovic (Michlovic 1975) and Turner (Turner III 1984) attribute Paleo activity in the vicinity of Saltville to its unique geology and the abundance and accessibility of salt, which would have made the area a prosperous hunting ground.

Data from archaeological excavations at the Cactus Hill site in Sussex County, VA indicate that Paleo-Indians may have inhabited Virginia prior to 10000 B.C., the traditional starting date for the Paleo-Indian period (Department of Historic Resources 2017).

Archaic (8000 B.C. – 1000 B.C.)

The Archaic period coincides with the beginning of the Holocene geological period around 8000 B.C. Climatic and environmental changes prompted increasing sedentism, particularly in riparian settings. Archaeological sites of this period are typically larger and more frequent than those dating to the Paleo-Indian period, suggesting an increase in population. Sites from this period typically indicate exploitation of more diverse lithic resources, such as quartz, quartzite, and rhyolite.

Researchers typically divide the Archaic period into three sub-periods: Early Archaic (8000 B.C. –6500 B.C.), Middle Archaic (6500 B.C. –3000 B.C.) and Late Archaic (3000 B.C. –1000 B.C.).

Early Archaic (8000 B.C. – 6500 B.C.)

The Early Archaic period heralded warmer, wetter, and more seasonally varied environments although climates were cool relative to modern temperatures. Forests were mostly hardwood mixed with spruce and hemlock (Delcourt and Delcourt 1981). The Early Archaic period shares enough similarities with the Paleo-Indian period that some researchers argue the two should be grouped together (Gardner 1974; Custer 1990; Gardner 1989). Groups were highly mobile and settlements mirrored Paleo-Indian patterns. However, sea levels were on the rise and, in contrast to the previous period, Early Archaic people began regularly exploiting upland settings (Custer 1983, 1990).

During the Early Archaic, a modern faunal assemblage was present including deer, elk, and moose (Custer 1990). Reliance on small game increased and Early Archaic people hunted gray

fox, opossum, cottontail, raccoon, squirrel, beaver, woodchuck, turkey and pigeon. This new source of animal protein coupled with an increased use of local, readily available raw lithic material likely brought about more advanced lithic technologies. People manufactured smaller notched haft points and archaeological evidence indicates the creation of an improved throwing spear (Geier 1990; Gardner 1974). The presence of Big Sandy, Charleston Corner-Notched, Hardaway, Kirk corner notched, or Palmer projectile points is a distinguishing characteristic of Early Archaic sites (Coe 1964).

Middle Archaic (6500 B.C. – 3000 B.C.)

During the Middle Archaic sub-period, climate change spurred by the Hypsithermal Climate Optimum brought warmer temperatures. Oak and pine forests dominated the Virginia region. As sea levels approached modern levels, swamps and estuaries appeared on the landscape (Delcourt and Delcourt 1981).

Native Americans primarily established their camps near ideal seasonal hunting and foraging locations as opposed to camping near restricted lithic raw material sites (Gardner 1983). Some functional characteristics of tools continued from Early Archaic technology, but there was a marked difference in appearance (Gardner 1974). A more diversified tool kit, including nutting stones, suggest an increased reliance on floral resources (Jefferies 1996). New projectile points appeared in Southwest Virginia including the Guilford, LeCroy, Morrow Mountain, and Stanly (Hranicky 1994).

Late Archaic (3000 B.C. – 1000 B.C.)

The Late Archaic sub-period coincided with the Sub-Boreal climate episode when the rate of sea level rise decreased dramatically (Stevens 1991). In coastal settings, shellfish became a diet staple as evidenced archaeologically by the presence of large shell middens in coastal environments. Habitation sites transitioned from temporary, seasonal camps to more permanent, sedentary settlements concentrated in riparian settings (Barber et al. 2004). Populations increased and more intensively occupied sites exhibited numerous hearths, and a wider variety of archaeological contexts including formal burials (McLearen 1991; Ward 1983).

Points associated with the Late Archaic are the Brewerton, Halifax, Lackawaxen, Lamoka, and Merom. In the Southern Piedmont, the Savannah River Stemmed point was especially prolific. The Savannah River point brought about an emphasis on percussion flaking technology from start to finish. Among the material culture that emerged during this period, ground stone artifacts such as the ground stone grooved axe and soapstone bowls appeared and there was an increase in use of expedient tools (McLearen 1991).

Woodland (1000 B.C. – A.D. 1600)

The Woodland period ushered in dramatic population growth, increased sedentism, more advanced technologies, including pottery, horticulture, and the adoption of the bow and arrow. Social organizations became more complex, shifting from bands to tribes and chiefdoms. Villages became more permanent and grew substantially in size. There was a shift from seasonal systems with two bases to systems with one single base and associated foray camps (Hodges 1991; Gardner 1982, 1984). The shift toward sedentism is associated with the domestication of plants. Excavations at Woodland settlements reveal more complex social practices such as ceremonialism associated with burials.

Researchers divide the Woodland period into three sub-periods: Early Woodland (1000 B.C. – A.D. 300), Middle Woodland (A.D. 300 – A.D. 1000), and Late Woodland (A.D. 1000 – A.D. 1600) based on quantifiable changes in material culture (Department of Historic Resources 2017).

Early Woodland (1000 B.C. – A.D. 300)

Early Woodland Native Americans began to show a strong preference for floodplain and riverine settings. They often established settlements on terraces rich with hydrophytic vegetation including beech and sycamore trees (Mouer 1982). In the Virginia Southern Piedmont, a combination of floodplains and some interior regions were the preferred locations for villages (Klein and Klatka 1991; Mouer 1991).

Villages became more permanent and grew substantially in size. There was a shift from seasonal systems with two bases to systems with one base and associated foray camps (Hodges 1991; Gardner 1982, 1984). The swing toward sedentism is associated with the domestication of plants. Excavations at Early Woodland settlements reveal more complex social practices such as ceremonialism associated with burials.

McLearen (McLearen 1991) notes the most significant transformations in material culture from the Late Archaic to the Early Woodland include a phasing out of the broadspear (particularly the Savannah River tradition), more elaborate ground stone artifacts, and the development of ceramic technology. In the Piedmont region, there was a heavier reliance on quartz and expedient tools produced from flakes (McLearen 1991). Ceramic vessels became commonplace around 600 B.C. and include Badin, Currituck, and McCary ceramic types in the Piedmont region (McLearen 1991).

Middle Woodland (A.D. 300 – A.D. 1000)

With the widespread adoption of ceramic technology, prehistoric peoples become increasingly sedentary and populations continued to rise during the Middle Woodland period. Faunal remains provide evidence that some Middle Woodland settlements were occupied year-round (Barber 1981) and an increasing number of re-occupied sites and developing exchange systems may indicate the landscape is starting to “fill up” and cultural territories are becoming more defined (Blanton 2000).

Fox Creek, Jacks Reef, Potts, and Rossville projectile points were introduced (Stewart 1992). Other artifacts include stone mauls, hollow antler tines, and an increase in the quantity and size of ceramic vessels. It was during this period that ceramics became a mainstay (Stewart 1992). Both Hyco and Vincent ceramic variants are common throughout the Virginia Piedmont during this period.

Late Woodland (A.D. 1000 – A.D. 1600)

In the Late Woodland period, the cultivation of corn, beans, and squash became an essential component of the subsistence systems in the Piedmont of Virginia, and large, permanent settlements developed along the fertile floodplains and low-lying ridges surrounding the region’s major drainages. With a change to a horticulturally-based subsistence system, inhabitants became increasingly sedentary, as crops could not be left for long periods of time once sowed.

