



# Emmet Streetscape Improvements Multimodal Corridor Analysis Report



July 2018 (Draft)

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# **Emmet Streetscape Improvements Multimodal Corridor Analysis Report**

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## 1. Introduction and Purpose

The purpose of this report is to summarize the analysis of existing and future multimodal and vehicular traffic operations throughout the study corridor area, and to provide recommendations for the ultimate design to be carried forward for the Emmet Streetscape Project.

The extent of the Emmet Streetscape Project is along Emmet Street from the intersection with Ivy Road/University Avenue to the intersection with Arlington Boulevard. The intersections examined in this report include the following. They are illustrated on **Figure 1 (see attached)**.

- Emmet Street/Ivy Road
- Emmet Street/Massie Road
- Emmet Street/Arlington Boulevard
- University Avenue/Culbreth Road
- Emmet Street/Lambeth Lane, and
- Emmet Street/Copeley Road

Emmet Street is also U.S. 29 Business, which is part of the Seminole Corridor in the state's Corridors of Statewide Significance program. Emmet Street within the study area is classified by VDOT as a principal arterial roadway, and the posted speed limit is 35 mph. At present, the corridor carries approximately 26,000 vehicles per day, and also is also heavily traversed by bicycles and pedestrians. The abutting land use is primarily institutional and the primary land ownership is related to the University of Virginia, though on the north end of the corridor, in close proximity to Arlington Blvd, the land use transitions to retail uses. Overall, the users of the corridor are a mix of commuters, students, and shorter local trips. As well, the John Paul Jones arena is located adjacent to the corridor and at times the corridor conveys event traffic, including both vehicular traffic and bicycle and pedestrian traffic.

Overall, this corridor is a critically important linkage in the City's transportation system that experiences strong multimodal demand and high traffic volumes.

## 2. Study Methodology

The study effort focused on providing a balance between enhancing multimodal mobility and maintaining adequate vehicular mobility. This report is structured in manner that first provides traffic data and technical analyses as required to identify roadway geometric needs for the road users to maintain adequate vehicular travel capacity in the future. Then, building on the traffic operational analyses, multimodal features are analyzed and recommendations are provided for multimodal accommodations. These will help to ensure that corridor is well setup for multimodal mobility in the future.

The study process is detailed in this document and includes a summary of the technical analyses followed by illustrations of the roadway and multimodal improvements.

### **Vehicular Traffic Operations**

EPR studied vehicular traffic operations at the study intersections and along the corridor for the existing year (2018) and the future design horizon year (2045) using Synchro/SimTraffic (for

standard intersections) and Sidra (for roundabout intersections) with existing traffic volume data and projected future year traffic volume data.

### **Traffic Volume Data**

EPR obtained existing traffic volume data from *Charlottesville 2017 Signal Timing Study* for the intersections of Emmet Street/Ivy Road, Emmet Street/Massie Road, and Emmet Street/Arlington Boulevard. The consulting team counted traffic in November 2017 for the intersections of University Avenue/Culbreth Road, Emmet Street/Lambeth Lane, and Emmet Street/Copeley Road. The future year (2045) traffic volume projections were developed utilizing the following sources of information.

- Historical traffic trends,
- Travel demand model projections,
- VDOT Statewide Planning System, and
- Comparison of 2007 and 2017 traffic counts

## **3. Existing Traffic Operations**

### **Existing Traffic Volume Data**

As previously described, EPR obtained existing traffic volume data from the *Charlottesville 2017 Signal Timing Study* for the intersections of Emmet Street/Ivy Road, Emmet Street/Massie Road, and Emmet Street/Arlington Boulevard. EPR conducted new traffic counts for the intersections of University Avenue/Culbreth Road, Emmet Street/Lambeth Lane, and Emmet Street/Copeley Road on Tuesday, November 7th, 2017; Wednesday, November 8th, 2017; Thursday, November 16th, 2017; and Thursday, November 30th, 2017. These were typical weekdays while schools were in session and no special events occurred. The existing traffic volume data has been illustrated in **Figure 2 (see attached)** and the traffic data sheets have been included in the **Appendix A**.

It should be noted that Culbreth Road and Lambeth Lane have significant left turn movements occurring using the right turn only outbound lane. Applying engineering judgment, the left turn movements at the Culbreth Road outbound lane were modeled as right turn movements for the future year conditions, and the egress left turn movements from Lambeth Lane were kept as the left turn movements. The study team observed that left turn movements from the Culbreth Road outbound lane are frequently causing traffic to backup on Culbreth Road during the afternoon peak period. Note that the design concepts should consider engineering a solution that will prevent left turns from Culbreth Road. The adjusted traffic volume data has been illustrated in **Figure 3 (see attached)**.

### **Traffic Model Developments**

The traffic modeling network was developed using aerial mapping, roadway geometry, traffic, and signal operational information provided by the City. The operational analysis for the study area intersections was completed using Synchro 9.1, a computer-based intersection operations model that replicates procedures from the *Highway Capacity Manual (HCM)* (Transportation Research Board, 2000 and 2010). In addition, Sidra (version 5.1) was used to examine roundabout traffic operations.

Two measures of effectiveness were selected to measure the quantitative performance of the study area intersections:

- Average vehicle delay by movement, approach, and intersection – measured in seconds per vehicle
- Maximum queue length – measured in feet

The signal timing and phasing plans for all signalized intersections were provided by the City of Charlottesville for existing conditions. For future conditions the timings were optimized and also included implementation of Leading Pedestrian Intervals (LPI). Note that the City is waiting to implement new signal timings currently that will include LPIs. These timings were developed in the 2017 effort to identify coordinated signal timing plans and will be implemented once certain upgrades are added to the existing traffic signals.

### Performance Measures

To determine lane geometric needs, intersection level of service (LOS) standards have been applied. Intersection LOS is a qualitative measure of vehicular delay and takes into account a number of conditions related to intersection design and traffic volume, and the perception of those conditions by motorists. Ratings range from A to F, with LOS A indicating little or no average delay and LOS F indicating severe average delays. Typically, LOS A-C are considered acceptable ratings for an intersection, while LOS D-F indicate the potential need for improvements. To note, LOS D (and sometimes LOS E), with greater vehicle delay, are often considered acceptable for more urbanized areas because of the accessibility benefits and higher pedestrian interactions that result from increased density. **Table 1** summarizes the LOS criteria, as specified in HCM.

*Table 1 Level of Service Criteria*

Level of Service (LOS)	Signalized Intersection Control Delay (seconds/vehicle)	Unsignalized Intersection Control Delay (seconds/vehicle)
A	0-10	0-10
B	>10-20	> 10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

*Source: 2010 Highway Capacity Manual*

In addition to LOS, the maximum queue is the probable furthest distance from the stop bar to the back of the last vehicle waiting at an intersection. This queue represents the length of the line of cars that arrive at an intersection when the signal is red combined with vehicles that did not clear the intersection during the previous green light. Comparing the length of this line of vehicles to potential lane lengths available at each intersection provides another measure of how efficiently the intersection is processing traffic demand.

Volume-to-capacity is another common measure of the performance of street segments and intersections. However, the study team decided to use LOS as the primary measure of performance because it is an easier to understand measure for the general public, and generally reflects the volume to capacity ratio.

The level of service, delay, and queue results have been summarized in **Table 2** and included in **Appendix B**.

*Table 2 Existing Traffic Operations Summary*

Approach	Movement	Storage	AM			PM		
			LOS	Delay	Queue	LOS	Delay	Queue
<b>1. Emmet/Ivy</b>								
Ivy	EBL	215	E	59.6	280	E	73	279
	EBT	-	E	70.5	417	E	56.8	439
	EBR	215	D	36.8	280	A	0	280
University	WBL	120	E	59.9	170	E	62.3	170
	WBT	-	D	53.7	341	E	62.4	347
	WBR	75	C	32	140	D	36.9	140
Emmet	NBL	325	B	18.8	348	C	26	349
	NBT/NBR	-	C	25.1	394	C	30.1	951
Emmet	SBL	-	B	16.4	280	C	20.2	854
	SBT/SBR	-	C	26	442	D	38.5	843
Intersection (v/c – 0.88 AM/0.84 PM)		-	D	36.6		D	41.5	
<b>2. Emmet/Massie</b>								
Massie	EBL	200	D	43.8	104	E	67.5	229
	EBT/EBR	-	A	0	123	D	38.4	466
Business	WBL/WBT/WBR	-	A	0	28	A	0	29
Emmet	NBL	80	A	8.3	99	A	9.2	124
	NBT/NBR	230	A	8	140	B	13.6	292
Emmet	SBL	90	A	6.5	72	A	9	129
	SBT/SBR	-	B	13.5	317	B	14.9	349
Intersection (v/c – 0.52 AM/0.89 PM)		-	B	12.8		C	21.8	
<b>3. Emmet/Arlington</b>								
Arlington	EBL	-	D	50.6	166	D	48.6	263
	EBR	100	D	39.5	169	C	29.8	170
Emmet	NBL	200	D	48.1	188	D	49.9	228
	NBT	-	A	2.1	100	A	4.6	212
Emmet	SBT/SBR	-	B	12	441	B	14.9	327
Intersection (v/c – 0.59 AM/0.70 PM)		-	B	16.8		B	16.7	
<b>4. University/Culbreth</b>								
Culbreth	WBR	-	B	11.7	113	B	14.8	350
University	NBT/NBR	-	A	0	110	A	0	352
University	SBL	70	A	8.6	94	A	9.3	116
	SBT	-	A	0	0	A	0	96
Intersection (v/c – 0.26 AM/0.39 PM)		-	A	3.1		A	4	
<b>5. Emmet/Lambeth</b>								
Lambeth	WBL/WBR	-	C	19.5	35	E	36.5	86
Emmet	NBT/NBR	-	A	0	0	A	0	7
Emmet	SBL/SBT	-	A	0.3	67	A	0.7	198
Intersection (v/c – 0.04 AM/0.28 PM)		-	A	0.3		A	1.1	
<b>6. Emmet/Copeley</b>								
Copeley	EBR	-	B	14.7	67	B	11.7	38
Emmet	NBT	-	A	0	0	A	0	12
Emmet	SBT/SBR	-	A	0	10	A	0	0
Intersection (v/c – 0.04 AM/0.04 PM)		-	A	0.1		A	0.1	

The analysis demonstrates that while most intersection approaches in the study area operate fairly well for vehicles (LOS C or better), there are some intersections in the study that perform poorly for vehicles, with levels of service worse than D. Most of these approaches are on the intersecting streets to Emmet.

The analysis of existing conditions for each intersection indicate that the following storage lanes are insufficient relative to existing queuing. The additional distance needed to accommodate existing queuing is shown in parentheses.

- Emmet Street/Ivy Road – Ivy Road EBL (75'), Ivy Road EBR (75'), University Avenue WBL (50'), University Avenue WBR (75'), and Emmet Street NBL (25');
- Emmet Street/Massie Road – Massie Road EBL (50'), Emmet Street NBL (50'), Emmet Street NBT/NBR (75'), and Emmet Street SBL (50');
- Emmet Street/Arlington Boulevard – Arlington Boulevard EBR (75'), Emmet Street NBL (50');
- University Avenue/Culbreth Road – University Avenue SBL (50').

The analysis results also show approximately 850' queues for the Emmet Street SBL and SBT/SBR movements (thus extending beyond the railroad bridge) at the intersection of Emmet Street/Ivy Road and approximately 300' queues for the Emmet Street NBT/NBR movements at the intersection of Emmet Street/Massie Road. These queues indicate that in order to not degrade the existing traffic conditions the future design for Emmet Street will need to retain the two existing southbound lanes for at least 850' (passing the railroad bridge) at the intersection of Emmet Street/Ivy Road and provide the two northbound lanes for at least 300' at the intersection of Emmet Street/Massie Road.

The increase in the storage lane for the Emmet Street northbound approaches might impact the grassy median south of Massie. The city has previously expressed an interest in extending that grassy median south towards the Goodwin Bridge. During the design concept process the design team will examine implications of providing the recommended storage lengths relative to the length and shape of the existing grassy median. the competing demand of adding substantial bicycle and pedestrian facilities outside of the existing curb line.

#### 4. Traffic Speeds

As part of the analysis process, the existing prevailing travel speeds were measured to identify the daily 85th percentile and average traffic speeds for vehicles using the corridor. Hourly speed and volume data was collected continuously Tuesday, April 17, 2018 thru Thursday, April 19, 2018. Data was recorded as the number of vehicles traveling within a 5mph range (from 5mph to 59pm) over the course of each hour. For visualization using graphs, the average speeds for each hour were calculated. The 85th percentile speeds were also calculated. The number of vehicles recorded in each hour was summed to find the hourly traffic volume.

**Figure 4**, below, shows the northbound and southbound traffic volumes for the portion of the study corridor North of Massie. **Figure 5** shows the average speeds by direction, and

Figure 6 shows the 85<sup>th</sup> percentile speeds by direction for that portion of the overall study area.

Figure 7 shows the northbound and southbound traffic volumes for the portion of the study corridor South of Massie. Figure 8 shows the average speeds, and Figure 9 shows the 85<sup>th</sup> percentile speeds for the same portion of the corridor.

