

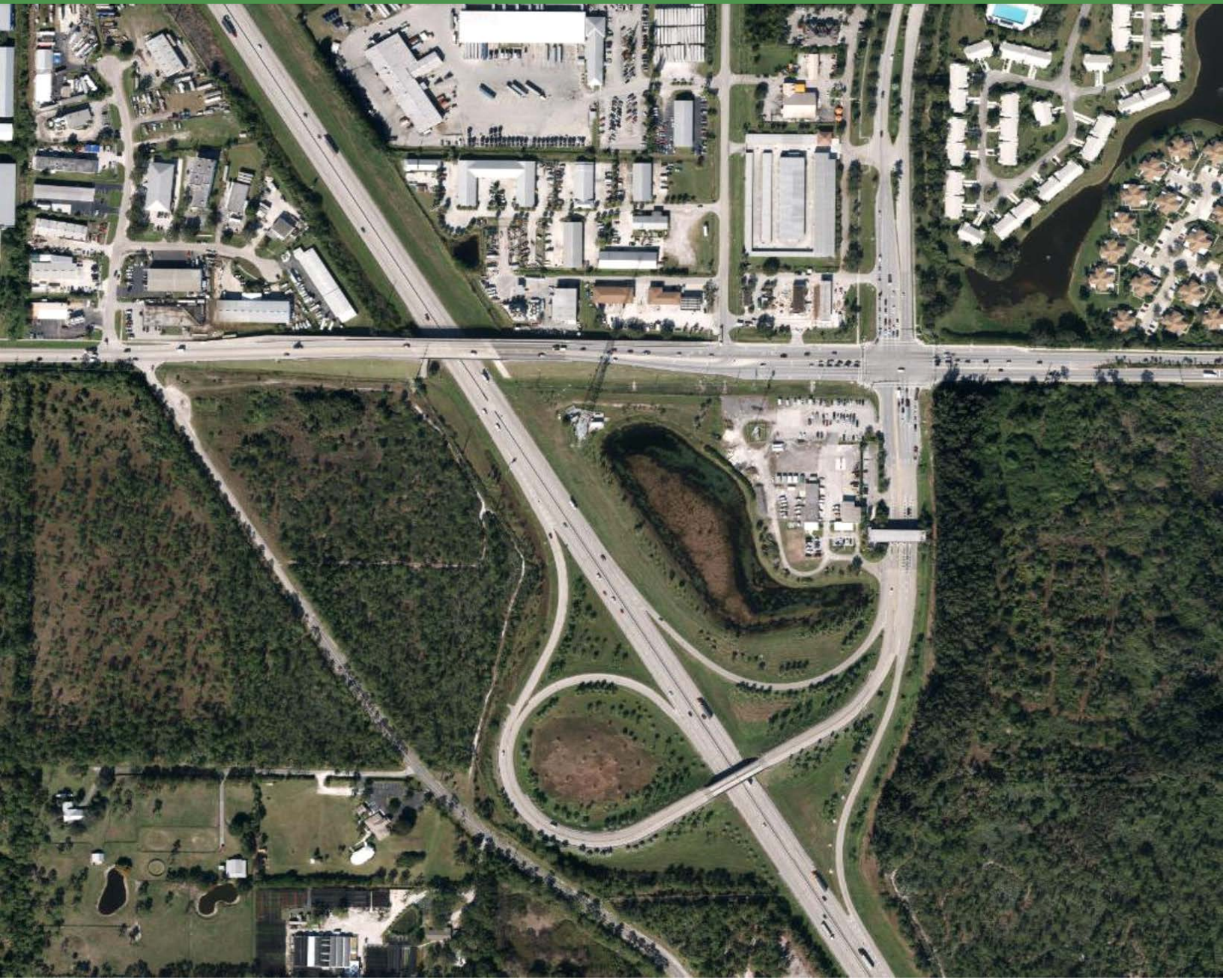
October 2021



# Florida's Turnpike (SR 91) and Martin Highway (SR 714) Martin County, Florida

Financial Project ID: 423374-1

## INTERCHANGE MODIFICATION REPORT (IMR)



# Interchange Modification Report (IMR)



## Florida's Turnpike (SR 91) and Martin Highway (SR 714)

Martin County, Florida


FPID:423374-1


### Florida Department of Transportation

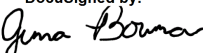
#### Determination of Safety, Operational and Engineering Acceptability

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:  <small>3B887FB255B94F2...</small> Carol Scott	10/19/2021   6:11 PM EDT <hr style="width: 100%;"/> Date
Florida's Turnpike Enterprise Planning Manager		

Interchange Review Coordinator	DocuSigned by:  <small>3B887FB255B94F2...</small> Carol Scott	10/19/2021   6:11 PM EDT <hr style="width: 100%;"/> Date
Turnpike		

District Review Coordinator	DocuSigned by:  <small>DC7B7B72D0BD4A2...</small> Cesar Martinez, P.E.	10/20/2021   8:43 AM EDT <hr style="width: 100%;"/> Date
District Four		

Systems Management Administrator	DocuSigned by:  <small>4AD03E6A337F4C1...</small> Jenna Bowman, PE	10/21/2021   10:07 AM EDT <hr style="width: 100%;"/> Date
Systems Implementation Office – Central Office		

### QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: \_\_\_\_\_

FM Number: 423374-1

Project Title: Florida’s Turnpike (SR 91) and Martin Highway (SR 714) – Interchange Modification Report

District: Turnpike

Requestor: Carol Scott, CPM

Phone: 407-264-3023

District IRC: Carol Scott, CPM

Phone: 407-264-3023

Document Type:    MLOU         IJR         IMR         IOAR         OTHER \_\_\_\_\_

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)

#### 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.

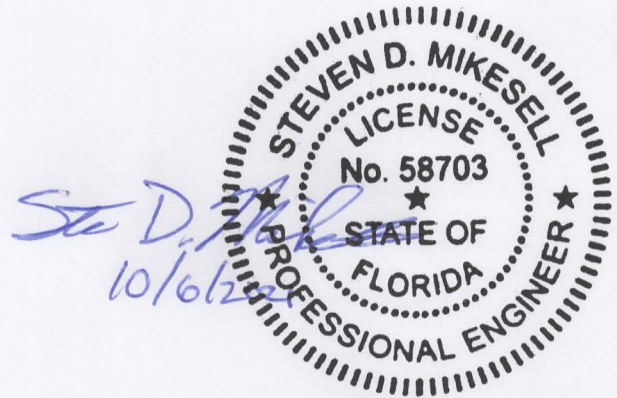
Requestor \_\_\_\_\_  
DocuSigned by:  
*Carol Scott*  
3B887FB255B94E2  
Carol Scott, CPM

IRC \_\_\_\_\_  
DocuSigned by:  
*Carol Scott*  
3B887FB255B94E2  
Carol Scott, CPM

## Engineer's Certification

I, Steven Mikesell, PE number 58703, certify that I currently hold an active Professional Engineer's License in the State of Florida, and I am competent through education or experience to provide engineering services in the civil and traffic engineering disciplines contained in this report. I further certify that this report was prepared by me or under my responsible charge as defined in Chapter 61G15-18.001 F.A.C. and that the statements, conclusions, and recommendations made herein are true and correct to the best of my knowledge and ability.

Project Description: Florida's Turnpike (SR 91) and Martin Highway (SR 714) – Interchange Modification Report



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Steven Mikesell, PE  
Florida Registration PE No. 58703  
AECOM Technical Services, Inc.  
Orlando, Florida 32801

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## Executive Summary

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Florida's Turnpike Enterprise (FTE) is in the process of preparing a Project Development and Environment (PD&E) study [FPID 423374-1] for widening a 36-mile section of Florida's Turnpike from north of Jupiter / Indiantown Road at Milepost (MP) 116 to north of Fort Pierce / Okeechobee Road (SR 70) at MP 152. This section of Florida's Turnpike is currently a four-lane (two lanes in each direction) limited-access facility. Existing interchanges within the study corridor include SW Martin Highway (SR 714), Becker Road, Port St. Lucie Boulevard (SR 716), and Okeechobee Road (SR 70). The PD&E study is evaluating widening the 36-mile section from four to eight lanes. The proposed corridor improvements will bring many additional benefits to the community, such as reduced congestion, enhanced mobility options for longer trips, and improved evacuation and emergency response times.

The primary purpose of the Martin Highway Interchange Modification Report (IMR) project is to enhance the integrity of the service interchange while accommodating future traffic demands, improving overall safety, meeting current design standards, and assessing operational impacts of the improvements to the study area. The Martin Highway interchange is the only interchange in Martin County with direct access to and from the Turnpike in Martin County, leading to more traffic demand than the existing capacity. Due to the increased traffic demand expected in the future, the widening of the Turnpike mainline to eight lanes is currently being evaluated. The Becker Road interchange, 5 miles north of the Martin Highway interchange, does not provide a direct Turnpike connection to/from the east, as Becker Road does not connect all the way to the east the way the Martin Highway interchange does. For this reason, the Martin Highway interchange becomes a natural choice for the Turnpike traffic destined for eastern Martin County.

The Martin Highway interchange has a trumpet configuration with ramps that connect to SR 714 at a single intersection. At the Martin Highway interchange, the ramp terminal intersection has a fourth (northern) leg connecting to Martin Downs Boulevard. The ramp terminal currently operates at level of service (LOS) D during both the AM and the PM peak hours. As traffic demand increases in the future, traffic operations are expected to deteriorate within the interchange weaving section, thus impacting the freeway mainline. This IMR evaluates the traffic operations of the No-Build and Build alternatives.

The information and analysis indicate that the southbound off-ramp diverge areas along Florida's Turnpike and the ramp intersection with Martin Highway are projected to experience operational failures in 2045 during the AM peak hour. Proposed modifications to the mainline, ramps, and the interchange are recommended to address projected deficiencies in the future. Specific modifications and projected benefits are the following:

- The proposed Build alternative provides for the separation of the heaviest off-ramp right-turn movement (northbound to eastbound) from the left-turn and through movements on the northbound approach of the ramp terminal.
- The Build alternative also eliminates the weave between the northbound through and left-turn movements from the northbound and southbound off-ramps.
- The arrangement proposed under the Build alternative not only eliminates the weaving

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between the movements from the northbound and southbound off-ramps, but also reduces the demand on the northbound approach by approximately 400 vehicles per hour (vph) by diverting the movement from southbound Turnpike to westbound Martin Highway from the existing ramp terminal to a roundabout on Leighton Farm Avenue.

- The Build alternative is projected to reduce the average vehicle delay at the Turnpike ramp terminal intersection by more than 70 seconds/vehicle (approximately 58 percent reduction) during the 2045 AM design hour and by 150 seconds/vehicle (approximately 63 percent reduction) during the 2045 PM design hour when compared with the 2045 No-Build intersection delays.
- Even though there are deficiencies projected for the Build Alternative at the intersection of SW High Meadow and Martin Highway Boulevard intersection, it should be noted that there is little or no degradation in the eastbound direction queues compared to the No-Build alternative. Based on the 2040 Treasure Coast Regional Long-Range Transportation Plan, no improvement has been identified at Martin Highway Boulevard and SW High Meadow intersection.

The mainline and ramp freeway segments are projected to operate at LOS D or better under the Build condition.

These improvements address the traffic operation deficiencies by eliminating or improving the failing conditions within the interchange influence area and improving safety by reducing congestion and improving operating conditions along Martin Highway and the ramp terminal. A comparison of the Design Year 2045 intersection analysis results shows that the Build alternative is projected to provide better operating conditions than the No-Build in Design Year 2045. The Highway Safety Manual (HSM) safety analysis shows that the overall predicted crashes are lower for Build compared to No-Build. Based on the HSM results, the Build alternative is predicted to have a 20-year crash cost savings of approximately \$27 Million compared to the No-Build alternative, in 2019 present value.

A discussion of the access modifications with respect to conformance with the Federal Highway Administration (FHWA) policy points related to access is provided below. Florida's Turnpike is not, however, part of the interstate system.

### **Considerations and Requirements**

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, and 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 (Title 23, Code of Federal Regulations (CFR), paragraphs 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*

## Executive Summary

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*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)).*

The operational analysis conducted for the IMR confirmed that the proposed interchange modifications are not expected to have adverse impacts on safety and operations on the Florida's Turnpike. The proposed Build alternative provides for the separation of the heaviest off-ramp right-turn movement (northbound to eastbound) from the left-turn and through movements on the northbound approach of the ramp terminal. Furthermore, this alternative also eliminates the weave between the northbound through and left-turn movements from the northbound and southbound off-ramps. The arrangement proposed under the Build alternative not only eliminates the weaving between the movements from the northbound and southbound off-ramps but also reduces the demand on the northbound approach by approximately 400 vph. The Build alternative is projected to reduce the average vehicle delay at the Turnpike ramp terminal intersection by more than 70 seconds/vehicle (approximately 58 percent reduction) during the 2045 AM design hour and by 150 seconds/vehicle (approximately 63 percent reduction) during the 2045 PM design hour when compared with the 2045 No-Build intersection delays.

The projected failing conditions under the No-Build alternative are expected to increase future crash risk within the project corridor. This potential for increased crash risk is alleviated by the capacity improvements proposed in the Build alternative. The overall predicted crashes are lower for Build compared to No-Build. Based on the HSM results, the Build alternative is predicted to have a 20-year crash cost savings of approximately \$27 Million compared to the No-Build alternative, in 2019 present value.

- 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 or high occupancy vehicle and high occupancy toll 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.*

## Executive Summary

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This IMR does not propose new interchanges along Florida's Turnpike. The existing interchange provides access to public roads only. The improvements proposed at the interchange will maintain full access to the existing cross streets and accommodate all movements.

## 1.1 INTRODUCTION

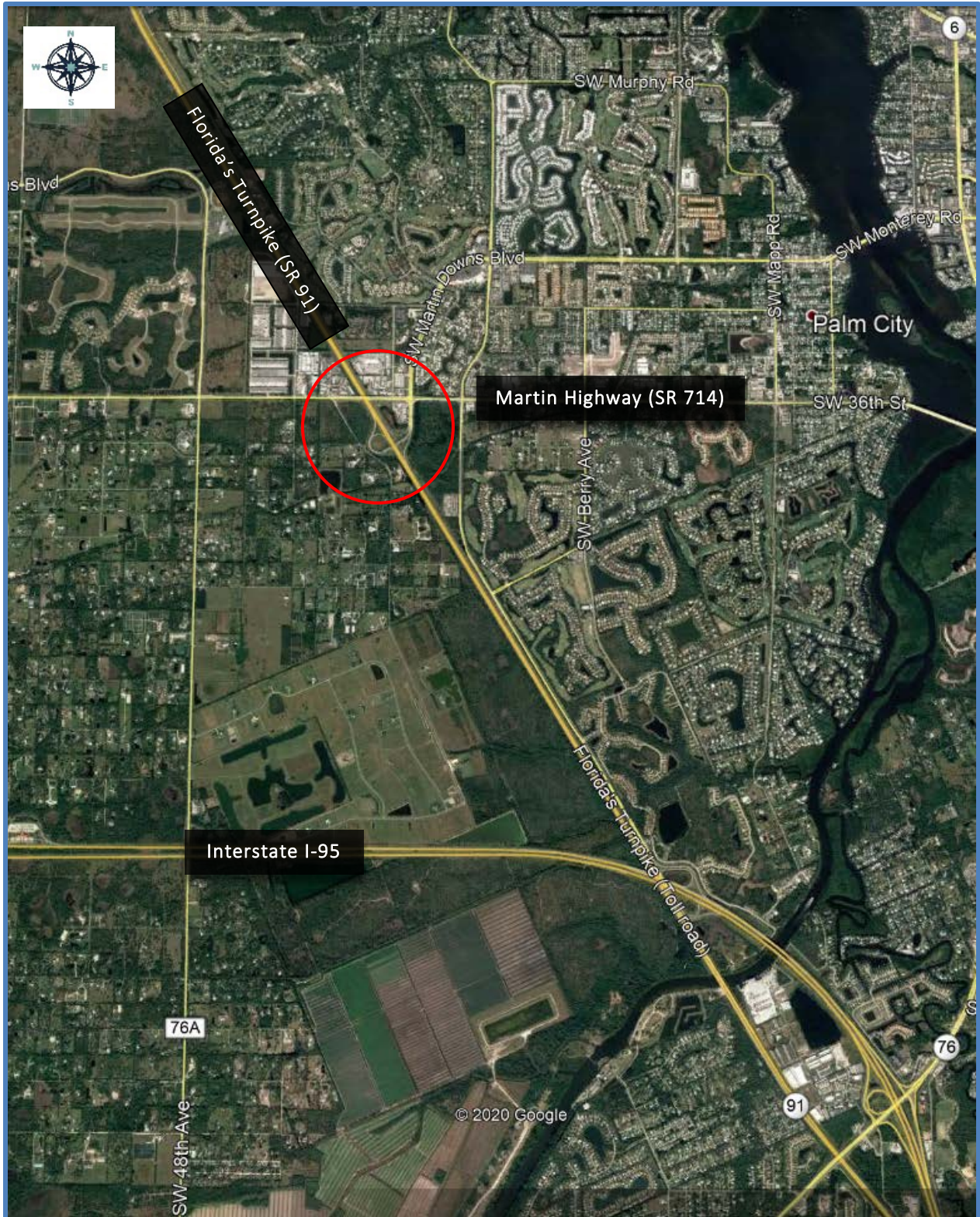
Urban population growth in Palm Beach, Martin, and St. Lucie Counties has resulted in high traffic growth within the study region. Florida's Turnpike Enterprise (FTE) is in the process of preparing a Project Development and Environment (PD&E) study [FPID 423374-1] for widening a 36-mile section of Florida's Turnpike from north of Jupiter / Indiantown Road at Milepost (MP) 116 to north of Fort Pierce / Okeechobee Road (SR 70) at MP 152. This section of Florida's Turnpike is currently a four-lane (two lanes in each direction) limited-access facility. Existing interchanges within the study corridor include SW Martin Highway (SR 714), Becker Road, Port St. Lucie Boulevard (SR 716), and Okeechobee Road (SR 70). The PD&E study is evaluating widening the 36-mile section from four to eight lanes. The proposed corridor improvements will bring many additional benefits to the community, such as reduced congestion, enhanced mobility options for longer trips, and improved evacuation and emergency response times.

There are currently four interchanges in the corridor (an average of one interchange for every 9-mile segment). Florida's Turnpike is a critical facility for daily commutes and emergency evacuation purposes in Palm Beach, Martin, and St. Lucie Counties. As traffic demand continues to grow in the region, there are needs to identify and address capacity deficiencies along the corridor and at existing interchanges and explore locations for potential new interchanges. The Martin Highway interchange is the only interchange with direct access to and from the Turnpike in Martin County, leading to more traffic demand than the existing capacity. Due to the increased traffic demand expected in the future, the widening of the Turnpike mainline to eight lanes is currently being evaluated. The Becker Road interchange, 5 miles north of the Martin Highway interchange, does not provide a direct Turnpike connection to/from the east, as the Martin Highway interchange does. For this reason, the Martin Highway interchange becomes a natural choice for the Turnpike traffic destined for eastern Martin County.

The primary purpose of the Martin Highway Interchange Modification Report (IMR) project is to enhance the integrity of the service interchange while accommodating future traffic demands, improving overall safety, meeting current design standards, and assessing operational impacts of the improvements to the study area.

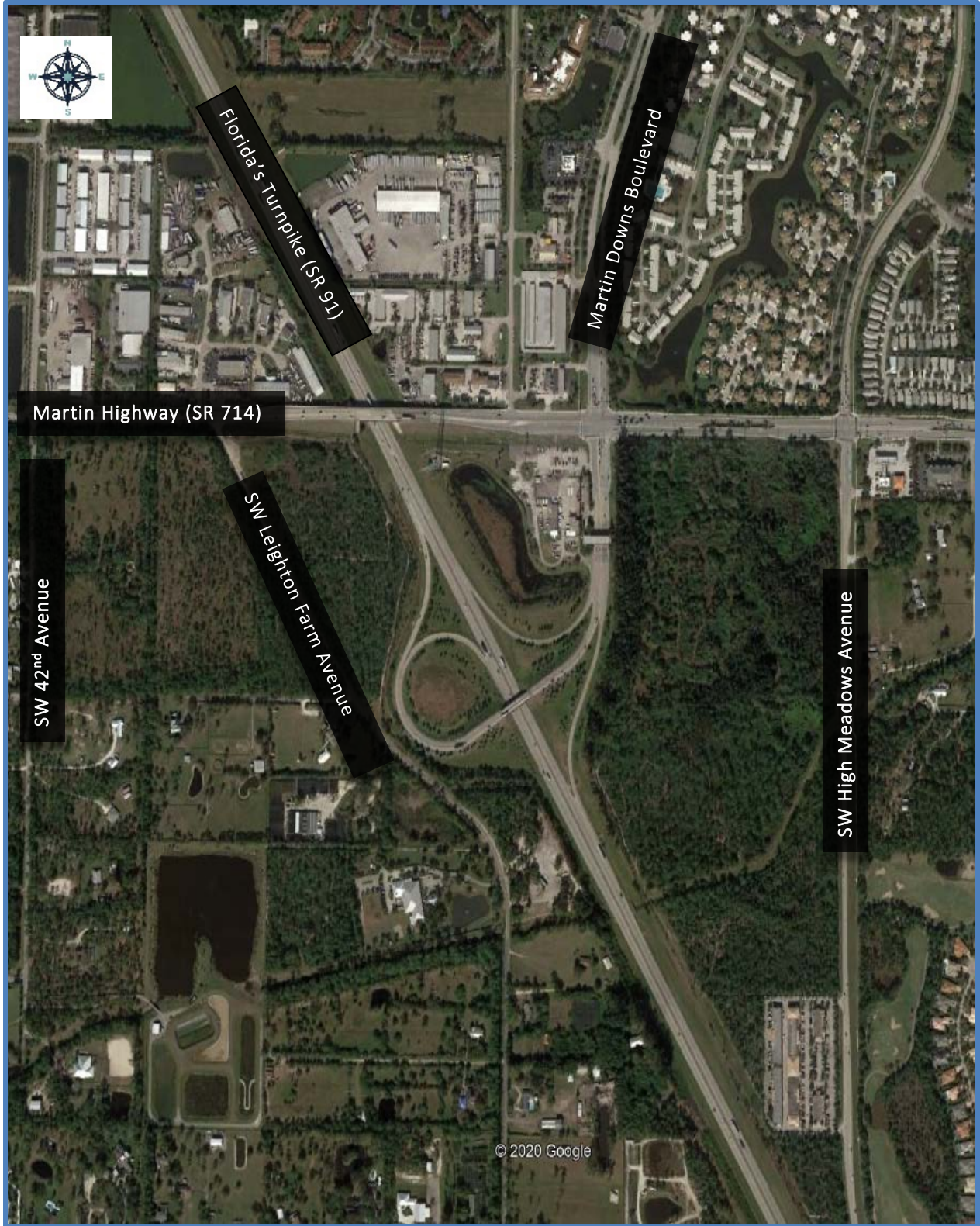
The project location is along Florida's Turnpike in Martin County (Stuart) at Milepost 133, the Martin Highway (SR 714) interchange. East of Florida's Turnpike, Martin Highway (SR 714) is a four-lane divided minor arterial with a posted speed limit of 45 mph. West of the Turnpike, it is a two-lane undivided facility. The Turnpike interchange has a trumpet configuration with ramps that connect to SR 714 at a single intersection. At the Martin Highway interchange, the ramp terminal intersection has a fourth (northern) leg connecting to Martin Downs Boulevard. **Figure 1.1** shows the project location map and **Figure 1.2** shows the Martin Highway interchange.

Figure 1.1  
Project Location Map



Source: Google Earth

Figure 1.2  
Martin Highway Interchange



Source: Google Earth



## SECTION ONE

## Project Overview

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### 1.2 PURPOSE AND NEED

The Martin Highway interchange modifications are being proposed to address existing and projected future traffic congestion and related capacity deficiencies caused by high traffic demand that cannot be accommodated by the existing trumpet interchange configuration. This interchange is the only access to and from the Turnpike, leading to more traffic demand than the existing available capacity. Due to the increased traffic demand expected in the future, the widening of the Turnpike mainline to eight lanes is currently being evaluated. The Becker Road interchange, 5 miles north of the Martin Highway interchange, does not provide a direct Turnpike connection to/from the beachside developments to the east through the St. Lucie River, as the Martin Highway interchange does. For this reason, the Martin Highway interchange becomes a natural choice for the Turnpike traffic destined for eastern Martin County.

