Southern Tip Phases III and IV

Preliminary Engineering Report and Feasibility Study

August 8, 2018 Final

Prepared for

Accomack-Northampton County Planning District Commission

Prepared By

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VDOT UPC 106472

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1 INTRODUCTION

1.1 EXECUTIVE SUMMARY

The Southern Tip Bike and Hike Trail is a 10' asphalt trail that begins at the Eastern Shore of Virginia Natural Wildlife Refuge and travels north for about five miles to Capeville Road. The first five miles were designed and constructed under two separate phases that provide connectivity to destinations along the alignment including Kiptopeke State Park and Sunset Beach Resort. The trail was built on property previously held by The Nature Conservancy that once was the route of a former railroad operation. The property is separated from vehicular traffic along Route 13 which generally parallels the alignment of the trail. The purpose of this study was to evaluate options for extending the trail north approximately 7.5 miles, crossing Route 13 and providing a path for users that would lead into Cape Charles.

More than 20 miles of alignments were studied initially that included both standalone trail options as well as paved, widened shoulders adjacent to vehicular traffic. In addition to trail alignments, two bridging locations were considered – the intersection of Route 13 and Stone Road and the intersection of Route 13 and the Nature Conservancy's former rail alignment (located approximately ¾ of a mile south of the Stone Road intersection, adjacent to the roadside picnic area).

After an initial assessment of options, alternatives Phase 3 and Phase 4 were identified as the safest and best and further research and investigations were conducted. Alternatives for Phase 3 would stay within the former rail right-of-way, connect to Kiptopeke Elementary, cross Route 13 with a bridge near the roadside picnic area, and have a trailhead near the intersection of Parsons Circle Road and Stone Road. Alternatives for Phase 4 would begin at the Phase 3 trailhead and travel west towards Cape Charles. Each Phase 4 alternative generally follows either Stone Road or Route 642 and brings the trail users into the Cape Charles Marina.

Rough order of magnitude (ROM) cost estimates were made for each trail alignment that included the required trailhead construction. Numerous grant and funding opportunities exist for the construction of the trail that can be pursued including VDOT Revenue Sharing, VDOT Transportation Alternatives Program (TAP), Open Container Fund, Safe Routes to School (SRTS), and Virginia's SMART SCALE. Each source of funding provides varying funding levels from 50% to 100% of project costs.

Southern Tip Trail Phases 3 and 4 Cost Summary

Trail Phase	ROM Cost
Phase 3A	$ 2,519,831
Phase 3B	$ 422,775
Phase 3C	$ 2,614,650
Phase 3 Trailhead	$ 163,125
Total Cost of Phase 3	**$ 5,720,381**
Phase 4A	$ 1,189,275
Phase 4 Trailhead at Cape Charles Marina	$ 89,628
Total Cost of Phase 4 (Recommended 4A)	**$ 1,278,903**
Total for Phases 3 and 4 (3A,B,C, 4A)	**$ 6,999,284**

1.2 STUDY PURPOSE AND BASIS OF ANALYSIS

The purpose of this study is to provide an analysis of potential multi-use trail alignment alternatives that provide connectivity to the Town of Cape Charles from the Southern Tip Trail. Construction of Phases III and IV will provide enhanced connectivity and provide an alternative mode of transportation to residents and visitors of the Eastern Shore. Phases I and II of the Southern Tip Trail provide access to the Eastern Shore of Virginia Natural Wildlife Refuge via a 5 mile long, 10' wide asphalt trail. The third phase will begin at Capeville Road and will allow trail users to travel further north to Parsons Circle and Stone Road intersection, with the 4th phase extending to Cape Charles. The construction of Phases III and IV would complete a 25-mile loop that connects businesses, communities and destinations along the trail such as the Wildlife Refuge. These sections of trail are part of a larger master plan for the development of bicycle facilities that will travel further north along the Eastern Shore.

The study evaluates trail alignments for Phases III and IV. Phase III will tie to the northern terminus of Phase II at Capeville Road and extend over Route 13 to Parsons Circle. A large majority of the Phase III alignment will be within a former rail right-of-way that is currently owned by the Nature Conservancy. Phase IV of the study will begin at the proposed trailhead located near the intersection of Parsons Circle and Stone Road (within the former rail right-of-way) and will travel west towards the Town of Cape Charles.

While Phases I and II of the Southern Tip Bike Trail were funded and constructed by the U.S. Fish and Wildlife Service, ANPDC may seek VDOT funding via the SmartScale program or other State grant programs. In addition, this study is funded by the Virginia Department of Transportation (VDOT) under UPC 106472. The project will therefore be subject to State requirements and will be designed and constructed using guidance from VDOT and AASHTO publications, the MUTCD, and the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These requirements are the basis of this preliminary engineering report and our analysis, development of alternatives and recommendations.

***Figure 1**- Phase I of the Southern Tip Bike & Hike Trail begins in the Eastern Shore of Virginia National Wildlife Refuge at the southern tip of the DelMarVA peninsula.*

1.3 REPORT SCOPE

This preliminary engineering report and feasibility study evaluates several alternative alignments for a 10' paved, multi-use asphalt trail as well as grade separated crossing options for crossing Route 13. The primary objectives of the report are as follows:

1) Perform field reconnaissance and evaluate existing conditions
2) Develop mapping and conceptual alignments of alternatives
3) Evaluate constraints (including environmental, encroachments, right-of-way, roadway crossings) for alignment alternatives
4) Evaluate grade separated crossing options and provide recommendations
5) Develop rough order of magnitude cost estimates for alignment options
6) Provide recommendations for trail construction

GIS mapping served as the basis for conceptual alignments mapping and were supplemented with available VDOT roadway plans, as well as construction documents for Phase II of the Southern Tip Trail. Measurements were primarily based on available GIS resources supplemented by field verification.

In addition to trail alignments, sites were identified for logical termini for the trail, for park and ride locations and for trailheads. As the large majority of trail options are within former rail corridors, utility investigations were based only on visible surface indicators.

While an asphalt trail is the preferred trail surface, due to uncertainty with funding, cost estimates were also developed for the alignments using a gravel surface.

2 EXISTING CONDITIONS

2.1 ALIGNMENT LOCATIONS AND FIELD RECONNAISSANCE

Nine alignment alternatives were investigated and are depicted in the maps found within Appendix A. The alignment options are not standalone trails and must be combined with other segments to complete the trail. Option 3A begins at the termini of Phase II and ends at the rail alignment's intersection near Stone Road and is the first alignment for all options. Beyond where the former rail right-of-way of Section 1 intersects with Fairview Road, just south of Kiptopeke Elementary School, multiple alignment options were evaluated. The alignments mostly follow unused, former rail right-of-way, easements owned by Accomack & Northampton electric cooperative, or are within VDOT right-of-way to minimize land acquisition from commercial or residential property owners.

***Figure 2** - Land use along the former rail right-of-way owned by the Nature Conservancy varies from mature forest to farm*

The former rail right-of-way represents the large majority of the trail options and varies from 60' to 70' in width which is more than adequate for the construction of a trail. The land use within the right-of-way varies but is mostly mature forested growth. There are ditches along some sections that may have been cut by farmers to augment drainage adjacent to the often elevated land that was formerly a railbed.

While a detailed hydraulic analysis was not within the scope of this report, due to the generous width of the right-of-way, a trail could likely be constructed within the right-of-way without disrupting the hydraulics of the ditches. Other sections of the rail right of way are cleared and have been farmed and integrated into agricultural use. The former railbeds of ballast stone that could be used for the trail base course have been mined within these sections. More information on encroachments can be found within Section 2.8 of this report and a picture of the mined railbeds found within the appendices.

Alignment options 2A and 2C propose 5' paved shoulders alongside existing roads of Fairview

Road and Bayview Circle. Paved shoulders with dedicated bicycle lanes are not the preferred alternative but due to their connectivity to residents and businesses, available right-of-way or established alignment, they were considered and initially reviewed as part of this study. Following the preliminary analysis and report submission, the focus of the investigations shifted to options 3A, 3B, 3C and 4A, 4B, and 4C.

Regardless of the alignment, State Route 13 must be crossed and presents the largest challenge for Phase III of the trail. State Route 13 is classified by VDOT as rural principal arterial and has a speed limit of 55 mph within the limits of Phase III, which is often exceeded by motorists. Route 13 also carries high truck volume. For these reasons, we do not recommend and did not investigate an at-grade crossing. We considered bridging options as the only safe and feasible crossing option at Route 13.

Two locations were investigated for the Route 13 crossings. The bridges will require a minimum 17'6" vertical clearance and as much as 32' horizontal clearance from the travel lanes. While the VDOT minimum vertical clearance is 16'6" for vehicular bridges, due to the hazards of unprotected users on pedestrian bridges, an additional 12-inches of clearance is required to the lowest vertical bridge member. Guardrails and other infrastructure can be used to reduce the clear zone requirements, thus reducing the length of the bridge spans and resulting in significantly lower costs.

2.2 SURROUNDING LAND USE AND ADJACENT DEVELOPMENT

Most of the alternative trail alignments are wooded and bordered on both sides by either mature forests or cultivated lands for agricultural use. Due to the limited topography of the Eastern Shore, some sections of the former rail right-of-way are within wetlands that must be avoided, mitigated or crossed with elevated boardwalks. The western terminus of alignment option 4A, B, C (the Cape Charles Marina Trailhead option) is within a mapped FEMA 100-year floodplain.

Commercial development operates adjacent to some sections of the alternative trail alignments and includes uses such as rental and storage facilities, shopping centers, breweries, or popular eateries that could be appealing to businesses, employees, and recreational trail users. The later sections of alternative analysis provide further detail on each alignment's adjacent land uses.

2.3 UPCOMING CONSTRUCTION PROJECTS

While most of the land use will remain largely unchanged, some sections of the trail will be affected by upcoming roadway improvement projects. ANPDC and Northampton County were not aware of any commercial or development projects within the project area that would influence the design or construction of trail. The Virginia Department of Transportation (VDOT) has two significant projects with details as follows:

1) **Route 13 Improvements at Stone Road (VDOT UPC 99751)**
   This project is in the scoping design phase and will improve a section Route 13 from the Food Lion shopping center to the intersection with Stone Road due to high number of crashes occurring at this intersection. Improvements there will include better signage,

installation of safety edges and backplates, lighting, widening of paved shoulders and lengthening of turn lanes to improve access management. This area is integral to the trail for several alignment alternatives and is also within the limits of one of the potential bridge locations.

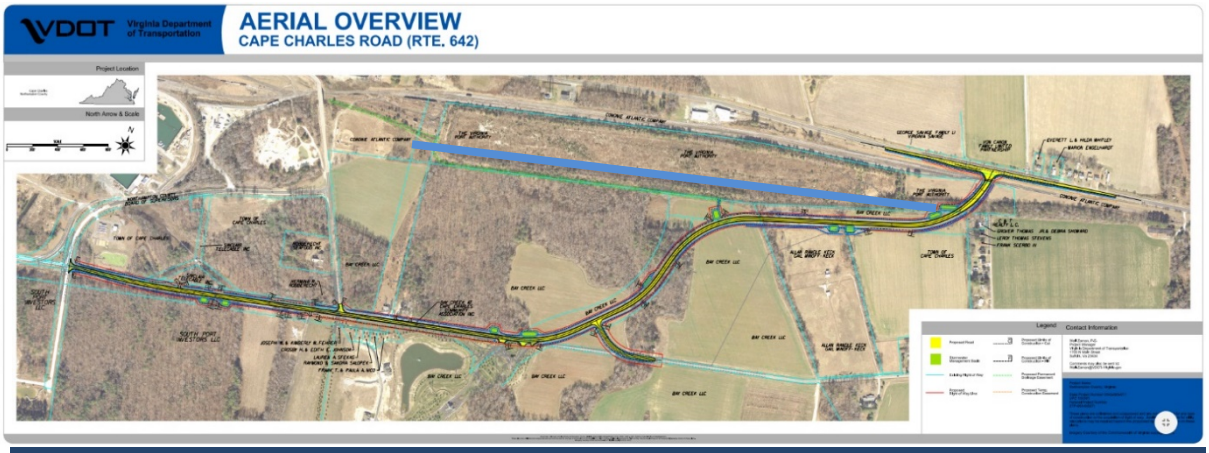


Figure 3 *- Improvements to Route 642 include 4' paved shoulders but no standalone trail option. The blue line shows temporary drainage easements that may be attractive alignments for Phase IV of the trail.*

2) Route 642 Roadway Improvements (VDOT UPC 103391)

Construction is nearing completion to provide safety improvements and enhance access to the Cape Charles Harbor and Marina. The improved roadway has two 12' lanes with 4' paved shoulders which will accommodate bicycles and pedestrians. While not ideal, the paved 4' shoulders provide an improved alternative for bicyclists. Pedestrian and bicycle crossing accommodations were not made at the Route 642's intersection with Stone Road.

Wide temporary drainage easements were granted for the construction of the project from east to west along the Virginia Port Authority and Bay Creek, LLC property lines. These cleared areas are attractive options for trail alignments as options 4A and 4B follow the ditches.

2.4 ENVIRONMENTAL FEATURES

Mapping of alignment alternatives indicated several environmental features that will affect the design, permitting, construction costs, and construction of the trail. Following a desktop view, some locations were further investigated during the field reconnaissance. Identified issues and field verified conditions are summarized in the sections that follow. A detailed environmental investigation will be required when the design is developed.

Stream Crossing

Topography is generally limited across the alignment alternatives. However, there is a small creek, Old Plantation Creek, that would require crossing, as well as several wetland areas and other small un-named tributaries to Old Plantation Creek. Alignment 1 crosses Old Plantation Creek with a bridge formerly used by the railroad and provides a picturesque crossing that would not impact. Further evaluation would need be required to receive approval from VDOT to use the bridge for the trail.

Figure 4 - *A culvert that formerly carried the railroad remains and provides an option for the crossing of Old Plantation Creek*

Wetlands

GIS maps indicate that wetlands are present throughout the project area and could significantly affect the design, permitting and construction of some of the alignment alternatives. Although a formal wetland and stream delineation was not performed, wetland hydrology indicators as well as hydrophytic vegetation and hydric soils are present throughout the alignments studied. An extensive field reconnaissance indicates jurisdictional Waters of the US and wetlands (PEM, PSS and PFO) Palustrine Emergent, Scrub Shrub and Forested wetlands may be present. This observation indicates that the boundary of the wetland systems may vary significantly in areas identified in the NWI maps; as such, a formal wetland delineation of the study area and jurisdictional determination by the U.S. Army Corps of Engineers should be performed to identify the actual boundary and to quantify the project impacts.

Phase II of the Southern Tip Bike/Hike Trail traversed similar conditions in several locations that required jurisdictional determination by the ACOE and enhanced protecting during construction.

Floodplains

Only the extreme western terminus of the Phase 4 alignments at the Cape Charles Marina is within a 100-year floodzone based upon the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM). At this location, there is a AE floodzone with elevation

of 5.0 that will have little to no effect on trail construction but would impact development of the parcel owned by the Town of Cape Charles for a Park and Ride. A more detailed investigation would be required before considering the use of this property for a public facility.

Resource Protection Areas

All alignment alternatives are within the Chesapeake Bay Preservation Area. Trails are an allowable use within Resource Protection Areas as well as Resource Management Areas throughout most localities. A key component of working within RPA's and RMA's is limiting the removal of trees and native vegetation.

Existing Railbed Ballast and Soils

While the rail at one time was on ballast stone that is often valuable in the development of rails to trails project, much of the stone for the ballast has been mined as the land was converted to agricultural uses. Other sections of the trail, especially near cross-roads, have also been mined for the valuable and limited stone resources on the Eastern Shore. In areas where the stone remains, the alignments are often deeply wooded and much of the structural integrity and benefit of the stone will be diminished during clearing operations.

The existing soils generally consist of well-drained sandy loams that are structurally favorable for trail construction. Appendix F contains a USGS Soils Survey that provides an overview of the soils that are present. A more detailed geotechnical investigation will be required for design of the trail pavement section, bridges, any retaining walls, or footbridges. Depending upon the location of the trail and any utility easements considered for shared use, pavement recommendations should be made by qualified geotechnical engineers that account for vehicular access along the trail and an appropriate design vehicle.

Given the proximity to the Atlantic Ocean and Chesapeake Bay, we anticipate groundwater can be found 4.5 to 6 feet below existing grade and will fluctuate seasonally and could be as shallow as 2-3 feet below existing grade. This may affect the cost of constructing a pedestrian bridge.

Threatened and Endangered Species

The Virginia Department of Game and Inland Fisheries Wildlife Information Service, (VaFWIS) System was reviewed for occurrences of Threatened and Endangered Species within the study area. The Northern Long-Eared Bat is one of the 42 known species of conservation concern identified. Habitat for the small insectivorous tree roosting bat exists throughout the project area. Most of the remaining species identified do not exist within the study area but are mentioned due to the relatively narrow width of the peninsula in this part of the Eastern Shore. A complete list of species and corresponding map are included in the appendices.

Cultural Resources

The Virginia Department of Historic Resources' (VDHR) V-CRIS database was searched for previously identified cultural resources (archaeological and architectural) within or adjacent to the project area.

While the funding sources for the construction of this phase have not yet been determined, if federal funds are used, compliance with Section 106 of the National Historic Preservation Act of 1966 and coordination with Northampton County, the Virginia Department of Historic Resources, and appropriate federal agencies will be required during the design phase of the project.

Wetlands

If the design of the trail impacts jurisdictional waters or wetlands of the United States, formal coordination and effect determination will be required from the US Army Corps of Engineers, Virginia Department of Environmental Quality, and the V irginia Marine Resources Commission.

Hazardous Waste Sites

As with most decommissioned rail beds, there is a possibility for soil contamination. Transportation of petroleum-based fuels, use of creosote treated railroad ties and the potential for past spills could result in elevated levels of soil contaminants with potential health risks to users.

A review of the Virginia Department of Environmental Quality Geographic Information System (VEGIS) was conducted and did not identify environmental contamination which would affect the project site. A field investigation identified several areas of past disposal of household related material and construction equipment. These areas did not appear to pose an environmental risk. However, due to our experience with other rails to trails projects, a Phase I environmental site assessment (ESA) for the selected alignment should be performed prior to the design phase of the project.

2.5 STORMWATER

Regardless of the alignment alternative, the land disturbance for project construction will exceed the threshold for stormwater management per requirements of the Virginia Stormwater Management Program and a NPDES General Construction Permit will be required. The NPDES permit will require the development of a stormwater pollution prevention plan (SWPPP) as part of the project design that will be comprised of an erosion and sediment control plan, stormwater management plan, and a stormwater pollution prevention plan.

Due to the significant increase in impervious area for trail construction, of the project will need to include stormwater best management practices (BMPs) that meet Virginia DEQ requirements or stormwater credits will need to be purchased from a source within the respective hydrologic unit code (HUC) of 02040304 A021. The cost of credits is variable, and the number of credits needed is governed by the increase in impervious area for each project.

2.6 EXISTING UTILITIES

Most of the trail alternatives follow the former railroad right-of-way that does not have above or below-ground utilities. However, at road crossings, both above and below ground utilities may be found. Based on our preliminary review, it does not appear that existing utilities will affect the choice of alignment. Due to the generous width of the railroad right-of-way, it appears that impacts to existing utilities can be avoided, minimizing construction costs and potential construction delays. Each potential location for the bridging options has utility challenges that are assessed within the bridge section of this report.

2.7 ENCROACHMENTS

As the railroad has not been active for many decades, adjacent land users have encroached upon the former rail right-of-way for various uses. While the exact limits of the right-of-way

would require a detailed survey not within the scope of this study, some sections of the trail have clear physical encroachments including fenced boat storage lots, personal access to residences, access roads for farming operations, or ponds for agricultural uses. In most instances, these uses can be discontinued and the trail protected via physical barriers such as removable bollards or landscaped barriers. However, in some areas such as near Capeville Road where boat storage and the Pottery Business encroach for income generating purposes, a land swap may be the solution that works best for both parties.

Figure 5 - A railroad tie marks the location of the Nature Conservancy's property, the former rail right-of-way, that has been encroached and crossed for agricultural purposes.

Many of the encroachments are for agricultural access to lands that have been cultivated for many decades. These encroachments are most often cleared paths between fields or gravel roads to residences, out buildings or other equipment. While some encroachments are critical points of ingress or egress, most are for convenience and alternative routes are available. The design of the trail would minimize the disturbance to farming operations while protecting the users and condition of the trail with pavement sections that more accommodate larger vehicles.

2.8 POTENTIAL PARK AND RIDE LOCATIONS AND NODES

VDOT's Guide for the Transportation Alternatives Program (2016) requires that trail projects have a logical terminus.

For pedestrian and bicycle facilities, logical termini usually represent a roadway intersection;

connection with another facility; or delivery to a destination such as the entrance to a park. Having logical beginning and ending termini creates "independent" utility or a usable facility even if the project does not continue or expand into future phases."

The third phase will have a logical terminus to the south as it connects to Phase II but the project must adhere to the requirement of providing a northern terminus. As there are not connecting trails that will continue the route, Phase III will need to provide an ADA compliant trailhead, parking area or similar terminus. We assumed a park and ride lot (for conceptual scoping and pricing) that was similar to the Cedar Grove Park and Ride within Phase I, but with 8 standard parking spaces and 2 ADA accessible spaces. Depending upon the alignment chosen, there are several options available to the ANPDC.

Option 3A Trailhead – Kiptopeke Elementary School

Kiptopeke Elementary School is an ideal location for a trailhead because it would provide families and children access to the elementary school and promote a healthier lifestyle. The elementary school is on state-owned property and could potentially share a parking lot which would minimize land disturbance and project costs. This location is also appealing because trail construction beyond Kiptopeke Elementary begins to be challenged by the bridged crossing of Route 13 as well as potential wetland pockets in the Phase 3B section.

Option 3B Trailhead – Bridge over Route 13

A bridge is proposed at the skewed crossing of Route 13, approximately 3100 LF northwest of Kiptopeke Elementary along the former rail right-of-way. To reduce the construction costs of the bridge, the triangular parcel (91-A-13A) l that is currently a roadside table picnic area could be used for the bridge and potentially a park and ride location. While the parcel may have the area needed for the park and ride and bridge embankment, there will be challenges acquiring VDOT approval for a new turning lane for the park and ride at this location.

Option 3C Trailhead – Parsons Circle

A trailhead could be provided at the former rail right-of-way's intersection with Parsons Circle. This mostly wooded, narrow strip is wide enough to provide a small parking area with minimal improvements to Parsons Circle. While not yet verified by a ground survey, there could potentially be private property encroachments within this section of the former rail right-of-way that will need addressing. This trailhead location would serve as the beginning of Phase IV as well.

Option 4 Trailhead – Cape Charles Marina

The Cape Charles Marina would provide an ideal destination for trail users as they would have views of the picturesque waters and access to local restaurants and businesses. As this location would be an extension of the exiting parking area, construction costs could be less than other locations. However, this parcel will require additional investigation because it is within an AE flood zone and some trail amenities may not be well-suited for this location.

Option 4A – Cape Charles Museum

Another option that would provide a point of interest is the Cape Charles Museum and Welcome Center along the Trail Alternative 4A. While development costs would be less than other options due to the existing infrastructure, the parking area is not ADA compliant and would require at minimal paved ADA parking and sidewalks providing access to the trail. This location would also provide access to some businesses along Stone Drive as you approach

Downtown Cape Charles and connections to other sidewalks and trails.

Trail Nodes

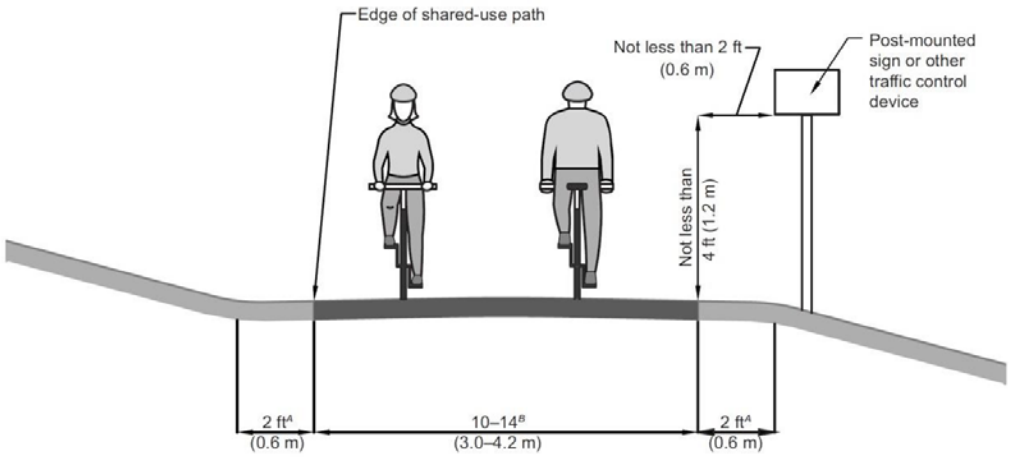
There are multiple locations along the trail alignment that would be appealing locations for nodes. If the skewed bridging option is selected, the small triangular parcel (Parcel 91-A-13A) on the southeast corner would be an attractive site. The elevated ramps would offer users a unique vantage point of the trails, surrounding land and this location is currently a roadside table area. Another location appears to be the location of a former trail station or platform and is located approximately 4900 feet north of Capeville Road. The former rail right-of-way widens to more than 120' and could be an ideal location for a linear park to learn about the former land-use and the importance of rail to the Eastern Shore.

Figure 6 *- Nodes can be placed along the length of the trail to provide information on points of interest or locations to pause, picnic and learn more about the trail or the Eastern Shore.*

3 DESIGN CRITERIA

3.1 TRAIL DESIGN GUIDELINES

Due to the likely VDOT and Federal funding sources for Phase III and Phase IV, the basis of the analysis for the trail development were the *Shared Use Path Design Criteria included in Appendix A of the Virginia Department of Transportation (VDOT) Roadway Design Manual*, and *Guide for the Development of Bicycle Facilities, 2012, by the American Association of State Highway and Transportation Officials (AASHTO).* Our analysis conservatively assumed trail design criteria for all users from experienced bicycling enthusiasts, to residents, and recreational walkers, joggers and visitors to the Eastern Shore. The recommended minimum width of the asphalt paved trail is 10' and includes 2' graded, grassed shoulders that are clear of obstructions horizontally and 10' vertically above the trail and clear zones. In addition to trail section requirements, the design considerations for alignment alternatives considered sight distances and design speed (typically 18-25 mph) depending upon the anticipated users.



