Systems Interchange Modification Report (SIMR)

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1)

Duval County, Florida

FPID: 442414-1

October 2022

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Prepared for:

Florida Department of Transportation
District Two

1109 South Marion Avenue
Lake City, Florida 32020

October 2022

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Florida Department of Transportation

Determination of Safety, Operational and Engineering Acceptability

Acceptance of this document indicates successful completion of the review and determination of safety, operational and engineering acceptability of the Interchange Access Request. Approval of the access request is contingent upon compliance with applicable Federal requirements, specifically the National Environmental Policy Act (NEPA) or Department's Project Development and Environment (PD&E) Procedures. Completion of the NEPA/PD&E process is considered approval of the project location design concept described in the environmental document.

Requestor	DocuSigned by: 718194A7584B44F... David Tyler, P.E., AICP District Two	12/8/2022 | 8:13 AM EST Date
Interchange Review Coordinator	DocuSigned by: 718194A7584B44F... David Tyler, P.E., AICP District Two	12/8/2022 | 8:13 AM EST Date
Systems Management Administrator	DocuSigned by: 4AD03E6A337F401... Jenna Bowman, PE Systems Implementation Office – Central Office	12/13/2022 | 10:20 AM ES Date
State Chief Engineer	DocuSigned by: 042B6FE103D643A... Dan Hurtado, P.E. Central Office	12/13/2022 | 10:35 AM ES Date

SYSTEMS IMPLEMENTATION OFFICE

QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: 12-7-2022

FM Number: 442414-1

Project Title: I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) Systems Interchange Modification Report (SIMR)

District: Two

Requestor: David Tyler, P.E., AICP Phone: (386) 961-7842

District IRC: David Tyler, P.E., AICP Phone: (386) 961-7842

Document Type: ☐ MLOU ☐ IJR ☐ IMR ☐ IOAR ☒ OTHER SIMR

Status of Document (Only complete documents will be submitted for review; however, depending on the complexity of the project, interim reviews may be submitted as agreed upon in the MLOU)

Completed document with appendices and model files.

Quality Control (QC) Statement

This document has been prepared following FDOT Procedure Topic No. 525-030-160 (New or Modified Interchanges) and complies with the FHWA two policy requirements. Appropriate District level quality control reviews have been conducted and all comments and issues have been resolved to their satisfaction. A record of all comments and responses provided during QC review is available in the project file or Electronic Review Comments (ERC) system.

Requestor: [signature] Date: 12-7-2022
David Tyler, P.E., AICP

IRC: [signature] Date: 12-7-2022
David Tyler, P.E., AICP

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with BW Engineers and Planners, Inc., a Florida corporation authorized to operate under the provisions of Section 471.023, Florida Statutes, to offer engineering services to the public through a Professional Engineer, duly licensed under Chapter 471, Florida Statutes by the State of Florida Board of Professional Engineers and I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice hereby reported for:

PROJECT: I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) Systems Interchange Modification Report (SIMR)

LOCATION: Duval County, FL

FPID NUMBER: 442414-1

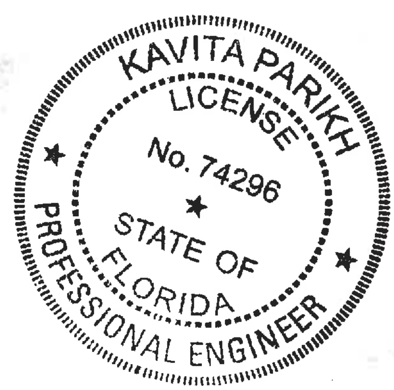
This report includes a summary of the data collection effort, safety analysis, operational analysis, discussion of build alternative, and summary of conclusions. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering and planning as applied through professional judgment and experience.

Name: Kavita Parikh, P.E., PTOE

Florida P.E. No.: 74296

Signature: K. Parikh

Date: 10/05/2022



EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) is conducting a Project Development and Environment (PD&E) study for the project limits concurrently with this Systems Interchange Modification Report (SIMR). The Interstate 95 (I-95) SIMR limits extend from north of the I-10 system-to-system interchange to south of the Martin Luther King Jr. Parkway interchange (SR 115/US 1), approximately two and a half miles. FDOT is proposing to widen the I-95 mainline to add two general purpose lanes in each direction between the I-95 C-D road entrance and north of 8th street. Lane additions of one to two lanes are proposed along the I-95 C-D road in both directions. In addition, modifications are proposed at several interchanges and intersections along the corridor to address capacity deficiencies, enhance safety and upgrade roadway design elements to meet current standards.

The purpose of this project is to add capacity, enhance operations, provide better travel time reliability and improve safety along the I-95 corridor and at the study interchanges. The need for this project is driven by current peak hour congestion and forecasted increased volumes along this segment of the interstate with periods of congestion extending the peak periods of travel. Several I-95 segments between I-10 and Martin Luther King Jr. Parkway are additionally listed as high crash segments. The spacing of interchanges has a significant effect on the operations and safety of any corridor. The spacing between ramps at several of the interchanges does not meet current standards. Also, several exit and entrance ramps are located on the left side of the mainline travel lanes in the segment between Myrtle Avenue and Kings Road which also effect the operations and safety. This SIMR considers safe connections to the interstate. Additionally, the capacity modifications will aid in reducing the number of crashes within the project limits by lessening congestion within the corridor and at the interchanges and providing better travel time reliability for the users.

The methodology used in this SIMR is documented in the Methodology Letter of Understanding (MLOU), signed in October 2020. The MLOU was approved by the FDOT District Two Interchange Review Coordinator (IRC) and FDOT Central Office. The MLOU outlines the criteria, assumptions, processes, analyses and documentation requirements for the project. The MLOU was prepared in accordance with the FDOT's Interchange Access Request User's Guide (IARUG). Traffic operational and safety analyses for this project were performed following the methodology approved in the MLOU. I-95 is a north-south limited access facility that serves as the main entryway to the Jacksonville Central Business District. The proposed I-95 mainline modifications are in the City of Jacksonville in Duval County, Florida. I-95 between the I-10 interchange and Martin Luther King Jr. Parkway is primarily six lanes (three in each direction) with various auxiliary lanes and collector-distributor roads (mainly near the I-10 interchange). The I-95 corridor within the study area is functionally classified as a Divided Urban Principal Arterial Interstate and has a posted speed limit of 55 miles per hour. There are seven interchanges within the area of influence (AOI) that provide connections to arterial facilities. Four ramps at two additional interchanges, I-10 and Martin Luther King Jr. Parkway, within the AOI, are also analyzed. The ramps at I-10 are the I-10 eastbound to I-95 northbound to off ramp and I-95 southbound to I-10 westbound/southbound C-D road. The ramps at Martin Luther King Jr. Parkway are the northbound to eastbound off ramp and the southbound on ramp.

In 2019, this segment of I-95 carried Annual Average Daily Traffic (AADT) volume of 151,000 vehicles north of the I-10 interchange at the beginning of the study corridor, 133,000 north of Kings Road, and 131,500 north of W 8th Street interchange which is towards the northern end of the study corridor.

A comparative assessment performed for the No-Build and Build Alternatives for the Design Year 2045 shows that the Build Alternative performs better than the No-Build Alternative. By providing additional lanes on the I-95 mainline and I-95 C-D road, the Build Alternative increases the overall capacity and reduces the densities at each segment along I-95 within the study area. The acceptable LOS target for the freeway, ramps and intersections within the AOI in this SIMR is LOS D. In the Design Year 2045 during the AM and PM peak hours, the I-95 mainline Build Alternative will operate at LOS D or better for all segments except those south of the I-95 northbound C-D Road entrance that will operate LOS E. For the same time period, the No-Build Alternative will have 73 percent of the I-95 mainline segments operating at LOS E or worse. A similar pattern is noticed for the I-95 C-D road which is forecasted to operate at LOS D or better with the 2045 Build Alternative during the AM and PM peak hours. Fifty percent of the I-95 C-D Road is forecasted to operate at an unacceptable LOS during the 2045 No-Build Alternative. Five of the 13 study intersections will operate at unacceptable LOS E or worse under the No-Build Alternative.

In the Design Year 2045, significant operational benefits result from the Build Alternative. Overall, the total delay along the network will decrease by 75 percent. The average speed in the network will increase by 75 percent, and the total travel time will decrease by 39 percent. All the intersections are expected to operate without excessive delay. These improvements will help process traffic traveling along I-95 and to and from the study interchanges.

Crash data over the five-year span (2013-2017) indicated 1,891 crashes occurred within the study area. Of those 1,891 crashes, 1,232 crashes occurred along the I-95 mainline corridor, of which eight were fatal and 330 crashes involved injuries. Rear-end crashes are the most predominant crash type within the study area and indicate stop-and-go conditions reflective of congestion. In addition to the crashes along the I-95 mainline, the existing crash data was collected along the I-95 C-D roadway and arterials within the AOI. 40 crashes occurred on the I-95 C-D roadway, 86 along Forest Street, 4 along Church Street, 227 along Kings Road and 302 along 8th Street. A detailed Predictive Safety Analysis was conducted for this project to evaluate the No-Build Alternative and the Build Alternative that adds two lanes in the northbound and southbound directions along the I-95 and one to two lanes along the I-95 C-D road within the study area. The Build Alternative will reduce crashes by approximately 10.4 crashes/year compared to the No-Build Alternative.

In conclusion, the Build Alternative showed significant operational improvements over the No-Build in Opening Year 2025 and the Design Year 2045. Based on the safety and traffic operations benefits of the Build, it is considered the preferred alternative for this SIMR.

This SIMR has been developed in accordance with relevant procedures and processes contained in the latest FDOT Project Traffic Forecasting Handbook (2019), FDOT Traffic Analysis Handbook (2021), FDOT Interchange Access Request User's Guide (2020) and FDOT Design Manual (2020).

E.1 Compliance with FHWA General Requirements

The proposed modifications to I-95 will provide traffic relief and enhance safety within the AOI. The preferred Build Alternative will operate better than the No-Build Alternative for this project.

E.1.1 FHWA Policy Point 1

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational *impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).*

An in-depth operational and safety analysis was conducted to study the operational and safety benefits offered by the proposed improvements when compared to the No-Build Alternative.

Several performance measures were used to compare the traffic operations and safety of the existing system under No-Build and Build conditions. Key measures include freeway densities, freeway volume to capacity (V/C) ratios, intersection delays, level of service (LOS), max queue lengths, crash rates and frequency, predominant crash patterns, expected crashes and potential crash reduction.

During the Opening Year 2025, the No-Build Alternative analysis showed that traffic operations are expected to degrade significantly, and several freeway segments will operate at unacceptable LOS E or worse during the AM and PM peak hours. These operational deficiencies are due to the increase in traffic within the study area by 2025. The Build Alternative, which provides general use lane capacity improvements through the extent of the study area, shows significant improvements over the No-Build, with all the freeway segments operating at acceptable LOS C or better in both AM and PM peak hours in Opening Year 2025. Arterial roadways will also benefit from the proposed improvements. By 2025 all study intersections will operate at an acceptable LOS in both AM and PM peak hours under the Build Alternative. The proposed improvements at the study intersections indicate a reduction in max queue length under the 2025 Build Alternative, where most of the proposed storage can accommodate the queues.

The Design Year 2045 operational analysis results show that the Build Alternative improved traffic operations within the I-95 study area compared to the No-Build Alternative. By providing two additional mainline lanes northbound and southbound on I-95 and an additional one to two lanes northbound and southbound on the I-95 C-D Road, the Build Alternative increases the overall capacity and reduces the densities along I-95 within the study area. In terms of intersection delay, the Build Alternative decreased the overall delay at the study intersections. The 42 percent of study intersections that were operating with unacceptable delay in 2045 No-Build Alternative improve to only one intersection performing at an unacceptable in the PM peak hour. This intersection (8th Street at Illinois Street) is not a terminal intersection and will not impact I-95 operations.

A total of 1,891 crashes occurred within the study area over a five-year span from 2013-2017. Of those 1,891 crashes, 1,232 crashes occurred along the I-95 mainline, which included eight fatalities and 330 injuries. A detailed Predictive Safety Analysis was conducted for this project for the period 2025 to 2045 to evaluate the No-Build Alternative and the Build Alternative that adds two lanes in the northbound and southbound directions along the I-95 corridor within the study area and one to two lanes on the I-95 C-D Road in the northbound and southbound directions. This analysis indicated that the predicted yearly average crashes for the I-95 mainline under the No-Build Alternative will be approximately 84.1 crashes whereas the Build Alternative is predicted to have approximately 71.3 crashes per year. The Build Alternative will reduce crashes by approximately 12.8 crashes/year along the mainline and by three crashes/year along the ramps compared to the No-Build Alternative. In addition to the improvements along I-95, improvements at the 8th Street interchange should reduce the number of crashes by 3.09 crashes/year. The Kings Road southbound terminal intersection should experience approximately the same number of crashes, with a 0.38 crashes/year difference between No-Build and Build Alternatives. New intersection connections at Union Street and Church Street may increase the number of crashes by 8.04 crashes/year and 0.13 crashes/year, respectively

Lastly, several interchanges and intersection improvements are proposed that cannot be accounted for using the HSM Part C methodology or CMF methodology. The proposed improvements are at I-95 at Forest Street interchange, I-95 at Church Street and Cleveland Street intersection, I-95 northbound at Beaver Street new terminal intersection, Beaver Street roundabout and I-95 southbound at I-95 C-D Road off ramp. As a result, a qualitative safety analysis was performed and concluded the overall safety benefits of these improvements:

- Reduction of conflict points and improved operations at intersections
- Reduced crash severity and conflict points due to eliminating some mainline weaving segments
- Reduction in speed at a roundabout intersection and a significant reduction in angle crash possibility
- Reduce the potential for mainline ramp queueing

- Reduced congestion-related accidents on mainline

Overall, the proposed improvements will benefit the study corridor (I-95) with a reduction in density, delay and crashes for future traffic conditions. Therefore, the proposed improvements will enhance the traffic operations and safety of the study corridor (I-95).

E.1.2 FHWA Policy Point 2

The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2) and 655.603(d)). In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial-interchange option. The report should also include the mitigation proposed to compensate for the missing movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements on ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.

I-95 is a public facility and all interchanges within the study area provide full access (interchanges at Forsyth Street/Bay Street, Monroe Street/Adams Street and Union Street connect to one-way streets) and will continue to do so with the Build Alternative. The Build alternative will maintain and provide all interchange accesses catering to all traffic movements to/from existing interchanges within the study limits.

The proposed improvements under the Build Alternative were designed to meet current standards for federal-aid projects on the interstate system and conform to the AASHTO and the FDM.

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1 INTRODUCTION

Interstate 95 (I-95) is in the City of Jacksonville, Duval County. The Florida Department of Transportation (FDOT) District Two requests the Federal Highway Administration's (FHWA's) approval of this Systems Interchange Modification Report (SIMR) for improvements to a portion of I-95 from north of the I-10 system-to-system interchange to the south of the Martin Luther King Jr. Parkway (SR 115/US 1) interchange, approximately two and a half miles in length. This SIMR has been developed in accordance with relevant procedures and processes contained in the latest FDOT Project Traffic Forecasting Handbook (2019), FDOT Traffic Analysis Handbook (2021), FDOT Interchange Access Request User's Guide (2020) and FDOT Design Manual (2020).

1.1 Background

I-95 is a significant component of the Strategic Intermodal System (SIS) and the National Highway System (NHS) and provides a key transportation element linking the major ports, airports and railways that handle Florida's passenger and freight traffic throughout the region. I-95 is a north-south limited access facility that provides the main entryway to the City of Jacksonville's Central Business District. I-95 also serves as a major emergency evacuation route for the state, as it connects to other major arterials and highways of the state evacuation route such as I-10, SR 9B and I-295. Currently, there are four general use lanes (GULs) on I-95 from south of Forest Street to north of Forsyth Street. The GULs then increase to six lanes and continue as six lanes past the northern AOI boundary. The additional lanes lead to connections to the southbound Collector-Distributor (C-D) road from Adams Street and connections from the northbound C-D road near the northbound Adams Street on ramp. This project aims to reduce congestion and improve traffic operations and safety through the study area.

FDOT conducted a Project Development and Environment (PD&E) study in 2018 for I-95 at Martin Luther King Jr. Parkway interchange, which is partially within the northern area of influence (AOI) limits of this SIMR project. The Interchange Modification Report (IMR) for the PD&E study was approved in October 2018, and the project is currently in the design phase. The IMR recommends eliminating the northwest quadrant loop ramp, signalizing movements at the I-95 southbound on/off ramps terminal intersection, signalizing the I-95 northbound on ramp intersection, extending the deceleration lane for the I-95 southbound off ramp to Martin Luther King Jr. Parkway eastbound and I-95 northbound off ramp to Martin Luther King Jr. Parkway westbound and repositioning the I-95 southbound off ramp to Martin

Luther King Jr. Parkway westbound. These improvements are proposed to increase the efficiency of I-95, Martin Luther King Jr. Parkway and the ramps by improving interchange operations, congestion and safety.

This SIMR documents traffic operational analysis and safety evaluations for the proposed improvements along the I-95 corridor and at the interchanges listed below. The pair of interchange ramps along the I-95 mainline which allow reciprocating movements are listed as one interchange.

- Forest Street
- Forsyth Street/Bay Street
- Monroe Street/Adams Street
- Union Street
- Church Street/ W Beaver Street
- Kings Road
- 8th Street

The interchanges of I-95 at I-10 and I-95 at Martin Luther King Jr. Parkway, south and north of the project limits respectively, are included within the AOI to understand their impacts to the mainline and other adjacent interchanges. These ramps include the I-10 eastbound to I-95 northbound off ramp, the I-95 southbound to I-10 westbound/southbound C-D road, the I-95 at Martin Luther King Jr. Parkway northbound to eastbound off ramp and the I-95 at Martin Luther King Jr. Parkway southbound on ramp. No improvements are recommended at these two (2) interchanges under this SIMR.

1.2 Purpose and Need

The purpose of this study is to add capacity on I-95 from north of I-10 to the south of the Martin Luther King Jr. Parkway interchange to provide better travel time reliability, improve safety and enhance operations along the I-95 study corridor and interchanges.

The need for this project is driven by current peak hour congestion and forecasted volumes along this segment of the interstate with periods of congestion extending the peak periods of travel. Congestion is expected to get worse in the future as the state of Florida and Jacksonville area continue to grow. The University of Florida's Bureau of Economic and Business Research (BEBR) has a Duval County 2020 population of 982,080. The BEBR data also projects Duval County's 2045 estimated population to be

1,192,500 (medium projection). This represents an increase of approximately 210,420 (21.4%) residents from 2020 to 2045.

Mobility

In 2019, this segment of I-95 carried Annual Average Daily Traffic (AADT) volume of 151,000 vehicles north of the I-10 interchange at the beginning of the study corridor, 133,000 north of Kings Road, and 131,500 north of W 8th Street interchange which is towards the northern end of the study corridor. Based on existing year analysis, the I-95 southbound mainline segments from Kings Road entrance to the C-D road exit (Kings Road entrance to Church Street exit in the AM peak hour) and Kings Road exit to Union Street exit (AM peak hour), currently operate below the LOS D target. Many merge/diverge segments along the corridor also operate at lower speeds.

Downtown arterials comprise of one-way streets and roadways with one to two lanes in each travel direction. In 2019, Forest Street carried an AADT of 2,600 vehicles, Bay Street carried an AADT of 10,400 vehicles, Union Street carried an AADT of 7,600 vehicles, Adams Street carried an AADT of 5,700 vehicles, Monroe Street carried an AADT of 3,1600 vehicles, Church Street carried an AADT of 700 vehicles, Beaver Street carried an AADT of 11,900 vehicles, Union Street carried an AADT of 28,500 vehicles, Kings Road carried an AADT of 26,000 vehicles and 8th Street carried an AADT of 18,700 vehicles.

The 2045 AADT forecast estimate for I-95 is 181,000 vehicles north of I-10 at the beginning of the study corridor, 168,000 north of Kings Road, and 160,000 north of W 8th Street interchange which is towards the northern end of the study corridor.

If no capacity improvements are made to the facilities, congestion within the corridor and at the interchanges will get progressively worse, with the periods of congestion extending the peak periods of travel, increasing the number of crashes and deteriorating the travel time reliability for the users.

Social/Economic Demand

I-95 is a major north-south corridor in central Jacksonville. Within the study limits, I-95 serves as the main entryway to the Jacksonville Central Business District (CBD) and connects suburban residential areas throughout the corridor to office, commercial, recreational and industrial areas. The communities of Brooklyn, LaVilla, Mixon Town, New Town, Hogan's Creek and Springfield are located adjacent to I-95 in the study area. Major employers are in the CBD such as CSX Corporation, TIAA Bank, Bank of America and Haskell. There are also tourism attractors downtown including but not limited to TIAA Bank Field (home of the Jacksonville Jaguars), the Baseball Grounds of Jacksonville, Jacksonville Veterans Memorial Arena, Prime F. Osborn III Convention Center and the Times-Union Center for the Performing Arts. North of the CBD and adjacent to the study area, UF Heath's Jacksonville complex attracts significant traffic from the surrounding areas.

The population of Duval County is expected to increase by approximately 29% and employment is expected to increase by 43% from 2015 to 2045 (Source: North Florida Transportation Planning Organization (North Florida TPO) 2045 Long Range Transportation Plan (LRTP)). This increase in population and employment will result in higher traffic volumes on I-95. Without any additional improvements, I-95 will begin to operate below FDOT target LOS D.

Modal Interrelationships

I-95 serves as a key transportation element in linking the major ports, airports and railways that handle Florida's passenger and freight traffic throughout the region. Additionally, I-95 is a National Highway on FDOT's SIS, which is Florida's high-priority network of transportation facilities important to the state's economy and mobility. SIS facilities are the workhorses of Florida's transportation system and account for a dominant share of the people and freight movement to, from and within Florida.

I-95 provides direct access to JAXPORT's Talleyrand Marine Terminal (SIS Seaport) via Martin Luther King Jr. Parkway and the Hart Expressway (Talleyrand Connector is currently under construction) and is used to transport cargo to/from the Jacksonville International Airport and other intermodal facilities. Once the Talleyrand Connector is constructed and enhanced Intelligent Transportation System (ITS) infrastructure along Martin Luther King Jr. Parkway is implemented, freight flow and accessibility to and from the Talleyrand Port District from I-95 will be improved.

In addition, connections from I-95 to W Forsyth Street and W Adams Street are designated SIS Strategic Growth Highway Connectors for the Jacksonville Greyhound bus station located on W Forsyth Street.

Safety

Crash data from 2013-2017 shows that a total of 2,061 crashes were reported over the five-year period resulting in 544 injury crashes and ten fatal crashes. The predominant collision type was rear end crashes in the study area. Common factors that contribute to rear end crashes are congestion, inadequate gaps in traffic, tailgating and driver distractions. Most of the congestion occurs during the morning and afternoon peak periods, which although accounting for only four-five hours, serve the highest volume of traffic in a day. Therefore, the number of crashes on I-95 within the study area may be closely related to the level of congestion caused by various attractions throughout the corridor. Without any improvements, the congestion on I-95 during the morning and afternoon peak hours will worsen and may lead to an increasing number of crashes.

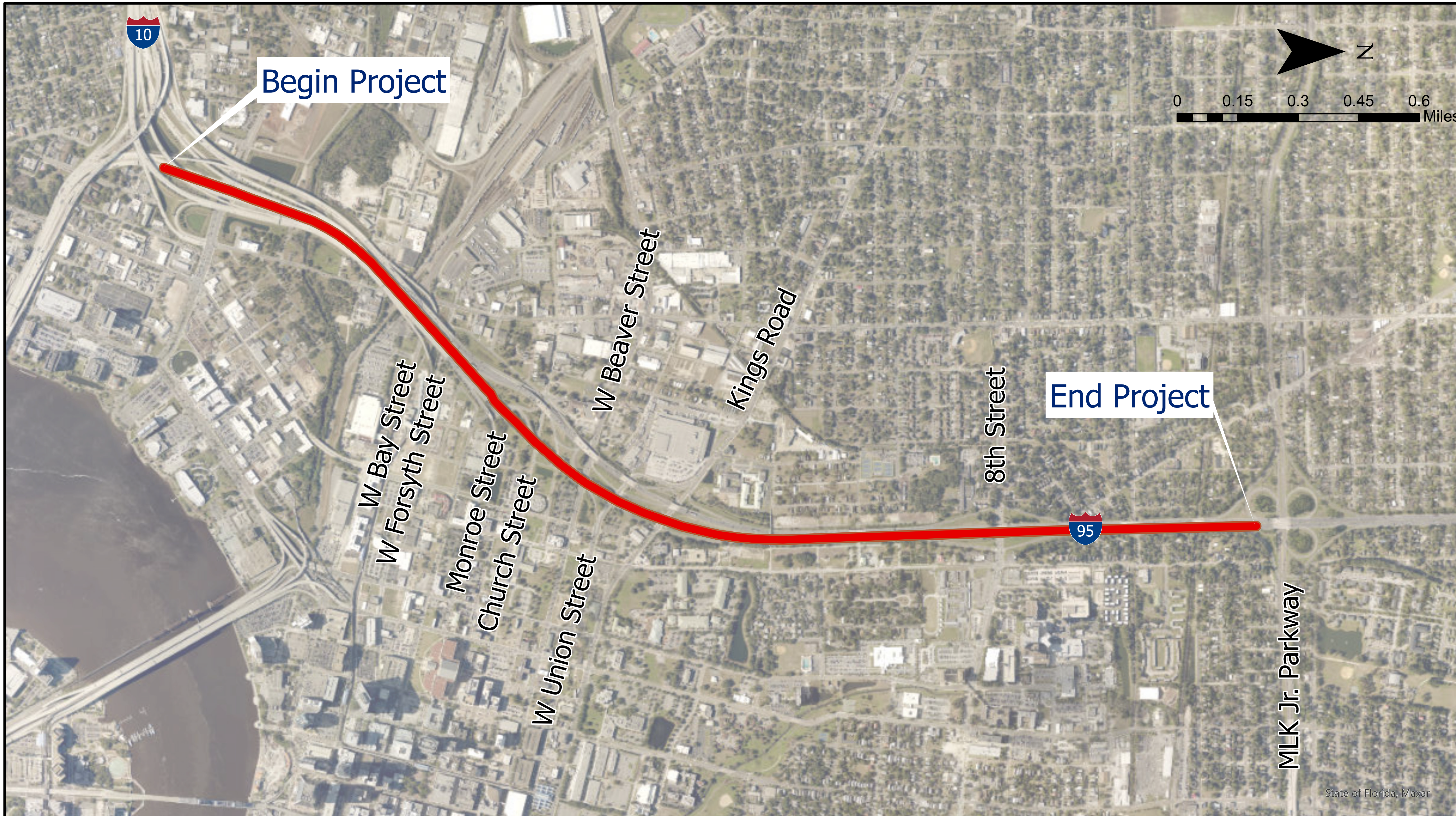
The spacing of interchanges has a significant effect on the operations and safety of any corridor. The close spacing of the interchanges is a result of construction of this segment as part of the Jacksonville Expressway System prior to the development of these standards. The spacing between ramps at several of the interchanges does not meet current standards. Also, several exit and entrance ramps are located on the left side of the mainline travel lanes in the segment between Myrtle Avenue and Kings Road which also effect the operations and safety. This SIMR will consider safe connections to the interstate. Additionally, the capacity modifications will aid in reducing the number of crashes within the project limits.

The project is anticipated to improve emergency evacuation capabilities by enhancing connectivity and accessibility to major arterials designated on the state evacuation route. I-95 serves as part of the emergency evacuation route network designated by the Florida Division of Emergency Management and Duval County. I-95 is critical in facilitating traffic during emergency evacuation periods as it connects to other major arterials and highways of the state evacuation route network such as I-10, SR 9B and I-295. Without any improvements to I-95, evacuation clearance times will continue to increase and may discourage residents from evacuating, thus jeopardizing public safety.

FDOT has initiated this SIMR to investigate alternatives for the I-95 facility that will help alleviate congestion and enhance safety and operations at the study interchanges to improve safety and operations throughout the study area.

1.3 Project Location

The project is in the City of Jacksonville's Central Business District, in Duval County, Florida. The project begins north of the I-10 system-to-system interchange and ends south of the Martin Luther King Jr. Parkway interchange. The land use along the project study area is highly urbanized with predominantly residential, commercial and office land uses adjacent to the I-95 corridor. The project location and the study area are shown in **Figure 1-1**.



FDOT

I-95 (SR 9) from north of I-10 to south of
Martin Luther King Jr. Parkway (SR 115/US 1)
SIMR

Project Location and Study Area Map

Figure 1-1

2 METHODOLOGY

2.1 Overview

A Methodology Letter of Understanding (MLOU) was prepared to document the methodology used for the analysis and evaluation in this SIMR. The signed MLOU is provided in **Appendix A**. The following sections summarize the methodology as set forth in the MLOU.

The methodology used for travel demand forecasting and development of design hour traffic is consistent with the FDOT Project Traffic Forecasting Handbook. The primary basis for traffic projections is version 3 of the adopted Northeast Regional Planning Activity-Based Model (NERPM-AB1v3) which has a base year of 2010 and a horizon year of 2040.

2.2 Area of Influence

The I-95 AOI for this study extends from the north of the I-10 interchange to south of the Martin Luther King Jr. Parkway interchange. **Figure 2-1** depicts the AOI along I-95 and crossing roadways.

There are seven study interchanges plus ramps at the adjacent interchanges of I-10 and Martin Luther King Jr. Parkway within the AOI along I-95. These seven study interchanges are listed below.

- Forest Street
- Forsyth/Bay Street
- Monroe Street/Adams Street
- Union Street
- Church Street/W Beaver Street
- Kings Road
- 8th Street

I-95 interchanges at Forsyth Street/Bay Street, Monroe Street/Adams Street, Union Street and Church Street/W Beaver Street connect to one-way streets or are not controlled by signalized intersections. For these interchanges, only on and off ramp connections along the I-95 mainline were analyzed. The Martin Luther King Jr. Parkway interchange was recently studied as part of a separate IMR approved in October 2018. As a result, this SIMR does not evaluate any additional improvements to the Martin Luther King Jr. Parkway interchange. The AOI extends to the adjacent on and off ramps of this interchange and ramp terminals are not included as per the Interchange Access Request User Guide (IARUG) requirements.

Along the arterials, the AOI includes the ramp terminal intersections and at least one signalized intersection adjacent to the ramp terminal intersections. There are 13 study intersections within the AOI along the crossing roadways (seven arterial intersections and six ramp terminal intersections). These study intersections are listed below:

Forest Street

- I-95 northbound ramp terminal
- I-95 southbound ramp terminal
- Park Street

Church Street

- I-95 southbound ramp terminal

Kings Road

- I-95 northbound ramp terminal
- Cleveland Street
- N Davis Street

8th Street

- I-95 northbound ramp terminal
- I-95 southbound ramp terminal
- Myrtle Avenue
- N Davis Street
- James Hall Drive
- Illinois Street

Adjacent Interchanges:

The below listed adjacent interchange ramps have been included in the traffic operational analysis per the guidance provided in the FDOT's IARUG:

- I-10 eastbound to I-95 Northbound off ramp
- I-95 southbound to I-10 westbound /southbound C-D Road off ramp
- I-95 at Martin Luther King Jr. Parkway northbound to eastbound off ramp
- I-95 at Martin Luther King Jr. Parkway southbound on ramp

FDOT	I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR	Area of Influence	Figure 2-1
			Page 10

2.3 Data Collection

The analysis conducted for this SIMR is based on a combination of data that includes recent data collection efforts and data available from FDOT Florida Traffic Online (FTO), straight-line diagrams and Google Earth aerial imagery. The data collection effort conformed to the Project Traffic Forecasting Handbook (Chapter Two – Traffic Data Sources and Factors) and Procedure 525-030-120. Additional existing conditions data that was necessary to understand recent land use changes was completed for this project. This includes the following data identified in the MLOU.

- Transportation System Data
  - Roadway Characteristics Data
    - Roadway geometry information
    - Functional Classification
    - Number of lanes
    - Truck data
    - Length of acceleration/deceleration lanes
    - Extent and amount of curvature along mainline I-95
    - Posted speed limits
  - Control Data
    - Signal timing data
    - Stop/Yield signs
    - Regulatory/Advisory speed limits
    - Guide sign locations
- Existing and Historical Traffic Data
  - Traffic counts were collected in the field during May 2017 as part of the traffic data collection effort for the I-95 Express Lanes Feasibility Study from Interstate (I-10) to Florida/Georgia State Line, prior to the COVID-19 pandemic. This 2017 count data was adjusted by applying a growth rate to develop the Existing Year 2019 traffic used in this SIMR. This approach ensured that the base traffic used in the SIMR is not impacted by the COVID-19 pandemic in 2020. Daily vehicle machine counts were collected in 15-minute intervals on typical weekdays, Tuesday, Wednesday and Thursday for up to forty-eight hours; peak hour turning movement counts were conducted from 6:00 a.m. to 10:00 a.m. and from 3:00 p.m. to 7:00 p.m. for the morning and evening peak hours, respectively.

    - Historical traffic volume information from FDOT FTO was used to supplement additional data needs and understand traffic growth since May 2017 to develop the Existing Year 2019 volumes.
    - In May 2017, a Bluetooth Origin and Destination Survey was conducted along the corridor with the objective of understanding the major origins and destinations of the study area and identifying potential corridor improvements. This data was utilized to gain an understanding of the popular routes being taken within the project area and traffic patterns.
- Land Use Data
    - Land use data was obtained from the Florida Geographic Data Library (FGDL).
- Environmental Data
    - Environmental data were produced using the Efficient Transportation Decision Making (ETDM) Environmental Screening Tool (EST). This project will be constructed within the existing right-of-way, so significant environmental impacts are not anticipated.
- Planned and Programmed Projects
    - The IMR for the I-95 at Martin Luther King Jr. Parkway PD&E study was approved in October 2018, and the project is currently in the design phase. The IMR recommended eliminating the northwest quadrant loop ramp, signalizing movements at the I-95 southbound on/off ramps terminal intersection, signalizing the I-95 northbound on ramp intersection, extending the deceleration lane for the I-95 southbound off ramp to Martin Luther King Jr. Parkway eastbound and I-95 northbound off ramp to Martin Luther King Jr. Parkway westbound and repositioning the I-95 southbound off ramp to Martin Luther King Jr. Parkway westbound.

2.4 Design Traffic Factors

The factors used for design traffic analysis include the Standard K (K) factor, Directional (D) factor, T_{Daily} factor and Peak Hour Factor (PHF).

- The K factor is the proportion of the AADT estimated to occur during the design hours of the Opening Year and Design Year, depending upon the area type and facility type.
- The D factor is the proportion of the 30th highest hour of the design year traveling in the peak direction.

- The T_{Daily} factor is the adjusted, annual daily percentage of truck traffic. The Design Hour Truck (DHT) factor is the percentage of truck traffic during the peak hour and can be estimated as half of the T_{Daily} factor.
- The PHF is applied to convert hourly flow to a peak 15-minute flow rate for capacity analysis.

The traffic factors used in this SIMR are presented in **Table 2-1** as obtained from the approved MLOU.

Table 2-1: Summary of Traffic Factors

Roadway	K	D	T_{24}	DHT	PHF	MOCF
I-95	8.5%	60.0%	8.0%	4.0%	N/A	N/A
Arterials	N/A	N/A	4.0%	2.0%	N/A	N/A

Source: 2019 FTO and May 2017 field counts

2.5 Travel Demand Forecasting

2.5.1 Project Traffic Forecast Development Methodology

The travel demand modeling and the future year 2025 and 2045 AADT forecasts developed by the Department as part of the I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study were utilized in this SIMR.

The methodology used for travel demand forecasting and development of design hour traffic volumes is consistent with the FDOT Project Traffic Forecasting Handbook. The primary basis for traffic projections is the NERPM-AB1v3, which has a Base Year of 2010 and a Horizon Year of 2040.

A minimum compounded growth rate was developed for the Existing Year 2019 volumes by comparing the growth between the 2017 AADTs and 2025 AADTs obtained from the I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study and also by comparing the growth between 2017 AADTs and 2019 AADTs obtained from FTO on all available roadway links in the study area.

2.5.2 Selected Travel Demand Model

The travel demand modeling and future year AADT forecasts for this study were developed by the Department as part of the I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study. The NERPM-AB1v3, with Base Year 2010 and Horizon Year 2040, was used to estimate the future years' daily forecasts for the study area. The NERPM-AB1v3 model is based on the Florida Standard Urban Transportation Modeling Structure (FSUTMS) and is recognized by both FDOT District Two, as well as the North Florida TPO as an acceptable travel demand forecasting tool which has been used to develop Design Traffic for several recent interchange improvement projects. The daily forecasts projected were used in the development of the Directional Design Hour Volumes (DDHV).

2.5.3 Validation Methodology

The NERPM-AB1v3 is validated to base year 2010. The base year and horizon year model validation was performed by the Department and daily forecasts were developed as part of I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study. No further modifications or validation of the travel demand model was performed as part of this SIMR. However, the future daily volumes and travel patterns were checked for reasonableness. Any changes made to the model volumes were submitted to the Department for review and approval.

2.6 Analysis Years

The MLOU establishes the following study years for the analysis of this SIMR:

- Existing Year: 2019
- Opening Year: 2025
- Design Year: 2045

In addition, the travel demand model years of evaluation were established as:

- Base Year: 2010
- Horizon Year: 2040

No Interim Year 2035 analysis is utilized for this project as the area adjacent to the project limits is relatively built out and the potential for land-use changes between the Opening Year 2025 and Design Year 2045 is minimal. The analysis years for future conditions are consistent with I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study.

2.7 Measures of Effectiveness

FDOT Topic No. 525-000-006 provides level of service (LOS) targets for the State Highway System (SHS). The acceptable LOS target from this document for the AOI is LOS “D” for the intersections, freeways and ramps. The following Measures of Effectiveness (MOEs) were used to evaluate the performance of the No-Build and Build Alternative considered and are reported as listed below:

- Network-wide Output: Average speed (mph), total travel time (hr), total delay time (hr), latent demand (vehicles), latent delay (hr) and vehicles arrived.

- Freeway Segments: Estimated Level of Service (LOS), Operating speed (mph), volume and estimated density in hourly intervals (pc/mi/ln), density heat diagrams for 15-min intervals to illustrate any operational concerns along the freeway mainline segments.
- Intersections/ interchange performance: Volume, delay and max queue length (ft) for ramp movements.

Link based density obtained from the microsimulation model is in vehicles per mile. Methodology recommended in Traffic Analysis Handbook, 2021 to convert microsimulation model density to passenger cars per mile per lane was utilized to document hourly density.

2.8 Safety Analysis

A quantitative safety analysis based on the procedures in the Highway Safety Manual (HSM) was also performed as part of this SIMR. Crash data was obtained from an approved FDOT safety office source, University of Florida's Signal Four Analytics, for the five-year period (January 1, 2013 to December 31, 2017) on the mainline, interchanges and major cross streets within the AOI. The data collected included the number, type and location of crashes, the crash severity and estimates of property damage. Actual crash rates along the facility were compared with the statewide average rates for similar facilities to determine if any high crash locations exist within the study area. Utilizing the information obtained from the crash data, the evaluation identified needs associated with the safety of the existing facility. The SIMR identified the source of the crash data, documented crash rates and compared them to the statewide averages for similar corridors.

The predictive safety analysis complies with the guidelines of the FDOT IARUG and includes the use of Safety Performance Functions along with the Empirical Bayes Method (where applicable) to determine the estimated change in the expected number of crashes due to the proposed improvements of the project.

This SIMR also provides tables and figures summarizing the analysis results. The following MOEs were used to evaluate the safety performance of the No-Build and Build Alternatives.

- Crash rate
- Crash frequency
- Predicted reduction in crashes

2.9 Analysis Procedures

AM and PM peak hour operations within the study area were assessed under existing, No-Build and Build conditions. Analysis of I-95 and the arterials, including the interchange ramps and the adjacent signalized intersections, were based on criteria and policies detailed in the FDOT Traffic Analysis Handbook, 2021 Edition. The methods, tools and assumptions are described in this section.

The operational analysis for this study was performed using Vissim 2020 and Synchro 10. Vissim microsimulation was used to assess the study area on a network-wide basis. In addition, it was used to assess the traffic operation conditions of individual facilities, such as the freeway mainline, ramps and signalized intersections. Synchro 10 was used for the execution of existing timing plans to aid in signal timing optimization for future year scenarios.

The microsimulation analysis using Vissim software was conducted to evaluate the system-wide operational performance. Microsimulation analysis enhances the capability of capturing the network-wide vehicular interaction between the individual roadway elements (mainline segments, ramp junctions and arterial intersections). The microsimulation model was calibrated to the existing year traffic counts and speeds observed in the field. The simulation model was modified accordingly to reflect future conditions. A three-hour AM and PM peak period analysis was conducted using 15-minute flow rates with microsimulation for Existing Year 2019. The microsimulation was performed consistently with guidelines provided in the FDOT 2021 Traffic Analysis Handbook. Ramp, mainline and entry volumes were calibrated to within 10% of counts. Existing Travel time data for the project corridor was not collected considering it could have been impacted due to decreased traffic following COVID-19 instead project corridor speed data from the Regional Integrated Transportation Information System (RITIS) were utilized. Speed profiles of the field data and simulation data illustrated similar trends.

Vissim is a stochastic model that produces different results by changing the random seed numbers. To ensure model variation does not skew the results, a certain number of model runs is required. A sample size of 10 runs was used for the initial test and the results from these runs were averaged. The number of required runs was calculated from the Student's t-test using a 95% confidence level with a 10% allowable error. The results of the Existing Year 2019 statistical analyses are provided in **Appendix B**.

2.10 Alternatives Considered

The following scenarios were considered for this project:

- Existing Year 2019 – AM and PM peak hours and peak periods
- No-Build Alternative – Opening Year 2025 and Design Year 2045 – AM and PM peak hours and peak periods
- Build Alternative – Opening Year 2025 and Design Year 2045 – AM and PM peak hours and peak periods

2.11 Model Spatial Limits

The VISSIM model spatial limits are based on this SIMR's AOI. The AOI typically

includes adjacent interchanges that could be affected by the construction of the proposed project or future improvements to adjacent interchanges that could influence how the proposed project is constructed.

The following segments were included in the AOI for the Vissim analysis:

- I-95 from north of I-10 to south of Martin Luther King Jr. Parkway
- I-95 C-D Road from I-10 to I-95 northbound entrance/southbound exit
- All interchanges and intersections within these limits

2.12 Model Temporal Limits

The temporal limits of the modeling period relate to the location of the project, the length of peak periods and the duration of the expected congestion. Field observations and RITIS data were used to determine the temporal limits and develop speed profiles for this project.

The model temporal limit assumed for this study was a three-hour AM and three-hour PM peak period for existing calibration and a three-hour AM and three-hour PM peak period for future year models. The three-hour AM and PM peak period models were achieved by developing "shoulder hours" to the AM and PM peaks, which were based on the existing traffic counts in the study area. The shoulder hours allowed the modeling to capture the buildup to the congestion, the potential failure and the recovery of the transportation network in the AOI for this study. Additionally, a thirty-minute seed period was used to load traffic prior to the start of the three-hour period. Fifteen-minute volumes were developed for each hour of the peak period.

2.13 Model Calibration

Traffic simulation software Vissim 2020 was utilized for simulating the project area. VISSIM models were constructed and calibrated to existing conditions. The simulation calibration incorporated guidance and criteria from FDOT's Traffic Analysis Handbook. Traffic volume data, project corridor speed data from RITIS and field observations were used for calibrating the VISSIM models.

The calibration of the existing AM and PM peak-period models targeted the thresholds indicated in the FDOT's Traffic Analysis Handbook. Individual link flow targets are 15% of field traffic flows for more than 85% of cases. The target of the GEH statistic is less than five for more than 85% of the links. Travel time targets are within 15% of the field measured speeds for more than 85% of cases. The target of the modeled average link speeds to be within the ±10 mph of field-measured speeds on at least 85% of all network links Travel speed profiles compared RITIS speed with the simulation output to make sure that the simulation model replicates the field conditions and areas of congestion.
Visual audits of the simulation were performed to the analyst's satisfaction to observe speed-flow relationships for individual links and appropriate queuing at bottlenecks. Average travel speeds, individual link speeds and peak period speed profiles for both directions were used to replicate the congestion and assess the performance of the freeway segments.

The Existing Conditions analysis has a simulation duration to allow traffic flow conditions for the buildup and dissipation of congestion. For the existing conditions, three-hour AM and PM peak periods analyses were conducted using 15-minute flow rates in addition to the required seed time. The required number of simulation runs was determined using statistical tests with a 95% confidence level and an allowable error of 10%. Any simulation model parameter adjusted from the default value during the calibration process was documented in the Vissim Existing Conditions Model Development and Calibration Report.

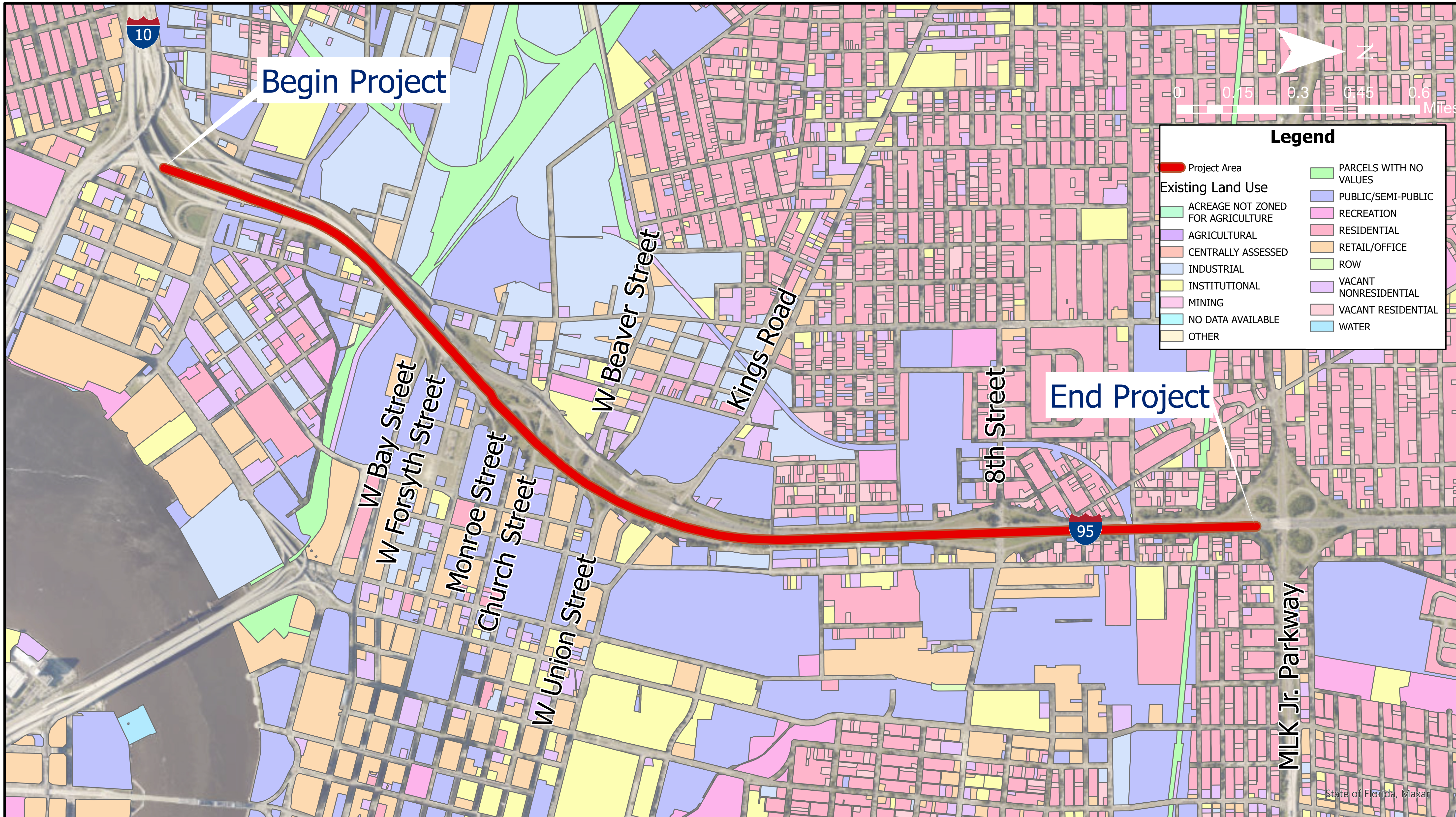
All future year Build models were created from the calibrated 2019 existing model. The future conditions assumed that all viable enhancements to the traffic control devices and signal timing optimizations are executed. Synchro 10 was used for signal timing optimization for future conditions. These timings were implemented within the Vissim models and adjusted if necessary. The calibration effort was documented in detail in the Vissim Existing Conditions Model Development and Calibration Report provided in **Appendix B**.