The Turnpike interchange has a trumpet configuration with ramps that connect to SR 714 at a single intersection. A typical trumpet ramp terminal normally operates with a 3-phase signal timing operation. At the Martin Highway interchange, the ramp terminal intersection has a fourth (northern) leg connecting to Martin Downs Boulevard. The intersection traffic signal requires an inefficient 4-phase operation, causing frequent queues during peak periods. The ramp intersection currently operates at LOS D during both peak hours.

At the request of the Florida Department of Transportation (FDOT), and as part of Financial Project ID 423374-1, this study evaluates the ultimate improvements under the Florida's Turnpike Mainline Widening Project from north of Indiantown Road interchange (MP 116) through the Martin Highway interchange (MP 133) in Martin County. The traffic analysis includes the evaluation of the proposed additional mainline capacity and safety, operational, and engineering (SO&E) acceptability for the modifications to the Martin Highway interchange.

### 1.3 PLANNED AND PROGRAMMED TRANSPORTATION PROJECTS

Planned and programmed improvements within the study area have been considered in developing the traffic and interchange concepts and are included in the analysis. The key planned improvements include:

- Central Turnpike Widening from north of Jupiter / Indiantown Road at MP 116 to north of Fort Pierce / Okeechobee Road (SR 70) at MP 152, FTE Work Program (2018/2019 – 2022/2023) and Master Plan (2017 – 2045)
- The FDOT District 4 Five-Year Work Program and FDOT Florida Intrastate Highway System (FIHS)/Strategic Intermodal System (SIS) Plan
- The Treasure Coast 2045 Regional Long Range Transportation Plan (RLRTP), which includes the Indian River, Martin, and St. Lucie Counties Metropolitan Planning Organizations (MPOs)
- The FDOT I-95 Multimodal Master Plan [FPID: 436577-1-22-01] and City and County Access Management Plans

## SECTION TWO

## Methodology

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The methodology applied for the Martin Highway (SR 714) Interchange Modification Report (IMR) is documented in the Methodology Letter of Understanding (MLOU) dated November 2020. The MLOU was approved by FDOT District 4 and the Systems Implementation Office (SIO) of FDOT Central Office. The MLOU outlines the criteria, assumptions, processes, analyses, and documentation requirements for the project. The approved MLOU is included in **Appendix A**. Some of the more prominent topics covered under the MLOU are summarized here.

### 2.1 AREA OF INFLUENCE

Based on FDOT's 2020 Interchange Access Request User's Guide (IARUG), the Interchange Access Modification Request should include an area of influence based on safety and operations concerns. The Jupiter / Indiantown Road interchange (MP 116) is 17 miles south of Martin Highway, while the Becker Road interchange (MP 138) is 5 miles north of Martin Highway. Based on these distances, and since the proposed modifications at the Martin Highway interchange are not expected to change adjacent interchange demand or operation, the anticipated Area of Influence (AOI) along the Turnpike mainline will not include the freeway merge/diverge ramps at interchanges to the south and north of Martin Highway. Therefore, the anticipated AOI for the access request document includes the following, as depicted on **Figure 2.1**:

**Mainline** – the mainline basic segments; merging and diverging, segments from south and north of the Martin Highway interchange.

**Ramps and Cross Streets** – the AOI along Martin Highway includes intersections at SW 42<sup>nd</sup> Avenue, SW Leighton Farm Avenue, Turnpike Ramps/Martin Downs Boulevard, and SW High Meadows Avenue.

### 2.2 ANALYSIS YEARS

The analysis years for the project were determined as follows:

For Traffic Forecasting:

- Base year 2010
- Opening year 2025
- Horizon year 2045

For Traffic Operational Analysis:

- Existing year 2016
- Opening year 2025
- Design year 2045



## SECTION TWO

## Methodology

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### 2.3 TRAVEL DEMAND FORECASTING

#### 2.3.1 Travel Demand Model

The Treasure Coast Regional Planning Model version 4 (TCRPM 4) was used to develop the traffic forecasts for this project. The TCRPM covers a three-county region in central east Florida: Martin, St. Lucie, and Indian River Counties. The TCRPM produces traffic volumes at a daily level, as well as for five periods: AM Peak (6:00 – 9:00 AM), Mid-Day (MD, 9:00 AM – 3:00 PM), PM Peak (3:00 – 7:00 PM), Evening (EV, 7:00 – 10:00 PM), and Nighttime (NT, remainder of the day). The TCRPM 4 was used as a base model for this project since this Activity Based version has an enhanced modeling process for truck traffic. Numerous updates were made to the TCRPM 4, including socioeconomic data and networks, to produce a modified version of the TCRPM 4 FTE model. The model was updated specifically for evaluating toll road and managed lanes projects in the study region.

#### 2.3.2 Project Traffic Forecast Development Methodology

The TCRPM 4 forecast year was 2040 but updates were made to create 2025 and 2045 scenarios, corresponding to the opening and design analysis years, respectively, for the PD&E study. The model Annual Average Daily Traffic (AADT) forecasts were adjusted following the National Cooperative Highway Research Program (NCHRP) 765 methodology. Once the No-Build forecast was established for 2025 and 2045, the Build project forecasts were developed by applying the model differences to the No-Build project forecast. For example, when computing the forecast using the differences, the 2045 Build project traffic forecasts = 2045 No-Build project traffic + (2045 Build Model – 2045 No-Build Model). The final forecasted AADTs from the subarea model, along with K-factors and D-factors, were used to develop corridor-level directional design hour volumes (DDHVs), consistent with the guidelines set forth in the FDOT Project Traffic Forecasting Handbook.

#### 2.3.3 Model Validation Methodology

The model development for this project consisted of enhancing the TCRPM regional model by correcting roadway configurations and adding local streets important to local circulation around the study corridor. The TCRPM model was validated to reflect 2010 traffic conditions in an iterative fashion, following standard model validation procedures and principles by adjusting link attributes at the regional level. Land use and socioeconomic data were reviewed to verify that existing and proposed land uses within the study area are properly accounted for within the model.

## SECTION TWO

## Methodology

### 2.3.4 Adjustment Procedures

Procedures outlined in the Project Traffic Forecasting Handbook and Procedure (525-030-120) are typically used for post-model adjustments. Additionally, traffic forecasts provided in the Turnpike's Annual Traffic Trends Reports are also referenced and compared with the No-Build volumes on the Central Mainline Turnpike. As previously stated, post-model adjustments also considered 2010 model volumes with the 2045 No-Build and Build forecasts. No-Build and Build AADTs were checked and adjusted to reflect adequate growth between 2010 and 2045.

### 2.4 TRAFFIC FACTORS

24-hour truck factors (T24) and design hour truck factors (DHT) were based on FTE's annual factor, FTO and the PD&E data collection effort. Future condition utilized estimated truck factor from 2015 -2019 historical truck percentage trend line were obtained from FTO. The proposed traffic factors for this IMR are summarized in **Table 2.1**.

**Table 2.1**  
**Traffic Factor Values**

Roadway	K <sup>STD</sup>	D	Existing Analysis		Future Analysis		PHF
			T	Tf	T	Tf	
Turnpike Mainline	10.5	58.0	14.0	7.0	14.0	7.0	0.95
Martin Downs Boulevard	10.0	55.0	5.2	3.0	8.0	4.0	0.95
Martin Highway – West of Turnpike	9.5	62.3	11.0	6.0	11.0	6.0	0.95
Martin Highway – East of Turnpike	9.5	62.3	5.2	3.0	10.0	5.0	0.95

**Sources:** Turnpike's Standard K factor is based on FTE's annual factor development. Arterials Standard K and D factors are from Florida Traffic Online (FTO). 24-hour truck factors (T24) and design hour truck factors (DHT) are based on FTE's annual factor, FTO, and the PD&E data collection effort. Existing conditions Synchro and HCS analysis will use peak hour factors (PHF) and truck percentages obtained from traffic count data. Future conditions Synchro and HCS analysis will use the estimated truck factor from the 2015 - 2019 historical truck percentage trend line obtained from FTO.

### 2.5 TRAFFIC OPERATIONAL ANALYSIS

Traffic operational analyses were performed for the Existing Conditions and future No-Build and Build alternatives. Analyses were performed using the Highway Capacity Software (HCS) Version 7.8.5 and Synchro Version 11.

The HCS and Synchro operations analyses were performed for the following conditions:

- Existing year 2016 conditions, AM and PM peak hours
- Year 2025 conditions for No-Build and Build alternatives, AM and PM design hours
- Year 2045 conditions for No-Build and Build alternatives, AM and PM design hours
- Existing year Synchro analysis was conducted using the existing signal timing data
- Future year Synchro analysis for both the No-Build and the Build conditions included signal optimization

## SECTION TWO

## Methodology

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### 2.5.1 Measures of Effectiveness (MOEs)

Analyses of the interchange ramp terminals and adjacent intersections were conducted using Synchro 11 software. The level of service (LOS) target for state roads during peak travel hours is LOS D in urbanized areas, per the State Highway System Policy No. 000-525-006c, effective April 19, 2017.

In addition to the signalized intersection level of service criteria stated above, operational analysis criteria included the following:

#### ***HCS Analysis***

- Level of service and density (passenger cars/mile/lane)

#### ***Synchro Analysis***

- Level of service and delay (seconds per vehicle)
- 95<sup>th</sup> Percentile Queue Lengths
- Interchange off-ramp queue lengths: The 95<sup>th</sup> percentile queue was used to determine the required storage length for each interchange off-ramp queue length. The 95<sup>th</sup> percentile queue was calculated using Synchro queue results, which are reported in feet by lane. To obtain the total queue length, the Synchro reported queue length was multiplied by the number of turn lanes and the lane utilization factor.

## SECTION THREE

## Existing Conditions

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### 3.1 EXISTING ROAD CHARACTERISTICS

The general characteristics of the roadway facilities located within the project limits are described in the sections below. The data below are based on information gathered from the FDOT's Roadway Characteristics Inventory (RCI), Straight Line Diagrams (SLDs), Palm Beach County MPO, Palm Beach County Traffic and Engineering Division, and field reviews. The existing roadway and intersection lane configurations are depicted on **Figure 3.1**.

#### 3.1.1 Florida's Turnpike (SR 91) from North of Indiantown Road Interchange (MP 116) to North of Martin Highway Interchange (MP 133)

Florida's Turnpike (SR 91) from north of the Indiantown Road Interchange (MP 116) to north of the Martin Highway Interchange (MP 133) is a four-lane toll facility. Based on SIS Facility Functional Classification, this toll facility has been designated as Urban Principal Arterial. Based on Access Management Classification (FDOT), SR 91 has been assigned Class 1. The posted speed on Florida's Turnpike is 70 mph within the study area.




#### 3.1.2 Martin Highway (SR 714)

Martin Highway (SR 714) is a four-lane divided minor arterial with a posted speed limit of 45 mph. West of the Turnpike, it is a two-lane undivided facility. The Turnpike interchange has a trumpet configuration with ramps that connect to Martin Highway and through Martin Downs Boulevard at a single intersection.

Stuart  
(MP 133)



**Legend**

- Florida's Turnpike
- Arterial
-  Signal Controlled
-  STOP Controlled
-  Lane Direction





## SECTION THREE

## Existing Conditions

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### 3.2 EXISTING TRAFFIC DATA

Existing traffic data were obtained from various sources, including FTE, FDOT, and Martin County, in addition to aerial photography and field-collected data. Field visits were conducted to collect information on existing lane geometry, storage lengths, and traffic signal phasing. The signal timing plans for signalized intersections were obtained from Martin County.

Existing traffic data were obtained from the FDOT, FTE, and through traffic data collection efforts undertaken as part of this project. The traffic data collected include:

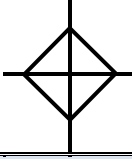
- Directional link traffic volume counts
  - Hourly Continuous Counts from Telemetered Traffic Monitoring Site (TTMS) 97-9913 on Mainline Turnpike, north of Becker Road interchange
  - Synopsis Reports from Portable Traffic Monitoring Site (PTMS) 89-0054 along Martin Highway west of the interchange ramps
  - Synopsis Reports from PTMS 89-7060 along Martin Highway east of SW Berry Avenue
  - Synopsis Reports from PTMS 89-0001 along Martin Downs Boulevard north of Martin Highway
  - The 24-hour directional counts were collected from southbound on-ramps and northbound off-ramps for a week in April 2016
  - Continuous Counts from toll data for each ramp
- Intersection turning movement counts (TMCs) collected for the AM peak, mid-day, and PM peak periods at AOI signalized intersections
- Traffic Signal data for each signalized intersection
- Historical Arterial AADTs, Traffic Design and Conversion Factors from FTO

The data for the PD&E study were collected in 2016 and there were no follow-up data collection efforts afterwards. The information contained in the access request document was obtained from the PD&E efforts. Due to the project's accelerated schedule it was not anticipated that the Turnpike would collect additional data or duplicate the previous effort. These counts were supplemented with available toll data and information from FDOT and Florida's Turnpike count database. **Table 3.1** shows AADTs for 2013, 2016, and 2019. The Annual Compound Growth Rates (ACGRs) are shown from 2013 to 2019 and from 2016 to 2019. The purpose of showing 2013 traffic is to illustrate the historical growth along the project mainline segments and ramps compared to recent growth between 2016 and 2019. Comparing the two growth rate columns in **Table 3.1** illustrates that the 2016 to 2019 growth compares well with the historical trend between 2013 and 2019. This comparison illustrates that 2016 traffic volumes fall within historical norms and that an updated 2019 base year is not needed for this access request document.

## SECTION THREE

## Existing Conditions

**Table 3.1**  
**2013 through 2019 Annual Average Daily Traffic (AADT) Volumes**

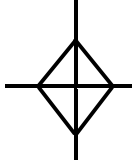
Mainline Milepost – Location	Two-Way AADT			ACGR*	
	2013	2016	2019	2013-2019	2016-2019
133 - Stuart (Martin Downs Boulevard / SR 714) 	40,400	50,000	57,400	6%	5%
	7,300	8,700	9,500	4%	3%
	2,400	3,100	3,300	5%	2%
	<b>35,500</b>	<b>44,400</b>	<b>51,200</b>	<b>6%</b>	<b>5%</b>
<b>Cross-Streets</b>					
Martin Downs Boulevard / SR 714 – North of Martin Highway	15,300	19,000	22,300	6%	5%
Martin Highway / SR 714 – West of Turnpike	20,500	25,500	27,500	5%	3%
Martin Highway – East of Turnpike	21,800	27,100	29,600	5%	3%

Source: FDOT, FTE, and through traffic data collection . \* Annual Compound Growth Rate (ACGR)

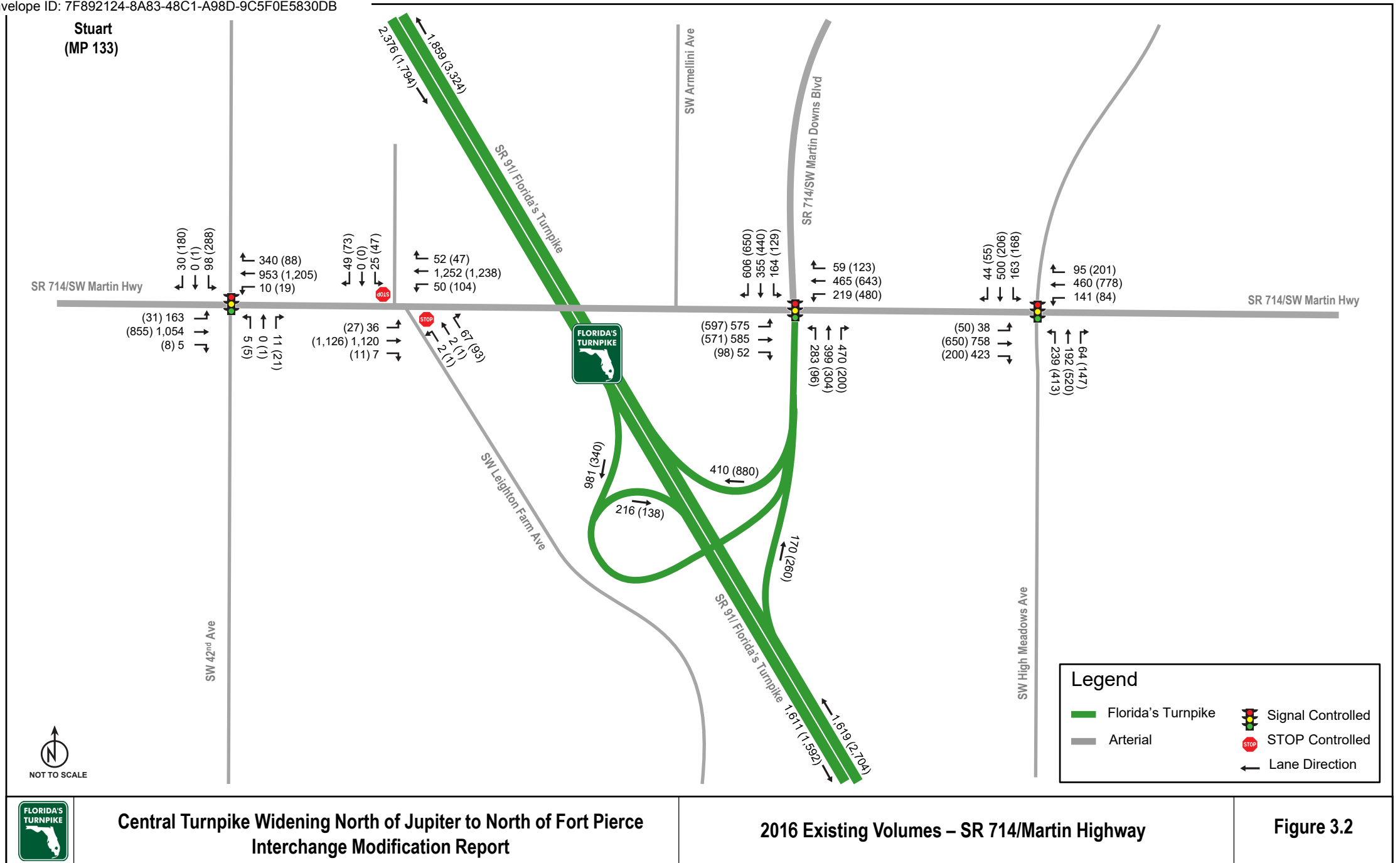
### 3.2.1 Existing Traffic Volumes

The 2016 AADT volumes from the *Florida's Turnpike System Traffic Engineer's Annual Report (TEAR)* are shown in **Table 3.2**. The bold text represents the Turnpike mainline volumes and the non-bold text represents the ramp volumes. **Figure 3.2** presents a summary of the balanced 2016 existing peak season peak hour traffic volumes. The raw traffic counts and the existing signal timing are provided in **Appendix B**.

**Table 3.2**  
**2016 Annual Average Daily Traffic (AADT) Volumes**

Milepost – Description	AADT		
	SB	NB	2-Way AADT
133 - Stuart (Martin Downs Boulevard/S.R. 714) 	<b>24,900</b>	<b>26,700</b>	<b>51,600</b>
	6,400	4,700	11,100
	1,700	2,300	4,000
	<b>20,200</b>	<b>24,300</b>	<b>44,500</b>

Source: Florida's Turnpike System Traffic Engineer's Annual Report (TEAR)



## SECTION THREE

## Existing Conditions

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### 3.3 EXISTING TRAFFIC OPERATIONAL ANALYSIS

A traffic operational analysis was conducted to evaluate the existing conditions in the study area. Major analysis parameters include volume, design hour truck percentage, peak hour factor (PHF), and roadway geometry. The existing intersection PHFs were used for the intersection analysis. Design Hour Truck (DHT) values were calculated based on historical data from the FDOT count sites within the study area and mechanical classification counts and turning movement counts conducted as part of this study. Peak hour values from mechanical counts were calculated as half the daily value in accordance with the FDOT Project Traffic Forecasting Handbook. The calculated DHT used for the Florida's Turnpike mainline and ramps was 8.0 percent. The calculated DHT used was 3.0 percent for the interchange cross streets.

#### 3.3.1 Existing Traffic – Freeway Operational Analysis

The measures of effectiveness (MOEs) used to estimate the level of service were density and volume to capacity ratio. The level of service for each basic freeway segment and ramp junction was determined using the Freeway Facility module of the most current HCS Version 7.8.5.

The mainline/basic, weaving, and ramp merge/diverge analysis results, as applicable, are summarized on **Figures 3.3** and **3.4** for the northbound and southbound directions, respectively. Documentation of the existing traffic freeway operational analysis is provided in **Appendix C**. The results indicate that the freeway segments are operating at an acceptable LOS D or better.

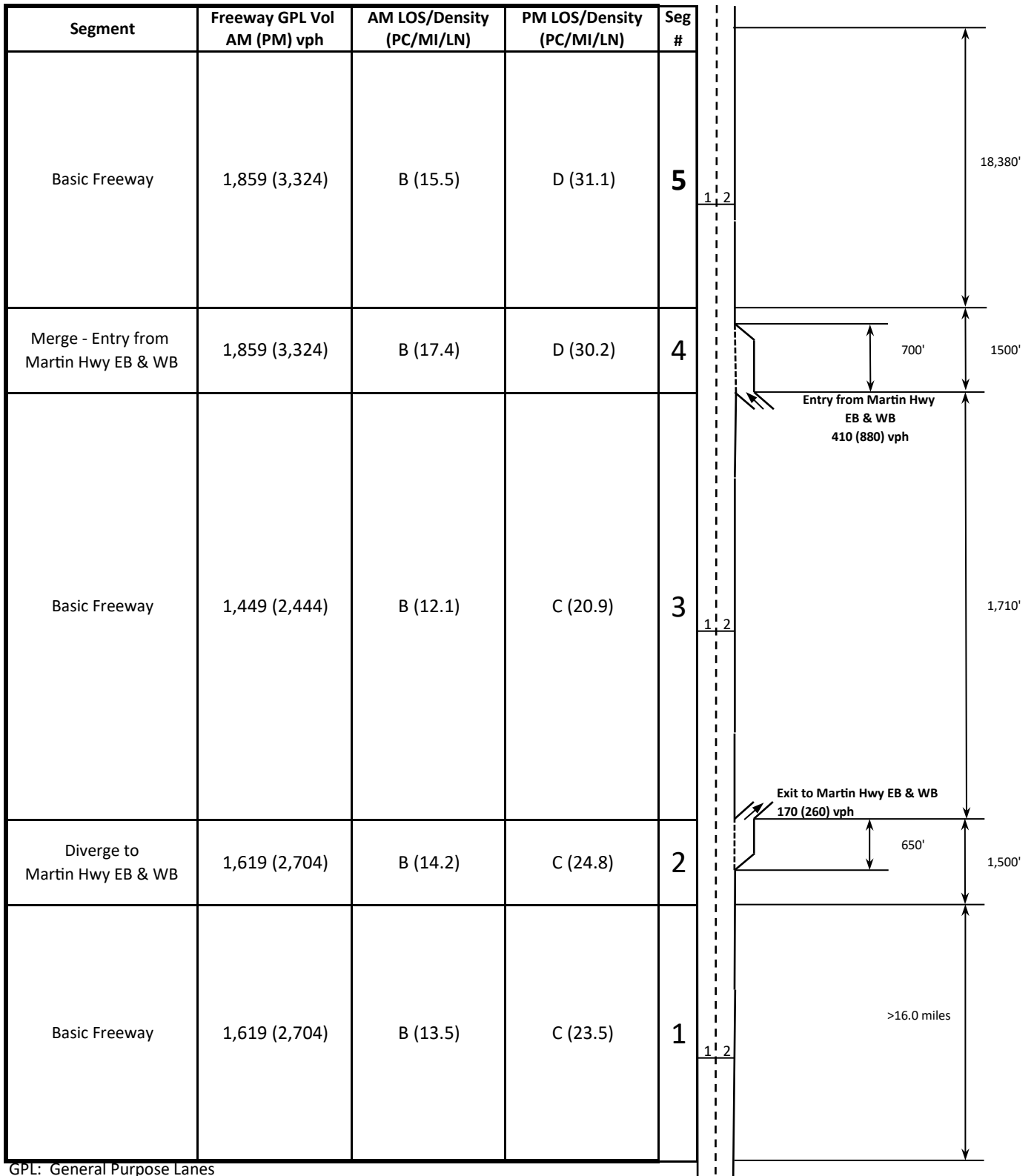
#### 3.3.2 Existing Traffic – Intersection Operational Analysis

Intersection analysis for ramp terminals and adjacent intersections was performed using existing turning movement volumes, existing lane geometry, and signal timing observations and information obtained from Martin County. Analyses of the interchange ramp terminals and adjacent intersections were conducted using Synchro 11 software. The intersection analyses are presented in **Appendix D**.

