



PLANTATION ROAD *Corridor Study*

115

Prepared for:



Prepared by:





Plantation Road (State Route 115) Corridor Study
Roanoke, Virginia
May 2012
Plantation Road:
I-81 Interchange (Exit 146) to Williamson Road (U.S. Route 11)

Prepared for:

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PLANTATION ROAD *Corridor Study* 115

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Chapter 1.0 Executive Summary

The Plantation Road (State Route 115) Corridor Study provides a comprehensive understanding of the corridor for existing and future conditions, and its associated transportation needs within Roanoke County. The study identifies potential transportation improvement projects along Plantation Road between the I-81 Interchange (Exit 146) to the north and Williamson Road (Route 11) to the south for short, mid, and long-term time frames. As planned, the report itself will serve as a beneficial tool to both VDOT and Roanoke County in their discussions with developers as they convey future plans and projects for the corridor. This will provide the opportunity to obtain right-of-way, as well as realize implementation of both specific and regional improvements through the development process. On a much broader scale, the study will ultimately be used as a planning tool by VDOT and Roanoke County to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study corridor.

The study examined existing and future conditions for year 2035, with the intent of gaining a better understanding of the more immediate needs along the corridor. The Plantation Road corridor contains one of largest employment bases in the County (4,000+ jobs) with approximately 400 hotel rooms with new hotels planned, numerous commercial development opportunities (new and redevelopment), and is in close proximity to Hollins University.

As a result of the field reviews, traffic analyses, and discussions with the County and VDOT, recommendations for improvements have been identified along the corridor for the short, mid, and long-term. These recommendations were based on the desire to safely and efficiently address future internal and external traffic growth along the corridor. As this is a planning level study, it is not practical under current economic conditions to expect that the construction of the recommended improvements would occur all at once as a single project. Rather, it will be the responsibility of the County and VDOT to establish logical termini, determine the potential phasing of improvements/projects, and secure the necessary funding for these improvements over time.

Project specific recommendations focus on operational, capacity, and safety improvements along the Plantation Road corridor and have been split into short-term, mid-term, and long-term categories based primarily on their scale, available funding, and the time frame in which the improvement will be needed. Planning-level cost estimates, expressed in year 2011 dollars, have been included for all recommendations. These planning-level cost estimates have been based on VDOT's statewide two-year cost averages, the VDOT Transportation & Mobility Planning Division's (TMPD) "Statewide Planning Level Cost Estimates" worksheet from 2009, and familiarity with similar projects and improvements throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, fluctuations in the market and the outcome of competitive bidding, and the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

Chapter 7.0: Corridor Recommendations reflects the cost estimates for all those projects that fall within a particular time frame (i.e., short-term, mid-term, long-term). **Figure 7.4-7: Ultimate Corridor Recommendations** illustrates graphically those capacity improvements recommended as a result of intersection, corridor, and interchange analysis.

Short-term recommendations for the Plantation Road corridor through Roanoke County include the construction of a raised median within the existing Two-Way Left-Turn Lane (TWLTL) area, signage and pavement markings, installation/replacement of existing guardrail, installation of a new traffic signal that is currently warranted, pedestrian crosswalk enhancements, installation/stripping of pedestrian crosswalks, ongoing maintenance work, and intersection improvements.

Mid-term recommendations for the Plantation Road corridor consists of, the addition/delineation of turn-lanes or lengthening of existing ones, realignment of off-set intersections and the continued implementation of necessary access management improvements, as well as the construction of pedestrian sidewalks, pedestrian crosswalks, and/or the multi-use path network.

The extension of the multi-use path network to the Hollins University property located on the north/west side of I-81 will require the expansion or replacement of the existing bridge to accommodate the proposed 10-foot multi-use path along with the barrier necessary to maintain separation between the travel lane and the proposed multi-use path.

Long-term improvements along the Plantation Road corridor include new traffic signals that are warranted based on the projected 2035 traffic volumes, turn lane improvements at Williamson Road, and a speed limit study with a speed reduction if warranted. These improvements are contingent on the surrounding retail/commercial development that the County anticipates in 2035 with the largest proposed development being the Huffman Property that consists of approximately 63.22 acres located between commercial properties fronting Plantation Road and the Hollins University campus. These improvements are considered long-term due to the anticipated right-of-way impacts, design elements/costs, and construction costs.

In summary, the study outlines the long-term vision for the corridor and its associated transportation network needs. The intent is to now use the vision as projects emerge, whether small or large, public or private, to ensure that the ultimate overarching desires and needs of the corridor are achieved. Each potential project should be evaluated against the overall *Plantation Road Corridor Study* to determine specifically how it can best contribute towards realizing the vision.

The next key step in the planning process is to determine how the recommended improvements will be implemented. Both VDOT and Roanoke County officials will need to determine implementation strategies as well as establish project priorities. Implementation strategies to consider include seeking and identifying funding streams, both public and private, to construct improvements. There are several potential public programs that may assist with funding projects. At the federal level there are earmarks, National Highway System funds, bridge funds, and Highway Safety Improvement Program (HSIP) funds to name a few. At the state level there is the six-year improvement plan (SYIP), multimodal planning grants and enhancement funds. Private funds may be realized through rezoning action and proffer contributions, as well as dedication of right-of-way. All these programs must be considered for each recommended improvement as outlined in the report. The recommended improvements should be prioritized into projects with both County and VDOT input. Each project should be thoroughly evaluated, then identified for priority order, time frame from implementation and potential funding sources.



Chapter 2.0 Introduction

Section 2.1 Background

Kimley-Horn and Associates, Inc. (KHA) was retained by VDOT to identify the vision for the Plantation Road corridor, assess and evaluate current and future conditions, and make recommendations for improvements through this corridor study. The corridor study serves as a technical document which identifies future conditions and potential projects. The project team included VDOT Transportation Mobility & Planning Division (TMPD), Roanoke County, and Kimley-Horn and Associates. Roanoke County, Virginia, is located in the western part of the state nestled in the heart of the Blue Ridge Mountain Range. State Route 115, named Plantation Road is classified by VDOT as an Urban Minor Arterial and is oriented in a general north-south direction while intersecting Interstate 81 (See Figure 2.3-1). Plantation Road is a key corridor in Roanoke County that serves as a local link between I-81 and downtown Roanoke and also is in close proximity to Hollins University (the only four-year University in the County). Plantation Road also serves the largest employment base in Roanoke County with 4,000+ employees between ITT Exelis, Wells Fargo and BSC Ventures/Double Envelope along with approximately 400 hotel rooms and two more new hotels planned in the future. Roanoke County, particularly along Plantation Road, is experiencing retail and commercial growth with Gander Mountain and Camping World poised for additional commercial development and the several vacant outparcels available for development. Roanoke County staff anticipates development of these parcels in the near future for commercial and industrial uses. Additionally, it will alter the traffic's character as it adds to the demand for access points along Plantation Road and to the number of vehicles entering and exiting the facility. As development continues to grow along the corridor, pedestrian and bicyclist activity also anticipated to increase. Several businesses along the corridor recommend to their employees that they drive and not walk along or across Plantation Road due to the safety concerns.

Section 2.2 Purpose and Need

The purpose of this study is to examine the existing and future conditions along an approximate 1.0 mile section of Plantation Road in Roanoke County, Virginia. The study identifies potential transportation improvements projects along the corridor as well as assists VDOT and Roanoke County staff in their discussions with developers as they convey future plans and projects for the corridor. The study will ultimately be used as a planning tool by Roanoke County and VDOT to manage growth and assess transportation network impacts created by regional influences internally and externally to the study corridor. The study links the issue of surrounding traffic demand, land use along the corridor, and the roadway network together, allowing Roanoke County to make informed land use and economic development decisions. The study also provides an assessment of the level of improvements necessary and helps identify the need for funding to support future anticipated growth along the corridor by both public and private funding streams. The study will describe the future vision for the corridor, supported by projects to ensure the vision is achieved.

This study supports Roanoke County in its goals of maintaining the quality and safety of travel on Plantation Road, while preserving the economic vitality and character of the corridor.

Section 2.3 Study Area

The study area for the project includes an approximate 1.0 mile section of Plantation Road (State Route 115) extending from its interchange with I-81 (Exit 146) in the north to its intersection with Williamson Road (U.S. Route 11) as shown in **Figure 2.3-1: Study Area**.

Figure 2.3-1: Study Area





Located along Plantation Road, there are eleven (11) existing intersections serving both public roads and private driveways. The eleven study area intersections are listed below in order from north to south (for clarity purposes, Plantation Road will be referenced in a north and south orientation):

- 1) Interstate 81 Southbound On and Off-Ramps - Unsignalized
- 2) Interstate 81 Northbound On and Off-Ramps - Unsignalized
- 3) Days Inn/McDonald's Driveways - Unsignalized
- 4) Friendship Lane/Gander Way - Signalized
- 5) Walrond Drive – Unsignalized
- 6) Lila Drive (Private Street) – Unsignalized
- 7) ITT Exelis Main Entrance – Unsignalized
- 8) Hitech Road/ITT Exelis Service Entrance – Unsignalized
- 9) Milk-A-Way Drive – Unsignalized
- 10) Old Dominion Drive/Indian Road – Unsignalized
- 11) Williamson Road (U.S. Route 11) – Signalized

Study area intersections were identified during conversations with VDOT and Roanoke County staff. Along the majority of the corridor within the study area, Plantation Road is an undivided, five-lane-wide roadway with a continuous two-way left-turn lane (TWLTL) with a shoulder and ditch, and a posted speed limit of 45 MPH.

Section 2.4 Study Assumptions

At the onset of this project the following key assumptions were identified by the project team:

- The study is a technical review and planning level analysis of the corridor.
- A planning horizon is a future year milestone used to evaluate level of service (LOS) along the study corridor. For this project, the 2035 planning horizon is 24 years from the study year of 2011. This is consistent with the current Roanoke Valley Area MPO Long Range Transportation Plan and the current regional travel demand model.
- The current regional travel demand model was referenced to obtain anticipated future conditions. In addition, trip generation was estimated based on potential development along the corridor. For detailed intersection and arterial analyses, a Synchro (Version 7.0) model was developed for existing, unimproved (no-build), and improved conditions during AM, Midday, and PM peak hours.
- The study will identify short, mid, and long-term recommendations to mitigate anticipated future traffic demand.
- A public involvement process was not included as part of this study. As projects recommended from this study are carried forward, the public involvement process will take place for each individual project, as necessary.
- VDOT access management regulations were considered as part of this study.



Chapter 3.0 Existing Conditions

Section 3.1 Existing Land Use

The Hollins Area Plan, adopted by the Roanoke County Board of Supervisors in 2008, is a community-scaled component of the 2005 Roanoke County Comprehensive Plan. The purpose of the Hollins Area Plan is to improve upon the established commercial, industrial, residential and institutional foundations of the Hollins area. As a result of its prime location with Interstate 81 to the north and commercial Williamson Road (Route 11) to the south, the Hollins area is a community struggling to maintain its historical and agricultural character amidst the expansion of commercial, industrial and institutional uses.

Existing land use refers to the current functional use of a parcel of land regardless of the structure type, zoning or future land use designation. Many of the existing land uses on Plantation Road are commercial and industrial in nature. It should be noted that several vacant parcels ready for development are located along Plantation Road and Gander Way.

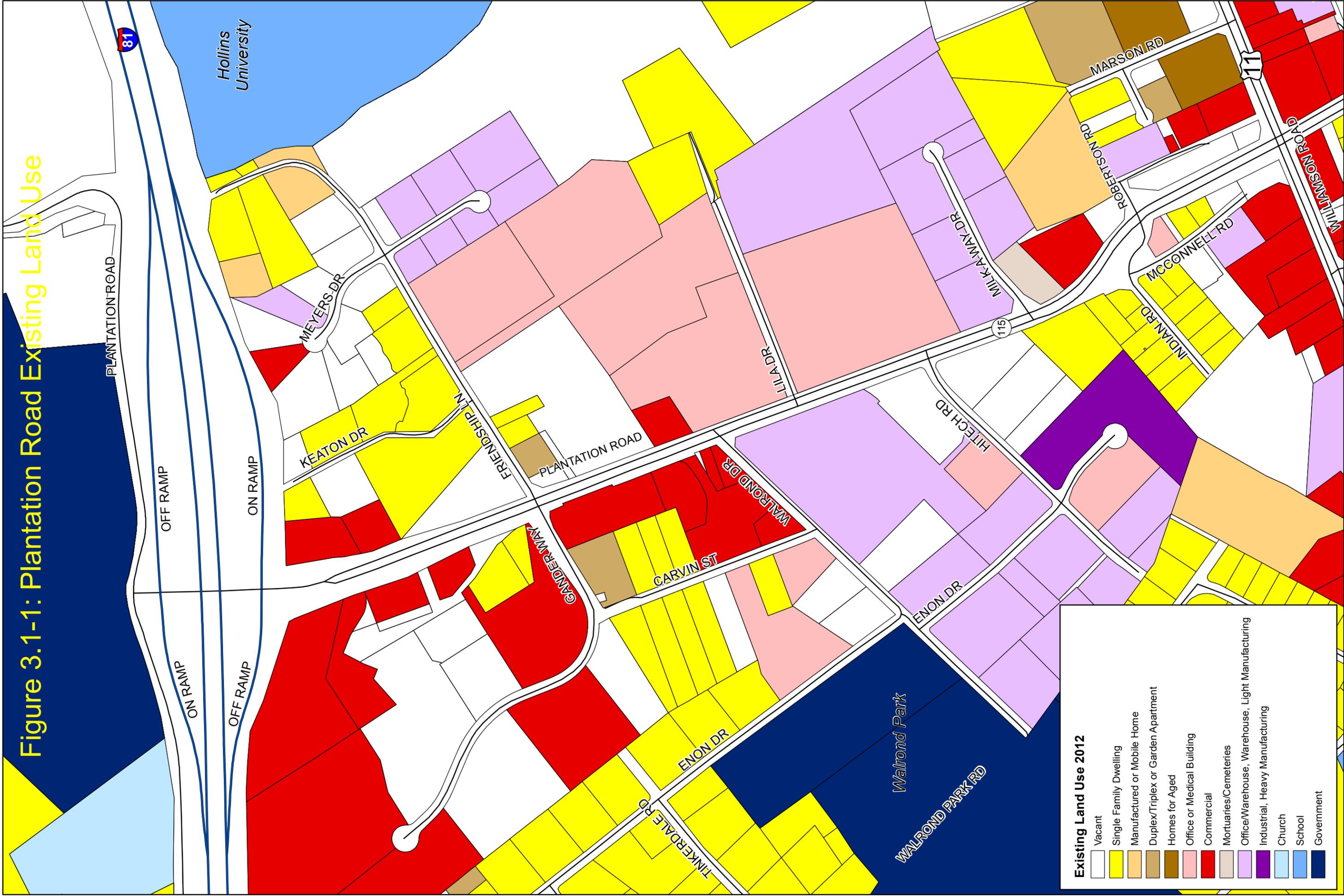
Every property in the county has a zoning classification which determines what kinds of uses are permitted on a property as well as where a building can be located, how tall it can be and other characteristics. The Plantation Road area is comprised mostly of commercial and industrial zoning districts with a small number of residentially-zoned parcels.

- ◆ The existing land use and zoning for Plantation Road is shown in **Figure 3.1-1: Plantation Road Existing Lane Use Plan** and **Figure 3.1-2: Plantation Road Existing Zoning**.

The Future Land Use designation for each property in the County can be found on the Future Land Use Map, which is a component of the Comprehensive Plan. These colored categories indicate the type of development that the community wants to see in a particular area. Future land use designations are particularly important when properties are proposed for rezoning from one zoning district to another. In the Plantation Road area (see **Figure 6.1-1**), Principal Industrial (purple) on the future land use map is intended for industrial uses and regional employment centers. The Core (red) category is appropriate for high intensity urban development including general retail shops and personal services, office and institutional uses as well as limited industrial uses. Highway-oriented retail and regionally-based shopping facilities can also be located in areas listed as Core. Properties identified as Transition (orange) are intended to serve as a buffer between highways and their associated uses and adjacent lower-intensity development. Typical uses include office, institutional and small-scale retail. The University (blue) designation is intended to guide a mix of educational, institutional, limited commercial, recreational, and open space uses related to a college or university campus, such as Hollins University. Neighborhood Conservation (yellow) is planned to encourage traditional single-family neighborhoods and uses typically found in residential neighborhoods such as parks, schools and churches.

It is anticipated that, due to the zoning and future land use designations of the area, the Plantation Road corridor will continue to develop with small and large commercial and industrial uses.

Figure 3.1-1: Plantation Road Existing Land Use



Existing Land Use 2012

Vacant	Single Family Dwelling	Manufactured or Mobile Home	Duplex/Triplex or Garden Apartment	Homes for Aged	Office or Medical Building	Commercial	Mortuaries/Cemeteries	Office/Warehouse, Warehouse, Light Manufacturing	Industrial, Heavy Manufacturing	Church	School	Government
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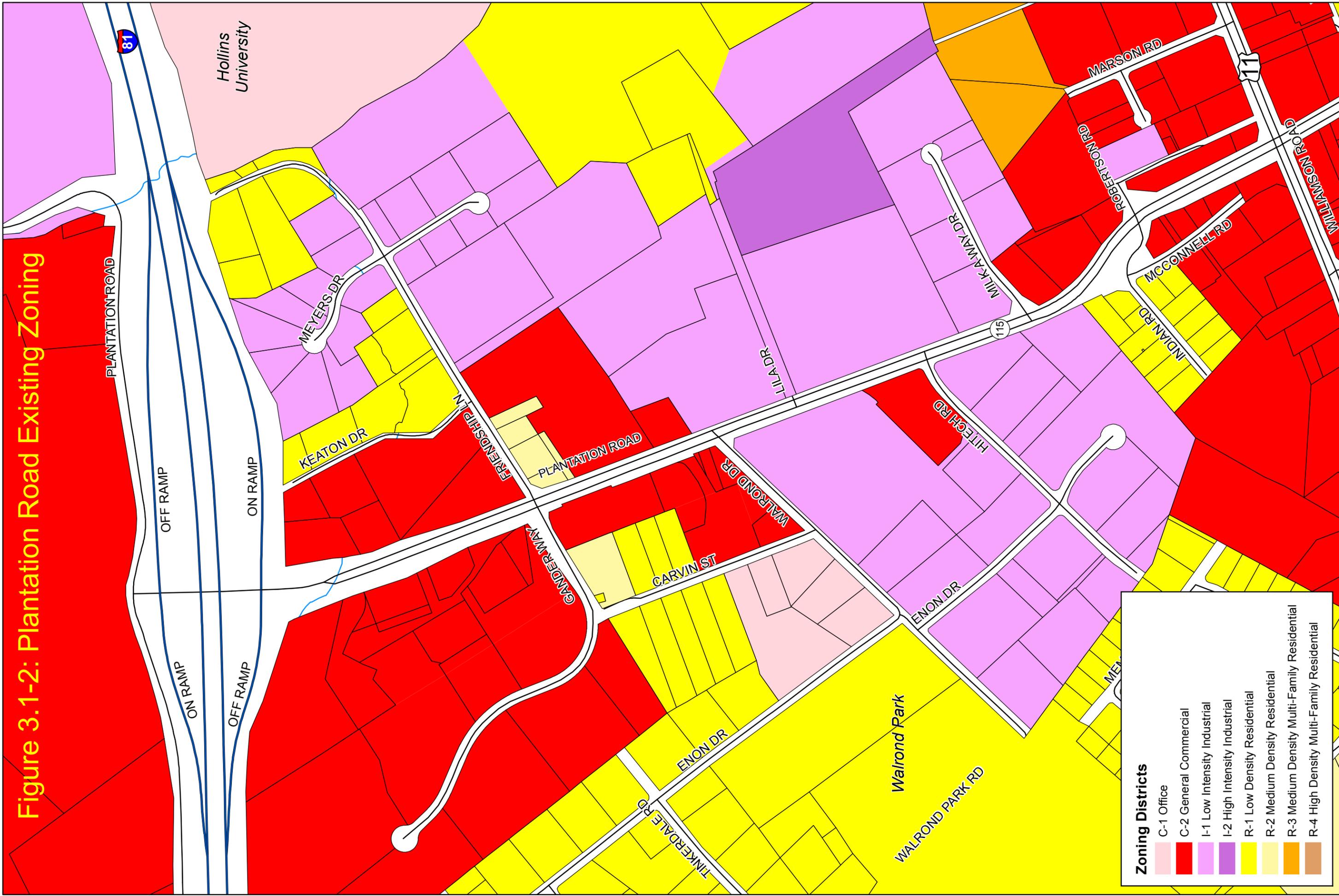
Plantation Road Existing Land Use

April 25, 2012

Scale: 0, 125, 250, 500, 750, 1,000 Feet

Boonville County
Department of Community Development
Roanoke, Virginia 24218
DPO 12-2005

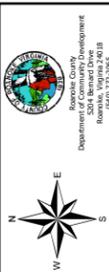
Figure 3.1-2: Plantation Road Existing Zoning



Zoning Districts	
[Light Pink Box]	C-1 Office
[Red Box]	C-2 General Commercial
[Light Purple Box]	I-1 Low Intensity Industrial
[Dark Purple Box]	I-2 High Intensity Industrial
[Light Yellow Box]	R-1 Low Density Residential
[Orange Box]	R-2 Medium Density Residential
[Brown Box]	R-3 Medium Density Multi-Family Residential
[Dark Brown Box]	R-4 High Density Multi-Family Residential

Plantation Road Zoning Districts

April 25, 2012



Boonville County
Department of Community Development
Roanoke, Virginia 24018
CDP 12-2005



Section 3.2 Existing Geometry

According to VDOT’s statewide planning database, Plantation Road is classified as an Urban Minor Arterial that provides a major connection between Interstate 81 and Williamson Road. Primarily Plantation Road exists as a five-lane, typical section with two travel lanes in each direction and a single two-way, left-turn lane (TWLTL). The posted speed limit of Plantation Road is 45 MPH in the study area. In general, access points along Plantation Road are relatively uncontrolled. At several intersections along the corridor, exclusive, left and/or right-turn lanes exist, some left-turn lanes taper directly from the TWLTL. Pedestrian facilities are relatively limited to non-existent within the corridor study area. **Figure 3.2-1: Plantation Road Typical Section** illustrates the typical configuration of Plantation Road as observed in the field.