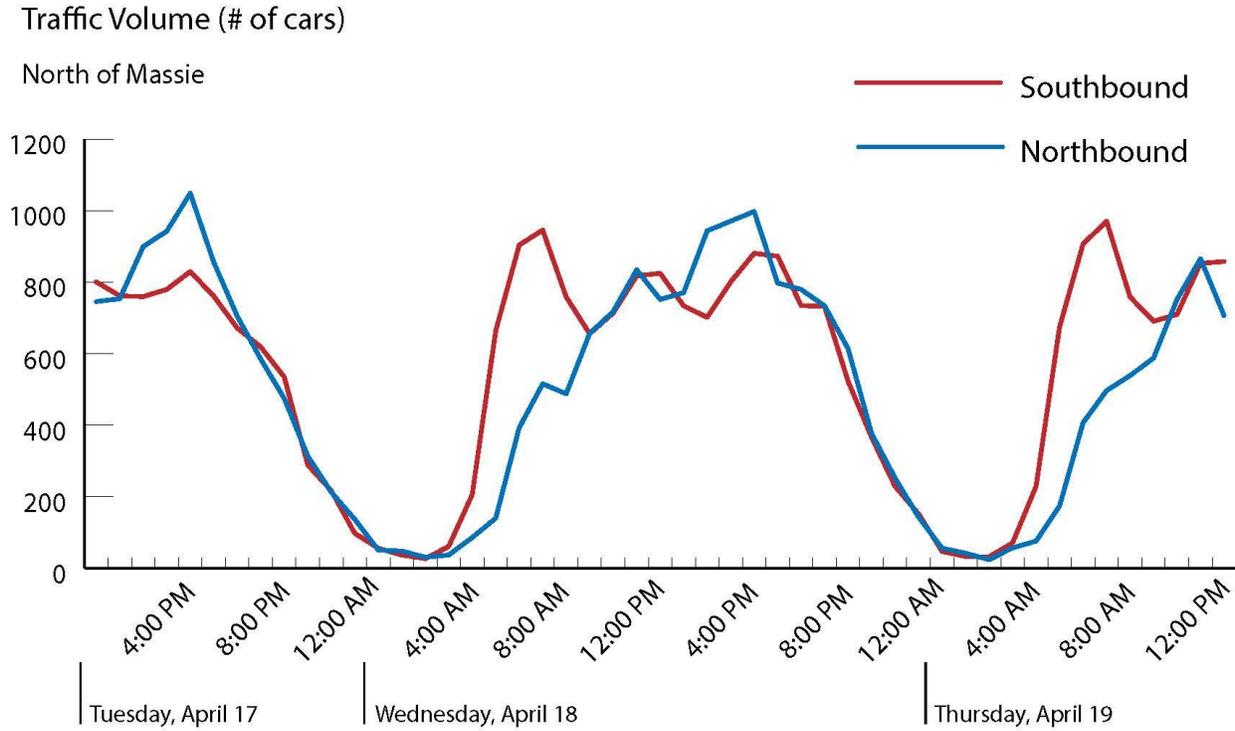


Figure 4 Traffic Volume N of Massie

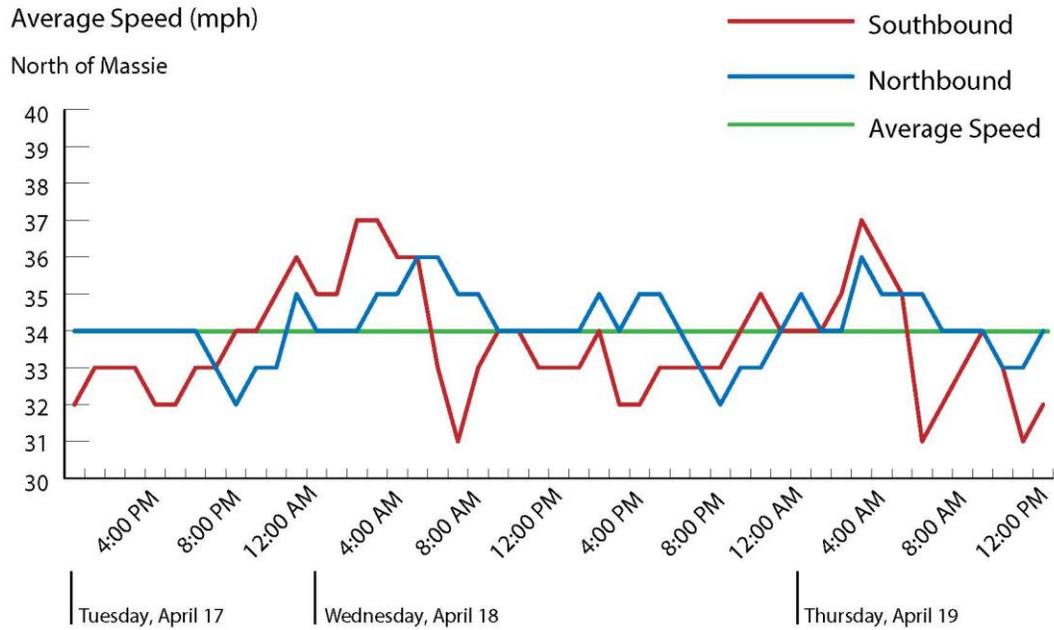


Figure 5 Average Speeds North of Massie

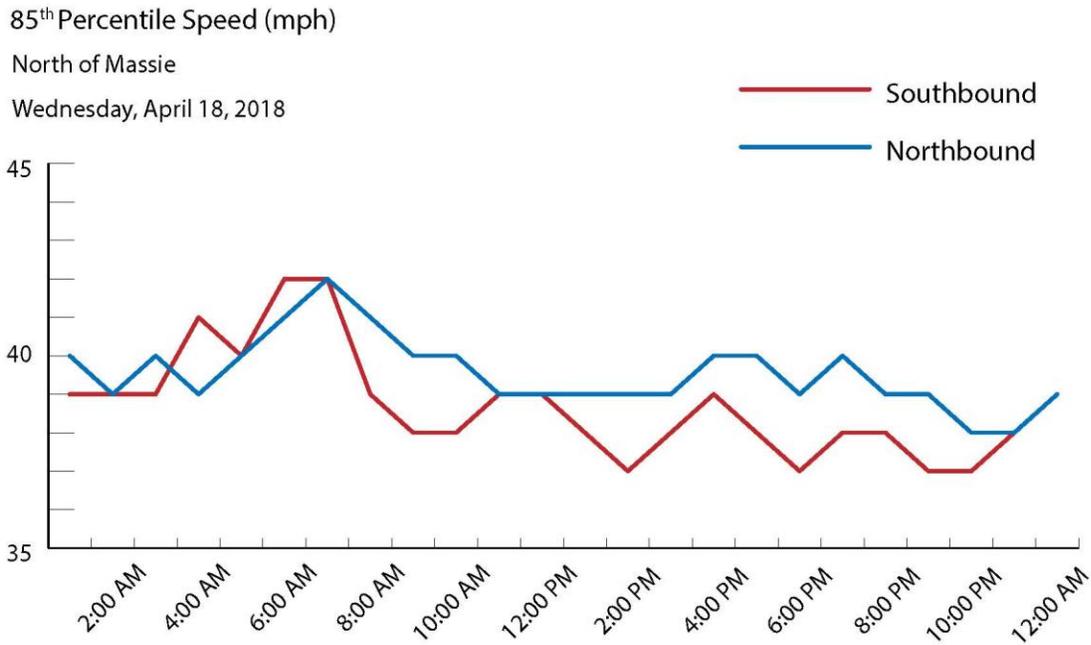


Figure 6 85th Percentile Speeds North of Massie

85<sup>th</sup> Percentile Speed (mph)

South of Massie

Wednesday, April 18, 2018

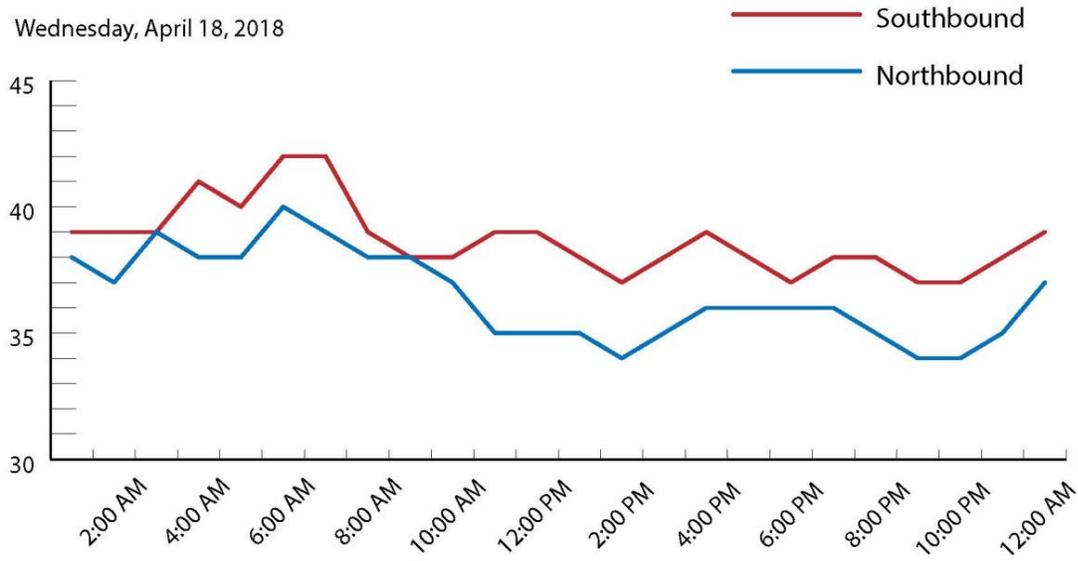


Figure 7 Traffic Volume S of Massie

Average Speed (mph)

South of Massie

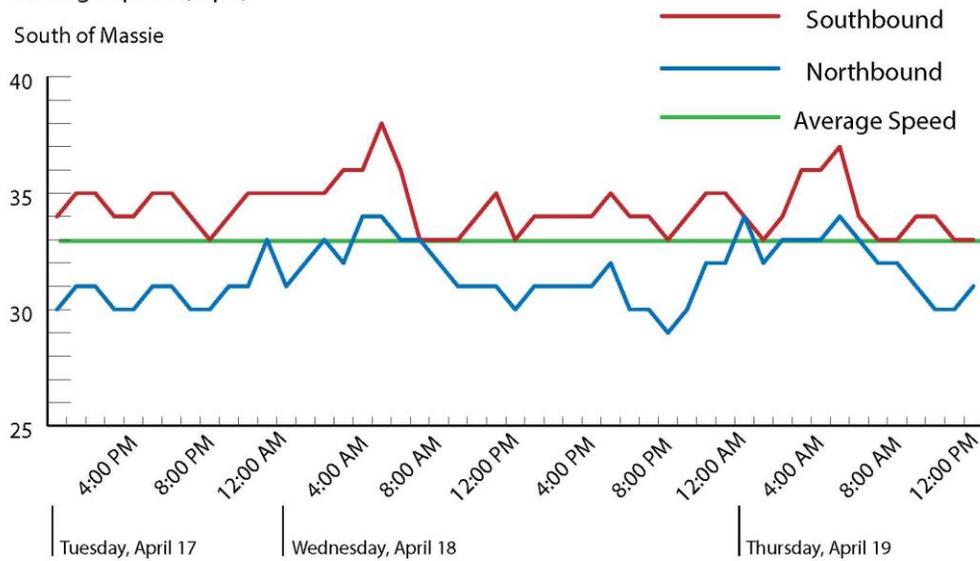


Figure 8 Average Speeds South of Massie

85<sup>th</sup> Percentile Speed (mph)

South of Massie

Wednesday, April 18, 2018

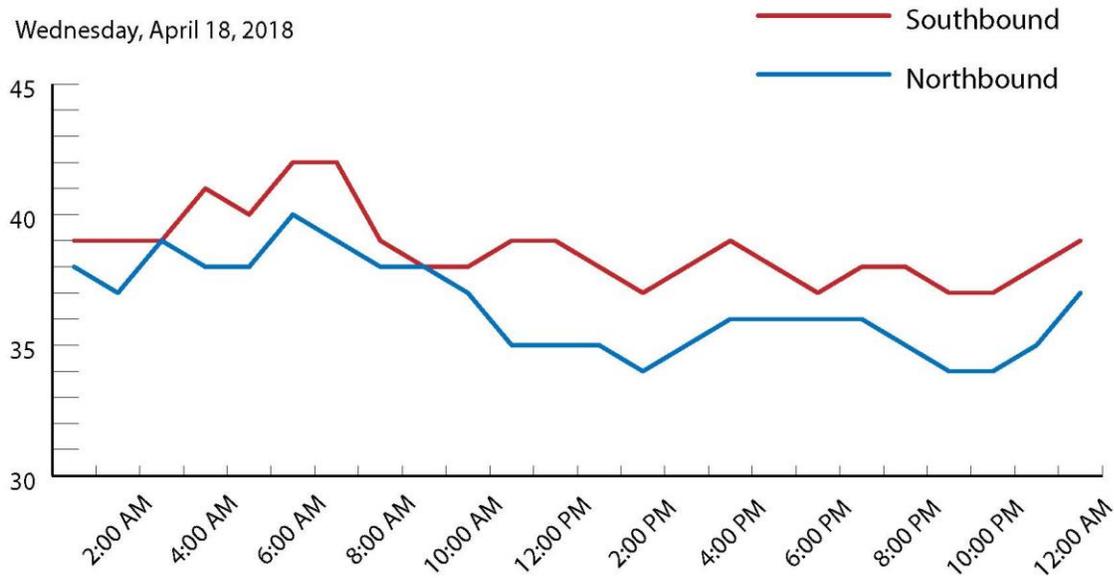


Figure 9 85th Percentile Speeds South of Massie

Table 3 below shows the hourly 85<sup>th</sup> percentile speeds (mph) in a tabular form.