3 EXISTING CONDITIONS

The following section provides a brief discussion and evaluation of the existing conditions within the AOI for the I-95 SIMR project. This discussion includes existing land use data, transportation systems data, existing traffic data and existing operating conditions.

3.1 Existing Land Use

The project study area is in the Jacksonville Metropolitan Statistical Area and within Duval County. The I-95 corridor serves as the main gateway to Jacksonville's Central Business District and is a primary commuter corridor for Duval, St. Johns and Nassau County residents and an evacuation corridor for the state. The corridor is also the main thoroughfare for freight moving in and out of Talleyrand Marine Terminal. **Figure 3-1** shows the major land-use types along the study corridor of I-95.



FDOT	I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR	Existing Land Use	Figure 3-1
			Page 20

3.2 Existing Transportation Network

3.2.1 Existing Roadway Network

Table 3-1 lists the functional classification, speed limit and number of lanes for the roadways within the AOI.

Table 3-1: Functional Classification of Area Roadways

Roadway	Functional Classification[1]	Posted Speed Limit (mph)	Number of Lanes
I-95	11 – Urban Principal Arterial – Interstate	55	4-6
Forest Street	16 – Urban Minor Arterial	35	5-6
Forsyth Street/Bay Street	16 – Urban Minor Arterial	30	4
Monroe Street/Adams Street	16 – Urban Minor Arterial	30	5
Union Street	14 – Urban Principal Arterial -Other	35	1-4
Church Street/W Beaver Street	16 – Urban Minor Arterial	30	2-4
Kings Road	16 – Urban Minor Arterial	30	3-4
8th Street	16 – Urban Minor Arterial	30	4

[1]Source: Census 2010 Functional Classification, FDOT Straight-Line Diagrams and Urban Boundary based map for Duval County.

I-95 – I-95 within the study area is primarily a six-lane, north-south, limited-access facility with connections to a southbound C-D road from Adams Street and connections from the northbound C-D road near the northbound Adams Street on ramp. The median width in this section of I-95 varies from a 16-foot paved median with barrier wall to a 150-foot median with vegetation. I-95 forms service interchanges with Forest Street, Bay Street/Forsyth Street, Adams Street/Monroe Street, Church Street, Beaver Street, Union Street, Kings Road, Martin Luther King Jr. Parkway/US 1/SR 115 and 8th Street and a system-to-system interchange with I-10.

Arterial corridor

There are seven existing study interchanges within the project limits. **Figure 3-2** depicts the existing lane geometry and configuration.

Forest Street – This corridor consists of five lanes west of I-95 and six lanes east of I-95 (three lanes in each direction). Within the study area, Forest Street has a posted speed of 35 mph with one signalized intersection. Forest Street is functionally classified as an Urban Minor Arterial.

Forsyth Street/Bay Street – This corridor consists of four lanes, two lanes on Forsyth Street and two lanes on Bay Street. These streets are one-way with a posted speed of 30 mph, and the on and off ramps are uncontrolled. Forsyth Street/Bay Street is functionally classified as an Urban Minor Arterial.

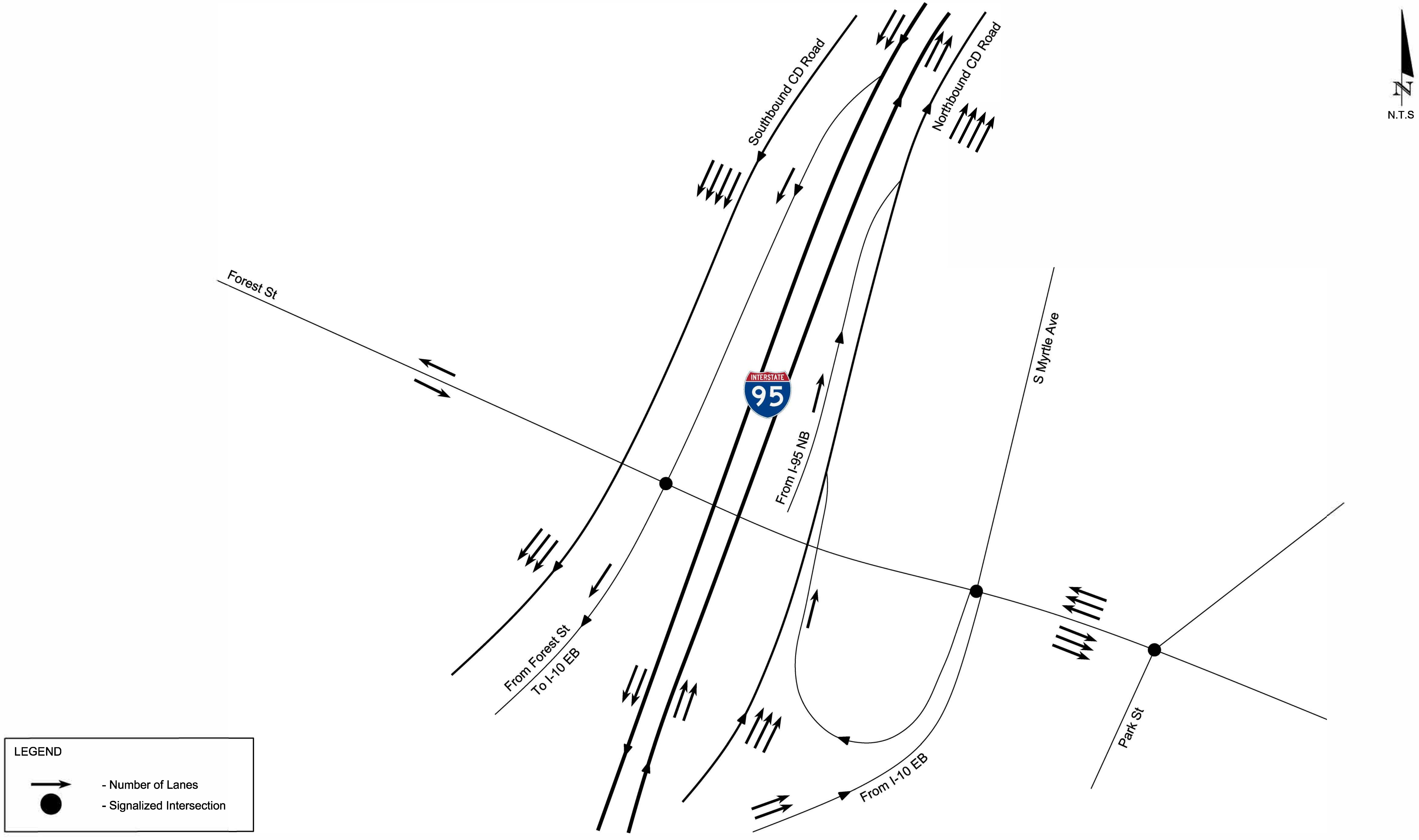
Monroe Street/Adams Street – This corridor consists of five lanes, three lanes on Adams Street and two lanes on Monroe Street. These streets are one-way with a posted speed of 30 mph, and the on and off ramps are uncontrolled. Monroe Street/Adams Street is functionally classified as an Urban Minor Arterial.

Church Street/W Beaver Street – This corridor consists of two to four lanes, two lanes on Church Street (one lane in each direction) and four lanes on W Beaver Street (two lanes in each direction), with a posted speed of 30 mph and one signalized I-95 southbound ramp terminal. The Beaver Street northbound ramp terminal is unsignalized. Church Street/W Beaver Street is functionally classified as an Urban Minor Arterial.

Union Street – This corridor consists of four one-way lanes, one lane west of I-95 and four lanes east of I-95, with a posted speed of 35 mph. The on and off ramps are uncontrolled. Union Street is functionally classified as an Urban Principal Arterial-Other.

Kings Road – This corridor consists of four lanes west of I-95, two lanes in each direction and three lanes east of I-95 (one-way) with a posted speed of 30 mph, two signalized intersections and a diamond interchange. Kings Road is functionally classified as an Urban Minor Arterial.

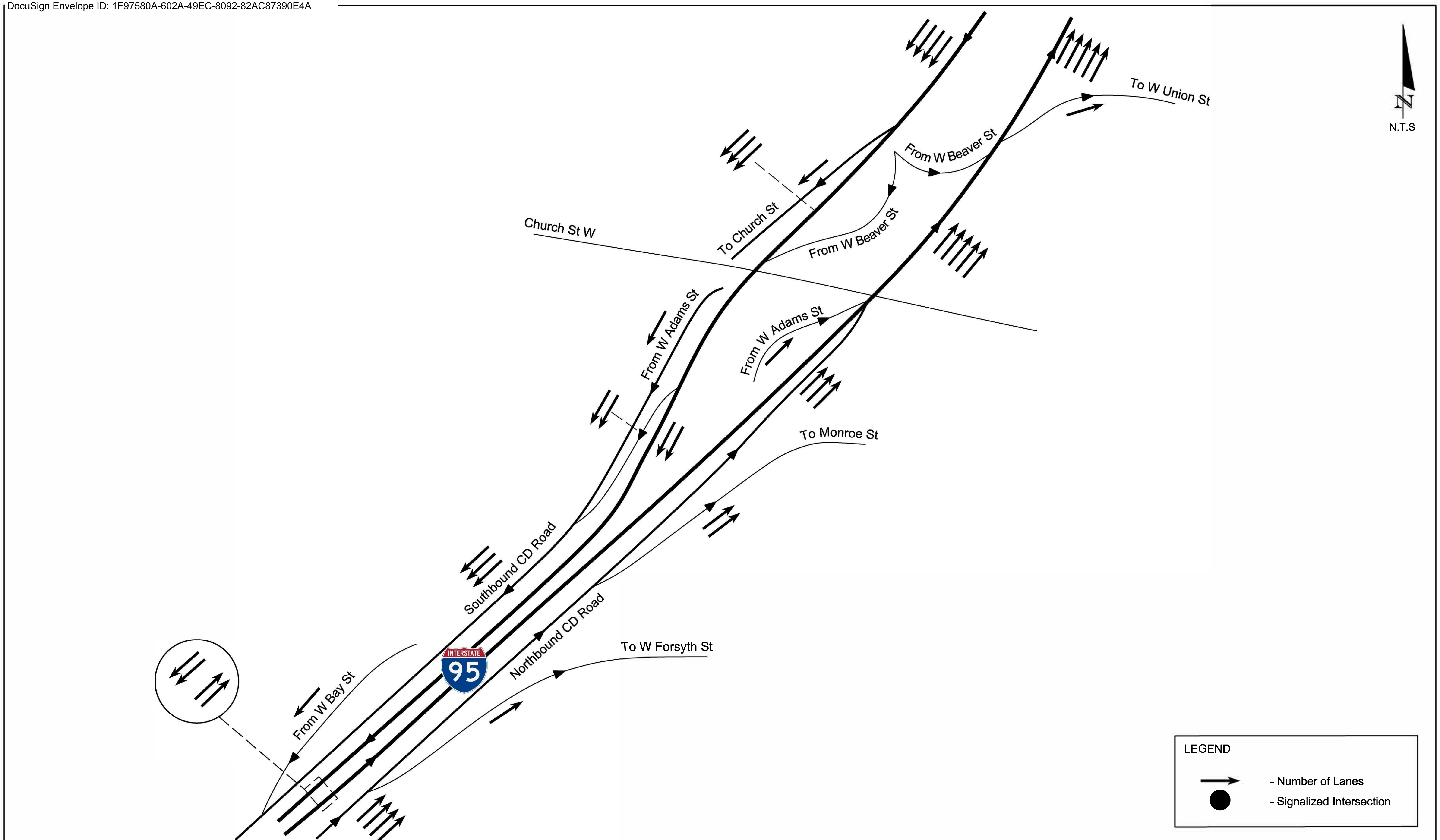
8th Street – This corridor consists of four lanes, two lanes in each direction, with a posted speed of 30 mph, four signalized intersections and a diamond interchange. 8th Street is functionally classified as an Urban Minor Arterial.



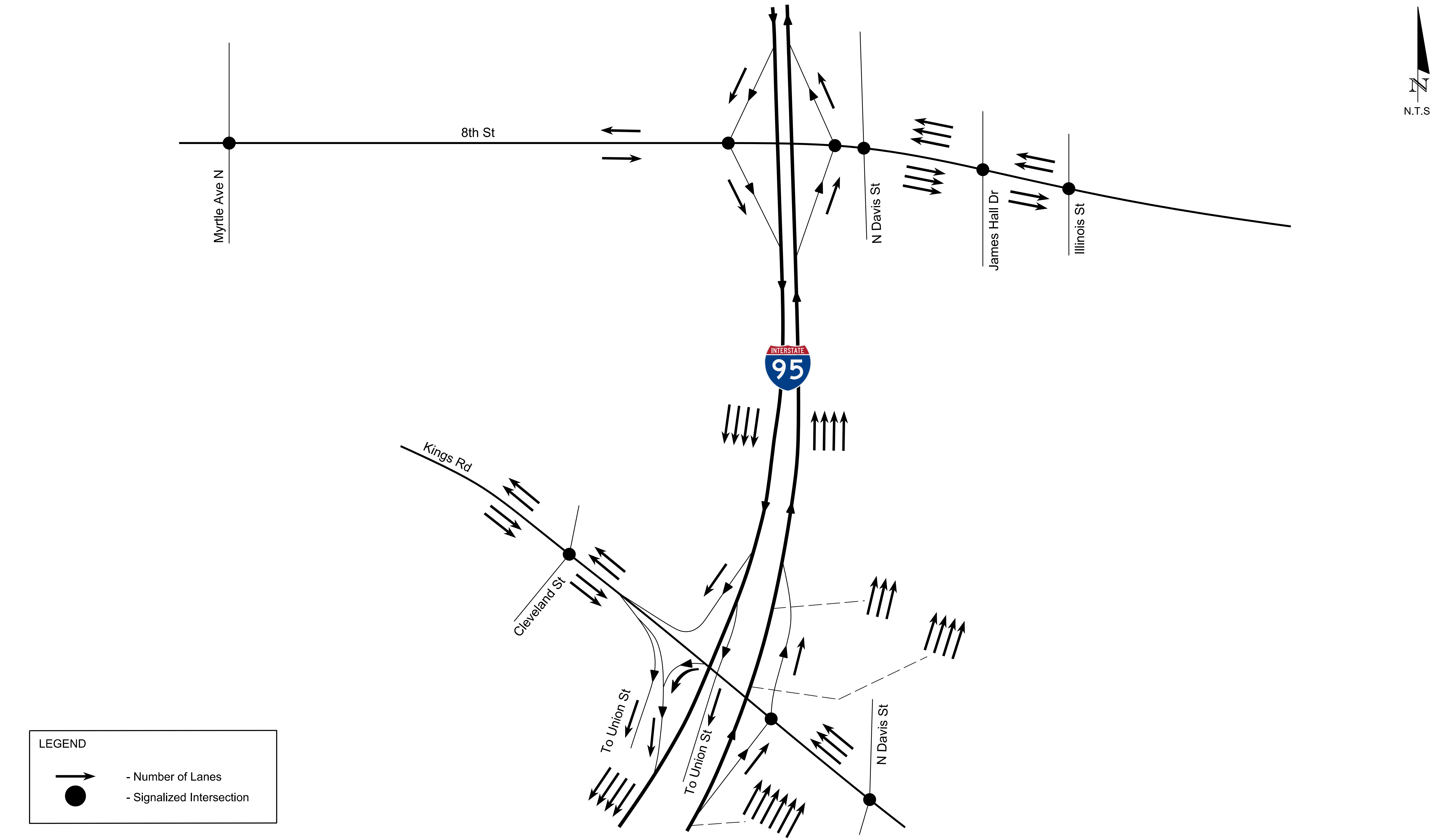
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Lane Configuration

Figure 3-2
Sheet 1/4



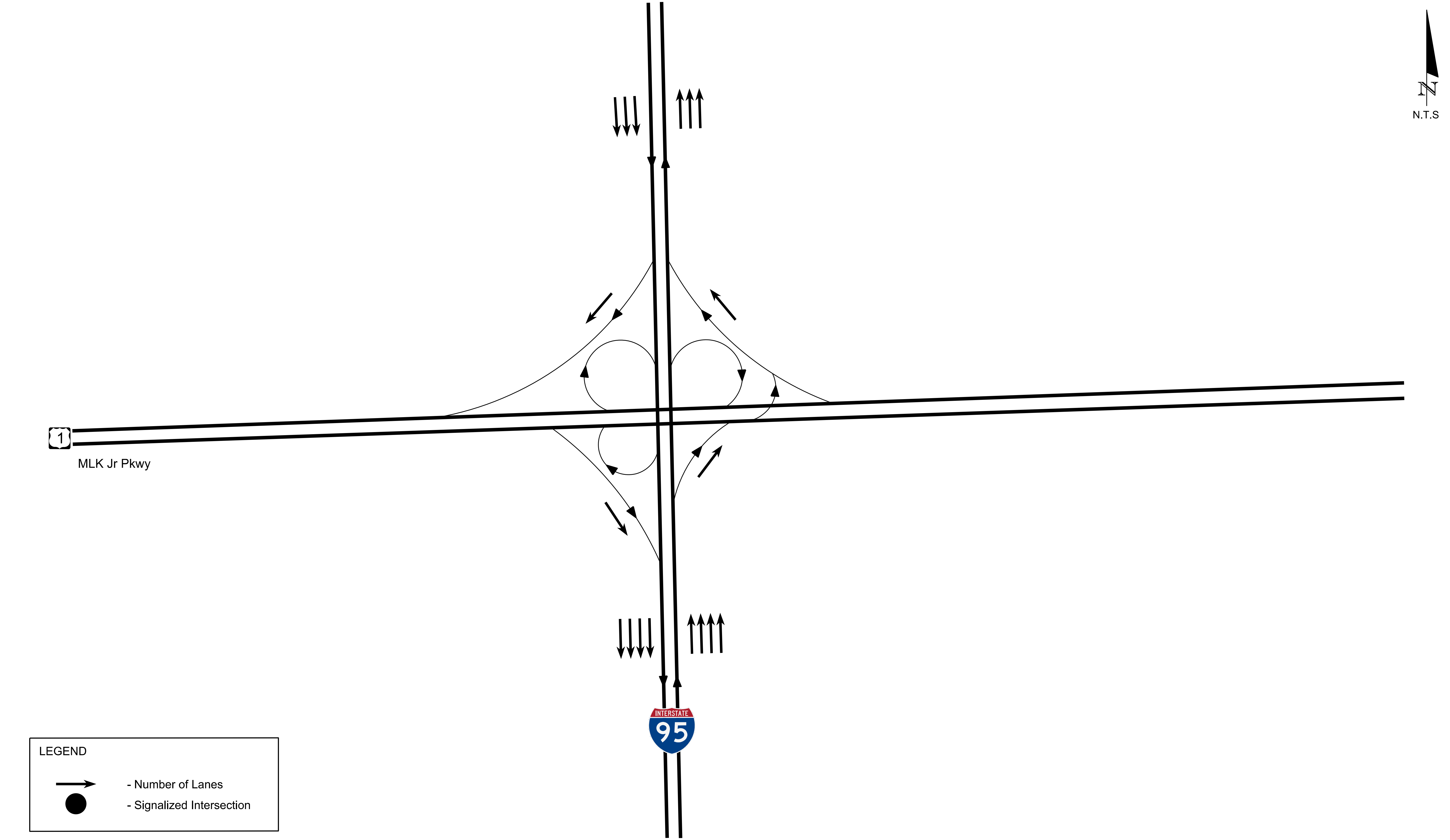
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)	Existing Year 2019 Lane Configuration	Figure 3-2 Sheet 2/4



I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Lane Configuration

Figure 3-2
Sheet 3/4



FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Lane Configuration

Figure 3-2
Sheet 4/4

3.3 Alternative Travel Modes

The I-95 corridor is an urban limited-access facility, bicyclists and pedestrians are prohibited from using this facility. The Jacksonville Transportation Authority (JTA) at LaVilla is located on Bay Street adjacent to the study area. It is the main transfer facility downtown with JTA bus routes, the First Coast Flyer, the Skyway, regional shuttles, rideshare, paratransit and other shared transportation in one facility. There are multiple buses with a fixed route service that runs along I-95 in the study area. This includes Route 1-North Main, Route 11 – A Philip Randolph, Route 12- Myrtle/Lem Turner, Route 21- Boulevard/Gateway and Route 22- Avenue B. No alternate travel mode is considered implementable enough to impact traffic and will not change vehicle demand on I-95 within the study area.

3.4 Interchanges

The project AOI includes seven study interchanges along I-95. The adjacent interchange south of the project limit (I-95 at I-10 system-system interchange) and the adjacent interchange north of the project limit (I-95 at Martin Luther King Jr. Parkway) were included in the traffic operational analysis per the guidance provided in the FDOT's IARUG. The ramps analyzed at these interchanges are as follows:

- I-95 at I-10 (south of project limit)
    - I-10 eastbound to I-95 northbound off ramp
    - I-95 southbound to I-10 westbound /southbound C-D Road
- I-95 at Martin Luther King Jr. Parkway (north of project limit)
    - I-95 at Martin Luther King Jr. Parkway northbound to eastbound off ramp
    - I-95 at Martin Luther King Jr. Parkway southbound on ramp

Table 3-2 and Table 3-3 provide the interchange locations, mileposts and descriptions. I-95 within the study area is a SIS facility.

Table 3-2: I-95 Interchange Data (Northbound)

I-95 Interchange	Description	Milepost	Ramp Spacing (miles)
I-10	System-to-System Interchange	2.517	-
Forest Street (NB on ramp from US 17)	Partial Cloverleaf Interchange	2.784	0.3
Forsyth Street/Bay Street (C-D Road NB on ramp to I-95)	Three Leg Directional Interchange	3.402	0.6
Monroe Street/Adams Street (NB on ramp from Adams Street-LT Lane)	Three Leg Directional Interchange	3.563	0.2
Church Street/W Beaver Street (NB on ramp from Beaver – LT Lane)	Partial Diamond Interchange	3.673	0.1
Union Street (NB off ramp to Union)	Three Leg Directional Interchange	3.726	0.1
Kings Road (NB off ramp to Kings Road)	Diamond Interchange	3.807	0.1
Kings Road (NB on ramp from Kings Road)	Diamond Interchange	4.035	0.2
8th Street (NB off ramp to 8th Street)	Diamond Interchange	4.453	0.4
8th Street (NB on ramp from 8th Street)	Diamond Interchange	4.743	0.3
Martin Luther King Jr. Parkway (NB off ramp to EB MLK)	Partial Cloverleaf Interchange	5.146	0.4

Table 3-3: Interchange Data (Southbound)

I-95 Interchange	Description	Milepost	Interchange Spacing (miles)
Martin Luther King Jr. Parkway (SB on ramp from EB MLK)	Partial Cloverleaf Interchange	5.087	-
8th Street (SB off ramp to 8th Street)	Diamond Interchange	4.750	0.3
8th Street (SB on ramp from 8th Street)	Diamond Interchange	4.475	0.3
Kings Road (SB off ramp to Kings Road)	Diamond Interchange	4.022	0.5
Union Street (SB off ramp to Union-LT Lane)	Three Leg Directional	3.87	0.2
Kings Road (SB on ramp from State St.)	Diamond Interchange	3.815	0.1
Church Street/W Beaver Street (SB Off Ramp to Beaver Street)	Partial Diamond Interchange	3.711	0.1
Church Street/W Beaver Street (SB on ramp from Beaver Street – LT Lane)	Partial Diamond Interchange	3.541	0.2
Monroe Street/Adams Street (SB off to C-D)	Three Leg Directional Interchange	3.364	0.2
Forest Street (SB off ramp to Forest Street)	Partial Cloverleaf Interchange	2.900	0.5
I-10 (Off ramp to I-10)	System-to-System	2.680	0.2

3.5 Existing Operational Performance

This section summarizes the existing traffic and operational analysis performed within the AOI to assess the traffic and mobility conditions. This facility accommodates interstate and regional mobility for commuter and freight traffic.

3.5.1 Existing Traffic Data

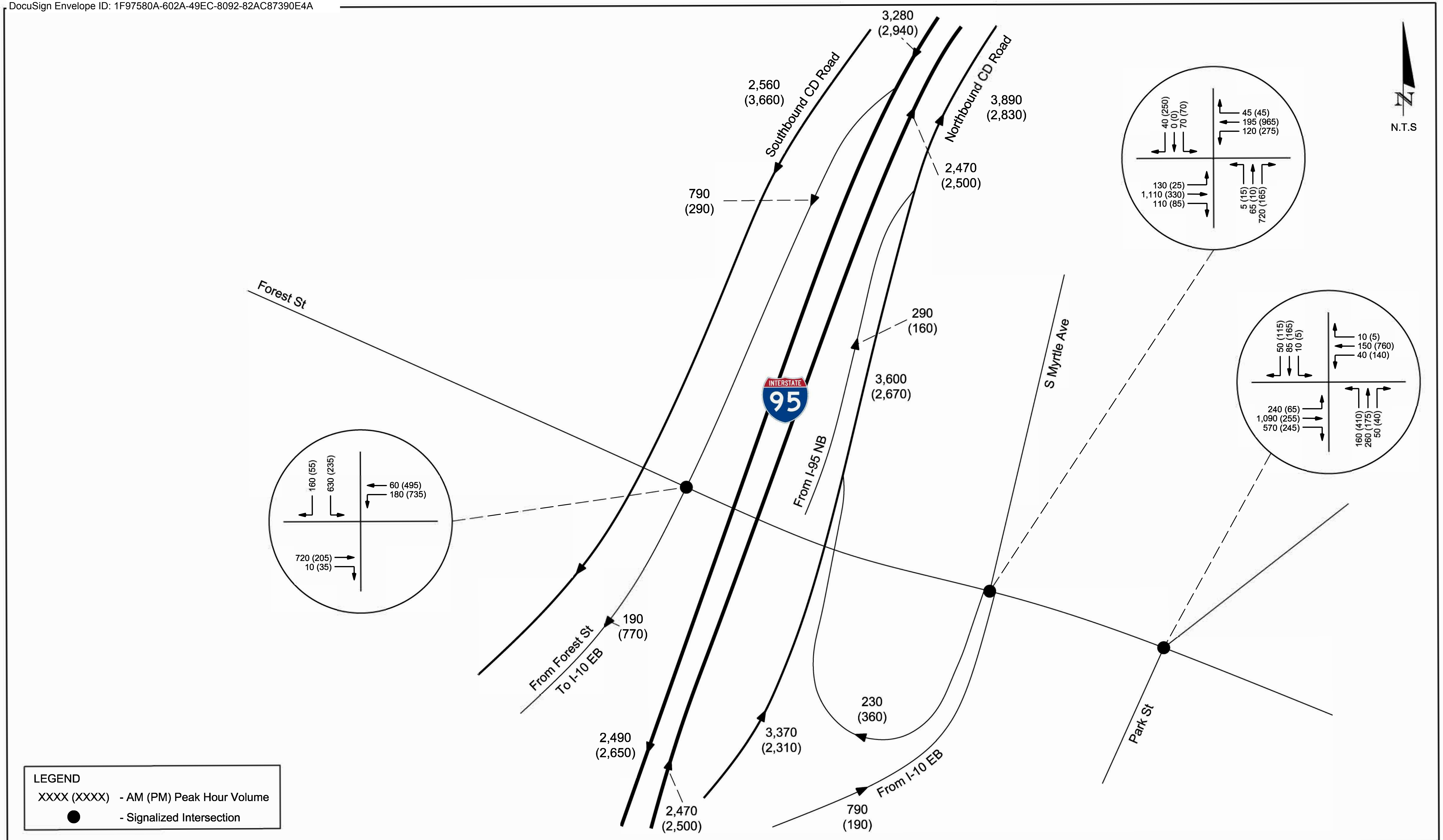
Existing daily vehicle counts and turning movement counts were conducted within the study area in May 2017 as part of the traffic data collection effort for I-95 from Interstate 10 (I-10) to Florida/Georgia State Line Express Lanes Feasibility Study. Daily vehicle machine counts were collected in 15-minute intervals on typical weekdays, Tuesday, Wednesday and Thursday for up to forty-eight hours; peak hour turning movement counts were conducted from 6:00 a.m. to 10:00 a.m. and from 3:00 p.m. to 7:00 p.m. for the morning and evening peak hours, respectively.

These counts were checked for reasonableness and validated prior to use in this study. Historical traffic volume information from FDOT Florida Traffic Online (FTO) was used to supplement additional data needs and understand traffic growth since May 2017 to develop the Existing Year 2019 volumes.

A minimum compound growth rate of 0.5% was developed for the study area by comparing the growth between 2017 AADTs and 2019 AADTs obtained from FTO on all available roadway links in the study area. This compound growth rate was applied to the 2017 field counts to develop the estimated Existing Year 2019 AADTs, DDHVs and turning movement volumes. The 0.5% growth rate is reflective of the built out Jacksonville core urban study area. Synopsis reports were obtained for the I-95 mainline count stations from 2017 to 2019. Traffic information from these synopsis reports resulted in a 0.5% growth rate. The Existing Year 2019 traffic volumes used in the SIMR match very closely to the 2019 historic traffic counts.

In May 2017, a Bluetooth Origin and Destination Survey was conducted along the corridor with the objective of understanding the major origins and destinations of the study area and identifying potential corridor improvements. This was utilized to gain an understanding of the popular routes being taken within the project area and traffic patterns.

Figure 3-3 illustrates the estimated peak hour volumes for Existing Year 2019.



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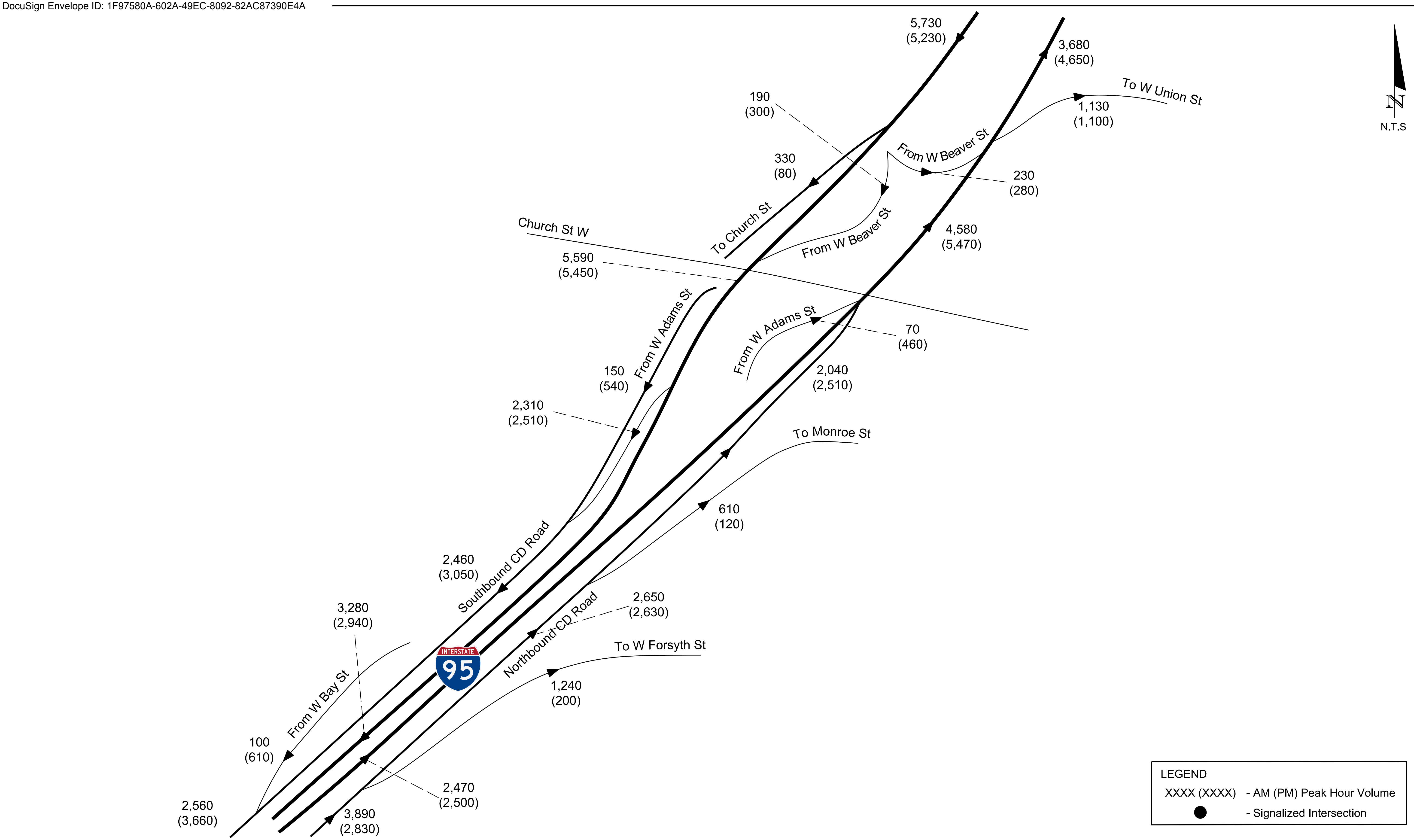
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 3-3
Sheet 1/4



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I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 3-3
Sheet 2/4

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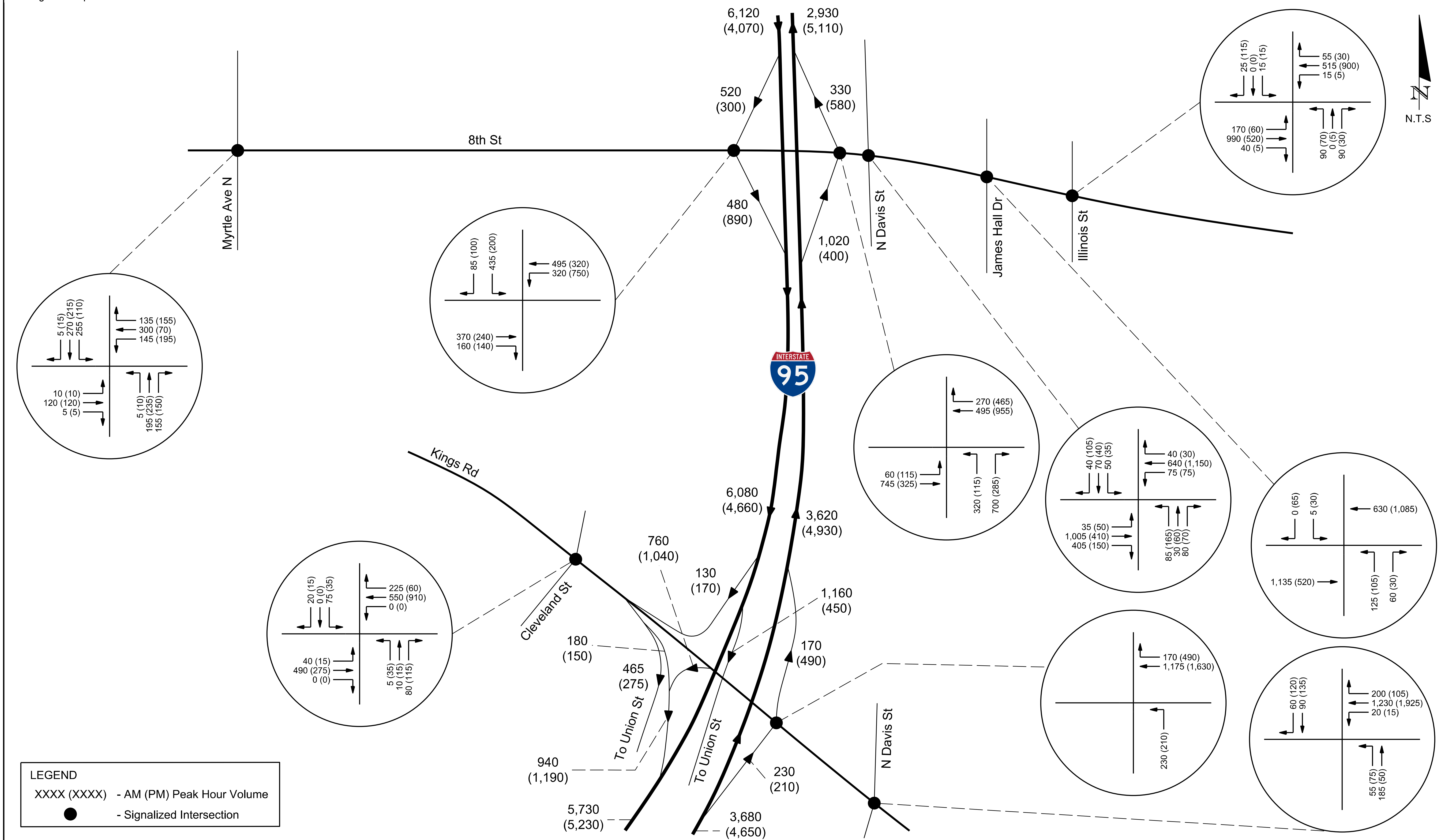
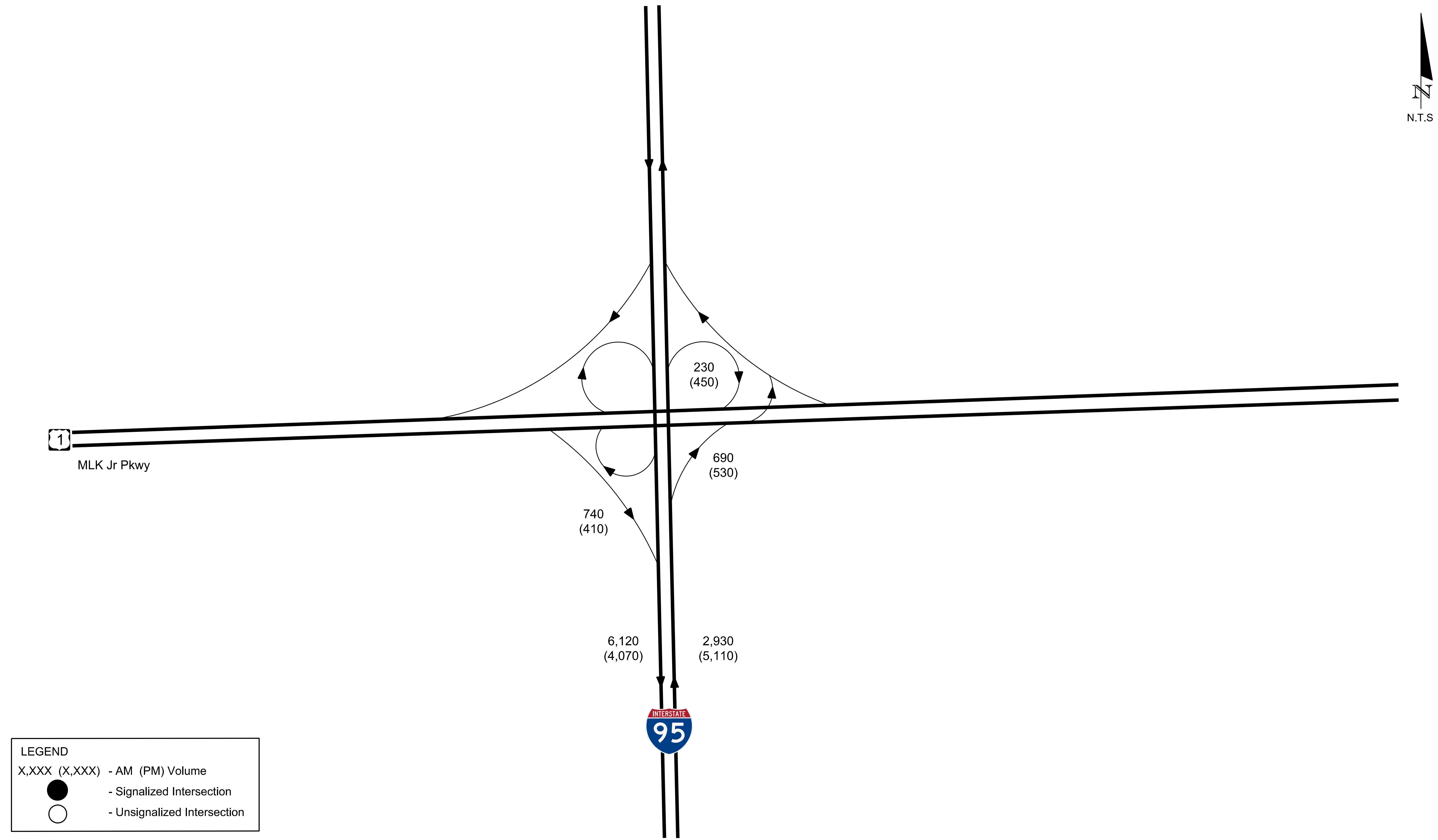


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 3-3
Sheet 3/4



FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Existing Year 2019 Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 3-3
Sheet 4/4

3.5.2 I-95 Operational Analysis

A detailed microsimulation analysis using Vissim 2020 was conducted to evaluate the system-wide operational performance. Vissim models were prepared for the Existing Year, 2019 AM and PM peak periods. The primary objective of the existing conditions analysis was to establish the current operational conditions along I-95 and the study interchanges and intersections.

Speed data collected using RITIS was used to plot speed profiles for the AM and PM peak periods. These speed profiles were used in the calibration of the existing peak period models. Simulated speeds for AM and PM peak periods were plotted against the RITIS speeds to evaluate how well the Vissim models replicate existing operations.

Fifteen-minute volume profiles were developed for the analysis area and input into Vissim for the three-hour AM and PM peak periods. The volume profiles were developed from the 15-minute variation in traffic observed in the traffic counts collected for this project.

Ten model iterations with different random seed numbers were executed for the AM and PM peak periods; the results provided in this report represent an average of the 10 simulation runs. A summary of the results of the existing Vissim operational analysis is provided in the following sections. Additional information on the existing conditions calibration effort is provided in **Appendix B**.

Synchro 10 was utilized for the execution of existing timing plans and the optimization of future conditions timing plans. Existing signal timing plans obtained from the City of Jacksonville are included in **Appendix B**.

3.6 Existing Speed Profiles

The speed profiles (derived from Vissim travel time output) for the existing 2019 AM and PM peak periods can be found in **Figure 3-4**, which presents the average speed output from Vissim for each of the three hours along with the 15-minute interval RITIS speed data that started within each hour of the peak period, and show that the final calibration parameters provide reasonable speed/congestion trends in both the AM and PM peak periods that capture the build-up of congestion and its dissipation.

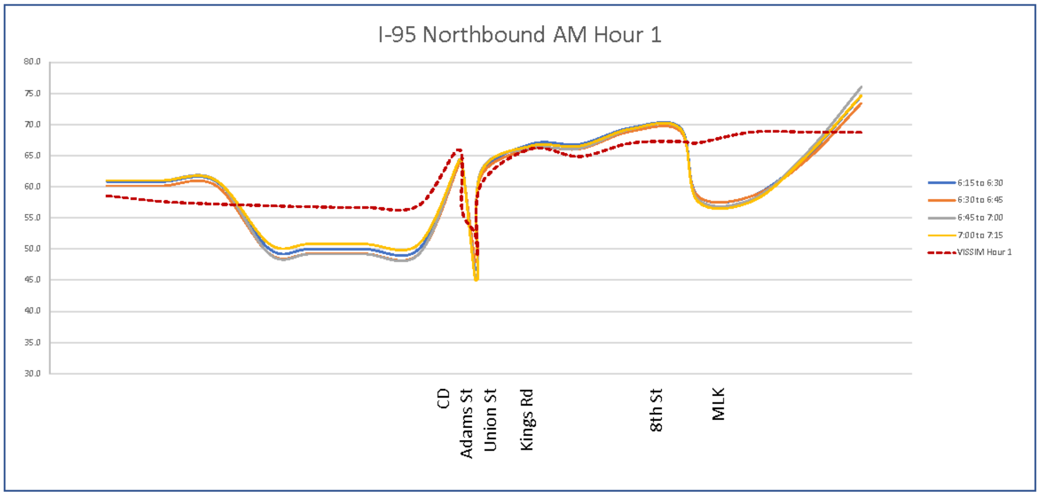
During the AM peak period, the Vissim model simulated speeds closely imitate the field measured speed with congestion building northbound between north of the C-D Road entrance to Union Street (around 50 mph) and then increasing speed after Union Street until reaching Martin Luther King Jr. Parkway. In the southbound direction, lower speeds are observed during the AM peak period from south of Forest Street to Kings Road interchanges.

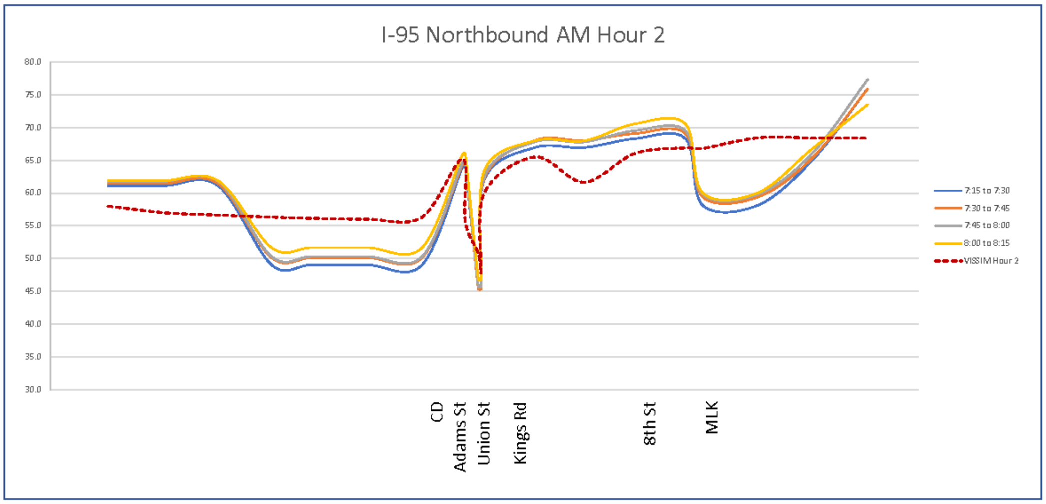
Similar to AM peak, the northbound direction experiences slightly lower speeds between the Northbound C-D Road entrance to Kings Road interchange in PM peak as well. The southbound direction experiences lower speeds south of Forest Street to Kings Road interchanges.

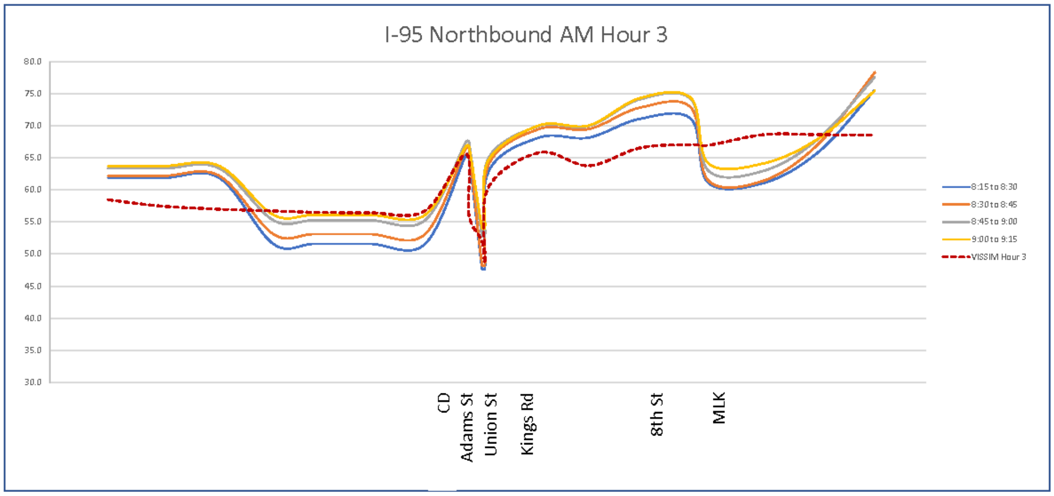
Some larger gaps in speed are observed at the north and south ends of the Vissim network, outside the AOI. These are due to the extra links/network length coded in Vissim. The extra links help traffic enter the network and give enough distance to make lane changes. Posted speed limit in this area is 55 mph. Traffic was observed to enter at higher speeds and no calibration effort was done on these extra links as they are outside the AOI. This does not impact the calibration within the AOI.

