General Services Administration and Department of Homeland Security

THE DHS HEADQUARTERS CONSOLIDATION AT ST. ELIZABETHS

FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX D Part 1 of 2

WASHINGTON, DC

AUGUST 2020

APPENDIX D
Transportation Technical Report

U.S. Department of Homeland Security Headquarters at St. Elizabeths West Campus Master Plan Amendment 2 **FINAL** Supplemental Environmental Impact Statement

Transportation Technical Report

Final Version

August 2020

Prepared by
Jacobs Engineering Group Inc.

Prepared for
U.S. General Services Administration

U.S. Department of Homeland Security Headquarters at St. Elizabeths West Campus Master Plan Amendment 2 Final Supplemental Environmental Impact Statement
Transportation Technical Report

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1 INTRODUCTION AND BACKGROUND

1.1 Introduction

The U.S. General Services Administration (GSA) has prepared a Draft Supplemental Environmental Impact Statement (EIS) to assess impacts of the proposed Master Plan Amendment 2 to the Department of Homeland Security (DHS) Headquarters Consolidation at St. Elizabeths Master Plan completed in November 2008 (hereafter "Master Plan").

The Master Plan was amended in 2012 (Master Plan Amendment 1) to specify development on the St. Elizabeths East Campus (East Campus) North Parcel to house the Federal Emergency Management Agency (FEMA). The proposed Master Plan Amendment 2 eliminates development on the East Campus and reevaluates development on the St. Elizabeths West Campus (West Campus) to accommodate 4.1 million gross square feet (gsf) of secure office and shared-use space and 1.6 million gsf of associated parking on the West Campus only.

GSA has performed a transportation study to evaluate the changes to the transportation conditions in the St. Elizabeths area as a result of Master Plan Amendment 2. To support the Draft Supplemental EIS, this Transportation Technical Report (TTR) documents the process and results from this study. Specifically, it includes the following components:

- Existing traffic operations and safety conditions in the St. Elizabeths area;
- Forecasted traffic volumes for future scenarios under No Action and Action conditions;
- Technical analysis and information in support of the development of the transportation alternatives;
- Traffic data needed for noise and air quality analysis to support the National Environmental Policy Act (NEPA) efforts; and
- Future traffic operations and safety conditions under No Action and Action scenarios.

This report builds upon the previous TTR prepared for the 2012 Final Environmental Impact Statement (2012 EIS) in support of Master Plan Amendment 1. Throughout this report, transportation conditions associated with the 2012 TTR for Master Plan Amendment 1 are referred to as the No Action Alternative, while transportation conditions associated with Master Plan Amendment 2 are referred to as the Action Alternative[1].

1.2 Project Location and Study Boundaries

1.2.1 Project Location

St. Elizabeths is located in Ward 8 which is in the southeast quadrant of the District of Columbia (District). The site is adjacent to the Congress Heights community and overlooks Joint Base Anacostia-Bolling (JBAB) and the Anacostia River (**Figure 1-1**).

[1] The "Action Alternative" refers to Alternatives A and B for the Draft Supplemental EIS. The traffic impacts for Alternatives A and B of the Draft Supplemental EIS would be identical.

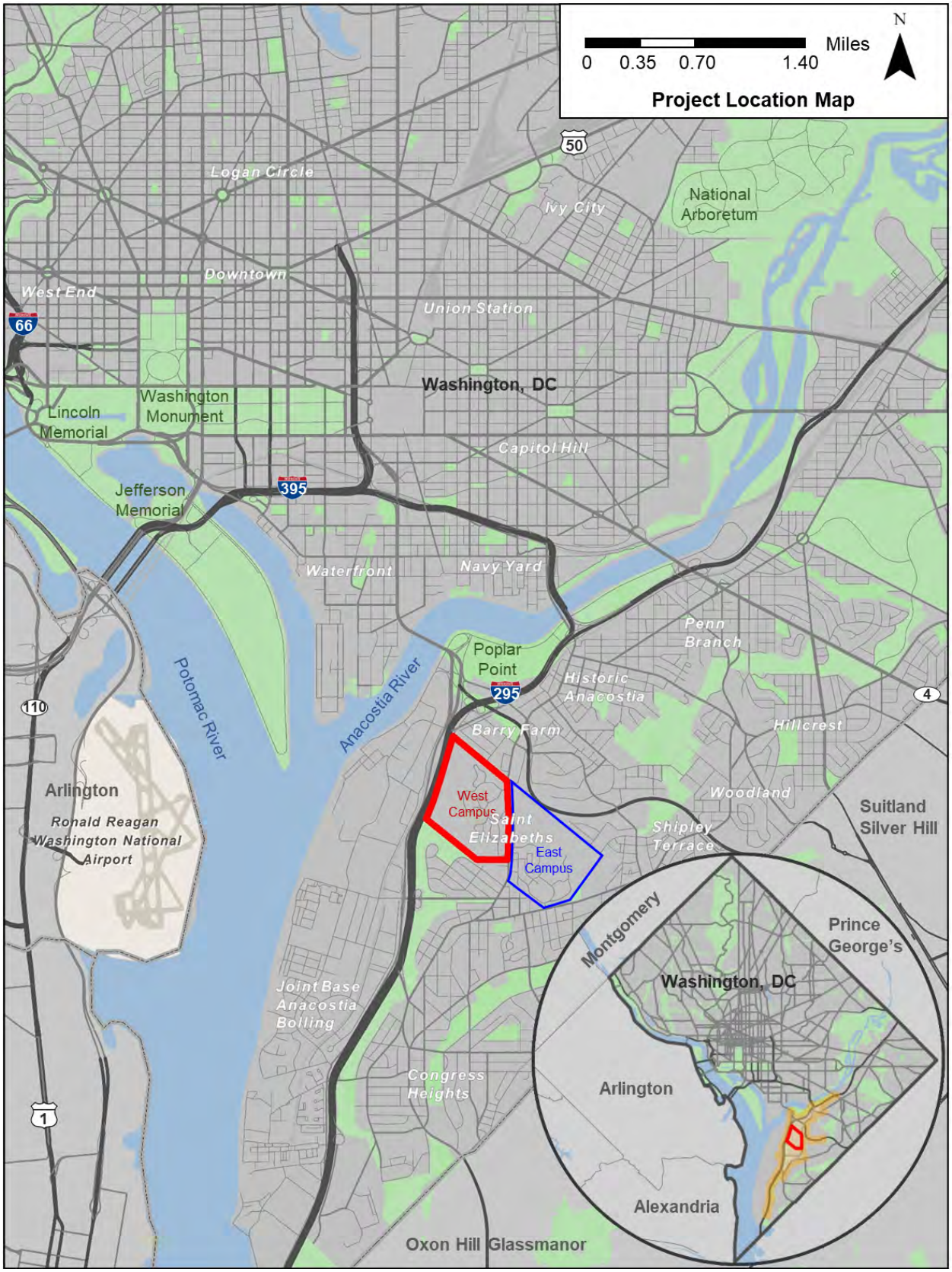

Figure 1-1: Project Location Map

St. Elizabeths is composed of two campuses, East and West, located on either side of Martin Luther King Jr. Avenue SE. The West Campus is a 176-acre former mental health facility that is bounded by residential communities to the north and south (Barry Farm and Congress Heights, respectively); Martin Luther King Jr. Avenue SE to the east; I-295 to the west; and Shepherd Parkway (i.e., National Park Service lands) to the southwest (**Figure 1-2**). Demolition and construction under Master Plan Amendment 2 is proposed on the West Campus only. The East Campus, located on the east side of Martin Luther King Jr. Avenue SE, is owned by the District. Master Plan Amendment 2 proposes eliminating the GSA's development on the East Campus North Parcel and incorporating it into the West Campus. In its stead, the District is planning a new development including a 150-bed new hospital with 230,000 sf ambulatory services, an 801 East Men's Shelter (380-bed low-barrier shelter) and an 800-space parking garage in the North Parcel. The St. Elizabeths East and West Campuses are designated as a National Historical Landmark (NHL), including the brick wall running along Martin Luther King Jr. Avenue SE on the West Campus grounds. **Figure 1-3** illustrates the existing land use in the St. Elizabeths area.

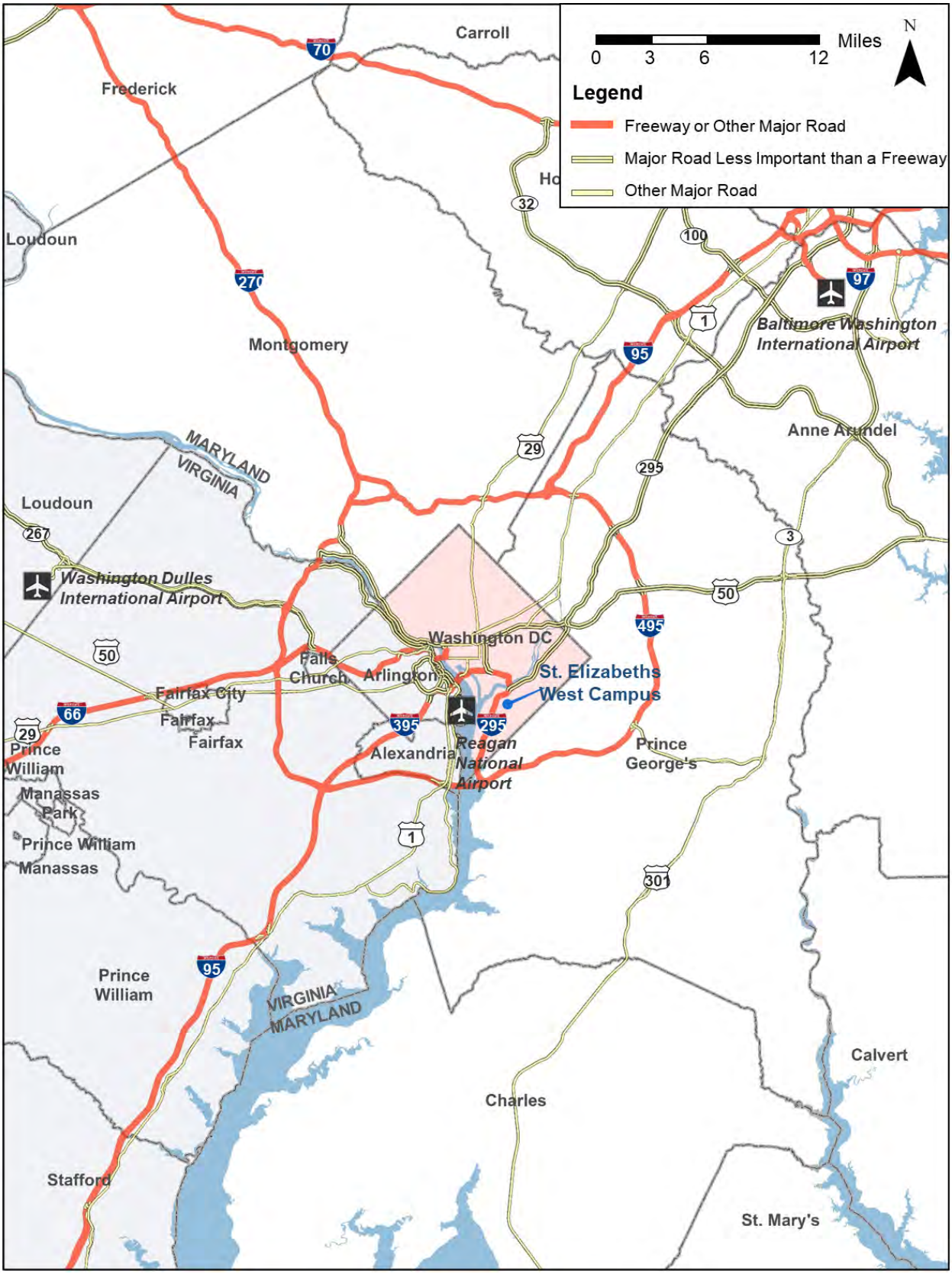

Figure 1-2: Regional Road Network

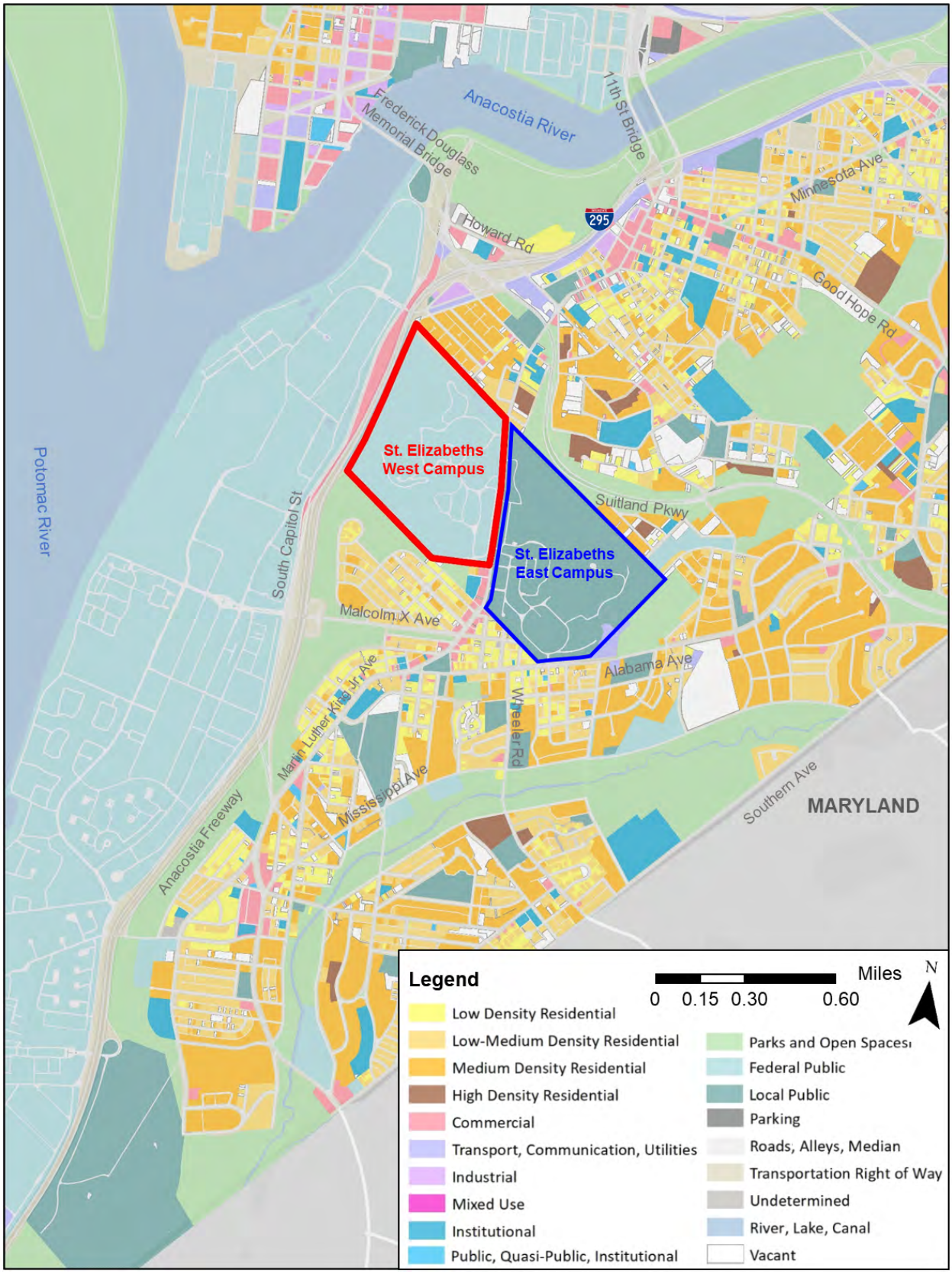

Figure 1-3: Existing Land Use in St. Elizabeths Area

1.2.2 Master Plan Amendment 2 Supplemental EIS Study Area

Construction under Master Plan Amendment 2 is proposed on the plateau site and the Sweetgum Lane site on the West Campus (**Figure 1-4**).

1.2.3 Transportation Study Area

Under the current proposal of Master Plan Amendment 2, there will be an increase of 37 percent in the number of seats (from 10,900 to 14,900 seats) on the West Campus and 6 percent in the total number of DHS personnel assigned (from 14,000 to 14,900) (**Table 1-1**). The influx of employment in this part of the District is expected to have impacts on the existing transportation network. Thus, it is important to provide a comprehensive transportation impact analysis to determine the effects of the additional trips associated with this action, assess the impacts of various network and operational changes, and suggest mitigation strategies that may alleviate any potential impacts. The Transportation Study Area (hereafter "the Study Area") has been defined to be commensurate with the additional travel demand generated by an employment activity center of this size. It is bounded by a number of roadways (**Figure 1-5**), as follows:

- 11th Street Bridges to the northeast;
- Frederick Douglass Bridge, South Capitol Street to the northwest;
- I-295 interchange at the Naval Research Laboratory to the southwest;
- The divergence of South Capitol Street and Martin Luther King Jr. Avenue SE to the south; and
- The intersection of Alabama Avenue and Suitland Parkway to the southeast.

The extended study areas for traffic operations and safety analysis are discussed in detail in **Section 2.1**.

Figure 1-4: Master Plan Amendment 2 Study Areas (Source: GSA 2019)

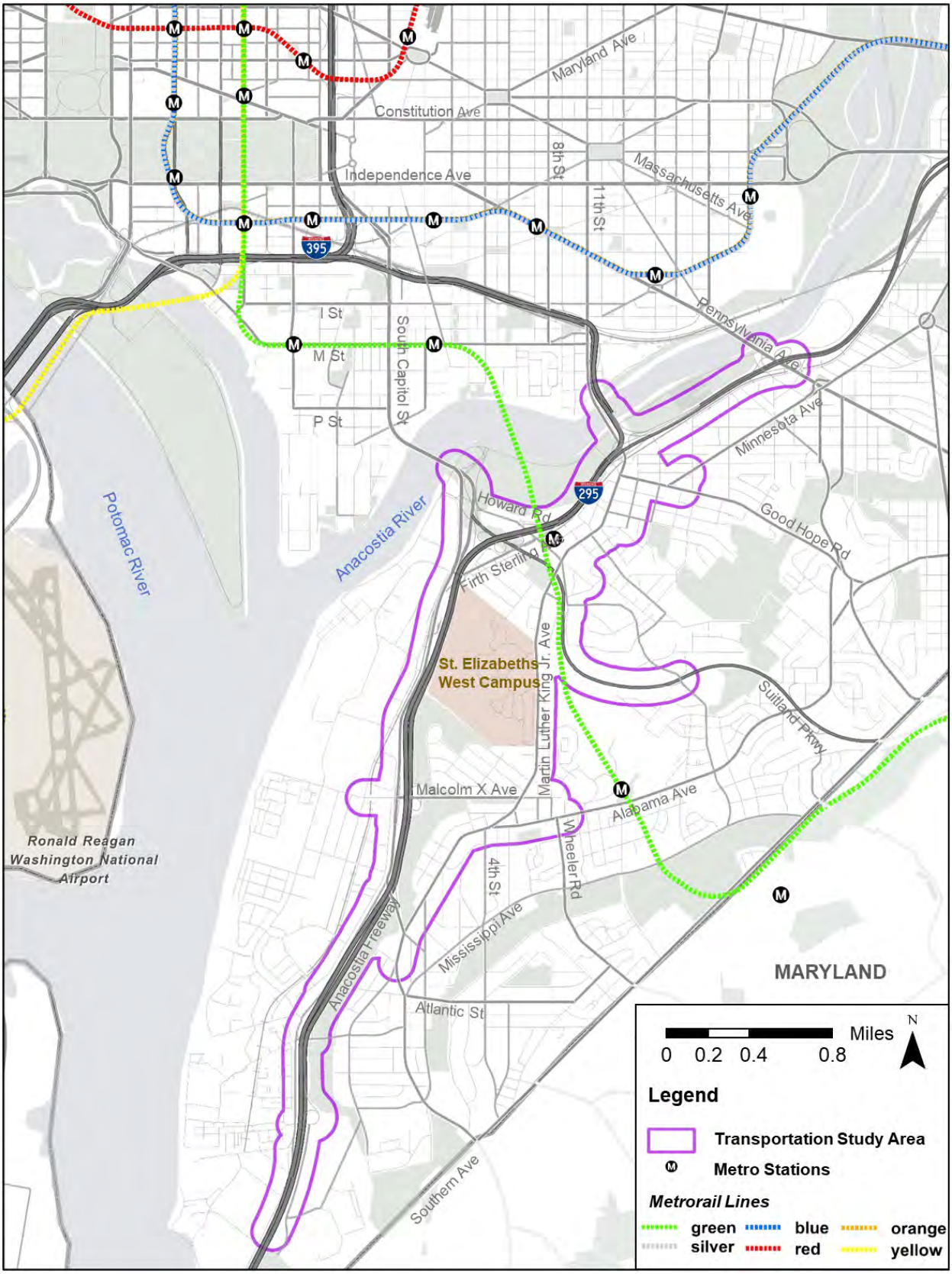

Figure 1-5: Transportation Study Area

1.3 Project History and Previous Studies

This TTR builds upon previous efforts that have examined land use, development scenario analyses, and potential transportation impacts for the St. Elizabeths campuses. It is important to recognize both the context and constraints that frame the approach for assessing transportation issues and potential mitigation strategies. Four previous studies, described in the following sections, provide background information for the site, as well as a context for examining the broader issues affecting the Study Area.

1.3.1 Master Plan and Final Environmental Impact Statement for Consolidation of DHS Headquarters at St. Elizabeths and Record of Decision (2008)

On January 8, 2009, the National Capital Planning Commission (NCPC) approved the Final Master Plan for the DHS Headquarters Consolidation, and the U.S. Commission of Fine Arts (CFA) approved the Final Master Plan on November 20, 2008. The Master Plan presents the strategy for developing the West Campus into a high-security campus for several Federal agencies. It provides the development framework for accommodating 4.5 million gross square feet (gsf) of office space for the DHS headquarters on both the West and East campuses. The Master Plan outlines 3.8 million gsf of office space on the West Campus and 750,000 gsf of office space on the East Campus (identified as East Campus North Parcel). The development will be consistent with a DHS Interagency Security Committee (ISC) Level V campus to house mission-critical Federal agencies. Part of the master planning process includes an EIS under the National Environmental Policy Act (NEPA) and compliance with the Section 106 regulations under the National Historic Preservation Act (NHPA).

In support of the Master Plan, GSA prepared the 2012 EIS for the consolidation of DHS Headquarters at St. Elizabeths in 2008 (hereafter 2008 EIS). Required by NEPA, the 2008 EIS assessed and reported potential impacts as a result of the consolidation of DHS Headquarters at the West Campus and planned mitigation. It comprises two major parts: Campus Development (Volume I) and Transportation Improvements (Volume II). Volume I assessed site development and new construction on the West Campus. Volume II assessed reconstruction of the I-295/ Malcolm X Avenue interchange to accommodate access to the West Campus. The 2008 EIS also considered the impacts to the East Campus at a programmatic level of analysis in order to determine if the use of the site posed any overall environmental risk. GSA signed a Record of Decision (ROD) for the project on December 16, 2008. The ROD approved the proposed activities on the West Campus to go forward and conditioned the East Campus upon further environmental and historic resource reviews and analyses.

1.3.2 Master Plan Amendment 1, Final EIS and Transportation Technical Report for Consolidation of DHS Headquarters at St. Elizabeths (2012)

In 2012, GSA amended the Master Plan to include detailed planning, a Tier II EIS, and an additional NHPA assessment for the East Campus North Parcel, including the widening of Martin Luther King Jr. Avenue SE to accommodate a left-turn lane, a streetcar lane, and improved pedestrian-friendly sidewalks. These changes are collectively known as Master Plan Amendment 1. Master Plan Amendment 1 provided a framework for the future development considering historic and natural resources, site characteristics, circulation and access, and massing and density while meeting the programmatic needs of the DHS Consolidation.

As part of Master Plan Amendment 1, GSA completed the 2012 EIS and issued a ROD on the amended Master Plan in 2012. A comprehensive transportation study was performed for the local and regional transportation system surrounding and including the St. Elizabeths campus. It provides a comprehensive transportation impact analysis evaluating the impacts on this transportation network of the DHS Headquarters consolidation to the St. Elizabeths campus. The results are documented in the 2012 Transportation Technical Report (hereafter "2012 TTR") as an appendix of the 2012 EIS. Through this study, a number of transportation improvements were committed in the 2012 Master Plan Amendment 1 as follows:

- Improvements at the I-295 / Malcolm X Avenue interchange to allow direct access to the West Campus from I-295 and eliminate existing unsafe weaving conditions on I-295 and reduce the number of merge points onto I-295 northbound;
- Construction of a new West Campus Access Road (St. Elizabeths Avenue) that would parallel I-295 and connect the I-295 / Malcolm X Avenue interchange and Firth Sterling Avenue with the West Campus;
- Improvements at the intersection of Firth Sterling Avenue and St. Elizabeths Avenue to connect the West Campus Gate 4 with existing Firth Sterling Avenue and provide improvements and modifications to Firth Sterling Avenue and its side streets; and
- Improvements along Martin Luther King Jr. Avenue SE to include two travel lanes in each direction, an additional turn lane, median, and sidewalks along Martin Luther King Jr. Avenue SE to mitigate traffic associated with FEMA and Gates 1 and 2 on the West Campus.

1.4 Changes in Master Plan Amendment 2

Several changes to the St. Elizabeths campus have occurred since Master Plan Amendment 1. Agencies have begun occupying the campus, and portions of the proposed transportation improvements have been completed. In addition, GSA has proposed modifications to the campus Master Plan in order to accelerate completion of the campus.

1.4.1 Completed Phases in Master Plan Amendment 1

Phase 1 of the consolidation was completed in December 2013, when the United States Coast Guard (USCG) relocated its headquarters to the West Campus. St. Elizabeths Avenue was completed between Gate 4 and Firth Sterling Avenue, and a 1,985-space parking garage at Gate 4 was also completed. One of the proposed three shuttle lines that would serve the campus is in operation. Shuttle service between Gate 4 and the Anacostia Metrorail Station is currently being provided by the Washington Metropolitan Area Transit Authority (WMATA). An existing Metrobus route (A4) was modified in order to provide the shuttle service.

Phase 2 of the consolidation is currently under construction. Under Phase 2, the renovation of the Center Building on the West Campus was completed in April 2019 to house DHS's headquarters functions. Other Phase 2 buildings include the West Addition (completed in April 2019), the Central Utility Plan (CUP) 2 (completed in September 2019), and Hitchcock Hall (scheduled to be completed in Fall/Winter 2019). Besides the buildings, the I-295 / Malcolm X Avenue Interchange project is also part of Phase 2 under construction, which is currently scheduled to be complete by Spring 2022.

1.4.2 Campus Development in Master Plan Amendment 2

Master Plan Amendment 2 includes developments on the plateau and the Sweetgum Lane sites on the West Campus and the transportation improvements necessary to accommodate employee access and egress. **Figure 1-6** summarizes the areas under review in Master Plan Amendment 2. The recommended transportation improvements are summarized in **Chapter 5** of this TTR.

Table 1-1 lists the primary changes in assigned personnel, building development, and parking under consideration in Master Plan Amendment 2. The changes would result an overall lower development level than Master Plan Amendment 1 within the St Elizabeths campus. However, since all development would be consolidated to the West Campus, development and parking on the West Campus would be greater than what was considered for the West Campus under Master Plan Amendment 1. The additional parking would be concentrated at Gate 1.

Table 1-1: Campus Development Program Summary

Development Elements	Master Plan	Master Plan Amendment 1	Master Plan Amendment 2	Change
Total Personnel Assigned	**14,000**	**14,000**	**14,900**	**+6%**
West Campus Building Development (gsf)	3,830,386	3,830,386	4,142,740	+8%
East Campus Building Development (gsf)	715,072	750,000	0	-100%
Total Building Development (gsf)	**4.5M**	**4.5M**	**4.1M**	**-9%**
West Campus Parking Structures (gsf)	1,216,500	1,216,500	1,591,800	+30%
East Campus Parking Structures (gsf)	271,250	271,250	0	-100%
Total Parking Structures (gsf)	**1.5M**	**1.5M**	**1.6M**	**+6%**
West Campus Parking Spaces	3,459	3,459	4,448	+29%
East Campus Parking Spaces	775	775	0	-100%
Total Parking Spaces	**4,234**	**4,234**	**4,448**	**No change to NCPC approved parking ratio**
Total Campus (gsf)	**6M**	**6M**	**5.7M**	**-5%**

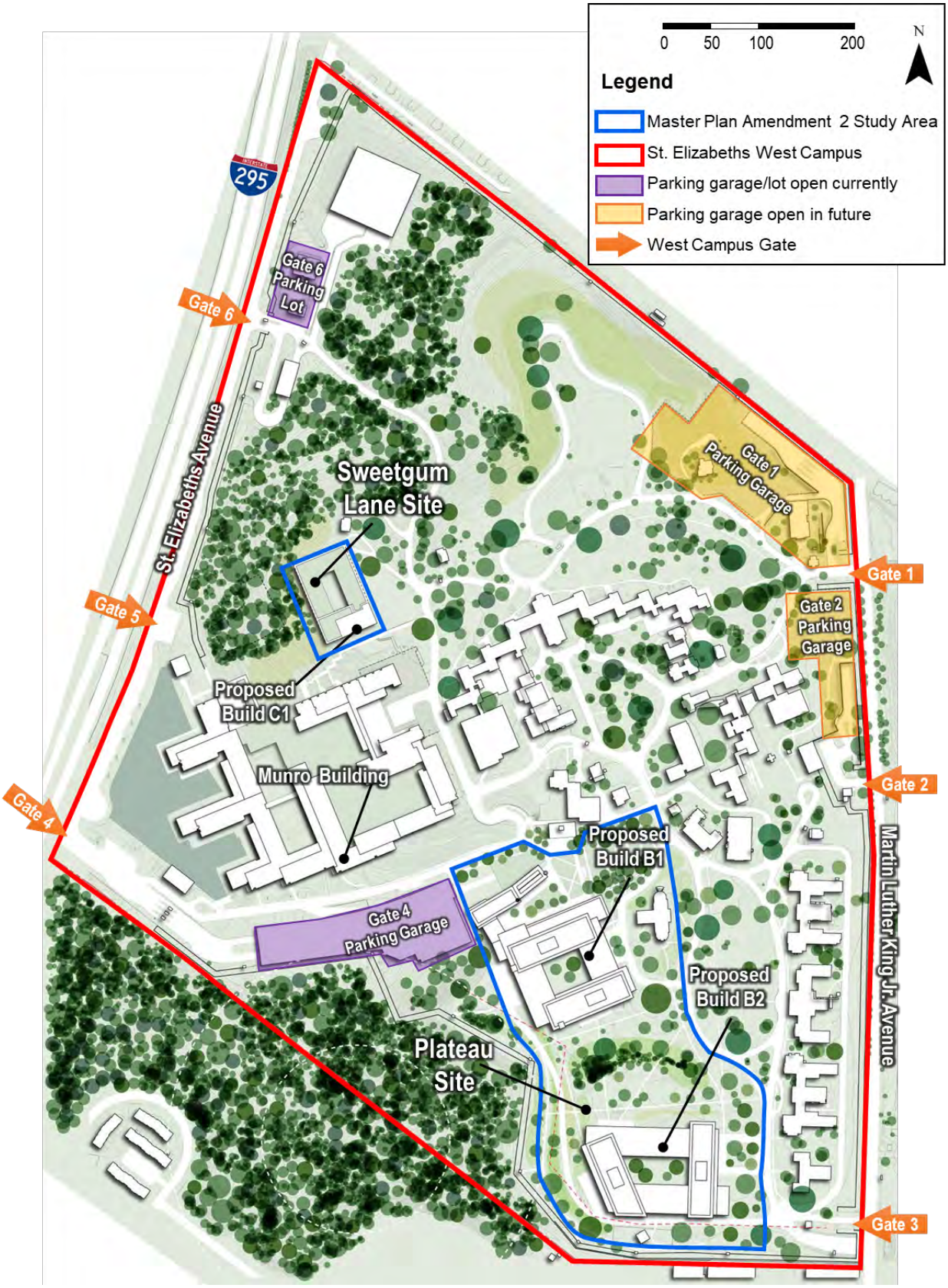

Figure 1-6: Master Plan Amendment 2 Areas under Review (Source: GSA 2019)

Note, the traffic analysis performed for the St. Elizabeths West Campus Master Plan Amendment 2 evaluated, among other data inputs, the traffic impacts of an occupancy of up to 17,000 employees, 12,800 available seats, and a total proposed parking space number of 4,058 for the West Campus. This parking space number included the parking allowances and needs for employees, visitors and government vehicles. The employee-only parking allotment was derived by applying the NCPC's employee parking ratio guidelines to the proposed number of employee seats available on the West Campus.

After this traffic analysis was performed, further consultation with the NCPC established that the parking made available for employees should not be based off the number of employee seats, but the total number of employees that would be assigned to the West Campus. As such, GSA increased the proposed parking spaces for the West Campus from 4,058 to 4,448 to accommodate a change in DHS components assigned to the campus, a change in occupancy numbers, and a change in workplace management strategies for the campus. The revised employee population for the campus is 14,900, with an up-to 1:1 employee-to-seat ratio, depending on the workplace management strategies for each component. The newly reflected parking space proposal adheres to what is allowable under current NCPC established parking ratios; however, the increase in the number of spaces for Phase 2 may be limited by the design constraints of the National Historic Landmark (NHL) campus, as well as limited project funding.

With a new proposed occupancy count of 14,900, an up to 1:1 employee-to-seat ratio, and a parking count of 4,448, the traffic analysis can no longer be considered as a conservative estimate of traffic demand to the local networks; however, the results from this traffic analysis are a good representation of the anticipated effects to the local transportation networks. As program, mission, and employee requirements evolve over the various phases of DHS consolidation and build-out on the West Campus, further traffic analysis may be required. Once the current phase of the West Campus Master Plan Amendment 2 is complete (Phase 2), GSA will explore the need for an additional traffic analysis, separate from the TMP, for full campus occupancy in 2035, based off of projected campus population, commuting habits, and Transportation Demand Management (TDM) progress. The campus TMP will be continuously reevaluated on a biannual basis in order to work toward the outlined transportation goals and will be updated prior to full occupancy.

GSA is also coordinating with the District Department of Transportation (DDOT) to develop conceptual roadway improvements along Martin Luther King Jr. Ave. SE. These proposed concepts (see details in **Chapter 5**) are potential mitigation options for traffic impacts to the local roadway network for the West Campus full occupancy year (2035), dependent upon continued analysis and coordination with DDOT.

1.4.3 Changes in Adjacent Projects

Since the completion of Master Plan Amendment 1, changes have occurred to adjacent projects that may influence transportation conditions at St. Elizabeths. The following adjacent projects have notable changes; therefore, their impacts are included in this TTR. These projects are also discussed in additional detail in **Chapter 2**: Methodology and Assumptions.

1.4.3.1 St. Elizabeths East Campus North Parcel

As mentioned previously, Master Plan Amendment 2 eliminates the GSA's development on the East Campus North Parcel. Therefore, the DHS shuttle route and stop for the East Campus proposed in

the 2012 EIS/TTR would be modified. In August 2018, the Government of District of Columbia signed a letter of intent (District, 2018) that will allow George Washington University Hospital to operate, maintain, and govern a new hospital that is to be developed on the St. Elizabeths East Campus North Parcel. The new hospital is expected to be open and operational by 2023. The street network proposed due to the new hospital was accounted for in this TTR.

The District is redeveloping the remainder of the East Campus, and DDOT has proposed a street network for the East Campus to support redevelopment. This TTR assumed the entire proposed street network for the East Campus from Pecan Street and south would be completed by the design year (2035) of the West Campus, which is consistent with the 2012 TTR.

1.4.3.2 South Capitol Street Bridge Project

The 2012 TTR assumed that DDOT would complete construction of the South Capitol Street Bridge Project in 2018, before full build-out of the West Campus. Since that time, the Federal Highway Administration (FHWA) and DDOT have revised the Preferred Alternative for the project, and a Final Supplemental EIS was prepared, and a ROD was issued in August 2015 for the Revised Preferred Alternative.

This TTR includes the new Preferred Alternative of the South Capitol Street Bridge Project as a background project in design year 2035.

1.5 Purpose and Need

The proposed Master Plan Amendment 2 assessed in the Draft Supplemental EIS is to amend the DHS Master Plan to accommodate a total of 4.1 million gsf of secure office and shared-use space and 1.6 million gsf of associated parking at the West Campus. The GSA's purpose for this proposed Master Plan Amendment 2 is to support the continued Consolidated Headquarters of DHS and its components at St. Elizabeths, in accordance with the DHS mission requirements and housing plan. The need for the proposed Master Plan Amendment 2 is to provide maximum flexibility for current and future department programming, increase space utilization, leverage workplace mobility to reduce overall space needs, accelerate completion of the DHS consolidation, and eliminate the need for DHS occupancy on the St. Elizabeths East Campus.

The purpose of the transportation study for this TTR is to evaluate the transportation impacts of the GSA's proposed Master Plan Amendment 2 in support of the corresponding Draft Supplemental EIS. The transportation analysis was built upon previous analyses and documentation in the 2012 EIS/TTR but updated with newly collected traffic data, employee residence zip code information, updated transportation network, and land use forecasts.

The TTR document provides detailed technical information, methodology, analysis results and recommended improvements as a reference by a regulatory approval document: the St. Elizabeths Master Plan Amendment 2 Draft Supplemental EIS. As such, this TTR will be an appendix of the Draft Supplemental EIS document.

1.6 Organization of Report

The remainder of this report is organized as follows:

- **Chapter 2**: Methodology and Assumptions

- **Chapter 3**: Existing Transportation Networks
- **Chapter 4**: Existing Traffic Operations and Safety Conditions
- **Chapter 5**: Transportation Improvements
- **Chapter 6**: Future Conditions Assessment
- **Chapter 7**: Summary and Recommendation
- **Chapter 8**: References

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2 METHODOLOGY AND ASSUMPTIONS

This chapter summarizes the key data, assumptions, and methodology used in travel demand forecasting and traffic and safety analysis for this project, which have been discussed and agreed upon with DDOT and follow the guidelines and specifications in the following documents:

- FHWA Traffic Analysis Toolbox (TAT) Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software;
- DDOT Guidelines for Comprehensive Transportation Review (CTR); and
- National Cooperative Highway Research Program (NCHRP) Report 765 – Analytical Travel Forecasting Approaches for Project-Level Planning and Design

Additional technical details can be found in

- **Attachment A**: Assumptions and Methodology Framework Document for Draft Supplemental EIS Transportation Technical Report;
- **Attachment B**: Comprehensive Transportation Review for St. Elizabeths West Campus Transportation Study; and
- **Attachment C**: St. Elizabeths West Campus Amendment 2 – Travel Demand Model Technical Memorandum

2.1 Roadway Network Scope for the Study Area

The extent of the roadway network included in the Study Area for the 2019 Draft Supplemental EIS/TTR encompasses major freeway segments, local arterials and intersections around the West Campus (**Figure 2-1**). These intersections and freeway segments are directly associated with the proposed Master Plan Amendment 2 and impacted by the DHS Headquarters consolidation at St. Elizabeths.

The following roadways bound the Study Area:

- 11th Street Bridges to the northeast;
- Frederick Douglass Bridge (South Capitol Street) to the northwest;
- I-295 interchange at the Naval Research Laboratory to the southwest;
- The divergence of South Capitol Street and Martin Luther King Jr. Avenue SE to the south; and
- The interchange of Suitland Parkway and Stanton Road to the southeast

Major roadways within the Study Area include the following:

- Limited access facilities (freeways and expressways)
  - I-295 from the Naval Research Laboratory Road interchange to the 11th Street Bridges interchange

  - Suitland Parkway from the Martin Luther King Jr. Avenue SE interchange to South Capitol Street

- Arterials and intersections
  - Martin Luther King Jr. Avenue SE from South Capitol Street to the 11th Street Bridges
  - South Capitol Street from Martin Luther King Jr. Avenue SE to the Frederick Douglass Bridge
  - Malcolm X Avenue SE from the Joint Base Anacostia-Bolling (JBAB) entrance to east of Martin Luther King Jr. Avenue
  - Howard Road SE from Martin Luther King Jr. Avenue SE to South Capitol Street
  - Firth Sterling Avenue SE from South Capitol Street to Howard Road
  - Alabama Avenue SE from Martin Luther King Jr. Avenue SE to Wheeler Road
  - Good Hope Road SE from Martin Luther King Jr. Avenue SE to Minnesota Avenue
  - 13th Street / Pleasant Street SE from Martin Luther King Jr. Avenue SE to 11th Street Bridges

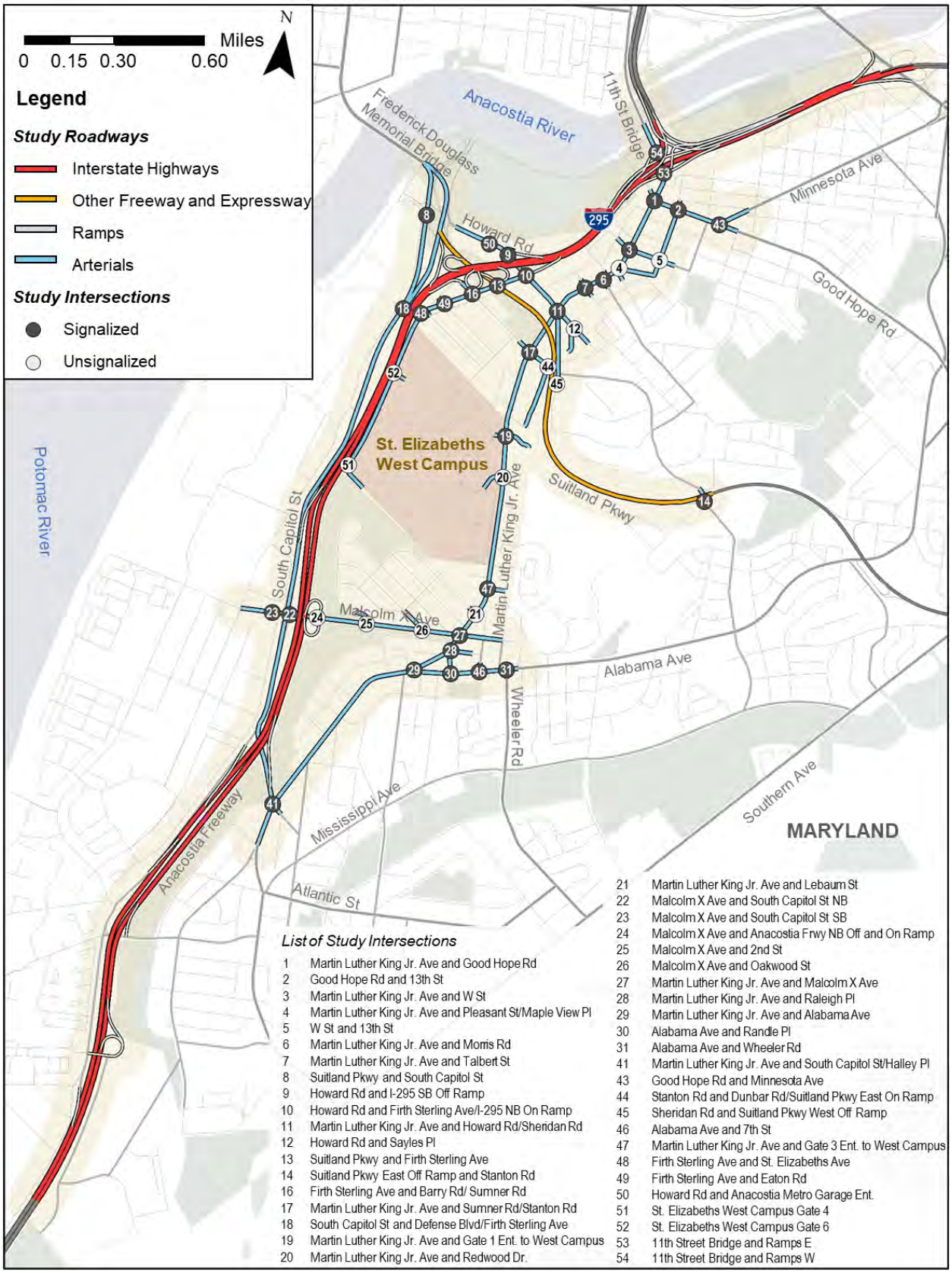

Figure 2-1: Transportation Study Area

2.2 Land Use and Transportation Assumptions

Table 2-1 summarizes major assumptions regarding land use and transportation improvements under the Master Plan Amendment 2 in design year 2035. For comparison, the table includes the 2012 EIS-related assumptions as well. A separate memorandum has been prepared discussing these assumptions in additional detail. It is included as **Attachment C** of this report.

Table 2-1: Transportation and Land Use Assumptions near the Study Area for Draft Supplemental EIS Transportation Analysis in Design Year 2035

Transportation or Land Use Improvement	2012 EIS/TTR Assumption	Current Status	Draft Supplemental EIS/TTR Assumption
Highway and Transit Transportation Improvements to be Completed by Other Agencies			
DC Streetcar – Anacostia Initial Segment (DDOT)	Completed before 2035 and included in design year (2035) analysis	Construction occurred in 2009 and 2010, but the project was abandoned before the line was complete due to financial concerns.	Exclude from design year (2035) analysis as DDOT requested to remove this project from the Visualize 2045 and the latest FY2019-2024 TIP
DC Streetcar – Anacostia Extension (DDOT)	Completed before 2035 and included in design year (2035) analysis	Construction occurred in 2009 and 2010, but the project was abandoned before the line was complete due to financial concerns.	Exclude from design year (2035) analysis as DDOT requested to remove this project from the Visualize 2045 and the latest FY2019-2024 TIP
South Capitol Street Bridge Project (DDOT)	Completed before 2035 and included in design year (2035) analysis	A revised Preferred Alternative was developed as part of the South Capitol Street Supplemental EIS Currently under construction	Include the revised Preferred Alternative in design year (2035) analysis Revise models to match Preferred Alternative configuration
St Elizabeths East Campus Roadway Network (DDOT / DMPED)	Completed before 2035 and included in design year (2035) analysis	Only Stage 1 streets (Cypress Street and south) are constructed Under development by DMPED	Include full build out East Campus roadway network in design year (2035) analysis
2012 EIS Transportation Improvements			
Martin Luther King Jr. Avenue SE Improvements	Completed before 2035 and included in design year (2035) analysis	No change	No change or with additional improvements if needed.
Firth Sterling Avenue Improvements	Completed before 2035 and included in design year (2035) analysis	Currently complete	No change
St. Elizabeths Avenue (West Campus Access Road)	Completed before 2035 and included in design year (2035) analysis	Northern section (between Gate 4 and Firth Sterling Avenue) complete Southern section (between Malcolm X Avenue interchange and Gate 4) under construction and projected completion date Spring 2022	No change
I-295 / Malcolm X Avenue Interchange	Completed before 2035 and included in design year (2035) analysis	Currently under construction Project completion date: Spring 2022	No change
East Campus North Parcel Transportation and Transit Improvements	Completed before 2035 and included in design year (2035) analysis	East Campus North Parcel Transit component provided by Pecan Street bus bays will	Exclude roadway improvements in design year (2035) analysis

Transportation or Land Use Improvement	2012 EIS/TTR Assumption	Current Status	Draft Supplemental EIS/TTR Assumption
		be retained but specific location has not yet been identified by the East Campus redevelopment team	Retain transit component provided by Pecan Street bus bays
Land Use			
St. Elizabeths East Campus (DDOT / DMPED)	Completed before 2020 and included in design year analysis (2035) • Building: 1.8 million sf • Residential: 1,300 units • Retail: 206,000 sf • Hospitality: 330,000 sf • Civic & Educational: 250,000 sf	Various redevelopment options under consideration.	Include the latest development plan from St. Elizabeths East Campus Parking Master Plan dated June 2017 • Building: 1.68 million sf • Residential: 1,621 units • Retail: 168,000 sf • Hospitality: 352,000 sf • Concert/Entertainment: 5,000 seats • Civic/Art/Institutional: 310,000 sf
St. Elizabeths East Campus North Parcel	FEMA Headquarters complete by 2020 • Building: 750,000 sf • 3,100 seats • 775 parking spaces	Master Plan Amendment 2 excluded GSA/DHS' development in East Campus	Include the latest development plan from East Campus Team • 150-bed new Hospital with 230,000 sf Ambulatory Services • 801 East Men's Shelter (380-bed low-barrier shelter) • 800-space parking garage
St. Elizabeths West Campus	• Development: 3,750,000 gsf • 10,900 seats • 3,459 parking spaces	Partially occupied: • About 5,000 employees (DHS, GSA, and USCG) currently reporting to the West Campus • About 2,000 parking spaces actively used	Include Master Plan Amendment 2: • Development: 4,142,740 gsf • 12,800 seats • 4,058 parking spaces
Background Land Use Forecasts and Travel Demand Model Version	MWCOG Travel Demand Model: Version 2.2 Land Use Forecasts: MWCOG Round 7.2A for 2012 Draft EIS and later updated to Round 8.0 for 2012 Final EIS for 2,191 TAZs	MWCOG Travel Demand Model: Version 2.3 Land Use Forecasts: MWCOG Round 9.1 for 3,722 TAZs	Retain MWCOG Model Version 2.2 model Land Use Forecasts: Convert Round 9.1 data for 3,722 TAZs to Round 9.1 for 2,191 TAZs using conversion methodology provided by MWCOG

FY – Fiscal year
TIP – Transportation Improvement Program
DDOT – District Department of Transportation
DMPED – Office of the Deputy Mayor for Planning and Economic Development
FEMA – Federal Emergency Management Agency
MWCOG – Metropolitan Washington Council of Governments
sf – Square feet, gsf – Gross square feet
TAZ – Traffic Analysis Zone

In addition, there are several regionally significant major projects that are included in the approved FY 2019-2024 Transportation Improvement Program (TIP) for the National Capital Region. These projects were originally not included in the 2012 EIS analysis as they were still in the infancy stage

and were not part of the then Constrained Long Range Plan (CLRP). Since they have been included in the current CLRP, travel demand models for this transportation study also included them as regional background projects to forecast trips in 2035. Specifically, these projects include:

- Maryland I-270 and I-495 Managed Lanes project by Maryland Department of Transportation (MDOT)/State Highway Administration (SHA);
- Purple Line Light Rail project by MDOT/Maryland Transit Authority (MTA);
- I-66 Inside the Beltway Express Lanes and Eastbound Widening project by Virginia Department of Transportation (VDOT);
- I-66 Outside the Beltway Express Lanes project by VDOT; and
- I-495 Express Lanes Northern Extension (NEXT) project by VDOT

2.3 Analysis Year, Time Periods and Alternatives

2.3.1 Analysis Year

The analysis years for the study are the existing year (2019) and the design year 2035. The design year assumption is consistent with the 2012 EIS analysis to ensure that a comparative analysis can be made between the 2012 study and the current study. It is also consistent with other resources analyzed in the 2019 Draft Supplemental EIS. The traffic analysis included an assessment of typical weekday AM and PM peak hour operations.

2.3.2 Analysis Time Periods

All measures of effectiveness (MOEs) from traffic operational analysis were reported to represent a typical weekday 1-hour traffic conditions during the AM and PM peak periods. Based on a preliminary analysis of freeway mainline throughputs at multiple locations along the study corridor, a system peak hour in each period has been determined as follows:

- AM peak hour: 7:15 – 8:15 a.m.
- PM peak hour: 4:30 – 5:30 p.m.

The AM peak hour is slightly later than the previous AM peak hour in the 2012 EIS/TTR (7 – 8 a.m.). The PM peak hour in this study is half an hour earlier than the PM peak hour in the previous study (5 – 6 p.m.). These time periods represent the most critical periods for traffic operations and have the highest capacity requirements on the roadway networks within the Study Area on a typical weekday. The analysis process and supporting data to determine the system peak hours are discussed in **Section 4.1.1.1**.

2.3.3 Alternatives Considered

Traffic analysis was conducted for two alternatives:

- A No Action Alternative, which contains the land use and transportation assumptions from the 2012 EIS and Master Plan Amendment 1; and
- A transportation Action Alternative, which assumes the land use and transportation updates from Master Plan Amendment 2 described in the previous sections.

2.3.3.1 No Action Alternative

The transportation No Action Alternative contains the land use and transportation assumptions from the 2012 EIS and Master Plan Amendment 1. It assumes that no further updates to the Master Plan for the St. Elizabeths Campus take place. Traffic operational analysis results for this alternative are taken directly from the 2012 EIS.

2.3.3.2 Action Alternative Development

The Action Alternative development involved an iterative process. First, a 2035 Action Baseline Alternative was analyzed as an initial analysis of the Master Plan Amendment 2 changes as compared to the 2012 EIS/TTR. It analyzed impacts to traffic operations as a result of implementing the Master Plan Amendment 2 without any additional transportation improvements other than those already proposed in the 2012 EIS/TTR. The Action Baseline Alternative includes the following basic assumptions:

- Updates to land use and development levels as described in **Section 2.2**, including consolidation of GSA development at St. Elizabeths onto the West Campus only and development of the East Campus North Parcel by outside parties. This results in lower levels of development by GSA in the Study Area but, in the design year, higher overall levels of development in the Study Area in the Action Alternative;
- Updates to background transportation projects as described in **Section 2.2**, including the design of the Suitland Parkway/Martin Luther King Jr. Avenue SE interchange and the alignment of the Anacostia Streetcar. Note that some background transportation projects, including construction of the Suitland Parkway/Martin Luther King Jr. Avenue SE interchange and expansion of the Suitland Parkway/Firth Sterling Avenue intersection, were included in the opening-year analysis for the 2012 EIS (No Action Alternative) but are not assumed to be complete by the opening year for the transportation Action Alternative; and
- All transportation improvements proposed as mitigation in the 2012 EIS (same as in the No Action Alternative).

In all, the initial traffic operational analysis of the Action Baseline Alternative concluded that there would be no significant system-wide degradation in traffic operations as a result of Master Plan Amendment 2. For the majority of the transportation networks within the Study Area, the previously committed transportation improvements proposed in the 2012 EIS will meet the transportation needs for Master Plan Amendment 2. However, the initial analysis also identified a couple of locations with operational issues in design year 2035 that require potential further mitigation strategies. Several options of spot improvements were tested and analyzed using the VISSIM models. The preliminary results are documented in **Chapter 6**.

2.4 Data Collection

Data collection for this study included traffic counts, travel times, signal timing and historical crash data within the Study Area. Extensive field data collection was performed during November 2018 through March 2019, avoiding holidays, severe weather conditions, construction zones, and 2019 U.S. Federal government shutdown periods (from December 22, 2018, to January 25, 2019).

2.4.1 Continuous Traffic Counts

Two midweek days (48 hours) of continuous, directional counts with vehicle classifications were conducted at 44 locations within the Study Area including freeway mainlines, interchange ramps and key arterials using video equipment and pneumatic tubes. The data were recorded in 15-minute intervals and a six-bin vehicle classification (**Figure 2-2**).

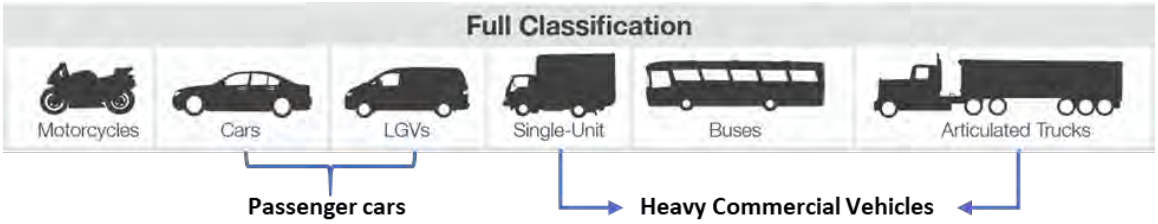

Figure 2-2: 6-Bin Vehicle Classification

The data collection locations of continuous traffic counts are listed and illustrated in **Figure 2-3.**

2.4.2 Intersection Turning Movement Counts

Intersection turning movement counts were performed at 50 locations (**Figure 2-4**) over a 13-hour period (6 a.m. – 7 p.m.) on midweek days, using a combination of video equipment and manual/electronic count boards. The data were recorded in 15-minute intervals and captured vehicular volumes along with pedestrian and bicycle movements.