Table 3 Hourly 85th Percentile Speed

Time	North of Massie		South of Massie	
	Northbound	Southbound	Northbound	Southbound
1:00 AM	40	39	38	39
2:00 AM	39	39	37	39
3:00 AM	40	39	39	39
4:00 AM	39	41	38	41
5:00 AM	40	40	38	40
6:00 AM	41	42	40	42
7:00 AM	42	42	39	42
8:00 AM	41	39	38	39
9:00 AM	40	38	38	38
10:00 AM	40	38	37	38
11:00 AM	39	39	35	39
12:00 PM	39	39	35	39

1:00 PM	39	38	35	38
2:00 PM	39	37	34	37
3:00 PM	39	38	35	38
4:00 PM	40	39	36	39
5:00 PM	40	38	36	38
6:00 PM	39	37	36	37
7:00 PM	40	38	36	38
8:00 PM	39	38	35	38
9:00 PM	39	37	34	37
10:00 PM	38	37	34	37
11:00 PM	38	38	35	38

Table 4 shows the average 85th percentile for each day.

*Table 4 Average 85th Percentile Speed*

	North of Massie		South of Massie	
	Northbound	Southbound	Northbound	Southbound
85 <sup>th</sup> Percentile	39	38	35	39

**Conclusions**

Overall it appears that the present speed limits are fairly well adhered to by motorists in the corridor. Per field observations there is a substantial amount of congestion occurring throughout the day along the corridor in the study area. It is likely that this results in a general inability to travel at speeds significantly higher than the posted speeds. As the data graphs indicate, it appears that speeds are highest in the early morning hours when the volumes are the lowest.

Speeds of 45 miles per hour or greater are rare. About 1 percent of vehicles were observed traveling at this speed. This level of speed was most common in the segment between Massie Road and Arlington Road. This is an important finding because pedestrian fatalities from vehicle crashes increase dramatically when the vehicle is traveling at a speed of greater than 35 miles per hour.<sup>1</sup>

The purpose of the Emmet Streetscape project is to transform the street into a complete street that safely accommodates all people, regardless of their abilities or means of travel. The speed of vehicular traffic, and the buffer space between the pedestrian and roadway zones, affects the safety and comfort of pedestrians and bicyclists. In order to achieve the objective of the project it is important to reduce the observed vehicle speeds on Emmet Street. It is recommended that the street be designed for a 25 mile per hour speed limit south of Massie Road and a 35 mile per hour speed limit south of Arlington Road.

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<sup>1</sup> U.S. Department of Transportation. National Highway Traffic Safety Administration. "Literature Review on Vehicle Travel Speeds and Pedestrian Injuries." <https://one.nhtsa.gov/people/injury/research/pub/hs809012.html>. Accessed July 13, 2018.

## 5. Future Year (2045) Traffic Volume Projection

EPR developed the future year (2045) traffic volume projection using the following multiple sources of information:

- Historical traffic trends,
- Travel demand model projections,
- VDOT Statewide Planning System (SPS), and
- Comparison of 2007 and 2017 traffic counts.

### Historical Traffic Trends

The Virginia Department of Transportation (VDOT) maintains a statewide traffic count database that is updated on an annual basis. Recent average daily traffic (ADT) counts indicate that Emmet Street (between Ivy Road and Arlington Boulevard) serves approximately 26,000 vehicles per day (vpd) and University Avenue (between Emmet Street to Culbreth Road) serves approximately 14,000 vehicles per day. However, it's important to recognize, after a sharp decrease in 2009, traffic demand has fluctuated over the last eight years. **Table 5** illustrates the trends and annual changes in ADTs on Emmet Street and University Avenue over the last decade.

*Table 5 Historical Traffic Trends*

Location	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average Growth Rate
Emmet Street	28,000	29,000	25,000	25,000	25,000	25,000	24,000	23,000	25,000	26,000	
				0.0%	0.0%	0.0%	-4.0%	-4.2%	8.7%	4.0%	<b>0.5%</b>
University Avenue	16,000	17,000	14,000	15,000	14,000	13,000	13,000	12,000	13,000	14,000	
				7.1%	-6.7%	-7.1%	0.0%	-7.7%	8.3%	7.7%	<b>0.2%</b>

Source: VDOT's Count Program, between City Limits and the Expressway.

The overall trends on Emmet Street and University Avenue indicate the average annual growth rates (linear) equates to 0.5% on Emmet Street and 0.2% on University Avenue.

### Travel Demand Model Projections

The Charlottesville-Albemarle Metropolitan Planning Organization (MPO) maintains a regional travel demand model (TDM). A TDM is an analytical tool to support policy decision making and utilizes a traditional four-step trip-based model process consisting of trip generation, trip distribution, mode choice, and trip assignment. The model has a base year of 2005, mid-years of 2015, 2025, 2030, 2035, and a planning horizon year of 2040. Growth rates are based on interpolation between the base year and the planning horizon year. Linear growth rates on Emmet Street and University Avenue have been summarized in **Table 6**.

*Table 6 TDM Summary*

Location	ADT		2040 Growth Rate
	2005	2040	
Emmet Street	29,230	38,812	<b>0.9%</b>
University Avenue	15,944	25,492	<b>1.7%</b>

Source: Charlottesville-Albemarle MPO TDM (2040)

The projected annual growth rates are 0.9% on Emmet Street and 1.7% on University Avenue.

### VDOT Statewide Planning System

VDOT’s resources for statewide planning include a database of projected traffic volumes for key routes throughout the state. This database, referred to as the Statewide Planning System (SPS), provides guidance to planners relative to using a consistent system for traffic forecasting. The SPS data is generally derived through inspection of historical growth rates, and in areas that utilize a regional travel demand model, the SPS data considers the model output which corresponds to forecasted growth within the model area. Data from SPS on Emmet Street and University Avenue is summarized in **Table 7**.

*Table 7 SPS Summary*

Location	ADT			2035 Growth Rate	2045 Growth Rate
	2014	2035	2045		
Emmet Street	23272	31968	43242	1.8%	<b>2.8%</b>
University Avenue	12412	13715	14336	0.5%	<b>0.5%</b>

Source: VDOT SPS Data

As indicated in the SPS data, the 2014 traffic counts are estimated to increase annually by nearly 2.8% on Emmet Street and by 0.5% on University Avenue to 2045.

### Comparison of 2007 and 2017 Traffic Counts

The above three sources indicate different annual growth rates on Emmet Street and University Avenue (as shown in **Table 8**).

*Table 8 Estimated Growth Rate Summary*

Location	Average Annual Growth Rate		
	Historical Traffic Trends	TDM	SPS
Emmet Street	0.5%	0.9%	2.8%
University Avenue	0.2%	1.7%	0.5%

To further examine the most appropriate growth rate for the study area, EPR compared two groups of peak period traffic counts for the study area in 2007 and 2017 (at the intersections of Emmet Street/Ivy Road, Emmet Street/Massie Road, and Emmet Street/Arlington Boulevard). The 2007 traffic counts are from a prior traffic study and the 2017 traffic counts are from *Charlottesville 2017 Signal Timing Study*. The data at the intersections of Emmet Street/Ivy Road, Emmet Street/Massie Road, and Emmet Street/Arlington Boulevard are summarized in **Table 9**.

*Table 9 2007 and 2017 Traffic Counts Summary*

Intersection	2007		2017		Growth Rate	
	AM	PM	AM	PM	AM	PM
Emmet Street/ Ivy Road	2,059	2,628	2,019	2,744	<b>-0.2%</b>	<b>0.4%</b>
Emmet Street/ Massie Road	1,821	2,331	1,740	2,453	<b>-0.4%</b>	<b>0.5%</b>
Emmet Street/ Arlington Boulevard	2,022	2,524	1,928	2,397	<b>-0.5%</b>	<b>-0.5%</b>

The comparison of 2007 and 2017 traffic counts indicates over the past decade the annual growth rates at the study intersections are mostly negative and all are at 0.5% or less.

### Recommendation

EPR reviewed multiple sources to determine an appropriate growth rate for a 27-year time horizon (2018 to 2045). Based on:

- historical growth rates of 0.5% on Emmet Street and 0.2% on University Avenue;
- TDM growth rates of 0.9% on Emmet Street and 1.7% on University Avenue;
- SPS growth rates of 2.8% on Emmet Street and 0.5% on University Avenue;
- 2007/2017 traffic count indicating growth rates of 0.5% or below at the study intersections.
- Potential of a change in the mode split from automobile over to walking or bicycling with the future implementation of dedicated bicycle lanes and more inviting sidewalks and/or multiuse paths.

Based on inspection of the various data sources and considering capacity constraints of the existing road system, EPR concluded that a growth rate of .5%/year is appropriate to utilize for this study. The emphasis of the Emmet Streetscape on improving bicycle and pedestrian facilities also supports the projected growth rate. The funded Smart Scale grant application calls for bicycle lanes and a shared-use path. Presently the street has no bicycle facilities, and five-foot sidewalks on either side with fairly narrow curbside buffers. The improvements are likely to encourage more people to walk and ride a bicycle, which will somewhat mitigate the growth in vehicular traffic.

Thus, the **0.5% annual background growth rate is being applied to existing traffic volumes to derive the design horizon year 2045 traffic projections.**

*Note that this background rate is expected to encompass additional traffic generated by both the replacement of the Excel Inn with larger hotel and also the redevelopment of the Cavalier Inn site. For the Cavalier Inn site the amount of parking remains the same thus trips made to the new uses will mostly be via walking or bicycling. Therefore, we do not anticipate any significant changes to the traffic volumes accessing that site.*

### Future Year (2045) Traffic Volume Data

The 0.5% linear rate as recommended above was applied to the existing traffic volume data to estimate future year (2045) traffic volume. Further minor refinements were made to the Ivy/Emmet intersection in consideration of the approved UVA development at the corner of Emmet Street/Ivy Road which is not adding parking capacity though is resulting in the elimination of cut-thru traffic for the southbound right turn from Emmet to Ivy. Furthermore, parking for the existing Cavalier Inn and the existing Villa Diner is being removed, along with trips associated with those uses. The proposed hotel site (replacement of the former Excel Inn) was considered but deemed to be included in the general background traffic growth rate. The adjusted future year (2045) traffic volume data is illustrated in **Figure 10 (see attached)**.

## 6. Future Year (2045) No-build Traffic Operations

EPR again used Synchro/SimTraffic (version 9.1) to analyze the traffic operations at the study intersections in the future year (2045) no build conditions (with no improvements). The level of service, delay, and queue results are summarized in **Table 10** and included in **Appendix C**.

*Table 10 Future Year (2045) Traffic Operations Summary*

Approach	Movement	Storage	AM			PM		
			LOS	Delay	Queue	LOS	Delay	Queue
<b>1. Emmet/Ivy</b>								
Ivy	EBL	215	E	59.8	279	E	76.8	280
	EBT	-	E	79.7	558	E	55.4	572
	EBR	215	D	35.8	280	C	33.4	280
University	WBL	120	E	60.2	169	E	64.2	170
	WBT	-	E	55.3	345	E	68.1	349
	WBR	75	C	30	140	D	36.3	140
Emmet	NBL	325	C	22.9	349	D	36.8	350
	NBT/NBR	-	C	28.4	619	D	38.4	1011
Emmet	SBL	-	B	18.6	618	C	31.2	894
	SBT/SBR	-	C	32.7	790	F	106.4	877
Intersection (v/c – 0.93 AM/1.12 PM)		-	D	41		E	65.7	
<b>2. Emmet/Massie</b>								
Massie	EBL	200	D	43.2	163	F	91.7	229
	EBT/EBR	-	D	41.6	78	D	38.3	468
Business	WBL/WBT/WBR	-	E	58.5	65	E	58.7	58
Emmet	NBL	80	B	14.4	119	B	14.5	125
	NBT/NBR	230	B	12.8	172	C	21.4	441
Emmet	SBL	90	A	9.7	61	B	13.6	130
	SBT/SBR	-	C	21.4	496	C	22.2	441
Intersection (v/c – 0.65 AM/1.00 PM)		-	B	19.6		C	31.5	
<b>3. Emmet/Arlington</b>								
Arlington	EBL	-	D	51.1	259	D	49.1	370
	EBR	100	D	40.4	170	C	29.1	170
Emmet	NBL	200	D	47.3	204	D	50	238
	NBT	-	A	2.3	190	A	5.4	252
Emmet	SBT/SBR	-	B	13.9	442	B	17.6	378
Intersection (v/c – 0.63 AM/0.73 PM)		-	B	17.9		B	17.9	
<b>4. University/Culbreth</b>								
Culbreth	WBR	-	B	12.6	174	C	17	437
University	NBT/NBR	-	A	0	263	A	0	554
University	SBL	70	A	8.9	114	A	9.8	119
	SBT	-	A	0	49	A	0	338
Intersection (v/c – 0.32 AM/0.47 PM)		-	A	3.3		A	4.5	
<b>5. Emmet/Lambeth</b>								
Lambeth	WBL/WBR	-	C	23.6	29	F	56.3	188
Emmet	NBT/NBR	-	A	0	0	A	0	7
Emmet	SBL/SBT	-	A	0.4	123	A	0.9	682
Intersection (v/c – 0.05 AM/0.40 PM)		-	A	0.4		A	1.6	
<b>6. Emmet/Copeley</b>								
Copeley	EBR	-	C	16.3	64	B	12.5	46
Emmet	NBT	-	A	0	0	A	0	10
Emmet	SBT/SBR	-	A	0	0	A	0	0
Intersection (v/c – 0.05 AM/0.05 PM)		-	A	0.1		A	0.1	

The analysis demonstrates that under future year (2045) no build conditions, the study intersections will operate at level of service (LOS) D or better with the exception of the intersection of Emmet Street/Ivy Road, which will operate at LOS E with 65.7-second delay. The Emmet Street SBT/SBR movement will operate at LOS F with 106.4-second delay. The results also indicate Ivy

Road, University Avenue, Massie Road, commercial entrance, and Lambeth Lane all have approach movements that will experience delays resulting in LOS E or F (with less than 100-second delay) during the peak hours.