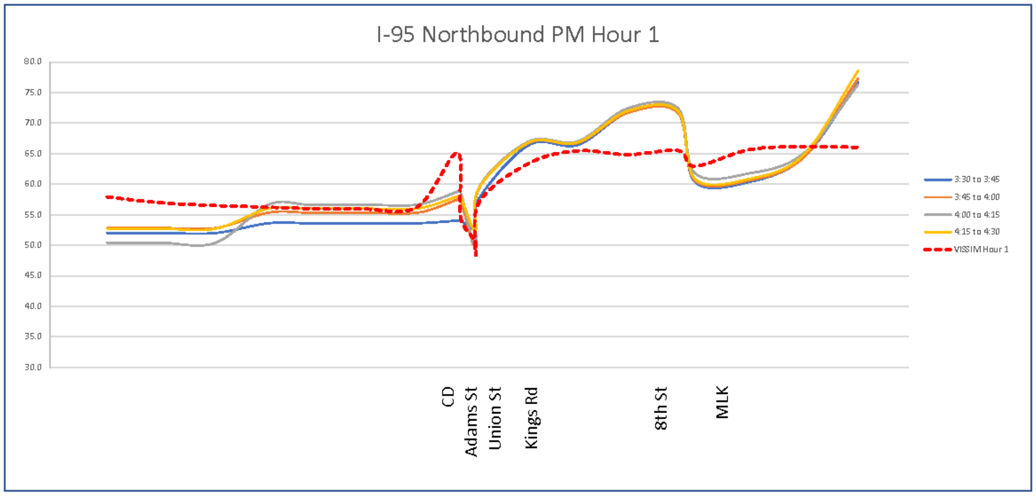
None of these congestion impact operations on the I-95 interchange ramps. No congestion was observed on northbound or southbound C-D Road within the study area.

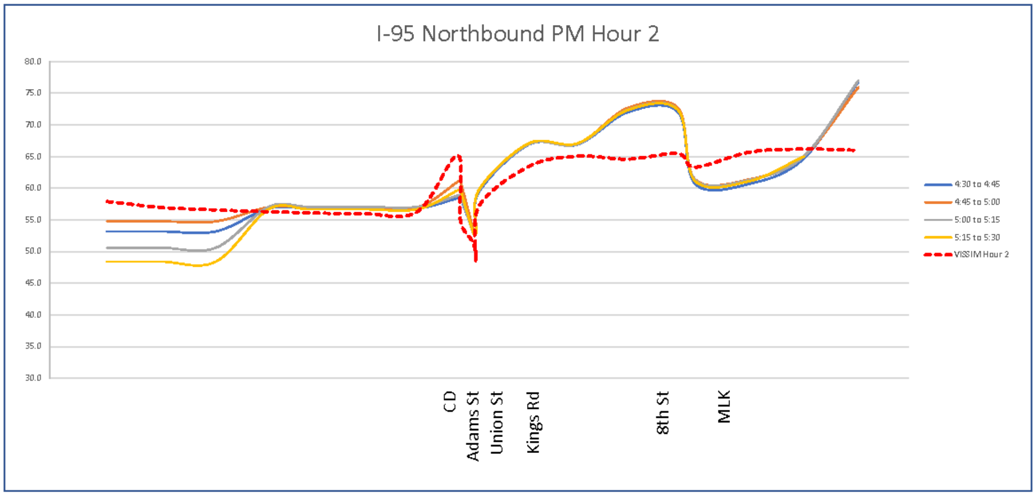
Figure 3-4: Existing Year 2019 I-95 Speed Profiles

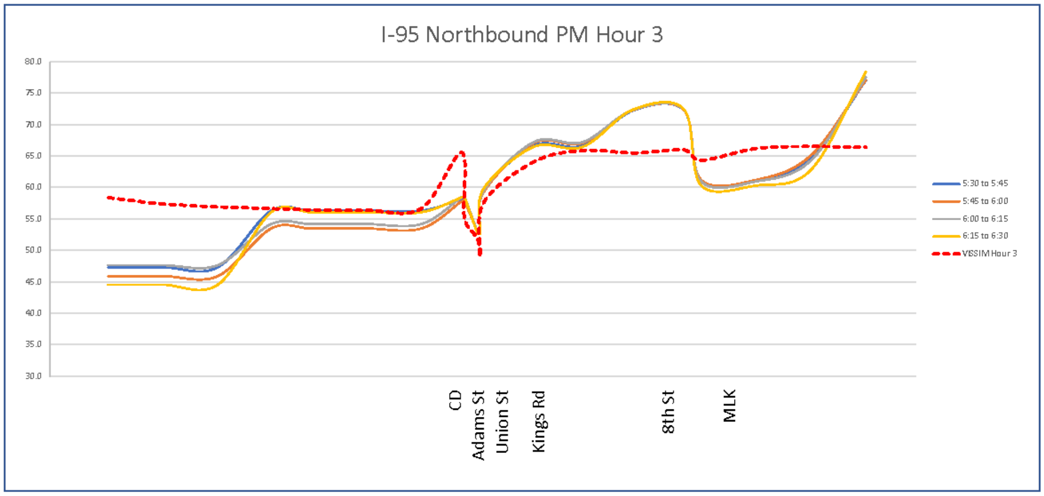


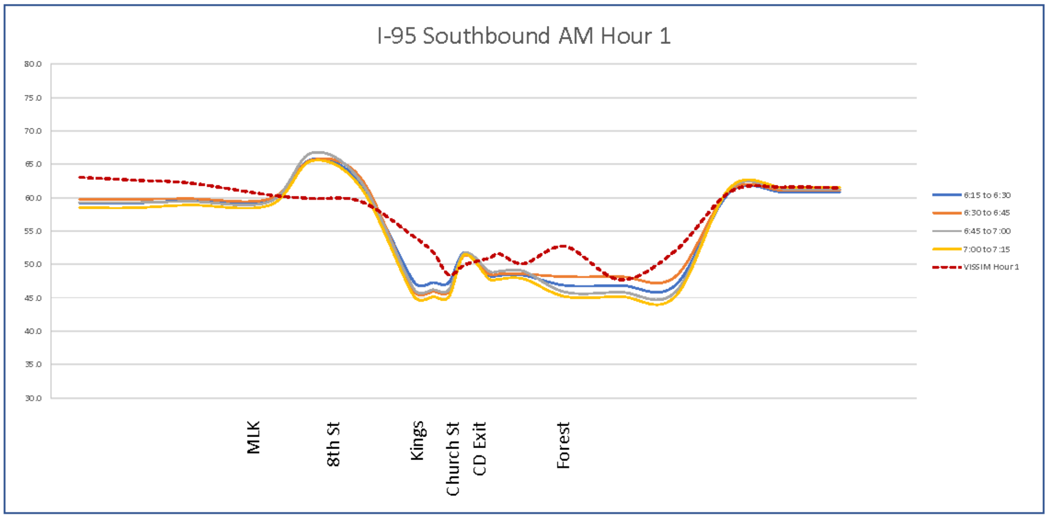


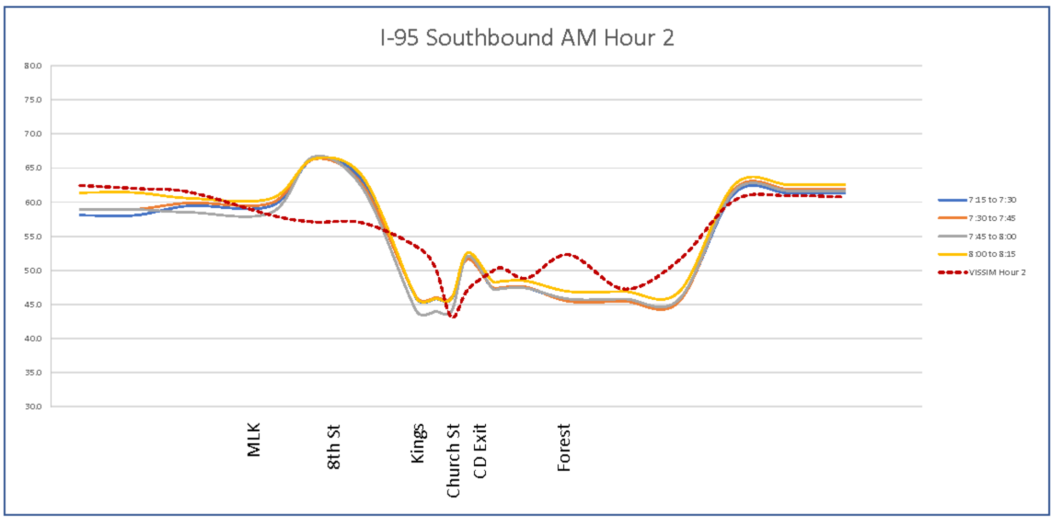


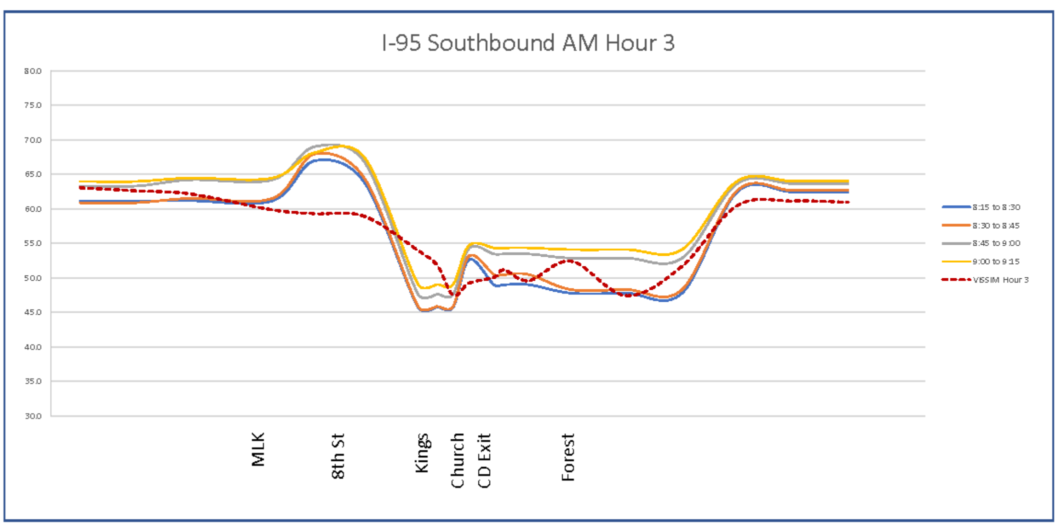

I-95 Northbound PM Hour 1
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
CD
Adams St
Union St
Kings Rd
8th St
MLK
3:30 to 3:45
3:45 to 4:00
4:00 to 4:15
4:15 to 4:30
VISSIM Hour 1

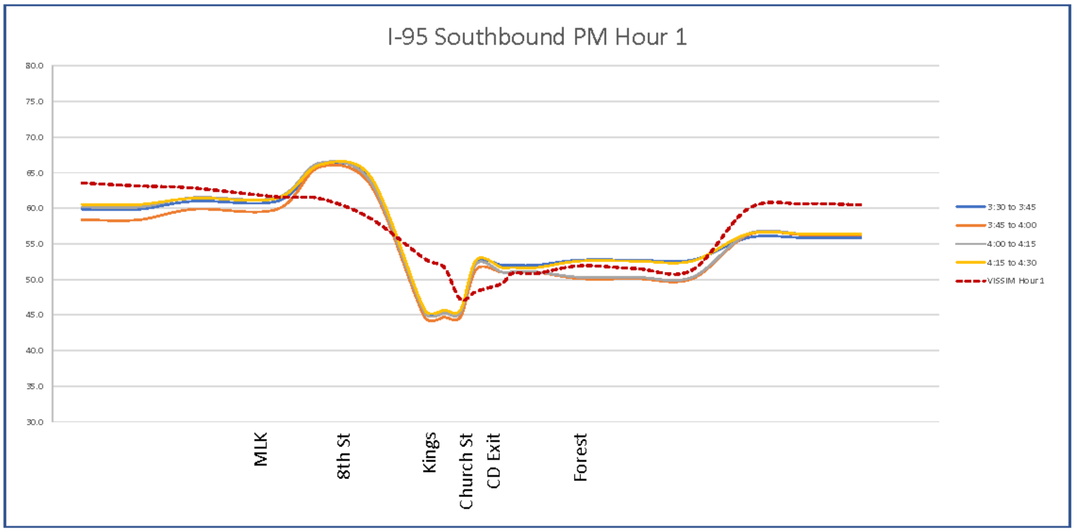

I-95 Northbound PM Hour 2
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
CD
Adams St
Union St
Kings Rd
8th St
MLK
4:30 to 4:45
4:45 to 5:00
5:00 to 5:15
5:15 to 5:30
VISSIM Hour 2

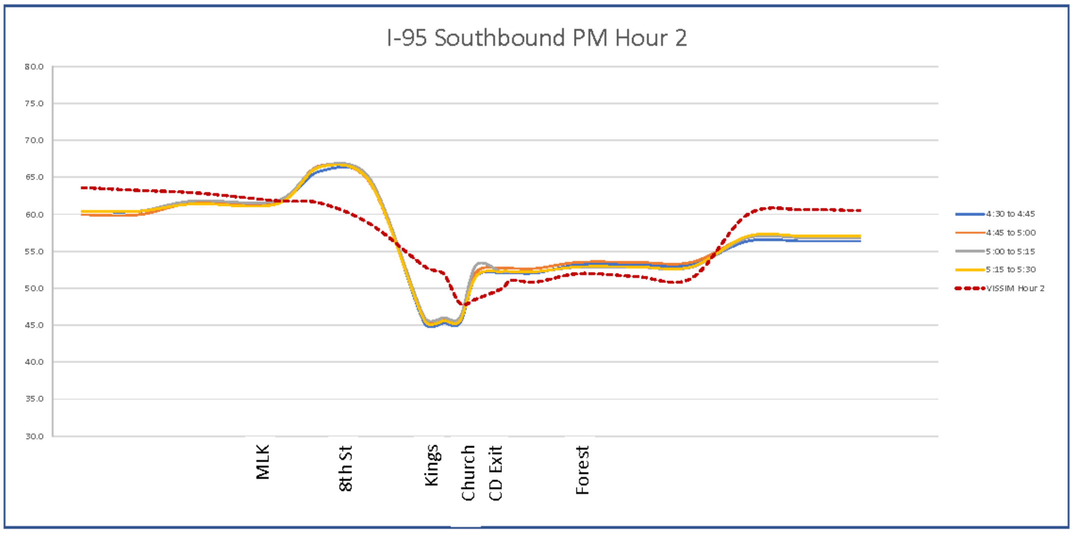

I-95 Northbound PM Hour 3
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
CD
Adams St
Union St
Kings Rd
8th St
MLK
5:30 to 5:45
5:45 to 6:00
6:00 to 6:15
6:15 to 6:30
VISSIM Hour 3

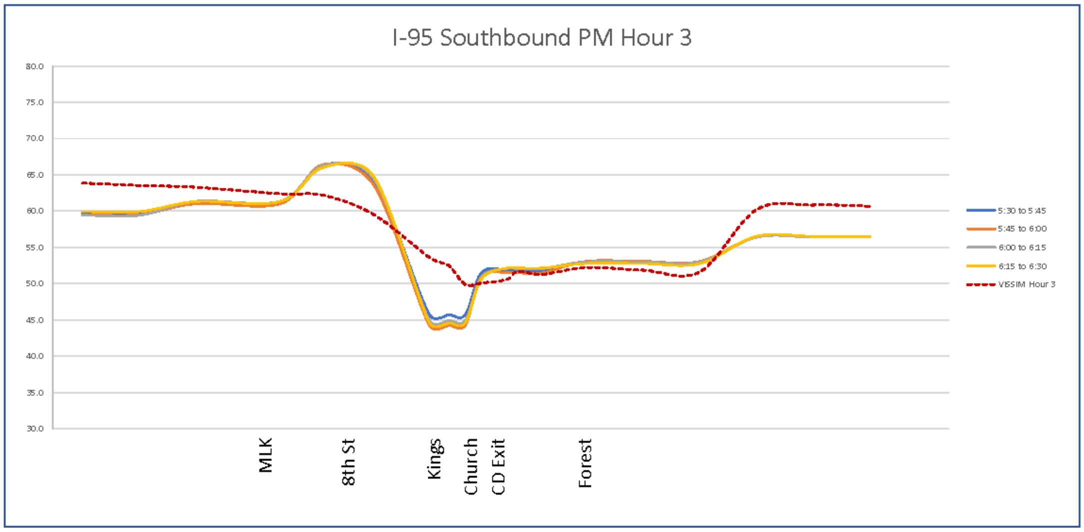

I-95 Southbound AM Hour 1
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church St
CD Exit
Forest
6:15 to 6:30
6:30 to 6:45
6:45 to 7:00
7:00 to 7:15
VISSIM Hour 1


I-95 Southbound AM Hour 2
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church St
CD Exit
Forest
7:15 to 7:30
7:30 to 7:45
7:45 to 8:00
8:00 to 8:15
VISSIM Hour 2


I-95 Southbound AM Hour 3
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church
CD Exit
Forest
8:15 to 8:30
8:30 to 8:45
8:45 to 9:00
9:00 to 9:15
VISSIM Hour 3


I-95 Southbound PM Hour 1
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church St
CD Exit
Forest
3:30 to 3:45
3:45 to 4:00
4:00 to 4:15
4:15 to 4:30
VISSIM Hour 1


I-95 Southbound PM Hour 2
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church
CD Exit
Forest
4:30 to 4:45
4:45 to 5:00
5:00 to 5:15
5:15 to 5:30
VISSIM Hour 2


I-95 Southbound PM Hour 3
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
MLK
8th St
Kings
Church
CD Exit
Forest
5:30 to 5:45
5:45 to 6:00
6:00 to 6:15
6:15 to 6:30
VISSIM Hour 3

3.7 Mainline Operations

Figure 3-5 and **Figure 3-6** show lane schematics for I-95 mainline operations and I-95 C-D Road operations during the AM and PM Peak hours, respectively. The lane schematics represent the overall speed, density, LOS and volumes over the peak hour.

The AM peak hour results for the Existing Year 2019 show congestion on I-95 southbound between the Kings Road entrance and Beaver Street entrance. Speeds in this area are below 47 mph, with the lowest speed of 43 mph occurring between the Kings Road entrance and Church Street exit. The density observed between the Kings Road entrance and Church Street exit is 32 pc/mi/ln with a total simulated volume of 5,658 vph and an estimated LOS D. Congestion occurs in a similar location northbound between Adams Street and Union Street with the slowest speed occurring between W Beaver Street and Union Street. The observed speed in this area is 48 mph with an estimated density of 16 pc/mi/ln and a total simulated volume of 4,736 vph. The estimated LOS is LOS B. LOS C occurs on I-95 northbound before the C-D Road entrance.

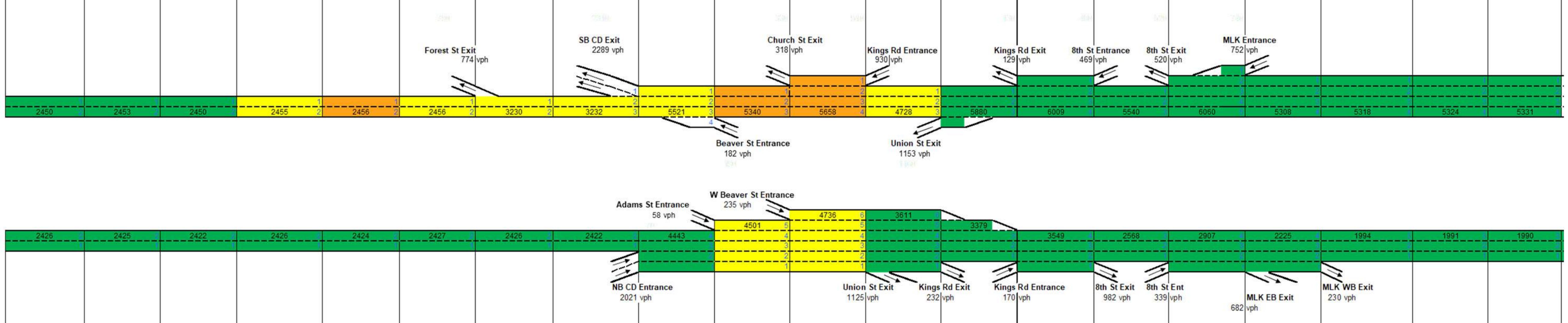
Speeds on I-95 southbound C-D Road are slowest in the AM peak hour before the Adams Street entrance. Speeds here average 48 mph, with a density of 23 pc/mi/ln, total simulated volume of 2,289 vph and operation of LOS C. Speeds northbound are slower beginning at the Forest Street entrance. The slowest speed is from the I-95 mainline entrance to Forsyth Street exit. Speeds in this area are 45 mph with a density of 21 pc/mi/ln, a total simulated volume of 3,874 vph and estimated LOS C.

The PM peak hour results for the Existing Year 2019, shown in **Figure 3-6**, indicate congestion on I-95 southbound between the Kings Road exit through the Forest Street exit. Speeds in this area are below 53 mph, with the lowest speed of 48 mph occurring between the Kings Road Entrance and Church Street exit. The density observed between the Kings Road Entrance and Church Street exit is 26 pc/mi/ln and an estimated LOS C. LOS E occurs in the weaving segment between the Beaver Street entrance and I-95 C-D Road exit. Slower speeds occur in a similar location northbound between Beaver Street and Union Street. The observed speed in this area is 49 mph with an estimated density of 19 pc/mi/ln and a simulated volume of 5,631 vph. The estimated LOS is LOS B. LOS C occurs on I-95 northbound before the C-D Road entrance.

Speeds throughout I-95 southbound C-D Road are consistently 48 mph in the PM peak hour. The density is highest between the Adams Street entrance and Bay Street entrance (31 pc/mi/ln) and operates at LOS D. Speeds northbound are slower beginning at the Forest Street entrance. The slowest speed is after the Monroe Street exit. Speeds in this area are 45 mph with a density of 26 pc/mi/ln, simulated volume of 2,453 vph and estimated LOS D.

I-95 Southbound

Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	884	352	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	61	61	60	52	47	52	49	50	50	47	43	50	53	57	57	58	61	62	62	63
Estimated Density (pc/mi/ln)	20	20	20	23	25	23	32	31	36	37	32	31	36	26	32	25	21	21	21	21
Estimated LOS	C	C	C	C	C	C	D	D	E	E	D	D	E	C	D	C	C	C	C	C
Total Demand Volume (vph)	2490	2490	2490	2490	2490	2490	3280	3280	5590	5400	5730	4790	5950	6080	5600	6120	5380	5380	5380	5380
Total Simulated Volume (vph)	2450	2453	2450	2455	2456	2456	3230	3232	5521	5340	5658	4728	5880	6009	5540	6060	5308	5318	5324	5331



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	101	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	58	57	57	56	56	56	56	65	56	51	48	60	66	62	66	67	67	68	68	68
Estimated Density (pc/mi/ln)	20	21	21	21	21	21	21	18	19	17	16	10	17	14	13	11	8	9	9	9
Estimated LOS	C	C	C	C	C	C	C	C	B	B	B	A	B	B	B	B	A	A	A	A
Total Demand Volume (vph)	3370	3600	3890	2650	2040	2470	2470	2470	4510	4580	4810	3680	3450	3620	2600	2930	2240	2010	2010	2010
Total Simulated Volume (vph)	2426	2425	2422	2426	2424	2427	2426	2422	4443	4501	4736	3611	3379	3549	2568	2907	2225	1994	1991	1990

I-95 Northbound

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph): 43 below; 43 - 48; 48 - 53; 53 and above

Estimated Density (pc/mi/ln): 75 and above; 55 - 75; 45 - 55; 45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

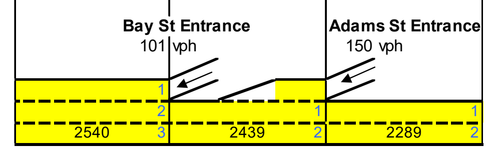
Existing Year 2019 AM Peak Hour Lane Schematics

Figure 3-5

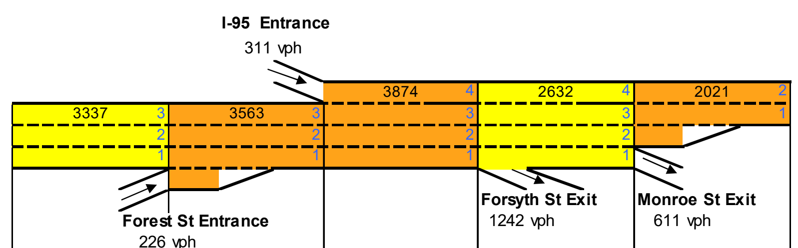
← I-95 SB C-D Road

	507		506		505
Distance (ft)	1264		1567		608
Speed (mph)	49		49		48
Estimated Density (pc/mi/ln)	17		24		23
Estimated LOS	B		C		C
Total Demand Volume (vph)	2560		2460		2310
Total Simulated Volume (vph)	2540		2439		2289

Simulated Volumes



Simulated Volumes



Distance (ft)	909	965	992	1167	1263
Speed (mph)	48	47	45	48	46
Estimated Density (pc/mi/ln)	22	25	21	13	22
Estimated LOS	C	C	C	B	C
Total Demand Volume (vph)	3370	3600	3890	2650	2040
Total Simulated Volume (vph)	3337	3563	3874	2632	2021

508 501 502 503 504

I-95 NB C-D Road →

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)

Speed (mph)
42 below
42 - 47
47 - 50
50 and above

Estimated Density (pc/mi/ln)

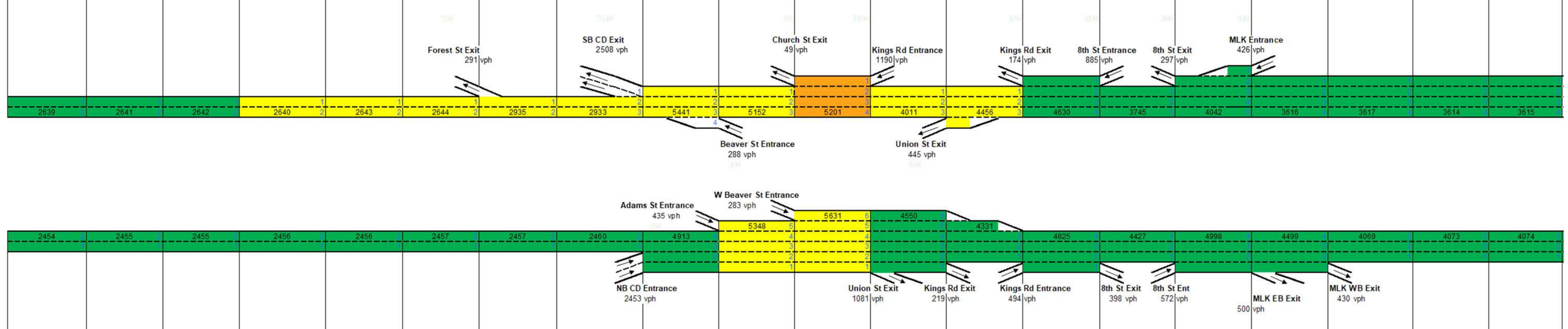
Estimated Density (pc/mi/ln)
75 and above
55 - 75
45 - 55
45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT	I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR	Existing Year 2019 AM Peak Hour Lane Schematics	Figure 3-5
			Page 44

I-95 Southbound

Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	884	352	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	60	61	60	51	52	52	51	51	50	49	48	52	53	59	62	62	63	63	64	64
Estimated Density (pc/mi/ln)	21	21	22	25	25	25	28	28	35	35	26	25	27	19	20	16	14	14	14	14
Estimated LOS	C	C	C	C	C	C	D	D	E	D	C	C	C	B	C	B	B	B	B	B
Total Demand Volume (vph)	2650	2650	2650	2650	2650	2650	2940	2940	5450	5150	5230	4040	4490	4660	3770	4070	3660	3660	3660	3660
Total Simulated Volume (vph)	2639	2641	2642	2640	2643	2644	2935	2933	5441	5152	5201	4011	4456	4630	3745	4042	3616	3617	3614	3615



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	101	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	58	57	57	56	56	56	56	65	55	51	49	57	63	65	65	65	63	66	66	66
Estimated Density (pc/mi/ln)	21	21	21	21	21	21	21	18	22	20	19	13	22	18	22	19	17	20	20	20
Estimated LOS	C	C	C	C	C	C	C	C	C	C	B	B	C	B	C	B	B	C	C	C
Total Demand Volume (vph)	2310	2670	2830	2630	2510	2500	2500	2500	5010	5470	5750	4650	4440	4930	4530	5110	4580	4130	4130	4130
Total Simulated Volume (vph)	2454	2455	2455	2456	2456	2457	2457	2460	4913	5348	5631	4550	4331	4825	4427	4998	4499	4069	4073	4074

I-95 Northbound

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph)	
43	below
43 - 48	
48 - 53	
53	and above

Estimated Density (pc/mi/ln)	
75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

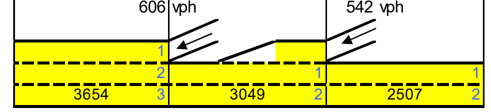
Existing Year 2019 PM Peak Hour Lane Schematics

Figure 3-6

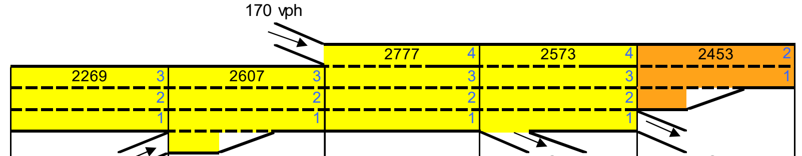
← I-95 SB C-D Road

	507	506	505
Distance (ft)	1264	1567	608
Speed (mph)	48	48	48
Estimated Density (pc/mi/ln)	25	31	25
Estimated LOS	C	D	C
Total Demand Volume (vph)	3660	3050	2510
Total Simulated Volume (vph)	3654	3049	2507

Simulated Volumes



Simulated Volumes



	508	501	502	503	504
Distance (ft)	909	965	992	1167	1263
Speed (mph)	50	49	48	48	45
Estimated Density (pc/mi/ln)	15	17	14	13	26
Estimated LOS	B	B	B	B	D
Total Demand Volume (vph)	2310	2670	2830	2630	2510
Total Simulated Volume (vph)	2269	2607	2777	2573	2453

I-95 NB C-D Road →

LEGEND

= Travel Time Segment Number

Freeway Coloring Speed (mph)	Estimated Density (pc/mi/ln)
42 below	75 and above
42 - 47	55 - 75
47 - 50	45 - 55
50 and above	45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

Existing Year 2019 PM Peak Hour Lane Schematics

Figure 3-6

3.7.1 Existing Intersection and Interchange Operations

The existing conditions intersection and interchange analysis summary results are shown in **Table 3-4**. The results show that all the study intersections meet the acceptable delay time of less than 80 seconds/vehicle. Results by intersection approach are included in **Appendix B**.

Table 3-4: Existing Year 2019 Intersection Analysis Summary

Intersection	Delay (seconds/vehicle)	
	AM Peak	PM Peak
Forest Street @ I-95 southbound	34.7	33.2
Forest Street @ I-95 northbound	25.1	14.8
Forest Street @Park Street	18.3	75.6
Kings Road @ Cleveland Street	50.5	6.4
Kings Road @ I-95 northbound	27.1	10.2
Kings Road @ N Davis Street	16.2	12.9
8th Street @ Myrtle Avenue	24.7	16.8
8th Street @ I-95 southbound	17.6	15.5
8th Street @ I-95 northbound	19.0	27.1
8th Street @ N Davis Street	25.3	22.8
8th Street @ James Hall Drive	6.6	9.1
8th Street @ Illinois Street	7.8	8.0

Table 3-5 shows the results for the intersection queuing analysis, which contains the ramp length, available storage and maximum queue length for ramp movements. The ramp length is measured from the stop bar to the painted gore along I-95. The available storage is measured from the stop bar to the end of the turn bay taper. This analysis was performed to assess whether the maximum queue length may impact the I-95 mainline or arterial roadways. In Existing Year, the available storage will accommodate the max queue at all intersection approaches except the following:

- Forest Street at I-95 Southbound Ramps
  - Westbound left (PM peak)
- Forest Street at I-95 Northbound Ramps
  - Westbound left (PM peak)
  - Northbound right (AM peak) – The northbound right movement is beyond available storage but does not back up to the I-95 mainline.
- Kings Road at I-95 Northbound Ramps

  - Westbound through and right (AM peak)
- 8th Street at I-95 Southbound Ramps
  - Westbound left and through (AM and PM peaks)
  - Southbound left (AM peak) – The southbound left movement is beyond available storage but does not back up to the I-95 mainline.
- 8th Street at I-95 Northbound Ramps
  - Eastbound left (AM and PM peaks)
  - Eastbound through (AM peak)
  - Westbound through (AM and PM peaks)
  - Westbound right (PM peak)
  - Northbound right (PM peak) – The northbound right movement is beyond available storage and the ramp length.

The maximum queues that are beyond available storage are marked as red in **Table 3-5**.

Table 3-5: Existing Year 2019 Intersection Queueing Analysis Summary

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Forest Street at I-95 SB Ramps	Ramp Length		N/A			N/A			N/A			980		
	Available Storage (ft)			300		430	720					730		440
	Max Queue (ft)	AM Peak		220	221	153	43					348		201
		PM Peak		111	115	635	131					230		123
Forest Street at I-95 NB Ramps	Ramp Length		N/A			N/A			1,100			N/A		
	Available Storage (ft)		260	745		165	330		275	850	280	250		
	Max Queue (ft)	AM Peak	203	513	548	162	111	137	18	96	320	96	23	60
		PM Peak	64	225	260	307	261	212	57	44	107	101	112	139
Kings Road at I-95 NB Ramps	Ramp Length		N/A			N/A			930			N/A		
	Available Storage (ft)						435		680					
	Max Queue (ft)	AM Peak					521	521	247					
		PM Peak					408	408	280					
8th Street at I-95 SB Ramps	Ramp Length		N/A			N/A			N/A			850		
	Available Storage (ft)			300	250	100	370					600		450
	Max Queue (ft)	AM Peak		224	183	327	423					601		77
		PM Peak		158	172	466	440					315		86
8th Street at I-95 NB Ramps	Ramp Length		N/A			N/A			850			N/A		
	Available Storage (ft)		80	380			120		300		600			
	Max Queue (ft)	AM Peak	332	434			236	77	299		532			
		PM Peak	127	185			240	173	243		958			

3.8 Crash and Safety Information

Vehicular crash data along the I-95 mainline, study interchanges and cross streets within the AOI were obtained from the University of Florida's Signal Four Analytics. Signal Four Analytics is considered one of the approved sources of historic crash data per the FDOT *Safety Crash Data Guidance*. Signal Four Analytics is a database maintained by the GeoPlan Center of the University of Florida. Florida's Signal Four Analytics is an interactive, web-based system designed to support the crash mapping and analysis needs of law enforcement, traffic engineering, transportation planning agencies, and research institutions in the State of Florida. The web-based database provides information on various characteristics associated with each crash including collision type, severity, weather conditions, road surface conditions and date/time information. The crash data was collected for five years available (January 1, 2013 to December 31, 2017). The crashes were analyzed to assess safety conditions along I-95, study interchanges and signalized intersections within the project limits. Within the whole study area, 1,891 crashes occurred. A break-down of these crashes is provided in the sections to follow. Each section will discuss the different roadway's historic crash statistics. The existing crash analysis performed for the SIMR is consistent with the methods outlined in the IARUG Safety Guidance. The raw crash data is provided in **Appendix C**.

3.8.1 I-95 Mainline

A safety analysis was conducted for I-95 north of I-10 and Martin Luther King Jr. Parkway. Over the five-year span (2013-2017), this area experienced a total of 1,232 crashes, of which eight were fatal and 330 crashes involved injuries. Of these crashes, 73 percent (894 crashes) involved property damage. **Table 3-6** summarizes the crash data for the I-95 mainline.

Table 3-6: Crash Data Summary – I-95 Mainline

Injury Type	2013	2014	2015	2016	2017	Total	Percent of Total
Number of Property Damage Only Crashes	166	142	119	215	252	894	73%
Number of Crashes with Injuries	64	55	54	67	90	330	26%
Number of Crashes with Fatalities	1	1	1	2	3	8	1%
Total	***231***	***198***	***174***	***284***	***345***	***1232***	***100%***
Number of Injuries	101	90	81	103	156	531	
Number of Fatalities	1	1	1	2	3	8	

Crash types within the study area were evaluated to determine the most predominant crash type and its causes. **Table 3-7** summarizes all crash types observed within the study area. Each of these crash types have different manners of collision, of which front to rear (rear-end) crashes were most prominent, 47 percent (574 crashes). The high number of rear-end crashes can be attributed to the congestion and stop-and-go conditions experienced by the study area during the peak hours. Sideswipe crashes (26 percent) and Off Road (12 percent) are the second and third most predominant crash types within the study area. Sideswipe crashes are a result of lane changing near merge or diverge locations and in weave segments.

Table 3-7: Manner of Collision – I-95 Mainline

Crash Type	Number of Crashes					Total	Percent of Total	Mean Crashes Per Year
	2013	2014	2015	2016	2017			
Front to Rear (Rear End)	101	88	81	133	171	574	47%	114.8
Front to Front	0	0	0	2	1	3	0%	0.6
Angle	0	1	4	2	2	9	1%	1.8
Sideswipe, same direction	51	51	50	85	87	324	26%	64.8
Sideswipe, opposite direction	1	1	0	0	1	3	0%	0.6
Off Road	43	34	17	23	36	153	12%	30.6
Single Vehicle	15	7	8	10	10	50	4%	10
Unknown	5	4	5	12	10	36	3%	7.2
Other	15	12	9	17	27	80	7%	16
Total Crashes	***231***	***198***	***174***	***284***	***345***	***1232***	***100%***	***246.4***

3.8.2 I-95 Ramps

A safety analysis was conducted for the I-95 ramps between north of I-10 to south of Martin Luther King Jr. Parkway. The ramp analysis also includes the Martin Luther King Jr. Parkway northbound to eastbound off ramp, northbound to westbound off ramp and eastbound to southbound on ramp. Over the five-year span (2013-2017), the ramps in this area experienced a total of 107 crashes, of which none were fatal and 29 were injury crashes. Of these crashes, 73 percent (78 crashes) involved property damage. **Table 3-8** summarizes the crash data for the study area.

Table 3-8: Study Area Crash Data Summary – I-95 Ramps

Injury Type	2013	2014	2015	2016	2017	Total	Percent of Total
Number of Property Damage Only Crashes	16	16	19	13	14	78	73%
Number of Crashes with Injuries	4	5	8	6	6	29	27%
Number of Crashes with Fatalities	0	0	0	0	0	0	0%
Total	***20***	***21***	***27***	***19***	***20***	***107***	***100%***
Number of Injuries	5	8	8	6	6	33	
Number of Fatalities	0	0	0	0	0	0	

Crash types within the study area were evaluated to determine the most predominant crash type and its causes. **Table 3-9** summarizes all crash types observed within the study area. Each of these crash types have different manners of collision, of which front to rear (rear-end) crashes were the most prominent manner of 36 percent (38 crashes). The high number of rear-end crashes can be attributed to the congestion and stop-and-go conditions experienced by the study area during the peak hours. Sideswipe (26 percent) and Off Road crashes (17 percent) are the second and third most predominant crash types within the study area. Sideswipe crashes are a result of lane changing near merge or diverge locations and in weave segments.

Table 3-9: Manner of Collision – I-95 Ramps

Crash Type	Number of Crashes					Total	Percent of Total	Mean Crashes Per Year
	2013	2014	2015	2016	2017			
Front to Rear (Rear End)	8	9	8	6	7	38	36%	7.6
Front to Front	1	0	0	0	0	1	1%	0.2
Angle	0	0	1	2	0	3	3%	0.6
Sideswipe, same direction	5	5	9	5	4	28	26%	5.6
Sideswipe, opposite direction	0	0	0	0	1	1	1%	0.2
Off Road	4	6	2	1	5	18	17%	3.6
Single Vehicle	1	0	3	1	1	6	6%	1.2
Unknown	0	1	1	1	0	3	2%	0.6
Other	1	0	3	3	2	9	8%	1.8
Total Crashes	***20***	***21***	***27***	***19***	***20***	***107***	***100%***	***21.4***

3.8.3 C-D Road

A safety analysis was conducted for the C-D road adjacent to I-95 and within the study area. The C-D road is between north of I-10 to Adams Street. Over the five-year span (2013-2017), the C-D road in this area experienced a total of 40 crashes, of which one was fatal and seven were injury crashes. Of these crashes, 80 percent (32 crashes) involved property damage. **Table 3-10** summarizes the crash data for the study area.

Table 3-10: Study Area Crash Data Summary – C-D Road

Injury Type	2013	2014	2015	2016	2017	Total	Percent of Total
Number of Property Damage Only Crashes	7	10	6	5	4	32	80%
Number of Crashes with Injuries	2	3	1	1	0	7	18%
Number of Crashes with Fatalities	0	0	0	1	0	1	2%
Total	***9***	***13***	***7***	***7***	***4***	***40***	***100%***
Number of Injuries	3	7	1	2	0	13	
Number of Fatalities	0	0	0	1	0	1	

Crash types within the study area were evaluated to determine the most predominant crash type and its causes. **Table 3-11** summarizes all crash types observed within the study area. Each of these crash types have different manners of collision, of which front to rear (rear-end) crashes were the most prominent manner of 38 percent (15 crashes). The high number of rear-end crashes can be attributed to the congestion and stop-and-go conditions experienced by the study area during the peak hours. Off-Road crashes (25 percent) and Sideswipe (20 percent) are the second and third most predominant crash types within the study area. Signal Four Analytics classifies Off-Road crashes as any “Collision with Fixed Object”. These crashes are likely to occur during evasive actions.

Table 3-11: Manner of Collision – C-D Road

Crash Type	Number of Crashes					Total	Percent of Total	Mean Crashes Per Year
	2013	2014	2015	2016	2017			
Front to Rear (Rear End)	2	6	2	4	1	15	38%	3
Angle	0	1	0	0	0	1	3%	0.2
Sideswipe, same direction	2	2	1	1	2	8	20%	1.6
Off Road	2	3	2	2	1	10	25%	2
Single Vehicle	0	0	1	0	0	1	2%	0.2
Other	3	1	1	0	0	5	12%	1
Total Crashes	***9***	***13***	***7***	***7***	***4***	***40***	***100%***	***8***

3.8.4 Crash Frequencies and Rates

I-95 mainline between north of I-10 and south of Martin Luther King Jr. Parkway was separated by northbound and southbound directions. Northbound and Southbound were divided into 10 sections. The crossroads were divided into signalized intersections and segments between each signalized intersection. This was done to further analyze the crash frequencies and rates at different segments along I-95 and crossroads within the project limits to provide a better understanding of the existing crash patterns. **Table 3-12** provides the segmentation.

After segmenting I-95 and crossroads, the crash frequency and crash rates were calculated for each segment. The 'Average Crash Rate Method' of crash analysis, based on segment length, AADT and number of crashes that occurred, was used for calculating the actual crash rate for the roadway segments and the study intersections. The actual crash rate for the study corridors from the year 2013 to 2017 was compared with the statewide average crash rate for the same type of facility. Based on the analysis presented in **Table 3-13**, the following segments have higher actual crash rates compared to the statewide average crash rates and are therefore considered a high crash location for the years 2013-2017:

<u>I-95 Northbound</u>

- I-95 between I-10 and Forest Street (ramp from US 17)
- I-95 between Forsyth Street/Bay Street (C-D Road NB on ramp to I-95) and Monroe Street/Adams Street On Ramp
- I-95 between Monroe Street/Adams Street On Ramp and Church Street/W Beaver Street On Ramp
- I-95 between Church Street/W Beaver Street On Ramp and Union Street Off Ramp

- I-95 between Kings Road Off Ramp and Kings Road On Ramp
- I-95 between Kings Road Off Ramp and Kings Road On Ramp
- I-95 between 8th Street Off Ramp and 8th Street On Ramp

I-95 Southbound

- I-95 between 8th Street Off Ramp and 8th Street On Ramp
- I-95 between Union Street Off Ramp and Kings Road On Ramp
- I-95 between Kings Road On Ramp and Church Street/W Beaver Street Off Ramp
- I-95 between Church Street/W Beaver Street Off Ramp and Church Street/W Beaver Street On Ramp

I-95 Northbound C-D Road

- C-D Road between Forest Street On Ramp and Forsyth Street Off Ramp
- C-D Road between Monroe Street Off Ramp and I-95 On Ramp

Table 3-12: Roadway Segmentation for Crash Analysis

Segment #	Location	Description	Segment #	Location	Description
1	I-95 Northbound	I-95 between I-10 and Forest Street (ramp from US 17)	**22**	Forest Street	Forest Street at I-95 SB Ramp Terminal
2		I-95 between Forest Street (ramp from US 17) and Forsyth Street/Bay Street (C-D Road NB on ramp to I-95)	**23**		Forest Street at I-95 NB Ramp Terminal
3		I-95 between Forsyth Street/Bay Street (C-D Road NB on ramp to I-95) and Monroe Street/Adams Street On Ramp	**24**		Forest Street at Park Street
4		I-95 between Monroe Street/Adams Street On Ramp and Church Street/W Beaver Street On Ramp	**25**	Church Street	Church Street at I-95 SB Ramp Terminal
5		I-95 between Church Street/W Beaver Street On Ramp and Union Street Off Ramp	**26**	Kings Road	Kings Road at Cleveland Street
6		I-95 between Union Street Off Ramp and Kings Road Off Ramp	**27**		Kings Road from Cleveland Street to I-95 NB Ramp Terminal
7		I-95 between Kings Road Off Ramp and Kings Road On Ramp	**28**		Kings Road at I-95 NB Ramp Terminal
8		I-95 between Kings Road On Ramp and 8th Street Off Ramp	**29**		Kings Road at N Davis Street
9		I-95 between 8th Street Off Ramp and 8th Street On Ramp	**30**	8th Street	8th Street at Myrtle Avenue
10		I-95 between 8th Street On Ramp and MLK EB off Ramp	**31**		8th Street from Myrtle Avenue to I-95 Southbound Ramp Terminal
11	I-95 Southbound	I-95 between MLK EB On Ramp and 8th Street Off Ramp	**32**		8th Street at I-95 Southbound Ramp Terminal
12		I-95 between 8th Street Off Ramp and 8th Street On Ramp	**33**		9th Street at I-95 Northbound Ramp Terminal
13		I-95 between 8th Street On Ramp and Kings Road Off Ramp	**34**		8th Street at N Davis Street

Segment #	Location	Description	Segment #	Location	Description
14		I-95 between Kings Road Off Ramp and Union Street Off Ramp	**35**		8th Street at James Hall Drive
15		I-95 between Union Street Off Ramp and Kings Road On Ramp	**36**		8th Street at Illinois Street
16		I-95 between Kings Road On Ramp and Church Street/W Beaver Street Off Ramp	**37**	**I-95 Northbound C-D**	C-D Road between Forest Street On Ramp and Forsyth Street Off Ramp
17		I-95 between Church Street/W Beaver Street Off Ramp and Church Street/W Beaver Street On Ramp	**38**		C-D Road between Forsyth Street Off Ramp and Monroe Street Off Ramp
18		I-95 between Church Street/W Beaver Street On Ramp and Monroe Street/Adams Street CD Road Off Ramp	**39**		C-D Road between Monroe Street Off Ramp and I-95 On Ramp
19		I-95 between Monroe Street/Adams Street CD Road Off Ramp and Forest Street Off Ramp	**40**	**I-95 Southbound C-D**	C-D Road between I-95 Off Ramp and Adams Street On Ramp
20		I-95 between Forest Street Off Ramp and I-10 Off Ramp	**41**		C-D Road between Adams Street On Ramp and Bay Street On Ramp
21		I-95 between I-10 Off Ramp and I-10 Flyover	**42**		C-D Road between Bay Street On Ramp and I-95 Off Ramp

Table 3-13: Existing Crash Frequencies and Rates

Location	Description	Number of Crashes	Crash Frequency (crashes/year)*	Crash Rate*	Statewide Crash Rate	High Crash Location
I-95 Northbound	I-95 between I-10 and Forest Street (ramp from US 17)	71	14.2	1.033	0.976	Yes
	I-95 between Forest Street (ramp from US 17) and Forsyth Street/Bay Street (C-D Road NB on ramp to I-95)	107	21.4	0.672	0.976	No
	I-95 between Forsyth Street/Bay Street (C-D Road NB on ramp to I-95) and Monroe Street/Adams Street On Ramp	73	14.6	1.761	0.976	Yes
	I-95 between Monroe Street/Adams Street On Ramp and Church Street/W Beaver Street On Ramp	48	9.6	1.695	0.976	Yes
	I-95 between Church Street/W Beaver Street On Ramp and Union Street Off Ramp	21	4.2	1.539	0.976	Yes
	I-95 between Union Street Off Ramp and Kings Road Off Ramp	12	2.4	0.575	0.976	No
	I-95 between Kings Road Off Ramp and Kings Road On Ramp	74	14.8	1.423	0.976	Yes
	I-95 between Kings Road On Ramp and 8th Street Off Ramp	66	13.2	0.692	0.976	No
	I-95 between 8th Street Off Ramp and 8th Street On Ramp	121	24.2	1.860	0.976	Yes
	I-95 between 8th Street On Ramp and MLK EB off Ramp	53	10.6	0.586	0.976	No
I-95 Southbound	I-95 between MLK EB On Ramp and 8th Street Off Ramp	35	7.0	0.463	0.976	No
	I-95 between 8th Street Off Ramp and 8th Street On Ramp	81	16.2	1.313	0.976	Yes
	I-95 between 8th Street On Ramp and Kings Road Off Ramp	78	15.6	0.755	0.976	No
	I-95 between Kings Road Off Ramp and Union Street Off Ramp	21	4.2	0.606	0.976	No

Location	Description	Number of Crashes	Crash Frequency (crashes/year)*	Crash Rate*	Statewide Crash Rate	High Crash Location
	I-95 between Union Street Off Ramp and Kings Road On Ramp	178	35.6	14.187	0.976	Yes
	I-95 between Kings Road On Ramp and Church Street/W Beaver Street Off Ramp	34	6.8	1.100	0.976	Yes
	I-95 between Church Street/W Beaver Street Off Ramp and Church Street/W Beaver Street On Ramp	57	11.4	1.302	0.976	Yes
	I-95 between Church Street/W Beaver Street On Ramp and Monroe Street/Adams Street CD Road Off Ramp	8	1.6	0.176	0.976	No
	I-95 between Monroe Street/Adams Street CD Road Off Ramp and Forest Street Off Ramp	66	13.2	0.552	0.976	No
	I-95 between Forest Street Off Ramp and I-10 Off Ramp	7	1.4	0.160	0.976	No
	I-95 between I-10 Off Ramp and I-10 Flyover	21	4.2	0.371	1.976	No
Forest Street	Forest Street at I-95 SB Ramp Terminal	3	0.6	0.197	3.634	No
	Forest Street at I-95 NB Ramp Terminal	26	5.2	1.708	4.714	No
	Forest Street at Park Street	57	11.4	3.745	4.714	No
Church Street	Church Street at I-95 SB Ramp Terminal	4	0.8	2.740	3.654	No
Kings Road	Kings Road at Cleveland Street	74	14.8	2.150	6.815	No
	Kings Road from Cleveland Street to I-95 NB Ramp Terminal	35	7.0	6.177	6.815	No
	Kings Road at I-95 NB Ramp Terminal	22	4.4	0.437	10.842	No
	Kings Road at N Davis Street	96	19.2	1.906	10.842	No

Location	Description	Number of Crashes	Crash Frequency (crashes/year)*	Crash Rate*	Statewide Crash Rate	High Crash Location
8th Street	8th Street at Myrtle Avenue	28	5.6	0.816	3.654	No
	8th Street from Myrtle Avenue to I-95 Southbound Ramp Terminal	23	4.6	2.270	3.654	No
	8th Street at I-95 Southbound Ramp Terminal	48	9.6	1.399	3.634	No
	9th Street at I-95 Northbound Ramp Terminal	20	4.0	0.583	5.885	No
	8th Street at N Davis Street	85	17.0	2.477	3.634	No
	8th Street at James Hall Drive	38	7.6	1.108	4.714	No
	8th Street at Illinois Street	60	12.0	1.749	4.714	No
I-95 Northbound C-D Road	C-D Road between Forest Street On Ramp and Forsyth Street Off Ramp	16	3.2	3.122	0.976	Yes
	C-D Road between Forsyth Street Off Ramp and Monroe Street Off Ramp	3	0.6	0.702	0.976	No
	C-D Road between Monroe Street Off Ramp and I-95 On Ramp	5	1.0	1.115	0.976	Yes
I-95 Southbound C-D Road	C-D Road between I-95 Off Ramp and Adams Street On Ramp	8	1.6	0.753	0.976	No
	C-D Road between Adams Street On Ramp and Bay Street On Ramp	6	1.2	0.303	0.976	No
	C-D Road between and Bay Street On Ramp I-95 Off Ramp	2	0.4	0.109	0.976	No

*Intersection: crashes per million entering vehicles; Segment: crashes per million vehicle miles traveled.