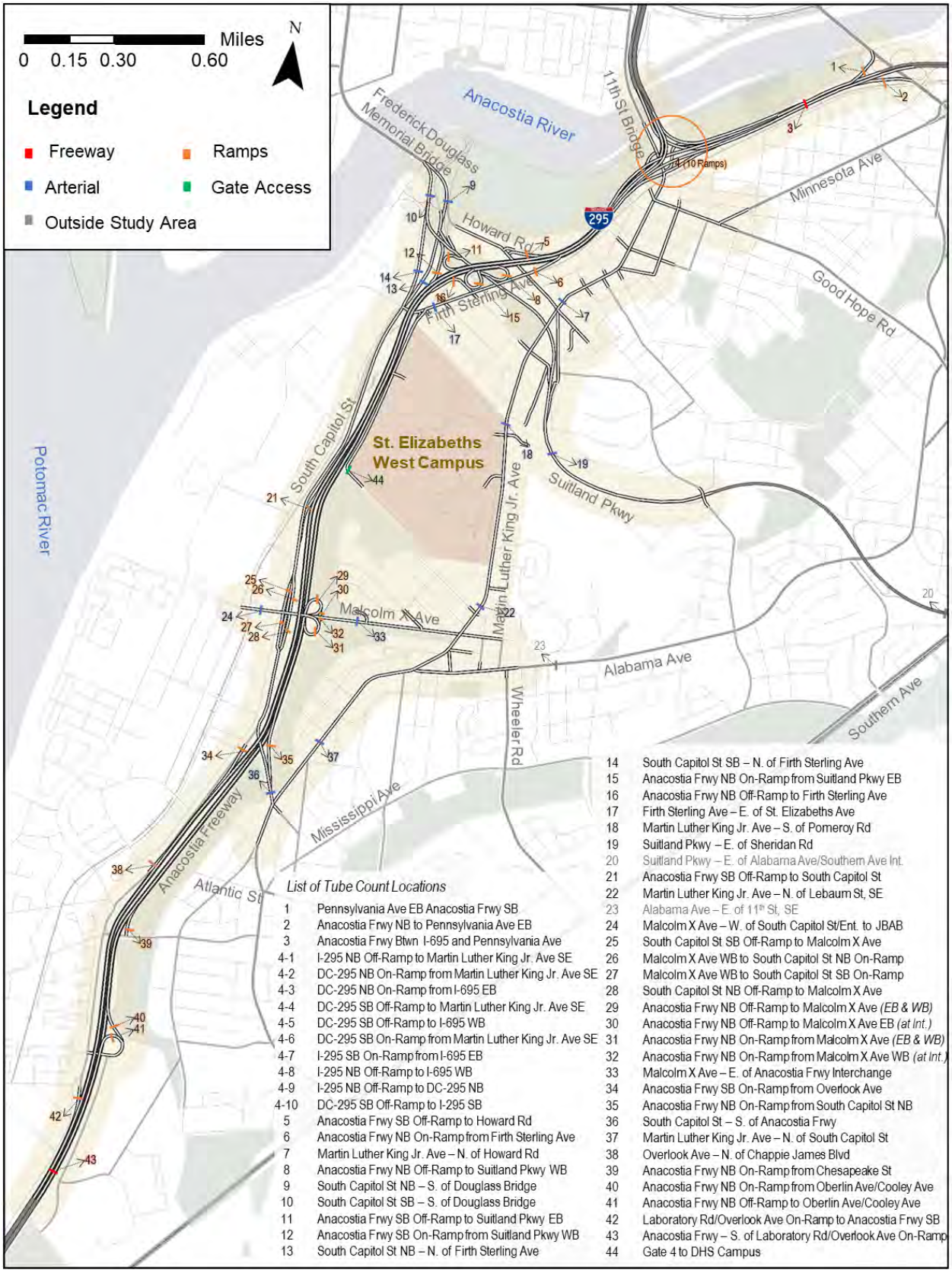

Figure 2-3: Data Collection Locations of 48-Hour Continuous Traffic Counts

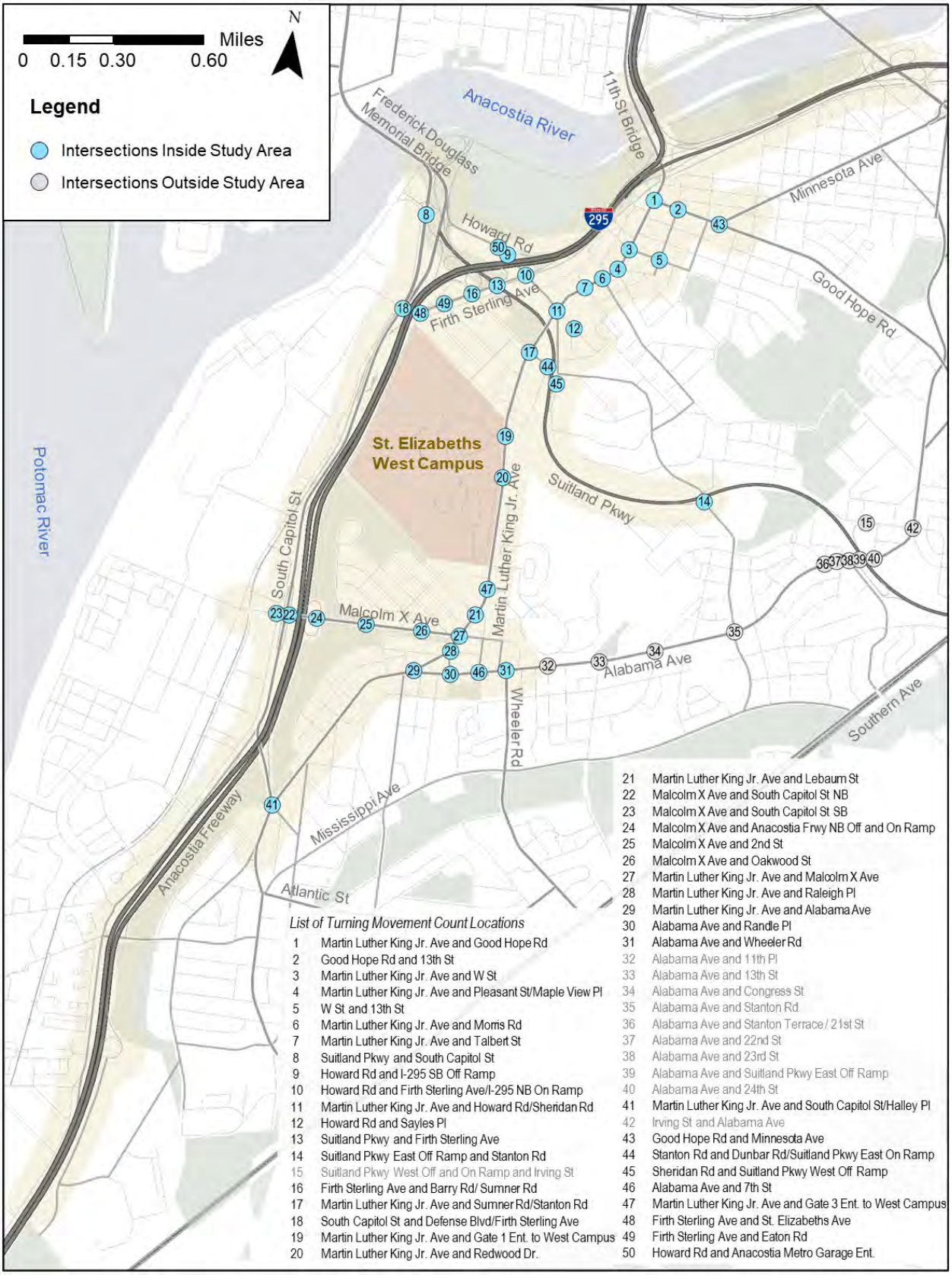

Figure 2-4: Data Collection Locations of 13-Hour Intersection Turning Movement Counts

2.4.3 Travel Times

Travel time runs were conducted using floating-car technique with multiple runs on three key corridors within the Study Area: I-295, Martin Luther King Jr. Avenue, and Firth Sterling Avenue in each direction during the peak periods of 6:00 to 9:00 a.m. and 4:00 to 7:00 p.m. on typical working weekdays. In the floating-car technique, a test-car driver attempts to keep the test car in an unchanged position relative to the traffic steam by passing as many vehicles as pass the test-car (Poess et al., 2011). Field observations were also performed with travel time runs to gain a better understanding of locations of bottlenecks and possible causes of recurring congestion conditions during weekdays peak periods.

2.4.4 West Campus Gate 4 Access and Vehicle Dwell Times

Data collection was conducted to obtain the entry and exit vehicle volumes and processing/dwell times at West Campus Gate 4 on St. Elizabeths Avenue. The observations were performed during the AM and PM peak periods on typical weekdays.

2.4.5 Signal Timing Data

The current signal timing data at all signalized intersections within the Study Area were received from DDOT Traffic Engineering and Safety Division in Synchro files in May 2019.

2.4.6 Historical Crash Data

The most recent 3-year crash data (2016 – 2018) at all intersections within the Study Area were obtained from DDOT's crash database in July 2019.

2.5 Overview for Traffic Analysis Methodology

Figure 2-5 illustrates a flow chart of the traffic analysis methodology for this study. Each of these elements in the flow chart is discussed in subsequent sections.

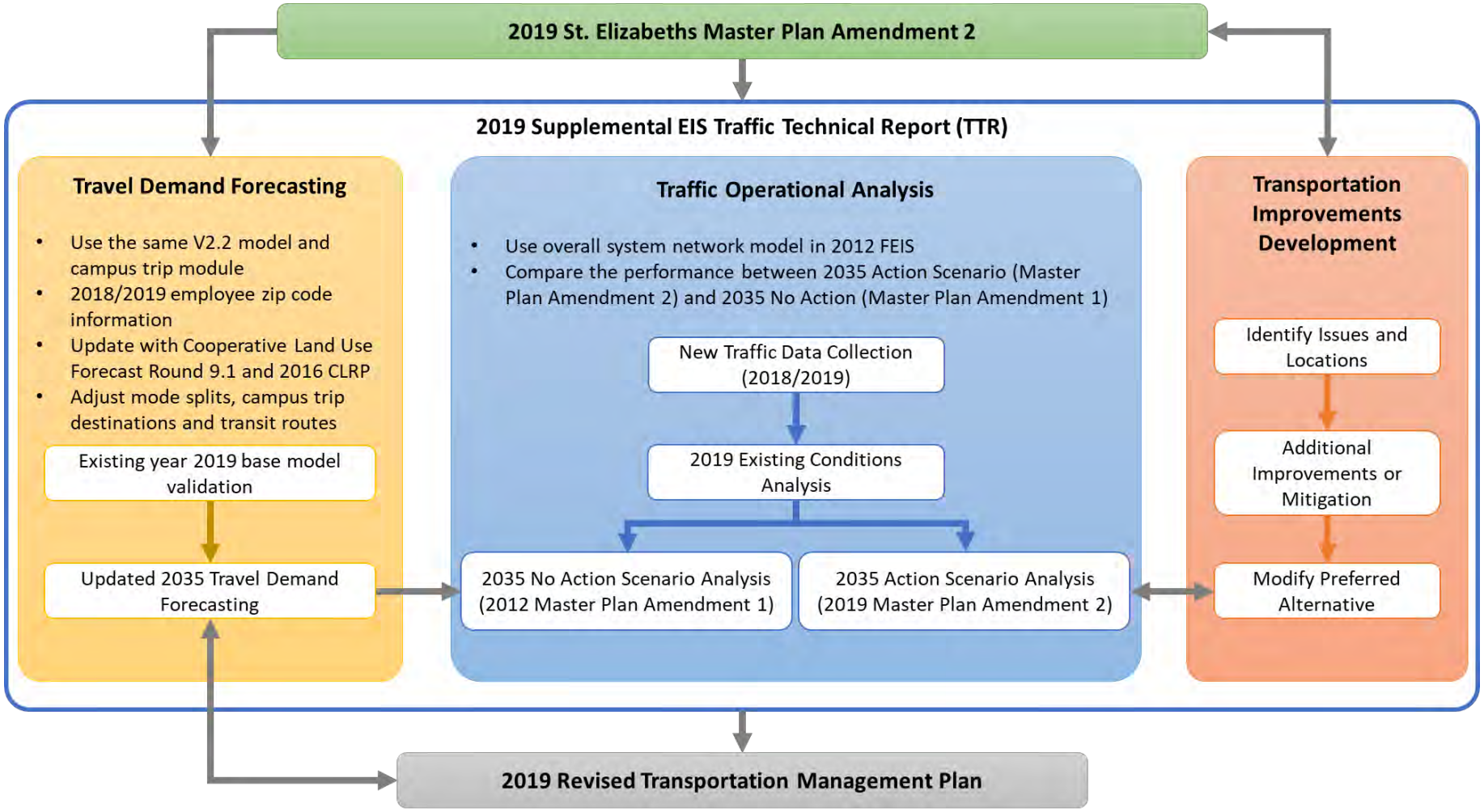

Figure 2-5: Traffic Analysis Methodology Flow Chart for Draft Supplemental EIS/TTR

2.6 Travel Demand Modeling Methodology

This section provides a brief synopsis of the travel demand model process to forecast future trips in design year 2035 for the 2019 Draft Supplemental EIS/TTR transportation study. Additional technical details are included in **Attachment C** of this report.

Travel demand forecasting for the 2012 EIS/TTR was conducted using an application that was based on the Version 2.2 regional travel demand model developed by the Metropolitan Washington Council of Governments/National Capital Region Transportation Planning Board (MWCOG/TPB). The major components of the MWCOG/TPB model were retained to forecast background traffic and were fused with a set of project-specific submodels based on the 2010 DHS Employee Survey conducted specifically to support development of the 2012 Transportation Management Plan (TMP).

Since completion of the original travel demand modeling for the 2012 EIS/TTR, there have been two major changes in the MWCOG/TPB modeling process for the development of the current Version 2.3 model. The first major change was the modification from a 2,191 Traffic Analysis Zone (zone or TAZ) system to a 3,722-zone system. The second major change is that the Version 2.3 model has been calibrated with the newly collected travel survey data from the 2007/2008 Household Travel Survey. The Version 2.2 model was based on the 1994 Household Travel Survey. Additionally, the land use inputs (current Round 9.1) to the Version 2.3 model have been revised in the annual Regional Cooperative Land Use Forecasting Program to allocate land use across 3,722 zones. In contrast, for the 2012 EIS, land use inputs Round 7.2A version was used for 2,191 zones.

The modeling approach for travel demand forecasting for the 2019 Draft Supplemental EIS/TTR future scenarios is to utilize the customized Version 2.2 MWCOG model developed and calibrated for the 2012 EIS/TTR. Using the same model version would allow a direct comparison between the 2012 EIS/TTR results and the 2019 Draft Supplemental EIS/TTR results. While changes have occurred in the MWCOG/TPB modeling process between Version 2.2 and Version 2.3, the modifications made for the 2012 EIS/TTR model to represent the latest employee information, land use changes and transportation improvements specifically for the Master Plan Amendment 2 make it the best model to use.

The overall travel demand modeling approach is illustrated in **Figure 2-6**.

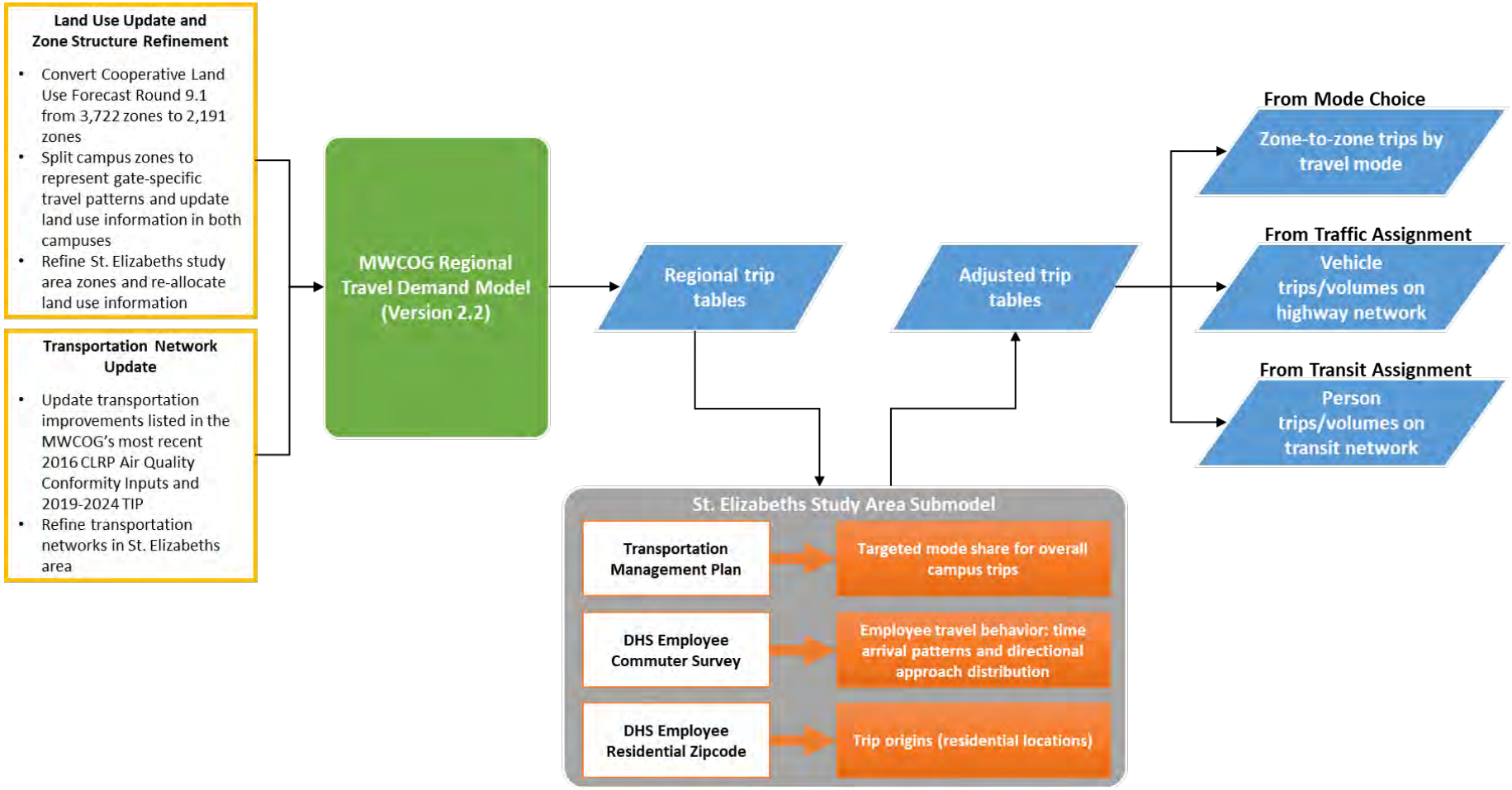

Figure 2-6: Travel Demand Modeling Approach

2.7 Traffic Volume Estimation Methodology

2.7.1 Routing and Volume Sources

Three separate sources of volume data were used for this study:

- Origin-destination (O-D) matrices from the subarea travel demand model;
- Balanced freeway and ramp demand; and
- Balanced intersection turning movement.

These sources were merged together (i.e., synthesized) with the objective of developing volumes and vehicle routing data for the VISSIM network. As shown in **Figure 2-7**, these data sets were first imported to a common database, VISUM, a travel demand modeling and network data management software. This model possesses matrix estimation tools (e.g., TFlowFuzzy) to develop a calibrated Origin-Destination (O-D) matrix and then export the resulting O-D matrix and associated travel paths to VISSIM. Once exported to VISSIM, the VISSIM model can be calibrated based on calibration criteria.

The first step in developing the VISUM model was to create the Study Area network. This was accomplished by extracting a subarea network from the MWCOG travel demand model.

The second step required importing the peak period seed O-D matrices[2] from the MWCOG subarea model. Consequently, the VISUM network required additional network refinements to match the subarea cut made in the MWCOG and to load the MWCOG O-D matrices.

Third, the freeway and ramp demand estimates contained in Excel spreadsheets were imported to VISUM. These estimates were matched to the corresponding links in VISUM. In addition, turning movements for all intersections were imported into VISUM for the AM and PM system peak hours.

2.7.2 O-D Synthesis Method

The three separate volume sources were combined to develop O-D matrices and path sets that are representative of each study period. TFlowFuzzy is an O-D matrix estimation (ODME) method used in VISUM to adjust a given O-D matrix in such a way that the result of the assignment closely matches observed volumes at points within the network. TFlowFuzzy characteristics are as follows:

- Link volumes, O-D travel demand and turning volumes can be combined for correction purposes;
- Counted data need not be available for all links, zones, and/or turning movements; and
- The statistical uncertainty of the count figures can be modeled explicitly by interpreting the figures as Fuzzy Sets of input data.

One of the primary challenges with solving the matrix-correction problem is overcoming the fact that traffic counts are inherently variable from one day to the next. If this variability is not taken into account, the traffic counts obtain an inappropriate weight since any count only provides a snapshot situation which is subject to considerable sampling error. For this reason, TFlowFuzzy employs an

[2] A seed matrix is an initial matrix used to start a numerical procedure or algorithm for O-D matrix estimation.

approach that models the counts as imprecise values based on Fuzzy Sets theory. If one knows, for example, that the volume on a freeway section fluctuates by up to 10 percent on a day-to-day basis, this variability can be represented as bandwidths (i.e., tolerances). TFlowFuzzy then replaces the exact count values by Fuzzy Sets with varying bandwidths to solve the matrix-correction problem.

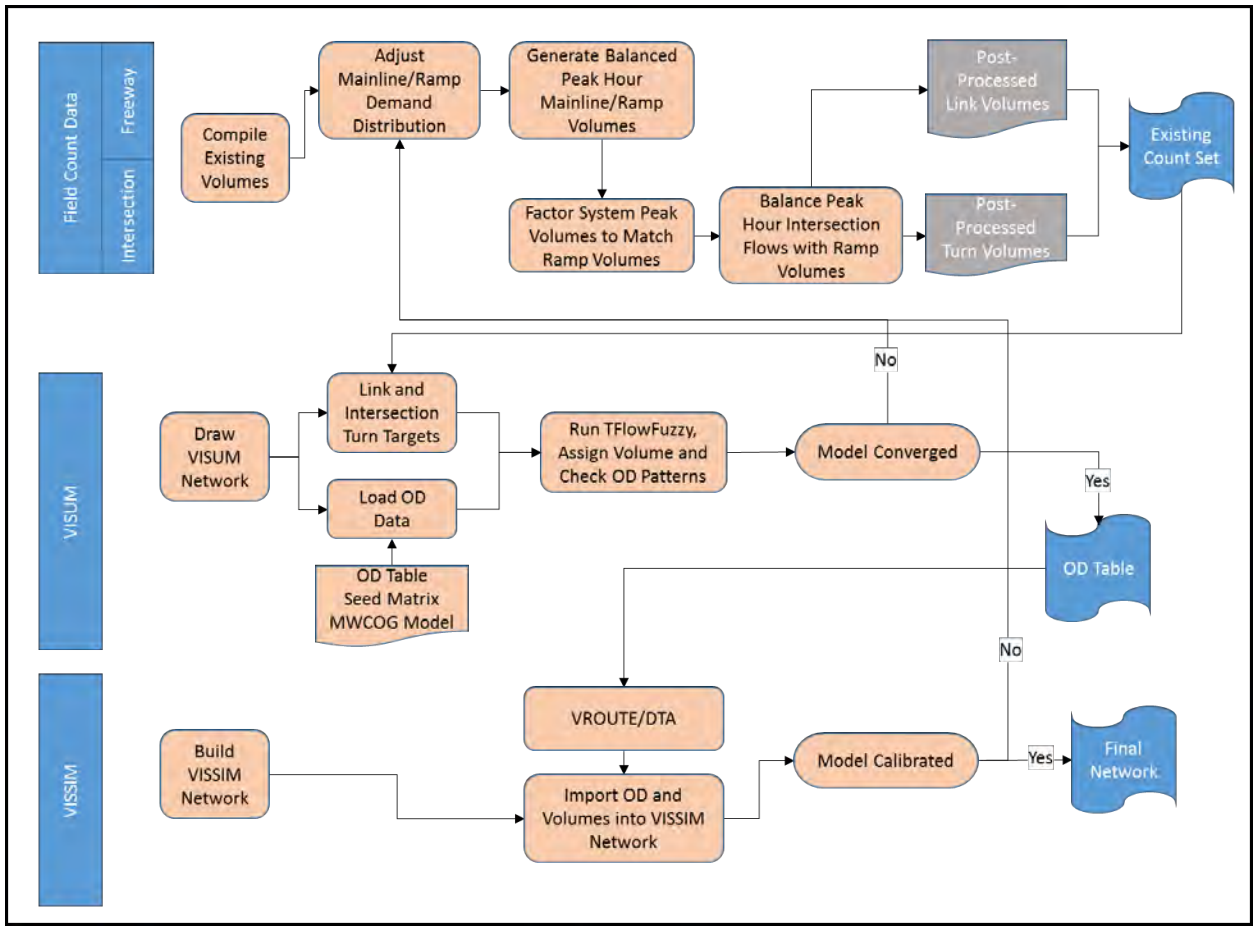

Figure 2-7: Flow Chart for O-D Matrices Estimation

2.8 Traffic Operational Analysis Methodology

2.8.1 Analysis Tools

The Study Area includes I-295, one of the most congested freeway corridors in the District. Within the Study Area, it connects with multiple congested arterials including Martin Luther King Jr. Avenue, Malcolm X Avenue, Firth Sterling Avenue, Suitland Parkway, and South Capitol Street. There are multiple closely spaced interchanges and ramps where frequent merge, diverge and weaving maneuvers occur. Traffic flow on the transportation network within the Study Area during weekday peak hours is constantly affected by several bottlenecks in the peak direction, resulting in severe congestion and queuing conditions. Hence, the traffic flows on these corridors during peak hours are typically under "oversaturated" conditions.

Based on the FHWA's guideline in traffic analysis tools, and in recognition of the limitations of deterministic analytical models such as Highway Capacity Software (HCS), microsimulation analysis has been determined to be the appropriate evaluation tool for traffic operations for this study.

Specifically, VISSIM software (Version 11) has been selected as the primary tool to provide a microscopic level of traffic operation analysis with an integrated consideration of upstream and downstream impacts. Synchro (Version 10) software was used to develop optimized traffic signal timing for all future scenarios. However, Synchro was not used to analyze and report intersection operations. All results were reported from VISSIM outputs. The traffic operational analysis methodology is same as 2012 TTR, which ensures a consistent comparison between scenarios.

2.8.2 Measures of Effectiveness

The following measures of effectiveness (MOE) were used to assess the operations of the roadway network in the Study Area:

- Freeway mainline segments:
  - Average density (vehicles per mile per lane)
  - Freeway level of service (LOS) (based on density)
  - Throughputs or served demand (vehicles per hour)
  - Unserved demand (vehicles per hour)
  - Average travel times (seconds per vehicle)
  - Average travel speed (miles per hour)
- Arterials and intersections:
  - Average travel times (seconds per vehicle)
  - Average travel speed (miles per hour)
  - Average intersection and approach control delay (seconds per vehicle)
  - Intersection LOS (based on control delay)
  - Average and maximum queue length by movement (feet)

Operational conditions of different facilities are categorized into four congestion levels by comparing the corresponding MOE values to the LOS thresholds established in the Highway Capacity Manual (HCM), Sixth Edition (TRB 2016). Namely, these MOEs are control delay for intersections, density for freeway segments, and travel speed for arterials. **Table 2-2** through **Table 2-4** present the MOE thresholds for LOS criteria and color scheme for congestion levels.

Table 2-2: Intersection Level of Service Criteria

LOS	Congestion Level	Signalized	Unsignalized
		Average Delay (sec/veh)	
A	Light Traffic	<=10	<=10
B		>10-20	>10-15
C		>20-35	>15-25
D	Moderate Traffic	>35-55	>25-35
E	Heavily Congested Traffic	>55-80	>35-50
F	Severely Congested Traffic	>80	>50

Table 2-3: Freeway Level of Service Criteria

LOS	Congestion Level	Freeway Basic Segment	Freeway Merge or Diverge Segment	Freeway Weave Segment
		Average Density (pc/mi/ln)		
A	Light Traffic	<=10	<=11	<=11
B		>11-18	>12-20	>12-20
C		>18-26	>20-28	>20-28
D	Moderate Traffic	>26-35	>28-35	>28-35
E	Heavily Congested Traffic	>35-45	>35-45	>35-45
F	Severely Congested Traffic	>45	>45	>45

Table 2-4: Arterial Level of Service Criteria

Urban Street Class		Class I	Class II	Class III	Class IV
Free Flow Speed		45 to 55 mph	35 to 45 mph	30 to 35 mph	25 to 30 mph
LOS	Congestion Level	Average Travel Speed (mph)			
A	Light Traffic	>42	>35	>30	>25
B		>34-42	>28-35	>24-30	>19-25
C		>27-34	>22-28	>18-24	>13-19
D	Moderate Traffic	>21-27	>17-22	>14-18	>9-13
E	Heavily Congested Traffic	>16-21	>13-17	>10-14	>7-9
F	Severely Congested Traffic	<=16	<=13	<=10	<=7

2.8.3 Simulation Model Development and Calibration

FHWA's TAT guidelines were followed for VISSIM microsimulation modeling, including model calibration methodology, seeding time, the number of simulation model runs, simulation parameters, and MOE outputs. **Attachment A**, Assumptions and Methodology Framework Document, summarizes the VISSIM model parameters and assumptions in detail.

2.8.3.1 Existing Conditions Model Calibration

The VISSIM models for this study were developed from previously calibrated models from the transportation study in 2012 EIS/ TTR with the current traffic volumes and latest transportation improvement projects in the Study Area. Then, additional model recalibration was performed to ensure the updated "Existing Conditions" models accurately replicate the field conditions. Following guidance from FHWA's TAT, the criteria below were used to verify the adequacy of the model calibration and validation.

- Capacity calibration criteria:
  - Throughput volumes served on freeway segments, interchange ramps and key arterials
- System performance calibration criteria:
  - Travel time or travel speed on the freeway mainlines
  - Key bottleneck locations (by visual comparison with field observations)

Table 2-5 shows the detailed criteria and acceptance targets used.

Table 2-5: FHWA Recommended Calibration Criteria

Criteria and Measures	
Individual Link Flows	
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases
Sum of All Link Flows	Within 5% of sum of all link counts
GEH Statistics for Sum of All Link Flows	GEH < 4 for sum of all link counts
Journey Time, Network	
Visual Audit	
Visually Acceptable Speed-Flow Relationship	To analyst's satisfaction
Visually Acceptable Queuing	To analyst's satisfaction

2.8.3.2 Simulation Seeding Time

A VISSIM model starts with zero vehicles on the network, which would incorrectly model how the peak hour begins in the field. Therefore, seeding time, a period of model initialization time, must be added to the start of the simulation period to allow vehicles to be on the network by the time performance statistics collection begins. The guidance from FHWA TAT suggests that seeding time should be determined based on either the existing peak hour travel time to traverse between the farthest points of the study network in the peak direction of travel or twice the off-peak travel time between the network study limits.

Under free flow conditions, the travel times on I-295, Firth Sterling Avenue, and Martin Luther King Jr. Avenue SE based on distances and posted speeds for both directions, vary between 3 and 10 minutes. Based on the average field travel time during peak hours on these corridors collected in 2019, they varied between 3 and 16 minutes depending on directions and peak periods but all within 30 minutes. The field data are summarized in **Table 2-6**. Therefore, it was determined that a seeding time of the first 30 minutes (1800 seconds) is sufficient for both AM and PM peak hours.

Table 2-6: Existing Average Field Travel Times on Key Corridors in AM and PM Peak Hours

Corridor (Direction)	Segment Start/End Location	Average Field Travel Time (Minutes per Vehicle)	
		AM Peak	PM Peak
Martin Luther King Jr. Avenue SE (NB)	From Xenia Street to O Street	11.5	15.6
Martin Luther King Jr. Avenue SE (SB)	From O Street to Xenia Street	11.5	14.5
I-295 (NB)	From South of Malcolm X Avenue to North of I-695	4.4	10.6
I-295 (SB)	From North of I-695 to South of Malcolm X Avenue	4.0	9.7
Firth Sterling Avenue (NB)	From Gate 4 to North of Howard Road	4.5	4.7
Firth Sterling Avenue (SB)	From Howard Road to Gate 4	3.1	4.0

2.8.3.3 Simulation Time

Based on the size of the network, field observations, and traffic counts on roadway networks within the Study Area, the models were run for 1 hour (3,600 seconds) after the seeding period to evaluate traffic operational performance during the peak hour for the entire network.

2.8.3.4 Number of Simulation Runs

Given the stochastic nature of the microsimulation, VISSIM models need to be run with several different random seeds. The results need to be post-processed and averaged to determine the representative state of traffic operations in the study network. To obtain a statistically valid result, the numbers of runs necessary for the analysis were determined following the guidance in FHWA's TAT. Link throughput volume was used to determine the sample size. It was determined that 10 runs were sufficient for all the scenarios.

2.8.4 Future Scenarios Models

To maintain a consistent base for traffic operational analyses of all the scenarios, driver behavior parameters in the calibrated existing year models were retained in the future No-Action and Action models. In the case where significant changes in roadway geometry are made, the driving behavior parameters at those locations were rolled back to the default values first, and further adjustments were made based on test runs and engineering judgment. New roadway geometry, lane configurations, and future traffic volumes were updated in 2035 No-Action and Action scenarios models. Iterative model assessments were performed by reviewing simulation numerical outputs and visually inspecting simulation animations to ensure that the future models generate reasonable outputs.

2.9 Safety Analysis Methodology

A quantitative safety analysis based on the most recent available 3-year crash history at all intersections within the Study Area was performed to identify hot-spot locations and crash patterns. At locations where transportation improvements are required, safety factors were incorporated in the alternative design process.

3 EXISTING TRANSPORTATION NETWORKS

3.1 Roadway Network

The Study Area is composed of several limited-access facilities, arterials and collectors, which are highlighted in the sections below. **Figure 3-1** shows the functional classification of all roadways included within the Study Area. The definitions of these functional classifications are as follows:

- A limited-access road usually refers to an interstate, a freeway or an expressway. For the purpose of functional classification, freeways and expressways "have directional travel lanes are usually separated by some type of physical barrier, and their access and egress points are limited to on- and off-ramp locations or a very limited number of at-grade intersections." (FHWA, 2013)
- An arterial street is "a street interrupted by traffic control devices (e.g., signals, STOP signs or YIELD signs) that primarily serves through traffic and that secondarily provides access to abutting properties." (TRB, 2016)
- A collector street is "a surface street providing land access and traffic circulation within residential, commercial, and industrial areas." (TRB, 2016)

The detailed roadways and intersections that were included in the TTR Study Area and analyses are presented in **Chapter 2**.

3.1.1 Limited-Access Facilities

3.1.1.1 Interstate 295 (Anacostia Freeway)

I-295 (Anacostia Freeway), located east of the Anacostia River, is a four-lane divided freeway with a posted speed limit of 50 miles per hour (mph). It generally runs in a north-south direction within Ward 8. On September 4, 2018, DDOT began construction on the I-295/Malcolm X Avenue Interchange Improvement Project. The multiple phases of this project include the reconstruction of the I-295 interchange with Malcolm X Avenue SE, including modified ramps and a new access roadway to the West Campus. The project is scheduled to be completed by Spring 2022. The planned improvements will be made between Firth Sterling Avenue SE, to the north, and the South Capitol Street/Martin Luther King Jr. Avenue SE intersection to the south. During the construction period, DDOT reduced the speed limit from 50 mph to 40 mph on the section of I-295 between the area south of Exit 1, U.S. Naval Research Laboratory, and the area south of East Capitol Street.

3.1.1.2 Suitland Parkway

Suitland Parkway is a limited-access freeway that generally runs east-west between South Capitol Street and Andrews Air Force Base in Prince George's County, Maryland. Its cross section varies from four lanes east of the Martin Luther King Jr. Avenue SE overpass to six lanes west of I-295. It is classified as an expressway through the Study Area and carries mostly commuter traffic. The speed limit on Suitland Parkway ranges from 35 mph to 45 mph from South Capitol Street Bridge to Alabama Avenue.

3.1.2 Local Street Network and Arterials

3.1.2.1 Martin Luther King Jr. Avenue SE

Martin Luther King Jr. Avenue SE is a four-lane urban minor arterial that runs north-south from the 11th Street Bridge to DC Village in Southwest Washington, DC. The speed limit is 30 mph within the Study Area. However, the posted speed limit along Martin Luther King Jr. Avenue SE ranges from 25 mph – 30 mph from 11th Street Bridge to South Capitol Street SE. Parking is permitted on either side of the street north and south of the St. Elizabeths complex. Between the north and south borders of St. Elizabeths, parking is prohibited along the northbound side of the street during the AM peak period and along the southbound side of the street during the PM peak period.

3.1.2.2 South Capitol Street SE

South Capitol Street SE is classified as a principal arterial north of Firth Sterling Avenue/Defense Boulevard. The Frederick Douglass Memorial Bridge carries South Capitol Street across the Anacostia River, where it continues south, parallel to I-295. The classification of the roadway changes from principal arterial to minor arterial south of the South Capitol Street and Firth Sterling Avenue SE intersection. The posted speed limit is 35 mph north of Firth Sterling Avenue and 40 mph south of Firth Sterling Avenue.

3.1.2.3 Malcolm X Avenue SE

Malcolm X Avenue SE is a four-lane urban minor arterial that runs east-west and extends from South Capitol Street and the Joint Base Anacostia-Bolling (JBAB) main gate to 8th Street SE and serves as the main connection thoroughfare for residential areas. The speed limit along Malcolm X Avenue is 30 mph. Parking is allowed on both sides of the street east of the I-295 on- and off-ramps.

3.1.2.4 Howard Road SE

Howard Road SE is a four-lane collector road that runs southeast from South Capitol Street SE to Bowen Road, traveling under I-295. Vehicles are permitted to park along both sides of Howard Road west of I-295. Traveling westbound on Howard Road is the most direct route from southbound I-295 to downtown DC (via northbound South Capitol Street). Howard Road also provides access to the Anacostia Metrorail Station and garage. The speed limit along Howard Road is 25 mph.

3.1.2.5 Firth Sterling Avenue SE

Firth Sterling Avenue SE is a four-lane collector road that runs southwest to northeast from South Capitol Street (Anacostia Naval Station entrance) to the I-295 northbound on-ramp just north of Howard Road. Firth Sterling Avenue is a major route for motorists and pedestrians traveling between the Anacostia Naval Annex, the Anacostia Metrorail Station, and Historic Anacostia. It also provides access to the Barry Farm neighborhood. The speed limit for Firth Sterling Avenue is 25 mph.

3.1.2.6 Alabama Avenue SE

Alabama Avenue SE is a minor arterial that comprises the eastern and southern border of the TTR Study Area. Its cross section is one lane with a curbside parking lane in each direction. Access to and from the Congress Heights Metrorail Station is provided via a signalized intersection at Alabama Avenue. The speed limit on Alabama Avenue within the Study Area is 25 mph.

3.1.2.7 Good Hope Road SE

Good Hope Road SE is an undivided minor arterial that runs east-west through the Study Area and has a posted speed limit of 25 mph. Good Hope Road has on-street parking on either side of the roadway. The section between Martin Luther King Jr. Avenue SE and Minnesota Avenue is a four-lane roadway (two travel lanes in each direction). The section between Minnesota Avenue and 16th Street is a four-lane section with one travel lane and a parking lane in each direction.

3.1.2.8 13th Street SE

13th Street SE is a one-way three-lane collector road that runs north-south within the Study Area and has a posted speed limit of 25 mph. 13th Street SE has on-street parking on either side of the roadway.

3.1.2.9 Pleasant Street SE

Pleasant Street SE is a two-way local road that runs east-west through the Study Area and has a posted speed limit of 25 mph. Pleasant Road has on-street parking on the north side of the roadway. Along Pleasant Street SE, there is Capital Bikeshare parking on the north side of the roadway, close to the Martin Luther King Jr. Avenue SE.

3.1.2.10 St. Elizabeths Avenue SE (West Campus Access Road)

St. Elizabeths Avenue SE (also known as West Campus Access Road) is a local road that runs along the west side of the Campus between Firth Sterling Avenue SE and Gate 4 of West Campus. As part of I-295/Malcolm X Avenue Interchange Improvement Project, St. Elizabeths Avenue will be further extended south and connected to I-295 through the Malcolm X Avenue interchange. The project is currently under construction and expected to be completed by Spring 2022. The speed limit for St. Elizabeths Avenue is 25 mph.

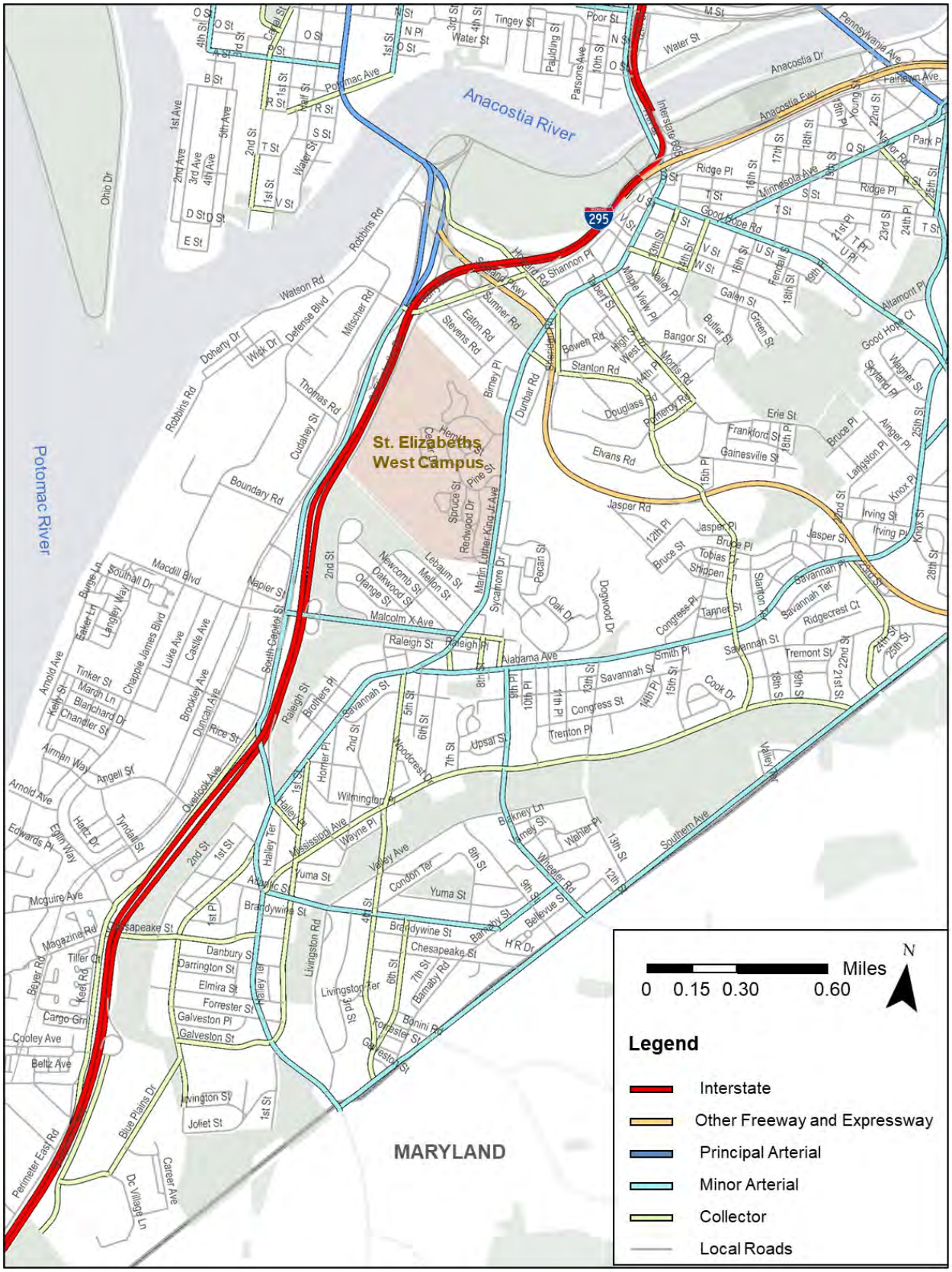

Figure 3-1: Roadway Functional Classification in St. Elizabeths Area

3.1.3 Existing Roadway Conditions

3.1.3.1 Existing Pavement Conditions

Road pavements throughout the Study Area were assessed from a visual examination in May 2019. In all, pavement surface conditions of key roadways are acceptable. St. Elizabeths Avenue is a newly constructed roadway, and Firth Sterling Avenue was reconstructed after 2014. Both pavement conditions are almost new. The remaining road pavements are in good to fair conditions, having areas that are showing age and use (cracks, buckling, missing lane markings). No roadway pavements are in poor conditions with major deficiencies.

Table 3-1 and **Figure 3-2** provide additional condition information for the key roadways in the Study Area. Based on a DDOT's guidance (2017), the pavement conditions are categorized into four levels as follows:

- Excellent – No defects or deficiencies
- Good – Low severity defects and deficiencies
- Fair – Low to moderate severity defects or deficiencies
- Poor – Medium to high severity defects or deficiencies

Table 3-1: Roadway Pavement Assessment

Roadway	Condition Descriptions	Overall Assessment
South Capitol Street (from South Capitol Street Bridge to Martin Luther King Jr. Avenue SE)	The roadway pavement is asphalt and in fair-to-good condition, markings are in good condition. Portions of the roadway have a center two-way left-turn lane (TWLTL).	Fair to Good
Anacostia Freeway I-295 (from 11th Street Bridge to the Naval Research Lab interchange)	Portions of the roadway are under repaving and construction at the time of survey, consequently, conditions can be expected to improve. The roadway is a combination of asphalt and concrete. The pavement and markings are in generally fair condition, although certain areas have faded markings and uneven pavement. The roadway is three lanes in each direction.	Fair
Martin Luther King Jr. Avenue SE (from 11th Street Bridge to South Capitol Street)	The roadway pavement is a combination of asphalt and concrete. Most parts are in good condition, although certain sections are in fair condition. The roadway has two lanes in each direction, although pavement markings do not run throughout. For many sections, the right lane is a parking lane.	Good
Malcolm X Avenue (from South Capitol Street to Martin Luther King Jr. Avenue SE)	The roadway pavement is a combination of asphalt and concrete and is in good condition. It is generally one travel and one parking lane in each direction.	Good
Alabama Avenue (from Martin Luther King Jr. Avenue SE to Wheeler Road)	The roadway pavement is a combination of asphalt and concrete and is in good condition, generally consisting of one travel and one parking lane in each direction.	Good
Suitland Parkway (from South Capitol Street Bridge to Stanton Road)	The roadway pavement is asphalt, and markings are in good condition. It is two lanes in each direction.	Good
Howard Road (from South Capitol Street Bridge to Martin Luther King Jr. Avenue SE)	The roadway pavement is concrete and in fair condition. It is two lanes in each direction.	Fair
Firth Sterling Avenue (from South Capitol Street to Anacostia Freeway north of Suitland Parkway)	Firth Sterling Avenue was reconstructed after 2014 with two lanes in each direction and in very good condition. The roadway pavement is a combination of asphalt and concrete. The inner lanes are asphalt and the outer lanes are concrete with streetcar tracks running on the pavement.	Excellent
St. Elizabeths Avenue (from Firth Sterling Avenue to West Campus Gate 4)	The roadway was newly constructed in 2014. The asphalt pavement and markings are in very good condition. It has one lane in each direction.	Excellent

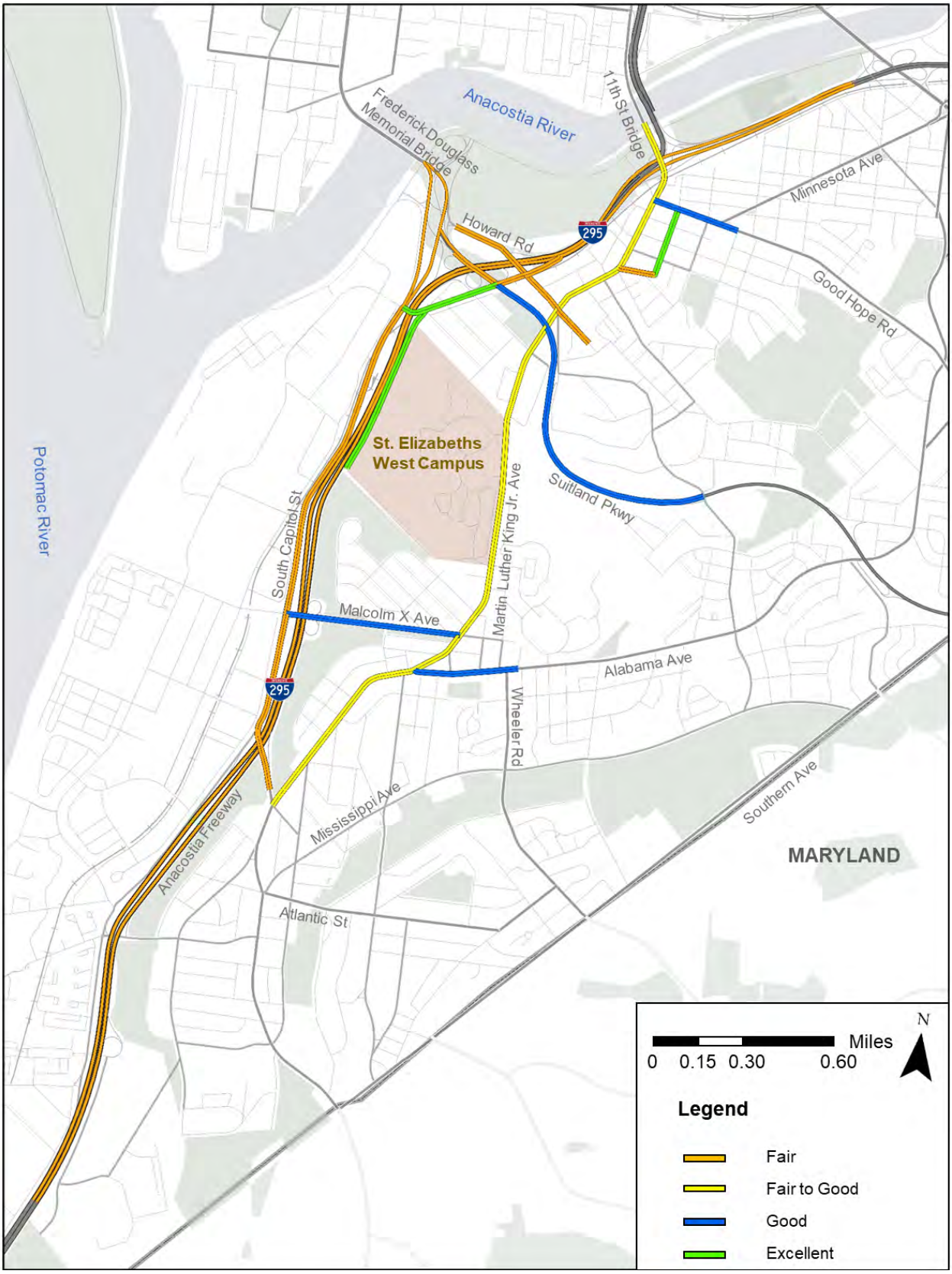

Figure 3-2: Study Area Roadway Pavement Conditions Assessment

3.1.3.2 Intersection Controls

Among all 39 intersections within the Study Area, the majority, 29 intersections, are signalized. The remaining 10 intersections are either two-way stop-controlled (TWSC) or one-way stop-controlled (OWSC). Intersections appear to be appropriately signalized for the level of traffic they currently handle. However, changes to the level of throughput could be achieved with refinements to signal timings or additional signalization. **Table 3-2** summarizes all Study Area intersections and the type of intersection control present.

Table 3-2: Study Area Intersections and Intersection Controls

Intersection ID	Intersection Location	Control Type
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal
2	Good Hope Road and 13th Street	Signal
3	Martin Luther King Jr. Avenue SE and W Street	Signal
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC
5	W Street and 13th Street	TWSC
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal
8	Suitland Parkway and South Capitol Street	Signal
9	Howard Road and I-295 SB Off-Ramp	Signal
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	Signal
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal
12	Howard Road and Sayles Place	OWSC
13	Suitland Parkway and Firth Sterling Avenue	Signal
14	Suitland Parkway East Off-Ramp and Stanton Road	Signal
16	Firth Sterling Avenue and Barry Road/Sumner Road	Signal
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal
18	South Capitol Street and Defense Boulevard/Firth Sterling Avenue	Signal
19	Martin Luther King Jr. Avenue SE and Gate 1 to West Campus	Signal
20	Martin Luther King Jr. Avenue SE and Redwood Drive	TWSC
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC
22	Malcolm X Avenue and South Capitol Street NB	Signal
23	Malcolm X Avenue and South Capitol Street SB	Signal
24	Malcolm X Avenue and Anacostia Frwy NB Off- and On-Ramp	OWSC
25	Malcolm X Avenue and 2nd Street	OWSC
26	Malcolm X Avenue and Oakwood Street	OWSC
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal
30	Alabama Avenue and Randle Place	Signal
31	Alabama Avenue and Wheeler Road	Signal
41	Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place	Signal
43	Good Hope Road and Minnesota Avenue	Signal
44	Stanton Road and Dunbar Road/Suitland Parkway East On-Ramp	TWSC
45	Sheridan Road and Suitland Parkway West Off-Ramp	OWSC
46	Alabama Avenue and 7th Street	Signal
47	Martin Luther King Jr. Avenue SE and Gate 3 to West Campus	Signal
48	Firth Sterling Avenue and Street. Elizabeths Avenue	Signal
49	Firth Sterling Avenue and Eaton Road	Signal
50	Howard Road and Anacostia Metro Garage Entrance	Signal

3.1.3.3 Posted Speed Limits

Speed limits within the Study Area vary greatly, from highway/parkway speeds of 50 mph along I-295/Anacostia Freeway to 25 mph along Alabama Avenue and residential streets. The posted speed limits are appropriate and consistent with adjacent land uses and intensities. **Table 3-3** below provides the range of speed limits present on each of the targeted roadways within the Study Area.

Table 3-3: Post Speed Limits on Roadway within the Study Area

Roadway	Posted Speed Limits
I-295 (from 11th Street Bridge to the Naval Research Lab interchange)	50 mph*#
South Capitol Street (from South Capitol Street Bridge to Martin Luther King Jr. Avenue SE)	35 – 40 mph
Suitland Parkway (from South Capitol Street Bridge to Alabama Avenue)	35 – 45 mph
Martin Luther King Jr. Avenue SE (from 11th Street Bridge to South Capitol Street)	25 – 30 mph
Malcolm X Avenue (from South Capitol Street to Martin Luther King Jr. Avenue SE)	30 mph
Howard Road (from South Capitol Street Bridge to Martin Luther King Jr. Avenue SE)	25 mph#+
Firth Sterling Avenue (from South Capitol Street to I-295 north of Suitland Parkway)	25 mph#+
Alabama Avenue (from Suitland Parkway to Martin Luther King Jr. Avenue SE)	25 mph
Good Hope Road SE (from Martin Luther King Jr. Avenue SE to Minnesota Avenue)	25 mph
13th Street (from Pleasant Street to Good Hope Road)	25 mph
Pleasant Street (from 13th Street to Martin Luther King Jr. Avenue SE)	25 mph

* As of August 2019, the I-295/ Malcolm X Avenue intersection is under reconstruction. During the construction period, the posted speed is reduced to 40 mph on the section of I-295 between the area south of Exit 1, U.S. Naval Research Laboratory, and the area south of East Capitol Street.[3]
# There are sections at school zones with 15 mph posted speed limits during 7 a.m. – 5 p.m.
+ There was no speed limit sign posted on Howard Road. Based on speeding laws in DC, on all streets and highways, unless otherwise designated, the maximum lawful speed is 25 mph[4].

3.2 Non-Motorized Transportation Facilities

3.2.1 Public Transportation

The majority of the public transportation within the area surrounding the West Campus is provided by the Washington Metropolitan Area Transit Authority (WMATA). Metrobus routes provide local service throughout the immediate community and provide connections to downtown DC. The Metrorail provides access to the area through two nearby stations, Anacostia and Congress Heights, both on the Green Line. The Maryland Transit Authority (MTA) runs an express/commuter bus that has two stops at South Capitol Street and Malcolm X Avenue in the Study Area. Regionally, the area is served by additional commuter rail and commuter/express buses. **Figure 3-3** illustrates the existing rail and bus routes in the Study Area.

[3] District Department of Transportation (DDOT) (2019, May). *The official I-295 Malcolm X Interchange Project Website.* Retrieved July 15, 2019 from https://295malcolmxproject.com/.

[4] Metropolitan Police Department (MPDC). *Speeding Laws in DC*. Retrieved July 15, 2019 from https://mpdc.dc.gov/page/speeding-laws-fines-and-safety-tips

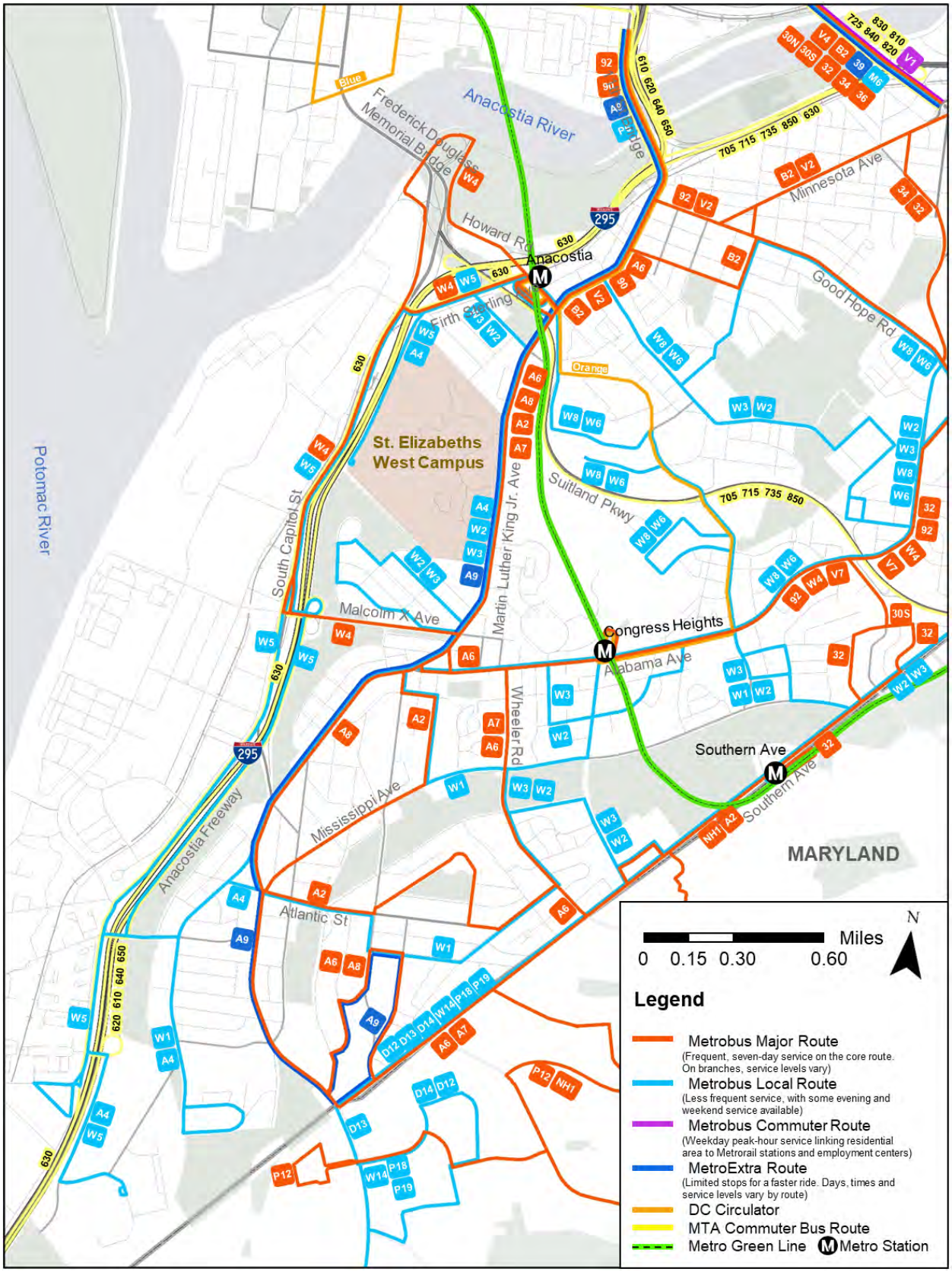

Figure 3-3: Existing Transit Network in St. Elizabeths Area

3.2.1.1 Metrorail

WMATA provides Metrorail access to the Green Line at the Anacostia and Congress Heights Metrorail Stations. WMATA projections indicate that the peak periods for the Green Line rail operations at these stations are 7:30–8:30 a.m. and 4:30–5:30 p.m., weekdays.

The Anacostia Station is at the intersection of Howard Road and Firth Sterling Avenue, approximately 0.6 miles from the nearest West Campus entrance (Gate 1). The walk time from the Anacostia Metrorail Station to the West Campus Gate 1 is about 14 minutes. The walking route from Anacostia Station to St. Elizabeths is on a 4 percent uphill grade.

The Congress Heights Metrorail Station is on Alabama Avenue at 13th Street, approximately 0.8 miles from the nearest West Campus entrance (Gate 3). Direct pedestrian access from Congress Heights Station to the West Campus is provided through various existing pedestrian facilities such as sidewalks and crosswalks, with walk times about 15 minutes to Gate 3.

3.2.1.2 Commuter Rail

Washington, DC, is served by two commuter rail systems. Virginia Railway Express (VRE) provides service from Virginia to L'Enfant Plaza and Union Station. VRE operates 24 trains per day on two lines to and from Union Station. Maryland Area Regional Commuter (MARC) provides service from Maryland to Union Station, operating 104 trains a day on three lines.

3.2.1.3 Metrobus

In addition to Metrorail, WMATA provides transit service throughout the Study Area by Metrobus. **Figure 3-4** shows the Metrobus stops in this area along Martin Luther King Jr. Avenue. Metrobus routes provide connections throughout the immediate community, to Metrorail at the Anacostia and Congress Heights Metrorail Stations, and to downtown DC

The Anacostia Metrorail Station is served by 18 Metrobus routes with stops at or near the station. The Congress Heights Metrorail Station is served by 8 Metrobus routes that stop at or near the station. In the future scenarios, no changes are assumed for the existing routes, stops, or schedules of the Metrobuses that travel through the St. Elizabeths Study Area road network. As the St. Elizabeths campus reaches full development, the expanded road network presents an opportunity for the realignment of existing bus routes and the addition of new routes serving the campus and surrounding area.

Currently, Metrobus routes A4 and W5 travel between the Anacostia Metrorail Station and West Campus Gate 4. There are bus bays next to Gate 4 along St. Elizabeths Avenue SE. Metrobus routes A2, A4, A6, A7, A8, A9, W2, and W3 stop at Anacostia Metrorail Station and on both sides of Martin Luther King Jr. Avenue SE near West Campus Gates 1 and 2.

