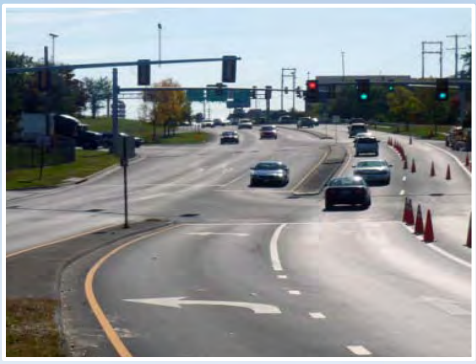
Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)



DRAFT

Prepared by:

Baker

Michael Baker Jr., Inc.

In Association with:

Renaissance Planning Group

JUNE 2010

DRAFT ROUTE 522 MULTIMODAL CORRIDOR STUDY

CITY OF WINCHESTER
FREDERICK COUNTY
CLARKE COUNTY
WARREN COUNTY

June, 2010

Prepared by:

Michael Baker Jr., Inc.

With assistance from:

RENAISSANCE PLANNING GROUP

I. TABLE OF CONTENTS

II. LIST OF FIGURES

III. LIST OF TABLES

1.0 INTRODUCTION

Purpose and Need

The Route 522 Corridor, spanning from the southeastern section of the City of Winchester to north of the Town of Front Royal, is a corridor of mixed land use, including areas of residential, retail and rural development. The northern section of the Route 522 Study Corridor, near Interstate 81, is largely developed with mostly retail and some residential uses. The central section, including southeastern Frederick County, western Clarke County, and northern Warren County, is rural in nature with low-density rural residential uses with pockets of retail and industrial land uses. The southern section of the Route 522 Corridor, near Interstate 66, is again largely developed with mostly retail land use and is one of the most rapidly developing sections of the corridor.

This is a cooperative project between the Northern Shenandoah Valley Regional Commission (NSVRC), the Winchester-Frederick MPO (Win-Fred) and the localities of the City of Winchester, Frederick County, Clarke County, and Warren County to analyze existing and future planned development and travel demand along the corridor to address future transportation needs. This study is a multimodal corridor study that analyzes and documents the many modes of transportation along this corridor, including freight movement via trucks, area transit, and bicycle and pedestrian facilities. In particular, this study will serve the following purposes:

- Collect highway performance measures (i.e. traffic counts, accident data, congestion/delay studies, recent traffic impact analysis, etc.) to determine the operational efficiency of the corridor.
- Determine current access patterns and volumes of truck traffic along Route 522. Freight movement via trucks to the Virginia Inland Port will be studied to determine access needs and /or signage and routing improvements.
- Information on safety will be gathered from previous studies in the corridor and field observation to determine short-term and long-term safety needs in the corridor.
- Access management and corridor preservation recommendations will be determined for the corridor that address the needs of adjacent existing and potential future land uses.
- Coordination of land use issues will be analyzed to determine future growth trends in the corridor and to assess the need for additional land use controls and

ordinances in the corridor that will minimize the transportation impacts of future growth.

- In addition, the potential for additional transit routes, bicycle and pedestrian facilities to be located within this corridor will be identified. The development of bicycle and pedestrian facilities will include not only routes along the Route 522 Corridor, but also look at needs to link bicycle and pedestrian generators along the corridor, such as major or planned residential development to activity centers or schools. New potential Park and ride lot locations will be determined as per the MPO Long-Range Plan.
- Identify projected deficiencies on Route 522 for build-out future conditions based on future traffic growth and anticipated land use changes.
- Provide concepts for roadway and intersection improvements and access management to address the identified deficiencies along the Route 522 Corridor.

This study will provide the Northern Shenandoah Valley Regional Commission (NSVRC), the Winchester-Frederick MPO (Win-Fred), the localities and VDOT with a tool to help identify corridor needs as future land use driven development advances throughout the Route 522 Corridor and surrounding areas.

Study Area and Corridor

The Study Area is located along Route 522 from S. Pleasant Valley Road in the City of Winchester to south of Interstate 66 in Warren County, covering a distance of over 10 miles. The study area includes the following 22 intersections, which were analyzed as a part of this study.

- Rte 522 (Millwood Ave) & S Pleasant Valley Rd
- Rte 522 (Millwood Ave) & Frontage Rd
- Rte 522 (Millwood Ave) & I-81 SB
- Rte 522 (Millwood Pke) & I-81 NB / Front Royal Pke
- Rte 522 (Front Royal Pke) & Costello Drive
- Rte 522 (Front Royal Pke) & Airport Rd
- Rte 522 (Front Royal Pke) & Papermill Rd
- Rte 522 (Front Royal Pke) & Macedonia Church Road
- Rte 522 (Front Royal Pke) & Tasker Rd
- Rte 522 (Front Royal Pke) & Moranto Manor
- Rte 522 (Front Royal Pke) & Lord Fairfax Hwy (Rte 277 & Rte 340)
- Rte 522 (Front Royal Pke) & Lake Frederick
- Rte 522 (Front Royal Pke) & Rocky Glen Dr
- Rte 522 (Front Royal Pke / Winchester Rd) & Ashby Station Rd
- Rte 522 (Winchester Rd) & Fairground Rd

- Rte 522 (Winchester Rd) & Toray Dr
- Rte 522 (Winchester Rd) & Rockland Rd
- Rte 522 (Winchester Rd) & Reliance Rd
- Rte 522 (Winchester Rd) & Country Club Rd (Townsend Dr)
- Rte 522 (Winchester Rd) & I-66 EB
- Rte 522 (Winchester Rd) & I-66 WB
- Rte 522 (Winchester Rd) & Riverton (North)

Figure 1-1 provides a detailed map of the study area and analyzed intersections and illustrates the location of the area in the northwestern Virginia region.

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

NSVRC
NORTHERN SHENANDOAH VALLEY REGIONAL COMMISSION

Senseny Road Elementary
Orchard View Elementary
Evendale Elementary
Admiral Richard E. Byrd Middle
Armel Elementary
Boyce Elementary School
Bass-Hoover Elementary
Robert E. Aylor Middle
Sherando High
Middletown Elementary
Winchester
Stephens City
Middletown
Double Tollgate

81
37
11
50
522
277
340
66

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Legend

- Intersections_Project_Study_Area
- Schools
- Secondary/Local Roadway
- Major Roadway
- Interstate Ramp
- Interstate
- **Route 522 Study Area**
- City / Town

Figure 1-1:
Project Study Area

N

7,400 3,700 0 7,400 Feet

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2.0 EXISTING CONDITIONS

This chapter identifies existing deficiencies and presents the traffic operating conditions along Route 522. A wide range of potential environmental, cultural, and social resources are located within the study area and should be considered fully in any subsequent National Environmental Policy Act (NEPA) studies for any federally funded improvement project. This study, however, focused on specific conditions and resources along the corridor in order to determine individual recommendations and identify any major constraints to their implementation.

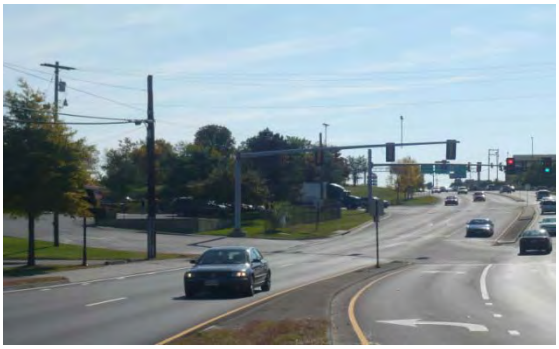
Existing Geometry

Route 522 (Millwood Avenue and Apple Blossom Drive) in the City of Winchester, from S. Pleasant Valley Road to Jubal Early Drive, is classified as a Minor Arterial roadway. Curb and gutter are present along this section of Route 522. Right of way varies from 70 - 80 feet in this segment.

Route 522 continues on Jubal Early Drive, east of Apple Blossom Drive. This segment, through Interstate 81 and into Frederick County, is classified as a Principal Arterial roadway. This segment has four lanes, features curb and gutter, a raised center median, and 80 – 90 feet of right-of-way. Right-of-way expands at the interchange area.

In Frederick County, east of Interstate 81, Route 522/50/17 (Millwood Avenue) is classified once again as a Minor Arterial roadway. Route 522 splits off from Route 50/17 and continues north/south as Front Royal Pike. This roadway segment from I-81 to south of Route 644 (Papermill Road) is five lanes, two lanes in each direction and a center bi-directional turn lane. Right-of-way ranges from 60 - 100 feet in this area. A speed limit of 35 mph is posted from

Figure 2-1: Typical Sections along Route 522



Route 522/17/50, west of Interstate 81

Route 522, north of Double Tollgate

Route 522, north of Interstate 66

Millwood Avenue (Route 50/17) to north of Bufflick Road and 45 mph from north of Bufflick Road to Airport Road.

From south of Route 644 to the Frederick County / Clarke County line, Route 522 (Front Royal Pike) is a four-lane divided roadway with a raised center median and varying right-of-way from 100 – 180 feet.

A two mile segment of Route 522 (Stonewall Jackson Highway) runs through Clarke County and intersects Routes 277 and 340 (Lord Fairfax Highway), known as the Double Tollgate area. Throughout this two-mile segment, Route 522 continues as a four-lane divided highway with a raised center median and right-of-way varying from 150 – 190 feet. A speed limit of 45 mph is posted in the Double Tollgate area.

In Warren County, from the Clarke County line to south of Interstate 66, Route 522 (Winchester Road) continues mostly as a four-lane divided highway with right-of-way ranging from 130 – 270 feet. A short segment of Route 522 becomes five-lane (two southbound, three northbound) from Interstate 66 to north of Country Club Road. This section features curb and gutter with right-of-way ranging from 130 – 370 feet.

As part of this study, 22 existing intersections were analyzed for capacity and safety deficiencies. The location of the existing intersections and their existing lane configuration are shown with the analysis presented later in this chapter.

Existing Zoning

The US 522 Corridor has a wide range of zoning classifications along it, including residential, agricultural, commercial and industrial zoned properties. In the northern section of the study corridor, in the City of Winchester and Frederick County, US 522 (Millwood Avenue, Millwood Pike, Front Royal Pike) consists of Highway Commercial zoned properties mixed with a Commercial Industrial district. Areas within the City of Winchester and Frederick Road, south of Costello Drive, are highly developed as the Apple Blossom Mall, Delco Plaza and other big box retail outlets are located along this section of US 522.

South of Costello Drive, in Frederick County, the corridor becomes much less developed, as parcels are predominantly residential or agricultural zoned properties with a few commercial or business zoned properties sparsely located along the corridor.

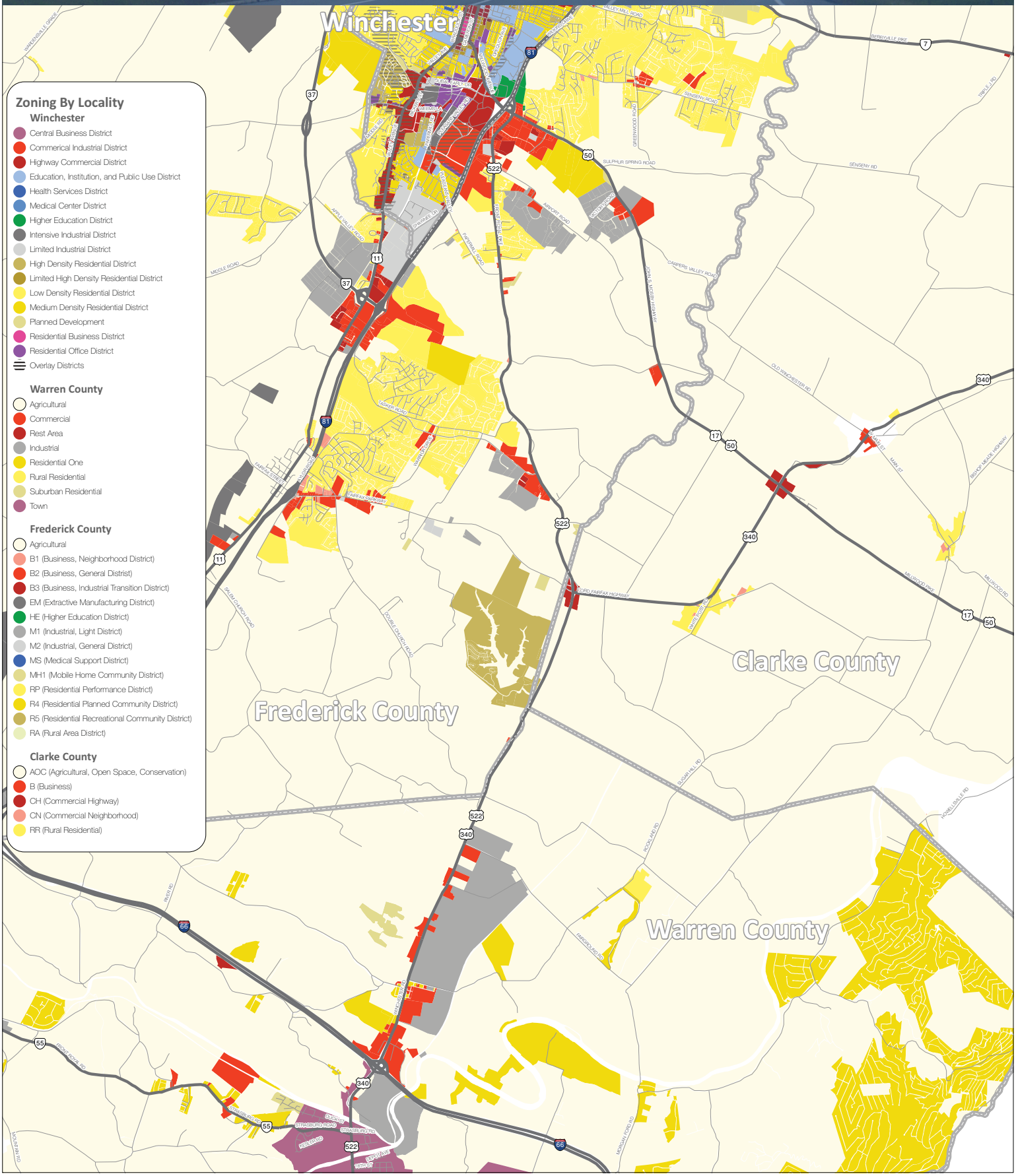
Further south along the corridor in Clarke County, all properties are zoned AOC (Agricultural, Open Space, Conservation), with the exception of a small Commercial Highway zoned district at the junction of US 522 and Lord Fairfax Highway (US 340).

Properties in Warren County primarily consist of Industrial and Commercial zoned parcels, with a small pocket of residential zoned properties existing at the US 522 intersection with Reliance Road. The industrial zoned property is located on the east side of US 522 and is the site of the Virginia Inland Port, while the commercial properties are located on the west side of US 522. A map of the existing zoning along the study corridor is shown in Figure 123

A map of the existing zoning in the City of Winchester and Frederick County is shown in Figure 2-2.

Route 522 Multimodal Corridor Study

Current Zoning by Locality



0 1/2 1 2 3 4 Miles

N

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Existing Traffic Volumes

Historic traffic counts were obtained from the Virginia Department of Transportation (VDOT) traffic count database. Table 2.1 documents Average Annual Daily Traffic (AADT) volumes from 2005-2008. Average annual growth rates along the Route 522 study area segments have ranged from -3.5% to 2.7%. The majority of the segments have experienced a decrease in traffic volumes since 2005. The weakened economy in recent years has had an impact and reduced traffic volumes not just along the Route 522 Corridor, but on a state-wide and nation-wide level as well.

Table 2.1 also shows heavy truck percentage on each segment of the Route 522 study area. Connecting Interstates 66 and 81, the Route 522 Corridor is home to the Virginia Inland Port (VIP). VIP handles 20,000 containers annually, generating several hundred truck trips utilizing Route 522. As shown in the table, the heavy truck percentage is between 3% and 5% outside of the Interstate 66 and 81 interchanges. Between the interchanges, the truck traffic ranges from 14% to 17% of the daily traffic volume.

Table 2.1: Historic Traffic Counts and Growth Rates

Locality	Roadway	Location	VDOT AADT				% Heavy Trucks	Average Annual Growth Rate
			2005	2006	2007	2008		
City of Winchester	Route 522 (Millwood Ave)	S Pleasant Valley Rd to Jubal Early Dr	13,000	13,000	14,000	13,000	3%	0.0%
	Route 522 (Millwood Ave)	Jubal Early Dr to I-81	26,000	25,000	28,000	25,000	3%	-1.3%
Frederick Co	Route 522 (Millwood Pike)	I-81 to Millwood Pike (50)	35,000	35,000	38,000	37,000	5%	1.9%
	Route 522 (Front Royal Pike)	Millwood Pike (50) to Papermill Rd (644)	15,000	15,000	16,000	14,000	15%	-2.2%
	Route 522 (Front Royal Pike)	Papermill Rd (644) to Macedonia Church Rd (642)	16,000	16,000	16,000	15,000	14%	-2.1%
	Route 522 (Front Royal Pike)	Macedonia Church Rd (642) to Clarke Co CL	14,000	14,000	14,000	14,000	14%	0.0%
Clarke Co	Route 522 (Stonewall Jackson Hwy)	Frederick Co CL to Double Tollgate	14,000	14,000	14,000	13,000	14%	-2.4%
	Route 522 (Stonewall Jackson Hwy)	Double Tollgate to Warren Co CL	19,000	19,000	19,000	17,000	17%	-3.5%
Warren Co	Route 522 (Winchester Rd)	NCL Warren Co to Reliance Rd (627)	19,000	19,000	19,000	17,000	16%	-3.5%
	Route 522 (Winchester Rd)	Reliance Rd (627) to I-66	22,000	22,000	22,000	22,000	15%	0.0%
	Route 522 (Winchester Rd)	I-66 to NCL Front Royal	25,000	25,000	25,000	27,000	4%	2.7%

Source: Virginia Department of Transportation Info Center – Traffic Data

Traffic counts were conducted along the study area corridor to supplement existing traffic count data obtained from previous studies in the corridor. Pneumatic tube counts and intersection turn movement counts were conducted in early June 2009.

Tube counts were conducted at six locations along Route 522. Four locations featured classification counts to record heavy truck percentages for comparison against the VDOT data. The other two count locations were conducted as volume-only tube counts. These Average Daily Traffic (ADT) volumes were compared to the VDOT Statewide Planning System 2008 counts and are shown in Table 2.2.

Table 2.2: Existing Route 522 Traffic Counts

Locality	Roadway	Location	2008 AADT (VDOT)	2009 ADT (Count)	2009 AM Peak Hour Volume	2009 PM Peak Hour Volume	% Heavy Trucks
City of Winchester	Route 522 (Millwood Ave)	South of Pleasant Valley Rd	13,000	15,200	895	1,255	-
	Route 522 (Millwood Ave)	Apple Blossom Dr to Jubal Early Dr	N/A	8,100	603	651	6.8%
Frederick Co	Route 522 (Front Royal Pike)	North of Costello Dr	14,000	21,600	1,198	1,681	-
	Route 522 (Front Royal Pike)	North of Double Tollgate	14,000	13,800	875	1,145	17.0%
Warren Co	Route 522 (Winchester Rd)	North of County Club Rd	22,000	21,700	1,316	1,726	16.6%
	Route 522 (Winchester Rd)	South of I-66	27,000	29,700	1,892	2,555	6.5%

Turning movement counts were also conducted in June 2009 at key intersections along the Route 522 Corridor. Recent traffic studies were review and new turn movement counts were conducted to supplement the existing data throughout the study area. Based on this data existing AM and PM peak hour turn movement volumes were developed for the study area intersections. The AM and PM peak hour intersection volumes are shown with the analysis results in the next section.

Existing Operating Conditions

Capacity analyses were conducted for the existing conditions at each of the 22 key intersections along Route 522 using Synchro 7.0 software. The key output from the capacity analyses is level of service for each intersection. Level of service (LOS) is a qualitative measure of the operating conditions of a traffic stream on a transportation facility. There are six LOS categories (LOS A through LOS F) used to rate facilities. LOS A represents the best operating conditions with no congestion and LOS F the worst with heavy congestion. LOS C is desirable but LOS D is considered an acceptable LOS in most urban and suburban areas. Detailed LOS and 95th percentile queue length results from the Synchro software analysis are shown in Table 2.3. Existing traffic conditions, including existing turn movement counts, lane geometry, and movement LOS, are shown in Figure 2-3 through Figure 2-6.

Fifteen existing signalized intersections were investigated along with seven stop-controlled intersections. Currently, fourteen of the fifteen signalized intersections are operating with an acceptable overall intersection LOS D or better in both the AM and PM peak hour. The following signalized intersections are currently operating with an overall intersection LOS E or LOS F in either the AM or PM peak hour.

- Intersection 3 – Route 522 (Millwood Pike) @ I-81 Southbound Ramps – This intersection is currently operating at LOS E during the AM peak hour and LOS C in the PM peak hour. The southbound approach (I-81 Southbound Ramp) is currently operating at LOS F in the AM peak hour and LOS E in the PM peak hour. This poor approach level of service contributes to the overall intersection LOS E in the AM peak hour. All other approaches at this intersection are operating at an acceptable LOS D or better in the AM and PM peak hours.

In addition to the signalized intersections, seven stop-controlled intersections were also analyzed. Shown below, two of the intersections have turn movements that are currently operating with an unacceptable LOS E or worse in either the AM or PM peak hour.

- Intersection 17 – Route 522 (Winchester Road) @ Route 658 (Rockland Road) – The westbound left-right shared lane turn movements are currently operating at LOS D in the AM peak hour and LOS F in the PM peak hour.
- Intersection 22 – Route 522 (Winchester Road) @ Route 637 (Riverton Road) – The westbound minor approach left-right shared lane turn movements are currently operating at LOS F in the PM peak hour. All approaches are operating at LOS C or better in the AM peak hour.

