SR 9/I-95 AT LANTANA ROAD

Palm Beach County, Florida

FPID No.: 413258-1-22-02 | ETDM# 14338

PD&E Study

Interchange Modification Report

FDOT

July 2020

INTERCHANGE MODIFICATION REPORT

Florida Department of Transportation

District Four

SR 9/I-95 at Lantana Road Interchange PD&E Study

Limits of Project: From North of Hypoluxo Road to South of 6th Avenue S (MP 18.420 to MP 19.158)

Palm Beach County, Florida

Financial Management Number: 413258-1-22-02

ETDM Number: 14338

July 12, 2020

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

Godfrey Lamptey

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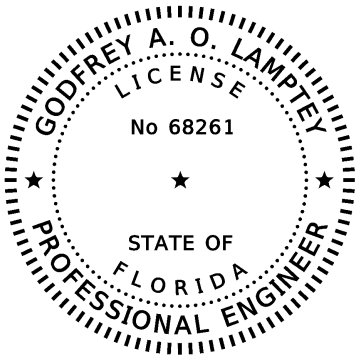

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Interchange Modification Report (IMR)

SR 9/I-95 at Lantana Road Interchange PD&E Study

Palm Beach County, Florida

FPID: 413258-1-22-02

Florida Department of Transportation

Determination of Engineering and Operational Acceptability

Acceptance of this document indicates successful completion of the review and determination of engineering and operational 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.

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SYSTEMS IMPLEMENTATION OFFICE

QUALITY CONTROL CERTIFICATION FOR INTERCHANGE ACCESS REQUEST SUBMITTAL

Submittal Date: 7/12/2020

FM Number: 413258-1-22-02

Project Title: SR 9/I-95 at Lantana Road Interchange PD&E Study

District: Four

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Document Type: ☐ MLOU ☐ IJR ☒ IMR ☐ IOAR ☐ OTHER (Specify)

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: Vandana Nagole F073D80BB3E2494... Date: 7/13/2020 | 1:41 PM EDT

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Cesar Martinez, P.E.

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EXECUTIVE SUMMARY

This Executive Summary presents the key findings of the analysis supporting the proposed interchange modification for the SR 9/I-95 at Lantana Road Interchange in Palm Beach County, Florida, and a discussion of the two Federal Highway Administration (FHWA) Policy Points.

1. Project Background

The Florida Department of Transportation (FDOT) completed the I-95 Interchange Master Plan for Palm Beach County in December 2015 to identify short-term and long-term needs at the interchange locations within the County through the 2040 design year horizon, and to develop design concepts to address traffic spillback onto I-95, improve interchange operations, reduce congestion, and increase safety at 17 interchanges from Linton Boulevard to Northlake Boulevard. SR 9/I-95 at Lantana Road Interchange was one of the interchange locations evaluated as part of the I-95 Interchange Master Plan.

The Concept Development Report prepared for this interchange identified several preliminary short-term and long-term improvements based on the traffic operations analysis conducted for the SR-9/I-95 at Lantana Road interchange and adjacent signalized intersections. The preliminary improvements at this location were recommended to be further evaluated as part of the Project Development and Environment (PD&E) Study.

This Interchange Modification Report (IMR) prepared as part of the PD&E Study will focus on the development and evaluation of alternatives for the proposed improvements at the SR-9/I-95 at Lantana Road interchange. This IMR has been developed in accordance with FDOT's Policy No. 000-525-015 and Procedure No. 525-030-160, including the FDOT Publication: Interchange Access Request User's Guide (IARUG), January 2018. It outlines the technical procedures, assumptions, traffic data, analyses, and documentation required for this process.

2. Project Description, Purpose & Need

The SR 9/I-95 at Lantana Road interchange is located along SR 9/I-95 (MP 18.420 to MP 19.158) between the Hypoluxo Road interchange (1.04 miles to the south) and the 6th Avenue South interchange (1.54 miles to the north) within the Town of Lantana in eastern Palm Beach County. The interchange is a tight urban diamond configuration. Based on the future traffic forecast, the interchange will have insufficient capacity to accommodate the projected travel demand.

Consequently, conditions at the interchange and along Lantana Road are anticipated to deteriorate below acceptable LOS targets if no improvements occur by the 2045 design year.

The purpose of the project is to enhance the overall traffic operations and safety at the existing interchange of SR 9/I-95 and Lantana Road. The study evaluated alternatives and recommended improvements for implementation to eliminate traffic spillback onto SR 9/I-95, enhance interchange operations and safety, reduce congestion, while providing for multimodal accommodations at this interchange location. The study also provides accommodation for potential extension of the I-95 Managed Lanes through Palm Beach County.

3. Methodology

The methodology applied in this IMR is based on the Methodology Letter of Understanding (MLOU) approved in September 2019. The MLOU is a companion document to this IMR Study and was approved by FDOT District Four and FDOT Central Office. The MLOU outlines the criteria, assumptions, processes, analyses, and documentation requirements for the project. A copy of the approved MLOU is provided in **Appendix A**. The MLOU was prepared in accordance with the FDOT's Interchange Access Request Users Guide.

4. Existing Traffic Conditions

The segment of SR 9/I-95 within the vicinity of the Lantana Road interchange is a ten-lane north-south Urban Interstate. It is part of the National Highway System (NHS) and serves as an integral part of the Strategic Intermodal System (SIS) highway network. Lantana Road within the project limits is primarily a four-lane divided east-west roadway classified as an Urban Principal Arterial under the jurisdiction of Palm Beach County.

The existing (2017) annual average daily traffic (AADT) along SR 9/I-95 is approximately 235,000 vehicles per day. Along Lantana Road, the existing AADT ranges from 29,000 to 52,000 vehicles per day. The existing AM and PM peak hour operating conditions for the SR 9/I-95 mainline sections show Level of Service (LOS) D or worse for the weaving segments and LOS D or better for the basic freeway segments.

The operational analysis for the signalized intersections indicated that most of the existing signalized intersections are operating at an overall LOS D or better during the peak periods. For the SR 9/I-95 ramp terminals, the northbound approach at the NB off-ramp operates at LOS D during both the AM and PM Peak periods. The southbound approach at the SB off-ramp terminal operates at LOS E and LOS F during the AM Peak and PM Peak period, respectively.

The vehicle queue analysis indicated that approximately 4 out of the 20 turn lanes (20%) have deficient storage lengths. Although the analysis results indicate that I-95 NB and SB ramps approaches queue lengths currently do not exceed the available storage length, significant queues were observed during the field reviews for the southbound off-ramps. It should be noted that the off-ramps were recently widened in 2015 as part of a short-term improvement project. As such, although the existing queues observed in the field were significant, they did not extend into I-95 mainline.

5. Future Conditions and Alternatives Considered

The alternatives considered as part of the SR 9/I-95 at Lantana Road Interchange PD&E Study include a No-Action Alternative and three Build Alternatives. The No-Action Alternative assumes no proposed improvements and serves as a baseline for comparison against the Build Alternatives.

Based on the future operational analysis, the No-Action Alternative will result in LOS F at both the I-95 northbound and southbound ramp terminals with extended queues backing onto the I-95 mainline during the AM and PM peak periods, if no additional improvements are done. In addition, the weaving freeway segments within the project limit will all operate at LOS F and the basic freeway segments between the on and off-ramps will operate at LOS D or worse. Consequently, it was determined that the No-Action Alternative will be inadequate to accommodate the future travel demand within this interchange.

In order to accommodate the future travel demand while enhancing safety within the interchange area, three Build Alternatives were developed as part of the alternatives analysis and include the following:

- Build Alternative 1 – Tight Urban Diamond Interchange (TUDI)
- Build Alternative 2 - Diverging Diamond Interchange (DDI)
- Build Alternative 3 – Single Point Urban Interchange (SPUI)

A qualitative evaluation of the Build Alternatives based on operational improvements, safety improvements, potential right of way impacts, environmental impacts, construction costs and public comments was performed as part of the study.

6. Build Alternatives

A detailed operational evaluation of the Build Alternatives was performed. The results from the analysis indicated that the Build Alternatives perform substantially better than the No-Action Alternative for all future year scenarios, particularly for the Lantana Road interchange ramp terminal approaches. However, it should be noted that some of the southbound movements along the side streets at High Ridge Road will operate at LOS F for the 2025 opening year for all the Build Alternatives. This is because the east-west movements along Lantana Road are prioritized due to the relatively higher traffic volumes. Given that the volume of traffic on these side streets is relatively small compared to the volume along Lantana Road, the delays do not significantly affect the entire intersection operation. In addition, the focus of the project is the SR 9/I-95 ramp terminal intersections to address spill back onto SR 9/I-95. The table below shows a comparison of the No-Action and Build Alternatives for the SR 9/I-95 ramp terminal intersections during the 2045 design year.

Performance Criteria		No-Action Alternative	Build Alternative 1 - TUDI	Build Alternative 2 – DDI	Build Alternative 3 - SPUI
I-95 SB Ramp Terminal	**LOS (AM/PM)**	F/F	C/D	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 123.4 PM: 84.8	AM: 27.6 PM: 35.8	AM: 23.0 PM: 23.2	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 78% PM: 58%	AM: 81% PM: 73%	AM: 79% PM: 62%
	Maximum Queue Length (ft)	#1,015	#534	264	343
	Storage Deficiency	Yes (9%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-47%	-74%	-66%
I-95 NB Ramp Terminal	**LOS (AM/PM)**	F/F	C/C	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 104.4 PM: 104.1	AM: 27.2 PM: 32.4	AM: 20.5 PM: 24.0	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 74% PM: 69%	AM: 80% PM: 77%	AM: 76% PM: 69%
	Maximum Queue Length (ft)	#1,191	#488	140	448
	Storage Deficiency	Yes (27%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-59%	-88%	-62%

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.

Based on the evaluation results, The SR 9/I-95 ramp terminals will operate at LOS C or D during the AM and PM peak periods in Build Alternative 1. However, the northbound approach and movements as well as the southbound approach and movements will operate at LOS E during both the AM and PM peak periods which does not meet the FDOT LOS targets. For Build Alternative 2 and Build Alternative 3, the SR 9/I-95 SB ramp terminal will operate at LOS C during both the AM and PM peak periods. It is anticipated that the Build Alternatives will provide 78% to 81% and 58% to 73% reduction in delays for the I-95 SB ramp terminal during the AM and PM peak periods, respectively compared to the No-Action Alternative. At the I-95 NB ramp terminal, the Build Alternatives will provide 74% to 80% and 69% to 77% reduction in delays during the AM and PM peak periods, respectively, compared to the No-Action Alternative. Alternative 2 provides the best operations at the ramp terminals compared to the other Alternatives due to the DDI configuration which reduces the number of signal phases.

A comparison of the queue lengths at the ramp terminal approaches indicate that all the Build Alternatives provide significant reduction in queues compared to the No-Action Alternative. It is anticipated that the Build Alternatives will result in a 47% to 74% reduction in queue length at the I-95 SB off-ramp and 59% to 88% reduction in queue length at the I-95 NB off-ramp. However, for Build Alternative 1, the queue lengths may be longer as indicated in the table below due to residual queues remaining after each cycle which may extend beyond the gore point. Further analysis using the SIMTRAFFIC microsimulation tool indicated that the queues for the SB ramp terminal intersection may be longer due to residual queues remaining after each cycle which may extend beyond the gore point during the AM peak period.

Build Alternative 2 resulted in the lowest number of expected total crashes with an overall crash reduction of 35.6% compared to the No-Action Alternative at the Lantana Interchange. Build Alternative 1 and Build Alternative 3 provide similar overall crash reduction of 15% compared to the No-Action Alternative at the Lantana Road Interchange. Build Alternatives 1 and 3 will require additional right of way from 9 properties along Lantana Road to accommodate the proposed improvements while Build Alternative 2 requires right of way from 6 properties.

A benefit-cost analysis prepared as part of the study indicated that Build Alternative 2 has the highest benefit-cost ratio of 1.70, followed by Build Alternative 1 with a benefit-cost ratio of 1.16, and Build Alternative 3 with the least benefit-cost ratio of 0.77. Overall, the results demonstrate that the Build Alternatives can accommodate the future travel demand while providing overall better traffic operating conditions, enhancing safety, and accommodating multimodal modes compared to the No-Action Alternative. In addition, Build Alternative 2 provides the best operational and safety performance among the three Build Alternatives.

7 Preferred Alternative

Based on the comprehensive evaluation presented in this IMR study, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the preferred alternative due to the significantly higher safety and traffic operational benefits it provides compared to the other alternatives. Build Alternative 2 also satisfies the purpose and need of this project and provides the highest benefit-cost ratio making it the most cost-effective alternative. In addition, it provides opportunity for additional landscape and aesthetic improvements and has the highest public support.

ASSESSMENT OF FHWA'S POLICY

The following requirements serve as the primary decision criteria used in approval of interchange modification projects. Responses to each of the FHWA 2 policy points are provided to show that the proposed modification for the SR 9/I-95 at Lantana Road interchange is viable based on the conceptual analysis performed to date. The following demonstrate compliance with the FHWA's requirements and justification for the proposed modifications to the SR 9/I-95 at Lantana Road Interchange.

Policy Point 1:

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

Response: An in-depth operational and safety analysis was conducted to study the impacts of the proposed improvements. Several performance measures were used to compare the operations and safety of the existing system under the No-Action and Build conditions. Key measures included freeway densities, freeway V/C ratios, intersection delays, level of service and 95th percentile queue lengths, crash rates and frequency, predominant crash patterns, expected crashes, and potential crash reduction using crash modification factors. Based on the results of this comprehensive evaluation, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the preferred alternative due to the significantly higher safety and traffic operational benefits it provides to offset its relatively higher construction cost.

From an operational perspective, the traffic analysis performed for the study indicated that Build Alternative 2 performs substantially better than the No-Action Alternative for all future year scenarios, particularly for the SR 9/I-95 ramp terminal intersections, which are the primary focus for this study. Under Build Alternative 2, both SR 9/I-95 ramp terminals will operate at LOS C during both the AM and PM peak periods for the 2045 design year compared to LOS F for the No-Action Alternative. The southbound ramp terminal intersection will experience 81% and 73% reduction in delay for the AM and PM peak periods, respectively, whereas the northbound ramp terminal will experience 80% and 77% reduction in delay during the AM and PM peak periods, respectively compared to the No-Action Alternative. Build Alternative 2 also results in 74% and 88% reduction in queue length at the I-95 southbound and northbound off-ramp approaches, respectively, with no spillback onto the I-95 mainline compared to the No-Action Alternative. The No-Action Alternative will exceed the existing ramp storage by 9% and 27% at the southbound and northbound off-ramp approaches, respectively.

From a safety perspective, a total of 470 crashes occurred along I-95 and the ramps at Lantana Road within the study area from 2014 to 2018. and a total of 172 crashes occurred along Lantana Road within the same period. The predominant crash types that occurred within the study area were rear-end collisions, sideswipe collisions and angled collisions. Crashes of these types are typically attributed to congested conditions along the arterials and interchange ramps and terminals. The proposed improvements under Build Alternative 2 is anticipated to result in an overall crash reduction of 35.6% compared to the No-Action Alternative due to the significant reduction in delays and improved mobility resulting from the DDI configuration. This will significantly enhance safety within the interchange area. In addition, Build Alternative 2 provides access management improvements along Lantana Road by closing the eastbound left-turn at Sunset Road and providing a new access road underneath the reconstructed Lantana Road bridge over the SFRC/CSX Railroad. This proposed underpass road provides an alternative access for the

existing movements at the Sunset Road Intersection. It also improves traffic operations and safety along Lantana Road by eliminating some of the vehicle conflicts at the intersection. In addition, it also eliminates traffic from the Costco to the adjacent residential communities.

