



PROJECT PIPELINE

**Route 199 (Humelsine Parkway)
Corridor**

HR05



Project Pipeline – Hampton Roads HR05 Route 199 (Humelsine Parkway) | February 2023

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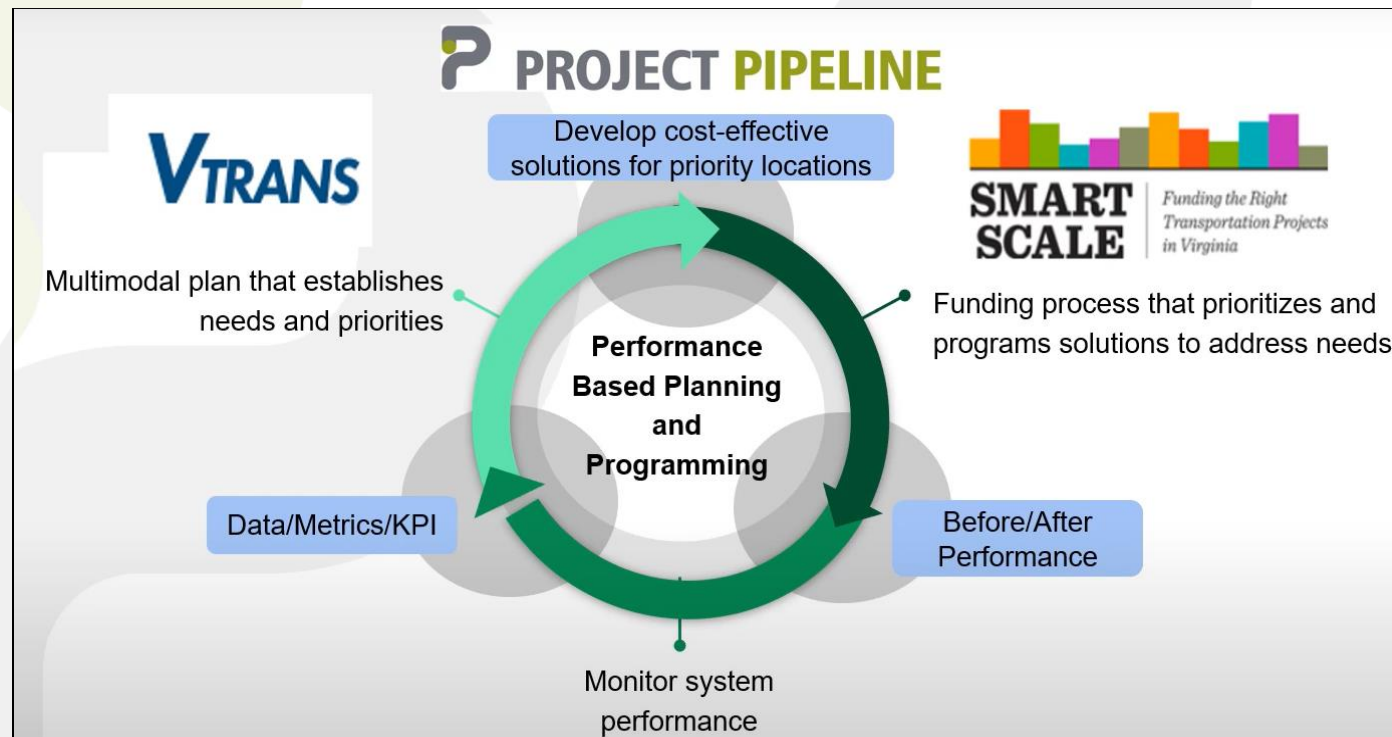
1 Needs Evaluation & Diagnosis

1.1 Introduction

Multimodal Project Pipeline (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. Visit the Project Pipeline webpage for additional information: vapipeline.org.

This study focuses on concepts targeting identified needs including congestion mitigation, safety and reliability improvements, pedestrian and bicycle infrastructure along the corridor, and transit and transportation demand management (TDM) access. The objectives of Project Pipeline are shown in Figure 1.

Figure 1: Project Pipeline Objectives

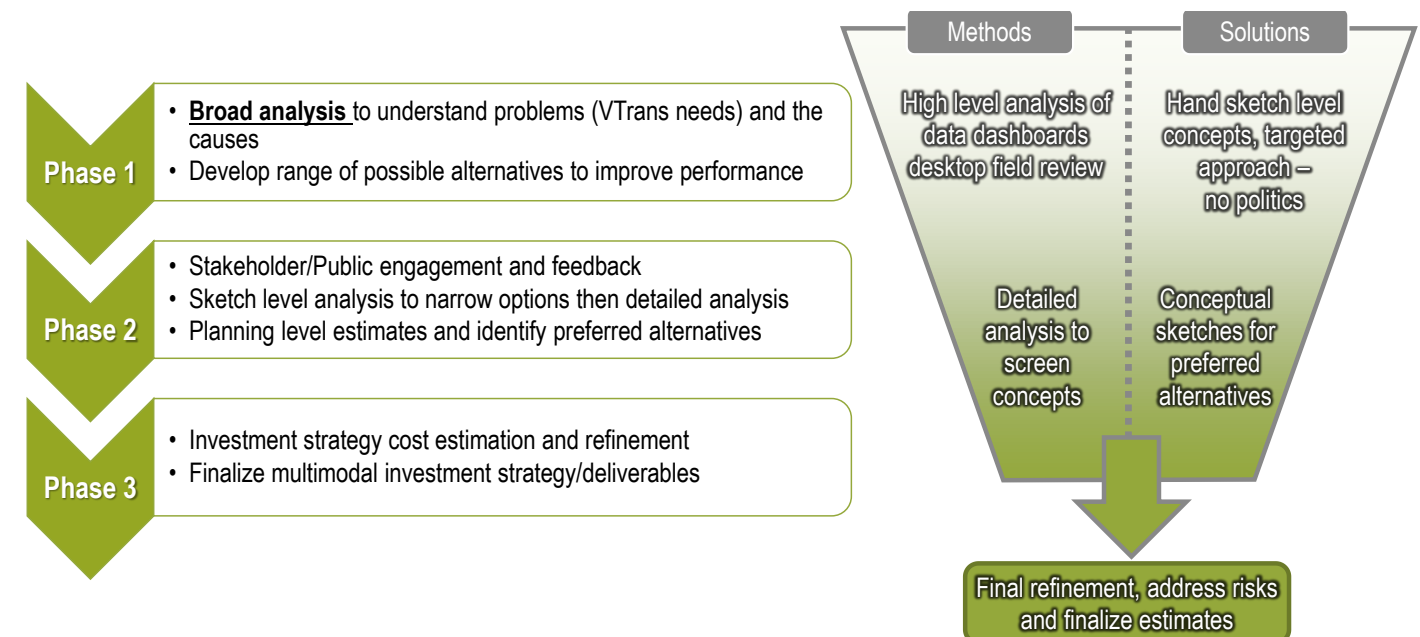


1.2 Methodology

The Project Pipeline study process consists of three phases, further detailed in Figure 2:

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

Figure 2: Study Phase Methods and Solutions



1.3 Study Background

A study work group (SWG) was formed for the Study to capture input from local stakeholders and to shape the development of improvement concepts. The SWG provided local and institutional knowledge of the corridor; reviewed study methodologies; provided input on key assumptions; and reviewed and approved proposed improvements created through the study process. The SWG included members representing the following organizations:

- Virginia Department of Transportation (VDOT)
- Office of Intermodal Planning and Investment (OIPI)
- City of Williamsburg
- James City County
- Hampton Roads Transportation Planning Organization (HRTPO)
- Department of Rail and Public Transportation (DRPT)
- Michael Baker
- RS&H
- Kimley-Horn

RS&H and Kimley-Horn performed the analysis and alternatives evaluation for this project and will be referred to as the study team in this report.

The study area limits along Route 199 (Humelsine Parkway) extend between John Tyler Highway and Brookwood Drive and total approximately one mile in length. Route 199 is a four-lane divided roadway with a 45-mph posted speed limit within the study area. Route 199 is classified as an “Other Freeway and Expressway”.

The study area runs along the border of the City of Williamsburg and James City County, Virginia, adjacent to I-64 and US Route 60. Route 199 serves as an important transportation corridor for the City of Williamsburg and James City County, and it continues to accommodate a wide array of users with varying trip purposes. The Williamsburg Area Transit Authority (WATA) Route 6 runs along Jamestown Road and has two stops near the corridor. The various trip purposes in the study area include, but are not limited to, the following:

- Employment commuting
- Local residential and shopping access
- Local business access
- Major highway access (I-64)
- The College of William and Mary access
- Williamsburg-Jamestown Airport access

The study area includes four at-grade intersections, three signalized intersections along Route 199 and one unsignalized intersection on John Tyler Highway. The four intersections are listed below and shown in **Figure 3**.

1. Route 199 at Brookwood Drive (signalized)
2. Route 199 at Jamestown Road (signalized)
3. Route 199 at John Tyler Highway (signalized)
4. John Tyler Highway at John Tyler Lane/Strawberry Plains Road (unsignalized)

The study team collected data including traffic counts, traffic signal timings, and ridership data to assist with the transportation analysis along Route 199.

A framework document was developed prior to commencing the study which outlined the study methods and assumptions. The signed framework document is provided in **Appendix A**. A kickoff meeting with the SWG was held on August 3, 2021. The materials can be found in **Appendix A**.

Figure 3: 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 Mid-Term needs were identified from a data-informed process and were used as a primary source for selecting Project Pipeline study corridors. The Route 199 corridor VTrans needs are listed in **Table 1**.

Table 1: VTrans Needs Identified in the Study Area

VTrans 2019 Mid-Term Need	Priority
Bicycle Access	Low
Capacity Preservation	Very High
Congestion Mitigation	Low
IEDA (UDA) Access	None
Pedestrian Access	Low
Safety Improvement	Very High
Pedestrian Safety Improvement	None
Reliability	None
Rail On-time Performance	None
Transit Access	None
Transit Access for Equity Emphasis Areas	None
Transportation Demand Management	Very High

Route 199 between Brookwood Drive and John Tyler Highway was selected as a Project Pipeline study location due to the presence of overlapping VTrans needs. The study team took the following steps to confirm and evaluate the VTrans needs identified in the study area:

- Reviewed the Project Pipeline Data Dashboard 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 tube counts along the corridor
- Reviewed relevant studies and plans near the study area to inform the alternative development
- Conducted detailed Existing Conditions and No-Build Conditions traffic operation analyses using Synchro and SimTraffic
- Assessed existing transit service, multimodal infrastructure, and the suitability for additional transit service within the study area

1.5 Needs Diagnosis

The Data Dashboard was 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 identify the core issues and patterns identified in the Framework Document.

The Data Dashboard contains performance measures including VDOT crash data, travel time index data, level of travel time reliability (LOTTR) data, speed data, and Streetlight data for each study area. The results of this analysis are summarized in the Phase 1 summary sheets in **Appendix B**.

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

1.5.1 Operational and Access Needs

The study area has a very high Capacity Preservation VTrans need, which is based on the Travel Time Index (TTI) and the proportion of travel taking place during excessively congested conditions.

Typical Traffic data from Google showed congestion occurring along Route 199 during weekday AM and PM peak periods. During the AM peak period, congestion begins to form on eastbound Route 199 at Brookwood Drive and extends nearly to John Tyler Highway. In the westbound direction, congestion forms at John Tyler Highway and Jamestown Road, extending back towards College Creek. In the PM peak period, congestion begins to form on eastbound Route 199 at Brookwood Drive and extends back to John Tyler Highway, while the westbound conditions remain similar to AM.

The study team used StreetLight data to better understand travel patterns throughout the study corridor. StreetLight is a transportation data analytics platform that leverages anonymized location-based data to provide on-demand insights into travel patterns for various travel modes. The data revealed that the most notable movements in the AM and PM peak periods, excluding pass-through traffic on Route 199, are northbound John Tyler Highway to eastbound Route 199 and westbound Route 199 to southbound John Tyler Highway. **Table 2** and **Table 3** summarize the StreetLight analysis results for the two notable movements.

Table 2: Proportion of Trips from Northbound John Tyler Highway

Origin: Northbound John Tyler Highway	AM Peak Hour	PM Peak Hour
To Westbound Route 199	21%	26%
To Northbound John Tyler Highway	23%	20%
To Southbound John Tyler Highway	0%	0%
To Northbound Jamestown Road	8%	6%
To Southbound Jamestown Road	4%	6%
To Eastbound Route 199	44%	42%

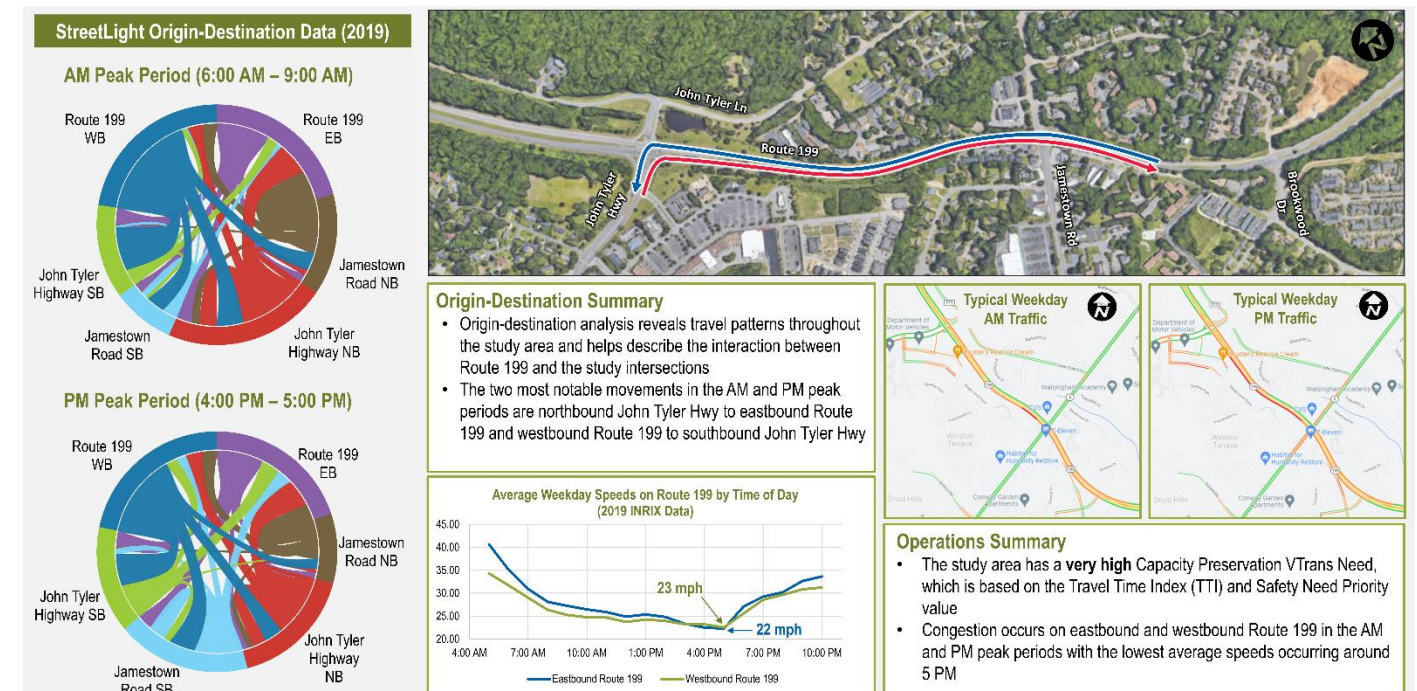
Table 3: Proportion of Trips from Westbound Route 199

Origin: Westbound Route 199	AM Peak Hour	PM Peak Hour
To Northbound Jamestown Road	17%	12%
To Southbound Jamestown Road	17%	30%
To Northbound John Tyler Highway	25%	22%
To Southbound John Tyler Highway	41%	37%

These high-level analyses informed the study team of the most significant congestion hot spots in the study area and the impact of closely spaced intersections on traffic operations. **Figure 4** includes additional details from the high-level operations needs diagnosis.

The study area also has a low Bicycle Access VTrans need due to the proximity to activity areas including residential and businesses along Jamestown Road and shopping center on John Tyler Highway. The study area offers opportunity for connectivity across Route 199 on John Tyler Highway and on Jamestown Road with enhanced pedestrian and bicycle accommodations. Bicycle and pedestrian infrastructure is further supported by proposed plans for regional connectivity to the Virginia Capital Trail to the south of Route 199.