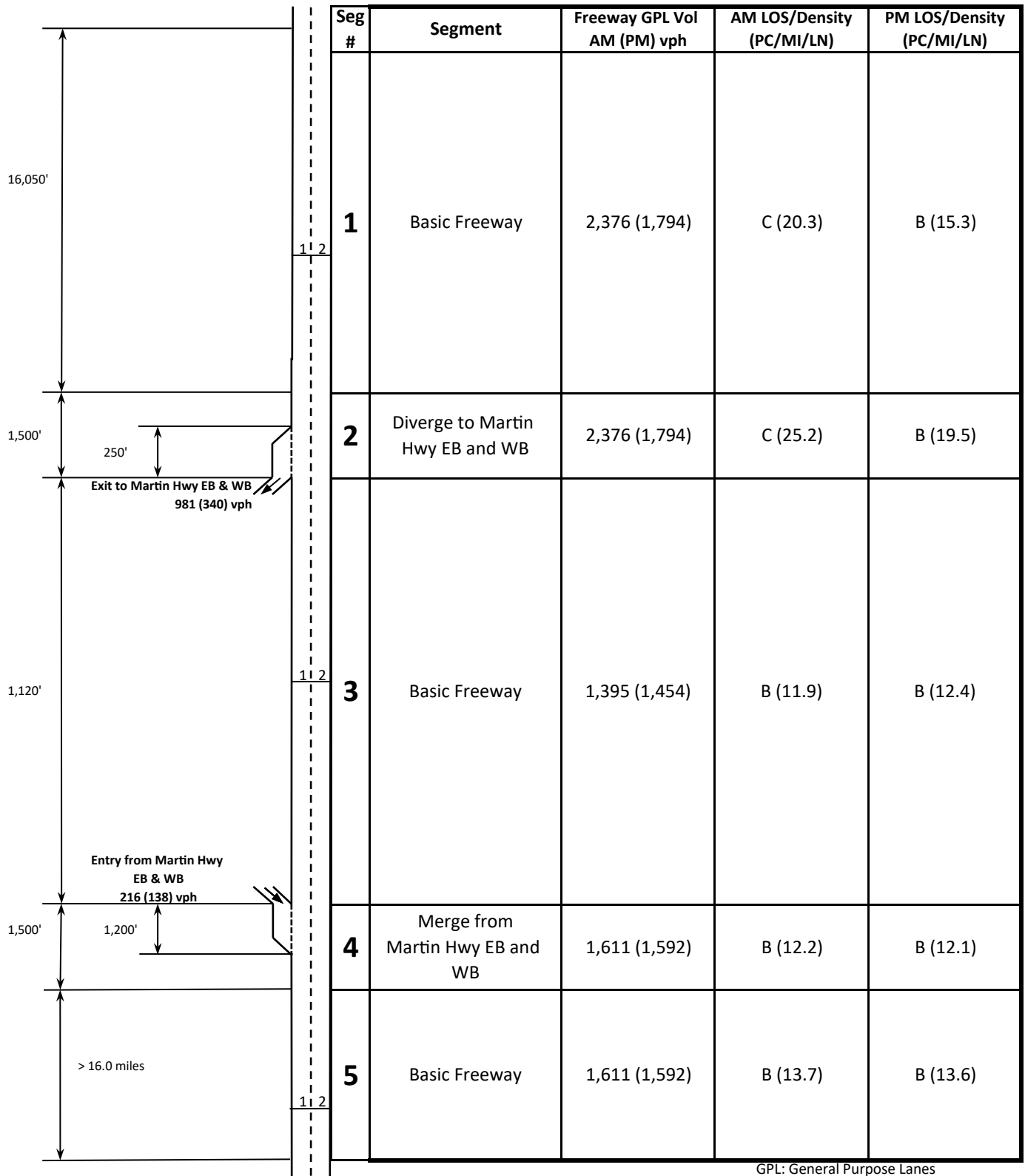
**Table 3.3** provides a detailed summary of the results of the signalized intersection analyses for the AM and PM peak hours for Martin Highway. The results include delays (in seconds per vehicle) and level of service by movement, approach, and the overall intersection. The 95<sup>th</sup> percentile queue lengths have also been summarized by movement. The intersection analysis results indicate the following:

- The Turnpike ramp terminal intersection is operating at LOS D during both the AM and the PM peak hours.
- Leighton Farm Avenue is operating at LOS F during both the AM and the PM peak hours.
- SW 42<sup>nd</sup> Avenue intersection is operating at LOS E during the PM peak hour.

**Figure 3.3: 2016 Existing Year Freeway Analysis Results - Northbound**



**Figure 3.4: 2016 Existing Year Freeway Analysis Results - Southbound**



**Table 3.3: 2016 Existing – Martin Highway (SR 714) Intersection Analysis**

AM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	AM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	B (13.5)	B (19.1)		A (3.5)	C (23.7)	A (2.7)		A (0.6)			F (87.0)	A (1.1)	C (20.4)
			Approach	B (18.3)			B (18.1)			A (0.6)			E (66.9)			
		Queue Length 95th (ft)	Movement	71	#1273		m2	m623	m14		0			170	0	
	SW Leighton Farm Ave*	LOS (Delay)	Movement	B (13.1)			B (12.0)				F (53.1)			F (216.6)		F (216.6)
			Approach	A (0.4)			A (0.4)			F (53.1)			F (216.6)			
		Queue Length 95th (ft)	Movement	25			25				75			150		
	Turnpike Ramps	LOS (Delay)	Movement	E (66.0)	E (57.8)	A (0.3)	E (58.8)	E (57.6)	A (3.2)	E (62.9)	E (66.9)	C (27.7)	D (53.1)	E (73.8)	D (46.4)	D (54.9)
			Approach	E (59.2)			D (53.6)			D (49.9)			E (56.0)			
		Queue Length 95th (ft)	Movement	#492	423	m0	m171	324	m21	#443	270	209	122	255	#547	
	SW High Meadow Avenue	LOS (Delay)	Movement	C (24.7)	D (45.0)	B (13.6)	D (41.7)	D (39.3)	A (3.4)	E (58.4)	D (42.8)	A (1.1)	C (28.2)	F (104.5)	A (0.3)	D (46.3)
			Approach	C (33.4)			C (34.9)			D (44.9)			F (80.5)			
		Queue Length 95th (ft)	Movement	m36	323	111	135	243	28	#351	267	6	172	#962	0	
PM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	PM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	B (16.7)	C (33.0)		B (10.2)	F (105.8)	A (3.5)		B (18.9)			F (88.3)	B (15.0)	E (68.7)
			Approach	C (32.4)			F (97.5)			B (18.9)			E (60.2)			
		Queue Length 95th (ft)	Movement	26	#1071		m9	#1945	m10		31			#465	106	
	SW Leighton Farm Ave*	LOS (Delay)	Movement	B (12.6)			B (12.7)				E (46.0)			F (999.0)		F (999.0)
			Approach	A (1.0)			A (3.2)			E (46.0)			F (999.0)			
		Queue Length 95th (ft)	Movement	25			25				75			~		
	Turnpike Ramps	LOS (Delay)	Movement	E (55.2)	D (40.2)	A (2.0)	E (76.2)	D (46.8)	A (7.8)	F (112.6)	E (73.0)	A (2.9)	E (69.2)	E (71.9)	D (36.6)	D (51.2)
			Approach	D (44.4)			D (54.3)			E (55.9)			D (52.8)			
		Queue Length 95th (ft)	Movement	353	307	m1	#355	330	m45	#216	216	22	106	297	481	
	SW High Meadow Avenue	LOS (Delay)	Movement	D (47.3)	E (69.7)	A (1.2)	C (32.4)	D (47.2)	B (12.0)	D (40.8)	E (66.9)	A (5.4)	D (47.1)	E (59.7)	A (0.5)	D (46.8)
			Approach	D (53.2)			D (39.4)			D (48.5)			D (47.2)			
		Queue Length 95th (ft)	Movement	85	463	13	104	#544	111	362	651	48	159	285	0	
Synchro Version 11 Build 168. *HCM 6th Edition output used for unsignalized intersections due to limitations in Synchro.																
LOS notes:				Queue notes:												
Delay is in sec/veh units				~: Volume exceeds capacity, queue is theoretically infinite												
:Level Of Service (LOS) E reflecting at capacity operations				#: 95th percentile volume exceeds capacity												
:Level Of Service (LOS) F reflecting over capacity operations				m: Upstream metering is in effect												

## SECTION THREE

## Existing Conditions

**Table 3.4** summarizes the results of the off-ramp signals back of queue analyses for the AM and PM peak hours. The Synchro-reported queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length. The results present the queue length in feet for each lane group movement. Since both the northbound and the southbound off-ramps come together at the ramp terminal, the estimated queue lengths were divided equally between the northbound and southbound off-ramp movements. The available storage length was calculated from the stop bar at the ramp terminal intersection to the gore with Turnpike mainline minus the 615 feet required for stopping distance for a design speed of 70 mph per FDOT's 2016 Green book (Table 3-22), and accounting for the changes in number of lanes. The analysis shows that the queues on the northbound and southbound off-ramps at the Martin Highway interchange do not exceed the available storage lengths during one or both peak hours.

**Table 3.4**  
**2016 Existing – Off-Ramp Signals Queuing Analysis Results**

Intersection	Approach	Movement	Available Storage (ft)	Queue (feet)	
				AM	PM
Martin Highway at northbound off-ramp	Northbound	L (WB)	840	#443	216
		TH (NB)	1,010	513	410
		R (EB)	950	367	39
Martin Highway at southbound off-ramp	Northbound	L (WB)	1,150	#443	216
		TH (NB)	1,320	513	410
		R (EB)	1,260	367	39

Queue Notes:

#: 95<sup>th</sup> percentile volume exceeds capacity; queue may be longer.

Synchro queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length.

### 3.4 EXISTING CRASH DATA

Crash data for existing facilities within the AOI were processed using the most recent five-year data from the state's Crash Analysis Reporting System (CARS), from 2013 through 2017. The data reports were analyzed for each mainline roadway, interchange ramp, and intersection within the study area. Detailed crash reports (long forms) from CARS were reviewed to verify the accuracy of the information obtained from the database. Detailed crash reports and analysis tables are provided in **Appendix E**.



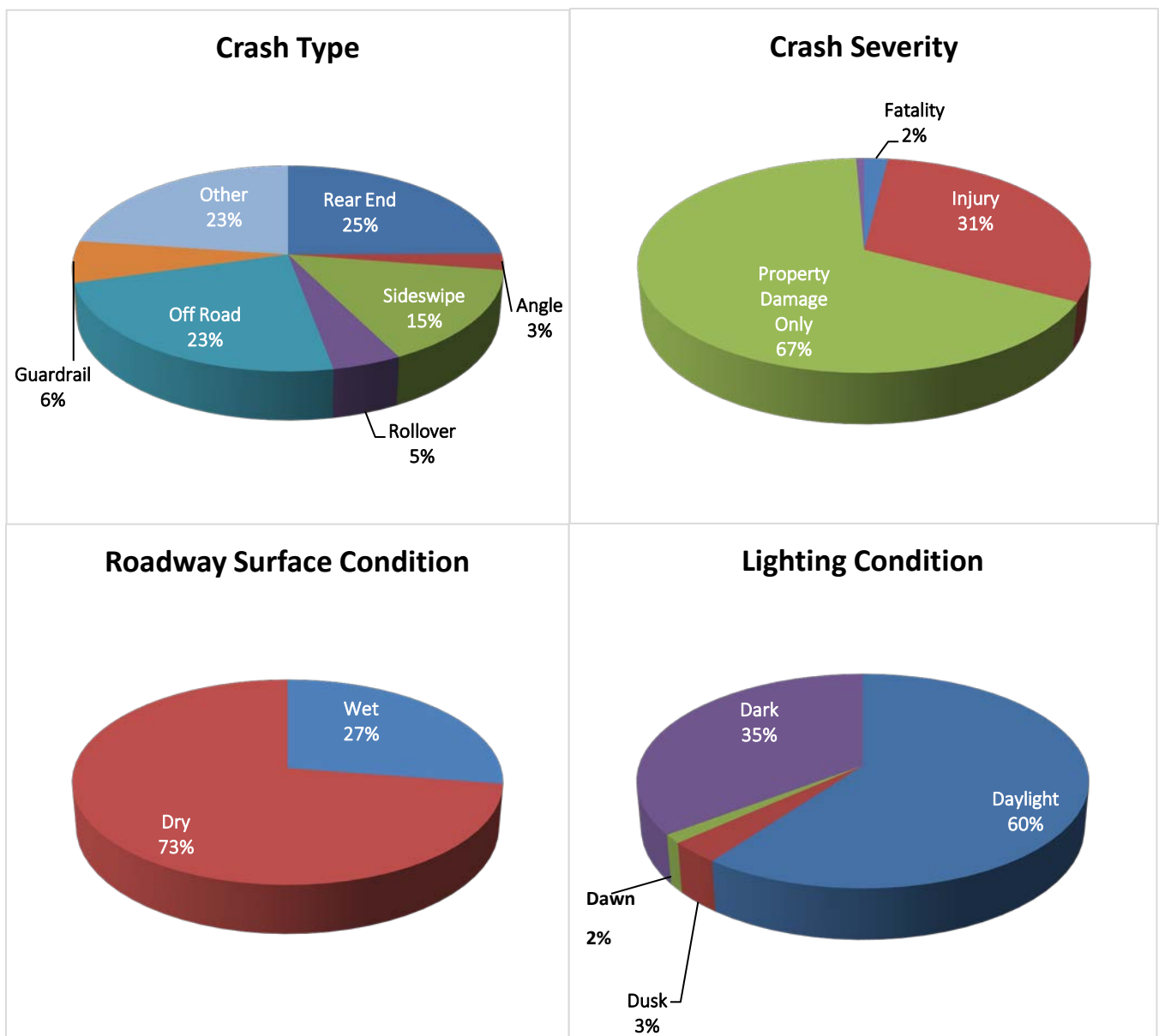
## SECTION THREE

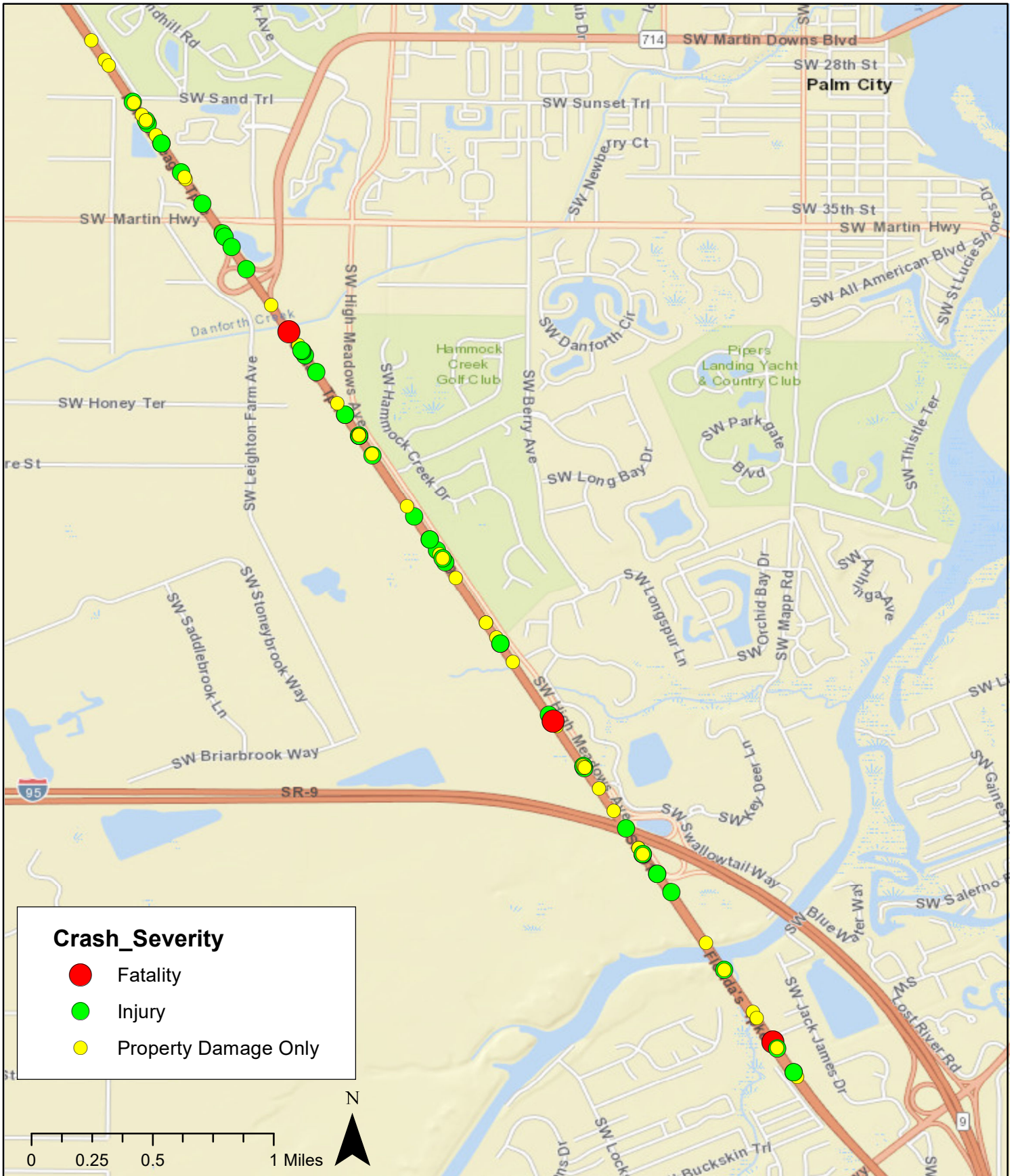
## Existing Conditions


### 3.4.1 Florida's Turnpike Mainline MP 130.5 to MP 135.5

A total of 153 crashes were reported along Florida's Turnpike mainline during the five-year analysis period from 2013 through 2017, with an average of 30.6 crashes per year. Off-Road (23 percent) and Rear-End (25 percent) crashes constituted the majority of the crashes. A total of three fatal crashes was reported. At least 67 percent of the total crashes resulted in property damage only. As shown on **Figure 3.5**, 27 percent of the crashes occurred on wet roadway conditions and 35 percent of the crashes occurred during dark conditions. **Figure 3.6** graphically depicts the locations of crashes by severity within the study area.

**Figure 3.5**  
Crash Data Summary (2013-2017) – Florida's Turnpike Mainline





	<p>Central Turnpike Widening North of Jupiter to North of Fort Pierce Interchange Modification Report</p>	<p>Severity of Crashes (2013-2017) - Florida's Turnpike</p>	<p>Figure 3.6</p>
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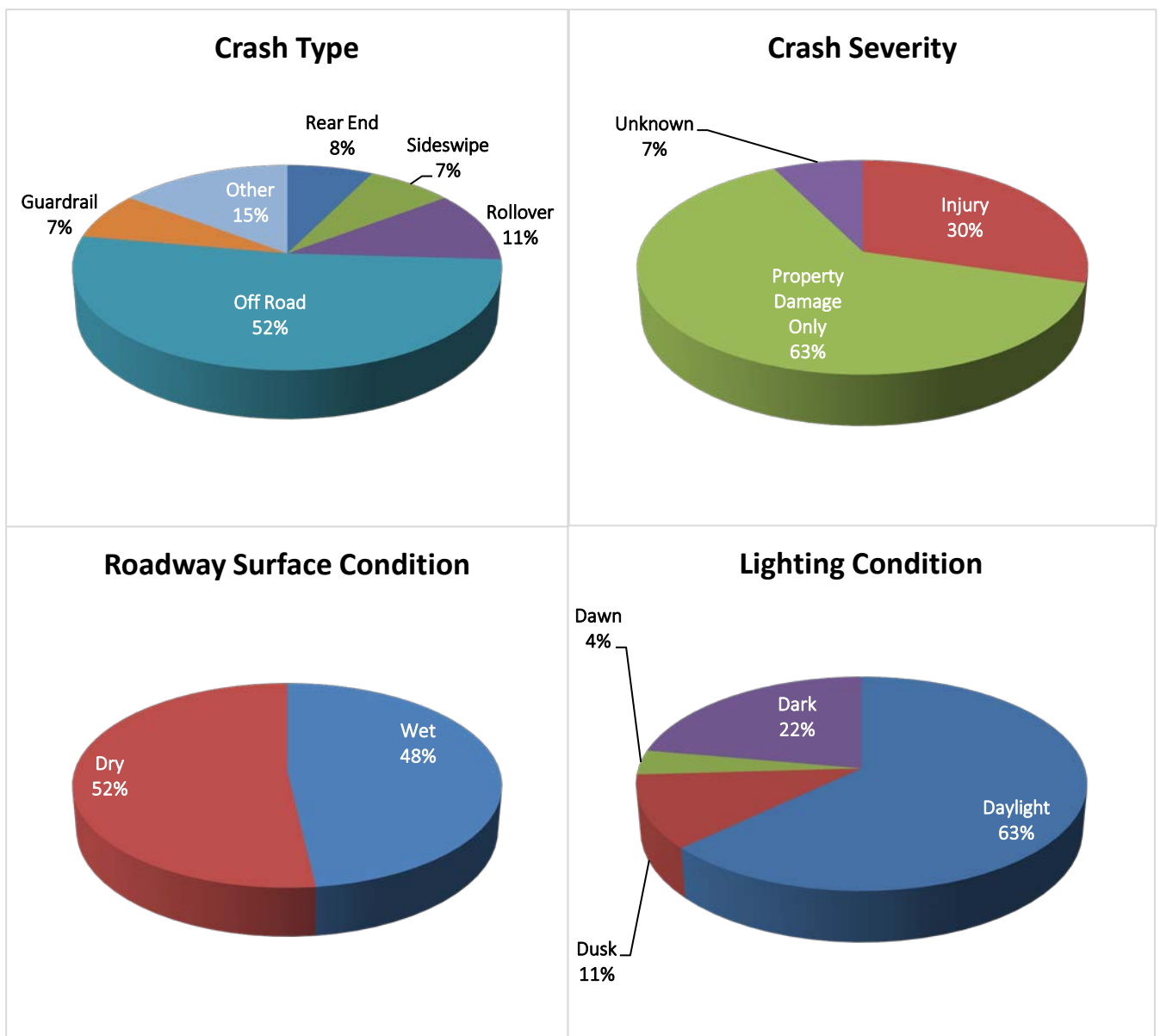
## SECTION THREE

## Existing Conditions

### 3.4.2 Martin Highway (SR 714) Interchange Ramp Roadways

The Florida's Turnpike at Martin Highway interchange ramps experienced a total of 27 crashes during the five-year analysis period. There were no fatal crashes reported during the study period. At least 30 percent of the total crashes resulted in injuries. As shown on **Figure 3.7**, off-road crashes (approximately 52 percent) and other crashes (such as single-vehicle crashes and front to front collision) (approximately 15 percent) were the prominent crash types along the interchange ramps. Reports indicated that 48 percent of the crashes occurred during wet roadway conditions and 22 percent occurred during night-time hours.

**Figure 3.7**  
Crash Data Summary (2013-2017) – Martin Highway (SR 714) Interchange Ramp



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## Existing Conditions

Actual crash rates for the freeway mainline and ramp segments were computed and compared with average crash rates for similar facilities across the state using the statewide five-year average crash rate (2013-2017). The majority of existing Florida's Turnpike segments of the mainline within the study area are categorized as Urban. Critical crash rates and safety ratios were also estimated. Crash rates for the roadways were estimated as crashes per Million Vehicle Miles Travelled (MVMT). The critical crash rate is based on the average crash rate for a similar facility adjusted by vehicle exposure and a probability constant. The safety ratio represents the actual crash rate divided by the critical crash rate. If a segment has an actual crash rate higher than the critical crash rate (i.e., safety ratio >1.0), it may have a safety deficiency. Florida's Turnpike and ramp segments within the study area have actual crash rates lower than the critical crash rate (i.e., safety ratio <1.0), as shown in **Table 3.5**.