Typical Cross Section of Two-Way, Shared Use Path on Independent Right-of-Way (Figure 5-2, AASHTO Guide for the Development of Bicycle Facilities, 2012)

4 CONCEPT DESIGN & ALTERNATIVES ANALYSIS

4.1 TRAIL TYPICAL SECTION

Phases I and II of the Southern Tip Bike/Hike Trail were constructed as 10-foot wide, asphalt, two-way cross-section, as shown in the figure above. This trail width represents the minimum acceptable width for a trail given the physical conditions as well as the number of anticipated users. A 2-foot minimum, graded clear zone is required and can be either gravel or grass. A similar buffer is required for any structure as well resulting in a minimum clear width of 14' for a footbridge or pedestrian bridge. As the project will likely be administer by VDOT, some waivers may be warranted to limit physical and environmental impacts.

Depending upon funding source, the trail could be constructed as a gravel trail for considerably less cost than an asphalt trail. A gravel trail would be less desirable and would not be ADA compliant and thus not eligible for funding via VDOT or Federal transportation programs. Cost Estimates are provided for this option within the appendix.

4.2 ALTERNATIVES ANALYSIS

Nine alternative alignments were established as options by the ANPDC. The alternative alignments were divided into shorter sections that could be considered and evaluated independently and combined into complete trail sections. Critical factors such as safety, construction costs, and environmental impacts were the primarily criteria evaluated and served as the framework for a decision matrix.

Alignment Alternative 2 – Fairview Road, Paved Shoulder

Fairview Road has many geometric deficiencies that would require extensive improvement to support a shoulder bicycle lane or a separated multi-use trail. The right-of-way is limited and utilities line both sides of the road which would further increase project costs. Due to the prohibitive costs of making improvements along this corridor, this option was not investigated in detail.

Alignment Alternative 2B – A&N Electric Easement

Accomack and Northampton (A&N) Electric Cooperative owns an easement that shares a property line near the skewed crossing of Route 13. The A&N easement travels north towards Stone Road's interaction with Route 13 and stays behind the Food Lion shopping center. While the rider experience would be favorable due to the wooded surroundings and pond at the northwest corner of the Food Lion parcel, this section of trail has the greatest potential wetland impact that would require mitigation or footbridges that would significantly impact construction costs. In addition, maintenance easements may be required from A&N and the trail's pavement section increased to support vehicle access.

Figure 7 *- Alignment 2B crosses wetland pockets in several areas and would require elevated footbridges.*

Alignment 2B's approach to the Stone Road intersection presents the largest design challenges where bicyclists and users cross the rail directly adjacent to vehicular traffic on Route 13. This intersection experiences elevated accident frequency that compromises the safety of trail users and motorists. With the potential decommissioning of the railroad, alternative 2B becomes a more appealing option if a railroad crossing is permitted east of Route 13 and does not lead trail users adjacent to the intersection. An alignment could be developed that leads from the Food Lion shopping center along Country Place into the large VDOT right-of-way north of the tracks.

Following the crossing of Route 13, the right-of-way narrows along Stone Road. Approximately 40-45' feet separate the active rail from power poles and given the rail operator's requirement for 40' clear of rails, the trail could not be constructed without significant utility relocation costs. We do not recommend this alignment due to safety concerns (that could be mitigated if an additional rail crossing is permitted) and significant utility relocation that would be required.

Alignment Alternative 2C- Bayview Circle

Bayview Circle Road would serve as a connecting route to Fairview Road. Like Fairview Road, this section of roadway lacks shoulders and has limited right of way with roadside ditches located close to the roadway. Significant investment would be required to accommodate bicycle facilities and therefore this section was not investigated in detail.

Alignment Alternative 3A – Capeville Road to Kiptopeke Elementary (Fairview Road)

Phase III of the Southern Tip Trail will begin at the northern terminus of Phase II at Capeville Road. All alternative alignments considered begin with Phase 3A that follows the former rail right-of-way for approximately 3.4 miles before reaching its intersection with Fairview Road at Kiptopeke Elementary. Alignment alternative 3A is very appealing for many reasons as it provides the safest and best trail experience to users. Most of this alignment is distanced from Route 13 and bisects forested areas or cultivated fields providing a picturesque background for a trail. Some sections of the trail are cleared and have been used for farmland for several decades, but the majority has become overgrown with trees and vegetation and will require heavy clearing. Encroachments by businesses or private owners for farming access present the largest challenges.

Alignment Alternative 3B -Kiptopeke Elementary to Route 13 and Former Rail Intersection

Phase III continues northwest along the former rail right-of-way beyond Kiptopeke Elementary through mostly densely forested former rail right-of-way up to its intersection with Route 13. An acute crossing of Fairview Road just north of the school would require enhanced signage and potentially signalization due to traffic volumes and the expected younger users. At the trail's intersection with Route 13, a small triangular parcel that is currently a roadside table and picnic area could be used for the ramps up to a bridge crossing. Field visits and mapping also indicate that there may be wetlands within the northern section of this alignment.

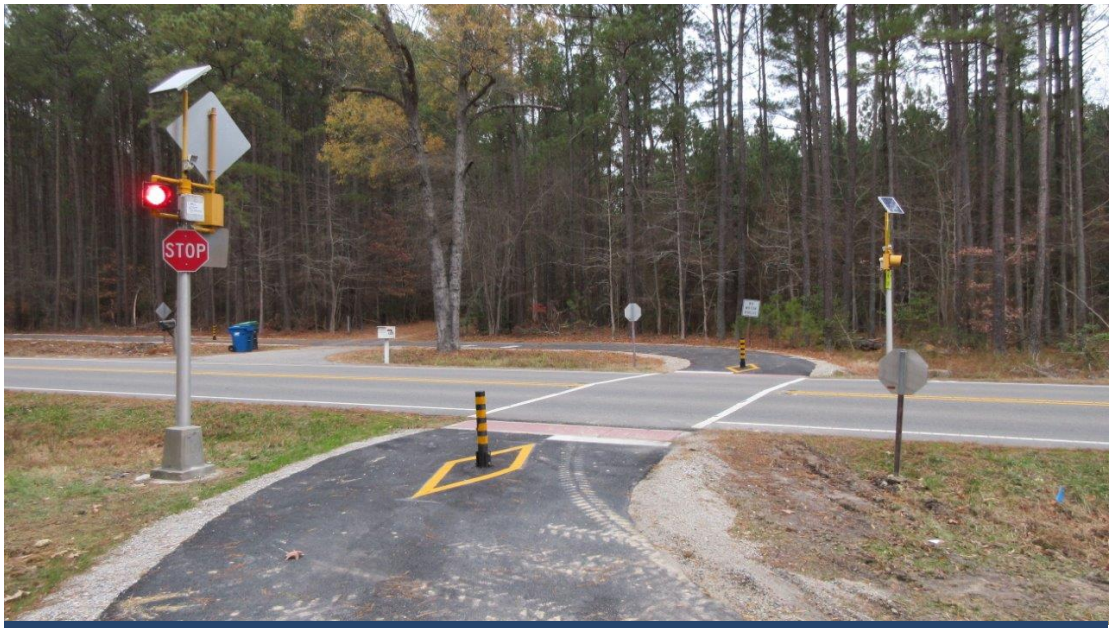


Figure 8 - Roadway crossings, depending on volume, may warrant the construction of more elaborate crossing infrastructure.

This final alignment of Phase 3 is through approximately 0.9 miles of densely wooded former rail right-of-way. GIS mapping indicates that there are encroachments that would need to be

addressed at both intersections with Parsons Circle. In addition, these roadway crossings with Parsons Circle have higher traffic volumes than many of the other roadways crossed. At minimum, a cleared sight line will be established, high visibility pavement markings and bollards will be required along with signage to warn drivers and trail users. Depending upon requirements of funding source and anticipated traffic volumes, additional roadway crossing infrastructure may be warranted that could include detection systems, warning lights, or llighted crosswalks.

Alignment Alternative 4A – North of Rail, Along Stone Road

The most direct course to Cape Charles and the Cape Charles Marina is via a route that parallels Stone Road. The Eastern Shore Railroad operates minimally through this corridor and may discontinue operations within the timeline of a trail's design and construction. This trail alternative would cross the Eastern Shore Railroad tracks from the Phase 3 Trailhead and parallel Stone Road within the Eastern Shore Railroad Property Line on the north side of the tracks between the rail and Stone Road- a picturesque route following roadside Crape Myrtles. From the park & ride, the alignment could follow Parsons Circle north to the Stone Road intersection, before a westbound departure but this would be a less safe and desirable route.

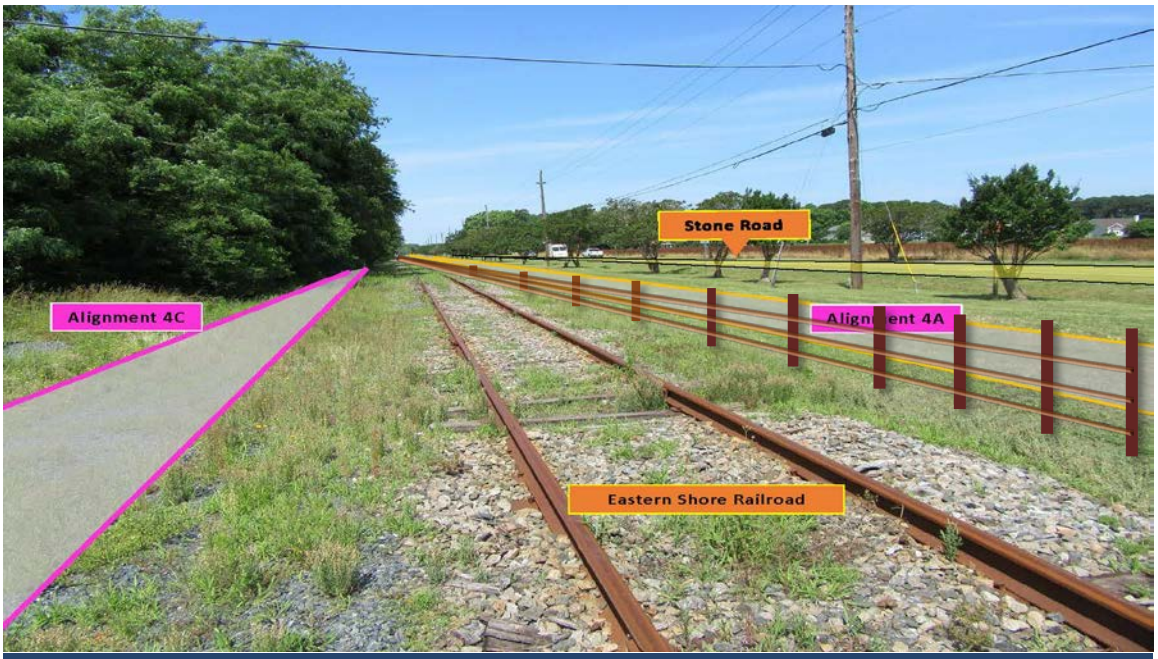


Figure 10 *– Alignments 4A and 4C are within the Eastern Shore Railroad right-of-way. The land to the north of the rail (4A) provides the greatest separation from the rail and more inviting experience for trail users.*

The Phase 4A alignment would be within the rail right of way and follow the rear property lines of parcels fronting Stone Road before reaching a potential trailhead location at the Cape Charles Museum. To mitigate some of the risk of being adjacent to the rail, fencing could be provided between the trail and rail. Much of this alignment would follow a well-worn, gravel Eastern Shore Railroad maintenance road that would ease construction and provide access to businesses such as the Cape Charles Brewing Company and others near the Cape Charles Museum. Alignment 4A can continue, if desired and within project budget, from the Museum within the Eastern Shore Railroad right-of-way and safely pass under the "Hump" to the Phase 4 Trailhead located at the Cape Charles Marina.

Alignment Alternative 4B – Wooded Route, South of Rail Right-of-Way

Alignment 4B travels west towards the newly constructed Route 642 primarily through two private properties that would require purchase of easements or right-of-way for the trail. The eastern property owned by Mr. Harry Hart is a mostly farmed parcel, however, this trail alternative would take advantage of the wooded, unfarmed north western corner of the parcel that may have wetlands. Continuing west, the alignment would follow the northeast and north property line of the adjacent C&T Realty parcel before returning to the Eastern Shore Railroad Right-of-Way.

At the trail's intersection with Route 642, the alignment could stay on Route 642 on the newly constructed 4' paved shoulder but this is a less safe and desirable option. The preferred alignment would follow a large drainage ditch that travels east to west and was constructed to support the construction of Route 642. A temporary drainage easement was granted for improvements to the ditch but a more permanent easement for the trail would be needed. Construction of a trail would be a prime use of land adjacent to the ditch that would also be appealing to the development of Bay Creek, LLC because it will provide connectivity to downtown Cape Charles as well as to the first three phases of the Southern Tip Trail. Due to the depth of the ditch this alignment would follow, fencing or landscaped barrier may be necessary. The alignment would continue until its intersection with Old Cape Charles Road and could either follow the drainage easement or the base of the fill-slope of the Hump. Depending upon the alignment's placement relative to the ditch, additional right-of-way or easement may be needed from Bay Creek, LLC or the Virginia Port Authority. Similar to alignments 4A and 4C, this alternative would pass under the Hump and towards the Cape Charles Marina.

Alignment Alternative 4C – Within Eastern Shore Railroad Right-of-Way, South of Rail

This alignment parallels Stone Road but travels on the south side of the Eastern Shore Railroad Tracks, thus avoiding a crossing of the tracks until the Route 642 intersection. The trail would be located within the rail right-of-way and follow its southern treeline. At this alternative's intersection with Route 642, the trail would follow the same proposed alignment as option 4B, discussed above.

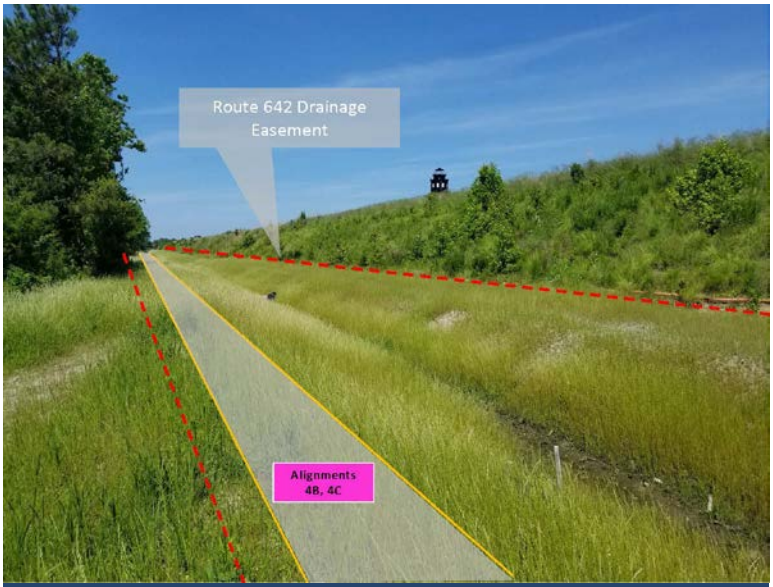


Figure 9 *- A large ditch bisects the Virginia Port Authority land (right) and Bay Creek, LLC (left) properties. This ditch alignment could serve as an ideal location for a trail into Cape Charles Marina.*

4.3 BRIDGING OPTIONS

The crossing of Route 13 presents the largest challenge to the development of the third phase of the Southern Tip Bike/Hike Trail. Due to safety reasons, at-grade crossings and or additional signals along the length of the project are not recommended nor considered within the scope of this report. Two locations were focused upon for the initial bridge scoping- within the right-of-way at the Stone Road and Route 13 intersection and the second location follows the former rail right-of-way's skewed crossing approximately 3900 linear feet south of the Stone Road Intersection (near the existing roadside table/picnic area).

Figure 11 *- Rendering of potential bridge crossing*

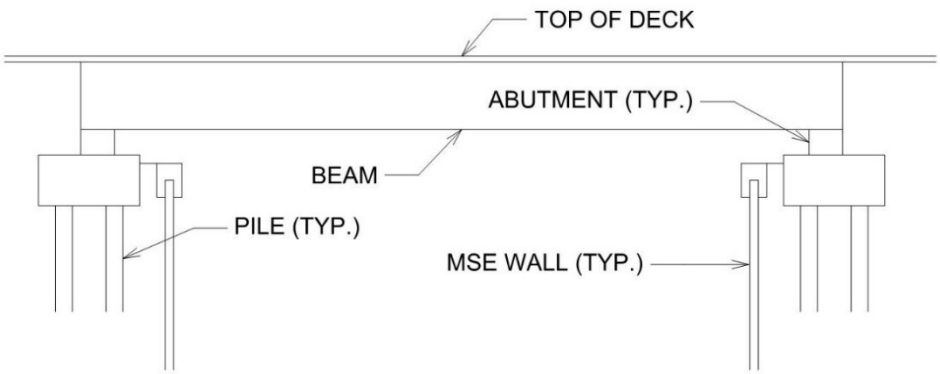


Figure 10 *- Rendering of potential bridge crossing*

Bridge Crossing at Stone Road Intersection

The bridge crossing at Stone Road could potentially tie several alignment alternatives as well as provide the opportunity to create an aesthetic gateway into Cape Charles. However, there are other drawbacks that make this crossing location less desirable. A traffic study completed of the Route 13 corridor completed in 2017 recognized this intersection as one of the most dangerous of the corridor. In addition, a crossing of an active rail line would be required directly adjacent to live vehicle traffic. As the rail operator will not permit an additional crossing away from Route 13 and the cost to relocate rail safety arms and signals is prohibitively expensive, this crossing was not investigated to the level of detail as the second option.

Bridge Crossing at former Rail Right-of-Way (Skewed Crossing)

Using the available former rail right-of-way as the primary corridor of the trail (following Option 1) provides the safest and best trail experience. The acute angle crossing of Route 13 presents several challenges especially with right-of-way and existing utility conflicts which can be costly and delay a project. ANDPC was uncertain of the ownership of parcel 91-A-13A which according to GIS resources is owned by Northampton County. This parcel would provide an ideal location for the eastbound ramp and could reduce delays to the project and right-of-way costs. The western approach is on private property (Parcel 91-A-14) that is currently farmed and wooded. GIS records for this parcel can be found in the Appendix of this report. To minimize the impact to income generating land, the proposed bridge alignment is shifted south to the wooded areas.

In addition to right-of-way and property acquisition challenges, three phase electric power poles and lines are set along the edge of the right-of-way that would conflict with a proposed bridge. While this presents an impediment to trail construction there are various options including shifting the power lines west, away from the bridge and its ramps, undergrounding the lines as well as elevating the power lines to sustain a minimum of 10' clearance from any trail infrastructure. Each option has merit and costs that would require further investigation, if this bridge location is selected for the final trail alignment.

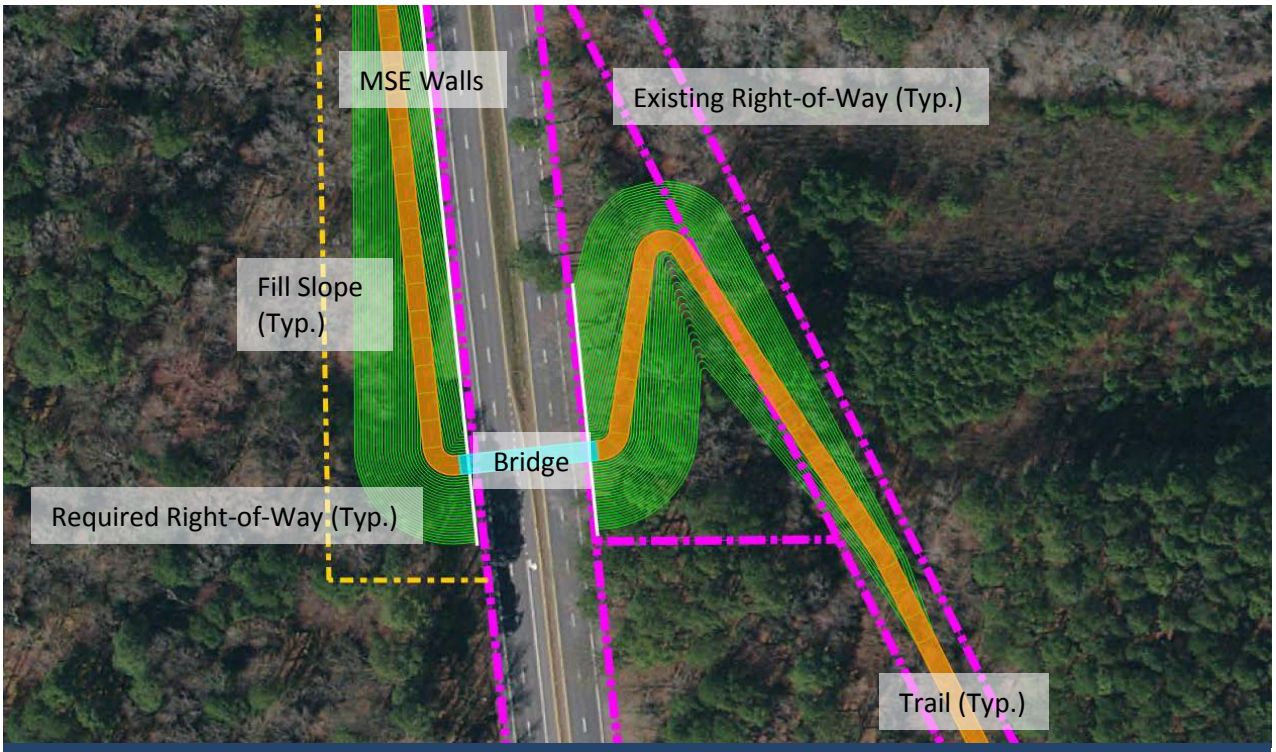


***Figure 12** - A conceptual design of the bridge crossing with supporting ramps at the skewed crossing.*

Bridge Conceptual Design Guidelines

The bridge will be constructed with VDOT and possibly Federal funding and must meet several critical design requirements that will govern the scope of the bridge. To develop a conceptual design and cost, the following design criteria were used.

- 17'-6" minimum vertical clearance
- Roadway is designated as a Rural Principal Arterial with 55 mph speed limit
- Horizontal clearance could be more than 30' if guardrails are not used
- Guardrails may be used to reduce clear zone and the length of the bridge
- Offset to guardrail from traveled lane is 12' with a 3' distance behind before an obstruction which in this case is the MSE wall or 2:1 slope
- Trail grade in the approaches used for design is 5%; up to 8.33% can be used with required landings
- Due to cost of walls, fill slopes were used with slopes of 2:1

The groundwater level is a consideration for construction and substructure type with groundwater levels varying from depths of 3'-6'. While some dewatering may need to occur and further geotechnical evaluation considered.

Bridge Types and Cost Considerations

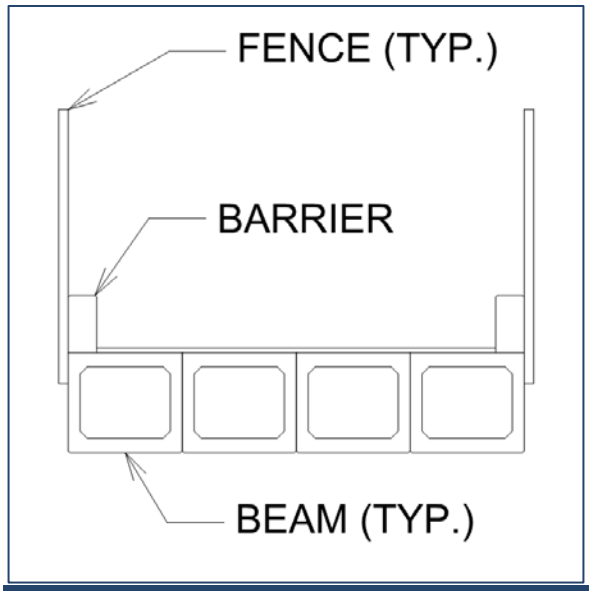


Figure 13 *- Conceptual cross-section of bridge*

Several of the alternatives investigated include Adjacent Box Beam, Type IV girder and Truss bridge superstructures. The costs, based on available information, were compared to determine the bridge type. To provide for the optimal choice several variables were considered including right of way costs, maintenance and design limitations. After review of the costs and options it was determined to use as much of existing right of way as possible and optimize the trail ramps leading up to the bridge. Using mechanically stabilized earth (MSE) walls as well as the other components for bridge design the following options were compared.

Upon comparison of the costs, maintenance and impacts including safety the optimum bridge bike and pedestrian crossing was determined to have a single span of around 100'. Due to accelerated construction, cost of the components of the bridge as well as provision to reduce the amount of right of way, the following option is the preferred alternative: Adjacent boxes with MSE wall and stub abutments with ADA compliant rails and ramps on either side of the bridge and leading up to the bridge.

4.4 COST ESTIMATES

Rough order of magnitude cost estimates were developed for the alternative alignments based on GIS data, aerial photos, existing plan review, field reconnaissance, and construction costs data for other trail projects. After our initial assessments of Options 2, 2B and 2C, they were considered the least favorable options primarily due to safety and other factors. Staying within the former rail right-of-way as shown in Options 3A, 3B, and 3C provided the best overall trail alignment to extend the trail to Parsons Circle and were studied in more depth.

Cost estimates for these linear improvements were developed based on a review of potential improvements and establishing a unit cost price for anticipated improvements. Due to the length of more than 20 miles of options, cost estimates considered the significant construction items such as trail conditions and roadway crossings while some items were estimated based upon percentage costs of total construction. Unit prices for construction items were established based on VDOT historical bid prices and the estimator's experience and judgment. The cost estimate also included a 25% contingency. Not included in this estimate are the costs for survey, easements, lighting, signals, or insurance. Although quantities and unit prices were

developed for each estimate, deviations in quantities and bid prices can be expected as design progresses. Cost estimates for each alternative are within Appendix B.

5 CONCLUSIONS

5.1 PREFERRED ALTERNATIVE AND RECOMMENDATIONS

As each alignment was analyzed, a decision matrix was created to better capture the elements of the trail that were considered integral to the project. while some factors were more important than others, the matrix illustrates why some alignments were better options and warranted more investigations and consideration.

Southern Tip Trail Phase III Decision Matrix

CRITERIA / OPTION	User Safety	Construction Cost	Environmental permitting & Impact	Connectivity to Businesses & School	Land Acquisition & Easements	Utility Impact	Trail User Experience
Option 2							
Option 2B							
Option 2C							
Option 3A							
Option 3B							
Option 3C							
Option 4A							
Option 4B							
Option 4C							

RATING
Favorable
Unfavorable

Following the former Eastern Shore Railway right-of-way from Capeville Road to Parsons Circle (Options 3A, 3B, 3C cumulatively) offers the safest, and least expensive option and with the least negative impact on the environment for Phase III of the trail. This alignment travels north and does not interface with the high volume of traffic on Route 13, however, it does have a few intersections with roadways and f that will require crossing improvements. These alternatives also connect to Kiptopeke Elementary and create the opportunity to pursue safe routes to school (SRTS) funding in addition to other grants.