Figure 4: High-Level Operations Needs Summary

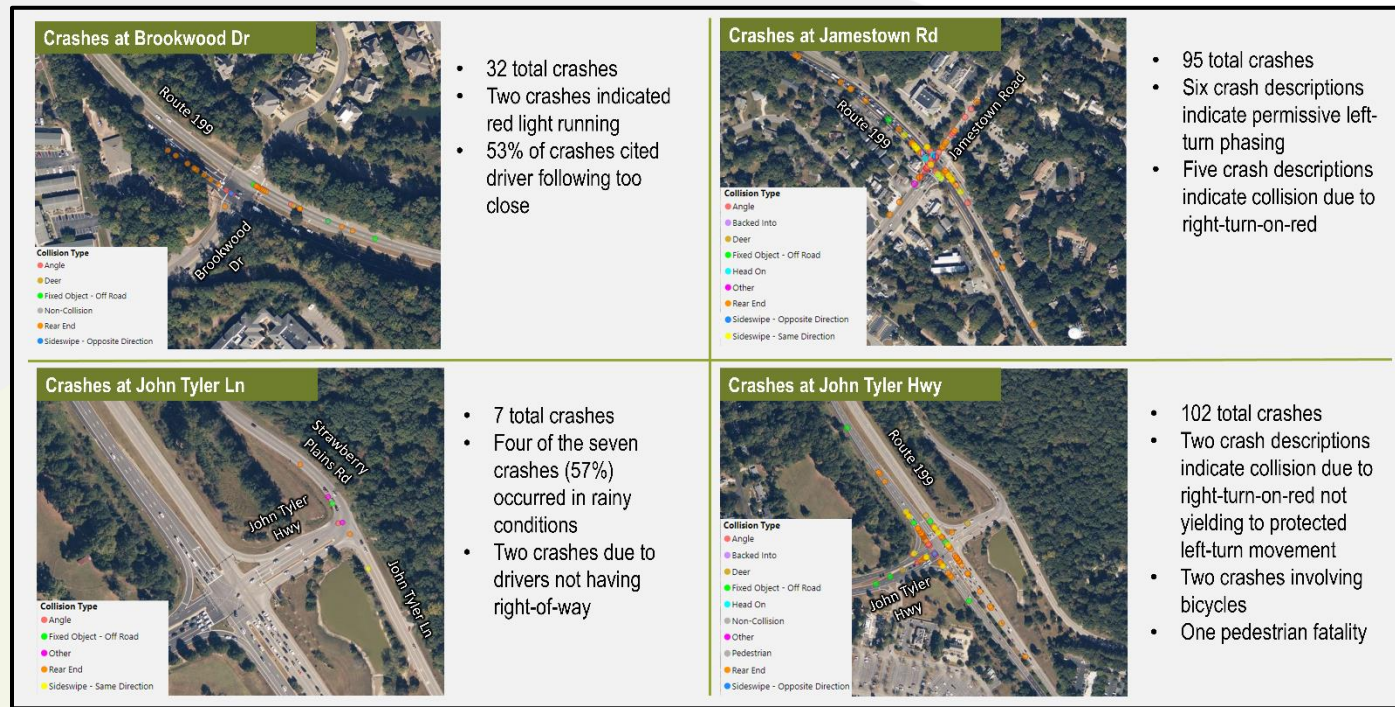


1.5.2 Safety Needs

The study area has Very High Safety Improvement and Low Pedestrian Safety Improvement VTrans needs. The study team reviewed VDOT crash data from 2015-2019 to identify high-level crash trends in the study corridor, consistent with other Project Pipeline studies. Crash data from 2015-2019 represents the most recent full five years of pre-pandemic crash data available at the time of the safety analysis. Crash data from 2020 was removed from the analysis as the emergence of the COVID-19 pandemic in 2020 reduced the vehicle miles traveled in the study area and therefore would skew 2020 crash data.

In total, 236 crashes were reported in the study area including one fatality, 113 injury crashes, and 122 crashes involving property damage only (PDO). Most crashes in the study area were either rear-end (54%) or angle (22%) crashes. **Figure 5** shows additional details regarding crashes in the study area.

Figure 5: High-Level Safety Needs Summary (2015-2019)



Route 199 and John Tyler Highway are VDOT Pedestrian Safety Action Plan (PSAP) priority corridors. Both roads are in the statewide top 5% of corridors. The City of Williamsburg 2021 Comprehensive Plan identified Jamestown Road from Route 199 to John Tyler Lane and John Tyler Lane/Strawberry Plains Road as critical gaps in bicycle infrastructure in Williamsburg. There is also a desire to add connectivity between John Tyler Lane/Strawberry Plains Road and the Virginia Capital Trail.

1.5.3 Transit and Transportation Demand Management

While the study area has no VTrans needs for Transit Access or Transit Access for Equity Emphasis Areas, it does have a Very High need for Transportation Demand Management (TDM). The Michael Baker team reviewed existing Hampton Roads Transit (HRT) bus and Trafix (HRT Transportation Demand Management) services in the area.

The Williamsburg Area Transit Authority (WATA) Route 6 runs along Jamestown Road and provides service connecting the Jamestown Settlement to the Williamsburg Transportation Center. Route 6 has two stops near the intersection of Route 199 and Jamestown Road. The southbound stop along Jamestown Road includes a bench and shelter, while the northbound stop has neither. Both stops are connected to existing sidewalks.

Additionally, TDM options within or near the study area include commuter and rideshare services through Trafix, standard Transportation Network Companies (TNC) availability (e.g., Uber, Lyft), the Jamestown-Scotland Ferry, and the Jamestown-Scotland Ferry Park-and-Ride.

The Michael-Baker team identified an initial list of improvements which included the following:

- Transit Improvements
 - Conduct further study on increasing frequency along high-demand routes and improving service dependability (city biennial goal)
 - Continue with current service; study area is an unlikely area for new stops
- TDM Improvements
 - Conduct study for e-mobility (city biennial goal) and coordinate with transit
 - Continue developing the Birthplace of America Trail
 - Leverage existing Trafix services to promote the use of transit, carpooling, vanpooling, and other commuter services

1.6 Detailed Needs Validation

The study team performed additional traffic operations, safety, and transit analyses 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 proposed improvements to the existing and anticipated no-build conditions.

1.6.1 Existing Conditions Traffic and Safety Analysis

The study team conducted a multifaceted analysis of the existing conditions of the study corridor, which included performing a safety analysis, reviewing access management, conducting a preliminary field review, analyzing traffic operations using Synchro and SimTraffic, and reviewing of pedestrian, bicycle, and transit activity. The results of the Phase 1 existing conditions analysis and a preliminary list of alternatives were presented to VDOT, the City of Williamsburg, and James City County on September 14, 2021. The presentation is provided for reference in **Appendix C**.

Relevant Studies and Plans

No previous studies and plans were identified along the study corridor.

Safety Analysis

A safety analysis was conducted using the crash data from the VDOT Crash Database over a five-year period (January 1, 2015 – December 31, 2019). In total, 236 crashes were reported in the study area, including one fatality. **Figure 6** and **Table 4** display the study area crashes by crash type. Additionally, a crash severity summary is shown in **Table 5**. **Appendix C** includes a detailed crash summary for the study area.

Figure 6: 2015-2019 Study Area Crashes by Crash Type

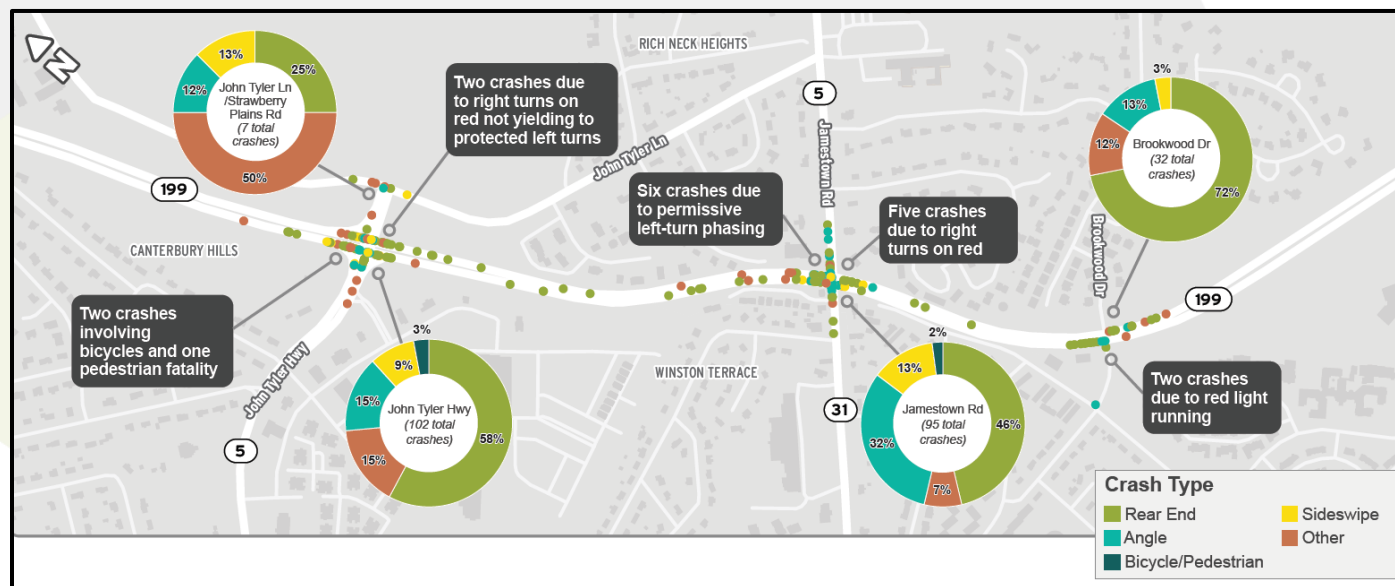


Table 4: 2015-2019 Study Area Crash by Crash Type

Intersection	Number of Crashes						Total
	Rear-End	Angle	Fixed Object – Off Road	Sideswipe	Pedestrian	Other	
Brookwood Drive	23	4	2	0	0	3	32
Jamestown Road	44	31	1	11	0	8	95
John Tyler Highway	59	16	7	8	1	11	102
John Tyler Lane/Strawberry Plains Road	2	1	1	1	0	2	7
Total	128	52	11	20	1	24	236

Table 5: 2015-2019 Study Area Crashes by Crash Severity

Intersection	Number of Crashes					
	K	A	B	C	PDO	Total
Brookwood Drive	0	0	4	11	17	32
Jamestown Road	0	6	6	30	53	95
John Tyler Lane	0	0	0	4	3	7
John Tyler Highway/Strawberry Plains Road	1	1	15	36	49	102
Total	1	7	25	81	122	236

All intersection and roadway segments within the VDOT linear referencing system (LRS) are evaluated annually for the potential for safety improvement (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. VDOT also identifies Targeted Safety Need (TSN) locations, which are intersections or segments that have been identified as PSI locations for three or more of the last five years.

Jamestown Road was identified as a 2018 Potential for Safety Improvement (PSI) intersection, with a ranking of 17 within the Hampton Roads District. The intersection was also identified as a Targeted Safety Need (TSN) location.

Field Review Observations

A preliminary field review of the study area was conducted on Wednesday, November 17, 2021, to verify existing conditions, confirm traffic control devices, and observe peak hour traffic conditions and driver behavior. The existing lane configurations and speed limits in the study area are summarized in **Figure 7**.

The following observations were made during the field review:

- **Route 199 at Brookwood Drive**

- Queue from westbound Route 199 at Jamestown Road extended through Brookwood Drive (AM and PM peak periods)
- Heavy northbound left queue from Brookwood Drive to westbound Route 199 (PM peak period)
- Queue from westbound Route 199 at Brookwood Drive extended back to College Creek bridge (PM peak period)
- Poor sight distance due to horizontal curve on Westbound Route 199 approaching Brookwood Drive

- **Route 199 at Jamestown Road**

- Heavy northbound left queue from Jamestown Road to westbound Route 199 (PM peak period)
- Queue from westbound Route 199 at Jamestown Road extended through Brookwood Drive (AM and PM peak periods)
- Multiple pedestrians and cyclists observed (AM and PM peak periods)

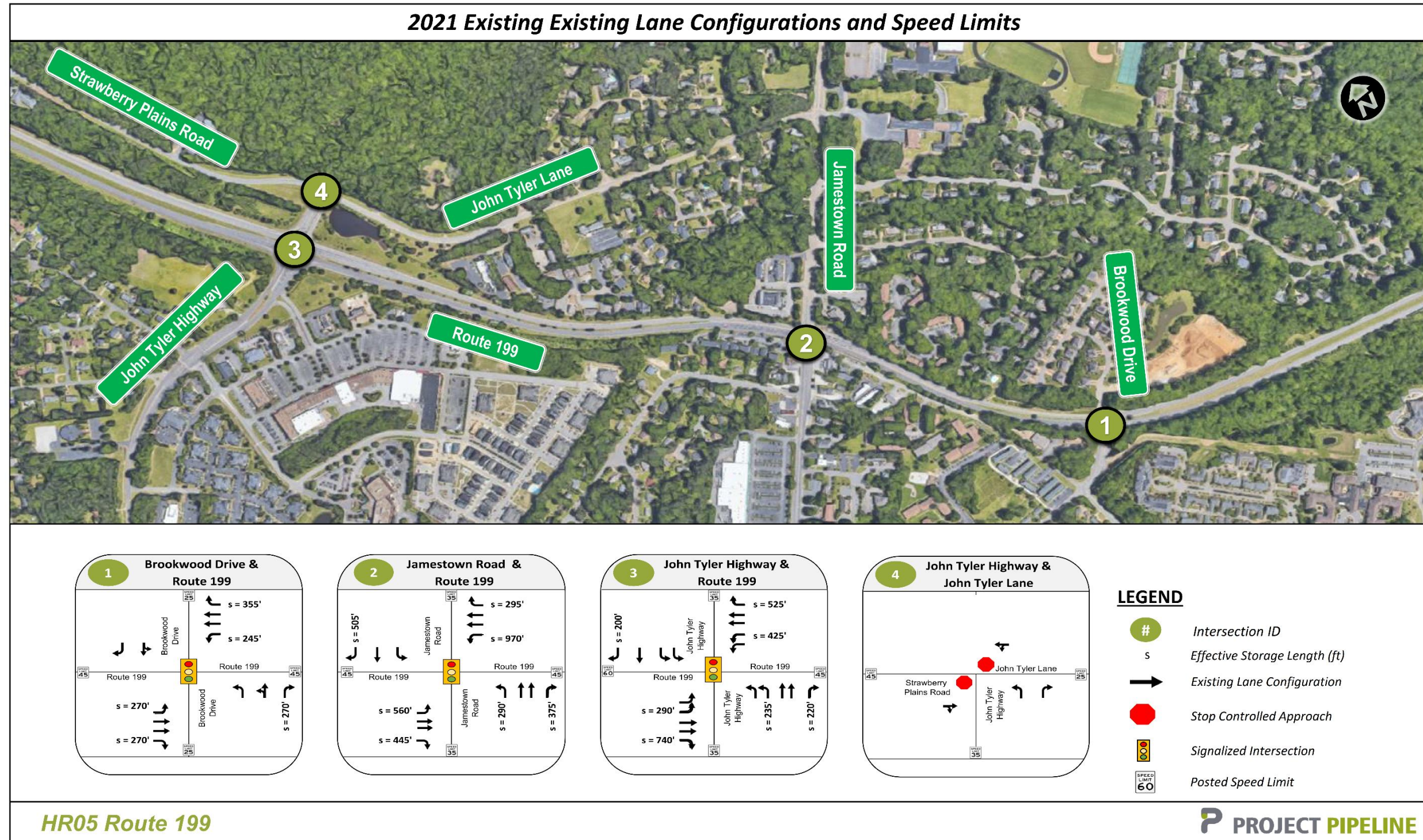
- **Route 199 at John Tyler Highway**

- Long westbound left turn queues extended beyond storage lanes (AM and PM peak periods)
- Southbound through queues extended back to John Tyler Lane (PM peak period)
- Northbound right turning vehicles traveled at higher speeds through channelized lane (AM and PM peak periods)
- Multiple cyclists were observed crossing Route 199 (PM peak period)
- Northbound right-turning vehicles traveled through the channelized right-turn lane at high speeds
- Northbound vehicles from Williamsburg Crossing Shopping Center (right-in/right-out) navigating multiple travel lanes in a short distance to make left turn onto westbound Route 199

- **John Tyler Highway at John Tyler Lane/Strawberry Plains Road**

- Large number of vehicles on eastbound Strawberry Plains Road to southbound John Tyler Highway (AM and PM peak periods)
- Pavement markings/tire tracks throughout the intersection
- Rutting on northbound John Tyler Highway where northbound vehicles turning right travel beyond the available pavement

Figure 7: 2021 Existing Lane Configurations and Speed Limits



Synchro and SimTraffic Analysis

A traffic operations analysis was conducted to evaluate the overall performance of the study corridor under existing (2021) AM and PM peak hour conditions. Existing conditions were modeled using Synchro 10 and SimTraffic 10.

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. Synchro and SimTraffic models were calibrated prior to the application of COVID-19 adjustment factors to the existing conditions volumes. **Appendix C** includes the SimTraffic Calibration Memo detailing the refinements made to the Synchro and SimTraffic models to reflect observed conditions.

Traffic Data

Fourteen-hour vehicular turning movement and pedestrian count data was collected at the four study intersections on Tuesday, October 12, 2021, from 6:00 AM to 8:00 PM. The AM and PM peak hours were determined to be 7:30 AM – 8:30 AM and 4:30 – 5:30 PM. Raw traffic data can be found in **Appendix C**.

Due to the current COVID-19 pandemic, traffic volumes in the region have been lower than pre-pandemic volumes, traffic volumes in the region have been lower than pre-pandemic volumes. The 2021 counts were increased by 5% during both peak hours to ensure that the existing volumes used in this study are representative of non-pandemic conditions. The COVID-19 adjustment factor was developed based on historical data trends and regional COVID-19 data trends. The methodology used to form the COVID-19 adjustment factor is included in **Appendix C**.

The resulting adjusted volumes were used as the existing volumes that form the basis of this study and are shown in **Figure 8**. Heavy vehicle percentages and peak hour factors are included in **Figure 9**.