Figure 3.2-1: Plantation Road Typical Section



Plantation Road traveling northbound



Plantation Road traveling southbound

The width of the Plantation Road roadway section varies throughout the corridor. Spot field measurements indicate lane width varying between 10 and 12 feet and shoulder width varying from 1 to 12 feet. Curb and gutter has been installed at several intersections, commercial properties, and recent developments along the corridor. Terrain along Plantation Road is generally level, with some rolling vertical features between Walrond Drive and Hitech Road.

Interstate 81 is a major interstate oriented in a general northeast/southwest direction. Plantation Road provides a direct access from Interstate 81 to Williamson Road. **Figure 3.2-2: I-81 Interchange** illustrates field observations of the interchange configuration at Plantation Road. Williamson Road (U.S. Route 11) is classified as an Urban Minor Arterial within the study area. Williamson Road provides access to several commercial and residential properties as well as Hollins University. Within the study area, Williamson Road is a five-lane typical section with two travel lanes in each direction and a center TWLTL.

Figure 3.2-2: I-81 Interchange



I-81 Interchange looking north/west



I-81 Interchange looking south/east

Section 3.3 Access Characteristics

As mentioned, the functional classification of Route 115 is defined by VDOT as an Urban Minor Arterial which places emphasis on land access while maintaining higher mobility than collector or local streets. Within the approximate one mile section of Plantation Road that is included in the study area, there exists over 25 different full-access, partial-access, private entrances, and streets. These entrances access both residential and commercial land uses with varying access configurations including single business driveways, strip center development driveways, signalized intersections, unsignalized intersections, and unsignalized private roadways. Due to the TWLTL along the length of the corridor, a greater emphasis on access management is required to efficiently and safely space driveways and control driveway access while not adversely affecting the progression of mainline traffic. **Figure 3.3-1: Plantation Road Typical Access** illustrates field observed access configuration along the corridor.

Figure 3.3-1: Plantation Road Typical Access



Plantation Road – looking south



Plantation Road looking north/west



Section 3.4 Signal Operations

Within the study area two fully actuated uncoordinated traffic signals currently exist. The traffic signals are located along Plantation Road at the cross streets of Friendship Lane/Gander Way and Williamson Road (U.S. Route 11). The traffic signals are not currently coordinated due to the spacing between the intersections (approximately 0.7 mile).

Section 3.5 Existing Traffic Volumes and Characteristics

Existing traffic volumes were collected by VDOT along Plantation Road throughout the week of December 6, 2010.

Peak Hour Turning Movement Counts (TMC's) were collected by VDOT at the following intersections AM (7:00 AM – 9:00 AM), Midday (11:00 AM – 1:00 PM), and PM (4:00 PM – 6:00 PM):

- Interstate 81 Southbound On and Off-Ramps
- Interstate 81 Northbound On and Off-Ramps
- Days Inn/McDonald's Driveways
- ITT Exelis Main Entrance
- Hitech Road/ITT Exelis Service Entrance
- Milk-A-Way Drive

12-Hour TMC's were collected by VDOT at the following intersections (7:00 AM – 7:00 PM):

- Friendship Lane/Gander Way
- Walrond Drive
- Lila Drive
- Williamson Road (U.S. Route 11)

72 Hour Average Daily Traffic (ADT) Counts were collected at the following locations:

- Between the I-81 Northbound On/Off Ramp Intersection and Friendship Lane
- Between Gander Way/Friendship Lane and Walrond Drive
- Between Milk-A-Way Drive and Hitech Road

ADT counts using automated counting tubes were also provided by VDOT at three locations for December 2010 along Plantation Road and Interstate 81 ramps. The data provided ranged from a one day period to a three day period. Data was omitted if the entire day was not captured. Average daily traffic volumes are shown in **Figure 3.5-1: Existing (2010) Intersection Peak Hour Volumes and Geometry – Segment 1** through **Figure 3.5-5: Existing (2010) Intersection Peak Hour Volumes and Geometry – Segment 5** along with the TMCs for each intersection. Vehicle speeds and classifications were measured concurrently and are summarized in **Table 3.5-1: Traffic Speed Data** and **Table 3.5-2: Heavy Vehicle Daily Percentages**, respectively.

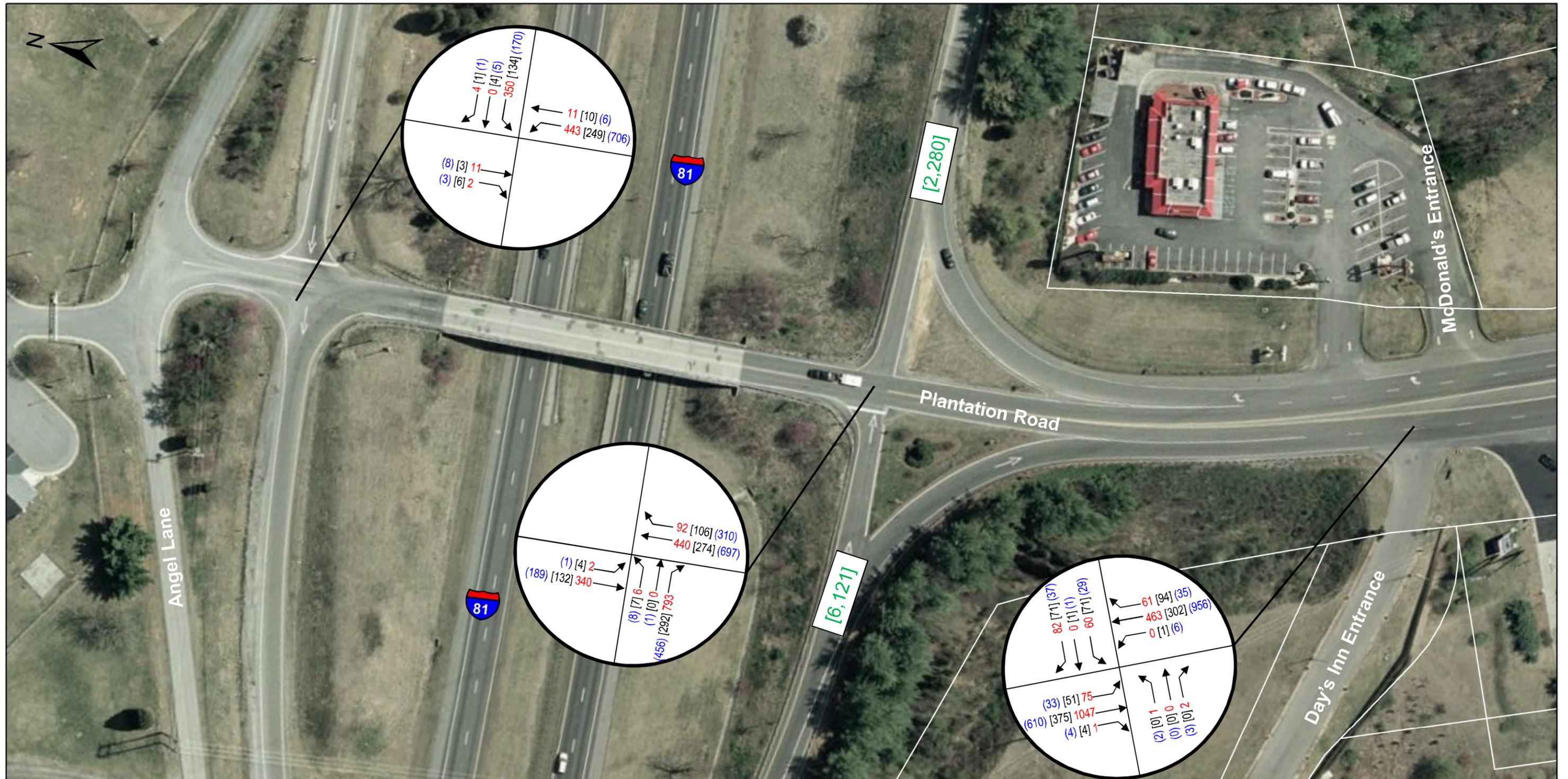
Table 3.5-1: Traffic Speed Data

ID	Location	Direction	Posted	Mean	15 th Percentile	50 th Percentile	85 th Percentile
1	Interstate 81 Northbound On-Ramp – (near Interstate 81)	EB	55 MPH	52.0 MPH	47.8 MPH	52.2 MPH	55.5 MPH
2	Interstate 81 Northbound Off-Ramp – (near Interstate 81)	EB	55 MPH	44.3 MPH	38.2 MPH	44.6 MPH	49.9 MPH
3	Plantation Road - between McDonald's and Gander Way	NB	45 MPH	39.4 MPH	32.8 MPH	39.5 MPH	46.2 MPH
4	Plantation Road - between McDonald's and Gander Way	SB	45 MPH	40.0 MPH	35.1 MPH	40.0 MPH	46.1 MPH
5	Plantation Road - between Friendship Lane and Walrond Drive	NB	45 MPH	38.9 MPH	32.5 MPH	39.3 MPH	44.7 MPH
6	Plantation Road - between Friendship Lane and Walrond Drive	SB	45 MPH	41.1 MPH	35.0 MPH	41.4 MPH	47.9 MPH
7	Plantation Road - between Hitech Road and Milk A Way Drive	NB	45 MPH	40.4 MPH	35.5 MPH	40.6 MPH	45.0 MPH
8	Plantation Road - between Hitech Road and Milk A Way Drive	SB	45 MPH	42.2 MPH	36.6 MPH	43.3 MPH	48.7 MPH

Source: Kimley-Horn and Associates, Inc.

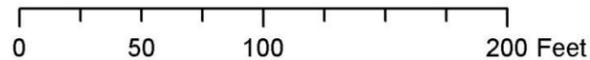
Speeding concerns are typically identified when the 85th percentile speed exceeds the posted speed limit by at least 5-6 MPH. As shown in **Table 3.5-1: Traffic Speed Data**, there are no sections along Plantation Road that pose speeding concerns based on the data collected. Within the study area, Plantation Road is primarily commercialized with several access driveways which interrupt traffic flow.

Figure 3.5-1: Existing (2010) Intersection Peak Hour Volumes – Segment 1



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)
 [XXXX] Average Daily Traffic (VPD)



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Figure 3.5-2: Existing (2010) Intersection Peak Hour Volumes – Segment 2



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)
 [XXXX] Average Daily Traffic (VPD)

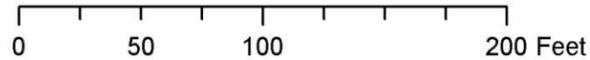


Figure 3.5-3: Existing (2010) Intersection Peak Hour Volumes – Segment 3



 Kimley-Horn and Associates, Inc.

Plantation Road (U.S. Route 115) Corridor Study

0 50 100 200 Feet

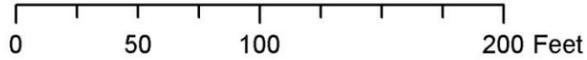
AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)
 [XXXX] Average Daily Traffic (VPD)

Figure 3-5-4: Existing (2010) Intersection Peak Hour Volumes – Segment 4



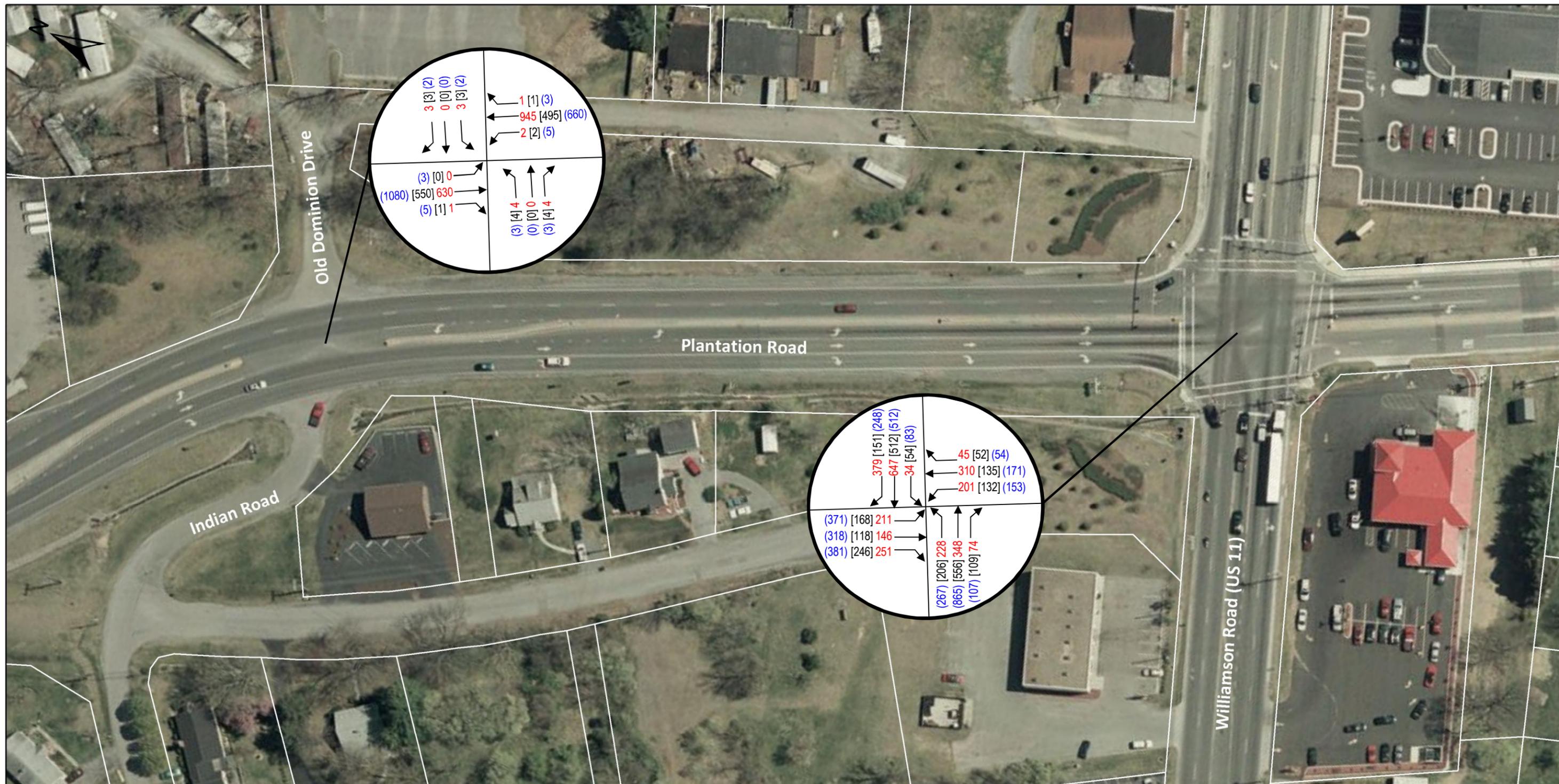
Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)
 [XXXX] Average Daily Traffic (VPD)



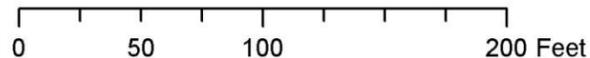
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Figure 3.5-5: Existing (2010) Intersection Peak Hour Volumes – Segment 5



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)
 [XXXX] Average Daily Traffic (VPD)



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The “heavy vehicle” classification combines individual counts for all heavy vehicles, including buses, single-unit trucks, and various configurations of cab-and-trailer combination. These larger vehicles have different acceleration, braking, and turning capabilities than light dual-axle vehicles and can impede traffic flows to some degree, the more heavy vehicles the greater the impedance. Heavy vehicles can weigh 10 to 20 times more than light dual axle vehicles thus placing greater stress on the pavement resulting in additional maintenance, shorter periods between roadway resurfacing, and overall increased maintenance costs. **Table 3.5-2: Heavy Vehicle Daily Percentages** illustrates the heavy vehicle percentages along the corridor.

Table 3.5-2: Heavy Vehicle Daily Percentages

ID	Location	Direction	Daily % Heavy Vehicles
1	Interstate 81 Northbound On-Ramp	EB	3.3%
2	Interstate 81 Northbound Off-Ramp	WB	7.8%
3	Plantation Road - between McDonald's and Gander Way	NB	7.4%
4	Plantation Road - between McDonald's and Gander Way	SB	9.3%
5	Plantation Road - between Friendship Lane and Walrond Drive	NB	6.8%
6	Plantation Road - between Friendship Lane and Walrond Drive	SB	7.2%
7	Plantation Road - between Hitech Road and Milk A Way Drive	NB	6.1%
8	Plantation Road - between Hitech Road and Milk A Way Drive	SB	7.3%

Source: Kimley-Horn and Associates, Inc.

Figure 3.5-6: Heavy Vehicle Observations



Looking west Williamson Road at Plantation Road

Looking north/west Plantation Road I-81 NB Off/On-Ramp

The turning movement counts performed by VDOT also included classification counts. The percent heavy vehicles on each approach for all eleven study area intersections during the AM, Midday, and PM peak period counts are shown in **Table 3.5-3: Intersection Heavy Vehicle Percentages**. When traffic counts were not available (denoted by the symbol “*”), a conservative heavy vehicle assumptions of two percent was assumed for all movements along

Plantation Road. Heavy vehicle traffic percent seems to be balanced in the northbound and southbound directions.

For existing conditions analysis, actual heavy vehicle percentages per approach were applied where available and the aforementioned assumptions were used where actual data was not available. The same methodology was applied to the 2035 future conditions analysis.

Table 3.5-3: Intersection Heavy Vehicle Percentages

ID	Intersecting Street	Peak Hour	Northbound Route 115 %HV	Southbound Route 115 %HV	Eastbound %HV	Westbound %HV
1	Interstate 81 (Southbound Ramp) & Plantation Road	AM	5.0%	8.0%	N/A	3.0%
		MID	9.0%	0.0%	N/A	4.0%
		PM	2.0%	0.0%	N/A	3.0%
2	Interstate 81 (Northbound Ramp) & Plantation Road	AM	5.0%	2.0%	2.0%	N/A
		MID	7.0%	5.0%	10.0%	N/A
		PM	2.0%	0.0%	5.0%	N/A
3	Days Inn/McDonald's Driveways & Plantation Road	AM	5.0%	2.0%	0.0%	0.0%
		MID	6.0%	9.0%	0.0%	0.0%
		PM	2.0%	4.0%	0.0%	0.0%
4	Friendship Lane/Gander Way & Plantation Road	AM	4.0%	2.0%	0.0%	0.0%
		MID	6.0%	8.0%	1.0%	5.0%
		PM	3.0%	3.0%	0.0%	0.0%
5	Walrond Drive & Plantation Road	AM	4.0%	3.0%	4.0%	0.0%
		MID	7.0%	7.0%	3.0%	0.0%
		PM	3.0%	3.0%	0.0%	0.0%
6	Lila Drive & Plantation Road	AM	3.0%	3.0%	0.0%	2.0%
		MID	5.0%	6.0%	0.0%	3.0%
		PM	2.0%	2.0%	0.0%	0.0%
7	ITT Exelis Main Entrance & Plantation Road	AM	3.0%	4.0%	0.0%	0.0%
		MID	6.0%	6.0%	0.0%	0.0%
		PM	2.0%	2.0%	0.0%	0.0%
8	Hitech Road/ITT Exelis Service Entrance & Plantation Road	AM	3.0%	4.0%	29.0%	0.0%
		MID	5.0%	6.0%	4.0%	0.0%
		PM	2.0%	2.0%	2.0%	0.0%
9	Milk-A-Way Drive & Plantation Road	AM	3.0%	5.0%	N/A	14.0%
		MID	5.0%	5.0%	N/A	0.0%
		PM	2.0%	2.0%	N/A	0.0%
10	*Old Dominion Drive/Indian Road & Plantation Road	AM	N/A	N/A	N/A	N/A
		MID	N/A	N/A	N/A	N/A
		PM	N/A	N/A	N/A	N/A
11	Williamson Road/U.S Route 11 & Plantation Road	AM	3.0%	4.0%	2.0%	2.0%
		MID	3.0%	5.0%	2.0%	3.0%
		PM	1.0%	2.0%	1.0%	2.0%

Source: Kimley-Horn and Associates, Inc.

* Turning movement counts were not collected at this intersection.

Section 3.6 Existing LOS

Through methodology outlined by the Transportation Research Board's *Highway Capacity Manual (HCM)*, turning movement and ADT counts were used in conjunction with Synchro 7.0 Professional to determine levels of service for the intersections and arterial segments. Level of service (LOS) describes the quality of the driving experience using six levels designated A through F. Each LOS is defined by a range of quantitative measurements appropriate to the described facility, such as the density and speed of traffic for a highway LOS or the number of vehicles stopped and average stop duration for a traffic signal LOS. The ranges of delay for each intersection LOS are shown in **Table 3.6-1: Signalized and Unsignalized HCM LOS Criteria**.