The queue results indicate that in 2045, under no build conditions, the following movements have queues that will exceed currently available storage. The queue storage deficit is shown in parentheses.

- Emmet Street/Ivy Road – Ivy Road EBL (75'), Ivy Road EBR (75'), University Avenue WBL (50'), University Avenue WBR (75'), and Emmet Street NBL (25');
- Emmet Street/Massie Road – Massie Road EBL (50'), Emmet Street NBL (50'), Emmet Street NBT/NBR (225'), and Emmet Street SBL (50');
- Emmet Street/Arlington Boulevard – Arlington Boulevard EBR (75'), Emmet Street NBL (50');
- University Avenue/Culbreth Road – University Avenue SBL (50').

The queue results also show approximately 900' queues for Emmet Street SBL and SBT/SBR movements (extending beyond the railroad bridge) at the intersection of Emmet Street/Ivy Road and approximate 450' queues on Emmet Street NBT/NBR movements at the intersection of Emmet Street/Massie Road. These queues indicate that in order to not degrade traffic conditions the future design for Emmet Street will need to retain the two existing southbound lanes for at least 900' (passing the railroad bridge) at the intersection of Emmet Street/Ivy Road and provide the two northbound lanes for at least 450' at the intersection of Emmet Street/Massie Road.

## 7. Future Year (2045) Alternative Scenarios Traffic Operations

EPR studied several variations in roadway laneage design alternatives to provide recommendations for the design to be carried forward for the Emmet Streetscape Project. EPR studied the traffic operations for different alternative scenarios at the three signalized intersections within the study area including Emmet Street/Ivy Road, Emmet Street/Massie Road, and Emmet Street/Arlington Boulevard. The analysis and comparison among design alternative scenarios are as follows.

All of the analysis reports (Synchro/SimTraffic/Sidra) have been included in **Appendix D**.

### Intersection of Emmet Street/Ivy Road

At the intersection of Emmet Street/Ivy Road, EPR analyzed the three alternative scenarios below and compared them to the existing conditions of a no build scenario:

- Alternative A – Remove northbound right turn channelization and change to a 120' standard turn lane (appearing to be compatible with existing right-of-way);
- Alternative B – Add a separate southbound right turn lane;
- Alternative C – Remove the northbound right turn channelization and change to 120' standard turn lane and add a separate southbound right turn lane.

EPR used Synchro/SimTraffic (version 9.1) to analyze the traffic operations including the level of service and delay results for the no build and three alternative scenarios as summarized and illustrated in **Figure 11 (see attached)**.

As revealed through the analysis process, Alternative C will provide the best traffic operations (better than the existing laneage scenario) in terms of the level of service and delay. In Alternative C, the intersection of Emmet Street/Ivy Road will operate at LOS D, the Emmet Street SBT movement will operate at LOS C in the AM and LOS D in the PM, and the Emmet Street SBR movement will operate at LOS B in the AM and LOS C in the PM.

Alternative C also improves conditions for pedestrians by removing the channelized right turn lane, which presents a safety concern for pedestrians crossing the lane on both University Avenue and Emmet Street. This change also reduces the overall pedestrian crossing distance for pedestrians on the east side of Emmet Street. Additionally, the vehicles on Emmet Street northbound are able to take the channelized lane at a high speed and are not forced to yield to pedestrians on Emmet Street (although there is a marked crosswalk). The standard right turn lane proposed for the future will force slower turning speeds, and allow for a leading pedestrian interval that gives pedestrians a head start relative to turning vehicles.

The queue results in the original laneage scenario and the three alternative scenarios have been summarized and illustrated in **Figures 12A-12H (see attached)**.

It should be noted that, in the Alternative C Scenario, the queue results show approximate 850' queues on Emmet Street SBL and SBT movements (extending beyond the railroad bridge). The long queues indicate that the design to be carried forward for the Emmet Streetscape Project would need to retain the two existing southbound lanes for at least 850' at the intersection of Emmet Street/Ivy Road.

### **Intersection of Emmet Street/Massie Road**

At the intersection of Emmet Street/Massie Road, EPR analyzed the following four alternative scenarios, and compared them to the existing conditions of the no build scenario:

- Alternative A – Change the northbound approach to LEFT, THROUGH/RIGHT;
- Alternative B – Change the southbound approach to LEFT, THROUGH/RIGHT;
- Alternative C – Change the northbound approach to LEFT, THROUGH/RIGHT and change the southbound approach to LEFT, THROUGH/RIGHT;
- Alternative D – Change the northbound approach to LEFT, THROUGH, RIGHT (200' storage) and change the southbound approach to LEFT, THROUGH, RIGHT (200' storage)

EPR used Synchro/SimTraffic (version 9.1) to analyze the traffic operations. The level of service and delay results for the no build and four alternative scenarios are summarized and illustrated in **Figure 13 (see attached)**.

Based on the level of service and delay results, in the future year (2045), the no build scenario (existing laneage) provides the best traffic operation in terms of the level of service and delay. The intersection of Emmet Street/Massie Road and the Emmet Street movements will operate at the acceptable level of service (LOS D or better). In all other alternatives, the intersection of Emmet Street/Massie Road will operate at LOS E or worse and the Emmet Street will have movements

operating at LOS F. The queue results for the no build and four alternative scenarios are summarized and illustrated in **Figures 14A-14J (see attached)**.

It should be noted that, for the no build scenario, the queue results show approximately 450' queues for Emmet Street NBT/NBR movements. The long queues indicate that the design to be carried forward for the Emmet Streetscape Project should provide the two northbound lanes for at least 450' at the intersection of Emmet Street/Massie Road.

**In addition to the four standard alternative scenarios, this study effort also analyzed a roundabout alternative scenario.** The geometric concept of the roundabout alternative scenario is illustrated in **Figure 15 (see attached)**.

EPR used Sidra (version 5.1) to analyze the traffic operations for the roundabout. The level of service and delay results for the roundabout alternative scenario is summarized and illustrated in **Figure 16 (see attached)**.

Based on the level of service and delay results, the roundabout alternative scenario would provide improved traffic operations in terms of the level of service and delay in the future year (2045), versus a conventional intersection. However, there may be concerns about the ability for police to control the roundabout traffic when the John Paul Jones arena has major events. It was found through iterative threshold analysis modeling that event ingress traffic volumes above 500 northbound left turns in an hour caused failing levels of service for the southbound through movement on Emmet Street. Assuming two inbound lanes on Massie Road there would be no constraint on the southbound right turns since the southbound right turn volumes could flow without interruption.

For event egress traffic, the southbound Emmet Street traffic would need to be stopped to allow the event traffic to flow freely into the roundabout. The Massie Road traffic would have the right-of-way over the northbound Emmet Street traffic. To control traffic, police would need to alternate between blocking the southbound approach to let the egress traffic out of Massie, and blocking Massie to allow Emmet Street to flow freely.

Relative to the innovative approach of utilizing a roundabout, this intersection configuration is controlled by a traffic signal and vehicular movements are continuous. Therefore, traffic is not stopped for pedestrians either through the regular operation of the traffic signal or through a pedestrian actuated push button. This can be a concern to pedestrians with vision impairments. However, a roundabout can include pedestrian actuated flashing beacons at the crosswalks. Additionally, for pedestrians without vision impairments the number of potential conflict points with vehicles is reduced through a roundabout, and their design also can include ample space for median refuge islands between opposite lanes of traffic.

Consideration of the roundabout as an option should be further discussed with UVA relative to their needs and concerns for handling event traffic.

The queue results in the roundabout alternative scenario for the weekday peak hour traffic are summarized and illustrated in **Figures 17A-17B (see attached)**.

Based on the queue results, the roundabout alternative scenario will provide better traffic operations (much shorter queues) in the future year (2045) than a conventional intersection.

### **Intersection of Emmet Street/Arlington Boulevard**

At the intersection of Emmet Street/Arlington Boulevard, EPR analyzed the following three alternative scenarios and compared them to the no build scenario:

- Alternative A – Change the northbound approach to LEFT, THROUGH;
- Alternative B – Change the southbound approach to THROUGH, RIGHT;
- Alternative C – Change the northbound approach to LEFT, THROUGH and change the southbound approach to THROUGH, RIGHT.

EPR used Synchro/SimTraffic (version 9.1) to analyze the traffic operation. The level of service and delay results for the no build scenario and the three alternative scenarios are summarized and illustrated in **Figure 18 (see attached)**.

The queue results for the no build and three alternative scenarios are summarized and illustrated in **Figures 19A-19H (see attached)**.

Based on the queue results, the no build (i.e. no change) scenario will provide the best traffic operations (shortest queues) in the future year (2045). In all other alternative scenarios, the queues on Emmet Street movements would be much longer than in the no build scenario, extending north to the intersection of Emmet Street/Wise Street and extending south and exceeding the left turn storage lane by 200'.

## **8. Traffic and Roadway Laneage Recommendations**

Based on the analyses of the future year (2045) no build conditions, and the future year (2045) alternative scenario build conditions, **this report provides the following recommendations for the design to be carried forward for the Emmet Streetscape Project:**

- At the intersection of Emmet Street/Ivy Road: Remove the northbound right turn channelization and change to a (at least) 120' standard turn lane, add a separate southbound right turn lane, and retain the two existing southbound lanes for at least 850' (passing the railroad bridge);
- At the intersection of Emmet Street/Massie Road: Retain the original intersection geometry, provide the two northbound lanes for at least 450', or consider constructing a roundabout with two lanes northbound and southbound;
- At the intersection of Emmet Street/Arlington Boulevard: Retain the existing intersection geometry;
- If feasible, extend the existing turn lanes at the study area intersections, as follows (extension distance shown in parentheses):
  - Emmet Street/Ivy Road – Ivy Road EBL (75'), Ivy Road EBR (75'), University Avenue WBL (50'), University Avenue WBR (75'), and Emmet Street NBL (25');

- Emmet Street/Massie Road – Massie Road EBL (50’), Emmet Street NBL (50’), Emmet Street NBT/NBR (225’), and Emmet Street SBL (50’);
- Emmet Street/Arlington Boulevard – Arlington Boulevard EBR (75’), Emmet Street NBL (50’);
- University Avenue/Culbreth Road – University Avenue SBL (50’).

## 9. Multimodal Study and Recommendations

This report section presents a summary of the findings of the multimodal analysis for Emmet Street between Arlington Boulevard and Ivy Road/University Avenue. The purpose of the Emmet Streetscape improvement project is to redesign Emmet Street in the study area, transforming it into a “complete street” that safely accommodates all people, regardless of their abilities or means of travel. Therefore, the analysis of the existing conditions must thoroughly consider all modal users.

This memorandum concludes with a set of recommendations that will inform the development of design concepts during the summer of 2018. The recommendations are a starting point for designing alternative concepts for how the various street elements will come together to form a complete street. The recommendations may change as additional information is revealed on cost, construction feasibility, environmental constraints, additional stakeholder input, and other factors.

### Data Sources

The City, Thomas Jefferson Planning District Commission (PDC), the University of Virginia, Charlottesville Area Transit, and University Transit Services all shared critical data sources with the consulting team, which are the basis for many of the findings in this memorandum. These data sources listed below:

#### Bicycle

- Thomas Jefferson PDC partial day bicycle counts for the Ivy/University/Emmet intersection conducted April 26 – 28, 2015; October 8 – 13, 2015; and September 29 – October 5, 2013.
- Emmet Streetscape project team bicycle counts conducted between 6:00 AM and 8:00 PM on April 17, 2018. UVA was in session on this day, there were no known special events, and the weather was sunny with a high temperature of 73.

#### Pedestrian

- City of Charlottesville full day pedestrian counts conducted continuously between September 22 and December 5, 2016 using an Eco-Counter.

#### Transit

- Charlottesville Area Transit total boardings and alightings between January 1 and April 26, 2018 for the three stops in the study area, all of which are served by Route 7.
- Charlottesville Area Transit average weekday boardings, alightings, and load manually counted for one week in the fall of 2017.