Policy Point 2:

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

Response: The proposed improvements to the I-95 at Lantana Road interchange and adjacent intersections will provide full access and accommodates all traffic movements from Lantana Road to and from SR 9/I-95. Lantana Road is a County Road and no private-only access is being sought on this interchange modification.

1.0 INTRODUCTION

The Florida Department of Transportation (FDOT), District Four, is conducting a Project Development and Environment (PD&E) Study that proposes improvements to SR 9/I-95 at Lantana Road Interchange from High Ridge Road to Andrew Redding Road. This Interchange Modification Report (IMR) contains detailed information that fulfills the purpose and need for the project. This project has been developed in compliance with Title VI of the Civil Rights Act of 1964 and other related federal and state nondiscrimination authorities. Neither the Florida Department of Transportation (FDOT) nor this project will deny the benefits of, exclude from participation in, or subject to discrimination, anyone on the basis of race, color, national origin, age, sex, disability, or family status. This project has been screened through the Efficient Transportation Decision Making (ETDM) process. The Summary Report was published on April 26, 2018 and can be viewed under the ETDM # 14338.

1.1 PROJECT BACKGROUND

SR 9/I-95 is the main Interstate Highway on the East Coast of the United States serving areas from Florida to Maine. Within the State of Florida, SR 9/I-95 is a major state transportation resource critical in the facilitation of statewide travel, and is included in the Strategic Intermodal System (SIS) established by the Florida Legislature in 2003, for its role in supporting the State's economy and mobility.

SR 9/I-95 has experienced increasing traffic volumes since its completion in Palm Beach County in 1980: fueled largely by population and economic growth within the County. The FDOT has responded to this increased transportation demand with various interventions to improve operations and safety along the SR 9/I-95 mainline including, adding a High Occupancy Vehicle (HOV) lane and auxiliary lanes from south of Linton Boulevard to north of PGA Boulevard in the 1990s and 2000s, and minor interchange improvements at eight interchange locations within this segment of SR 9/I-95.

In December 2015, the FDOT completed the SR 9/I-95 Interchange Master Plan for Palm Beach County to identify short-term and long-term needs at the interchange locations within the County through the 2040 design year horizon. This Master Plan included design concepts to address traffic spillback onto SR 9/I-95, improve interchange operations, reduce congestion, and increase safety at 17 interchanges from Linton Boulevard to Northlake Boulevard. SR 9/I-95 at Lantana Road Interchange was one of the interchange locations evaluated as part of the I-95 Interchange Master Plan.

A Concept Development Report (CDR) was completed for this interchange as part of the I-95 Interchange Master Plan Study for Palm Beach County. The CDR identified several preliminary short-term and long-term improvements at the SR 9/I-95 at Lantana Road Interchange including:

- Dual right-turn lanes for the SR 9/I-95 southbound off-ramp
- Dual eastbound left-turn lanes from Lantana Road to the SR 9/I-95 northbound on-ramp
- Additional westbound through lane between the SR 9/I-95 southbound off-ramp and High Ridge Road
- Additional eastbound through lane between the SR 9/I-95 northbound off-ramp and Andrew Redding Road
- Improvements at various intersections along Lantana Road including High Ridge Road, Andrew Redding Road, Sunset Road and Shopping Center Drive

Within Palm Beach County, the Transportation Planning Agency (TPA) adopted a vision to transform the County into a place where bicycling is a safe and convenient transportation option and an attractive form of recreation for residents and visitors alike by 2035. In keeping with this vision, Palm Beach County adopted the Master Comprehensive Bicycle Transportation Plan (MCBTP) with recommendations to include/improve bicycle facilities throughout Palm Beach County. Lantana Road from Jog Road to Dixie Highway was identified as one of the corridors for inclusion in the Priority Bicycle Network.

This PD&E Study is being conducted to evaluate concepts that improve interchange operations and safety, accommodate future transportation demand at the Lantana Road Interchange, and provide bicycle accommodations along Lantana Road within the project limits.

1.2 PROJECT DESCRIPTION

The SR 9/I-95 at Lantana Road interchange is primarily located within the Town of Lantana in Palm Beach County, Florida, between the 6th Avenue South (1.54 miles to the north) and the Hypoluxo Road (1.04 miles to the south) interchanges. The interchange provides access to the Palm Beach County Park/Lantana Airport, Hypoluxo Island, Lantana Scrub Natural Area, and the Lantana Lake Worth Health Center. The study interchange is a tight urban diamond interchange and the limits along Lantana Road extend from High Ridge Road to Andrew Redding Road. The South Florida Rail Corridor (SFRC)/CSX Railroad runs parallel along the west side of SR 9/I-95 in this area and crosses below an elevated section of Lantana Road.

SR 9/I-95 near the Lantana Road interchange is a ten-lane divided urban interstate, aligned south to north, providing four general purpose lanes and one High Occupancy Vehicle (HOV) lane in

each direction. Auxiliary lanes are provided in both the northbound and southbound direction within the study area. At the Lantana Road interchange, SR 9/I-95 crosses below an elevated section of Lantana Road. SR 9/I-95 is a SIS designated highway as well as an emergency evacuation route.

Within the project limits, Lantana Road is primarily a four-lane urban principal arterial under the jurisdiction of Palm Beach County, with two through lanes aligned west to east in each direction. At the interchange location, Lantana Road is elevated over SR 9/I-95 and the SFRC/CSX Railroad. There is one dedicated left-turn lane in each direction to access the SR 9/I-95 on-ramps and two through lanes in each direction. A single free-flow right-turn lane is also provided in both eastbound and westbound directions along Lantana Road to serve the SR 9/I-95 on-ramps. Sidewalks are provided along both sides of Lantana Road; however, bicycle lanes do not exist. The segment of Lantana Road from SR 9/I-95 to SR 5/US-1 is designated as an emergency evacuation route.

Land use adjacent to the interchange is predominantly commercial with some industrial, institutional, and residential uses. The adjacent signalized intersections within the project limits are: High Ridge Road west of SR 9/I-95 southbound ramps, and Shopping Center Drive and Andrew Redding Road east of SR 9/I-95 northbound ramps.

The proposed improvements will include operational and safety improvements to the Interchange including capacity improvements along Lantana Road, additional turning lanes at the SR 9/I-95 ramp terminal intersections and signal improvements. The project will also include improvements to sidewalks, ADA ramps, guide signs, and designated bicycle lanes.

1.3 PURPOSE AND NEED

The primary purpose of this interchange project is to improve the local and regional transportation network while also providing enhanced multimodal interrelationships at the SR 9/I-95/Lantana Road interchange. Additional features that will be improved include capacity and transportation demand, safety, and emergency evacuation. The study will evaluate alternatives that eliminate traffic spillback onto SR 9/I-95, enhance interchange operations and safety, reduce congestion, while providing for multimodal accommodations at this interchange location. The study will also consider accommodation for potential extension of I-95 Managed Lanes through Palm Beach County. The needs for this project are further described in the following sections:

1.3.1 Transportation Network

Lantana Road is a county roadway (CR 812) that provides access to the Town of Lantana and Hypoluxo Island via East Ocean Avenue (Lantana) Bridge. To the west, Lantana Road provides access to the Palm Beach County Park/Lantana Airport and the City of Atlantis. Although Lantana Road is not a designated road in the state's SIS, SR 9/I-95 is a part of the SIS system. The SIS includes Florida's important transportation facilities that support the State's economy and mobility. Improved interchange operations at Lantana Road will help to reduce traffic spillback onto I-95 thereby enhancing connectivity among the local and regional network.

1.3.2 Multimodal Interrelationships

The SR 9/I-95 at Lantana Road interchange accommodates east-west sidewalks on the north and south sides of Lantana Road, from High Ridge Road to Shopping Center Drive, extending beyond both intersections. Bicycle lanes are not provided in both directions along Lantana Road within the project limits. The Palm Beach County Transportation Planning Agency (TPA) Master Comprehensive Bicycle Transportation Plan (MCBTP) includes recommendations to improve bicycle facilities throughout Palm Beach County. The MCBTP recommends a "Detailed Corridor Study" along Lantana Road. Additionally, the MCBTP designates segments of High Ridge Road as "Bike Level of Service (LOS) Threshold Met" and "Shoulder Candidate." As part of the study, provision of bike lanes would be evaluated along Lantana Road.

Four schools are located within approximately one mile of the interchange: Barton Elementary School, Lantana Elementary School, Lantana Middle School, and Palm Beach Maritime Academy. There are no Palm Tran transit bus stops within the project limits. However, bus stops are located on Lantana Road west of High Ridge Road and east of Andrew Redding Road. Adding improvements to bicycle and pedestrian facilities at the intersections within the study area will enhance the safety of the local community pedestrian users traveling the corridor.

1.3.3 Capacity and Transportation Demand

The SR 9/I-95 southbound ramps within the study area currently operate at an overall LOS E during the A.M. peak hours, while the northbound ramps operate at a LOS C. During the P.M. peak hours, the southbound ramps operate at LOS D, and the northbound ramps operate at LOS C. If no improvements are made to the SR 9/I-95 at Lantana Road interchange, it is forecasted

that by 2045, both the southbound and northbound ramps will operate at LOS F for both the A.M. and P.M. peak hours.

Due to the current need to increase capacity, the proposed interchange improvements are included in the Palm Beach County TPA 2040 Long Range Transportation Plan (LRTP) as part of the 2020-2040 Desires Plan. Funding for Design (Preliminary Engineering and PD&E) are planned to be available in 2026-2030 and Construction in 2031-2040. The interchange improvements are also included in the SIS Cost Feasible Plan 2024-2040. The interchange is also included in the I-95 Interchange Master Plan.

1.3.4 Safety

Crash data from 2014 to 2018 for SR 9/I-95 (Roadway ID: 93220000) from south of Lantana Road to the north of Lantana Road, SR 9/I-95 Ramps at Lantana Road (Roadway ID: 93220037, 93220038, 93220039, and 93220040), and Lantana Road (Roadway ID: 93530000) from High Ridge Road to Andrew Redding Road (MP 2.80 to MP 3.50) was obtained from the FDOT State Safety Office GIS (SSOGis) Query Tool on the Traffic Safety Web Portal. Based on the crash analysis, 313 crashes occurred on the SR 9/I-95 mainline, 157 crashes occurred on the SR 9/I-95 ramps at Lantana Road interchange and 172 crashes occurred on Lantana Road within the study area from 2014 to 2018. The predominant crash types that occurred within the study area were rear-end collisions, sideswipe collisions, and angled collisions. Crashes of these types are typically attributed to congested conditions along the arterials and interchange ramps and terminals. As such, providing capacity improvements for different modes of transportation within the study area will help to improve safety by alleviating congestion.

1.3.5 Emergency Evacuation

Based on Palm Beach County's Evacuation Routes and Zones Map, Lantana Road is classified as an evacuation route from SR 5/US-1 to SR 9/I-95. Therefore, improvements to the interchange of I-95 and Lantana Road, along with improvements to nearby intersections, will decrease evacuation times by increasing connectivity between eastern and western towns/cities and SR 9/I-95. Additionally, emergency response times will be decreased by the proposed improvements.

2.0 METHODOLOGY

The methodology applied in this IMR is based on the previously approved Methodology Letter of Understanding (MLOU) signed September 2019. The MLOU was approved by FDOT District Four and FDOT Central Office Systems Implementation Office and will serve as a companion document to this IMR Study. The MLOU outlined the criteria, assumptions, processes, analyses, and documentation requirements for the project. A copy of the approved MLOU is provided in **Appendix A**.

2.1 ANALYSIS YEARS

The analysis years for the traffic forecasting and operational analysis were established as follows:

A. Traffic Forecasting

- Base year: 2010
- Horizon year: 2040

B. Traffic Operational Analysis

- Existing year: 2017
- Opening year: 2025
- Design year: 2045

The model 2040 horizon year forecast was extrapolated to obtain the 2045 design year forecast.

2.2 TRAVEL DEMAND FORECASTING

The travel demand modeling and future year AADT forecasts for this study were developed under a separate study – Traffic Data Collection and Traffic Projections for I-95 at Lantana Road PD&E Study, dated December 2017. The Southeast Regional Planning Model (SERPM) version 7.062 with base year 2010 and horizon year 2040 was used to estimate the future years daily forecasts for the study area. The SERPM model is based on the Florida Standard Urban Transportation Modeling Structure (FSUTMS) and is recognized by both FDOT District Four, as well as the Palm Beach County Transportation Planning Agency (TPA) as an acceptable travel demand forecasting tool which has been used to develop Design Traffic for several recent interchange improvement projects.

2.3 AREA OF INFLUENCE

The area of influence defines the extent that is anticipated to experience substantial changes in traffic operating characteristics as the result of the access proposal. In urban areas, the area of influence as defined in the Interchange Access Request Users Guide includes one adjacent interchange in each direction and signalized intersections within half-a-mile of the interchanges.