Table 3.6-1: Signalized and Unsignalized HCM LOS Criteria

LOS	Intersection Delay per Vehicle(s)	
	Signalized	Unsignalized
A	0 - 10	0 - 10
B	>10 - 20	>10 - 15
C	>20 - 35	>15 - 25
D	>35 - 55	>25 - 35
E	>55 - 80	>35 - 50
F	>80	>50

Source: Transportation Research Board, Highway Capacity Manual 2000

3.6.1 Intersection LOS Analysis

Capacity analyses for signalized and unsignalized intersections in the weekday AM, Midday, and PM peak hours were performed using Synchro Professional 7.0. This software uses methodologies contained in the *2000 Highway Capacity Manual (HCM)* [TRB Special Report 209, 2000].

Intersection turning movement counts (TMC) were used in conjunction with existing geometric data including number of lanes and traffic control (signalization) to determine existing levels of service. For intersections, LOS is based on the average delay experienced by all traffic using the intersection during the busiest 15-minute peak period. LOS A through D is considered acceptable.

The peak hour LOS along Plantation Road are shown in **Table 3.6-2: Interstate 81 (Southbound Ramp) and Plantation Road Unsignalized Intersection LOS** through **Table 3.6-12: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS**. Overall intersection LOS operations are summarized as well as per approach LOS for signalized and unsignalized intersections. For lanes serving only through and right-turn movements on Plantation Road at unsignalized intersections, no LOS were calculated as the *HCM* does not provide LOS criteria for the major street's through and right-turn movements at a two-way stop. LOS for all intersections are based on average per-vehicle seconds of delay calculated from the intersection laneage and geometry, traffic volumes and characteristics, and the traffic signal timing (for signalized intersections). The tables depict the LOS for each approach and the overall intersection LOS.

Table 3.6-2: Interstate 81 (Southbound Ramp) and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	*F (>300)	A (8.2)	A (0.0)	*F (>300)
Midday Peak Hour				
Existing (2010)	C (23.0)	A (7.6)	A (0.0)	B (13.0)
PM Peak Hour				
Existing (2010)	*F (>300)	B (10.3)	A (0.0)	*F (>300)

Source: Kimley-Horn and Associates, Inc.

* Synchro is unable to calculate actual delay due to extreme congestion. A delay of approximately 3 minutes and a queue of approximately 4 vehicles was observed in the field for the westbound off-ramp.

Table 3.6-3: Interstate 81 (Northbound Ramp) and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	C (19.2)	A (0.0)	A (0.1)	A (0.2)
Midday Peak Hour				
Existing (2010)	B (12.4)	A (0.0)	A (0.3)	A (0.3)
PM Peak Hour				
Existing (2010)	C (24.9)	A (0.0)	A (0.1)	A (0.3)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-4: Days Inn/McDonald's Driveways and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Days Inn	Westbound McDonald's	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Existing (2010)	C (22.1)	C (15.7)	A (0.0)	A (0.6)	A (1.8)
Midday Peak Hour					
Existing (2010)	A (0.0)	B (11.9)	A (0.0)	A (1.0)	A (2.3)
PM Peak Hour					
Existing (2010)	B (13.3)	C (17.4)	A (0.1)	A (0.6)	A (1.0)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-5: Friendship Lane/Gander Way and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Gander Wy.	Westbound Friendship Ln.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Existing (2010)	D (36.8)	C (34.8)	C (20.2)	A (6.8)	B (12.0)
Midday Peak Hour					
Existing (2010)	C (22.8)	C (25.6)	B (12.7)	B (15.7)	B (16.4)
PM Peak Hour					
Existing (2010)	D (42.7)	C (26.2)	C (31.9)	C (32.4)	C (30.7)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-8: ITT Exelis Main Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	C (16.9)	A (0.0)	A (0.4)	A (0.4)
Midday Peak Hour				
Existing (2010)	B (11.2)	A (0.0)	A (0.3)	A (0.3)
PM Peak Hour				
Existing (2010)	B (14.0)	A (0.0)	A (0.1)	A (0.3)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-6: Walrond Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound Walrond Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	B (13.1)	A (0.3)	A (0.0)	A (0.7)
Midday Peak Hour				
Existing (2010)	B (12.2)	A (0.5)	A (0.0)	A (2.0)
PM Peak Hour				
Existing (2010)	B (13.0)	A (0.6)	A (0.0)	A (1.0)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-9: Hitech Road/ITT Exelis Service Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Hitech Rd.	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Existing (2010)	C (17.7)	C (18.0)	A (0.6)	A (0.6)	A (1.0)
Midday Peak Hour					
Existing (2010)	B (12.9)	B (13.8)	A (0.5)	A (0.3)	A (1.3)
PM Peak Hour					
Existing (2010)	C (22.8)	C (15.9)	A (0.1)	A (0.1)	A (2.3)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-7: Lila Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Lila Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	C (17.9)	A (0.0)	A (1.5)	A (1.5)
Midday Peak Hour				
Existing (2010)	B (12.4)	A (0.0)	A (0.3)	A (0.9)
PM Peak Hour				
Existing (2010)	D (27.3)	A (0.0)	A (0.3)	A (3.3)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-10: Milk-A-Way Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Milk-A-Way	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Existing (2010)	C (22.5)	A (0.0)	A (0.2)	A (0.3)
Midday Peak Hour				
Existing (2010)	C (15.6)	A (0.0)	A (0.1)	A (0.2)
PM Peak Hour				
Existing (2010)	C (23.8)	A (0.0)	A (0.0)	A (0.5)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-11: Old Dominion Drive/Indian Road and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Indian Rd.	Westbound Old Dominion Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Existing (2010)	C (18.3)	C (22.1)	A (0.0)	A (0.0)	A (0.2)
Midday Peak Hour					
Existing (2010)	C (15.3)	B (14.7)	A (0.0)	A (0.0)	A (0.2)
PM Peak Hour					
Existing (2010)	D (33.2)	C (23.3)	A (0.1)	A (0.0)	A (0.2)

Source: Kimley-Horn and Associates, Inc.

Table 3.6-12: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Route 11	Westbound Route 11	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Existing (2010)	D (38.8)	D (49.9)	D (54.7)	D (50.9)	D (48.7)
Midday Peak Hour					
Existing (2010)	C (27.4)	C (31.0)	D (43.1)	D (40.6)	C (33.4)
PM Peak Hour					
Existing (2010)	D (49.4)	D (54.4)	E (67.6)	E (56.6)	D (54.6)

Source: Kimley-Horn and Associates, Inc.

3.6.2 Roadway Capacity Analysis

Roadway capacity analyses were performed for the weekday AM, Midday, and PM peak hours using Synchro Professional 7.0. This software uses methodologies contained in the 2000 Highway Capacity Manual (HCM) [TRB Special Report 209, 2000]. The ranges of delay for arterial LOS are shown in **Table 3.6-13: HCM Arterial LOS Criteria**.

Table 3.6-13: HCM Arterial LOS Criteria

Arterial Street Classification – II (Range of Free Flow Speed 35-45 MPH)	
LOS	Average Travel Speed (MPH)
A	> 35
B	> 28-35
C	> 22-28
D	> 17-22
E	> 13-17
F	≤ 13

Source: Transportation Research Board, Highway Capacity Manual 2000

Using intersection TMC and ADT counts collected by VDOT, the arterial level of service was determined for Plantation Road. Level of service (LOS) describes traffic conditions at an intersection or on a roadway. LOS ranges from A to F—A indicating a condition of little or no congestion and F indicating a condition with severe congestion, unstable traffic flow, and stop-and-go conditions. For roadways, the arterial LOS is determined based on the arterial speed and distance between intersections. A LOS D or better is typically considered acceptable. **Table 3.6-14: 2010 Existing Arterial Level of Service - Northbound Plantation Road** and **Table 3.6-15: 2010 Existing Arterial Level of Service - Southbound Plantation Road** summarizes the results of the arterial LOS analyses with detailed results provided in the Appendix.

As shown in the level of service results, all arterial sections along Plantation Road operate at an acceptable LOS D or better under existing peak hour conditions. However, the northbound section from Williamson Road to Friendship Lane is LOS F.

Table 3.6-14: 2010 Existing Arterial Level of Service - Northbound Plantation Road

Cross Street	AM		Midday		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
Williamson Road	7.6	F	9.4	F	6.5	F
Friendship Lane/Gander Way	31.3	B	35.3	A	28.2	B
Overall	20.1	D	23.7	C	17.7	D

ATS- Average travel speed (mph)

Access points introduce conflicts and friction into the traffic stream. Vehicles entering and leaving the main roadway often slow the through traffic and cause a difference in speeds between the through and turning traffic. Lila Drive, Walrond Drive, and HiTech have a large amount of traffic entering and exiting, causing the average travel speed along Plantation Road to decrease.

Table 3.6-15: 2010 Existing Arterial Level of Service - Southbound Plantation Road

Cross Street	AM		MID		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
Friendship Lane/Gander Way	30.3	B	23.6	C	18.0	D
Williamson Road	22.5	C	24.3	C	21.0	D
Overall	24.6	C	24.1	C	19.9	D

ATS- Average travel speed (mph)

Section 3.7 Existing Traffic Deficiencies

Due to safety concerns with the introduction of pedestrian and bicyclist enhancements along the corridor, a sight distance evaluation was conducted for the following study area intersections along Plantation Road:

- Walrond Drive
- Lila Drive
- ITT Exelis Main Entrance
- HiTech Road/ITT Exelis Entrance
- Milk-A-Way Drive

According to the *2004 Geometric Design of Highways and Streets* (AASHTO Green Book), the sight distance requirement for a 4 lane major road with a speed limit of 45 mph is 570 feet. **Figure 3.7-1: Walrond Drive Sight Distance Evaluation** through **Figure 3.7-6: Milk-A-Way Sight Distance Evaluation** are photos that were taken as part of the sight distance evaluation that was completed in the field on March 11, 2011.

Figure 3.7-1: Walrond Drive Sight Distance Evaluation



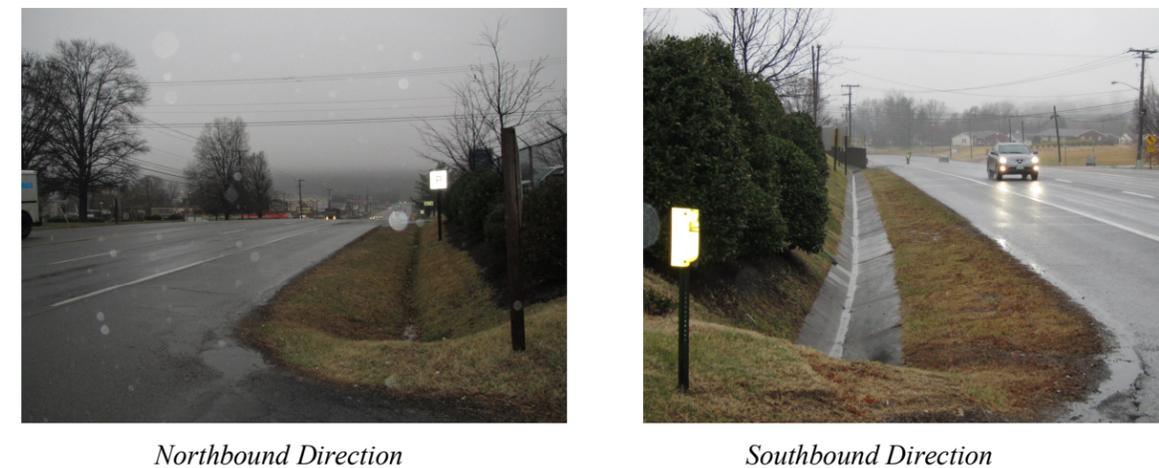
Based on the field review the southbound direction does not meet the sight distance requirements.

Figure 3.7-2: Lila Drive Sight Distance Evaluation



Based on the field review the southbound direction does not meet the sight distance requirements.

Figure 3.7-3: ITT Exelis Main Entrance Sight Distance Evaluation



Based on the field review the northbound direction does not meet the sight distance requirements.

Figure 3.7-4: HiTech Road/ITT Exelis Driveway (West Leg) Sight Distance Evaluation



Northbound



Southbound

Based on the field review both directions (northbound and southbound) meet the adequate sight distance requirements.

Figure 3.7-5: HiTech Road/ITT Exelis Driveway (East Leg) Sight Distance Evaluation



Northbound



Southbound

Based on the field review both directions (northbound and southbound) meet the adequate sight distance requirements.

Figure 3.7-6: Milk-A-Way Sight Distance Evaluation



Northbound



Southbound

Based on the field review the southbound direction does not meet the sight distance requirements.

Based on the limited sight distance along the corridor it was recommended the County consider reducing the speed limit along the corridor from 45 mph to 35 mph. It is recommended a speed limit study be conducted to determine the 85th percentile speed for the corridor as shown in the *2000 Highway Capacity Manual (HCM)*.

3.7.1 Safety Concerns

As discussed above, Plantation Road is used to access a variety of land uses, such as retail, industrial, residential, educational, and public uses. As a result there is a wide variety of vehicles and users present on the roadway, all with different operational requirements. These various requirements become more apparent at the 25+ entrances/streets located along Plantation Road. This is further complicated by lack of exclusive turn-lanes with dedicated storage resulting in significant interruptions to mainline traffic flow when a vehicle slows or stops to access one of these driveways. Any interruption to traffic flow creates greater crash potential, regardless of capacity or location along a roadway. Further, field observations revealed multiple roadside hazards, such as fixed objects (primarily signs and telephone poles) in the clear zone, and drop-offs to unpaved shoulder. Locations with insufficient clear zone and fixed obstacles located in recovery areas have increased risks of crashes when vehicles leave the roadway and are more likely to result in severe crashes. Additional information regarding roadway safety on Plantation Road is discussed in **Chapter 5.0 Crash Analysis**.

3.7.2 Bicycle, Pedestrian, and Transit Activity Accommodations

Plantation Road currently has no pedestrian or bicycle facilities. There are no designated bicycle lanes, bike route signage, or sidewalks along Plantation Road. Williamson Road is the only intersection in the study area that has marked crosswalks, but does not have pedestrian features such as pedestrian signal heads and push buttons.

Bicycle and pedestrian safety and awareness is an issue within the project area due to the commercial nature of land uses, both existing and planned, as well as vehicle operating speed based on the current posted speed limit of 45 MPH. Recommendations considering bicycle and pedestrian accommodations improvements will be made where deemed necessary. **Figure 3.7-7: Bicyclist on Plantation Road** and **Figure 3.7-8: Old Roadbed and Bridge** are photos that were taken in the field that demonstrate the need for pedestrian accommodations.

Figure 3.7-7: Bicyclist on Plantation Road



Figure 3.7-8: Old Roadbed and Bridge
(utilized prior to the construction of I-81)





Chapter 4.0 Preliminary Environmental Screening

(Completed by VDOT)

VDOT conducted a preliminary environmental screening of the project corridor in order to provide a cursory assessment of potential environmental constraints that may be relevant to the project. The screening consisted of a desktop review of data obtained from various standard environmental data sources related to wetlands and other surface waters, threatened and endangered species, cultural and historic resources, and hazardous materials. In order to conduct the screening, a study area was created by applying a 200 foot buffer to each side of the existing centerline of Plantation Road within the defined limits of the project area using Geographic Information System (GIS) technology.

Proposed improvements included in corridor study: Bike lanes; sidewalk; curb & gutter; conversion of existing two-way center turn lane to a median with defined left turn lanes; drainage improvements; with the goal to maintain work within existing right-of-way (RW).

Section 4.1 Cultural Resources

(Historic Structures and Archaeological Sites)

If all improvements stay within existing RW, it is not anticipated that any cultural resource (CR) surveys will be needed. If additional RW or easements are required for any of the proposed roadway improvements, then CR surveys will be necessary. An architectural survey may include up to 12 structures over 50 years of age; however, it is not anticipated that any of these would be determined to be eligible for the National Register of Historic Places. An archaeological survey could include up to 8 parcels scattered along the corridor; however, the overall potential for archaeological resources is low to moderate. Several of the vacant parcels had former structures on them, but most of these deposits would be on the back half of the parcels. Thus, taking small slivers of frontage is not a big archaeological site consideration. The greater archaeological site concern is for total property takes that may be associated with storm water management, drainage, etc. Should archaeological sites be present they very seldom present a problem for roadway improvement projects and typically just require additional evaluation, excavation and recordation, and sometimes preservation in place if fill only is proposed for the area.

Section 4.2 Hazardous Materials

There are several hazardous material sites, also known as Recognized Environmental Conditions (REC), adjacent to the proposed project limits. These REC's include: four active, commercial petroleum sites; four petroleum release sites; one hazardous waste site (active industrial manufacturing facility); four toxic release incidents; and six historic hazardous waste sites.

Out of this list, only the toxic release incidents were reported within existing RW and these incidents were resolved with the Department of Environmental Quality. If the scope of work stays within existing RW, then it is anticipated that there will be minimal likelihood the proposed improvements will be affected by any known REC. However, if deep excavation is required, such as associated with drainage structure improvements, there is the potential to encounter petroleum impacted soils in certain areas that may need to be properly managed during construction. If the scope of work does involve the need for additional RW or easements in the vicinity of an REC, then limited Phase II Environmental Site Assessments (ESA) would be recommended. The ESA's would fully evaluate the potential for the presence of an REC so that the information could be considered as part of the RW acquisition process or used for development of special provisions for proper management of the REC during construction.

Section 4.3 Jurisdictional Streams, Wetlands or Other Regulated Water Bodies

The only jurisdictional areas within the immediate project corridor are two unnamed tributaries to Carvin Creek. One of the tributaries runs along the southwest side of Route 115 in a concrete channel and the other is located in the vicinity of Friendship Lane.

Section 4.4 Threatened and Endangered Species and Natural Heritage Resources

There are no documented collections of threatened or endangered (T&E) species within the potential area of project affect. A designation of potential T&E waters (associated with the federally and state listed endangered Roanoke logperch) has been applied to the downstream Carvin and Tinker Creeks. Other than the T&E waters there are no other known potential natural heritage resources (habitat of rare, threatened or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest) within the general vicinity of this project corridor.

Section 4.5 Other Environmentally Sensitive Resources

- Agricultural Forest Districts – None
- Conservation Lands – Carvins Cove, Western Virginia Land Trust easement; Virginia Outdoors Foundation easement; all located north of I-81
- Forest Cover – Only occurs north of I-81 in Carvins Cove area
- Prime Farmlands – Groseclose silt loam in some areas adjacent to Route 115
- Geology – High potential for karst topography; Ordovician Beekmantown group underlies northern part of study area
- Riparian Buffer – None
- Floodplains – None
- Surface Water Intake Watershed – Carvins Cove north of project area
- Wells, Springs or Other Water Supplies – Carvins Cove Water Treatment Plant north of project area
- Air Quality – Roanoke County is in Early Action Compact Area for ozone
- Recreation Areas – No golf courses or other recreational use sites, no scenic rivers or scenic roads; the Appalachian Trail is located north of project area

Section 4.6 National Environmental Policy Act

If project is federally funded, a National Environmental Policy Act document will be required. If all work remains within existing RW a Programmatic Categorical Exclusion will likely be appropriate; however, at the most the proposed work will qualify for a Categorical Exclusion.

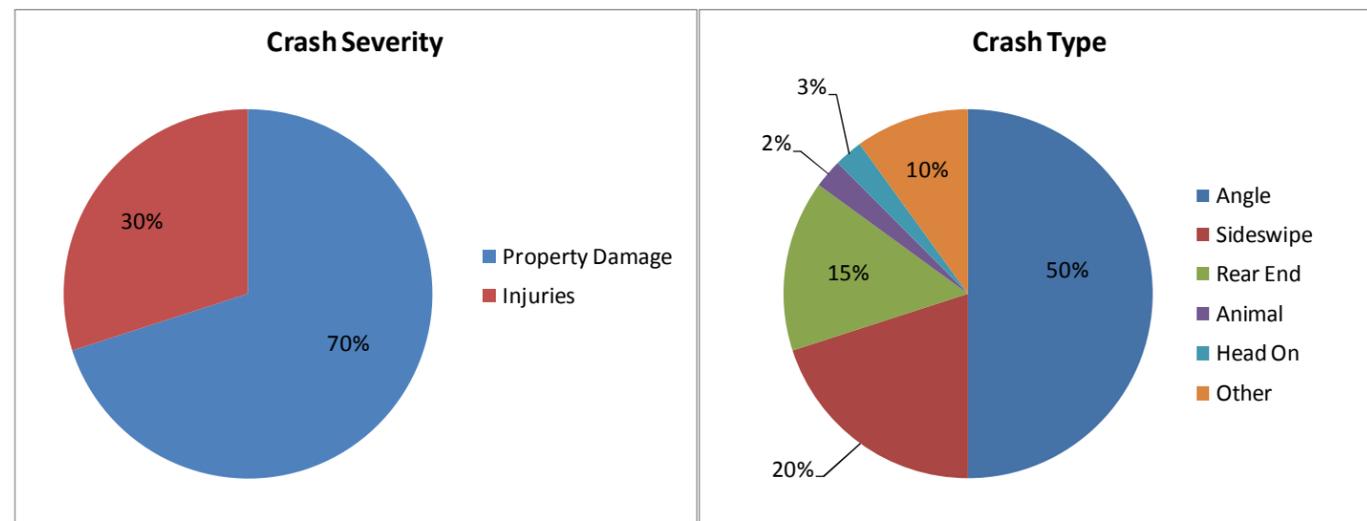


Chapter 5.0 Crash Analysis

Section 5.1 Crash Evaluation

Two and one-half years of FR-300 crash reports (January 1, 2007 to May 31, 2009) were obtained from the Roanoke County Police Department and analyzed within the study area. Over the 2.5-year time period, 40 crashes were reported within the study area. Primarily, crashes along the corridor included angle and sideswipe crashes but there were also instances of rear-end, fixed object and loss of control collisions. For purposes of the crash analysis, both left-turn and 90-degree angle collisions were grouped together as “Angle” collisions. The 40 crashes occurring during the study period were broken down by type and severity and are illustrated in **Figure 5.1-1: Distribution of Crashes by Type and Severity**.