Table 2.3: Existing Conditions Level of Service Summary

Intersection #	Operation	Intersection		Approach	Lane Group L = Left T = Thru R = Right	Existing Year 2008							
						AM Peak Hour				PM Peak Hour			
		E/W Roadway	N/S Roadway			95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS	95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS
1	Signalized	Millwood Ave	Pleasant Valley Rd	Eastbound	L	80	D	E	D	41	D	E	D
					T	628	F			780	F		
					R	166	D			204	C		
				Westbound	L	55	D	E		100	E	E	
					T	379	E			559	E		
					R	395	E			388	E		
				Northbound	L	232	F	D		328	F	D	
					T-R	123	B			356	C		
				Southbound	L	103	B	C		171	D	D	
					T	249	C			397	D		
					R	0	A			0	A		
2	Signalized	Millwood Pike	Frontage Rd	Eastbound	L	13	D	B	B	54	E	D	C
					T-R	109	B			587	D		
				Westbound	L	98	B	A		186	B	A	
					T-R	94	A			34	A		
				Northbound	L	28	D	D		48	D	E	
					T-R	48	D			176	E		
				Southbound	L-T	28	D	D		26	D	D	
					R	19	D			28	D		
3	Signalized	Millwood Pike	I-81 SB Ramps	Northbound	T	43	A	A	E	156	B	A	C
					R	0	A			5	A		
				Westbound	L	262	D	C		442	F	C	
					T	481	C			360	A		
				Southbound	R	348	F	F		299	E	E	
4	Signalized	Millwood Pike	I-81 NB Ramps/Front Royal Pike	Eastbound	L	115	C	B	B	535	D	C	C
					T	170	A			330	B		
					R	0	A			0	A		
				Westbound	L	50	C	B		113	D	C	
					T	147	B			422	C		
					R	0	A			0	A		
				Northbound	L	132	C	C		454	D	D	
					T	140	C			300	C		
					R	9	C			37	B		
				Southbound	L	125	D	B		193	E	D	
					T	69	D			86	D		
					R	0	A			0	A		
5	Signalized	Costello Drive	Route 522	Eastbound	L-T	37	D	D	B	41	E	E	C
					R	11	D			13	D		
				Westbound	L	84	D	D		142	D	D	
					T-R	38	C			81	D		
				Northbound	L	0	C	C		17	E	D	
					T-R	171	C			288	D		
				Southbound	L	18	B	A		381	C	B	
					T-R	14	A			37	A		
6	Signalized	Airport Road	Route 522	Westbound	L	107	D	D	A	42	C	C	A
					R	41	D			25	C		
				Northbound	T	125	A	A		173	A	A	
					R	13	A			17	A		
				Southbound	L	15	A	A		16	A	A	
					T	65	A			71	A		
7	Signalized	Papermill Rd (Route 644)	Route 522	Eastbound	L-R	170	D	D	B	390	E	E	C
				Northbound	L	75	A	A		79	A	A	
					T	76	A			104	A		
				Southbound	T-R	124	B	B		196	B	B	
8	Stop-Controlled	Macedonia Church Rd (Route 642)	Route 522	Eastbound	L-R	51	C	C	N/A	38	C	C	N/A
				Northbound	L	1	A	A		2	A	A	
					T	0	A			0	A		
				Southbound	L	0	A	A		0	A	A	
					T	0	A			0	A		
					R	0	A			0	A		
9	Stop-Controlled	Tasker Rd (Route 642)	Route 522	Eastbound	L	26	B	B	N/A	36	C	C	N/A
					R	26	A			36	A		
				Northbound	L	9	A	A		19	A	A	
					T	0	A			0	A		
				Southbound	L	0	N/A	A		0	N/A	A	
					T	0	A			0	A		
					R	0	A			0	A		
10	Signalized	Maranto Manor Dr	Route 522	Eastbound	L	9	E	E	A	22	E	E	A
					R	12	E			15	E		
				Northbound	L	12	E	A		12	E	A	
					T	70	A			114	A		
				Southbound	L	6	E	A		6	E	A	
					T	78	A			93	A		
					R	6	A			2	A		
11	Signalized	Lord Fairfax Hwy (Rte 277 & Rte 340)	Route 522	Eastbound	L-T	215	D	C	C	133	D	D	D
					R	48	C			50	D		
				Westbound	L	108	D	D		171	C	D	
					T-R	93	C			328	D		
				Northbound	L	104	D	C		182	E	C	
					T	145	C			213	C		
					R	45	C			52	C		
				Southbound	L	102	D	C		59	D	C	
					T	141	C			180	C		
					R	14	C			21	C		

Table 2.3: Existing Conditions Level of Service Summary (cont.)

Intersection #	Operation	Intersection		Approach	Lane Group L = Left T = Thru R = Right	Existing Year 2008							
						AM Peak Hour				PM Peak Hour			
		E/W Roadway	N/S Roadway			95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS	95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS
12	Signalized	Lake Frederick	Route 522	Eastbound	L	21	D	D	A	20	D	D	A
					R	8	D			8	D		
				Northbound	L	6	D	A		7	D	A	
					T	47	A			68	A		
				Southbound	L	0	N/A	A		0	N/A	A	
					T	100	A			132	A		
					R	8	A			11	A		
13	Stop-Controlled	Rocky Glen Dr	Route 522	Westbound	R	0	A	A	N/A	1	B	A	N/A
				Northbound	T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	T	0	A	A		0	A	A	
14	Stop-Controlled	Ashby Station Rd (Route 639)	Route 522	Eastbound	L-T-R	4	C	C	N/A	5	D	D	N/A
				Westbound	L-T-R	2	C	C		1	B	B	
				Northbound	L-T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	L	0	A	A		0	A	A	
					T	0	A			0	A		
					R	0	A			0	A		
15	Signalized	Fairground Rd (Route 661)	Route 522	Westbound	L	46	C	C	A	75	C	C	A
					R	23	C			31	C		
				Northbound	L	0	A	A		0	A	A	
					T	103	A			143	A		
					R	17	A			16	A		
				Southbound	L	62	D	A		49	D	A	
					T	48	A			74	A		
16	Signalized	Toray Dr	Route 522	Westbound	L	83	C	C	B	110	C	C	B
					R	12	C			21	C		
				Northbound	L	0	A	B		0	A	B	
					T	162	B			198	B		
					R	22	B			10	B		
				Southbound	L	12	C	A		5	C	A	
					T	107	A			162	A		
17	Stop-Controlled	Rockland Rd (Route 658)	Route 522	Westbound	L-R	92	D	D	N/A	100	F	F	N/A
				Northbound	T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	L	4	A	A		5	A	A	
					T	0	A			0	A		
18	Stop-Controlled	Reliance Rd (Route 627)	Route 522	Eastbound	L	15	C	C	N/A	10	C	C	N/A
					R	5	C			10	C		
				Northbound	L	0	A	A		0	B	B	
					T	0	A			0	A		
				Southbound	T-R	0	A	A		0	A	A	
19	Signalized	Country Club Rd / Townsend Dr (Route 655)	Route 522	Eastbound	L	18	D	D	C	70	D	D	C
					T	35	D			61	D		
					R	34	D			71	D		
				Westbound	L	74	D	C		139	D	D	
					T	30	C			91	D		
					R	24	C			49	D		
				Northbound	L	65	D	B		172	D	C	
					T	182	B			163	B		
					R	21	B			32	B		
				Southbound	L	50	D	C		76	D	C	
					T	215	B			317	C		
					R	19	B			50	B		
20	Signalized	I-66 WB	Route 522	Westbound	L	28	C	C	A	94	C	C	A
					R	68	C			72	C		
				Northbound	T	135	A	A		193	A	A	
				Southbound	T	110	A	A		135	A	A	
21	Signalized	I-66 EB	Route 522	Eastbound	L	109	C	C	A	33	C	D	A
					LT	109	C			34	C		
					R	75	C			183	D		
				Northbound	T	231	B	B		365	B	B	
					R	30	N/A			24	N/A		
				Southbound	L	202	N/A	B		148	N/A	B	
					T	92	D			157	D		
22	Stop-Controlled	Riverton Road	Route 522	Westbound	L-R	12	C	C	N/A	198	F	F	N/A
				Northbound	T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	L	2	B	B		6	B	B	
					T	0	A			0	A		

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

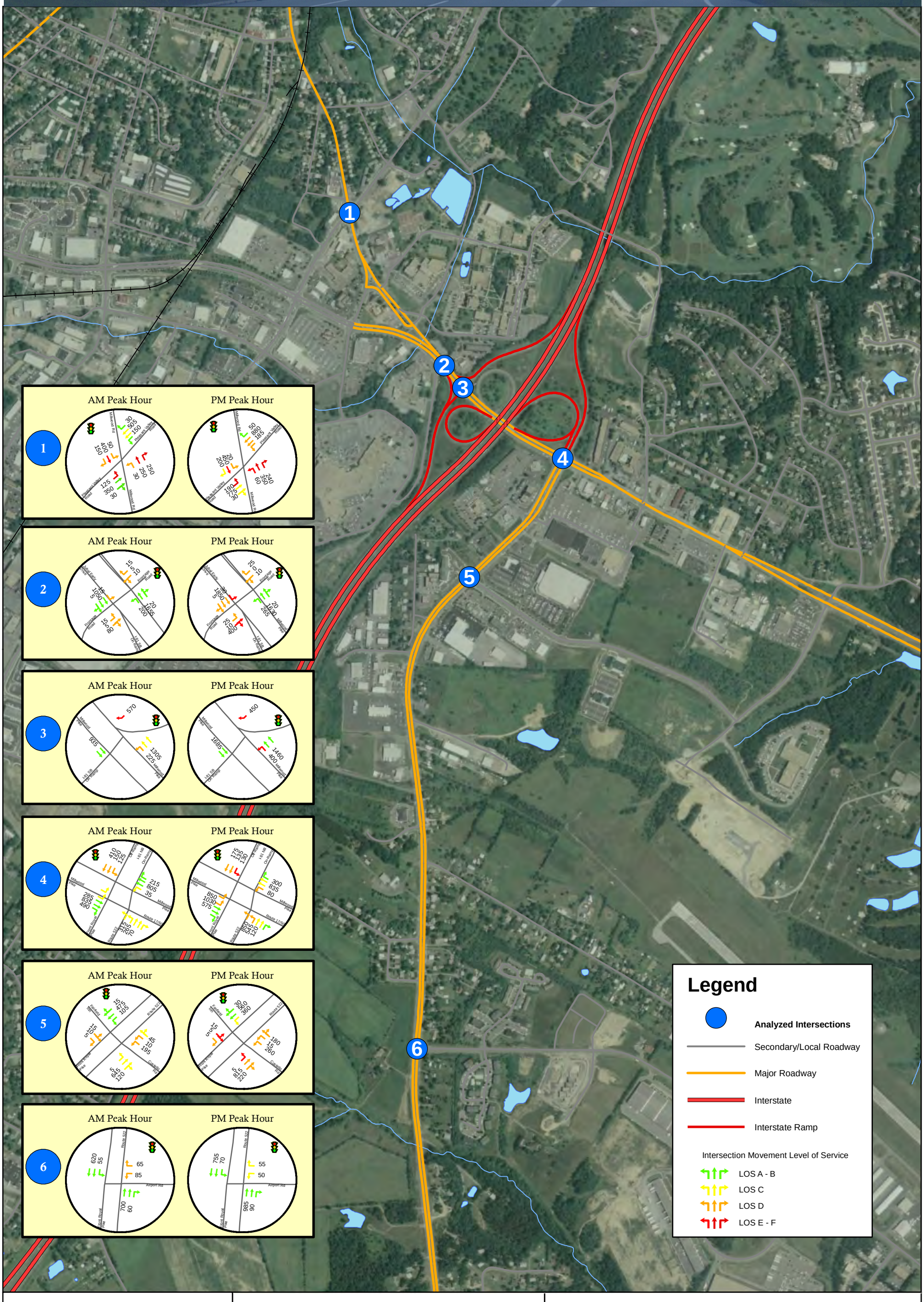


Figure 2-3:
Existing Conditions

N

1,100 550 0 1,100 Feet

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

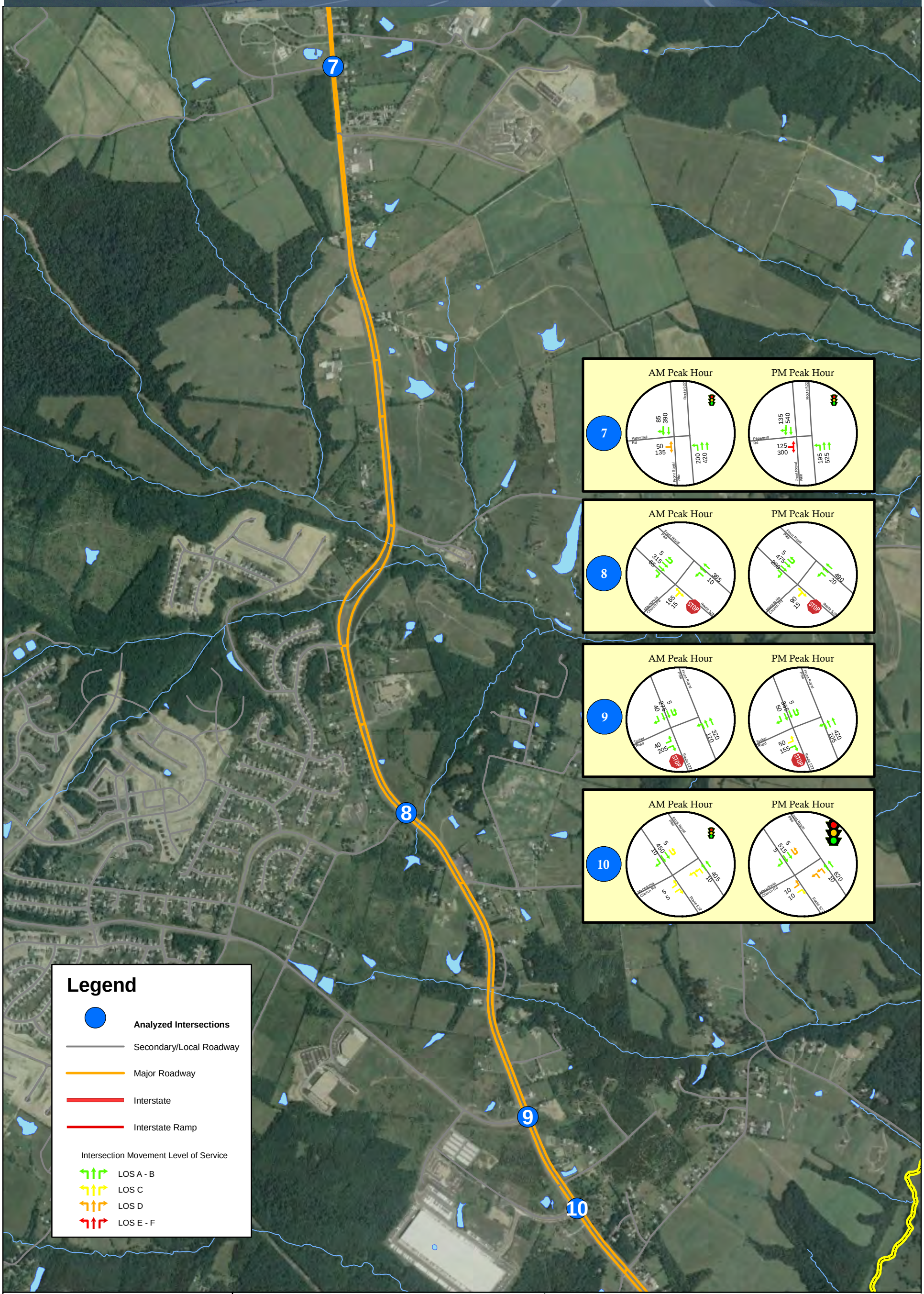


Figure 2-4:
Existing Conditions

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

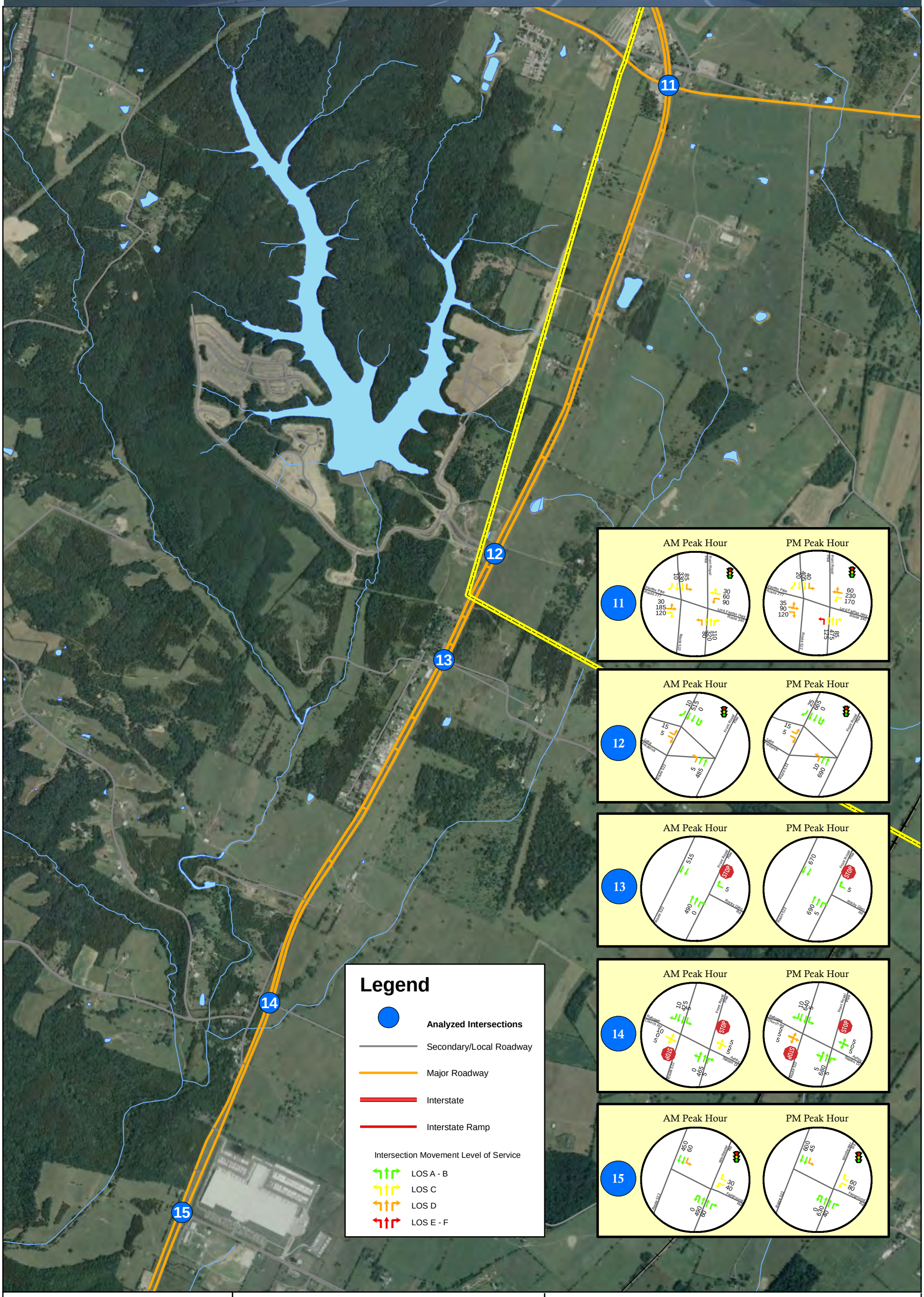


Figure 2-5:
Existing Conditions

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

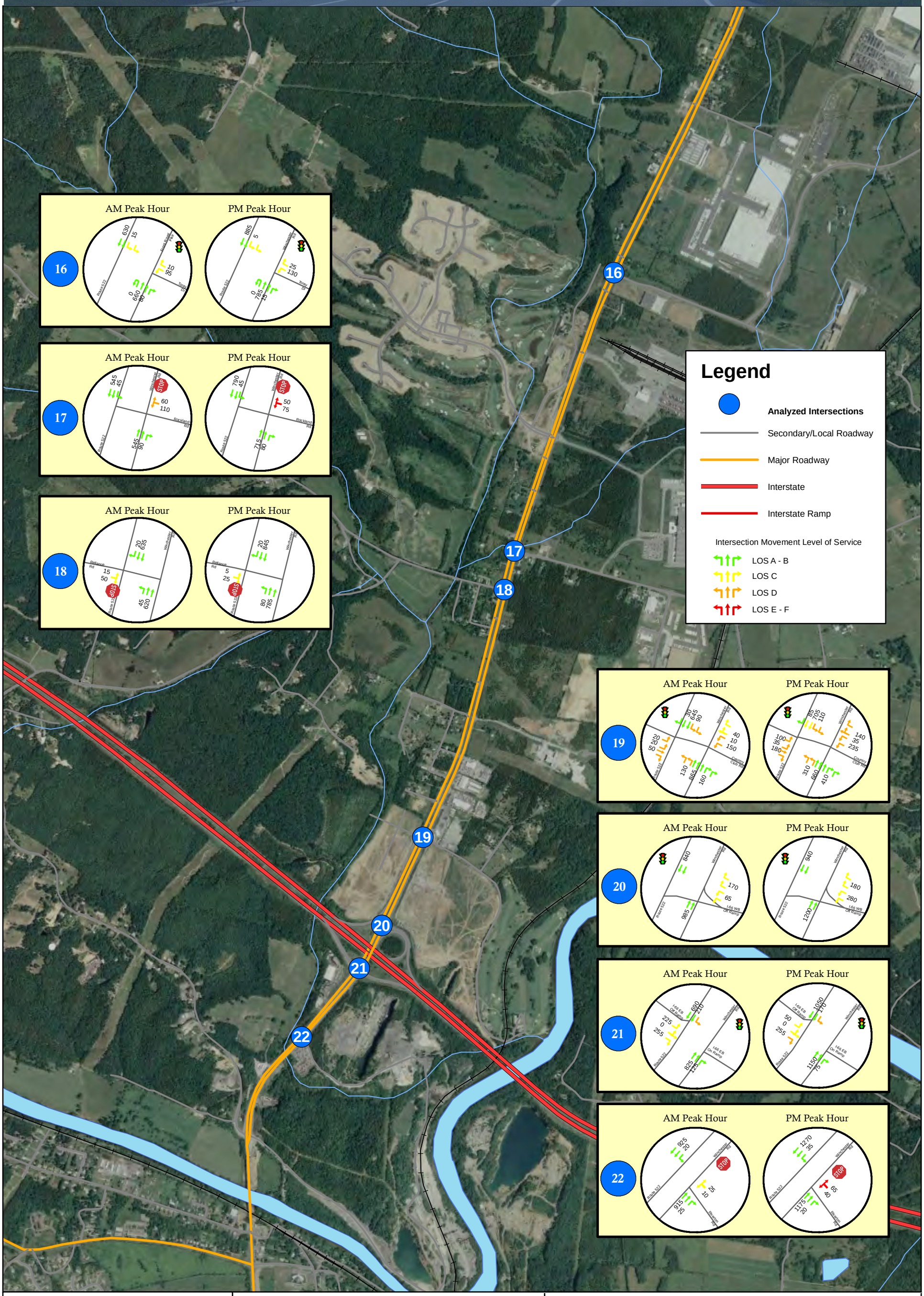


Figure 2-6:
Existing Conditions

N

1,900 950 0 1,900 Feet

Baker

RENAISSANCE PLANNING GROUP

For the signal warrant analysis, the volumes at each intersection were analyzed using the *Manual on Uniform Traffic Control Devices (MUTCD)*, Millennium Edition. Given the limited nature of this study and the limited amount of volume data collected, each intersection was analyzed only for its satisfaction of the Peak Hour signal warrant conditions (Signal Warrant 3). The Peak Hour signal warrant conditions apply to intersections where a large number of vehicles pass through the intersection in a relatively short time period.