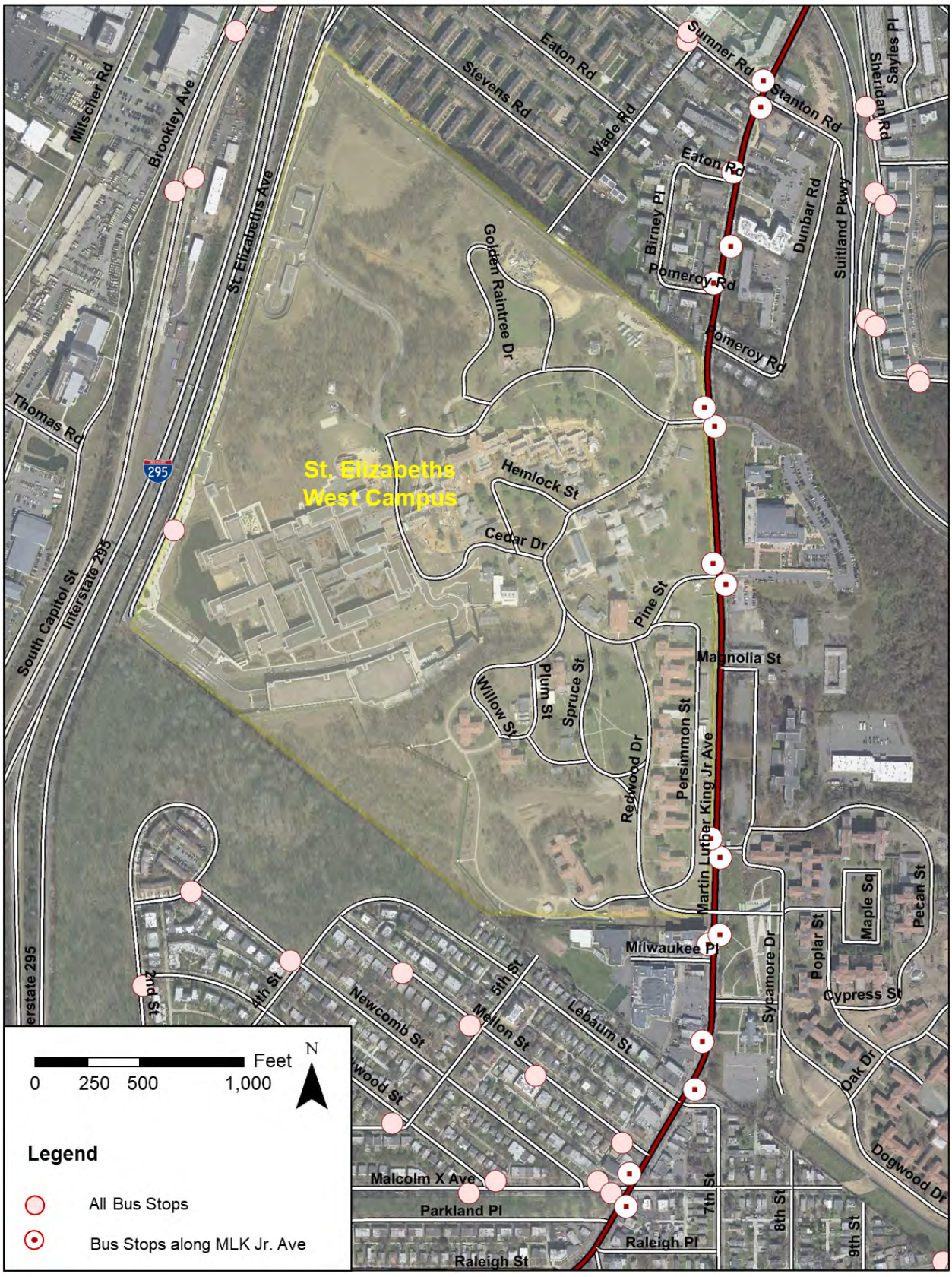

Figure 3-4: Metrobus Stop Locations near the West Campus

3.2.1.4 Commuter and Express Bus

Regional commuter buses that provide indirect service to the West Campus include Fairfax Connector (VA), Loudoun County Transit (VA), OmniRide (Prince William County, VA), Maryland Transit Authority (MTA) commuter buses, and Prince George's County/Charles County (MD) transit providers. Buses typically pick up at park-and-ride lots and drop off at multiple locations in downtown DC.

The Route 630 Commuter Bus, operated by MTA, travels between La Plata/Waldorf (in Charles County, MD) to Washington, DC, and has two stops at the intersection of South Capitol Street and Malcolm X Avenue. In the morning, four of the eight trips stop at Malcolm X Avenue. In the evening, all eight trips stop at Malcolm X Avenue.

Three regional transportation agencies also provide indirect service to the West Campus through the operation of express buses from outer counties into downtown DC. These include the Potomac and Rappahannock Transportation Commission (PRTC), Loudoun County Transit (LCT), and MTA. The buses typically pick up at park-and-ride lots and drop off at locations downtown.

3.2.1.5 DC Circulator

DDOT, in partnership with DC Surface Transit, Inc. and the National Park Service, operates several DC Circulator bus routes through Washington, DC. These buses typically operate every 10 minutes. The DC Circulator route between Congress Heights and Union Station travels through the Study Area. It originates at Union Station, travels across the 11th Street Bridge, along Martin Luther King Jr. Avenue SE to Anacostia Metrorail Station, and east through Anacostia to its terminus at the Congress Heights Metrorail Station.

3.2.2 Pedestrian Network and Sidewalk Assessment

Primary pedestrian routes in the vicinity of the West Campus include Martin Luther King Jr. Avenue SE, Firth Sterling Avenue, and Howard Road. Pedestrian access to the campus is provided via sidewalks on each roadway; most intersections have crosswalks and curb ramps. Sidewalks with a typical width of 6 feet are located along Howard Road and Martin Luther King Jr. Avenue SE. These provide direct pedestrian access from the Anacostia Metrorail Station to the existing West Campus gates. There is a grass buffer (typically 4 feet) between the vehicle travel lanes and the sidewalk in many locations within the Study Area. Sidewalks are generally adequate to carry the existing relatively low levels of pedestrian traffic adjacent to the campus.

Further south on Martin Luther King Jr. Avenue SE (near Malcolm X Avenue), numerous retail establishments, schools, and bus stops generate high levels of pedestrian activity. The Martin Luther King Jr. Avenue SE/Malcolm X Avenue intersection has crosswalks and countdown pedestrian signals. A crossing guard is present during the peak periods of school-age pedestrian usage to improve safety along this corridor. There are numerous driveways that cross the sidewalk along this segment of Martin Luther King Jr. Avenue SE. In addition, clearing the overgrown vegetation at a few locations could improve the pedestrian safety and experience.

Firth Sterling Avenue currently has a continuous pedestrian route along the southern side of the roadway from the JBAB gate at South Capitol Street to the Anacostia Metrorail Station. Crosswalks exist on the south and west legs of the Firth Sterling Avenue/South Capitol Street intersection. A crosswalk exists across the east leg of the intersection of Firth Sterling Avenue/Suitland Parkway.

Sidewalks are provided on most of the major roadways in the Study Area and are composed of concrete, brick, asphalt, or a combination of these materials; only I-295 does not have sidewalks along the roadway. Suitland Parkway has a pathway that runs parallel to the roadway for a limited section. The existing sidewalk conditions near the West Campus were assessed through a visual examination in May 2019, as illustrated in **Figure 3-5**. The general definition of each condition category is defined in **Section 3.1.3.1**.

Overall, the condition of sidewalks within the Study Area is Good to Fair and appears to provide adequate capacity for pedestrian users on at least one side of the roadway. Increased pedestrian, bicycle, or vehicular traffic likely would require improvements or additional facilities to ensure capacity and safety for all the users.

The overall condition of the sidewalks along the major roadways in the Study Area is summarized in **Table 3-4**. Along with the width and materials of the sidewalk, a brief discussion of any compliance issues with regards to the Americans with Disabilities Act (ADA) and DDOT guidelines are summarized in the table. Majority of the study intersections have crosswalks as well as wheelchair accessible curb cuts. Within the Study Area, no compliance issues were noted, except for a few utility elements causing a minor reduction in unobstructed walking width of the sidewalk.

Table 3-4: Sidewalk Assessment

Roadway	Sidewalk Assessment			
	Width	Material	Overall Condition	ADA or DDOT Compliance Issues
South Capitol Street (South Capitol Street Bridge – Martin Luther King Jr. Avenue SE)	6 ft	Mixture of Concrete, and Asphalt	Good – Fair bike trail north of Firth Sterling with uneven pathway and vegetative growth	None
Martin Luther King Jr. Avenue SE (11th Street Bridge – South Capitol Street)	≤ 6 ft	Concrete, Brick	Good – few areas of Fair conditions with vegetative growth and cracked pathway	Few areas with utility and signage poles in the walking pathway causes reduction in unobstructed walking width. Crosswalk on the north side of Upsal Street SE does not have a curb ramp.
Martin Luther King Jr. Avenue SE (Within West Campus Boundaries)	< 6 ft	Concrete	Fair – cracked pathway, vegetative growth, and uneven pathway	Few areas with utility and signage poles in the walking pathway causes reduction in unobstructed walking width. The sidewalk on the east side of the roadway is consistently less than 6 ft.
Alabama Avenue (Suitland Parkway – Martin Luther King Jr. Avenue SE)	6 ft	Concrete	Good	Few areas where planting boxes decrease the unobstructed walking width

Roadway	Sidewalk Assessment			
	Width	Material	Overall Condition	ADA or DDOT Compliance Issues
Suitland Parkway (South Capitol Street Bridge – Stanton Road)	6 ft	Asphalt	Good – few areas of uneven and patched pathway, vegetative growth	None
Malcolm X Avenue (South Capitol Street – Martin Luther King Jr. Avenue SE)	6 ft	Concrete	Good – few areas of Fair conditions with cracked, patched and missing concrete	Few areas where planting boxes decrease the unobstructed walking width
Howard Road (South Capitol Street Bridge – Martin Luther King Jr. Avenue SE)	> 6 ft	Concrete	Good – few areas of Fair condition, vegetative growth, cracked and uneven concrete	Few areas with utility and signage poles in the walking pathway causes reduction in unobstructed walking width. Few areas where planting boxes decrease the unobstructed walking width. Crosswalks at Anacostia Freeway Ramps and Suitland Parkway missing curb ramps and pavement crosswalk markings.
Firth Sterling Avenue (South Capitol Street – I-295 north of Suitland Parkway)	6 ft	Concrete	Good to Fair – the sidewalk on the south side of the roadway is in Fair condition with patched, cracked, and uneven concrete with vegetative growth	Curb ramp for Firth Sterling Avenue SE at Eaton Rd SE is in disrepair
13th Street (Pleasant Street – Good Hope Road)	6 ft	Brick and Concrete	Good – few areas of vegetative growth	Corner of 13th Street SE and Pleasant Street SE has obstruction in concrete and the curb is not cut for ADA access; Areas with planting strip are less than 4 ft wide
Pleasant Street (13th Street – Martin Luther King Jr. Avenue SE)	6 ft	Brick and Concrete	Good – few areas of vegetative growth	Few areas with planting strip less than 4 ft wide
Good Hope Road (Martin Luther King Jr. Avenue SE – 16th Street)	6 ft	Brick and Concrete	Good to Fair – few areas with cracked, uneven, and missing bricks/pathway	An area with planting strip less than 4 ft wide near Minnesota Avenue SE

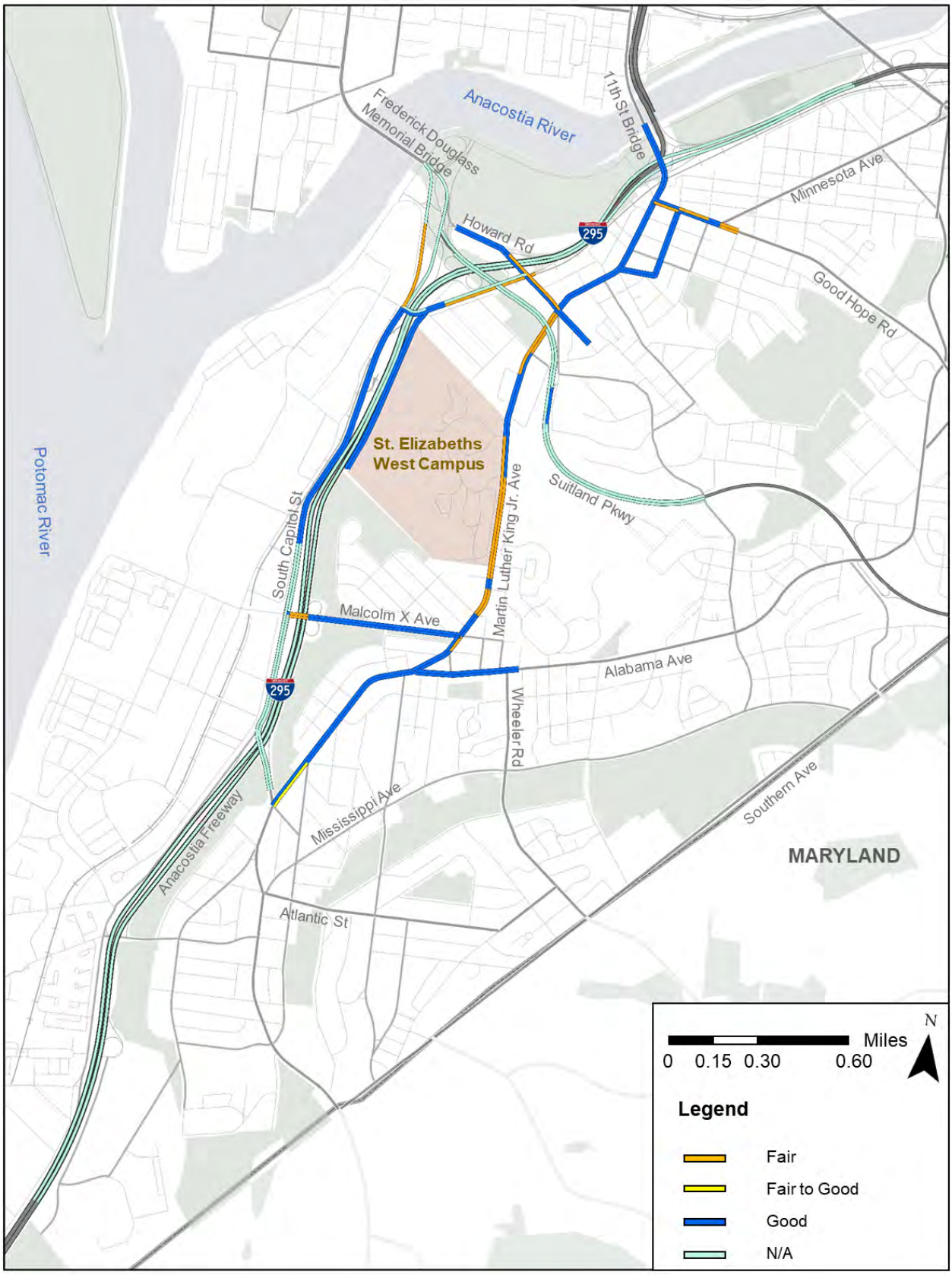

Figure 3-5: Study Area Sidewalk Assessment

3.2.3 Curbside Management

As depicted in **Figure 3-6**, the curbside parking available around the West Campus is limited. The neighborhood street parking is not intended to serve as parking for employees who work at the West Campus. Martin Luther King Jr. Avenue SE has no parking adjacent to the campus and limited parking with peak period restrictions to the north and south. Along Malcolm X Avenue to the south of the West Campus, parking is available with fewer restrictions. Additionally, there are Residential Permitted Parking (RPP) restrictions on several of the neighborhood roads (e.g., Sumner Road SE, Lebaum Street SE, and Mellon Street SE) immediately north and south of the West Campus.

3.2.4 Bicycle Facilities

There are several bicycle facilities within the Study Area. A signed bicycle route runs along Howard Road from east of Martin Luther King Jr. Avenue SE to Poplar Point along the Anacostia River. There are two walking and bicycle trails: one along Suitland Parkway that ends at Martin Luther King Jr. Avenue SE near the Anacostia Metrorail Station and another along South Capitol Street north of Firth Sterling Avenue that connects to the Frederick Douglass Memorial Bridge. The 2013 update to the 2005 District of Columbia Bicycle Master Plan notes that the connection between the bicycle facilities and the bridge are substandard on the southern side of this bridge. A portion of Martin Luther King Jr. Avenue SE between Alabama Avenue and South Capitol Street and Malcolm X Avenue have designated bicycle lanes. Currently there are no designated bicycle facilities directly connected to the West Campus.

Capital Bikeshare racks can be found in several locations north and south of the West Campus along Martin Luther King Jr. Avenue SE, and bicycle lockers are located at both the Anacostia and Congress Heights Metrorail Stations.

Figure 3-7 illustrates the existing bicycle facilities in the vicinity of the St. Elizabeths Campus.

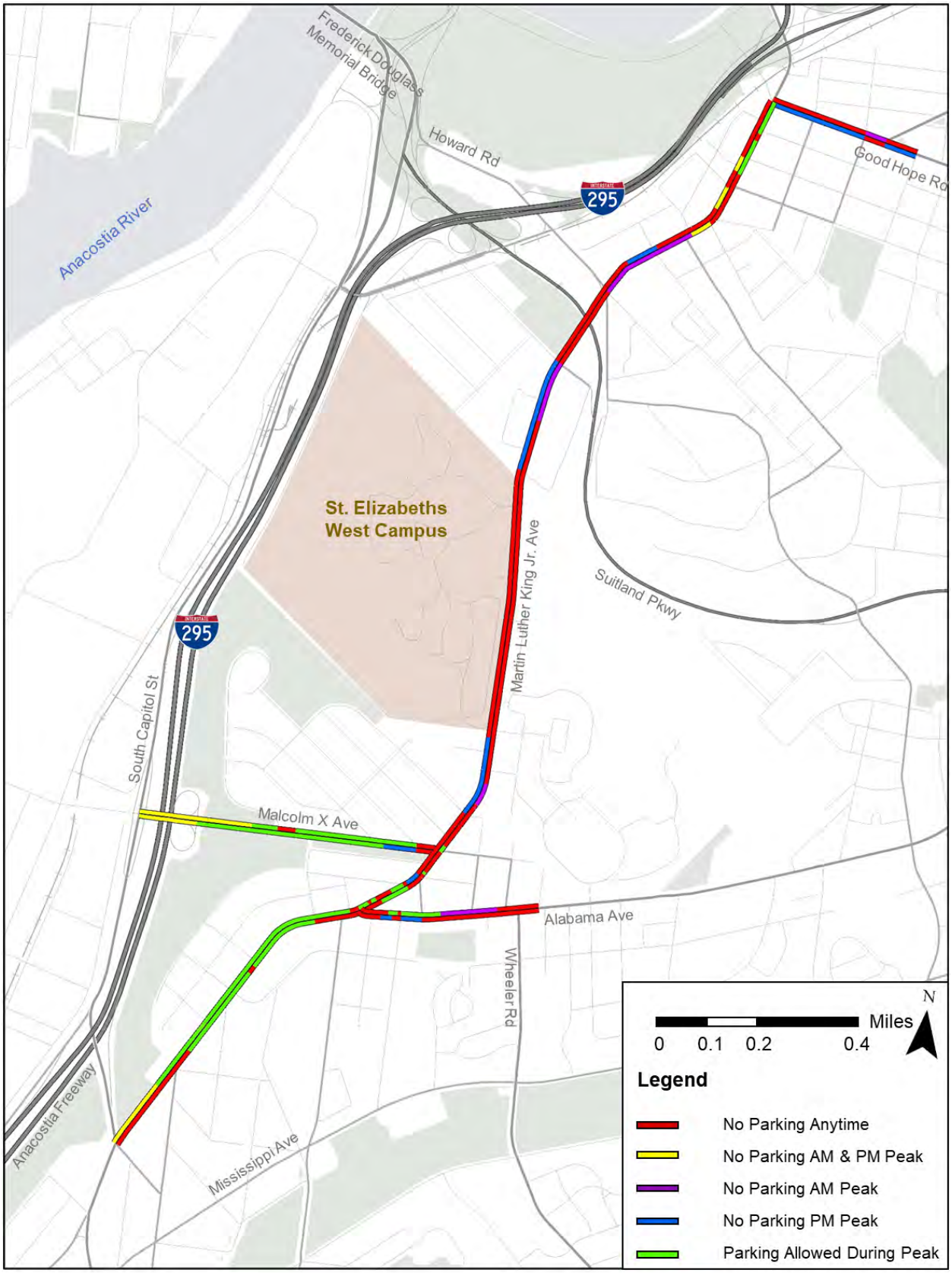

Figure 3-6: Study Area Curbside Management

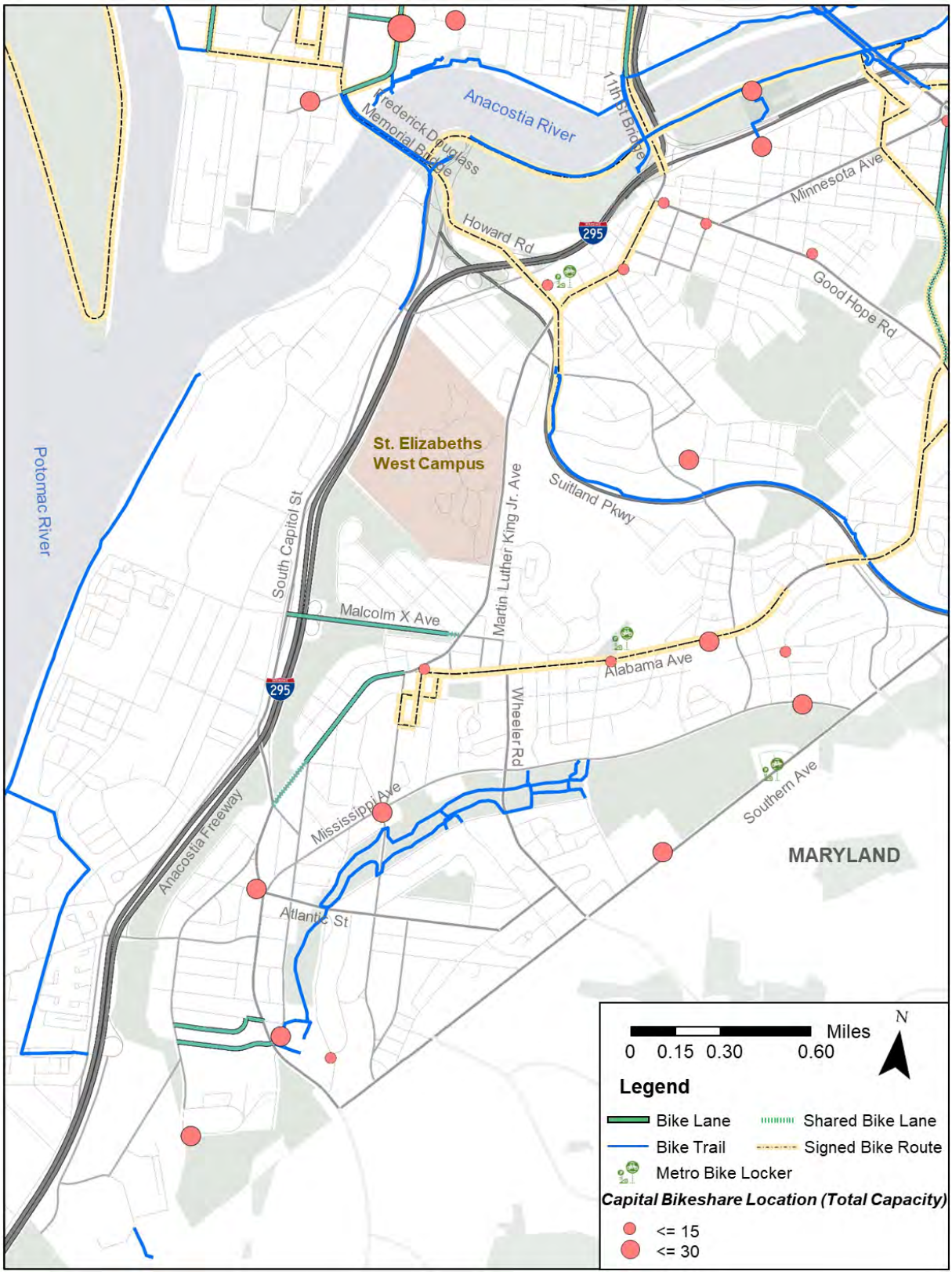

Figure 3-7: Bicycle Facilities in St. Elizabeths Area

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4 EXISTING TRAFFIC OPERATIONS AND SAFETY CONDITIONS

4.1 Existing Traffic Volumes

4.1.1 Peaking Patterns and Existing Peak-Hour Traffic Volumes

4.1.1.1 Peak Hours Identification

Aggregated diurnal traffic volumes collected on freeway mainlines, key arterials, and for intersection turning movements, were used initially to determine the system peak hours to be used in this analysis. As shown in **Figure 4-1**, the overall traffic peaking patterns are somewhat inconsistent between I-295 freeway corridor and key arterials within the Study Area.

In the AM peak period, the peak hours for both I-295 freeway and key arterials occurs between 7:15 a.m. and 8:15 a.m. This hour was therefore identified as the AM peak hour. In the PM peak period, however, the freeway and key arterials peaks occur at different hours. I-295 traffic peaks between 2:30 p.m. and 3:30 p.m., whereas arterial traffic peaks between 4:30 p.m. and 5:30 p.m. A primary focus of this study is on the Master Plan Amendment 2's impacts on the surrounding arterial network and intersections. Therefore, to identify a representative system peak hour for the PM peak period that captures the worst-case scenario, it was decided to review the total intersection turning movement volumes within the Study Area during the peak period to determine the peak hour.

Table 4-2 below shows the total intersection volumes at 15-minute intervals within the Study Area. Cells in red represent the highest 15-minute interval volumes for each individual intersection during AM and PM peak periods. During the AM peak, the peak hour for most of the intersections occurs between 7:15 a.m. and 8:15 a.m. During the PM peak, the peak hour for most of the intersections occurs between 4:30 p.m. and 5:30 p.m.

Based on a comprehensive look at traffic volumes within the Study Area, as well as considerations of the main purpose of this study and the unique local traffic patterns, it was decided that the system peak hours to be analyzed for this project are between **7:15 a.m. and 8:15 a.m.** during the AM peak period and between **4:30 p.m. and 5:30 p.m.** during the PM peak period.

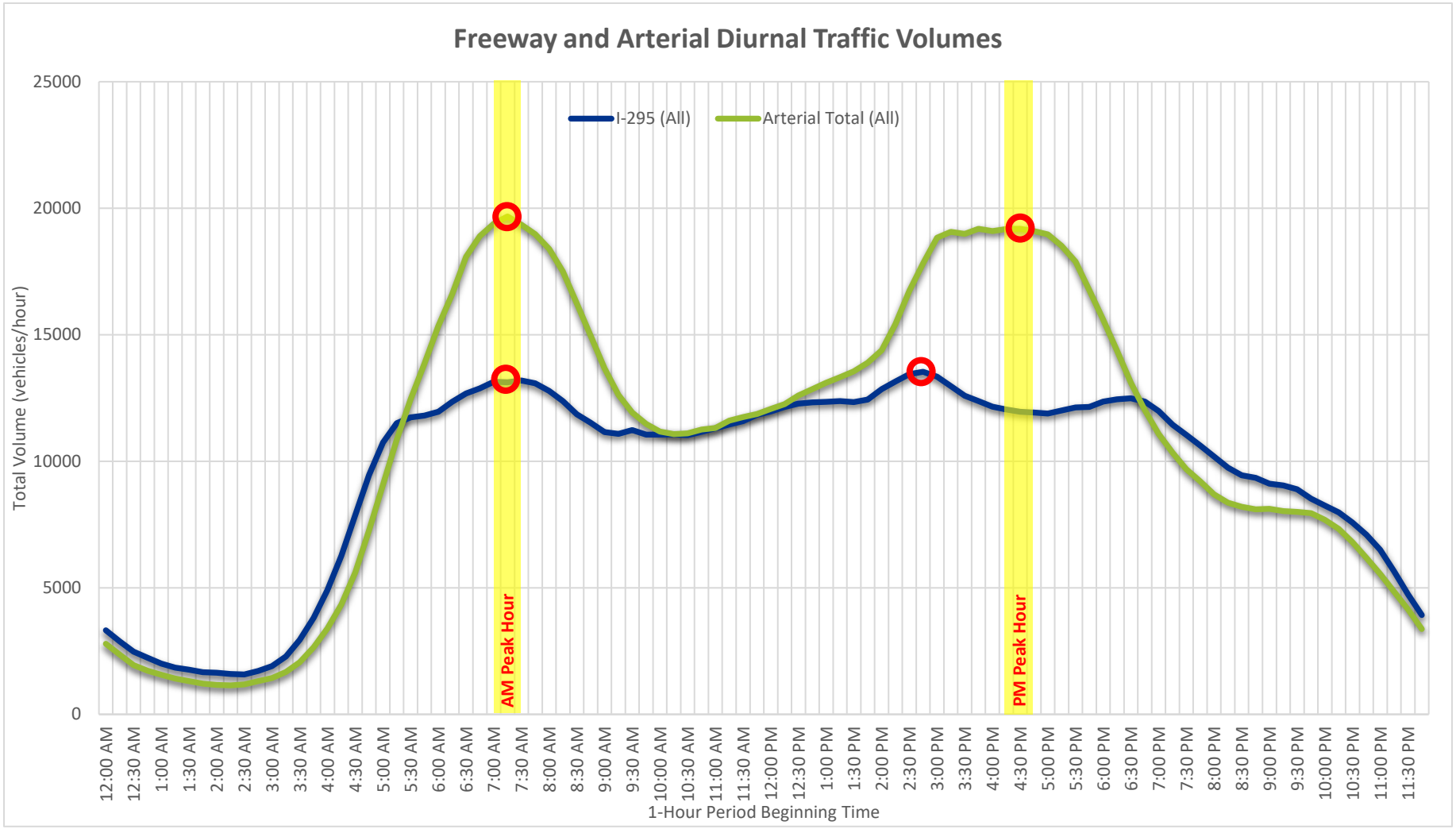

Figure 4-1: Freeway and Arterial Diurnal Traffic Volumes

Table 4-1: Intersection Volumes Peaking Patterns within the Study Area (15-Minute Interval)

Intersection ID	Intersection Location	6:00 AM	6:15 AM	6:30 AM	6:45 AM	7:00 AM	7:15 AM	7:30 AM	7:45 AM	8:00 AM	8:15 AM	8:30 AM	8:45 AM	9:00 AM	9:15 AM	9:30 AM	9:45 AM	10:00 AM	10:15 AM	10:30 AM	10:45 AM	11:00 AM	11:15 AM	11:30 AM	11:45 AM	12:00 PM	12:15 PM	12:30 PM	12:45 PM	1:00 PM	1:15 PM	1:30 PM	1:45 PM	2:00 PM	2:15 PM	2:30 PM	2:45 PM	3:00 PM	3:15 PM	3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM	6:30 PM	6:45 PM
14	Suitland Parkway East Off-Ramp and Stanton Road																																																		
13	Suitland Parkway and Firth Sterling Avenue																																																		
8	Suitland Parkway and South Capitol Street																																																		
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12	Howard Road and Sayles Place																																																	
	Total Intersection Volume																																																	

Note: 1. Red cells represent highest 15-minute volumes at the intersections during each peak period.
2. Intersections are sorted on the descending order of total intersection volumes.

4.1.1.2 Existing Peak-Hour Traffic Volumes

Using the 1-hour system peak hour volumes, the AM and PM peak hour freeway volumes and intersection turning movement counts were balanced within the Study Area and then incorporated into the VISSIM and Synchro models. The balanced traffic volumes on freeway mainline and interchange ramps during peak hours are shown in **Figure 4-2**, and intersection turning volumes are shown in **Figure 4-3** through **Figure 4-5**.

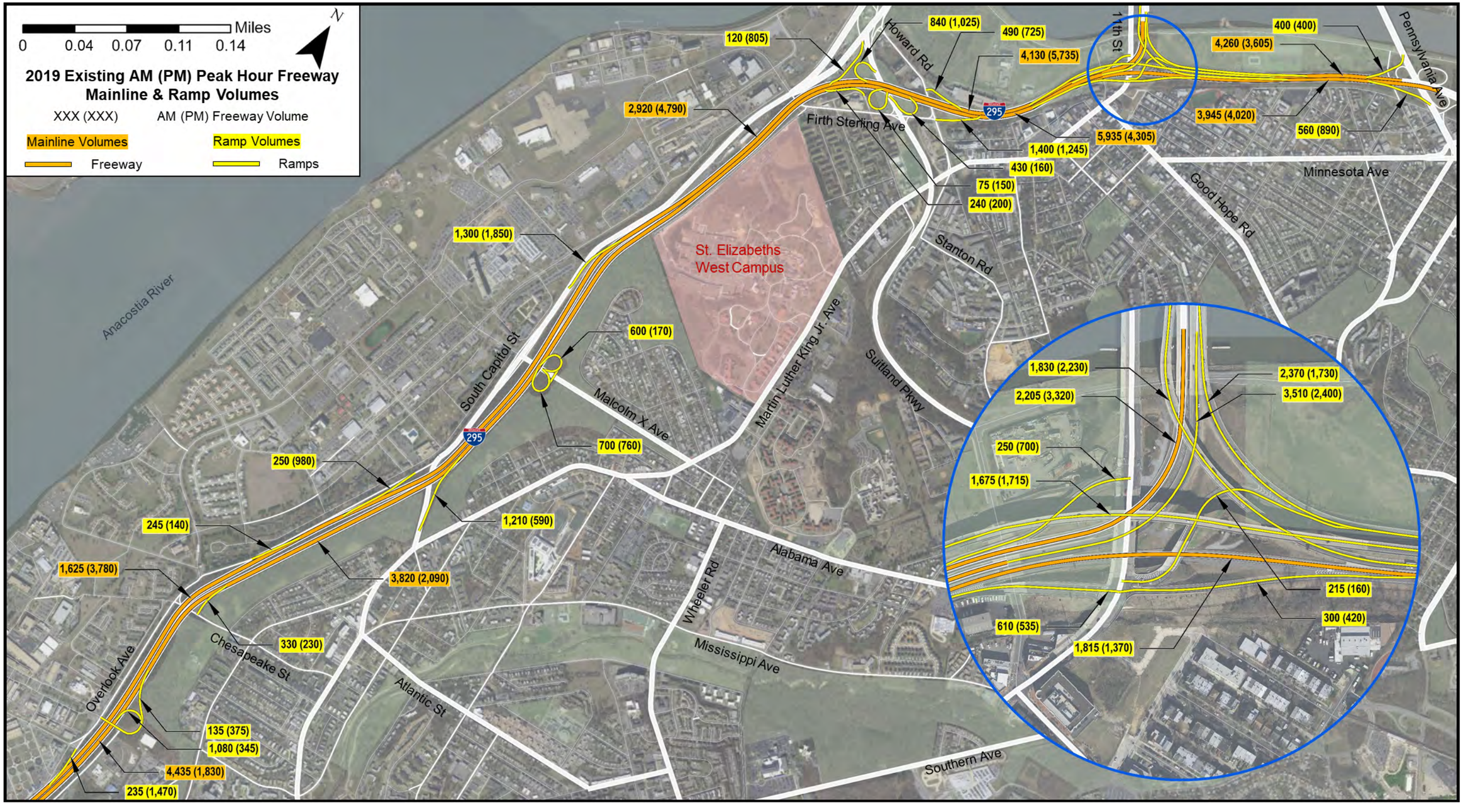

Figure 4-2: Existing (2019) Freeway Mainline and Ramp Volumes during AM and PM Peak Hours

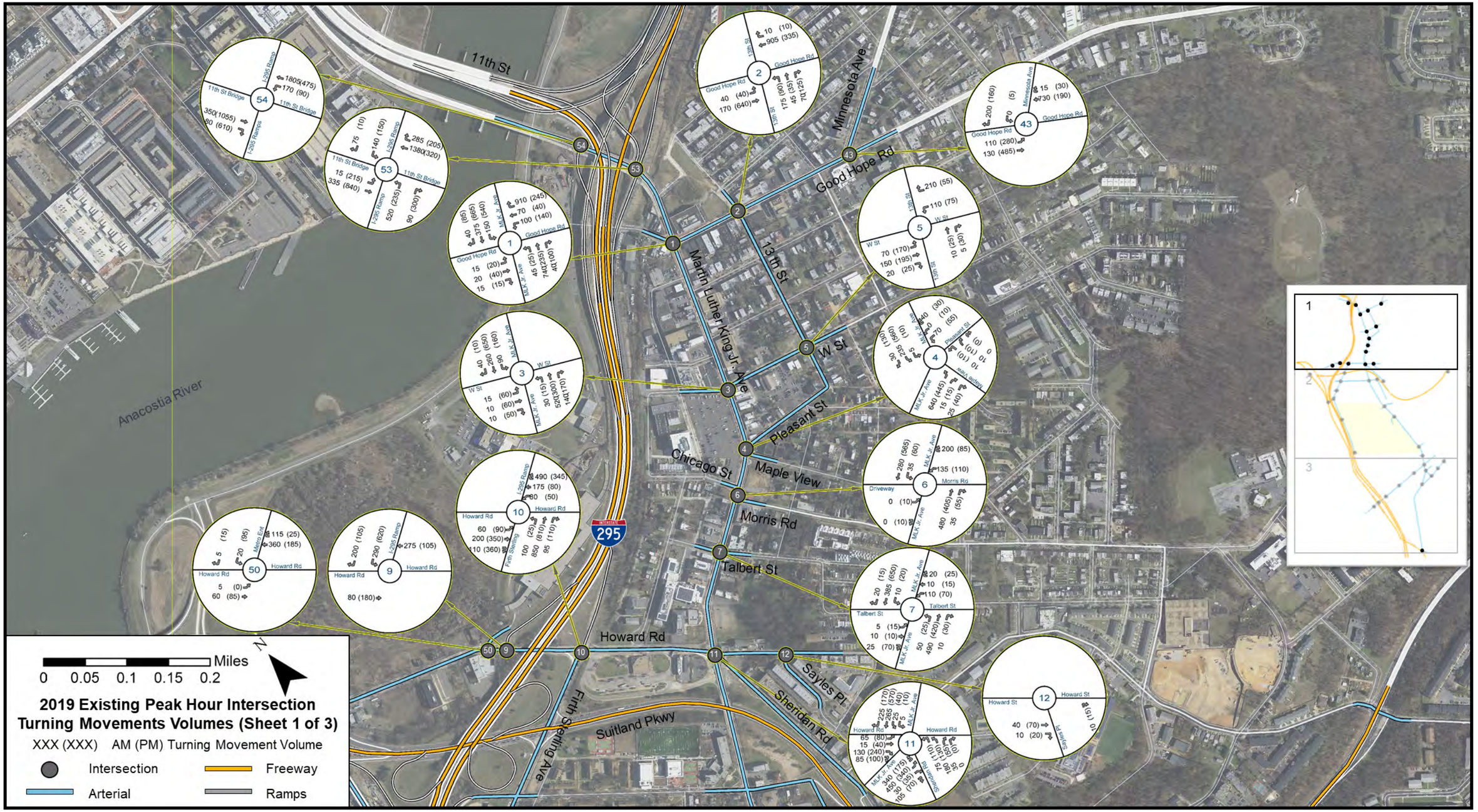

Figure 4-3: Existing (2019) Intersection Turning Movement Volumes during AM and PM Peak Hours (Sheet 1 of 3)

Figure 4-4: Existing (2019) Intersection Turning Movement Volumes during AM and PM Peak Hours (Sheet 2 of 3)

Figure 4-5: Existing (2019) Intersection Turning Movement Volumes during AM and PM Peak Hours (Sheet 3 of 3)

4.1.2 Existing Daily Traffic Volumes

Existing (2019) average weekday daily traffic (AWDT) counts were collected at 16 locations on six key corridors within the Study Area. Daily traffic counts were collected using Automated Traffic Recorder (ATR) pneumatic tubes for a 2-day, midweek (Tuesday – Wednesday or Wednesday – Thursday) period during November 2018 through March 2019, avoiding holidays, severe weather conditions, construction zones, and 2019 U.S. Federal government shutdown periods (from December 22, 2018 to January 25, 2019). **Chapter 2** shows the detailed tube continuous counts locations. **Table 4-2** shows existing daily traffic volumes at key locations.

Table 4-2: Existing Average Weekday Daily Traffic Volumes at Key Corridors with the Study Area

ATR ID	Roadway	Type	Direction	AWDT
3	Anacostia Freeway Between I-695 and Pennsylvania Avenue	Freeway	NB	67,115
3	Anacostia Freeway Between I-695 and Pennsylvania Avenue	Freeway	SB	63,529
43	Anacostia Freeway – South of Laboratory Road/Overlook Avenue	Freeway	NB	44,492
43	Anacostia Freeway – South of Laboratory Road/Overlook Avenue	Freeway	SB	53,729
7	Martin Luther King Jr. Avenue SE – North of Howard Road	Arterial	NB	6,433
7	Martin Luther King Jr. Avenue SE – North of Howard Road	Arterial	SB	6,000
18	Martin Luther King Jr. Avenue SE – South of Pomeroy Road	Arterial	NB	9,282
18	Martin Luther King Jr. Avenue SE – South of Pomeroy Road	Arterial	SB	7,073
22	Martin Luther King Jr. Avenue SE – South of Lebaum Street SE	Arterial	NB	6,877
22	Martin Luther King Jr. Avenue SE – South of Lebaum Street SE	Arterial	SB	6,999
37	Martin Luther King Jr. Avenue SE – North of South Capitol Street	Arterial	NB	4,573
37	Martin Luther King Jr. Avenue SE – North of South Capitol Street	Arterial	SB	4,812
24	Malcolm X Avenue – West of South Capitol Street/Entrance to JBAB	Arterial	EB	8,837
24	Malcolm X Avenue – West of South Capitol Street/Entrance to JBAB	Arterial	WB	7,226
33	Malcolm X Avenue – East of Anacostia Freeway Interchange	Arterial	EB	8,848
33	Malcolm X Avenue – East of Anacostia Freeway Interchange	Arterial	WB	6,774
9	South Capitol Street NB – South of Douglass Bridge	Arterial	NB	27,212
10	South Capitol Street SB – South of Douglass Bridge	Arterial	SB	29,035
13	South Capitol Street NB – North of Firth Sterling Avenue	Arterial	NB	7,306
14	South Capitol Street SB – North of Firth Sterling Avenue	Arterial	SB	11,106
36	South Capitol Street – South of Anacostia Freeway	Arterial	NB	14,486
36	South Capitol Street – South of Anacostia Freeway	Arterial	SB	17,473
17	Firth Sterling Avenue – East of St. Elizabeths Avenue	Arterial	NB	3,291
17	Firth Sterling Avenue – East of St. Elizabeths Avenue	Arterial	SB	6,199
19	Suitland Parkway – East of Sheridan Road	Arterial	EB	29,158
19	Suitland Parkway – East of Sheridan Road	Arterial	WB	32,897

4.1.3 Existing Heavy Vehicle Percentages

Heavy commercial vehicle percentages were determined from the 48-hour continuous vehicular classifications counts. Truck volumes were collected at mainlines, all on- and off-ramp locations along the Anacostia Freeway (I-295) north of the 11th Street Bridges and south of the Overlook

Avenue SW ramps, and at key arterial locations. **Table 4-3** summarizes the existing heavy vehicle percentages on mainlines at key corridors within the Study Area.

In all, heavy vehicle traffic is not significant through all the roadways within the Study Area. On the I-295 freeway corridor within the Study Area, heavy vehicles account for 2 to 7 percent of all vehicle trips in the AM peak hour, 2 to 4 percent in the PM peak hour, and 3 to 4 percent in daily traffic. On the arterial corridors within the Study Area, the heavy vehicle percentages are lower than on the freeways. They vary from 0 to 5 percent, and on most arterial locations, they are less than 2 percent.

Heavy vehicles percentages were input in the VISSIM model by the facility type and the heavy vehicle percentages indicated from the 24-hour tube counts. The VISSIM model also accounted for the distribution of single-unit and articulated trucks within the network. Based on 24-hour tube counts, single-unit trucks were the predominate type in heavy vehicle traffic. On I-295 freeway within the Study Area, 74.4 percent of trucks were single-unit trucks while the remaining 25.6 percent were articulated trucks. Along key arterials within the Study Area, the majority, 91.3 percent, were single-unit trucks while only 8.7 percent were articulated trucks.

Table 4-3: Existing Heavy Vehicle Percentages at Key Corridors with the Study Area

ATR ID	Roadway	Type	Direction	Heavy Vehicle %		
				AM Peak	PM Peak	Daily
3	Anacostia Freeway Between I-695 and Pennsylvania Avenue	Freeway	NB	3.5%	3.6%	3.6%
3	Anacostia Freeway Between I-695 and Pennsylvania Avenue	Freeway	SB	5.1%	2.5%	3.7%
43	Anacostia Freeway – South of Laboratory Road/Overlook Avenue	Freeway	NB	2.0%	3.5%	3.3%
43	Anacostia Freeway – South of Laboratory Road/Overlook Avenue	Freeway	SB	6.6%	2.0%	3.1%
7	Martin Luther King Jr. Avenue SE – North of Howard Road	Arterial	NB	1.4%	0.5%	1.7%
7	Martin Luther King Jr. Avenue SE – North of Howard Road	Arterial	SB	2.1%	0.6%	2.1%
18	Martin Luther King Jr. Avenue SE – South of Pomeroy Road	Arterial	NB	0.9%	0.7%	1.7%
18	Martin Luther King Jr. Avenue SE – South of Pomeroy Road	Arterial	SB	1.4%	0.5%	1.8%
22	Martin Luther King Jr. Avenue SE – South of Lebaum Street SE	Arterial	NB	1.2%	0.8%	2.1%
22	Martin Luther King Jr. Avenue SE – South of Lebaum Street SE	Arterial	SB	1.4%	1.0%	1.8%
37	Martin Luther King Jr. Avenue SE – North of South Capitol Street	Arterial	NB	2.4%	1.3%	2.4%
37	Martin Luther King Jr. Avenue SE – North of South Capitol Street	Arterial	SB	1.0%	1.0%	2.3%
24	Malcolm X Avenue – West of South Capitol Street/Entrance to JBAB	Arterial	EB	4.0%	0.2%	1.1%
24	Malcolm X Avenue – West of South Capitol Street/Entrance to JBAB	Arterial	WB	0.1%	0.0%	0.4%
33	Malcolm X Avenue – East of Anacostia Freeway Interchange	Arterial	EB	1.9%	0.4%	2.4%
33	Malcolm X Avenue – East of Anacostia Freeway Interchange	Arterial	WB	2.1%	0.6%	2.2%
9	South Capitol Street NB – South of Douglass Bridge	Arterial	NB	1.4%	0.4%	2.0%
10	South Capitol Street SB – South of Douglass Bridge	Arterial	SB	3.6%	0.7%	2.0%
13	South Capitol Street NB – North of Firth Sterling Avenue	Arterial	NB	0.9%	0.7%	1.8%
14	South Capitol Street SB – North of Firth Sterling Avenue	Arterial	SB	2.0%	0.7%	1.8%
36	South Capitol Street – South of Anacostia Freeway	Arterial	NB	0.6%	0.5%	1.2%
36	South Capitol Street – South of Anacostia Freeway	Arterial	SB	1.7%	0.4%	1.3%
17	Firth Sterling Avenue – East of St. Elizabeths Avenue	Arterial	NB	5.2%	0.2%	2.6%
17	Firth Sterling Avenue – East of St. Elizabeths Avenue	Arterial	SB	1.8%	0.6%	2.2%
19	Suitland Parkway – East of Sheridan Road	Arterial	EB	0.6%	0.4%	0.7%
19	Suitland Parkway – East of Sheridan Road	Arterial	WB	3.5%	3.6%	3.6%

4.1.4 Existing Pedestrian and Bicycle Movements

Existing pedestrian and bicycle counts were collected at each of the study intersections during a 13-hour daytime period (from 6 a.m. to 7 p.m.) between November 2018 to March 2019 in conjunction with the vehicular turning movement counts. **Table 4-4** lists the pedestrian and bicycle counts at each intersection within the Study Area during the AM peak hour, PM peak hour, and total 13-hour period.

Table 4-4: Existing Pedestrian and Bicycle Counts at Study Intersections

Int ID	Intersection	Pedestrian			Bicycle		
		AM Peak	PM Peak	13-Hour	AM Peak	PM Peak	13-Hour
1	Martin Luther King Jr. Avenue SE and Good Hope Road	56	78	624	1	9	56
2	Good Hope Road and 13th Street	104	117	1601	1	3	21
3	Martin Luther King Jr. Avenue SE and W Street	143	209	2862	0	3	17
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	93	101	1503	2	1	19
5	W Street and 13th Street	26	40	443	0	0	3
6	Martin Luther King Jr. Avenue SE and Morris Road	99	155	1939	2	3	11
7	Martin Luther King Jr. Avenue SE and Talbert Street	152	259	2909	2	3	24
8	Suitland Parkway and South Capitol Street	0	0	0	0	0	0
9	Howard Road and I-295 SB Off-Ramp	4	9	61	0	1	4
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	39	27	363	0	1	8
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	300	263	2689	1	1	11
12	Howard Road and Sayles Place	54	61	412	0	0	1
13	Suitland Parkway and Firth Sterling Avenue	11	16	125	0	0	2
14	Suitland Parkway East Off-Ramp and Stanton Road	5	5	47	0	0	4
16	Firth Sterling Avenue and Barry Road/Sumner Road	6	1	57	0	0	0
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	237	124	1348	0	1	5
18	South Capitol Street and Defense Boulevard/Firth Sterling Avenue	47	23	303	1	6	23
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	12	34	251	0	1	16
20	Martin Luther King Jr. Avenue SE and Redwood Drive	13	25	223	0	1	25
21	Martin Luther King Jr. Avenue SE and Lebaum Street	206	160	2204	1	1	11
22	Malcolm X Avenue and South Capitol Street NB	7	7	120	0	0	1
23	Malcolm X Avenue and South Capitol Street SB	13	13	142	0	0	0
24	Malcolm X Avenue and I-295 NB Off- and On-Ramp	1	4	23	0	0	0
25	Malcolm X Avenue and 2nd Street	1	7	66	0	0	2
26	Malcolm X Avenue and Oakwood Street	35	35	331	2	2	7
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	245	344	3714	0	0	13
28	Martin Luther King Jr. Avenue SE and Raleigh Place	291	181	2047	0	3	9
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	82	77	782	0	1	4
30	Alabama Avenue and Randle Place	414	323	3259	0	0	9
31	Alabama Avenue and Wheeler Road	68	62	521	0	2	13
41	Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place	11	8	154	0	0	7
43	Good Hope Road and Minnesota Avenue	46	93	1146	0	1	7
44	Stanton Road and Suitland Parkway East On-Ramp	0	0	1	0	0	0
45	Sheridan Road and Suitland Parkway West Off-Ramp	10	2	35	0	0	0
46	Alabama Avenue and 7th Street	38	45	433	0	0	6
47	Martin Luther King Jr. Avenue SE and West Campus Gate 3	102	108	1030	0	2	11
48	Firth Sterling Avenue and St. Elizabeths Avenue	7	5	92	0	0	0
49	Firth Sterling Avenue and Eaton Road	3	1	51	0	0	1
50	Howard Road and Anacostia Metro Garage Entrance	37	25	414	0	2	15

Figure 4-6 presents the spatial distribution of pedestrian activity during the 13-hour daytime period within the Study Area. The two busiest locations for pedestrians are both on Martin Luther King Jr. Avenue SE: south of the West Campus and Anacostia Metrorail Station. Intersections adjacent to each of these two locations have the most pedestrian activities within the Study Area. The following are the 10 busiest intersections in the order of pedestrian counts (persons per 13-hour daytime period):

1. Martin Luther King Jr. Avenue SE and Malcolm X Avenue 3,714
2. Alabama Avenue and Randle Place 3,259
3. Martin Luther King Jr. Avenue SE and Talbert Street 2,909
4. Martin Luther King Jr. Avenue SE and W Street 2,862
5. Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road 2,689
6. Martin Luther King Jr. Avenue SE and Lebaum Street 2,204
7. Martin Luther King Jr. Avenue SE and Raleigh Place 2,047
8. Martin Luther King Jr. Avenue SE and Morris Road 1,939
9. Good Hope Road and 13th Street 1,601
10. Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place 1,503

Bicycle traffic is generally light through the Study Area. The busiest intersection for bicycles is the intersection of Martin Luther King Jr. Avenue SE and Good Hope Road. There were 56 bicyclists observed during the 13-hour period. At 41 of 50 study intersections, there were fewer than 15 bicyclists observed in 13 hours, and the average count was nine at the 50 study intersections. Below are the 10 busiest intersections in order of bicycle counts (bicycles per 13-hour daytime period)

1. Martin Luther King Jr. Avenue SE and Good Hope Road 56
2. Martin Luther King Jr. Avenue SE and Redwood Drive 25
3. Martin Luther King Jr. Avenue SE and Talbert Street 24
4. South Capitol Street and Defense Boulevard/Firth Sterling Avenue 23
5. Good Hope Road and 13th Street 21
6. Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place 19
7. Martin Luther King Jr. Avenue SE and W Street 17
8. Martin Luther King Jr. Avenue SE and West Campus Gate 1 16
9. Howard Road and Anacostia Metro Garage Entrance 15
10. Martin Luther King Jr. Avenue SE and Malcolm X Avenue 13

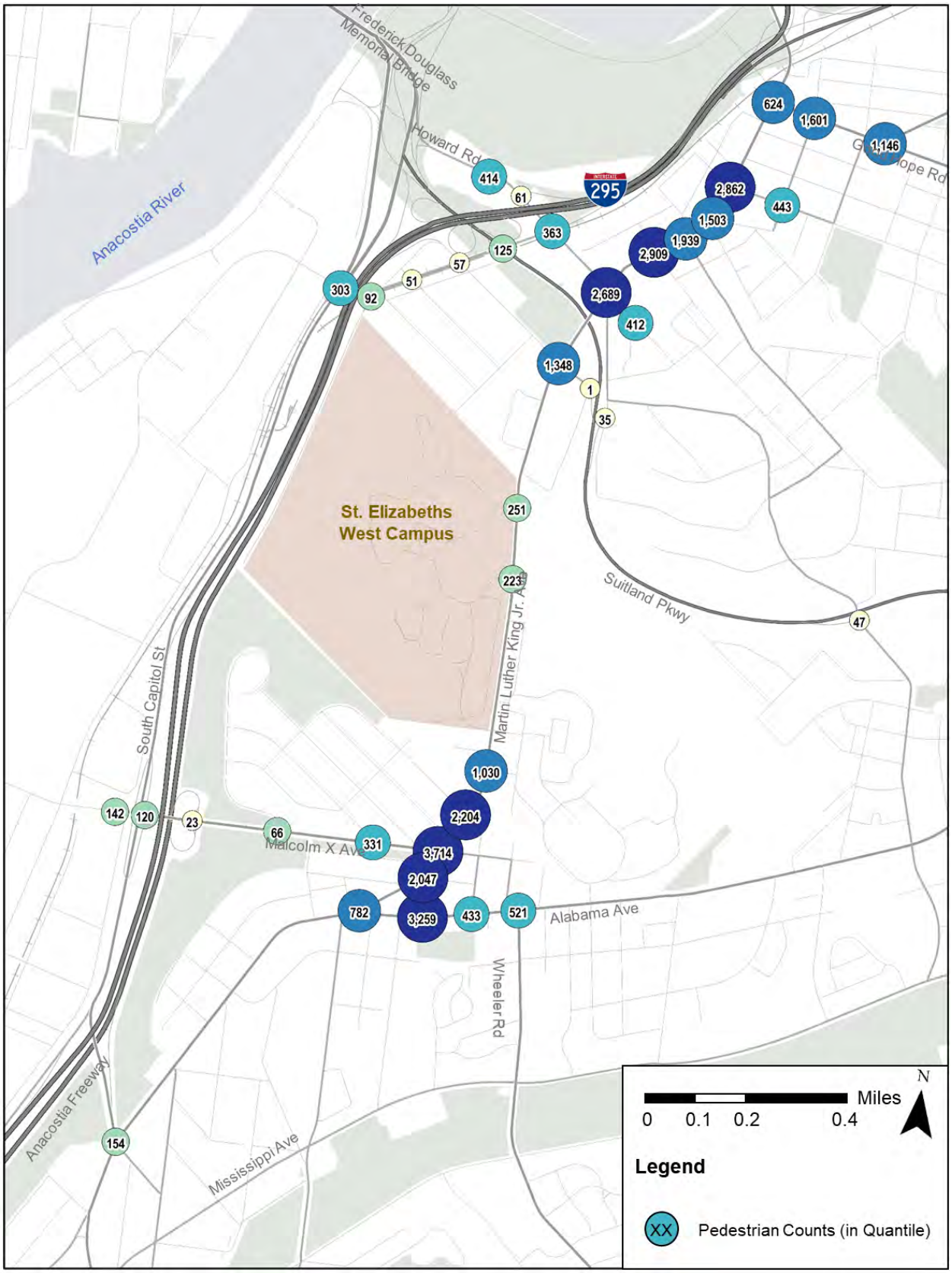

Figure 4-6: 13-Hour Daytime Pedestrian Counts within the Study Area

4.2 Existing Travel Patterns

Existing travel patterns within the Study Area are affected by the following interwoven and often competing traffic conditions: (1) regional trips that include work commutes, long-distance through trips, and visitors traveling to downtown DC; (2) local trips that include shorter travel distances (i.e., trips produced by neighborhoods within Ward 8), as well as medium and longer travel distances with trip ends located at one of several institutional land uses within the Study Area including, but not limited to, the USCG at the West Campus, St. Elizabeths Hospital, Unified Communications Center, and the recently opened Entertainment and Sports Arena on the East Campus, Anacostia Naval Air Station, JBAB, the Naval Research Laboratory, and the National Park Service (NPS) – National Capital Parks East.

4.2.1 Regional Trips or Patterns during Peak Periods

Regional trips constitute the majority of total trips occurring within the Study Area. Travel patterns are dominated by peak-directional trips that are highly concentrated during the 3-hour morning and afternoon peak periods. During the morning peak, inbound commuter trips originate in the suburban counties of Prince George's, Charles, St. Mary's in Maryland, and Fairfax and Prince William in Virginia; these trips are generally focused along northbound and westbound routes within the Study Area, with destinations concentrated in the urban core between the Potomac and Anacostia rivers. Conversely, most of the trips occurring in the afternoon peak period are outbound and directed eastbound and southbound. Major highway corridors carrying the highest traffic volumes include I-295 and South Capitol Street/Frederick Douglass Bridge (northbound in the morning peak and southbound in the afternoon peak) and the 11th Street Bridges and Suitland Parkway (westbound in the morning peak and eastbound in the afternoon peak). Mass transit trips primarily occur via regional rail lines and the Metrorail, which is operated by the Washington Area Metropolitan Transit Authority (WMATA). The Green Line Metrorail offers nearby access to St. Elizabeths through the Anacostia and Congress Heights Stations. The remaining mass transit trips occur via Metrobus routes that follow traffic patterns along the South Capitol Street corridor.

Other major categories of regional travel patterns include bypass trips that use I-295 as a through route to bypass downtown Washington, DC, and connect with the Capital Beltway and visitors to the nation's capital whose travel patterns usually mirror those of commuters but occur outside the peak AM and PM time periods.