- University Transit Service estimated boardings and alightings between April 9 and April 13, 2018 for the two stops in the study area (Goodwin Bridge north and south bound). UTS expanded sample counts to estimate daily boardings and alightings at the stops.

The consulting team also made multiple site visits and led a walking audit with community members of the corridor between Ivy and Massie on May 12, 2018. These visits yielded valuable qualitative data about the existing conditions along the corridor.

**Existing Conditions**

The existing design of Emmet Street in the study area favors vehicles. There are no bicycle facilities, the sidewalks in most places have narrow buffers between the roadway and sidewalk, the bus stops lack sufficient shelters from the elements, and some facilities are not accessible for people with disabilities. A primary purpose of this project is to rectify these conditions.

Table 1 below shows the estimated number of people using each mode between the CSX railroad bridge and the Goodwin Bridge. Data on passenger loads were not available from UTS. Therefore, the transit person throughput is the sum total of boardings and alightings for UTS, and passenger load for CAT. The number of people riding the buses is likely significantly higher. Another important caveat is that the bicycle count captures only 6:00 AM to 8:00 PM. A total of 62 bicyclists were counted during that time. About 86 percent of 24-hour vehicle traffic volumes occur within the 6:00 AM – 8:00 PM time period. Therefore, the particular day bicycle count is increased by 14 percent to estimate a full day count of 71.

*Table 11 Person Throughput (Emmet north of RR Bridge)*

<b>Mode</b>	<b>Average Weekday Users</b>
<b>Pedestrian</b>	1,025
<b>Bicycle</b>	71
<b>Transit</b>	2,100
<b>Vehicle</b>	26,000
<b>Total</b>	<b>29,196</b>

**Pedestrian Use**

The City of Charlottesville placed an Eco-Counter on Emmet Street just north of the CSX Railroad Bridge during the summer and fall of 2016. The location of the counter did not capture pedestrian traffic accessing the Lambeth Trail spur just north of the railroad bridge. The counter recorded pedestrians for 24 hours per day during this time. The consulting team analyzed these data to understand patterns. Some of the key findings are the following:

- The pedestrian traffic is fairly well balanced between the east and west sides of Emmet Street, with about 600 pedestrians per day on each side when UVA classes are in session. That number drops to just more than 500 per day when outliers driven by special events are removed.
- Events at JPJ Arena and on campus cause a large number of outliers where pedestrian volumes can be up to four times greater than a typical day (about 2,000 pedestrians).
- Pedestrian traffic is about 48 percent higher on weekdays when class is in session compared to when it is not.
- “Goat trails” have been created where pedestrians are taking short cuts or walking in places that lack pedestrian infrastructure. A notable trail connects the east side sidewalk just south of the old Excel Inn with University Avenue, going behind the wall on the northeast corner of the Emmet/Ivy/University intersection.



*Figure 20 Goat trail reflecting a desire line for pedestrians that deviates from the sidewalk and trails around Carr's Hill Field*

*Table 12 Pedestrian Use Conditions*

Element	Observations
<b>Ivy/University to RR Bridge (Up to 60' right-of-way)</b>	
<b>Sidewalks</b>	<ul style="list-style-type: none"> <li>• Consistent 5' sidewalk width on both sides</li> <li>• Intermittent utility pole obstructions on the west side</li> <li>• Abundant shade on the east side south of the old Excel Inn</li> <li>• Pedestrian scale lighting that illuminates the sidewalks on the east side, south of the former Excel Inn.</li> </ul>
<b>Crosswalk</b>	<ul style="list-style-type: none"> <li>• Outdated parallel line crosswalks on Emmet at Ivy/University</li> <li>• Preferred continental crosswalk markings on Ivy/University at Emmet</li> <li>• No mid-block crosswalks between Emmet and Massie, a distance of more than 1,600 feet</li> <li>• No leading pedestrian interval for pedestrians to gain a head start</li> </ul>

<b>Curbside Buffers</b>	<ul style="list-style-type: none"> <li>No buffer on the west side between the road and sidewalk</li> <li>Varying buffer of 3 to 4 feet on the east side</li> <li>No shade trees or protective objects between the sidewalk and road on either side</li> </ul>
<b>Accessibility</b>	<ul style="list-style-type: none"> <li>Utility pole obstructions constrain the clear zone on the west side</li> <li>Lack of audible pedestrian signals at intersections</li> <li>Insufficient landings where the sidewalk meets the crosswalk</li> </ul>
<b>RR Bridge to Massie (Varying 60' to 100' right-of-way)</b>	
<b>Sidewalks</b>	<ul style="list-style-type: none"> <li>Consistent 5' sidewalk width on both sides</li> <li>Abundant shade on the east side north of the railroad bridge</li> <li>Pedestrian scale lighting that illuminates the sidewalks on both sides</li> </ul>
<b>Crosswalk</b>	<ul style="list-style-type: none"> <li>Preferred continental crosswalk markings at Massie</li> <li>No leading pedestrian interval for pedestrians to gain a head start</li> </ul>
<b>Curbside Buffers</b>	<ul style="list-style-type: none"> <li>Varying buffer on the east side of 0' at the RR bridge to 24' just north of the RR bridge on the east side</li> <li>Varying buffer on the west side of 0' at the RR bridge to 7' just north of the RR bridge on the west side</li> <li>No shade trees or protective objects between the sidewalk and road on either side</li> </ul>
<b>Accessibility</b>	<ul style="list-style-type: none"> <li>No tactile domes at all 4 Massie/Emmet crosswalk curb ramps</li> <li>Lack of level landing where the sidewalk meets the crosswalk at Emmet/Massie</li> </ul>
<b>Massie to Arlington (Up to 100' right-of-way)</b>	
<b>Sidewalks</b>	<ul style="list-style-type: none"> <li>Consistent 5' sidewalk width on both sides</li> <li>Well shaded by trees outside of the right-of-way on both sides</li> <li>Pedestrian scale lighting on the west side</li> </ul>
<b>Crosswalk</b>	<ul style="list-style-type: none"> <li>Preferred continental crosswalk markings on the northern and eastern sides of the Arlington/Emmet intersection</li> <li>Pedestrian median refuge island for safety on the east side of the Arlington/Emmet intersection</li> <li>No crosswalk at Copeley Road at its intersection with Emmet</li> </ul>
<b>Curbside Buffers</b>	<ul style="list-style-type: none"> <li>Consistent 2' curbside buffer on both sides of the roadway</li> </ul>
<b>Accessibility</b>	<ul style="list-style-type: none"> <li>Tactile domes provided at the curb cuts that accommodated the crosswalks at the Arlington/Emmet intersection</li> <li>No tactile domes at the Copeley Road intersection with Emmet</li> <li>Utility poles are in the curbside buffer zone on both sides and do not present an accessibility problem</li> </ul>

### Bicycle Use

The consulting team captured 14 hours of video of Emmet Street north of the CSX railroad bridge on April 17, 2018. The video captured 62 bicyclists over this period, which accounts for 58 percent of the day, but captures the morning and afternoon peak periods.

### **Bicycle Use Conditions**

The Goodwin Bridge is an important feature that may help explain the low number of bicyclists using Emmet Street. This bridge provides a connection between the North and Central Grounds. It also likely intercepts Emmet Street southbound bicyclists that are heading to Central Grounds. Bicycle volumes are also affected by the lack of infrastructure. Emmet Street lacks any kind of bicycle facility. The average vehicle traffic speeds exceed 35 miles per hour, all segments have at least three travel lanes, and the traffic volume exceeds 25,000 per day. The National Association of City Transportation Officials' (NACTO) "Designing for All Ages and Abilities" guidebook calls for a protected bicycle lane or shared-use path in these conditions. The complete lack of a facility is likely why so few bicyclists are observed on the street, and many are riding on the sidewalks.

### **Transit Use**

Four bus routes use Emmet Street in the study area. These are the Charlottesville Area Transit (CAT) Route 7 and the University Transit Service's Green, Northline, and Central Grounds Shuttle routes. CAT serves three stops – a north and south bound stop near the Goodwin Bridge and a stop on the east side of Emmet Street near the old Excel Inn. UTS serves two stops, both of which are near the Goodwin Bridge.

- More than 500 people board and alight these four transit lines on an average weekday.
- More than 2,000 people ride on Emmet Street using these four transit lines on an average weekday. This number is likely much higher as it does not incorporate rider load for the UTS routes (only boardings and alightings).

### **Transit Use Conditions**

The transit service providers use standard 40' transit buses on Emmet Street. The stops provide minimal amenities and there are no features to enhance the service quality of the buses, such as dedicated lanes, queue jumping, or signal priority for buses at intersections. The stops near the Goodwin Bridge provide seating, but no other amenities such as a shelter. There are two seats for passengers waiting at the northbound stop and six for passengers waiting at the southbound stop. Neither stop is shaded.

### **Existing Cross Sections**

The existing conditions are portrayed through cross sections in the following series of graphics. The cross sections show a lack of bicycle facilities, the narrow curbside buffers that are found throughout the corridor with the exception of the Massie Road to railroad bridge segment, and the constraint of the railroad bridge.