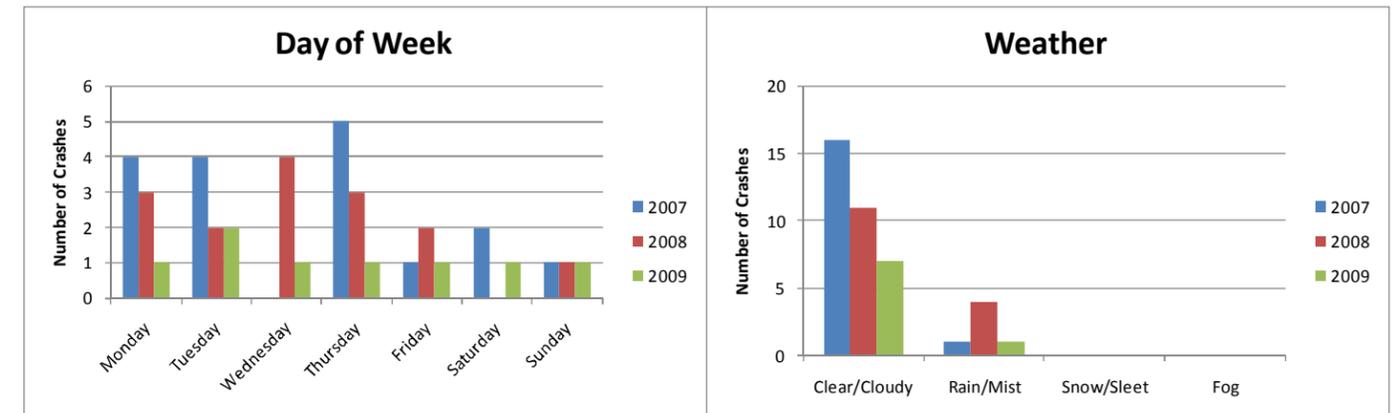
Figure 5.1-1: Distribution of Crashes by Type and Severity



The number of crashes remained relatively constant each year, with 17 during the first year, 15 during the second year, and 8 during the first half of the third year. The weekly distribution of crashes varied from year to year, with crashes most often occurring on a Thursday. Crashes occurred mostly during clear or cloudy but dry, weather conditions. Six of the 40 crashes (15%) occurred during rain or mist conditions. A detailed yearly distribution of crashes by day of week and weather conditions is provided in **Figure 5.1-2: Yearly Distribution of Crashes by Day of Week and Weather Conditions**.

With respect to severity, 12 of the 40 crashes resulted in injuries with no crashes resulting in fatalities. Of the 12 injury crashes, three crashes resulted in multiple injured persons. Only one alcohol-related crash occurred during the study period.

Figure 5.1-2: Yearly Distribution of Crashes by Day of Week and Weather Conditions



When examining individual crashes along the corridor, there are several locations that experienced relatively high concentrations of crashes during the study period. **Figure 5.1-4: Plantation Road Crash Diagrams – Segment 1** through **Figure 5.1-8: Plantation Road Crash Diagrams – Segment 5** show detailed crash diagrams indicating the approximate location of all crashes along the corridor during the study period. As can be seen in crash diagram figures there is a high concentration of crashes occurring in the vicinity of the McDonald’s driveways on the east side of Plantation Road. Seven of the 20 total angle crashes that occurred along the corridor involved a vehicle either entering or exiting the McDonald’s driveway. The two access driveways serving the McDonald’s are relatively wide (approximately 35 and 45 feet for the northern and southern driveways, respectively) and are closely spaced (approximately 95 feet apart). The combination of close spacing and wide openings may be a contributing factor to crashes as drivers misjudge where and when to turn to access the McDonald’s. The uncertainty and consequent hesitation may be a factor in causing left-turn collisions.

Another location with a high concentration of crashes is at the Lila Drive unsignalized intersection shown in the **Figure 5.1-3: Lila Drive and Plantation Road**.

Figure 5.1-3: Lila Drive and Plantation Road





As shown in crash diagram figures, seven crashes at this intersection involved a vehicle entering Plantation Road from Lila Drive colliding with an oncoming northbound vehicle. This pattern suggests and field observations confirm that there is limited sight distance for vehicles attempting to enter Plantation Road from Lila Drive. The picture above shows the limited sight distance of approximately 300 feet to the south for vehicles entering Plantation Road due to the vertical curvature of Plantation Road. This falls well short of the minimum intersection sight distance of approximately 570 feet (for passenger vehicles turning left from the minor road approach) as prescribed in the *AASHTO – A Policy On Geometric Design of Highways and Streets*.

Four crashes occurred in the vicinity of the Williamson Road intersection. Three of the four crashes were rear-end collisions with the fourth involving a vehicle attempting to turn right on red. These crash types are some of the most common types associated with signalized intersections and do not suggest a readily apparent crash pattern or safety concern.



LEGEND

<p>Weather</p> <ul style="list-style-type: none"> C - Clear/Cloudy R - Rain/Mist W - Snow/Sleet F - Fog <p>Road Surface</p> <ul style="list-style-type: none"> D - Dry, W - Wet, S - Snow/Ice <p>Light Conditions</p> <ul style="list-style-type: none"> L - Daylight D - Darkness DN - Dawn, DU - Dusk 	<p>VEHICLE PATH</p> <ul style="list-style-type: none"> ☒ STOPPED VEHICLE ☒ FIXED OBJECT ☒ ANIMAL IN ROADWAY ☒ PEDESTRIAN ☒ BICYCLIST ☒ SPEED RELATED ☒ ALCOHOL/DRUG RELATED ☒ DEBRIS IN ROADWAY 	<ul style="list-style-type: none"> ↔ REAR-END COLLISION ↔ HEAD-ON COLLISION ↔ SIDE SWIPE ↔ SIDE SWIPE OPPOSITE DIRECTION ↔ BACKING VEHICLE ↔ RIGHT ANGLE COLLISION ↔ OVERTURNED VEHICLE ↔ OUT OF CONTROL 	<p>EXAMPLE:</p> <p>CRASH SEVERITY</p> <p>ALCOHOL/DRUG RELATED</p> <p>CRASH ID # 15</p> <p>0 FAT-10 INJ</p> <p>C-D-L</p> <p>SPEED RELATED</p> <p>WEATHER-ROAD CONDITIONS-LIGHTING</p>
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**PLANTATION ROAD
CORRIDOR STUDY**

**CRASH DIAGRAM
2007-2009
SEGMENT 1**

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and Associates, Inc.**

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**FIGURE
5.1-4**



LEGEND

<p>Weather C - Clear/Cloudy R - Rain/Mist W - Snow/Sleet F - Fog</p> <p>Road Surface D - Dry, W - Wet, S - Snow/Ice</p> <p>Light Conditions L - Daylight D - Darkness DN - Dawn, DU - Dusk</p>	<p>← VEHICLE PATH</p> <p>☒ STOPPED VEHICLE</p> <p>☒ FIXED OBJECT</p> <p>☒ ANIMAL IN ROADWAY</p> <p>☒ PEDESTRIAN</p> <p>☒ BICYCLIST</p> <p>☒ SPEED RELATED</p> <p>☒ ALCOHOL/DRUG RELATED</p> <p>☒ DEBRIS IN ROADWAY</p>	<p>↔ REAR-END COLLISION</p> <p>→→ HEAD-ON COLLISION</p> <p>↔ SIDE SWIPE</p> <p>↔ SIDE SWIPE OPPOSITE DIRECTION</p> <p>←← BACKING VEHICLE</p> <p>↔ RIGHT ANGLE COLLISION</p> <p>↔ OVERTURNED VEHICLE</p> <p>↔ OUT OF CONTROL</p>	<p>EXAMPLE:</p> <p>CRASH SEVERITY</p> <p>ALCOHOL/DRUG RELATED</p> <p>SPEED RELATED</p> <p>WEATHER-ROAD CONDITIONS-LIGHTING</p>
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PLANTATION ROAD CORRIDOR STUDY

CRASH DIAGRAM 2007-2009 SEGMENT 2

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FIGURE 5.1-5



LEGEND

<p>Weather</p> <ul style="list-style-type: none"> C - Clear/Cloudy R - Rain/Mist W - Snow/Sleet F - Fog <p>Road Surface</p> <ul style="list-style-type: none"> D - Dry, W - Wet, S - Snow/Ice <p>Light Conditions</p> <ul style="list-style-type: none"> L - Daylight D - Darkness DN - Dawn, DU - Dusk 	<p>VEHICLE PATH</p> <ul style="list-style-type: none"> ☐ STOPPED VEHICLE ☒ FIXED OBJECT ☒ ANIMAL IN ROADWAY ☒ PEDESTRIAN ☒ BICYCLIST ☒ SPEED RELATED ☒ ALCOHOL/DRUG RELATED ☒ DEBRIS IN ROADWAY 	<ul style="list-style-type: none"> ⇄ REAR-END COLLISION ⇄ HEAD-ON COLLISION ⇄ SIDE SWIPE ⇄ SIDE SWIPE OPPOSITE DIRECTION ⇄ BACKING VEHICLE ⇄ RIGHT ANGLE COLLISION ⇄ OVERTURNED VEHICLE ⇄ OUT OF CONTROL 	<p>EXAMPLE:</p> <p>CRASH ID # 15</p> <p>0 FAT-10 INJ</p> <p>C-D-L</p> <p>ALCOHOL/DRUG RELATED</p> <p>SPEED RELATED</p> <p>WEATHER-ROAD CONDITIONS-LIGHTING</p>
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PLANTATION ROAD CORRIDOR STUDY

CRASH DIAGRAM 2007-2009

SEGMENT 3

FIGURE 5.1-6



LEGEND

<p>Weather</p> <p>C - Clear/Cloudy R - Rain/Mist W - Snow/Sleet F - Fog</p> <p>Road Surface</p> <p>D - Dry, W - Wet, S - Snow/Ice</p> <p>Light Conditions</p> <p>L - Daylight D - Darkness DN - Dawn, DU - Dusk</p>	<p>← VEHICLE PATH</p> <p>☒ STOPPED VEHICLE</p> <p>☒ FIXED OBJECT</p> <p>☒ ANIMAL IN ROADWAY</p> <p>☒ PEDESTRIAN</p> <p>☒ BICYCLIST</p> <p>☒ SPEED RELATED</p> <p>☒ ALCOHOL/DRUG RELATED</p> <p>☒ DEBRIS IN ROADWAY</p>	<p>↔ REAR-END COLLISION</p> <p>↔ HEAD-ON COLLISION</p> <p>↔ SIDE SWIPE</p> <p>↔ SIDE SWIPE OPPOSITE DIRECTION</p> <p>↔ BACKING VEHICLE</p> <p>↔ RIGHT ANGLE COLLISION</p> <p>↔ OVERTURNED VEHICLE</p> <p>↔ OUT OF CONTROL</p>	<p>EXAMPLE:</p> <p>CRASH SEVERITY</p> <p>ALCOHOL/DRUG RELATED</p> <p>CRASH ID # 15</p> <p>0 FAT-10 INJ</p> <p>C-D-L</p> <p>S</p> <p>A</p> <p>SPEED RELATED</p> <p>WEATHER-ROAD CONDITIONS-LIGHTING</p>
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PLANTATION ROAD CORRIDOR STUDY

CRASH DIAGRAM 2007-2009

SEGMENT 4

FIGURE 5.1-7

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LEGEND

<p>Weather</p> <p>C - Clear/Cloudy R - Rain/Mist W - Snow/Sleet F - Fog</p> <p>Road Surface</p> <p>D - Dry, W - Wet, S - Snow/Ice</p> <p>Light Conditions</p> <p>L - Daylight D - Darkness DN - Dawn, DU - Dusk</p>	<p>← VEHICLE PATH</p> <p>▣ STOPPED VEHICLE</p> <p>▣ FIXED OBJECT</p> <p>⊘ ANIMAL IN ROADWAY</p> <p>⊘ PEDESTRIAN</p> <p>⊘ BICYCLIST</p> <p>⊘ SPEED RELATED</p> <p>⊘ ALCOHOL/DRUG RELATED</p> <p>⊘ DEBRIS IN ROADWAY</p>	<p>↔ REAR-END COLLISION</p> <p>↔ HEAD-ON COLLISION</p> <p>↔ SIDE SWIPE</p> <p>↔ SIDE SWIPE OPPOSITE DIRECTION</p> <p>↔ BACKING VEHICLE</p> <p>↔ RIGHT ANGLE COLLISION</p> <p>↔ OVERTURNED VEHICLE</p> <p>↔ OUT OF CONTROL</p>	<p>EXAMPLE:</p> <p>CRASH SEVERITY</p> <p>ALCOHOL/DRUG RELATED</p> <p>SPEED RELATED</p> <p>WEATHER-ROAD CONDITIONS-LIGHTING</p>
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PLANTATION ROAD CORRIDOR STUDY

CRASH DIAGRAM 2007-2009

SEGMENT 5



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FIGURE 5.1-8



Chapter 6.0 Future Conditions

In order to determine 2035 horizon year traffic volumes within the study area, numerous factors were taken into consideration. Anticipated future development within the study area was established through conversations with the Roanoke County staff and VDOT. For purposes of this study, existing traffic patterns were assumed to remain constant through 2035; however, volumes are anticipated to increase. The factors that influenced the future volumes are discussed in detail in the following sections.

Section 6.1 Future Land Use

As mentioned, currently the largest approved commercial development along the corridor is the Oppidan Retail Center. Currently this development is partially built-out with Gander Mountain, Tractor Supply Company, and Camping World complete. The additional phases are planned in the future and will increase traffic along Plantation Road. Another undeveloped parcel that could contribute to an increase in traffic is an approximate 63.22 acre parcel directly west of the Hollins University campus. These developments are illustrated in **Table 6.1-1: Oppidan Retail Center - Potential Trip Generation** and **Table 6.1-2: Huffman Properties Site - Potential Trip Generation**. Each development is discussed in detail below.

It is noted the cost burden of infrastructure improvements should not fall solely on Roanoke County or VDOT as a result of these developments. For purposes of this study, the infrastructure improvements required for acceptable operation at the site driveways are considered “developer driven improvements.” Although these developments are purely speculative at this time, Roanoke County and VDOT could seek additional funding for other improvements along the corridor due to the scale at which these sites could develop.

The future land use is shown in **Figure 6.1-1: Plantation Road Future Land Use Plan**.

Oppidan Retail Center

According to the approved traffic impact analysis (TIA) submitted for the Oppidan Retail Center (dated February 9, 2007) by HSMM Transportation, it included background traffic volumes for the approved Oppidan Retail Center. The proposed Oppidan Retail Center is located west of Plantation Road north of Walrond Drive and will have one point of access via Gander Way/Friendship Lane. According to the TIA, the retail center is proposed to include approximately 236,500 square feet of general retail, specialty retail, and restaurant space in addition to an 80-room hotel. At the time of data collection, 113,900 square feet of retail space has been developed into a 66,400 square feet Gander Mountain store, 19,000 square feet Tractor Supply Company store, and a 28,500 Camping World store. The resulting peak hour trips from the undeveloped parcels are illustrated in **Table 6.1-2: Huffman Properties Site - Potential Trip Generation**. Traffic generation potential for the Oppidan Retail Center was determined using traffic generation rates published in *Trip Generation* (Institute of Transportation Engineers [ITE], 8th Edition). It is assumed that the specialty retail and two of the high turnover sit down restaurants will not be open during the AM peak hour.

Table 6.1-1: Oppidan Retail Center - Potential Trip Generation

Land Use (ITE Code)	Quantity	Units	Daily Total	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Hotel (310)	80	Rooms	654	27	18	45	25	22	47
High-Turnover Sit Down Restaurant (932)	13,500	SF	1,717	81	75	156	89	62	151
Specialty Retail (814/820)	109,100	SF	4,705	66	43	109	125	158	283
Total	122,600 + 80-room hotel		7,076	174	136	310	239	242	481

Note: ITE Code 814 is Specialty Retail and ITE Code 820 is Shopping Center
ITE Trip Generation Handbook was used (8th Edition)

Huffman Properties

The Huffman Properties were identified as a site for potential future development by Roanoke County. The pending future development would occupy the undeveloped parcel located on the east side of Plantation Road, directly west of Hollins University. In general, the parcel is bound by Friendship Lane to the north, undeveloped land to the south, Hollins University to the east and industrial and commercial properties to the west. The Huffman Properties consists of approximately 63.22 acres. After discussions with County and VDOT officials, a floor area ratio (FAR) of 0.25 per acre was assumed such that approximately 675,000 square feet could be developed. Two options were reviewed for the Huffman Properties (Retail and Office), the anticipated trip generation of the Huffman Properties Site is shown below in **Table 6.1-2: Huffman Properties Site - Potential Trip Generation**.

Table 6.1-2: Huffman Properties Site - Potential Trip Generation

Land Use (ITE Code)	Quantity	Units	Daily	AM Peak Hour			PM Peak Hour		
				Enter	Exit	Total	Enter	Exit	Total
Retail (814/820) Option 1	675,000	SF	23,495	412	263	675	722	919	1,641
General Office Building (710) Option 2	675,000	SF	5,804	760	104	864	142	693	835

Note: ITE Code 814 is Specialty Retail and ITE Code 820 is Shopping Center
ITE Trip Generation Handbook was used (8th Edition)

Huffman Properties - Option 1: Retail

Based upon *ITE Trip Generation* (8th Edition), if the Huffman Properties developed into a retail land use, the site has the potential to generate approximately 23,500 daily weekday vehicle trips. Access was assumed to be distributed among three locations – one along Friendship Lane, one along Lila Drive, and one along Williamson Road about a half mile east of Plantation Road. Due to the large residential communities that exist along Williamson Road, a large portion of the traffic was assigned along Williamson Road or south of Williamson Road along Plantation Road. A trip distribution figure is shown in **Appendix E**.



Based on the ADT volumes shown in the VDOT Peak Hour Level of Service for Urban Minor Arterials (shown in **Appendix E**), if the Huffman Properties would develop into a retail site, Plantation Road would need to be widened to a six lane section from I-81 to Williamson Road. Projected 2035 ADT volumes for this development are shown in **Appendix E**.

Figures 6.2-1 - 6.2-5 Future (2035) Peak Hour Volumes show peak hour volumes based on the Option 1 - Retail.

Huffman Properties - Option 2: Office

Based upon ITE Trip Generation (8th Edition), if the Huffman Properties developed into an office land use, the site has the potential to generate approximately 5,804 daily weekday vehicle trips. Access was assumed to be distributed along Plantation Road at Friendship Lane and Lila Drive. It was assumed majority of the traffic would be coming to and from Interstate 81. A trip distribution figure is shown in **Appendix E**.

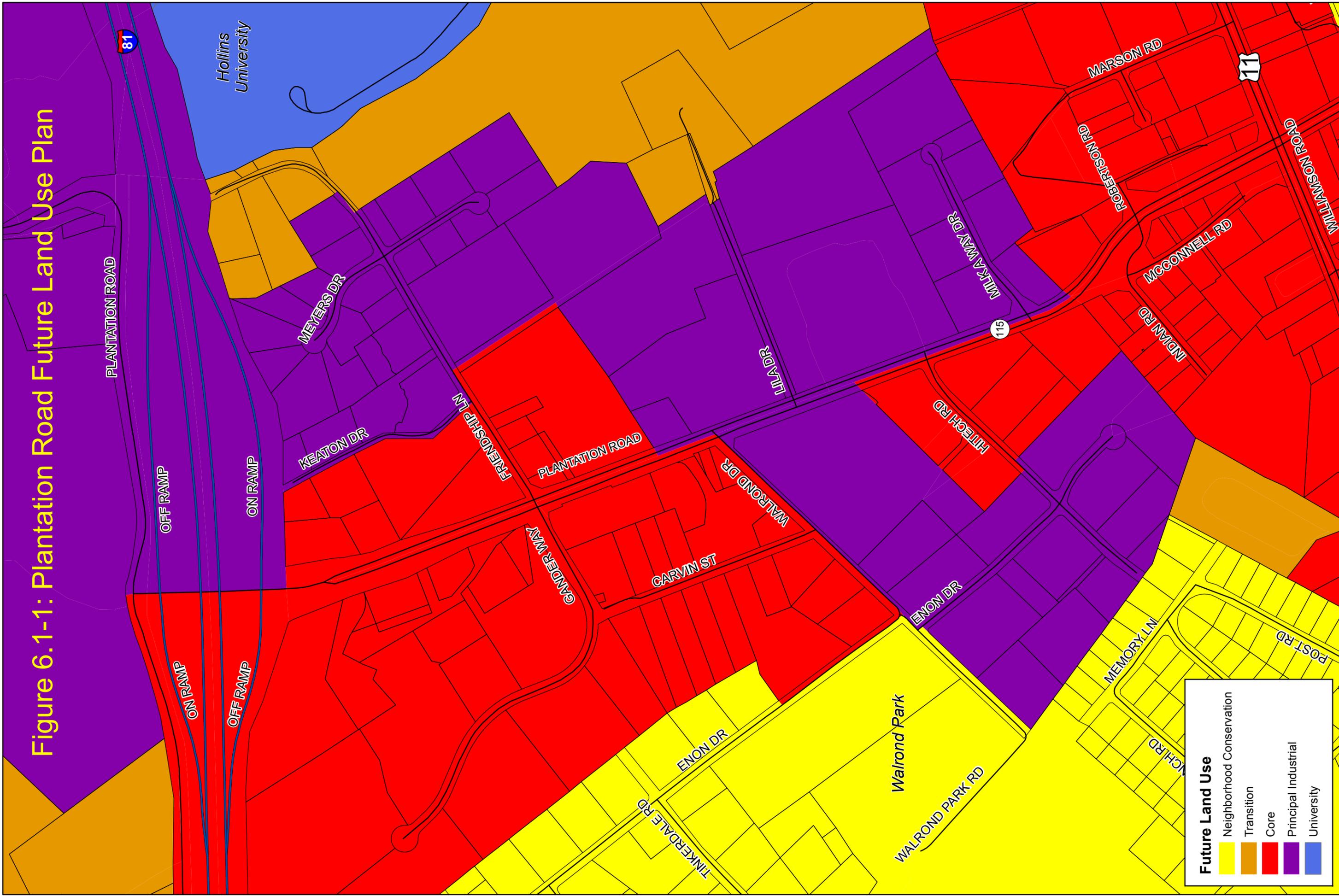
Based on the ADT volumes shown in the VDOT Peak Hour Level of Service for Urban Minor Arterial (shown in **Appendix E**), if the Huffman Properties would develop into an office site, Plantation Road would need to be widened to a six lane section from I-81 to approximately Friendship Lane/Gander Way.

