Appendix J:
Traffic Analysis Report

TRAFFIC ANALYSIS REPORT

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1.0 INTRODUCTION AND STUDY AREA

1.1 INTRODUCTION

The South Carolina Department of Transportation (SCDOT) proposes to improve I-526, currently referred to as the I-526 Lowcountry Corridor (LCC). This study represents the eastern section of that effort with project limits that extend from the Don Holt Bridge east of Virginia Avenue to Bowman Road, south of U.S. 17. The Western section, which is not part of this study, extends from Virginia Avenue to Paul Cantrell Boulevard in West Ashley. The study of both sections involves evaluating the potential for adding capacity along the I-526 mainline, including interchange improvements within the corridor.

Information from the Data Collection Report submitted in October of 2018 is discussed in Section 1 of this report to provide perspective on the characteristics of this corridor and issues that need to be addressed. The information is condensed to highlight important points, and more detailed analysis can be found in the previous report. Capacity analysis from the Traffic Projections and Levels of Service Technical Memorandum submitted in February of 2019 is discussed in Sections 2-4 of this report to provide context on the projected conditions of the study corridor with and without additional lanes. More detailed information can be found in the previous memorandum.

1.2 RELATIONSHIP TO I-526 LCC WEST STUDY

Originally, the I-526 LCC East study area included the North Rhett and Virginia Avenue interchanges, but this was later refined to remove those sections because those interchanges were heavily influenced by design implications related to the I-526 and I-26 system-to-system interchange. The new boundaries for each study begin and end at the Don Holt Bridge east of Virginia Avenue. This report includes some information that was originally evaluated but notes the new boundary between the East and West studies at the Don Holt Bridge and is not intended to provide guidance for improvements to the West section. The recommendations resulting from this study focus exclusively on the section of I-526 east of the Don Holt Bridge.

1.3 I-526 LCC EAST STUDY AREA

1.3.1 I-526 LCC East Corridor Characteristics

The study area for I-526 LCC East extends from the Don Holt Bridge east of Virginia Avenue to Bowman Road south of U.S. 17 and includes intersections adjacent to the interchanges along the corridor. **Figure 1** shows the approximately 10-mile study section of the I-526 corridor highlighted in blue, with corresponding mile markers. The corridor contains two basic lanes in each direction from Virginia Avenue to U.S. 17. The lane widths are a standard 12-feet throughout the study corridor in each direction and are separated by a grass or barrier median, with a shoulder on each side of the travel lane.

I-526 crosses two rivers via three bridge structures in the LCC East Section: the Cooper River via the Don Holt Bridge, an eastern branch of the Cooper River via an elevated segment of I-526 just west of Clements Ferry Road, and the Wando River via the James Edwards Bridge. Each crossing can be seen in **Figure 1**, which also highlights the truck climbing lanes for the bridges spanning the Cooper River and Wando River. The eastbound truck climbing lane spanning the Cooper River begins where I-526 crosses over Virginia Avenue and continues for 3,850 feet before merging back to two lanes. The westbound portion begins approximately 1.5 miles west of the Clements Ferry Road interchange and spans 11,160 feet, merging back to two lanes prior to Virginia Avenue. At the Wando River Bridge, the eastbound truck climbing lane over the Wando River begins where I-526 crosses over Island Park Drive and continues for 4,777 feet before merging back to two lanes. The westbound portion begins about 1.75 miles west of Long Point Road and continues 5,403 feet over the Wando River.

The corridor provides access to arterials through four interchanges, including its terminus at U.S. 17 where the two routes merge into surface streets. **Table 1-1** lists the location and type of each interchange and notes the distance between interchanges (measured between crossing routes). Seven Farms Drive and River Landing Drive are highlighted in this table as cross streets, but the interchange is primarily referred to as Daniel Island in this report.

Table 1-1: Study Interchanges

Street(s)	MM	Interchange Type	Distance to Next Interchange
Clements Ferry Road	22-23	Partial Cloverleaf	1.89 miles
Seven Farms Drive/River Landing Drive	24	Displaced Left-turn	2.97 miles
Long Point Road	27-28	Partial Cloverleaf	2.06 miles
U.S. 17	29	Directional & Partial Cloverleaf	-

Figure 2 highlights the interchanges and includes the East Section segment designation used for this report.

Figure 1: I-526 LCC East Study Area

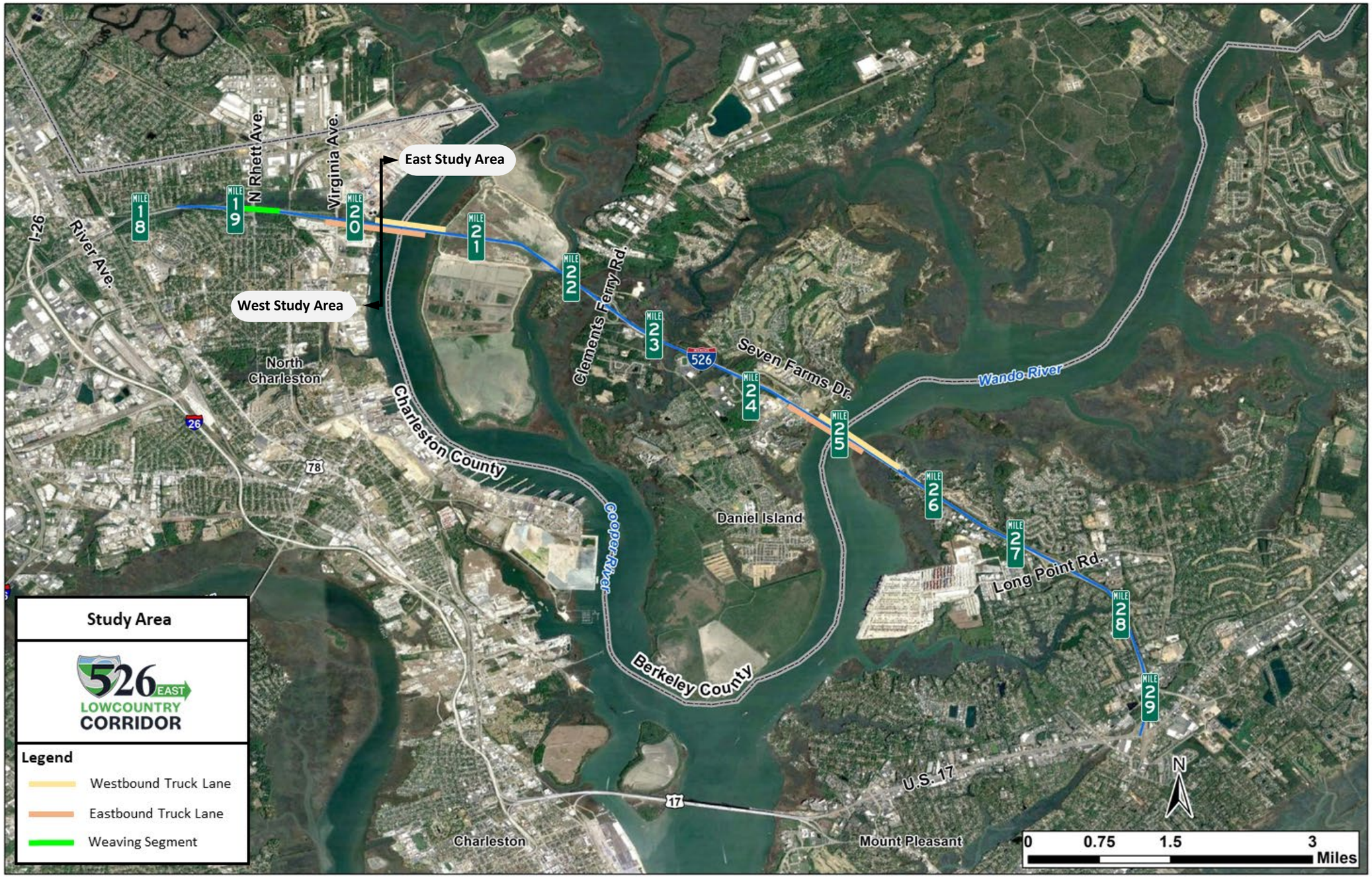
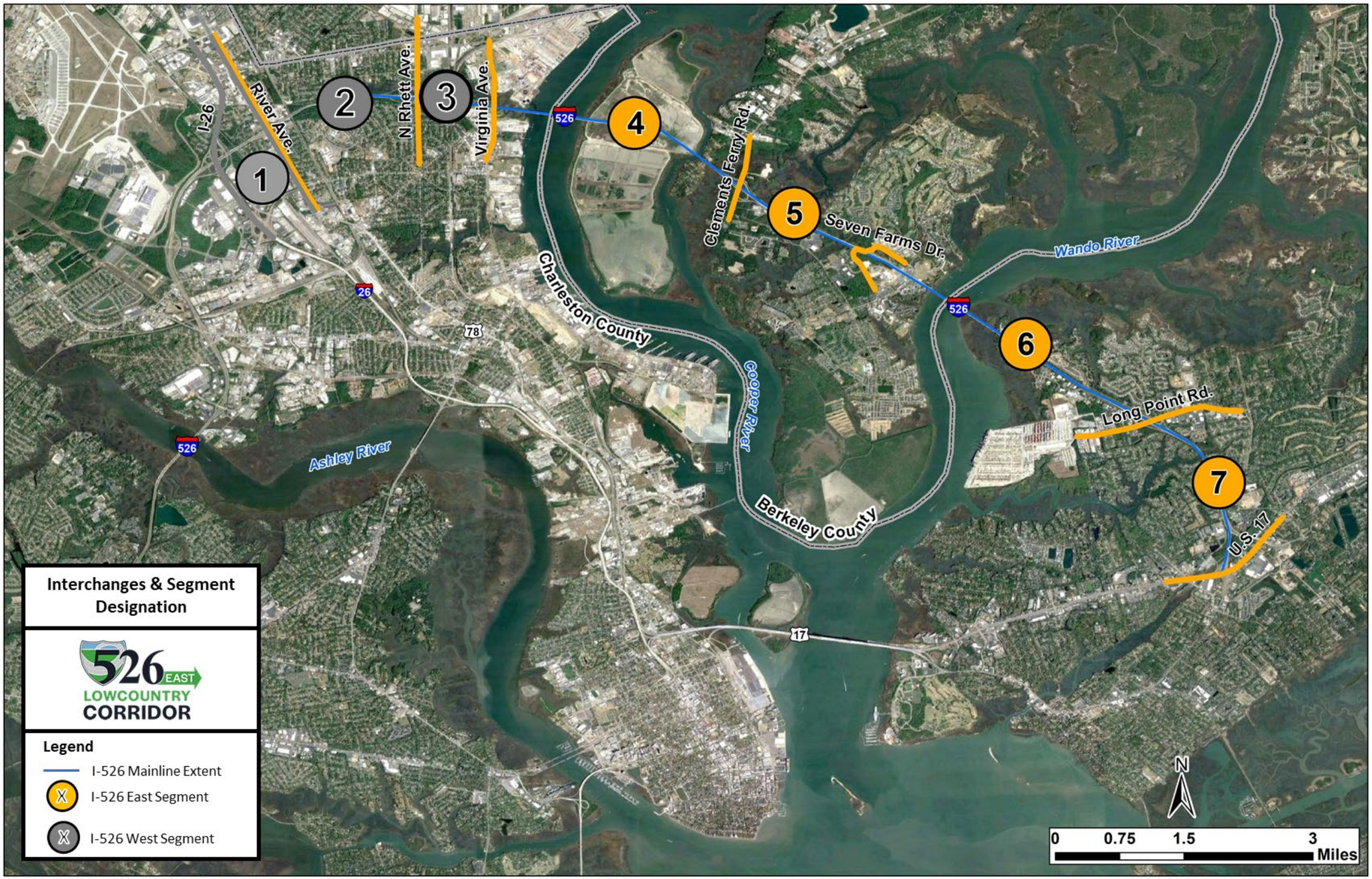


Figure 2: I-526 Interchanges and Segment Designations

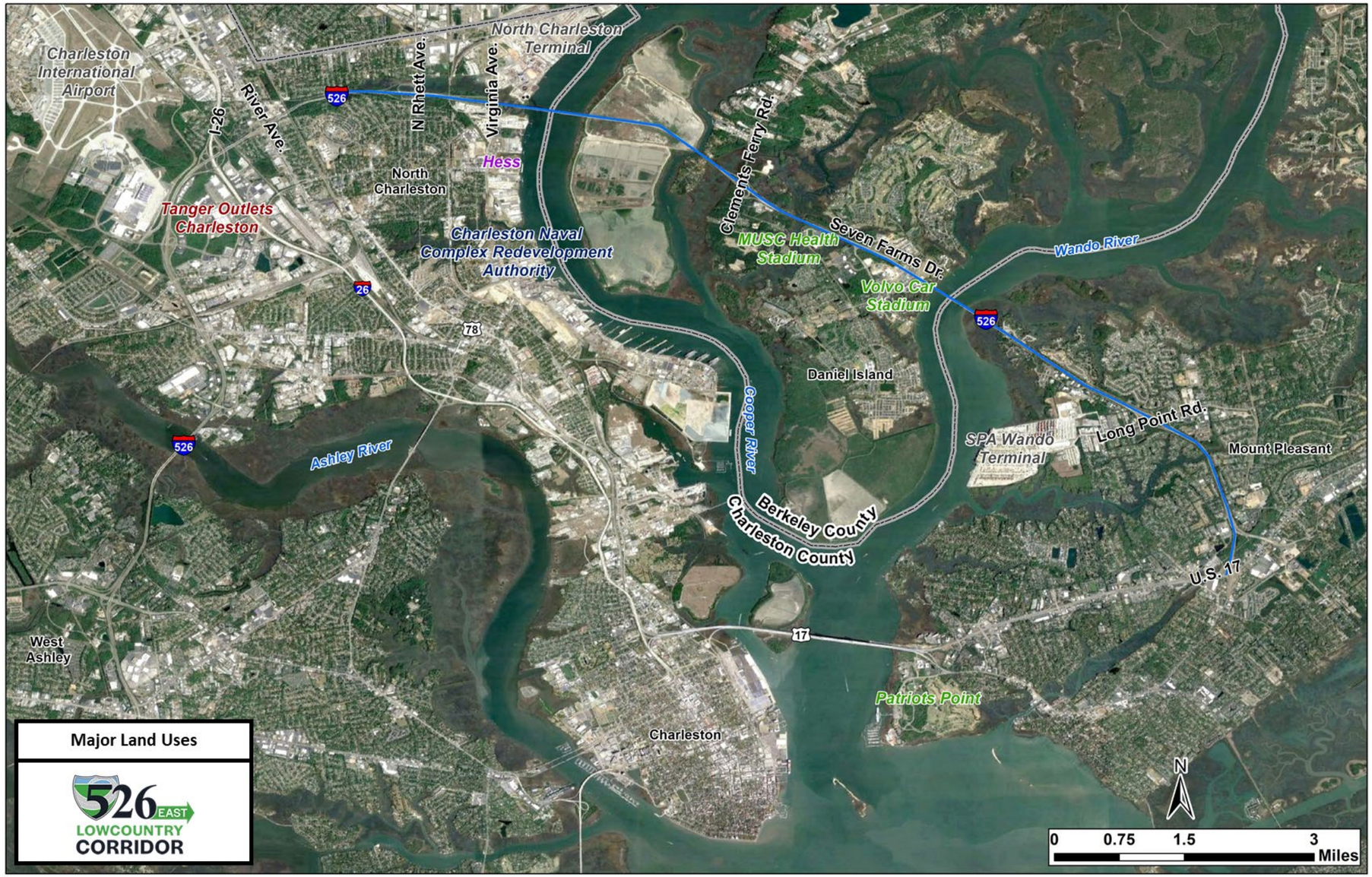


1.3.2 Study Area Land Use

There are several major land uses in the I-526 study area as well as in the areas adjacent. Several of these land uses are industrial in nature, generating more freight traffic. The eastern part of Remount Road and Virginia Avenue is home to several manufacturing facilities. The North Charleston Terminal is located off Remount Road in North Charleston, north of I-526. The KapStone Paper Mill is also in this area on Virginia Avenue, north of I-526. Adjacent to the paper mill, on the south side of I-526, is Hess and Amalie Oil companies. The Wando Welch Terminal is located on Long Point Road in Mount Pleasant.

The MUSC Health Stadium and Volvo Car Stadium are recreational and entertainment uses and host large events. The MUSC Health Stadium is home to the Charleston Battery soccer team and hosts games regularly in the summer and fall seasons. The stadium is located on Daniel Island Drive. The Volvo Car Stadium hosts concerts and tennis matches and is adjacent to the Family Circle Tennis Center. The Volvo Car Stadium and Tennis Center are located on Seven Farms Drive. **Figure 3** illustrates the major land uses near the I-526 study area.

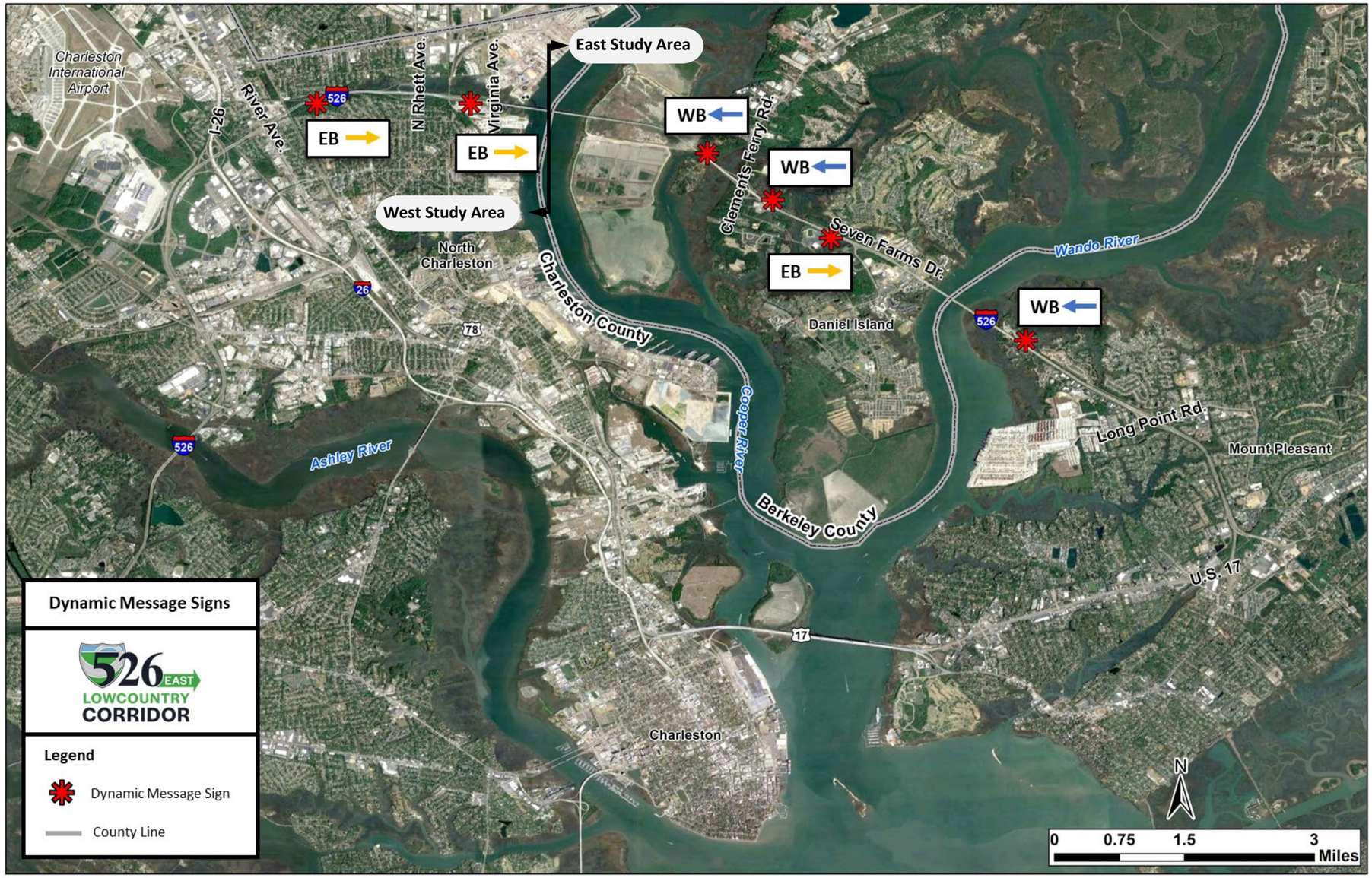
Figure 3: Major Land Uses



1.3.3 Dynamic Message Signs

In total, there are four Dynamic Message Signs within the I-526 LCC East study area. **Figure 4** shows the approximate locations of dynamic message signs east of I-26. East of I-26, there are three eastbound and three westbound signs providing route and drive time information to drivers. The eastbound signs are located approximately half a mile to the east of Rivers Avenue, 0.2 miles east of Virginia Avenue, and 0.3 miles west of the Daniel Island interchange. The three westbound signs are located approximately half a mile west of the Clements Ferry Road interchange, 0.4 miles east of the Clements Ferry Road interchange, and one and a half miles west of Long Point Road.

Figure 4: I-526 Dynamic Message Sign Locations

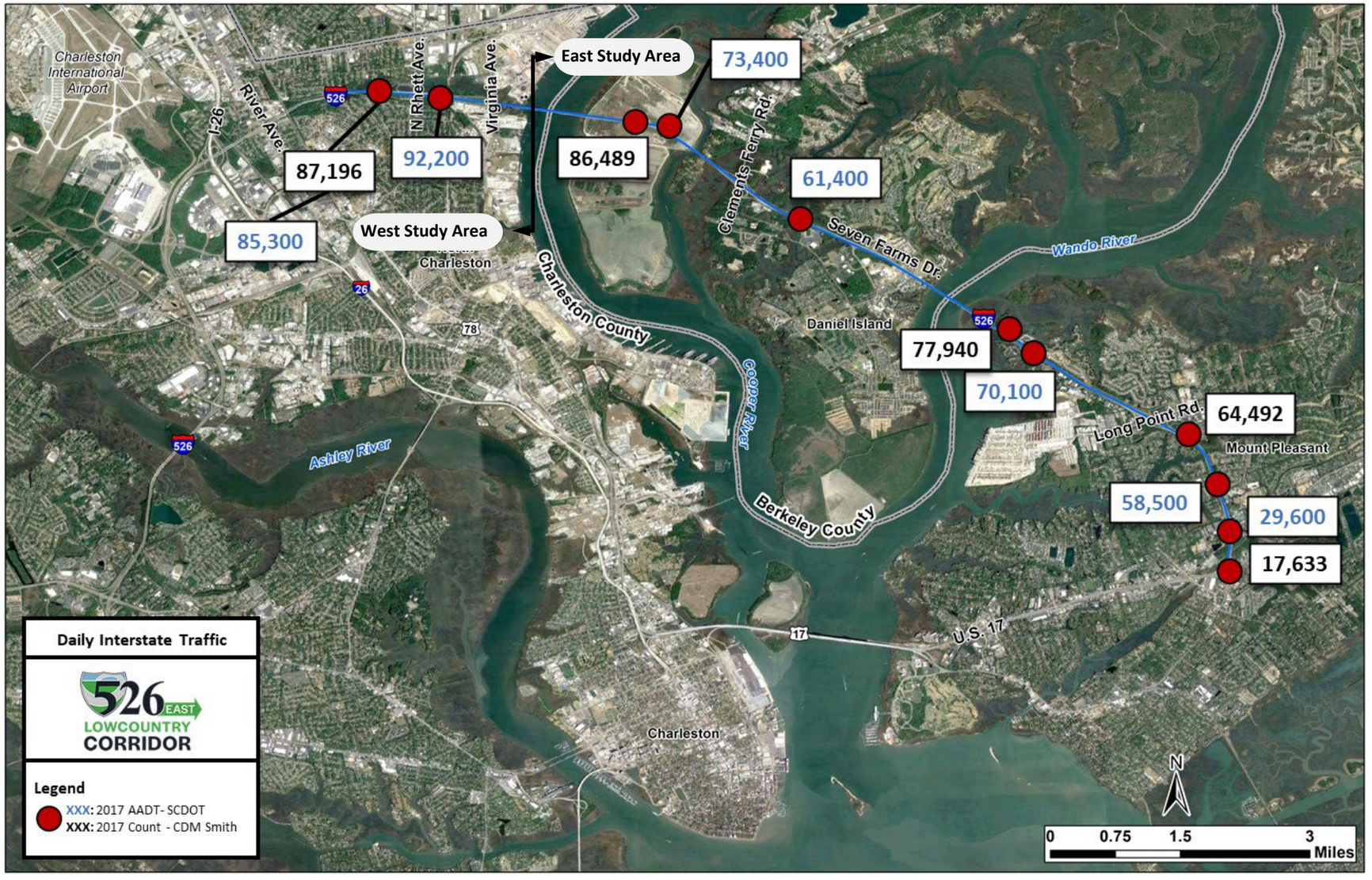


To develop alternatives to improve traffic conditions on I-526 it is important to understand existing traffic operations. The following sections describe traffic operations within the study corridor based on volume, speed, crash and vehicle data collected for this report.

1.4 Average Daily Interstate Traffic

Figure 5 presents interstate traffic volumes representing average daily interstate traffic on an average weekday during 2017. Two sources were utilized to prepare this figure, one conducted by CDM Smith and the other by SCDOT. The CDM Smith counts were collected via video and radar recording methods over a two-day period during the week, and the volumes shown in **Figure 5** represent the average daily volume. The SCDOT volumes shown in **Figure 5** represent estimated AADT volumes from traffic data collected at the respective locations. The data shows that generally average total weekday traffic was heaviest in 2017 in the western section of the study corridor between Rivers Avenue and Clements Ferry Road. The second highest section is between the Daniel Island and Long Point Road interchanges.

Figure 5: Average Daily Interstate Traffic



1.5 Speed Characteristics

Speed characteristics provide insight into traffic flow characteristics and can be useful in identifying capacity issues at specific locations or during particular time periods. Existing speed limits are presented first for comparison with collected speed data, followed by NPMRDS data for the interstate mainline and collected data for the ramps.

1.5.1 Speed Limits on I-526

There are three posted speed limits east of I-26 as illustrated in **Figure 6**. There is a 60-mph posted speed limit starting west of North Rhett Avenue which continues approximately one half-mile south of the Clements Ferry Road interchange. Between this point and the bridge crossing over Mathis Ferry Road, the posted speed limit is 65 mph. Between Mathis Ferry Road and U.S. 17, the speed limit is 55 mph.

Figure 6: I-526 Speed Limits

1.5.2 Corridor Speeds

The National Performance Monitoring Research Data Set (NPMRDS) was evaluated for travel speeds during the peak periods in the study corridor. The NPMRDS AM peak data is presented in **Figure 7** and PM peak data is presented in **Figure 8**. **Figure 7** shows that the sections experiencing the slowest speeds in the AM peak are adjacent to North Rhett Avenue for the eastbound direction and adjacent to Long Point Road for the westbound direction. **Figure 8** shows that the segment between Daniel Island and the western terminus of the project experiences the slowest speeds in the PM peak, dropping below 20 mph between Clements Ferry Road and Virginia Avenue. This was confirmed by field observations and SCDOT 511 traffic monitoring.

Figure 7: I-526 NPMRDS Speed Analysis: AM Peak Slowest Speeds

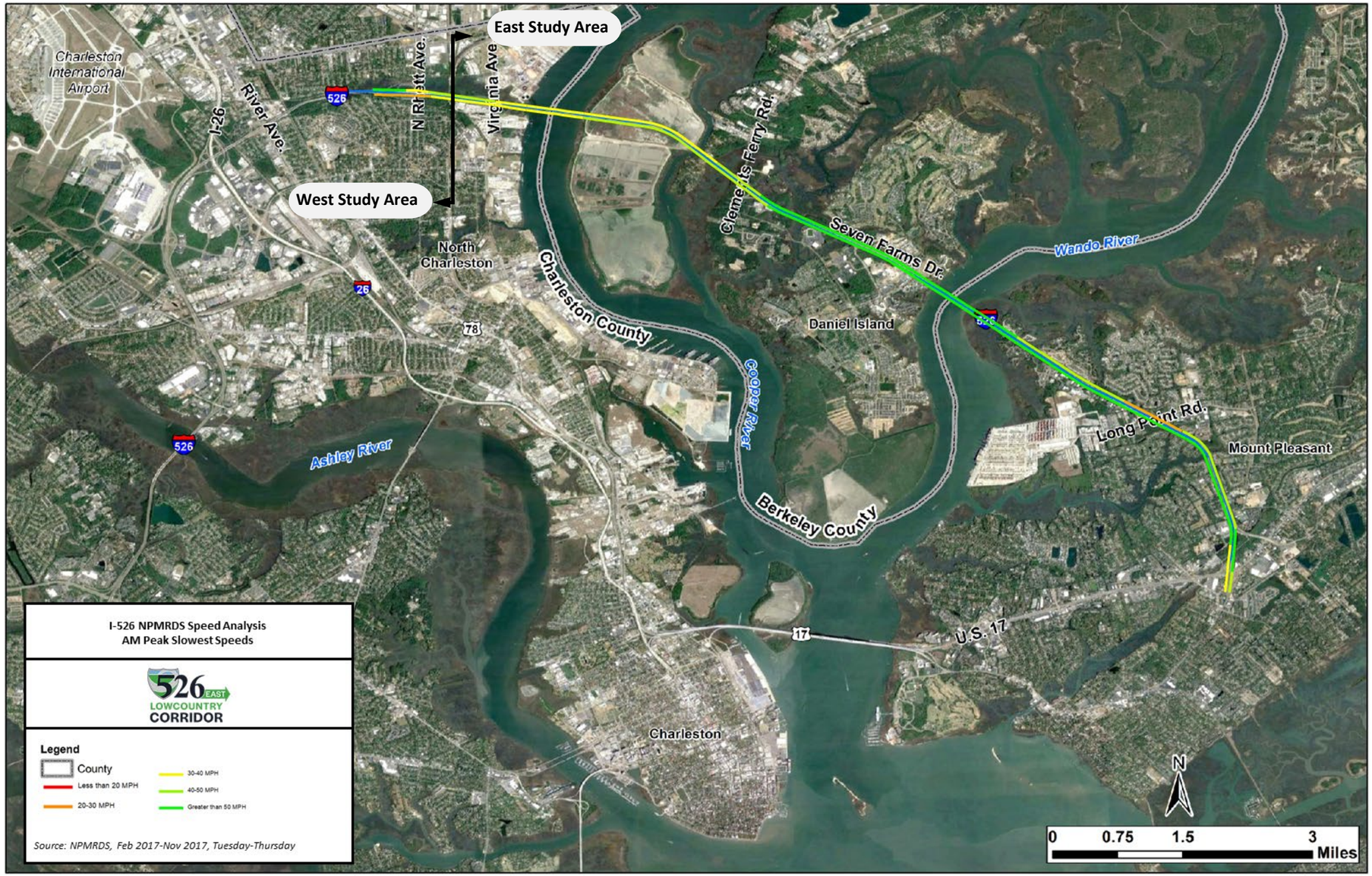
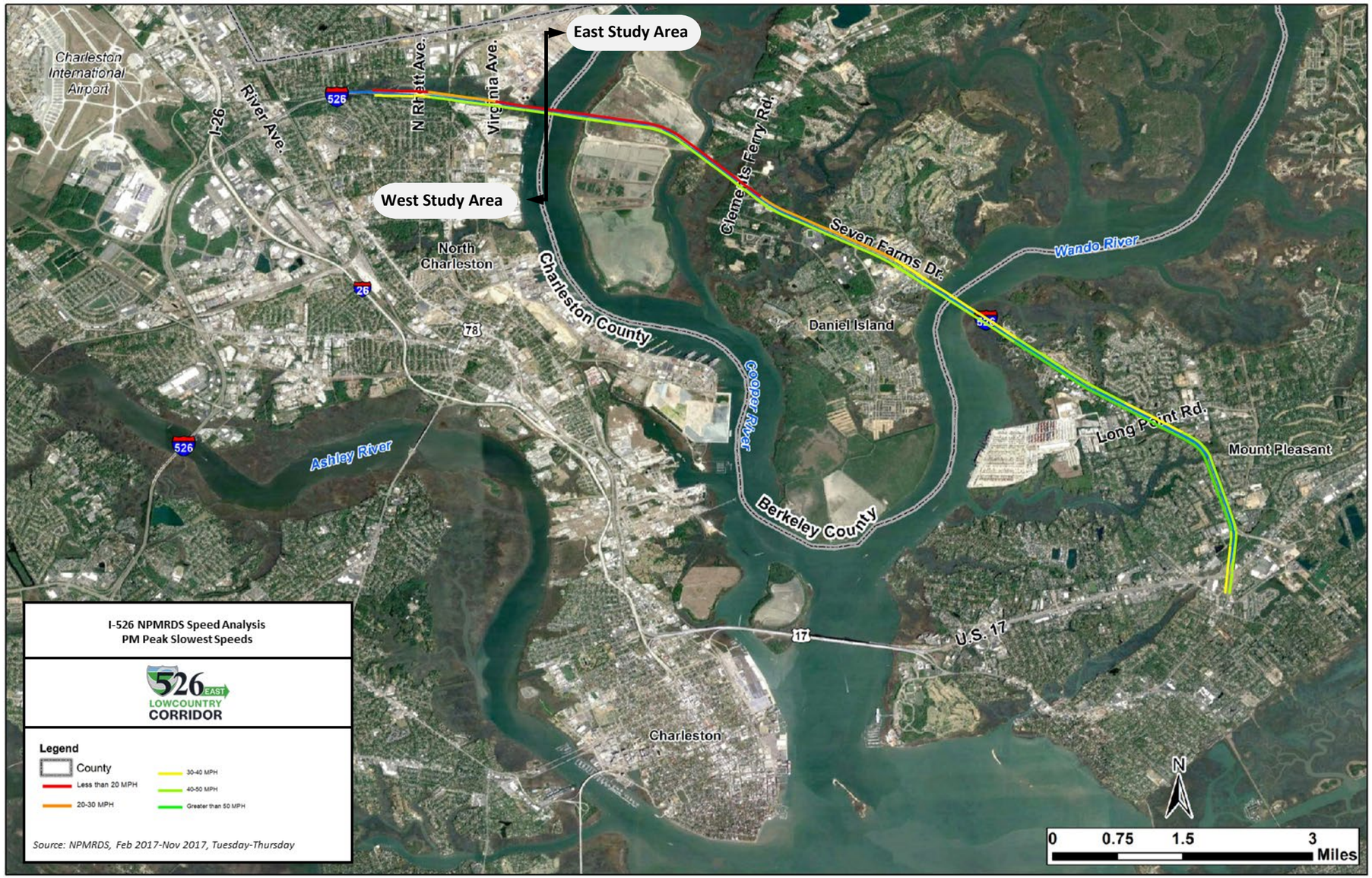


Figure 8: I-526 NPMRDS Speed Analysis: PM Peak Slowest Speeds



1.5.3 Ramp Speeds

Ramp speed measurements were compared with the NPMRDS data to draw conclusions regarding congestion in the corridor. Speeds on ramps between 15 mph and 35 mph were assumed to be normal operating speeds, while speeds above 35 mph were assumed to be high. It should be noted that the nature of the ramp may contribute to higher or lower speeds, and the location of the data collection may affect the recorded speed.

