



ROUTE 15

Safety and Operations Study

FROM WHITES FERRY ROAD TO THE MARYLAND STATE LINE

Existing Conditions Summary - February 2018



Kimley»Horn



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1. Existing Transportation Conditions

TRANSPORTATION NETWORK

Study Area Streets

Route 15 (James Monroe Highway)

Route 15 serves as a regional commuter route, and within the study area, provides access to numerous large retail shopping centers, small rural businesses, residences, schools, parks, and healthcare facilities. Route 15 is a four-lane, divided principal arterial with a posted speed limit of 45 miles per hour within the Town of Leesburg but transitions into a two-lane undivided roadway approximately 1,000 feet north of its intersection with Battlefield Parkway until its intersection with Route 15 Business (King Street). Within the Village of Lucketts, the posted speed changes to 35 mph and there is a school speed zone of 25 mph during weekdays around 7:50 a.m., when school starts, and around 2:35 p.m. when school lets out. North of the King Street intersection, Route 15 has a raised median until just north of its intersection with Raspberry Drive/Whites Ferry Road where it transitions to an undivided cross-section. North of Lucketts, Route 15 crosses the Potomac River into Maryland.

Route 15 is also part of the Journey Through Hallowed Ground corridor from Gettysburg, PA to Monticello in Charlottesville, VA. The corridor was designated as a National Scenic Byway in 2009 and is lined with presidential homes, civil war battlefields, and historic "Main Street" communities. It is a primary touring route from which visitors can explore a scenic and historically rich landscape. The Journey Through Hallowed Ground Partnership formed to ensure that the roadway receives respect and intentional planning as well as promote the conservation and enhancement of the corridor's scenic, historic, archaeological, cultural, natural, and recreational resources. Considering the transportation element of the roadway, the Byway designation aims to promote transportation systems that employ context-sensitive design and protect efficient, safe, and enjoyable travel through the corridor for all modes of travel and types of users, all while maintaining character-defining features.

EXISTING GEOMETRY

The roadway geometry along Route 15 changes throughout the study area. Table 1 shows is a summary of the roadway geometry.

Route 15



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Table 1: Route 15 Existing Geometry¹

Segment	# of Lanes	Median	Shoulders	Rumble Strips*	ROW Width
Whites Ferry Road to approximately 550 feet north	2	Y – raised concrete	Y - paved	None	Approximately 120 Feet
550 Feet North of Whites Ferry Road to Approximately 800 Feet South of Rocky Meadow Lane	2	None	Y – 0-2 Feet Paved	Centerline	Approximately 120 Feet
800 feet South of Rocky Meadow Lane to 700 Feet North of Montresor Road	2	None, except paved median near turn lanes	Y – 0-2 Feet Paved	Centerline and edgeline near Montresor Road	Approximately 80 Feet
700 Feet North of Montresor Road to Stumptown Road	2	None, except paved median near turn lanes	Y – 0-2 Feet Paved	Centerline and some portions of outside shoulder	Approximately 60 feet
North of Stumptown Road	2	None, except raised median near St. Clair Lane	Y – 0-2 Feet Paved	Centerline	Prescriptive ROW, approximately 60 feet in most locations however narrows down to 26 feet in one location

*Includes new centerline rumble strips installed in Fall 2017 by VDOT

Between Whites Ferry Road and the Maryland State Line there are:

- 9 stop-controlled intersections
- 1 signalized intersection
- 90 driveway entrances
- 10 left turn lanes
- 9 right turn lanes

VDOT is also in the process of reviewing the feasibility of installing edgeline rumble strips.

¹ Data source: US 15 Corridor Analysis Using the Interactive Highway Safety Design Model (IHSDM), prepared by Parsons Brinckerhoff, March 30, 2009



Intersecting Roadways

Several intersecting roadways serve as local transportation network connections within the study area and include the following:

- **Lovettsville Road (Route 672):** two-lane, undivided local road with a posted speed limit of 45 mph. Lovettsville Road is as a rural road that provides access to residential communities across Northwestern Loudoun County. At its western terminus, Lovettsville Road intersects Milltown Road and East Broad Way in the Town of Lovettsville.
- **Wilt Store Road (Route 664):** two-lane, gravel undivided local road with no posted speed. It is mainly utilized to access residential communities and terminates at its intersection with Taylorstown Road.
- **Potomac Overlook Lane:** private access easement driveway with no posted speed. It provides access to a handful of homes.
- **St. Clair Lane (Route 658):** two-lane, undivided local road with a posted speed limit of 45 mph. St. Clair Lane provides access to several residential communities, wineries, farms, and other rural businesses in Northern Loudoun.
- **Lucketts Road (Route 662):** two-lane, undivided local road with a posted speed limit of 30 mph through the Village of Lucketts that increases to 40 mph outside of village limits. Like St. Clair Lane, Lucketts Road provides access to residential communities, businesses, and other community locations. At the intersection of Lucketts Road and Route 15, Lucketts Roads changes names to Stumptown Road. This road has been reportedly used at times by commuter traffic to avoid congestion along Route 15.
- **Stumptown Road (Route 662):** two-lane, undivided local road with a posted speed limit of 30 mph through the Village of Lucketts that increases to 40 mph outside of village limits. At its western terminus, Stumptown Road intersects Loyalty Road in Western Loudoun County, which serves as a route to Waterford and Taylorstown.
- **Spinks Ferry Road (Route 657):** two-lane, undivided local road with a posted speed limit of 45 mph west of its intersection with Limestone School Road and 35 mph east of the intersection. Spinks Ferry Road primarily serves residential communities and rural businesses located east of Route 15. Spinks Ferry Road is paved between Route 15 and Limestone School Road.
- **Newvalley Church Road (Route 663):** two-lane, undivided local road with a posted speed limit of 40 mph. Newvalley Church Road provides additional access to Stumptown Road and becomes Taylorstown Road at its intersection with Bald Hill Road.
- **Montresor Road (Route 661):** two-lane, partially paved, undivided local road with a posted speed limit of 25 mph through Stumptown Road, which increases to 35 mph as it approaches the intersection with Route 15. Montresor Road terminates at Stumptown Road and primarily provides access to residential communities.

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- **Limestone School Road (Route 661):** two-lane, gravel undivided local road with a posted speed limit of 35 mph. Limestone School Road provides access to wineries and parks and a few residential properties. It terminates at its intersection with Spinks Ferry Road.

Intersections

Figure 1 provides an overview of the study area. A complete list of study intersections is provided below:

1. Route 15 and Lovettsville Road
2. Route 15 and Wilt Store Road/Potomac Overlook Lane
3. Route 15 and St. Clair Street
4. Route 15 and Stumptown Road/Lucketts Road
5. Route 15 and Lucketts Elementary School (North)
6. Route 15 and Lucketts Elementary School (South)
7. Route 15 and Spinks Ferry Road
8. Route 15 and Newvalley Church Road
9. Route 15 and Montresor Road
10. Route 15 and Limestone School Road

Figure 2 illustrates the lane designations and intersection traffic control for each of the study intersections. All intersections are unsignalized, except for the signalized intersection of Route 15 with Lucketts Road.

Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities currently do not exist within the study area with the exception of an uncontrolled crosswalk between the north driveway to the Lucketts Elementary School and a residential community along the west side of Route 15 (without any sidewalk connections). Both north and south of the study area, however, Route 15 intersects two major regional trails. Within the Town of Leesburg, Route 15 Business, or S King Street, intersects with the Washington and Old Dominion (W&OD) Trail, which runs east-west from Purcellville, Virginia to Arlington County. As Route 15 crosses the Potomac River into Maryland, it travels over the Chesapeake & Ohio (C&O) Canal Trail, which runs east-west from Cumberland, Maryland to Georgetown, D.C. The Potomac Heritage Trail is another regional trail network in Northern Virginia that runs along the Virginia side of the Potomac River from Eastern Loudoun to the Mount Vernon Trail in Alexandria. The current terminus is located southeast of the study area.

Transit Network

There are currently no transit facilities or public transit routes in the study area. South of the study area Loudoun Transit bus routes exist. North of the study area is the Point of Rocks MARC commuter rail station along Clay Street in Maryland.

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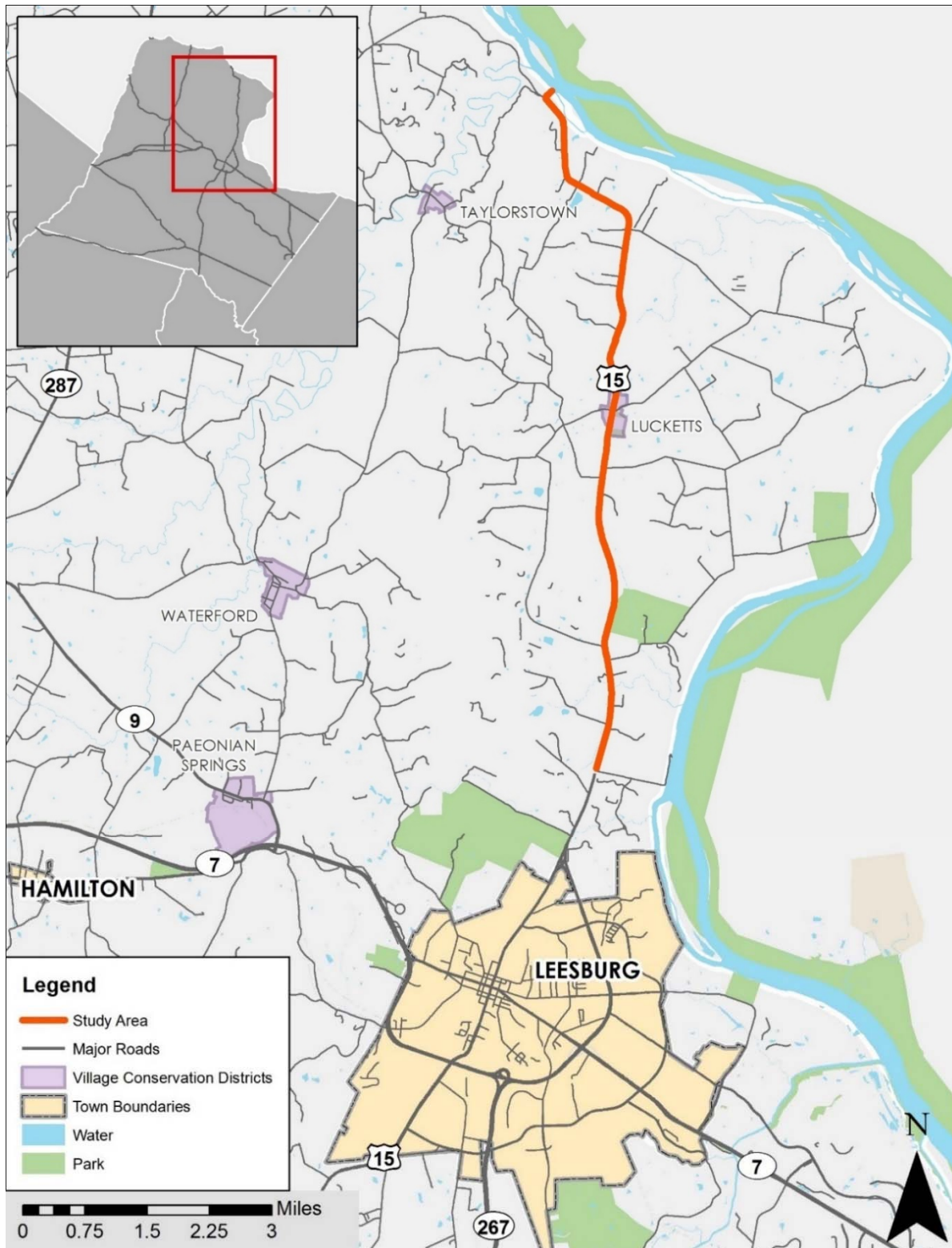


