



PROJECT PIPELINE

**Route 218 (Caledon Road) from Bloomsbury Road
to Lambs Creek Church Road**

**Fredericksburg District
King George County
FR-25-04**

**PHASE 3 REPORT
July 2026**

Prepared for



Prepared by

Kimley»Horn

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Needs Evaluation and Diagnosis

1.1 Introduction

Project Pipeline is a performance-based planning program to identify cost-effective solutions to multimodal transportation needs in Virginia. Through this planning process, projects and solutions may be considered for funding through programs, including SMART SCALE, revenue sharing, interstate funding, and others. SMART SCALE is Virginia's data driven prioritization process that scores and evaluates potential transportation projects based on key factors including congestion reduction, safety improvement, accessibility, land use, economic development, and environmental quality to determine which projects may receive state funding. Visit the Project Pipeline webpage for additional information:

<https://vapipeline.virginia.gov/>.

This study, entitled FR-25-04—Route 218 (Caledon Road) from Bloomsbury Road to Route 694 (Lamb's Creek Church Road/Long Leaf Lane), focuses on concepts targeting identified needs including safety and transit access. The four key steps within the Project Pipeline performance-based planning and programming process are shown in **Figure 1**.

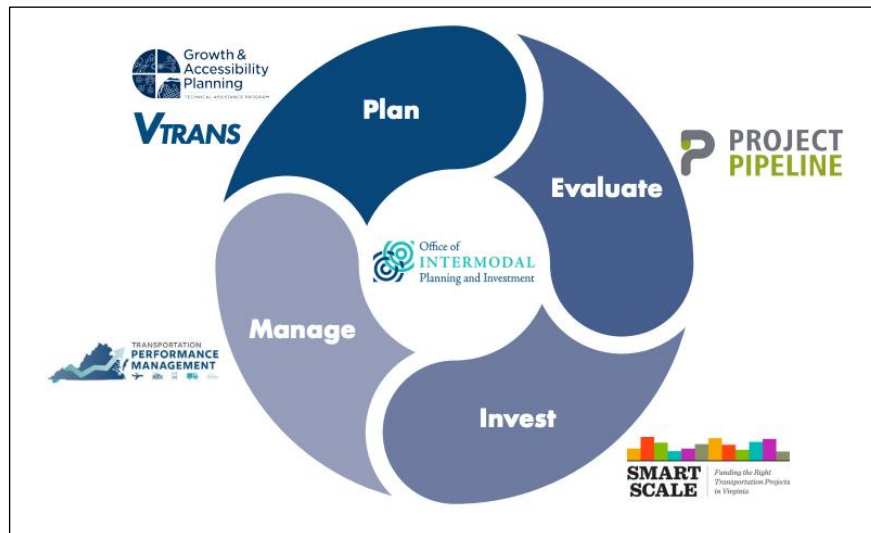


Figure 1: Project Pipeline Key Steps

1.2 Methodology

The Project Pipeline study process consists of three phases:

- **Phase 1:** Problem Diagnosis and Alternative Brainstorming
- **Phase 2:** Alternative Evaluation and Sketch-Level Analysis
- **Phase 3:** Investment Strategy and Cost Estimate

Figure 2 shows the overall Project Pipeline process, key milestones, and schedule in relation to critical SMART SCALE dates.

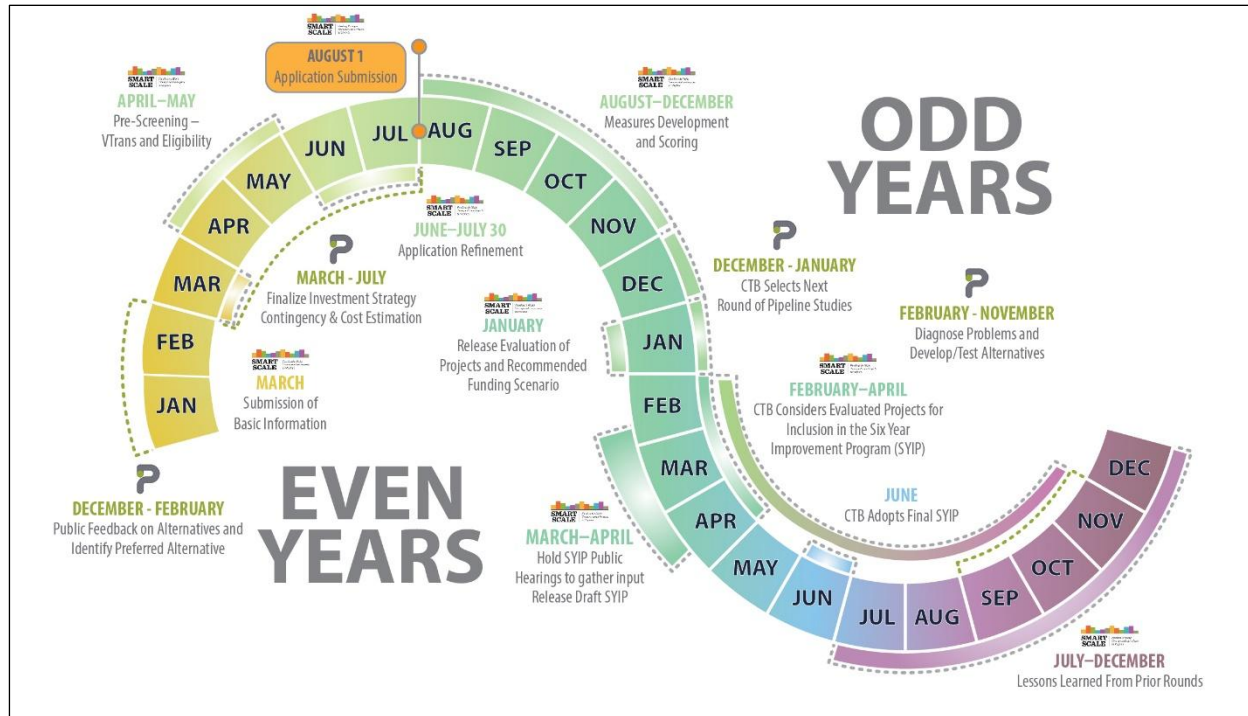


Figure 2: Study Phase Methods and Solutions

The study team is broken down into technical teams to review data, develop preliminary alternatives, refine solutions, and provide clear messages to stakeholders regarding the most viable and effective solutions related to the priorities and needs for each study. The priorities, needs, and scope of each study guides the level of Technical Team involvement. In general, the technical teams include the Office of Intermodal Planning and Investment (OIPI), the Virginia Department of Transportation (VDOT), and consultant staff from the following departments and/or disciplines:

- District Planning
- District Traffic Operations
- District Location and Design (L&D)
- District subject matter experts (e.g., Right of Way, Utilities, and Environmental, as needed)
- Consultant Teams, Central Office Divisions, as needed
- Department of Rail and Public Transportation as needed
- Localities, if applicable
- Metropolitan Planning Organizations or Planning District Commissions, if applicable

A sample organizational chart of a technical team is shown in **Figure 3**.

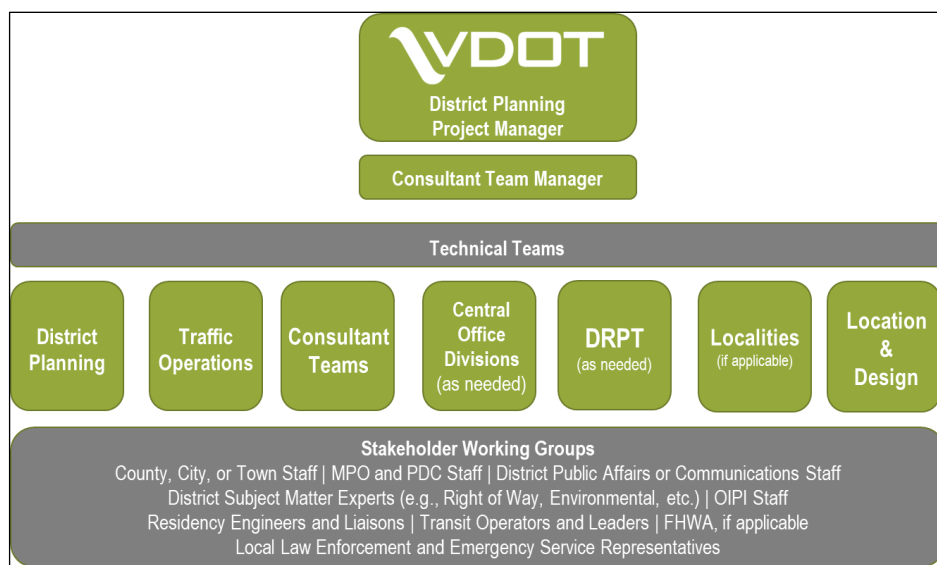


Figure 3: Structure of a Technical Team

1.3 Study Background

A Study Work Group (SWG) was formed for this study to capture input from local stakeholders and shape the development of potential improvements. The SWG provided local and institutional knowledge of the corridor, reviewed study methodologies, provided input on key assumptions, and reviewed and approved proposed improvements developed through the study process. The SWG included members representing the following organizations:

- OIPI
- VDOT
- Fredericksburg Area Metropolitan Planning Organization (FAMPO)
- King George County
- Kimley-Horn

The study area along Route 218, also known as Caledon Road, spans from Bloomsbury Road to the west to Lambs Creek Church Road/Long Leaf Lane to the east. Route 218 is a two-lane rural connector with curves, moderate traffic, and many access points to driveways. Route 218 is classified as a Minor Arterial with a posted speed limit of 45 miles per hour (mph) throughout the study area. Posted warning signs recommend traveling at 35 mph through curving sections and at 30 mph near Vertical Ridge Road. Bloomsbury Road has a posted speed limit of 45 mph and is a two-lane rural road classified as a Minor Collector. Lambs Creek Church Road is a two-lane rural road classified as Local, with a posted speed limit of 40 mph.

The study area is situated in a rural area of King George County and is primarily wooded. The roadway is an important route for local traffic and regional connectivity. The adjacent land uses include scattered residential properties and occasional larger residential developments. Route 218 parallels Route 3, a Principal Arterial, and serves as an alternative route to Route 3 for commuters traveling east or west.

The study area includes three at-grade, unsignalized intersections. The three study intersections are shown in **Table 1** and **Figure 4**.

Table 1: Study Intersections

#	Intersection Name	Control Type
1	Route 218 and Bloomsbury Road	Unsignalized
2	Route 218 and Worman Drive	Unsignalized
3	Route 218 and Lambs Creek Church Road	Unsignalized

The study team collected traffic counts, 48-hour speeds and classification counts, and pedestrian and bicycle counts to assist with the transportation analysis in the study area.

A framework document was developed prior to commencing the study which outlined the study methods and assumptions. The signed framework document is in **Appendix A**. The Round 3 Kickoff and Framework Meeting (SWG Meeting #1) was held on April 2, 2025, to provide an overview of the study and obtain feedback on the study's assumptions. The kickoff meeting materials are in **Appendix A**.

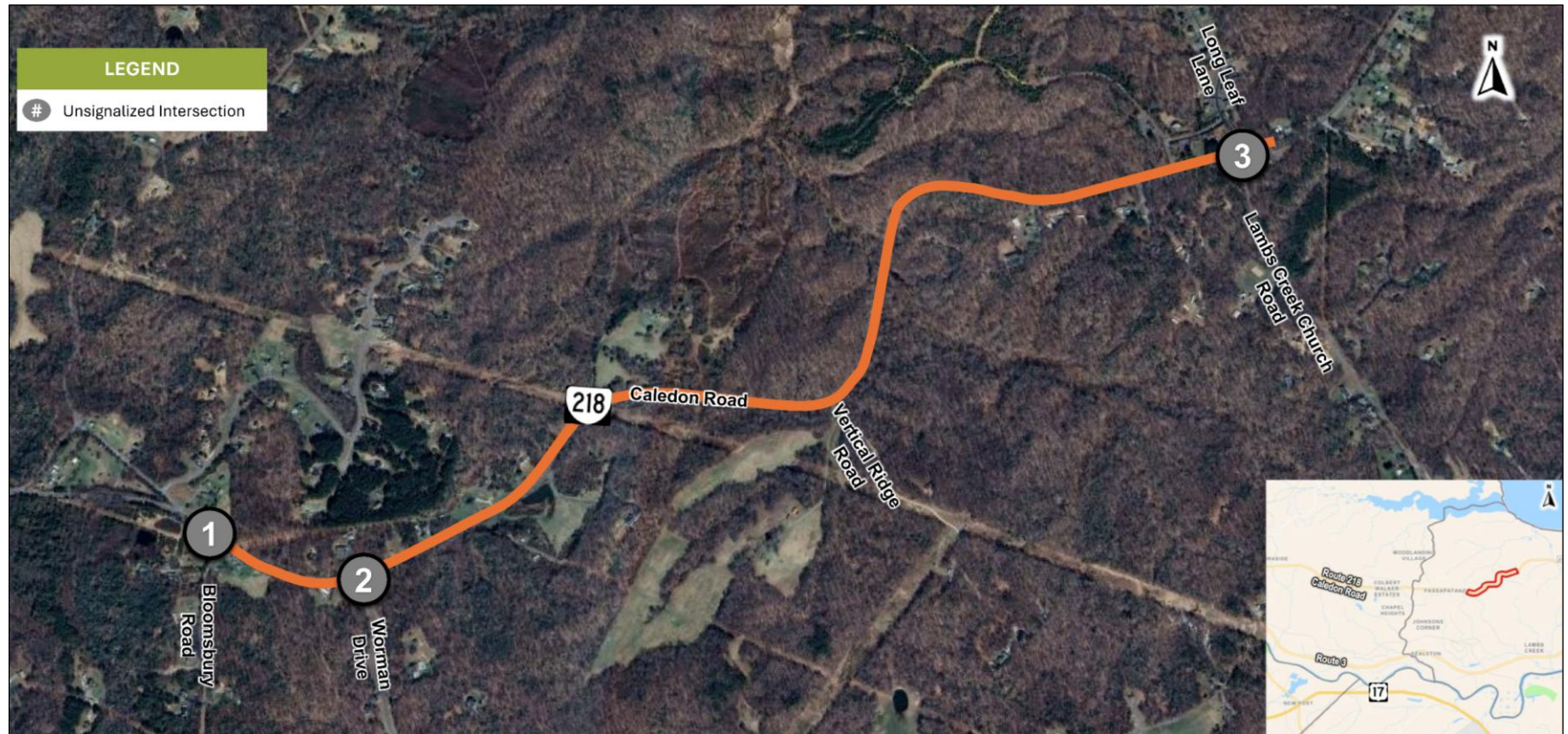


Figure 4: Project Study Area

1.4 VTrans Needs

Project Pipeline follows a performance-based planning approach to identify solutions that address VTrans mid-term needs. VTrans is Virginia's statewide transportation plan that is prepared by OIPI for the Commonwealth Transportation Board (CTB). VTrans mid-term needs (0–10 years) were identified from a data-informed process and were used as a primary source in the selection of Project Pipeline study corridors. **Table 2** outlines the VTrans needs in the study area.

Table 2: VTrans Needs Identified in the Study Area

VTrans 2023 Mid-Term Need	Priority
 Safety Improvement	High
 Transit Access	Low

Route 218 (Caledon Road) intersection was selected as a Project Pipeline study location due to the presence of multiple VTrans needs. The project team took the following steps to confirm and evaluate the VTrans needs identified in the study area:

- Reviewed the Project Pipeline data dashboards to identify issues and transportation trends in the study area
- Conducted a field review of the study area to observe issues and document existing conditions
- Collected traffic counts at the study area intersections and speeds at four locations in the study area
- Reviewed relevant studies and plans near the study area to inform the alternatives development
- Conducted detailed existing conditions operational analyses using Synchro
- Reviewed crash data available on VDOT's Virginia Roads portal
- Assessed existing transit service, multimodal infrastructure, and the suitability for additional transit service within the study area

1.5 High-Level Needs Diagnosis

Data dashboards were developed by OIPI and VDOT to centralize data collection and leverage big data sources to streamline VTrans needs and problem diagnosis across all Project Pipeline studies as well as to expand on the core issues and patterns identified in the study's framework document.

The data dashboards contained performance measures including VDOT crash data, travel time index data, level of travel time reliability data, and speed data for each study area. The results of this analysis are summarized in the Phase 1 Executive Summary, which can be found in **Appendix B**.

The study team reviewed the dashboard performance measures in addition to other sources to validate the presence of VTrans needs and identify the most effective improvements in the study area.

1.5.1 Operations and Access Needs

VTrans did not identify any operations nor access needs in the study area. However, the study team assessed the current traffic operations at a high level to further understand the corridor needs. Travel on Route 218 is reliable throughout the day. The average eastbound speed stays consistently at or above the

posted speed limit. The average westbound speed falls slightly below the posted speed limit in the afternoon. **Figure 5** and **Figure 6** show the average speed and travel time indices for weekdays and weekends in the study area.

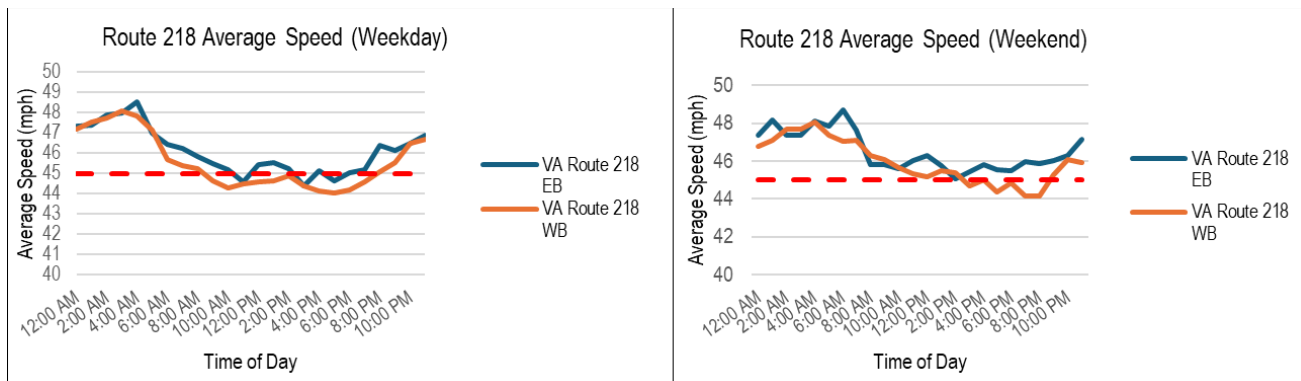


Figure 5: Route 218 Average Speed (Weekday and Weekend)

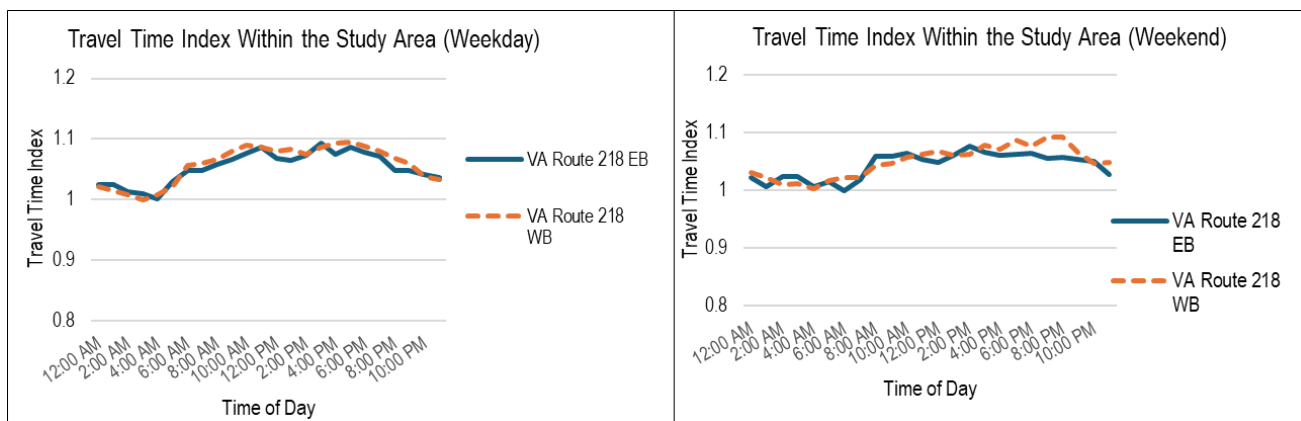


Figure 6: Travel Time Index Within the Study Area (Weekday and Weekend)

1.5.2 Safety and Reliability Needs

VTrans identified a High need for Construction District Safety Improvement in the study area. The study team reviewed the VDOT crash data from 2020-2024 to identify high-level crash trends in the study corridor.