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 and signalized intersections as specified in the HCM. The delay criteria for LOS differs slightly for unsignalized and signalized intersections due to driver expectations and behavior. For signalized intersections, LOS is calculated as the lost travel time caused by vehicles waiting at a traffic signal. 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 the 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)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10.0	≤ 10.0
B	> 10.0 to 20.0	> 10.0 to 15.0
C	> 20.0 to 35.0	> 15.0 to 25.0
D	> 35.0 to 55.0	> 25.0 to 35.0
E	> 55.0 to 80.0	> 35.0 to 50.0
F	≥ 80.0	≥ 50.0

Figure 8: 2021 Existing Peak Hour Volumes (COVID Adjusted)

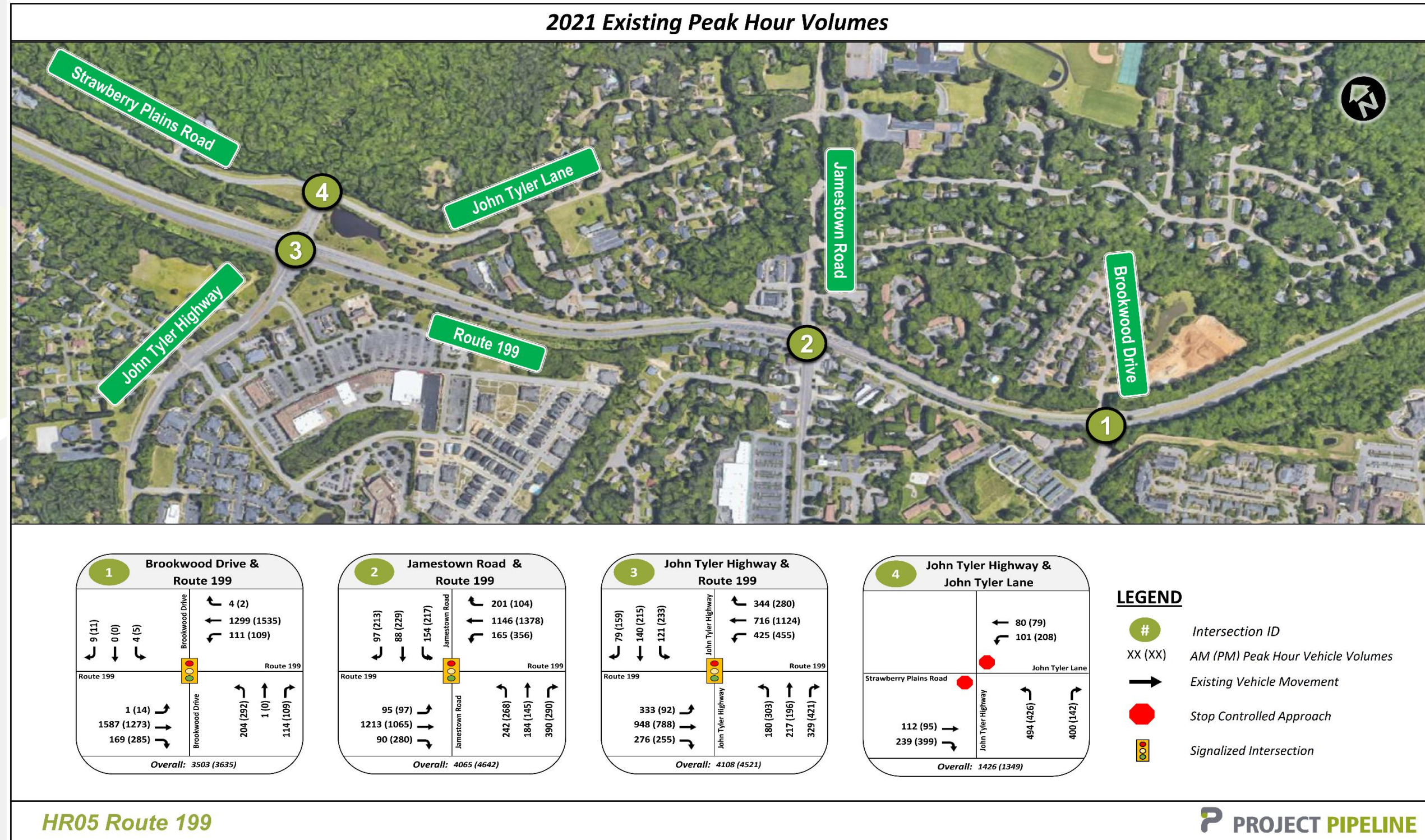
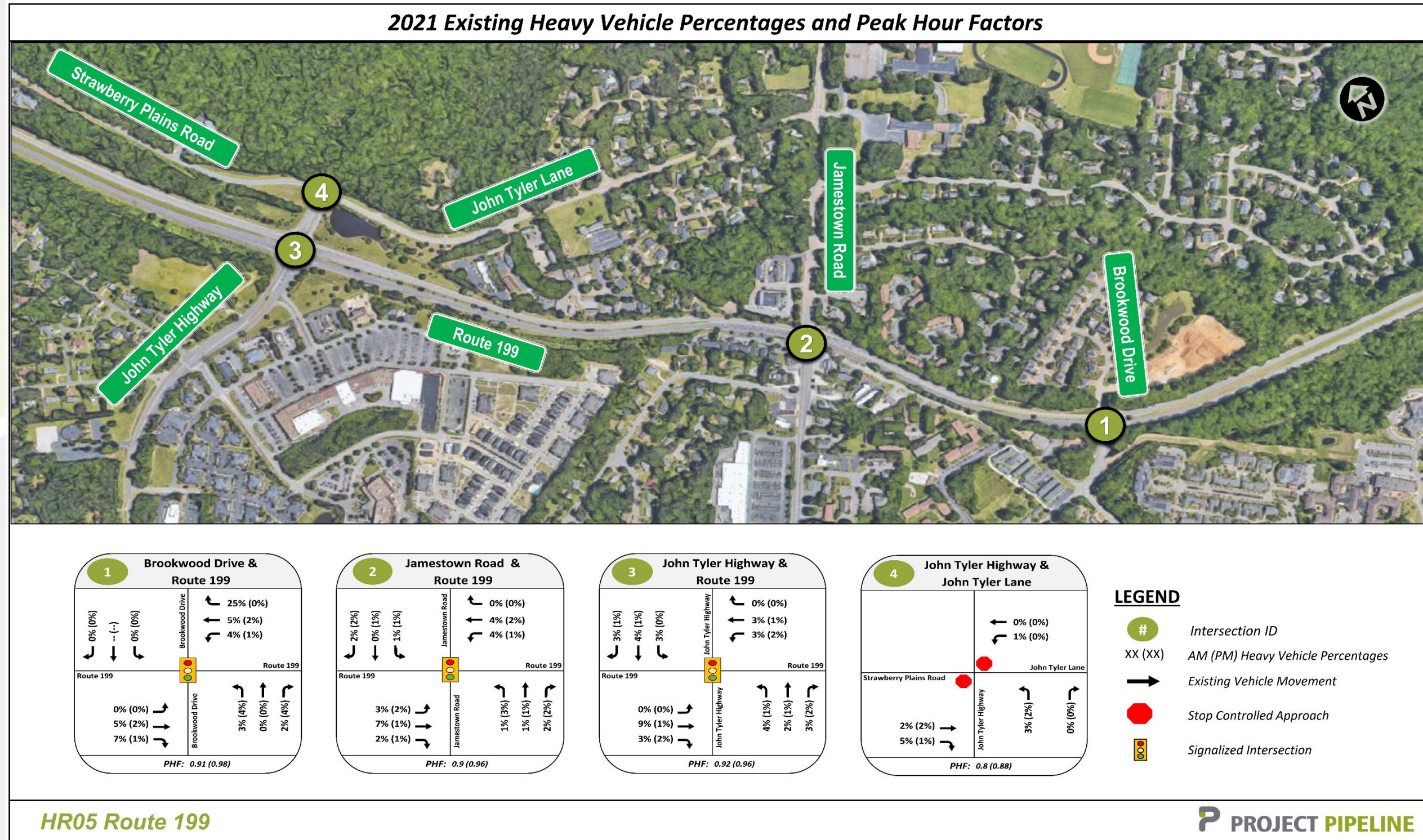


Figure 9: 2021 Existing Heavy Vehicle Percentages and Peak Hour Factors



Traffic Analysis Results

Control delay (seconds per vehicle), LOS, and maximum queue length (feet) were selected as measures of effectiveness to quantitatively report the performance of each study intersection. The Highway Capacity Manual (HCM) 2000 methodology was selected to analyze all signalized and unsignalized intersections.

Ten simulations were conducted for both the AM and PM models. The VDOT *Sample Size Determination Tool* was used to confirm the number of SimTraffic model runs necessary. The full Synchro and SimTraffic reports are included in **Appendix C**. Existing Conditions results are shown in **Table 7** and **Table 8**.

Westbound Route 199, east of Jamestown Road, was identified as the critical link for calibration purposes as it was the dominant movement and had the longest queues in both the AM and PM peak hours. While efforts were made to calibrate the entire network, adjustments were chosen in favor of the critical links. The existing conditions results are based on the calibrated model.

Under existing conditions, all signalized intersections operated at LOS C or worse in both AM and PM peak hours. The eastbound approach of Route 199 and John Tyler Highway operated at LOS F in both peak hours. Multiple individual movements also operated at LOS F in both AM and PM peak hours at all three signalized intersections.

LOS and queue data showed that there are significant operational deficiencies on westbound Route 199 during both the AM and PM peak hours. Westbound queues formed at Jamestown Road and extended back through Brookwood Drive during both peak hours, nearly reaching College Creek during the PM peak hour.

The following trends were observed under existing conditions:

AM Peak Hour

- The eastbound approach at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road experienced the highest approach delay (305.8 seconds) while the westbound approach was overcapacity
- The highest overall signalized delay occurred at the intersection of Route 199 and John Tyler Highway (46.7 seconds)
- The minor street approaches at the intersections of Route 199 and Brookwood Drive and Route 199 and John Tyler Highway all operated at LOS E
- The westbound queue at the intersection of Route 199 and John Tyler Highway extended back to Jamestown Road for 23% of the analysis period

PM Peak Hour

- The westbound approach at the intersection of Route 199 and Jamestown Road experienced the highest approach delay (73.3 seconds)
- The westbound approach at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road was overcapacity
- The highest overall signalized delay occurred at the intersection of Route 199 and Jamestown Road (62.9 seconds)
- The minor street approaches at the intersections of Route 199 and Brookwood Drive and Route 199 and John Tyler Highway all operated at LOS E
- The westbound Route 199 queue at Brookwood Drive extended back 3,536 feet

Table 7: 2021 Existing Conditions Peak Hour Control Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall					
				AM		PM		AM		PM		AM		PM		AM		PM							
				LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	AM	PM		
1	Route 199 & Brookwood Drive			Route 199				Route 199				Brookwood Drive				Brookwood Drive				Intersection					
		Signal	Left	E	77.2	E	62.5	E	71.2	E	69.5	E	66.3	E	66.9	E	69.2	E	69.5	Delay	Delay				
			Through	B	14.0	B	14.3	B	14.1	C	20.3	E	66.4	E	66.9					20.1	23.9				
			Right	A	4.7	A	9.6	A	7.5	B	10.0	E	56.4	D	53.4					E	67.5	E	67.4	LOS	LOS
			Approach	B	13.1	B	13.9	B	18.6	C	23.5	E	62.8	E	63.2					E	68.0	E	68.1	C	C
2	Route 199 & Jamestown Road			Route 199				Route 199				Jamestown Road				Jamestown Road				Intersection					
		Signal	Left	F	88.9	F	82.8	E	74.3	F	99.5	D	53.9	E	61.6	D	45.6	D	41.2	Delay	Delay				
			Through	C	31.0	E	66.7	C	33.7	E	58.3	E	57.1	D	51.2	E	64.5	F	84.3	40.8	62.9				
			Right	A	5.5	C	24.2	C	30.8	F	183.2	E	55.0	C	32.4	D	47.2	D	46.0	LOS	LOS				
			Approach	C	33.3	E	59.5	D	37.8	E	73.3	E	55.1	D	47.4	D	51.0	E	57.7	D	E				
3	Route 199 & John Tyler Highway			Route 199				Route 199				John Tyler Highway				John Tyler Highway				Intersection					
		Signal	Left	E	72.0	E	55.4	F	96.7	F	96.3	E	57.1	E	56.6	E	56.1	D	53.3	Delay	Delay				
			Through	D	38.7	D	40.9	B	19.8	D	37.6	E	57.8	D	53.3	E	65.8	E	64.9	46.7	48.7				
			Right	A	0.3	A	0.2	D	42.3	C	34.2	E	55.3	E	60.3	D	53.9	D	50.1	LOS	LOS				
			Approach	D	39.0	C	32.9	D	47.0	D	51.4	E	56.5	E	57.6	E	59.6	E	56.6	D	D				
4	John Tyler Highway & John Tyler Lane /Strawberry Plains Road			Strawberry Plains Road				John Tyler Lane				John Tyler Highway								Intersection					
		Unsignalized	Left					*	*	*	*	A	8.6	A	8.2					Delay	Delay				
			Through	F	305.8	F	71.8													-	-				
			Right									A	0.0	A	0.0					LOS	LOS				
			Approach					F	305.8	F	71.8	*	*	*	*					A	4.8	A	6.1	-	-

- Denotes a shared movement for individual approaches or the overall intersection is stop controlled

* SYNCHRO does not provide level or service or delay for moments where volume exceeds capacity

Table 8: 2021 Existing Conditions Peak Hour Maximum Queue

Intersection Number and Description		Type of Control	Lane Group	Maximum Queue							
				Eastbound		Westbound		Northbound		Southbound	
				AM	PM	AM	PM	AM	PM	AM	PM
1	Route 199 & Brookwood Drive			Route 199		Route 199		Brookwood Drive		Brookwood Drive	
		Signal	Left	** (4%)	** (5%)	** (1%)	** (46%)	204	264	29	35
			Through	387	540	303	3536	164	231		
			Right	** (5%)	** (5%)	38	** (47%)	129	128		
2	Route 199 & Jamestown Road			Route 199		Route 199		Jamestown Road		Jamestown Road	
		Signal	Left	** (2%)	** (6%)	485	*(14%)* (41%)	270	*(24%)* (13%)	234	** (2%)
			Through	608	769	769	^(5%)	305	^(2%)	182	^(2%)
			Right	** (4%)	** (9%)	** (16%)	** (51%)	345	255	127	** (2%)
3	Route 199 & John Tyler Highway			John Tyler Highway		John Tyler Highway		Route 199		Route 199	
		Signal	Left	*(26%)* (26%)	** (2%)	*(22%)* (17%)	*(15%)* (13%)	201	231	111	** (5%)
			Through	905	373	1,202	1,039	181	248	210	^(3%)
			Right	** (2%)	18	233	** (2%)	42	0	120	** (5%)
4	John Tyler Highway & John Tyler Lane /Strawberry Plains Road			Strawberry Plains Road		John Tyler Lane		John Tyler Highway			
		Unsignalized	Left			221	339	172	121		
			Through	460	772						
			Right								

† No queue reported. Movement does not have conflicting volumes

*(X%) - Maximum queue extends full length of storage bay for X% of the analysis period

** (Y%) - Queue in lane adjacent to storage bay extends beyond end of storage bay for Y% of the analysis period

^(Z%) - Maximum queue extends back to the upstream intersection for Z% of the analysis period

1.6.2 Transit Propensity and Transit Potential Analyses

The Michael Baker team conducted a series of transit propensity and transit potential analyses for the study corridor. The transit propensity analysis assisted in determining whether a location might be suitable for transit service using indices that reveal locations with significant clusters of potential transit-oriented users, commuters, jobs, or other non-work destinations that could be well-served by transit.

The results of the all-day and peak commuter transit propensity indices, shown in **Figure 10** and **Figure 11**, respectively, show a low to low-moderate need for transit in the study corridor and surrounding area.

