

Supplemental Information Alternatives (Alternate) Analysis (Response to 1/26/2022 DEQ Comments)

**Green Ridge Recycling and Disposal Facility, LLC
JPA Permit No. 20-1619
Solid Waste Permit No. 626**



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April 29, 2022
Final



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**GREEN RIDGE RECYCLING AND DISPOSAL FACILITY
JOINT PERMIT APPLICATION - TECHNICAL REVIEW NO. 3
RESPONSE TO COMMENT 1 OF JANUARY 26, 2022
REQUEST FOR ADDITIONAL INFORMATION
FINAL - APRIL 29, 2022
SUPPLEMENTAL STATEMENT OF PURPOSE AND NEED
AND ALTERNATIVES ANALYSIS**

INTRODUCTION

Applicant, Green Ridge Recycling and Disposal Facility, LLC and its parents, County Waste of Virginia, LLC and GFL Environmental, Inc. (altogether, "County Waste" or "Company"), is submitting a revision to the following Supplemental Statement of Purpose and Need and Supplemental Alternatives Analysis ("Supplemental Statement") regarding the proposed Green Ridge Recycling and Disposal Facility ("Green Ridge Facility" or "Project") previously submitted on January 11, 2022. This revision is being prepared in response to comments received from the Virginia Department of Environmental Quality - VWP, dated January 26, 2022.

This Supplemental Statement clarifies and provides additional information in support of the Statement of Purpose and Need and the Alternatives Analysis previously provided in County Waste's Joint Permit Application ("JPA") submitted on September 2, 2020, and/or subsequent submittals, including but not limited to information submitted May 7, 2021 ("May 7 Submittal") and information submitted January 11, 2022 ("January 11 Submittal").

Specific to this submittal, is the inclusion of new drawings relative to the Alternatives which utilize Lidar topography to provide a more detailed concept facility design as requested by DEQ during various communications.

This Supplemental Statement addresses the following:

- Purpose
- Need
- Economic Justification
- Alternative Analysis consisting of the following phases:
 - Phase 1 (Technology) - Determination of Most Suitable Waste Disposal Technology
 - Phase 2 (Logistics) - Implementation of Selected Technology
 - Phase 3 (Site Suitability, Availability)
 - Phase 3A - Identification of Interested Localities In Virginia
 - Phase 3B – Identification of Host Community
 - Phase 3C – Evaluation of Sites Within Host Community

The objective of the Green Ridge Facility is to establish a municipal solid waste ("MSW") landfill located near the Greater Richmond Metropolitan Area sufficiently sized to provide waste-disposal capacity for a minimum of 3,500 tons per day for 25-30 years in order to allow Green Ridge, its parent, subsidiaries, and affiliates to meet the waste disposal needs of their Central Virginia customers concentrated in the Greater Richmond Metropolitan Area, as well as in Southwest Virginia. At 3,500 tons per day for 6 days per week

for 30 years, capacity for 32.8 million tons would be required; at 5,000 tons per day capacity for 46.8 million tons would be required. **Appendix 1** provides a figure illustrating the location of the proposed facility relative to the Greater Richmond Metropolitan Area.

County Waste, along with its subsidiaries and affiliates, serves the waste disposal needs of more than 320,000 customers in Central and Southwest Virginia. More than three quarters of this volume — nearly eighty percent (80%) — comes from the east, including Fredericksburg and the Greater Richmond Metropolitan Area, which encompasses the City of Richmond, Chesterfield, Hanover, Henrico, King William, Prince George, and Powhatan Counties. The remaining approximately twenty percent (20%) of the volume that County Waste handles is anticipated to come from Southwest Virginia.

As a result of its hundreds of thousands of customers in the Commonwealth, County Waste faces the immediate need to dispose of approximately 3,200 tons of waste per day; given the recent acquisition of County Waste by GFL Environmental, Inc. ("GFL"), Green Ridge anticipates that this need will increase to as much as 5,000 tons a day. Accordingly, Green Ridge needs a landfill with sufficient waste capacity to accept a minimum of 3,500 tons a day, located near the Greater Richmond Metropolitan Area, but which can also conveniently serve Central and Southwest Virginia.

In order to recover the capital investment required for construction and operation of a modern, state-of-the-art municipal waste disposal facility, County Waste requires a landfill with a minimum capacity of 3,500 tons per day (6 days per week) for twenty-five to thirty (25-30) years or 32.8 million cubic yards. Assuming the maximum tonnage of 5,000 tons per day (6 days per week) for design purposes, capacity would need to be approximately 46.8 million cubic yards. Given the waste disposal boundaries needed to accommodate such tonnage as well as federal, state, and local regulatory requirements and buffers, the subject property must include a minimum of 1,000 acres. Logistically, the Facility must also have access to a local road network that can adequately and safely accommodate the trucks transporting waste from the interstate highway system to the Facility.

In addition, to providing purpose, need and economic justification statements, the following Supplemental Alternatives Analysis selects between four alternative sites determined based upon the following factors:

- (1) Technology (ascertaining feasible waste disposal technology);
- (2) Logistics (determining the feasibility of construction/operation of the selected technology);
- (3) Availability (including identification of interested localities in Virginia and selection of a host community from among those localities) and evaluating site alternatives within the host community); and
- (4) Site Suitability and Impacts (evaluation of the site alternatives within the host community).

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PURPOSE: The purpose of the proposed Green Ridge Facility is to provide MSW landfill capacity for County Waste and its affiliates to serve the waste disposal needs of the Company's more than 320,000 existing residential and commercial customers in the Greater Richmond Metropolitan Area as well as in Central and Southwest Virginia (the "Region") and to provide for the needs of future such customers while offering replacement capacity for the Commonwealth. Adequately fulfilling the purpose of and meeting the need for the Project requires a permitted landfill with a minimum of 25 years of disposal capacity for a minimum daily tonnage of 3,500 tons (which translates to a design capacity of 46.8 million tons assuming maximum tonnage) and an area of 1,000 acres with access to the Facility via U.S. Highways or Primary State Highways.

NEED: Green Ridge needs a municipal solid waste landfill that complies with Virginia statutory and solid waste management regulations governing permitting, constructing, and operating of the landfill and has sufficient waste capacity to accept a minimum of 3,500 tons per day for twenty-five to thirty (25-30) years and is located near the Greater Richmond Metropolitan Area, which can also serve the rest of Central Virginia as well as southwest areas of the Region. County Waste provides for the waste disposal needs of more than 320,000 customers in the Region. More than three quarters of this volume — nearly eighty percent (80%) — comes from Fredericksburg and the Greater Richmond Metropolitan Area, including the City of Richmond, Chesterfield, Hanover, Henrico, King William, Prince George, and Powhatan Counties. The remaining approximately twenty percent (20%) comes from Southwest Virginia. The Company concluded, therefore, that the landfill needed to be within a 45 mile radius of the intersection of Interstates 64 and 95 for efficient access to potential sites generally removed from urban congestion. This conclusion is based on time of travel, cost of fuel and minimization of the carbon footprint of the haul trailers. **Appendix 2** provides a Memorandum of Justification for this radius.

As a result of its hundreds of thousands of customers in the Commonwealth, the Company faces the need to dispose of approximately 3,200 tons of waste per day; given GFL's recent acquisition of County Waste, Green Ridge anticipates that this need will increase to as much as 5,000 tons a day. In order to recover the substantial capital investment required for construction and operation of a modern, state-of-the-art MSW disposal facility, County Waste requires a landfill with a minimum capacity of 3,500 tons per day for twenty-five to thirty (25-30) years, which translates to a design capacity of 46.8 million cubic yards assuming maximum tonnage. Given the necessary waste disposal boundaries, as well as state and federal regulatory requirements and buffers, the subject property must include a minimum of 1,000 acres. Logistically, the Facility must also have access to a local road network that can adequately and safely accommodate the tractor-trailers transporting waste from the interstate highway system to the Facility.

The need for the Project is further amplified by the landfill disposal capacity that will be lost by the imminent closing of the Shoosmith Landfill in Chester, Virginia. The Green Ridge Facility is needed to ensure that County Waste has sufficient capacity to meet the requirements of the Company's operations and that the Region has sufficient capacity to meet the disposal needs identified in the solid waste management plans of the localities in the Region given that:

- Certain landfills such as Shoosmith (denied expansion) and Old Dominion (will reach capacity) will no longer be able to serve the Region in the very near future. Loss of just these two facilities will require approximately 1.4 million tons per year of replacement capacity based on CY 2020 data as reported by VDEQ.
- Existing capacity at private landfills in Virginia is being utilized for out-of-state waste disposal. In CY 2020, approximately 72% of all waste landfilled in Virginia was landfilled at the private landfills and of this approximately 50% was from out of state.
- The closure of foreign recycling markets will create additional pressure on landfill disposal capacity.

Project need and diminishing landfill disposal capacity are further discussed in the VDEQ Notice of Intent submittal dated January 17, 2020 and the VDEQ/ACOE JPA submittals received by these agencies on September 2, 2020, May 7, 2021 and January 11, 2022, respectively.

ECONOMIC JUSTIFICATION: As set forth in detail in this Supplemental Response, having determined that new landfill capacity is required to meet the needs of the Company's residential and commercial customers in Central and Southwest Virginia, County Waste concluded that the proposed Green Ridge Facility must have a footprint of 1,000 acres and an operational lifespan of 25-30 year, in order to be economically viable.

As DEQ Director David Paylor previously has explained,¹ since 1993 when the Virginia Waste Management Board adopted the first modern Waste Management Regulations, the Board has shifted from favoring numerous smaller local landfills to permitting significantly larger facilities which can recognize the economies of scale necessary to sustain the enormous costs involved in meeting exacting modern-day environmental requirements while developing and maintaining the advanced and costly facilities and equipment needed to operate an efficient and cost-effective landfill. Moreover, landfills are a resource that is steadily consumed and must, therefore, be replaced over time.

The land acquisition, zoning, and permitting process required for modern landfills is not only incredibly complex, but takes at least 8-10 years to navigate, all while the capacity of existing landfills is increasingly depleted. Additionally, once the permitting and construction process has concluded, it

¹ See Partial Transcript: February 4, 2020 Senate Agriculture Committee, testimony of David K. Paylor, Director Department of Environmental Quality, attached hereto at **Appendix 3**.

takes upwards of a decade before a landfill owner/operator even begins to receive a return on the sizable capital investment needed to acquire, zone, and permit a site, all of which is incurred while the ultimate success of zoning and permitting of the facility is, at best, uncertain if not wholly speculative. The combination of the substantial delay before any return on the investment can be expected and the risk associated with that investment dramatically escalates the cost of capital needed for a landfill project.

The Green Ridge Facility demonstrates this basic reality. Although the Project is only in its initial stages, the fixed costs incurred in connection with the Project already exceed fifteen million dollars (\$15,000,000). Those fixed costs are projected to exceed more than thirty million dollars (\$30,000,000), *all before the first piece of waste is accepted and the first dollar of revenue received by the Facility.*

In order to justify such an enormous investment of time, capital, and effort, County Waste needs to be able to achieve a rate of return that exceeds its substantial cost of capital. That cost of capital — which includes the cost of debt as well as the opportunity cost of foregone alternative investment — increases exponentially with each year of the significant delay before the Company can earn the first dollar of revenue. That cost is further compounded by the inherent risk associated with the permitting and construction of a landfill.

Adding to the risk and cost of investment is the reality that, once the Green Ridge Facility has reached full waste capacity, County Waste will have to expend substantial further capital for the capping, closure and monitoring of the Project. The Company conservatively estimates that closure costs will exceed seventy-five million dollars (\$75,000,000). On top of that, it estimates that 30-year post-closure monitoring costs will reach another seventy- five to ninety million dollars (\$75,000,000 - \$90,000,000). In total, the overall cost of the Green Ridge Project will likely exceed three hundred million dollars (\$300,000,000), which amount does not include the cost of equipment to run the Facility and/or the cost of day-to-day operation. For all of these reasons, County Waste cannot economically justify the investment of such substantial sums without an anticipated 46 million cubic yards of waste (design capacity at maximum tonnage), which will accommodate approximately 3,500 tons of waste per day for 25-30 years. These parameters, the Company calculated, necessitate an approximately 240 acre waste disposal area, with a total Project area that, including buffers, contains at least 1,000 acres.

Moreover, Green Ridge is a perpetually-operating business. Given the extended time it takes to identify a potentially viable site, acquire the requisite acreage from multiple landowners, zone the property, obtain permits, and construct a landfill, the current Green Ridge Project must have at least a 25-year operational lifespan in order to provide the Company with sufficient time to identify and procure replacement capacity once the Green Ridge Facility has completed its useable life span. The 25-30 year horizon also enables Green Ridge to enter into long-term contracts with customers and vendors that are necessary to enable the Facility to operate in an efficient, cost-effective manner that can support the cost of land acquisition, construction, permitting, operation, closure and post- closure activities. And given the Company's need to dispose of at least 3,500 tons of waste a day, it would be

economically unviable to reduce the operational lifespan (and, thus, the total size) of the Project any further. Indeed, so doing would necessitate locating a second site almost immediately, with its additional attendant costs and environmental impacts. In short, having two or more smaller landfills is not economically sustainable and would not achieve any environmental benefit over the single, state-of-the-art Green Ridge Facility currently proposed.

PHASE 1 - TECHNOLOGY - DETERMINATION OF BEST ALTERNATIVE FOR WASTE DISPOSAL

The objective of Phase 1 was for Green Ridge to determine the most practicable technology to meet the purpose and need of the Project. For solid waste disposal there are three primary technologies that could address waste disposal in the Region as outlined below assuming that transporting waste out of Virginia to a permitted facility is not an option.

Phase 1 - Option 1 Material Recovery Facility (MRF)	Phase 1 - Option 2 Incineration Waste to Energy (WTE)	Phase 1 - Option 3 Landfill Disposal
<p>In a MRF, waste materials are brought in and sorted for recycling. This is sometimes referred to as a "dirty MRF" in contrast to a sorting facility that receives pre-sorted recyclables. A significant amount of residual material is created during sorting that must be disposed of in a permitted disposal facility.</p> <p>Given the lack of recycling markets for glass, composites, and plastics as well as the need for disposal of organics, Green Ridge determined that a MRF was not a viable or economically feasible technology to meet the purpose and need of the Project.</p>	<p>Incineration is the burning of solid waste. Waste to energy refers to the burning of solid waste to generate steam and/or electricity.</p> <p>This technology requires a significantly higher tonnage to meet the financial requirements for operation. Stringent environmental controls are associated with this technology along with significant power and cooling requirements as well as an electric distribution system to tie to. This technology also requires a landfill for disposal of materials inappropriate for incineration and for the residual ash (approximately 30%+).</p> <p>Only 1 WTE facility has been permitted in the United States (Palm Beach County, Florida) in the last 15 years. Because of permitting and operational</p>	<p>Both Option 1 and Option 2 require landfill disposal capacity for their operations. Landfills are highly engineered and permitted under stringent Federal and State regulations as well as adhering to local requirements. The operation of a landfill is flexible in its ability to handle varying waste types and tonnages.</p> <p>At this time, landfill disposal is the most appropriate and economically feasible technology to assure adequate waste disposal capacity in the Region. Moreover, landfill disposal does not preclude or inhibit the development of future technologies or recycling activities.</p> <p>Despite stringent permitting and operational requirements, landfill disposal is the most</p>

	difficulties, WTE facilities are closing and fewer now exist than ten (10) years ago. Based on these considerations, Green Ridge determined that WTE was not a viable or economically feasible technology to meet the purpose and need of the Project.	viable alternative for meeting the Company's goals. Thus, based on all available information, Green Ridge determined that landfill disposal is the most appropriate technology to meet the purpose and need of the Project.
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Conclusion: Based on the information provided above, Phase 1 - Option 3, Landfill Disposal, was determined to be the most practicable technology to meet the purpose and need of the Project. Further, this option provides for future integration of other waste management technologies when appropriate technologies are developed.

PHASE 2 - LOGISTICS - DETERMINING THE BEST METHOD FOR IMPLEMENTING THE SELECTED TECHNOLOGY IN VIRGINIA

The objective of Phase 2 was to determine the most practicable alternative for implementation of the chosen technology (landfill disposal) in Virginia to meet the purpose and need of the Project. Green Ridge is focused on serving the needs of Virginia and hence determined that the landfill should be located in Virginia. Three options were considered logistically for implementation of the technology as outlined below.

Phase 2 - Option 1 No Action	Phase 2 - Option 2 Purchase Existing Landfill	Phase 2 - Option 3 Permit and Construct New Landfill
Landfill disposal capacity is a finite resource and must be replaced as it is used to meet the needs of the Commonwealth. No action would submit the Company as well as the Region to escalating disposal costs and dwindling disposal capacity. As Virginia landfill capacity is exhausted, pressure will be placed on existing landfills and Virginia users will be required to transfer waste out of state unless additional disposal capacity can be developed. Such a scenario will	County Waste considered purchasing an existing landfill in Virginia. To that end, the Company approached various landfill owners and considered multiple disposal facilities, including Shoosmith Brothers Landfill (Permit 587) and the Lunenburg County landfill (Permit 544). The Company contacted Shoosmith multiple times; however County Waste accurately predicted that, with the loss of the proposed quarry	Based on the evaluation of Options 1 and 2, County Waste determined that the only viable alternative was permitting and constructing a new landfill in Virginia. 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 the Region. County Waste is expanding and anticipates that it will collect up to 5,000 tons of waste per day as its network

<p>only increase costs and reduce disposal options for Virginians.</p> <p>There is a demonstrable need for additional disposal capacity in Virginia, and County Waste determined that Option 1 is not a viable option to meet the purpose and need of the Project or the needs of local and regional solid waste management planning units.</p>	<p>expansion, this landfill would soon close.</p> <p>Lunenburg issued an RFP to sell its existing landfill. County Waste responded but the County awarded the contract to CFS.</p> <p>In addition, County Waste contacted Republic Services, Inc. about purchasing its property in Cumberland County. DEQ permitted the property as a sanitary landfill, but that facility was never constructed. Further, County Waste discovered that Republic had placed a restriction on its deed to the Cumberland site such that the property could not be used as a landfill; Republic ultimately terminated the permit for its facility.</p> <p>Despite these many diligent efforts, the Company could not find an operating landfill with sufficient remaining capacity, and offered by a willing seller, that would meet the purpose and need of the Project. As a result, based on the lack of available facilities, Green Ridge determined that Option 2 is not a viable alternative to meet the purpose and need of the Project.</p>	<p>of collections continues to increase, underscoring the need for additional disposal capacity.</p> <p>Given the duopoly that currently controls private landfills in Virginia and the projected decline in disposal capacity in the near future, permitting and construction of a new landfill to serve the Region is the only viable alternative.</p> <p>To implement Option 3, County Waste undertook a search for a property, suitable for construction of a new landfill in Virginia. That process had two components – the first: To identify interested localities that would consider hosting a landfill; the second: To identify suitable sites within an interested locality.</p>
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Conclusion: Based on the discussion above and the anticipated need for additional capacity in Virginia, Phase 2 – Option 3 was determined to be the most practicable alternative to meet the purpose and need of the Project.

PHASE 3A: SITE SUITABILITY, AVAILABILITY – IDENTIFICATION OF INTERESTED LOCALITIES IN VIRGINIA

The objective of Phase 3A was to determine the most practicable alternative for a location of a new landfill in Virginia that would meet the purpose and need of the Project. The alternative would need to be located in such a position as to serve the Region effectively and economically.

During Phase 3A, localities were contacted in Virginia to determine their interest in hosting a private landfill that would meet the purpose and need of the Project and Region. In all, twenty-four localities were contacted. The findings are summarized below.

LOCALITY	INTERESTED	NOT INTERESTED
James City County		X
Charles City County		X
Amelia County		X
New Kent County		X
York County		X
Henrico County		X
Prince George County		X
Chesterfield County		X
Cumberland County	X	
Lunenburg County	Lunenburg issued an RFP to sell their existing landfill. County Waste responded but CFS was awarded the contract.	
Gloucester County		X
Hanover County		No to landfill Yes, to transfer station
King and Queen County		X
Powhatan County		X
Caroline County		X
Louisa County		X
Goochland County		X
King William County		X
Hanover County		X
Prince Edward County	X	

Buckingham County	X	
Culpeper County		No to landfill Yes, to transfer station
City of Lynchburg		X
City of Newport News		X

Conclusion: Based on the information above, only three localities expressed interest - Buckingham County, Cumberland County, and Prince Edward County. Further evaluation of the interest of these localities and their conditions for hosting the landfill was conducted in light of the purpose and need of the Project.

PHASE 3B: SITE SUITABILITY, AVAILABILITY – IDENTIFICATION OF HOST COMMUNITY

The objective of Phase 3B was to determine the most practicable and economically viable location in Virginia for the landfill that would meet the purpose and need of the Project. To meet that objective, the locality needed to be located within a forty five (45) mile radius of the intersection of Interstates 64 and 95 as illustrated in the figure and as outlined in a Memorandum of Justification included in **Appendix 2**.

Fundamentally, the siting of the landfill requires buy-in from the host community for a multitude of reasons. The host community commitment is critical because all permitting requires approval by the host community relative to its ordinances and solid waste planning, including any rezoning or conditional use permit requirements. In addition, Virginia law requires that a host agreement be negotiated with the locality prior to submittal of any landfill permit application. (Va. Code § 10.1-1408.1.B.7)

Only three localities expressed any interest in possibly hosting a landfill.

A summary of the information collected and determination of a suitable host community is provided below.

Buckingham County

Buckingham County expressed possible interest in hosting a landfill, although it had not hosted a private landfill previously and is not now operating a landfill.

The Company determined that Buckingham County is too far west to consider, given that a primary element of the purpose and need of the Project is to serve the Greater Richmond Metropolitan Area, and any landfill in Buckingham would be outside the 45 mile radius of the Greater Richmond Metropolitan Area as outlined in the Project Statement of Purpose and Need. Buckingham was therefore eliminated as a potential host community because it did not meet the purpose of and need for the Project.

Prince Edward County

Prince Edward County indicated that it was only interested in hosting a landfill operation if it were located at or near the County's existing landfill.

Prince Edward owns and operates a landfill (Permit 584), just off of Route 648 approximately 1.5 miles south of Route 460. The facility permit documents indicate that the disposal unit is 21.47 acres. A recent disposal capacity was completed and reported 647,485 cubic yards of remaining capacity and an estimated closure date of 2035 at current usage rates assuming an average annual acceptance rate of 30,914 tons and calculated Airspace Utilization Rate of 1,652 pounds per cubic yard. (LaBella - Letter to Prince Edward County dated February 10, 2022 - Semiannual 2021 Compaction Report - See **Appendix 4**).

There is limited if any expansion area within the existing facility boundary. The County owns approximately 400 acres contiguous to the landfill, however, this area is of insufficient size to meet the purpose and need of the Project.

Further, access to the existing landfill is off Route 460 along Routes 695 and 648, two-lane state roads unsuitable for numerous larger haul trailers. In addition, the traffic will intersect the High Bridge Trail State Park. The intersection with Route 460 does not appear to be suitable for the number of haul trailers anticipated for the Project.

Distance from the adjacent parcel to end of runway at Farmville Airport is approximately 5 miles. This barely complies with Federal Aviation Administration ("FAA") regulations and expansion may trigger additional FAA requirements.

Finally, the location Prince Edward requested would have been significantly beyond the 45 mile radius of the Greater Richmond Metropolitan Area as outlined in the Project Statement of Purpose and Need.

Because of the limited capacity at the existing landfill, the limited acreage adjacent to this landfill, the distance to the Greater Richmond Metropolitan Area and the exceptionally difficult and unsafe access into the landfill for numerous larger haul trailers, Prince Edward County did not meet the purpose and need of the Project and was eliminated from consideration.

Cumberland County

Cumberland County had previously signed a host agreement with Republic to allow that company to site and permit a landfill in the County. This landfill was permitted but never constructed. Ultimately, Republic terminated the permit leaving the County without a projected revenue source, which had significant repercussions on their budgeting. They were interested in reviving a similar revenue stream and open to discussions on the siting of a new landfill.

Located in Central Virginia, Cumberland County has good access from the Region via Route 60, is rural in nature, and has many tracts of agriculture or timber lands to consider for sites for a landfill operation.

Green Ridge determined that Cumberland County was the most practicable and economically viable location to meet the purpose and need of the Project.

Conclusion: Based on the interest and geographic setting of Cumberland County, Cumberland County is the most practicable and economically viable locality to site a new landfill that would meet the purpose and need of the Project. With this determination, County Waste began review of potential Project sites within Cumberland County. Four sites were identified, then screened for specific criteria.

PHASE 3C: SITE SUITABILITY, AVAILABILITY – EVALUATION OF SITES WITHIN HOST COMMUNITY

The objective of Phase 3C was to determine the most practicable and economically viable alternative for location of the landfill in Cumberland County to meet the purpose and need of the Project and which was also the least environmentally damaging practicable alternative (“LEDPA”). To do this, a search was made in the County for suitable sites as identified below.

Summary of Criteria:

The purpose and need of the Project, as outlined, defines the size, capacity volume, and transportation requirements for the Project. In addition, there are environmental impacts to address, landfill-specific regulatory criteria to consider (see, e.g., 9 VAC 20-81), as well as safety and other logistical considerations to identify. Tables 1 through 3 in this section provide a detailed comparison of the four sites.

As reflected in Table 1 – Siting Criteria, the evaluation included an analysis of the actual road mileage from the intersection of Route 288 and Route 60 to the Cumberland County sites.

Further, unlike any other type of development, Virginia statute and regulation provides that, in constructing a landfill, developers cannot permanently impact more than 2 acres of wetlands. See Va. Code § 10.1-1408.5; 9 VAC 20-81-120 E. 1.

Summary of Alternative Sites:

In siting a landfill, a developer typically conducts a constraints analysis of the Host Community to identify areas unsuitable or less suitable for landfill development. County Waste presented the following discussion, relative to the constraints analysis for Cumberland County, in its May 7, 2021 (under Section 2.1 - Page 9) and January 11, 2022 (Supplement) submittals. Note that a constraints analysis is not a “fatal-flaw” analysis; the latter identifies areas where landfills **cannot** be located. A constraints analysis, by contrast, provides an understanding of the overall challenges of a specific community.

The geography of Cumberland County is important to consider in ascertaining suitable areas to locate a landfill. Key screening criteria (constraints) for a landfill of the proposed size and operational characteristics of the Green Ridge Facility relate directly to the geography of the County and include the availability of large tracts of land, suitable transportation networks, location of state parks (or similar protected areas),

identified development areas, and general population density. **Appendix 5 - Figure C.1** illustrates these constraints as they pertain to Cumberland County. A variety of resources were used to develop this map including 911 addresses, zoning/comprehensive plan information, National Wetland Inventory (NWI) mapping, and geologic mapping of Cumberland County.

Reviewing Figure C.1, it becomes clear that the most critical initial screening factor for a landfill of the size and operational characteristics of the Green Ridge Project (e.g. 3,500 to 5,000 tons per day), is the transportation network. Key to this constraint is the entrance to the Project - the closer the entrance of the landfill to a major highway, the safer the traffic flow at the projected high volume of vehicles. At the maximum operational capacity of 5,000 tons per day, over 250 trucks will enter and leave the Green Ridge Facility, with 80 percent of the traffic traveling west from the Greater Richmond Metropolitan Area. The large haul trailers, which will be the predominate type of vehicle delivering the waste, cannot be directed to secondary arteries, regardless of potential improvements to those roads because of mixed-usage and potential safety issues. **Appendix 5 - Figure C.2** considers the primary transportation network through the County. This figure *assumes a one-mile and 1.75 mile strip* along the major highways, which further constrains the potential location for landfill sites in the County.

Other key elements also inform the potential location of landfills within Cumberland County. Three additional elements - five-mile radius from Farmville airport, public water supply wells and a fault zone were added to further illustrate a reduction in potential locations as illustrated in **Appendix 5 - Figure C.3**.

Informed by the constraints analysis and after further discussions with Cumberland County, County Waste began alternative site selection for sites that could potentially meet the purpose and need of the Project. Siting of any landfill is a balancing act of limiting impact on a host community while identifying large tracts of land that either already meet or can meet zoning requirements when rezoned. To minimize impact to a host community, a landfill developer seeks to avoid impacting productive agricultural land and certainly should avoid disrupting future development of commercial or residentially-zoned property (which would adversely affect existing residents, future tax revenues, housing availability, and overall development within the host community). The most effective way to prevent negative effects is to focus the siting of the landfill on timberland/tree farms. Sites that had previously been used as timberland were desired for several reasons:

- Timber harvesting operations, to be profitable over a long period of time, usually consist of large tracts of land suitable for siting a facility of the size of the Project;
- Timber harvesting operations typically operate on a 25-year rotation for the regeneration of timber (usually pine) for sale. Depending on the rotation, owners may be amenable to sale of the property to obviate the need for cyclical restoration and replanting;
- Existing tree farms have often been cut and replanted multiple times and are, therefore, less likely to have suitable habitat for threatened or endangered species;

- Timber harvesting and replanting alters the species types of trees in the native forest. The second growth trees are typically softer woods -- such as pine -- with lower environmental value than the originally-harvested trees; and
- Timber harvesting typically creates significant disturbance of the soils from compaction by equipment and the loss of topsoil, making it unusable as an agricultural resource.

Using this as a basis for initiating the evaluation and combining it with the criteria of access, size, and transportation, the Company identified four possible sites in Cumberland County. **Appendix 5 - Figure C.4** shows these sites overlain on the final constraints mapping.

Brief descriptions of each site are provided below. More detailed and specific information for each site was provided previously in Supplemental documents submitted to DEQ on May 7, 2021 and which has been modified and included in **Appendix 6** of this report. Additional documents informing this discussion can be found as follows:

- **Appendix 7** - Report - Browning and Associates - Cultural Resources Evaluation - 3 Alternatives
- **Appendix 8** - Figure and Table - Transportation Routes, Mileage and Fuel Consumption.
- **Appendix 9** - Report - KBJW - Threatened and Endangered Species Report dated May 6, 2021.
- **Appendix 10** - Report - KBJW - Natural Resource Inventory Report dated May 6, 2021.
- **Appendix 11** - Report - Daguna - Mussel evaluation - Green Ridge dated December 9, 2019
- **Appendix 12** - Figures - Conceptual Layouts - Alternatives and Green Ridge

Note that the figures in **Appendix 12** replace previous figures submitted under this JPA and now represent use of Lidar topographic information and conceptual development layouts.

Green Ridge Site (Applicant's and County's Preferred) (Appendix 12 - Figure 5R):

Overview:

The preferred alternative is comprised of approximately 1,178± acres of which 500± acres are viable for disposal. In order to minimize jurisdictional impacts while meeting the minimal purpose and need of the Project, the Company reduced disposal area to 238 acres. The site is located east of Cumberland Courthouse, with access to the Facility via a 6,600 linear foot private entrance road to be built off of US Route 60. Entry onto the site allows for sufficient queuing space and a convenience center as well as other critical infrastructure. The entrance to the Facility is approximately 26 miles from the US Route 60/State Route 288 intersection (the route the majority of traffic would use). This property was approved for use as a landfill by the Board of Supervisors through a public rezoning and conditional use process. The County has signed a host agreement with Green Ridge for use of this site.

Wetlands and streams are present on the site as delineated in the field. A Phase 1 historic inventory was conducted on the site and approved by the Virginia Department of Historic Resources ("DHR"). A

Rosenwald School is located across the road from the Facility and would be shielded by a significant buffer area. A mitigation plan is being developed for review and approval by DHR.

Alternative 1 (Appendix 12 - Figure 2R):

Overview:

Alternative 1 is comprised of approximately 782± acres, of which the maximum practical area for disposal is less than 160 acres. The site is located east of Cumberland Courthouse and south on State Primary Route 13 (Old Buckingham Road). Entry onto the site would be immediately off Virginia State Primary Route 13, with limited queueing space and acreage for entrance infrastructure. A convenience center, required by the Host Agreement, would be difficult to provide but is illustrated on the drawing. The site is located approximately 35 miles from the U.S. Route 60/State Primary 288 intersection (the route a majority of traffic would use).

Wetlands (based on NWI mapping) and streams (based on Lidar) are present on the site. For comparative purposes, Figure 2R includes the "available disposal unit" a realistic outline for a landfill, and an additional boundary to meet the 238 acre minimum. Historic resources have not been formally evaluated; however, Green Ridge's archeologist has conducted a preliminary desk top assessment of historic resources in the general location of this site. See **Appendix 7**.

Comparison with Green Ridge - Appendix 12 - Figure 5R: The evaluation of potentially viable acreage identified above was based on placing a disposal unit onto the site in the most practical layout. The layout also includes important infrastructure, borrow areas, and operations boundary around the disposal unit.

As stated in the Purpose and Need a site should be at least 1,000 acres to support operations and buffer requirements, and provide a disposal area of at least 238 acres.

Figure 2R illustrates that the site cannot meet the required disposal unit size without extensive impacts to Waters of the US as illustrated by the "comparable" boundary area. The viable disposal unit illustrated will not meet the required capacity as outlined in the purpose and need. The entrance will not serve the traffic estimated for the operations and the site will not have sufficient borrow resources (< 40 acres) for operations.

The Company used information illustrated by Figure 2R to develop siting, environmental, and other criteria.

Alternative 2 (Appendix 12 - Figure 3R):

Overview:

Alternative 2 is comprised of approximately 1,089± acres, split by Frenchs Store Road. Considering only the portion of the parcel north of Frenchs Store Road (890± acres), the maximum practical area for disposal is less than 150 acres.

The site is located east of Cumberland Courthouse and abuts US Route 60 (Anderson Highway) and Frenchs Store Road (State Secondary Route 654). Entry onto the site would be immediately off of Route 60 with limited queuing area or acreage for required infrastructure. A convenience center would be difficult to provide but is illustrated on the drawing. The site is located approximately 26 miles from the US Route 60/State Primary Route 288 intersection that a majority of traffic would use.

Wetlands (based on NWI mapping) and streams (based on Lidar) are present on the site. For comparative purposes, Figure 3R includes the "available disposal unit" a realistic outline for a landfill, and an additional boundary to meet the 238 acre minimum. Historic resources have not been formally evaluated; however, Green Ridge's archeologist has conducted a preliminary desk top assessment of historic resources in the general location of this site. See **Appendix 7**.

Comparison with Green Ridge - Appendix 12 - Figure 5R: The evaluation of potentially viable acreage identified above was based on placing a disposal unit onto the site in the most practical layout. The layout also includes important infrastructure, borrow areas, and operations boundary around the disposal unit.

As stated in the Purpose and Need a site should be at least 1,000 acres to support operations and buffer requirements, and provide a disposal area of at least 238 acres.

Figure 3R illustrates that the site cannot meet the required disposal unit size without extensive impacts to Waters of the US as illustrated by the "comparable" boundary area. The viable disposal unit illustrated will not meet the required capacity as outlined in the purpose and need. The entrance will not serve the traffic estimated for the operations and the site will not have sufficient borrow resources (< 78 acres) for operations and the borrow areas are fragmented.

The Company used information illustrated by Figure 3R to develop siting, environmental, and other criteria.

Alternative 3 (Appendix 12 - Figure 4):

Overview:

Alternative 3 is comprised of approximately 1,990± acres of which 1,182± acres are potentially viable for development of a landfill on parcels south of the Willis River. The parcels north are within a fault zone and located on the far side of the Willis River and difficult to access. Within this area, the maximum practical area for disposal is less than 300 acres.

The site is located west of Cumberland Courthouse and south on State Primary Route 45 (Cumberland Road). Entry onto the site would be immediately off State Primary Route 45 with marginal queuing space and challenges for entrance infrastructure. This site is too far west to provide a usable convenience center for the majority of residents in Cumberland County (a condition of the Host Agreement) although one is shown on the drawing. The site is located approximately 40 miles from the US Route 60/State Primary Route 288 intersection (the route a majority of traffic would use).

Wetlands (based on NWI mapping) and streams (based on Lidar) are present on the site. Historic resources have not been formally evaluated; however, Green Ridge's archeologist has conducted a preliminary desktop assessment of historic resources in the general location of this site. See **Appendix 7**.

Comparison with Green Ridge - Appendix 12 - Figure 5R: The evaluation of potentially viable acreage identified above was based on placing a disposal unit onto the site in the most practical layout. The layout also includes important infrastructure, borrow areas, and operations boundary around the disposal unit.

As stated in the Purpose and Need a site should be at least 1,000 acres to support operations and buffer requirements, and provide a disposal area of at least 238 acres.

Figure 4R illustrates that the site meets and actually exceeds the required disposal unit size. The viable disposal unit illustrated would meet the required capacity as outlined in the purpose and need. The entrance can serve the traffic estimated for the operations although queuing will be a challenge, and the site will not have sufficient borrow resources (approx. 80 acres) for operations. The concern over this site is potential historic resources due to the proximity to the Willis River (See **Appendix 7**), travel distance from the Greater Richmond Metropolitan Area, and proximity to faults (See **Appendix 6**)

The Company used information illustrated by Figure 4R to develop siting, environmental, and other criteria.

As required for the JPA, the Company further evaluated these sites based on practicability, technology, cost, and logistics as set forth below.

PHASE 3C: SITE SUITABILITY, AVAILABILITY – EVALUATION OF SITES WITHIN HOST COMMUNITY SCREENING CRITERIA COMPARISON OF SITES

EXECUTIVE SUMMARY: Four alternatives were evaluated against the purpose and need of the Project. Based on the information provided and as supported by data in Tables 1 through 3 below, the Applicant's preferred alternative (Green Ridge) is the least environmentally damaging practicable alternative for the following reasons:

- The Applicant's preferred alternative is the most practicable and economically viable alternative that meets the purpose and need of the Project based on the size and capacity of the alternative, economics, location of the site, access to the site, and length of entrance road. In addition, the site is supported by the County and has been zoned for landfill development.
- The Applicant's preferred alternative is the least environmentally damaging practicable alternative that meets the purpose and need of the Project based on having the least impact to wetland and streams, zero threatened and endangered species on site, acceptable geologic setting, appropriate distance and direction from public water supplies and reduced fuel consumption and smaller carbon footprint. The site can also provide stream preservation and stream credits. The proposed stream preservation on the landfill property will include 26,716 linear feet of stream channel including a 100-foot buffer. A total of 18,913 linear feet will be included as credit generating providing up to 2,570 stream credits. The remaining 7,803 linear feet is proposed as non-credit generating preservation. Because of DEQ siting restrictions (9VAC20-81-120), both Alternative 2 and Alternative 3 would fail the siting criteria noted in the table, and therefore would not be permissible without a variance to the regulations.
- The Applicant's preferred alternative is the most practicable alternative that meets the purpose and need of the Project based on the limited number of residents within ½ mile of the site, limited number of upstream dams (1 without potential impact), ability to provide a suitable convenience center for the County residents, and greatest distance to airport.

Table 1 - Siting Criteria					
Criteria	Category of Evaluation	Applicant's Preferred	Alternative 1	Alternative 2	Alternative 3
Technology - Site could support chosen technology (Landfill Disposal).	Technology	Yes	Yes	Yes	Yes
Location: Location in Central Virginia; could serve Region.	Practicability Economics	Yes	Yes	Yes	Yes

Table 1 - Siting Criteria

Criteria	Category of Evaluation	Applicant's Preferred	Alternative 1	Alternative 2	Alternative 3
Project Size: Provides minimum <i>usable</i> facility area of 1,000 acres (Disposal unit, borrow areas, infrastructure, buffers)	Practicability Economics	1,178± (Total) Yes	782± (Total) No	890± (Usable - split by road) No	1,182± (Usable - split by river) Yes
Disposal Unit Size: Can provide a minimum of 238 acres for disposal without increased impacts Appendix 12	Cost Economics Rate of Return	Concept 238 ac Yes	Available disposal area 152 ac No	Available disposal area 149 ac No	Available disposal area 292 ac Yes
Project Capacity Provide minimum of 46.8 million cy of capacity (5,000 tpd, 6 days/week). Using available disposal area. Appendix 12	Cost Economics Rate of Return	46M± cy (concept design) Yes	20M ± cy (theoretical) No	19M± cy (theoretical) No	38M± cy (theoretical) No
Proximity to Greater Richmond Metropolitan Area (hub of waste generation): Distance from State Primary Route 288 considered as 80% of tonnage from east. Use previous Republic site as benchmark (28 miles). (Appendix 8)	Logistics Cost	26 miles <i>Meets</i>	35 miles Exceeds	26 miles <i>Meets</i>	40 miles Exceeds
Access from US Highway: Access from US Highway (e.g. Route 60 or 15) - least disruptive road system for truck traffic and access.	Logistics Safety	US Route 60 Yes	Route 13 No	US Route 60 Yes	Route 45 No
Visual distance from primary artery to disposal unit boundary (DEQ 9VAC 20-81-120.C - disposal unit shall be a minimum of 1,000 feet to primary highway. (Distance measured in horizontal plane)	Logistics Community Impact	3,980 feet <i>Meets</i>	2,600 feet <i>Meets</i>	3,100 feet <i>Meets</i>	1,600 feet <i>Meets</i>

Table 1 - Siting Criteria					
Criteria	Category of Evaluation	Applicant's Preferred	Alternative 1	Alternative 2	Alternative 3
Length of access road: Must be minimum of 0.25 miles to allow for queuing, scales, offices, convenience center.	Logistics Safety	>1.0 mile <i>Meets</i>	<0.25 mile <i>Does not meet</i>	<0.25 mile <i>Does not meet</i>	<0.25 mile <i>Does not meet</i>
Zoning: Cumberland County requires property to be zoned industrial with conditional use permit.	Logistics	Zoned M-2 Yes	<i>Zoned A2 No</i>	<i>Zoned A2 No</i>	<i>Zoned A2 No</i>
Ownership of property: Rezoning requires proof of ownership or contracts. Ownership required.	Practicability Logistics Cost	Yes	<i>No</i>	<i>No</i>	<i>No</i>
Permitting: Time to permit is <5 years from today	Practicability Logistics Cost	Yes	<i>No</i>	<i>No</i>	<i>No</i>
Statutorily required Host Agreement	Regulatory Requirement	Yes	<i>None</i>	<i>None</i>	<i>None</i>
Cost: County Waste anticipates investing several hundreds of millions of dollars into the Green Ridge Facility over the operational lifespan of the facility and during the closure/post-closure period. See Economic Justification.	Economics	Based on an analysis of rate of return on capital investment, construction of the Project is economically viable on this site. <i>Viable</i>	Based on an analysis of rate of return on capital investment, construction of the Project is not economically viable on this site due to limited capacity and access <i>Not Viable</i>	Based on an analysis of rate of return on capital investment, construction of the Project is not economically viable on this site due to limited capacity <i>Not viable</i>	Based on an analysis of rate of return on capital investment, construction of the Project is not economically viable on this site due to distance from primary generators <i>Not viable</i>
Conclusion: Based on the information provided in Table 1, Siting Criteria, the Applicant's preferred alternative is the most practicable and economically viable alternative that meets the purpose and need of the Project. This conclusion is based on the size and capacity of the alternative, economics, location of the site, access to the site, and length of entrance road. In addition, the site is supported by the County and has been zoned for landfill development.					

Table 2 - Environmental Impacts Applicant's preferred (See Appendix 12 - Figure 5R); Alternatives 1 through 3 (See Appendix 12 - Figures 2R, 3R, and 4R)					
Criteria	Category of Evaluation	Applicant's Preferred	Alternative 1	Alternative 2	Alternative 3
Hydric Soils - assists in assessment of potential presence of wetlands at site. Desktop evaluation - NRCS Appendix 10	Environmental	Area of development Low percentage rating of hydric components	Comparable area of development Low percentage rating of hydric components	Comparable area of development Low percentage rating of hydric components	Available area of development Low percentage rating of hydric components
Wetland impacts: Based on NWI for alternatives, actual data for preferred alternative. Excludes riverine systems. 9VAC20-81-120.E.1 places restrictions on wetland disturbance and indicates that no sanitary landfill can disturb more than 2.0 acres of wetlands.	Environmental Economics	Delineation Concept design 0.02 acres Meets SW criteria <i>Least environmental impact.</i> <i>Least mitigation cost</i>	NWI Comparable area of development Unknown - without delineation - impact anticipated	NWI Comparable area of development Unknown - without delineation - impact anticipated	NWI Available area of development Unknown - without delineation - impact anticipated
Stream impacts: <i>*impacts based on detailed wetland delineation</i> <i>**impacts based on probable streams using Lidar data</i> 9VAC20-81-120.C.b restricts location of disposal unit to no	Environmental Economics	Concept design 11,637 linear feet <i>Least environmental impact.</i> <i>Least mitigation cost</i>	Comparable Area 26,800 linear feet** <i>Greater environmental impact.</i>	Comparable Area 15,500 linear feet** <i>Greater environmental impact.</i>	Available area of development 22,900 linear feet** <i>Greater environmental impact.</i>

closer than 100 feet of perennial stream or river. 401 and 404 requirements.			<i>Greater mitigation cost</i>	<i>Greater mitigation cost</i>	<i>Greater mitigation cost</i>
Anadromous Fish Use Stream - data base (nearest waterway within 5-miles radius of the study boundary, disturbance); only stream identified is Willis River.	Environmental	Not in Willis River watershed <i>No</i>	Not in Willis River watershed <i>No</i>	Not in Willis River watershed <i>No</i>	In Willis River watershed <i>Yes</i>
Bald eagles - database: 9VAC20-81-120.C.2 restricts siting a landfill in areas designated by federal or state agency as critical habitat for any endangered species. Appendix 9	Environmental	7.6 miles <i>No</i>	13.8 miles <i>No</i>	9.5 miles <i>No</i>	13.5 miles <i>No</i>
Threatened and endangered species: 9VAC20-81-120.C.2 restricts siting a landfill in areas designated by federal or state agency as critical habitat for any endangered species. Appendix 9 Appendix 11	Environmental	Identified in: Database <i>Yes</i> Identified in: Field Review <i>None</i>	Identified in: Database <i>Yes</i> Field Review <i>Unknown</i>	Identified in: Database <i>Yes</i> Field Review <i>Unknown</i>	Identified in: Database <i>Yes</i> Field Review <i>Unknown</i>
100-year floodplain (ac)	Environmental	Concept Design	Comparable	Comparable	Available

Potential Impact to 100-year floodplain. 9VAC20-81-120.A - no new landfill can be sited in a 100-year flood plain.		0.0 acres <i>No</i>	area of development 0.0 acres <i>No</i>	area of development 0.0 acres <i>No</i>	area of development 0.0 acres <i>No</i>
Permittee Responsible Mitigation: Preferred by Owner if available. Environmental enhancement potential	Environmental	<i>Available 2,570 stream credits on site through preservation of 18,913 linear feet of on-site streams.</i>	<i>Unknown</i>	<i>Unknown</i>	<i>Unknown</i>
Underlying geology Subsurface conditions: 9VAC20-81-120.C.3.a(4) and (5) places restrictions on certain types of geology. Karst or heavily faulted conditions are considered unacceptable; monitorability is focus Appendix 6	Environmental Safety Public Health	Fractured gneiss <i>Acceptable</i>	Fractured gneiss <i>Acceptable</i>	Fractured gneiss <i>Acceptable</i>	Located on fault and eastern flank of Farmville Basis <i>Unacceptable under 9VAC20-81 permitting unless variance approved</i>
Underlying geology - distance to fault: 9VAC20-81-120.B requires landfills to be sited in geologically stable areas.	Environmental Public Health	3.6 miles <i>Acceptable</i>	4.4 miles <i>Acceptable</i>	5.5 miles <i>Acceptable</i>	0.0 miles <i>Unacceptable under 9VAC20-81 permitting unless variance approved</i>

If on or adjacent to fault, concerns about stability and monitorability are unacceptable. Appendix 6					
Public water supplies - groundwater/wells: 9VAC20-81-120.C.3 places restrictions on siting a landfill one/three miles upgradient of any surface or groundwater public water supply intake. Thus, the presence of a water supply (surface or well) downgradient of the landfill site (within 3 miles) is unacceptable. Appendix 6	Environmental Public Health	None Acceptable	None Acceptable	3 public water supplies down gradient <i>Unacceptable under 9VAC20-81 permitting unless variance approved</i>	None Acceptable
Drainage area: The smaller the drainage area, the lower the stormwater flow moving through the site with less likelihood of surface water impacts. Less than 20 square miles preferred.	Environmental	8 sq. miles <i>Low potential Impact</i>	7 sq. miles <i>Low potential Impact</i>	12 sq. miles <i>Moderate potential Impact</i>	112 sq. miles <i>Most potential Impact</i>
Minimize Carbon Footprint: Directly related to travel distances and assumed fuel usage;	Environmental	25.9 miles Annually 3,232,000 miles	34.9 miles Annually 4,356,000 miles	26.0 miles Annually 3,245,000 miles	39.9 miles Annually 4,980,000 miles

less is preferred. From intersection of Route 288 and Route 60. Appendix 8		4,500 tons of carbon emissions <i>Low environmental Impact</i>	6,100 tons of carbon emissions <i>Moderate environmental Impact</i>	4,500 tons of carbon emissions <i>Low environmental Impact</i>	6,900 tons of carbon emissions <i>Greatest environmental Impact</i>
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Conclusion: Based on the information provided in Table 2, Environmental Impacts, the Applicant's preferred alternative is the least environmentally damaging alternative that meets the purpose and need of the Project. This conclusion is based on the least impact to wetlands and streams, zero threatened and endangered species on site based on actual field work, acceptable geologic setting, distance and direction from public water supplies, and reduced fuel consumption and reduced carbon footprint.

The site can also provide stream preservation and stream credits. The proposed stream preservation on the landfill property will include 26,716 linear feet of stream channel including a 100-foot buffer. A total of 18,913 linear feet will be included as credit generating providing up to 2,570 stream credits. The remaining 7,803 linear feet is proposed as non-credit generating preservation.

Because of DEQ siting restrictions (9VAC20-81-120), both Alternative 2 and Alternative 3 would fail the siting criteria noted in the table, and therefore would not be permissible without a variance to the regulations.

Table 3 - Other Criteria Considered					
Criteria	Category of Evaluation	Applicant's Preferred	Alternative 1	Alternative 2	Alternative 3
911 residents adjacent within ½ mile of site: Used as a criteria to assess potential impact on residential properties within ½ mile. No specific permitting requirement. Assumed most residents on wells.	Community impact	72 Exclusive of access road	57	110	78
Upstream dams: Upstream dams are potentially problematic and inundation zones must be considered.	Safety	1 upstream DCR dam; no hazard dams <i>Acceptable</i>	4 upstream DCR dams; 2 significant hazard dams	1 upstream DCR dam; no hazard dams <i>Acceptable</i>	21 upstream DCR dams; 8 high hazard dams; 1

9VAC20-81.120.C.3.a.(3) states that no new landfill can be constructed in any area vulnerable to flooding resulting from dam failures. The more dams, the more costs in evaluation and higher the risk. Acceptable defined as <2 DCR dams without hazard rating. Appendix 6			<i>Unacceptable Risk</i>		significant hazard dam <i>Unacceptable Risk</i>
Historic resources: Historic resource impacts need to be mitigated but cannot be fatal flaws to the site. Level of difficulty considered. Appendix 7	Community impact	Historic resources mapped; offsite Rosenwald School. Mitigation plan in progress. <i>Similar</i>	Historic resources on-site not mapped but anticipated. <i>Similar</i>	Near Green Ridge site and some of the same historic sites identified in GR Phase 1. Historic resources on-site not mapped but anticipated. <i>Similar</i>	Historic resources on-site not mapped but anticipated. Special attention would be given to Willis River. <i>Similar</i>
Convenience center: County has been promised convenience center at Project site. Requires ability to handle high volumes of residential vehicles with sufficient queuing space. Requirement of Host Agreement.	Practicability	Sufficient space for convenience center <i>Acceptable</i>	Insufficient space <i>Unacceptable</i>	Insufficient space <i>Unacceptable</i>	Sufficient space for convenience center but too far west for residential use <i>Unacceptable</i>
Distance to airport: 9VAC20-81-120.I outlines limitations on distance from landfill to	Safety	21.0 miles <i>Meets standard (furthest away)</i>	14.8 miles <i>Meets standard</i>	19.5 miles <i>Meets standard</i>	7.2 miles <i>Meets standard</i>

airport. (5,000 - 10,000 feet depending on aircraft type.) FAA restriction at 5 - 6 miles from end of runway. (Farmville Airport)					
Conclusion: Based on the information provided in Table 3, Other Criteria, the Applicant's preferred alternative is the most practicable alternative that meets the purpose and need of the Project. This conclusion is based on the limited number of residents within ½ mile of the site, limited number of upstream dams (1 without potential impact), ability to provide a suitable convenience center for the County residents, and farthest distance to airport.					

APPENDICES

Appendix 1 – Figure – Facility Location to Greater Richmond Metropolitan Area

Appendix 2 - JPA Response - Comment #1 – 45 Mile Radius Memorandum

Appendix 3 - Transcript

Appendix 4 - Letter - LaBella to Prince Edward County - Landfill Capacity

Appendix 5 - Figures - Constraints Analysis

Appendix 6 - Report – Alternative Sites Analysis – Revision 1 – Hydrogeologic – Water Supplies – Dams, dated April 2, 2022

Appendix 7 – Report – Browning and Associates – Cultural Resources Evaluation – 3 Alternatives, 2019

Appendix 8 - Figure and Table - Transportation routes, mileage and fuel consumption

Appendix 9 - Report - KBKW - Threatened and Endangered Species Report dated May 6, 2021

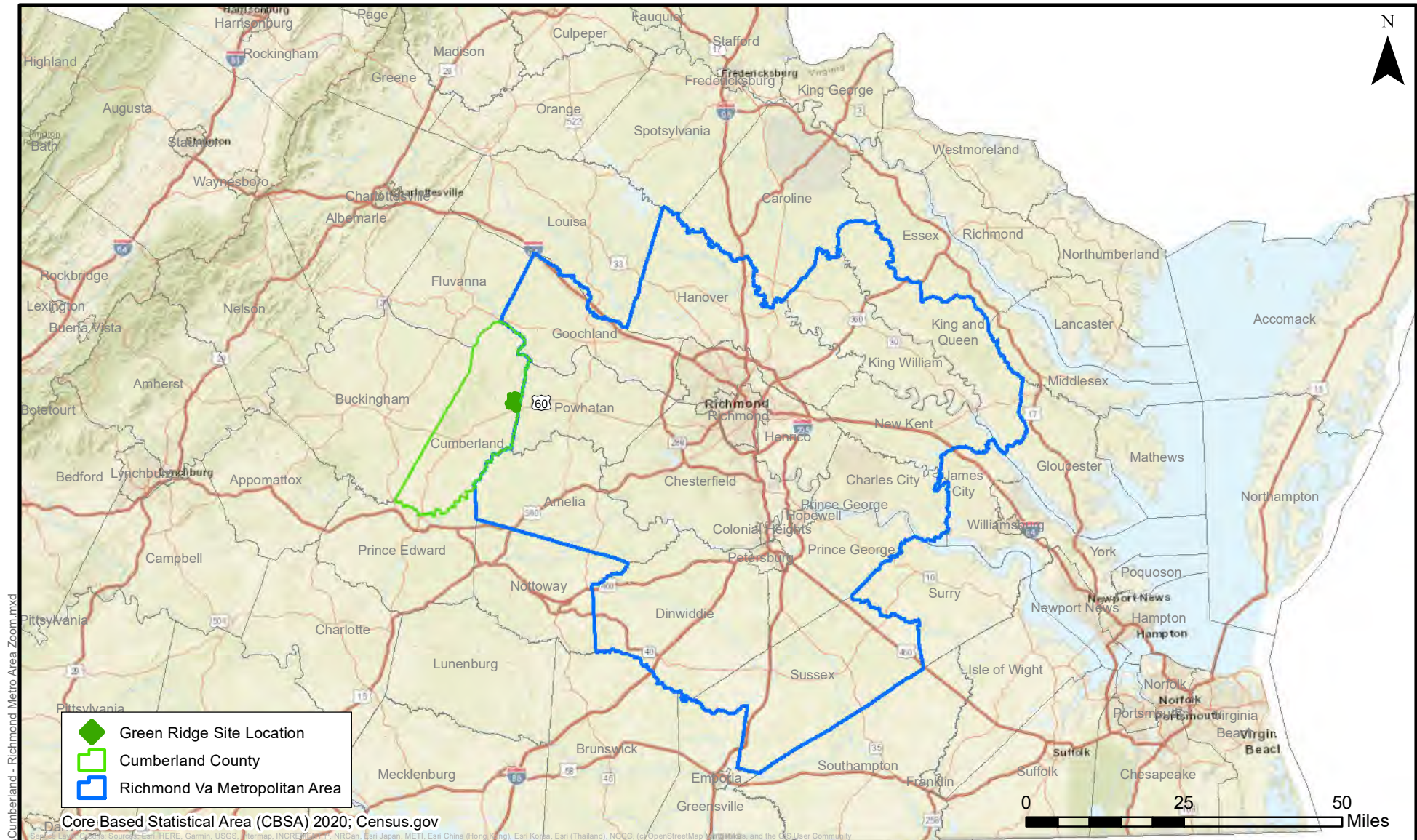
Appendix 10 - Report - KBJW - Natural Resource Inventory Report dated May 6, 2021

Appendix 11 - Report - Daguna - Mussel evaluation - Green Ridge dated December 9, 2019

Appendix 12 - Figures - Conceptual Layouts - Alternatives and Green Ridge

APPENDIX 1

FIGURE – FACILITY LOCATION TO GREATER RICHMOND METROPOLITAN AREA



Site Location in Virginia

Green Ridge Recycling and Disposal Facility Cumberland County, Virginia

Draper Aden Associates

Engineering • Surveying • Environmental Services

2200 South Main Street Suite A
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: LPK
DATE: 04-13-22

SCALE: to fit

PROJECT: 18020117-110102

FIGURE

1

APPENDIX 2

JPA RESPONSE - COMMENT #1 – 45 MILE RADIUS MEMORANDUM



1030 Wilmer Avenue, Suite 100
Richmond, Virginia 23227
www.daa.com

Memorandum

To: Brent Johnson (KBJW)
From: Lynn Klappich, Senior Project Manager
Date: April 29, 2022
Project Name: Green Ridge Recycling and Disposal Facility, LLC
Project Number: 18020117-110102
Subject: JPA response - Comment #1 – 45 Mile Radius
cc: David Kwasniewski (KBJW), William Shewmake (Woods Rogers), Wendy Karably (DAA)

This memorandum has been prepared as a response to Item 1 of Comment #1 of the January 26, 2022 letter from the Virginia Department of Environmental Quality (DEQ) requesting additional information regarding the Joint Permit Application (JPA) number 20-1619 for the above referenced facility (Green Ridge Facility).

JPA Comment 1 – Item 1: “Please provide additional information for how the project selected the 45 mile radius with I-64 and I-95.”

Response: The primary purpose of the Green Ridge facility is to serve GFL’s and County Waste’s more than 320,000 customers. Consequently, because the majority of the waste for the Green Ridge Facility will be coming from the Greater Richmond Metropolitan Area (GRMA), siting of the facility in an area that was within reasonable travel distance from the major intersection of the main interstate highways traversing the area (I-64 and I-95), yet central to other Virginia customers, was an important consideration. The distance from the major interstate intersection to Cumberland County, including all the alternatives reviewed, was generally within a 45-mile radius of the facility (horizontal distance).

The location of the facility is vital to the anticipated service area as stated in the JPA Purpose and Need: *“More than three quarters of this [waste] volume — nearly eighty percent (80%) — comes from Fredericksburg and the Greater Richmond Metropolitan Area, including the City of Richmond, Chesterfield, Hanover, Henrico, King William, Prince George, and Powhatan Counties.”* **Attachment 1** includes a figure which illustrates the relationship of Green Ridge to the Greater Richmond Metropolitan Area and includes a 45 mile radius from the intersection of I-64 and I-95

Green Ridge could not move further east from its current location and properly serve western portions of its service area. As set forth below, locating the facility within 45 miles of the intersection of the major interstate arteries in the region will control transportation and labor costs while minimizing traffic impacts and promoting public safety.

There are economic and operational considerations relative to the core radius for the facility. Below is a table that provides general information on the cost of truck travel per 10 miles of travel, including number of miles, gallons used, and estimated cost. This shows the potential economic and environmental impacts of travel per 10 miles and how additional travel beyond the identified 45-mile radius becomes burdensome to Green Ridge and its customers. For purposes of discussion we have assumed 80% of a maximum of 5,000 tons per day and 312 travel days per year (i.e. 52 weeks at 6 days per week).

TABLE 1
TIME - COST - TRAVEL
PER 10 MILE INCREMENT

ITEM	VALUE PER DAY (10 mile increment)	VALUE PER YEAR (312 travel days)
Total trucks – 20 tons per truck = 200 trucks = 400 truck hauls per day	4,000 miles	1,248,000 miles
Fuel consumption – 8 miles per gallon (6.5 mpg full; 9.0 mpg empty)	500 gallons	156,000 gallons
Fuel cost - \$4.00/gallon – diesel	\$2,000	\$624,000
Time of travel (assume average 50 mph)	80 hours	25,000 hours
Carbon emissions (pounds of CO2 emitted (22.2 pounds per gallon of diesel burned) (EPA, 2005 and 2010)	11,100	3.5M pounds

The table below summarizes the distances from the I-64/I-95 hub to Green Ridge then adds an additional 10 miles to the travel up to an additional 30 miles.

TABLE 2
TIME - COST - TRAVEL
PER 10, 20 AND 30 MILE INCREMENTS
(312 travel days per year)

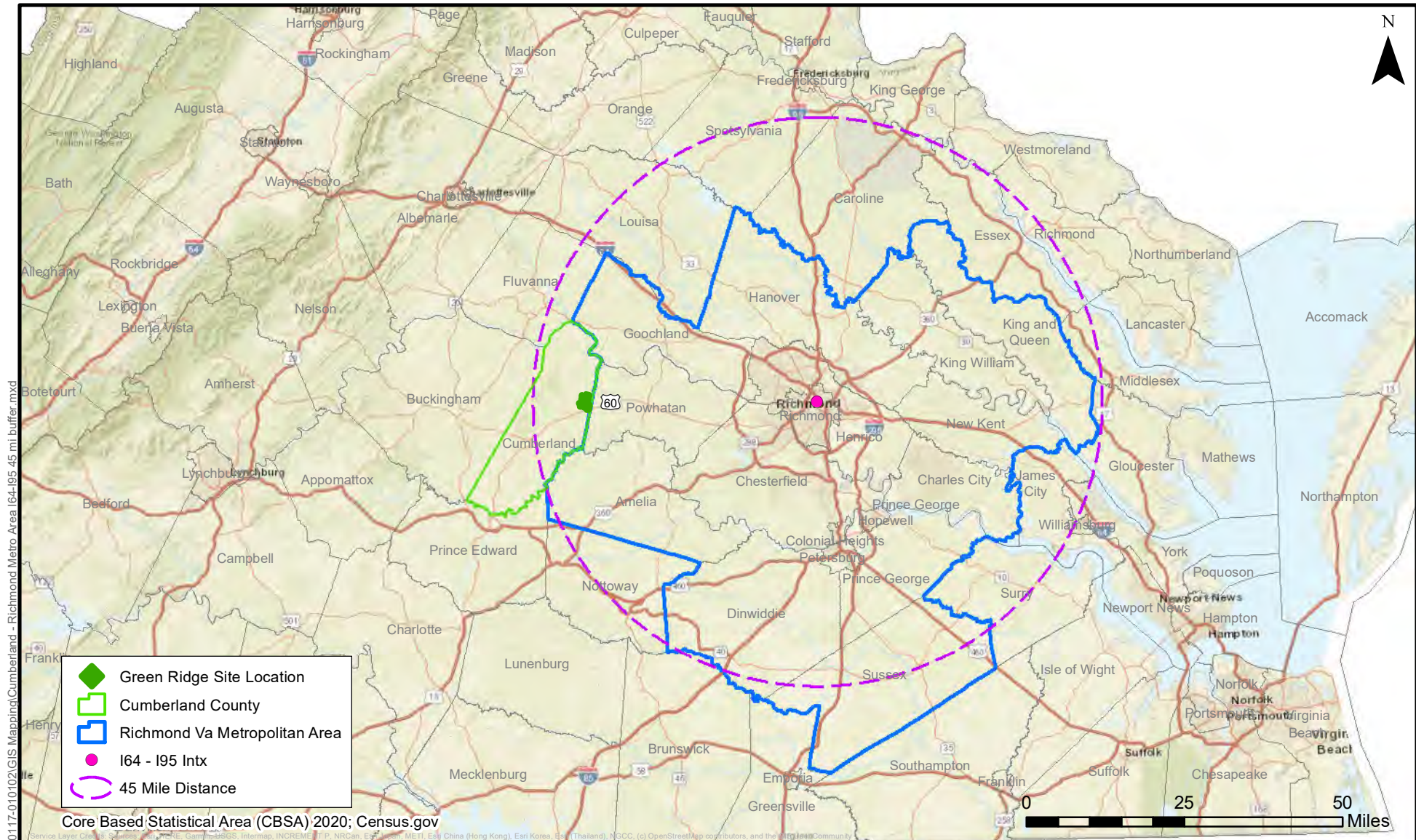
ALTERNATE	ONE-WAY DISTANCE (From I-64/I- 95 HUB (Approx.)	TOTAL ANNUAL MILES (200 trucks) (Millions of miles)	TOTAL ANNUAL FUEL (Millions of gallons)	TOTAL ANNUAL COST (Millions of dollars)	TOTAL TIME OF TRAVEL (Hours)	TOTAL ANNUAL CARBON EMISSIONS (Millions of pounds)
Green Ridge	45	5.6	0.7	\$2.8	112,000	15.6
+10 miles	55	6.9	0.9	\$3.4	137,000	19.0
+20 miles	65	8.1	1.0	\$4.1	162,000	22.5
+30 miles	75	9.4	1.2	\$4.7	187,000	26.0

An additional 30 miles of travel increases the costs by almost 70%. Locating the facility further away from the proposed 45-mile radius is not only economically impracticable but will significantly increase carbon emissions.

Green Ridge notes that beyond the Route 522/Route 60 intersection, Route 60 becomes primarily 2 lanes. The distance from the intersection of Route 522 and Route 60 to the Green Ridge site is approximately 9 miles. For reference, from this intersection to Route 45 south is approximately 19 miles; to Route 15 (Sprouses Corner) is approximately 31 miles; and to Route 24 (Mt Rush) is approximately 39 miles. Accordingly, the proposed location enables the Company to accomplish the majority of transport – to within closer than ten miles to the project site – on multilane interstate highways, maximizing safety and efficiency and minimizing impact upon local traffic patterns. Therefore, the 45-mile radius best satisfies operational constraints given the purpose and need that the facility is intended to meet.

ATTACHMENTS:

Attachment 1 - Figure 1 - Site Location - Green Ridge Recycling and Disposal Facility - 45 mile radius from the I-64 and I-95 intersection.



Site Location in Virginia

Green Ridge Recycling and Disposal Facility Cumberland County, Virginia

Draper Aden Associates

Engineering ♦ Surveying ♦ Environmental Services

2200 South Main Street Suite A
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: LPK
DATE: 04-29-22

SCALE: to fit

PROJECT: 18020117-110102

FIGURE

1

APPENDIX 3

TRANSCRIPT

Partial transcript: Feb 4, 2020 Senate Agriculture Committee – 3.5 hour meeting

Minute Mark 35 min:53 seconds

Chairman Chap Petersen – DEQ on the line?

Director Paylor: Yes Sir, I am here. The administration has no position on this bill, but I am happy to take any questions.

Chairman Petersen -Other than Green Ridge, what other landfills or the other 7 mega-landfills would be impacted. Is that correct?

Director Paylor – I believe they would only be impacted if they were to expand more than that, as I understand the bill. So it is a moratorium as I understand it on new landfills.

Senator Petersen –If it's a moratorium the only one that is seeking to expand right now is Cumberland.

Director Paylor—that is correct.

Senator Joe Morrissey – Can you enlighten us as to the on the efficacy of a mega- landfill as compared to 1, 2 or 3 smaller landfills. Focusing on the disruption to the environment or which one is more environmentally sound?

Director Paylor – Well, the history of landfills is...way back in the day every county had their own landfill and they became known as *[inaudible]* because most of them leaked. And so, 30 plus years ago we started transitioning away from the smaller landfills to the mega landfills primarily because they had the capital to be well designed and that sort of thing. So, most of the land disposal now is at mega landfills primarily because we have better designed engineering and liners and that sort of thing than we had 34 years ago. So, um, there is an emphasis on mega landfills to make sure the design is adequate to protect the environment. There have been some problems at a few mega landfills that have been taken care of, but the idea behind mega landfills was better design and by and large that has been successful.

Senator Morrissey – You and I have had conversations regarding other landfills in my district. With that in mind, can you tell me right now if DEQ is satisfied with the engineering design of the Cumberland project to prevent any environmental detriment, don't want to use the word disaster, but just want to focus on how its designed to protect our environment.

Director Paylor – Thank you Mr. Chairman, Senator Morrissey, the environmental permitting for landfills goes in two phases. One of them is siting and phase 2 is the

engineering design and so forth. We are in the siting stage phase right now to make sure that the site is compatible and that also goes through needs assessment, and those sorts of things. The best answer I can give is that should they get PART A permit which says the siting is adequate, then we would get to PART B. And we would not issue a permit to any landfill unless and until the design was adequate to protect all the environmental resources.

Senator Barbara Favola – Sen Morrissey touched on some of my questions. My question is this, if we do have this hard and fast threshold of 3,500 tons, could one draw to the conclusion that we would be forcing the industry to be more efficient and to be more creative in actually creating more landfills that are smaller but are still very safe and meet the goal. I'm assuming that this might have some beneficial effect on the industry? Is that fair?

Chairman Petersen – Well, that's assuming that you think smaller landfills are necessarily better. But, Mr. Director, do you have a position on this?

Director Paylor - It's a great question, Mr. Chair. But I don't think I do have a position on that. I believe in terms of recycling and those sorts of things that's what the Task Force is aimed at identifying ways to incentivize and to get better. I am not sure that I can draw a connection between the size of a land fill and the efficacy of recycling. There are other issues that come to bare to drive that more so than landfill availability.