Figure 1: Study Area Map

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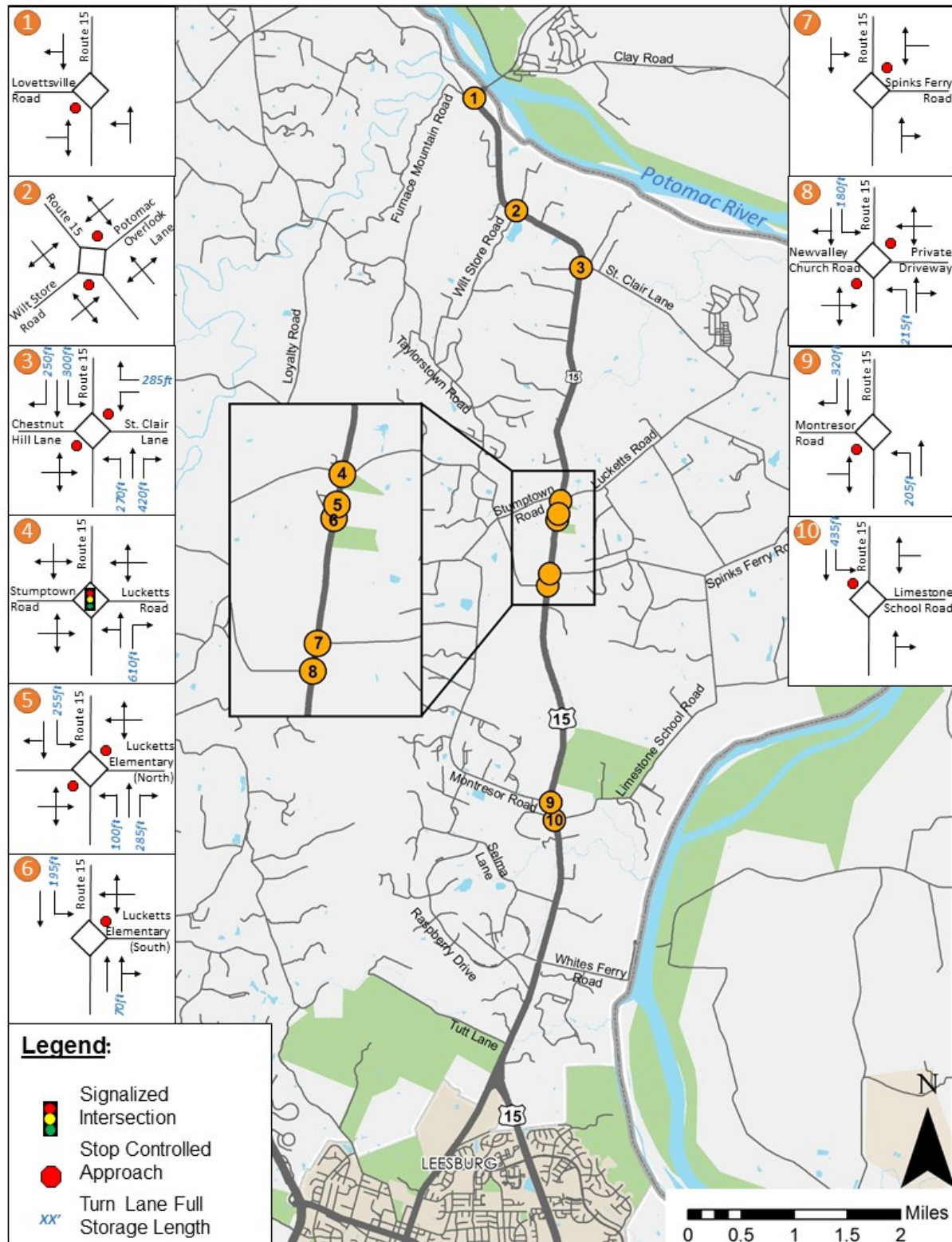


Figure 2: Existing Lane Designs and Traffic Control

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School Bus Routes

There are four schools located near or within the project study area:

- Lucketts Elementary School
- Frances Hazel Reid Elementary School
- Smart's Mill Middle School
- Tuscarora High School

Bus route information was provided by the Loudoun County Public Schools (LCPS) in the fall of 2017 and is summarized below. Routes and bus stop locations are subject to change in subsequent years, as the LCPS refines routes based on student population. It should be noted that LCPS buses use the Route 15 and Clay Street signalized intersection to turn around.

Frances Hazel Reid Elementary School, Smart's Mill Middle School, and Tuscarora High School are served by two major bus routes that travel up and down the Route 15 corridor, both in the morning and afternoon. In the AM peak period, the elementary school route, which begins at Tuscarora High School, makes six stops along Route 15 and Montresor Road and terminates at Frances Hazel Reid Elementary School. The same route is followed in the afternoon, but it does not occur within this study PM peak period. A second route for middle and high schoolers operates in the morning outside of the AM peak period. It makes several stops along the Route 15 corridor and extends from the Town of Leesburg to just south of Point of Rocks. This route is repeated in the afternoon during the PM peak period. The routes are shown in **Figure 3**.

Lucketts Elementary School is served by five different routes that travel on the Route 15 corridor, which are shown in **Figure 4**. Although most of these buses begin their routes at Lucketts Elementary School, Route 345 begins at the Smart's Mills Middle School parking lot and Routes 579 and 820 begin at the Tuscarora High School parking lot, where the buses are parked until the routes begin. The northern portion of the study area, including communities located off St. Clair Lane, are primarily served by Routes 345, 579, and 820. Along with serving the Village Green community, Route 579 also stops along Wilt Store Road. The eastern portion of the study area, including Lucketts Road, Lost Corner Road, and Spinks Ferry Road, is served by both Route 136 and Route 860. Route 820 operates on the western portion of the study area, making stops along Taylorstown Road and Stumptown Road. Due to early school end times, the Lucketts Elementary School afternoon bus routes do not occur within the study's PM peak period. In the morning, however, buses begin their routes as early as 6:18 AM until drop-off at 7:30 AM, which overlaps with the AM peak period.

The approximate operating times for the different bus routes are included in **Table 2**.

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Table 2: Bus Route Operating Times

Bus Route	Approximate Operating Time	
	AM	PM
Lucketts Elementary School Route	6:18 – 7:30 AM	2:16 – 3:39 PM
Frances Hazel Reid Elementary School Route	6:49 – 7:30 AM	2:26 – 3:17 PM
Smart's Mill Middle/Tuscarora High School Route	7:50 – 9:05 AM	3:21 – 5:04 PM

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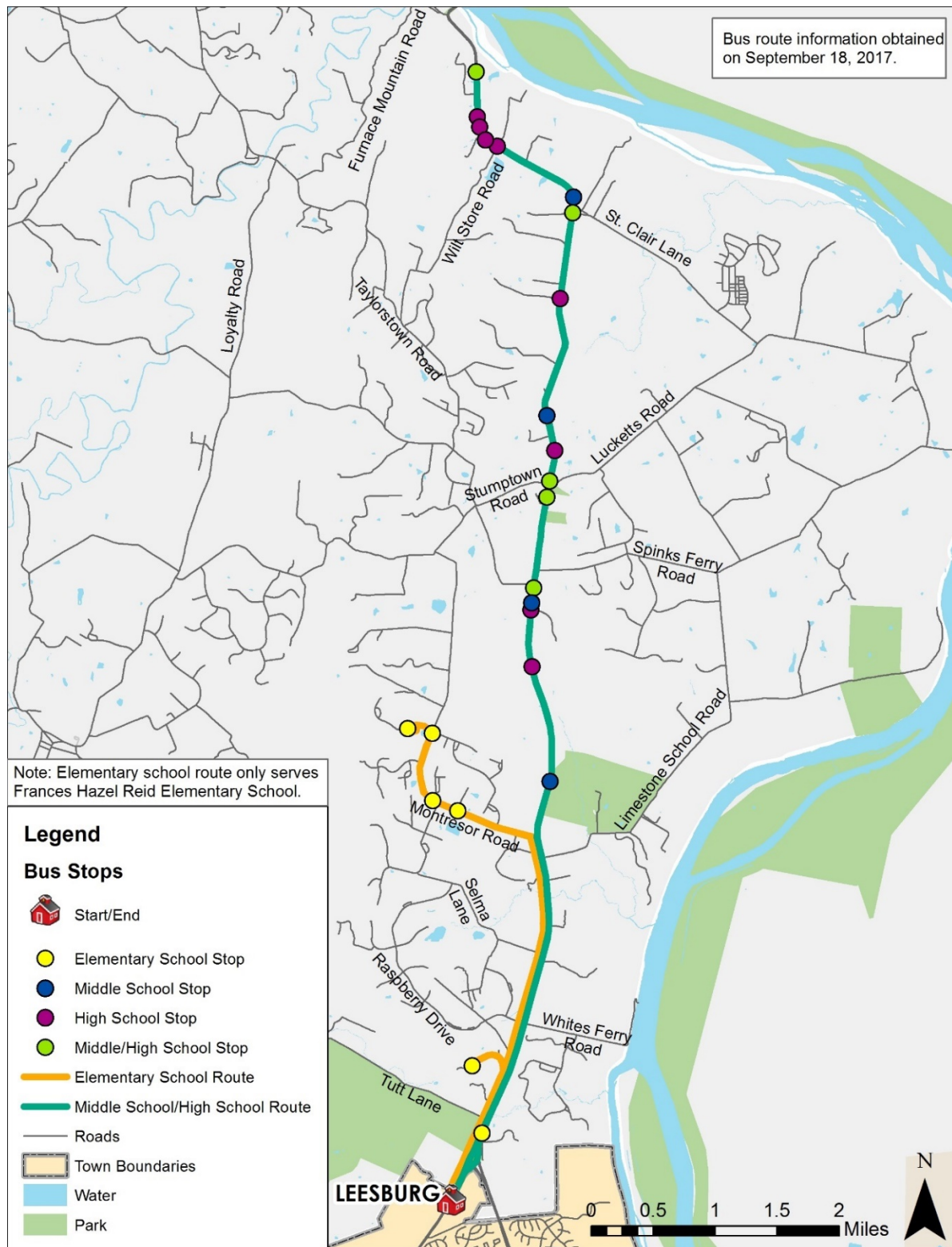


Figure 3: Frances Hazel Reid Elementary School, Smart's Mill Middle School, and Tuscarora High School Bus Routes and Stops

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Safety and Operations Study from Whites Ferry Road to the Maryland State Line