Section 6.2 Future 2035 Traffic Volumes

Discussions were held with VDOT to determine a growth rate to use for the calculation of potential background traffic. It was agreed that a growth rate of 1.0 percent per year be applied to the 2010 existing volume data for 25 years. Compounding the aforementioned growth rate annually resulted in total growth of approximately 28.2 percent for both the mainline and minor streets.

Once growth rates were applied to existing volumes, the site trips associated with the pending future developments were assigned to the network to develop 2035 future conditions. Future 2035 traffic volumes for the AM, Midday, and PM peak hours are illustrated in **Figure 6.2-1: Future (2035) Intersection Peak Hour Volumes – Segment 1** through **Figure 6.2-5: Future (2035) Intersection Peak Hour Volumes – Segment 5**.

Figure 6.1-1: Plantation Road Future Land Use Plan



Future Land Use	
	Neighborhood Conservation
	Transition
	Core
	Principal Industrial
	University

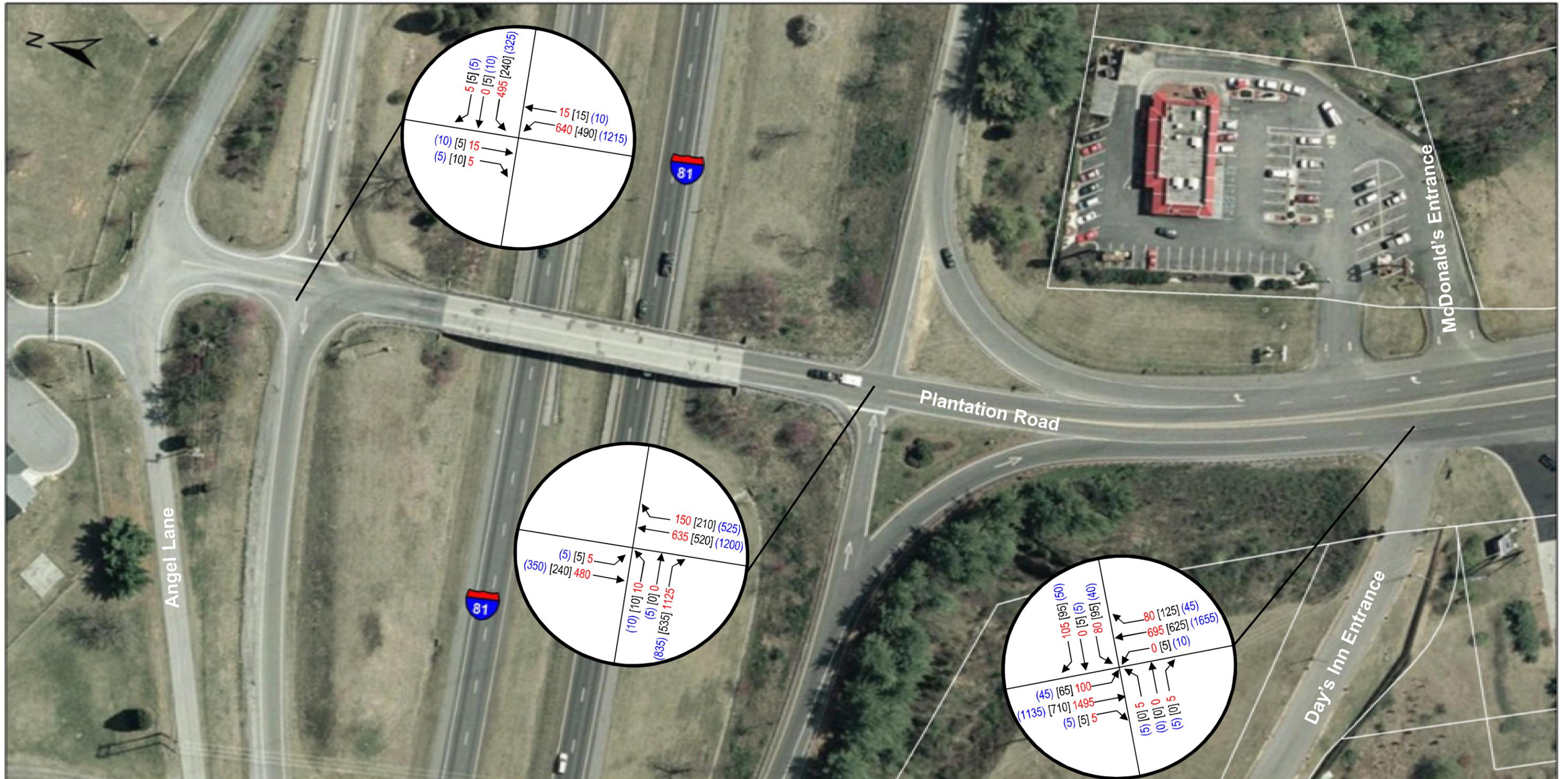
Plantation Road Future Land Use

April 6, 2012



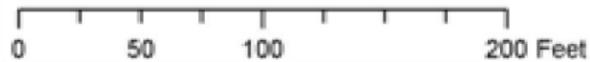
Boyd County
Department of Community Development
Roanoke, Virginia 24018
EPA# 12-2885

Figure 6.2-1: Future (2035) Intersection Peak Hour Volumes – Segment 1



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)



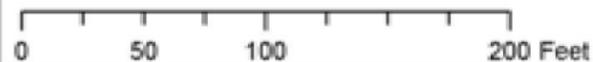
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Figure 6.2-2: Future (2035) Intersection Peak Hour Volumes – Segment 2



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)



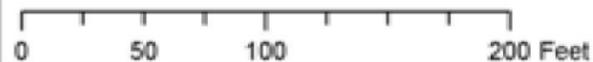
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Figure 6.2-3: Future (2035) Intersection Peak Hour Volumes – Segment 3



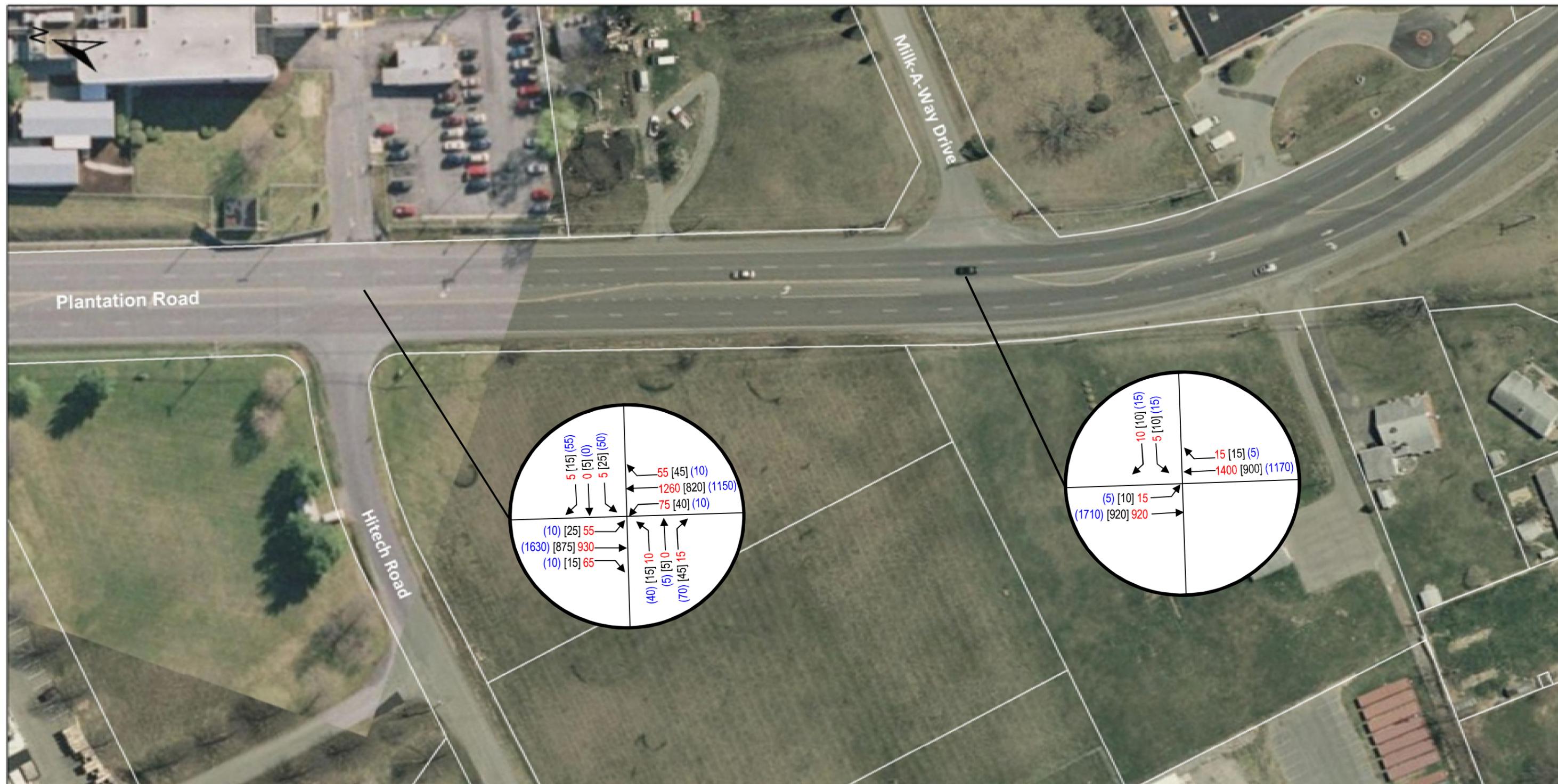
Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)



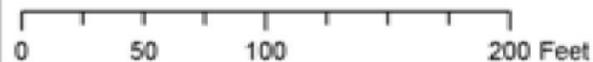
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Figure 6.2-4: Future (2035) Intersection Peak Hour Volumes – Segment 4



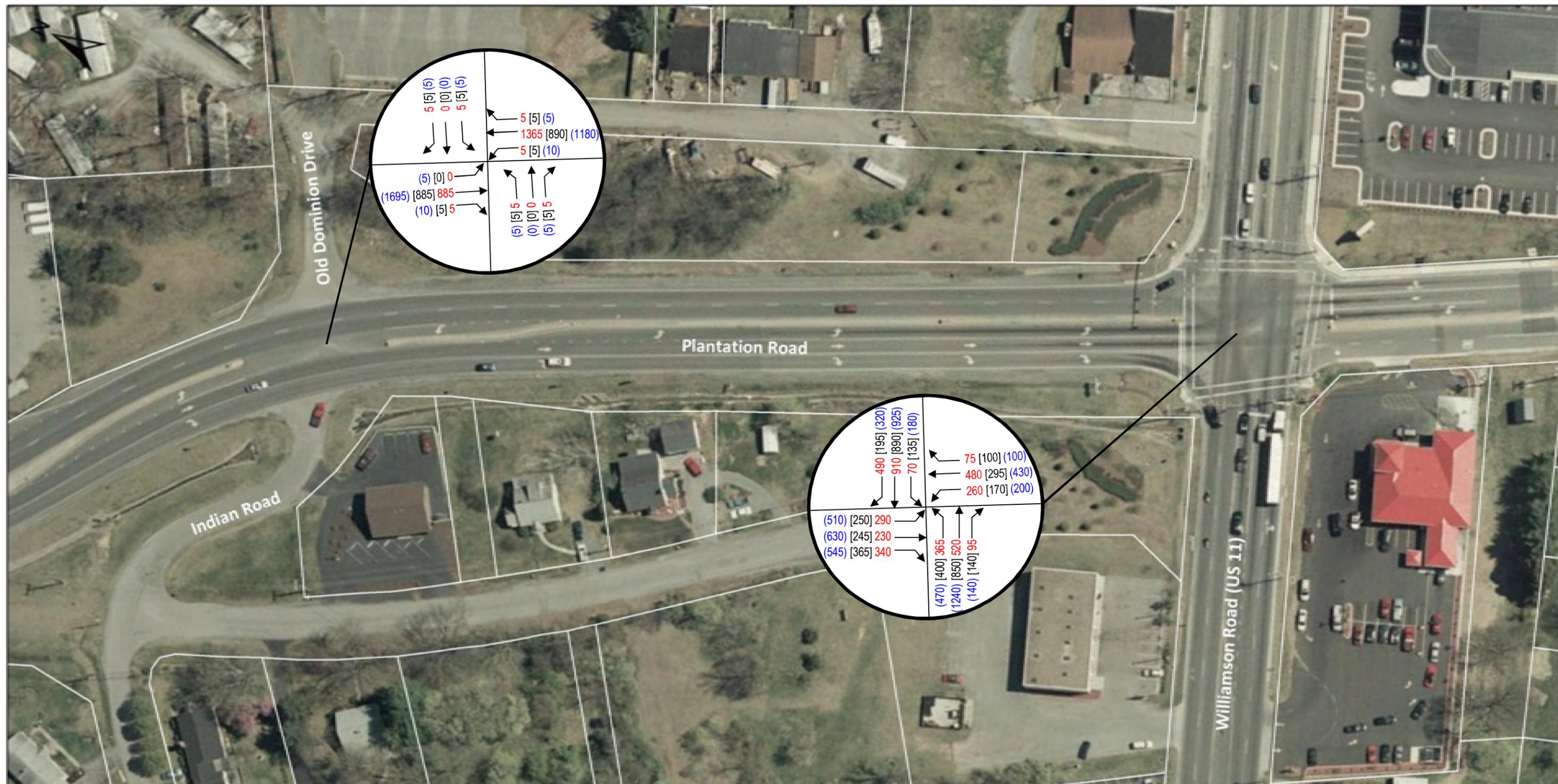
Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)



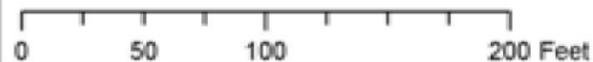
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Figure 6.2-5: Future (2035) Intersection Peak Hour Volumes – Segment 5



Plantation Road (U.S. Route 115) Corridor Study

AM [MID] (PM) Peak Hour Turning Movement Volumes (VPH)



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Section 6.3 Planned Roadway Improvements

Planned roadway improvements, or programmed roadway improvements, are projects in which funding has been secured and are under design or have been designed and are under construction. Listed below are planned roadway improvements for Plantation Road funded through VDOT Revenue Sharing funds:

- FY 2010-2011 funding is currently being spent on survey work and will be spent shortly on design. The current fund total for UPC 98220 is \$185,608 dollars and additional funds (\$144,243 dollars) will be transferred to the project shortly for a grand total of \$329,851 dollars. This is a Locally Administered project.
- FY 2011-2012 funding in the amount of \$100,000 dollars (UPC 101267) was approved for pedestrian signalization at the Williamson Road/Plantation Road signal and at Plantation Road/Gander Way/Friendship Lane signal. VDOT is administering this project.

Section 6.4 Unimproved/ No Build Future Levels of Service

Based upon the anticipated 2035 traffic volumes shown in Figure 6-2-1: Future (2035) Intersection Peak Hour Volumes – Segment 1 through Figure 6.2-5: Future (2035) Intersection Peak Hour Volumes – Segment 5 an unimproved conditions analysis was performed for the AM, Mid, and PM peak hours to serve as a “No-Build” condition. Unimproved conditions assume that no capacity improvements are constructed. Signal timings were optimized to best serve the anticipated traffic volumes with existing roadway geometry.

6.4.1 Intersection LOS Analysis

Anticipated 2035 peak hour LOS along Plantation Road is shown in Table 6.4-1: Interstate 81 (Southbound Ramp) and Plantation Road Unsignalized Intersection LOS through Table 6.4-11: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS. Overall intersection LOS operations are summarized as well as per approach LOS for signalized intersection and per lane LOS for unsignalized intersections.

Table 6.4-1: Interstate 81 (Southbound Ramp) and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	*F (>300)	A (9.0)	A (0.0)	*F (>300)
Midday Peak Hour				
No-Build (2035)	*F (>300)	A (8.3)	A (0.0)	*F (164.0)
PM Peak Hour				
No-Build (2010)	*F (>300)	C (16.7)	A (0.0)	*F (>300)

* Synchro is unable to calculate actual delay due to extreme congestion

Source: Kimley-Horn and Associates, Inc.

Table 6.4-2: Interstate 81 (Northbound Ramp) and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	D (34.0)	A (0.0)	A (0.2)	A (0.4)
Midday Peak Hour				
No-Build (2035)	C (21.6)	A (0.0)	A (0.3)	A (0.3)
PM Peak Hour				
No-Build (2035)	F (118.3)	A (0.0)	A (0.4)	A (1.2)

Source: Kimley-Horn and Associates, Inc.

Table 6.4-3: Days Inn/McDonald’s Driveways and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Days Inn	Westbound McDonald’s	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
No-Build (2035)	E (40.3)	C (22.3)	A (0.0)	A (0.6)	A (2.1)
Midday Peak Hour					
No-Build (2035)	A (0.0)	F (*)	A (0.1)	A (0.8)	F (*)
PM Peak Hour					
No-Build (2035)	C (24.1)	E (42.6)	A (0.1)	A (0.7)	A (1.7)

Source: Kimley-Horn and Associates, Inc.

* Approach has no volume during the peak hour analyzed

Table 6.4-4: Friendship Lane/Gander Way and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Gander Wy.	Westbound Friendship Ln.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
No-Build (2035)	D (38.9)	C (34.8)	C (26.7)	A (18.4)	C (22.4)
Midday Peak Hour					
No-Build (2035)	C (32.4)	C (32.0)	C (25.0)	B (17.7)	C (23.8)
PM Peak Hour					
No-Build (2035)	F (151.3)	D (53.7)	F (84.6)	D (38.0)	E (70.2)

Source: Kimley-Horn and Associates, Inc.



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Table 6.4-5: Walrond Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound Walrond Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	B (14.1)	A (0.3)	A (0.0)	A (0.8)
Midday Peak Hour				
No-Build (2035)	B (13.0)	A (0.4)	A (0.0)	A (1.0)
PM Peak Hour				
No-Build (2035)	C (19.2)	A (0.6)	A (0.0)	A (1.2)

Source: Kimley-Horn and Associates, Inc.

Table 6.4-6: Lila Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Lila Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	E (42.5)	A (0.0)	A (2.6)	A (3.6)
Midday Peak Hour				
No-Build (2035)	D (32.8)	A (0.0)	A (1.0)	A (5.0)
PM Peak Hour				
No-Build (2035)	*F (>300)	A (0.0)	A (0.8)	F (82.1)

Source: Kimley-Horn and Associates, Inc.

* Synchro is unable to calculate actual delay due to extreme congestion

Table 6.4-7: ITT Exelis Main Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	C (23.5)	A (0.0)	A (0.5)	A (0.4)
Midday Peak Hour				
No-Build (2035)	B (14.8)	A (0.0)	A (0.3)	A (0.4)
PM Peak Hour				
No-Build (2035)	C (22.6)	A (0.0)	A (0.1)	A (0.4)

Source: Kimley-Horn and Associates, Inc.

Table 6.4-8: Hitech Road/ITT Exelis Service Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Hitech Rd.	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
No-Build (2035)	D (26.4)	D (29.8)	A (0.6)	A (0.7)	A (1.0)
Midday Peak Hour					
No-Build (2035)	C (17.6)	C (21.2)	A (0.5)	A (0.3)	A (1.4)
PM Peak Hour					
No-Build (2035)	F (109.2)	E (35.8)	A (0.1)	A (0.1)	A (5.5)

Source: Kimley-Horn and Associates, Inc.

Table 6.4-9: Milk-A-Way Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Milk-A-Way	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
No-Build (2035)	F (51.0)	A (0.0)	A (0.2)	A (0.4)
Midday Peak Hour				
No-Build (2035)	D (27.1)	A (0.0)	A (0.1)	A (0.3)
PM Peak Hour				
No-Build (2035)	F (96.2)	A (0.0)	A (0.0)	A (1.0)

Source: Kimley-Horn and Associates, Inc.

Table 6.4-10: Old Dominion Drive/Indian Road and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Indian Rd.	Westbound Old Dominion Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
No-Build (2035)	E (37.0)	F (59.7)	A (0.0)	A (0.0)	A (0.4)
Midday Peak Hour					
No-Build (2035)	D (27.2)	D (26.5)	A (0.1)	A (0.0)	A (0.3)
PM Peak Hour					
No-Build (2035)	F (231.6)	F (113.8)	A (0.1)	A (0.0)	A (1.3)

Source: Kimley-Horn and Associates, Inc.