In general, most ramp traffic traveled in the 15-35 mph range for the AM and PM periods at the Clements Ferry Road interchange. The interchanges at Daniel Island and Long Point Road exhibit higher speeds.

The U.S. 17 interchange was not included in this analysis because it does not use typical on/off-ramps and the speed characteristics were not considered informative.

Key points about the ramp speeds at particular interchanges are listed below.

1.5.3.1 Clements Ferry Road Interchange

- Eastbound Off-Ramp (Diamond): The majority of AM traffic exits at speeds above 35 mph, while roughly 30% of PM peak traffic exits at speeds below 15 mph. Mainline speeds do not appear slow during either period, so this could represent a brief period of intense ramp congestion in the PM. A disruption in the data collection was ruled out because the scenario also occurs at the westbound off-ramp during the PM peak.
- Westbound Off-Ramp: The majority of AM traffic exits at speeds above 30 mph, while roughly 30% of PM peak traffic exits at speeds below 15 mph. Similar to the eastbound off-ramp, this discrepancy could indicate a brief period of intense congestion at the ramp, though it is also correlated with slow speeds on the mainline. A disruption in the data collection was ruled out because the scenario also occurs at the eastbound off-ramp during the PM peak.

1.5.3.2 Daniel Island Interchange

- Ramp traffic at this interchange typically traveled at speeds above 35 mph during both periods. This could be a result of the combination of the data collection points and the geometry of the ramps, given that the ramps have long, straight stretches. Mainline speed data shows lower speeds in the westbound PM, but otherwise decent speed levels.

1.5.3.3 Long Point Road Interchange

- Eastbound Off-Ramp: The majority of AM and PM peak traffic recorded at this ramp traveled at speeds above 35 mph. This corresponds with **Figure 7** and **Figure 8**, which show faster speeds on I-526.
- Eastbound On-Ramp (Diamond): The majority of traffic in both periods travels above 45 mph. This could be a result of the data collection location and the long, straight design of the ramp, giving drivers ample opportunity to attain speed before entering the through lanes. This also corresponded with **Figure 7** and **Figure 8**.
- Westbound Off-Ramp: PM peak traffic shows speeds at both ends of the spectrum, possibly indicating brief periods of congestion during the peak. The westbound mainline speeds also show a reduction at this interchange in both periods, though more in the AM than PM.
- Westbound On-Ramp (Cloverleaf): The majority of traffic in both periods travels between 15-30 mph. This could indicate some congestion during this period or be a result of the cloverleaf design.

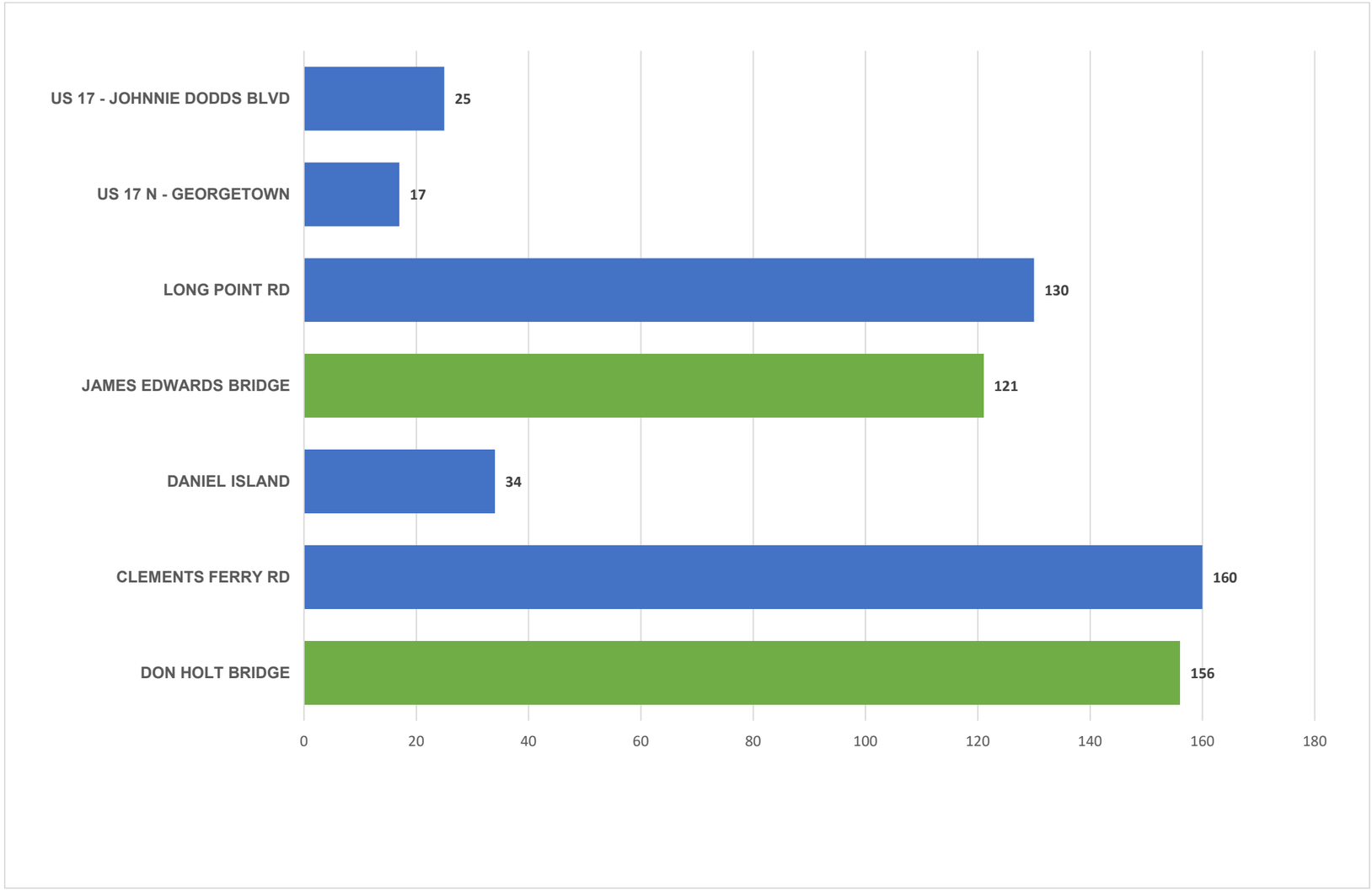
1.6 CRASH CHARACTERISTICS

In the three-year reporting period between January 1, 2014 to December 31, 2016 there were 1,077 crashes reported on I-526 between Rivers Avenue and Bowman Road. This number averages to around one crash per day over the roughly 10 miles of interstate and interchanges analyzed.

The crash data reported in this study includes crashes on interstate segments, ramp merge and diverge (gore) areas, ramp roadways, and at the ramp terminals. Of the study area crashes, 75% (804 crashes) occurred on the interstate segment (or mainline) while the remaining 25% (273 crashes) occurred along the ramp (from the terminal to gore area). **Figure 9** shows the number of crashes by interchange plus the James Edwards and Don Holt Bridges. The boundaries for each interchange were limited to 1500 feet from the ramp gore area; for interchanges closer than this, the crash boundary was defined from gore point to gore point.

Additionally, several crash instances were highlighted from the reports. Seventeen crashes involved a driver who was under the influence, and nearly 15 percent of the total crashes involved a distracted or inattentive driver.

Figure 9: Crashes by Interchange and Bridge (2014-2016)



Of the 1,077 crashes, two resulted in fatalities. One occurred in the West Study area near Virginia Avenue and one occurred near Long Point Road. Additional information was not available to determine the cause of these fatalities. Fatal crashes comprised less than 0.2% of total crashes and injury crashes totaled 22.5% of the reported total as shown in **Figure 10**.

Figure 10: Vehicle Crashes by Severity (2014-2016)

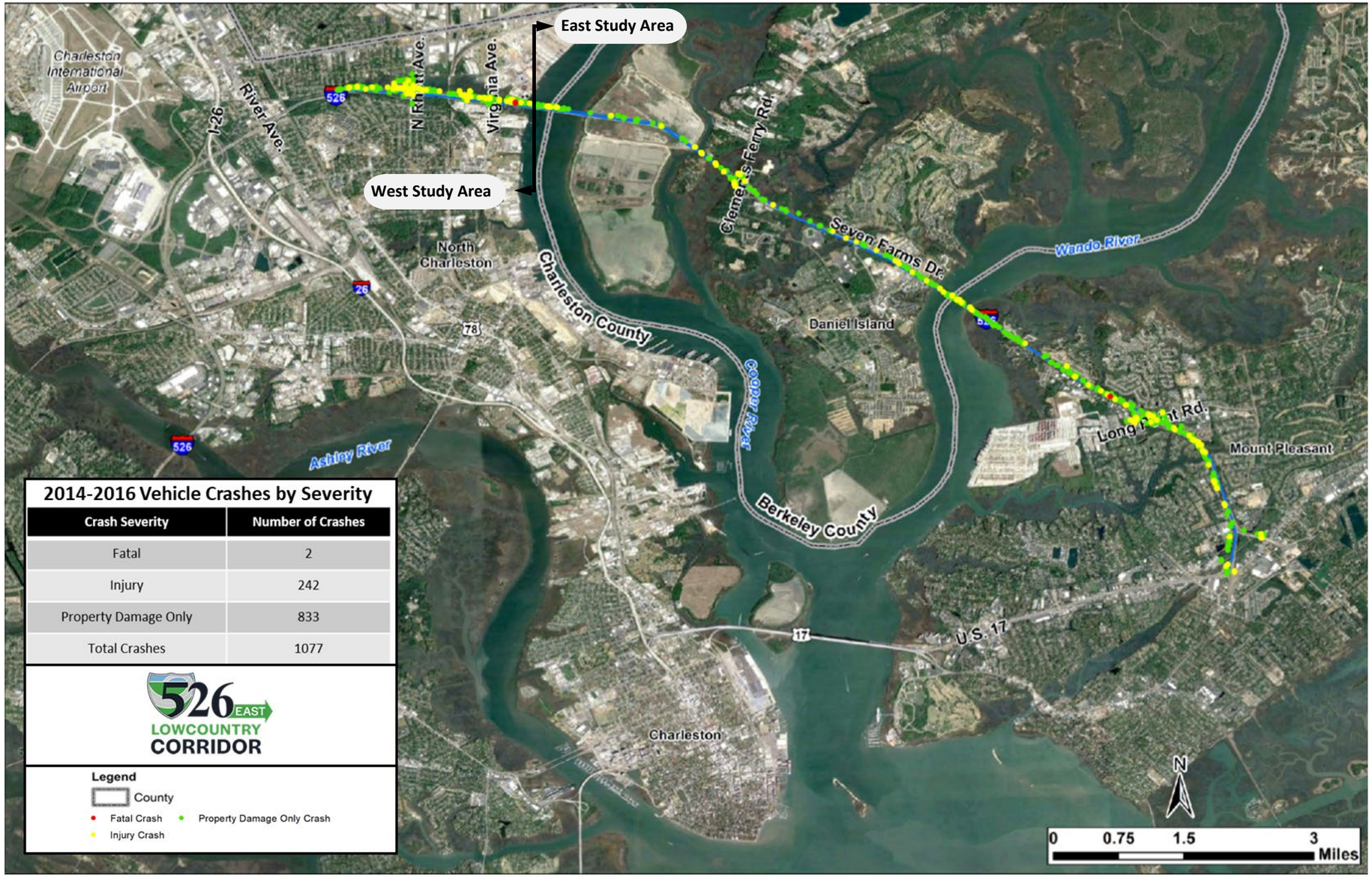
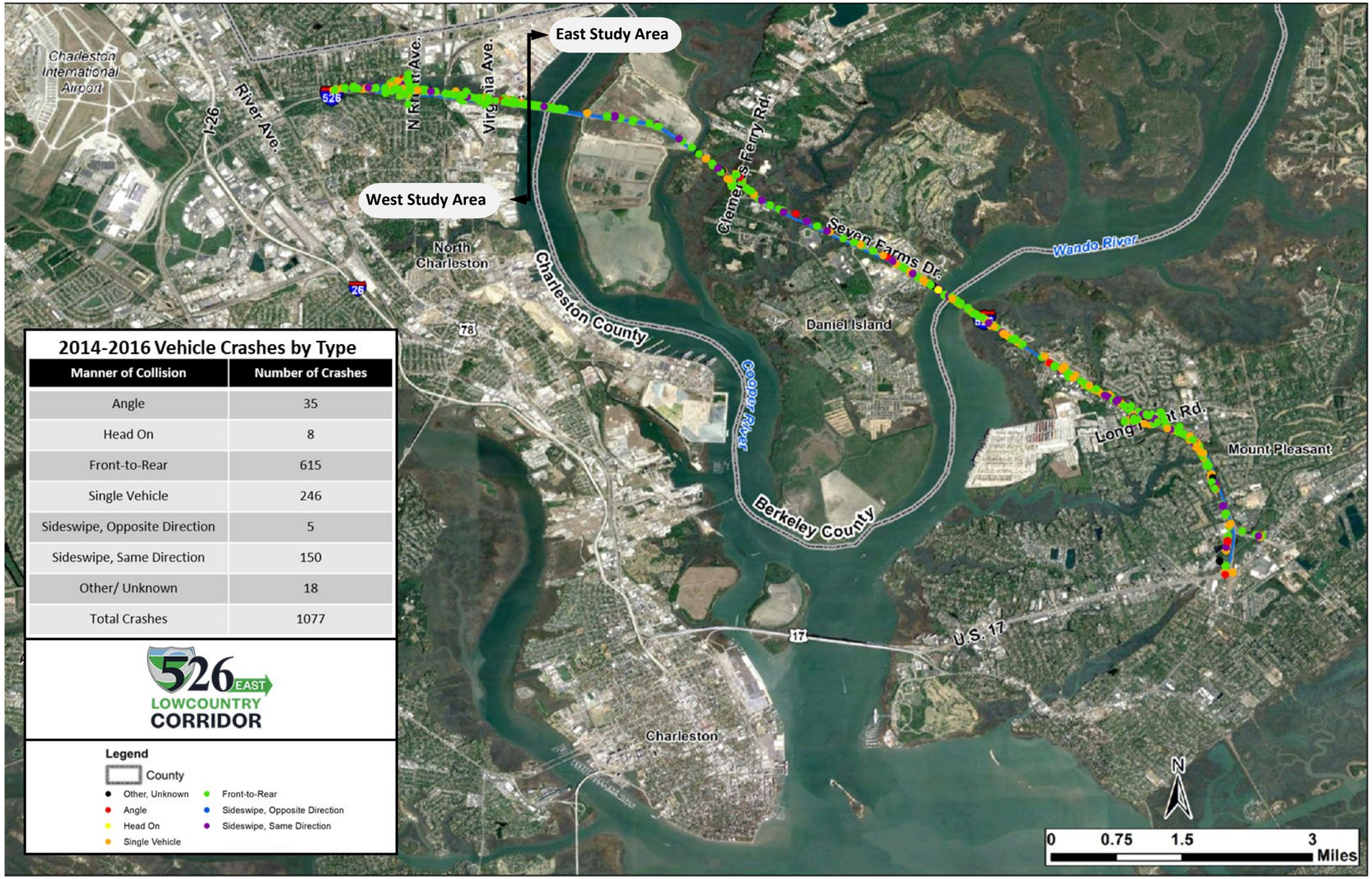


Figure 11 illustrates the various types of crashes observed. More than half of the reported crashes (57%) were front-to-rear which are an indication of congestion, followed by single vehicle crashes at nearly 23%, and sideswipe same direction crashes at 14%. Though front-to-rear and sideswipe crashes are typically less severe, the number of single vehicle (or off-the-road) crashes are significant because they typically lead to injuries.

Figure 11: Vehicle Crashes by Type (2014-2016)



2014-2016 Vehicle Crashes by Type

Manner of Collision	Number of Crashes
Angle	35
Head On	8
Front-to-Rear	615
Single Vehicle	246
Sideswipe, Opposite Direction	5
Sideswipe, Same Direction	150
Other/ Unknown	18
Total Crashes	1077

526 EAST LOWCOUNTRY CORRIDOR

Legend

- County
- Other, Unknown
- Angle
- Head On
- Single Vehicle
- Front-to-Rear
- Sideswipe, Opposite Direction
- Sideswipe, Same Direction

1.7 VEHICLE CHARACTERISTICS

1.7.1 Mainline Heavy Vehicle Composition

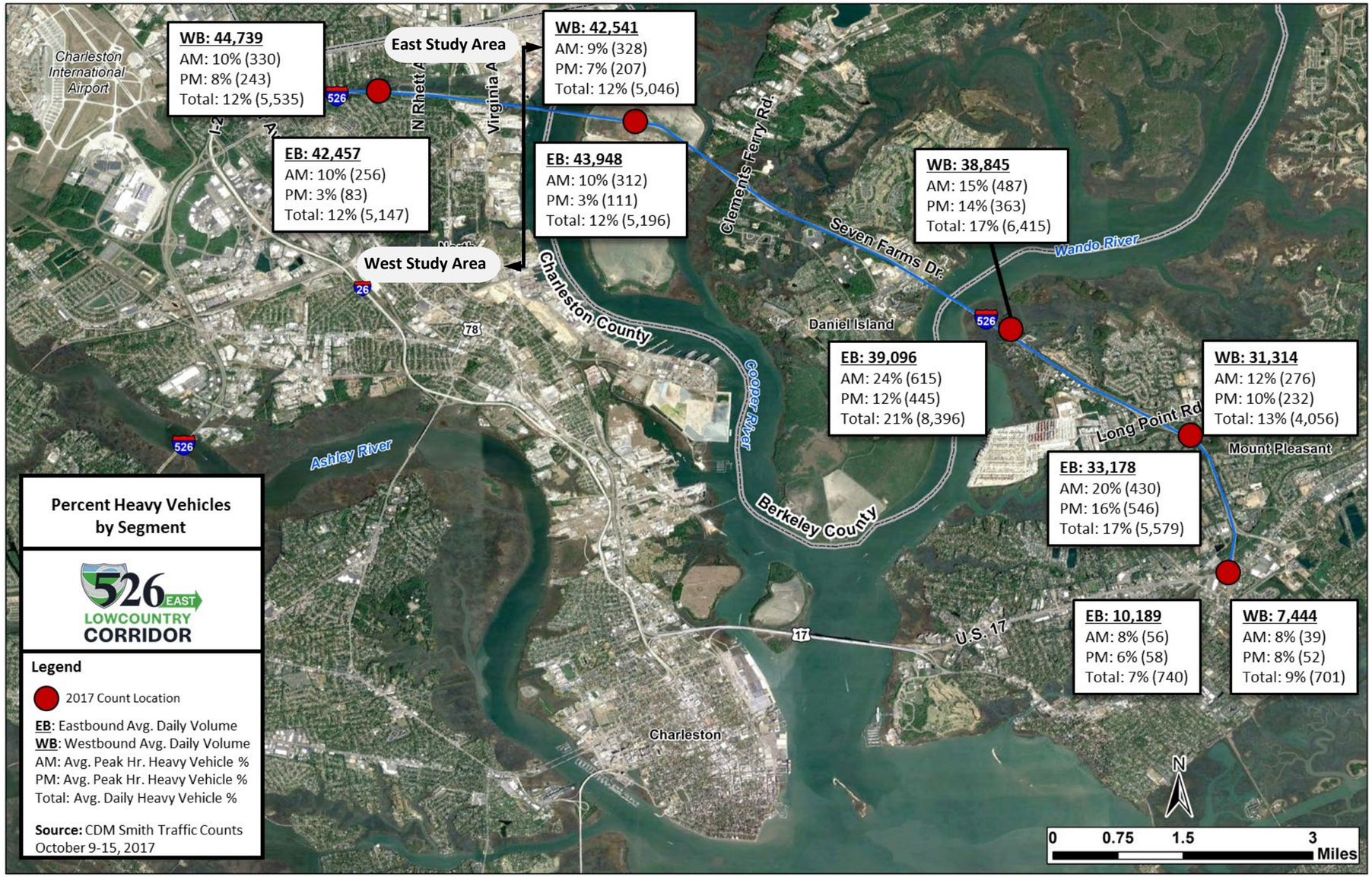
Vehicle classification data was collected during a 48-hour period for mainline traffic on I-526 at five different locations:

- West of North Rhett Avenue
- West of Clements Ferry Road
- West of Long Point Road
- North of Mathis Ferry Road
- North of Bowman Road

Figure 12 shows a summary of the mainline average heavy vehicle volumes. FHWA vehicle classifications 4 through 13 were used to derive the totals, which includes buses, single-unit vehicles, and multi-axle articulated vehicles.

The count data showed that multi-axle articulated vehicles—which are associated with freight movement—comprised the majority of heavy vehicle activity between I-26 and Long Point Road, whereas buses and single unit vehicles—which are associated with commercial or passenger activity—comprised the majority of heavy vehicle activity east of Long Point Road. This is likely a result of freight activity between I-26 and the Wando Terminal at the Long Point interchange. This should correlate with higher vehicle density and poorer LOS west of Long Point Road.

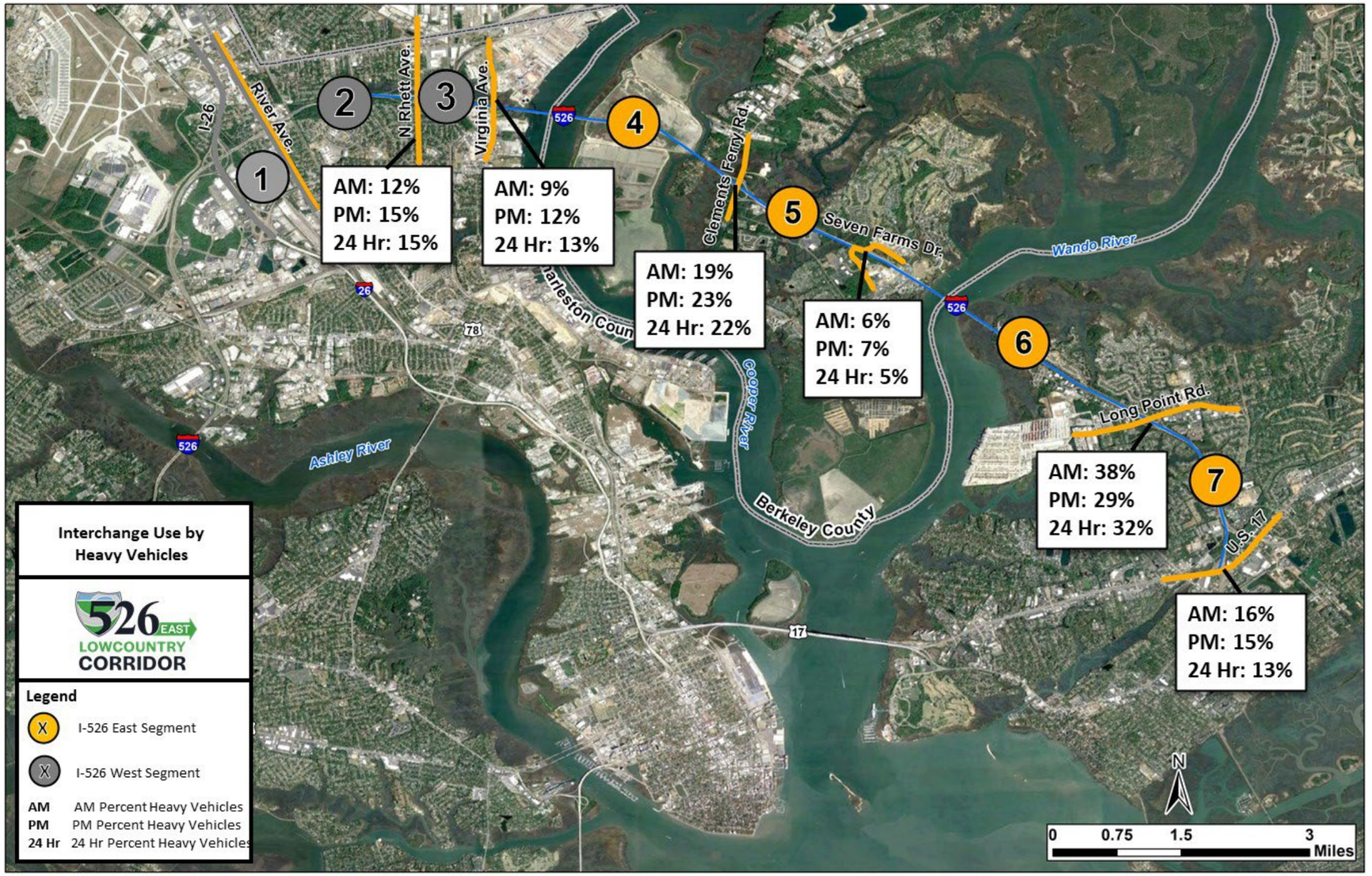
Figure 12: Percent Heavy Vehicles by Segment



1.7.2 I-526 Interchange Use by Heavy Vehicles

Figure 13 shows the distribution of heavy vehicle activity across all six of the interchanges east of I-26 using the same data discussed in the previous section. The percentages represent the amount of all heavy vehicles entering and exiting I-526 that are utilizing the respective interchange, with the total for each period equaling 100%. As **Figure 13** shows, Long Point Road has the greatest proportion of heavy vehicle usage in the corridor for the AM peak, PM peak and 24-hour periods. The Clements Ferry Road interchange sees almost the same amount of heavy vehicle activity as the Long Point Road interchange in the PM peak period.

Figure 13: Percent Heavy Vehicles by Interchange



1.7.3 Hourly Heavy Vehicle Composition

To evaluate the peak times of heavy vehicle movement and the proportion of heavy vehicles in mainline traffic, heavy vehicle volumes were plotted against total volumes. **Figure 14** through **Figure 21** show average volume data for the East study area, with the same FHWA classifications shown in **Figure 12** applied to distinguish heavy vehicles.

The figures show that while general traffic patterns may exhibit peaks during the day, heavy vehicle traffic tends to rise in the morning and fall by the afternoon, peaking around midday. This is consistent across the corridor, regardless of differences in volume. The travel patterns are also similar between directions, indicating a roughly even flow between directions.

Figure 14: Eastbound Hourly Variation of Heavy Vehicles – I-526 West of Clements Ferry Road

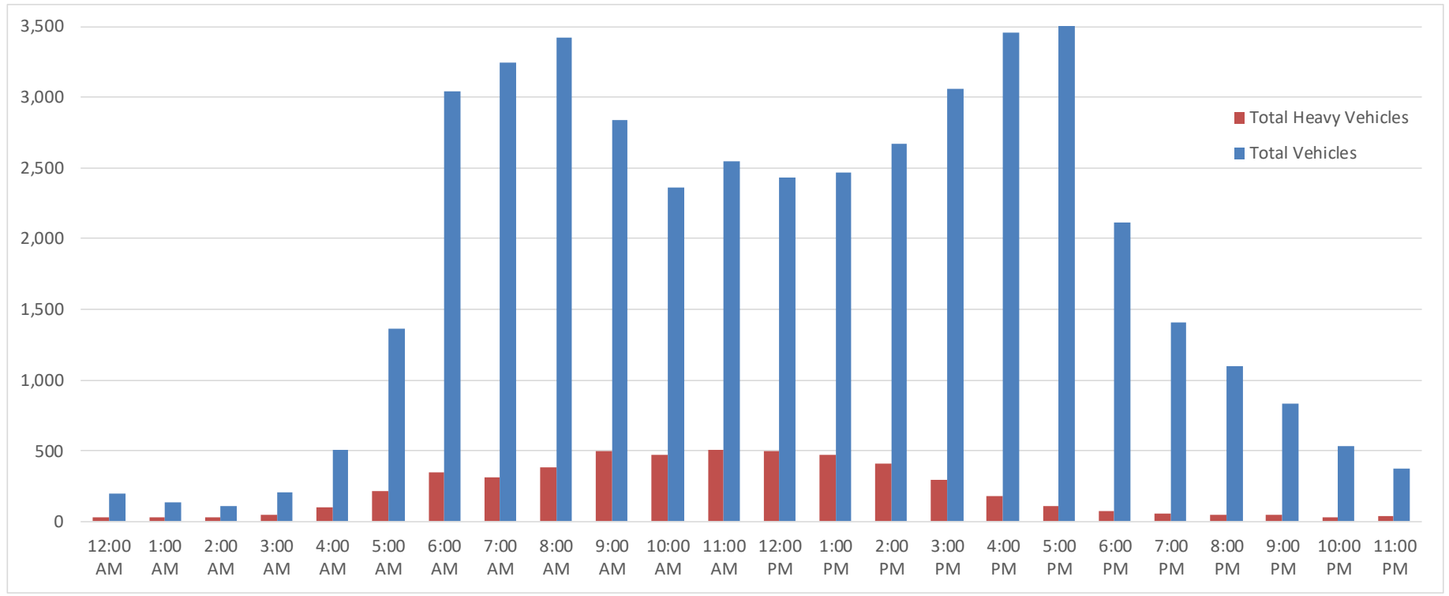


Figure 15: Westbound Hourly Variation of Heavy Vehicles – I-526 West of Clements Ferry Road

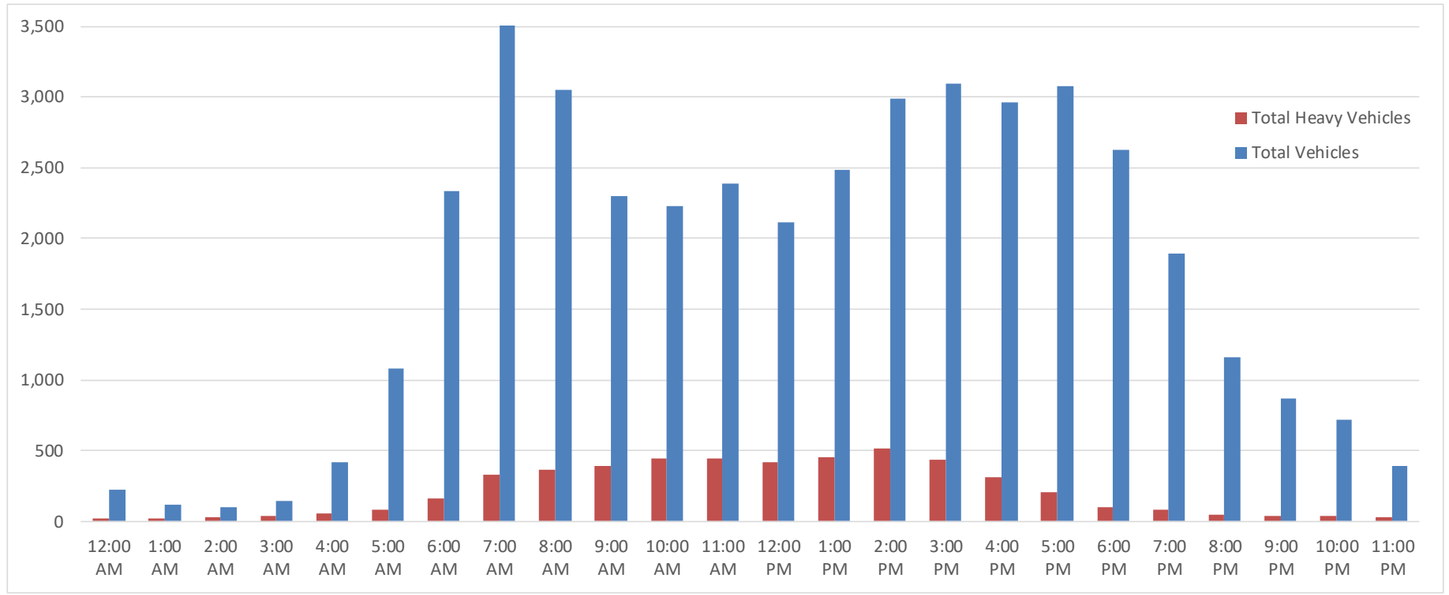


Figure 16: Eastbound Hourly Variation of Heavy Vehicles – I-526 West of Long Point Road