The preferred alignment capitalizes on the triangular parcel (91-A-13) that is owned by

Northampton County to develop ramps on the east side of Route 13 but the west side would require power pole modification as well as right-of-way acquisition. While costly, an alternative bridge crossing at Stone Road would require greater utility relocation costs and the length of the bridge slightly greater than the skewed crossing. A bridge at Stone Road is also further complicated by the existing Eastern Shore Railroad tracks that would require a designed bicycle and pedestrian crossing that is not included within the upcoming improvements to this intersection.

Several locations were considered for Park and Ride locations within Phase III with the Parsons Circle location being the recommended location. This location would extend the trail closer to Cape Charles and ties to the Eastern Shore Railroad land that is origin of all Phase 4 options. This location also would have eased turning moves from Parsons Circle and the width could easily support a smaller park and ride that could be expanded in the future as well with additional amenities.

The final phases of this project that lead trail users into Cape Charles offers several appealing options with 4A, 4B and 4C. Each alignment offers benefits and unique appeal, however, option 4A is recommended. While right-of-way or easements may be needed for all options, Option 4A would require agreements with less owners. Most of the Phase 4A option is located within the northern side of the Eastern Shore Rail which is much wider and provides a pleasant and safe experience separated from Stone Road by a mature line of crape myrtles. Option 4A also provides the best connectivity to many points of interest including downtown Cape Charles shops, Bay Creek community (via gravel paths), the Cape Charles Museum and other attractions such as Cape Charles Brewing Company.

5.2 KEY DESIGN CONSIDERATIONS

The following key design considerations have been identified for further investigation during the design phase of the project:

1) **Right-of-Way**: Prior to design commencement property owners should be approached regarding the need for easements or for acquisition of right-of-way. This is especially critical for the construction and decision on bridge location and Phase 4 options because regardless of option decided, an easement or acquisition would need to be secured. The early interest and response from owners or properties along Phase 4 may govern which alignment is pursued.

2) **Contractor Availability**: Phase II of the Southern Tip Trail only received one construction bid and created a less than favorable negotiating position for the U.S. Fish and Wildlife Service. While it is difficult to predict the market for contractors when the trail goes to construction, costs for construction could vary significantly.

3) **Environmental Conditions**: Federal aid is likely for this project; as such, a NEPA review will be required. We also recommend performing a Phase I Environmental Site Assessment prior to commencing a design phase of the project.

4) **Ownership and Maintenance:** The ultimate owner of this project has not yet been determined and should be established prior to commencement of detailed design. While VDOT owns and maintains some pedestrian bridges and trails, many trails and

pedestrian bridges while constructed with VDOT funding are maintained by local municipalities. Some potential alignments of the trail may require additional design considerations for emergency or maintenance vehicle access- especially if the A&N Electric Cooperative is the preferred alignment. The use of their right-of-way is further complicated by the presence of wetlands that may require footbridges that would not be designed to support these vehicles.

5.3 PROJECT FUNDING OPPORTUNITIES

Following the completion of this preliminary engineering report and feasibility study, ANPDC and/or Northampton County should pursue local, State and Federal grant funding, as well as an appropriate necessary local matching funds. Given the project's connectivity to Kiptopeke Elementary School, this project has the potential to secure Safe Routes to School (SRTS) grant funding in addition to SmartScale funding. Due to the safety of users and the number of accidents at the Stone Road and Route 13 intersection, this project has potential to receiver 100% federal funding via the Open Container Fund.

When funds have been identified for the entire corridor, a design consultant can be selected to provide preliminary and final design services, easement and land acquisition services, geotechnical recommendations, detailed final cost opinions, and bid and construction phase services. The design process can be expected to take more than a year, with engineering reviews, environmental permitting and right-of-way being the most variable schedule activities that could lengthen the design timeline. Construction of this trail (depending upon length and bid package development) can be completed with a twelve to eighteen-month construction schedule.

APPENDIX A:

Alignment
Alternative Maps

APPENDIX B:

Rough Order of Magnitude Cost Estimates

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Alignment Alternative 3A - Capeville Road North, following rail ROW to Fairview Road

Total Length, miles	3.42	miles
Dollar per Mile Cost	$ 736,793	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	10166	LF	$ 80	$ 813,280
Trail construction, cleared	7910.5	LF	$ 60	$ 474,630
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	4	EA	$ 5,000	$ 20,000
Farm Vehicle Access Crossings	9	EA	$ 4,000	$ 36,000
Subtotal				**$ 1,343,910**
Stormwater and E&S, 10%				$ 134,391
Landscaping, 5%				$ 67,196
Mobilization				$ 134,391
Subtotal				**$ 1,679,888**
Survey, engineering, permitting 15%				$ 251,983
Construction Inspection, 10%				$ 167,989
Subtotal				**$ 2,099,859**
Contingency, 25% of CN Costs				$ 419,972
Rough Order of Magnitude Project Costs				**$ 2,519,831**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Gravel Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Gravel Alignment Alternative 3A - Capeville Road North, following rail ROW to Fairview Road

Total Length, miles	3.42	miles
Dollar per Mile Cost	$ 340,378	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	10166	LF	$ 40	$ 406,640
Trail construction, cleared	7910.5	LF	$ 20	$ 158,210
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	4	EA	$ 5,000	$ 20,000
Farm Vehicle Access Crossings	9	EA	$ 4,000	$ 36,000
Subtotal				**$ 620,850**
Stormwater and E&S, 10%				$ 62,085
Landscaping, 5%				$ 31,043
Mobilization				$ 62,085
Subtotal				**$ 776,063**
Survey, engineering, permitting 15%				$ 116,409
Construction Inspection, 10%				$ 77,606
Subtotal				**$ 970,078**
Contingency, 25% of CN Costs				$ 194,016
Rough Order of Magnitude Project Costs				**$ 1,164,094**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Alignment Alternative 2B- Follow A&N Easement to Stone Road, then East to Parsons Circle

Total Length, miles	5.26	miles
Dollar per Mile Cost, All Costs	$ 1,124,648	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	20253	LF	$ 80	$ 1,620,240
Trail construction, cleared	7,514	LF	$ 60	$ 450,840
Restriped Roadway, Country Place	500	LF	$ 20	$ 10,000
Footbridges	600	LF	$ 600	$ 360,000
Roadway Crossings	9	EA	$ 5,000	$ 45,000
Bridge	1	LS	$ 303,000	$ 303,000
Bridge, Retaining Walls	1	LS	$ 360,000	$ 360,000
Bridge, Earthwork	1	LS	$ 210,000	$ 210,000
ROW Costs	1	LS	$ -	$ -
Subtotal				**$ 3,359,080**
Stormwater and E&S, 10%				$ 167,954
Landscaping, 5%				$ 167,954
Utility Modifications, at Stone Road				$ 80,000
Mobilization				$ 167,954
Subtotal				**$ 3,942,942**
Survey, engineering, permitting 15%				$ 591,441
Construction Inspection, 10%				$ 394,294
Subtotal				**$ 4,928,678**
Contingency, 25% of CN Costs				$ 985,736
Rough Order of Magnitude Project Costs				**$ 5,914,413**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Alignment Alternative 3B - Fairview Road to Trailhead at Route 13 Int. (Roadside Table)

Total Length, miles	0.43	miles
Dollar per Mile Cost, All Costs	$ 989,473	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	2256	LF	$ 80	$ 180,480
Trail construction, cleared	-	LF	$ 60	$ -
Footbridges	0	LF	$ 600	$ -
Roadway Crossings	1	EA	$ 5,000	$ 5,000
ROW Costs (Roadside Table Parcel)	1	LS	$ 40,000	$ 40,000
Subtotal				**$ 225,480**
Stormwater and E&S, 10%				$ 22,548
Landscaping, 5%				$ 11,274
Mobilization				$ 22,548
Subtotal				**$ 281,850**
Survey, engineering, permitting 15%				$ 42,278
Construction Inspection, 10%				$ 28,185
Subtotal				**$ 352,313**
Contingency, 25% of CN Costs				$ 70,463
Rough Order of Magnitude Project Costs				**$ 422,775**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Gravel Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Alignment Alternative 3B - Fairview Road to Trailhead at Route 13 Intersection

Total Length, miles	0.43	miles
Dollar per Mile Cost, All Costs	$ 593,473	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	2256	LF	$ 40	$ 90,240
Trail construction, cleared	-	LF	$ 20	$ -
Footbridges	0	LF	$ 600	$ -
Roadway Crossings	1	EA	$ 5,000	$ 5,000
ROW Costs (Roadside Table Parcel)	1	LS	$ 40,000	$ 40,000
Subtotal				**$ 135,240**
Stormwater and E&S, 10%				$ 13,524
Landscaping, 5%				$ 6,762
Mobilization				$ 13,524
Subtotal				**$ 169,050**
Survey, engineering, permitting 15%				$ 25,358
Construction Inspection, 10%				$ 16,905
Subtotal				**$ 211,313**
Contingency, 25% of CN Costs				$ 42,263
Rough Order of Magnitude Project Costs				**$ 253,575**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Alignment Alternative 3C - Bridge at Route 13 to Parsons Circle Park and Ride

Total Length, miles	0.86	miles
Dollar per Mile Cost	$ 3,030,147	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	3956	LF	$ 80	$ 316,480
Trail construction, cleared	600	LF	$ 60	$ 36,000
Footbridges	0	LF	$ 600	$ -
Bridge Superstructure	1	LS	$ 303,000	$ 303,000
Bridge Retaining Walls	1	LS	$ 321,000	$ 321,000
Bridge Earthwork	10500	TONS	$ 30	$ 315,000
Roadway Crossings, Paved or Gravel	3	EA	$ 5,000	$ 15,000
Farm Vehicle Access Crossings	2	EA	$ 4,000	$ 8,000
Subtotal				**$ 1,314,480**
Stormwater and E&S, 10%				$ 131,448
Landscaping, 5%				$ 65,724
Utility Modifications, power poles				$ 100,000
Mobilization				$ 131,448
Subtotal				**$ 1,743,100**
Survey, engineering, permitting 15%				$ 261,465
Construction Inspection, 10%				$ 174,310
Subtotal				**$ 2,178,875**
Contingency, 25% of CN Costs				$ 435,775
Rough Order of Magnitude Project Costs				**$ 2,614,650**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Gravel Alignment Alternative 3C - Bridge at Route 13 to Parsons Circle Park and Ride

Total Length, miles	0.86	miles
Dollar per Mile Cost	$ 2,634,147	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	3956	LF	$ 40	$ 158,240
Trail construction, cleared	600	LF	$ 20	$ 12,000
Footbridges	0	LF	$ 600	$ -
Bridge Superstructure	1	LS	$ 303,000	$ 303,000
Bridge Retaining Walls	1	LS	$ 321,000	$ 321,000
Bridge Earthwork	10500	TONS	$ 30	$ 315,000
Roadway Crossings, Paved or Gravel	3	EA	$ 5,000	$ 15,000
Farm Vehicle Access Crossings	2	EA	$ 4,000	$ 8,000
Subtotal				**$ 1,132,240**
Stormwater and E&S, 10%				$ 113,224
Landscaping, 5%				$ 56,612
Utility Modifications, power poles				$ 100,000
Mobilization				$ 113,224
Subtotal				**$ 1,515,300**
Survey, engineering, permitting 15%				$ 227,295
Construction Inspection, 10%				$ 151,530
Subtotal				**$ 1,894,125**
Contingency, 25% of CN Costs				$ 378,825
Rough Order of Magnitude Project Costs				**$ 2,272,950**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase III Rough Order of Magnitude Cost Estimate
Park and Ride Location in Rail Easement at Parsons Circle

Item	Quantity	Unit	Unit Price	Total Price
Clearing and grubbing	0.6	Ac.	$ 10,000	$ 6,000
Site grading	0.6	Ac.	$ 20,000	$ 12,000
Asphalt Parking Area and drive access	800	SY	$ 40	$ 32,000
Site Lighting	1	LS	$ 20,000	$ 20,000
Signage and Amenities	1	LS	$ 20,000	$ 20,000
				$ -
Subtotal				**$ 90,000**
Stormwater and E&S, 10%				$ 9,000
Landscaping, 10%				$ 4,500
Mobilization				$ 9,000
Subtotal				**$ 112,500**
Survey, engineering, permitting 10%				$ 11,250
Construction Inspection, 10%				$ 11,250
Subtotal				**$ 135,000**
Contingency, 25% of CN Costs				$ 28,125
Rough Order of Magnitude Project Costs				**$ 163,125**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Alignment Alternative 4A - Parsons Circle P&R, along Stone Drive to Marina

Total Length, miles	1.94	miles
Dollar per Mile Cost	$ 613,028	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	0	LF	$ 80	$ -
Trail construction, cleared	10238	LF	$ 60	$ 614,280
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Rail crossing	1	EA	$ 10,000	$ 10,000
Subtotal				**$ 634,280**
Stormwater and E&S, 10%				$ 63,428
Landscaping, 5%				$ 31,714
Mobilization				$ 63,428
Subtotal				**$ 792,850**
Survey, engineering, permitting 15%				$ 118,928
Construction Inspection, 10%				$ 79,285
Subtotal				**$ 991,063**
Contingency, 25% of CN Costs				$ 198,213
Rough Order of Magnitude Project Costs				**$ 1,189,275**

*Costs are for the preferred alighment that avoids the Parson Road and Stone Road Intersection

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Gravel Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Gravel Alignment Alternative 4A - Parsons Circle P&R, along Stone Drive to Marina

Total Length, miles	1.94	miles
Dollar per Mile Cost	$ 217,229	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	0	LF	$ 40	$ -
Trail construction, cleared	10238	LF	$ 20	$ 204,760
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Rail crossing	1	EA	$ 10,000	$ 10,000
Subtotal				**$ 224,760**
Stormwater and E&S, 10%				$ 22,476
Landscaping, 5%				$ 11,238
Mobilization				$ 22,476
Subtotal				**$ 280,950**
Survey, engineering, permitting 15%				$ 42,143
Construction Inspection, 10%				$ 28,095
Subtotal				**$ 351,188**
Contingency, 25% of CN Costs				$ 70,238
Rough Order of Magnitude Project Costs				**$ 421,425**

*Costs are for the preferred alighment that avoids the Parson Road and Stone Road Intersection

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Alignment Alternative 4B - From Parsons Circle P&R, through private property, to Marina

Total Length, miles	2.08	miles
Dollar per Mile Cost	$ 776,729	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	4,393	LF	$ 80	$ 351,437
Trail construction, cleared	6,589	LF	$ 60	$ 395,366
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Rail Crossing	1	EA	$ 4,000	$ 4,000
ROW Costs	2.52	Acre	$ 40,000	$ 100,848.48
Subtotal				**$ 861,652**
Stormwater and E&S, 10%				$ 86,165
Landscaping, 5%				$ 43,083
Mobilization				$ 86,165
Subtotal				**$ 1,077,065**
Survey, engineering, permitting 15%				$ 161,560
Construction Inspection, 10%				$ 107,706
Subtotal				**$ 1,346,331**
Contingency, 25% of CN Costs				$ 269,266
Rough Order of Magnitude Project Costs				**$ 1,615,597**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Gravel Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Gravel Alignment Alternative 4B - From Parsons Circle P&R, through private property, to Marina

Total Length, miles	2.08	miles
Dollar per Mile Cost	$ 380,729	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	4,392.96	LF	$ 40	$ 175,718
Trail construction, cleared	6,589.44	LF	$ 20	$ 131,789
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Farm Vehicle Access Crossings	1	EA	$ 4,000	$ 4,000
ROW Costs	2.52	Acre	$ 40,000	$ 100,848.48
Subtotal				**$ 422,356**
Stormwater and E&S, 10%				$ 42,236
Landscaping, 5%				$ 21,118
Mobilization				$ 42,236
Subtotal				**$ 527,945**
Survey, engineering, permitting 15%				$ 79,192
Construction Inspection, 10%				$ 52,794
Subtotal				**$ 659,931**
Contingency, 25% of CN Costs				$ 131,986
Rough Order of Magnitude Project Costs				**$ 791,917**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Alignment Alternative 4C - Parsons Rd. P&R, South of Rail following Stone Road to Marina

Total Length, miles	1.93	miles
Dollar per Mile Cost	$ 686,801	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	4,076.16	LF	$ 80	$ 326,093
Trail construction, cleared	6,114.24	LF	$ 60	$ 366,854
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Farm Vehicle Access Crossings	1	EA	$ 4,000	$ 4,000
Subtotal				**$ 706,947**
Stormwater and E&S, 10%				$ 70,695
Landscaping, 5%				$ 35,347
Mobilization				$ 70,695
Subtotal				**$ 883,684**
Survey, engineering, permitting 15%				$ 132,553
Construction Inspection, 10%				$ 88,368
Subtotal				**$ 1,104,605**
Contingency, 25% of CN Costs				$ 220,921
Rough Order of Magnitude Project Costs				**$ 1,325,526**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Gravel Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Alignment Alternative 4C - Parsons Rd. P&R, South of Rail following Stone Road to Marina

Total Length, miles	1.93	miles
Dollar per Mile Cost	$ 290,801	

Item	Quantity	Unit	Unit Price	Total Price
Trail construction, wooded conditions	4,076	LF	$ 40	$ 163,046
Trail construction, cleared	6,114	LF	$ 20	$ 122,285
Footbridges	0	LF	$ 600	$ -
Roadway Crossings, Paved or Gravel	2	EA	$ 5,000	$ 10,000
Farm Vehicle Access Crossings	1	EA	$ 4,000	$ 4,000
Subtotal				**$ 299,331**
Stormwater and E&S, 10%				$ 29,933
Landscaping, 5%				$ 14,967
Mobilization				$ 29,933
Subtotal				**$ 374,164**
Survey, engineering, permitting 15%				$ 56,125
Construction Inspection, 10%				$ 37,416
Subtotal				**$ 467,705**
Contingency, 25% of CN Costs				$ 93,541
Rough Order of Magnitude Project Costs				**$ 561,246**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Park and Ride Location at Cape Charles Museum

Item	Quantity	Unit	Unit Price	Total Price
Clearing and grubbing	0.0	Ac.	$ 10,000	$ -
Site grading	0.0	Ac.	$ 20,000	$ -
Asphalt Parking Area and drive access	300	SY	$ 35	$ 10,500
Site Lighting	1	LS	$ 20,000	$ 20,000
Signage and Amenities	1	LS	$ 20,000	$ 20,000
				$ -
Subtotal				**$ 50,500**
Stormwater and E&S, 10%				$ 5,050
Landscaping, 10%				$ 2,525
Mobilization				$ 5,050
Subtotal				**$ 63,125**
Survey, engineering, permitting 10%				$ 6,313
Construction Inspection, 10%				$ 6,313
Subtotal				**$ 75,750**
Contingency, 25% of CN Costs				$ 15,781
Rough Order of Magnitude Project Costs				**$ 91,531**

A. Morton Thomas and Associates, Inc.
Consulting Engineers

Southern Tip Bike/Hike Trail - Phase IV Rough Order of Magnitude Cost Estimate
Park and Ride Location at Cape Charles Marina (Phase 4 Trailhead)

Item	Quantity	Unit	Unit Price	Total Price
Clearing and grubbing	0.0	Ac.	$ 10,000	$ -
Site grading	0.0	Ac.	$ 20,000	$ -
Asphalt Parking Area	270	SY	$ 35	$ 9,450
Site Lighting	1	LS	$ 20,000	$ 20,000
Signage and Amenities	1	LS	$ 20,000	$ 20,000
				$ -
Subtotal				**$ 49,450**
Stormwater and E&S, 10%				$ 4,945
Landscaping, 10%				$ 2,473
Mobilization				$ 4,945
Subtotal				**$ 61,813**
Survey, engineering, permitting 10%				$ 6,181
Construction Inspection, 10%				$ 6,181
Subtotal				**$ 74,175**
Contingency, 25% of CN Costs				$ 15,453
Rough Order of Magnitude Project Costs				**$ 89,628**

Costs assume that the north side of existing parking lot could be extended

A. Morton Thomas and Associates, Inc.
Consulting Engineers

APPENDIX C:

Wetland Maps,
Environmental Due Diligence

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0295F

FIRM

FLOOD INSURANCE RATE MAP

NORTHAMPTON COUNTY, VIRGINIA

AND INCORPORATED AREAS

PANEL 295 OF 610

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAPE CHARLES, TOWN OF	510106	0295	F
NORTHAMPTON COUNTY	510105	0295	F

- NOTE -

THIS MAP INCLUDES BOUNDARIES OF THE COASTAL BARRIER RESOURCES SYSTEM ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT ENABLING LEGISLATION.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
51131C0295F

Virginia Department of Game and Inland Fisheries

5/8/2018 10:49:14 AM

Fish and Wildlife Information Service

VaFWIS Search Report Compiled on 5/8/2018, 10:49:14 AM

Help

Known or likely to occur within a **2 mile radius around point Cape Charles Cape Northampton**
(at 37,08,56.5 -75,57,27.7)
in **131 Northampton County, VA**

View Map of Site Location

537 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 42) (42 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
030074	FESE	Ia	Turtle, Kemp's ridley sea	Lepidochelys kempii	Yes	BOVA,SppObs,HU6
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus		BOVA,HU6
030075	FESE	Ic	Turtle, leatherback sea	Dermochelys coriacea		BOVA
030073	FESE		Turtle, hawksbill sea	Eretmochelys imbricata		BOVA
040183	FESE		Tern, roseate	Sterna dougallii dougallii	Yes	BOVA,SppObs,HU6
030071	FTST	Ia	Turtle, loggerhead sea	Caretta caretta	Yes	BOVA,SppObs,HU6
040144	FTST	Ia	Knot, red	Calidris canutus rufa		BOVA,HU6
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
030072	FTST	Ib	Turtle, green sea	Chelonia mydas	Yes	BOVA,SppObs,HU6
040120	FTST	IIa	Plover, piping	Charadrius melodus	Potential	BOVA,BBA,HU6
100361	FTST	IIa	Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis	Yes	BOVA,Habitat,SppObs,HU6
120030	FTSE	IVb	Manatee, West Indian	Trichechus manatus		HU6
040118	SE	Ia				BOVA,HU6

			Plover, Wilson's	Charadrius wilsonia		
040110	SE	Ia	Rail, black	Laterallus jamaicensis	Potential	BOVA,Habitat,HU6
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
040096	ST	Ia	Falcon, peregrine	Falco peregrinus	Yes	BOVA,BBA,SppObs,HU6
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040385	ST	Ia	Sparrow, Bachman's	Peucaea aestivalis		BOVA
040379	ST	Ia	Sparrow, Henslow's	Ammodramus henslowii	Potential	Habitat,HU6
040179	ST	Ia	Tern, gull-billed	Sterna nilotica	Potential	BOVA,Habitat,BBA,HU6
040403	ST		Falcon, Arctic peregrine	Falco peregrinus tundrius	Yes	BOVA,SppObs
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030067	CC	IIa	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Yes	BOVA,Habitat,SppObs,HU6
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA,HU6
040092		Ia	Eagle, golden	Aquila chrysaetos	Yes	BOVA,SppObs,HU6
040040		Ia	Ibis, glossy	Plegadis falcinellus	Potential	BOVA,BBA,HU6
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera	Yes	BOVA,SppObs
040213		Ic	Owl, northern saw-whet	Aegolius acadicus	Yes	BOVA,SppObs,HU6
040052		IIa	Duck, American black	Anas rubripes	Yes	BOVA,SppObs,HU6
040033		IIa	Egret, snowy	Egretta thula	Potential	BOVA,BBA,HU6
040029		IIa	Heron, little blue	Egretta caerulea caerulea	Potential	BOVA,Habitat,BBA,HU6
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea	Potential	BOVA,BBA

040114		IIa	Oystercatcher, American	Haematopus palliatus	Potential	BOVA,Habitat,BBA,HU6
040192		IIa	Skimmer, black	Rynchops niger	Potential	BOVA,BBA,HU6
040181		IIa	Tern, common	Sterna hirundo	Potential	BOVA,BBA,HU6
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040140		IIa	Woodcock, American	Scolopax minor	Yes	BOVA,SppObs,HU6
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus	Yes	BOVA,SppObs,HU6
040105		IIb	Rail, king	Rallus elegans		BOVA
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		HU6
050062		IIc	Squirrel, Delmarva Peninsula fox	Sciurus niger cinereus		BOVA

To view **All 537 species** View 537

*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 Widlife 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.