Figure 10: Transit Propensity for All-Day Service and Peak Commuter Indices

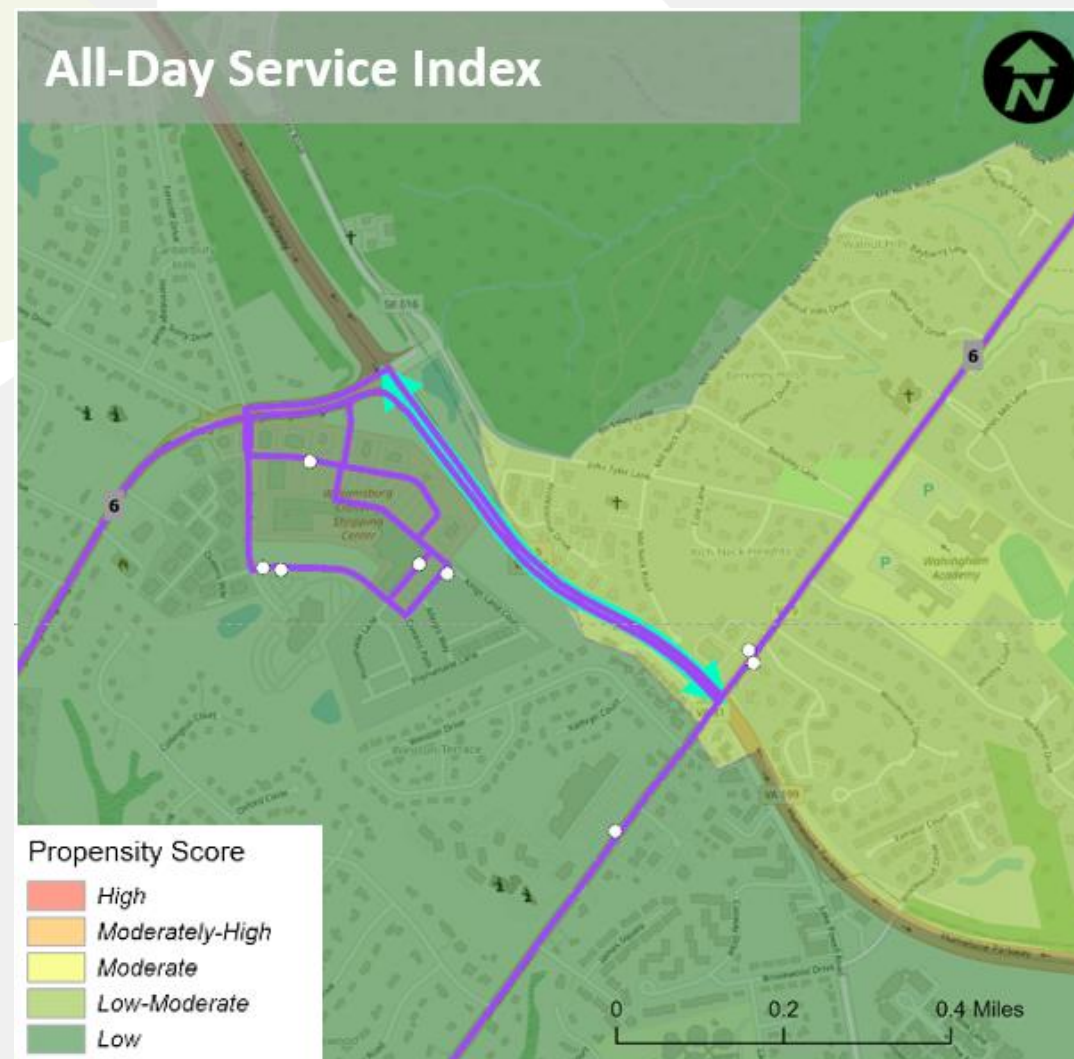
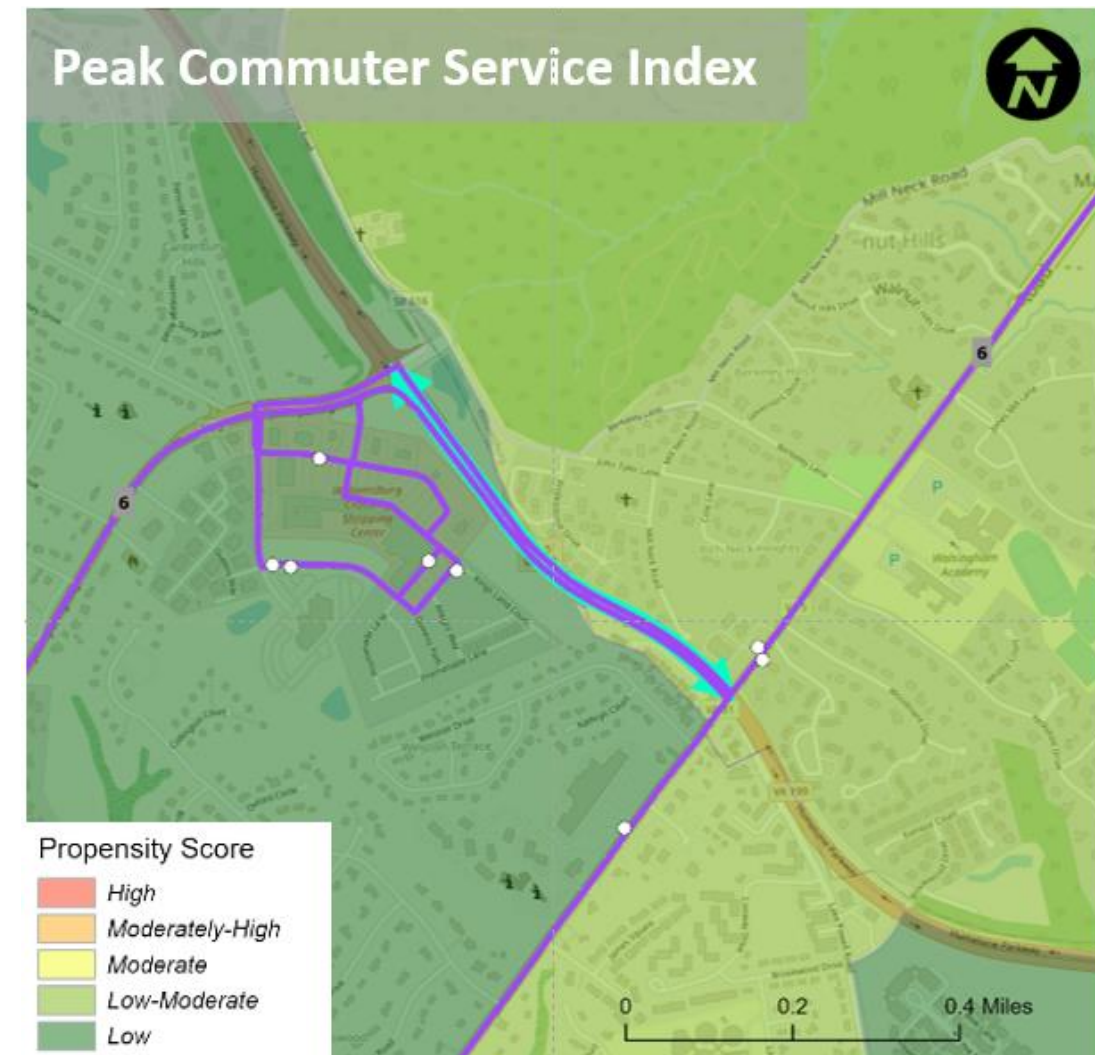
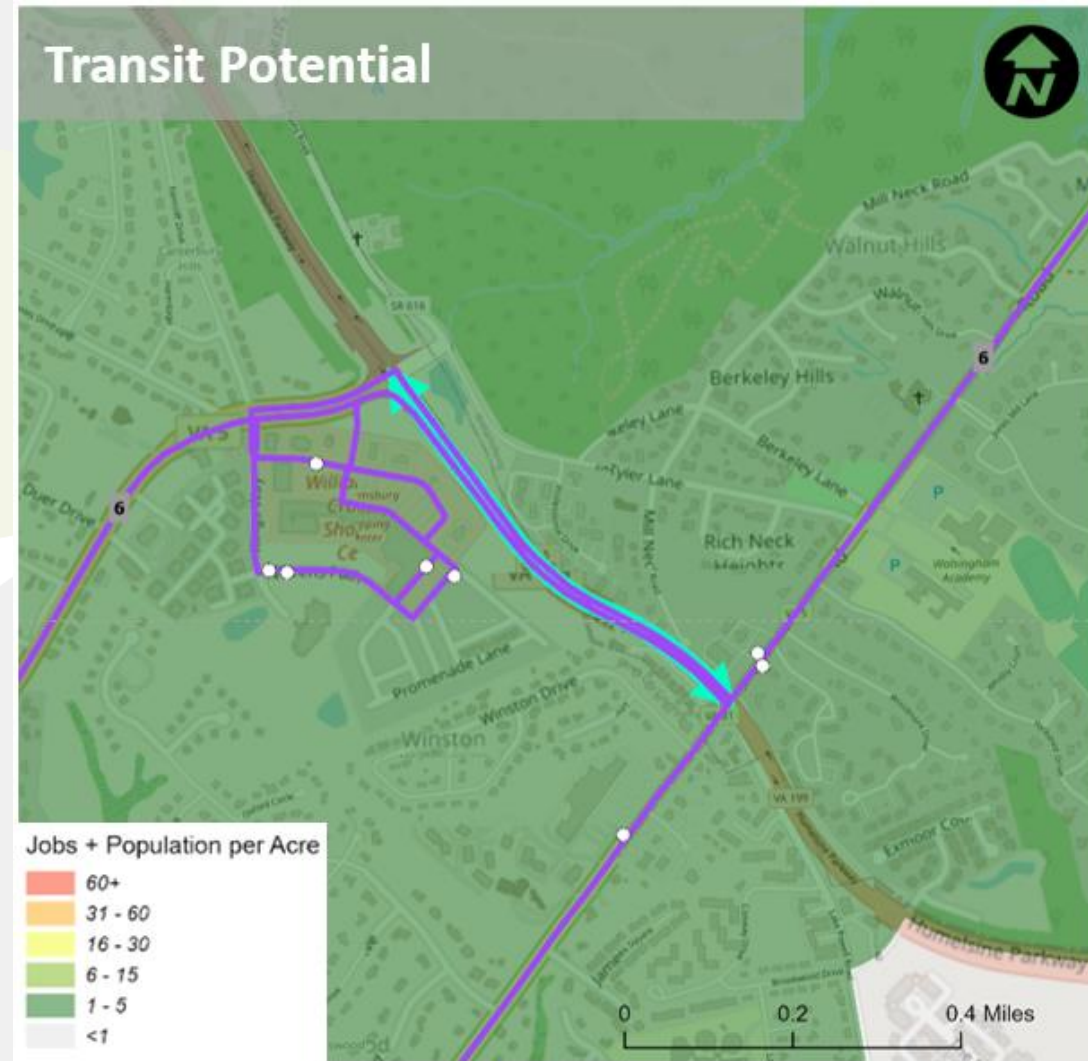


Figure 11: Transit Propensity for Peak Commuter Indices



The transit potential analysis included combined population and employment densities for each Census Block Group to indicate the viability of fixed-route service in the study area, shown in **Figure 12**. These analyses offer insight to where transit could be best utilized and validate the presence of existing service. Further analysis is recommended to better understand if higher frequency service is warranted along the existing routes, considering future growth and development in the area.

Figure 12: Transit Potential Analysis Results



1.6.3 No-Build Conditions Analysis

Traffic operational analyses were conducted to evaluate the overall performance of the study corridor under No-Build (2045) AM and PM peak hour conditions. The intent of the No-Build conditions analyses is to provide a general understanding of the baseline future traffic conditions as a starting point for developing improvement concepts.

The following sources were reviewed to determine the growth rates to apply to existing traffic volumes to forecast future (2045) traffic volumes:

- **Hampton Roads Regional Travel Demand Model (TDM)**
Outputs from the Hampton Roads Regional TDM, which included base year data from 2017 and future year data from 2045, were adjusted using NCHRP-765 methodologies that incorporate project-specific and VDOT project traffic count data to calibrate future volume projections. Linear growth rates for the study area were developed using the adjusted future year (2045) TDM output and existing available count data.
- **Historical traffic count data**
Historical traffic count data were sourced primarily from official VDOT historical AADT counts. Trends were identified between years of significant development or regression, outliers were removed, and a linear regression analysis was performed to produce linear growth rates for segments throughout the study area.
- **Socioeconomic data**
Population and employment data from traffic analysis zones (TAZ) in the 2017-2045 Hampton Roads Regional TDM were reviewed and compared to the linear traffic growth rates developed with the 2017-2045 Richmond TPO Regional TDM.

Table 9 and **Figure 13** present the recommended linear growth rates and the growth rates determined from historical volume and the HRPTO TDM. The SWG discussed recent travel patterns and traffic growth being relatively less than the historic growth rates. A 1% growth rate was agreed up by the SWG and applied to Route 199 and various growth rates were applied to the side streets along the study area ranging between 0.5% and 1.0%. A growth factor of 1.56 was applied to southbound Brookwood Drive to account for the expected 56% increase in volume from the anticipated townhome development. Due to the landlocked nature of the area, this leg of Brookwood Drive is not expected to experience any additional growth after the completion of the townhomes. This methodology was agreed upon by the SWG during a meeting held on January 24, 2022. The presentation is included in **Appendix D**.

Table 9: Linear Growth Rate Development Summary

ID	Segment	Historical Linear Growth Rate	Project TDM Linear Growth Rate	Recommended Linear Growth Rate
1	Route 199 west of Jamestown Road	1.58%	2.05%	1.00%
2	Route 199 east of Jamestown Road	1.11%	1.21%	1.00%
3	John Tyler Highway	-0.99%	0.41%	0.50%
4	Jamestown Road	0.18%	1.28%	1.00%
5	Brookwood Drive	–	0.54%	0.50%*

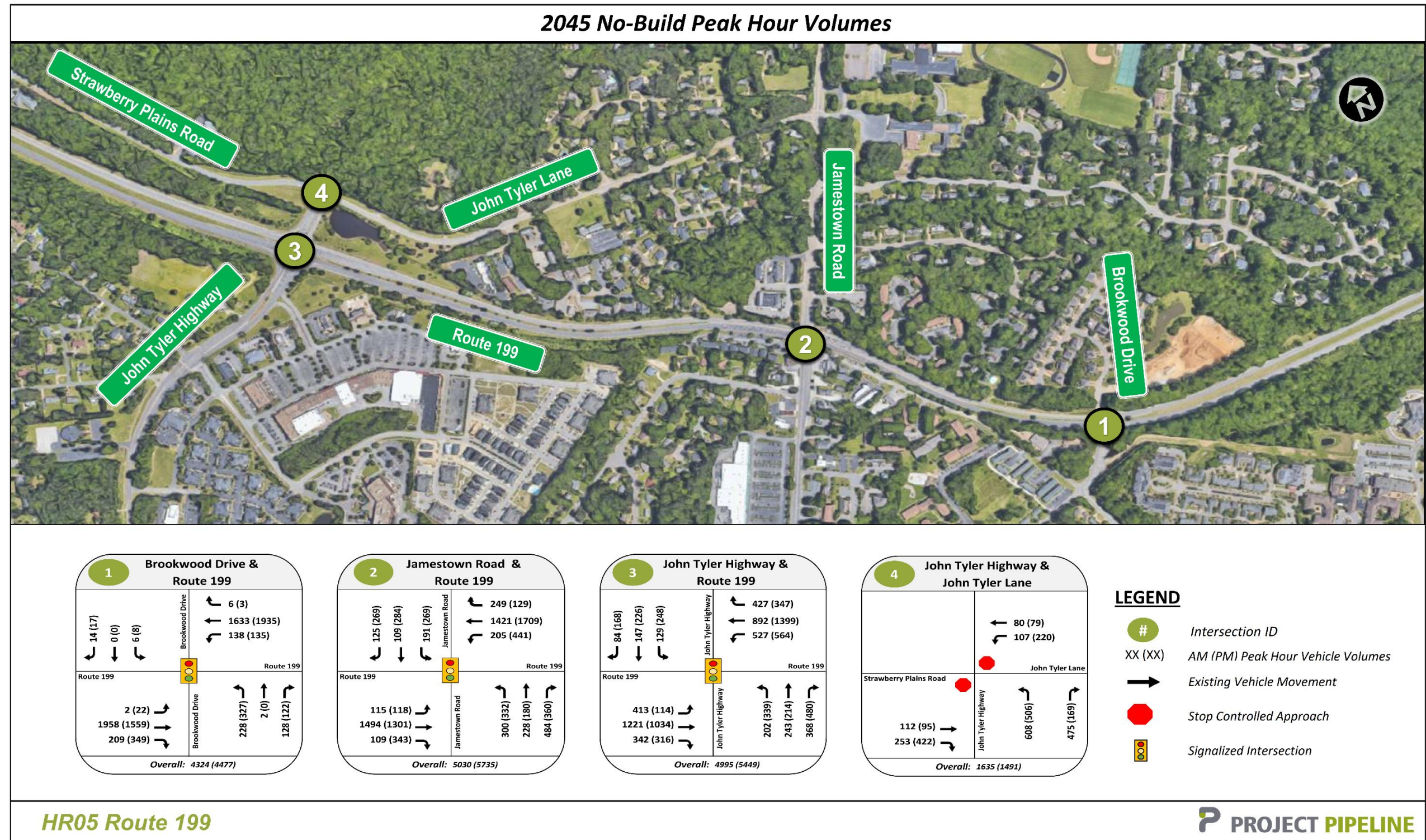
* A 1.56 growth factor was applied to southbound Brookwood Drive

Figure 13: Study Area Linear Growth Rate



Figure 14 shows the 2045 design year volumes used in the 2045 No-Build and 2045 Build conditions Synchro and SimTraffic models.

Figure 14: 2045 No Build Peak Hour Volumes



Synchro and SimTraffic Analysis

Traffic operational analyses were conducted to evaluate the overall performance of the study corridor under No-Build (2045) AM and PM peak hour conditions. The intent of No-Build conditions analyses was to provide a general understanding of the baseline future traffic conditions as a starting point for developing improvement alternatives. No-Build conditions were modeled using Synchro 10 and SimTraffic 10 for the entire study area.

The existing conditions Synchro models were used as a basis to develop the No-Build models for the AM and PM peak hour conditions. The models were updated with the projected 2045 No-Build traffic volumes. Traffic signal cycle lengths were assumed to be consistent with existing conditions, while splits and offsets were optimized. No-Build inputs and analysis methodologies were applied consistently with the *TOSAM*.

Ten simulations were conducted for both the AM and PM No-Build SimTraffic models. Control delay (seconds per vehicle) and LOS and maximum queue length (feet) were selected as measures of effectiveness to quantitatively report the performance of each study intersection. HCM 2000 methodology was used to analyze the five intersections. The full Synchro and SimTraffic reports are included in **Appendix D** and shown in **Table 10** and **Table 11**.

Similar trends in delay and queuing were observed under No-Build conditions as observed in Existing conditions. Under No-Build conditions, all signalized intersections operated at LOS D or worse in both AM and PM peak hours. Multiple individual movements also operated at LOS F in both AM and PM peak hours at all three signalized intersections.

LOS and queue data showed that there are significant operational deficiencies on westbound Route 199 during both AM and PM peak hours. Westbound queues began forming at Jamestown Road and extended back through Brookwood Drive during both peak hours. From Brookwood Drive, queues extended over a mile east, nearly reaching the Colonial Parkway interchange.