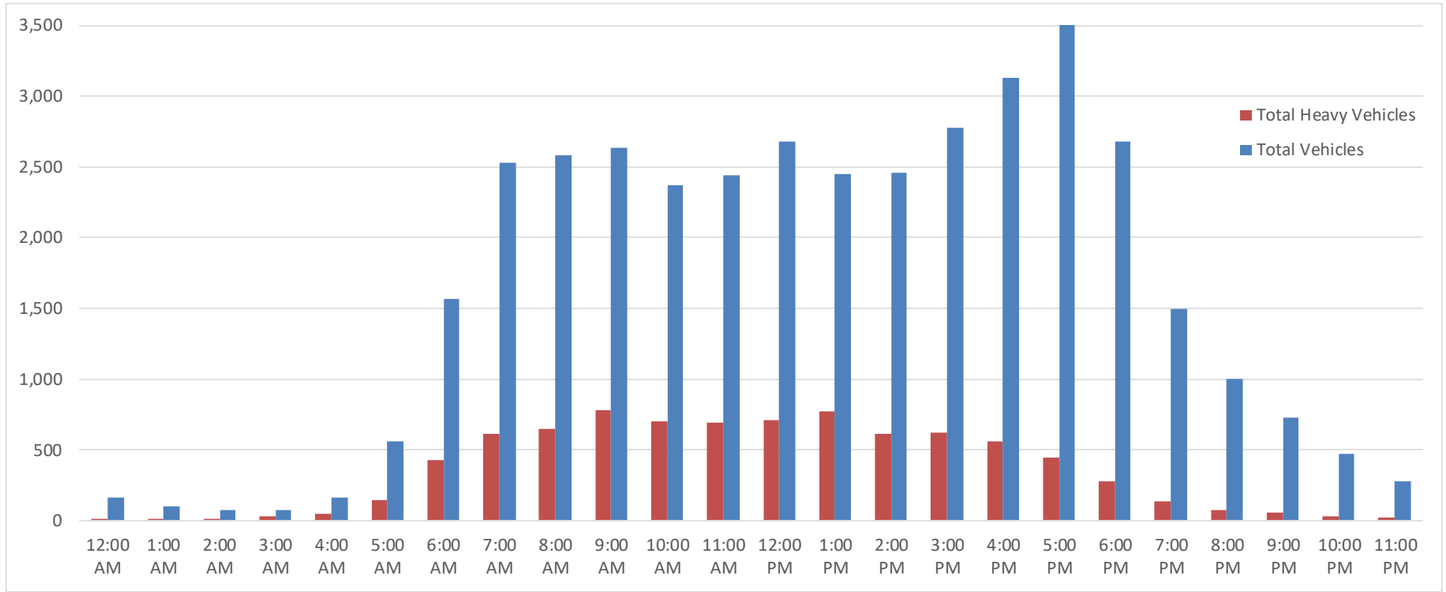


Figure 17: Westbound Hourly Variation of Heavy Vehicles – I-526 West of Long Point Road

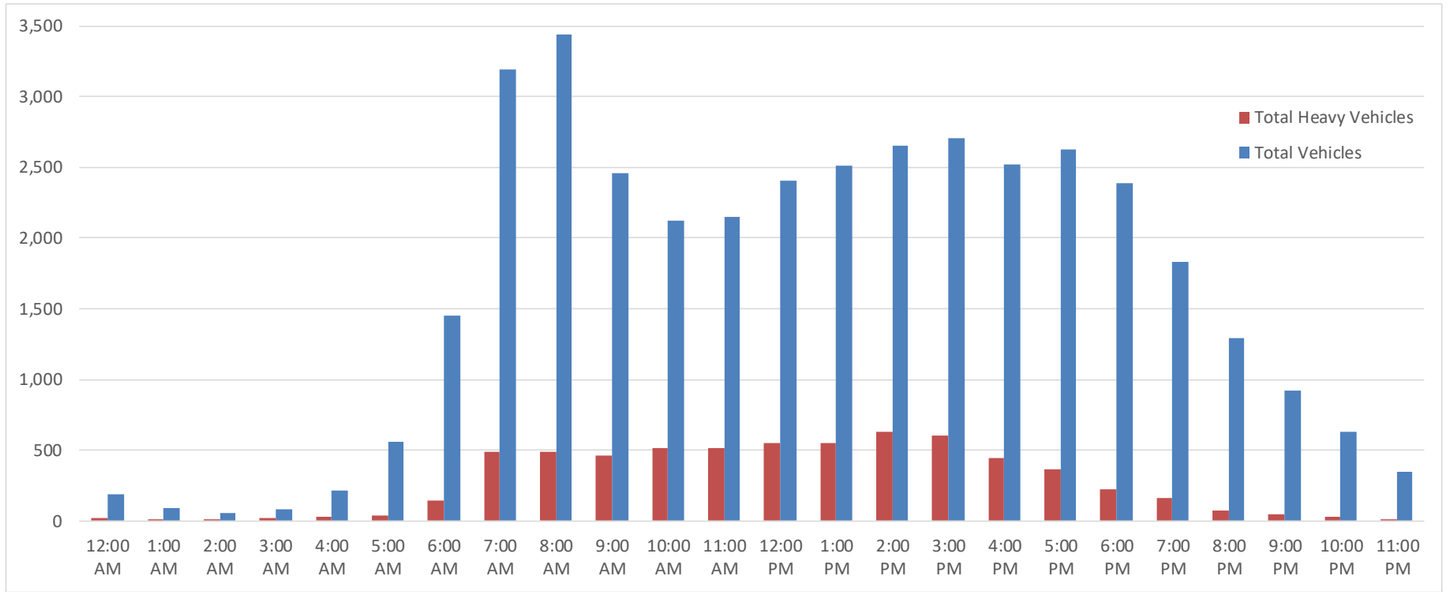


Figure 18: Eastbound Hourly Variation of Heavy Vehicles – I-526 North of Mathis Ferry Road

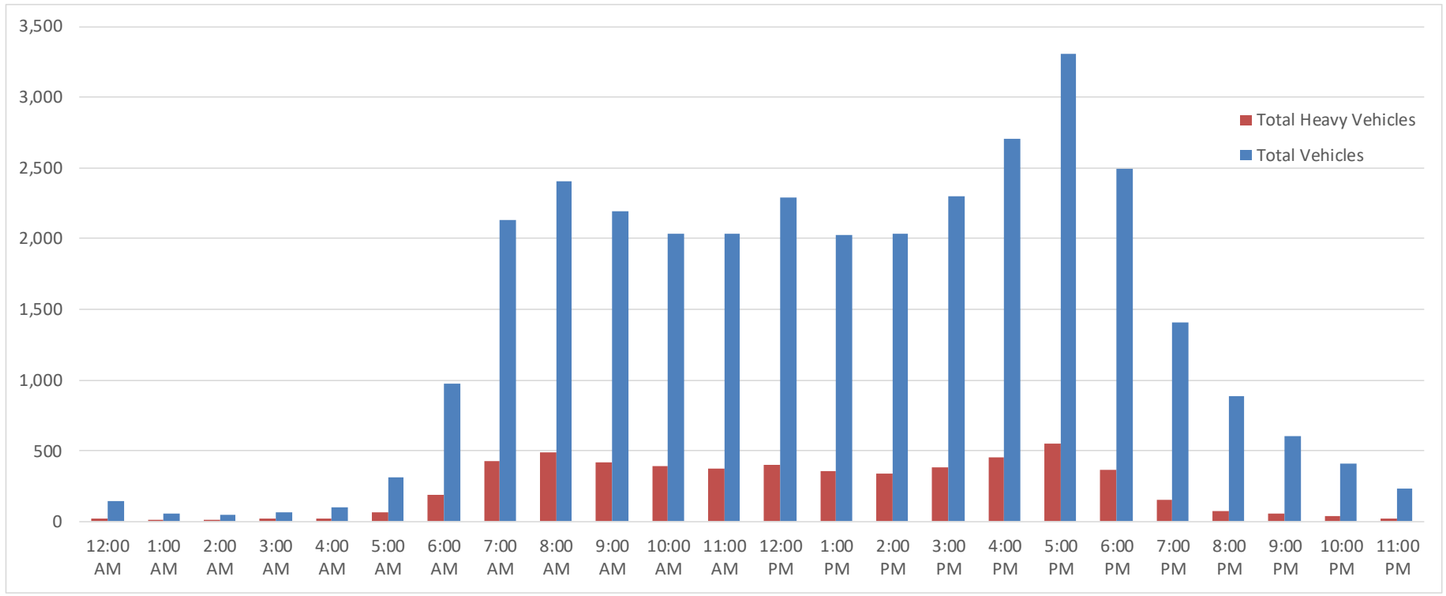


Figure 19: Westbound Hourly Variation of Heavy Vehicles – I-526 North of Mathis Ferry Road

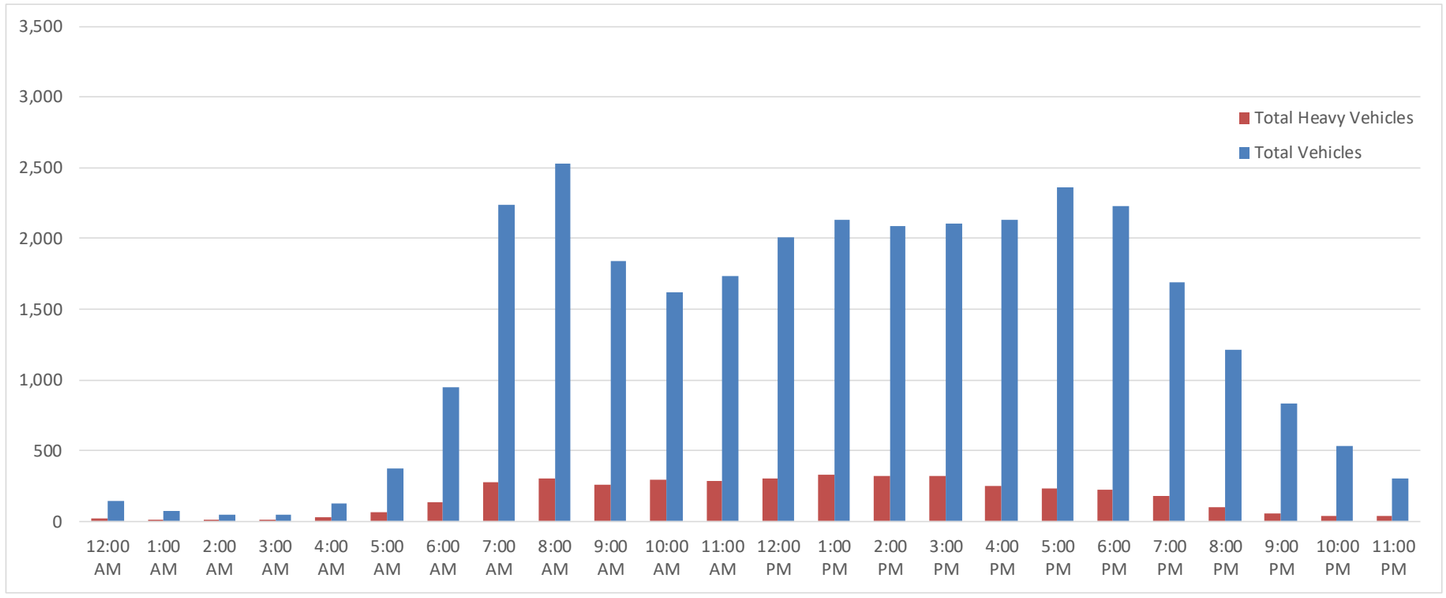


Figure 20: Eastbound Hourly Variation of Heavy Vehicles – I-526 North of Bowman Road

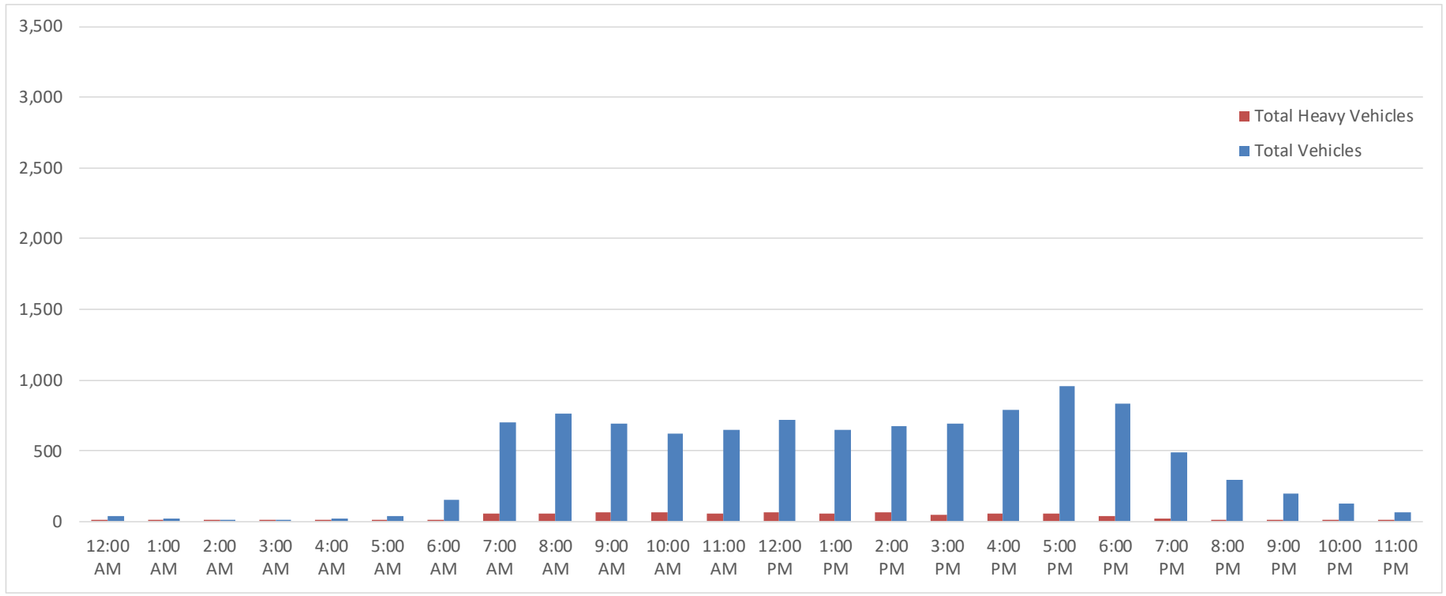
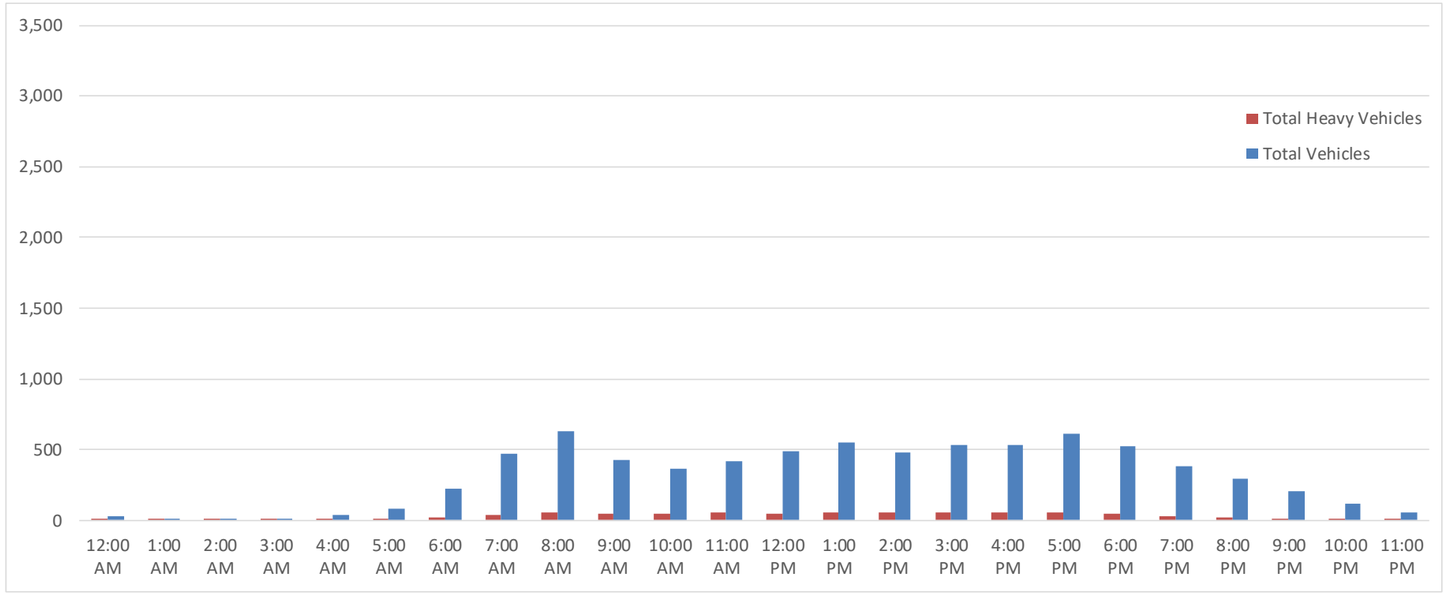


Figure 21: Westbound Hourly Variation of Heavy Vehicles – I-526 North of Bowman Road



1.8 Lane Utilization – Don Holt Bridge

Using an SCDOT camera on the Don Holt Bridge over the Cooper River, CDM Smith performed a survey of lane utilization and classification data from 7AM to 6PM. The results are depicted in **Figure 22**. In these segments of the Don Holt Bridge, a truck climbing lane is present.

Figure 22 shows that in the AM peak period, 75% of the vehicles in the eastbound truck climbing lane were heavy vehicles. Conversely, in the PM peak, only 9% of the vehicles in the truck climbing lane were heavy vehicles. The westbound direction exhibited similar characteristics. Drivers operating passenger cars were observed taking advantage of both direction's truck climbing lane in the PM peak. During the off-peak hours (9AM to 4PM), the vehicle composition of the truck climbing lane is occupied by one-third cars and two-thirds heavy vehicles in the eastbound direction and 40% cars to 60% heavy vehicles in the westbound direction.

Figure 22: Vehicle Classification by Lane and Time of Day on the Don Holt Bridge

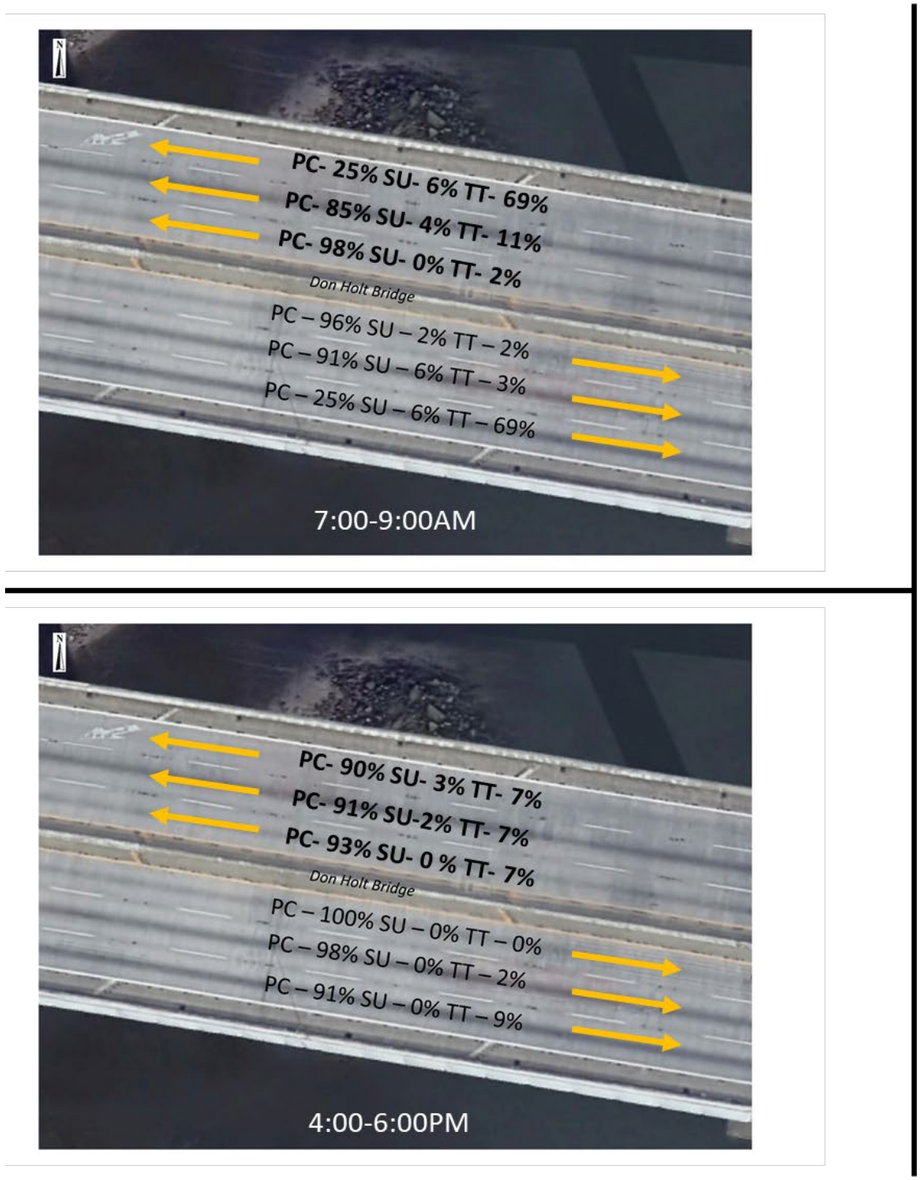
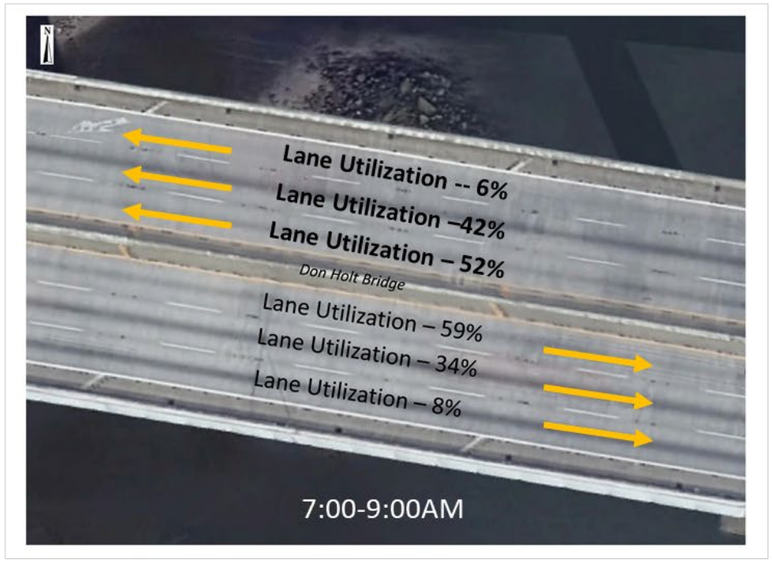


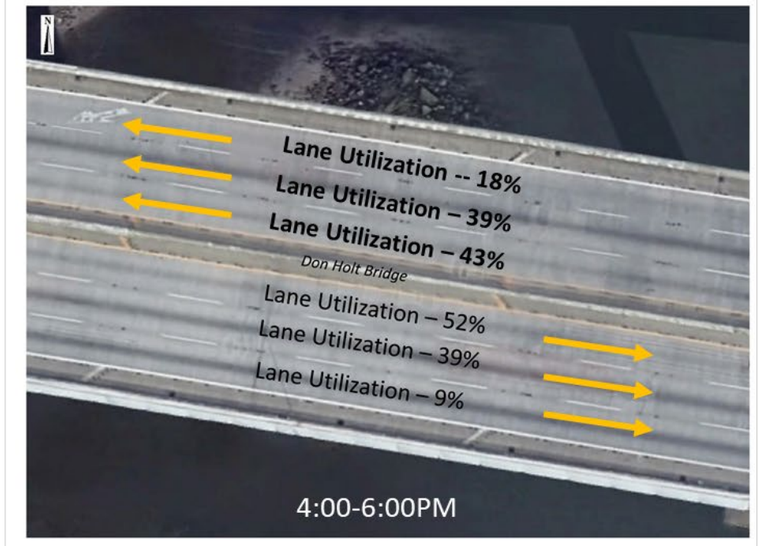
Figure 23 depicts I-526 vehicle usage by lane. The eastbound truck climbing lane accommodates only 8%-9% of the total traffic in the AM peak, PM peak, and daily. Traffic in the westbound truck climbing lane increases from the AM to PM period, which coincides with the observation of an increasing number of passenger vehicles in the westbound truck climbing lane over the course of the day.

In all three time-periods surveyed except the PM peak for the westbound direction, the inside (median) lane of each direction accommodated over 50% of the traffic. This suggests that drivers are aware of the downstream lane drop for the truck climbing lane and favor the inside lane to avoid potential merging issues with trucks.

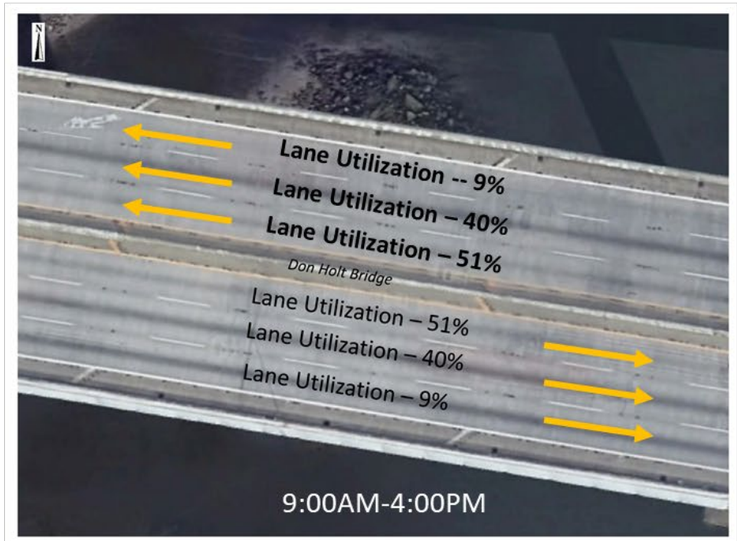
In general, the introduction and elimination of the truck climbing lanes creates diverge and merge-like conditions that contribute to congestion and queues. The truck climbing lanes are beneficial with moderate traffic volumes because trucks are out of the general-purpose lanes. However, with heavy traffic volumes their benefits are offset by the creation of merging and diverging friction.

Figure 23: Utilization by Lane and Time of Day on the Don Holt Bridge





I-526 at Don Holt Bridge
Utilization by Lane and Time of Day



LEGEND:
PC – Passenger Cars
SU – Single Unit Trucks
TT – Tractor Trailer Trucks

Source: SCDOT Traffic Cameras, June 2018

526 EAST LOWCOUNTRY CORRIDOR

1.9 Directional Distribution

The directional distribution of traffic provides an illustration of traffic flow, helping to identify the degree to which traffic is balanced within the corridor and the concentration of flow. The distribution of traffic is discussed below for mainline and ramp-specific traffic respectively to provide information about the flow of traffic both on the interstate and to and from the interstate.

1.9.1 Mainline and Ramp Distribution

The mainline distribution shows that traffic is roughly balanced in the AM and PM peak periods, though traffic is heavier in the westbound direction in the AM and eastbound direction in the PM. At the ramps, the distribution is as follows:

- The majority of traffic entering westbound I-526 in the AM come from the U.S. 17, Long Point Road, and Clements Ferry Road interchanges. The majority in the PM come from the Clements Ferry Road and US 17 interchanges.
- The majority of traffic exiting westbound I-526 in the AM and PM peak periods does so at Long Point Road and Daniel Island.
- The majority of traffic entering eastbound I-526 in the AM and PM peak periods does so from west of the Don Holt Bridge, the Daniel Island interchange, and the Long Point Road interchange.
- The majority of traffic exiting eastbound I-526 in the AM does so at Clements Ferry Road and Long Point Road. The majority in the PM occurs at Long Point Road and U.S. 17.

Based on the daily counts done for this study, the Long Point Road and Clements Ferry Road interchanges experience the most activity of the four interchanges in the corridor. Generally, the majority of traffic travels to and from the northern side of I-526. The main exception is the Daniel Island interchange where the area south of the interstate is heavily developed.

The following sections detail the existing conditions for the interstate and adjacent intersections. LOS results for the overall corridor are presented first, followed by detailed interchange information.

2.1 2017 CAPACITY ANALYSIS

Capacity analysis was performed using HCS software (Version 7.6) for the corridor and Synchro10 software for the intersections to determine performance characteristics during peak hour conditions. The results are illustrated in **Figure 24** and **Figure 25** for the AM and PM peak periods. For both periods, the segments from Clements Ferry Road to the west consistently show poor LOS while the segments east of Long Point Road generally operate with acceptable levels of service.

The 2017 AM LOS conditions shown in **Figure 24** indicate congested conditions adjacent to intersections in the westbound direction, with heavy congestion for both directions between Clements Ferry Road and the Don Holt Bridge.

The Bowman Road signalized intersection on US 17 shows poor LOS in the AM peak, and unsignalized intersections at Clements Ferry Road and Daniel Island show poor conditions for side street movements, particularly left turns.

The 2017 PM LOS conditions are similar to the 2017 AM but mirrored to reflect the reverse in the major direction of traffic. The segment between Clements Ferry Road and the Don Holt Bridge continues to show congestion, especially in the westbound direction.

The Bowman Road and Hungryneck Boulevard signalized intersections on US 17 show poor levels of service in the PM peak. Unsignalized intersections at Clements Ferry Road, and Daniel Island show poor conditions for side street movements, particularly left turns.

More detailed information regarding the LOS of movements at intersections is provided in the following section. HCS and Synchro reports for 2017 conditions are provided in **Appendix A** and **Appendix B** respectively.

Figure 24: 2017 AM Mainline and Intersection Level of Service

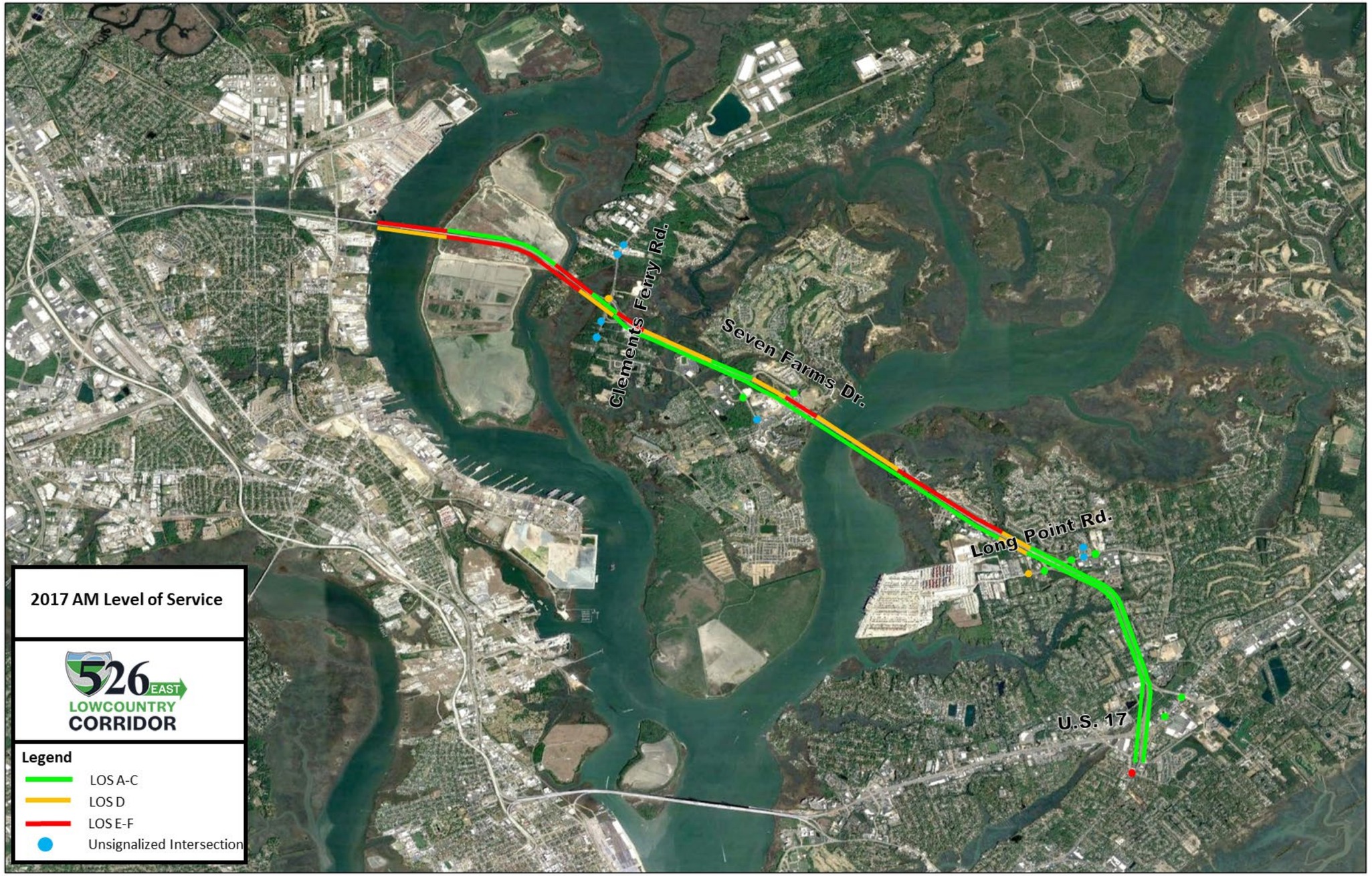
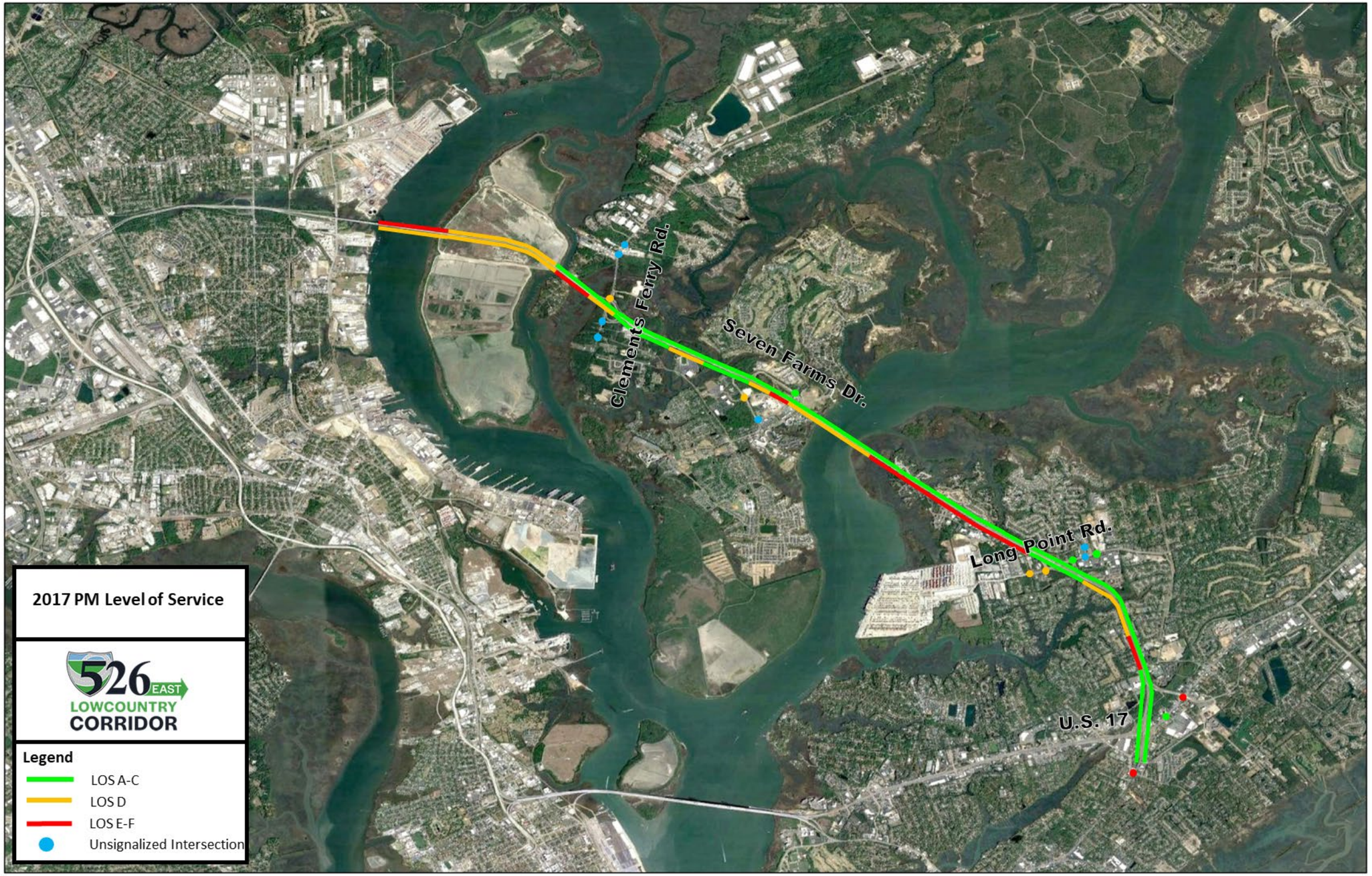


Figure 25: 2017 PM Mainline and Intersection Level of Service



2.2 2017 VOLUMES, GEOMETRICS AND LOS

Figure 26 through **Figure 37** show the 2017 Design Hour Volumes used as the general representation of traffic for the I-526 LCC East study area interstate, ramps, and intersections, as well as the geometrics and traffic control devices for the study area intersections and their corresponding LOS.