4.2.2 Local Trips or Patterns during Peak Periods

Local travel patterns are influenced less by regional commuter trips and more by local land-use functions. Medium and low-density residential neighborhoods that surround St. Elizabeths Campus account for a portion of the local traffic; these include Bellevue and Congress Heights to the south, Shipley Terrace and Douglass to the east, and Barry Farm and Anacostia to the north. In addition, the Anacostia Metrorail Station on the Green Line serves as a local transportation hub because of its large park-and-ride garage (1,150 spaces) and convenient access to bus transfer stations (with 14 bus bays) at both station entrances. This station generates a significant portion of the transit and pedestrian traffic in the northern half of the Study Area. The other Green Line station within the Study Area, Congress Heights, is smaller by comparison and provides only short-term metered parking (67 spaces) and a modest Metrobus circulation/transfer area (with 7 bus bays). Several schools and churches along Martin Luther King Jr. Avenue SE also attract pedestrian and vehicular traffic.

Similar to the higher-capacity routes associated with regional trips, the main local arterials of Martin Luther King Jr. Avenue SE and Alabama Avenue predominantly carry northbound and westbound trips in the morning, with the reverse being true at the end of the typical workday. Good Hope Road is another local arterial that runs parallel to Suitland Parkway on the south and Pennsylvania Avenue on the north and carries significant westbound traffic in the morning by providing a key transportation link to the 11th Street Bridges (local) and access to I-295/DC 295 via the intersection with Martin Luther King Jr. Avenue SE. Malcolm X Avenue serves as a major interface between the local roadway network and the principal arterials, as well as the primary entrance for JBAB; traffic patterns along this arterial are highly correlated with commuter traffic patterns seen at the regional level. Firth Sterling Avenue, which runs parallel to I-295, connects South Capitol Street with Howard Road and serves as a transportation link between Anacostia, Barry Farm, and JBAB. Travel patterns along Firth Sterling Avenue are similar to Malcolm X Avenue, but less pronounced.

With the initial phase of DHS consolidation/relocation efforts to West Campus, there are currently about 5,000 USCG and some DHS employees reporting to the West Campus via Gate 4. Access is provided by St. Elizabeths Avenue. During morning peak, the predominant movement is southbound coming into the campus and reverse being true in the afternoon with all campus-related trips going through the intersection of Firth Sterling Avenue and St. Elizabeths Avenue.

4.2.3 Existing Peak Origin-Destination Distribution

The plan for the St. Elizabeths Campus consolidation and relocation is based on targets for travel by different modes and limitations on onsite parking and vehicle access at different gates. Understanding the existing origin-destination trip distribution will help in making assumptions on employee arrivals by a certain route and a specific designated mode during peak periods. The process involved identifying origins of work trips destined for the campus and is based on determining home location and other information related to employee travel to and from work. To achieve this, a combination of the 2008 DHS Employee Travel Survey, 2019 DHS aggregated employee residence information, and Metropolitan Washington Council of Governments (MWCOG) travel forecasting model was used to develop a zip-code-level trip table of campus-bound trips. This trip table was further refined to represent these trips at the traffic analysis zone (TAZ) level for use with the regional transportation model.

Figure 4-7 illustrates the existing residential distribution of the DHS employees based on 2019 aggregated information provided by DHS. **Figure 4-8** presents the home-based work trip distribution of employees currently reporting to the West Campus across various jurisdictions within the MWCOG region.

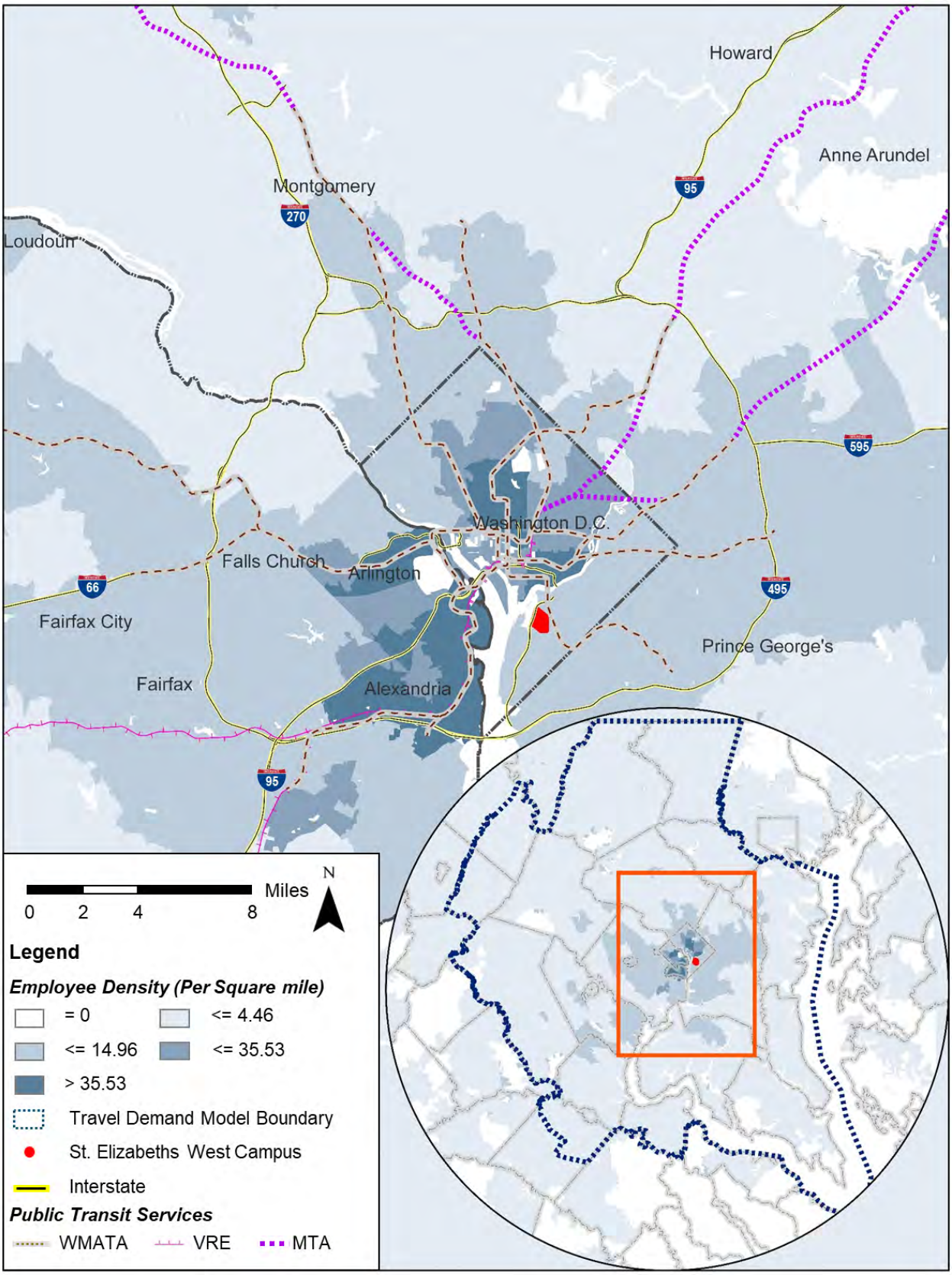

Figure 4-7: DHS Employee Residence Distribution

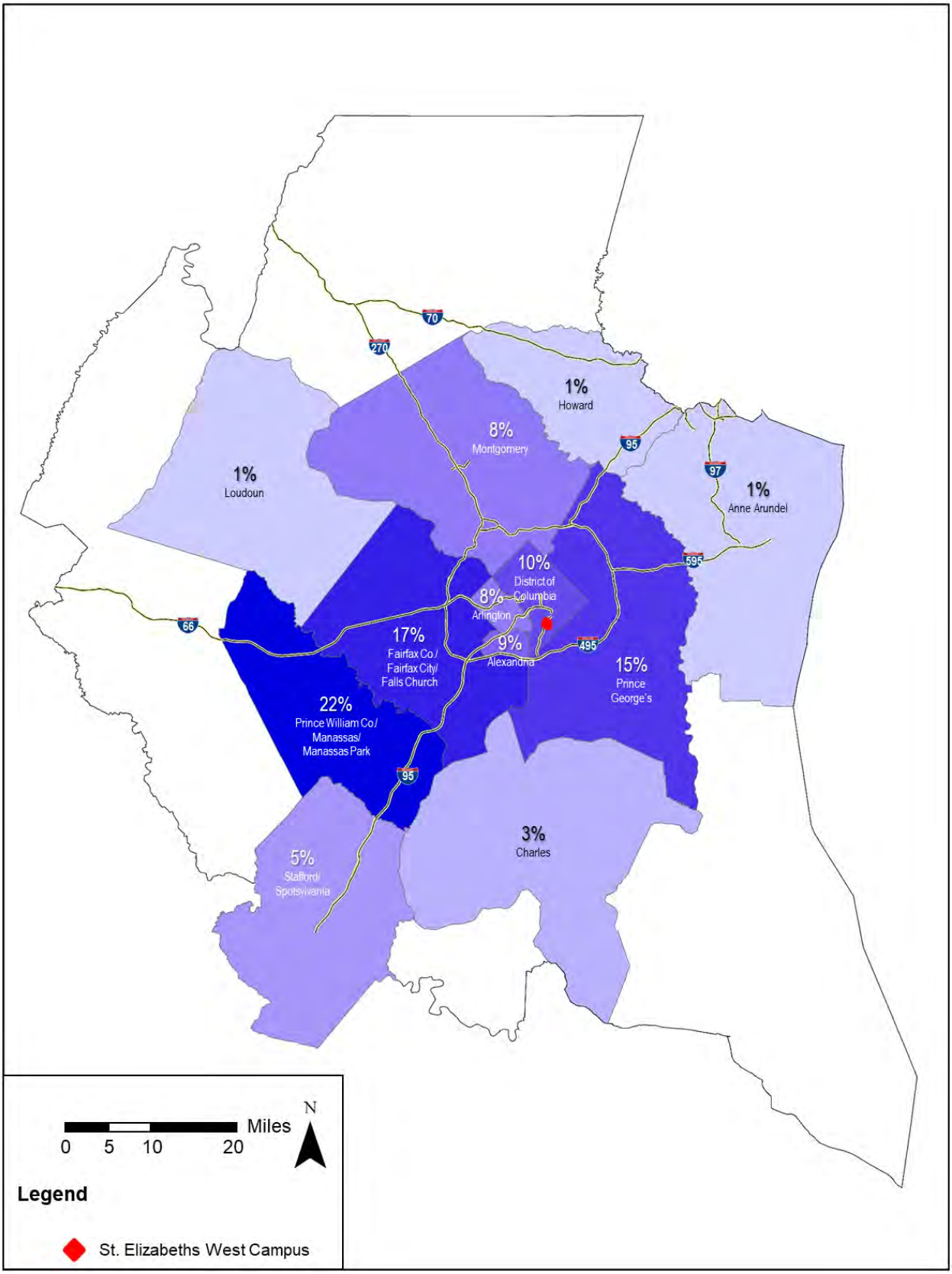

Figure 4-8: Existing (2019) Home-Based Work Trip Distribution to West Campus

4.3 Existing Traffic Operational Conditions

4.3.1 VISSIM Model Calibration

4.3.1.1 Existing VISSIM Model Development and Validation Process

A Methodology Framework Document was developed for this project to outline methods, assumptions, and criteria used for developing and calibrating the VISSIM microsimulation models used in the analysis. The VISSIM microsimulation models were developed based on the guidelines in FHWA's Traffic Analysis Toolbox (TAT) Volume III. The Framework Document is included in **Attachment A**.

The VISSIM models for the existing conditions in this study were developed from the calibrated models for the 2012 EIS/TTR study. Therefore, after discussion with GSA and DDOT, the previously calibrated models were updated with latest traffic data, signal timing, and new transportation improvements in the Study Area. Then the Existing Conditions VISSIM models (AM and PM peak hours) were re-calibrated and validated to ensure the simulation outputs could replicate actual conditions in the field. The model outputs were compared against the current data on field conditions at key locations within the Study Area collected during the period between November 2018 and April 2019.

To remain consistent with previous efforts, the same calibration process and criteria were used, which were based on the FHWA's TAT calibration. Following guidance from FHWA, a customized three-step strategy was applied. In order of priority, the three steps are:

- Capacity calibration
  - VISSIM model parameters were adjusted to meet the calibration criteria of the throughput volumes. These candidate model parameters include driving behavior parameters (car-following parameters and lane-changing parameters) and lane-change distances for different facilities.
- System performance calibration
  - Travel time and speed profiles from VISSIM model results were then compared to field measurements. Link free-flow speed and capacity-related parameters were further refined to better match field conditions.
- Visual review
  - VISSIM simulation animation was then reviewed to compare queuing and congestion conditions at key locations between the model and the field observations. Travel time trajectories were also used to perform a visual comparison between VISSIM simulation results and field data.

The following criteria will be used to verify the adequacy of the model validation:

- Capacity criteria
  - Throughput volumes served at intersections, on freeway segments, and interchange ramps.

- System performance criteria
  - Travel time on key corridors and freeway mainlines.
  - Key bottleneck locations (by visual comparison with field observations).

Table 2-5 in **Chapter 2** shows the detailed criteria and acceptance targets used. For this study, the updated Existing Conditions models were validated at several key locations including I-295, Martin Luther King Jr. Avenue SE, and Firth Sterling Avenue.

4.3.1.2 Existing Model Calibration Results

After the calibration, the model replicated field conditions within an acceptable range. In order to validate this, modeled traffic volumes and travel times were compared against field-observed conditions.

4.3.1.2.1 Simulated Traffic Volumes (Link Throughputs)

The comparisons between observed demand (balanced field volumes) and calibration results of model throughputs from AM and PM VISSIM of all links and intersection turning movements are presented in **Figure 4-9**. Overall, the model throughputs in VISSIM AM and PM model matches with the balanced field volumes with an R-Square over 0.99.

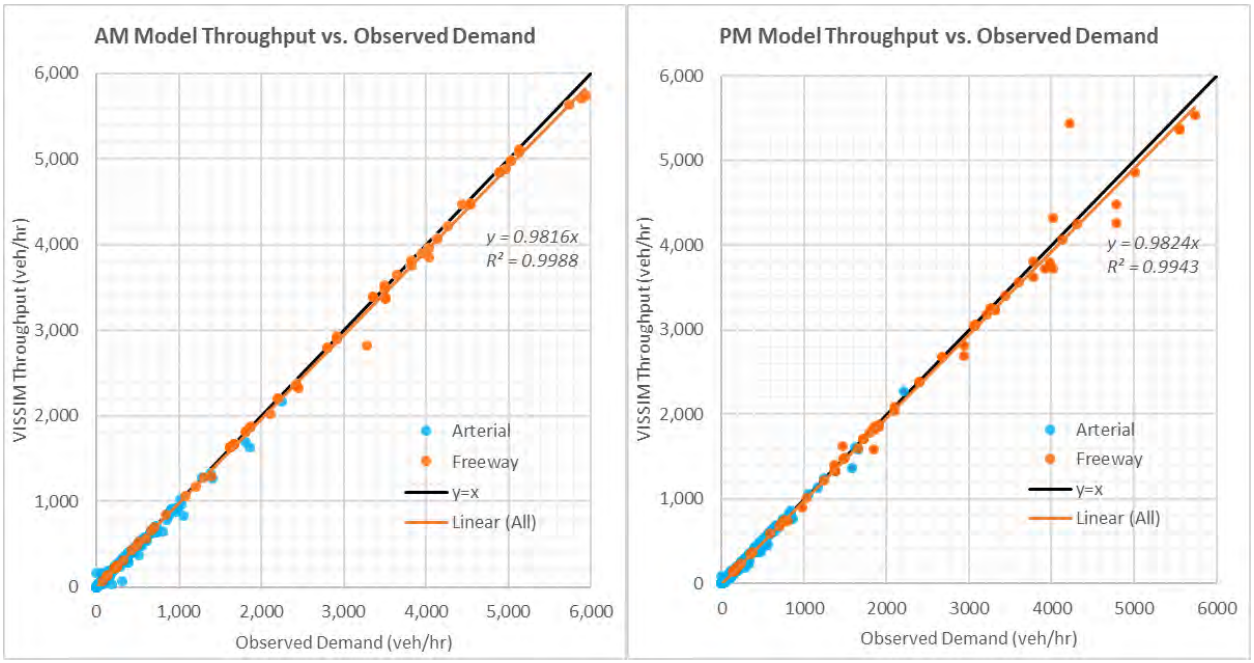

Figure 4-9: AM and PM Model Throughputs vs. Balanced Field Volumes

For intersections, VISSIM model throughputs at each movement were compared against observed demand (balanced field counts) and validated against FHWA guidelines. In the AM peak period, 95 percent of all approaches met the calibration target; while during the PM peak hour, 98 percent of all intersection approaches met calibration targets. **Table 4-5** summarizes the validation results for the intersection volume calibration.

Table 4-5: Existing AM and PM Peak Hour Intersection Volume Calibration Summary

Calibration Criteria	AM Peak	PM Peak
Number of Intersection Approaches	138	138
Approaches that Meet FHWA Individual Link Flow Criteria	131	135
Approaches that Meet GEH Criteria	129	135
Intersection Calibration Met?	Yes	Yes

The freeway volumes were validated against existing counts for each freeway segment within the Study Area. All 31 analyzed freeway segments met validation criteria in the AM model, and 30 out of 31 segments met validation criteria in PM peak hours. Freeway volume calibration results are summarized in **Table 4-7**.

Table 4-6: Existing AM and PM Peak Hour Freeway Volume Calibration Summary

Calibration Criteria	AM Peak	PM Peak
Number of Freeway Segments	32	32
Segments that Meet FHWA Individual Link Flow Criteria	32	31
Segments that Meet GEH Criteria	32	31
Freeway Calibration Met?	Yes	Yes

4.3.1.2.2 Simulated Travel Times

Table 4-7 and **Table 4-8** provide a summary of AM and PM peak hour travel times from the VISSIM models against field data on three key corridors surrounding the West Campus: I-295, Martin Luther King Jr. Avenue SE and Firth Sterling Avenue. On average, 7 – 12 different floating car corridor travel times were collected in February and March 2019 for each corridor. Based on the VISSIM model output, simulated travel times on all corridors and directions from VISSIM AM and PM models are within 15 percent (or) less than 60 seconds difference from the field data, within the travel-time calibration thresholds established by FHWA.

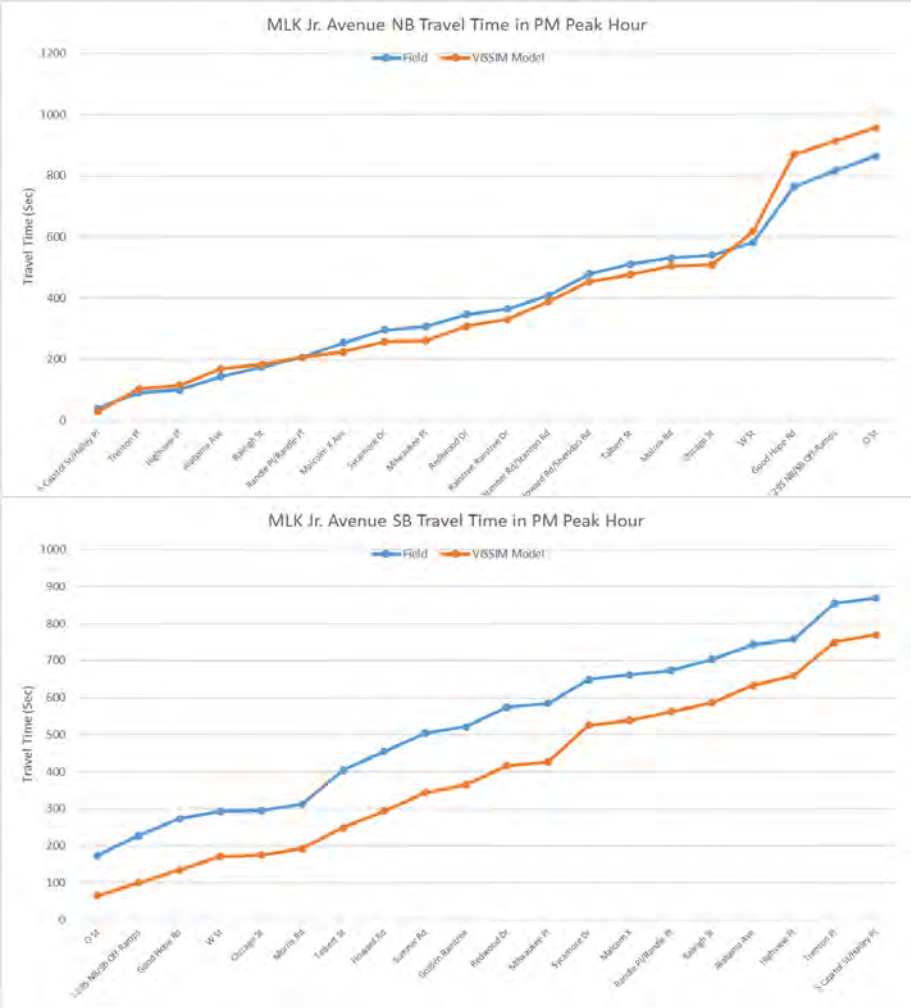

Figure 4-10 through **Figure 4-12** show the cumulative travel times on Martin Luther King Jr. Avenue SE, I-295, and Firth Sterling Avenue corridors. The travel-time trajectories from VISSIM models well align with field travel times on all corridors and directions, indicating the AM and PM models well replicated the field conditions.

Table 4-7: Existing AM Peak Hour Travel-Time Calibration

Corridor	Direction	Segment Start/End Location	Free-Flow Speed (mph)	Average Field Travel Time (sec)	Average Model Travel Time (sec)	Percent Difference	Absolute Difference (sec)	Calibration Criteria Met?
Martin Luther King Jr. Avenue SE	NB	From Xenia Street to O Street	25 – 30	692	681	-2%	-15	Yes
Martin Luther King Jr. Avenue SE	SB	From O Street to Xenia Street	25 – 30	689	760	10%	66	Yes
I-295	NB	From South of Malcolm X Avenue to North of I-695	50	261	251	5%	12	Yes
I-295	SB	From North of I-695 to South of Malcolm X Avenue	50	239	212	-1%	-2	Yes
Firth Sterling Avenue	NB	From Gate 4 to North of Howard Road	25	268	306	16%	44	Yes
Firth Sterling Avenue	SB	From Howard Road to Gate 4	25	184	234	32%	58	Yes

Table 4-8: Existing PM Peak Hour Travel-Time Calibration

Corridor	Direction	Segment Start/End Location	Free-Flow Speed (mph)	Average Field Travel Time (sec)	Average Model Travel Time (sec)	Percent Difference	Absolute Difference (sec)	Calibration Criteria Met?
Martin Luther King Jr. Avenue SE	NB	From Xenia Street to O Street	25 – 30	836	957	14%	121	Yes
Martin Luther King Jr. Avenue SE	SB	From O Street to Xenia Street	25 – 30	869	769	-11%	-100	Yes
I-295	NB	From South of Malcolm X Avenue to North of I-695	50	634	590	-7%	-44	Yes
I-295	SB	From North of I-695 to South of Malcolm X Avenue	50	583	522	-11%	-61	Yes
Firth Sterling Avenue	NB	From Gate 4 to North of Howard Road	25	281	294	5%	14	Yes
Firth Sterling Avenue	SB	From Howard Road to Gate 4	25	239	249	4%	11	Yes

Figure 4-10: Martin Luther King Jr. Avenue SE Travel Times Calibration

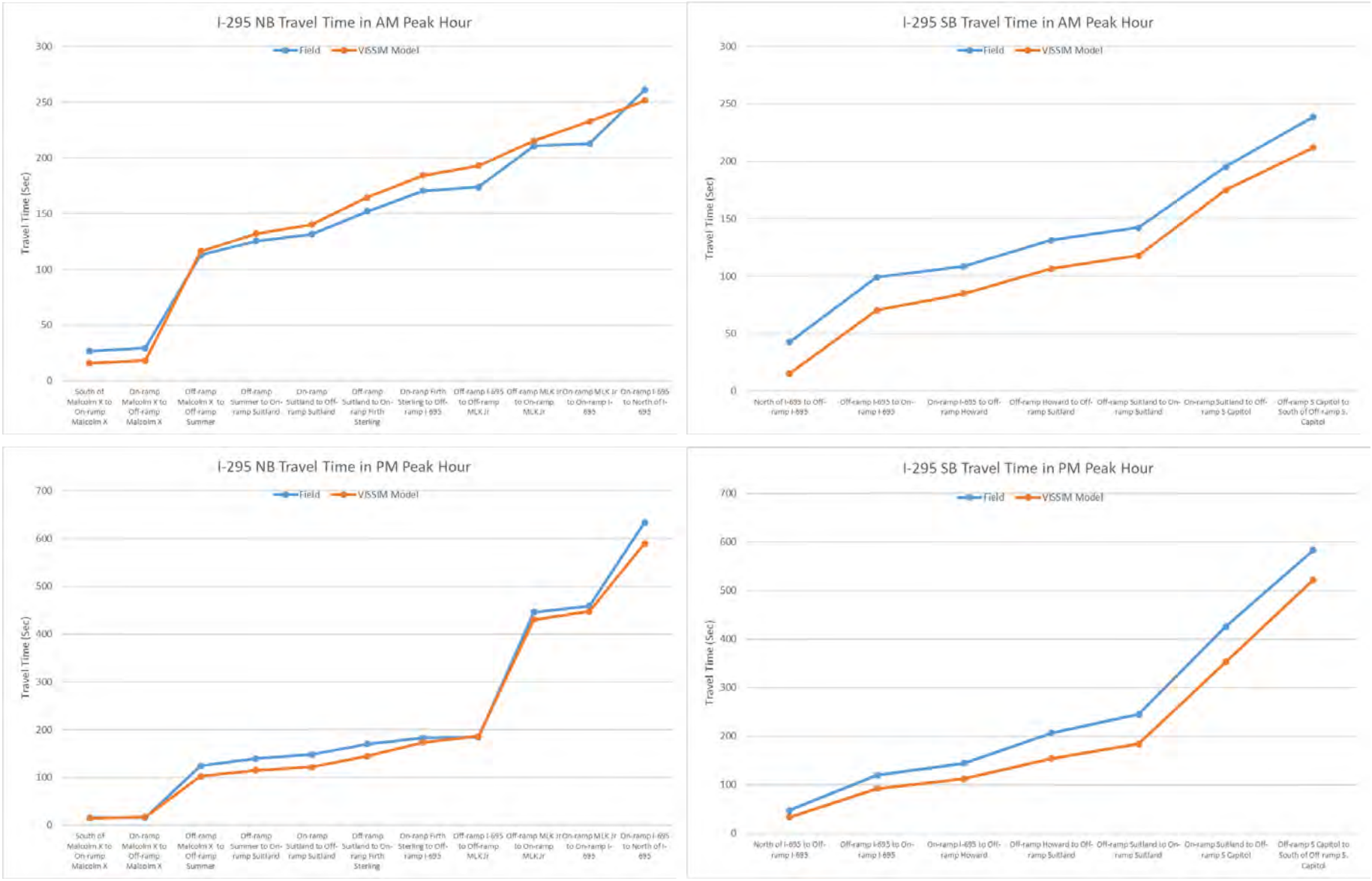

Figure 4-11: I-295 Travel Times Calibration

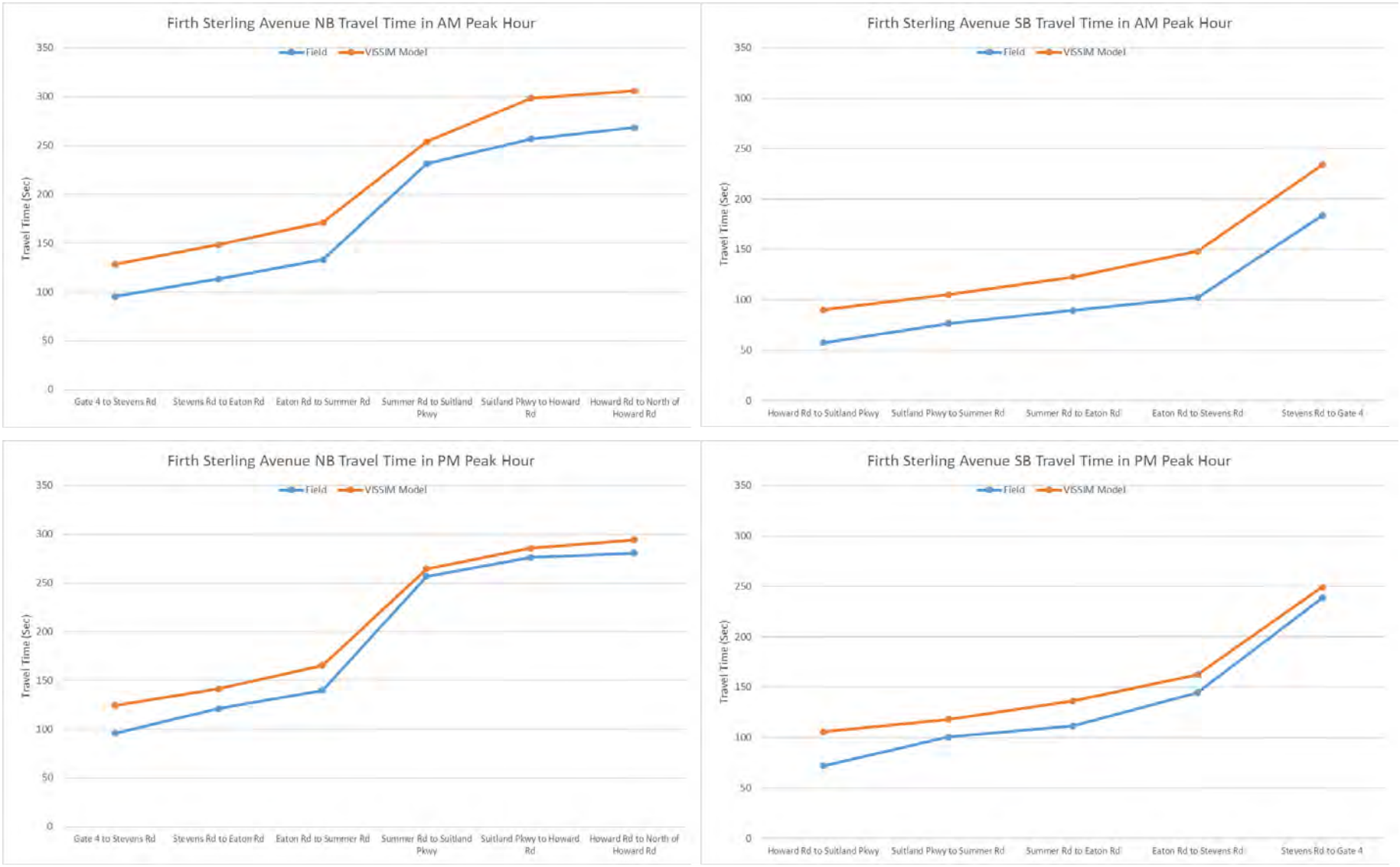

Figure 4-12: Firth Sterling Avenue Travel Times Calibration

4.3.2 Existing Traffic Operations Analysis Results

The following sections presents key measures of effectiveness (MOE) and discussion of the traffic operational analysis results under the existing (2019) conditions using VISSIM microsimulation.

Figure 4-13 and **Figure 4-14** graphically illustrate the existing conditions level of service (LOS) of intersections, freeways, and arterials within the Study Area during the AM and PM peak hours, respectively. The definitions and MOE thresholds of LOS for different facilities are listed in **Chapter 2**.

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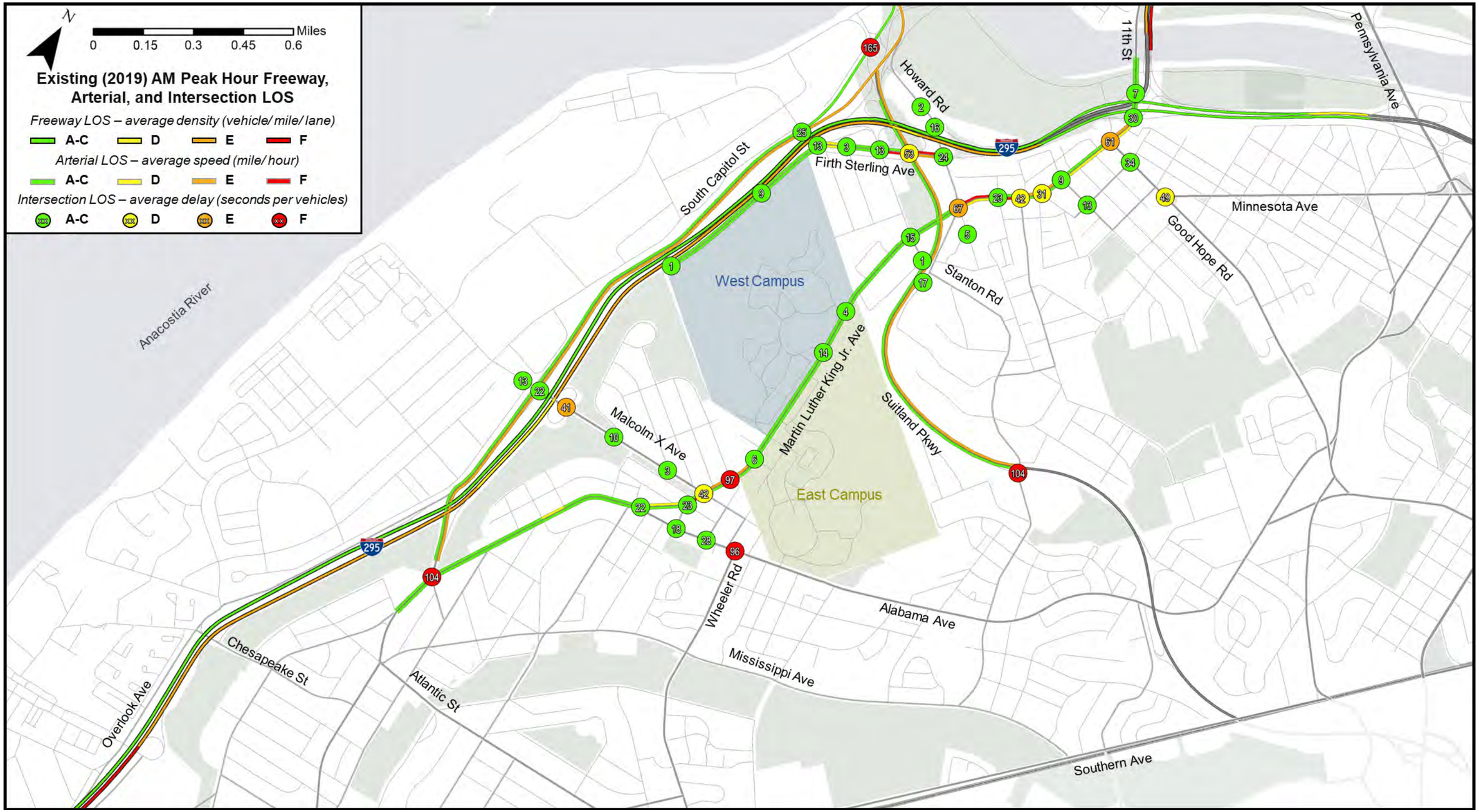

Figure 4-13: Existing (2019) AM Peak Hour Traffic Operations – Freeway, Arterial, and Intersection LOS

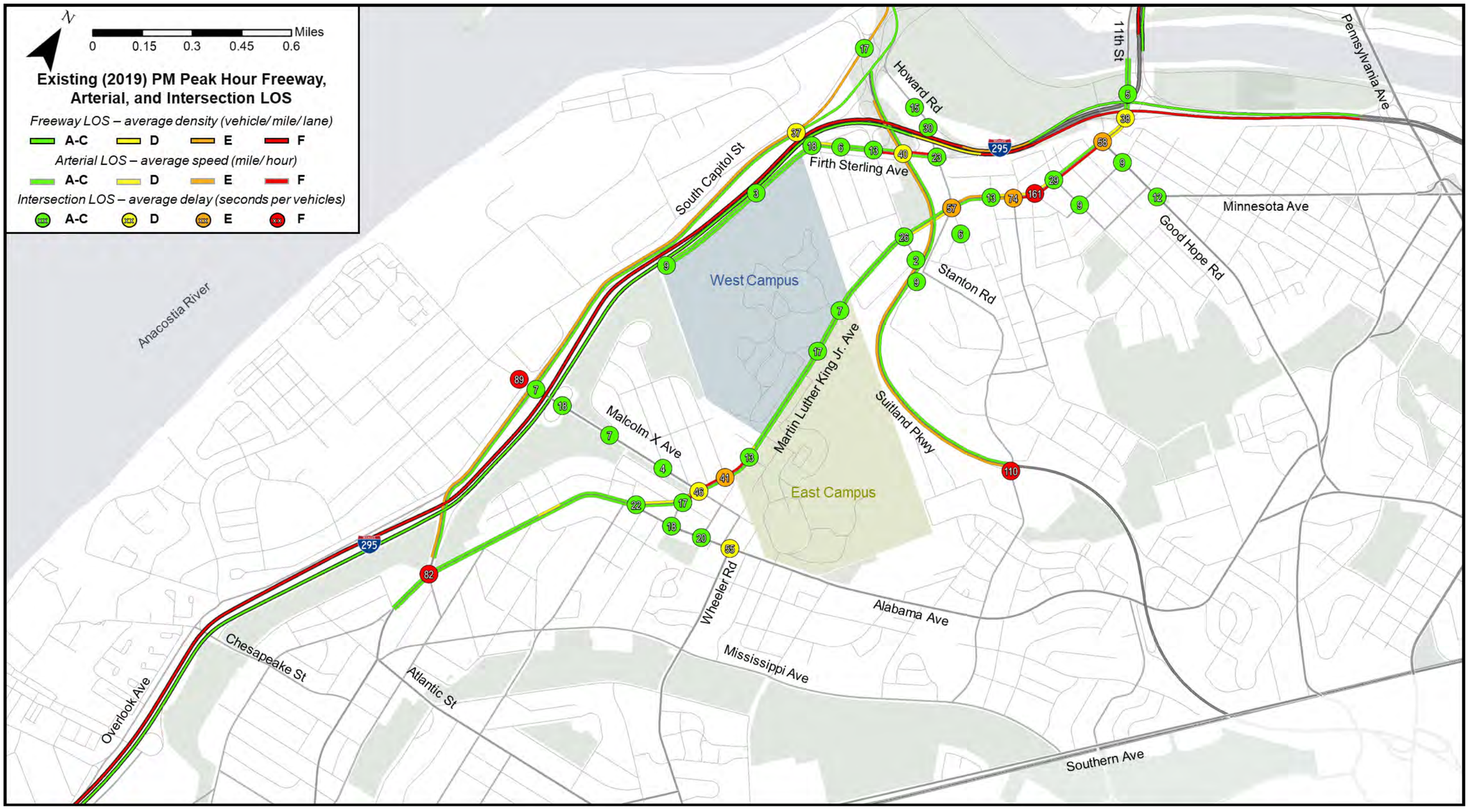

Figure 4-14: Existing (2019) PM Peak Hour Traffic Operations – Freeway, Arterial, and Intersection LOS

4.3.2.1 Existing Intersection Operations

The VISSIM analysis results of existing operational conditions at the 43 study intersections are summarized in **Table 4-9**.

Figure 4-13 and **Figure 4-14** graphically illustrate intersection LOS in color coding in the AM and PM peak hours, respectively.

Table 4-9: Existing AM and PM Peak Hour Intersection Operations – Delay and LOS

Int ID	Intersection Name	Traffic Control	AM Peak Hour		PM Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	61	E	58	E
2	Good Hope Road and 13th Street	Signal	34	C	9	A
3	Martin Luther King Jr. Avenue SE and W Street	Signal	9	A	29	C
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	31	D	161	F
5	W Street and 13th Street	TWSC	13	B	9	A
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	42	D	74	E
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	23	C	13	B
8	Suitland Parkway and South Capitol Street	Signal	165	F	17	B
9	Howard Road and I-295 SB Off-Ramp	Signal	16	B	30	C
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	Signal	24	C	23	C
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	67	E	57	E
12	Howard Road and Sayles Place	OWSC	5	A	6	A
13	Suitland Parkway and Firth Sterling Avenue	Signal	53	D	40	D
14	Suitland Parkway and Stanton Road	Signal	104	F	110	F
16	Firth Sterling Avenue and Barry Road/Sumner Road	Signal	13	B	13	B
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	15	B	26	C
18	South Capitol Street and Defense Blvd/Firth Sterling Avenue	Signal	25	C	37	D
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1/Golden Raintree Drive	Signal	4	A	7	A
20	Martin Luther King Jr. Avenue SE and Redwood Drive	TWSC	14	B	17	C
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	97	F	41	E
22	Malcolm X Avenue and South Capitol Street NB	Signal	22	C	7	A
23	Malcolm X Avenue and South Capitol Street SB	Signal	13	B	89	F
24	Malcolm X Avenue and I-295 NB On- and Off-Ramps	OWSC	41	E	18	C
25	Malcolm X Avenue and 2nd Street	OWSC	10	A	7	A
26	Malcolm X Avenue and Oakwood Street	OWSC	3	A	4	A
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	42	D	46	D
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	23	C	17	B
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	22	C	22	C
30	Alabama Avenue and Randle Place	Signal	18	B	18	B
31	Alabama Avenue and Wheeler Road	Signal	96	F	55	D
41	Martin Luther King Jr. Avenue SE /South Capitol Street/Halley Place	Signal	104	F	82	F
43	Good Hope Road and Minnesota Avenue	Signal	49	D	12	B
44	Stanton Road and Dunbar Road/Suitland Parkway EB On-Ramp	TWSC	1	A	2	A
45	Sheridan Road and Suitland Parkway WB Off-Ramp	OWSC	17	C	9	A
46	Alabama Avenue and 7th Street	Signal	28	C	20	B
47	Martin Luther King Jr. Avenue SE and West Campus Gate 3	Signal	6	A	13	B
48	Firth Sterling Avenue and St. Elizabeths Avenue	Signal	13	B	18	B
49	Firth Sterling Avenue and Eaton Road	Signal	3	A	6	A
50	Howard Road and Anacostia Metro Garage Entrance	Signal	2	A	15	B
51	West Campus Gate 4	OWSC	1	A	9	A
52	West Campus Gate 6	OWSC	9	A	3	A
53	Martin Luther King Jr. Avenue SE /11th Street Bridge and I-295 NB Off-Ramp	Signal	30	C	38	D

Int ID	Intersection Name	Traffic Control	AM Peak Hour		PM Peak Hour	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
54	11th Street Bridge and I-295 SB On-Ramp	Signal	7	A	5	A

4.3.2.1.1 AM Peak Hour

During the AM peak hour, five study intersections operate at LOS F and another three intersections at LOS E. The following paragraphs highlight the potential leading factors of poor operations of these intersections during the AM peak hour:

- The intersection of Martin Luther King Jr. Avenue SE and Good Hope Road is a gateway point for the Anacostia area to and from the freeways and downtown DC. In the morning, this intersection carries heavy traffic toward the 11th Street Bridge or I-295/DC 295 and operates at LOS E. In particular, the through traffic on northbound Martin Luther King Jr. Avenue SE averages 740 vehicles in the AM peak hour; while the competing movement, the right-turn traffic from westbound Good Hope Road is even heavier at over 900 vehicles per hour. It usually takes more than one cycle for both movements to be discharged through the intersection in the AM peak hour.

- The intersection of Suitland Parkway and South Capitol Street operates at LOS F during the AM peak hour. Northbound Frederick Douglass Memorial Bridge is a major bottleneck location in the AM peak hour due to heavy inbound traffic toward downtown DC. Northbound traffic experiences stop-and-go condition and the queue frequently spills back to this intersection, which in turn causes excessive delay on two approaches at this intersection; northbound approach on South Capitol Street and northbound approach on Suitland Parkway.

- The intersection of Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road is approaching a LOS E condition during the AM peak hour. The unconventional geometry of this five-legged intersection, the split intersection phasing, bus blockages along Sheridan Road, and the high pedestrian volumes conflicting with unprotected left and right turning movements all contribute to poor intersection operations at the location.

- The intersection of Suitland Parkway and Stanton Road is a major bottleneck along Suitland Parkway, approaching LOS F during the AM peak hour. The key contributing factor is the limited capacity at the at-grade intersection to handle excessive traffic demand on Suitland Parkway mainlines as well as heavy turning movements from Stanton Road. The queues on Suitland Parkway from this intersection could extend over one mile long in the morning.

- The Martin Luther King Jr. Avenue SE and Lebaum Street intersection is a two-way stop-controlled intersection that has very high average vehicle delays for the westbound approach. High traffic volumes and the proximity of two closely spaced signalized intersections along Martin Luther King Jr. Avenue SE (Malcolm X Avenue and West Campus Gate 3) result in westbound vehicles having a difficult time finding acceptable gaps to turn into the traffic stream on Martin Luther King Jr. Avenue SE.

- Malcolm X Avenue and northbound I-295 ramps is a two-way stop-controlled intersection operating at LOS E. The southbound approach from the northbound I-295 off-ramp is heavy in the morning. This ramp carries, on average, 600 vehicles in the AM peak hour,

which includes 500 right-turn vehicles under yield control and 100 left-turn vehicles under stop control. In addition, on the westbound approach on Malcolm X Avenue, there are, on average, 550 left-turn vehicles to the northbound I-295 on-ramp. Heavy turning movements at this unsignalized intersection results in long delay times in the AM peak hour.

- The intersection of Alabama Avenue and Wheeler Road operates at LOS F condition during the AM peak hour. The main contributing factor for the poor LOS is the heavy left-turn traffic from northbound Wheeler Road, 800 vehicles per hour. These left-turn vehicles would need to wait for multiple cycles to be discharged through the intersection. Also, along Alabama Avenue, intersections are closely spaced and queues from upstream intersection periodically spill back, which further increases the difficulties for northbound Wheeler Road traffic to turn onto Alabama Avenue.

- The intersection of Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place is another gateway point for the Anacostia southwest area. Major traffic comes to this point to access I-295 and South Capitol Street in the morning. VISSIM analysis indicates the northbound left-turn movement at this intersection is operating over capacity, and the intersection operates at LOS F. This is primarily attributed to heavy northbound traffic volumes (1,275 vehicles per hour) and poor lane utilization due to the northbound I-295 ramp approximately 300 feet downstream of the intersection. Furthermore, since a large portion of the intersection green time is allocated to the northbound approach, other approaches have much shorter green intervals and, therefore, all approaches have high average vehicle delays.

4.3.2.1.2 PM Peak Hour

During the PM peak hour, four study intersections operate at LOS F and four other intersections operate at LOS E. Most of locations are similar to the AM peak hour conditions, with reversed traffic flows. The following paragraphs highlight the causes of poor intersection operations within the Study Area during the PM peak hour.

- The Martin Luther King Jr. Avenue SE and Good Hope Road intersection operates at LOS E during the PM peak hour. The split phasing for all four approaches in conjunction with high southbound traffic volumes (1,290 vehicles per hour) contribute to the poor operations at this location.

- The two adjacent intersections on Martin Luther King Jr. Avenue SE at Pleasant Street/Maple View Place and at Morris Road are both under two-way stop-control. They operate at LOS F and LOS E, respectively, during the PM peak hour. High pedestrian crossing traffic and heavy through traffic along this section of Martin Luther King Jr. Avenue SE lead to long delay times for side street traffic under unsignalized controls.

- Similar to the AM peak hour, the intersection of Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road operates at LOS E with high vehicle delays. The unconventional geometry of this five-legged intersection, the split intersection phasing, bus blockages along Sheridan Road, and the high pedestrian volumes conflicting with unprotected left and right turning movements all contribute to poor intersection operations at the location. Furthermore, during the PM peak hour, northbound left turning vehicle heading to northbound I-295 and Suitland Parkway struggle to find gaps in the opposing southbound traffic stream, leading to high vehicle delays for this movement.

- The bottleneck conditions at the intersection of Suitland Parkway and Stanton Road also exists during the PM peak hour. Significant eastbound traffic on Suitland Parkway and limited green time for side streets are the key factors contributing to a LOS F condition at this intersection.
- The Martin Luther King Jr. Avenue SE and Lebaum Street intersection operates at LOS E in the PM peak hour with a similar situation as in the AM peak hour. For traffic from the westbound approach, it is difficult to find gaps to complete turning maneuvers.
- The intersection of Malcolm X Avenue and southbound South Capitol Street is one of two intersections at the diamond interchange of Malcolm X Avenue and South Capitol Street. They are controlled under one signal controller. This intersection approaches a LOS F condition during the PM peak hour. The key issue is the southbound approach from the South Capitol Street off-ramp where 465 left-turn vehicles are mixed with 255 through vehicles and 185 right-turn vehicles. After turning onto Malcolm X Avenue, most southbound left-turn vehicles must immediately stop at the northbound South Capitol Street intersection due to the concurrent phasing of southbound off-ramp (phase 4) and northbound on-ramp (phase 7). In addition, the two intersections are less than 80-feet apart, which provides little storage space for queuing and greatly limits the capacity for southbound left-turn movements.
- The intersection of Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place operates at LOS F in the PM peak hour for similar reasons as the AM peak hour. The mirror movement, eastbound right-turn movement from South Capitol Street, carries a 1,580 vehicles per hour, operating over capacity.

4.3.2.2 Existing Freeway Operations

Table 4-10 summarizes the existing AM and PM peak hour freeway operations, while

Figure 4-13 and **Figure 4-14** graphically illustrate the AM and PM peak hour freeway operations in LOS color coding, respectively. The VISSIM freeway analysis confirmed that traffic speeds were lower and densities were higher in the peak travel direction. Most I-295 freeway segments operate at LOS E or F in the northbound direction into downtown DC during the AM peak hour; while almost all freeway segments operate at LOS F heading southbound out of the downtown area during the PM peak period.

4.3.2.2.1 AM Peak Hour

Traveling northbound on I-295 in the AM peak hour, segments south of the South Capitol Street on-ramp operate at LOS E and LOS F due to short merge taper lengths at the Chesapeake Street SW on-ramp and mainline capacity constraints. Operations improve north of the South Capitol Street on-ramp but continuously deteriorate to LOS E and LOS F immediately north of the Malcolm X Avenue interchange due to heavy weaving traffic streams between Suitland Parkway interchange and ramps to Martin Luther King Jr. Avenue SE, DC 295, and 11th Street Bridge, as well as congestions spillback from I-695.

In the southbound direction, all freeway segments operate at LOS D or better with no obvious bottlenecks in the AM peak hour.

4.3.2.2.2 PM Peak Hour

In the PM peak hour, the outbound movement faces a severe level of congestion, starting from the southbound I-295 project limits and extending to the northern study limits. Southbound freeway congestion starts south of the Study Area, from the interchange with I-495. This congestion spills back into the Study Area and further extends north due to heavy traffic through mainlines and at most on- and off-ramps. Almost the entire southbound I-295 corridor within the Study Area operates at LOS F in the PM peak hour.

Northbound freeway segments operate at LOS D or better south of the Howard Road off-ramp. However, the weaving condition between Suitland Parkway/Howard Road on-ramps and Martin Luther King Jr. Avenue SE off-ramp, as well as the diverging condition to DC 295 and 11th Street Bridge, result in severe congestion and a LOS F condition along northbound freeway segments in the north portion of the St. Elizabeths Study Area.

4.3.2.3 Existing Arterial Operations

Table 4-11 summarizes peak hour travel times and LOS collected from existing VISSIM models along four key arterials within the Study Area: Martin Luther King Jr. Avenue SE, Firth Sterling Avenue, South Capitol Street, and Suitland Parkway. Travel time trajectories on Martin Luther King Jr. Avenue SE and Firth Sterling Avenue are illustrated in

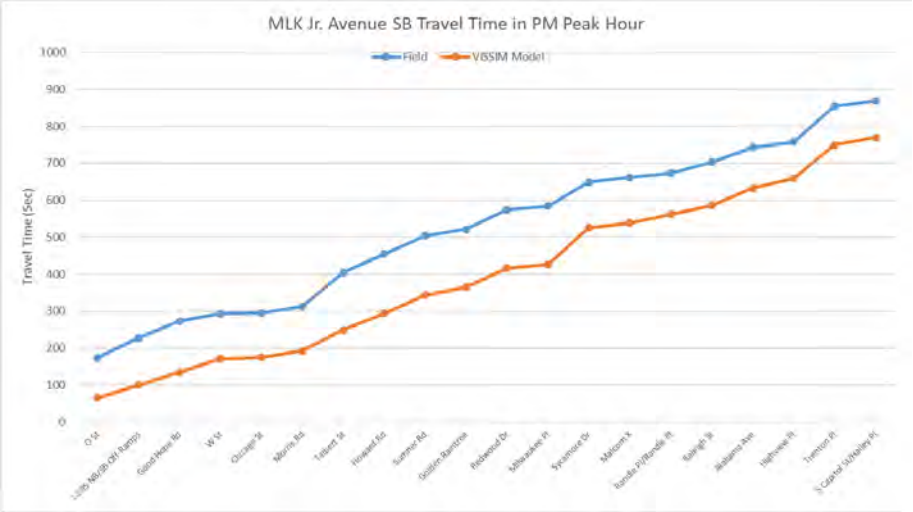

Figure 4-10 and **Figure 4-12**, respectively.

4.3.2.3.1 AM Peak Hour

Six of eight study arterials/directions operate at an acceptable LOS (D or better) during the AM peak hour. Northbound South Capitol Street and westbound Suitland Parkway operate at LOS E. Both are key routes feeding into Frederick Douglass Memorial Bridge and carry heavy inbound traffic to downtown DC during the AM peak hour. The reversed directions of both corridors as well as Martin Luther Jr. Avenue and Firth Sterling Avenue operate at LOS C or better.

4.3.2.3.2 PM Peak Hour

During the PM peak hour, the peak directions on South Capitol Street and Suitland Parkway reverse. Southbound South Capitol Street and eastbound Suitland Parkway operate at LOS E due to heavy outbound traffic from downtown DC. The remaining six corridors/directions operate at LOS D or better.

Table 4-10: Existing AM and PM Peak Hour Freeway Operations – Average Density and LOS

Segment Location	AM Peak Hour					PM Peak Hour				
	Demand (vph)	Volume Served (vph)	Speed (mph)	Density (pc/mi/ln)	LOS	Demand (vph)	Volume Served (vph)	Speed (mph)	Density (pc/mi/ln)	LOS
Northbound										
I-295 NB - Diverge b/w I-495 and Laboratory Road	4435	4467	35	55	F	1830	1816	49	13	B
I-295 NB - Basic b/w Laboratory Road SW Off-Ramp and On-Ramp	3355	3390	47	36	E	1485	1477	50	15	B
I-295 NB - Merge from Laboratory Road	3490	3476	43	37	E	1860	1822	48	18	B
I-295 NB - Basic b/w Laboratory Road and Chesapeake Street	3490	3476	47	37	E	1860	1822	49	18	C
I-295 NB - Merge from Chesapeake Street	3820	3749	44	41	E	2090	2037	47	21	C
I-295 NB - Basic b/w Chesapeake Street and South Capitol Street	3820	3749	47	41	E	2090	2037	49	21	C
I-295 NB - Merge from South Capitol Street	5030	4983	46	35	D	2680	2676	49	18	B
I-295 NB - Weave b/w Malcolm X Avenue SE On-Ramp and Off-Ramp	5730	5631	40	35	D	3440	3402	39	22	C
I-295 NB - Basic b/w Malcolm X Avenue and Barry/Sumner Off-Ramp	5130	5111	45	40	E	3270	3258	49	22	C
I-295 NB - Diverge to Sumner Road/Firth Sterling Avenue	5130	5111	45	41	E	3270	3258	49	23	C
I-295 NB - Basic b/w Firth Sterling Avenue Off-Ramp and Suitland Parkway EB On-Ramp	4890	4849	45	41	E	3070	3059	49	21	C
I-295 NB - Weave b/w Suitland Parkway EB On-Ramp and Suitland Parkway WB Off-Ramp	4965	4877	41	33	D	3220	3177	43	18	B
I-295 NB - Basic b/w Suitland Parkway WB Off-Ramp and Howard Road On-Ramp	4535	4477	44	40	E	3060	3048	41	27	D
I-295 NB - Weave b/w Howard Road On-Ramp and DC 295 NB Off-Ramp	5935	5741	43	39	E	4305	4255	25	48	F
I-695 NB - Weave b/w I-695 NB On-Ramp and 12th Street Off-Ramp	5880	5700	31	54	F	4130	4070	47	22	C
DC 295 NB - Diverge to DC 295 NB and Martin Luther King Jr. Avenue SE	2425	2346	45	19	B	1905	1854	12	57	F
DC 295 NB - Basic b/w Martin Luther King Jr. Avenue SE Off-Ramp and On-Ramp	1815	1816	49	18	C	1370	1344	6	107	F
DC 295 NB - Merge from Martin Luther King Jr. Avenue SE On-Ramp	2115	2016	47	20	C	1790	1781	9	103	F
DC 295 NB - Weave b/w I-695 On-Ramp and Pennsylvania Avenue Off-Ramp	3945	3894	49	20	C	4020	4318	14	76	F
Southbound										
DC-295 SB - Weave b/w Pennsylvania Avenue On-Ramp and I-695 Off-Ramp	4260	4220	49	29	D	3605	3560	45	26	C
I-695 SB - Weave b/w I-695 SB Off-Ramp and 12th Street On-Ramp	4035	3958	32	35	E	5550	5362	14	100	F
I-295 SB - Basic b/w I-695 Off-Ramp and Martin Luther King Jr. Avenue SE On-Ramp	1675	1670	49	17	B	1715	1712	48	18	B
I-295 SB - Weave b/w Martin Luther King Jr. Avenue SE On-Ramp and Howard Road Off-Ramp	4130	4074	44	23	C	5735	5535	37	42	E
I-295 SB - Diverge b/w Howard Road Off-Ramp and Suitland Parkway EB Off-Ramp	3640	3640	49	23	C	5010	4869	29	60	F
I-295 SB - Basic b/w Suitland Parkway EB Off-Ramp and EB On-Ramp	2800	2801	49	19	C	3985	3756	20	68	F
I-295 SB - Merge from Suitland Parkway EB On-Ramp	2920	2926	48	18	B	4790	4486	18	89	F
I-295 SB - Basic b/w Suitland Parkway EB On-Ramp and South Capitol Street Off-Ramp	2920	2926	49	20	C	4790	4486	17	97	F
I-295 SB - Diverge to South Capitol Street	2920	2926	46	24	C	4790	4486	17	107	F
I-295 SB - Basic b/w South Capitol Street Off-Ramp and On-Ramp	1620	1629	49	17	B	2940	2696	13	107	F
I-295 SB - Weave b/w South Capitol Street On-Ramp and Overlook Avenue Off-Ramp	1870	1874	47	18	B	3920	3722	22	86	F
I-295 SB - Basic b/w Overlook Avenue Off-Ramp and Laboratory Road On-Ramp	1625	1628	49	17	B	3780	3803	23	80	F
I-295 SB - Merge from Laboratory Road On-Ramp and I-495	1860	1863	49	11	B	4215	5442	26	68	F

Table 4-11: Existing AM and PM Peak Hour Arterial Operations – Average Travel Time and LOS

Arterial Corridor	Direction	Segment Start/End Location	Free-Flow Speed (mph)	Class	AM Peak Hour			PM Peak Hour		
					Average Travel Time (Sec)	Average Speed (mph)	Arterial LOS	Average Travel Time (Sec)	Average Speed (mph)	Arterial LOS
Martin Luther King Jr. Avenue SE	NB	From Xenia Street to O Street	25 – 30	IV	681	17	C	957	12	D
Martin Luther King Jr. Avenue SE	SB	From O Street to Xenia Street	25 – 30	IV	760	15	C	769	15	C
Firth Sterling Avenue	NB	From Gate 4 to North of Howard Road	25	IV	306	12	D	294	12	D
Firth Sterling Avenue	SB	From Howard Road to Gate 4	25	IV	234	14	C	249	13	C
South Capitol Street	NB	From Frederick Douglass Memorial Bridge to Halley Place	35	III	739	13	E	314	30	B
South Capitol Street	SB	From Halley Place to Frederick Douglass Memorial Bridge	35	III	448	21	C	733	13	E
Suitland Parkway	EB	From South Capitol to Stanton Road	35	III	151	34	A	444	12	E
Suitland Parkway	WB	From Stanton Road to South Capitol Street	35	III	378	13	E	174	29	B

4.4 Existing Intersection Safety Conditions

The scope of safety analysis included all the existing intersections with the Study Area. DDOT Safety Division provide a full crash dataset for this analysis, which includes crash summary reports of 39 study intersections during the past three-year period (from 2016 to 2018). As noted by DDOT, all crashes occurred within a 200-feet radius of each intersection were inquired in the reports. However, when two intersections are closely spaced with less than 250 feet apart, their inquiry radiuses are overlapped. To avoid double counting crash records, DDOT combined these two intersections into one analysis location. Within the Study Area, two intersections on Howard Road, at I-295 Southbound Off-Ramp and at Anacostia Metro Garage, were combined into one crash summary report. Similarly, two ramp terminal intersections of the South Capitol Street and Malcolm X Avenue interchange were combined too. Therefore, 37 crash summary reports were provided. For clarity, all the safety analysis and statistics performed in this section were based on these 37 locations.