View Map of All Query Results from All Observation Tables

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Impediments to Fish Passage

N/A

Colonial Water Bird Survey (1 records)

View Map of All Query Results
Colonial Water Bird Survey

Colony_Name	N Obs	Latest Date	N Species			View Map
			Different Species	Highest TE*	Highest Tier**	
Seaside, Fishermans Island, Northampton	1	May 9 2013	1			Yes

Displayed 1 Colonial Water Bird Survey

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests (7 records)

View Map of All Query Results
Bald Eagle Nests

Nest	N Obs	Latest Date	DGIF Nest Status	View Map
NT0501	4	Apr 25 2006	HISTORIC	Yes
NT0701	2	May 11 2007	HISTORIC	Yes
NT0801	8	Apr 23 2011	Unknown	Yes
NT1001	4	Apr 23 2011	Unknown	Yes
NT9301	1	Jan 1 1993	HISTORIC	Yes
NT9302	3	May 11 1994	HISTORIC	Yes
NT9701	25	Apr 23 2011	Unknown	Yes

Displayed 7 Bald Eagle Nests

Species Observations (1795 records - displaying first 181 , 181 Observations with Threatened or Endangered species)

View Map of All Query Results
Species Observations

obsID	class	Date Observed	Observer	N Species			View Map
				Different Species	Highest TE*	Highest Tier**	
600897	SppObs		Christina; Trapani	3	FESE	I	Yes

		Oct 5 2008					
606876	SppObs	Oct 5 2008	Christina; Trapani	1	FESE	I	Yes
603671	SppObs	Sep 29 2008	Shannon; Davis	1	FESE	I	Yes
607408	SppObs	Jul 9 2008	Shannon; Davis	2	FESE	I	Yes
601516	SppObs	Jun 13 2008	Christina; Trapani	1	FESE	I	Yes
602336	SppObs	Jun 13 2008	Christina; Trapani	1	FESE	I	Yes
603164	SppObs	May 23 2008	Shannon; Davis	1	FESE	I	Yes
64577	SppObs	Sep 16 1999	e. s. brinkley	1	FESE		Yes
601789	SppObs	Nov 3 2008	Christina; Trapani	1	FTST	I	Yes
605066	SppObs	Nov 2 2008	Lisa; Wright	1	FTST	I	Yes
601598	SppObs	Oct 7 2008	Christina; Trapani	1	FTST	I	Yes
600254	SppObs	Sep 11 2008	Wendy; Walton	1	FTST	I	Yes
602745	SppObs	Aug 15 2008	Christina; Trapani	1	FTST	I	Yes
600346	SppObs	Aug 15 2008	Christina; Trapani	1	FTST	I	Yes
601369	SppObs	Jul 15 2008	Shannon; Davis	1	FTST	I	Yes
606945	SppObs	Jul 14 2008	Christina; Trapani	1	FTST	I	Yes
603273	SppObs	Jun 5 2008	Christina; Trapani	1	FTST	I	Yes
604920	SppObs	May 28 2008	Christina; Trapani	1	FTST	I	Yes
367032	SppObs	Jan 1 1900		1	FTST	I	Yes
55146	SppObs	Jun 13 1998	C. Barry Knisley, Randolph-Macon College	1	FTST	II	Yes
604291	SppObs	Sep 28 2009	JILL ; MORROW| JUDY; GOOD| LANCE; MORROW	1	ST	I	Yes
314164	SppObs	Nov 1 2005	Robert Anderson	8	ST	I	Yes

314163	SppObs	Oct 1 2005	Robert Anderson	8	ST	I	Yes
314162	SppObs	Sep 1 2005	Robert Anderson	6	ST	I	Yes
309024	SppObs	Dec 2 2004	Smith, Zach	3	ST	I	Yes
309003	SppObs	Oct 26 2004	Smith, Zach	5	ST	I	Yes
308995	SppObs	Oct 16 2004	Smith, Zach	3	ST	I	Yes
308983	SppObs	Oct 4 2004	Smith, Zach	4	ST	I	Yes
308981	SppObs	Oct 2 2004	Smith, Zach	4	ST	I	Yes
308980	SppObs	Oct 1 2004	Smith, Zach	4	ST	I	Yes
308979	SppObs	Sep 30 2004	Smith, Zach	4	ST	I	Yes
308974	SppObs	Sep 24 2004	Smith, Zach	4	ST	I	Yes
308973	SppObs	Sep 23 2004	Smith, Zach	4	ST	I	Yes
308970	SppObs	Sep 20 2004	Smith, Zach	4	ST	I	Yes
308968	SppObs	Sep 17 2004	Smith, Zach	3	ST	I	Yes
310205	SppObs	Oct 4 2003	Jennifer Ottinger	1	ST	I	Yes
310202	SppObs	Sep 25 2003	Jennifer Ottinger	1	ST	I	Yes
310200	SppObs	Sep 20 2003	Jennifer Ottinger	1	ST	I	Yes
310199	SppObs	Sep 17 2003	Jennifer Ottinger	1	ST	I	Yes
310196	SppObs	Sep 8 2003	Jennifer Ottinger	1	ST	I	Yes
305969	SppObs	Nov 29 2002	Smith, Zach	6	ST	I	Yes
305960	SppObs	Nov 20 2002	Smith, Zach	11	ST	I	Yes
305949	SppObs	Nov 8 2002	Smith, Zach	9	ST	I	Yes
305945	SppObs	Nov 3 2002	Smith, Zach	12	ST	I	Yes
305944	SppObs		Smith, Zach	12	ST	I	Yes

		Nov 2 2002					
305941	SppObs	Oct 29 2002	Smith, Zach	9	ST	I	Yes
305938	SppObs	Oct 26 2002	Smith, Zach	9	ST	I	Yes
305937	SppObs	Oct 25 2002	Smith, Zach	5	ST	I	Yes
305934	SppObs	Oct 22 2002	Smith, Zach	13	ST	I	Yes
305933	SppObs	Oct 20 2002	Smith, Zach	12	ST	I	Yes
306004	SppObs	Oct 19 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	3	ST	I	Yes
305932	SppObs	Oct 19 2002	Smith, Zach	8	ST	I	Yes
305930	SppObs	Oct 17 2002	Smith, Zach	12	ST	I	Yes
305929	SppObs	Oct 15 2002	Smith, Zach	8	ST	I	Yes
305928	SppObs	Oct 14 2002	Smith, Zach	10	ST	I	Yes
305927	SppObs	Oct 13 2002	Smith, Zach	11	ST	I	Yes
305926	SppObs	Oct 12 2002	Smith, Zach	11	ST	I	Yes
305925	SppObs	Oct 10 2002	Smith, Zach	8	ST	I	Yes
305924	SppObs	Oct 9 2002	Smith, Zach	11	ST	I	Yes
305923	SppObs	Oct 8 2002	Smith, Zach	12	ST	I	Yes
305995	SppObs	Oct 7 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	4	ST	I	Yes
305922	SppObs	Oct 7 2002	Smith, Zach	12	ST	I	Yes
305921	SppObs	Oct 6 2002	Smith, Zach	12	ST	I	Yes
305993	SppObs	Oct 5 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	1	ST	I	Yes

305920	SppObs	Oct 5 2002	Smith, Zach	8	ST	I	Yes
305919	SppObs	Oct 4 2002	Smith, Zach	10	ST	I	Yes
305992	SppObs	Oct 4 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	3	ST	I	Yes
305918	SppObs	Oct 3 2002	Smith, Zach	10	ST	I	Yes
305917	SppObs	Oct 2 2002	Smith, Zach	10	ST	I	Yes
305916	SppObs	Oct 1 2002	Smith, Zach	10	ST	I	Yes
305989	SppObs	Oct 1 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	5	ST	I	Yes
305915	SppObs	Sep 30 2002	Smith, Zach	10	ST	I	Yes
305988	SppObs	Sep 30 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	5	ST	I	Yes
305914	SppObs	Sep 29 2002	Smith, Zach	11	ST	I	Yes
305913	SppObs	Sep 28 2002	Smith, Zach	10	ST	I	Yes
305912	SppObs	Sep 27 2002	Smith, Zach	7	ST	I	Yes
305985	SppObs	Sep 27 2002	BRYAN D. WATTS, THE CENTER FOR CONSERVATION BIOLOGY	4	ST	I	Yes
305911	SppObs	Sep 25 2002	Smith, Zach	10	ST	I	Yes
305910	SppObs	Sep 24 2002	Smith, Zach	11	ST	I	Yes
305908	SppObs	Sep 22 2002	Smith, Zach	11	ST	I	Yes
305907	SppObs	Sep 21 2002	Smith, Zach	11	ST	I	Yes
305906	SppObs	Sep 20 2002	Smith, Zach	9	ST	I	Yes
305905	SppObs	Sep 19 2002	Smith, Zach	12	ST	I	Yes

305904	SppObs	Sep 18 2002	Smith, Zach	10	ST	I	Yes
305903	SppObs	Sep 17 2002	Smith, Zach	11	ST	I	Yes
305901	SppObs	Sep 15 2002	Smith, Zach	5	ST	I	Yes
305893	SppObs	Sep 7 2002	Smith, Zach	10	ST	I	Yes
68574	SppObs	Nov 11 2001	Sue Rice (principle permittee), Deniz Aygen (Collector)	3	ST	I	Yes
68572	SppObs	Nov 8 2001	Sue Rice (principle permittee), Deniz Aygen (Collector)	2	ST	I	Yes
68571	SppObs	Nov 7 2001	Sue Rice (principle permittee), Deniz Aygen (Collector)	2	ST	I	Yes
68539	SppObs	Oct 4 2001	Sue Rice (principle permittee), Deniz Aygen (Collector)	6	ST	I	Yes
64279	SppObs	Oct 30 2000	REESE F. LUKEI JR. (PRINCIPLE PERMITTEE), CENTER FOR CONSERVATION BIOLOGY COLLEGE OF WILLAM AND MARY	7	ST	I	Yes
64278	SppObs	Sep 30 2000	REESE F. LUKEI JR. (PRINCIPLE PERMITTEE), CENTER FOR CONSERVATION BIOLOGY COLLEGE OF WILLAM AND MARY	6	ST	I	Yes
310816	NonConfirm	Nov 29 1997	David Holt	10	ST	I	Yes
310812	NonConfirm	Nov 27 1997	David Holt	9	ST	I	Yes
310805	NonConfirm	Nov 22 1997	David Holt	8	ST	I	Yes
310791	NonConfirm	Nov 18 1997	David Holt	11	ST	I	Yes
310788	NonConfirm	Nov 17 1997	David Holt	12	ST	I	Yes
310785	NonConfirm	Nov 16 1997	David Holt	13	ST	I	Yes
310752	NonConfirm	Nov 15 1997	David Holt	12	ST	I	Yes

310749	NonConfirm	Nov 11 1997	David Holt	11	ST	I	Yes
310748	NonConfirm	Nov 10 1997	David Holt	10	ST	I	Yes
310743	NonConfirm	Nov 5 1997	David Holt	11	ST	I	Yes
310741	NonConfirm	Nov 3 1997	David Holt	9	ST	I	Yes
310740	NonConfirm	Nov 2 1997	David Holt	7	ST	I	Yes
310739	NonConfirm	Oct 31 1997	David Holt	10	ST	I	Yes
310738	NonConfirm	Oct 30 1997	David Holt	12	ST	I	Yes
310736	NonConfirm	Oct 28 1997	David Holt	8	ST	I	Yes
310732	NonConfirm	Oct 24 1997	David Holt	6	ST	I	Yes
310731	NonConfirm	Oct 23 1997	David Holt	9	ST	I	Yes
310730	NonConfirm	Oct 22 1997	David Holt	11	ST	I	Yes
310729	NonConfirm	Oct 21 1997	David Holt	12	ST	I	Yes
310728	NonConfirm	Oct 20 1997	David Holt	10	ST	I	Yes
310727	NonConfirm	Oct 18 1997	David Holt	8	ST	I	Yes
310726	NonConfirm	Oct 17 1997	David Holt	9	ST	I	Yes
310725	NonConfirm	Oct 15 1997	David Holt	9	ST	I	Yes
310724	NonConfirm	Oct 14 1997	David Holt	9	ST	I	Yes
310723	NonConfirm	Oct 13 1997	David Holt	12	ST	I	Yes
310722	NonConfirm	Oct 12 1997	David Holt	12	ST	I	Yes
310721	NonConfirm	Oct 11 1997	David Holt	11	ST	I	Yes
310720	NonConfirm	Oct 10 1997	David Holt	8	ST	I	Yes
310719	NonConfirm	Oct 9 1997	David Holt	10	ST	I	Yes
310718	NonConfirm		David Holt	11	ST	I	Yes

		Oct 8 1997					
310717	NonConfirm	Oct 7 1997	David Holt	11	ST	I	Yes
310716	NonConfirm	Oct 6 1997	David Holt	10	ST	I	Yes
310715	NonConfirm	Oct 5 1997	David Holt	9	ST	I	Yes
310714	NonConfirm	Oct 4 1997	David Holt	11	ST	I	Yes
310713	NonConfirm	Oct 3 1997	David Holt	11	ST	I	Yes
310712	NonConfirm	Oct 2 1997	David Holt	11	ST	I	Yes
310711	NonConfirm	Oct 1 1997	David Holt	10	ST	I	Yes
310710	NonConfirm	Sep 30 1997	David Holt	9	ST	I	Yes
310709	NonConfirm	Sep 29 1997	David Holt	10	ST	I	Yes
310708	NonConfirm	Sep 28 1997	David Holt	7	ST	I	Yes
310707	NonConfirm	Sep 27 1997	David Holt	11	ST	I	Yes
310706	NonConfirm	Sep 26 1997	David Holt	11	ST	I	Yes
310705	NonConfirm	Sep 25 1997	David Holt	8	ST	I	Yes
310704	NonConfirm	Sep 24 1997	David Holt	9	ST	I	Yes
310703	NonConfirm	Sep 23 1997	David Holt	7	ST	I	Yes
310702	NonConfirm	Sep 22 1997	David Holt	10	ST	I	Yes
310701	NonConfirm	Sep 21 1997	David Holt	11	ST	I	Yes
310700	NonConfirm	Sep 20 1997	David Holt	7	ST	I	Yes
310699	NonConfirm	Sep 19 1997	David Holt	9	ST	I	Yes
310696	NonConfirm	Sep 17 1997	David Holt	11	ST	I	Yes
310695	NonConfirm	Sep 16 1997	David Holt	10	ST	I	Yes
310694	NonConfirm		David Holt	9	ST	I	Yes

		Sep 15 1997					
310693	NonConfirm	Sep 14 1997	David Holt	10	ST	I	Yes
310692	NonConfirm	Sep 13 1997	David Holt	10	ST	I	Yes
310691	NonConfirm	Sep 12 1997	David Holt	9	ST	I	Yes
310689	NonConfirm	Sep 10 1997	David Holt	8	ST	I	Yes
310688	NonConfirm	Sep 9 1997	David Holt	11	ST	I	Yes
310687	NonConfirm	Sep 8 1997	David Holt	10	ST	I	Yes
310686	NonConfirm	Sep 7 1997	David Holt	10	ST	I	Yes
310683	NonConfirm	Sep 4 1997	David Holt	10	ST	I	Yes
310682	NonConfirm	Sep 3 1997	David Holt	5	ST	I	Yes
310681	NonConfirm	Sep 2 1997	David Holt	7	ST	I	Yes
310680	NonConfirm	Sep 1 1997	David Holt	4	ST	I	Yes
612397	SppObs	Oct 31 2011	Robert; Reilly	17	ST	III	Yes
612388	SppObs	Oct 27 2011	Robert; Reilly	14	ST	III	Yes
612387	SppObs	Oct 26 2011	Robert; Reilly	22	ST	III	Yes
321800	SppObs	Oct 19 2007	Robert Reilly	4	ST	III	Yes
321797	SppObs	Oct 16 2007	Robert Reilly	4	ST	III	Yes
612406	SppObs	Nov 3 2011	Robert; Reilly	14	ST	IV	Yes
612377	SppObs	Oct 18 2011	Robert; Reilly	24	ST	IV	Yes
612372	SppObs	Oct 14 2011	Robert; Reilly	18	ST	IV	Yes
612371	SppObs	Oct 13 2011	Robert; Reilly	21	ST	IV	Yes
612369	SppObs	Oct 11 2011	Robert; Reilly	28	ST	IV	Yes
612379	SppObs		Robert; Reilly	7	ST		Yes

		Oct 20 2011					
321817	SppObs	Nov 13 2007	Robert Reilly	2	ST		Yes
321799	SppObs	Oct 18 2007	Robert Reilly	3	ST		Yes
321798	SppObs	Oct 17 2007	Robert Reilly	3	ST		Yes
321791	SppObs	Oct 10 2007	Robert Reilly	4	ST		Yes
321789	SppObs	Oct 8 2007	Robert Reilly	4	ST		Yes
321786	SppObs	Oct 5 2007	Robert Reilly	5	ST		Yes
321785	SppObs	Oct 4 2007	Robert Reilly	4	ST		Yes
321784	SppObs	Oct 3 2007	Robert Reilly	3	ST		Yes
321783	SppObs	Oct 2 2007	Robert Reilly	4	ST		Yes
321782	SppObs	Oct 1 2007	Robert Reilly	4	ST		Yes
321781	SppObs	Sep 30 2007	Robert Reilly	5	ST		Yes
321777	SppObs	Sep 26 2007	Robert Reilly	5	ST		Yes
321760	SppObs	Sep 9 2007	Robert Reilly	5	ST		Yes
316288	SppObs	Jun 26 2006	Joseph C. Mitchell	1	SS	II	Yes

Displayed 181 Species Observations

Selected 1795 Observations View 500 (system constraint) Species Observations

Habitat Predicted for Aquatic WAP Tier I & II Species

N/A

Habitat Predicted for Terrestrial WAP Tier I & II Species (8 Species)

View Map of Combined Terrestrial Habitat Predicted for 8 WAP Tier I & II Species Listed Below

ordered by Status Concern for Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	View Map

100361	FTST	IIa	Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis	Yes
040110	SE	Ia	Rail, black	Laterallus jamaicensis	Yes
040379	ST	Ia	Sparrow, Henslow's	Ammodramus henslowii	Yes
040179	ST	Ia	Tern, gull-billed	Sterna nilotica	Yes
030067	CC	IIa	Terrapin, northern diamond-backed	Malaclemys terrapin terrapin	Yes
040029		IIa	Heron, little blue	Egretta caerulea caerulea	Yes
040114		IIa	Oystercatcher, American	Haematopus palliatus	Yes
040186		IIIa	Tern, least	Sterna antillarum	Yes

Virginia Breeding Bird Atlas Blocks (6 records)

View Map of All Query Results
Virginia Breeding Bird Atlas Blocks

BBA ID	Atlas Quadrangle Block Name	Breeding Bird Atlas Species			View Map
		Different Species	Highest TE*	Highest Tier**	
63052	Fishermans Island, NE	9		II	Yes
63051	Fishermans Island, NW	26	FTST	I	Yes
63064	Townsend, CE	2		III	Yes
63063	Townsend, CW	15		III	Yes
63066	Townsend, SE	10	ST	I	Yes
63065	Townsend, SW	26		I	Yes

Public Holdings: (3 names)

Name	Agency	Level
Mockhorn Wildlife Management Area	Va DGIF	
Eastern Shore of Virginia National Wildlife Refuge	U.S. Fish and Wildlife Service	Federal
Kiptopeke State Park	VA Dept. of Conservation and Recreation	State

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
131	Northampton	470	FESE	I

USGS 7.5' Quadrangles:
Fishermans Island
Townsend

USGS NRCS Watersheds in Virginia:

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
AO21	The Thorofare-Smith Island Inlet	98	FESE	I
CB46	Lower Chesapeake Bay-Cherrystone Inlet	98	FESE	I
CB47	Lower Chesapeake Bay	78	FESE	I

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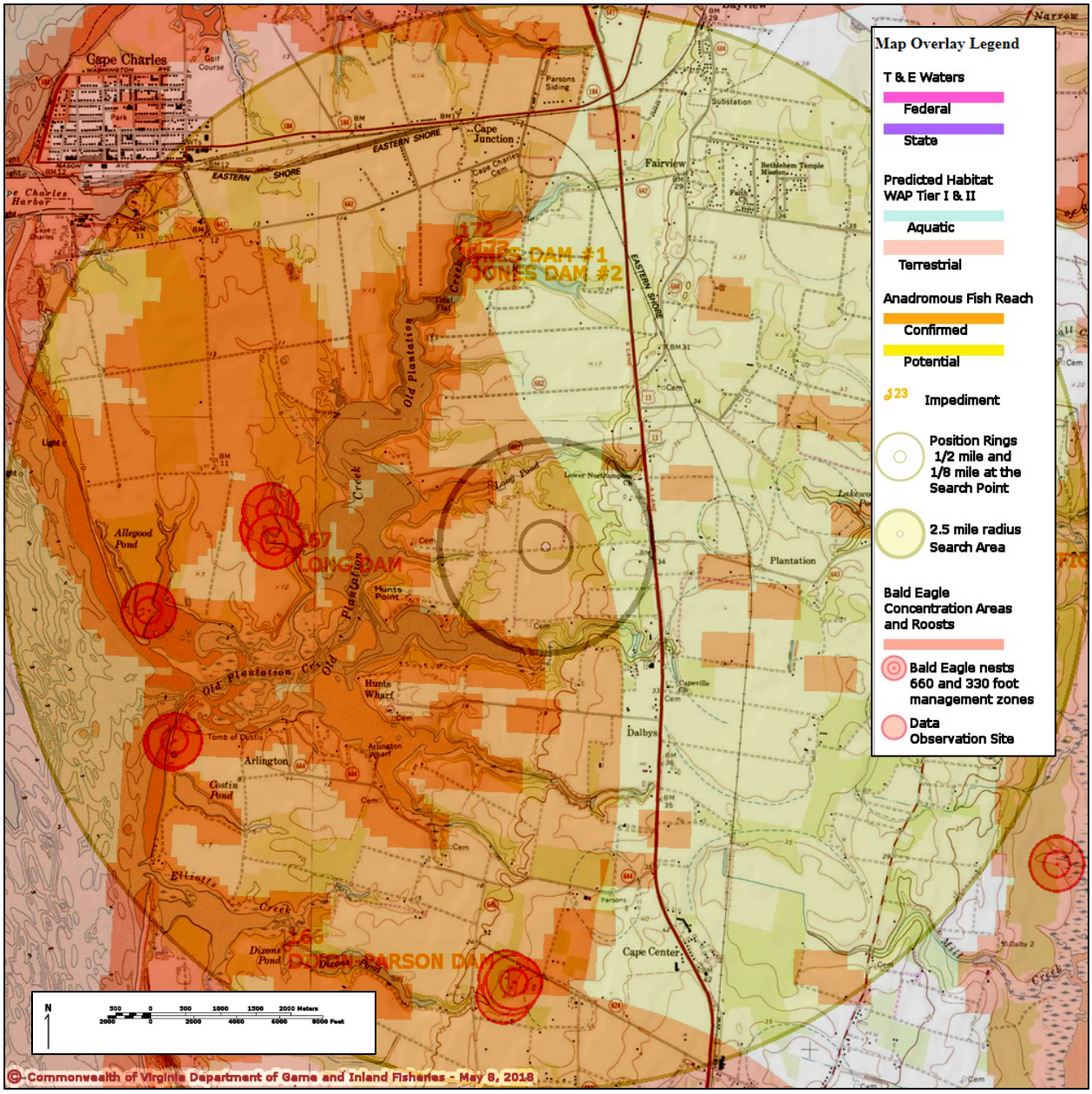
audit no. 902883 5/8/2018 10:49:14 AM Virginia Fish and Wildlife Information Service



Virginia Department of Game and Inland Fisheries Wildlife Information System

Virginia Dept. of Historic Resources

V-CRIS

Virginia Cultural Resource Information System

Legend

- Architecture Resources
- Architecture Labels
- Individual Historic District Properties
- Archaeological Resources
- Archaeology Labels
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- DHR Easements
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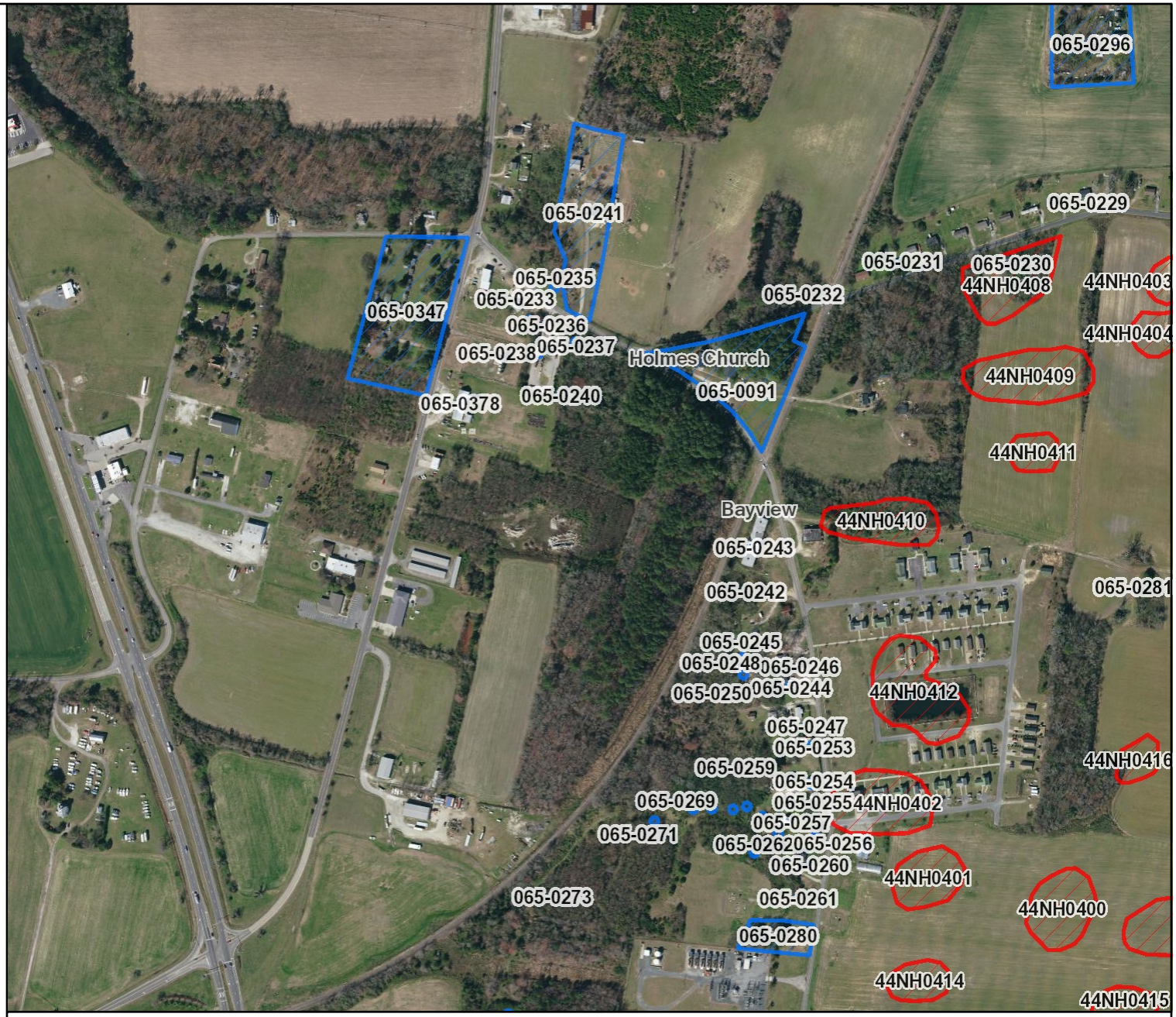