For this study, the project area of influence is along SR 9/I-95 from north of Hypoluxo Road Interchange (MP 18.420) to south of 6th Avenue S Interchange (MP 19.158). The on and off ramps of the adjacent interchanges at Hypoluxo Road and 6th Avenue S are included in the area of influence. However, the ramp terminal intersections are not included since an interchange access request was recently approved for the 6th Avenue S interchange and the Hypoluxo Road interchange is currently programmed for interchange improvements. The following freeway segments, arterial segment, and signalized intersections are included in the area of influence for this study as illustrated in **Figure 2-1**

- **Freeway Segments**
    a. I-95 NB and SB between Hypoluxo Road and Lantana Road Interchanges
    b. I-95 NB and SB between Lantana Road and 6th Avenue S Interchanges
- **Ramps**
    a. I-95 SB On-Ramp at Lantana Road
    b. I-95 SB Off-Ramp at Lantana Road
    c. I-95 NB On-Ramp at Lantana Road
    d. I-95 NB Off-Ramp at Lantana Road
    e. I-95 SB On-Ramp at 6th S. Avenue Road
    f. I-95 NB Off-Ramp at 6th S. Avenue Road
    g. I-95 SB Off-Ramp at Hypoluxo Road
    h. I-95 NB On-Ramp at Hypoluxo Road
- **Arterial Segment**
    a. Lantana Road between High Ridge Road and Andrew Redding Road
- **Signalized Intersections**
    a. Lantana Road at High Ridge Road
    b. Lantana Road at I-95 SB ramp terminal
    c. Lantana Road at I-95 NB ramp terminal
    d. Lantana Road at Shopping Center Drive
    e. Lantana Road at Andrew Redding Road
- **Unsignalized Intersection**
    a. Lantana Road at Sunset Road

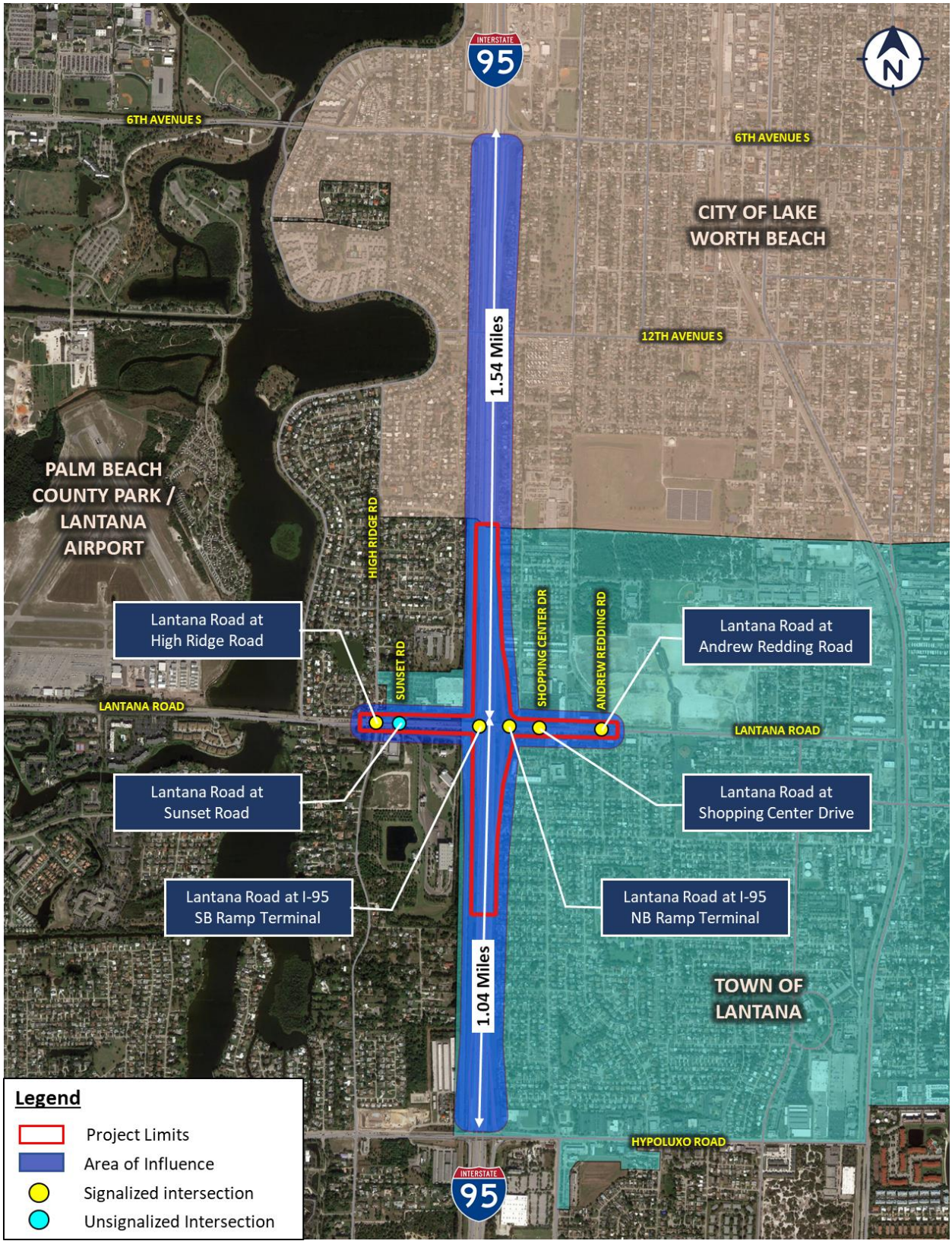


Figure 2-1 Project Location and Area of influence

2.3.1 AADT Forecast Volumes

The AADT forecast volumes for this IMR Study was developed under a separate study – *Traffic Data Collection and Traffic Projections for I-95 at Lantana Road PD&E Study*, dated December 2017. The traffic forecasting methodology used for each intersection approach was based on the 2017 AADT obtained from the field as well as 2010 and 2040 SERPM 7.062 model volumes. The 2017 model volume was interpolated using 2010 and 2040 model volumes. Then, the percentage differences of the 2017 field AADT and the interpolated 2017 forecasted AADT from the model was calculated. The recommended 2040 AADTs were calculated by applying this percentage difference to the 2040 SERPM 7.062 model volumes. The 2020 and 2030 volumes were then interpolated using the 2017 AADT and the recommended 2040 volumes. The 2045 design year volumes were obtained by extrapolation using the 2017 AADT and the recommended 2040 AADT volumes. The 2025 opening year volumes were obtained by interpolation using 2017 AADT and recommended 2040 volumes. For the roadway segments where the SERPM 7.062 2040 model volumes are lower than the SERPM 7.062 2010 model volumes or are not included in the SERPM 7.062 network, the future 2020, 2030, 2040 and 2045 AADTs were calculated using 2017 AADT and a compound growth factor of 0.5%.

2.3.2 Design Hour Traffic Development

The future DDHVs of arterial segments was developed by applying AADT x K x D. The existing ratio of AM to PM peak hour volumes was maintained for future years. Therefore, if the highest traffic volume on an arterial segment is in the PM, future PM peak hour volume was calculated by multiplying the future AADT by K-factor, and the future AM peak hour volume was calculated by multiplying the future PM peak hour volume with the ratio of existing AM to PM peak hour volumes.

Turning movement volumes development for the future years at the signalized was based upon the existing turning movement percentages obtained from the field. The TMTOOL spreadsheet was used to estimate turning movement volumes for the 2025 Opening Year and 2045 Design Year based on projected link volumes and existing turning movements. The existing and future year projected turns were smoothed and balanced to within +/- 7% tolerance level.

2.3.3 Validation Methodology

No further modifications or validation of the travel demand model was performed as part of this IMR. However, the future daily volumes and travel patterns were checked for reasonableness. Any

changes made to the model volumes were documented and concurred by the Systems Implementation Office.

2.4 TRAFFIC FACTORS

Traffic factors used for the development of design hour traffic volumes include the K factor, Directional Distribution (D), Daily Truck (T_{24}), Design Hour Truck (T_f) and peak hour factors (PHF). The Design Hour Truck percentage is calculated as one half of the daily truck percentage. The recommended K, D and T_{24} factors for the freeway, ramps and arterial within the study area are provided in the table below.

Table 2-1 Traffic Factors

Roadway	K [1]	D [2]	T_{24}	PHF [1]
I-95 Mainline	8.0%	54.3%	7.37% [3]	0.95
I-95 NB Ramps	8.0%	100.0%	5.29% [3]	0.95
I-95 SB Ramps	8.0%	100.0%	5.12% [3]	0.95
Lantana Road	9.0%	57.9%	4.95% [3]	0.95
High Ridge Road	9.0%	56.2%	4.95% [3]	0.95
Sunset Road	9.0%	60.8%	4.95% [3]	0.95
Shopping Centre Drive	9.0%	57.4%	4.95% [3]	0.95
Andrew Redding Road	9.0%	55.1%	4.95% [3]	0.95

Sources:

1. Project Traffic Forecasting Handbook
2. Based on average from Traffic Counts collected for PD&E Study and 5-year average from FDOT Traffic online 2018
3. Based on average from Traffic Counts collected for PD&E Study and 3-year average from FDOT Traffic online 2018

2.5 TRAFFIC OPERATIONAL ANALYSIS

Traffic operational analysis for existing and future conditions was performed using methodologies outlined in the Highway Capacity Manual 6th Edition (HCM 6). Where the HCM 6 methodology does not support the intersection characteristics, the HCM 2010 or HCM 2000 methodologies were used. AM and PM peak period analysis were performed for the existing year (2017). 2025 Opening Year and 2045 design year operational analysis was performed for the No-Action and all the Build Alternatives during both the AM and PM peak periods.

Capacity analysis for the AM and PM periods was performed for freeway and ramp segments using Highway Capacity Software (HCS) to determine densities and Level of Service (LOS). The arterial and intersection analysis was performed using the HCM module within the SYNCHRO 10 Software.

2.6 SAFETY ANALYSIS

A quantitative safety analysis based on the procedures in the Highway Safety Manual (HSM) was also performed as part of the IMR. Crash data was obtained from the FDOT safety office for the most recent five-year period on the mainline, interchanges, and major cross streets within the area of influence. The data collected included the number, type and location of crashes, the crash severity, and estimates of property damage and economic loss. Utilizing the information obtained from the crash data, the evaluation identified needs associated with the safety of the existing facility. The IMR identified the source of the crash data, documented crash rates, and compared to the statewide averages for similar corridors It also provided tables and figures summarizing the analysis results. The following measures of effectiveness were used to evaluate the safety performance of the No-Action and Build Alternatives considered.

- Crash rate
- Crash frequency
- Reduction in crashes

In addition, a benefit-cost analysis was performed to compare the cost-effectiveness of the study alternatives.

2.7 MEASURES OF EFFECTIVENESS

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

- Mainline freeway segments – Density (pc/mi/ln), average travel speed (mph) and LOS
- Freeway ramps (merge and diverge) – Density (pc/mi/ln) and LOS
- Weaving segments – Density (pc/mi/ln) and speed (mph) and LOS
- Signalized intersections – Delay (sec/veh), LOS and 95th percentile queue length (feet)
- Arterial Segments – Speed (mph), travel time (sec) and LOS

In addition to the Level of Service criteria, the following other operational MOEs have been utilized for the evaluation of alternatives.

- Maintenance of traffic impacts
- Potential for crash reduction

3.0 EXISTING CONDITIONS

3.1 EXISTING LAND USE

The study area falls within the Town of Lantana in Palm Beach County. The existing land use is a mix of retail/office, residential, industrial, recreational, agricultural, institutional, public, semi-public, right of way, and vacant residential and non-residential uses. **Figure 3-1** shows the existing land use within the study area.

Land use directly adjacent to the SR 9/I-95 at Lantana Road interchange between Andrew Redding Road and High Ridge Road is primarily commercial, interspersed with some institutional uses. Residential uses are located behind the adjacent commercial and institutional uses within the study limits and along Lantana Road, east of Andrew Redding Road and west of High Ridge Road.

The Lantana Shopping Center is adjacent to the study intersection in the northeast quadrant. The shopping center houses large retailers including Publix, AutoZone as well as restaurants and other small-scale retailers. The Lantana Bureau of Administrative Review building is located east of the Lantana Shopping Center along Lantana Road. Further east is the parcel demarcated for the construction of the Water Tower Commons in Lantana. This development includes 360 apartment units with various amenities.

The southeast quadrant of the study intersection features banking institutions including Chase Bank and Wells Fargo, a McDonald's restaurant, Dollar General and the Palm Beach Maritime Academy. Shell Gas Station and 7-eleven Gas Station are located west and east of Andrew Redding Road adjacent to Lantana Road within this quadrant. First Baptist Church and Holy Spirit Catholic Church are located east of Andrew Redding Road.

The Lantana Road Costco Wholesale is located in the northwest quadrant of the study intersection with Sunshine Park Academy directly adjacent to the Costco Wholesale to the west. Lake Osborne Estate is located west of High Ridge Road. The Palm Beach County Park/Lantana Airport is located further west between Lake Osborne Drive and S Congress Avenue.

The southwest quadrant between High Ridge Road and the SR 9/I-95 interchange is occupied by the Palm Beach County Solid Waste Authority (SWA) Central Transfer Station and Lantana Self-Storage. Seacoast Bank and Living Word Lutheran Church are located west of High Ridge Road. Future land use within the project location is anticipated to remain unchanged. **Figure 3-1** shows the future land use in the project location.

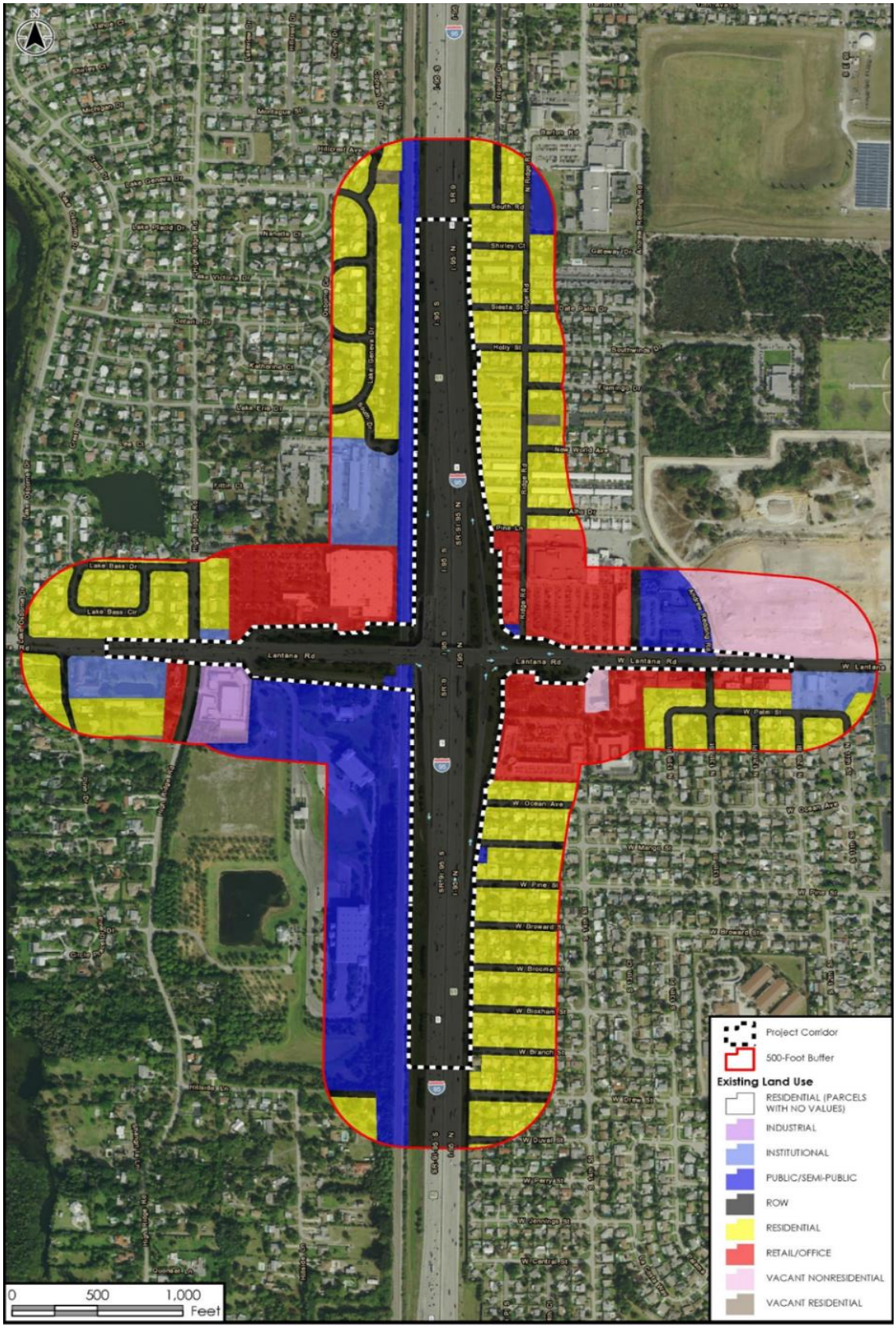


Figure 3-1 Existing Land Use Map

3.2 EXISTING ROADWAY CHARACTERISTICS

3.2.1 Context Classification

In 2014, the Florida Department of Transportation (FDOT) adopted the Statewide Complete Streets Policy (Topic No. 000-625-017-a), a comprehensive statewide policy to promote safety, quality of life, and economic development along the state roads. The context classification is based on the existing or future land use characteristics, development patterns, and roadway connectivity of an area. Lantana Road is a non-state road under the jurisdiction of Palm Beach County with a context classification of C4-Urban General. In the case of interstates and limited-access facilities, the function of the roadway is considered complete. As such, no context classification is assigned for SR 9/I-95.