3.8.5 I-95 Segments

I-95 within the study area was divided into 21 segments as presented in **Table 3-12.** The findings and observations from this analysis are presented below.

Segment 1: I-95 between I-10 and Forest Street (ramp from US 17)

The segment between I-10 and Forest Street on ramp experienced 71 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 2: I-95 between Forest Street (ramp from US 17) and Forsyth Street/Bay Street (C-D Road NB on ramp to I-95)

The segment between Forest Street on ramp and Forsyth Street/Bay Street on ramp experienced 107 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is lower than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 3: I-95 between Forsyth Street/Bay Street (C-D Road NB on ramp to I-95) and Monroe Street/Adams Street On Ramp

The segment between Forsyth Street/Bay Street on ramp and Monroe/Adams Street on ramp experienced 73 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 4: I-95 between Monroe Street/Adams Street On Ramp and Church Street/W Beaver Street On Ramp

The segment between Monroe/Adams Street on ramp and Church Street/ W Beaver Street on ramp experienced 48 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 5: I-95 between Church Street/W Beaver Street On Ramp and Union Street Off Ramp

The segment between Church Street/ W Beaver Street on ramp and Union Street off ramp experienced 21 crashes in five years. Rear-end crashes are the most predominant crash types, indicating stop-and-go conditions.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 6: I-95 between Union Street Off Ramp and Kings Road Off Ramp

The segment between Union Street off ramp and Kings Road off ramp experienced 12 crashes in five years. Rear-end crashes are the most predominant crash types, indicating stop-and-go conditions.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 7: I-95 between Kings Road Off Ramp and Kings Road On Ramp

The segment between Kings Road off ramp and Kings Road on ramp experienced 74 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 8: I-95 between Kings Road On Ramp and 8th Street Off Ramp

The segment between Kings Road on the ramp and 8th Street off ramp experienced 66 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 9: I-95 between 8th Street Off Ramp and 8th Street On Ramp

The segment between 8th Street off ramp and 8th Street on ramp experienced 121 crashes in five years. Rear-end crashes are the most predominant crash types, indicating stop-and-go conditions.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 10: I-95 between 8th Street On Ramp and MLK EB off Ramp

The segment between 8th Street on the ramp and Martin Luther King Jr. Parkway eastbound on the ramp experienced 53 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

Two fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 11: I-95 between MLK EB On Ramp and 8th Street Off Ramp

The segment between Martin Luther King Jr. Parkway eastbound on the ramp and 8th Street off ramp experienced 35 crashes in five years. Rear-end crashes are the most predominant crash type, indicating stop-and-go conditions.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 12: I-95 between 8th Street Off Ramp and 8th Street On Ramp

The segment between 8th Street off ramp and 8th Street on ramp experienced 81 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 13: I-95 between 8th Street On Ramp and Kings Road Off Ramp

The segment between 8th Street on ramp and Kings Road off ramp experienced 78 crashes in five years. Rear-end is the most predominant crash type, indicating stop-and-go conditions.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 14: I-95 between Kings Road Off Ramp and Union Street Off Ramp

The segment between Kings Road off ramp and Union Street off ramp experienced 21 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 15: I-95 between Union Street Off Ramp and Kings Road On Ramp

The segment between Union Street off ramp and Kings Road on ramp experienced 178 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

One fatality occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 16: I-95 between Kings Road On Ramp and Church Street/W Beaver Street Off Ramp

The segment between Kings Road on the ramp and Church Street/W Beaver Street off ramp experienced 34 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 17: I-95 between Church Street/W Beaver Street Off Ramp and Church Street/W Beaver Street On Ramp

The segment between Church Street/W Beaver Street off ramp and Church Street/W Beaver Street on ramp experienced 57 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 18: I-95 between Church Street/W Beaver Street On Ramp and Monroe Street/Adams Street CD Road Off Ramp

The segment between Church Street/W Beaver Street on ramp and Monroe Street/Adams Street CD Road off ramp experienced eight crashes in five years. Sideswipe crashes are the most predominant crash type, indicating lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 19: I-95 between Monroe Street/Adams Street CD Road Off Ramp and Forest Street Off Ramp

The segment between Monroe Street/Adams Street CD Road off ramp and Forest Street off ramp experienced 66 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 20: I-95 between Forest Street Off Ramp and I-10 Off Ramp

The segment between Forest Street off ramp and I-10 off ramp experienced seven crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 21: I-95 between I-10 Off Ramp and I-10 Flyover

The segment between the I-10 off ramp and I-10 flyover experienced 21 crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 mainline segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

The study arterials within the study area were divided into 15 segments (Segments 22 to 36) as presented in **Table 3-12**. The findings and observations for these segments are summarized by arterial in **Sections 3.8.7 to 3.8.10**.

3.8.6 I-95 C-D Road Segments

Segment 37: C-D Road between Forest Street On Ramp and Forsyth Street Off Ramp

The segment between Forest Street on ramp and Forsyth Street off ramp experienced 16 crashes in five years. Off-road and sideswipe crashes are the most predominant crash types, indicating lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 C-D road segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 38: C-D Road between Forsyth Street Off Ramp and Monroe Street Off Ramp

The segment between Forsyth Street off ramp and Monroe Street off ramp experienced three crashes in five years. Rear-end and sideswipe crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 C-D road segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 39: C-D Road between Monroe Street Off Ramp and I-95 On Ramp

The segment between Monroe Street off ramp and I-95 on ramp experienced five crashes in five years. Rear-end crashes are the most predominant crash type, indicating stop-and-go conditions.

No fatalities occurred in this segment. The actual average crash rate for this I-95 C-D road segment is higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is a high crash location (**Table 3-13**).

Segment 40: C-D Road between I-95 Off Ramp and Adams Street On Ramp

The segment between I-95 off ramp and Adams Street on ramp experienced eight crashes in five years. Rear-end, other and off-road crashes are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 C-D road segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 41: C-D Road between Adams Street On Ramp and Bay Street On Ramp

The segment between Adams Street on ramp and Bay Street on ramp experienced six crashes in five years. Rear-end crashes are the most predominant crash type, indicating stop-and-go conditions.

One fatality occurred in this segment. The actual average crash rate for this I-95 C-D road segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

Segment 42: C-D Road between and Bay Street On Ramp I-95 Off Ramp

The segment between Bay Street on ramp and I-95 off ramp experienced two crashes in five years. Rear-end and sideswipe crashes (one crash each) are the most predominant crash types, indicating stop-and-go conditions and lane-changing crash patterns.

No fatalities occurred in this segment. The actual average crash rate for this I-95 C-D road segment is not higher than the statewide average crash rate for the years 2013-2017 indicating that this segment is not a high crash location (**Table 3-13**).

3.8.7 Forest Street

The crash analysis results reveal that there was a total of 86 crashes on Forest Street within the study area during the five study years (2013-2017). Of these 86 crashes, front to rear (rear-end) crashes were the most common type of crash accounting for 24 (28 percent) of total crashes followed by 18 angle crashes accounting for (20 percent) and seven sideswipe crashes (eight percent).

No fatalities occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 62 (72 percent) of all crashes; 24 crashes resulted in Injury. Among the contributing causes documented in the crash data, “careless driving” (21 crashes), resulted in the most crashes. Other contributing causes included “backing - improper” (5 crashes) and “fail to stop at steady red signal” (3 crashes. **Table 3-13** shows the crash summary along Forest Street within the study area.

3.8.8 Church Street

The crash analysis results reveal that there was a total of four crashes on Church Street within the study area during the five study years (2013-2017). Of these four crashes, off-road crashes were the most common type of crash accounting for 2 (50 percent) of total crashes followed by one left turn and one angle crash.

No fatalities occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for three (75 percent) of all crashes; one crash resulted in Injury. Among the contributing causes documented in the crash data, “careless driving”, was one of the reported causes. **Table 3-13** shows the crash summary along Church Street within the study area.

3.8.9 Kings Road

The crash analysis results reveal that there was a total of 227 crashes on Kings Road within the study area during the five study years (2013-2017). Of these 227 crashes, front to rear (rear-end) crashes were the most common type of crash accounting for 103 (45 percent) of total crashes followed by 36 sideswipe crashes accounting for (16 percent) and 15 off-road crashes (seven percent).

No fatalities occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 185 (80 percent) of all crashes; 45 crashes resulted in Injury. Among the contributing causes documented in the crash data, "careless driving" (39 crashes), resulted in the most crashes. Other contributing causes included "following too closely" (9 crashes) and "improper lane change" (4 crashes). **Table 3-13** shows the crash summary along Kings Road within the study area.

3.8.10 8th Street

The crash analysis results reveal that there was a total of 302 crashes on 8th Street within the study area during the five study years (2013-2017). Of these 302 crashes, front to rear (rear-end) crashes were the most common type of crash accounting for 188 (30 percent) of total crashes followed by left turn, angle, sideswipe and parked vehicle – all of which had 30 crashes (10 percent), respectively.

One fatal crash occurred within the study limits during the five-year period (involving a collision with a tree). Property Damage Only (PDO) crashes accounted for 213 (71 percent) of all crashes; 88 crashes resulted in Injury. Among the contributing causes documented in the crash data, "careless driving" (35 crashes), resulted in the most crashes. Other contributing causes included "fail to yield – to oncoming traffic" (21 crashes), "following too closely" (6 crashes) and "fail to obey traffic control device" (6 crashes). **Table 3-13** shows the crash summary along 8th Street within the study area.

3.9 Consistency with Master Plans, LRTP, Developments of Regional Impact and Projects

This SIMR considers all programmed and planned roadway improvements within the study area. The proposed capacity improvements are consistent with the following studies:

- North Florida TPO Year 2040 Long-Range Transportation Plan (LRTP)
- North Florida TPO Transportation Improvement Program (TIP)
- North Florida TPO Cost Feasible Plan
- City of Jacksonville Comprehensive Plan
- FDOT Five-Year Work Program
- I-95 at Martin Luther King Jr. Parkway/US 1/SR 115 IMR

4 NEED

The purpose of this I-95 SIMR project is to add capacity along the I-95 corridor from north of I-10 to south of the Martin Luther King Jr. Parkway interchange to provide better travel time reliability, improve safety and enhance operations along the I-95 study corridor and interchanges.

The need for the project in this SIMR is based on the following factors:

Mobility

In 2019, this segment of I-95 carried Annual Average Daily Traffic (AADT) volume of 151,000 vehicles north of the I-10 interchange at the beginning of the study corridor, 133,000 north of Kings Road, and 131,500 north of W 8th Street interchange which is towards the northern end of the study corridor. Based on existing year analysis, the I-95 southbound mainline segments from Kings Road entrance to the C-D road exit (Kings Road entrance to Church Street exit in the AM peak hour only) and Kings Road exit to Union Street exit (AM peak hour only), currently operate below the LOS D target. Many merge/diverge segments along the corridor also operate at lower speeds.

Arterials in downtown comprise of one-way streets and roadways with one to two lanes in each travel direction. In 2019, Forest Street carried an AADT of 2,600 vehicles, Bay Street carried an AADT of 10,400 vehicles, Union Street carried an AADT of 7,600 vehicles, Adams Street carried an AADT of 5,700 vehicles, Monroe Street carried an AADT of 3,100 vehicles, Church Street carried an AADT of 700 vehicles, Beaver Street carried an AADT of 11,900 vehicles, Union Street carried an AADT of 28,500 vehicles, Kings Road carried an AADT of 26,000 vehicles and 8th Street carried an AADT of 18,700 vehicles.

The 2045 AADT forecast estimate for I-95 is 181,000 vehicles north of I-10 at the beginning of the study corridor, 168,000 north of Kings Road, and 160,000 north of W 8th Street interchange which is towards the northern end of the study corridor.

If no capacity improvements are made to the facilities, congestion within the corridor and at the interchanges will get progressively worse, with the periods of congestion extending the peak periods of travel, increasing the number of crashes and deteriorating the travel time reliability for the users.

Social/Economic Demand

I-95 is a major north-south corridor around central Jacksonville. Within the study limits, I-95 serves as the main entryway to the Jacksonville Central Business District (CBD) and connects suburban residential areas throughout the corridor to office, commercial, recreational and industrial areas. The communities of Brooklyn, LaVilla, Mixon Town, New Town, Hogan's Creek and Springfield are located adjacent to I-95 in the study area. Major employers are in the CBD such as CSX Corporation, TIAA Bank, Bank of America and Haskell. There are also tourism attractors downtown including but not limited to TIAA Bank Field (home of the Jacksonville Jaguars), the Baseball Grounds of Jacksonville, Jacksonville Veterans Memorial Arena, Prime F. Osborn III Convention Center and the Times-Union Center for the Performing Arts. North of the CBD and adjacent to the study area, UF Heath's Jacksonville complex attracts significant traffic from the surrounding areas.

The population of Duval County is expected to increase by approximately 29% and employment is expected to increase by 43% from 2015 to 2045 (Source: North Florida Transportation Planning Organization (North Florida TPO) 2045 Long Range Transportation Plan (LRTP)). This increase in population and employment will result in higher traffic volumes on I-95. Without any additional improvements, I-95 will begin to operate below FDOT target LOS D.

Modal Interrelationships

I-95 serves as a key transportation element in linking the major ports, airports and railways that handle Florida's passenger and freight traffic throughout the region. Additionally, I-95 is a National Highway System (NHS) on FDOT's Strategic Intermodal System (SIS), which is Florida's high-priority network of transportation facilities important to the state's economy and mobility. SIS facilities are the workhorses of Florida's transportation system and account for a dominant share of the people and freight movement to, from and within Florida.

I-95 provides direct access to JAXPORT's Talleyrand Marine Terminal (SIS Seaport) via Martin Luther King Jr. Parkway and the Hart Expressway (Talleyrand Connector is currently under construction) and is used to transport cargo to/from the Jacksonville International Airport and other intermodal facilities. Once the Talleyrand Connector is constructed and enhanced ITS infrastructure along Martin Luther King Jr. Parkway is implemented, freight flow and accessibility to and from the Talleyrand Port District from I-95 will be improved.

In addition, connections from I-95 to W Forsyth Street and W Adams Street are designated SIS Strategic Growth Highway Connectors for the Jacksonville Greyhound bus station located on W Forsyth Street.

Safety

Crash data from 2013-2017 shows that a total of 2,061 crashes were reported over the five-year period resulting in 544 injury crashes and ten fatal crashes. The predominant collision type was rear end crashes in the study area. Common factors that contribute to rear end crashes are congestion, inadequate gaps in traffic, tailgating and driver distractions. Most of the congestion occurs during the morning and afternoon peak periods, which although accounting for only four-five hours, serve the highest volume of traffic in a day. Therefore, the number of crashes on I-95 within the study area may be closely related to the level of congestion caused by various attractions throughout the corridor. Without any improvements, the congestion on I-95 during the morning and afternoon peak hours will worsen and may lead to an increasing number of crashes.

The project is anticipated to improve emergency evacuation capabilities by enhancing connectivity and accessibility to major arterials designated on the state evacuation route. I-95 serves as part of the emergency evacuation route network designated by the Florida Division of Emergency Management and Duval County. I-95 is critical in facilitating traffic during emergency evacuation periods as it connects to other major arterials and highways of the state evacuation route network such as I-10, SR 9B and I-295. Without any improvements to I-95, evacuation clearance times will continue to increase and may discourage residents from evacuating, thus jeopardizing public safety.

FDOT has initiated this SIMR to investigate alternatives for the I-95 facility that will help alleviate congestion and enhance safety and operations at the study interchanges to improve safety and operations throughout the study area.

5 Future Traffic Forecasts

The future year traffic forecasts for the Opening Year 2025 and Design Year 2045 were developed in accordance with the procedures outlined in FDOT Project Traffic Forecasting Handbook and the methodology documented in the approved MLOU for this SIMR provided in **Appendix A.** The NERPM-AB1v3 was used for the development of future year daily and peak hour traffic projections within the study area. The NERPM-AB1v3 model is based on the Florida Standard Urban Transportation Modeling Structure (FSUTMS) and is recognized by FDOT District Two, FHWA and the North Florida TPO as an acceptable travel demand forecasting tool. The NERPM-AB1v3 model is the locally approved travel demand model validated for the region. It encompasses the northeast Florida region, specifically St. Johns and Duval Counties. It has a Base Year of 2010 with a Horizon Year of 2040.

This section discusses the details of the traffic forecasting methodology utilized to obtain future traffic volumes.

5.1 Future Roadway Network

The North Florida TPO is responsible for maintaining the FSUTMS based NERPM-AB1v3 travel demand model. Updates to the roadway network in NERPM-AB1v3 were based on projects identified in the TPO's current adopted LRTP Cost Feasible Plan. Projects planned within the AOI that add capacity along I-95 are listed below.

- I-95 at Martin Luther King Jr. Parkway/US 1/20th street interchange modification

5.2 Socioeconomic Data

In addition to the future roadway improvements, all other recently constructed or major approved developments within the project area vicinity were included in the NERPM-AB1v3 No-Build and Build models to ensure that model output was reasonable. The population and socioeconomic data within the study area for the Horizon Year 2040 model was evaluated and adjusted to ensure the accuracy of new traffic projections. There are no known major developments proposed within the study area.

5.3 Development of Opening Year 2025 No-Build and Build Traffic

The Opening Year 2025 No-Build and Build AADTs, DDHVs and intersection turning movements were developed by the Department as part of the I-95 from I-10 to Florida/Georgia State Line Express Lanes Feasibility Study and were utilized in this SIMR.

Figure 6-2 shows the mainline, ramps and intersections volumes for the Opening Year 2025 No-Build condition.

5.4 Development of Design Year 2045 No-Build and Build Traffic Volumes

- The NERPM-AB1v3 future year 2040 Build and No-Build scenarios model runs were conducted to incorporate the land use growth and network improvements.
- Year 2019 calibrated volumes were developed as discussed earlier in **Section 2.6**. The 2025 and 2045 traffic projections were developed by the Department as part of the I-95 from I-10 to Florida/Georgia State Line Express Lanes Feasibility Study. No further project traffic forecasting effort was conducted as part of this SIMR.

Figure 6-3 shows the mainline, ramps and intersections volumes for the Design Year 2045 No-Build condition.

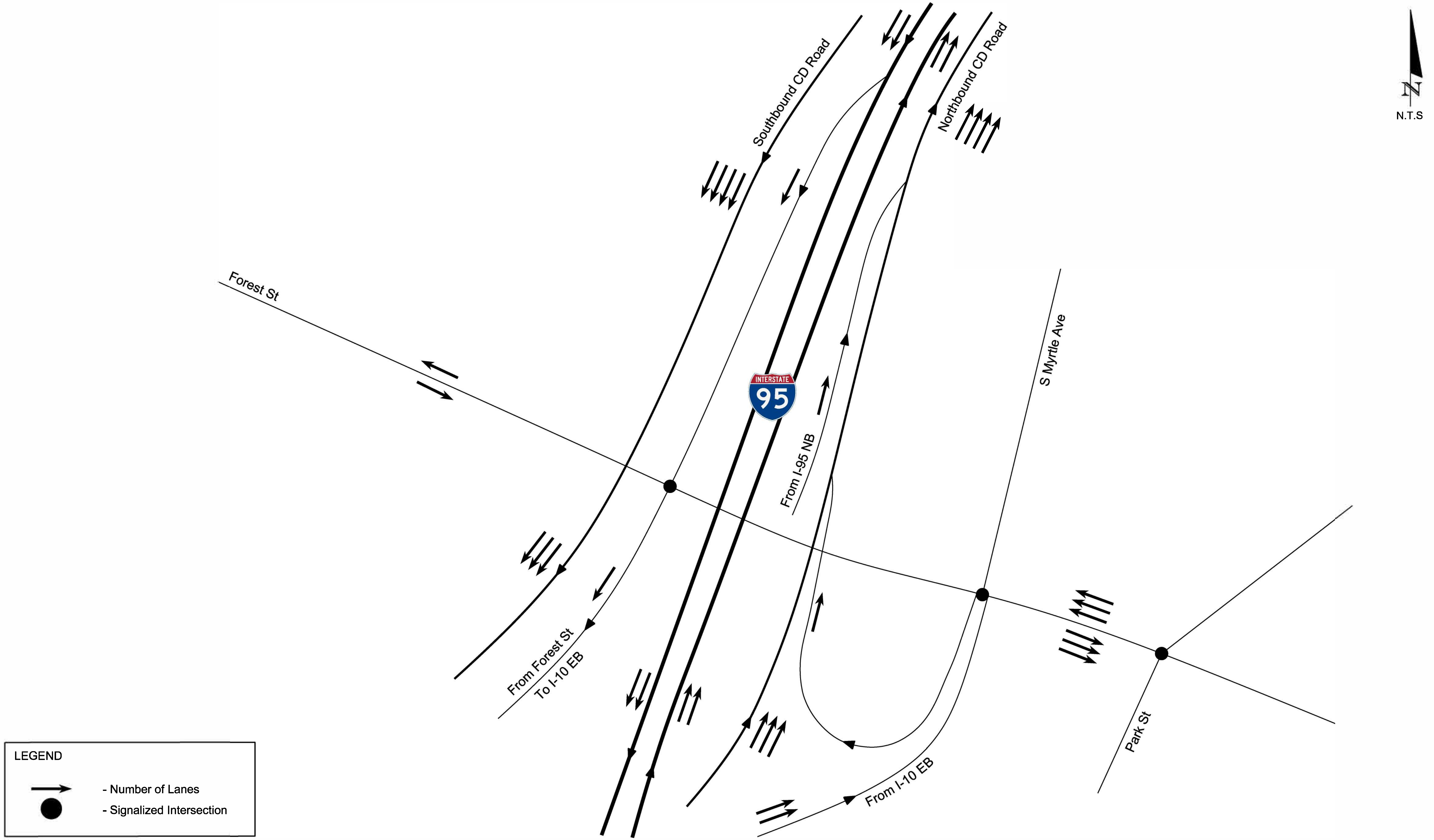
6 NO-BUILD CONDITIONS

This section documents the future conditions along I-95 within the study area for the No-Build Alternative. The No-Build Alternative assumes the existing plus any programmed improvements with future traffic and provides a baseline for comparison to all study alternatives. This alternative represents the existing physical and operational conditions within the AOI including all planned and programmed roadway improvements over the course of the analysis years.

At this time, the No-Build alternative considers the existing configuration plus any programmed improvements with future traffic as discussed earlier in **Section 5** of this SIMR. The improvements recommended in the I-95 at Martin Luther King Jr. IMR were assumed to be part of the No-Build Alternative analysis.

The analysis years considered under the No-Build Alternative are Opening Year 2025 and Design Year 2045. The primary purpose for this analysis was to establish the No-Build operational conditions along I-95 and at the study interchanges and intersections. The No-Build lane configuration is provided in **Figure 6-1.**

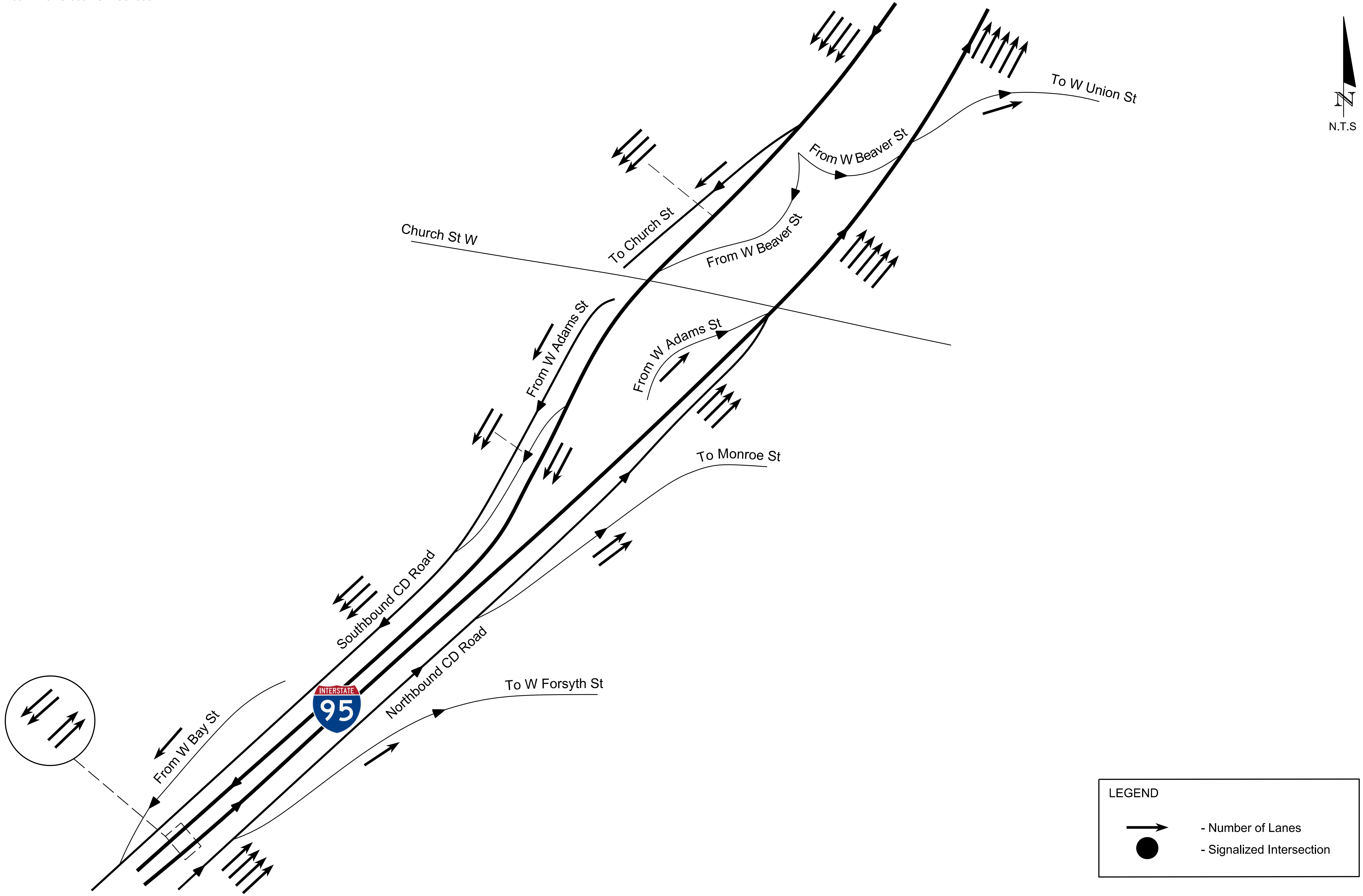
The No-Build AM and PM peak hour volumes were developed using the methodology described in **Section 5**. These peak hour volumes were used to develop the 15-minute Vissim volume inputs for the operational analysis. The observed average weekday profile utilized for developing the 15-minute flow rate was used for developing three hour volumes. This volume profile was applied to the design hour volumes to obtain three hour volumes for future years. The No-Build AM and PM peak hour volumes for Opening Year 2025 are presented in **Figure 6-2**. The No-Build AM and PM peak hour volumes for Design Year 2045 are presented in **Figure 6-3**.



I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

No-Build Alternative Lane Configuration

Figure 6-1
Sheet 1/4

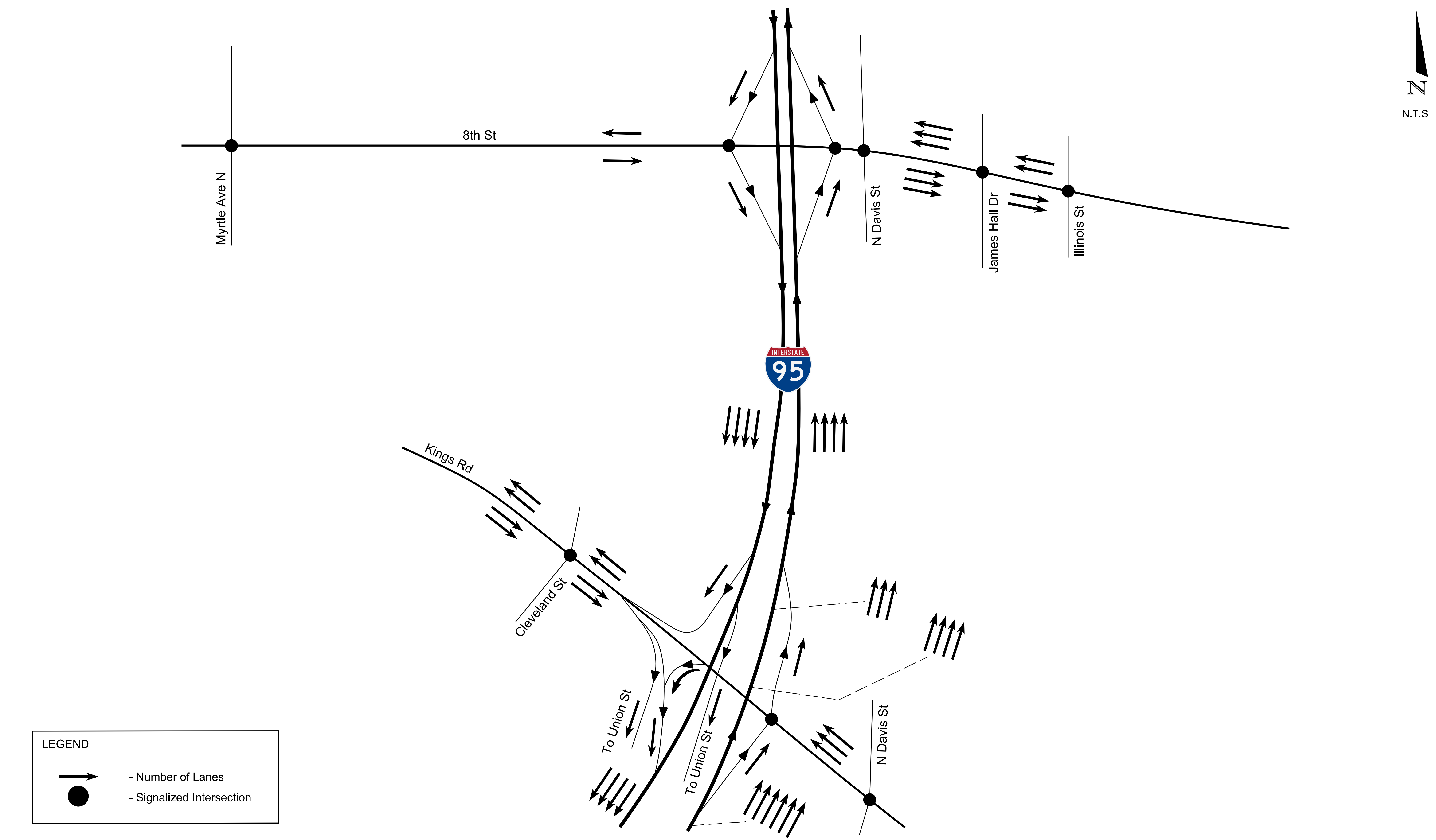


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

No-Build Alternative Lane Configuration

Figure 6-1
Sheet 2/4

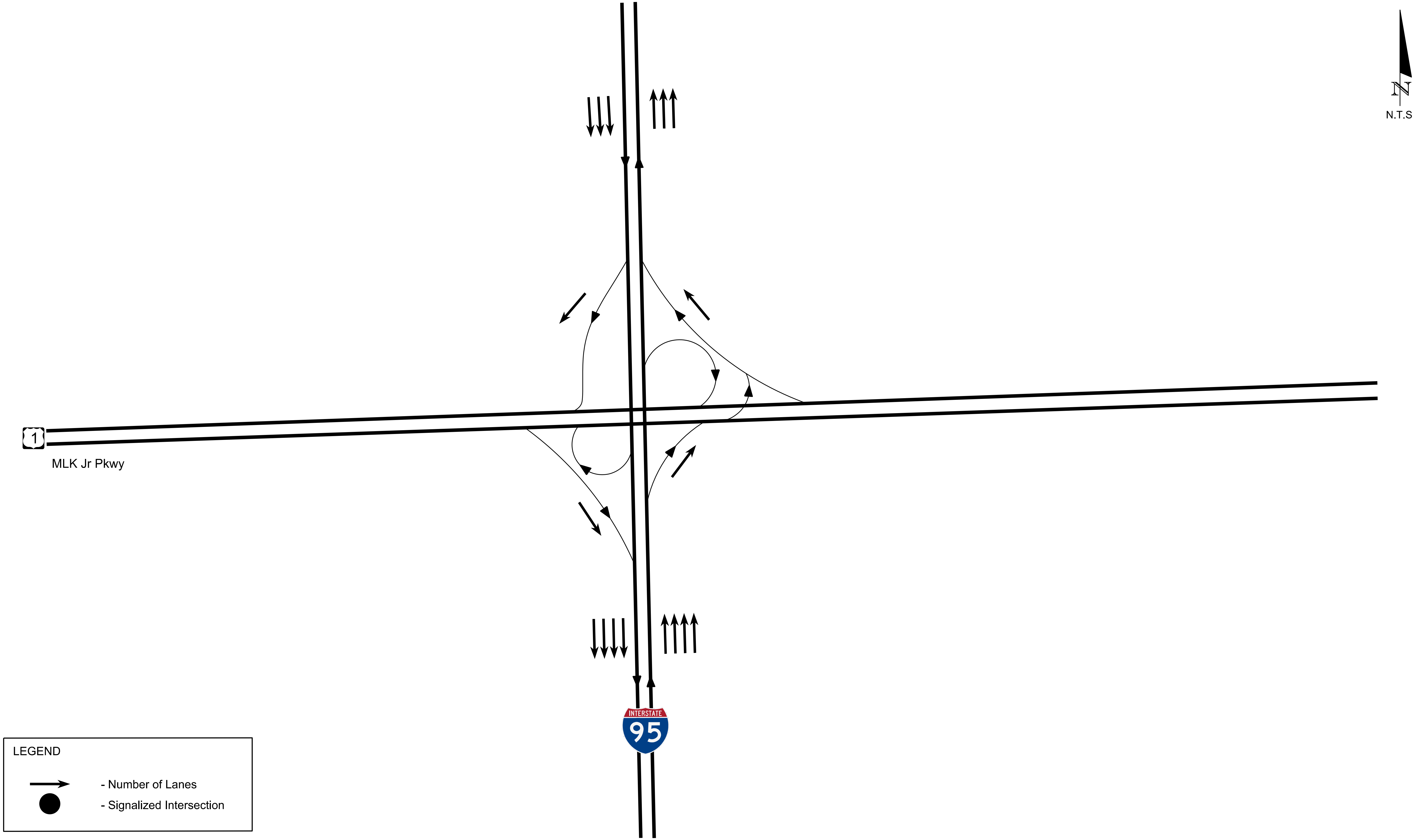


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

No-Build Alternative Lane Configuration

Figure 6-1
Sheet 3/4



LEGEND

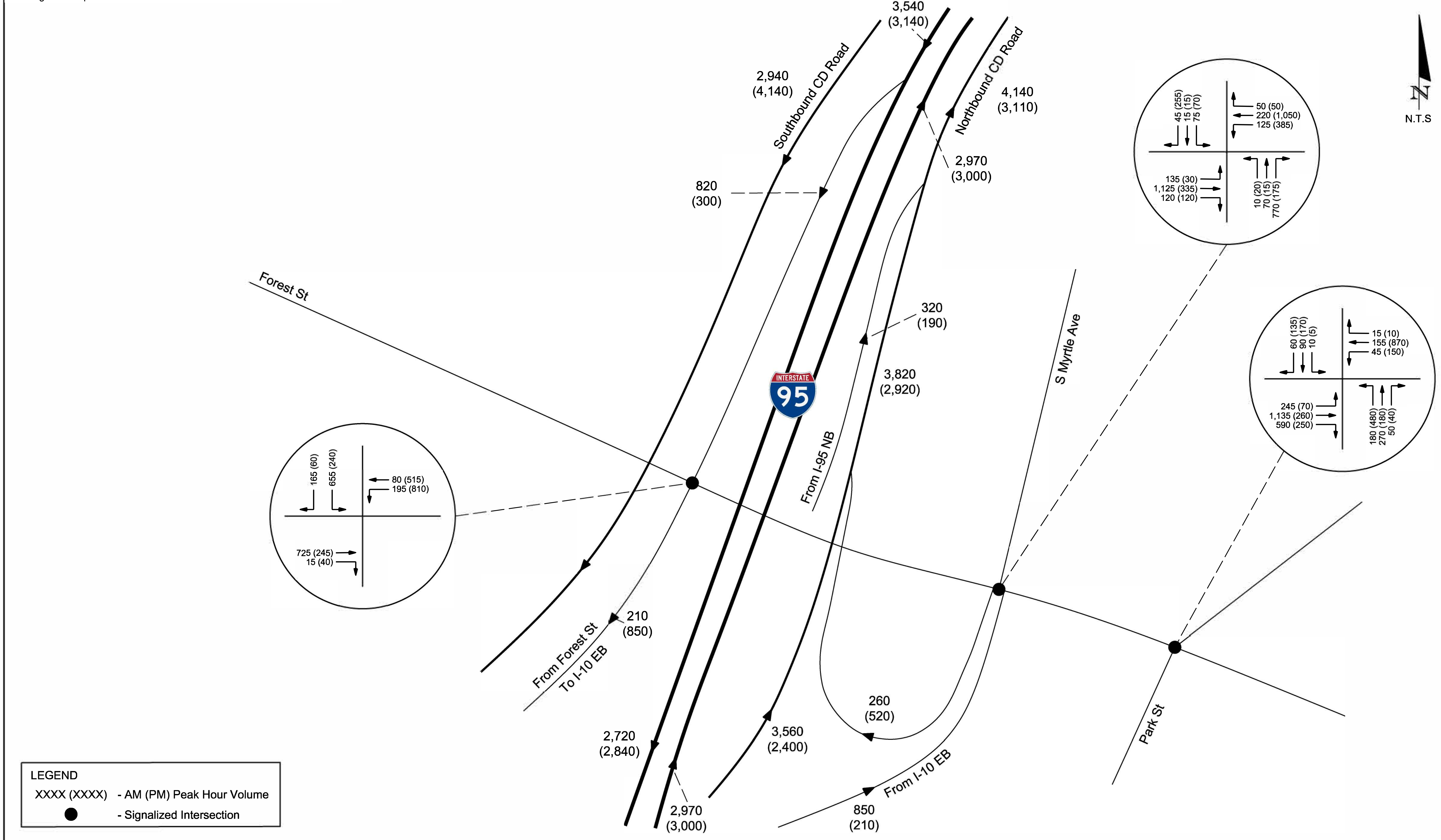
- Number of Lanes
- Signalized Intersection

FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

No-Build Alternative Lane Configuration

Figure 6-1
Sheet 4/4

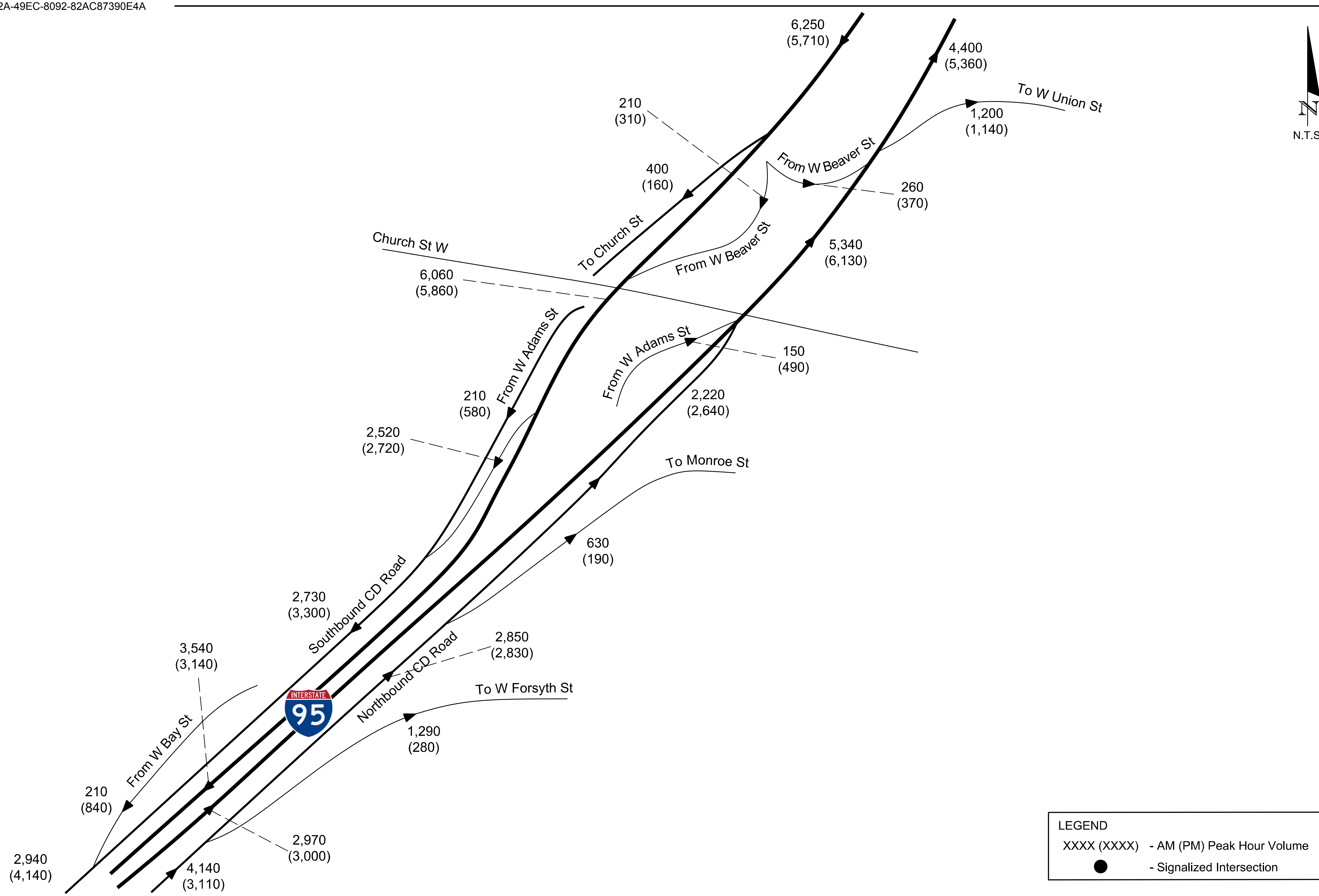


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 No-Build Peak Hour Volumes
Mainline, Ramps and Intersections