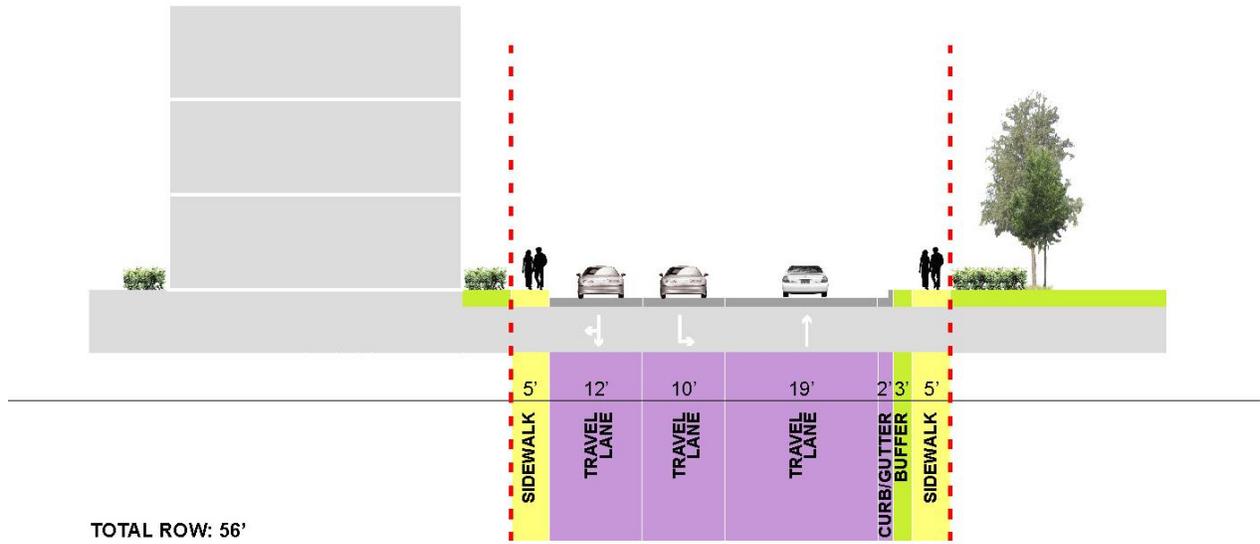


Figure 21 Between Ivy/University and the former Excel Inn

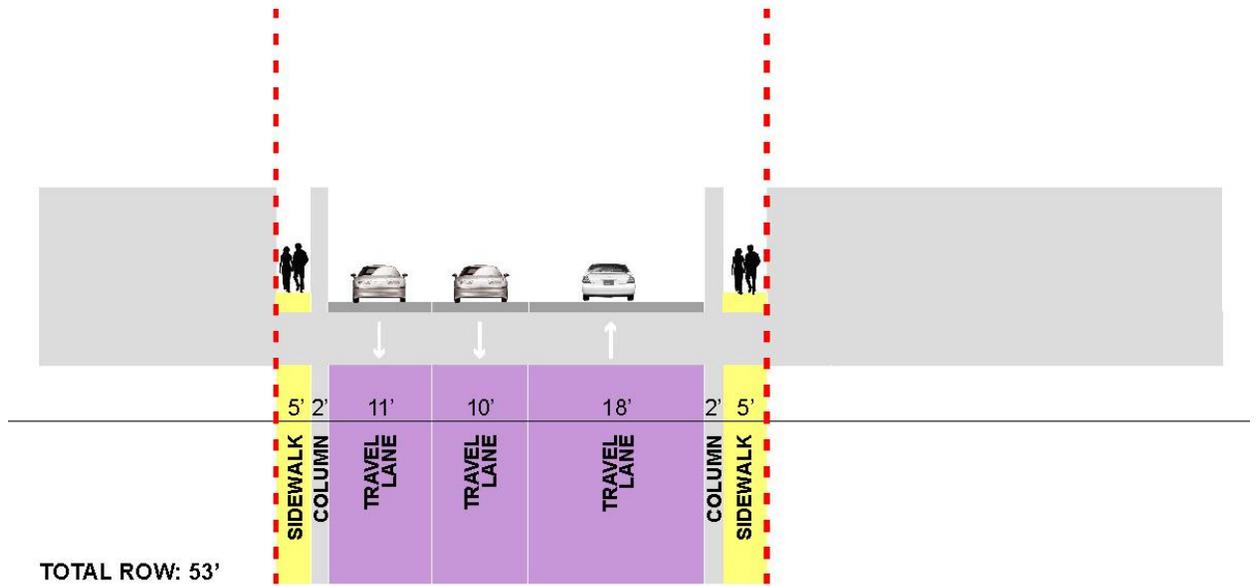


Figure 22 Beneath Railroad Bridge

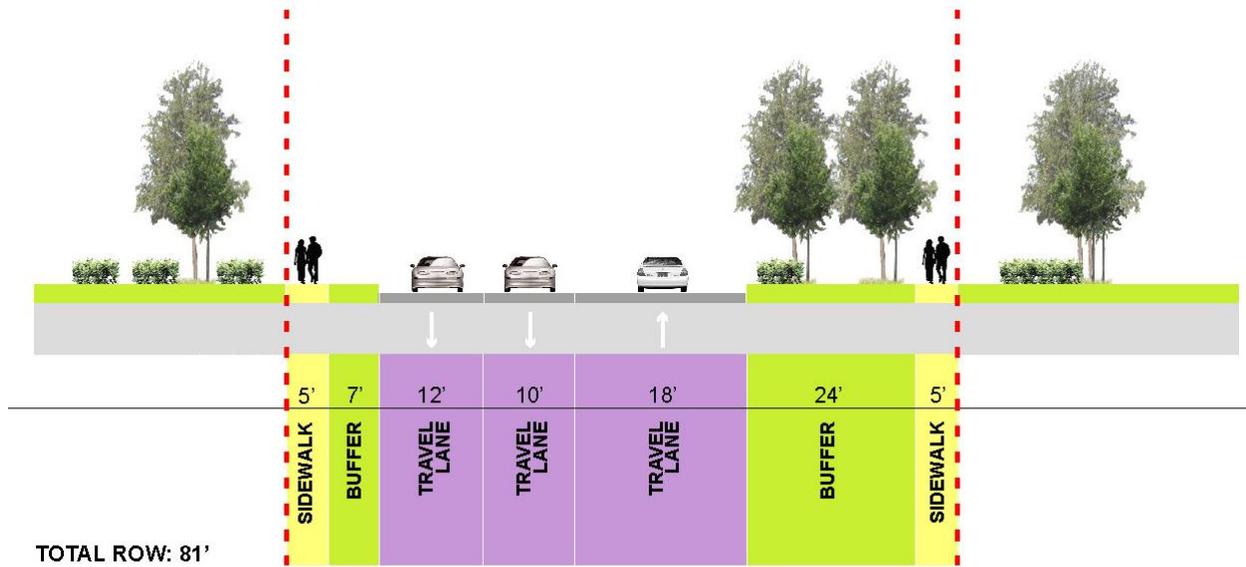


Figure 23 Between Railroad Bridge and Goodwin Bridge (Bike/Ped Bridge)



Figure 24 Between Massie and Arlington

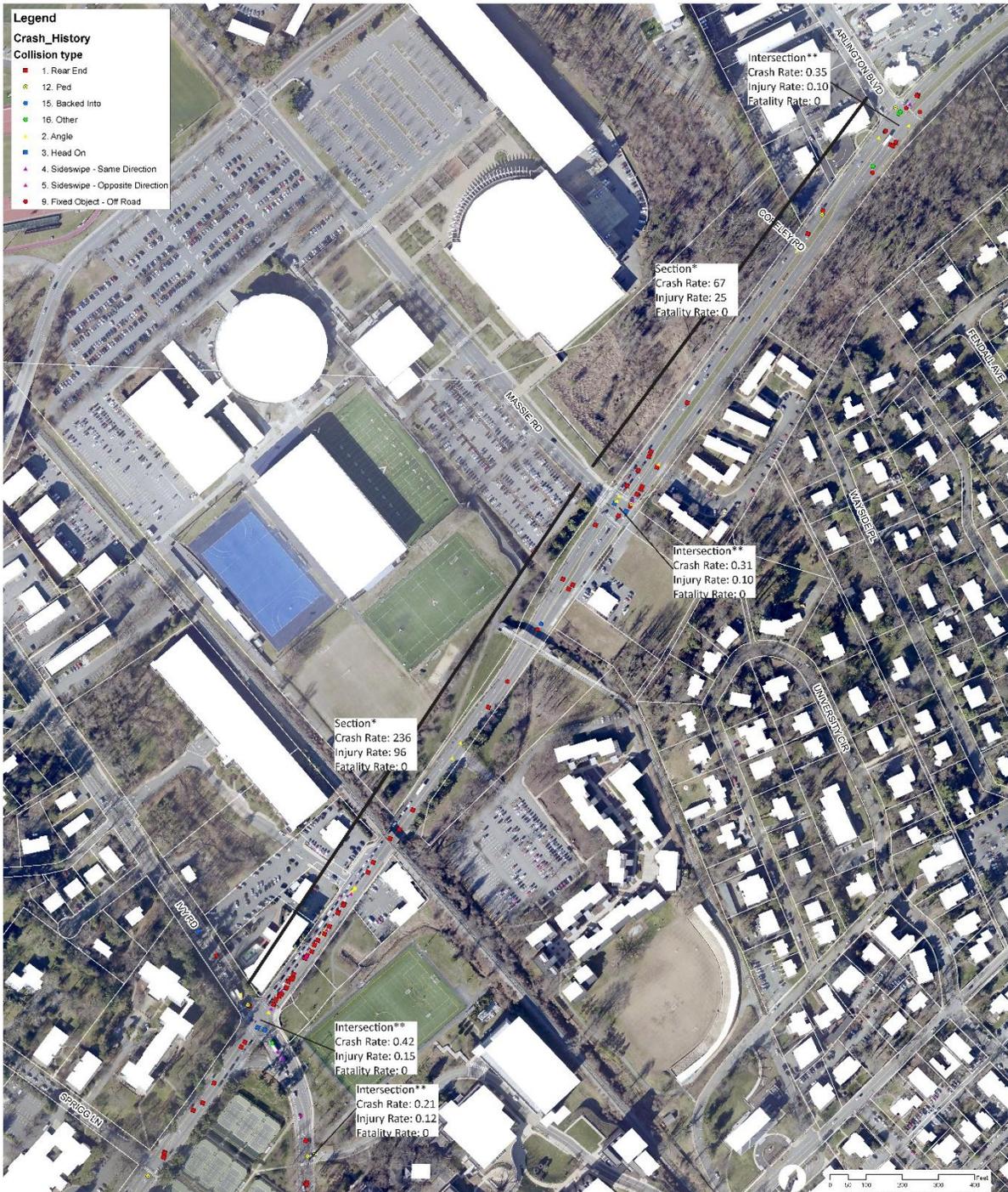
**Crashes**

Figure 25 shows the location and rate of crashes in the study area. Emmet Street between Ivy Road/University Avenue and the railroad bridge had the highest crash rate and greatest concentration of crashes. The crash rate in this segment exceeds the state average for similar facilities.

There were a total of eight crashes involving a pedestrian and two crashes involving a bicycle between 2013 and 2017. The two bicycle crashes occurred in the Ivy/Emmet intersection. Of the crashes involving a pedestrian, one was at the Emmet/Arlington intersection, two were near the

Emmet/Copeley intersection, one was at the Emmet/Massie intersection, two were at the University/Culbreth intersection, one was at the Emmet/Ivy intersection, and one at the Emmet/Sprigg Lane intersection.

Figure 25 Crash History and Crash Rates



\* Virginia Urban Other Principal Arterials Average Crash Rate: 181; Injury Rate: 105; Fatality Rate: 0.67  
 \*\* No comparable data is available for intersection crash rates

## Future Development

The Emmet Streetscape improvement project is expected to be complete in 2023. The expected construction timeframe will overlap with major redevelopment projects proposed by UVA between Ivy and the railroad bridge, and the redevelopment of the former Excel Inn (expected to be named the Gallery Court Hotel). These projects will have many effects on the concepts that are developed in the summer of 2018, and further coordination with UVA, the UVA Foundation, and the owners of the proposed Gallery Court Hotel site will be important.

The latest plans for the Gallery Court Hotel, as reported in local news accounts in March of 2018, would include 72 rooms in a 75,000 square foot building with parking tucked underneath and accessed from Emmet Street.<sup>2</sup> UVA is expected to build a hospitality and performing arts facility on the west side of Emmet Street between the railroad bridge and Ivy Road.<sup>3</sup> The square footage, parking, and timing related to this development are not known.

Among the potential effects of these development proposals are the following:

- The UVA redevelopment concept for its property on the west side of Emmet Street between the railroad bridge and Ivy Road (former Cavalier Inn and Villa Diner) is anticipated to close the access drive just south of the Villa Diner. This will add right turns from Emmet southbound to Ivy, affecting the multimodal performance of that intersection. An additional right turn lane will widen the crossing for pedestrians, and cause bicyclists to need to cross an additional traffic lane for left turns from Emmet Street southbound to University Avenue eastbound.
- Both the UVA and old Excel Inn redevelopment projects will add traffic volume to Emmet Street. The trip generation from these projects is unclear since they are both at a conceptual level of design and the final square footage and land uses are in flux.
- The building footprints, access drives, and land uses will influence the placement of the shared-use path. Should the shared-use path be built on the east side it would likely need to go behind the Gallery Court hotel. This would take the shared-use path more than 100 feet from the street right-of-way. Development proposed for the west side has more flexibility in regard to building locations and footprints. However, the shared-use path would still need to cross private property regardless of which side it is placed on.

## Public Input

The community meeting on May 12, 2018 offered residents an opportunity to comment on existing conditions and desired future improvements. The project also has a website ([www.emmetstreetscape.com](http://www.emmetstreetscape.com)) through which the public can obtain information, ask questions, and share their ideas through an online survey that was open between May 12 and June 8, 2018. The

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<sup>2</sup> Jacobsen, Natalie. "Gallery Court Hotel rises out of Excel Inn's ashes." March 28, 2018. <http://www.charlottesville.com/excel-inn/#.WxrYOKgvxPY>.

<sup>3</sup> Serven, Ruth. "UVA gives update on Ivy-Emmet plans." May 17, 2018. [http://www.dailyprogress.com/news/local/uva/uva-gives-update-on-emmet-ivy-plans/article\\_e7e1351e-5a3a-11e8-a1d8-d7418113359b.html](http://www.dailyprogress.com/news/local/uva/uva-gives-update-on-emmet-ivy-plans/article_e7e1351e-5a3a-11e8-a1d8-d7418113359b.html)

initial round of engagement also included a Steering Committee meeting on April 18, 2018. Below are some of the themes that emerged from the initial round of public engagement.

Existing Conditions Themes

- The grassy median north of Massie is a nice feature to preserve
- The row of trees on the east side of Emmet just north of the railroad bridge creates comfortable walking conditions
- Sidewalks are too narrow
- Vehicle speeds are too fast and traffic is too loud
- Pedestrian wait time to cross at signalized intersections is too long
- The channelized turn lane from Emmet northbound to University eastbound is dangerous for pedestrians and bicyclists
- Curbside buffers are too narrow
- The entire corridor is uncomfortable for bicyclists due to a lack of facilities
- Bus stops lack shelter, shade, and comfort
- Jaywalking and stepping into the street from the sidewalk to pass slower users is common
- Lack of street furniture and trash cans

Desired Future Conditions and Improvements

- More attractive with more greenspaces
- Prioritize pedestrians, bicyclists, and transit riders
- Separate bicycles, pedestrians, and vehicles with strong buffers
- Protected raised bicycle lanes adjacent to the vehicle travel lanes
- Coordinated signal timing
- Safe mid-block crossings near housing
- Accessible crosswalks and sidewalks
- Better traffic flow

Shared-Use Path

The consulting team also asked the public for their opinions on the question of which side of Emmet Street they would prefer to use a shared-use path. Nineteen people answered the question with 13 preferring the west side (JPJ side) and 6 preferring the east side (Lambeth Lane side). The table below lists several of the pros and cons associated with each side, based on public input and the professional judgement of the consulting team. Determining which side the shared-use path should be located on has been a central challenge of the design phase of this project.