The volumes were balanced in three steps: first the mainline volumes were balanced, then the corresponding ramp volumes were balanced to match the mainline volumes, and finally the corresponding surface street volumes were balanced to match the ramp volumes.

Figure 26: Clements Ferry Road 2017 Design Hour Volumes

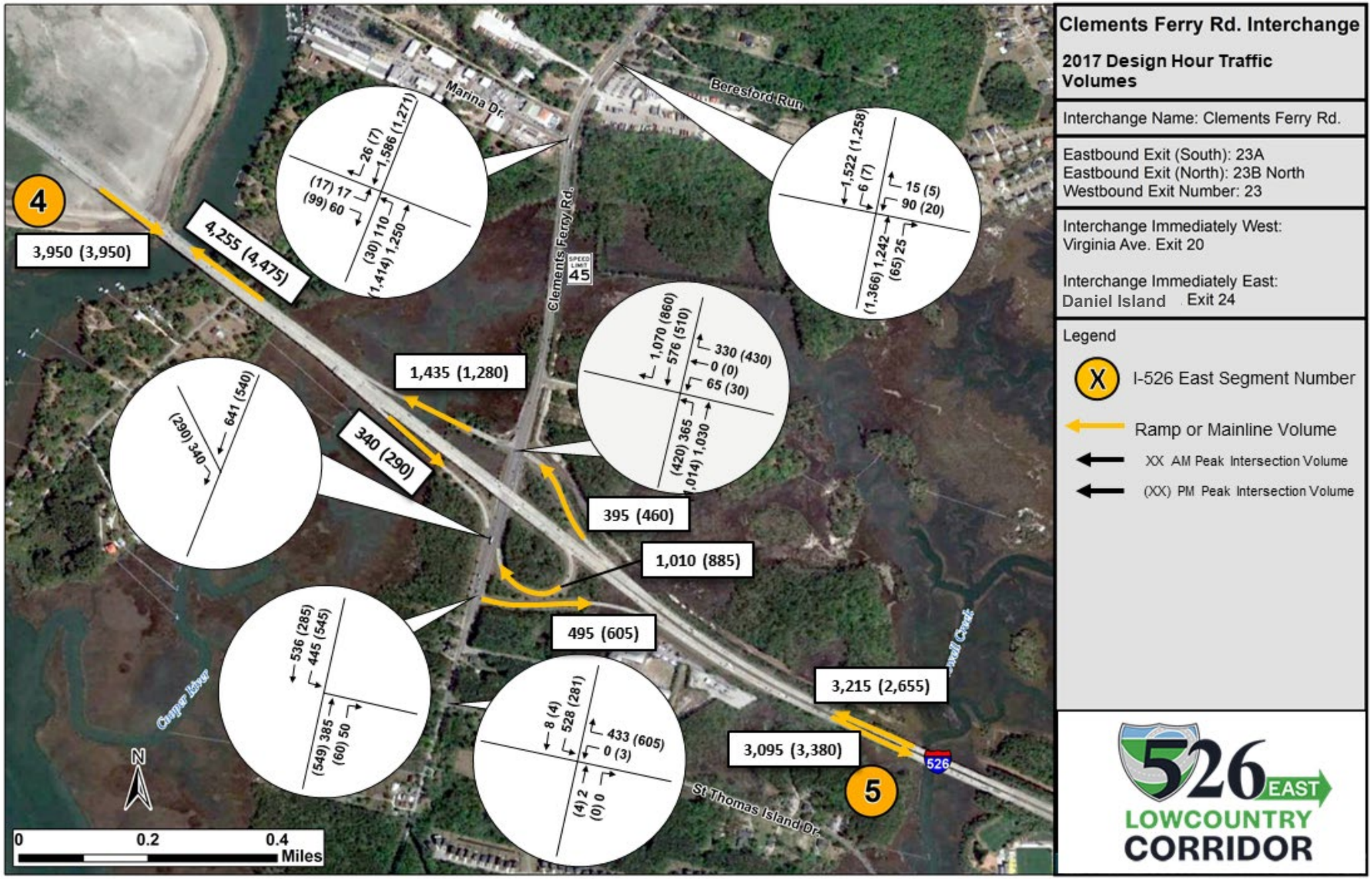


Figure 27: Clements Ferry Road Intersection Lanes and Traffic Control

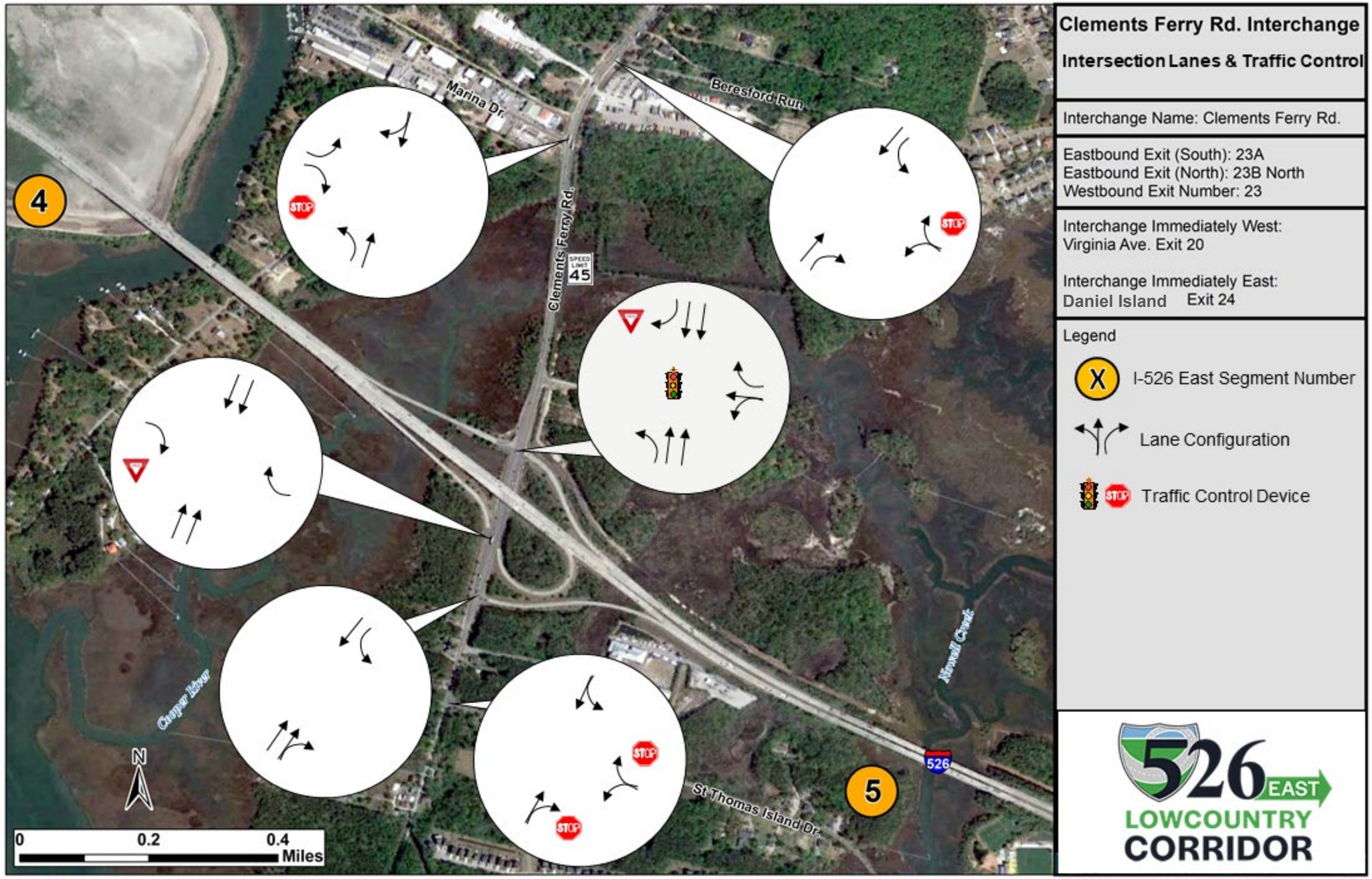


Figure 28: Clements Ferry Road 2017 Intersection Level of Service

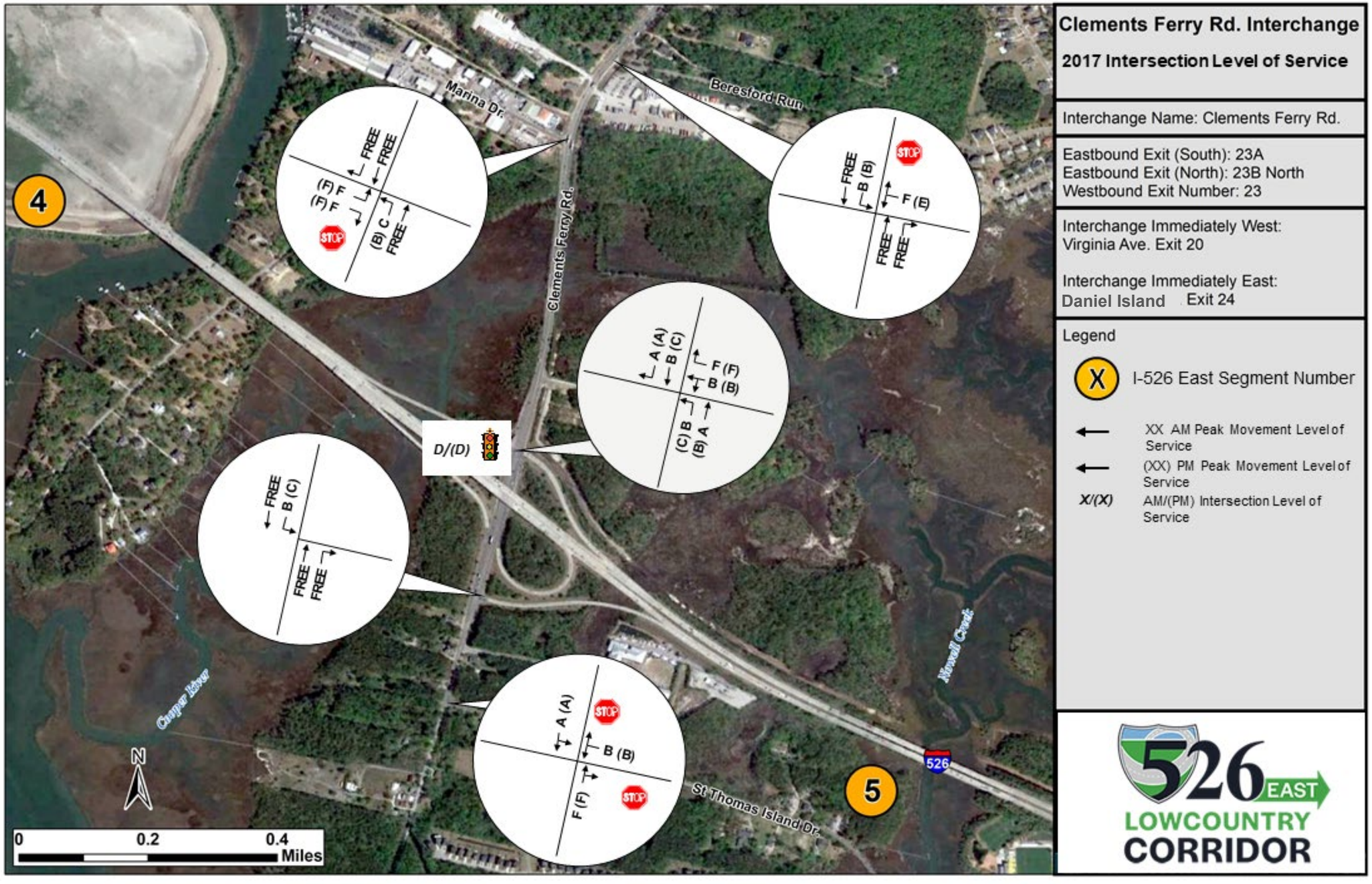


Figure 29: Daniel Island 2017 Design Hour Volumes

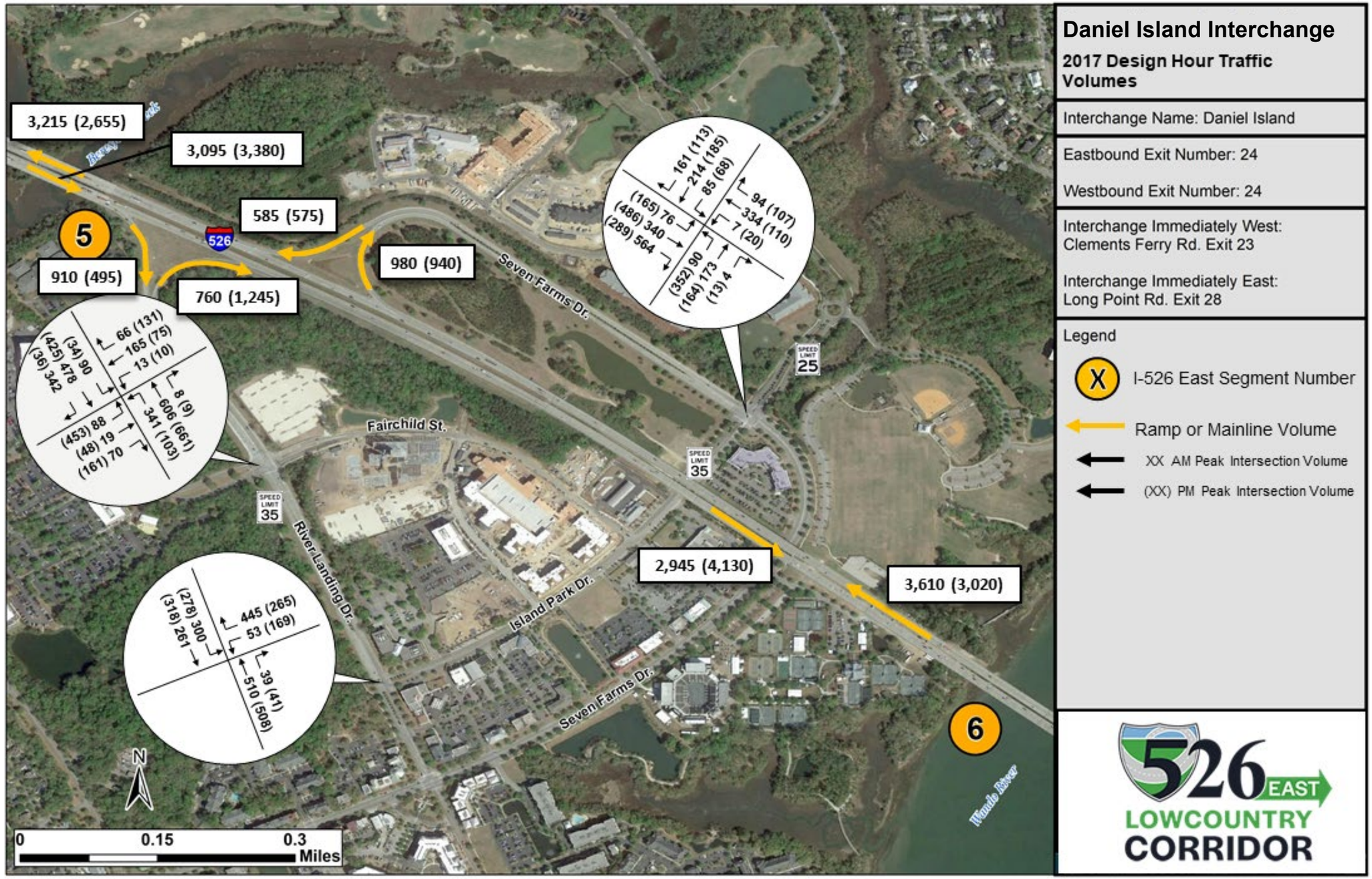


Figure 30: Daniel Island Intersection Lanes and Traffic Control

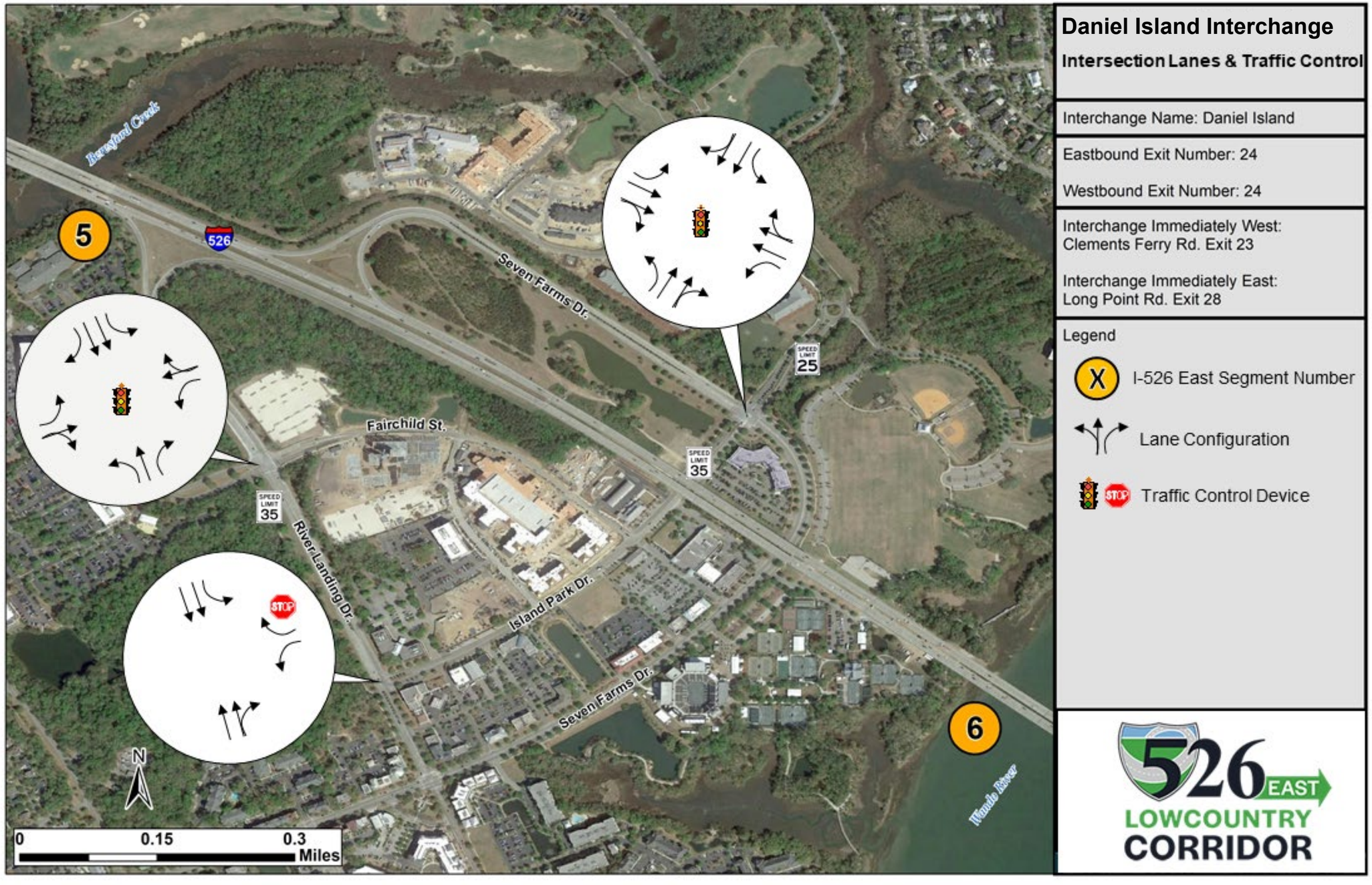


Figure 31: Daniel Island 2017 Intersection Level of Service

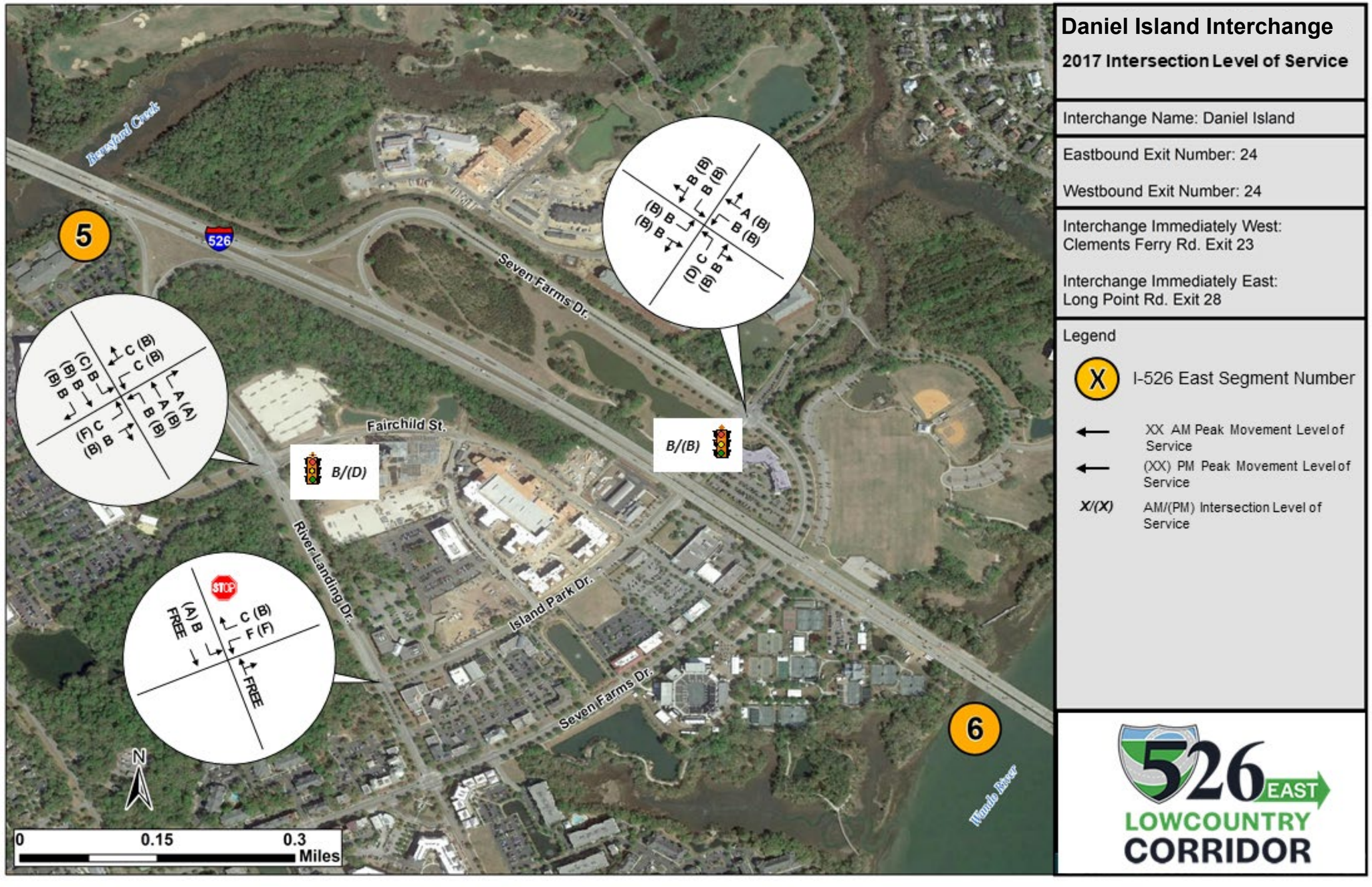


Figure 32: Long Point Road 2017 Design Hour Volumes

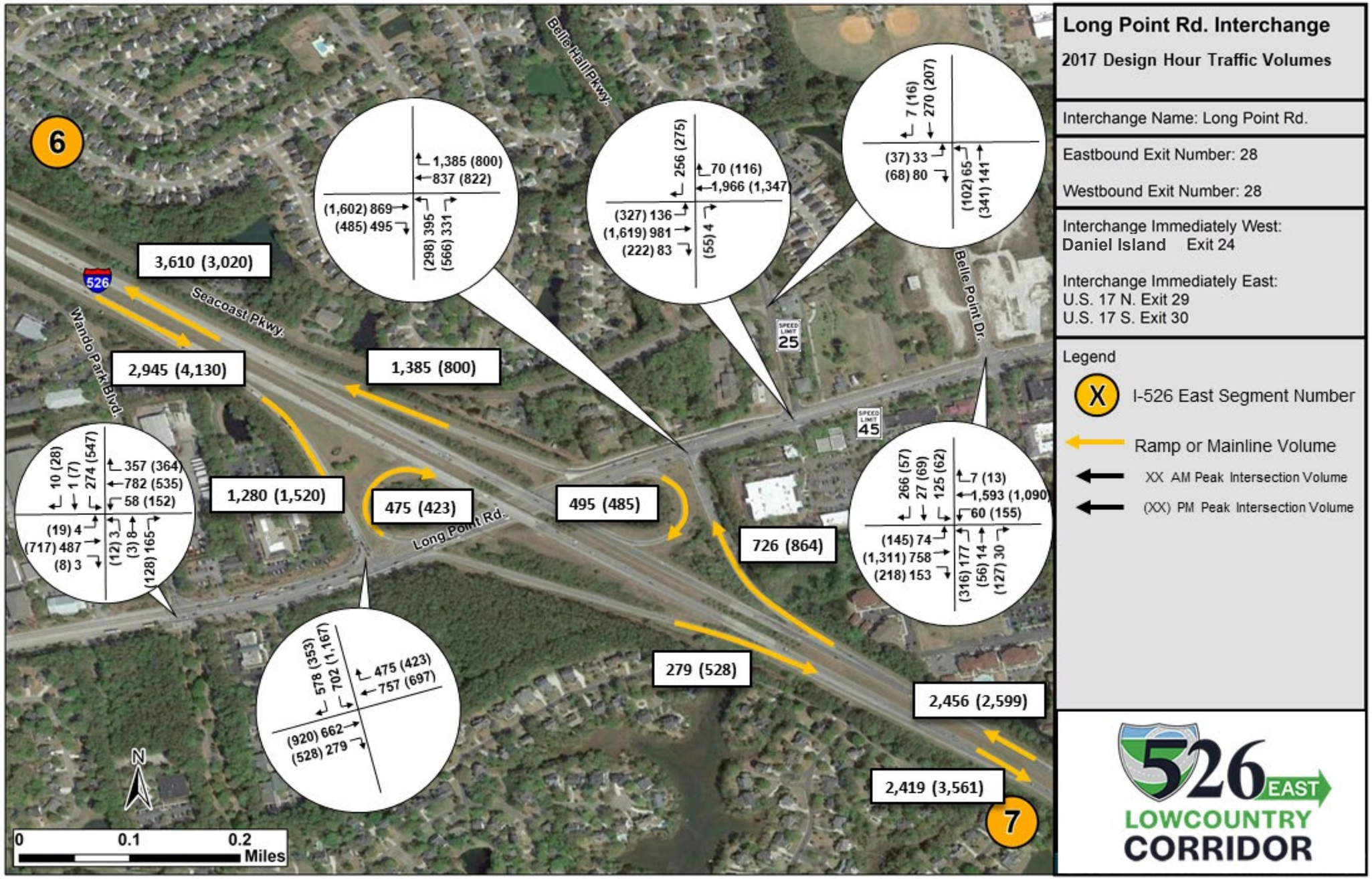


Figure 33: Long Point Road Intersection Lanes and Traffic Control

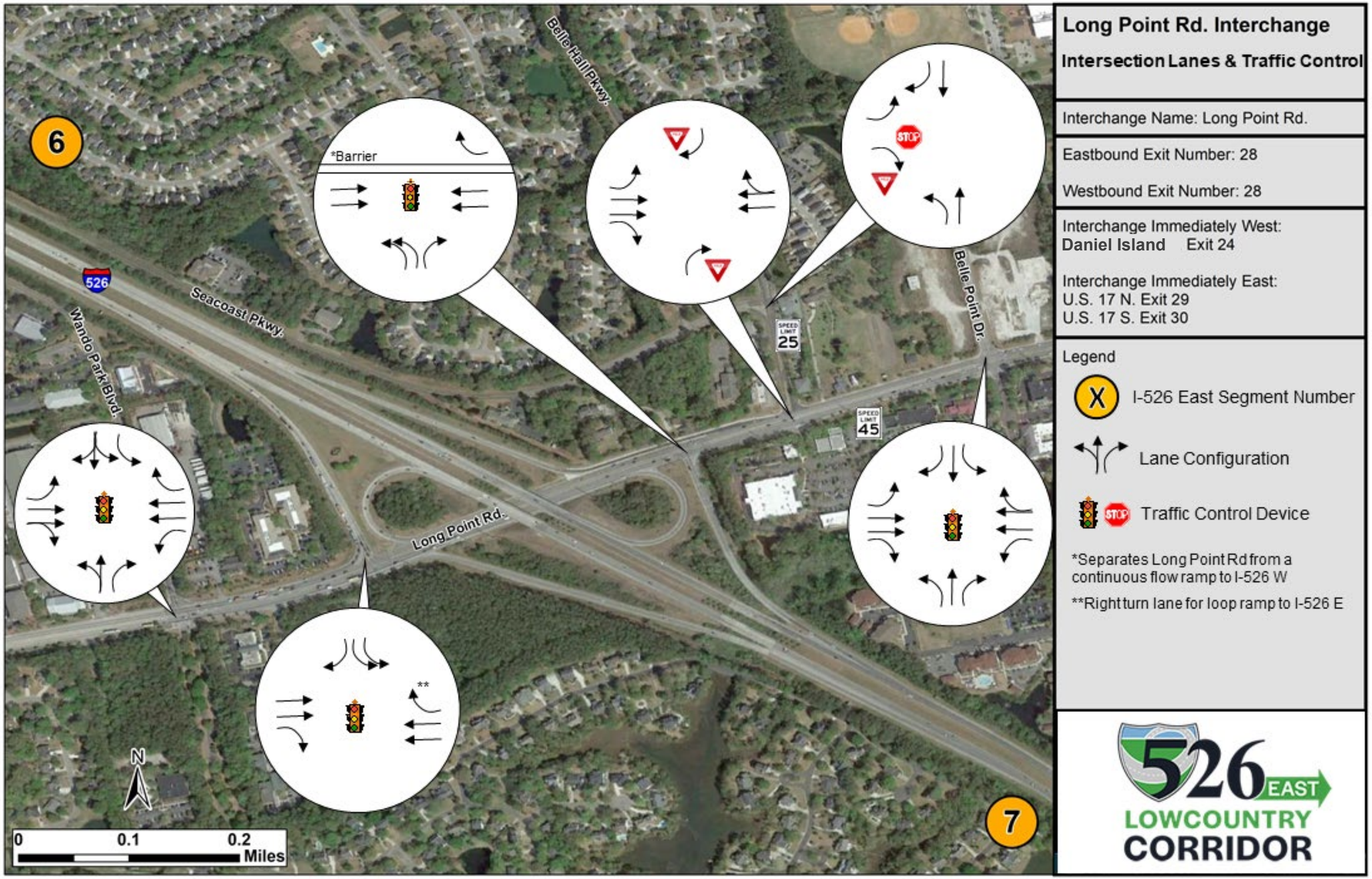


Figure 34: Long Point Road 2017 Intersection Level of Service

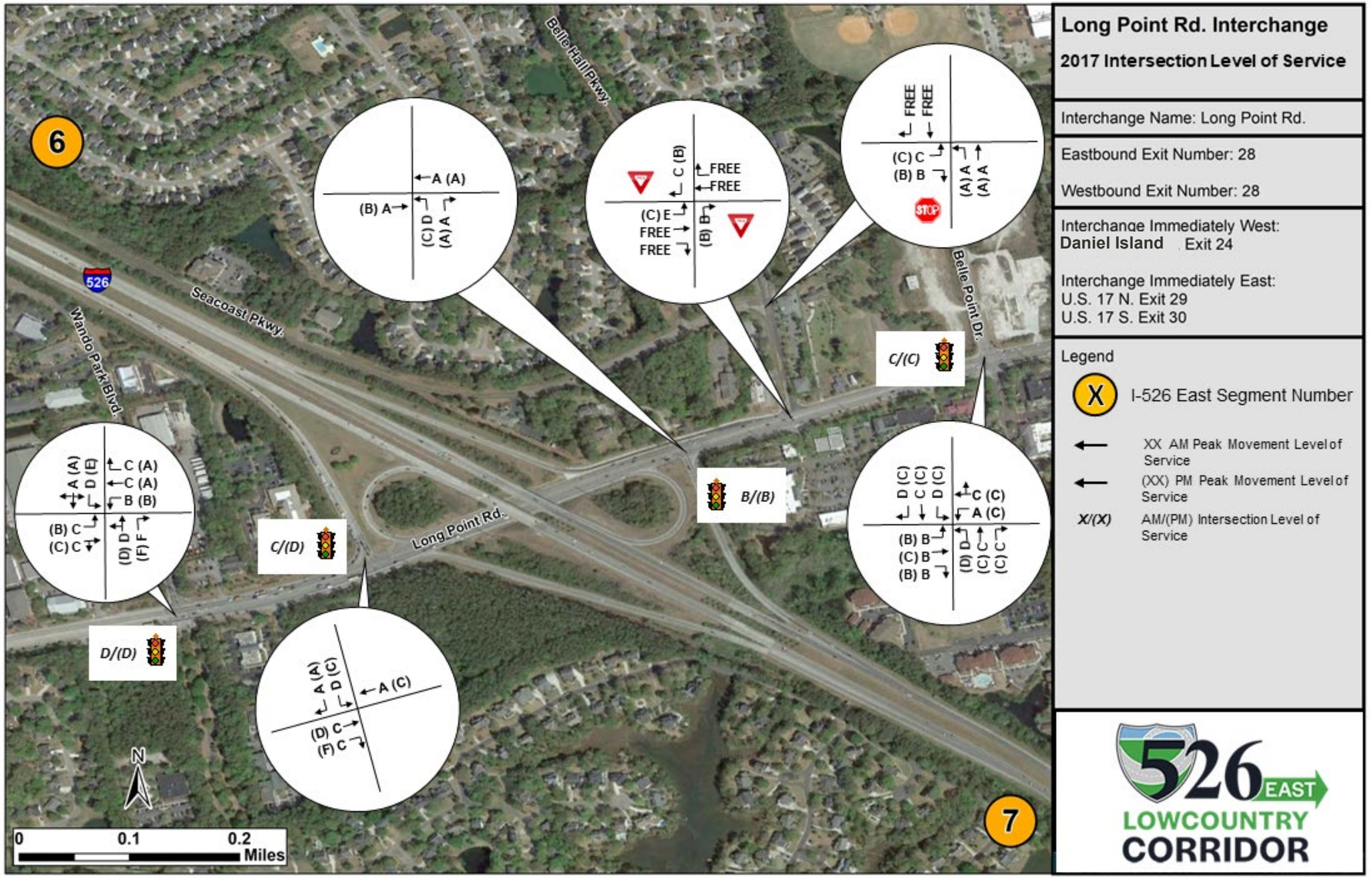


Figure 35: US 17 Interchange 2017 Design Hour Volumes

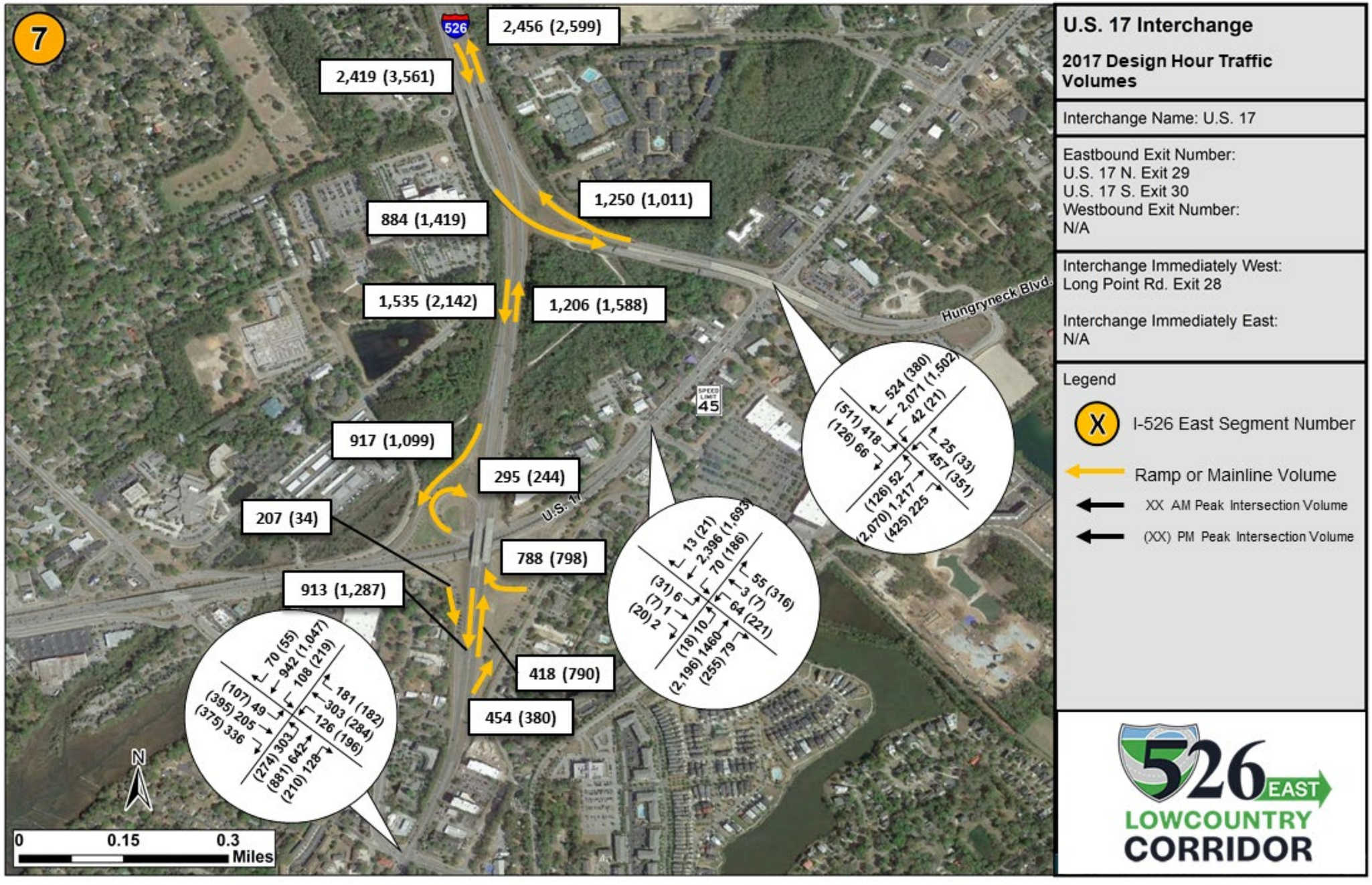


Figure 36: U.S. 17 Interchange Lanes and Traffic Control

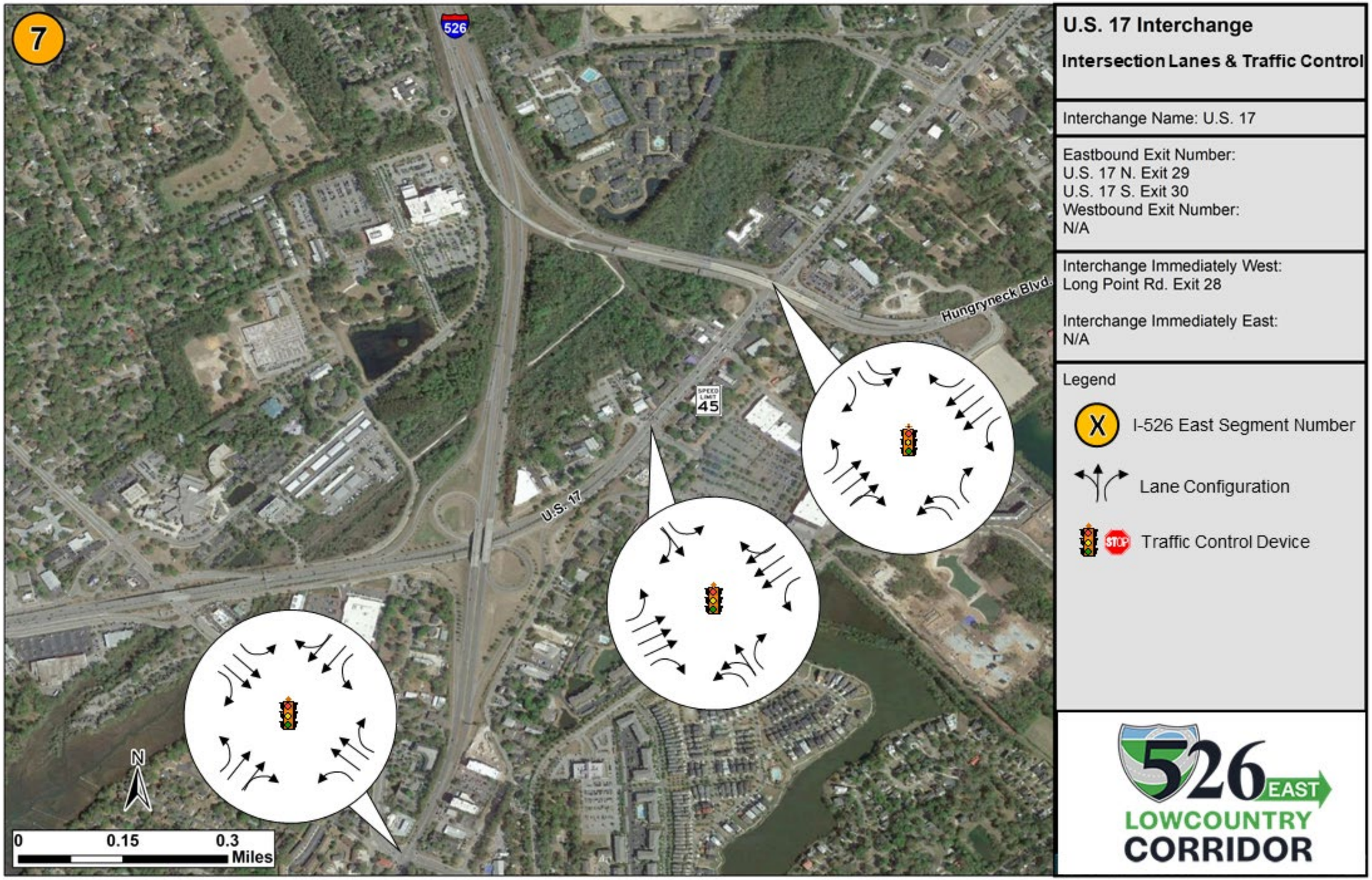
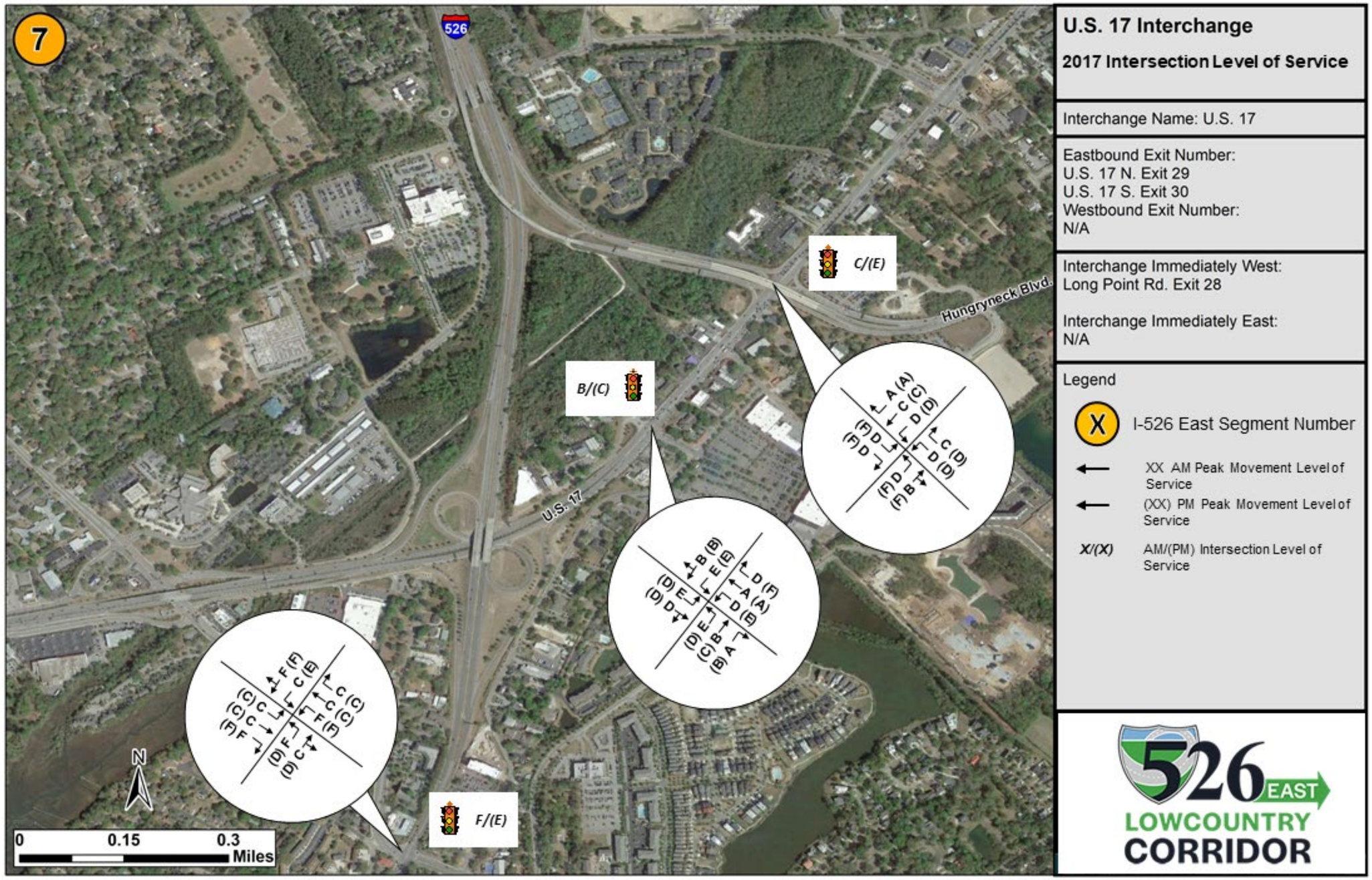


Figure 37: US 17 Interchange 2017 Intersection Level of Service



The following sections detail the 2050 No Build conditions for the interstate and adjacent intersections. As in the previous chapter, the resulting LOS for the overall corridor are presented first, followed by detailed interchange information.

3.1 2050 No Build Capacity Analysis

Capacity analysis was performed using the methods previously described to determine performance characteristics for future No Build peak hour conditions. The results are illustrated for the AM and PM peak periods in **Figure 38** and **Figure 39**, showing that most segments will operate at LOS F in each peak. The eastern section near US 17 and segments between on and off-ramps at Daniel Island and Clements Ferry Road are expected to exhibit favorable LOS.

More intersections are expected to exhibit poor LOS under future conditions, as represented by the red dots in **Figure 38** and **Figure 39**. Unsignalized intersections at Clements Ferry Road, Daniel Island, and Long Point Road may exhibit poor conditions for side street movements, particularly left turns.

HCS and Synchro reports for 2050 No Build conditions are provided in **Appendix C** and **Appendix D** respectively.

Figure 38: 2050 No Build AM Mainline and Intersection Level of Service

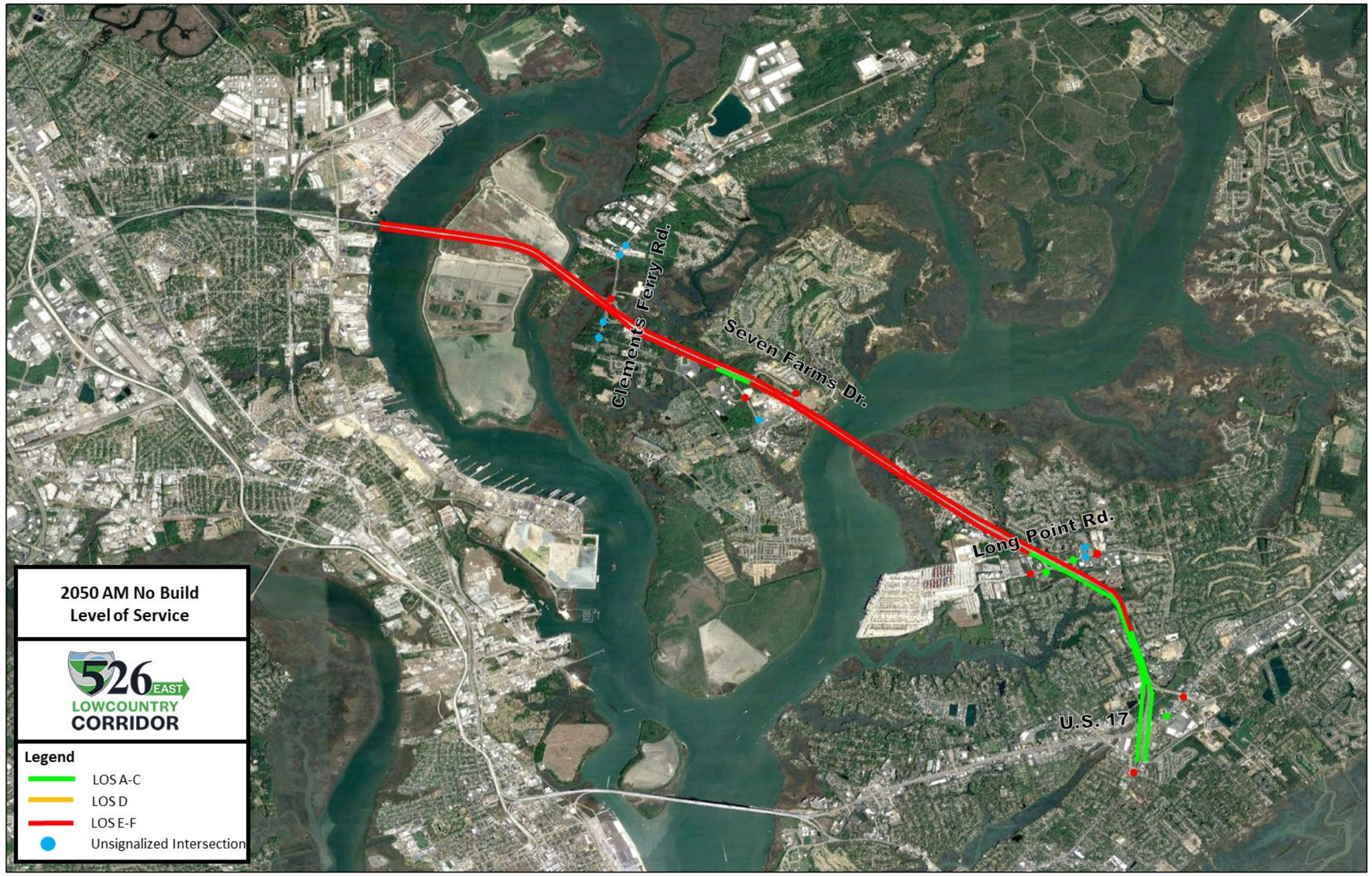
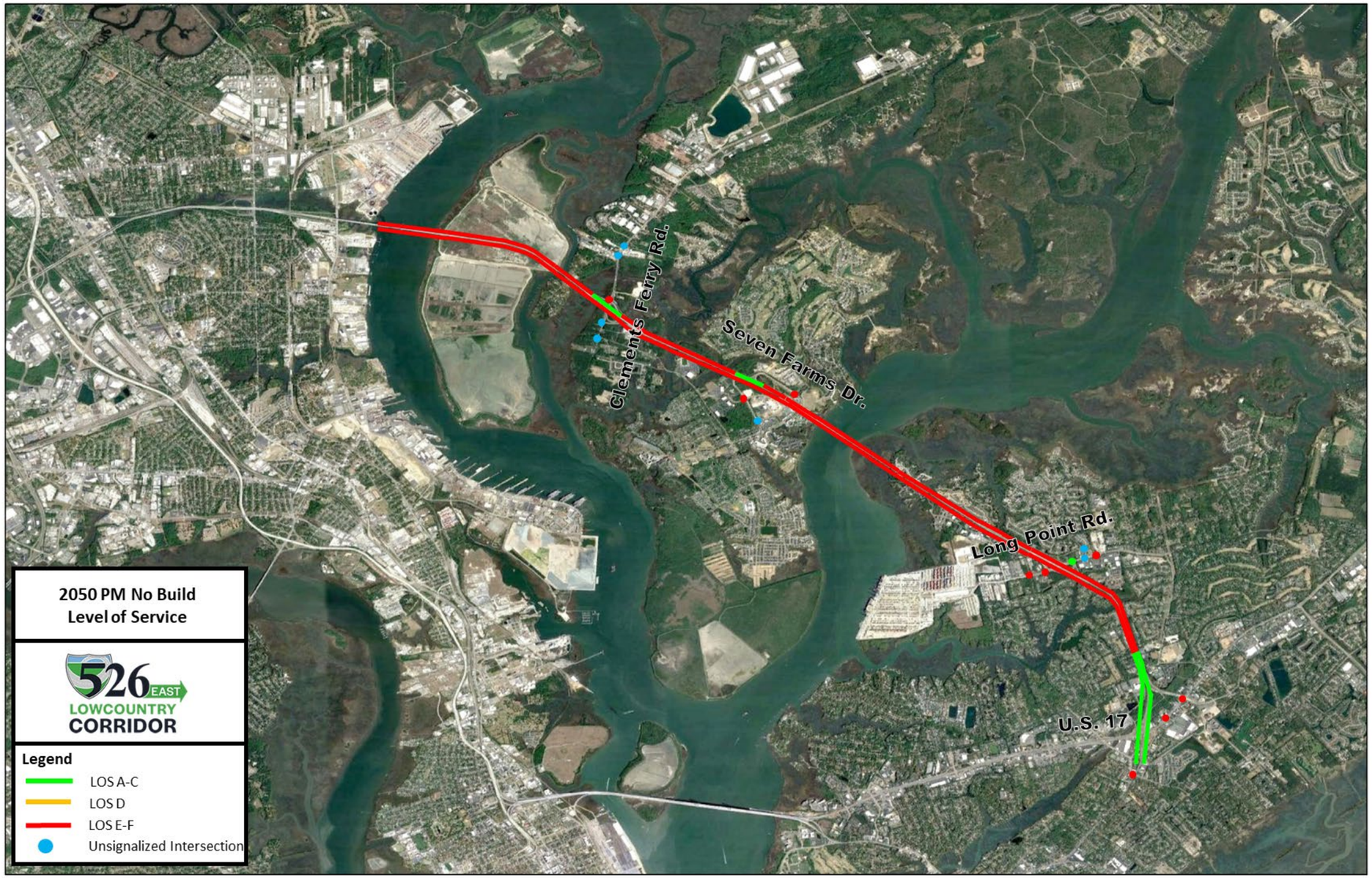


Figure 39: 2050 No Build PM Mainline and Intersection Level of Service