Archaeological evidence of continuously occupied settlements comes in the form of substantial middens, palisaded villages, long houses, communal houses, a variety of storage pits, and burial features (Barber et al. 2004). It is unclear if palisades were constructed for protection or to define

activity areas, or both, but within the palisades, houses and communal structures were typically arranged around a central plaza, indicating some degree of social organization (Egloff 2000). Clarksville, Haw River, and Dan River ceramic series and Clarksville and Fort Ancient projectile points are considered defining artifact types for sites in the southern Piedmont that date to this period (Coe 1964).

Settlement to Society (1607-1750)

Contact Period

Ethnohistorical accounts suggest the Spanish reached the mouth of the Chesapeake Bay as early as the 1520s, having contacted the Powhatan Confederation by the middle of the century. In 1570, Spanish Jesuits founded the Ajacan mission (also known as St. Mary's Mission), believed to have been on the York River; however, less than a year later all of the mission's inhabitants were slain by local Native Americans, with the exception of a small boy named Alonso de Olmos. The Spanish retaliated in 1572, retrieving Alonso and killing twenty Powhatans, but made no attempt to reestablish the mission. In 1607, the English settlement of Jamestown was established on a defensible peninsula on the James River (Shackel and Little 1994). Jamestown would become the first permanent English settlement in North America.

At the time of English settlement, eastern Virginia was controlled by the powerful Powhatan Confederation, an alliance of approximately thirty Algonquian tribes comprised of 14,000 to 21,000 individuals (Egloff and Woodward 2015). To the west were the Siouan-speaking Manahoac of the upper Rappahannock drainage, the Monacan of the James River valley, and Occaneechi, Sappony, and Tutelo of southwest Virginia; to the south were two small tribes of the Iroquois Confederacy, the Nottoway and Meherrin (Bracey 1977). The fall line roughly marked the boundary between the Powhatan Confederacy and western tribes and the Powhatans conducted seasonal raids to reinforce the boundary.

The early western political border separating the interior native populations from English settlements followed the fall line; which marked the limits of navigation for ocean-going vessels (Hatfield 2004). Just, as the fall line had been the border marking Powhatan territory, so it became the border marking early English control, as evidenced in John Smith's map of Virginia first drawn in 1608 (published in 1612) where he visually identified Virginia and Powhatan territory as similar – if not the same – entity (Hatfield 2004).

With the focus of English settlement primarily confined to the Coastal Plain, indigenous Native American communities in the interior of the Virginia colony were able to retain their traditional ways of life longer than their counterparts in the east. Initial interactions with Native Americans of the Tidewater frontier came in the form of explorers and trade parties, followed by a continuous migration of European settlers.

Frontier Period

The earliest written records of European and Native American encounters in western Virginia begins with Abraham Wood's expedition in 1654 followed by Batts and Fallam in 1671, and Governor Alexander Spottswood's 1716 expedition from Williamsburg into the Shenandoah Valley (Rouse 1976; Barber et al. 2004).

European westward expansion was slow. Typically, initial expansion came in the form of large land grants bestowed by the King of England. Over time, these grants were subdivided into smaller and smaller parcels as more settlers moved west. Barber et al. (Barber et al. 2004) states

that while the earliest settlers were mostly English, a majority of the settlers in western Virginia in the early 18th century were of German or Scots-Irish descent. These settlers were fleeing religious persecution in Europe and subsequent discrimination in Pennsylvania. German and Scots-Irish settlers claimed the Shenandoah Valley by the mid-18th century as they largely moved down the backcountry via the Great Wagon Road, bringing non-English styles of religion, architecture, and agricultural practices. Examples of imported architectural styles include houses and bank barns built of stone instead of the brick structures more common in English communities (Department of Historic Resources 2017). As these English and non-English pioneers gained control of the interior regions, their understanding of the over ground trade networks increased.

Following the establishment of the Carolina and Maryland colonies on the Virginia borders, Virginia had to compete for trade with native populations outside of its boundaries. Carolina tried to stop Virginia traders from doing business with natives within its borders and in 1670, the Carolina Lords Proprietors ratified several acts passed by the Assembly of Albemarle County, one of which included a prohibition on "strangers" trading with the Carolina natives (Hatfield 2004).

Virginia also attempted to guard its resources from other colonies and colonial powers. When the Dutch cut the Carolina Road through the western portion of the colony and began using Susquehannock natives to trade with the Ocaneechees of southern Virginia and Carolina, in a blatant attempt to circumvent a ban on trading with Virginia, Virginia responded in turn by passing an act in 1661/2 prohibiting "all… Indians to the Northward of Maryland from trucking, trading, bartering or dealing with any English or Indians to the southward of that place" (Bracey 1977). This intercolonial competition placed added value on pivotal points in the Native American overland trading network as control of such areas allowed Virginia direct access to commodities otherwise regulated by other colonies or powers in the maritime network of the coast. By the end of the 17th century, the web of overland trails in the Southern Piedmont had become integrated with maritime trade (Hatfield 2004).

Rise of the Plantation System and the Institution of Slavery

As settlers pushed into the frontier of Virginia, they brought with them English culture and institutions associated with government, society and economy that had already been formalized in the Tidewater. These institutions included the House of Burgesses, established religion, and small commercial enterprises (Department of Historic Resources 2017). The new settlers raised tobacco, corn, potatoes, peas, sheep, cows, hogs, geese, bees, flax, and cotton (Bracey 1977).

Both the plantation system and the institution of slavery in Virginia are closely tied to tobacco monoculture, characteristic of farming practices beginning in the early 17th century. Following the successful cultivation of a milder type of tobacco by John Rolfe in 1612, tobacco quickly became the cash crop of the young Virginia colony. The complex process of tobacco cultivation led to the rise of the plantation system as a formula for economic success: large tracts of land cultivated with large labor forces (Department of Historic Resources 2017). While this system began in the Tidewater during the 17th and 18th centuries, it eventually expanded further inland along Virginia's many navigable rivers. Docks belonging to large plantations dotted the shorelines of rivers and towns serving as courthouse complexes and tobacco warehouses; however, the plantations existed as virtually autonomous entities (Department of Historic Resources 2017).

The first Africans came to Virginia in the early seventeenth century, most likely as indentured servants; however, slavery gradually became entrenched in Virginia society as the demand for labor increased (Department of Historic Resources 2017). At first, English emigration provided this labor, but as economic conditions in England improved and cheap land was available in Virginia, fewer Englishmen arrived as indentured servants, leading Virginia planters to look elsewhere to satisfy the labor demand required by their plantations, thus establishing the institution of slavery (Department of Historic Resources 2017).

The development of slavery in Virginia as an answer to the labor problem largely resulted from Virginia's 17th century exposure to slavery in the English Caribbean colonies, which provided a legal and cultural precedent of enslaved labor, and intercolonial trade with Dutch merchants, who were largely based in New Netherland and provided access to slaves. Slavery in Virginia before the 1670s emerged from these two connections, and by the end of the century laws were passed further regulating the lives of slaves and belief in racial distinction solidified throughout the English Atlantic (Hatfield 2004). Though slavery, like the early practice of indentured servitude, departed from English labor traditions, it took root in the English New World largely because Spanish and Portuguese America had laid the template for American colonization – a template that included slave labor. When the English colonized the New World they looked to the successful Iberian colonies and tried to emulate them. From this, English colonists learned how Africans fit into a colonial American context as labor benefiting Europeans, so when a labor shortage arose, merchants made slaves available for purchase and the institution of slavery quickly became embedded in English American colonies. The Caribbean English colonists mimicked the Iberian model and later more northern English colonies, such as Virginia, followed suit (Hatfield 2004).