In total, 68 crashes were reported in the study area including one fatality, 21 injury crashes, and 46 crashes involving property damage only (PDO). Most crashes in the study area were either fixed-object off-road (69%) or angle (15%) crashes, occurring primarily at intersections or curves. **Figure 7** shows the geographic distribution and frequency of crashes in the study area.

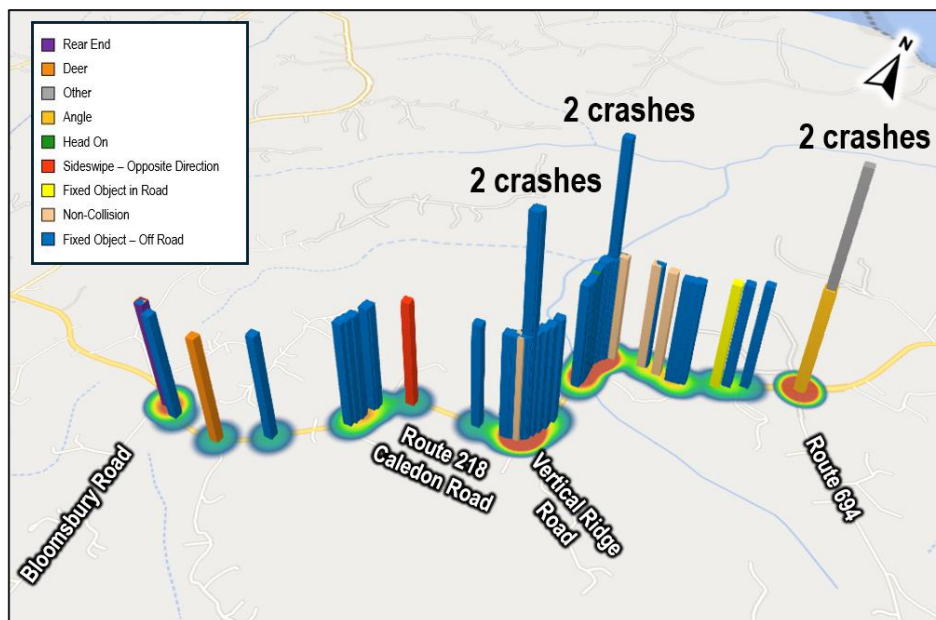


Figure 7: Route 218 between Bloomsbury Road and Route 694 Crash Data (2020-2024)

Route 218 is not within the VDOT Pedestrian and Bicycle Safety Action Plan (PBSAP). Route 218 is ranked 27th in the VDOT Rank District 2019-2023 Potential Safety Improvement (PSI), shown in **Figure 8**. This PSI ranking reflects a crash rate (crashes per 100 million Vehicle Miles Traveled) of 654.21, which is significantly higher than the Fredericksburg District crash rate from 2019 to 2023 of 101.67 for rural Minor Arterials. The statewide crash rate for rural Minor Arterials from 2019 to 2023 was 127.99. This indicates a clear need for safety improvements in the study area. The study area did not include a Reliability VTrans need, which is measured by variability in travel time along a corridor and impacted by factors such as incidents, weather, construction, and changes in demand.



Figure 8: PSI Segment Location

1.5.3 Transit and Transportation Demand Management Needs

VTrans identifies a Low transit need within the study area. There are no existing transit routes within the corridor. Previous transit routes were discontinued due to low ridership. After discussion with the study work group, it was decided to not consider transit as part of this study given the previous low ridership and rural nature of the corridor.

1.5.4 Environmental Considerations

A high-level review of existing environmental conditions was completed to better understand the existing environment, potential impacts of the project to resources within the study area, and future actions that may need to be taken to comply with state and federal environmental review regulations. The environmental resources discussed in this report are within the proposed project's study area.

A desktop review using readily available Geographic Information System (GIS) data, online environmental resource maps, census data, and other relevant information was referenced to identify existing socioeconomic and environmental conditions within the project study area. The methods utilized to complete this review were drawn from national, statewide, and local sources. Data was gathered to identify resources pertaining to the natural and human environment consistent with the resource categories included in the VDOT Categorical Exclusion checklist (EQ-104). The Virginia Department of Environmental Quality (DEQ) [EJScreen+ tool](#) is an enhanced environmental justice screening and mapping tool and was used to gather information on environmental and demographic indicators.

A summary of the environmental resources that were considered and the source for the data used to evaluate the existing conditions and potential impacts are summarized in **Table 3**. For this study, community services were defined as publicly accessible facilities used to provide services to the public or as gathering spaces for organizations. These may include public education, welfare, emergency services, postal office, libraries, social work, food banks, health care, police, fire services, public transportation, and public housing.

The limits of the environmental resources review were developed by implementing a buffer from the identified roadways and interchanges that were being evaluated for improvements, as well as initial improvement concepts being developed. The width of the buffer varied based on the anticipated improvements or level of impacts in that area from 100 to 500 feet. Therefore, the limits of the environmental resources review conservatively captured an inventory of known environmental resources. As part of this review, it was assumed that the entire study area may experience some level of disturbance. However, avoidance and minimization measures would be applied throughout project development, resulting in reduced impacts as the project progresses. The resources identified in the study areas are also shown in **Figure 9**.

Table 3: Existing Environmental Conditions Summary

Environmental Resource	Description	Source	Existing Resources in Study Area
Environmental Justice	Identifying communities of color and low-income communities adjacent to the project corridor, as defined by the Virginia Department of Environmental Quality. A low-income community has 30% or more of the population under the Department of Housing and Urban Development (HUD) 80% adjusted median income (AMI) and under two times the federal poverty level as defined by the American Community Survey. A community of color has a population with a higher percent of people of color as compared to the statewide average.	Virginia DEQ EJScreen+	Within the study area, there are no census block groups with communities of color or low-income communities.
Limited English Proficiency	Populations who speak English less than very well within the Census Tract where the study area is located.	US Census Bureau People That Speak English Less Than "Very Well" in the United States	Within the study area, one census block group was identified as having less than 3.5% (0.6%) of their population considered as limited English proficiency (LEP).
Recreational Facilities	Places available for recreational or communal use, such as a YMCA or community parks.	Virginia Department of Conservation Recreation (VDCR) Natural Heritage Data Explorer (NHDE) VDCR Virginia Outdoor Plan Mapper Aerial Imagery Google Maps	No recreation facilities were identified within the study area or in the surrounding vicinity.
Community Services	Places available to the public such as hospitals, schools, and churches.	Aerial Imagery Virginia Geographic Information Network (VGIN) King George County GIS Data Google Maps	No community services were identified within the study area or in the surrounding vicinity.

Environmental Resource	Description	Source	Existing Resources in Study Area
Bike/Pedestrian Facilities	Existing sidewalks, bike paths, and trails.	King George County GIS Data Aerial Imagery Google Maps VDCR Virginia Outdoor Plan Mapper	No bike or pedestrian facilities were identified within the study area or in the surrounding vicinity.
Section 6(f)	Sites funded through the Land and Water Conservation Fund (LWCF) and owned by state or local entities.	VDCR Virginia Outdoor Plan Mapper VDCR Conservation Lands Virginia Outdoor Foundation	No Section 6(f) sites were identified within the study area or in the surrounding vicinity.
Section 106* Resources	Known historic architectural or archaeological sites within or immediately adjacent to the project corridor including sites that are listed or eligible for listing on the National Register of Historic Places (NRHP) and sites that have not been evaluated are potentially eligible, or any other status as noted on the VDHR V-CRIS website.	Virginia Department of Historic Resources (VDHR) Virginia Cultural Resource Information System (V-CRIS) NRHP	No known listed or eligible historic resources were identified within the study area.
Section 4(f)*	Publicly owned parks or recreation lands, wildlife and waterfowl refuges, and privately and publicly owned historic sites protected by Section 4(f) of the U.S. Department of Transportation Act of 1966.	VDCR NHDE VDCR Virginia Outdoor Plan Mapper VDHR V-CRIS King George County GIS Data	No publicly owned parks or recreation lands, wildlife and waterfowl refuges, or privately and publicly owned historic sites are located within the study area or the surrounding vicinity.

Environmental Resource	Description	Source	Existing Resources in Study Area
Protected Species	Threatened and endangered species, as defined by the state and federal government databases, existing within or near the project corridor.	-United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) -Virginia Department of Wildlife Resource (VDWR) -Virginia Fish and Wildlife Information Services (VaFWIS) -VDWR Wildlife Environmental Review Map Service (WERMS) -VDWR Bat Consultation Tool (Northern Long-Eared Bat [NLEB], Tri-Colored Bat, and Little Brown Bat) -Center for Conservation Biology (CCB) Eagle Nest Locator	USFWS No critical habitats are located within the study area. Bald and/or golden eagles were noted in the study area. VDWR Databases <u>VDWR VaFWIS</u> - No endangered or threatened species were identified within a 2-mile radius of the study area. <u>VDWR WERMS</u> - No endangered species were identified within the study area. <u>VDWR Bat Consultation Tool</u> - The study area is within the consultation range of the NLEB and tri-colored bat but outside the year-round presence zone, capture area, and hibernacula regulatory buffer for all three bats. <u>USFWS IPaC</u> - NLEB and PESU may occur within the study area and surrounding vicinity. <u>CCB</u> - No nests were identified within the study area.
Floodplains	Areas considered at risk for flooding during 100-year and 500-year storms.	Federal Emergency Management Agency (FEMA) Flood Hazard Areas	No floodplains were identified within the study area or in the surrounding vicinity.
Surface Water & Wetlands	Review of NHD and NWI to determine the likelihood of streams and wetlands present within and immediately adjacent to the project corridor.	- United States Geological Survey (USGS) National Hydrography Dataset (NHD) - USFWS National Wetland Inventory (NWI)	Multiple wetlands are scattered within and around the study area. Multiple ponds are located within and surrounding the study area. The Passapatanzy Creek is located to the north of the study area and runs through the study area. Portions of the study area and surrounding vicinity are located within the Chesapeake Bay Preservation Area.

Environmental Resource	Description	Source	Existing Resources in Study Area
Hazardous Materials	Any documented spills, releases, or history of contamination on surrounding sites that may be impacted by the proposed project.	Virginia DEQ Environmental Data Mapper	Multiple closed petroleum release cases are located within the study area near the southern terminus.
Open Space, Conservations Easements, Agricultural, and Forestral Districts	Lands protected by a voluntary agreement with a non-profit land trust or government agency that allows a landowner to limit the type or amount of development on the property. Agricultural and forestal districts are those defined as such in the zoning map.	VDCR NHDE VDCR Outdoors Plan Mapper King George County GIS Data The Virginia Outdoor Foundation The Nature Conservancy	Forested areas are scattered within and around the study area in all directions. An easement is located < 1 mile to the southeast of study area. No agricultural districts were located within the study area or in the surrounding vicinity.
Farmland	Lands with soils that are considered prime farmland and outside a census-designated urban area.	United States Census Bureau Urban Area Maps Natural Resources Conservation Service Web Soil Survey	A small portion of prime farmland is located throughout the study area. The entire study area is located within a census designated non-urban area and is therefore subject to the Farmland Protection Policy Act.
Land Use	Land Area that has been given a specific use based on local jurisdiction land use designations.	King George County GIS Data	The study area is classified as rural agriculture.

**Assessment based on the currently listed, determined eligible, or recommended eligible for the NRHP properties pending potential further investigations for recommendations not yet confirmed by VDHR or for individual sites not yet evaluated.*

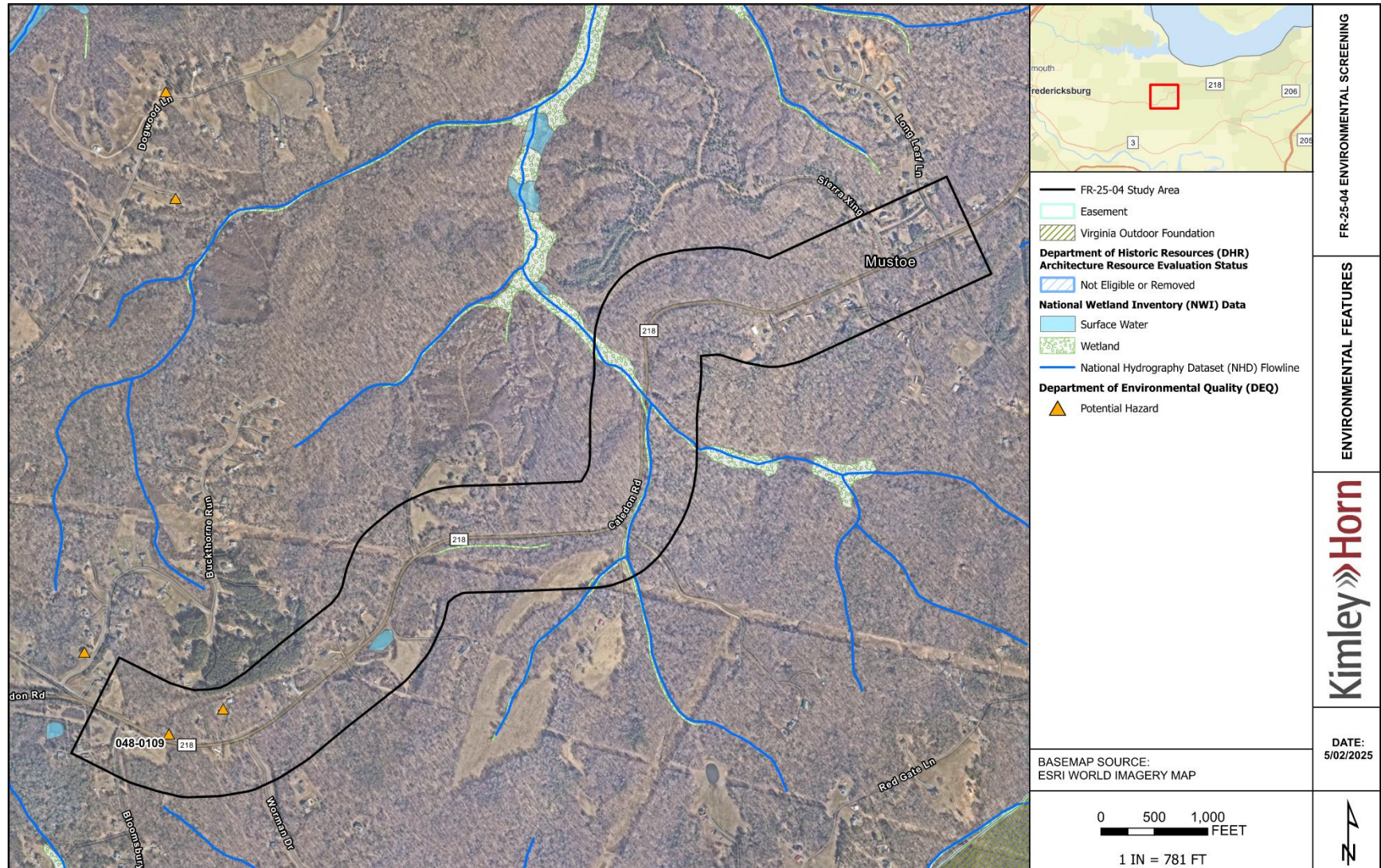


Figure 9: Existing Environmental Conditions Map

1.6 Detailed Needs Validation

The study team performed additional traffic operations and safety analysis to further quantify the existing and anticipated needs within the study area. Results from these analyses were used as a baseline when comparing the conditions of the proposed improvements to the existing conditions.

1.6.1 Existing Conditions Traffic Operations and Safety Analysis

The study team conducted a multifaceted analysis of the existing conditions of the study corridor, which included reviewing previous studies, conducting a safety analysis, conducting a preliminary field review, conducting a speed analysis, analyzing traffic operations using Synchro, and reviewing pedestrian, bicycle, and transit activity. Preliminary concepts were presented at the Needs Evaluation, Diagnosis, and Preliminary Concepts Meeting (SWG Meeting #2) on June 12, 2025. The meeting materials are provided for reference in **Appendix C**.

Relevant Studies, Plans, and Projects

Information for the following studies, plans, and projects was collected and reviewed to identify previous or ongoing recommendations in and adjacent to the study area:

- King George County Transportation Needs Study (April 2020)
- Rural Long Range Transportation Plan (February 2020)
- Green Energy Ventures TIA (January 2025)

The three relevant studies and plans did not contain recommendations within the study area.

Safety Analysis

A safety analysis was conducted using crash data from the VDOT Crash Database over a five-year period (January 1, 2020–December 31, 2024) as well as detailed crash descriptions provided by VDOT. Summaries of crashes in the study area by severity and type are shown in **Table 4** and **Table 5**, respectively. **Appendix C** includes a detailed crash summary for the study area.

Crash severity is coded using the KABCO scale, which is defined using the following classifications:

- K—Fatality
- A—Suspected Serious Injury
- B—Suspected Minor Injury
- C—Possible Injury
- PDO—Property Damage Only

In total, 68 crashes were reported in the study area, including one K crash.

Table 4: Study Area Crashes by Crash Severity

Intersection	# of Crashes—K	# of Crashes—A	# of Crashes—B	# of Crashes—C	# of Crashes—PDO	Total
Route 218 and Bloomsbury Road	0	0	2	0	2	4
Route 218 and Worman Drive	0	0	0	0	1	1
Route 218 and Lambs Creek Church Road	0	0	2	0	7	9
Rest of Corridor	1	3	14	0	36	54
Total	1 (1%)	3 (4%)	18 (26%)	0 (0%)	46 (68%)	68

Table 5: Study Area Crashes by Crash Type

Intersection	Number of Fixed Object - Off Road Crashes	Number of Angle Crashes	Number of Non-Collision Crashes	Number of Head On Crashes	Number of Other Crashes	Total Number of Crashes
Route 218 and Bloomsbury Road	1	2	0	0	1	4
Route 218 and Worman Drive	0	0	0	0	1	1
Route 218 and Lambs Creek Church Road	0	8	0	0	1	9
Rest of Corridor	46	0	4	2	2	54
Total	47 (69%)	10 (15%)	4 (6%)	2 (3%)	5 (7%)	68

Route 218 and Bloomsbury Road

There were 4 total crashes at the intersection of Route 218 and Bloomsbury Road between 2020 and 2024. Two angle crashes occurred when a turning vehicle failed to yield the right of way, resulting in two B crashes. A four-car rear-end crash on Route 218 began when one vehicle rear-ended another, leading to a chain reaction as the other vehicles were following too closely, resulting in property damage only. There was one fixed object-off road crash at the intersection which occurred when a vehicle failed to maintain control and ran off the road, resulting in property damage only.

Route 218 and Worman Drive

There was one crash at the intersection of Route 218 and Worman Drive between 2020 and 2024. The one crash occurred when a vehicle traveling eastbound on Route 218 struck a deer, resulting in property damage only. While this crash occurred in the vicinity of the intersection, it was not associated with intersection operation.