3.2.2 Functional Classification

The existing roadway network within the project study area is comprised of state roads, county roads and local roads which provide access and traffic circulation within residential, commercial, and industrial areas. SR 9/I-95, near the Lantana Road interchange, is a ten-lane divided freeway classified as an Urban Interstate. It is part of the National Highway System (NHS) and serves as an integral part of the Strategic Intermodal System (SIS) highway network. Lantana Road within the project limits, is a four-lane divided county roadway classified as an Urban Principal Arterial. High Ridge Road is a two-lane undivided city roadway classified as an Urban Minor Collector. The straight-line diagram for SR 9/I-95 is provided in **Appendix B**.

3.2.3 Typical Sections

3.2.3.1 SR 9/I-95

SR 9/I-95 (Roadway ID: 93220000) is a ten-lane divided interstate freeway providing four general purpose lanes and one High Occupancy Vehicle (HOV) lane separated by a 4 ft buffer in each direction. The travel lanes are 12 ft wide with 15 ft paved inside shoulders and 12 ft outside shoulders with 10 ft paved in each direction. The shoulders underneath Lantana Road bridge vary from 13 ft to 14.5 ft paved inside shoulders and 10 ft paved outside shoulders. A 2 ft raised concrete barrier divides the roadway. Two auxiliary lanes are provided in the northbound direction and one auxiliary lane is provided in the southbound direction, north of Lantana Road between the Lantana Road and 6th Avenue South interchanges. South of Lantana Road, one auxiliary lane is provided in both directions between the Lantana Road and Hypoluxo Road interchanges. The right of way along SR 9/I-95 is typically 300 ft. The design speed for this freeway

segment is 70 mph with a posted speed of 65 mph. The existing typical sections for SR 9/I-95 are provided in **Figure 3-2** through **Figure 3-4**.

3.2.3.2 Lantana Road

Lantana Road (Roadway ID: 93530000) extends approximately 0.57 miles from High Ridge Road (MP 2.861) to Andrew Redding Road (MP 3.430). West of SR 9/I-95, the typical section consists of two 11 ft travel lanes in each direction separated by either a traffic separator or raised landscape median. An exclusive right-turn lane and an inside left-turn lane are provided in the eastbound direction to connect to the SR 9/I-95 southbound on-ramp and northbound on-ramp, respectively. The roadway has Type F curb and gutter along both sides of the pavement with 6 ft wide sidewalks on both sides adjacent to the curb and gutter. The right of way for this segment of Lantana Road varies with 110 ft minimum width. The typical section for this section of Lantana Road are provided in **Figure 3-5** and **Figure 3-6**.

East of SR 9/I-95, the typical section along Lantana Road consist of two travel lanes in each direction with 11 to 12 ft lane widths separated by either a traffic separator or a painted median. At the SR 9/I-95 interchange, single right-turn and left-turn lanes provide access from Lantana Road to the SR 9/I-95 northbound and southbound ramps, respectively. 5 ft sidewalks separated from the roadway curb and gutter by a sod buffer are provided along both sides of the roadway. The right of way for this segment of Lantana Road varies with 80 ft minimum width. The design speed for Lantana Road within the project limits is 45 mph with a posted speed of 40 mph. The typical sections for Lantana Road, east of SR 9/I-95 are provided in **Figure 3-7** and **Figure 3-8.**