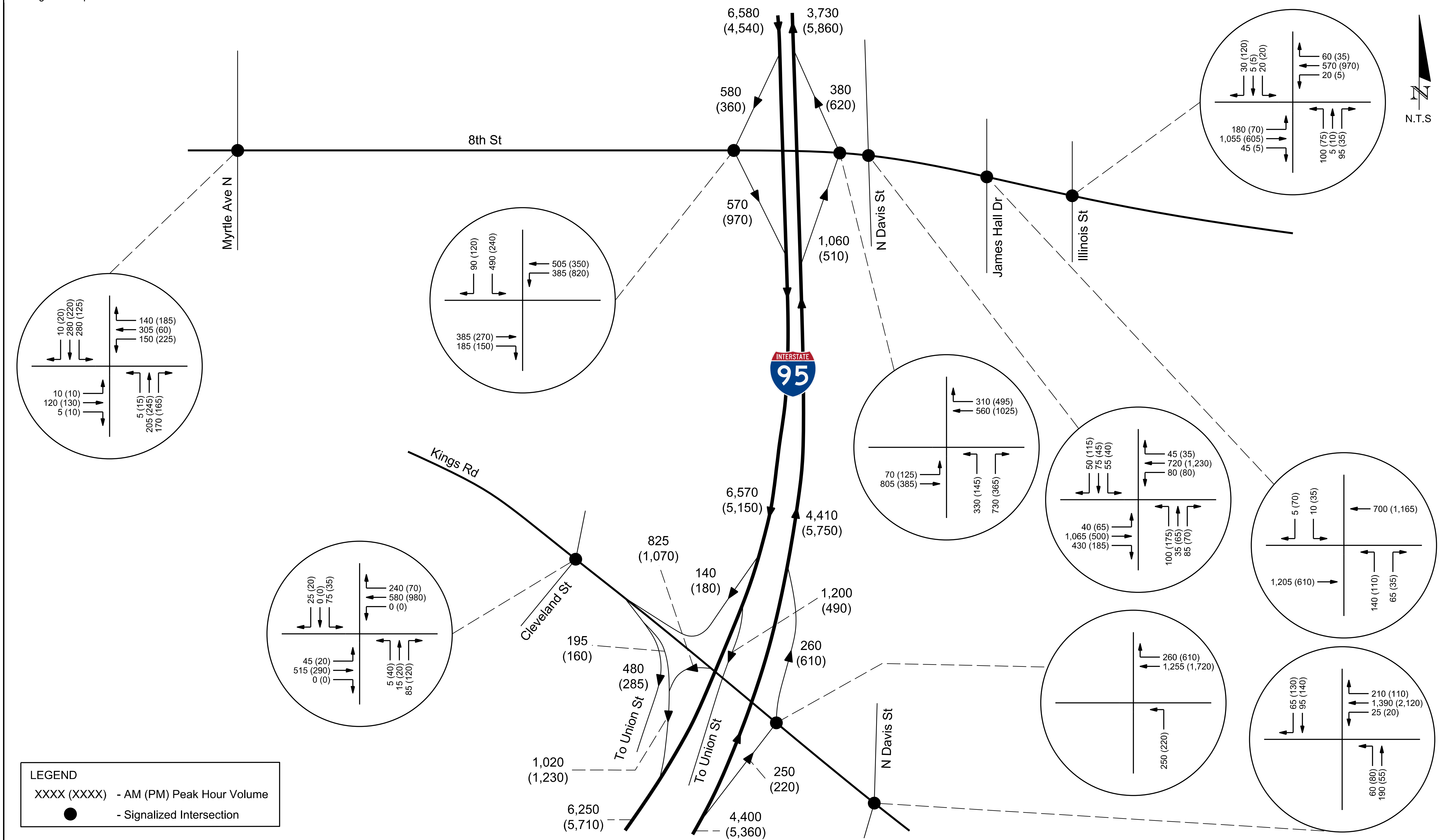
Figure 6-2
Sheet 1/4



LEGEND

XXXX (XXXX)	- AM (PM) Peak Hour Volume
●	- Signalized Intersection

FDOT — *I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)*	Opening Year 2025 No-Build Peak Hour Volumes Mainline, Ramps and Intersections	Figure 6-2 Sheet 2/4

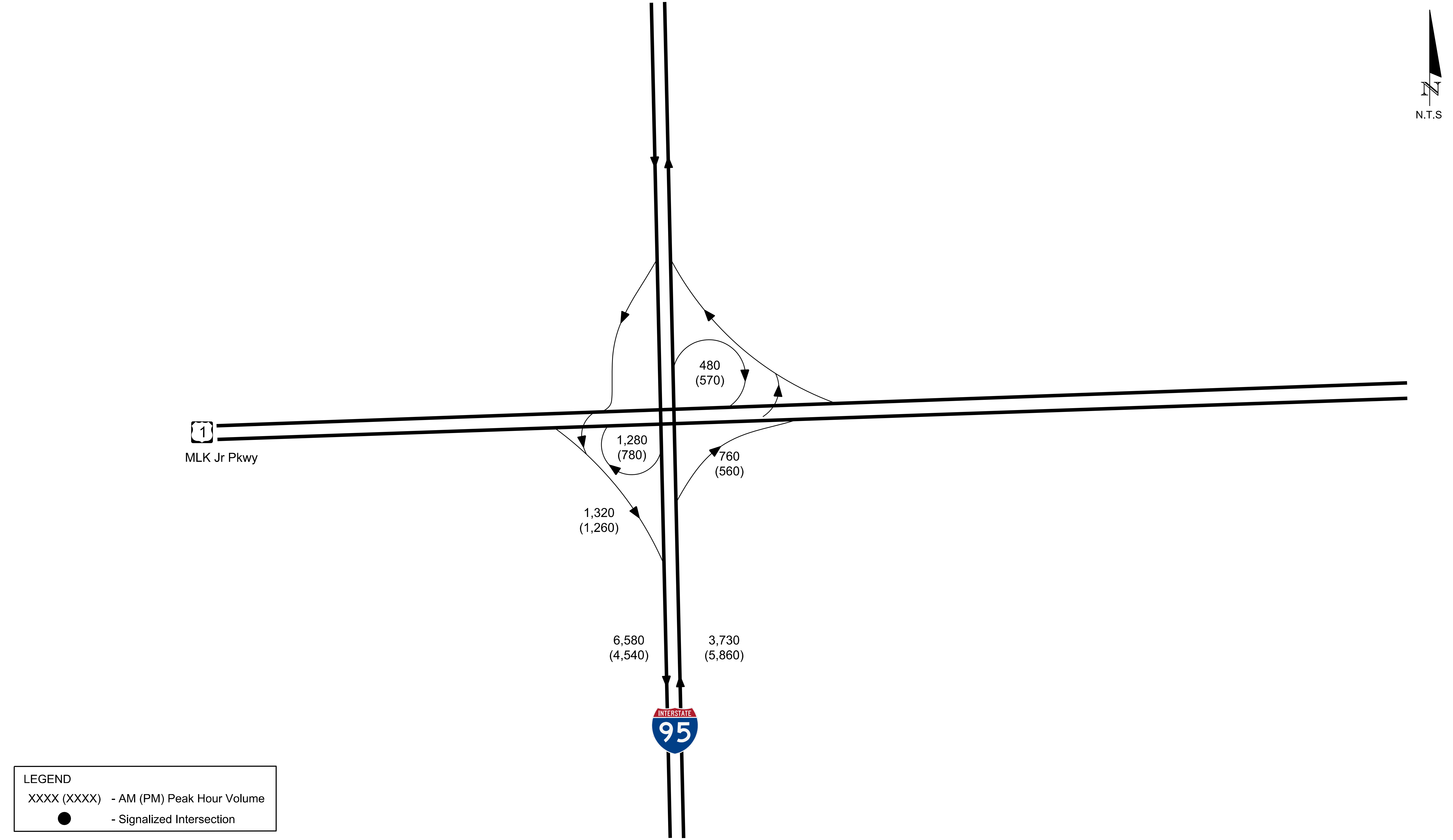


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 No-Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 6-2
Sheet 3/4

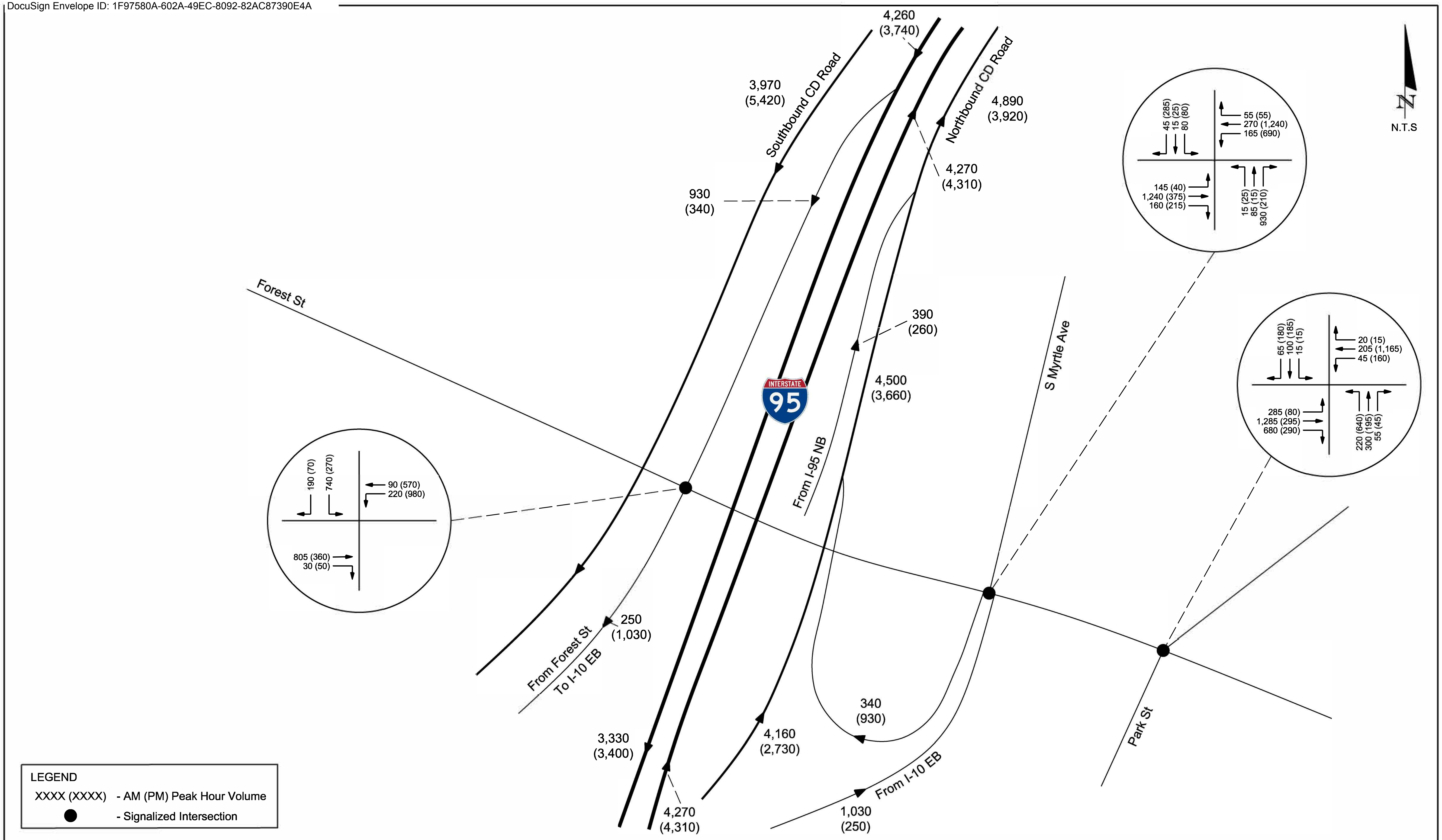


FDOT

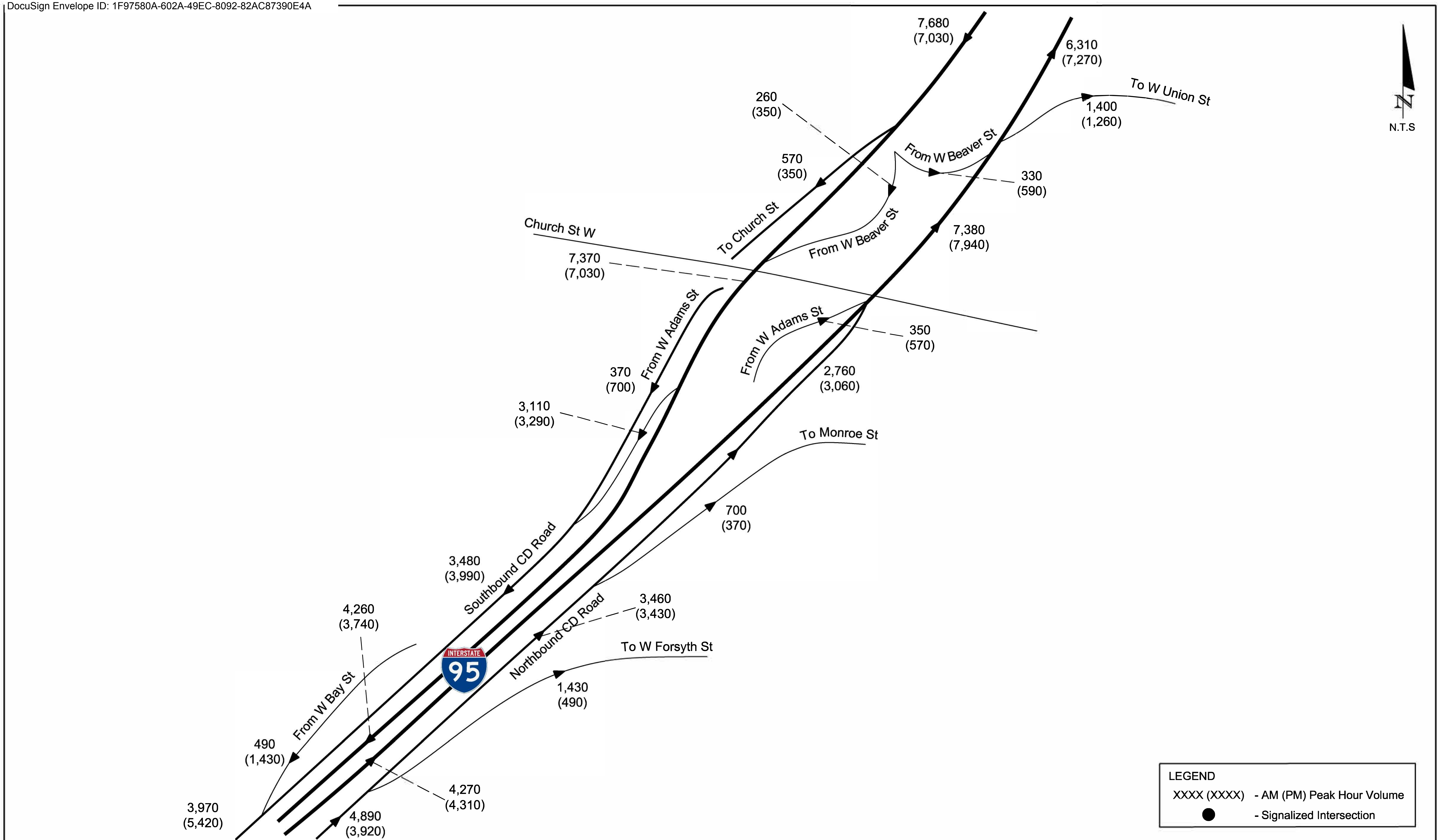
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 No-Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 6-2
Sheet 4/4



FDOT *I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)*	Design Year 2045 No-Build Peak Hour Volumes Mainline, Ramps and Intersections	Figure 6-3 Sheet 1/4

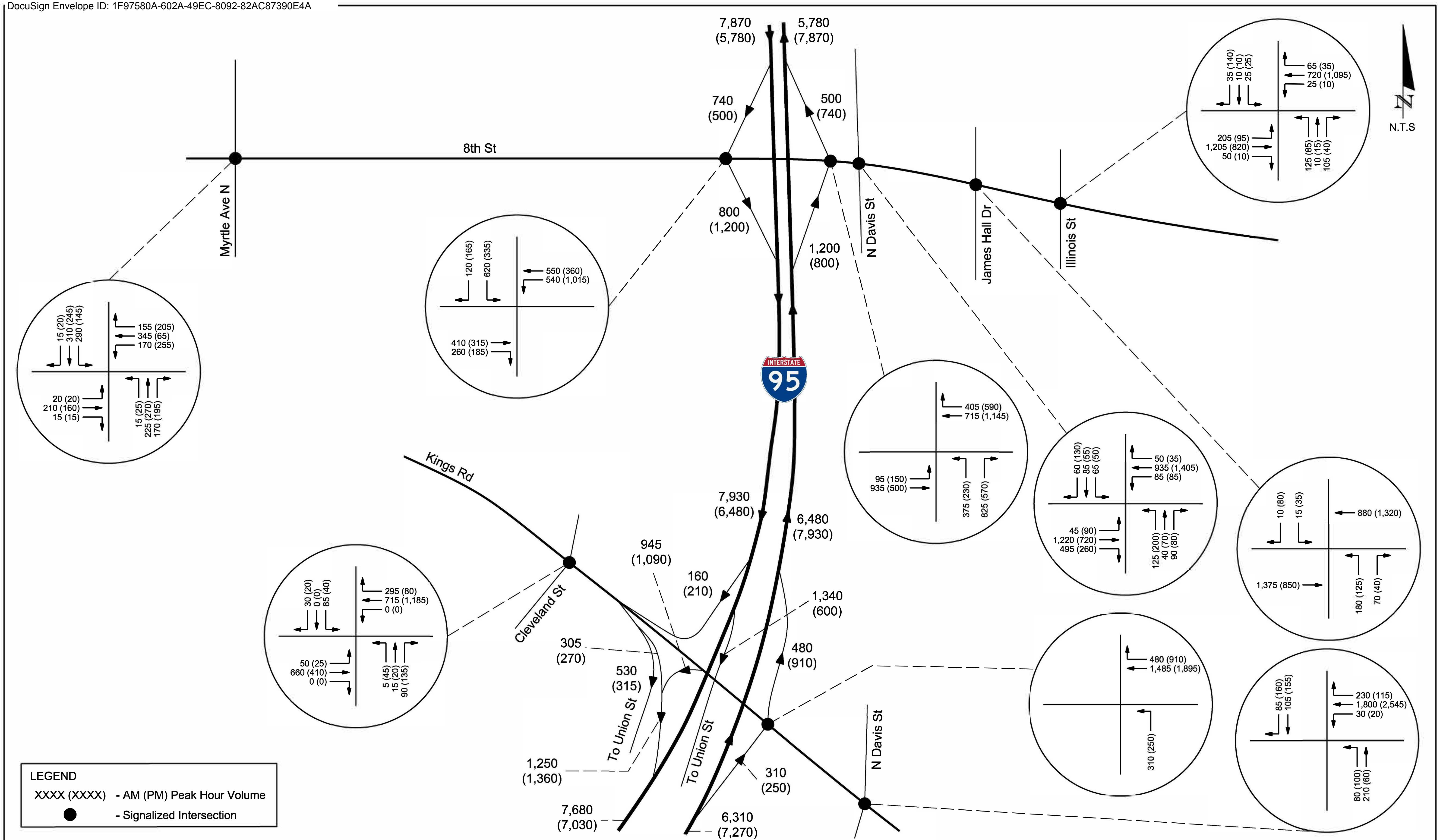


FDOT

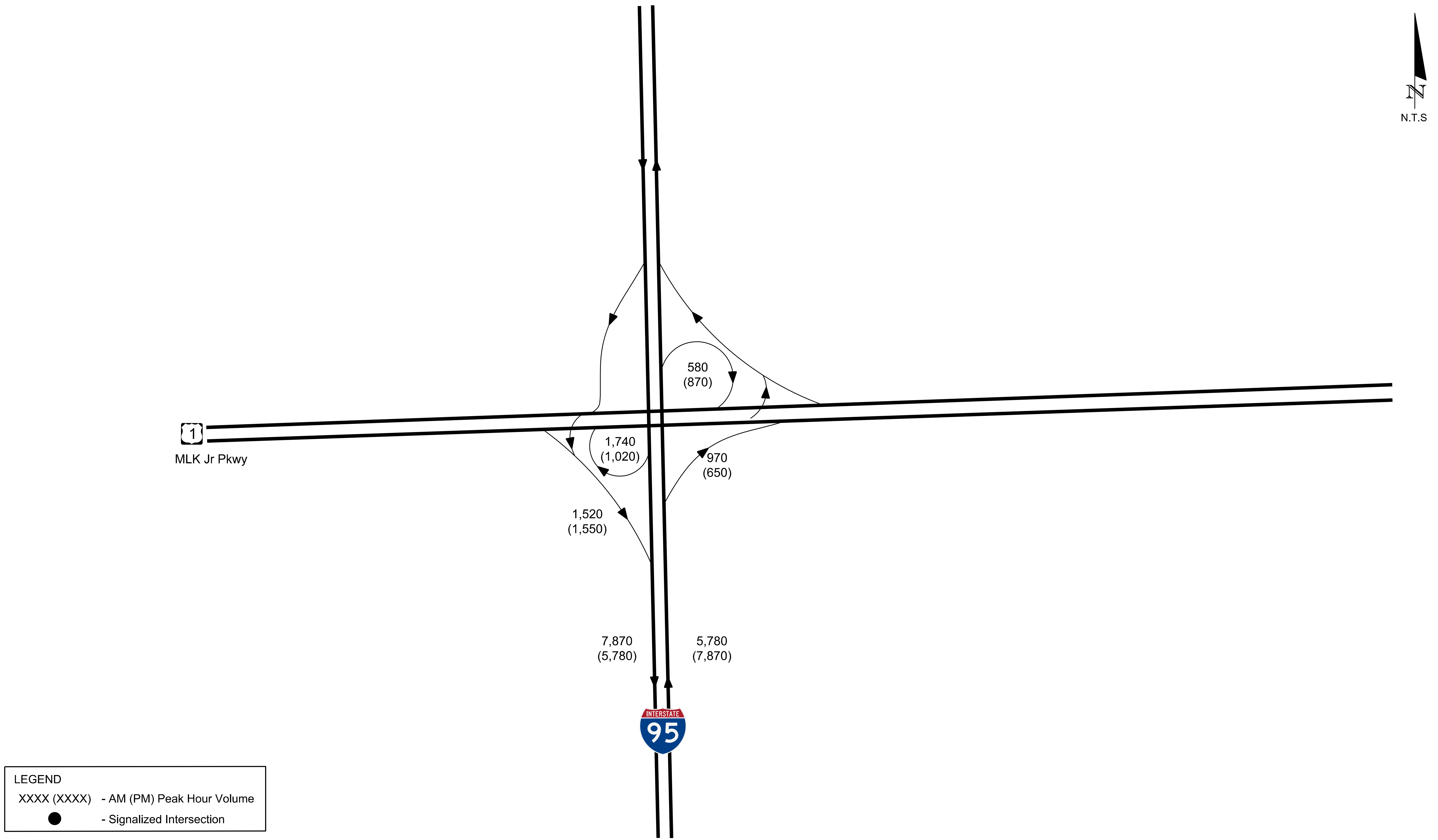
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 No-Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 6-3
Sheet 2/4



FDOT — *I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)*	Design Year 2045 No-Build Peak Hour Volumes Mainline, Ramps and Intersections	Figure 6-3 Sheet 3/4



FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 No-Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 6-3
Sheet 4/4

6.1 2025 No-Build Operational Analysis

A detailed microsimulation analysis using Vissim 2020 was conducted to evaluate the system-wide operational performance of the No-Build Alternative. No-Build Vissim outputs are included in **Appendix E**.

The Opening Year 2025 Vissim models analyzed three-hour AM and PM peak periods. Peak-hour traffic forecasts were developed using NERPM-AB1v3 as discussed in **Section 5**. Fifteen-minute flow rates were used to develop the three-hour AM and PM peak period Vissim models. The Opening Year 2025 simulation model parameters are based on those used for the Existing Year 2019 calibrated model. The simulation time consisted of a 30-minute seed time to load traffic into the network, followed by a 3-hour peak period consisting of a preceding shoulder hour, the peak hour and subsequent off-peak hour. The purpose of the off-peak hours was to allow all or most of the congestion built during the peak hour to subside during the simulation period. The performance targets for the freeway segments are LOS D and an operating speed of 45 mph.

The following MOEs were used to evaluate the network's operational performance:

- Freeways
    - Freeway estimated LOS
    - Operating speed
    - Demand and simulated volume in hourly interval
    - Estimated density in hourly interval
    - Density heat diagrams for 15-min interval
- Intersections
    - Intersection volume
    - Intersection delay
    - Maximum queue length
- Network-Wide Performance
    - Total network delay
    - Average network speed

- Total network travel time
- Latent demand
- Latent delay
- Vehicles arrived

Documentation for the No-Build Alternative analysis is provided in **Appendix E**.

2025 Peak Hour Results Overview

The lane schematics for the Opening Year 2025 No-Build AM and PM peak hours are presented in **Figure 6-4** and **Figure 6-5**, respectively. The lane schematics provide an operational overview representing the overall speed, density, LOS and volume of I-95 and the I-95 C-D road during the peak hour.

The AM peak hour results for the Opening Year 2025 No-Build show significant congestion on I-95 southbound from north of the Martin Luther King Jr. Parkway entrance to the 8th Street exit due to the insufficient capacity. This leads to severe congestion in the southbound direction. Speeds in this area are below 30 mph, with the lowest speed of 12 mph occurring between the Martin Luther King Jr. Parkway entrance and the 8th Street exit. The density observed between the Martin Luther King Jr. Parkway entrance and 8th Street exit is 101 pc/mi/ln with a total demand volume of 6,580 vph and a total simulated volume of 4,972 vph. This is equivalent to estimated LOS F. Additional congestion is observed south of the Union Street exit through the Forest Street exit. Northbound congestion occurs between Adams Street and Union Street. The observed speed in this area is less than 50 mph with an estimated density of 34 to 37 pc/mi/ln and a total simulated volume of 5,510 vph. The estimated LOS is E between W Beaver Street entrance and Union Street exit.

Speeds on I-95 southbound C-D Road in the AM peak hour were consistent through the study area. Speeds here average 49 mph, a density between 13 and 16 pc/mi/ln and operates at LOS B. The total simulated volume averages 2,200 vph. Speeds northbound are slower beginning at the Forest Street entrance and continuing past the Monroe Street exit. The slowest speed is from the I-95 mainline entrance to Forsyth Street exit and after the Monroe Street exit. Speeds in these areas are 45 mph with a density of 30 pc/mi/ln and 16 pc/mi/ln, respectively. Total simulated volume ranges from 4,110 vph to 2,195 vph.

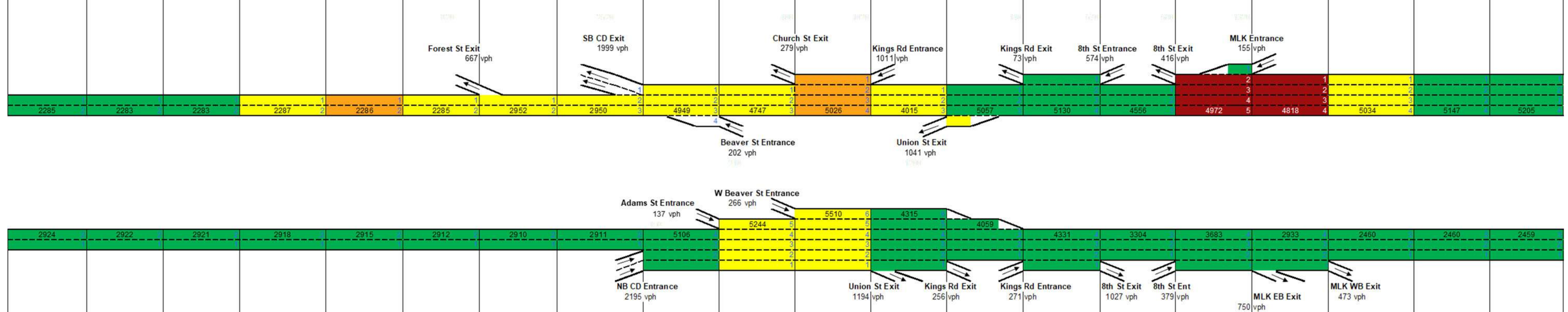
The PM peak hour results for the Opening Year 2025, shown in **Figure 6-5**, indicate significant congestion on I-95 southbound between the Kings Road entrance and Beaver Street entrance. Speeds in this area average 47 mph, with the lowest speed of 46 mph occurring between the Church Street exit and Beaver Street entrance. The density observed between the Church Street exit and Beaver Street entrance is 40 pc/mi/ln with a total simulated volume of 5,625 vph and operates at LOS E. Slower speeds occur in a similar location northbound between Beaver Street and Union Street between the Beaver Street entrance and Union Street exit. The average speed in this area is 50 mph with an estimated density range of 38 to 42 pc/mi/ln. The total simulated volume between the Beaver Street entrance and Union Street Exit is 6,384 vph. The estimated LOS is E.

Similar to the AM peak hour, speeds on I-95 southbound C-D Road are slowest in the PM peak hour before the Adams Street entrance. Speeds here average 48 mph, a density of 18 pc/mi/ln, a total simulated volume of 2,682 vph and operates at LOS C. Speeds northbound are slower after the Monroe Street exit. Speeds in this area average 44 mph with a density of 19 pc/mi/ln, a total simulated volume of 2,585 vph and estimated LOS C.

The heat maps in **Appendix E** show the density levels for the AM and PM peak periods, respectively. On I-95 southbound during AM peak period, a hot spot is observed exceeding 134 vpmpl during hour 3 in the weaving segment between Martin Luther King Jr. Parkway and 8th Street. On I-95 southbound during the PM peak period, another is observed between Kings Road and the C-D road exit with density levels around 40 vpmpl during hours 1 and 2. Significant hot spots were not observed on I-95 northbound or C-D road during the AM and PM peak periods.

← I-95 Southbound

Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	884	352	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	61	61	60	51	47	52	49	50	51	49	48	52	54	58	55	12	30	53	59	63
Estimated Density (pc/mi/ln)	9	12	12	14	16	11	15	19	32	31	34	25	30	29	27	101	53	31	28	27
Estimated LOS	A	B	B	B	B	A	B	C	D	D	D	C	D	D	D	F	F	D	D	D
Total Demand Volume (vph)	2720	2720	2720	2720	2720	2720	3540	3540	6060	5850	6250	5230	6430	6570	6000	6580	5260	5260	5260	5260
Total Simulated Volume (vph)	2285	2283	2283	2287	2286	2285	2952	2950	4949	4747	5026	4015	5057	5130	4556	4972	4818	5034	5147	5205



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	101	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	57	56	56	56	56	55	56	65	55	50	49	60	65	64	67	66	65	68	68	68
Estimated Density (pc/mi/ln)	17	17	17	17	17	17	17	15	30	34	37	24	20	22	16	18	15	12	12	12
Estimated LOS	B	B	B	B	B	B	B	B	D	D	E	C	C	C	B	B	B	B	B	B
Total Demand Volume (vph)	3560	3820	4140	2850	2220	2970	2970	2970	5190	5340	5600	4400	4150	4410	3350	3730	2970	2490	2490	2490
Total Simulated Volume (vph)	2924	2922	2921	2918	2915	2912	2910	2911	5106	5244	5510	4315	4059	4331	3304	3683	2933	2460	2460	2459

I-95 Northbound →

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph)	Estimated Density (pc/mi/ln)
43 below	75 and above
43 - 48	55 - 75
48 - 53	45 - 55
53 and above	45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

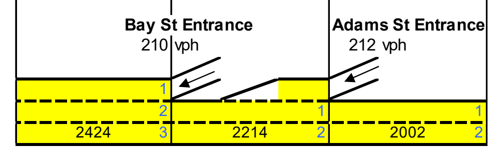
Opening Year No-Build 2025
AM Peak Hour Lane Schematics

Figure 6-4

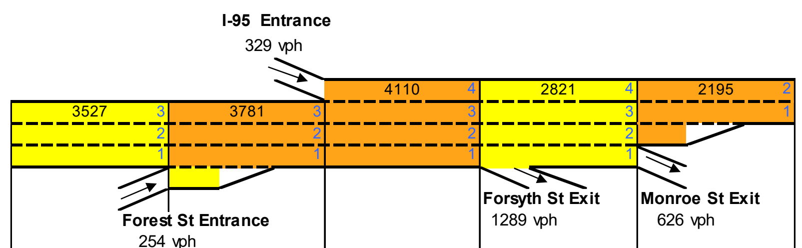
← I-95 SB C-D Road

	507	506	505
Distance (ft)	1264	1567	608
Speed (mph)	49	49	49
Estimated Density (pc/mi/ln)	16	15	13
Estimated LOS	B	B	B
Total Demand Volume (vph)	2940	2730	2520
Total Simulated Volume (vph)	2424	2214	2002

Simulated Volumes



Simulated Volumes



	508–501	501–502	502–503	503–504	504–
Distance (ft)	909	965	992	1167	1263
Speed (mph)	48	46	45	47	45
Estimated Density (pc/mi/ln)	18	27	30	19	16
Estimated LOS	B	C	D	B	B
Total Demand Volume (vph)	3560	3820	4140	2850	2220
Total Simulated Volume (vph)	3527	3781	4110	2821	2195

508 501 502 503 504

→ I-95 NB C-D Road

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph)

42	below
42 - 47	
47 - 50	
50	and above

Estimated Density (pc/mi/ln)

75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

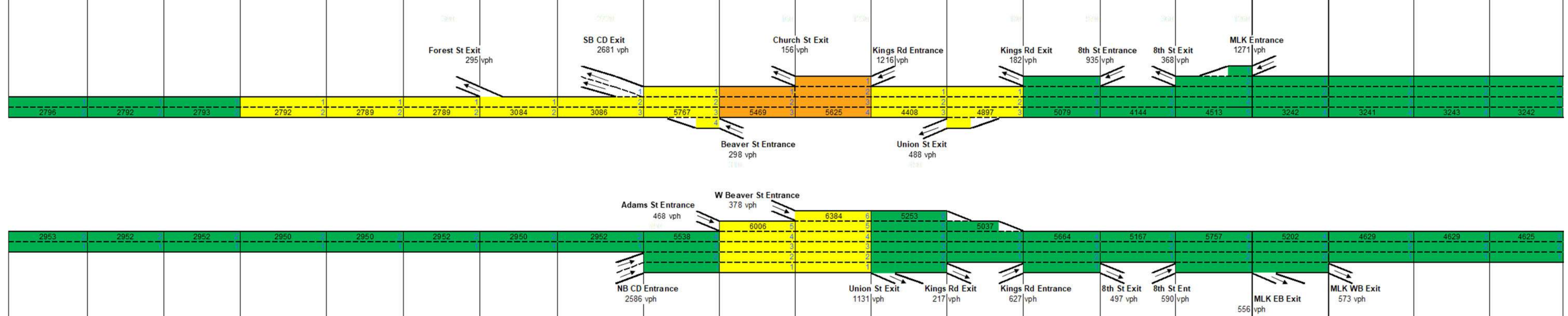
I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

Opening Year No-Build 2025 AM Peak Hour Lane Schematics

Figure 6-4

← I-95 Southbound

Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	854	382	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	60	60	60	51	51	52	51	51	49	48	46	51	52	58	61	61	63	63	64	64
Estimated Density (pc/mi/ln)	11	15	15	18	18	13	15	20	38	37	40	28	31	29	22	18	17	17	17	16
Estimated LOS	B	B	B	B	B	B	B	C	E	E	E	D	D	D	C	B	B	B	B	B
Total Demand Volume (vph)	2840	2840	2840	2840	2840	2840	3140	3140	5860	5550	5710	4480	4970	5150	4180	4540	3280	3280	3280	3280
Total Simulated Volume (vph)	2796	2792	2793	2792	2789	2789	3084	3086	5767	5469	5625	4408	4897	5079	4144	4513	3242	3241	3243	3242



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	110	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	57	56	56	56	56	55	56	65	55	52	49	57	60	55	62	64	60	64	66	65
Estimated Density (pc/mi/ln)	17	17	17	17	17	17	17	15	33	38	42	30	27	33	27	29	28	23	23	23
Estimated LOS	B	B	B	B	B	B	B	B	D	E	E	D	D	D	D	D	D	C	C	C
Total Demand Volume (vph)	2400	2920	3110	2830	2640	3000	3000	3000	5640	6130	6500	5360	5140	5750	5240	5860	5300	4730	4730	4730
Total Simulated Volume (vph)	2953	2952	2952	2950	2950	2952	2950	2952	5538	6006	6384	5253	5037	5664	5167	5757	5202	4629	4629	4625

I-95 Northbound →

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph)
- 43 below
- 43 - 48
- 48 - 53
- 53 and above

Estimated Density (pc/mi/ln)
- 75 and above
- 55 - 75
- 45 - 55
- 45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

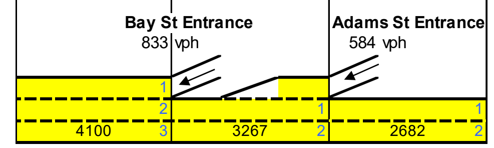
Opening Year No-Build 2025 PM Peak Hour Lane Schematics

Figure 6-5

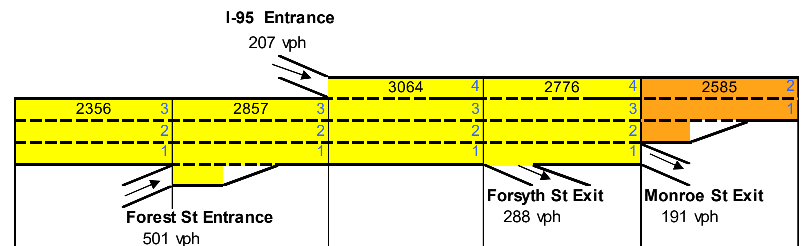
← I-95 SB C-D Road

	507	506	505
Distance (ft)	1264	1567	585
Speed (mph)	48	48	48
Estimated Density (pc/mi/ln)	28	22	18
Estimated LOS	C	C	C
Total Demand Volume (vph)	4140	3300	2720
Total Simulated Volume (vph)	4100	3267	2682

Simulated Volumes



Simulated Volumes



	508–501	501–502	502–503	503–504	504–
Distance (ft)	2000	1949	992	1167	1263
Speed (mph)	50	49	48	47	44
Estimated Density (pc/mi/ln)	12	19	21	19	19
Estimated LOS	B	B	C	B	C
Total Demand Volume (vph)	2400	2920	3110	2830	2640
Total Simulated Volume (vph)	2356	2857	3064	2776	2585

508 501 502 503 504

→ I-95 NB C-D Road

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)

42 below
42 - 47
47 - 50
50 and above

Estimated Density (pc/mi/ln)

75 and above
55 - 75
45 - 55
45 and below

Simulated volume highlighted if difference > 10% of demand volume

2025 Freeway Travel Time

Travel time and speed results for the AM and PM peak hours on I-95 mainline and I-95 C-D road during No-Build Opening Year 2025 are presented in **Table 6-1**. The travel time measurements were performed for two segments on I-95 (I-10 to the I-95 C-D Road and I-95 C-D Road to north of Martin Luther King Jr. Parkway). The total travel time on I-95 northbound and southbound are also provided. For the I-95 C-D road travel time, the entire length of the I-95 C-D in the study area was used for the travel time calculation.

Table 6-1: Opening Year 2025 No-Build I-95 Peak Hour Travel Time/Speed

AM Peak			Travel Time (min)
I-95	NB	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	1.9
		Total Travel Time (min)	**3.7**
	SB	North of MLK Jr. Parkway to C-D Road	4.8
		C-D Road to I-10	1.5
		Total Travel Time (min)	**6.2**
C-D Road	NB	**Total Travel Time (min)**	**1.3**
	SB	**Total Travel Time (min)**	**0.8**
PM Peak			**Travel Time (min)**
I-95	NB	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	2.1
		Total Travel Time (min)	**3.9**
	SB	North of MLK Jr. Parkway to C-D Road	2.3
		C-D Road to I-10	1.4
		Total Travel Time (min)	**3.7**
C-D Road	NB	**Total Travel Time (min)**	**1.3**
	SB	**Total Travel Time (min)**	**0.8**

2025 Study Intersection/Interchange Performance

The performance of the study area intersections was evaluated as part of the Vissim analysis. Signal optimization was performed to account for the 2025 peak-hour volumes. The Opening Year 2025 intersection delay results are summarized in **Table 6-2**. Additional details for the intersection analysis are provided in **Appendix E**. In the Opening Year 2025, two of the 12 study area intersections are expected to operate with excessive delay (> 80 seconds per vehicle). Those intersections are the following:

- 8th Street at I-95 southbound (AM Peak)
- 8th Street at Illinois Street (PM Peak)

Table 6-2: Opening Year 2025 No-Build Intersection Analysis Summary

Intersection	Delay (seconds/vehicle)	
	AM Peak	PM Peak
Forest Street @ I-95 southbound	39.5	33.2
Forest Street @ I-95 northbound	38.5	21.9
Forest Street @Park Street	21.8	43.4
Kings Road @ Cleveland Street	48.1	6.0
Kings Road @ I-95 northbound	21.2	19.0
Kings Road @ N Davis Street	22.0	19.5
8th Street @ Myrtle Avenue	26.2	17.7
8th Street @ I-95 southbound	176.9	21.2
8th Street @ I-95 northbound	28.6	43.6
8th Street @ N Davis Street	36.3	57.6
8th Street @ James Hall Drive	19.2	37.4
8th Street @ Illinois Street	17.4	180.1

A queuing analysis was performed as part of the study to determine the adequacy of the existing turn lane storage lengths for the study intersections and ramp terminal intersections. In the Opening Year 2025 No-Build Alternative, the available storage will accommodate the max queue at all intersection approaches except the following:

- Forest Street at I-95 Southbound Ramps
  - Westbound left (PM peak)
- Forest Street at I-95 Northbound Ramps
  - Westbound left (PM peak)

- Northbound right (AM peak) – The northbound right movement is beyond available storage but does not back up to the I-95 mainline. It is approximately 490 feet from impacting the I-95.
- Southbound through and right (PM peak)

- Kings Road at I-95 Northbound Ramps
  - Westbound through and right (AM and PM peaks)
- 8th Street at I-95 Southbound Ramps
  - Eastbound through and right (PM peak)
  - Westbound left and through (AM and PM peaks)
  - Southbound left (AM peak) – The southbound left movement is beyond available storage and the ramp length. As a result, the I-95 mainline is being impacted.
- 8th Street at I-95 Northbound Ramps
  - Eastbound left (AM and PM peaks)
  - Eastbound through (AM peak)
  - Westbound through (AM and PM peaks)
  - Westbound right (PM peak)
  - Northbound left (AM peak) – The northbound left movement is beyond available storage and the ramp length. As a result, the I-95 mainline is being impacted.
  - Northbound right (AM and PM peaks) – The northbound right movement is beyond available storage and the ramp length. As a result, the I-95 mainline is being impacted.

The max queues that are beyond available storage are marked as red in **Table 6-3**.

Table 6-3: Opening Year 2025 No-Build Intersection Queueing Analysis Summary

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Forest Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			980		
	Available Storage (ft)			300		430	720					730		440
	Max Queue (ft)	AM Peak		266	292	148	61					362		222
		PM Peak		169	162	620	197					214		142
Forest Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			1,250			N/A		
	Available Storage		260	745		165	330		275	850	280	250		
	Max Queue (ft)	AM Peak	337	605	640	213	132	145	47	145	761	133	73	101
		PM Peak	99	269	304	474	287	169	77	70	146	153	421	448
Kings Road at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			930			N/A		
	Available Storage						435		680					
	Max Queue (ft)	AM Peak					545	545	339					
		PM Peak					543	543	280					
8th Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			850		
	Available Storage			300	250	100	370					600		450
	Max Queue (ft)	AM Peak		293	211	408	448					6,104		101
		PM Peak		370	350	479	417					340		102
8th Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			850			N/A		
	Available Storage		80	380			120		300		600			
	Max Queue (ft)	AM Peak	362	456			240	103	816		1,181			
		PM Peak	198	157			253	265	247		2,031			

2025 Network-Wide Performance

The network-wide performance for Opening Year 2025 is presented in **Table 6-4** for the 2025 No-Build AM and PM peak periods.

Table 6-4: Opening Year 2025 No-Build Network-Wide Performance

2025 No-Build	AM Peak	PM Peak
Average Speed (mph)	35	42
Total Travel Time (hr)	4,238	3,961
Total Delay (hr)	1,535	937
Latent Delay (hr)	2,169	37
Latent Demand (veh)	2,158	0
Vehicles Arrived	56,963	62,229

6.2 2045 No-Build Operational Analysis

A detailed microsimulation analysis using Vissim 2020 was conducted to evaluate the system-wide operational performance of the No-Build Alternative in Design Year 2045. No-Build Vissim outputs are included in **Appendix E**.

The Design Year 2045 Vissim models analyzed three-hour AM and PM peak periods. Peak-hour traffic forecasts were developed using NERPM-AB1v3 as discussed in **Section 5**. Fifteen-minute flow rates were used to develop the three-hour AM and PM peak period Vissim models. The Opening Year 2025 simulation model parameters are based on those used for the Existing Year 2019 calibrated model. The simulation time consisted of a 30-minute seed time to load traffic into the network, followed by a 3-hour peak period consisting of a preceding shoulder hour, the peak hour and subsequent off-peak hour. The purpose of the off-peak hours was to allow all or most of the congestion built during the peak hour to subside during the simulation period. The performance targets for the freeway segments are LOS D and an operating speed of 45 mph.

The following MOEs were used to evaluate the network's operational performance:

- Freeways
  - Freeway estimated LOS
  - Operating speed
  - Demand and simulated volume in hourly interval
  - Estimated density in hourly interval
  - Density heat diagrams for 15-min interval
- Intersections
  - Intersection volume
  - Intersection delay
  - Maximum queue length
- Network-Wide Performance
  - Total network delay
  - Average network speed

- Total network travel time
- Latent demand
- Latent delay
- Vehicles arrived

Documentation for the No-Build Alternative analysis is provided in **Appendix E**.

2045 Peak Hour Results Overview

The lane schematics for the Design Year 2045 No-Build AM and PM peak hours are presented **in Figure 6-6** and **Figure 6-7**, respectively. The lane schematics provide an operational overview representing the overall speed, estimated density and LOS and volume of I-95 and the I-95 C-D road during the peak hour. No-Build conditions continue to worsen from 2025 to 2045.

The AM peak hour results for the Design Year 2045 No-Build show significant congestion on I-95 southbound from north of the Martin Luther King Jr. Parkway entrance through the Forest Street exit. The worst congestion is north of the Martin Luther King Jr. Parkway entrance. Speeds in this area average 16 mph, with a density of 83 pc/mi/ln and an estimated LOS F. There is significant congestion throughout I-95 southbound caused by the insufficient capacity and heavy mainline and ramp volumes. The greatest total demand is 7,930 vph between the 8th Street entrance and Kings Road exit. Northbound congestion occurs south of the C-D road entrance until the 8th Street exit. Similar to the southbound results, the slowest speed observed is 16 mph. This occurs between the Kings Road entrance and the 8th Street exit, with a total simulated volume of 4,348 vph. The total demand in this area is 6,480 vph, and the observed density is 65 pc/mi/ln with an estimated LOS F.

Speeds on I-95 southbound C-D Road in the AM peak hour are averaging 48 mph north of the Adams Street entrance, with a density of 27 pc/mi/ln, total simulated volume of 2,570 vph and estimated LOS D. Speeds northbound are slow throughout the length of the C-D Road. The slowest speed is observed after the Monroe Street exit, averaging 21 mph with a density of 53 pc/mi/ln, total simulated volume of 2,212 vph and estimated LOS F.

The PM peak hour results for the Design Year 2045, shown in **Figure 6-7**, indicate significant congestion on I-95 southbound from north of Martin Luther King Jr. Parkway to the Beaver Street entrance. Speeds are slowest between the Martin Luther King Jr. Parkway entrance and 8th Street exit, averaging 11 mph with an observed density of 113 pc/mi/ln, a total simulated volume of 5,218 vph and estimated LOS F. Slower speeds were observed northbound from south of the C-D road entrance to the 8th Street exit. The slowest speed was observed from Union Street Exit to Kings Road, averaging 11 mph with an estimated density of 84 pc/mi/ln, a total simulated volume of 5,928 vph and estimated LOS E. However, the segments just north and south of this segment operate at LOS F. Limited capacity north of 8th street results in northbound congestion and unmet demand.

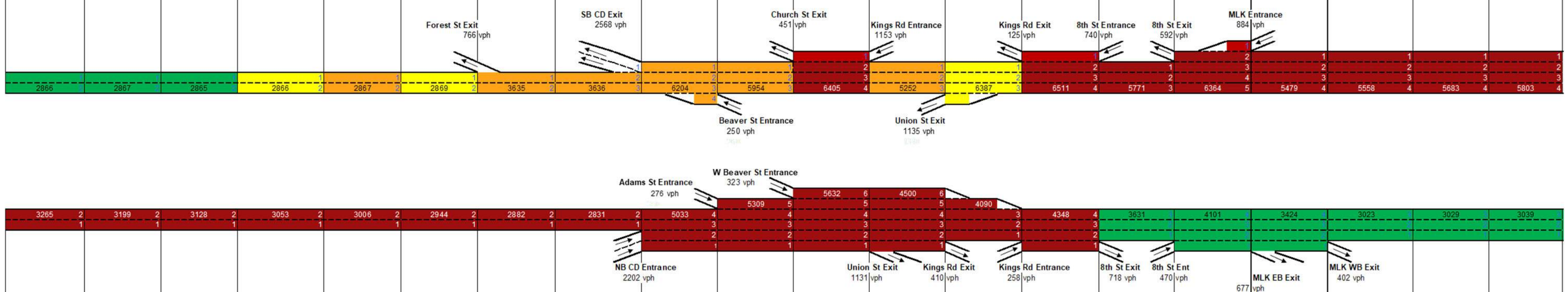
Similar to the AM peak hour, speeds on I-95 southbound C-D Road are slowest in the PM peak hour before the Adams Street entrance. Speeds here average 47 mph, a total simulated volume of 2,989 vph a density of 31 pc/mi/ln and estimated LOS D. Speeds northbound are slowest beginning at the Forsyth Street exit. The slowest speed observed is after the Monroe Street exit, 30 mph, with a density of 47 pc/mi/ln, total simulated volume of 2,863 vph and estimated LOS F.