**Table 3.5**  
**Mainline and Ramps Crash Rates and Safety Ratios (2013-2017)**

Description	Total Crashes	Actual Crash Rate	Average Crash Rate*	Critical Crash Rate	Safety Ratio
<b>Florida's Turnpike Mainline</b>					
South of Martin Highway (SR 714) Interchange (MP 130.5) to north of Martin Highway (SR 714) Interchange (MP 135.5)	153	0.38	0.766	1.00	0.38
<b>Florida's Turnpike Interchange Ramps</b>					
Martin Highway (MP 133)	27	0.90	0.766	1.68	0.54

\*Florida Statewide five-year Average Crash Rate (2013-2017)

Freeway and Interchanges Crash Rate used for "Toll Road Urban"

Freeways and Ramps: Crashes per Million Vehicle Miles Travelled (MVMT)

### 3.4.3 Intersections Along Martin Highway (SR 714)

Signal Four, a FDOT-funded database developed in coordination with the state's CARS, was used to obtain crash data for side streets that are not included in the FDOT crash database. Intersection crashes were extracted by providing a 250-foot influence area. A brief discussion of the crash analysis for the intersections is provided below.

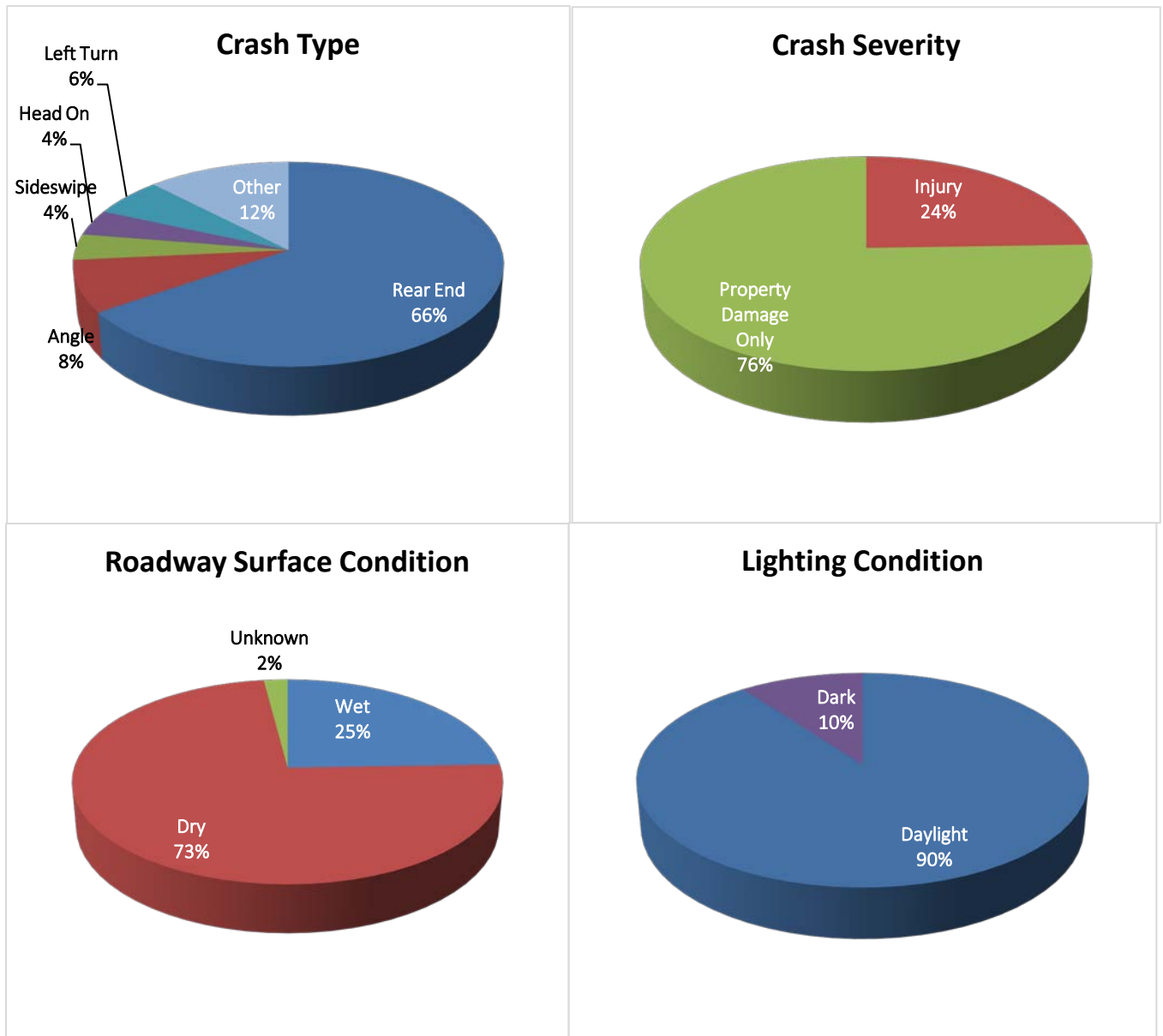
## SECTION THREE

## Existing Conditions

### ***Martin Highway (SR 714) and SW 42<sup>nd</sup> Avenue Intersection***

The Martin Highway and SW 42<sup>nd</sup> Avenue intersection experienced a total of 49 crashes during the five-year analysis period. There were no fatal crashes reported during that period. At least 24 percent of the total crashes resulted in injuries. As shown on **Figure 3.8**, rear-end crashes (approximately 66 percent) was the prominent crash type at the intersection. Reports indicated that 25 percent of the crashes occurred during wet roadway conditions and 10 percent occurred during night-time hours.

**Figure 3.8**  
**Crash Data Summary (2013-2017) – SW 42<sup>nd</sup> Avenue Intersection**



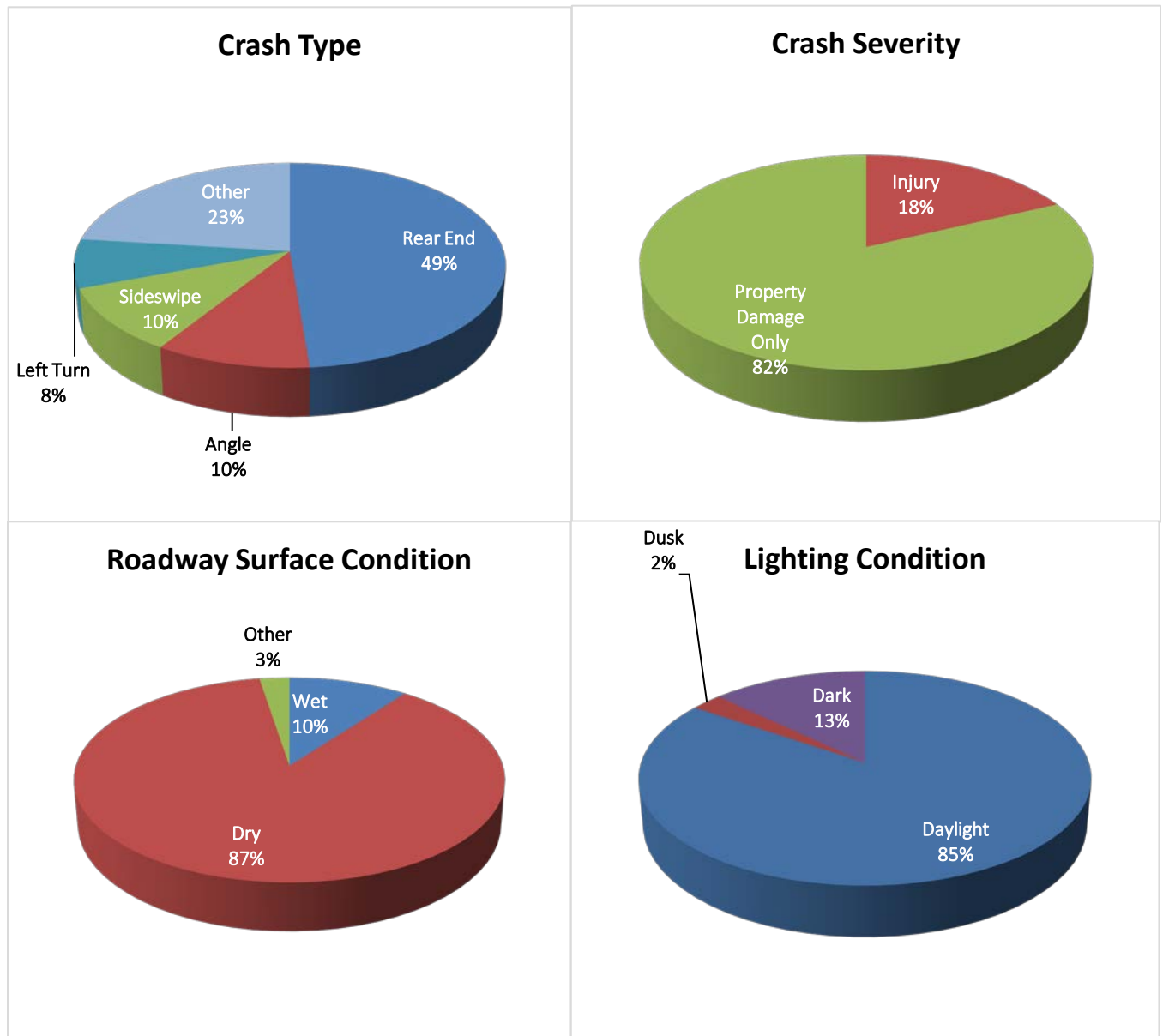
## SECTION THREE

## Existing Conditions

### *Martin Highway and SW Leighton Farm Avenue Intersection*

The Martin Highway and SW Leighton Farm Avenue intersection experienced a total of 39 crashes during the five-year analysis period. There were no fatal crashes reported during that period. At least 18 percent of the total crashes resulted in injuries. As shown on **Figure 3.9**, rear-end crashes (approximately 49 percent) were the prominent crash type at the intersection. Reports indicated that 10 percent of the crashes occurred during wet roadway conditions and 13 percent occurred during night-time hours.

**Figure 3.9**  
**Crash Data Summary (2013-2017) – SW Leighton Farm Avenue Intersection**



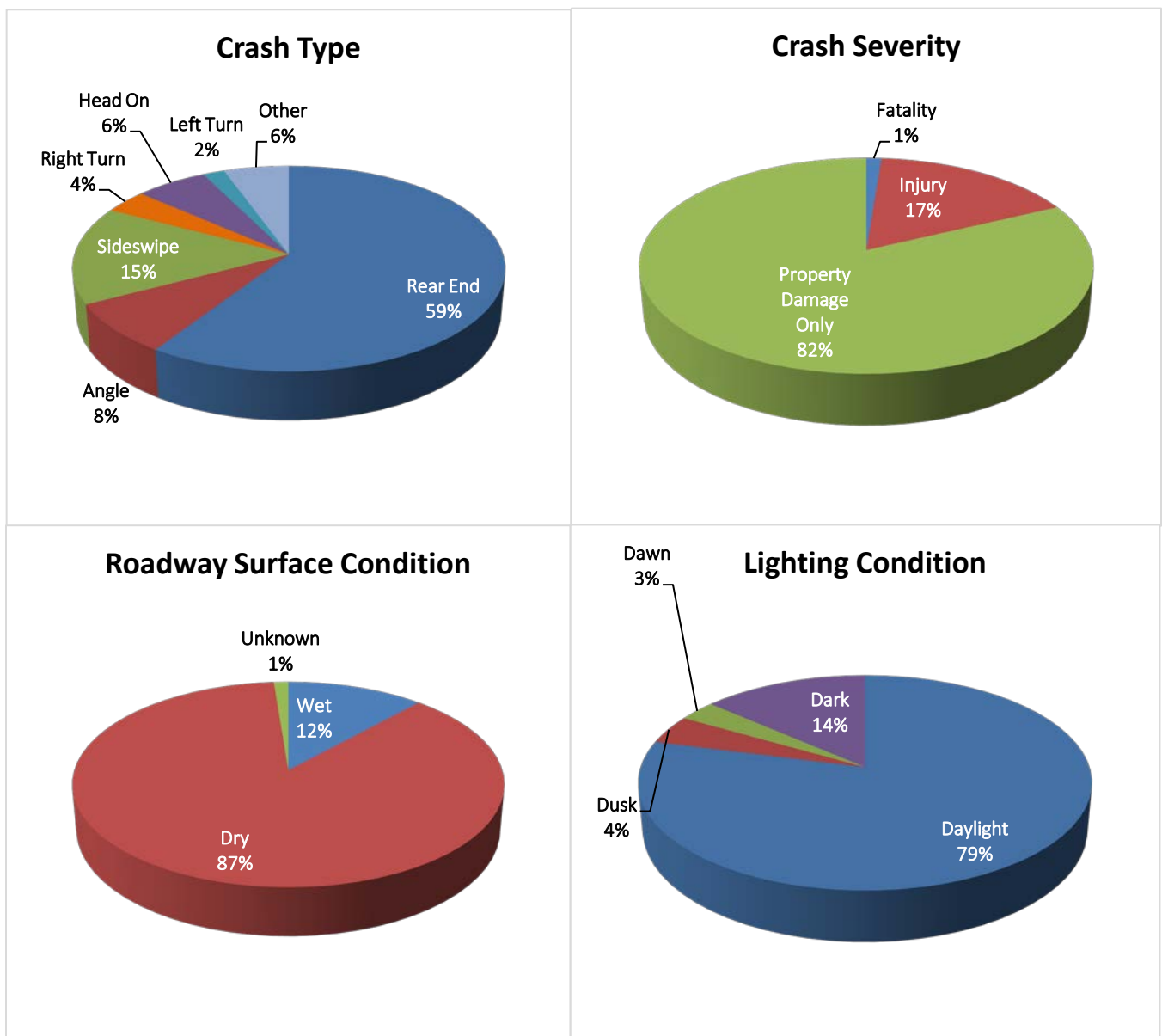
## SECTION THREE

## Existing Conditions

### *Martin Highway and Florida's Turnpike Ramps Intersection*

The Florida's Turnpike and Martin Highway intersection experienced a total of 162 crashes during the five-year analysis period. This interchange has a trumpet configuration with ramps that connect to SW Martin Highway, forming a single four-legged intersection aligned with SW Martin Downs Boulevard. There were two fatal crashes reported during the study period at this intersection. At least 17 percent of the total crashes resulted in injuries. As shown on **Figure 3.10**, rear-end crashes (approximately 59 percent) were the prominent crash type at the intersection. Reports indicated that 12 percent of the crashes occurred during wet roadway conditions and 14 percent occurred during night-time hours.

**Figure 3.10**  
Crash Data Summary (2013-2017) – Turnpike Ramps Intersection



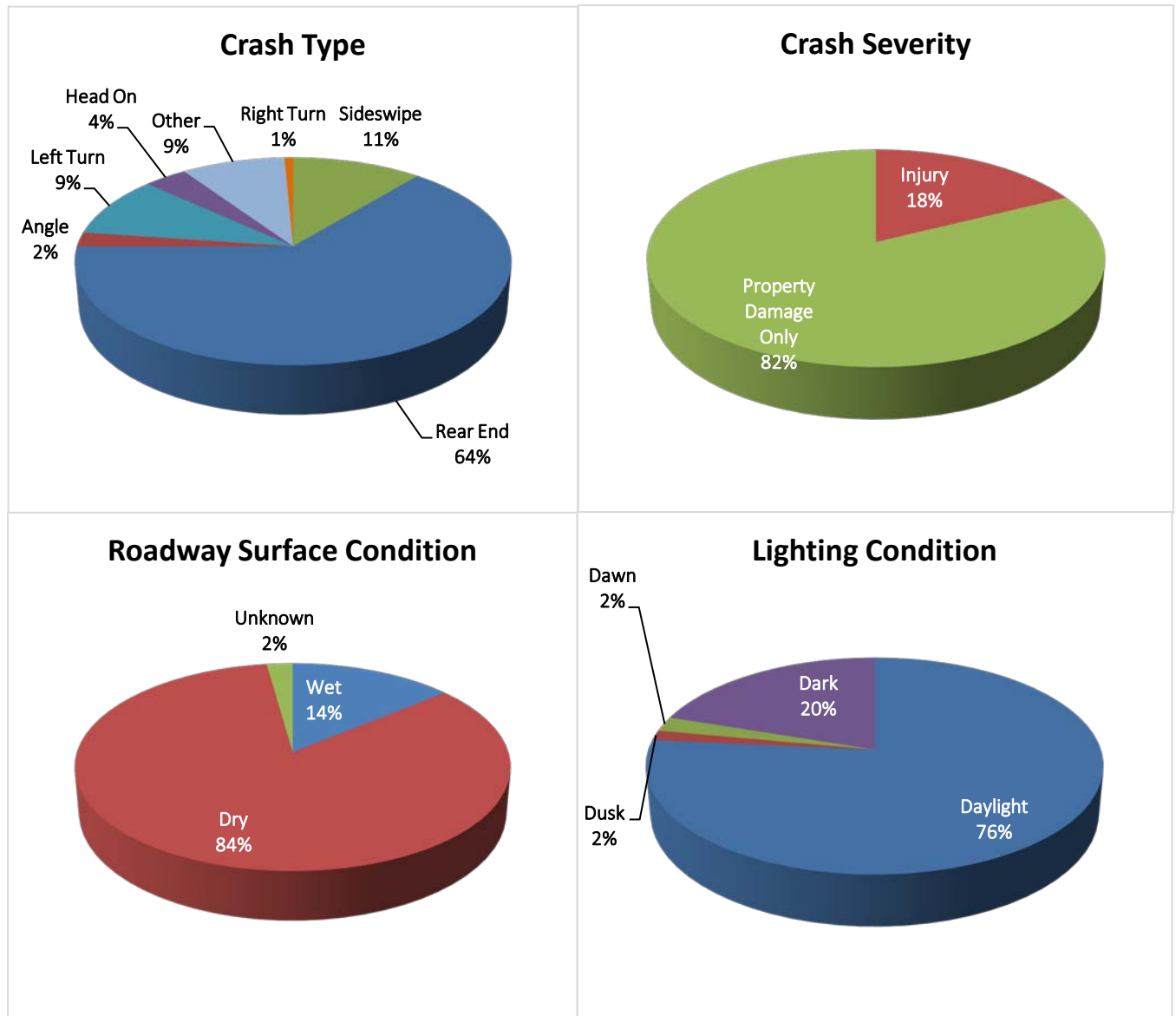
## SECTION THREE

## Existing Conditions

### ***Martin Highway and SW High Meadows Avenue Intersection***

The Martin Highway and SW High Meadows Avenue intersection experienced a total of 136 crashes during the five-year analysis period. There were no fatal crashes reported during that period. At least 18 percent of the total crashes resulted in injuries. As shown on **Figure 3.11**, rear-end crashes (approximately 64 percent) were the prominent crash type at the intersection. Reports indicated that 14 percent of the crashes occurred during wet roadway conditions and 20 percent occurred during night-time hours.

**Figure 3.11**  
**Crash Data Summary (2013-2017) – SW High Meadows Intersection**



Actual crash rates at the intersections were computed and compared with average crash rates for similar facilities across the state using the statewide five-year average crash rate (2013-2017). Critical crash rates and safety ratios were also estimated. Crash rates for the intersections were estimated



## SECTION THREE

## Existing Conditions

as crashes per Million Entering Vehicles (MEV). The critical crash rate is based on the average crash rate for a similar facility adjusted by vehicle exposure and a probability constant. The safety ratio represents the actual crash rate divided by the critical crash rate. If an intersection has an actual crash rate higher than the critical crash rate (i.e., safety ratio >1.0), it may have a safety deficiency. The crash rates are presented in **Table 3.6**.

**Table 3.6**  
**Intersection Crash Rates and Safety Ratios (2013-2017)**

Description	Total Crashes	Actual Crash Rate	Average Crash Rate*	Critical Crash Rate	Safety Ratio
<b>SW Martin Highway</b>					
SW 42 <sup>nd</sup> Avenue	49	1.15	0.517	1.15	1.00
SW Leighton Farms Avenue	39	0.90	0.517	1.14	0.78
Florida's Turnpike Ramps	162	2.94	0.517	1.07	2.76
SW High Meadows Avenue	136	3.18	0.517	1.15	2.77

\*Florida Statewide five-year Average Crash Rate (2013-2017): Intersection Crash Rate: Crashes per Million Entering Vehicles (MEV): Intersection Average Crash Rate used "SUBURBAN 2-3LN 2WY DIVD PAVD", "SUBURBAN 4-5LN 2WY DIVD RASD"  
Highlighted Safety Ratio >1.0

Rear-end crashes were the prominent crash type at the three intersections above with safety ratio greater than 1.0. Congestion and long queues contributed to the high number of crashes at those locations. However, the overall predicted crashes (See Table 5.8) showed lower numbers of predicted crashes under the Build alternative when compared to No-Build due to capacity improvements and redistribution of southbound off-ramp traffic at the SW Leighton Farm Avenue and Martin Highway intersection. Crashes along the arterials at mid-block locations (i.e., outside the intersection influence areas) were also evaluated and discussion is provided here.

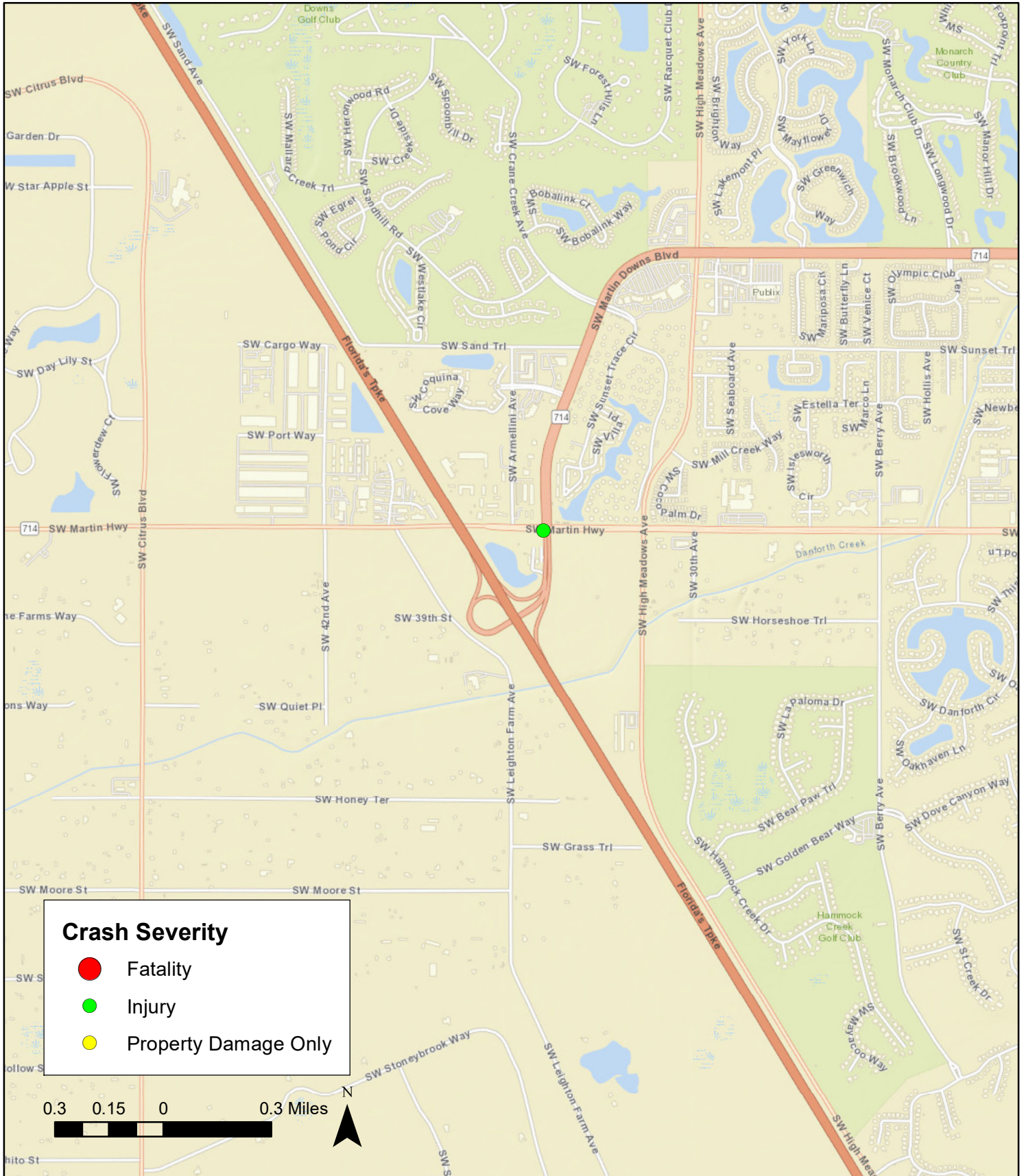
### ***Martin Highway Mid-block from 42<sup>nd</sup> Avenue to High Meadows Avenue***

A total of 22 crashes were reported along the mid-block sections of Martin Highway within the study area from 2013 through 2017. No fatal crashes were reported. Rear-end (59 percent) constituted the majority of the crashes. Approximately 59 percent of the crashes resulted in property damage only.