*Table 13 Shared-Use Path*

Shared-Use Path Side	Pros	Cons
West Side (JPJ Side)	<ul style="list-style-type: none"> <li>• Would connect more directly to major commercial and entertainment venues</li> </ul>	<ul style="list-style-type: none"> <li>• Would need to coordinate with proposed UVA redevelopment of the Villa Diner and Cavalier Inn</li> </ul>

Shared-Use Path Side	Pros	Cons
	<ul style="list-style-type: none"> <li>• More direct connection to the Goodwin Bridge, which connects Central Grounds with North Grounds</li> <li>• The west side has fewer right-of-way and natural constraints than the east side</li> <li>• May help reduce trespassing on the railroad tracks on the west side of Emmet Street which is a concern of the railroad operator</li> </ul>	<ul style="list-style-type: none"> <li>• Many users would need to cross Emmet Street to get to Central Grounds</li> </ul>
<p><b>East Side (Lambeth Lane Side)</b></p>	<ul style="list-style-type: none"> <li>• Lends itself to shortcuts to Culbreth Road via trails that surround Carr’s Hill Field</li> <li>• Stream is a natural amenity that could create more of a greenway feel</li> </ul>	<ul style="list-style-type: none"> <li>• The required setback of the shared-use path from the railroad bridge abutments (45’) will require the path to go behind the hotel, which raised safety concerns with the public and police</li> <li>• The east side has more constraints including water and steep slopes north of the railroad bridge. The existing box culvert would potentially need to be extended and retaining walls installed to minimize impacts on the creek.</li> </ul>

**Guiding Principles**

The consulting team worked with the project Steering Committee and public to define a set of guiding principles that will influence the concepts developed during the course of the project. The principles are based on the City’s 2015 Bicycle and Pedestrian Master Plan, the City’s 2016 Streets that Work Plan, and public and Steering Committee feedback. The proposed guiding principles are listed below:

*Table 14 Proposed Guiding Principles*

<p><b>Make a Complete Street</b></p>	<ul style="list-style-type: none"> <li>• Improve pedestrian, bicycle, and transit accommodations while maintaining vehicle flow</li> <li>• Balance the needs of each travel mode</li> </ul>
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<p><b>Increase Safety and Comfort for Pedestrians and Bicyclists</b></p>	<ul style="list-style-type: none"> <li>• Provide a buffer between the roadway and pedestrian and bicycle facilities</li> <li>• Where feasible, separate and buffer pedestrian and bicycle facilities</li> <li>• Provide safe crossings of Emmet Street for pedestrians and bicyclists</li> </ul>
<p><b>Beautify the Corridor as an Appropriate Gateway</b></p>	<ul style="list-style-type: none"> <li>• Provide landscaping and hardscape materials that provide shade, comfort, safety, and increase the attractiveness of the gateway</li> </ul>

Additional principles suggested by the public at the community meeting on May 12, 2018 include:

- Reduce vehicle travel speed
- Increase environmental health with trees and green infrastructure elements

**Multimodal Recommendations**

The consulting team recommends the following specific features for the concept alternatives that will be developed during the summer of 2018. They are presented below by segment and mode, going from south to north.

*Table 15 Multimodal Recommendations*

Element	Recommendations
<b>Ivy/University to RR Bridge</b>	
<b>Pedestrian</b>	<ul style="list-style-type: none"> <li>• A 10' <b>shared use path</b> on the west side, going through the railroad embankment via a tunnel set back 45' from the bridge abutment</li> <li>• A <b>sidewalk</b> with a 7' clear walk zone on the east side</li> <li>• A 6' <b>curbside buffer</b> with street trees between the raised bicycle lane and the sidewalk on both sides</li> <li>• <b>Accessibility</b> improvements at Emmet/Ivy/University with highly visible crosswalks and curb ramps aligned with the direction of the crosswalk</li> <li>• 4 second <b>leading pedestrian interval</b> at the Emmet/Ivy/University intersection</li> <li>• <b>Audible pedestrian signals</b></li> </ul>
<b>Bicycle</b>	<ul style="list-style-type: none"> <li>• A 10' <b>shared use path</b> on the west side, going through the railroad embankment via a tunnel set back 45' from the bridge abutment</li> <li>• A 5' <b>raised bicycle lane</b> with a 2' buffer on the east side, continuing beneath the railroad bridge</li> <li>• A 5' <b>raised bicycle lane</b> with a 2' buffer on the west side, transitioning to a <b>sharrow</b> beneath the railroad bridge</li> <li>• <b>Bicycle box</b> for the southbound approach of Emmet Street to the Ivy/University intersection to facilitate left turns from the shared-use path to University Avenue east bound and Central Grounds</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Colored pavement</b> to indicate to vehicles where the Ivy Road/University Avenue bicycle lanes cross Emmet Street</li> <li>• <b>Lighting</b> improvements to illuminate the raised bicycle lane beneath the railroad bridge</li> </ul>
<b>Transit</b>	<ul style="list-style-type: none"> <li>• A new stop with a protective <b>shelter</b> on the west side; coordinate with CAT and UTS at June 18<sup>th</sup> meeting</li> <li>• Design the raised bicycle lane to go behind an <b>island</b> where the transit stop is located, with a crosswalk over the bicycle lane for pedestrians</li> </ul>
<b>Vehicle</b>	<ul style="list-style-type: none"> <li>• Add southbound dedicated <b>right turn lane</b> (Emmet to Ivy Road)</li> <li>• <b>Remove northbound channelized right</b> turn lane and add standard right turn lane (Emmet to University Avenue)</li> <li>• Outer <b>travel lane</b> width of 11'</li> <li>• Inner and <b>turning lane</b> width of 10'</li> <li>• Design for a <b>25 mile per hour</b> speed limit</li> </ul>
<b>General</b>	<ul style="list-style-type: none"> <li>• <b>Landscaping and green infrastructure</b> elements as feasible (permeable pavement and bioswales)</li> <li>• <b>Trash receptacles and benches</b>, especially on the shared-use path</li> <li>• <b>Wayfinding</b> signage for pedestrians and bicyclists</li> </ul>
<b>RR Bridge to Massie</b>	
<b>Pedestrian</b>	<ul style="list-style-type: none"> <li>• A 10' <b>shared use path</b> on the west side with connections to the trails leading to the Goodwin Bridge</li> <li>• A <b>sidewalk</b> with a 7' clear walk zone on the east side</li> <li>• A 6' <b>curbside buffer</b> with street trees between the raised bicycle lane and the sidewalk on both sides, with the exception of just north of the railroad bridge where the 20' + buffer and trees should be maintained</li> <li>• An accessible and highly visible <b>crosswalk</b> across Lambeth Lane</li> <li>• <b>Audible pedestrian signals</b> at the Massie intersection</li> </ul>
<b>Bicycle</b>	<ul style="list-style-type: none"> <li>• A 10' <b>shared use path</b> on the west side with connections to the trails leading to the Goodwin Bridge</li> <li>• A 5' <b>raised bicycle lane</b> with a 2' buffer on the west side, transitioning from a sharrow beneath the railroad bridge</li> <li>• A 5' <b>raised bicycle lane</b> with a 2' buffer on the east side, continuing from beneath the railroad bridge</li> <li>• <b>Bicycle box</b> for the northbound approach of Emmet Street to the Massie intersection to facilitate left turns from the raised bicycle lane to Massie Road and North Grounds, and to access the shared-use path connecting to Barracks Road Shopping Center</li> <li>• <b>Colored pavement</b> to indicate to vehicles where the southbound raised bicycle lane crosses Massie Road at grade</li> </ul>
<b>Transit</b>	<ul style="list-style-type: none"> <li>• New stops with protective <b>shelters</b> on the both sides at Goodwin Bridge; coordinate with CAT and UTS at June 18<sup>th</sup> meeting.</li> </ul>

	<ul style="list-style-type: none"> <li>Design the raised bicycle lane to go behind an <b>island</b> where the transit stop is located, with a crosswalk over the bicycle lane for pedestrians</li> </ul>
<b>Vehicle</b>	<ul style="list-style-type: none"> <li>Outer <b>travel lane</b> width of 11'</li> <li>Inner and <b>turning lane</b> width of 10'</li> <li>Design for a <b>25 mile per hour</b> speed limit</li> </ul>
<b>General</b>	<ul style="list-style-type: none"> <li>Enhanced <b>landscaping</b></li> <li><b>Green infrastructure</b> elements as feasible (such as permeable pavement and bioswales)</li> <li><b>Trash receptacles and benches</b>, especially on the shared-use path</li> <li><b>Wayfinding</b> signage for pedestrians and bicyclists</li> </ul>
<b>Massie to Arlington</b>	
<b>Pedestrian</b>	<ul style="list-style-type: none"> <li>A 10' <b>shared use path</b> on both the east and west sides, with a potential boardwalk for the segment that fronts JPJ Arena</li> <li>A 6' <b>curbside buffer</b> with street trees between the raised bicycle lane and the multiuse path on both sides</li> <li>Marked and accessible <b>crosswalk</b> at Copeley and accessible curb ramps with tactile domes</li> <li><b>Audible pedestrian signals</b> at the Arlington intersection</li> </ul>
<b>Bicycle</b>	<ul style="list-style-type: none"> <li>A 10' <b>shared use path</b> on the west side, with a potential boardwalk for the segment that fronts JPJ Arena</li> <li>A 5' <b>raised bicycle lane</b> with a 2' buffer on the west side</li> <li>A 5' <b>raised bicycle lane</b> with a 2' buffer on the east side</li> <li>A <b>jughandle</b> for bicyclists turning left onto Arlington from Emmet Street northbound, facilitating a crossing at the existing crosswalk.<sup>4</sup></li> </ul>
<b>Transit</b>	<ul style="list-style-type: none"> <li>No specific transit recommendations for this segment</li> </ul>
<b>Vehicle</b>	<ul style="list-style-type: none"> <li>Outer <b>travel lane</b> width of 11'</li> <li>Inner and <b>turning lane</b> width of 10'</li> <li>Design for a <b>35 mile per hour</b> speed limit</li> </ul>
<b>General</b>	<ul style="list-style-type: none"> <li>Enhanced <b>landscaping</b></li> <li><b>Green infrastructure elements</b> as feasible (such as permeable pavement and bioswales)</li> <li><b>Trash receptacles and benches</b>, especially on the shared-use path</li> <li><b>Wayfinding</b> signage for pedestrians and bicyclists</li> <li>Appropriate <b>landscaping</b> in the median</li> </ul>

<sup>4</sup> National Association of City Transportation Officials. Two-Stage Turn Box Queue Boxes. <https://nacto.org/publication/urban-bikeway-design-guide/intersection-treatments/two-stage-turn-queue-boxes/>. Accessed July 13, 2018.

The following graphic series illustrates each of the three-road links. A typical road section for each of the three links is also provided. Plan view summary illustrations of the infrastructure improvements are also included.

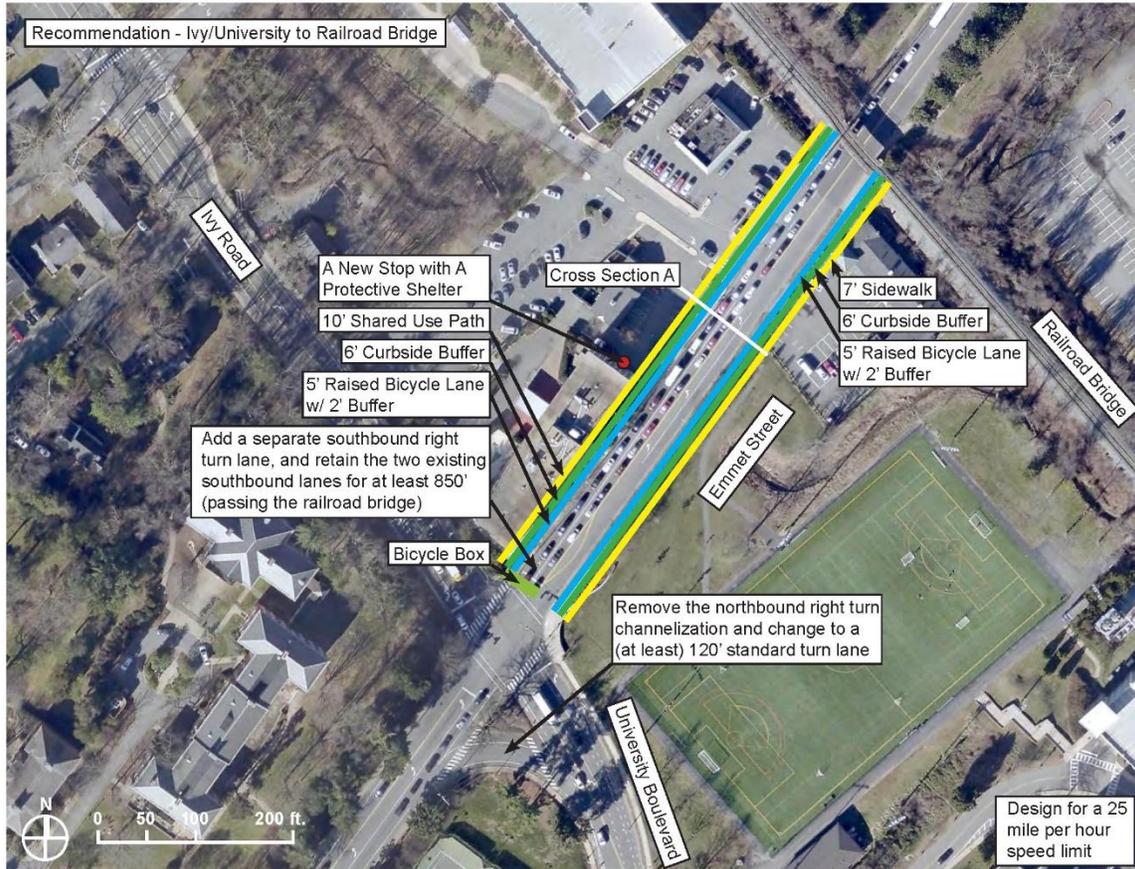


Figure 26 Summary of Recommendations, between Ivy Road/University Ave and Railroad Bridge