4.4.1 Crash History and Trend

A total of 1,160 crashes were reported in the Study Area in the past 3 years (2016 – 2018), equivalent to an annual crash frequency of 386.7. **Figure 4-15** shows the 3-year crash trends in the Study Area. The number of crashes in 2017 is 30 less than that in 2016, a 7-percent decrease. However, in 2018, the number crashes in the Study Area increased by 66 or 18 percent as compared to 2017, and reached 422 crashes in total. As a comparison, the total number of crashes in the District was only 20 more than that in the previous year (DDOT, n.d.).

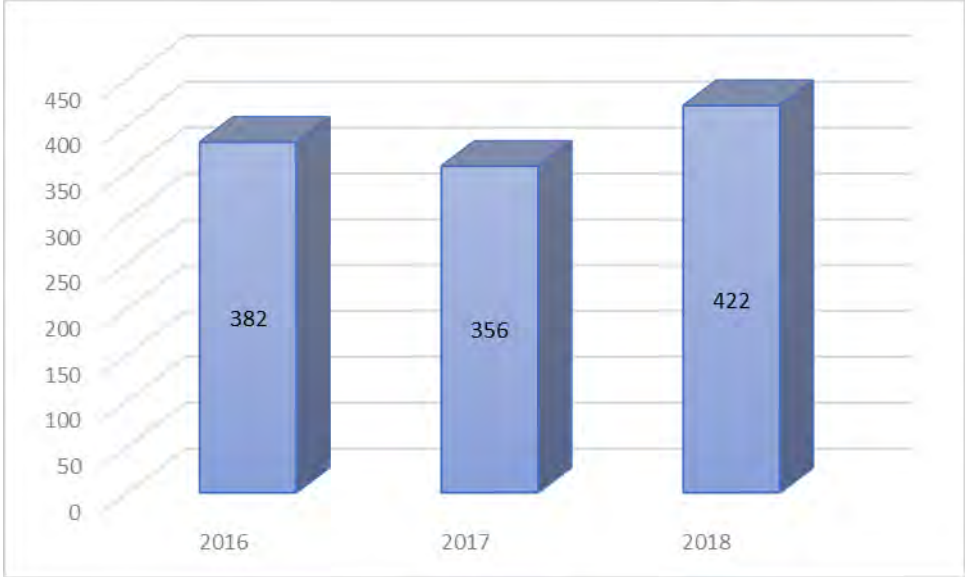

Figure 4-15: Yearly Crash Trend within the Study Area

Over the past 3 years, two intersections within the Study Area experienced noticeable increase in the total annual crashes. At the intersection of Howard Road and Firth Sterling Avenue/I-295 Northbound On-Ramp, the annual number of crashes almost doubled from 2016 to 2018. It had 49 crashes in 2016, but 92 crashes in 2018. The intersection Alabama Avenue and Wheeler Road had 16 crashes in 2016, and 27 crashes in 2018. The other 35 intersections within the Study Area remained in same level in total number of crashes during the past 3 years.

4.4.2 Crash Severity

Breaking down all the crashes by severity type, 28 percent of crashes within the Study Area resulted in either fatality or injury, and the other 72 percent were Property Damage Only (PDO) crashes. The share of fatal and injury crashes in the Study Area was identical to city-wide intersection crashes in 2015.

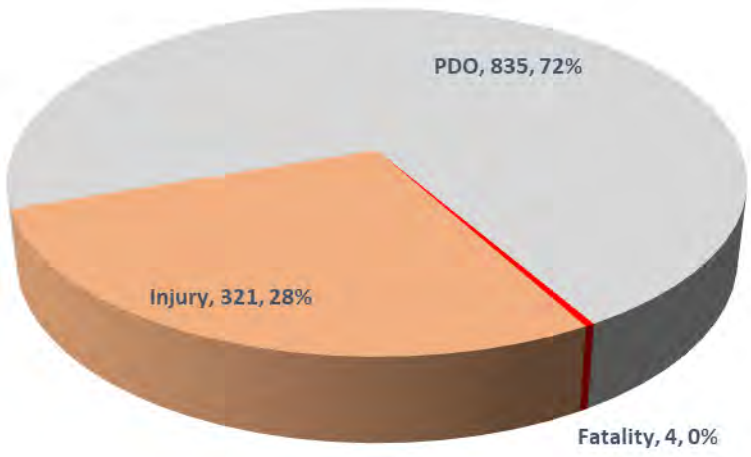

Figure 4-16: Intersection Crash Severity during 2016-2018 in the Study Area

In the past 3 years, four crashes resulted in fatalities within the Study Area. Brief descriptions of these fatal crashes are as follows:

- In September 2016, a motorcyclist succumbed to his injuries after losing control of the vehicle while overtaking at a high rate of speed at the intersection of Martin Luther King Jr. Avenue SE and Talbert Street.
- In October 2016, a speeding vehicle failed to stop for the traffic signal at the intersection of Suitland Parkway and Stanton Road and crashed a vehicle on the broadside. During the rescue, the vehicle caught fire with one passenger left in rear seat.
- In March 2018, a pedestrian was pronounced dead at the Alabama Avenue and Wheeler Road after a vehicle operated by an impaired driver crashed into them.
- In December 2018, another rear seat passenger succumbed to her injuries after the vehicle crashed into a fixed pole while turning in the wrong lane and sideswiped by the vehicle that had the right of the way at the Howard Road and I-295 Southbound Off-Ramp.

4.4.3 Crash Types

While the four fatal crashes were angle, fixed-object, and pedestrian crashes, the two predominant collisions in the Study Area were rear-end and sideswipe, each accounted for 32 percent and 29 percent, respectively. Potential contributing factors include heavy traffic volumes, significant queuing conditions, gridlocked congestions, and closely spaced intersections with direct connections to freeways or expressways. Another two noticeable crash types are head-on and angle crashes,

taking up 15 percent in total. They were mainly associate with red light running, speeding, or failing to yield to through traffic while making left turns. Vehicles that crashed into traffic barrier, poles, or other fixed objects was 7 percent and another 5 percent of vehicles crashed into pedestrians or cyclist. Nearly half of the pedestrian crashes occurred in marked crosswalks, while vehicles failed to yield to pedestrians or cyclists. There were also circumstances when vehicles did not notice people walking or biking along the sidewalk or roadside.

Driving Under Impairment (DUI) was a safety issue in the Study Area. There were 24 impaired-related crashes reported during the past 3 years and 37.5 percent of them resulted in either fatality or injury with one fatal crash in March 2018. The injury and fatal crashes related to DUI amounted to 0.8 percent of the total reported crashes in the Study Area, while the city-wide figure in the same period was less than 0.5 percent (DDOT, n.d.).

4.4.4 Individual Intersection Crash Analysis and Hotspots Identification

Preliminary crash trends data revealed spatial variations in safety conditions within the Study Area. Therefore, crash analysis was performed at each individual intersection for comparison and hotspot identification. Crash frequencies and crash rates were calculated at each intersection per FHWA's *Road Safety Information Analysis: A Manual for Local Rural Road Owners* (FHWA, 2011). The crash frequency counts the number of crashes that have occurred at each intersection over a specified time period (3 years). The crash rate for the intersection expressed as accidents per million entering vehicles (MEV) is given by:

$$Intersection\ Crash\ Rate = \frac{1{,}000{,}000 \times C}{365 \times N \times V}$$

Where, C = Total number of intersection crashes in the study period;
N = Number of years of data;
V = Traffic volumes entering the intersection daily.

The MEV for crash rate were calculated per FHWA Annual Average Daily Traffic Estimation Technical Report (FHWA, 2015) by applying time of day, day of week, and seasonal factors to 13-hour intersection turning movement counts. These factors were derived from the most recent 4 years' hourly traffic counts published by MWCOG[5] in the 36 count locations within the Study Area.

Table 4-12 summarizes the crash frequencies, rates and severity type for each intersection. The average intersection crash frequency within the Study Area was 31.35 in 3 years, and the average intersection crash rate was 1.58 crashes per MEV. About one third of the intersections were higher than the average statistics.

[5] WMCOG Regional Transportation Data Clearinghouse (RTDC). http://rtdc-mwcog.opendata.arcgis.com/datasets/traffic-counts-hourly?geometry=-82.802%2C37.391%2C-71.673%2C40.383

Table 4-12 Three-Year Intersection Crash Frequencies and Rates (2016 – 2018)

Int ID	Intersection Name	Frequency	Rate	Severity		
				Fatal	Injury	PDO
1	Martin Luther King Jr. Avenue SE and Good Hope Road	63	2.00	0%	13%	87%
2	Good Hope Road and 13th Street	42	2.33	0%	19%	81%
3	Martin Luther King Jr. Avenue SE and W Street	33	2.04	0%	18%	82%
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	21	1.43	0%	0%	19%
5	W Street and 13th Avenue	4	0.64	0%	25%	75%
6	Martin Luther King Jr. Avenue SE and Morris Road	26	1.67	0%	19%	81%
7	Martin Luther King Jr. Avenue SE and Talbert Street	56	3.61	2%	18%	80%
8	Suitland Parkway and South Capitol Street	11	0.21	0%	9%	91%
9/50	Howard Road and I-295 SB Off-Ramp / Howard Road and Anacostia Metro Garage Entrance	24	1.27	4%	21%	75%
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	202	6.52	0%	29%	71%
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	77	3.62	0%	32%	68%
12	Howard Road and Sayles Place	4	3.79	0%	25%	75%
13	Suitland Parkway and Firth Sterling Avenue	94	1.56	0%	34%	66%
14	Suitland Parkway and Stanton Road	68	1.00	1%	26%	72%
16	Firth Sterling Avenue and Barry Road/Sumner Road	61	4.66	0%	44%	56%
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	31	1.49	0%	23%	77%
18	South Capitol Street and Defense Blvd/Firth Sterling Avenue	10	0.35	0%	40%	60%
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1/	5	0.30	0%	60%	40%
20	Martin Luther King Jr. Avenue SE and Redwood Drive	19	1.15	0%	37%	63%
21	Martin Luther King Jr. Avenue SE and Lebaum Street	25	1.46	0%	32%	68%
22/23	Malcolm X Avenue and South Capitol Street (two intersections)	27	0.99	0%	41%	59%
24	Malcolm X Avenue and I-295 NB On- and Off-Ramps	11	0.49	0%	27%	73%
25	Malcolm X Avenue and 2nd Street	37	2.25	0%	19%	81%
26	Malcolm X Avenue and Oakwood Street	1	0.06	0%	100%	0%
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	35	1.23	0%	26%	74%
28	Martin Luther King Jr. Avenue SE and Raleigh Place	10	0.63	0%	40%	60%
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	8	0.45	0%	38%	62%
30	Alabama Avenue and Randle Place	22	2.03	0%	36%	64%
31	Alabama Avenue and Wheeler Road	57	2.21	2%	28%	70%
41	Martin Luther King Jr. Avenue SE /South Capitol Street/Halley Place	27	0.69	0%	41%	59%
43	Good Hope Road and Minnesota Avenue	23	1.32	0%	17%	83%
44	Stanton Road and Dunbar Road/Suitland Parkway EB On-Ramp	6	2.17	0%	0%	100%
45	Sheridan Road and Suitland Parkway WB Off-Ramp	5	2.10	0%	40%	60%
46	Alabama Avenue and 7th Street	13	0.71	0%	38%	62%
47	Martin Luther King Jr. Avenue SE and West Campus Gate 3	0	0.00	0%	0%	0%
48	Firth Sterling Avenue and St. Elizabeths Avenue	1	0.08	0%	0%	100%
49	Firth Sterling Avenue and Eaton Road	1	0.10	0%	0%	100%
Average		**31.35**	**1.48**	**0.3%**	**27.7%**	**78.0%**

The top five intersections with highest crash frequencies during the past 3 years were:

1. Howard Road and Firth Sterling Avenue/I-295 Northbound On-Ramp — 202 crashes
2. Suitland Parkway and Firth Sterling Avenue — 94 crashes
3. Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road — 77 crashes
4. Suitland Parkway and Stanton Road — 68 crashes
5. Martin Luther King Jr. Avenue SE and Good Hope Road — 63 crashes

The top six intersections with highest crash rates (crashes/MEV) during the past 3 years were:

1. Howard Road and Firth Sterling Avenue/I-295 Northbound On-Ramp — 6.52
2. Firth Sterling Avenue and Barry Road/Sumner Road — 4.66
3. Howard Road and Sayles Place — 3.79
4. Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road — 3.62
5. Martin Luther King Jr. Avenue SE and Talbert Street — 3.61
6. Good Hope Road and 13th Street — 2.33

Note that the crash rate at the intersection of Howard Road and Sayles Place was 3.79, the third highest among all intersections. However, there were only four crashes at Howard Road and Sayles Place in 3 years. The MEV was less than one, the lowest in the Study Area, which magnified the crash rate and skewed the results. Therefore, Howard Road and Sayles Place is not included in crash hotspots for further discussions.

The four intersections with fatal crashes during the past 3 years were:

1. Martin Luther King Jr. Avenue SE and Talbert Street
2. Howard Road and I-295 SB Off-Ramp
3. Suitland Parkway and Stanton Road
4. Alabama Avenue and Wheeler Road

Figure 4-17 and **Figure 4-18** graphically illustrate the spatial distribution of intersection crash frequencies and crash rates through the Study Area.

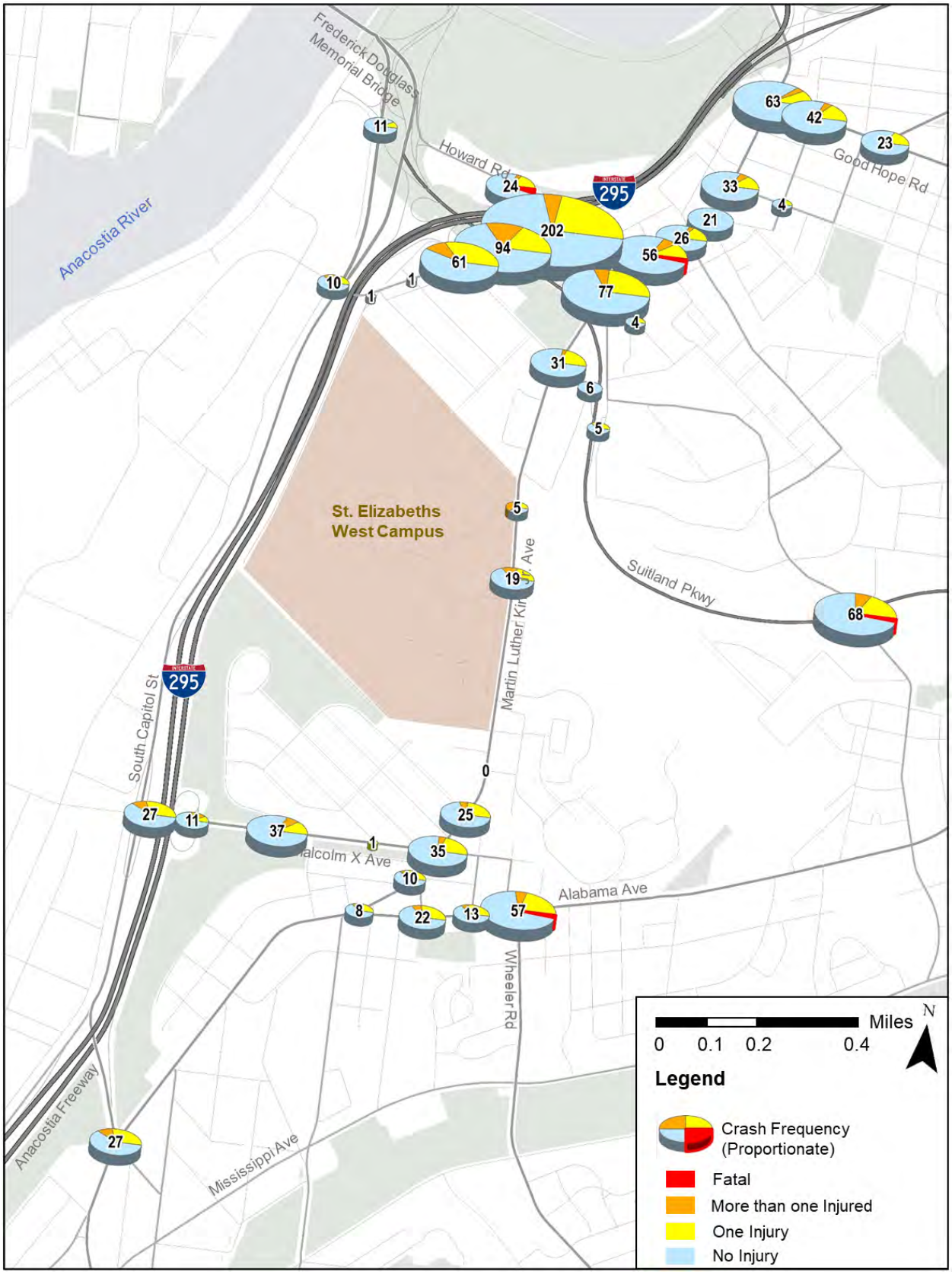

Figure 4-17: Intersection Crash Frequencies and Severity (2016 – 2018)

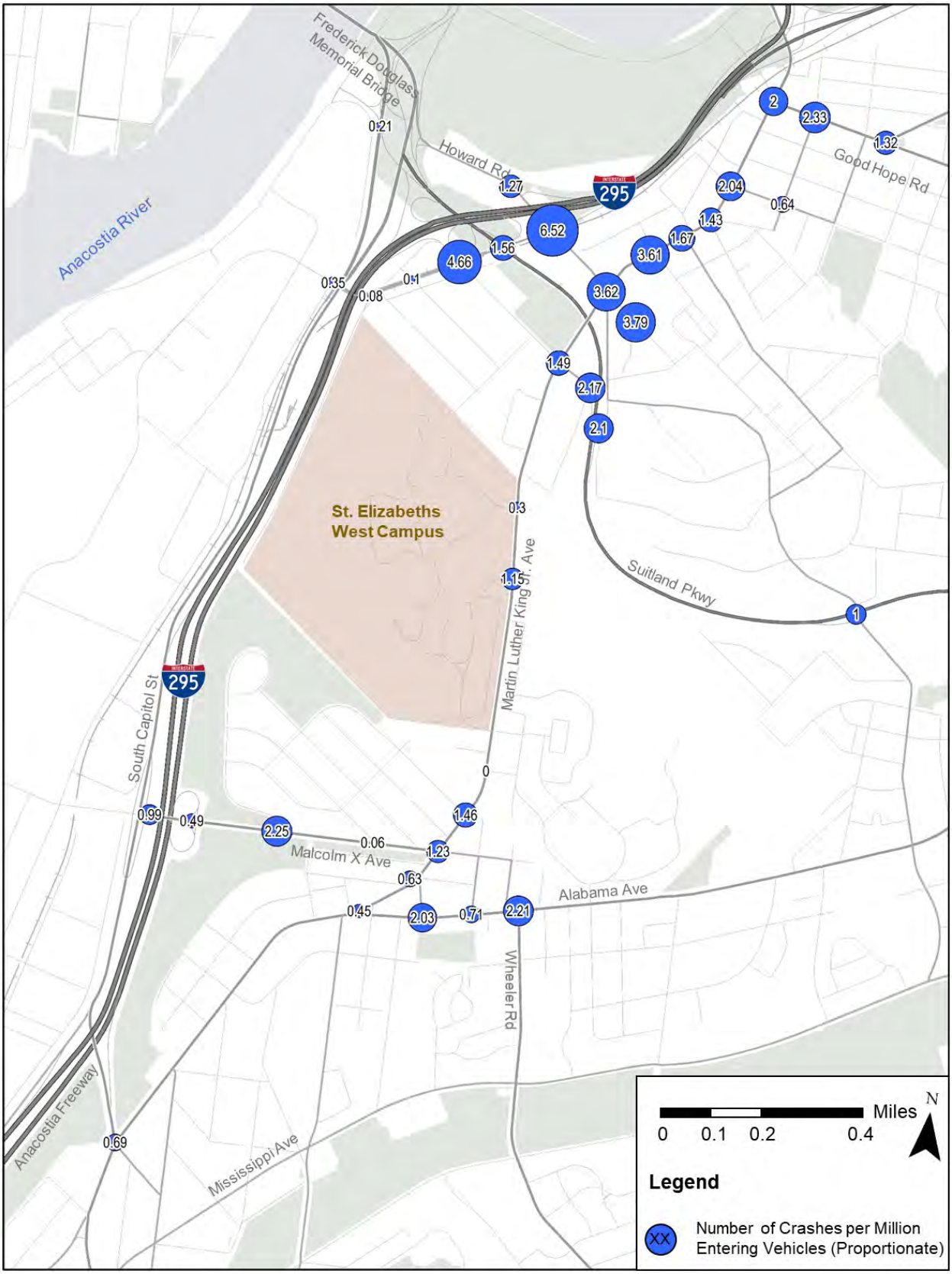

Figure 4-18: Intersection Crash Rates (2016 – 2018)

Table 4-13 lists the locations that were identified as safety hotspots within the Study Area. These locations either had high crash frequency, and/or high crash rate, and/or a fatal crash in the past 3 years.

Table 4-13: Crash Hotspots within the Study Area

Intersection		Crash Frequency		Crash Rate		Crash Severity	
ID	Name	Frequency	Rank	Rate	Rank	Fatality	Injury %
1	Martin Luther King Jr. Avenue SE and Good Hope Road	63	5	2.00	13	-	13%
2	Good Hope Road and 13th Street	42	9	2.33	6	-	19%
7	Martin Luther King Jr. Avenue SE and Talbert Street	56	8	3.61	5	1	20%
9/ 50	Howard Road and I-295 SB Off-Ramp / Howard Road and Anacostia Metro Garage Entrance	24	18	1.27	20	1	25%
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	202	1	6.52	1	-	29%
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	77	3	3.62	4	-	32%
13	Suitland Parkway and Firth Sterling Avenue	94	2	1.56	15	-	34%
14	Suitland Parkway and Stanton Road	68	4	1.00	23	1	28%
16	Firth Sterling Avenue and Barry Road/Sumner Road	61	6	4.66	2	-	44%
31	Alabama Avenue and Wheeler Road	57	7	2.21	8	1	30%

The most unsafe intersection within the Study Area is at Howard Road and Firth Sterling Avenue, where 203 crashes or 6.52 crashes/MEV occurred in the past 3 years. This intersection topped in both crash frequency and rate among all the study intersections. On an average, more than one crash occurred here each week. A fatal crash occurred 400 feet from this intersection, at the intersection of Howard Road and I-295 Southbound Off-Ramp. Furthermore, two adjacent intersections on Firth Sterling Avenue were also "hotspots." The intersection at Suitland Parkway and Firth Sterling Avenue had 94 crashes in 3 years, the second highest. The intersection of Firth Sterling Avenue and Barry Road/Sumner Road had 61 crashes, the fourth highest. These three intersections are within 1,500 feet. They together are the most crash-prone location within the Study Area, accounting for 30 percent of the total reported intersection crashes. This segment directly connects to two of the busiest expressways in Study Area, I-295 and Suitland Parkway. Motorists went through three consecutive signalized intersections in a short distance with complicated maneuvers of lane changes, weaving and turning while dealing with gridlock congestions and significant queuing conditions. These are potentially contributing factors to the high occurrences of both rear-end crashes and sideswipe crashes. It is also worth noting that the shares of angle crashes and head-on crashes at these three intersections were higher than the Study Area average. A detailed screening of individual crash report and signal timing revealed that many vehicles on the scene failed to yield to through traffic, while making permissive left turns from crossing roads to Firth Sterling Avenue.

Two consecutive intersections on Martin Luther King Jr. Avenue SE at Howard Road/Sheridan Road and at Talbert Street were also crash-prone locations. Crash rate was more than 3.6 crashes per MEV at each intersection, twice higher than the Study Area average. The rates of injury crashes were also higher than the Study Area average. Sideswipe crash is the dominated type at both intersections, mostly occurred along Martin Luther King Jr. Avenue SE or Sheridan Road when vehicles changing lanes or making turns. In addition, with busy pedestrian traffic, these two intersections also witnessed many pedestrian crashes, and most of which occurred at locations without crosswalk or sidewalk.

Along Good Hope Road, the intersections at Martin Luther King Jr. Avenue SE and at 13th Street had the highest percentages of sideswipe crashes, taking up nearly half of the reported crashes within these two intersections, and 15 percent of which were crashes with parked vehicles along Good Hope Road. Moreover, 30 out of the 138 crashes involved buses, and two thirds of them were sideswipe crashes too.

Rear-end crashes were the most prominent crash type at the intersection of Suitland Parkway and Stanton Road, accounting for about half of the reported crashes. The potential contributing factors were the heavy congestion conditions with significant queues and stop-and-go conditions. In most cases, vehicles traveling on Suitland Parkway failed to stop at signal or did not expect end-of-queue locations during traffic slowdowns. As mentioned previously, red-light running had caused a fatal crash at this intersection.

Another intersection with a fatal crash was Alabama Avenue and Wheeler Road, where impaired drivers crashed into a pedestrian and then a fixed object. In the past 3 years, eight vehicles crashed into trees or fences of private properties and four vehicles crashed into pedestrians in marked crosswalk. These two types of crashes were comparably higher in this intersection, despite the continued dominance of rear-end and sideswipe crashes.

The above discussion presents crash hotspots and their crash patterns within the Study Area. However, none of them are immediately adjacent to the West Campus. At the intersections immediately surrounding the West Campus, both crash frequency and crash rate were lower than the Study Area average. The total crash frequency within 1,000-foot buffered area of the West Campus was 61 crashes in the past 3 years, equivalent to an average crash frequency of 2.9 per intersection per year. The overall crash rate was 0.52 crashes per MEV, only one third of the Study Area.

5 TRANSPORTATION IMPROVEMENTS

This chapter reviews potential improvements to address operational issues within the Study Area identified in the design year 2035 under Master Plan Amendment 2. In all, with the transportation improvements previously committed in the 2012 EIS, no system-level deficiencies were identified within the Study Area that would cause major failures in traffic operations in 2035. However, traffic operational analysis revealed some spot operational issues in design year 2035. The primary concerns are traffic operations on Martin Luther King Jr. Avenue SE and performance of the Gate 1 intersection in the design year.

This chapter has been compiled with the following subsections:

- **Section 5.1** discusses the development and evaluation process of transportation improvements within the Study Area.
- **Section 5.2** provides an overview of the transportation projects previously committed based on the 2012 EIS/TTR under Master Plan Amendment 1 and the current status of each project.
- **Section 5.3** highlights the locations where analysis reveals traffic operational issues in 2035 under Master Plan Amendment 2.
- **Section 5.4** explains the improvement concepts at each location that has been under consideration.

Transportation improvement concepts developed through September 2019 are shown in this document. Multiple factors are still under consideration for option screening and selection, which will be shown in the Final TTR.

5.1 Transportation Improvements Development and Evaluation Process

The development of transportation improvements is an iterative process involving engineering, planning and environmental inputs. All alternatives presented in this 2019 Draft TTR are currently going through extensive review and comment by stakeholders. The final preferred transportation alternative selected by stakeholders will be refined and documented in the Final TTR.

The study team first identified spot locations with traffic operational issues in the 2035 Action Baseline scenario. This scenario assumes the land use updates from Master Plan Amendment 2, but with no additional transportation improvements beside the projects previously committed in Master Plan Amendment 1. These previously committed projects are discussed in detail in **Section 5.3**. This scenario serves as the baseline to identify traffic operational issues as compared to the 2035 No Action scenario, which contains the land use and transportation assumptions from Master Plan Amendment 1.

At those location, different mitigation strategies and potential improvements have been developed to resolve issues that have been identified. The goal of these concepts is to maintain equal or better operations. At two locations, potential improvements will require further coordination with adjacent local and private development efforts that will cause a compounding effect at these locations. At the Gate 1 intersection, there are several right-of-way (ROW), utilities and historical structure constraints that limit the number of concepts that can be considered, but some of the concepts were

recommended for further analysis or revised for more detailed evaluation, which are included in this draft TTR. The criteria when developing the alternatives included providing sufficient roadway capacity to accommodate the expected additional traffic caused by both this project and other developments in or near the Study Area, minimization of footprint to reduce impact to historic properties and adjacent utilities, considering multimodal connectivity, and the construction costs.

A DHS shuttle service between Congress Heights Metrorail Station and Pecan Street was originally proposed in the 2012 EIS transportation analysis. This route would be impacted since the East Campus North Parcel would no longer be developed by GSA in Master Plan Amendment 2. An alternate route is needed so that transit access between the West Campus and the Congress Heights Metrorail Station is maintained.

A minimum of two alternatives are currently under consideration for each location. All alternatives will be carried through a multiple-round review/screening process in which the alternatives will be evaluated by several key stakeholders. After the review process, a preferred concept for each location will be selected to be included in the Final TTR and Master Plan Amendment 2.

5.2 Previously Committed Transportation Improvements and Current Status

The 2012 EIS/TTR identified a Transportation Preferred Alternative for Master Plan Amendment 1 that includes four roadway improvement projects together with a DHS shuttle transit system needed to accommodate access to the consolidated DHS Headquarters at St. Elizabeths. As part of commitments in Master Plan Amendment 1, these projects were planned to be implemented before design year 2035. Since then, some projects have been fully or partially constructed and some are not active due to the changes in the campus development plan.

5.2.1 Roadway Improvement Projects

Figure 5-1 illustrates the four roadway improvement projects previously committed in the 2012 EIS for Master Plan Amendment 1, along with the East Campus road network planned by the District. The descriptions and current status of each project are discussed in detail in the following sections.

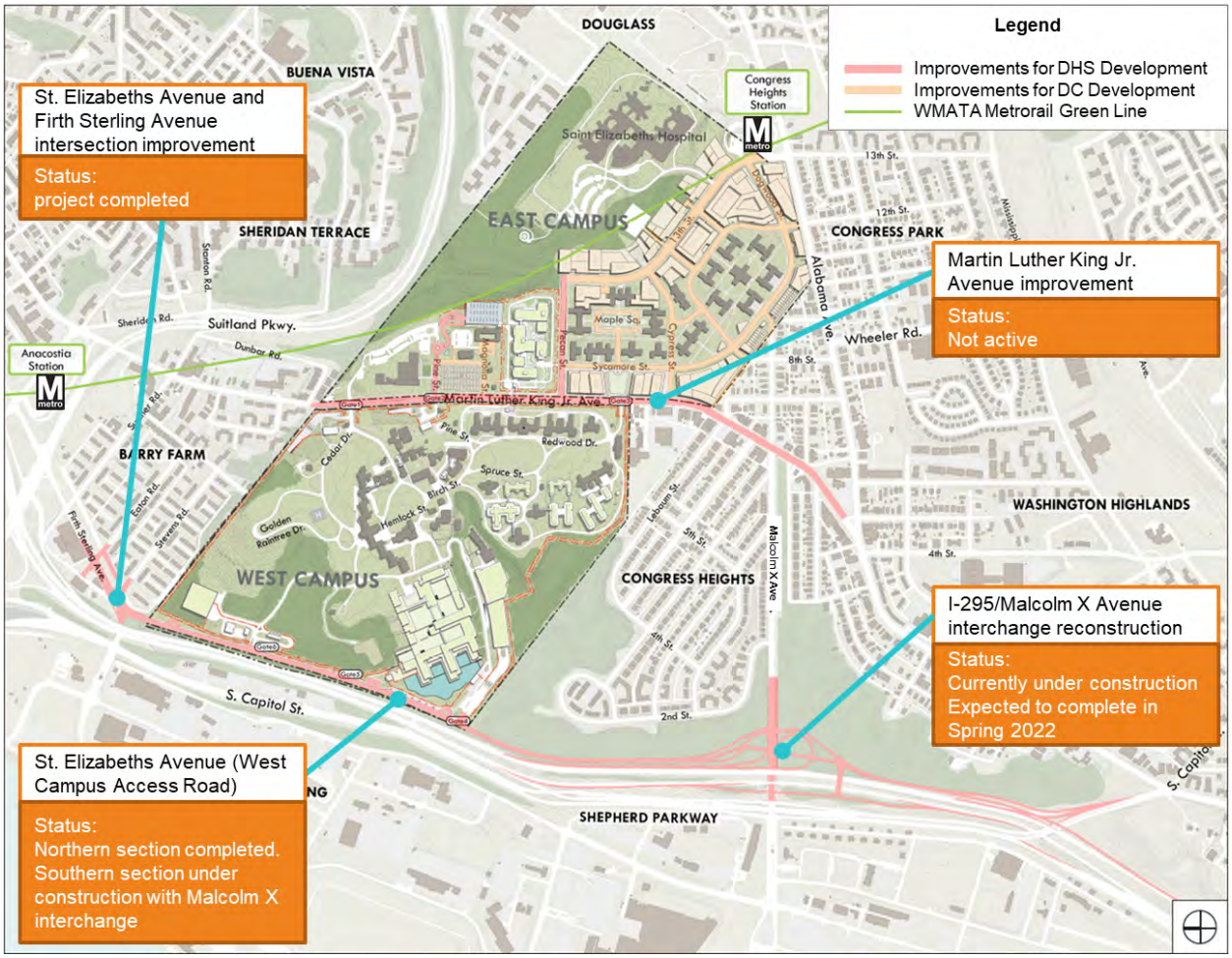

Figure 5-1: Previously Committed Transportation Improvements in 2012 EIS – Roadways

5.2.1.1 I-295/Malcolm X Avenue Interchange

This project is to improve the existing interchange that would provide direct freeway access to the proposed St. Elizabeths Avenue (previously referred as West Campus Access Road). These improvements are currently under construction and anticipated to be completed by Spring 2022. **Figure 5-2** is the proposed roadway configuration of new I-295/Malcolm X Avenue interchange.

5.2.1.2 St. Elizabeths Avenue Construction

This project is to construct a new three-lane road, St. Elizabeths Avenue, that would run parallel to I-295 to its east between the Malcolm X Avenue interchange and Firth Sterling Avenue. This road would connect to the proposed access modifications at the I-295/Malcolm X Avenue interchange and provide access to the West Campus. The northern section of St. Elizabeths Avenue between Firth Sterling Avenue and Gate 4 has been completed and opened to traffic in December 2013. The southern section between Malcolm X Avenue and Gate 4 is currently under construction as part of I-295/Malcolm X Avenue Interchange project. The lane configuration is also included in **Figure 5-2**.

5.2.1.3 Firth Sterling Avenue/St. Elizabeths Avenue Intersection Improvements

The construction of the Firth Sterling Avenue and St. Elizabeths Avenue intersection is to connect St. Elizabeths Avenue with existing Firth Sterling Avenue and provide improvements and modifications to Firth Sterling Avenue and its side streets. These improvements have been completed together with the opening of St. Elizabeths Avenue northern section.

5.2.1.4 Martin Luther King Jr. Avenue SE Improvements

The proposed improvements on Martin Luther King Jr. Avenue SE include two travel lanes in each direction, an additional turn lane, median, and sidewalks along Martin Luther King Jr. Avenue SE. This project originally was to improve access to both the East and West Campus portions of the DHS consolidation. Martin Luther King Jr. Avenue SE improvements continue south of St. Elizabeths Campus to Alabama Avenue. Improvements include wider sidewalks, on-street parking, and continuation of two travel lanes in each direction with turn pockets. Since the 2012 EIS, GSA's development plan on the East Campus North Parcel has been eliminated. Also, the development on the West Campus in the past years has been primarily at Gate 4 on St. Elizabeths Avenue. There has been no large-scale employee access to the West Campus at gates along on Martin Luther King Jr. Avenue SE side. Therefore, this project has not actively progressed since then. **Figure 5-3** shows the proposed conceptual plan of Martin Luther King Jr. Avenue SE improvements. The full-size plans are included in **Attachment D**.

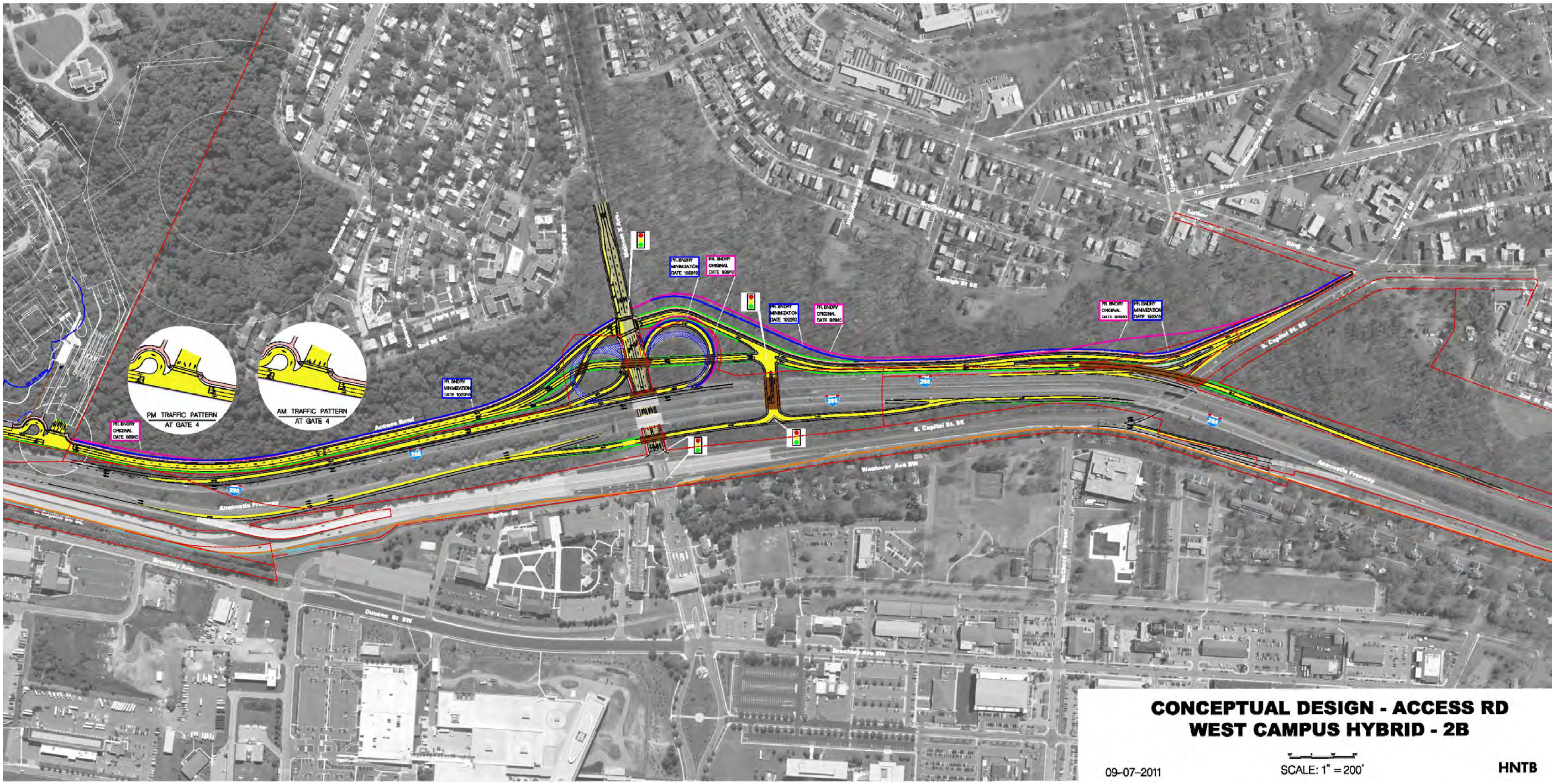

Figure 5-2: I-295/Malcolm X Avenue Interchange Design Plan

Figure 5-3: Martin Luther King Jr. Avenue SE Improvement Conceptual Plan

5.2.2 Transit Improvement Project

5.2.2.1 DHS Shuttle Transit

In addition to the above roadway improvement projects, the Preferred Alternative in the 2012 EIS also included the implementation of a shuttle system to reduce vehicular demand within or near the Study Area. There were three proposed shuttle routes in the 2012 EIS (**Figure 5-4**):

- Shuttle Route 1 connects the Congress Heights Metrorail Station and Gate 4 through Malcolm X Avenue and St. Elizabeths Avenue (labeled in red line)
- Shuttle Route 2 connects the Congress Heights Metrorail Station and the East Campus North Parcel through Pecan Street (labeled in purple line)
- Shuttle Route 3 connects the Anacostia Metrorail Station to Gate 4 of the West Campus through Firth Sterling Avenue and St. Elizabeths Avenue (labeled in blue line)

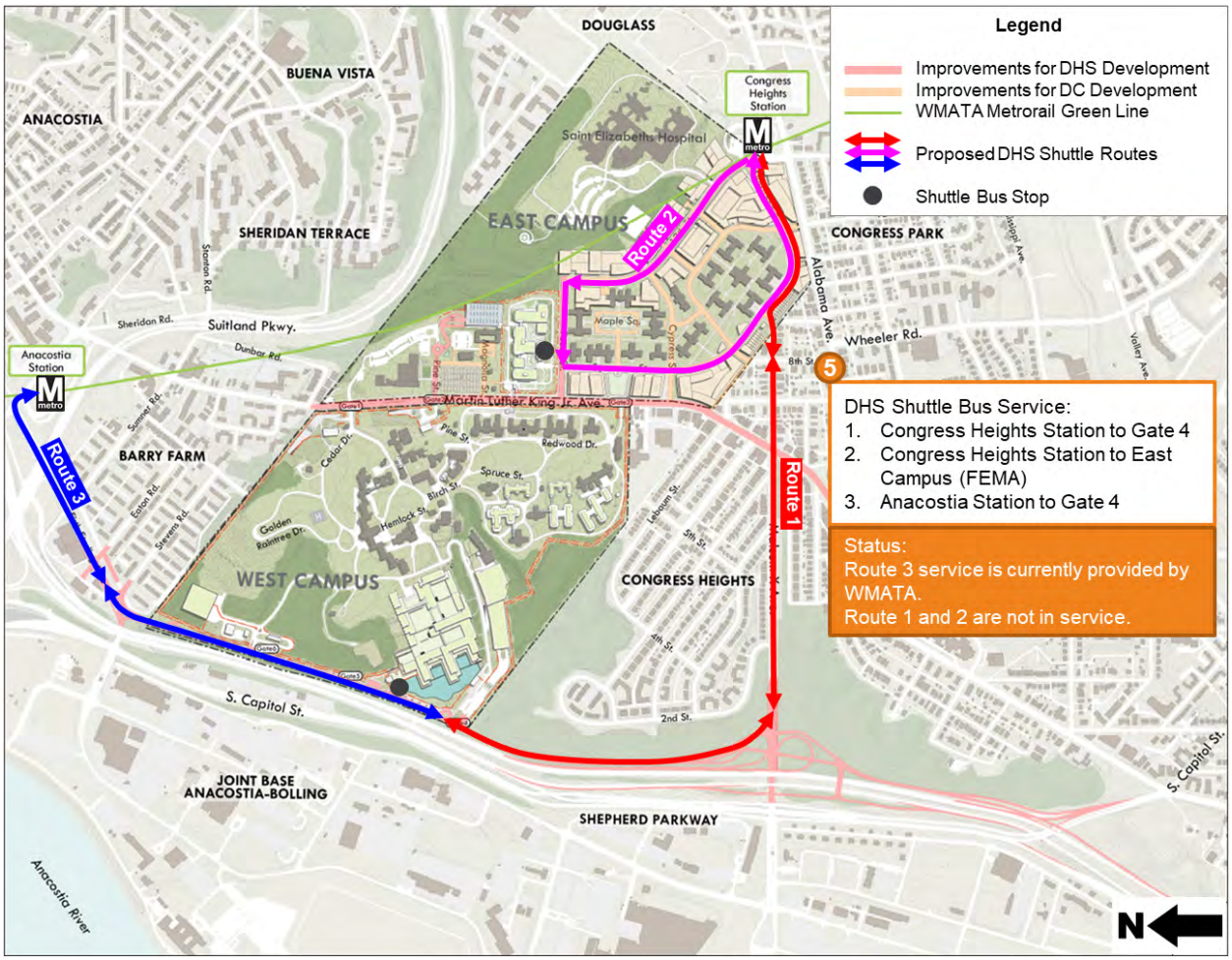

Figure 5-4: Previously Committed Transportation Improvements in 2012 EIS – Transit

Currently, shuttle Route 3 is being operated by WMATA. An existing Metrobus route (A4) was modified in order to provide the shuttle service. Shuttle Routes 1 and 2 have not been in active service. In addition, DHS is running two other shuttles from L'Enfant Plaza Metro Station to Gate 1

and Gate 4, respectively, to connect the Virginia Railway Express (VRE) commuter rail riders and the West Campus.

5.3 Traffic Operational Issues under 2035 Action Baseline Alternative

This section provides a high-level summary of traffic operational analysis results under the 2035 Action Baseline Alternative as compared to the 2035 No Action Alternative. The results help identify operational issues in the transportation system within the Study Area under 2035 No Action Alternative. At these locations, mitigations are further discussed in **Section 5.4** in addition to the previously transportation commitments described in **Section 5.2**. Note that this section only focuses on the locations that would have operational issues in 2035 and may be under considerations for further improvements in Master Plan Amendment 2. **Chapter 6** documents the full details of traffic operational analysis results in design year 2035.

5.3.1 2035 Action Baseline Alternative Traffic Operations Overview

Traffic operational analysis results show that generally the freeway conditions forecasted in the 2035 Action Baseline Alternative under Master Plan Amendment 2 are similar to the same conditions in the 2035 No Action Alternative under Master Plan Amendment 1 from the 2012 EIS transportation analysis. The demand is nearly identical between the two scenarios along the freeways. Because Master Plan Amendment 2 does not change the physical conditions along the freeways, the operating conditions remain similar with some minor impact due to change in the rate of flow of traffic along the arterials due to congestion.

Analysis also indicates that arterials and most intersections within the Study Area would operate at similar conditions with equal or better LOS in the 2035 Action Baseline scenario as compared to the 2035 No Action scenario. However, there are a few exceptions, and all are located on Martin Luther King Jr. Avenue SE, including Gate 1 intersection and Malcolm X Avenue intersection.

In all, the previously committed transportation improvement would still sufficiently support the majority part of the transportation networks within the Study Area under Master Plan Amendment 2 in 2035. The impacts would be localized to traffic operations along Martin Luther King Jr. Avenue SE, especially on the segments and intersections between South Capitol Street and Suitland Parkway.

5.3.2 Martin Luther King Jr. Avenue SE Operations

Master Plan Amendment 2 would result in two changes to traffic conditions along Martin Luther King Jr. Avenue SE. Incorporating additional developments and employees into the West Campus would concentrate traffic at the intersection with Gate 1 – where the majority of employee parking is to be located. As Master Plan Amendment 2 eliminates the GSA's development on the East Campus North Parcel, the District is planning a new development to occur at this parcel in its instead. The additional development that would occur on the East Campus North Parcel would result in slightly higher traffic demand along Martin Luther King Jr. Avenue SE, approximately 100 to 200 more vehicles in the peak hours, based on the latest assumptions for future land use provided by the East Campus Development Team and Office of the Deputy Mayor for Planning and Economic Development (DMPED). This estimate of additional trips is based on MWCOG regional travel demand model outputs based on proposed development input. They do not account for travel demand management (TDM) strategies from corresponding developers' TMP. It is highly recommended that DMPED and DC Office-Planning (DCOP) conduct a detailed trip generation analysis to determine the most likely volumes in and out of the East Campus North Parcel and at

the intersections along Martin Luther King Jr. Avenue SE. Both of these changes would result in increased delays at signalized intersections along Martin Luther King Jr. Avenue SE. **Table 5-1** summarizes the comparison of traffic operations at all signalized intersection along Martin Luther King Jr. Avenue SE in 2035 No Action vs. Action Baseline scenarios. Existing operational conditions in 2019 are also included as a reference.

Table 5-1: Traffic Operations at Martin Luther King Jr. Avenue SE Signalized Intersections (2019 Existing, 2035 No Action vs. Action Baseline)

Int ID	Intersection Name	2019 Existing		2035 No Action		2035 Action Baseline		Significant Impact?
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
AM Peak Hour								
54	11th Street Bridge and I-295 SB On-Ramp	7	A	3	A	5	A	No
53	Martin Luther King Jr. Avenue SE /11th Street Bridge and I-295 NB Off-Ramp	30	C	90	F	45	D	No
1	Martin Luther King Jr. Avenue SE and Good Hope Road	61	E	70	E	39	D	No
3	Martin Luther King Jr. Avenue SE and W Street	9	A	15	B	8	A	No
6	Martin Luther King Jr. Avenue SE and Morris Road	42	D	24	C	50	D	No
7	Martin Luther King Jr. Avenue SE and Talbert Street	23	C	10	A	30	C	No
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	67	E	32	C	46	D	No
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Interchange	N/A		29	C	57	E	Yes
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	15	B	37	D	49	D	No
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	4	A	11	B	74	E	Yes
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2	14	B	15	B	16	B	No
107	Martin Luther King Jr. Avenue SE and Pecan Street	N/A		16	B	13	B	No
47	Martin Luther King Jr. Avenue SE and Cypress Street	6	A	10	A	11	B	No
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	42	D	41	D	61	E	Yes
28	Martin Luther King Jr. Avenue SE and Raleigh Place	23	C	75	E	33	C	No
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	22	C	25	C	36	D	No
41	Martin Luther King Jr. Avenue SE /South Capitol Street/Halley Place	104	F	77	E	120	F	Yes
PM Peak Hour								
54	11th Street Bridge and I-295 SB On-Ramp	5	A	53	D	9	A	No
53	Martin Luther King Jr. Avenue SE /11th Street Bridge and I-295 NB Off-Ramp	38	D	141	F	62	E	No
1	Martin Luther King Jr. Avenue SE and Good Hope Road	58	E	85	F	67	E	No
3	Martin Luther King Jr. Avenue SE and W Street	29	C	117	F	28	C	No
6	Martin Luther King Jr. Avenue SE and Morris Road	74	E	41	D	32	C	No
7	Martin Luther King Jr. Avenue SE and Talbert Street	13	B	34	C	24	C	No
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	57	E	54	D	55	D	No
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Interchange	N/A		35	C	35	C	No
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	26	C	21	C	38	D	No
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	7	A	21	C	33	C	No
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2	17	C	22	C	15	B	No
107	Martin Luther King Jr. Avenue SE and Pecan Street	N/A		10	A	16	B	No
47	Martin Luther King Jr. Avenue SE and Cypress Street	13	B	9	A	15	B	No
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	46	D	43	D	56	E	Yes
28	Martin Luther King Jr. Avenue SE and Raleigh Place	17	B	13	B	11	B	No
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	22	C	6	A	16	B	No
41	Martin Luther King Jr. Avenue SE /South Capitol Street/Halley Place	82	F	21	C	58	E	Yes

* Intersections 102 and 107 are not existing intersections. They are part of future projects. Therefore, no results are available at these two locations in 2019 Existing Conditions.

Traffic operations at four intersections would degrade from LOS D or better in 2035 No Action scenario to LOS E or F in 2035 Action Baseline scenario in either or both peak hours. The degradation of LOS at these locations is likely to affect both the local neighborhood traffic and the site-generated trips by DHS employees. These intersections are:

- Martin Luther King Jr. Avenue SE and Suitland Parkway On-/Off-Ramps (AM peak hour)
- Martin Luther King Jr. Avenue SE and Malcolm X Avenue (both peak hours)
- Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place (both peak hours)
- Martin Luther King Jr. Avenue SE and West Campus Gate 1 (AM peak hour)

The first three intersections are key gateway points on Martin Luther King Jr. Avenue SE that provide connections to and from freeways or expressways in St. Elizabeths area. Note that operation at the intersection of Martin Luther King Jr. Avenue SE and South Capitol Street is a pre-existing issue, currently experiencing LOS F in both peak hours. These intersections would experience the greatest increases in delay due to compound impacts from both West Campus and East Campus development, which should be further studied with DMPED and DCOP to determine the compound impacts. The degradation at Gate 1 intersection is more directly related to West Campus site development; therefore, it is discussed in detailed in the section below.

5.3.3 Gate 1 Operations at Martin Luther King Jr. Avenue SE Intersection

Figure 5-5 illustrates the original design of lane configurations at the Gate 1 and Martin Luther King Jr. Avenue SE intersection proposed in the 2012 EIS and Master Plan Amendment 1. Martin Luther King Jr. Avenue SE at Gate 1 accommodates five lanes—two in each direction with turning pockets, with no curbside parking, and Metrobus stops on each side, south of the intersection.

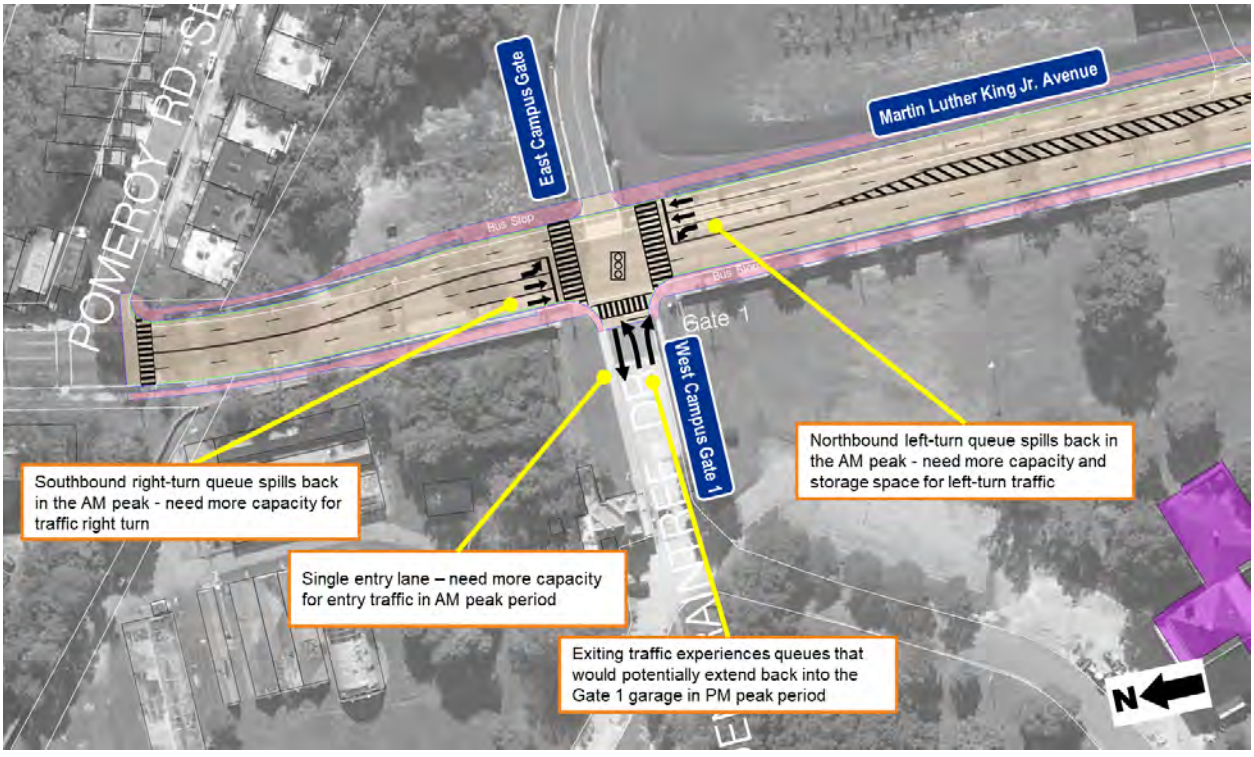

Figure 5-5: Proposed Lane Configurations at Gate 1 Intersection in 2012 EIS

It is forecasted that in the AM peak hour in design year 2035, 565 vehicles would access Gate 1 from the southbound direction and 255 vehicles from the northbound. In the PM peak hour, a total of 740 vehicles per hour would exit from Gate 1, of which 500 vehicles turn left and 240 turn right. **Table 5-2** summarizes the operational results and traffic demand served at Gate 1 intersection by movements. The average and 95th percentile queue lengths during AM and PM peak hours are illustrated in **Figure 5-6** and **Figure 5-7**, respectively.