The peak hour volume signal warrant analysis showed only one intersection, Route 522 / Riverton Road, which met the AM or PM peak hour warrant. It is important to note when assessing traffic signal needs that VDOT does not install a traffic signal until it meets warrants for eight hours and is approved by the District Traffic Engineer. Therefore, this intersection of concern should be continuously monitored.

In 2008, a VDOT traffic signal warrant study was conducted for the intersection of Route 522 (Front Royal Pike) and Route 756 (Macedonia Church Road). A twelve hour set of traffic data was used to determine whether the warrants provided by the MUTCD were satisfied. The study found that the intersection does warrant a traffic signal based on the procedures described in the MUTCD. VDOT funding has been requested, but has not yet been approved.

Roadway Level of Service was also analyzed using Highway Capacity Software (HCS+) for the Route 522 Corridor at various locations along the corridor. Roadway LOS is determined by the peak hour roadway volumes as well as roadway characteristics such as roadway type, lane width, free flow speed, truck percentage and other factors. Roadway LOS is similar to intersection LOS in that both use the letters "A" through "F" to designate the different service levels. Table 2.4 shows the existing conditions Roadway LOS for the analyzed segments of Route 522.

Table 2.4: Existing Roadway Level of Service Summary

Locality	Roadway	Location	# Lanes	HCM Methodology	2009 ADT (Count)	2009 Roadway Level of Service
City of Winchester	Route 522 (Millwood Ave)	South of Pleasant Valley Rd	4	Urban Street	15,200	B
	Route 522 (Millwood Ave)	Apple Blossom Dr to Jubal Early Dr	2	Urban Street	8,100	B
	Route 522 (Millwood Ave)	Jubal Early Dr to I-81 SB Ramps	4	Urban Street	27,700	C
Frederick Co	Route 522 (Millwood Ave)	I-81 SB Ramps to I-81 NB Ramps	4	Urban Street	37,300	D
	Route 522 (Front Royal Pike)	North of Costello Dr	4	Rural Multilane	21,600	B
	Route 522 (Front Royal Pike)	North of Double Tollgate	4	Rural Multilane	13,800	A
Warren Co	Route 522 (Winchester Rd)	North of County Club Rd	4	Rural Multilane	21,700	B
	Route 522 (Winchester Rd)	South of I-66	4	Rural Multilane	29,700	C

The Roadway Level of Service results show that the entire corridor is currently operating at Level of Service D or better. The roadway segments along Route 522/50/17, near the I-81 interchange in the City of Winchester and Frederick County, are operating at LOS C and LOS D, respectively. Volumes are moderate to high and are expected to increase in the future, creating a worse Level of Service. The rural areas of the corridor are currently operating between LOS A and LOS C.

Safety

Crash data from 2006 through 2008 was obtained from the City of Winchester and VDOT for the portion of the Route 522 Corridor north of Double Tollgate Road. This safety analysis was conducted to complement the August 2008 VDOT Study, *US 340/522 Geometrics and Safety* Survey, and only contains data from the northern terminus of the previous study (Double Tollgate) through the northern terminus of this study area (City of Winchester).

The Institute of Transportation Engineers (ITE) recommends that improvements be evaluated for intersections with a crash rate of over 2 crashes per million entering vehicles (MEV). As shown in Table 2.5 most of the intersections along the northern portion of Route 522 have crash rates of less than 1.00 crashes per MEV. The intersection of Millwood Avenue and Pleasant Valley Road has a crash rate of 3.27 per million vehicles entering the intersection, which is over the ITE threshold.

For the portion of Route 522 south of Double Tollgate Road, crash data from the *US 340/522 Geometric and Safety Survey* was used for the analysis. The data for this study was collected from 2003 to 2007. The intersections of Route 522 with Double Tollgate Road, Fairground Road, and Reliance Road average 2.4 to 4.2 crashes per year. Traffic volume data is not available for these intersections, however when compared to the average crash data from the northern portion of the Route 522 Corridor, it seems that these intersections will be below the threshold of 1.00 crashes per MEV.

Crash data was also analyzed for roadway segments along Route 522. Only intersection data and not link data was available from Pleasant Valley Road to Front Royal Pike. The statewide crash rate for primary roadways is 161 crashes per 100 million vehicle miles traveled (VMT). The crash rate in the Staunton Region is 111 crashes per 100 million VMT. As shown in Table 2.6, all of the roadway links along Route 522 have crash rates less than the statewide average; however the section of Route 522 from the I-81 northbound ramps to Papermill Road (Route 644) has a crash rate of 126 per 100 million VMT which exceeds the Staunton Region crash rate. This may be due to the number of access points along this portion of the facility as well as the more developed residential and commercial land uses.

The crash data showed that there were 162 crashes along the northern portion of the Route 522 Corridor during the three year period. Approximately 33 percent of these were “Angle” type crashes, 25 percent were “Rear End” type, and 16 percent were “Fixed Object Off-Road”. “Angle” and “Rear End” type accidents are often associated with at shared left turn lane.

Table 2.5: Intersection Crash Rates Summary

From	To	Link Length	Avg # acc	ADT	Crashes per 100M Vehicle Miles Traveled
Pleasant Valley Rd	Frontage Rd	NO DATA			
Frontage Rd	I-81 SB Ramps				
I-81 SB Ramps	I-81 NB Ramps/Front Royal Pike				
North of Study Area	I-81 NB Ramps/Front Royal Pike	0.19	NA	37,000	NA
I-81 NB Ramps/Front Royal Pike	Papermill Rd (644)	2.43	16	14,000	126
Papermill Rd (644)	Clark/Frederick Co Line	4.69	13	14,500	54
Clark/Frederick Co Line	Double Tollgate	0.3	0.8	13,000	56
Double Tollgate	Warren/Clark Co Line	1.8	7.6	17,000	68
Warren/Clark Co Line	Reliance Rd	4.5	14.2	17,000	51
Reliance Rd	I-66	1.5	10.2	22,000	85
I-66	Warren Co Line/Front Royal	NO DATA			

Source: Crash Records from City of Winchester Police Department, VDOT

Table 2.6: Roadway Link Crash Rates Summary

Intersection				2006	2007	2008	Average # Accidents per year	Average Crashes per Million Entering Vehicles
1	Millwood Ave	@	Pleasant Valley Rd	38	19	40	30.8	2.46
2	Millwood Pike	@	Frontage Rd	13	14	10	11.0	0.71
3	Millwood Pike	@	I-81 SB Ramps	0	2	0	0.8	0.05
4	Millwood Pike	@	I-81 NB Ramps/Front Royal Pike	1	1	2	1.3	0.06
5	Costello Dr	@	Rte 522	1	1	1	1.0	0.11
6	Airport Rd	@	Rte 522	0	2	0	0.7	0.09
7	Papermill Rd (644)	@	Rte 522	0	3	0	1.0	0.15
8	Macedonia Church Rd (642)	@	Rte 522	3	4	2	3.0	0.63
9	Tasker Rd (642)	@	Rte 522	0	3	1	1.0	0.22
10	Maranto Manor Dr	@	Rte 522	NA	NA	NA	NA	NA

Source: Crash Records from City of Winchester Police Department, VDOT

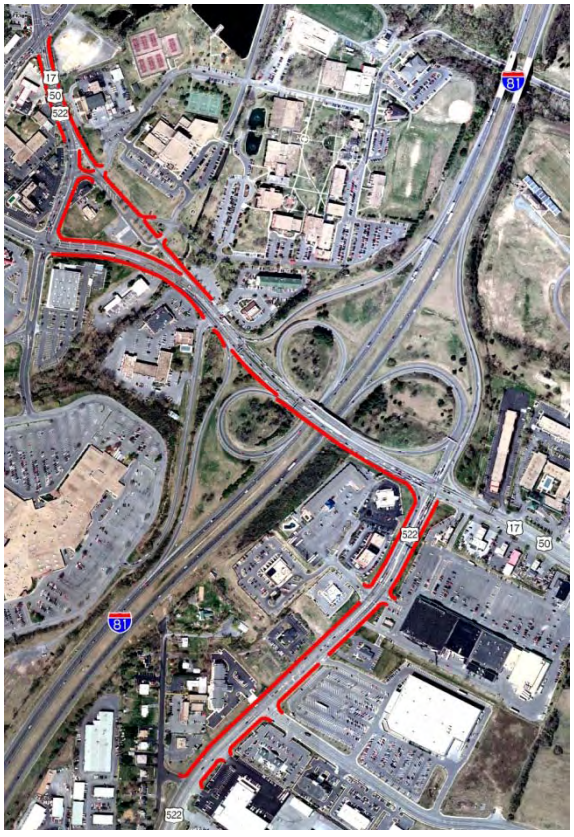
Existing Multimodal Facilities

This section discusses existing multimodal facilities in the Route 522 Corridor. Recommendations for multimodal improvements to facilitate alternatives to single-occupant vehicle movements will be based on existing and future need and presented in the Recommendations chapter of this report. Data has been collected for pedestrian and bicycle facilities, freight and goods movement in the corridor, transit operations, and potential intermodal facilities such as park and ride lots. In the corridor's existing condition, the dominant mode of transportation within the Route 522 Corridor is by private automobile. Alternative modes are accommodated more so to the north of the I-81 interchanges, within the city limits of Winchester, where there are transit services and the provision of sidewalk networks that can meet demand for alternative modes. In general, alternative modes do not exist in the rest of the study corridor. The following sections discuss the existing conditions for the various modes.

Pedestrian Facilities

Sidewalks exist along Route 522 within the City of Winchester and along the Route 522 Corridor in Frederick County, to the area of Costello Drive. Pedestrian facilities along the corridor are generally sufficient within the City of Winchester and Frederick County as sidewalks and crosswalks are part of the Route 522 streetscape and provide connection between commercial and mixed use developments in the area. Existing sidewalks are shown in Figure 2-7.

Figure 2-7: Existing Sidewalk Locations



Pedestrian facilities become non-existent along the rest of the Route 522 Corridor, south of Costello Drive and the Costco / Delco Plaza shopping center. Pedestrian facilities are lacking in the more rural sections of the study area; particularly in Frederick, Clark and Warren Counties.

Bicycle

Currently, there is a lack of bicycle facilities along US 522. With the exception of a single shared-use path along Macedonia Church Rd, south of Armel Elementary School, there are no other existing bike lanes or multi-purpose trails along or adjacent to the US 522 study corridor.

As a result of minimal bicycle accommodations currently existing along most of the study corridor, only bicycle users who are comfortable riding with motor vehicle traffic would likely ride on the current state of Route 522.

Transit

The Route 522 Corridor is served by one fixed route line of Win-Tran that operates within the corporate limits of Winchester. Win-Tran Route 3, the Apple Blossom Mall route, is a fixed route service that operates between Winchester City Hall and the Apple Blossom Mall area. On weekdays, Route 3 departs City Hall every hour on the hour between 6AM and 7PM and on Saturdays between 9AM and 4PM. The Apple Blossom Mall route departs City Hall and then travels along Braddock St and Cork St before heading south along Parkway St. and Pleasant Valley Rd. to the Apple Blossom Mall area. On its inbound route, the Apple Blossom Route takes a more direct route to City Hall, as it follows Route 522 for the entire inbound route. According to ridership figures obtained from the Winchester Department of Transportation, the Apple Blossom Mall route served 18,283 riders between July 1, 2008 and June 30, 2009.

In addition to the fixed route public transportation service, the Route 522 Corridor is also served by para-transit services. Para-transit is a curb-to-curb service available to citizens who are unable to utilize the regular fixed-route public transit system. Win-Tran operates para-transit services within the City of Winchester, while Virginia Regional Transit (VRT) operates a demand response service in Clark, Frederick and Warren Counties.

Freight Patterns

Freight is a vital contributor to the local economy as truck traffic accounts for up to 17 % of vehicles along the US 522 Corridor (VDOT Traffic Count Data). Furthermore, truck traffic from the Virginia Inland Port uses US 522 to access I-81, I-66 and I-70 via US 340. Due to the important linkage US 522 has to the Interstate Highway System, incorporating freight accommodations is needed to allow the free flow movement of goods and services within and through the region. By addressing freight needs in this

study, the US 522 Corridor will be better able to limit the negative impacts that freight and truck traffic often have on regional roadways.

Virginia Inland Port:

The Virginia Inland Port (VIP) is a major generator of truck traffic along the US 522 Corridor. The Virginia Inland Port is located on US 522 in Warren County, approximately one mile north of I-66. The VIP is an inland intermodal container transfer facility for containers to transfer across modes for cargo shipped to and from the marine terminals in the Hampton Roads area. Along with the marine terminals in the Hampton Roads area, the Virginia Inland Port is one of four facilities that have been consolidated into the "Port of Virginia" by the Virginia Port Authority and processed 24,500 containers in 2009.

The VIP is connected to rail owned and operated by Norfolk Southern and is part of the Crescent Corridor initiative. The Crescent Corridor is a key north-south rail corridor that provides intermodal freight service between the Southeast United States and New England. Norfolk Southern plans to improve efficiency along the Crescent Corridor by upgrading rail infrastructure in order to provide double-stacking services that will increase container capacity.

Contacts with county officials, port representatives and trucking companies and a review of the available data have yielded the following conclusion:

- While located directly on Route 522, the VIP does not appear to be a significant contributor to the high truck volume percentage on Route 522, between Interstates 66 and 81. The average number of containers processed daily (less than 100) at the VIP would equate to under one-percent of the average daily traffic along Route 522. The high percentage of truck traffic along Route 522 may be caused by cut-through traffic between Interstates 66 and 81, creating a more direct route and also bypassing a truck weigh station along I-81. It would be difficult to divert any of this traffic without impacting the local freight activity centers, including local retailers and distribution centers.

These conclusions are supported by the following observations:

- Since 2004, the VIP processes an average of 31,400 containers annually, which is unlikely to produce more than several hundred truck trips daily;
- Trucks that service the Virginia Inland Port (VIP) use U.S. 340 and U.S. 522, which provide direct access to the VIP;
- The majority of the local commercial and logistics development, likely destinations for much outbound container traffic, has occurred along the U.S. 522 Corridor, and
- Heavy truck percentages range from seven to seventeen percent of the Average Annual Daily Traffic along Route522 in the City of Winchester, Frederick County, Clarke County, and Warren County.

- While the VIP container traffic adds to the number of heavy trucks on Route 522, the high percentage of heavy trucks along Route 522 may be caused by cut-through traffic between Interstates 66 and 81, and other freight activity centers along the corridor.

There are several activity centers and freight markets that attract freight traffic along key Virginia corridors. Several of these markets are directly or indirectly connected to Route 522. This section details the freight markets surrounding Route 522, as reflected in Figure 2-8.

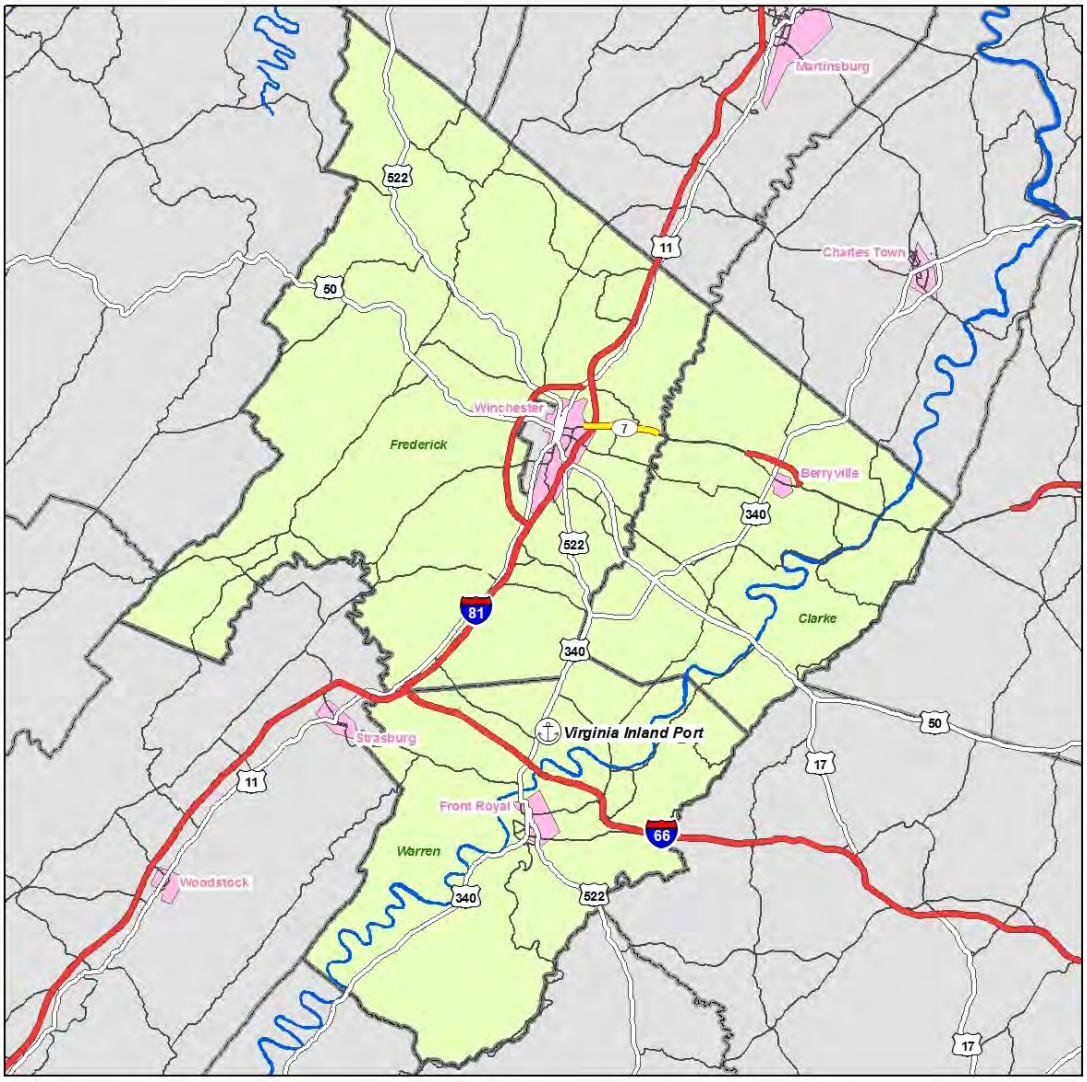
Frederick County/Winchester - The City of Winchester is an incorporated city within the boundaries of Frederick County. Winchester is only 50 minutes west of Dulles International Airport. Using I-66, one can reach Winchester from Tyson's Corner, Northern Virginia, in just over an hour. Both the City of Winchester and Frederick County promote economic development and encourage many retailers, manufacturers and technology enterprises to be located within their borders. The County has focused on two freight intensive industries in its economic development efforts:

- Food Processing - The food processing industry is a link between the agricultural and retail sectors and Winchester is the critical location for these companies to operate. Winchester is an attractive location for perishable products and packaged foods manufacturing operations.
- Distribution - Located on the Interstate 81 corridor and at a mid-point on the east coast, Fredrick County is well suited for high-end assembly operations. Ford Distribution Center, Home Depot Distribution and Kohl's Distribution have taken advantage of the area's transportation system, workforce and tax advantages.

Warren and Clarke Counties - Warren County is located in the Shenandoah Valley of northwestern Virginia and is approximately 70 miles from Washington, D.C., 110 miles from Baltimore and 135 miles from Richmond. The Virginia Inland Port is located in the county, with direct access to the Route 522 Corridor.

Clarke County is a rural county with a population of approximately 14,500. Over 97 percent of the county is zoned as either agricultural/open space or forestry. The preservation of the rural landscape of the county has influenced many industries, business and residential developments to move farther west to Frederick County.

Figure 2-8: Virginia Inland Port and Surrounding Region



Regional Routes Used by VIP Traffic

This assessment focuses on the impact of VIP truck traffic on Route 522. Discussions with both VIP representatives and local freight-related industries suggest that Route 522, while directly used by VIP freight, is not impacted significantly by VIP-generated traffic, simply because VIP does not generate a large volume of truck traffic.

VIP daily truck traffic is not estimated to exceed several hundred truck trips per day. Therefore, much of the truck traffic that is on U.S. 522/340, adjacent to VIP, is a combination of local warehousing/distribution center traffic and other possible cut-through traffic.

VIP traffic is oriented to Interstate 81, I-66 and I-70, using U.S. 522 and U.S. 340 to access the interstate system for regional destinations. In addition, U.S. 522 connects with U.S. 340 and provides a direct route to I-70, which extends east and provides connectivity to Baltimore.

Park and Ride Lots

VDOT maintains park and ride facilities across the Commonwealth in efforts to reduce congestion through the encouragement of carpooling. The US 522 Corridor is served by the Crooked Run and the Double Tollgate Park & Ride lots. The Crooked Run lot is owned by Warren County and is located just south of US 66 in Front Royal at the intersection of US 522 and Riverton Road. The Crooked Run facility has 262 spaces available and is also served by the Valley Connection express bus service to Northern Virginia and Washington D.C. The Double Tollgate lot is a VDOT owned facility located at the US 522 intersection with Ray Hope Lane, just south of VA 277/340 and has 187 spaces available.

Other Roadway Deficiencies

A field visit was conducted to assess the safety and access of the US 522 Corridor and to build upon the VDOT *US 340/522 Geometrics and Safety Survey*, dated August 2008. The focus of the field visit was the northern section of the corridor from Lord Fairfax Parkway (Route 277 / 340) in Clarke County, through the I-81 interchange, to Pleasant Valley Road in the City of Winchester. The southern portion of the corridor, south of Lord Fairfax Parkway is discussed in the *VDOT US 340/522 Geometrics and Safety Survey*.

The typical section for most of the Route 522 Corridor is up to VDOT standards. South of Papermill Road (Route 644), the typical section of US 522 is two twelve-foot lanes in each direction, the shoulders are a minimum of six feet, and there is a raised or depressed median at least twelve feet wide, except where left-turn lanes are present. North of Papermill Road, US 522 is five lanes, with the center lane being a shared left-turn lane. Curb and gutter are present on both sides of the roadway.

The access point spacing throughout the corridor does not meet the standards set by VDOT's *Access Management Design Standards for Entrances and Intersections: Principal Arterials*. The VDOT access management regulations state that unsignalized crossovers on rural principal arterials should be spaced at distances of at least 1,760 feet for roadways with speed limits of 50 miles per hour or greater.

Some of the commercial access points throughout the corridor also do not meet the VDOT regulation of 585 feet for a rural arterial or the 325 feet for an urban arterial. This is especially true for the northern portion of US 522 leading into the City of Winchester as many commercial access points are in close proximity to each other.

Figure 2-9 and Figure 2-10 show examples of close proximity access points along the corridor.

Other deficiencies in the northern portion of the US 522 are discussed in Appendix A:

- Missing portions of sidewalk and below-standard pedestrian ramps (Also shown in Figure 2-10)
- Deteriorating pavement conditions and pavement markings.
- Inoperable pedestrian signals and pedestal poles missing signal heads.
- Trailblazing signs that are not standard sizes.
- Possible drainage issues and/or puddling.