The success of tobacco led to the development of colonial plantations and manor houses; which were the embodiment of Virginia's economic dominance in the early and mid-eighteenth century, even though most people lived in far humbler circumstances than the wealthy landed gentry. Today, the surviving plantation mansions and their networks of dependencies, outbuildings, and gardens are symbols of some of our nation's finest achievements in colonial design and craftsmanship, which yield valuable archaeological, historical, and architectural information critical to understanding this period of our nation's history (Department of Historic Resources 2017).

English settlement in the area now known as Cumberland County likely began on the floodplains of the James and Appomattox Rivers, as settlers in need of fertile soils for growing tobacco continued to push westward. The influx of settlers led to the formation of Cumberland County from Goochland County in 1749.

Colony to Nation (1751-1789)

Virginia played an important role in the formation of the United States. Her residents participated in crucial political and military phases of the Revolutionary War and in the shaping of the nation following the conflict. Many of the nation's founding fathers called Virginia home and a majority of their homes still stand, significant both for their architecture and the status of those who lived in them.

The passing of the Stamp Act (1765) and the Townsend Acts (1767) ignited simmering tensions between the American Colonies and Britain, inciting Virginia's planter-statesmen, such as Southside resident Patrick Henry, to stand up to what they believed was taxation without

representation. Although initially considered radicals, Henry, and Samuel Adams and John Hancock of Massachusetts became the voice of the Revolution. While revolutionaries like Henry, Hancock, and Adams were early opponents to British sovereignty, many Southside residents were reluctant to break ties with England. However, as British taxes and tariffs engendered a spirit of bitterness and resentment among both the plantation class and poorer southern planters, attitudes quickly changed. Given its location along the western frontier of Virginia, Southside was largely unaffected by the War. Economic impacts were minimal and were principally the result of decreased tobacco production, as many farmers opted to grow food, instead of tobacco, in support of the war effort (Mix and Weber 1998).

Cumberland's population continually increased throughout the latter part of the eighteenth century, leading to the formation of Powhatan County, from the eastern half of Cumberland County in 1777. The original county seat for Cumberland County was located in Deep Creek, near the intersection of Anderson Highway (US 60) and Old Tavern Road (SR 629), in what is now Powhatan County. Following the founding of Powhatan County, the courthouse was moved to Effingham, now known as Cumberland Courthouse.

Early National Period (1790-1829)

Following the Revolution, Britain refused to recognize American sovereignty. The British interfered with U.S. / European trade, encouraged Native American resistance to westward expansion, and impressed American seamen into Royal Navy service. After the execution of King Louis the XVI of France, Britain and France were once again at war. The British still viewed Americans as British subjects, and expected the United States should cease trade with France and join the fight on behalf of Britain. In response to British impressment of American sailors and French confiscation of American ships, the U.S. passed the Embargo Act of 1807. Intended to force Britain and France to respect U.S. neutrality by placing restrictions on trade with both nations, the measure was largely ineffectual and had the greatest impact on American citizens, who were unable to sell their goods. The embargo was lifted in 1809 and impressment of American sailors continued. On June 18, 1812, the United States declared war on Great Britain and by August 1814, British forces had captured and burned the nation's capital, Washington, D.C., but the Americans ultimately prevailed and the war ended with the ratification of the Treaty of Ghent on February 17, 1815, sparking a new era of patriotism (Bracey 1977).

After the War of 1812, Britain imposed prohibitive tariffs against the importation of American grain. Wheat prices briefly rose to two dollars a bushel again in 1817 due to the "year without a summer" when the global climate felt the effects of the Tambora volcanic eruption in the East Indies, but these prices were short-lived and quickly declined, eventually hitting their lowest point in 1843 (Sharrer 2001). However, after the war ended the U.S. overall experienced economic gains that relieved the hardship caused by the embargo until the Panic of 1819, the first major financial crisis in the U.S. during peacetime. The Panic was blamed on the policies of the Second Bank of the United States and the collapse of the American economy continued through 1821, after which it recovered and later fell to the Panic of 1837. Virginia, like the rest of the United States, experienced a variety of periods of both prosperity and depression in the years between the Revolution and the Civil War (Bracey 1977).

The period after the Revolution is sometimes called the "Great Rebuilding" in many of Virginia's rural areas. During this time living standards improved, resulting in expansion or replacement of smaller dwellings characteristic of the previous period. In the Piedmont region, the I-house became the dominating domestic type rather than the previously commonplace one- or two-

room houses on small farms. Furthermore, numerous wealthy Tidewater families migrated to lands they owned farther west, transplanting the Tidewater-style plantation house where they went, and new churches were built as the Anglican Church was disestablished and other religious denominations rose.

The end of the 18th century and the beginning of the 19th century saw a transition in Virginia from a near completely agrarian colonial society to a new state with developing urban centers. Many Virginia counties had only small villages if they had any village at all, but the Early National Period witnessed the expansion of Fall Line river ports into flourishing economic centers, such as Alexandria, Fredericksburg, and Petersburg, as well as the prosperity of Piedmont county seats like Charlottesville, Warrenton, and Leesburg.

Originally known as Rutledge's Ford, Farmville was strategically located at the western limits of the Upper Appomattox Navigation Canal System. Constructed in 1795 and operational by 1816, the canal facilitated the transportation of tobacco and other local crops by bateau to markets in Petersburg, Williamsburg, and beyond. Northern Cumberland County used the Willis River for its transportation route. In 1774, the County Court acted to clear the river from its mouth to Ca Ira. The General Assembly passed the Willis River Navigation Act in 1787 and divided it into maintenance precincts. The head of navigation was Ca Ira but was later extended another 11.8 miles and ended in Buckingham County. Combined with the lower precincts of 33.6 miles length, the total canal system ran for 45.4 miles. The system was complete by 1797 and provided farmers with access to markets in Richmond, via the James River.

The Willis River and Appomattox canal systems remained the primary means of transporting goods to market until the mid-nineteenth century, when ever expanding railroad networks provided a faster, more reliable means of transportation. Milling was a major industry in Cumberland County during this period. Mills were set up by individual millers who operated on a custom basis, either taking a set amount of grain as a fee or on a pay basis for grinding. Mills also processed cotton, lumber and a variety of other materials. Boye's 1823 Map of Virginia lists 21 mill locations in Cumberland County (Figure 4). Three are located on Muddy Creek in the vicinity of the project area.

Antebellum Period (1830-1860)

In the first half of the nineteenth century, rolling roads and canals gave way to improved roadways and rail transportation. The Virginia Board of Public Works made great strides in augmenting the state's transportation network, and roads and railroads challenged the reign of the waterways as the primary means of transportation for the first time (Department of Historic Resources 2017). Originally designed to provide an easier and more reliable means to transport farm products to port towns, railroads transformed the way people and goods moved through the landscape, opening up previously inaccessible areas for settlement and exploitation. Railroads required tremendous amounts of lumber for the construction of rail beds, trestles, stations, and cars and as railroads expanded west, so too did the lumber industry, resulting in unprecedented deforestation in Virginia's Piedmont region. The South Side Railroad was chartered in 1846 and had line completed to High Bridge by 1853 and service to Farmville by 1855, thus focusing rail transportation in the southern half of the county and rendering the Appomattox River canal system obsolete by the late 1850s. As regional transportation continued to expand and improve, population increased, tobacco warehouses were opened, towns were planned and the Cumberland County economy evolved based on commercial agriculture (Beeman 1989).