Table 5-2: Gate 1 Intersection Operations in 2035 No Action vs. Action Baseline Alternatives

Approach	Movement	2035 No Action		2035 Action Baseline				
		Average Delay (second/ vehicle)	LOS	Average Delay (second/v ehicle)	LOS	Demand	Volume Served	% Demand Served
AM Peak Hour								
Northbound	Left turn	38	D	25	C	255	256	100%
	Through	3	A	5	A	1160	1160	100%
	Right turn	8	A	0	A	0	0	100%
	Total	6	A	9	A	1415	1415	100%
Eastbound	Left turn	36	D	51	D	95	97	102%
	Through	0	A	0	A	0	0	100%
	Right turn	39	D	10	B	110	109	99%
	Total	38	D	30	C	205	206	100%
Southbound	Left turn	9	A	112	F	5	5	104%
	Through	12	B	152	F	680	557	82%
	Right turn	20	C	185	F	565	513	91%
	Total	14	B	168	F	1250	1075	86%
Westbound	Left turn	0	A	0	A	0	0	100%
	Through	8	A	0	A	0	0	100%
	Right turn	5	A	6	A	5	5	98%
	Total	5	A	6	A	5	5	98%
Intersection Total		11	B	74	E	2875	2702	94%
PM Peak Hour								
Northbound	Left turn	39	D	48	D	65	66	102%
	Through	13	B	12	B	755	763	101%
	Right turn	38	D	6	A	5	4	84%
	Total	15	B	15	B	825	833	101%
Eastbound	Left turn	42	D	72	E	500	497	99%
	Through	0	A	0	A	0	0	100%
	Right turn	24	C	44	D	240	238	99%
	Total	37	D	63	E	740	735	99%
Southbound	Left turn	25	C	27	C	5	4	88%
	Through	19	B	26	C	990	942	95%
	Right turn	22	C	34	C	175	161	92%
	Total	19	B	27	C	1170	1107	95%
Westbound	Left turn	19	B	40	D	5	5	98%
	Through	0	A	0	A	0	0	100%
	Right turn	5	A	0	A	0	0	100%
	Total	7	A	40	D	5	5	98%
Intersection Total		21	C	33	C	2740	2680	98%

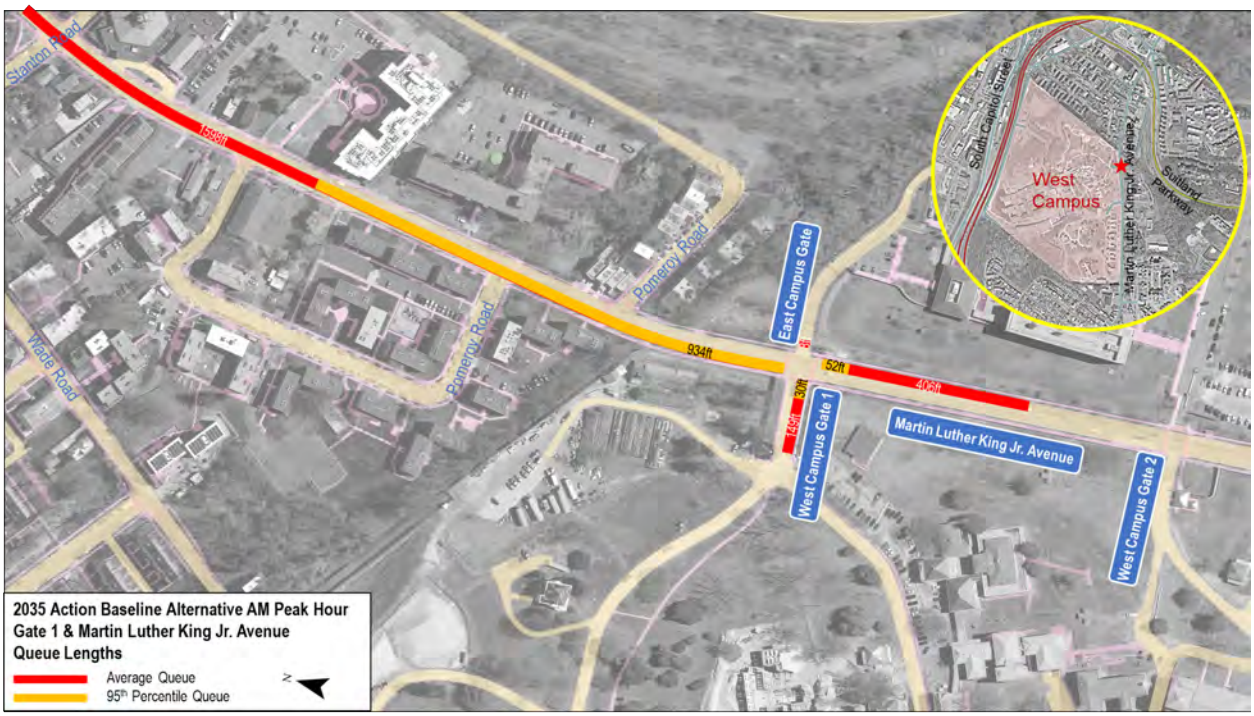

Figure 5-6: Gate 1 and Martin Luther King Jr. Avenue SE Intersection Queue Lengths in AM Peak Hour

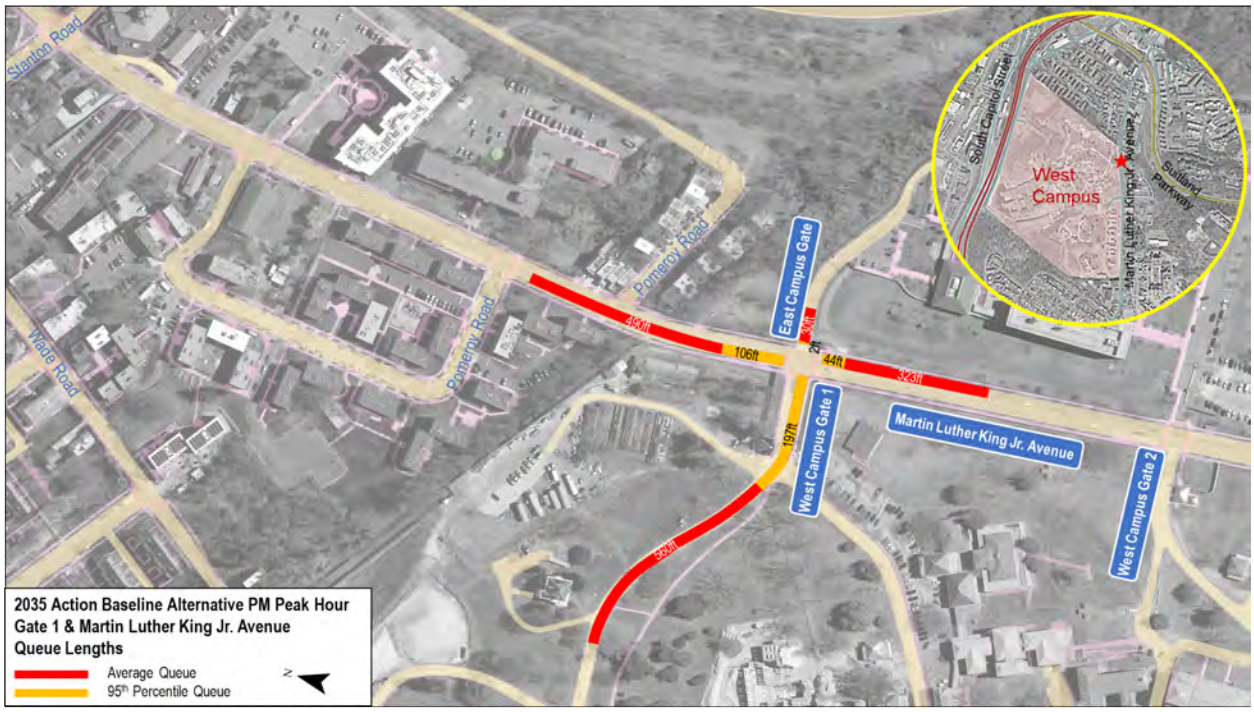

Figure 5-7: Gate 1 and Martin Luther King Jr. Avenue SE Intersection Queue Lengths in PM Peak Hour

Results from the traffic analysis indicate that the Gate 1 intersection with the 2012 proposed configurations can accommodate the increased traffic demand with no recurring failure operations. The Gate 1 intersection is forecasted to operate at LOS E and LOS C in the AM and PM peak hours, respectively. Therefore, the intersection would operate near or at capacity in the AM peak

hour and would be extremely sensitive to disruption which could cause queuing. Specifically, traffic analysis revealed some operational issues at this intersection summarized as follows:

- AM peak hour operations:
  - The Gate 1 intersection would degrade from LOS B in the 2035 No Action scenario to LOS E in the 2035 Action Baseline scenario.
  - Southbound Martin Luther King Jr. Avenue SE approach and movements would experience severe delay and operate at LOS F in the AM peak hour. The shared right turns with through movement would not provide sufficient capacity to handle increased right-turn inbound traffic in the AM peak hour. The southbound queuing conditions at Gate 1 would be significant (Figure 5-6). The average southbound queue length would be nearly 900 feet and the 95th percentile queue would extend to the upstream intersection at Stanton Road. Results indicate that the intersection can process inbound traffic to the garage in the AM peak hour. However, the southbound traffic demand would be impeded by queuing conditions and 86 percent of peak hour traffic demand would be served through the intersection in the AM peak hour.
  - There is only a single lane at Gate 1 for entry traffic. More inbound capacity for entry traffic is needed in AM peak period.
  - The proposed 2012 design only includes a short bay for northbound left-turn traffic. Queue spills back beyond the storage space and could potentially block the through traffic in the AM peak. Additional storage space is needed for northbound left-turn traffic.
- PM peak hour operations:
  - The overall intersection would operate at LOS C, similar to 2035 No Action scenario.
  - The Gate 1 exiting approach would operate at LOS E. Exiting traffic from the West Campus would experience queues that would potentially extend back into the Gate 1 garage. The average queue length would be about 250 feet inside the Gate 1, and the maximum queue would be over 600 feet, as shown in **Figure 5-7**. However, this is an internal circulation issue and no operational issues would be expected on Martin Luther King Jr. Avenue SE.

While the analysis for the peak hour of the West Campus does not show recurring failure (i.e. LOS F) at the Gate 1 intersection in traffic operations, the analysis: (1) assumes that DHS and its units strictly adhere to the mode splits, staggered arrival/departure times, and other travel demand management strategies specified in the 2019 TMP;(2) is extremely sensitive to increases in traffic demand or changes in lane configuration assumptions. This means that traffic operations are on the cusp of being unstable.

A minor change in lane configuration and a small increase in traffic demand could result in significant degradation in traffic operations. For instance, the widening of Martin Luther King Jr. Avenue SE proposed in the 2012 EIS included shifting bus stops from the near side of intersections to the far side. If buses stop on southbound Martin Luther King Jr. Avenue SE on the near side of the intersection with Gate 1 (before the traffic signal), and an additional 100 vehicles arrive during the peak hour at Gate 1, traffic operations would significantly degrade on Martin Luther King Jr. Avenue SE in the AM peak hour. The Gate 1 intersection would experience significant delay and recurring signal failure (LOS F). Queues on southbound Martin Luther King Jr. Avenue SE, which

in the current analysis do not reach Sumner Road, would extend past the Sumner Road intersection to Suitland Parkway. Therefore, even though not at failure conditions at the Gate 1 intersection in 2035 Action Baseline scenario, additional improvements should be considered to mitigate potential impacts due to fluctuation in traffic demand, which in turn would ensure a more sustainable and viable arterial operation for West Campus and neighborhood communities.

5.4 Transportation Improvement Options

Several mitigation options have been conceptualized to address the potential traffic issues identified in **Section 5.3**. The following section describes those improvements identified as "Likely Needed" on Martin Luther King Jr. Avenue SE and Gate 1.

5.4.1 Martin Luther King Jr. Avenue SE and Gate 1 Intersection Improvements

As discussed in **Section 5.3.3**, there would be three operational issues at the intersection of Gate 1 and Martin Luther King Jr. Avenue SE in the AM peak hour. The operational issues in the PM peak hour would be primarily internal and would not affect external arterial operations.

1. No dedicated right-turn lane on southbound Martin Luther King Jr. Avenue SE approach at Gate 1, which would cause significant southbound queues and delays in the AM peak period.
2. Single entrance lane at Gate 1, which would limit the entering capacity to handle inbound arrival traffic in AM peak period.
3. Insufficient storage bay for northbound left-turn movement, which would cause northbound queue spills back and potentially block through traffic in the AM peak.

The degradation of Gate 1 intersection operations is forecasted to be localized. The improvement options are generally small, spot improvements which, for the most part, do not require additional ROW and are geared to mitigate traffic operational issues triggered by volume increases along Martin Luther King Jr. Avenue SE and at Gate 1. Improvements generally include signal timing modifications, lane channelization changes, lane storage capacity increases (e.g., turning bay extensions) which do not require additional ROW. Corresponding to each issue, various concepts for mitigations have been considered, developed and discussed. **Table 5-3** summarizes these concepts together with discussion on their pros and cons.

Table 5-3: Mitigation Concepts for Gate 1 Intersection

Issue	Mitigation	Discussion
Gate 1 entrance	Widen to four-lane entrance, two for each direction	o Provide sustainable capacity at Gate 1 entrance o Construction costs needed for widening and potentially have ROW, utility or historical structures impacts
	Retain the three-lane entrance, but convert the center lane to a reversible lane (entry in AM, exit in PM)	o Minimize impacts to ROW, utility or historical structures o May have challenge in signal operation for the convertible lane
Southbound right-turn traffic	Convert the rightmost lane to an exclusive right-turn lane without island (hard right turn)	o Low cost improvements with no construction needed o Hard right turn may not be efficient enough to process heavy right turn demand o Take partial capacity from southbound through movement
	Convert the rightmost lane to an exclusive right-turn lane with a raised/painted island for channelization treatment (continuous right turn)	o Moderate cost improvements with minor construction of a channelization island o Channelized treatment ensures continuous right turn flow and maximum single right turn lane capacity o Take partial capacity from southbound through movement o Not compatible with the reversible lane concept because it requires a dedicated receiving lane
	Convert the rightmost lane to an exclusive right-turn lane and the center lane to a shared right-turn and through lane	o Maximize the right turn capacity o Take more capacity from southbound through movement o Not compatible with the reversible lane concept because it requires a dedicated receiving lane
Northbound left-turn traffic	Extend left-turn bay to 400 feet or more	o Low cost improvements with no ROW, utility or historical structures impacts o Enough to cover projected 95th percentile queue lengths
	Divert portion northbound traffic to Gate 2	o Relieve traffic operations at Gate 1 o Concept has been dismissed due to additional security process at Gate 2

By combining different mitigations, four improvement options have been developed for further analysis and evaluation. The elements for each option are explained as follows:

- Gate 1 Option 1A (**Figure 5-8**)
  1. Convert the southbound rightmost lane to an exclusive right-turn lane with no island (hard right turn).
  2. Widen Gate 1 entrance to four lanes, two for each direction.
  3. Extend northbound left-turn bay to 400 feet or more.
- Gate 1 Option 1B (**Figure 5-9**)
  1. Convert the southbound rightmost lane to an exclusive right-turn lane with a raised/painted island for channelization treatment (continuous right turn).

  2&3. Same as Option 1A.
- Gate 1 Option 1C (**Figure 5-10**)
  1. Convert the southbound rightmost lane to an exclusive right-turn lane and the center lane to a shared right-turn and through lane.

  2&3. Same as Option 1A.
- Gate 1 Option 2A (**Figure 5-11**)

  1&3. Same as Option 1A.
  2. Retain three lanes at Gate 1 entrance and convert the center lane to a reversible lane (inbound in AM peak period and outbound in PM peak period).

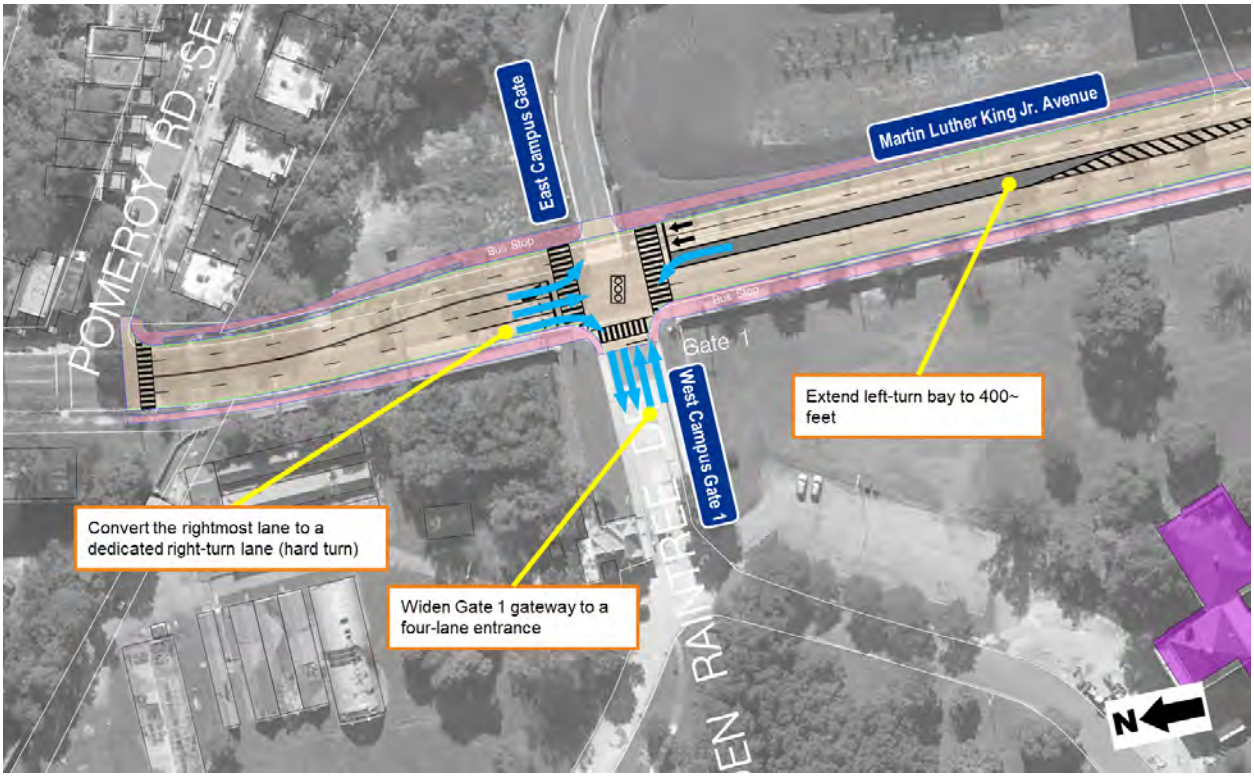

Figure 5-8: Gate 1 Improvement Concept 1A

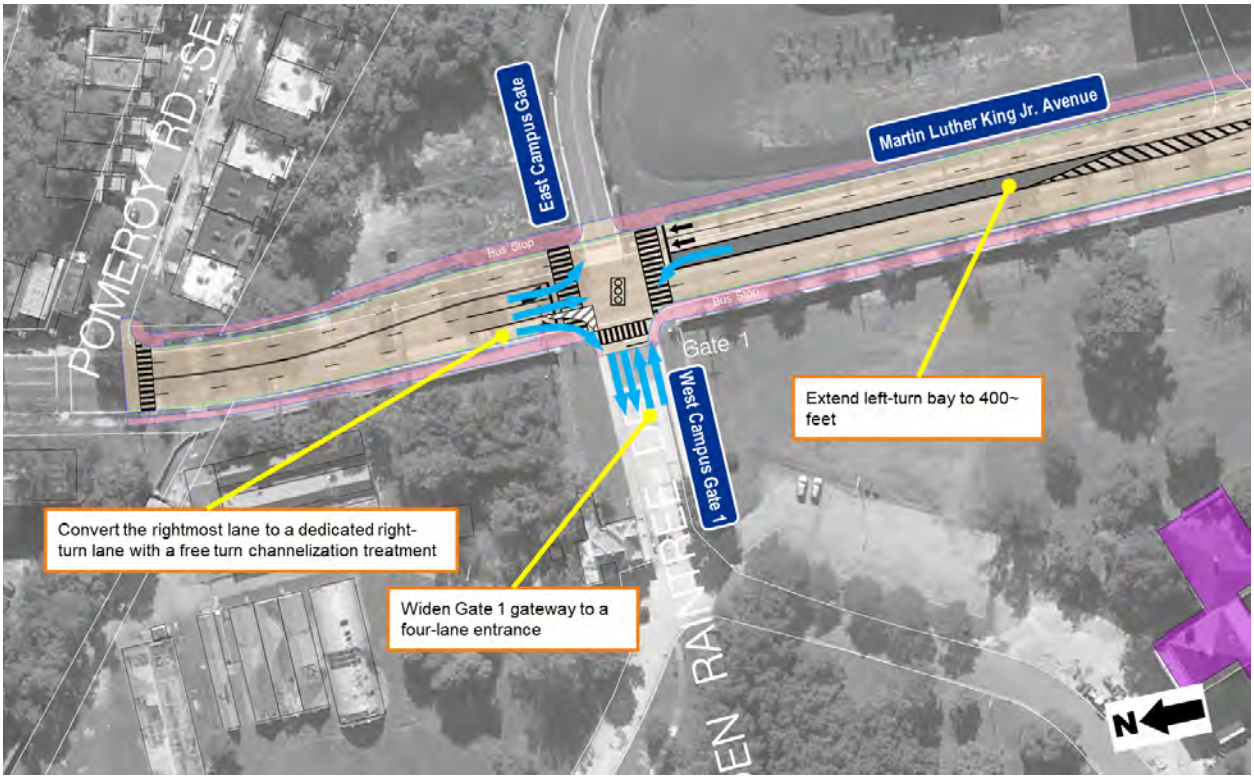

Figure 5-9: Gate 1 Improvement Concept 1B

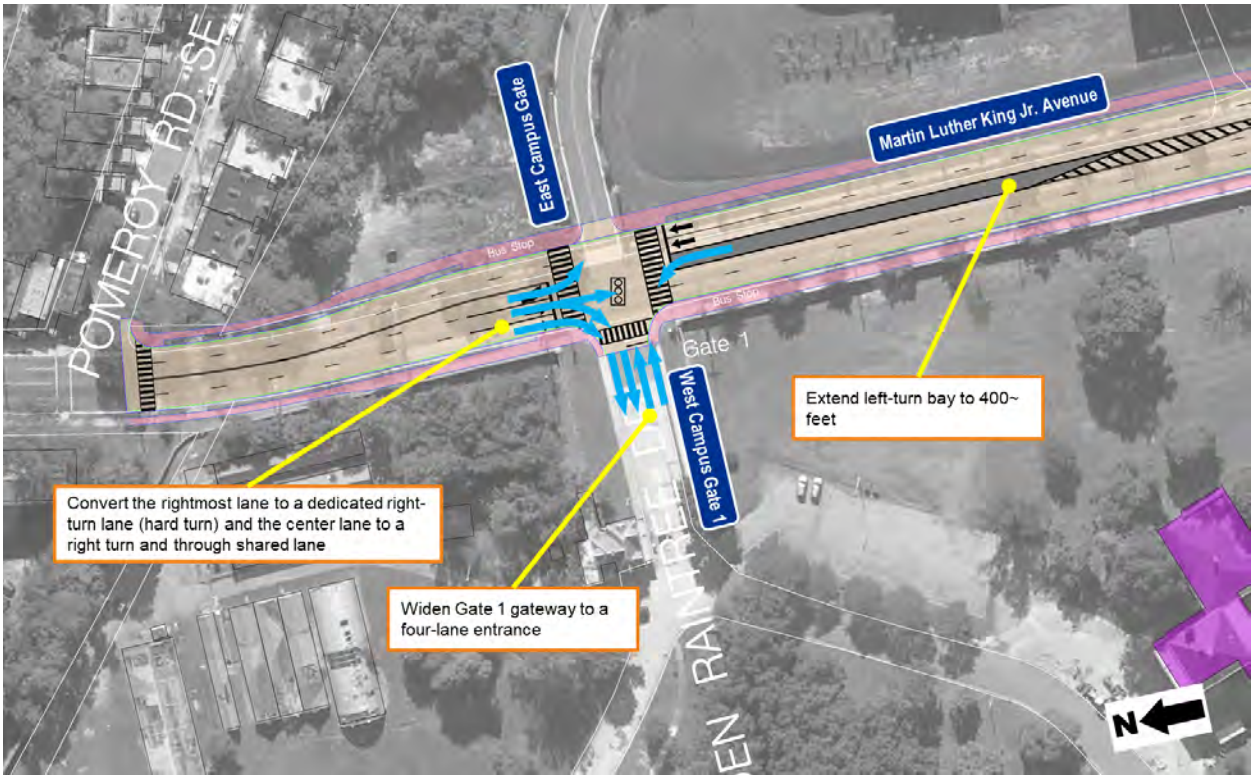

Figure 5-10: Gate 1 Improvement Concept 1C

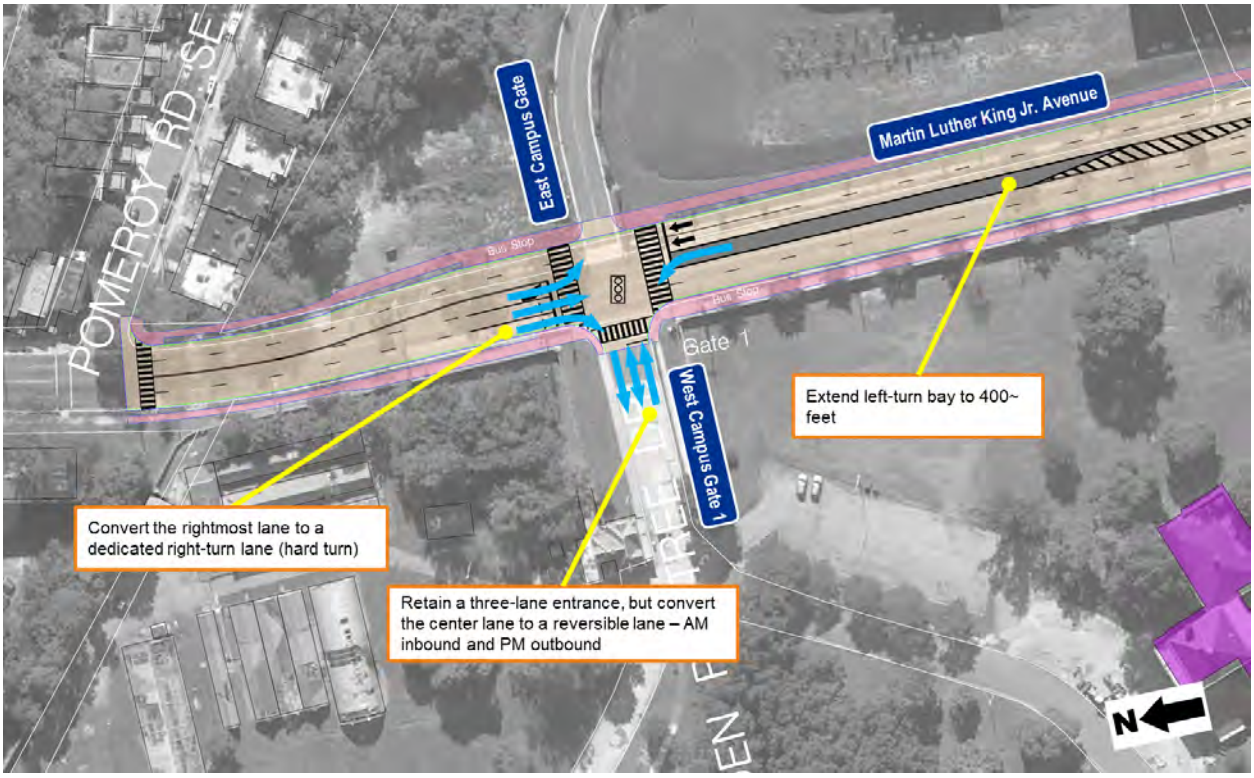

Figure 5-11: Gate 1 Improvement Concept 2A

The above four options have been tested in traffic microsimulation analysis to verify their operational benefits. The detailed results are presented in **Chapter 6**. In addition, GSA and DHS are currently having internal discussions to evaluate these options with other considerations. The selection of a preferred option will be included in the Final TTR.

5.4.2 DHS Shuttle Bus Service Modification

The 2012 EIS included a shuttle route between the Congress Heights Metrorail Station and Pecan Street on the East Campus North Parcel directly in front of the FEMA Headquarters (as shown in purple lines in **Figure 5-4**). The shuttle would support the transit mode share goal set forth in the St. Elizabeths TMP. Since development of the East Campus North Parcel by the GSA would no longer occur under Master Plan Amendment 2, a new route and stop location would be required to serve the same purpose as the Pecan Street shuttle under the 2012 EIS.

Figure 5-12 through **Figure 5-14** illustrate three proposed routes for the shuttle transit service between the Congress Heights Metrorail Station to West Campus entrance along Martin Luther King Jr. Avenue SE.

- DHS shuttle Option 1 (**Figure 5-12**)
  - The route would follow the same loop route proposed in the 2012 EIS: Congress Heights Metrorail Station – Pecan Street – Sycamore Drive – Congress Heights Metrorail Station. This route would avoid adding shuttle vehicular traffic on Martin Luther King Jr. Avenue SE as well as eliminate the need to enter through West Campus gates.
  - The shuttle stop would be relocated to Sycamore Street between Pecan Street and Cypress Street.
  - Shuttle patrons would cross Martin Luther King Jr. Avenue SE via a secure underground pedestrian tunnel. This would provide DHS employees a safer grade-separated option to access Gate 3. The existing tunnel under Martin Luther King Jr. Avenue SE at Gate 3 would need to be upgraded to accommodate pedestrians in compliance with Americans with Disabilities Act (ADA) requirements. The feasibility of opening the pedestrian tunnel to shuttle patrons will be under further discussion with GSA and DHS.
  - An alternate for shuttle patrons is to use a pedestrian signal near Gate 3 to cross Martin Luther King Jr. Avenue SE at grade. However, this could introduce additional delay to through traffic.
- DHS shuttle Option 2 (**Figure 5-13**)
  - Option 2 would modify the shuttle route to this path: Congress Heights Metrorail Station – Pecan Street – Martin Luther King Jr. Avenue SE – West Campus Gate 1. This route would put additional vehicular traffic on Martin Luther King Jr. Avenue SE and potentially add delays at Gate 1 intersection.
  - The shuttle stop would be relocated inside West Campus near Gate 1 to connect to other internal shuttle system or pedestrian facilities.
- DHS shuttle Option 3 (**Figure 5-14**)
  - Option 3 would modify the shuttle route to this path: Congress Heights Metrorail Station – Pecan Street – Martin Luther King Jr. Avenue SE – West Campus Gate 2

(visitor entrance). This route would put additional vehicular traffic on Martin Luther King Jr. Avenue SE but avoid going through the Gate 1 intersection.

- The shuttle stop would be relocated inside West Campus near Gate 2 to connect to other internal shuttle system or pedestrian facilities.

These options are currently under evaluation by GSA and DHS. The preferred option will be included in the Final TTR.

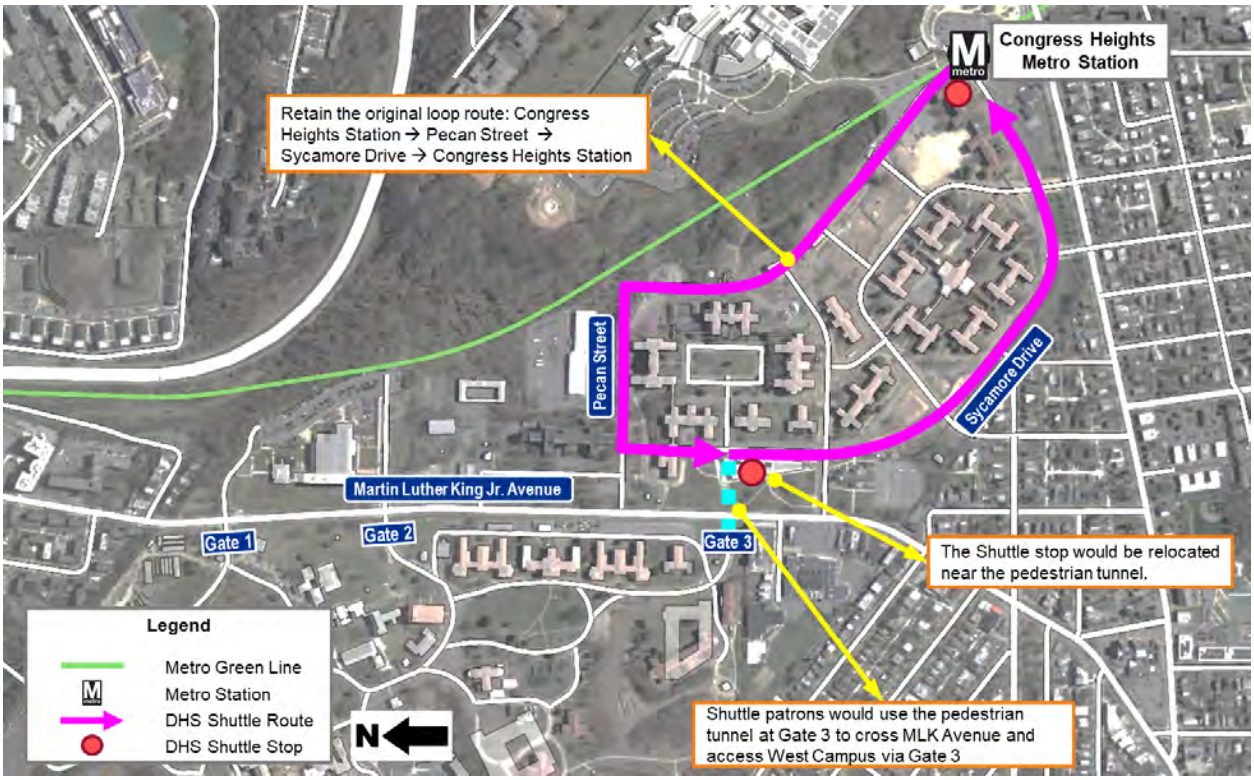

Figure 5-12: DHS Shuttle Route Modification Option 1

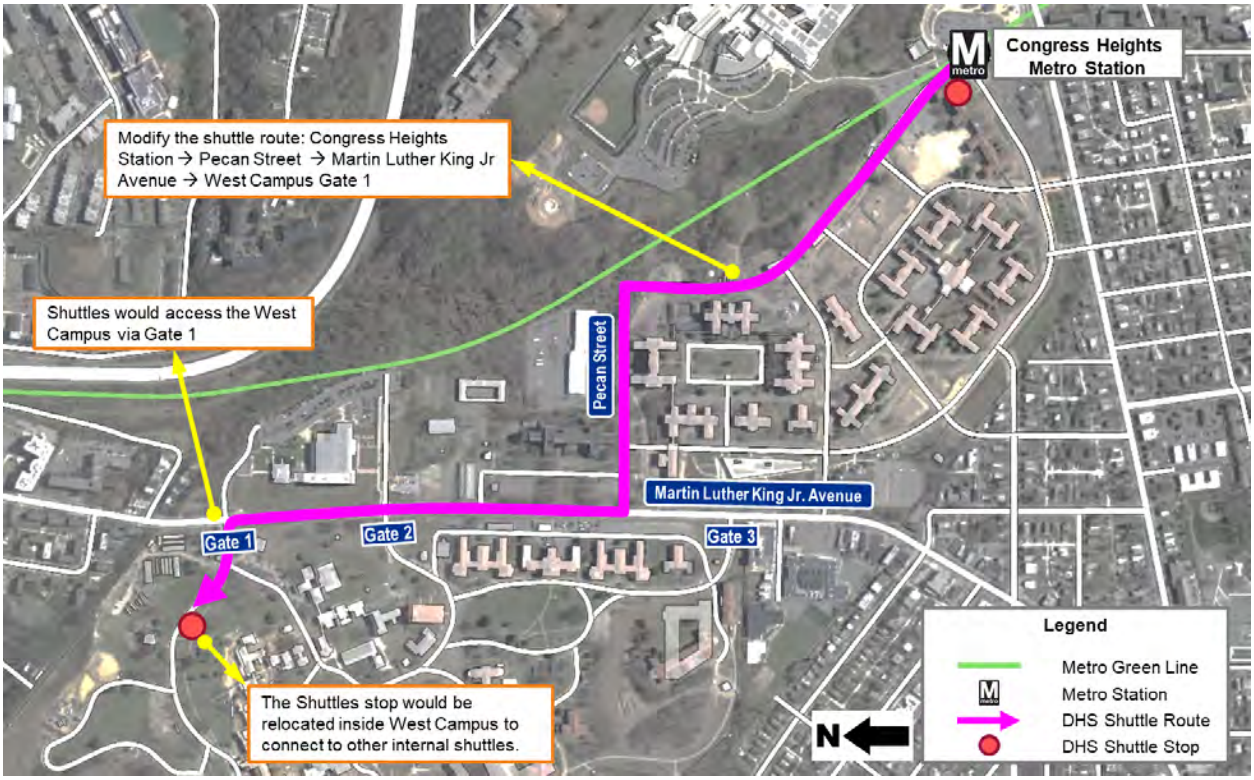

Figure 5-13: DHS Shuttle Route Modification Option 2

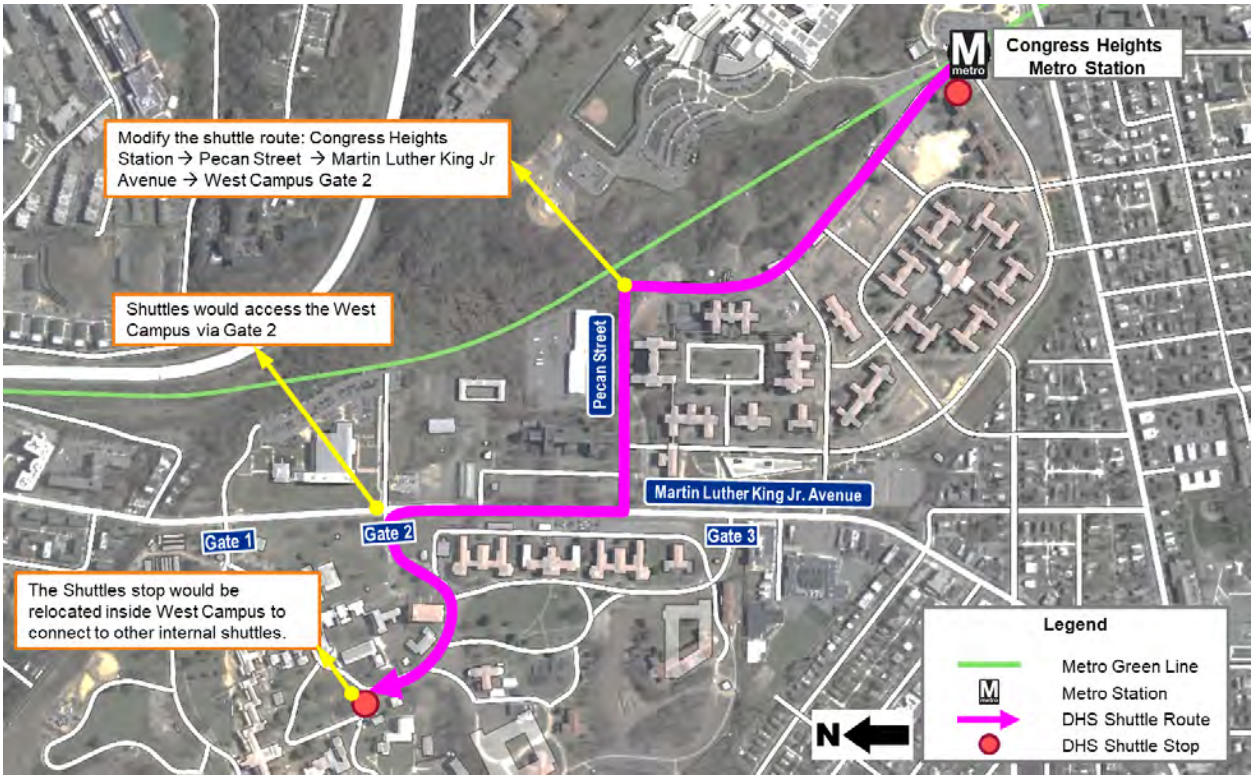

Figure 5-14: DHS Shuttle Route Modification Option 3

5.4.3 Bicycle Lanes on Martin Luther King Jr. Avenue SE

In the Martin Luther King Jr. Avenue SE improvement concept plan proposed in the 2012 EIS, no bicycle lanes were included. **Figure 5-15** exhibits the proposed typical cross sections with no bicycle lanes.

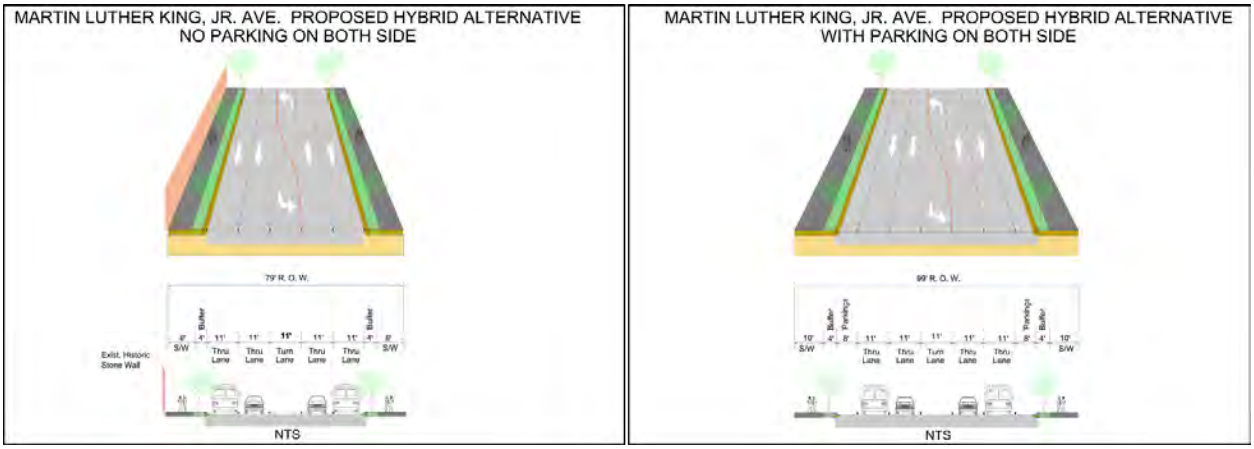

Figure 5-15: Proposed Typical Cross Sections on Martin Luther King Jr. Avenue SE in 2012 EIS

Since then, the District has made a commitment and initiated aggressive efforts to building a citywide network of on-street bicycle lanes, signed routes, and other bicycle facilities to accommodate the rapidly growing number of cyclists. The 2005 DC Bicycle Master Plan (DDOT, 2005) recommended improving bicycle facilities along this section of Martin Luther King Jr. Avenue SE (**Figure 5-16**). From a West Campus development perspective, adding bicycle facilities will also bring transportation benefits. Increasing bicycle travel reduces the number of motor vehicles on roadways. Completing bicycle paths, providing more bicycle lanes, and enhancing connectivity among different modes will provide convenient transportation options, and encourage multimodal usage for DHS employees and surrounding communities. These will eventually help DHS fulfill the vehicle trip reduction and non-motorized transportation mode-share goals established in the 2019 TMP.

Therefore, the update of the Martin Luther King Jr. Avenue SE improvement concept in the 2019 Draft Supplemental EIS/TTR should consider bicycle facilities (preferably physically separated lanes where feasible) into Martin Luther King Jr. Avenue SE improvements in accordance with the latest DDOT design standards. The incorporation of bicycle lanes may have potential ROW impacts and/or parking lane reduction. They are currently under investigation and discussion with GSA, DHS and DDOT. The final concept will be included in the Final TTR.

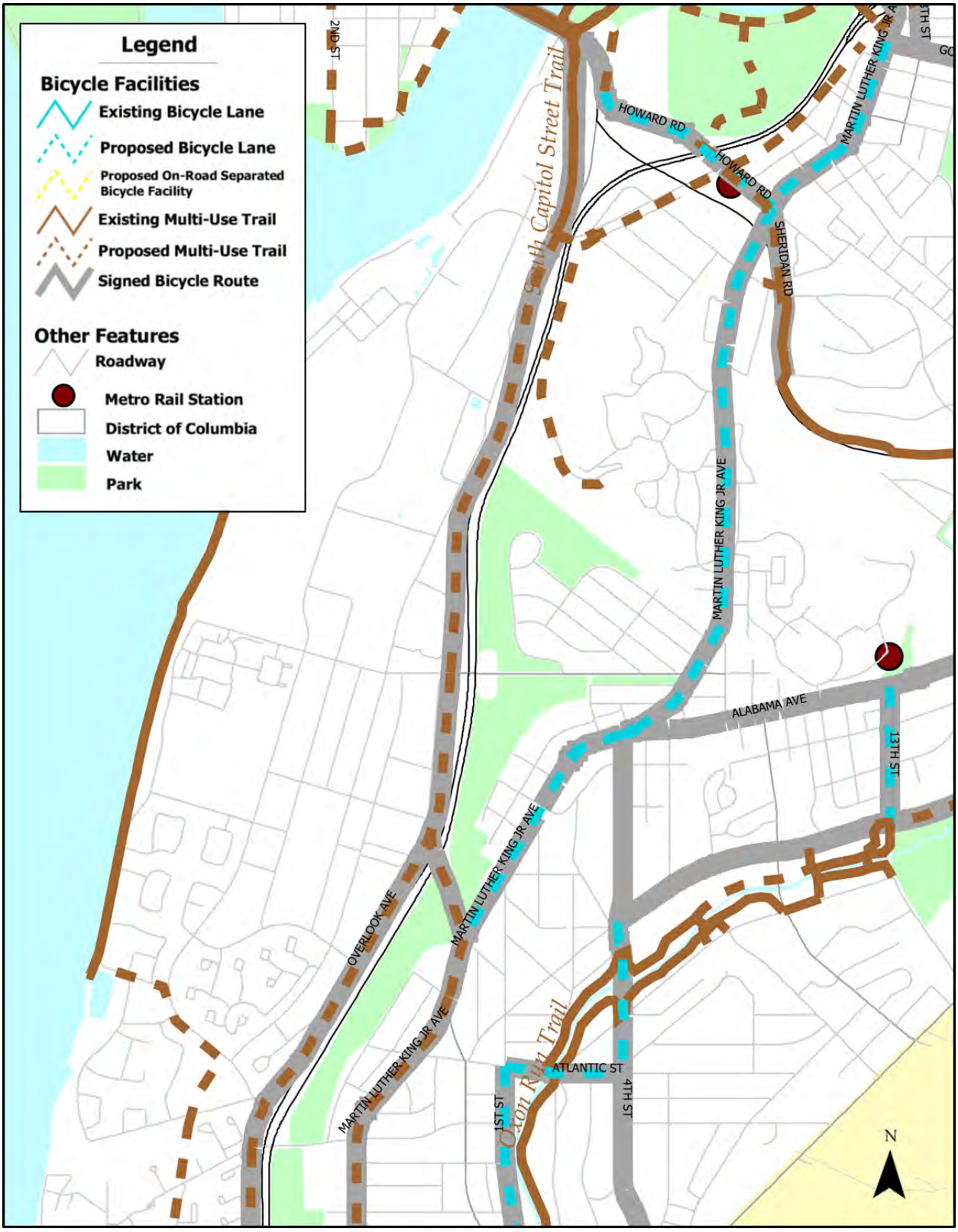

Figure 5-16: Proposed Bicycle Facilities in St. Elizabeths Area in DC Bicycle Master Plan (Source: DDOT, 2005)

6 FUTURE CONDITIONS ASSESSMENT

This chapter summarizes the traffic operational analysis for the future alternatives in the design year 2035. The alternatives that were analyzed include the following:

- 2035 No Action Alternative, which contains the land use and transportation assumptions from the 2012 EIS and Master Plan Amendment 1.
- 2035 Action Alternative:
  - 2035 Action Baseline scenario, which assumes transportation improvements, the land use assumptions from Master Plan Amendment 2, and the same transportation improvements from Master Plan Amendment 1;
  - 2035 Action scenario with different West Campus Gate 1 improvement options under consideration; and
  - 2035 Action scenario with different West Campus Gate 1 improvement options and bicycle lanes on Martin Luther King Jr. Avenue SE

The organization of **Chapter 6** is as follows:

- **Section 6.1** provides an overview of the analysis approach;
- **Section 6.2** summarizes future socioeconomic characteristics and key land use developments in and near the Study Area;
- **Section 6.3** explains the technical process to develop future traffic demand volumes for 2035 Action Alternative;
- **Section 6.4** compares traffic operational analysis results between No Action and Action Baseline in 2035; and
- **Section 6.5** provides a further analysis for the Action Alternative with different improvement options proposed in **Chapter 5.**

6.1 Overview

To forecast and evaluate the surrounding transportation system needed to support the proposed DHS Headquarters consolidation at the West Campus, the study team enhanced the regional travel model for the Washington metropolitan area developed by the Metropolitan Washington Council of Governments (MWCOG). These enhancements were made to support specialized forecasting requirements of this project. The MWCOG regional model is used to analyze broad impacts of transportation projects for long-range network planning and environmental assessments. MWCOG, which acts as the regional planning organization for the nation's capital, and the National Capital Region Transportation Planning Board (TPB), as the designated transportation planning agency for Metropolitan Planning Organization (MPO), are responsible for the development and maintenance of this regional travel forecasting model.

The most current MWCOG/TPB model, which uses Version 2.3 of Citilab's Cube program, meets EPA's requirements for air quality and conformity analysis. This version of the model incorporates the latest Round 9.1 land use forecasts. However, DDOT deemed appropriate the customized

Version 2.2 MWCOG model developed and calibrated for the 2012 EIS/TTR for future demand forecasting purposes in this Master Plan Amendment 2 Draft Supplemental EIS/TTR. While changes have occurred in the MWCOG/TPB modeling process between Versions 2.2 and 2.3, the modifications made for the 2012 EIS/TTR model to represent the latest employee information, land use changes, and transportation improvements specifically for the Master Plan Amendment 2 make it the best model to use. Also, using the model version allows for a direct comparison between the 2012 EIS/TTR results and the 2019 Draft Supplemental EIS/TTR results. Additional technical details are included in **Attachment C** of this report.

The analysis was based on estimating projected traffic for various scenarios involving roadway and transit networks, land use forecasts, and assumptions regarding project site access and development. To validate the model, an existing conditions model was created for the year 2019 and the traffic; then, volumes generated by the model were compared against observed traffic counts. For the design year of the West Campus (2035), MWCOG's 2035 regional land use and network datasets were used to evaluate the No Action and Action Alternatives. For all scenarios and alternatives, travel during three separate time periods was forecasted: the AM peak period (i.e., 6:00 a.m. to 9:00 a.m.), the PM peak period (i.e., 4:00 p.m. to 7:00 p.m.), and the off-peak period (i.e., remaining hours of the day). The peak period volumes for the background trips were converted to peak hour volumes by factoring period volumes by 0.40 for the AM peak and 0.37 for the PM peak (as determined by MWCOG). Consistent with the 2012 EIS/TTR assumptions and methodology, for the St. Elizabeths campus trips, compressed time schedules for employee arrivals/departures were assumed based on Transportation Management Plan (TMP) strategies. As a result, 50 percent of the peak period employee arrivals/departures are expected to arrive in the peak hour and 25 percent on either side of the peak hour. This higher concentration of St. Elizabeths campus peak hour employee trips were then added to the background peak hour trips (with the default MWCOG's lower peak hour adjustment factors) to capture the overall trips patterns. A more detailed discussion on the generation of peak hour trips is in **Section 6.4**.

These peak hour outputs were then post-processed to develop the balanced volumes that were used as inputs to perform operational analysis. Synchro was used for developing signal optimization inputs, and VISSIM was used for microsimulation to better assess impacts on traffic operations in the defined transportation analysis Study Area. A detailed description of the operating procedures and applications of these models is provided in **Section 6.5**.

6.2 Future Land Use Developments

6.2.1 Land Use and Social and Economic Characteristics

The existing land use within the Study Area is predominantly Federal, low- to medium-density residential, and commercial. Other land uses in this region include institutional, government, and parks and recreational (**Figure 1-3**).

Table 6-1 shows the MWCOG regional model's forecasts of population, households, and employment in and around the Study Area, which include 64 MWCOG Traffic Analysis Zones (TAZ) bounded by the Potomac River to the west, I-395/I-695 to the north, Pennsylvania Avenue SE to the northeast, and Southern Avenue SE to the southeast.. For comparison, the table also shows the projected growth for all 2,191 TAZs in the MWCOG region. The comparisons reveal that the Study Area will have rapid growth rates in all categories, more than double the growth rate of the overall Washington metropolitan area.

Table 6-1: Projected Growth in and around the Study Area and MWCOG Region

Land Use and Social and Economic Characteristics	Existing Year 2019	Design Year 2035	% Change
Study Area Vicinity			
Population	124,721	171,436	37.50%
Households	53,697	72,876	35.70%
Employment	87,696	136,266	55.40%
Industry Employment	6,333	6,333	0.00%
Retail Employment	4,246	8,334	96.28%
Office Employment	66,437	99,841	50.28%
Other Employment	10,680	21,758	103.73%
MWCOG Region			
Population	7,408,323	8,569,716	15.70%
Households	2,753,137	3,249,661	18.00%
Employment	4,230,578	5,088,209	20.30%
Industry Employment	415,665	482,735	16.14%
Retail Employment	786,895	942,265	19.74%
Office Employment	2,301,654	2,798,666	21.59%
Other Employment	726,364	864,543	19.02%

6.2.2 Key Developments in St. Elizabeths Area

Other than the DHS Headquarters Consolidation Project at the West Campus, several other projects in the Southeast and Southwest quadrant of the District contribute to this growth. Some of the key developments included in the 2035 projected growth are listed below. **Figure 6-1** illustrates the locations of these development projects.

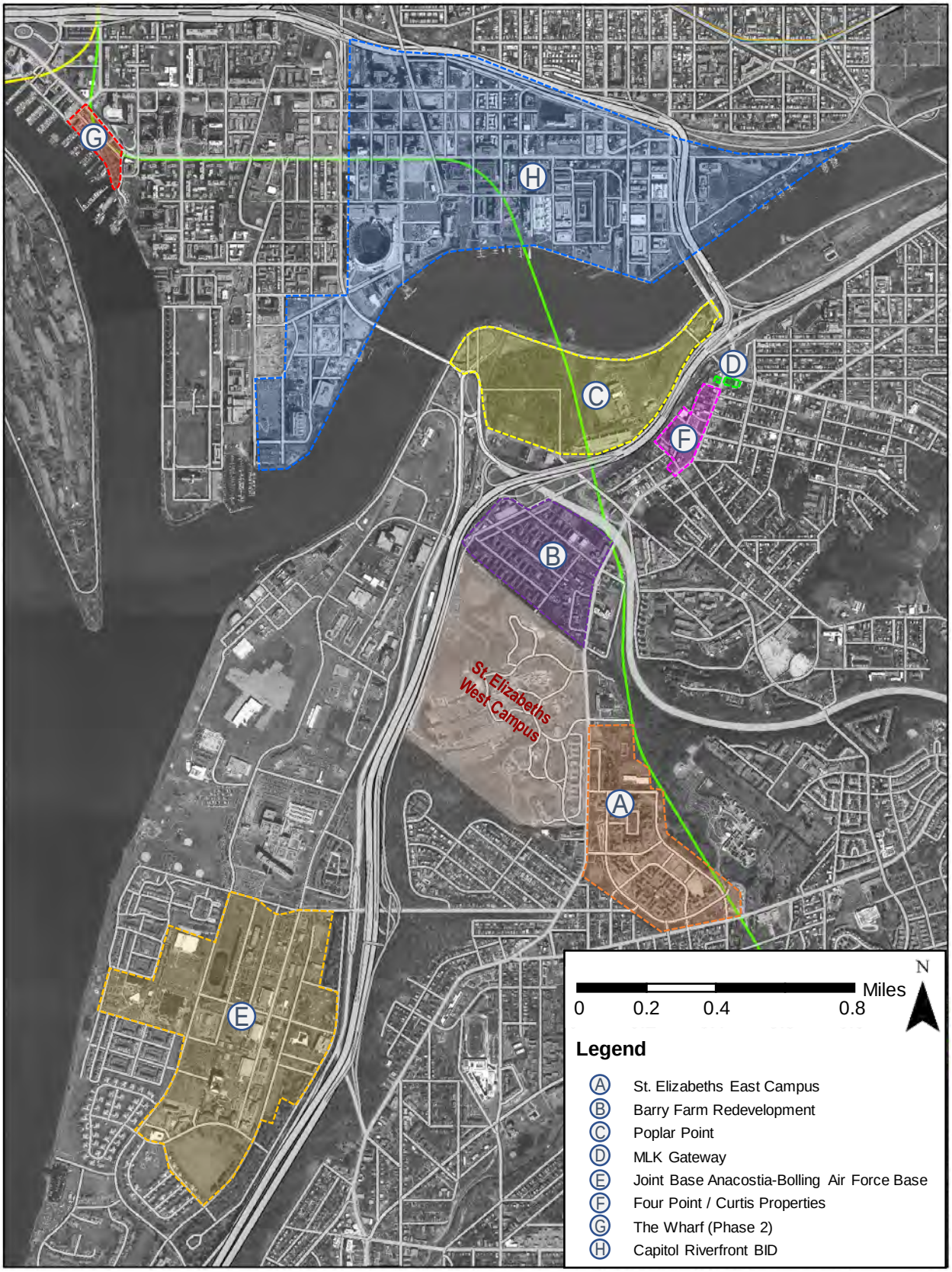

Figure 6-1: Key Land Development Projects in St. Elizabeths Area

6.2.2.1 St. Elizabeths East Campus

The District will redevelop the portion of the East Campus that is to the south of Pecan Street. DMPED and DCOP prepared a master plan for the East Campus in 2012. The plan envisioned a certain level of development at the East Campus at that time. As years progressed, DMPED revised those plans. The latest plans call for over 2.5 million square feet of mixed-use development, including retail, office, hospitality, and civic/art/educational uses, along with more than 1,600 residential units and a recently completed 5,000-seat concert/entertainment facility.

6.2.2.2 Barry Farm

The Barry Farm neighborhood is bordered by the West Campus, Firth Sterling Avenue, Suitland Parkway, and Martin Luther King Jr. Avenue SE. The DCOP and DMPED have initiated a major redevelopment of this area under the New Communities Initiative. The 25.4-acre Barry Farm redevelopment plan will be led by A&R Development, the DC Housing Authority (DCHA) and Preservation of Affordable Housing (POAH). The Master Plan includes 1,400 mixed-income residential units, 55,000 square feet of retail space, a redefined street grid, and a new central park.

6.2.2.3 MLK Gateway

The MLK Gateway has been designed to be a hub of office, retail, and community activity at the most prominent intersections in the Historic Anacostia neighborhood. The development will house 150 new high-tech jobs and is anticipated to serve as a catalyst to increase economic activity. Other proposed uses include accessible neighborhood-serving retail and a sit-down restaurant, fresh food market, and a real estate educational and career training academy.

6.2.2.4 Joint Base Anacostia-Bolling Air Force Base

The Pentagon is planning to increase both employment and base housing at Bolling Air Force Base and the Anacostia Naval Air Station, as part of the Base Realignment and Closure process. A Master Plan was prepared in 2014 that consisted of a 5-year, short-term development program with only minor projects; and a 20-year long-range framework plan. The long-range plan will be heavily driven by a TMP to reduce employee parking by 10 percent, and increase the employee-parking ratio from 1:1.67 to 1:4 to transform Joint Base Anacostia-Bolling Air Force Base into a more sustainable facility.

6.2.2.5 Four Points / Curtis Properties

Four Points / Curtis Properties has accumulated a group of properties on Martin Luther King Jr. Avenue SE and Shannon Place from Chicago Street to U Street. Reunion Square is a 9.5-acre site located between U Street SE and Chicago Street SE along the western side of Martin Luther King Jr. Avenue SE; the site will be developed into 1.54 million square feet of mixed-use development in three phases. Plans call for 892,000 square feet of office space, 450 residential units, and 171,400 square feet of retail space in eight new buildings. They have started the rezoning process and submitted a Planned Unit Development application.

6.2.2.6 The Wharf

The Wharf is a 1-mile-long waterfront development between Maine Avenue SW and the Washington Channel in the Southwest quadrant. Currently, Phase 1 is complete, with

1,375 residential units, 335,000 square feet of restaurant and retail space, 400 boat slips, 800 hotel rooms, 2,500 underground parking spaces, and 1,150 bike spaces.

Scheduled to open in 2022, Phase 2 buildings and infrastructure will deliver an additional 1.25 million square feet of mixed-use spaces, including 131 hotel rooms, 350 residential units, 223 boat slips, 95,000 square feet of retail space, 550,000 square feet of office space, and 1.5-acre parks and public space in the District's Southwest Waterfront.

6.2.2.7 Capitol Riverfront

The Capitol Riverfront is a business improvement district (BID) encompassed by I-395/I-695, 11th Street Bridges, Anacostia River, and the Buzzard Point area. The BID is a mixed-use neighborhood. It was a former industrial area that is being transformed into a business center, urban neighborhood, entertainment district, and waterfront destination. By 2021, the Capitol Riverfront BID is anticipated to add more than 9,000 new residential units, 900,000 square feet of retail space (e.g., two grocery stores, new restaurants, shops, and cafes), 7.1 million square feet of office space, six hotels, and a new 445,000-square foot Audi Field soccer stadium was open in 2018.

6.3 Future Traffic Demand Volume Development

6.3.1 Traffic Demand Model Refinement and Enhancement

Section 2.6 provides an overview of the travel demand modeling approach for this study. This section includes additional technical details in steps in model refinement, enhancement and post processing.

6.3.1.1 Land Use and Zone Structures

An initial review of zone descriptions and boundaries within the modeling Study Area used for this analysis were preformed to assure correct representation of the land use of the background developments and on the St. Elizabeths campus. Out of the 2,191 zones, 45 zones are within the modeling Study Area. These 45 zones were manually disaggregated to create 64 TAZs, with 10 of them representing the St Elizabeths campus (formerly designated as one zone, TAZ 297, in the MWCOG/TPB Model network). **Figure 6-2** shows the refined TAZ structures within the Study Area for 2019 Draft Supplemental EIS/TTR.