Figure 2-9: Example of Median Crossover Not Meeting VDOT Regulation

Figure 2-10: Example of Commercial Access Not Meeting VDOT Regulation

3.0 PROJECTED FUTURE CONDITIONS

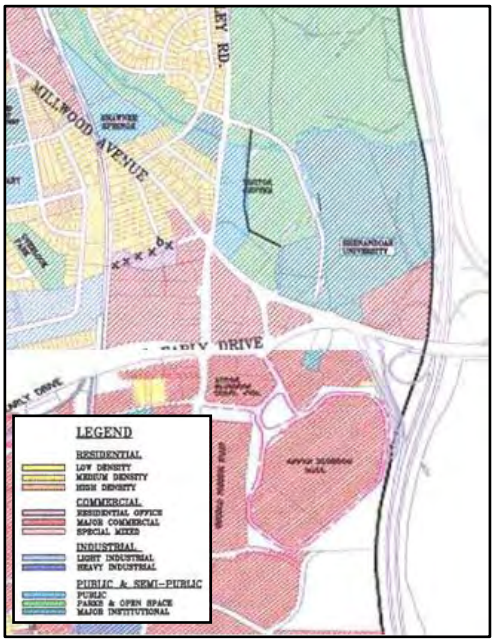
Projections of future traffic along the Route 522 Corridor were developed for the Horizon Year 2035. Various methods and sources were used in generating future condition traffic volumes within our study area. These methods, described below, were utilized to determine future traffic levels in the study area for the Horizon Year 2035. The highway capacity analysis presented in this chapter is based on a future roadway condition where no new roadway improvements are in place other than those already planned and programmed in the regional plan.

2035 Future Land Use

Planned land use was obtained from the City of Winchester, Frederick County, Clarke County, and Warren County and compared to the respective existing zoning. The planned and expected land use along the corridor was analyzed to determine the expected corridor growth.

The Route 522 Corridor in the City of Winchester is a short but heavily traveled portion of the study area. The Millwood Avenue and Jubal Early Drive area is composed of relatively mature and stable land uses, including institutional (Shenandoah University) and commercial (Apple Blossom Mall) areas. Local land use policies are focused on infill and redevelopment of adjacent commercial uses. A corridor overlay district controls property setbacks and controls design of adjacent uses. The Frederick County future land use is shown for the study area in Figure 3-1.

Figure 3-1: City of Winchester Future Land Use



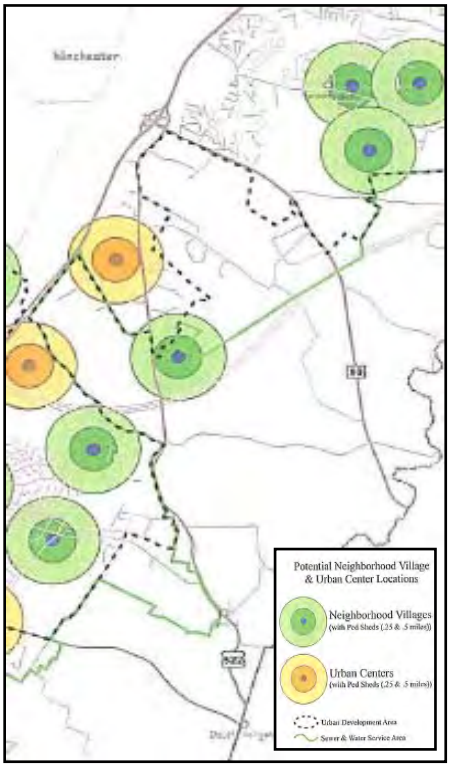
Source: City of Winchester Comprehensive Plan Map

Similar to its existing zoning, Frederick County has a variety of planned future land uses, ranging from Urban Development Areas (UDA) to rural conservation areas. Frederick County implements a policy of channeling growth into UDAs and Sewer and Water Service Areas (SWSA) with a more urban character. The Route 522 study area, from the Interstate 81 interchange to south of Papermill Road, is labeled as a UDA. The UDA picks up again on the west side of the Route 522 Corridor, from W Parkins Mill Road to south of Armel Road. From there a SWSA, on the west side of Route 522, extends south to Maranto Manor Drive. South of Maranto Manor Drive is expected to remain rural in character. The Frederick County future land use is shown for the study area in Figure 3-2.

Figure 3-2: Frederick County Future Land Use

Source: Frederick County Comprehensive Plan Map

Figure 3-3: Frederick County Development Areas



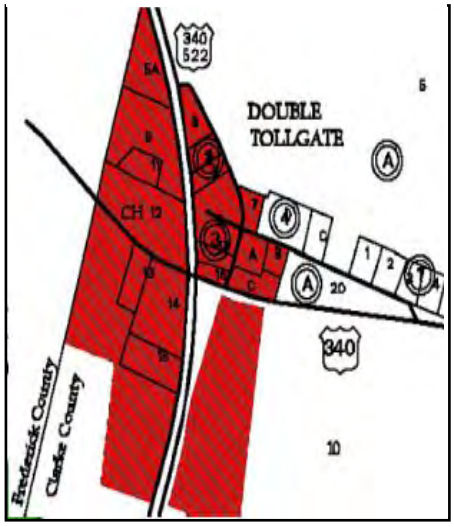
Also in the Frederick County 2007 Comprehensive Plan, potential locations of Neighborhood Villages and Urban Centers are identified. Both the Neighborhood Villages and Urban Centers are intended to create mixed-use neighborhoods that incorporate residential, commercial, retail, educational and public uses into walkable neighborhoods with half mile walk sheds. As stated in the Frederick County Comprehensive Plan, Neighborhood Villages "are envisioned to be compact centers that focus and complement the surrounding neighborhoods, are walkable and designed at a human scale, and which are supported by existing and planned road networks." The Urban Centers are intended to be more intensive than the neighborhood Villages containing higher densities and a larger commercial core designed around a public space which would serve as a focal point of the development. One Neighborhood Village and one Urban Center are planned within ¼ mile of Route 522. The potential Urban Center is located on the west side of Route 522, between Airport Road and Papermill Road. The potential Neighborhood Village is located on the east side of Route 522, south of Papermill Road. Both are shown in Figure 3-3.

The Winchester Regional Airport is located in the vicinity of the study area, off of Airport Road, in Frederick County. Historically, there have been conflicts between residential communities and airports, citing fly-over areas and noise sensitive areas surrounding airports. To address this, the Winchester Regional Airport Authority developed an Airport Support Area for the airport. The support area extends to the east of Route 522 from the intersection of Route 522/Route 50 to south of the intersection of Route 522/Airport Road, shown in Figure 3-4. As stated in the Frederick County 2007 Comprehensive Plan, this area would prohibit further residential rezoning to protect the fly-over areas and noise sensitive areas and ensure continued airport use and

Figure 3-4: Airport Support Area

future airport expansion. Business, low rise commercial development, and industrial land uses should be the primary uses in the airport support area.

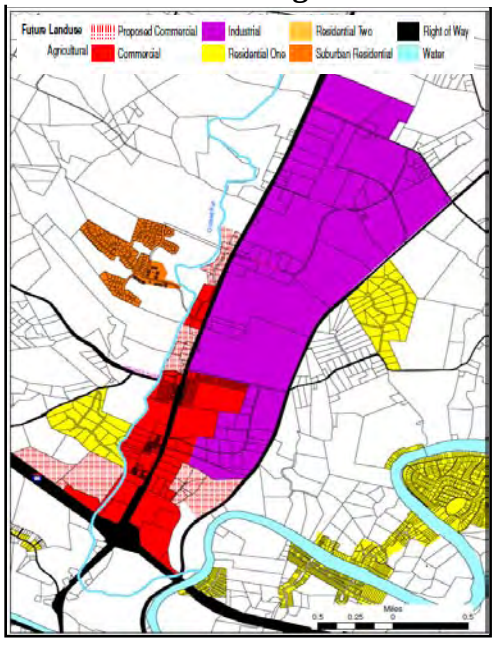
Figure 3-5: Future Land Use at Double Tollgate



Clarke County is a predominately rural county and the future land uses are designed to keep the majority of land in Clarke County as AOC (Agricultural, Open Space and Conservation). The Double Tollgate (Intersection of US 340 and US 522) is the sole area along the US 522 Corridor in Clarke County to be designated as something other than AOC. The Clarke County Comprehensive plan has a Business Intersection Area Plan for the Double Tollgate, which indicates that the area will consist of a zoned highway commercial area. This is consistent with the findings of the existing land use conditions. Clarke County is currently working on land use guideline standards for the Double Tollgate area.

In Warren County, parcels along the US 522 Corridor are designated to have future land uses virtually identical to those of the current zoning ordinance. The future designated land uses along the corridor consist of commercial parcels on the west side of US 522/ US 340 and industrial land uses along the east side of the roadway. Minor changes in the future designated land uses, call for three proposed commercial areas to infill parcels that are currently agricultural zoned properties that are located adjacently to already commercially zoned properties.

Figure 3-6: Warren County Future Land Use along US 522



2035 Traffic Forecasts Methodology

Forecast traffic volumes were generated for the Horizon Year 2035 using the following methodology.

1) Historic traffic counts (2005-2008) were obtained from VDOT's Traffic Count Database. At most roadway segments the 2008 traffic volume was less than the 2005 traffic volume, resulting in a negative growth rate. Therefore, the historic traffic growth rate was not used, as it would not accurately reflect the anticipated growth in the corridor.

2) Many developments are planned and expected within the next 25 years throughout the study area. Meetings were conducted with each locality's planning department to better understand the anticipated future land use and proposed developments in the Route 522 Corridor. These plans were compared to the existing VDOT Winchester Region Travel Demand Model's 2030 socioeconomic data. The travel demand model is a tool to calculate and forecast existing or future demand on a transportation network. The Traffic Analysis Zones (TAZ) in the model only extend to the MPO boundary, including the City of Winchester and Frederick County, while the model's roadway network extends to the Town of Front Royal. The MPO localities identified areas within the model network where the current future land use socioeconomic data (population and employment) from the VDOT Model did not accurately represent future development data. The model's socioeconomic data was updated based on these planned developments. Not being in the MPO area, Clarke County and Warren County planners identified planned and potential developments along the Route 522 Corridor to be accounted for in projecting future traffic volumes.

3) Taking into account the length of the corridor, and its large development potential, it was decided that a simple straight growth rate would not accurately reflect traffic conditions at the intersection level, which is a focus of this study. Future large-scale development projects would impact the intersection traffic volumes in specific locations more significantly than applying a straight growth rate along the entire corridor. Four large scale developments were identified along the corridor that would have significant impacts at various study area intersections. These developments are:

    a. Russell 150 (Frederick County - near Airport Road) – A mixed use development with a proposed 285 residential units, 440,000 square feet (sf.) of commercial retail, and 264,000 sf. of office space.

    b. Wal-Mart @ Eastgate (Frederick County – near Tasker Road) – Proposed plans call for 152,000 sf of retail.

c. Cedarville Center (Warren County – near Rockland Road) – A proposed 750,000 sf. commercial development

d. Crooked Run II (Warren County – near Country Club Road) – A proposed 800,000 sf. Commercial development

The traffic impact studies for these developments were utilized to help develop AM and PM peak hour site trips at each development. Trip distributions, trip assignments, driveway locations, and other data from the traffic studies were used in generating the trips at the intersections and along Route 522.

4) The VDOT Winchester Region Travel Demand Model was run with the updated socioeconomic data based on the input from the localities. The four large developments were not included in the model. The model roadway network remained the same except for a roadway connection between East Tevis Road (Winchester) and Route 522 (Frederick). This connection is a planned project with VDOT's Revenue Sharing program, requiring a 50% local match, which will provide an additional connection from Winchester over Interstate 81 and into Frederick County. This connection is expected to divert a significant amount of vehicles away from the Interstate 81 interchange area of Route 522/50/17.

   The model output generated a growth rate for different sections of the corridor, which was then applied to the existing count data to develop 2035 background traffic volumes. The trips generated from the large developments were added to the background traffic volumes to determine the overall 2035 future traffic. Horizon Year 2035 A.M. and P.M. peak hour volumes were generated for the study area intersections. Daily roadway segment volumes were also developed for analysis.

5) The proposed Route 37 Bypass was not accounted for in the travel demand model network. This decision was made due to the uncertainty of the construction of the Route 37 Bypass, given the status of the current funding sources. Should the Route 37 Bypass be constructed it would be assumed that some of the traffic using Route 522 would be diverted to Route 37, reducing overall traffic along Route 522. By not modeling the Route 37 Bypass, a more conservative approach was taken developing future traffic volumes.

Forecast 2035 Future Traffic Volumes

As described in the methodology section, the existing intersection and roadway traffic volumes were forecast to Horizon Year 2035. Future year intersection turn movements were developed for the AM and PM peak hours and Average Daily Traffic (ADT) volumes were developed for the roadway segments analyzed in the existing conditions. Resulting 2035 roadway traffic volumes along Route 522 are compared to existing volumes in Table 3.1.

Table 3.1: Horizon Year 2035 Future Roadway Traffic Volumes

Locality	Roadway	Location	2009 ADT (Count)	Projected 2035 Roadway Volume	Resulting Average Annual Growth Rate (AAGR)
City of Winchester	Route 522 (Millwood Ave)	South of Pleasant Valley Rd	15,200	19,200	1.0%
	Route 522 (Millwood Ave)	Apple Blossom Dr to Jubal Early Dr	8,100	10,200	1.0%
	Route 522 (Millwood Ave)	Jubal Early Dr to I-81 SB Ramps	27,700	37,500	1.4%
Frederick Co	Route 522 (Millwood Ave)	I-81 SB Ramps to I-81 NB Ramps	37,300	54,200	1.7%
	Route 522 (Front Royal Pike)	North of Costello Dr	21,600	44,000	4.0%
	Route 522 (Front Royal Pike)	North of Double Tollgate	13,800	26,400	3.5%
Warren Co	Route 522 (Winchester Rd)	North of County Club Rd	21,700	40,400	3.3%
	Route 522 (Winchester Rd)	South of I-66	29,700	45,100	2.0%

*ADT denotes Average Daily Traffic

Existing turn movement counts at key intersections throughout the Route 522 study area were also grown to Year 2035 based on model output and development trip generation. A number of planned changes to the intersections are expected by Year 2035, including the following.

- The Russell 150 development is planned to develop across from the existing Route 522 / Airport Road intersection (Intersection 6). The development would access Route 522 at this existing intersection.

- The intersection of Route 522 / Macedonia Church Road (Intersection 8) is expected to be signalized, as VDOT currently has requested for the signalization.
- The intersection of Route 522 / Toray Drive (Intersection 16) is planned to accommodate a secondary driveway to the Blue Ridge Shadows Community and is expected to be signalized.
- The intersections of Reliance Road and Rockland Road with Route 522 (Intersections 17 & 18) are expected to be combined into one intersection at Reliance Road. Existing Rockland Road is expected to dead end prior to intersecting with Route 522.

The forecast 2035 AM and PM peak hour intersection volumes are shown with the 2035 future analysis results in the next section.

2035 Traffic Deficiencies

Capacity analyses were conducted for Horizon Year 2035 conditions at each of the key intersections along Route 522, using Synchro 7.0 software. Analysis was conducted with optimized traffic signal timings, as it was assumed that all signalized intersections would be optimized as needed. Seventeen signalized intersections were investigated along with four stop-controlled intersections. By Year 2035, ten of the seventeen future signalized intersections are expected to operate with a poor LOS E or LOS F during either the AM or PM peak hours. The following seven signalized intersections are expected to operate with an acceptable overall intersection LOS D or better in both the 2035 future AM and PM peak hours.

- Route 522 (Millwood Ave) / Pleasant Valley Road
- Route 522 (Front Royal Pike) / Macedonia Church Road
- Route 522 (Front Royal Pike) / Maranto Manor Drive
- Route 522/340 (Stonewall Jackson Hwy) / Lake Frederick Drive
- Route 522/340 (Winchester Road) / Fairground Road
- Route 522/340 (Winchester Road) / Toray Drive
- Route 522/340 (Winchester Road) / Reliance Road (relocated Rockland Road)

The remaining signalized intersections are expected to operate at LOS E or LOS F for either the AM or PM peak hour.

By Year 2035, three of the four stop-controlled intersections have turn movements that are operating with an unacceptable LOS E or worse in either the AM or PM peak hour, including:

- Route 522 (Front Royal Pike) / Tasker Road
- Route 522/340 (Winchester Road) / Ashby Station Road
- Route 522/340 (Winchester Road) / Riverton Road

Only the intersection of Route 522 (Winchester Road) / Rocky Glen Drive is expected to have all movements operating at LOS D or better in the AM and PM peak hours.

Detailed LOS and 95th percentile queue length results from the Synchro software analysis are shown in Table 3.2. Existing traffic conditions, including existing turn movement counts, lane geometry, and movement LOS, are shown in Figure 3-7 through Figure 3-10.

For the signal warrant analysis, the future volumes at each stop-controlled intersection were analyzed using the *Manual on Uniform Traffic Control Devices (MUTCD)*, Millennium Edition. Given the limited nature of this study and the limited amount of volume data collected, each intersection was analyzed only for its satisfaction of the Peak Hour signal warrant conditions (Signal Warrant 3). The Peak Hour signal warrant conditions apply to intersections where a large number of vehicles pass through the intersection in a relatively short time period.

The intersection of Route 522 / Tasker Road is expected to meet AM and PM peak hour signal warrants by Horizon Year 2035. The planned Wal-Mart near this intersection would trigger the peak hour signal warrants when it is constructed.

The Route 522 / Riverton Road intersection met the PM peak hour signal warrant in the existing conditions and is expected to meet the same warrant in the future.

Table 3.2: Future Year 2035 Conditions - Level of Service Summary

Intersection #	Operation	Intersection		Approach	Lane Group L = Left T = Thru R = Right	Future Year 2035							
						AM Peak Hour				PM Peak Hour			
		E/W Roadway	N/S Roadway			95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS	95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS
1	Signalized	Millwood Ave	Pleasant Valley Rd	Eastbound	L	40	B	D	D	42	D	F	F
					T	498	E			975	F		
					R	91	B			229	C		
				Westbound	L	26	B	C		107	E	D	
					T	283	C			695	D		
					R	311	C			416	D		
				Northbound	L	120	C	C		403	F	F	
					T-R	153	C			749	F		
				Southbound	L	98	D	F		347	F	F	
					T	275	F			870	F		
					R	0	A			0	A		
2	Signalized	Millwood Pike	Frontage Rd	Eastbound	L	51	E	D	C	67	E	F	E
					T-R	653	D			1063	F		
				Westbound	L	171	B	A		178	B	A	
					T-R	92	A			42	A		
				Northbound	L	53	E	E		54	E	F	
					T-R	102	E			290	F		
				Southbound	L-T	70	F	E		26	E	E	
					R	31	E			30	E		
3	Signalized	Millwood Pike	I-81 SB Ramps	Eastbound	T	190	B	B	D	377	F	F	F
					R	0	A			0	A		
				Westbound	L	535	F	E		865	F	F	
					T	1216	E			1055	F		
				Southbound	R	626	F	F		476	F	F	
4	Signalized	Millwood Pike	I-81 NB Ramps/Front Royal Pike	Eastbound	L	234	E	C	C	771	F	F	F
					T	466	D			670	D		
					R	0	A			0	A		
				Westbound	L	82	C	C		124	F	F	
					T	417	C			615	F		
					R	0	A			0	A		
				Northbound	L	338	D	D		805	F	F	
					T	325	D			498	F		
					R	72	B			106	C		
				Southbound	L	209	E	C		242	F	F	
					T	222	E			130	F		
					R	0	A			0	A		
5	Signalized	Costello Drive	Route 522	Eastbound	L-T	40	D	D	C	36	C	C	F
					R	15	D			13	C		
				Westbound	L	102	C	C		124	C	C	
					T-R	39	C			71	C		
				Northbound	L	0	A	C		18	D	F	
					T-R	472	C			718	F		
				Southbound	L	144	D	B		510	F	E	
					T-R	232	A			216	B		
6	Signalized	Airport Road	Route 522	Eastbound	L	92	D	D	C	849	F	F	F
					T	24	D			50	B		
					R	30	D			65	F		
				Westbound	L	171	D	D		88	C	C	
					T-R	72	D			68	C		
				Northbound	L	43	B	C		257	F	F	
					T	782	C			884	F		
					R	40	A			86	C		
				Southbound	L	92	D	B		126	D	F	
					T	497	B			861	F		
					R	53	A			201	C		
7	Signalized	Papermill Rd (Route 644)	Route 522	Eastbound	L-R	406	E	E	D	1395	F	F	F
				Northbound	L	393	F	C		690	F	F	
					T	240	B			860	C		
				Southbound	T-R	586	E	E		1780	F	F	
8	Stop-Controlled	Macedonia Church Rd (Route 642)	Route 522	Eastbound	L-R	213	B	B	B	116	C	C	A
				Northbound	L	17	A	A		32	A	B	
					T	240	A			512	B		
				Southbound	L	0	A	A		0	A	A	
					T	195	A			259	A		
					R	23	A			28	A		
9	Stop-Controlled	Tasker Rd (Route 642)	Route 522	Eastbound	L	N/A	F	F	N/A	N/A	F	F	N/A
					R	N/A	B			N/A	F		
				Northbound	L	44	A	A		263	F	A	
					T	0	A			0	A		
				Southbound	L	0	N/A	A		0	N/A	A	
					T	0	A			0	A		
					R	0	A			0	A		
10	Signalized	Maranto Manor Dr	Route 522	Eastbound	L	25	D	D	A	160	F	F	B
					R	21	C			28	D		
				Northbound	L	26	D	A		57	D	B	
					T	124	A			369	A		
				Southbound	L	0	N/A	A		0	N/A	B	
					T	314	B			446	B		
					R	23	A			17	B		

Table 3.2: Future Year 2035 Conditions - Level of Service Summary (cont.)