The following trends were observed under No-Build conditions:

AM Peak Hour

- The eastbound approach at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road experienced the highest approach delay (740.8 seconds) while the westbound approach was overcapacity
- The highest overall signalized delay occurred at the intersection of Route 199 and Jamestown Road (95.2 seconds)
- All approaches for all signalized intersections operated at LOS E or F except for the westbound approach at the intersection of Route 199 and Brookwood Drive (LOS C)
- The westbound Route 199 queue at Brookwood Drive extended back 5,321 feet

PM Peak Hour

- The eastbound approach at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road experienced the highest approach delay (170.1 seconds) while the westbound approach was overcapacity
- The highest overall signalized delay occurred at the intersection of Route 199 and Jamestown Road (86.7 seconds)
- All approaches for all signalized intersections operated at LOS D or worse except for the eastbound approach at the intersection of Route 199 and Brookwood Drive (LOS C)
- The westbound Route 199 queue at Brookwood Drive extended back 5,314 feet

Table 10: 2045 No-Build Conditions Peak Hour and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall	
				AM		PM		AM		PM		AM		PM		AM		PM			
				LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1	Route 199 & Brookwood Drive			Route 199				Route 199				Brookwood Drive				Brookwood Drive				Intersection	
		Signal	Left	E	79.9	E	61.5	E	77.4	F	125.3	E	65.4	F	82.6	E	67.6	E	67.6	Delay	Delay
			Through	E	65.4	C	22.4	C	21.0	D	38.0	E	66.2	F	82.6	E	66.2	E	66.1	45.8	37.4
			Right	A	6.1	B	14.9	A	8.5	B	11.5	E	55.3	D	54.4	E	66.6	E	66.6	LOS	LOS
			Approach	E	59.7	C	21.5	C	25.3	D	43.7	E	62.0	E	74.9	E	66.6	E	66.6	D	D
2	Route 199 & Jamestown Road			Route 199				Route 199				Jamestown Road				Jamestown Road				Intersection	
		Signal	Left	F	89.7	F	136.9	E	63.6	F	177.0	E	65.8	F	179.8	D	46.4	D	53.8	Delay	Delay
			Through	F	173.6	F	84.5	E	66.2	E	55.7	E	58.2	E	59.1	E	65.5	F	247.0	95.2	86.7
			Right	A	5.2	C	33.7	D	37.1	B	10.5	E	76.9	D	43.2	D	46.1	D	54.5	LOS	LOS
			Approach	F	157.3	E	78.2	E	62.0	E	76.6	E	69.4	F	98.5	D	51.2	F	120.8	F	F
3	Route 199 & John Tyler Highway			Route 199				Route 199				John Tyler Highway				John Tyler Highway				Intersection	
		Signal	Left	F	111.5	F	107.0	F	194.6	E	68.3	E	56.2	E	57.5	E	55.6	E	58.7	Delay	Delay
			Through	E	67.7	E	57.9	C	22.2	D	48.9	E	57.1	D	53.1	E	65.6	F	105.3	67.3	67.8
			Right	A	0.4	A	0.3	D	42.8	F	120.6	D	54.5	F	146.7	D	53.4	D	53.8	LOS	LOS
			Approach	E	65.2	D	49.3	E	76.2	E	64.4	E	55.7	F	98.0	E	59.2	E	73.8	E	E
4	John Tyler Highway & John Tyler Lane /Strawberry Plains Road			Strawberry Plains Road				John Tyler Lane				John Tyler Highway								Intersection	
		Unsignalized	Left					*	*	*	*	A	9.2	A	8.4					Delay	Delay
			Through	F	740.8	F	170.1													-	-
			Right									A	0.0	A	0.0					LOS	LOS
			Approach	F	740.8	F	170.1	*	*	*	*	A	5.2	A	6.3					-	-

- Denotes a shared movement for individual approaches or the overall intersection is stop controlled

* SYNCHRO does not provide level or service or delay for moments where volume exceeds capacity

Table 11: 2045 No-Build Conditions Peak Hour Maximum Queue

Intersection Number and Description		Type of Control	Lane Group	Maximum Queue							
				Eastbound		Westbound		Northbound		Southbound	
				AM	PM	AM	PM	AM	PM	AM	PM
1	Route 199 & Brookwood Drive			Route 199		Route 199		Brookwood Drive		Brookwood Drive	
		Signal	Left	** (35%)	** (3%)	** (77%)	** (76%)	232	^ (68%)	35	29
			Through	1,166	818	5,321	5,314	209	^ (75%)		
			Right	** (35%)	** (3%)	** (88%)	** (82%)	160	** (77%)		
2	Route 199 & Jamestown Road			Route 199		Route 199		Jamestown Road		Jamestown Road	
		Signal	Left	** (57%)	*(69%)** (57%)	** (71)	*(70%)** (63%)	*(38%)** (26%)	*(77%)** (84%)	394	** (78%)
			Through	^ (2%)	1879	^ (4%)	^ (19%)	599	657	224	1,016
			Right	** (65)	** (21%)	*(2%)** (57%)	** (7%)	*(9%)** (5%)	363	178	** (78%)
3	Route 199 & John Tyler Highway			John Tyler Highway		John Tyler Highway		Route 199		Route 199	
		Signal	Left	*(22%)** (61%)	** (73%)	*(40%)** (33%)	295	226	267	** (2%)	223
			Through	2,352	2,334	1369	391	232	173	216	^ (3%)
			Right	*(2%)** (53%)	*(5%)** (62%)	211	114	85	0	** (2%)	200
4	John Tyler Highway & John Tyler Lane/Strawberry Plains Road			Strawberry Plains Road		John Tyler Lane		John Tyler Highway			
		Unsignalized	Left			337	540	176	194		
			Through	905	1,001						
			Right								

† No queue reported. Movement does not have conflicting volumes

*(X%) - Maximum queue extends full length of storage bay for X% of the analysis period

** (Y%) - Queue in lane adjacent to storage bay extends beyond end of storage bay for Y% of the analysis period

^(Z%) - Maximum queue extends back to the upstream intersection for Z% of the analysis period

2 Alternatives Development & Refinement

The study team developed alternative concepts along Route 199 and at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road to enhance multimodal access and address safety, geometric, and operational deficiencies in the study area.

The study team screened alternatives based on anticipated safety benefits, operational performance, multimodal access, constructability, and input from the SWG. A SWG meeting was held on October 20, 2021 to review the preliminary alternatives. The meeting materials can be found in **Appendix E**. The study team selected seven alternatives to present to the public and gather feedback.

2.1 Phase 1 Alternative Development

The study team developed preliminary alternatives in parallel with the highest-level needs diagnosis efforts documented in **Chapter 1.5**. The proposed Phase 1 alternatives were developed to meet the following criteria:

- Improve operations at intersections in the study area
- Mitigate safety issues for the turning movements onto and from Route 199
- Preserve capacity for travel along Route 199
- Enhance bike and pedestrian access throughout the study area

The following sections describe the process used to develop Phase 1 alternatives encompassing various categories of needs.

2.1.1 Alternatives Addressing Traffic Operations and Safety Needs

The study team conducted a high-level traffic operations and safety analysis of the four study area intersections using the Virginia Junction Screening Tool (VJuST) using the developed 2045 No-Build peak hour volumes. The VJuST screening looked at innovative intersection configurations that have the potential to reduce congestion and improve safety.

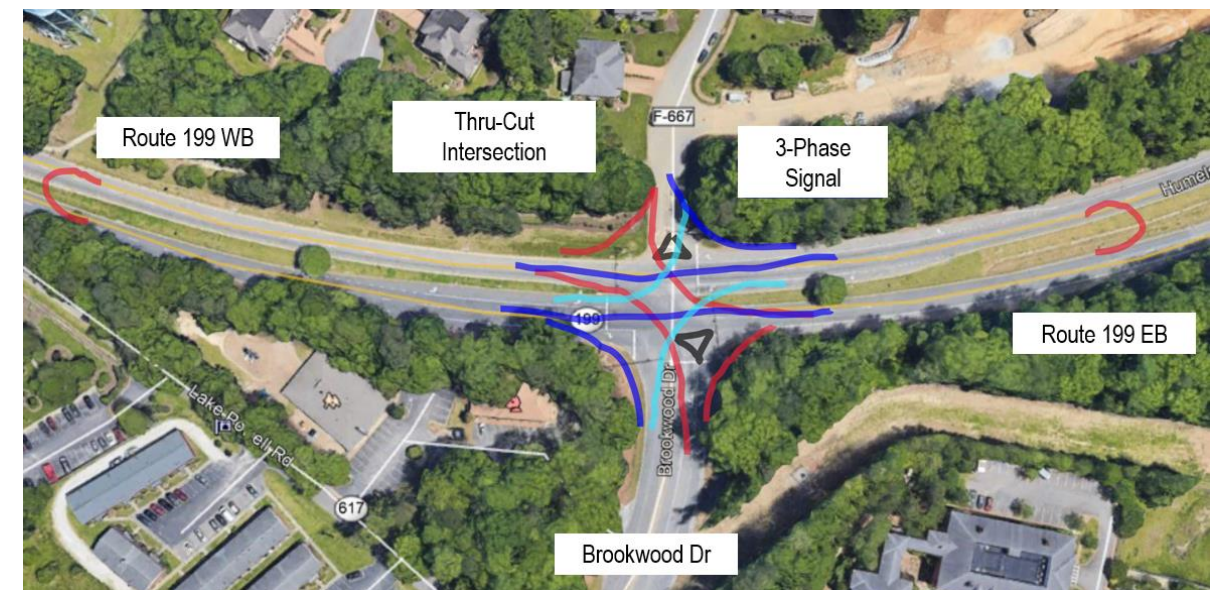
Route 199 at Brookwood Drive

In existing conditions, the intersection of Route 199 and Brookwood Drive experiences heavy queueing in the westbound direction, especially during the PM peak hour. Northbound left-turning vehicles also experience high delays in the AM and PM peak hours. Westbound Route 199 vehicles

travel at higher speeds approaching the Brookwood Drive intersection. Poor sight distance is present due to the horizontal curvature of Route 199 and is likely the primary cause, in conjunction with the presence of a traffic signal, of rear-end crashes within the influence area of the intersection.

The preliminary alternative, illustrated in **Figure 15**, is a Thru-Cut which would reroute through movements on Brookwood Drive to U-turn locations to the east and west of the main intersection.

Figure 15: Phase 1 Alternative – Brookwood Drive Thru-Cut



Route 199 at Jamestown Road

Queues on westbound Jamestown Road spill back through Brookwood Drive in the AM and PM peak hours. In addition to vehicular traffic, pedestrians and cyclists frequently cross Route 199. Five crashes occurred at this intersection due to vehicles making a right turn on red. Additionally, six crashes occurred due to permissive left turn phasing from Route 199 to Jamestown Road.

One preliminary alternative, illustrated in **Figure 16**, includes widening Jamestown Road, as well as adding dual lefts with a left, left/through, through, and right lane configuration on the westbound and northbound approaches. Another option considered was only adding dual westbound lefts.

Figure 16: Phase 1 Alternative – Jamestown Road Dual Lefts



Figure 17 shows a bowtie concept. The bowtie would reroute all left turn movements at Route 199 and Jamestown Road to roundabouts along Jamestown Road. The northern roundabout would be located at Woodmere Drive and the southern roundabout would be located at Winston Drive. The southern roundabout could also be located at Old Colony Lane as shown in **Figure 18**. For more information on how bowtie intersections operate, visit [VDOT's Innovative Intersection website](#).

Figure 17: Phase 1 Alternative – Jamestown Road Bowtie



Figure 18: Phase 1 Alternative – Jamestown Road Southern Roundabout



Figure 19 shows the third preliminary alternative which is a quadrant intersection. The quadrant would reroute all left turn movements at Route 199 and Jamestown Road to adjacent intersections via a connector roadway. For more information on how quadrant intersections operate, visit [VDOT's Innovative Intersection website](#).

Figure 19: Phase 1 Alternative – Jamestown Road Quadrant



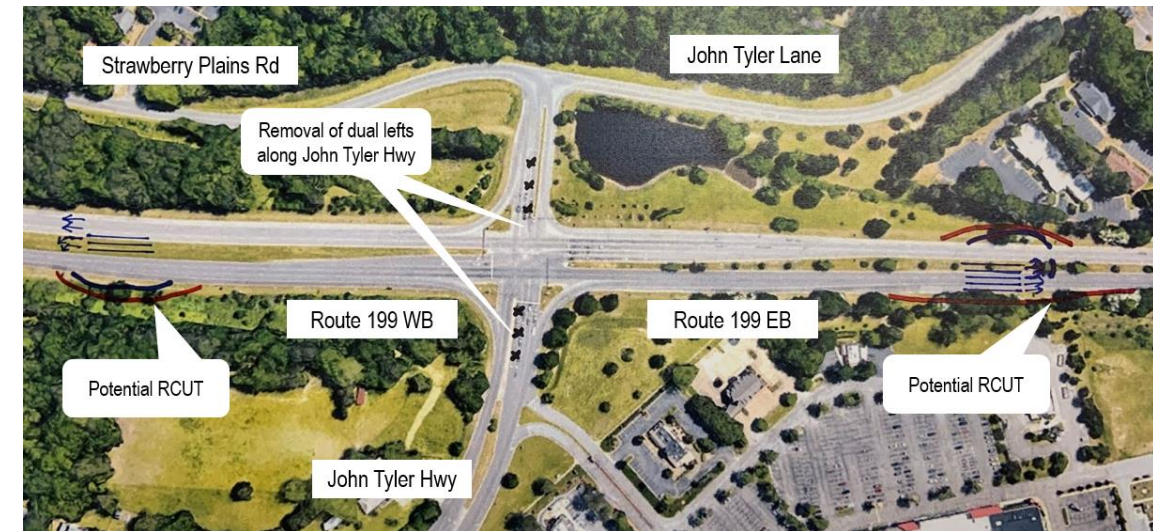
Another option considered was lowering the Route 199 facility underneath Jamestown Road to remove eastbound and westbound through movements from the intersection.

Route 199 and John Tyler Highway

Heavy queuing is present at John Tyler Highway, especially in the westbound direction during both the AM and PM peak hours. The westbound left turn also experiences long queues that often extend beyond the available storage bay. Two crashes involving bicycles and one pedestrian fatality occurred at this intersection.

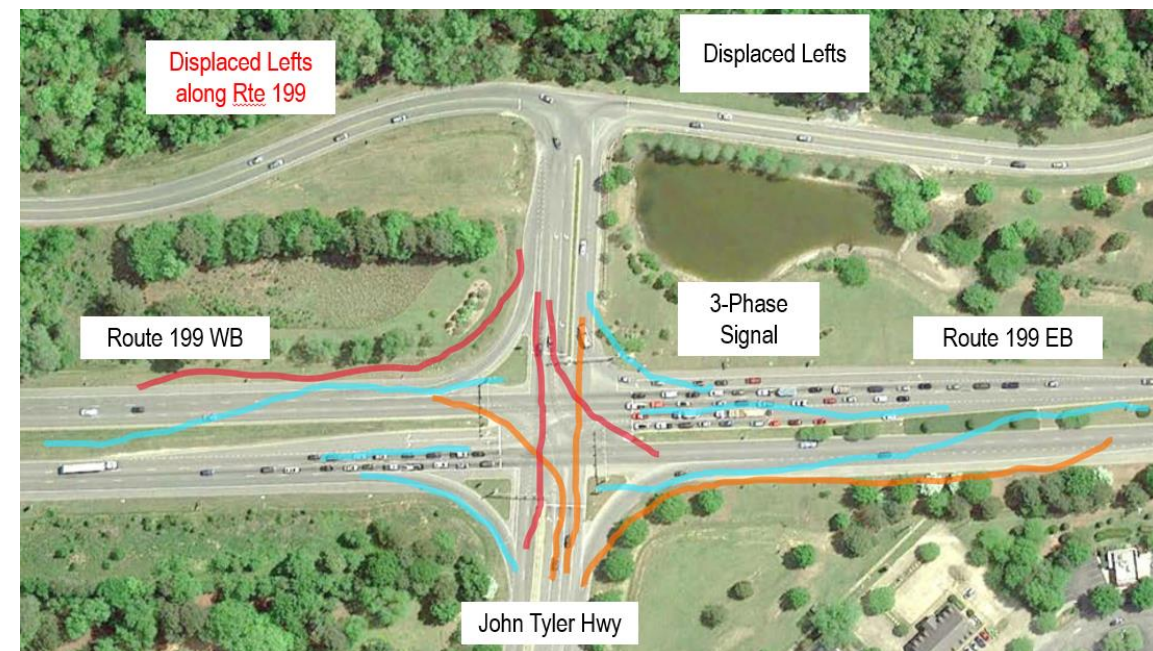
Figure 20 shows a preliminary alternative comprising of a Restricted Crossing U-Turn (RCUT) which would reroute left turns from John Tyler highway to U-turn locations to the east and west of the intersection.

Figure 20: Phase 1 Alternative – John Tyler Highway RCUT



Another alternative, illustrated in **Figure 21**, shows a partial displaced left turn which would allow left turns and through movements on Route 199 to run simultaneously.

Figure 21: Phase 1 Alternative – John Tyler Highway Partial Displaced Left Turn



Short-term improvements for this intersection included adding delineators along Route 199 at the channelized right turn lanes and reviewing the posted speed limit for vehicles traveling eastbound approaching John Tyler Highway.

John Tyler Highway and John Tyler Lane/Strawberry Plains Road

Southbound queues from John Tyler Highway at Route 199 extend to John Tyler Lane/Strawberry Plains Road and affect the eastbound and westbound movements during the AM and PM peak hours.

The preliminary alternative, illustrated in **Figure 22**, is a roundabout which would convert the intersection from stop-controlled to yield-controlled.