APPENDIX 4

LETTER - NARRATIVE ONLY

LABELLA TO PRINCE EDWARD COUNTY - LANDFILL CAPACITY



February 10, 2022

Mr. Jeff Jones
Solid Waste General Manager
Prince Edward County
130 Trashmore Road
Farmville, VA 23901

**RE: Prince Edward County Sanitary Landfill
Second Semiannual 2021 Compaction Report
LaBella Project No. 2220095 Phase 05**

Dear Jeff:

At the request of Prince Edward County, LaBella Associates, D.P.C., P.C. (LaBella) coordinated and performed topographic mapping of the Prince Edward County Sanitary Landfill. This topographic mapping was performed on December 14, 2021. The results of this mapping event were compared to the results of the June 2021 mapping event. This comparison was used to determine the volume of airspace consumed and the in-place compaction rate achieved between June 2021 and December 14, 2021 at the Prince Edward County Sanitary Landfill.

As of Tuesday, December 14, 2021, Prince Edward County was performing operations in Cell E of the PN 584 facility. The compaction results are presented below.

Net Volume of airspace consumed*:	22,525 yd ³
Amount of waste placed:	18,610 tons
In-place Compaction*:	1,652 lbs/yd ³

* Airspace consumed includes the volume of daily cover soil.

The results of this compaction study indicate a good compaction rate for waste in comparison to compaction rates for MSW landfills.

Comparing the December 14, 2021 topographic mapping to the constructed area intermediate grading plan (Drawing No. 2), the remaining gross airspace volume of the constructed footprint of the facility is approximately 206,568 yd³. This gross airspace value includes the volume of waste, daily cover, intermediate cover, and final cover soils. Given the average waste acceptance rate (based on previous three annual reports) of 30,914 tons/yr and calculated Airspace Utilization Rate (as of December 14, 2021) of 1,652 lb/CY, the total remaining life of the constructed facility is approximately **3.4 years**.



Comparing the December 14, 2021 topographic mapping to the permitted final cover grading plan (Drawing No. 3), the remaining gross airspace volume of the permitted facility is approximately 647,485 yd³. This gross airspace value includes the volume of waste, daily cover, intermediate cover, and final cover soils. There are approximately 4,717 CY of fill placed above the final cover grades. Any overfill remaining after settlement or incorporation into a new permit modification that provides additional airspace will need to be relocated.

The remaining volume for waste disposal is approximately 526,675 CY for the permitted facility. Given the average waste acceptance rate (based on previous three annual reports) of 30,914 tons/yr and calculated Airspace Utilization Rate (as of December 14, 2021) of 1,652 lb/CY, the total remaining life of the permitted facility is approximately **14.1 years**.

Thank you for this opportunity to serve you. We trust that you will find this information helpful. If you have any questions or need additional information, please do not hesitate to call me at (804) 355-4520.

Respectfully submitted,

LaBella Associates

Darrell Thornock, P.E.
Technical Consultant

Enclosure

Drawing No. 1 - Consumed Airspace
Drawing No. 2 - Remaining Constructed Airspace
Drawing No. 3 - Remaining Permitted Airspace
June 2021– December 14, 2021 Airspace Utilization Rate
Remaining Capacity and Life Estimate (Constructed Cells)
Remaining Capacity and Life Estimate (Permitted Cells)



Job: Prince Edward County Sanitary Landfill
Job Number: 2220095 Phase 05
Calculated By: DWT Date: 1/31/2022
Checked By: Date:
Subject: Airspace Utilization Rate

Determine the airspace utilization rate for the Prince Edward County Sanitary Landfill.

Given:

The volume of airspace consumed between the June 2021 and December 14, 2021 topographic mapping events.

Find:

The airspace utilization rate using the following variables.

Tonnage landfilled between mapping events (as provided by the county)	=	18,610
Total Tonnage (tons)	=	18,610
Volume used between mapping events (from AutoCAD)(yd ³)	=	22,438
Net Volume (yd ³)	=	22,438

Calculated in-place density* in lbs/yd ³	=	1,659
---	---	-------

* Includes waste and daily cover.

Determine the estimated remaining capacity and life of the constructed cells at the Prince Edward County Sanitary Landfill.

Given:

The volume of airspace consumed using the intermediate cover grades for the permitted facility compared to the December 14, 2021 mapping event using AutoCAD software.

Date of mapping event 12/14/2021

Find:

The remaining life using the following variables.

V_a	=	gross remaining airspace in the permitted facility (AutoCAD)	=	206,568 yd ^{3**}
L_a	=	total area of the landfill (not previously closed)	=	12.6 acres
L_d	=	depth of cap system	=	3.5 feet
I_a	=	area of intermediate cover not placed yet	=	2.7 acres
I_d	=	depth of intermediate cover	=	0.5 foot***
R_w	=	Annual waste acceptance rate	=	30,914 tons/year*
Volume of airspace consumed by cap system ($V_1 = L_a \times L_d$)				= 71,148 yd ³
Volume of airspace consumed by intermediate cover ($V_i = I_a \times I_d$)				= 2,178 yd ³
Volume of airspace consumed by daily cover ($V_{dc} = (V_a - V_1 - V_i) \times 0.05$)				= 6,662 yd ³
Volume of airspace available for waste disposal ($V_{as} = V_a - V_1 - V_i - V_{dc}$)				= 126,579 yd ³

Determine Closure Date using Compaction Density

Compaction Density C_r	=	1,659 lb/yd ³
Mass of waste able to fit into landfill ($M_a = V_{as} \times C_r$)	=	104,984 tons
Remaining life of disposal unit (M_a/R_w)	=	3.4 years
Estimated closure date	=	May 2025

*Annual waste acceptance estimated based on tonnage reports from the past three Annual Solid Waste Reports

** Gross airspace defined as volume of waste, daily cover, intermediate cover, and final cover

*** First 6" of intermediate cover layer is considered daily cover.

Determine the estimated remaining capacity and life of the permitted facility at the Prince Edward County Sanitary Landfill.

Given:

The volume of airspace consumed using the permitted final cover grades for the facility compared to the December 14, 2021 mapping event using AutoCAD software.

Date of mapping event 12/14/2021

Find:

The remaining life using the following variables.

V_a	=	gross remaining airspace in the permitted facility (AutoCAD)	=	647,485 yd ^{3**}
L_a	=	total area of the landfill (not previously closed)	=	16.1 acres
L_d	=	depth of cap system	=	3.5 feet
I_a	=	area of intermediate cover not placed yet	=	6.2 acres
I_d	=	depth of intermediate cover	=	0.5 foot***
R_w	=	Annual waste acceptance rate	=	30,914 tons/year*
Volume of airspace consumed by cap system ($V_1 = L_a \times L_d$)				= 90,911 yd ³
Volume of airspace consumed by intermediate cover ($V_i = I_a \times I_d$)				= 5,001 yd ³
Volume of airspace consumed by daily cover ($V_{dc} = (V_a - V_1 - V_i) \times 0.05$)				= 27,579 yd ³
Volume of airspace available for waste disposal ($V_{as} = V_a - V_1 - V_i - V_{dc}$)				= 523,993 yd ³

Determine Closure Date using Compaction Density

Compaction Density C_r	=	1,659 lb/yd ³
Mass of waste able to fit into landfill ($M_a = V_{as} \times C_r$)	=	434,597 tons
Remaining life of disposal unit (M_a/R_w)	=	14.1 years
Estimated closure date	=	January 2036

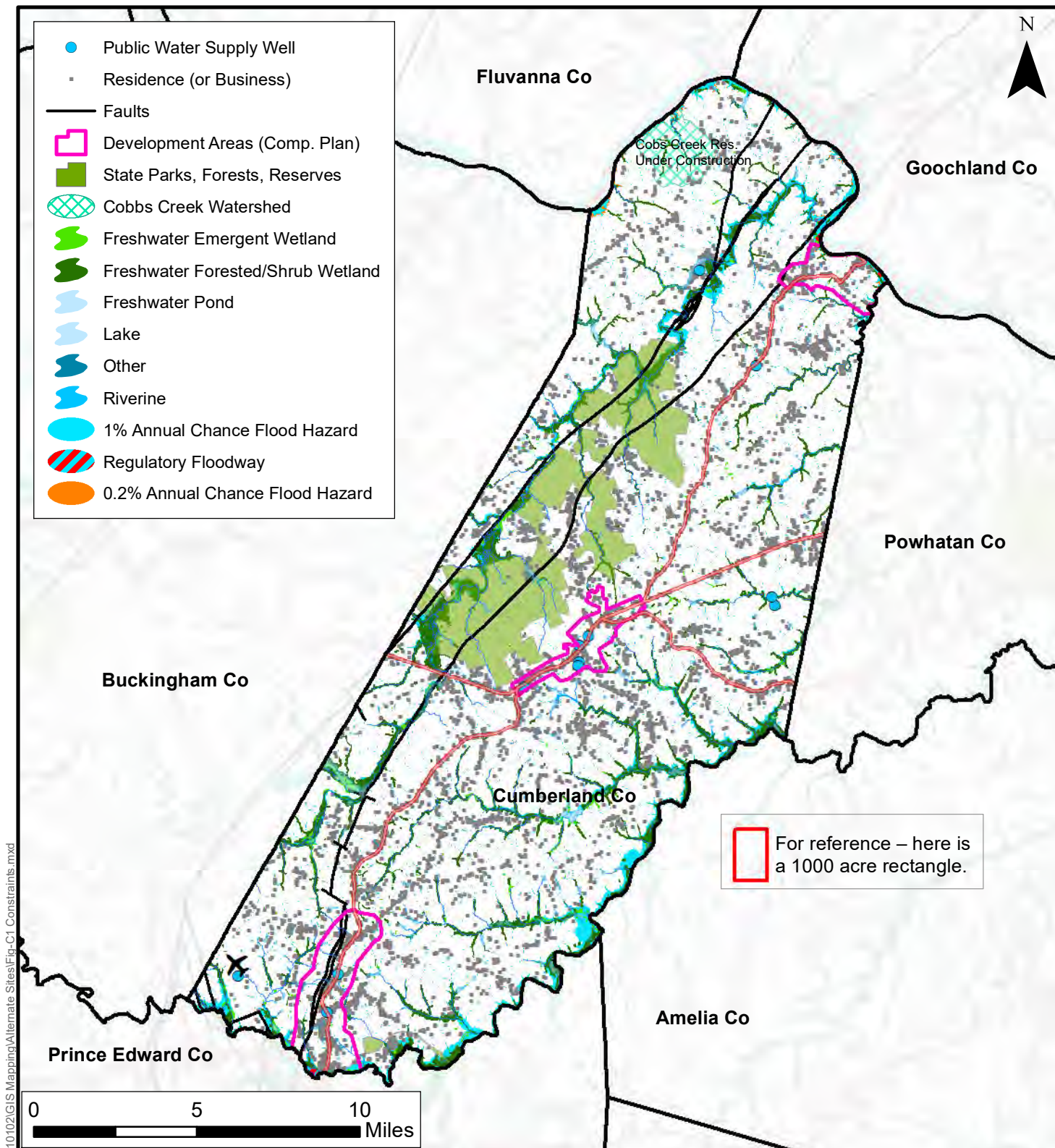
* Annual waste acceptance estimated based on tonnage reports from the past three Annual Solid Waste Reports

** Gross airspace defined as volume of waste, daily cover, intermediate cover, and final cover

*** First 6" of intermediate cover layer is considered daily cover.

APPENDIX 5

FIGURES - CONSTRAINTS ANALYSIS



Constraints Map

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-110102

Draper Aden Associates

Engineering • Surveying • Environmental Services

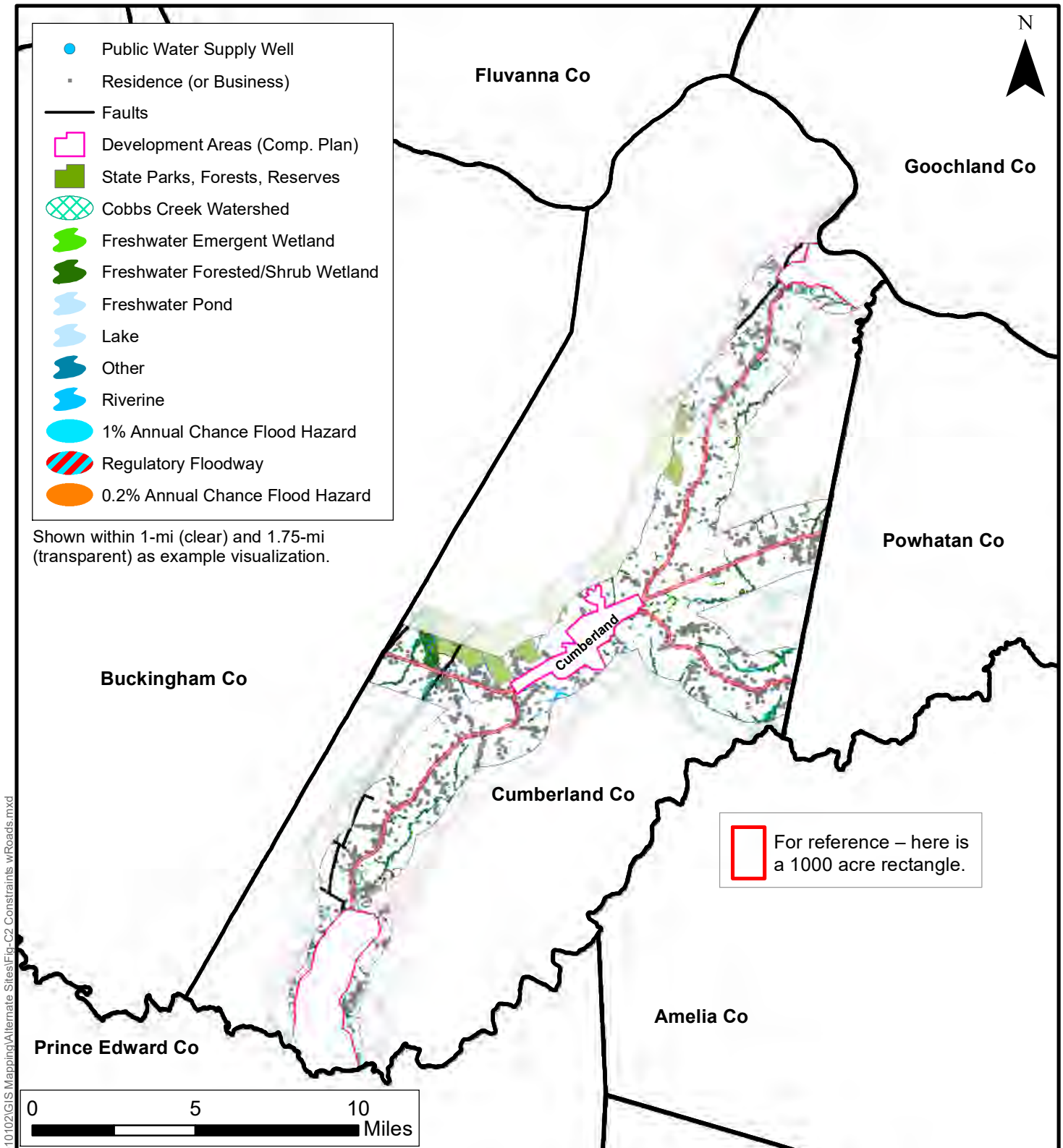
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: SMF
CHECKED: LPK
DATE: 02-22-21

FIGURE
C.1



Constraints Map

Near Main Roads

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-110102

Draper Aden Associates

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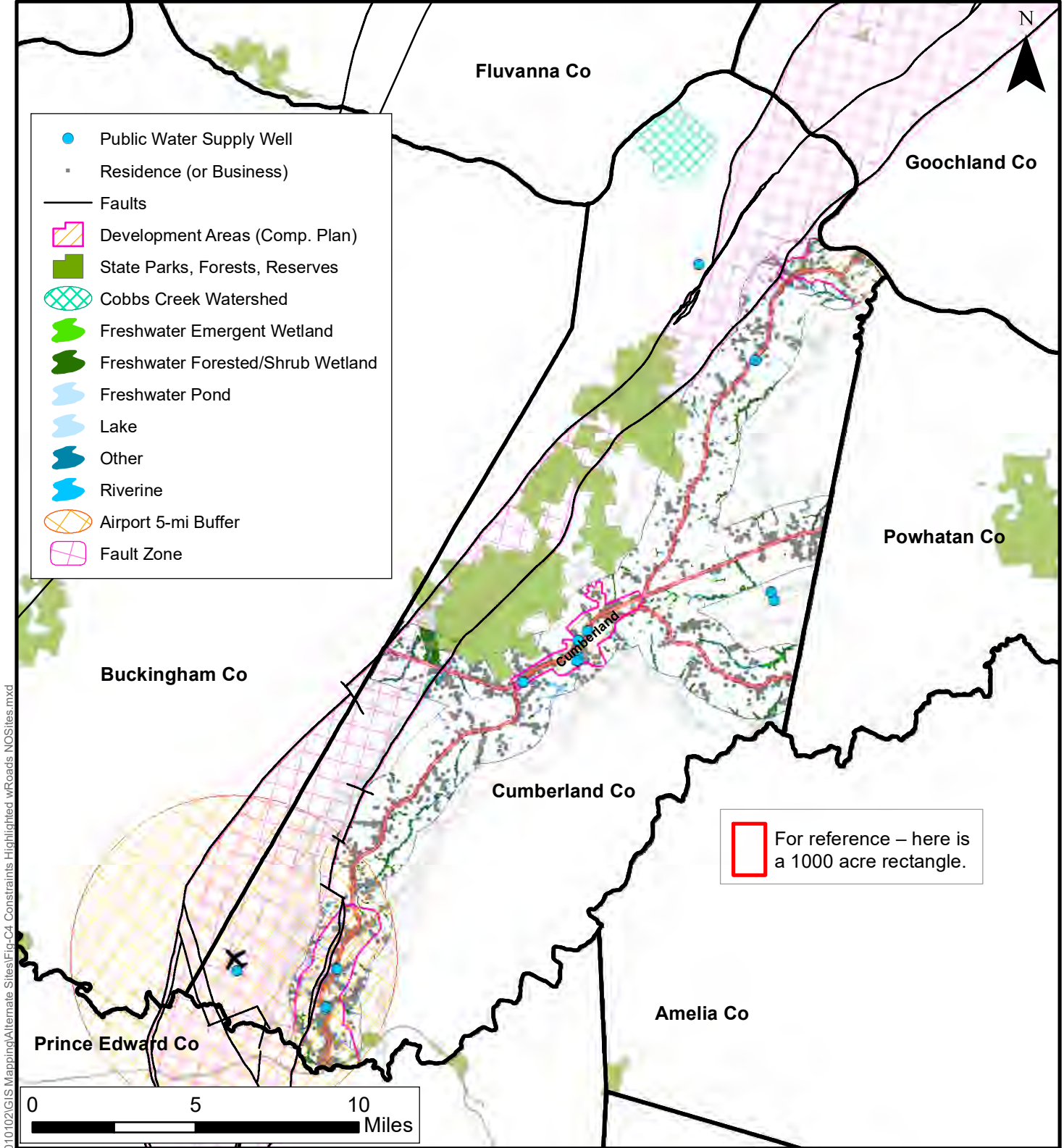
2206 South Main Street
Blacksburg, VA 24060
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Richmond, VA
Charlottesville, VA
Hampton Roads, VA

Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: SMF
CHECKED: LPK
DATE: 02-22-21

FIGURE
C.2



Constraints Map

Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-110102

Draper Aden Associates

Engineering • Surveying • Environmental Services

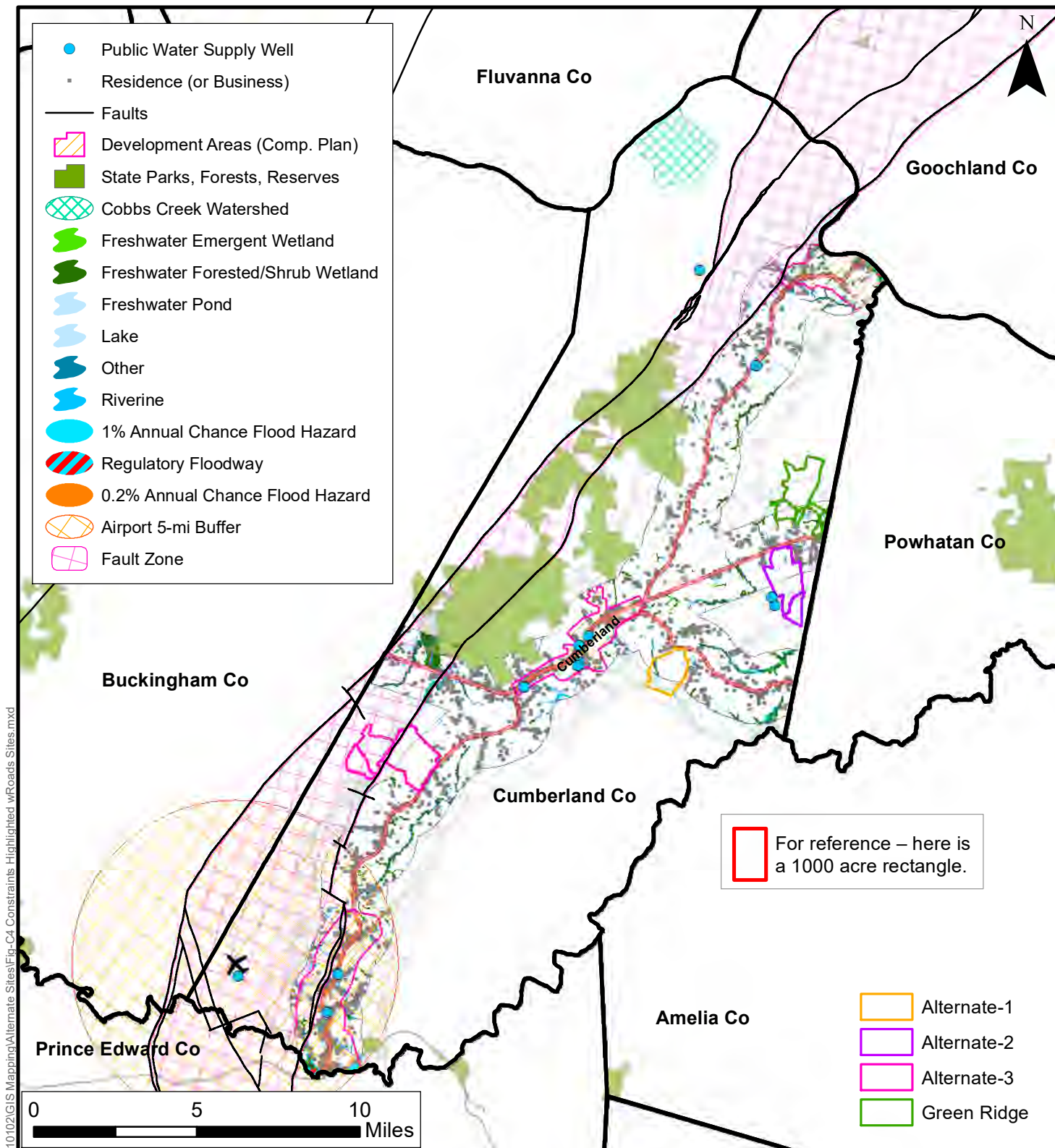
2206 South Main Street
Blacksburg, VA 24060
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Richmond, VA
Charlottesville, VA
Hampton Roads, VA

Raleigh, NC
Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: SMF
CHECKED: LPK
DATE: 02-22-21

FIGURE
C.3



Constraints Map

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-110102

Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
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Hampton Roads, VA

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Fayetteville, NC
Northern Virginia

DESIGNED: LPK
DRAWN: SMF
CHECKED: LPK
DATE: 02-22-21

FIGURE
C.4

APPENDIX 6

REPORT – ALTERNATIVE SITES ANALYSIS – REVISION 1

HYDROGEOLOGIC – WATER SUPPLIES – DAMS

Alternative Sites Analysis

Revision 1 - Hydrogeology – Water Supplies - Dams

Green Ridge Recycling and Disposal Facility

JPA Permit No. 20-1619

Solid Waste Permit No. (626)

Cumberland County, Virginia



Prepared For:
Green Ridge Recycling and Disposal Facility, LLC
12230 Deer Grove Road
Midlothian, Virginia 23112

Prepared By:
Draper Aden Associates
1030 Wilmer Avenue, Suite 100
Richmond, Virginia 23227

FINAL – April 29, 2022



Draper Aden Associates
Engineering • Surveying • Environmental Services

TABLE OF CONTENTS

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2.1 Geologic Setting.....	5
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2.3 Public Water Supplies.....	10
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APPENDICES

- Appendix 1 Tables
- Appendix 2 Figures

GREEN RIDGE RECYCLING AND DISPOSAL, LLC

ALTERNATIVE SITES ANALYSIS

Revision 1 - Hydrogeology - Water Supplies - Dams

EXECUTIVE SUMMARY

A Part A Application was submitted to the Virginia Department of Environmental Quality (DEQ) - Land Protection and Revitalization Division on January 22, 2020 on behalf of the Green Ridge Recycling and Disposal Facility, LLC ("Green Ridge") for landfill permitting. A requirement of this submittal was the development of a Landfill Impact Statement including an alternative analysis. Four sites (including Green Ridge) were considered in the context of the Part A requirements.

A Joint Permit Application (JPA) was filed on behalf of Green Ridge on September 1, 2020 which included the Part A alternative analysis included in the Part A application. In response to comments by the DEQ VWP permit reviewer regarding the alternative analysis in the initial submittal of the JPA and subsequent review comments on the May 7, 2021 and January 11, 2022 Green Ridge submittals, Draper Aden Associates has expanded the alternative discussion to consider other key environmental factors that impact landfill development. This report considers these factors including geology, public water systems, groundwater and private wells, dam locations, and other information as may be relevant. This information has been compiled for the four alternatives.

As shown in **Table 1** in **Appendix 1**, the supplemental information compiled summarizes these key environmental factors. The evaluation of the alternative sites, based on the information collected and reviewed, resulted in two of the sites being considered high risk based on major flaws per the DEQ solid waste management regulations (VSWMR - 9VAC20-81-120) (without having variances granted through permitting):

- The Alternative 2 site is located upgradient of three public water systems, the closest of which is only 1,000 feet from the site boundary. This is considered a major flaw for this site under DEQ landfill regulations.
- The Alternative 3 site has several concerns that also lead to identification of major flaws under the DEQ landfill regulations. First and foremost is its geologic setting on the Spotsylvania Fault and the eastern flank of the Mesozoic Farmville Basin; this setting lends itself to potential seismic activity, potentially enhanced groundwater flow, and geotechnically unstable soil and rock. Additionally, there is a significant number of Department of Conservation and Recreation (DCR) dams upstream, eight of which are classified as high hazard dams and one which is classified as a significant hazard dam. These factors are considered as potential risks for this site.

Alternative 1 does not have significant issues relative to public water supply or groundwater and private wells. However, there are four upstream DCR dams, two of which are very close to the site and one of which is identified as a significant hazard dam. The presence of these dams along with the proximity to

the High Strain Zone, which also passes beneath its largest upstream dam, identify this site as having moderate risk.

The Green Ridge site has no public water supply downgradient; only one upstream DCR dam but no hazard (high or significant) dams; and only two small downgradient areas of impact for private wells. The information presented in this document, provides information for the alternative analysis.

1.0 INTRODUCTION – METHODOLOGY

1.1 Introduction

This report presents analysis of three alternative (ALT) solid waste disposal sites (ALT 1, ALT 2, ALT 3) and the site that Green Ridge ultimately selected (the “Green Ridge Site”). See **Figure 1 (Appendix 2)** for locations. In response to comments by the DEQ VWP permit reviewer regarding the alternative analysis in the initial submittal of the JPA (September 1, 2020) and subsequent review comments on the May 7, 2021 and January 11, 2022 Green Ridge submittals, Draper Aden Associates has expanded the alternative discussion to consider other key environmental factors that impact landfill development. This report considers these factors including geology, public water systems, groundwater and private wells, dam locations, and other information as may be relevant. This information has been compiled for the four alternatives.

The alternative sites were originally selected by the project applicant for consideration based on existing land use (timber farms), likely availability, and strategic positioning relative to transportation. The previous alternatives analyses have focused on traffic, cultural resources, and general site conditions. The information presented in this report consolidates information provided in the May 7, 2021 submittal, removing discussion on ranking. The information provided herein is based on a set of siting criteria specifically relevant to the DEQ VSWMR including:

- Geologic setting and the ability to adequately monitor and remediate potential impacts;
- Faults and related seismicity, groundwater flow/transport, and geotechnical site implications;
- Proximity to public water systems and potential for impact;
- Number of dams and their upstream pool capacity; and
- Number and relative location of presumed private drinking water wells.

1.2 Methodology

This analysis was largely conducted as a ‘desktop study,’ reviewing:

- Existing geological publications: U.S. Geological Survey, Virginia DMME,
- Data and information provided by Virginia Department of Health,
- Virginia Department of Conservation and Recreation - Dam Safety Information System (DSIS),
- U.S. Geological Survey-National Flood Hazard Layer (NFHL),
- U.S. Geological Survey-National Hydrography Dataset (NHD),
- U.S. Department of Agriculture, Natural Resources Conservation Service Part 631 Geology-National Engineering Handbook- Chapter 4 Engineering Classification of Rock Materials,
- U.S. Army Corps of Engineering, National Inventory of Dams, and
- 911 location maps to identify nearby homes (and assumed water wells).

Site visits and windshield surveys were also conducted in areas near each site, and other areas as needed. In addition to literature review and site visits, extensive air photo analysis was conducted of the sites and surrounding areas.

2.0 TECHNICAL INFORMATION

2.1 Geologic Setting

In preparation of the Part A Application, extensive field work was completed on the Green Ridge Site. Due to access restrictions, no on-site reconnaissance was conducted on any of the alternative sites. Thus, detailed site-specific comparisons of geological factors such as depth to bedrock or depth to groundwater at the alternative sites could not be made. However, there is sufficient information on the geology of Cumberland County, and the Virginia Piedmont in general, to make useful and comparative observations about the nature and geologic setting of each site.

Figure 2 (Appendix 2) is a general geologic map of the study area, showing all four alternative sites and the underlying bedrock geology.¹ For ALT 1, ALT 2, and the Green Ridge Site the underlying geology is similar, consisting of various types of fractured gneiss (a metamorphic rock lacking primary porosity, which transmits groundwater through fractures in the bedrock). The most common formation is the Maidens Gneiss.

For ALT 3, the geologic setting is quite different. ALT 3 is underlain by the Spotsylvania Fault and High Strain Zone (a broad zone of intense high-pressure deformation) as shown in **Figure 3 (Appendix 2)**.² Rock types here consist of mylonite, gouge, breccia, and other similar fault derived rocks.³ No faults are mapped in the vicinity of ALT 1, ALT 2 or the Green Ridge Site.

Beneath ALT 3 are severely sheared metamorphic rocks associated with the Spotsylvania and Lakeside Faults.⁴ A second period of faulting at ALT 3 occurred during the Mesozoic creating the Farmville Basin, which underlies western portions of the site and contains permeable sedimentary rocks such as sandstone, arkose, and conglomerate (with primary porosity).⁵ These permeable deposits are the reason similar Mesozoic Basins in Culpepper, Richmond, and Taylorsville have been prospected for oil and gas resources. No such prospecting has occurred in the crystalline gneiss bedrock that underlies ALT 1, ALT 2 and the Green Ridge Site, as this rock type does not transmit fluids easily and has no primary porosity.

¹ Virginia Division of Mineral Resources Publication 174 - Digital Representation of the 1993 Geologic Map of Virginia; 1:500,000-U.S. Geological Survey, 2003

² Witt, Anne C., Kelly, Wendy S., Heller, Matthew J., and David B. Spears - GIS Fault Mapping of Virginia Seismic Zones- Virginia Division of Geology and Mineral Resources - Plate 2 Version: March 2017 - Completed in Accordance with Grant Agreement HGMP 4042-000-014

³ Spears, D.B., 2011, Geologic Map of the Lakeside Village quadrangle, Virginia: Virginia Division of Geology and Mineral Resources Publication 177, 1:24,000-scale geologic map and report

⁴ Spears, D. B., and C. M. Bailey, 2002, Geology of the Central Virginia Piedmont Between the Arvonian Syncline and the Spotsylvania High-Strain Zone. Virginia Department of Mines, Minerals and Energy, Thirty-Second Annual Virginia Geological Field Conference October 11-13, 2002

⁵ Wilkes, Gerald P. 1982, Geology and Mineral Resources of the Farmville Triassic Basin, Virginia, Virginia Minerals, Vol 28, No. 3. Division of Mineral Resources

Settings with fractured gneiss bedrock are geotechnically more stable than those that are faulted and have fault derived materials, and thus are preferred. ^{6 7 8} Marr, 1980⁹ states that the arkose and conglomerate materials that underlie ALT 3 in the Farmville Basin have "limited potential for solid waste disposal. Deep construction cuts would be subject to sloughing".

Groundwater flow in the fracture system of the gneiss bedrock is somewhat predictable, with remote sensing and geophysics used to identify fracture zones and effectively locate monitoring wells. The orientation of stream channels in the Piedmont is often controlled by fractures in the underlying bedrock, creating linear reaches (segments), also assisting in monitoring well siting. This fracture control of stream segments even impacts James River segmentation. ¹⁰ For ALT 1, ALT 2 and the Green Ridge Site, this is the case. However, for ALT 3 in the Farmville Basin, the faults most likely control stream and river segments in that area and exert strong control over groundwater flow.

The analysis for monitor well siting and remedial response is more difficult in a sedimentary basin (such as beneath ALT 3), where groundwater flow is not likely to be along discrete and identifiable zones, but across a wide and more permeable area controlled by primary porosity and permeability. This site would require an extensive monitoring network with increased potential for missing a plume.

⁶ Geng,N., Yao, X., and Y. Chen, "Primary study on mechanical properties of the gouge for five large faults in China," Earthquake Research in China, vol. 1, no. 4, pp. 60–65, 1985

⁷ Han Bao , Qun Qi , Hengxing Lan, Changgen Yan , Wei Xu , Xin Liu, and Langping Li, 2019, Shear Mechanical Behaviours and Multistrength Parameter Characteristics of Fault Gouge, Advances in Civil Engineering, Volume 2019, Article ID 4208032, 14 pages, <https://doi.org/10.1155/2019/4208032>

⁸ U.S. Department of Agriculture, 2012, National Engineering Handbook - Part 631 Geology - Engineering Classification of Rock Materials

⁹ Marr, J. D., Jr., 1980, The Geology of the Willis Mountain quadrangle, Virginia. Virginia Division of Mineral Resources Publication 25.

¹⁰ Bailey, C.M., Shaken, Earthquake Rocks Central Virginia, The Geology of Virginia, College of William and Mary, The Geology of Virginia (<http://web.wm.edu/geology/virginia/>)

Beneath the sedimentary units of the Farmville Basin at ALT 3 lie the Spotsylvania and Lakeside faults.¹¹ These faults offer preferred pathways for potentially rapid down-valley transport of groundwater (and contaminants) northward along the Willis River Basin and directly toward significant natural areas. It is well documented that faults are preferred migration pathways in rock.^{12 13} The faults at ALT 3 are likely in hydraulic communication with overlying Mesozoic sediments, which would conduct any released contaminants into the faults. The eastern boundary fault (which appears to directly underlie ALT 3) dips to the northeast, meaning that any vertical leakance from ALT 3 will be influenced by this slope and directed northeast from the site to the valley center, directly over the center of the basin and fault system.

Igneous intrusions (diabase dikes) of Jurassic age have been mapped across much of the County (long thin red lines on **Figure 2**) and have been observed in the field at the Green Ridge Site. These intrusions are important as they infill fractures and thus help to identify possible routes of groundwater flow in these fractures, helping to site monitoring wells.

2.2 Faults

Faults (or a lack thereof) are a part of the geologic setting - a category in Table 1. Due to the potential hazards created by faults and the impact on a site's viability, they merit further discussion.¹⁴ While the obvious issue with faults is movement along them and the resulting earthquake, there are other factors related to faulting that bear on site suitability. Faults are problematic with landfill siting in the following ways:

- Seismic - the potential for earthquakes and resulting structural damage and/or liquefaction.
- Geotechnical – fault generated rock types are not suitable for loads, nor is their derived soil without significant mitigation.
- Hydrogeological – there can be preferred groundwater flow / contaminant transport along faults.

¹¹ Spears, D. B., and C. M. Bailey, 2002, Geology of the Central Virginia Piedmont Between the Arvonian Syncline and the Spotsylvania High-Strain Zone. Virginia Department of Mines, Minerals and Energy, Thirty-Second Annual Virginia Geological Field Conference October 11-13, 2002

¹² Bense, V.F., Gleeson, T., Loveless, S.E., Bour, O., Scibek J., 2013, Fault zone hydrogeology, 2013 Earth Science Reviews 127- (2013) 171-192 Elsevier

¹³ Cohen, A. J. B., and N. Sitar, Influence of Faults on Groundwater Flow and Transport at Yucca Mountain, Nevada, Lawrence Berkeley National Laboratory, UC Berkeley Dept. Civil and Environmental Engineering

¹⁴ Z. Wu, P. J. Barosh, D. Hu et al., "Hazards posed by active major faults along the Golmud-Lhasa railway route, Tibetan Plateau, China," *Engineering Geology*, vol. 74, no. 3-4, pp. 163-182, 2004.

All sites that were considered are within the Central Virginia Seismic Zone (CVSZ) as shown on **Figure 3 (Appendix 2)**.¹⁵ One might presume a site located on a fault and within a seismic zone would be an automatic major flaw. However, that is not necessarily the case. In fact, only faults for which there is documented movement in the Quaternary are part of the siting criteria considered in the Part A application¹⁶. Because no specific faults of that nature are reported near any of the alternative sites or the Green Ridge Site,^{17 18 19} no further analysis would typically be required in the Part A.

However, DEQ provided three comments in its Technical Review letter dated April 8, 2021 on the Green Ridge Part A Application, regarding the siting of a landfill within a seismic impact zone and the consideration of peak ground acceleration and peak acceleration in bedrock, as well as assessing liquefaction potential. Additional investigatory work was conducted at the Green Ridge site, and a report prepared by Schnabel Engineering in response to these comments. This report was submitted to DEQ on April 13, 2022 as an attachment to the Supplement to Response TR-1 (October 1, 2021), Notice of Intent and Part A Application – SWP 626. The Schnabel Engineering report provides engineering calculations using the data collected, and the general conclusions from the report are that there are no concerns for the Green Ridge site regarding the seismic setting, including design for the peak acceleration and liquefaction potential, relative to the design of a landfill at this location.

Because faults that may be present are not Holocene in age, and not reportable under the Part A criteria, does not mean they should not be considered as related to site suitability. Nor does it necessarily mean they are not active or related to the seismicity in the region. There is still some doubt on that point.²⁰ In fact, there does appear to be an overlap in Cumberland County between the Spotsylvania and Lakeside faults and epicenters of quakes. The only quake identified with an epicenter beneath one of the alternative sites occurred at ALT 3, directly on the Spotsylvania Fault on 4/3/1993, magnitude 1.4. Other quakes in the Lakeside area (on 5/31/66 and 2/7/53) appear to have had epicenters beneath the trace of the Spotsylvania fault, and beneath the Lakeside Fault just south of the Lakeside Breccia (on 4/16/81). Near ALT 3, there was an epicenter beneath the Lakeside Fault, but not directly beneath the site. However, this quake on 10/21/98 was a magnitude 3.8, reasonably large for this area. Thus, there are documented epicenters beneath both the Lakeside and Spotsylvania Faults (bounding the west and east walls of the Farmville Basin) both in the vicinity of and beneath ALT 3.

¹⁵ Witt, Anne C., Kelly, Wendy S., Heller, Matthew J., and David B. Spears, March 2017, GIS Fault Mapping of Virginia Seismic Zones- Virginia Division of Geology and Mineral Resources - Plate 2 Version:

¹⁶ Virginia Department of Environmental Quality - Solid Waste Management Regulations and Part A Submittal Requirements

¹⁷ Crone, A. J. and Wheeler, R. L., 2000, Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front U.S. Geological Survey, Open-File Report 00-260.

¹⁸ U.S. Geological Survey, 2006, Faults and associated folds in the United States that are believed to be sources of M>6 earthquakes during the Quaternary (the past 1,600,000 years). Quaternary fault and fold data base for the United States, accessed Sept 25, 2018, from USGS web site: <http://earthquake.usgs.gov/hazards/qfaults/>

¹⁹ Wheeler, R. L., 2006, Quaternary tectonic faulting in the Eastern United States. Engineering Geology 82 (2006) 165– 186.

²⁰ Witt, Anne C., Kelly, Wendy S., Heller, Matthew J., and David B. Spears - GIS Fault Mapping of Virginia Seismic Zones- Virginia Division of Geology and Mineral Resources - Plate 2 Version: March 2017 - Completed in Accordance with Grant Agreement HGMP 4042-000-014

Earthquakes are caused by abrupt displacements along faults; the seismic record has revealed relatively frequent displacements along geologically ancient faults in the CVSZ during historical time.²¹ To the extent that such displacements are generally believed to occur at depth, the potential for near surface displacement should not be dismissed. Given the uncertainty about the relationship between faults and earthquakes in the seismic zone, the choice of siting a facility on a fault when there are alternatives would not be advisable. Regardless of any surficial or near-surface displacement along either of these fault zones, or lack thereof, there is potential for reduced long-term stability of the underlying bedrock at ALT 3.

ALT 3 is located **on** the Spotsylvania fault. In conjunction with the uncertainty discussed above, and other impacts created by faulting (sedimentary units of the Farmville basin, fault pathway for groundwater, unstable soils and rock), and the fact that an actual earthquake has been recorded at this site, with another twice as large in magnitude close by, the overall geologic setting constitutes a **major flaw for ALT 3** under the VDEQ Solid Waste Management Regulations (9VAC2--81-120.C.3.b).

The faults and associated high strain zone are extensive in the western portion of the County, including along Route 45 and west of Route 45 to the County line. North of Route 60 and west of Route 45, the Cumberland State Forest, Bear Creek State Park, and other natural areas are potential downstream receptors for any flow/transport along the fault system from ALT 3.

Distance to a fault is not generally considered a reliable indicator of absolute seismic risk²² (which is hard to measure and for which there are volumes of publications and studies). For purposes of this exercise, comparative seismic risk is assumed to be represented by distance to the nearest mapped fault, which in this case is the Spotsylvania Fault, see **Figure 4 (Appendix 2)**. We also consider distance to the fault *zone* (High Strain Zone), which varies in width from the fault. It is understood that this measure is only one means of assessing relative seismic risk, however it provides a comparison of sites relative to faults and lets the reader factor that information into the decision making, with the understanding of the limitations of the method.

SITE	DISTANCE FROM FAULT (Spotsylvania Fault)	DISTANCE FROM HIGH STRAIN ZONE
Green Ridge Site	3.6	1.4
ALT 1	4.4	0.8
ALT 2	5.5	2.5
ALT 3	0	0

²¹ Witt, Anne C., Kelly, Wendy S., Heller, Matthew J. and Martin C. Chapman, 2017, Seismic History of Virginia, Virginia Division of Geology and Mineral Resources, Publication 185.

2.3 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 [emphasis added]* (PWS) intake or reservoir (unless certain criteria, monitoring requirements, and design considerations are met). And a new sanitary landfill is not permitted within one mile of any PWS intake. The Part A application process requires reporting on PWSs within 5 miles of a proposed landfill. Neither the Code of Virginia nor the Virginia Solid Waste Management Regulations define “public water supply.” For that one must look to the Virginia Department of Health.

A “public water supply” or “community water system” 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”. It is a public community water system.

Additionally, water systems serving the same population daily, but in a non-residential setting (e.g., schools, places of work) are classified as a “public non-transient non-community water system”. Water systems serving a transient public population in a non-residential setting (e.g., restaurant, campground, event facility) are classified as a “public non-community system”. Standards for each of these three systems are different, with the highest standards set for the public water supply and community water system utilities.

All public water systems (wells) registered with the Virginia Department of Health (VDH), including community, non-transient, and transient, were mapped relative to the subject sites; see **Figure 5 (Appendix 2)**. This includes water systems in Cumberland County and the surrounding counties of Powhatan, Buckingham, Goochland, and Amelia (see **Table 2 (Appendix 1)** for a list from the VDH). Groundwater systems north of the James River (Goochland County) are not of interest because the river represents a hydrogeologic barrier, as well as being beyond the five-mile reporting distance to any of the subject sites.

Important factors in making an evaluation as to potential impact from a site on a public water system include distance between the site and water system, whether the site is upgradient or downgradient from the water system (or even in the same watershed), and whether there are any hydraulic barriers or topographic separations between the site and water system, such as a stream or groundwater divide. For example, the Lakeside water system is technically downgradient from ALT 3. However, it is over 16 miles away (well outside the five-mile reporting radius), so the risk is relatively low (but not zero). Likewise, although the Cumberland County water system, serving numerous homes and businesses in the Courthouse area, is only 2.1 miles from ALT 1, the wells are not downgradient from ALT 1, and are separated from ALT 1 by Little Guinea Creek, so there is limited potential impact to the Cumberland County water system from ALT 1.

ENVIGO, a newly permitted non-community public water system with two supply wells is located immediately *downgradient* from ALT 2, (1000 feet or less).²³ This represents a **major flaw for ALT 2** under the 9VAC20-81-120.C.3.a.(1) and (2). We note that this system was not permitted when the original Part A application was prepared for the Green Ridge Site but has since been permitted by the VDH. This system is 2.4 miles from the Green Ridge Site; however, the ENVIGO facility would not be impacted by the Green Ridge Site because the two locations are in different watersheds (HUCs): the Green Ridge Site is in the Muddy Creek watershed (020802050402), whereas the ENVIGO facility is in the Maxey Mill-Deep Creek watershed (020802050404). See **Figure 11, Appendix 2**. The divide between these two watersheds is approximately at the US Route 60-Pinegrove Road - Frenchs Store Road intersection. In general, north of that point, flow is toward Muddy Creek; south of that point, flow is toward Deep Creek.

To further evaluate potential impact on public water systems, intakes for major surface water systems downstream to Richmond and Hopewell were mapped. See **Figure 6 (Appendix 2)**. There are five systems identified; the closest downstream intakes are the James River Correctional Center (James River), and the Appomattox River Water Authority (Appomattox River). These two locations were used as points of reference for determining surface water flow distance from the subject sites to the closest public water system intake.

Analysis of information on public water supplies (wells and surface water intakes) relative to each alternative can be found in **Table 1 (Appendix 1)**.

2.4 Dams

According to *VSWMR*, 9VAC-20-81-120.C.3.a.(3): "No new sanitary landfill area shall be constructed: ... In any area vulnerable to flooding resulting from dam failures...."

The Part A submittal of January 22, 2020 addressed this requirement specifically for the Green Ridge Site, so the vicinity of dams to each alternative site is considered herein. It is important to consider dams because under certain conditions, the area affected by water released by a failed dam may extend beyond the limits of the physiographic flood plain, thereby potentially threatening appurtenances that are located outside the floodplain at a facility.

The locations of all dams in Cumberland County as catalogued by the Virginia Department of Conservation and Recreation (DCR) were plotted to determine location relative to the alternative sites, as shown on **Figure 7 (Appendix 2)**. Many dams outside of Cumberland County were also plotted using the same DCR database, as well as information from the National Inventory of Dams, especially in Buckingham and the upper reaches of the Willis River near ALT 3. **Figures 8a and 8b (Appendix 2)** focus more closely on the alternative sites and label key structures. These figures also include other impoundments not registered (non-DCR dams).

²³ Virginia Department of Health- Public Water System List and Engineering Description Sheets

Information was obtained from the Virginia Department of Conservation and Recreation's *Dam Safety Inventory System (DSIS)*, including maps of dam locations, dam safety data sheets, dam breach and inundation studies/maps, inspection reports/photos, and other important data. Information for every dam within Cumberland County and others relevant to the study were downloaded and reviewed. A summary of information for all 27 dams relevant to the study (upstream from at least one of the subject sites) is included in **Table 3 (Appendix 1)**, while **Table 4 (Appendix 1)** summarizes the number of "DCR dams" (those known on their DSIS system) upstream for each subject site, the total upstream pool capacity of these dams (how much water is held behind all dams above the site), hazard classification if assigned, and number of non-DCR impoundments (discussed below).

A review of these tables indicates that ALT 3 has over 20 DCR dams located upstream of the site. The pool capacity above ALT 3 is 24,712 acre-feet. For comparison purposes, the Green Ridge Site has an upstream pool capacity of 138 acre-feet; ALT 2 is similar in pool capacity to the Green Ridge Site with 156 acre-feet, and both only have one DCR dam in their watershed. The drainage area for ALT 3 is 112 square miles, whereas the drainage areas for ALT 1, ALT 2 and the Green Ridge Site range between 8.8 and 12.2 square miles; a larger catchment area means greater chance of flooding.

In addition to the DCR database, careful inspection of each watershed above the dams was conducted using Google Earth, as well as windshield surveys near and around the subject sites. This analysis revealed many other impoundments of varying size and function, not identified by the DCR. While it could be assumed that these are generally less risky dams, or smaller in size, that is not necessarily the case based on field observations where some significantly sizable "non-DCR" dams were observed. For example, next to and somewhat immediately upstream from ALT 1 is a significant private dam on Schalow Road (more than one actually). It is not as well maintained as some of the larger DCR dams, as evidenced by trees growing in the banks of the dam. The number of these non-DCR dams identified in each watershed above the subject sites is shown in **Table 4 (Appendix 1)**. For ALT 1, ALT 2 and the Green Ridge Site, the number of these impoundments identified was between 9 and 13; for ALT 3, the number is at least 75.

DEQ has included dams as part of the siting criteria to assure that during permitting, the potential for a dam failure with subsequent inundation of the landfill site is assessed. Inundation studies on some key structures were not readily available; for example, Lillie's, and Clayton dams (the main impoundments above ALT 1 and ALT 2, respectively), have no inundation studies. DCR has recently provided a dam inundation evaluation of Flippen lake and on some of the larger dams above ALT 3, such as the Seaman and Johns dams, there are inundation studies that detail some of the risks of breach. Due to lack of comparative inundation studies for several impoundments, for this analysis, risk is assumed to be directly related to number of potential structures (registered and not registered) upstream of the subject site, the amount of pool capacity stored upstream, and number of dams with a "hazard" designation. **Table 1 (Appendix 1)** summarizes the data relative to dams.

2.5 Groundwater/Nearby Wells

The VSWMR, 9VAC20-81-120.C.1.d states as follows:

C. Restrictions (distances are to be measured in the horizontal plane).

1. *No disposal unit or leachate storage unit shall be closer than:*

.....

d. 500 feet from any well, spring, or other groundwater source of drinking water in existence at the time of application;

Thus, it is relevant to this evaluation to consider private wells in the vicinity of the subject sites. Relative to an evaluation on private wells, assumptions had to be made on potential location because well locations are not included in readily searchable databases, nor was a door-to-door survey conducted. For this evaluation, it was assumed that homes outside the service area of the County's public water supply system would be likely to use groundwater wells for their water supply.

The evaluation was performed using maps, aerial photographs, and 'windshield' surveys to identify clusters of homes (or even individual homes) that are near each subject site. Consideration was given to whether these areas were upgradient or downgradient of the site, and/or possibly public in nature, despite not being regulated as such. **Figures 9, 10, 11 and 12, (Appendix 2)** illustrate potential homes or businesses based on 911 maps. The information from site visits and maps is summarized in **Table 1 (Appendix 1)**.

Many of the structures along Frenchs Store Road are close to the ALT 2 site, with some potentially downgradient. Additionally, the ALT 2 site is very close to numerous structures along Route 60 and the small road known as The Woods. Also, as discussed under the Public Water Supplies discussion, ALT 2 is directly upgradient from a farm with a permitted public water system.

The ALT 3 site has many structures near the site, but there are none directly downgradient, and only a very few downgradient at some distance. Most structures are along Rt. 45 or Ca Ira Road and upgradient from the site.

3.0 SUMMARY OF FINDINGS

This report provides an analysis of each of the subject sites considering the following:

- Geologic setting and the ability to adequately monitor and remediate potential impacts;
- Faults and related seismicity, groundwater flow/transport, and geotechnical site implications;
- Proximity to public water systems and potential for impact;
- Number of dams and their upstream pool capacity; and
- Number and relative location of presumed private drinking water wells.

A review of the information on each of the subject sites, as discussed in detail in Section 2, indicates that all sites have identified potential issues regarding one or more of the above criteria, but some issues are more critical than others. Major flaws per the VSWMR, were identified at two of the sites. ALT 2 has three public water systems downgradient of the site, with one located within 1,000 feet of the site. Pursuant to the requirements of 9VAC20-81-120.C.3.a.(2), 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, and per 9VAC20-81-120.C.3.a.(1), a new sanitary landfill is not permitted within one mile of any public water supply intake or reservoir. Therefore, siting a landfill at the ALT 2 site location would be prohibited, unless a variance was granted through permitting.

ALT 3 is located on the Spotsylvania Fault and the eastern flank of the Mesozoic Farmville Basin. Given the following regarding the ALT 3 site:

- Uncertainty about the relationship between faults and earthquakes in the seismic zone;
- Other impacts created by faulting;
- The fact that an actual earthquake has been recorded at this site; and
- Another earthquake twice as large in magnitude was recorded close by.

The overall geologic setting constitutes a Major Flaw for ALT 3 under the VDEQ Solid Waste Management Regulations (9VAC20-81-120.C.3.b). Additionally, ALT 3 site has 21 upstream DCR dams, eight of which are high hazard and one significant hazard; 75 non-DCR dams upstream of the site; and an upstream pool capacity of approximately 24,700 acre-feet. These factors are considered unacceptable risks for the use of ALT 3 as a candidate site.

ALT 1 site does not have significant issues regarding the geologic setting (although it is close to the high strain zone), there are no downgradient public water systems, and few private wells downgradient of the site. However, there are two DCR dams very close to the site and these dams are located close to or within the high strain zone. There is a total of four upstream DCR dams, two of which are significant hazard dams, and 13 upstream non-DCR dams. These factors constitute a classification as a near major flaw for this site as these factors are considered unacceptable risks and, unless variances could be granted through permitting, it would be difficult to support this location for siting a landfill.

The Green Ridge site has a relatively stable geologic setting (similar to the ALT 1 site but farther from the high strain zone), there are no downgradient public water systems, and only two small areas of impact to private wells. This site has one upstream DCR dam (no hazard dams) and nine upstream non-DCR dams, and only about 3% of the site is in a floodplain (not the disposal or leachate storage unit).

The information on the Green Ridge site and the three alternative sites provided above, supplements the previous alternative evaluations and supports the selection of the Green Ridge site for the facility. This report is considered a stand-alone evaluation of the subject sites from the perspective of hydrogeology, water supplies, and dams. This perspective was not considered in the original alternatives analysis submitted in the JPA in September 2020.

APPENDIX 1

TABLES – REV 1

Table 1 – Alternate Site Summary – Rev 1

Table 2 – Public Water Systems

Table 3 – DCR-Listed Dams Upgradient from Alt Sites

Table 4 – Dam Impacts Summary

**GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION – ALTERNATE ANALYSIS – REV 1**

**TABLE 1
SUBJECT SITE SUMMARY**

GREEN RIDGE FACILITY (GRRD)			
Geologic Setting	Public Water	Dams	Groundwater/Private Wells
Fractured Gneiss 3.63 mi. to fault 1.14 mi. to HSZ	No groundwater sources downgradient to James River at approx. 6.6 miles. First intake on James – an additional 20 miles (James River Correctional).	One upstream DCR dam - Flippen Dam No “Hazards” dams. Nine non-DCR dams Upstream pool capacity: 138 acre-ft. Drainage area of 8.81 mi ² .	Nearly all adjacent private wells are upgradient, two small downgradient areas of impact on Miller Lane and Pinegrove Road. Very few other wells downgradient to James River.

ALTERNATE 1: OLD BUCKINGHAM ROAD - RT 13			
Geologic Setting	Public Water	Dams	Groundwater/Private Wells
<p>Fractured Gneiss</p> <p>4.36 mi. to fault 0.78 mi. to HSZ</p> <p>Very close to high strain zone.</p>	<p>Cumberland Courthouse area has three systems but these are not downgradient of ALT 1 and not impacted: Cumberland County System - 2.1 mi., Dollar Store at 2.0 mi., and El Jinete at 3.7 mi.</p> <p>The ENVIGO system at 3.1 mi. is not in the same drainage basin as ALT 1, and thus not impacted by ALT 1.</p> <p>No groundwater sources downgradient to Appomattox at approx. 3.7 miles.</p> <p>First intake on Appomattox – an additional 22 miles – Appomattox River Authority.</p>	<p>Dams very close to or within High Strain Zone (Near Major Flaw).</p> <p>Four upstream DCR dams: Lillie's, Dowdy, Jamerson and Woodson; Jamerson and Woodson dams are very close to site.</p> <p>Two "Significant Hazard" dams: Dowdy and Woodson.</p> <p>Thirteen non-DCR dams.</p> <p>Upstream pool capacity: 519acre-ft.</p> <p>Drainage area of 7.06 mi²</p>	<p>Numerous wells adjacent site along Goshen Road (likely upgradient) Shallow Road, Strawberry Hill Road.</p> <p>Large farm and additional homes downgradient along Sunnyside Road.</p> <p>Homes along Stoney Point Road, Ranch Road and Langhorne Road are not likely downgradient of site, but worth mentioning for further consideration.</p>

ALTERNATE 2: FRENCHS STORE ROAD - RT. 60			
Geologic Setting	Public Water	Dams	Groundwater/Private Wells
Fractured Gneiss 5.46 mi. to fault 2.51 mi. to HSZ	Three public water systems downgradient. <ul style="list-style-type: none"> • ENVIGO - within 1,000 feet - MAJOR FLAW • Fairview Farm - approx. 2.3 miles. • Cozy Acres Campground – approx. 5.8 miles. Cumberland Courthouse area systems over 5 miles and not downgradient. First intake on James – approx. 13.7 miles down Deep Creek, then an additional 11.5 miles - James River Correctional.	One upstream DCR dam: Clayton Dam (Fleming Pond). No “Hazard” dams. Thirteen non-DCR dams. Upstream pool capacity: 156-acre ft. Drainage area of 12.1 mi ²	Many private wells along Route 60 and Frenchs Store Road, some likely not upgradient along Frenchs Store Road.

ALTERNATE 3: GUINEA MILLS - RT. 45			
Geologic Setting	Public Water	Floodplain-Dams	Groundwater/Private Wells
<p>Located on Spotsylvania Fault and eastern flank of Mesozoic Farmville Basin</p> <p>Possible fault enhanced groundwater flow</p> <p>Permeable subsurface materials- sandstones and conglomerates</p> <p>Geotechnically unstable soil and rock</p> <p>MAJOR FLAW – fault and fault created setting- unstable materials, fast groundwater, not recommended for solid waste</p>	<p>No PWS directly downgradient for 16.5 miles (Lakeside).</p> <p>Lakeside PWS on same fault system as ALT 3 site, with fault being possible route of travel in groundwater. Potential Willis River transport by surface water.</p> <p>Several Courthouse area PWS including Cumberland County System (5.1 mi.), Dollar General (5.9 mi.), and El Jinete (3.4 mi.) - none likely impacted as they are well off the valley floor to the east.</p> <p>Cobbs Creek Reservoir - 21 miles north, not likely impacted, not in the Willis River basin.</p> <p>PWS at Kyanite Mine approximately 4 miles east, significantly upgradient.</p> <p>Virginia Keys School approximately 4.5 miles to the northwest, west of and off valley floor, unlikely to be impacted.</p> <p>Very long travel down Willis to James River (approximately 22 miles) First intake on James (James River Correctional) is an additional 26 miles</p>	<p>Twenty-one upstream DCR dams</p> <p>Eight “High Hazard” dams.</p> <p>One “Significant Hazard” dam.</p> <p>Seventy-five non-DCR dams.</p> <p>Upstream, pool capacity of 24,712-acre feet</p> <p>Drainage area of 112.0 mi²</p>	<p>There are several homes and the Midway Grocery in the Guinea Mills area, near the Route 45/ Holman Mill Road (640) intersection; north for a mile to Vogel Road (633); and south along Route 45 to the Salem Church Road intersection.</p> <p>There is a closed VDOT facility on Salem Church Road.</p> <p>Immediately west of site are several homes and large farms along Ca Ira Road, properties less than 0.4 miles from site.</p> <p>Downgradient of site are several homes along Ca Ira Road at about 1.5 miles, and next to Willis River and along Vogel Road and its branch side roads (less than a mile).</p>

GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION – ALTERNATE ANALYSIS

TABLE 2
PUBLIC WATER SYSTEMS

Powhatan County, Virginia

4145025 The Bridge Church 6 Powhatan NTNC1 110 GW The Bridge Church 2480 Academy Road Powhatan VA 23139

4145070 Fine Creek Brewing Company NA Powhatan NC 10 32 GW Fine Creek Mills, LLC 2434 Robert E. Lee Road Powhatan VA 23139

4145075 Cafe At Maidens NA Powhatan NC 1 29 GW Ernest L. & Donna B. Belvin Trust C/O Mrs. Natalie B. Meredith 17417 Midlothian Turnpike Midlothian VA 23113

4145080 Cozy Acres Campground NA Powhatan NC 116 43 GW Daniel, Larry Daniel Cozy Acres Campground 2177 Ridge Road Powhatan VA 23139

4145100 Powhatan Wellness 6 Powhatan NTNC2 25 GW Moss, Shawn Moss Sprouses Corner, LLC P. O. Box 10 Powhatan VA 23139

4145150 Essene Home For Adults 6 Powhatan C 1 33 GW Lewis, Clarence Lewis Essene Home, Inc. 4332 Worsham Road Powhatan VA 23139

4145190 Flat Rock Area Water System 6 Powhatan NTNC39 3020 SWP Carter, Ramona Carter County of Powhatan 3849 Old Buckingham Road Powhatan VA 23139

4145200 Founders Bridge 5 Powhatan C 295 980 SWP Charles W. Ewing, II, Vice-President Gray Land and Development Company 5004 Monument Avenue - Suite 200 Richmond VA 23230

4145240 Goodwyn Lumber Company 4 Powhatan NTNC2 30 GW Goodwyn, Michael Goodwyn R. C. Goodwyn & Sons, Inc. 3600 Goodwyn Road Powhatan VA 23139

4145320 Blessed Sacrament-Huguenot 6 Powhatan NTNC1 315 GW Catholic Diocese of Richmond 811 Cathedral Place Richmond VA 23220

4145510 Lake Shawnee Estates 5 Powhatan C 126 348 GW Aqua Virginia, Inc. 2414 Granite Ridge Road Rockville VA 23146

4145540 Lucky's NA Powhatan NC 1 307 GW Rozy Corporation 11321 Sadler Green Drive Glen Allen VA 23060

4145595 The Mill At Fine Creek NA Powhatan NC 1 201 GW Benusa, Lisa Benusa Le Moulin LLC 2434 Robert E. Lee Road Powhatan VA 23139

4145600 Mill Quarter Plantation 4 Powhatan C 114 273 GW Aqua Virginia, Inc. 2414 Granite Ridge Road Rockville VA 23146

4145625 Moslow Wood Products 6 Powhatan NTNC 1 75 GW Moslow, William (Bill) Moslow Wood Products 3450 Maidens Rd Powhatan VA 23139

4145650 Plainview Business Center 6 Powhatan NTNC 5 30 GW Plainview Condominium Association Mr. James R. Sowers, Jr. 2205 Rosson Road Powhatan VA 23139

4145655 Passion Community Church 6 Powhatan NTNC 1 33 GW Powhatan Community Church, Inc. 4480 Anderson Highway Powhatan VA 23139

4145665 Pocahontas Landmark Center 4 Powhatan NTNC 2 1457 GW Powhatan County School Board 2320 Skaggs Road Powhatan VA 23139

GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION – ALTERNATE ANALYSIS

TABLE 2
PUBLIC WATER SYSTEMS

4145675 Powhatan Courthouse 4 Powhatan C 271 2605 GW Aqua Virginia, Inc. 2414 Granite Ridge Road Rockville VA 23146

4145678 Powhatan State Park 4 Powhatan NC 3 25 GW Hougland, J. Eric Hougland Division of State Parks Pocahontas State Park 10301 State Park Road Chesterfield VA 23832

4145679 Powhatan State Park Campground NA Powhatan NC 45 90 GW Hougland, J. Eric Hougland Division of State Parks Pocahontas State Park 10301 State Park Road Chesterfield VA 23832

4145820 Tilmans Farm 4 Powhatan C 62 59 GW Sydnor Hydro, Inc.

Amelia County, Virginia

5007015 ABC Preschool of Arbor Baptist Church NA Amelia NC 3 40 GW Arbor Baptist Church

5007070 Amelia Family Campground NA Amelia NC 97 25 GW Hutchinson, Ferne O. Hutchinson Amelia Family Campground 9650 Military Road Amelia VA 23002

5007135 Amelia Courthouse 5 Amelia C 444 3100 GW Amelia County 16360 Dunn St, Suite 101 P. O. Box A Amelia Court House VA 23002

5007150 Black Forest Haus NA Amelia NC 1 53 GW Renschler, Rolf Renschler R.O.R.E., Inc. 18540 Patrick Henry Highway Amelia Court House VA 23002

5007230 Journey Community Center NA Amelia NC 1 100 GW Journey Community Center

Buckingham County, Virginia

5029070 Bear Garden Generating Station 4 Buckingham NTNC3 25 GW Dominion Virginia Power 2608 C G Woodson Road New Canton VA 23123

5029085 Buckingham Co Water System 2 Buckingham C 413 5759 SW Carter, Rebecca S. Carter Buckingham County-Admin Office Co Adm Office, Courthouse Village/Hwy 60 P O Box 252 Buckingham VA 23921

029115 Calvary Christian School 6 Buckingham NTNC1 85 GW Calvary Christian School 31139 North James Madison Highway New Canton VA 23123

5029120 Central Virginia Community Health Center 6 Buckingham NTNC1 95 GW Central Virginia Community Health Center 25892 North James Madison Highway P.O. Box 220 New Canton VA 23123

5029170 Discovery School of Virginia 6 Buckingham C 4 65 GW Discovery School of Virginia P.O. Box 1160 Dillwyn VA 23936

5029182 Ali's Marketplace NA Buckingham NC 1 100 GW NX Gen Retail LLC 13338 South Constitution Route Scottsville VA 24590

5029200 Gold Hill Village 6 Buckingham C 21 22 GW Buckingham Housing Development Corp. Buckingham Housing Development Corp. Gold Hill Village, #19-Office New Canton VA 23123

5029225 The Bridge Ministry NA Buckingham NC 1 500 GW The Bridge Ministry HCO2, Box 239 Buckingham VA 23921

5029280 James River State Park NA Buckingham NC 5 236 GW Dept of Conservation and Recreation Division of State Parks 600 E. Main Street Richmond VA 23219

GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION – ALTERNATE ANALYSIS

TABLE 2
PUBLIC WATER SYSTEMS

5029291 Kyanite Mine-East Ridge 6 Buckingham NTNC3 40 GW Kyanite Mining Corporation 30 Willis Mountain Plant Lane Dillwyn VA 23936

5029335 Nazarene Camp NA Buckingham NC 1 200 GW Church of Nazarene 3910 Monze Rd. Richmond VA 23234

5029340 Virginia Keys School NA Buckingham NC 9 100 GW L.I.N.K., LLC Richard Kingswell 9011 Arboretum Pkwy, Suite 240 Richmond VA 23236

5029770 Saint Thomas Aquinas Seminary 4 Buckingham C 3 150 GW Stas, Inc.

Cumberland County, Virginia

5049110 Envigo - Cumberland 6 Cumberland NTNC15 25 GW Envigo 482 Frenchs Store Road Cumberland VA 23040

5049150 Cumberland County Water System 4 Cumberland C 124 1840 GW Cumberland County 1 Courthouse Circle P.O. Box 110 Cumberland VA 23040

5049151 Dollar General-Cumberland NA Cumberland NC 1 50 GW Dolgencorp, LLC 100 Mission Ridge Goodlettsville TN 37072

5049293 Farmville Municipal Golf Course NA Cumberland NC 2 25 GW Farmville, Town of 116 North Main Street P O Drawer 368 Farmville VA 23901

5049320 El Jinete Mexican Restaurant NA Cumberland NC 1 45 GW Spears, Ronald Spears El Jinete Mexican Restaurant 2576 Ridge Road Powhatan VA 23139

049400 Lakeside Village 6 Cumberland C 89 220 GW Aqua Virginia, Inc. 2414 Granite Ridge Road Rockville VA 23146

5049500 New Life Schools 6 Cumberland NTNC4 35 GW New Life Assembly of God 9 Mahan Road Farmville VA 23901

5049819 Southside Enterprises 6 Cumberland NTNC2 50 GW Crossroads Community Services Board P.O. Drawer 248 60 Bush River Drive Farmville VA 23901

Surface Water Intakes James and Appomattox Rivers

4075735 James River Correctional Ctr 2 Goochland C 9 6902 SW Virginia Dept of Corrections

4041035 Appomattox River Authority 1 Chesterfield C 13 0 SW Appomattox River Water Auth. 21300 Chesdin Road Petersburg VA 23803

4087125 Henrico County Water System 1 Henrico C 95816 292000 SW Henrico County Dept of Public Utilities P.O. Box 90775 Henrico VA 23273-0775

4760100 Richmond, City of 1 Richmond City C 64944 197000 SW Richmond Dept. of Public Utilities 730 East Broad Street, 6th Floor Richmond VA 23219

3670800 Virginia-American Water Co. 1 Hopewell C 9299 28000 SW Virginia- American Water 2223 Duke Street Alexandria VA 22314

NOTES:

No info for Prince William County as none of the alternate sites drain to that county

**GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION - ALTERNATE ANALYSIS**

**TABLE 3
DCR-LISTED DAMS UPGRADIENT FROM ALTERNATE SITES**

Dam Name	Dam Inventory #	Date of Construction	Owner	River/ stream	Top Capacity (Acre-ft)	Dam Height	Dam Length	HUC 12 Watershed Name	VAHU 6 Watershed Code	Hazard Classification	Emergency Plan
Green Ridge											
Flippen Dam	049007	1/1/1900	Pam Layman	Muddy Creek	138	20	--	Muddy Creek	JM71	Unk.	No
Alternate 1											
George Dowdy Dam	049046	--	George Lee, Jr.& G.Lee, III Dowdy	TR-Little Guinea Creek	47.1	25	--	Appomattox River-Little Guinea Creek	JA19	Unk. (Significant)	No
Jamerson Dam (Po Boy)	049020	--	S M Jamerson	TR-Little Guinea Creek	45	24	--	Appomattox River-Little Guinea Creek	JA19	Unk.	No
Lillie's Dam (Pearsall Dam-Garrett Pond)	049006	1/1/1956	Mark Wafoed	Little Guinea Creek	392	29.3	410	Appomattox River-Little Guinea Creek	JA19	Low	Yes
Robert Woodson Dam	049052	--	Robert G., Jr. & Laura M. Woodson	TR-Little Guinea Creek	35.5	25	--	Appomattox River-Little Guinea Creek	JA19	Unk. (Significant)	No
Alternate 2											
Clayton Dam (Fleming Dam)	049004	1/1/1969	Thomas E. Andrews	Maxey Mill Creek	156	23	423	Deep Creek-Maxey Mill Creek	JM73	Unk.	Possibly
Alternate 3											
Buckingham County Dam #24	029055	--		Whispering Creek	148	25.5	640	Willis River-Whispering Creek	JM64	Unk. (Significant)	No
Buckingham County Dam #27	029056	--		TR-Whispering Creek	34.2	35	--	Willis River-Whispering Creek	JM64	Unk. (Significant)	No
Buckingham County Dam #28	029057	--		TR-Whispering Creek	192.8	35	--	Willis River-Whispering Creek	JM64	Unk. (Significant)	No
Buckingham County Dam #30	029058	--		TR-Whispering Creek	2850.05	64	1350	Willis River-Whispering Creek	JM64	Unk. (Significant)	No
Buckingham County Dam #33	029060	--		Bishop Creek	46	25	--	Willis River-Bishop Creek	JM63	Unk. (Significant)	No
Buckingham County Dam #39	029064	--		Little Willis River	111.8	21.5	350	Little Willis River	JM65	Unk. (Significant)	No
David Asal Dam	049044	--	David Mark Asal	Little Willis River	193.35	24.75	400	Little Willis River	JM65	Unk. (Significant)	No
Gieseke Dam	029038	--		TR-Whispering Creek	0	25	--	Willis River-Whispering Creek	JM64	Unk.	No
Kyanite #3	029020	1/1/1976		Nelson Fork	762	50	--	Willis River-Whispering Creek	JM64	Unk.	No
Kyanite East Ridge	029031	--		Nelson Fork	992	72	--	Willis River-Whispering Creek	JM64	Unk.	No
Kyanite Mine Waste Dam #1	029015	1/1/1956	Kyanite Mining Corporation	TR-Whispering Creek	1545	70	--	Willis River-Whispering Creek	JM64	Unk.	No
Monroe, Melvin & Johns	029030	1/1/1977		TR- Perkins Creek	163	22	400	Little Willis River	JM65	Unk.	No
Willis River Dam #1A (Big Chesapeake)	029001	1/1/1975	M. Todd Smith	Bishop Creek	3183	41.7	390	Willis River-Bishop Creek	JM63	High	Yes
Willis River Dam #1B (Little Chesapeake)	029002	1/1/1975	M. Todd Smith	TR-Willis River	1204	43.1	300	Willis River-Bishop Creek	JM63	Significant	Yes
Willis River Dam #2 (Booker)	029019	1/1/1975	M. Todd Smith	TR-Tongue Quarter Creek	2730	46.3	660	Willis River-Bishop Creek	JM63	High	Yes
Willis River Dam #3 (Tipton)	029003	1/1/1974	M. Todd Smith	Bishop Creek	871	43.8	475	Willis River-Bishop Creek	JM63	High	Yes
Willis River Dam #4 (Seaman Sam)	029004	1/1/1973	M. Todd Smith	Cattail Creek	1102	43.6	517	Willis River-Whispering Creek	JM64	High	Yes
Willis River Dam #5E (Hardiman)	029005	1/1/1973	M. Todd Smith	Whispering Creek	1448	41.7	784	Willis River-Whispering Creek	JM64	High	Yes
Willis River Dam #5F (Kyanite)	029006	1/1/1973	M. Todd Smith	TR-Whispering Creek	1178	43.2	595	Willis River-Whispering Creek	JM64	High	Yes
Willis River Dam #6 (Johns)	029007	1/1/1972	M. Todd Smith	Little Willis River	4922	47.1	496	Little Willis River	JM65	High	Yes
Willis River Dam #6A (Elcan)	029008	1/1/1973	M. Todd Smith	Little Willis River	1036	33.1	496	Little Willis River	JM65	High	Yes

**GREEN RIDGE RECYCLING AND DISPOSAL, LLC
SUPPLEMENTAL INFORMATION – ALTERNATE ANALYSIS**

**TABLE 4
DAM IMPACTS - SUMMARY**

Alternate	Number of DCR Dams Upstream	Total Upstream Pool Capacity (acre/ft)	Number of Dams with High or Significant Risk	Number of Non-DCR Impoundments Upstream	Drainage Area Above Site (square miles)
Green Ridge	1	138	0	9	8.81
Alternate Site 1	4	519	2	13	7.06
Alternate Site 2	1	156	0	13	12.1
Alternate Site 3	21	24,712	8	75	112

APPENDIX 2

FIGURES – Rev 1

Figure 1 – Area Map – Location – Rev 1

Figure 2 – Area Map – Geologic – Rev 1

Figure 3 – Central Virginia Seismic Zone with Sites – Rev 1

Figure 4 – Distance to Spotsylvania Fault – Rev 1

Figure 5 – Public Water Supplies – Groundwater – Rev 1

Figure 6 – Public Water Supplies – Surface Water – Rev 1

Figure 7 – Dam Locations –County Level – Rev 1

Figure 8A – Dam Locations – Alternate Site 3 – Rev 1

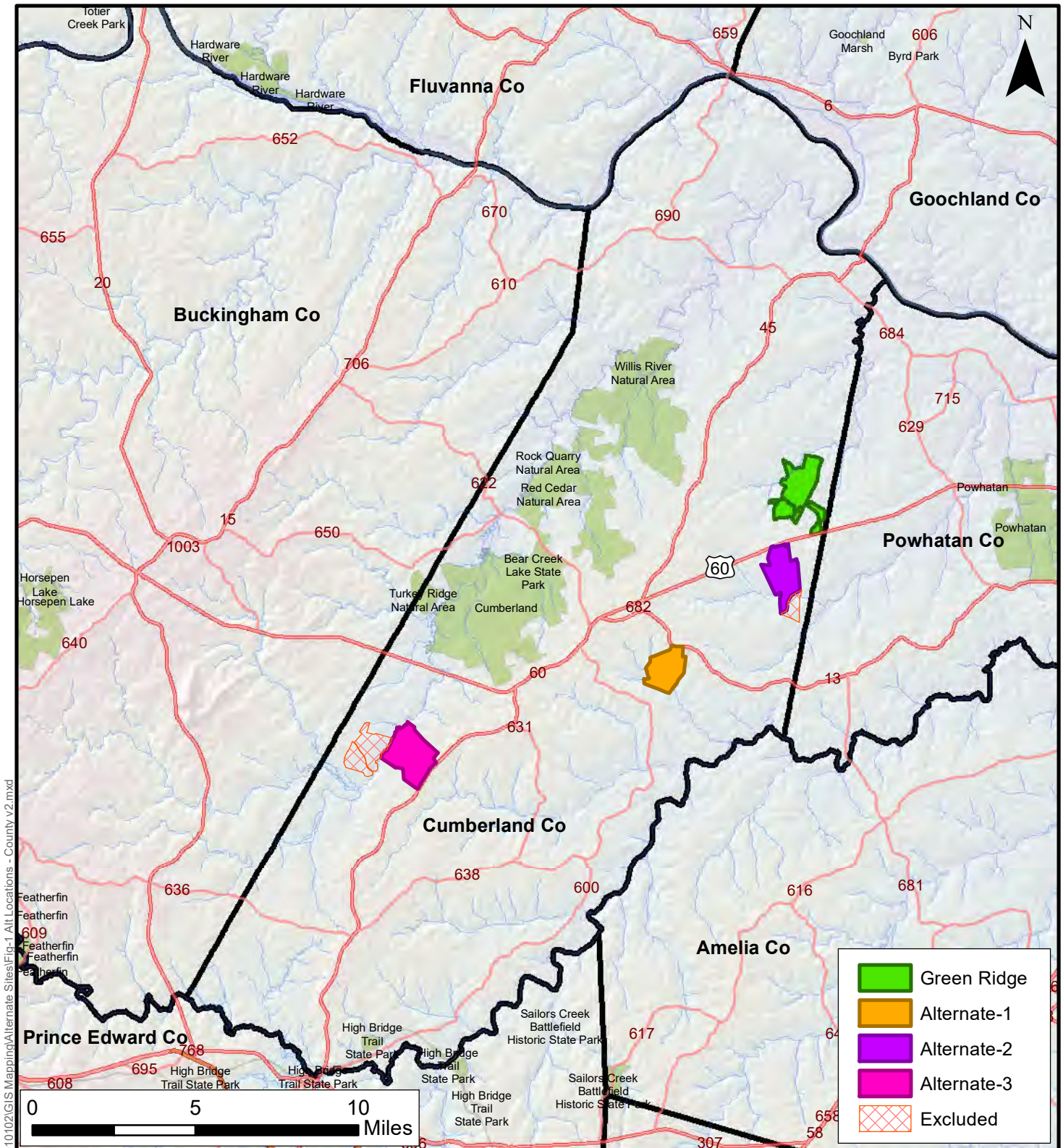
Figure 8B – Dam Locations – All Sites – Rev 1

Figure 9 – Green Ridge Site – Vicinity Map – Rev 1

Figure 10 –Alternate Site 1 – Vicinity Map – Rev 1

Figure 11 – Alternate Site 2 – Vicinity Map – Rev 1

Figure 12 – Alternate Site 3 – Vicinity Map – Rev 1



Area Map Location in County

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-110102

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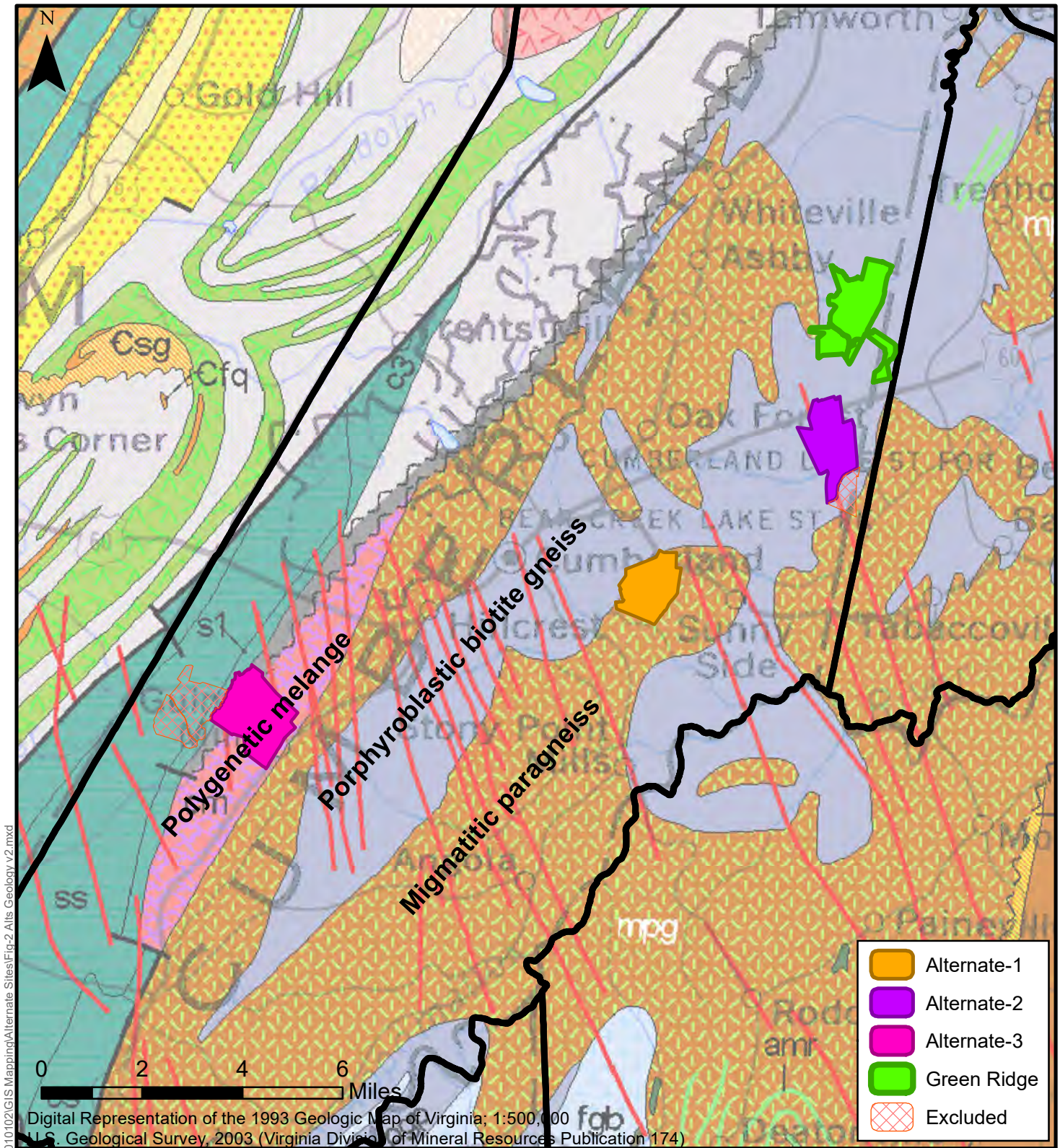
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FIGURE
1



Geologic Map

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1 : 175,000

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FIGURE

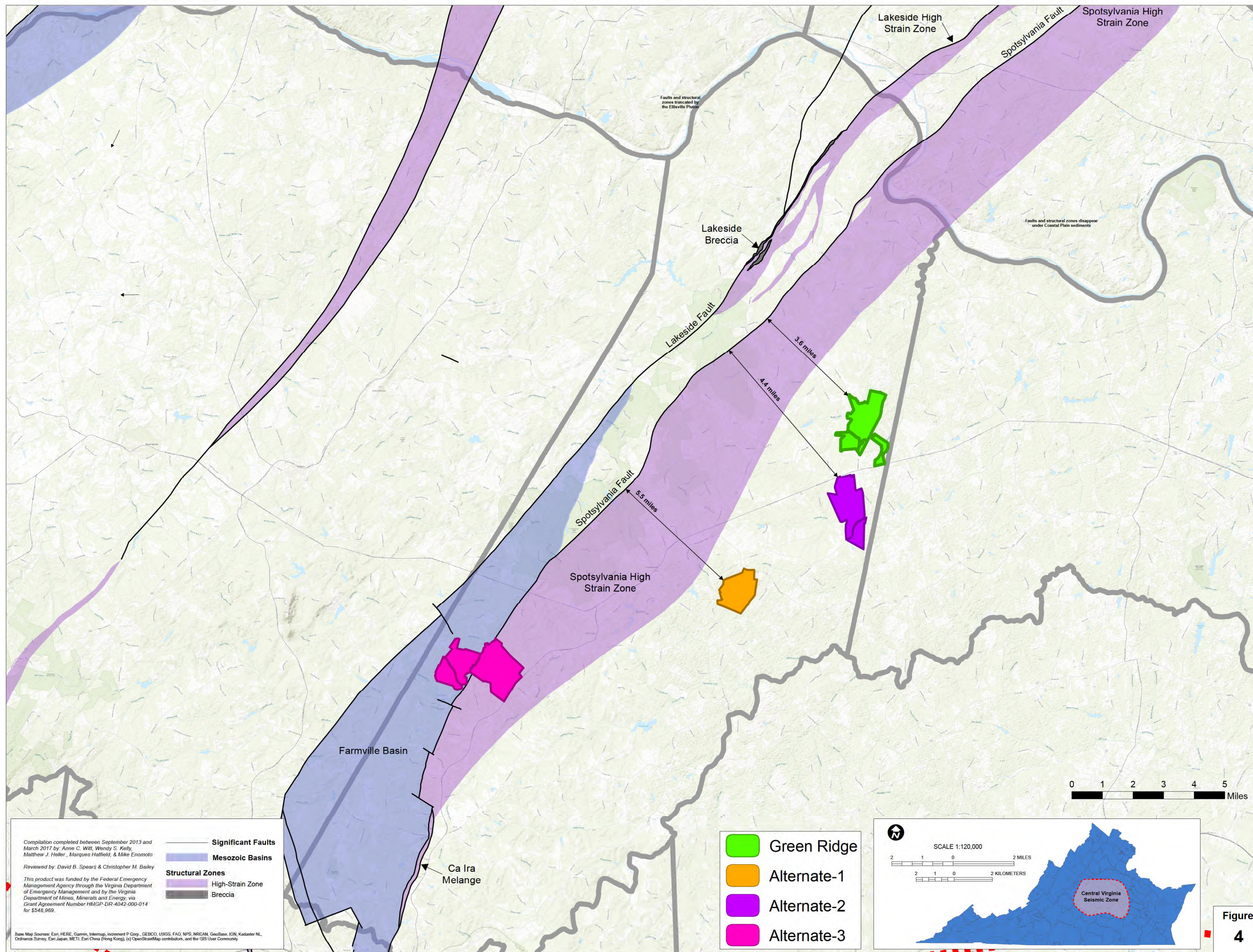
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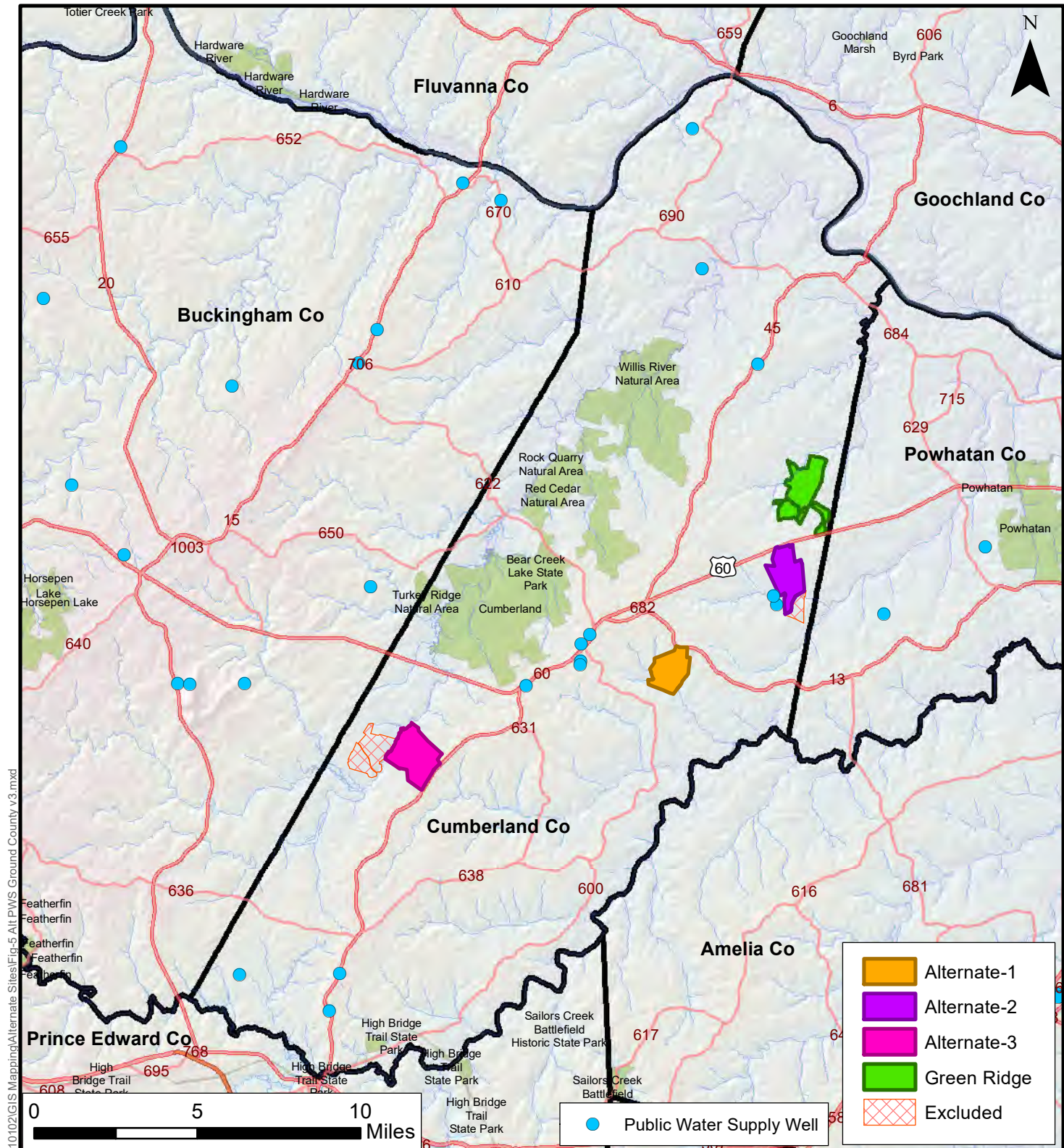
GIS Fault Mapping of Virginia Seismic Zones
Virginia Division of Geology and Mineral Resources
Plate 2, Version: March 2017



CENTRAL VIRGINIA SEISMIC ZONE

Digital Fault Compilation





Public Water Supplies Groundwater

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-010102

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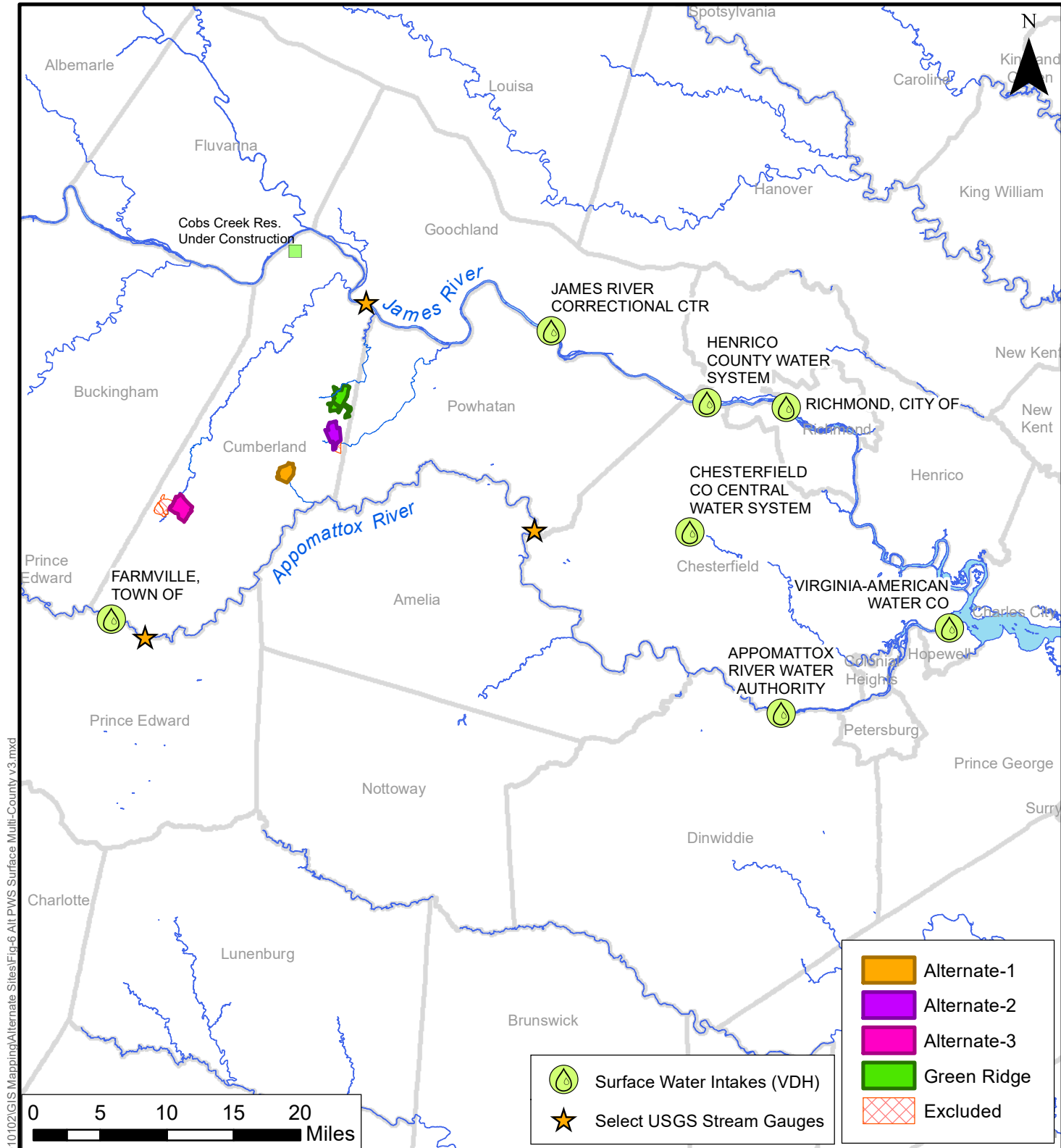
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FIGURE
5



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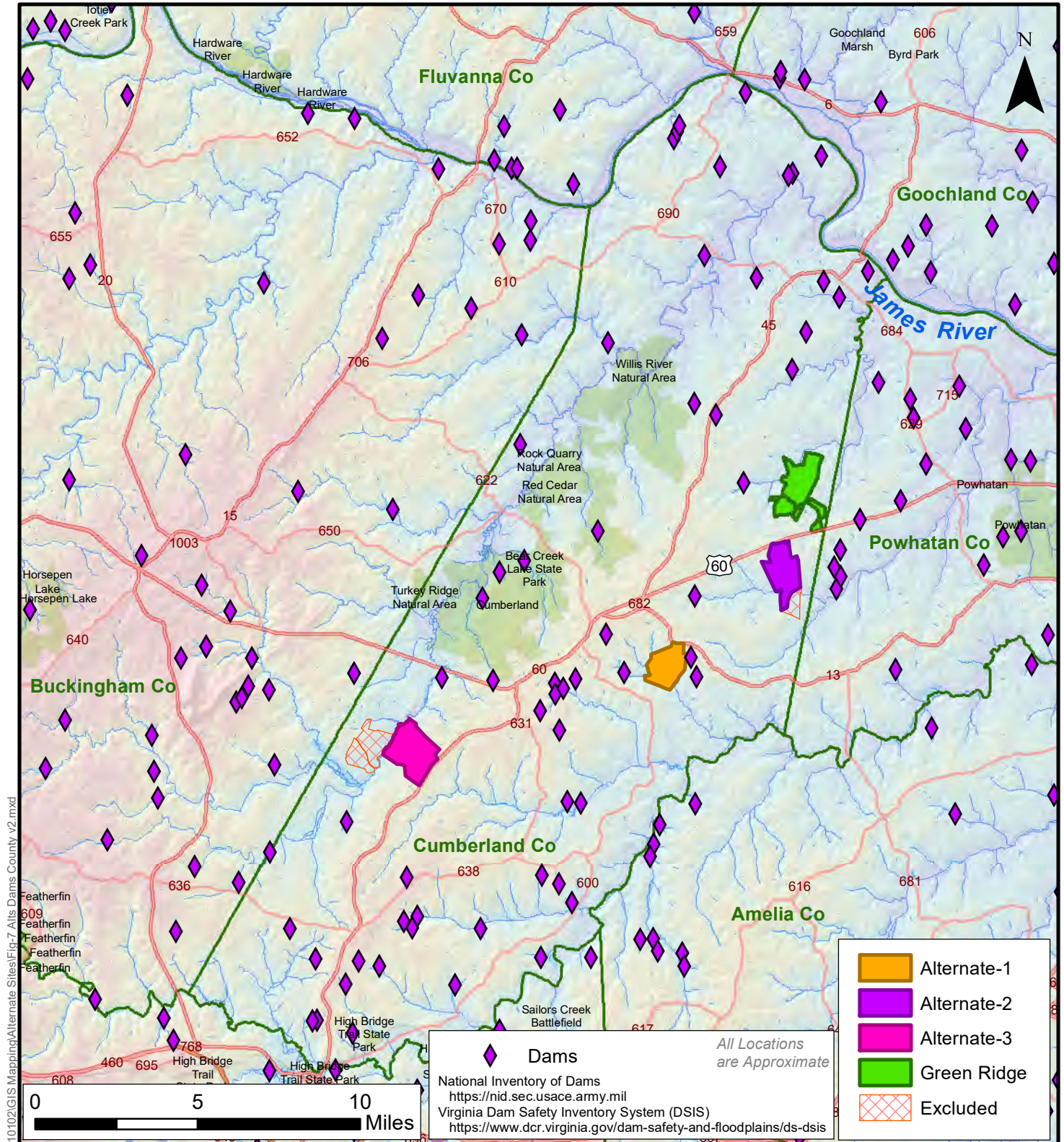
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FIGURE

6



Dam Locations

Alternate Sites
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 Cumberland County, Virginia

SCALE: 1:270,000

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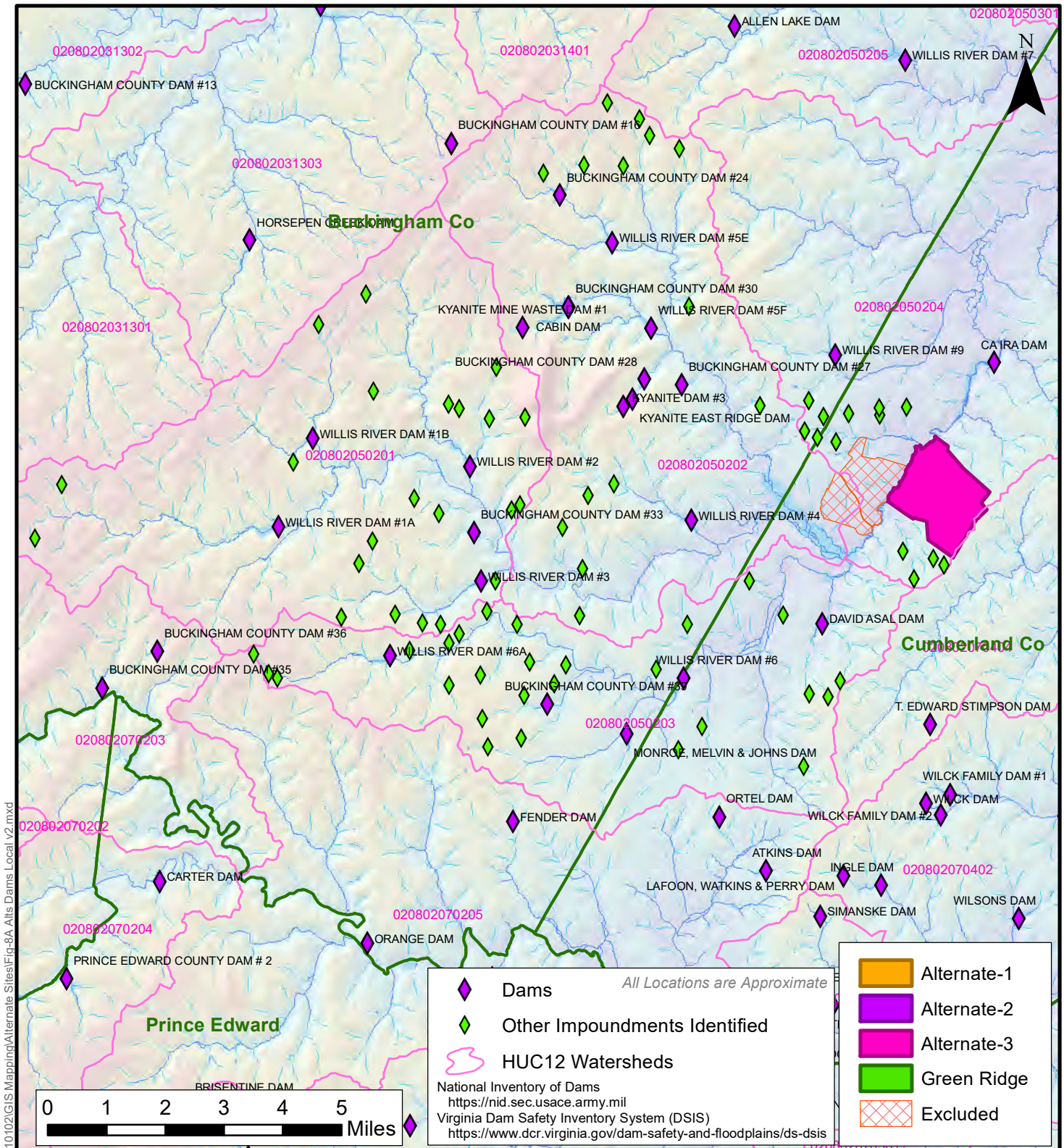
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FIGURE

7



Path: P:\2018\18020100\18020117\18020117-010102\GIS Mapping\Alternate Sites\Fig-8A_Alt3 Dams Local v2.mxd

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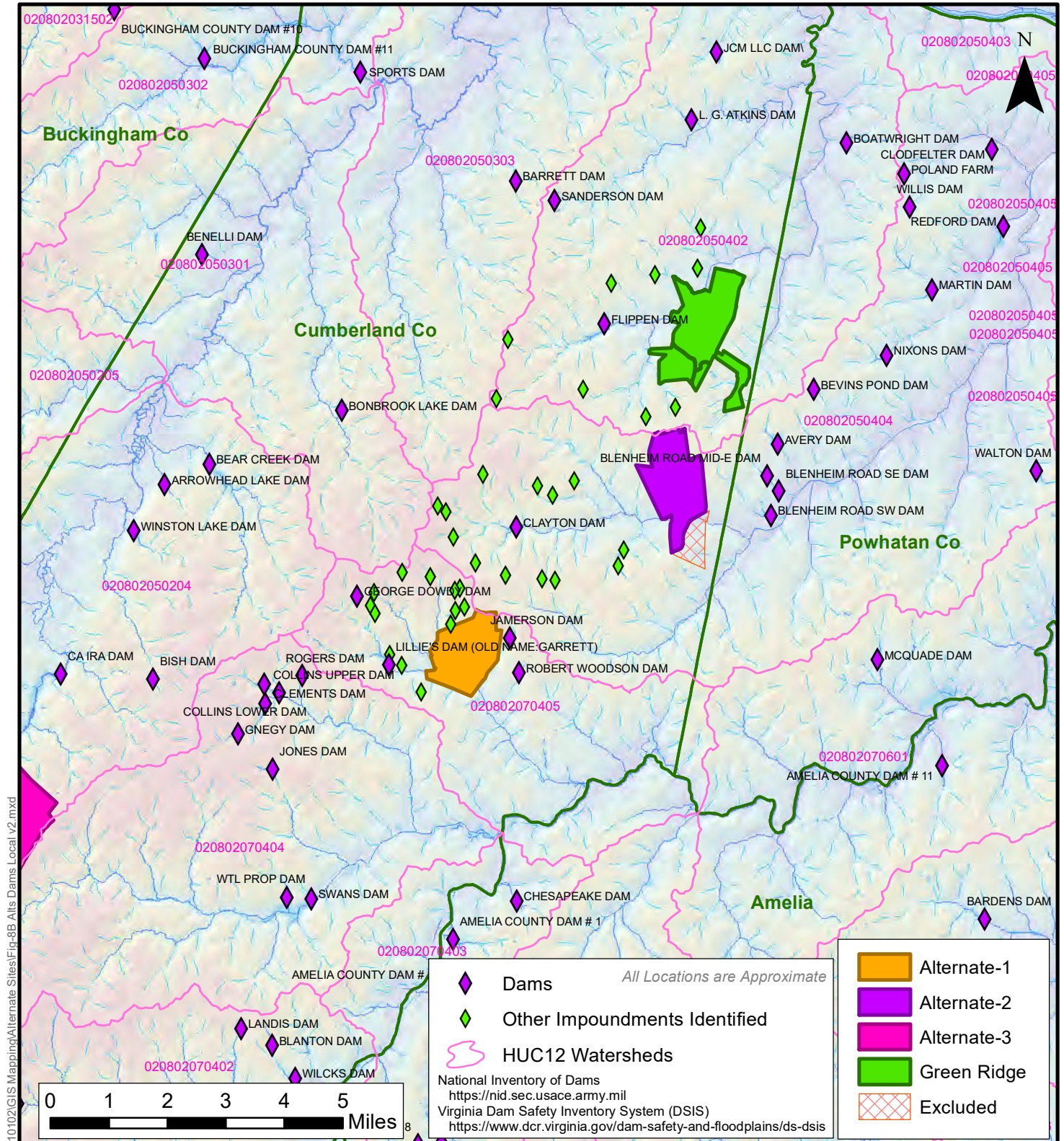
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FIGURE
8A



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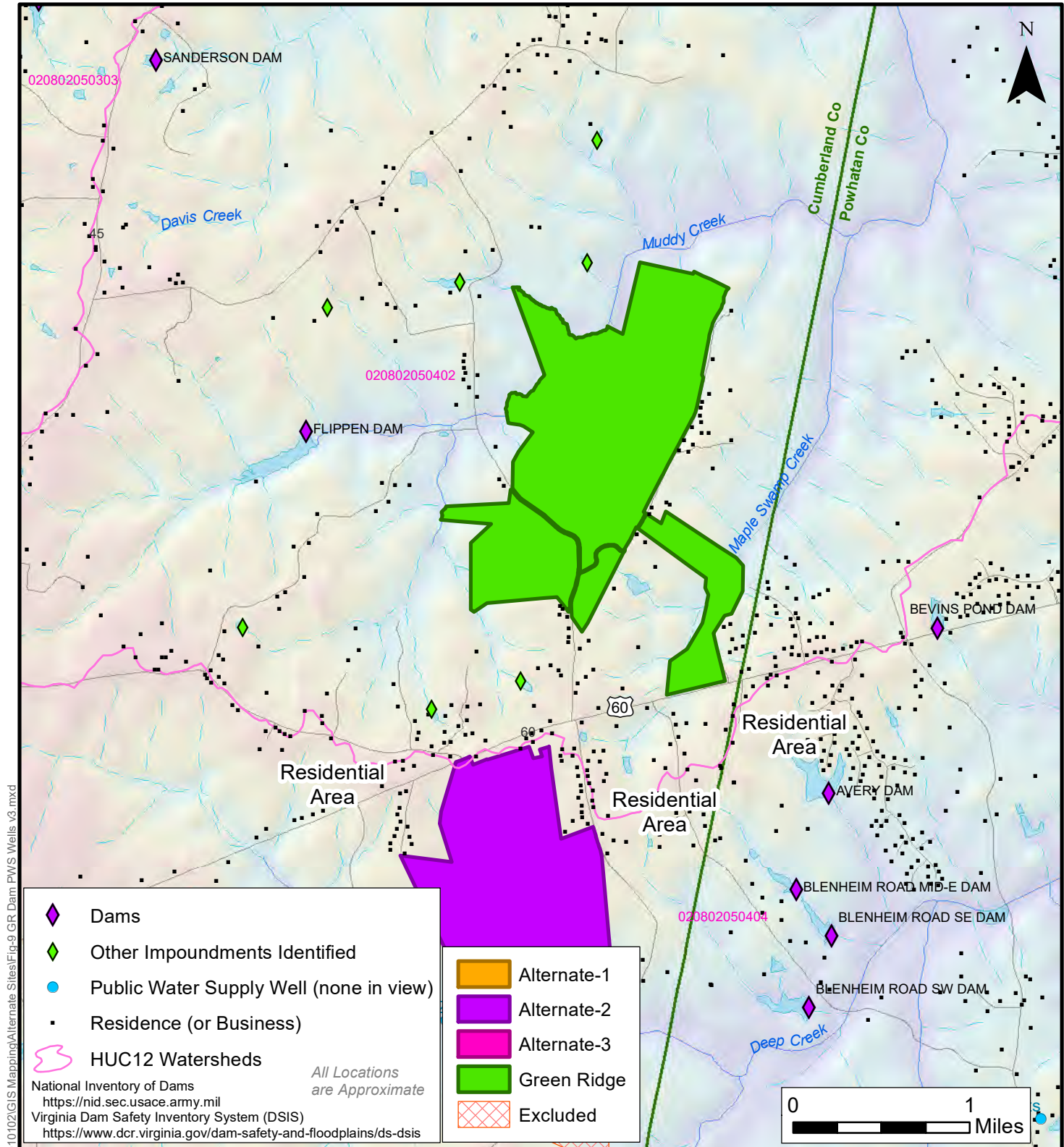
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FIGURE
8B



Green Ridge Vicinity Map

Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

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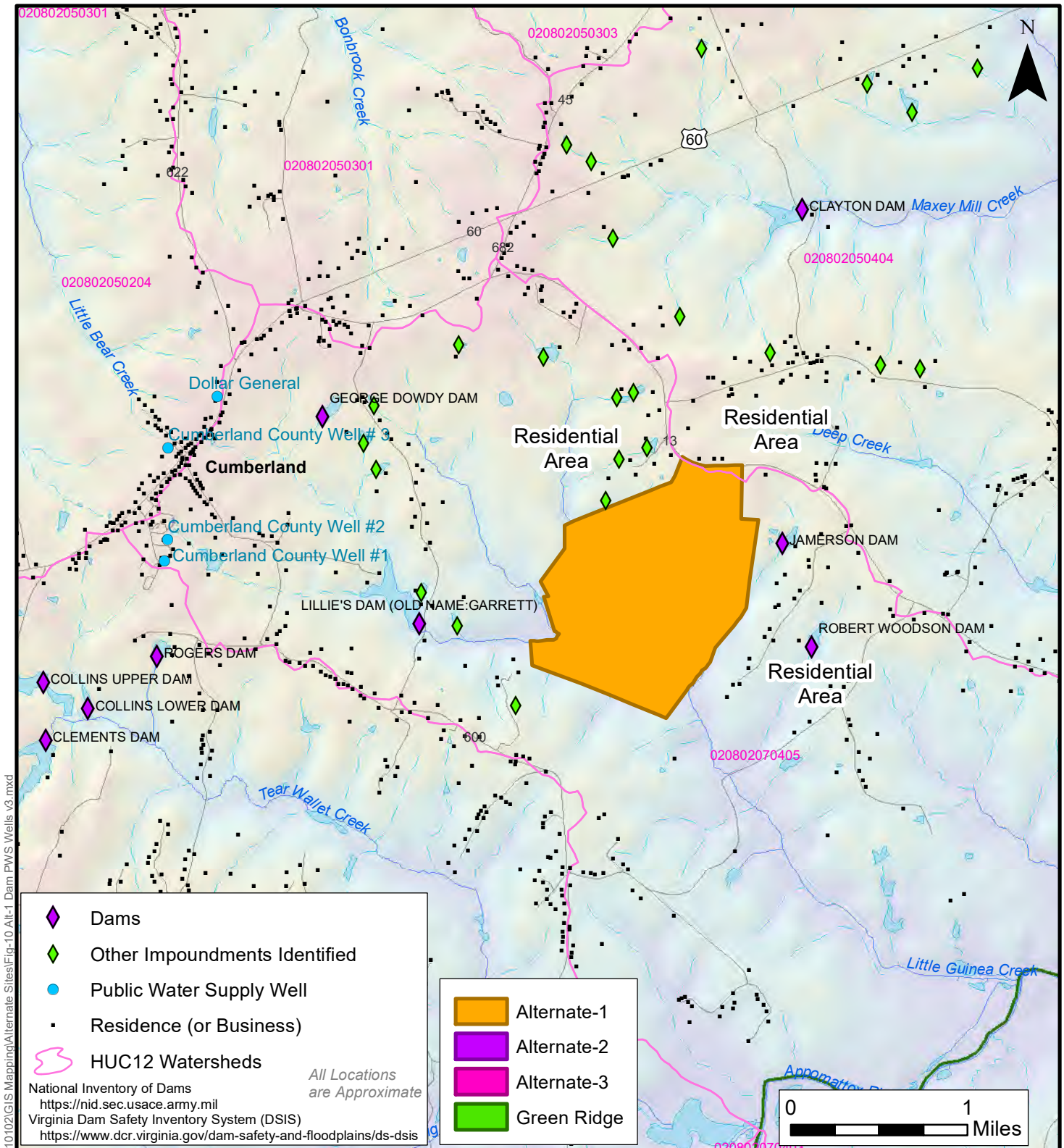
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FIGURE
9



Alternate Site No. 1 Vicinity Map

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

SCALE: 1:50,000

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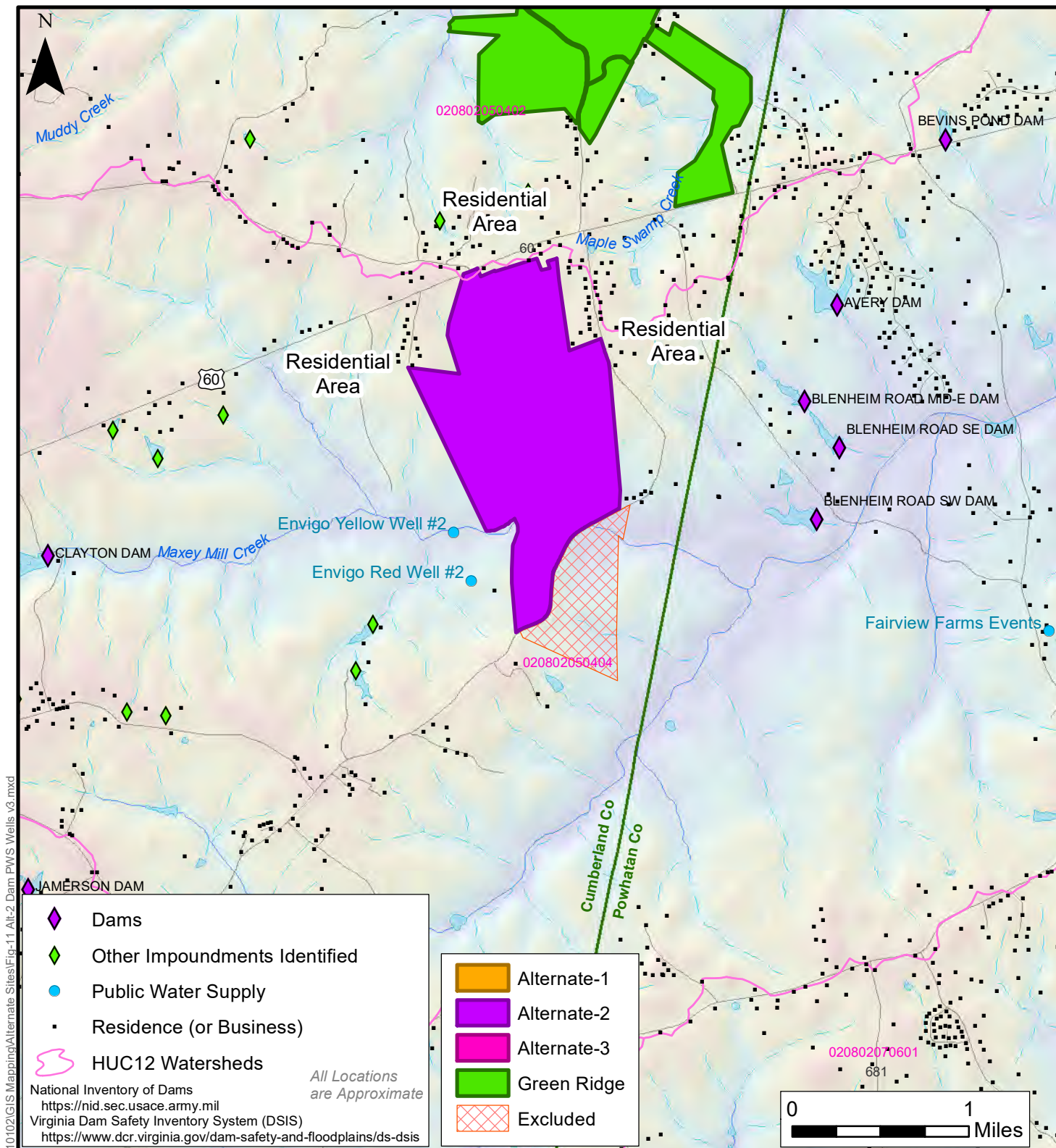
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FIGURE
10



Alternate Site No. 2 Vicinity Map

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

SCALE: 1:50,000

PROJECT: 18020117-110102

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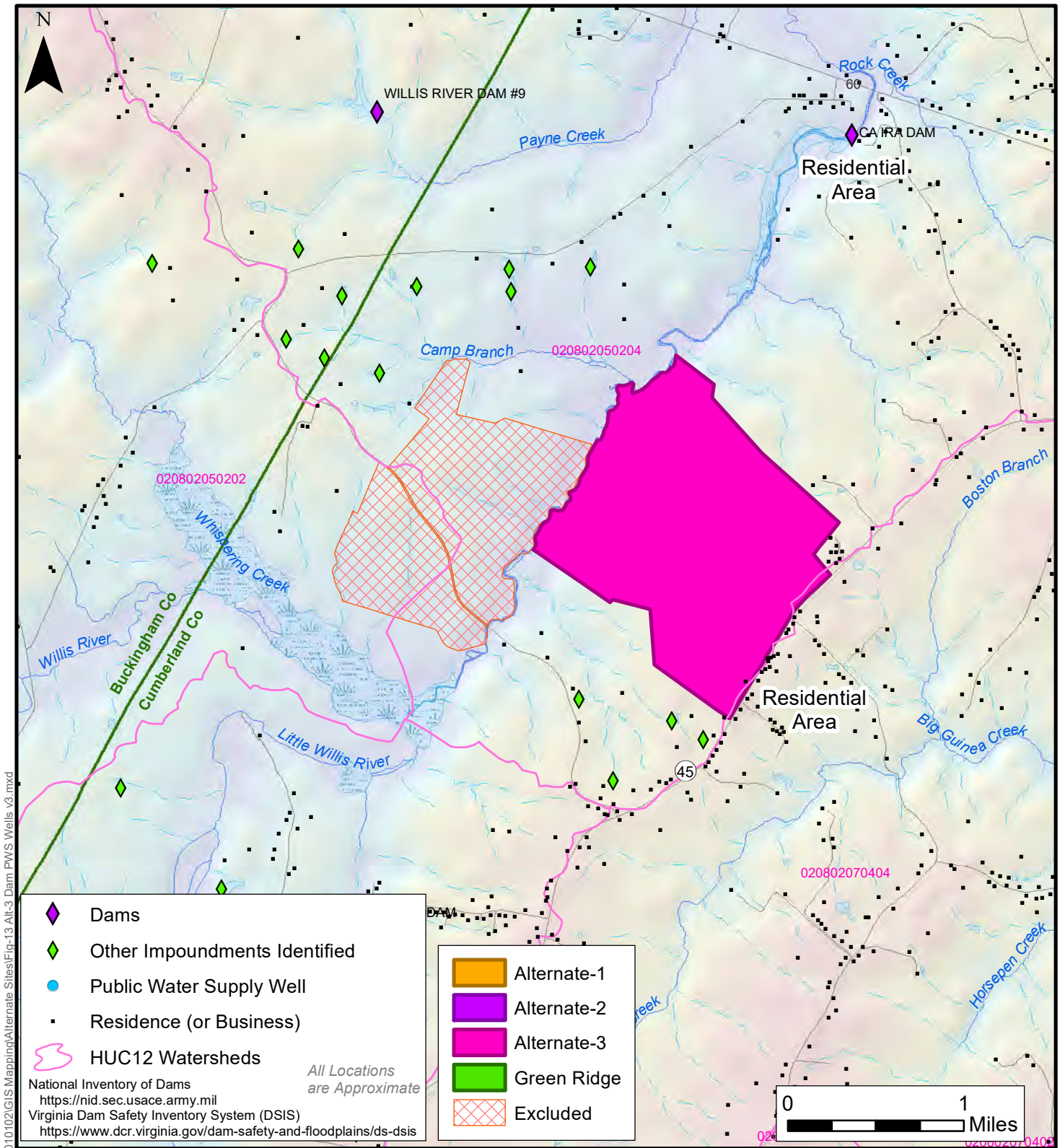
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FIGURE
11



Alternate Site No. 3 Vicinity Map

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

SCALE: 1:50,000

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FIGURE
12

APPENDIX 7

REPORT – BROWNING AND ASSOCIATES

CULTURAL RESOURCES EVALUATION – 3 ALTERNATIVES, 2019

**CULTURAL RESOURCES EVALUATION:
3 ALTERNATIVES TO THE CHOSEN
ALTERNATIVE AT THE
PROPOSED GREEN RIDGE LANDFILL
CUMBERLAND COUNTY, VIRGINIA**

Surveyed for:

**MS. LYNN KLAPPICH, CSI, CCCA
WRE PROGRAM MANAGER
DRAPER ADEN ASSOCIATES
2206 South Main Street
Blacksburg, VA 24060
540-552-0444**

Surveyed by:

**LYLE E. BROWNING
Principal Investigator
BROWNING & ASSOCIATES, LTD.
138 SCOGGINS CREEK TRAIL
HARTFIELD, VA 23071
(804) 379-1666**

The Locations of the Alternatives.....	1
Terrain Description	1
Alt-1 Prehistoric.....	5
Alt-1 Historic	5
Alt-2 Prehistoric.....	8
Alt-2 Historic	8
Alt 3 Prehistoric	11
Alt 3 Historic.....	11
Summary & Recommendations	15
References Cited	17
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Figure 2. Cumberland County Map With 3 Alternatives & Chosen Alternative.....	4
Figure 3. 1864 Gilmer Map of Cumberland County Showing Alt-1.	6
Figure 4. 1960 Lakeside Village 15' USGS Quad Showing Alt-1.....	7
Figure 5. 1864 Gilmer Map of Cumberland County Showing Alt-2.	9
Figure 6. 1960 Lakeside Village 15' USGS Quad Showing Alt-2.....	10
Figure 7. 1864 Gilmer Map of Cumberland County Showing Alt-3.	13
Figure 8. 1960 Lakeside Village 15' USGS Quad Showing Alt-3.....	14

Section 106 of the National Historic Preservation Act of 1969 as amended sets forth criteria for federally funded or permitted undertakings within the jurisdiction of the United States. The National Park Service (NPS) administers the Act. Each state and territory has the responsibility for administering the act and those efforts are under the direction of the State Historic Preservation Officer (SHPO). In Virginia, the Virginia Department of Historic Resources (DHR) is responsible for fulfilling these obligations.

Section 106 has implementing 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.

Cultural Resources are a part of the investigation. Until such time as a comprehensive survey of the entirety of the United States is completed, the normal practice is to conduct evaluations of alternatives such that "project killers" may be identified and best-case evaluations may be made of the alternatives.

The Locations of the Alternatives

Three such alternative areas were identified for Cumberland County and the proposed Green Ridge Landfill. The chosen alternative is the ±1,178 acre area north of Route 60 straddling Pinegrove Road and bounded generally on the east by Miller Lane. Figures 1 and 2 show the location of the three alternatives and the chosen alternative.

Alternative 1 is comprised of 783 acres in Cumberland Tax Parcels 58-A-19, 58-A-20, 58-A-22, and 67-A-69. It is located east of Cumberland Courthouse on the south side of a rounded bend on Rt. 13, the Old Buckingham Road.

Alternative 2 is comprised of 1089 acres in Cumberland Tax Parcels 52-A-20 and 52-A-21. It is located south of Route 60 at the community of Clinton. It almost abuts the chosen alternative. It is very near the Powhatan County border.

Alternative 3 is comprised of 1988 acres in Cumberland Tax Parcels 72-A-3, 72-A-4, 72-A-5, 71-A-9, 72-A-10 and 72-A-11. It is located south of Route 60, west of and abutting onto Rt. 45 and is very near the border with Buckingham County. It straddles the Willis River.

Terrain Description

Terrain features are an important part of cultural resources evaluation. Access to potable water, arable land, game animals, transportation routes for both land and water movement are vital parts of the investigation of archaeological and architectural resources locations. These are typically broken down into prehistoric and historic components.

Topographically, Cumberland County is within both the James River and Appomattox River drainages. There is basically a "T" shaped upland area that has served in the historic periods as the location of the main transportation arteries. From the north near Cartersville heading south-southeast to Cumberland Courthouse and then continuing south south-west is a ridge that today contains Rt. 45. From Cumberland Courthouse eastward is a ridge that is today traversed by Rt. 60. The Willis's River parallels the county boundary that is just west of that watercourse. It discharges into the James River. South and east of the Rt. 45/60 alignment are several large creeks that empty into the Appomattox River. Railroad development followed the ridge along Rt. 60 to Cumberland Courthouse and then southwest along Rt. 45.

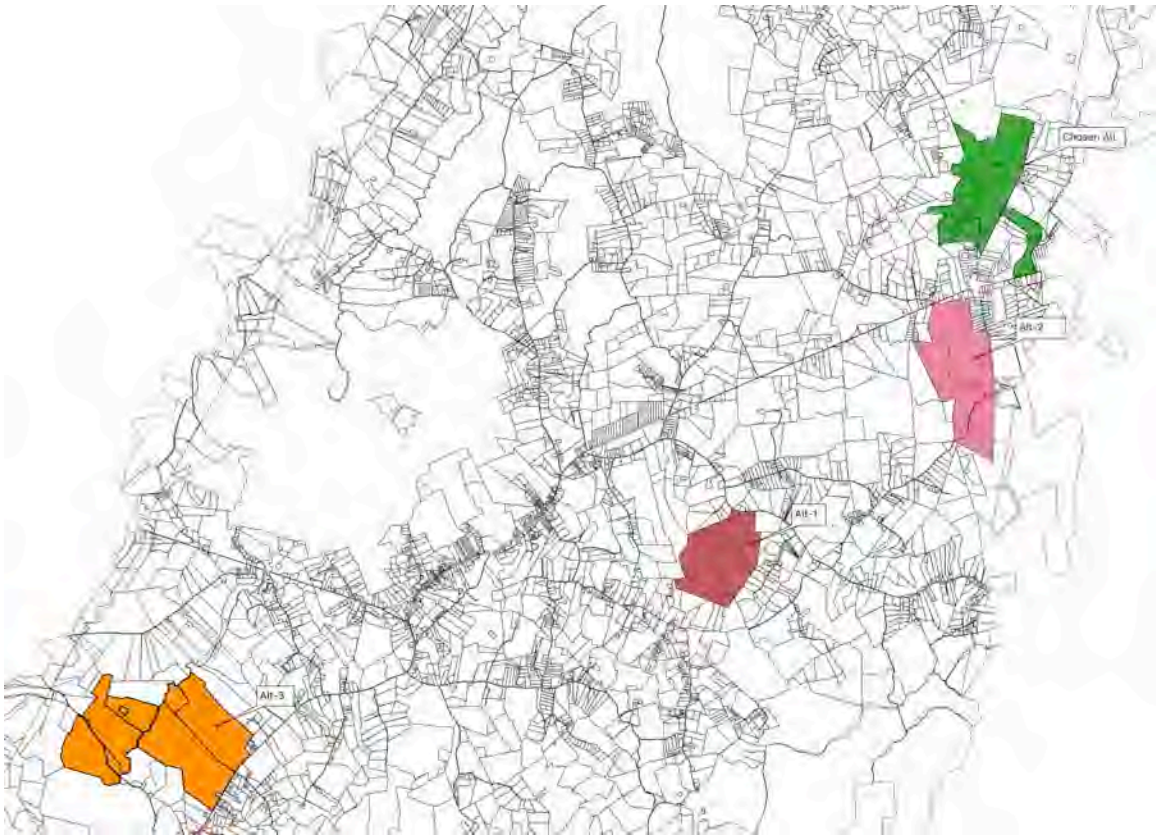


Figure 1. Cumberland County Land Parcels & 3 Alternatives & Chosen Alternative.

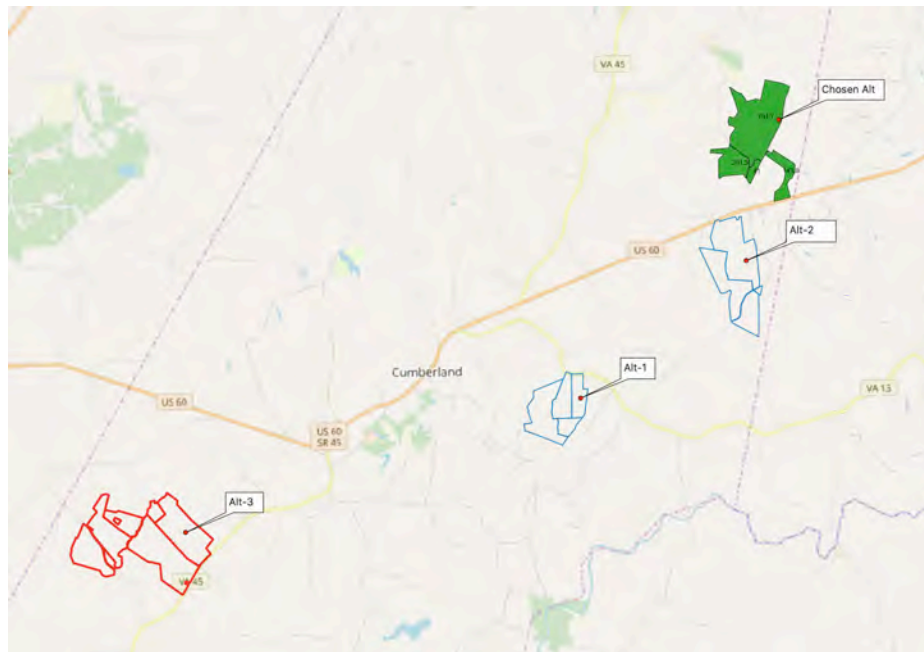


Figure 2. Cumberland County Map With 3 Alternatives & Chosen Alternative.

Alt-1 Prehistoric

The terrain in Alt-1 is highly dissected by Little Guinea Creek and its associated perennial and seasonal tributaries. Flat lands are upland erosion spurs and spur tips. Little Guinea Creek cuts through the bottom portion of the parcels and there are two intermittent streams drained by a perennial stream on the central and eastern portions.

The set of spur tips oriented perpendicular to Little Guinea Creek and those abutting the two intermittent creek swales are suitable for low-slope access by Cervidae (Deer, Elk) and Bison in their daily rounds from one watershed to another.

The expectation for prehistoric sites along the ridges, spurs and spur tips would be high due to the presence of stream cuts for hunting big game animals and for seasonal rounds for nut and berry gathering in the Archaic Period. These sites would be represented by stone chips from weapons/tool manufacture and maintenance with little expectation of subsurface deposits, although some sites do exhibit small numbers of pits.

Alt-1 Historic

The 1864 Gilmer Map of Cumberland County (Figure 3) shows Jones Upper Mill on Little Guinea Creek where it intersects a perennial stream drainage. Mrs. J. D. Isbell has a house on an upland flat and there is an unnamed structure at the edge of Rt. 13.

The 1850 Slave Schedule lists James Isbell with 47 slaves. It is not at this stage known whether the J. D. Isbell and James Isbell are the same person.

The 15' Lakeside Village 1960 USGS Quad (Figure 4) shows most of the property in forest. It also has several cleared patches that in general correspond with upland level terrain, suggesting past agricultural practices. No structures are shown on that map.

The expectation for historic sites is based on the Gilmer map that has a mill in Little Guinea Creek as well as Mrs. J. D. Isbell on the adjacent upland flat terrain that is suitable for agricultural pursuits. Another house without a name is also shown. There are at least three structures dating to the middle of the 19th century that may well extend back into the 18th century and original patenting.



Figure 3. 1864 Gilmer Map of Cumberland County Showing Alt-1.

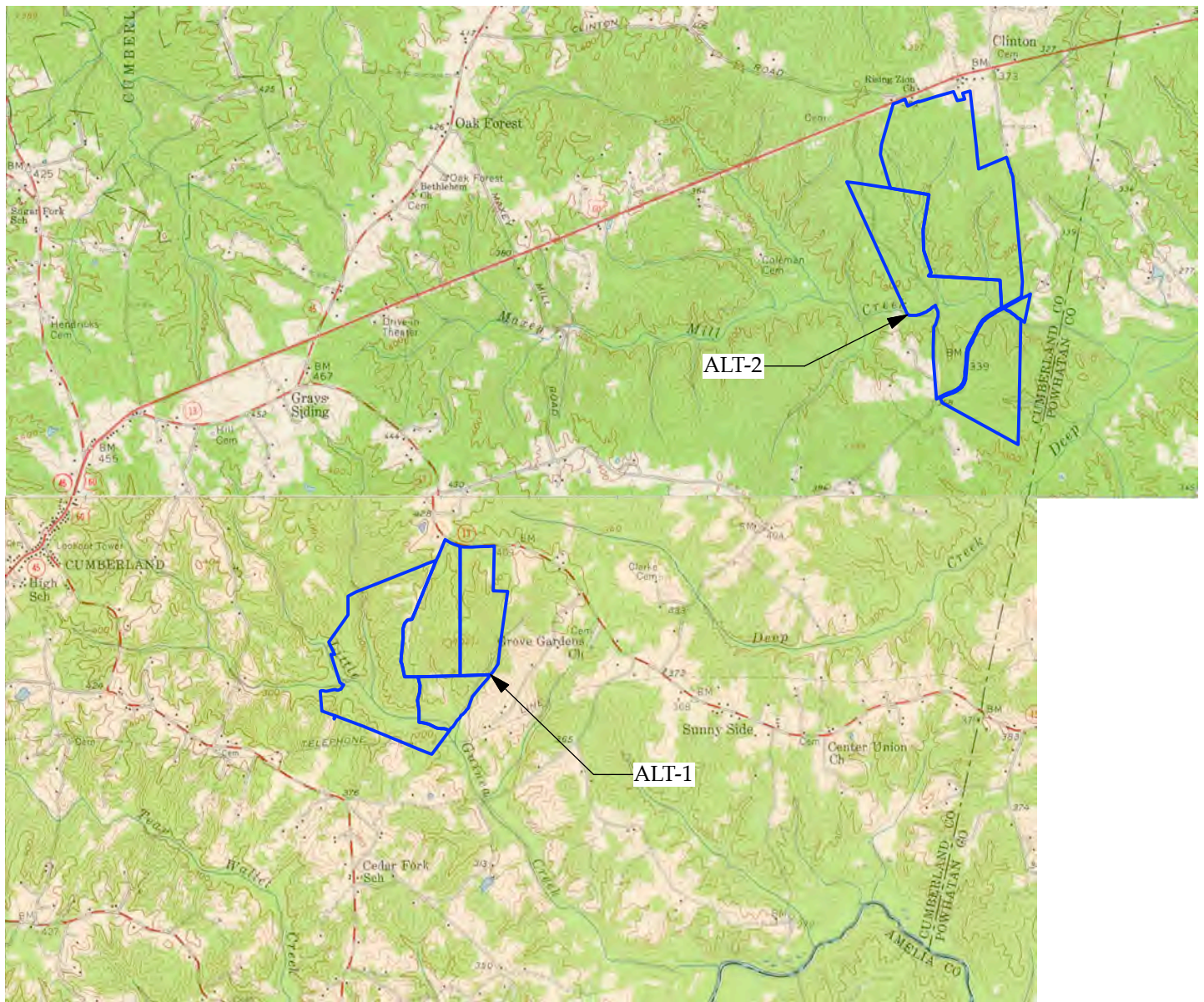


Figure 4. 1960 Lakeside Village and 1958 Jetersville 15' USGS Quad Sheets.

Alt-2 Prehistoric

The parcels are located on the south side of Rt. 60 just west of the community of Clinton. The parcels are directly across the road from Rising Zion Church. The parcels are bounded on the east and south by Rt. 654 and partially on the west by The Woods. Maxey Mill Creek cuts through the bottom 20% of the property. Two perennial streams feed the creek and cut the property into several linear strips. There are upland flats, spurs and spur tips that are suitable for prehistoric intermittent and seasonal occupation.

The expectation for prehistoric sites along the ridges, spurs and spur tips would be high due to the presence of stream cuts for hunting big game animals and for seasonal rounds for nut and berry gathering in the Archaic Period. These sites would be represented by stone chips from weapons/tool manufacture and maintenance with little expectation of subsurface deposits, although some sites do exhibit small numbers of pits.

Alt-2 Historic

The 1864 Gilmer Map of Cumberland County (Figure 5) shows William Hobson's house on the parcel south of Deep Creek. The North Fork of Deep Creek known later as Maxey Mill Creek does not have a mill, although there is a mill west of the parcels. The parcels are approximately bisected by the North Fork of Deep Creek. To either side of the creek there is arable cleared land shown on the uplands overlooking the creek and around the Hobson house.

The 15' Lakeside Village 1960 USGS Quad (Figure 6) shows Maxey Mill Creek. One of the two roads mentioned above are the probable location of the Maxey Mill. No structures are shown on the parcels, nor are there roads within the parcel part from the county road on the west side.

The expectation for historic sites is high based on the Gilmer Map. William H. Hobson owned 22 slaves and William T. Hobson owned 13 slaves in the 1850 Slave Schedule. There is a Samuel Garrett listed next in the owner sequence and there is a nearby S. Garrett to the W. T. Hobson. The presumption is that there may be both a house for the Hobson family, a house or houses at the main house and/or in adjacent fields for slaves.