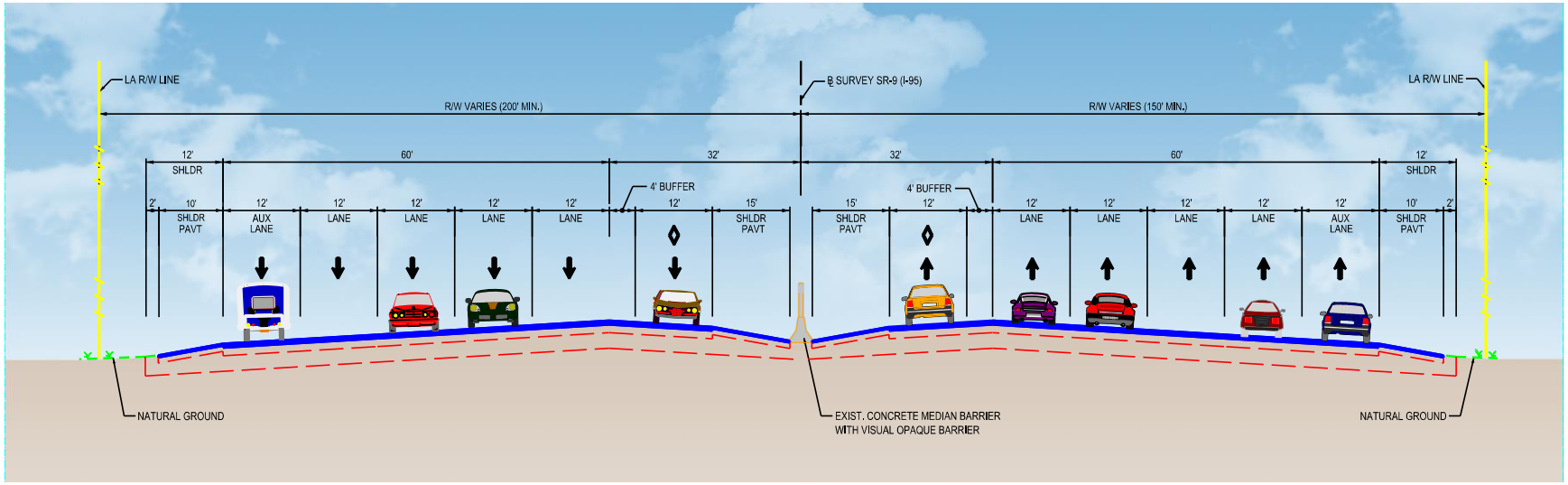


Figure 3-2 Typical Section – SR 9/I-95 South of Lantana Road

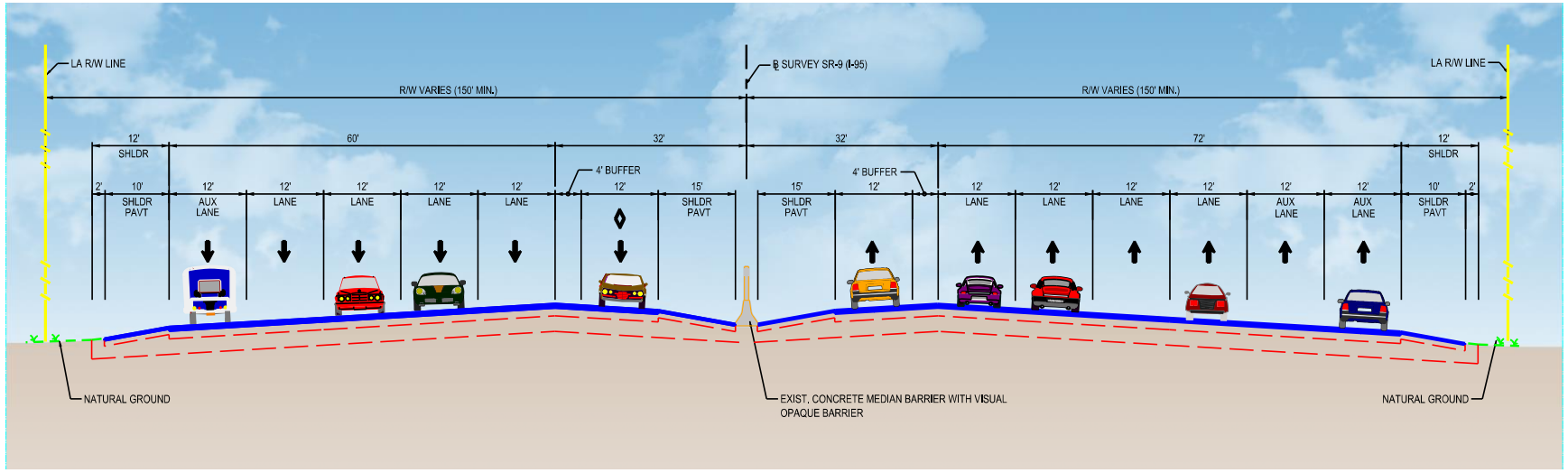


Figure 3-3 Typical Section – SR 9/I-95 North of Lantana Road

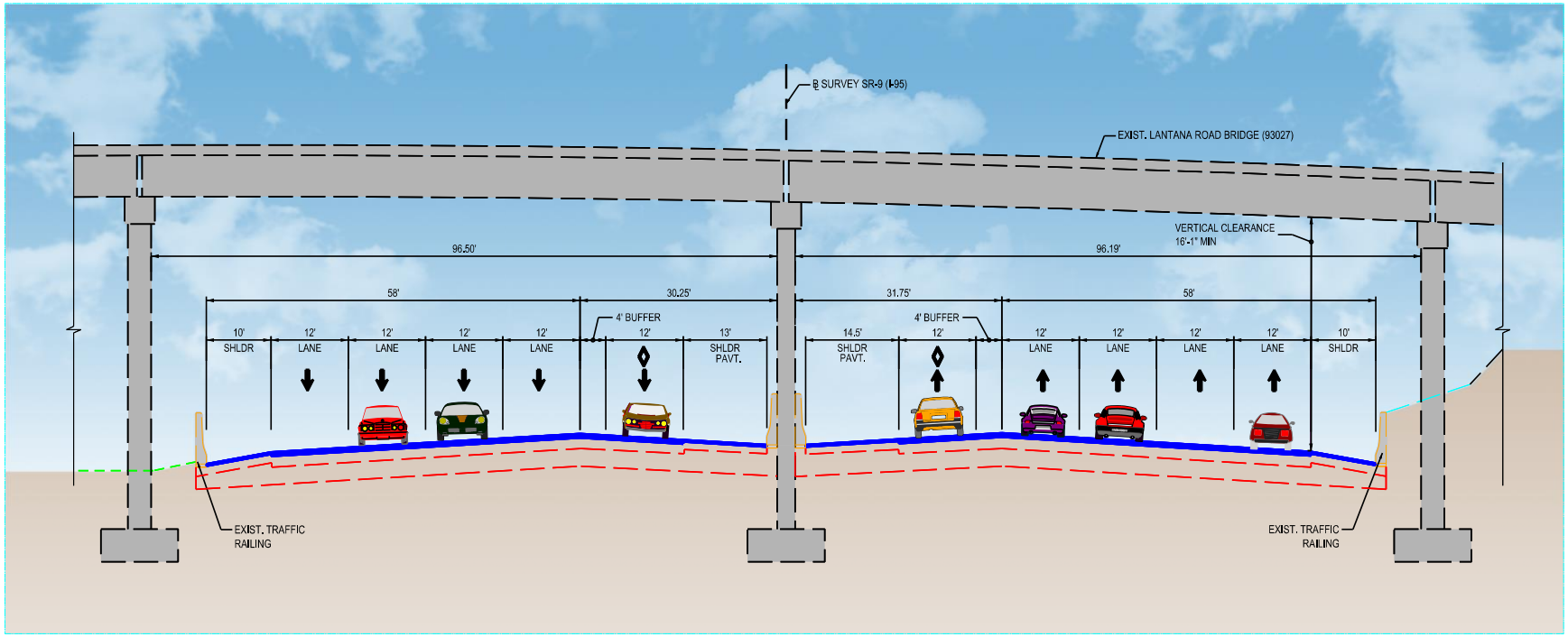


Figure 3-4 Typical Section – SR 9/I-95 Underneath Lantana Road

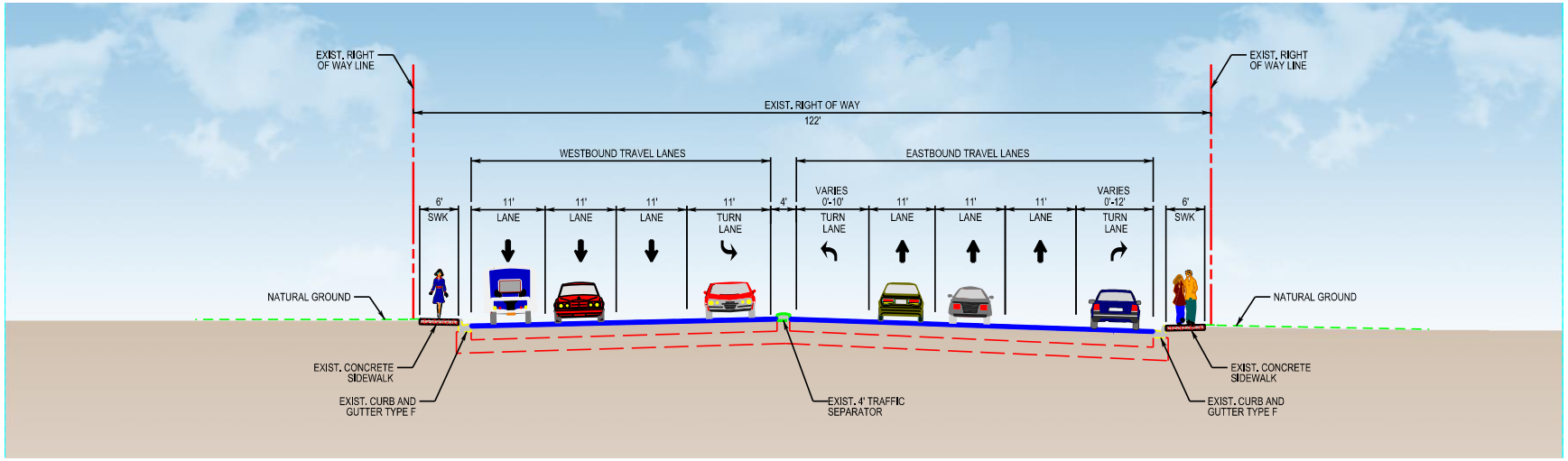


Figure 3-5 Lantana Road from High Ridge Road to Sunset Road

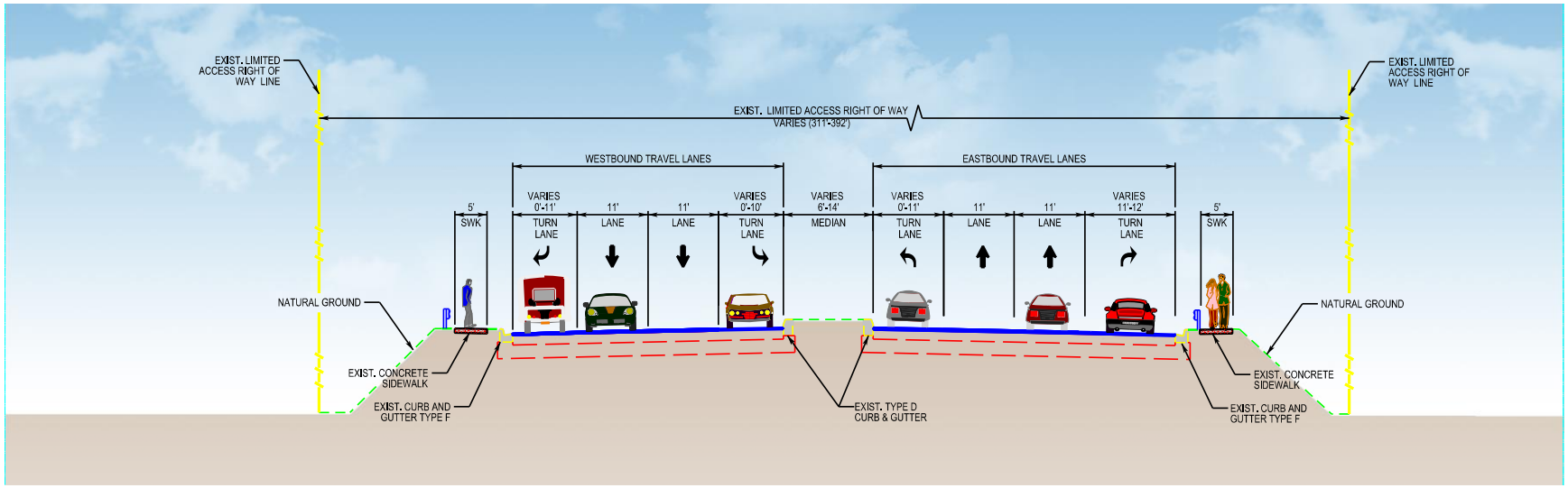


Figure 3-6 Lantana Road from Sunset Road to SR 9/I-95

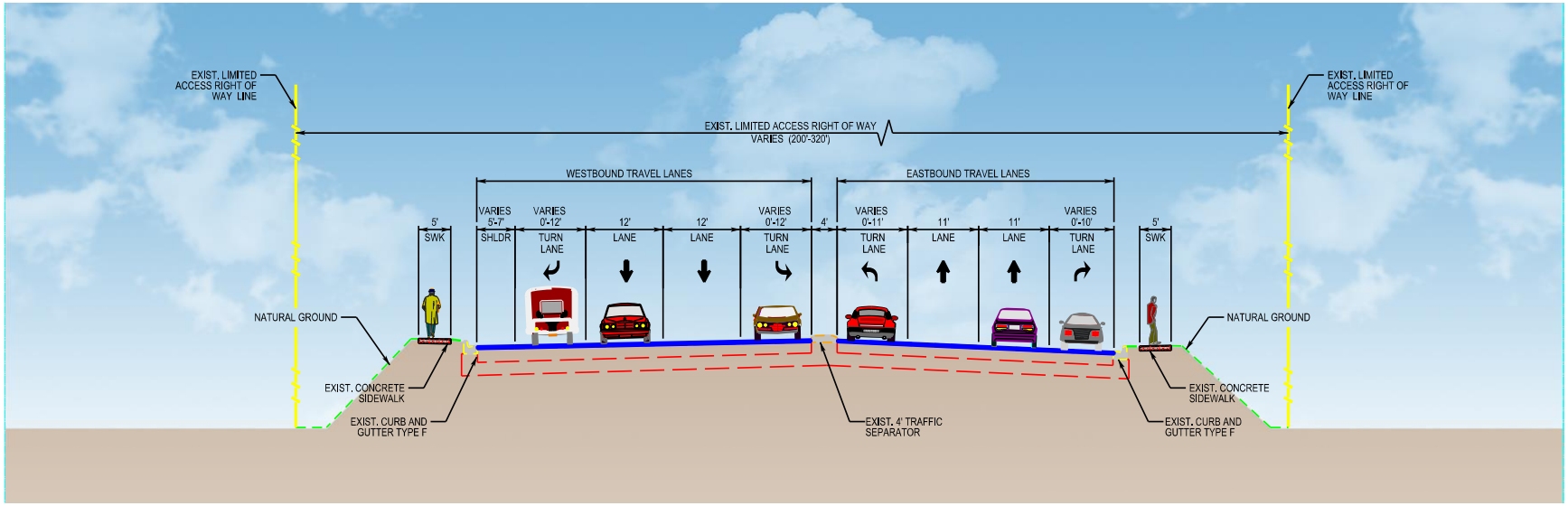


Figure 3-7 Lantana Road from SR 9/ I-95 to Shopping Center Drive

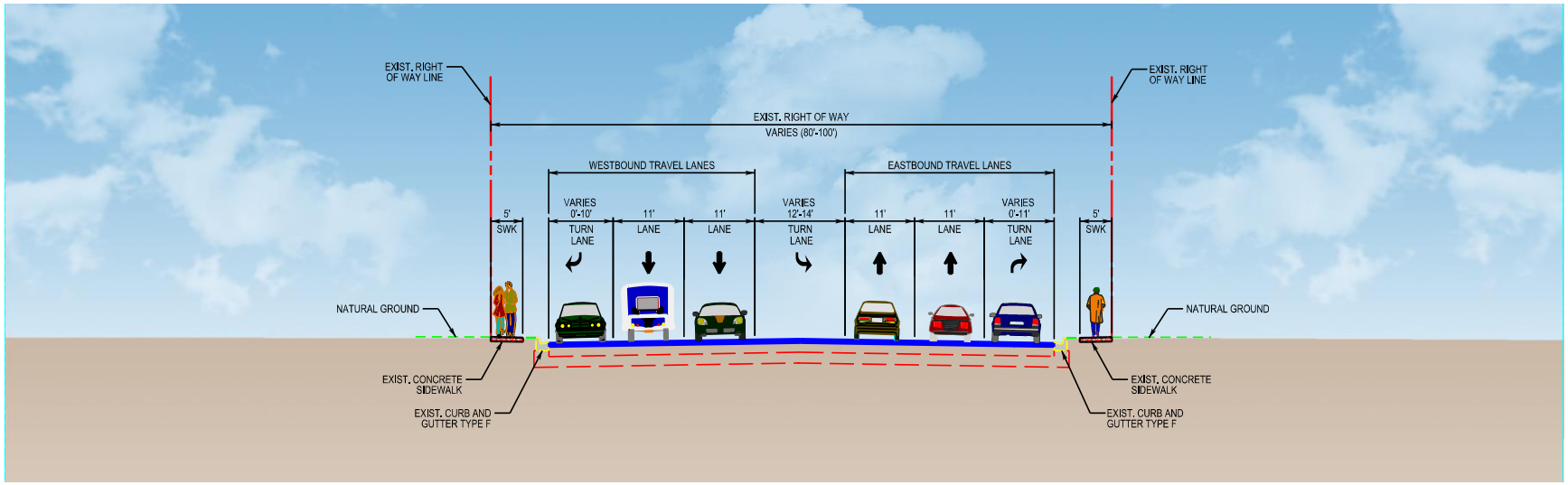


Figure 3-8 Lantana Road from Shopping Center Drive to Andrew Redding Road

3.2.4 Interchange Ramps

The existing tight urban diamond interchange provides four ramps at Lantana Road.

- Ramp Q- southbound on-ramp
- Ramp R- northbound off-ramp
- Ramp S- northbound on-ramp
- Ramp T - southbound off-ramp

The northbound and southbound off-ramps provide one exit lane from I-95 that transitions into three-lane approaches at the ramp intersections with Lantana Road. The northbound off- ramp approach consists of two left-turn lanes and a right-turn lane, all under signal control. The southbound off-ramp consists of a left and a right-turn lane and a center lane which allows both left-turn and right-turn movements all under signal control.

The northbound on-ramp provides two receiving lanes at the Lantana intersection and merges with I-95 at approximately 1,300 ft. north of the gore area. The northbound on-ramp accommodates one receiving lane for the eastbound Lantana Road left-turn movement and a single, free-flow, channelized right-turn lane.

The southbound on-ramp accommodates two receiving lanes for the westbound Lantana Road left-turn movement and a single free-flow channelized right-turn lane. The southbound on-ramp provides a single lane along the entire length of the ramp. The ramp lane that merges with I-95 becomes an auxiliary lane between the Lantana Road and the Hypoluxo Road interchanges.

Lane widths for the multilane ramps are 12 ft. with 12 ft. (10 ft. paved) outside shoulders and 8 ft. (4 ft. paved) inside shoulders. The single lane ramp has a lane width of 15 ft. with 6 ft. (4 ft. paved) outside shoulder width and 6 ft. (2 ft. paved) inside shoulder width. The design speed for all the ramps varies from 40 to 60 mph based on the final as-built plans from FM# 413258-1-22-02. The interchange ramps acceleration and deceleration lengths were evaluated as part of the study to determine any deficiencies. **Table 3-1** shows the evaluation summary.

Table 3-1 Ramps Acceleration/Deceleration Lengths

Ramp	Type	Speed	Acceleration/ Deceleration Length	Criteria	Compliance
I-95 NB to Lantana Road Ramp	Off-Ramp	40	1780’ (D)	820 ft.	Yes
Lantana Road to I-95 NB Ramp	On-Ramp	40	1300’ (A)	580 ft.	Yes
I-95 SB to Lantana Road Ramp	Off-Ramp	40	1500’ (D)	820 ft.	Yes
Lantana Road to I-95 SB Ramp	On-Ramp	40	1350’ (A)	580 ft.	Yes

3.3 ALTERNATIVE TRAVEL MODES

3.3.1 Pedestrian and Bicycle Facilities

Sidewalks are provided along Lantana Road, Andrew Redding Road and High Ridge Road for pedestrian use. Along Lantana Road, 6-ft sidewalks are provided on both sides of the roadway adjacent to the curb and gutter west of SR 9/I-95. East of SR 9/I-95, 5-ft sidewalks separated by a sod buffer are provided along both sides of Lantana Road. Along High Ridge Road, 6-ft sidewalks are provided on the east side of the roadway south of Lantana Road and on the west side of the roadway north of Lantana Road. The sidewalks are separated from the roadway by a landscaped buffer. 5-ft sidewalks separated by a sod area are provided along Andrew Redding Road north of Lantana Road. South of Lantana Road, 5-ft sidewalks separated by a sod area are provided on both sides of the roadway. Crosswalks are provided at all the intersections along Lantana Road including the SR 9/I-95 ramp terminals except for the east leg of Shopping Center Drive. Also, the pavement marking for the crosswalk at the eastbound to northbound on-ramp is barely visible. ADA compliant curb ramps and pedestrian signals with countdown are generally provided at the intersections along Lantana Road with the exceptions of the intersections at High Ridge Road and Andrew Redding Road where the existing curb ramps do not have tactile domes and the pedestrian signals do not have countdown. There are no bicycle lanes along any of the roadways within the study area.

3.3.2 Transit

Palm Beach County operates two Palm Tran services within the project study area. The County's Palm Tran Connection, a transportation disadvantaged service providing transportation services to disadvantaged populations from Jupiter to Boca Raton and from Palm Beach to South Bay also operates within the study area. MV Transportation Inc., a paratransit provider, also has operations within the study area.

Palm Tran routes 63 and route 70 operate within the project area. Route 63 runs along Lantana Road and Jog Road from Hypoluxo Road and US 1 to River Bridge Center/Forest Hill Boulevard with connections to routes 1, 2, 3, 46, 60, 61, 62, 64, 70 and 71. Route 63 operates an hourly service on weekdays and weekends with extended hours on weekdays. Route 70 operates via Seacrest Boulevard from Lantana Road to Delray Beach Tri-Rail Station, with connections to routes 2, 63, 71, 73, 80, 81, and 88. This route has more frequent services on weekdays with a 40-minute headway. On weekends, the service runs hourly with a weekend-only stop at Andrew Reading Road.

There are three bus stops located within the study limits. Two bus stops are located east of Andrew Redding Road intersection in the eastbound and westbound direction. Both bus stops have a shelter, bench and garbage disposal. The third bus stop is located west of High Ridge Road intersection in the westbound direction with no shelter, bench or garbage disposal. All three bus stops do not have bus bays. The existing transit information within the study area is provided in **Appendix C.**

3.4 EXISTING TRAFFIC DATA

3.4.1 Existing Traffic Volumes

Daily traffic counts recorded by 15-minute intervals were obtained for all the study intersections approaches for a three-day period from 09/26/2017 to 09/28/2017 **(See Appendix D)**. The Average Daily Traffic (ADT) volume was then estimated as the average of the three-day counts. The Annual Average Daily Traffic (AADT) was computed by applying the seasonal factor (SF) and axle factor (AF) published in the 2016 FDOT Traffic DVD. **Table 3-2** and **Figure 3-9** show the AADT obtained for the various roadway segments within the study area.

Table 3-2 2017 Existing AADT Volumes

Intersection	Location	ADT (3-Day Avg)	SF	AF	AADT
High Ridge Road	High Ridge Road north of Lantana Road	8,209	1.02	0.99	8,300
	Lantana Road east of High Ridge Road	51,953	1.02	0.99	52,000
	High Ridge Road south of Lantana Road	3,801	1.02	0.99	3,800
	Lantana Road west of High Ridge Road	43,495	1.02	0.99	44,000
Sunset Road	Sunset Road north of Lantana Road	5,343	1.02	0.99	5,400
	Lantana Road east of Sunset Road	45,540	1.02	-	46,000
	Sunset Road south of Lantana Road	2,201	1.02	0.99	2,200
	Lantana Road west of Sunset Road	51,953	1.02	0.99	52,000
I-95 SB Ramps	I- 95 SB Off-Ramp	13,850	1.04	-	14,000
	Lantana Road east of I-95 SB Ramps	46,307	1.02	0.99	47,000
	I-95 SB On-Ramp	13,650	1.04	-	14,000
	Lantana Road west of I-95 SB Ramps	45,540	1.02	-	4,6000

Table 3-2 2017 Existing AADT Volumes					
Intersection	**Location**	**ADT (3-Day Avg)**	**SF**	**AF**	**AADT**
I-95 NB Ramps	I-95 NB On-Ramp	9,373	1.04	-	9,700
	Lantana Road east of I-95 NB Ramps	37,749	1.02	-	39,000
	I- 95 NB Off-Ramp	12,892	1.04	-	13,000
	Lantana Road west of I-95 NB Ramps	46,307	1.02	0.99	47,000
Lantana Shopping Center Drive	Shopping Center Drive north of Lantana Road	15,498	1.02	0.99	16,000
	Lantana Road east of Shopping Center Drive	38,340	1.02	0.99	39,000
	Shopping Center Drive south of Lantana Road	7,746	1.02	0.99	7,800
	Lantana Road west of Shopping Center Drive	37,749	1.02	-	39,000
Andrew Redding Road/N13 Street	Andrew Redding Road north of Lantana Road	6,439	1.02	0.99	6,500
	Lantana Road east of Andrew Redding Road	29,110	1.02	0.99	29,000
	N 13 Street south of Lantana Road	6,187	1.02	0.99	6,200
	Lantana Road west of Andrew Redding Road	38,340	1.02	0.99	39,000
I-95	I-95 north of Lantana Road	256,634	0.94	0.94	232,000
I-95	I-95 south of Lantana Road	235,000[1]	-	-	235,000