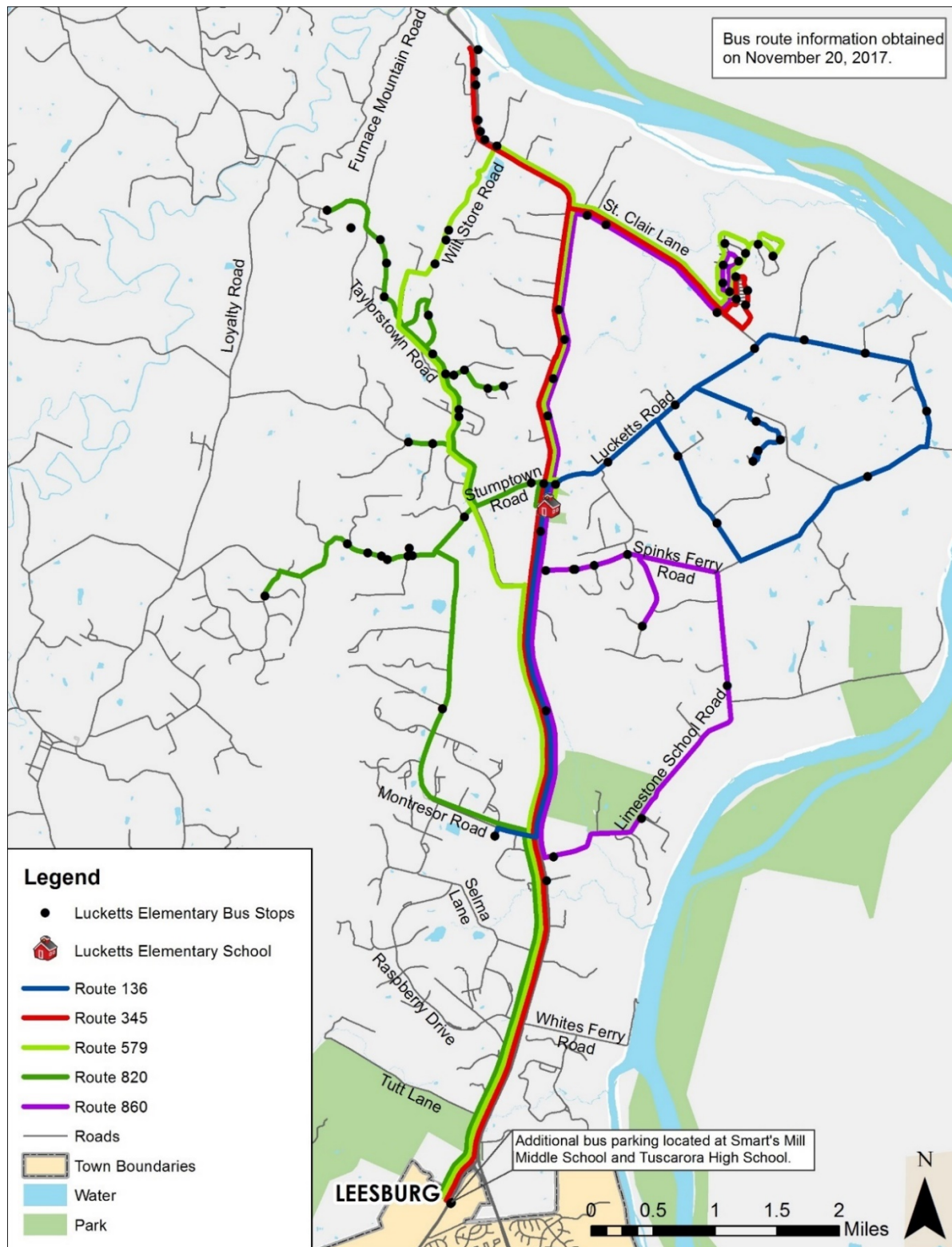


Figure 4: Luckett's Elementary School Bus Routes and Stops

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LOUDOUN COUNTY COUNTYWIDE TRANSPORTATION PLAN (CTP)

The Loudoun County CTP was adopted in 2010, and updated through December 6, 2016 (with map updates through November 12, 2015), as a planning document for the anticipated roadway network needed to accommodate future development and travel demand. US Route 15 is shown from the Town of Leesburg northern limits to Tutt Lane as an urban four-lane roadway, transitioning to a rural two-lane roadway north of Tutt Lane designated as a Virginia Scenic Byway. There are no planned interchanges at the existing intersections along US Route 15, north of the Town of Leesburg.

Figure 5 shows an overview of US Route 15 near the study area from the CTP. Following the Route 15 Congestion Study, a CPAM was initiated to extend the 4-lane section of Route 15 to Montresor Road. Loudoun County is also currently in the process of updating the Comprehensive Plan through the Envision Loudoun process.

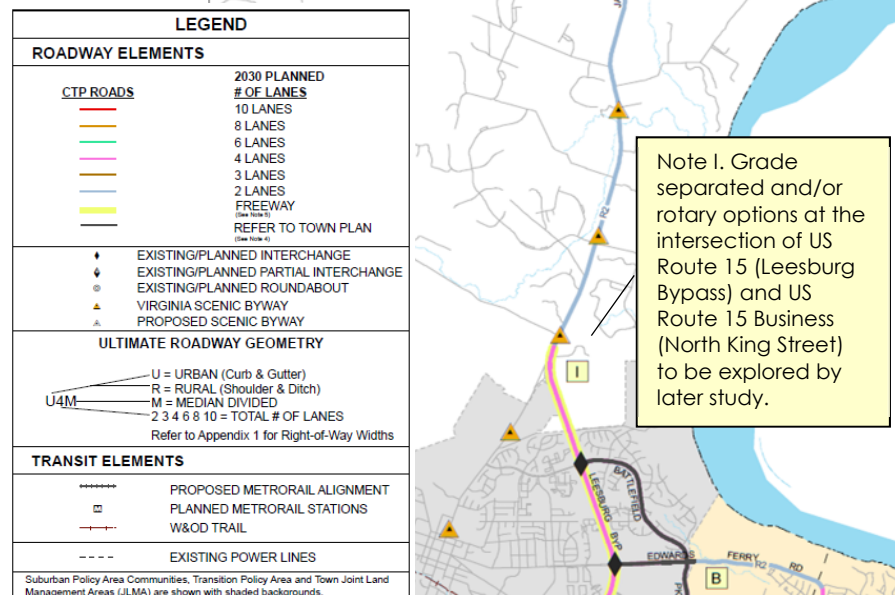


Figure 5: Countywide Transportation Plan



2. Analysis of Existing Transportation Conditions

SAFETY ANALYSIS

Crash data for Route 15 from Battlefield Parkway to the Maryland State line (milepost 231.15 to 241.95) was used to evaluate historical corridor safety and identify crash patterns. The crash analysis was expanded from the study area limits since the previous Congestion Report was focused on congestion. Crash data was obtained from Virginia Department of Transportation (VDOT) for the latest available five years of crash data, as well as, the available 2017 crash data (January 1, 2012 to June 30, 2017).

Over the 5.5-year period for which crash data was collected, there were a total of 531 crashes on Route 15 in the study corridor. There were 396 Property Damage Only (PDO) crashes, 131 injury crashes, and four fatalities. Of the injury crashes, 16 were categorized as Type A or severely injured. Police reports (FR-300s) were collected for the severe Type A injury and fatal crashes. A summary of the corridor crashes is shown in **Table 3** with additional details provided in the following sections.

Table 3: Route 15 Crash Year Summary

Year	2012	2013	2014	2015	2016	2017*	Total
Fatality	1	0	0	1	0	2	4
Injury	20	17	29	23	28	14	131
PDO	51	69	66	83	90	37	396
Total	72	86	95	107	118	53	531

Note: 2017 crash data was only available through June 30, 2017

Fatality Summaries

One fatality happened on December 25, 2012 about 0.10 miles south of Black Walnut Lane during daylight. The driver was distracted by using a cellphone and was weaving between the northbound and southbound lanes multiple times. The driver ran off road, hit a utility pole, resulting in one fatality. The second vehicle experienced no injuries.

Another fatality occurred on November 25, 2015 100 feet north of Selma Lane during a clear night, on a road segment with no road lighting present. A vehicle traveling northbound veered to the southbound lane, striking the second vehicle. The vehicle at fault ran off road hitting a fence on the side of the road, resulting in one fatality. It is unknown whether the driver was under the influence. The second vehicle experienced no injuries.

The third fatality happened on January 3, 2017 about 500 feet south of Newvalley Church Road during a rainy night, on a road segment with no road lighting present. The vehicle at fault was traveling southbound on US 15 when he fell asleep and crossed

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over to the northbound traffic lane. This was a head-on collision that resulted in a serious injury for the driver traveling southbound and a fatality for the northbound driver.

The fourth fatality happened on March 22, 2017 about 400 feet north of Rocky Meadow Lane during a clear night, on a road segment with no road lighting present. The driver at fault was traveling southbound when he fell asleep and crossed over to the northbound traffic lane causing a head-on collision that resulted in a fatality for the vehicle with no improper action.

Crash Characteristics

Along the corridor, the most common collision types were rear end crashes (58%), followed by deer/other animal crashes (13%), fixed object - off road crashes (10%), and angled crashes (9%). The other collision types each consisted of 3% or less of the total crashes that happened between the five years as shown on the

Figure 6.

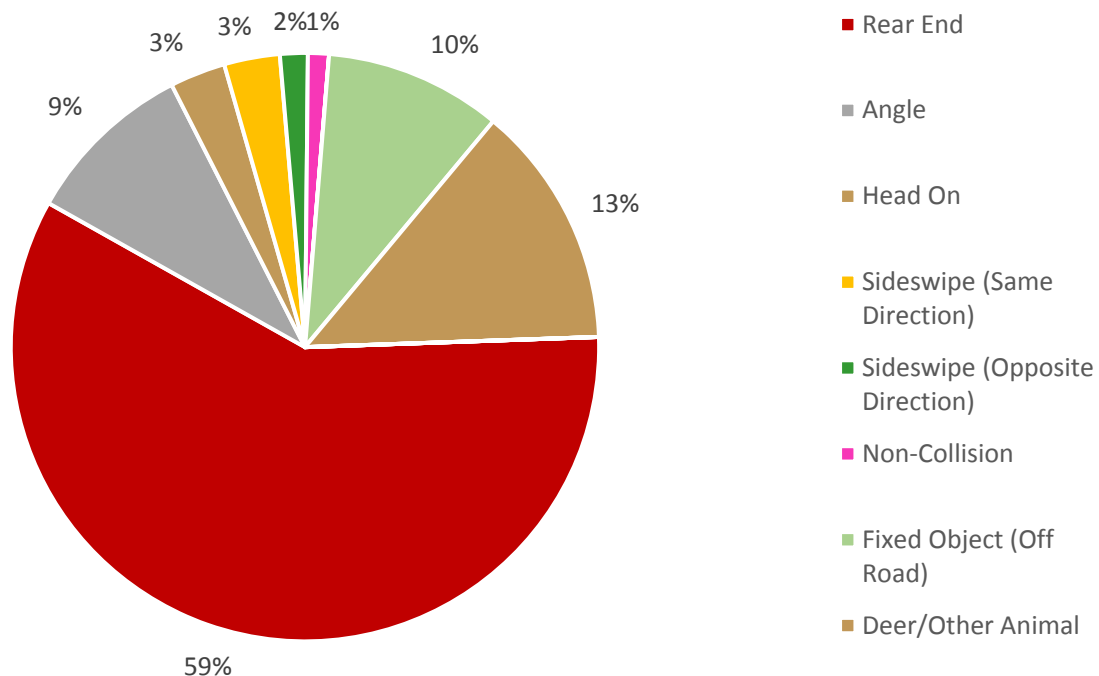


Figure 6: Collision Type

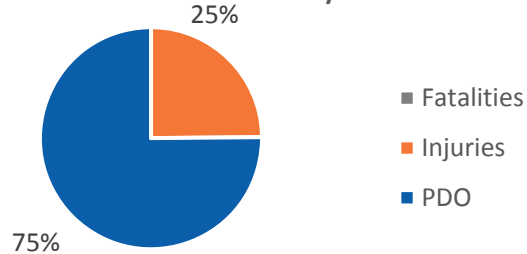
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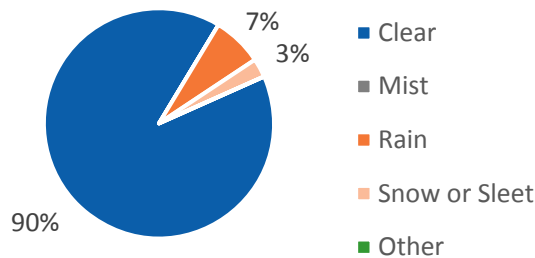
Other crash trends are as follows:

Crash Severity



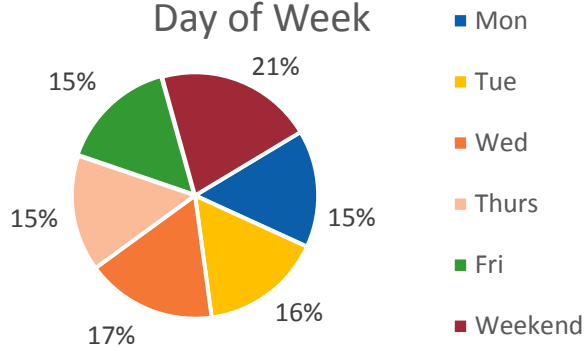
- 75 percent of the total crashes were PDO, and about 25 percent of the total crashes were injuries. There were 4 fatalities, which was less than one percent of total crashes

Weather Condition



- 90 percent of the reported crashes occurred during clear weather conditions, 7 percent during rain or mist and 3% during snow or sleet

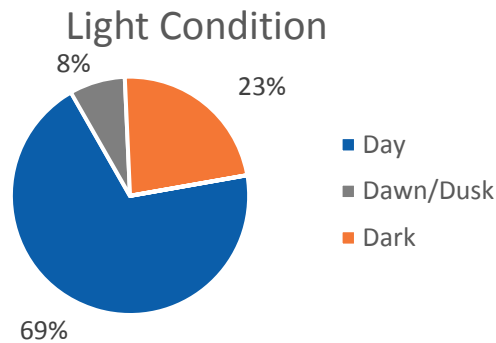
Day of Week



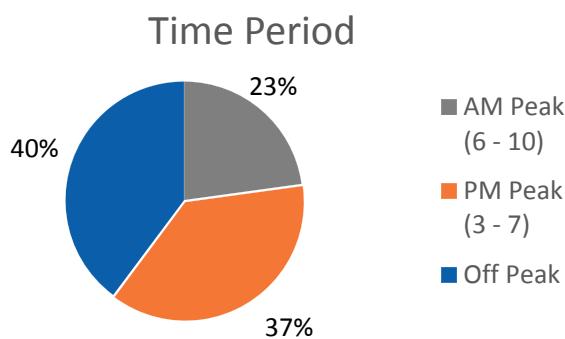
- Crashes were distributed evenly during the days of the week and weekends

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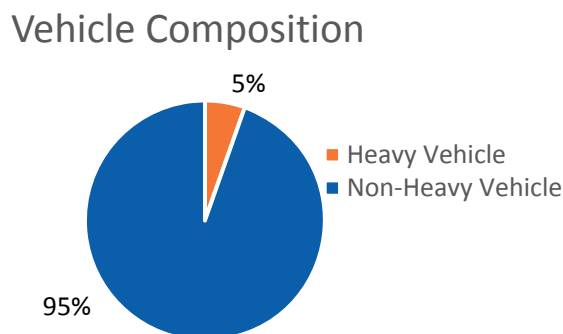
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- 69 percent of the total crashes occurred during daylight conditions, 23 percent during dark conditions, and 8 percent during dawn and dusk conditions



- 40 percent of the crashes occurred during off peak, 37 percent occurred during the PM peak period and 23 percent occurred during the AM peak period



- Of the 1,076 vehicles involved in the 531 recorded crashes, 5% were classified as heavy vehicles.

Identified Crash Hot Spot Locations

On Route 15, there are several identified segments that had high crash densities along the study corridor.

Figure 7 through **Figure 9** illustrate the collision types along the corridor in quarter mile increments.

The segment with the highest crashes was between milepost 235.50 and 235.75, by the signalized intersection of Route 15, Lucketts Road and Stumptown Road. At this segment, there is the Lucketts Elementary School, Lucketts Community Center, a

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residential community, the Lucketts Fire Department, and several commercial stores. This intersection provides a shared lane at each approach for all turning movements, except for one turn lane designated for northbound Route 15 traffic turning right onto Lucketts Road. The most common collision types at this location were rear end (23 crashes), angled (5 crashes), fixed object – off road (5 crashes), and deer/animal (4 crashes).

The second highest number of crashes occurred between milepost 239.75 and 240.0, by the intersection of Raspberry Drive, Whites Ferry Road, and US 15. This is a signalized intersection with the most common collision types being rear end (21 crashes), fixed object - off road (6 crashes), angle (4 crashes), and deer/animal (4 crashes). Rear end crashes are common at congested, signalized intersections due to long queues.

The third highest number of crashes was between milepost 240.75 and 241.0, the segment that Tutt Lane and Maple View Lane surround. This is the segment right off the Route 15 and Business Route 15 (King Street) intersection. Common collision types at this segment were rear end (18 crashes), angle (3 crashes), and deer/animal (3 crashes).

Another identified segment high crash location was at the intersection of Battlefield Parkway and Route 15 Bypass. The most common collision types were rear end (14 crashes) and angle (4 crashes). This segment is from milepost 241.75 to 241.95, considering only the northern leg of the Route 15 and Battlefield Parkway intersection.

Moreover, near the Maryland Stateline and by the unsignalized intersection of Lovettsville Road and Route 15 (milepost 231.15 to 231.5), there is a total of 23 crashes. The most common collision types were rear end (10 crashes), fixed object off road (5 crashes), and deer/animal (3 crashes). On the northbound approach to the horizontal curve near Lovettsville Road, there is an overhead warning sign with flashing beacons.

Crash Type and Period of Day Correlation

Congestion is an issue on Route 15 specifically during the AM and PM peak periods. Rear end, angle crashes, and side-swipe (same direction) collisions were most prevalent during the PM peak period. **Figure 10** portrays the distribution of collision types versus the peak period. The figure also analyzes the fixed-object (off road) collision type to further identify that vehicles are running off road more frequently towards the right side than the left side.

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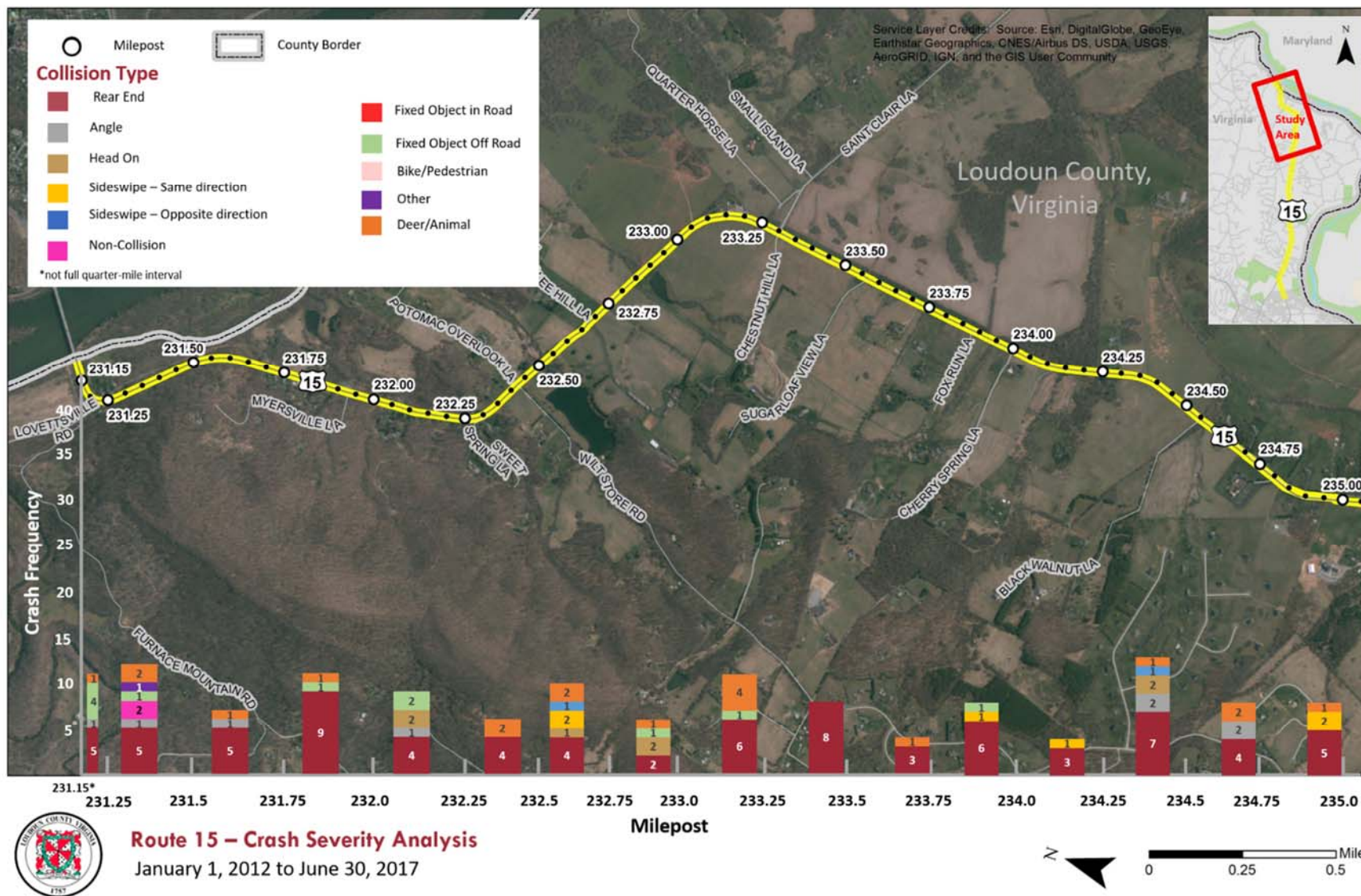


Figure 7: Route 15 Collision Type Histogram (1 of 3)