The density heat maps in **Appendix E** show the density levels for the AM and PM peak periods, respectively. During the AM peak period, I-95 is observed to have a large hotspot exceeding 167 vpmpl northbound during hour 3 from the project limit starting point to the weaving segment between Kings Road and 8th Street. On I-95 southbound, a hot spot is observed exceeding 104 vpmpl during hour 3 in the weaving segment between Martin Luther King Jr. Parkway and 8th Street. During hour 3 on the C-D road, a hot spot is observed throughout the northbound C-D road corridor with areas exceeding 155 vpmpl. No significant hotspots were observed on the southbound C-D road.

During the PM peak period, I-95 is observed to have a large hotspot exceeding 127 vpmpl northbound during hour 2 from the project limit starting point to the weaving segment between Kings Road and 8th Street. On I-95 southbound, a hot spot is observed between Martin Luther King Jr. Parkway and the 8th Street ramps with density levels around 120 vpmpl during hour 2. Another hotspot was observed on the C-D road northbound after the Monroe Street exit during hour 2 with a density exceeding 60 vpmpl. Significant hot spots were not observed on I-95 southbound C-D road during the PM peak period.

← I-95 Southbound

Travel Time Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	884	352	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	60	60	60	51	47	52	47	48	47	44	36	45	50	42	39	17	16	26	34	38
Estimated Density (pc/mi/ln)	23	23	23	27	30	27	38	37	43	44	44	38	41	37	48	91	83	53	41	37
Estimated LOS	C	C	C	D	D	D	E	E	E	E	E	E	E	E	F	F	F	F	E	E
Total Demand Volume (vph)	3330	3330	3330	3330	3330	3330	4260	4260	7370	7110	7680	6430	7770	7930	7130	7870	6350	6350	6350	6350
Total Simulated Volume (vph)	2866	2867	2865	2866	2867	2869	3635	3636	6204	5954	6405	5252	6387	6511	5771	6364	5479	5558	5683	5803



Travel Time Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	101	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	37	37	36	34	33	32	30	31	25	21	20	20	21	16	60	65	64	67	67	67
Estimated Density (pc/mi/ln)	44	42	43	43	45	46	47	44	50	49	46	36	64	65	20	15	13	15	15	15
Estimated LOS	E	E	E	E	E	F	F	E	F	F	F	E	F	F	C	B	B	B	B	B
Total Demand Volume (vph)	4160	4500	4890	3460	2760	4270	4270	4270	7030	7380	7710	6310	6000	6480	5280	5780	4810	4230	4230	4230
Total Simulated Volume (vph)	3265	3199	3128	3053	3006	2944	2882	2831	5033	5309	5632	4500	4090	4348	3631	4101	3424	3023	3029	3039

I-95 Northbound →

LEGEND

(###) Travel Time Segment Number

Freeway Coloring — Speed (mph)

Speed (mph)	
43	below
43 - 48	
48 - 53	
53	and above

Estimated Density (pc/mi/ln)

Density	
75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

Design Year No-Build 2045
AM Peak Hour Lane Schematics

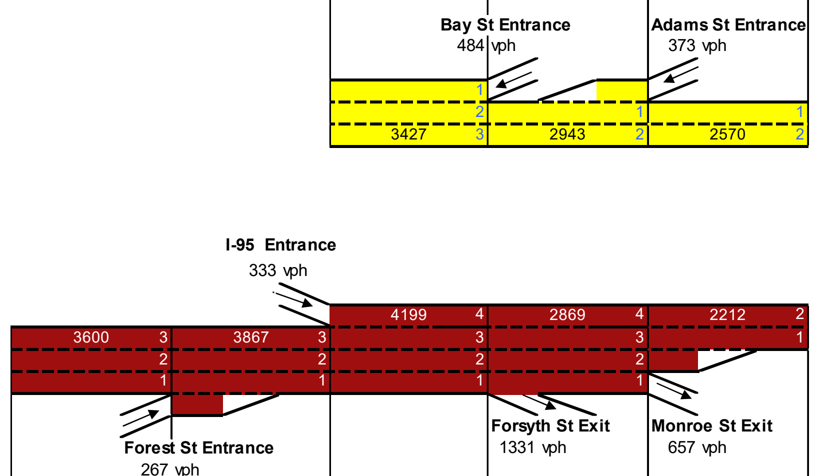
Figure 6-6

← I-95 SB C-D Road

	507	506	505
Distance (ft)	1264	1567	608
Speed (mph)	49	49	48
Estimated Density (pc/mi/ln)	23	30	26
Estimated LOS	C	D	D
Total Demand Volume (vph)	3970	3480	3110
Total Simulated Volume (vph)	3427	2943	2570

Simulated Volumes

Simulated Volumes



	508	501	502	503	504
Distance (ft)	909	965	992	1167	1263
Speed (mph)	34	31	28	26	21
Estimated Density (pc/mi/ln)	34	40	37	27	53
Estimated LOS	D	E	E	C	F
Total Demand Volume (vph)	4160	4500	4890	3460	2760
Total Simulated Volume (vph)	3600	3867	4199	2869	2212

I-95 NB C-D Road →

LEGEND

Travel Time Segment Number

Freeway Coloring

Speed (mph)		
42	below	
42	-	47
47	-	50
50	and above	

Estimated Density (pc/mi/ln)		
75	and above	
55	-	75
45	-	55
45	and below	

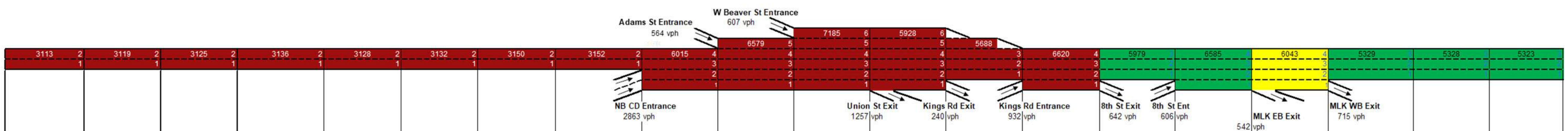
Simulated volume highlighted if difference > 10% of demand volume

← I-95 Southbound

Segment	184	183	182	181	180	179	178	177	174	173	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	884	352	883	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	60	60	60	51	51	52	50	50	48	42	25	24	26	21	18	11	29	63	63	64
Estimated Density (pc/mi/ln)	25	25	25	30	30	29	33	33	43	47	63	67	68	65	86	113	35	16	16	16
Estimated LOS	C	C	C	D	D	D	D	D	E	F	F	F	E	F	F	F	E	B	B	B
Total Demand Volume (vph)	3400	3400	3400	3400	3400	3400	3740	3740	7030	6680	7030	5670	6270	6480	5280	5780	4230	4230	4230	4230
Total Simulated Volume (vph)	3101	3103	3103	3101	3103	3101	3368	3368	6358	6023	6314	4961	5523	5690	4735	5218	4191	4187	4184	4184

Simulated Volumes

Simulated Volumes



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	101	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	18	18	18	18	18	18	18	18	20	13	13	11	16	22	55	62	52	62	65	65
Estimated Density (pc/mi/ln)	86	84	84	84	84	84	84	84	72	96	92	84	116	74	36	26	28	28	27	27
Estimated LOS	F	F	F	F	F	F	F	F	E	E	F	E	F	F	E	C	D	D	D	D
Total Demand Volume (vph)	2730	3660	3920	3430	3060	4310	4310	4310	7370	7940	8530	7270	7020	7930	7130	7870	7220	6350	6350	6350
Total Simulated Volume (vph)	3113	3119	3125	3136	3128	3132	3150	3152	6015	6579	7185	5928	5688	6620	5979	6585	6043	5329	5328	5323

I-95 Northbound →

LEGEND

(###) Travel Time Segment Number

Freeway Coloring Speed (mph)		
43	below	
43	-	48
48	-	53
53	and above	

Estimated Density (pc/mi/ln)		
75	and above	
55	-	75
45	-	55
45	and below	

Simulated volume highlighted if difference > 10% of demand volume

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1)
SIMR

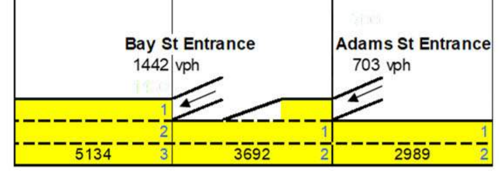
Design Year No-Build 2045
PM Peak Hour Lane Schematics

Figure 6-7

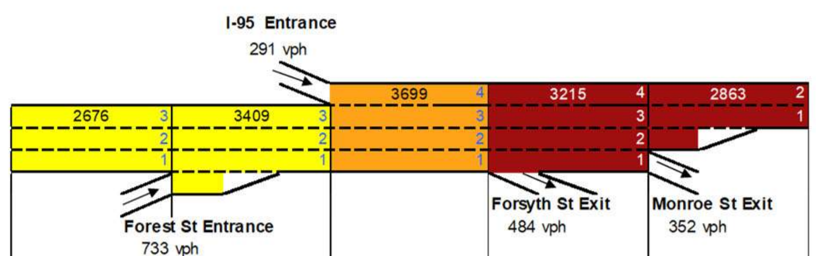
← I-95 SB C-D Road

	507	506	505
Distance (ft)	1264	1567	608
Speed (mph)	48	48	47
Estimated Density (pc/mi/ln)	35	38	31
Estimated LOS	D	E	D
Total Demand Volume (vph)	5420	3990	3290
Total Simulated Volume (vph)	5134	3692	2989

Simulated Volumes



Simulated Volumes



	508–501	501–502	502–503	503–504	504–
Distance (ft)	909	965	992	1167	1263
Speed (mph)	49	48	45	40	30
Estimated Density (pc/mi/ln)	18	23	20	20	47
Estimated LOS	B	C	C	C	F
Total Demand Volume (vph)	2730	3660	3920	3430	3060
Total Simulated Volume (vph)	2676	3409	3699	3215	2863

Segments: 508, 501, 502, 503, 504

→ I-95 NB C-D Road

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)

42	below
42 - 47	
47 - 50	
50	and above

Estimated Density (pc/mi/ln)

75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT	I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR	Design Year No-Build 2045 PM Peak Hour Lane Schematics	Figure 6-7

2045 Freeway Travel Time

Travel time and speed results for the AM and PM peak hours on I-95 mainline and I-95 C-D road during No-Build Design Year 2045 are presented in **Table 6-5**. The travel time measurements were performed for two segments on I-95 (I-10 to the I-95 C-D Road and I-95 C-D Road to north of Martin Luther King Jr. Parkway). The total travel time on I-95 northbound and southbound are also provided. For the I-95 C-D road travel time, the entire length of the I-95 C-D in the study area was used for the travel time calculation.

Table 6-5: Design Year 2045 No-Build I-95 Peak Hour Travel Time/Speed

AM Peak			Travel Time (min)
I-95	NB	I-10 to C-D Road	6.9
		C-D Road to north of MLK Jr. Parkway	6.5
		Total Travel Time (min)	**13.5**
	SB	North of MLK Jr. Parkway to C-D Road	5.2
		C-D Road to I-10	1.5
		Total Travel Time (min)	**6.7**
C-D Road	NB	**Total Travel Time (min)**	**5.2**
	SB	**Total Travel Time (min)**	**0.8**
PM Peak			**Travel Time (min)**
I-95	NB	I-10 to C-D Road	5.9
		C-D Road to north of MLK Jr. Parkway	4.3
		Total Travel Time (min)	**10.2**
	SB	North of MLK Jr. Parkway to C-D Road	6.4
		C-D Road to I-10	1.4
		Total Travel Time (min)	**7.8**
C-D Road	NB	**Total Travel Time (min)**	**1.7**
	SB	**Total Travel Time (min)**	**0.8**

2045 Study Intersection/Interchange Performance

The performance of the study area intersections was evaluated as part of the Vissim analysis. Signal optimization was performed to account for the 2045 peak-hour volumes. The Design Year 2045 intersection delay results are summarized in **Table 6-6.** Additional details for the intersection analysis are provided in **Appendix E**. In the Design Year 2045, five of the 12 study area intersections are expected to operate with excessive delay (> 80 seconds per vehicle). Those intersections are the following:

- Forest Street at Park Street (PM Peak)
- Kings Road @ N Davis Street (AM Peak)
- 8th Street @ I-95 southbound (AM Peak)
- 8th Street @ I-95 northbound (AM Peak)
- 8th Street @ Illinois Street (AM and PM Peaks)

Table 6-6: Design Year 2045 No-Build Intersection Analysis Summary

Intersection	Delay (seconds/vehicle)	
	AM Peak	PM Peak
Forest Street @ I-95 southbound	41.5	39.2
Forest Street @ I-95 northbound	44.5	36.1
Forest Street @Park Street	23.2	279.0
Kings Road @ Cleveland Street	48.6	5.9
Kings Road @ I-95 northbound	56.4	22.9
Kings Road @ N Davis Street	81.5	43.0
8th Street @ Myrtle Avenue	23.3	19.2
8th Street @ I-95 southbound	143.8	56.7
8th Street @ I-95 northbound	145.8	71.0
8th Street @ N Davis Street	55.1	62.9
8th Street @ James Hall Drive	40.3	45.5
8th Street @ Illinois Street	98.0	323.6

A queuing analysis was performed as part of the study to determine the adequacy of the existing turn lane storage lengths for the study intersections and ramp terminal intersections. In the Design Year 2045 No-

Build Alternative, the available storage will accommodate the max queue at all intersection approaches except the following:

- Forest Street at I-95 Southbound Ramps
  - Eastbound through and right (AM peak)
  - Westbound left (PM peak)
- Forest Street at I-95 Northbound Ramps
  - Eastbound left, through and right (AM peak)
  - Westbound left (AM and PM peaks)
  - Westbound through and right (PM peak)
  - Northbound right (AM peak) – The northbound right movement is beyond available storage but does not back up to the I-95 mainline. It is approximately 300 feet from impacting the I-95.
  - Southbound through and right (PM peak)
- Kings Road at I-95 Northbound Ramps
  - Westbound through and right (AM and PM peaks)
- 8th Street at I-95 Southbound Ramps
  - Eastbound through and right (AM and PM peaks)
  - Westbound left and through (AM and PM peaks)
  - Southbound left (AM peak) – The southbound left movement is beyond available storage and the ramp length. As a result, the I-95 mainline is being impacted.
- 8th Street at I-95 Northbound Ramps
  - Eastbound left (AM and PM peaks)
  - Eastbound through (AM peak)
  - Westbound through and right (AM and PM peaks)
  - Northbound left and right (AM and PM peaks) – The northbound left and right movements are beyond available storage and the ramp length. As a result, the I-95 mainline is being impacted.

The max queues that are beyond available storage are marked as red in **Table 6-7**.

Table 6-7: Design Year 2045 No-Build Intersection Queueing Analysis Summary

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Forest Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			980		
	Available Storage			300		430	720					730		440
	Max Queue (ft)	AM Peak		322	335	181	89					363		214
		PM Peak		295	281	667	204					247		137
Forest Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			1,250			N/A		
	Available Storage		260	745		165	330		275	850	280	250		
	Max Queue (ft)	AM Peak	509	785	820	280	137	147	49	130	949	151	79	106
		PM Peak	113	398	433	500	490	445	92	67	161	161	527	554
Kings Road at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			930			N/A		
	Available Storage						435		680					
	Max Queue (ft)	AM Peak					560	560	375					
		PM Peak					548	548	350					
8th Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			850		
	Available Storage			300	250	100	370					600		450
	Max Queue (ft)	AM Peak		1,346	1,377	502	472					7,637		103
		PM Peak		321	286	474	460					1,412		150
8th Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			850			N/A		
	Available Storage		80	380			120		300		600			
	Max Queue (ft)	AM Peak	484	490			254	180	19,555		18,602			
		PM Peak	231	196			257	228	306		20,538			

2045 Network-Wide Performance

The network-wide performance for Design Year 2045 is presented in **Table 6-8** for the 2045 No-Build AM and PM peak periods.

Table 6-8: Design Year 2045 No-Build Network-Wide Performance

2045 No-Build	AM Peak	PM Peak
Average Speed (mph)	23	25
Total Travel Time (hr)	7,812	7,791
Total Delay (hr)	4,554	4,257
Latent Delay (hr)	5,088	8,251
Latent Demand (veh)	5,170	4,982
Vehicles Arrived	67,683	73,197

7 ALTERNATIVES

This section offers a discussion on the alternatives considered as part of this SIMR, which are as follows:

- No-Build Alternative
- Build Alternative

The alternatives are described below.

7.1 No-Build Alternative

The No-Build Alternative provides a baseline for comparison to all study alternatives. This alternative represents the existing physical and operational conditions within the AOI including all planned and programmed roadway improvements over the course of the analysis years. The basis for any interchange proposal is based on a comparison of the No-Build and Build Alternative, identification of the network that is considered in the No-Build Alternative in each analysis year is required.

At this time, the No-Build alternative considers the existing configuration plus any programmed improvements with future traffic as discussed earlier in **Section 5** of this SIMR. The improvements recommended in the I-95 at Martin Luther King Jr. IMR were assumed to be part of the No-Build Alternative analysis. The No-Build Alternative does not satisfy the purpose and need for this project. The operational analysis results for the No-Build Alternative are provided in **Section 6**.

7.2 Build Alternative

A summary of the Build Alternative improvements is discussed in this section.

I-95 Mainline Improvements:

- Two additional lanes along I-95 Northbound from C-D Road entrance to N of 8th Street entrance
- Two additional lanes along I-95 Southbound from north of 8th Street to the C-D road exit

I-95 C-D Road:

- One additional lane on I-95 northbound C-D Road to Forest Street entrance
- Two additional lanes on I-95 northbound C-D Road from Forest Street entrance to C-D Road entrance on I-95 Northbound
- One additional lane along southbound C-D Road at beginning of the C-D Road
- Two additional lanes on I-95 southbound C-D Road from Kings Road entrance to south of Bay Street entrance/end of the project

I-95 at Forest Street Interchange Improvements:

- Restrict southbound through and southbound left turn movements at Forest Street at Myrtle Avenue intersection
- Provide dual left turn lanes northbound, exclusive right turn lane eastbound and exclusive southbound left turn lane at Forest Street at Park Street intersection

I-95 at Monroe Street/Adams Street Ramp Improvements:

- Remove and reconfigure the existing I-95 southbound entrance from Beaver Street and Adams Street

I-95 at Church Street Interchange Improvements:

- Remove and reconfigure the existing I-95 southbound exit to Church Street
- Provide a roundabout at Beaver Street and a new intersection at Church Street, providing roundabout traffic access to I-95

I-95 at Union Street Interchange Improvements:

- Provide a new I-95 northbound terminal intersection at Union Street

I-95 at Kings Road Interchange Improvements:

- Southbound to westbound Kings Road exit convert to two lanes
- Reconfigure Kings Road entrance ramp making it a 2-lane entrance onto C-D Road
- Reconfigure access to/from Kings Road
- Signalize Kings Road at I-95 southbound intersection

I-95 at 8th Street Interchange Improvements:

- At northbound off ramp terminal intersection - Provide triple right turn northbound, extend eastbound left turn storage, convert westbound right turn to free flow
- At southbound off ramp terminal intersection - Provide dual left turn lane southbound, dual left turn westbound and convert westbound receiving lane to one lane

Appendix I shows the concept plans for the Build Alternative.

7.3 Build Design Traffic

The Build Alternative design traffic development for the Opening Year 2025 and Design Year 2045 is discussed in **Section 5** of this SIMR. The Build AM and PM peak hour volumes for Opening Year 2025 and Design Year 2025 are presented in **Section 8** of this SIMR. The Build AM and PM peak hour volumes for Opening Year 2025 and Design Year 2045 are presented in **Figure 8-2 and Figure 8 3** respectively**.**

8 EVALUATION OF ALTERNATIVES

This section discusses the analysis of alternatives based on safety, operational and engineering factors of the I-95 corridor. The No-Build Alternative was evaluated in **Section 6.** The analysis of the Build Alternative and comparison with the No-Build Alternative are provided in this section. The evaluation criteria include:

- Conformance with Regional and State Transportation Plans
- Compliance with Policies and Engineering Standards
- Traffic Operational Performance
- Safety
- Achievement of Objectives

8.1 Conformance with Local, Regional and State Transportation Plans

This SIMR is consistent with the LRTP for the area. Additional I-95 capacity within the study limits is listed as one of the cost feasible projects in the North Florida TPO 2045 Cost Feasible Plan.

8.2 Compliance with Policies and Engineering Standards

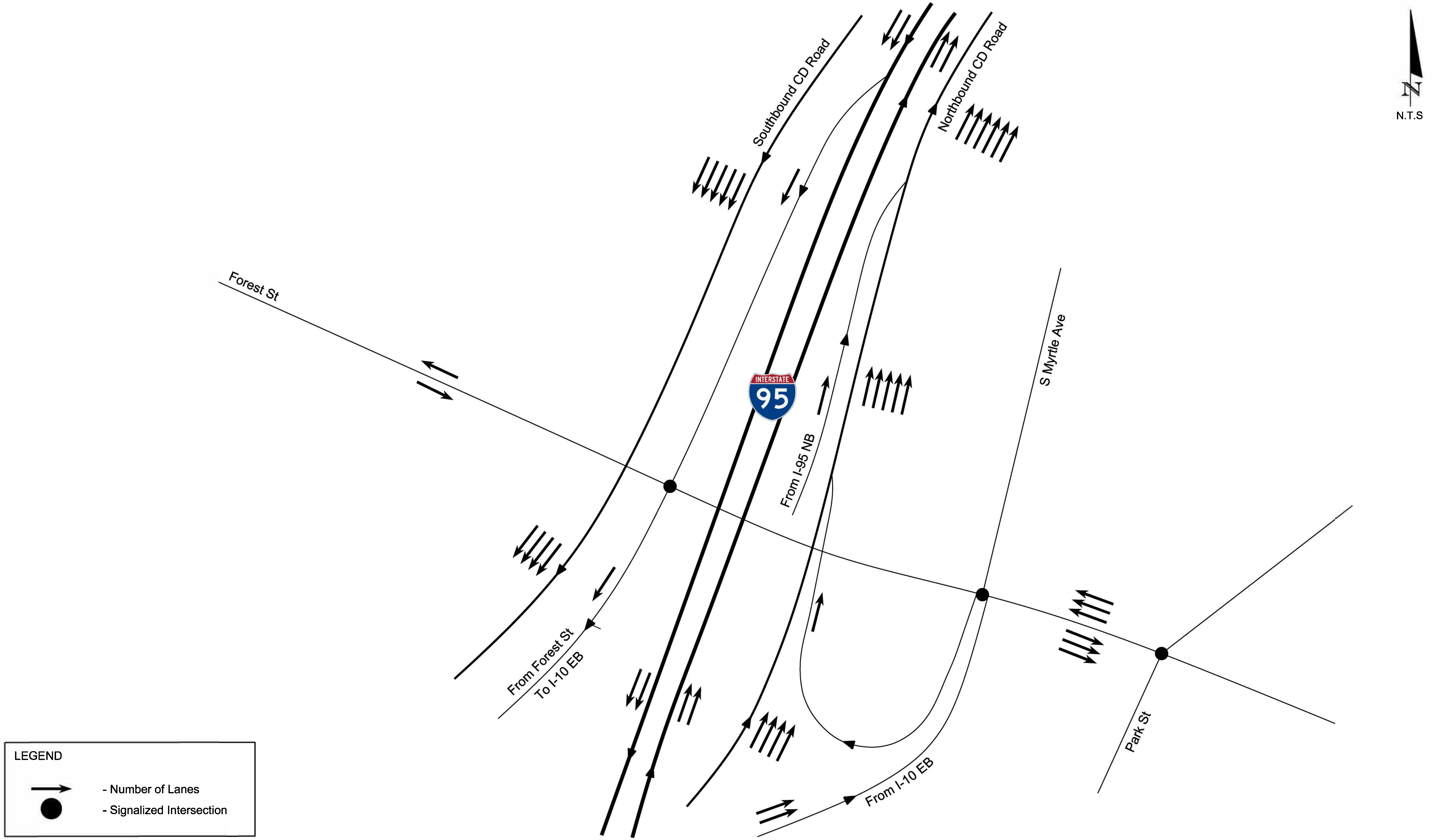
The design criteria for this project are based on design parameters outlined in the FDOT Design Manual, the FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways and AASHTO's A Policy on Geometric Design of Highway and Streets.

8.3 Build Alternative Operational Analysis

The Build Alternative being considered for this SIMR along I-95 is described in detail in **Section 7**.

The No-Build Alternative operational analyses presented in **Section 6** of this SIMR, demonstrated that failing conditions are expected within the study area by Design Year 2045 if no infrastructure improvements are considered. To address these operational deficiencies, Build Alternative was developed and evaluated for the study area. A detailed microsimulation analysis using Vissim 2020 was conducted to evaluate the system-wide operational performance of the study area. Vissim was used to analyze the Opening Year 2025 and Design Year 2045 AM and PM peak periods for the Build Alternative. The primary objective of this analysis was to establish the Build operational conditions along I-95, study interchanges and intersections.

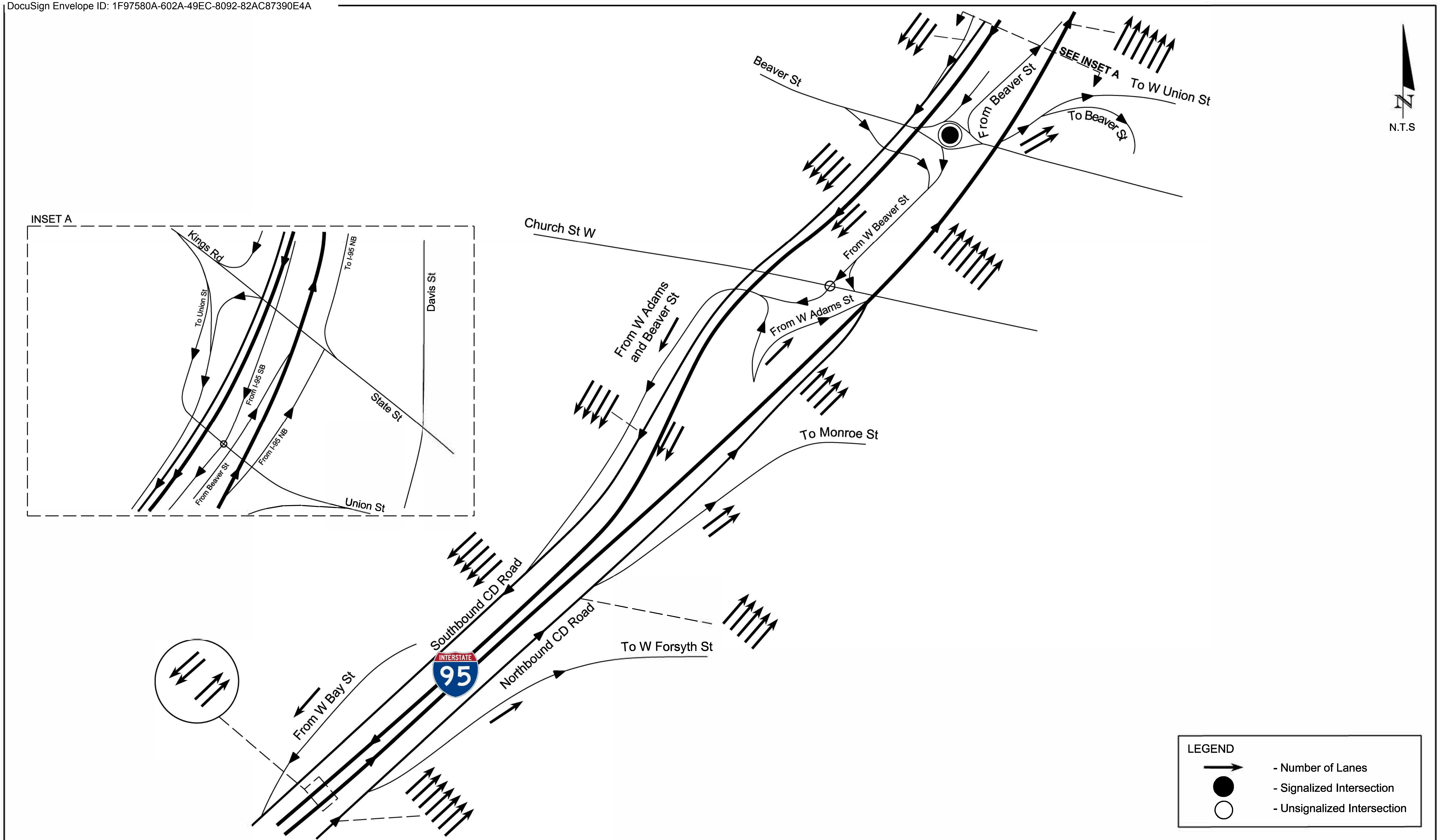
The Build AM and PM peak hour volumes were developed using the methodology described in **Section 5**. The Build AM and PM peak hour volumes for Opening Year 2025 are presented in **Figure 8-2**. The Build AM and PM peak hour volumes for Design Year 2045 are presented in **Figure 8-3**.



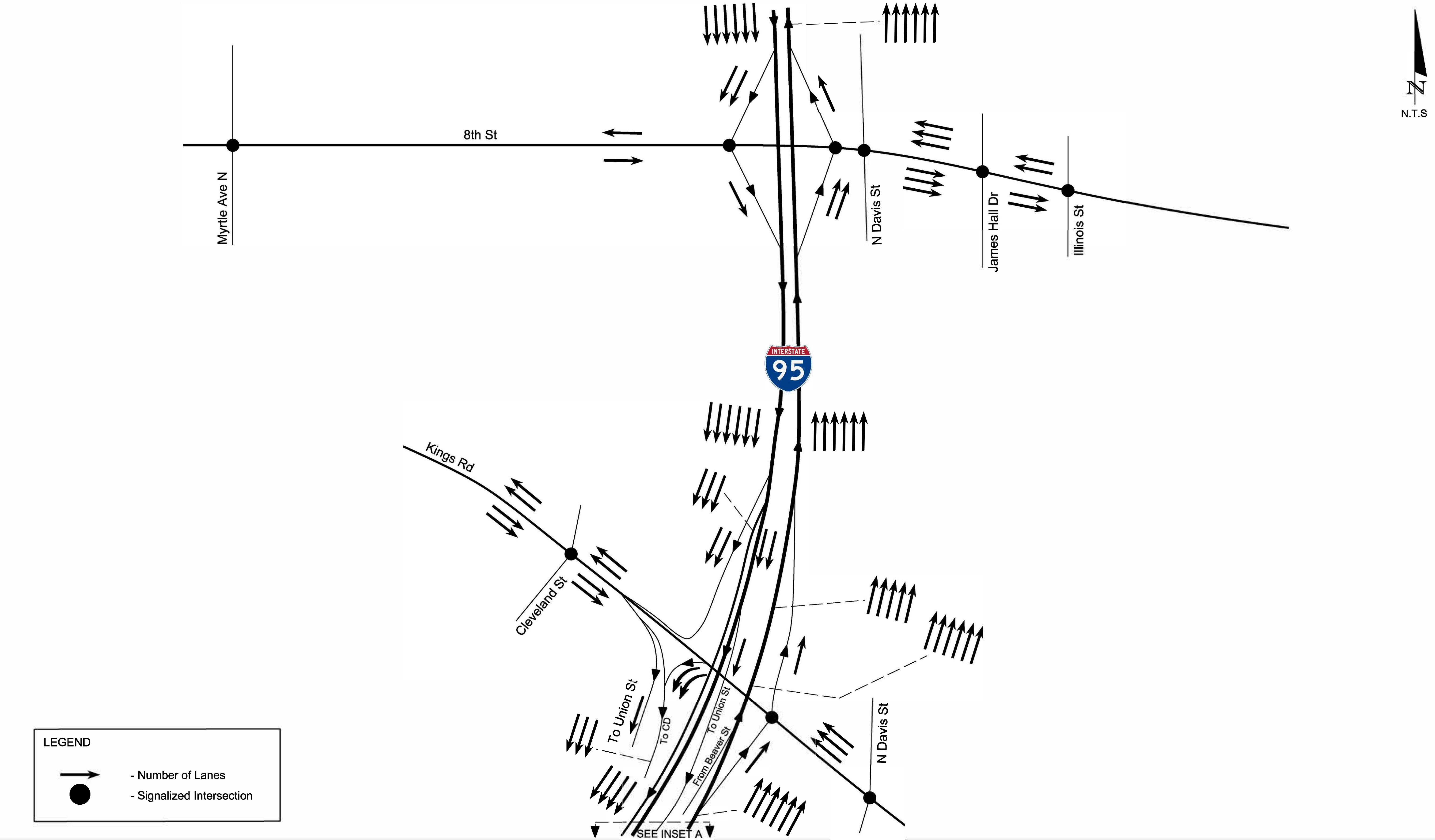
I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Build Alternative Lane Configuration

Figure 8-1
Sheet 1/4



FDOT — I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)	Build Alternative Lane Configuration	Figure 8-1 Sheet 2/4

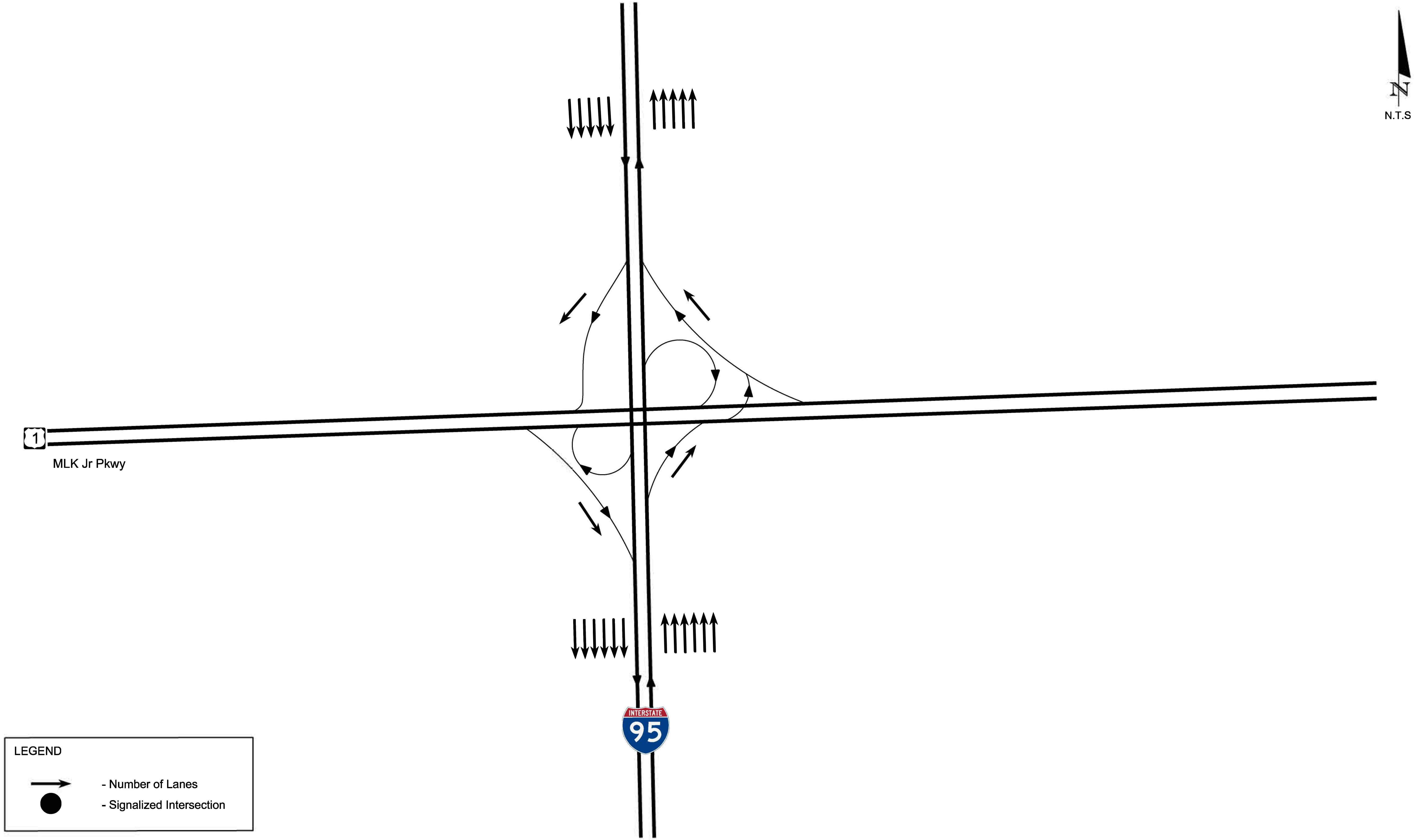


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Build Alternative Lane Configuration

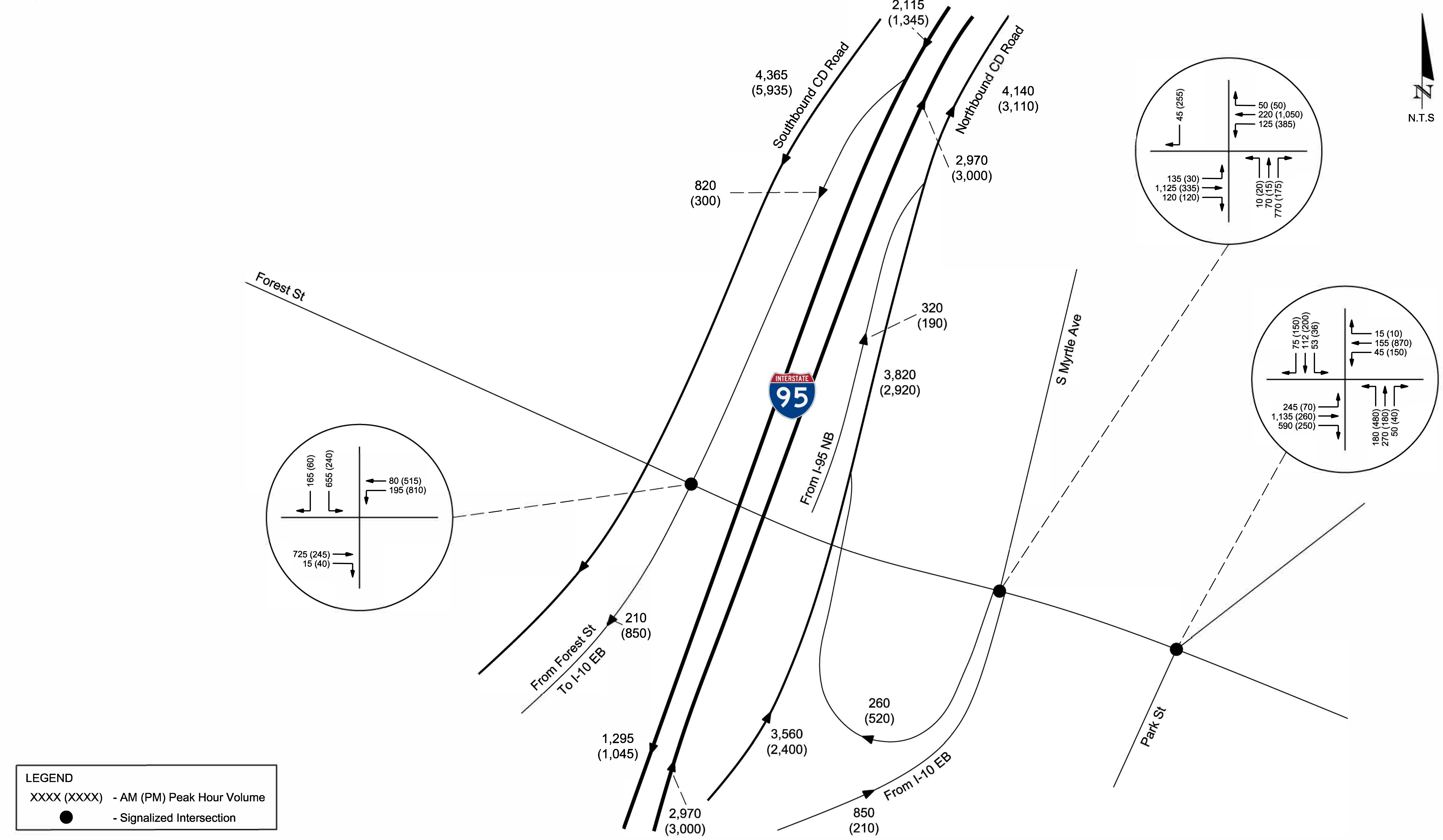
Figure 8-1
Sheet 3/4



I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Build Alternative Lane Configuration

Figure 8-1
Sheet 4/4

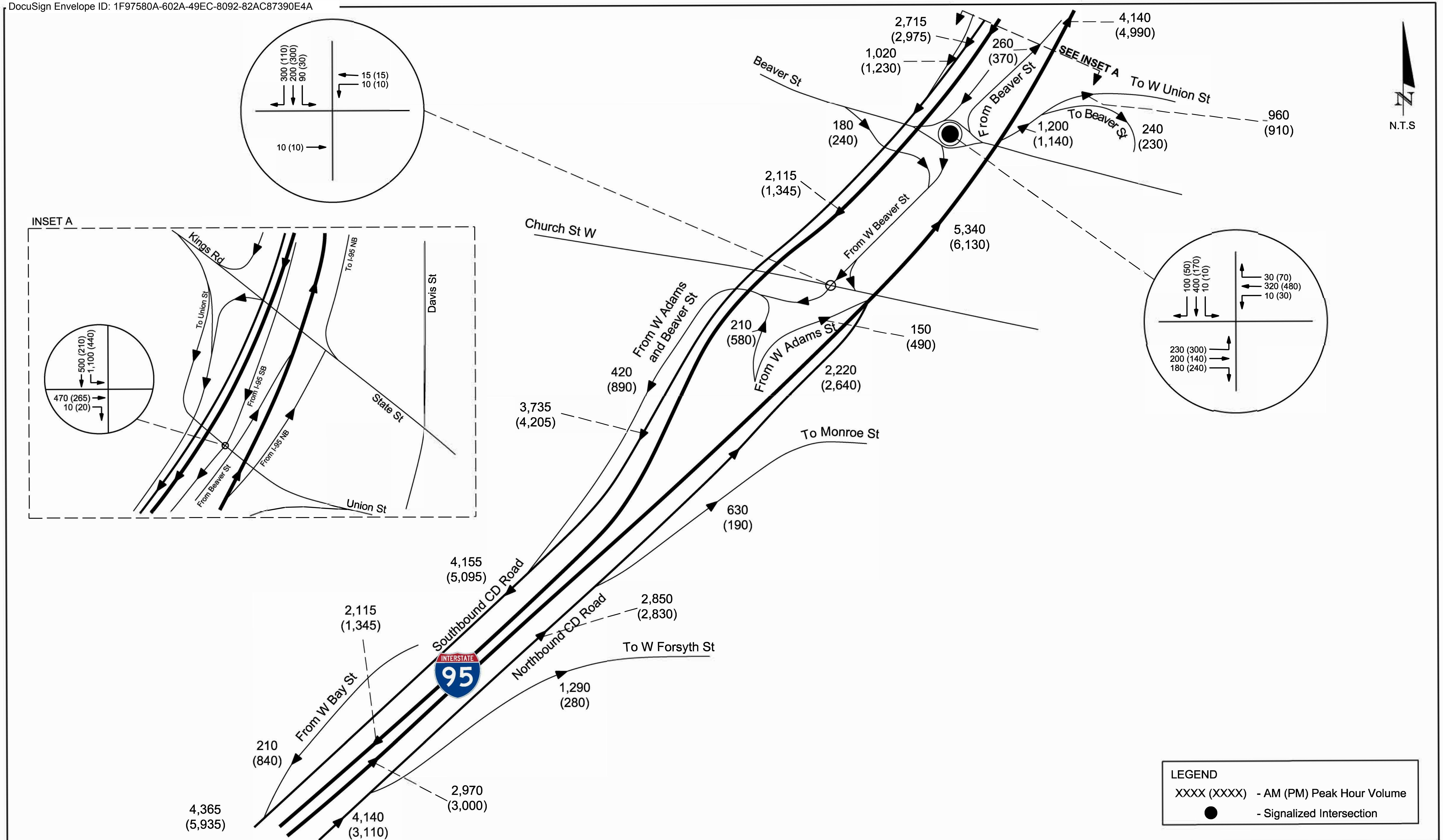


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-2
Sheet 1/4

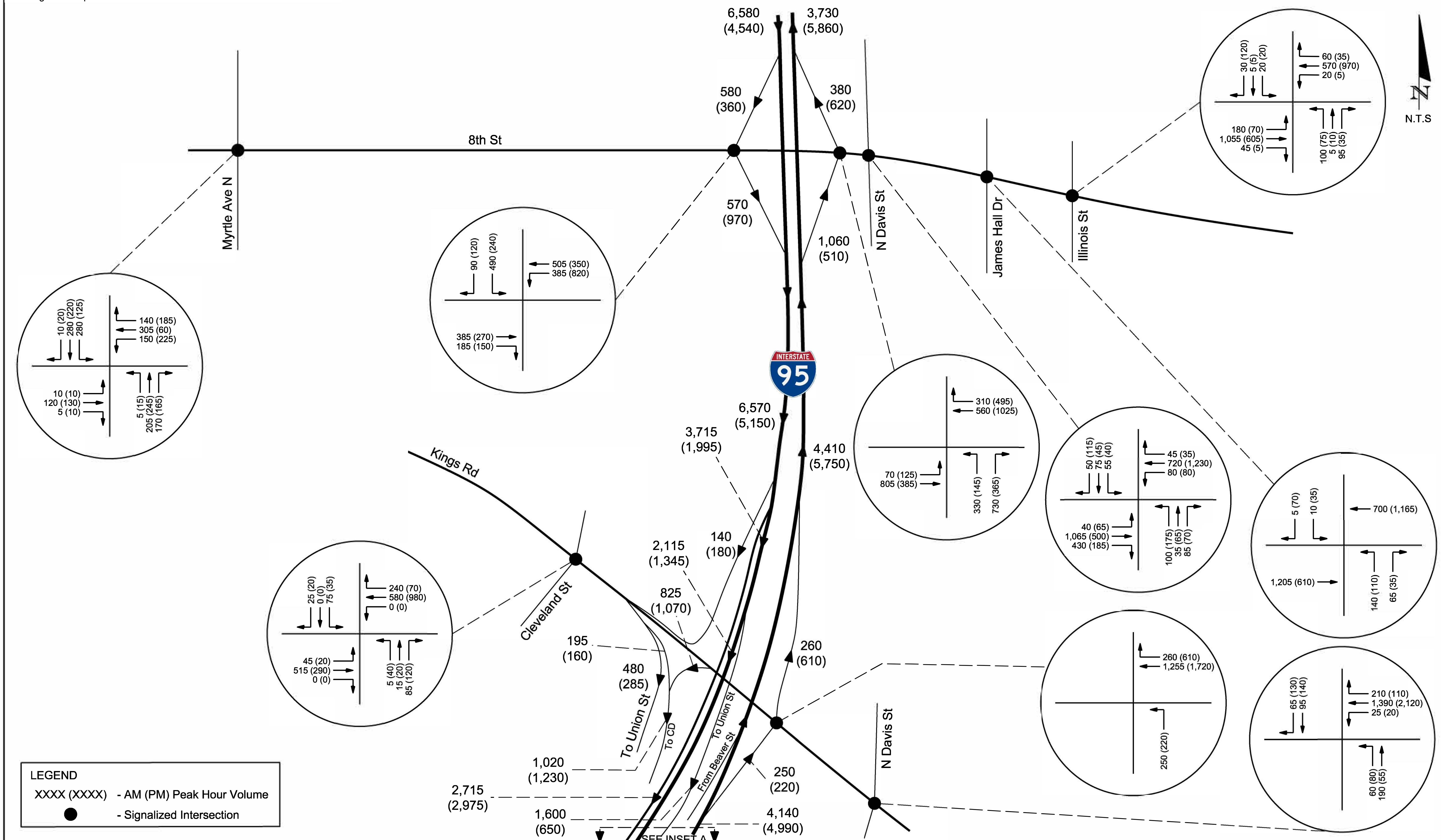


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-2
Sheet 2/4

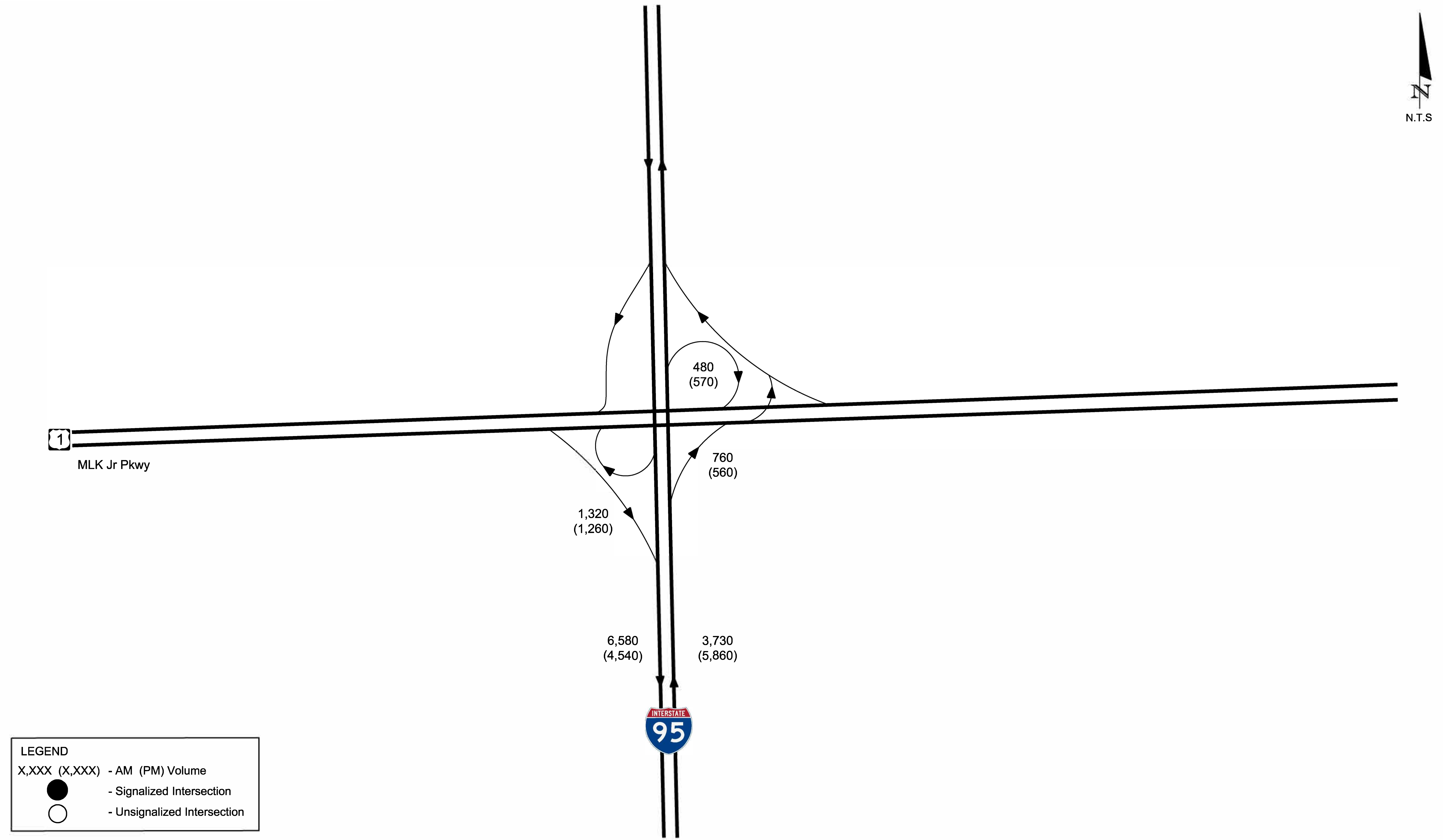


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-2
Sheet 3/4

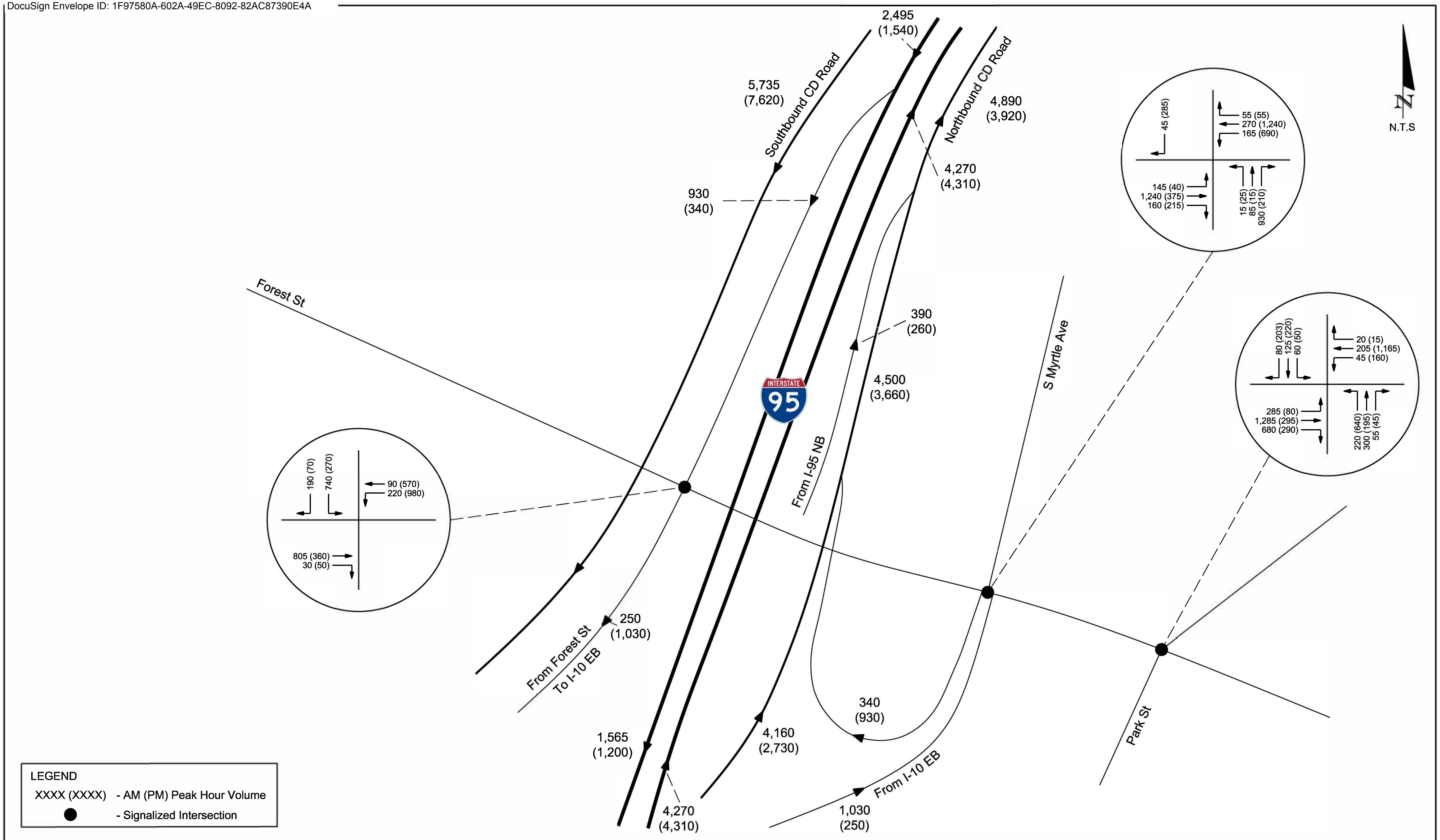


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Opening Year 2025 Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-2
Sheet 4/4