Table 6.4-11: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Route 11	Westbound Route 11	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
No-Build (2035)	E (76.8)	E (78.3)	F (91.0)	E (63.6)	E (77.4)
Midday Peak Hour					
No-Build (2035)	D (44.3)	F (224.0)	E (68.3)	E (58.7)	F (105.0)
PM Peak Hour					
No-Build (2035)	F (123.7)	F (171.3)	F (288.4)	F (155.1)	F (166.0)

Source: Kimley-Horn and Associates, Inc.

6.4.2 Roadway Capacity Analysis

As shown in the level of service results, several arterial sections along Plantation Road (particularly in the southbound direction) are anticipated to operate at an acceptable LOS D or better under during AM or Midday peak hour conditions. However, several arterial sections are anticipated to operate poorly at LOS E or worse, particularly during the PM peak hours. **Table 6.4-12: 2035 Unimproved Arterial Level of Service - Northbound Plantation Road** and **Table 6.4-13: 2035 Unimproved Arterial Level of Service - Southbound Plantation Road** illustrate the anticipated 2035 Unimproved Arterial LOS.

Table 6.4-12: 2035 Unimproved Arterial Level of Service - Northbound Plantation Road

Cross Street	AM		MID		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
Williamson Road	3.8	F	6.5	F	1.6	F
Friendship Lane/Gander Way	28.7	B	29.2	B	16.2	E
Overall	13.3	E	18.0	D	6.3	F

ATS- Average travel speed (mph)

Table 6.4-13: 2035 Unimproved Arterial Level of Service - Southbound Plantation Road

Cross Street	AM		MID		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	LOS	ATS (mph)
Friendship Lane/Gander Way	26.6	C	22.9	C	15.7	E
Williamson Road	18.2	D	20.9	D	8.5	F
Overall	20.4	D	21.5	D	10.0	F

ATS- Average travel speed (mph)



Section 6.5 Future Levels of Service with Improvements

Based upon the anticipated 2035 traffic volumes shown in **Figure 6.2-1: Future (2035) Intersection Peak Hour Volumes – Segment 1** through **Figure 6.2-5: Future (2035) Intersection Peak Hour Volumes – Segment 5**, an improved conditions analysis was performed for the AM, Mid, and PM peak hours to serve as a “Build” condition. The recommended improvements for the corridor are shown in Chapter 7.0. Signal timings were optimized to best serve the anticipated traffic volumes with the recommended improvements.

6.5.1 Signal Warrant Analysis

A traffic signal warrant analysis was performed at the following study area intersections:

- ◆ Interstate 81 Southbound On and Off-Ramps
- ◆ Walrond Drive
- ◆ Lila Drive (Private Street)

The Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition was used for the signal warrant analysis. The evaluation included both existing and future 2035 conditions. According to the MUTCD, a traffic control signal should not be installed unless one or more of the signal warrants in the MUTCD are met. However, “the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.” The three main warrants are as follows:

6.5.1.1 Interstate 81 Southbound On and Off-Ramps

Existing Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes exceed the necessary thresholds for this warrant during seven hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during four hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes meet or exceed the necessary combination of thresholds for this warrant during five hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during eight hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes meet or exceed the necessary thresholds for this warrant during four hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **satisfied**.

These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

2035 Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes exceed the necessary thresholds for this warrant during 10 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during six hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes meet or exceed the necessary combination of thresholds for this warrant during nine hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during 10 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes meet or exceed the necessary thresholds for this warrant during nine hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **satisfied**.

These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

6.5.1.2 Lila Drive

Existing Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes do not exceed the necessary thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during 12 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes meet or exceed the necessary combination of thresholds for this warrant during three hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during five hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes meet or exceed the necessary thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **satisfied**.



These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

2035 Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes do not exceed the necessary thresholds for this warrant during six hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during 10 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes meet or exceed the necessary combination of thresholds for this warrant during seven hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during 10 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes meet or exceed the necessary thresholds for this warrant during seven hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **satisfied**.

These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

6.5.1.3 Walrond Drive

Existing Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes do not exceed the necessary thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during seven hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes do not meet or exceed the necessary combination of thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during six hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes do not meet or exceed the necessary thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **not satisfied**.

These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

2035 Conditions

Warrant 1 (Eight-Hour Vehicular Volume)-is satisfied if **ONE** of the following conditions exists for any eight hours of a day:

Condition A (Minimum Vehicular Volume)-volumes do not exceed the necessary thresholds for this warrant during any hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Condition B (Interruption of Continuous Traffic) – volumes meet or exceed the necessary thresholds for this warrant during 12 hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **satisfied**.

Combination of Condition A and B (Combination of Condition A and B)-volumes meet or exceed the necessary combination of thresholds for this warrant during three hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for eight hours. Therefore, the criterion is **not satisfied**.

Warrant 2 (Four-Hour Vehicular Volume)-volumes meet or exceed the necessary thresholds for this warrant during nine hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for four hours. Therefore, the criterion is **satisfied**.

Warrant 3 (Peak Hour Volume)-volumes meet or exceed the necessary thresholds for this warrant during six hours of the day. For the warrant to be met, volume thresholds must be at or above thresholds for one hour. Therefore, the criterion is **satisfied**.

These warrants are based on anticipated mainline and side street traffic volumes for both existing and projected 2035 traffic volumes, number of travel lanes, and mainline travel speed. The warrant analysis indicates that the anticipated volumes at the intersection meet warrants for signalization. Detailed warrant analyses are included in the **Appendix**.

6.5.2 Intersection LOS Analysis

Anticipated 2035 peak hour LOS along Plantation Road is shown in **Table 6.5-1: Interstate 81 (Southbound Ramp) and Plantation Road Signalized Intersection LOS** through **Table 6.5-11: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS** for the studied intersections, both signalized and unsignalized. Overall intersection LOS operations are summarized as well as per approach LOS for signalized intersection and per lane LOS for unsignalized intersections. The reduction of delay at the study area intersections are based on the recommended improvements shown in **Appendix D**.

Table 6.5-1: Interstate 81 (Southbound Ramp) and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	E (61.1)	E (59.0)	B (10.1)	E (59.1)
Midday Peak Hour				
Build (2035)	D (38.0)	B (17.9)	A (5.5)	C (24.5)
PM Peak Hour				
Build (2035)	F (180.1)	F (158.2)	A (3.9)	F (161.4)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-2: Interstate 81 (Northbound Ramp) and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound I-81 Ramp	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	D (33.6)	A (0.0)	A (0.2)	A (0.4)
Midday Peak Hour				
Build (2035)	C (21.5)	A (0.0)	A (0.3)	A (0.3)
PM Peak Hour				
Build (2035)	F (101.7)	A (0.0)	A (0.4)	A (1.1)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-3: Days Inn/McDonald's Driveways and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Days Inn	Westbound McDonald's	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Build (2035)	F (167.8)	F (212.4)	A (0.0)	A (0.6)	B (16.3)
Midday Peak Hour					
Build (2035)	A (0.0)	F (54.9)	A (0.1)	A (0.8)	A (6.6)
PM Peak Hour					
Build (2035)	*F (>300)	*F (>300)	A (0.1)	A (0.6)	F (151.6)

Source: Kimley-Horn and Associates, Inc.

* Synchro is unable to calculate actual delay due to extreme congestion

Table 6.5-4: Friendship Lane/Gander Way and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Gander Wy.	Westbound Friendship Ln.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Build (2035)	D (50.2)	D (49.8)	C (25.0)	B (15.0)	C (20.6)
Midday Peak Hour					
Build (2035)	C (39.9)	C (39.2)	B (14.7)	B (13.2)	B (19.7)
PM Peak Hour					
Build (2035)	E (68.6)	E (75.2)	E (55.2)	C (27.3)	D (52.9)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-5: Walrond Drive and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Eastbound Walrond Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	D (50.9)	A (1.8)	A (1.0)	A (3.9)
Midday Peak Hour				
Build (2035)	D (42.1)	A (1.1)	A (1.4)	A (4.0)
PM Peak Hour				
Build (2035)	D (49.6)	A (0.6)	A (0.9)	A (3.2)

Source: Kimley-Horn and Associates, Inc.



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Table 6.5-6: Lila Drive and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Lila Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	D (48.3)	A (4.0)	A (2.1)	A (6.2)
Midday Peak Hour				
Build (2035)	D (38.3)	A (5.7)	A (3.6)	A (9.7)
PM Peak Hour				
Build (2035)	D (45.2)	B (13.6)	B (12.4)	B (18.2)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-9: Milk-A-Way Drive and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound Milk-A-Way	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	E (47.7)	A (0.0)	A (0.2)	A (0.4)
Midday Peak Hour				
Build (2035)	D (26.0)	A (0.0)	A (0.1)	A (0.3)
PM Peak Hour				
Build (2035)	F (60.4)	A (0.0)	A (0.0)	A (0.6)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-7: ITT Exelis Main Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)			Overall LOS
	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour				
Build (2035)	F (87.1)	A (0.0)	A (0.5)	A (1.0)
Midday Peak Hour				
Build (2035)	C (24.4)	A (0.0)	A (0.3)	A (0.5)
PM Peak Hour				
Build (2035)	F (102.5)	A (0.0)	A (0.1)	A (1.7)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-10: Old Dominion Drive/Indian Road and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Indian Rd.	Westbound Old Dominion Dr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Build (2035)	E (37.5)	F (60.4)	A (0.0)	A (0.0)	A (0.5)
Midday Peak Hour					
Build (2035)	D (27.8)	D (27.1)	A (0.1)	A (0.0)	A (0.3)
PM Peak Hour					
Build (2035)	F (185.0)	F (93.8)	A (0.1)	A (0.0)	A (1.0)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-8: Hitech Road/ITT Exelis Service Entrance and Plantation Road Unsignalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Hitech Rd.	Westbound ITT Exelis Entr.	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Build (2035)	F (118.9)	F (117.6)	A (0.6)	A (0.7)	A (2.3)
Midday Peak Hour					
Build (2035)	D (33.6)	F (69.2)	A (0.5)	A (0.3)	A (3.1)
PM Peak Hour					
Build (2035)	F (*)	F (>300)	A (0.1)	A (0.1)	F (>300)

Source: Kimley-Horn and Associates, Inc.

Table 6.5-11: Williamson Road/U.S Route 11 and Plantation Road Signalized Intersection LOS

Scenario	Level of Service per by Approach (Delay in sec/veh)				Overall LOS
	Eastbound Route 11	Westbound Route 11	Northbound Route 115	Southbound Route 115	
AM Peak Hour					
Build (2035)	D (42.5)	D (41.4)	E (59.1)	D (53.5)	D (47.7)
Midday Peak Hour					
Build (2035)	D (39.7)	D (40.4)	E (58.4)	E (58.6)	D (46.5)
PM Peak Hour					
Build (2035)	D (51.4)	D (48.6)	E (75.1)	E (69.3)	E (59.1)

Source: Kimley-Horn and Associates, Inc.

* Synchro was unable to calculate delay due to volume to capacity ratio being greater than three.

6.5.3 Roadway Capacity Analysis

In 2035 it is assumed the speed limit along Plantation Road was lowered from the existing posted speed of 45 mph to 35 mph. As shown in the level of service results, the overall arterial LOS along Plantation Road operates at LOS D with the exception of the northbound PM peak hour that operates at a LOS F. However, several arterial sections are also anticipated to operate poorly at LOS D or worse, particularly the segment between Williamson Road and Lila Drive and the segment between I-81 SB Ramp and Friendship Lane. **Table 6.5-12: 2035 Improved Arterial Level of Service - Northbound Plantation Road** and **Table 6.5-13: 2035 Improved Arterial Level of Service - Southbound Plantation Road** illustrate the anticipated 2035 Improved Arterial LOS.

Table 6.5-12: 2035 Improved Arterial Level of Service - Northbound Plantation Road

Cross Street	AM		MID		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	ATS (mph)	LOS
Williamson Road	6.8	F	7.1	F	6.4	F
Lila Drive	27.9	B	26.9	B	23.6	C
Walrond Drive	20.7	C	22.4	C	23.4	C
Friendship Lane/Gander Way	11.8	E	15.3	D	7.3	F
I-81 SB Off-Ramp	11.8	E	19.4	C	5.9	F
Overall	14.0	D	17.0	D	9.5	F

ATS- Average travel speed (mph)

Table 6.5-13: 2035 Improved Arterial Level of Service - Southbound Plantation Road

Cross Street	AM		MID		PM	
	ATS (mph)	LOS	ATS (mph)	LOS	LOS	ATS (mph)
I-81 SB Off-Ramp	6.7	F	9.9	F	12.8	E
Friendship Lane/Gander Way	24.8	B	21.1	C	16.9	D
Walrond Drive	26.8	B	26.3	B	27.0	B
Lila Drive	21.1	C	17.8	D	10.8	E
Williamson Road	14.4	D	14.4	D	13.1	E
Overall	17.9	D	17.3	D	15.2	D

ATS- Average travel speed (mph)



Chapter 7.0 Corridor Recommendations

As short, mid, and long-term improvements are implemented along the corridor, listed below are some ongoing recommendations to consider:

- Closing access points and consolidating commercial driveways as site plan approval, rezoning approval, and conditional use permits are given.
- Routinely clearing vegetation that blocks sign visibility, especially on minor street approaches.
- Retiming future traffic signals along the corridor on a regular schedule at 3 to 5 year intervals.
- The infrastructure improvements required for acceptable operation at the site driveways are considered “developer driven improvements”.

Recommendations for specific improvements to the Plantation Road corridor have been split into short-term, mid-term, and long-term categories based on discussion with the County and the time frame in which they will be needed and possibly funded. Planning-level cost estimates, expressed in year 2011 dollars, have been included for all recommendations. These planning-level cost estimates have been based on VDOT’s statewide two-year cost averages, the VDOT Transportation & Mobility Planning Division’s “Statewide Planning Level Cost Estimates” worksheet from 2009, and familiarity with similar projects and improvements throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, fluctuations in the market and the outcome of competitive bidding, and the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed. Variation between actual and estimated costs will change as time passes, and the time value of money has not been taken into account. Cost estimations performed using the “Statewide Planning Level Cost Estimates” worksheet include right-of-way acquisition cost estimates developed with the sheet’s methodology. The cost breakdown per scenario includes engineering costs, landscaping costs, pavement marking costs, urban roadway costs, rigid material costs (milling, overlay, sidewalks, channelization, etc.), signal costs (timing and construction), signing costs, and miscellaneous costs which includes, mobilization, sediment and erosion control, traffic control. Furthermore, a 15 percent contingency was applied to each item in addition to the contingency already embedded in the planning level cost estimate. In the following cost summary tables, estimated dollars were rounded to the nearest \$5,000. A detailed breakdown of the planning level cost estimates is included in the **Appendix. Figure 7.4-7: Ultimate Corridor Recommendations** illustrates graphically recommendations made along the entire length of the corridor.

Section 7.1 Typical Cross Section

Recommendations for the typical cross section for Plantation Road are illustrated in **Figure 7.4-1: Cross Section 1A** through **Figure 7.4-6: Cross Section 3B**. Cross Sections 1A and 1B both include 5 foot bike lanes and 5 foot sidewalks with the main difference being Cross Section 1A has a wider median with minimal green space (buffer space) between the roadway and sidewalk. Cross Sections 2A and 2B both include 5 foot sidewalks and 14 foot outside lanes to accommodate both bicyclist and vehicles with “Share the Road” signage. The main difference between the options is Cross Section 2A has a wider median with less green space (buffer space) between the roadway and sidewalk. Cross Sections 3A and 3B both include a 10 foot multi-use trail and a 7 foot sidewalk with the main difference being Option 3B has a wider median with minimal green space (buffer space) between the roadway and sidewalk. Due to the multi-use trail present in both alternatives, no bicycle accommodations were provided in the roadway. Cross Sections 3A and 3B were provided as an option for the segment along Plantation Road located between Friendship Lane and Walrond Drive to connect a multi-use path for the proposed Hollins/Tinker Creek Greenway to Walrond Park. Based on discussion with the County, Cross Sections 2B and 3A were preferred options due to the narrower median width and the shared outside travel lane for bicyclist. These options work best due for the corridor due to the limited right-of-way that exists.

Section 7.2 Short-Term Recommendations and Planning Level Cost Estimates

The following opinions of costs were estimated based on a combination of VDOT’s Transportation & Mobility Planning Division (TMPD) Statewide Planning Level Cost Estimates with costs inflated to 2011 dollars as well as recent cost estimating experience on projects throughout the Commonwealth of Virginia. The Opinion of Probable Costs (OPC) include anticipated construction and materials costs, engineering costs (e.g., design, survey, signal retiming, etc.), mobilization costs, general right-of-way and utility relocation costs, maintenance of traffic, and storm water management costs if applicable (i.e., under miscellaneous). They do not include planning, programming, relocation or installation of street lighting, or construction inspection/construction phase services costs.

Plantation Road Corridor (I-81 Southbound Off/On-Ramps to Williamson Road (U.S. Route 11))

Plantation Road

- Eliminate the center TWLTL.
- Construct a raised/landscaped median within existing TWLTL.
- Employ desirable access management strategies (as desired by the County) along Plantation Road to delineate exclusive left-turn turn-lanes at designated key corridor intersections

Short-term recommendations for the Plantation Road corridor consists of construction of a raised median within the existing Two-Way Left-Turn Lane (TWLTL) area, the addition/delineation of turn-lanes or lengthening of existing ones, implementing access management guidelines, as well as the construction of pedestrian sidewalks and/or a multi-use path.

The following improvements are recommended along Plantation Road in the short term. Given the existing operations along Plantation Road, and the desire to accommodate pedestrian/bicyclists activity these improvements should be considered immediately as funding becomes available.

Plantation Road Signal System Improvements

- Optimize traffic signal phasing and timing plans between the existing Friendship Lane signal and the proposed traffic signal at Lila Drive to accommodate vehicle demands during AM, Midday, PM, Evening, Off-peak and/or Weekend peak hours for a coordinated system along Plantation Road.
 - Signal coordination improvements should facilitate the progression of traffic along Plantation Road.
 - Coordinated signal timing optimization should occur upon installation of proposed new traffic signal located at the intersection of Lila Drive

Plantation Road at I-81 Northbound Off/On-Ramps

- Remove existing guardrail located on the northeast corner of the northbound on-ramp and replace guardrail to the appropriate turning radius for a WB-62 truck. Based on AASHTO standards, a WB-62 truck has a minimum turning radius of 45 feet. Currently the radius of the guardrail is approximately 40 feet.

Plantation Road at Friendship Lane/Gander Way

- Provide/stripe crosswalks across the north and south legs of Plantation Road, the east leg of Friendship Lane, and the west leg of Gander Way.
- Install pedestrian countdown heads, push buttons, and signing at each identified crosswalk location in accordance with Roanoke County, VDOT, and/or 2009 MUTCD standards.



Plantation Road at Walrond Drive

- Install/construct a 10-foot multi-use path along Walrond Drive and Enon Drive that connects to Plantation Road.

Pedestrian Accommodations - Alternative 1

- Install a Rectangular Rapid Flashing Beacon (RRFB) and lighted pedestrian signs. This is an interim recommendation until the intersection meets the appropriate signal warrants in accordance with the 2009 MUTCD. Lighted pedestrian signage typically includes standard flashing beacons or strobe lights mounted in conjunction with standard crosswalk warning signage. Some newer systems also include light-emitting diodes (LED) mounted directly in the sign (See the following pictures).



- Systems are powered using either self-contained solar systems or by direct power connection. These systems are typically activated by push button or a pedestrian detector and flash for a predetermined amount of time depending on the width of the roadway and the time typically taken for pedestrians to cross. This flashing light helps alert motorists that a pedestrian is waiting to cross since it only flashes after being triggered by a pedestrian, either manually or automatically.

Pedestrian Accommodations - Alternative 2

- A more obtrusive alternative to the RRFB is the pedestrian hybrid beacon. These systems were formally referred to as High-Intensity Activated Crosswalks (HAWK). When a pedestrian activates the system (either through detection or a push button) a hybrid traffic signal brings traffic to a stop similar to a traditional traffic signal and provides the pedestrian with a walk signal similar to traditional signalized intersection. This system has a distinct advantage in that it controls traffic by bringing it to a complete stop and provides a walk signal to pedestrians instead of simply warning drivers or drawing their attention to signage. Based on the 2009 MUTCD (Figure 4F-2) the pedestrian hybrid beacon requires a minimum of 20 pedestrians per hour (pph) to meet the warrants for installation.
- The primary disadvantage of the pedestrian hybrid beacon is that it can confuse drivers and are not ideal to install in close proximity to an unsignalized intersection. It is recommended the pedestrian hybrid beacon be installed slightly north of Walrond Drive to avoid confusing drivers at this unsignalized intersection. The MUTCD recommends for pedestrian hybrid beacons be installed at least 100 feet from side streets or driveways that are controlled by STOP signs. In the future when Walrond Drive meets the appropriate warrants and is signalized in

the future it is recommended that the pedestrian hybrid beacon will be removed and pedestrian cross at the intersection. (See picture below).



High-Intensity Activated Crosswalk (HAWK)



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Pedestrian Accommodations – Alternative 3

- Install a pedestrian crosswalk with overhead flashing beacons. This alternative is a more obtrusive alternative compared to the RRFB. The flashing lights installed on a mast arm provide motorists with a more visible alert system compared to the RRFB and lighted signs. (See picture below).