Intersection #	Operation	Intersection		Approach	Lane Group L = Left T = Thru R = Right	Future Year 2035							
						AM Peak Hour				PM Peak Hour			
		E/W Roadway	N/S Roadway			95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS	95th % Queue Length (ft)	Movement LOS	Approach LOS	Intersection LOS
11	Signalized	Lord Fairfax Hwy (Rte 277 & Rte 340)	Route 522	Eastbound	L-T	560	F	F	F	513	F	F	F
					R	147	C			218	E		
				Westbound	L	296	C	C		378	D	F	
					T-R	279	C			978	F		
				Northbound	L	307	F	F		418	F	F	
					T	515	F			510	E		
					R	179	D			134	D		
				Southbound	L	307	F	F		418	F	F	
					T	535	F			879	F		
					R	28	C			51	D		
12	Signalized	Lake Frederick	Route 522	Eastbound	L	19	D	D	A	19	D	D	A
					R	10	D			10	D		
				Northbound	L	6	D	A		6	D	A	
					T	160	A			403	A		
				Southbound	L	0	N/A	A		0	N/A	A	
					T	302	A			435	A		
					R	11	A			14	A		
13	Stop-Controlled	Rocky Glen Dr	Route 522	Westbound	R	2	B	B	N/A	3	C	C	N/A
				Northbound	T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	T	0	A	A		0	A	A	
14	Stop-Controlled	Ashby Station Rd (Route 639)	Route 522	Eastbound	L-T-R	59	F	F	N/A	118	F	F	N/A
				Westbound	L-T-R	64	F	F		N/A	F	F	
				Northbound	L-T	0	A	A		2	A	A	
					R	0	A			0	A		
				Southbound	L	2	B	B		2	C	C	
					T	0	A			0	A		
					R	0	A			0	A		
15	Signalized	Fairground Rd (Route 661)	Route 522	Westbound	L	42	C	C	B	33	C	C	B
					R	22	C			0	C		
				Northbound	L	0	A	B		0	A	C	
					T	495	C			425	C		
					R	27	A			20	A		
				Southbound	L	62	D	A		51	C	B	
					T	163	A			244	A		
16	Signalized	Toray Dr / Blue Ridge Shadow Site Driveway	Route 522	Eastbound	L-T-R	190	D	D	D	194	E	E	D
				Westbound	L	242	F	F		581	F	F	
					R	0	D			0	D		
				Northbound	L	114	E	D		225	F	D	
					T	614	E			715	D		
					R	12	B			58	C		
				Southbound	L	152	F	D		82	E	D	
					T	356	C			957	D		
					R	0	B			20	B		
17 / 18	Signalized	Rockland Rd (Route 658) / Reliance Rd	Route 522	Eastbound	L	210	D	D	D	113	D	D	B
					T	77	C			115	D		
					R	41	C			70	D		
				Westbound	L	82	C	D		106	D	D	
					T	77	C			115	D		
					R	278	E			122	D		
				Northbound	L	107	D	E		130	F	B	
					T	725	E			149	A		
					R	51	B			12	A		
				Southbound	L	43	D	C		58	A	A	
					T	529	C			315	A		
					R	17	B			9	A		
19	Signalized	Country Club Rd / Townsend Dr (Route 655)	Route 522	Eastbound	L	55	E	D	D	121	E	F	F
					T	56	D			79	D		
					R	120	D			1868	F		
				Westbound	L	186	F	F		397	F	F	
					T	53	D			148	D		
					R	35	D			58	D		
				Northbound	L	405	F	C		1065	F	F	
					T	444	C			628	D		
					R	32	B			157	C		
				Southbound	L	94	D	D		158	F	F	
					T	783	E			1968	F		
					R	66	C			284	D		
20	Signalized	I-66 WB	Route 522	Westbound	L	55	D	E	B	274	E	F	F
					R	174	E			571	F		
				Northbound	T	698	B	B		1722	E	E	
				Southbound	T	290	A	A		1880	F	F	
21	Signalized	I-66 EB	Route 522	Eastbound	L	545	F	F	F	73	E	F	F
					LT	545	F			73	E		
					R	665	F			797	F		
				Northbound	T	1314	F	F		2167	F	F	
					R	105	C			91	C		
				Southbound	L	892	F	D		1673	F	F	
					T	332	A			890	B		
22	Stop-Controlled	Riverton Road	Route 522	Westbound	L-R	143	F	F	N/A	N/A	F	F	N/A
				Northbound	T	0	A	A		0	A	A	
					R	0	A			0	A		
				Southbound	L	11	C	C		42	E	E	
					T	0	A			0	A		

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

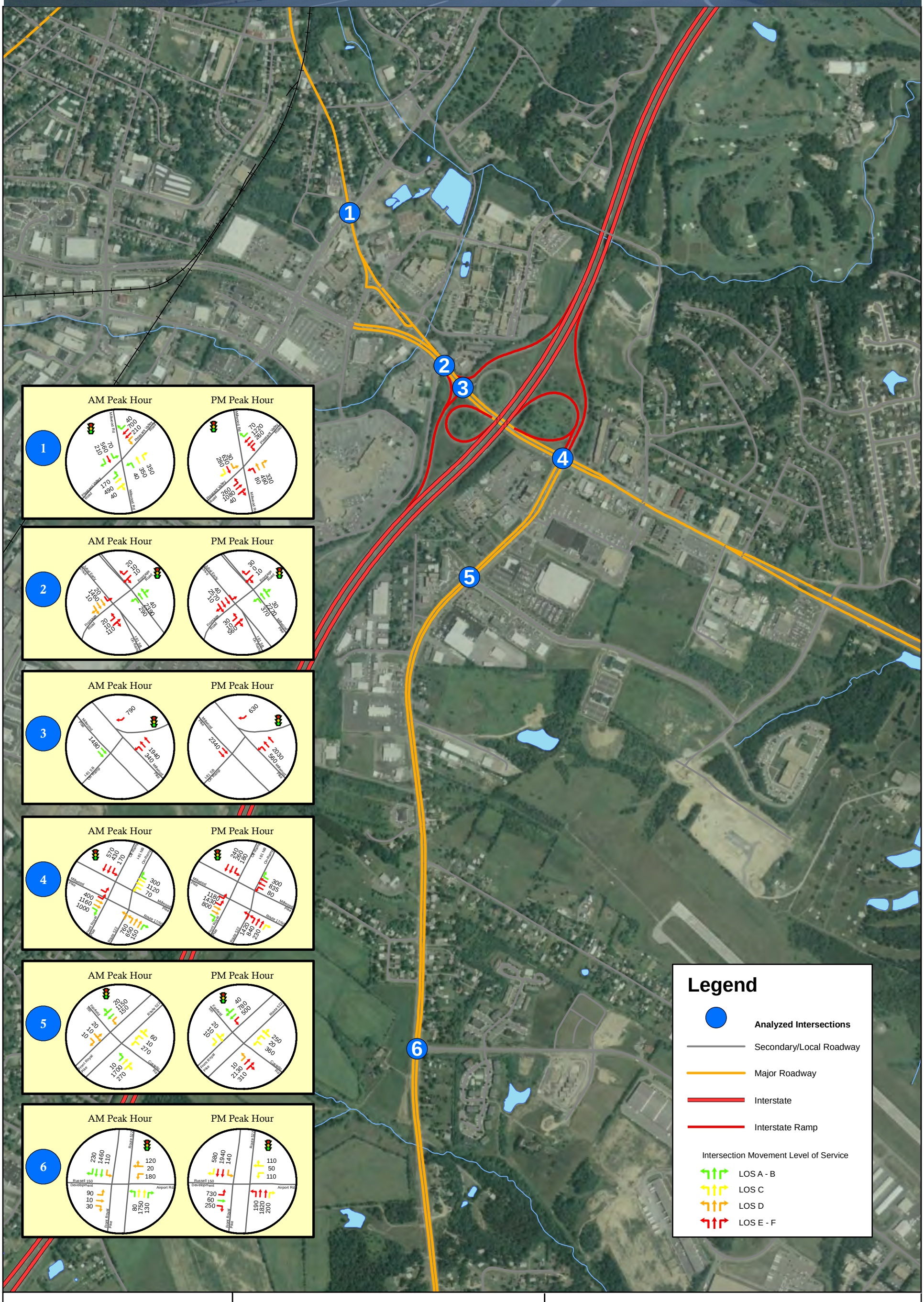


Figure 3-7:
Existing Conditions

N

1,100 550 0 1,100 Feet

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

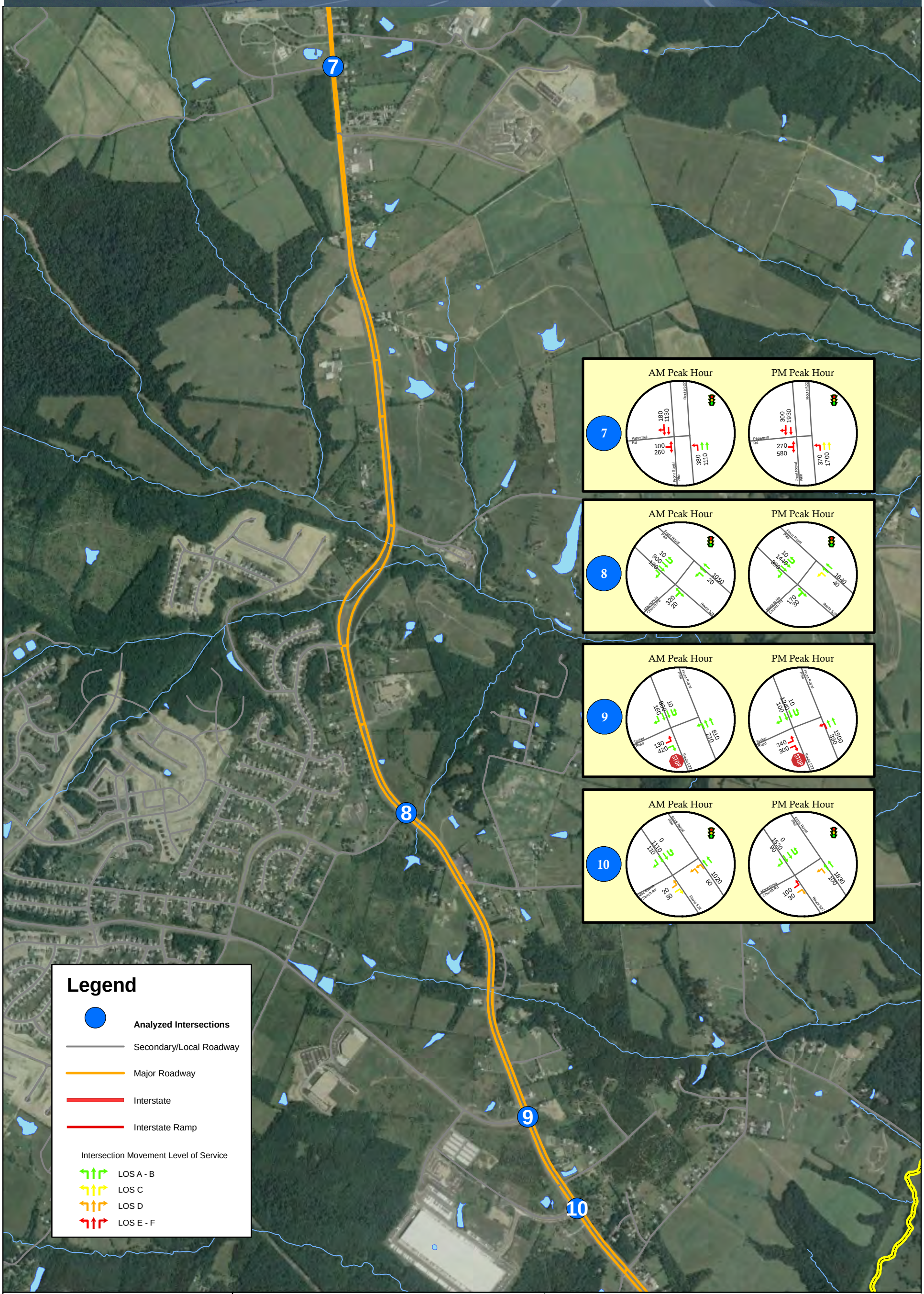


Figure 3-8:
Future Year 2035 Conditions

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

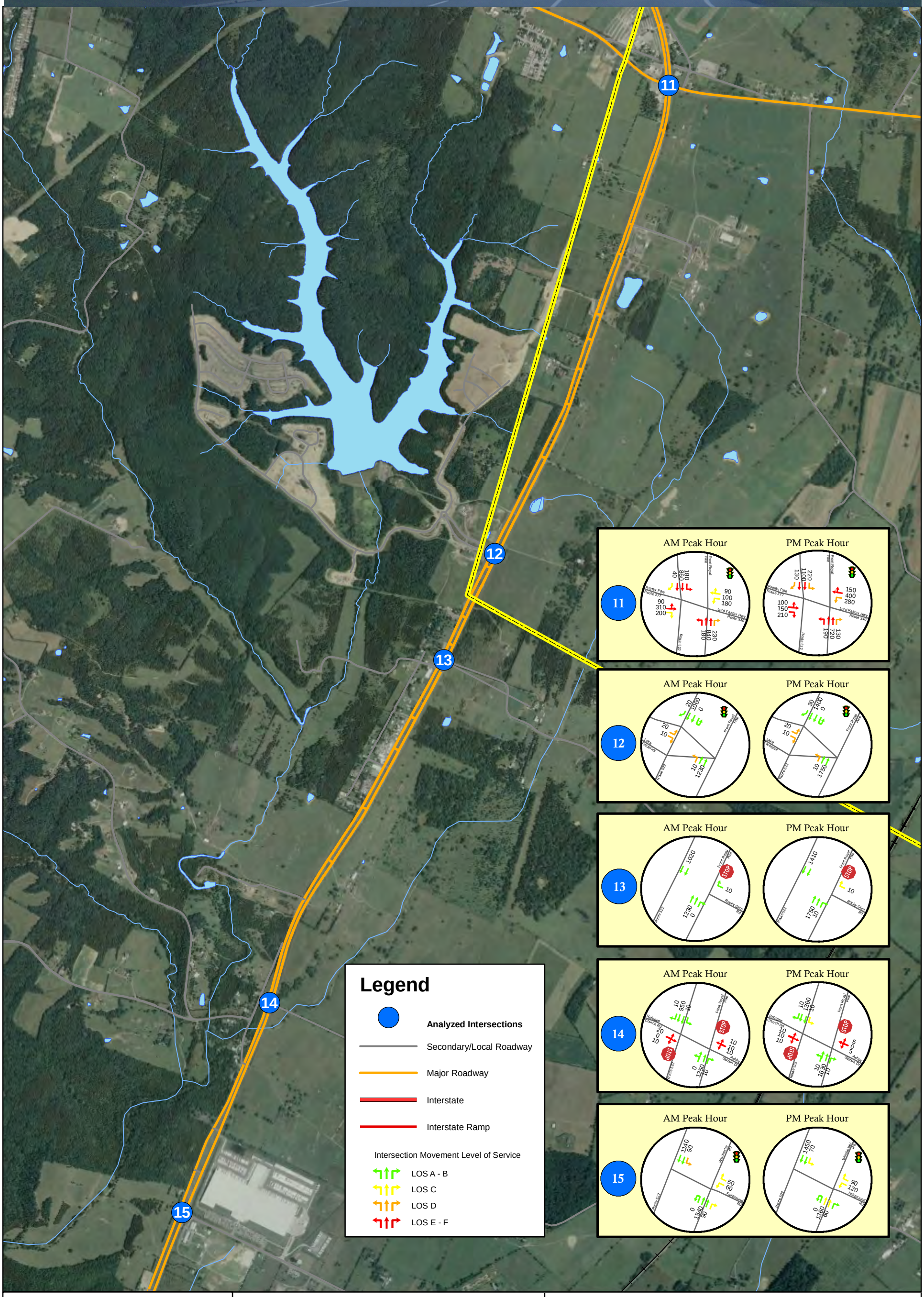


Figure 3-9:
Future Year 2035 Conditions

Baker

RENAISSANCE PLANNING GROUP

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

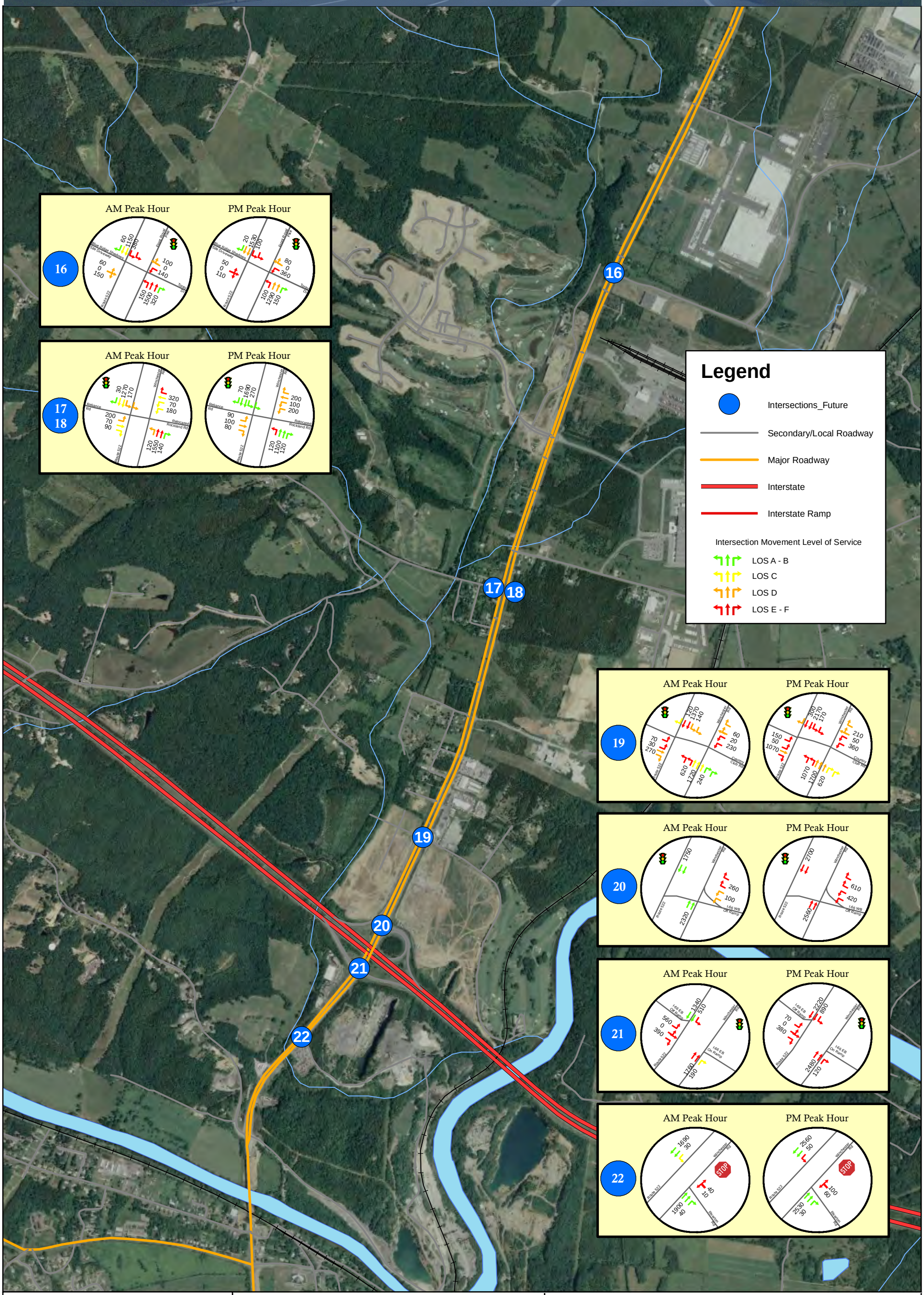


Figure 3-10:
Future Year 2035 Conditions

1,900 950 0 1,900 Feet

Horizon Year 2035 Roadway LOS was analyzed using Highway Capacity Manual methodologies for the Route 522 Corridor at various locations along the corridor. Table 3.3 shows the existing and future conditions Roadway LOS for the analyzed segments of Route 522.

Table 3.3: Future Roadway Level of Service Summary

Locality	Roadway	Location	# Lanes	HCM Methodology	2009 ADT (Count)	2009 Roadway Level of Service	Projected 2035 Roadway Volume	2035 Roadway Level of Service
City of Winchester	Route 522 (Millwood Ave)	South of Pleasant Valley Rd	4	Urban Street	15,200	B	19,200	C
	Route 522 (Millwood Ave)	Apple Blossom Dr to Jubal Early Dr	2	Urban Street	8,100	B	10,200	C
	Route 522 (Millwood Ave)	Jubal Early Dr to I-81 SB Ramps	4	Urban Street	27,700	C	37,500	E
Frederick Co	Route 522 (Millwood Ave)	I-81 SB Ramps to I-81 NB Ramps	4	Urban Street	37,300	D	54,200	E
	Route 522 (Front Royal Pike)	North of Costello Dr	4	Rural Multilane	21,600	B	44,000	D
	Route 522 (Front Royal Pike)	North of Double Tollgate	4	Rural Multilane	13,800	A	26,400	B
Warren Co	Route 522 (Winchester Rd)	North of County Club Rd	4	Rural Multilane	21,700	B	40,400	D
	Route 522 (Winchester Rd)	South of I-66	4	Rural Multilane	29,700	C	45,100	D

The future conditions results show that the corridor is expected to operate at LOS B – LOS E. The Route 522/50/17 Corridor in proximity to Interstate 81 is expected to operate at a poor LOS E. Volumes are high and are expected to experience breakdown conditions in the future. Certain areas of the corridor are currently operating at LOS D and could potentially be a problem if not addressed.

Other Modes and Summary

Vehicular traffic increases in areas as development occurs. Due to the developments expected along the Route 522 Corridor, passenger car and freight traffic are expected to increase at a moderate to high rate between now and the Horizon Year 2035. Without improving the study area roadway network, the intersections along Route 522 and the roadway itself are expected to experience capacity deficiencies as development occurs

throughout the corridor and surrounding areas. Capacity improvements, reductions in vehicle demand, and smart growth planning are all ways of protecting the character and flow of the corridor. Corridor improvements are discussed in the next chapter.

As vehicle demand increases, so do the other modes. Bicycle and pedestrian travel is also expected to increase as more mixed-use development occurs. Improvements to the bicycle and pedestrian facilities and other multimodal facilities are expected to occur and are also discussed in the next chapter.

Freight traffic is also expected to increase. However, as more passenger car trips are generated by developments, the percentage of freight traffic could be expected to decrease. Interviews with VIP officials and data received provided no additional insight to future freight projections. There are plans for an inland port in Martinsburg, West Virginia, roughly 40 miles north of VIP. An inland port at this location would have the potential to divert container traffic from VIP, although is expected to mainly relieve pressure from the Port of Baltimore, Maryland. The Martinsburg inland port is still in the planning phase.

4.0 ROUTE 522 CORRIDOR RECOMMENDATIONS

The expected growth in the Route 522 Corridor will bring additional traffic to the study area and have a negative impact on the operation of area roadways and intersections. As shown in the previous chapter, these deficiencies are moderate to severe, with more than half of the intersections expected to operate at poor levels of service (LOS E or LOS F) during one or both peak periods of the day. There are some simple geometric fixes for certain intersections, such as adding turn lanes, while others have no traditional geometric solution. Opportunities for reducing demand by diverting traffic off of Route 522 to help improve the corridor without increasing capacity are limited due to the limited north-south connectivity through the immediate area.

Ultimate solutions to the Route 522 Corridor and the intersections will require right-of-way, potentially impacting existing development, and has the potential to be very expensive. The recommendations developed consist of all of the improvements that would be needed to improve the study area roadways and intersections to acceptable operating conditions. Many of these improvements will be difficult to implement and will require significant political will and a long time frame. These recommendations will provide the City of Winchester, Frederick County, Clarke County, Warren County, and VDOT with a tool to help advance projects in VDOT's Six-Year Improvement Program and to obtain the needed right-of-way and roadway improvements when properties along the corridor develop or redevelop.