### ***Pedestrian and Bicycle Safety Analysis***

Bicycle and pedestrian crashes were extracted from the CARS database and the Signal Four Analytics tool for the study area. As shown on **Figure 3.12**, one bicycle crash was reported along this arterial within the study limit from 2013 through 2017.

**Section 5.5** of this report documents the safety analysis of the No-Build and Build alternatives using the predictive methods in Chapters 12 and 19 of the Highway Safety Manual (HSM), where available, and the Enhanced Interchange Safety Analysis Tool (ISATe), which apply a combination of Safety Performance Functions (SPFs), Crash Modification Factors (CMFs), and calibration factors to estimate frequency and cost of crashes for each segment and intersection.



Central Turnpike Widening North of Jupiter to  
North of Fort Pierce  
Interchange Modification Report

Bicycle and Pedestrian  
Crashes (2013-2017)

Figure 3.12

## SECTION FOUR

## Future Traffic Data

### 4.1 NO-BUILD ALTERNATIVE – TRANSPORTATION NETWORK

The future year No-Build alternative network includes the existing (2016) roadway conditions plus funded and committed projects within the study corridor. A traffic signal has been proposed at Martin Highway and SW Leighton Farm Avenue under No-Build as plans for signalization are being developed within a near term project. **Figure 4.1** presents the No-Build Lane Configuration for the AOI.

### 4.2 FUTURE TRAFFIC FORECAST

The TCRPM 4 was used as a base model for this project since this Activity Based version has an enhanced modeling process for truck traffic. Numerous updates were made to the TCRPM 4, including socioeconomic data and networks, to produce a modified version of the TCRPM 4 FTE model. The model was updated specifically for evaluating toll road and managed lanes projects in the study region. Both the No-Build and Build scenarios included widening of the Turnpike mainline to eight lanes. The Daily forecasts for 2025 and 2045 for the Turnpike mainline and ramps are shown in **Table 4.1**.

**Table 4.1**  
**No-Build and Build Forecasted Mainline and Ramp AADTs**

Milepost - Description	No-Build		Build	
	2025	2045	2025	2045
133 – Martin Highway (SR 714)	62,000	87,900	63,400	90,100
	12,800	23,800	14,000	25,400
	5,100	13,200	4,900	13,100
	54,300	77,300	54,300	77,800

The historical growth rates provided by Martin County were used to develop the cross street volumes, as shown in **Table 4.2**.

**Table 4.2**  
**No-Build and Build Forecasted Cross Street AADTs**

Cross Street	Intersection	Location	No Build		Build	
			2025	2045	2025	2045
Martin Highway (SR 714)	NB and SB Ramps Terminal	East	34,500	48,000	35,300	49,200
		West	31,600	44,000	29,900	41,200

**Figures 4.2** and **4.3** present the No-Build Design Hour Volumes for Opening Year 2025 and Design Year 2045, respectively.

Stuart  
(MP 133)



### Central Turnpike Widening North of Jupiter to North of Fort Pierce Interchange Modification Report

### No-Build Lane Geometry – SR 714/Martin Highway

Figure 4.1



Stuart  
(MP 133)

SR 714/SW Martin Hwy

60 (130)  
50 (10)  
300 (230)

(130) 110  
(1,490) 1,870  
(30) 90

190 (150)  
1,540 (1,850)  
10 (200)

30 (30)  
90 (110)  
40 (90)

20 (20)  
60 (110)  
10 (130)

(120) 70  
(1,610) 2,120  
(20) 10

70 (80)  
1,710 (2,160)  
70 (90)

200 (110)  
10 (10)  
10 (20)



510 (560)  
1,030 (1,620)  
190 (240)

(880) 490  
(830) 1,390  
(140) 450

1,160 (670)  
1,240 (1,030)  
450 (320)

210 (320)  
790 (500)  
420 (110)

(100) 80  
(1,060) 1,710  
(580) 950

210 (440)  
1,000 (1,720)  
310 (190)

160 (280)  
490 (990)  
610 (780)

SR 714/SW Martin Hwy

SW 42<sup>nd</sup> Ave

SW Armellini Ave

SR 714/SW Martin Downs Blvd

SW Leighton Farm Ave

SW High Meadows Ave

2,250 (960)

1,060 (600)

960 (2,250)

600 (1,060)

SR 91/ Florida's Turnpike 5,070 (3,490)

3,490 (5,070)

SR 91/ Florida's Turnpike

6,260 (3,850)

3,850 (6,260)

**Legend**

- Florida's Turnpike
- Arterial
- Signal Controlled
- STOP Controlled
- Lane Direction



## SECTION FOUR

## Future Traffic Data

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### 4.3 BUILD ALTERNATIVE – TRANSPORTATION NETWORK

The widening of the Turnpike is planned to include widening to eight lanes (four lanes in each direction) for both the No-Build and the Build conditions. Future Build alternatives include a planned Turnpike Mainline widening and the modifications of the Martin Highway interchange.

### 4.4 MAINLINE AND RAMPS LANE REQUIREMENTS

**Tables 4.3** shows the Turnpike Mainline and ramp lane requirements for No-Build within the study area for the years 2025 through 2045 using mainline LOS D maximum service volume (MSV) and ramp capacity (LOS E MSV) thresholds. The colored highlighting provides the required directional number of lanes per the color-coding key at the bottom of the table. **Table 4.4** shows the lane requirements for Build within the study area.

In the future, four lanes of travel in each direction will be required on SR 91 between SW Martin Highway and SE Becker Road by year 2031. State Road 91 will require three lanes of travel in each direction by year 2025.

**Table 4.4**  
Lane Requirements by Year for No-Build

Mile Post - Description		Mainline (LOS D MSV) and Ramp Capacity (LOS E MSV) Lane Requirements -Worst Case Southbound or Northbound Design Hour Volumes																				
		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
133 - SW Martin Highway (SR 714)		4,460	4,550	4,640	4,730	4,820	4,910	5,000	5,090	5,180	5,270	5,360	5,450	5,540	5,630	5,720	5,810	5,900	5,990	6,080	6,170	6,260
		1,210	1,260	1,310	1,370	1,420	1,470	1,520	1,570	1,630	1,680	1,730	1,780	1,830	1,890	1,940	1,990	2,040	2,090	2,150	2,200	2,250
		410	440	480	510	540	570	610	640	670	700	740	770	800	830	870	900	930	960	1,000	1,030	1,060
		3,660	3,730	3,800	3,870	3,940	4,010	4,080	4,150	4,220	4,290	4,370	4,440	4,510	4,580	4,650	4,720	4,790	4,860	4,930	5,000	5,070

Assumptions	
Trucks <sup>(1)</sup>	7.00%
Peak Hour Factor (PHF) <sup>(2)</sup>	0.95
Free Flow Speed (mph)	75.00
Total Ramp Density (TRD) <sup>(2)</sup>	0.60
Grade <sup>(3)</sup>	0.00%
Terrain <sup>(3)</sup>	Level
RVs <sup>(3)</sup>	0.00%
Lane Width <sup>(3)</sup>	12.00 ft
Right-shoulder Lateral Clearance (LC) <sup>(3)</sup>	10.00
Driver Population	Mostly Familiar

(1) Source: AET Phase V Turnpike Mainline - Traffic Factors  
 (2) Source: Assumed  
 (3) Source: HCM 2010 default value.

Number of Mainline Lanes by LOS D Maximum Service Volume (MSV)	
No. of Lanes	LOS D
2	3,300
3	4,950
4	6,600
5	8,250
6	9,900
7	11,550

Base Free Flow Speed = 75.4 mph.  
 Values rounded to nearest tenth place

Number of Ramp Lanes by Capacity (veh/hr)	
No. of Lanes	Capacity
1	1,830
2	3,660
3	5,490
4	5,490

Free Flow Speed = 31-40 mph  
 Truck Percentage = 5%  
 Values rounded to nearest tenth place

Number of Ramp Lanes by Capacity (veh/hr)	
No. of Lanes	Capacity
1	1,780
2	3,560
3	5,340
4	5,340

Free Flow Speed = 41-50 mph  
 Truck Percentage = 5%  
 Values rounded to nearest tenth place



**Table 4.5  
Lane Requirements by Year for Build**

Mile Post - Description	Mainline (LOS D MSV) and Ramp Capacity (LOS E MSV) Lane Requirements -Worst Case Southbound or Northbound Design Hour Volumes																				
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
133 - SW Martin Highway (SR 714)	4,430	4,520	4,620	4,710	4,800	4,900	4,990	5,080	5,170	5,270	5,360	5,450	5,540	5,640	5,730	5,820	5,910	6,000	6,100	6,190	6,280
	1,320	1,370	1,430	1,480	1,540	1,590	1,640	1,700	1,750	1,810	1,860	1,910	1,970	2,020	2,080	2,130	2,180	2,240	2,290	2,350	2,400
	400	430	470	500	530	570	600	630	660	700	730	760	800	830	860	900	930	960	990	1,030	1,060
	3,510	3,580	3,650	3,720	3,800	3,870	3,940	4,010	4,080	4,150	4,230	4,300	4,370	4,440	4,510	4,580	4,650	4,730	4,800	4,870	4,940

Assumptions	
Trucks <sup>(1)</sup>	7.00%
Peak Hour Factor (PHF) <sup>(2)</sup>	0.95
Free Flow Speed (mph)	75.00
Total Ramp Density (TRD) <sup>(2)</sup>	0.60
Grade <sup>(3)</sup>	0.00%
Terrain <sup>(3)</sup>	Level
RVs <sup>(3)</sup>	0.00%
Lane Width <sup>(3)</sup>	12.00 ft
Right-shoulder Lateral Clearance (LC) <sup>(3)</sup>	10.00
Driver Population	Mostly Familiar

(1) Source: AET Phase V Turnpike Mainline - Traffic Factors  
 (2) Source: Assumed  
 (3) Source: HCM 2010 default value.

Number of Mainline Lanes by LOS D Maximum Service Volume (MSV)	
No. of Lanes	LOS D
2	3,300
3	4,950
4	6,600
5	8,250
6	9,900
7	11,550

Base Free Flow Speed = 75.4 mph.  
 Values rounded to nearest tenth place

Number of Ramp Lanes by Capacity (veh/hr)	
No. of Lanes	Capacity
1	1,830
2	3,660
3	5,490
4	5,490

Free Flow Speed = 31-40 mph  
 Truck Percentage = 5%  
 Values rounded to nearest tenth place

Number of Ramp Lanes by Capacity (veh/hr)	
No. of Lanes	Capacity
1	1,780
2	3,560
3	5,340
4	5,340

Free Flow Speed = 41-50 mph  
 Truck Percentage = 5%  
 Values rounded to nearest tenth place

## SECTION FOUR

## Future Traffic Data

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### 4.5 DEVELOPMENT AND SCREENING OF BUILD ALTERNATIVES

Of the varying number of interchange alternatives developed for the Martin Highway interchange, two viable alternatives were ultimately selected for detailed evaluation. This selection process is outlined in the *Recommendation of Preferred Alternative Memorandum – February 2021* and is provided in **Appendix F**. This memorandum includes the conceptual designs for these two alternatives, the Preliminary Interchange Alternatives Evaluation Matrix, and the traffic data that were used from the *Central Turnpike PD&E: Tier 2 Interchange Alternative Evaluation*.

The interchange alternatives were analyzed based on specific criteria. There were 3 categories and 15 design parameters evaluated for each alternative analysis. The categories included Engineering Considerations, Environmental and Community Considerations, and Cost Considerations. The 15 design parameters included traffic operations, local road impacts, overall interchange performance, floodplain impacts, wetland impacts, potential residential and business relocations, right-of-way impacts, Florida Gas Transmission (FGT) impacts, and right-of-way and construction costs, among others. The 15 design parameters were distributed among the 3 categories as follows: Engineering Considerations (7 parameters), Environmental and Community Considerations (5 parameters), and Cost Considerations (3 parameters). Each design parameter was weighted and assigned a score between 1 and 10, with 1 being the worst score and 10 being the best score. The scores were accumulated to reflect a total score, and a ranking of either 1 or 2 was assigned based on the total score. Color coding was used to facilitate the interpretation of the results. A ranking of 1 reflects the Preferred Alternative of the two interchange alternatives compared for the interchange location under consideration.

The existing Martin Highway interchange has a trumpet configuration with only one point of access to/from the Turnpike mainline. As mentioned above, two preferred interchange reconfiguration alternatives were proposed to address the existing traffic congestion and related safety issues. The alternatives were evaluated for opening (2025), and design (2045) years as described below:

**Alternative 7B:** Approximately 3,500 feet south of SW Martin Highway, the northbound off-ramp diverts from the Turnpike mainline and curves to the right. The ramp splits into two, one-lane ramps that intersect SW Martin Highway at SW Martin Downs Boulevard. The outside ramp provides drivers the ability to make a right turn onto SW Martin Highway, while the inside ramp provides drivers the ability to continue through onto SW Martin Downs Boulevard, as well as turn left onto SW Martin Highway. The two-lane northbound on-ramp begins approximately 800 feet south of the SW Martin Highway and SW Martin Downs Boulevard intersection and loops from the south to the north, to tie into the Turnpike mainline approximately 1,900 feet north of SW Martin Highway. Approximately 750 feet north of SW Martin Highway, the southbound off-ramp diverts from the Turnpike mainline and curves to the right, splitting into a one-lane ramp and a two-lane ramp. A single-lane ramp continues to the west until ending at SW Leighton Farm Avenue at a proposed roundabout. Leighton Farm Avenue will be realigned to intersect SW Martin Highway at SW Deggeller Court. Drivers can turn left or right onto SW Martin Highway or continue through on SW Deggeller Court. At the southbound off-ramp split, a two-lane ramp curves from the west to the east, crossing at a bridge over the Turnpike

## SECTION FOUR

## Future Traffic Data

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mainline, until it loops to the north to intersect SW Martin Highway at SW Martin Downs Boulevard. Drivers can continue through onto SW Martin Downs Boulevard or turn right onto SW Martin Highway. The southbound on-ramp begins approximately 800 feet south of SW Martin Highway and curves to the west, crossing at a bridge over the Turnpike mainline, before looping around to tie into the Turnpike mainline approximately 3,500 feet south of SW Martin Highway. Between SW High Meadows Avenue and SW Armellini Avenue, SW Martin Highway is widened from the existing four-lane typical section to a six-lane typical section with three lanes in each direction. West of SW Armellini Avenue until SW Deggeller Court, SW Martin Highway is widened from the existing two-lane typical section to a six-lane typical section with three lanes in each direction. The SW Martin Highway Bridge over the Turnpike mainline is reconstructed to accommodate the widening. For a detailed graphic of SW Martin Highway Interchange Alternative 7B, please refer to **Appendix F**.

**Alternative 7S:** Approximately 4,500 feet south of SW Martin Highway, the northbound off-ramp diverts from the Turnpike mainline and curves to the right. The ramp continues east until it intersects SW High Meadows Avenue at a proposed signalized intersection approximately 2,200 feet south of SW Martin Highway. The two-lane northbound on-ramp begins approximately 800 feet south of the SW Martin Highway and SW Martin Downs Boulevard intersection and loops from the south to the north, to tie into the Turnpike mainline approximately 1,900 feet north of SW Martin Highway. Approximately 750 feet north of SW Martin Highway, the southbound off-ramp diverts from the Turnpike mainline and curves to the right, splitting into a one-lane ramp and a two-lane ramp. A single-lane ramp continues to the west until ending at a proposed roundabout at SW Leighton Farm Avenue. SW Leighton Farm Avenue will be realigned to intersect SW Martin Highway at SW Deggeller Court. Drivers can turn left or right onto SW Martin Highway or continue through on SW Deggeller Court. At the southbound off-ramp split, a two-lane ramp curves from the west to the east, crossing at a bridge over the Turnpike mainline, until it loops to the north to intersect SW Martin Highway at SW Martin Downs Boulevard. Drivers can continue through onto SW Martin Downs Boulevard or turn right onto SW Martin Highway. The southbound on-ramp begins at the proposed signalized intersection on SW High Meadows Avenue, approximately 2,200 feet south of SW Martin Highway. The ramp curves from the west to the south, crossing at a bridge over the Turnpike mainline, until it ties into the Turnpike mainline approximately 5,700 feet south of SW Martin Highway. Along SW High Meadows Avenue, from the driveway entrance to the Palm City Business Park until the proposed signalized intersection, the existing two-lane undivided typical section is widened to a four-lane divided typical section with two lanes in each direction. From the proposed signalized intersection to SW Martin Highway, the existing two-lane undivided typical section is widened to a six-lane divided typical section with three lanes in each direction. Between SW High Meadows Avenue and SW Armellini Avenue, SW Martin Highway is widened from the existing four-lane typical section to a six-lane typical section with three lanes in each direction. West of SW Armellini Avenue until SW Deggeller Court, SW Martin Highway is widened from the existing two-lane typical section to a six-lane typical section with three lanes in each direction. The SW Martin Highway Bridge over the Turnpike mainline is reconstructed to accommodate the widening. For a detailed graphic of SW Martin Highway Interchange Alternative 7S, please refer to **Appendix F**.

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## Future Traffic Data

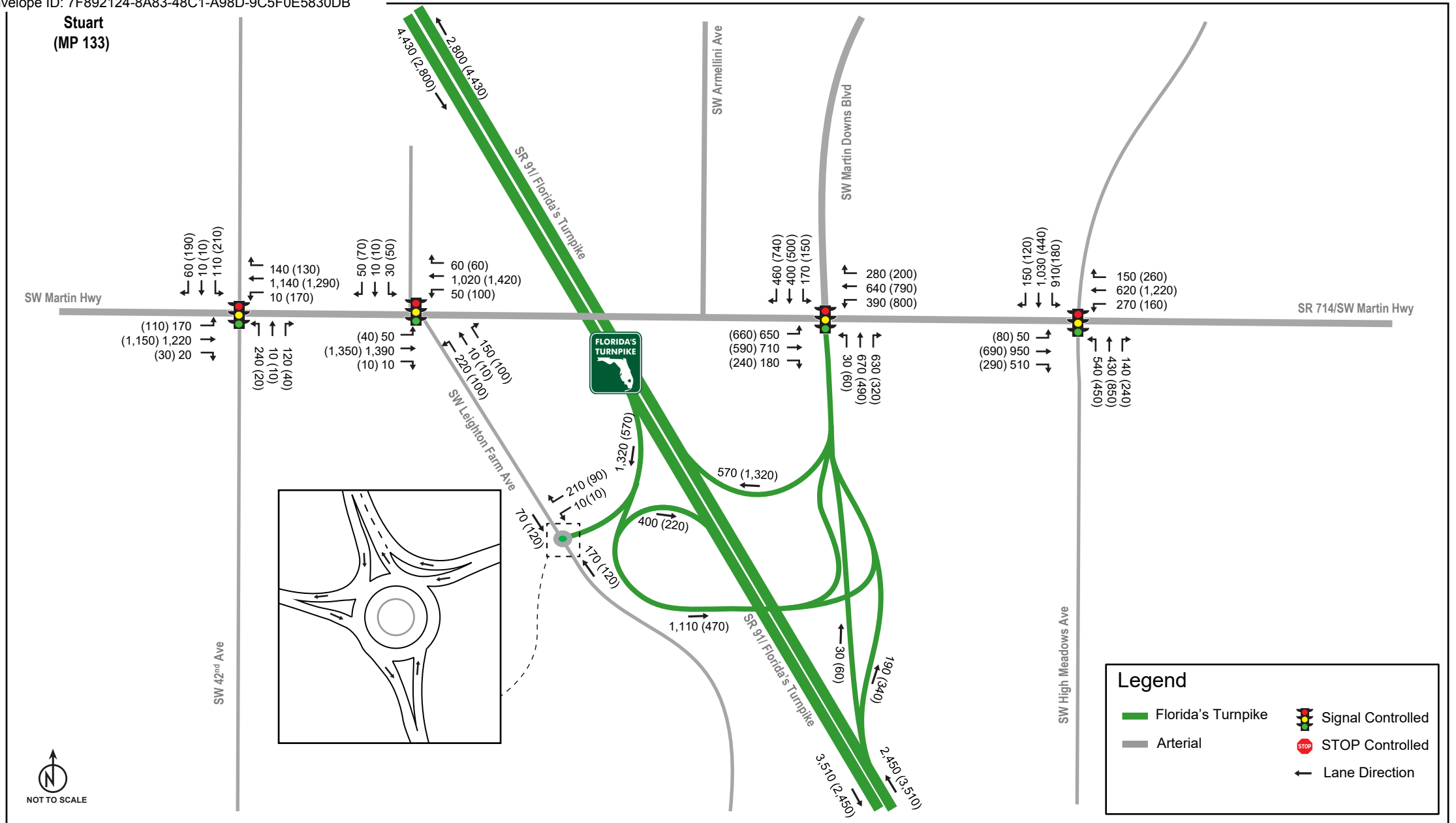
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Alternative 7B scored equal to or better in a majority of the categories, is markedly less expensive, and has fewer right-of-way impacts than Alternative 7S. Hence, Alternative 7B was recommended as the Preferred Interchange Alternative for SW Martin Highway. ***Alternative 7B will be considered the Build alternative for this IMR.*** The conceptual and signing plans for the Build alternative are included in **Appendix G**.

**Figure 4.4** shows the Roadway and Intersection Lane Configuration for the Build alternative. The 2025 and 2045 design hour traffic volumes for the Build alternative are shown on **Figures 4.5** and **4.6**, respectively.

Stuart  
(MP 133)

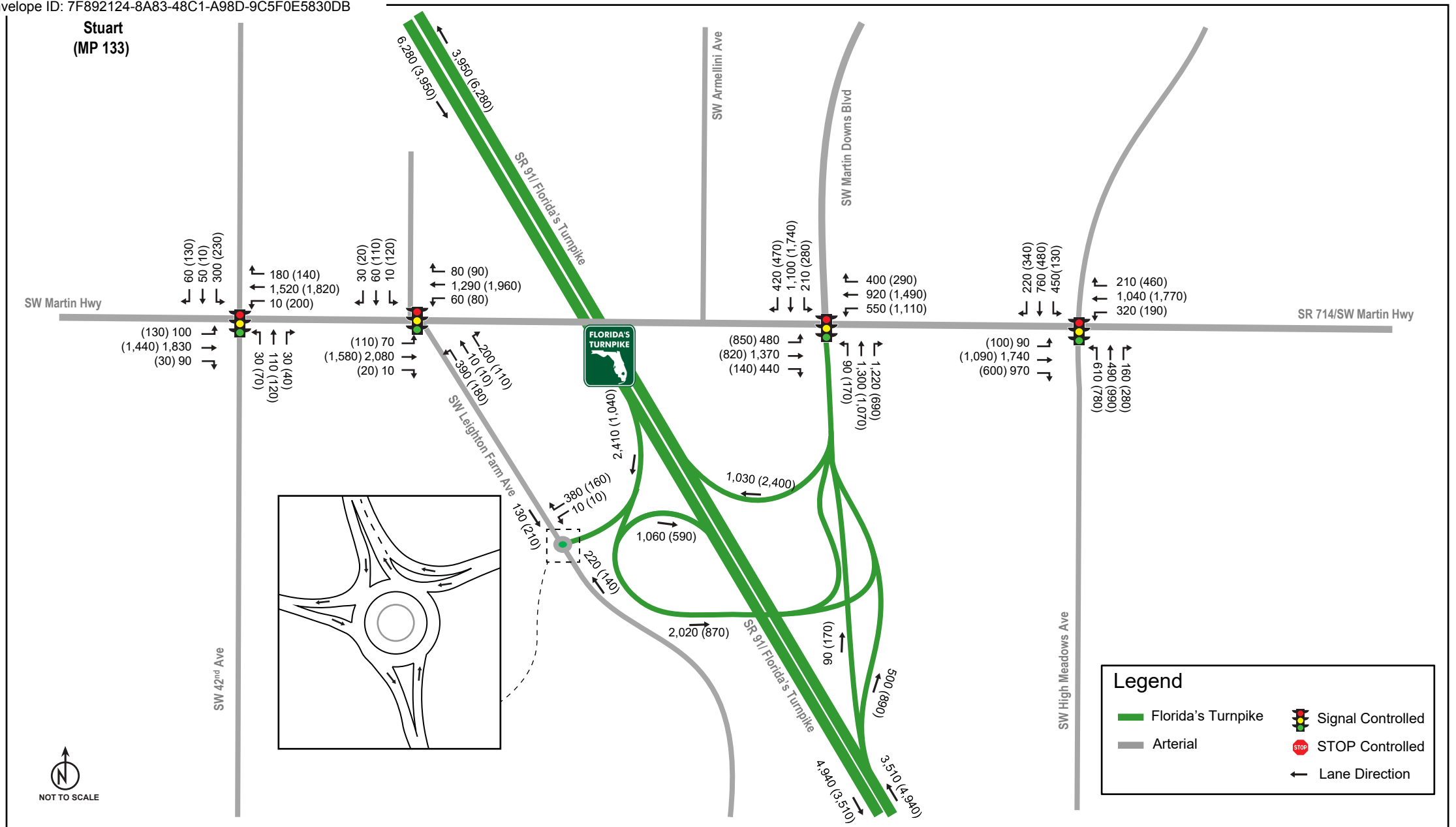




**Central Turnpike Widening North of Jupiter to North of Fort Pierce Interchange Modification Report**

**2025 DDHVs Build – SR 714/Martin Highway**

**Figure 4.5**



## 5.1 NO-BUILD ALTERNATIVE – TRAFFIC OPERATIONAL ANALYSIS

The future year No-Build alternative network includes the existing (2016) roadway conditions plus funded and committed projects within the study corridor.