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Title: Cultural Resources 1

Date: 5/8/2018

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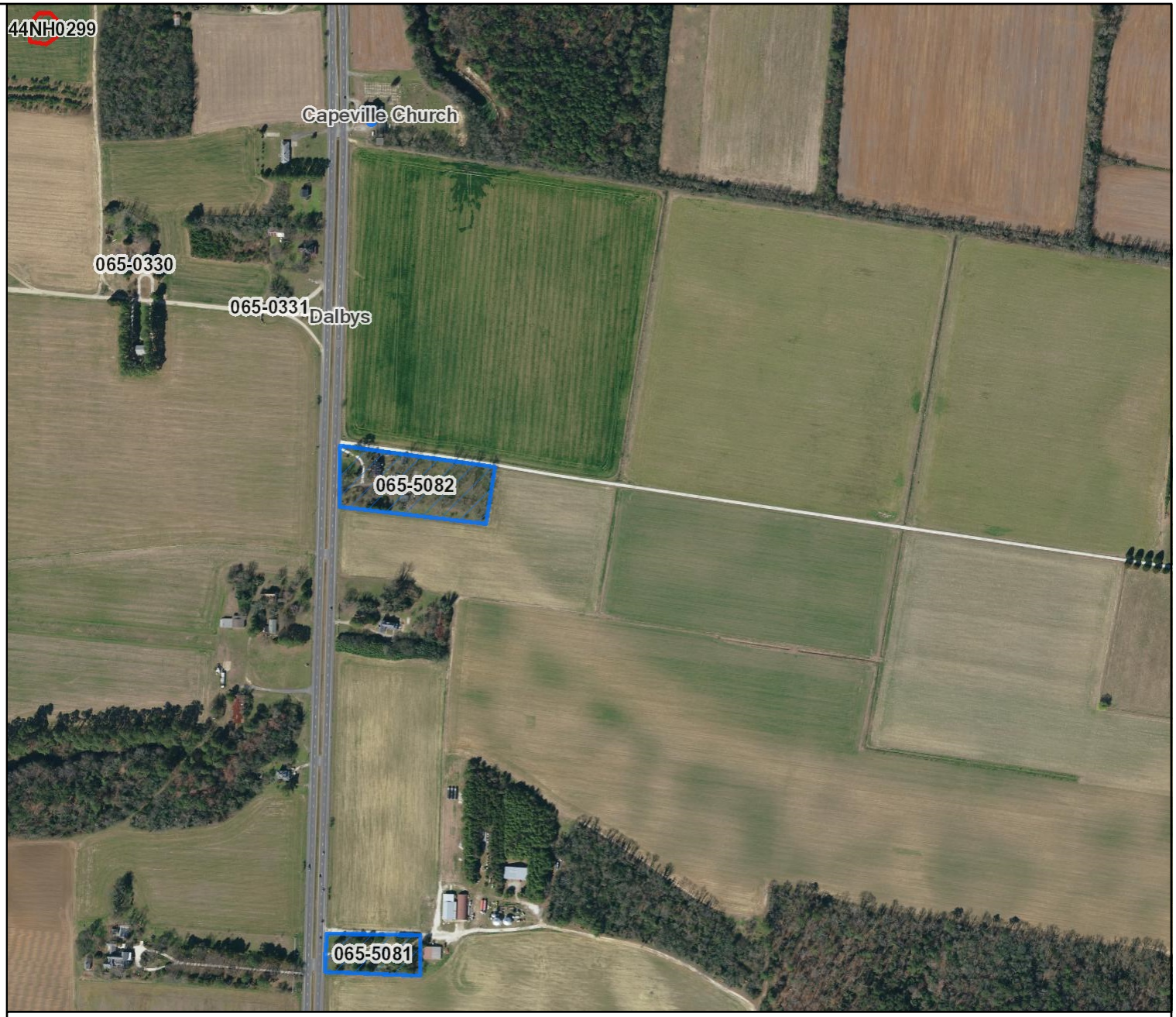

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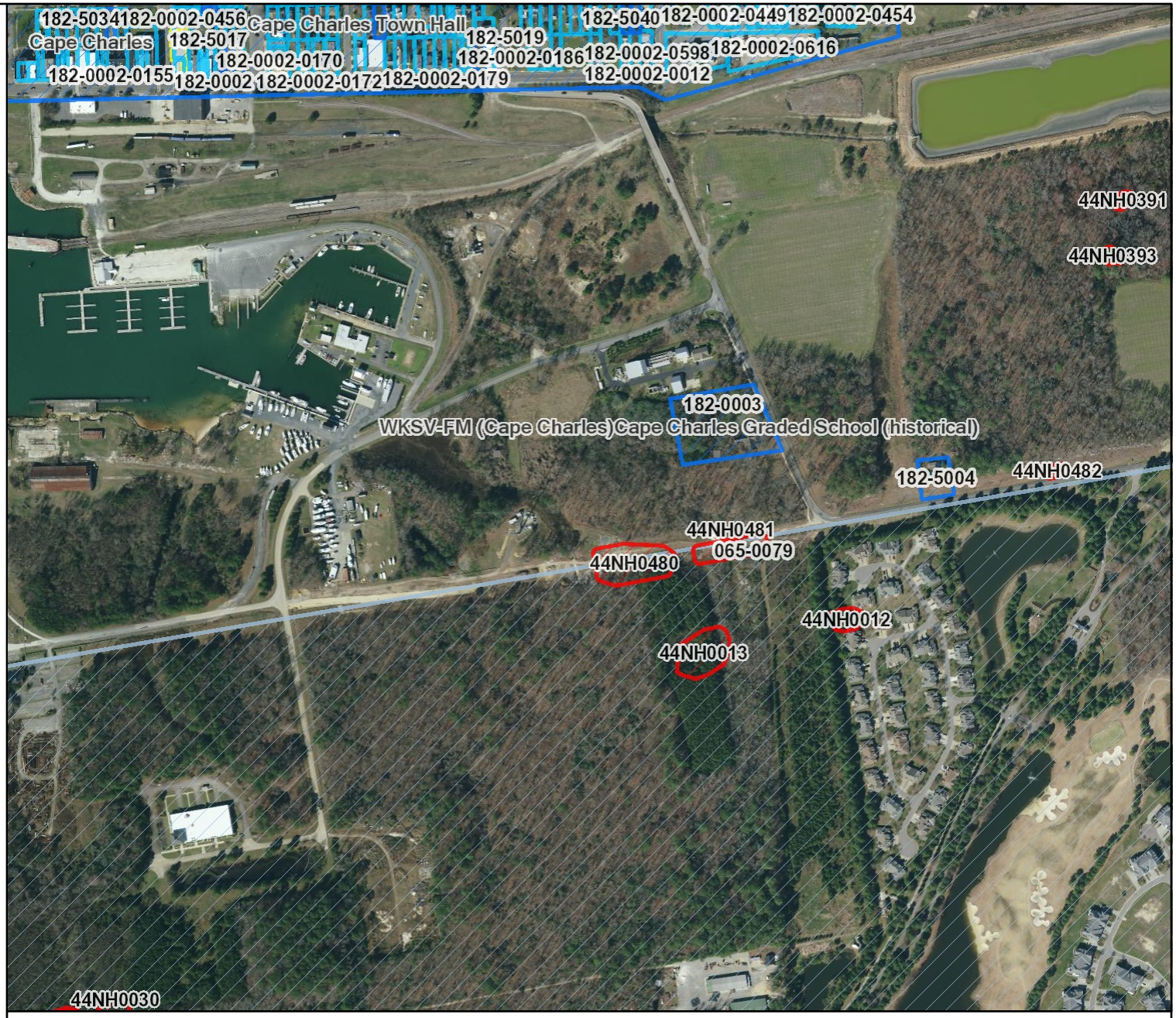

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APPENDIX D:

Site Photographs

Figure 1 - Route 642 (2, 4' wide shoulders)

Figure 2 - Recently completed ditch between Route 642 and Virginia Port Authority property. Potential trail alignments (2B, 2C) could follow.

Figure 3 - Gravel road at base of "The Hump" follows proposed 2B, 2C alignments

Figure 4 - Railroad tie remains, ballast stone mostly removed

Figure 5 - Phase I trailhead with bathroom amenities (right)

Figure 6 - Dense vegetation and elevated railbed (right) behind Kiptopeke Elementary School

Figure 7 - Phase 3A Park and Ride at Parsons drive encroachment- gravel driveway within former rail right-of-way

Figure 8 - Stone Road and Parsons Road Intersection

Figure 9 - Stone Road is shoulderless for approximately 360' after Parsons Road intersection.

Figure 10 - Steep, grassed shoulders to deep ditches impede the construction of a trail along the recently completed Route 642. The best location, if not within drainage easement, would be north of ditches.

Figure 11 - Route 13 and Stone Road Intersection

Figure 12 - Former railbed, densely forested behind Food Lion shopping center

Figure 13 - Compromised bicyclists crossing rail at Stone Road/Route 13 intersection

Figure 14 - Stone Road and Eastern Shore Railroad corridor is lined with power poles and crepe myrtles approximately 42' from nearest rail

Figure 15 - Potential trailhead location at Cape Charles Museum would require some asphalt parking and connectivity to meet ADA requirements.

Figure 16 - Stone Road has a 4' shoulder that is often used by bicyclists adjacent to vehicle traffic.

Figure 17 - Recently completed Route 642 does not provide pedestrian or bicycle crossing accommodations.

Figure 18 - Roadside table (picnic area) that could be used for bridge landing or possibly park and ride.

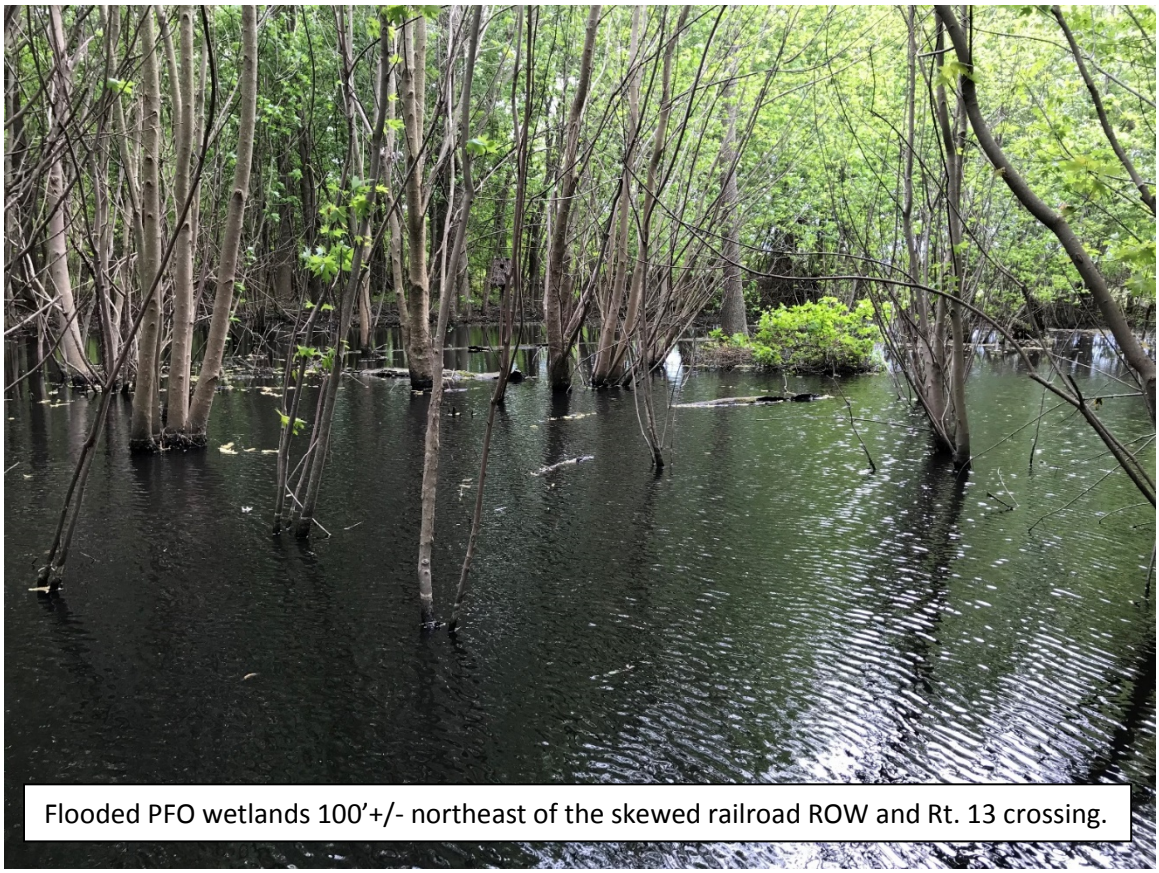
Figure 19 - Forested area is the former rail right-of-way at its intersection with Route 13.

Figure 20 - Northern terminus of Phase II of Southern Tip Trail, under construction April 2018.

PEM wetland north of the Food Lion Shopping Center and southwest of the SWM pond.

PFO wetland north of the Food Lion Shopping Center and southwest of the SWM pond.

PEM and PSS wetlands 500’+/- east of the Parsons Circle and Rt. 13 Intersection.



Flooded PFO wetlands 100’+/- northeast of the skewed railroad ROW and Rt. 13 crossing.

Flooded PFO wetlands 600'+/- northeast of the Parsons Circle and Rt. 13 Intersection. Several small potentially jurisdictional stream channels are the headwaters of Old Plantation Creek.

APPENDIX E:

USGS Soils Survey

United States Department of Agriculture

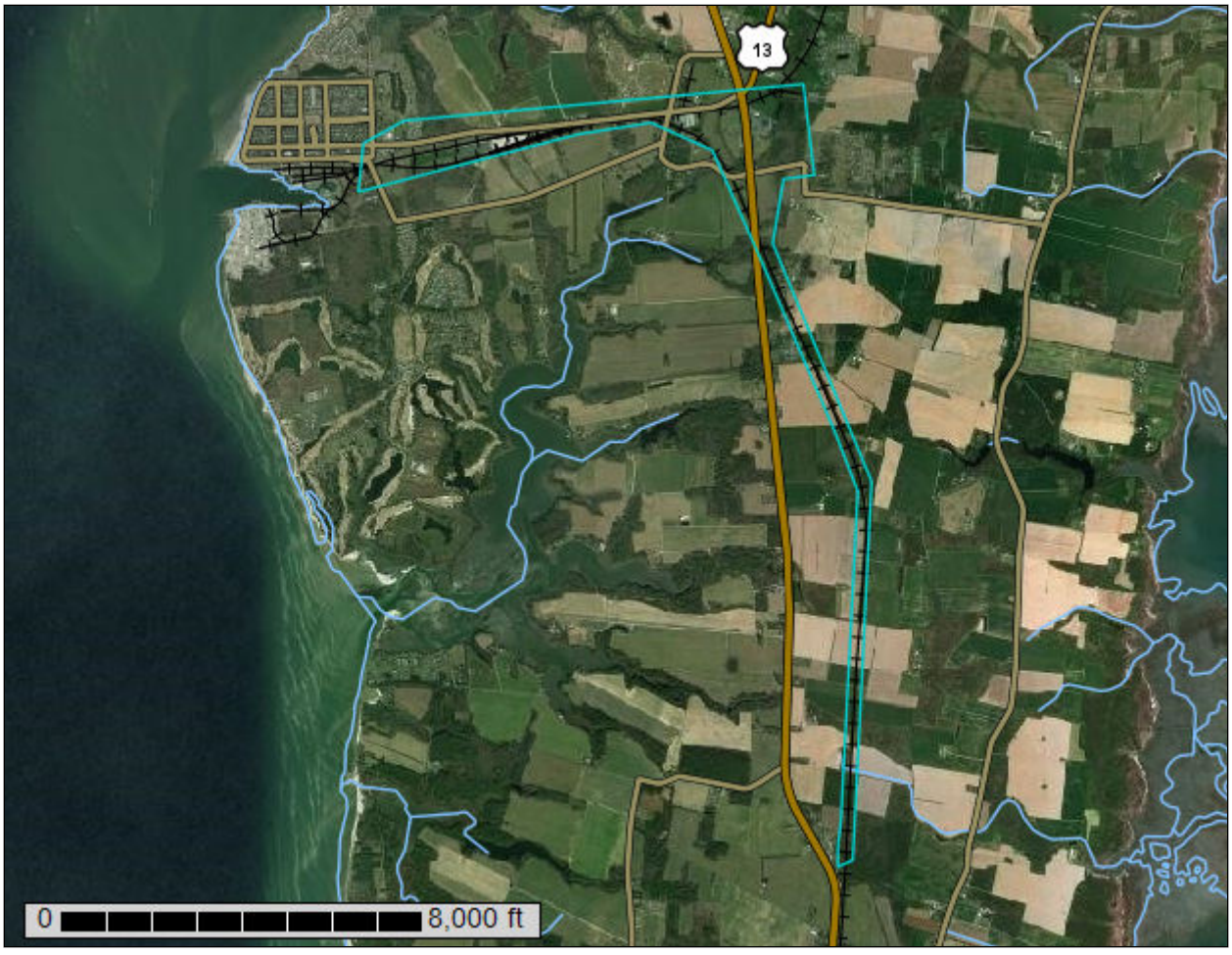
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Northampton County, Virginia

Southern Tip - Phase III Soils Survey



May 6, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

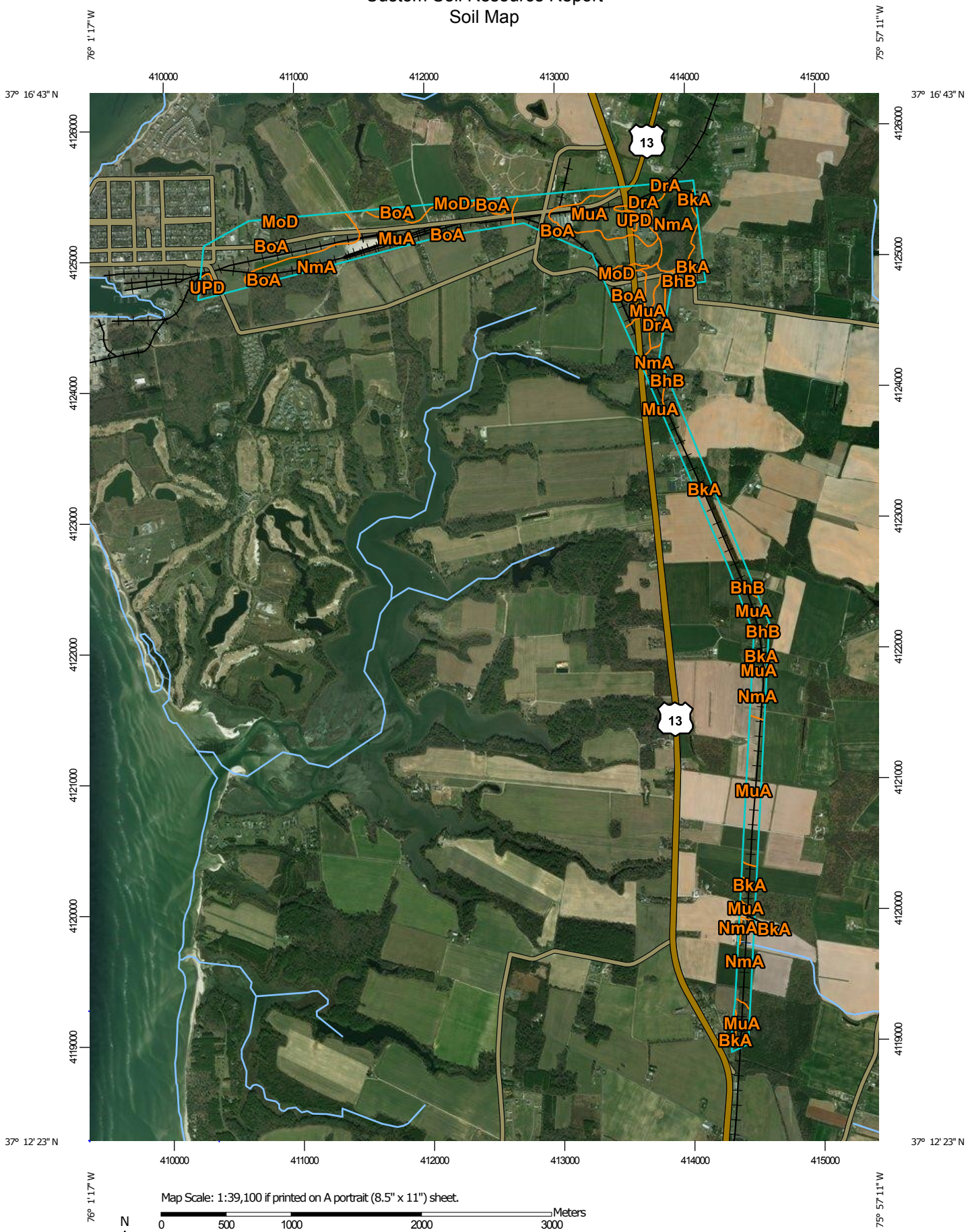
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


76° 1' 17" W
75° 57' 11" W
37° 16' 43" N
37° 12' 23" N
410000
411000
412000
413000
414000
415000
4126000
4125000
4124000
4123000
4122000
4121000
4120000
4119000
13
MoD
BoA
MuA
NmA
UPD
DrA
BkA
BhB
Map Scale: 1:39,100 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 500 1000 2000 3000
Feet
0 1500 3000 6000 9000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Northampton County, Virginia
Survey Area Data: Version 11, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Mar 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhB	Bojac loamy sand, 2 to 6 percent slopes	6.5	1.0%
BkA	Bojac sandy loam, 0 to 2 percent slopes	83.7	13.3%
BoA	Bojac fine sandy loam, 0 to 2 percent slopes	201.9	32.0%
DrA	Dragston fine sandy loam, 0 to 2 percent slopes	14.9	2.4%
MoD	Molena loamy sand, 6 to 35 percent slopes	6.7	1.1%
MuA	Munden sandy loam, 0 to 2 percent slopes	221.2	35.1%
NmA	Nimmo sandy loam, 0 to 2 percent slopes	88.3	14.0%
UPD	Udorthents and Udipsamments soils, 0 to 30 percent slopes	6.6	1.0%
W	Water, less than 40 acres	0.8	0.1%
Totals for Area of Interest		**630.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Northampton County, Virginia

BhB—Bojac loamy sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 40kn
Elevation: 10 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bojac and similar soils: 80 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bojac

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits

Typical profile

H1 - 0 to 6 inches: loamy sand
H2 - 6 to 38 inches: fine sandy loam
H3 - 38 to 60 inches: fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 4 percent
Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Hydric soil rating: Yes

BkA—Bojac sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 40kp
Elevation: 10 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bojac and similar soils: 80 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bojac

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 9 inches: sandy loam
H2 - 9 to 32 inches: fine sandy loam
H3 - 32 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 4 percent
Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

BoA—Bojac fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 40kq
Elevation: 10 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Bojac and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bojac

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 32 inches: fine sandy loam
H3 - 32 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Polawana

Percent of map unit: 6 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Nimmo

Percent of map unit: 2 percent
Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

DrA—Dragston fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 40kt
Elevation: 0 to 50 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Dragston and similar soils: 80 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dragston

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 6 inches: fine sandy loam

H2 - 6 to 45 inches: loam
H3 - 45 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Minor Components

Polawana

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

MoD—Molena loamy sand, 6 to 35 percent slopes

Map Unit Setting

National map unit symbol: 40kz
Elevation: 10 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Molena and similar soils: 85 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Molena

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile
H1 - 0 to 5 inches: loamy sand
H2 - 5 to 46 inches: loamy sand
H3 - 46 to 72 inches: sand

Properties and qualities
Slope: 6 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Polawana
Percent of map unit: 7 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

MuA—Munden sandy loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 40l0
Elevation: 0 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Munden and similar soils: 80 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Munden

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 42 inches: loam
H3 - 42 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 7 percent
Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Polawana

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

NmA—Nimmo sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 40l1
Elevation: 10 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Nimmo and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nimmo

Setting

Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 7 inches: sandy loam
H2 - 7 to 43 inches: loam
H3 - 43 to 65 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

UPD—Udorthents and Udipsamments soils, 0 to 30 percent slopes

Map Unit Setting

National map unit symbol: 40l4
Elevation: 0 to 80 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 55 to 64 degrees F
Frost-free period: 200 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 40 percent
Udipsamments and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Udipsamments

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Marine deposits

Typical profile

H1 - 0 to 6 inches: fine sand
H2 - 6 to 60 inches: sand

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 18 to 48 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Nimmo

Percent of map unit: 5 percent
Landform: Carolina bays
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Chincoteague

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Polawana

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Magotha

Percent of map unit: 5 percent
Landform: Salt marshes
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

W—Water, less than 40 acres

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX F:

Bridge Details and
Exhibits

Figure 1 *– Crossing at Stone Road, within VDOT Right-of-Way*

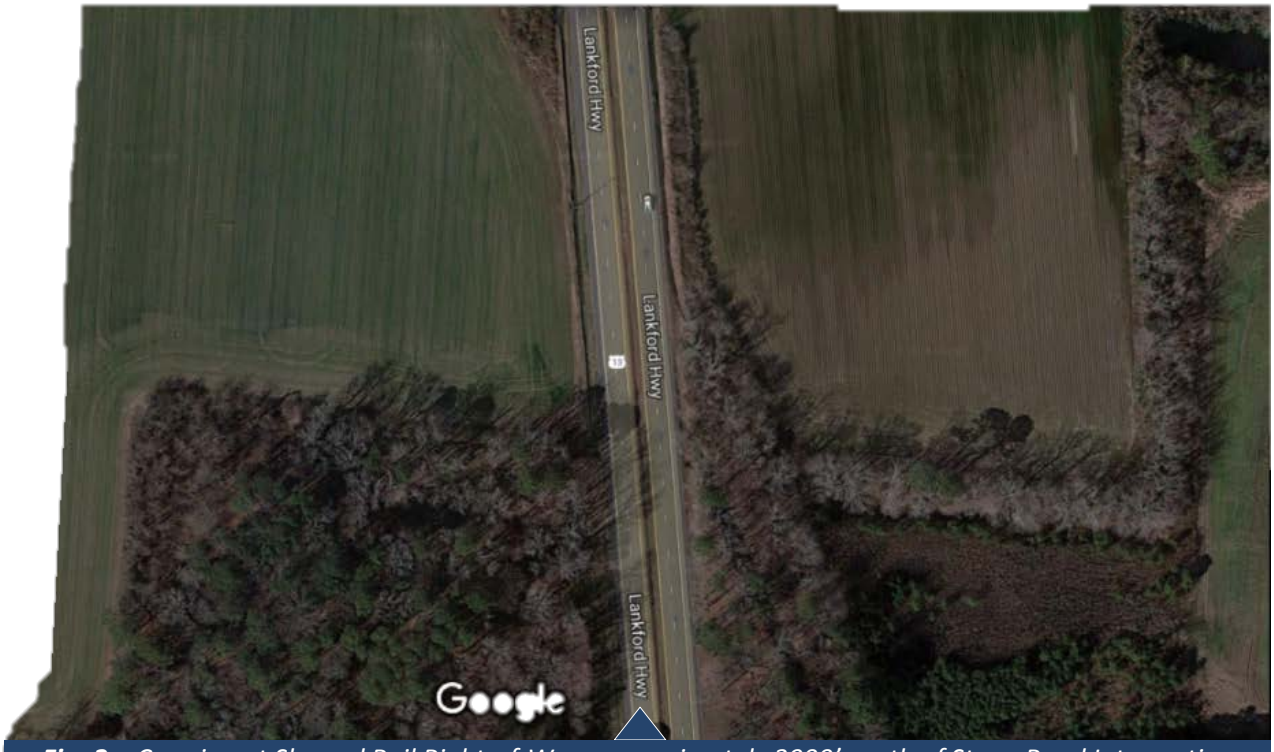
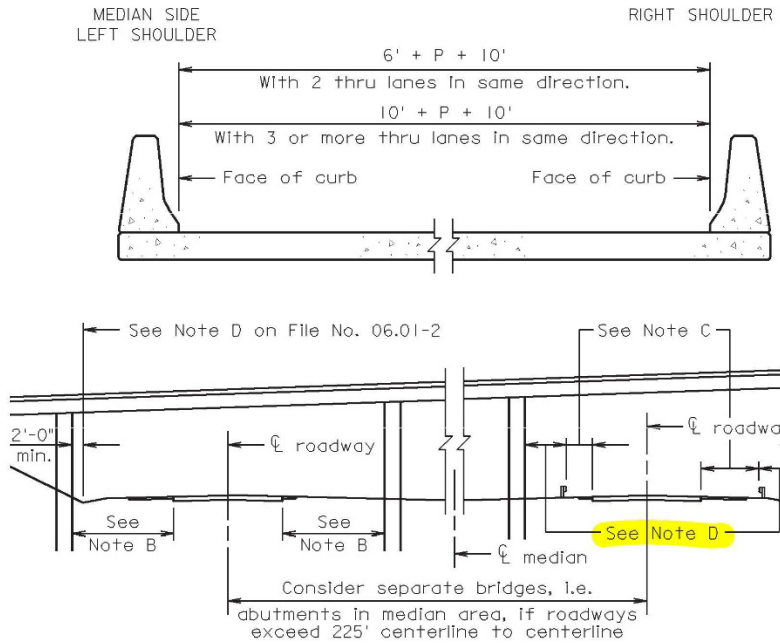


Fig. 2 *– Crossing at Skewed Rail Right-of-Way, approximately 3900' south of Stone Road Intersection*



RURAL PRINCIPAL ARTERIAL SYSTEM

Notes:

A. The minimum vertical clearance shall be 16'-6". Vertical clearance less than 16'-6" requires a design exception.

B. The minimum horizontal clearance shall equal or exceed the clear zone distances shown in Table 1 on File No. 06.03-4.

C. Guardrail or median barrier shall be used as shown when the required minimum horizontal clearance cannot be provided or such clearance cannot be economically justified. For guardrail offset, see Tables 1 and 2 on Standard GR-INS, sheet 6 of 8, of VDOT *Road and Bridge Standards*. Offset should be confirmed with the road designer.