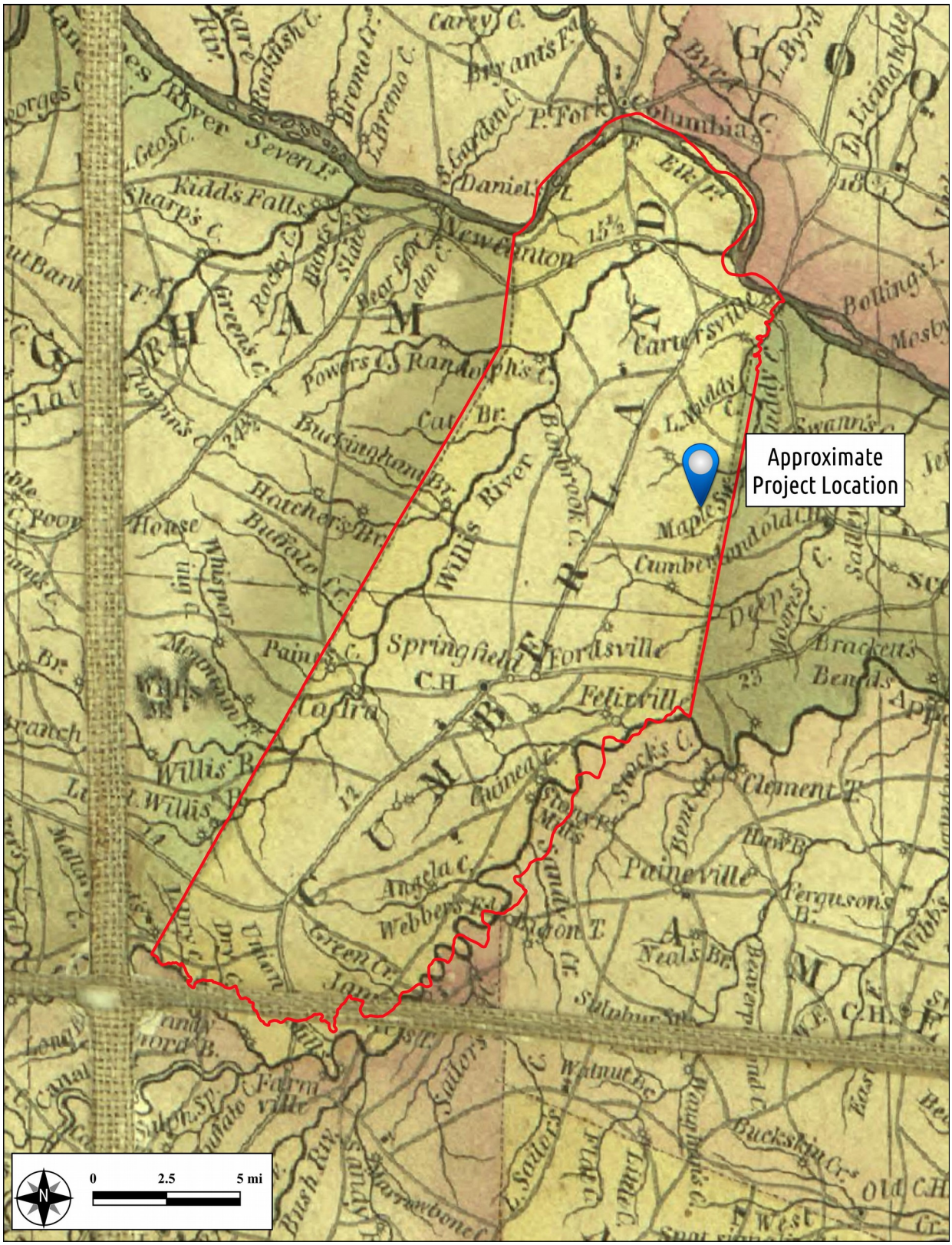


Figure 4: Approximate Project Location on 1823 Boye Map of Virginia.
(Mills noted with circular symbol along creeks)

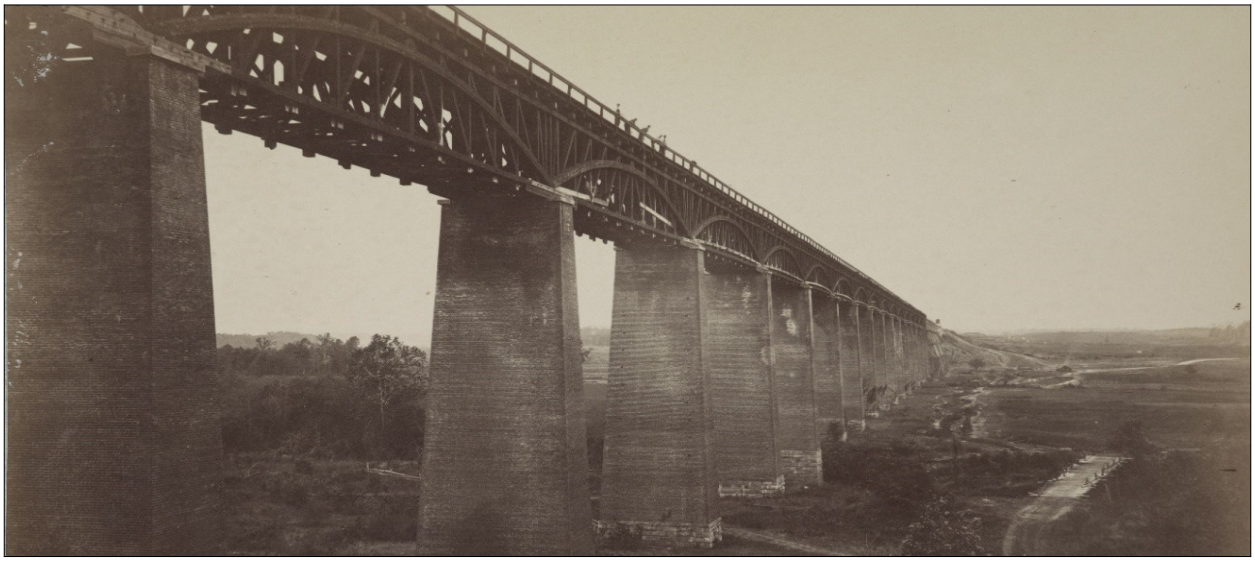


Figure 5: High Bridge in April 1865.

A hallmark of the Antebellum Period was that of the abolitionist debate. In Virginia, there had been free African Americans from as early as the middle of the 17th century. There was also an increase in emancipations after the Revolution for those slaves who had aided the American cause. In 1782, the Virginia General Assembly made the legal process easier for freeing one's slaves and the second Great Awakening of the latter 18th and early 19th centuries furthered this spirit of egalitarianism (Bracey 1977). However, the early emancipation momentum slowed and anti-emancipation sentiment grew in the South in the wake of Nat Turner's 1831 Rebellion in Southampton County, which created much fear among white southerners who were concerned about such an insurrection from their own slaves or from neighboring freedmen. Following the rebellion, the Virginia House of Delegates debated the issue of the abolition of slavery over the winter of 1831-32.