Plantation Road at Lila Drive

- Construct a traffic signal at this intersection
 - Install pedestrian countdown heads, push buttons, crosswalks, and signing at each identified crosswalk location in accordance with Roanoke County, VDOT, and/or 2009 MUTCD standards.
 - Interconnect traffic signal with adjacent signal located at Friendship Lane
 - Optimize traffic signal phasing and timing plans to accommodate peak hour/off-peak traffic volumes along Plantation Road
 - Signal coordination improvements should facilitate the progression of traffic along Plantation Road

Northbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes
- Construct one exclusive right-turn lane

Southbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes

Eastbound Double Envelope Site Access Driveway

- Coordinate with Double Envelope to reconfigure/realign site access driveway such that it aligns with Lila Drive approach and business access can be accommodated via the proposed signalized intersection
- Construct approach to consist of the following:
 - One shared left/through/right-turn lane
 - One inbound/receiving lane

Westbound Lila Drive

- Construct one shared through/left-turn lane
- Construct one exclusive right-turn lane

Plantation Road at Hitech Road/ITT Exelis Night Vision Service Driveway

- Install/construct a 10-foot multi-use path along Hitech Road to Plantation Road.

Pedestrian Accommodations - Alternative 1

- Install a RRFB and lighted pedestrian signs. Lighted pedestrian signage typically includes standard flashing beacons or strobe lights mounted in conjunction with standard crosswalk warning signage. Some newer systems also include LED mounted directly in the sign.
- Systems are powered using either self-contained solar systems or by direct power connection. These systems are typically activated by push button or a pedestrian detector and flash for a predetermined amount of time depending on the width of the roadway and the time typically taken for pedestrians to cross. This flashing light helps alert motorists that a pedestrian is waiting to cross since it only flashes after being triggered by a pedestrian, either manually or automatically.

Pedestrian Accommodations - Alternative 2

- A more obtrusive alternative to the RRFB is the pedestrian hybrid beacon. These systems were formally referred to as High-Intensity Activated Crosswalks (HAWK). When a pedestrian activates the system (either through detection or a push button) a hybrid traffic signal brings traffic to a stop similar to a traditional traffic signal and provides the pedestrian with a walk signal similar to traditional signalized intersection. This system has a distinct advantage in that it controls traffic by bringing it to a complete stop and provides a walk signal to pedestrians instead of simply warning drivers or drawing their attention to signage. Based on the 2009 MUTCD (Figure 4F-2) the pedestrian hybrid beacons requires a minimum of 20 pedestrians per hour (pph) to meet the warrants for installation.
- The primary disadvantage of the pedestrian hybrid beacon is that it can confuse drivers and are not ideal to install in close proximity to an unsignalized intersection. The MUTCD recommends pedestrian hybrid beacons should be installed at least 100 feet from side streets or driveways that are controlled by STOP signs. It is recommended the pedestrian hybrid beacon be installed slightly north of HiTech Road/ITT Exelis Night Vision Service Driveway to avoid confusing drivers at this unsignalized intersection.

Pedestrian Accommodations - Alternative 3

- Install a pedestrian crosswalk with overhead flashing beacons. This alternative is a more obtrusive alternative compared to the RRFB. The flashing lights installed on a mast arm provide motorists with a more visible alert



system compared to the RRFB and lighted signs.

Plantation Road at Milk-A-Way Drive

- Relocate existing STOP bar and STOP sign closer to Plantation Road to improve sight distance.

Plantation Road at Williamson Road

Recommendations shown below have already been funded with VDOT Revenue Sharing funds and will be constructed shortly.

- Provide/stripe crosswalks across the north and south legs of Plantation Road at the intersection, as well as the east and west legs of Williamson Road.
- Install pedestrian countdown heads, push buttons, and signing at each identified crosswalk location in accordance with Roanoke County, VDOT, and/or 2009 MUTCD standards.

7.2.1 Planning Level Cost Estimates – Short Term Alternative 1

<u>Item</u>	<u>Total</u>
Engineering	\$882,000.00
Landscaping/Excavation	\$400,000.00
Pavement Markings	\$96,500.00
Rigid Materials & Guardrail	\$1,272,000.00
Traffic Signal Equipment	\$450,000.00
Signage	\$53,000.00
Construction Contingency (10%)	\$227,000.00
<u>Miscellaneous</u>	<u>\$1,092,000.00</u>
Total	\$4,472,500.00

7.2.2 Planning Level Cost Estimates – Short Term Alternatives 2 and 3

<u>Item</u>	<u>Total</u>
Engineering	\$919,000.00
Landscaping/Excavation	\$400,000.00
Pavement Markings	\$96,500.00
Rigid Materials & Guardrail	\$1,272,000.00
Traffic Signal Equipment	\$620,000.00
Signage	\$3,000.00
Construction Contingency (10%)	\$239,000.00
<u>Miscellaneous</u>	<u>\$1,146,000.00</u>
Total	\$4,695,500.00

Section 7.3 Mid-Term Recommendations and Planning Level Cost Estimates

The following opinions of costs were estimated based on a combination of VDOT’s Transportation & Mobility Planning Division (TMPD) Statewide Planning Level Cost Estimates with costs inflated to 2011 dollars as well as recent cost estimating experience on projects throughout the Commonwealth of Virginia. The Opinion of Probable Costs (OPC) include anticipated construction and materials costs, engineering costs (e.g., design, survey, signal retiming, etc.), mobilization costs, general right-of-way and utility relocation costs, maintenance of traffic, and stormwater management costs (i.e., under miscellaneous). They do not include planning, programming, relocation or installation of street lighting, or construction inspection/construction phase services costs.

Access Management

It is recommended that all new developments and redevelopments along the corridor follow the VDOT Access Management Guidelines. The safety and efficiency of the corridor depends heavily on the effective management of access to adjacent developments. Access points introduce conflicts and friction into the traffic stream. Vehicles entering and leaving the main roadway often slow the through traffic, and the difference in speeds between the through and turning traffic increases accident potential. The access management guidelines preserve the flow of traffic on the surrounding roadways, improve safety, and maintain mobility. It is believed that increasing the spacing between access appoints improves arterial flow and safety by reducing the number of conflict points per mile, by providing greater distance to anticipate and recover from turning maneuvers, and by providing opportunities for use of turn lanes. Many studies that have been completed prove that an increase in the number of access points along a corridor directly translates into higher accident rates.

It is recommended the following driveways be realigned/ reconstructed:

- The Day’s Inn Driveway and McDonald’s Driveway (located approximately 375 feet south of the I-81 interchange)
- Indian Road and Old Dominion Drive (located approximately 650 feet north of Williamson Road)
- Combine the existing four access points between Exxon and Shell gas stations into one access point along the corridor. Provide one interconnect access point between the parcels.

Plantation Road Multi-Modal Corridor Improvements Project (Friendship Lane/Gander Way to Williamson Road (U.S. Route 11)

Plantation Road

- Employ desirable access management strategies (as desired by the County) along Plantation Road to delineate exclusive left-turn turn-lanes at designated key corridor intersections

The following improvements are recommended along Plantation Road in the mid-term. Given the existing operations along Plantation Road and a strong desire within the community to improve pedestrian/bicyclists accommodations and safety along the roadway, these improvements should be considered immediately as funding becomes available.

- Install/construct a 10-foot multi-use path along Plantation Road from Friendship Lane across Interstate 81 to the planned parking lot on Hollins University property.
 - Retrofit/modify existing bridge to accommodate proposed multi-use path and associated barriers separating vehicle traffic from multi-use path traffic.
- Install/construct a 5-foot wide pedestrian sidewalk along the west side of Plantation Road in its entirety between the Days Inn/McDonald’s Driveway (located approximately 375 feet south of the I-81 interchange) and



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Williamson Road

- Install/construct a 5-foot wide pedestrian sidewalk along the eastern side of Plantation Road from Walrond Drive to Williamson Road
- Install/construct a 10-foot multi-use path along the east side of Plantation Road between the Gander Way/Plantation Road intersection and Walrond Drive
 - Construct multi-use path along Friendship Lane and tie into the proposed multi-use path along the east side of Plantation Road
 - Construct multi-use path along Walrond Drive and tie into the proposed multi-use path along the east side of Plantation Road
- Install/construct a multi-use path along Enon Drive between Walrond Drive and Hitech Road.
- Provide bicycle accommodations along both sides of Plantation Road incorporating the multi-use path along the eastern side of Plantation Road.

Plantation Road at Friendship Lane/Gander Way

- No physical capacity improvements are proposed for this intersection.

Plantation Road at Walrond Drive/Wells Fargo Right-Out (RO) Only Driveway

Northbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes

Southbound Plantation Road

- Maintain two through travel lanes
- Construct one exclusive right-turn lane

Eastbound Walrond Drive

- Construct one exclusive left-turn lane
- Construct one exclusive right-turn lane

Westbound Wells Fargo Site Access Driveway

- Reconstruct/reconfigure site access driveway to consist of right-out (RO) only **(by others)**
- Construct an exclusive channelized right-turn lane to prohibit outbound through or left-turn movements
 - Provide raised curb to delineate right-out movement only
 - Provide STOP control on outbound (driveway) approach
 - Construct one outbound lane 14 feet in width through channelized sections

Plantation Road at Lila Drive/Double Envelope Driveway

- No physical capacity improvements are proposed for this intersection based on the implementation of proposed short-term intersection improvements.

Plantation Road at Hitech Road/ITT Exelis Night Vision Service Driveway

Northbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes

Southbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes

Eastbound Hitech Road

- Construct an exclusive right-turn lane
- Improve/restripe approach to include the following laneage:
 - One shared through/left-turn lane
 - One exclusive right-turn lane

Westbound ITT Exelis Night Vision Service Driveway

- Restripe site access driveway to consist of:
 - One shared through/left-turn lane
 - One exclusive right-turn lane

Plantation Road at Milk-A-Way Drive

Northbound Plantation Road

- Maintain two through travel lanes

Southbound Plantation Road

- Construct/delineate one exclusive left-turn lane
- Maintain two through travel lanes

Westbound Milk-A-Way Drive

- Construct an exclusive right-turn lane
- Improve/restripe approach to include the following laneage:
 - One exclusive left-turn lane
 - One exclusive right-turn lane



7.3.1 Mid-Term Planning Level Cost Estimates

<u>Item</u>	<u>Total</u>
Engineering	\$1,967,000.00
Landscaping/Excavation	\$422,000.00
Pavement Markings	\$33,000.00
Urban Roadway*	\$2,775,000.00
Rigid Materials**	\$2,472,000.00
Guardrail	\$23,000.00
Signage	\$5,600.00
Construction Contingency (10%)	\$573,000.00
<u>Miscellaneous</u>	<u>\$2,729,000.00</u>
Total	\$10,999,600.00

*Urban Roadway cost includes applicable signage and pavement marking cost for corridor intersection improvements.

** Rigid Materials cost includes sidewalk, multi-use path, and bridge retrofit costs for pedestrians/bicyclist over I-81.

Section 7.4 Long-Term Recommendations and Planning Level Cost Estimates

The following opinions of costs were estimated based on a combination of VDOT's Transportation & Mobility Planning Division (TMPD) Statewide Planning Level Cost Estimates with costs in 2011 dollars as well as recent cost estimating experience on projects throughout the Commonwealth of Virginia. The Opinion of Probable Costs (OPC) include anticipated construction and materials costs, engineering costs (e.g., design, survey, signal retiming, etc.), mobilization costs, general right-of-way and utility relocation costs, maintenance of traffic, and storm water management costs (i.e., under miscellaneous). They do not include planning, programming, relocation or installation of street lighting, or construction inspection/construction phase services costs.

Park and Ride

Park and Ride locations should be considered near the northern end of the corridor as future developments and roadway improvements occur along the corridor.

Plantation Road Corridor (I-81 Southbound Off/On-Ramps to Williamson Road (U.S. Route 11))

With the three additional traffic signals, high truck traffic percentages, sight distance issues, and the pedestrian and bicyclists accommodations implemented along the corridor the speed limit should be reduced from 45 mph to 35 mph. It is recommended that a speed limit study be conducted to determine the 85th percentile speed for the corridor in accordance with the 2000 Highway Capacity Manual (HCM).

Plantation Road Signal System Improvements

- Coordinated signal timing optimization should occur upon installation of proposed two new traffic signals located at the intersections of Walrond Drive and I-81 Southbound Off/On-Ramps.

Plantation Road at I-81 Southbound Off/On-Ramps

- Construct a traffic signal at this intersection when warranted
 - Interconnect traffic signal with adjacent signals along Plantation Road
 - Optimize traffic signal phasing and timing plans to accommodate peak hour/off-peak traffic volumes along Plantation Road
 - Signal coordination improvements should facilitate the progression of traffic along Plantation Road
- Install pedestrian countdown heads, push buttons, and signing at the east leg (I-81 SB Off-Ramp) in accordance with Roanoke County, VDOT, and/or 2009 MUTCD standards.

Plantation Road at Walrond Drive

- Construct a traffic signal at this intersection when warranted
 - Interconnect traffic signal with adjacent signals along Plantation Road
 - Optimize traffic signal phasing and timing plans to accommodate peak hour/off-peak traffic volumes along Plantation Road
 - Signal coordination improvements should facilitate the progression of traffic along Plantation Road
- Install pedestrian countdown heads, push buttons, and signing in accordance with Roanoke County, VDOT, and/or 2009 MUTCD standards.

Plantation Road at Williamson Road (U.S. Route 11)

- Modify/upgrade traffic signal at this intersection
 - Interconnect traffic signal with adjacent signals along Williamson Road
 - Optimize traffic signal phasing and timing plans to accommodate peak hour/off-peak traffic volumes along Williamson Road
 - Signal coordination improvements should facilitate the progression of traffic along Williamson Road

Northbound Plantation Road

- Construct an exclusive right-turn lane

Southbound Plantation Road

- Construct two exclusive left-turn lanes
- Construct two through travel lanes
- Construct an exclusive right-turn lane

Eastbound Williamson Road

- Construct two exclusive left-turn lanes
- Maintain two through travel lanes
- Construct one exclusive right-turn lane

Westbound Williamson Road

- No geometric changes



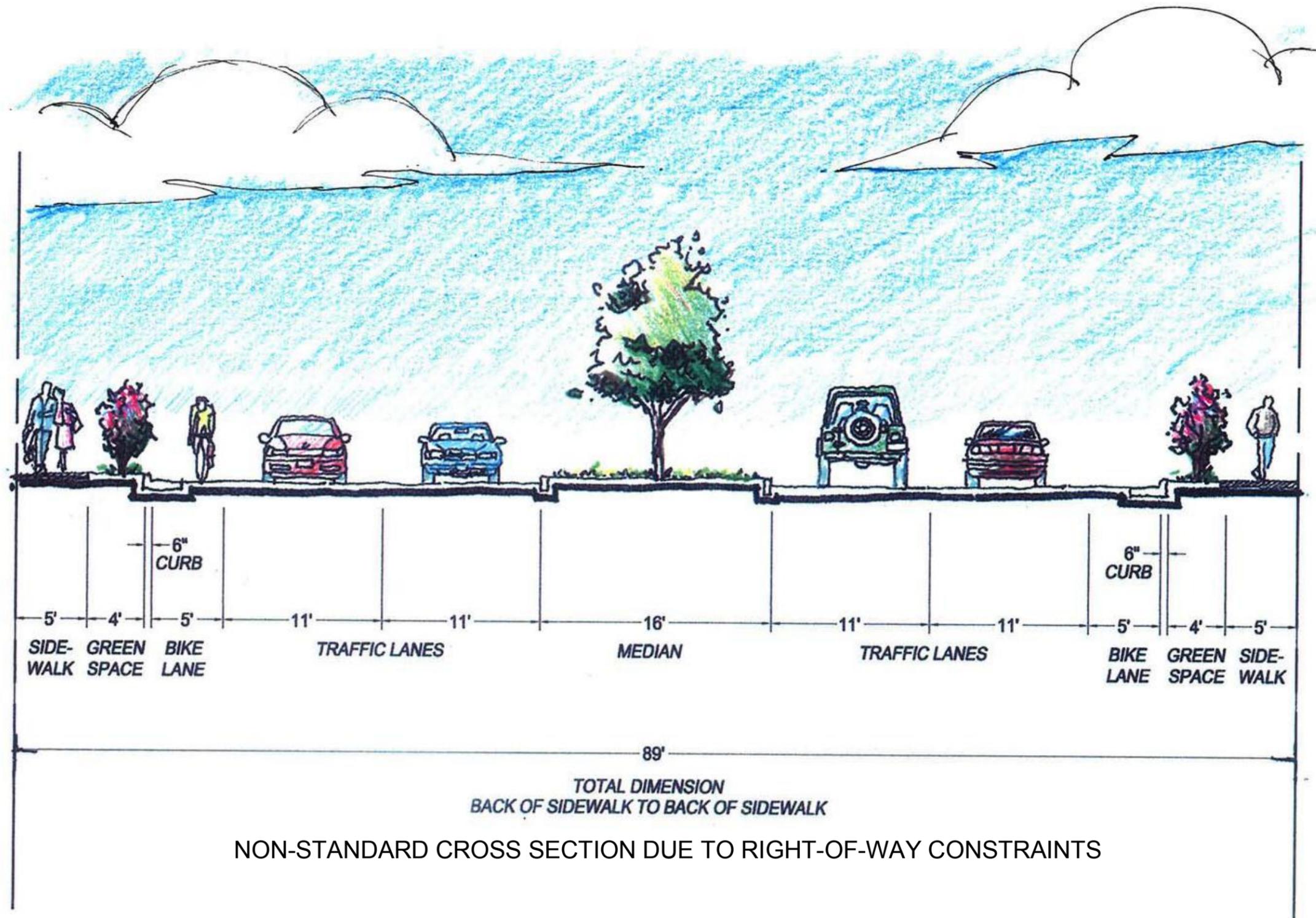
PLANTATION ROAD *Corridor Study* 115

7.4.1 Long-Term Planning Level Cost Estimates

<u>Item</u>	<u>Total</u>
Engineering	\$1,405,000.00
Pavement Markings	\$28,000.00
Urban Roadway*	\$3,515,000.00
Traffic Signal Equipment	\$962,500.00
Construction Contingency (10%)	\$451,000.00
<u>Miscellaneous</u>	<u>\$3,304,000.00</u>
Total	\$9,665,500.00

*Urban Roadway cost includes applicable signage and pavement marking cost for improvements associated with the Plantation Road/Williamson Road intersection improvements.

FIGURE 7.4-1: CROSS SECTION 1A



PLANTATION ROAD

CROSS SECTION 1A

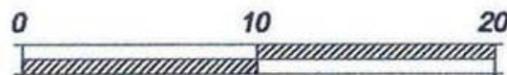
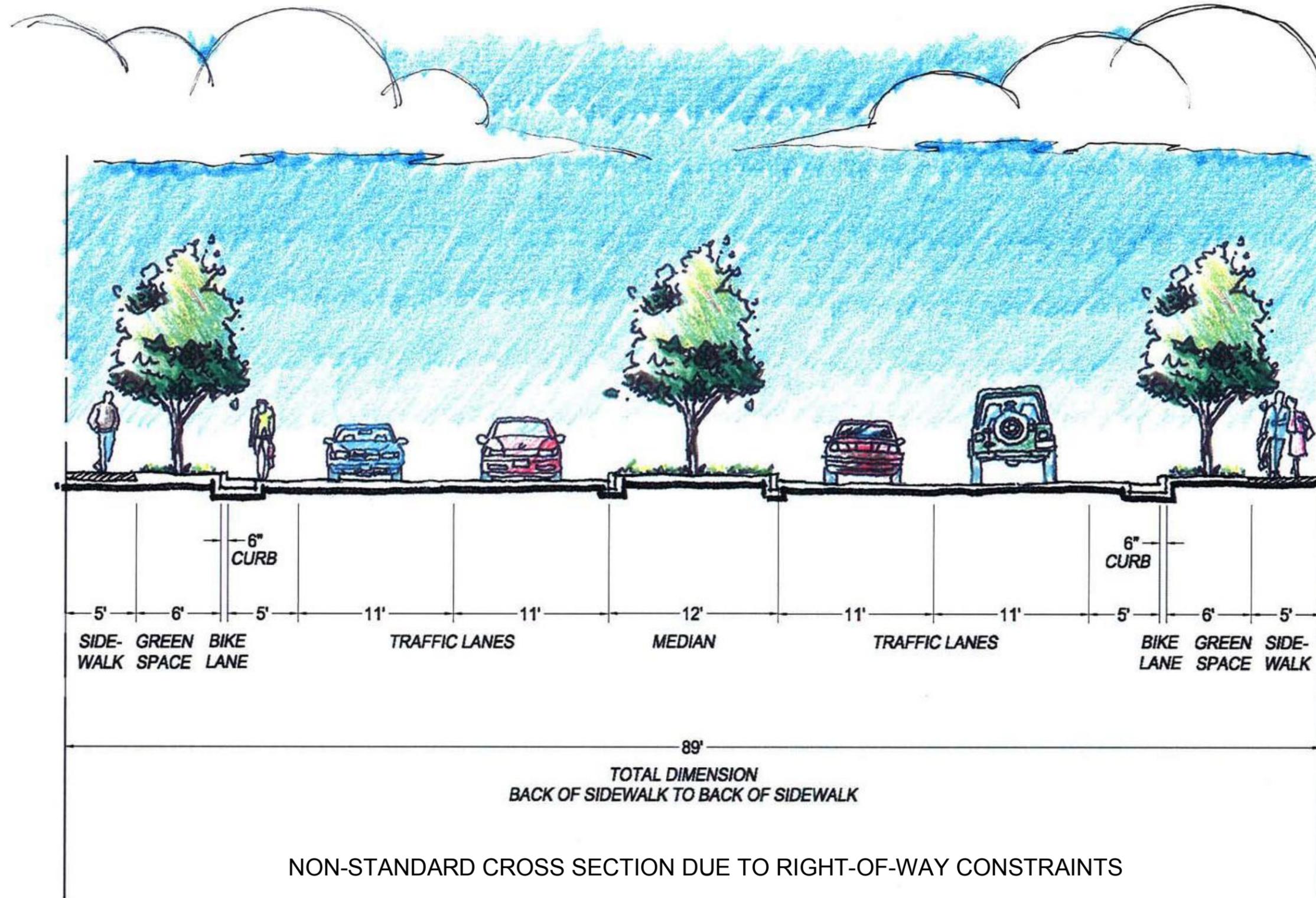