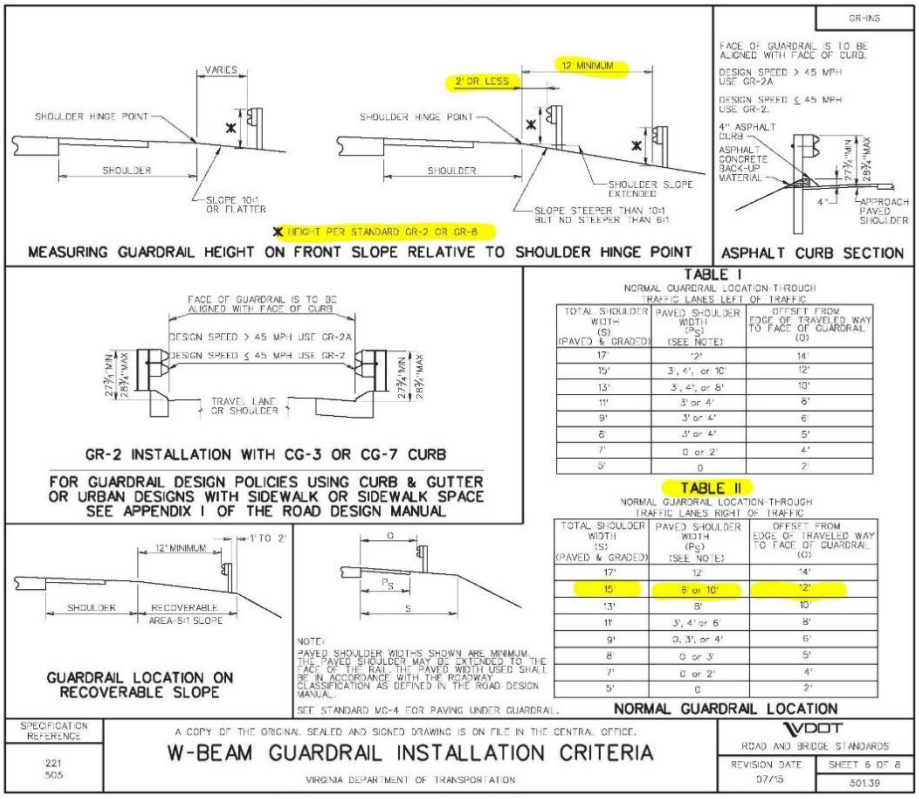
D. When required, guardrail shall be located to provide the clearance shown on Standard GR-INS, sheet 3 of 8, of VDOT *Road and Bridge Standards* corresponding to the maximum dynamic deflection of the guardrail being used. The overall dimension shall account for the guardrail width and should be confirmed with the road designer.

E. For additional requirements for curved bridges and tangent bridges with a horizontal curve located on the roadway at either end, see File No. 06.03-1.

GEOMETRICS ROAD CLASSIFICATIONS RURAL PRINCIPAL ARTERIAL SYSTEM	PART 2 DATE: 09July2012 SHEET 2 of 16 FILE NO. 06.02-2

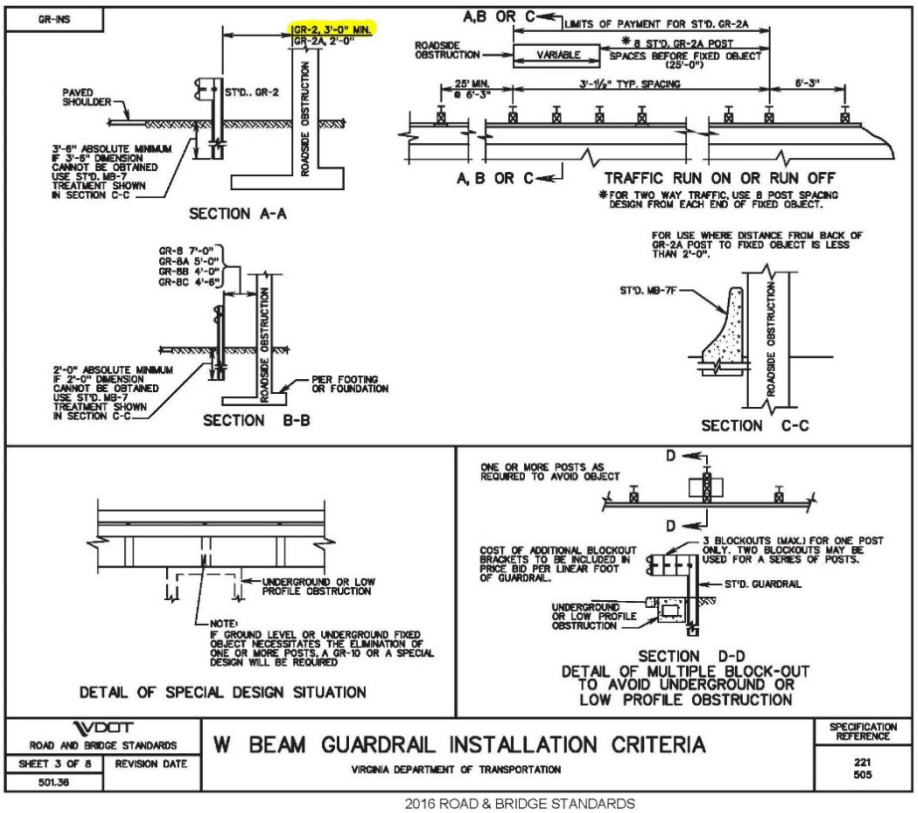
***Figure 14** – VDOT requirements for clear zones*

2016 ROAD & BRIDGE STANDARDS



2016 ROAD & BRIDGE STANDARDS

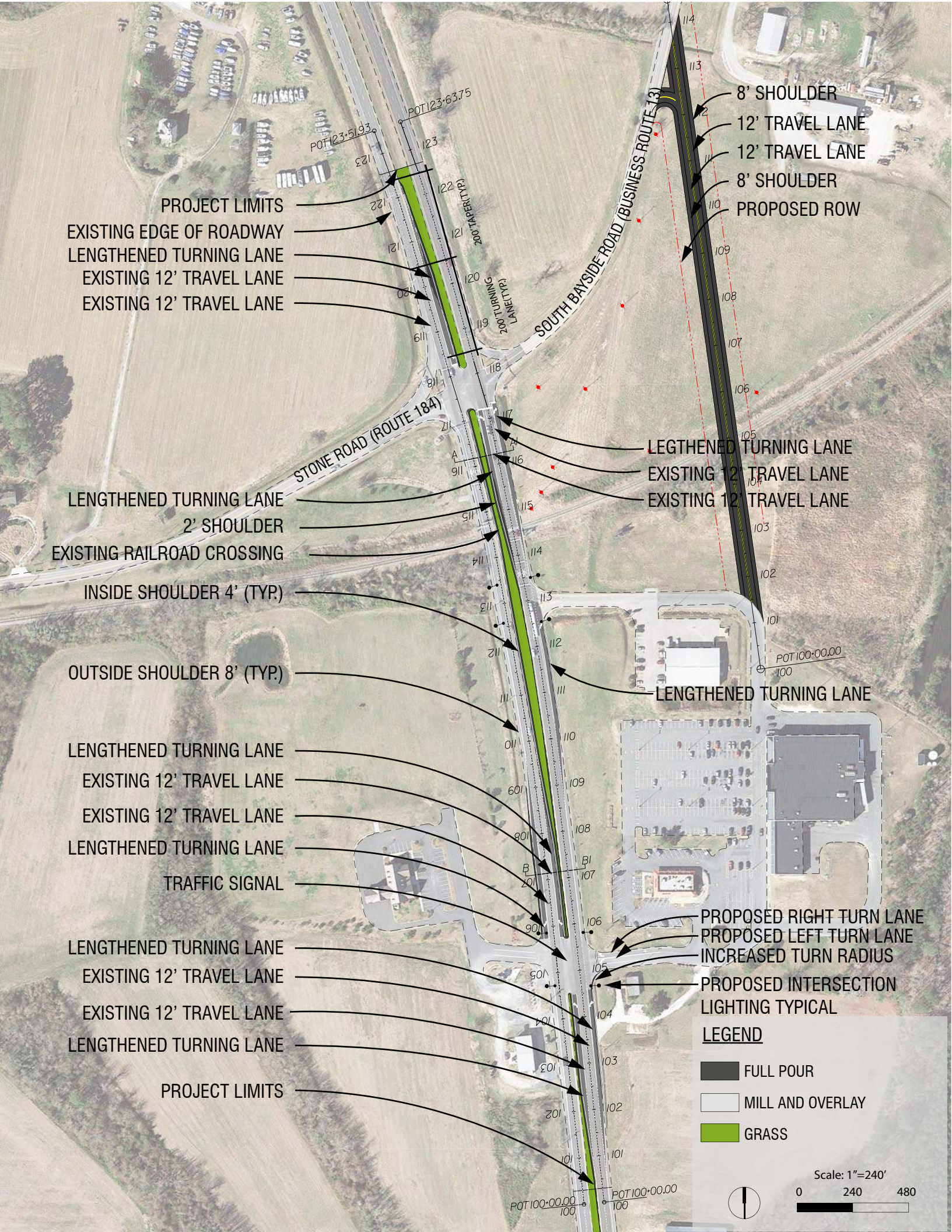
2016 ROAD & BRIDGE STANDARDS



2016 ROAD & BRIDGE STANDARDS

APPENDIX G:

Roadway
Development
Plans


PROJECT LIMITS
EXISTING EDGE OF ROADWAY
LENGTHENED TURNING LANE
EXISTING 12' TRAVEL LANE
EXISTING 12' TRAVEL LANE
LENGTHENED TURNING LANE
2' SHOULDER
EXISTING RAILROAD CROSSING
INSIDE SHOULDER 4' (TYP.)
OUTSIDE SHOULDER 8' (TYP.)
LENGTHENED TURNING LANE
EXISTING 12' TRAVEL LANE
EXISTING 12' TRAVEL LANE
LENGTHENED TURNING LANE
TRAFFIC SIGNAL
LENGTHENED TURNING LANE
EXISTING 12' TRAVEL LANE
EXISTING 12' TRAVEL LANE
LENGTHENED TURNING LANE
PROJECT LIMITS
8' SHOULDER
12' TRAVEL LANE
12' TRAVEL LANE
8' SHOULDER
PROPOSED ROW
LEGTHENED TURNING LANE
EXISTING 12' TRAVEL LANE
EXISTING 12' TRAVEL LANE
LENGTHENED TURNING LANE
PROPOSED RIGHT TURN LANE
PROPOSED LEFT TURN LANE
INCREASED TURN RADIUS
PROPOSED INTERSECTION LIGHTING TYPICAL
SOUTH BAYSIDE ROAD (BUSINESS ROUTE 13)
STONE ROAD (ROUTE 184)
200' TAPER (TYP.)
200' TURNING LANE (TYP.)
POT 123+63.75
POT 123+51.93
POT 100+00.00
POT 100+00.00
LEGEND
FULL POUR
MILL AND OVERLAY
GRASS
Scale: 1"=240'
0
240
480

AERIAL OVERVIEW
CAPE CHARLES ROAD (RTE. 642)

Virginia Department of Transportation

Project Location

Cape Charles
Northampton County

North Arrow & Scale

N

SCALE
0 200' 400' 600' 800'

Legend

- Proposed Road
- Stormwater Management Basin
- Existing Right of Way
- Proposed Right of Way Line
- C — Proposed Limits of Construction - Cut
- F — Proposed Limits of Construction - Fill
- Proposed Permanent Drainage Easement
- Proposed Temp. Construction Easement

Contact Information

Wali Zaman, P.E.
Project Manager
Virginia Department of Transportation
1700 N Main Street
Suffolk, Va 23434

Comments may also be sent to:
Wali.Zaman@VDOT.Virginia.gov

Project Name
Northampton County, Virginia

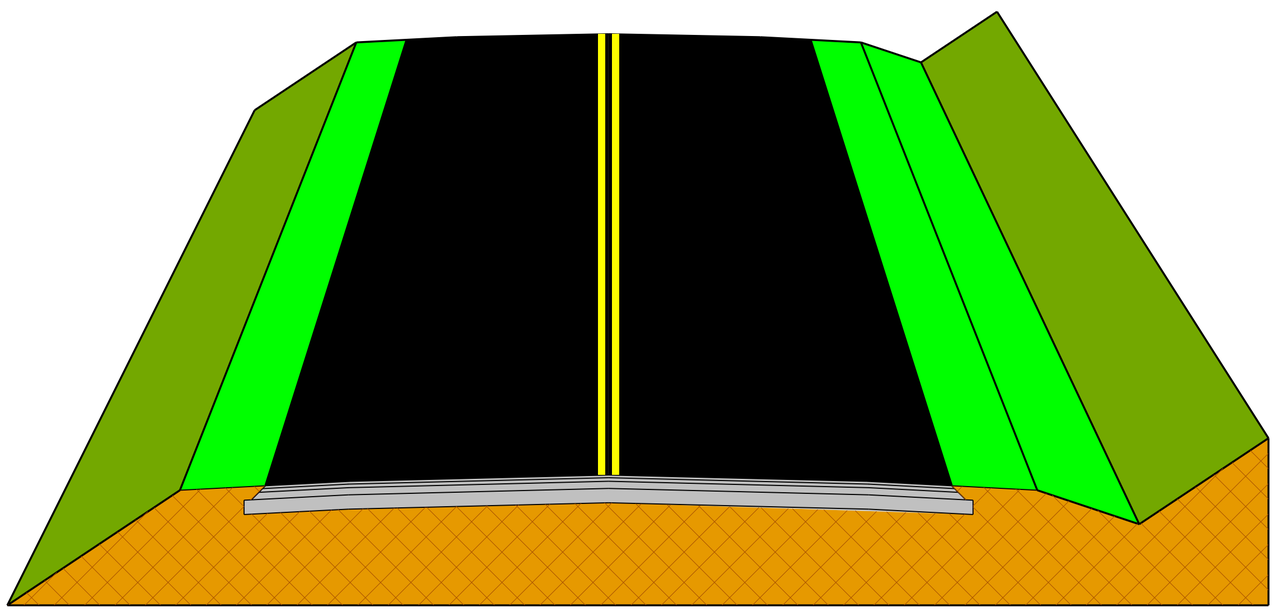
State Project Number 0642-065-577
UPC 103391
Federal Project Number
STP-065-5(027)

These plans are unfinished and unapproved and are not to be used for any type of construction or the acquisition of right of way. Additional easements for utility relocations may be required beyond the propposed right-of-way shown on these plans.

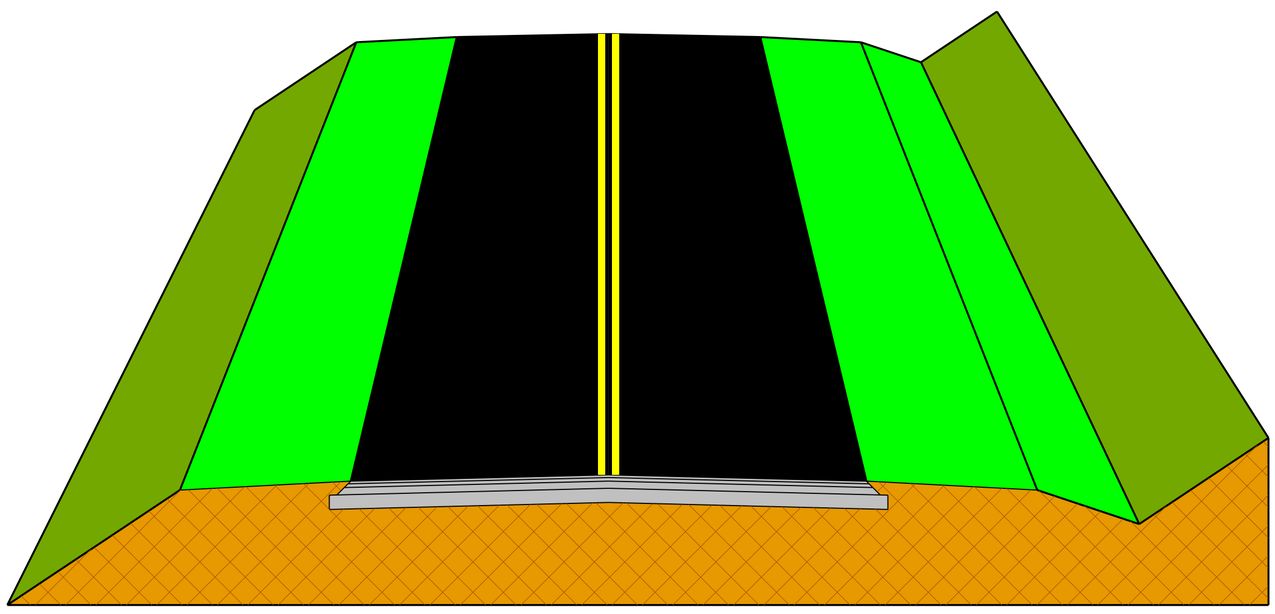
Virginia Department of Transportation

TYPICAL SECTIONS
CAPE CHARLES ROAD (RTE. 642)

Route 642



Route 642 Connection



PROJECT MANAGER Walt Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads) 8/3/2015
DESIGN BY Michael Baker International (757) 631-8770 ---
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015

FOR INDEX OF SHEETS SEE SHEET 1B

THIS PROJECT WAS DEVELOPED UTILIZING THE DEPARTMENT'S ENGINEERING DESIGN PACKAGE (GEOPAK).
GEOPAK Computer Identification No. 103391

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF TRANSPORTATION

PLAN AND PROFILE OF PROPOSED STATE HIGHWAY

COUNTY OF NORTHAMPTON
ROUTE 642, OLD CAPE CHARLES ROAD
FROM: FROM ROUTE 1117
TO: 0.61 MILES WEST OF ROUTE 641 ON ROUTE 184

FHWA 534 DATA 14004
UPC NO. 103391

STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
VA.	STP-065-5(027) (SEE TABULATION BELOW FOR SECTION NUMBERS)	642	(NFO) 0642-065-577 (SEE TABULATION BELOW FOR SECTION NUMBERS)	1

FUNCTIONAL CLASSIFICATION AND TRAFFIC DATA (NON NHS)

ROUTE 642 - RURAL MAJOR COLLECTOR (GS-3) - LEVEL - 40 MPH MIN. DES. SPEED

Fr: From Route 1117
To: 0.61 Miles West of Route 641 on Route 184

	Fr: Sta. 100+00.00 To: Sta. 121+93.56	Fr: Sta. 121+93.56 To: Sta. 137+60.65	Fr: Sta. 137+60.65 To: Sta. 178+45.89
ADT (2014)	0	1150	0
ADT (2039)	2025	3100	2400
DHV	215	330	252
D (%) (design hour)	50/50		
T (%) (design hour)	4%		
V (MPH)	*		
DESIGN VEHICLE	WB-62		

*SEE PLAN AND PROFILE SHEETS FOR HORIZONTAL AND VERTICAL CURVE DESIGN SPEEDS.

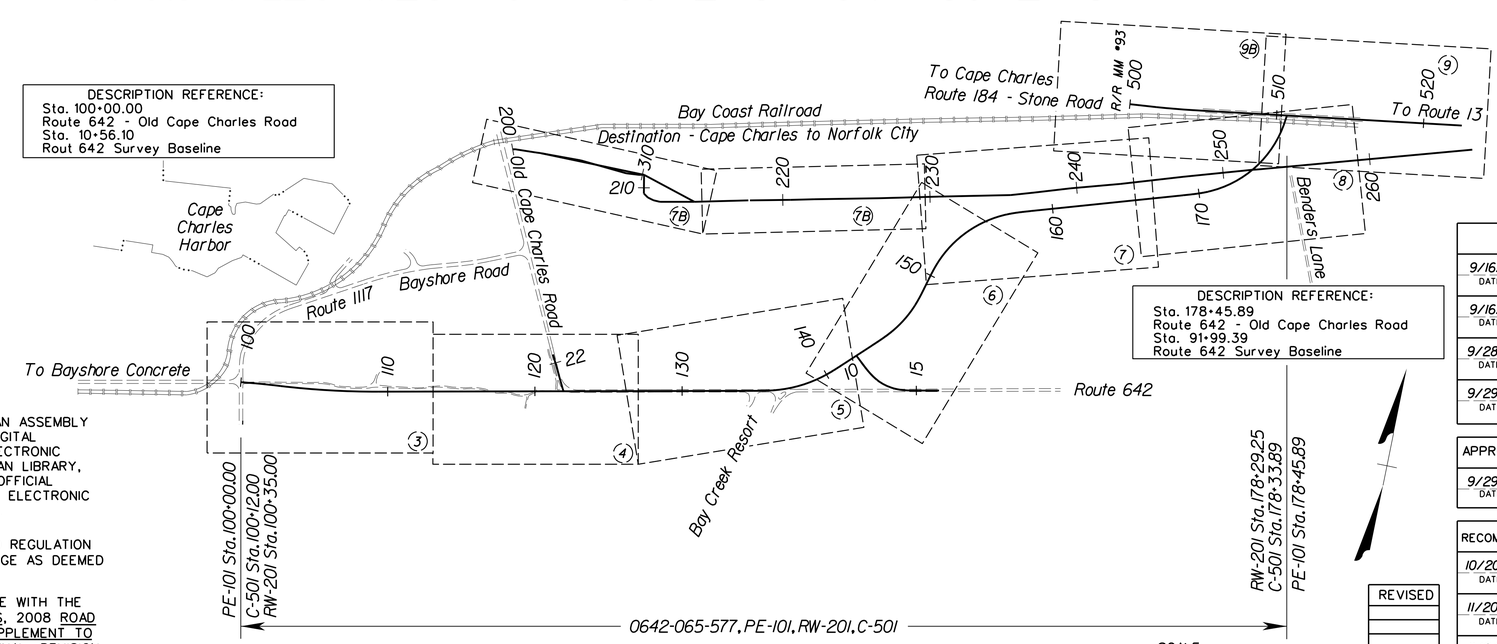
FOR FUNCTIONAL CLASSIFICATION AND TRAFFIC DATA (NON NHS) FOR ROUTE 184 (STONE ROAD), CHARLES CONNECTOR ROAD AND OLD CAPE CHARLES ROAD, SEE SHEET 1A

FUNCTIONAL CLASSIFICATIONS WERE UPDATED FEBRUARY 2015 AFTER THE PROJECT DESIGN CRITERIA DECISION

CONVENTIONAL SIGNS

STATE LINE
COUNTY LINE
CITY,TOWN OR VILLAGE
RIGHT OF WAY LINE
FENCE LINE
UNFENCED PROPERTY LINE
FENCED PROPERTY LINE
WATER LINE
SANITARY SEWER LINE
GAS LINE
ELECTRIC UNDERGROUND CABLE
TRAVELED WAY
GUARD RAIL
RETAINING WALL
RAILROADS
BASE OR SURVEY LINE

LEVEE OR EMBANKMENT
BRIDGES
CULVERTS
DROP INLET
POWER POLES
TELEPHONE OR TELEGRAPH POLES
TELEPHONE OR TELEGRAPH LINES
HEDGE
TREES
HEAVY WOODS
GROUND ELEVATION
GRADE ELEVATION



THE COMPLETE ELECTRONIC PDF VERSION OF THE PLAN ASSEMBLY AS AWARDED, HAS BEEN SEALED AND SIGNED USING DIGITAL SIGNATURES AND THE OFFICIAL PLAN ASSEMBLY IN ELECTRONIC FORMAT IS STORED IN THE VDOT CENTRAL OFFICE PLAN LIBRARY, INCLUDING ALL SUBSEQUENT REVISIONS, WILL BE THE OFFICIAL CONSTRUCTION PLANS. FOR INFORMATION RELATIVE TO ELECTRONIC FILES AND LAYERED PLANS, SEE THE GENERAL NOTES.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT.