Civil War (1861-1865)

Virginia hesitated in declaring her secession for several months after South Carolina became the first to secede from the Union. Elected candidates attended the 1861 Virginia Peace Convention to consider the issue. In a secret session April 17, 1861, Virginia's secession was approved, after the mid-April attack on Fort Sumter in South Carolina shifted many of the opinions at the convention away from peace. On May 23, 1861 a vote officially approved secession and Virginia joined the Confederacy (Bracey 1977). Like most places in the South, Cumberland County was suffering effects of the war by the summer of 1861 as the Confederacy demanded of them soldiers, equipment, and other supplies. The closest documented engagement between Union and Confederated forces was the Battle of High Bridge (DHR #024-0416), located approximately twenty miles southwest of the project area.

The battlefield spans Cumberland and Prince Edward counties and encompasses 3,760.5 acres. Included within the resource is the Battle of High Bridge (April 6-7, 1865) battlefield and the subsequent route of Confederate retreat. The battle was part of the Appomattox Campaign (March-April 1865). Following defeat at Sailor's Creek, Robert E. Lee's army retreated towards Farmville via the Southside Railroad. Union forces initially clashed with Confederate Reserves

at High Bridge on April 6th, but were repelled by the Confederate cavalry and Lee's army successfully crossed the bridge and made their way to Farmville on April 7th (Figure 5).

Once safely across, the Confederates destroyed the high bridge, but the wagon bridge below remained intact and the Union army followed the Confederates to Appomattox where Lee was forced to surrender, officially ending the Civil War. The American Battlefield Protection Program (ABPP) and DHR collaborated with the Civil War Sites Advisory Commission to determine the boundaries of the resource. The resource includes an earthen fortification at High Bridge (024-0416-0001). The fortification features a raised perimeter in the shape of a square bisected by another raised section that runs through the middle. The corners of the squares exhibit a dirt mound used for mounting artillery. It was garrisoned by the 3rd Virginia Reserves and equipped with artillery during the Battle of High Bridge.

On the morning of April 7, 1865, Robert E. Lee in retreat from his defeat at Sailor's Creek, held a meeting at 304 Beech Street while awaiting trains of rations, but was forced to leave before his supplies had arrived, upon learning that Union forces were entering the town. Lee's forces would head to Appomattox Station, where two days later, he surrendered to Ulysses S. Grant.

The 1864 Gilmer Map of Cumberland County shows considerable expansion in local transportation networks. Cartersville, Cumberland Courthouse, and Ca Ira remained the major settlements, but an expanded secondary transportation network facilitated settlement throughout the County. In the project area, secondary roads connected the Jesse Parker, Jeffrey, and Ammoynett farmsteads to Cartersville, Cumberland Courthouse, and Richmond via the predecessors of Pinegrove Road, Miller Lane, Cartersville Road, and Old Courthouse Road (Figure 6).

Reconstruction and Growth (1866-1916)

With the ratification of the 1870 Constitution, Virginia was once again a part of the United States, slavery was outlawed, and for the first time Virginia had a state-subsidized public school system. Emancipated slaves made up the majority of the work force and large Antebellum plantations were divided into smaller farms, a tenant and share-cropping system became prominent throughout the South in the century following the war (St. John and St. John 1990).

Although policies established during the brief period of martial law following the Civil War benefited freedmen, making education, suffrage, and land ownership available to them, institutionalized racism would curb their upward advance. African American workers were paid less, and their schools did not receive as much funding as white schools.

In 1912, Julius Rosenwald, president of Sears, Roebuck, became a member of the board of directors for the Tuskegee Institute and provided funding for a project developed by Dr. Booker T. Washington to design and construct schools for African American children throughout the rural south. The Rosenwald Fund, established in 1917 would be used to construct more than 5,000 schools in areas where African American schools were traditionally underfunded. The Pine Grove School (DHR #024-5082), located along Pinegrove Road, west of the project area, is an example of a two-room "Rosenwald" schoolhouse constructed between 1917 and 1920.

Institutionalized segregation gave rise to African American culture and inspired the formation of institutions like the National Association for the Advancement of Colored People (NAACP), formed in 1909, but a lack of equal access to public institutions and programs created many difficulties in both economic and political advancement (Department of Historic Resources 2017). On July 10, 1902, the Virginia Constitutional Convention enacted the 1902 Constitution.

Figure 6: Approximate Project Location on the 1864 Gilmer Map of Cumberland County.

Received by VMRC September 2, 2020 /blh

This document established poll taxes and literacy tests specifically intended to disenfranchise many African American voters. Other provisions of the Constitution included mandated formation of the Virginia State Corporation Commission, which replaced the Virginia Board of Public Works and was charged with oversight of the State's growing railroad network (Maddex 1998). In 1884 the Farmville & Powhatan Railroad was chartered and by 1890 it was connected with the Brighthope Railway of Chesterfield and provided rail service for 93 miles between Farmville and Petersburg, via Cumberland County. The railway transported the region's coal, lumber, grains, and tobacco to urban markets and provided passenger service six days a week. When first established, the company owned 7 engines and 210 cars. Initially profitable, the railway was losing money by 1894 and by 1895 was down to five locomotives (Allen 1966). The Farmville & Powhatan was sold under receivership in 1905 to the Tidewater and Western Railroad Company.

World War I to World War II (1917-1945)

The Farmville & Powhatan line remained operational under the Tidewater and Western Railroad company until 1917 when the US Government decreed that all railroads less than 100 miles long were to be taken up for the war effort. That year, the 92 mile long Farmville & Powhatan Railroad was removed and sold to the French government. With the gradual demise of canal companies following the introduction of railroads and the loss of the Farmville & Powhatan, the Southside Railroad in Farmville became Cumberland's closest link to a railway with access to urban markets to the east and west. Overland transportation routes including Routes 45 and 60, which roughly followed the alignment of the former railway became increasingly important to the County's economy.

The country suffered casualties from WWI and the Great Influenza Epidemic simultaneously. American deaths on the front in France totaled 67,813 while 548,000 deaths from influenza were reported in the U.S. within the span of just a few months; just a fraction of the 20 million who perished worldwide (St. John and St. John 1990). In the period following the war, the U.S. economy was unstable, driven by international, post-war deflation. In 1919, tobacco crops sold for 51 cents per pound, but overproduction, in America and abroad, caused prices to fall to just 22 cents a year later. In the 1920s markets stabilized ushering in a decade of sustained economic prosperity.

Improvements in farming practices, including mechanization and more effective fertilizers, caused a decrease in the number of people needed to tend crops and vast numbers of Americans moved from the countryside into cities, urbanizing the nation (Department of Historic Resources 2017). Waves of small farmers and sharecroppers migrated from the rural South to the industrialized cities of the North, seeking better opportunities. For African-Americans, this move also represented a chance for increased social equality. They did, however, often face restrictions that limited their housing to certain parts of cities. While intended to enforce racial segregation, the restrictions often resulted the formation of African-American cultural and economic centers.