Route 218 and Lambs Creek Church Road

There were nine total crashes at the intersection of Route 218 and Lambs Creek Church Road between 2020 and 2024. Eight angle crashes occurred when a turning vehicle failed to stop at the stop sign on

Lambs Creek Church Road before entering the intersection or failed to yield to oncoming traffic when entering the intersection. These angle crashes resulted in primarily property damage only, although two resulted in B crashes. The one Other crash occurred when a vehicle failed to maintain control and crossed the centerline pavement marking, striking an oncoming vehicle in the opposing travel lane and resulting in property damage only.

Route 218 Corridor

There were 54 total crashes between 2020 and 2024 in the study corridor that were not in the influence area of the three study intersections. Four non-collision crashes occurred when vehicles ran off-road; three resulted in property damage only while one involving a motorcycle resulted in a B crash. One same-direction sideswipe crash resulted in property damage only. One fixed object in-road crash occurred when a vehicle was unable to brake in time and struck a tree that had fallen across the roadway, resulting in property damage only. Two head-on crashes occurred when drivers crossed the center line, one of which resulted in a fatal injury to a motorcyclist. Both of these crash details indicate the drivers lost control on the sharp curves near Vertical Ridge Road and crossed into the opposite lane. There were 46 fixed object off-road crashes, occurring when vehicles ran off road, generally after losing control. The majority of these crashes occurred at the sharp curves near Vertical Ridge Road. 33% resulted in injury while 67% resulted in property damage only.

The majority of crashes (37 out of 68) occurred at the sharp curves near Vertical Ridge Road. Four out of the five crashes involving motorcycles occurred near Vertical Ridge Road. Eighteen crashes occurred at the curve closest to Vertical Ridge Road and 19 crashes occurred along the curve east of Vertical Ridge Road. **Figure 10** visualizes the frequency and geographic location of the crashes occurring in the curves.

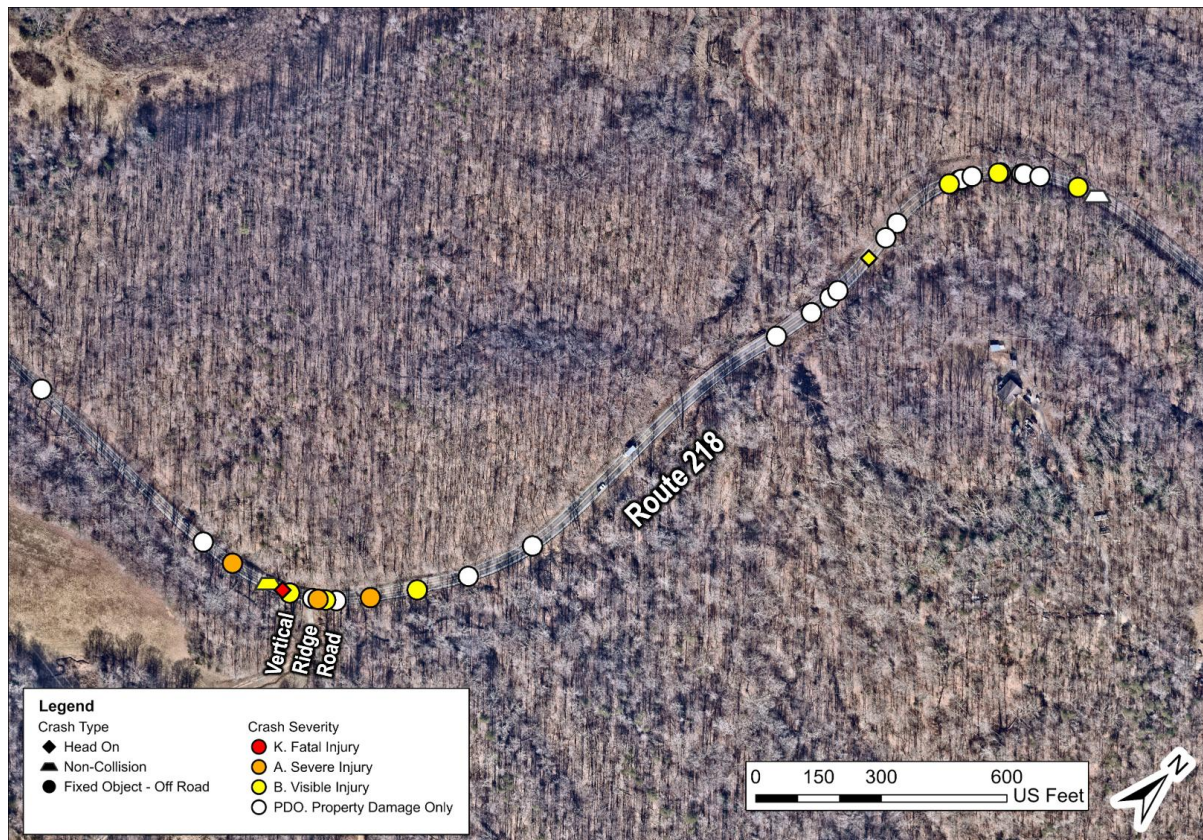


Figure 10: 2020–2024 Crashes in Curves near Vertical Ridge Road

All intersection and roadway segments within the VDOT linear referencing system (LRS) are evaluated annually for the PSI based on the Highway Safety Manual (HSM) methodology by VDOT. The crash frequency, severity of crashes, volume, and length of segment are contributing factors in the predicative analysis. Crash predictions, based on the safety performance function (SPF) crash data files, are made for intersection and segments. The top 100 intersections and 100 miles of segments are published by VDOT for each district on an annual basis. Route 218 between Vertical Ridge Road and Lambs Creek Church Road was identified as one of the top 100 2019-2023 PSI segments, with a ranking of 27 within the VDOT District category. See previous **Figure 8**.

Field Review Observations

A preliminary field review of the study area was conducted on Thursday, April 7, 2025, to verify existing conditions, confirm traffic control devices and lane configurations, and observe peak hour traffic conditions and driver behavior.

The following observations were made regarding Route 218 and the three intersections within the study area during the field review:

Route 218 and Bloomsbury Road

- There are significant sight distance concerns due to road curvature, especially the sight distance looking west from the Bloomsbury Road approach, shown in **Figure 11**.



Figure 11: Bloomsbury Road, looking west

- The stop bar needs to be re-marked at the Bloomsbury Road approach.

Route 218 and Worman Drive

- Faded pavement markings and lack of a stop bar.
- Moderate sight distance concerns looking east from Worman Drive due to road curvature and slight grade change.

Route 218 and Lambs Creek Church Road/Long Leaf Lane

- Guardrail is needed on the north side of the curve on the east leg of the intersection.
- Significant sight distance concerns due to embankment when making a turn from the Lambs Creek Church Road approach.
- Pavement markings need to be refreshed.
- Inadequate sight distance looking to the east when exiting the Long Leaf Lane approach, shown in **Figure 12**.



Figure 12: Lambs Creek Church Road, looking south

Additional observations in the study area

- The westbound travel lane near Ford Lane has rumble strips, but the flashing beacon is hard to see during daylight.
- There is no stop sign and a faded stop bar marking at the intersection with Sierra Crossing.
- There are sight distance concerns for vehicles with driveways on Route 218, especially near the Vertical Ridge Road curves.
- Tight curves causing sight distance concerns for those travelling along the corridor.
- Vegetation trimming needed to improve visibility.
- Rumble strips effective for eastbound traffic but pavement markings need to be refreshed.
- Guardrail installation should be reviewed, as grade requirements are not met at end terminals. See **Figure 12.**



Figure 13: Guardrail in the curves near Vertical Ridge Road

The existing lane configurations and speeds limits in the study area are summarized in **Figure 14.**

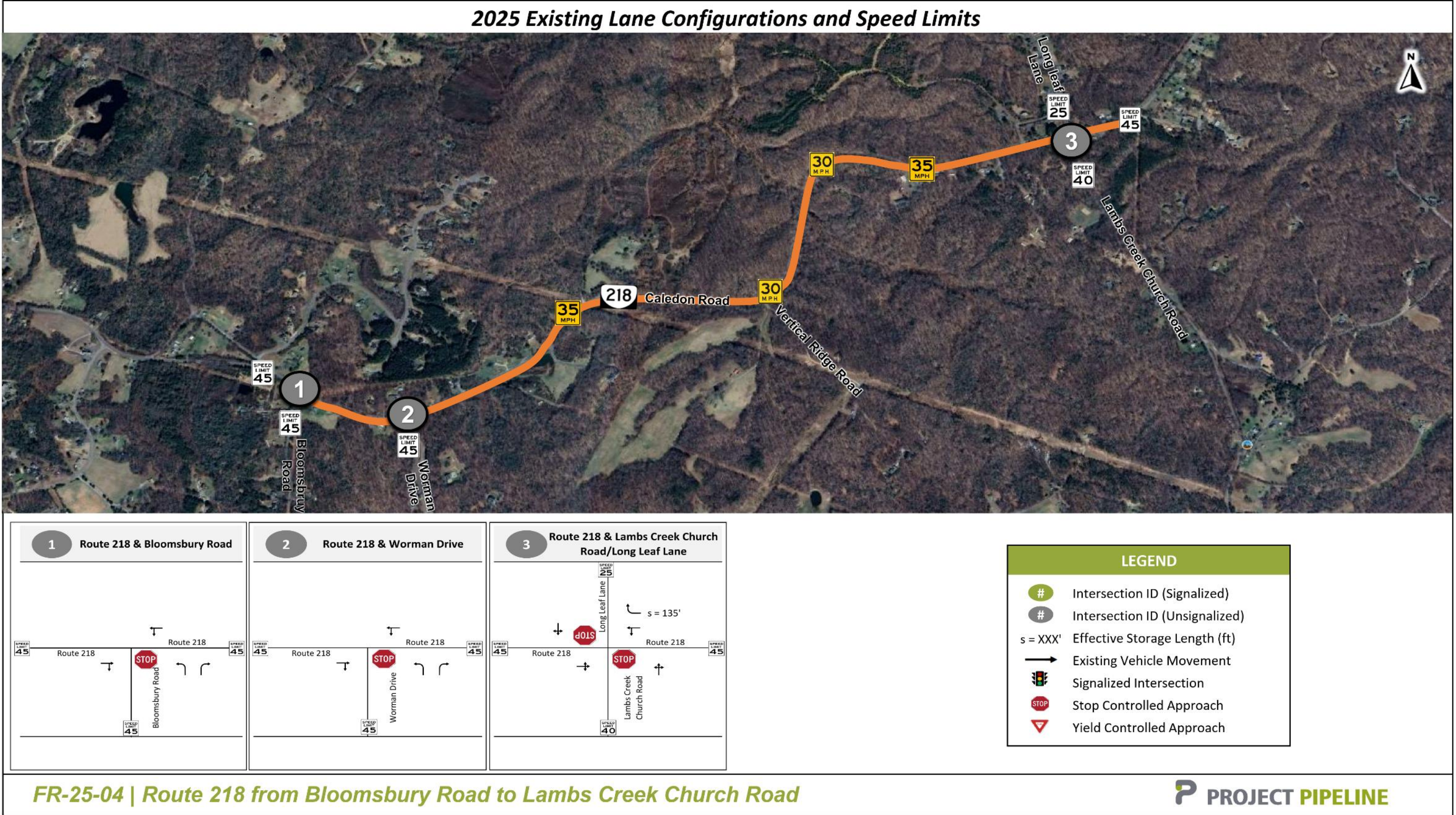


Figure 14: 2025 Existing Lane Configurations and Speed Limits

Speed Analysis

The study team conducted an analysis of the speeds collected over 48 hours at four locations in the corridor. Speeds were collected just east of the intersection of Route 218 and Bloomsbury Road, at the curve near 2532 Caledon Road, just east of Vertical Ridge Road, and in the curve east of Vertical Ridge Road. **Figure 15** shows these locations on a map. The average speed was calculated for each location for every hour of the day, visualized in **Figure 16**. In general, speeds hovered around the posted speed of 45 mph at all locations. The average speed is 10 mph greater than the posted curve advisory speed of 30 mph at the Vertical Ridge Road curves. However, at the curve near 2532 Caledon Road, there was road work occurring nearby between 10 AM and 3 PM which led to a very high increase in vehicles traveling at 0 to 15 mph on both collection days during this time period. These outliers were removed from the dataset and replaced with the average number of vehicles traveling 0 to 15 mph during daytime hours (two vehicles) to avoid falsely inflating the average speed.

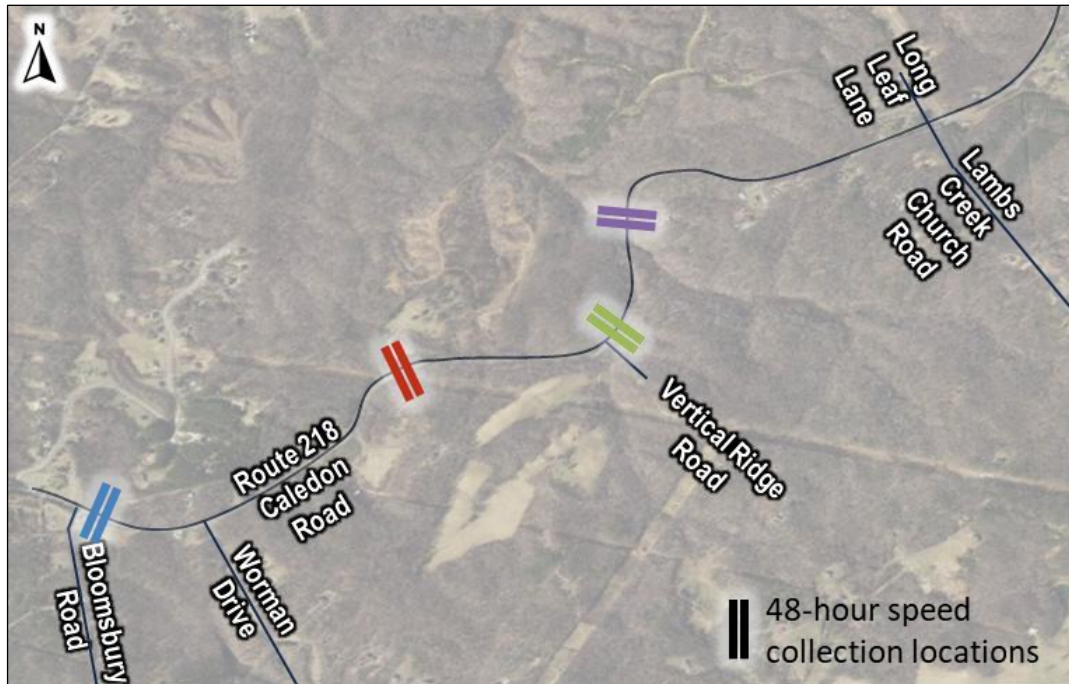


Figure 15: 48-hour Speed Collection Locations

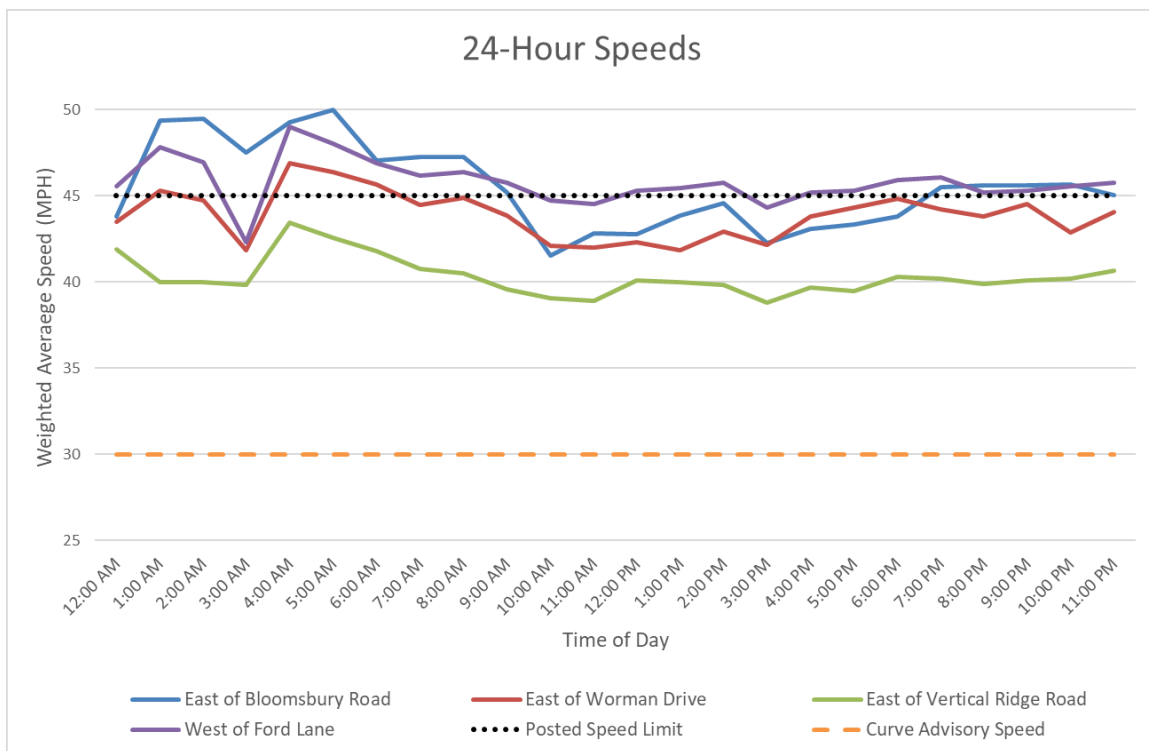


Figure 16: Speeds by Time of Day

Synchro Analysis

The study team conducted a traffic operations analysis to evaluate the overall performance of the study corridor under existing (2025) AM and PM peak hour conditions. Existing conditions were modeled using Synchro 11. The existing AM and PM Synchro models were developed based on the existing roadway geometry and collected traffic count data. Inputs and analysis methodologies were consistent with the VDOT Traffic Operations and Safety Analysis Manual (TOSAM), Version 2.0.

Traffic Data

Twelve-hour vehicular turning movement, pedestrian, and bicycle count data was collected at the three study intersections on Thursday, April 17, 2025 between 6:30 AM and 6:30 PM. The AM and PM peak hours were determined to be 6:45–7:45 AM and 4:30–5:30 PM. Raw traffic data can be found in **Appendix C**. The existing volumes are shown in **Figure 17**. Heavy vehicle percentages and peak hour factors are included in **Figure 18**.

Level of Service Criteria

The intersection Level of Service (LOS) is a qualitative measure that describes a driver's perception of the operating conditions. LOS ratings range from A to F. LOS A indicates little or no congestion and LOS F indicates severe congestion, unstable traffic flow, and/or stop-and-go conditions.

Table 6 summarizes the LOS corresponding to the delay at unsignalized intersections as specified in the HCM. The delay criteria for LOS differs slightly for unsignalized intersections due to driver expectations and behavior. For unsignalized intersections, LOS and corresponding delay is calculated by determining the number of gaps that are available in the conflicting traffic stream, since the LOS analysis assumes that traffic on the mainline is not affected by the traffic on the side street.

Table 6: Level of Service Criteria

Level of Service	Control Delay (seconds/vehicle) - Unsignalized Intersection
A	≤ 10.0
B	> 10.0 to 15.0
C	> 15.0 to 25.0
D	> 25.0 to 35.0
E	> 35.0 to 50.0
F	≥ 50.0

Traffic Analysis Results

Control delay (seconds per vehicle) and 95th percentile queue length (feet) was selected to quantitatively report the performance of each study intersection. Control delay for each intersection was determined using the HCM 6th Edition TWSC report. The full Synchro reports are included in **Appendix C**. Synchro results for the existing condition models are included in **Table 7** and **Table 8**.