Social and economic data (i.e. households, population, and employment) from MWCOG's latest Round 9.1 Cooperative Forecasts were reviewed and refined to account for more current land use information of the proposed developments within the Study Area. Some of the key proposed developments within the modeling Study Area are described in **Section 6.2.2**.

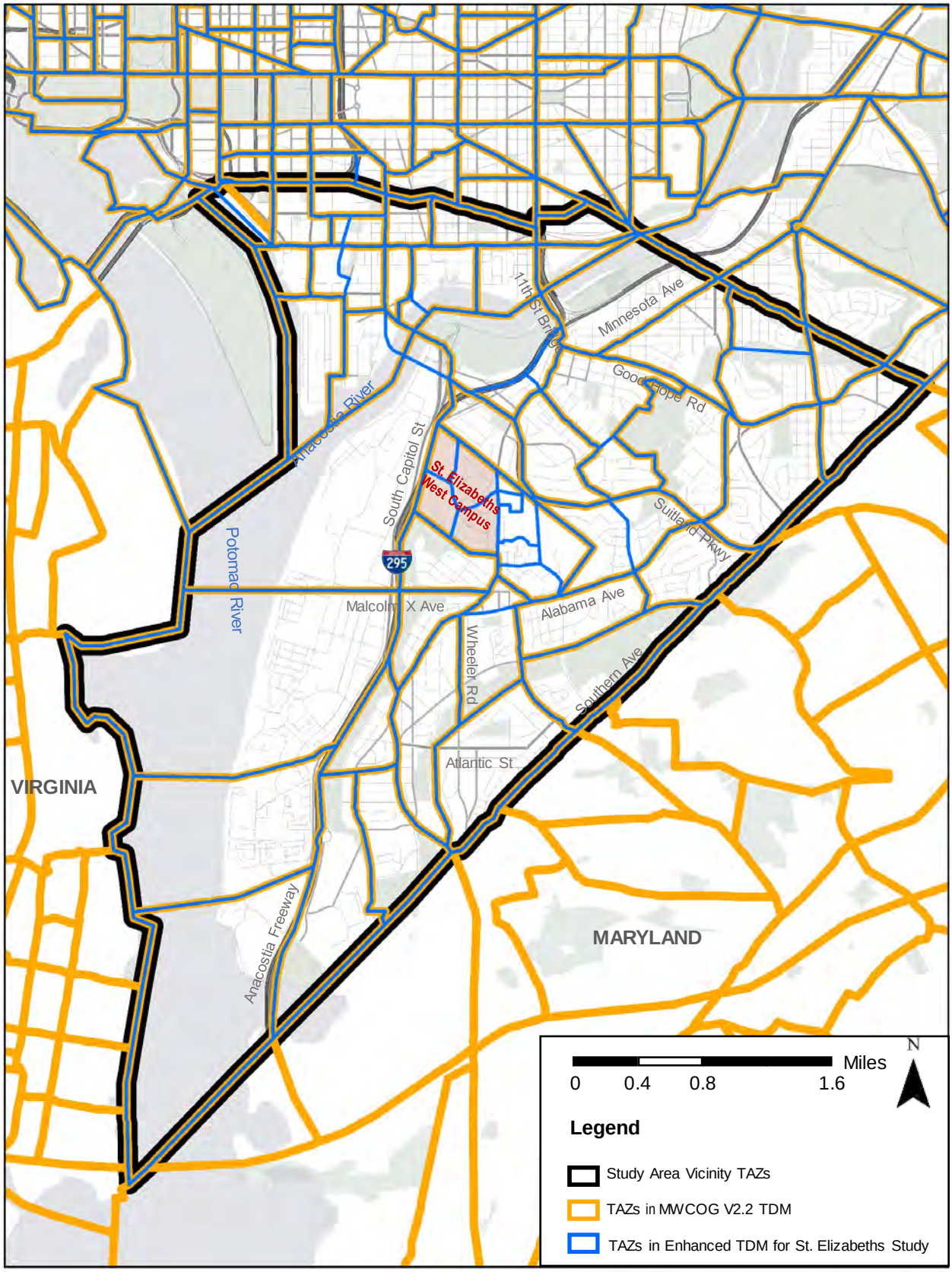

Figure 6-2: St. Elizabeths Campus and Vicinity Area TAZs Refinement

6.3.1.2 Background Transportation Network

The future year networks used in the traffic model include the roadway improvements listed in the MWCOG's most recent 2016 CLRP Air Quality Conformity Inputs, which is the official list of proposed projects. A thorough review of the comprehensive transportation network updates was performed to make sure all of the future planned improvements are included in the travel demand model network for 2035.

Some of the key planned transportation improvements that are expected to have a potential impact on the modeling Study Area roads are described in **Section 2.2**.

6.3.1.3 Road Network Enhancements and Modifications

The MWCOG regional model networks classify facilities into a hierarchical system that includes freeways, arterials, collectors, and local roads for mobility to land access. In the 2012 EIS/TTR, additional modifications to the highway networks were deemed necessary to improve model performance and reasonably reflect the actual street network. For consistency with the previous study, the model for the 2019 Draft Supplemental EIS/TTR included the same enhancements in its highway network because of the nature of this study and the need for extensive data. Specifically, the highway network was upgraded to:

- Add links that represent several key roadways, minor collectors, local streets, St. Elizabeths campus gate access links (for employees and visitors), and intra-campuses walk access links;
- Add nodes that represent several key intersections in and around the modeling Study Area that can provide model-forecasted turning movement volumes for operational analysis;
- Reconfigure network coding and updating the number of lanes, facility type, speed class consistent with the field conditions; and
- Modify/reconnect zone access links (links to connect the street network to where people live and work) to reflect logical trip loading on the road network.

In the MWCOG model, transit routes are represented using the highway network, but speeds and other transit-specific network attributes are calculated separately. Transit networks are based on the actual bus running times and transit fares. Because of the extensive changes made to the highway network, transit routes (using the same highway network) were updated as needed to correctly reflect their use of the enhanced highway network.

6.3.1.4 Travel Demand Management (TDM) Strategies

A key step in the travel demand forecasting process is the integration of Transportation Demand Management (TDM) strategies developed as part of the 2019 TMP for Master Plan Amendment 2. Information from 2010 DHS Employee Survey was used to summarize current travel patterns and expected travel mode to the new St. Elizabeths Campus, with a key goal of recommending and implementing TDM strategies. **Table 6-2** summarizes the distribution of DHS employee arrival mode by 2035 full occupancy at the West Campus. These mode shares have been set forth in the 2019 TMP as targets. The survey data were used to develop commuter travel mode splits, parking ratios, and average vehicle occupancy information for existing and expected conditions.

Table 6-2: Employee Arrival Mode Distribution in 2035

Travel Mode	Target Mode Share in 2035 (%)
SOV	15
Carpool with non-DHS (arrive SOV)	4
Carpool/vanpool (HOV)	18
Drop off	1
Commuter/express bus	8
Shuttle from Metrorail station	30
Scheduled-route Metrobus	6
Walk from home or Metrorail station	5
Bicycle	1
Motorcycle	1
Work from home/telework	9
Did not work (vacation/sick)	2
Total	**100**

HOV – high-occupancy vehicle
SOV – single-occupancy vehicle

DHS provided aggregated employee residential information by unit. Based on employees' residential location and their units, the projected directional, employee, vehicular-trip distribution was developed for the 2035 Action Alternative (**Figure 6-3)**.

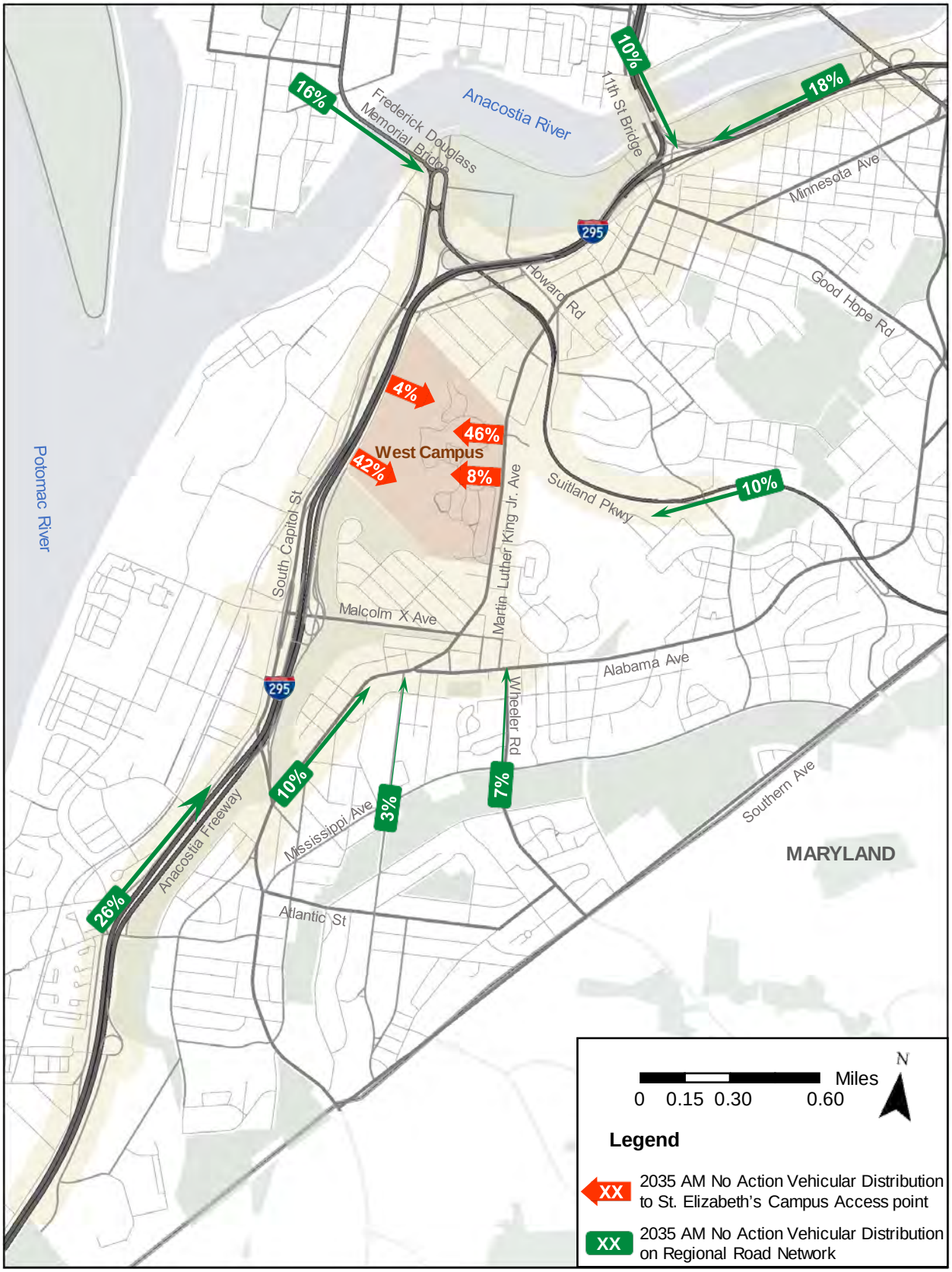

Figure 6-3: Projected Directional Campus Trip Distribution in 2035 Action Alternative

6.3.1.5 Trip Table Adjustment

The trip tables for the MWCOG model represent travel between each pair of the defined travel zones, within the metropolitan area and in surrounding areas (catering for trips drawn from more remote counties along the major roads into the area). However, the trips to and from St. Elizabeths Campus zones are strictly driven by the TDM strategies as developed in the 2019 TMP. This required the study team to develop customized trip tables (matrices), applicable to only St. Elizabeths Campus zones. In other words, the St. Elizabeths zones trip information in the trip table was replaced with customized DHS zones trips that were constrained by TDM strategies and parking availability at West Campus. All of the customized procedures and programs introduced in the modeling process of this travel demand evaluation effort have been an extension and modification of the approved MWCOG Version 2.2 model procedures.

This process had been performed for the 2012 EIS/TTR study. The same process was repeated in this study for the proposed Master Plan Amendment 2 to forecast the travel demand on the Study Area road network. However, adjustments to those custom trip matrices for this study were deemed necessary for the following reasons:

- With updated land use data (Round 9.1) and additional background transportation and transit projects (2016 CLRP), the regional model's trip-making characteristics and travel patterns are expected to change. A re-mapping of the DHS employee from-and-to trips (based on 2010 DHS Employee Survey) with the updated MWCOG's standard from-and-to trips was required.
- DHS provided current employee residence zip code. Therefore, the above re-mapping process also reflected the latest information that impacts where trips originate.
- FEMA will be moving their headquarters from East Campus North Parcel to the West Campus. FEMA employment represented approximately 50 percent of the sample being used in developing the custom DHS trip tables. Based on type of work, range of employee incomes, and similarity of other demographic characteristics, and to keep from degrading the sample size, the FEMA-related data from both the previous survey and the current employee zip code database were retained as a surrogate for new staff that would be assigned to the West Campus by DHS.
- While the 2012 EIS/TTR assumed 10,900 employees with a planned seat count of 10,900 (employee-to-seat ratio of 1:1) on the West Campus, the analysis for Master Plan Amendment 2 assumed up to 17,000 employees assigned at the West Campus with a planned seat count of 12,800 (employee-to-seat ratio of 1.33:1). GSA and DHS assumed to accommodate up to 17,000 employees in those 12,800 seats by means of employee schedule rotation throughout the day. Because the West Campus is planned to be a 24/7 active facility, assuming that employees will be assigned to one of the 8-hour shifts on any given day is reasonable. From a modeling process, DHS trips were first generated at the daily level based on up to 17,000 employees, which were then distributed among AM, off-peak, and PM periods. These period trips were constrained by the limited parking (1:4 ratio) on the

West Campus and reflective of a 12,800 maximum seat capacity in any given work shift. The daily trips were reflective of up to 17,000 maximum employees.[6]

6.3.1.6 Other Refinements

Based on the TDM strategies outlined in the 2019 TMP and the updated information on campus employees under the proposed Master Plan Amendment 2, MWCOG inputs for trip distribution and mode choice were modified to reflect the latest information. Specifically, these adjustments included:

- The campus traffic analysis zone structure was modified to reflect trip numbers and types of trips associated with specific campus access locations (example, accounting for USCG employees' access to Gate 4 via St. Elizabeths Avenue).
- Trip generation outputs from these zones were adjusted to better match the characteristics and trip-making behavior associated with specified uses (**Section 6.3.1.5**).
- Mode shares as output by the MWCOG model were modified to match projected TMP targets (**Table 6-2**) for the campus.

In addition, based on specification of a proposed campus shuttle bus system that would link nearby Metrorail stations (i.e., Anacostia and Congress Heights) to the campus, the following assumptions from the 2012 EIS/TTR were carried forward to support forecasting of transit system usage under Master Plan Amendment 2:

- 50 percent of employees using transit arrive during the peak hour of the peak period (worst case); and
- Shuttle buses carry 36 passengers seated, plus 20 percent standee allowance, for a maximum of 42 passengers.

With all of these enhancements to the model inputs and processes, models were run to generate outputs, after which the raw data were postprocessed to be used as inputs in traffic operations analysis tools, like VISSIM microsimulation.

6.3.2 Post Processing

Forecasted volumes generated by the MWCOG regional travel model were postprocessed in accordance with NCHRP 765 guidelines, prior to being used in the traffic operational analysis. The steps used to postprocess future forecast volumes are outlined below:

[6] Note, the traffic analysis related to the TTR and TMP performed for the St. Elizabeths West Campus Master Plan Amendment 2 assumed an occupancy of up to 17,000 employees, 12,800 available seats, and a total of 4,058 proposed parking spaces. After this analysis was performed, a change in DHS components assigned to the campus resulted in a change in occupancy numbers and workplace management strategies for the campus. The revised employee population for the campus is 14,900, with an up-to 1:1 employee-to-seat ratio, dependent on the workplace management strategy for each component, and 4,448 parking spaces.

With a new proposed occupancy count of 14,900 and parking count of 4,448, this traffic analysis can no longer be considered as a conservative estimate of traffic demand to the local networks; however, the results from this traffic analysis are a good representation of the anticipated effects to the local transportation networks. As program, mission, and employee requirements evolve over the various phases of DHS consolidation and build-out on the West Campus, further traffic analysis may be required. Once the current phase of the West Campus Master Plan is complete (Phase 2), GSA will explore the need for an additional traffic analysis, separate from the TMP, for full campus occupancy in 2035, based off of projected campus population, commuting habits, and Transportation Demand Management (TDM) progress. The campus TMP will be continuously reevaluated on a biannual basis to work toward the outlined transportation goals and will be updated prior to full occupancy.

- Existing traffic counts obtained in the Study Area were compared to the MWCOG's Base Year model to develop existing link-specific deltas.
- Existing link volume deltas were added to future year MWCOG link volumes to generate postprocessed link volumes.
- Existing turning movement counts and future-year link volumes were processed through an iterative Furness distribution model to develop future-year unbalanced turning movement volumes. The Furness distribution model is a mathematical model that can produce a future-year trip matrix from an existing trip matrix and future row/column totals.
- New intersections and links in future-year networks were manually adjusted based on future-year raw-model volumes and adjacent postprocessed intersections and links.
- All intersection turn movements and links were then rounded to the nearest five trips and balanced within the entire Study Area.

Figure 6-4 through **Figure** 6-7 exhibit 2035 No Action alternative traffic volumes for Master Plan Amendment 1. **Figure 6-4** presents traffic volumes on the freeway mainline and interchange ramps during peak hours, and **Figure 6-5** through **Figure** 6-7 show intersection turning movement volumes.

Figure 6-8 through **Figure** 6-11 exhibit 2035 Action alternative traffic volumes for Master Plan Amendment 2. **Figure 6-8** presents traffic volumes on the freeway mainline and interchange ramps during peak hours, and **Figure 6-9** through **Figure** 6-11 show intersection turning movement volumes.

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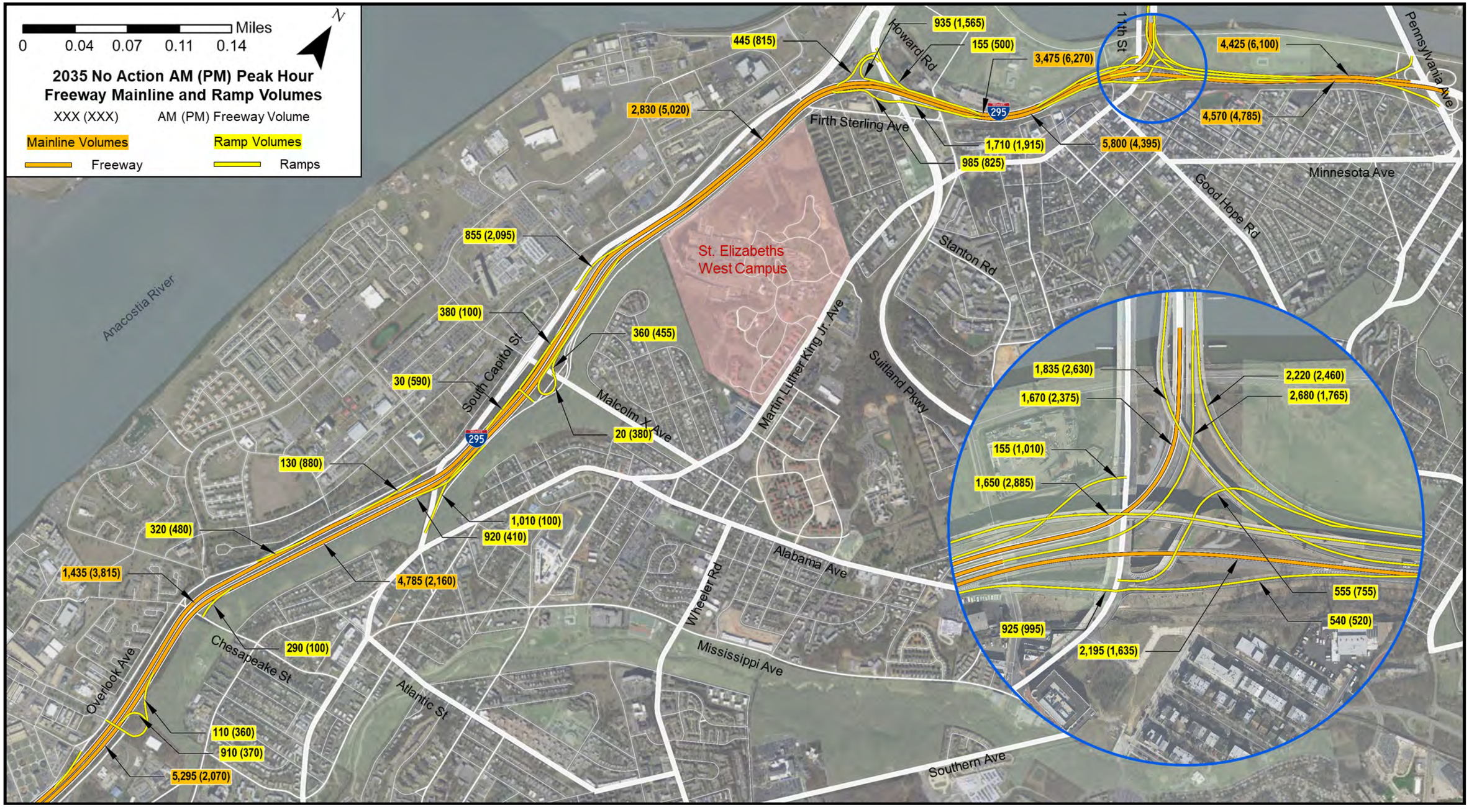

Figure 6-4: 2035 No Action Alternative Freeway Mainline and Ramp Volumes during AM and PM Peak Hours

Figure 6-5: 2035 No Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 1 of 3)

Figure 6-6: 2035 No Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 2 of 3)

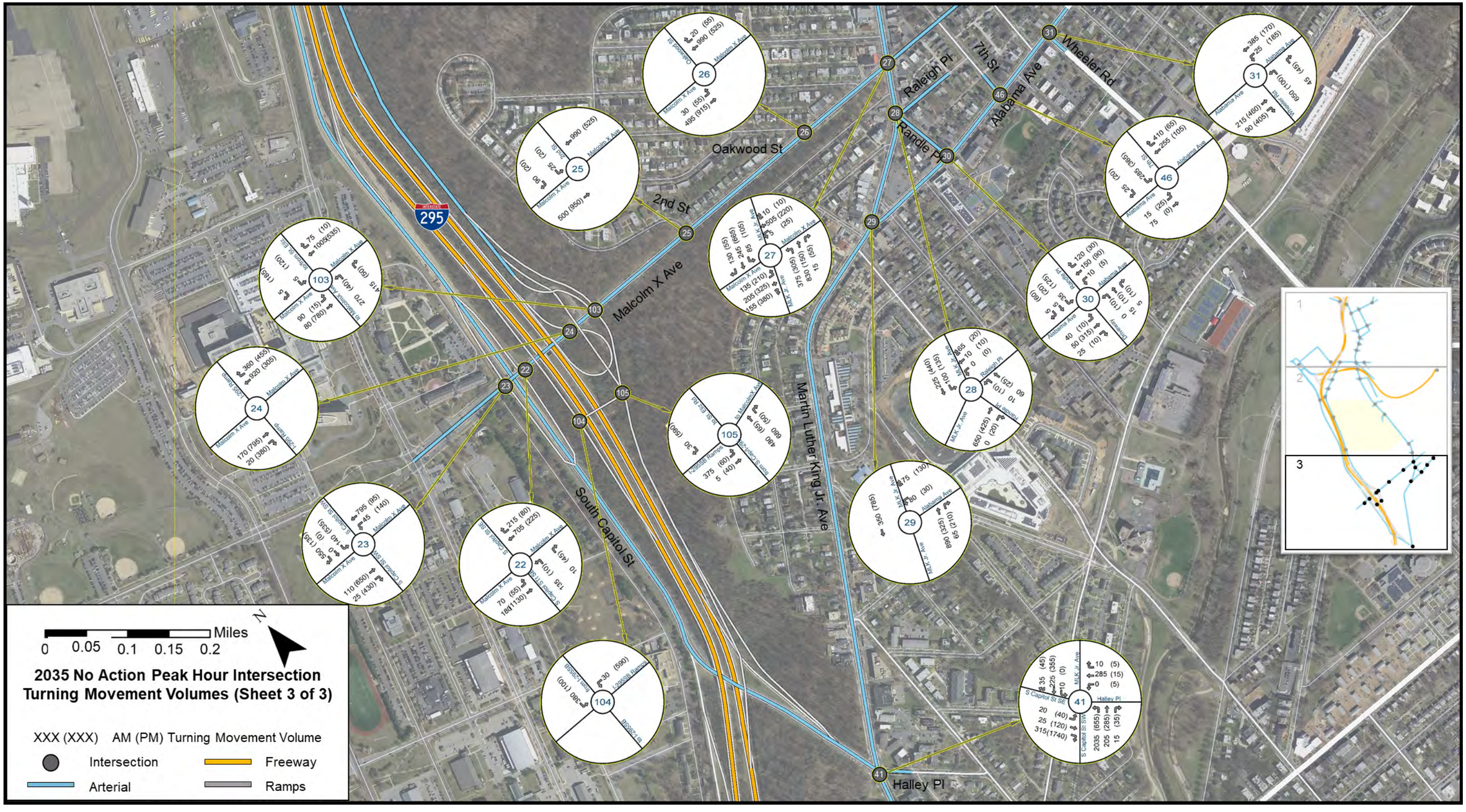

Figure 6-7: 2035 No Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 3 of 3)

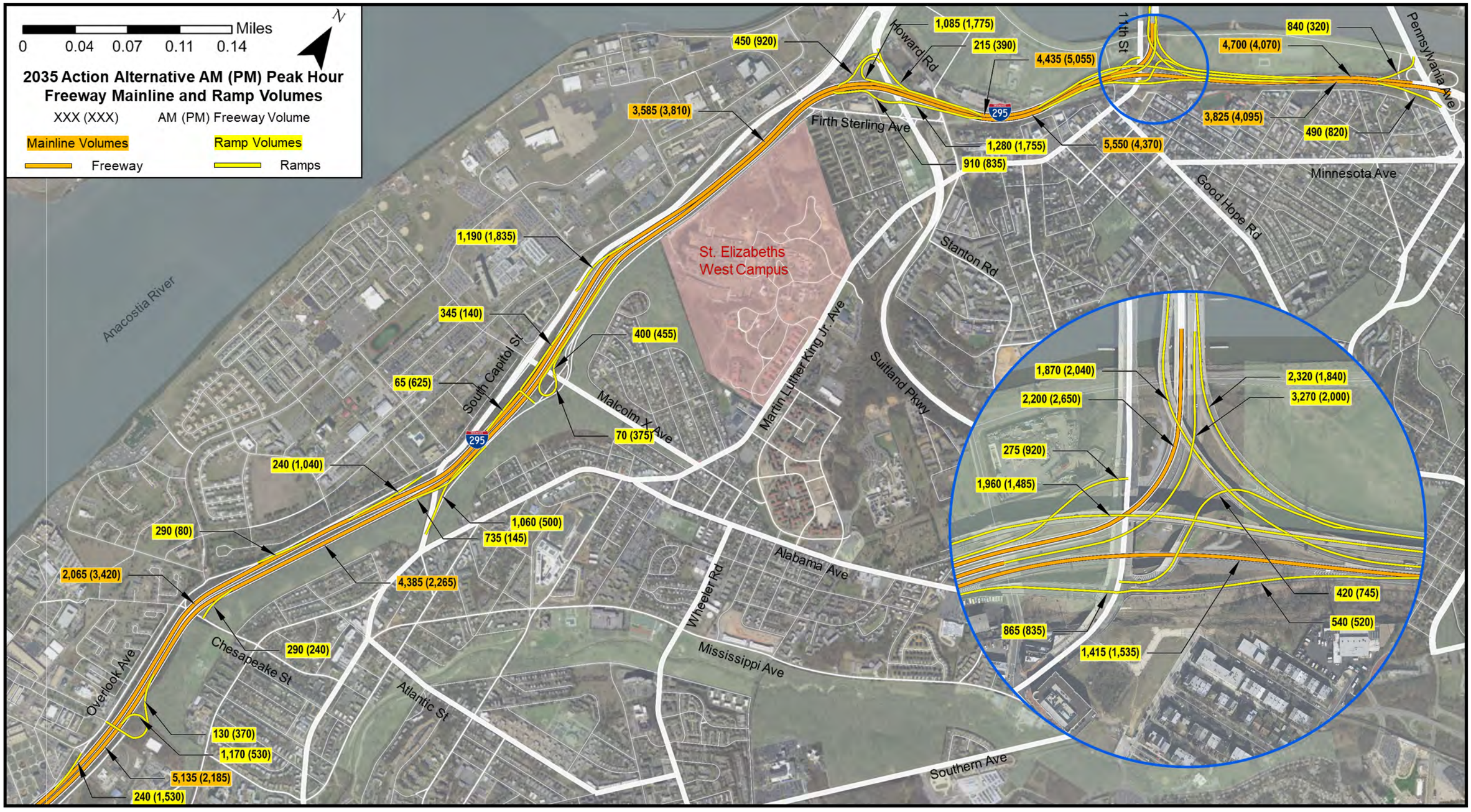

Figure 6-8: 2035 Action Alternative Freeway Mainline and Ramp Volumes during AM and PM Peak Hours

Figure 6-9: 2035 Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 1 of 3)

Figure 6-10: 2035 Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 2 of 3)

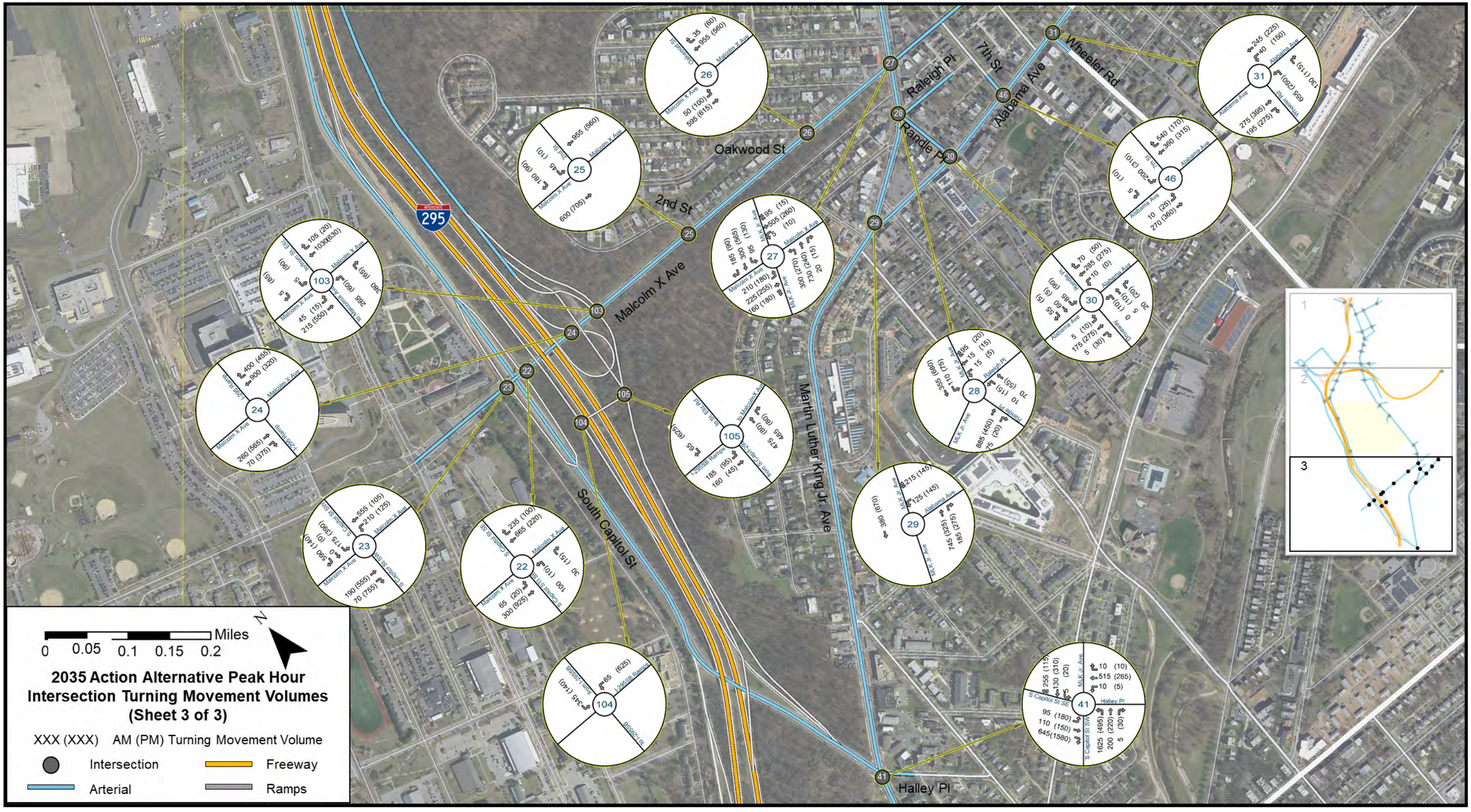

Figure 6-11: 2035 Action Alternative Intersection Turning Movement Volumes during AM and PM Peak Hours (sheet 3 of 3)

6.3.3 Campus Trip Summary

Differences in traffic forecasts between the No Action and Action Alternatives primarily occur along Martin Luther King Jr. Avenue SE. Traffic along Martin Luther King Jr. Avenue SE generally increases in the model based on land use assumptions in the Action Alternative. Incorporating DHS employees originally planned in the East Campus North Parcel into the West Campus concentrates traffic at the Gate 1 intersection at Martin Luther King Jr. Avenue SE. Redevelopment of the East Campus North Parcel adds to traffic because it would be an additional development on the corridor, for which the No Action Alternative did not account. The increases are in the direction of travel toward the St. Elizabeths campuses during the AM and away from the campuses in the PM.

The Action Alternative would concentrate traffic entering and exiting St. Elizabeths to the intersection of Martin Luther King Jr. Avenue SE and Gate 1. In the No Action Alternative, the garage entrance for the former planned FEMA headquarters was located on the eastern leg of the Gate 2 intersection. This distributed St. Elizabeths traffic over two intersections rather than one intersection. By concentrating traffic at one intersection, traffic operations along Martin Luther King Jr. Avenue SE under the Action Alternative would deteriorate.

Approximately 820 vehicles would enter Gate 1 in the AM peak hour and 740 vehicles would exit Gate 1 in the PM peak hour under the 2035 Action Alternative. For comparison, approximately 435 vehicles enter, and 470 vehicles exit Gate 1 in the 2035 No Action Alternative. In the AM peak hour, most traffic would enter Gate 1 from the north. There would be 565 vehicles making a right turn from southbound Martin Luther King Jr. Avenue SE to Gate 1. In the PM peak hour, 500 vehicles would turn left from Gate 1 to northbound Martin Luther King Jr. Avenue SE.

Table 6-3 shows peak-hour vehicular traffic volumes at St. Elizabeths Campus gates in the two alternatives. This table shows that the overall number of vehicles into the campus decreases during the AM and PM peak hours under the Action Alternative.

Table 6-3: Summary of Peak Hour Vehicular Volumes at Campus Gates, Design Year

Location	Developed Agencies	2035 No Action Alternative		2035 Action Alternative	
		AM In	PM Out	AM In	PM Out
West Campus Gate 1 (on Martin Luther King Jr. Ave)	GSA	435	470	820	740
West Campus Gate 2 (on Martin Luther King Jr. Ave)	GSA	135	130	135	120
West Campus Gate 4 (on St. Elizabeths Avenue)	GSA	1,140	1,200	750	670
West Campus Gate 6 (on St. Elizabeths Avenue)	GSA	190	175	75	55
East Campus North Parcel Development	GSA (No Action); Other Parties (Action)	470	495	445	440
Overall Total AM Trips In / PM Trips Out		**2,370**	**2,470**	**2,225**	**2,025**
West Campus Total		1,900	1,975	1,780	1,585
GSA Total		2,370	2,470	1,780	1,585
Other Parties Total		--	--	445	440

These trips are more concentrated at intersections along Martin Luther King Jr. Avenue SE (the West Campus Gate 1 and Gate 2) in the Action Alternative. Notably, the number of trips generated by GSA-developed facilities decreases in both the AM and PM peak hours in the Action Alternative. This decrease is attributed to the following factors:

- The maximum number of seats available during any given employee shift in the No Action is 14,000, whereas the number is 12,800 seats in the Action Alternative. Also, total parking spaces in the No Action Alternative are 4,234, and 4,058 in the Action Alternative. The reductions in total number of seats and parking spaces fundamentally would constrain vehicular trips generated by DHS employees and affect the way they are assigned to each gate.
- Since 2014, USCG employees partially occupied West Campus by phases. They all accessed West Campus via Gate 4 on St. Elizabeths Avenue. Continuous traffic counts at Gate 4 were collected in 2015, 2016, 2017, and 2019. The latest traffic information provided better insights into the diurnal distribution of vehicular arrival and departure trips at Gate 4 which helped in the postprocessing step to develop more reasonable AM and PM peak-hour turning movement volumes. This type of information was not available in the volume development process for the No Action Alternative during the 2012 EIS/TTR study, which led to an overly conservative estimate of demand.

6.4 2035 Traffic Operational Analysis (No Action vs. Action Baseline)

This section presents traffic operations analysis results for the 2035 No Action and Action Baseline Alternatives obtained from VISSIM microscopic simulations. A primary focus of this section is to compare the operational performances of the 2035 No Action Alternative with the Action Alternative, understanding that these alternatives are factored by different campus trip patterns, as described in **Section 6.3.3**.

Note the design changes between the No Action and Action Alternatives at the following two locations, based on the modified design plan of the South Capitol Street Improvement Project. The design changes are as follows:

- The interchange of South Capitol Street and Suitland Parkway
  - Original design: a traffic circle at the southern end of this interchange
  - Modified design: a traffic oval at the southern end
- The interchange of Martin Luther King Jr. Avenue SE and Suitland Parkway
  - Original design: a single point urban interchange (SPUI)
  - Modified design: a tight urban diamond interchange

These design changes were made after the completion of the 2012 EIS/TTR. Because the No Action Alternative analysis results for this study are directly taken from the 2012 EIS/TTR, the original designs at the above location remains unchanged in the No Action Alternative. The Action Alternative analysis includes the modified designs.

Figure 6-12 and **Figure 6-14** present a summary of LOS for freeways, arterials, and intersections during AM and PM peak hours under the No Action Alternative. **Figure 6-13** and **Figure 6-15** present a summary of LOS under the Action Alternative during AM and PM peak hours.

The following sections provide detailed comparisons between the No Action and Action Alternatives, in terms of intersections, and freeway and arterials operations.

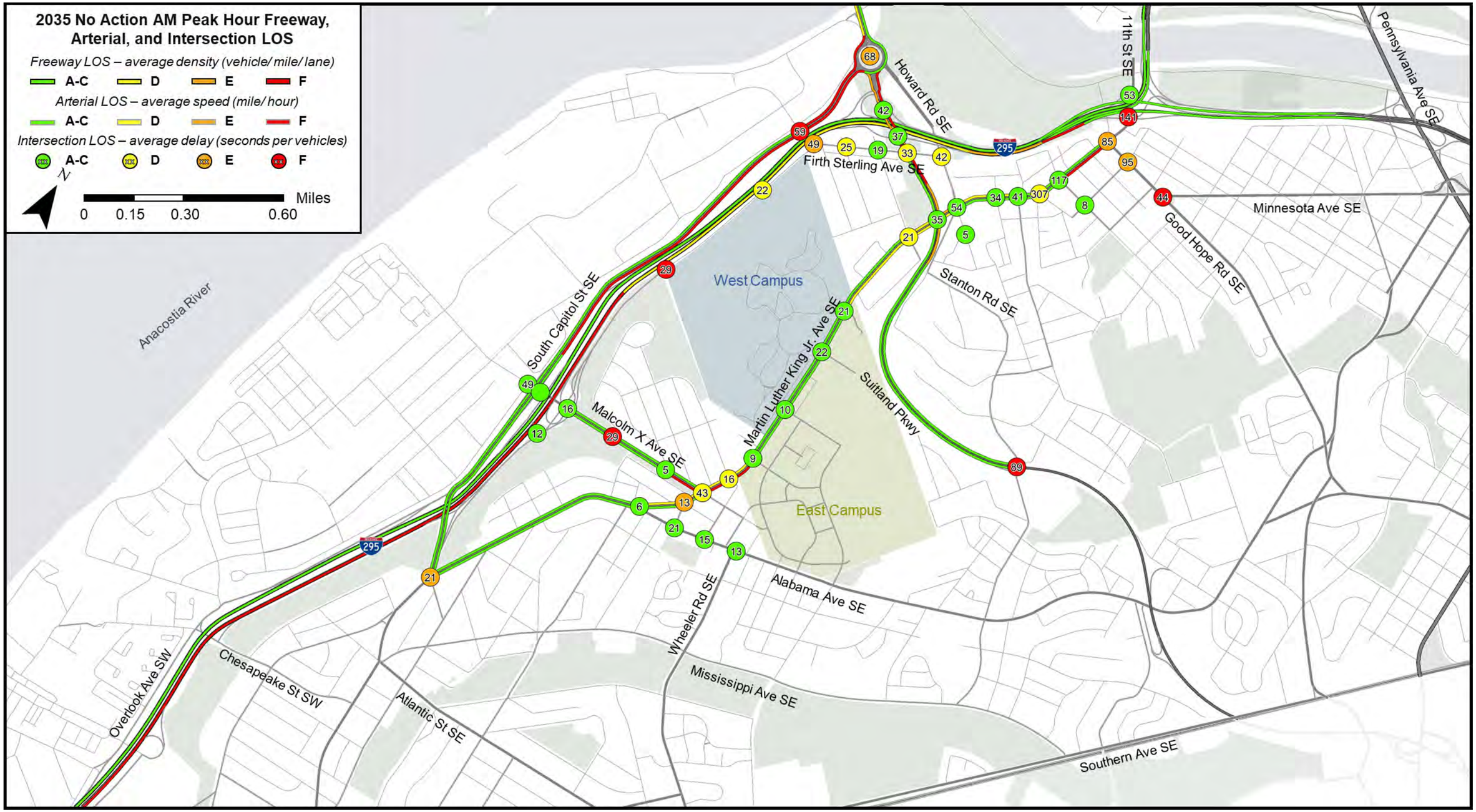

Figure 6-12: No Action (2035) AM Peak-hour Traffic Operations – Freeway, Arterial, and Intersection LOS

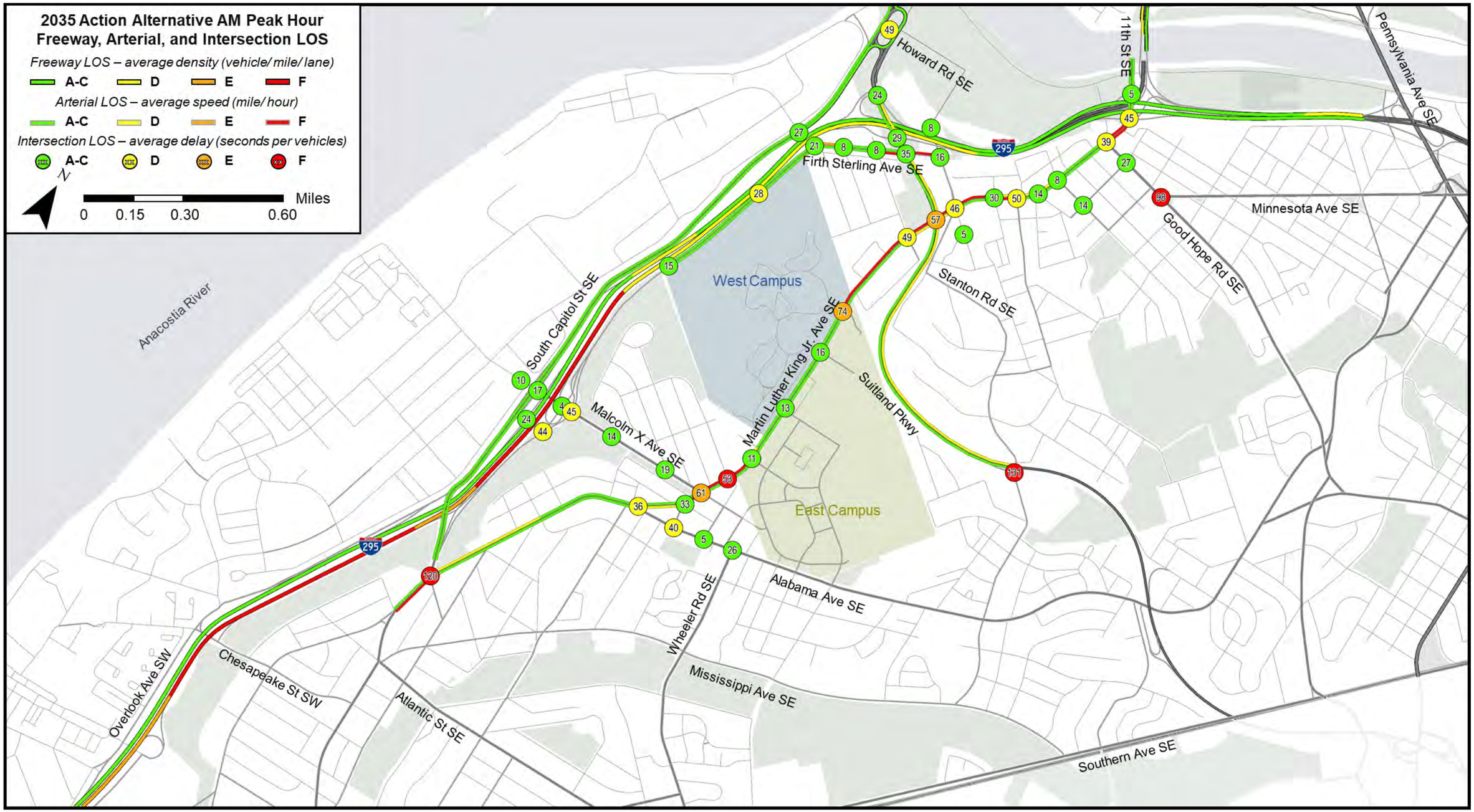

Figure 6-13: Action Baseline (2035) AM Peak-hour Traffic Operations – Freeway, Arterial, and Intersection LOS

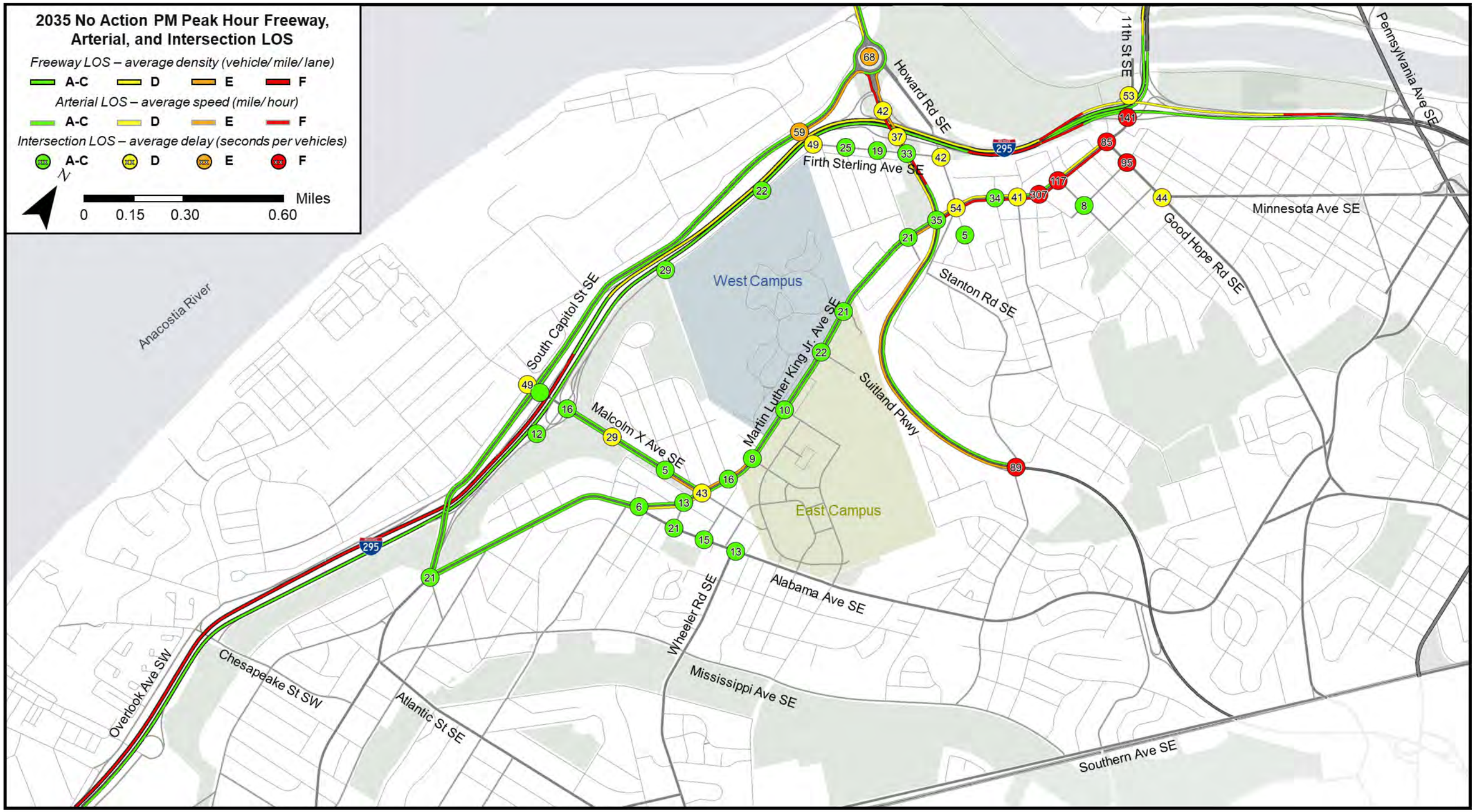

Figure 6-14: No Action (2035) PM Peak-hour Traffic Operations – Freeway, Arterial, and Intersection LOS

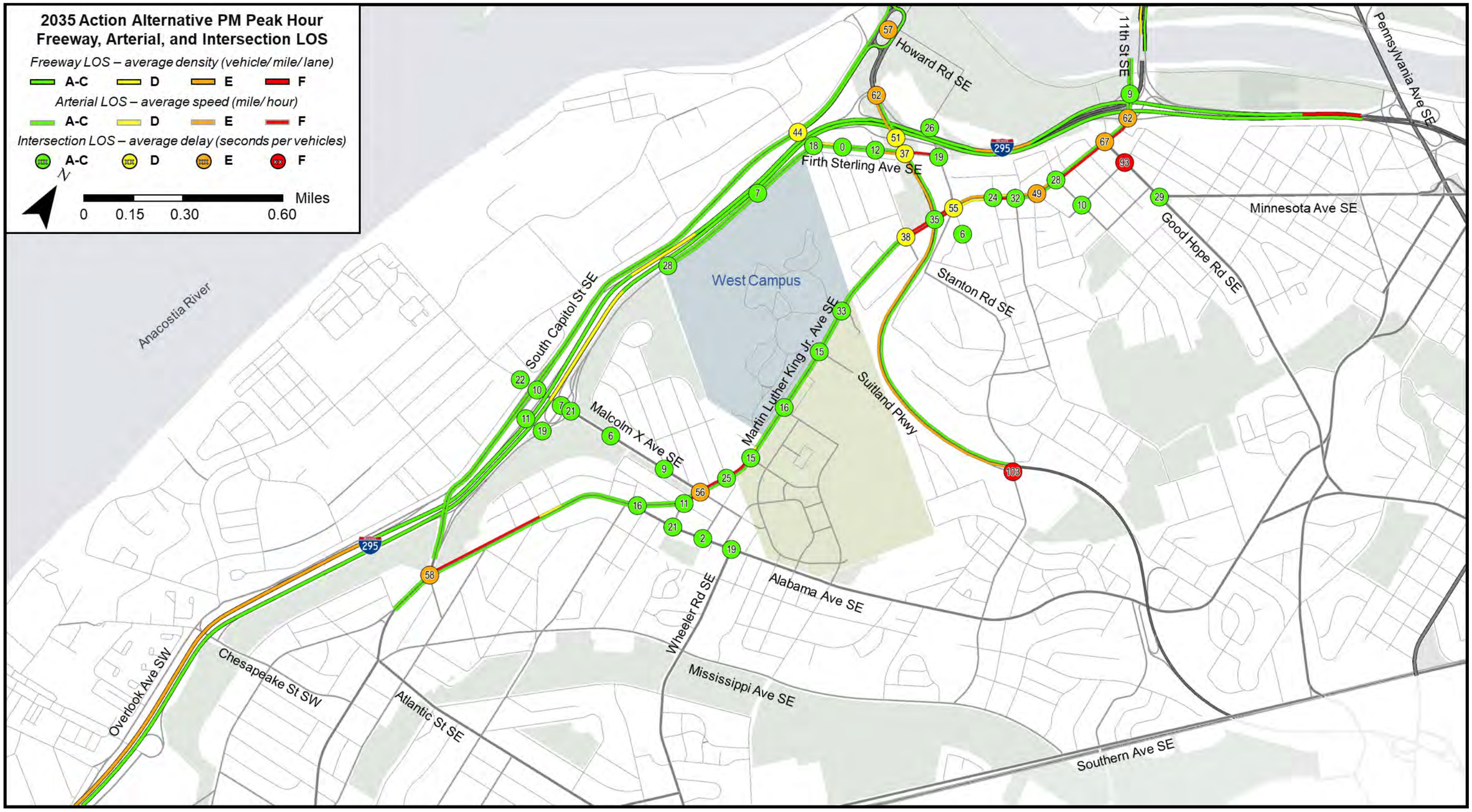

Figure 6-15: Action Baseline (2035) PM Peak-hour Traffic Operations – Freeway, Arterial, and Intersection LOS

6.4.1 2035 No Action vs. Action Baseline Intersection Operations

Table 6-4 and **Table 6-5** compare intersection operations within the Study Area between the 2035 No Action and Actions Alternatives in the AM and PM peak hours, respectively. Following the criteria in DDOT's *Guidance for Comprehensive Transportation Review* (2019), intersections with significant impacts were identified and indicated in the last column in both tables. The changes were considered significant when following conditions are met:

- When the proposed project causes overall intersection LOS to exceed the established LOS threshold (example.g., LOS E or F); or
- When the proposed project causes overall intersection LOS E or F to experience an increase in vehicle delay of 5 percent or more.

6.4.1.1 AM Peak Hour

During the AM peak hours, five intersections were identified as showing significant impacts under the Action Alternative, as compared to the No Action Alternative. Details of these impacts are as follows:

- The intersection at Martin Luther King Jr. Avenue SE and the Suitland Parkway interchange would operate at LOS C in the No Action Alternative and LOS E in the Action Alternative. Left-turning traffic from westbound Suitland Parkway to southbound Martin Luther King Jr. Avenue SE would increase from 135 vehicles/hour to 365 vehicles/hour, resulting in a failure operation on the westbound approach with excessive delay times. The proposed Suitland Parkway interchange with Martin Luther King Jr. Avenue SE was originally designed as a SPUI, as shown in the 2012 EIS/TTR. However, as a part of the modifications of South Capitol Street Improvement Project, this interchange was reconfigured as a tight-diamond interchange. Even though this reconfiguration would help address some operational issues in the previous design, it also compromises the operations within Martin Luther King Jr. Avenue SE. Two ramp terminal intersections are closely spaced, which would easily cause queue to spill back, making it hard to efficiently allocate green times among conflicting movements especially with high demand at all approaches.
- The Gate 1 intersection would operate at LOS B in the No Action Alternative and degrade to LOS E in the Action Alternative. This is a result of the increase in inbound traffic volumes towards Gate 1. The right-turning traffic from southbound Martin Luther King Jr. Avenue SE increased from 315 vehicles/hour to 565 vehicles/hour in the Action Alternative, resulting in southbound approach failure at LOS F.
- The intersection of Martin Luther King Jr. Avenue SE and Malcolm X Avenue would operate at LOS D in the No Action Alternative and degrade to LOS E in the Action Alternative. This is mainly due to the increase in left-turn traffic volumes from the eastbound Malcolm X Avenue, from 135 vehicles/hour to 210 vehicles/hour during AM peak. This volume increase is mainly contributed to the redistributed trips to access to both West Campus and East Campus from the reconfigured I-295/Malcolm X Avenue interchange. In addition, no exclusive left-turn lane is available at the eastbound approach. The left-turn traffic shares the leftmost lane with through traffic, under a permissive left-turn phase. The lane configuration and signal phasing at this approach would not efficiently handle the high demand in 2035 Action Alternative, leading to a LOS F condition with excessive delay times and queues.

- The intersection at Martin Luther King Jr. Avenue SE and Suitland Parkway/Halley Place would operate at LOS E under the No Action Alternative and degrade at LOS F in the Action Alternative. Overall, intersection delay would increase from 77 seconds per vehicle to 120 seconds. Based on the analysis for the 2019 existing conditions (**Chapter 4**), this intersection currently operates at LOS F. This intersection is one of the critical gateway points of St. Elizabeths area, where the intersection feeds into heavy traffic to northbound I-295 during AM peak hours. Under the Action Alternative, the intersection would be further loaded with the volumes entering to northbound I-295, adding 220 more vehicles on the right-turning traffic from southbound Martin Luther King Jr. Avenue SE and 230 more vehicles on the through traffic from Halley Place when compared to the No Action Alternative. The limited green time assigned for the westbound approach only processes 62 percent of the projected demand volumes during the AM peak hour, resulting in a failure intersection operation.
- The intersection of Martin Luther King Jr. Avenue SE and Lebaum Street is currently under a two-way stop control. Martin Luther King Jr. Avenue SE approaches are free flow, with no stops. The Lebaum Street approach is controlled by a stop sign. The control at this intersection is not expected to change in 2035. With higher demand volumes on Martin Luther King Jr. Avenue SE, the side street approach would experience longer delay times, increasing from 30 seconds per vehicle to 53 seconds under the 2035 Action Alternative.

6.4.1.2 PM Peak Hour

During the PM peak hour, three intersections were identified as showing significant impacts under Action Alternative compared to the No Action Alternative. Details of these impacts are as follows:

- Operations at the intersection of Martin Luther King Jr. Avenue SE and Malcolm X Avenue would degrade from LOS D in the No Action Alternative to LOS E in the Action Alternative. The right-turn traffic from southbound Martin Luther King Jr. Avenue SE would nearly double, from 55 vehicles per hour to 90 vehicles per hour. Left-turning traffic from northbound Martin Luther King Jr. Avenue SE would also experience high delays because of the limited green time allocations.
- The intersection of Martin Luther King Jr. Avenue SE and South Capitol Street/Halley Place would operate at LOS C in the No Action Alternative and degrade to LOS E in the Action Alternative. However, based on the analysis for the 2019 existing conditions (**Chapter 4**), this intersection currently operates at LOS F. Therefore, failure operation at this intersection is a pre-existing condition.
- The intersection of Suitland Parkway/I-295 SB ramp would operate at LOS D under the No Action Alternative and degrade to LOS E under the Action Alternative. In particular, the traffic approaching from the southbound I-295 off-ramp to eastbound Suitland Parkway would cause critical delays. Based on microsimulation analysis, vehicles in the queue at this approach would need two cycles to be discharged, but they would not spill over to the freeway mainline.