As people from diverse backgrounds converged in cities, arts and industry flourished. Telephones, automobiles, air travel, jazz music, motion pictures, radio, and professional sports were introduced to American culture. The optimism of the period led to over speculation amongst investors and by the end of the 1920s the stock market was beginning to show signs of instability. The Great Stock Market Crash of 1929 ushered in a twelve year downturn in the U.S. economy known as the Great Depression. While the crash devastated investors, farmers at first seemed safe; however, the U.S. suffered an extreme drought in the summer of 1930 that forced

tobacco prices to a ten year low. Combined with the failure of banks and businesses, the country sank into an economic depression (St. John and St. John 1990).

During the period between 1929 and 1933, unemployment increased from 3.3% to 25% and gross domestic product decreased by one third (VanGiezen and Schwenk 2003). Beginning in 1933, President Franklin Roosevelt enacted regulations designed to stabilize the banking industry and created relief programs such as the Works Progress Administration (WPA), Civilian Conservation Corps (CCC), Tennessee Valley Authority (TVA), and Rural Electrification Administration (REA) to provide employment opportunities for Americans and stimulate the economy. At the time of the establishment of the REA in 1934, approximately 7.6 percent of rural Virginian farms had electricity, but in just four years that number rose to 21 percent (St. John and St. John 1990). Despite contributions from government funded programs, the economy of the region remained stagnant until the onset of World War II.

After the bombing of Pearl Harbor on December 7, 1941, America entered the Second World War. Again, citizens from Virginia served their country. The era of the World Wars saw struggles for both gender and racial equality. Black leaders pushed for equal rights in Virginia, and sometimes whites, such as *Richmond Times-Dispatch* editor Virginius Dabney, joined their cause. At times the fight for racial equality mixed with the drive for women's suffrage in the early parts of the century. In 1920, the struggle for women's suffrage came to an end in the U.S. with the ratification of the 19th Amendment, but Virginia did not ratify it until 1952. In 1948, the *Universal Declaration of Human Rights by the United Nations* added voting rights for women to international law. World War II brought much social change to the country. As African American veterans returned home from a segregated military and women who had gone to work during the war remained in the workforce the call for equality became louder (Department of Historic Resources 2017).

The New Dominion (1946 to the present)

The prosperity that followed World War II and the mechanization of farming brought about the decline of the share-cropping system that had developed after the Civil War (St. John and St. John 1990). Virginians began leaving rural homesteads and farms and moved to urban centers like Richmond and Washington, D.C. By 1955, Virginia had more urban residents than rural residents and by 1990, suburbs were the preferred place of residence. This transition from rural to urban lifestyle were aided by transportation progress including the construction of the Interstate Highway System.

On May 17, 1954 the Supreme Court ruled in *Brown v. the Board of Education* that "separate educational facilities are inherently unequal" and were a violation of the Fourteenth Amendment of the Constitution. By 1958, most Virginia counties had complied with the ruling and public school systems throughout the state were integrated, ending the need for Rosenwald schools, such as the Pine Grove School. In spite of the ruling, the Pine Grove School remained in use until 1964, and was later adapted for use as a community center (Branch 2018). At the time of this investigation, the building was in fair condition, but was no longer in use.

Agriculture remains a key component of the County's economy and Cumberland retains a largely agrarian landscape composed of grassy pastures, plowed fields, and managed timberland. Aerial photographs of the project vicinity show little change within the project area and surrounding environs between 1947 and 2018 (Figures 7 through 10).

Figure 7: Project Location on the 1947 Black and White Aerial Imagery of the Project Vicinity.

Figure 8: Project Location on the 1958 Black and White Aerial Imagery of the Project Vicinity.

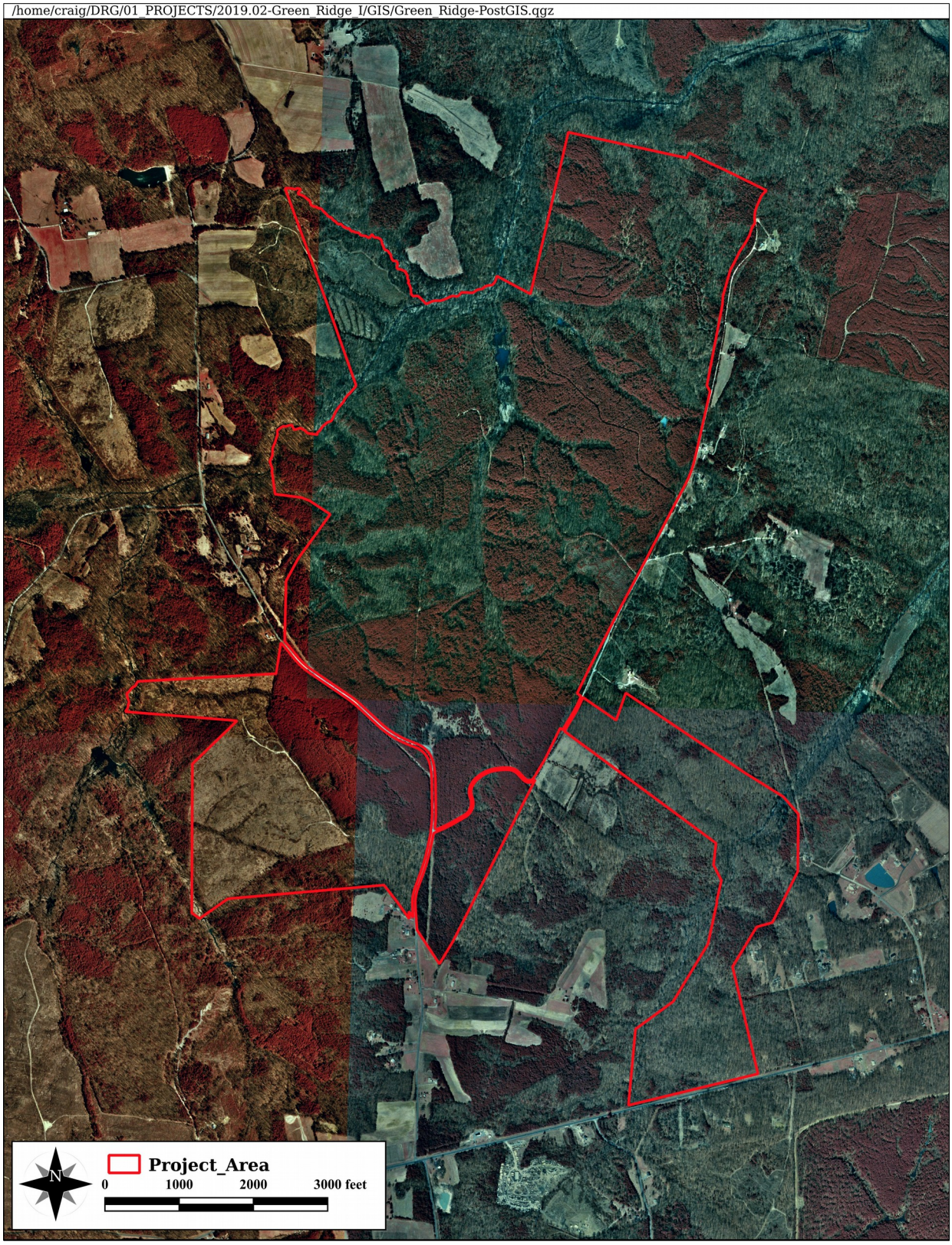


Figure 9: Project Location on the 1996 Color Infrared Aerial Imagery of the Project Vicinity.