### 5.1.1 2025 and 2045 No-Build – Freeway Analysis

The mainline/basic, and ramp merge/diverge analysis results, as applicable, for Opening Year 2025 are summarized and depicted on **Figures 5.1** and **5.2** for the northbound and southbound directions, respectively. The Design Year 2045 analysis results are summarized and depicted on **Figures 5.3** and **5.4** for the northbound and southbound directions, respectively. Documentation of the 2025 and 2045 No-Build alternative traffic freeway operational analysis is provided in **Appendix H**. The information and analysis indicate that the southbound off-ramp diverge areas along Florida's Turnpike and the ramp intersection with Martin Highway are projected to experience operational failures in 2045 during the AM peak hour.

### 5.1.2 2025 and 2045 No-Build – Intersection Analysis

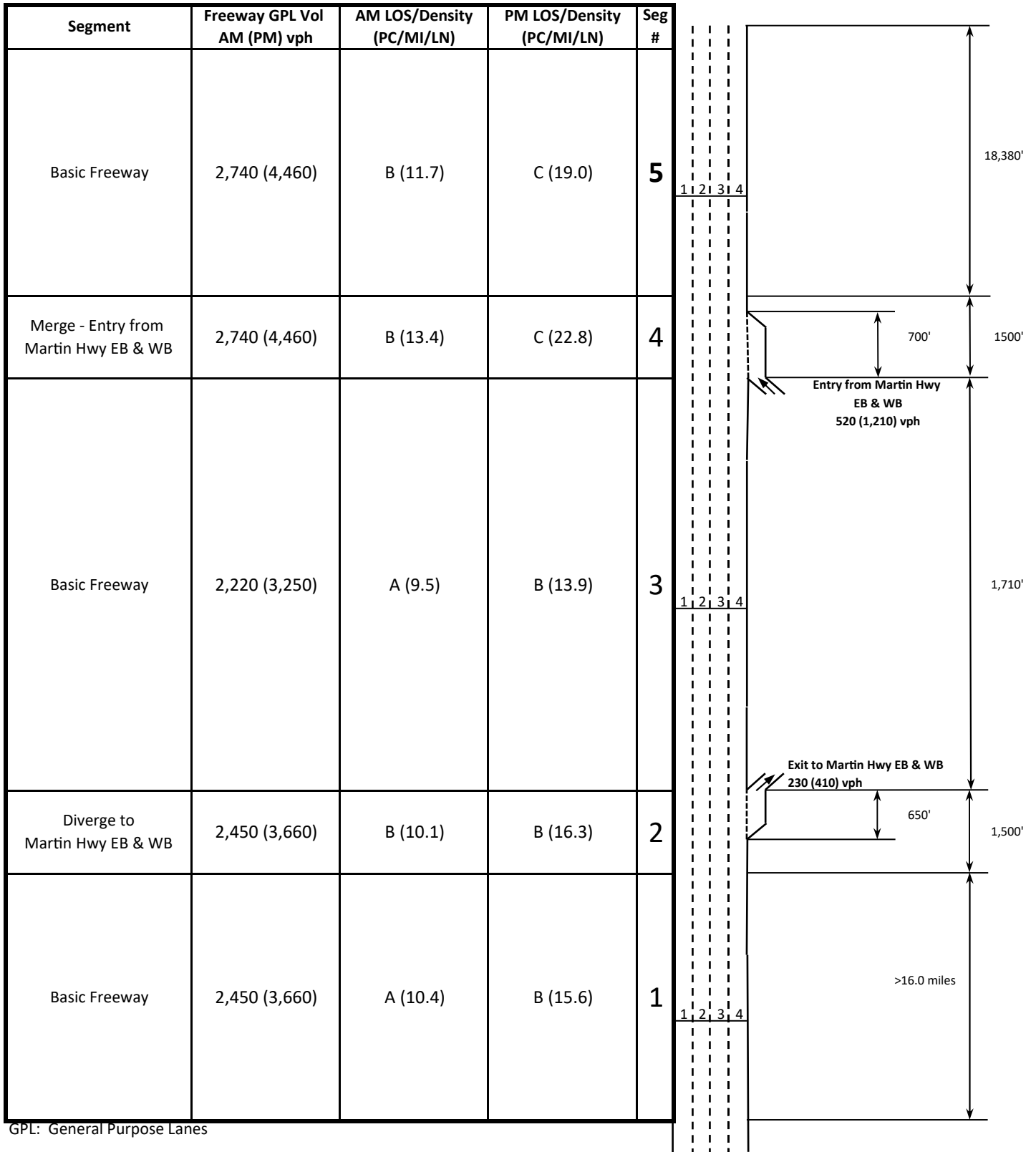
Intersection analysis for ramp terminals and adjacent intersections was performed in a similar manner as for the existing conditions. The No-Build alternative includes the existing intersection control and existing lane geometry. **Figure 4.1**, previously presented, presents the No-Build alternative Lane Configuration; and **Figures 4.2** and **4.3**, previously presented, show the AM and PM intersection volumes for 2025 and 2045 conditions, respectively. Signal timing was optimized to reflect routine maintenance operations. To avoid the starvation, the offset and splits were optimized. **Appendix I** presents the intersection analysis worksheets.

**Tables 5.1** and **5.2** summarize the results of the No-Build signalized intersection analyses for the AM and PM design hours for 2025 and 2045, respectively. The results include delays (in seconds per vehicle) and level of service by movement, approach, and the overall intersection. The 95<sup>th</sup> percentile queue lengths have also been summarized by movement. The intersection analysis results indicate the following for the 2045 Design Year:

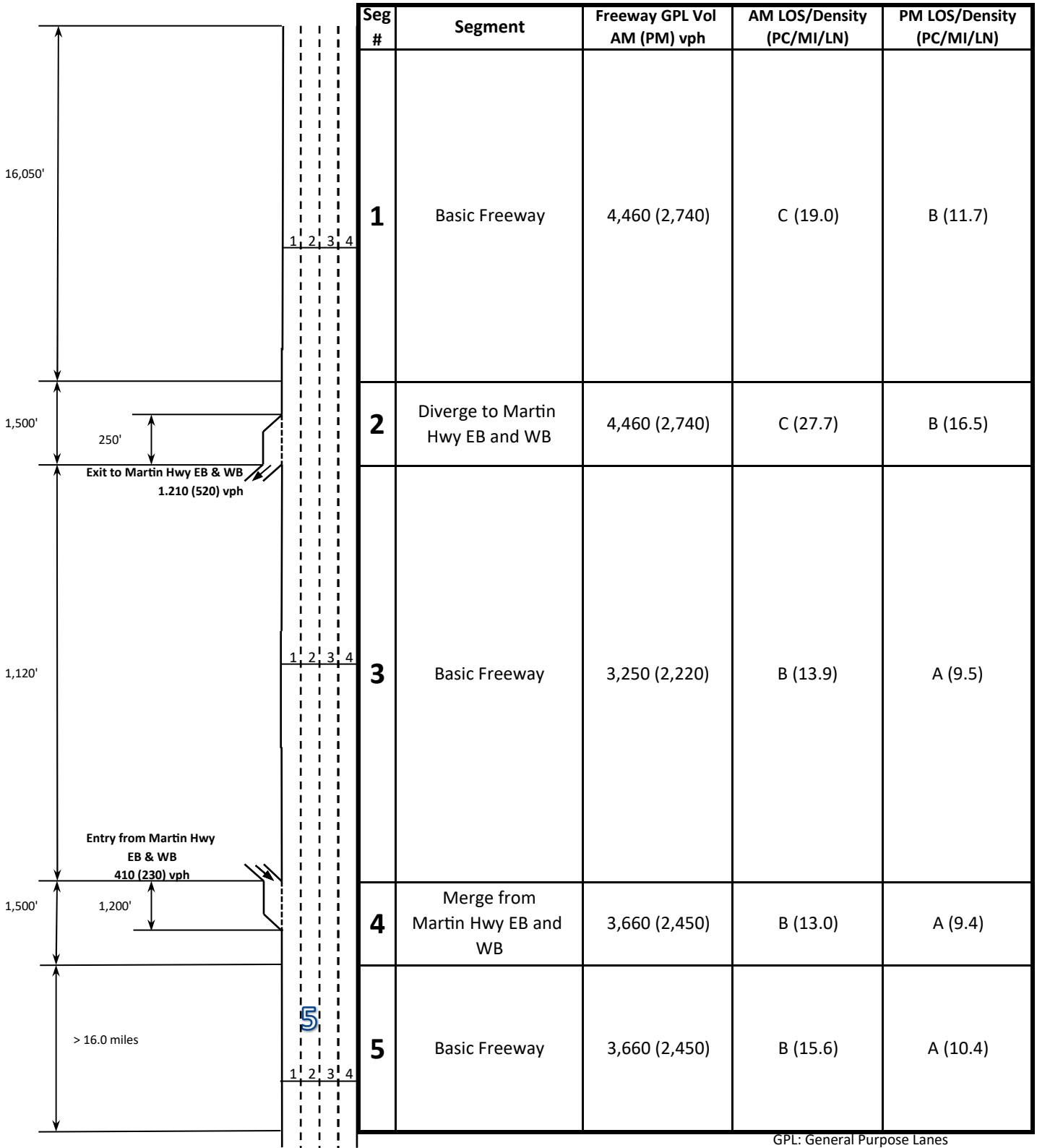
- The Turnpike ramp terminal is projected to operate at LOS F during the AM and PM design hours.
- The intersection of High Meadows Avenue is also projected to operate at LOS F during the AM and PM design hours.
- The intersection of Leighton Farm Avenue is projected to operate at LOS D during both the AM and PM design hours.
- The intersection of SE 42<sup>nd</sup> Avenue is at LOS E during the AM and LOS D during PM design hours, respectively.



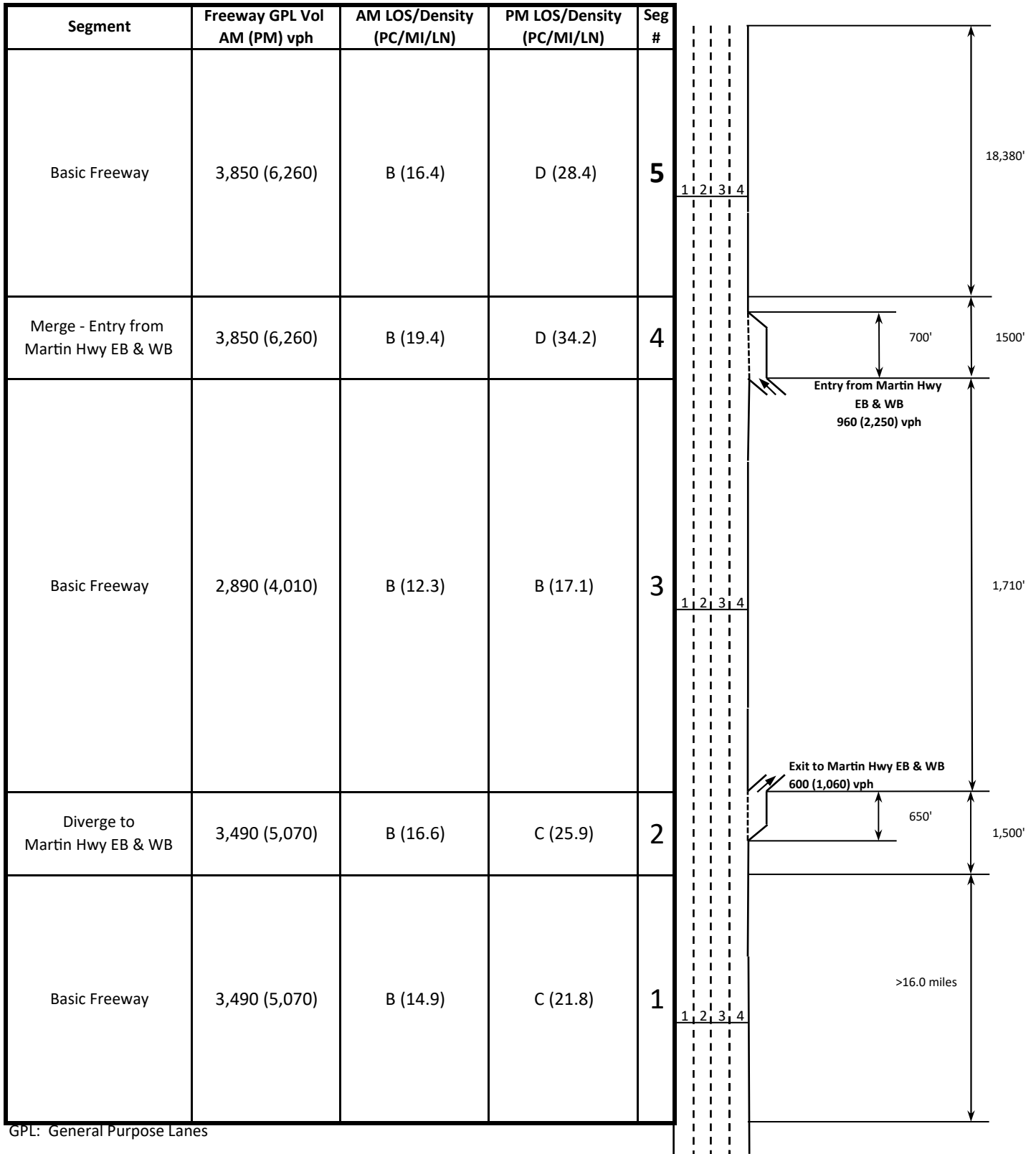
**Figure 5.1: 2025 No-Build Freeway Analysis Results - Northbound**



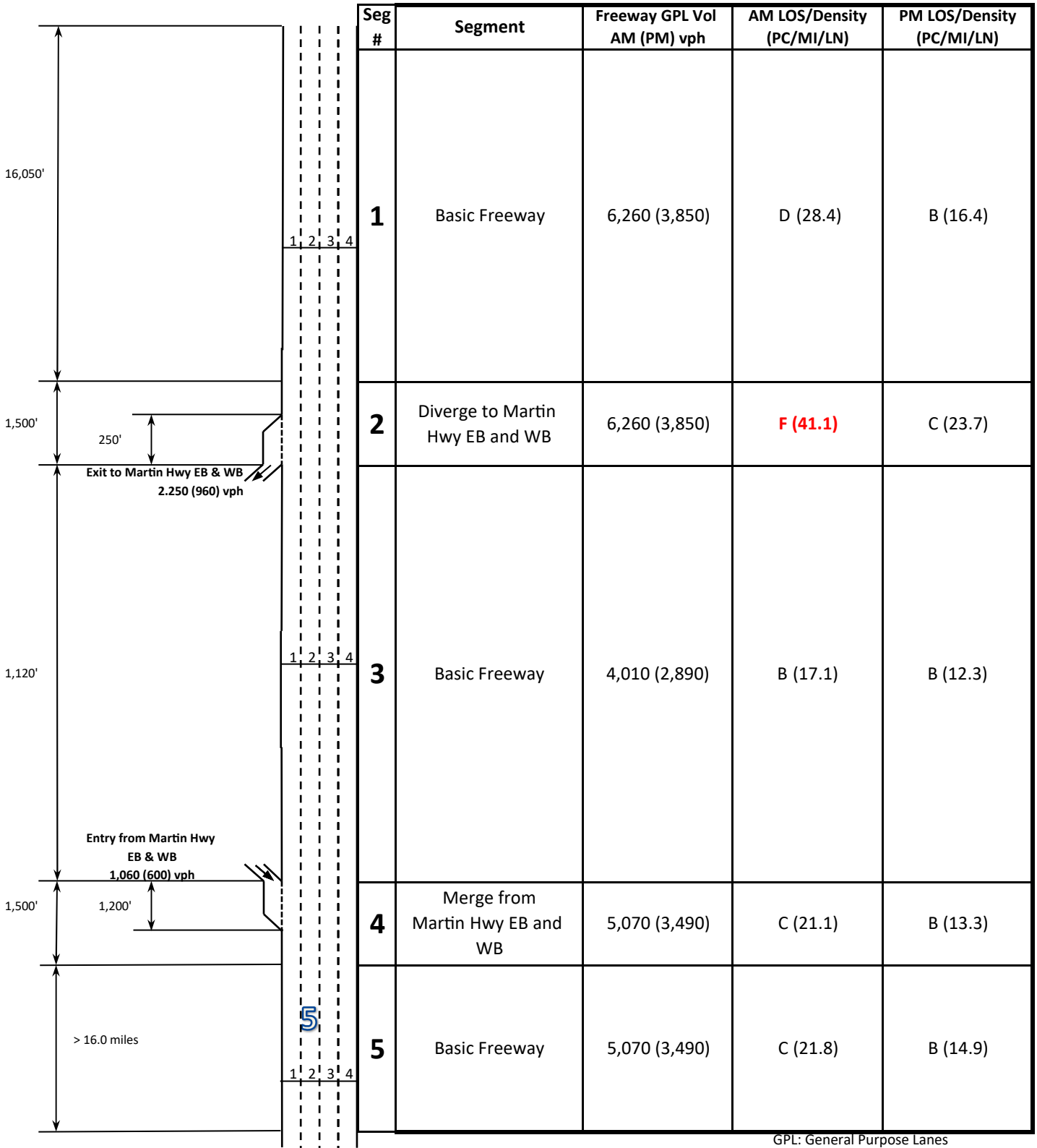
**Figure 5.2: 2025 No-Build Freeway Analysis Results - Southbound**



**Figure 5.3: 2045 No-Build Freeway Analysis Results - Northbound**



**Figure 5.4: 2045 No-Build Freeway Analysis Results - Southbound**



**Table 5.1: 2025 No-Build – Martin Highway (SR 714) Intersection Analysis**

AM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	AM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (81.9)	D (38.7)		B (11.7)	C (32.1)	A (1.7)		E (74.4)			D (37.2)		D (41.8)
			Approach	D (44.0)			C (28.6)			E (74.4)			D (37.2)			
		Queue Length 95th (ft)	Movement	#285	735		m3	750	12		#718			144		
	SW Leighton Farm Ave	LOS (Delay)	Movement	F (97.5)	B (12.1)		F (113.5)	B (16.6)	A (0.9)		B (13.7)			D (39.1)		B (18.1)
			Approach	B (15.1)			C (20.3)			B (13.7)			D (39.1)			
		Queue Length 95th (ft)	Movement	m83	m151		m105	601	m3		98			132		
	Turnpike Ramps	LOS (Delay)	Movement	D (48.3)	C (31.1)	A (5.8)	C (33.2)	C (24.6)	A (5.0)	F (97.6)	E (65.5)	C (24.2)	F (90.4)	E (76.0)	C (27.4)	D (41.7)
			Approach	D (36.2)			C (23.0)			D (53.7)			E (56.7)			
		Queue Length 95th (ft)	Movement	#432	368	47	m179	m241	m107	#387	433	253	145	307	419	
	SW High Meadow Avenue	LOS (Delay)	Movement	E (58.4)	F (151.6)	D (36.5)	F (308.8)	E (62.2)	A (8.4)	F (412.2)	F (98.4)	A (8.4)	F (416.8)	F (285.5)	A (5.9)	F (214.7)
			Approach	F (108.5)			F (108.9)			F (239.7)			F (324.4)			
		Queue Length 95th (ft)	Movement	m82	#815	344	#506	433	64	#1149	#741	60	#1911	#1955	54	
PM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	PM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	D (47.8)	D (38.0)		C (34.2)	B (11.1)	A (0.6)		C (21.9)		E (62.8)	A (7.2)	C (26.3)	
			Approach	D (38.7)			B (12.8)			C (21.9)			D (37.1)			
		Queue Length 95th (ft)	Movement	132	678		m158	201	m5		67			312		64
	SW Leighton Farm Ave	LOS (Delay)	Movement	F (98.2)	B (20.0)		F (95.8)	B (15.5)	A (0.1)		B (14.7)			D (40.7)		C (21.7)
			Approach	C (22.1)			C (20.2)			B (14.7)			D (40.7)			
		Queue Length 95th (ft)	Movement	m53	904		m118	m601	m0		78			171		
	Turnpike Ramps	LOS (Delay)	Movement	D (38.4)	C (27.6)	A (8.0)	C (23.9)	B (19.5)	A (4.1)	F (100.5)	E (61.6)	C (22.0)	E (74.3)	E (73.0)	F (109.9)	D (45.9)
			Approach	C (29.3)			B (19.1)			D (54.7)			F (92.7)			
		Queue Length 95th (ft)	Movement	#431	382	m88	m229	m222	m25	#275	305	137	117	#351	#753	
	SW High Meadow Avenue	LOS (Delay)	Movement	E (62.8)	D (39.9)	A (7.6)	F (92.0)	F (129.2)	B (16.5)	F (131.1)	F (163.8)	A (9.2)	F (222.6)	F (96.4)	A (0.9)	F (98.0)
			Approach	C (33.6)			F (107.1)			F (129.8)			F (111.4)			
		Queue Length 95th (ft)	Movement	m92	496	m82	#265	#895	155	#681	#1377	105	#354	#705	0	
Synchro Version 11 Build 156. HCM 6th Edition output used for unsignalized intersections due to limitations in Synchro.																
LOS notes:				Queue notes:												
Delay is in sec/veh units				-: Volume exceeds capacity, queue is theoretically infinite												
:Level Of Service (LOS) E reflecting at capacity operations				#: 95th percentile volume exceeds capacity												
:Level Of Service (LOS) F reflecting over capacity operations				m: Upstream metering is in effect												

**Table 5.2: 2045 No-Build – Martin Highway (SR 714) Intersection Analysis**

AM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	AM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (97.0)	F (92.0)		B (17.3)	C (25.7)	A (3.8)		E (57.1)			F (144.4)	A (9.6)	E (66.6)
			Approach	F (92.3)			C (23.2)			E (57.1)			F (124.7)			
		Storage (ft)	Movement	365	2500		50	3000	500		2800			2500	50	
		Queue Length 95th (ft)	Movement	#225	#1578		m6	516	m45		251			#724	39	
	SW Leighton Farm Ave	LOS (Delay)	Movement	F (106.4)	E (66.4)		F (109.2)	C (20.2)	A (1.6)		D (52.3)			E (67.7)		D (47.9)
			Approach	E (67.7)			C (22.8)			D (52.3)			E (67.7)			
		Storage (ft)	Movement	100	800		100	2130	180		>3000			875		
	Turnpike Ramps	LOS (Delay)	Movement	F (82.0)	F (160.0)	C (21.1)	F (277.2)	D (37.1)	B (14.7)	F (331.3)	F (123.4)	E (72.1)	F (156.8)	F (239.7)	D (42.7)	F (131.1)
			Approach	F (116.8)			F (103.5)			F (135.3)			F (172.5)			
		Storage (ft)	Movement	500	2130	350	425	1200	170				400	1800	400	
	SW High Meadow Avenue	LOS (Delay)	Movement	D (52.5)	F (331.2)	F (151.1)	F (420.4)	E (63.1)	B (15.7)	F (507.5)	E (67.7)	A (6.1)	F (442.1)	F (300.1)	B (19.5)	F (242.3)
			Approach	F (260.6)			F (129.3)			F (272.8)			F (300.6)			
		Storage (ft)	Movement	300	1250	300	375	1660	180	150	>3000	180	170	>3000	100	
		Queue Length 95th (ft)	Movement	m49	m#1357	m#715	#746	709	135	#1397	728	56	#983	#1644	152	
	PM Peak															
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	PM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (116.6)	D (48.4)		D (43.2)	C (31.5)	A (0.2)		F (119.4)			F (130.4)	B (12.7)	D (48.6)
			Approach	D (53.8)			C (30.4)			F (119.4)			F (89.1)			
		Storage (ft)	Movement	365	2500		50	3000	500		2800			2500	50	
		Queue Length 95th (ft)	Movement	#273	1010		m158	m188	m1		#487			#517	78	
	SW Leighton Farm Ave	LOS (Delay)	Movement	F (149.2)	A (5.8)		F (111.1)	E (77.6)	A (1.6)		C (26.0)			F (142.8)		D (54.9)
			Approach	B (15.7)			E (76.3)			C (26.0)			F (142.8)			
		Storage (ft)	Movement	100	800		100	2130	180		>3000			875		
	Turnpike Ramps	LOS (Delay)	Movement	F (430.4)	E (58.7)	A (10.0)	F (452.0)	F (263.7)	A (5.0)	F (371.4)	F (99.2)	C (29.5)	F (97.1)	F (372.4)	D (43.7)	F (241.2)
			Approach	F (231.8)			F (310.8)			F (119.2)			F (269.0)			
		Storage (ft)	Movement	500	2130	350	425	1200	170				400	1800	400	
	SW High Meadow Avenue	LOS (Delay)	Movement	F (110.1)	E (69.2)	B (16.2)	F (258.4)	F (285.9)	D (42.6)	F (415.6)	F (208.0)	B (15.7)	F (153.8)	F (192.4)	C (35.0)	F (185.6)
			Approach	D (53.9)			F (238.1)			F (260.7)			F (133.6)			
		Storage (ft)	Movement	300	1250	300	375	1660	180	150	>3000	180	170	>3000	100	
		Queue Length 95th (ft)	Movement	m#137	m#828	m258	#451	#1703	492	#1685	#1874	178	#246	#1024	292	

Synchro Version 11 Build 168. HCM 6th Edition output used for unsignalized intersections due to limitations in Synchro.