3.2 2050 No Build Traffic Volumes and LOS

The recommended growth rates used to grow the design hour volumes are shown in **Table 3-1**.

Table 3-1: Recommended Annual Growth Rates

Corridor	Segment	Recommended Growth Rate
I-526	U.S. 52 to North Rhett Avenue	1.6%
	North Rhett Avenue to Virginia Avenue	1.6%
	Virginia Avenue to Clements Ferry Road	1.6%
	Clements Ferry Road to Seven Farms Drive	1.6%
	Seven Farms Drive to Long Point Road	1.6%
	Long Point Road to Mathis Ferry Road	1.6%
	Mathis Ferry Road to U.S. 17	1.6%
Interchange	**Segment**	**Recommended Growth Rate**
North Rhett Avenue	N of I-526	1.1%
	S of I-526	0.9%
Virginia Avenue	N of I-526	0.7%
	S of I-526	0.8%
Clements Ferry Road	N of I-526	3.0%
	S of I-526	1.2%
Seven Farms Drive	Between Ramps	1.5%
Long Point Road	N of I-526	1.0%
	S of I-526	1.2%

To provide perspective on projected growth, **Figure 40** on the following page presents interstate traffic volumes for 2050 representing projected average daily traffic. These volumes were projected by applying the I-526 growth rate shown in **Table 3-1** to the SCDOT and CDM Smith volumes presented previously in **Figure 5**. The volumes shown in **Figure 40** illustrate the effect of using the 1.6% annual growth rate, not as a basis for any other analysis, as the resulting volumes are generally almost twice the 2017 volumes.

To prepare 2050 volumes for analysis of the I-526 LCC East study area, the growth rate for I-526 shown in **Table 3-1** was applied uniformly across the mainline and ramp volumes. The interchange growth rates were applied according to their respective side of the interstate and represent projected changes in the surrounding area, beyond the intersections under study. The difference in rates between the interstate and surface streets and between intersections on opposite sides of the interstate was reconciled by first balancing the volumes to the interstate ramps at the ramp intersections, then adjusting surface street volumes between intersections as appropriate. Volume imbalances at surface street intersections were typically adjusted via through volumes in order to maintain the projected growth without unduly affecting turning movements. Note that all volumes were rounded to the nearest 5 to represent that they are projected and not actual volumes. **Figure 41** through **Figure 48** depict 2050 No Build volumes and resulting LOSs.

Note that the analysis of Clements Ferry Road future No Build conditions did incorporate Berkeley County's Clements Ferry Road Widening Project Phase 1, which was under construction at the time of this study. This involved lane additions on Clements Ferry Road, but no additional traffic control measures. The traffic signal at the I-526 westbound ramps was optimized for the No Build Scenario to account for the changes in the number of lanes at the intersection.