Under existing conditions, the three unsignalized intersections operate acceptably.

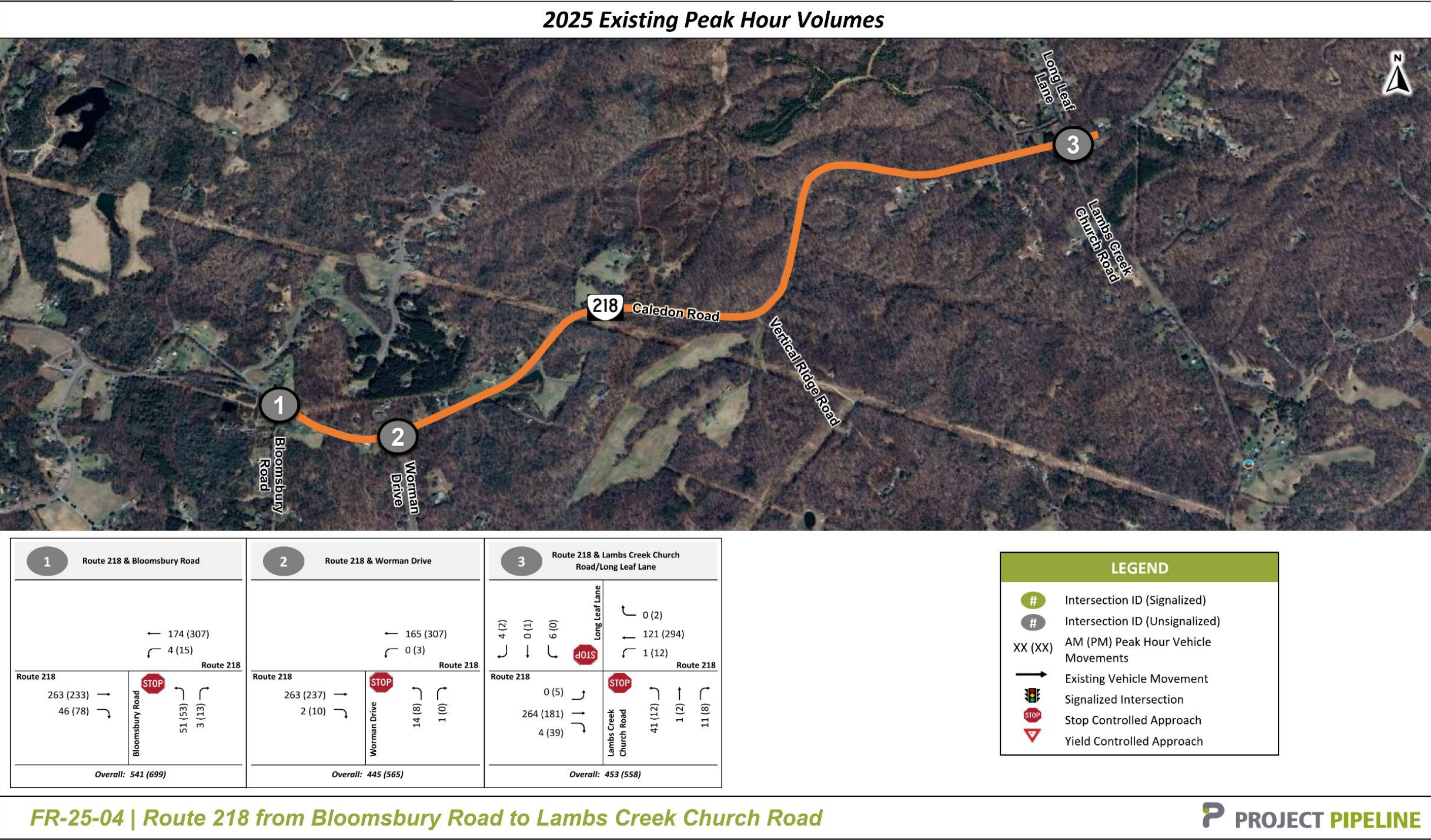


Figure 17: 2025 Existing Peak Hour Volumes

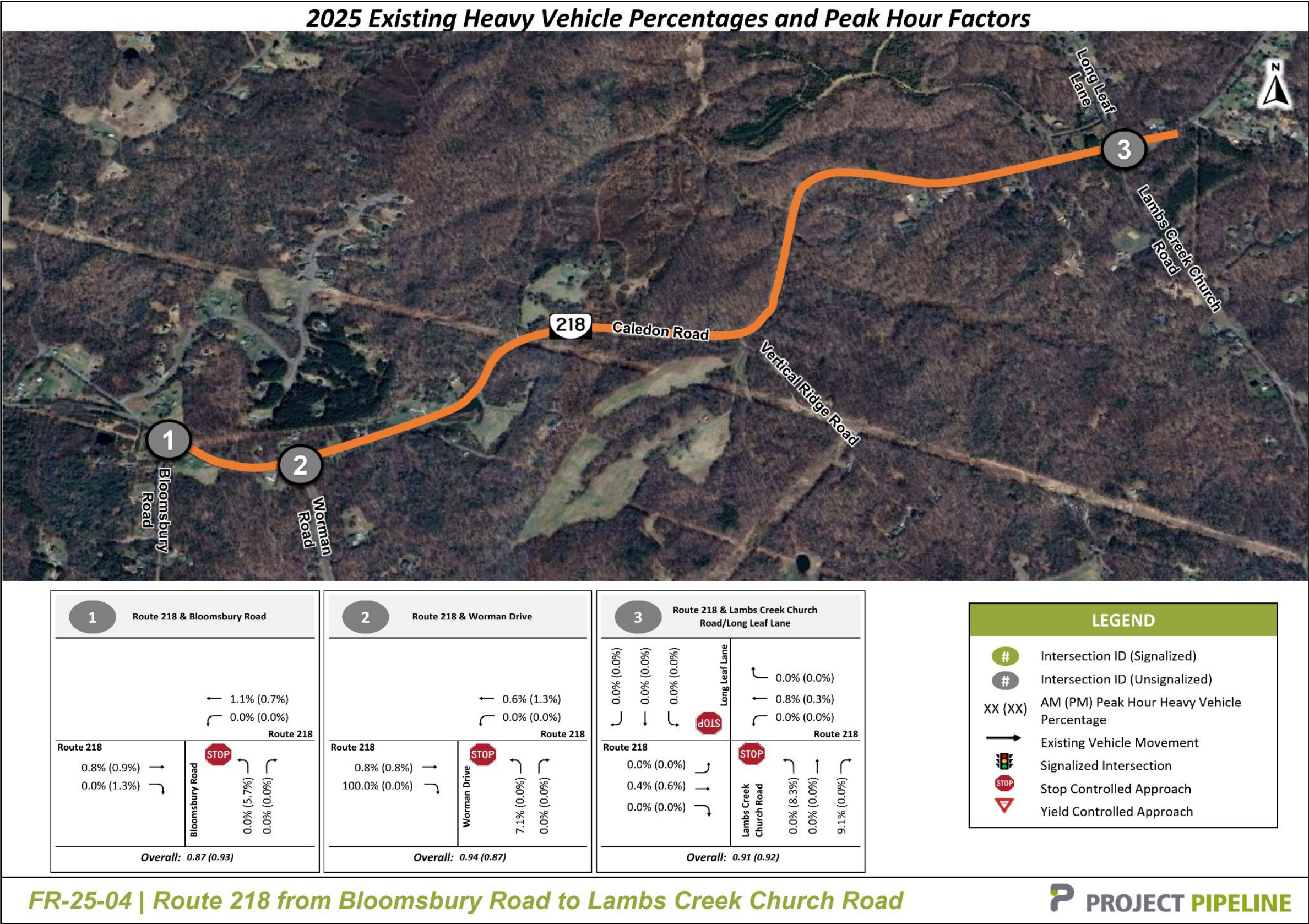


Figure 18: 2025 Existing Heavy Vehicle Percentages and Peak Hour Factors

Table 7: 2025 Existing Conditions Peak Hour Intersection Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
				AM		PM		AM		PM		AM		PM		AM		PM	
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Route 218 & Bloomsbury Road			Route 218				Route 218				Bloomsbury Road							
		Unsignalized	Left					8.0	A	8.0	A	12.9	B	15.3	B				
			Through	-	A	-	A	-	A	-	A								
			Right	-	A	-	A					-	A	15.3	B				
			Approach	0.0	A	0.0	A	0.2	A	0.4	A	12.9	B	15.3	B				
2	Route 218 & Worman Road			Route 218				Route 218				Worman Drive							
		Unsignalized	Left					N/A	A	7.8	A	11.8	B	13.5	B				
			Through	-	A	-	A	-	A	-	A								
			Right	-	A	-	A					-	A	13.5	B				
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	11.8	B	13.5	B				
3	Route 218 & Lambs Creek Church Road			Route 218				Route 218				Lambs Creek Church Road				Long Leaf Lane			
		Unsignalized	Left	0.0	A	7.9	A	7.8	A	7.8	A	12.3	B	13.3	B	10.9	B	11.6	B
			Through	-	A	-	A	-	A	-	A	12.3	B	13.3	B	10.9	B	11.6	B
			Right	-	A	-	A	-	A	-	A	12.3	B	13.3	B	10.9	B	11.6	B
			Approach	0.0	A	0.2	A	0.1	A	0.2	A	12.3	B	13.3	B	10.9	B	11.6	B

- Denotes a free movement

N/A Denotes a movement with zero volume during the study period.

Table 8: 2025 Existing Conditions Peak Hour 95th Percentile Queues

Intersection Number and Description		Type of Control	Lane Group	95th Percentile Queue (feet)							
				Eastbound		Westbound		Northbound		Southbound	
				AM	PM	AM	PM	AM	PM	AM	PM
1	Route 218 & Bloomsbury Road	Unsignalized	Left	Route 218		Route 218		Bloomsbury Road			
			Through	-	-	0	0	10	18		
			Right	-	-	-	-				
				-	-		10	18			
2	Route 218 & Worman Road	Unsignalized	Left	Route 218		Route 218		Worman Drive			
			Through	-	-	0	0	3	3		
			Right	-	-	-	-				
				-	-		3	3			
3	Route 218 & Lambs Creek Church Road	Unsignalized	Left	Route 218		Route 218		Lambs Creek Church Road		Long Leaf Lane	
			Through	0	8	0	0	10	5	3	0
			Right	-	-	-	-	10	5	3	0
				-	-	-	-				

- Denotes a free movement

Phase 1 Public Outreach

The Phase 1 Public Input survey was held from May 7, 2025 to May 21, 2025 to collect feedback on existing traffic, safety, transit, and bicycle and pedestrian issues within the study area. The online survey had a total of 731 participants who provided 1,024 comments. Participants identified safety and speeding/aggressive driving as the two most important issues in the study area. **Figure 19** shows the geographic spread and frequency of public input comments. Detailed results from the Phase 1 public outreach efforts can be found in **Appendix C**.

The most common topics in the comments included:

- Difficulty making turns due to lack of sight distance
- Sharp curves at Vertical Ridge Road
- Difficulty of traffic enforcement, easy recovery, and space to pull over given the lack of shoulders
- Requests to not allow through trucks
- Foliage covering road signs
- Concerns about speeding and tailgating
- Concerns about school buses being able to stop
- Trees falling into the road
- More legal passing zones
- Concern with roadside ditches being steep
- Concern with potholes and drainage
- Requests for realignment
- Improve guardrail placement / add guardrails
- Some desire for bike access but also recognition that the rumble strips hinder biking as do the narrow corridor and speeds
- Concerns about commuters taking Route 218 instead of Route 3

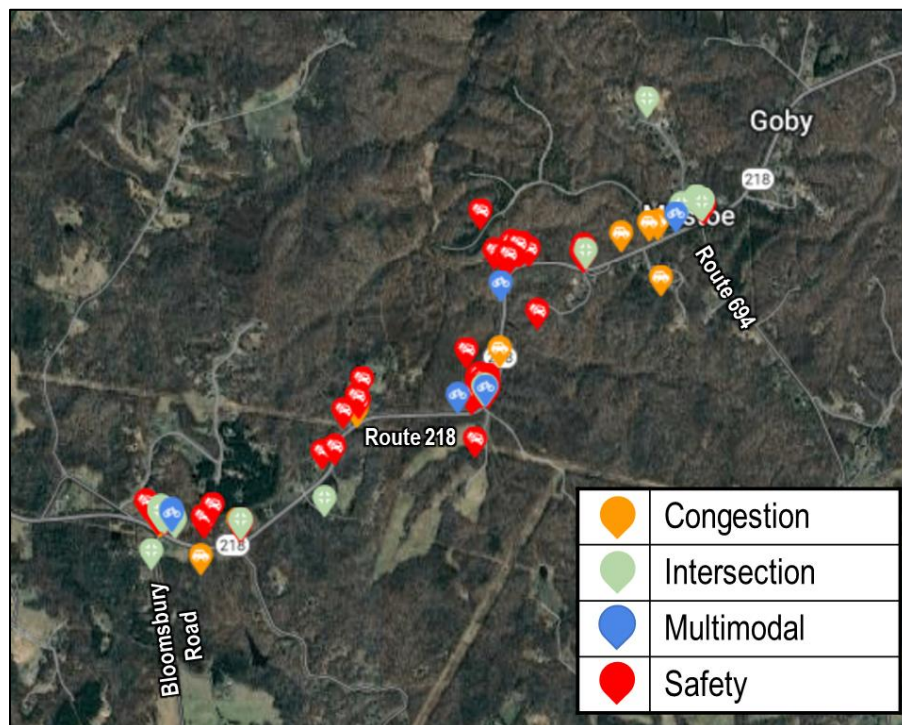


Figure 19: Public Input Comment Pins and Themes

1.7 Phase 1 Alternatives Development

The study team developed preliminary alternatives in parallel with the high-level needs diagnosis efforts documented in **Chapter 1.5**. The proposed Phase 1 alternatives were developed to improve safety in the study area whether at intersections or along curves in the study area.

1.7.1 Initial Alternatives

The Needs Evaluation, Diagnosis, and Preliminary Concepts Meeting (SWG Meeting #2) was held on June 12, 2025. Ten alternatives for Route 218 were presented during the meeting, which are summarized in **Table 9**. The meeting materials can be found in **Appendix C**.

Table 9: Phase 1 Alternatives

Location	Alternative	Description
Route 218 and Bloomsbury Road	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve intersection sight distance for turning vehicles
Curve #1 near 3041 Caledon Road	Realignment	Realign the roadway horizontal geometry to be in compliance with VDOT standards
Curve #1 near 3041 Caledon Road	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve stopping sight distance for vehicles navigating the curve
Curve #2 at Vertical Ridge Road	Realignment	Realign the roadway horizontal geometry to be in compliance with VDOT standards
Curve #2 at Vertical Ridge Road	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve stopping sight distance for vehicles navigating the curve
Curve #3 west of Ford Lane	Realignment	Realign the roadway horizontal geometry to be in compliance with VDOT standards
Curve #3 west of Ford Lane	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve stopping sight distance for vehicles navigating the curve
Curve #4 at Ford Lane	Realignment	Realign the roadway horizontal geometry to be in compliance with VDOT standards
Curve #4 at Ford Lane	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve stopping sight distance for vehicles navigating the curve
Route 218 and Lambs Creek Church Road	Sight Distance Clearing	Perform clearing, grubbing, and grading to improve intersection sight distance for turning vehicles

1.7.2 Phase 1 Alternatives Summary

The initial concepts were revised and presented at the Preliminary Concepts Refinement and Phase 2 Scoping Meeting (SWG Meeting #3), held on July 2, 2025, where it was decided which concepts would move forward to Phase 2. A summary matrix was generated to facilitate comparison of the many alternatives. An eleventh alternative, to add an eastbound right-turn lane, was added at the intersection of Route 218 and Bloomsbury Road. In total, the SWG agreed to carry all eleven alternatives forward to Phase 2 for further refinement. Right-of-way acquisition is a potential challenge, but the SWG expressed no major concerns given the anticipated right-of-way impacts are minimal. All alternatives were selected for further evaluation due to their potential for safety improvements.

Figure 20 shows the preliminary alternatives graphically categorized by the needs addressed by the alternative. The meeting materials can be found in **Appendix D**.

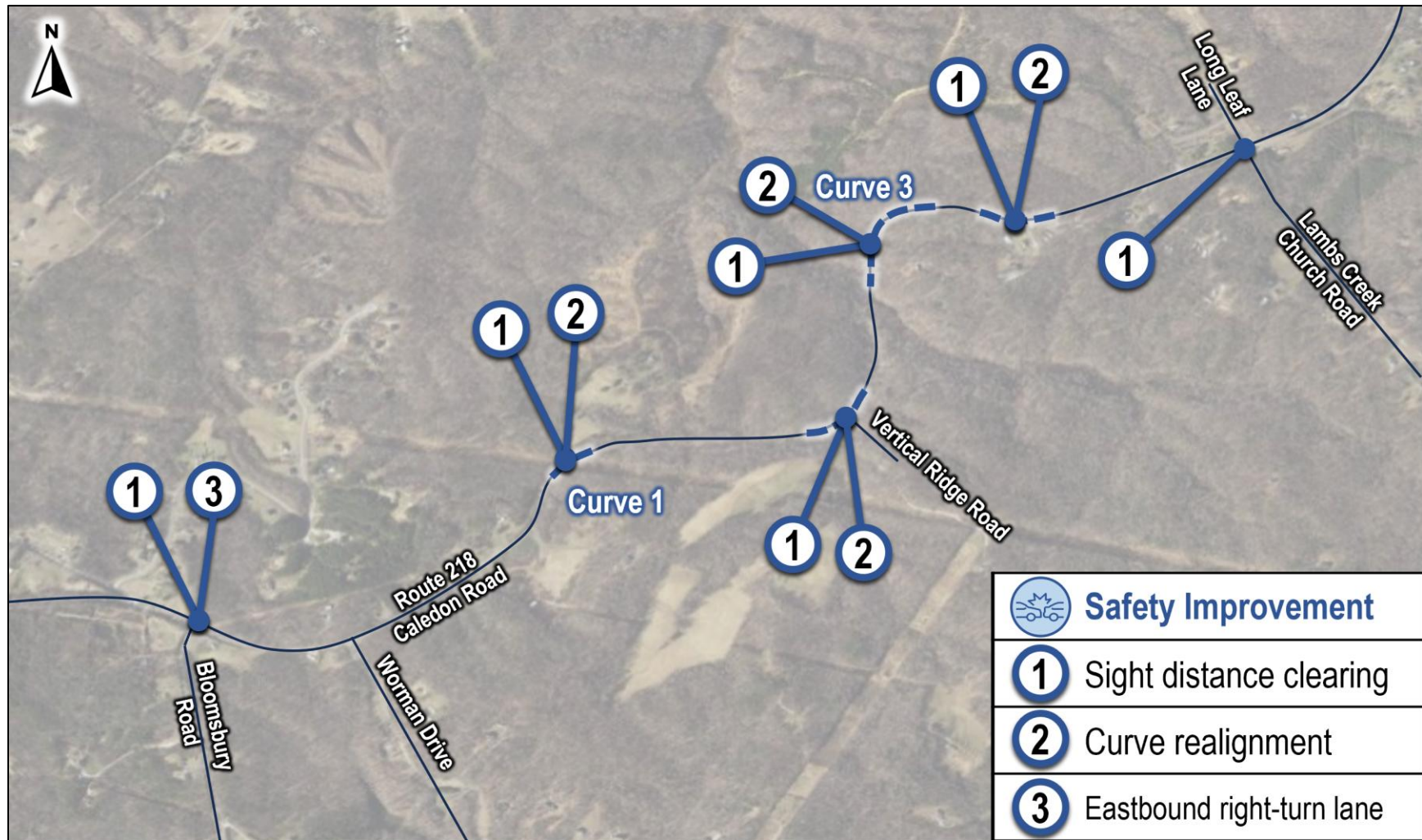


Figure 20: Phase 1 Scoping Level Improvement Alternatives (Not to scale)

Alternatives Refinement

2.1 Alternatives Refinement Overview

The study team refined the alternatives chosen to be carried forward in Phase 2 including concept drawings, cost estimates, and concept screening safety analysis. The primary goal of the Phase 2 alternatives refinement effort was to select a Preferred Alternative. The study team compared each alternative across several metrics including safety and cost to determine the refined list of alternatives to identify a preferred alternative.