Route 522 Corridor – Roadway Capacity Recommendations

Mainline recommendations cover roadway improvements of Route 522 from S Pleasant Valley Road, in the City of Winchester, to Riverton Road, south of Interstate 66 in Warren County. Traffic volumes along most segments of Route 522 are currently, and are expected to remain, under capacity through Year 2035. Areas with expected poor roadway operations include the segment of Route 522/50/17 from Apple Blossom Drive to Front Royal Pike. Vehicles from Winchester and Frederick County use this segment of roadway to access the Interstate 81 interchange. The expected high traffic volumes and the number of traffic signals will require additional capacity along this segment. A widening from a four-lane to six-lane roadway should be considered from Apple Blossom Drive through Front Royal Pike. In addition to this recommended widening other roadway improvement recommendations should be considered. The Route 522 Corridor should adhere to VDOT design standards including, proper lane widths, shoulder widths, and lane striping/markings. Proper informational and directional signage should be provided where deemed needed.

The roadway segment near the Interstate 66 interchange is also expected to experience high traffic volumes as a result of planned developments in this area. Warren County has anticipated these high volumes and, as part of the 2008 Route 340/522 Corridor Transportation Plan, has recommended that the roadway be ultimately widened from a four-lane roadway to six lanes from Fairground Road (Route 661) to the Interstate 66 interchange ramps. The plan identifies the segment from Reliance Road (Route 627) to Interstate 66 be widened as Phase I, and the segment from Fairground Road to Reliance Road as Phase II. Based on future traffic numbers generated for this study, it is not expected that the roadway will experience a poor level of service in Year 2035. Future conditions intersection analysis revealed the need of additional through lanes in this section of Warren County. The Route 340/522 Corridor Transportation Plan does include this widening and should be considered, as aggressive land use and development occur.

The rural sections of the study area are not expected to require additional roadway capacity along Route 522.

Route 522 Corridor – Intersection Recommendations

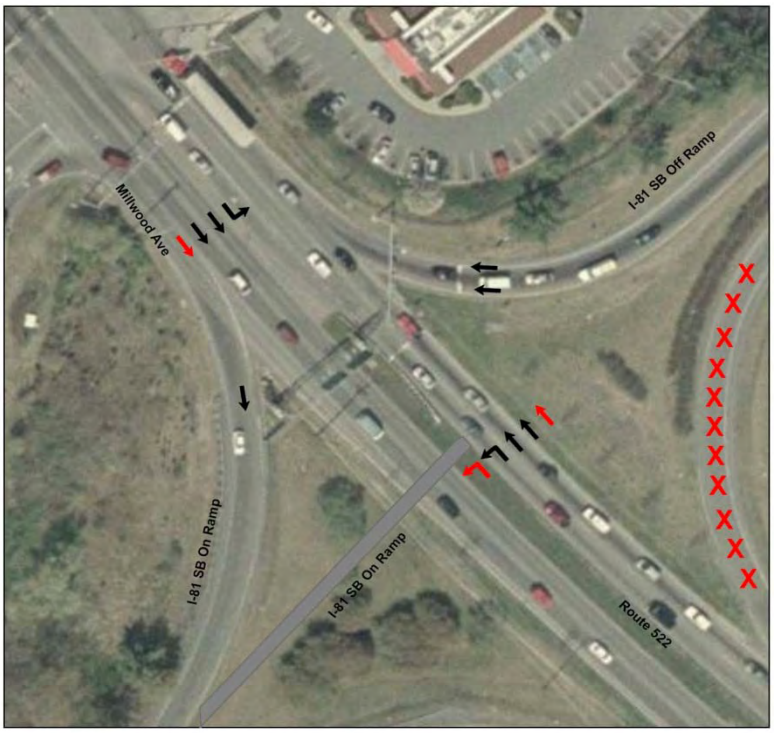
In addition to roadway capacity improvements to sections of the Route 522 Corridor, improvements are necessary to improve the analyzed intersections to acceptable operating conditions (LOS D or better). These intersection improvements include providing new or additional turn lanes and improvements to or new traffic signals (including traffic signal optimization). The majority of the intersections are able to achieve LOS D or better through traditional intersection improvements. The intersection improvement recommendations are discussed and graphically shown below.

Intersection 1: US 522 (Millwood Avenue) and Pleasant Valley Road

It is recommended that additional through lanes be added to the Millwood Avenue approaches at this intersection. It is also recommended that an exclusive northbound right turn lane be added to the S Pleasant Valley Road intersection.

Intersection 2: US 522 and Frontage Road

It is recommended that an exclusive northbound right-turn lane be constructed at the intersection of US 522 and Frontage Road. This will reduce the signal time needed for this phase while increasing the green time for other phases.



Intersection 3: US 522 (Millwood Avenue) and Interstate 81 Southbound Ramps

For the intersection of US 522 and the Interstate 81 southbound ramps, it is recommended that a westbound left-turn lane be constructed on US 522 and a through lane added in both the eastbound and westbound directions. These recommendations will coincide with the removal of the Interstate 81 southbound loop on-ramp.

Intersection 4: US 522 (Millwood Avenue) and Interstate 81 Northbound Ramp

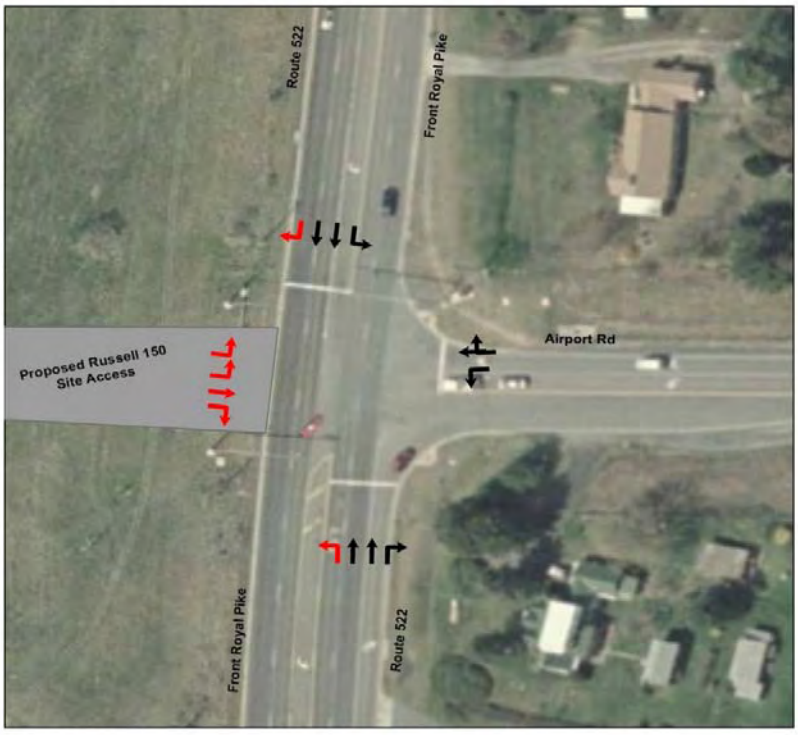
The intersection of US 522 and the Interstate 81 northbound ramps is expected to operate over capacity in the year 2035. This intersection LOS could potentially be improved by future regional improvements that help reduce demand and increase capacity.

Intersection 5: US 522 (Front Royal Pike) and Costello Drive

It is recommended that an additional southbound left-turn lane be constructed at the intersection of US 522 and Costello Drive. This will reduce the green time needed for this movement and distribute the time to other movements. It is also recommended that the signal timing be optimized to include a westbound right-turn overlap.

Intersection 6: US 522 (Front Royal Pike) and Airport Road

The intersection of US 522 and Airport Road is the location of the new access road to the Russell 150 Development. The recommended lane configuration for the new eastbound leg contains dual left-turn lands, a through lane, and a right-turn lane. It is also recommended that a northbound left-turn lane and a southbound right-turn lane be installed to accommodate new development traffic volumes.



Intersection 7: US 522 (Front Royal Pike) and Route 644 (Papermill Road)

For the intersection of US 522 and Papermill Road, it is recommended that the intersection be widened to include an additional northbound left-turn lane, an eastbound right-turn lane, and a southbound right-turn lane. The additional turning lanes should improve delay at this location.

Intersection 8: US 522 (Front Royal Pike) and Route Macedonia Church Road

In a separate study, VDOT has recommended the installation of a traffic signal at the intersection of US 522 and Macedonia Church Road. For the signal to operate at an acceptable LOS, it is recommended that an exclusive eastbound right-turn lane be installed as well.

Intersection 9: US 522 (Front Royal Pike) and Tasker Road

In the year 2035, due to the planned Wal-Mart development in the vicinity, a traffic signal is warranted for the intersection of US 522 with Tasker Road.

No other improvements are recommended at this intersection.

Intersection 10: US 522 (Front Royal Pike) and Maranto Manor Drive

For the intersection of US 522 and Maranto Manor Drive, it is recommended that an additional eastbound left-turn lane be constructed to accommodate the expected traffic generated from the planned Wal-Mart in the area. This will reduce vehicle queues and wait time for the eastbound approach.

Intersection 11: US 522 (Stonewall Jackson Highway) and US 340/VA 277 (Lord Fairfax Parkway)

The intersection of US 522 and Lord Fairfax Parkway (US340/VA 277) is expected be over capacity in the year 2035. It is recommended that an additional through-lane be added in the eastbound and westbound directions as well as an eastbound left-turn lane and a westbound right-turn lane. This will reduce the green time needed for these approaches and improve the overall LOS for the intersection.

Intersection 12: US 522/340 (Stonewall Jackson Highway) and Lake Frederick Drive

This intersection is expected to operate at an acceptable LOS A in the AM and PM peak hours. No improvements are expected to be needed.

Intersection 13: US 522/340 (Winchester Rd) and Rocky Glen Drive

Due to the low expected traffic at this intersection, no improvements are recommended at this stop-controlled intersection.

Intersection 14: US 522/340 (Winchester Rd) and Ashby Station Road

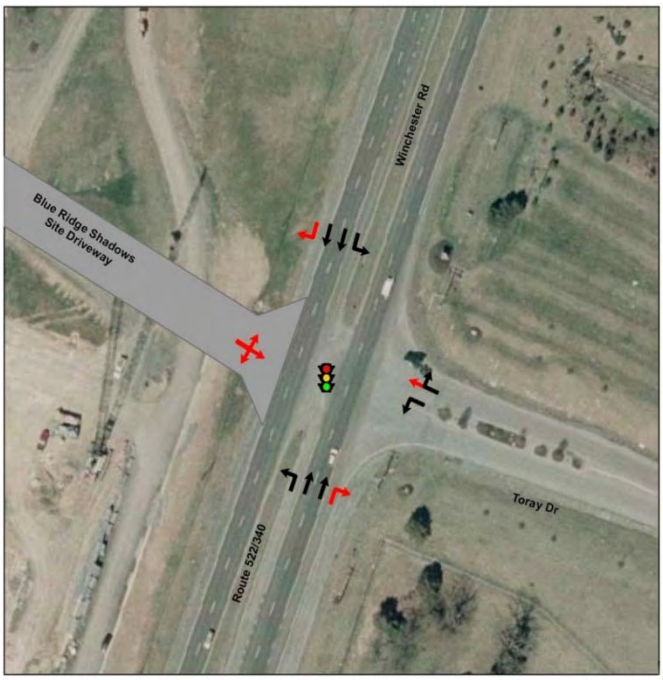
Due to the low expected traffic at this intersection, no improvements are recommended at this stop-controlled intersection.

Intersection 15: US 522/340 (Stonewall Jackson Highway) and Lake Frederick Drive

This intersection is expected to operate at an acceptable LOS B in the AM and PM peak hours. No improvements are expected to be needed.

Intersection 16: US 522 (Winchester Road) and Toray Drive/Blue Ridge Shadow Site Driveway

The intersection of US 522 and Toray Drive will be the location of the new Blue Ridge Shadows development site access. It is recommended that the intersection be signalized and northbound and southbound right-turn lanes be added. A new left-through-right shared lane is recommended for the new eastbound access point. The westbound approach should also be reconfigured to include an exclusive left-turn lane and a shared through-right lane.



Intersections 17 and 18: US 522 (Winchester Road) and Rockland Road / Reliance Road

For the intersection of US 522 and Reliance Road, it is recommended that Rockland Road be re-aligned to intersect with the existing Reliance Road and the intersection be signalized. The recommended lane configuration at the new intersection includes dual left-turns for the southbound approach, exclusive right-turns for the northbound and southbound approach, and exclusive left and right-turn lanes for the eastbound approach. The relocated Rockland Road approach should have dual left-turn lanes, a through lane, and a right-turn lane.

Intersection 19: US 522 (Winchester Road) and Country Club Road

The intersection of US 522 and Country Club Road is expected to operate with a poor LOS in the year 2035. Recommendations for this location include constructing an additional eastbound right-turn lane and providing an additional southbound through-lane. The intersection will remain over capacity, but these improvements will reduce delay.

Intersection 20: US 522 (Winchester Road) and the Interstate 66 Westbound Ramps

It is recommended that an additional northbound and southbound through-lane be added at the intersection of US 522 and the Interstate 66 westbound ramps. Although this will reduce delay, the intersection is expected to operate over capacity in the year 2035. This intersection LOS can be improved by future regional improvements.

Intersection 21: US 522 (Winchester Road) and the Interstate 66 Eastbound Ramps

At the intersection of US 522 and the eastbound Interstate 66 ramps, it is recommended that an additional northbound and southbound through-lane be added, and an additional southbound left-turn lane. Although this will reduce delay, the intersection is expected to operate over capacity in the year 2035. This intersection LOS can be improved by future regional improvements.

Intersection 22: US 522 (Winchester Road) and Riverton Road

It is recommended that a signal be installed at the intersection of US 522 and Riverton Road due to future peak hour volumes. It is also recommended that a right-turn lane be added to the westbound approach.

Route 522 Corridor – Other Capacity Improvement Recommendations

The majority of the intersection lane configurations and signal timings can be improved to reach LOS D or better in 2035. However, many of these recommendations are major improvements to intersections, possibly requiring large quantities of right-of-way, relocating businesses, extensive earthwork, and other constraints. Few of the intersections are still expected to remain over capacity with traditional intersection improvements. This section will discuss planned regional improvements that would increase capacity, potentially reduce demand, and ultimately create better traffic flow along the problem sections of the corridor.

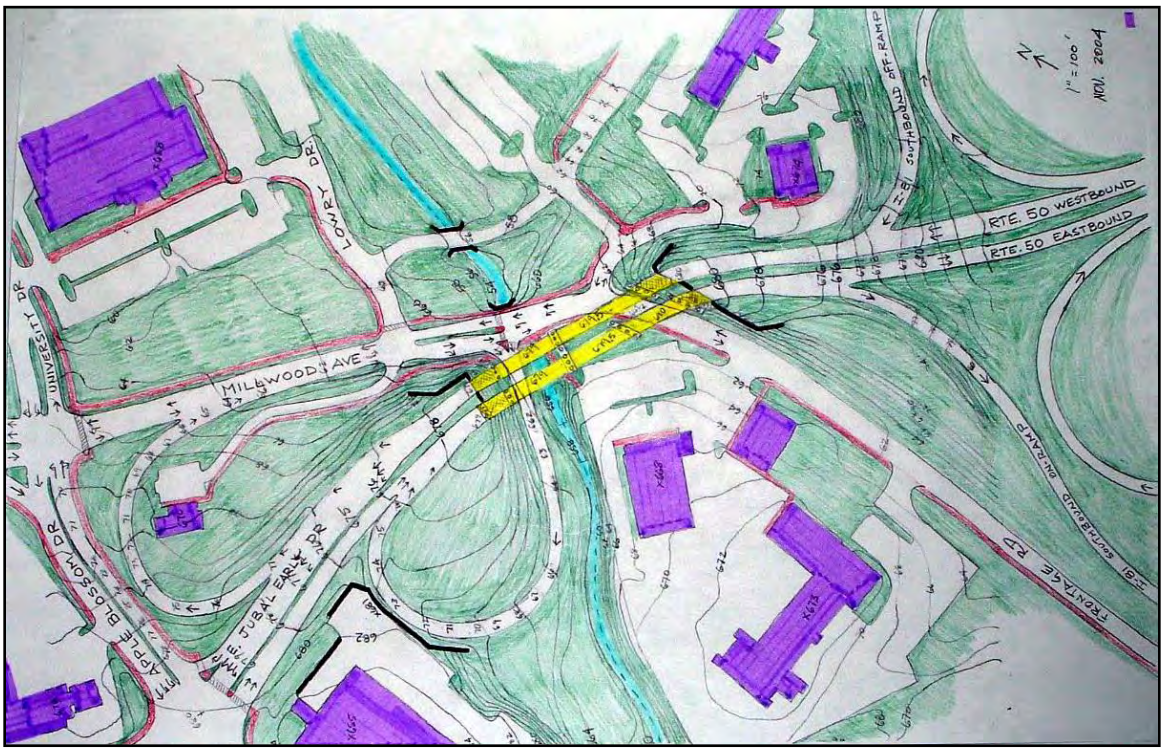
Grade Separation – Jubal Early Drive, Millwood Ave

One of the City of Winchester's Transportation Planning Area Objectives in the Comprehensive Plan Update to "**Improve east-west traffic flow in terms of convenience and safety along E. Jubal Early Dr in the area between I-81 and Apple Blossom Dr."** In order to achieve this the City of Winchester has plans to create grade separated intersections in the vicinity of Jubal Early Drive, Apple Blossom Drive, Millwood Ave, and Frontage Road (west of the I-81 interchange). The potential grade separation is a Vision Plan project in the Win-Fred MPO 2030 Transportation Plan that would better handle the increasing east-west traffic volumes. Advantages for the grade separation at this location include:

- Provides for safer and more efficient free-flowing right-turn movement off of major E-W arterial to major commercial center on south side of Route 50
- Reduces congestion and pollution caused by current need to accommodate left-turning traffic at Frontage Rd and Apple Blossom Drive
- Potential to reduce crashes by reducing the number of conflict points in the area
- Provides improved bike and pedestrian movement between Shenandoah University and parking on north side of Jubal Early Drive to shopping, lodging, and restaurants on south side
- Minimal condemnation of private property (vacant Woolen Mill & Belltone sites only)
- Raises Jubal Early Drive up out of Abrams Creed floodpain/floodway
- Provides safer corridor for Green Circle Trail
- Eliminates conflicts associated with preserving Frontage Road and Bob Evans access in close proximity to I-81 ramps
- Provides a panoramic view of Shenandoah University

A conceptual sketch of a type of grade separation is shown below in Figure 4-1.

Figure 4-1: Conceptual Sketch of Grade Separation



Millwood Avenue Closure

Also in the City of Winchester, an upcoming Win-Fred MPO study will be investigating the possibility of closing Millwood Avenue to vehicular traffic between Jubal Early Drive and Apple Blossom Drive. This project would eliminate the one-way access point off of Route 522 and divert that traffic to the intersection of Jubal Early Drive / Apple Blossom Drive. While the closure would not increase capacity or reduce demand, it would be step in the right direction to consolidate close-proximity access points near the Interstate 81 interchange area.

Route 522/50 intersection relocation (RIRO at existing intersection)

Another project in the win-Fred MPO 2030 Transportation Plan is the relocation of the Route 522 / Route 50/17 intersection to the east of the Interstate 81 interchange. Route 522 (Front Royal Pike) would be realigned, beginning north of Airport Road, and would intersection with Route 50 (Millwood Pike) east of I-81. While the MPO plan was not specific about the exact location of the relocation, the intersection should be offset from the Interstate 81 ramps by ½ mile (in the vicinity of Prince Frederick Drive). The existing section of Route 522, north of Airport Road would remain open to local residential and commercial traffic. A right-in / right-out access point would still be provided for the existing Route 522 at its current intersection with the I-81 ramps.

By providing this relocation, it is expected that the demand at the existing intersection of Millwood Pike / Front Royal Pike / I-81 NB ramps would be reduced, as vehicles accessing southbound US 522 from the east would not be entering the I-81 interchange area. The project is shown as Vision Plan Project #37 in the Win-Fred MPO 2030 Transportation Plan, and is shown in Figure 4-2.

Figure 4-2: MPO Vision Plan Projects

East Tevis Street / Route 522 Connection over Interstate 81

A VDOT Revenue Sharing project is planned between the City of Winchester and Frederick County to provide a connection between existing East Tevis Street in the City of Winchester and Route 522 in the vicinity north of Airport Road. This connection is expected to divert significant traffic volume away from Route 522/50/17 and the Interstate 81 interchange area. Papermill Road, also crossing over I-81, is expected to experience a reduction in vehicles due to this new connection.

Warren County Route 340/522 Corridor Transportation Plan

The 2008 Route 340/522 Corridor Transportation Plan was created for Warren County and provides a framework for improvements to the corridor. Ultimately, the plan calls for Route 522/340 to be widened to six-lane roadway from Fairground Road (Route 661) to Interstate 66. The plan also recommends a reverse frontage / parallel roadway system along segments of the corridor, south of Fairground Road. This system of parallel roadways has the potential to reduce demand from Route 522/340 by connecting developments with roadways set back from Route 522/340. Access management is considered by recommending closures to certain median cross-over points, which would help the performance and flow of the corridor. Proposed traffic signals should be properly spaced according to VDOT standards.

Conclusion

In addition to necessary intersection and roadway improvements, these regional projects are designed to increase capacity and reduce demand along the expected problem areas of the Route 522 Corridor. As development occurs and funding becomes available, implementation of these projects and others should follow the locality's land use guidelines standards. The next section provides an overview of potential land use guidelines along the Route 522 Corridor study area.

Land Use Guidelines/Context Zone Summary

The multi-modal design guidelines will enable localities to preserve roadway capacity along the corridor by managing the quality of future growth, so that development supports and expands transportation choices. The design guidelines provide localities with a series of multi-modal design standards to be considered in guiding public and private improvements along the Route 522 corridor. A full copy of the Guidelines can be found in the complementary report.

Design Standards

The section on Design Standards identifies various design elements based within four specific zones of the overall corridor:

I. Right of Way: The public owned land between the curbs that includes travel lanes for automobiles, transit vehicles, bicycles and pedestrians. Recommendations regarding street and lane width, on-street parking, bicycle facilities, medians, curb radii, street crossings and pedestrian facilities are all included in the right of way section of the design guidelines.

II. Edge: The space generally between the public right of way and the edge of adjacent buildings and includes a variety of public and private elements that contribute to the pedestrian experience and reinforce the adjacent land use setting. Setbacks, streetscape, on-site parking, bicycle parking, walkways, sidewalk connections and transit stops and amenities considered in the edge zone.