Figure 40: 2050 Projected Average Daily Interstate Traffic

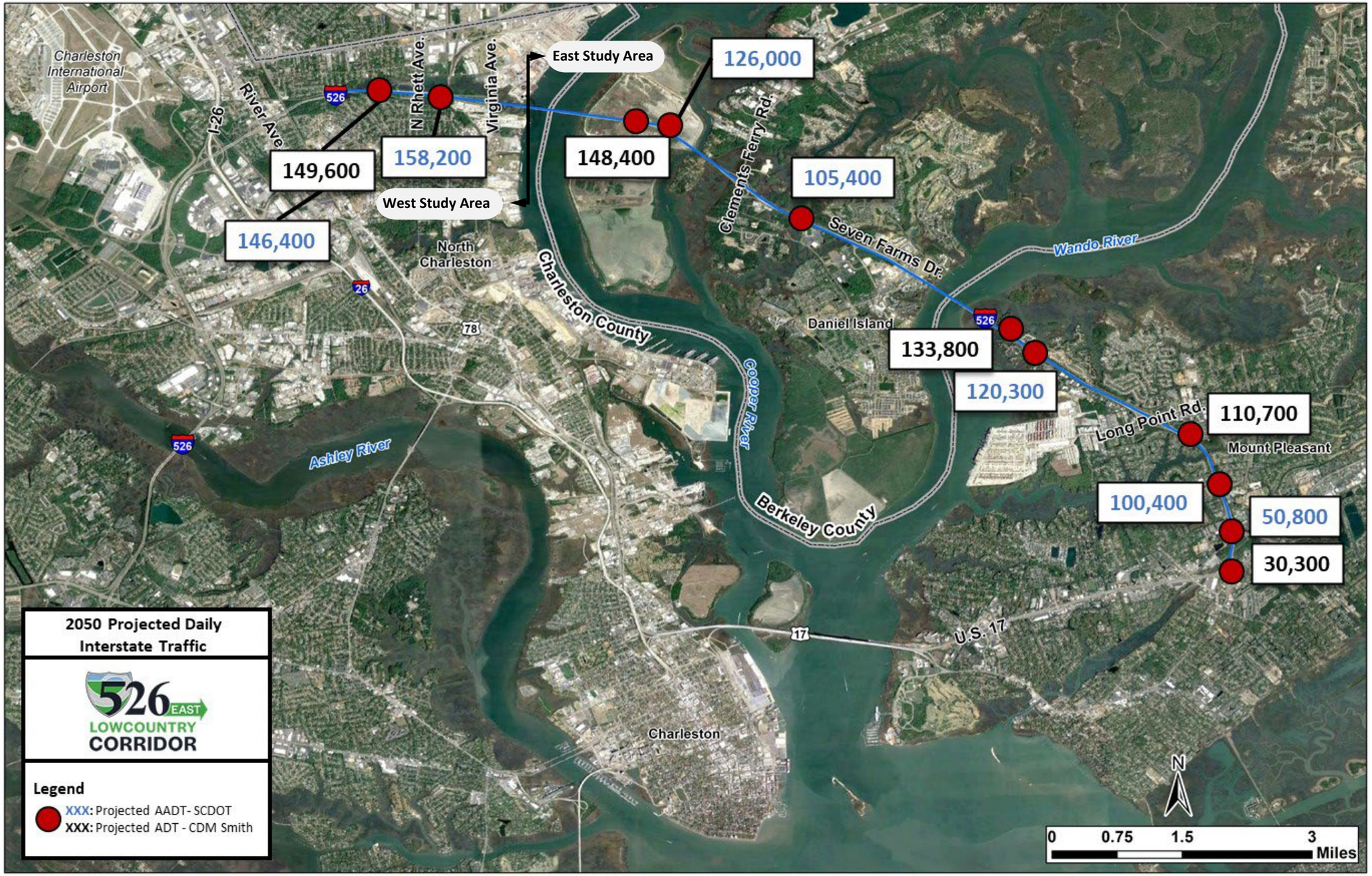


Figure 41: Clements Ferry Road 2050 Projected No Build Volumes

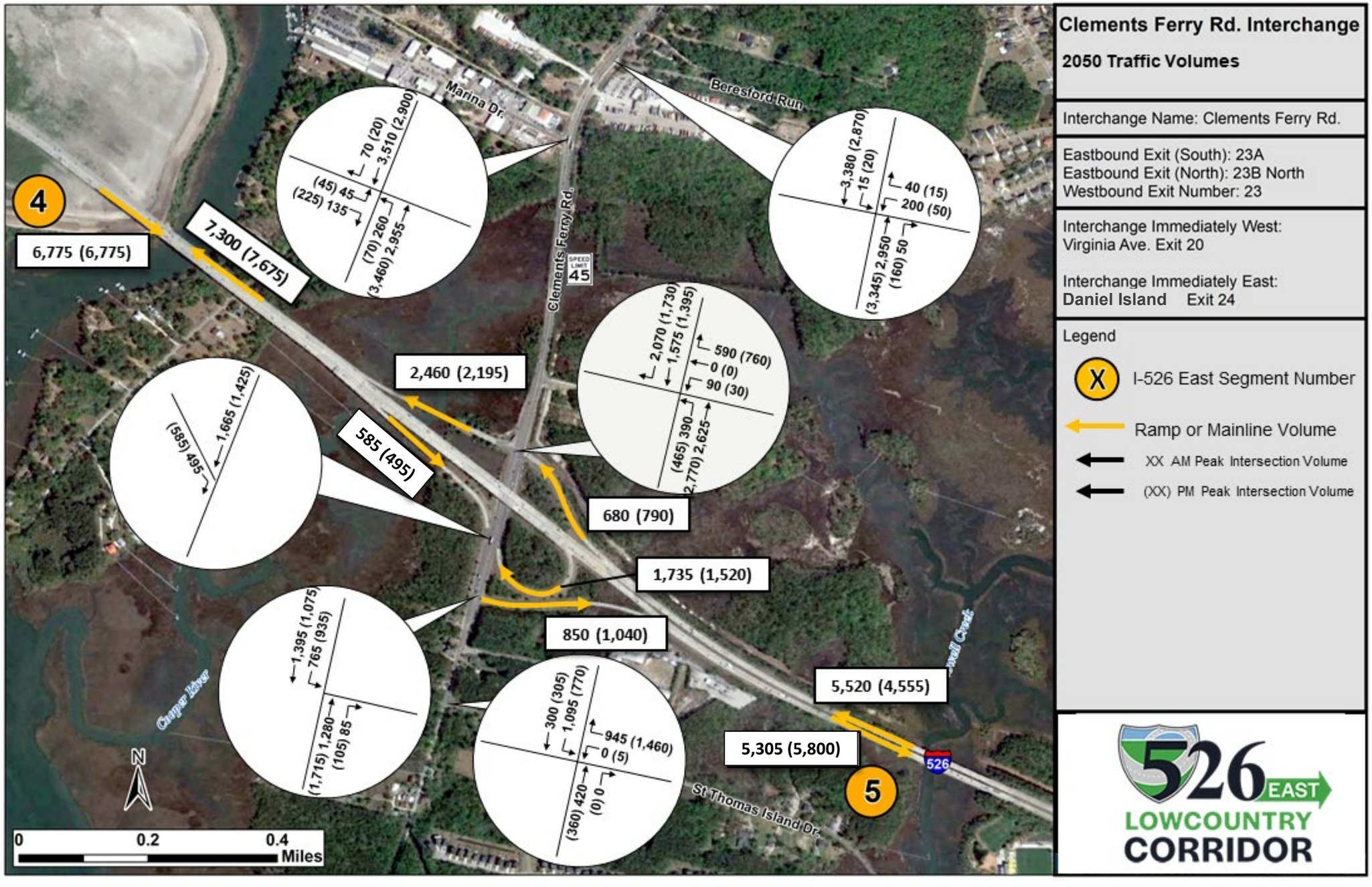


Figure 42: Clements Ferry Road 2050 No Build Intersection Level of Service

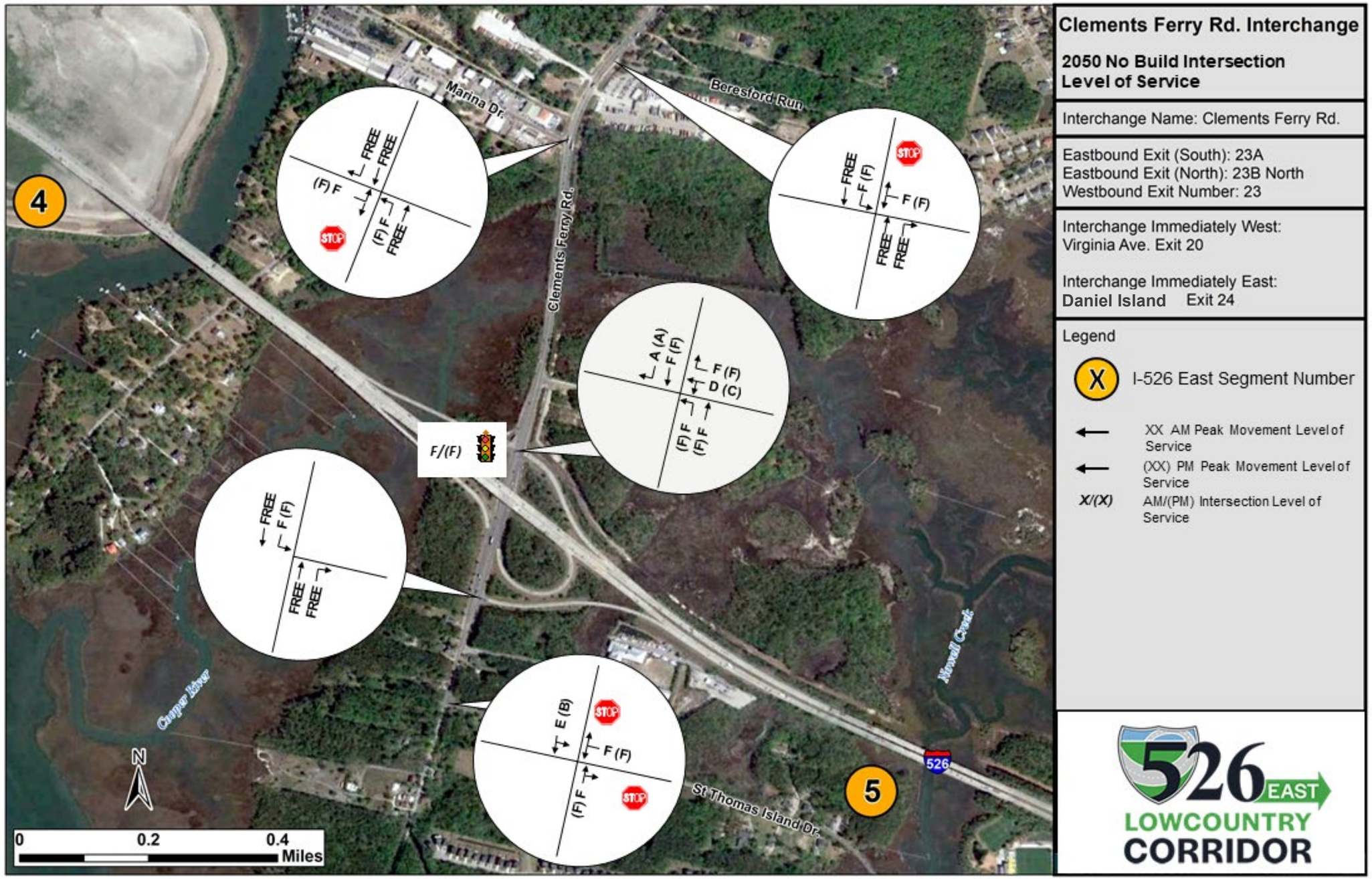


Figure 43: Daniel Island 2050 Projected No Build Volumes

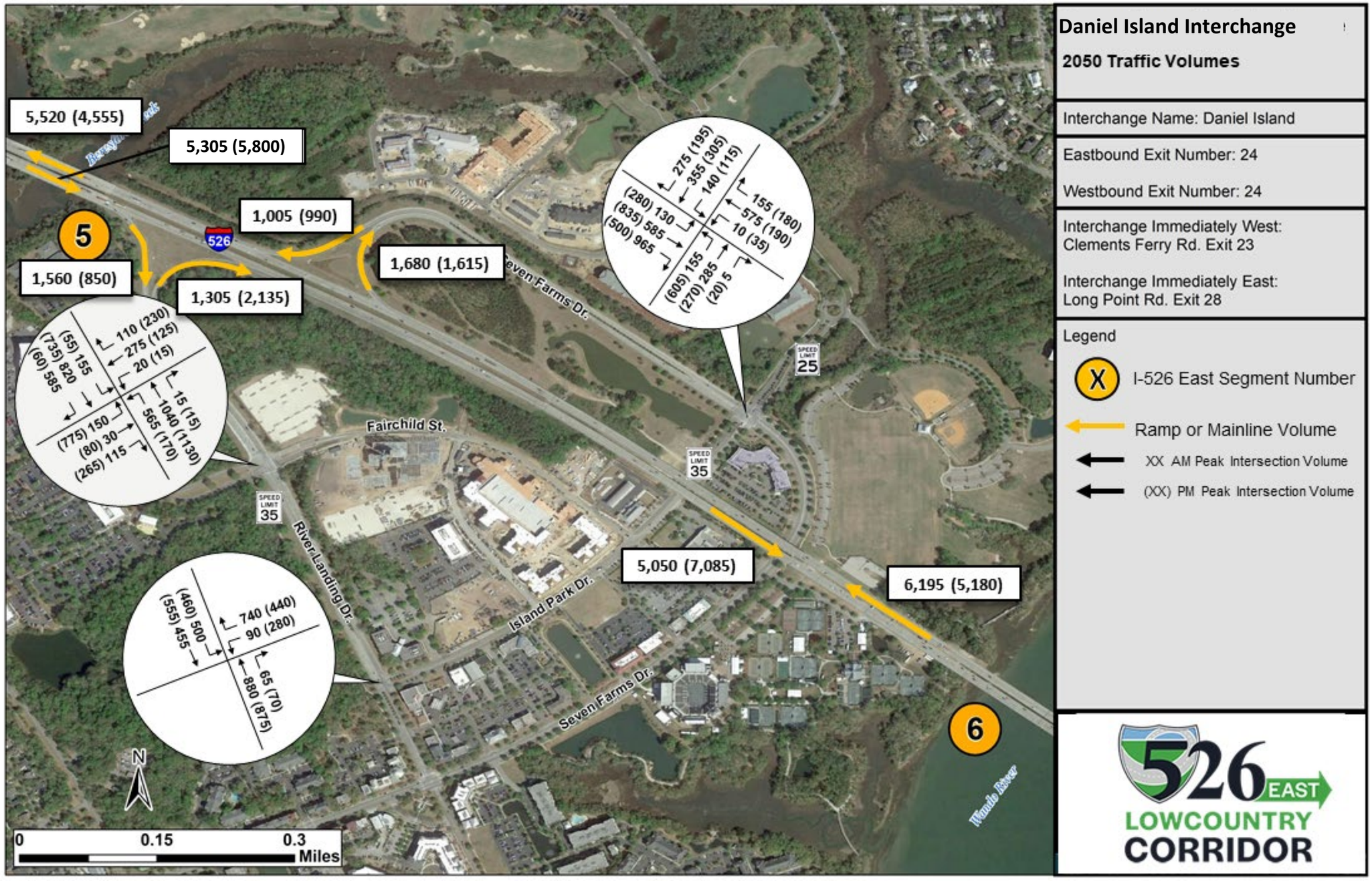


Figure 44: Daniel Island 2050 No Build Intersection Level of Service

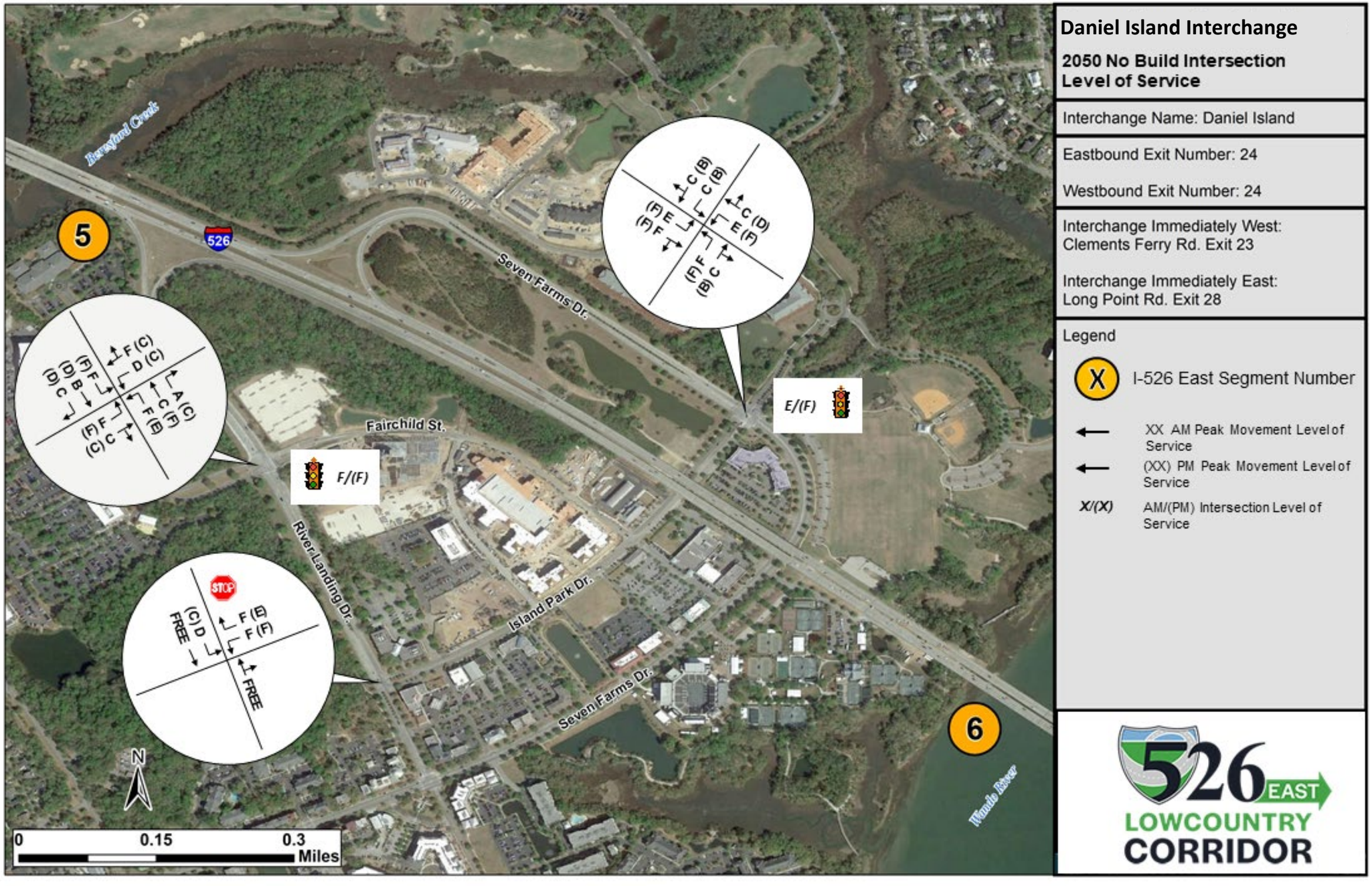


Figure 45: Long Point Road 2050 Projected No Build Volumes

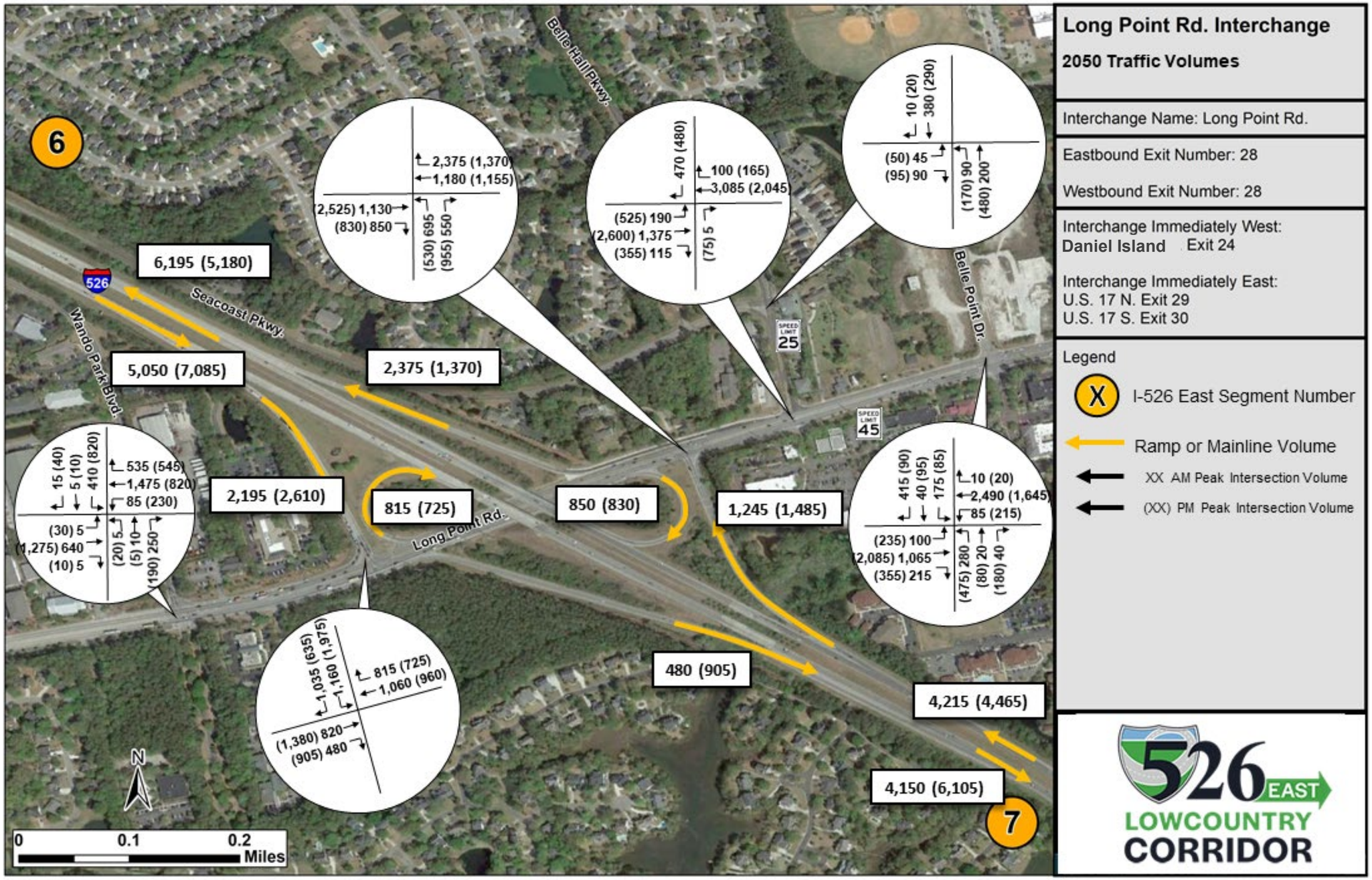


Figure 46: Long Point Road 2050 No Build Intersection Level of Service

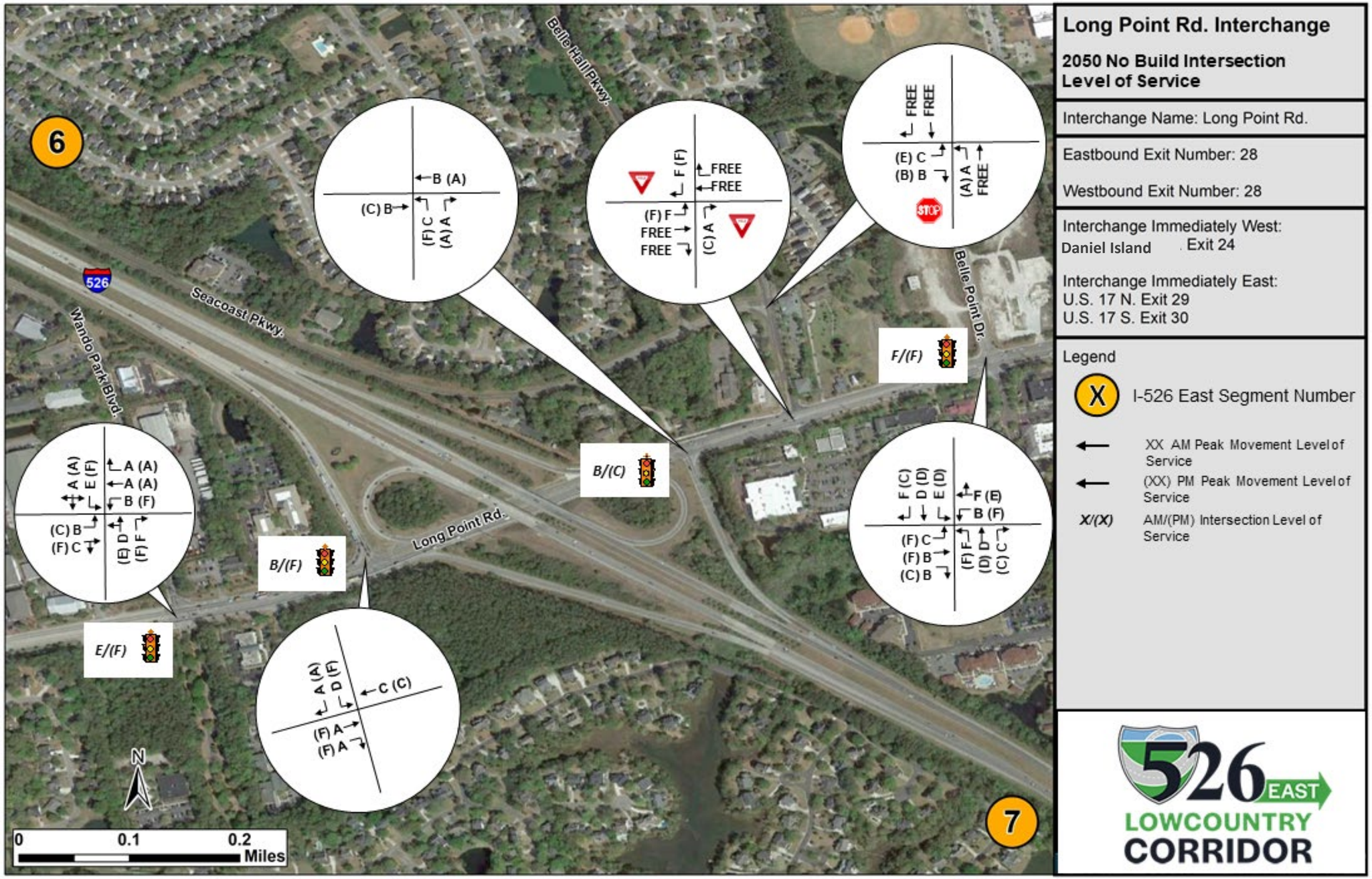


Figure 47: US 17 Interchange 2050 Projected No Build Volumes

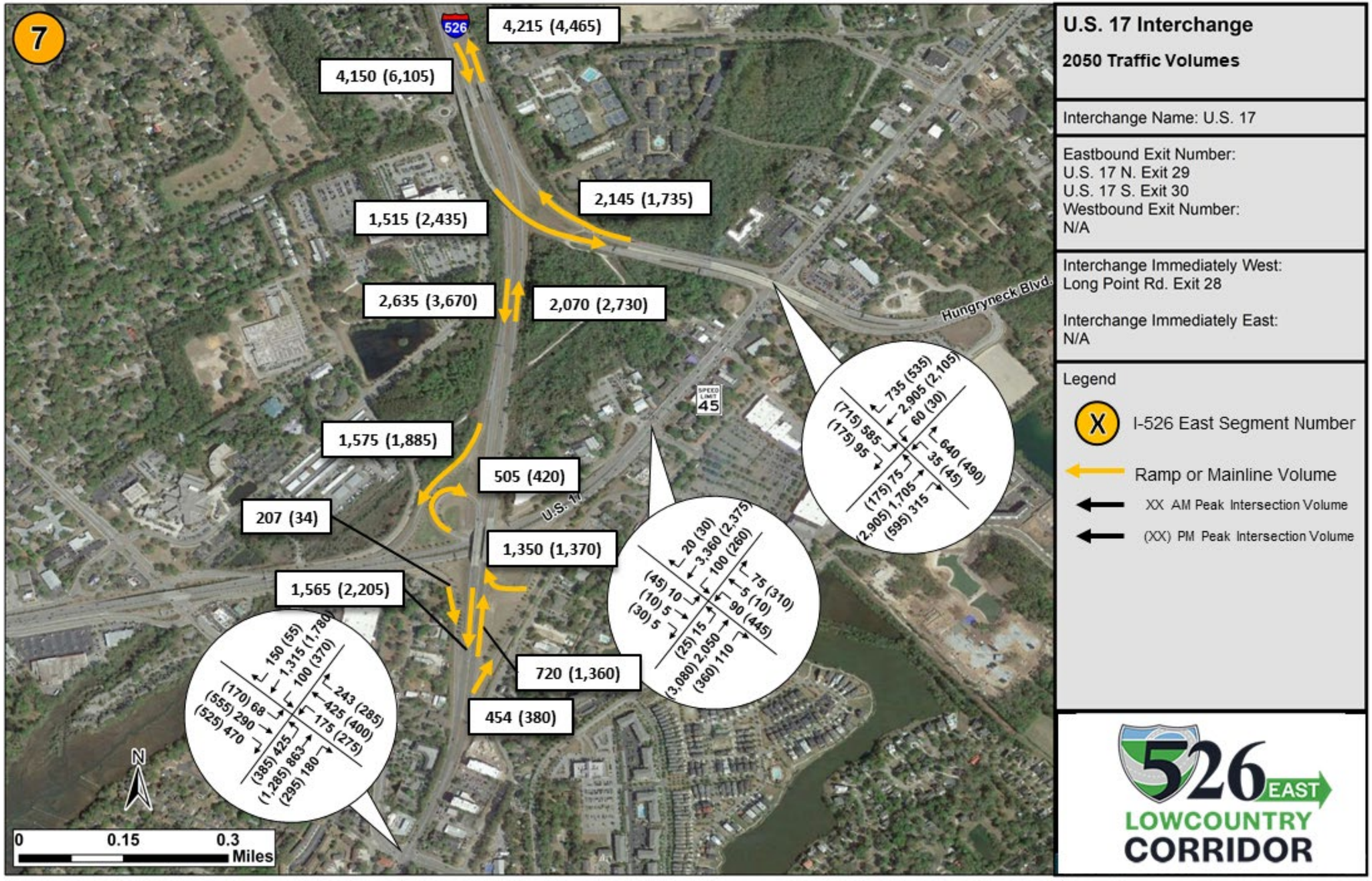
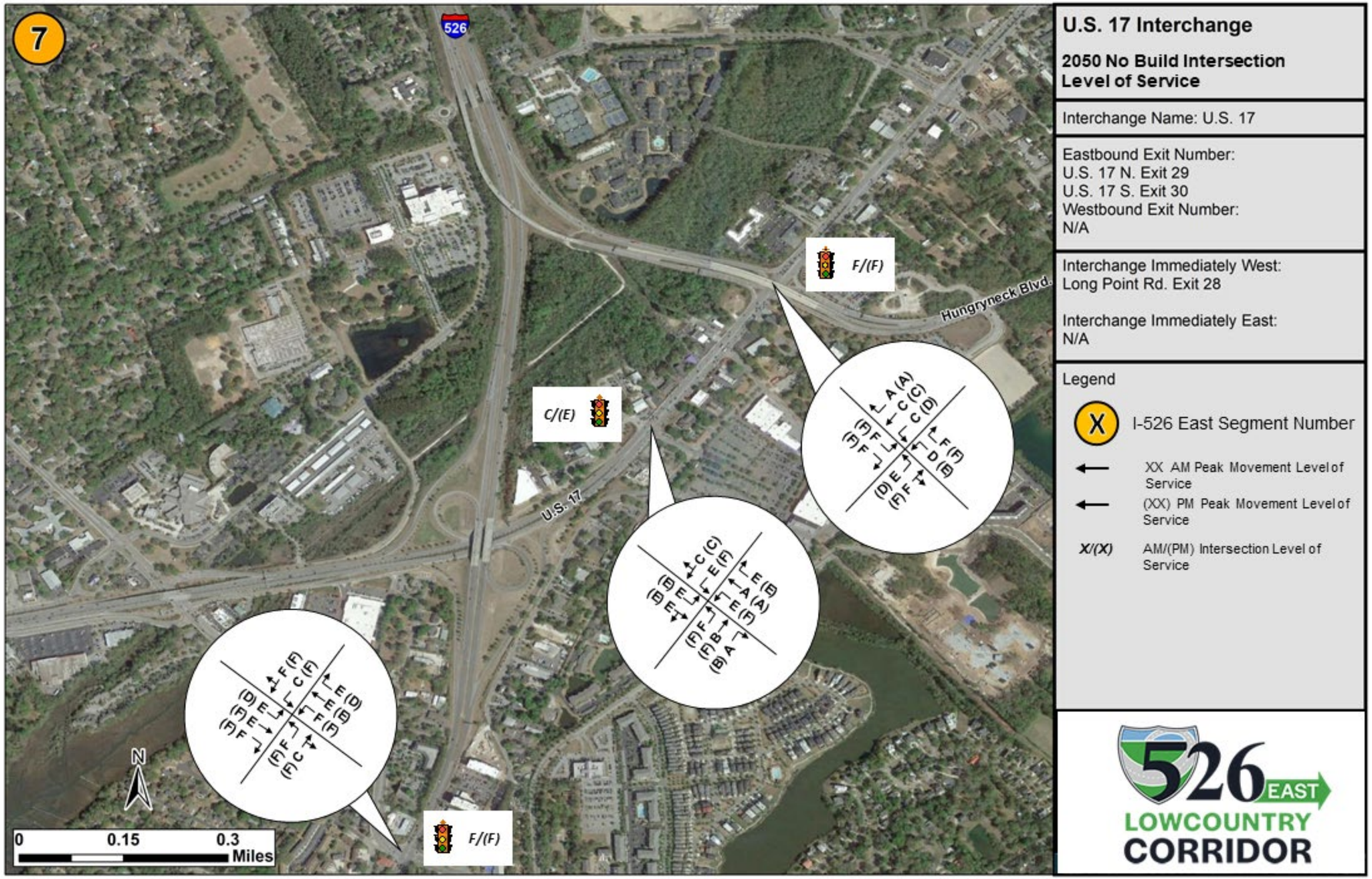


Figure 48: US 17 Interchange 2050 No Build Intersection Level of Service



4.1 2017 MAINLINE LOS ANALYSIS – 3 MAINLINE LANES PER DIRECTION

Since the 2050 No Build analysis results for I-526 show poor LOS for a majority of the corridor, the addition of 1 lane in each direction across the corridor (totaling 3 lanes per direction) was evaluated using HCS software. Under this scenario, it was assumed that the truck climbing lanes would be converted to general purpose lanes, maintaining 3 lanes on the bridges. The configuration of the interchanges was assumed to remain the same in order to focus on the effect of widening the interstate only. The HCS reports for this analysis are provided in **Appendix E**.

As **Figure 49** and **Figure 50** show, the LOS of failing segments could be improved to a D or better through the addition of 1 lane in each direction across the corridor. The westbound segment from Clements Ferry Road is anticipated to operate at LOS D in both periods, so this segment was further evaluated to determine a design life of the improvements, which is discussed in the next section.

Figure 49: AM Peak 2017 Additional Lane Level of Service Summary

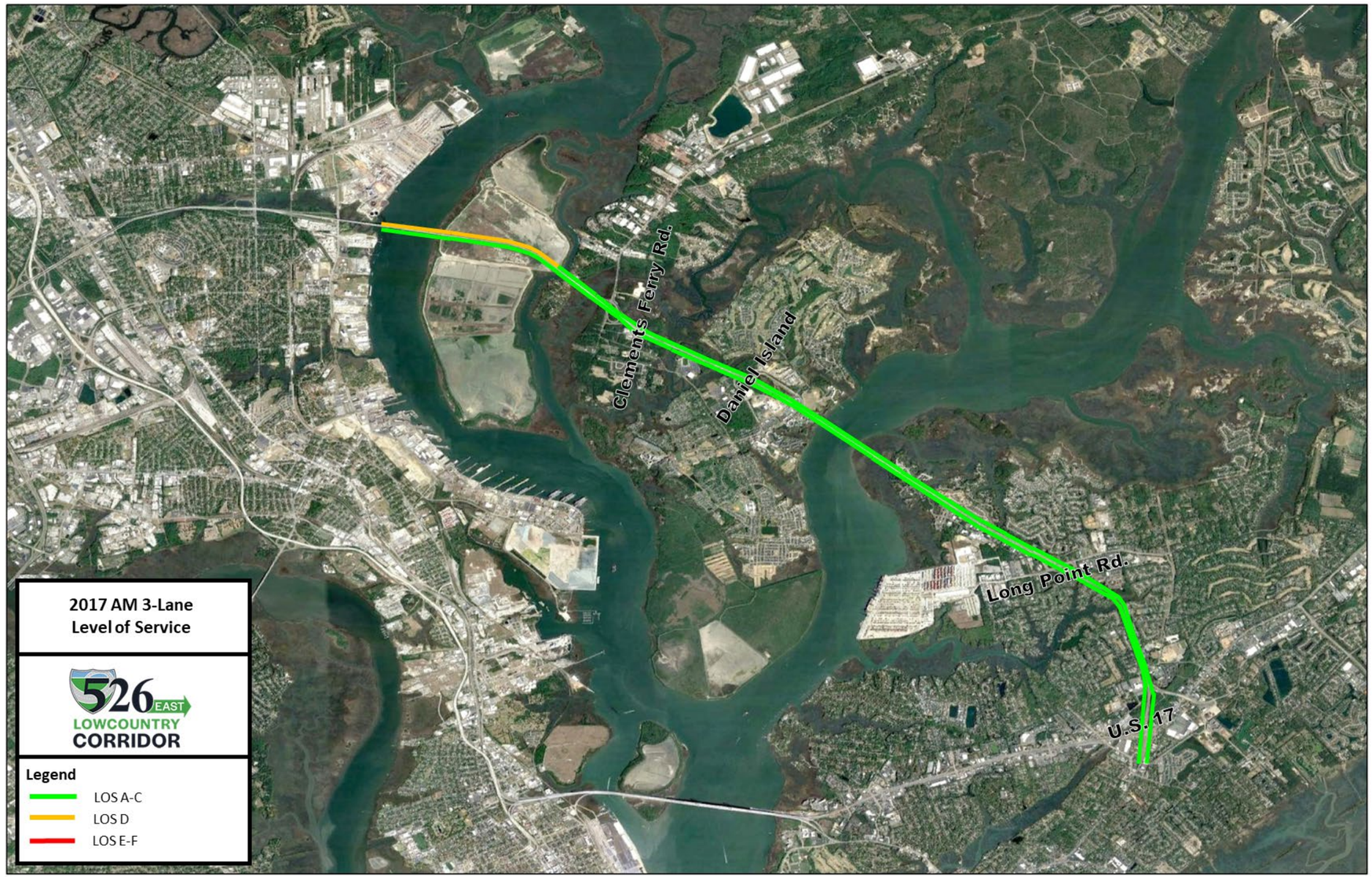
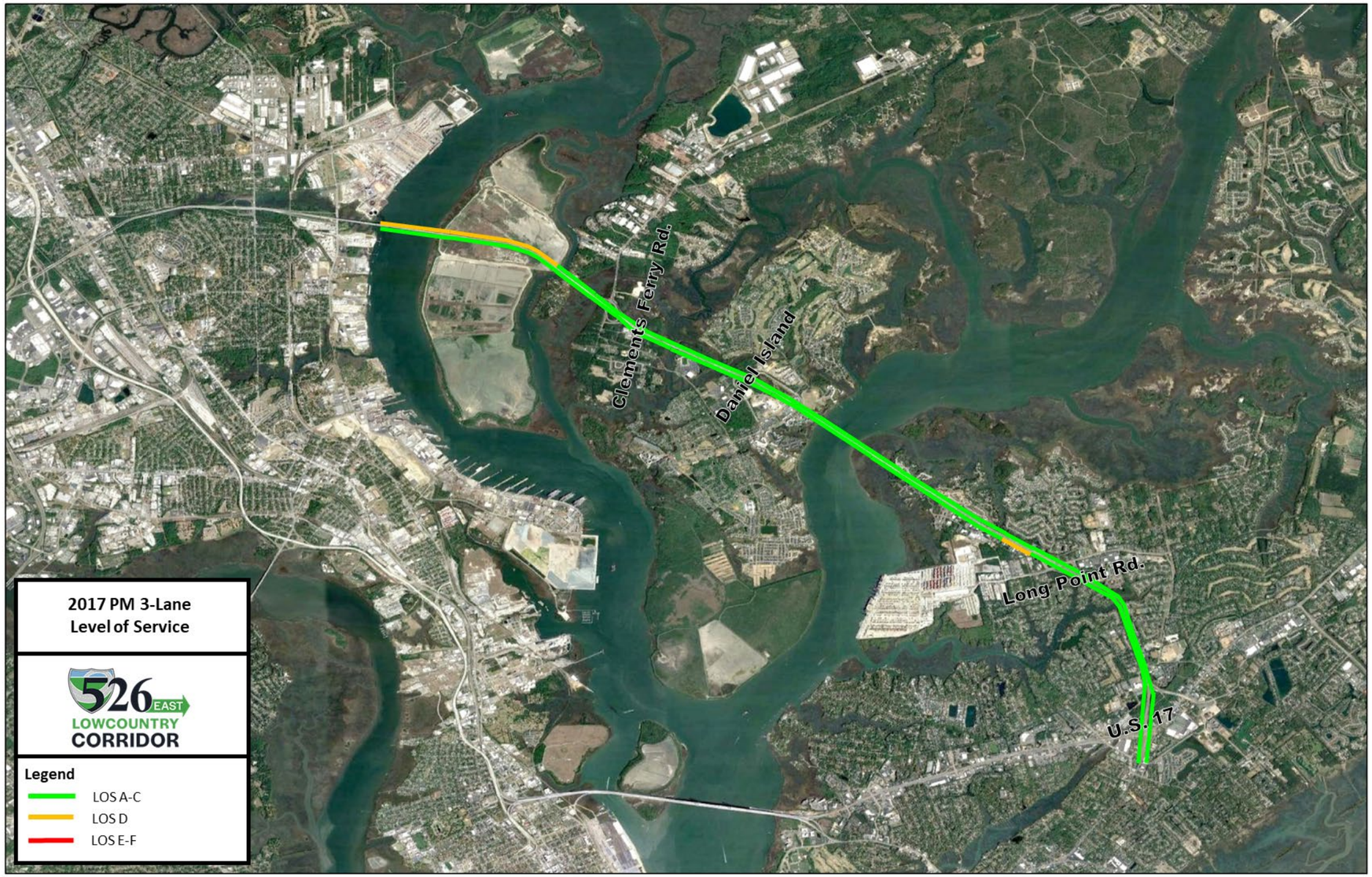


Figure 50: PM Peak 2017 Additional Lane Level of Service Summary



4.2 2050 Mainline LOS Analysis - 3 Mainline Lanes per Direction

Figure 51 and **Figure 52** show the capacity results of applying the 2050 volumes to a 3-lane cross section across the full study corridor. As the figures show, the additional lane in each direction does not completely mitigate congestion. The section between Clements Ferry Road and the western terminus of the study shows poor LOS in both directions during both peak periods. The section between Long Point Road and Clements Ferry Road also shows poor LOS, though only in one direction per period. The HCS reports for this analysis are provided in **Appendix F**.