Table 6-4: 2035 No Action vs. Action AM Peak-hour Intersection Operations – Delay and LOS

ID	Intersection Name	Traffic Control	2035 No Action		2035 Action		Significant Impact
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	70	E	39	D	
2	Good Hope Road and 13th Street	Signal	65	E	27	C	
3	Martin Luther King Jr. Avenue SE and W Street	Signal	15	B	8	A	
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	30	D	14	B	
5	W Street and 13th Street	TWSC	9	A	14	B	
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	24	C	50	D	
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	10	A	30	C	
8	Suitland Parkway and South Capitol Street	Signal	64	E	49	D	
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	Signal	39	D	16	B	
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	32	C	46	D	
12	Howard Road and Sayles Place	OWSC	6	A	5	A	
13	Suitland Parkway and Firth Sterling Avenue	Signal	47	D	35	C	
14	Suitland Parkway and Stanton Road	Signal	105	F	131	F	
16	Firth Sterling Avenue and Barry Road/Sumner Road	Signal	10	A	8	A	
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	37	D	49	D	
18	South Capitol Street and Defense Blvd/Firth Sterling Avenue	Signal	189	F	27	C	
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	11	B	74	E	Yes
20	Martin Luther King Jr. Avenue SE and Redwood Drive	Signal	15	B	16	B	
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	30	D	53	F	Yes
22	Malcolm X Avenue and South Capitol Street NB	Signal	20	B	17	B	
23	Malcolm X Avenue and South Capitol Street SB	Signal	9	A	10	B	
24	Malcolm X Avenue and I-295 NB Ramps	OWSC	2	A	4	A	
25	Malcolm X Avenue and 2nd Street	OWSC	66	F	14	B	
26	Malcolm X Avenue and Oakwood Street	OWSC	18	C	19	C	
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	41	D	61	E	Yes
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	75	E	33	C	
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	25	C	36	D	
30	Alabama Avenue and Randle Place	Signal	14	B	40	D	
31	Alabama Avenue and Wheeler Road	Signal	23	C	26	C	
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	77	E	120	F	Yes
43	Good Hope Road and Minnesota Avenue	Signal	103	F	98	F	
46	Alabama Avenue and 7th Street	Signal	25	C	5	A	
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	10	A	11	B	
48	Firth Sterling Avenue and St. Elizabeths Avenue	Signal	70	E	21	C	
49	Firth Sterling Avenue and Eaton Road	Signal	44	D	8	A	
50	Howard Road and Anacostia Metro Garage Entrance	Signal	4	A	8	A	
51	West Campus Gate 4	Signal	109	F	15	B	
52	West Campus Gate 6	OWSC	31	D	28	D	
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	90	F	45	D	
54	11th Street Bridge and I-295 SB On-Ramp	Signal	3	A	5	A	
100	Suitland Parkway and I-295 NB	Signal	20	B	29	C	
101	Suitland Parkway and I-295 SB	Signal	22	C	24	C	
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Interchange	Signal	29	C	57	E	Yes
103	Malcolm X and I-295 Interchange	Signal	21	C	45	D	
104	Shepherd Parkway/St. Elizabeths Ave/I-295 Ramps	Signal	16	B	24	C	
105	Shepherd Parkway/St. Elizabeths Ave/I-295 Ramps	Signal	16	B	44	D	
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	16	B	13	B	

NB – northbound
SB – southbound

Table 6-5: 2035 No Action vs. Action PM Peak Hour Intersection Operations – Delay and LOS

ID	Intersection Name	Traffic Control	2035 No Action		2035 Action		Significant Impact
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	85	F	67	E	
2	Good Hope Road and 13th Street	Signal	95	F	93	F	
3	Martin Luther King Jr. Avenue SE and W Street	Signal	117	F	28	C	
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	307	F	49	E	
5	W Street and 13th Street	TWSC	8	A	10	A	
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	41	D	32	C	
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	34	C	24	C	
8	Suitland Parkway and South Capitol Street	Signal	68	E	57	E	
10	Howard Road and Firth Sterling Avenue/I-295 NB On-Ramp	Signal	42	D	19	B	
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	54	D	55	D	
12	Howard Road and Sayles Place	OWSC	5	A	6	A	
13	Suitland Parkway and Firth Sterling Avenue	Signal	33	C	37	D	
14	Suitland Parkway and Stanton Road	Signal	89	F	103	F	
16	Firth Sterling Avenue and Barry Road/Sumner Road	Signal	19	B	12	B	
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	21	C	38	D	
18	South Capitol Street and Defense Blvd/Firth Sterling Avenue	Signal	59	E	44	D	
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	21	C	33	C	
20	Martin Luther King Jr. Avenue SE and Redwood Drive	Signal	22	C	15	B	
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	16	C	25	C	
22	Malcolm X Avenue and South Capitol Street NB	Signal	11	B	10	A	
23	Malcolm X Avenue and South Capitol Street SB	Signal	49	D	22	C	
24	Malcolm X Avenue and I-295 NB Ramps	OWSC	1	A	7	A	
25	Malcolm X Avenue and 2nd Street	OWSC	29	D	6	A	
26	Malcolm X Avenue and Oakwood Street	OWSC	5	A	9	A	
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	43	D	56	E	Yes
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	13	B	11	B	
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	6	A	16	B	
30	Alabama Avenue and Randle Place	Signal	21	C	21	C	
31	Alabama Avenue and Wheeler Road	Signal	13	B	19	B	
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	21	C	58	E	Yes
43	Good Hope Road and Minnesota Avenue	Signal	44	D	29	C	
46	Alabama Avenue and 7th Street	Signal	15	B	2	A	
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	9	A	15	B	
48	Firth Sterling Avenue and St. Elizabeths Avenue	Signal	49	D	18	B	
49	Firth Sterling Avenue and Eaton Road	Signal	25	C	0	A	
50	Howard Road and Anacostia Metro Garage Entrance	Signal	9	A	26	C	
51	West Campus Gate 4	Signal	29	C	28	C	
52	West Campus Gate 6	OWSC	22	C	7	A	
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	141	F	62	E	
54	11th Street Bridge and I-295 SB On-Ramp	Signal	53	D	9	A	
100	Suitland Parkway and I-295 NB	Signal	37	D	51	D	
101	Suitland Parkway and I-295 SB	Signal	42	D	62	E	Yes
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Interchange	Signal	35	C	35	C	
103	Malcolm X and I 295 Interchange	Signal	16	B	21	C	
104	Shepherd Parkway/St. Elizabeths Ave/I-295 Ramps	Signal	12	B	11	B	
105	Shepherd Parkway/St. Elizabeths Ave/I-295 Ramps	Signal	12	B	19	B	
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	10	A	16	B	

NB – northbound
SB – southbound

6.4.2 2035 No Action vs. Action Baseline Arterial Operations

Table 6-6 and **Table 6-7** shows the comparisons of travel times and LOS along four key arterial corridors by direction between the No Action and Action Alternatives. These four corridors are Martin Luther King Jr. Avenue SE, Firth Sterling Avenue, South Capitol Street, and Suitland Parkway. Overall, arterial operations in the Action Alternative would be better than or comparable with the No Action Alternative.

6.4.2.1 AM Peak Hour

Out of eight arterial segments, seven showed comparable arterial operations (LOS D or better) in both the No Action and Action Alternatives. The only exception is the northbound Firth Sterling Avenue, which would degrade from LOS D in the No Action Alternative to LOS E in the Action Alternative.

In the Action Alternative, southbound Martin Luther King Jr. Avenue SE shows a minor increase in travel time compared to the No Action Alternative. This is partially a result of the concentration of traffic at Gate 1 intersection, which would become a bottleneck along the arterial.

Southbound Firth Sterling Avenue would operate at a failing condition (LOS F) under the No Action Alternative. In the Action Alternative, this direction would be improved to LOS E. This improvement results from a reduction in the inbound trips to Gate 4 from 190 vehicles under the No Action Alternative to 75 vehicles under the Action Alternative.

As a part of the modifications for the South Capitol Street Improvement Project, the Suitland Parkway and Martin Luther King Jr. Avenue SE interchange has been reconfigured as a tight-diamond interchange, which was previously considered as a SPUI. By addressing the issues of short sight distances and left-side ramps adherent to the previous interchange design, southbound South Capitol Street is improved from LOS D to B, and the reverse direction is improved from LOS C to A.

6.4.2.2 PM Peak Hour

In the PM peak hour, seven out of eight arterial segments show comparable or better operations in the Action Alternative over the No Action Alternative. The only exception is southbound Martin Luther King Jr. Avenue SE, degrading from LOS C to LOS D; but the arterial would still operate at acceptable conditions.

Table 6-6: 2035 No Action vs. Action AM Peak Hour Arterial Operations – Average Travel Time and LOS

Arterial Corridors	Direction	Segment Start/End Location	FFS (mph)	Class	2035 No Action			2035 Action Baseline		
					Average Travel Time (sec)	Average Speed (mph)	Arterial LOS	Average Travel Time (sec)	Average Speed (mph)	Arterial LOS
Martin Luther King Jr. Avenue SE	NB	From Xenia Street to O Street	28	IV	804	12	D	833	14	C
Martin Luther King Jr. Avenue SE	SB	From O Street to Xenia Street	28	IV	684	13	C	1067	11	D
Firth Sterling Avenue	NB	From Gate 4 to North of Howard Road	25	IV	150	10	D	230	7	E
Firth Sterling Avenue	SB	From Howard Road to Gate 4	25	IV	294	5	F	199	8	E
South Capitol Street	NB	From Halley Pl to Frederick Douglass Memorial Bridge	35	III	606	14	D	368	26	B
South Capitol Street	SB	From Frederick Douglass Memorial Bridge to Halley Place	35	III	468	17	C	298	31	A
Suitland Parkway	EB	From South Capitol to Stanton Road	35	III	273	23	C	173	29	B
Suitland Parkway	WB	From Stanton Road to South Capitol Street	35	III	344	17	D	331	15	D

EB – eastbound
WB – westbound
mph – mile per hour
sec – second

Table 6-7: 2035 No Action vs. Action PM Peak Hour Arterial Operations – Average Travel Time and LOS

Arterial Corridors	Direction	Segment Start/End Location	FFS (mph)	Class	2035 No Action			2035 Action Baseline		
					Average Travel Time (sec)	Average Speed (mph)	Arterial LOS	Average Travel Time (sec)	Average Speed (mph)	Arterial LOS
Martin Luther King Jr. Avenue SE	NB	From Xenia Street to O Street	28	IV	2040	5	F	973	12	D
Martin Luther King Jr. Avenue SE	SB	From O Street to Xenia Street	28	IV	672	14	C	1050	11	D
Firth Sterling Avenue	NB	From Gate 4 to North of Howard Road	25	IV	222	7	E	205	8	E
Firth Sterling Avenue	SB	From Howard Road to Gate 4	25	IV	288	5	F	185	9	E
South Capitol Street	NB	From Halley Pl to Frederick Douglass Memorial Bridge	35	III	348	24	B	356	27	B
South Capitol Street	SB	From Frederick Douglass Memorial Bridge to Halley Place	35	III	294	28	B	412	22	C
Suitland Parkway	EB	From South Capitol to Stanton Road	35	III	473	13	E	512	10	E
Suitland Parkway	WB	From Stanton Road to South Capitol Street	35	III	215	27	C	205	25	B

6.4.3 2035 No Action vs. Action Baseline Freeway Operations

Table 6-8 and **Table 6-9** compare freeway operations within the Study Area between the 2035 No Action and Actions Alternatives in the AM and PM peak hours, respectively.

In all, freeway operations along I-295 and DC-295 corridors within the Study Area do not show major differences between the No Action and Action Alternatives in both the AM and PM peak hours. Both alternatives reveal similar traffic patterns for the recurrent congestions along I-295, which arise from demand fluctuations during the peak hours. Northbound I-295 mainline would experience congestions from the inbound traffic toward downtown DC during the AM peak hours. Similarly, the mirror movement, southbound I-295 would be congested for the outbound traffic during the PM peak hours. There are locations where the Action Alternative shows better freeway operations over the No Action Alternative. This improvement is mostly because the operations at the adjacent ramp terminal intersections would be improved under the Action Alternative.

6.4.3.1 AM Peak Hour

For both the No Action and Action Alternatives, the simulation result shows that traffic congestion would extend throughout northbound I-295 from the 11th Street Bridge to the southern limit of the Study Area. This is a result of the frequent weaving maneuvers caused by existing and entering traffic to/from St. Elizabeths Avenue, South Capitol Street, Martin Luther King Jr. Avenue SE, Suitland Parkway, and 11th Street Bridge.

The I-295 freeway mainline condition is often influenced by the operations at the ramp terminal intersections. Queues on this ramp would easily extend to freeway mainlines, thereby causing reductions in speeds and throughputs in the freeway. In particular, the intersection at the off-ramp to Martin Luther King Jr. Avenue SE would be highly saturated. However, this intersection's operations would be improved from LOS F in the No Action Alternative to LOS E in the Action Alternative. Therefore, the freeway operations on the northbound segments between on-ramp from Howard Road and off-ramp to Martin Luther King Jr. Avenue SE would be also improved from LOS E in No Action Alternative as compared to LOS C in Action Alternative.

6.4.3.2 PM Peak Hour

Similar with the AM peak analysis, freeway operations would be at similar conditions between the No Action and Action Alternatives during the PM peak hours. In the southern end of freeways within the Study Area, traffic congestion originating from the I-495 interchange would spill back toward I-295/Malcolm X Avenue interchange in both the No Action and Action Alternatives.

Within the Study Area, the major congestion along the freeway would extend from the off-ramp to South Capitol Street up to Pennsylvania Avenue. The weaving segment between the on-ramp from

Table 6-8: 2035 No Action vs. Action AM Peak Hour Freeway Operations – Average Density and LOS

Segment Location	2035 No Action					2035 Action Baseline				
	Volume Served (vph)	Volume Served %	Speed (mph)	Density (pc/mi/ln)	LOS	Volume Served (vph)	Volume Served %	Speed (mph)	Density (pc/mi/ln)	LOS
Northbound										
I-295 NB - Diverge b/w I-495 and Laboratory Road	5168	98%	30	63	F	5133	100%	43	37	E
I-295 NB - Basic b/w Laboratory Road SW Off-Ramp and On-Ramp	4262	97%	28	78	F	3980	100%	48	42	E
I-295 NB - Merge from Laboratory Road	4372	97%	29	77	F	4039	99%	41	45	F
I-295 NB - Basic b/w Laboratory Road and Chesapeake Street	4372	97%	29	77	F	4039	99%	41	50	F
I-295 NB - Merge from Chesapeake Street	4659	97%	36	64	F	4286	98%	42	51	F
I-295 NB - Diverge to Malcolm X Avenue and West Access Road	4659	97%	43	54	F	4286	98%	47	47	F
I-295 NB - Basic b/w Malcolm X Avenue and West Access Road Off-Ramp and S Capitol Street On-Ramp	3673	97%	34	62	F	3611	101%	48	37	E
I-295 NB - Merge from S Capitol Street	4465	95%	48	48	F	4466	96%	46	46	F
I-295 NB - Basic b/w S. Capitol Street On-Ramp and Malcolm X Avenue On-Ramp	4465	95%	36	66	F	4466	96%	48	47	F
I-295 NB - Merge from Malcolm X Avenue On-ramp	4828	95%	49	34	D	4910	96%	49	30	D
I-295 NB - Diverge to Suitland Parkway	4828	95%	48	33	D	4910	96%	48	30	D
I-295 NB - Basic b/w Suitland Parkway Off-Ramp and On-Ramp	3884	95%	47	29	D	4060	98%	49	28	D
I-295 NB - Weave b/w Howard Road On-Ramp and DC-295 NB Off-Ramp	5364	92%	39	42	E	5004	92%	49	26	C
I-695 NB - Weave b/w I-695 NB On-Ramp and 12th Street Off-Ramp	Not reported in 2012 EIS/TTR					5235	94%	49	27	C
DC 295 NB - Diverge to DC-295 NB and MLK Jr. Avenue	2763	100%	43	37	E	2002	92%	49	15	B
DC 295 NB - Basic b/w MLK Jr. Avenue Off-Ramp and On-Ramp	2028	92%	49	22	C	1271	98%	50	13	B
DC 295 NB - Merge from MLK Jr. Avenue On-Ramp	2490	91%	47	26	C	1698	94%	48	17	B
DC 295 NB - Weave b/w I-695 On-Ramp and Pennsylvania Avenue Off-Ramp	4328	95%	49	23	C	3598	98%	49	18	B
Southbound										
DC 295 SB - Weave b/w Pennsylvania Avenue On-Ramp and I-695 Off-Ramp	4427	100%	46	26	C	4658	99%	49	32	D
I-295 SB - Basic b/w I-695 Off-Ramp and MLK Jr. Avenue On-Ramp	1661	100%	49	18	B	1963	100%	49	20	C
I-295 SB - Weave b/w MLK Jr. Avenue On-ramp and Suitland Parkway Off-ramp	3462	100%	49	19	B	4370	99%	49	22	C
I-295 SB - Basic b/w Suitland Parkway On-Ramps and Off-Ramps	2384	100%	49	17	B	3129	105%	49	21	C
I-295 SB - Merge from Suitland Parkway EB On-Ramp	2793	99%	49	23	C	3499	102%	48	24	C
I-295 SB - Basic b/w Suitland Parkway EB On-Ramp and S Capitol Street Off-Ramp	2793	99%	49	20	C	3499	102%	49	24	C
I-295 SB - Diverge to S Capitol Street	Not reported in 2012 EIS/TTR					3499	102%	47	29	D
I-295 SB - Diverge b/w S Capitol Street Off-Ramp and Malcolm X Avenue Off-Ramp	1946	99%	49	14	B	2345	105%	47	17	B
I-295 SB - Basic b/w Malcolm X Avenue Off-Ramp and On-Ramp	1571	98%	49	17	B	2298	124%	49	20	C
I-295 SB - Merge from Malcolm X Avenue On-Ramp	1615	99%	49	17	B	2067	110%	45	21	C
I-295 SB - Basic from Malcolm X Avenue On-Ramp	1615	99%	49	17	B	2067	110%	49	21	C
I-295 SB - Weave b/w Overlook Avenue Off-Ramp and On-Ramp	1737	99%	48	18	B	2298	109%	48	24	C
I-295 SB - Basic b/w Overlook Avenue Off-Ramp and Laboratory Road On-Ramp	1430	100%	49	15	B	2010	110%	49	21	C
I-295 SB - Merge from Laboratory Road On-Ramp and I-495	1647	100%	49	12	B	2253	109%	49	13	B

Table 6-9: No Action vs. Action PM Peak Hour Freeway Operations – Average Density and LOS

Segment Location	2035 No Action					2035 Action Baseline				
	Volume Served (vph)	Volume Served %	Speed (mph)	Density (pc/mi/ln)	LOS	Volume Served (vph)	Volume Served %	Speed (mph)	Density (pc/mi/ln)	LOS
Northbound										
I-295 NB - Diverge b/w I-495 and Laboratory Road	2082	100%	49	15	B	2182	98%	48	14	B
I-295 NB - Basic b/w Laboratory Road SW Off-Ramp and On-Ramp	1715	100%	49	18	B	1641	97%	49	17	B
I-295 NB - Merge from Laboratory Road	2074	100%	48	21	C	1975	96%	48	20	B
I-295 NB - Basic b/w Laboratory Road and Chesapeake Street	2074	100%	49	22	C	1975	96%	49	20	C
I-295 NB - Merge from Chesapeake Street	2174	100%	48	23	C	2206	96%	47	23	C
I-295 NB - Diverge to Malcolm X Avenue and West Access Road	2174	100%	49	23	C	2206	96%	49	23	C
I-295 NB - Basic b/w Malcolm X Avenue and West Access Road Off-Ramp and S Capitol Street On-Ramp	2079	100%	49	22	C	2070	96%	49	21	C
I-295 NB - Merge from S Capitol Street	2489	100%	49	26	C	2590	98%	49	25	C
I-295 NB - Basic b/w S. Capitol Street On-Ramp and Malcolm X Avenue On-Ramp	2489	100%	48	26	C	2590	98%	49	27	D
I-295 NB - Merge from Malcolm X Avenue On-ramp	3261	99%	49	23	C	3397	98%	49	25	C
I-295 NB - Diverge to Suitland Parkway	3261	99%	48	25	C	3397	98%	48	22	C
I-295 NB - Basic b/w Suitland Parkway Off-Ramp and On-Ramp	2437	98%	49	17	B	2598	99%	49	18	B
I-295 NB - Weave b/w Howard Road On-Ramp and DC-295 NB Off-Ramp	4142	94%	33	45	F	4321	100%	48	21	C
I-695 NB - Weave b/w I-695 NB On-Ramp and 12th Street Off-Ramp	Not reported in 2012 EIS/TTR					3753	98%	34	31	D
DC 295 NB - Diverge to DC-295 NB and MLK Jr. Avenue	2681	83%	12	126	F	2303	98%	45	21	C
DC 295 NB - Basic b/w MLK Jr. Avenue Off-Ramp and On-Ramp	1516	93%	49	16	B	1525	101%	49	15	B
DC 295 NB - Merge from MLK Jr. Avenue On-Ramp	1904	88%	48	19	B	1968	97%	48	20	C
DC 295 NB - Weave b/w I-695 On-Ramp and Pennsylvania Avenue Off-Ramp	4538	95%	49	24	C	4057	100%	49	21	C
Southbound										
DC 295 SB - Weave b/w Pennsylvania Avenue On-Ramp and I-695 Off-Ramp	5114	84%	14	106	F	4010	98%	40	44	F
I-295 SB - Basic b/w I-695 Off-Ramp and MLK Jr. Avenue On-Ramp	2414	84%	45	28	D	1473	98%	46	17	B
I-295 SB - Weave b/w MLK Jr. Avenue On-ramp and Suitland Parkway Off-ramp	5675	91%	47	31	D	4926	97%	34	40	E
I-295 SB - Basic b/w Suitland Parkway On-Ramps and Off-Ramps	3821	91%	49	27	D	2872	99%	49	19	C
I-295 SB - Merge from Suitland Parkway EB On-Ramp	4498	90%	48	33	D	3642	96%	49	27	C
I-295 SB - Basic b/w Suitland Parkway EB On-Ramp and S Capitol Street Off-Ramp	4498	90%	46	34	D	3642	96%	49	25	C
I-295 SB - Diverge to S Capitol Street	Not reported in 2012 EIS/TTR					3642	96%	49	30	D
I-295 SB - Diverge b/w S Capitol Street Off-Ramp and Malcolm X Avenue Off-Ramp	2637	90%	41	24	C	1968	100%	49	12	B
I-295 SB - Basic b/w Malcolm X Avenue Off-Ramp and On-Ramp	2523	89%	31	52	F	2454	134%	49	19	C
I-295 SB - Merge from Malcolm X Avenue On-Ramp	3004	88%	21	77	F	2436	99%	48	23	C
I-295 SB - Basic from Malcolm X Avenue On-Ramp	3004	88%	19	87	F	2436	99%	49	25	C
I-295 SB - Weave b/w Overlook Avenue Off-Ramp and On-Ramp	3765	88%	24	79	F	2454	70%	47	37	E
I-295 SB - Basic b/w Overlook Avenue Off-Ramp and Laboratory Road On-Ramp	3346	88%	20	87	F	3392	99%	48	35	E
I-295 SB - Merge from Laboratory Road On-Ramp and I-495	4598	91%	18	86	F	4905	99%	49	33	D

pc/mi/ln – passenger cars per mile per lane
vph – vehicle per hour

6.5 2035 Action with Improvements Operational Analysis

As revealed from the 2035 Action Baseline Alternative analysis results in **Section 6.4**, the previously committed transportation improvement would still sufficiently support the majority of the transportation networks within the Study Area under Master Plan Amendment 2 in 2035. The impacts would be localized to traffic operations along Martin Luther King Jr. Avenue SE, especially on the segments and intersections between South Capitol Street and Suitland Parkway.

Chapter 5 provides different improvement concepts at the Gate 1 intersection for impact mitigations under Master Plan Amendment 2. This section provides quantified comparisons based on simulation analysis among these proposed concepts. This section also discusses the analysis results for incorporating a bicycle lane system along Martin Luther King Jr. Avenue SE, with different Gate 1 improvement options. Because the proposed improvements are limited to lane configuration changes at the Gate 1 intersection, the impacts show at a local level rather than across the Study Area. Therefore, this section only presents the results within the Martin Luther King Jr. Avenue SE corridor. For the rest of the Study Area, these improvement concepts would not significantly influence the operations.

6.5.1 2035 Action Baseline vs. Action with Improvements at Gate 1

The comparisons analysis reviewed three aspects:

- Movement LOS (or delay) at the Gate 1 intersection;
- Average and maximum queue length at each approach at the Gate 1 intersection to diagnose the local impact of each improvement option; and
- Operations at other intersections along the Martin Luther King Jr. Avenue SE to investigate any systematic impacts within the corridor

The comparisons on per-movement LOS at the Gate 1 intersection are in **Figure 6-16**. **Table 6-10** and **Table 6-11** show queue analysis results, which include average and maximum queue length for each approach at the Gate 1 intersection. Movement where the queue length is greater than or equal to the corresponding storage lane length were marked in red fonts. The comparison of the intersection operations along Martin Luther King Jr. Avenue SE are in **Table 6-12** and **Table 6-13** for AM and PM peak hours, respectively. Note that both tables show the intersections in the direction of north to south along Martin Luther King Jr. Avenue SE. All these analysis results compare the four different improvement options against the Action Baseline Alternative.

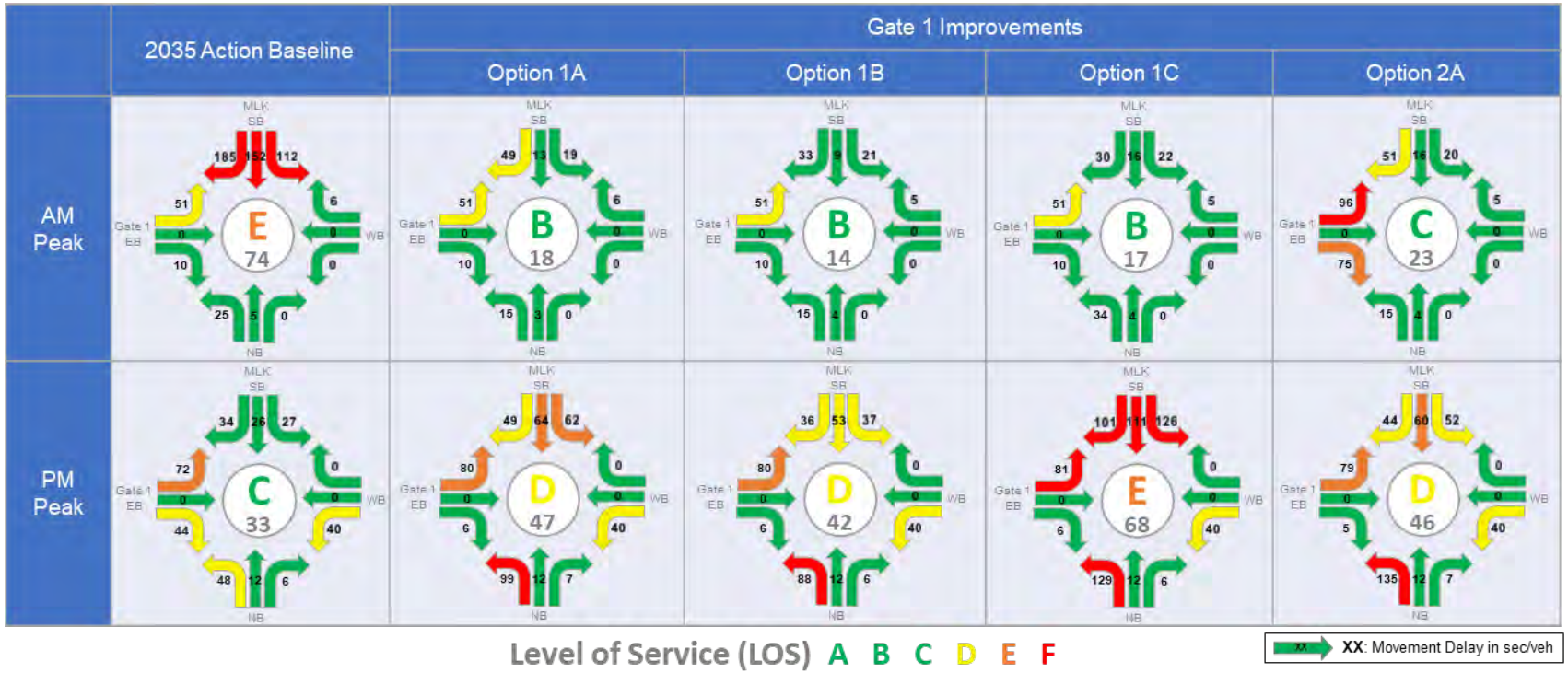

Figure 6-16: Action Baseline vs. Improvements at Gate 1

6.5.1.1 AM Peak Hour

Traffic operational analysis for the AM peak-hour scenarios are as follows:

- The AM results in **Figure 6-16** show that all four improvement options address the excessive delays in the southbound Martin Luther King Jr. Avenue SE and improve the intersection operations from LOS E to C or better. Particularly, Options 1A, 1B, and 1C result in reasonable operation of all movement (LOS D or better). Option 2A results in LOS F for the left-turning traffic on the eastbound approach, when the eastbound lane is reduced from two to a single lane during AM peak.
- **Table 6-10** shows that Option 1B, which provides a continuous right-turn lane, would benefit the queue length the most among the four improvement options. Under Option 1B, reductions in average queue length on the southbound right-turning traffic is up to 87 percent, and the reductions in maximum queue length is up to 56 percent over the Action Baseline Alternative.
- Facilitating the southbound right-turn traffic on the Martin Luther King Jr. Avenue SE at Gate 1 helps mitigate the queue on the left-turning traffic, which previously experienced spillbacks under the Action Baseline alternative. Both Options 1B and 1C results show significant reductions in the average queues, so that traffic does not spill over into mainline lanes.
- In Option 1C, left-turn traffic on northbound Martin Luther King Jr. Avenue SE experiences additional delays because the northbound left-turning traffic conflicts with the right-turning traffic, thereby increasing difficulty for vehicles/drivers to find a gap between vehicles.
- Based on **Table 6-12**, the arterial-wide impacts within the Martin Luther King Jr. Avenue SE are shown to be minimal across the four improvement options. The congestion at the Martin Luther King Jr. Avenue SE and Suitland Parkway interchange remain unaffected, even with the mitigations of southbound delays and queues at the Gate 1 intersection.

6.5.1.2 PM Peak Hour

Traffic operational analysis results for the PM peak-hour scenarios are as follows:

- The PM results in **Figure 6-16** show that all improvement options degrade the intersection operations, from LOS C under the Action Baseline Alternative to LOS D under Options 1A, 1B, or 2A, and LOS E under Option 1C. As mentioned in the previous section, these options would significantly improve the southbound right-turn movement in the AM peak hours by changing the rightmost lane at the southbound approach to an exclusive right turn lane. This change would take partial capacity from the southbound through movement. **Figure 6-17** shows the projected turning movement volumes at the Gate 1 intersection in the 2035 Action Alternative. The traffic at this intersection would be highly directional in both peak hours. In the AM peak hour, the southbound right-turn volume is 565 vehicles and the through movement volume is 680 vehicles. In the PM peak hour, the through movement volume is 990 vehicles with only 175 right-turn vehicles. Therefore, even though the Gate 1 improvement options would significantly mitigate the southbound approach operations in the AM peak hour, it would also compromise the PM peak hour operations, particularly the southbound through movements. However, the impacts for most options would be limited and within an acceptable level (LOS D).

- Similar to the AM peak results, promoting the southbound right-turning traffic imposes extra delays on the conflicting left-turn traffic from northbound Martin Luther King Jr. Avenue SE. All the four Gate 1 improvements options result in the left-turning traffic from northbound failing at LOS F.
- To provide a dedicated right-turn lane on the southbound approach, the southbound through lanes are reduced from two to a single lane in all four options. This helps improve the Gate 1 outbound traffic's right-turning maneuvers, because the outer lane in the receiving approach does not conflict with any other movements; therefore, outbound traffic can make complementary right turns. The PM results in **Figure 6-16** show that the eastbound right-turning traffic is operating at LOS D in the Action Baseline Alternative, whereas LOS increases to A under all four improvements.
- **Table 6-11** shows that all the options would compromise the southbound operations in the PM peak hour because they take partially capacity from the through movement. However, Option 1B would have the least adverse impacts on the queues.
- Similarly with the AM peak result, **Table 6-13** shows that the improvement at Gate 1 is independent from the congestion at the immediate upstream intersection at Martin Luther King Jr. Avenue SE and Sumner Road. The improvement does not adversely impact the intersection operations.

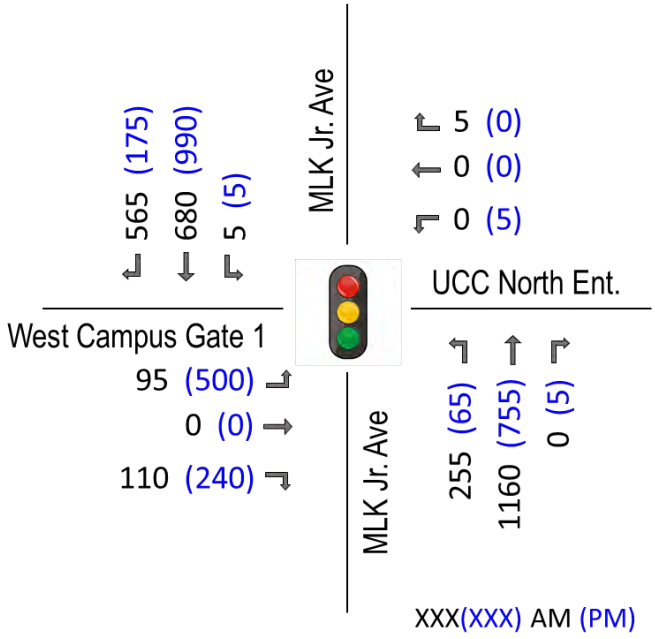

Figure 6-17: Projected Turning Movement Volumes at Gate 1 Intersection during AM and PM Peak Hours in 2035 Action Alternative

Table 6-10: 2035 Action Baseline vs. Action with Gate 1 Improvements during AM Peak Hour - Queues

Approach	Movement	2035 Action Baseline			Option 1A			Option 1B			Option 1C			Option 2A		
		Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)
NB	Left turn	180	48	492*	350	31	383*	350	31	357*	350	60	425*	350	33	352*
	Through	675	48	492	675	31	383	675	31	357	675	60	425	675	33	352
	Right turn	675	44	502	675	27	393	675	27	367	675	50	435	675	29	362
EB	Left turn	160	26	140	160	26	140	160	26	145	160	26	145	1000	103	170
	Through	1000	26	140	1000	26	140	1000	26	145	1000	26	145	1000	103	170
	Right turn	1000	30	146	1000	31	147	1000	31	152	1000	31	152	1000	109	177
SB	Left turn	160	885*	1379*	160	200*	725*	160	110	625*	160	109	604*	160	205*	755*
	Through	1480	885	1379	1480	175	688	1480	93	588	1480	109	604	1480	180	717
	Right turn	1480	888	1381	1480	201	727	1480	111	627	1480	110	606	1480	206	756
WB	Left turn	265	0	0	265	0	2	265	0	0	265	0	0	265	0	0
	Through	265	0	0	265	0	2	265	0	0	265	0	0	265	0	0
	Right turn	265	0	7	265	0	7	265	0	7	265	0	5	265	0	5

*: queue length greater than or equal to available storage length

Table 6-11: 2035 Action Baseline vs. Action with Gate 1 Improvements during PM Peak Hour - Queues

Approach	Movement	2035 Action Baseline			Option 1A			Option 1B			Option 1C			Option 2A		
		Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)	Storage Length (ft)	Avg Queue (ft)	Max Queue (ft)
NB	Left turn	180	43	351*	350	55	341	350	52	358*	350	64	361*	350	66	347
	Through	675	43	351	675	55	341	675	52	358	675	64	361	675	66	347
	Right turn	675	20	312	675	27	302	675	25	319	675	34	322	675	36	308
EB	Left turn	160	246*	632*	160	294*	783*	160	293*	783*	160	299*	788*	160	291*	783*
	Through	1000	246	632	1000	294	783	1000	293	783	1000	299	788	1000	291	783
	Right turn	1000	246	632	1000	264	748	1000	263	749	1000	267	752	1000	261	749
SB	Left turn	160	109	597	160	379	996	160	325	918	160	627	1182	160	352	924
	Through	1480	109	597	1480	379	996	1480	325	918	1480	627	1182	1480	352	924
	Right turn	1480	109	597	1480	379	996	1480	325	918	1480	648	1205	1480	352	924
WB	Left turn	265	1	27	265	1	27	265	1	27	265	1	27	265	1	27
	Through	265	1	27	265	1	27	265	1	27	265	1	27	265	1	27
	Right turn	265	1	37	265	1	37	265	1	37	265	1	37	265	1	37

*: queue length greater than or equal to available storage length

Table 6-12: 2035 Action Baseline vs. Action with Gate 1 Intersection Improvements during AM Peak Hour – Intersection Operations on Martin Luther King Jr. Avenue SE

Int ID	Intersection Name	Traffic Control	2035 Action Baseline		Option 1A		Option 1B		Option 1C		Option 2A	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
54	11th Street Bridge and I-295 SB On-Ramp	Signal	5	A	4	A	4	A	4	A	4	A
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	45	D	43	D	44	D	45	D	44	D
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	39	D	38	D	39	D	39	D	39	D
3	Martin Luther King Jr. Avenue SE and W Street	Signal	8	A	8	A	8	A	8	A	8	A
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	14	B	14	B	15	C	14	B	15	C
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	50	D	51	D	51	D	46	D	50	D
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	30	C	33	C	31	C	27	C	33	C
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	46	D	50	D	45	D	49	D	52	D
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Diamond Interchange	Signal	57	E	56	E	57	E	55	E	53	D
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	49	D	44	D	45	D	43	D	43	D
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	74	E	18	B	14	B	17	B	23	C
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2/Redwood Drive	Signal	16	B	16	B	16	B	16	B	15	B
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	13	B	13	B	13	B	13	B	13	B
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	11	B	11	B	12	B	11	B	12	B
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	53	F	52	F	49	E	62	F	56	F
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	61	E	61	E	63	E	62	E	62	E
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	33	C	40	D	40	D	41	D	36	D
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	36	D	41	D	45	D	44	D	38	D
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	120	F	121	F	120	F	120	F	121	F

Table 6-13: 2035 Action Baseline vs. Action with Gate 1 Intersection Improvements during PM Peak Hour – Intersection Operations on Martin Luther King Jr. Avenue SE

Int ID	Intersection Name	Traffic Control	2035 Action Baseline		Option 1A		Option 1B		Option 1C		Option 2A	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
54	11th Street Bridge and I-295 SB On-Ramp	Signal	9	A	9	A	10	A	9	A	10	A
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	62	E	62	E	63	E	61	E	63	E
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	67	E	71	E	65	E	73	E	76	E
3	Martin Luther King Jr. Avenue SE and W Street	Signal	28	C	31	C	28	C	30	C	31	C
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	49	E	36	E	49	E	45	E	43	E
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	32	C	32	C	32	C	31	C	32	C
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	24	C	24	C	24	C	24	C	24	C
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	55	D	56	E	55	E	54	D	56	E
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Diamond Interchange	Signal	35	C	34	C	35	C	35	D	35	C
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	38	D	39	D	39	D	42	D	39	D
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	33	C	47	D	42	D	68	E	46	D
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2/Redwood Drive	Signal	15	B	16	B	16	B	17	B	16	B
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	16	B	18	B	17	B	22	C	18	B
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	15	B	13	B	12	B	13	B	13	B
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	25	C	26	D	22	C	25	C	21	C
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	56	E	48	D	49	D	52	D	48	D
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	11	B	11	B	11	B	12	B	12	B
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	16	B	16	B	16	B	16	B	16	B
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	58	E	57	E	56	E	60	E	58	E

6.5.2 2035 Action Baseline vs. Action with Improvements at Gate 1 and Bicycle Lanes

Currently, partially dedicated bicycle lanes go along both sides of Martin Luther King Jr. Avenue SE between South Capitol Street and Alabama Avenue. In addition, fully dedicated bicycle lanes go along Malcolm X Avenue between South Capitol Street and Martin Luther King Jr. Avenue SE. As discussed in **Section 5.4.3**, incorporating dedicated bicycle lanes along Martin Luther King Jr. Avenue SE between Malcolm X Avenue and Gate 1 is currently under consideration. This section discusses analysis results of the proposed bicycle lanes impacts to traffic operations.

Table 6-14 and **Table** 6-15 present the intersection operations results along Martin Luther King Jr. Avenue SE during AM and PM peak hours. In this analysis, the proposed bicycle lane system along Martin Luther King Jr. Avenue SE was integrated with each Gate 1 improvement option to identify the overall impacts. The 2035 Action Baseline shown in **Table 6-14** and **Table** 6-15 represent the network without any Gate 1 improvements or the bicycle lanes along Martin Luther King Jr. Avenue SE.

Overall, the impacts of expanding the existing bicycle lanes along Martin Luther King Jr. Avenue SE up to Gate 1 appear insignificant across the four Gate 1 improvement options during both AM and PM peak hours.

Within Martin Luther King Jr. Avenue SE corridor, the AM peak hour traffic travels northbound toward the West Campus Gate 1. The outbound traffic travels in reverse during PM peak hour. Given such peak-hour trip patterns, in the morning hours, additional bicycle traffic passing through the intersections triggers extra delays at the upstream of AM peak traffic stream, especially at the intersection that is already saturated at capacity. **Table 6-14** shows that the intersections at Raleigh Place and at Alabama Avenue show slight increases in delays, compared to the without-bicycle lane-option of each improvement.

In the AM peak hour result, the reductions in delay at Gate 1 intersection shown in all four improvement options were statistically insignificant at 95th percentile confidence interval.

In the PM peak hour, the Gate 1 intersection shows slight increases in delay, compared to each of the without-bicycle lane options. Impacts on the other intersections along the Martin Luther King Jr. Avenue SE were marginal during PM peak hour.

Table 6-14: 2035 Action Baseline vs. Action with Bicycle Lanes during AM Peak Hour – Intersection Operations on Martin Luther King Jr. Avenue SE

Int ID	Intersection Name	Traffic Control	2035 Action Baseline		Option 1A & Bicycle Lanes		Option 1B & Bicycle Lanes		Option 1C & Bicycle Lanes		Option 2A & Bicycle Lanes	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
54	11th Street Bridge and I-295 SB On-Ramp	Signal	5	A	4	A	4	A	4	A	4	A
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	45	D	38	D	39	D	38	D	37	D
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	39	D	37	D	38	D	38	D	36	D
3	Martin Luther King Jr. Avenue SE and W Street	Signal	8	A	8	A	8	A	8	A	8	A
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	14	B	19	C	14	B	14	B	14	B
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	50	D	60	E	52	D	47	D	47	D
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	30	C	44	D	34	C	26	C	26	C
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	46	D	66	E	53	D	43	D	40	D
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Diamond Interchange	Signal	57	E	53	D	53	D	50	D	49	D
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	49	D	43	D	41	D	41	D	38	D
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	74	E	18	B	12	B	17	B	22	C
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2/Redwood Drive	Signal	16	B	14	B	14	B	14	B	14	B
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	13	B	12	B	11	B	12	B	11	B
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	11	B	10	B	10	B	10	B	12	B
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	53	F	54	F	59	F	58	F	53	F
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	61	E	55	E	56	E	56	E	59	E
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	33	C	34	C	45	D	40	D	40	D
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	36	D	35	D	52	D	44	D	47	D
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	120	F	109	F	109	F	109	F	109	F

Table 6-15: 2035 Action Baseline vs. Action with Bicycle Lanes during PM Peak Hour – Intersection Operations on Martin Luther King Jr. Avenue SE

Int ID	Intersection Name	Traffic Control	2035 Action Baseline		Option 1A & Bicycle Lanes		Option 1B & Bicycle Lanes		Option 1C & Bicycle Lanes		Option 2A & Bicycle Lanes	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
54	11th Street Bridge and I-295 SB On-Ramp	Signal	9	A	8	A	9	A	8	A	8	A
53	Martin Luther King Jr. Avenue SE/11th Street Bridge and I-295 NB Off-Ramp	Signal	62	E	55	E	54	D	53	D	54	D
1	Martin Luther King Jr. Avenue SE and Good Hope Road	Signal	67	E	67	E	72	E	77	E	73	E
3	Martin Luther King Jr. Avenue SE and W Street	Signal	28	C	29	C	30	C	31	C	31	C
4	Martin Luther King Jr. Avenue SE and Pleasant Street/Maple View Place	TWSC	49	E	44	E	45	E	43	E	42	E
6	Martin Luther King Jr. Avenue SE and Morris Road	Signal	32	C	32	C	31	C	32	C	32	C
7	Martin Luther King Jr. Avenue SE and Talbert Street	Signal	24	C	24	C	24	C	23	C	23	C
11	Martin Luther King Jr. Avenue SE and Howard Road/Sheridan Road	Signal	55	D	55	D	55	D	54	D	55	D
102	Martin Luther King Jr. Avenue SE and Suitland Parkway Diamond Interchange	Signal	35	C	30	C	30	C	30	C	30	C
17	Martin Luther King Jr. Avenue SE and Sumner Road/Stanton Road	Signal	38	D	39	D	40	D	38	D	39	D
19	Martin Luther King Jr. Avenue SE and West Campus Gate 1	Signal	33	C	49	D	45	D	49	D	45	D
20	Martin Luther King Jr. Avenue SE and West Campus Gate 2/Redwood Drive	Signal	15	B	16	B	16	B	16	B	16	B
107	Martin Luther King Jr. Avenue SE and Pecan Street	Signal	16	B	16	B	16	B	16	B	15	B
47	Martin Luther King Jr. Avenue SE and Cypress Street	Signal	15	B	11	B	11	B	11	B	11	B
21	Martin Luther King Jr. Avenue SE and Lebaum Street	TWSC	25	C	21	C	23	C	21	C	23	C
27	Martin Luther King Jr. Avenue SE and Malcolm X Avenue	Signal	56	E	48	D	46	D	48	D	48	D
28	Martin Luther King Jr. Avenue SE and Raleigh Place	Signal	11	B	10	B	11	B	10	A	11	B
29	Martin Luther King Jr. Avenue SE and Alabama Avenue	Signal	16	B	14	B	14	B	14	B	14	B
41	Martin Luther King Jr. Avenue SE/South Capitol Street/Halley Place	Signal	58	E	48	D	48	D	49	D	49	D

7 TRANSPORTATION ANALYSIS SUMMARY

7.1 Overview

The purpose of the transportation study for this TTR is to evaluate the transportation impacts of the GSA's proposed Master Plan Amendment 2 in support of the corresponding 2019 Draft Supplemental EIS. Master Plan Amendment 2 accommodates a total of 4.1 million gsf of secure office and shared-use space and 1.5 million gsf of associated parking at the West Campus. It eliminates GSA's development on the East Campus proposed in in the Master Plan Amendment 1. The transportation analysis was built upon previous analyses and documentation in the 2012 EIS/TTR, but updated with newly collected traffic data, employee residence zip code information, updated transportation network, and land use forecasts.

The transportation and traffic analysis for this study include the following analysis years and alternatives:

- 2019 existing year conditions.
- 2035 No Action Alternative, which contains the land use and transportation assumptions from the 2012 EIS and Master Plan Amendment 1. Traffic analysis results for this alternative was directly taken from the 2012 TTR for Master Plan Amendment 1.
- 2035 Action Alternative:
  - 2035 Action Baseline scenario, which assumes transportation improvements, the land use assumptions from Master Plan Amendment 2, and the same transportation improvements from Master Plan Amendment 1
  - 2035 Action scenario with different West Campus Gate 1 improvement options under consideration
  - 2035 Action scenario with different West Campus Gate 1 improvement options and bicycle lanes on Martin Luther King Jr. Avenue

The 2012 EIS/TTR identified a Transportation Preferred Alternative for Master Plan Amendment 1, which includes four roadway improvement projects together with a DHS shuttle transit system needed to accommodate access to the consolidated DHS Headquarters at St. Elizabeths. As part of commitments in Master Plan Amendment 1, the following projects were planned to be implemented before the design year 2035:

1. Interchange modifications at I-295 interchange with Malcolm X Avenue
2. St. Elizabeths Avenue Construction
3. Firth Sterling Avenue/St. Elizabeths Avenue Intersection Improvements
4. Martin Luther King Jr. Avenue SE Improvements

The first project is currently under construction and will be completed by 2021. The second and third projects have been constructed and already open to traffic. The fourth project is not active because of the changes in the campus development plan. These committed transportation projects were all included in both 2035 No Action and 2035 Action Alternatives. In addition, DDOT is constructing the South Capitol Street Improvement Project by phases that is within the Study Area and have significant impacts. This project was included as a background project in both alternatives.

7.2 Summary of Traffic Operational Analysis Findings

Table 7-1 and **Table 7-2** summarize an overall comparison in traffic operations on transportation networks within the Study Area among the 2019 existing year, the 2035 No Action Alternative, and 2035 Action Alternative in the AM and PM peak hours, respectively. For most measures of effectiveness, the 2035 Action Alternative show equal or better results as compared to the 2035 No Action Alternative.

Table 7-1: Overall Performance Comparison in the Study Area in the AM Peak Hour

Measure of Effectiveness		Corridor	Boundary	2019 Existing	2035 No Action	2035 Action Baseline	2035 Action Performance Compared to 2035 No Action
Freeways	Average Speed in Freeway Mainline (in Peak Direction)	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	44 mph	40 mph	47 mph	↑
	Number of Freeway Segments Congested (LOS E or F) in Peak Direction	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	13 out of 19	11 out of 17	9 out of 18	↑↑
	Average % Demand Unserved in Peak Direction	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	1%	3%	2%	↑
Arterials	Average Speed and Level of Service in Arterials (in Peak Direction)	Martin Luther King Jr. Avenue SE	From Xenia Street to O Street	17 mph (LOS C)	12 mph (LOS D)	14 mph (LOS C)	↑
		Firth Sterling Avenue	From Gate 4 to North of Howard Road	12 mph (LOS D)	10 mph (LOS D)	7 mph (LOS E)	↓
		South Capitol Street	From Halley Place to Frederick Douglass Memorial Bridge	13 mph (LOS E)	14 mph (LOS D)	26 mph (LOS B)	↑↑
		Suitland Parkway	From Stanton Road to South Capitol Street	13 mph (LOS E)	17 mph (LOS D)	15 mph (LOS D)	o
	Intersection Delay (LOS E or F)	Summary of All Intersections	All Study Intersections in the Project Area	8 out of 43	12 out of 47	7 out of 48	↑

Legend

Worse	<<	Neutral	>>	Better
↓↓	↓	o	↑	↑↑

Table 7-2: Overall Performance Comparison in the Study Area in the PM Peak Hour

Measure of Effectiveness		Corridor	Boundary	2019 Existing	2035 No Action	2035 Action Baseline	2035 Action Performance Compared to 2035 No Action
Freeways	Average Speed in Freeway Mainline (in Peak Direction)	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	25 mph	33 mph	47 mph	↑↑
	Number of Freeway Segments Congested (LOS E or F) in Peak Direction	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	11 out of 13	7 out of 14	4 out of 15	↑↑
	Average % Demand Unserved in Peak Direction	I-295/DC 295	Northbound I-295/DC 295 from I-495 to Pennsylvania Avenue Off-ramp	3%	8%	3%	↑↑
Arterials	Average Speed and Level of Service in Arterials (in Peak Direction)	Martin Luther King Jr. Avenue SE	From Xenia Street to O Street	15 mph (LOS C)	14 mph (LOS C)	11 mph (LOS D)	↓
		Firth Sterling Avenue	From Gate 4 to North of Howard Road	13 mph (LOS C)	5 mph (LOS F)	9 mph (LOS E)	↑
		South Capitol Street	From Halley Place to Frederick Douglass Memorial Bridge	13 mph (LOS E)	28 mph (LOS B)	22 mph (LOS C)	↓
		Suitland Parkway	From Stanton Road to South Capitol Street	12 mph (LOS E)	13 mph (LOS E)	10 mph (LOS E)	o
	Intersection Delay (LOS E or F)	Summary of All Intersections	All Study Intersections in the Project Area	8 out of 43	8 out of 47	9 out of 48	o

Legend

Worse	<<	Neutral	>>	Better
↓↓	↓	o	↑	↑↑

7.2.1 Existing Conditions

A major issue demonstrated in existing year 2019 analysis is the recurring congestion patterns on I-295 corridor. Weekday mainline operations on I-295 consist of sustained congestion and reduced travel speeds in the peak direction of travel (northbound in the AM peak hour, southbound in the PM peak hour). Major points of congestion include the I-295 and Malcom X Avenue, Martin Luther King Jr. Avenue SE, DC 295, and 11th Street Bridge interchanges. Within the Study Area, traffic analysis also exhibited some operational issues on arterials including South Capitol Street, Suitland Parkway, Martin Luther King Jr. Avenue SE, and Alabama Avenue, with 8 out of 43 intersections within the Study Area operating at LOS E or F during the AM and PM peak hour.

7.2.2 2035 No Action Alternative

In the 2035 No Action Alternative, the committed transportation projects would noticeably improve the operations in the overall transportation system within the Study Area in terms of greater demand served, higher speeds, and lower densities. Capacity improvement at I-295 and Malcom X Avenue interchange, and St. Elizabeths Avenue allow for greater throughputs for inbound and outbound traffic through the critical gateway point of St Elizabeths area. In both peak hours, the 2035 No Action Alternative shows mostly comparable or improved traffic conditions in freeway, arterials, and intersection operations as compared to the existing conditions. However, the continued development within the Study Area and increase in travel demand would still result in congestion at certain locations during the peak hours. Severe congestion would remain in existing conditions through a good portion of I-295, at the junction of South Capitol Street and Suitland Parkway, and along Martin Luther King Jr. Avenue SE during the AM peak hour in the northbound direction. The PM peak hour conditions show similar patterns but in reverse peak directions, and traffic congestions are generally less pronounced than that in the AM peak hour within the Study Area.

7.2.3 2035 Action Alternative

The comparison of analysis results between the 2035 No Action and 2035 Action Alternatives shows similar operational conditions within the Study Area. Noticeably, some of the congestion observed in the 2035 No Action Alternative are projected to be addressed or improved in the 2035 Action Alternative. One of the reasons is the modified concept of the South Capitol Street Improvement project. The modification plan proposed different interchange configurations at two locations. First, the 2035 No Action Alternative considers a traffic circle at the South Capitol Street and Suitland Parkway junction, while the 2035 Action Alternative assumes an oval rotary at this location. Second, at the intersection of Martin Luther King Jr. Avenue SE, the 2035 No Action Alternative would consider a SPUI; whereas the 2035 Action Alternative considers a tight urban diamond interchange to address the issue of short weaving distances and left-side ramps. Based on the analysis results from 2035 Action Alternative, the modified concepts at the South Capitol Street and Suitland Parkway would positively affect the traffic operations on the arterials within the Study Area.

Travel times on the major arterials would generally improve in the 2035 Action Alternative except at Martin Luther King Jr. Avenue SE and Firth Sterling Avenue. In the 2035 Action Alternative, moderate to intermediate congestion is projected along the Martin Luther King Jr. Avenue SE. With Master Plan Amendment 2, the campus consolidation would redistribute DHS-related traffic into the Gate 1 intersection under the 2035 Action Alternative, which would previously use the garage entrance for the FEMA headquarters located on the eastern side of Gate 2 intersection under 2035

No Action Alternative. By concentrating traffic to Gate 1, the Gate 1 intersection operations under the Action Alternative would become sensitive. In addition, the District's decision to redevelop the East Campus North Parcel would induce additional traffic as it would be an additional development on the corridor that are not accounted for in the 2035 No Action Alternative. As a result, operations at West Campus Gate 1 intersection at Martin Luther King Jr. Avenue SE would degrade during both peak hours in term of delay time and queues. Nevertheless, the impacts to traffic operational would be only localized at Gate 1 intersection of West Campus, and the overall arterial operations would remain similar as in the 2035 No Action Alternative.

7.2.4 Transportation Improvements

Given that the degradation of Gate 1 intersection operations is forecasted to be localized, the proposed improvements include lane channelization changes and lane storage capacity increases, which do not require additional right-of-way. Considering the operational issues under Action Baseline Alternative, four options (Options 1A, 1B, 1C, and 2A) have been proposed by combining different mitigations. Mitigation measures that are considered across four options are twofold. First mitigation is about lane utilization on the southbound rightmost lane – either to a hard-right turn with dedicated lane, to a continuous right turn through channelization, or to an exclusive right-turn lane and a shared right turn and through in the center lane. The second mitigation strategy is to expand to four lanes at the Gate 1 entrance or retain three lanes at Gate 1 entrance but convert the center lane to a reversible lane to accommodate peak direction traffic.

During the AM peak, all four improvement options would address delays in southbound Martin Luther King Jr. Avenue SE, and improved intersection operations from LOS E to C or better. In particular, 1A, 1B, 1C results in all movements are operationally acceptable (LOS D or better), but Option 2A results in LOS F for the left-turn traffic on the eastbound when the lanes in Gate 1 entrance reduces from 4 to 3 lanes. Option 1B and 1C outperform Option 1A by addressing the significant queue spillbacks from the southbound left-turn bay. Option 1B outperforms Option 1C in terms of resolving the significant delay on the northbound left-turn traffic by allowing for a complementary right-turn maneuver for the southbound approach. These options would significantly improve the southbound right-turn movement in the AM peak hours by changing the rightmost lane at the southbound approach to an exclusive right-turn lane. However, this change would take partial capacity from the southbound through movement. In the PM conditions where southbound through volumes are critical over the right-turn volumes, result analysis identified that all improvement options degrade the intersection operations, from LOS C under the Action Baseline Alternative to LOS D under Options 1A, 1B, or 2A, and LOS E under Option 1C. However, the impacts for most options would be limited and within an acceptable level at LOS D.

Aside from the Gate 1 improvements, incorporating dedicated bicycle lanes along Martin Luther King Jr. Avenue between Malcolm X Avenue and Gate 1 is currently under consideration. During the AM peak period, the introduction of bicycle lanes on Martin Luther King Jr. Avenue SE would have insignificant impacts to arterial and intersection operations. In the PM peak hour, the Gate 1 intersection would show slight increases in delay, compared to each of the without-bicycle lane options. Impacts on the other intersections along the Martin Luther King Jr. Avenue SE would be marginal during PM peak hour.

7.3 Conclusions

Based on the traffic analysis results, this study draws the following main conclusions:

- The 2035 Action Alternative aligned with Master Plan Amendment 2 identifies no system-level deficiencies, not causing major traffic operational failure within the Study Area.
- The 2035 Action Alternative would accommodate the campus trip changes upon the West Campus Consolidations with the completion of previously committed transportation improvements proposed in 2012 EIS/TTR by the design year of 2035. However, analysis results revealed some spot operational issues at the Gate 1 intersection of West Campus. The primary concerns are traffic operations on Martin Luther King Jr. Avenue SE and performance of the Gate 1 intersection in the design year.
- Through diverse options of Gate 1 improvements, provision for a dedicated right-turn lane on the southbound Martin Luther King Jr. Avenue SE accommodates inbound traffic to Gate 1, with the additional capacity of four lanes at the Gate 1 entrance driveway providing more reliable transportation option for inbound and outbound traffic during peak periods. Based on the results, the continuous right-turn lane under channelization would most effectively address the delay at Gate 1 intersection. In addition, analysis described that the impacts of expanding the existing bicycle lanes along Martin Luther King Jr. Avenue SE up to Gate 1 appear insignificant across the four Gate 1 improvement options during both AM and PM peak hours.

In all, the traffic operations in the 2035 Action Alternative would be within acceptable conditions at the system level, which is comparable with the 2035 No Action Alternative proposed in 2012 EIS/TTR. Additional recommendations in transportation improvements will be at spot level and will bring more sustainable and multimodal-friendly arterials near the West Campus and its neighborhood communities. The decision of which improvement options will be advanced is currently under discussion between GSA, DHS, DDOT, and other stakeholders. The final recommendation for transportation improvements as part of Master Plan Amendment 2 will be documented in the Final TTR.

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