[1] Traffic Data obtained from FDOT Count Station Site 932222

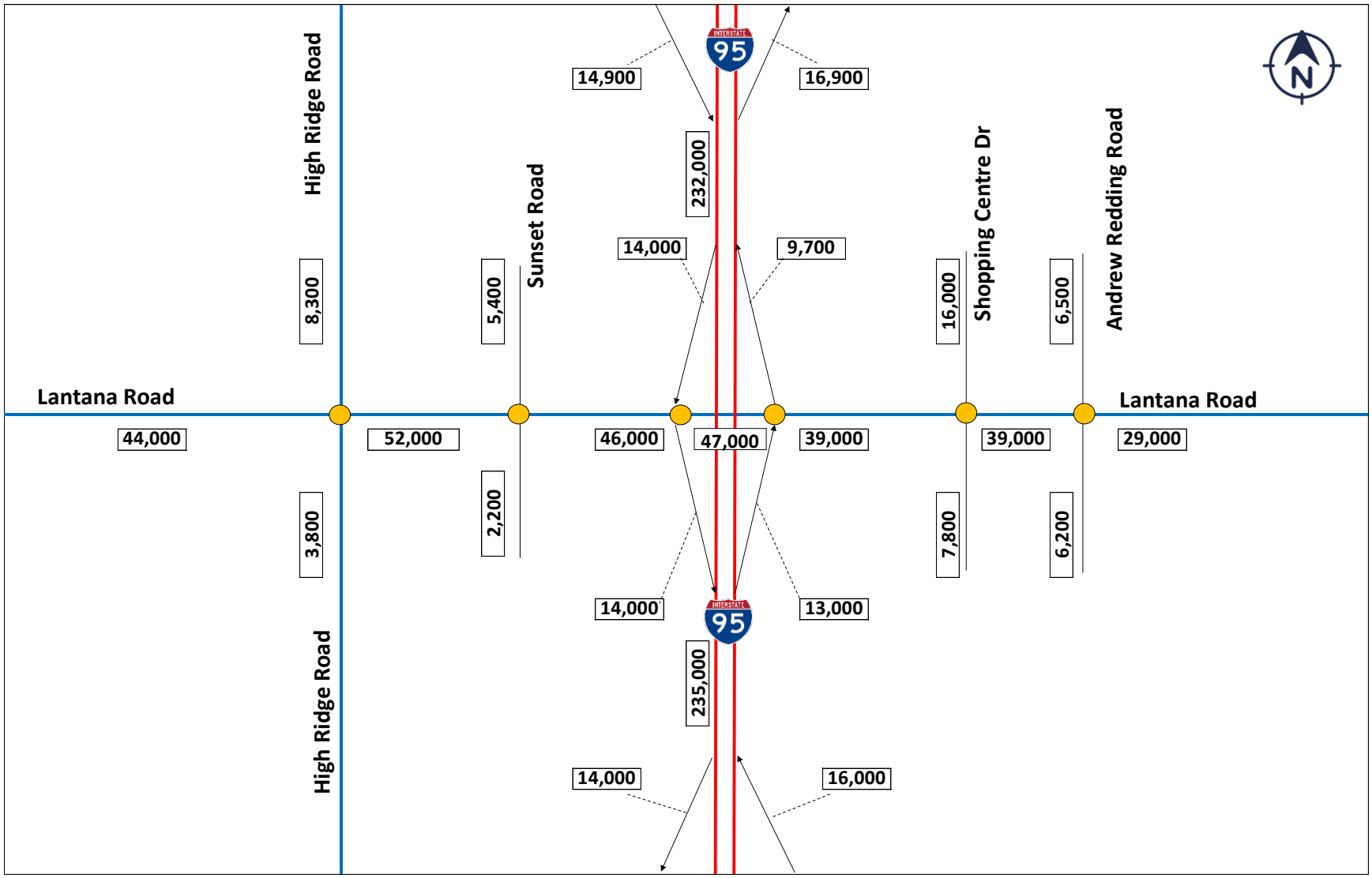


Figure 3-9 Existing Segment AADT Volume

3.4.2 Turning Movement Counts (TMCs)

Six-hour vehicle turning movement counts (TMCs) were obtained as part of the data collection effort for the following study intersections.

1. Lantana Road & High Ridge Road
2. Lantana Road & Sunset Road
3. Lantana Road & SR 9/I-95 SB Ramps
4. Lantana Road & SR 9/I-95 NB Ramps
5. Lantana Road & Andrew Redding Road

The TMCs consist of 3 hours during the morning peak period (from 6:00 am to 9:00 am), and 3 hours during the evening peak period (from 4:00 pm to 7:00 pm). The TMCs were obtained for three consecutive days from 09/26/2017 to 09/28/2017 (**See Appendix D**).

The peak hours for the AM and PM peak periods was established by analyzing the 72- hour machine counts to find a single window for the morning (AM) and evening (PM) peak periods. This was done by considering the total volumes at the study intersections for every hour in 15 minutes increments and selecting the peak hour as the 4 consecutive 15 minutes periods with the highest total volumes for the AM and PM peak periods.

Based on the turning movement counts, the period from 7:30 AM to 8:30 AM and the period from 4:15 PM to 5:15 PM, were identified as the AM and PM peak hours, respectively.

Figure 3-10 and **Figure 3-11** show the TMCs obtained for the study intersections.

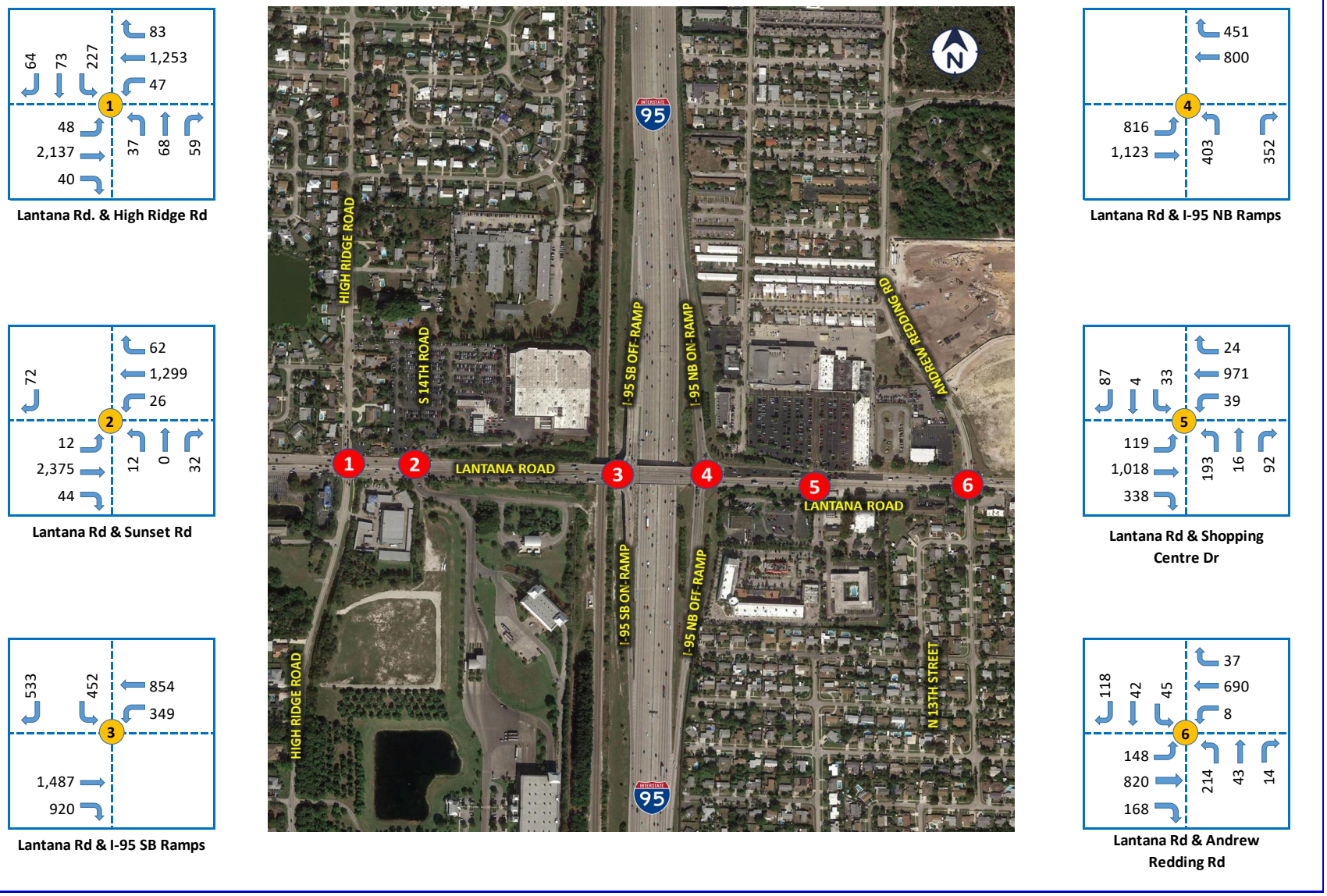


Figure 3-10 Existing Intersection Turning Movement Volumes – AM Peak Hour

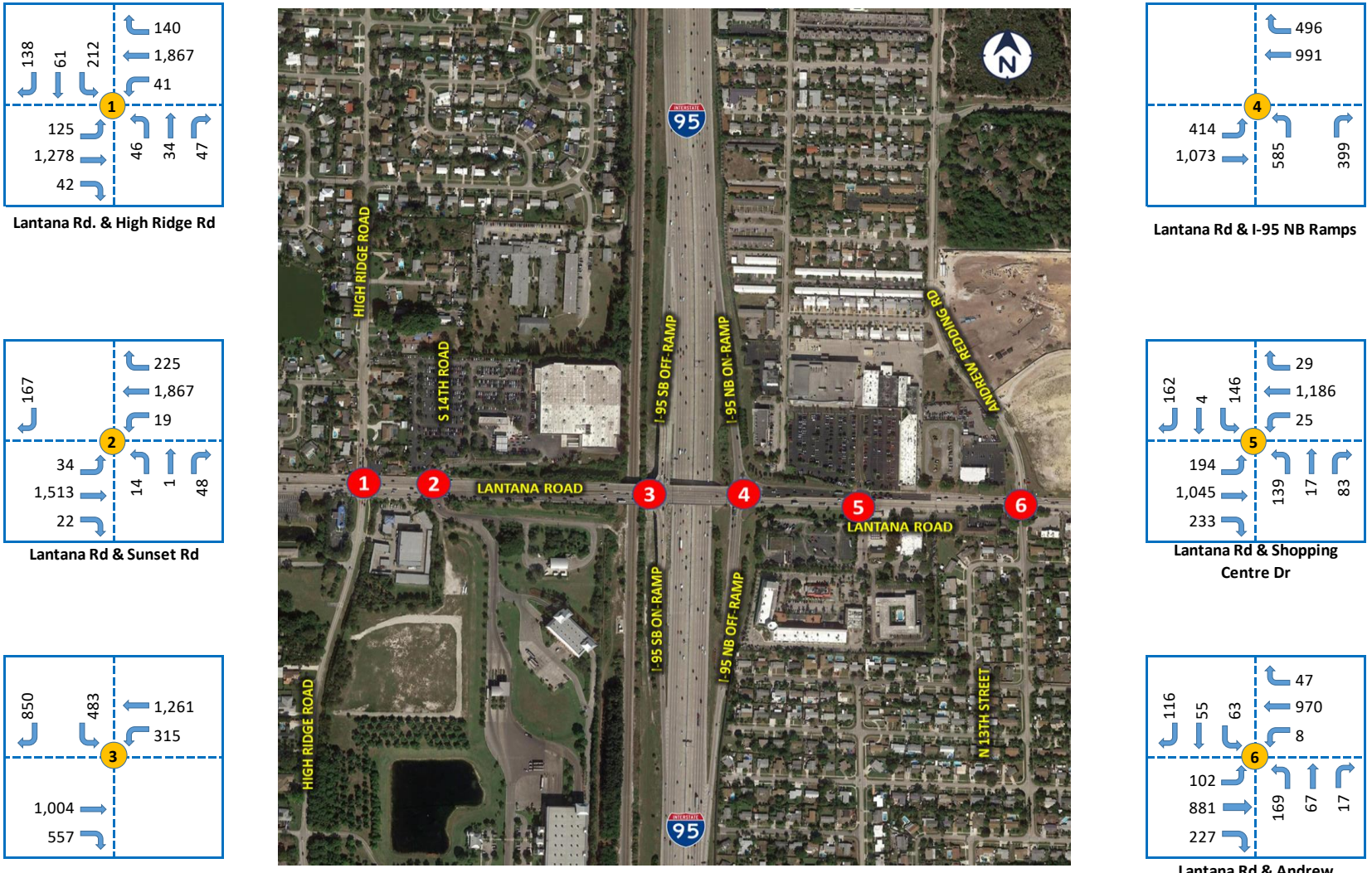


Figure 3-11 Existing Intersection Turning Movement Volumes – PM Peak Hour

3.4.3 Vehicle Classification

Vehicle classification counts were performed as part of the intersection approach counts at eight locations within the study area. The vehicle classification counts were collected for three consecutive days from 09/26/2017 to 09/28/2017 (See **Appendix D**). **Table 3-3** shows the summary of the vehicle classification counts.

Table 3-3 Vehicle Classification Summary

Location	Direction	Passenger Vehicles	Buses	Medium Trucks	Heavy Trucks	Trucks and Buses
Lantana Road East of Sunset Road	E	96.0%	0.5%	2.0%	1.5%	4.0%
	W	95.4%	0.5%	2.3%	1.8%	4.6%
Lantana West of I-95 SB Off-Ramp	E	96.0%	0.5%	2.0%	1.5%	4.0%
	W	95.4%	0.5%	2.3%	1.8%	4.6%
Lantana Road East of I-95 NB Off-Ramp	E	96.8%	0.3%	1.6%	1.3%	3.2%
	W	94.9%	0.7%	2.4%	1.9%	5.1%
Lantana Road West of Shopping Center Dr	E	96.8%	0.3%	1.6%	1.3%	3.2%
	W	94.9%	0.7%	2.4%	1.9%	5.1%
I -95 SB Off-Ramp	S	93.8%	0.3%	1.7%	4.2%	6.2%
I-95 SB On-Ramp	S	94.5%	0.8%	2.8%	1.9%	5.5%
I-95 NB On-Ramp	N	95.8%	0.6%	2.2%	1.3%	4.2%
I-95 NB Off-Ramp	N	91.7%	1.1%	5.6%	1.7%	8.3%

3.4.4 Signal Timings and Traffic Control

Traffic signal timing information was obtained from the Palm Beach County Traffic Engineering Division for the major intersections in the study area, including all the interchange ramp intersections. Field visits were conducted to verify the signal timing and phasing information provided during the AM and PM peak hours. It is essential to confirm the signal timing information in the field, as recent projects in the region might have altered these timings. Field visits were also be conducted to inventory the following items:

- Stop/yield sign locations
- Regulatory/advisory speed limits
- Guide sign locations

Details of the signal phasing and timing plans are provided in **Appendix E.**

3.5 EXISTING OPERATIONAL ANALYSIS

3.5.1 Freeways and Ramps

The existing AM and PM peak hour operating conditions for the off-ramps, on- ramps and I-95 mainline sections between the ramps were analyzed using Highway Capacity Software 7. The High Occupancy Vehicle (HOV) lane along the I-95 mainline was analyzed as a Continuous Access Managed Lane with a default capacity of 1,750 pc/h/ln as per HCM 6 methodologies for managed lanes. Given the existing congested conditions along the freeway, the default capacity was used as the HOV demand (i.e. 1750 pc/h/ln which converts to 1554 veh/hr). The DDHV for the general use lanes were obtained by subtracting the HOV demand from the total DDHV. The freeway segments were analyzed to determine the operational analysis type. For the segments between the adjacent interchanges, when the computed maximum weaving length (Lmax) exceeds the length between ramps, then the segment qualifies to be analyzed as a weaving segment. **Table 3-4** shows the operational analysis performed for the freeway segments.