Because the westbound segment from Clements Ferry Road is anticipated to operate at LOS D in both peak periods under 2017 volume conditions, this segment was further evaluated to determine a design life of the improvements. This evaluation showed that after increasing the number of interstate lanes in both directions by 1, the increase in traffic would reach LOS E after 5 years and LOS F after 13 years for this particular section.

Figure 51: AM Peak 2050 Additional Lane Level of Service Summary

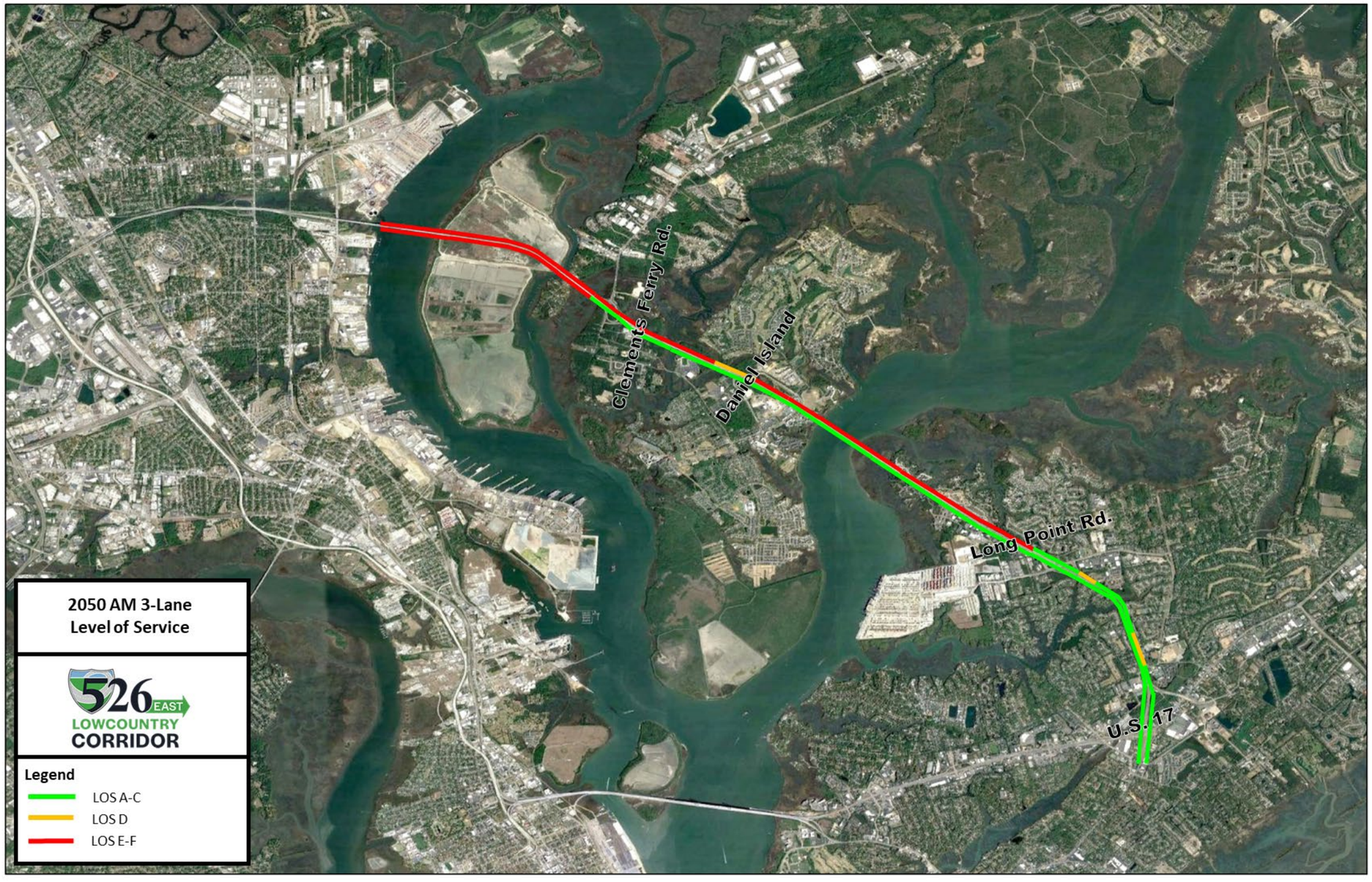
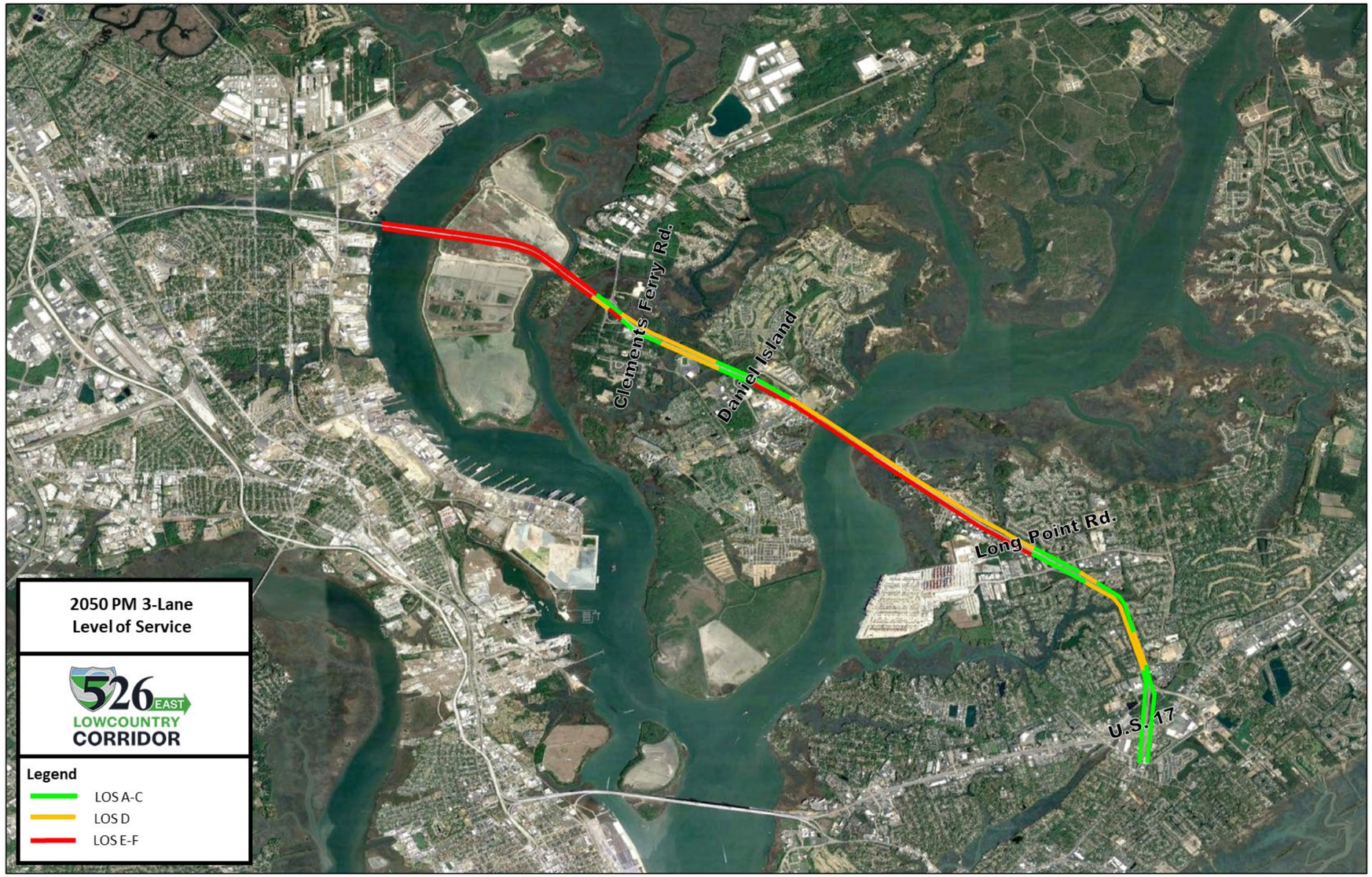


Figure 52: PM Peak 2050 Additional Lane Level of Service Summary



4.3 2050 Mainline LOS Analysis - 4 Mainline Lanes per Direction

As the previous sections show, application of a 3-lane cross section across the full corridor improves service but does not fully mitigate congestion conditions. Therefore a 4-lane cross section was evaluated with HCS software to determine the level of improvement on congestion. Previous assumptions regarding the truck climbing lanes, and no interchange modifications were included. The HCS reports for this analysis are provided in **Appendix G**.

As **Figure 53** and **Figure 54** show, the addition of 2 lanes in each direction across the corridor can improve large portions of the corridor to LOS D or better under 2050 projected volumes. The exception to this is the westbound segment from Clements Ferry Road. This segment is expected to operate under poor LOS conditions in both periods.

Given this result, this segment was again evaluated to determine a design life of the improvements. This evaluation showed that after increasing the number of interstate lanes in both directions by 2, the increase in traffic would reach LOS F after 23 years for this particular section.

Figure 53: AM Peak 2050 4 Lane Level of Service Summary

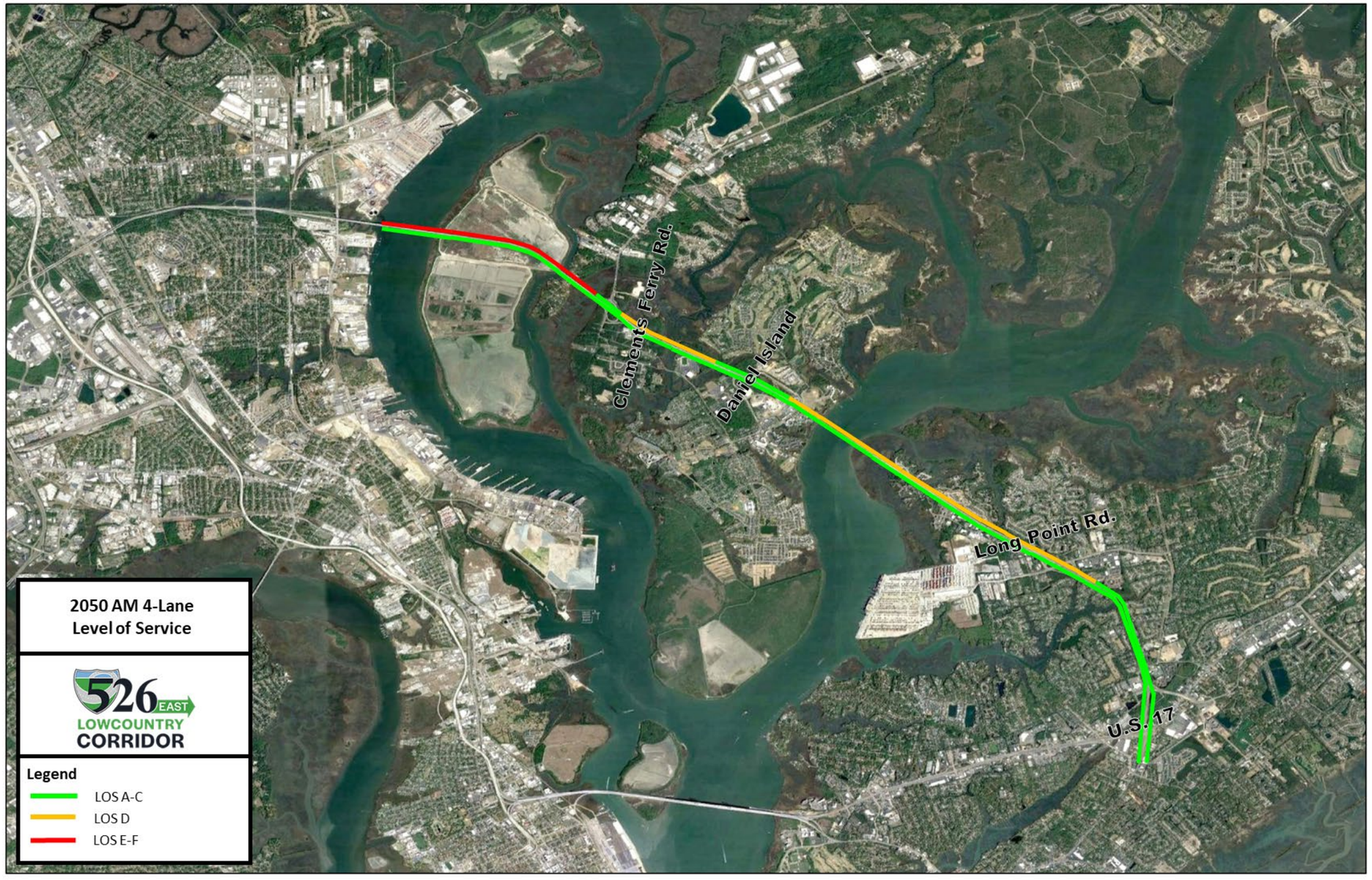
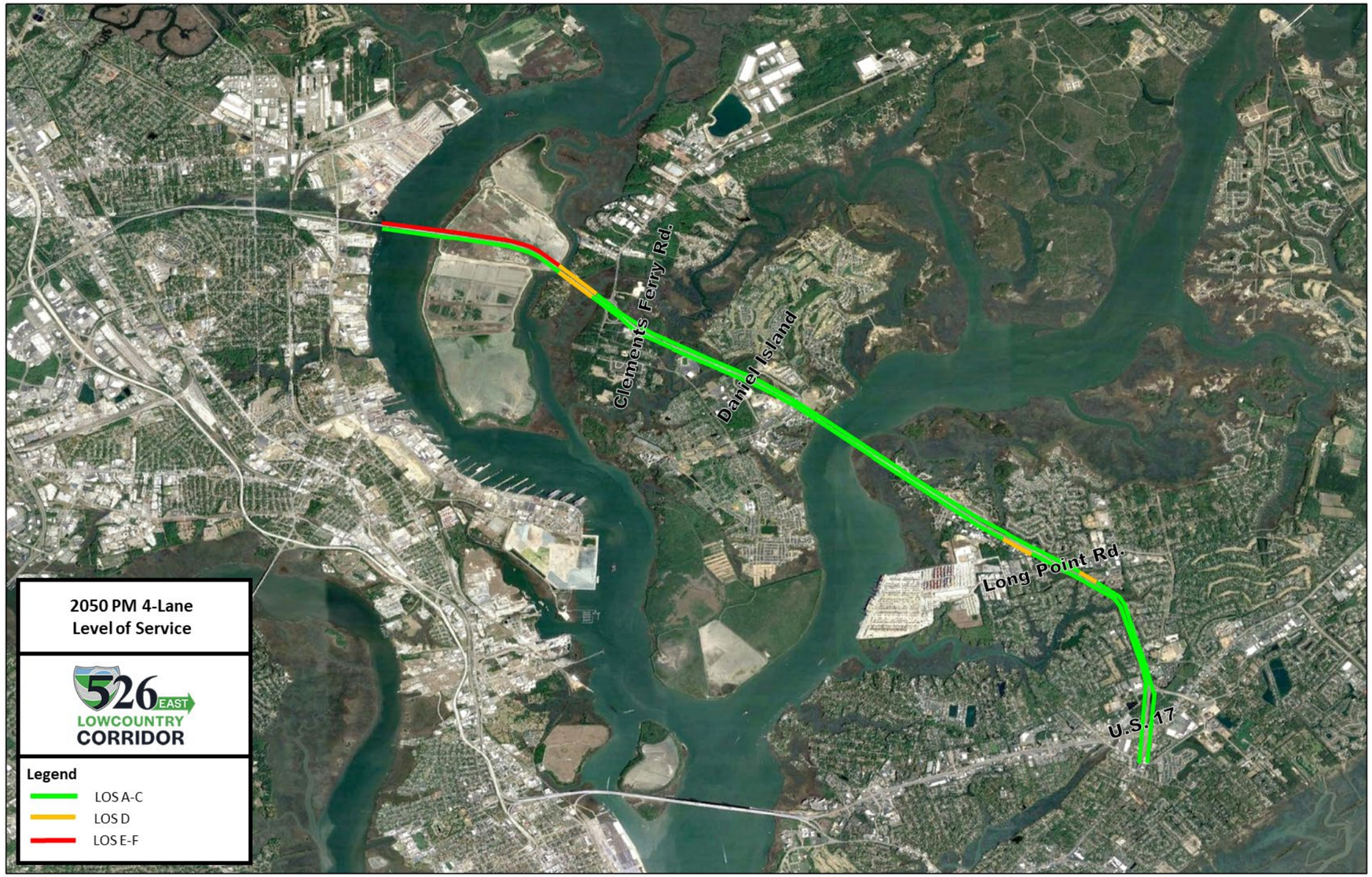


Figure 54: PM Peak 2050 4 Lane Level of Service Summary



4.4 Interchange Improvement Evaluation

The previous section shows that four mainline lanes per direction is preferable to three. Using this outcome, the interchanges and interchange ramp intersections within the study corridor were evaluated to determine the need for ramp lane additions and intersection modifications to improve future LOS. This analysis was performed using Vissim microsimulation software for the corridor segments and ramps and Synchro macrosimulation software for the study area intersections. The analysis assumed I-526 to be primarily four lanes in each direction with no truck climbing lanes.

The proposed improvements in this section do not include reconstruction of interchanges. Instead, effective improvements were evaluated within an expected limitation on right-of-way and other constraints. Proposals for additional interchange ramp lanes were made based on the expected volume and queuing at ramp intersections.

Additional ramp lanes are recommended at every study interchange. These recommendations include:

- Clements Ferry Road Interchange
  - One additional ramp lane for the eastbound cloverleaf Off-Ramp and On-Ramp
  - One additional ramp lane for the westbound Off-Ramp and On-Ramp
    - Additional ramp roadway lanes (4 total) to accommodate turning traffic from Clements Ferry Road
- Daniel Island Interchange
  - One additional ramp lane for the eastbound On-Ramp
  - One additional ramp lane for the westbound Off-Ramp
- Long Point Road Interchange
  - One additional ramp lane for the eastbound Off-Ramp
  - One additional ramp lane for the westbound On-Ramp
- U.S. 17 Interchange
  - One additional ramp lane for the eastbound Off-Ramp to Hungryneck Boulevard
  - One additional ramp lane for the westbound On-Ramp from Hungryneck Boulevard
  - One additional ramp lane for the eastbound Off-Ramp to U.S. 17

Figure 55 and **Figure 56** the expected LOS conditions from corridor and ramp improvements.

Recommendations for intersection modifications are listed below. Intersections beyond the interchange were included based on their proximity to the interchange and potential for network impact.

- Clements Ferry Road @
  - Beresford Run
    - Signalize and coordinate the intersection*
    - Add an exclusive southbound left-turn lane on Clements Ferry Road
    - Widen and restripe the westbound approach to delineate exclusive left- and right-turn lanes on Beresford Run
  - Marina Drive
    - Signalize and coordinate the intersection*
    - Add an exclusive eastbound right-turn lane on Marina Drive
  - I-526 Westbound Ramps
    - Convert the exclusive southbound right-turn lane to a channelized yield lane and add an additional right turn lane
    - Install a second exclusive northbound left-turn lane on Clements Ferry Road
    - Add a second westbound receiving lane on the I-526 WB On-Ramp for the northbound left-turn
    - Add a second westbound right turn only lane to the Off-Ramp
  - I-526 Eastbound Ramps
    - Signalize and coordinate the intersection*
    - Install exclusive southbound dual left-turn lanes on Clements Ferry Road and an additional receiving lane on the I-526 EB On-Ramp
  - St. Thomas Island Drive
    - Signalize and coordinate the intersection*
    - Install exclusive southbound dual left-turn lanes on Clements Ferry Road with appropriate receiving lanes
    - Install westbound channelized yield right-turn lane on St. Thomas Island Drive
  - Widen Clements Ferry Road to a six-lane cross-section from Beresford Run to the I-526 Eastbound Ramps
- Seven Farms Drive @ Island Park Drive
  - Add an exclusive eastbound right-turn lane on Seven Farms Drive
  - Add an exclusive southbound right-turn lane on Island Park Drive
- River Landing Drive @
  - Island Park Drive
    - Signalize the intersection*
  - Fairchild Street
    - Install a second exclusive eastbound left-turn lane on Fairchild Street
    - Install an exclusive eastbound right-turn lane on Fairchild Street
    - Install an exclusive westbound right-turn lane on Fairchild Street
    - Add a northbound through lane and receiving lane on River Landing Drive
- Long Point Road @
  - Wando Park Boulevard/Hobcaw Bluff Drive
    - Add an eastbound through lane and receiving lane on Long Point Road
    - Widen the intersection to accommodate simultaneous opposing left turn movements from Hobcaw Bluff Drive and Wando Park Boulevard and remove split phase operation
    - Add an exclusive northbound left-turn lane and convert the existing through/left-turn lane into an exclusive through lane on Hobcaw Bluff Drive
    - Install a second exclusive southbound left-turn lane and convert the existing left/through/right-turn lane to a through/right-turn lane on Wando Park Boulevard
  - I-526 Eastbound Ramps
    - Install a third exclusive southbound left-turn lane on the I-526 eastbound Off-Ramp
    - Add a third eastbound lane on Long Point Road between the I-526 eastbound On-Ramp and the I-526 westbound cloverleaf On-Ramp
  - I-526 Westbound Ramps
    - None - projected to operate at LOS D or better under 2050 No Build conditions
  - Belle Hall Parkway
    - Signalize the intersection*
    - Install a second exclusive eastbound left-turn lane on Long Point Road
  - Belle Point Drive
    - Install a second exclusive northbound left-turn lane on Belle Point Drive
    - Install a second exclusive southbound right-turn lane on Belle Point Drive
- U.S. 17 @
  - Hungryneck Boulevard
    - Install a third exclusive eastbound left-turn lane on Hungryneck Boulevard
    - Install two additional exclusive westbound right-turn lanes on Hungryneck Boulevard
  - Ira Road
    - Widen the intersection to accommodate simultaneous opposing left-turn movements from Ira Road and remove split phase operation
    - Install a second exclusive westbound left-turn lane on Ira Road
    - Install a second exclusive southbound left-turn lane on U.S. 17
  - Bowman Road
    - Install a second exclusive northbound left-turn lane on Chuck Dawley Boulevard
    - Install a second exclusive southbound left-turn lane on Chuck Dawley Boulevard
    - Install exclusive eastbound and westbound channelized right-turn lanes on Bowman Road
    - Install exclusive northbound and southbound right-turn lanes

These changes are indicated in red in Figures 57, 59, 61 and 63. Figures 58, 60, 62 and 64 show the resulting LOS with mitigation. The Synchro reports for this analysis are provided in **Appendix H**. A table of Vissim outputs for the corridor and ramps is provided in **Appendix I**.