The Concept Screening Refinements and Results Meeting (SWG Meeting #4) was held on October 30, 2025, to gather feedback on the draft concept sketches and cost estimates. During the meeting, the study team discussed each alternative based on impacts to safety, cost, and right-of-way impacts. Meeting materials are included in **Appendix D**.

2.2 Phase 2 Alternatives Description

The following section gives a description of each of the alternatives and provides a conceptual sketch of the alternative.

Bloomsbury Road—Eastbound Right-Turn Lane

This concept would add a right-turn lane in the eastbound direction at the intersection of Route 218 and Bloomsbury Road. The proposed right-turn lane would have 200 feet of storage and a 100-foot taper. This concept includes tree clearing and limited grading as well as replacement of a 15-inch culvert. This concept would improve stopping sight distance and intersection sight distance. There are minor right-of-way impacts. **Figure 21** presents a conceptual sketch of the alternative.

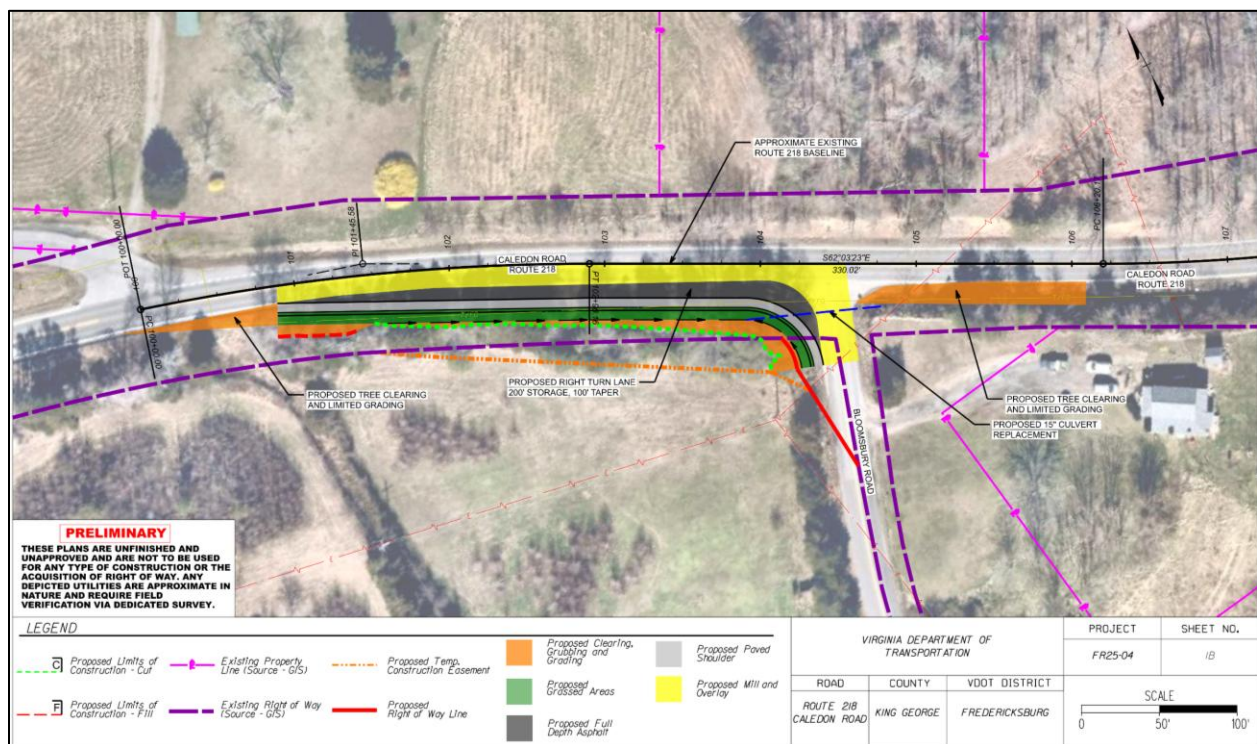


Figure 21: Phase 2 Alternative—Eastbound Right-Turn Lane at Bloomsbury Road

Bloomsbury Road—Sight Distance Clearing

This concept proposes tree clearing and limited grading at the intersection of Route 218 and Bloomsbury Road. This concept would improve stopping sight distance and intersection sight distance. There are no anticipated right-of-way impacts. **Figure 22** presents a conceptual sketch of the alternative.

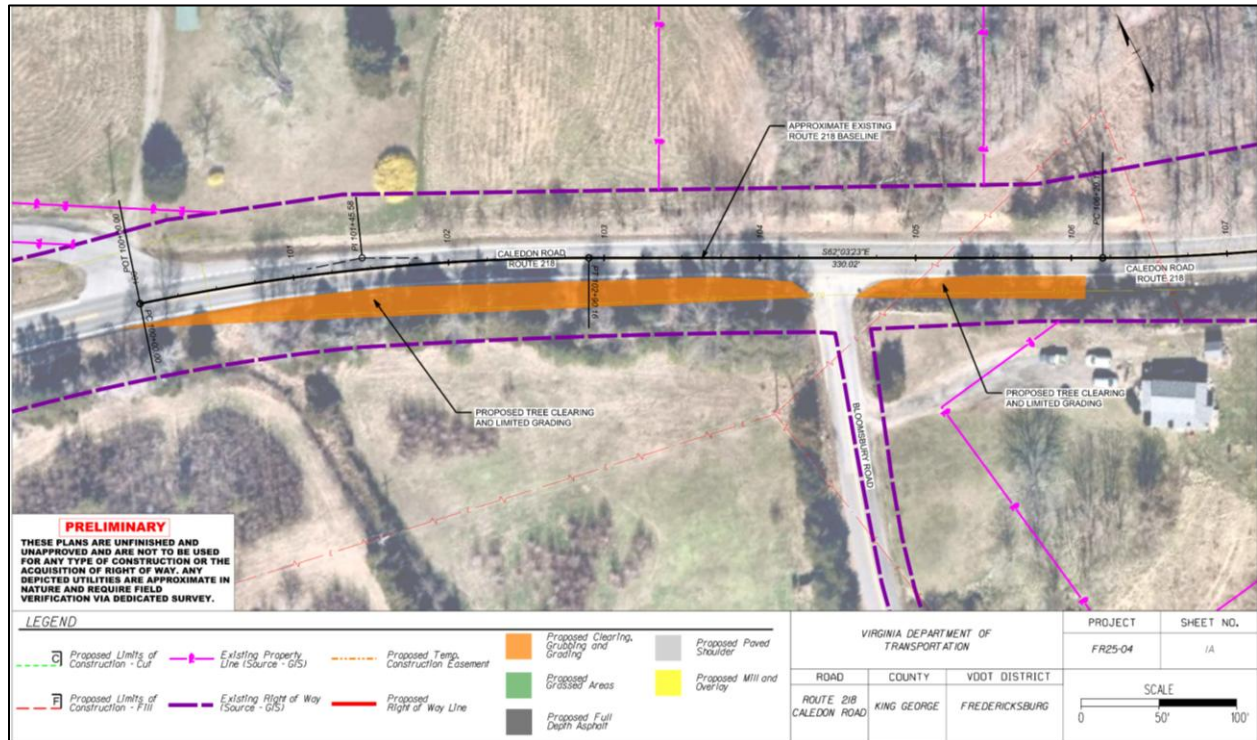


Figure 22: Phase 2 Alternative—Sight Distance Clearing at Bloomsbury Road

Curve #1—Realignment

This concept proposes realignment of the curve near 3041 Caledon Drive. This would bring the curve into compliance with VDOT specifications and would correct the superelevation of the roadway. Temporary construction easements would be required. **Figure 23** presents a conceptual sketch of the alternative.

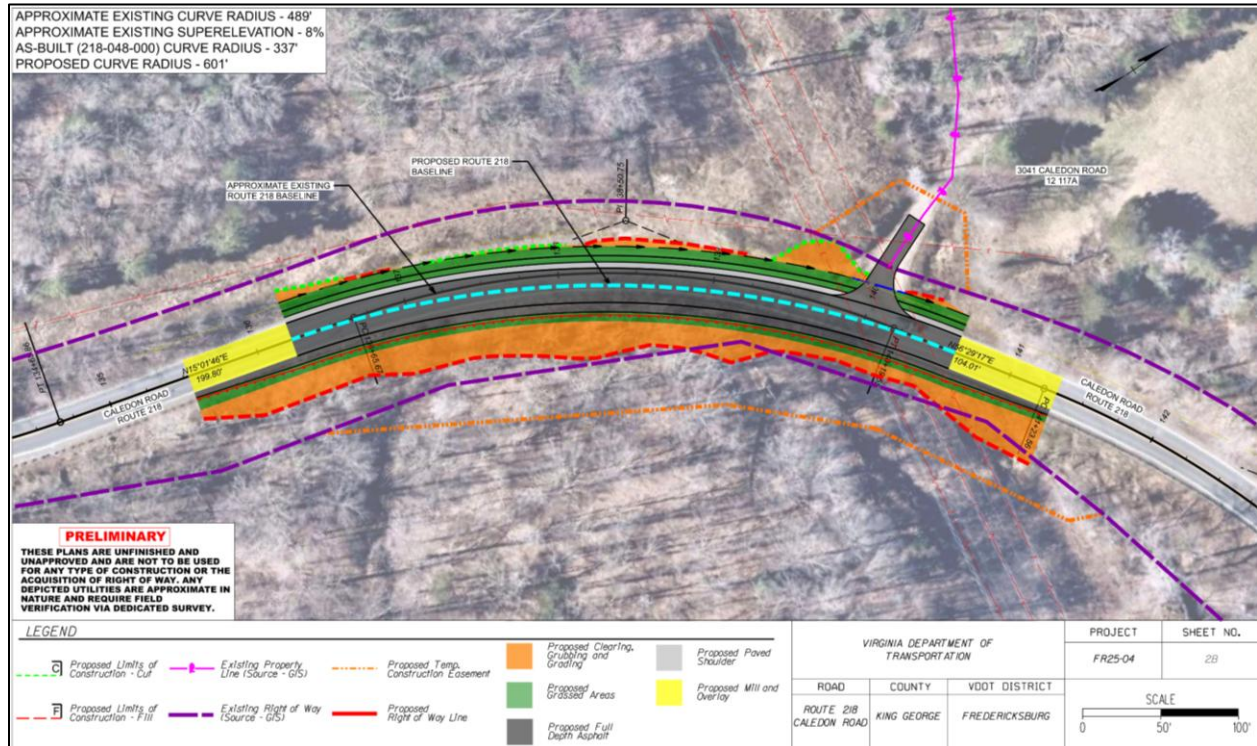
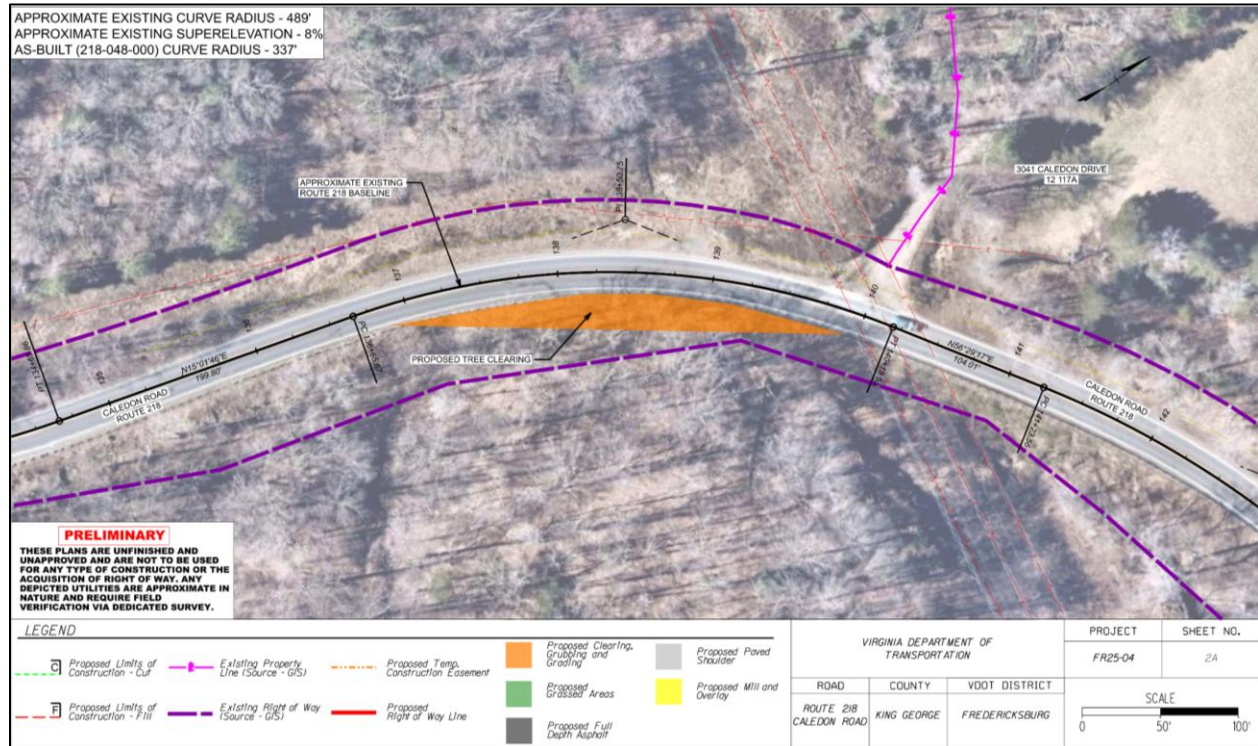


Figure 23: Phase 2 Alternative—Curve #1 Realignment

Curve #1—Sight Distance Clearing

This concept proposes tree clearing on the southern side of the curve near 3041 Caledon Drive. This would improve stopping sight distance. There are no anticipated easements or right-of-way needs. **Figure 24** presents a conceptual sketch of the alternative.



Curve #2—Realignment

This concept proposes realignment of the curve at Vertical Ridge Road to be in compliance with VDOT specifications. A temporary construction easement would be needed for construction and grading. Additional right-of-way would be needed to encompass the proposed curve alignment. **Figure 25** presents a conceptual sketch of the alternative.

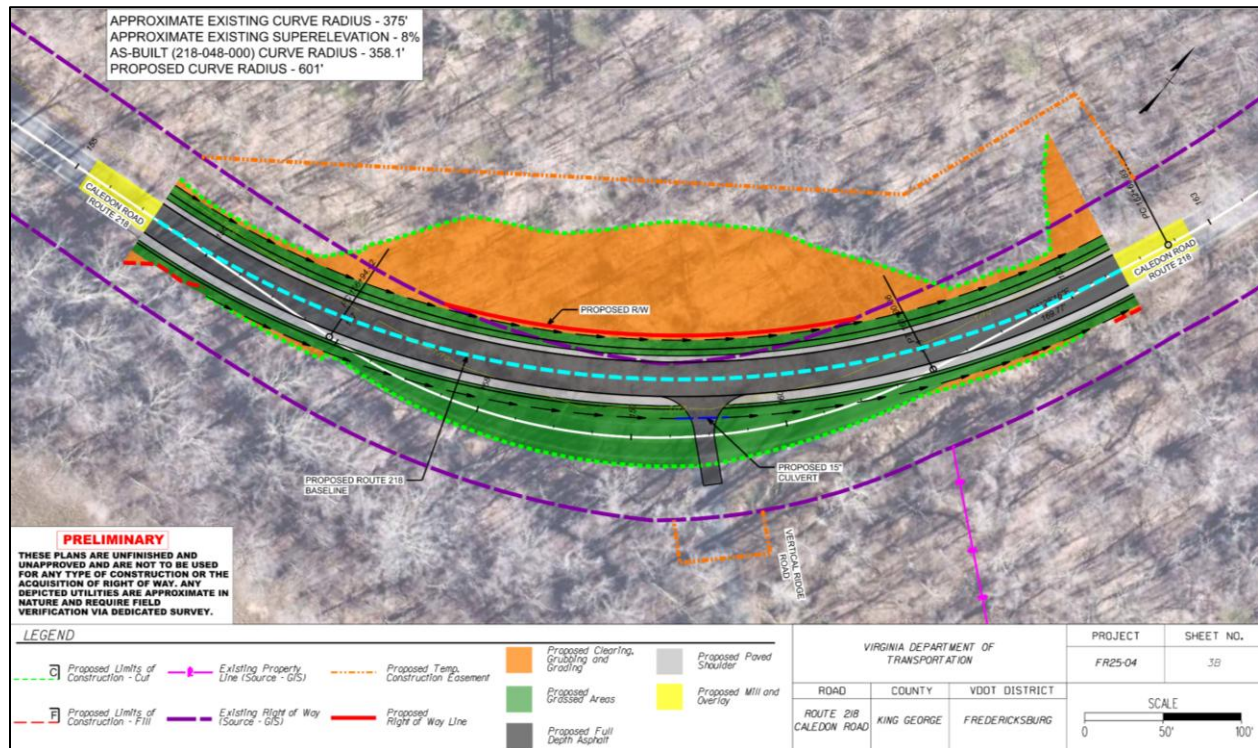


Figure 25: Phase 2 Alternative—Curve #2 Realignment

Curve #2—Sight Distance Clearing

This concept proposes tree clearing and grading at the curve at Vertical Ridge Road. This would improve stopping sight distance. Temporary construction easements are needed for grading. **Figure 26** presents a conceptual sketch of the alternative.

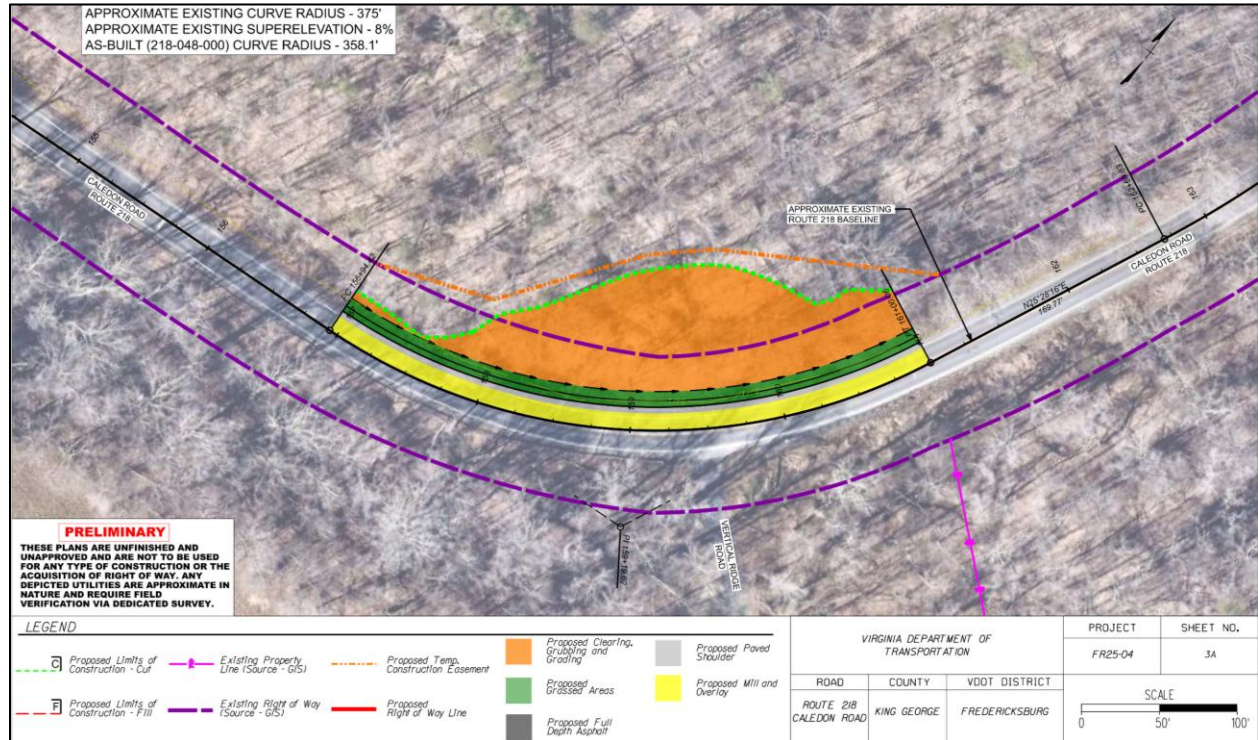


Figure 26: Phase 2 Alternative—Curve #2 Sight Distance Clearing

Curve #3—Realignment

This concept proposes realignment of the curve west of Ford Lane to be in compliance with VDOT specifications. A temporary construction easement would be needed for construction and grading. Additional right-of-way would be needed to encompass the proposed curve alignment. **Figure 27** presents a portion of the alternative.