Route 15

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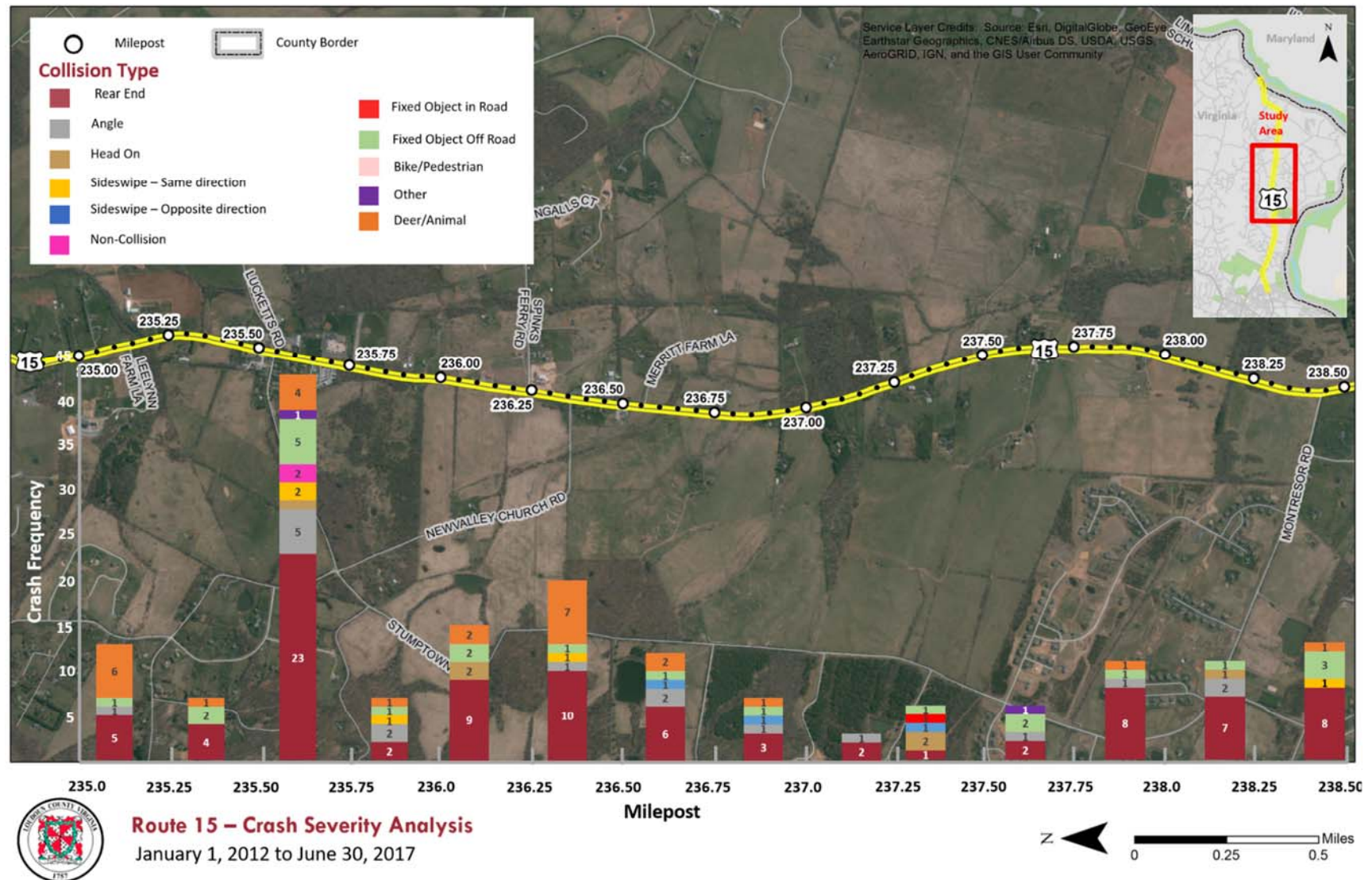


Figure 8: Route 15 Collision Type Histogram (2 of 3)

Route 15

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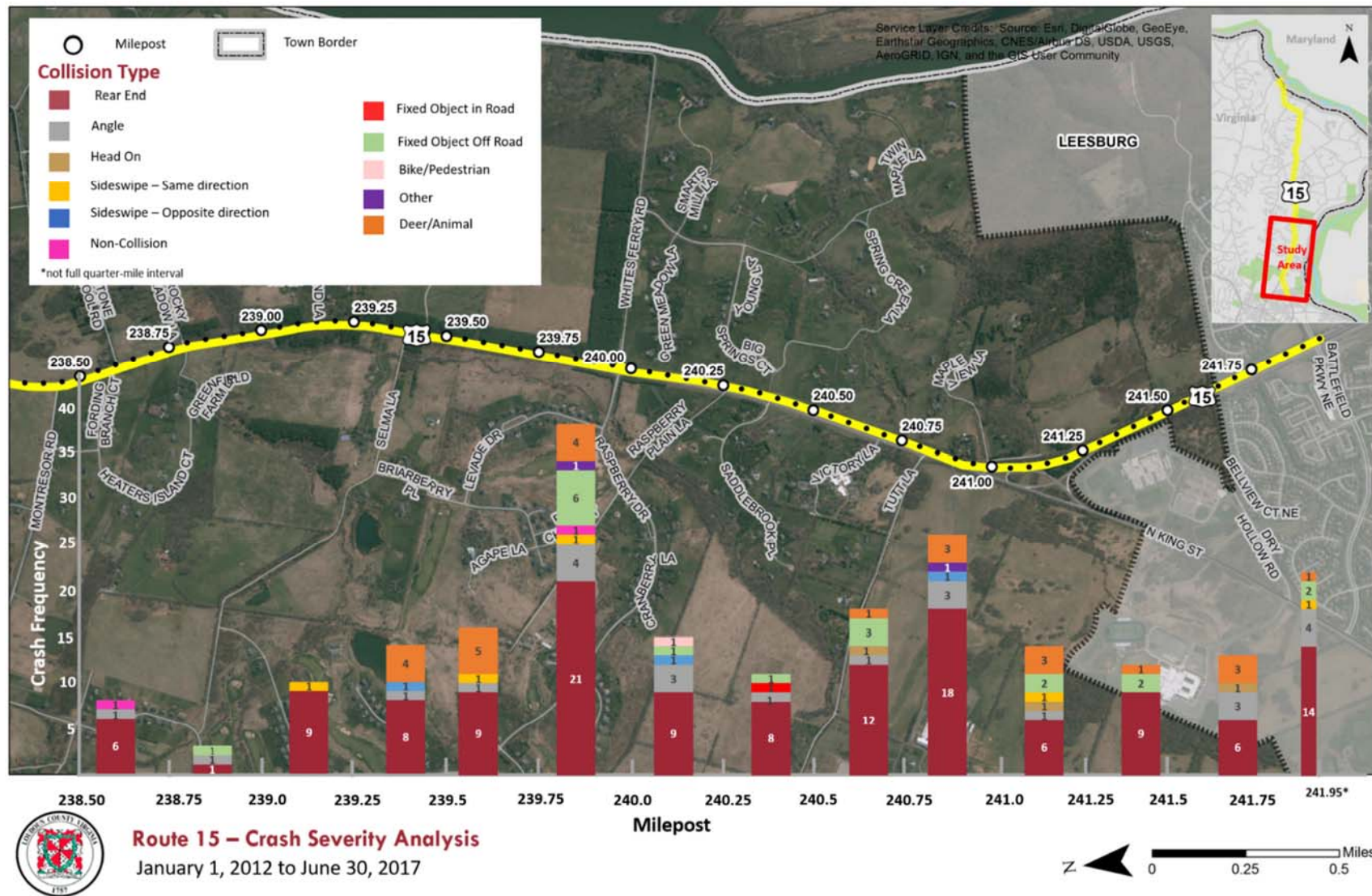


Figure 9: Route 15 Collision Type Histogram (3 of 3)

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Safety and Operations Study from Whites Ferry Road to the Maryland State Line

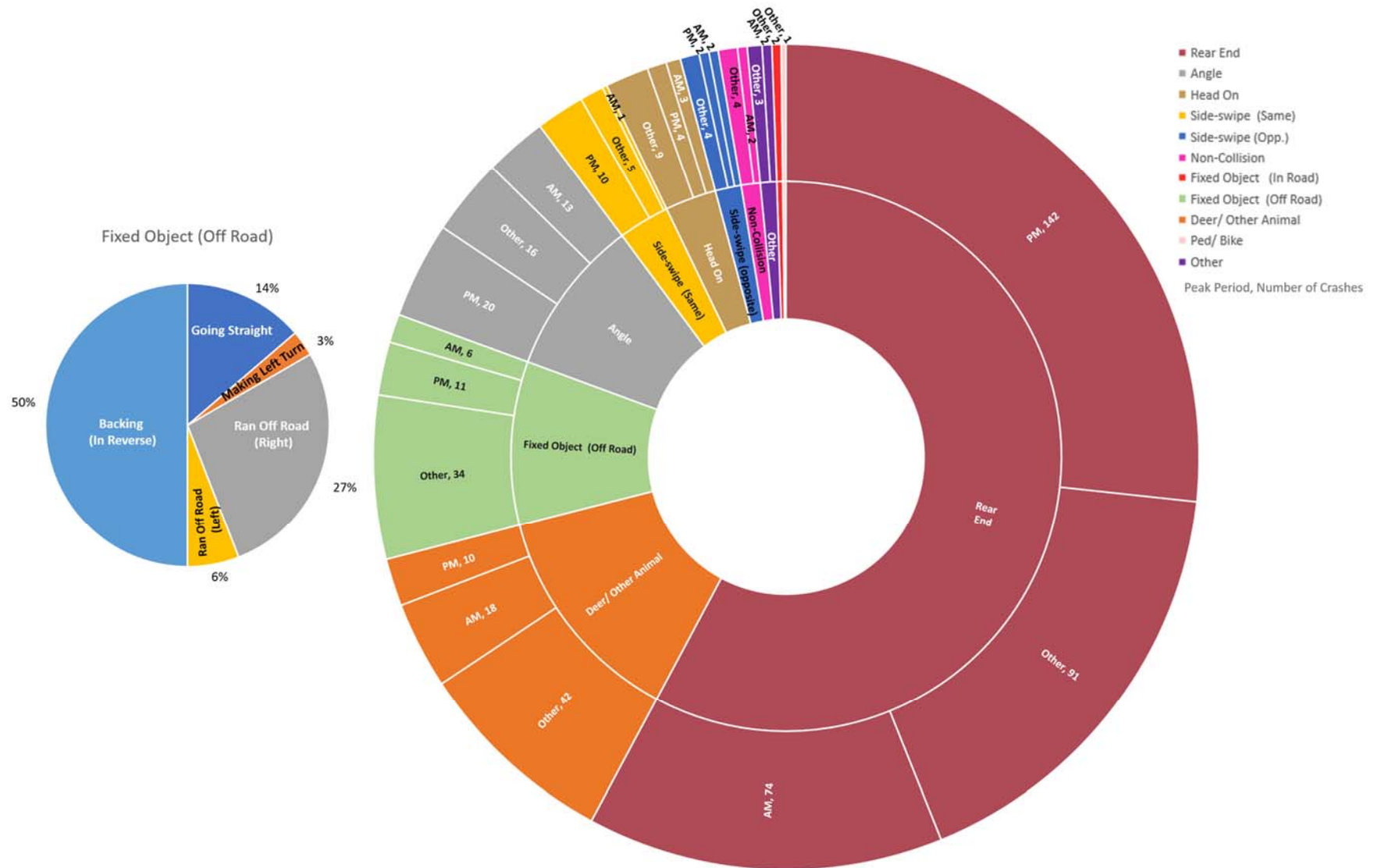


Figure 10: Collision Type and Crash Period Correlation



TRAFFIC OPERATIONS

Traffic Volume

Data Collection

In order to conduct an analysis of existing conditions, traffic data was collected from September 11 to 21, 2017 along the study corridor. Turning movement count (TMC) data was collected along Route 15 between 6:00 and 9:00 a.m. and between 3:30 and 6:30 p.m. The type and quantity of data included the following:

- TMCs at 10 intersections in the study area. In addition, TMCs were collected at the Route 15 and Clay Street intersection in Maryland for traffic analysis modeling purposes. Heavy vehicle designation was also collected at these intersections.
- TMCs at 4 additional intersections to observe trips patterns adjacent to the corridor. These were collected at:
 - o Montresor Road and Stumptown Road
 - o Stumptown Road and Newvalley Church Road
 - o Wilt Store Road and Taylorstown Road
 - o Loyalty Road and Stumptown Road

Seven-day continuous counts were also collected from September 11 to 17, 2017 at three locations along Route 15, collecting daily volumes and vehicle classification. These locations include:

- o Route 15 north of Whites Ferry Road/Raspberry Drive (data from VDOT continuous count station)
- o Route 15 between Montresor Road and Spinks Ferry Road
- o Route 15 north of the Village of Lucketts
- o Route 15 north of Lovettsville Road

Peak Hour Data

The overall AM and PM peak hours of the study area were determined by first reviewing the individual TMC data. Based upon the available data, the individual intersection AM peak hours ranged between 6:15 a.m. and 8:30 a.m. and the individual intersection PM peak hours ranged between 4:30 p.m. and 6:00 p.m.. Network peak hours for the AM and PM peaks were calculated to determine the hour during which the greatest volume of vehicles was being processed through the study area intersections. The network AM peak hour was determined to be 6:30 a.m. to 7:30 a.m. and the network PM peak hour was determined to be 4:45 p.m. to 5:45 p.m..

Given the distance between some of the intersections where data was collected, some driveway volumes were not captured in the TMCs. As such, there were resulting slight imbalances (less than 10%) in traffic volumes from intersection to intersection.

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The AM and PM overall peak hour factor was calculated for each intersection, and the heavy vehicle percentages were calculated for each turning movement. **Figure 11** illustrates the existing traffic volume at the study intersections and weekday daily traffic volumes (average of the Tuesday, Wednesday, and Thursday counts).

Travel Time

Data Collection

Travel time data was collected on September 20-21, 2017 during the AM and PM peak periods. Ten travel time runs were completed for the entire length of Route 15, from Clay Street to Whites Ferry Road, in each direction for each peak period. The data limits were expanded for the traffic analysis model calibration purposes. The AM data was collected from 6:00 a.m. to 9:00 a.m. and the PM data was collected from 3:30 p.m. to 6:30 p.m. For a point of comparison, Google travel time data were also obtained for September 11 through 25, 2017. This data was reviewed to see if the trends of the collected travel time data were consistent amongst multiple weekdays. The two data sets were summarized, compared, and aligned well with each other. Travel time data comparisons are provided in **Appendix A**.

AM Peak Period

The northbound average travel time was 920 seconds, or 15.3 minutes, which translates to a cumulative average speed of approximately 44 mph. In the southbound direction, the average travel time was 1,698 seconds, or 28.3 minutes, which translates to a cumulative average speed of approximately 24 mph. The southbound travel time is longer than that of the northbound direction due to the heavier commuter traffic and associated congestion throughout the corridor, especially at the intersections of Route 15 with Lucketts Road/Stumptown Road, with Montresor Road, and with Whites Ferry Road/Raspberry Drive. **Tables 4 and 5**, and **Figure 12**, show this travel times by segment. Travel time data summaries are provided in **Appendix A**.

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line

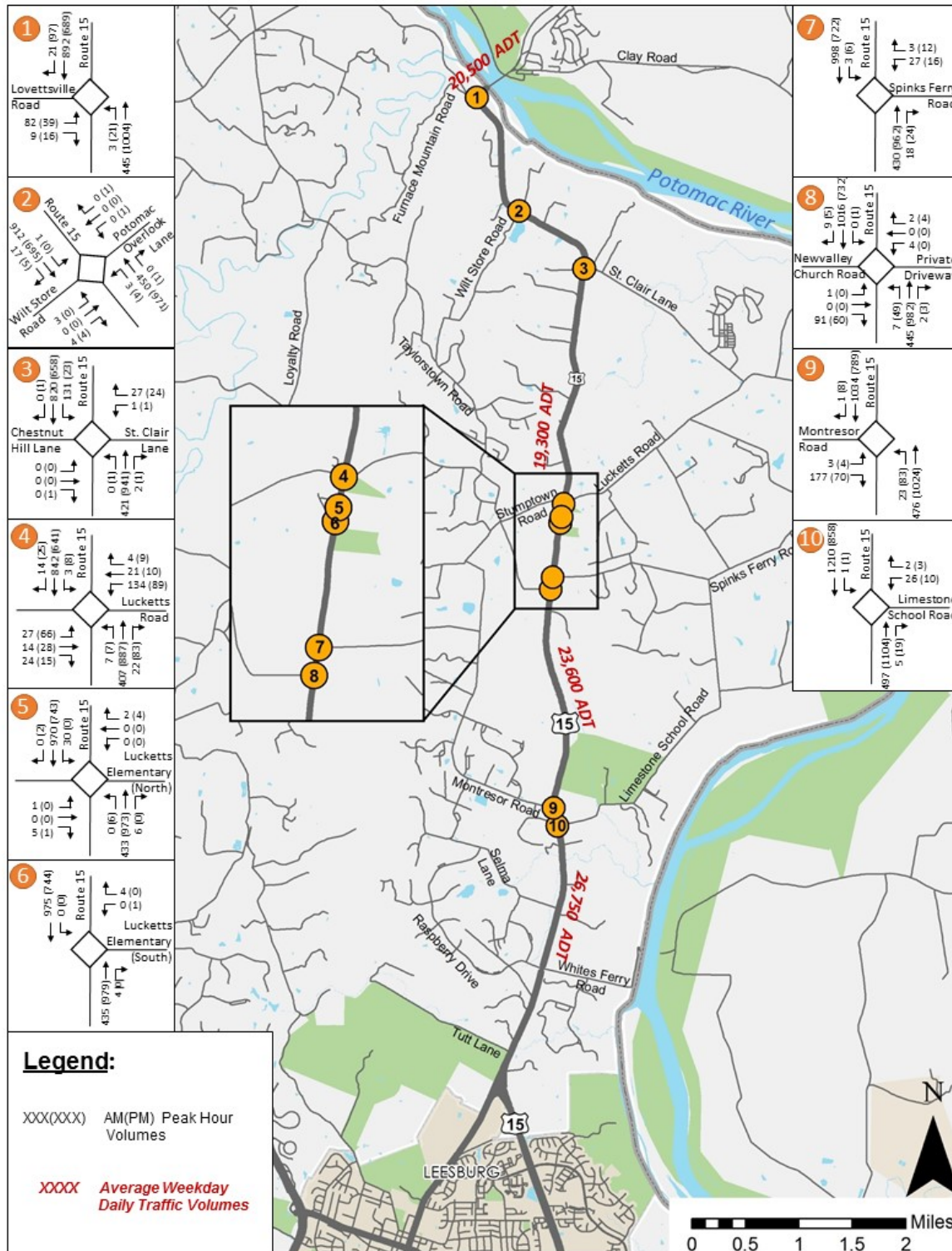


Figure 11: Existing Peak Hour Traffic Volumes

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line

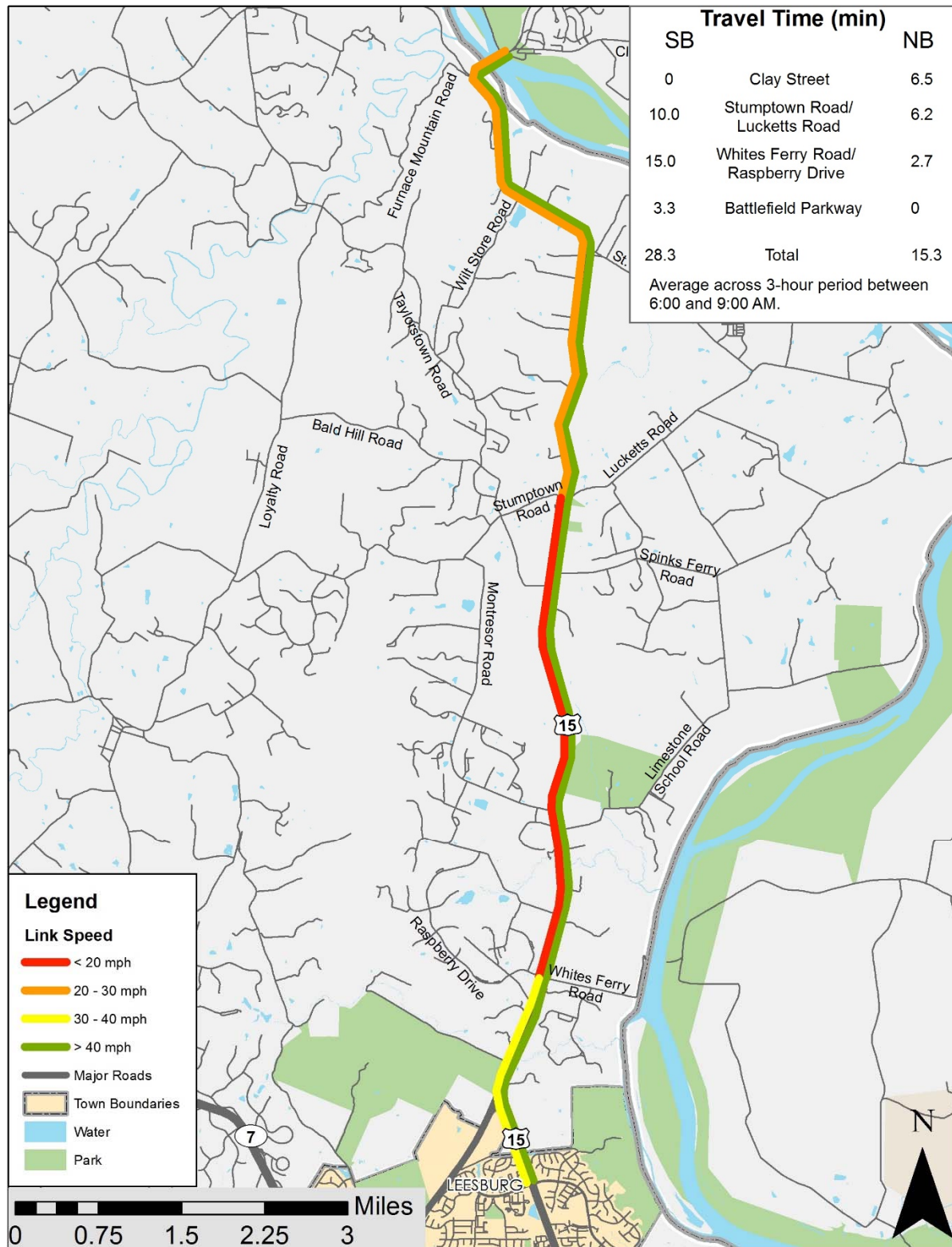


Figure 12: AM Peak Travel Time Summary

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line



Table 4: Northbound Route 15 Travel Time Runs - AM Peak Period

Segment	Distance (mi)	Average Travel Time (sec)	Incremental Average Speed (mph)	Cumulative Average Speed (mph)
Battlefield Parkway to Whites Ferry Road	1.97	159	44.6	44.6
Whites Ferry Road to Stumptown Road /Lucketts Road	4.45	370	43.4	43.4
Stumptown Road/Lucketts Road to Clay Street	4.78	391	44.0	43.8
Total Travel Time	11.20	920 (15.3 minutes)	43.8	43.8