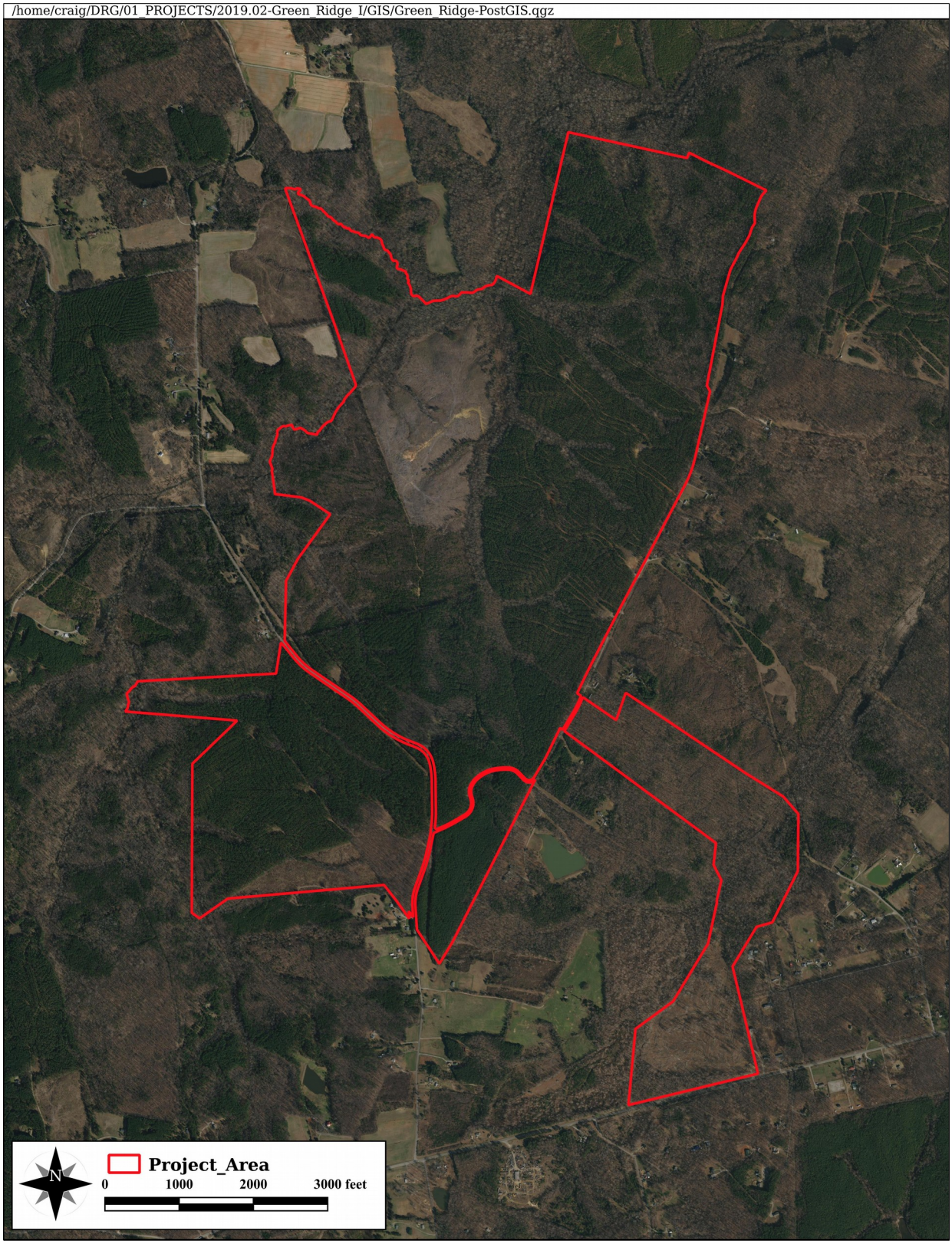


Figure 10: Project Location on the 2018 Natural Color Aerial Imagery of the Project Vicinity.

PREVIOUS INVESTIGATIONS

Information about architectural resources and archaeological sites previously recorded in the project vicinity was gathered from the Department of Historic Resource's (DHR's) online Virginia Cultural Resource Information System (V-CRIS). V-CRIS lists one hundred eighty-eight architectural resources (Table 1) and four archaeological sites (Table 2) within five miles of the project area. None of the archaeological sites or historic structures are located within the current project area. The locations of these resources in relation to the current project area is illustrated in Figure 11.

Ten of the architectural resources located within five miles of the project area have either been determined eligible for- or are listed on- the Virginia Landmarks Register or National Register of Historic Places (Table 1, **bold** font). Twenty-one of the remaining resources were evaluated and determined ineligible for the National Register (Table 1, **gray bold** font).

Thomas Chapel United Methodist Church (DHR#024-0029) is a one-story, two-bay brick church laid in 5-course American bond located approximately 3 miles northwest of the project area. Constructed in 1847, the one-room Greek Revival church is representative of mid-nineteenth century rural churches constructed throughout Virginia and was determined eligible for the NRHP in 2001 under Criteria A and C, for its contributions to local history and possible affiliation with Thomas Jefferson's master builders and Robert E. Lee.

The one-room, frame schoolhouse on a stone foundation at the intersection of Cartersville Road (VA 45) and SR 683 (DHR#024-0089), lies approximately three miles northwest of the subject property and is thought to have been constructed around the beginning of the twentieth century. It was listed on the NRHP in 2001 under Criterion A, for its contributions to our understanding of the history of education in Cumberland County.

Goshen (DHR#024-0091) is a well-preserved example of an Antebellum Period (1830-1860) domestic complex comprised of a two-story, three-bay brick dwelling, barn, smokehouse, corncrib, shed and other outbuildings. This resource was determined eligible for inclusion on the NRHP in 1994. Goshen is located on the north side of Goshen Road, approximately four miles southwest of the project area.

DHR #024-0109 is a one-story, frame structure supported with concrete block piers, with standing seam metal roof on the northwest side of Cartersville Road (VA 45) approximately 3 miles northwest of the project. The structure was constructed circa 1915 by Cumberland County to serve as a voting precinct and continues in that function to the present day. This resource was determined eligible for the NRHP in 2001.

The Sims/Connor House (DHR#024-5021) is a one-story, three-bay frame dwelling with continuous brick foundation in English and Flemish bond, gable roof clad in standing seam, metal panels, and interior-end, corner brick chimney. The dwelling and associated smokehouse were constructed circa 1800 and were determined eligible for the National Register in 2001. The structures are located on the south side of Cartersville Road (VA 45), approximately 3 miles northwest of the project area.

The Pine Grove Elementary School (DHR#5082) is located on the western side of Pinegrove Road immediately adjacent to the current project area. The schoolhouse was constructed circa 1917 for a cost of $1,550.00. Known as a "Rosenwald School", construction of the 1-story, frame structure with slate-clad, steep-hipped roof was financed by the Julius Rosenwald Fund, established by then president of Sears and Roebuck and Company for the expressed purpose of

improving educational opportunities for African Americans. This resource was recommended eligible for inclusion on the National Register of Historic Places in April of 2019 under Criterion A (Education, Ethnic Heritage: African American) and Criterion C (Architecture).

Blenheim (DHR# 072-0003) is located west of Ballsville Road, on Blenheim Road (US 606) approximately 2.75 miles southeast of the project area, and was listed on the National Register of Historic Places and Virginia Landmarks Register in 1986. The earliest portions of the structure were constructed by the son of prominent Virginia surveyor Major William May circa 1750, making it one of the oldest extant dwellings in Powhatan County. Subsequent additions by Mayo's grandson and later owners in the early nineteenth century have resulted in a U-shaped structure in the vernacular cottage style. This resource includes a smokehouse.