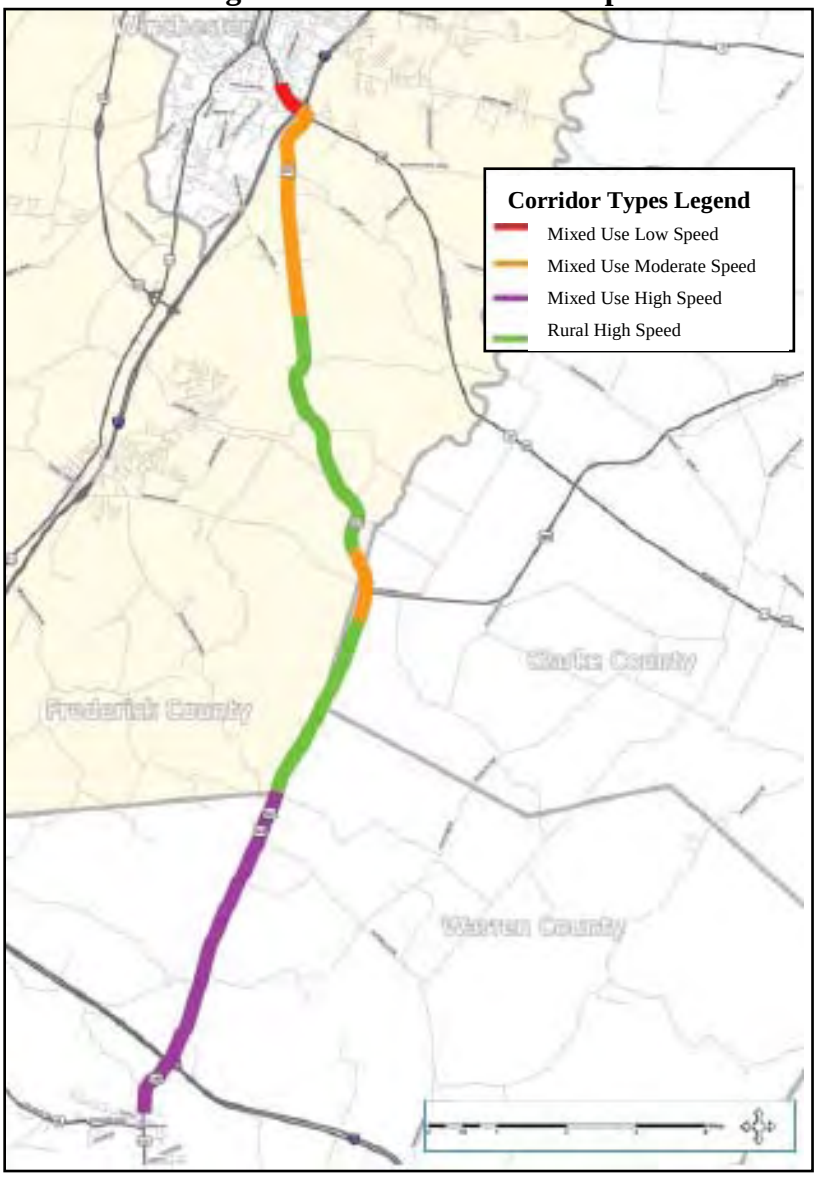
III. Adjacent Land Use: Incorporates building adjacent to the roadway, and extends to surrounding land uses that are generally accessible and functionally related to the corridor. The adjacent land use recommendations include those for building site design, mixed-use development, natural features, compact development, building orientation, transparency, block size and massing façade and design.

IV. Road System: The road system refers to the entire functional system of transportation that is directly related to the corridor, including parallel roads and connectivity to the secondary road network. Recommendations within the road system include those for access management and connectivity.

Corridor Types

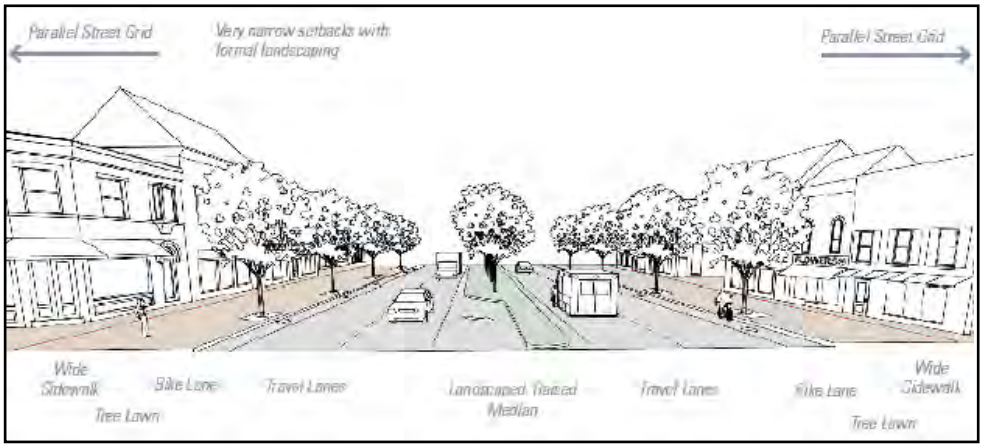
The corridor types illustrate idealized cross-sections that support the future land use vision for the Route 522 corridor, and are intended to be implemented over time, as development occurs and if the corridor is reconstructed or expanded. The corridor types describe both the context and function of the Route 522 corridor in the future, ranging from a more urban setting on the northern end of the corridor within the Winchester city limits and portions of Frederick County, and passing through both suburban and rural areas in Frederick, Clarke and Warren Counties. The map in Figure 4-3, below, shows recommended locations for the corridor types and cross sections identified on the following pages.

Figure 4-3: Context Zone Map



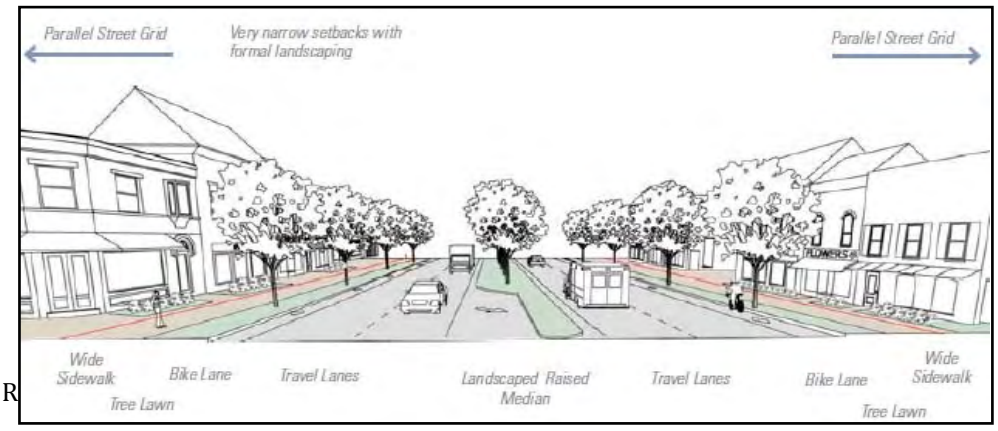
Mixed Use Slow Speed Corridor

The Mixed Use Low Speed Type is located in the eastern portion of the City of Winchester along 522 from Millwood Avenue and Pleasant Valley Rd. to I-81. It is intended to support future multimodal transportation and development around Shenandoah University and the Apple Blossom Mall, which is expected to develop with commercial and institutional uses and generate significant amounts of pedestrian activity in the next 25 years. The mixed use slow speed corridor has very narrow setbacks, wide sidewalks and landscape buffers to create a more pedestrian friendly environment.



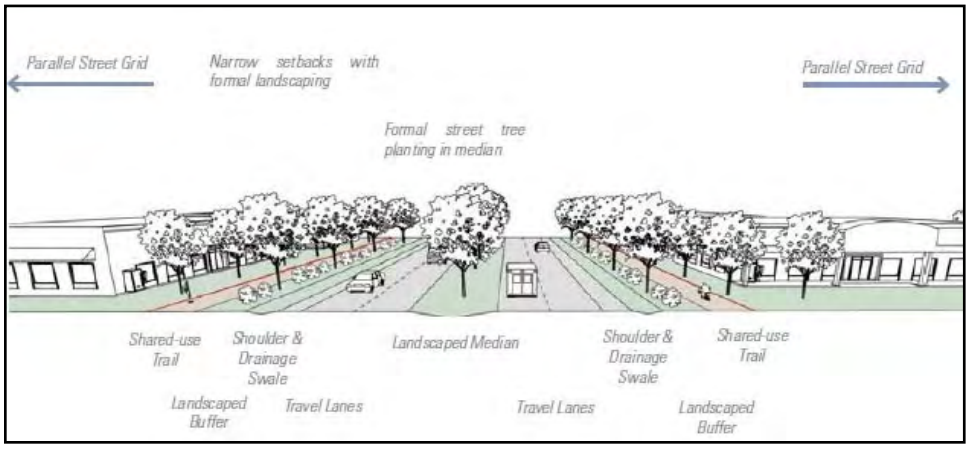
Mixed Use Moderate Speed Corridor

The Mixed Use Moderate Speed Type is located in the northern portion of Frederick County, from 1-81 to just south of Papermill Road where the current road section has a continuous center turn lane, and in the Double Tollgate Area of Clarke County, approximately 1/2 mile north and south of the intersection with 340. In Frederick County, growth is intended to be urban in character and to support a more intensive, dense form of residential development. The Double Tollgate area in Clarke County is envisioned as the future commercial center for the County. The mixed use moderate speed corridor is highlighted by narrow setbacks, wide sidewalks, a landscaped median and accommodations for multimodal travel.



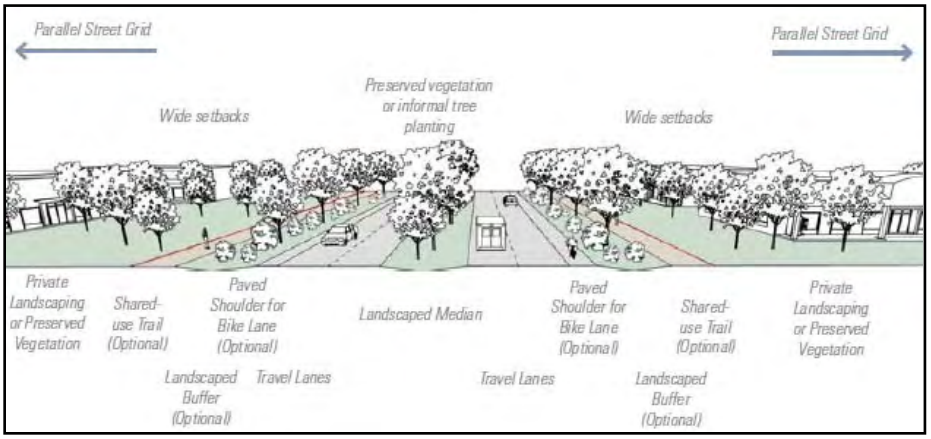
Mixed Use High Speed Corridor

The Mixed Use High Speed Type is located in the northern portion of Warren County and generally corresponds to the same area as the 340/522 Corridor Study. The mixed use high speed corridor is occurs in less densely developed or suburban areas and is characterized by a shared multi-use path and a shoulder & drainage swale.



Rural Use High Speed Corridor

The Rural High Speed Type is designed to support multimodal transportation in designated rural areas. The corridor type is located in the southern portion of Frederick County, as well as the area south of Double Tollgate in Clarke and Warren Counties. The rural use high speed corridor is characterized by wide setbacks and the multi-modal features are optional.



Route 522 Overlay District

The Route 522 Corridor Overlay District is a “framework” for a multi-jurisdictional effort to protect the scenic nature of the Route 522 corridor between the City of Winchester and the Town of Front Royal. General in nature, the conceptual draft ordinance text is meant to provide guidance for the four jurisdictions located within the corridor: the City of Winchester and the counties of Frederick, Clarke and Warren.

The Corridor Overlay District Conceptual Text provides an opportunity to apply various standards within the corridor types identified and described within the accompanying Multimodal Design Guidelines. Narrative in format, the Conceptual Text includes administrative provisions such as a statement of intent, establishment of Corridor Types, applicability, and non-conformities. It addresses land use provisions, including conditional or special uses, and reliance on underlying zoning district regulations, as well as a preferred mix of uses. Finally, the Conceptual Text addresses development standards by which recommended Design Guidelines can be regulated, including building height, massing and siting; building materials, colors and styles; parking requirements; signs and billboards; outdoor lighting; landscaping, screening and grading; and tree and woodland conservation.

In most cases, appropriate language is recommended based upon ordinances of a similar vein found in Virginia and elsewhere; however, there are some cases where reliance upon existing zoning ordinances or additional study is recommended. A full copy of the route 522 Overlay District can be found in the complementary report.

Other Growth Management Techniques

Trigger Mechanisms

In addition to the Design Guidelines, another growth management technique to be considered for the US 522 corridor are triggering mechanisms. Triggering mechanisms involve completing reports to monitor the conditions along a corridor and address deficiencies based on the conditions found in the monitoring report. While triggering mechanisms are typically utilized along more urbanized corridors, this technique can be tweaked to fit the needs of the US 522 corridor by decreasing the frequency of monitoring reports.

Triggering mechanisms are based on the monitoring reports which track the conditions along a corridor. The monitoring report should track land use and traffic conditions along the corridor, including rezoning, new developments, traffic volumes, level of service and accident rates. Major land development activity would trigger a review of the transportation needs including level of service implications, safety concerns, and any potential multimodal opportunities including transit service, pedestrian, and bicycle needs. Should the level of service deteriorate to LOS D or below, a review of potential improvements would be triggered to identify projects that would reduce demand through TDM measures or increase roadway capacity through lane additions or turning lanes.

Once a consensus has been reached as to what improvements would effectively address deficiencies along the corridor, those projects should be moved up in the Transportation Improvement Program via amendments to the TIP. Conversely, if the monitoring reports indicate that there are no deficiencies and need for improvements, projects could also be moved down or removed from the TIP.

One of the better examples of triggering mechanisms for a corridor study is in the Route 40 Corridor Improvements Study in Wilmington, Delaware. The Route 40 study is an ongoing effort that annually reviews existing conditions, the status of transportation and development projects along the corridor as well as developments in nearby areas that are likely to impact the study corridor. This study is led by a steering committee consisting of representatives from the MPO, state DOT and local jurisdiction. The improvements along the corridor are based on the annual Corridor Monitoring and Triggering Reports that outline conditions along the corridor and form recommendations for improving deficiencies in various sections of the corridor.

Access Management

In addition to intersection and other roadway improvements, the localities must focus on the management of access to developed land to ensure efficient traffic flow and

minimize hazards as development occurs in the study area. In July 2008, VDOT adopted access management standards that roadways need to adhere in the design of intersections, turn lanes, entrances and spacing of entrances, intersections, crossover medians and traffic signals. The goals of VDOT's *Access Management Design Standards for Entrances and Intersections: Principal Arterials* are to:

- Reduce traffic congestion,
- Enhance public safety by decreasing traffic crash rates,
- Support economic development by promoting the efficient movement of people and goods,
- Reduce the need for new highways and road widening by maximizing the performance of the existing state highways, and
- Preserve the public investment in new highways.

As development increases in the study area, the localities should look for opportunities to regulate interparcel connections, site access restrictions, traffic signal and access point spacing and other measures to help maintain traffic flow along the Route 522 Corridor. In the areas expecting future developments it is recommended that the locality monitor potential development and rezoning, while preserving proper intersection spacing.

In all, these regulations seek to balance the land development right of property owners against the need to maintain acceptable traffic conditions along Route 522. Ensuring these regulations are strictly adhered to will help maintain acceptable levels of traffic congestion on Route 522 longer than if these regulations did not exist, thus extending its capacity and limiting delay.

Route 522 Corridor – Multimodal Recommendations

A variety of multimodal improvements were developed for the US 522 Corridor and are presented in this section. These multimodal improvements will not only enhance the movement of people and goods in the corridor by meeting potential future demand, but they also provide alternative modes of transportation in the corridor, which is especially critical to growing areas such as this study area. As discussed in the land use section of this report, the corridor is anticipated to continue to develop, especially in the northern portion of the study area. It is critical to ensure that all modes of transportation are integrated into the corridor. As development projects are proposed and reviewed in the future, multimodal improvements should be part of the comprehensive approach to meeting future needs in the US 522 Corridor.

Bicycle

A series of bicycle improvements are proposed in the corridor, including a network of potential bicycle connections that can be incorporated as part of shared use trails or side paths. While there is currently a lack of non-motorized amenities, the Win-Fred MPO Bicycle and Pedestrian Mobility Plan calls for a series of proposed bicycle improvements in the vicinity of the US 522 study corridor. These facilities are recommended to be at least 10 feet wide to meet space requirements for accessibility and bicycle movements and they do adhere to the MPO Draft Bike Plan adopted in 2007. These improvements include a 7.12 mile long on-road facility for US 522 from I-81 in the City of Winchester, to Double Tollgate in Clarke County. In addition to the proposed on-road facility along US 522, multiple east-west connections to US 522 are also proposed in the form of multi-use trails and on-road facilities of perpendicular roadways. On-road bicycle facilities or multi-use trails are proposed on the following roadways that cross or connect to the US 522 Corridor:

- Millwood Pike
- Justes Drive
- Warrior Drive
- Airport Road
- Evendale Lane
- West Parkins Mill Road
- Tasker Road

The Federal Highway Administration has traditionally defined three types of bicycle users (A, B and C) to assist in describing different facility types and roadway conditions for bicyclists. Group A includes advanced or experienced riders who are comfortable riding with motor vehicle traffic. Group B includes basic or less confident adult riders, and Group C includes children riders. Future bicycle planning initiatives are moving

away from the traditional group types (A, B, and C) and are addressing riders through more detailed descriptions of trip types and rider experience level and designing appropriate facilities based on the intended use.

Pedestrian

The proposed pedestrian improvements include the shared and multi-use trails indicated in the MPO Bicycle and Pedestrian Plan. In addition to the MPO recommendations, this study also calls for specific pedestrian safety improvements based on the context zone designs for each section of the US 522 Corridor. Specific pedestrian improvements should be made in the vicinity of the Interstate 81 interchange and in the commercial areas of northern Frederick County. These investments are needed to meet demand for walking between shopping destinations and residential development and to ensure that pedestrians can traverse the US 522 Corridor in a safer pedestrian environment. The following recommendations are suggested to enhance pedestrian safety at intersections within Winchester south to Airport Road in Frederick County:

- Install Pedestrian Crossing signs along the I-81 exit ramps
- Implement Pedestrian crosswalks and signals at intersections that connect commercial properties to other commercial developments or residential areas
- As part of the design, additional enhancements such as median pedestrian refuges, traffic calming measures, signage, and other safety features should be considered and implemented as appropriate

In addition to the implementation of a comprehensive trail system, enhanced sidewalk connections, and a new multi-use trail along US 522, the access management recommendations and transit investments should also enhance the pedestrian experience in the corridor. The access management recommendations will reduce the number of curb cuts along the corridor, and thus, also reduce potential vehicular – pedestrian conflict points significantly. Design enhancements and streetscape improvements that enhance the pedestrian scale should also be implemented as part of making investments in the corridor. These types of enhancements, such as pedestrian-scale lighting, wide sidewalks, additional plantings, and implementation of benches, receptacles and other amenities will serve as an indication to drivers that they need to change their behavior as they enter a more pedestrian-oriented corridor.

Transit

Currently, the US 522 Corridor is only served by one public transportation route, the Apple Blossom Mall Route. Based on the *Transit Services Plan for Win-Fred Metropolitan Planning Organization,* it is recommended that the Apple Blossom Mall route be extended south along US 522. Extending the route would provide transit service to the Winchester Airport, the Virginia Employment Commission and the Delco Plaza retail center. Extending the current route 4.7 miles to the south would increase the headway of the route to an hour, therefore doubling the amount of time it takes to complete the current route.

In addition to extending transit service along the corridor, other transit amenities are also recommended. Provision of additional transit and transit amenities in the corridor such as benches and shelters will also aid in converting the corridor from an auto-dominated corridor into a more multimodal corridor. Providing exclusive pull-off areas for the buses would also add to a more multimodal corridor and provide additional safety to the riders and operators of the transit service.

Longer term additional transit service could be provided to the recommended park-and-ride lot located on Millwood Pike, just east of the US 522 intersection. By providing transit services to park-and ride lots, alternative means of transportation are provided for transit service locally into Winchester.

Park & Ride

One new Park & Ride lot is proposed within the study area. This proposed lot is recommended to be situated along Millwood Pike, just east of Interstate 81 and would be constructed as land use changed in the corridor. This lot would serve local transit trips as well as persons interested in forming carpools, vanpools, etc. By locating this lot near major cross-routes, there would be higher potential to capture multiple origins and destinations in the corridor.

Travel Demand Management

Travel demand management (TDM) programs can further decrease the traffic impacts of development in the US 522 Corridor. A number of programs can be developed, many of which could coordinate with or be supported by the regional ridesharing and travel demand management programs of the Northern Shenandoah Valley Regional Commission (NSVRC). For example, the Valley Commuter Assistance Program (VCAP) is a “free ride-matching service that provides users the opportunity to connect with individuals who use similar commuting patterns.” The VCAP offers coordination of carpooling, vanpooling, commuter buses and other services. The VCAP can help determine other commuting options or alternatives that fit individual’s schedules. The VCAP can be beneficial by providing these services within the US 522 Corridor.

The TDM strategies most relevant to the study area are ridesharing, flextime, and telecommuting. Employers who support these programs will help reduce peak period congestion. Specifically, ridesharing reduces vehicle trips through carpooling or vanpooling, but for success would need to be supported by a Guaranteed Ride Home program. Flextime has to be promoted by individual employers, but when successfully implemented, it serves to spread work trips across a longer period of time in the mornings and evenings, reducing peak congestion. Telecommuting options offered by local employers would reduce trips in the area, and incorporation of telework center(s) in the corridor would help reduce regional travel.

In working with developers, the starting point for TDM programs may include designated parking for carpools and vanpools. A coordinated plan for the corridor, which could be incorporated into a corridor overlay plan, should include goals or targets for park and ride facilities and telework centers. These are items that could be proffered if corridor-level goals were established. Another mechanism to encourage success with TDM strategies is the establishment of a Transportation Management Association for the corridor. This would be a public-private agency supported by the Win-Fred MPO and NSVRC and corridor employers to provide information, coordination, and administration of travel demand management programs to foster their implementation and fulfillment of travel reduction goals. Programs should be available to encourage TDM strategies including subsidizing costs, rebates to employers, and other benefits.

TDM strategies have been successful in many areas including Arlington, Virginia (Arlington County Commuter Services) and Montgomery County, Maryland (Montgomery County Commuter Services).

Freight

As discussed in the existing and future conditions sections, there are no pressing needs for making freight improvements in the Route 522 Corridor. As downward economic trends begin to rise, freight movement along the corridor should be monitored to identify potential freight facility deficiencies and other roadway impacts.

Further freight study, including future projections and origin-destination data / surveys, would present a better understanding of freight uses in the corridor.

Project Prioritization

The recommendations provided in this chapter are intended to provide the localities and VDOT with a tool to ensure that as development occurs within the Route 522 Corridor study area, the capacity and safety of the corridor are maintained. The recommendations also provide a blueprint of the ultimate corridor so roadway and intersection improvement projects can be implemented and pursued in a fashion that results in a well-planned corridor with good operational characteristics.