THIS PROJECT IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT'S 2007 ROAD AND BRIDGE SPECIFICATIONS, 2008 ROAD AND BRIDGE STANDARDS, 2009 MUTCD, 2011 VIRGINIA SUPPLEMENT TO THE MUTCD, 2011 VIRGINIA WORK AREA PROTECTION MANUAL, REVISION 1 APRIL 1, 2015 AND AS AMENDED BY CONTRACT PROVISIONS AND THE COMPLETE ELECTRONIC PDF VERSION OF THE PLAN ASSEMBLY.

ALL CURVES ARE TO BE SUPERELEVATED, TRANSITIONED AND WIDENED IN ACCORDANCE WITH STANDARD TC-5.11 R, EXCEPT WHERE OTHERWISE NOTED.

THE ORIGINAL APPROVED TITLE SHEET(S), INCLUDING ORIGINAL SIGNATURES, ARE FILED IN THE VDOT CENTRAL OFFICE PLAN LIBRARY. ANY MISUSE OF ELECTRONIC FILES, INCLUDING SCANNED SIGNATURES, IS ILLEGAL AND ENFORCED TO THE FULL EXTENT OF THE LAW.

Northampton County Population 12,121 (2014 Census)

STATE PROJECT NO.	SECTION	FEDERAL AID PROJECT NO.	TYPE CODE	UPC NO.	EQUALITIES	LENGTH INCLUDING BRIDGE(S)		LENGTH EXCLUDING BRIDGE(S)		BRIDGE PROJECT NO.	TYPE PROJECT	DESCRIPTION
					FEET	FEET	MILES	FEET	MILES			
0642-065-577	PE-101	STP-065-5(027)	PENG	103391	NONE	7,845.89	1.486	7,845.89	1.486		Prel. Engr.	FROM: FROM ROUTE 1117 TO: 0.61 MILES WEST OF ROUTE 641 ON ROUTE 184
	RW-201	STP-065-5(031)	ROWA	103391	NONE	7,794.25	1.476	7,794.25	1.476		R.O.W.	
	C-501	STP-065-5(032)	1000	103391	NONE	7,821.89	1.481	7,821.89	1.481		CONSTR.	

Project Lengths are based on Construction Baseline.

TIER 2 PROJECT

RECOMMENDED FOR APPROVAL FOR RIGHT OF WAY ACQUISITION

9/16/15 DATE	Kim Pryor INFRASTRUCTURE INVESTMENT DIRECTOR
9/16/15 DATE	B.A. Thrasher STATE LOCATION AND DESIGN ENGINEER
9/28/15 DATE	John W Lawson CHIEF FINANCIAL OFFICER
9/29/15 DATE	Garrett Moore CHIEF ENGINEER

APPROVED FOR RIGHT OF WAY ACQUISITION

9/29/15 DATE	Richard L. Walton Jr. CHIEF OF POLICY

RECOMMENDED FOR APPROVAL FOR CONSTRUCTION

10/20/15 DATE	Kim Pryor INFRASTRUCTURE INVESTMENT DIRECTOR
11/20/15 DATE	B.A. Thrasher STATE LOCATION AND DESIGN ENGINEER
11/24/15 DATE	John W Lawson CHIEF FINANCIAL OFFICER

APPROVED FOR CONSTRUCTION

11/30/15 DATE	Mohammad Mirshahi CHIEF ENGINEER

APPROVED

DATE	DIVISION ADMINISTRATOR FEDERAL HIGHWAY ADMINISTRATION U.S. DEPARTMENT OF TRANSPORTATION

REVISED

PROJECT MANAGER Wali Zaman, P.E. (757) 925-1605 (Hampton Roads) _____
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads) 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770. _____.
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015. _____.

REVISED	STATE	STATE		SHEET NO.
		ROUTE	PROJECT	
11/30/16 1/24/17 2/2/18	VA.	642	0642-065-577, RW-201, C-501	IB

DESIGN FEATURES RELATING TO CONSTRUCTION
OR TO REGULATION AND CONTROL OF TRAFFIC
MAY BE SUBJECT TO CHANGE AS DEEMED
NECESSARY BY THE DEPARTMENT

INDEX OF SHEETS

TOTAL CROSS SECTION SHEETS 52 (SEE CROSS SECTION SHEET NUMBER X-1 FOR INDEX OF SHEETS)

NOTE: CADD Level Structure Sheet no longer required In Plan Assembly per CADD Manual Revision November 04, 2013

	PROJECT	SHEET NO.
	0642-065-577	IB

PROJECT MANAGER Wall Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015.

FLEXIBLE PAVEMENT TYPICAL SECTION ALTERNATIVE

COMMONWEALTH OF VIRGINIA
CHARLES G. EASTMAN
Lic. No. 33233
PROFESSIONAL ENGINEER

Michael Baker International
Virginia Beach, Virginia
Roadway

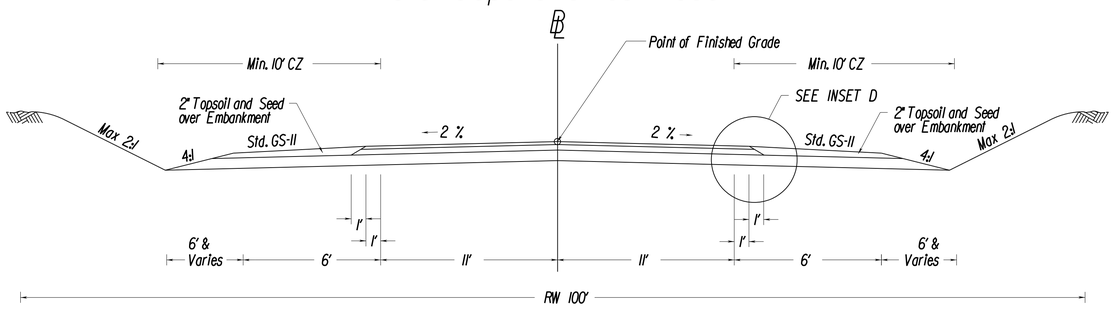
REVISED	STATE	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.	642	0642-065-577, RW-201, C-501	2A(1)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

PAVEMENT DESIGN

1. 2" ASPHALT CONCRETE, TYPE SM-12.5D @ 220 LBS. PER SQ. YD.
2. 4" ASPHALT CONCRETE BASE COURSE, TYPE BM-25.0A
3. 8" UNTREATED DENSE-GRADED AGGREGATE BASE MAT'L, SIZE 21B
4. GRADE SEPARATION GEOTEXTILE FABRIC
5. 10" UNTREATED DENSE-GRADED AGGREGATE SUBBASE MAT'L, SIZE 21B
6. 7" PLAIN HYDRAULIC CEMENT CONCRETE
7. 7" UNTREATED DENSE-GRADED AGGREGATE SUBBASE MAT'L, SIZE 21B

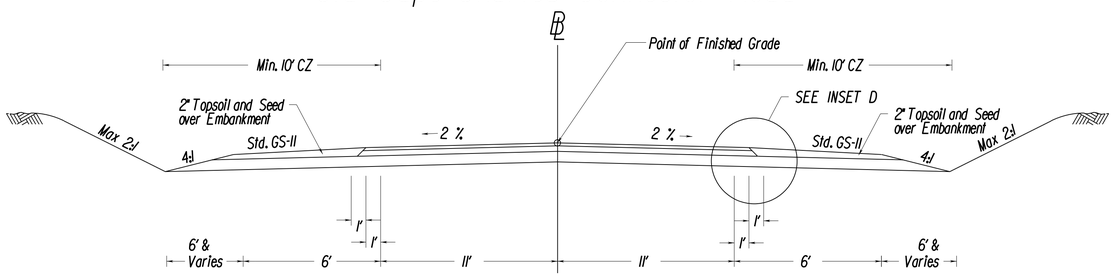
Old Cape Charles Road



STATION 20+12.46 TO STATION 22+00.00

Pavement Structure Extended 1' On The Same Slope Into The Shoulder To Eliminate Unraveling At The Pavement Edge.

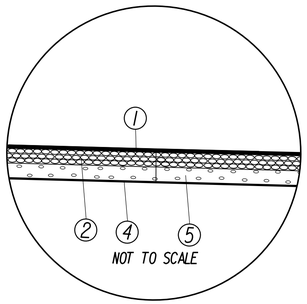
Old Cape Charles Connector Road



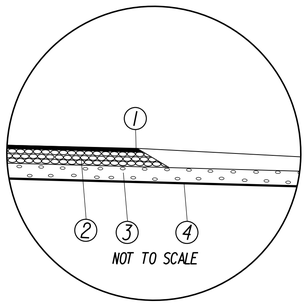
STATION 10+12.00 TO STATION 16+00.00

Pavement Structure Extended 1' On The Same Slope Into The Shoulder To Eliminate Unraveling At The Pavement Edge.

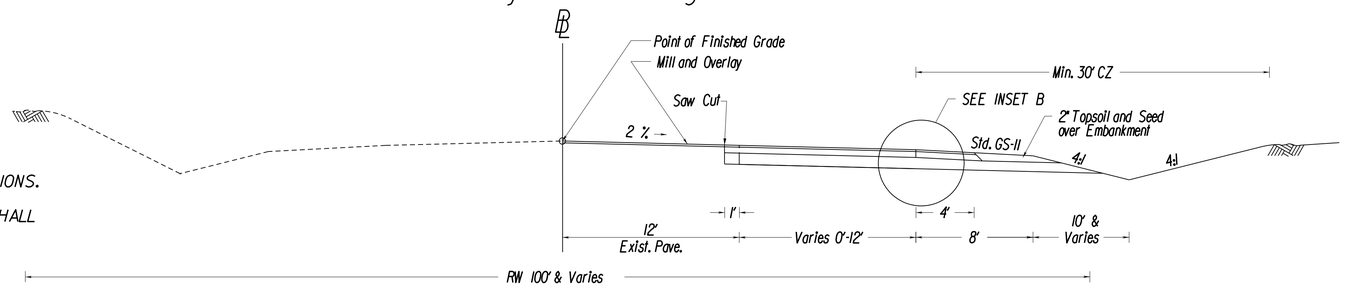
INSET B



INSET D



Route 184 Reconstruction (Stone Road) Overlay & Widening



STATION 505+50.00 TO STATION 517+10.00

LOCATION OF UNSUITABLE MATERIAL

Beginning Station	End Station	Thickness of Unsuitable Material (ft)	Baseline
100+00.00	101+00.00	2.5	Route 642
101+00.00	105+00.00	1.5	Route 642
109+00.00	111+00.00	1.0	Route 642
113+00.00	119+00.00	2.0	Route 642
128+00.00	135+00.00	1.5	Route 642
135+00.00	138+00.00	1.0	Route 642
138+00.00	140+00.00	1.5	Route 642
140+00.00	141+00.00	0.5	Route 642
12+00.00	13+00.00	1.5	Old Cape Charles Connector
13+00.00	15+00.00	2.0	Old Cape Charles Connector
15+00.00	16+00.00	3.0	Old Cape Charles Connector
143+00.00	144+00.00	1.0	Route 642
174+00.00	176+00.00	2.5	Route 642
176+00.00	178+29.25	2.0	Route 642
514+00.00	517+14.65	2.0	Route 184

See cross sections for limits of unsuitable material.

NOTES:

1. FOR DITCH DEPTH REFER TO PLANS AND CROSS-SECTIONS.
2. THE MINIMUM BORROW MATERIAL FOR THIS PROJECT SHALL BE SELECT MATERIAL TYPE II, MINIMUM CBR-10.
3. UNTREATED AGGREGATE BASE MATERIAL TO BE DAY-LIGHTED TO THE FACE OF THE DITCH.
4. PAVEMENT WIDENING ALONG ROUTE 184 SHALL BE PER VDOT STANDARD WP-2.

	PROJECT	SHEET NO.
	0642-065-577	2A(1)

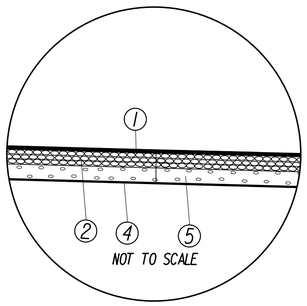
PROJECT MANAGER Wali Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015.

RIGID PAVEMENT TYPICAL SECTIONS ALTERNATIVE

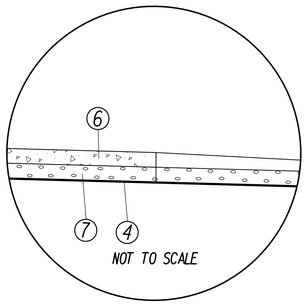
PAVEMENT DESIGN

1. 2" ASPHALT CONCRETE, TYPE SM-12.5D @ 220 LBS. PER SQ. YD.
2. 4" ASPHALT CONCRETE BASE COURSE, TYPE BM-25.0A
3. 8" UNTREATED DENSE-GRADED AGGREGATE BASE MAT'L, SIZE 21B
4. GRADE SEPARATION GEOTEXTILE FABRIC
5. 10" UNTREATED DENSE-GRADED AGGREGATE SUBBASE MAT'L, SIZE 21B
6. 7" PLAIN HYDRAULIC CEMENT CONCRETE
7. 7" UNTREATED DENSE-GRADED AGGREGATE SUBBASE MAT'L, SIZE 21B

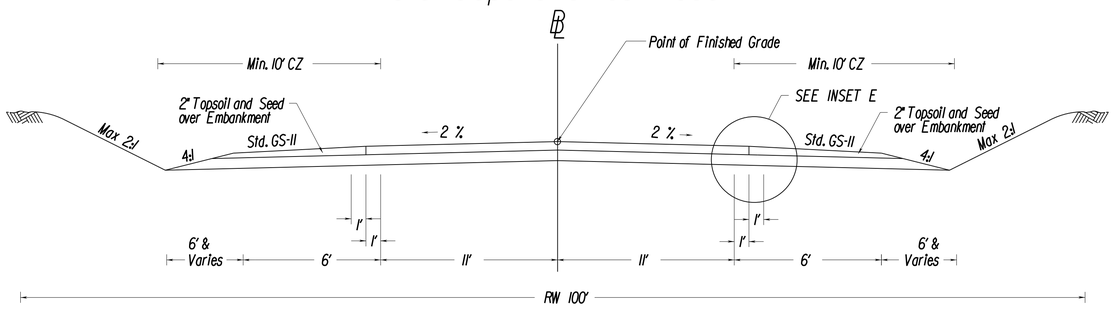
INSET B



INSET E



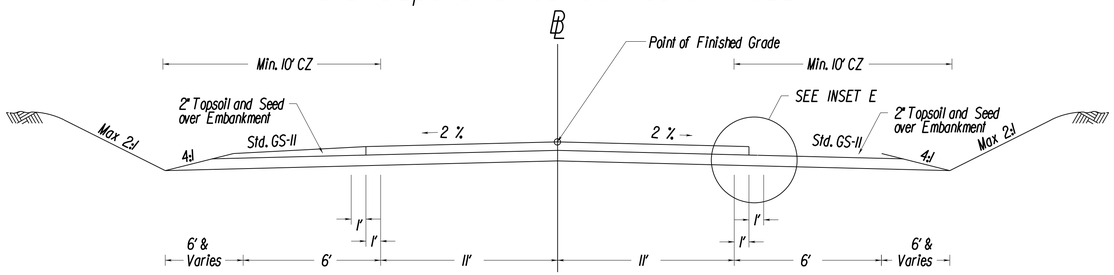
Old Cape Charles Road



STATION 20+12.46 TO STATION 22+00.00

Pavement Structure Extended 1' On The Same Slope Into The Shoulder To Eliminate Unraveling At The Pavement Edge.

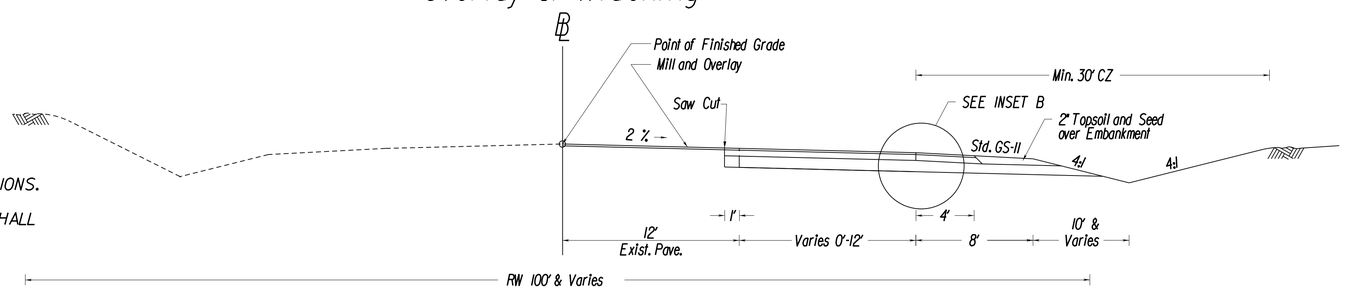
Old Cape Charles Connector Road



STATION 10+12.00 TO STATION 16+00.00

Pavement Structure Extended 1' On The Same Slope Into The Shoulder To Eliminate Unraveling At The Pavement Edge.

Route 184 Reconstruction (Stone Road) Overlay & Widening



STATION 505+50.00 TO STATION 517+10.00

NOTES:

1. FOR DITCH DEPTH REFER TO PLANS AND CROSS-SECTIONS.
2. THE MINIMUM BORROW MATERIAL FOR THIS PROJECT SHALL BE SELECT MATERIAL TYPE II, MINIMUM CBR-10.
3. UNTREATED AGGREGATE BASE MATERIAL TO BE DAY-LIGHTED TO THE FACE OF THE DITCH.
4. PAVEMENT WIDENING ALONG ROUTE 184 SHALL BE PER VDOT STANDARD WP-2.

COMMONWEALTH OF VIRGINIA
CHARLES G. EASTMAN
Lic. No. 33233
PROFESSIONAL ENGINEER

Michael Baker International
Virginia Beach, Virginia
Roadway

REVISED	STATE	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.	642	0642-065-577, RW-201, C-501	2B(1)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

LOCATION OF UNSUITABLE MATERIAL

Beginning Station	End Station	Thickness of Unsuitable Material (ft)	Baseline
100+00.00	101+00.00	2.5	Route 642
101+00.00	105+00.00	1.5	Route 642
109+00.00	111+00.00	1.0	Route 642
113+00.00	119+00.00	2.0	Route 642
128+00.00	135+00.00	1.5	Route 642
135+00.00	138+00.00	1.0	Route 642
138+00.00	140+00.00	1.5	Route 642
140+00.00	141+00.00	0.5	Route 642
12+00.00	13+00.00	1.5	Old Cape Charles Connector
13+00.00	15+00.00	2.0	Old Cape Charles Connector
15+00.00	16+00.00	3.0	Old Cape Charles Connector
143+00.00	144+00.00	1.0	Route 642
174+00.00	176+00.00	2.5	Route 642
176+00.00	178+29.25	2.0	Route 642
514+00.00	517+14.65	2.0	Route 184

See cross sections for limits of unsuitable material.

PROJECT	SHEET NO.
0642-065-577	2B(1)

PROJECT MANAGER Wall Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770.
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015.

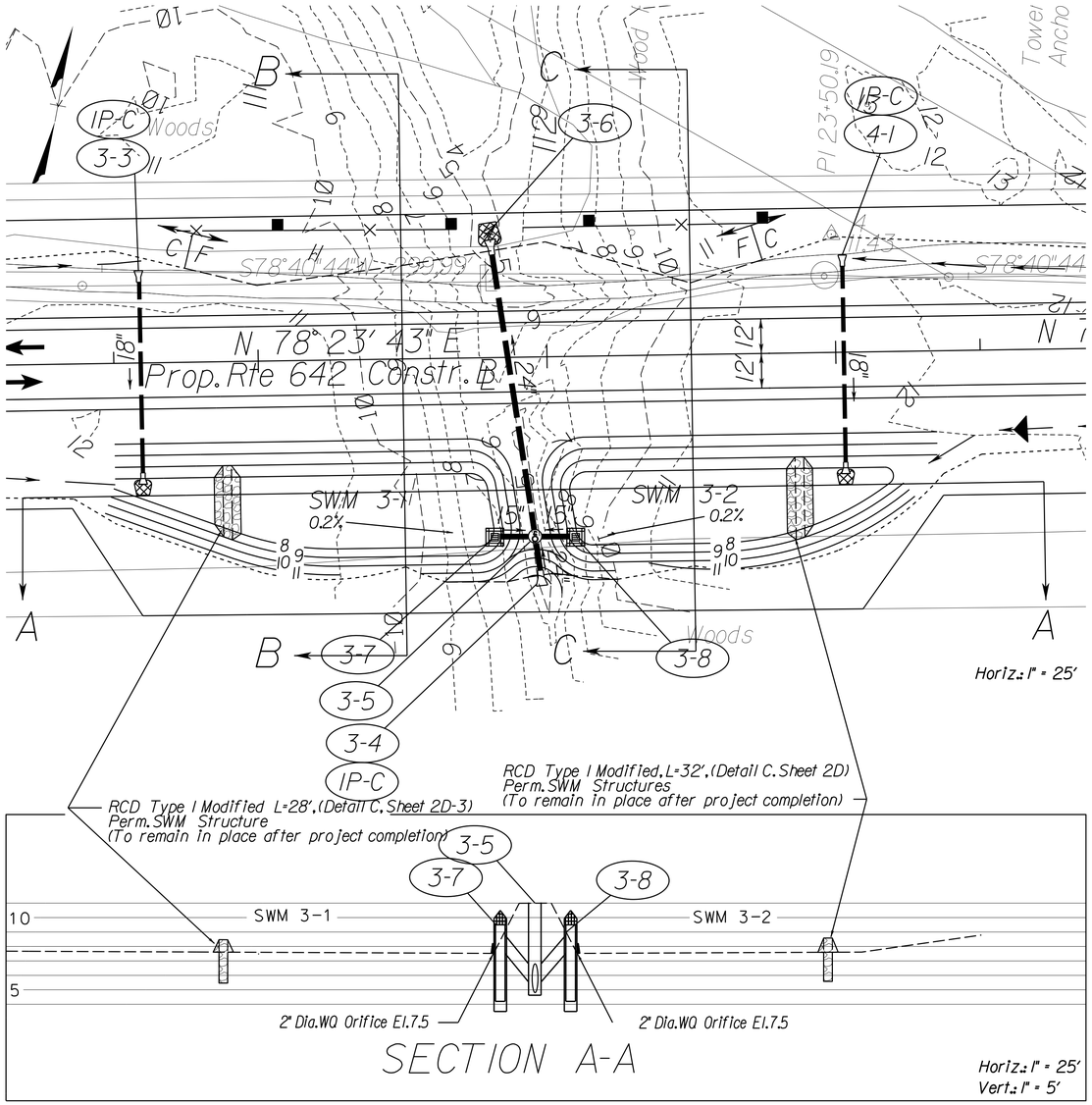
COMMONWEALTH OF VIRGINIA
JUNE BARRETT-McDANIELS
Lic. No. 019893
PROFESSIONAL ENGINEER

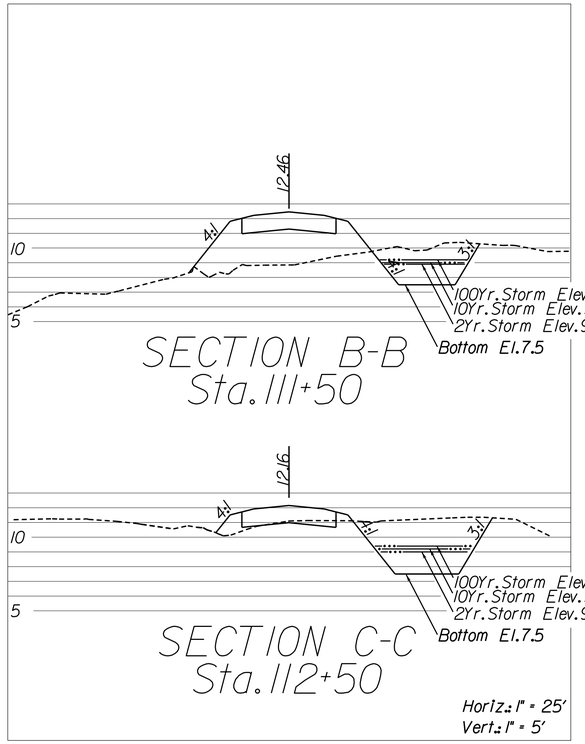
Aquarius Engineering
Virginia Beach, Virginia
Hydraulics

REVISED	STATE	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.	642	0642-065-577, RW-201, C-501	2D(1)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

BMP DETAILS
SWM 3-1 and SWM 3-2





SWM 3-1 is to be used as a temporary sediment trap during construction. The outlet structure is required to be modified in accordance with Std. 114.04 SWM-DR.

Wet Storage Provided:	193 CY
Wet Storage Elevation:	9.5
Dry Storage Provided:	204 CY
Dry Storage elevation:	11
Basin Bottom Elevation:	7.5
Area served:	1.9 acres

SWM 3-2 is to be used as a temporary sediment trap during construction. The outlet structure is required to be modified in accordance with Std. 114.04 SWM-DR.

Wet Storage Provided:	187 CY
Wet Storage Elevation:	9.5
Dry Storage Provided:	192 CY
Dry Storage elevation:	11
Basin Bottom Elevation:	7.5
Area served:	1.8 acres

PROJECT MANAGER Wali Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770.
SUBSURFACE UTILITY BY, DATE JMT, (757) 499-1895, 7/22/2015.