Located approximately one and one quarter miles east of the project area, Somerset and the Brown Cemetery (DHR# 072-0040) lie southeast of the intersection of Anderson Highway (US 60) and Ballsville Road (SR 630). Somerset is a late eighteenth century domestic complex comprised of a one-and-a-half story single dwelling with steeply pitched side-gabled roof with two gabled dormers and two sets of gable-end chimneys, and contemporary barn, silo, corncrib, dairy, and family cemetery. This resource was listed on the Virginia Landmarks Register in 2006.

The Littleberry Mosby House/Mosby Tavern/Old Cumberland Courthouse (DHR# 072-0054) lies at the intersection of Old Tavern Road (SR 629) and Anderson Highway (US 60) approximately four and a half miles east of the project area. The resource, which includes a two-story dwelling constructed in the mid-eighteenth century, and contemporary and modern outbuildings, was used as the Cumberland County Seat prior to the formation of Powhatan County, during the latter part of the eighteenth century. This resource was listed on the Virginia Landmarks Register in 2002 and the National Register of Historic Places in 2003.

French's Tavern , Harris's Store , Indian Camp , Swan's Creek Plantation , The Coleman Place (DHR# 072-0105) is located on the north side of Old Buckingham Road approximately five miles southeast of the project area. The resource includes a well-preserved, two-and-a-half story frame tavern/dwelling constructed circa 1730 and a barn. French's Tavern was listed on the VLR in 1988 and on the National Register in 1989.

The remaining resources are primarily comprised of nineteenth and twentieth century dwellings and domestic farmsteads concentrated along the region's primary transportation routes, including Anderson Highway (US 60), Cartersville Road (VA 40), and Ballsville Road (SR 630). Other resources include 19th- and 20th-century churches, schools, and cemeteries; and a motel, post office, and gun club dating to the twentieth century.

Table 1: Architectural Resources Previously Recorded within Five Miles of the Project Area

DHR ID	Resource Name	Temporal Affiliation	Visible	NRHP Eligibility
024-0029	**Thomas Chapel United Methodist Church**	**1847**	**No**	**Eligible**
024-0043	**House, Route 45**	**0**	**N/A**	**Not Eligible**
024-0060	**House, Route 45**	**0**	**N/A**	**Not Eligible**
024-0067	House, Route 45	0	No	Not Evaluated
024-0081	Tally Ho	1850	No	Not Evaluated
024-0082	Locust Grove	0	**Yes**	Not Evaluated
024-0083	**Oakland**	**1750**	**N/A**	**Not Eligible**
024-0084	Adam's Store	1911	No	Not Evaluated
024-0085	Melrose	0	**Yes**	Not Evaluated
024-0086	Wine House	0	No	Not Evaluated
024-0088	House, Route 607	0	No	Not Evaluated

DHR ID	Resource Name	Temporal Affiliation	Visible	NRHP Eligibility
024-0089	**School, Route 45**	**0**	**No**	**Eligible**
024-0091	**Goshen**	**1840**	**No**	**Eligible**
024-0096	Rock Castle	1811	No	Not Evaluated
024-0109	**Chapel, Route 45, Voting Precinct**	**ca. 1915**	**No**	**Eligible**
024-0111	School, Route 45	ca. 1875	No	Not Evaluated
024-0118	Bruners Store, M. H. Maxey Store, R. O. Moore Store	1880	**Yes**	Not Evaluated
024-0122	House, Route 624	0	No	Not Evaluated
024-0125	Single Dwelling, 219 Anderson Highway	0	No	Not Evaluated
024-0168	Single Dwelling, 57 Cumberland Road	0	No	Not Evaluated
024-0216	House, Route 654	0	No	Not Evaluated
024-0217	House, Route 654	0	**Yes**	Not Evaluated
024-0218	House, Route 616	ca. 1935	No	Not Evaluated
024-0219	House, Route 616	0	No	Not Evaluated
024-0220	Oakland	1847	No	Not Evaluated
024-0221	House, Parker Road (Route 648)	0	No	Not Evaluated
024-0222	House, Deep Run Road (Route 616)	0	**Yes**	Not Evaluated
024-0223	Mayo House	0	No	Not Evaluated
024-0224	House, Route 616	1930	No	Not Evaluated
024-0225	House, Route 616	1880	**Yes**	Not Evaluated
024-0229	House, Route 687	0	No	Not Evaluated
024-0233	House, Brown Road (Route 647)	ca. 1885	No	Not Evaluated
024-0234	House, Route 647, Winfield Farm	0	No	Not Evaluated
024-0235	House, Route 647	0	No	Not Evaluated
024-0236	House, Route 601	0	No	Not Evaluated
024-0237	Single Dwelling, 302 Anderson Highway	0	No	Not Evaluated
024-0238	Rising Zion Baptist Church	0	**Yes**	Not Evaluated
024-0239	Single Dwelling, 217 Anderson Highway	0	No	Not Evaluated
024-0240	Clinton Manor House, 199 Anderson Highway	0	**Yes**	Not Evaluated
024-0241	House, Route 45 N	ca. 1875	No	Not Evaluated
024-0242	Bethlehem Baptist Church	0	No	Not Evaluated
024-0243	House, Route 45 (Cartersville Road)	0	No	Not Evaluated
024-0244	House, Route 45 (Cartersville Road)	0	No	Not Evaluated
024-0245	House, Rt 45	0	No	Not Evaluated
024-0246	House, Rt 45	0	No	Not Evaluated
024-0247	Oak Grove Baptist Church	1909	No	Not Evaluated
024-0248	Ashby General Store, Stonenell and Holland Store	0	No	Not Evaluated
024-0249	House, Rt 45	0	No	Not Evaluated
024-0250	House, Route 45	ca. 1885	No	Not Evaluated
024-0251	House, Route 45	0	No	Not Evaluated
024-0252	Greenfield Farm	0	**Yes**	Not Evaluated
024-0253	Farm, Route 45	ca. 1885	No	Not Evaluated
024-0254	House, Route 45	0	No	Not Evaluated
024-0255	House, Route 45	0	No	Not Evaluated
024-0256	House, Route 45	0	No	Not Evaluated
024-0257	House, Route 45	0	No	Not Evaluated
024-0258	House, Route 45	0	No	Not Evaluated
024-0259	House, Route 45	0	No	Not Evaluated
024-0260	Barn, Route 615	0	No	Not Evaluated
024-0261	House, Route 45	0	No	Not Evaluated
024-0262	House, Route 614	0	No	Not Evaluated
024-0263	**Mt. Horeb Church**	**0**	**N/A**	**Not Eligible**
024-0264	**House, Route 45**	**0**	**N/A**	**Not Eligible**
024-0265	House, Route 626	0	No	Not Evaluated
024-0266	Cemetery, Route 624	ca. 1914	No	Not Evaluated
024-0271	House, Route 624	ca. 1846	No	Not Evaluated
024-0272	House, Rt 625	1880	No	Not Evaluated
024-0273	House, Rt 663	1880	No	Not Evaluated
024-0274	Farm, Rt 663	0	No	Not Evaluated
024-0275	Mullein School, Mullins Bottom, Rosenwald School,Turkey Cock School	1921	No	Not Evaluated
024-0276	House, Route 697	0	No	Not Evaluated