The recommendations provided should be prioritized by the jurisdictions, based on need, expected cost, and overall feasibility. Recommendations receiving a high priority should be improvements that are expected to correct existing deficiencies and that could be implemented without significant impact to existing structures or development. Other high priority recommendations should include starting the project improvement process on the large scale items, including the grade separation at Jubal Early Drive, the relocation of Route 522, and any lane widening projects. Recommendations receiving a low priority should be projects at locations without immediate need or locations expected to be cost intensive without significant impact on the overall corridor.

The project steering committee should provide comments in this section pertaining to specific project prioritization. This section is intended to develop an improvement prioritization that looks at all aspects of this study, including multimodal elements, roadway/intersection capacity, safety, and others. The input received will be used to develop a final improvement prioritization.

Appendix A

Route 522 – Roadway Geometric & Safety Review

Introduction

A field visit was conducted to assess the safety and access of the US 522 Corridor and to build upon the VDOT *US 340/522 Geometrics and Safety Survey*, dubbed "Phase I" and dated August 2008. The focus of the field visit was the northern section of the corridor from the Clarke County / Frederick County boundary, through the I-81 interchange, to Pleasant Valley Road in the City of Winchester. The southern area from the Town of Front Royal to the southern terminus of the Phase I study at Country Club Road was also reviewed. This appendix shows an inventory of the crossovers, access points, and other geometric and safety concerns for the Phase II sections of the corridor that were not covered in the VDOT *US 340/522 Geometrics and Safety Survey.* Figure A-1 shows the limits of the previous Phase I study and the limits of this Phase II review.

As shown in the following pictures, the access point spacing throughout the corridor does not meet the standards set by VDOT's *Access Management Design Standards for Entrances and Intersections: Principal Arterials*. The VDOT access management regulations state that unsignalized crossovers on rural principal arterials should be spaced at distances of at least 1,760 feet for roadways with speed limits of 50 miles per hour or greater.

The pictures also show that some of the commercial access points along the corridor do not meet the VDOT regulation of 585 feet for a rural arterial or the 325 feet for an urban arterial. This is especially true for the northern portion of US 522 leading into the City of Winchester as many commercial access points are in close proximity to each other.

Other deficiencies in the northern portion of the US 522 are shown in the following pictures:

- Missing portions of sidewalk and below-standard pedestrian ramps
- Deteriorating pavement conditions and pavement markings.
- Inoperable pedestrian signals and pedestal poles missing signal heads.
- Trailblazing signs in the City of Winchester that are not standard sizes.
- Possible drainage issues and/or puddling in the area of the Interstate 81 ramps.

Route 522 Multimodal Corridor Study

From Millwood Avenue & S Pleasant Valley Road (Winchester) to Riverton Road (Front Royal)

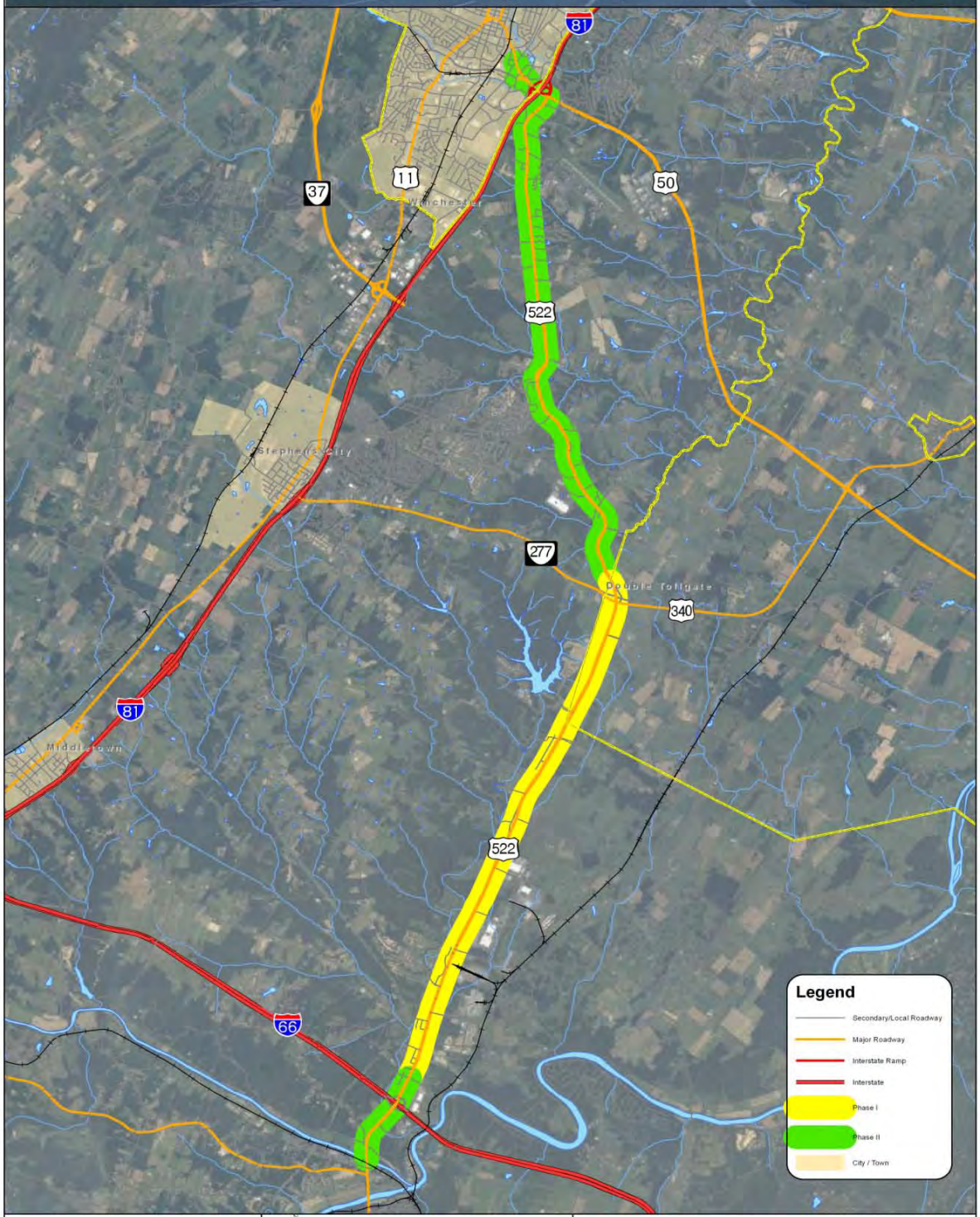


Figure A-1:
Field Review Area

7,200 3,600 0 7,200 Feet

Baker

RENAISSANCE PLANNING GROUP

Photo Inventory and Review

Facing north on the bridge over the North Fork Shenandoah River has recently been reconstructed.

Facing north at the crossover at Route 637, just north of the North Fork Shenandoah River. There is sidewalk just north of the bridge, but it terminates at Rt. 637

Facing east at the crossover at the Shell Station just north of Route 637.

Facing southbound at the crossover at the dump, just north of the Shell Station.

Facing northbound at the crossover at the McDonalds, just south of Interstate 66

Facing east from McDonalds Lot at the crossover.

The northbound approach of the intersection of US 522 and the I-66 ramps. Notice the Truck is turning left during the green phase for oncoming traffic.

v 

The northbound approach at the traffic signal at the intersection of US 522 and Lord Fairfax Hwy (US 340).

Facing northwest at the traffic signal at the intersection of US 522 and Lord Fairfax Hwy (US 340). There may be clearzone issues with these signs.

Facing southwest at the traffic signal at the intersection of US 522 and Lord Fairfax Hwy (US 340). There may be clearzone issues with these signs.

Another picture facing southwest at the traffic signal at the intersection of US 522 and Lord Fairfax Hwy (US 340). There may be clearzone issues with these signs.

Facing east at the crossover at the Shen-Valley Flea Market north of the US 522/US 340 intersection.

Facing north at the crossover just north of the Shen-Valley Flea Market.

Facing north at the crossover north of the previous crossover.

Facing north at the crossover at Rt. 646

This picture shows the proximity of is the crossover at Rt. 646 and the crossover just north of that intersection.

This is the crossover to the north shown in the previous picture.

Facing north at the crossover adjacent to Garbers Ice Cream.

Facing north at the crossover at the intersection at Rt. 643 and US 522.

Facing west at the crossover at the intersection at Rt. 643 and US 522.

Facing north at the intersection of US 522 and Rt. 1600

Facing northeast at the intersection of US 522 and Rt. 1600

Facing east at the crossover of US 522 and Tasker Road.

Facing north at the intersection of US 522 and Gemstone Road. There are signs indicating a bus stop ahead.

Facing northwest at the intersection of US 522 and Fries Loop Road.

Facing south from the northbound lane of US 522 just south of Fries Loop Road.

Facing west at the intersection of US 522 and Armel Road (Rt. 642).

Facing south from the truck yard at the intersection of US 522 and Armel Road (Rt. 642). The driveway is just a few feet from the intersection.

Facing north at the truck yard access points just north of the intersection of US 522 and Armel Road (Rt. 642).

Facing north at the intersection of US 522 and Macedonia Church Rd.

Facing north at the intersection of US 522 and Armel Elementary School

Facing north at the intersection of US 522 and Clydesdale Drive.

Facing north at the intersection of US 522 and Rt. 644.

Traveling northbound on US 522 north of the intersection with Rt. 644. The sight distance at this location is poor.

This is the crossover approximately 1000 feet north of the intersection of US 522 and Rt. 644.

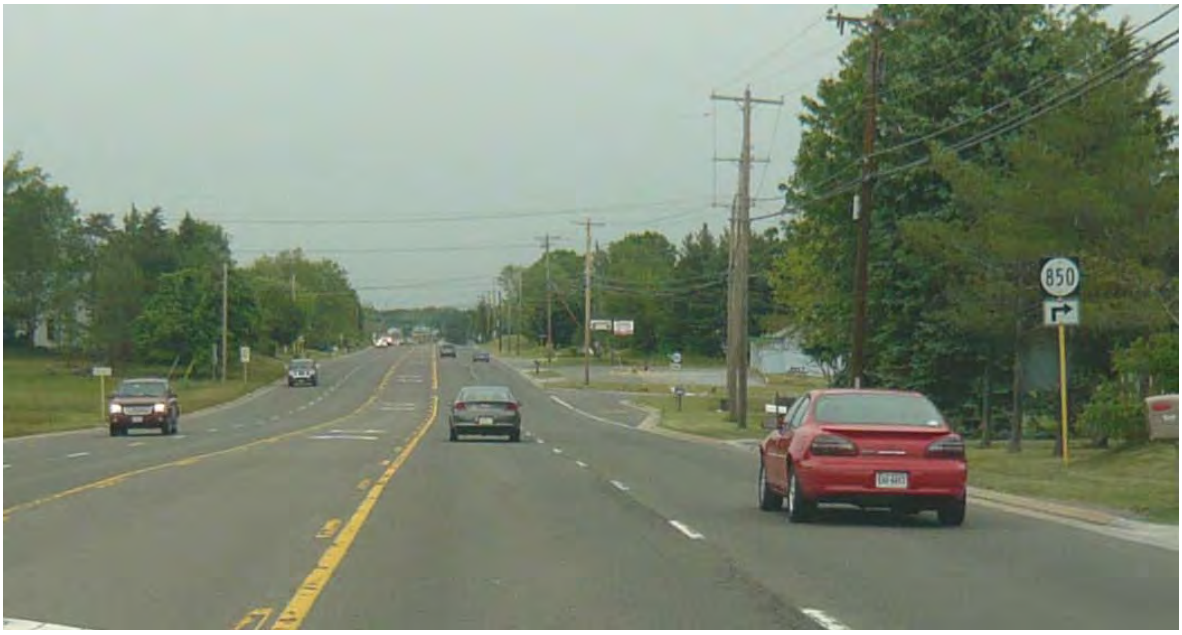
This crossover is approximately 500 feet north of the previously pictured crossover. This location is also 1500 feet north of the intersection of US 522 and Rt. 644.

This crossover is approximately 500 feet north of the previously pictured crossover. This location is also 2000 feet north of the intersection of US 522 and Rt. 644.

The median terminates approximately 1500 feet south of 3rd Street or approximately 500 feet north of the previously pictured crossover.

Facing north at the intersection of US 522 and Justes Drive.

Facing north at the intersection of US 522 and Rt. 644



Facing north at the intersection of US 522 and Rt. 850

Facing west at the intersection of US 522 and Rt. 850 (Vine Lane)

Facing north at the intersection of US 522 and Westwood Dr/Grindstone Dr.

Traveling northbound on US 522 just north of the intersection with Westwood Dr/Grindstone Dr.

Facing north at the intersection of US 522 and Bentley Avenue.

Facing north at the intersection of US 522 and Longcroft Road.

Facing west at the intersection of US 522 and Longcroft Road.

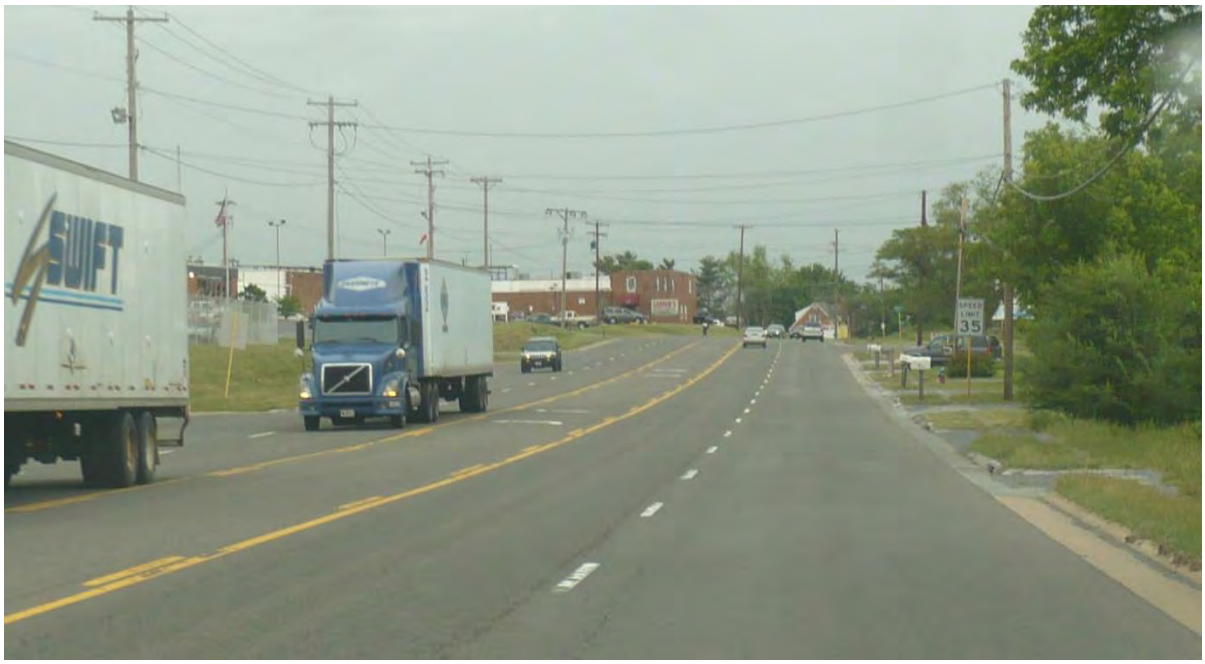
Traveling northbound on US 522 toward the intersection with Route 645 (Airport Road)

Facing north at the intersection of US 522 and Route 645 (Airport Road).

Traveling north at the intersection of US 522 and Rt 777 (Royal Drive).

Traveling north at the intersection of US 522 and Rt 776 (Bufflick Road)

Facing west at the intersection of US 522 and Rt 776 (Bufflick Road)



Traveling north on US 522 just north of the intersection with Rt 776 (Bufflick Road).

Facing west at the intersection adjacent to FedEx.

There is new sidewalk adjacent to the Holiday Inn on US 522.

There is new sidewalk adjacent to the Holiday Inn on US 522.

North of the Holiday Inn there is currently no sidewalk.

There are no sidewalks in this area (same as above) but there are pedestrian ramps that are not up to standard.

There are no sidewalks in this area (same as above) but there are pedestrian ramps that are not up to standard.

There is minimal distance between access points just south of Costello Drive. Notice there is sidewalk in the northern portion of the picture.

This picture shows additional access points south of Costello Drive. The sidewalk continues on the east side of US 522.

Facing north at the intersection of US 522 and Costello Drive.

Facing east at the intersection of US 522 and Costello Drive.

This picture shows the pavement conditions near Costello Drive.

This picture shows the pavement conditions near Costello Drive.

This picture shows the Entrance/Exit to the Costco. Notice the Exit is right only. Delineators are used to prevent lefts. The picture shows that some of the Delineators have been damaged or removed.

This picture shows the Entrance/Exit to the Costco. Notice the Exit is right only. Delineators are used to prevent lefts. The picture shows that some of the Delineators have been damaged or removed.

The exit from the bank has a left and right turn lane.

Facing north at the intersection of US 522 and the entrance/exit of the Delco Plaza Shopping Center.

Facing west at the intersection of US 522 and the entrance/exit of the Delco Plaza Shopping Center.

Facing north approaching the intersection of US 522 and the I-81 ramps.

Facing north at the intersection of US 522 and the I-81 ramps.

This is a photo of a truck making a northbound right at the intersection of US 522 and the I-81 ramps.

Facing west at the intersection of US 522 and the I-81 ramps.

Facing south from the northbound lanes of US 522 (at the I-81 ramp intersection)

Facing southeast on Millwood Avenue towards the Frontage Road and I-81 intersections.

Facing southeast on Millwood Avenue towards the Frontage Road and I-81 intersections.

Facing southeast on Millwood Avenue towards the Frontage Road and I-81 intersections.

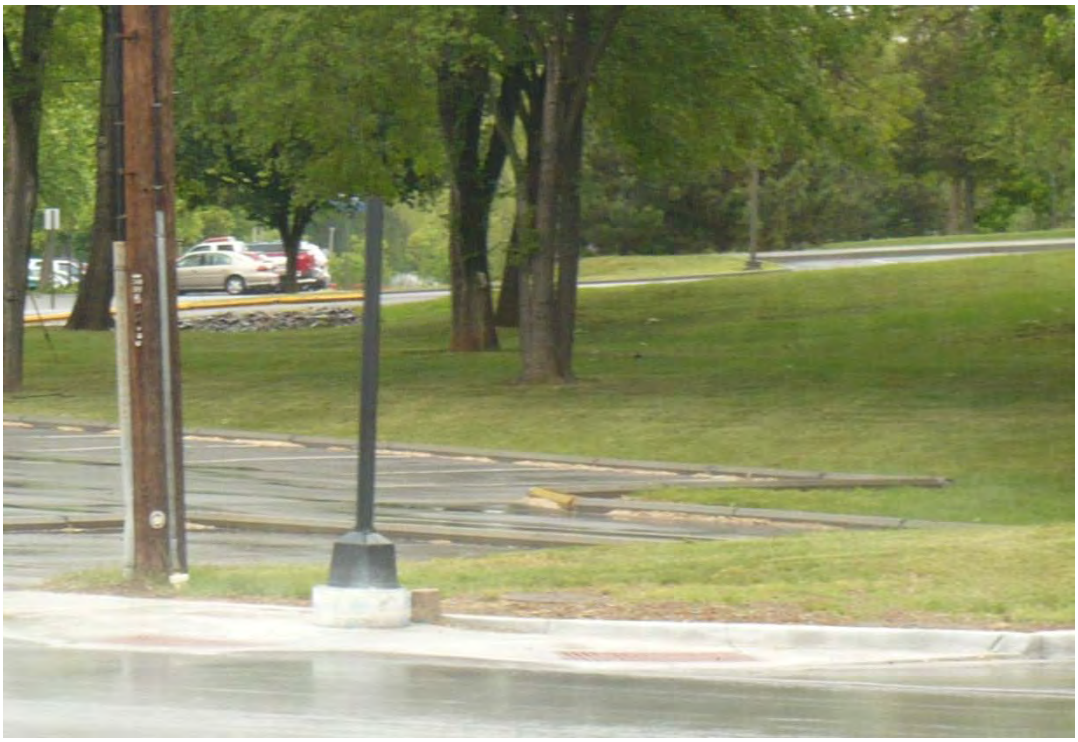
The driveway to the Best Western is very close to the intersection of US 522 and the I-81 ramps.

Facing west from the intersection of Millwood Avenue and Pleasant Valley Road.

Facing south from the intersection of Millwood Avenue and Pleasant Valley Road.

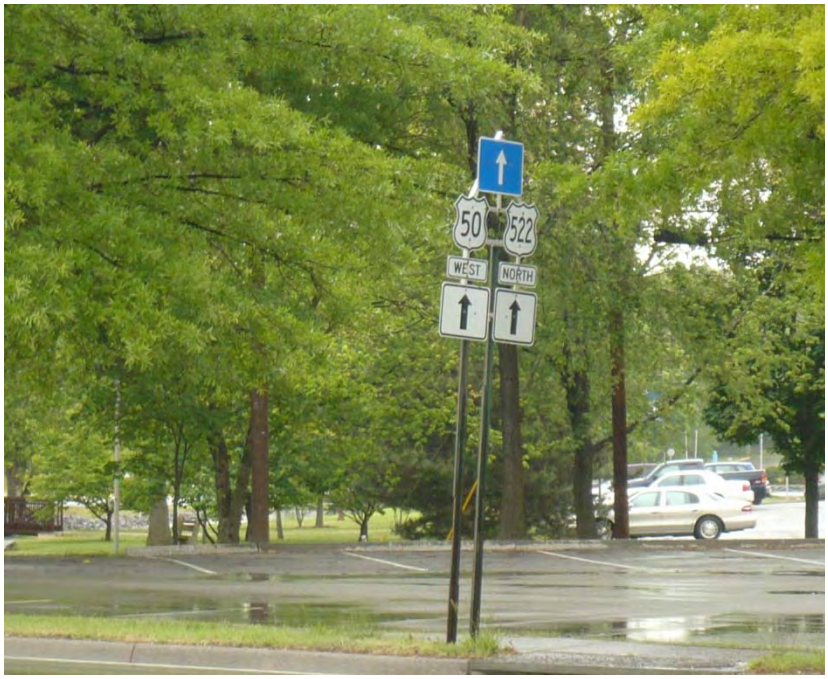
Facing north towards the intersection of Millwood Avenue and Pleasant Valley Road.

The pedestrian signals at the intersection of Millwood Avenue and Frontage Road are inoperable.



This pedestal pole at the intersection of Millwood Avenue and Frontage Road does not have a signal head.

Sidewalks are present on this section of Millwood Avenue with standard pedestrian ramps.



The signing on Millwood Avenue is not up to standard around the I-81 ramps.

There may be drainage issues adjacent to the Best Western near the intersection of Millwood Avenue and Frontage Road.

There may be drainage issues along the eastbound channelized right turn at the intersection of Millwood Avenue and Front Royal Pike.