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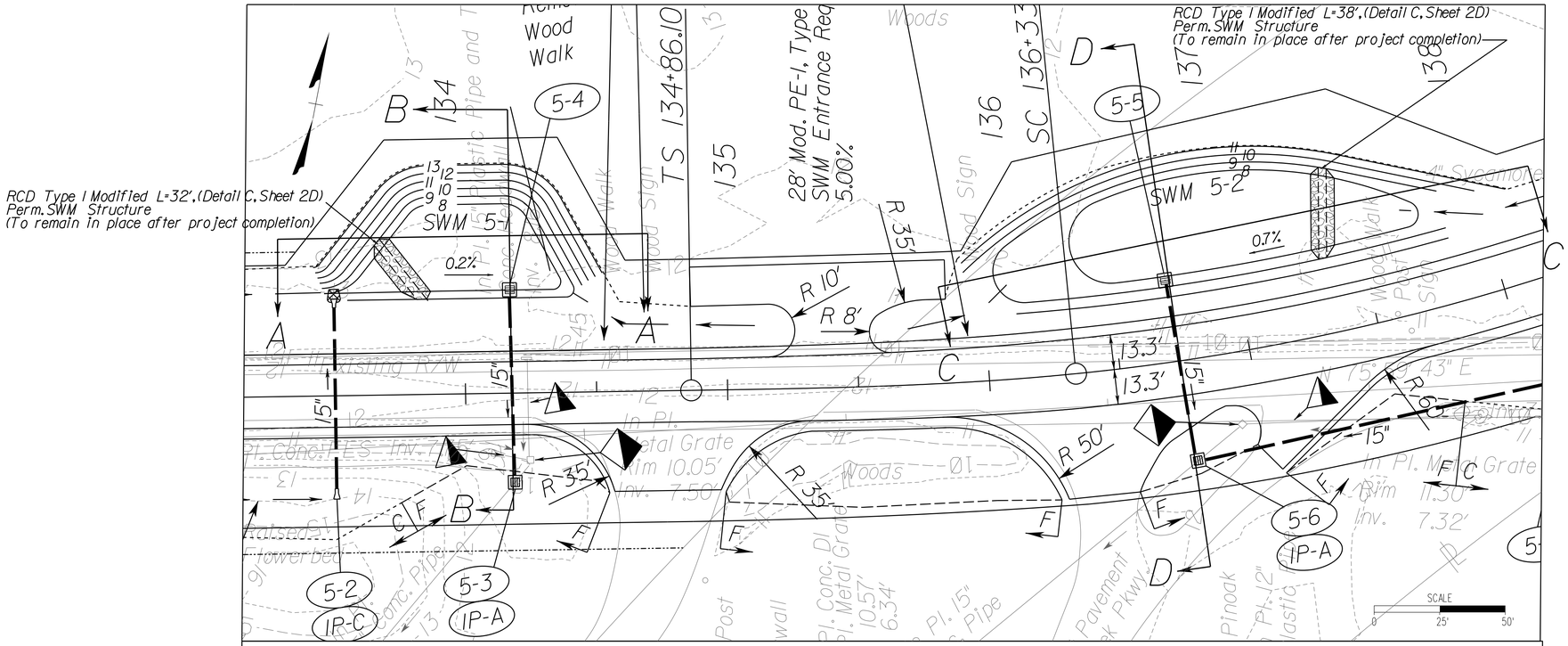
REVISED	STATE	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.	642	0642-065-577, RW-201, C-501	2D(2)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

BMP DETAILS

SWM 5-1 and SWM 5-2



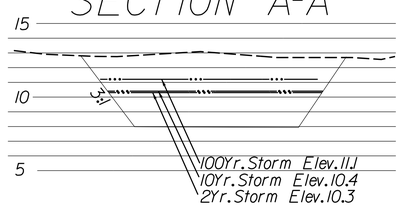
SWM 5-1 is to be used as a temporary sediment trap during construction. The outlet structure is required to be modified in accordance with Std. 114.04 SWM-DR.

Wet Storage Provided:	168 CY
Wet Storage Elevation:	10.2
Dry Storage Provided:	260 CY
Dry Storage elevation:	12.0
Basin Bottom Elevation:	7.80
Area served:	3.2 acres

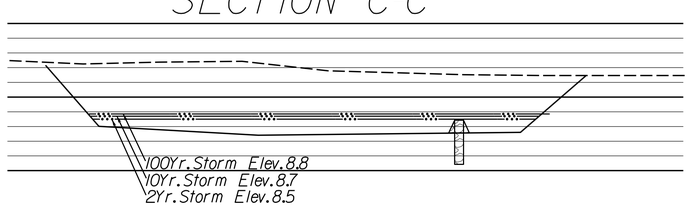
SWM 5-2 is to be used as a temporary sediment trap during construction. The outlet structure is required to be modified in accordance with Std. 114.04 SWM-DR.

Wet Storage Provided:	386 CY
Wet Storage Elevation:	9.7
Dry Storage Provided:	294 CY
Dry Storage elevation:	11.0
Basin Bottom Elevation:	7.30
Area served:	5.1 acres

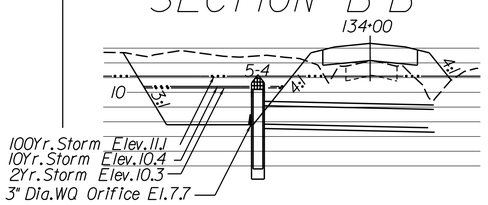
SECTION A-A



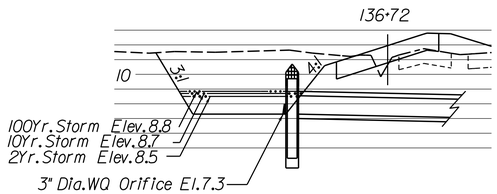
SECTION C-C



SECTION B-B



SECTION D-D

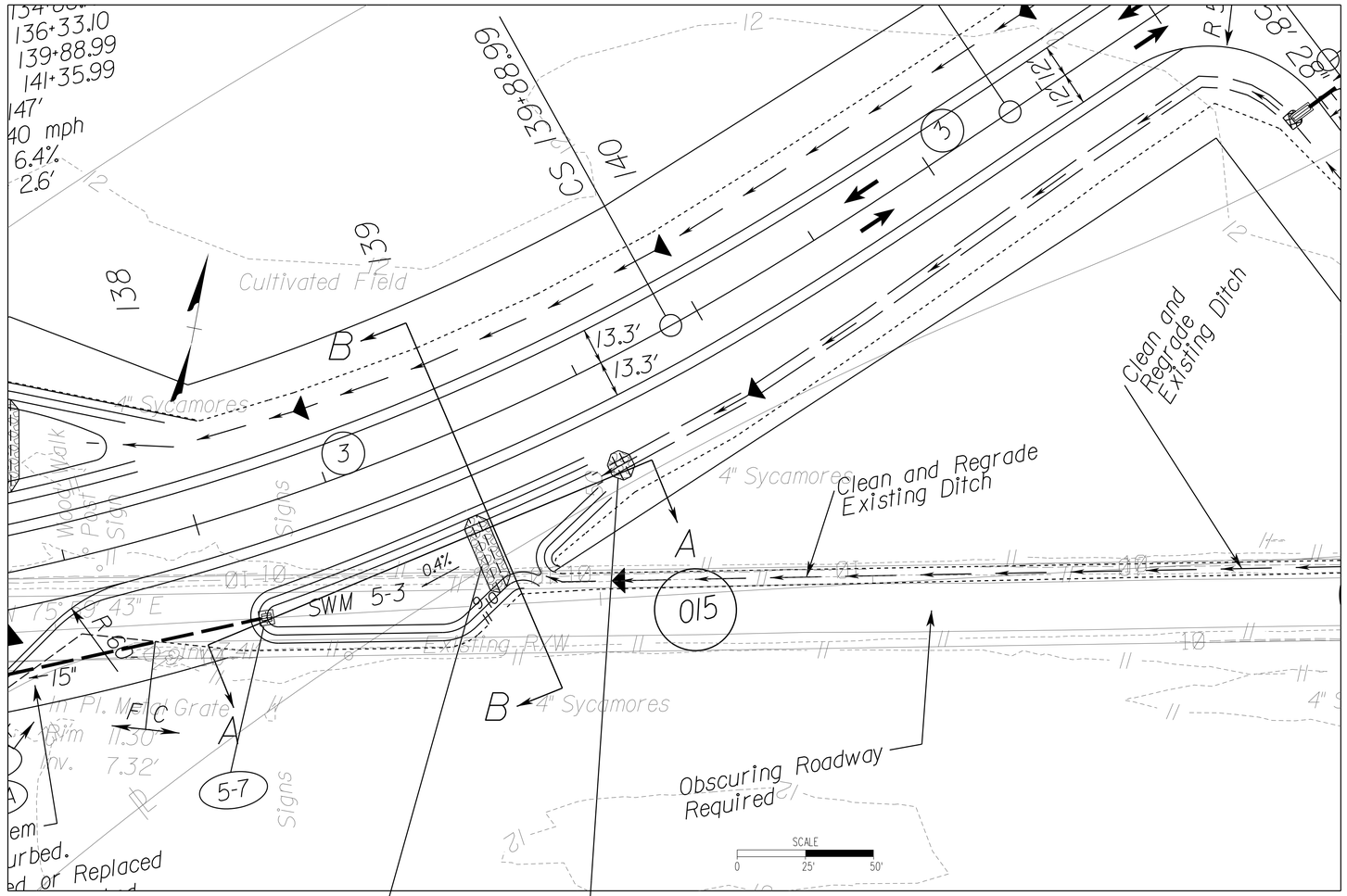


Horiz.: 1" = 25'
Vert.: 1" = 5'

PROJECT	SHEET NO.
0642-065-577	2D(2)

PROJECT MANAGER Wall Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015

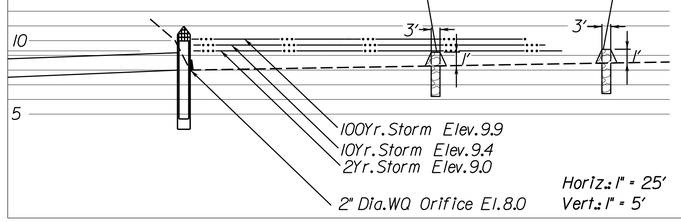
BMP DETAILS SWM - 5-3



RCD Type I Modified L=34', (Detail C, This Sheet)
Perm. SWM Structure
(To remain in place after project completion)

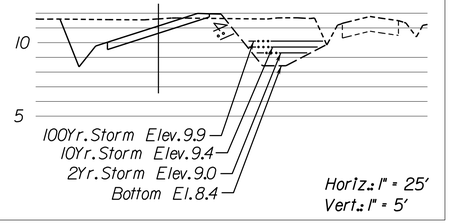
RCD Type I Modified L=11', (Detail C, This Sheet)
Perm. SWM Structure
(To remain in place after project completion)

SECTION A-A



Horiz.: 1" = 25'
Vert.: 1" = 5'

SECTION B-B
Sta. 139+00



Horiz.: 1" = 25'
Vert.: 1" = 5'

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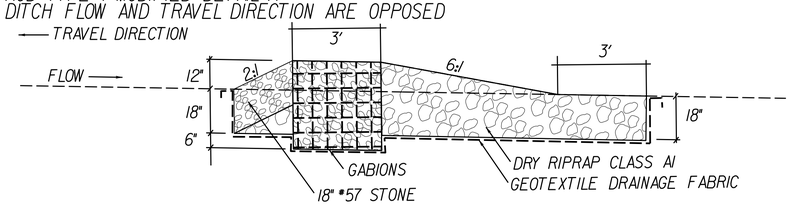
Hydraulics

REVISED	STATE	STATE		SHEET NO.
		ROUTE	PROJECT	
11/4/16 12/2/16	VA.	642	0642-065-577, RW-201, C-501	2D(3)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

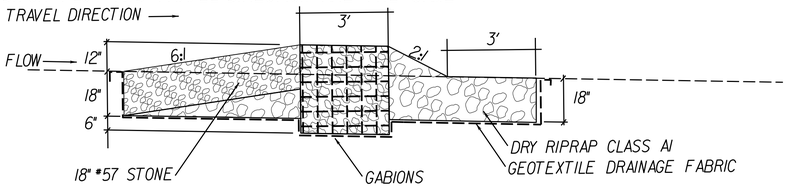
ROCK CHECK DAM
TYPE I, Modified

RCD TYPE I MODIFIED DETAIL A
DITCH FLOW AND TRAVEL DIRECTION ARE OPPOSED



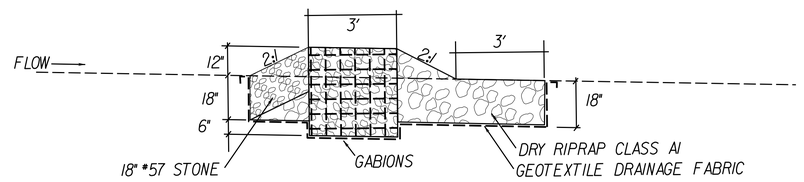
Scale: 1" = 10'

RCD TYPE I MODIFIED DETAIL B
DITCH FLOW AND TRAVEL DIRECTION ARE THE SAME

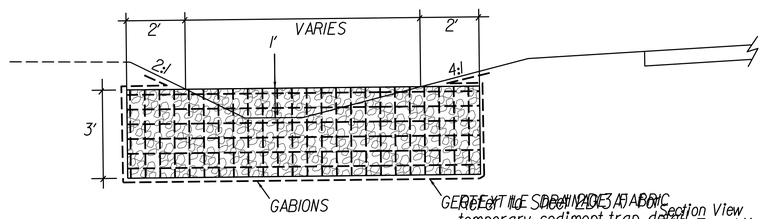


Scale: 1" = 10'

RCD TYPE I MODIFIED DETAIL C



Scale: 1" = 10'



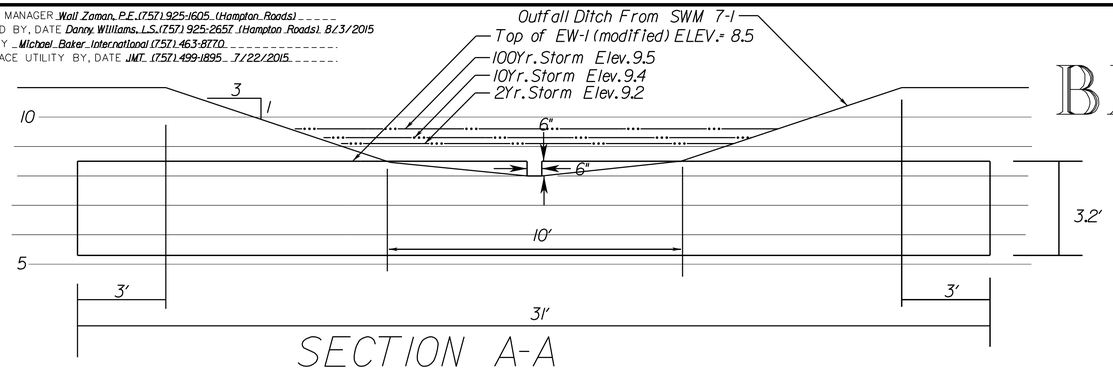
Refer to Sheet 2D(3) for Section View of temporary sediment trap detail. Type I Mod.

Scale: 1" = 10'

	PROJECT	SHEET NO.
	0642-065-577	2D(3)

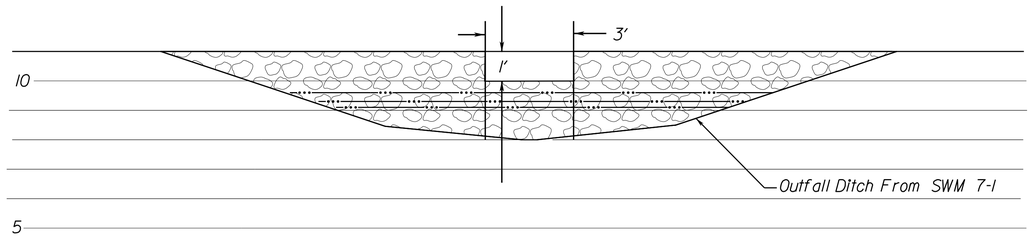
PROJECT MANAGER Wall Zaman, P.E. (757) 925-1605 (Hampton Roads)
SURVEYED BY, DATE Danny Williams, L.S. (757) 925-2657 (Hampton Roads), 8/3/2015
DESIGN BY Michael Baker International (757) 463-8770
SUBSURFACE UTILITY BY, DATE JMT (757) 499-1895 7/22/2015

BMP DETAILS
SWM 7-1



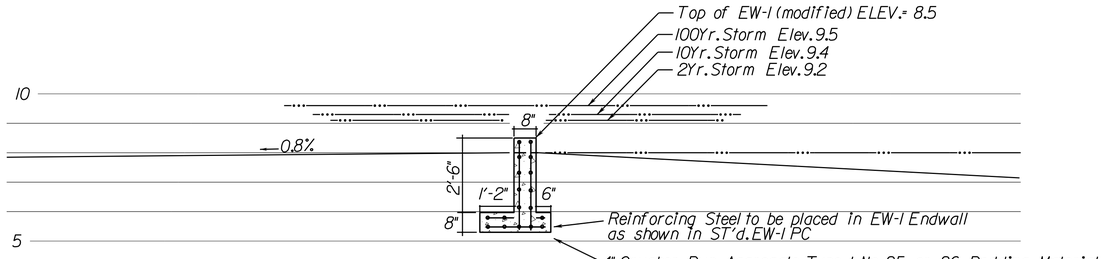
SECTION A-A

Horiz. Scale: 1" = 10'
Vert. Scale: 1' = 10'



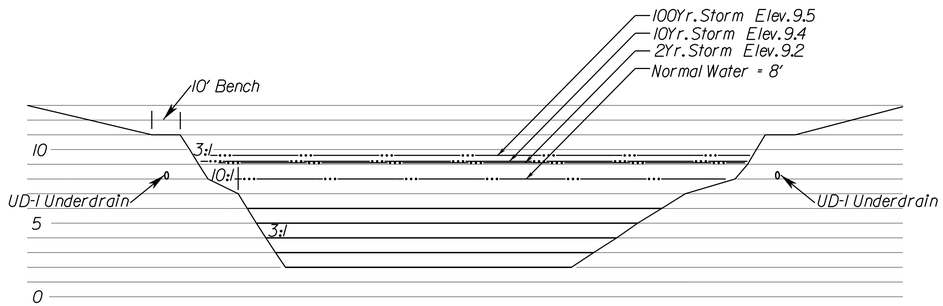
SECTION A1-A1 (Temp. RCD)

Horiz. Scale: 1" = 10'
Vert. Scale: 1' = 10'



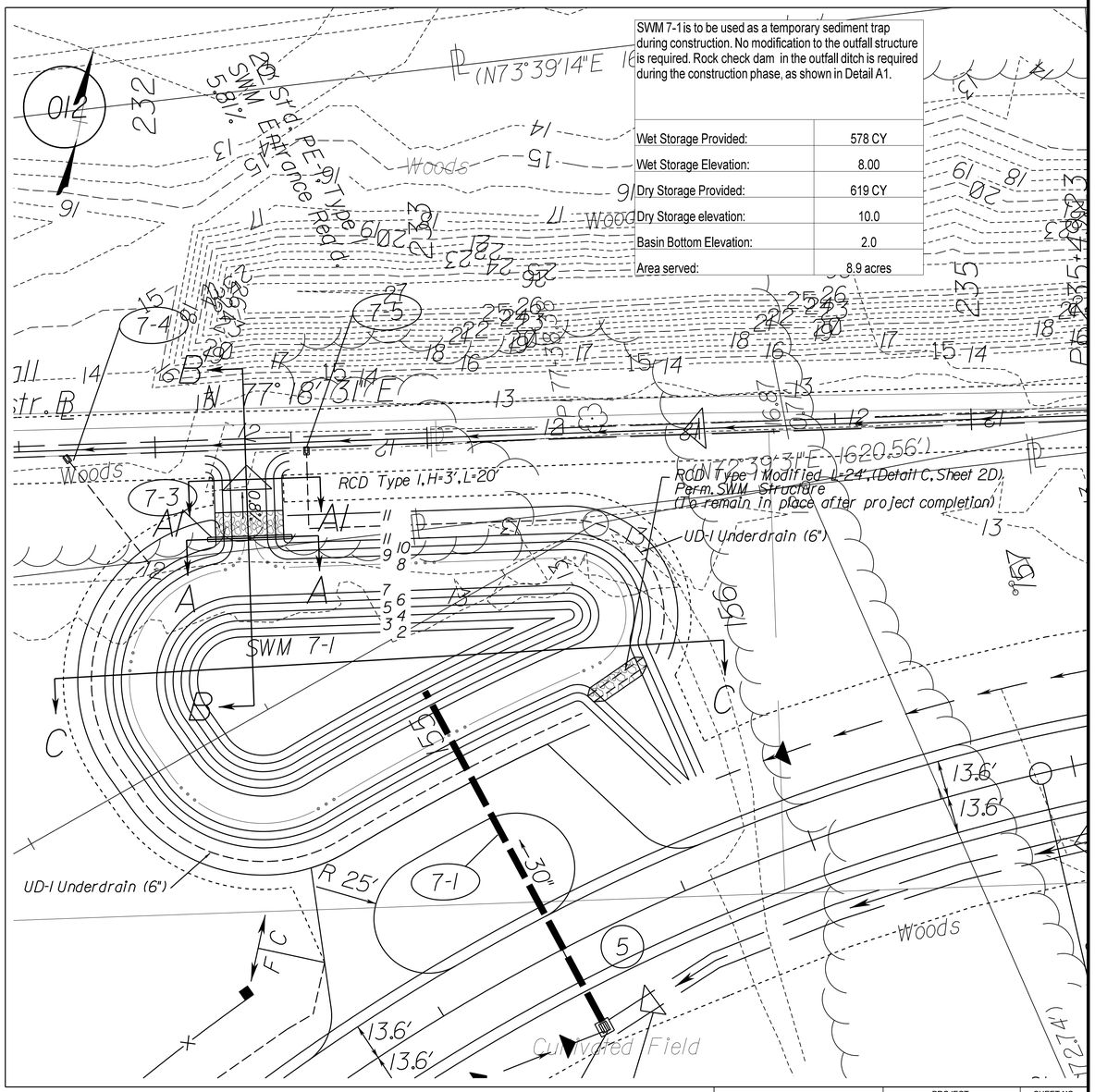
SECTION B-B

Horiz. Scale: 1" = 10'
Vert. Scale: 1' = 10'



SECTION C-C

Horiz : 1" = 25'
Vert : 1" = 5'



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Hydraulics

REVISED	STATE	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.	642	0642-065-577, RW-201, C-501	2D(4)

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

PROJECT	SHEET NO.
0642-065-577	2D(4)

APPENDIX H:

Property Information

May 08, 2018

Northampton County, Virginia

Tax Map #:	91-A-13A
Owner:	NORTHAMPTON COUNTY BOARD OF SUPERVISORS

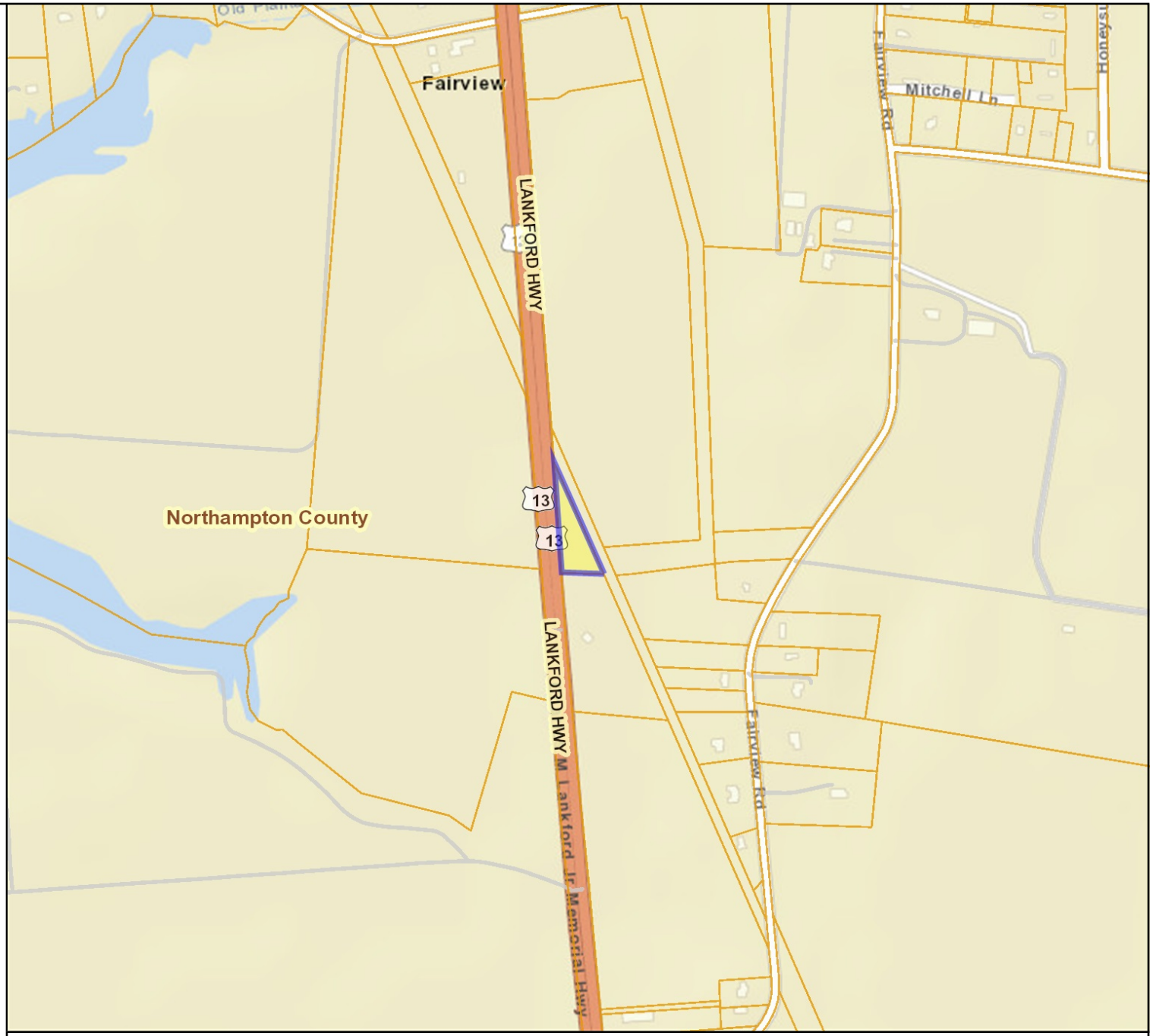
Details

Billing Address:	PO BOX 66
City:	EASTVILLE
State:	VA
Zip:	23347
Total Acres:	1.00
Land Value:	$25,000
Improvement Value:	$0
Total Value:	$25,000
Deed Book:	153
Deed Page:	607
Will Book:	*N/A*
Will Page:	*N/A*
Plat:	DB144-281
Instrument Number:	*N/A*
Parcel_Description:	TRIANGULAR LOT BETWEEN RR AND RT. 13

Northampton County, Virginia

Legend

- County Boundaries
- Town Names
- Route Numbers
- Road Labels
- Parcels
- Driveways



Feet

0 200 400 600 800

Title: Parcels

Date: 5/8/2018

DISCLAIMER:This drawing is neither a legally recorded map nor a survey and is not intended to be used as such. The information displayed is a compilation of records,information, and data obtained from various sources, and Northampton is not responsible for its accuracy or how current it may be.