** Signal may be installed when warranted.*

Figure 55: Projected 2050 AM Level of Service with Improvements

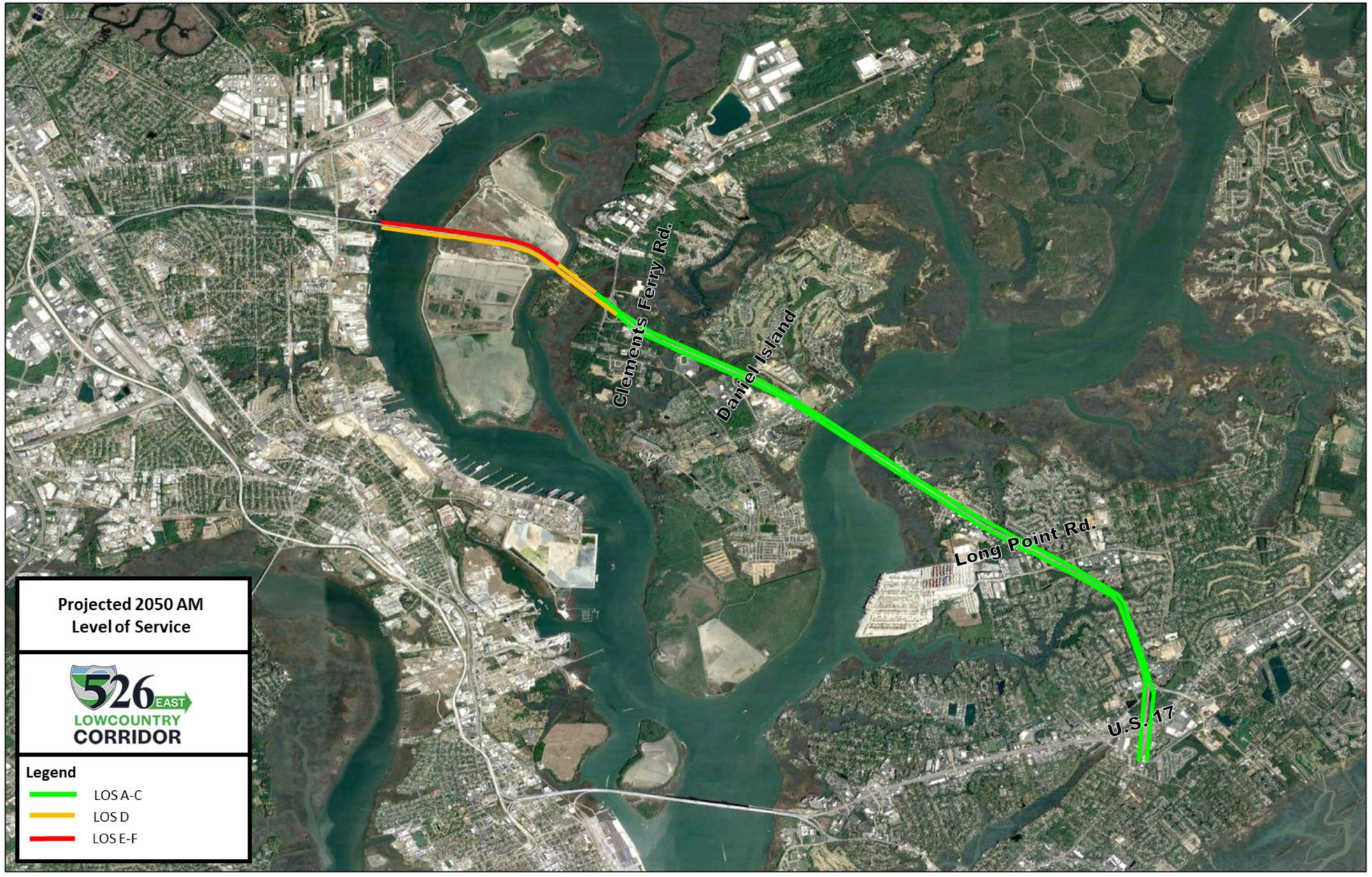


Figure 56: Projected 2050 PM Level of Service with Improvements

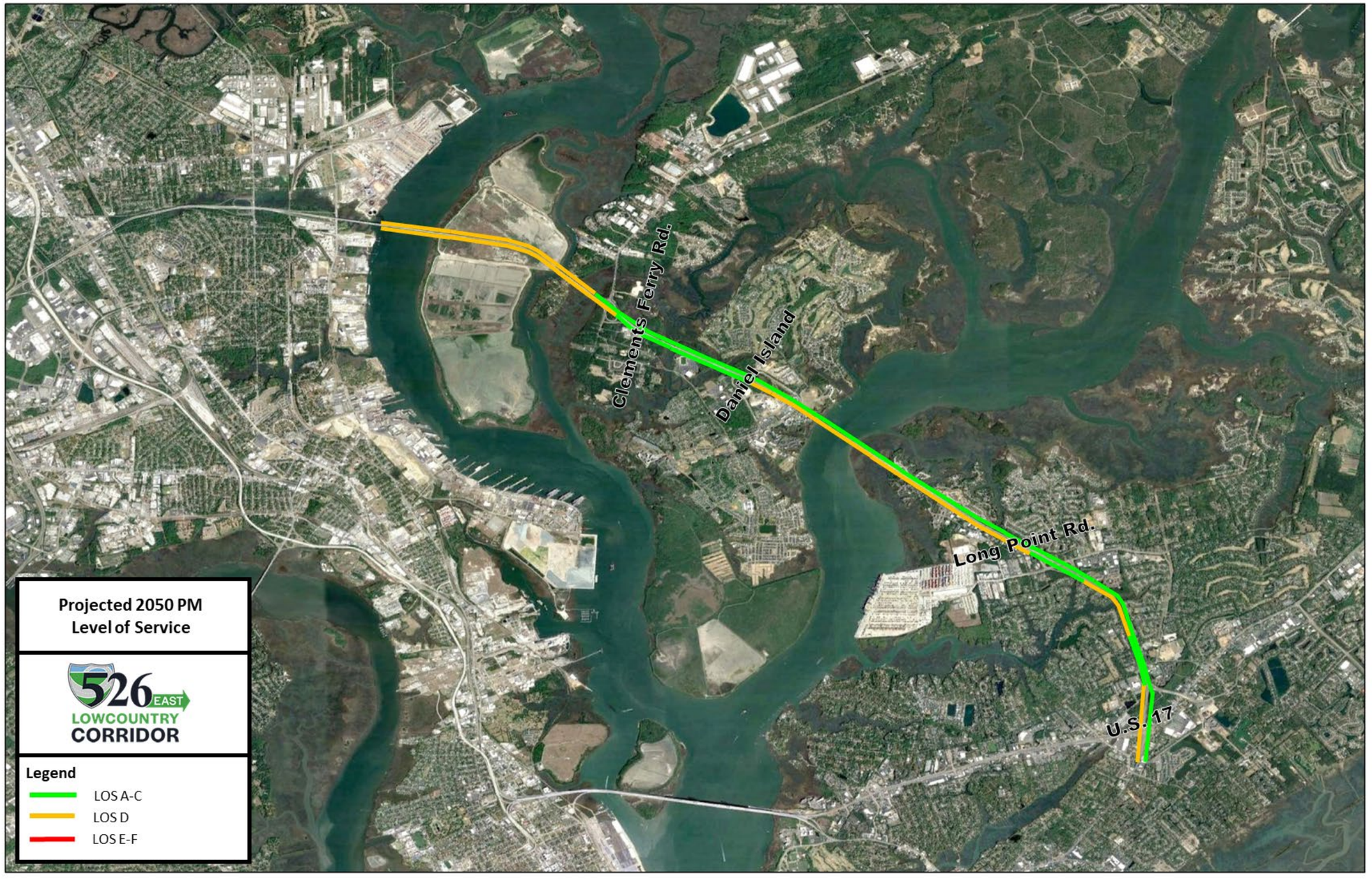


Figure 57: Recommended Improvements - Clements Ferry Road Interchange

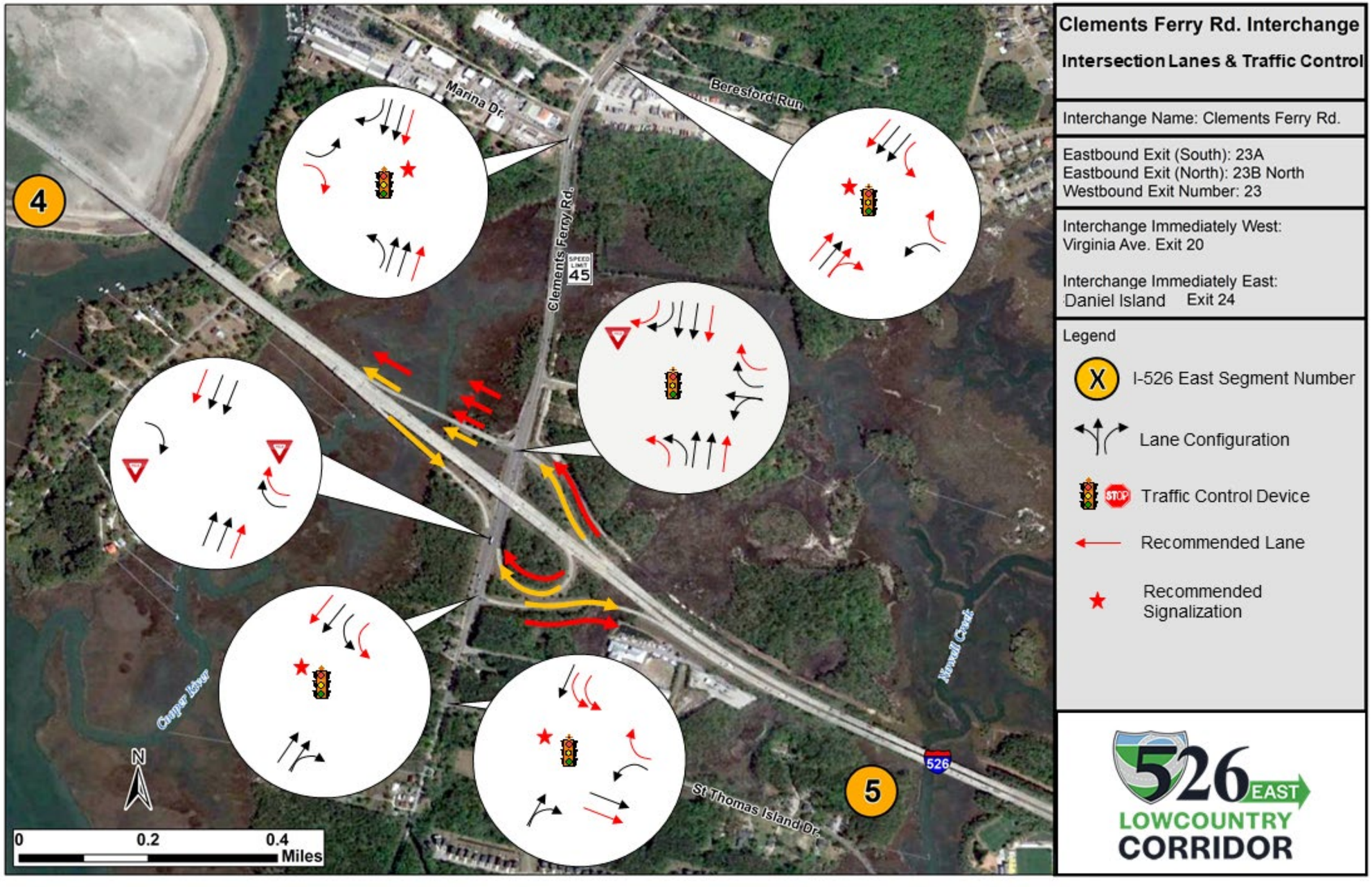


Figure 58: 2050 Build LOS - Clements Ferry Road Interchange

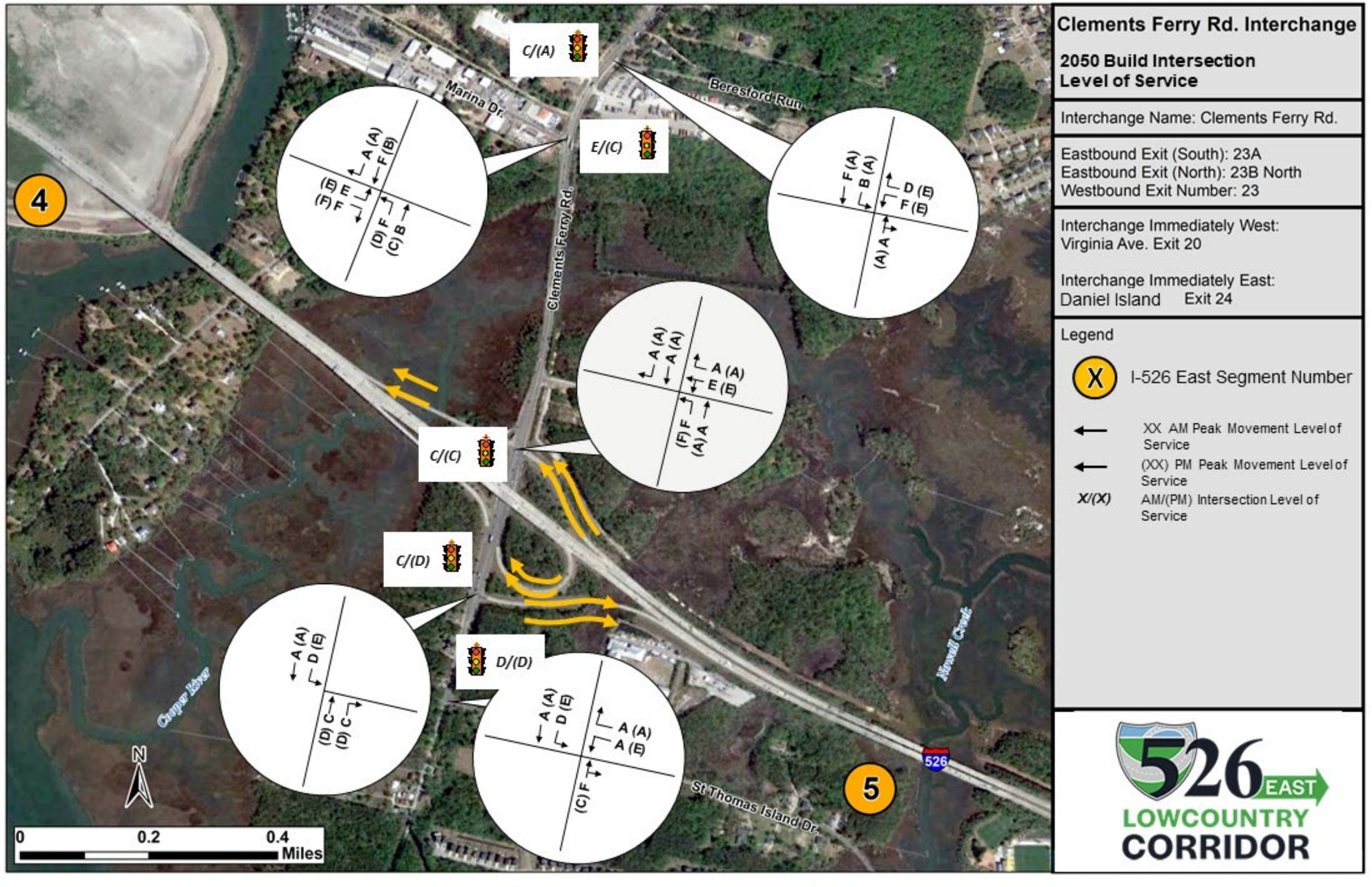


Figure 59: Recommended Improvements – Daniel Island Interchange

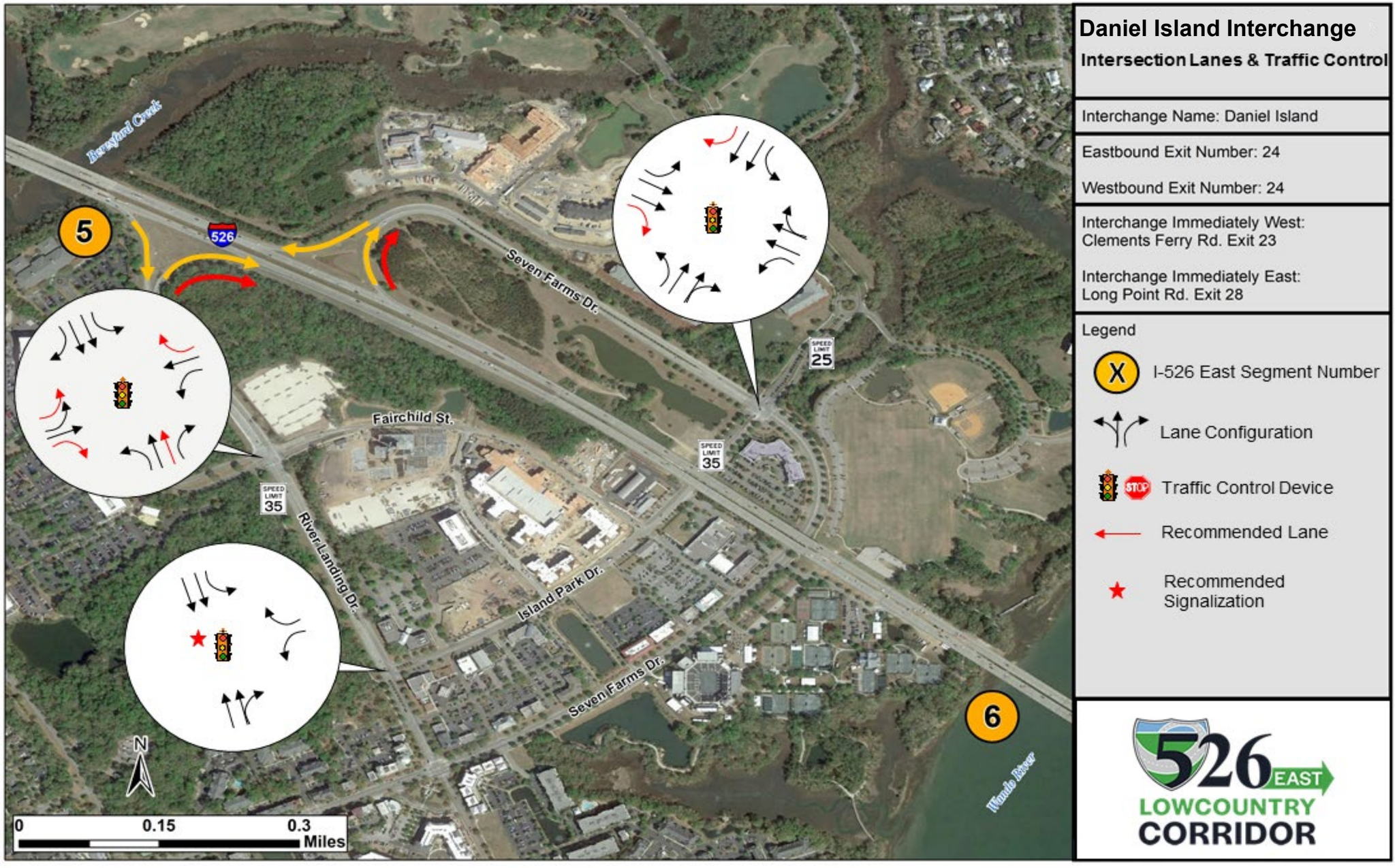


Figure 60: 2050 Build LOS - Daniel Island Interchange

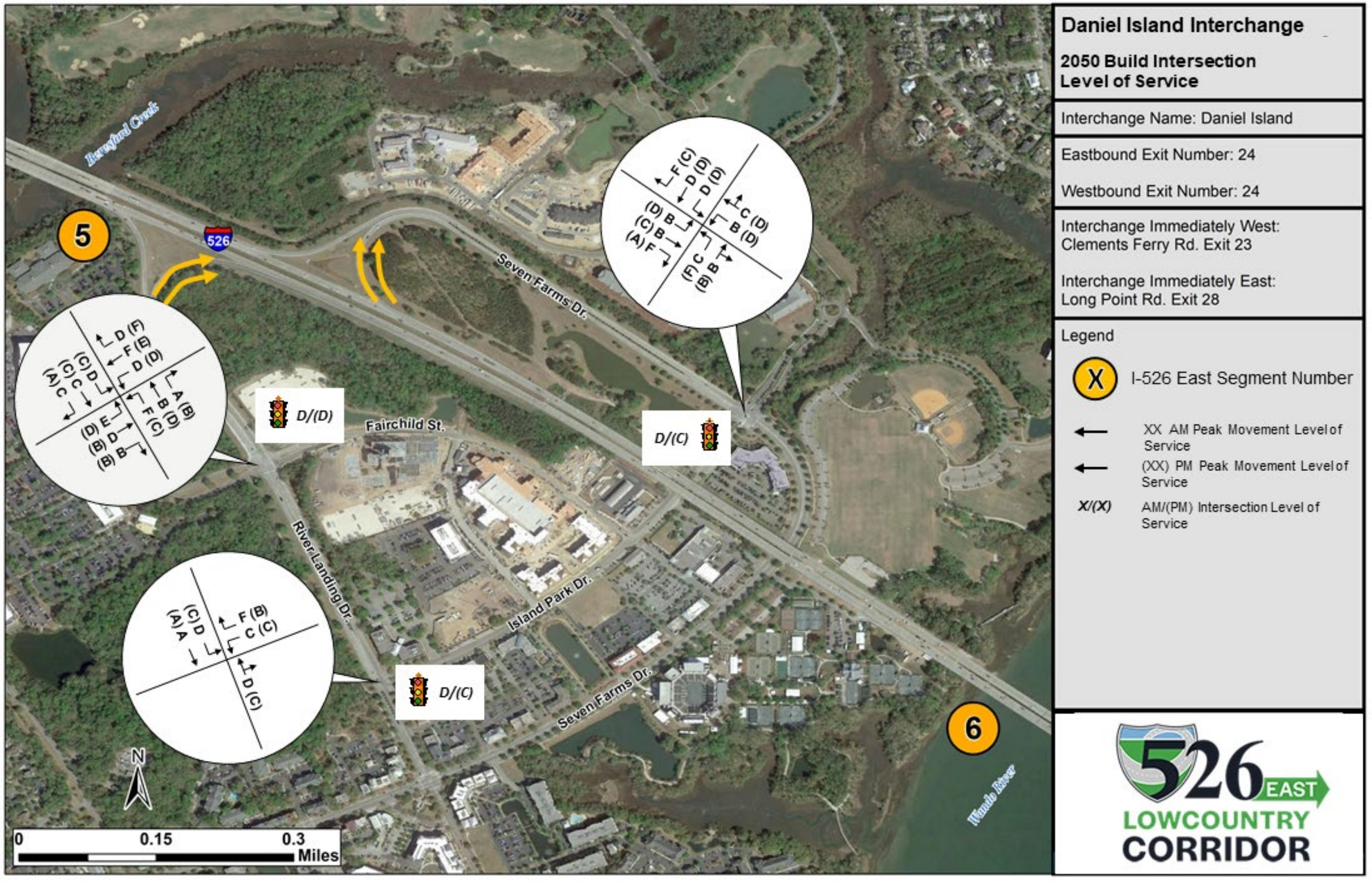


Figure 61: Recommended Improvements - Long Point Road Interchange

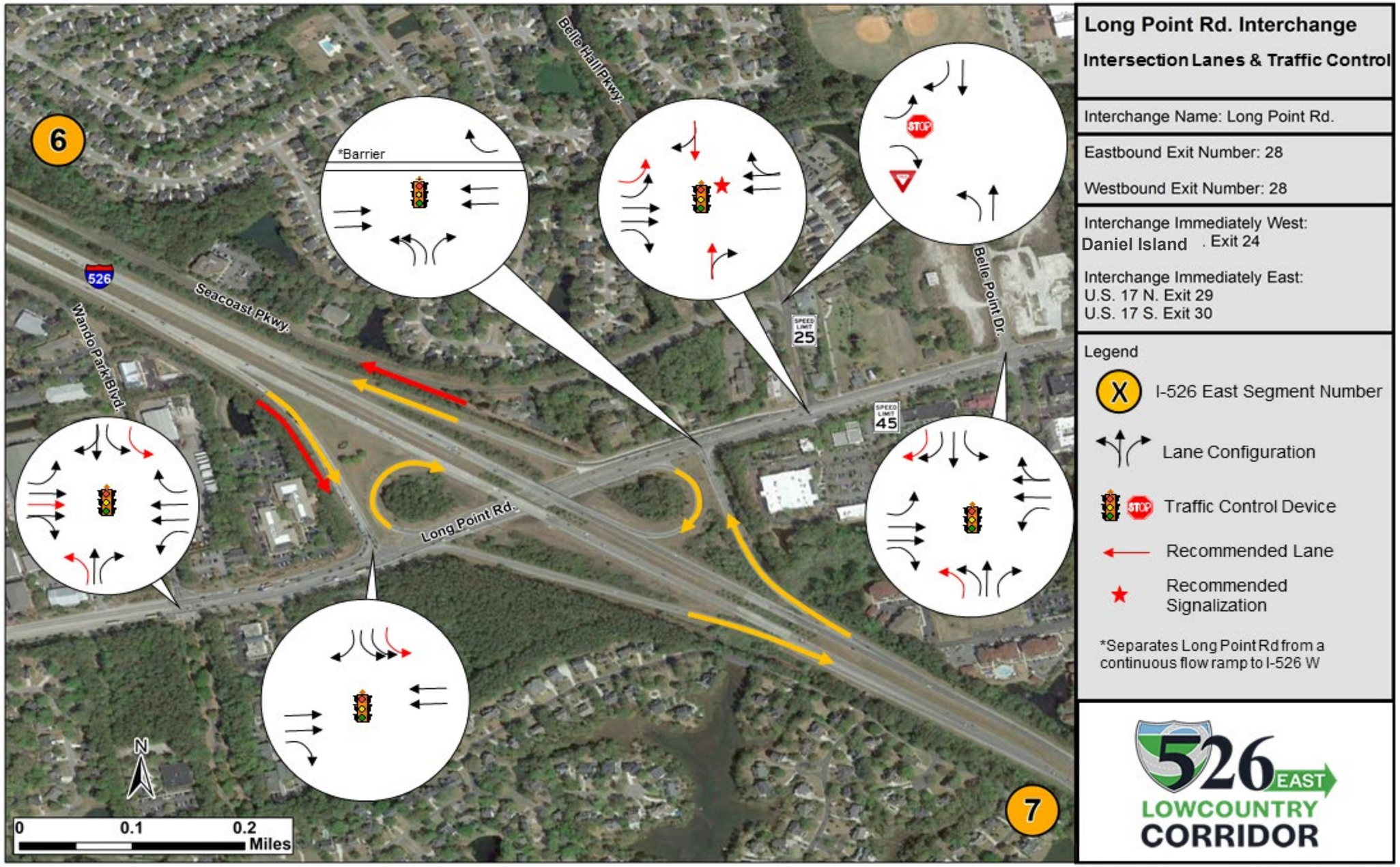


Figure 62: 2050 Build LOS - Long Point Road Interchange

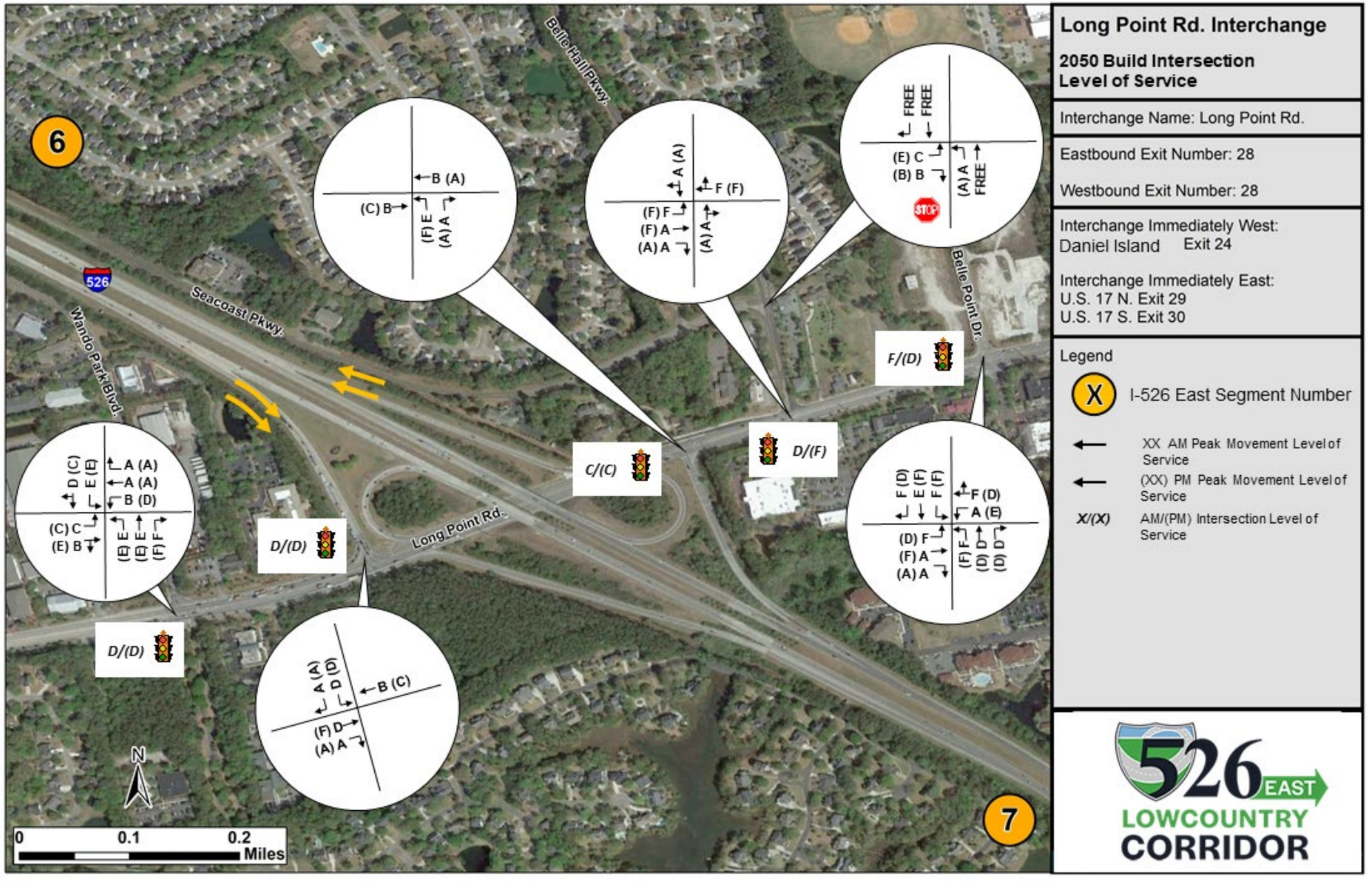


Figure 63: Recommended Improvements - U.S. 17 Interchange

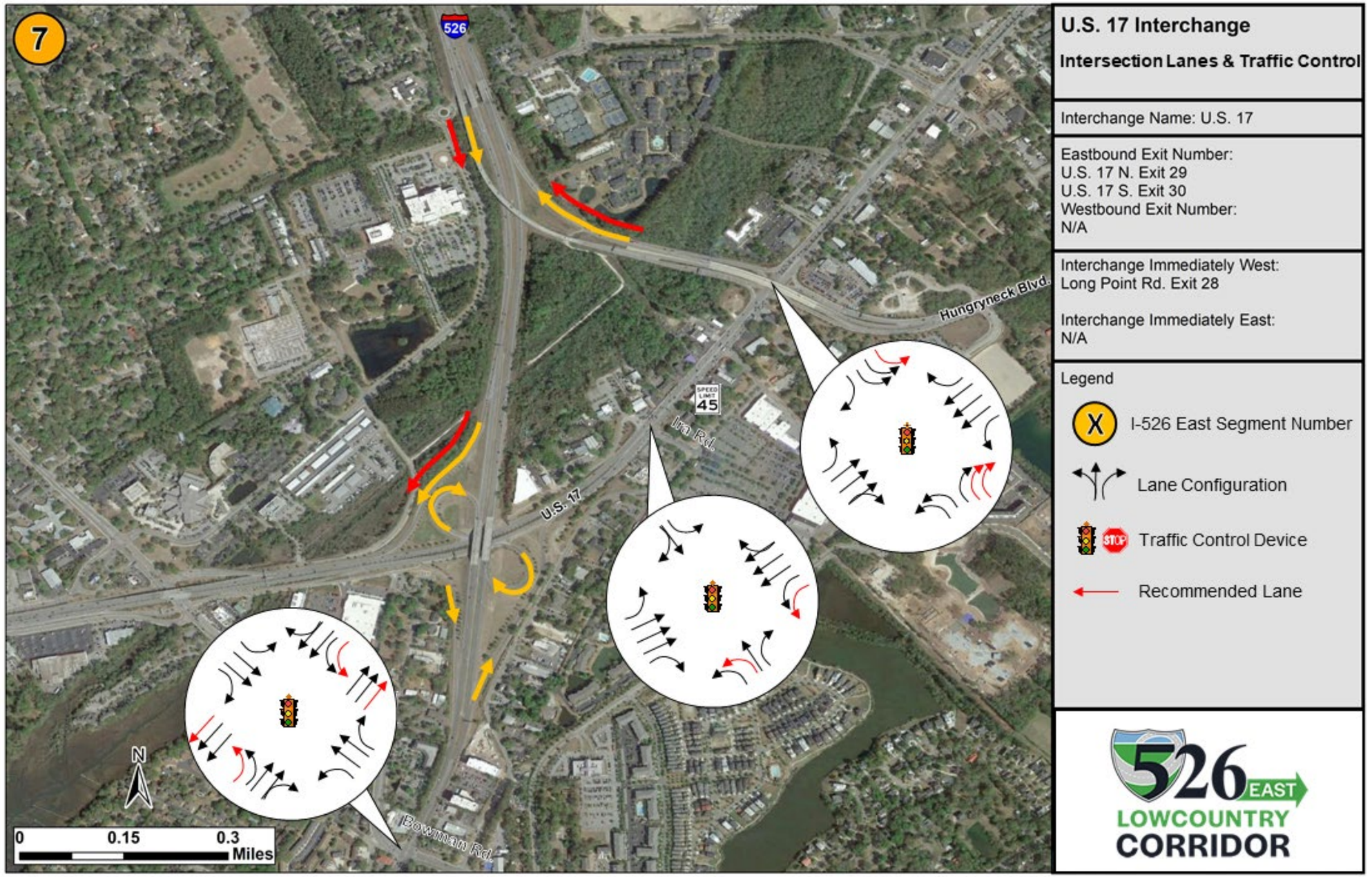
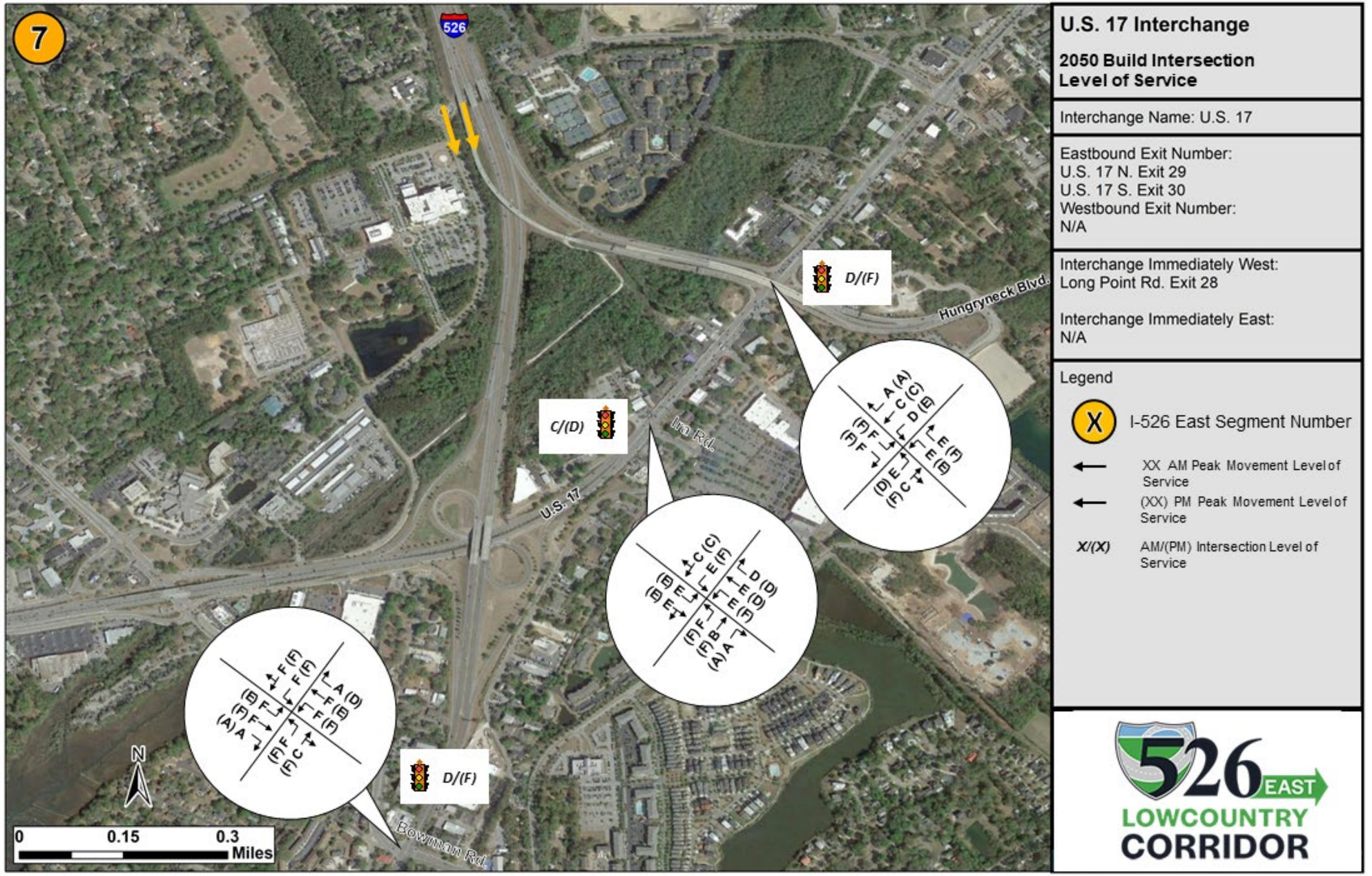


Figure 64: 2050 Build LOS – U.S. 17 Interchange



This report summarizes traffic analysis efforts used to determine potential design improvements for the I-526 LCC East corridor and its interchanges, evaluating 2017 and 2050 conditions. Based on the projected 2050 volumes, it is recommended that the I-526 LCC East corridor be widened to four lanes in each direction between its western terminus at the Don Holt Bridge and mile point 28.6 (approximate) where the ramps diverge to the Hungryneck Boulevard interchange. From this point to the U.S. 17 interchange, it is recommended that the corridor be widened to three lanes in each direction. The mainline lanes should be reduced to two in the eastbound direction at Exit 30 and increased from two to three in the westbound direction at the first cloverleaf on-ramp following Exit 30. This widening assumes no truck climbing lanes.

Additional ramp lanes are recommended at every study interchange. These recommendations include:

- Clements Ferry Road Interchange
  - One additional ramp lane for the eastbound cloverleaf Off-Ramp and On-Ramp
  - One additional ramp lane for the westbound Off-Ramp and On-Ramp
    - Additional ramp roadway lanes (4 total) to accommodate turning traffic from Clements Ferry Road
- Daniel Island Interchange
  - One additional ramp lane for the eastbound On-Ramp
  - One additional ramp lane for the westbound Off-Ramp
- Long Point Road Interchange
  - One additional ramp lane for the eastbound Off-Ramp
  - One additional ramp lane for the westbound On-Ramp
- U.S. 17 Interchange
  - One additional ramp lane for the eastbound Off-Ramp to Hungryneck Boulevard
  - One additional ramp lane for the westbound On-Ramp from Hungryneck Boulevard
  - One additional ramp lane for the eastbound Off-Ramp to U.S. 17

Additional lanes and operational improvements are recommended at each study intersection except the intersection of Long Point Road with the I-526 Westbound Ramps, which is projected to operate at LOS D or better under 2050 No Build conditions. The study area intersections include:

- Clements Ferry Road @
  - Beresford Run
  - Marina Drive
  - I-526 Westbound Ramps
  - I-526 Eastbound Ramps
  - St. Thomas Island Drive
- Seven Farms Drive @ Island Park Drive
- River Landing Drive @
  - Island Park Drive
  - Fairchild Street
- Long Point Road @
  - Wando Park Boulevard/Hobcaw Bluff Drive
  - I-526 Eastbound Ramps
  - I-526 Westbound Ramps
  - Belle Hall Parkway
  - Belle Point Drive
- U.S. 17 @
  - Hungryneck Boulevard
  - Ira Road
  - Bowman Road

Lane and operational recommendations for these intersections are detailed in **Section 4.4**. **Figure 65** illustrates the proposed additional interstate lanes, ramp lanes, and cross street through lanes, as well as proposed signalization.

The analysis shows that congestion may persist in the AM period for the westbound segment from Clements Ferry Road to the Don Holt Bridge. Interchanges to the west of the study area may require further investigation to improve traffic flow for this period.

Figure 65: Illustration of Proposed Lane and Operational Improvements