LOS notes:

Delay is in sec/veh

- :Level Of Service (LOS) E reflecting at-capacity operations
- :Level Of Service (LOS) F reflecting over-capacity operations

Queue notes:

- : Volume exceeds capacity, queue is theoretically infinite
- #: 95th percentile volume exceeds capacity
- m: Upstream metering is in effect

## SECTION FIVE

## Future Traffic Conditions

**Table 5.3** summarizes the results of the off-ramp signals back of queue analyses for the AM and PM design hours for the 2045 No-Build conditions. The 95<sup>th</sup> percentile queues were obtained from Synchro reports. The Synchro reported queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length. The results present the queue length in feet for each lane group movement. Since both the northbound and the southbound off-ramps come together at the ramp terminal, the estimated queue lengths were divided equally between the northbound and southbound off-ramp movements. The available storage length was calculated from the stop bar at the ramp terminal intersection to the gore with Turnpike mainline minus the 615 feet required for stopping distance for a design speed of 70 mph per FDOT’s 2016 Green book (Table 3-22), and accounting for the changes in number of lanes. The analysis shows that even though the queues on the northbound and southbound off-ramps at the Martin Highway interchange do not exceed the available storage lengths during one or both design hours, they are approaching failing conditions, particularly during the AM design hour. As noted by the “#” sign, the 95<sup>th</sup> percentile queue could be longer than shown in the Synchro output.

**Table 5.3**  
**2045 No-Build – Off-Ramp Signals Queuing Analysis Results**

Intersection	Approach	Movement	Available Storage (feet)	Queue (feet)	
				AM	PM
Martin Highway at NB Off-Ramp	Northbound	L (WB)	840	#518	#397
		TH (NB)	1,010	#1,024	#823
		R (EB)	950	#776	323
Martin Highway at SB Off-Ramp	Northbound	L (WB)	1,150	#518	#397
		TH (NB)	1,320	#1,024	#823
		R (EB)	1,260	#776	323

**Notes:**

Synchro queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length.

# = 95th percentile volume exceeds capacity; queue may be longer.

Queue lengths exceeding the available storage lengths are shown in Red.

### 5.2 BUILD ALTERNATIVE – TRAFFIC OPERATIONAL ANALYSIS

The proposed improvements are expected to provide better operating conditions than the No-Build conditions and prevent spillbacks from the ramp terminals onto the mainline.

#### 5.2.1 2025 and 2045 – Freeway Analysis

The mainline/basic, and ramp merge/diverge analysis results for Opening Year 2025 are summarized and depicted on **Figures 5.5** and **5.6** for the northbound and southbound directions, respectively. The Design Year 2045 analysis results are summarized and depicted on **Figures 5.7** and **5.8** for the northbound and southbound directions, respectively. Documentation of the 2025 and 2045 Build Alternative traffic freeway operational analysis is provided in **Appendix J**.

## SECTION FIVE

## Future Traffic Conditions

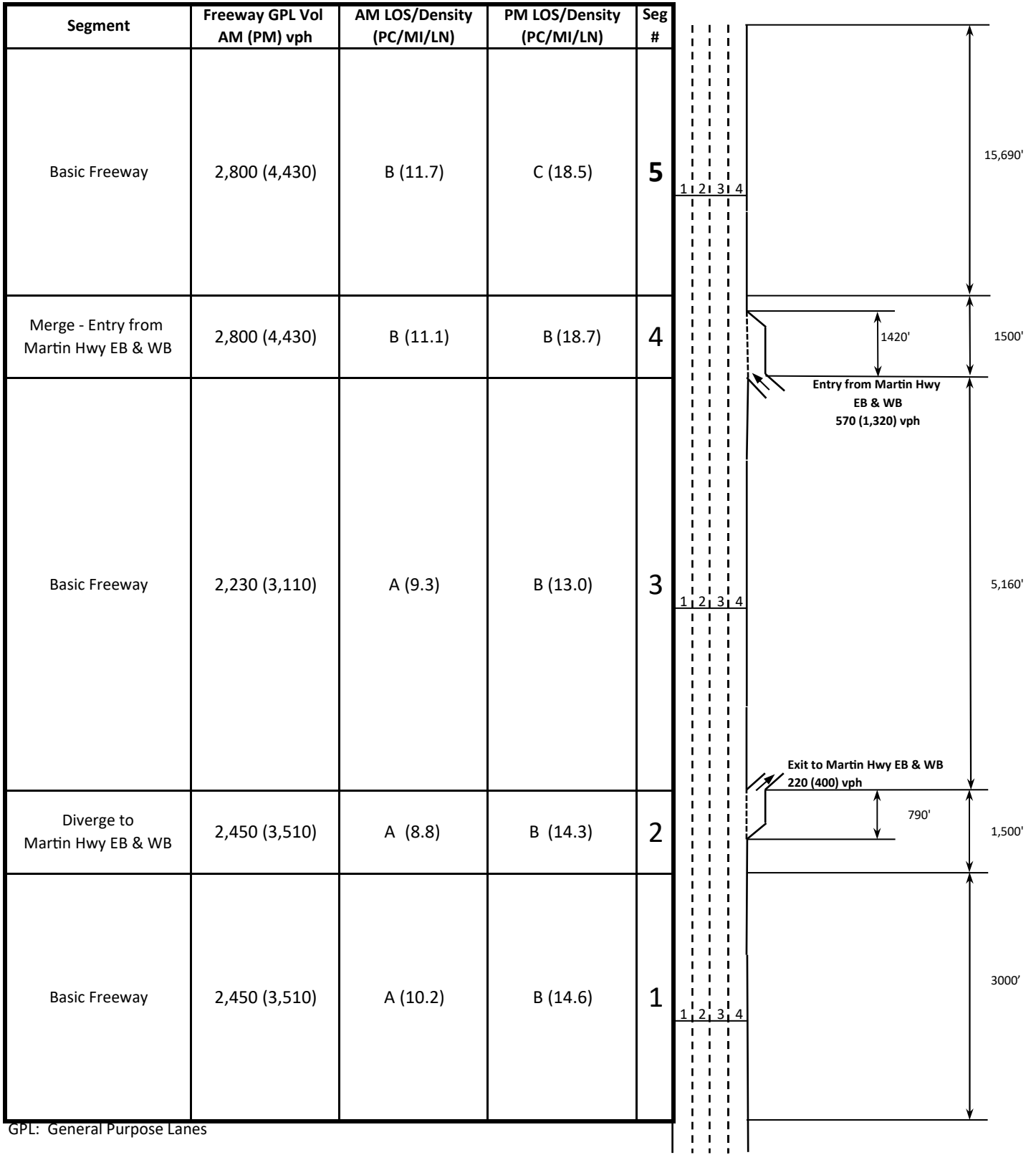
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The mainline and ramp freeway segments are projected to operate at LOS D or better under the Build condition by Design Year 2045. Following are the key points for traffic operational improvements under Build compared to No-Build:

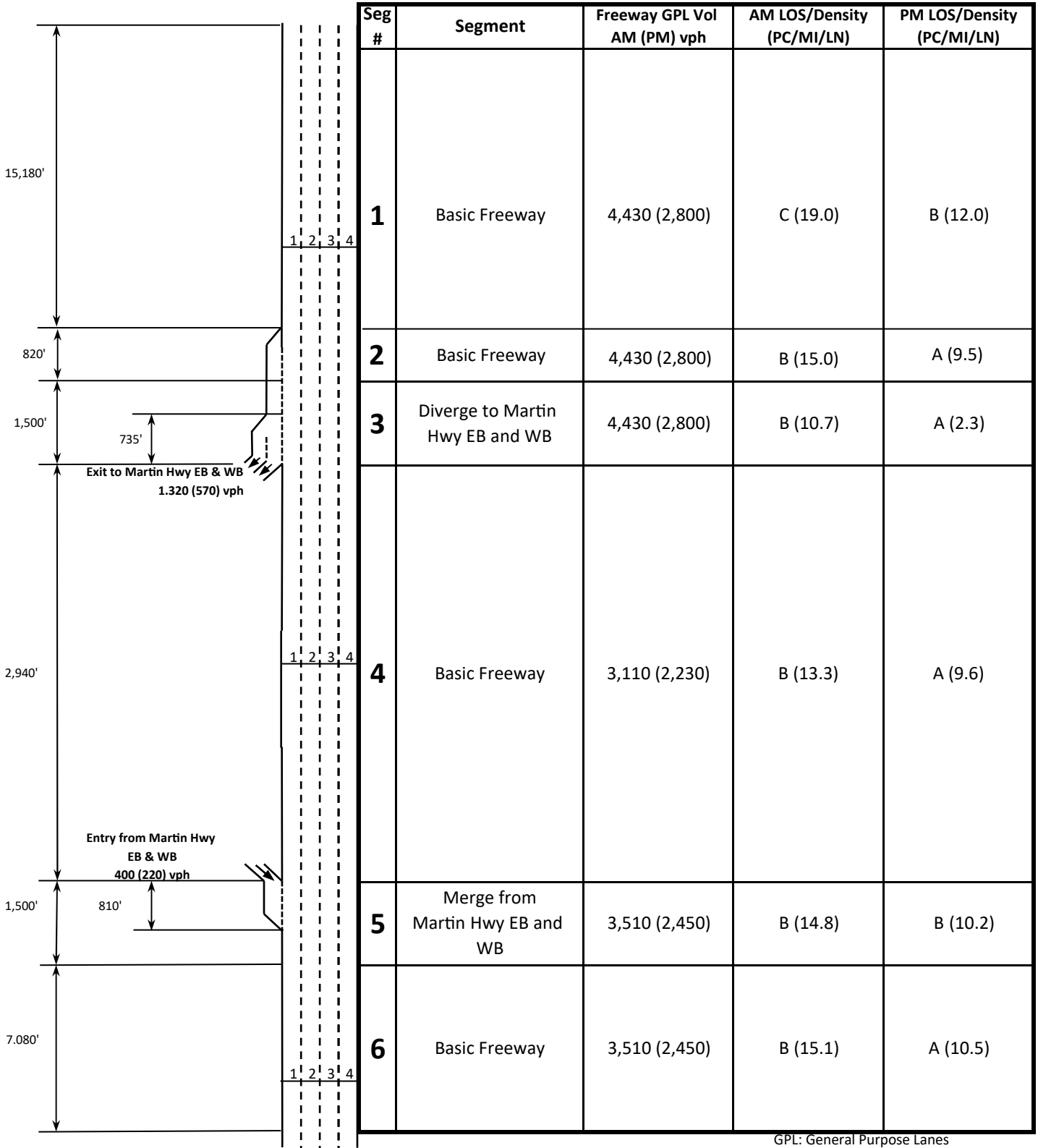
- Two-lane southbound off-ramp from Turnpike to SW Martin Highway.
- Two-lane northbound on-ramp from SW Martin Highway to until it ties to Turnpike as single lane . The single-lane ramps will provide acceptable operations at other locations beyond the design year (2045)
- These improvements are also likely to improve safety by reducing congestion.



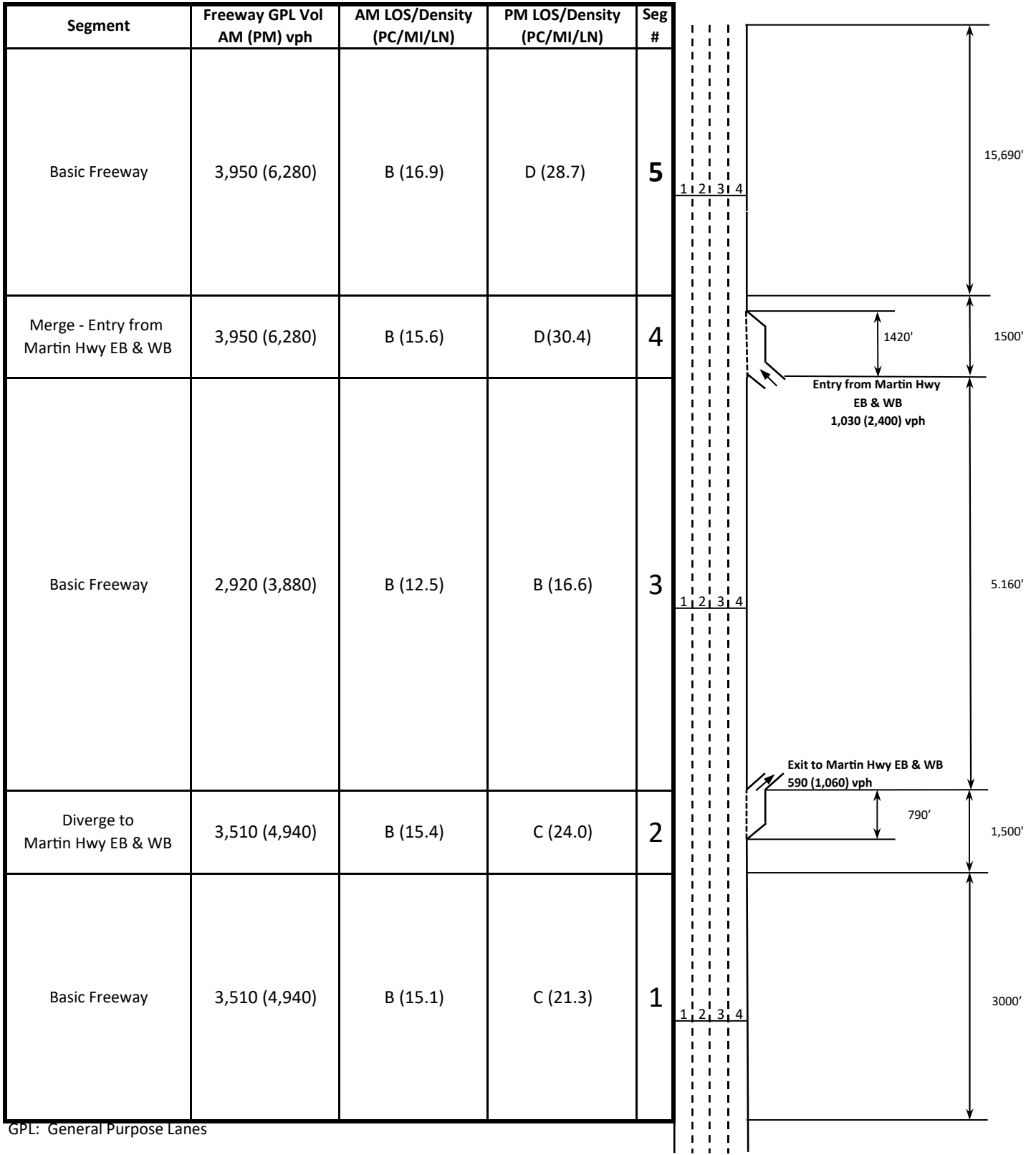
**Figure 5.5: 2025 Build Freeway Analysis Results - Northbound**



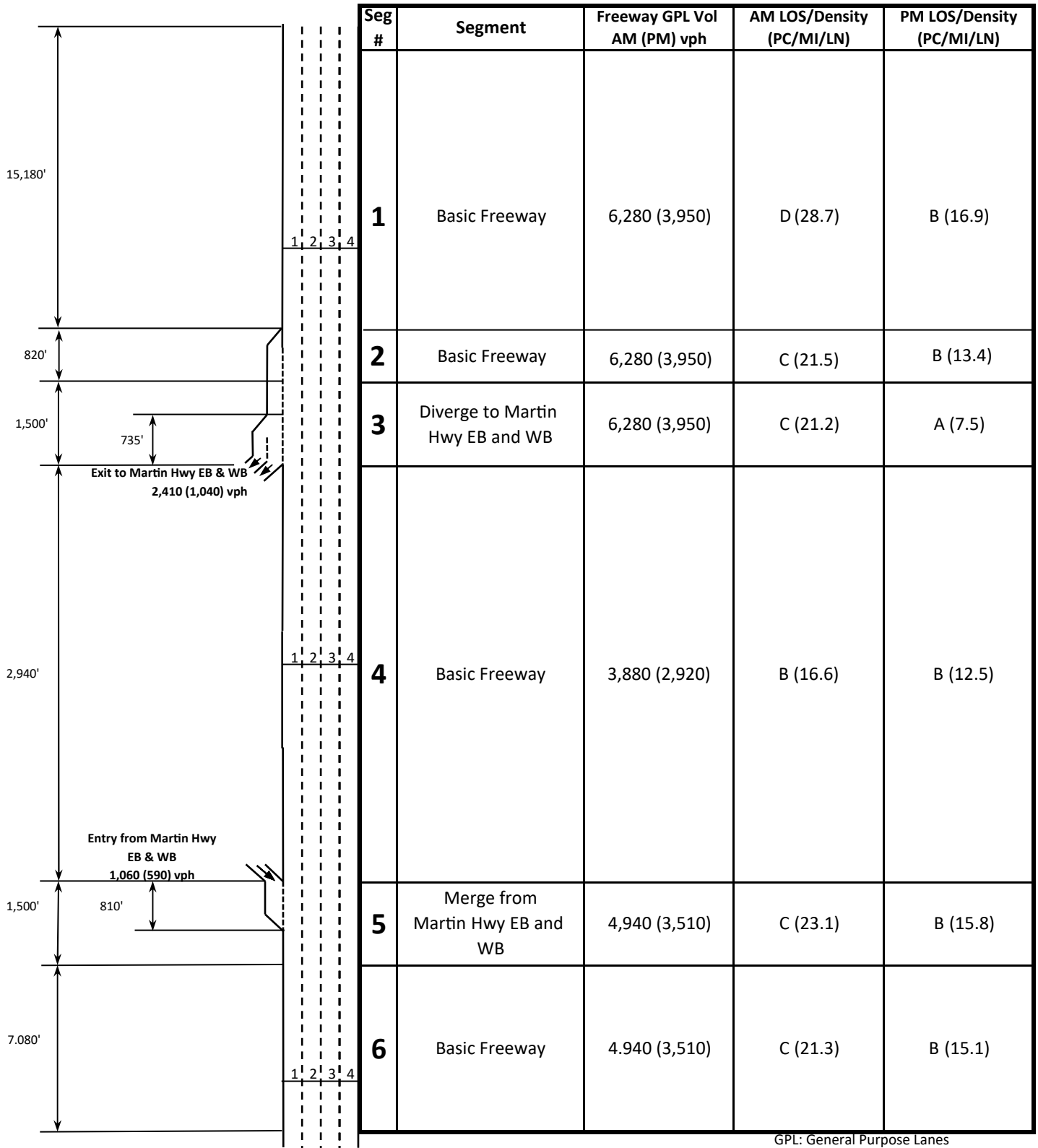
**Figure 5.6: 2025 Build Freeway Analysis Results - Southbound**



**Figure 5.7: 2045 Build Freeway Analysis Results - Northbound**



**Figure 5.8: 2045 Build Freeway Analysis Results - Southbound**



## SECTION FIVE

## Future Traffic Conditions

### 5.2.2 2025 and 2045 – Intersection Analysis

**Tables 5.4** and **5.5** summarize the results of the Martin Highway signalized intersection analyses for the AM and PM design hours for the Build Alternative in 2025 and 2045, respectively. Signal timing was optimized for each intersection. To avoid the starvation, the offset and splits were optimized. Also, an exclusive southbound left turn lane has been proposed at the intersection of Martin Highway and SW Leighton Farm Avenue. The results include delays (in seconds per vehicle) and level of service by movement, approach, and the overall intersection. The 95<sup>th</sup> percentile queue lengths have also been summarized by movement. **Appendix K** presents the intersection analysis worksheets. The intersection analysis results indicate the following for the 2045 Design Year:

The intersection of High Meadows Avenue is projected to operate at LOS F during both the AM and the PM design hours. However, the overall delay is lower during the AM peak hour and slightly higher compared to No-Build. Even though there are deficiencies projected for the Build Alternative at the intersection of SW High Meadow and Martin Highway Boulevard intersection, it should be noted that there is little or no degradation in the eastbound direction queues compared to the No-Build alternative. Based on the 2040 Treasure Coast Regional Long-Range Transportation Plan, no improvement has been identified at Martin Highway Boulevard and SW High Meadow intersection. However, under Regional Roadway Needs, SW High Meadow Avenue has been listed as widen 2 to 4L from I-95 to Martin Highway Boulevard.

The Build alternative is projected to reduce the average vehicle delay at the Turnpike ramp terminal intersection by more than 70 seconds/vehicle (approximately 58 percent reduction) during the 2045 AM design hour and by 150 seconds/vehicle (approximately 63 percent reduction) during the 2045 PM design hour when compared with the 2045 No-Build intersection delays.

- The intersections of SW 42<sup>nd</sup> Avenue and Leighton Farm Avenue are projected to operate at LOS D or better.
- The roundabout at SW Leighton Farm Avenue and southbound off-ramp is expected to operate at LOS A.

Following are the key points for traffic operation improvements under Build:

- Between SW High Meadows Avenue and SW Armellini Avenue, SW Martin Highway will be widened from the existing four-lane typical section to a six-lane typical section with three lanes in each direction.
- West of SW Armellini Avenue until SW Deggeller Court, SW Martin Highway will be widened from the existing two-lane typical section to a six-lane typical section with three lanes in each direction. The SW Martin Highway Bridge over the Turnpike mainline will be reconstructed to accommodate the widening.
- Intersection capacity improvements at SW Leighton Farm Avenue, Turnpike ramp terminal/SW Martin Downs Boulevard and SW High Meadows Avenue along SW Martin Highway.