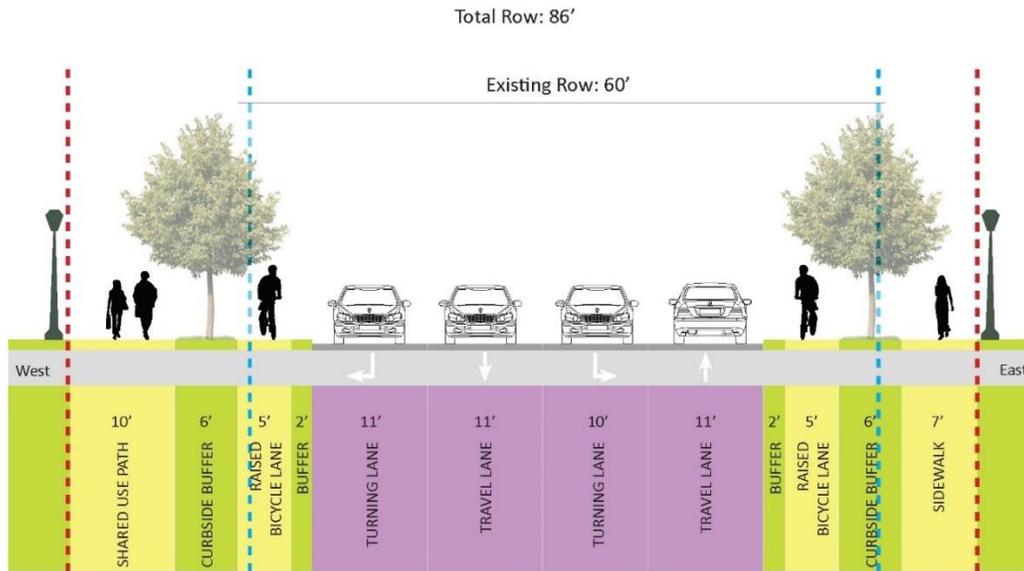


Figure 27 Typical Future Cross Section A, between Ivy Road/University Ave and Railroad Bridge

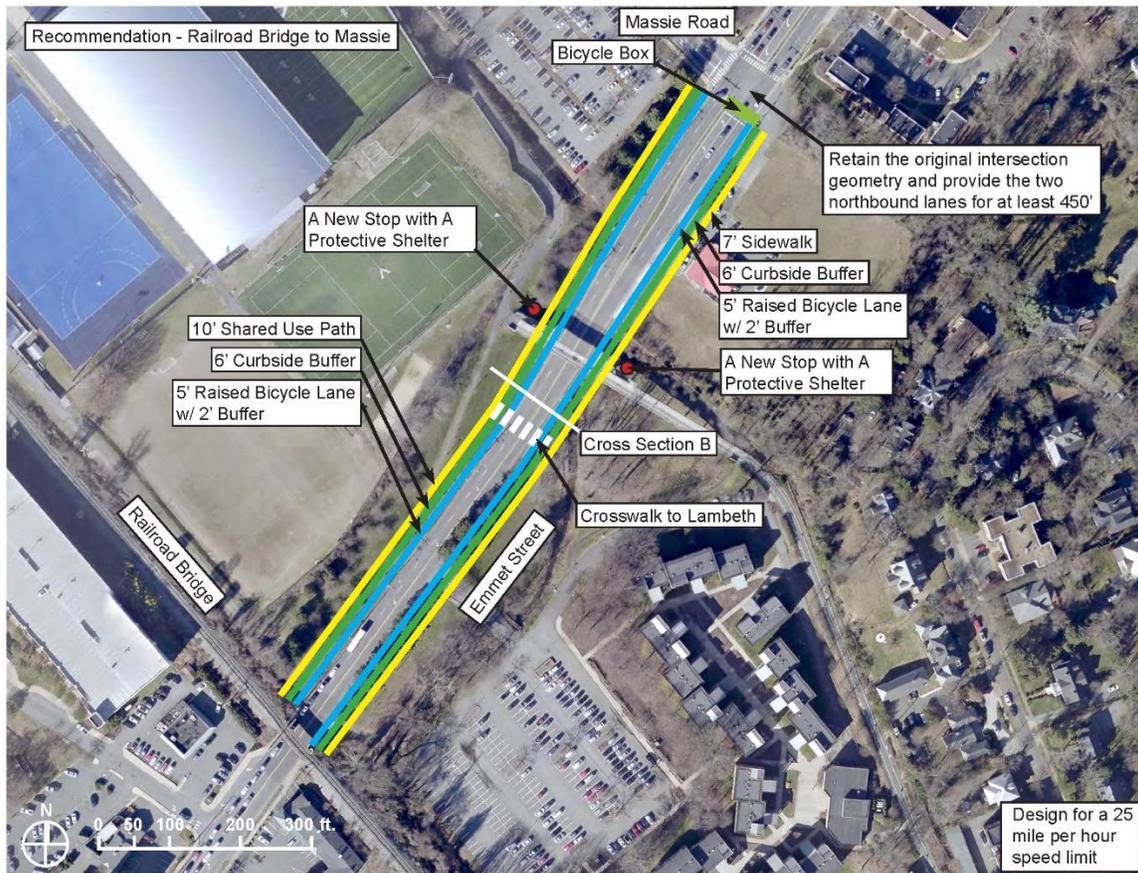


Figure 28 Summary of Recommendations, between Railroad Bridge and Massie

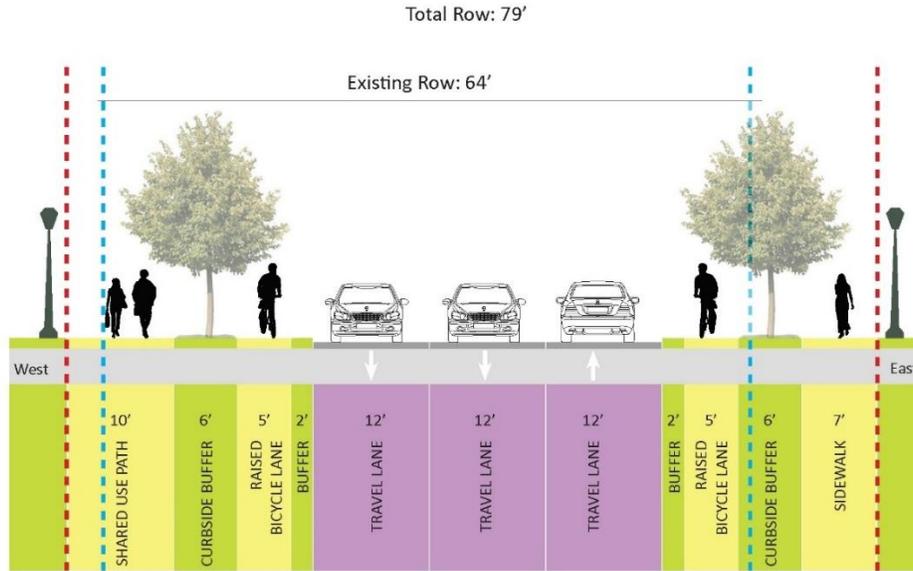


Figure 29 Typical Future Cross Section B, between Railroad Bridge and Massie

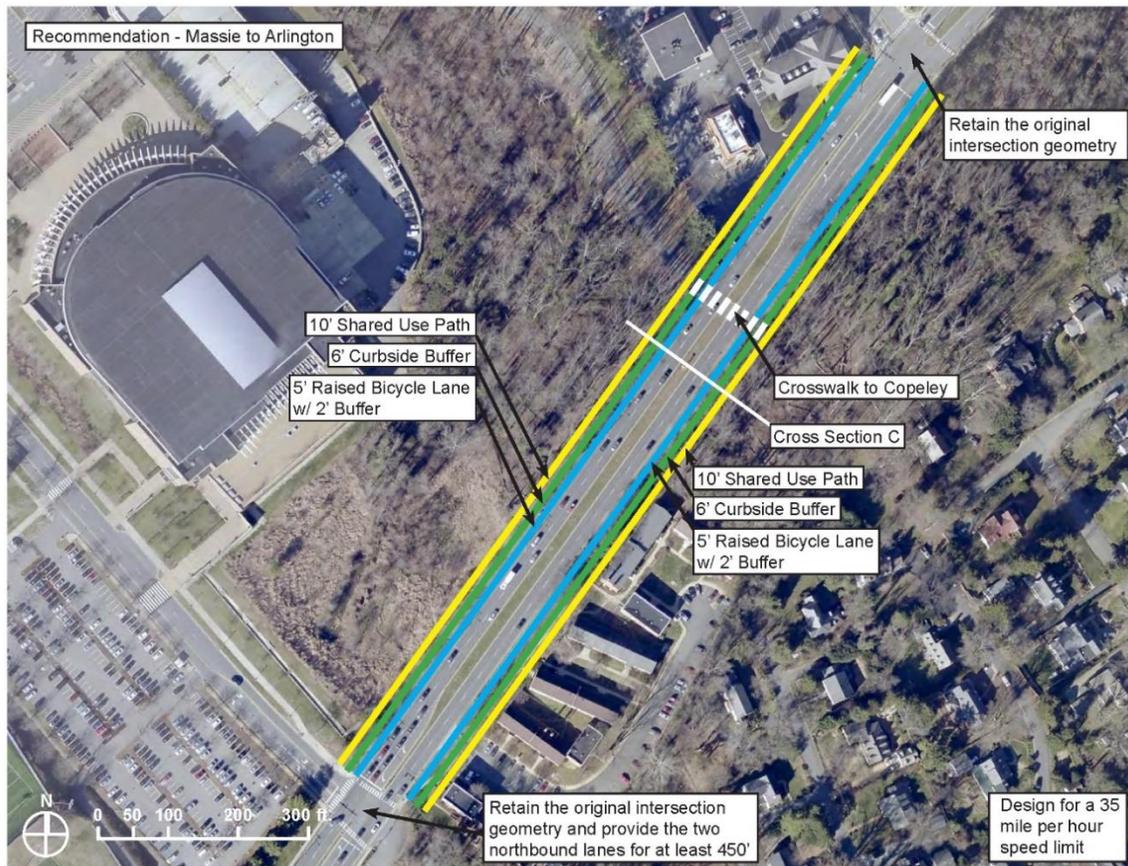


Figure 30 Summary of Recommendations, between Massie and Arlington

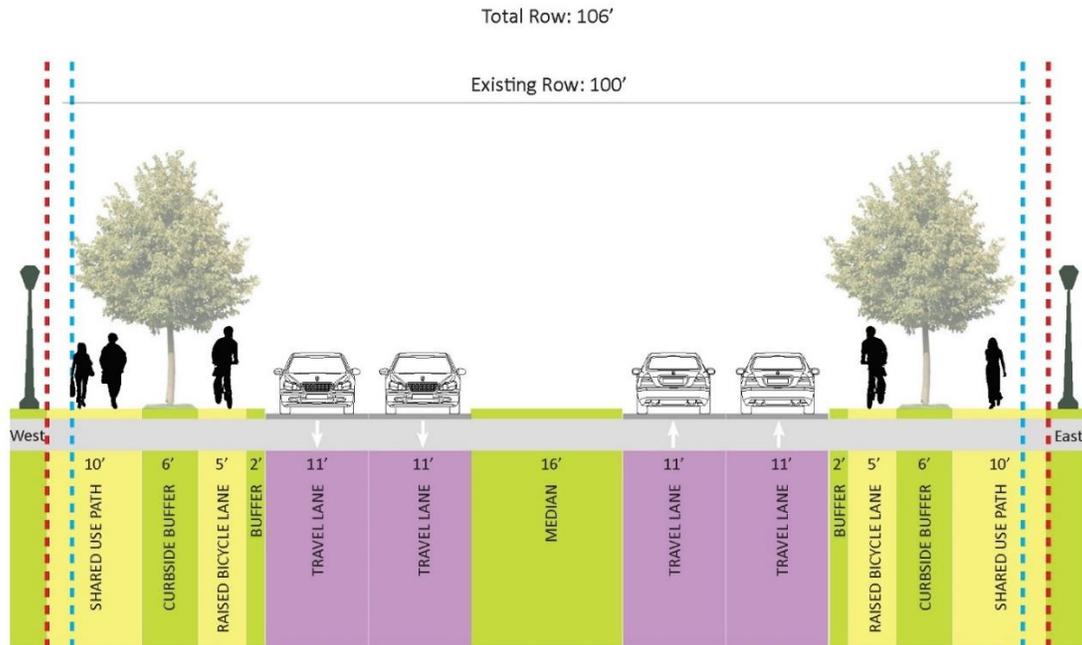


Figure 31 Typical Future Cross Section C, between Massie and Arlington

### Next Steps

The next phase of design entails the development of conceptual options to assess potential constraints to implementing the recommended configuration. Constraints to consider may include environmental impacts (streams/wetlands), right-of-way (property) impacts, utility impacts, construction feasibility and construction costs. Conceptual options to consider can include the following design elements:

1. 10' shared-use path and pedestrian tunnel location
  - a. East Side
  - b. West Side
2. Bike lane configuration
  - a. Raised
  - b. Street-level with 2-ft mountable curb
3. Mid-block Crossing at Lambeth Lane
4. Variation of proposed typical section widths
  - a. Sidewalk width (minimum 5')
  - b. Bike lane width
  - c. Curbside buffer width
5. Need for on roadway bike lane on the side of shared-use path

These options can be considered as part of the development of the conceptual designs.