Table 5: Southbound Route 15 Travel Time Runs - AM Peak Period

Segment	Distance (mi)	Average Travel Time (sec)	Incremental Average Speed (mph)	Cumulative Average Speed (mph)
Clay Street to Stumptown Road/Lucketts Road	4.80	600	28.8	28.8
Stumptown Road/Lucketts Road to Whites Ferry Road	4.44	903	17.7	22.1
Whites Ferry Road to Battlefield Parkway	2.02	195	37.3	23.9
Total Travel Time	11.26	1698 (28.3 minutes)	23.9	23.9

PM Peak Period

The northbound average travel time was 1,431 seconds, or 23.9 minutes, which translates to a cumulative average speed of approximately 28 mph. In the southbound direction, the average travel time was approximately 1,020 seconds, or 17 minutes, which translates to a cumulative average speed of approximately 40 mph. The northbound travel time is longer than that of the southbound direction due to commuter traffic and associated congestion along the corridor, especially at the intersections of Route 15 with King Street, with Whites Ferry Road/Raspberry Drive, with Lucketts Road/Stumptown Road, and with Clay Street (north of study area). **Tables 6** and **7**, and **Figure 13**, show this data by segment. Travel time data summaries are provided in **Appendix A**.

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line

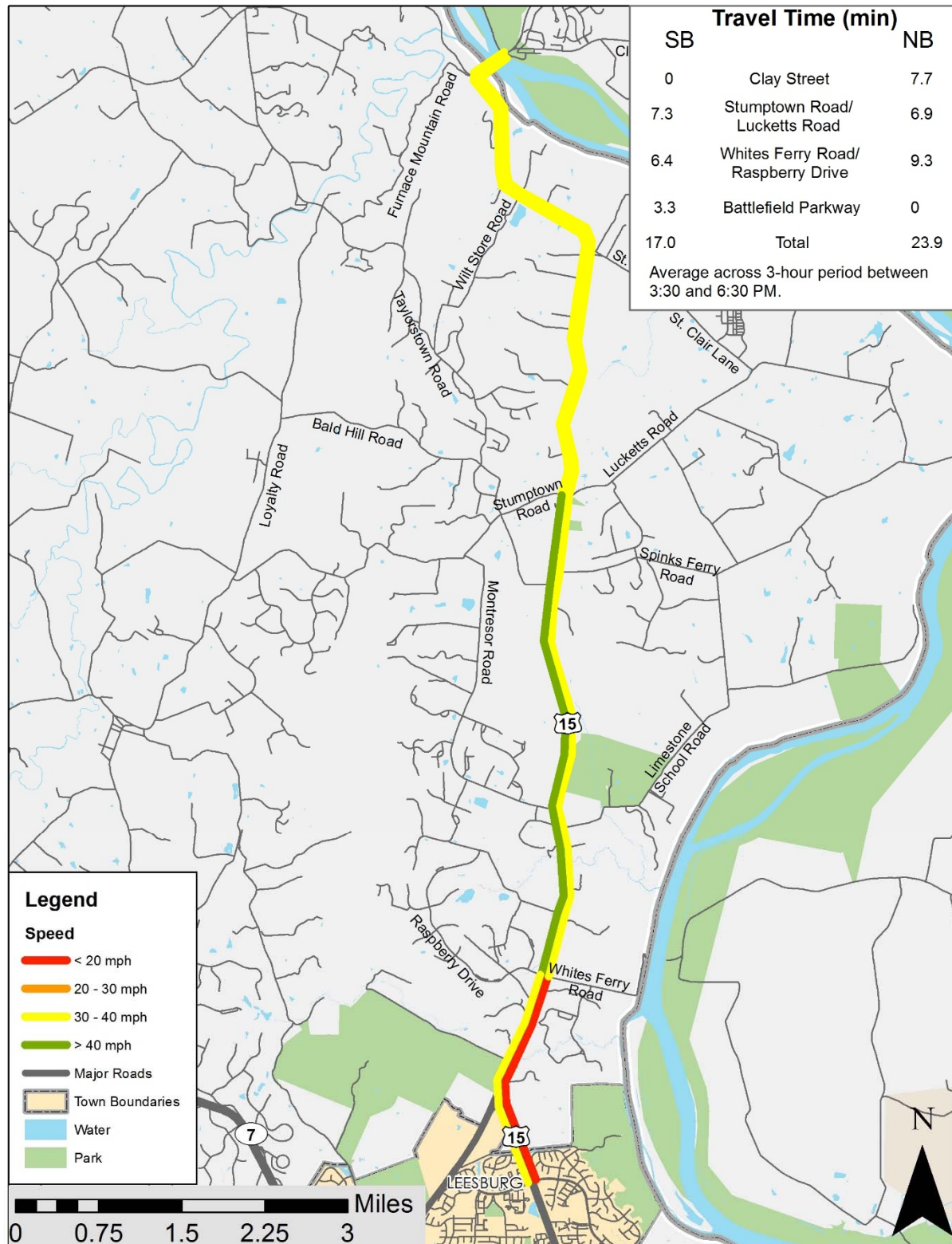


Figure 13: PM Peak Travel Time Summaries

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line



Table 6: Northbound Route 15 Travel Time Runs - PM Peak Period

Segment	Distance (mi)	Average Travel Time (sec)	Incremental Average Speed (mph)	Cumulative Average Speed (mph)
Battlefield Parkway to Whites Ferry Road	1.97	557	12.7	12.7
Whites Ferry to Stumptown Road/Lucketts Road	4.45	412	38.9	38.9
Stumptown Road/Lucketts Road to Clay Street	4.78	462	37.2	28.2
Total Travel Time	11.20	1431 (23.9 minutes)	28.2	28.2

Table 7: Southbound Route 15 Travel Time Runs - PM Peak Period

Segment	Distance (mi)	Average Travel Time (sec)	Incremental Average Speed (mph)	Cumulative Average Speed (mph)
Clay Street to Stumptown Road/Lucketts Road	4.80	439	39.3	39.3
Stumptown Road/Lucketts Road to Whites Ferry Road	4.44	381	42.0	40.6
Whites Ferry Road to Battlefield Parkway	2.02	200	36.4	39.8
Total Travel Time	11.26	1020 (17 minutes)	39.8	39.8



Queuing

Queue observations were collected on September 14, 2017 during the AM and PM peak periods, at known locations of significant queuing. The three observation locations were:

- Route 15 and Clay Street (outside of study area but this location influences traffic operations in the study area and was collected for traffic analysis model calibration)
- Route 15 and Lucketts Road/Stumptown Road
- Route 15 and Montresor Road

All traffic data collection sheets are provided in **Appendix A**.

The maximum queues for the AM and PM peak periods are shown in **Figure 14** and **15**, respectively.

In the AM peak period, there is notable southbound queuing at the Route 15 and Lucketts Road/Stumptown Road signalized intersection, reaching over 7,000 feet around 7:50 a.m. This pattern of southbound queuing continues as vehicles travel south through the network to Montresor Road. At this intersection, it was observed that vehicles alternate turns with eastbound traffic from Montresor Road, resulting in southbound queues of almost 5,000 feet around 8:30 a.m., and 9,900 feet by 8:50 a.m.. This queue also stems from southbound spillback at the intersection of Route 15 at Whites Ferry Road/Raspberry Drive, which was observed in the Route 15 Congestion Report.

In the PM peak period, significant queuing is observed in the northbound direction. As noted in the Congestion Report, significant queuing occurs at the merge of Route 15 with King Street, and at Whites Ferry Road, when the northbound approach is stopped at the red signal. As vehicles travel north beyond Whites Ferry Road, queues occur again at the Route 15 and Lucketts Road/Stumptown Road traffic signal, resulting in a maximum observed queue of over 4,500 feet at 6:25 p.m. Beyond this signal, the next queue begins over the Maryland border, at the intersection of Route 15 and Clay Street. This northbound queue reached over 4,100 feet around 5:05 pm, which extends across the Potomac River bridge, around the curve at Lovettsville Road for another 2,000 feet to the next horizontal curve on Route 15.