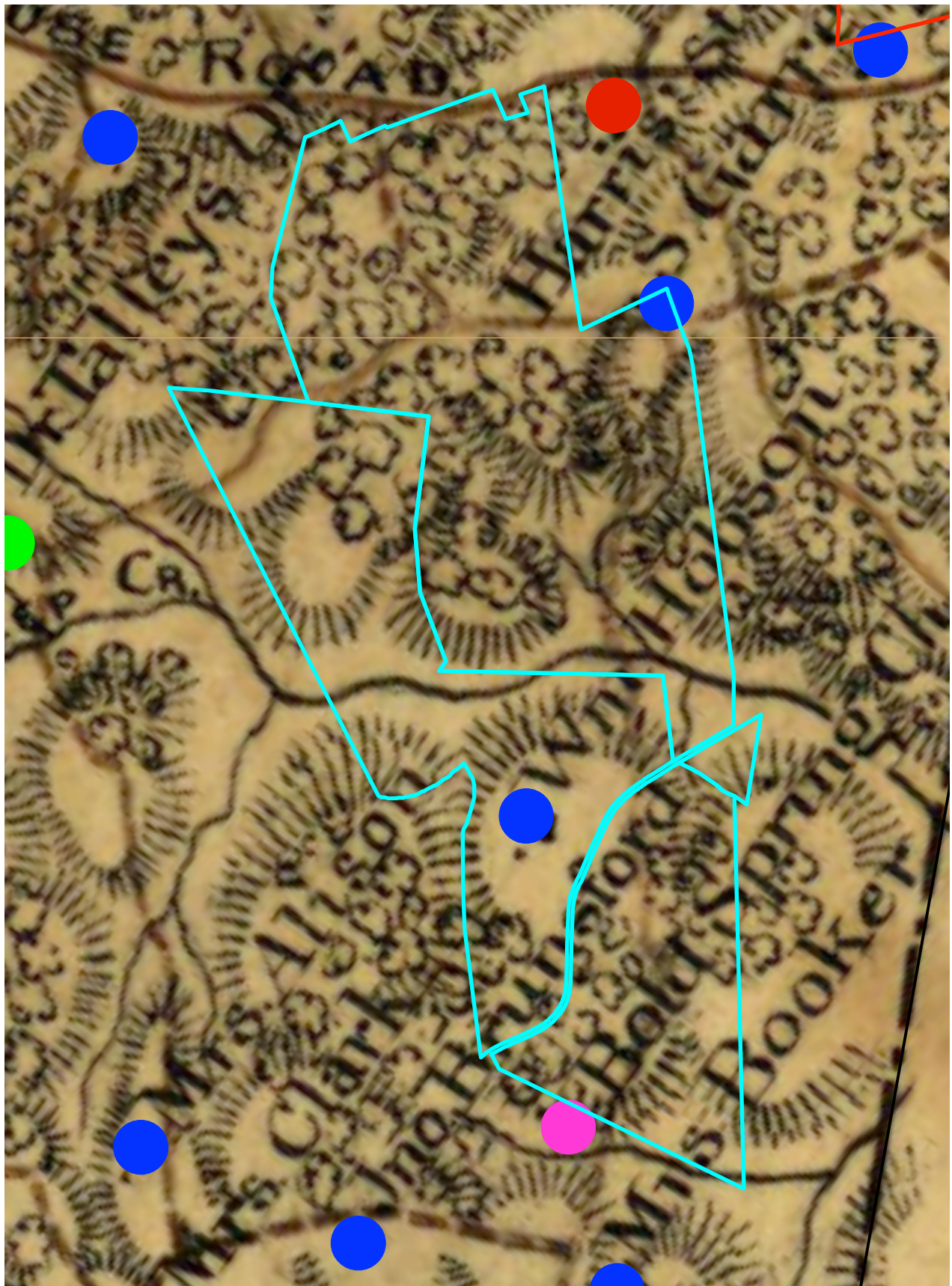


Figure 5. 1864 Gilmer Map of Cumberland County Showing Alt-2.

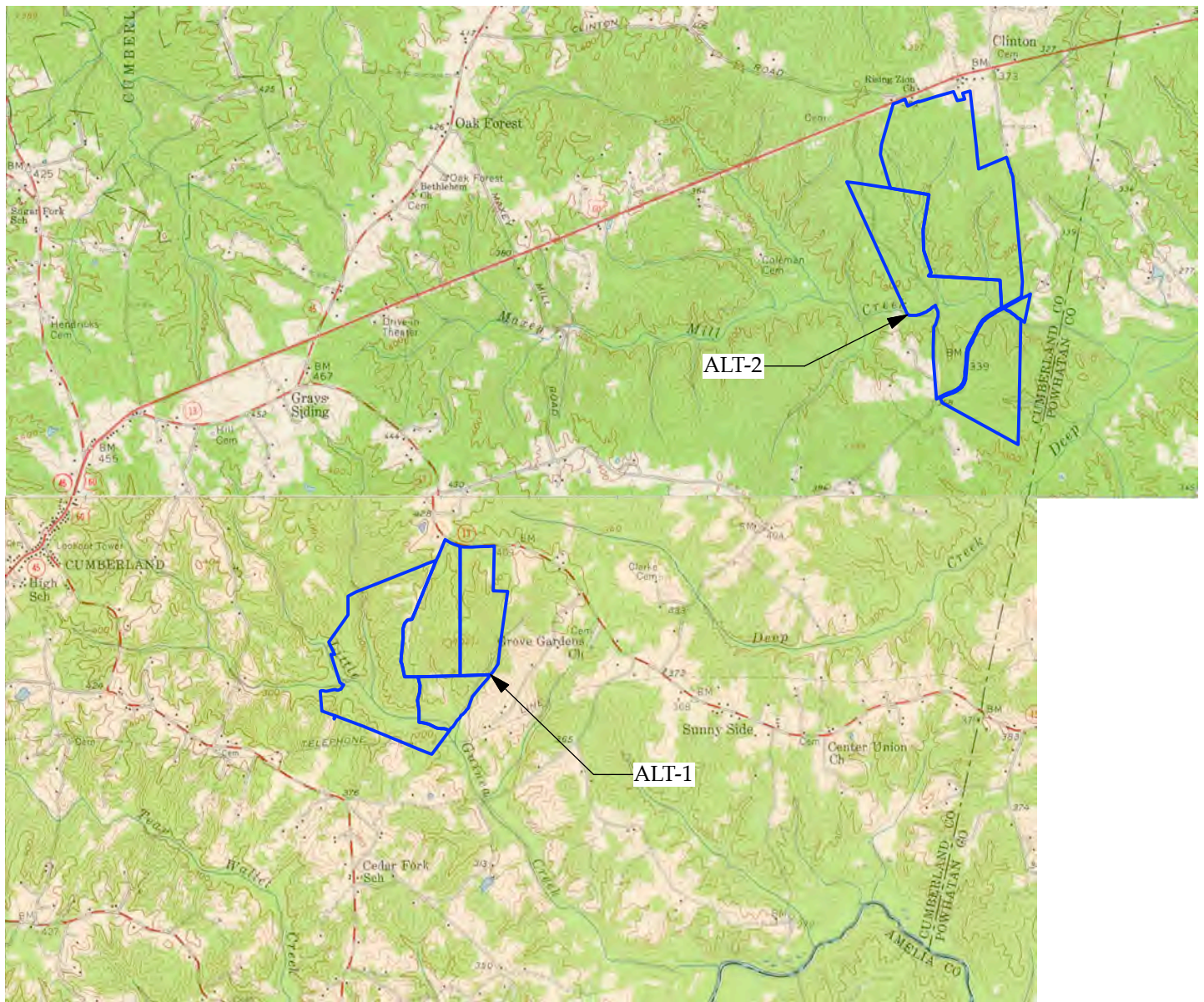


Figure 6. 1960 Lakeside Village and 1958 Jetersville 15' USGS Quad Sheets Showing Alt-2.

Alt 3 Prehistoric

The parcels are located on the west side of Rt. 45 straddling the Willis's River and nearly abutting the county border with Buckingham. The parcels east of the river are highly dissected uplands with erosion tongues oriented perpendicular to the ridge and the river. Both parcels have small streams approximately bisecting them leading to the river. The river and associated floodplain would provide riparian resources for Native Americans. The stream beds have corresponding streams on the southeast side of Rt. 45 that offer low-slope access by Cervidae (Deer, Elk) and Bison in their daily rounds from one watershed to another.

The west side of the river has similar terrain, but much wider spurs and significant floodplain for settlement. The parcel adjacent to Fork Swamp has a wide flattish area abutting onto floodplain that has produced Woodland period sites in other Piedmont locations. Most of the knowledge about Woodland Period sites comes from 1950's and 1960's investigations of palisaded villages whereas more dispersed villages are hardly represented in the site inventories.

The expectation for prehistoric sites along the ridges, spurs and spur tips would be high due to the presence of stream cuts for hunting big game animals and for seasonal rounds for nut and berry gathering in the Archaic Period. These sites would be represented by stone chips from weapons/tool manufacture and maintenance with little expectation of subsurface deposits, although some sites do exhibit small numbers of pits.

The nature of Late Woodland habitation is moderately understood where large rivers and extensive floodplains offer semi-permanent village site locales. These depended upon the arable soils for their incipient horticultural lifeway. The highly dissected inland terrain has multitudes of small, probably seasonally occupied sites, hunting stations and the like. Lithic procurements sites where suitable quartz outcrops occur are also likely. The floodplain at the site is suitable for a small Late Woodland and/or Contact period site.

Alt 3 Historic

The Willis River has historic canal navigation structures. The James River and Kanawha Canal system operated to Lynchburg by 1850. The Willis River Navigation began in 1774 and continued to past 1900. Just downstream from Alt 3 is Ca Ira to which a slackwater canal was built from the junction of the Willis and the James Rivers (Trout 1994). This was the head of navigation until 1816 when it was extended to Curdsville in 1816.

The 15' USGS quad (Figure 8) shows Rt. 634 crossing the river that also passes through the southwestern or upriver portion of the project. The Hillcrest 24k quad shows a road leading off Rt. 45 that also appears on the Farmville 15' and 30' USGS Quads. The road leads from Guinea Mills to the river and appears to be related to canal transport.

The 1864 Gilmer Map of Cumberland County (Figure 7) was examined to determine whether resources were present that were depicted on the map. Alt-3 borders Rt. 45 on the southeast. A straight copy and paste of the parcel boundaries was less than satisfactory as the middle of the parcel set was bisected by the Willis River and on the northeast was about 3100 feet from the northwest corner of the project set. Alt-3 did not project beyond Camp Branch. Route 632 with its characteristic bend appears on Gilmer as an additional placement point.

Placing a current property/parcel line onto an older map is seldom done with absolute accuracy. A process of "rubber-sheeting" whereby the overlaid parcel map is stretched to fit the available known points is accepted as a "best-fit" solution. With the given boundaries and anchors, there are two named houses within Alt-e and one map notation of "B.S." which may correspond to "base station" as used by surveyors currently. B.S. appears at other locations, each of which is on a roadway. Each major road has circles with dots in their centers that appear to denote where transits were located for the purposes of surveying the county. It is also possible that these were points at which shots were taken although they have far shorter line of sight distances than the map depicts.

Sources of "confusion" are a byword in historic research. Census tabulations are meant to be a list of every person residing in the United States and territories. Census takers did circuits each day. It has been observed that the spelling of names is often problematic, based on what the enumerator thought the persons name was and then how it was written. The cartographers who produced the Gilmer maps were on a wartime footing and had what can only be termed creative spellings. Mistakes of spelling and of place cannot be ruled out. In this case, the US Census had two parts: the enumeration of the people living in Cumberland County as defined by Federal Law; and the Slave Schedules that listed the owner of slaves as well as an information set about each slave, except for their names. Two such cases exist on Alt-3. O. Smith is shown on the Gilmer Map. The census lists Sion O. Smith (Assuming that Sion is actually correct). What is not known is what Smith was called in everyday life. The census would be a more formal listing while the Gilmer map could show the everyday name for the person. The transformation from the script of the earlier centuries to the far more legible and thus able to be digitized typeface is also a frequent source of error.

On the Gilmer map a Dr. Toles is shown. In the 1860 census, there is a William B. Towles who is a physician, but his name is spelled with the "w". On the slave schedules, the transliteration of slave owners showed a William B. Fowles with 20 slaves.

By listing the various spellings and then comparing where they are listed in relation to their neighbors, it is often possible to determine the location and spelling of the parties of interest. However, the dispositive spelling is in legal documents prepared by attorneys. O. Smith and Dr. Toles (Towles, Fowles) are shown on the map. Smith is near Rt. 45 and Toles is on the west side of Big Willis River. Smith's house is along Rt. 45 and he is listed as owning 10 slaves. The map shows the upland ridge that Rt. 45 centerlines and it shows cleared land on the ridge and on one erosion tongue overlooking the river. The other two erosion tongues appear as wooded.

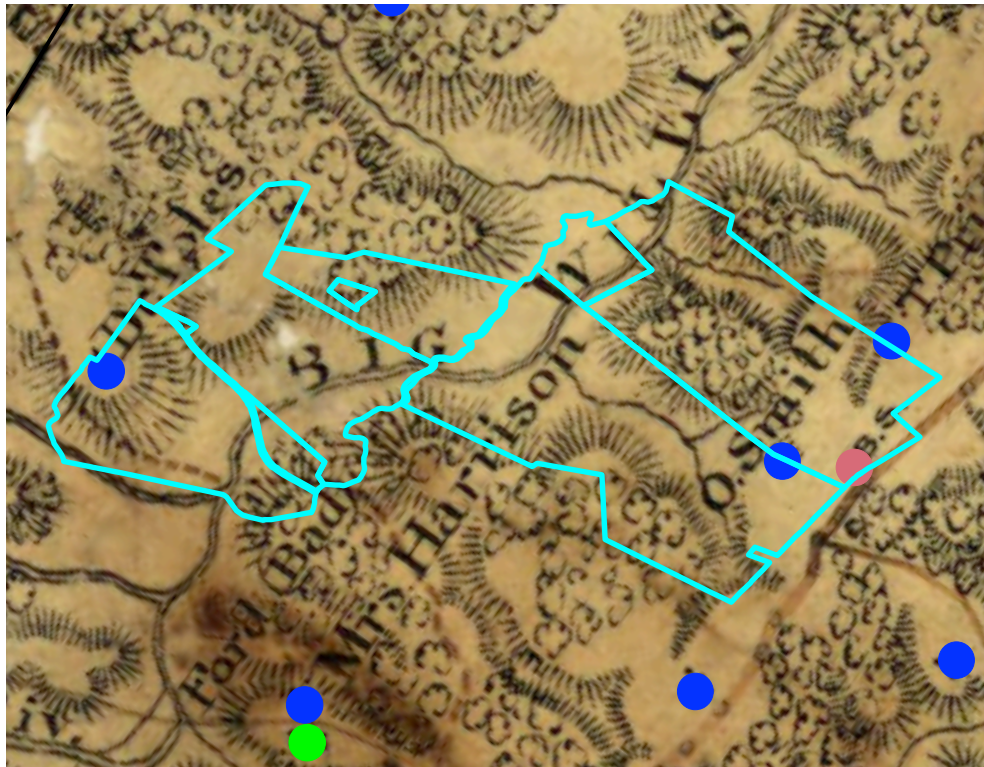
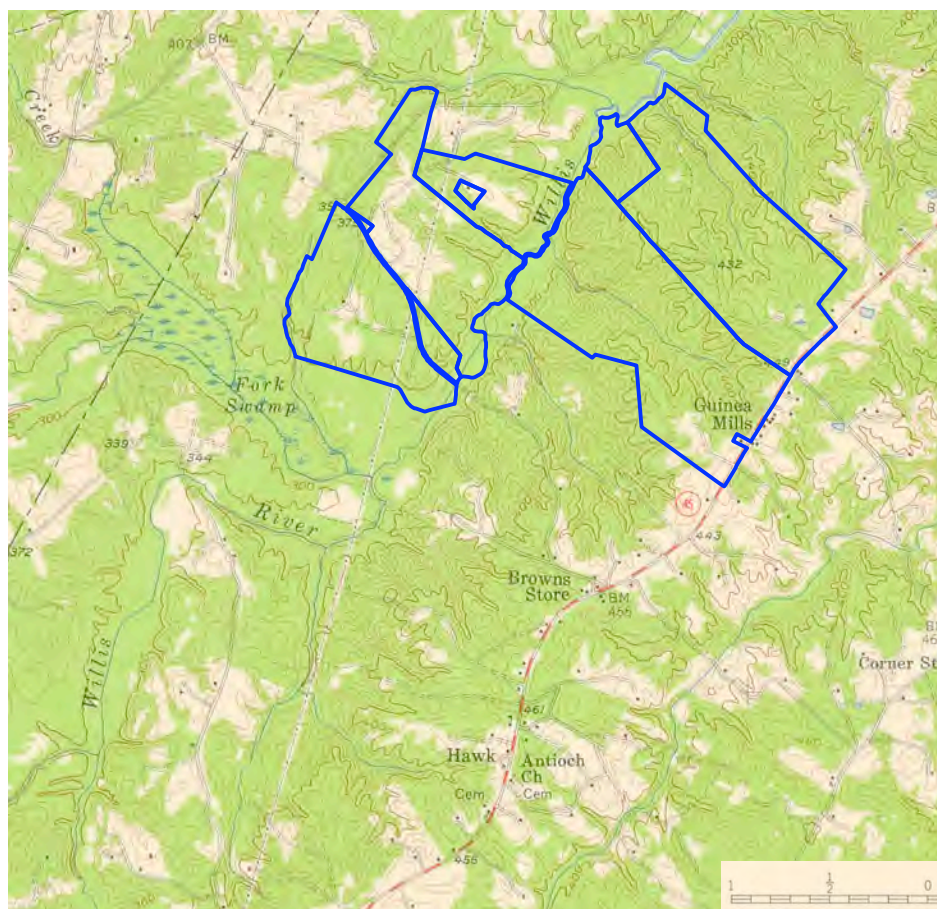


Figure 7. 1864 Gilmer Map of Cumberland County Showing Alt-3.



Toles is listed as having 20 slaves in the 1860 Slave Schedule with a total value of \$16,605 and had 4 slave houses listed as well. The terrain is entirely suitable for agricultural pursuits and with the number of slaves that Dr. Toles (Towles, Fowles) owned, it is highly likely that there will be outlying slave quarters on his property. Towles property has upland ridge terrain that is open as well as erosion tongues that are wooded. The property includes a road leading to the river and crossing it, thus either a bridge or ford would be present.

In the historic period as depicted on the 1864 Gilmer Map, the land in Alt-3 is in agricultural fields, forest and floodplain. Slave ownership figures have 30 slaves on the parcels. While there will be houses in the main compound for each for the owners and slaves, there is a very high probability that there will also be separate field quarters located at a distance from the house.

The presence of Willis's River Navigation structures is highly probable, along with at least one bridge or ford.

The 1958 Farmville USGS 15' Quad (see Figure 8) shows the road across the Willis's River and shows several roads leading into the parcels adjoining Rt. 45 towards the river. There are clear patches shown that might indicate former habitation sites. One extant structure is shown at the base of the floodplain on the east side of the river and three extant structures are shown on the west side of the river on the uplands..

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.

Summary & Recommendations

It is no exaggeration to say that for any acreage similar to that of the chosen alternative, the population and structural density will have similar numbers. At this point, while the names of the property owners are known but for one, additional research will need to be done to show how many people lived on these properties and when they lived there and when historic occupation started. Exhaustive research of this nature is in the vast majority of cases reserved for structures in the chosen alternative. It is certain that any 19th century structural complex will require a Phase II investigation if affected. The Gilmer Map is a snapshot in time and how far back to the first land patentees the particular parcel reaches can only be determined by a deep title search.

The prehistoric potential for the three alternatives is much higher than for the chosen alternative due to the presence of watercourses that penetrate inland from larger water courses. Any structure or boat remnant associated with the historic Willis's River Navigation is without doubt going to require additional investigation.

The historic potential for Alt-1 and Alt-2 is lower than that of the chosen alternative and higher for Alt-3 than that of the chosen alternative.

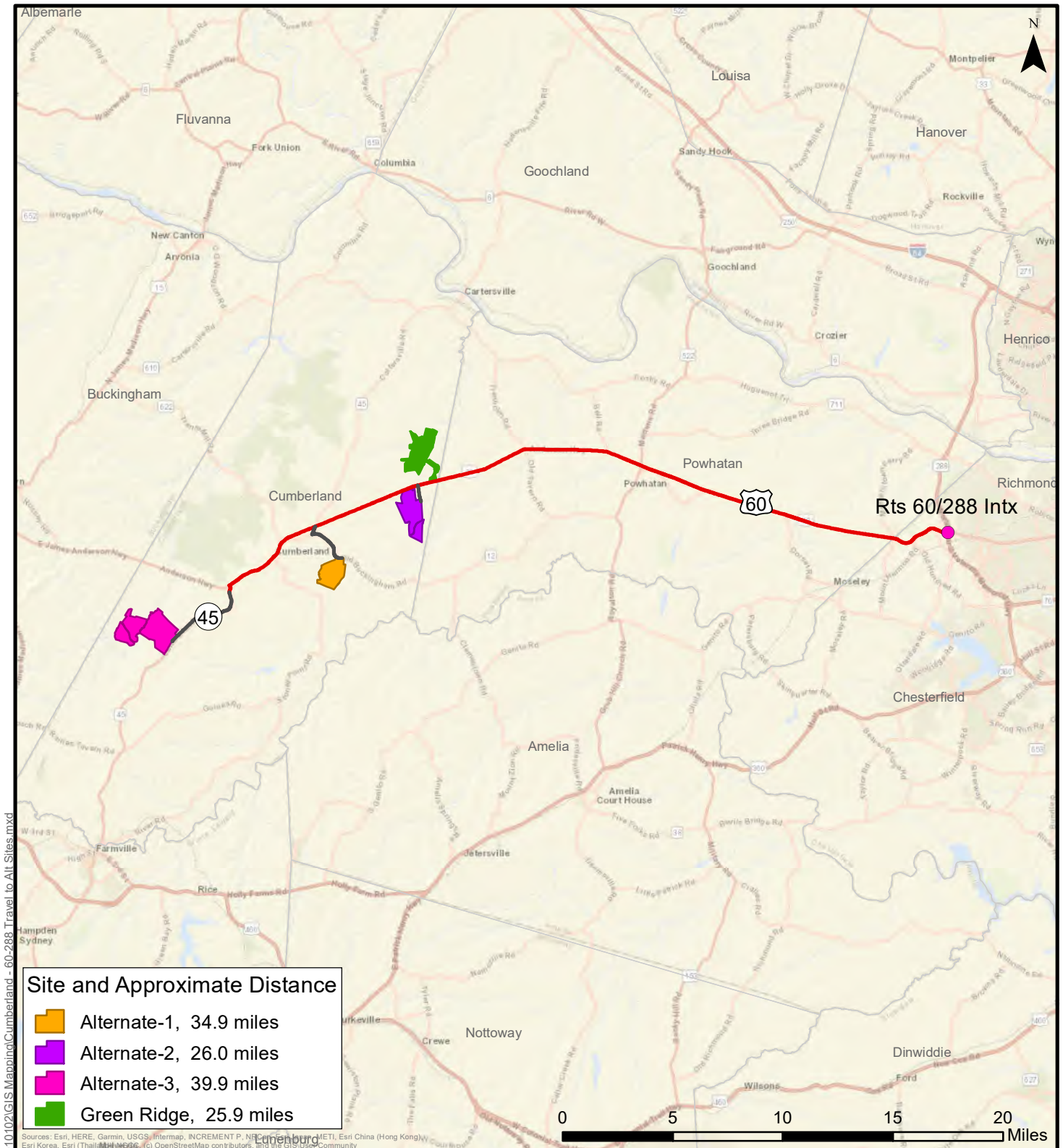
Combining the potential for archaeological sites for each of the alternatives, Alt-1, Alt-2 and Alt-3 all have a higher potential for the presence of archaeological sites based upon standard settlement models than the chosen alternative.

References Cited

Trout, William E., III
1994 The Slate And Willis's Rivers Atlas. VA Canals and Navigations Society
Publication.

APPENDIX 8

FIGURE AND TABLE - TRANSPORTATION ROUTES, MILEAGE AND FUEL CONSUMPTION



**Approximate Travel Distances
to Alternate Sites
From Intersection of Routes 288 and 60**

Green Ridge
Recycling and Disposal Facility
Cumberland Co., Virginia

SCALE: 1:400,000

PROJECT: 18020117-110102

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: SMF
CHECKED: LPK
DATE: 10-14-21

FIGURE

1

GREEN RIDGE RECYCLING AND DISPOSAL FACILITY
TRANSPORTATION DISTANCES TO SITES
INTERSECTION OF ROUTE 288 AND ROUTE 60
ASSUMED 80% OF 5,000 TONS PER DAY

Travel days per year	312 days
Tonnage per truck	20 tons
Total trucks per day	200 trucks
Avg. Miles per gallon	8 mpg
Fuel cost	\$4.00 per gallon
Carbon emissions	22.2 pounds per gallon of diesel

SITE	ONE WAY MILEAGE	DAILY TOTAL ROUND TRIP MILEAGE	ANNUAL MILEAGE	ANNUAL FUEL CONSUMPTION (Gallons)	ANNUAL CARBON EMISSIONS (Pounds)	ANNUAL FUEL COSTS
Green Ridge	25.9	10,360	3,232,320	404,040	8,969,688	\$1,616,160
Alternative 1	34.9	13,960	4,355,520	544,440	12,086,568	\$2,177,760
Alternative 2	26.0	10,400	3,244,800	405,600	9,004,320	\$1,622,400
Alternative 3	39.9	15,960	4,979,520	622,440	13,818,168	\$2,489,760

APPENDIX 9

REPORT - KBJW - THREATENED AND ENDANGERED SPECIES



Green Ridge Recycling and Disposal Facility Threatened and Endangered Species Technical Memorandum May 6, 2021

Background

Federal- and state- listed species that are found in Virginia including Cumberland County (County), generally require specialized habitat for continued survival. A total of six (6) protected species are potentially known, known, and/or likely to occur within the County. Listed species in Cumberland County include the Northern long-eared bat (*Myotis septentrionalis*), Yellow Lance (*Elliptio lanceolata*), Atlantic Pigtoe (*Fusconaia masoni*), Brook Floater (*Lasmigona subviridis*), Green Floater (*Lasmigona subviridis*), and Loggerhead Shrike (*Lanius ludovicianus*) (**Table 1**). Listed bivalves (mussel) species have been documented in the James River and Appomattox River. According to the Virginia Department of Wildlife Resources no observations have been confirmed in their associated tributaries.

Table 1: Listed Species Known or Likely to Occur in Cumberland County

Common Name	Scientific Name	Legal Status	IPAC	VAFWIS Confirmed Observation	DCR-DNH
Northern long-eared bat	<i>Myotis septentrionalis</i>	FT	X		
Yellow Lance	<i>Elliptio lanceolata</i>	FT/ST			X
Atlantic Pigtoe	<i>Fusconaia masoni</i>	FPT/ST	X	P	X
Brook Floater	<i>Lasmigona subviridis</i>	ST		P	
Green Floater	<i>Lasmigona subviridis</i>	ST		P	X
Loggerhead Shrike	<i>Lanius ludovicianus</i>	ST			X
Total	6 listed species		2	3	4

FT = Federally Threatened, FPT = Federally Proposed Threatened, ST = State Threatened
X = confirmed within the County, P = Potential

On September 1, 2020, a single Joint Permit Application (JPA) was submitted to the Virginia Marine Resource Commission (VMRC) to gain authorization for permanent fill impacts as part of the Green Ridge Facility project. The JPA was received by the VMRC on September 2, 2020 for distribution to the federal and state review agencies. Pursuant to Section 7 of the Threatened and Endangered Species Act, a U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Consultation (IPAC) system database search was conducted on May 6, 2019 as part of Section 7 of the JPA submittal (USFWS consultation code: 05E2VA00-2018-SLI-4952, Project Name: Cumberland County Wetland Delineation - Landfill) to identify threatened, endangered, proposed and candidate species that may occur within the **Green Ridge Facility** project.

On September 10, 2020, the US Army Corps of Engineers (USACE) in coordination with the USFWS submitted a formal review (USFWS consultation event code 05E2VA00-2020-TA-6063) for the Northern long-eared bat effects determination for the **Green Ridge Facility** project. Documentation of this coordination can be found on the USACE Public Notice website <https://www.nao.usace.army.mil/Media/Public-Notices/Tag/175585/green-ridge/>. To date the project is under review and a permit is pending.

Under 50 CFR 402.12(e) the accuracy of the species list should be verified after 90 days. Therefore, on January 29, 2021, February 1, 2021, and February 15, 2021. Additionally, to ensure no new species were identified, a follow up database search was conducted on May 6, 2021. Koontz Bryant Johnson Williams (KBJW) environmental



scientist reviewed the **Green Ridge Facility** project including the Green Ridge Facility (Green Ridge, preferred), Alternative 1, Alternative 2, and Alternative 3 located in Cumberland County, Virginia (**Exhibit 1**) to verify the occurrence of threatened and endangered species that may occur within a five (5)-mile search radius and/or sub-watersheds (12-digit hydrologic unit code (HUC)) of the project/parcel boundary(s). To ensure the protection and continued survival of federally and/or state listed threatened and endangered species, a desktop analysis was conducted for any listed, proposed or candidate species that may be present in the parcel boundary.

Desktop Analysis

KBW conducted database searches and used best professional judgement to assess potential impacts that may occur to threatened and endangered species as a result of the **Green Ridge Facility**. KBW queried threatened and endangered species databases to determine if any federal- and/or state-listed species have been documented within five (5)-mile search radius and/or sub-watersheds of each Alternative as shown on (**Exhibit 2**). The database searches include the USFWS IPAC database, Virginia Fish and Wildlife Information Service (VAFWIS) of the Virginia Department of Wildlife Resources (VDWR) formerly Virginia Department of Game and Inland Fisheries (VDGIF), and the Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR-DNH) online searchable available databases (**Exhibit 3-5**).

As part of IPAC environmental review process a five (5)-mile search radius around the project/parcel boundary was used as the action area for each Alternative. Listed species and resources under the Endangered Species Act that should be considered for protection were displayed. Formal consultation for the **Green Ridge Facility** has been initiated with the USFWS. Therefore, an official species list generated by the USFWS is included as part of this memorandum. An official species response has not been initiated for consultation with the USFWS for Alternates 1-3. However, a 5-mile search radius from the parcel boundary has been entered into IPAC to determine the presence and/or absence of listed species. The VAFWIS of the VDWR maintains the most current comprehensive information about Virginia's wildlife resources including protected species. The coordinates of each Alternative's parcel boundary location were entered as Latitude/Longitude (decimal degrees). A five (5)-mile search buffer around the parcel boundary was used to generate a list of protected species known or likely to occur within the buffer. Under the Virginia Endangered Plant and Insect Act (Section: 3.1-1020 -1030, Code of Virginia), the Virginia Department of Agriculture and Consumer Services (VDACS) has regulatory responsibility of listing and protecting endangered and/or threatened plants and insects. An agreement between DCR-DNH and VDACS allows DCR-DNH to recommend species for listing to the regulatory agencies. DCR-DNH's database query limits its search to the sub-watershed (12-digit HUC) boundary. Therefore, each Alternative was reviewed by its associated 12-digit HUC boundary.

Bald eagles (*Haliaeetus leucocephalus*) are protected under the Bald and Golden Eagle Protection Act which prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. A search of the nearest nesting location and concentration area is included as part of this memorandum to determine if this species would be affected by the project as shown on **Exhibit 6**.

Species Background

Northern Long-eared Bat (*Myotis septentrionalis*)

The northern long-eared bat was listed by the USFWS as threatened on April 2, 2015. The listing became effective on May 4, 2015. The northern long-eared bat is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending southward to parts of southern states from Georgia to Louisiana, even reaching into eastern Montana and Wyoming. Virginia is within the native range of the northern long-eared bat.

Suitable winter habitat (hibernacula) for the northern long-eared bat includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius or 32-48.2 degrees Fahrenheit) with high humidity and minimal air currents. Northern long-eared bats will typically hibernate between mid-fall through mid-spring each year.

During the summer, northern long-eared bats roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥ 3 inches diameter at breast height [DBH]). Northern long-eared bats have also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). Northern long-eared bats emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. Suitable



summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. Northern long-eared bats typically occupy their summer habitat from mid-May through mid-August each year.

The greatest and most immediate threat for the northern long-eared bat is the disease white-nose syndrome (WNS). Specifically, declines due to WNS have significantly reduced the number and size of northern long-eared bat populations in some areas of its range. This disease has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand.

Yellow Lance (*Elliptio lanceolata*)

The yellow lance was federally listed as threatened on May 3, 2018 and state listed as threatened on July 1, 2019. It is known to occur in Maryland, Virginia, and North Carolina. No stable populations are known in Virginia. The yellow lance is a freshwater mussel that prefers clean, coarse to medium sized sands as stream bed substrate and is sometimes found in a gravel substrate of medium sized to smaller streams. The species is dependent on clean, moderate flowing water with high dissolved oxygen. It is found buried deep and moves with shifting sands at the downstream end of stable sand and gravel bars.

To successfully reproduce it relies on host fish where the glochidia must attach to gills or fins to continue to develop. Some of the conservation challenges that contribute to the decline of this species are pollution, sedimentation, and dams.

Atlantic Pigtoe (*Fusconaia masoni*)

The Atlantic pigtoe has been listed as federally proposed threatened on October 11, 2018. On September 22, 2020, the USFWS under the Endangered Species Act reopened the 30-day comment period for listing the species as federally threatened. In Virginia, its historical range included the James and Chowan River basins. The Atlantic pigtoe is a freshwater mussel species that prefers coarse sand and gravel of relatively fast-moving waters of small creeks to larger rivers and is rarely found in silt and detritus. Generally, it can be found inhabiting rivers with excellent water quality with a silt-free substrate. This species is being threatened by water pollution coming directly from sites such as sewage treatment plants, road drainage runoff, private wastewater discharges, or other sources; erosion; or dams that affect mussel populations by disrupting natural flow patterns, scouring river bottoms, changing water temperatures, and fragmenting habitat. To successfully reproduce it relies on host fish where the glochidia must attach to gills or fins to continue to develop. This mussel species is considered a short-term breeder.

Green Floater (*Lasmigona subviridis*)

The green floater has been listed as state threatened on July 1, 2006. It can be found from New York south to Georgia and west to Tennessee. This species inhabits small to medium-sized streams with sand and gravel bottoms and low current with water depths of one (1) to four (4) feet. It occurs in calm water areas with low to medium gradient such as pools and is intolerant of strong currents, flooding, or droughts. Good water quality is important to this species existence. The introduction of non-native mussel species including zebra mussels and Asian clams have negatively impacted green floater populations.

Loggerhead Shrike (*Lanius ludovicianus*)

The loggerhead shrike was state listed as threatened in Virginia in January 1992. It was once common throughout the United States; however, the species has undergone a substantial decline. It is believed that the population decline of the species is due to loss of habitat, pesticide contamination, disease, climate change, and competition with kestrels or starlings but this is only speculation. The exact reason is unknown.

Loggerhead shrike foraging habitat includes areas of open country with grassland having scattered shrubs and trees where it can perch on fence posts, telephone poles or open tree limbs. Most of the time it forages in areas of short grass. It relies on thorns, barbed wire, or other sharp objects to impale its prey since they do not have talons like a raptor. Its primary food source includes invertebrates, but it will also feed on snakes and small birds. It breeds in more open spaces and avoids dense deciduous woods as nesting areas. Loggerhead shrikes have been found nesting in conifers, spruces, firs, pines, apple trees and other low trees, elms, cottonwoods, hawthorns, and oaks and are never far from farmed lands.

Bald Eagle (*Haliaeetus leucocephalus*)



Bald eagles are no longer federally- or state-listed. Bald eagles were removed from the federal list in 2007 and from the state list in 2013. The bald eagle is common throughout Virginia where there is suitable habitat. They are a common summer and winter visitor in the Chesapeake Bay region and nearby counties. The bald eagle forages along coastal areas, rivers, and large bodies of water. Nesting sites are commonly located in large, forested areas adjacent to marshes, on farmland, or in seed tree cut-over areas. Although some threats, such as contaminants or habitat loss may occur on a localized basis, none of the existing or potential threats are likely to cause the bald eagle to become in danger of extinction within the foreseeable future throughout all or any significant portion of its range.

Results

The results of the database queries are included as part of this documentation. Species identified in February were consistent with the May query. Species that were identified in the vicinity of each Alternative are identified in **Table 2** below. Possible winter and suitable summer roosting and foraging habitat have not been identified within the vicinity of each Alternative as shown on **Exhibit 7**. Additionally, to document the presence of any of bald eagle nests within the vicinity of each Alternative, a search of the Center for Conservation Biology Eagle Nest Locator mapping was searched to identify if eagle nest are in the vicinity of each Alternative (**Table 3**).

Table 2: Potential Listed Species Known and/or Likely to Occur within 5 miles of each Alternative

Common Name	Scientific Name	Legal Status	Green Ridge	Alt. Site 1	Alt. Site 2	Alt. Site 3	IPaC	VAFWIS Confirmed Observation within a 5-mile search radius	DCR-DNH (12 Digit HUC)
Northern long-eared bat	<i>Myotis septentrionalis</i>	FT	X	X	X	X	X		
Yellow Lance	<i>Elliptio lanceolata</i>	FT/ST	X*						X
Atlantic Pigtoe*	<i>Fusconaia masoni</i>	FPT/ST	X*						X*
Green Floater*	<i>Lasmigona subviridis</i>	ST	X*						X*
Loggerhead Shrike	<i>Lanius ludovicianus</i>	ST	X						X
Total	5 listed species		5	1	1	1	1	0	4

FT = Federally Threatened, FPT = Federally Proposed Threatened, ST = State Threatened, BGEPA = Bald and Golden Eagle Protection Act (within 660')

X = confirmed database search result

*on-site survey for the imperiled freshwater mussels was conducted. See Appendix F, Section 7 of the JPA "Surveys for Protected Freshwater Mussels at the Proposed Green Ridge Facility in Cumberland County, VA"

Table 3: Approximate Distance to Known Bald Eagle Nest for each Alternative

Common Name	Scientific Name	Legal Status	Green Ridge	Alt. Site 1	Alt. Site 2	Alt. Site 3
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA	7.6 miles	13.8 miles	9.5 miles	13.5 miles

The VAFWIS of the VDWR has documented species occurrence as known or likely to occur within the 6th order hydrologic unit boundary. Based on this information only mussel species are known or likely to occur within sub-watershed, JM71, which encompasses the Green Ridge parcel boundary as shown in **Table 4**. Listed species occurrences is shown on **Exhibit 8** by sub-watershed where they are known and/or likely to occur. Generally, these species are associated with the James River which is located approximately 13.7 river miles north north/east of the Green Ridge Alternative. None of the listed mussel species have been documented as confirmed within 5-mile search radius of the Green Ridge or the other Alternatives. Bald eagles are not known or likely to occur within each sub-watershed search as shown on **Table 5**.



Table 4: Listed Species Known or Likely to Occur within a Sub-watershed

Common Name	Scientific Name	Legal Status	Green Ridge	Alt. Site 1	Alt. Site 2	Alt. Site 3
Northern long-eared bat	<i>Myotis septentrionalis</i>	FT	N	N	N	N
Yellow Lance	<i>Elliptio lanceolata</i>	FT/ST	Y	N	N	N
Atlantic Pigtoe	<i>Fusconaia masoni</i>	FPT/ST	Y	N	N	N
Green Floater	<i>Lasmigona subviridis</i>	ST	Y	N	N	N
Loggerhead Shrike	<i>Lanius ludovicianus</i>	ST	N	N	N	N
Sub-watershed			JM71	JA19	JM73	JM66 JM64
Total			Y=3, N=2	Y=0, N=5	Y=0, N=5	Y=0, N=5

Y = Yes, N = No

JM71 = Muddy Creek, JA19 = Little Guinea Creek-Appomattox River, JM73 = Maxey Mill Creek-Deep Creek, JM66 = Buffalo Creek-Willis River, JM64 = Whispering Creek-Willis River

Table 5: Bald Eagles Known or Likely to Occur within a Sub-watershed

Common Name	Scientific Name	Legal Status	Green Ridge	Alt. Site 1	Alt. Site 2	Alt. Site 3
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA	N	N	N	N
Sub-watershed			JM71	JA19	JM73	JM66 JM64

N = No

JM71 = Muddy Creek, JA19 = Little Guinea Creek-Appomattox River, JM73 = Maxey Mill Creek-Deep Creek, JM66 = Buffalo Creek-Willis River, JM64 = Whispering Creek-Willis River

Alternatives

Green Ridge (13.7 river miles to threatened and endangered waters, James River):

Northern Long-eared Bat (*Myotis septentrionalis*)

The Green Ridge Alternative does not contain suitable winter hibernacula or habitat for the northern long-eared bat; the nearest known winter hibernacula is approximately 79.3 miles away from the study area. Suitable summer roosting and foraging habitat does exist in the study area, although the closest known maternity roost is approximately 87 miles away from the Green Ridge parcel boundary.

On September 10, 2020, the USACE in coordination with the USFWS submitted an assisted determination key (Dkey) for the northern long-eared bat. The results of the Dkey can be found in **Exhibit 9**.

Mussel Species (Yellow lance (*Elliptio lanceolata*), Atlantic Pigtoe (*Fusconaia masoni*), and Green Floater (*Lasmigona subviridis*))

Protected mussel species including the yellow lance (*Elliptio lanceolata*), Atlantic pigtoe (*Fusconaia masoni*), and green floater (*Lasmigona subviridis*) were identified by the DCR-DNH as known to occur within the Muddy Creek-Davis Creek sub-watershed. To further document this species existence within the watershed a five (5)-mile search radius of the VAFWIS was performed. The database search result did not confirm protected mussel species are located within 5-miles of the Green Ridge Alternative. Additionally, IPAC did not identify any federally protected mussels to occur in the area. On-site surface waters flow to threatened and endangered waters (James River) located approximately 13.7 river miles away. Therefore, on May 25th and 26th, 2019, biologists Brett Ostby and Braven Beaty of Daguna Consulting, LLC visited the Green Ridge property to assess potential mussel habitat in streams and conduct surveys for freshwater mussels where necessary. Surveys were conducted to meet the requirements of "Abbreviated Surveys" as defined in "Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2013)". Most efforts focused on Muddy Creek and Maple Swamp Creek. "None of the Muddy Creek tributaries draining the Green Ridge property appeared to provide suitable habitat for native mussels. We found no evidence



to suggest Maple Swamp Creek or its tributaries were inhabited by native mussels” (see Duguna Consulting, “**Surveys for Protected Freshwater Mussels at the Proposed Green Ridge Recycling and Disposal Facility in Cumberland County, VA Report**” dated May 29th, 2019, Revised August 15th, 2019, Final Revision December 5th, 2019. This document was included in the original JPA submittal on September 9th, 2020 and distributed to the USACE and DEQ.

James Spiny mussel (*Pleurobema collina*)

The James spiny mussel was not listed as confirmed in the results of the database searches as part of the JPA submitted on September 1, 2020. An updated database search was conducted to determine the presence of this species in the area. The search results were consistent with past results as being not confirmed within a five (5) mile search radius. The species is known to occur in the James River basin however, the current range of this species is unknown. The James River is located along the northern portion of the County. Due to the presence of this species in the James River, habitat may exist in tributaries feeding James River. Therefore, as part of a due diligence an on-site search for this mussel species was included as part of the “**Surveys for Protected Freshwater Mussels at the Proposed Green Ridge Recycling and Disposal Facility in Cumberland County, VA Report**”. The results of the survey indicate “None of the Muddy Creek tributaries draining the Green Ridge property appeared to provide suitable habitat for native mussels. We found no evidence to suggest Maple Swamp Creek or its tributaries were inhabited by native mussels”.

Loggerhead Shrike (*Lanius ludovicianus*)

The Green Ridge Alternative is unlikely to contain suitable habitat for the loggerhead shrike. Historically, the majority of the area appeared to be dense woodlands with planted pine used for timber production. Based off the most recent aerial imagery as shown on Google Earth, the parcel has large areas that have been managed for timber production. VDWR has not confirmed this species as being within a five (5) mile search radius. Open areas with hunting perches may exist within portions of the area. However, the landscape has been altered and is continually being managed for timber production and is in an early successional phase of regrowth. No suitable grasslands have been identified within the parcel boundary.

Bald Eagle (*Haliaeetus leucocephalus*)

The nearest known bald eagle nest is located approximately 7.6 miles from a *Green Ridge Alternative* ; therefore, it is unlikely that the project will disturb nesting bald eagles. Additionally, a bald eagle concentration area is approximately 44.5 miles from this alternative which will not be intersected.

Alternative 1 (34.5 miles to threatened and endangered waters, Appomattox River):

Northern Long-eared Bat (*Myotis septentrionalis*)

Alternative 1 does not contain suitable winter hibernacula or habitat for the northern long-eared bat; the nearest known winter hibernacula is approximately 80.3 miles away from the study area. Suitable summer roosting and foraging habitat does exist in the study area, although the closest known maternity roost is approximately 84.5 miles away from Alternative 1 parcel boundary.

Bald Eagle (*Haliaeetus leucocephalus*)

The nearest known bald eagle nest is located approximately 13.8 miles from *Alternative 1*; therefore, it is unlikely that the project will disturb nesting bald eagles. Additionally, a bald eagle concentration area is approximately 47.2 miles from this alternative which will not be intersected.

Alternative 2 (15.2 river miles to threatened and endangered waters, James River):

Northern Long-eared Bat (*Myotis septentrionalis*)

Alternative 2 does not contain suitable winter hibernacula or habitat for the northern long-eared bat; the nearest known winter hibernacula is approximately 80.7 miles away from the study area. Suitable summer roosting and foraging habitat does exist in the study area, although the closest known maternity roost is approximately 87 miles away from Alternative 2 parcel boundary.

Bald Eagle (*Haliaeetus leucocephalus*)

The nearest known bald eagle nest is located approximately 9.5 miles from *Alternative 2*; therefore, it is unlikely that the project will disturb nesting bald eagles. Additionally, a bald eagle concentration area is approximately 44.2 miles from this alternative which will not be intersected.



Alternative 3 (47.2 river miles to threatened and endangered waters, James River):

Northern Long-eared Bat (*Myotis septentrionalis*)

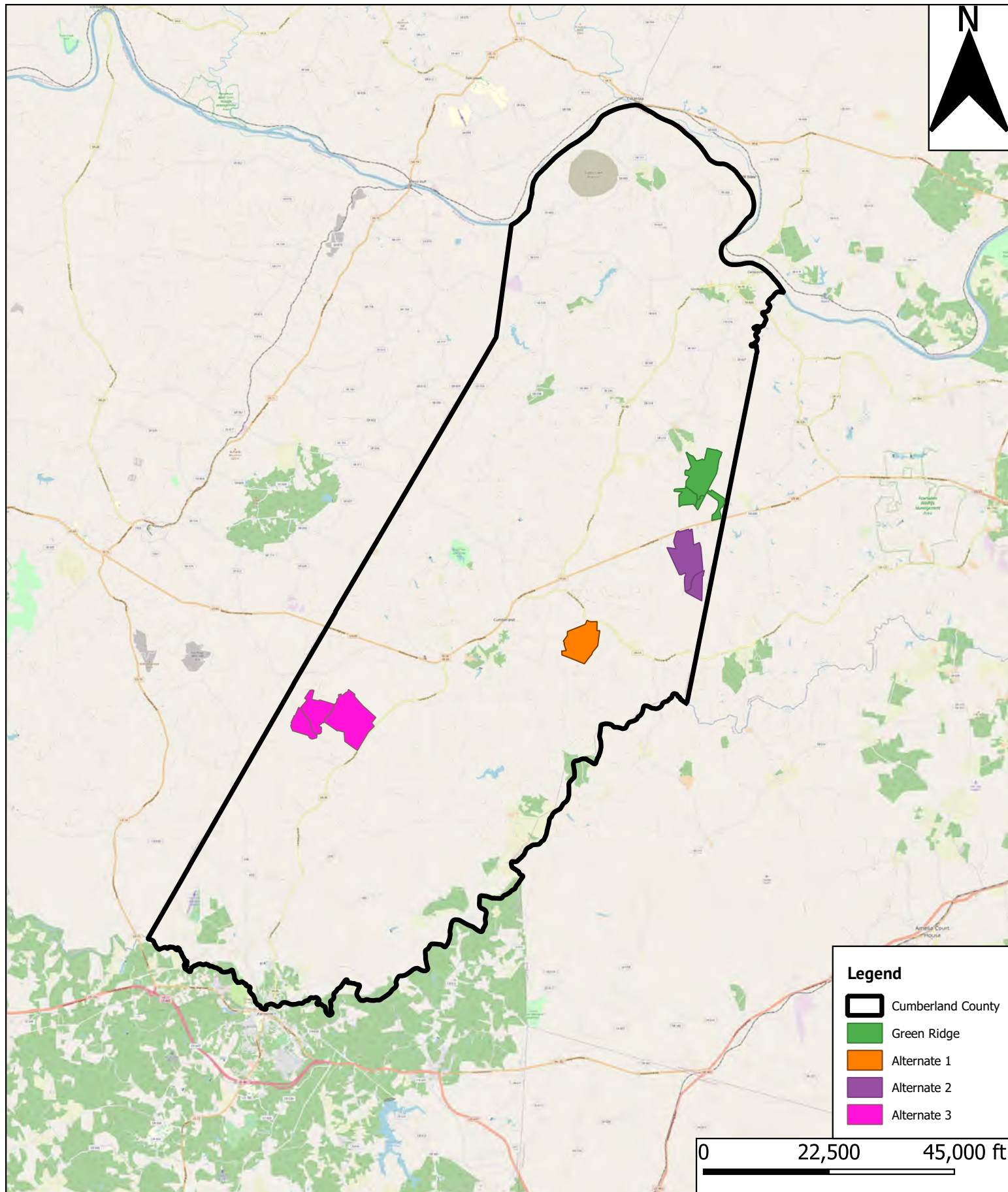
Alternative 3 does not contain suitable winter hibernacula or habitat for the northern long-eared bat; the nearest known winter hibernacula is approximately 76.5 miles away from the study area. Suitable summer roosting and foraging habitat does exist in the study area, although the closest known maternity roost is approximately 76.1 miles away from Alternative 3 parcel boundary.

Bald Eagle (*Haliaeetus leucocephalus*)

The nearest known bald eagle nest is located approximately 13.5 miles from *Alternative 3*; therefore, it is unlikely that the project will disturb nesting bald eagles. Additionally, a bald eagle concentration area is approximately 55.6 miles from this alternative which will not be intersected.

Exhibits

**Exhibit 1:
Location Map**



Project Name: Green Ridge Recycling and Disposal Facility LLC
Project Location: Cumberland County, Virginia
Date: 2/8/2021
Source: HUC, OpenStreets Map

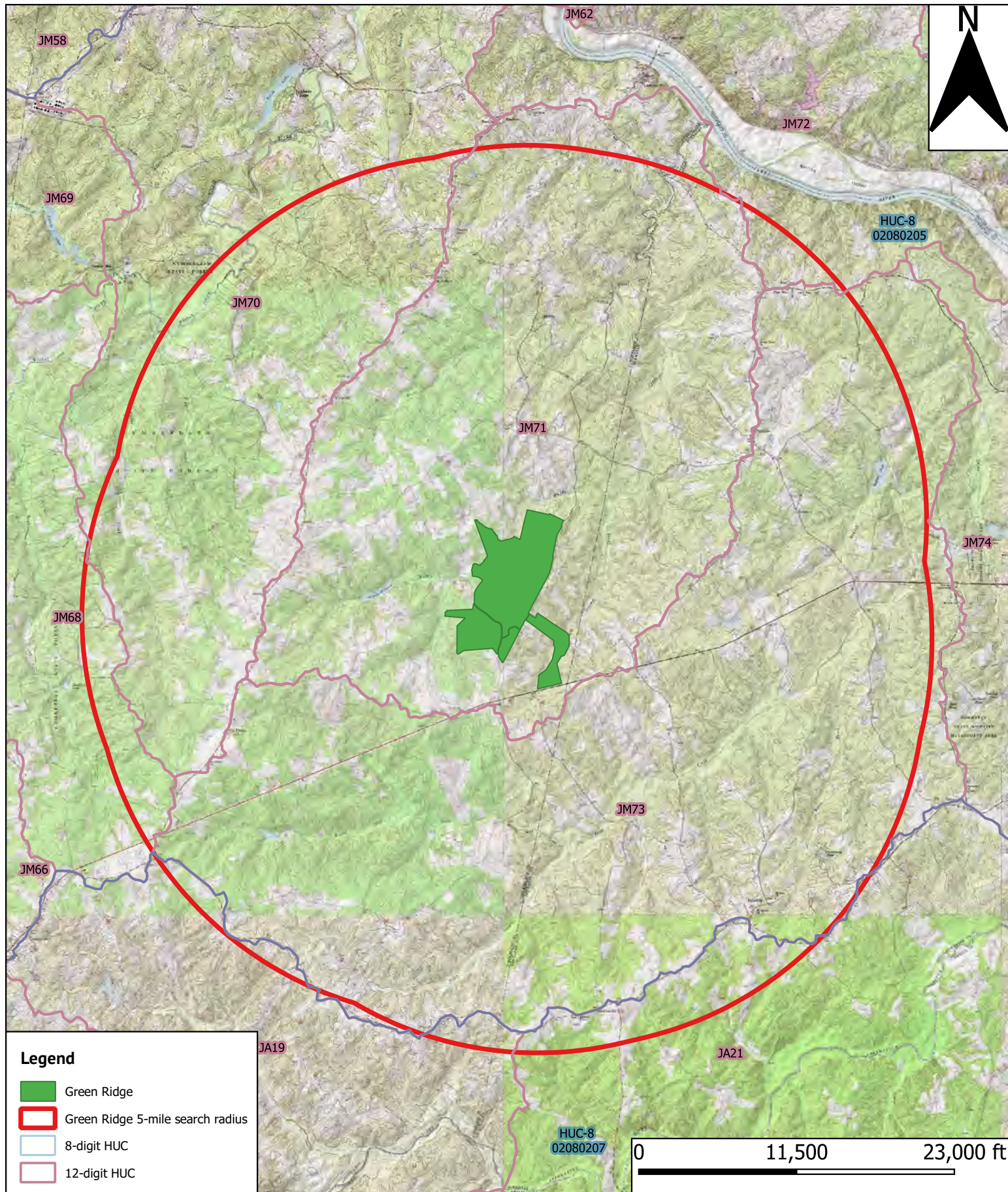


**KOONTZ
BRYANT
JOHNSON
WILLIAMS**

**Exhibit 1:
Location Map**

Exhibit 2:
5-mile Search Radius and Sub-watershed Location Map
Green Ridge, Alternate 1, Alternate 2, Alternate 3

Green Ridge



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

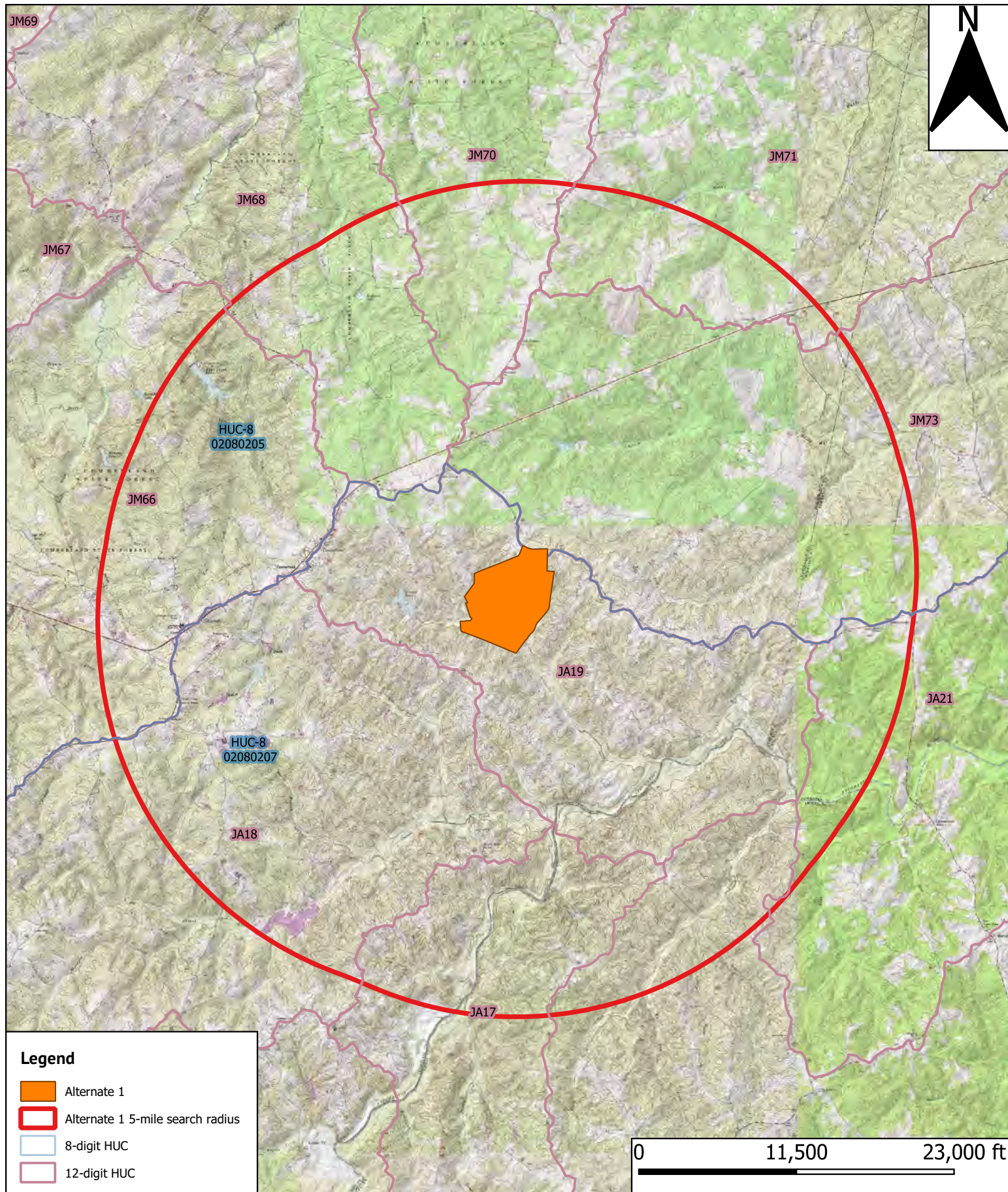
Source: HUC, USGS (Whiteville and Trenholm) Quads.



**KOONTZ
BRYANT
JOHNSON
WILLIAMS**

Exhibit 2:
Green Ridge
5-Mile Search Radius
and Sub-watershed
Location Map

Alternate 1



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

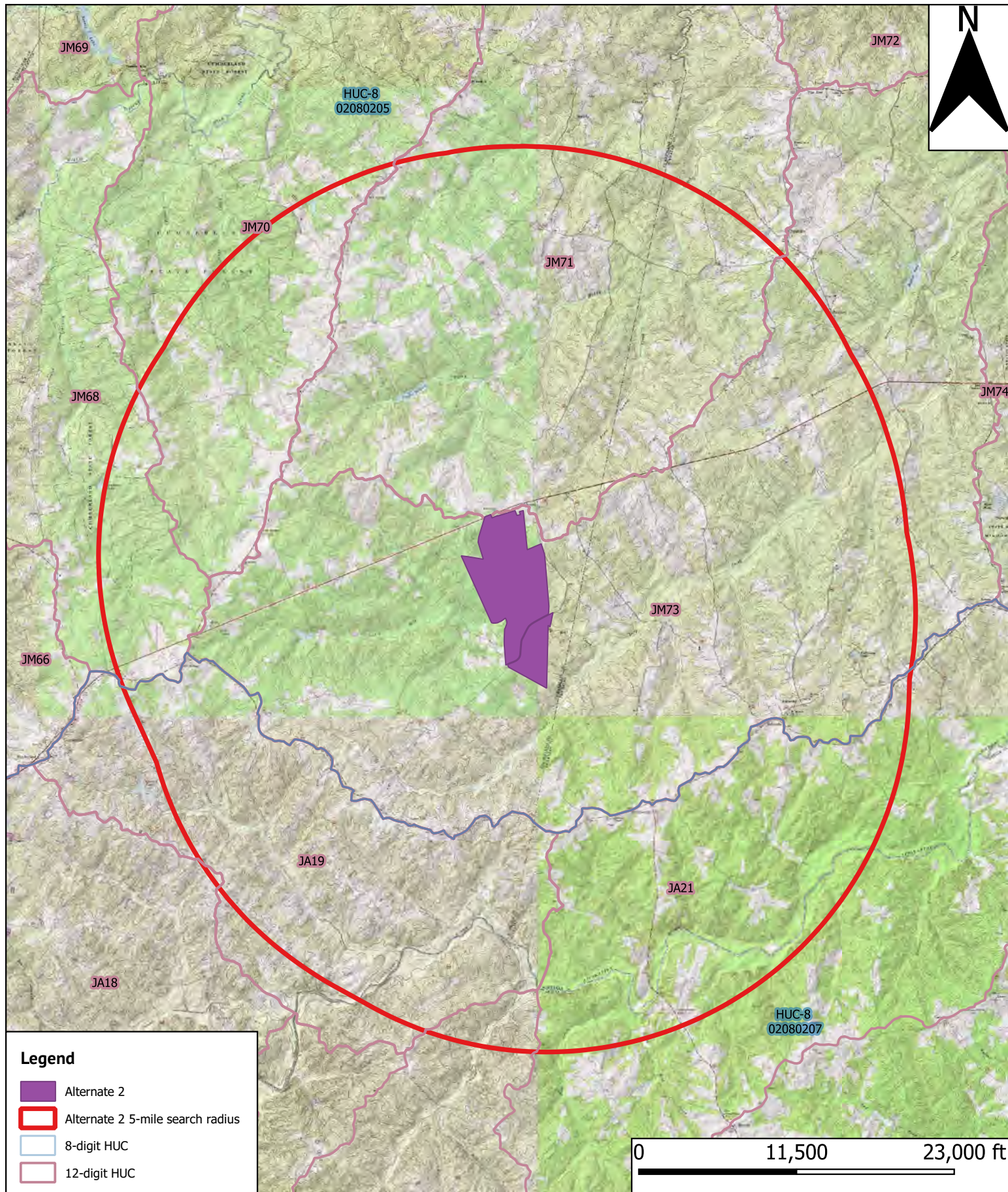
Source: HUC, USGS (Cumberland) Quad.



**KOONTZ
BRYANT
JOHNSON
WILLIAMS**

Exhibit 2:
Alternate 1
5-Mile Search Radius
and Sub-watershed
Location Map

Alternate 2



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

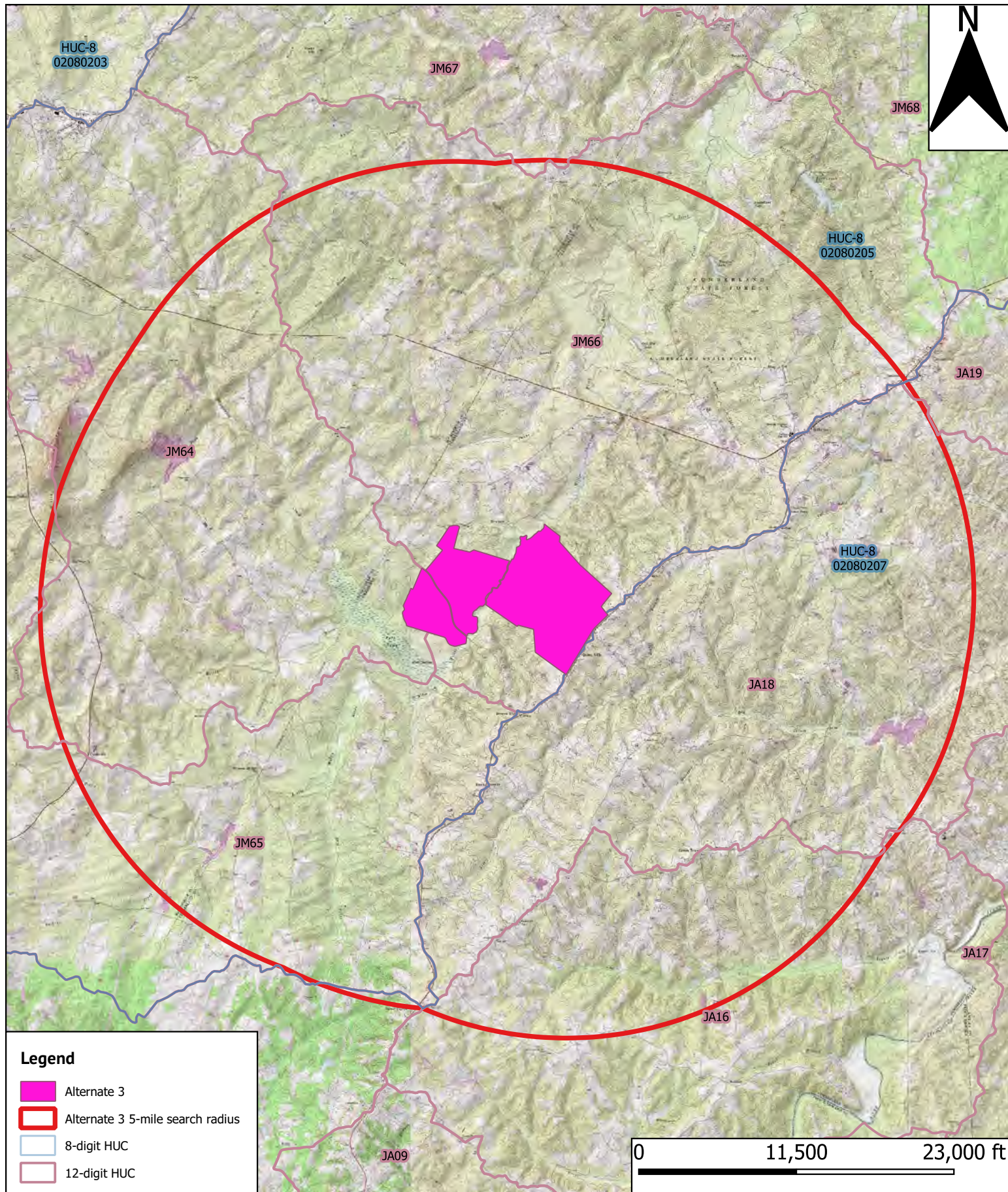
Source: HUC, USGS (Whiteville and Trenholm) Quads.



**KOONTZ
BRYANT
JOHNSON
WILLIAMS**

Exhibit 2:
Alternate 2
5-Mile Search Radius
and Sub-watershed
Location Map

Alternate 3



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

Source: HUC, USGS (Hillcrest and Willis Mountain) Quads.



**KOONTZ
BRYANT
JOHNSON
WILLIAMS**

Exhibit 2:
Alternate 3
5-Mile Search Radius
and Sub-watershed
Location Map

Exhibit 3:
IPAC Database Search Results
Green Ridge, Alternate 1, Alternate 2, Alternate 3

Green Ridge



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
<http://www.fws.gov/northeast/virginiafield/>

In Reply Refer To:

February 09, 2021

Consultation Code: 05E2VA00-2018-SLI-4952

Event Code: 05E2VA00-2021-E-05866

Project Name: Cumberland County Wetland Delineation - Landfill

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>;

<http://www.towerkill.com>; and

www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

[http://](http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html)

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
 - USFWS National Wildlife Refuges and Fish Hatcheries
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office

6669 Short Lane

Gloucester, VA 23061-4410

(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2018-SLI-4952

Event Code: 05E2VA00-2021-E-05866

Project Name: Cumberland County Wetland Delineation - Landfill

Project Type: DEVELOPMENT

Project Description: Cumberland County Potential Landfill - Wetland delineation

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@37.563559517272864,-78.12966063086748,14z>



Counties: Cumberland County, Virginia

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Alternate 1

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Amelia, Cumberland, and Powhatan counties, Virginia



Local office

Virginia Ecological Services Field Office

☎ (804) 693-6694

📠 (804) 693-9032

6669 Short Lane
Gloucester, VA 23061-4410

<http://www.fws.gov/northeast/virginiafield/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

Blue-winged Warbler <i>Vermivora pinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Eastern Whip-poor-will <i>Antrostomus vociferus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Kentucky Warbler <i>Oporornis formosus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
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Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

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What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

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Facilities

National Wildlife Refuge lands

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THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the [NWI map](#) for a full list.

FRESHWATER EMERGENT WETLAND

- [PEM1Cb](#)
- [PEM1/SS1Cb](#)
- [PEM1Ch](#)
- [PEM1A](#)
- [PEM1C](#)
- [PEM1Fb](#)
- [PEM1Fh](#)
- [PEM1/FO1A](#)
- [PEM1F](#)
- [PEM1/SS1Eb](#)
- [PEM1/UBFb](#)
- [PEM1Eb](#)
- [PEM1/SS1A](#)
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- [PEM1B](#)

FRESHWATER FORESTED/SHRUB WETLAND

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[PFO/SS1Cb](#)
[PSS1Fb](#)
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[PSS1/UBFb](#)
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[PUB/SS1Fb](#)
[PUBF](#)

LAKE

[L1UBHh](#)
[L2US2Ch](#)
[L2US2Ah](#)

RIVERINE

[R4SBC](#)
[RSUBH](#)
[R3UBH](#)
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A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

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Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Alternate 2

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Amelia, Cumberland, and Powhatan counties, Virginia



Local office

Virginia Ecological Services Field Office

☎ (804) 693-6694

📠 (804) 693-9032

6669 Short Lane
Gloucester, VA 23061-4410

<http://www.fws.gov/northeast/virginiafield/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

Eastern Whip-poor-will <i>Antrastomus vociferus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Kentucky Warbler <i>Oporornis formosus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

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[PFO/SS1Cb](#)
[PFO/EM1A](#)
[PSS1/UBFb](#)
[PFO1/SS4A](#)
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Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Alternate 3

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Buckingham and Cumberland counties, Virginia



Local office

Virginia Ecological Services Field Office

☎ (804) 693-6694

📠 (804) 693-9032

6669 Short Lane
Gloucester, VA 23061-4410

<http://www.fws.gov/northeast/virginiafield/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Atlantic Pigtoe <i>Fusconaia masoni</i> Wherever found There is proposed critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/5164	Proposed Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds
<http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY
------	--

LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Blue-winged Warbler <i>Vermivora pinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Eastern Whip-poor-will <i>Antrostomus vociferus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Kentucky Warbler <i>Oporornis formosus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the [NWI map](#) for a full list.