FIGURE 7.4-2: CROSS SECTION 1B



PLANTATION ROAD

CROSS SECTION 1B

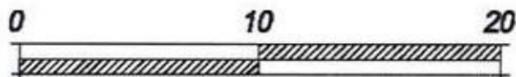
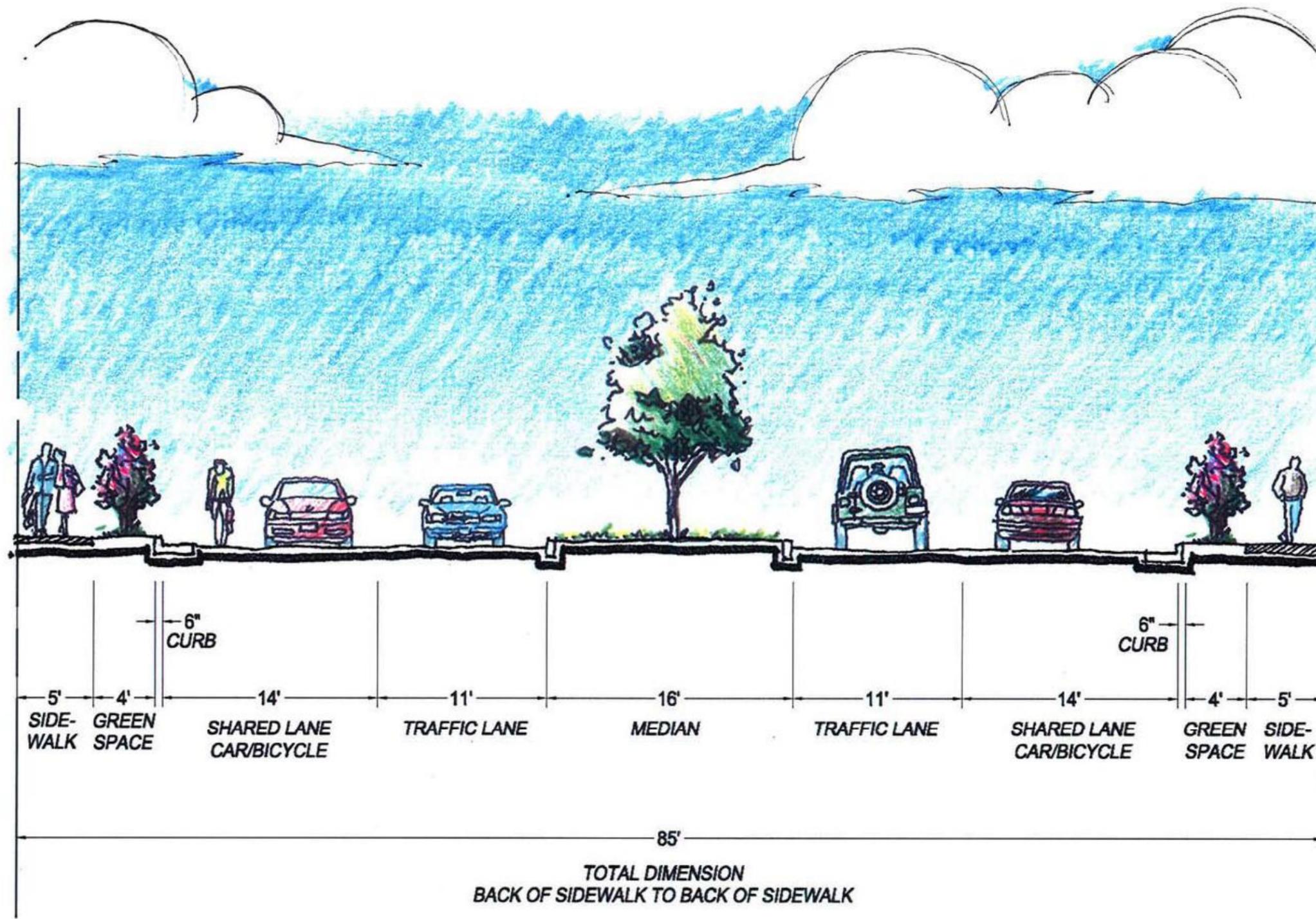


FIGURE 7.4-3: CROSS SECTION 2A



NON-STANDARD CROSS SECTION DUE TO RIGHT-OF-WAY CONSTRAINTS

PLANTATION ROAD
CROSS SECTION 2A

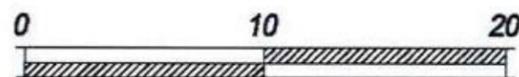
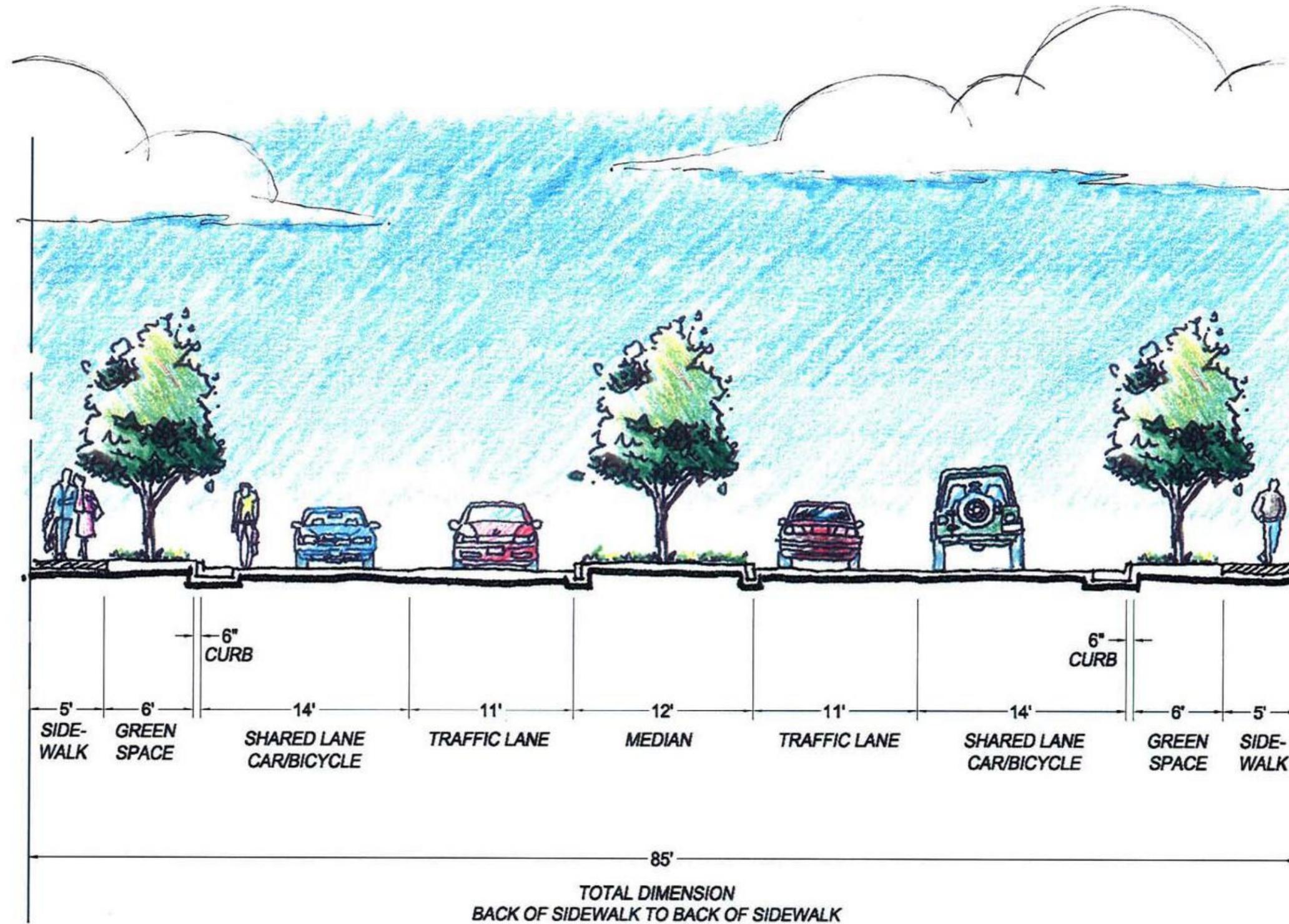


FIGURE 7.4-4: CROSS SECTION 2B



NON-STANDARD CROSS SECTION DUE TO RIGHT-OF-WAY CONSTRAINTS

PLANTATION ROAD

CROSS SECTION 2B

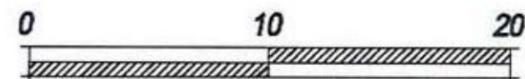
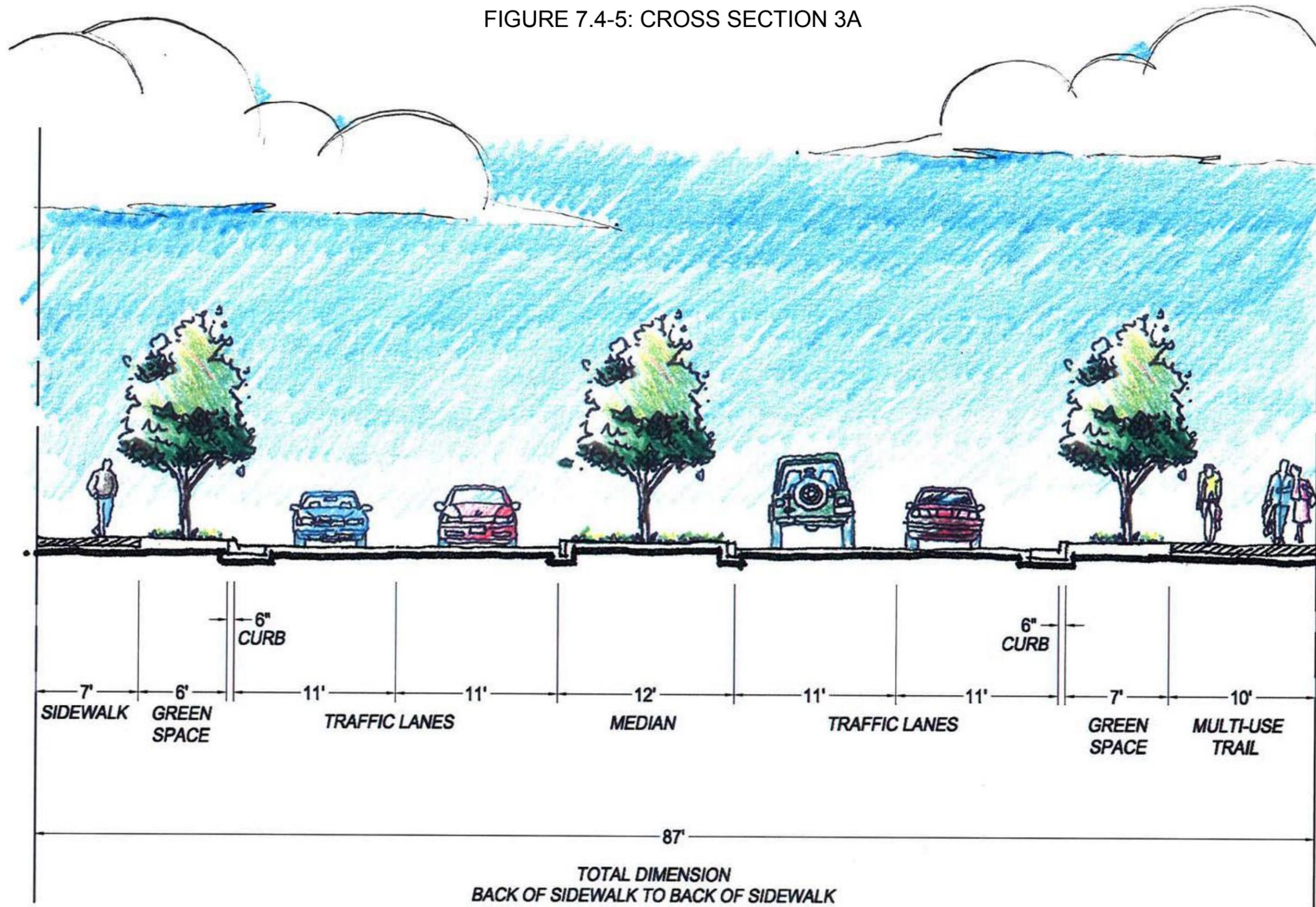


FIGURE 7.4-5: CROSS SECTION 3A



NON-STANDARD CROSS SECTION DUE TO RIGHT-OF-WAY CONSTRAINTS

PLANTATION ROAD

CROSS SECTION 3A

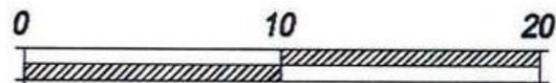
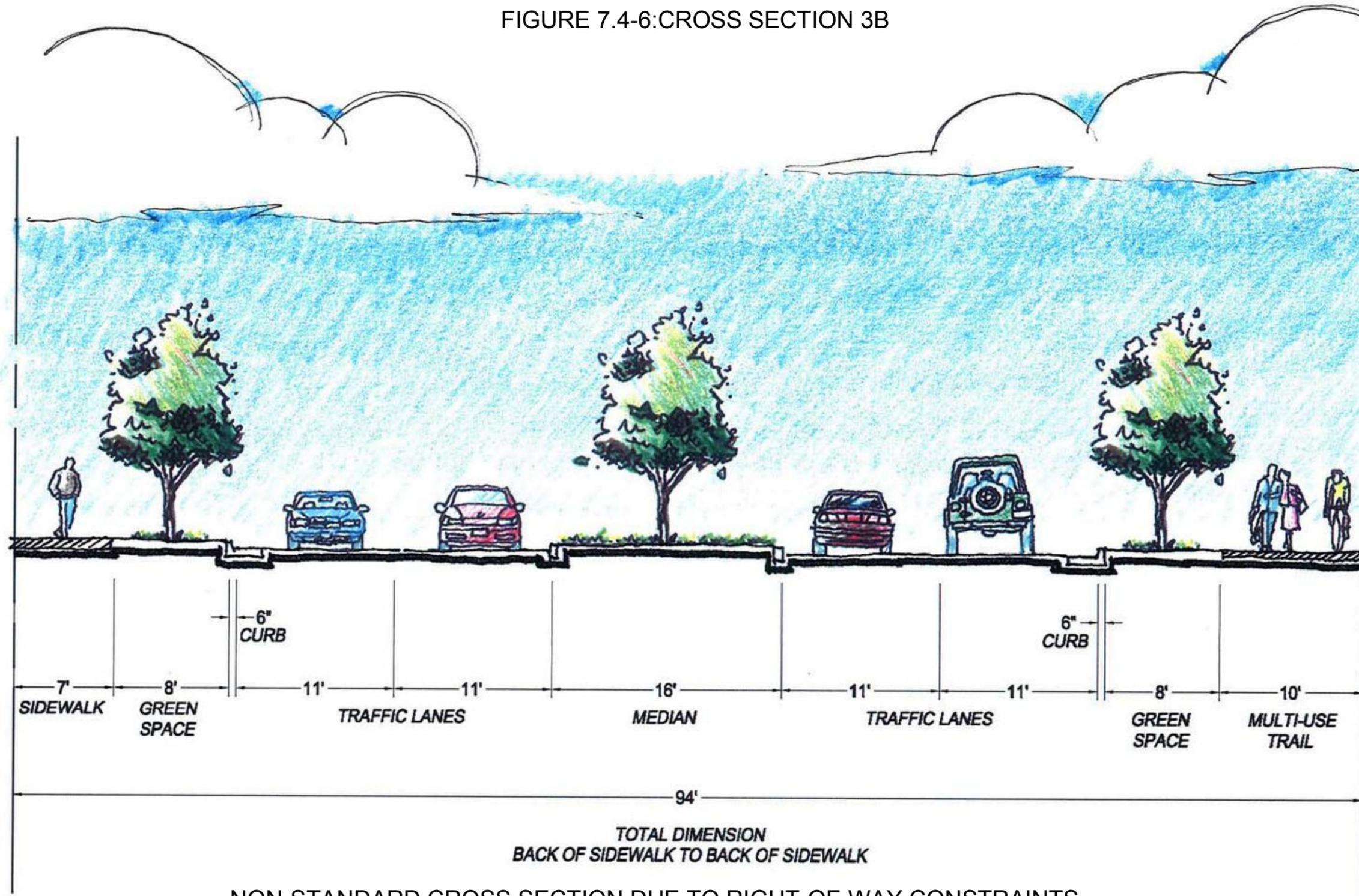


FIGURE 7.4-6: CROSS SECTION 3B



NON-STANDARD CROSS SECTION DUE TO RIGHT-OF-WAY CONSTRAINTS

PLANTATION ROAD
CROSS SECTION 3B

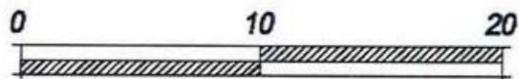


FIGURE 7.4-7: ULTIMATE CORRIDOR RECOMMENDATIONS



- LEGEND**
- EXISTING EDGE OF PAVEMENT
 - PROPOSED IMPROVEMENTS
(including curb and sidewalk)
 - PROPOSED LANDSCAPED
 - RAISED MEDIAN
 - CROSSWALK LOCATIONS

NOTE: CROSS SECTIONS SHOWN IN FIGURE 7.4-4 AND FIGURE 7.4-5 WERE USED FOR THIS ULTIMATE CORRIDOR CROSS SECTION DUE TO THE LIMITED RIGHT-OF-WAY ALONG THE CORRIDOR. THE CROSS SECTIONS USED HAVE WIDE OUTSIDE LANES TO ACCOMMODATE BOTH VEHICLES AND BIKES.



Chapter 8.0 Conclusions

The *Plantation Road (State Route 115) Corridor Study* provides a comprehensive understanding of the corridor for existing and future conditions, and its associated transportation needs within Roanoke County. The study identifies potential transportation improvement projects along the corridor for short, mid, and long-term time frames. As planned, the report itself will serve as a beneficial tool to both VDOT and Roanoke County in their discussions with developers as they convey future plans and projects for the corridor. This will provide the opportunity to obtain right-of-way, as well as realize implementation of both specific and regional improvements through the development process. On a much broader scale, the study will ultimately be used as a planning tool by VDOT and Roanoke County to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study corridor.

As a result of the field reviews, traffic analyses and discussions with the County and VDOT, recommendations for improvements have been identified along the corridor for the short, mid, and long-term. These recommendations were based on discussions with the County and the desire to safely and efficiently address future traffic growth along the corridor. Project specific recommendations focus on operational, capacity, and safety improvements within the study area. Planning-level cost estimates, expressed in year 2011 dollars, have been included for all recommendations. These planning-level cost estimates have been based on VDOT's statewide two-year cost averages for 2009, the VDOT Transportation & Mobility Planning Division's (TMPD) "Statewide Planning Level Cost Estimates" worksheet from 2006, as well as familiarity with similar project and improvement costs throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, fluctuations in the market and the outcome of competitive bidding, and the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

Variation between actual and estimated costs will change as time passes, and the time value of money has not been taken into account. Cost estimations performed using the "Statewide Planning Level Cost Estimates" worksheet include right-of-way acquisition cost estimates developed with the sheet's methodology. The cost breakdown per scenario includes engineering costs, landscaping costs, pavement marking costs, urban roadway costs, rigid material costs (milling, overlay, sidewalks, channelization, etc.), signal costs (timing and construction), signing costs, and miscellaneous costs which includes, mobilization, sediment and erosion control, traffic control, right-of-way and utility costs, and stormwater management (where or when applicable). **Chapter 7.0 Corridor Recommendations** reflects the cost estimates for those projects that fall within a particular time frame (i.e., short term, mid-term, long term). **Figure 7.4-7: Ultimate Corridor Recommendations** illustrates graphically those capacity improvements recommended as a result of intersection, corridor, and interchange analyses. The study outlines the strategic long-term vision for the corridor and the intent is to now use the vision as projects emerge, whether small or large, public or private, to ensure that the ultimate overarching desires and needs of the corridor are achieved. Each project should be evaluated against the overall *Plantation Road Corridor Study* to determine specifically how it can best contribute towards realizing the vision.

The next key step in the planning process is to determine how the recommended improvements will be implemented. Both VDOT and County officials will need to determine implementation strategies as well as establish project priorities. Implementation strategies to consider include seeking and identifying funding streams, both public and private, to construct improvements. There are several potential public programs that may assist with funding projects. At the federal level there are earmarks, National Highway System funds, bridge funds, and Highway Safety Improvement Program (HSIP) funds to name a few. At the state level there is the six-year plan, multimodal planning grants and enhancement funds. Private funds may be realized through rezoning action and proffer contributions, as well as dedication of right-of-way. All these programs must be considered for each recommended improvement as outlined in the report. The recommended improvements should be prioritized into projects with both County and VDOT input. Each project should be thoroughly evaluated then identified for priority order, time frame from implementation and potential funding sources.



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Technical Appendix

- APPENDIX A: Traffic Counts
- APPENDIX B: Signal Warrant Analysis
- APPENDIX C: Capacity Analysis
- APPENDIX D: Sketch-Level Plans
- APPENDIX E: Huffman Properties
- APPENDIX F: Planning Level Cost Estimate