Figure 22: Phase 1 Alternative – John Tyler Lane/Strawberry Plains Road Roundabout

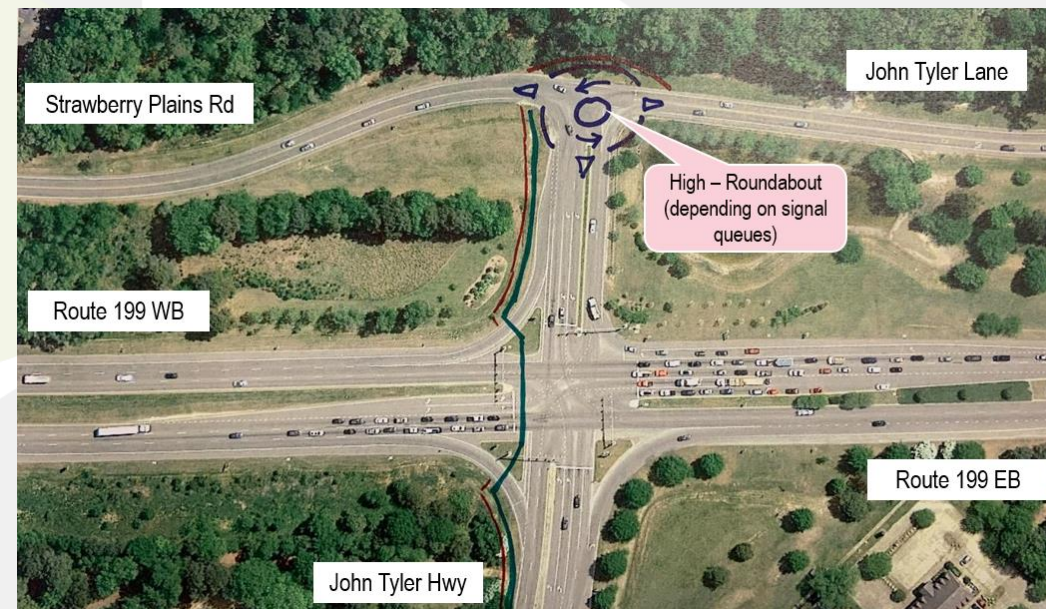
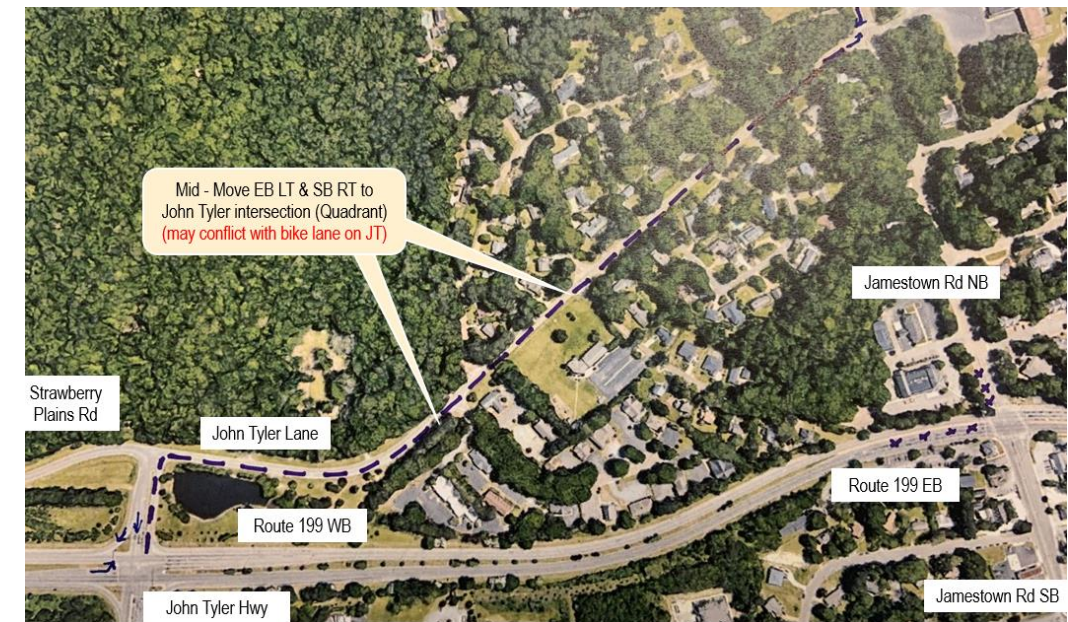


Figure 23 illustrates a quadrant on John Tyler Lane. This concept would reroute eastbound and southbound left turns at Route 199 and Jamestown Road along John Tyler Lane.

Figure 23: Phase 1 Alternative – John Tyler Lane Quadrant



A third alternative included adding eastbound and westbound turn lanes on John Tyler Lane/Strawberry Plains Road.

2.1.2 Alternatives Addressing Bicycle and Pedestrian Access and Safety

Alternatives addressing bicycle and pedestrian access included adding additional sidewalk along Jamestown Road, ensuring adequate lane widths on Jamestown Road to allow for future bike lanes, and a shared-use path along John Tyler Highway. These bicycle and pedestrian facilities will allow for greater connectivity throughout the area and future connection to the Virginia Capital Trail and future projects such as the College Woods Circuit Trail.

Additionally, the concepts that proposed innovative intersections benefit bicycles and pedestrians due to reducing signal phases. A reduction of signal phases allows for the possibility of median refuge islands and shortens the distance bicycles and pedestrians must traverse through the intersection.

2.1.3 Alternatives Addressing Transit and Transportation Demand Management (TDM) Access

The Michael Baker team identified alternatives to improve access to existing TDM services ranging from high-level programmatic recommendations to targeted improvements at Route 199 and John Tyler Highway. The transit and TDM improvements included the following:

- Study the potential for increased frequency along high-demand WATA routes throughout the city
- Promote Trafix commuter assistance programs to residents and employers
- Install crosswalk infrastructure at the intersection of Route 199 and John Tyler Highway

The Phase 2 transit and TDM project benefit analysis is included in **Appendix E**.

2.1.4 Phase 1 Alternatives Summary

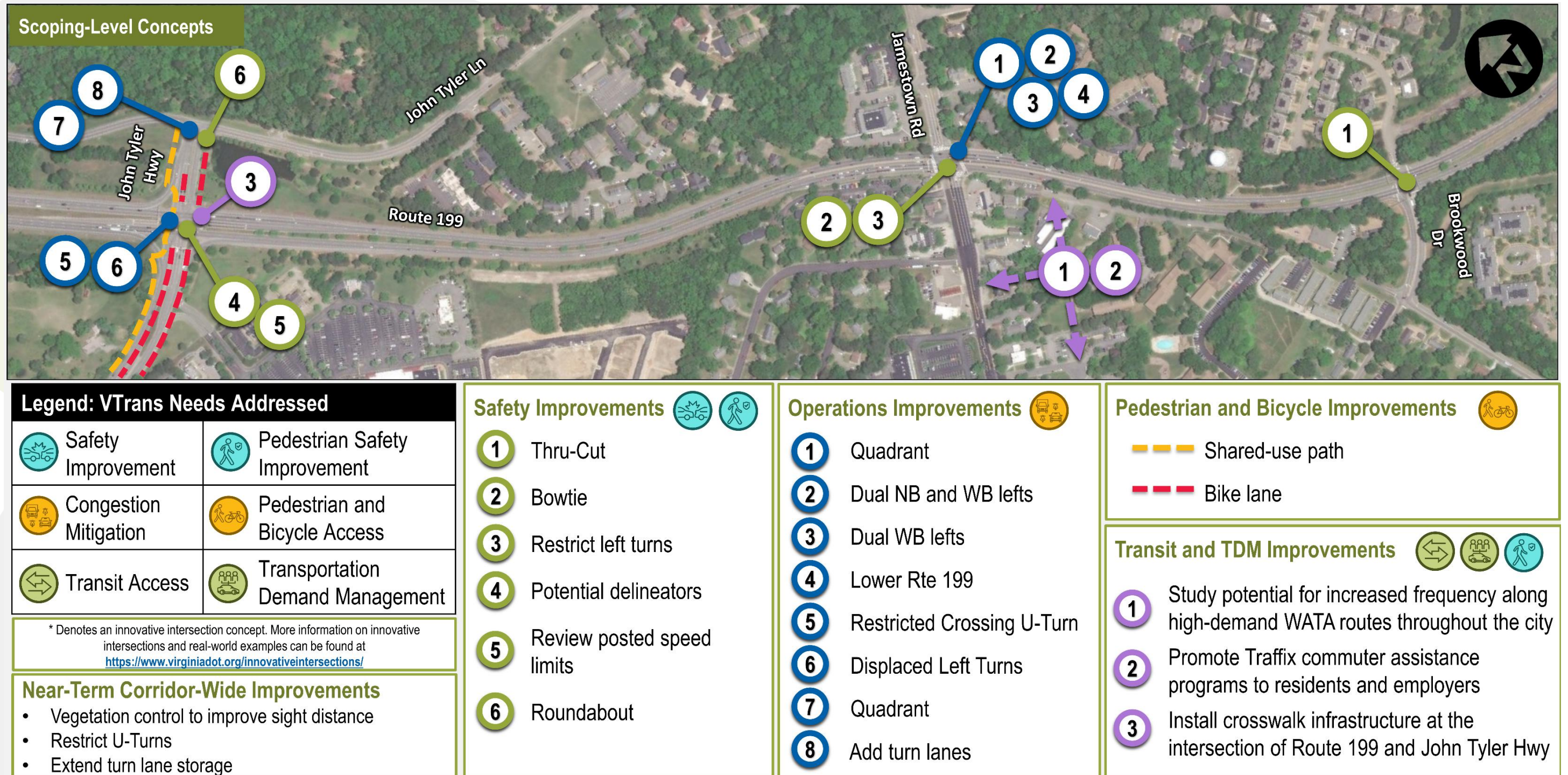
Table 12 includes a refined list of the alternatives considered in Phase 1 and the associated needs addressed. **Figure 24** shows the preliminary alternatives graphically categorized by the needs addressed by the alternative. The study team discussed further details of the Phase 1 improvement alternatives during the Preliminary Alternatives and Phase 2 Scoping meeting held with the SWG on October 20, 2021.

Table 12: Phase 1 Alternatives and Anticipated Needs Addressed

Intersection	Improvement	Safety Need	Congestion Need	Pedestrian Need	Bike Need	Transit/TDM Need
Route 199 and Brookwood Drive	Thru-Cut	●	●		○	
Route 199 and Jamestown Road	Quadrant	●	●	●	●	○
	Dual NB and WB Lefts	○	●	○	○	○
	Lower Route 199	●	●	○	○	○
	Bowtie	●	●	●	●	○
	Restrict Left Turns	●	●	●	●	○
Route 199 and John Tyler Highway	Potential Delineators for Channelized Rights	●	○	○	○	
	Review Posted Speed Limits	●	○	○	○	
	RCUT	●	●	●	●	
	Partial Displaced Left Turns	●	●	●	●	
John Tyler Highway and John Tyler Lane/ Strawberry Plains Road	Roundabout	●	●	●	●	
	Quadrant	●	○	○	●	
	Add Turn Lanes	○	●	○	○	

Legend | ● Need exists and is addressed ○ Need exists and is not addressed If no circle is present, need is not present

Figure 24: Phase 1 Scoping-Level Improvement Alternatives



2.2 Phase 2 Alternatives Analysis and Refinement

The study team conducted a screening-level traffic operations analysis using Synchro 10 on a series of intersection improvement alternatives. A meeting with VDOT Right-of-Way (ROW) and Location and Design (L&D) was held on February 9, 2022 to discuss the alternatives. Additional results for each alternative were presented during a concept-screening meeting with the SWG on February 11, 2022. During the meeting, the study team discussed each alternative based on impacts to safety, traffic operations, cost, and right-of-way impacts. Both presentations, along with the detailed concept benefits, are included in **Appendix E**.

2.2.1 Intersection Alternative Analysis

The following sections present the details for each alternative analyzed.

Brookwood Drive Alternative 1A: Thru-Cut

The Thru-Cut alternative will reroute through movements on Brookwood Drive to unsignalized U-turn locations to the east and west of the main intersection. Left turns from Brookwood Drive and Route 199 will remain permitted. **Figure 25** presents a conceptual sketch of the alternative.

Figure 25: Phase 2 Alternative – Brookwood Drive Thru-Cut



Brookwood Drive Alternative 1B: Thru-Cut + No Route 199 Lefts

This alternative will reroute through movements on Brookwood Drive as well as left turn movements on Route 199 to signalized U-turn locations to the east and west of the main intersection. Left turns from Brookwood Drive will remain permitted. **Figure 26** presents a conceptual sketch of the alternative.

Figure 26: Phase 2 Alternative – Brookwood Drive Thru-Cut + No Route 199 Lefts



Jamestown Road Alternative 2A: Quadrant with Jamestown Road Signal

The quadrant will reroute all left turn movements at Route 199 and Jamestown Road to adjacent intersections via a connector roadway. The connector roadway will tie into Route 199 and Jamestown Road with two signalized intersections. Jamestown Road will include sidewalks for pedestrians and fourteen-foot lane widths to accommodate cyclists. **Figure 27** presents a conceptual sketch of the alternative. For more information on how quadrant intersections operate, visit [VDOT's Innovative Intersection website](#).

Figure 27: Phase 2 Alternative – Jamestown Road Quadrant with Signal



Jamestown Road Alternative 2B: Quadrant with Roundabout at Jamestown Road/Woodmere Drive

The quadrant will reroute all left turn movements at Route 199 and Jamestown Road to adjacent intersections via a connector roadway. The connector roadway will tie into Route 199 via a signalized intersection and Jamestown Road via a roundabout. Jamestown Road will include sidewalks for pedestrians and fourteen-foot lane widths to accommodate cyclists. **Figure 28** presents a conceptual sketch of the alternative.

Figure 28: Phase 2 Alternative – Jamestown Road Quadrant with Roundabout



Jamestown Road Alternative 3A: Full Bowtie

This concept will reroute all left turn movements at the intersection of Route 199 and Jamestown Road to roundabouts along Jamestown Road. Jamestown Road will include sidewalks for pedestrians and fourteen-foot lane widths to accommodate cyclists. **Figure 29** presents a conceptual sketch of the alternative. There is potential to refine this alternative by shifting the southern roundabout to Old Colony Lane. For more information on how bowtie intersections operate, visit [VDOT's Innovative Intersection website](#).

Figure 29: Phase 2 Alternative – Jamestown Road Full Bowtie



Jamestown Road Alternative 3B: Partial Bowtie

The partial bowtie concept will reroute left turn movements from Jamestown Road to roundabouts along Jamestown Road. Left turns from Route 199 will remain permitted. Jamestown Road will include sidewalks for pedestrians and fourteen-foot lane widths to accommodate bikes. **Figure 30** presents a conceptual sketch of the alternative. There is potential to refine this alternative by shifting the southern roundabout to Old Colony Lane.

Figure 30: Phase 2 Alternative – Jamestown Road Partial Bowtie



John Tyler Highway/John Tyler Lane Alternative 4A: Partial Displaced Lefts + Signal at John Tyler Lane/Strawberry Plains Road

This concept will allow left turns and through movements on Route 199 to occur simultaneously by displacing the left turn movements. Two additional signals will be constructed along Route 199 to accommodate the left turn movements. Left turns from John Tyler Highway will still be permitted. A shared-use path will be constructed along John Tyler Highway and connect Strawberry Plains Road to the existing sidewalk on John Tyler Highway at Ferncliff Drive. A signalized intersection will be constructed at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road. This signal will be coordinated with the intersection at Route 199 to prevent queues from spilling back into either intersection. **Figure 31** presents a conceptual sketch for the alternative.

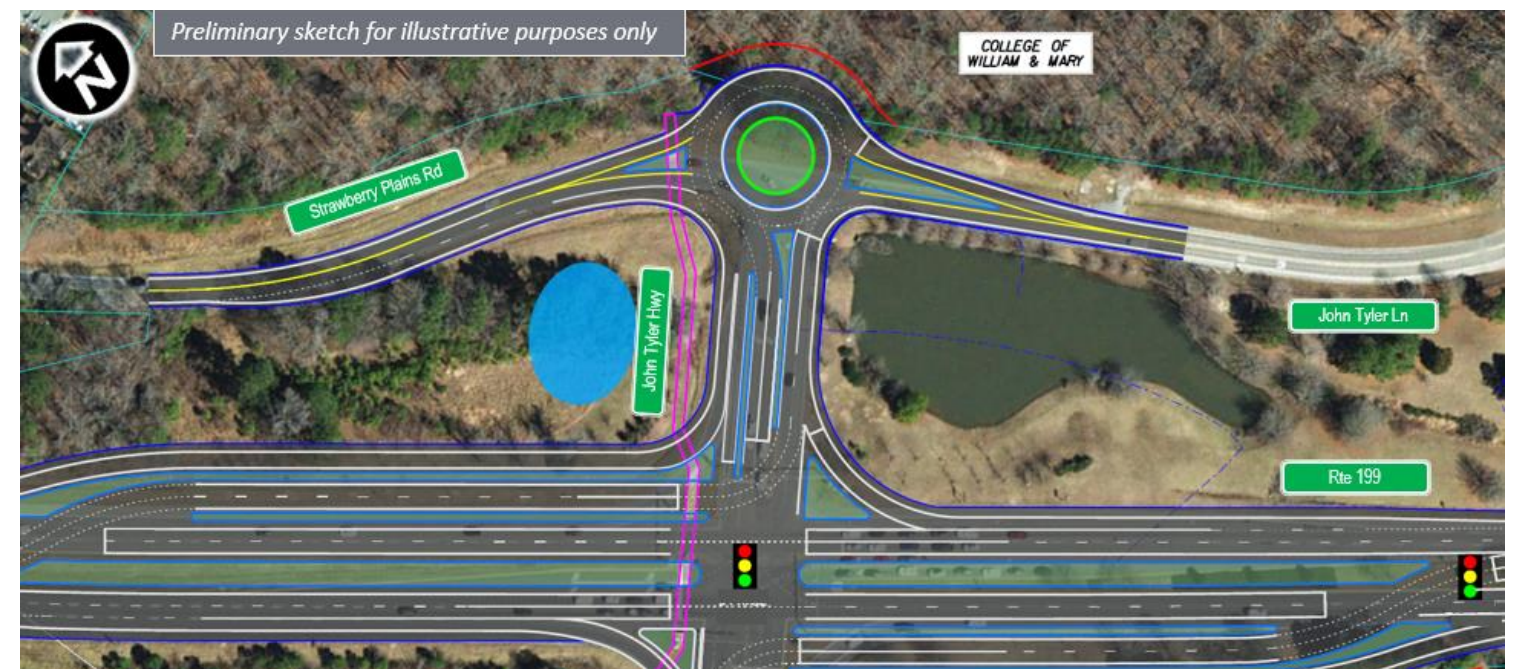
Figure 31: Phase 2 Alternative – John Tyler Highway/John Tyler Lane Partial Displaced Lefts + Signal



John Tyler Highway/John Tyler Lane Alternative 4B: Partial Displaced Lefts + Roundabout at John Tyler Lane/Strawberry Plains Road

This concept will allow left turns and through movements on Route 199 to occur simultaneously by displacing the left turn movements. Two additional signals will be constructed along Route 199 to accommodate the left turn movements. Left turns from John Tyler Highway will still be permitted. A shared-use path will be constructed along John Tyler Highway and connect Strawberry Plains Road to the existing sidewalk on John Tyler Highway at Ferncliff Drive. A roundabout will be constructed at the intersection of John Tyler Highway and John Tyler Lane/Strawberry Plains Road. **Figure 32** presents a conceptual sketch for the alternative.