FRESHWATER EMERGENT WETLAND

[PEM1/SS1Cb](#)
[PEM1Cb](#)
[PEM1A](#)
[PEM1Ch](#)
[PEM1C](#)
[PEM1Fh](#)
[PEM1/UBFb](#)
[PEM1Fb](#)
[PEM1B](#)
[PEM1Eb](#)
[PEM1Ah](#)
[PEM1E](#)

FRESHWATER FORESTED/SHRUB WETLAND

[PFQ1A](#)
[PFQ1Cb](#)

[PFO1C](#)
[PSS1A](#)
[PSS/EM1A](#)
[PFO1Ab](#)
[PSS/EM1Ch](#)
[PSS/EM1Cb](#)
[PSS1Cb](#)
[PSS1/FO1A](#)
[PSS1C](#)
[PFO/EM1A](#)
[PFO1Ah](#)
[PFO/EM1Ab](#)
[PFO1/SS1A](#)
[PFO5Fb](#)
[PFO1Ch](#)
[PSS1Ch](#)

FRESHWATER POND

[PUBHh](#)
[PUBFh](#)
[PUBGh](#)
[PUBFb](#)
[PUBGb](#)
[PUB/EM1Fh](#)

LAKE

[L1UBHh](#)

RIVERINE

[R4SBC](#)
[R2UBH](#)
[R3UBH](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Exhibit 4:
DGIF Database Search Results
Green Ridge, Alternate 1, Alternate 2, Alternate 3

Green Ridge

Site Location

37,34,43.0 -78,07,52.4
is the Search Point

Show Position Rings

☐ Yes ☒ No

4 miles and 1 mile at the Search Point

Show Search Area

☒ Yes ☐ No

5 Search distance miles
buffer

Display Search Point is not
at center at map center

Base Map Choices

Topography

Map Overlay Choices

Current List: Search, BECAR,
BAEANests, TEWaters, TierII,
Habitat, Trout, Anadromous

Map Overlay Legend

T & E Waters

Federal

State

Predicted Habitat WAP Tier I & II

Aquatic

Terrestrial

Trout Waters

Class I - IV

Class V - VI

Anadromous Fish Reach

Confirmed

Potential

Impediment

5 mile radius
Search Area

Bald Eagle Concentration Areas and Roosts

Bald Eagle Nests

Data
Observation Site



[back](#)

37,39,22.1 -78,08,16.8

[Refresh Browser Page](#)

Map
Click

Pan

Map
Scale

Screen
Size

Help



Point of Search 37,34,43.0 -78,07,52.4

Map Location 37,33,46.6 -78,07,24.5

Select Coordinate System: ☒ Degrees, Minutes, Seconds Latitude - Longitude

☐ Decimal Degrees Latitude - Longitude

☐ Meters UTM NAD83 East North Zone

☐ Meters UTM NAD27 East North Zone

Base Map source: USGS 1:250,000 topographic maps (see [Microsoft terraserver-usa.com](http://microsoft.terraserver-usa.com) for details)

Map projection is UTM Zone 17 NAD 1983 with left 734870 and top 4180415. Pixel size is 33. .
Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed
as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 38400 meters
east to west by 38400 meters north to south for a total of 1474.5 square kilometers. The map
display represents 126005 feet east to west by 126005 feet north to south for a total of 569.5 square
miles.

A UTM Zone change occurs within the image. The right-hand side of the image is a pseudo
projection from UTM Zone 18 into UTM Zone 17 resulting in reduced spatial accuracy within the
portion of the image occurring in UTM Zone 18.

Topographic maps and Black and white aerial photography for year 1990+-
are from the United States Department of the Interior, United States Geological Survey.
Color aerial photography acquired 2002 is from Virginia Base Mapping Program, Virginia
Geographic Information Network.

Shaded topographic maps are from TOPO! ©2006 National Geographic

<http://www.national.geographic.com/topo>

All other map products are from the Commonwealth of Virginia Department of Game and Inland
Fisheries.

map assembled 2021-02-15 08:05:29 (qa/qc March 21, 2016 12:20 - tn=1078619.0 dist=8045

1)

Spoi=37.5786100 -78.1312299

Known or likely to occur within a 5 mile buffer around polygon; center 37.5786100 -78.1312299 in 049 Cumberland County, 145 Powhatan County, VA

[View Map of Site Location](#)

421 Known or Likely Species ordered by Status Concern for Conservation (displaying first 20) (20 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina		BOVA
060003	FESE	Ia	Wedgemussel, dwarf	Alasmidonta heterodon		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
060029	FTST	Ila	Lance, yellow	Elliptio lanceolata		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050034	SE	Ia	Bat, Rafinesque's eastern big-eared	Corynorhinus rafinesquii macrotis		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060173	FPST	Ia	Pigtoe, Atlantic	Fusconaia masoni		BOVA,Habitat
060081	ST	Ila	Floater, green	Lasmigona subviridis		BOVA,Habitat
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata	Yes	BOVA,SppObs
060084		Ib	Pigtoe, Virginia	Lexingtonia subplana		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA
040052		Ila	Duck, American black	Anas rubripes		BOVA
040029		Ila	Heron, little blue	Egretta caerulea caerulea		BOVA
040320		Ila	Warbler, cerulean	Setophaga cerulea		BOVA
040140		Ila	Woodcock, American	Scolopax minor		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA

To view All 421 species [View 421](#)

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Wildlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.; b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams (1 records) [View Map of All Anadromous Fish Use Streams](#)

Stream ID	Stream Name	Reach Status	Anadromous Fish Species			View Map
			Different Species	Highest TE*	Highest Tier**	
P180	Willis river	Potential	0			Yes

Impediments to Fish Passage (11 records) [View Map of All Fish Impediments](#)

ID	Name	River	View Map
706	BARRETT DAM	TR-WILLIS RIVER	Yes
472	BEVINS POND DAM	TR-DEEP CREEK	Yes
1050	CLAYTON DAM	MAXEY MILL CREEK	Yes
1053	ELIPPEN DAM	MUDDY CREEK	Yes
708	L. G. ATKINS DAM	TR-DAVIS CREEK	Yes
461	LAKE SHAWNEE DAM #3	TR-APPOMATTOX RIVER	Yes
473	NIXONS DAM	HORSEPEN BRANCH	Yes
448	REDFORD DAM	HORSEPEN BRANCH	Yes
701	ROBERTSON DAM	TR-DEEP RUN	Yes
707	SANDERSON DAM	DAVIS CREEK	Yes
475	WILLIS DAM	TR-DEEP CREEK	Yes

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species (5 Reaches) [View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species](#)

Stream Name	Tier Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Deep Creek (20802051)	ST	060081	ST	Ila	Floater, green	Lasmigona subviridis	Yes
Tongue Quarter Creek (20802051)	FPST	060081	ST	Ila	Floater, green	Lasmigona subviridis	Yes

Alternate 1

Site Location

37,28,42.5 -78,12,26.1
is the Search Point

Show Position Rings

☐ Yes ☒ No
4 miles and 1 mile at the Search Point

Show Search Area

☒ Yes ☐ No
5 Search distance miles
buffer

Search Point is at
map center

Base Map Choices

Topography

Map Overlay Choices

Current List: Search, BECAR, BAEANests, TEWaters, TierII, Habitat, Trout, Anadromous

Map Overlay Legend

T & E Waters

Federal

State

Predicted Habitat

WAP Tier I & II

Aquatic

Terrestrial

Trout Waters

Class I - IV

Class V - VI

Anadromous Fish Reach

Confirmed

Potential

Impediment

5 mile radius
Search Area

Bald Eagle
Concentration Areas
and Roosts

Bald Eagle Nests

Data
Observation Site

[back](#)

Map Click **Pan**

Map Scale

[Refresh Browser Page](#)

Screen Size

[Help](#)



Point of Search 37,28,42.5 -78,12,26.1

Map Location 37,28,42.5 -78,12,26.1

Select Coordinate System: ☒ Degrees,Minutes,Seconds Latitude - Longitude

☐ Decimal Degrees Latitude - Longitude

☐ Meters UTM NAD83 East North Zone

☐ Meters UTM NAD27 East North Zone

Base Map source: USGS 1:250,000 topographic maps (see Microsoft.terraserver-usa.com for details)

Map projection is UTM Zone 17 NAD 1983 with left 727747 and top 4170819. Pixel size is 64 meters. Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 38400 meters east to west by 38400 meters north to south for a total of 1474.5 square kilometers. The map display represents 126005 feet east to west by 126005 feet north to south for a total of 569.5 square miles.

A UTM Zone change occurs within the image. The right-hand side of the image is a pseudo projection from UTM Zone 18 into UTM Zone 17 resulting in reduced spatial accuracy within the portion of the image occurring in UTM Zone 18.

Topographic maps and Black and white aerial photography for year 1990+ are from the United States Department of the Interior, United States Geological Survey. Color aerial photography acquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network.

Shaded topographic maps are from TOPO! ©2006 National Geographic

<http://www.national.geographic.com/topo>

All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2021-02-15 07:57:37 (qa/qc March 21, 2016 12:20 - tn=1078614.0 dist=8045

1)

Spoi=37.4784900 -78.2072599

Known or likely to occur within a 5 mile buffer around polygon; center 37.4784900 -78.2072599 in 007 Amelia County, 049 Cumberland County, 145 Powhatan County, VA

[View Map of Site Location](#)

455 Known or Likely Species ordered by Status Concern for Conservation (displaying first 23) (23 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina		BOVA
060003	FESE	Ia	Wedgemussel, dwarf	Alasmidonta heterodon		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
060029	FTST	IIa	Lance, yellow	Elliptio lanceolata		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050034	SE	Ia	Bat, Rafinesque's eastern big-eared	Corynorhinus rafinesquii macrotis		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's	Centronyx henslowii		BOVA
060173	FPST	Ia	Pigtoe, Atlantic	Fusconaia masoni		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis		BOVA,Habitat
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata	Yes	BOVA,SppObs
010077		Ia	Shiner, bridle	Notropis bifrenatus		BOVA
060084		Ib	Pigtoe, Virginia	Lexingtonia subplana		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus	Yes	BOVA,SppObs
040052		IIa	Duck, American black	Anas rubripes		BOVA
040029		IIa	Heron, little blue	Egretta caerulea caerulea		BOVA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythrophthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA

To view All 455 species [View 455](#)

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Wildlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented; b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests (1 records) [View Map of All Query Results](#)
[Bald Eagle Nests](#)

Nest	N Obs	Latest Date	DGIF Nest Status	View Map
AM1001	1	May 2 2010	UNKNOWN	Yes

Displayed 1 Bald Eagle Nests

Habitat Predicted for Aquatic WAP Tier I & II Species (1 Reach) [View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species](#)

Stream Name	Tier Species					View Map	
	Highest TE *	BOVA Code, Status *, Tier **, Common & Scientific Name					
Deep Creek (20802051)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Public Holdings: (2 names)

Name	Agency	Level
Bear Creek Lake State Park	VA Dept. of Conservation and Recreation	State
Cumberland State Forest	VA Dept. of Forestry	State

Alternate 2

Known or likely to occur within a 5 mile buffer around line beginning 37.5204500 -78.1207699 in 007 Amelia County, 049 Cumberland County, 145 Powhatan County, VA

View Map of Site Location

455 Known or Likely Species ordered by Status Concern for Conservation (displaying first 23) (23 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James.	Parvaspina collina		BOVA
060003	FESE	Ia	Wedgemussel, dwarf.	Alasmidonta heterodon		BOVA
050022	FTST	Ia	Bat, northern long-eared.	Myotis septentrionalis		BOVA
060029	FTST	Ila	Lance, yellow.	Elliptio lanceolata		BOVA
050020	SE	Ia	Bat, little brown.	Myotis lucifugus		BOVA
050034	SE	Ia	Bat, Rafinesque's eastern big-eared.	Corynorhinus rafinesquii macrotis		BOVA
050027	SE	Ia	Bat, tri-colored.	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook.	Alasmidonta varicosa		BOVA
040293	ST	Ia	Shrike, loggerhead.	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's.	Centronyx henslowii		BOVA
060173	FPST	Ia	Pigtoe, Atlantic.	Fusconaia masoni		BOVA
060081	ST	Ila	Floater, green.	Lasmigona subviridis		BOVA,Habitat
040292	ST		Shrike, migrant loggerhead.	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted.	Clemmys guttata	Yes	BOVA,SppObs
010077		Ia	Shiner, bridle.	Notropis bifrenatus		BOVA
060084		Ib	Pigtoe, Virginia.	Lexingtonia subplana		BOVA
040213		Ic	Owl, northern saw-whet.	Aegolius acadicus		BOVA
040052		Ila	Duck, American black.	Anas rubripes		BOVA
040029		Ila	Heron, little blue.	Egretta caerulea caerulea		BOVA
040320		Ila	Warbler, cerulean.	Setophaga cerulea		BOVA
040140		Ila	Woodcock, American.	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed.	Coccyzus erythrophthalmus		BOVA
040105		IIb	Rail, king.	Rallus elegans		BOVA

To view All 455 species View 455

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

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Bat Colonies or Hibernacula: Not Known

Anadromous Fish Use Streams

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species (2 Reaches)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species					View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name				
Deep Creek (20802051)	ST	060081	ST	Ila	Floater, green. Lasmigona subviridis	Yes
tributary (20802051)	ST	060081	ST	Ila	Floater, green. Lasmigona subviridis	Yes
tributary (20802051)	ST	060081	ST	Ila	Floater, green. Lasmigona subviridis	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Public Holdings: (1 names)

Name	Agency	Level
Cumberland State Forest	VA Dept. of Forestry	State

Compiled on 2/15/2021, 7:53:05 AM 1078613.0 report=0PA searchType=L dist= 8045 poi= 37.5204500 -78.1207699 siteDD= 37.5204500 -78.1207798 37.5176000 -78.1215298 37.5179000 -78.1219998 37.5098100 -78.1222398 37.5053900 -78.1223798 37.5062500 -78.1243198 37.5095700 -78.1319198 37.5100500 -78.1321898 37.5100700 -78.1321498 37.5101000 -78.1320898 37.5101100 -78.1320498 37.5101700 -78.1317898 37.5102200 -78.1315298 37.5102500 -78.1314498 37.5103000 -78.1312998 37.5103300 -78.1311798 37.5103700 -78.1310998 37.5104000 -78.1309998 37.5104300 -78.1309298 37.5104600 -78.1308598 37.5105000 -78.1307898 37.5105300 -78.1307098 37.5105600 -78.1306298 37.5105900 -78.1305498 37.5106200 -78.1304698 37.5106500 -78.1303898 37.5106800 -78.1303098 37.5107100 -78.1302298 37.5107400 -78.1301498 37.5107700 -78.1300698 37.5108000 -78.1299898 37.5108300 -78.1299098 37.5108600 -78.1298298 37.5108900 -78.1297498 37.5109200 -78.1296698 37.5109500 -78.1295898 37.5109800 -78.1295098 37.5110100 -78.1294298 37.5110400 -78.1293498 37.5110700 -78.1292698 37.5111000 -78.1291898 37.5111300 -78.1291098 37.5111600 -78.1290298 37.5111900 -78.1289498 37.5112200 -78.1288698 37.5112500 -78.1287898 37.5112800 -78.1287098 37.5113100 -78.1286298 37.5113400 -78.1285498 37.5113700 -78.1284698 37.5114000 -78.1283898 37.5114300 -78.1283098 37.5114600 -78.1282298 37.5114900 -78.1281498 37.5115200 -78.1280698 37.5115500 -78.1279898 37.5115800 -78.1279098 37.5116100 -78.1278298 37.5116400 -78.1277498 37.5116700 -78.1276698 37.5117000 -78.1275898 37.5117300 -78.1275098 37.5117600 -78.1274298 37.5117900 -78.1273498 37.5118200 -78.1272698 37.5118500 -78.1271898 37.5118800 -78.1271098 37.5119100 -78.1270298 37.5119400 -78.1269498 37.5119700 -78.1268698 37.5120000 -78.1267898 37.5120300 -78.1267098 37.5120600 -78.1266298 37.5120900 -78.1265498 37.5121200 -78.1264698 37.5121500 -78.1263898 37.5121800 -78.1263098 37.5122100 -78.1262298 37.5122400 -78.1261498 37.5122700 -78.1260698 37.5123000 -78.1259898 37.5123300 -78.1259098 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37.5175800 -78.1119200 37.5176100 -78.1118400 37.5176400 -78.1117600 37.5176700 -78.1116800 37.5177000 -78.1116000 37.5177300 -78.1115200 37.5177600 -78.1114400 37.5177900 -78.1113600 37.5178200 -78.1112800 37.5178500 -78.1112000 37.5178800 -78.1111200 37.5179100 -78.1110400 37.5179400 -78.1109600 37.5179700 -78.1108800 37.5180000 -78.1108000 37.5180300 -78.1107200 37.5180600 -78.1106400 37.5180900 -78.1105600 37.5181200 -78.1104800 37.5181500 -78.1104000 37.5181800 -78.1103200 37.5182100 -78.1102400 37.5182400 -78.1101600 37.5182700 -78.1100800 37.5183000 -78.1100000 37.5183300 -78.1099200 37.5183600 -78.1098400 37.5183900 -78.1097600 37.5184200 -78.1096800 37.5184500 -78.1096000 37.5184800 -78.1095200 37.5185100 -78.1094400 37.5185400 -78.1093600 37.5185700 -78.1092800 37.5186000 -78.1092000 37.5186300 -78.1091200 37.5186600 -78.1090400 37.5186900 -78.1089600 37.5187200 -78.1088800 37.5187500 -78.1088000 37.5187800 -78.1087200 37.5188100 -78.1086400 37.5188400 -78.1085600 37.5188700 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37.5201900 -78.1049600 37.5202200 -78.1048800 37.5202500 -78.1048000 37.5202800 -78.1047200 37.5203100 -78.1046400 37.5203400 -78.1045600 37.5203700 -78.1044800 37.5204000 -78.1044000 37.5204300 -78.1043200 37.5204600 -78.1042400 37.5204900 -78.1041600 37.5205200 -78.1040800 37.5205500 -78.1040000 37.5205800 -78.1039200 37.5206100 -78.1038400 37.5206400 -78.1037600 37.5206700 -78.1036800 37.5207000 -78.1036000 37.5207300 -78.1035200 37.5207600 -78.1034400 37.5207900 -78.1033600 37.5208200 -78.1032800 37.5208500 -78.1032000 37.5208800 -78.1031200 37.5209100 -78.1030400 37.5209400 -78.1029600 37.5209700 -78.1028800 37.5210000 -78.1028000 37.5210300 -78.1027200 37.5210600 -78.1026400 37.5210900 -78.1025600 37.5211200 -78.1024800 37.5211500 -78.1024000 37.5211800 -78.1023200 37.5212100 -78.1022400 37.5212400 -78.1021600 37.5212700 -78.1020800 37.5213000 -78.1020000 37.5213300 -78.1019200 37.5213600 -78.1018400 37.5213900 -78.1017600 37.5214200 -78.1016800 37.5214500 -78.1016000 37.5214800 -78.1015200 37.5215100 -78.1014400 37.5215400 -78.1013600 37.5215700 -78.1012800 37.5216000 -78.1012000 37.5216300 -78.1011200 37.5216600 -78.1010400 37.5216900 -78.1009600 37.5217200 -78.1008800 37.5217500 -78.1008000 37.5217800 -78.1007200 37.5218100 -78.1006400 37.5218400 -78.1005600 37.5218700 -78.1004800 37.5219000 -78.1004000 37.5219300 -78.1003200 37.5219600 -78.1002400 37.5219900 -78.1001600 37.5220200 -78.1000800 37.5220500 -78.1000000 37.5220800 -78.0999200 37.5221100 -78.0998400 37.5

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Alternate 3

Site Location

37,26,57.6 -78,22,04.0
is the Search Point

Show Position Rings

☐ Yes ☒ No

4 miles and 1 mile at the Search Point

Show Search Area

☒ Yes ☐ No

5 Search distance miles
buffer

Display Search Point is not
at center at map center

Base Map Choices

Topography

Map Overlay Choices

Current List: Search, BECAR,
BAEANests, TEWaters, TierII,
Habitat, Trout, Anadromous

Map Overlay Legend

T & E Waters

Federal

State

Predicted Habitat

WAP Tier I & II

Aquatic

Terrestrial

Trout Waters

Class I - IV

Class V - VI

Anadromous Fish Reach

Confirmed

Potential

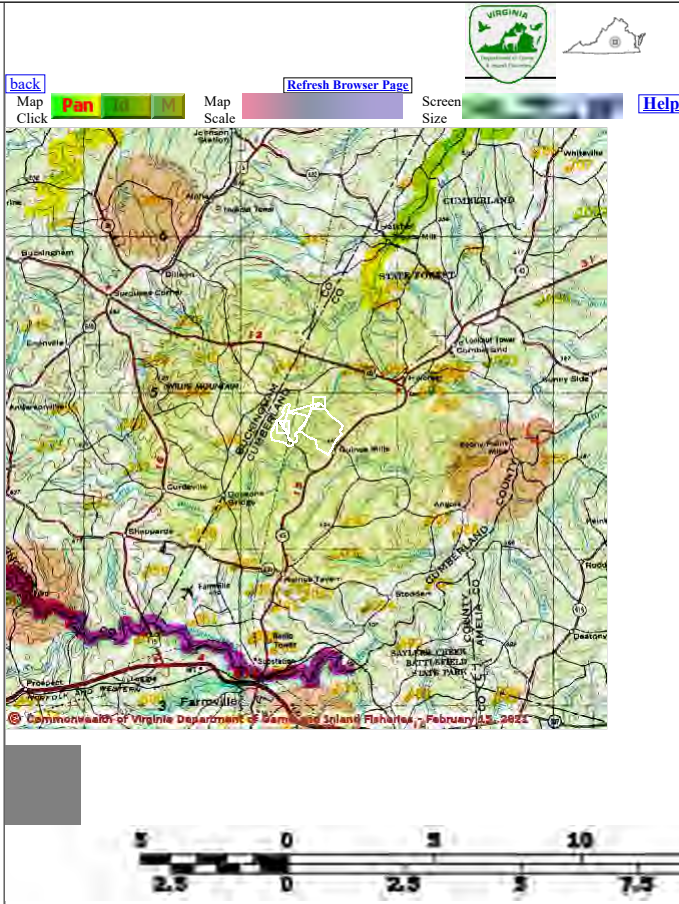
Impediment

5 mile radius
Search Area

Bald Eagle
Concentration Areas
and Roosts

Bald Eagle Nests

Data
Observation Site



Point of Search 37,26,57.6 -78,22,04.0

Map Location 37,26,51.0 -78,21,01.2

Select Coordinate System: ☒ Degrees,Minutes,Seconds Latitude - Longitude

☐ Decimal Degrees Latitude - Longitude

☐ Meters UTM NAD83 East North Zone

☐ Meters UTM NAD27 East North Zone

Base Map source: USGS 1:250,000 topographic maps (see Microsoft.terraserver-usa.com for details)

Map projection is UTM Zone 17 NAD 1983 with left 715190 and top 4167016. Pixel size is 34. .
Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed
as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 38400 meters
east to west by 38400 meters north to south for a total of 1474.5 square kilometers. The map
display represents 126005 feet east to west by 126005 feet north to south for a total of 569.5 square
miles.

Topographic maps and Black and white aerial photography for year 1990+-
are from the United States Department of the Interior, United States Geological Survey.
Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia
Geographic Information Network.
Shaded topographic maps are from TOPO! ©2006 National Geographic
<http://www.national.geographic.com/topo>
All other map products are from the Commonwealth of Virginia Department of Game and Inland
Fisheries.

map assembled 2021-02-15 08:01:49 (qa/qc March 21, 2016 12:20 - tn=1078617.0 dist=8045
1)
Spoi=37.4493500 -78.3677799

Known or likely to occur within a 5 mile buffer around polygon; center 37.4493500 -78.3677799 in 029 Buckingham County, 049 Cumberland County, VA

[View Map of Site Location](#)

418 Known or Likely Species ordered by Status Concern for Conservation (displaying first 21) (21 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina		BOVA
060003	FESE	Ia	Wedgemussel, dwarf	Alasmidonta heterodon		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
060029	FTST	Ila	Lance, yellow	Elliptio lanceolata		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060173	FPST	Ia	Pigtoe, Atlantic	Fusconaia masoni		BOVA
060081	ST	Ila	Floater, green	Lasmigona subviridis		BOVA
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA
060084		Ib	Pigtoe, Virginia	Lexingtonia subplana		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA
020023		Ila	Salamander, mole	Ambystoma talpoideum		BOVA
040052		Ila	Duck, American black	Anas rubripes		BOVA
040320		Ila	Warbler, cerulean	Setophaga cerulea		BOVA
040140		Ila	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythrophthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA

To view All 418 species [View 418](#)

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Wildlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented; b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time; c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams (1 records)

[View Map of All Anadromous Fish Use Streams](#)

Stream ID	Stream Name	Reach Status	Anadromous Fish Species			View Map
			Different Species	Highest TE*	Highest Tier**	
P180	Willis river	Potential	0			Yes

Impediments to Fish Passage (20 records)

[View Map of All Fish Impediments](#)

ID	Name	River	View Map
699	BISH DAM	BEAR CREEK	Yes
1056	CA IRA DAM	WILLIS RIVER	Yes
1051	CLEMENTS DAM	TEAR WALLET CREEK	Yes
700	COLLINS LOWER DAM	TR-WALLET CREEK	Yes
1049	COLLINS UPPER DAM	TR-TEAR WALLET CREEK	Yes
698	GNEG Y DAM	TEAR WALLET CREEK	Yes
696	JONES DAM	DOE BRANCH	Yes
353	KYANITE DAM #3	NELSON FORK	Yes
989	KYANITE EAST RIDGE DAM	NELSON FORK WHISPERING CREEK	Yes
697	LANDIS DAM	TR-ANGOLA CREEK	Yes
988	MONROE, MELVIN & JOHNS DAM	TR-PERKINS CREEK	Yes
689	ROGERS DAM	TR-TEAR WALLET CREEK	Yes
1058	SWANS DAM	BIG GUINEA CREEK	Yes
687	T. EDWARD STIMPSON DAM	TR-ANGOLA CREEK	Yes
1059	WILCKS DAM	ANGOLA CREEK	Yes
338	WILLIS RIVER DAM #4	CATTAIL CREEK	Yes
340	WILLIS RIVER DAM #5F	TR-WHISPERING CREEK	Yes
341	WILLIS RIVER DAM #6	LITTLE WILLIS RIVER	Yes
344	WILLIS RIVER DAM #9	PAYNE CREEK	Yes
694	WINSTON LAKE DAM	WINSTON CREEK	Yes

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

N/A

N/A

N/A

Name	Agency	Level
Cumberland State Forest	VA Dept. of Forestry	State

[illegible]

PixelSize=64; Anadromous=0.049978; BECAR=0.034232; Bats=0.032127; Buffer=0.940741; County=0.124496; Impediments=0.057803; Init=1.202991; PublicLands=0.082182; SppObs=0.653166; TEWaters=0.058686; TierReaches=0.095177; TierTerrestrial=0.15182; Total=2.761836; Tracking_BOVA=0.153292; Trout=0.049188

Exhibit 5:
DCR-DNH Database Search Results
Green Ridge, Alternate 1, Alternate 2, Alternate 3

Green Ridge

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

Watershed (8 digit HUC): 02080205 - Middle James-Willis River

Subwatershed (12 digit HUC): JM71 - Muddy Creek-Davis Creek

Search Run: 1/29/2021 16:06:25 PM

Result Summary

Total Species returned: 4

Total Communities returned: 0

Click scientific names below to go to NatureServe report.

Click column headings for an explanation of species and community ranks.

Common Name/Natural Community	Scientific Name	Scientific Name Linked	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences	Virginia Coastal Zone
Middle James-Willis								
Muddy Creek-Davis Creek								
BIRDS								
Loggerhead Shrike	Lanius ludovicianus	Lanius ludovicianus	G4	S1B,S2N	None	LT	41	N
BIVALVIA (MUSSELS)								
Yellow Lance	Elliptio lanceolata	Elliptio lanceolata	G2	S2	LT	LT	46	N
Atlantic Pigtoe	Fusconaia masoni	Fusconaia masoni	G1	S2	PT	LT	27	N
Green Floater	Lasmigona subviridis	Lasmigona subviridis	G3	S2	None	LT	65	N

Note: On-line queries provide basic information from DCR's databases at the time of the request. They are NOT to be substituted for a project review or for on-site surveys required for environmental assessments of specific project areas.

For Additional Information on locations of Natural Heritage Resources please submit an [information request](#).

To Contribute information on locations of natural heritage resources, please fill out and submit a [rare species sighting form](#).

Alternate 1

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

Watershed (8 digit HUC): 02080207 - Appomattox River

Subwatershed (12 digit HUC): JA19 - Little Guinea Creek-Appomattox River

Result Summary

Total Species returned: 0

Total Communities returned: 0

Alternate 2

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

Watershed (8 digit HUC): 02080205 - Middle James-Willis

Subwatershed (12 digit HUC): JM73 - Maxey Mill Creek-Deep Creek

Result Summary

Total Species returned: 0

Total Communities returned: 0

Alternate 3

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened,C - Candidate

Watershed (8 digit HUC): 02080205 - Middle James-Willis

Subwatershed (12 digit HUC): JM66 - Buffalo Creek-Willis River

JM64 - Whispering Creek-Willis River

Result Summary

Total Species returned: 0

Total Communities returned: 0

Exhibit 6:

Bald Eagle Search Information

Green Ridge, Alternate 1, Alternate 2, Alternate 3

- 1) Known Nest Locations
- 2) Concentration Areas

Green Ridge

- 1) Known Nest Locations
- 2) Concentration Areas



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- Resources
- News Room
- Give to CCB

CCB MAPPING PORTAL

Help / FAQ

- Layers
- Bald Eagle
- VA Eagle Nest Locator
- Zoom to Extents
- Most recent data CCB has on bald eagle nest locations in Virginia. Data is largely from two annual aerial flights conducted in winter and spring of all tributaries of the lower Chesapeake Bay and other prominent bodies of water. Reported ground survey data is also included.
- More info
- VA Eagle Nest Buffers
- Eagle Roosts
- Eagle Roost Polygons
- Eagle Roost Buffers
- Eagle Roosts by Topoquad
- Waterbirds
- Shorebird Roost Registry
- Colonial Waterbirds 2018
- Colonial Waterbirds 2013
- Chesapeake Bay Herons 2013
- Colonial Waterbirds 2008
- Colonial Waterbirds 2003
- Osprey
- OspreyWatch Nests
- Chesapeake Bay Osprey Nests 1995-1996
- Nightjars
- Nightjar Survey Network Routes

- Toggle Draw Tools
- Generate Link
- Print Report
- Search

5 km

3 mi

+

-

Measure Distances and Areas

Last Point

37° 37' 21.09" N / 78° 00' 30.01" W

37.622526 / -78.008337

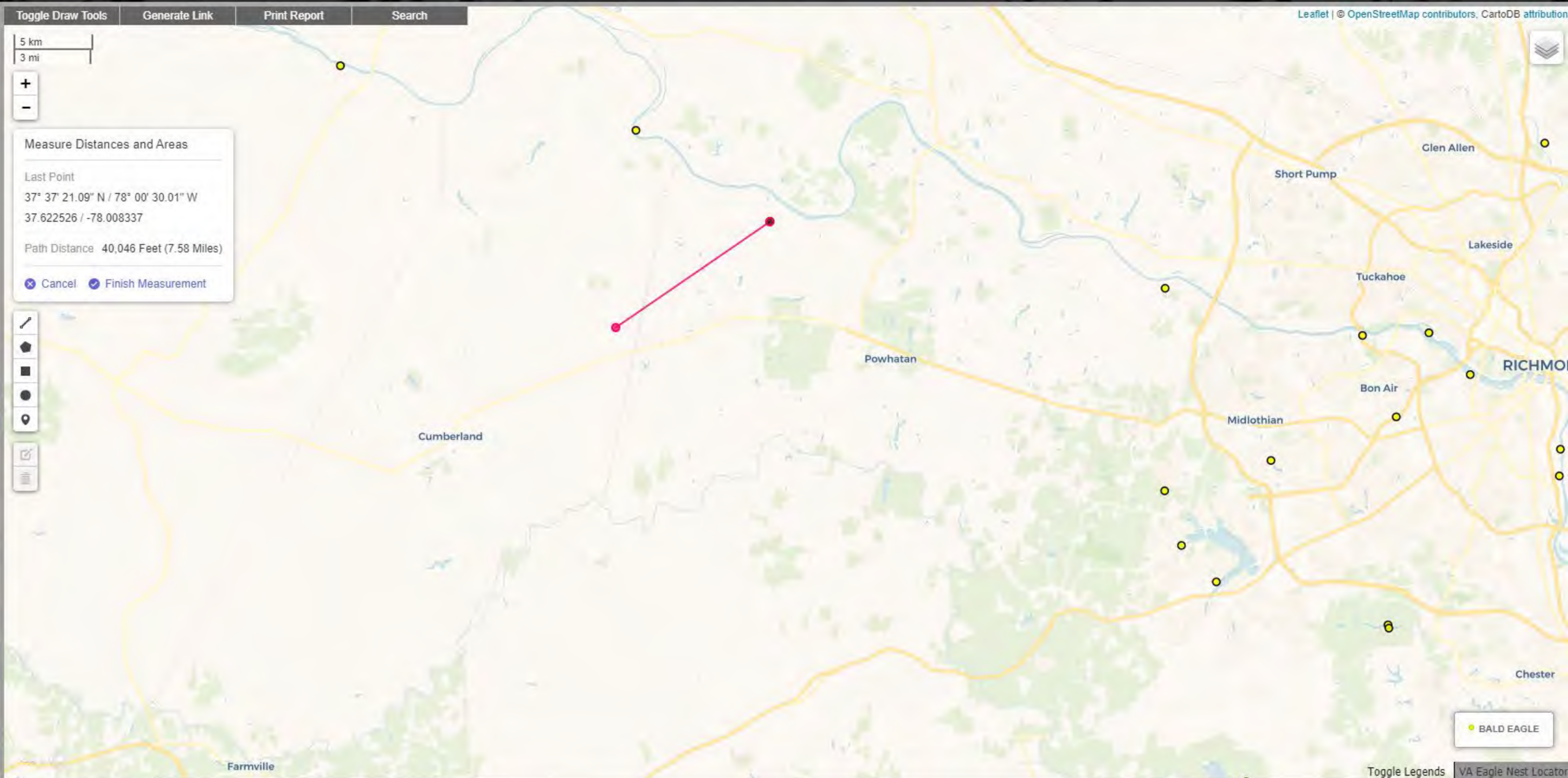
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Cancel

Finish Measurement

-
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-



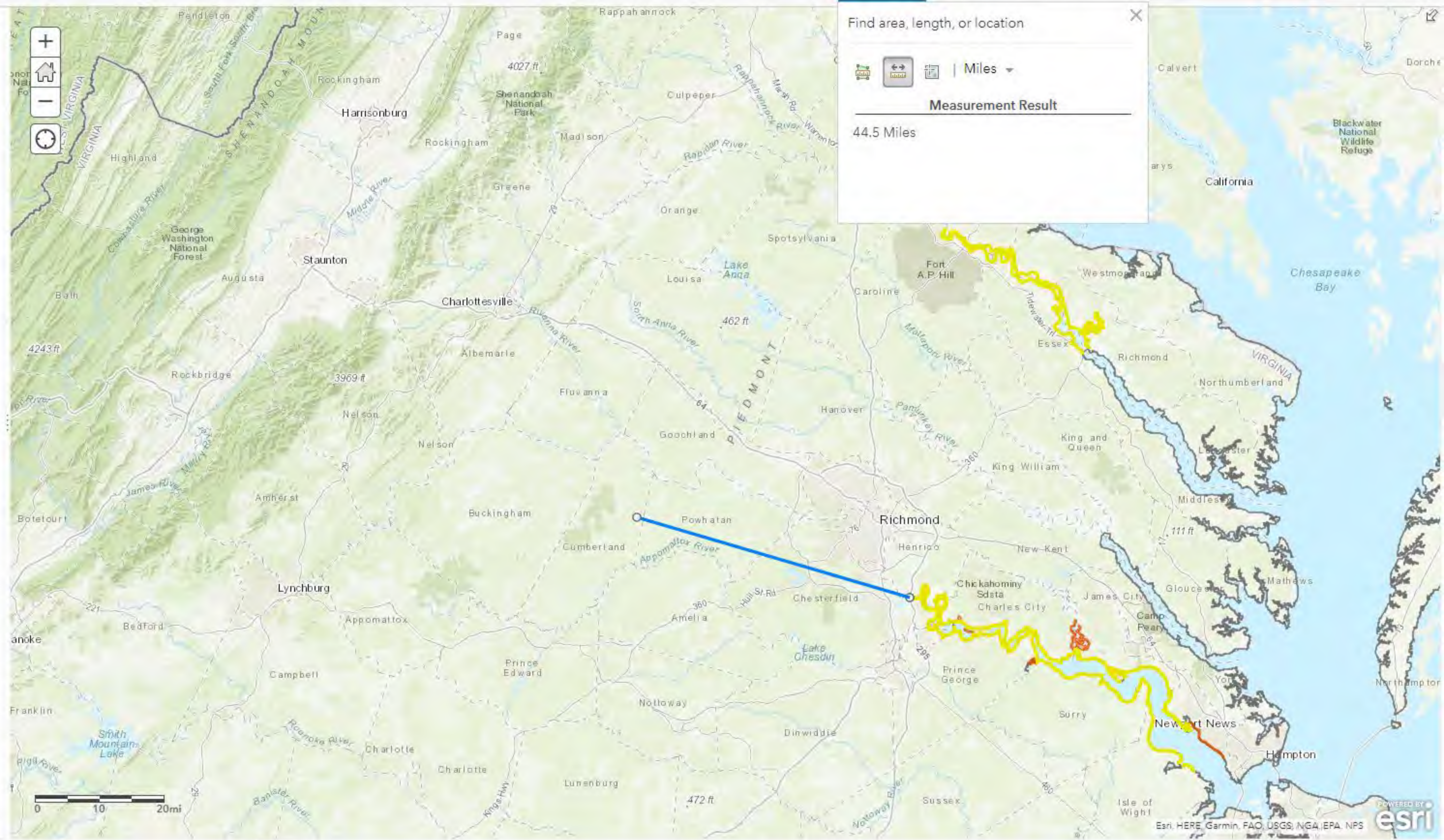
Leaflet | © OpenStreetMap contributors, CartoDB attribution

Legend

Bald Eagle Concentration Areas

- December 15 to March 15
- May 15 to August 31 and December 15 to March 15

Virginia



Alternate 1

- 1) Known Nest Locations
- 2) Concentration Areas



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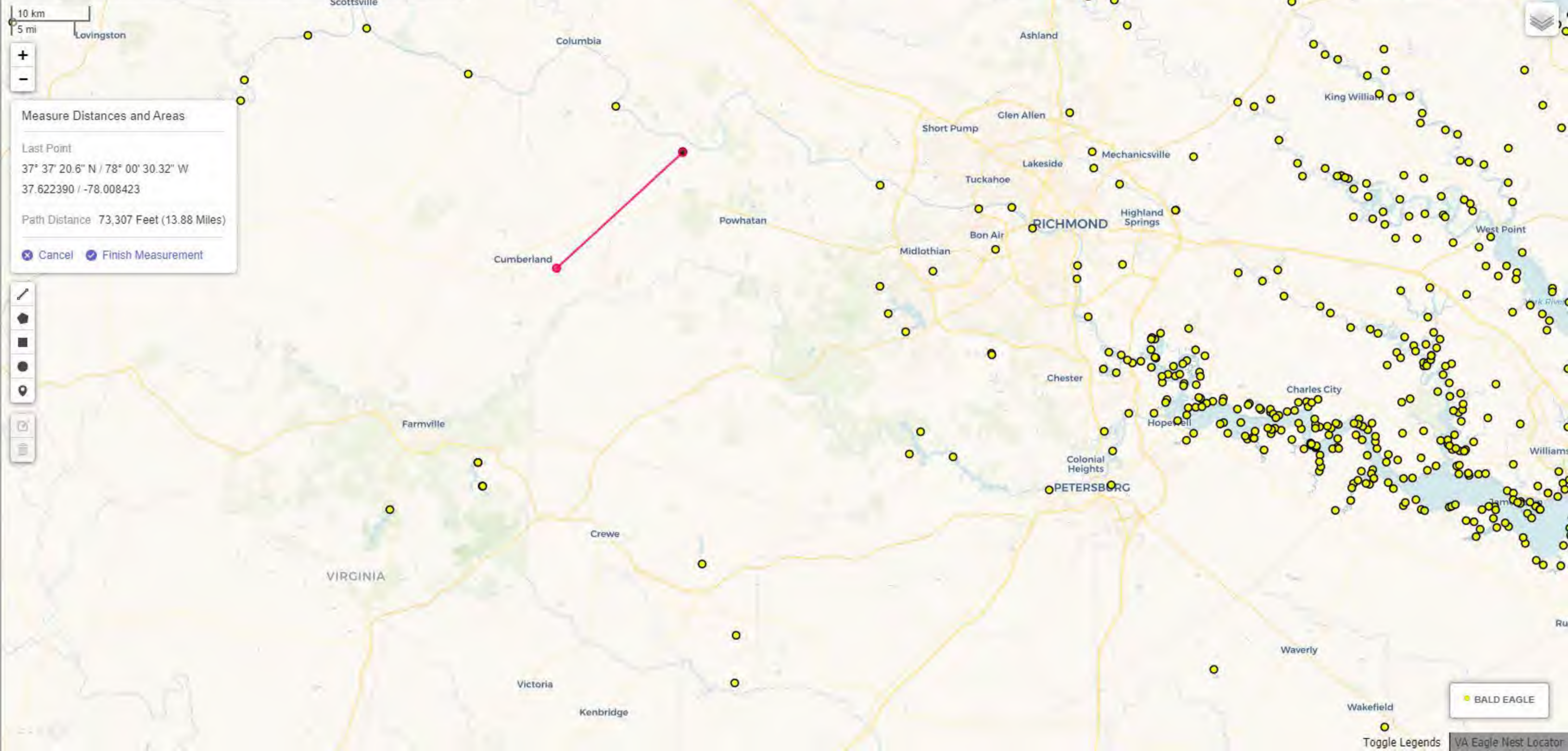
CCB MAPPING PORTAL

Help / FAQ

Layers

- Bald Eagle
 - VA Eagle Nest Locator
 - Zoom to Extents
 - Most recent data CCB has on bald eagle nest locations in Virginia. Data is largely from two annual aerial flights conducted in winter and spring of all tributaries of the lower Chesapeake Bay and other prominent bodies of water. Reported ground survey data is also included.
 - More info
 - VA Eagle Nest Buffers
 - Eagle Roosts
 - Eagle Roost Polygons
 - Eagle Roost Buffers
 - Eagle Roosts by Topoquad
- Waterbirds
 - Shorebird Roost Registry
 - Colonial Waterbirds 2018
 - Colonial Waterbirds 2013
 - Chesapeake Bay Herons 2013
 - Colonial Waterbirds 2008
 - Colonial Waterbirds 2003
- Osprey
 - OspreyWatch Nests
 - Chesapeake Bay Osprey Nests 1995-1996
- Nightjars
 - Nightjar Survey Network Routes

- Toggle Draw Tools
- Generate Link
- Print Report
- Search



BALD EAGLE

Toggle Legends VA Eagle Nest Locator

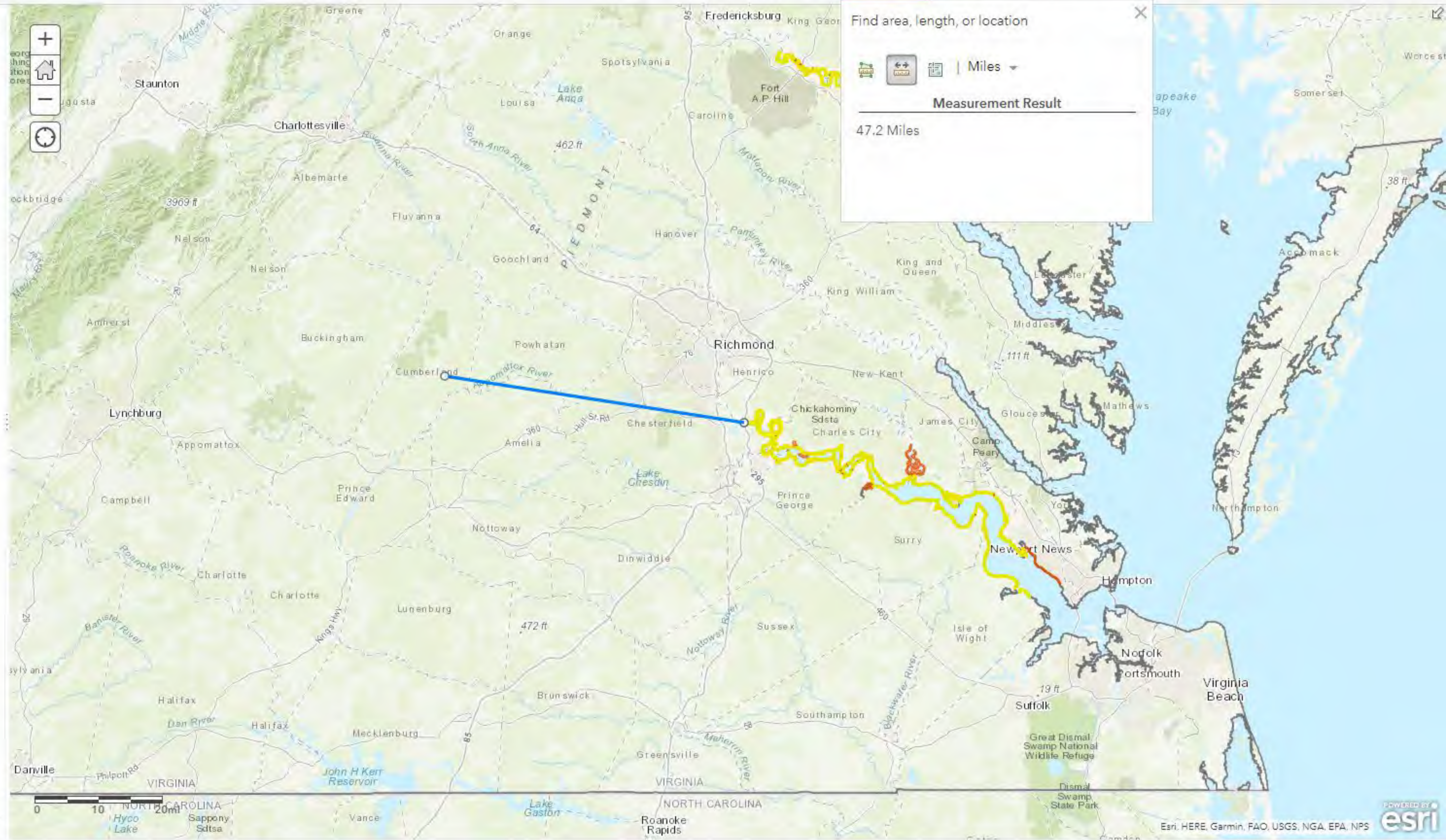
Legend

Bald Eagle Concentration Areas

December 15 to March 15

May 15 to August 31 and December 15 to March 15

Virginia



Find area, length, or location

Find area, length, or location

Measurement Result

47.2 Miles

Alternate 2

- 1) Known Nest Locations
- 2) Concentration Areas



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CCB MAPPING PORTAL

Help / FAQ

- Layers
- Bald Eagle
- VA Eagle Nest Locator
- Zoom to Extents
- Most recent data CCB has on bald eagle nest locations in Virginia. Data is largely from two annual aerial flights conducted in winter and spring of all tributaries of the lower Chesapeake Bay and other prominent bodies of water. Reported ground survey data is also included.
- More info
- VA Eagle Nest Buffers
- Eagle Roosts
- Eagle Roost Polygons
- Eagle Roost Buffers
- Eagle Roosts by Topoquad
- Waterbirds
- Shorebird Roost Registry
- Colonial Waterbirds 2018
- Colonial Waterbirds 2013
- Chesapeake Bay Herons 2013
- Colonial Waterbirds 2008
- Colonial Waterbirds 2003
- Osprey
- OspreyWatch Nests
- Chesapeake Bay Osprey Nests 1995-1996
- Nightjars
- Nightjar Survey Network Routes

- Toggle Draw Tools
- Generate Link
- Print Report
- Search

10 km
5 mi

+
-

Measure Distances and Areas

Last Point

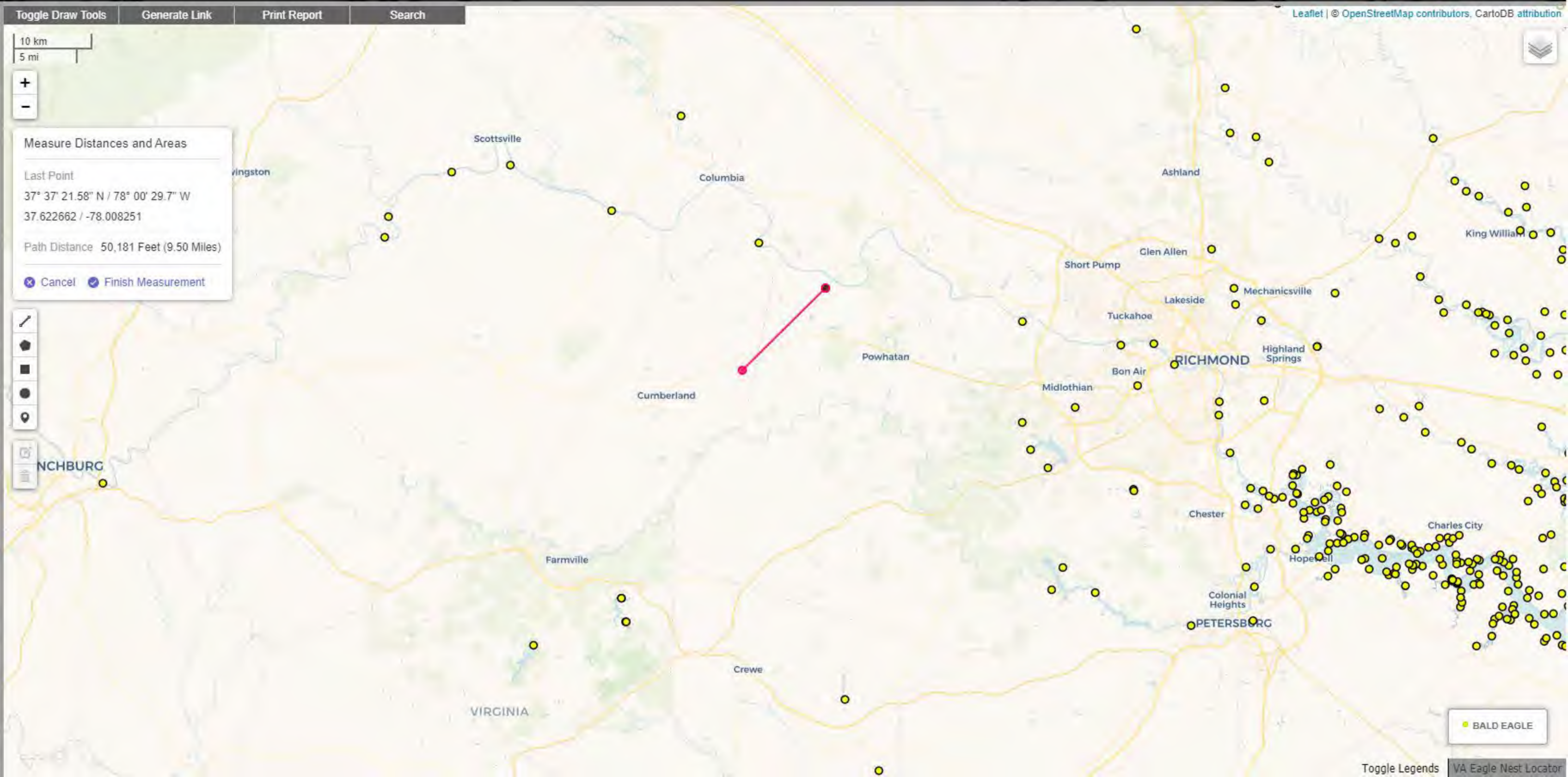
37° 37' 21.58" N / 78° 00' 29.7" W

37.622662 / -78.008251

Path Distance 50,181 Feet (9.50 Miles)

Cancel Finish Measurement

- Draw Tools
- Measure
- Area
- Line
- Point
- Location
- Layers



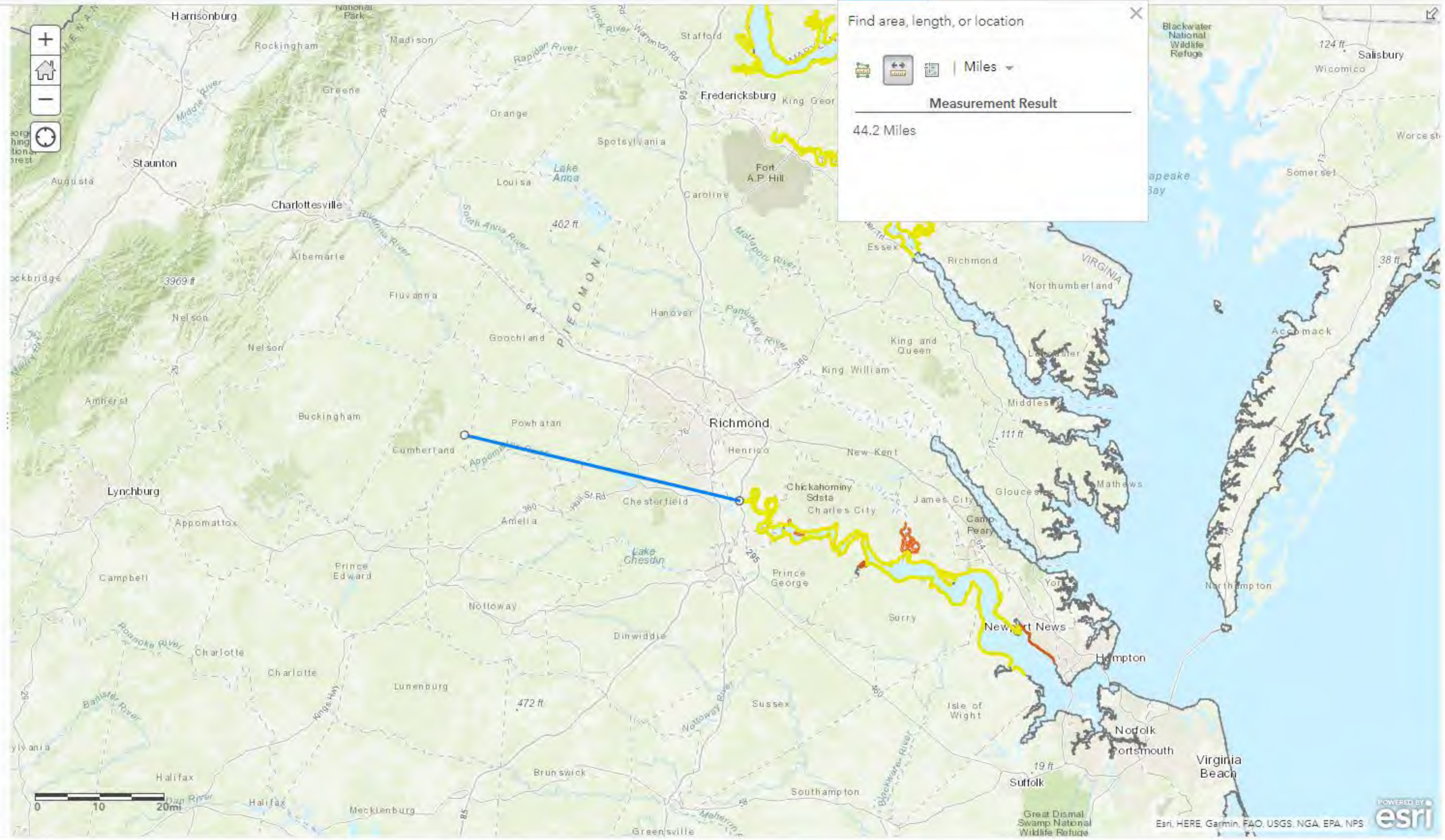
BALD EAGLE

Legend

Bald Eagle Concentration Areas

- December 15 to March 15
- May 15 to August 31 and December 15 to March 15

Virginia



Find area, length, or location

Find area, length, or location

Measurement Result

44.2 Miles

Alternate 3

- 1) Known Nest Locations
- 2) Concentration Areas



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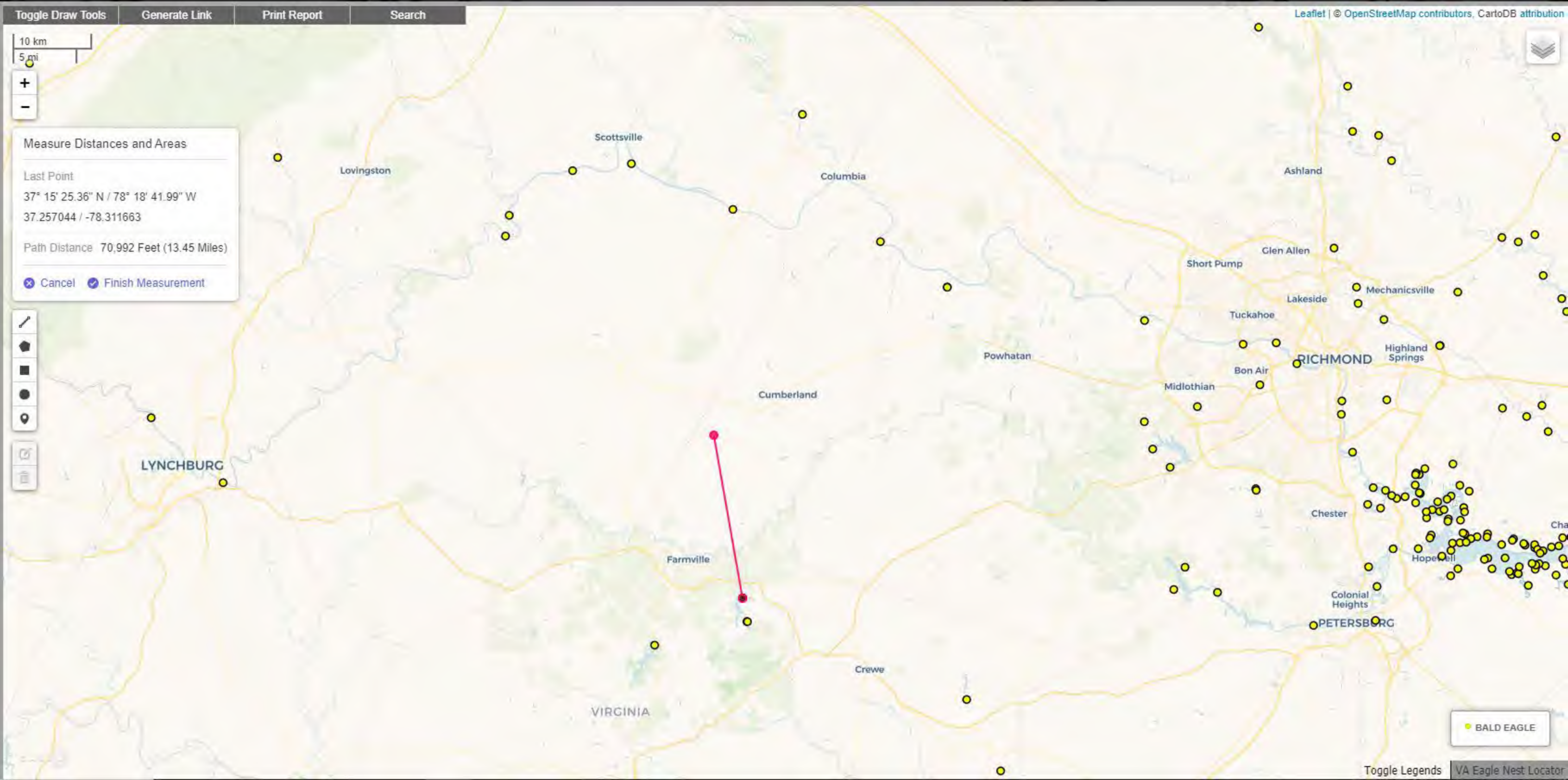
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Layers

- Bald Eagle
 - VA Eagle Nest Locator
 - Zoom to Extents
 - Most recent data CCB has on bald eagle nest locations in Virginia. Data is largely from two annual aerial flights conducted in winter and spring of all tributaries of the lower Chesapeake Bay and other prominent bodies of water. Reported ground survey data is also included.
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 - Eagle Roost Polygons
 - Eagle Roost Buffers
 - Eagle Roosts by Topoquad
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 - Colonial Waterbirds 2013
 - Chesapeake Bay Herons 2013
 - Colonial Waterbirds 2008
 - Colonial Waterbirds 2003
- Osprey
 - OspreyWatch Nests
 - Chesapeake Bay Osprey Nests 1995-1996
- Nightjars
 - Nightjar Survey Network Routes



ArcGIS ▾ USFWS Bald Eagle Concentration Areas - Virginia

Modify Map Sign In

Details | Basemap

Share Print ▾ | Measure Bookmarks

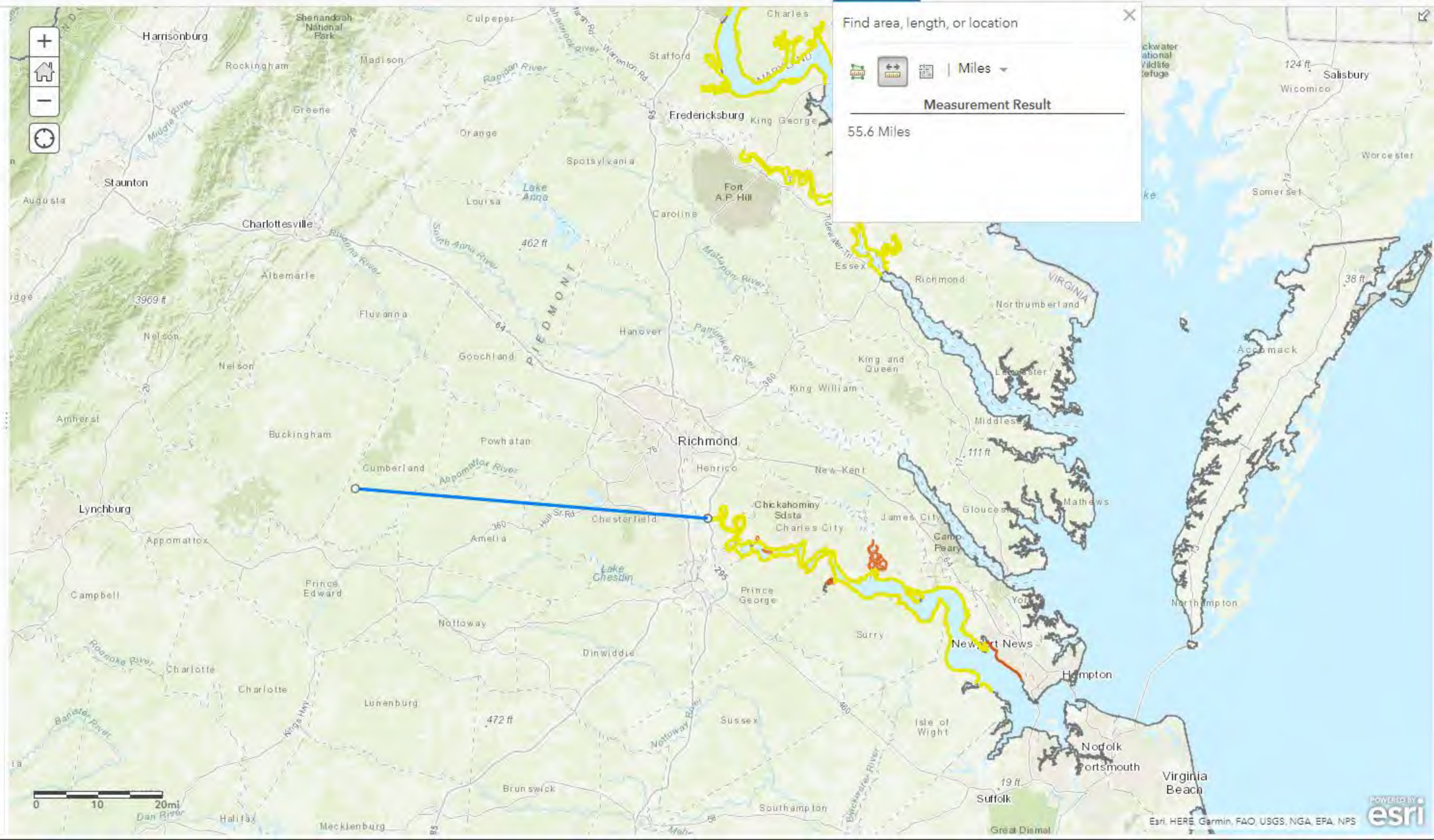
About Content Legend

Legend

Bald Eagle Concentration Areas

- December 15 to March 15
- May 15 to August 31 and December 15 to March 15

Virginia



Find area, length, or location

| Miles ▾

Measurement Result

55.6 Miles

Exhibit 7:

Northern long-eared bat Search Information

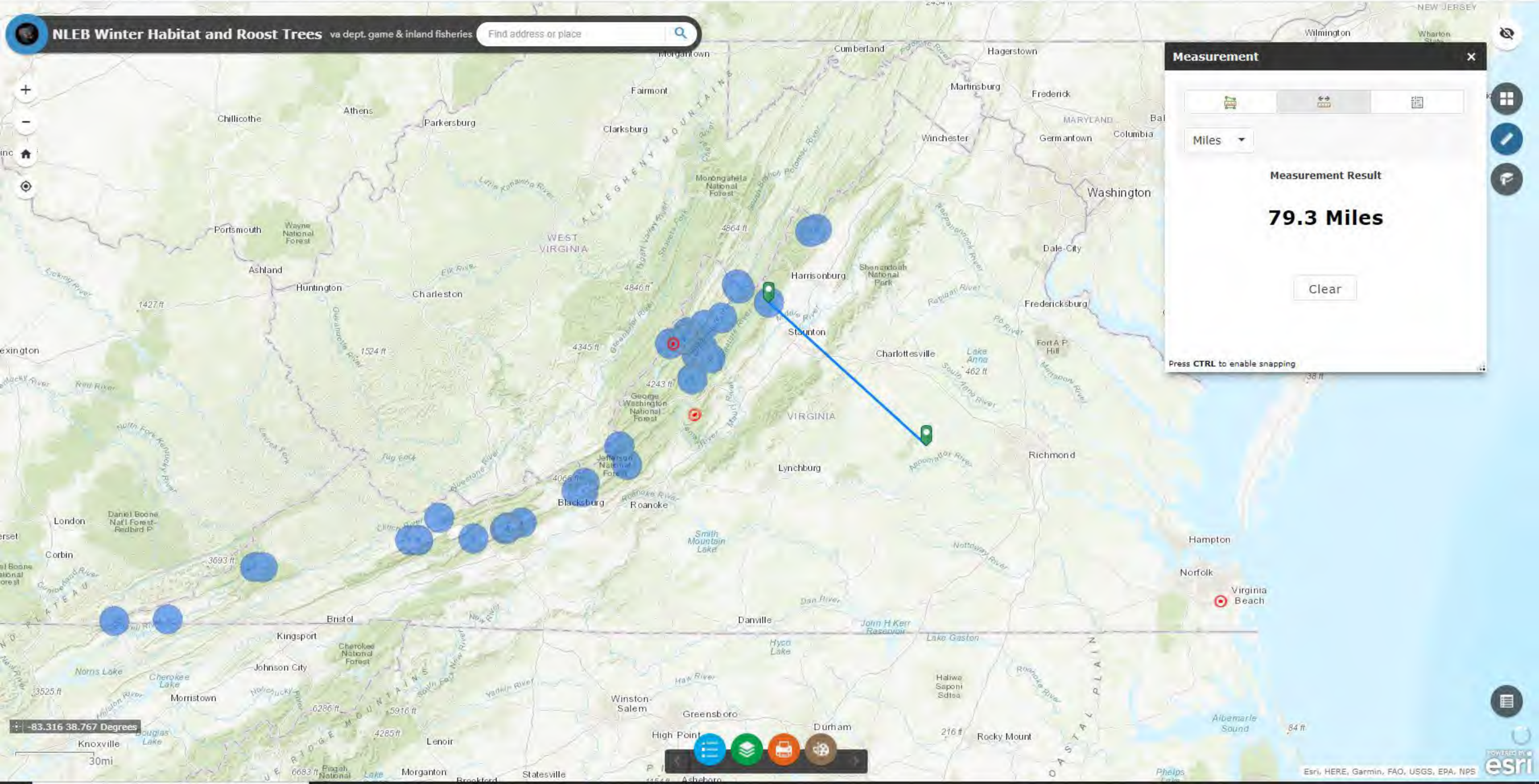
Green Ridge, Alternate 1, Alternate 2, Alternate 3

- 1) Roost Tree Locations
- 2) Winter Habitat (Hibernacula)

Green Ridge

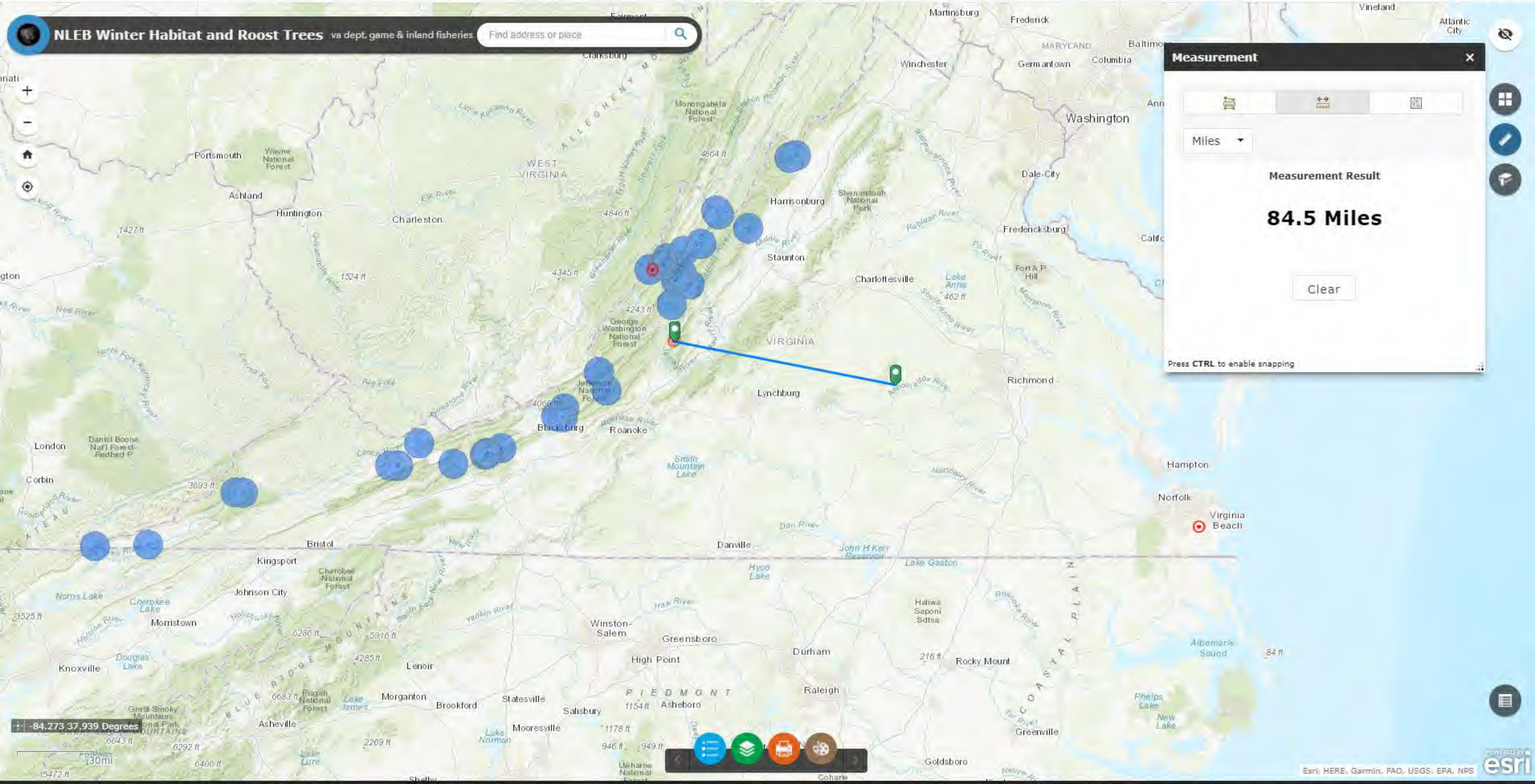
- 1) Roost Tree Locations
- 2) Winter Habitat (Hibernacula)

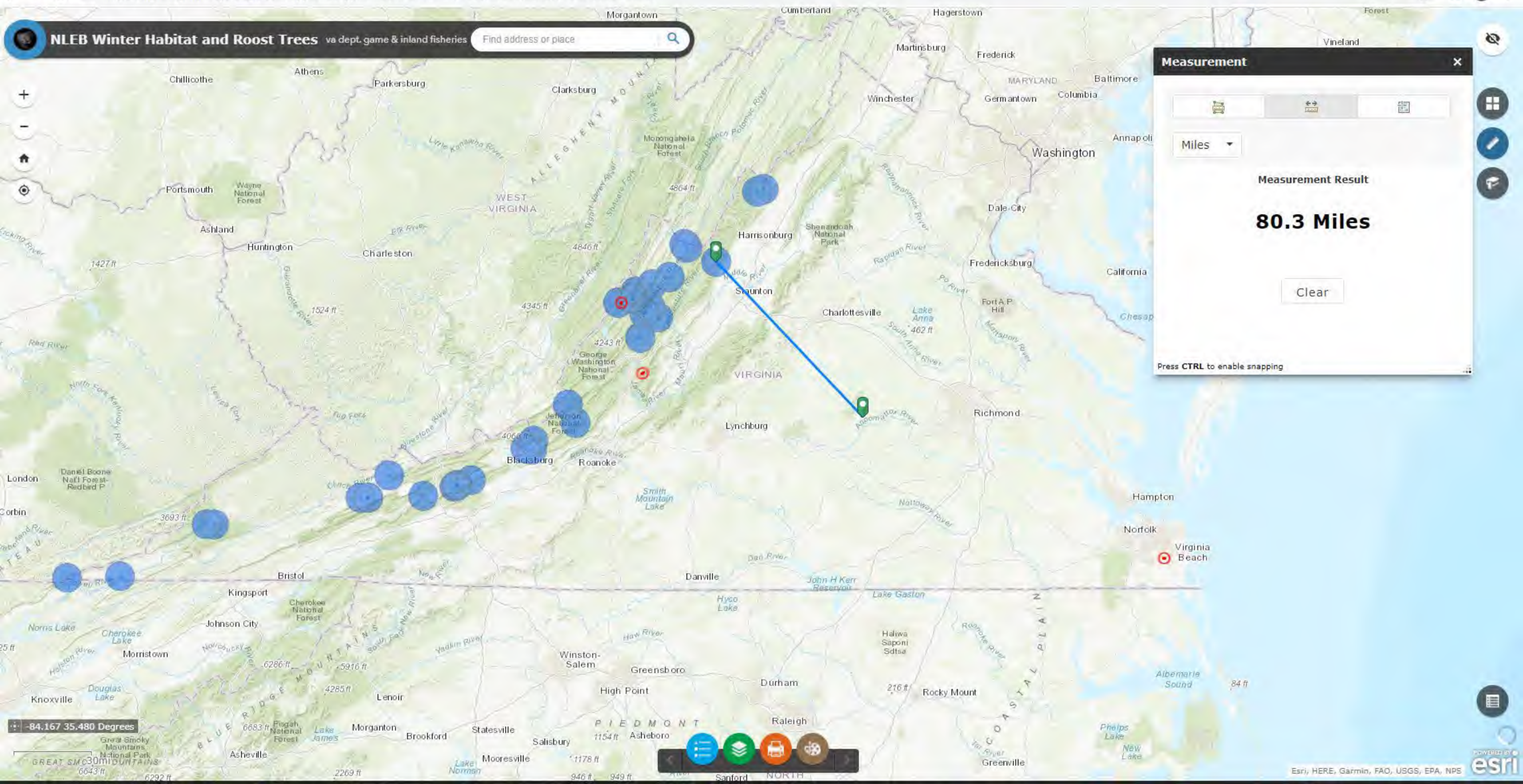
The screenshot displays a web map application with a measurement tool overlay. The map shows a region in the Appalachian area, with labels for cities such as Lexington, Roanoke, Blacksburg, and Harrisonburg. A blue line connects two points, and a measurement of 87 miles is displayed. The measurement tool overlay includes a 'Clear' button and a 'Press CTRL to enable snapping' instruction. The map also shows various geographical features like the Allegheny Mountains, Shenandoah National Park, and the Potomac River. The bottom of the map has a scale bar and a coordinate display showing -83.941 39.031 Degrees.