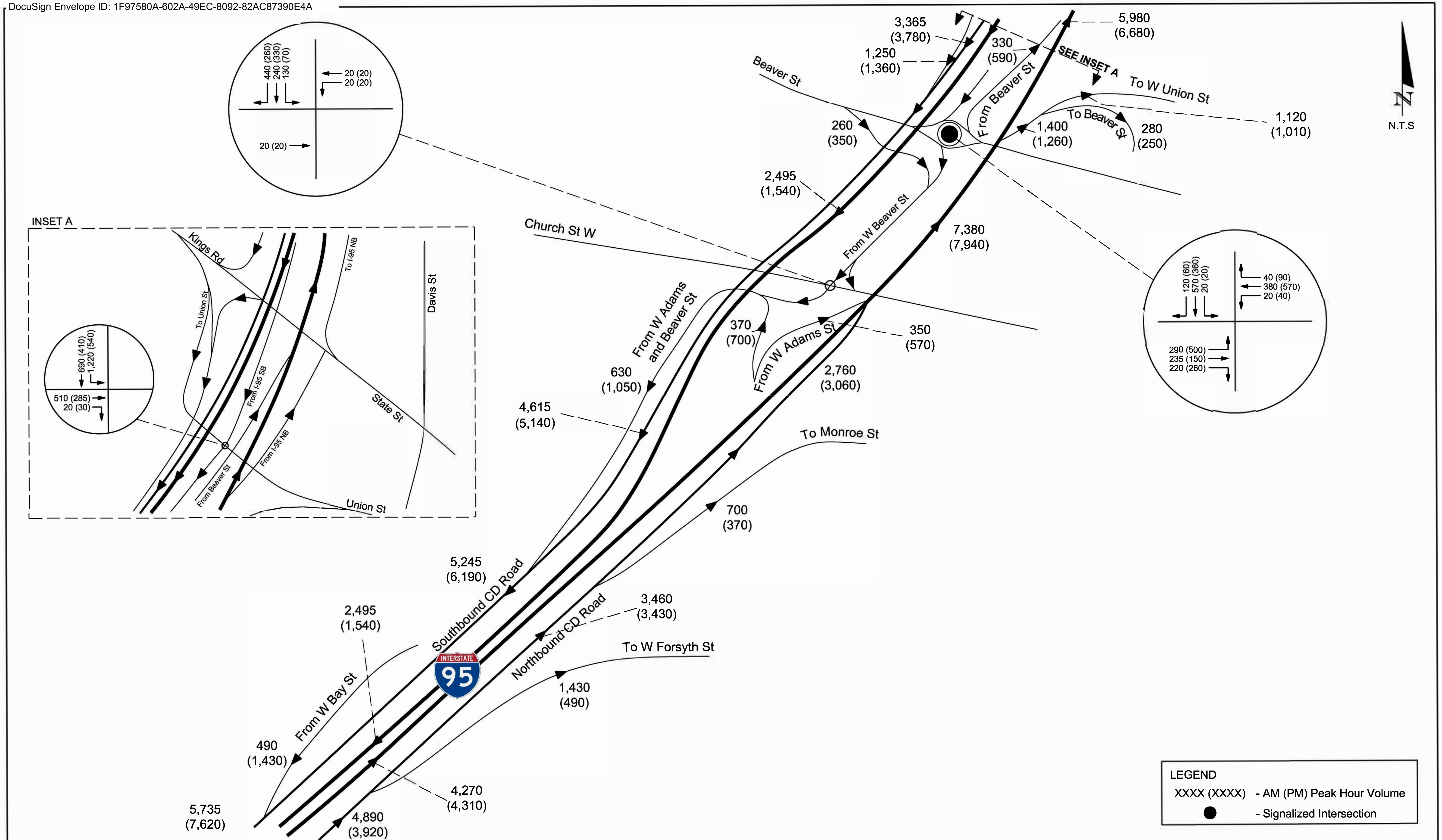


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-3
Sheet 1/4

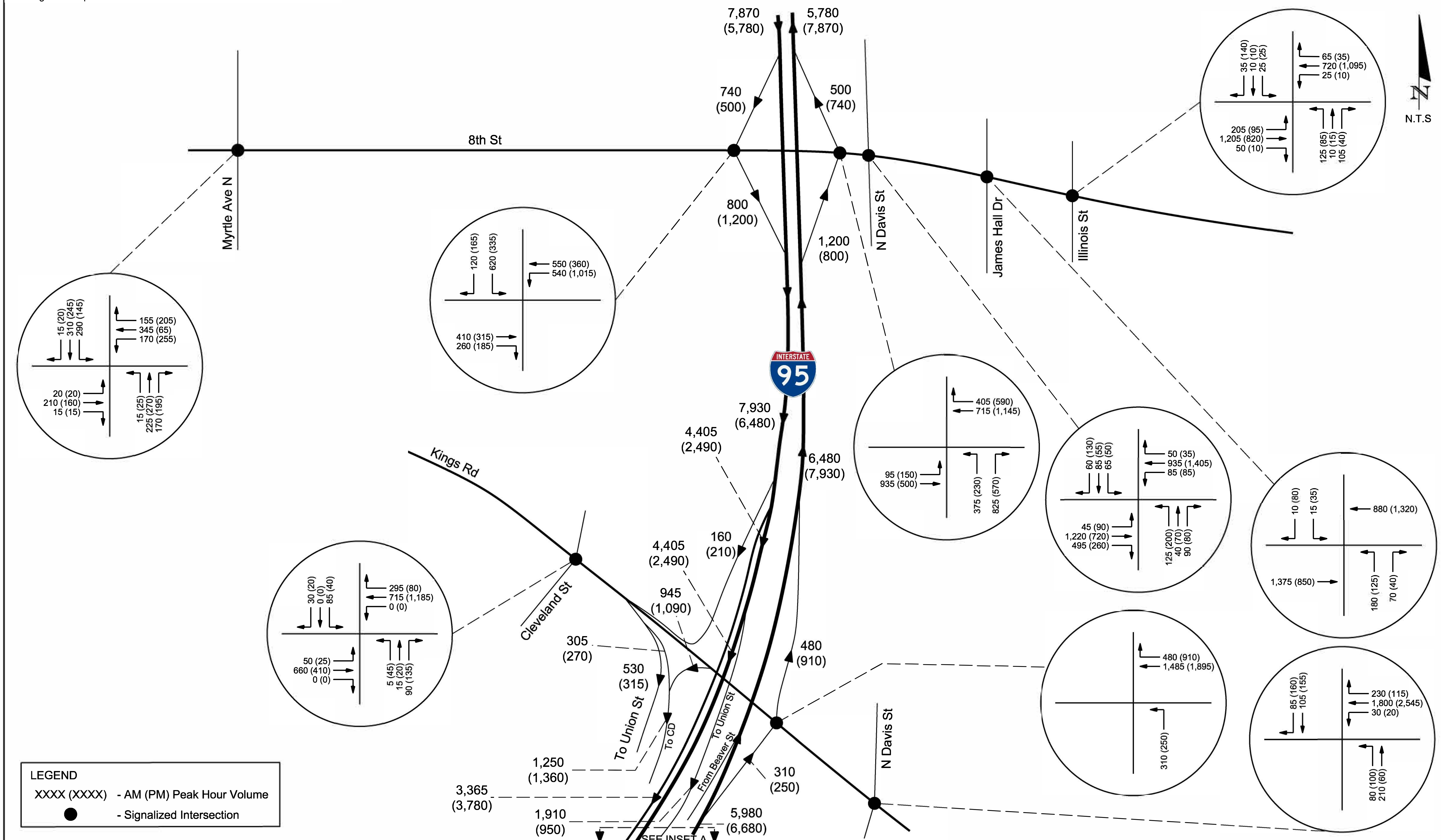


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-3
Sheet 2/4

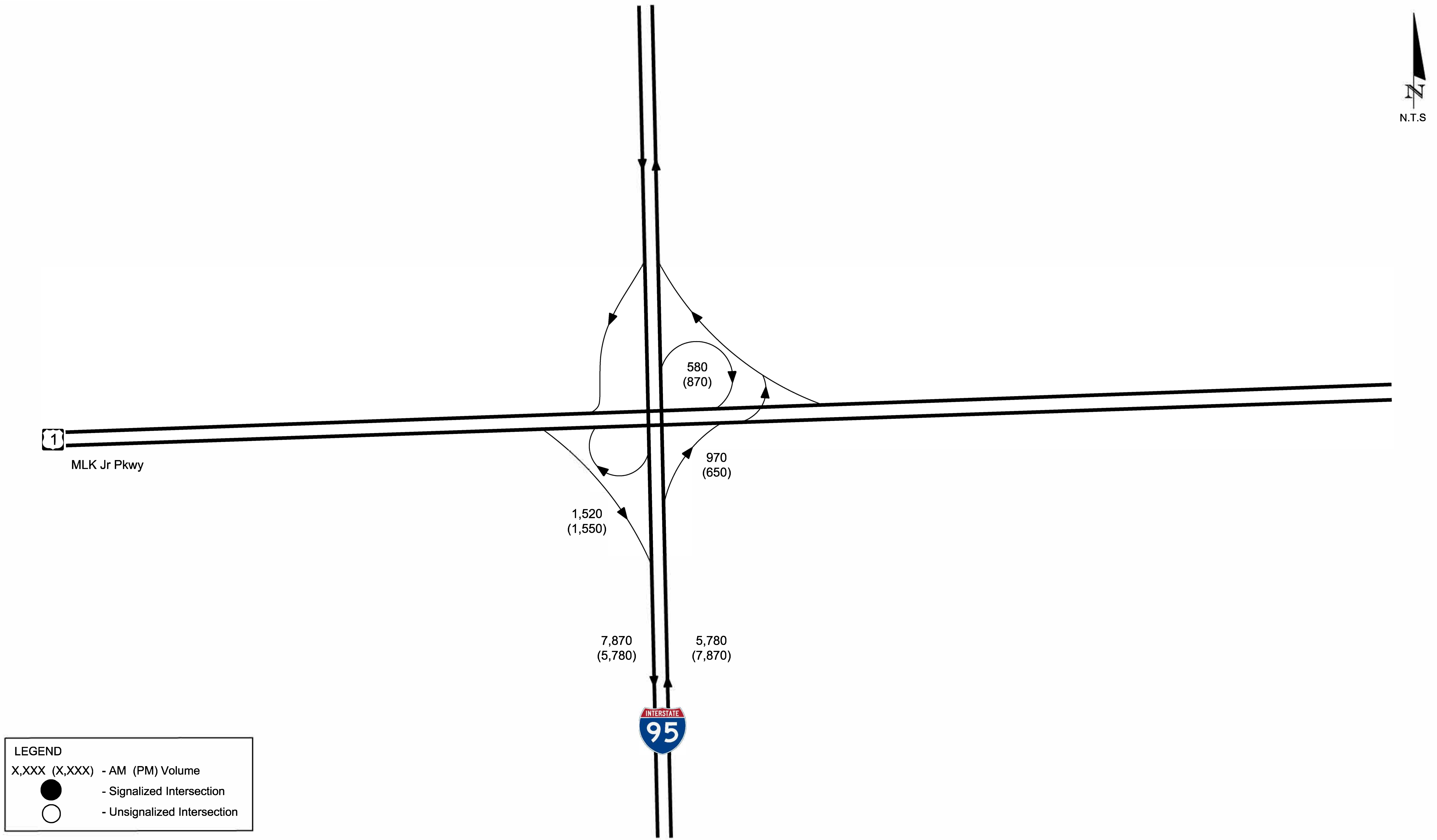


FDOT

I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-3
Sheet 3/4



I-95 (SR 9) from North of I-10 to South of Martin Luther King Jr. Parkway (SR 115/US 1)

Design Year 2045 Build Peak Hour Volumes
Mainline, Ramps and Intersections

Figure 8-3
Sheet 4/4

8.3.1 2025 Build Operational Analysis

The Opening Year 2025 Vissim models analyzed three-hour AM and PM peak periods. Peak-hour traffic forecasts were developed using NERPM-AB1v3 as discussed in **Section 5**. Fifteen-minute flow rates were used to develop the three-hour AM and PM peak period Vissim models. The Opening Year 2025 simulation model parameters are based on those used for the Existing Year 2019 calibrated model. The simulation time consisted of a 30-minute seed time to load traffic into the network, followed by a 3-hour peak period consisting of a preceding shoulder hour, the peak hour and subsequent off-peak hour. The purpose of the off-peak hours was to allow all or most of the congestion built during the peak hour to subside during the simulation period.

The following MOEs were used to evaluate the network's operational performance:

- Freeways
    - Freeway estimated LOS
    - Operating speed
    - Demand and simulated volume in hourly interval
    - Estimated density in hourly interval
    - Density heat diagrams for 15-min interval
- Intersections
    - Intersection volume
    - Intersection delay
    - Maximum queue length
- Network-Wide Performance
    - Total network delay
    - Average network speed
    - Total network travel time
    - Latent demand
    - Latent delay
    - Vehicles arrived

Documentation for the Build Alternative analysis is provided in **Appendix F**.

2025 Peak Hour Results Overview

The lane schematics for the Opening Year 2025 No-Build AM and PM peak hours are presented in **Figure 8-4** and **Figure 8-5**, respectively. The lane schematics provide an operational overview representing the overall speed, estimated density, estimated LOS and demand and simulated volume comparison of I-95 and the I-95 C-D road during the peak hour.

The AM peak hour results for the Opening Year Build Alternative show significant improvement compared to 2025 No-Build. No congestion is observed on I-95 in either direction indicating that the added capacity accommodates demand volumes within the study area. I-95 southbound operate at an average speed of 58 mph with the lowest speed of 48 mph occurring downstream of the Forest Street interchange. The total simulated volume there is 1,328 vph with estimated density 13 pc/mi/ln. This is an indication of generally reduced speed travelling through the I-95 and I-10 interchange and not an insufficient capacity. All I-95 southbound segments are expected to operate at an estimated LOS C or better in the AM peak hour. I-95 northbound operate at an average speed of 62 mph with the lowest speed of 55 mph occurring before the northbound I-95 C-D Road entrance. The total simulated volume there is 2,912 vph and a density of 26 pc/mi/ln.. All I-95 northbound segments are expected to operate at an estimated LOS C or better in the AM peak hour.

In the AM peak hour, I-95 southbound C-D Road operate at an average speed of 49 mph with the lowest speed of 48 mph occurring between the Adams Street entrance and Bay Street entrance. The total simulated volume observed is 4,053 vph and density of 21 pc/mi/ln. I-95 northbound C-D Road operate at an average speed of 49 mph with the slowest speed observed downstream of the I-95 mainline entrance, averaging 47 mph with a total simulated volume of 4,110 vph and density of 14 pc/mi/ln. All I-95 C-D Road segments are expected to operate at LOS C or better in the AM peak hour.

Similar to the AM peak hour, the PM peak hour results for the Opening Year 2025, shown in **Figure 8-5**, indicate improved operations when compared to the No-Build Alternative. No congestion is observed on I-95 in either direction indicating that the added capacity accommodates demand volumes within the study area. I-95 southbound operate at an average speed of 59 mph with the lowest speed of 52 mph occurring upstream of the Forest Street exit. The total simulated volume there is 1,371 vph with estimated density 13 pc/mi/ln. All I-95 southbound segments are expected to operate at an estimated LOS B or better in the PM peak hour. I-95 northbound operate at an average speed of 61 mph with the lowest speed of 55 mph occurring before the northbound I-95 C-D Road entrance. The total simulated volume there is 2,952 vph and a density of 26 pc/mi/ln. All I-95 northbound segments are expected to operate at an estimated LOS C or better in the PM peak hour.

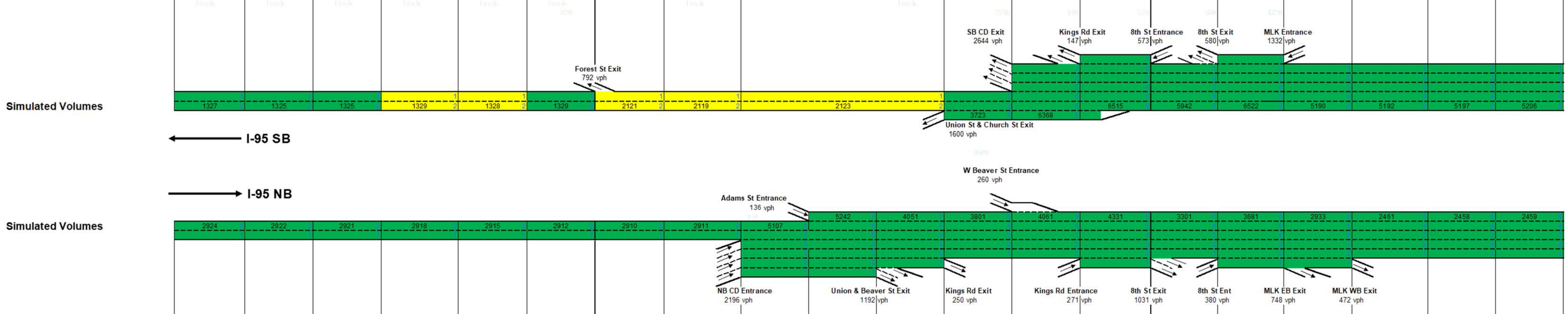
In the PM peak hour, I-95 southbound C-D Road operate at an average speed of 48 mph with the lowest speed of 47 mph occurring between the Adams Street entrance and Bay Street entrance. The total simulated volume observed is 4,975 vph and density of 26 pc/mi/ln. All I-95 southbound C-D Road segments are expected to operate at LOS C or better in the PM peak hour. I-95 northbound C-D Road operate at an average speed of 49 mph Speeds with the slowest speed observed downstream of the I-95 mainline entrance, with an observed speed of 49 mph and a total simulated volume of 3,065 vph and density of 10 pc/mi/ln. All I-95 northbound C-D Road segments are expected to operate at LOS B or better in the PM peak hour. These results have improved when compared to the No-Build Alternative.

It should be noted that under the Build Alternative, the I-95 southbound C-D Road will be moved upstream from its existing location. Kings Road and Beaver Street entrances occur on the C-D Road in the Build Alternative that were previously occurring on the mainline in the No-Build Alternative. This results in more traffic shifting to the C-D Road and correspondingly lower traffic volume on the mainline under the Build Alternative. The total demand south of Forest Street (mainline + C-D Road) in the Build is same as the No-Build but the traffic distribution on these facilities is different based on the Build configuration.

The density heat maps in **Appendix F** show the density levels for the AM and PM peak periods, respectively. Densities for both I-95 and the I-95 C-D Roads are less than 27 vpmpl and no operational issues are observed during the AM and PM peak periods.

I-95 Southbound

	184	183	182	181	180	179	178	177	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	854	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	62	63	61	53	48	53	50	52	53	56	61	60	59	61	62	63	63	64
Estimated Density (pc/mi/ln)	10	10	11	12	13	12	21	20	20	22	17	18	20	17	16	16	16	16
Estimated LOS	A	A	A	B	B	B	C	C	C	C	B	B	B	B	B	B	B	B
Total Demand Volume (vph)	1295	1295	1295	1295	1295	1295	2115	2115	2115	3715	6430	6570	6000	6580	5260	5260	5260	5260
Total Simulated Volume (vph)	1327	1325	1325	1329	1328	1329	2121	2119	2123	3723	6368	6515	5942	6522	5190	5192	5197	5206



	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	110	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	57	56	56	56	56	55	56	65	57	58	62	65	62	66	68	67	66	69	69	69
Estimated Density (pc/mi/ln)	25	25	25	26	26	26	25	22	15	13	11	11	13	11	9	9	7	7	7	7
Estimated LOS	C	C	C	C	C	C	C	C	B	B	B	B	B	B	A	A	A	A	A	A
Total Demand Volume (vph)	2970	2970	2970	2970	2970	2970	2970	2970	5190	5340	4140	3890	4150	4410	3350	3730	2970	2490	2490	2490
Total Simulated Volume (vph)	2924	2922	2921	2918	2915	2912	2910	2911	5107	5242	4051	3801	4061	4331	3301	3681	2933	2461	2458	2459

I-95 Northbound

LEGEND

- (###) Travel Time Segment Number

Speed (mph)	
43 below	
43 - 48	
48 - 53	
53 and above	

Freeway Coloring Density (Veh/Mi/Ln)
75 and above
55 - 75
45 - 55
45 and below

Simulated volume highlighted if difference > 10% of demand volume

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

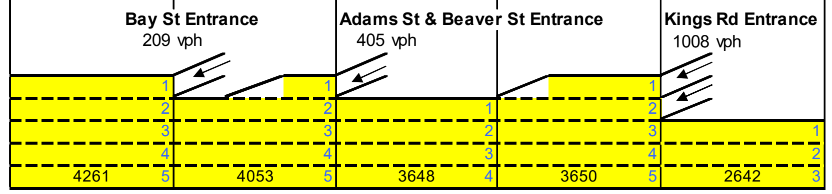
Opening Year Build 2025 AM Peak Hour Lane Schematics

Figure 8-4

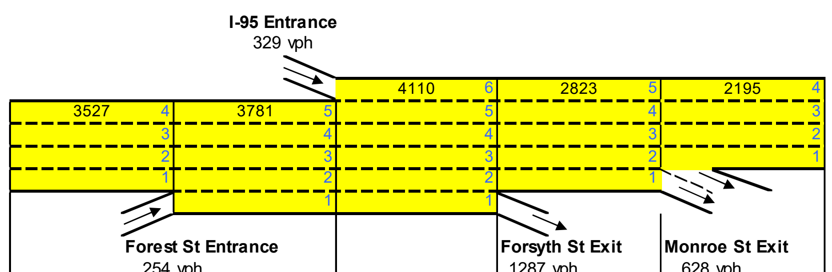
I-95 SB C-D Road

	507	506	505	174	173
Distance (ft)	1264	1567	585	382	883
Speed (mph)	49	48	49	48	50
Estimated Density (pc/mi/ln)	17	21	18	15	17
Estimated LOS	B	C	B	B	B
Total Demand Volume (vph)	4365	4155	3735	3735	2715
Total Simulated Volume (vph)	4261	4053	3648	3650	2642

Simulated Volumes



Simulated Volumes



	508	501	502	503	504
Distance (ft)	2000	1949	992	1167	1263
Speed (mph)	49	48	47	49	49
Estimated Density (pc/mi/ln)	17	15	14	11	11
Estimated LOS	B	B	B	B	A
Total Demand Volume (vph)	3560	3820	4140	2850	2220
Total Simulated Volume (vph)	3527	3781	4110	2823	2195

I-95 NB C-D Road

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)	Estimated Density (pc/mi/ln)
42 below	75 and above
42 - 47	55 - 75
47 - 50	45 - 55
50 and above	45 and below

Simulated volume highlighted if difference > 10% of demand volume

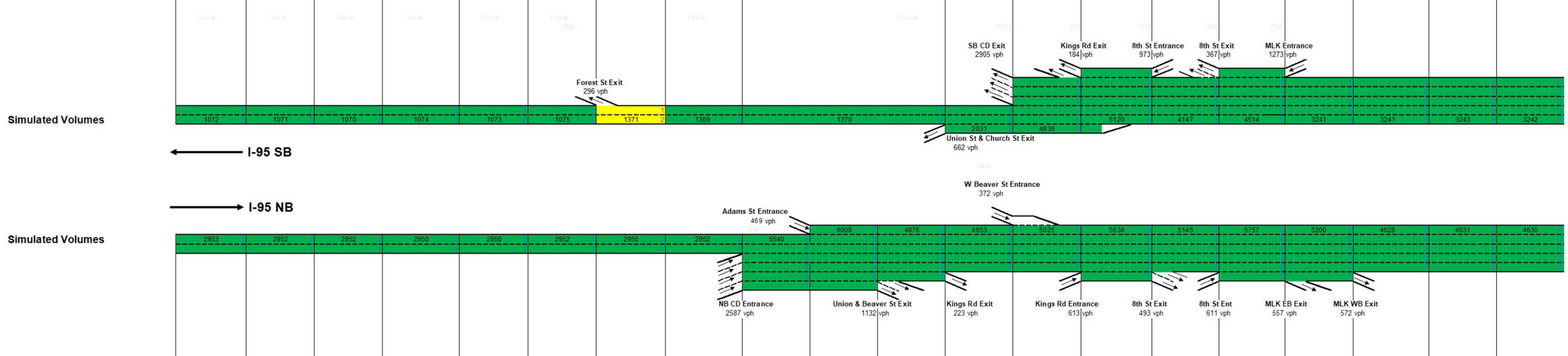
I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

Opening Year Build 2025
AM Peak Hour Lane Schematics

Figure 8-4

I-95 Southbound

Segment	184	183	182	181	180	179	178	177	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	854	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	63	63	62	53	54	54	52	53	54	59	62	62	63	63	64	64	64	64
Estimated Density (pc/mi/ln)	8	8	8	10	10	10	13	13	12	11	13	13	13	12	10	10	10	10
Estimated LOS	A	A	A	A	A	A	B	B	B	B	B	B	B	B	A	A	A	A
Total Demand Volume (vph)	1045	1045	1045	1045	1045	1045	1345	1345	1345	1995	4970	5150	4180	4540	3280	3280	3280	3280
Total Simulated Volume (vph)	1072	1071	1070	1074	1073	1075	1371	1369	1370	2031	4936	5120	4147	4514	3241	3241	3243	3242



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	110	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	57	56	56	56	56	55	56	65	57	57	59	63	59	66	67	66	64	68	68	68
Estimated Density (pc/mi/ln)	25	26	26	26	26	26	26	22	16	15	13	14	17	14	15	14	13	13	13	13
Estimated LOS	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B
Total Demand Volume (vph)	3000	3000	3000	3000	3000	3000	3000	3000	5640	6130	4990	4770	5140	5750	5240	5860	5300	4730	4730	4730
Total Simulated Volume (vph)	2953	2952	2952	2950	2950	2952	2950	2952	5540	6009	4876	4653	5025	5638	5145	5757	5200	4628	4631	4630

I-95 Northbound

LEGEND

(###) Travel Time Segment Number

Speed (mph)	
43	below
43 - 48	
48 - 53	
53	and above

Freeway Coloring Density (Veh/Mi/Ln)	
75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

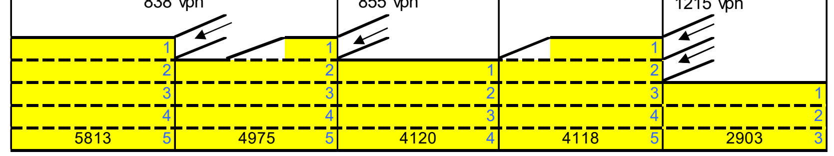
Opening Year Build 2025
PM Peak Hour Lane Schematics

Figure 8-5

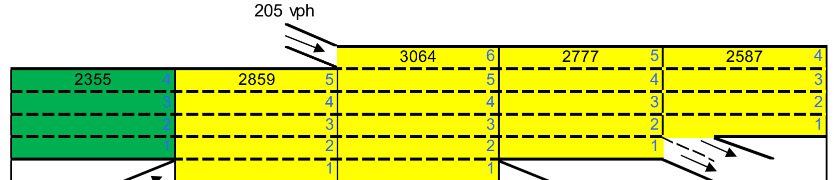
I-95 SB C-D Road

	507	506	505	174	173
Distance (ft)	1264	1567	585	382	883
Speed (mph)	48	47	49	47	49
Estimated Density (pc/mi/ln)	24	26	21	17	19
Estimated LOS	C	C	C	B	C
Total Demand Volume (vph)	5935	5095	4205	4205	2975
Total Simulated Volume (vph)	5813	4975	4120	4118	2903

Simulated Volumes



Simulated Volumes



	508	501	502	503	504
Distance (ft)	2000	1949	992	1167	1263
Speed (mph)	51	49	49	49	49
Estimated Density (pc/mi/ln)	11	11	10	11	13
Estimated LOS	B	B	B	B	B
Total Demand Volume (vph)	2400	2920	3110	2830	2640
Total Simulated Volume (vph)	2355	2859	3064	2777	2587

I-95 NB C-D Road

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)	Estimated Density (pc/mi/ln)
42 below	75 and above
42 - 47	55 - 75
47 - 50	45 - 55
50 and above	45 and below

Simulated volume highlighted if difference > 10% of demand volume

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR	Opening Year Build 2025 PM Peak Hour Lane Schematics	Figure 8-5

2025 Freeway Travel Time

Travel time and speed results for the AM and PM peak hours on I-95 mainline and I-95 C-D road during Build Opening Year 2025 are presented in **Table 8-1**. The travel time measurements were performed for two segments on I-95 (I-10 to the I-95 C-D Road and I-95 C-D Road to north of Martin Luther King Jr. Parkway). The total travel time on I-95 northbound and southbound are also provided. For the I-95 C-D road travel time, the entire length of the I-95 C-D in the study area was used for the travel time calculation. Compared to the No-Build, the total travel time along the I-95 mainline and northbound C-D road are expected to slightly reduce. The travel time is expected to increase along the southbound C-D road. This is expected with the assumption that the volume and demand for the I-95 C-D road will increase. It is expected that the decrease in travel time will increase as traffic volumes increase within the study area.

Table 8-1: Opening Year 2025 Build I-95 Peak Hour Travel Time/Speed

AM Peak			**Travel Time (min)**
I-95	**NB**	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	1.9
		Total Travel Time (min)	**3.7**
	SB	North of MLK Jr. Parkway to C-D Road	1.6
		C-D Road to I-10	2.1
		Total Travel Time (min)	**3.6**
C-D Road	**NB**	**Total Travel Time (min)**	**1.2**
	SB	**Total Travel Time (min)**	**1.5**
PM Peak			**Travel Time (min)**
I-95	**NB**	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	1.9
		Total Travel Time (min)	**3.7**
	SB	North of MLK Jr. Parkway to C-D Road	1.5
		C-D Road to I-10	2.0
		Total Travel Time (min)	**3.5**
C-D Road	**NB**	**Total Travel Time (min)**	**1.2**
	SB	**Total Travel Time (min)**	**1.5**

2025 Intersection/Interchange Performance

The performance of the study area intersections was evaluated as part of the Vissim analysis. Signal optimization was performed to account for the 2025 peak-hour volumes. The Opening Year 2025 intersection delay results are summarized in **Table 8-2**. Additional details for the intersection analysis are provided in **Appendix F**. In the Opening Year 2025, none of the 14 study area intersections are expected to operate with excessive delay (> 80 seconds per vehicle).

Table 8-2: Opening Year 2025 Build Intersection/Interchange Analysis Summary

Intersection	Delay (seconds/vehicle)	
	AM Peak	PM Peak
Forest Street @ I-95 southbound	35.0	26.0
Forest Street @ I-95 northbound	28.7	16.6
Forest Street @Park Street	19.9	31.2
Kings Road @ Cleveland Street	44.6	7.5
Kings Road @ I-95 northbound	8.2	7.1
Kings Road @ N Davis Street	17.4	18.4
Kings Road @ I-95 southbound	7.9	7.8
Church St @ I-95 Southbound	16.1	15.7
8th Street @ Myrtle Avenue	22.5	18.2
8th Street @ I-95 southbound	24.8	35.5
8th Street @ I-95 northbound	21.3	14.4
8th Street @ N Davis Street	12.8	39.9
8th Street @ James Hall Drive	6.1	44.0
8th Street @ Illinois Street	8.3	14.1

A queuing analysis was performed as part of the study to determine the adequacy of the proposed turn lane storage lengths for the study intersections and ramp terminal intersections. In the Opening Year 2025 Build Alternative, the available storage will accommodate the max queue at all intersection approaches except the following:

- Forest Street at I-95 Northbound Ramps
    - Eastbound left (AM peak)
    - Westbound left, through and right (PM peak)

    - Northbound right (AM peak) – The northbound right movement is beyond available storage but does not back up to the I-95 mainline. There is an additional 920 feet on the off ramp to accommodate the queue.
- 8th Street at I-95 Southbound Ramps
    - Eastbound through (AM peak)
    - Eastbound right (AM and PM peaks)
    - Westbound left and through (PM peak)
- 8th Street at I-95 Northbound Ramps
    - Westbound through (AM and PM peaks)
    - Northbound left (AM peak) – The northbound left movement is beyond available storage but does not back up to the I-95 mainline. There is an additional 550 feet on the off ramp to accommodate the queue.

The max queues beyond storage are also marked as red in **Table 8-3**. Overall, the 2025 Build Alternative accommodates intersection queues better than the 2025 No-Build Alternative. Significant improvements in queue lengths are at the 8th street interchange. For example, the northbound off ramp movements at the 8th Street northbound ramp terminal had queues over 2,000 feet and impacted operations on the I-95 mainline. The improvements result in queues being less than 450 feet and no longer impact the I-95 mainline. There are some locations where the queues exceed the available storage length but they will not impact the I-95 mainline or adjacent intersections.

I-95 intersections at Beaver Street and Union Street are proposed intersections under Build Alternative. No operational issues were observed at the proposed roundabout at Beaver Street providing access to I-95 and at Union Street unsignalized intersections. Vissim link-based speed results for the peak hour for these two intersections are included in the **Appendix F.**

Table 8-3: Opening Year 2025 Build Intersection Queuing Analysis Summary

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Forest Street at I-95 SB Ramps	**Ramp Length (ft)**		N/A			N/A			N/A			980		
	Available Storage (ft)			300		430	720					730		440
	Max Queue (ft)	**AM Peak**		272	260	159	57					381		228
		PM Peak		205	181	296	128					246		144
Forest Street at I-95 NB Ramps	**Ramp Length (ft)**		N/A			N/A			1,200			N/A		
	Available Storage (ft)		260	745		330			275	850	280			250
	Max Queue (ft)	**AM Peak**	411	412	453	241	241	282	53	125	763			0
		PM Peak	100	254	296	451	451	494	72	71	127			103
Kings Road at I-95 NB Ramps	**Ramp Length (ft)**		N/A			N/A			930			N/A		
	Available Storage (ft)						435		680					
	Max Queue (ft)	**AM Peak**					143	143	336					
		PM Peak					242	242	288					
Kings Road at I-95 SB Ramps	**Ramp Length (ft)**		N/A			N/A			N/A			710		
	Available Storage (ft)					315								460
	Max Queue (ft)	**AM Peak**				218	218							109
		PM Peak				254	254							126
Church Street at I-95 SB Ramps	**Ramp Length (ft)**		N/A			N/A			N/A			N/A		
	Available Storage (ft)			350		950	950					400	450	400
	Max Queue (ft)	**AM Peak**		36		57	57					101	155	266
		PM Peak		23		51	51					62	231	120

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
8th Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			850		
	Available Storage (ft)			300	250	370	370					600		450
	Max Queue (ft)	AM Peak		381	394	261	261					334		332
		PM Peak		251	265	453	453					178		191
8th Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			850			N/A		
	Available Storage (ft)		350	380			120	80	300		600			
	Max Queue (ft)	AM Peak	123	281			249	0	423		324			
		PM Peak	136	230			279	0	225		204			

Note- No ramp length applicable for Church Street at I-95 SB ramps intersection.

2025 Network-Wide Performance

The network-wide performance for Opening Year 2025 is presented in **Table 8-4**. for the 2025 Build AM and PM peak periods. When compared to the No-Build alternative, the 2025 Build alternative performs better. The average speed in the network is higher. Travel time and delay (total and latent) are significantly reduced and vehicles arrived has increased..

Table 8-4: Opening Year 2025 Build Network-Wide Performance

2025 Build	AM Peak	PM Peak
Average Speed (mph)	45	45
Total Travel Time (hr)	3,288	3,502
Total Delay (hr)	500	565
Latent Delay (hr)	45	4
Latent Demand (veh)	44	0
Vehicles Arrived	61,023	64,026

8.3.2 2045 Build Operational Analysis

The Design Year 2045 Vissim models analyzed three-hour AM and PM peak periods. Peak-hour traffic forecasts were developed using NERPM-AB1v3 as discussed in **Section 5.4**. Fifteen-minute flow rates were used to develop the three-hour AM and PM peak period Vissim models. The Design Year 2045 simulation model parameters are based on those used for the Existing Year 2019 calibrated model. The simulation time consisted of a 30-minute seed time to load traffic into the network, followed by a 3-hour peak period consisting of a preceding shoulder hour, the peak hour and one subsequent off-peak hour. The purpose of the off-peak hours was to allow all or most of the congestion built during the peak hour to subside during the simulation period.

The following MOEs were used to evaluate the network's operational performance:

- Freeways
  - Freeway estimated LOS
  - Operating speed
  - Demand and simulated volume in hourly interval
  - Estimated density in hourly interval
  - Density heat diagrams for 15-min interval
- Intersections
  - Intersection volume
  - Intersection delay
  - Maximum queue length
- Network-Wide Performance
  - Total network delay
  - Average network speed
  - Total network travel time
  - Latent demand
  - Latent delay
  - Vehicles arrived

Documentation for the Build Alternative analysis is provided in **Appendix F**.

2045 Peak Hour Results Overview

The lane schematics for the Design Year 2045 Build Alternative AM and PM peak hours are presented in **Figure 8-6** and **Figure 8-7**, respectively. The lane schematics provide an operational overview representing the overall speed, estimated density, estimated LOS and demand and simulated volume comparison of I-95 and the I-95 C-D road during the peak hour.

The AM peak hour results for the Design Year 2045 Build Alternative have improved significantly compared to the 2045 No-Build. No congestion is observed on I-95 in either direction indicating that the added capacity accommodates demand volumes within the study area. . I-95 southbound operate at an average speed of 55 mph with the lowest speed of 48 mph occurring between the 8th Street exit and entrance ramps. The total simulated volume of 7,030 vph and a density of 29 pc/mi/ln was observed for this segment of I-95 southbound. All I-95 southbound segments are expected to operate at an estimated LOS D or better in the AM peak hour. I-95 northbound operate at an average speed of 60 mph with the lowest speed of 49 mph occurring at the beginning of the network. The total simulated volume of 4,177 vph and density of 41 pc/mi/ln was observed for this segment of I-95. I-95 northbound segments upstream of northbound C-D road entrance were observed to operate at an estimated LOS E in the AM peak hour. These segments operate at speed 54 mph indicating nearly free flow speed. These segments of I-95 are approximately 13,000 feet in length and were simulated mainly to load traffic in the project area and confirm that the improvements in the project area do not adversely impact operations. There are no capacity improvements proposed at these segments. All I-95 northbound and southbound segments with the proposed Build Alternative improvements operate at LOS D or better.

Speeds on I-95 southbound C-D Road also improved during the Build Alternative compared to the No-Build Alternative. In the AM peak hour, , I-95 southbound C-D Road operate at an average speed of 48 mph with the lowest speeds average 47 mph between the Adams Street entrance and Bay Street entrance. The total simulated volume of 5,186 vph and density of 27 pc/mi/ln was observed for this segment. I-95 northbound C-D Road operations were also improved compared to the No-Build with an average speed of 48 mph with the slowest speed of 45 mph observed after the I-95 mainline entrance. The total simulated volume of 4,853 vph and density of 18 pc/mi/ln were observed for this segment. All I-95 C-D Road segments operate at LOS C or better.

The PM peak hour results for the Design Year 2045, shown in **Figure 8-7**, indicate improved operations when compared to the No-Build Alternative. No congestion is observed on I-95 in either direction indicating that the added capacity accommodates demand volumes within the study area. I-95 southbound operate at an average speed of 59 mph with the lowest speed of 52 mph occurring upstream of the Forest Street exit. The total simulated volume there is 1,520 vph with estimated density 14 pc/mi/ln. All I-95 southbound segments are expected to operate at an estimated LOS B or better in the PM peak hour. I-95 northbound operate at an average speed of 59 mph with the lowest speed of 47 mph occurring at the beginning of the network. The total simulated volume of 4,251 vph and density of 44 pc/mi/ln was observed for this segment of I-95. I-95 northbound segments upstream of northbound C-D road entrance were observed to operate at an estimated LOS E in the PM peak hour. These segments operate at speed 54 mph indicating nearly free flow speed. These segments of I-95 are approximately 13,000 feet in length and were simulated mainly to load traffic in the project area and confirm that the improvements in the project area do not adversely impact operations. There are no capacity improvements proposed at these segments. All I-95 northbound and southbound segments with the proposed Build Alternative improvements operate at LOS D or better.

In the PM peak hour, I-95 southbound C-D Road operate at an average speed of 47 mph with the lowest speed of 46 mph occurring between the Adams Street entrance and Bay Street entrance. The total simulated volume observed is 6,025 vph and density of 32 pc/mi/ln. All I-95 southbound C-D Road segments are expected to operate at LOS D or better in the PM peak hour. I-95 northbound C-D Road operate at an average speed of 49 mph Speeds with the slowest speed observed downstream of the I-95 mainline entrance, with an observed speed of 48 mph and a total simulated volume of 3,920 vph and density of 13 pc/mi/ln. All I-95 northbound C-D Road segments are expected to operate at LOS B or better in the PM peak hour. These results have improved when compared to the No-Build Alternative.