Figure 32: Phase 2 Alternative – John Tyler Highway/John Tyler Lane Partial Displaced Lefts + Roundabout



Anticipated Crash Reduction for Alternatives

The study team reviewed crash modification factors (CMFs) to determine the potential safety benefits for each alternative. CMFs were selected from the approved list of CMFs applied during the VDOT SMART SCALE safety scoring process. The CMF resulting in the highest anticipated crash reduction was applied to fatal and injury crashes within the influence area of each intersection, as shown in **Table 13: CMF and Crash Reduction Summary**.

Table 13: CMF and Crash Reduction Summary

Intersection	Alternative	F+I CMF	5-Year Crash Reduction (F+I)
Brookwood Drive	Thru-Cut	0.91*	1.17
	Thru-Cut + Restrict Lefts on Route 199	0.91*	1.17
Jamestown Road	Quadrant	0.70*	12.30
	Full Bowtie	0.70*	12.30
	Partial Bowtie	0.91*	3.69
John Tyler Highway	Partial Displaced Lefts	0.80*	10.20
John Tyler Lane/ Strawberry Plains Road	Signal	0.65	1.40
	Roundabout	0.20	3.20

* No CMF for the improvement exists. CMF values developed based on SMART SCALE safety methodology

2.2.2 Phase 2 Alternative Screening Summary

The primary goal of the Phase 2 alternatives development effort was to prepare a refined set of alternatives to present to the public and solicit feedback. The study team compared each alternative across several metrics including traffic operations, safety, pedestrian and bicycle access, and cost to determine the refined list of concepts to present to the public, as shown in **Table 14**. Systemic improvements such as vegetation control, signal ahead warning signs, and signal coordination were not presented to the public as there were not multiple alternatives for comparison for these improvements.

Table 14: Phase 2 Alternative Screening Summary

Intersection	Alternative	Synchro Operations (Δ in delay from No-Build)		Safety	Ped/Bike Access	Preliminary Construction Cost Estimate	Advance to Public Engagement
Brookwood Drive	Alternative 1A: Thru-Cut	<u>EB Route 199 Approach</u> AM: -28.8s delay PM: -4.8s delay	<u>WB Route 199 Approach</u> AM: +0.6s delay PM: -22.1s delay	+	0	\$2.5M to \$5.0M	Yes
	Alternative 1B: Thru-Cut + Restrict Lefts on Route 199	<u>EB Route 199 Approach</u> AM: -37.8s delay PM: -0.9s delay	<u>WB Route 199 Approach</u> AM: -6.0s delay PM: 13.1s delay	+	0	\$2.5M to \$5.0M	Yes
Jamestown Road	Alternative 2A: Quadrant with Jamestown Road Signal	<u>EB Route 199 Approach</u> AM: -111.3s delay PM: +35.6s delay	<u>WB Route 199 Approach</u> AM: -20.2s delay PM: +29.5s delay	+	+	\$10M to \$20M	Yes
	Alternative 2B: Quadrant with Jamestown Road Roundabout	<u>EB Route 199 Approach</u> AM: -54.9s delay PM: +10.6s delay	<u>WB Route 199 Approach</u> AM: -16.6s delay PM: +2.8s delay	+	+	\$10M to \$20M	Yes
	Alternative 3A: Full Bowtie	<u>EB Route 199 Approach</u> AM: -111.2s delay PM: -53.6s delay	<u>WB Route 199 Approach</u> AM: -8.8s delay PM: -20.7s delay	+	+	\$6.5M to \$13.0M	Yes
	Alternative 3B: Partial Bowtie	<u>EB Route 199 Approach</u> AM: -104.4s delay PM: -26.4s delay	<u>WB Route 199 Approach</u> AM: -37.3s delay PM: -11.4s delay	+	+	\$6.5M to \$13.0M	Yes
John Tyler Highway	Alternative 4: Partial Displaced Lefts	<u>EB Route 199 Approach</u> AM: -28.9s delay PM: -22.0s delay	<u>WB Route 199 Approach</u> AM: -54.4s delay PM: -27.6s delay	+	+	\$11M to \$22M	Yes
John Tyler Lane/ Strawberry Plains Road	Alternative 4A: Signal at John Tyler Lane/Strawberry Plains Road	<u>EB Strawberry Plains Road Approach:</u> AM: -718.5s delay PM: -156.0s delay	<u>WB John Tyer Lane Approach:</u> No-Build volume exceeds capacity – no delay provided	+	+		Yes
	Alternative 4B: Roundabout at John Tyler Lane/Strawberry Plains Road	<u>EB Strawberry Plains Road Approach:</u> AM: -735.5s delay PM: -164.6s delay	<u>WB John Tyer Lane Approach:</u> No-Build volume exceeds capacity – no delay provided	+	+		Yes

Legend for Table 14

Rating	Ped/Bike Access: Alternative Bike/Ped Accommodations Compared to No-Build	Safety: Anticipated Safety Impact Compared to No-Build
-	Negative Impact	Anticipated Reduction to Safety
0	Neutral Impact	No Benefit/Reduction Anticipated
+	Positive Impact	Anticipated Safety Benefit

3 Public & Stakeholder Outreach & Feedback

The Project Pipeline process involved targeted outreach and stakeholder input for the alternative concepts in the study area. The study team developed concept sketches, prepared presentation materials, and created a public survey to meet the public engagement needs for this study.

3.1 Stakeholder Coordination

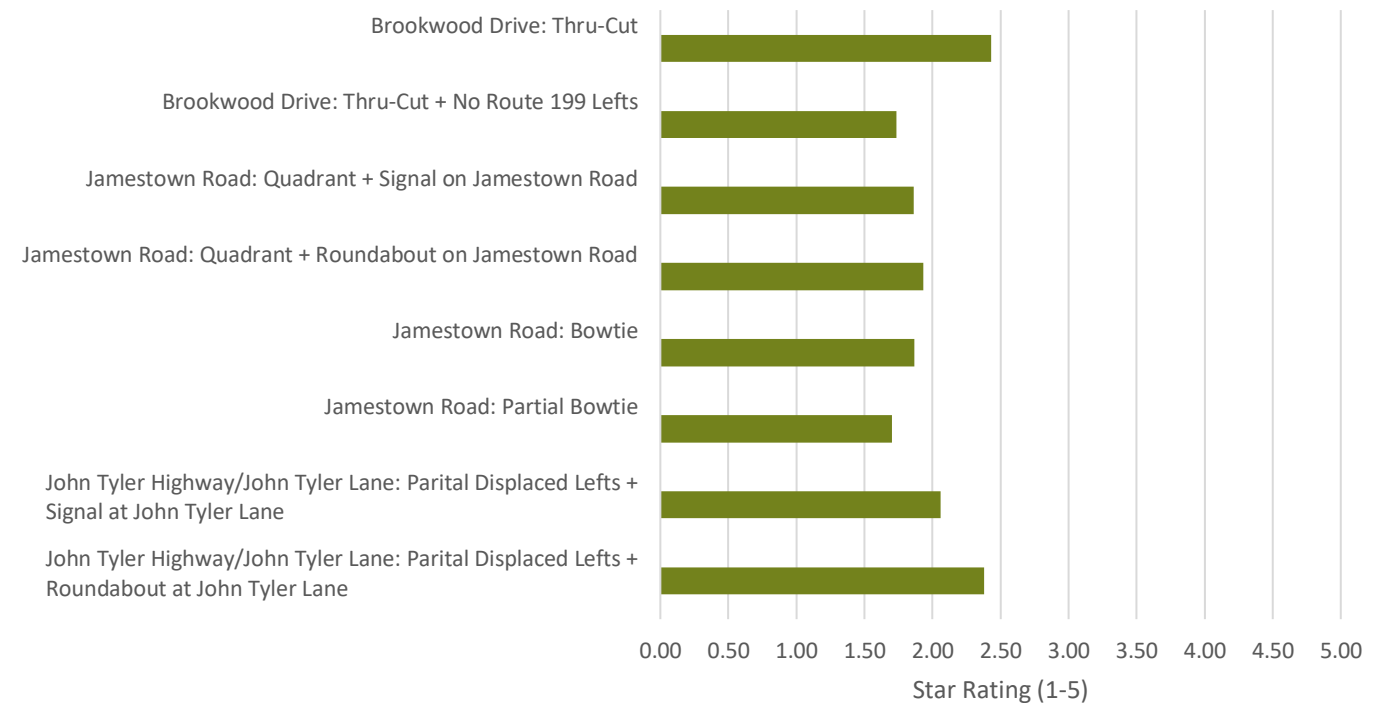
Stakeholder engagement is a key part in making the recommendations of the study successful from more than a traffic operations standpoint. The stakeholders provide regional and local knowledge about the study area and help guide the study direction. The project stakeholders identified in **Chapter 1.3** were involved in all steps of the Project Pipeline process and assisted in making decisions regarding which concepts to move forward to public engagement.

3.2 Public Involvement

3.2.1 Spring 2022

A MetroQuest survey was available from March 4 to March 26, 2022, to collect feedback on potential improvements and innovative intersection concepts within the study corridor. The survey provided the study team, the City of Williamsburg, James City County, and VDOT with an understanding of how the public viewed each concept before selecting a preferred option. 97% of respondents indicated that they normally travel through the study area by personal vehicle. **Figure 33** summarizes the average ranking for each concept presented at Brookwood Drive, Jamestown Road, and John Tyler Highway/John Tyler Lane. A rating of 5.0 represents a strongly favored concept and a rating of 1.0 represents a strongly unfavorable concept. The Brookwood Thru-Cut and the John Tyler Highway/John Tyler Lane Partial Displaced Lefts with a Roundabout received the highest ratings. A summary of the MetroQuest survey is shown in **Appendix F**. Reoccurring themes in comments and feedback about the survey suggested that the proposed improvements were not clearly articulated and/or interpreted by the public. The full SWG supported an additional, more targeted in-person public outreach effort in the study area.

Figure 33: Public Engagement – Average Rating of Alternatives



Following the spring 2022 outreach survey, the study team presented to the local governing bodies to provide an update on the study and an overview of existing conditions and forecasted no-build conditions. The study team presented to the Williamsburg City Council on April 11, 2022 and James City County Board of Supervisors on April 26, 2022. Both governing bodies supported a more targeted in-person outreach effort to reaffirm the needs and challenges in the study corridor and seek input on improvement concepts.

3.2.2 Fall 2022

In fall 2022, the study team facilitated a round of briefings with local elected officials and in-person community meetings to provide an overview of the existing conditions and forecasted no-build conditions in the study area and walk through each proposed alternative and associated benefits.

A 10-minute narrated presentation was posted to the project website and the [VDOT YouTube](#) channel for the public to review. The goal of the video presentation was to present study findings and obtain public input on the recommended preferred alternative. The presentation included the following:

- Overview of project and goal of study
- Existing traffic operational and safety challenges in the study area
- Approach to analyzing future conditions
- Improvement alternatives and associated benefits

Four public meetings were held in fall 2022:

- Two (2) Community Meetings in City of Williamsburg at the Stryker Center
 - Wednesday, September 14 at 12PM (approximately 35 attendees)
 - Wednesday, September 14 at 5PM (approximately 20 attendees)
- One (1) Public Open House Meeting in James City County at Laurel Lane Elementary School
 - Monday, September 19 at 5PM (85 attendees)
- One (1) Public Open House Meeting in the Williamsburg Community Building
 - Tuesday, September 20 at 11AM (33 attendees)

All improvement alternatives from Phase 2 were presented at the public meetings:

- **Route 199 at Brookwood Drive**
 - Alternative 1A: Thru-Cut
 - Alternative 1B: Thru-Cut + No Route 199 Lefts
- **Route 199 at Jamestown Road**
 - Alternative 2A: Quadrant with Signal
 - Alternative 2B: Quadrant with Roundabout
 - Alternative 3A: Full Bowtie
 - Alternative 3B: Partial Bowtie
- **Route 199 at John Tyler Highway/John Tyler Lane**
 - Alternative 4A: Partial Displaced Left Turns + Signal at John Tyler Lane
 - Alternative 4B: Partial Displaced Left Turns + Roundabout at John Tyler Lane

At each meeting, the study team presented an overview of the study and showed the narrated video. Team members were available at project boards to discuss existing conditions, describe proposed improvements and associated benefits, and gather feedback from community members. Copies of meeting materials presented at the public meetings are shown in **Appendix F**. 28 written comments and 18 emails were received. **Figure 34** shows photos from fall 2022 in-person public meetings.

A summary of the feedback captured during the fall 2022 engagement is summarized in **Appendix F**. The provided public input was used to inform the refined concepts outlined in **Chapter 4**.

Figure 34: Fall 2022 Public Meetings



4 Refined Concepts

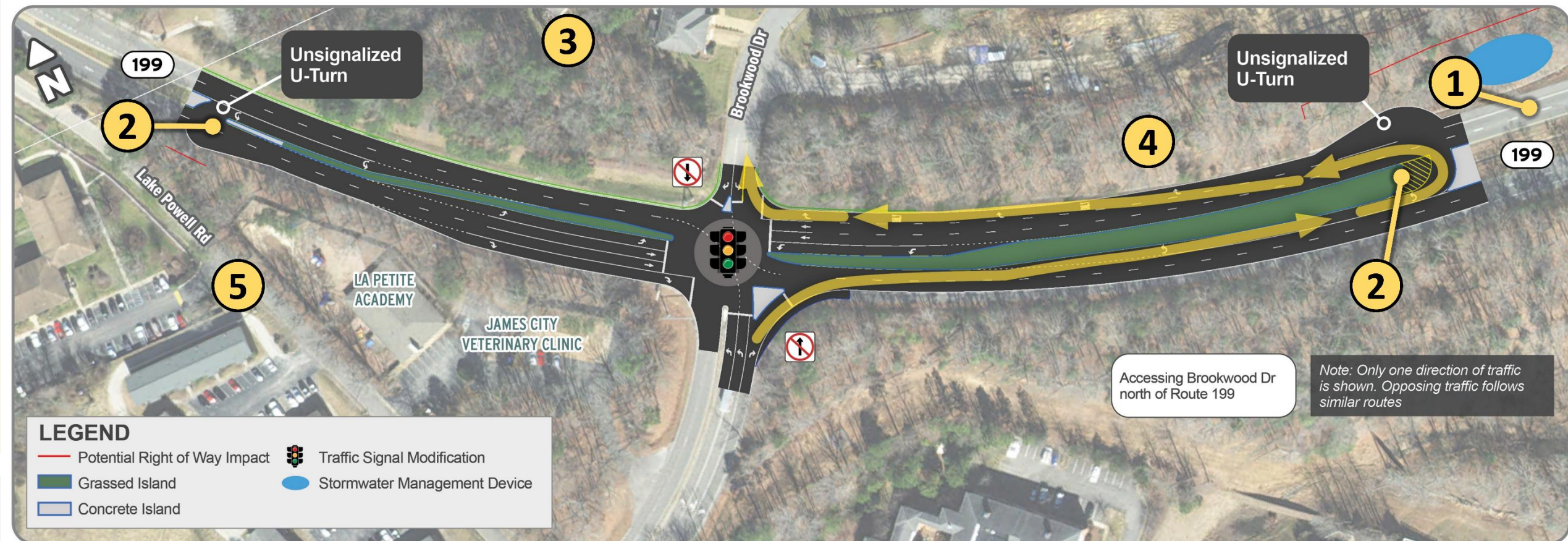
Following the fall 2022 public involvement meetings, the study team met with the SWG to review public feedback and assess potential updates to the improvement concepts. Recommended changes included modification to roundabout alignments, additional signage to help motorists better navigate innovative intersections, and additional enhancements to infrastructure to accommodate non-motorist users. In addition to recommended additions and/or changes, the study team also identified factors that may be considered in a future analysis phase and project development.