Table 3-4 Operational Analysis Type for Freeway Segments

No.	Segment	Distance (ft)	Weaving Length – Lmax (ft)	Operational Type
1	Hypoluxo Road NB On-Ramp to Lantana Road NB Off-Ramp	2,265	5,530	Weaving
2	Lantana Road NB Off-Ramp to Lantana Road NB On-Ramp	3,165	-	Basic Freeway
3	Lantana Road NB On-Ramp to 6th Avenue S NB Off-Ramp	4,445	5,456	Weaving
4	Lantana Road SB On-Ramp to Hypoluxo Road SB Off-Ramp	2,165	5,691	Weaving
5	Lantana Road SB Off-Ramp to Lantana Road SB On-Ramp	3,065	-	Basic Freeway
6	6th Avenue S SB On-Ramp to Lantana Road SB Off-Ramp	4,375	6,402	Weaving

The weaving volumes were developed using the origin destination matrix values obtained from the recently completed I-95 Managed Lanes Master Plan Report (FM: 436576-1). The percentages of the volumes for the on-ramps and off-ramps were obtained from the I-95 Managed Lanes Master Plan Report and were applied to the DDHV's calculated to obtain the ramp to freeway, ramp to ramp and freeway to ramp volumes.

Figure 3-12 and **Figure 3-13** show the density, speed, volume to capacity ratio, and level of service for the freeway segments for the AM and PM peak periods respectively.

Based on the analysis, the basic freeway segments between the ramp terminals operate at LOS D or better during both AM and PM peak periods. Most of the weaving segments analyzed operate at LOS F during both AM and PM peak periods, except the section of I-95 from Lantana Road to Hypoluxo Road southbound direction which operates at LOS D during the AM peak period and the section of I-95 from Hypoluxo Road to Lantana Road northbound direction which operates at LOS D and LOS E during the AM and PM peak period respectively. The details of the results are included in **Appendix F.**

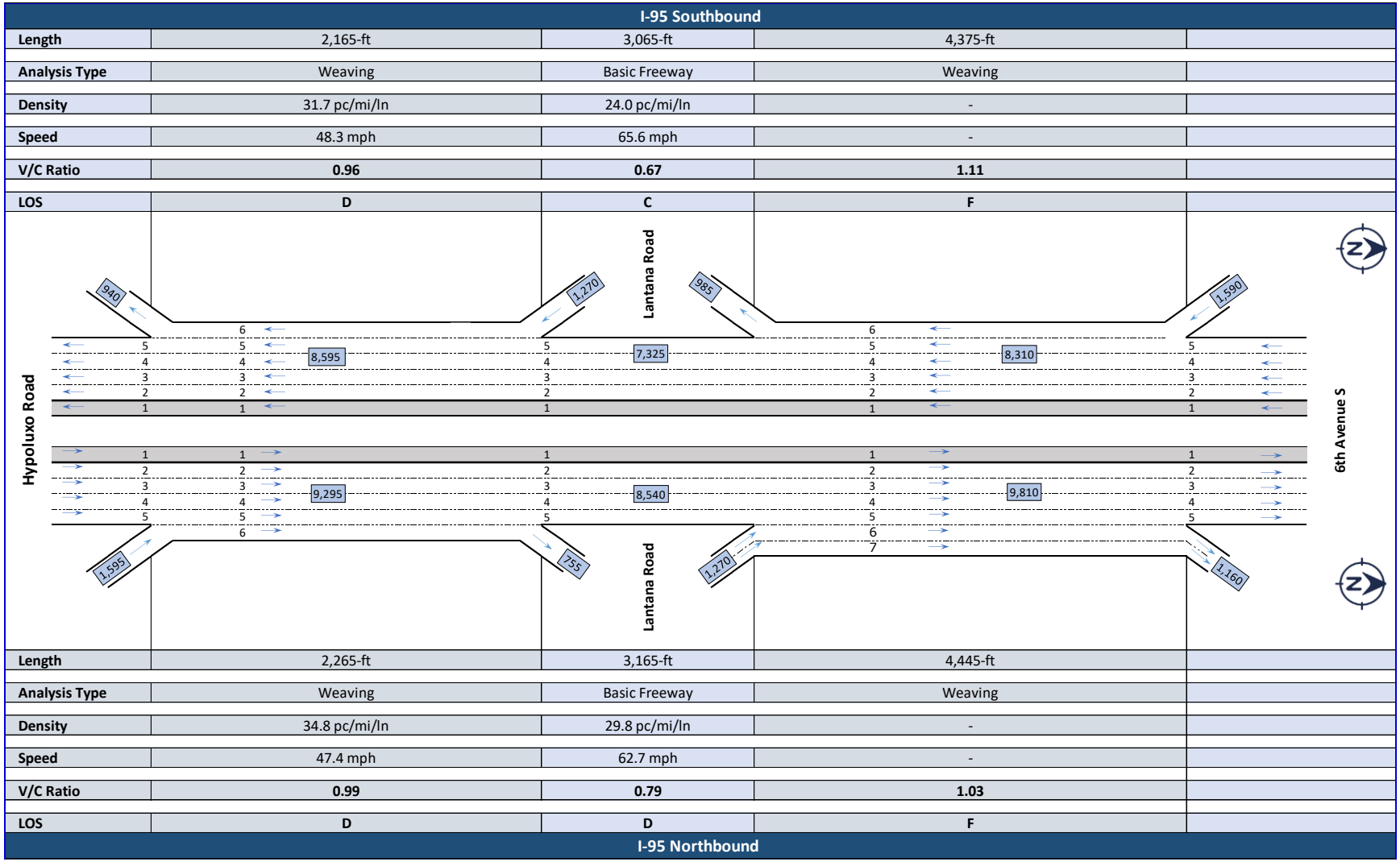


Figure 3-12 2017 Existing Freeway Analysis – AM Peak

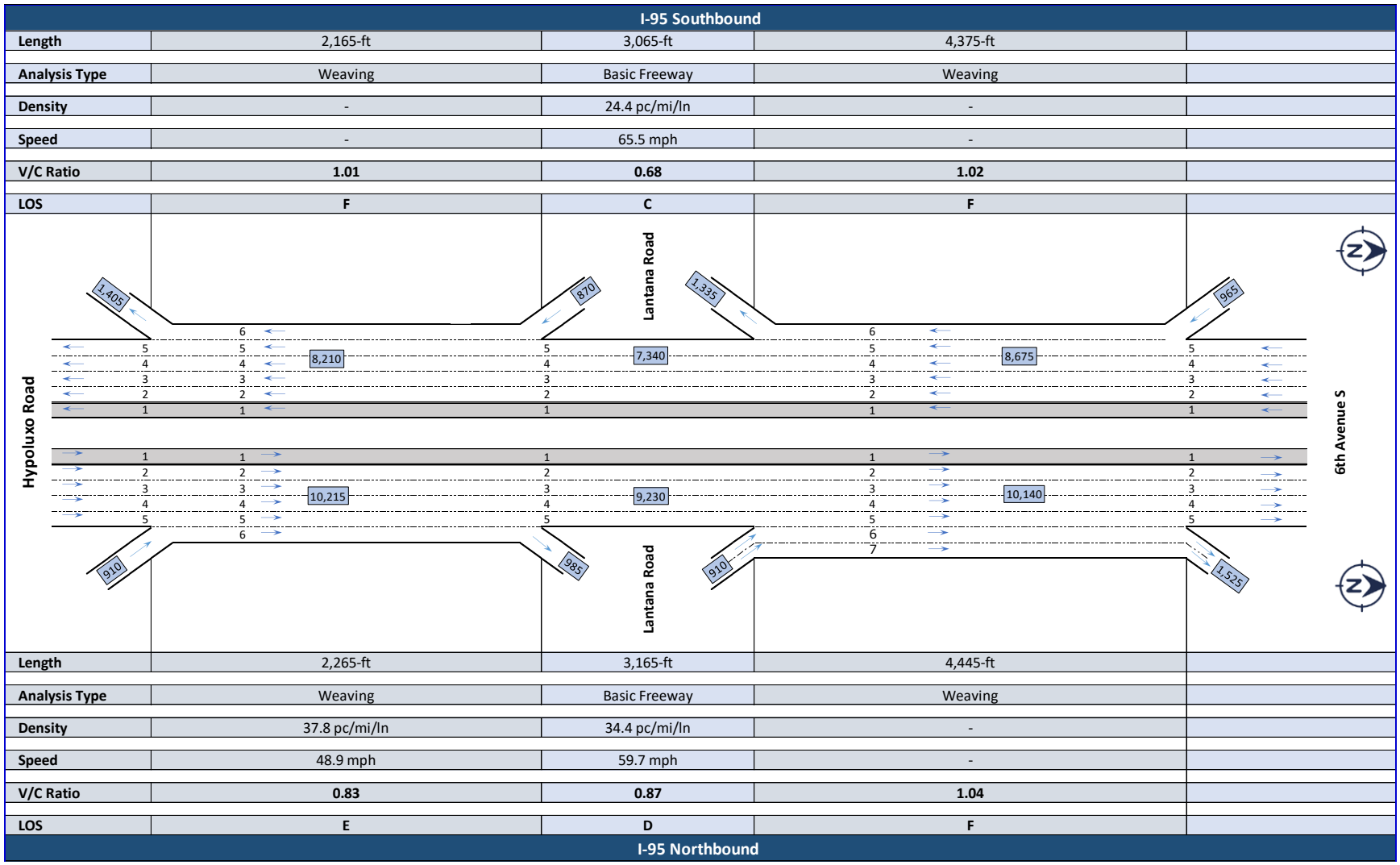


Figure 3-13 2017 Existing Freeway Analysis – PM Peak

3.5.2 Existing Intersection Configuration

The lane configuration of the existing intersections along the project corridor were verified during field review and data collection effort and are shown in **Figure 3-14.**

3.5.3 Intersection Operations

Existing traffic conditions for signalized intersections were analyzed using HCM 2010 methodology or HCM 2000 methodology where HCM 2010 was not applicable. SYNCHRO 10 software was used to perform the analysis. The analysis was performed for the AM and PM peak periods. For the existing conditions analysis, the actual Right Turn on Red (RTOR) volumes obtained from the data collection were used instead of the estimated values from SYNCHRO. **Table 3-5** and **Table 3-6** show the existing conditions LOS analysis results for the signalized intersections.

The analysis results show that all the existing signalized intersections are operating at an overall LOS D or better during both the AM and PM peak periods. However, some of the movements and approaches operate at LOS F. For the SR 9/I-95 ramp terminals, the northbound approach at the NB off-ramp operates at LOS D while the southbound approach at the SB off-ramp terminal operates at LOS E during the AM peak period. During the PM peak period, the northbound approach at the NB off-ramp operates at LOS D while the southbound approach at the SB off-ramp terminal operates at LOS F.

It should be noted that the northbound left-turn movement for the Lantana Road at Sunset Road unsignalized intersection is overcapacity due to excessive delays from lack of gaps in the east-west traffic stream. As such, the HCS methodology does not provide any delay values for the northbound left-turn movement. This impacts the combined delays for the northbound approach as well as the overall intersection delays. Consequently, the northbound approach delay and overall intersection delay and LOS for the Lantana Road at Sunset Road unsignalized intersection was omitted from the results table.

The detailed results of the 2017 existing year operational analysis for the signalized intersections within the project limits are provided in **Appendix G**.

Figure 3-14 Existing intersection configuration

Table 3-5 2017 Existing Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	17.6	B	24.8	C	64.6	E	58.7	E	35.1	D
			T	25.3	C	40.6	D	79.2	E	44.2	D		
			R	27.4	C	41.2	D						
			App	25.9	C	40.3	D	75.9	E	53.3	D		
2	Lantana Rd & Sunset Rd.	AM	L	13.0	B	95.8	F	OC	F	-	-	-	-
			T	-	-	-	-	38.7	E	-	-		
			R	-	-	-	-			16.5	C		
			App	-	-	-	-	OC	F	16.5	C		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	16.2	B	-	-	75.5	E	48.4	D
			T	70.2	E	2.4	A	-	-	-	-		
			R	44.1	D	-	-	-	-	46.4	D		
			App	60.2	E	6.4	A	-	-	70.9	E		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	40.6	D	-	-	53.6	D	-	-	36.7	D
			T	1.3	A	93.5	F	-	-	-	-		
			R	-	-	0.4	A	38.5	D	-	-		
			App	17.8	B	59.9	E	46.6	D	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	27.5	C	31.1	C	33.4	C	54.6	D	33.7	C
			T	47.6	D	15.5	B	-	-	-	-		
			R	42.3	D	9.8	A	27.1	C	56.7	E		
			App	44.8	D	16.0	B	31.1	C	56.1	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	21.3	C	30.6	C	39.6	D	47.9	D	29.1	C
			T	22.4	C	30.3	C	31.4	C	52.3	D		
			R	22.4	C	30.3	C						
			App	22.3	C	30.3	C	37.9	D	51.3	D		

Note: OC = Overcapacity

Table 3-6 2017 Existing Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	62.4	E	43.5	D	76.2	E	60.5	E	31.7	C
			T	18.8	B	29.4	C	71.7	E	53.1	D		
			R	19.3	B	31.5	C						
			App	22.7	C	30.4	C	73.4	E	56.9	E		
2	Lantana Rd & Sunset Rd.	PM	L	23.3	C	25.8	D	OC	F	-	-	-	-
			T	-	-	-	-	129.9	F	-	-		
			R	-	-	-	-			49.4	E		
			App	-	-	-	-	OC	F	49.4	E		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	8.4	A	-	-	102.9	F	49.7	D
			T	56.1	E	3.9	A	-	-	-	-		
			R	22.1	C	-	-	-	-	58.8	E		
			App	44.0	D	4.8	A	-	-	109.6	F		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	16.7	B	-	-	58.7	E	-	-	35.7	D
			T	4.5	A	82.6	F	-	-	-	-		
			R	-	-	0.4	A	32.9	C	-	-		
			App	7.9	A	55.2	E	48.2	D	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	74.9	E	42.6	D	61.5	E	88.2	F	50.8	D
			T	52.4	D	41.2	D	-	-	-	-		
			R	41.3	D	24.8	C	42.8	D	63.3	E		
			App	53.6	D	40.9	D	53.7	D	75.2	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	63.4	E	74.4	E	57.1	E	63.8	E	27.8	C
			T	14.5	B	21.4	C	42.9	D	79.1	E		
			R	14.5	B	21.3	C						
			App	18.6	B	21.7	C	52.4	D	75.0	E		

Note: OC = Overcapacity

3.5.4 Arterial Operations

The arterial Level of Service (LOS) analysis for the Lantana Road arterial segment was determined using SYNCHRO 10 for both the AM and PM peak periods based on the travel speed. (See **Appendix G**). The travel speed within each segment is based on signalized intersection spacing, the running time between intersections, and the control delay to through vehicles at each signalized intersection. **Table 3-7** and **Table 3-8** show the existing LOS along Lantana Road.