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line



Maximum Queues: US Route 15 Corridor Existing Conditions

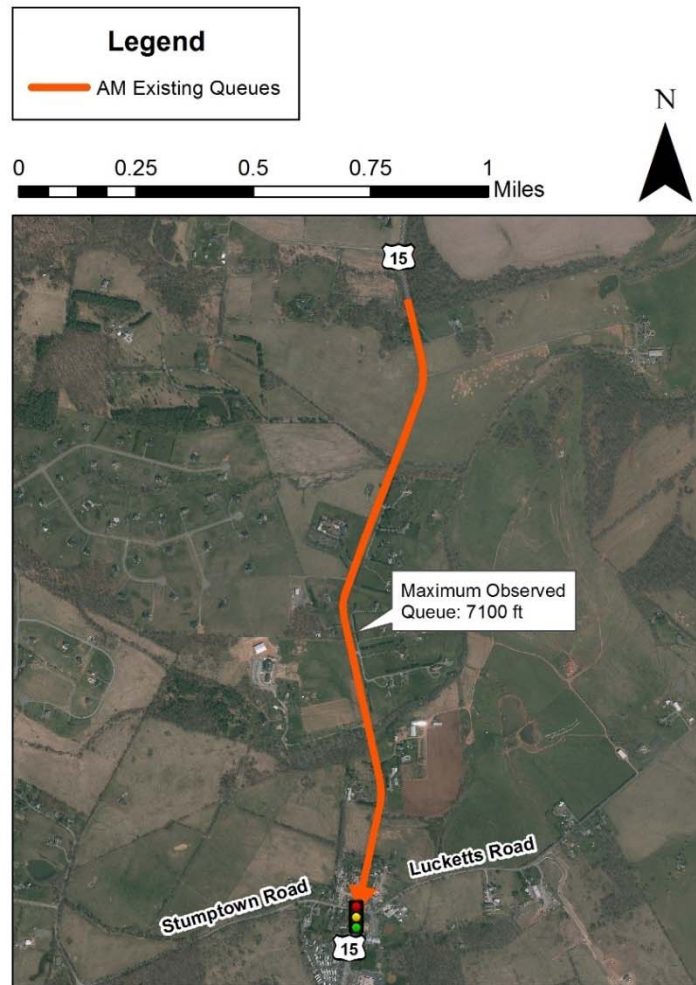


Figure 14: Observed Queues- AM Peak Period

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line



Maximum Queues: US Route 15 Corridor Existing Conditions

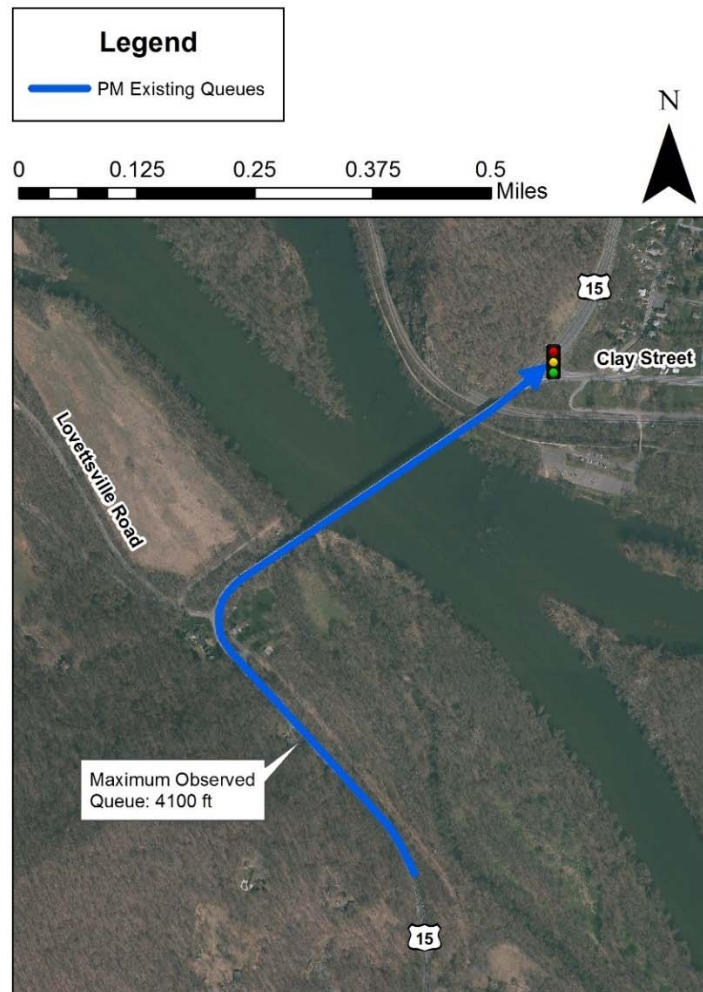


Figure 15: Observed Queues- PM Peak Period



VISSIM MODEL DEVELOPMENT

Existing AM and PM peak hour conditions were evaluated using VISSIM 9 traffic modeling software. VISSIM is a microscopic, time-step, and driver behavior based simulation model that uses the driver behavior model for each vehicle in the system. VISSIM was selected to model the oversaturated conditions on US Route 15, merge and weave sections, and study intersections. This modeling is consistent with the Route 15 Congestion Report.

The existing model from the previous Route 15 Congestion Report was modified to include ten additional intersections on Route 15, north to Clay Street in Maryland, as well as other updates to best represent 2017 existing conditions. The base model was developed using existing roadway geometry, traffic signal timings and phasing for all signalized intersections, peak hour traffic volume data for the revised study peak hour, travel time data, and field observations of queue lengths and corridor operations.

Geometric Data

Geometric Data such as link distance, number of lanes, turning lane storage length, lane widths, and curvature were obtained from aerial imagery and verified through field observations. The aerial image of the study network was created using Bing Maps.

Traffic Control Data

Intersection signal timings for Route 15 at Lucketts Road/Stumptown Road, and at Whites Ferry Road, were provided by VDOT. These intersections operate as fully-actuated, uncoordinated signals. Signal timings for the intersection of Route 15 at Clay Street were provided by Maryland State Highway Administration.

The intersections south of Whites Ferry Road that were modeled in the Congestion Report were carried over from that study's VISSIM models, as were the associated signal timings. These intersections were included to best replicate the congestion and queueing around Leesburg that impact operations in this report's study area.

Model Calibration

Existing AM and PM VISSIM models were calibrated using existing balanced peak hour TMCs, travel time data, and queuing and congestion observation data in accordance with VDOT parameters contained in the Traffic Operations Analysis and Safety Analysis Manual (TOSAM) Version 1.0. The calibration results and modifications to the models were summarized in the calibration memorandum, which is included in **Appendix B**.

VISSIM ANALYSIS RESULTS

The simulation models were each run 10 times with different random seeds for each run. The VDOT Sample Size Determination Tool was used to verify that 10 runs were



performed at a 95th percentile confidence level. The measures of effectiveness (MOEs) analyzed to determine the number of runs were link volume and corridor travel time. VISSIM results were generated for the AM and PM peak hours. The following MOEs were used to depict the operational characteristics of the study area network and identify bottleneck locations:

- Arterial mainline:
 - Average travel time (minutes)
 - Average and maximum queue length (feet)
- Arterial intersections (by movement and approach)
 - Average simulation delay (seconds per vehicle)
 - Average and maximum queue length (feet)

The level of service (LOS) thresholds from the VISSIM model for the signalized intersection are shown in **Table 8**.

Table 8: Levels of Service Thresholds

LOS Scale ²	Average Delay (seconds/vehicle)
A	≤10 (Free Flow)
B	>10 – 20 (Slight Delays)
C	>20 – 35 (Acceptable Delays)
D	>35 – 55 (Occasional Delays)
E	>55 – 80 (Significant Delays)
F	>80 (Excessive Delays)

AM Peak Period Results

Simulation delay and maximum queue length were reported from VISSIM for intersection operational conditions in the study area. The following intersection approaches operate with significant delays (level of service E or worse) during the first or second hour of the AM peak period:

- Eastbound Stumpton Road and westbound Lucketts Road at Route 15
- Southbound Route 15 at Lucketts Road/ Stumpton Road
- Southbound Route 15 at Spinks Ferry Road (based on downstream queue spill back from Montresor Road)
- Southbound Route 15 at Montresor Road
- Eastbound Montresor Road at Route 15

² LOS for the VISSIM models is an approximation to the Highway Capacity Manual (HCM) LOS

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line



- Westbound Limestone School Road at Route 15

The following intersection approaches have notable queues:

- Westbound Lucketts Road at Route 15
- Southbound Route 15 at Lucketts Road/ Stumptown Road
- Southbound Route 15 at Lucketts Elementary School (North)
- Southbound Route 15 at Lucketts Elementary School (South)
- Southbound Route 15 at Newvalley Church Road
- Southbound Route 15 at Montresor Road
- Eastbound Montresor Road at Route 15
- Southbound Route 15 at Limestone School Road (based on downstream queue spill back from Whites Ferry Road/Raspberry Drive)

A full table of delay and queue results for all study intersections can be found in **Appendix C**.

PM Peak Period Results

Simulation delay and maximum queue length were reported from VISSIM for intersection operational conditions in the study area. The following intersection approaches operate with significant delays (level of service E or worse) during the first or second hour of the PM peak period:

- Eastbound Lovettsville Road at Route 15
- Eastbound Stumptown Road and westbound Lucketts Road at Route 15

The following intersection approaches have notable queues:

- Northbound Route 15 at Lovettsville Road (based on downstream queue spill back from Clay Street)
- Northbound/Southbound Route 15 at Lucketts Road/Stumptown Road
- Northbound Route 15 at Lucketts Elementary School (North) (based on downstream queue spill back from Lucketts Road/Stumptown Road)
- Northbound Route 15 at Lucketts Elementary School (South) (based on downstream queue spill back from Lucketts Road/Stumptown Road)

A summary of existing condition results is provided in **Figure 16** and a full table of delay and queue results for all study intersections can be found in **Appendix C**.

Route 15

Safety and Operations Study from Whites Ferry Road to the Maryland State Line

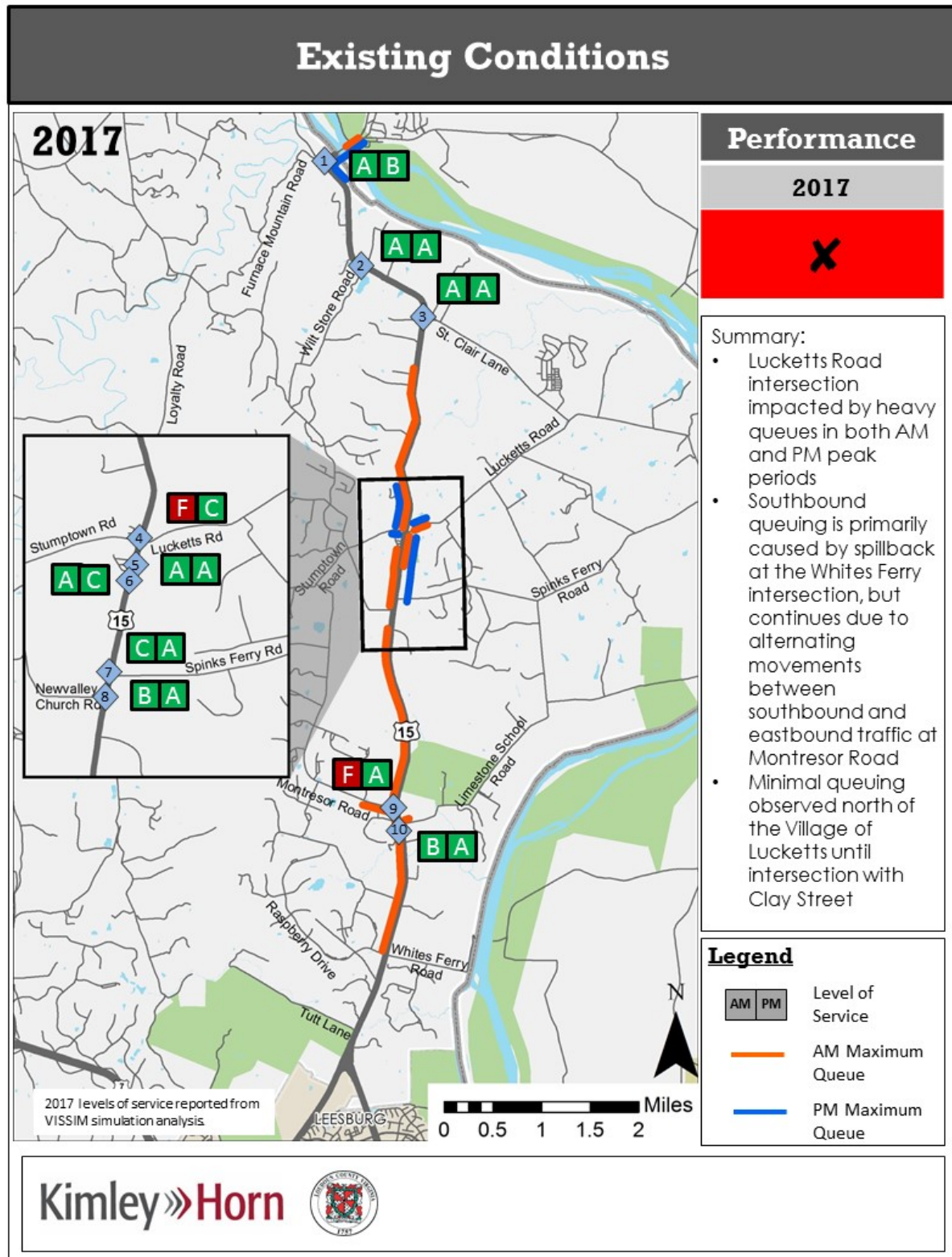


Figure 16: Summary of Existing Conditions VISSIM Results



APPENDIX A: Traffic Data Collection



APPENDIX B:

Calibration Memorandum



APPENDIX C:

Measures of Effectiveness