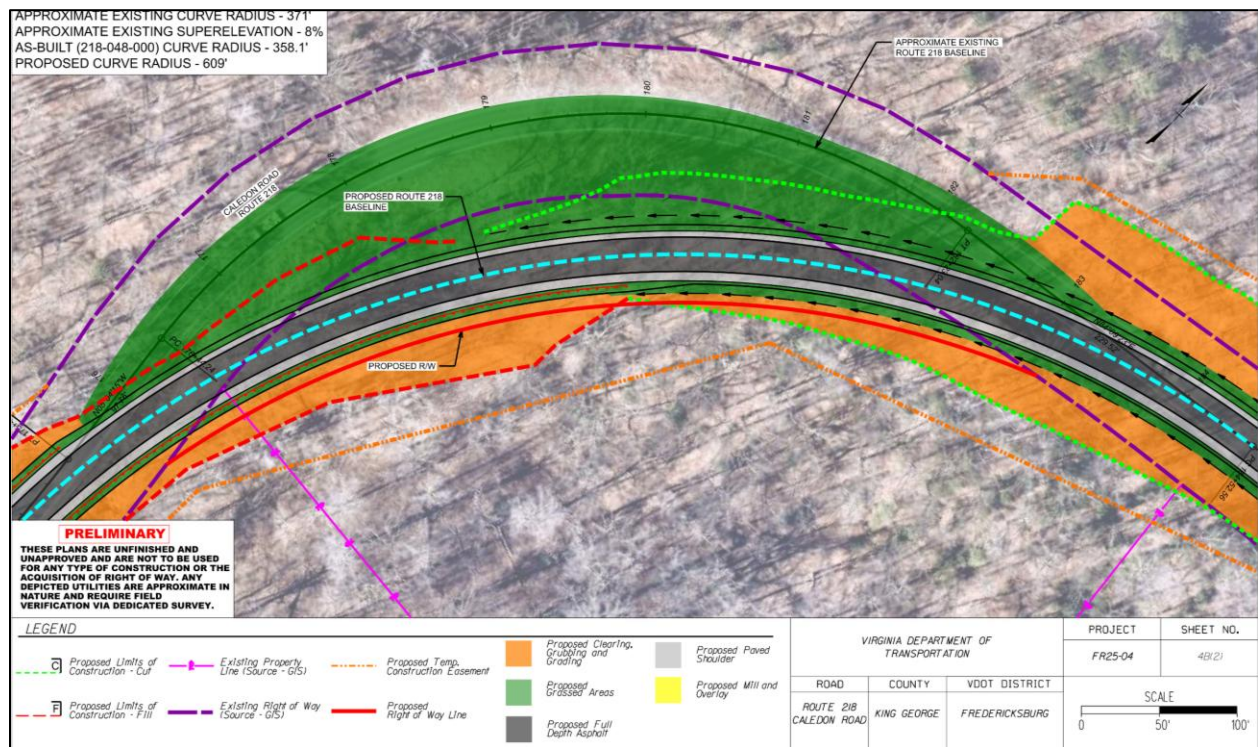


Figure 27: Phase 2 Alternative—Curve #3 Realignment

Curve #3—Sight Distance Clearing

This concept proposes tree clearing and grading at the curve west of Ford Lane. This would improve stopping sight distance. Temporary construction easements are needed for grading. **Figure 28** presents a conceptual sketch of the alternative.

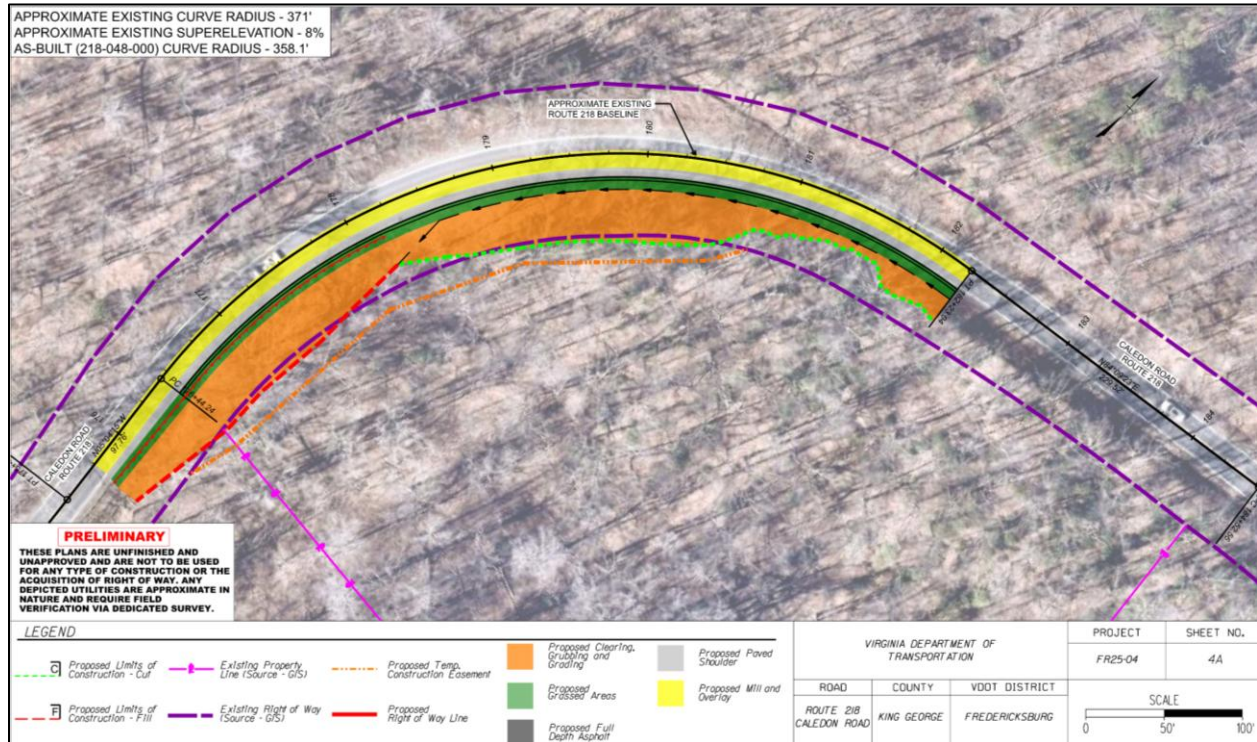


Figure 28: Phase 2 Alternative—Curve #3 Sight Distance Clearing

Curve #4—Realignment

This concept proposes realignment of the curve at Ford Lane to be in compliance with VDOT specifications. A temporary construction easement would be needed for construction and grading.

Figure 29 presents a conceptual sketch of the alternative.

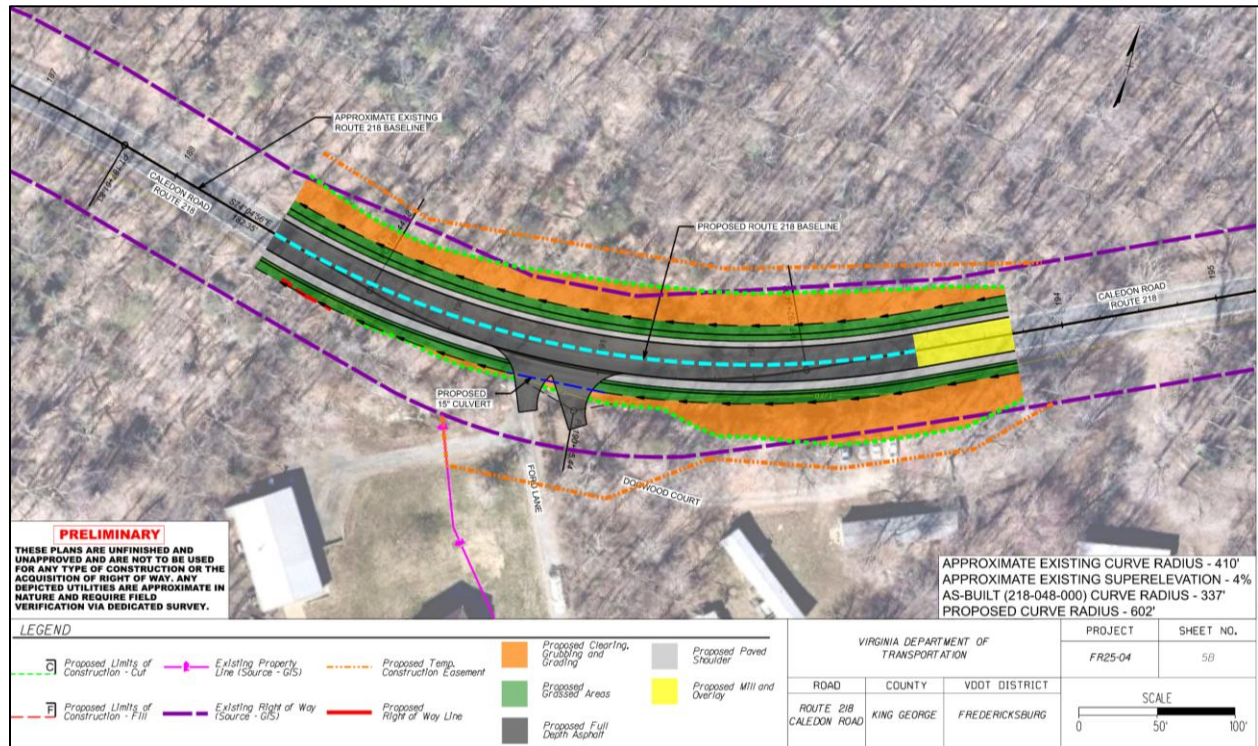


Figure 29: Phase 2 Alternative—Curve #4 Realignment

Curve #4—Sight Distance Clearing

This concept proposes tree clearing and grading at the curve at Ford Lane. This would improve stopping sight distance. Temporary construction easements are needed for grading. **Figure 30** presents a conceptual sketch of the alternative.

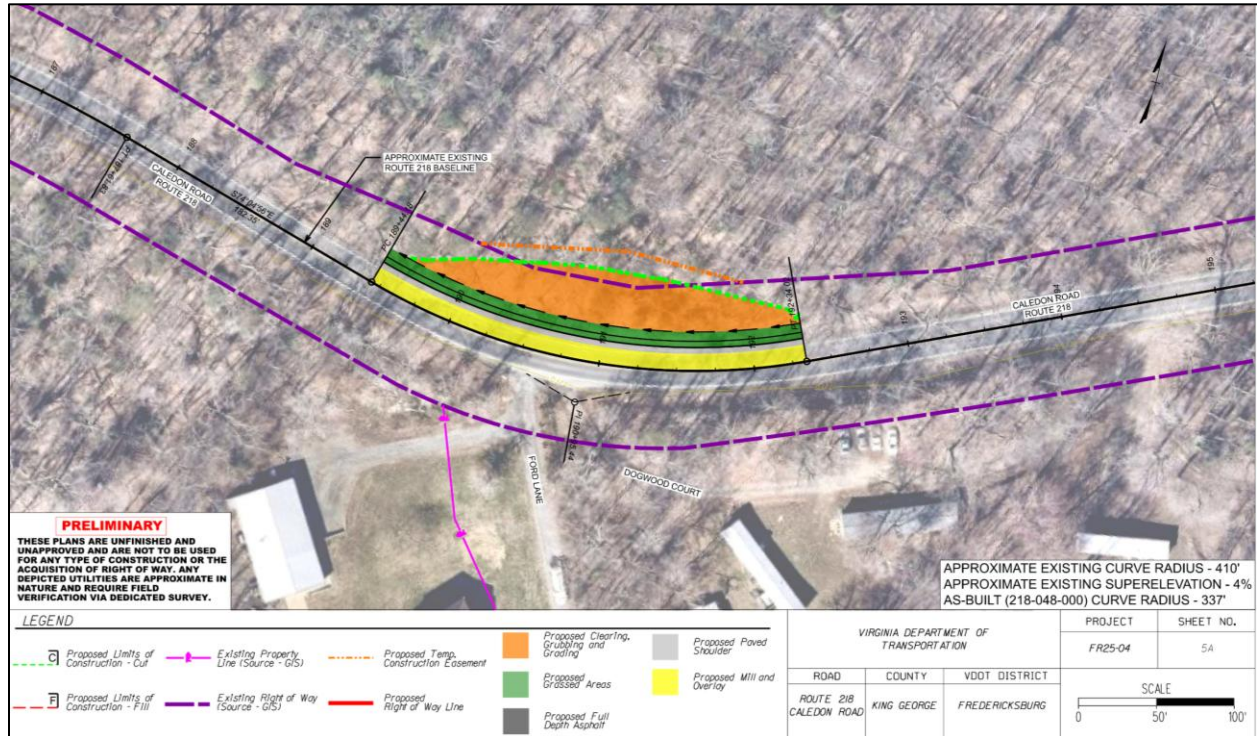


Figure 30: Phase 2 Alternative—Curve #4 Sight Distance Clearing

Lambs Creek Church Road—Sight Distance Clearing

This concept proposes tree clearing and grading at the curve at Ford Lane. This would improve stopping sight distance and intersection sight distance. There are no anticipated right-of-way or easement needs.

Figure 31 presents a conceptual sketch of the alternative.

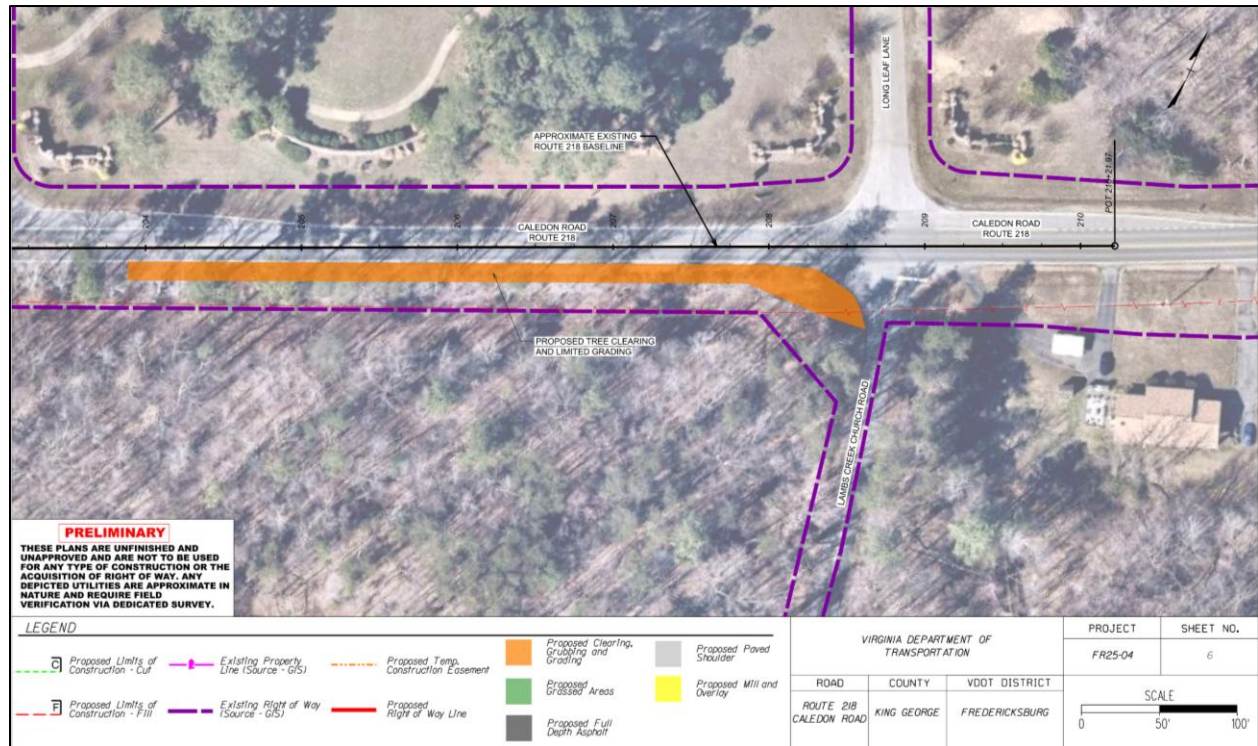


Figure 31: Phase 2 Alternative—Lambs Creek Church Road Sight Distance Clearing

2.3 Alternatives Screening Safety Results

The study team conducted a screening-level safety analysis. Improvement alternatives were further screened to aid in selecting a preferred alternative using a matrix to rank each alternative based on safety, right-of-way impacts, environmental impacts, constructability, and cost.

Projected Crash Reduction

The study team reviewed crash modification factors (CMFs) to determine the potential safety benefits for each alternative. CMFs are used to estimate the expected change in the number of crashes after a specific countermeasure is implemented. They are calculated as the ratio of crashes with the countermeasure to the number of crashes without the countermeasure. A CMF of 1.00 means that there is no expected change, a CMF less than 1.00 means there is an expected reduction in crashes, and a CMF greater than 1.00 means there is an expected increase in crashes (e.g., a CMF of 0.6 means the countermeasure is projected to reduce crashes by 40%). CMFs were selected from the CMF Clearinghouse and the VDOT *State Preferred CMF List*. The CMFs selected represent the most applicable treatments for each location based on SMART SCALE and Virginia guidance, as shown in **Table 10**.

Table 10: CMF and Crash Reduction Summary

Location	Alternative	Fatal + Injury CMF	Annual Crash Reduction (Fatal & Injury Crashes)
Caledon Road and Bloomsbury Road	Sight Distance Clearing	0.53	0.18
Caledon Road and Bloomsbury Road	Right-Turn Lane	0.86	0.06
Curve 1 near 3041 Caledon Road	Realignment	0.32	0.42
Curve 1 near 3041 Caledon Road	Sight Distance Clearing	0.70	0.18
Curve 2 at Vertical Ridge Road	Realignment	0.32	1.36
Curve 2 at Vertical Ridge Road	Sight Distance Clearing	0.70	0.6
Curve 3 west of Ford Lane	Realignment	0.32	0.54
Curve 3 west of Ford Lane	Sight Distance Clearing	0.70	0.24
Curve 4 at Ford Lane	Realignment	0.32	0.14
Curve 4 at Ford Lane	Sight Distance Clearing	0.70	0.06
Caledon Road and Lambs Creek Church Road	Sight Distance Clearing	0.53	0.18

2.4 Summary Matrix

A summary matrix was created to compare the alternatives considered, shown in **Table 11**. Generally positive or better alternatives are shown in green and with a “+” symbol, no effect or moderate alternatives are indicated by gray-blue and a “0” symbol, and negative or worse alternatives are shown in red and by a “-” symbol.