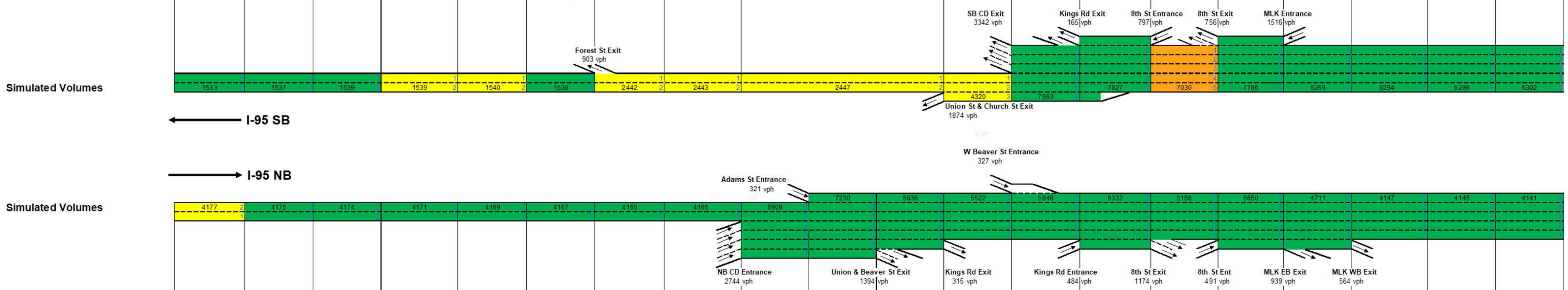
It should be noted that under the Build Alternative, the I-95 southbound C-D Road will be moved upstream from its existing location. Kings Road and Beaver Street entrances occur on the C-D Road in the Build Alternative that were previously occurring on the mainline in the No-Build Alternative. This results in more traffic shifting to the C-D Road and correspondingly lower traffic volume on the mainline under the Build Alternative. The total demand south of Forest Street (mainline + C-D Road) in the Build is same as the No-Build but the traffic distribution on these facilities is different based on the Build configuration.

The density heat maps in **Appendix F** show the density levels for the AM and PM peak periods, respectively. During the AM peak period, I-95 southbound operate at densities less than 35 vpmpl during the entire simulation period. I-95 northbound depicted highest density of 46 vpmpl in the beginning of the network and operated with densities 21 vpmpl or lower north of the I-95 northbound C-D road entrance. No congestion was observed on the I-95 C-D roads in the AM peak period. All I-95 northbound and southbound segments with the proposed Build Alternative improvements operate at densities 35 vpmpl or lower.

PM peak density heat maps depicted similar operations as the AM peak hour. During the PM peak period, I-95 southbound operate at densities less than 17 vpmpl during the entire simulation period. I-95 northbound depicted highest density of 47 vpmpl in the beginning of the network and operated with densities 24 vpmpl or lower north of the I-95 northbound C-D road entrance. All I-95 northbound and southbound segments with the proposed Build Alternative improvements operate at densities 25 vpmpl or lower. No congestion was observed on the I-95 C-D roads in the PM peak period.

← I-95 Southbound

Segment	184	183	182	181	180	179	178	177	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	854	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	62	62	61	52	48	53	49	52	51	48	54	54	48	56	60	62	63	63
Estimated Density (pc/mi/ln)	12	12	12	14	16	14	24	23	24	29	23	24	29	23	20	20	20	19
Estimated LOS	B	B	B	B	B	B	C	C	C	D	C	C	D	C	C	C	C	C
Density (veh/mi/ln)	12	12	13	15	16	14	25	23	24	30	23	24	29	23	21	20	20	20
Total Demand Volume (vph)	1565	1565	1565	1565	1565	1565	2495	2495	2495	4405	7770	7930	7130	7870	6350	6350	6350	6350
Total Simulated Volume (vph)	1533	1537	1539	1539	1540	1538	2442	2443	2447	4320	7663	7827	7030	7786	6269	6294	6298	6302



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	110	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	49	54	54	54	54	54	54	63	57	58	61	65	61	64	66	64	61	68	68	68
Estimated Density (pc/mi/ln)	41	38	38	38	38	38	37	32	20	17	15	17	19	16	15	14	13	12	12	12
Estimated LOS	E	E	E	E	E	E	E	D	B	B	B	B	B	B	B	B	B	B	B	B
Density (veh/mi/ln)	42	39	38	39	39	39	38	33	20	18	16	17	19	17	16	15	13	12	12	12
Total Demand Volume (vph)	4270	4270	4270	4270	4270	4270	4270	4270	7030	7380	5980	5670	6000	6480	5280	5780	4810	4230	4230	4230
Total Simulated Volume (vph)	4177	4175	4174	4171	4169	4167	4165	4165	6909	7230	5836	5522	5848	6332	5158	5650	4711	4147	4145	4141

I-95 Northbound →

LEGEND

(###) Travel Time Segment Number

Speed (mph)	
43	below
43 - 48	
48 - 53	
53	and above

Freeway Coloring Density (Veh/Mi/Ln)	
75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

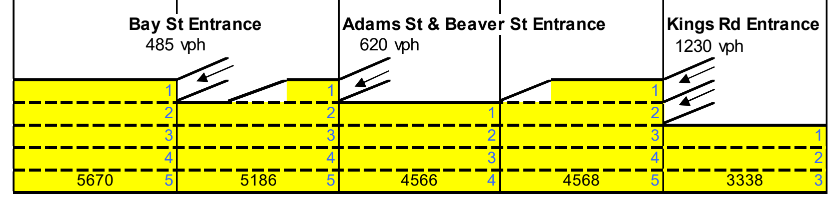
Design Year Build 2045 AM Peak Hour Lane Schematics

Figure 8-6

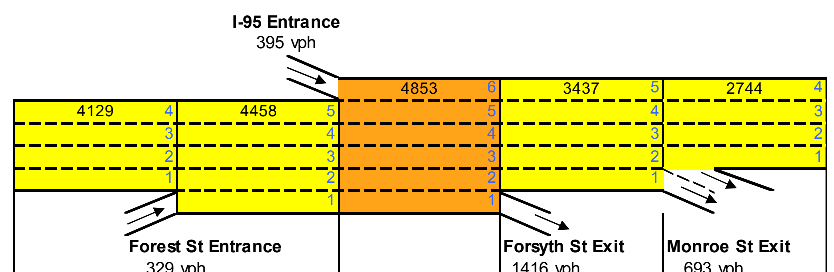
← I-95 SB C-D Road

	507	506	505	174	173
Distance (ft)	1264	1567	585	382	883
Speed (mph)	48	47	49	48	49
Estimated Density (pc/mi/ln)	23	27	23	19	22
Estimated LOS	C	C	C	B	C
Total Demand Volume (vph)	5735	5245	4615	4615	3365
Total Simulated Volume (vph)	5670	5186	4566	4568	3338

Simulated Volumes



Simulated Volumes



	508	501	502	503	504
Distance (ft)	2000	1949	992	1167	1263
Speed (mph)	49	48	45	48	48
Estimated Density (pc/mi/ln)	21	18	18	14	14
Estimated LOS	C	B	B	B	B
Total Demand Volume (vph)	4160	4500	4890	3460	2760
Total Simulated Volume (vph)	4129	4458	4853	3437	2744

I-95 NB C-D Road →

LEGEND

Travel Time Segment Number

Freeway Coloring

Speed (mph)
42 below
42 - 47
47 - 50
50 and above

Estimated Density (pc/mi/ln)
75 and above
55 - 75
45 - 55
45 and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

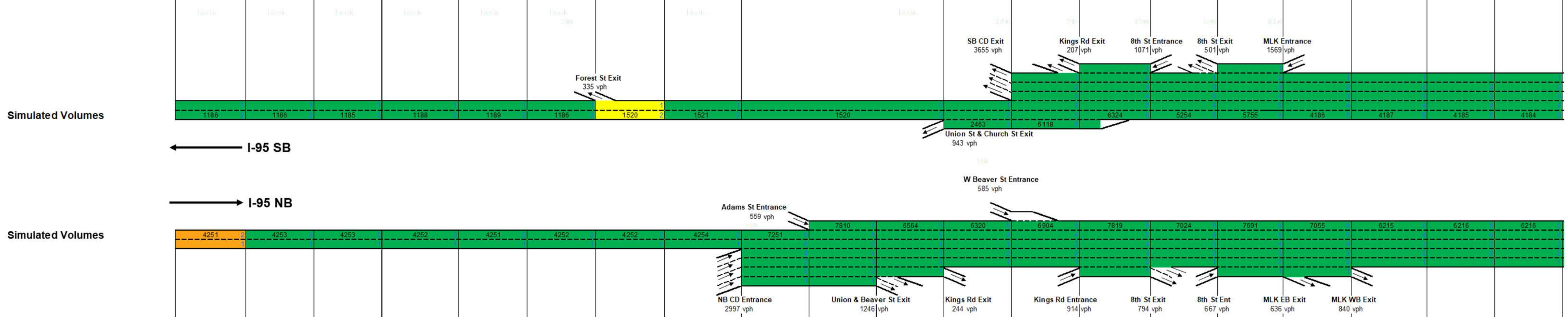
I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

Design Year Build 2045
AM Peak Hour Lane Schematics

Figure 8-6

I-95 Southbound

Segment	184	183	182	181	180	179	178	177	170	169	168	159	158	155	154	153	152	151
Distance (ft)	2005	2000	2006	2000	2000	2000	1514	854	596	589	700	1963	1784	1511	2957	2001	2000	1293
Speed (mph)	63	63	62	53	53	54	52	53	54	58	60	61	62	62	63	63	64	64
Estimated Density (pc/mi/ln)	9	9	9	11	11	11	14	14	14	14	16	17	16	15	13	13	13	13
Estimated LOS	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B
Total Demand Volume (vph)	1200	1200	1200	1200	1200	1200	1540	1540	1540	2490	6270	6480	5280	5780	4230	4230	4230	4230
Total Simulated Volume (vph)	1186	1186	1185	1188	1189	1186	1520	1521	1520	2463	6118	6324	5254	5755	4186	4187	4185	4184



Segment	100	101	102	103	104	105	106	107	108	109	110	121	122	123	126	127	130	131	132	133
Distance (ft)	2000	2001	2000	1963	1502	2000	2002	1457	124	481	110	101	1868	1802	1857	1850	645	2000	2000	2001
Speed (mph)	47	54	54	54	54	54	54	63	57	58	60	63	56	61	64	61	55	66	67	67
Estimated Density (pc/mi/ln)	44	38	38	38	38	39	38	33	21	19	18	20	24	21	21	20	21	19	18	18
Estimated LOS	E	E	E	E	E	E	E	D	C	B	B	B	C	C	C	C	C	C	C	C
Total Demand Volume (vph)	4310	4310	4310	4310	4310	4310	4310	4310	7370	7940	6680	6430	7020	7930	7130	7870	7220	6350	6350	6350
Total Simulated Volume (vph)	4251	4253	4253	4252	4251	4252	4252	4254	7251	7810	6564	6320	6904	7819	7024	7691	7055	6215	6216	6216

I-95 Northbound

LEGEND

(###) Travel Time Segment Number

Speed (mph)	
43	below
43 - 48	
48 - 53	
53	and above

Freeway Coloring Density (Veh/Mi/Ln)	
75	and above
55 - 75	
45 - 55	
45	and below

Simulated volume highlighted if difference > 10% of demand volume

FDOT

I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1) SIMR

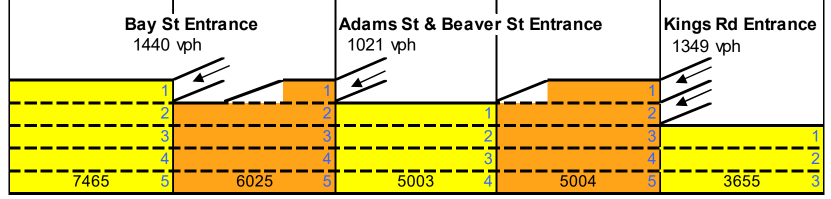
Design Year Build 2045 PM Peak Hour Lane Schematics

Figure 8-7

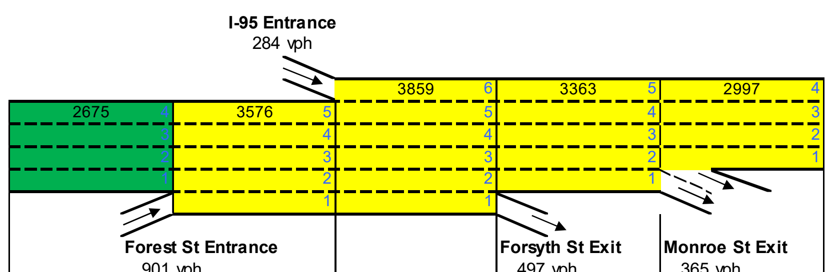
← I-95 SB C-D Road

	507	506	505	174	173
Distance (ft)	1264	1567	585	382	883
Speed (mph)	47	46	48	47	48
Estimated Density (pc/mi/ln)	31	32	25	21	25
Estimated LOS	D	D	C	C	C
Total Demand Volume (vph)	7620	6190	5140	5140	3780
Total Simulated Volume (vph)	7465	6025	5003	5004	3655

Simulated Volumes



Simulated Volumes



	508–501	501–502	502–503	503–504	504–
Distance (ft)	2000	1949	992	1167	1263
Speed (mph)	50	48	48	49	48
Estimated Density (pc/mi/ln)	13	14	13	14	15
Estimated LOS	B	B	B	B	B
Total Demand Volume (vph)	2730	3660	3920	3430	3060
Total Simulated Volume (vph)	2675	3576	3859	3363	2997

508 501 502 503 504

I-95 NB C-D Road →

LEGEND

Travel Time Segment Number

Freeway Coloring Speed (mph)
- 42 below
- 42 - 47
- 47 - 50
- 50 and above

Estimated Density (pc/mi/ln)
- 75 and above
- 55 - 75
- 45 - 55
- 45 and below

Simulated volume highlighted if difference > 10% of demand volume

2045 Freeway Travel Time

Travel time and speed results for the AM and PM peak hours on I-95 mainline and I-95 C-D road during Build Design Year 2045 are presented in **Table 8-5**. The travel time measurements were performed for two segments on I-95 (I-10 to the I-95 C-D Road and I-95 C-D Road to north of Martin Luther King Jr. Parkway). The total travel time on I-95 northbound and southbound are also provided. For the I-95 C-D road travel time, the entire length of the I-95 C-D in the study area was used for the travel time calculation. Compared to the No-Build the total travel time along the I-95 mainline and northbound C-D road are expected to reduce. The travel time is expected to increase along the southbound C-D road. This is expected with the assumption that the volume and demand for the I-95 C-D road will increase.

Table 8-5: Design Year 2045 Build I-95 Peak Hour Travel Time/Speed

AM Peak			Travel Time (min)
I-95	NB	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	1.9
		Total Travel Time (min)	**3.8**
	SB	North of MLK Jr. Parkway to C-D Road	1.8
		C-D Road to I-10	2.1
		Total Travel Time (min)	**3.9**
C-D Road	NB	**Total Travel Time (min)**	**1.3**
	SB	**Total Travel Time (min)**	**1.5**
PM Peak			**Travel Time (min)**
I-95	NB	I-10 to C-D Road	1.8
		C-D Road to north of MLK Jr. Parkway	2.0
		Total Travel Time (min)	**3.8**
	SB	North of MLK Jr. Parkway to C-D Road	1.5
		C-D Road to I-10	2.0
		Total Travel Time (min)	**3.5**
C-D Road	NB	**Total Travel Time (min)**	**1.2**
	SB	**Total Travel Time (min)**	**1.5**

Study Intersection/Interchange Performance

The performance of the study area intersections was evaluated as part of the Vissim analysis. Signal optimization was performed to account for the 2045 peak-hour volumes. The Design Year 2045 intersection delay results are summarized in **Table 8-6**. Additional details for the intersection analysis are provided in **Appendix F**. In the Design Year 2045, only one of the 14 study area intersections is expected to operate with excessive delay (> 80 seconds per vehicle). This is a significant improvement from the 2045 No-Build Alternative, in which almost half of the intersections operated with excessive delay. The intersection with excessive delay is the following:

- 8th Street at Illinois Street (PM Peak)

This intersection (8th Street at Illinois Street) is not a terminal intersection and will not impact I-95 operations.

Table 8-6: Design Year 2045 Build Intersection/Interchange Analysis Summary

Intersection	Delay (seconds/vehicle)	
	AM Peak	PM Peak
Forest Street @ I-95 southbound	34.9	34.6
Forest Street @ I-95 northbound	39.5	25.2
Forest Street @Park Street	20.7	42.7
Kings Road @ Cleveland Street	46.0	8.1
Kings Road @ I-95 northbound	8.8	8.0
Kings Road @ N Davis Street	19.1	21.8
Kings Road @ I-95 southbound	8.2	8.6
Church St @ I-95 southbound	16.3	16.0
8th Street @ Myrtle Avenue	38.0	23.4
8th Street @ I-95 southbound	26.0	39.1
8th Street @ I-95 northbound	22.0	20.7
8th Street @ N Davis Street	19.6	64.3
8th Street @ James Hall Drive	6.6	79.5
8th Street @ Illinois Street	9.9	220.0

A queuing analysis was performed as part of the study to determine the adequacy of the proposed turn lane storage lengths for the study intersections and ramp terminal intersections. In the Design Year 2045 Build Alternative, the available storage will accommodate the max queue at all intersection approaches except the following.

- Forest Street at I-95 Southbound Ramps
  - Eastbound through and right (AM and PM peaks)
- Forest Street at I-95 Northbound Ramps
  - Eastbound left (AM peak)
  - Westbound left, through and right (PM peak)
  - Northbound right (AM peak) – The northbound right movement is beyond available storage but does not back up to the I-95 mainline. There is an additional 920 feet on the off ramp to accommodate the queue.
- 8th Street at I-95 Southbound Ramps
  - Eastbound through and right (AM and PM peaks)
  - Westbound left and through (PM peak)
  - Southbound right (AM peak) – The southbound right movement is beyond available storage but does not back up to the I-95 mainline. There is an additional 400 feet on the off ramp to accommodate the queue.
- 8th Street at I-95 Northbound Ramps
  - Westbound through (AM and PM peaks)
  - Northbound left (AM and PM peaks) – The northbound left movement is beyond available storage but does not back up to the I-95 mainline. There is an additional 550 feet on the off ramp to accommodate the queue.

The max queues beyond storage are also marked as red in **Table 8-7**. Overall, the 2045 Build Alternative accommodates intersection queues better than the 2045 No-Build Alternative. Significant improvements in queue lengths are at the 8th street interchange are observed where multiple No-Build movements had queues over 1,000 feet were improved. For example, the No-Build Alternative northbound off ramp movements at the 8th Street northbound ramp terminal had queues over 18,000 feet and impacted operations on the I-95 mainline. The improvements result in queues being less than 450 feet and no longer impact the I-95 mainline. There are some locations where the queues exceed the available storage length but they will not impact the I-95 mainline or adjacent intersections.

I-95 intersections at Beaver Street and Union Street are proposed intersections under Build Alternative. No operational issues were observed at the proposed roundabout at Beaver Street providing access to I-95 and at Union Street unsignalized intersections. Vissim link-based speed results for the peak hour for these two intersections are included in the **Appendix F.**

Table 8-7: Design Year 2045 Build Intersection Queuing Analysis Summary

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Forest Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			980		
	Available Storage (ft)			300		430	720					730		440
	Max Queue (ft)	AM Peak		342	306	182	55					440		239
		PM Peak		479	525	315	134					257		169
Forest Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			1,200			N/A		
	Available Storage (ft)		260	745		330			275	850	280			250
	Max Queue (ft)	AM Peak	522	547	579	279	279	310	53	156	919			0
		PM Peak	121	409	449	515	515	555	88	62	131			214
Kings Road at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			930			N/A		
	Available Storage (ft)						435		680					
	Max Queue (ft)	AM Peak					175	175	400					
		PM Peak					264	264	304					
Kings Road at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			710		
	Available Storage (ft)					315								460
	Max Queue (ft)	AM Peak				251	251							122
		PM Peak				264	264							134
Church Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			N/A		
	Available Storage (ft)			350		950	950					400	450	400
	Max Queue (ft)	AM Peak		32		76	76					112	200	325
		PM Peak		41		71	71					79	267	203

Intersection			Eastbound			Westbound			Northbound			Southbound		
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
8th Street at I-95 SB Ramps	Ramp Length (ft)		N/A			N/A			N/A			850		
	Available Storage (ft)			300	250	370	370					600		450
	Max Queue (ft)	AM Peak		605	569	315	315					466		464
		PM Peak		378	393	467	467					232		245
8th Street at I-95 NB Ramps	Ramp Length (ft)		N/A			N/A			850			N/A		
	Available Storage (ft)		350	380			120	80	300		600			
	Max Queue (ft)	AM Peak	170	369			266	0	437		386			
		PM Peak	156	269			285	0	307		279			

Note- No ramp length applicable for Church Street at I-95 SB ramps intersection.

2045 Network-Wide Performance

The network-wide performance for Design Year 2045 is presented in **Table 8-8** for the 2045 Build AM and PM peak periods. When compared to the No-Build alternative, the 2045 Build alternative performs significantly better. The average speed in the network is higher. Travel time and delay (total and latent) are significantly reduced and vehicles arrived has increased.

Table 8-8: Design Year 2045 Build Network-Wide Performance

2045 Build	AM Peak	PM Peak
Average Speed (mph)	44	40
Total Travel Time (hr)	4,385	5,154
Total Delay (hr)	790	1,385
Latent Delay (hr)	108	690
Latent Demand (veh)	73	363
Vehicles Arrived	76,308	80,660

8.3.3 Comparison of No-Build Alternative and Build Alternative Analysis

Table 8-9 summarizes the comparison of all freeway and C-D road basic segments. Improvements were observed for the 2045 Build Alternative segments as compared to the No-Build. The I-95 southbound segment from the C-D Road to I-10 and the southbound C-D Road segment experience an increase in travel time under the Build. Travel time for these segments is expected to increase slightly, which is consistent with the assumption that the volume and demand for the I-95 C-D road will increase in the Build alternative after adding lanes. In addition, I-95 C-D road exit in the Build alternative is moved 2,500 feet north of its location in the No-Build resulting in more distance to travel. In addition, excessive congestion is observed on I-95 southbound in the No-Build upstream of C-D road exit which resulted in simulating lesser demand on the C-D Road showing decrease in the C-D road travel time. All of these resulted in slightly higher travel time in the Build compared to the No-Build.

Table 8-9: I-95 Peak Hour Travel Time/Speed – No-Build vs. Build Alternative

AM Peak			Travel Time (min)		Percent Difference
			Build	No Build	
I-95	NB	I-10 to C-D Road	1.8	6.9	-74%
		C-D Road to north of MLK Jr. Parkway	1.9	6.5	-70%
		Total Travel Time	**3.8**	**13.5**	**-72%**
	SB	North of MLK Jr. Parkway to C-D Road	1.8	5.2	-66%
		C-D Road to I-10	2.1	1.5	41%
		Total Travel Time	**3.9**	**6.7**	**-42%**
C-D Road	NB	**Total Travel Time**	**1.3**	**5.2**	**-76%**
	SB	**Total Travel Time**	**1.5**	**0.8**	**88%**
PM Peak			**Travel Time (min)**		**Percent Difference**
			Build	**No Build**	
I-95	NB	I-10 to C-D Road	1.8	5.9	-69%
		C-D Road to north of MLK Jr. Parkway	1.9	4.3	-55%
		Total Travel Time	**3.8**	**10.2**	**-63%**
	SB	North of MLK Jr. Parkway to C-D Road	1.8	6.4	-72%
		C-D Road to I-10	2.1	1.4	48%
		Total Travel Time	**3.9**	**7.8**	**-50%**
C-D Road	NB	**Total Travel Time**	**1.3**	**1.7**	**-24%**
	SB	**Total Travel Time**	**1.5**	**0.8**	**85%**

Table 8-10 compares the network-wide performance for the 2045 No-Build and Build Alternatives during the AM and PM peak periods. The Build Alternative performs better than the No-Build Alternative during the AM and PM peak periods. The average speed has increased by 91 and 60 percent in the AM and PM peak periods, and total delay decreases by 83 percent and 67 percent, respectively. Improvements were also observed for travel time, latent delay, latent demand and vehicles arrived.

Table 8-10: Network-wide Performance – No-Build vs. Build Alternative

AM Peak	Build	No-Build	Percent Difference
Average Speed (mph)	44	23	91%
Total Travel Time (hr)	4,385	7,812	-44%
Total Delay (hr)	790	4,554	-83%
Latent Delay (hr)	108	5,088	-98%
Latent Demand (veh)	73	5,170	-99%
Vehicles Arrived	76,308	67,683	13%
PM Peak	**Build**	**No-Build**	**Percent Difference**
Average Speed (mph)	40	25	60%
Total Travel Time (hr)	5,154	7,791	-34%
Total Delay (hr)	1,385	4,257	-67%
Latent Delay (hr)	690	8,251	-92%
Latent Demand (veh)	363	4,982	-93%
Vehicles Arrived	80,660	73,197	10%

8.4 Safety

A predictive safety analysis was performed in the study area. The predictive safety analysis was performed per the guidelines in the American Association of State Highway and Transportation Officials (AASHTO) HSM and the IARUG Safety Analysis Guidance.

Predictive safety analysis was performed using a quantitative and qualitative approach. Quantitative safety analysis, using the Enhanced Interchange Safety Analysis Tool (ISATe), was performed where applicable in the study area. The quantitative safety analysis was performed for a 20-year design period from 2025 to 2045 for the No-Build and Build Alternative. For sections where the HSM Part C and CMF methodologies could not be applied, a qualitative safety analysis was performed. The following improvements were analyzed either quantitatively or qualitatively:

- Quantitative
  - Addition of two lanes on I-95 in each direction and modification of speed change lanes
  - Additional one to two lanes on I-95 C-D Road in each direction and modification of speed change lanes
  - Improvements at 8th Street interchange ramp terminals
  - Improvements at Kings Road southbound ramp terminal
  - Improvements at Union Street ramps
  - Improvements at Beaver Street ramps
  - Improvements at Union Street ramps
  - Improvements at Kings Road ramps
- Qualitative
  - Intersection improvements at Forest Street and Myrtle Avenue intersection
  - Intersection improvements at Forest Street and Park Street intersection
  - Intersection improvements at Church Street and Cleveland Street intersection
  - New intersection at Beaver Street at I-95 northbound off ramp
  - Intersection improvements (roundabout) at Beaver Street
  - Improvements at I-95 southbound and I-95 C-D road off ramp

8.4.1 Quantitative Safety Analysis

A quantitative safety analysis was performed as part of this SIMR, where applicable. To perform the analysis, the ISATe tool was used. The ISATe tool is intended to apply the HSM Part C methodology to freeway facilities, including freeway segments and interchanges in urban and rural areas. ISATe was developed as part of the National Cooperative Highway Research Program (NCHRP) Project 17-45. To perform the safety analysis in ISATe, the study area, where improvements are being recommended, was segmented into homogenous sections. Once the study area was segmented, the applicable inputs were provided to produce a predicted number of crashes for the 2025 to 2045 study period. The total number of crashes was then distributed using the KABCO injury classification scale. The KABCO distribution provided in the FDM Chapter 122 was used.

For the safety analysis, the No-Build alternative uses the existing roadway with the proposed improvements described in **Section 5.1**. The Build alternative uses the proposed improvements described in **Section 7.2**. The No-Build and Build Alternative predictive crash results were compared to determine the safety benefits of the proposed improvements. Since the Build alternative does require significant changes in the geometric configuration, the predictive safety analysis did not utilize the Empirical-Bayes Method for the No-Build or Build Alternative, as recommended in the Safety Guidance. The following quantitative safety analysis compares the No-Build and Build Alternative for the I-95 mainline, I-95 ramps, 8th Street interchange improvements, Kings Road southbound terminal intersection improvements and Union Street terminal intersection improvements. No improvements are recommended at the Kings Road northbound terminal intersection or the Bay Street, Forsyth Street, Adams Street and Monroe Street ramps as part of this SIMR, therefore a quantitative safety analysis was not performed. Improvements at Forest Street, Church Street, Beaver Street and I-95 southbound C-D Road off ramp are discussed in the qualitative safety analysis. **Appendix G** presents the input data used to perform the quantitative safety analysis and output summary for the No-Build and Build Alternatives.

<u>I-95</u>

A predictive safety analysis was performed for I-95 from north of I-10 to south of Martin Luther King Jr. Parkway. The addition of two general use lanes along I-95 in each direction and modifications to the length of the merge and diverge lanes were coded for the Build alternative. **Table 8-11**, presented below, shows the expected crash frequencies for the No-Build and Build Alternative.

Table 8-11: Predicted Crash Frequency along I-95 Mainline (Crashes/Year)

Alternative	K	A	B	C	PDO	Total
No-Build	0.59	3.45	10.43	18.25	51.39	84.10
Build	0.50	2.92	8.84	15.47	43.56	71.30
Change	-0.09	-0.52	-1.59	-2.78	-7.82	-12.80

The analysis indicates the additional lanes provided along I-95 should reduce the number of crashes along the I-95 mainline by 12.80 crashes/year. Additionally, the analysis indicates a reduction in crashes along I-95's ramps by 3.1 crashes/year as shown in **Table 8-12**.

Table 8-12: Predicted Crash Frequency along I-95 Ramps (Crashes/Year)

Alternative	K	A	B	C	PDO	Total
No-Build	0.06	0.33	0.99	1.74	4.89	8.00
Build	0.03	0.20	0.61	1.06	2.99	4.90
Change	-0.03	-0.13	-0.38	-0.68	-1.90	-3.10

8th Street Interchange

A predictive safety analysis was performed for I-95 at 8th Street interchange. The improvements to the I-95 northbound and southbound ramp terminals were coded in the Build alternative. **Table 8-13**, presented below, shows the expected crash frequencies for the No-Build and Build Alternative.

Table 8-13: Predicted Crash Frequency at the I-95 and 8th Street Interchange (Crashes/Year)

Ramp Terminal	Alternative	K	A	B	C	PDO	Total
Northbound Ramp Terminal	No-Build	0.06	0.38	1.14	2.00	5.63	9.21
	Build	0.05	0.27	0.82	1.44	4.05	6.63
	Change	-0.02	-0.11	-0.32	-0.56	-1.58	-2.58
Southbound Ramp Terminal	No-Build	0.05	0.27	0.82	1.43	4.03	6.60
	Build	0.04	0.25	0.76	1.32	3.72	6.09
	Change	0.00	-0.02	-0.06	-0.11	-0.31	-0.51
Total	No-Build	0.11	0.65	1.96	3.43	9.66	15.81
	Build	0.09	0.52	1.58	2.76	7.77	12.72
	Change	-0.02	-0.13	-0.38	-0.67	-1.89	-3.09

The analysis shows the improvements provided at the northbound ramp terminal should reduce the number of crashes by 2.58 crashes/year. The analysis also shows the improvements provided at the

Southbound ramp terminal should reduce the number of crashes by 0.51 crashes/year. Overall, the improvements at the I-95 and 8th Street interchange should reduce the number of crashes by 3.09 crashes/year.

Kings Road Southbound Terminal Intersection

A predictive safety analysis was performed for I-95 at Kings Road southbound terminal intersection. The conversion of the ramp from an unsignalized ramp to a signalized intersection and additional intersection improvements were coded in the Build alternative. **Table 8-14**, presented below, shows the expected crash frequencies for the No-Build and Build Alternative.

Table 8-14: Predicted Crash Frequency at Kings Road Southbound Terminal Intersection (Crashes/Year)

Ramp Terminal	Alternative	K	A	B	C	PDO	Total
Southbound Ramp Terminal	No-Build	0.00	0.02	0.07	0.12	0.35	0.57
	Build	0.01	0.04	0.12	0.21	0.58	0.95
	Change	0.00	0.02	0.05	0.08	0.23	0.38

The analysis shows the improvements provided at the southbound ramp terminal may increase the number of crashes by 0.38 crashes/year. This slight increase in crashes is most likely a result of adding a signal at the intersection instead of the free-flow movement allowed in the No-Build. The number of rear-end crashes could increase with the signal but the improvement should reduce the number of free flowing sideswipe collisions, as a result of eliminating the potential friction point. This is a safety benefit that could result in less serious collisions.

Union Street Southbound Terminal Intersection

A predictive safety analysis was performed for I-95 at Union Street southbound terminal intersection. The removal of various ramps in the Build alternative along the I-95 mainline contributed to increased ramp volume at Union Street. This volume and intersection improvements were coded in the Build alternative. **Table 8-15**, presented below, shows the expected crash frequencies for the No-Build and Build Alternative.

Table 8-15: Predicted Crash Frequency at Union Street Southbound Terminal Intersection (Crashes/Year)

Ramp Terminal	Alternative	K	A	B	C	PDO	Total
Southbound Ramp Terminal	No-Build	0.08	0.48	1.45	2.54	7.15	11.70
	Build	0.14	0.81	2.45	4.28	12.06	19.74
	Change	0.06	0.33	1.00	1.74	4.91	8.04

The analysis shows the improvements provided at the southbound ramp terminal may increase the number of crashes by 8.04 crashes/year. As a result of the removal of ramps and volume redistribution, the crashes at the Union Southbound Ramp Terminal do increase. However, because of these improvements, there is also a decrease in crashes along the I-95 mainline, ramps and other ramp terminals within the study area. The removal of ramps along I-95 results in far less friction along the I-95 mainline resulting in improved safety operations.

Church Street Southbound Terminal Intersection

A predictive safety analysis was performed for I-95 at Church Street southbound terminal intersection. This is a new intersection proposed in the Build Alternative. This intersection is not existing and is not present in the No-Build alternative**. Table 8-16**, presented below, shows the expected crash frequencies for the Build Alternative.

Table 8-16: Predicted Crash Frequency at Church Street Southbound Terminal Intersection (Crashes/Year)

Ramp Terminal	Alternative	K	A	B	C	PDO	Total
Southbound Ramp Terminal	Build	0.00	0.01	0.02	0.03	0.08	0.13

The analysis shows this new southbound terminal intersection at Church Street should result in 0.13 crashes/year.

Summary of Quantitative Safety Analysis

A quantitative safety analysis was performed for all applicable segments/intersections within the study area. **Table 8-17** summarizes the quantitative safety analysis for all segments/intersections analyzed. Overall, the Build alternative reduces crashes within the study area by 10.44 crashes/year. The reduction in crashes is most prominent along the I-95 mainline, I-95 ramps and at the 8th Street interchange ramp terminals. Additional improvements that could not be analyzed using quantitative safety analysis are discussed qualitatively in **Section 8.4.2**. These additional improvements should provide additional safety benefits.

Table 8-17: Predicted Crash Frequency (Crashes/Year) Comparison – No-Build vs. Build

I-95 Segment/Interchange	Alternative	K	A	B	C	PDO	Total
I-95 Mainline	No-Build	0.59	3.45	10.43	18.25	51.39	84.10
	Build	0.50	2.92	8.84	15.47	43.56	71.30
	Change	**-0.09**	**-0.52**	**-1.59**	**-2.78**	**-7.82**	**-12.80**
I-95 Ramps	No-Build	0.06	0.33	0.99	1.74	4.89	8.00
	Build	0.03	0.20	0.61	1.06	2.99	4.90
	Change	**-0.02**	**-0.13**	**-0.38**	**-0.67**	**-1.89**	**-3.10**
8Th Street Interchange	No-Build	0.11	0.65	1.96	3.43	9.66	15.81
	Build	0.09	0.52	1.58	2.76	7.77	12.72
	Change	**-0.02**	**-0.13**	**-0.38**	**-0.67**	**-1.89**	**-3.09**
Kings Road Southbound Terminal Intersection	No-Build	0.00	0.02	0.07	0.12	0.35	0.57
	Build	0.01	0.04	0.12	0.21	0.58	0.95
	Change	**0.00**	**0.02**	**0.05**	**0.08**	**0.23**	**0.38**
Union Street Southbound Terminal Intersection	No-Build	0.08	0.48	1.45	2.54	7.15	11.70
	Build	0.14	0.81	2.45	4.28	12.06	19.74
	Change	**0.06**	**0.33**	**1.00**	**1.74**	**4.91**	**8.04**
Church Street Southbound Terminal Intersection	No-Build	-	-	-	-	-	-
	Build	0.00	0.01	0.02	0.03	0.08	0.13
	Change	**0.00**	**0.01**	**0.02**	**0.03**	**0.08**	**0.13**
Overall	No-Build	0.84	4.93	14.9	26.08	73.44	120.18
	Build	0.77	4.5	13.62	23.81	67.04	109.74
	Change	-0.07	-0.43	-1.28	-2.27	-6.4	-10.44

8.4.2 Qualitative Safety Analysis

The HSM Part C methodology and CMF methodology cannot always account for unique configurations and as a result, quantitative predictive safety analysis cannot be performed. However, to still account for the proposed improvements that cannot be analyzed using HSM Part C or with CMFs, a qualitative safety analysis has been performed for these applicable improvements.

I-95 at Forest Street Interchange

Improvements at the northbound ramp terminal (Forest Street at Myrtle Avenue intersection) are proposed to eliminate the southbound through and left turn movements on Myrtle Avenue. Myrtle Avenue is a public road with no connections to I-95. The elimination of these movements would create fewer conflict points at the intersection and improved intersection operations.

Northbound dual left turn lanes, a southbound exclusive left turn lane and an eastbound exclusive right turn lane are proposed at the intersection of Forest Street and Park Street. The addition of the eastbound exclusive right turn lane would eliminate a shared right-through movement on the intersection leg. This would reduce potential rear end crashes.

I-95 at Church Street and Cleveland Street Intersection

The southbound off ramp at I-95 and Church Street (Church Street at Cleveland Street intersection) is proposed to be removed. Vehicles wanting to exit at Church Street would need to utilize the Union Street exit and proposed roundabout at Beaver Street.

The removal of a mainline ramp will eliminate the weaving segment on I-95 southbound between Kings Road and Church Street and potential queues that may otherwise have back up onto the mainline. It should also improve operations at the Church Street at Cleveland Street intersection and reduce crash severity due to the reduction of conflict points.

I-95 Northbound at Beaver Street New Terminal Intersection

It is proposed to modify the Beaver Street northbound off ramp to create a new terminal intersection at Beaver Street. Similar to the existing conditions, the off ramp would still have an exit onto Union Street; however, a new loop portion would be constructed to intersect with Beaver Street. The loop would replace a portion of Lee Street. The removal of this Lee Street roadway portion would reduce crash types such as head on and sideswipe since the new loop is one-directional. Lee Street is currently two-directional. It would also eliminate current crashes at Union and Lee Street.

Beaver Street Roundabout

A single-lane roundabout is proposed at Beaver Street, which connects the I-95 southbound Union Street off ramp to Church Street. The roundabout would also provide a direct connection to I-95 northbound. Federal Highway Administration (FHWA) sites a reduction in speed along roundabout corridors as one of the many benefits. The conversion of the current intersection to a roundabout also significantly reduces the possibility of an angle crash and can reduce queuing, which could potentially spill back onto the I-95 off ramp.

I-95 Southbound at I-95 C-D Road Off Ramp

The I-95 C-D road is proposed to have one to two additional lanes in the Build alternative. This improvement cannot be accounted for using the HSM Part C methodology or CMF methodology. Since there are no other ways to quantify this improvement, a qualitative discussion has been provided. By adding lanes to the C-D road, capacity is increased, and it is anticipated that queues on I-95 would be reduced. The entrance to the C-D road southbound is also proposed to be moved further north on I-95 (approximately over ½ a mile earlier exit). This would remove potential weaving conflicts from vehicles trying to access the I-95 Southbound Union Street exit, as vehicles accessing the I-95 Southbound C-D road would already be removed from the mainline traffic.

I-95 C-D Roadway System

The C-D road system improvements cannot be analyzed using the HSM Part C methodology or CMF methodology due to the complex geometry. In the southbound direction, traffic volumes increase on the C-D road which could potentially increase crashes, but by adding lanes to the C-D road, capacity is increased which should reduce congestion and lane changes on the C-D road. Also, the elimination of some access points on the C-D road should eliminate weave and lane change movements, thereby reducing crashes. In the northbound direction, traffic volumes remain the same under the Build Alternative, and safety should get better due to the recommended improvements. The entrance to the C-D road southbound is also proposed to be moved further north on I-95 (approximately over ½ a mile earlier exit). This would remove potential weaving conflicts from vehicles trying to access the I-95 Southbound Union Street exit, as vehicles accessing the I-95 Southbound C-D road would already be removed from the mainline traffic.

8.5 Project Cost

The anticipated cost of this project based on the FDOT Long Range Estimating (LRE) System is provided in **Appendix H**.

8.6 Conceptual Signing Plan

A conceptual signing plan was prepared for the preferred alternative in accordance with the IARUG requirements. **Appendix I** presents the conceptual signing plan for proposed modifications within the AOI. No modifications are proposed at I-10 and Martin Luther King Jr. Parkway interchanges as part of this SIMR.

8.7 Design Exceptions and Variations

Implementation of the proposed improvements will require the following design exceptions and variations:

1. Shoulder Width Variation
   a. The southbound I-95 ramp from the non-truss bridge section to southbound I-95 has 2.5' shoulders. The existing ramp structure currently operates as a single lane ramp.
   b. Northbound outside mainline section south of the R/R crossing has 6' shoulders to minimize the r/w impacts to Historic Allen Chapel AME Church
   c. All existing bridge shoulders are 10'

8.8 Recommendation

The No-Build Alternative will not accommodate the travel demand along I-95 and at the study interchanges. In the Design Year 2045, significant operational deficiencies will exist with the No-Build Alternative. Multiple segments along I-95 northbound and southbound operate at densities greater than 45 vhpmpl and estimated LOS F in both AM And PM peak hours. Multiple segments along I-95 northbound C-D road also experience higher densities and lower speed. Five of the 12 study intersections will operate at unacceptable delay (greater than 80 seconds per vehicle) under the No-Build Alternative. Vissim operational analysis results show latent demand at the end of AM and PM peak periods. These operational deficiencies are associated with high traffic demand and insufficient capacity.

The Build Alternative for this study performs substantially better than the No-Build alternative for all future years. The proposed improvements provide additional capacity along the I-95 mainline and I-95 C-D road while improving traffic flow with ramp modifications and removals at interchanges. In the Design Year 2045, significant operational benefits result from the Build Alternative. Overall, the total delay along the network will decrease by 83 percent and 67 percent in AM and PM peak respectively. The average speed in the network will increase by 91 percent and 60 percent in AM and PM peak respectively, and the total travel time will decrease by 44 percent and 34 percent in AM and PM peak respectively. The five study intersections that were operating with unacceptable delay in 2045 No-Build Alternative improve to only one intersection performing at an unacceptable in the PM peak hour. This intersection (8th Street at Illinois Street) is not a terminal intersection and will not impact I-95 operations. These improvements will help process traffic traveling along I-95 and to and from the study interchanges.

A predicted quantitative safety analysis was also performed where applicable to determine if the Build Alternative addressed the existing safety concerns. Based on the proposed improvements, combined crashes for mainline, ramps and intersections are expected to reduce by 10.4 crashes per year under the Build Alternative.

Considering all the analysis findings described in this SIMR, the Build Alternative is recommended for approval in this study.

9 JUSTIFICATION

The proposed modifications to I-95 will provide traffic relief and enhance safety within the AOI. The proposed Build Alternative will operate better than the No-Build Alternative for this project.

9.1 Compliance with FHWA General Requirements

The following requirements serve as the primary decision criteria used in the approval of interchange modification projects. Responses to each of the FHWA 2 policy points are provided to show that the proposed project is viable based on the conceptual analysis performed to date.

9.1.1 FHWA Policy Point 1

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

An in-depth operational and safety analysis was conducted to study the operational and safety benefits offered by the proposed improvements when compared to the No-Build Alternative.

Several performance measures were used to compare the traffic operations and safety of the existing system under No-Build and Build conditions. Key measures include freeway densities, freeway volume to capacity (V/C) ratios, intersection delays, level of service (LOS), max queue lengths, crash rates and frequency, predominant crash patterns, expected crashes and potential crash reduction.

During the Opening Year 2025, the No-Build Alternative analysis showed that traffic operations are expected to degrade significantly, and several freeway segments will operate at unacceptable LOS E or worse during the AM and PM peak hours. These operational deficiencies are due to the increase in traffic within the study area by 2025. The Build Alternative, which provides general use lane capacity improvements through the extent of the study area, shows significant improvements over the No-Build, with all the freeway segments operating at acceptable LOS C or better in both AM and PM peak hours in Opening Year 2025. Arterial roadways will also benefit from the proposed improvements. By 2025 all study intersections will operate at an acceptable LOS in both AM and PM peak hours under the Build Alternative. The proposed improvements at the study intersections indicate a reduction in maximum queue length under the 2025 Build Alternative, where most of the proposed storage can accommodate the queues.

The Design Year 2045 operational analysis results show that the Build Alternative improved traffic operations within the I-95 study area compared to the No-Build Alternative. By providing two additional mainline lanes northbound and southbound on I-95 and an additional one to two lanes northbound and southbound on the I-95 C-D Road, the Build Alternative increases the overall capacity and reduces the densities along I-95 within the study area. In terms of intersection delay, the Build Alternative decreased the overall delay at the study intersections. The five of study intersections that were operating with unacceptable delay in 2045 No-Build Alternative improve to only one intersection performing at an unacceptable in the PM peak hour. This intersection (8^{th} Street at Illinois Street) is not a terminal intersection and will not impact I-95 operations.

A total of 1,891 crashes occurred within the study area over a five-year span from 2013-2017. Of those 1,891 crashes, 1,232 crashes occurred along the I-95 mainline, which included eight fatalities and 330 injuries. A detailed Predictive Safety Analysis was conducted for this project for the period 2025 to 2045 to evaluate the No-Build Alternative and the Build Alternative that adds two lanes in the northbound and southbound directions along the I-95 corridor within the study area and one to two lanes on the I-95 C-D Road in the northbound and southbound directions. This analysis indicated that the predicted yearly average crashes for the I-95 mainline under the No-Build Alternative will be approximately 84.1 crashes whereas the Build Alternative is predicted to have approximately 71.3 crashes per year. The Build Alternative will reduce crashes by approximately 12.8 crashes/year along the mainline and by three crashes/year along the ramps compared to the No-Build Alternative. In addition to the improvements along I-95, improvements at the 8th Street interchange should reduce the number of crashes by 3.09 crashes/year. Kings Road southbound terminal intersection should experience approximately the same number of crashes, with a 0.38 crashes/year difference between No-Build and Build Alternatives. New intersection connections at Union Street and Church Street may increase the number of crashes by 8.04 crashes/year and 0.13 crashes/year, respectively

Lastly, several interchanges and intersection improvements are proposed that cannot be accounted for using the HSM Part C methodology or CMF methodology. The proposed improvements are at I-95 at Forest Street interchange, I-95 at Church Street and Cleveland Street intersection, I-95 northbound at Beaver Street new terminal intersection, Beaver Street roundabout and I-95 southbound at I-95 C-D Road off ramp. As a result, a qualitative safety analysis was performed and concluded the overall safety benefits of these improvements:

- Reduction of conflict points and improved operations at intersections
- Reduced crash severity and conflict points due to eliminating some mainline weaving segments
- Reduction in speed along roundabout corridor and significant reduction in angle crash possibility
- Reduce potential for mainline ramp queueing
- Reduced congestion related accidents on mainline

Overall, the proposed improvements will benefit the study corridor (I-95) with a reduction in density, delay and crashes for future traffic conditions. Therefore, the proposed improvements will enhance the traffic operations and safety of the study corridor (I-95).

9.1.2 FHWA Policy Point 2

The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2) and 655.603(d)). In rare *instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial-interchange option. The report should also include the mitigation proposed to compensate for the missing movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectation leading to wrong-way movements on ramps, etc. The report should describe whether future provision of a full interchange is precluded by the proposed design.*

I-95 is a public facility and all interchanges within the study area provide full access (interchanges at Forsyth Street/Bay Street, Monroe Street/Adams Street and Union Street connect to one-way streets) and will continue to do so with the Build Alternative. The Build alternative will maintain and provide all interchange accesses catering to all traffic movements to/from existing interchanges within the study limits.

The proposed improvements under the Build Alternative were designed to meet current standards for federal-aid projects on the interstate system and conform to the AASHTO and the FDM.

10 CONCEPTUAL FUNDING PLAN/CONSTRUCTION SCHEDULE

The improvements proposed as part of the Build Alternative within the study area along I-95 from north of I-10 to south of Martin Luther King Jr. Parkway are performed under the Programmatic Agreement with FHWA. Therefore, FDOT Central Office will conduct the necessary review and assessment of the justification for the proposed improvements. This project is funded for Fiscal Year (FY) 2023 to 2027 in FDOT's Five Year Work Program as Financial Project Identification Number (FPID) 442414-1. The funding for the project phases in the FDOT Five Year Work Program is shown in **Table 10-1**.

Table 10-1: Funding for FPID 442414-1 – I-95 (SR 9) from north of I-10 to south of Martin Luther King Jr. Parkway (SR 115/US 1)

Fiscal Year	2023	2024	2025	2026	2027
Highways/PD&E					*(On-Going)*
Amount:	$25,000				

LIST OF APPENDICES