Improvement concepts with recommended updates and additional factors for consideration are provided on the following pages:

- **Figure 35** shows the refined concept for Route 199 and Brookwood Drive intersection
- **Figure 36** shows the refined concept for Route 199 and Jamestown Road intersection
- **Figure 37** shows the refined concept for Route 199 and John Tyler Highway/John Tyler Lane

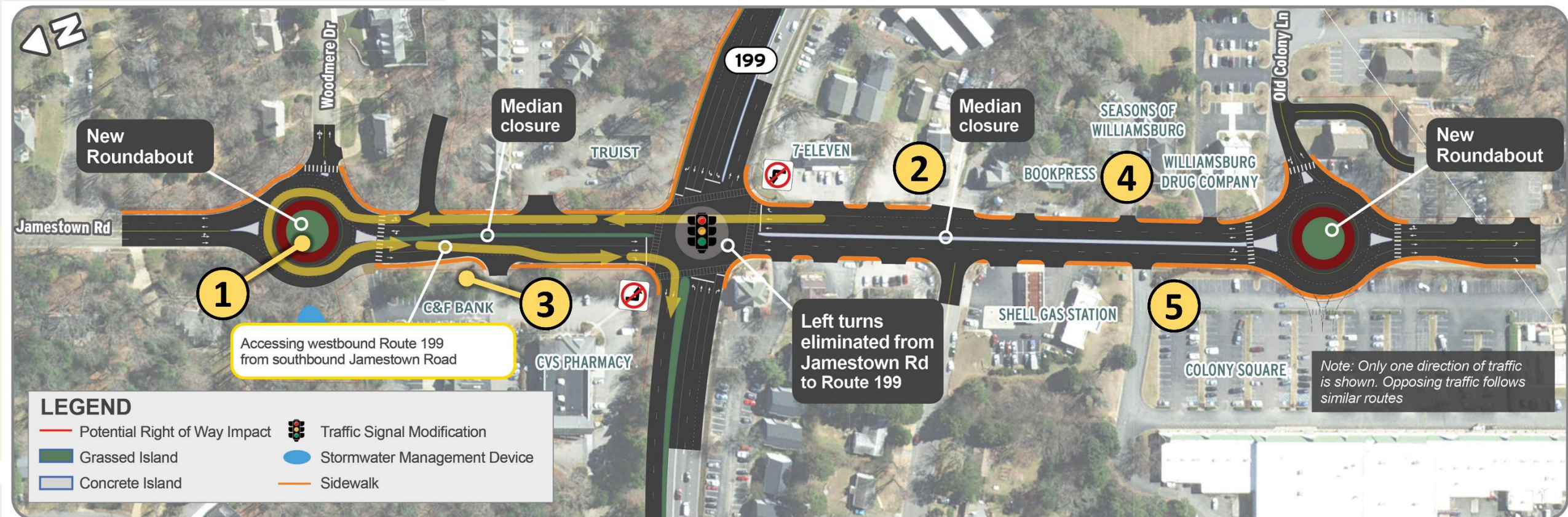
The Synchro and SimTraffic analysis performed for this study did not follow VDOT's typical review process; specifically, VDOT did not review Synchro or SimTraffic analysis files beyond the existing condition. Based on feedback from the spring 2022 MetroQuest survey, the SWG decided that the proposed improvements were not clearly articulated and/or interpreted by the public. This led to additional in-person public outreach in fall 2022, which is outlined in **Chapter 3**. The SWG agreed to consider moving forward with a more detailed analysis after the extended fall 2022 public outreach efforts. As such, the traffic analysis results presented in this report are preliminary and will need to be revisited with a more detailed analysis if the recommended concepts are advanced forward with support from the local jurisdictions.

Figure 35: Refined Concept – Brookwood Drive Thru-Cut



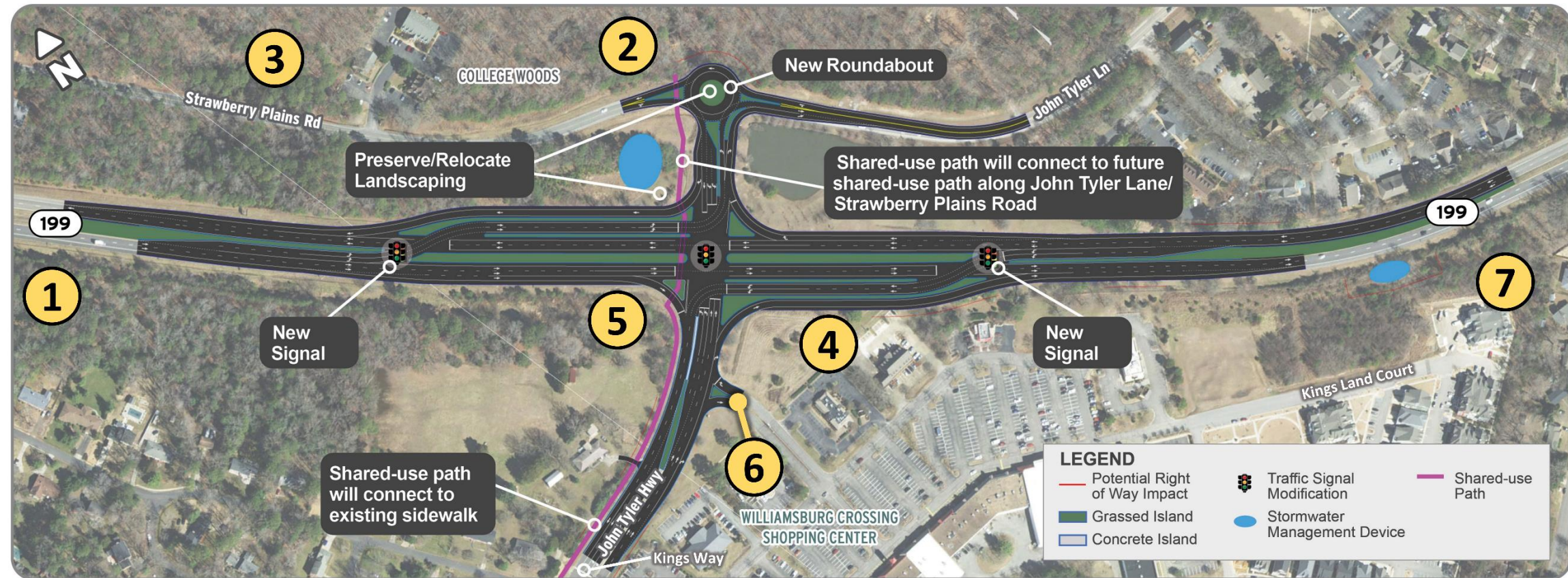
#	Recommended Updates to Concept	Considerations for Implementation
1	<ul style="list-style-type: none"> Add flashing signs east of Brookwood Drive on westbound Route 199 to alert drivers of downstream congestion 	<ul style="list-style-type: none"> Adhere to VDOT guidance for sign installation
2	<ul style="list-style-type: none"> Consider removal of U-turn locations on Route 199 	<ul style="list-style-type: none"> Reduced right-of-way impacts at La Petite Academy Increase signing to convey alternative routes in-lieu of Brookwood Drive through movement rerouting
3	<ul style="list-style-type: none"> Explore bicycle connectivity from Holly Hills Carriage Homes to Jamestown Road via Woodmere Drive 	<ul style="list-style-type: none"> Potential right-of-way and utility easements required
4	<ul style="list-style-type: none"> Clear vegetation along westbound Route 199 to improve sight distance 	<ul style="list-style-type: none"> Tree clearing effort completed by VDOT, Fall 2022
5	<ul style="list-style-type: none"> Maintain existing connection from Lake Powell Road to Jamestown Road for non-motorized users 	

Figure 36: Refined Concept – Jamestown Road Partial Bowtie



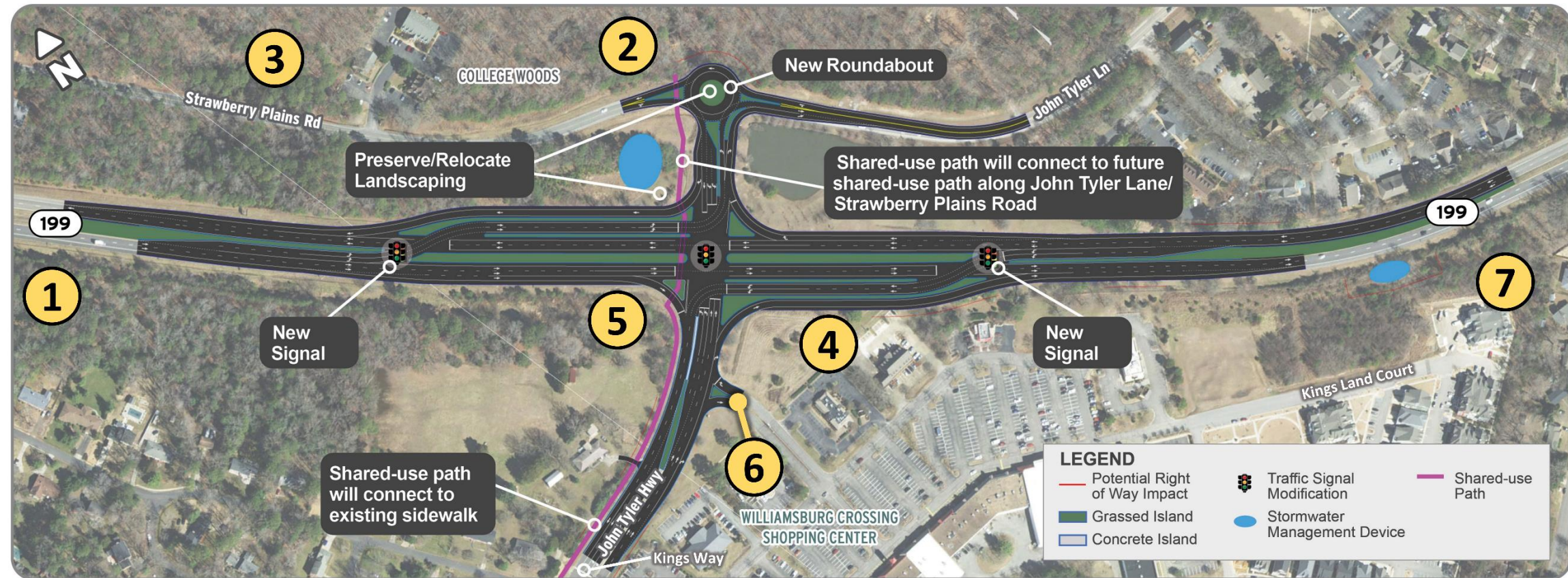
#	Recommended Updates to Concept	Additional Considerations
①	<ul style="list-style-type: none"> Evaluate shifting northern roundabout at Woodmere Drive to the west to reduce impacts to local properties Consider connecting C&F Bank and CVS development to northern roundabout at Woodmere Drive via a fourth connector leg 	<ul style="list-style-type: none"> Anticipate increased right-of-way and environmental impacts
②	<ul style="list-style-type: none"> Consider short-term improvements to address access management along Jamestown Road 	<ul style="list-style-type: none"> Additional right-of-way impacts and costs
③	<ul style="list-style-type: none"> Provide transit shelter on the west side of Jamestown Road 	<ul style="list-style-type: none"> Additional right-of-way impacts and costs
④	<ul style="list-style-type: none"> Commit to providing lane widths on Jamestown Road for shared bike use Commit to improving pedestrian sidewalks along Jamestown Road through reconstruction Commit to enhanced aesthetics and streetscaping along Jamestown Road corridor 	<ul style="list-style-type: none"> Additional review needed for right-of-way and utility impacts to the Truist property related to proposed dual left widening and sidewalk improvements along Route 199 Impacts to parking and/or lot reconfiguration required at Truist
⑤	<ul style="list-style-type: none"> Consolidate and update signage to help motorists navigate through roundabouts to local destinations 	<ul style="list-style-type: none"> Adhere to VDOT guidance for sign installation

Figure 37: Refined Concept – John Tyler Highway/John Tyler Lane Partial Displaced Lefts + Roundabout (1 of 2)



#	Recommended Updates to Concept	Additional Considerations
①	<ul style="list-style-type: none"> Add flashing signs west of John Tyler Highway on eastbound Route 199 to slow traffic approaching the reduced 45 mph speed zone between John Tyler Highway and Brookwood Drive 	<ul style="list-style-type: none"> Adhere to VDOT guidance for sign installation
②	<ul style="list-style-type: none"> Explore oval-shaped roundabout to reduce impacts to College Woods Consider direct connection ramp from eastbound Strawberry Plains Road to westbound Route 199 Include lighting at new roundabout 	<ul style="list-style-type: none"> Conduct further survey of College Woods, as elevation change is known to be extreme to the north of John Tyler Highway/Strawberry Plains Road Plan for right-of-way acquisition and coordination with Virginia Legislature Commitment to Green Spring Garden Club to avoid or replace their current landscaping investments at the John Tyler Highway intersection. Present proposed relocations within future concept refinements.
③	<ul style="list-style-type: none"> Add additional signage on Strawberry Plains Road to slow vehicles down prior to intersection 	<ul style="list-style-type: none"> Evaluate speeds on Strawberry Plains Road approaching proposing roundabout for additional traffic calming

Figure 38: Refined Concept – John Tyler Highway/John Tyler Lane Partial Displaced Lefts + Roundabout (2 of 2)



#	Recommended Updates to Concept	Additional Considerations
④	<ul style="list-style-type: none"> Consolidate signage to help motorist navigate to local destinations 	<ul style="list-style-type: none"> Adhere to VDOT guidance for sign installation
⑤	<ul style="list-style-type: none"> Confirm proposed storage lane lengths along Route 199 with new displaced left intersection Evaluate traffic operations between the displaced left intersection and roundabout 	<ul style="list-style-type: none"> Conduct a single network analysis of preferred concepts to evaluate operations across full study area
⑥	<ul style="list-style-type: none"> Provide access management control to reroute traffic from Williamsburg Crossing Shopping Center to westbound Route 199 via Kings Way 	<ul style="list-style-type: none"> Add signs to convey alternative route
⑦	<ul style="list-style-type: none"> Revisit bicycle/pedestrian connectivity between the rear of Williamsburg Crossing Shopping Center and Jamestown Road via Kings Land Court 	<ul style="list-style-type: none"> Anticipate added residential and commercial right-of-way impacts

5 Next Steps

This section outlines the next steps to advance the refined recommended improvements if it is determined that the improvements are desirable to local residents.

5.1 Network Operational Analysis

The study team will evaluate intersection improvements as one single comprehensive network. The analysis will account for interactions between the three intersection areas and include Woodmere Drive and Old Colony Lane intersections on Jamestown Road.

5.2 Project Risks

The study team will facilitate a risk assessment workshop with VDOT and other identified project stakeholders to evaluate the preferred alternatives and associated planning level estimates for the three intersection improvements. The workshop will serve to identify potential project risks, discuss mitigation strategies, and determine risk items which need additional contingencies.

The study team will develop an initial planning-level project risk register identifying potential major high impact project risk elements following guidance provided in the VDOT Cost Estimating Manual (Chapter 5) and PM-103B Matrix. This initial risk register, project alternatives, and estimates will be provided to the workshop team for their review prior to the meeting.

Upon completion of the workshop, the study team will prepare the project's risk plan based on feedback and decisions made during this meeting. The risk plan matrix will identify project risks, outline the assessment of each risk item, and provide mitigation strategies recommended by the workshop team for implementation. Estimate contingencies will be outlined within this risk plan for team identified high-risk items and will be added to the project's planning level estimate within VDOT's Cost Estimating Work Booklet (CEWB).

5.3 Preferred Alternative Development

In coordination with VDOT District staff, the study team will refine the intersection improvement concepts during the study phase of project development. Concept refinements will include adjustments based on a more in-depth traffic operational analysis, comments received during VDOT's fall 2022 public involvement meetings, and District staff and project stakeholder comments received during the risk assessment. At the beginning of this study phase, the study team will conduct field inspections at the three intersection sites with VDOT staff, including representatives from the L&D, Hydraulics, Utilities, and Right of Way Departments, to review the current concepts and discuss and solicit additional staff feedback to the proposed improvements. The concept exhibits will be updated, and a Basis of Design Memorandum will be prepared in coordination with VDOT's L&D Department to

document the project's design criteria, design approach, and any potential design exceptions and/or waivers anticipated at this early planning level development of the project.

5.4 Planning-Level Cost Estimates and Schedule

The study team will prepare a planning-level project estimate based on the refined concepts at each of the three intersections along Route 199. In addition to the construction costs, the estimate will include forecasted costs for Preliminary Engineering Services (PE) to include VDOT and consultant costs, PE and construction cost for environmental permitting and stormwater credits, and construction engineering inspection (CEI). The project estimate will include the addition of contingency factors discussed and identified in the risk assessment workshop and plan.

VDOT's Regional Right of Way and Utility staff will be responsible for providing right-of-way and utility cost estimates for the project. The study team will provide right-of-way and easements impacts and forecasted utility conflicts to VDOT to aid in development of their cost estimates.

A project schedule will be developed for the three intersection improvements including projected timeframes for the preliminary engineering, right-of-way acquisition and utility relocation, and construction phases based on engineering knowledge, prior experience, and stakeholder feedback.

5.5 Possible Funding Sources

The following funding sources may be considered to advance any future recommendations:

- **SMART SCALE** – A state program that allocates funding to transportation projects based on congestion mitigation, economic development, accessibility, safety, environmental quality, and land use
- **Highway Safety Improvement Program (HSIP)** - A federal program that provides funding for improvements that correct or improve safety on a section of roadway or at an intersection that experience high crash incidents
- **Revenue Sharing** – A state program that provides a dollar-for-dollar state match to local funds for construction, reconstruction, improvement, and/or maintenance transportation projects
- **Community Development Block Grants (CDBG)** – A federal program that provides funding opportunities for transportation projects that aim to develop viable urban communities by providing a suitable living environment and expanding economic activities, principally for persons of low- and moderate-income.
- **Congestion Mitigation and Air Quality (CMAQ)** – A federal program that allocates funding to surface transportation projects that improve air quality by reducing congestion.
- **Transportation Alternatives (TA)** – A federal program that provides funding opportunities for pedestrian and bicycle facilities and requires a 20% match of local funds.