Alternate 1

- 1) Roost Tree Locations
- 2) Winter Habitat (Hibernacula)





Measurement ✕

Miles ▾

Measurement Result

80.3 Miles

Clear

Press CTRL to enable snapping

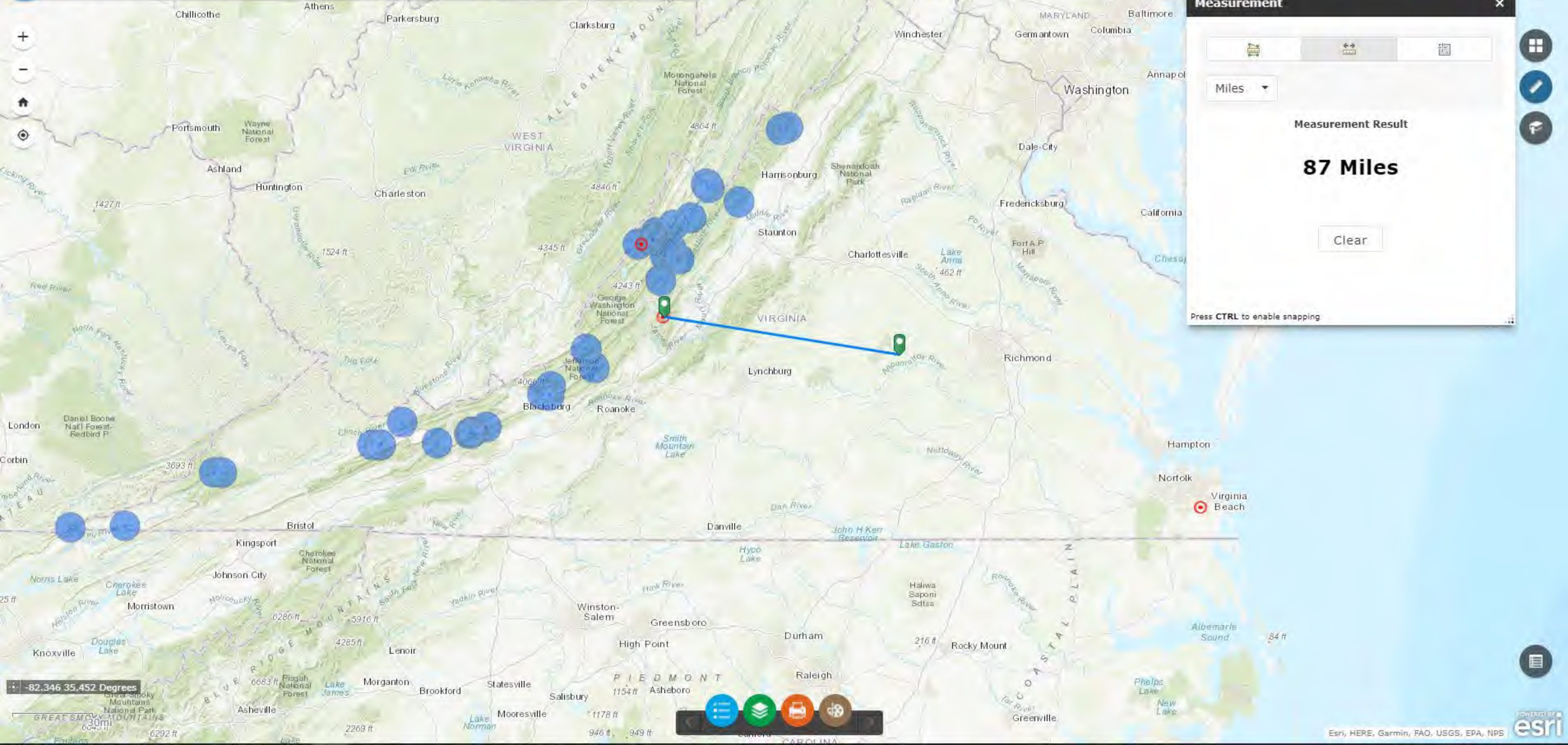


-84.167 35.480 Degrees



Alternate 2

- 1) Roost Tree Locations
- 2) Winter Habitat (Hibernacula)



Measurement

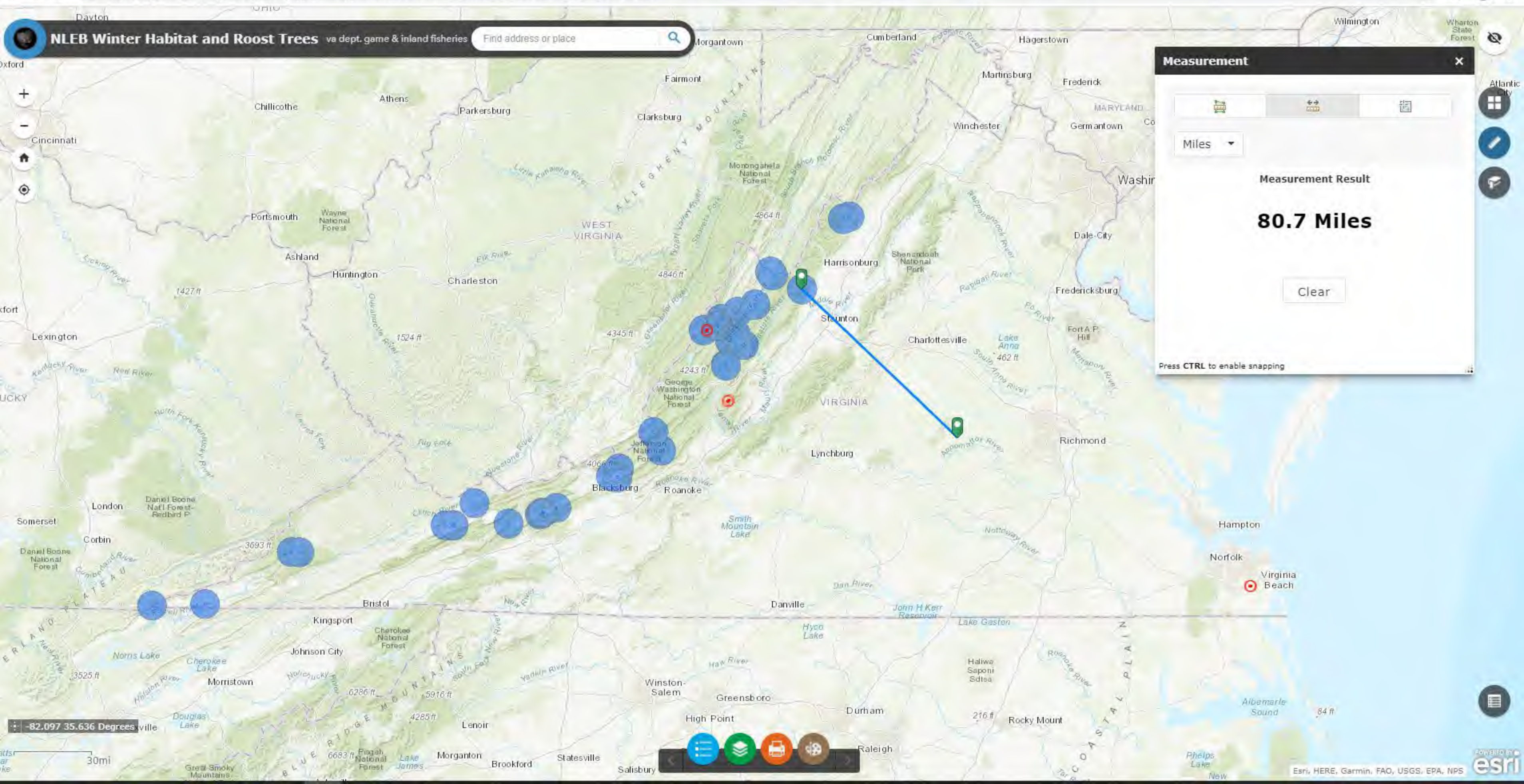
Miles

Measurement Result

87 Miles

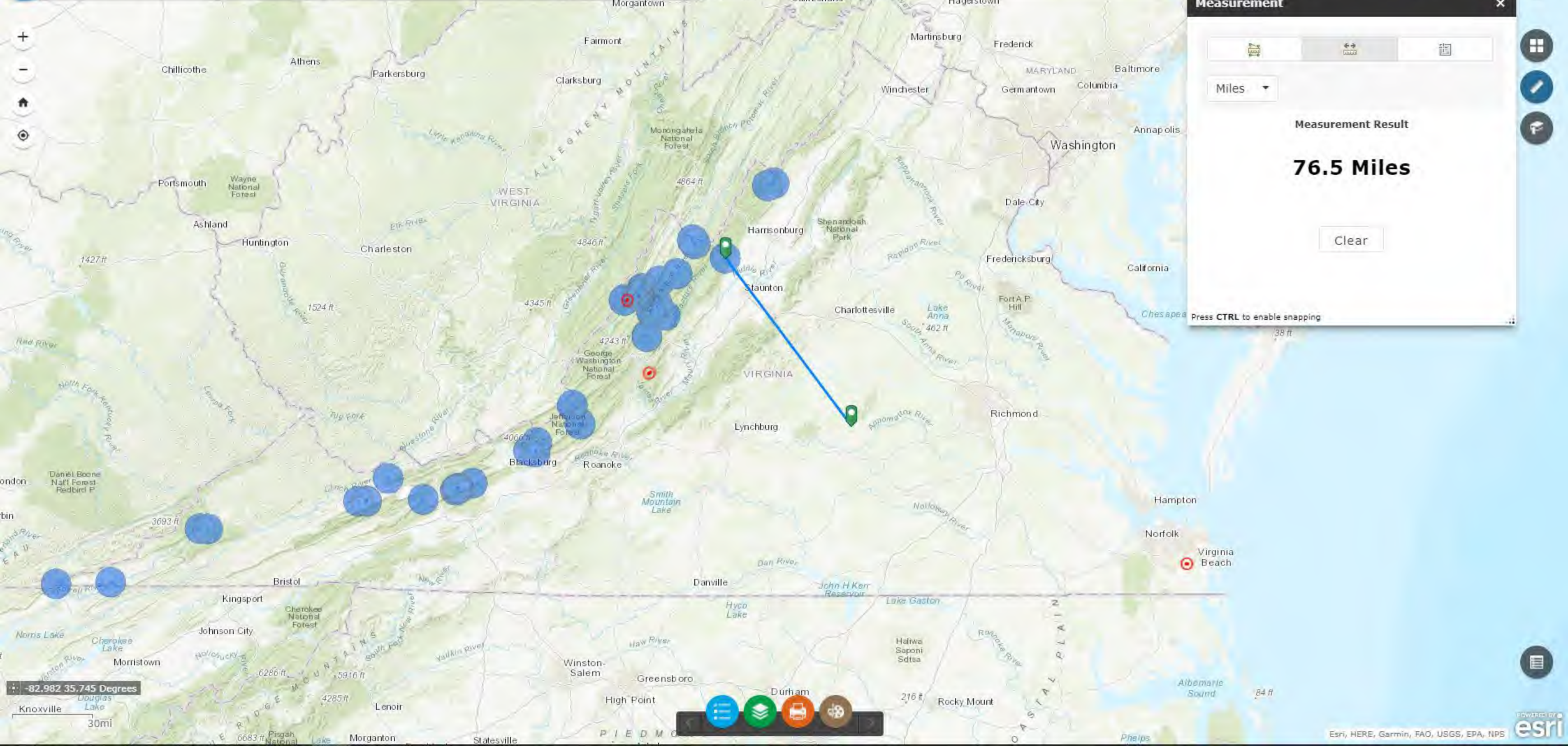
Clear

Press CTRL to enable snapping



Alternate 3

- 1) Roost Tree Locations
- 2) Winter Habitat (Hibernacula)



Measurement

Miles

Measurement Result

76.5 Miles

Clear

Press CTRL to enable snapping

Exhibit 8:

DGIF Species Occurrences

- 1) Northern long-eared bat
- 2) Yellow lance
- 3) Atlantic Pigtoe
- 4) Green Floater
- 5) Loggerhead Shrike

1) Northern long-eared bat

- [Commonwealth of Virginia](#)
- [Governor](#)
- [Skip to Content](#)
- [Web Policy](#)
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- [Virginia Fish and Wildlife Information Service](#)

[Close Window](#)

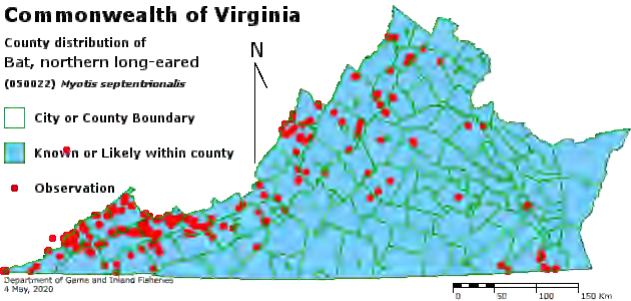
»
Occurrence

- [BOVA Booklet](#)

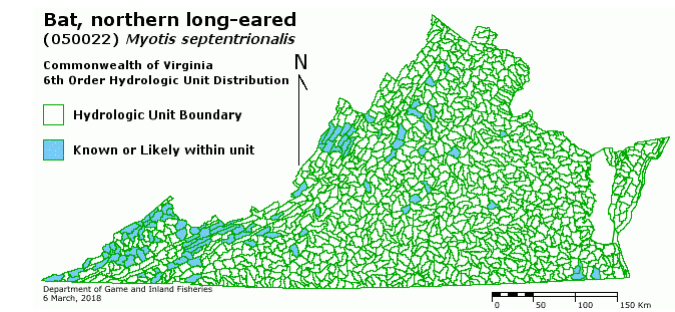
(067) Franklin

- [Taxonomy](#)
- [Status](#)
- [Life History](#)
- [Occurrence](#)
- [County Abundance](#)
- [Distributions within Administrative Units](#)
- [Management Practices](#)
- [Food Habits](#)
- [Habitat](#)
- [Environmental Associations](#)
- [References](#)
- [Gap Habitat](#)
- [All Chapters](#)
- [BOVA Update View](#)
- [Show This Page as Printer Friendly](#)

Occurrence chapter for Bat, northern long-eared (050022)



- [DGIF| Credits | Disclaimer | Contact vafwis_support@dgif.virginia.gov](#) |Please view our [privacy policy](#) |
© Copyright: 1998-2021 Commonwealth of Virginia Department of Game and Inland Fisheries
- W3C HTML [validation](#) <BASE href="https://vafwis.dgif.virginia.gov/fwis/NewPages/">[VaFWIS_booklet_chapters.asp](#)



County Occurrences

County	County Name	General Occurrence	Resident Occurrence	Seasonal Occurrence
001	Accomack	2 - Likely		
003	Albemarle	1 - Known		
005	Alleghany	2 - Likely		
007	Amelia	2 - Likely		
009	Amherst	2 - Likely		
011	Appomattox	1 - Known		
013	Arlington	2 - Likely		
015	Augusta	1 - Known	1 - Known	
017	Bath	1 - Known	1 - Known	
019	Bedford	2 - Likely		
021	Bland	1 - Known	1 - Known	
023	Botetourt	1 - Known		
025	Brunswick	2 - Likely		
027	Buchanan	1 - Known		
029	Buckingham	1 - Known		
031	Campbell	2 - Likely		
033	Caroline	1 - Known		
035	Carroll	2 - Likely		
036	Charles City	2 - Likely		
037	Charlotte	2 - Likely		
041	Chesterfield	1 - Known		
043	Clarke	2 - Likely		
045	Craig	1 - Known	1 - Known	
047	Culpeper	2 - Likely		
049	Cumberland	2 - Likely		
051	Dickenson	1 - Known	1 - Known	
053	Dinwiddie	2 - Likely		
057	Essex	2 - Likely		
059	Fairfax	2 - Likely		
061	Fauquier	2 - Likely		
063	Floyd	1 - Known		
065	Fluvanna	2 - Likely		
067	Franklin	2 - Likely		
069	Frederick	2 - Likely		
071	Giles	1 - Known	1 - Known	
073	Gloucester	2 - Likely		
075	Goochland	2 - Likely		
077	Grayson	2 - Likely		
079	Greene	1 - Known		
081	Greensville	2 - Likely		
083	Halifax	2 - Likely		
085	Hanover	2 - Likely		
087	Henrico	2 - Likely		
089	Henry	2 - Likely		
091	Highland	1 - Known	1 - Known	
093	Isle of Wight	2 - Likely		
095	James City	2 - Likely		
097	King and Queen	2 - Likely		
099	King George	2 - Likely		
101	King William	2 - Likely		
103	Lancaster	2 - Likely		
105	Lee	1 - Known	1 - Known	

107	Loudoun	2 - Likely		
109	Louisa	1 - Known		
111	Lunenburg	2 - Likely		
113	Madison	1 - Known		
115	Mathews	2 - Likely		
117	Mecklenburg	2 - Likely		
119	Middlesex	2 - Likely		
121	Montgomery	2 - Likely		
125	Nelson	2 - Likely		
127	New Kent	2 - Likely		
131	Northampton	2 - Likely		
133	Northumberland	2 - Likely		
135	Nottoway	2 - Likely		
137	Orange	2 - Likely		
139	Page	1 - Known		
141	Patrick	2 - Likely		
143	Pittsylvania	2 - Likely		
145	Powhatan	2 - Likely		
147	Prince Edward	2 - Likely		
149	Prince George	2 - Likely		
153	Prince William	2 - Likely		
155	Pulaski	1 - Known		
157	Rappahannock	2 - Likely		
159	Richmond	2 - Likely		
161	Roanoke	1 - Known		
163	Rockbridge	1 - Known	1 - Known	
165	Rockingham	1 - Known	1 - Known	
167	Russell	2 - Likely		
169	Scott	1 - Known		
171	Shenandoah	2 - Likely		
173	Smyth	1 - Known		
175	Southampton	2 - Likely		
177	Spotsylvania	2 - Likely		
179	Stafford	2 - Likely		
181	Surry	2 - Likely		
183	Sussex	2 - Likely		
185	Tazewell	1 - Known	1 - Known	
187	Warren	1 - Known		
191	Washington	1 - Known		
193	Westmoreland	2 - Likely		
195	Wise	1 - Known	1 - Known	
197	Wythe	1 - Known		
199	York	2 - Likely		
510	Alexandria City	2 - Likely		
515	Bedford City	2 - Likely		
520	Bristol City	2 - Likely		
530	Buena Vista City	2 - Likely		
540	Charlottesville City	2 - Likely		
550	Chesapeake City	1 - Known		
560	Clifton Forge City	2 - Likely		
570	Colonial Heights City	2 - Likely		
580	Covington City	2 - Likely		
590	Danville City	2 - Likely		
595	Emporia City	2 - Likely		
600	Fairfax City	2 - Likely		
610	Falls Church City	2 - Likely		
620	Franklin City	2 - Likely		
630	Fredericksburg City	2 - Likely		
640	Galax City	2 - Likely		
650	Hampton City	2 - Likely		
660	Harrisonburg City	2 - Likely		
670	Hopewell City	2 - Likely		
678	Lexington City	2 - Likely		
680	Lynchburg City	2 - Likely		
683	Manassas City	2 - Likely		
685	Manassas Park City	2 - Likely		
690	Martinsville City	2 - Likely		
700	Newport News City	2 - Likely		

710	Norfolk City	2 - Likely		
720	Norton City	2 - Likely		
730	Petersburg City	2 - Likely		
735	Poquoson City	2 - Likely		
740	Portsmouth City	2 - Likely		
750	Radford City	2 - Likely		
760	Richmond City	2 - Likely		
770	Roanoke City	2 - Likely		
775	Salem City	2 - Likely		
780	South Boston City	2 - Likely		
790	Staunton City	1 - Known	1 - Known	
800	Suffolk City	1 - Known		
810	Virginia Beach City	2 - Likely		
820	Waynesboro City	1 - Known		
830	Williamsburg City	2 - Likely		
840	Winchester City	2 - Likely		

General Occurrence Comments: Most of the bat surveying has been done in the caves of western Virginia and therefore the list of confirmed counties occurs in those counties. Most sources say that this bat is statewide (11321,147,152) but there is very little data to back this up. It is not collected often mainly because the habit of roosting singly or in very small groups in the very darkest cracks and crevices makes them difficult to survey *9261*.

Resident Occurrence Comments: Most of the bat surveying has been done in the caves of southwestern Virginia and therefore that is where the concentration of confirmed counties is. Most sources say that this bat is statewide (11321,147,152) but there is very little data to back this up. It is not collected often mainly because its habits of roosting singly or in very small groups in the very darkest cracks and crevices, makes them difficult to survey *9261*.

Seasonal Occurrence Comments: Most of the bat surveying has been done in the caves of southwestern Virginia and therefore that is where the concentration of confirmed counties is. Most sources say that this bat is statewide (11321,147,152) but there is very little data to back this up. It is not collected often mainly because its habits of roosting singly or in very small groups in the very darkest cracks and crevices, makes them difficult to survey *9261*. This species is found year round in all the counties previously mentioned *8867*.

References for County Occurrence

Ref.Id	Citation
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89	Douglas, H.H., 1964, Caves of Virginia, 761 pgs., VA Reg. of the Nat'l Speleological Soc.
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5668	Hall, E.R., 1981, The Mammals of North America, 2nd Ed. Vol.1 & 2, 1181 pgs., John WI Sons, Inc., NY
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6203	Elder, W.H., Collection records., UNPB., Univ. of MO
9806	Virginia Dept. Game and Inland Fisheries, 1989, Virginia nongame and endangered wildlife investigations-annual report July 1, 1989-June 30, 1990, 140 pgs., Richmond, Va.
10865	Virginia Dept. of Game and Inland Fisheries, 1992, Nongame and Endangered Wildlife Program Annual Report, 99 pgs., VDGIF, Richmond, VA
10949	Virginia Department of Game and Inland Fisheries, 1995, Collections Database
11161	VA Dept. of Game and Inland Fisheries, 1995, Caves database
11185	Schwab, D., 1996, Health Dept. bat identification specimens
11321	Linzey, D.W., 1998, The mammals of Virginia, 459 pp. pgs., McDonald and Woodward Publishing Comp., Blacksburg, VA
11325	Virginia Dept. of Health, 1998, Bats captured and tested for rabies, bats identified by Don Schwab
11359	Nongame and Endangered Wildlife, Program, VDGIF, 1995, Nongame Annual Report, 1994-1995, 123 pgs., VDGIF
11621	Rick Reynolds, 2001, DGIF Nongame Biologist, Comments on species profiles

2) Yellow Lance

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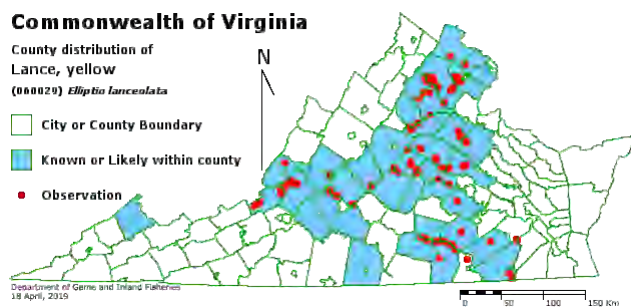
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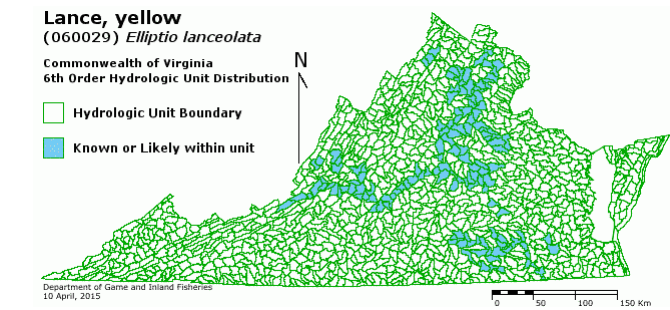
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Occurrence chapter for Lance, yellow (060029)





County Occurrences				
County	County Name	General Occurrence	Resident Occurrence	Seasonal Occurrence
003	Albemarle	1 - Known		
005	Alleghany	1 - Known		
009	Amherst	1 - Known		
019	Bedford	1 - Known		
023	Botetourt	1 - Known		
025	Brunswick	1 - Known		
027	Buchanan		1 - Known	
029	Buckingham	1 - Known		
031	Campbell	1 - Known	1 - Known	
033	Caroline	1 - Known		
041	Chesterfield	1 - Known		
045	Craig	1 - Known		
047	Culpeper	1 - Known	1 - Known	
049	Cumberland	1 - Known	1 - Known	
053	Dinwiddie	1 - Known		
059	Fairfax	1 - Known	1 - Known	
061	Fauquier	1 - Known	1 - Known	
065	Fluvanna	1 - Known	1 - Known	
075	Goochland	1 - Known	1 - Known	
083	Halifax	1 - Known	1 - Known	
085	Hanover	1 - Known	1 - Known	
107	Loudoun	1 - Known		
109	Louisa	1 - Known	1 - Known	
111	Lunenburg	1 - Known		
113	Madison	1 - Known		
125	Nelson	1 - Known		
135	Nottoway	1 - Known		
137	Orange	1 - Known	1 - Known	
145	Powhatan	1 - Known	1 - Known	
153	Prince William	1 - Known	1 - Known	
157	Rappahannock	1 - Known		
163	Rockbridge	1 - Known	1 - Known	
175	Southampton	1 - Known		
177	Spotsylvania	1 - Known		
183	Sussex	1 - Known		
530	Buena Vista City	1 - Known	1 - Known	
600	Fairfax City	1 - Known	1 - Known	
610	Falls Church City	1 - Known	1 - Known	
620	Franklin City	1 - Known	1 - Known	
678	Lexington City	1 - Known	1 - Known	

Seasonal Occurrence Comments: Mussels are very sedentary, therefore seasonal occurrence and general occurrence are the same *8825*.

References for County Occurrence

Ref.Id	Citation
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USGS National 6th Order Watershed Occurrences	
HU6	6th Order Watershed Name
CM16	Great Creek
CM17	Meherrin River-Coldwater Creek
CM19	Meherrin River-Douglas Run
CM20	Meherrin River-Falling Run
CU03	Big Hounds Creek

CU04	Nottoway River-Falls Creek
CU06	Little Nottoway River-Whetstone Creek
CU07	Nottoway River-Cedar Creek
CU08	Hurricane Branch-Long Branch
CU09	Nottoway River-Red Oak Creek
CU11	Nottoway River-Beaver Pond Creek
CU13	Nottoway River-Turkey Egg Creek
CU14	Sturgeon Creek
CU15	Nottoway River-Indian Creek
CU17	Nottoway River-Harris Swamp
CU18	Nottoway River-Island Swamp
CU22	Stony Creek-Chamberlains Bed
CU24	Lower Sappony Creek
CU25	Stony Creek-Southwest Swamp
CU30	Nottoway River-Cabin Point Swamp
CU31	Nebblets Mill Run-Joseph Swamp
CU32	Nottoway River-Austin Branch
CU36	Nottoway River-Parker Run
CU37	Three Creek-Slagles Lake
CU43	Nottoway River-Buckhorn Swamp
CU48	Nottoway River-Courtland
CU51	Nottoway River-Round Gut
CU59	Blackwater River-Terrapin Swamp
CU62	Blackwater River-Antioch Swamp
JA42	Swift Creek-Third Branch
JA44	Swift Creek-Franks Branch
JM01	James River-Otter Creek
JM02	Reed Creek
JM03	James River-Thomas Mill Creek
JM06	Pedlar River-Horsley Creek
JM07	James River-Judith Creek
JM10	Blackwater Creek
JM11	James River-Opossum Creek
JM13	James River-Beck Creek
JM14	James River-Stonewall Creek
JM15	James River-Christian Mill Creek
JM17	James River-Allens Creek
JM20	James River-Alabama Creek
JM34	James River-Mallorys Creek
JM35	James River-Sycamore Creek
JM42	James River-Ballinger Creek
JM43	James River-Rock Island Creek
JM45	James River-Little George Creek
JM50	James River-Bremo Creek
JM58	James River-Bear Garden Creek
JM62	James River-Hooper Rock Creek
JM71	Muddy Creek
JM72	James River-Picketts Creek
JM75	James River-Solomons Creek
JM78	James River-Mohawk Creek
JM79	Beaverdam Creek
JM80	James River-Fine Creek
JM82	James River-Little River
JM83	James River-Bernards Creek
JM84	Tuckahoe Creek
JR18	Mechunk Creek
JR19	Rivanna River-Stigger Creek
JR22	Rivanna River-Carys Creek
JU10	Jackson River-Falling Spring Creek
JU11	Jackson River-Indian Draft
JU34	Cowpasture River-Mill Creek
JU35	Pads Creek
JU36	Cowpasture River-Simpson Creek
JU44	Upper Johns Creek
JU45	Lower Johns Creek
JU46	Craig Creek-Rolands Run Branch
JU48	Craig Creek-Mill Creek

JU49	Patterson Creek
JU50	Craig Creek-Roaring Run
JU51	James River-Lapsley Run
JU54	James River-Hickory Hollow Branch
JU56	James River-Purgatory Creek
JU58	James River-Roaring Run
JU60	James River-Elk Creek
JU76	Maury River-Mill Creek
JU80	Lower South River
JU81	Maury River-Bennetts Run
JU86	Maury River-Poague Run
PL13	Little River
PL14	Goose Creek-Big Branch
PL33	Kettle Run
PL34	Broad Run-Rocky Branch
PL36	Cedar Run-Owl Run
PL37	Licking Run
PL38	Cedar Run-Walnut Branch
PL42	Upper Bull Run
PL44	Middle Bull Run
PL45	Cub Run
PS69	North Fork Shenandoah River-Toms Brook
PS70	North Fork Shenandoah River-Tumbling Run
PS75	Cedar Creek-Meadow Brook
RA01	Rappahannock River-Buck Run
RA02	Jordan River
RA03	Rappahannock River-Lake Mosby
RA04	Thumb Run
RA05	Rappahannock River-Glascock Run
RA06	Carter Run
RA07	Rappahannock River-Great Run
RA10	Hazel River-Devils Run
RA14	Thornton River-Mill Run
RA16	Hazel River-Indian Run
RA17	Marsh Run
RA18	Rappahannock River-Ruffans Run
RA21	Mountain Run-Flat Run
RA22	Rappahannock River-Rock Run
RA27	Rapidan River-Marsh Run
RA28	Blue Run
RA30	Rapidan River-Poplar Run
RA37	Rapidan River-Rapidan
RA38	Cedar Run
RA39	Rapidan River-Potato Run
RA41	Mine Run
RA42	Rapidan River-Fields Run
YO01	South Anna River-Dove Fork
YO03	South Anna River-Roundabout Creek
YO04	South Anna River-Harris Creek
YO05	South Anna River-Fork Creek
YO07	South Anna River-Owens Creek
YO08	Taylors Creek
YO09	South Anna River-Turkey Creek
YO11	South Anna River-Cedar Creek
YO12	North Anna River-Mountain Run
YO16	Pamunkey Creek-Lake Anna-Clear Creek
YO17	Terrys Run-Lake Anna
YO39	Po River-Robertson Run
YO40	Glady Run
YO41	Po River-Lake Pocahontas
YO43	Mat River
YO44	Ta River
YO45	Matta River
YO46	South River
YO47	Mattaponi River-Campbell Creek
YO48	Polecat Creek

6th Order Hydrologic Unit Comments: 6th order hydrologic unit distribution reviewed in year 2009 by Virginia Department of Game and Inland Fisheries Taxonomic Advisory Committees.

References for 6th Order Hydrologic Unit

Ref.Id Citation

12325 VDGIF, 2009, Tiered Species Distributions by 6th Order Watershed, as Reviewed by VDGIF's Taxonomic Advisory Committees

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3) Atlantic Pigtoe

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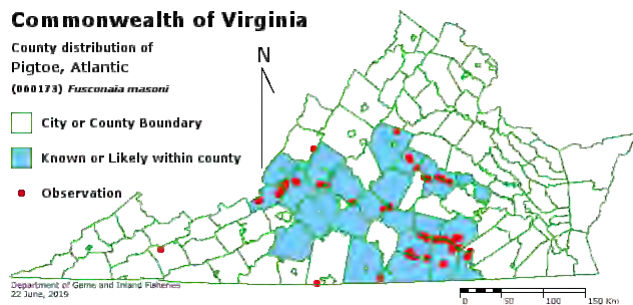
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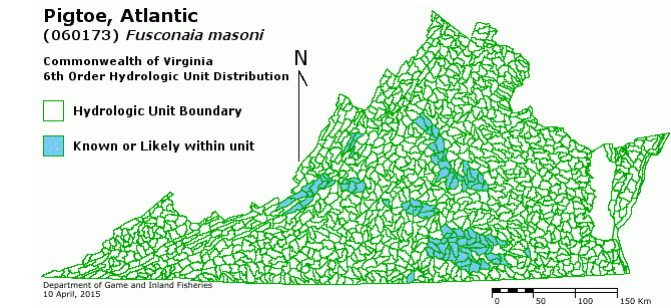
Occurrence chapter for Pigtoe, Atlantic (060173)

Commonwealth of Virginia

County distribution of
Pigtoe, Atlantic
(060173) *Fusconaia masoni*

-  City or County Boundary
-  Known or Likely within county
-  Observation





County Occurrences

County	County Name	General Occurrence	Resident Occurrence	Seasonal Occurrence
003	Albemarle	1 - Known		
005	Alleghany	1 - Known		
009	Amherst	1 - Known		
011	Appomattox	1 - Known		
019	Bedford	1 - Known		
023	Botetourt	1 - Known		
025	Brunswick	1 - Known		
029	Buckingham	1 - Known		
031	Campbell	1 - Known		
045	Craig	1 - Known		
053	Dinwiddie	1 - Known		
065	Fluvanna	1 - Known		
067	Franklin	1 - Known		
075	Goochland	1 - Known		
081	Greensville	1 - Known		
083	Halifax	1 - Known		
087	Henrico	1 - Known		
111	Lunenburg	1 - Known		
117	Mecklenburg	1 - Known		
135	Nottoway	1 - Known		
145	Powhatan	1 - Known		
147	Prince Edward	1 - Known		
163	Rockbridge	1 - Known		

General Occurrence Comments: The Atlantic pigtoe is known from the James, Roanoke and Nottoway river systems in Virginia, south to the Ogeechee River system in Georgia. Recent records include tributaries of the James River between Albemarle and Henrico counties, the Craig Creek drainage in Craig, Alleghany and Botetourt counties and the Appomattox River, Prince Edward County; Roanoke River drainage in Franklin and Bedford counties; and Meherrin River, Mecklenburg County *9286*.

Seasonal Occurrence Comments: Mussels are very sedentary, therefore seasonal occurrence and general occurrence are the same *8825*.

References for County Occurrence

Ref.Id Citation

9286 Terwilliger, K.T., 1991, Virginia's endangered species: Proceedings of a symposium. Coordinated by the Virginia Dept. of Game and Inland Fisheries, Nongame and Endangered Species Program, 672 pp. pgs., McDonald and Woodward Publ. Comp., Blacksburg, VA

USGS National 6th Order Watershed Occurrences

HU6	6th Order Watershed Name
CM01	Middle Meherrin River
CM02	South Meherrin River-Finneywood Creek
CM03	South Meherrin River-Blackstone Creek
CM05	North Meherrin River-Big Juniper Creek
CM06	Couches Creek
CM07	North Meherrin River-Reedy Creek
CM08	Meherrin River-Mason Creek
CM09	Meherrin River-Crooked Creek
CM10	Flat Rock Creek
CM11	Meherrin River-Stony Creek
CM12	Meherrin River-Taylors Creek
CM13	Genito Creek
CM14	Meherrin River-Allen Creek
CM16	Great Creek
CM17	Meherrin River-Coldwater Creek
CU01	Nottoway River-Dry Creek
CU02	Modest Creek

CU03	Big Hounds Creek
CU04	Nottoway River-Falls Creek
CU06	Little Nottoway River-Whetstone Creek
CU07	Nottoway River-Cedar Creek
CU08	Hurricane Branch-Long Branch
CU09	Nottoway River-Red Oak Creek
CU10	Tommeheton Creek
CU11	Nottoway River-Beaver Pond Creek
CU12	Waqua Creek
CU13	Nottoway River-Turkey Egg Creek
CU14	Sturgeon Creek
CU15	Nottoway River-Indian Creek
CU16	Buckskin Creek
CU23	Upper Sappony Creek
CU24	Lower Sappony Creek
CU36	Nottoway River-Parker Run
CU37	Three Creek-Slagles Lake
CU38	Maclins Creek
CU39	Three Creek-Otterdam Swamp
JA01	Appomattox River-Wolf Creek
JA02	Appomattox River-Suane Creek
JA03	Appomattox River-Fishpond Creek
JA04	Vaughans Creek
JA05	Appomattox River-Ducker Creek
JA08	Buffalo Creek-Locket Creek
JA09	Appomattox River-Bad Luck Branch
JM01	James River-Otter Creek
JM13	James River-Beck Creek
JM58	James River-Bear Garden Creek
JM62	James River-Hooper Rock Creek
JM70	Willis River-Trice Lake
JM71	Muddy Creek
JM72	James River-Picketts Creek
JM74	Deep Creek-Sallee Creek
JM75	James River-Solomons Creek
JM77	Big Lickinghole Creek
JM78	James River-Mohawk Creek
JM79	Beaverdam Creek
JM80	James River-Fine Creek
JM81	Norwood Creek
JM82	James River-Little River
JM83	James River-Bernards Creek
JR09	North Fork Rivanna River-Lynch River
JR10	Swift Run
JR11	North Fork Rivanna River-Jacobs Run
JR12	Preddy Creek
JR13	North Fork Rivanna River-Flannigan Branch
JR17	Rivanna River-Carroll Creek
JR18	Mechunk Creek
JR19	Rivanna River-Stigger Creek
JR20	Cunningham Creek
JR21	Ballinger Creek
JR22	Rivanna River-Carys Creek
JU40	James River-Black Lick
JU41	Craig Creek-Trout Creek
JU43	Craig Creek-Broad Run
JU44	Upper Johns Creek
JU45	Lower Johns Creek
JU46	Craig Creek-Rolands Run Branch
JU47	Barbours Creek
JU48	Craig Creek-Mill Creek
JU49	Patterson Creek
JU50	Craig Creek-Roaring Run
JU51	James River-Lapsley Run
JU58	James River-Roaring Run
JU59	Cedar Creek-Spring Gap Creek
JU60	James River-Elk Creek
JU65	Calfpasture River-Fridley Branch

JU66	Mill Creek-Cabin Creek
JU68	Calfpasture River-Guys Run
JU86	Maury River-Poague Run
RD75	Aarons Creek-John H Kerr Reservoir

6th Order Hydrologic Unit Comments: 6th order hydrologic unit distribution reviewed in year 2009 by Virginia Department of Game and Inland Fisheries Taxonomic Advisory Committees.

References for 6th Order Hydrologic Unit

Ref.Id Citation

12325 VDGIF, 2009, Tiered Species Distributions by 6th Order Watershed, as Reviewed by VDGIF's Taxonomic Advisory Committees

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4) Green Floater

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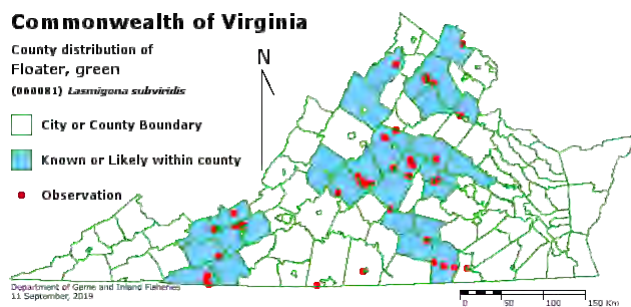
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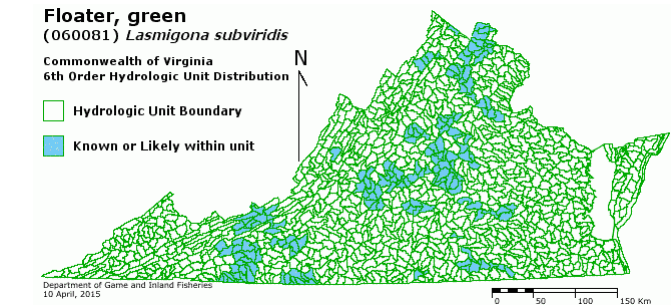
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Occurrence chapter for Floater, green (060081)





County Occurrences

County	County Name	General Occurrence	Resident Occurrence	Seasonal Occurrence
003	Albemarle	1 - Known	1 - Known	
009	Amherst	1 - Known		
021	Bland	1 - Known		
025	Brunswick	1 - Known		
029	Buckingham	1 - Known		
035	Carroll	1 - Known	1 - Known	
047	Culpeper	1 - Known		
061	Fauquier	1 - Known		
065	Fluvanna	1 - Known		
071	Giles	1 - Known		
075	Goochland	1 - Known		
077	Grayson	1 - Known	1 - Known	
085	Hanover	1 - Known	1 - Known	
107	Loudoun	1 - Known	1 - Known	
109	Louisa	1 - Known		
111	Lunenburg	1 - Known		
121	Montgomery	1 - Known		
125	Nelson	1 - Known	1 - Known	
135	Nottoway	1 - Known		
145	Powhatan	1 - Known		
147	Prince Edward	1 - Known		
155	Pulaski	1 - Known	1 - Known	
157	Rappahannock	1 - Known		
163	Rockbridge	1 - Known	1 - Known	
165	Rockingham	1 - Known	1 - Known	
171	Shenandoah	1 - Known	1 - Known	
179	Stafford	1 - Known		
197	Wythe	1 - Known	1 - Known	
595	Emporia City	1 - Known		

General Occurrence Comments: This species occurs in the Potomac, Shenandoah, Pamunkey, James and New rivers of Virginia *9286*.

Resident Occurrence Comments: This species occurs in the Potomac, Shenandoah, Pamunkey, James, and New rivers in Virginia *9286*.

Seasonal Occurrence Comments: Mussels are very sedentary, therefore seasonal occurrence and general occurrence are the same *8825*.

References for County Occurrence

Ref.Id	Citation
3907	Blood, F.B., M.B. Riddick, 1974, Unionidae of the Pamunkey River system, Virginia, Nautilus, Vol. 88, Num. 2, pg. 65
9286	Tervilliger, K.T., 1991, Virginia's endangered species: Proceedings of a symposium. Coordinated by the Virginia Dept. of Game and Inland Fisheries, Nongame and Endangered Species Program, 672 pp. pgs., McDonald and Woodward Publ. Comp., Blacksburg, VA

USGS National 6th Order Watershed Occurrences

HU6	6th Order Watershed Name
CM12	Meherrin River-Taylors Creek
CM13	Genito Creek
CM14	Meherrin River-Allen Creek
CM16	Great Creek
CM17	Meherrin River-Coldwater Creek
CM19	Meherrin River-Douglas Run
CM20	Meherrin River-Falling Run
CM21	Meherrin River-Greenville/Southampton Co. Border
CU04	Nottoway River-Falls Creek
JA01	Appomattox River-Wolf Creek

JA02	Appomattox River-Suane Creek
JA03	Appomattox River-Fishpond Creek
JA04	Vaughans Creek
JA05	Appomattox River-Ducker Creek
JA27	Flat Creek-Haw Branch
JA28	Appomattox River-Smacks Creek
JA34	Appomattox River-Winticomack Creek
JA36	Appomattox River-Lake Chesdin-Nooning Creek
JA39	Appomattox River/Lake Chesdin-Cattle Creek
JA40	Appomattox River-Oldtown Creek
JA44	Swift Creek-Franks Branch
JA45	Appomattox River-Ashton Creek
JM01	James River-Otter Creek
JM03	James River-Thomas Mill Creek
JM04	Pedlar River-Lynchburg Reservoir
JM05	Pedlar River-Browns Creek
JM06	Pedlar River-Horsley Creek
JM07	James River-Judith Creek
JM08	Harris Creek
JM09	Ivy Creek-Cheese Creek
JM10	Blackwater Creek
JM11	James River-Opossum Creek
JM20	James River-Alabama Creek
JM22	Tye River-Cub Creek
JM23	Hat Creek
JM24	Tye River-Black Creek
JM26	Piney River-Naked Creek
JM27	Tye River-Brown Creek
JM29	Buffalo River-Stonewall Creek
JM31	Buffalo River-Rocky Creek
JM32	Rucker Run
JM33	Tye River-Joe Creek
JM34	James River-Mallorys Creek
JM35	James River-Sycamore Creek
JM42	James River-Ballinger Creek
JM43	James River-Rock Island Creek
JM45	James River-Little George Creek
JM50	James River-Bremo Creek
JM57	Slate River-Hunts Creek
JM58	James River-Bear Garden Creek
JM59	Upper Byrd Creek
JM60	Middle Byrd Creek
JM62	James River-Hooper Rock Creek
JM68	Willis River-Bonbrook Creek
JM69	Randolph Creek
JM70	Willis River-Trice Lake
JM71	Muddy Creek
JM72	James River-Picketts Creek
JM73	Deep Creek-Maxey Mill Creek
JR02	Mechums River-Beaver Creek
JR03	Moormans River-North Moormans River
JR04	Doyles River
JR05	Moormans River-Wards Creek
JR06	Buck Mountain Creek
JR08	South Fork Rivanna River
JR16	Buck Island Creek
JR17	Rivanna River-Carroll Creek
JR18	Mechunk Creek
JR19	Rivanna River-Stigger Creek
JR20	Cunningham Creek
JR21	Ballinger Creek
JR22	Rivanna River-Carys Creek
JU34	Cowpasture River-Mill Creek
JU81	Maury River-Bennetts Run
NE04	New River-Grassy Creek
NE07	New River-Bridle Creek
NE08	New River-Saddle Creek

NE09	Peach Bottom Creek
NE10	New River-Brush Creek-Little Brush Creek
NE11	Little River-Crab Creek
NE12	New River-Rock Creek
NE14	Elk Creek-Turkey Fork
NE15	New River-Meadow Creek
NE16	New River-Eagle Bottom Creek
NE17	Chestnut Creek
NE18	New River-Brush Creek-Bournes Branch
NE20	Crooked Creek-Cranberry Creek
NE21	New River-Poor Branch
NE24	Cripple Creek-Slate Spring Branch
NE25	New River-Shorts Creek
NE26	Reed Creek-Hutson Branch
NE28	Reed Creek-South Fork Reed Creek
NE29	Reed Creek-Muskrat Branch
NE30	Cove Creek
NE31	Reed Creek-Miller Creek
NE32	New River-Pine Run
NE34	Lower Little Reed Island Creek
NE48	Little River-Beaverdam Creek
NE49	Little River-Pine Creek
NE51	West Fork Little River-Dodd Creek
NE52	Little River-Brush Creek
NE53	Little River-Lost Bent Creek
NE55	Little River-Big Laurel Creek
NE57	New River-Connellys Run
NE59	New River-Stroubles Creek
NE62	New River-Dry Branch
NE63	New River-Bear Spring Branch
NE67	Walker Creek-Helveys Mill Creek
NE68	Kimberling Creek-East Wilderness Creek
NE69	Nobusiness Creek
NE70	Kimberling Creek-Dismal Creek
NE71	Walker Creek-Flat Hollow
NE73	Walker Creek-Sugar Run
NE74	New River-Little Stony Creek
NE81	Lower Wolf Creek
NE83	New River-Bluestone Lake-Clendennin Creek
NE84	East River
NE85	New River/Bluestone Lake-Adair Run
PL01	Potomac River-Piney Run-Dutchman Creek
PL02	South Fork Catoctin Creek
PL03	Catoctin Creek
PL04	Potomac River-Tuscarora Creek
PL07	Goose Creek-Crooked Run-Gap Run
PL08	Panther Skin Creek
PL10	Goose Creek-Wancopin Creek
PL11	Beaverdam Creek
PL12	North Fork Goose Creek
PL13	Little River
PL14	Goose Creek-Big Branch
PL15	Sycolin Creek
PL16	Goose Creek-Cattail Branch
PS68	North Fork Shenandoah River-Narrow Passage Creek
PS69	North Fork Shenandoah River-Toms Brook
PS70	North Fork Shenandoah River-Tumbling Run
PS78	North Fork Shenandoah River-Molly Booth Run
PU19	Opequon Creek-Turkey Run
RA01	Rappahannock River-Buck Run
RA02	Jordan River
RA03	Rappahannock River-Lake Mosby
RA04	Thumb Run
RA05	Rappahannock River-Glascock Run
RA06	Carter Run
RA07	Rappahannock River-Great Run
RA16	Hazel River-Indian Run

RA18	Rappahannock River-Ruffans Run
RA22	Rappahannock River-Rock Run
RA23	Rappahannock River-Deep Run
RA27	Rapidan River-Marsh Run
RA28	Blue Run
RA29	Beautiful Run
RA30	Rapidan River-Poplar Run
RA36	Robinson River-Great Run
RA37	Rapidan River-Rapidan
RA44	Rapidan River-Hazel Run
RA45	Rappahannock River-Motts Run
RA46	Rappahannock River-Hazel Run
RD02	Dan River-Archies Creek
RD03	Little Dan River
RD04	Dan River-Elk Creek
RD05	Dan River-Peters Creek
RD06	Upper South Mayo River-Poorhouse Creek
RD07	Russell Creek
RD08	Spoon Creek
RD09	Lower South Mayo River-Crooked Creek
RD12	North Mayo River-Koger Creek
RD77	Dan River/John H Kerr Reservoir-Buffalo Creek
RU94	Roanoke River/John H Kerr Reservoir-Sandy Creek
YO04	South Anna River-Harris Creek
YO05	South Anna River-Fork Creek
YO06	Cub Creek
YO07	South Anna River-Owens Creek
YO12	North Anna River-Mountain Run
YO13	Hickory Creek
YO15	North Anna River-Lake Anna-Christopher Creek

6th Order Hydrologic Unit Comments: 6th order hydrologic unit distribution reviewed in year 2009 by Virginia Department of Game and Inland Fisheries Taxonomic Advisory Committees.

References for 6th Order Hydrologic Unit

Ref.Id Citation

12325 VDGIF, 2009, Tiered Species Distributions by 6th Order Watershed, as Reviewed by VDGIF's Taxonomic Advisory Committees

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5) Loggerhead Shrike

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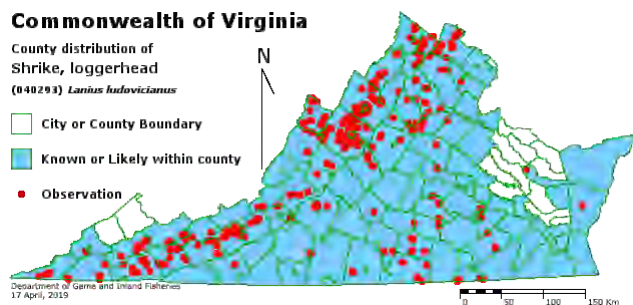
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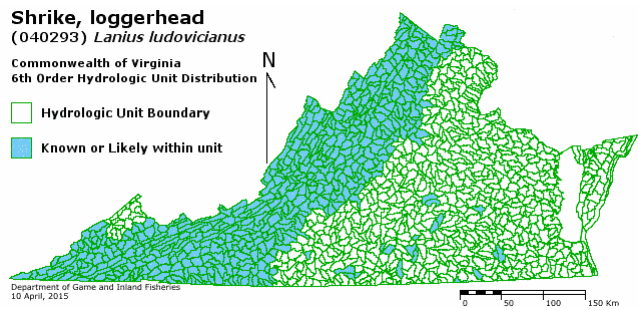
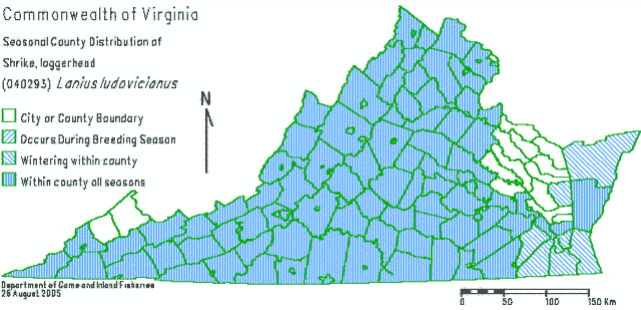
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Occurrence chapter for Shrike, loggerhead (040293)





County Occurrences

County	County Name	General Occurrence	Resident Occurrence	Seasonal Occurrence
001	Acomack	1 - Known	1 - Known	
003	Albemarle	1 - Known	1 - Known	
005	Alleghany	1 - Known	1 - Known	
007	Amelia	1 - Known	1 - Known	
009	Amherst	1 - Known	1 - Known	
011	Appomattox	1 - Known	1 - Known	
015	Augusta	1 - Known	1 - Known	
017	Bath	1 - Known	1 - Known	
019	Bedford	1 - Known	1 - Known	
021	Bland	1 - Known	1 - Known	
023	Botetourt	1 - Known	1 - Known	
025	Brunswick	1 - Known	1 - Known	
029	Buckingham	1 - Known	1 - Known	
031	Campbell	1 - Known	1 - Known	
033	Caroline	1 - Known	1 - Known	
035	Carroll	1 - Known	1 - Known	
036	Charles City	1 - Known	1 - Known	
037	Charlotte	1 - Known	1 - Known	
041	Chesterfield	1 - Known	1 - Known	
043	Clarke	1 - Known	1 - Known	
045	Craig	1 - Known	1 - Known	
047	Culpeper	1 - Known	1 - Known	
049	Cumberland	1 - Known	1 - Known	
053	Dinwiddie	1 - Known	1 - Known	
059	Fairfax	1 - Known	1 - Known	
061	Fauquier	1 - Known	1 - Known	
063	Floyd	2 - Likely		
065	Fluvanna	1 - Known	1 - Known	
067	Franklin	1 - Known	1 - Known	
069	Frederick	1 - Known	1 - Known	
071	Giles	1 - Known	1 - Known	
075	Goochland	1 - Known	1 - Known	
077	Grayson	1 - Known	1 - Known	
079	Greene	1 - Known	1 - Known	
081	Greensville	1 - Known	1 - Known	
083	Halifax	1 - Known	1 - Known	
085	Hanover	1 - Known	1 - Known	
087	Henrico	1 - Known	1 - Known	
089	Henry	2 - Likely		

091	Highland	1 - Known	1 - Known	
093	Isle of Wight	2 - Likely		
095	James City	1 - Known	1 - Known	
099	King George	1 - Known	1 - Known	
105	Lee	1 - Known	1 - Known	
107	Loudoun	1 - Known	1 - Known	
109	Louisa	1 - Known	1 - Known	
111	Lunenburg	1 - Known	1 - Known	
113	Madison	1 - Known	1 - Known	
115	Mathews	1 - Known	1 - Known	
117	Mecklenburg	1 - Known	1 - Known	
119	Middlesex	1 - Known		
121	Montgomery	1 - Known	1 - Known	
125	Nelson	1 - Known	1 - Known	
131	Northampton	1 - Known	1 - Known	
135	Nottoway	1 - Known	1 - Known	
137	Orange	1 - Known	1 - Known	
139	Page	1 - Known	1 - Known	
141	Patrick	2 - Likely		
143	Pittsylvania	1 - Known	1 - Known	
145	Powhatan	1 - Known	1 - Known	
147	Prince Edward	2 - Likely		
149	Prince George	1 - Known	1 - Known	
153	Prince William	1 - Known	1 - Known	
155	Pulaski	1 - Known	1 - Known	
157	Rappahannock	1 - Known	1 - Known	
161	Roanoke	1 - Known	1 - Known	
163	Rockbridge	1 - Known	1 - Known	
165	Rockingham	1 - Known	1 - Known	
167	Russell	1 - Known	1 - Known	
169	Scott	1 - Known	1 - Known	
171	Shenandoah	1 - Known	1 - Known	
173	Smyth	1 - Known	1 - Known	
175	Southampton	1 - Known	1 - Known	
177	Spotsylvania	1 - Known	1 - Known	
179	Stafford	1 - Known	1 - Known	
181	Surry	1 - Known	1 - Known	
183	Sussex	1 - Known	1 - Known	
185	Tazewell	1 - Known	1 - Known	
187	Warren	1 - Known	1 - Known	
191	Washington	1 - Known	1 - Known	
195	Wise	1 - Known	1 - Known	
197	Wythe	1 - Known	1 - Known	
510	Alexandria City	1 - Known	1 - Known	
515	Bedford City	2 - Likely		
520	Bristol City	2 - Likely		
530	Buena Vista City	2 - Likely		
540	Charlottesville City	2 - Likely		
550	Chesapeake City	2 - Likely		
560	Clifton Forge City	2 - Likely		
570	Colonial Heights City	1 - Known	1 - Known	
580	Covington City	2 - Likely		
590	Danville City	2 - Likely		
595	Emporia City	2 - Likely		
600	Fairfax City	2 - Likely		
610	Falls Church City	2 - Likely		
620	Franklin City	2 - Likely		
630	Fredericksburg City	2 - Likely		
640	Galax City	2 - Likely		
650	Hampton City	1 - Known	1 - Known	
660	Harrisonburg City	1 - Known	1 - Known	
670	Hopewell City	1 - Known	1 - Known	
678	Lexington City	2 - Likely		
680	Lynchburg City	1 - Known	1 - Known	
683	Manassas City	1 - Known	1 - Known	
685	Manassas Park City	2 - Likely		
690	Martinsville City	2 - Likely		
700	Newport News City	1 - Known	1 - Known	

710	Norfolk City	1 - Known	1 - Known	
720	Norton City	2 - Likely		
730	Petersburg City	1 - Known	1 - Known	
740	Portsmouth City	2 - Likely		
750	Radford City	2 - Likely		
760	Richmond City	1 - Known	1 - Known	
770	Roanoke City	1 - Known	1 - Known	
775	Salem City	2 - Likely		
780	South Boston City	2 - Likely		
790	Staunton City	1 - Known	1 - Known	
800	Suffolk City	1 - Known	1 - Known	
810	Virginia Beach City	1 - Known	1 - Known	
820	Waynesboro City	2 - Likely		
830	Williamsburg City	2 - Likely		
840	Winchester City	1 - Known	1 - Known	

General Occurrence Comments: This subspecies reaches the northern limit of its range in central and eastern Virginia *691*. Only this subspecies breeds in the Piedmont and Coastal Plain Provinces, but both this subspecies and the other subspecies resident in Virginia, "migrans", as well as intermediate forms, may breed in the Ridge and Valley province of the state *8886,9333*. Both subspecies may be winter residents in Virginia *8886*. The two subspecies can only be distinguished reliably morphometrically, so that field identification to subspecies distribution is rarely reported. The major sources of data for shrike distribution in Virginia *9333, 8510* do not distinguish the two subspecies in their records, and occurrences listed in this report may be either subspecies. Records for this species exist from every part of the state, but the Shenandoah Valley population, consisting primarily of "migrans" appears to be the most significant and stable in Virginia *9333*. Species is a permanent resident near the Fall Line but rare farther east *8511*, with only one report of the species from Northampton County *10949*. It is an uncommon permanent resident in the Piedmont and a rare to uncommon permanent resident in the Mountains and Valleys, being more numerous in the winter *8511*.

Resident Occurrence Comments: This subspecies reaches the northern limit of its range in central and eastern Virginia *691*. Only this subspecies breeds in the Piedmont and Coastal Plain Provinces, but both this subspecies and the other subspecies resident in Virginia, "migrans", as well as intermediate forms, may breed in the Ridge and Valley province of the state *8886,9333*. Both subspecies may be winter residents in Virginia *8886*. The two subspecies can only be distinguished reliably morphometrically, so that field identification to subspecies is rarely reported. The major sources of data for shrike distribution in Virginia *9333,8510* do not distinguish the two subspecies in their records, and occurrences listed in this report may be either subspecies. Records for this species exist from every part of the state, but resident occurrences in this list are based only on records since 1980, since shrikes clearly appear to be losing ground. The Shenandoah Valley population, consisting primarily of "migrans" appears to be the most significant and stable in Virginia *9333*. Species is an uncommon permanent resident near the fall line but rare farther east *8511*, with only one reported sighting in Northampton County *10949*. The species is an uncommon permanent resident in the Piedmont. It is a rare to uncommon permanent resident and more numerous in the winter in the Mountain and Valleys *8511*.

Seasonal Occurrence Comments: This subspecies is a permanent resident in central and eastern Virginia *691, 700*. This species is believed to breed between 20 April and 20 July *8510*. Some breeding birds may be migratory and some winter birds may migrate into Virginia from northern breeding areas *8886*. This species is rare, if not absent, on the Eastern Shore of Virginia. No recent records have appeared for this species on the Eastern Shore *11627*.