**Table 5.4: 2025 Build – Martin Highway (SR 714) Intersection Analysis**

AM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	AM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (103.4)	D (36.5)		B (13.0)	C (23.4)	A (2.3)		E (60.0)			D (40.1)	A (0.3)	D (36.0)
			Approach	D (44.6)			C (21.0)			E (60.0)			C (26.9)			
		Queue Length 95th (ft)	Movement	#254	717		m6	245	18		#552			161	0	
	SW Leighton Farm Ave	LOS (Delay)	Movement	A (6.6)	A (7.2)		C (25.9)	B (15.8)	A (0.3)	E (79.4)	C (30.5)		F (85.1)	C (23.5)		B (17.8)
			Approach	A (7.2)			B (15.4)			E (58.8)			D (44.1)			
		Queue Length 95th (ft)	Movement	m11	146		m67	533	m0	166	151		71	60		
	Turnpike Ramps	LOS (Delay)	Movement	D (38.6)	C (25.1)	A (2.5)	C (31.6)	C (20.5)	A (9.3)	E (75.7)	E (59.5)	C (24.0)	E (78.9)	D (46.3)	A (5.6)	C (31.3)
			Approach	C (28.2)			C (21.4)			D (43.0)			C (33.5)			
		Queue Length 95th (ft)	Movement	255	249	33	m122	m157	m108	35	300	182	134	162	62	
	SW High Meadow Avenue	LOS (Delay)	Movement	D (52.0)	F (219.1)	C (26.8)	F (433.3)	E (64.2)	B (13.1)	F (369.3)	F (230.7)	B (13.9)	F (225.8)	F (304.9)	A (8.1)	F (209.4)
			Approach	F (148.5)			F (152.6)			F (270.8)			F (249.1)			
		Queue Length 95th (ft)	Movement	58	#850	238	#601	424	85	#1111	#848	79	#1598	#1876	66	
SB Off-Ramp @ Leighton Farm*	LOS (Delay)	Movement				A (3.5)		A (0.0)		A (3.9)			A (3.3)		A (2.0)	
		Approach				A (0.2)			A (3.9)			A (3.3)				
	Queue Length 95th (ft)	Movement				0		0		0			0			
PM Peak																
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	PM Movement/Approach LOS (Delay)												Intersection AM LOS (Delay)
				Eastbound			Westbound			Northbound			Southbound			
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	C (30.1)	C (29.1)		C (24.1)	B (13.6)	A (0.5)		B (17.1)			E (63.0)	A (5.9)	C (22.5)
			Approach	C (29.2)			B (13.6)			B (17.1)			D (36.5)			
		Queue Length 95th (ft)	Movement	#81	413		66	205	m0		51			#257	44	
	SW Leighton Farm Ave	LOS (Delay)	Movement	A (4.9)	A (2.2)		C (33.9)	B (10.2)	A (0.3)	D (47.8)	C (25.1)		E (56.6)	C (26.7)		B (10.1)
			Approach	A (2.2)			B (11.3)			D (35.9)			D (38.2)			
		Queue Length 95th (ft)	Movement	m2	50		m#79	314	m1	56	#89		#73	#73		
	Turnpike Ramps	LOS (Delay)	Movement	D (37.5)	C (22.6)	A (6.5)	D (42.2)	D (37.0)	A (6.1)	D (43.4)	D (51.6)	B (16.9)	E (57.1)	D (42.1)	B (18.5)	C (32.6)
			Approach	C (26.6)			D (35.8)			D (38.2)			C (31.2)			
		Queue Length 95th (ft)	Movement	#202	140	69	m148	m142	m49	38	#160	76	#88	143	215	
	SW High Meadow Avenue	LOS (Delay)	Movement	F (110.0)	E (72.6)	C (23.5)	E (78.8)	F (122.4)	C (23.0)	F (128.0)	F (139.1)	B (12.6)	F (248.4)	F (80.1)	A (1.1)	F (98.9)
			Approach	E (62.0)			F (102.4)			F (116.1)			F (108.2)			
		Queue Length 95th (ft)	Movement	m#157	537	130	#267	#1060	205	#738	#1527	134	#420	#725	1	
SB Off-Ramp @ Leighton Farm*	LOS (Delay)	Movement				A (3.3)		A (0.0)		A (3.5)			A (3.6)		A (2.6)	
		Approach				A (0.3)			A (3.5)			A (3.6)				
	Queue Length 95th (ft)	Movement				0		0		0			0			

Synchro Version 11 Build 156. HCM 6th Edition output used for unsignalized intersections due to limitations in Synchro.

**LOS notes:**

Delay is in sec/veh units

Level Of Service (LOS) E reflecting at capacity operations

Level Of Service (LOS) F reflecting over capacity operations

**Queue notes:**

-: Volume exceeds capacity, queue is theoretically infinite

#: 95th percentile volume exceeds capacity

m: Upstream metering is in effect

\*Roundabout Intersection. Delays more than 99 sec/veh shown as 99 sec/veh indicating LOS F.

**Table 5.5: 2045 Build – Martin Highway (SR 714) Intersection Analysis**

AM Peak																	
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	AM Movement/Approach LOS (Delay)											Intersection AM LOS (Delay)		
				Eastbound			Westbound			Northbound			Southbound				
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through		Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (88.6)	E (64.1)		B (12.4)	C (27.3)	A (2.4)		D (51.8)			A (0.4)	D (54.7)		
		Approach		E (65.3)			C (24.6)			D (51.8)		F (150.9)					
		Storage (ft)	Movement	365	2500		50	800	500		2800			2500		50	
		Queue Length 95th (ft)	Movement	#172	#1422		m7	m697	m32		239			#668		0	
	SW Leighton Farm Ave	LOS (Delay)	Movement	A (4.0)	B (10.7)		F (260.3)	A (7.2)	A (0.2)		F (186.2)	E (68.3)		F (81.8)	F (202.4)	D (35.8)	
		Approach		B (10.5)			B (17.4)			F (144.8)			F (189.9)				
		Storage (ft)	Movement	100	800		300	2130	180				875	875			
		Queue Length 95th (ft)	Movement	m10	m188		m#159	625	m1		See Table 5.6		35	#233			
	Turnpike Ramps	LOS (Delay)	Movement	E (57.7)	D (52.8)	A (9.5)	E (59.3)	C (29.2)	B (11.3)		E (70.4)	F (93.4)	D (48.9)	F (107.2)	E (67.1)	B (19.7)	D (54.1)
		Approach		D (45.5)			C (34.2)			E (71.8)			E (60.4)				
		Storage (ft)	Movement	500	2130	350	700	1200	170				400	1800	400		
		Queue Length 95th (ft)	Movement	m203	#654	m132	m195	m262	m151		See Table 5.6		#200	493	151		
	SW High Meadow Avenue	LOS (Delay)	Movement	D (49.2)	F (338.3)	B (13.3)	F (365.9)	E (58.4)	A (8.9)		F (445.8)	F (103.4)	A (5.4)	F (396.2)	F (442.0)	B (14.8)	F (230.4)
		Approach		F (216.4)			F (114.5)			F (256.7)			F (361.8)				
		Storage (ft)	Movement	300	1250	300	375	1660	180		150	>3000	180	170	>3000	100	
		Queue Length 95th (ft)	Movement	m58	m#1555	m156	#677	666	89		#1232	#809	45	#925	#1533	121	
	SB Off-Ramp @ Leighton Farm*	LOS (Delay)	Movement				A (3.8)		A (0.0)			A (4.3)			A (3.7)	A (2.0)	
		Approach					A (0.1)				A (4.3)			A (3.7)			
Storage (ft)		Movement				200		200			>3000			900			
Queue Length 95th (ft)		Movement				0		0			0			0			
PM Peak																	
Arterial	Signal Controlled Intersections	Measure of Effectiveness (MOE)	Location	PM Movement/Approach LOS (Delay)											Intersection AM LOS (Delay)		
				Eastbound			Westbound			Northbound			Southbound				
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through		Right	
SW Martin Highway (MP 133)	SW 42nd Avenue	LOS (Delay)	Movement	F (281.3)	D (45.6)		D (51.0)	B (15.9)	A (0.7)		F (173.8)			F (222.7)	B (16.7)	D (54.7)	
		Approach		E (64.8)			B (18.2)			F (173.8)			F (150.3)				
		Storage (ft)	Movement	365	2500		50	800	500		2800			2500	50		
		Queue Length 95th (ft)	Movement	#327	950		m233	m746	m6		#528			#577	93		
	SW Leighton Farm Ave	LOS (Delay)	Movement	F (222.6)	A (3.0)		B (12.8)	B (12.9)	A (0.0)		F (228.6)	F (117.2)		F (228.4)	F (238.8)	D (38.6)	
		Approach		B (17.2)			B (12.4)			F (183.8)			F (233.8)				
		Storage (ft)	Movement	100	800		300	2130	180				875	875			
		Queue Length 95th (ft)	Movement	m#207	m131		m8	m346	m0		See Table 5.6		#335	#357			
	Turnpike Ramps	LOS (Delay)	Movement	F (155.4)	E (59.4)	B (12.7)	D (50.5)	F (101.6)	B (13.9)		F (140.0)	E (76.1)	B (15.5)	F (105.9)	F (145.0)	C (27.5)	F (88.3)
		Approach		F (100.9)			E (73.2)			E (60.1)			F (118.4)				
		Storage (ft)	Movement	500	2130	350	700	1200	170				400	1800	400		
		Queue Length 95th (ft)	Movement	m#532	m404	m90	m259	m357	m64		See Table 5.6		#263	#1041	246		
	SW High Meadow Avenue	LOS (Delay)	Movement	F (114.9)	E (69.7)	A (7.1)	F (231.6)	F (285.8)	D (41.1)		F (346.7)	F (251.2)	B (18.1)	F (205.8)	F (328.8)	D (43.0)	F (191.9)
		Approach		D (51.2)			F (235.1)			F (255.7)			F (209.6)				
		Storage (ft)	Movement	300	1250	300	375	1660	180		150	>3000	180	170	>3000	100	
		Queue Length 95th (ft)	Movement	m#143	#877	m87	#442	#1748	503		#1630	#1938	193	#289	#1088	#319	
	SB Off-Ramp @ Leighton Farm*	LOS (Delay)	Movement				A (3.4)		A (0.0)			A (3.7)			A (4.2)	A (2.8)	
		Approach					A (0.2)				A (3.7)			A (4.2)			
Storage (ft)		Movement				200		200			>3000			900			
Queue Length 95th (ft)		Movement				0		0			0			0			

Synchro Version 11 Build 156. HCM 6th Edition output used for unsignalized intersections due to limitations in Synchro.

LOS notes: Queue notes:  
 Delay is in sec/veh ~: Volume exceeds capacity, queue is theoretically infinite  
 :Level Of Service (LOS) E reflecting at-capacity operations #: 95th percentile volume exceeds capacity  
 :Level Of Service (LOS) F reflecting over-capacity operations m: Upstream metering is in effect

\*Roundabout Intersection. Delays more than 99 sec/veh shown as 99 sec/veh indicating LOS F.

## SECTION FIVE

## Future Traffic Conditions

**Table 5.6** summarizes the results of the off-ramp signals back of queue analyses for the AM and PM design hours for the 2045 Build conditions. The Synchro reported queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length. The results present the queue length in feet for each lane group movement. Since both the northbound and the southbound off-ramps come together at the ramp terminal, the estimated queue lengths were divided equally between the northbound and southbound off-ramp movements. The available storage length was calculated from the stop bar at the ramp terminal intersection to the gore with Turnpike mainline minus the 615 feet required for stopping distance for a design speed of 70 mph per FDOT’s 2016 Green book (Table 3-22), and accounting for the changes in number of lanes. The analysis indicates that the off-ramp queue lengths are not expected to exceed the available storage lengths.

**Table 5.6**  
**2045 Build – Off-Ramp Signals Queuing Analysis Results**

Intersection	Approach	Movement	Available Storage (feet)	Queue (feet)	
				AM	PM
Martin Highway at NB off-ramp	Northbound	L (WB)	2,220	155	#380
		TH (NB)	1,720	#906	#740
		R (EB)	2,600	#526	177
Martin Highway at SB off-ramp	Northbound	L (WB)*	1,430	0	0
		TH (NB)	5,190	#906	#740
		R (EB)	4,390	#526	177

\*The southbound off-ramp to westbound Martin Highway movement has been diverted to a roundabout at Leighton Farm Avenue.

Notes:

Synchro queue was multiplied by the number of turn lanes and the lane utilization factor to calculate the total queue length.

# = 95<sup>th</sup> percentile volume exceeds capacity; queue may be longer.



## SECTION FIVE

## Future Traffic Conditions

**Table 5.7** provides a comparison of the intersection analysis results for the No-Build and Build conditions. It is evident from this summary that the Build alternative is projected to provide better operating conditions than the No-Build in Design Year 2045. Considering the overall operations along Florida’s Turnpike, ramp terminals, and along Martin Highway, the Build alternative is projected to provide better operating conditions than the No-Build.

**Table 5.7  
Comparison of No-Build and Build – Intersection Analysis Results**

Arterial	Signal Controlled Intersections	2045	
		No-Build	Build
		LOS (Delay)	LOS (Delay)
<b>AM Peak</b>			
SR 714/Martin Highway (MP 133)	SW 42 <sup>nd</sup> Avenue	E (66.6)	D (54.7)
	SW Leighton Farm Avenue	D (47.9)	D (35.8)
	Turnpike Ramps	F (131.1)	D (54.1)
	SW High Meadows Avenue	F (242.3)	F (230.4)
	SB off-ramp at Leighton Farm (Roundabout)		A (2.0)
<b>PM Peak</b>			
SR 714/Martin Highway (MP 133)	SW 42 <sup>nd</sup> Avenue	D (48.6)	D (54.7)
	SW Leighton Farm Avenue	D (54.9)	D (38.6)
	Turnpike Ramps	F (241.2)	F (88.3)
	SW High Meadows Avenue	F (185.6)	F (191.9)
	SB off-ramp at Leighton Farm (Roundabout)		A (2.8)

**Notes:**

Synchro Version 11. HCM 6<sup>th</sup> Edition output used for roundabout intersections due to limitations in Synchro.

Delay is in seconds per vehicle (sec/veh).

  = Level of service (LOS) E reflecting at capacity operations

  = Level of service (LOS) F reflecting overcapacity operations

## SECTION FIVE

## Future Traffic Conditions

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### 5.3 SAFETY ANALYSIS OF THE 2045 NO-BUILD AND BUILD ALTERNATIVES

#### 5.3.1 HSM Analysis

A safety analysis was conducted to study the impacts of the proposed Build Alternative on the local street network within the AOI. The study area focused on the Florida's Turnpike freeway segments, ramp terminals and ramp segments, and Martin Highway arterial segment and major intersections along the arterial. The analysis was conducted using the predictive methods in Chapters 12 and 19 of the Highway Safety Manual (HSM), where available, and the Enhanced Interchange Safety Analysis Tool (ISATe), which apply a combination of Safety Performance Functions (SPFs), crash modification factors (CMFs), and calibration factors to estimate frequency and cost of crashes for each segment and intersection.

It is important to note that the current edition of the HSM does not include a predictive method for arterial segments with six or more lanes. A research effort under the NCHRP Project 17-58 is underway to develop predictive methods for six-lane urban and suburban arterials and will be included in the next edition of the HSM (Chapter 12). The analysis was conducted assuming the predictive methods for four-lane divided arterials for both the No-Build and the Build alternatives.

The No-Build scenario assumes widening on the Florida's Turnpike mainline to eight lanes. Under the Build alternative, approximately 3,500 feet south of Martin Highway, the northbound off-ramp diverts from the Turnpike mainline and curves to the right. The ramp splits into two, one-lane ramps that intersect Martin Highway at SW Martin Downs Boulevard. The outside ramp provides drivers the ability to make a right turn onto Martin Highway, while the inside ramp provides drivers the ability to continue through onto SW Martin Downs Boulevard, as well as turn left onto Martin Highway. The two-lane northbound on-ramp begins approximately 800 feet south of the Martin Highway and SW Martin Downs Boulevard intersection and loops from the south to the north, to tie into the Turnpike mainline approximately 1,900 feet north of Martin Highway.

Approximately 750 feet north of Martin Highway, the southbound off-ramp diverts from the Turnpike mainline and curves to the right, splitting into a one-lane ramp and a two-lane ramp. A single-lane ramp continues to the west until ending at SW Leighton Farm Avenue at a proposed roundabout. Note that ISATe does not support roundabout configuration. Leighton Farm Avenue is realigned to intersect Martin Highway at SW Deggeller Court. Drivers can turn left or right onto Martin Highway or continue through on SW Deggeller Court. At the southbound off-ramp split, a two-lane ramp curves from the west to the east, crossing at a bridge over the Turnpike mainline, until it loops to the north to intersect Martin Highway at SW Martin Downs Boulevard. Drivers can continue through onto SW Martin Downs Boulevard or turn right onto Martin Highway. The southbound on-ramp begins approximately 800 feet south of SW Martin Highway and curves to the west, crossing at a bridge over the Turnpike mainline, before looping around to tie into the Turnpike mainline approximately 3,500 feet south of Martin Highway. Between SW High Meadows Avenue and SW Armellini Avenue, Martin Highway is widened from the existing four-lane typical section to a six-lane typical section with three

## SECTION FIVE

## Future Traffic Conditions

lanes in each direction. West of SW Armellini Avenue until SW Deggeller Court, Martin Highway is widened from the existing two-lane typical section to a six-lane typical section with three lanes in each direction.

The No-Build and Build Alternatives were evaluated, and the predicted number of crashes and associated costs were compared for the 2025 to 2045 analysis period. The results of the safety analysis are summarized in **Table 5.8**. It is important to note that the safety analysis tools available to date are deterministic in nature and estimate future crashes mainly based on AADT and roadway characteristics. These tools do not account for vehicle interactions. The overall predicted crashes are lower for Build compared to No-Build. Based on these results, the Build alternative is predicted to have a 20-year crash cost savings of approximately \$27 Million compared to the No-Build alternative, in 2019 present value. Detailed analysis tables are provided in **Appendix L**.

**Table 5.8**  
**2025 to 2045 Predicted Number of Crashes and Cost Saving**

Site	No-Build		Build	
	N <sub>predicted</sub> *	2019 Present Value	N <sub>predicted</sub> *	2019 Present Value
<b>SW Martin Highway Interchange</b>				
Freeway segments	918.53	\$83,853,990.18	749.73	\$68,513,848.85
Ramp segments	242.70	\$18,182,248.44	184.19	\$13,784,511.09
Ramp Terminals	198.77	\$20,271,107.94	197.01	\$20,041,119.71
<b>SUBTOTAL</b>	<b>1,360.00</b>	<b>\$122,307,346.56</b>	<b>1,130.94</b>	<b>\$102,339,479.64</b>
<b>SW Martin Highway Intersection</b>				
SW Martin Highway/SW 42 <sup>nd</sup> Avenue	311.13	\$36,180,888.66	304.70	\$35,431,470.63
SW Martin Highway/SW Leighton Farm Avenue	412.47	\$47,960,357.59	343.43	\$39,943,041.03
SW Martin Highway/SW High Meadows Avenue	598.52	\$69,613,547.12	613.74	\$71,373,764.87
<b>SUBTOTAL (Intersection)</b>	<b>1,322.12</b>	<b>\$153,754,793.37</b>	<b>1,261.87</b>	<b>\$146,748,276.54</b>
<b>SW Martin Highway Segments</b>				
Between SW 42 <sup>nd</sup> Avenue and SW Deggeller Court	9.50	\$1,106,099.37	9.27	\$1,079,050.89
Between SW Leighton Farm Avenue and SW Armellini Avenue	88.28	\$10,272,351.12	81.76	\$9,523,600.28
Between SW Martin Downs Boulevard and SW High Meadows Avenue	30.31	\$3,527,077.27	31.25	\$3,634,875.61
<b>Leighton Farm Avenue Segments</b>				
Between SW Martin Highway and SW 39 <sup>th</sup> Street	2.45	\$309,863.18	3.40	\$428,167.06
<b>SUBTOTAL (Segment)</b>	<b>130.54</b>	<b>\$15,215,390.94</b>	<b>125.67</b>	<b>\$14,665,693.84</b>
<b>TOTAL</b>	<b>2812.66</b>	<b>\$291,277,530.87</b>	<b>2518.48</b>	<b>\$263,753,450.02</b>
<b>CRASH COST SAVING</b>	<b>\$27,524,080.85</b>			

\*Predicted Crashes; Source: FDOT 2020 Design Manual Crash Cost Table 122.6.2 and HSM Crash Distribution for Florida Table 122.6.4

## SECTION SIX

## Other Considerations

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### 6.1 POTENTIAL DESIGN EXCEPTIONS AND VARIATIONS

No potential design exceptions or variations have been identified for the Turnpike mainline widening or the proposed modification to the existing interchange. If design variations and exceptions arise, they will be processed per FHWA and FDOT standards.

A discussion of the access modifications with respect to conformance with the FHWA policy points related to access is provided below. Florida's Turnpike is not, however, part of the interstate system.

## 7.1 FHWA'S POLICY ON ACCESS TO THE INTERSTATE SYSTEM

### ***Considerations and Requirements***

- 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, and 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 (Title 23, Code of Federal Regulations (CFR), paragraphs 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)).*

The operational analysis conducted for the Martin Highway IMR confirmed that the proposed interchange modifications are not expected to have adverse impacts on safety and operations Florida's Turnpike. The proposed Build alternative provides for the separation of the heaviest off-ramp right-turn movement (northbound to eastbound) from the left-turn and through movements on the northbound approach of the ramp terminal. Furthermore, this alternative also eliminates the weave between the northbound through and left-turn movements from the northbound and southbound off-ramps. The arrangement proposed under the Build alternative not only eliminates the weaving between the movements from the northbound and southbound off-ramps but also reduces the demand on the northbound approach by approximately 400 vph. The Build alternative is projected to reduce the average vehicle delay at the Turnpike ramp terminal intersection by more than 70 seconds/vehicle (approximately 58 percent reduction) during the 2045 AM design hour and by 150 seconds/vehicle (approximately 63 percent reduction) during the 2045 PM design hour when compared with the 2045 No-Build intersection delays.

The projected failing conditions under the No-Build alternative are expected to increase future crash risk within the project corridor. This potential for increased crash risk is alleviated by the

## SECTION SEVEN

## Project Justification

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capacity improvements proposed in the Build alternative. The overall predicted crashes are lower for Build compared to No-Build. Based on the HSM results, the Build alternative is predicted to have a 20-year crash cost savings of approximately \$27 Million compared to the No-Build alternative, in 2019 present value.

- 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 or high occupancy vehicle and high occupancy toll 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.*

This Martin Highway IMR does not propose new interchanges along Florida’s Turnpike. The existing interchange provides access to public roads only. The improvements proposed at the interchange will maintain full access to the existing cross streets and accommodate all movements.

## **SECTION EIGHT**

## **Conceptual Funding**

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The PD&E reevaluation is concurrent with ongoing Turnpike projects and is expected to be completed in 2021. Design and construction of the Turnpike mainline widening and the modifications of the Martin Highway interchange are currently outside FTE's five-year work program.

## SECTION NINE

## Conclusion and Recommendation

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The primary purpose of the Martin Highway IMR project is to identify the long-term needs through 2045 and to develop design concepts to address existing traffic congestion and related capacity deficiencies caused by the high traffic demand that cannot be accommodated by the existing trumpet interchange configuration. The ramp terminal currently operates at LOS D during both peak hours. As traffic demand increases in the future, traffic operations are expected to deteriorate within the interchange weaving section, thus impacting the freeway mainline. This IMR evaluates the traffic operations of the No-Build and Build alternatives.

The information and analysis indicate that the southbound off-ramp diverge areas along Florida's Turnpike and ramp intersection with Martin Highway are projected to experience operational failures in 2045. Proposed modifications to the mainline, ramps, and the interchange are recommended to address projected deficiencies in the future. Listed below are specific modifications and projected benefits:

- The proposed Build alternative provides for the separation of the heaviest off-ramp right-turn movement (northbound to eastbound) from the left-turn and through movements on the northbound approach of the ramp terminal. The Build alternative lane configuration is depicted on **Figure 4.4**.
- The Build alternative also eliminates the weave between the northbound through and left-turn movements from the northbound and southbound off-ramps.
- The arrangement proposed under the Build alternative not only eliminates the weaving between the movements from the northbound and southbound off-ramps but also reduces the demand on the northbound approach by approximately 400 vph by diverting the movement from southbound Turnpike to westbound Martin Highway from the existing ramp terminal to a roundabout on Leighton Farm Avenue.
- The Build alternative is projected to reduce the average vehicle delay at the Turnpike ramp terminal intersection by more than 70 seconds/vehicle (approximately 58 percent reduction) during the 2045 AM design hour and by 150 seconds/vehicle (approximately 63 percent reduction) during the 2045 PM design hour when compared with the 2045 No-Build intersection delays.
- The mainline and ramp freeway segments are projected to operate at LOS D or better under the Build condition.

These improvements address the traffic operation deficiencies by eliminating or improving the failing conditions within the interchange influence area, improving safety by reducing congestion, and improving operating conditions along Martin Highway and the ramp terminal. A comparison of the Design Year 2045 intersection analysis results shows that the Build alternative is projected to provide better operating conditions than the No-Build in Design Year 2045. The HSM safety analysis shows that the overall predicted crashes are lower for Build compared to No-Build. Based on the HSM results, the Build alternative is predicted to have a 20-year crash cost savings of approximately \$27 Million compared to the No-Build alternative, in 2019 present value.