Table 11: Phase 2 Alternatives Summary Matrix

Intersection	Concepts	Safety Improvements	R/W and Utility Impacts	Environmental Impacts	Cost	Constructability & MOT
Intersection of Caledon Road & Bloomsbury Road	Eastbound Right Turn Lane	+	0	+	0	0
	Sight Distance Clearing	+	+	+	+	+
Curve 1 (3041 Caledon Road)	Realignment	+	-	-	-	-
	Sight Distance Clearing	0	+	+	+	0
Curve 2 (Vertical Ridge Road)	Realignment	+	-	0	-	-
	Sight Distance Clearing	0	0	+	0	0
Curve 3 (West of Ford Lane)	Realignment	+	-	-	-	-
	Sight Distance Clearing	0	0	0	0	0
Curve 4 (Ford Lane)	Realignment	+	0	+	-	-
	Sight Distance Clearing	0	0	+	0	0
Intersection of Caledon Road & Lambs Church Creek Road	Sight Distance Clearing	+	+	+	+	+

2.5 Preferred Alternative Selection

The study team suggested a set of alternatives to advance towards the development of the Preferred Alternative during SWG Meeting #4. The following section presents the alternatives considered and the rationale for the selection of the preferred alternative. A prioritization matrix was developed for the alternatives which included safety analysis, construction cost, and cost-benefit ratio.

The Project Pipeline Program requires that all recommended improvements be categorized into three distinct groups:

- **Short Term Recommendations (State/Local Forces):** This category consists of immediate maintenance and operational improvements that could be implemented through state/local forces. Examples include vegetation management, HSIP systemic-level safety improvements, adjusting signal timings. Some improvements in this category may also be included in the final-mid-term investment strategy.
- **Mid-Term Investment Strategy (Preferred Alternative):** This category consists of improvements that are targeted for a funding request/application within the next 12 months. Items in this group will advance to Phase 3 of the Project Pipeline study process for further design and cost refinement. All recommendations in the mid-term investment strategy category will be considered the preferred alternative per SMART SCALE High Priority Program (HPP) policy.
- **Long-Term Investment Vision:** This category includes recommendations that represent a long-term investment vision (beyond 20 years). These improvements are not targeted for funding in near or mid-term but are intended to guide localities in their comprehensive planning efforts, inform land development decisions, and reserve and protect future right-of-way. Recommendations in this category will not advance to Phase 3 of Project Pipeline.

Table 12 shows the prioritization matrix for the alternatives discussed for the study. VDOT Traffic Crash Cost 2025 memorandum, which provides Virginia-specific comprehensive crash costs¹, was utilized to develop the cost-benefit ratio. Based on the cost-benefit ratio, the SWG decided to move forward with the sight distance clearing at intersections and curves and realignment of the curve at Vertical Ridge Road as the preferred alternative. The preferred alternative also aligns with key SMART SCALE factor areas by improving safety and operations within the study area, consistent with current SMART SCALE evaluation criteria. **Table 13** shows the recommended investment strategy identified for the study. The locations of these preferred alternatives are shown in **Figure 32**.

The preferred alternative concepts are provided for reference in **Appendix D**. The Phase 2 Preferred Alternative Summary Sheet is provided in **Appendix E**.

¹ https://www.vdot.virginia.gov/media/vdotvirginiagov/about/strategic-highway-safety-plan/VDOT-Crash-Costs-Memo-2024_10252024_508c_acc08182025_RM.pdf

Table 12: Prioritization Matrix

Location	Alternative	Reduction of EPDO Crashes	Concept Construction Cost	Cost- Benefit Ratio
Caledon Road and Bloomsbury Road	Right-Turn Lane	1.1	\$750,000	0.03
Caledon Road and Bloomsbury Road	Sight Distance Clearing	3.8	\$120,000	0.54
Curve 1 near 3041 Caledon Road	Realignment	8.2	\$2,230,000	0.06
Curve 1 near 3041 Caledon Road	Sight Distance Clearing	3.6	\$120,000	0.51
Curve 2 at Vertical Ridge Road	Realignment	109.6	\$3,130,000	0.96
Curve 2 at Vertical Ridge Road	Sight Distance Clearing	48	\$1,410,000	0.93
Curve 3 west of Ford Lane	Realignment	11.0	\$10,060,000	0.02
Curve 3 west of Ford Lane	Sight Distance Clearing	4.8	\$1,320,000	0.07
Curve 4 at Ford Lane	Realignment	2.7	\$2,340,000	0.02
Curve 4 at Ford Lane	Sight Distance Clearing	1.2	\$860,000	0.03
Caledon Road and Lambs Creek Church Road	Sight Distance Clearing	3.8	\$280,000	0.26

Table 13: Preferred Alternative Selection

Improvement Concept	Location	Short-Term Recommendation	Mid-Term Investment Strategy (Preferred Alternative)	Long-Term Investment Vision
Sight Distance Clearing	Caledon Road and Bloomsbury Road		✓	
Sight Distance Clearing	Curve 1 (3041 Caledon Road)		✓	
Sight Distance Clearing	Curve 3 (West of Ford Lane)		✓	
Sight Distance Clearing	Curve 4 (Ford Lane)		✓	
Sight Distance Clearing	Caledon Road and Lambs Creek Church Road		✓	
Curve Realignment	Curve 2 (Vertical Ridge Road)		✓	

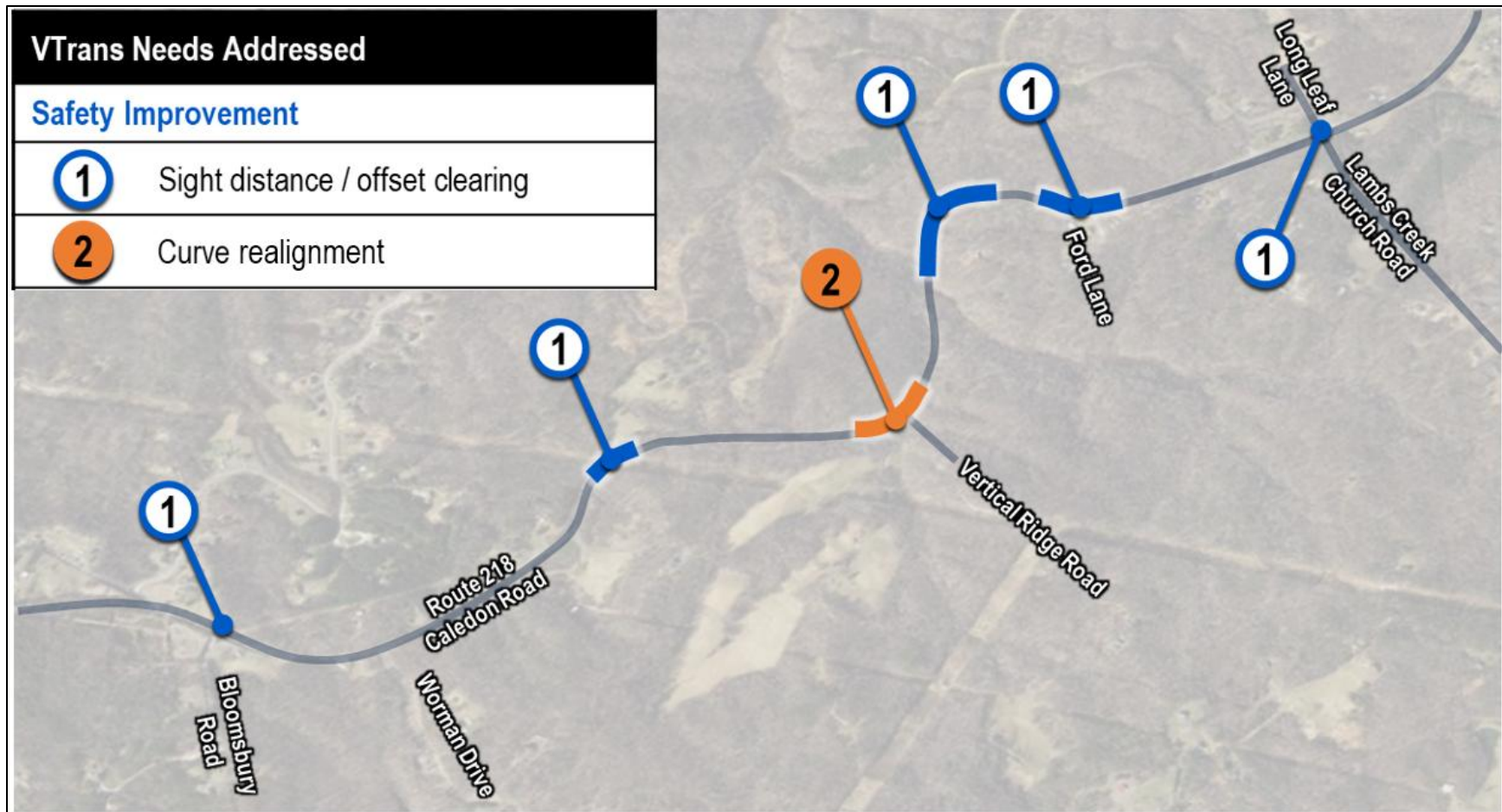


Figure 32: Preferred Alternative: Sight Distance Clearing and Curve Realignment (Not to scale)

Preferred Alternative Analysis and Investment Strategy

3.1 Phase 3 Preferred Alternative Summary

Phase 3 of the study included a detailed design, cost estimate, risk assessment, and further operations assessment of the selected preferred alternative. As discussed in **Section 2.5**, the SWG selected sight distance clearing at five locations and roadway realignment at Vertical Ridge Road as the preferred alternative. The preferred alternative concept has the following components:

- Perform sight distance clearing at the following locations:
 - Caledon Road and Bloomsbury Road
 - Curve 1 (3041 Caledon Road)
 - Curve 3 (West of Ford Lane)
 - Curve 4 (Ford Lane)
 - Caledon Road and Lambs Creek Church Road
- Re-align the curve at Vertical Ridge Road

A field review meeting was conducted with the VDOT and SWG members on March 10, 2026, to evaluate and discuss the draft concept designs within the existing context of the corridor. Based on this meeting, revisions were made to the components to be included in the preferred alternative, as listed below.

- Expanded grading limits and added stop bar at Bloomsbury Road
- Added typical sections throughout the corridor
- At Vertical Ridge Road: updated grading limits, reviewed impacts to the stream, added note regarding removal of large diameter trees
- Expanded grading limits and added power pole location at Lambs Creek Church Road

The final Phase 3 Preferred Alternative consists of the following components:

- Perform sight distance clearing at the following locations:
 - Caledon Road and Bloomsbury Road
 - Curve 1 (3041 Caledon Road)
 - Curve 3 (West of Ford Lane)
 - Curve 4 (Ford Lane)
 - Caledon Road and Lambs Creek Church Road
- Re-align the curve at Vertical Ridge Road

A detailed description of the preferred alternative is described below.

Sight Distance Clearing

Sight distance clearing will occur at 5 locations throughout the corridor. At Bloomsbury Road, the stop bar will be re-painted.

Curve Re-alignment

The curve will be re-aligned at Vertical Ridge Road. This includes grading of the hillside and removal of large diameter trees.

3.2 Conceptual Sketch and Cost Estimates

Appendix E includes the Basis of Design Memo detailing the established project design criteria, field review notes, risk assessment, and assumptions made during the design effort. **Figure 33** through **Figure 38** present the preferred alternative conceptual sketches, which are also included in **Appendix E**.

An engineer's preliminary opinion of probable cost was created for construction costs, right-of-way acquisition costs, and utility relocation costs for the preferred alternative. These cost opinions established the project budget as shown in **Table 14**. Detailed cost estimates are included in **Appendix E**.

Table 14: FR-25-04 SMART SCALE Standard PE Start Date Cost Estimate

Phase Description	Phase Start Date	Total Estimate (FY 2026)
Preliminary Engineering	8/1/2029	\$1,191,400
Right of Way and Utility Relocation	4/4/2031	\$ 663,750
Construction	4/8/2033	\$8,181,286
Total Project Budget		\$10,036,436

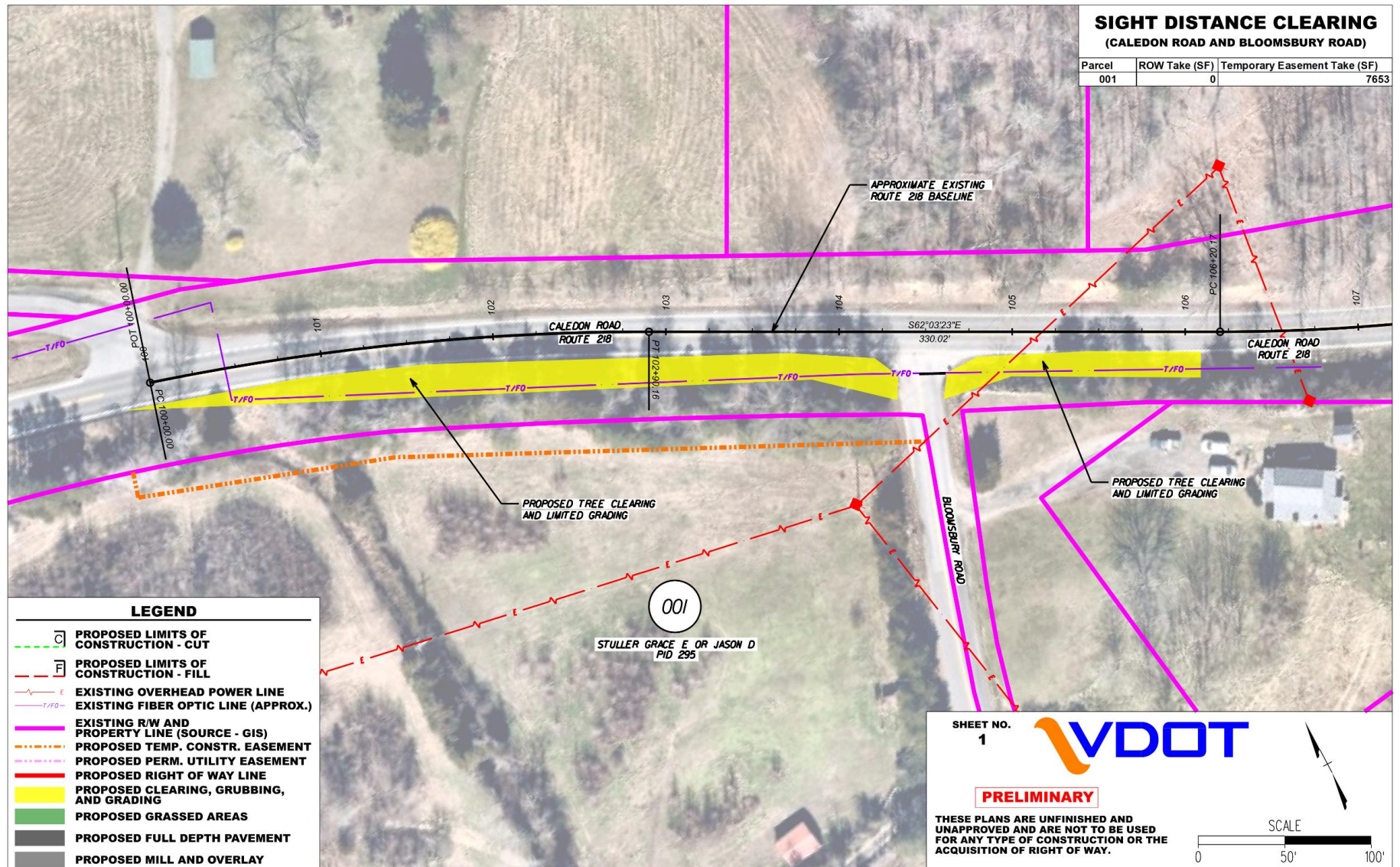


Figure 33: Caledon Road and Bloomsbury Road Preferred Alternative Conceptual Sketch

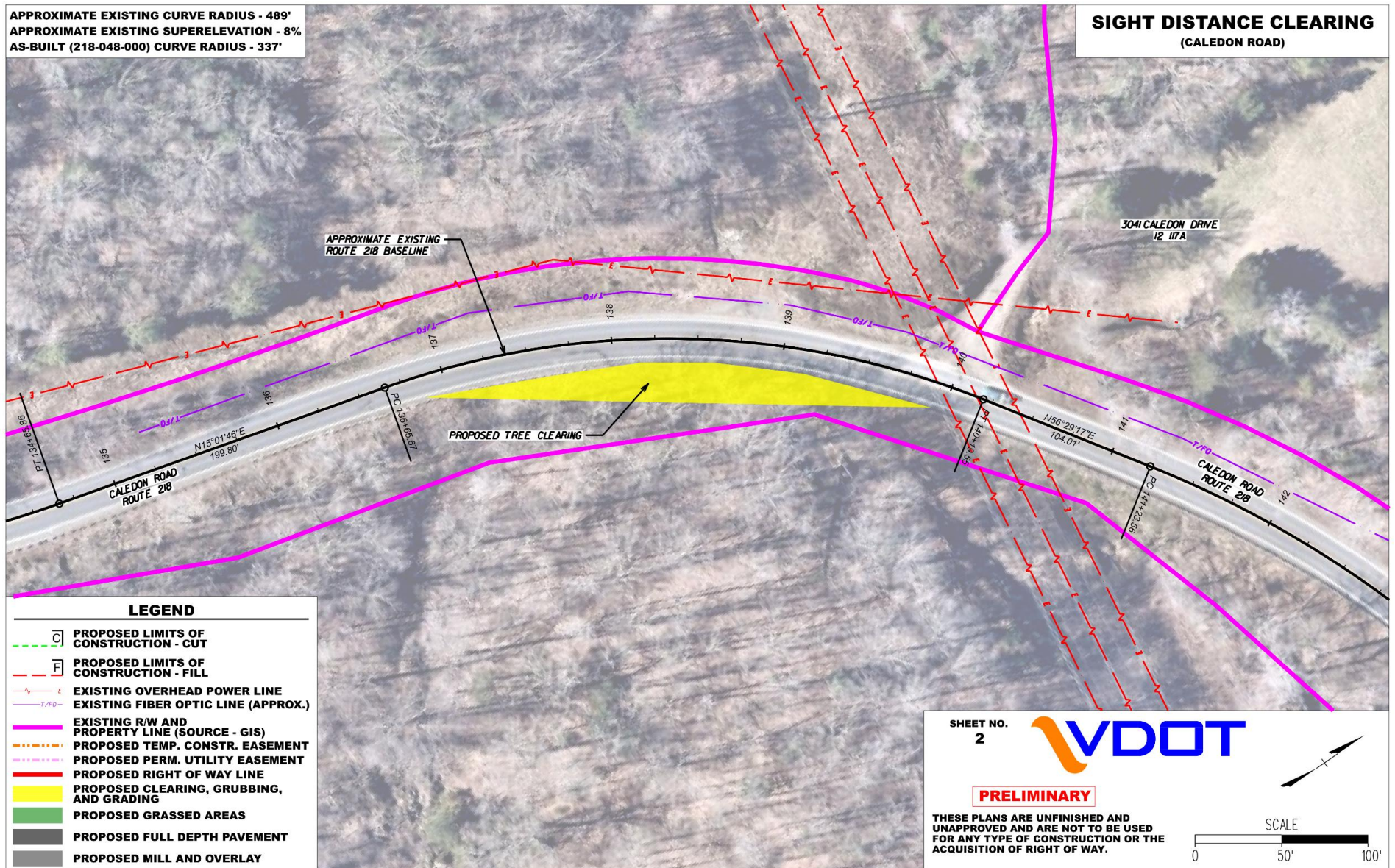


Figure 34: Caledon Road Sight Distance Clearing Preferred Alternative Conceptual Sketch