References for County Occurrence

Ref.Id	Citation
8510	Virginia Society of Ornithology and the, Virginia Dept. of Game and Inland Fisheries, VSO Atlas Committee (Ed.), 1989, The Breeding Bird Atlas Project Handbook and Data, 1984-1989, 20 pgs., VSO
8886	Luuukkonen, D.R., Fraser, J.D., 1987, Status and distribution of the loggerhead shrike in Virginia., Virginia J. Sci., Vol. 38, Num. 4, pg. 342-350
10949	Virginia Department of Game and Inland Fisheries, 1995, Collections Database
11627	Day, H. F., III, 2001, Personal Communication, Expert Review for GAP Analysis Project
11850	Simpson, R.C., 2000, Salvage Permit No. 015434

USGS National 6th Order Watershed Occurrences

HU6	6th Order Watershed Name
BS01	Jacobs Fork
BS02	Upper Dry Fork
BS08	Garden Creek
BS09	Levisa Fork-Grassy Creek
BS10	Upper Dismal Creek
BS16	Russell Fork-Hurricane Creek
BS17	Indian Creek-Cane Creek
BS22	Open Fork
BS23	McClure Creek-Roaring Fork
BS24	Caney Creek
BS28	North Fork Pound River-South Fork Pound River
BS29	Pound River-Indian Creek
BS30	Pound River-John W Flannagan Reservoir-Cane Creek
BS31	Cranesnest River-Trace Fork
BS32	Birchfield Creek
BS33	Cranesnest River-John W Flannagan Reservoir-Lick Fork
CM07	North Meherrin River-Reedy Creek
CM08	Meherrin River-Mason Creek
CM21	Meherrin River-Greenville/Southampton Co. Border
CM25	Beaverpond Creek
CU02	Modest Creek
CU36	Nottoway River-Parker Run
CU46	Assamoosick Swamp-Mill Run
JA21	Appomattox River-Bent Creek

JA27	Flat Creek-Haw Branch
JA30	Cellar Creek
JA32	Deep Creek-Sweathouse Creek
JA45	Appomattox River-Ashton Creek
JM01	James River-Otter Creek
JM02	Reed Creek
JM03	James River-Thomas Mill Creek
JM04	Pedlar River-Lynchburg Reservoir
JM05	Pedlar River-Browns Creek
JM06	Pedlar River-Horsley Creek
JM07	James River-Judith Creek
JM08	Harris Creek
JM09	Ivy Creek-Cheese Creek
JM14	James River-Stonewall Creek
JM21	North Fork Tye River-South Fork Tye River
JM22	Tye River-Cub Creek
JM23	Hat Creek
JM24	Tye River-Black Creek
JM25	Piney River-Little Piney River
JM26	Piney River-Naked Creek
JM27	Tye River-Brown Creek
JM28	Buffalo River-North Fork Buffalo River
JM29	Buffalo River-Stonewall Creek
JM30	Rutledge Creek
JM31	Buffalo River-Rocky Creek
JM32	Rucker Run
JM36	North Fork Rockfish River
JM37	South Fork Rockfish River
JM38	Rockfish River-Buck Creek
JM39	Cove Creek-Hickory Creek
JM40	Rockfish River-Dutch Creek
JM41	Rockfish River-Beaver Creek
JM46	North Fork Hardware River
JM47	South Fork Hardware River
JR01	Mechums River-Stockton Creek
JR02	Mechums River-Beaver Creek
JR03	Moormans River-North Moormans River
JR04	Doyles River
JR05	Moormans River-Wards Creek
JR06	Buck Mountain Creek
JR07	Ivy Creek-Little Ivy Creek
JR08	South Fork Rivanna River
JR09	North Fork Rivanna River-Lynch River
JR10	Swift Run
JR11	North Fork Rivanna River-Jacobs Run
JR12	Preddy Creek
JR15	Moores Creek
JU01	Jackson River-Dry Branch
JU02	Jackson River-Bolar Run
JU03	Jackson River-Warm Springs Run
JU04	Back Creek-East Back Creek
JU05	Back Creek-Jim Dave Run
JU06	Little Back Creek
JU07	Back Creek-Cummings Run
JU08	Jackson River/Lake Moomaw
JU09	Cedar Creek-Hot Springs Run
JU10	Jackson River-Falling Spring Creek
JU11	Jackson River-Indian Draft
JU12	Cove Creek-Sweet Springs Creek
JU13	Dunlap Creek-Cove Run
JU14	Ogle Creek-Johnsons Creek
JU15	Dunlap Creek-Jerrys Run
JU16	North Fork Potts Creek-South Fork Potts Creek
JU17	Potts Creek-Trout Branch
JU18	Potts Creek-Mill Branch
JU19	Potts Creek-Cast Steel Run
JU20	Potts Creek-Hays Creek

JU21	Jackson River-Pounding Mill Creek
JU22	White Rock Creek-Karnes Creek
JU23	Wilson Creek
JU24	Jackson River-Smith Creek
JU25	Cowpasture River-Wolfe Draft
JU26	Shaws Fork
JU27	Cowpasture River-Benson Run
JU28	Bullpasture River-Davis Run
JU29	Bullpasture River-Crab Run
JU30	Cowpasture River-Scotchtown Draft
JU31	Dry Run
JU32	Cowpasture River-Thompson Creek
JU33	Stuart Run-Lick Run
JU34	Cowpasture River-Mill Creek
JU35	Pads Creek
JU36	Cowpasture River-Simpson Creek
JU37	James River-Big Creek
JU38	Sinking Creek
JU39	Mill Creek-Smith Branch
JU40	James River-Black Lick
JU41	Craig Creek-Trout Creek
JU42	Meadow Creek
JU43	Craig Creek-Broad Run
JU44	Upper Johns Creek
JU45	Lower Johns Creek
JU46	Craig Creek-Rolands Run Branch
JU47	Barbours Creek
JU48	Craig Creek-Mill Creek
JU49	Patterson Creek
JU50	Craig Creek-Roaring Run
JU51	James River-Lapsley Run
JU52	Catawba Creek-Little Catawba Creek
JU53	Catawba Creek-Town Branch
JU54	James River-Hickory Hollow Branch
JU55	Looney Creek-Mill Creek
JU56	James River-Purgatory Creek
JU57	Jennings Creek-North Creek
JU58	James River-Roaring Run
JU59	Cedar Creek-Spring Gap Creek
JU60	James River-Elk Creek
JU61	Calfpasture River-Chair Draft
JU62	Ramseys Draft
JU63	Calfpasture River-Holloway Draft
JU64	Hamilton Branch
JU65	Calfpasture River-Fridley Branch
JU66	Mill Creek-Cabin Creek
JU67	Brattons Run
JU68	Calfpasture River-Guys Run
JU69	Upper Little Calfpasture River
JU70	Lower Little Calfpasture River
JU71	Maury River-Taylor Branch
JU72	Walker Creek
JU73	Hays Creek
JU74	Maury River-Alone Mill Creek
JU75	Kerrs Creek
JU76	Maury River-Mill Creek
JU77	Saint Marys River
JU78	Upper South River
JU79	Irish Creek
JU80	Lower South River
JU81	Maury River-Bennetts Run
JU82	South Buffalo Creek
JU83	North Buffalo Creek
JU84	Colliers Creek
JU85	Buffalo Creek
JU86	Maury River-Poague Run
NE01	Big Horse Creek-Whitotop Creek

NE02	Helton Creek
NE03	Wilson Creek
NE04	New River-Grassy Creek
NE05	Fox Creek-Laurel Creek
NE06	Fox Creek-Middle Fox Creek
NE07	New River-Bridle Creek
NE08	New River-Saddle Creek
NE09	Peach Bottom Creek
NE10	New River-Brush Creek-Little Brush Creek
NE11	Little River-Crab Creek
NE12	New River-Rock Creek
NE13	Elk Creek-Stone Creek
NE14	Elk Creek-Turkey Fork
NE15	New River-Meadow Creek
NE16	New River-Eagle Bottom Creek
NE17	Chestnut Creek
NE18	New River-Brush Creek-Bournes Branch
NE19	Crooked Creek-East Fork Crooked Creek
NE20	Crooked Creek-Cranberry Creek
NE21	New River-Poor Branch
NE22	Cripple Creek-Blue Spring Creek
NE23	Cripple Creek-Francis Mill Creek
NE24	Cripple Creek-Slate Spring Branch
NE25	New River-Shorts Creek
NE26	Reed Creek-Hutson Branch
NE27	Stony Fork
NE28	Reed Creek-South Fork Reed Creek
NE29	Reed Creek-Muskrat Branch
NE30	Cove Creek
NE31	Reed Creek-Miller Creek
NE32	New River-Pine Run
NE33	Upper Little Reed Island Creek
NE34	Lower Little Reed Island Creek
NE35	Laurel Fork
NE36	Big Reed Island Creek-Stone Mountain Creek
NE37	Snake Creek
NE38	Burks Fork
NE39	Big Reed Island Creek-Road Creek
NE40	Greasy Creek
NE41	Big Reed Island Creek-Rock Creek
NE42	Big Macks Creek
NE43	New River-Upper Claytor Lake
NE44	Peak Creek-Gatewood Reservoir
NE45	Tract Fork
NE46	Peak Creek-Thorne Springs Branch
NE47	New River/Lower Claytor Lake
NE48	Little River-Beaverdam Creek
NE49	Little River-Pine Creek
NE50	West Fork Little River-Howell Creek
NE51	West Fork Little River-Dodd Creek
NE52	Little River-Brush Creek
NE53	Little River-Lost Bent Creek
NE54	Big Indian Creek
NE55	Little River-Big Laurel Creek
NE56	Little River-Meadow Creek
NE57	New River-Connellys Run
NE58	Crab Creek
NE59	New River-Stroubles Creek
NE60	Toms Creek-Poverty Creek
NE61	Back Creek
NE62	New River-Dry Branch
NE63	New River-Bear Spring Branch
NE64	Upper Sinking Creek
NE65	Lower Sinking Creek
NE66	Walker Creek-Crab Orchard Creek
NE67	Walker Creek-Helveys Mill Creek
NE68	Kimberling Creek-East Wilderness Creek

NE69	Nobusiness Creek
NE70	Kimberling Creek-Dismal Creek
NE71	Walker Creek-Flat Hollow
NE72	Little Walker Creek
NE73	Walker Creek-Sugar Run
NE74	New River-Little Stony Creek
NE75	Stony Creek
NE76	Burkes Garden Creek
NE77	Hunting Camp Creek
NE78	Upper Wolf Creek
NE79	Clear Fork
NE80	Laurel Creek-Dry Fork
NE81	Lower Wolf Creek
NE82	Rich Creek
NE83	New River-Bluestone Lake-Clendennin Creek
NE84	East River
NE85	New River/Bluestone Lake-Adair Run
NE86	Bluestone River-Brush Fork
NE87	Mud Fork
NE88	Bluestone River-Laurel Fork
PL01	Potomac River-Piney Run-Dutchman Creek
PL02	South Fork Catoctin Creek
PL03	Catoctin Creek
PL04	Potomac River-Tuscarora Creek
PL05	Potomac River-Limestone Branch
PL06	Goose Creek-Mitchells Branch
PL07	Goose Creek-Crooked Run-Gap Run
PL08	Panther Skin Creek
PL10	Goose Creek-Wancopin Creek
PL11	Beaverdam Creek
PL12	North Fork Goose Creek
PL15	Sycolin Creek
PL16	Goose Creek-Cattail Branch
PS01	Middle River-Edison Creek
PS02	Middle River-Buffalo Branch
PS03	Jennings Branch
PS04	Middle River-Bell Creek
PS05	Moffett Creek
PS06	Lewis Creek
PS07	Middle River-Falling Spring Run
PS08	Christians Creek-Folly Mills Creek
PS09	Christians Creek-Barterbrook Branch
PS10	Meadow Run
PS11	Middle River-Broad Run
PS12	North River-Skidmore Fork
PS13	Little River
PS14	Briery Branch
PS15	Mossy Creek
PS16	North River-Thorny Branch
PS17	Dry River-Skidmore Fork
PS18	Dry River-Black Run
PS19	Muddy Creek
PS20	Dry River-Honey Run
PS21	Long Glade Creek
PS22	Blacks Run
PS23	Cooks Creek
PS24	Naked Creek-North Fork Naked Creek
PS25	North River-Pleasant Run
PS26	North River-Mill Creek
PS27	South River-Stony Run
PS28	South River-Canada Run
PS29	Back Creek-Inch Branch
PS30	South River-Porterfield Run
PS31	South River-Paine Run
PS32	South Fork Shenandoah River-Big Run
PS33	Cub Run-Keezletown
PS34	South Fork Shenandoah River-Hawksbill Creek

PS35	South Fork Shenandoah River-Elk Run-Boone Run
PS36	Naked Creek-South Branch
PS37	South Fork Shenandoah River-Fultz Run
PS38	Cub Run-Pitt Spring Run
PS39	South Fork Shenandoah River-Stony Run
PS40	South Fork Shenandoah River-Hawksclaw Creek
PS41	South Fork Shenandoah River-Mill Creek
PS42	Hawksbill Creek-East Hawksbill Creek
PS43	Hawksbill Creek-Pass Run
PS44	South Fork Shenandoah River-Jeremys Run
PS45	South Fork Shenandoah River-Brown Hollow Run
PS46	Gooney Run
PS47	South Fork Shenandoah River-Punches Run
PS48	Happy Creek
PS49	German River
PS50	Crab Run
PS51	North Fork Shenandoah River-Capon Run
PS52	Little Dry River
PS53	Shoemaker River
PS54	North Fork Shenandoah River-Runion Creek
PS55	North Fork Shenandoah River-Turley Creek
PS56	Linville Creek
PS57	North Fork Shenandoah River-Long Meadow
PS58	North Fork Shenandoah River-Holmans Creek
PS59	Dry Fork
PS60	Smith Creek-Mountain Run
PS61	Smith Creek-War Branch
PS62	Smith Creek-Gap Creek
PS63	Mill Creek-Crooked Run
PS64	North Fork Shenandoah River-Mt Jackson
PS65	Stony Creek-Riles Run
PS66	Stony Creek-Yellow Spring Run
PS67	Stony Creek-Painter Run
PS68	North Fork Shenandoah River-Narrow Passage Creek
PS69	North Fork Shenandoah River-Toms Brook
PS70	North Fork Shenandoah River-Tumbling Run
PS71	Cedar Creek-Paddy Run
PS72	Cedar Creek-Duck Run
PS73	Fall Run
PS74	Cedar Creek-Froman Run
PS75	Cedar Creek-Meadow Brook
PS76	Upper Passage Creek
PS77	Lower Passage Creek
PS78	North Fork Shenandoah River-Molly Booth Run
PS79	Crooked Run
PS80	Shenandoah River-Manassas Run
PS81	Shenandoah River-Borden Marsh Run
PS82	Shenandoah River-Long Branch
PS83	Spout Run
PS84	Shenandoah River-Chapel Run
PS85	Shenandoah River-Dog Run
PS86	Long Marsh Run
PS87	Bullskin Run
PU01	North Fork South Branch Potomac River-Laurel Fork
PU02	South Branch Potomac River-Frank Run
PU03	Strait Creek
PU04	South Branch Potomac River-East Dry Run
PU05	Thorn Creek-Whitehorn Creek
PU06	South Fork South Branch Potomac River-Brushy Fork
PU08	Upper Sleepy Creek
PU09	Middle Fork Sleepy Creek
PU10	Back Creek-Mine Spring Run
PU11	Back Creek-Isaacs Creek
PU12	Hogue Creek
PU13	Back Creek-Brush Creek
PU14	Babbs Run
PU15	Back Creek-Warm Springs Hollow

PU16	Opequon Creek-Sulphur Spring Run
PU17	Abrams Creek
PU18	Opequon Creek-Redbud Run
PU19	Opequon Creek-Turkey Run
PU20	Mill Creek
RA01	Rappahannock River-Buck Run
RA02	Jordan River
RA03	Rappahannock River-Lake Mosby
RA04	Thumb Run
RA08	Hughes River
RA09	Hazel River-Sams Run
RA10	Hazel River-Devils Run
RA11	Thornton River-Piney River
RA12	Covington River
RA13	Battle Run
RA14	Thornton River-Mill Run
RA19	Mountain Run-Hiders Branch
RA24	Rapidan River-Garth Run
RA25	Conway River
RA26	Rapidan River-South River
RA27	Rapidan River-Marsh Run
RA28	Blue Run
RA29	Beautiful Run
RA30	Rapidan River-Poplar Run
RA31	Robinson River-Rose River
RA32	Robinson River-Leathers Run
RA33	White Oak Run
RA34	Robinson River-Deep Run
RA35	Crooked Run
RA36	Robinson River-Great Run
RD01	Dan River-Ivy Creek
RD02	Dan River-Archies Creek
RD03	Little Dan River
RD04	Dan River-Elk Creek
RD05	Dan River-Peters Creek
RD06	Upper South Mayo River-Poorhouse Creek
RD07	Russell Creek
RD08	Spoon Creek
RD10	North Mayo River-Polebridge Creek
RD15	Smith River-Rock Castle Creek
RD16	Sycamore Creek-Little Sycamore Creek
RD17	Smith River-Widgeon Creek
RD18	Rennet Bag Creek-Otter Creek
RD46	Dan River-Big Toby Creek
RD47	Birch Creek
RD49	Dan River-Chalmers Creek
RL07	Butcher Creek/John H Kerr Reservoir
RU01	Goose Creek-Lick Fork
RU02	Bottom Creek
RU03	South Fork Roanoke River-Purgatory Creek
RU04	Elliott Creek
RU05	South Fork Roanoke River-Brake Branch
RU06	North Fork Roanoke River-Dry Run
RU07	North Fork Roanoke River-Wilson Creek
RU08	North Fork Roanoke River-Bradshaw Creek
RU09	Roanoke River-Sawmill Hollow
RU10	Mason Creek
RU11	Tinker Creek-Buffalo Creek
RU12	Carvin Creek
RU13	Tinker Creek-Glade Creek
RU14	Roanoke River-Peters Creek
RU15	Back Creek
RU16	Roanoke River/Smith Mountain Lake-Lynville Creek
RU17	Beaverdam Creek
RU20	North Fork Blackwater River
RU21	South Fork Blackwater River
RU22	Blackwater River-Madcap Creek

RU23	Maggodee Creek
RU25	Gills Creek
RU29	Pigg River-Turners Creek
RU35	Snow Creek-Gourd Creek
RU39	Goose Creek-North Fork Goose Creek
RU40	Bore Auger Creek
RU49	Big Otter River-Stony Creek
RU50	North Otter Creek
RU51	Elk Creek-Chestnut Branch
RU52	Big Otter River-Roaring Run
RU85	Horsepen Creek
RU86	Roanoke Creek-Lipscomb Branch
TC01	Clinch River-Cavitts Creek
TC02	Clinch River-Pounding Mill Branch
TC03	Indian Creek-Laurel Branch
TC04	Clinch River-Middle Creek
TC05	Clinch River-Swords Creek
TC06	Maiden Spring Creek
TC07	Little River-Liberty Creek
TC08	Indian Creek-Hogwallow Branch
TC09	Little River-Katie Branch
TC10	Lewis Creek-Laurel Branch
TC11	Clinch River-Dilly Branch
TC12	Elk Garden Creek-Loop Creek
TC13	Big Cedar Creek
TC14	Clinch River-Thompson Creek
TC15	Dumps Creek
TC16	Clinch River-Big Spring Branch
TC17	Lick Creek-Honey Branch
TC18	Clinch River-Bull Run
TC19	Guest River-Rocky Fork
TC20	Bear Creek
TC21	Guest River-Toms Creek
TC22	Clinch River-Sinking Creek
TC23	Clinch River-Little Stony Creek
TC24	Stony Creek-Straight Fork
TC25	Cove Creek
TC26	Stock Creek
TC27	Clinch River-Mill Creek
TC28	Copper Creek-Grassy Creek
TC29	Copper Creek-Valley Creek
TC30	Copper Creek-Obeys Creek
TC31	Upper North Fork Clinch River
TC32	Lower North Fork Clinch River
TC33	Clinch River-Powers Branch
TC34	Blackwater Creek
TC35	Panther Creek
TH01	South Fork Holston River-Dickey Creek
TH02	South Fork Holston River-Rowland Creek
TH03	South Fork Holston River-Mill Creek
TH04	Whitetop Laurel Creek-Big Laurel Creek
TH05	Laurel Creek-Elliot Branch
TH06	Laurel Creek-Beaverdam Creek
TH07	South Fork Holston River-Rockhouse Run
TH08	Middle Fork Holston River-Nicks Creek
TH09	Bear Creek
TH10	Middle Fork Holston River-Staley Creek
TH11	Hungry Mother Creek
TH12	Middle Fork Holston River-Walker Creek
TH13	Middle Fork Holston River-Hutton Creek
TH14	Middle Fork Holston River-Cedar Creek
TH15	Fifteenmile Creek
TH16	Wolf Creek-Spoon Gap Creek
TH17	South Holston River/South Holston Lake
TH18	Spring Creek
TH19	South Holston River/South Holston Lake-Painter Spring Branch
TH20	South Fork Holston River-Beidleman Creek

TH21	Beaver Creek-Little Creek
TH22	Beaver Creek-Steele Creek
TH23	Reedy Creek
TH24	North Fork Holston River-McDonald Branch
TH25	Lick Creek-Lynn Camp Creek
TH26	North Fork Holston River-Sprouts Creek
TH27	North Fork Holston River-Locust Cove Creek
TH28	Laurel Creek
TH29	North Fork Holston River-Robertson Branch
TH30	Tumbling Creek
TH31	North Fork Holston River-Big Creek
TH32	Wolf Creek
TH33	North Fork Holston River-Logan Creek
TH34	Brumley Creek
TH35	North Fork Holston River-Little Creek
TH36	Smith Creek
TH37	North Fork Holston River-Nordyke Creek
TH38	Abrams Creek
TH39	North Fork Holston River-Livingston Creek
TH40	Cove Creek
TH41	North Fork Holston River-Roberts Creek
TH42	Big Moccasin Creek-Carr Creek
TH43	Big Moccasin Creek-Little Moccasin Creek
TH44	Possum Creek
TH45	North Fork Holston River-Newland Hollow
TH46	Big Creek
TP01	Roaring Fork
TP02	Powell River-Black Creek
TP03	Callahan Creek
TP04	Powell River-Pigeon Creek
TP05	South Fork Powell River-Butcher Fork
TP06	Powell River-Camp Creek
TP07	North Fork Powell River-Reeds Creek
TP08	Stone Creek
TP09	North Fork Powell River-Cane Creek
TP10	Powell River-Station Creek
TP11	Wallen Creek
TP12	Hardy Creek
TP13	Powell River-Yellow Creek
TP14	Martin Creek
TP15	Mulberry Creek
TP16	Powell River-Fourmile Creek
TP17	Powell River-Cox Creek
TP18	Indian Creek
TP19	Powell River-Gap Creek
YA01	Headwaters Fisher River
YA02	Little Fisher River
YA03	Headwaters Ararat River
YA04	Johnson Creek
YA05	Lovills Creek
YA06	Headwaters Stewart Creek
YA07	Pauls Creek
YO01	South Anna River-Dove Fork
YO12	North Anna River-Mountain Run

6th Order Hydrologic Unit Comments: 6th order hydrologic unit distribution reviewed in year 2009 by Virginia Department of Game and Inland Fisheries Taxonomic Advisory Committees.

References for 6th Order Hydrologic Unit

Ref.Id Citation

12325 VDGI, 2009, Tiered Species Distributions by 6th Order Watershed, as Reviewed by VDGI's Taxonomic Advisory Committees

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- W3C HTML [validation](#) <BASE href="https://vafwis.dgif.virginia.gov/fwis/NewPages/"> [VaFWIS_booklet_chapters.asp](#)

Exhibit 9:
Northern long-eared bat Coordination with USFWS



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
<http://www.fws.gov/northeast/virginiafield/>

In Reply Refer To:
Consultation Code: 05E2VA00-2020-SLI-6063
Event Code: 05E2VA00-2020-E-16854
Project Name: Green Ridge Recycling and Disposal

September 10, 2020

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
 - USFWS National Wildlife Refuges and Fish Hatcheries
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office

6669 Short Lane

Gloucester, VA 23061-4410

(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2020-SLI-6063

Event Code: 05E2VA00-2020-E-16854

Project Name: Green Ridge Recycling and Disposal

Project Type: DEVELOPMENT

Project Description: Construction of new solid waste disposal facility and associated structures.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/37.56270913686932N78.12435483641511W>



Counties: Cumberland, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Species Conclusions Table

Project Manager: Steven VanderPloeg	Project Name: Green Ridge Disposal and Recycling Facility
Date: 09/14/2020	Project Number: NAO-2018-00995

Project Description: The applicant proposes to construct a solid waste disposal facility and associated infrastructure. The project would permanently impact 10,951 linear feet of stream channels.

Species Under the Jurisdiction of FWS:

Species/Resource Name	Conclusion	ESA Section 7 / Eagle Act Determination	Species Info / Habitat Description	Notes / Determination
Northern long-eared bat (Myotis septentrionalis)	NLEB: Applying the 4(d) Rule; excepted from take	May affect	<p>"Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.</p> <p>During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds."</p>	4(d) rule determination included in the package.

Eagles (Haliaeetus leucocephalus)

Eagle Nests	Unlikely to disturb nesting bald eagles	No Eagle Act permit required		
Eagle Concentration Areas	Does not intersect with bald eagle concentration area	No Eagle Act permit required		

Critical Habitat

N/A				
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Species Under the Jurisdiction of NMFS

Species Conclusions Table

Date: 09/14/2020	Project Number: NAO-2018-00995
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NOAA Fisheries				
Other (species not listed above)				



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
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<http://www.fws.gov/northeast/virginiafield/>

In Reply Refer To:
Consultation Code: 05E2VA00-2020-TA-6063
Event Code: 05E2VA00-2020-E-16855
Project Name: Green Ridge Recycling and Disposal

September 10, 2020

Subject: Verification letter for the 'Green Ridge Recycling and Disposal' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Steven Vanderploeg:

The U.S. Fish and Wildlife Service (Service) received on September 10, 2020 your effects determination for the 'Green Ridge Recycling and Disposal' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"^[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Green Ridge Recycling and Disposal

2. Description

The following description was provided for the project 'Green Ridge Recycling and Disposal':

Construction of new solid waste disposal facility and associated structures.

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/37.56270913686932N78.12435483641511W>

**Determination Key Result**

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?
Yes
2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")
No
3. Will your activity purposefully **Take** northern long-eared bats?
No
4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?
Automatically answered
No
5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

No

7. Will the action involve Tree Removal?

Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

438

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

438

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

APPENDIX 10

REPORT - KBJW - NATURAL RESOURCE INVENTORY



Green Ridge Recycling and Disposal Facility Natural Resources Inventory Technical Memorandum May 6, 2021

On January 29th, 2021 and February 1st, 2021, a Koontz Bryant Johnson Williams (KBW) environmental scientist reviewed the *Green Ridge Recycling and Disposal Facility* Alternates including Green Ridge Recycling and Disposal Facility (Green Ridge, preferred), Alternate 1, Alternate 2, and Alternate 3 located in Cumberland County, Virginia for natural resources that may be located in each Alternate as shown on *Exhibit 1*. A desktop assessment was performed to include a review of the following: United States Geological Survey (USGS) Topography, Federal Emergency Management Agency (FEMA) floodplain, Natural Resource Conservation Service Soils (NRCS), National Hydrography Dataset (NHD), and U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) mapping.

In-Office Desktop Assessment

USGS Topography

The USGS topographic quadrangle map depicts the Alternates as having floodplains, gently rolling side slopes, and steep slopes. Streams are located within steep, well-defined valleys. Surface waters of Green Ridge, Alternate 2, and Alternate 3 generally drains to perennial stream features flowing north, north/east until ultimately reaching the James River which is in the Middle James-Willis watershed (hydrologic unit code 02080205) and eventually the Chesapeake Bay. Alternate 1 generally flows southeast until reaching the Appomattox River which is in the Little Guinea Creek-Appomattox River watershed (hydrologic unit code 02080207) as shown on *Table 1* below. The Appomattox eventually flows to the James River at its mouth near Hopewell, Virginia, and the Chesapeake Bay. Green Ridge and Alternate 2 are shown on USGS mapping (Whiteville and Trenholm). Alternate 1 is associated with the Cumberland quadrangle and Alternate 3 is associated with Hillcrest and Willis Mountain. All USGS quadrangles indicate that streams bisect each Alternate as shown on *Exhibits 2-5*. As depicted on the FEMA's on-line Flood Insurance Rate Map, each Alternate lies within the 100-year floodplain. The 500-year floodplain has not been mapped in any of the Alternates. The percent of mapped floodplain that occupies the parcel boundary is listed in *Table 2*.

National Hydrography Dataset

The most current version of the mapped NHD flowlines and waterbodies was obtained from the USGS which has the most comprehensive dataset for the nation including Cumberland County. This dataset includes drainage features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gages networks that may be present in each Alternate. Each Alternate has mapped streams/flowlines and is shown in *Table 2* and *Exhibits 6-9*.



Table 1: Watershed by HUC

Alternate	USGS Quad	8-digit HUC (Name)	12-digit HUC (Name)	VAHU6	NHD Named Streams	Approximate Contributing Drainage Area (Square Miles)
Green Ridge	Whiteville and Trenholm	02080205 (Middle James-Willis)	020802050402 (Muddy Creek)	JM71	Maple Swamp Creek and Muddy Creek	8.81
Alternate 1	Cumberland	02080207 (Appomattox) and 02080205 (Middle James-Willis)	020802070405 (Little Guinea Creek-Appomattox River) and 020802050404 (Maxey Mill Creek-Deep Creek)	JA19 and JM73	Little Guinea Creek	7.06
Alternate 2	Whiteville and Trenholm	02080205 (Middle James-Willis)	020802050404 (Deep Creek-Maxey Mill Creek) and 020802050402 (Muddy Creek)	JM73 and JM71	Maxey Mill Creek	12.1
Alternate 3	Hillcrest and Willis Mountain	02080205 (Middle James-Willis) and 02080207 (Appomattox)	020802050204 (Buffalo Creek-Willis River), 020802050202 (Whispering Creek-Willis River), and 020802070404 (Big Guinea Creek)	JM66, JM64, and JA18	Willis River	112

JM71 = Muddy Creek, JA19 = Little Guinea Creek-Appomattox River, JM73 = Maxey Mill Creek-Deep Creek, JM66 = Buffalo Creek-Willis River, JM64 = Whispering Creek-Willis River

Table 2: Flowline and 100-year flood

Alternate	Alternate Parcel Boundary (Ac.)	FEMA Zone A Ac./(% of parcel boundary)	NHD (lf)
Green Ridge	1,177.6	38.0/(3.2%)	33,470.5
Alternate 1	782.9	107.9/(13.8%)	24,447.9
Alternate 2	1,089.2	53.5/(4.9%)	29,776.1
Alternate 3	1,990.1	120.2/(6.0%)	37,559.6

Ac. = acres

Natural Resource Conservation Service Soil Survey

NRCS digital soils data and mapping were obtained from the NRCS web soil survey website. NRCS Web Soils Survey mapping depicts thirty (30) soil mapping units soil types mapped in Cumberland County that encompasses the Alternates as shown on *Exhibits 6-9*. Mapped soils are associated with drainageways, floodplains, stream terraces, interfluvies, and hillslopes. Textures in a typical profile are highly variable and consist of gravelly sandy loam, fine sandy loam, sandy clay loam, sandy loam, loam, and clay. Mapped hydric soils within each alternate are summarized in *Table 3* below. This data was used to compare each Alternate as it relates to hydric soil and hydrologic soil group. The majority of the mapped hydric soil units are associated with drainageways, floodplains, hillslopes, and interfluvies. Generally, lower gradient areas such as floodplains and drainages are associated with a higher runoff potential. While lower runoff potential is associated with hillslopes.

Table 3: NRCS Mapped Soils

NRCS Soils Symbol-Unit Name	LandForm	Percent Hydric Components	Hydrologic Soils Group	Green Ridge (% in Parcel Boundary)	Alternate 1 (% in Parcel Boundary)	Alternate 2 (% in Parcel Boundary)	Alternate 3 (% in Parcel Boundary)
1B-Applying fine sandy loam, 2 to 7 percent slopes	Interfluves	3	B	13.2	17.1	8.9	22.2
2C-Applying-Helena complex, 7 to 15 percent slopes	Hillslopes	3	B	15.8	1.3	12.6	17.2
5B-Brickhaven-Creedmoor complex, 2 to 7 percent slopes	Hillslopes	0	C				10.2
5C-Brickhaven-Creedmoor complex, 7 to 15 percent slopes	Hillslopes	0	C				4.4
6B-Cecil sandy loam, 2 to 7 percent slopes	Interfluves	0	B	11.0	2.5	14.5	
7C-Cecil sandy clay loam, 7 to 15 percent slopes, severely eroded	Hillslopes	0	B	16.3	1.9	9.6	0.6
8A-Chewacla and Monacan soils, 0 to 2 percent slopes, frequently flooded	Floodplains	5	B/D	6.2	17.5	7.2	3.5
15A-Dogue fine sandy loam, 0 to 2 percent slopes, rarely flooded	Stream terraces	0	C				1.6
15B-Dogue fine sandy loam, 2 to 7 percent slopes, rarely flooded	Stream terraces	0	C			1.8	4.4
16B-Enon-Helena complex, 2 to 7 percent slopes	Hillslopes	0	C	2.4	0.2	1.6	
16C-Enon-Helena complex, 7 to 15 percent slopes	Hillslopes	0	C	4.3	7.3	1.5	0.1
16D-Enon-Helena complex, 15 to 25 percent slopes	Hillslopes	0	C	0.5	0.0		
18D-Enon-Poindexter complex, 15 to 25 percent slopes, very stony	Hillslopes	0	C	0.4	0.0	0.6	0.1
21B-Helena sandy loam, 2 to 7 percent slopes	Hillslopes	5	C/D	2.4		11.8	0.8
21C-Helena sandy loam, 7 to 15 percent slopes	Hillslopes	5	C/D	2.5		16.3	
23B-Mattaponi-Applying complex, 2 to 7 percent slopes	Hillslopes	0	C	0.6	0.6	0.2	
24B-Mayodan-Exway complex, 2 to 7 percent slopes	Hillslopes	0	B				8.9
24C-Mayodan-Exway complex, 7 to 15 percent slopes	Hillslopes	0	B				2.2
30D-Pacolet-Waterree complex, 15 to 25 percent slopes	Hillslopes	0	B	1.5		0.9	11.7
30E-Pacolet-Waterree complex, 25 to 45 percent slopes	Hillslopes	0	B				1.4
31B-Pinoka-Carbonton complex, 2 to 7 percent slopes	Hillslopes	0	B				0.6
31D-Pinoka-Carbonton complex, 15 to 25 percent slopes	Hillslopes	0	B				3.7
32B-Poindexter-Wedowee complex, 2 to 7 percent slopes	Hillslopes	0	C	1.3	5.6	2.6	
32C-Poindexter-Wedowee complex, 7 to 15 percent slopes	Hillslopes	0	C	8.4	13.3	3.6	0.5
32D-Poindexter-Wedowee complex, 15 to 25 percent slopes	Hillslopes	0	C	11.4	3.5	2.4	2.0
40A-Toccoa fine sandy loam, 0 to 2 percent slopes, frequently flooded	Floodplains	0	A				1.7
41B-Trenholm sandy loam, 2 to 7 percent slopes	Hillslopes	0	D		2.8	2.9	
42D-Waterree sandy loam, 15 to 25 percent slopes	Hillslopes	0	B	2.1	26.4	1.1	
43A-Wehadkee sandy loam, 0 to 2 percent slopes, frequently flooded	Floodplains	90	B/D				1.8
45B-Worsham loam, 0 to 4 percent slopes	Drainageways	80	D				0.4
Total Soil Units				17	15	18	22
Percent of the Parcel Boundary Hydric Soil				Not Hydric	59.9%	64.2%	54.1%
				0-32%	40.1%	35.8%	44.2%
				66-99%			1.8%

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual class



National Wetland Inventory

NWI mapping was obtained from the U.S. Fish and Wildlife National Wetlands Inventory website. The information has been developed to provide the public and citizens of the United States the status and distribution of the nation's wetlands. NWI mapping has identified the following wetland types as occurring in Cumberland County including within the Alternate areas: Freshwater Forested/Shrub Wetland, Freshwater Emergent Wetland, Riverine, and Freshwater Pond as shown on **Table 4** and as shown on **Exhibits 6-9**. All of the wetland systems within the Alternates have been mapped a palustrine system and are do not receive tidal flow.

Table 4: NWI mapped wetlands

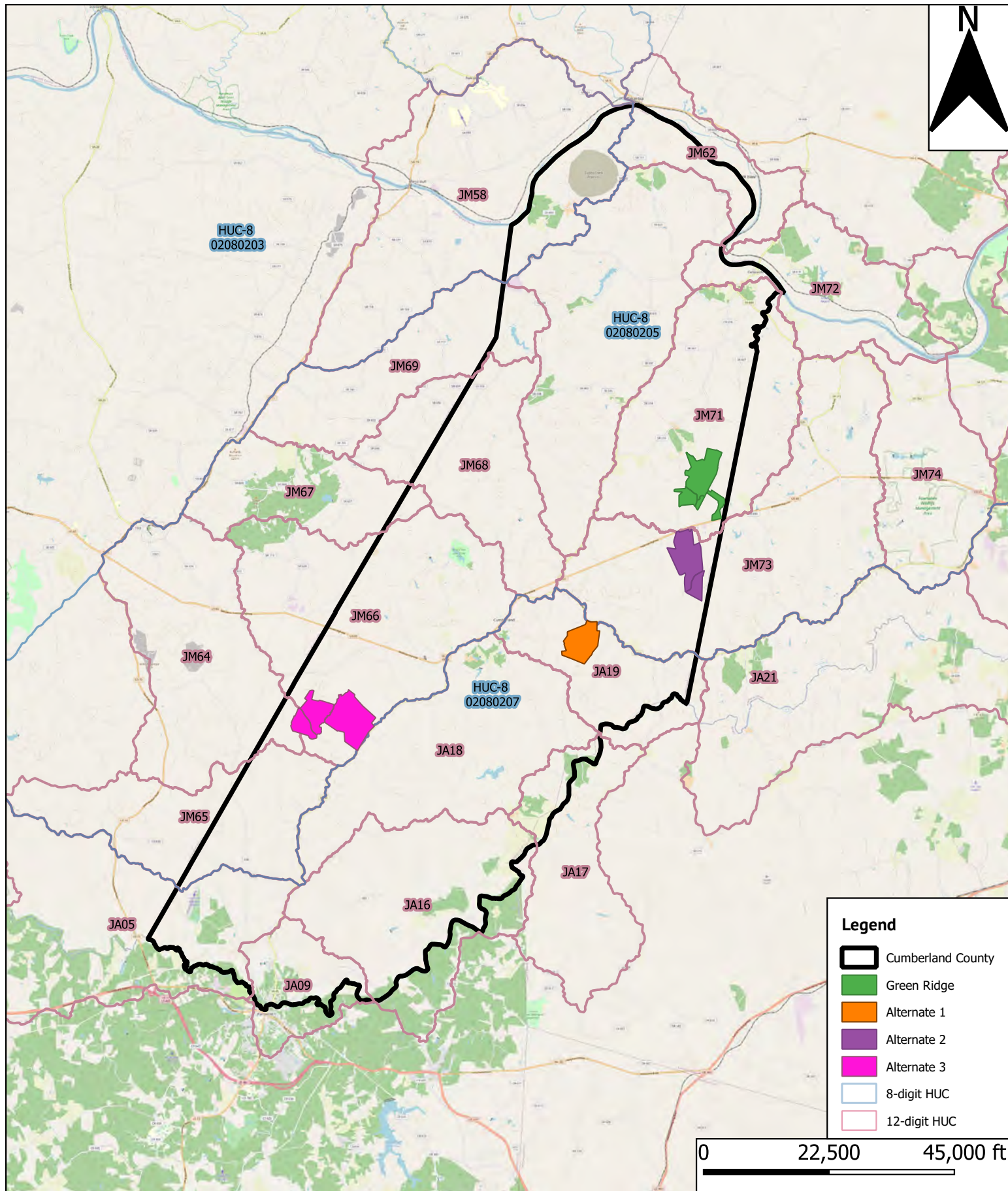
NWI (Attribute)	NWI (Wetland Type)	Green Ridge (Ac.)	Alternate 1 (Ac.)	Alternate 2 (Ac.)	Alternate 3 (Ac.)
R4SBC	Riverine	10.5	4.9	11.0	13.8
R5UBH	Riverine	1.5	0.6		
PFO1A	Freshwater Forested/Shrub Wetland	28.5	36.9	21.4	76.4
PFO1Ab	Freshwater Forested/Shrub Wetland		0.8		
PFO1C	Freshwater Forested/Shrub Wetland	22.2		5.6	13.0
PFO1Cb	Freshwater Forested/Shrub Wetland		1.4		17.6
PSS1A	Freshwater Forested/Shrub Wetland		1.0	0.2	
PSS1C	Freshwater Forested/Shrub Wetland			0.7	
PSS/EM1A	Freshwater Forested/Shrub Wetland		3.3		
PSS1/EM1Cb	Freshwater Forested/Shrub Wetland	0.5			
PSS1/EM1Eb	Freshwater Forested/Shrub Wetland	0.8			
PSS1E	Freshwater Forested/Shrub Wetland	0.9		0.9	
PSS1Eb	Freshwater Forested/Shrub Wetland	0.1			
PEM1A	Freshwater Emergent Wetland				0.4
PEM1C	Freshwater Emergent Wetland				1.4
PEM1Cb	Freshwater Emergent Wetland		7.4		
PEM1Eb	Freshwater Emergent Wetland	1.0			
PEM1/SS1Cb	Freshwater Emergent Wetland		26.1		
PUBFb	Freshwater Pond		1.6		
PUB/SS1Fb	Freshwater Pond		2.4		
Total (Ac./% of parcel boundary)					
	Not mapped as wetlands	96.1%	89%	96.3%	93.8%
	Riverine	12.0/(1%)	5.5/(0.7%)	11.0/(1.0%)	13.8/(0.7%)
	PFO	30.7/(2.6%)	39.1/(5%)	27.0/(2.5%)	107.0/(5.4%)
	PSS	2.2/(0.1%)	4.3/(0.5%)	1.8/(0.2%)	
	PEM	1.0/(0.08%)	33.5/(4.3%)		1.7/(0.1%)
	PUB		4.0/(0.5%)		

Wetland Classification Codes:

R4SBC = Riverine Intermittent Streambed Seasonally Flooded
 R5UBH = Riverine Unknown Perennial Unconsolidated Bottom Permanently Flooded
 PFO1A = Palustrine Forested Broad-Leaved Deciduous Temporarily Flooded
 PFO1Ab = Palustrine Forested Broad-Leaved Deciduous Temporarily Flooded Beaver
 PFO1C = Palustrine Forested Broad-Leaved Deciduous Seasonally Flooded
 PFO1Cb = Palustrine Forested Broad-Leaved Deciduous Seasonally Flooded Beaver
 PSS1A = Palustrine Scrub-Shrub Broad-Leaved Deciduous Temporarily Flooded
 PSS1C = Palustrine Scrub-Shrub Broad-Leaved Deciduous Seasonally Flooded
 PSS/EM1A = Palustrine Scrub-Shrub/
 PSS1/EM1Eb = Palustrine Scrub-Shrub Broad-Leaved Deciduous Emergent Persistent Seasonally Flooded/Saturated Beaver
 PSS1/EM1Cb = Palustrine Scrub-Shrub Broad-Leaved Deciduous Emergent Persistent Seasonally Flooded Beaver
 PSS1E = Palustrine Scrub-Shrub Broad-Leaved Deciduous Seasonally Flooded/Saturated
 PSS1Eb = Palustrine Scrub-Shrub Broad-Leaved Deciduous Seasonally Flooded/Saturated Beaver
 PEM1A = Palustrine Emergent Broad-Leaved Deciduous Temporarily Flooded
 PEM1C = Palustrine Emergent Broad-Leaved Deciduous Seasonally Flooded
 PEM1Cb = Palustrine Emergent Broad-Leaved Deciduous Seasonally Flooded Beaver
 PEM1Eb = Palustrine Emergent Broad-Leaved Deciduous Seasonally Flooded/Saturated Beaver
 PEM1/SS1Cb = Palustrine Emergent Persistent Scrub-Shrub Broad-Leaved Deciduous Seasonally Flooded Beaver
 PUBFb = Palustrine Unconsolidated Bottom Semipermanently Flooded Beaver
 PUB/SS1Fb = Palustrine Unconsolidated Bottom Scrub-Shrub Broad-Leaved Deciduous Semipermanently Flooded Beaver

Exhibits

**Exhibit 1:
Location Map**

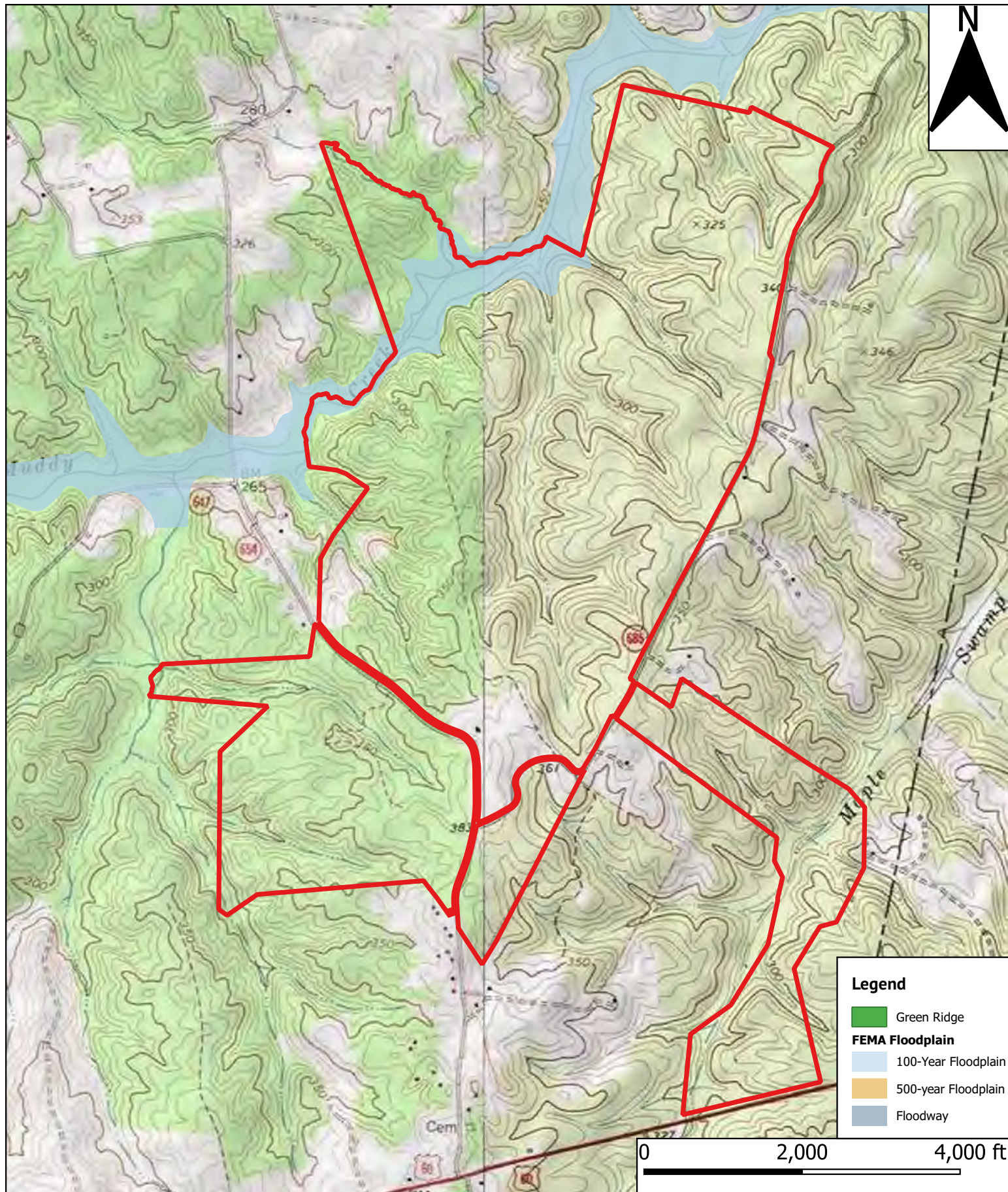


Project Name: Green Ridge Recycling and Disposal Facility LLC
Project Location: Cumberland County, Virginia
Date: 2/5/2021
Source: HUC, OpenStreets Map



Exhibit 1:
 Location Map

Exhibit 2:
Green Ridge USGS and FEMA Map



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

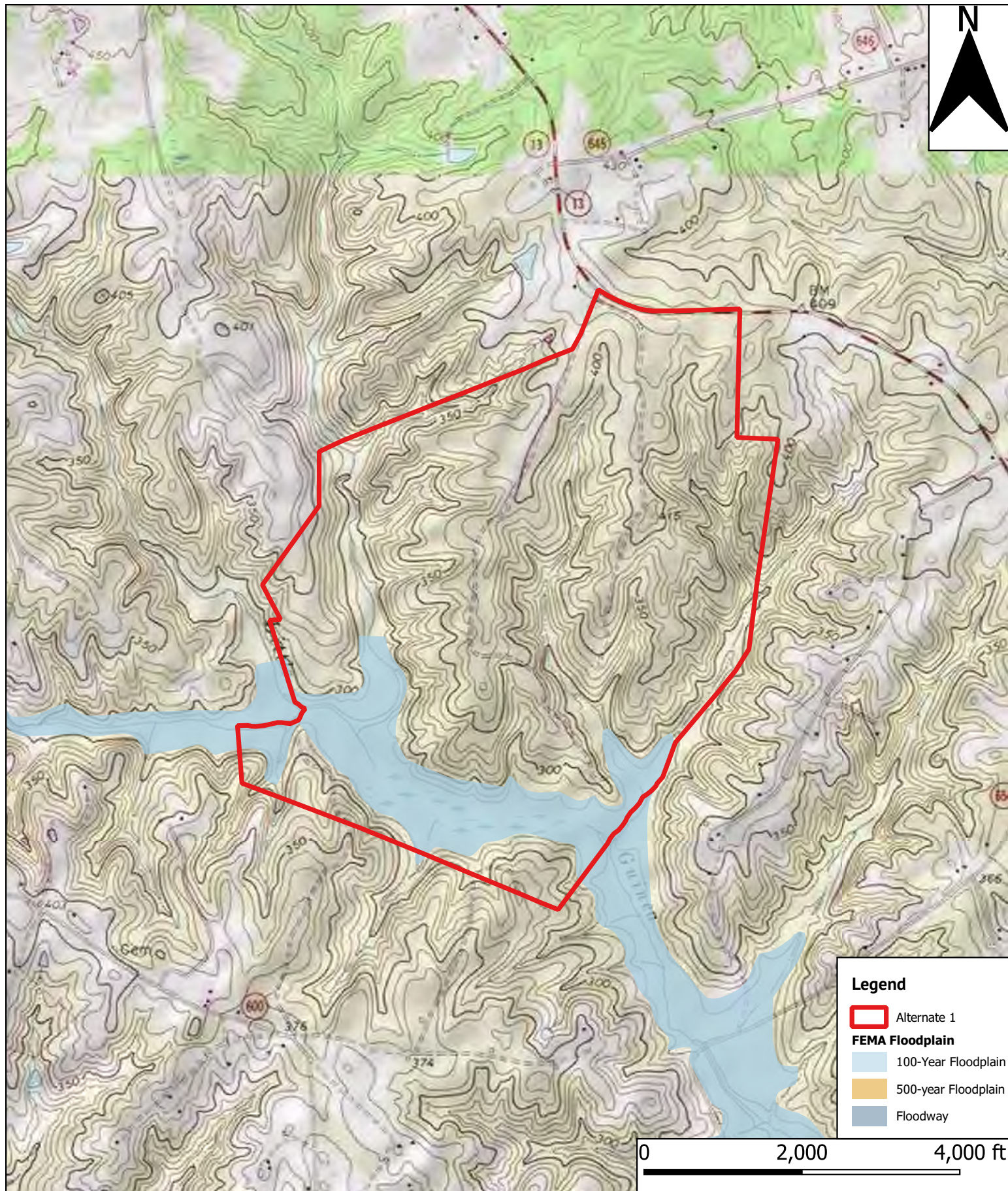
Date: 2/5/2021

Source: FEMA, USGS (Whiteville and Trenholm) Quads.



Exhibit 2:
Green Ridge
USGS and FEMA Map

Exhibit 3:
Alternate 1 USGS and FEMA Map



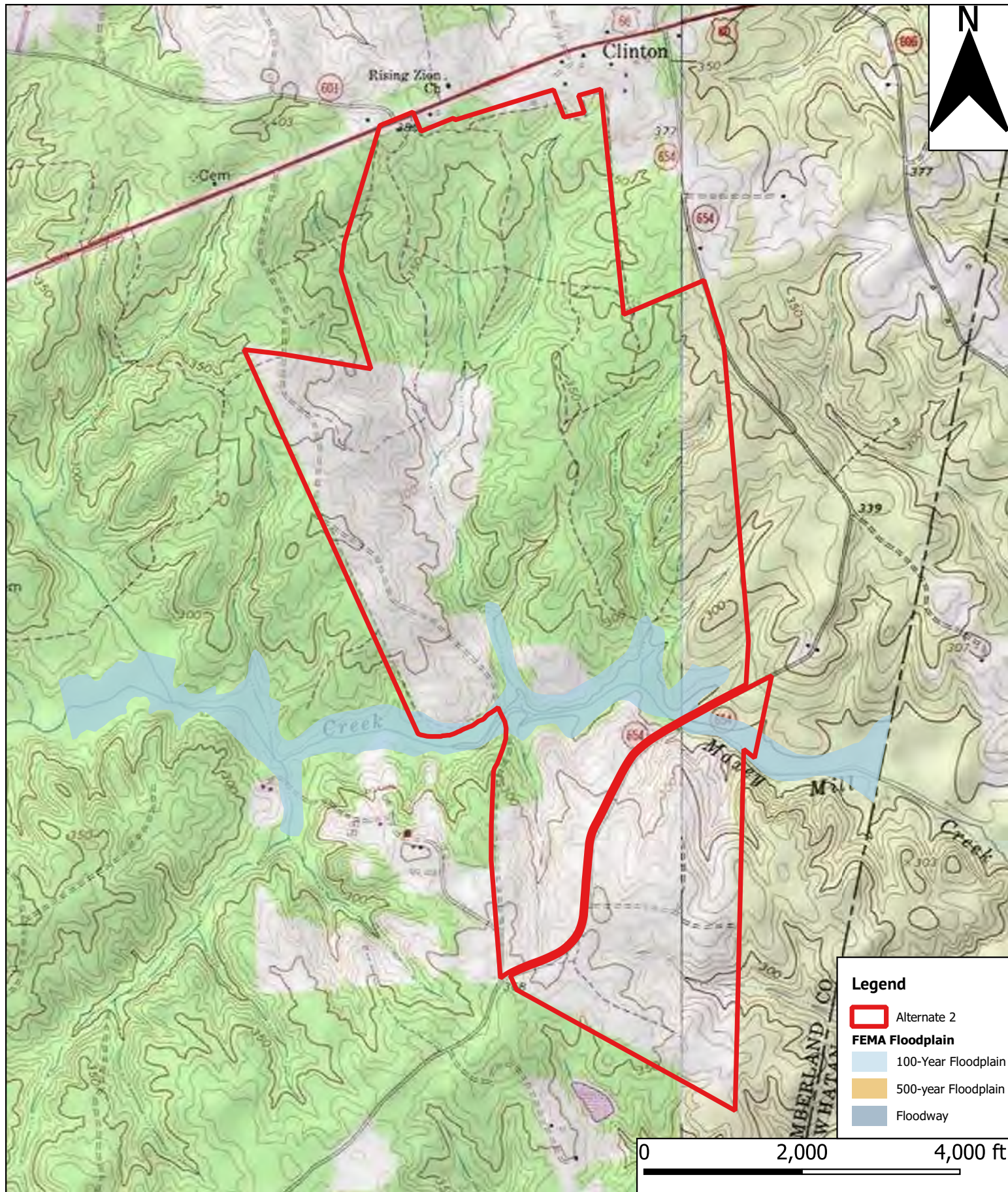
Project Name: Green Ridge Recycling and Disposal Facility LLC
Project Location: Cumberland County, Virginia
Date: 2/5/2021
Source: FEMA, USGS (Cumberland) Quad.



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Exhibit 3:
Alternate 1
USGS and FEMA Map

Exhibit 4:
Alternate 2 USGS and FEMA Map



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

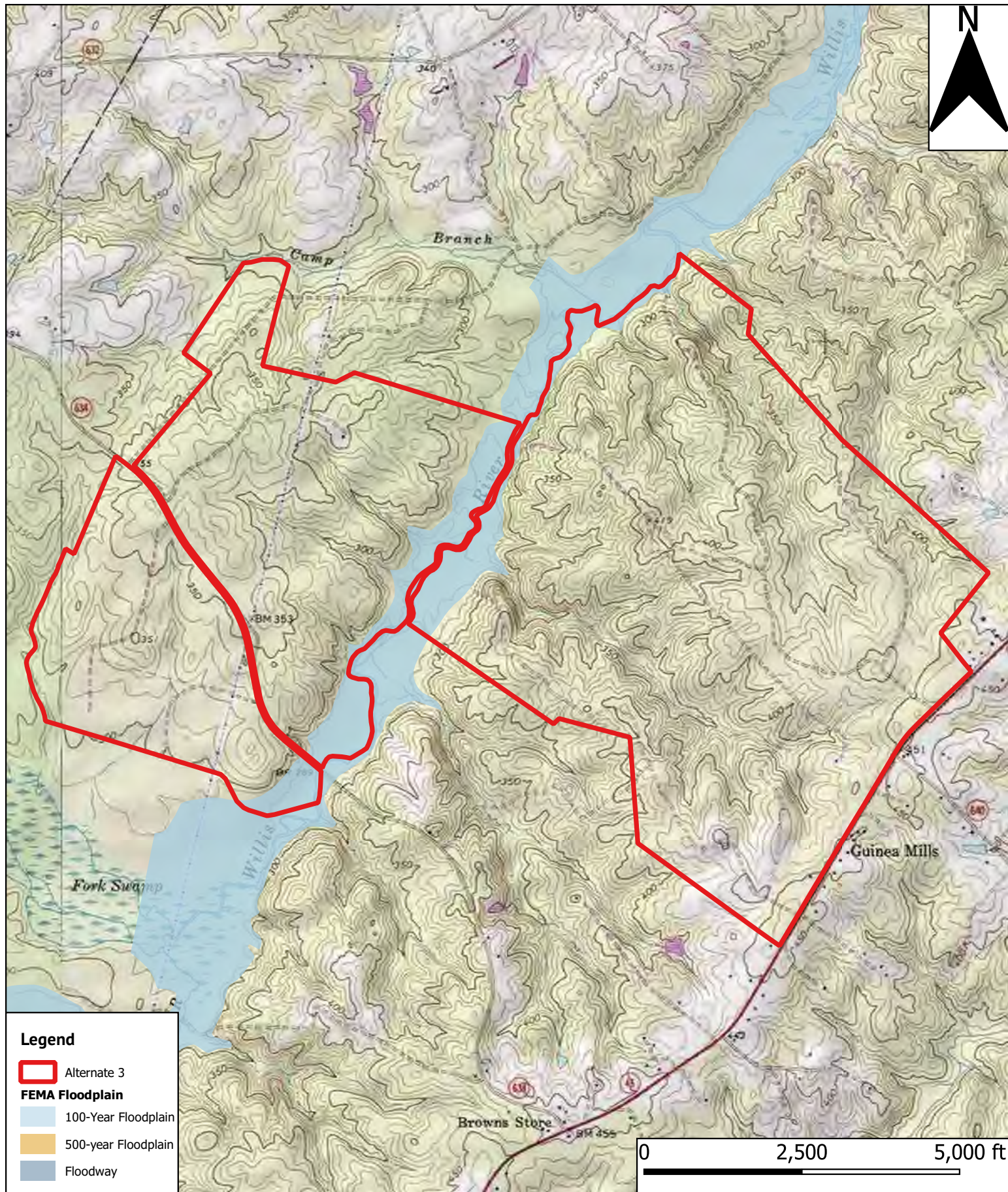
Source: FEMA, USGS (Whiteville and Trenholm Quads).



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Exhibit 4:
Alternate 2
USGS and FEMA Map

Exhibit 5:
Alternate 3 USGS and FEMA Map



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

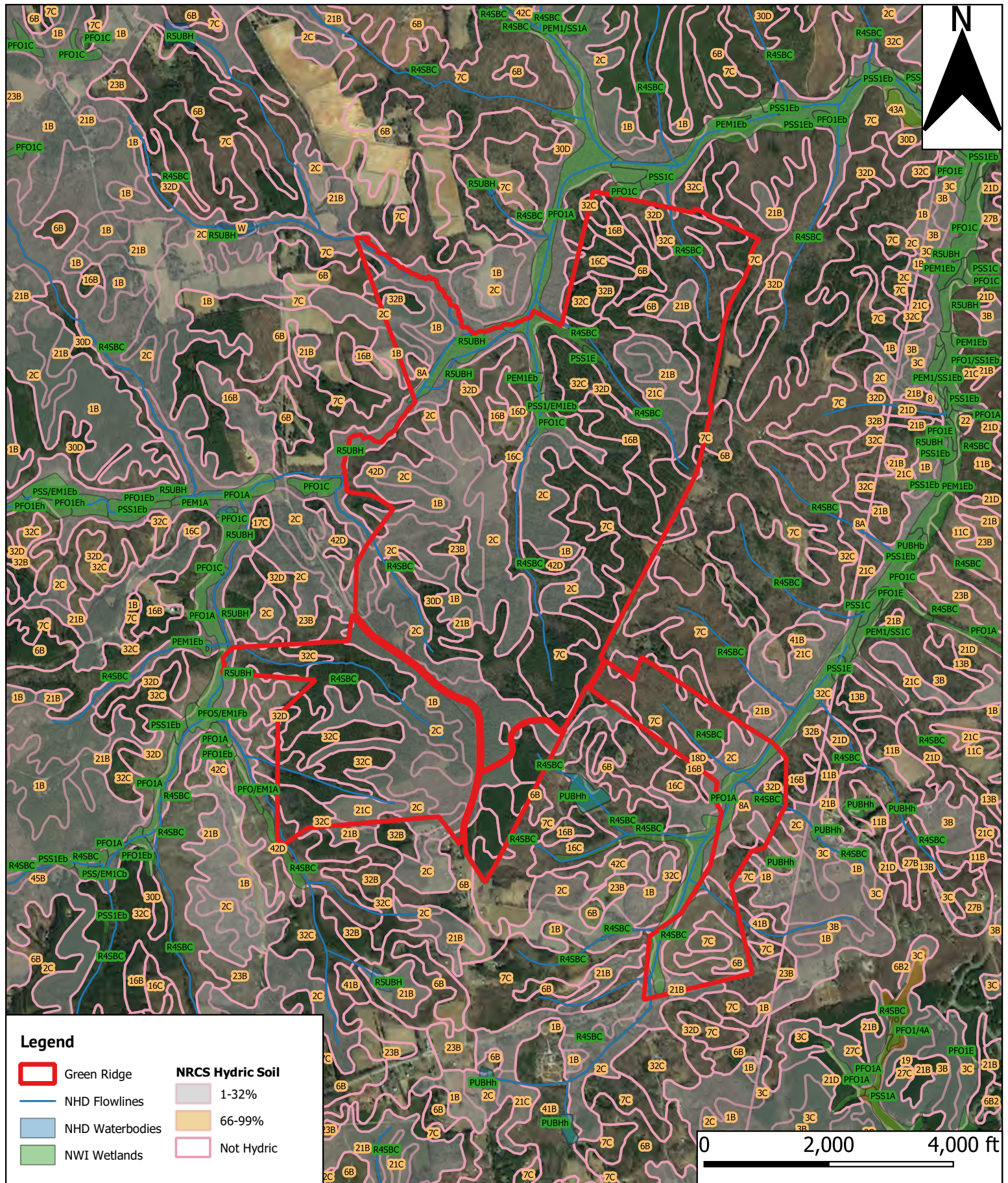
Source: FEMA, USGS (Hillcrest and Willis Mountain) Quads.



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Exhibit 5:
Alternate 3
USGS and FEMA Map

Exhibit 6:
Green Ridge Natural Resources Inventory Map



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

Source: NWI, NHD, NRCS, Google Earth Imagery

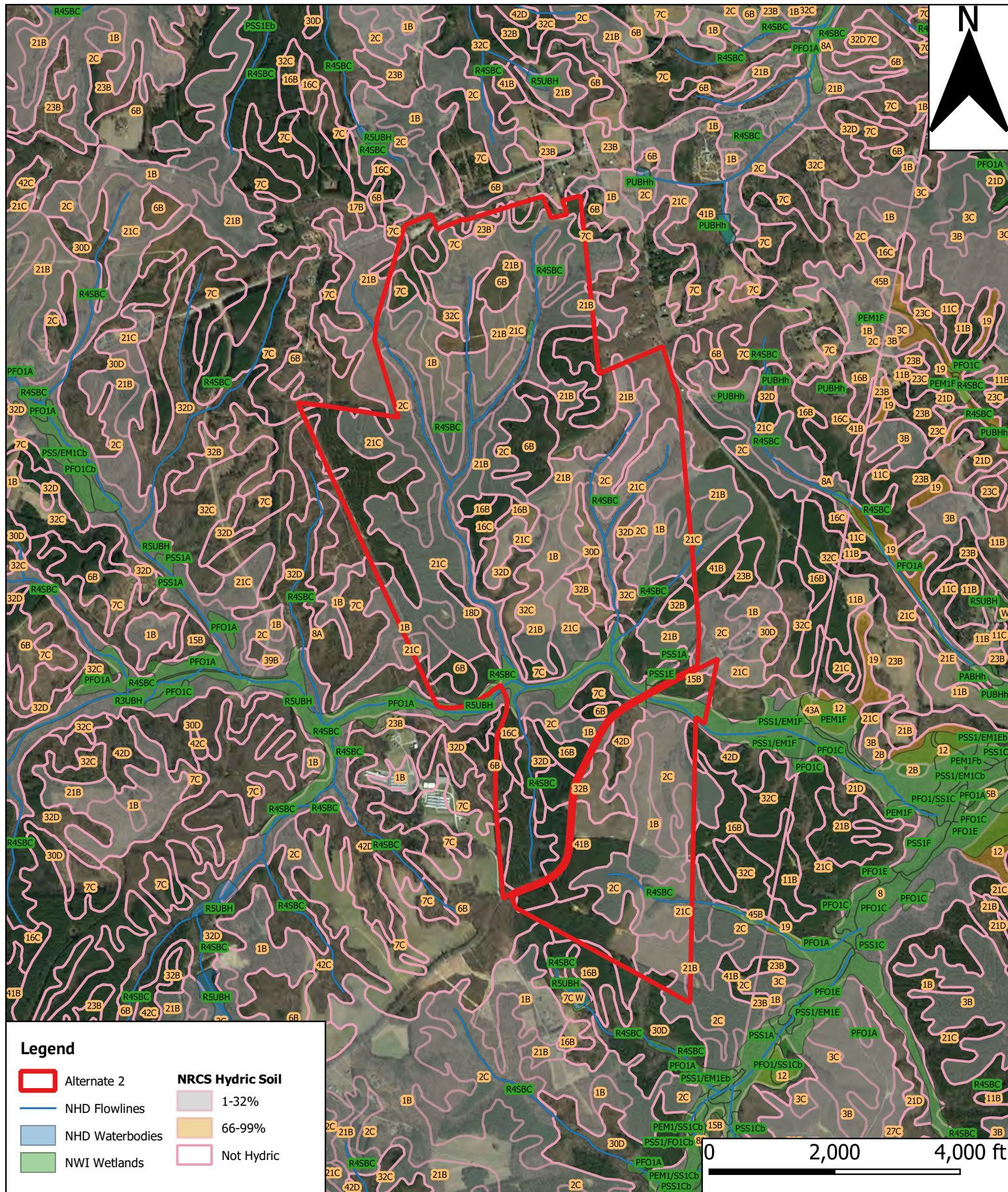


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Exhibit 6:
Green Ridge
Natural Resources
Inventory Map

Exhibit 7:
Alternate 1 Natural Resources Inventory Map

Exhibit 8:
Alternate 2 Natural Resources Inventory Map



Project Name: Green Ridge Recycling and Disposal Facility LLC

Project Location: Cumberland County, Virginia

Date: 2/5/2021

Source: NWI, NHD, NRCS, Google Earth Imagery



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Exhibit 8:
Alternate 2
Natural Resources
Inventory Map

Exhibit 9:
Alternate 3 Natural Resources Inventory Map

APPENDIX 11

REPORT - DAGUNA - MUSSEL EVALUATION - GREEN RIDGE

Threatened and Endangered Species Summary

Project: Green Ridge Landfill

Cumberland County, Virginia

May 24, 2019

Updated: December 9, 2019

Prepared by:

Koontz Bryant Johnson Williams
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Prepared for:

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Phone: (804) 356-4628



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Environmental Conservation Online System

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Environmental Conservation Online System	5
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Appendices

Appendix A: VDGIF Official Species List (OSL)

Appendix B: CCB Mapping Portal – Eagle Nest Locations and Buffers Map

Appendix C: NLEB Hibernaculum and Roost Tree Map

Appendix D: Species Conclusion Table

Appendix E: Threatened and Endangered Species of Virginia

Appendix F: Daguna Consulting – Mussels Survey



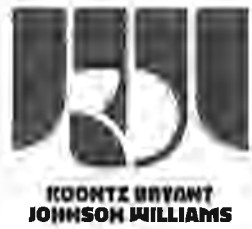
Section I: Introduction

The Green Ridge Landfill Project site lies off of Pinegrove Road and Anderson Highway (Rt. 60) in Cumberland County, Virginia. The site encompasses a total of 1,177.63 acres and contains both forested and unforested areas along with a wetland system that was delineated in March and April of 2018. The wetland system contains two named creeks. The first, Muddy Creek, lies on the northwestern portion of the associated project parcels. The second feature, Maple Swamp Creek, is a perennial stream that flows through the southeastern portion of the project area. This system encompasses a drainage basin that is approximately 8.31 square miles. For a list of the parcels that are associated with this project please see Table 1.0.

In order to assist with obtaining a Solid Waste Permit from the Virginia Department of Environmental Quality (VDEQ), the client, CWV, LLC., has decided to conduct a threatened and endangered species assessment for the project site. The following narrative is a summary of all research that has been performed in relation to the project.

**Table 1.0: Parcels
Associated with the Green
Ridge Landfill Project**

44-A-36	44-A-19-A
44-A-13	44-A-19
44-A-14	45-2-2-A
44-A-22	45-2-2-B
45-A-7	44-A-21
37-A-69	44-A-37
44-A-20	44-A-22-A
45-A-1	45-1-40
38-A-7	45-1-41



Research Summary



Section II: Threatened and Endangered Species - Animals

U.S. Fish and Wildlife Services (USFWS) – Endangered Species Project Review

The USFWS Endangered Species Project Review process was followed to evaluate the potential for the occurrence of threatened and endangered species populations within the project boundaries.

Step One: The Action Area was defined for the project site. According to the USFWS, the action area includes “all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action (50 CFR 402.02).”

Step Two - Four: An Official Species List (OSL) was produced via the USFWS “Information for Planning and Consultation (iPac)” website. This report was produced on August 14, 2018 and shows a summary of all threatened and endangered species that are potentially present along with a summary of any critical habitat within the designated project area. According to the OSL, there is “a total of 1 threatened, endangered, or candidate species” within the project area. This is the Northern Long-eared Bat (*Myotis septentrionalis*) which has a threatened status underneath the Endangered Species Act (ESA). No critical habitats were identified in the OSL. A species conclusion table was compiled with the results of the project review. This table can be found in the appendix. Please see Table 1.1 for a summary of the species predicted on the OSL.

Table 1.1: Summary of Potential T & E Species via the Official Species List (OSL)			
Group	Common Name	Scientific Name	ESA Status
Mammal	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened

In terms of suitable habitat, the OSL report states that “no critical habitat has been designated for this species.” In addition to the OSL, a search was done on the preferred habitat of the Northern Long-eared

Bat (NLEB). According to the Virginia Department of Game and Inland Fisheries (VDGIF) information page on the NLEB, the species “inhabits forested regions and will forage mainly on hillsides and ridge forests rather than riparian and floodplain forests.” A large portion of the site consists of low-lying forested areas that are adjacent to wetlands, streams and creeks and there are no cave or rock outcroppings on site that might harbor NLEB hibernacula. The VDGIF maintains the “NLEB Winter Habitat and Roost Trees” interactive map which shows that there are no known hibernacula located east of Interstate 81 and therefore there is no known NLEB habitat located within Cumberland County or the project area. In summary, it is unlikely that any populations of NLEB will be put a risk through this project.

Step Five: It should be noted that the site does not lie within any of the counties that contain federally designated critical habitat.



Step Six: The Center for Conservation Biology maintains the VA Eagle Nest Locator through the CCB Mapping Portal. According to this application, there are no known Bald Eagle nests or roosts located within the project area. The project will have no effect on this species. Please see the appendix for a copy of the VA Eagle Nest Locator generated map (Appendix B).

Step Seven: Please see the attached Species Conclusion Table (Appendix D) for all results of the Project Review.

Environmental Conservation Online System (ECOS) - USFWS

In addition to the research done through the Endangered Species Project Review and iPAC, the Environmental Conservation Online System (ECOS) was utilized to perform a county specific search for any potential threatened or endangered species. The search returned a list with a total of four potential species and includes three species of mussel, the James spiny mussel (*Pleurobema collina*), the Green floater (*Lasmigona subviridis*) and the Atlantic pigtoe (*Fusconaia masoni*). The fourth and final species on the list was the Northern Long-eared Bat. Please see Table 1.2 for a summary of all potential threatened and endangered species within Cumberland County, Virginia.

Table 1.2: Summary of Potential T & E Species for Cumberland County, Virginia			
Group	Common Name	Scientific Name	ESA Status
Clams	James spiny mussel	<i>Pleurobema collina</i>	Endangered
Clams	Green floater	<i>Lasmigona subviridis</i>	Under Review
Clams	Atlantic pigtoe	<i>Fusconaia masoni</i>	Proposed Threatened
Mammals	Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened

Having already determined that the potential for NLEB habitat on site is negligible, the three remaining mussel species take priority. As previously mentioned, the 1,177.63-acre site contains an extensive wetland system that primarily consists of two named creek systems, Muddy Creek and Maple Swamp Creek. Maple Swamp Creek flows into Muddy Creek to the northeast of the property and from there Muddy Creek flows directly into the James River, roughly 10-15 miles to the north. Due to the high prevalence of stream and creek habitats, the client has contracted Daguna Consulting, LLC to perform an onsite survey for any presence of these mussel species. This survey was conducted during the week of May 13th through the 17th of 2019. Please see Appendix F for their complete report.

For a complete list of all threatened and endangered animal species found within the state of Virginia, please see Appendix E.



Section III: Threatened and Endangered Species - Plants

U.S. Fish and Wildlife Services (USFWS) – Endangered Species Project Review

The USFWS Endangered Species Project Review process was followed to evaluate the potential for the occurrence of threatened and endangered plant species populations within the project boundaries. The Official Species List produced during Step Two did not report the presence of any endangered or threatened plant species within the project boundary. For more information regarding the Endangered Species Project Review process, please reference Section II.

Environmental Conservation Online System (ECOS) – USFWS

The ECOS system was also utilized to perform a county specific search for any endangered or threatened plant species. The system did not return a list for plant species and therefore, it is indicated that there are no reported endangered or threatened plant species within Cumberland County. For a list of all threatened and endangered plant species found within Virginia, please reference Appendix E.



RESOURCES

“Endangered Species: Project Reviews in Virginia.” *Virginia Field Office*, U.S. Fish and Wildlife, 3 Apr. 2019, https://www.fws.gov/northeast/virginiafield/endangered/projectreviews_step1.html

“IPAC: Information for Planning and Consultation.” *IPaC: Home*, U.S. Fish and Wildlife Service, <https://ecos.fws.gov/ipac/>.

Leon, Sarah. “Find Endangered Species.” Official Web Page of the U.S. Fish and Wildlife Service, U.S. Fish and Wildlife Service, <https://www.fws.gov/endangered/?s8fid=112762573903&countyName=Cumberland+County>.



Appendices



Appendix A



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Ecological Services Field Office

6669 Short Lane

Gloucester, VA 23061-4410

Phone: (804) 693-6694 Fax: (804) 693-9032

<http://www.fws.gov/northeast/virginiafield/>



In Reply Refer To:

May 06, 2019

Consultation Code: 05E2VA00-2018-SLI-4952

Event Code: 05E2VA00-2019-E-08954

Project Name: Cumberland County Wetland Delineation - Landfill

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office

6669 Short Lane

Gloucester, VA 23061-4410

(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2018-SLI-4952

Event Code: 05E2VA00-2019-E-08954

Project Name: Cumberland County Wetland Delineation - Landfill

Project Type: DEVELOPMENT

Project Description: Cumberland County Potential Landfill - Wetland delineation

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/37.563559517272864N78.12966063086748W>



Counties: Cumberland, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: http://www.dnr.state.nj.us/biodiversity/northern_long_eared_bat.html	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcherles

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.



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Appendix B



The Center for
Conservation
Biology

Appendix B CCB Mapping Portal



Layers: VA Eagle Nest Locator

Map Center [longitude, latitude]: [-78.10601234436035, 37.56318759963322]

Map Link:

https://ccbbirds.org/maps/#layer=VA+Eagle+Nest+Locator&zoom=14&lat=37.56318759963322&lng=-78.10601234436035&legend=legend_lah_7c321b7e-e523-11e4-aaa0-0e0c41326911&base=Street+Map+%28OSM%29

Report Generated On: 04/12/2019

The Center for Conservation Biology (CCB) provides certain data online as a free service to the public and the regulatory sector. CCB encourages the use of its data sets in wildlife conservation and management applications. These data are protected by intellectual property laws. All users are reminded to view the [Data Use Agreement](#) to ensure compliance with our data use policies. For additional data access questions, view our [Data Distribution Policy](#), or contact our Data Manager, Marie Pitts, at mlpitts@wm.edu or 757-221-7503.

Report generated by [The Center for Conservation Biology Mapping Portal](#).

To learn more about CCB visit ccbbirds.org or contact us at info@ccbbirds.org



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Appendix C

Appendix C: NLEB Hibernaculum and Roost Tree Map

Obtained from: <https://dgif-virginia.maps.arcgis.com/apps/webappviewer/index.html?id=32ea4ee4935942c092e41ddcd19e5ec5>

May 6, 2019



Legend

**NLEB Known Occupied Maternity Roost
(Summer Habitat)**



NLEB Hibernaculum 5.5 Mile Buffer



NLEB Hibernaculum Half Mile Buffer





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Appendix D

Appendix D: Species Conclusions Table

Project Name: Green Ridge Landfill – Cumberland County, Virginia

Date: May 6, 2019

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	No suitable habitat present	Not likely to adversely affect	-Please see Threatened and Endangered Species Summary -No active nests are present on the CCB Mapping Portal
Northern Long Eared Bat (<i>Myotis septentrionalis</i>)	No suitable habitat present	No effect	-Please see Steps Two – Four in the Threatened and Endangered Species Summary
Critical habitat	No critical habitat present	N/A	-Project does not occur in any of the designated counties

*Please note that this table includes only the species produced on the Official Species List generated by the Information, Planning and Consultation System (iPac), which is maintained by the U.S. Fish and Wildlife Service.



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Appendix E

Listed species -- 74 listings

Animals -- 57 listings

Status **Species/Listing Name**

E	Bat, gray Wherever found (<i><u>Myotis grisescens</u></i>)
E	Bat, Indiana Wherever found (<i><u>Myotis sodalis</u></i>)
T	Bat, Northern long-eared Wherever found (<i><u>Myotis septentrionalis</u></i>)
E	Bat, Virginia big-eared Wherever found (<i><u>Corynorhinus (=Plecotus) townsendii virginianus</u></i>)
E	Bean, Cumberland (pearlymussel) Wherever found; Except where listed as Experimental Populations (<i><u>Villosa trabalis</u></i>)
E	Bean, purple Wherever found (<i><u>Villosa perpurpurea</u></i>)
E	Bean, rayed Wherever found (<i><u>Villosa fabalis</u></i>)
E	Blossom, green (pearlymussel) Wherever found (<i><u>Epioblasma torulosa gubernaculum</u></i>)
E	Bumble bee, Rusty patched Wherever found (<i><u>Bombus affinis</u></i>)
E	Butterfly, Mitchell's satyr Wherever found (<i><u>Neonympha mitchellii mitchellii</u></i>)
T	Chub, slender Wherever found (<i><u>Erismystax cahni</u></i>)
T	Chub, spotfin Wherever found, except where listed as an experimental population (<i><u>Erismox monachus</u></i>)
E	Combshell, Cumberlandian Wherever found; Except where listed as Experimental Populations (<i><u>Epioblasma brevidens</u></i>)
T	Crayfish, Big Sandy Wherever found (<i><u>Cambarus callainus</u></i>)
T	Dace, blackside Wherever found (<i><u>Phoxinus cumberlandensis</u></i>)
E	Darter, candy Wherever found (<i><u>Etheostoma osburni</u></i>)
E	Darter, duskytail Wherever found (<i><u>Etheostoma percnurum</u></i>)
E	Fanshell Wherever found (<i><u>Cyprogenia stegaria</u></i>)

Status Species/Listing Name

E	Isopod, Lee County cave Wherever found (<i><u>Lirceus usdagalun</u></i>)
T	Isopod, Madison Cave Wherever found (<i><u>Antrolana lira</u></i>)
E	Kidneyshell, fluted Wherever found (<i><u>Ptychobranchnus subtentum</u></i>)
T	Knot, red Wherever found (<i><u>Calidris canutus rufa</u></i>)
T	Lance, yellow Wherever found (<i><u>Elliptio lanceolata</u></i>)
E	Logperch, Roanoke Wherever found (<i><u>Percina rex</u></i>)
T	Madtom, yellowfin Wherever found, except where listed as an experimental population (<i><u>Noturus flavipinnis</u></i>)
E	Monkeyface, Appalachian (pearlymussel) Wherever found (<i><u>Quadrula sparsa</u></i>)
E	Monkeyface, Cumberland (pearlymussel) Wherever found; Except where listed as Experimental Populations (<i><u>Quadrula intermedia</u></i>)
E	Mucket, pink (pearlymussel) Wherever found (<i><u>Lampsilis abrupta</u></i>)
E	Mussel, oyster Wherever found; Except where listed as Experimental Populations (<i><u>Epioblasma capsaeformis</u></i>)
E	Mussel, sheepnose Wherever found (<i><u>Plethobasus cyphus</u></i>)
E	Mussel, snuffbox Wherever found (<i><u>Epioblasma triquetra</u></i>)
E	Pearlymussel, birdwing Wherever found; Except where listed as Experimental Populations (<i><u>Lemiox rimosus</u></i>)
E	Pearlymussel, cracking Wherever found; Except where listed as Experimental Populations (<i><u>Hemistena lata</u></i>)
E	Pearlymussel, dromedary Wherever found; Except where listed as Experimental Populations (<i><u>Dromus dromas</u></i>)
E	Pearlymussel, littlewing Wherever found (<i><u>Pegias fabula</u></i>)
E	Pearlymussel, slabside Wherever found (<i><u>Pleuromma dolabelloides</u></i>)
E	Pigtoe, finerayed Wherever found; Except where listed as Experimental Populations (<i><u>Fusconaia cuneolus</u></i>)
E	Pigtoe, rough Wherever found (<i><u>Pleurobema plenum</u></i>)

Status Species/Listing Name

E	Pigtoe, shiny Wherever found; Except where listed as Experimental Populations (<i>Fusconaia cor</i>)
T	Plover, piping [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. (<i>Charadrius melodus</i>)
E	Rabbitsfoot, rough Wherever found (<i>Quadrula cylindrica strigillata</i>)
E	Riffleshell, tan Wherever found (<i>Epioblasma florentina walkeri</i> (= <i>E. walkeri</i>))
E	Salamander, Shenandoah Wherever found (<i>Plethodon shenandoah</i>)
T	Sea turtle, green North Atlantic DPS (<i>Chelonia mydas</i>)
E	Sea turtle, hawksbill Wherever found (<i>Eretmochelys imbricata</i>)
E	Sea turtle, Kemp's ridley Wherever found (<i>Lepidochelys kempii</i>)
E	Sea turtle, leatherback Wherever found (<i>Dermochelys coriacea</i>)
T	Sea turtle, loggerhead Northwest Atlantic Ocean DPS (<i>Caretta caretta</i>)
E	Snail, Virginia fringed mountain Wherever found (<i>Polygyriscus virginianus</i>)
E	Spectaclecase (mussel) Wherever found (<i>Cumberlandia monodonta</i>)
E	Spider, spruce-fir moss Wherever found (<i>Microhexura montivaga</i>)
E	Spinymussel, James Wherever found (<i>Pleurobema collina</i>)
E	Squirrel, Carolina northern flying Wherever found (<i>Glaucomys sabrinus coloratus</i>)
E	Tern, roseate Northeast U.S. nesting population (<i>Sterna dougallii dougallii</i>)
T	Tiger beetle, Northeastern beach Wherever found (<i>Cicindela dorsalis dorsalis</i>)
E	Wedgemussel, dwarf Wherever found (<i>Alasmidonta heterodon</i>)
E	Woodpecker, red-cockaded Wherever found (<i>Picoides borealis</i>)

Plants -- 17 listings

Status Species/Listing Name

T	Amaranth, seabeach (<i>Amaranthus pumilus</i>)
---	--

<u>Status</u>	Species/Listing Name
T	Birch, Virginia round-leaf (<i>Betula uber</i>)
E	Bittercress, small-anthered (<i>Cardamine micranthera</i>)
E	Bluet, Roan Mountain (<i>Hedysotis purpurea var. montana</i>)
E	Bulrush, Northeastern (<i>Scirpus ancistrochaetus</i>)
E	Coneflower, smooth (<i>Echinacea laevigata</i>)
E	Harperella (<i>Ptilimnium nodosum</i>)
T	Joint-vetch, Sensitive (<i>Aeschynomene virginica</i>)
E	Lichen, rock gnome (<i>Gymnoderma lineare</i>)
E	Mallow, Peter's Mountain (<i>Iliamna corei</i>)
T	Orchid, eastern prairie fringed (<i>Platanthera leucophaea</i>)
T	Pink, swamp (<i>Helonias bullata</i>)
T	Pogonia, small whorled (<i>Isotria medeoloides</i>)
E	rock cress, Shale barren (<i>Arabis serotina</i>)
T	Sneezeweed, Virginia (<i>Helenium virginicum</i>)
T	Spiraea, Virginia (<i>Spiraea virginiana</i>)
E	Sumac, Michaux's (<i>Rhus michauxii</i>)



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Appendix F

REVISED FINAL REPORT

Surveys for Protected Freshwater Mussels at the Proposed Green Ridge Recycling and Disposal Facility in Cumberland County, VA

by



Brett J. K. Ostby and B. B. Beaty
Daguna Consulting, LLC
7509 Pin Oak Circle
Bristol, VA 24202

for

Koontz, Bryant, Johnson, Williams Group
11901 Old Stage Road
Chester, VA

May 29th, 2019
Revised August 15th, 2019
Final Revision December 5th, 2019



INTRODUCTION

The proposed Green Ridge Recycling and Disposal Facility is planned for rural Cumberland County, Virginia. Preliminary review of the property indicated that streams potentially containing freshwater mussels may be present. Therefore, the project developer requested a survey for the imperiled freshwater mussels to better understand any potential impact. Nearby perennial streams include Muddy Creek and Maple Swamp Creek. These perennial streams border and, in some places, flow through the Green Ridge property (Figure 1). Many unnamed tributaries to these streams drain the property.

The James River Basin is inhabited by the federally endangered James Spinemussel (*Pleurobema collina*), the state-threatened Green Floater (*Lasmigona subviridis*), and the state-threatened Atlantic Pigtoe (*Fusconaia masoni*). The state-listed Green Floater is known from the James River upstream and downstream of the Muddy Creek confluence (The Catena Group 2010, Chazal et al. 2012). Relic shell material of the Atlantic Pigtoe was recently detected in the Powhatan County reach of the James River by Chazal et al. (2012). The James Spinemussel is known from nearby Rock Island Creek (~ 40 km to the northwest, Chazal et al. 2012). Ostby (2007) detected a significant population of a common mussel species (Eastern Elliptio, *Elliptio complanata*) in a small unnamed stream in Powhatan County (~20 km to the east). That small unnamed stream was comparable to the perennial streams on the Green Ridge site. Chazal et al. (2012) conducted 2 surveys of Davis Creek, a tributary to Muddy Creek entering downstream of the Green Ridge site. They identified suitable habitat but detected no native mussels in those surveys.

On May 25 and 26, 2019, biologists Brett Ostby and Braven Beaty of Daguna Consulting, LLC visited the Green Ridge property to assess potential mussel habitat in streams and conduct surveys for freshwater mussels where necessary. Surveys were conducted to meet the requirements of “Abbreviated Surveys” as defined in “Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2013)”. Most efforts focused on Muddy Creek and Maple Swamp Creek.

METHODS

Stream Assessment

We either visited streams by hiking through the site or assessed streams as they entered either Muddy Creek or Maple Swamp Creek. Assessments determined whether sufficient flow and suitable substrate were present to support freshwater mussels. We also assessed overall stream conditions. In some streams with sufficient flow, we searched for mussels.

Stream Surveys

The perennial streams (Muddy Creek and Maple Swamp Creek) were surveyed for mussels to qualitatively assess species composition, abundance, and the possible presence of protected species. In accordance with the published Virginia freshwater mussel survey guidelines, we searched reaches of stream extending from 400 downstream to 100 m upstream of proposed impacts. Because most habitats were shallow (<0.5 m), we used viewscopes and unaided visual



inspection. In some areas tactile searches were employed. All stream reaches were surveyed unless the habitat was deemed “unsuitable” for mussels based on the site visit. The “unsuitability” of any stream reach(es) as habitat for mussels was fully documented. We searched stream banks and exposed shoals for mussel shells to obtain a complete list of species at the site. Surveys were conducted when water level and clarity were suitable to locate shells and live individuals with ease. Sufficient effort was expended to visually inspect a sufficient amount of suitable habitat so that we could state with reasonable confidence that endangered and/or threatened species did or did not occur in the reach sampled. Representative specimens of each species detected were photographed. Geographical Information System (GIS) programs were used to georeference survey boundaries, location of protected species, and location of other pertinent features.

RESULTS

Weather and Stream Conditions

Skies were clear on both May 25th and May 26th. Air temperature reached a high of 29 °C (85 °F) on May 25th and 32 °C (90 °F) on May 26th. Flows were assumed to be near median in Muddy Creek and Maple Swamp Creek based on information from nearby gages, including USGS 02036500 on Fine Creek at Fine Creek Mills, VA and USGS 02039500 on the Appomattox River at Farmville, VA. Little to no rain had fallen in the area over the preceding week. Water clarity in Muddy Creek was limited due to tannins and turbidity from an unknown source. In general, the streambed was clearly visible in laminar flows less than 0.4 m depth. Water temperature in Muddy Creek was 22 °C (76 °F) when surveyed on May 25th. Maple Swamp Creek had no evidence of tannins and was considerably clearer, with all streambed habitats visible from the water surface in laminar flow. Water in Maple Swamp Creek was 18°C (64 °F) during the May 26th survey.

Muddy Creek Habitat and Species Observations

We surveyed Muddy Creek from the abandoned Miller Lane bridge (37.584320, -78.106711) to upstream of the Pine Grove culvert crossing (37.567270, -78.138347), with the exception of a 100 m reach directly downstream of the Pine Grove crossing (Figure 2). The total surveyed reach was approximately 3,800 m. Muddy Creek flowed through a corridor of mature bottomland forests, with extensive marshes in the 1000 m reach upstream of the abandoned bridge (Figure 3). Its average bankfull width was 7 m with wetted width usually 5-6 m. Bankfull height was 1 to 1.5 m throughout, with sand banks forming a natural dike between the channel and marsh areas. In forested areas, banks were steep but stable and usually vegetated (Figure 4).

Instream habitat in Muddy Creek was 95% run habitat with a sand streambed (see Figure 3). The sand streambed ranged from firm to soft. All instream habitat structure in the lower 3,400 m of the surveyed reach was formed by large woody debris. Approximately 5% of the habitat was pool. Exposed bedrock, boulders, cobble and gravel were only observed starting 300 m downstream of the Pine Grove crossing. From 400 m downstream to 200 m upstream of the Pine Grove crossing, a few riffles were noted (Figure 5). Overall the streambed was 99% sand, with



some patches being unstable and soft. Maximum water depth was 1.25 m with most habitats less than 0.4 m deep.

In a 9 person-hour effort, we detected 12 live Eastern Ellipito (*E. complanata*), 5 live Northern Lance (*E. fisheriana*) and 1 live Eastern Floater (*Pyganodon cataracta*) in the main channel of Muddy Creek. Figures 6-8 are photographs of example specimens. We detected live mussels only from the start point to approximately 1000 m upstream. We observed recent shell material on exposed banks nearer the Pine Grove crossing, but no live specimens were detected in the vicinity. Non-native Asian Clams (*Corbicula fluminea*) were present throughout the stream but not common. There was little habitat for aquatic insects except near the Pine Grove crossing where we observed a few mayfly larvae under cobbles. We also observed some water scorpions (*Ranatra*) in large woody debris closer to the survey start point. We observed cyprinids, mostly dace, and centrarchids. Several centrarchid nests were noted near the survey start point. Three frog species were abundant in Muddy Creek and its associated wetlands including Green Frogs, Cricket Frogs and Leopard Frogs. Tadpole of American Toads and calls of Grey Treefrogs were also noted.

We noted several tributaries entering Muddy Creek (marked as Trib 1-3 and 5-6 in Figure 2 and geo-referenced as Trib 1-6 in Table 1) but none appeared suitable for freshwater mussels, being either too small or unstable (Figures 9-14, see Table 1 for locations). We extensively searched a tributary flowing from the south which eventually dissipated into a marsh but found no evidence of mussels (Trib 1, see Figures 9 and 10). The largest tributary flowing through the Green Ridge property into Muddy Creek from the northwest had a significantly incised channel clogged by sand with little flow (Trib 3, 37.5744, -78.12536, see Figure 12). Upstream of the Pine Grove Road crossing, we assessed and surveyed an unnamed tributary draining from the south. This stream showed evidence of recent catastrophic disturbance, with a newly incised channel cut into clay banks (Figure 14). There was also a copious amount of gravel, likely originating from Brown Road, in the stream bed (see Figure 5). Further survey of this stream was not warranted. Other tributaries flowing off the Green Ridge site into the surveyed reach of Muddy Creek as marked on the topographic map by dotted blue lines (see Figure 2) were not detected during the survey of Muddy Creek because they were likely dry on May 25th.

Maple Swamp Creek Habitat and Species Observations

At the survey start point (37.55975, 78.10566), Maple Swamp Creek flowed along a marsh on its left ascending side and a mature forest on the other (Figure 15 and 16). This reach had low banks (<0.5 m). It was exclusively run habitat with a sand stream bed. Some patches of sand were extremely soft. Large woody debris was common. Bankfull width was 3-4 m and mostly wetted. Water depth was usually less than 0.3 m.

Moving from downstream to upstream the character of Maple Swamp Creek gradually changed. Further upstream, this stream flowed through a mature forested corridor with higher banks. Upstream of the unnamed tributary labeled Trib 7, riffles and larger streambed particles became more common. For approximately the upstream 600 m of the surveyed reach, bankfull height was usually 1 to 1.5 m, reaching a maximum of 2 m. For the upstream 600 m of the surveyed



reach habitat was 75% run, 10% riffle and 5% pool (Figure 17). While most of the streambed remained sand (75%), boulder, cobble and gravel were more common. Some habitats had an exposed bedrock streambed.

In a 5 person-hour effort, we surveyed an approximately 1,800 m reach, detecting no evidence of native mussels. No Asian Clams (*C. fluminea*) were detected either. Fish were more common in Maple Swamp Creek than in Muddy Creek, with dace, central stone rollers, and darters observed. Aquatic insects were more frequently encountered in Maple Swamp Creek than in Muddy Creek, including mayfly larvae, whirligig beetles, caddis fly larvae and water pennies. Several frog species were abundant in Maple Swamp Creek and its associated wetlands including Green Frogs, Cricket Frogs and Leopard Frogs. Calls of Grey Treefrogs were also noted.

Two apparently perennial tributaries (Trib 7 and 8 on Figure 15) were assessed. No evidence of mussels was detected though suitable habitat and habitat complexity were noted near Maple Swamp Creek in both cases (Figures 18 and 19).

CONCLUSION

Muddy Creek supports a low-density mussel assemblage comprised of three common species. We found no evidence to suggest additional species inhabited the surveyed reach. None of the Muddy Creek tributaries draining the Green Ridge property appeared to provide suitable habitat for native mussels. We found no evidence to suggest Maple Swamp Creek or its tributaries were inhabited by native mussels. Disturbances to any stream flowing off the Green Ridge property might impact native mussels living downstream in Muddy Creek. Maple Swamp Creek is also a tributary to Muddy Creek.

Adequate habitat area was searched to detect extremely low-density populations of protected species. Using a sampling equation from Smith (2006), we calculated post hoc detection probabilities based on total area searched and assumed detection of an individual mussel when present (or search efficacy, Table 2). We surveyed at least 19,000 m² of habitat in Muddy Creek and 5,400 m² in Maple Swamp Creek. Generally, detection of an individual mussel is 0.2 on a scale from 0 to 1, where “0” means an individual was present but not detected and “1” means an individual was detected. An individual detection rate of 0.1 was more appropriate for Muddy Creek due to tannins and turbidity, whereas 0.2 was appropriate for Maple Swamp Creek. We had an extremely high probability (>0.99) to detect mussels present at 0.01 m⁻² in both Maple Swamp Creek and Muddy Creek.

Densities in Muddy Creek were so low that it would require large areas be surveyed to detect existing populations, so it should be no surprise that Department of Conservation and Recreation, Division of Natural Heritage surveys conducted by Chazal et al (2012) failed to detect mussels in the Muddy Creek drainage.



LITERATURE CITED

Ostby, B. J. K. 2007. Stream Survey for Protected Mussels in Unnamed Tributaries to Fine Creek, Powhatan County, Virginia. Report for Balzer and Associates, Powhatan, VA. 13 pp.

Chazal, A. C., B. T. Watson and B. C. Flower. 2012. Results of James Spiny mussel Surveys in the James River and Tributaries of Central and Eastern Virginia. Report for Virginia Department of Game and Inland Fisheries, Richmond, VA. 222 pp.

Smith, D. R. 2006. Survey design for detecting rare freshwater mussels. Journal of the North American Benthological Society 25(3): 701-711.

The Catena Group. 2010. Freshwater Mussel Survey Report for Proposed Water Intake, James River, Powhatan Co, VA. Report for Malcom Pirnie, Inc. Newport News, VA. 15 pp.

U. S. Fish and Wildlife Service and Virginia Department of Game and Inland Fisheries. 2013. Freshwater Mussel Guidelines for Virginia. Gloucester, VA. 9 pp.



Table 1. Latitude and longitude markers (WGS84) for mussel surveys and assessments.

Label	Latitude	Longitude	Figure
Assessment Trib 1 upstream	37.57729	-78.11288	
Assessment Trib 1 and photo	37.57812	-78.11368	9
Assessment Trib 1 downstream and photo	37.58120	-78.11529	10
Muddy Creek survey start	37.58423	-78.10672	
Assessment Trib 2 and photo	37.57520	-78.12201	11
Assessment Trib 3 and photo	37.57440	-78.12536	12
Larger substrate and exposed bed upstream	37.57089	-78.12895	
Assessment Trib 4 and first riffle	37.57006	-78.12954	
Shells on exposed bar	37.56992	-78.13188	
Assessment Trib 5 and photo	37.56804	-78.13322	13
Road gravel noted in streambed	37.56740	-78.13779	5
Upstream Assessment Trib 6 and photo	37.56806	-78.13294	14
Muddy Creek survey end	37.56729	-78.13835	
Upstream Assessment Trib 7	37.55895	-78.11561	
Assessment Trib 7 and photo	37.55569	-78.11260	17
Maple Swamp Creek survey start	37.55971	-78.10574	15
Assessment Trib 8 and photo	37.55217	-78.11458	18
Upstream Assessment Trib 8	37.55216	-78.11551	
Maple Swamp Creek survey end	37.54780	-78.11513	



Table 2. Probability of detecting a species (p) using Smith (2006) equation, $p = 1 - e^{-\beta\alpha\mu}$, given search efficacy (β), actual area covered in a survey (α), and a theoretical density (μ). We also present a theoretical population size for a survey reach for a given density (0.01 or 0.005 individuals per meter square). For example, if we were only able to detect 1 in 10 *L. subviridis* present in Muddy Creek and there were only 94 in the entire surveyed reach, we had a 0.9913 probability to detect at least a single individual.

Stream	p Probability of population detection	β Probability of Individual Detection	α Area Visually Searched	μ Population Density	Population Size in Survey Reach
Muddy Creek	0.9999	0.05	19000	0.01	190
	1.0000	0.1	19000	0.01	190
	0.9913	0.05	19000	0.005	95
	0.9999	0.1	19000	0.005	95
Maple Swamp Creek	1.0000	0.2	5400	0.01	54
	0.9955	0.1	5400	0.01	54
	0.9328	0.05	5400	0.01	54
	0.9955	0.2	5400	0.005	27
	0.9328	0.1	5400	0.005	27
	0.7408	0.05	5400	0.005	27

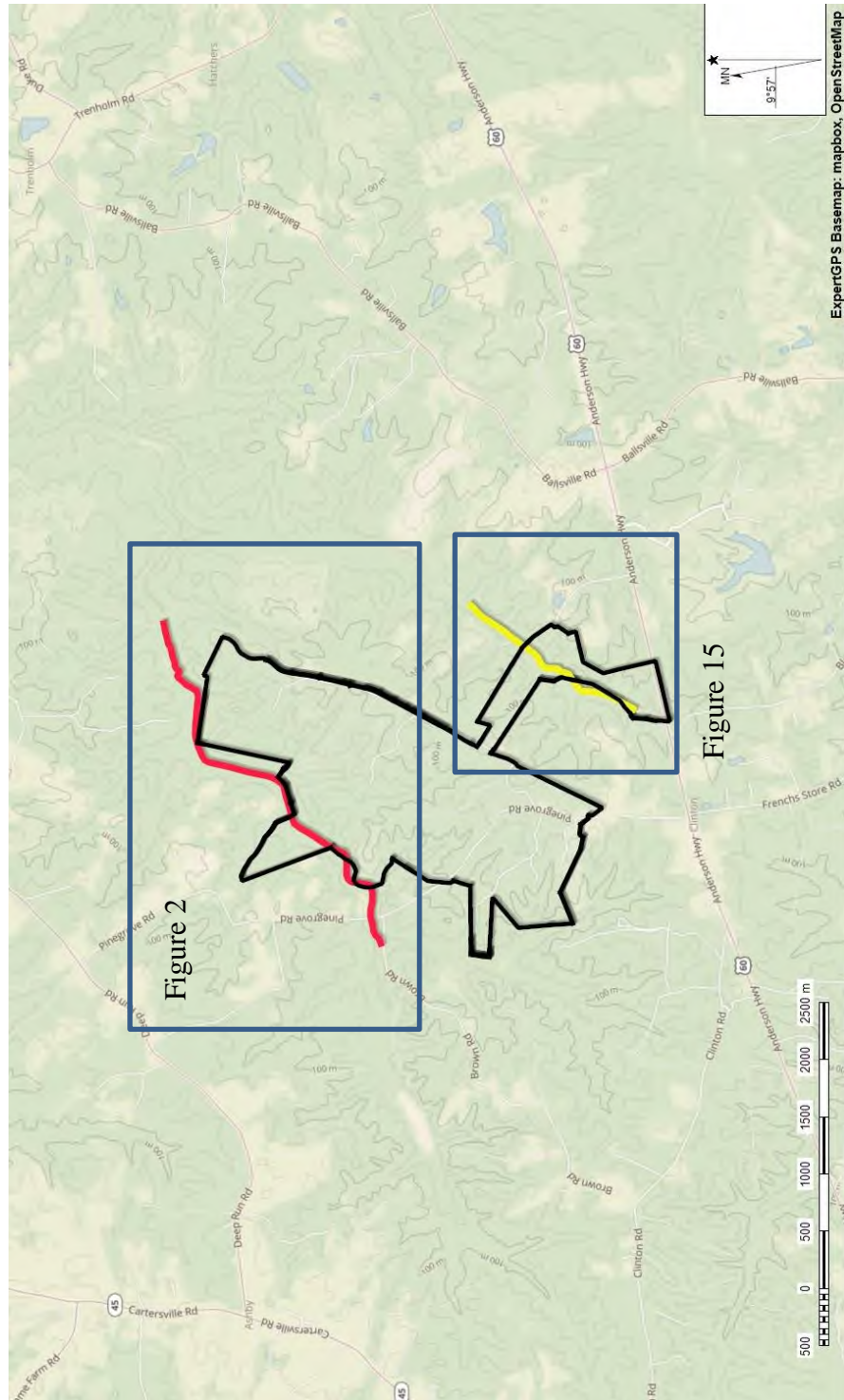


Figure 1. Area road map illustrating the reaches of Muddy Creek (red) and Maple Swamp Creek (yellow) that were surveyed for freshwater mussels. Property boundaries are marked in black.

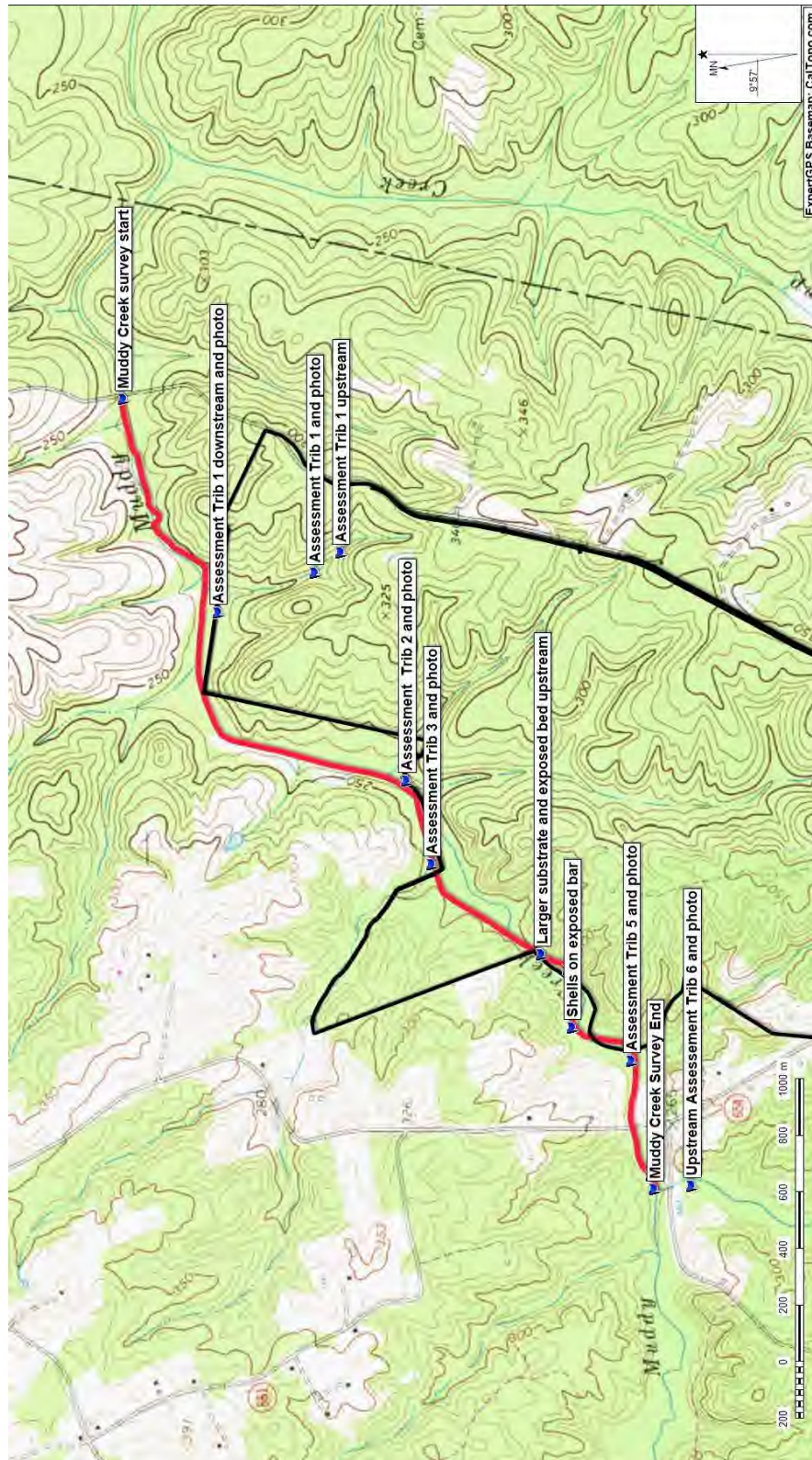


Figure 2. Topographic map illustrating survey reach of Muddy Creek (red) and its tributaries that were assessed. Property boundaries are marked in black. Tributary 4 was not marked here due to label overlap. All assessment are geo-referenced in Table 1.



Figure 3. Marsh bordering Muddy Creek near the survey start point. The most extensive marsh was present along the right ascending side.



Figure 4. Typical run habitat in Muddy Creek flowing through the forested corridor.



Figure 5. Muddy Creek upstream of Pine Grove crossing with gravel bar. Bar material appears to have originated from a gravel road and did not resemble stream bed material observed elsewhere in Muddy Creek or its tributaries.



Figure 6. The Eastern Elliptio (*E. complanata*) was the most frequently encountered species. Most were greater than 90 mm, with ages approximately 10 years or greater.



Figure 7. Northern Lance (*E. fisheriana*) were found in clay banks. Shell material of specimens as young as 3 years old were detected just downstream of the Pine Grove stream crossing on exposed bars.



Figure 8. We observed only a single specimen of Eastern Floater (*P. cataracta*) in Muddy Creek. It was 4 years old.



Figure 9. Stream feeding Muddy Creek from the south (Trib 1) was deeply incised in some locations. It was likely too small to support native mussels but did harbor dace.



Figure 10. Forested marsh near the Muddy Creek channel where the unnamed tributary channel (Trib 1) pictured in Figure 9 dissipated.



Figure 11. A beaver dam blocked this small tributary draining the Green Ridge site from the south (37.57520, -78.12201). This stream was too small to support freshwater mussels, so no further survey was warranted.



Figure 12. Unnamed tributary feeding Muddy Creek from the northwest had little flow and contributed large amounts of sand (37.5744, -78.12536). This stream drains the Green Ridge site and was not surveyed. Flow was only a few mm deep and filled less than half the channel, suggesting it may be ephemeral.



Figure 13. We followed this unnamed tributary as we exited Muddy Creek and made several checks (37.56804, -78.13322). Like other feeding tributaries it was too small to support mussels.



Figure 14. A recently incised channel within an older channel upstream of the new Brown Road crossing. This stream recently suffered a catastrophic event forming a new and deeper channel.

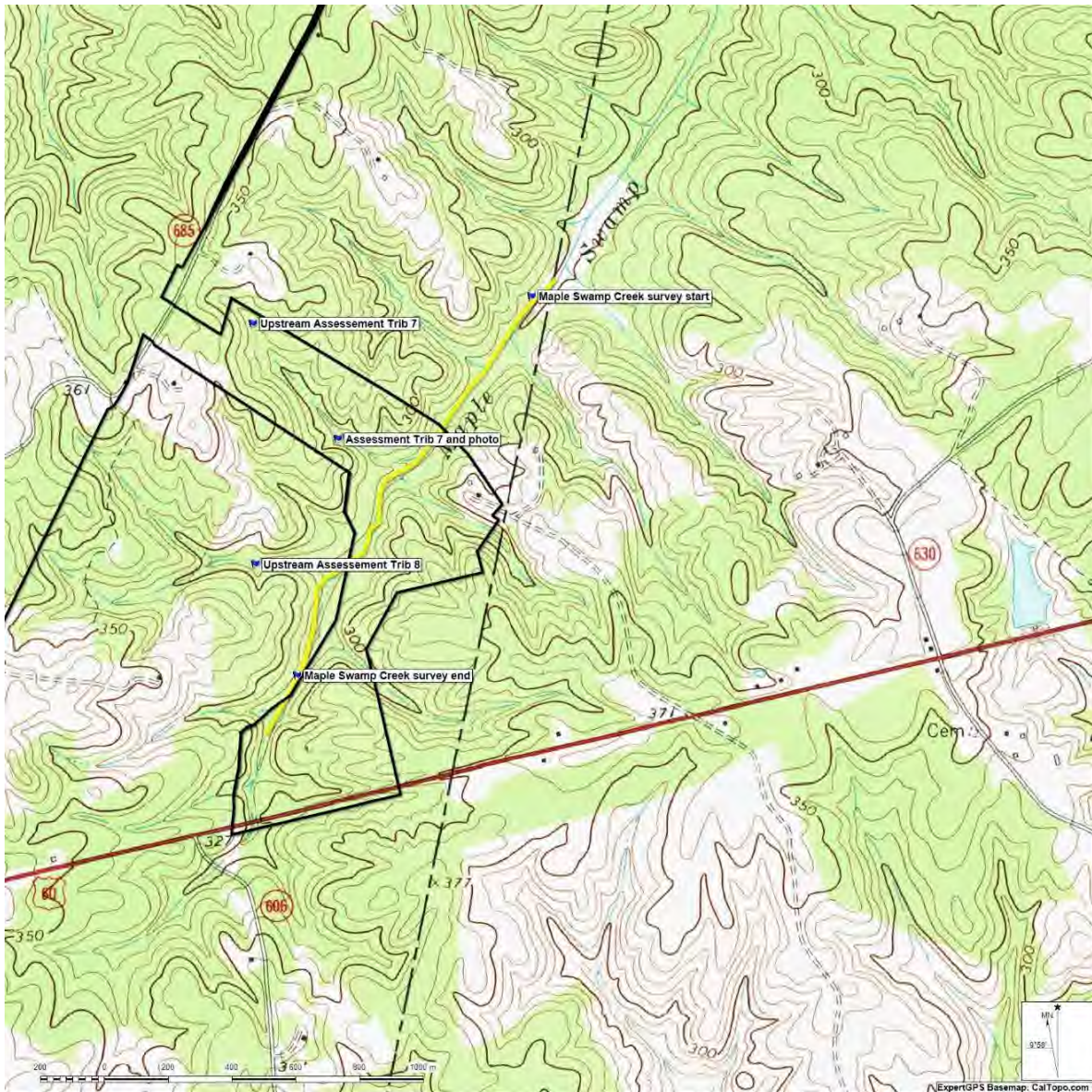


Figure 15. Topographic map illustrating survey reach of Maple Swamp Creek (yellow) and its tributaries that were assessed. Property boundaries are marked in black.

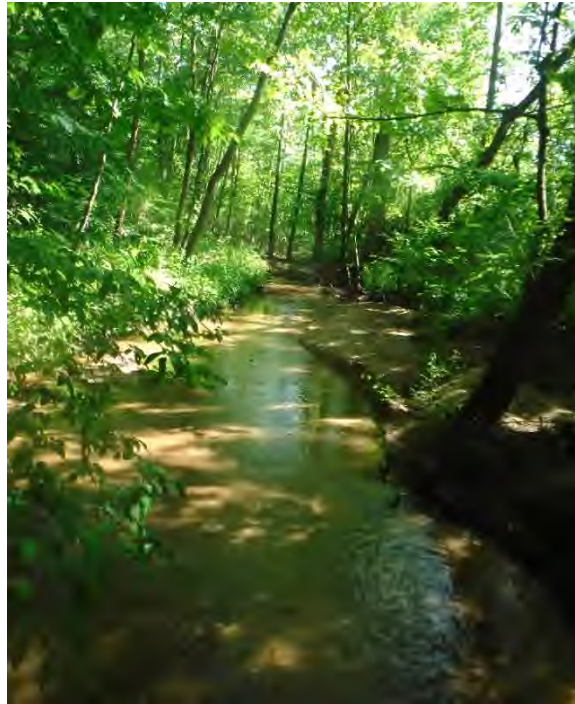


Figure 16. Run habitat with a sand streambed in Maple Swamp Creek near survey start.

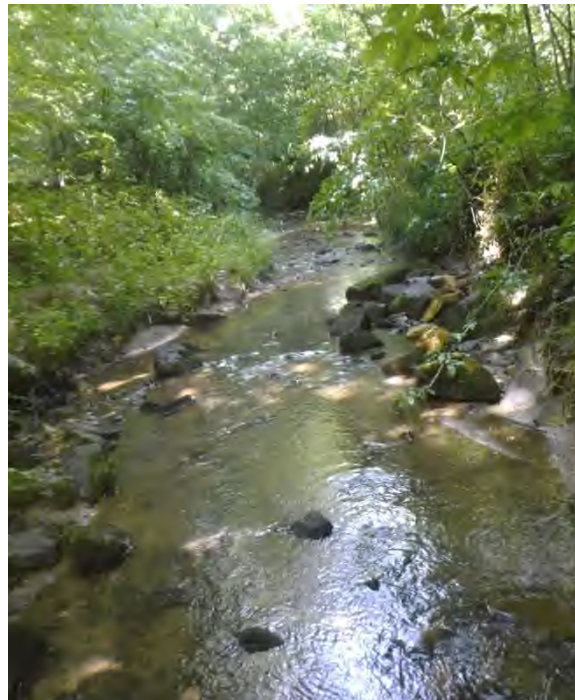


Figure 17. More complex meandering instream habitat farther upstream in Maple Swamp Creek. Boulders and cobble in the streambed here were absent downstream. We observed more fish, including darters in this habitat.

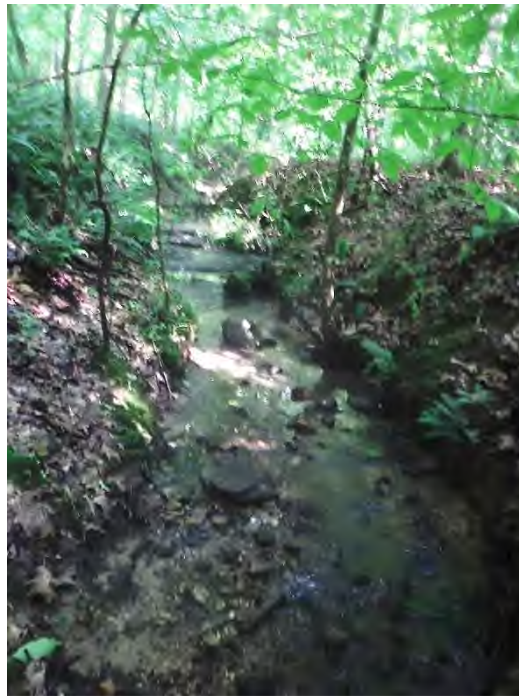


Figure 18. While hiking in from Miller Road, we searched approximately 200 m of a tributary feeding Maple Swamp Creek, finding suitable habitat but failing to detect any evidence of mussels (37.55569, -78.11260).



Figure 19. We searched an approximately 200 m reach of a small tributary feeding Maple Swamp Creek from its mouth upstream finding no evidence of mussels (37.5521, -78.11458).



Survey Record #1

Site #: DAGUNA05252019.1

Stream: Muddy Creek

County: Cumberland

Description: Surveyed 3,800 m reach of main channel and assessed several feeding tributaries

Drainage: James

USGS Quadrangle Map: Whiteville/Trenholm

Projection: WGS 84

Survey Start: 37.58423, -78.10672

Survey End: 37.56729, -78.13835

Survey Date: 5/25/2019 and 5/26/2019

Survey Effort: 9 person-hours

Personnel: B. J. K. Ostby, B. B. Beaty

Mollusks Observed:

12 Live *Elliptio complanta*

5 Live *E. fisheriana*

1 Live *Pyganodon cataracta*

Live *Corbicula fluminea* (uncommon)



Survey Record #2

Site #: DAGUNA05262019.1

Stream: Maple Swamp Creek

County: Cumberland

Description: Surveyed 1,800 m of main channel and assessed 2 feeding tributaries

Drainage: James

USGS Quadrangle Map: Trenholm

Projection: WGS 84

Survey Start: 37.55971, -78.10574

Survey End: 37.547796, -78.11513

Survey Date: 5/26/2019

Survey Effort: 5 person-hours

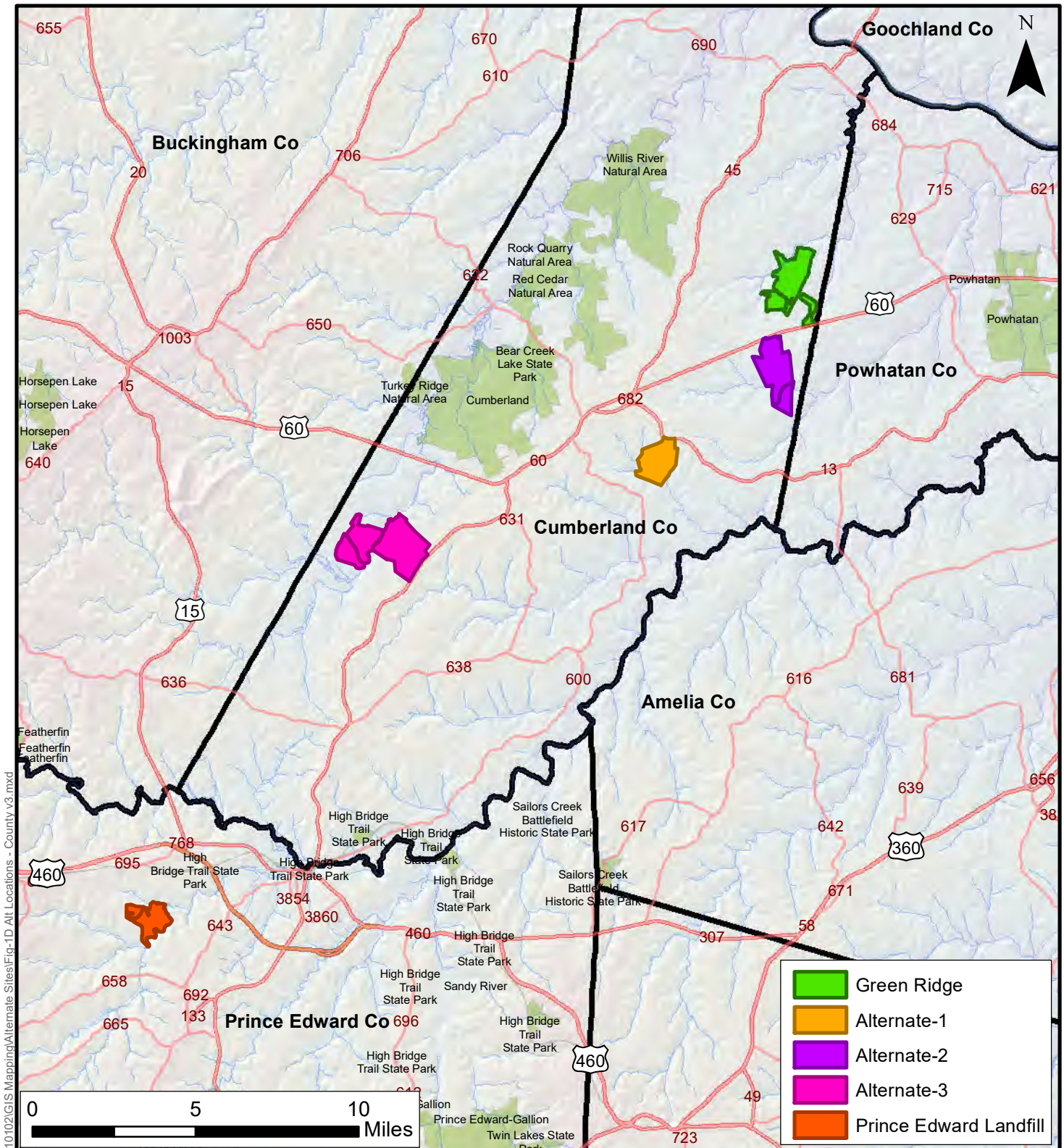
Personnel: B. J. K. Ostby, B. B. Beaty

Mollusks Observed:

None

APPENDIX 12

FIGURES - CONCEPTUAL LAYOUTS - ALTERNATIVES



Area Map Location in County

Alternate Sites
Green Ridge Recycling and Disposal Facility
Cumberland County, Virginia

SCALE: 1:270,000

PROJECT: 18020117-010102

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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: SMF
CHECKED: LPK
DATE: 07-06-21

FIGURE
1R

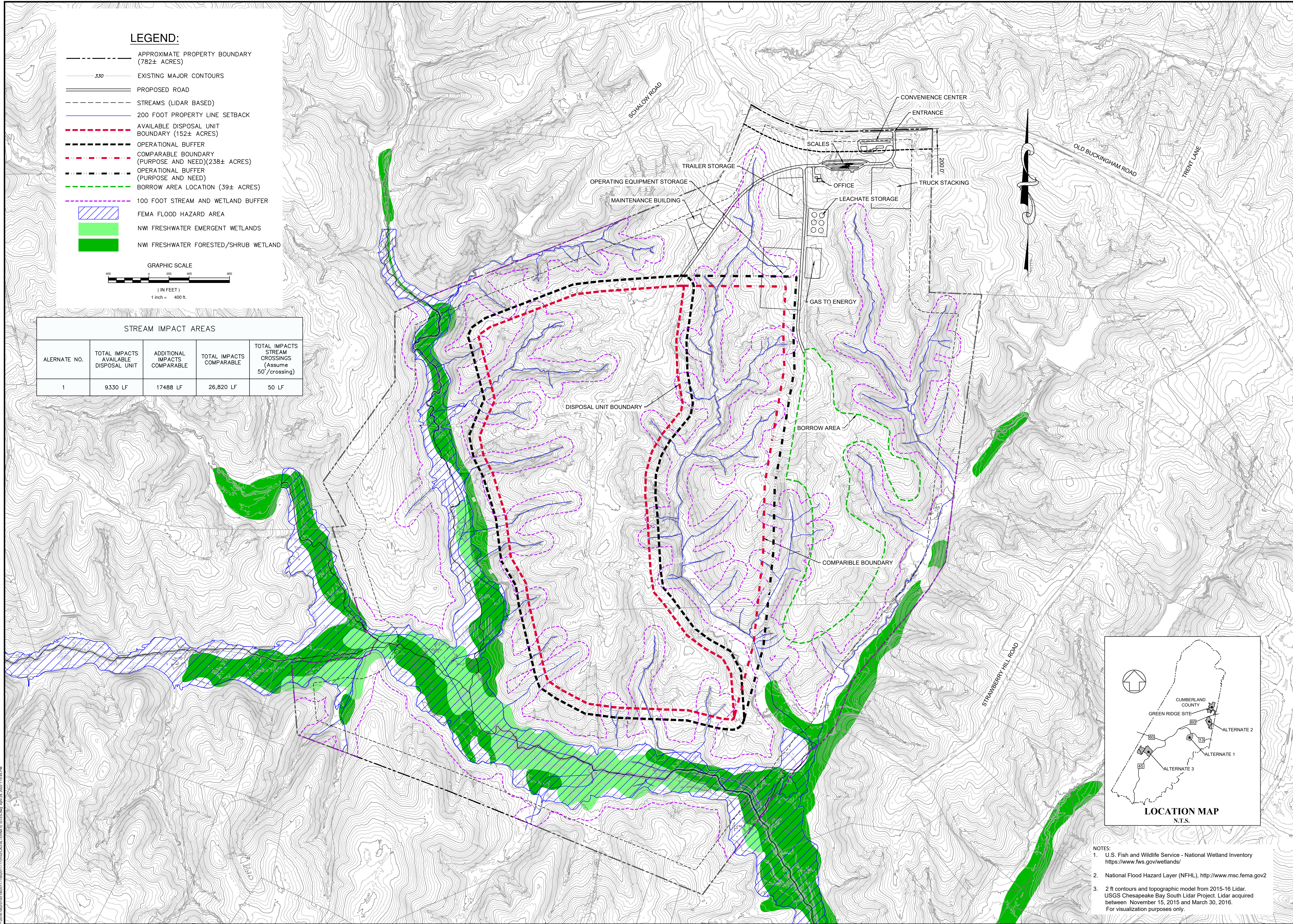
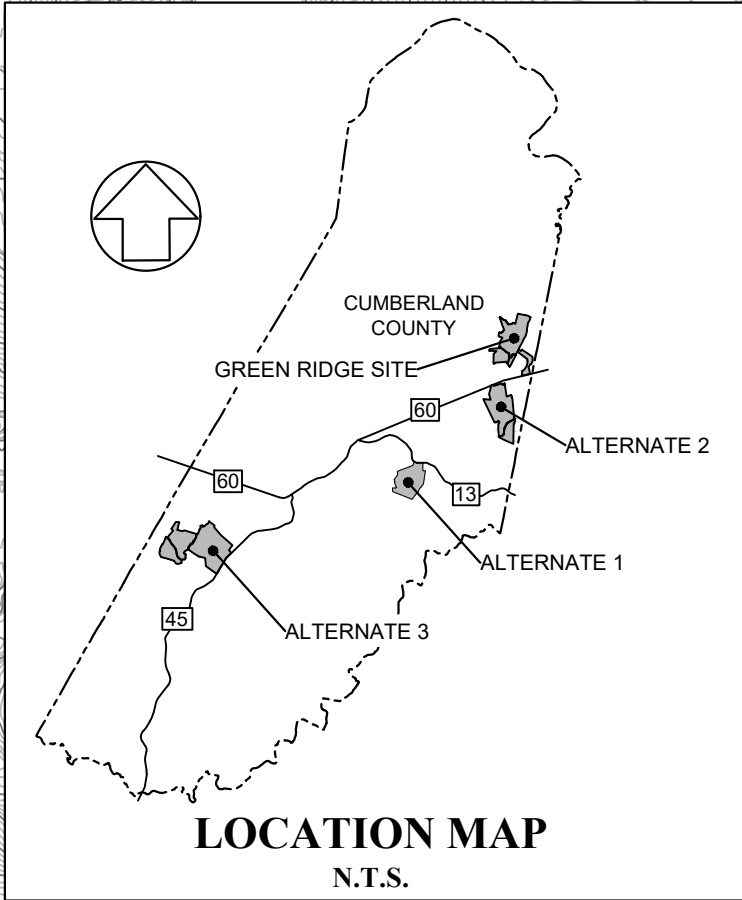


FIGURE 2R: 11/10/2021 11:02:02 AM 11/10/2021 11:02:02 AM ALTERNATE 1: 11/10/2021 11:02:02 AM



- NOTES:**
- U.S. Fish and Wildlife Service - National Wetland Inventory <https://www.fws.gov/wetlands/>
 - National Flood Hazard Layer (NFHL), <http://www.msc.fema.gov2>
 - 2 ft contours and topographic model from 2015-16 Lidar. USGS Chesapeake Bay South Lidar Project. Lidar acquired between November 15, 2015 and March 30, 2016. For visualization purposes only.

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• Charlottesville, VA
• Hampton Roads, VA
• Northern Virginia
• Virginia Beach, VA

Green Ridge JPA Application – Alternatives Analysis
Alternative 1 – Old Buckingham Road Conceptual layout

**GREEN RIDGE RECYCLING
AND DISPOSAL FACILITY**
CUMBERLAND COUNTY, VIRGINIA

GREEN RIDGE
RECYCLING AND DISPOSAL FACILITY

REVISIONS

This figure replaces figures submitted with previous versions of the JPA specifically Figure 2 dated 2/2/21 and Figure 2A dated 7/6/21.

DESIGNED BY:	LPK
DRAWN BY:	DLD
CHECKED BY:	LPK
SCALE:	1" = 400'
DATE:	4/29/2022
PROJECT NUMBER:	18020117-110102

FIGURE 2R

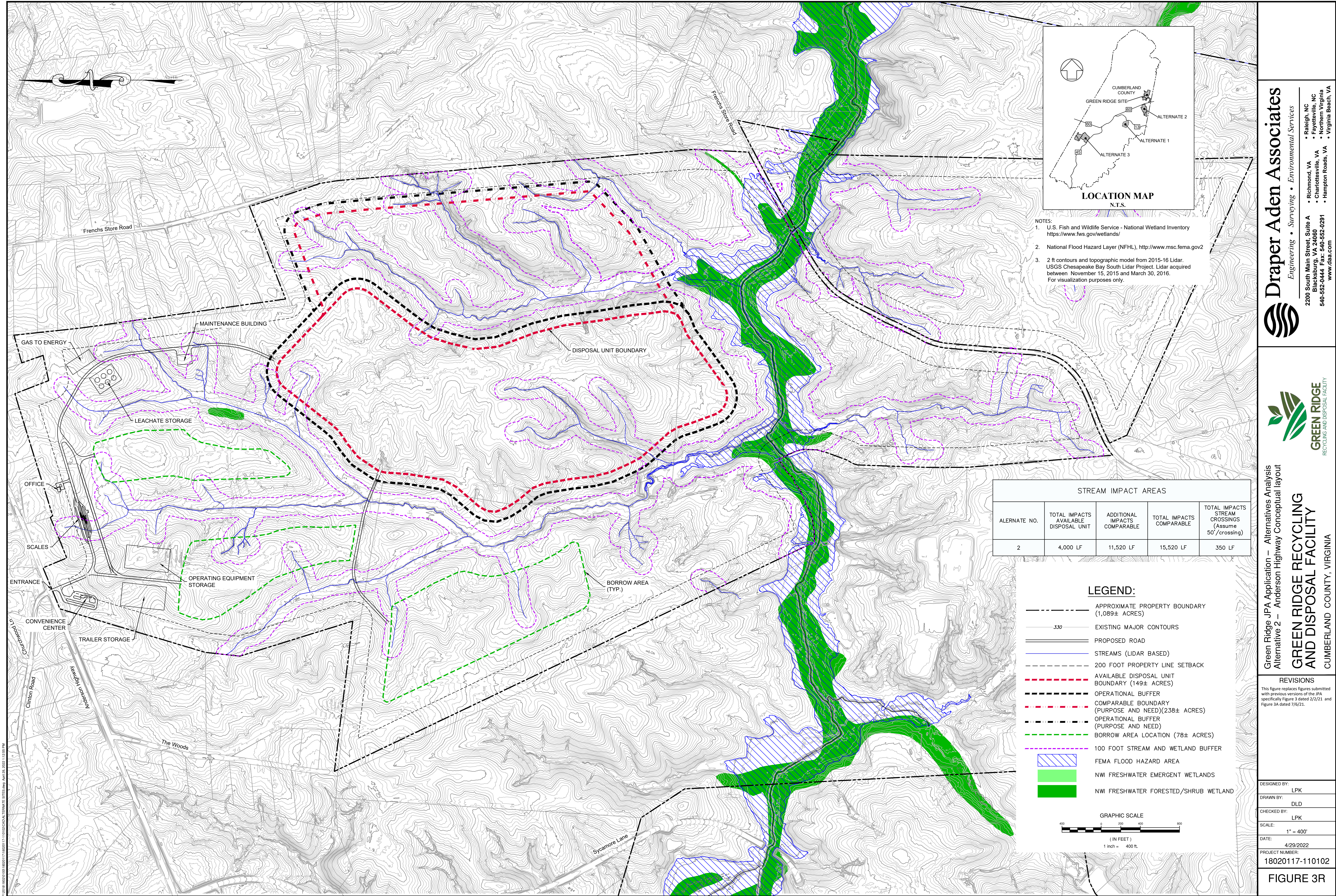


FIGURE 3R
18020117-110102
4/29/2022
LPK
LPK
DLD
LPK

Green Ridge JPA Application – Alternatives Analysis
Alternative 2 – Anderson Highway Conceptual layout

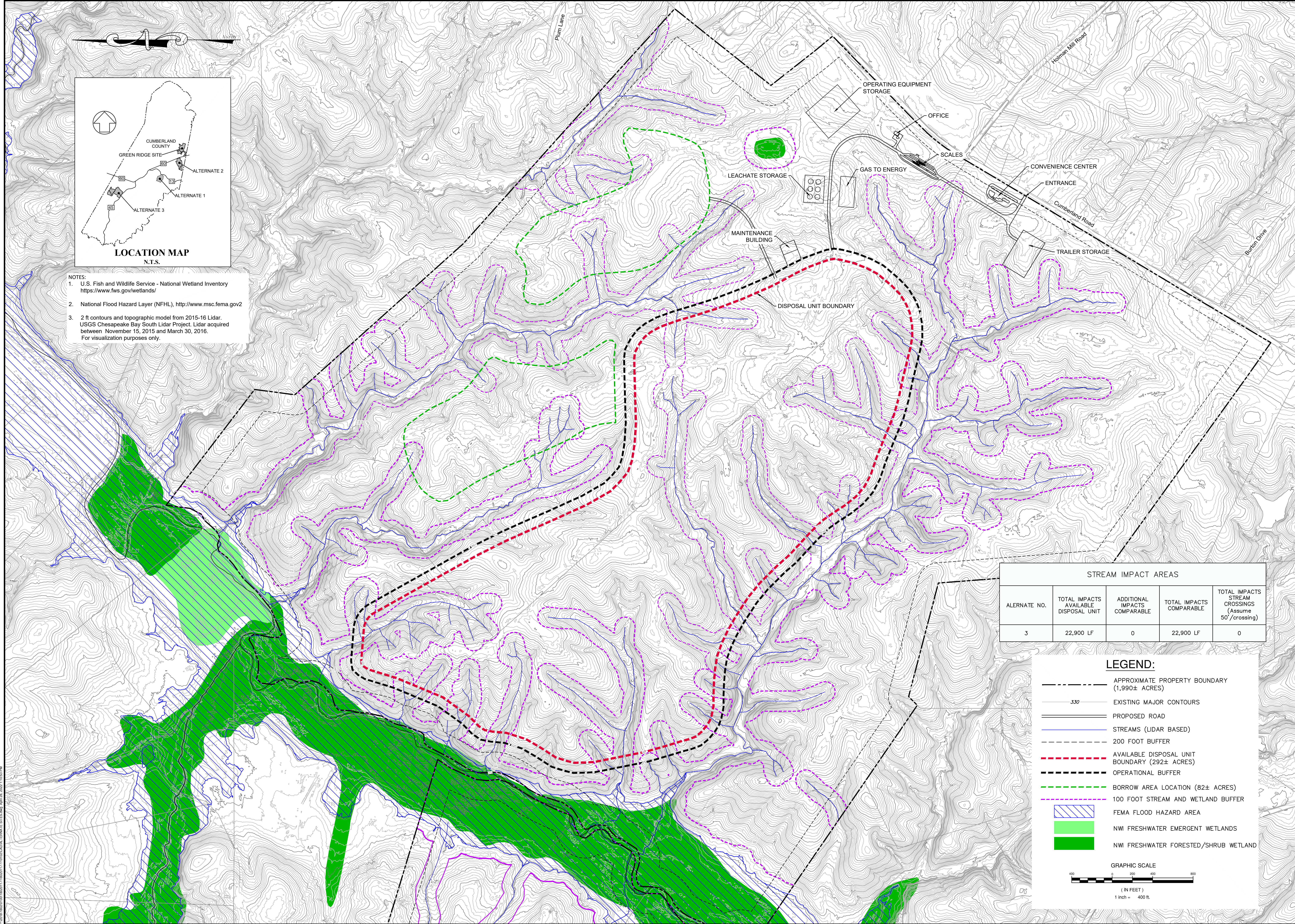


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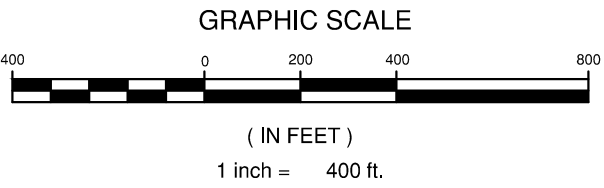
Green Ridge Recycling and Disposal Facility
CUMBERLAND COUNTY, VIRGINIA

FIGURE 3R

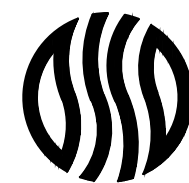


STREAM IMPACT AREAS				
ALTERNATE NO.	TOTAL IMPACTS AVAILABLE DISPOSAL UNIT	ADDITIONAL IMPACTS COMPARABLE	TOTAL IMPACTS COMPARABLE	TOTAL IMPACTS STREAM CROSSINGS (Assume 50' /crossing)
3	22,900 LF	0	22,900 LF	0

- LEGEND:**
- APPROXIMATE PROPERTY BOUNDARY (1,990± ACRES)
 - 330 EXISTING MAJOR CONTOURS
 - == PROPOSED ROAD
 - STREAMS (LIDAR BASED)
 - - - 200 FOOT BUFFER
 - - - AVAILABLE DISPOSAL UNIT BOUNDARY (292± ACRES)
 - - - OPERATIONAL BUFFER
 - - - BORROW AREA LOCATION (82± ACRES)
 - - - 100 FOOT STREAM AND WETLAND BUFFER
 - [Hatched Box] FEMA FLOOD HAZARD AREA
 - [Light Green Box] NWI FRESHWATER EMERGENT WETLANDS
 - [Dark Green Box] NWI FRESHWATER FORESTED/SHRUB WETLAND



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Green Ridge JPA Application – Alternatives Analysis
Alternative 3 – Cumberland Road Conceptual Layout

**GREEN RIDGE RECYCLING
AND DISPOSAL FACILITY**

CUMBERLAND COUNTY, VIRGINIA

REVISIONS

This figure replaces figures submitted with previous versions of the JPA specifically Figure 4 dated 2/2/21 and Figure 4A dated 7/6/21.

DESIGNED BY: LPK
DRAWN BY: DLD
CHECKED BY: LPK
SCALE: 1" = 400'
DATE: 4/29/2022
PROJECT NUMBER: 18020117-110102

FIGURE 4R