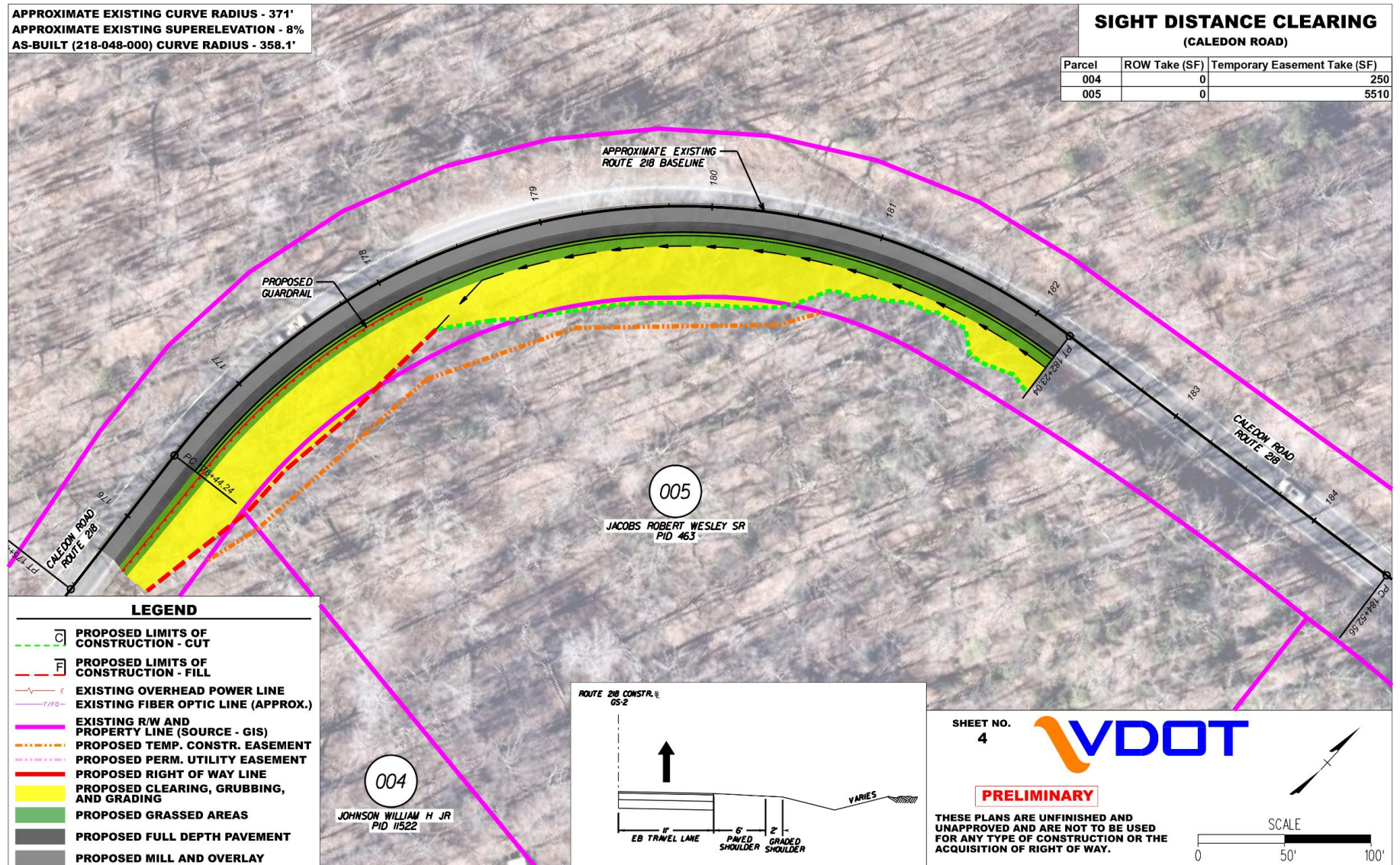


Figure 35: Caledon Road and Vertical Ridge Road Preferred Alternative Conceptual Sketch

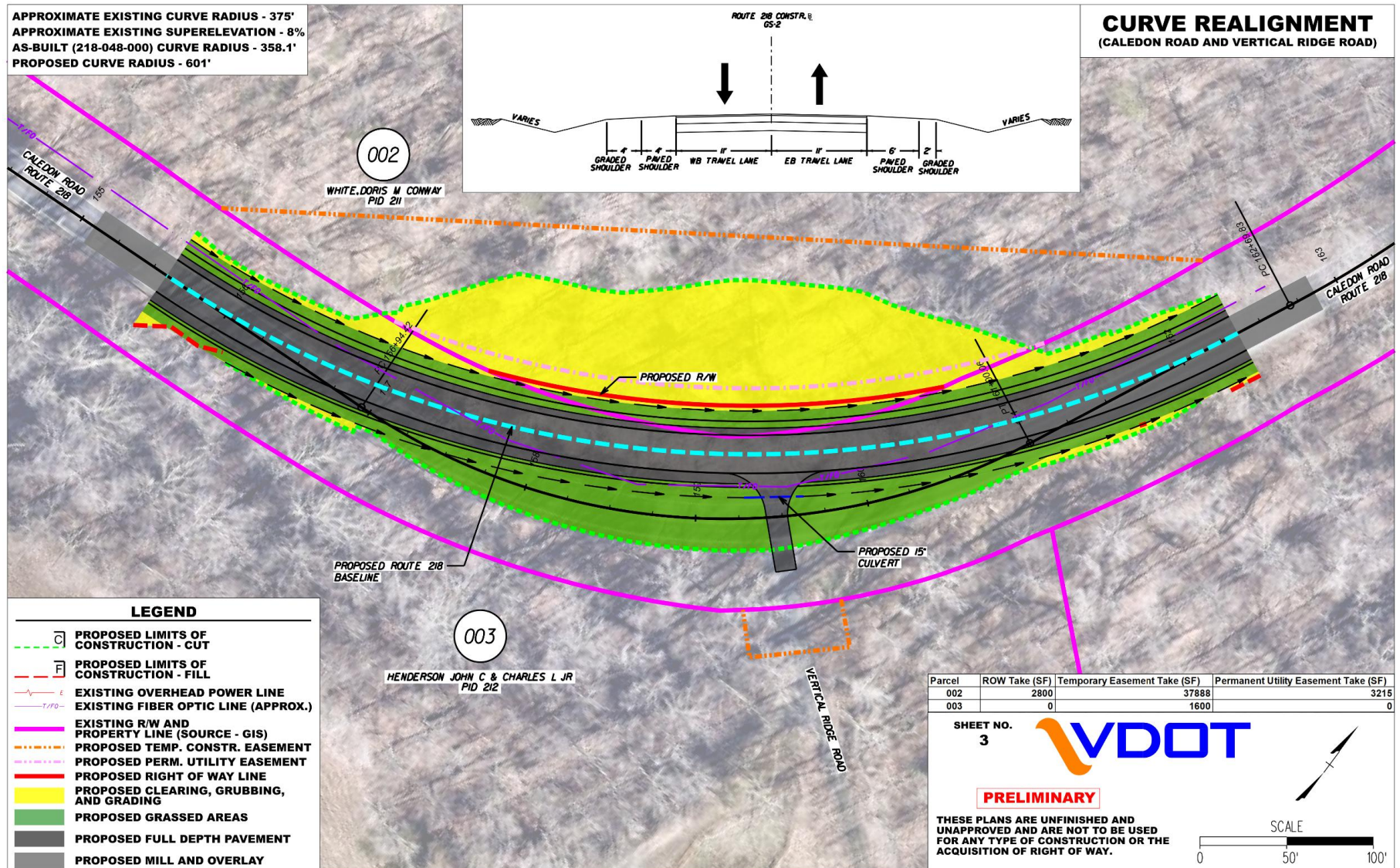


Figure 36: Caledon Road Sight Distance Clearing Continued Preferred Alternative Conceptual Sketch

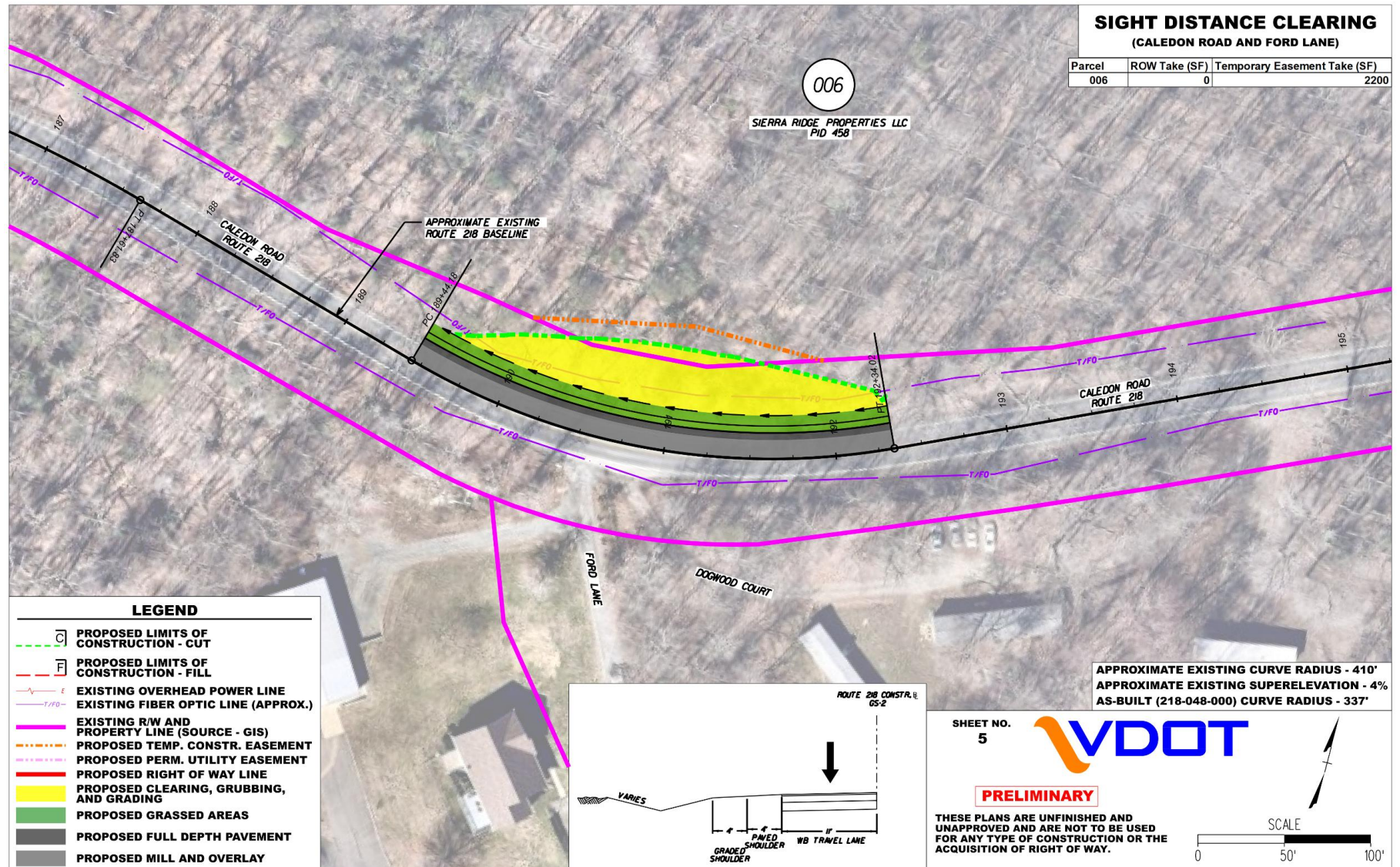


Figure 37: Caledon Road and Ford Lane Preferred Alternative Conceptual Sketch

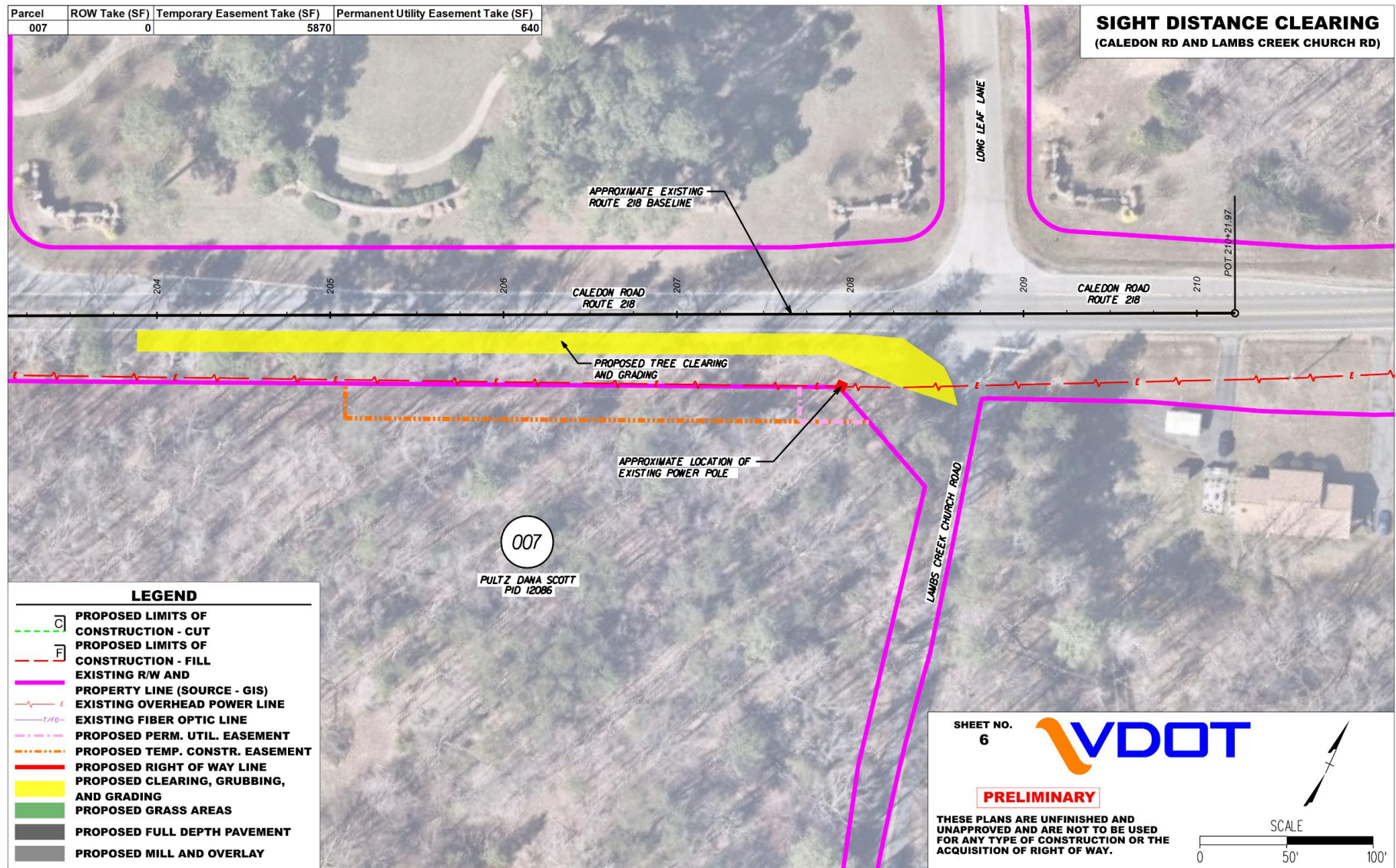


Figure 38: Caledon Road and Lambs Creek Church Road Preferred Alternative Conceptual Sketch

3.3 Schedule Estimates

A schedule estimate was developed for the preferred alternative. **Table 15** summarizes the projected timeframes for the preliminary engineering (PE), right of way (RW), and construction (CN) phases. It was assumed that the PE and RW phases have 9 months of overlap.

Table 15: Schedule Estimate

Preferred Alternative (all inclusive)	Estimated Schedule by Phase (months)
Preliminary Engineering	20
Right of Way and Utility Relocation	24 (33 months total but 9 months overlap with PE)
Construction	24
Total	58

3.4 Project Risks

All projects have risks; however, some projects may have more significant risks than others due to technical complexity, funding, financing, and stakeholder acceptance. Risk management generally involves the process of anticipating what risks a project may face, mitigating them to the extent reasonably possible, and having a plan to react to them if and when they occur. This is recognized in VDOT guidance regarding the analysis of and mitigation of risks.

A project risk meeting SWG Meeting #7 (SWG meetings #6 and #7 were combined, and no SWG Meeting #5 was held for this project) was held on March 19, 2026. The SWG decided to continue with the selected alternative. A final concept and cost were presented in SWG meeting #9 (SWG Meeting #8 and #9 were combined) on June 8, 2026. This SWG meeting was held to review the final preferred alternative prior to submittal to SMART SCALE.

The following is a list of the most notable potential issues and risks that may affect project development and provides risk mitigation strategies to be applied to manage and minimize risks throughout project development. **Appendix E** includes the materials from both SWG meetings and a risk analysis matrix with details on the risk assessment and the mitigation strategy.

Risk/Issue: Roadway Design

The large trees in vicinity of Vertical Ridge Road and Ford Lane may require alternative methods of removal. They have the potential to increase costs for clearing and grubbing. Quantities will increase if unsuitable materials are encountered during earthwork. Earthwork costs may also increase due to (anticipated) exporting of excess material and the rural location of project site.

Risk/Issue: Right of Way

The preferred alternative impacts seven parcels. As the design is refined, additional right of way may be required. Additional temporary construction easements may be needed to store equipment and materials.

Risk/Issue: Environmental

Based on the desktop environmental review, the area near the Vertical Ridge Road improvements may require additional environmental studies or data analysis. There is an adjacent stream which may require

stream credits or restoration. Additionally, there are wetlands adjacent to project improvements at Vertical Ridge Road.

Risk/Issue: Utilities

There are underground fiber and overhead power facilities adjacent to proposed improvements. There may be additional unmarked underground utilities within the corridor.

Risk/Issue: Geotechnical

Areas of unsuitable material have been assumed and are undefined without a geotechnical report. Given the proximity to wetlands and streams, it is possible that there is material that will require removal and replacement. If the selected pavement section depth is changed, costs may change.

Risk/Issue: Drainage

Quantity (channel and flood protection) requirements – project is adjacent to streams in a few locations; tying into natural channels will trigger energy balance. Limited space may make SWM facilities used to control flow difficult to implement.

Quality (phosphorus offset) requirements – due to space restriction along the corridor, it is anticipated that this project will require the purchase of nutrient credits.

Risk/Issue: Construction

A complex maintenance of traffic (MOT) plan will be required for realignment at Vertical Ridge Road. Depending on the means and methods, it could require a major detour (approximately 5 miles to Route 3 from Bloomsbury or Lambs Creek Church Road). The SWG group indicated that the MOT plan should not use a detour. Additionally, the construction improvements should be phased to avoid consecutive work zones along the project corridor to reduce impacts to through traffic.

Risk/Issue: Coordination with other Ongoing or Adjacent Projects

The proposed improvements will require coordination with VDOT Fredericksburg Office to verify if additional projects are being planned along this section of Route 218.

3.5 Possible Funding Sources

King George County elected to submit the preferred alternative for SMART SCALE funding, which includes sight distance clearing at two intersection and three curves, and realignment of the curve at Vertical Ridge Road. The Phase 3 Preferred Alternative Summary Sheet is provided in **Appendix E**.