Table 3-7 2017 Existing Arterial Level of Service - AM Peak Period

Corridor	Cross Street	Eastbound			Westbound		
		Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
Lantana Road	High Ridge Road	58.1	12.1	F	66.2	13.4	E
	I-95 SB On-Ramp/I-95 SB Off-Ramp	97.7	9.1	F	11.7	24.5	C
	I-95 NB On-Ramp/I-95 NB Off-Ramp	10.6	27.0	C	104.9	3.7	F
	Shopping Centre Dr.	58.9	6.6	F	49.1	10.3	F
	Andrew Redding Road	21.7	23.4	C	57.5	14.2	E
	Total	**247.0**	**11.2**	F	**289.4**	**10.0**	F

Table 3-8 2017 Existing Arterial Level of Service - PM Peak Period

Corridor	Cross Street	Eastbound			Westbound		
		Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
Lantana Road	High Ridge Road	40.4	17.4	D	65.2	13.6	E
	I-95 SB On-Ramp/I-95 SB Off-Ramp	85.1	10.4	F	13.3	21.5	D
	I-95 NB On-Ramp/I-95 NB Off-Ramp	14.0	20.5	D	95.0	4.1	F
	Shopping Centre Dr.	44.0	8.8	F	62.5	8.1	F
	Andrew Redding Road	35.5	14.3	E	53.3	15.3	E
	Total	**219.0**	**12.7**	F	**289.3**	**10.0**	F

The analysis results show that Lantana Road operates at an overall LOS F in the eastbound direction with an average speed of 11.2 mph and LOS F with an average speed of 12.7 mph during the AM and PM peak periods, respectively. The westbound direction also operates at an overall LOS F with average speeds of 10.0 mph during the AM and PM peak hours, respectively.

3.5.5 Intersection Queue Analysis

A queuing analysis was performed as part of the study to determine the adequacy of the existing turn lane storage lengths for the intersections within the study area. For this analysis, the 95th percentile vehicular queue length in feet (ft.) for left and right-turn movements at each of the study intersections were evaluated and compared against the existing storage distance in order to determine if the available storage lengths provided can accommodate the vehicular demands. **Table 3-9** compares the 95th percentile queues for the turning movements with the existing storage lengths and identifies instances where the estimated queue exceeds the storage capacity. The detailed queue analysis results are provided in **Appendix H**.

Table 3-9 Existing Intersection Queue Length

Corridor	No.	Intersection	Approach		AM	PM	Max Queue Length (ft)	Existing Storage (ft)	Storage Deficiency	Over Existing Storage
Lantana Road	1	High Ridge Road	EB	L	44	160	160	200	No	-
			WB	L	m64	33	64	250	No	-
			NB	L	71	100	100	200	No	-
			SB	L	240	295	295	500	No	-
	3	SB Off-Ramp	WB	L	m159	m127	159	480	No	-
			SB	L	#550	#668	668	930	No	-
				R	103	#526	103	930	No	-
	4	NB Off-Ramp	EB	L	m#1125	m82	1125	490	Yes	130%
			NB	L	251	#415	251	940	No	-
				R	224	171	224	940	No	-
	5	Shopping Center Drive	EB	L	157	225	225	270	No	-
				R	278	103	278	280	No	-
			WB	L	m32	36	36	400	No	-
				R	m23	0	23	365	No	-
			NB	L	198	240	240	200	Yes	20%
			SB	R	130	97	130	120	Yes	8%
	6	Andrew Redding Road	EB	L	m27	74	74	120	No	-
			WB	L	17	16	17	200	No	-
			NB	L	232	193	232	150	Yes	55%
			SB	L	80	108	108	200	No	-

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.

Based on the analysis, 4 out of the 20 locations (20%) have deficient storage lengths. Although the analysis results indicate that I-95 NB and SB ramps approaches queue lengths currently do not exceed the available storage length, significant queues were observed during the field reviews for the southbound off-ramps. It should be noted that the off ramps were recently widened in 2015 as part of a short-term improvement project. As such, although the existing queues observed in the field were significant, they did not extend into I-95 mainline.

3.6 EXISTING SAFETY ANALYSIS

Safety analysis was performed along SR 9/I-95 and Lantana Road within the study area using the latest available 5 years of crash data to identify crash patterns, contributing causes, countermeasures, and provide recommendations for further studies, if needed. The following sections summarize the safety analysis performed.

3.6.1 Crash Data

Crash data from 2014 to 2018 for SR 9/I-95 (Roadway ID: 93220000) from south of Lantana Road to north of Lantana Road, SR 9/I-95 ramps at Lantana Road (Roadway ID: 93220037, 93220038, 93220039, and 93220040), and Lantana Road (Roadway ID: 93530000) from High Ridge Road to Andrew Redding Road (MP 2.80 to MP 3.50) was obtained from the FDOT State Safety Office GIS (SSOGis) Query Tool on the Traffic Safety Web Portal. The data includes environmental and driver characteristics that were existent at the time of each crash and provides the basis for the crash data analysis. The detailed crash data is provided in **Appendix I.**

3.6.2 Crash Summary

3.6.2.1 SR 9/I-95 Mainline

Based on the crash analysis, a total of 313 crashes occurred on the SR 9/I-95 mainline within the study area from 2014 to 2018. Except for 2015 and 2017 which saw a decline from the previous years' crashes, all the other years recorded a gradual increase in crashes.

Rear-end crashes were the predominant crash type accounting for 134 (43%) of the total crashes followed by 57 sideswipe crashes (18%), 49 fixed object crashes (16%), and 26 angle crashes (8%). Majority of the crashes (183 crashes, 58.5%) occurred under daylight conditions with 112 crashes (35.8%) occurred during nighttime. The percentage of nighttime crashes is higher than the statewide percentage of 33%. Poor surface conditions contributed only marginally to the number

of crashes recorded over the five-year period as 235 (75.1%) of the total crashes occurred during clear weather conditions and on dry pavement surface. 77 of crashes (24.6%) occurred on wet pavement. This is higher than the statewide average of 15%.

Two (2) fatal crashes occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 162 (51.8%) of all crashes; 149 crashes (47.6%) resulted in Injury. Among the contributing causes documented in the crash data, 'carelessness or negligent manner' (116 crashes, 37%), resulted in the most crashes. Other contributing causes included 'failed to keep in proper lane' (18 crashes, 6%), 'drove to fast for conditions' (16 crashes, 5%), 'followed too closely' (12 crashes, 4%), and 'over-correcting /over-steering' (9 crashes, 3%). A significant number of crashes were documented to have been the result of 'other contributing action' (69 crashes, 22%) and 'no contributing action' (54 crashes, 17%). **Table 3-10** and **Figure 3-15** show the crash summary along the SR 9/I-95 mainline within the study area.

Table 3-10 SR 9/I-95 Crash Summary Statistics

SR 9/I-95 at Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
CRASH TYPE	Rear End	31	16	28	26	33	134	25	42.8%
	Head On	0	0	0	0	0	0	0	0.0%
	Angle	6	4	8	6	2	26	6	8.3%
	Left-turn	0	0	0	0	0	0	0	0.0%
	Right-turn	0	0	0	0	0	0	0	0.0%
	Sideswipe	15	10	16	6	10	57	14	18.2%
	Backed Into	0	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0	0.0%
	Bicycle	0	0	0	0	0	0	0	0.0%
	Fixed Object	*11*	*11*	*11*	*7*	*9*	*49*	*11*	*15.7%*
	Impact Attenuator/Crash Cushion	0	0	1	0	0	1	0	0.3%
	Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
	Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
	Bridge Rail	0	0	0	0	0	0	0	0.0%
	Culvert	0	0	0	0	0	0	0	0.0%
	Curb	0	0	0	0	0	0	0	0.0%
	Ditch	0	1	0	0	1	2	0	0.6%
	Embankment	0	0	0	0	0	0	0	0.0%
	Guardrail Face	0	2	0	0	1	3	1	1.0%
	Guardrail End	0	0	0	1	0	1	0	0.3%
	Cable Barrier	0	0	0	0	0	0	0	0.0%
	Concrete Traffic Barrier	4	7	8	5	5	29	6	9.3%
	Other Traffic Barrier	1	0	0	0	0	1	0	0.3%
	Tree (Standing)	2	0	0	0	0	2	0	0.6%
	Utility Pole/Light Support	3	0	0	0	0	3	1	1.0%

Table 3-10 SR 9/I-95 Crash Summary Statistics

SR 9/I-95 at Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
	Traffic Sign Support	1	1	1	1	0	4	1	1.3%
	Traffic Signal Support	0	0	0	0	0	0	0	0.0%
	Other Post, Pole or Support	0	0	0	0	0	0	0	0.0%
	Fence	0	0	0	0	1	1	0	0.3%
	Mailbox	0	0	0	0	0	0	0	0.0%
	Other Fixed Object	0	0	1	0	1	2	0	0.6%
	Other Non-Fixed Object Collisions	*1*	*5*	*3*	*2*	*3*	*14*	*3*	*4.5%*
	Railway Vehicle (Train, Engine)	0	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0	0.0%
	Motor Vehicle in Transport	0	0	0	0	0	0	0	0.0%
	Parked Motor Vehicle	0	1	1	0	0	2	0	0.6%
	Work Zone/Maintenance Equip.	0	0	0	0	0	0	0	0.0%
	Struck by Falling/Shifting Cargo	1	1	2	2	1	7	1	2.2%
	Other Non-Fixed Object	0	3	0	0	2	5	1	1.6%
	Non-Collisions	*3*	*5*	*4*	*4*	*3*	*19*	*4*	*6.1%*
	Overturn/Rollover	1	2	2	2	2	9	2	2.9%
	Fire/Explosion	0	0	0	0	0	0	0	0.0%
	Immersion	0	0	0	0	0	0	0	0.0%
	Jackknife	0	0	1	0	0	1	0	0.3%
	Cargo/Equipment Loss or Shift	2	0	0	0	0	2	0	0.6%
	Fell/Jumped from Motor Vehicle	0	0	1	0	0	1	0	0.3%
	Thrown or Falling Object	0	0	0	1	0	1	0	0.3%
	Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	3	0	1	1	5	1	1.6%
	Others	2	3	1	4	4	14	3	4.5%
	Total Crashes	**69**	**54**	**71**	**55**	**64**	**313**	**63**	**100.0%**
SEVERITY	PDO Crashes	34	27	35	29	37	162	32	51.8%
	Fatal Crashes	1	1	0	0	0	2	0	0.6%
	Injury Crashes	34	26	36	26	27	149	30	47.6%
LIGHTING CONDITIONS	Daylight	40	35	42	32	34	183	37	58.5%
	Dusk	2	0	1	2	5	10	2	3.2%
	Dawn	1	1	2	2	2	8	2	2.6%
	Dark	26	18	26	19	23	112	22	35.8%
	Unknown	0	0	0	0	0	0	0	0.0%
SURFACE CONDITIONS	Dry	48	40	52	42	53	235	47	75.1%
	Wet	21	14	18	13	11	77	15	24.6%
	Others	0	0	1	0	0	1	0	0.3%
MONTH OF YEAR	January	5	6	8	5	6	30	6	9.6%
	February	3	7	8	2	4	24	5	7.7%
	March	6	3	7	5	4	25	5	8.0%

Table 3-10 SR 9/I-95 Crash Summary Statistics

SR 9/I-95 at Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
	April	3	5	2	4	6	20	4	6.4%
	May	4	7	5	4	3	23	5	7.3%
	June	7	0	3	5	2	17	3	5.4%
	July	6	6	3	6	4	25	5	8.0%
	August	5	4	8	5	10	32	6	10.2%
	September	7	4	11	3	2	27	5	8.6%
	October	5	3	6	2	6	22	4	7.0%
	November	12	7	4	7	9	39	8	12.5%
	December	6	2	6	7	8	29	6	9.3%
DAY OF WEEK	Monday	15	8	13	6	12	54	11	17.3%
	Tuesday	9	6	9	12	6	42	8	13.4%
	Wednesday	13	10	8	9	14	54	11	17.3%
	Thursday	7	10	12	9	10	48	10	15.3%
	Friday	14	4	11	11	9	49	10	15.7%
	Saturday	4	2	13	7	8	34	7	10.9%
	Sunday	7	14	5	1	5	32	6	10.2%
HOUR OF DAY	00:00-06:00	8	6	11	8	10	43	9	13.7%
	06:00-09:00	13	11	26	16	15	81	16	25.9%
	09:00-11:00	5	1	3	3	6	18	4	5.8%
	11:00-13:00	6	1	3	3	2	15	3	4.8%
	13:00-15:00	2	4	5	5	5	21	4	6.7%
	15:00-18:00	13	17	7	6	11	54	11	17.3%
	18:00-24:00	22	14	16	14	15	81	16	25.9%
CONTRIBUTING CAUSES (VEHICLE ONLY)	No Contributing Action	8	11	18	12	5	54	11	17.3%
	Careless or Negligent Manner	29	13	26	18	30	116	23	37.1%
	Failed to Yield Right of way	0	0	1	2	1	4	1	1.3%
	Improper Backing	0	0	0	0	0	0	0	0.0%
	Improper Turn	0	0	0	0	0	0	0	0.0%
	Followed too Closely	3	3	1	0	5	12	2	3.8%
	Ran Red Light	0	0	0	0	1	1	0	0.3%
	Drove too Fast for Conditions	2	5	2	5	2	16	3	5.1%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	0	1	2	2	1	6	1	1.9%
	Exceed Posted Speed	0	0	0	0	0	0	0	0.0%
	Wrong Side or Wrong Way	0	0	0	0	1	1	0	0.3%
	Failed to Keep in Proper Lane	2	5	4	2	5	18	4	5.8%
	Ran Off Roadway	0	0	0	2	1	3	1	1.0%
	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	0	6	1	2	0	9	2	2.9%

Table 3-10 SR 9/I-95 Crash Summary Statistics

SR 9/I-95 at Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
	Swerved or Avoided	0	1	2	0	0	3	1	1.0%
	Erratic, Reckless or Aggressive	0	0	1	0	0	1	0	0.3%
	Other Contributing Action	25	9	13	10	12	69	14	22.0%
WEATHER CONDITIONS	Clear	39	30	42	33	43	187	37	59.7%
	Cloudy	19	15	23	17	15	89	18	28.4%
	Rain	11	9	6	5	6	37	7	11.8%
	Fog, Smog, Smoke	0	0	0	0	0	0	0	0.0%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

Figure 3-15 SR 9/I-95 Crash Summary Statistics Histograms

3.6.2.2 SR 9/I-95 Ramps at Lantana Road

Based on the crash analysis, a total of 157 crashes occurred on the SR 9/I-95 ramps at Lantana Road interchange within the study area from 2014 to 2018.

Rear-end crashes were the predominant crash type accounting for 96 crashes (61%) of the total crashes followed by 19 angle crashes (12%), 17 sideswipe crashes (11%), and 11 fixed object crashes (7%). Majority of the crashes (107 crashes, 68.2%) occurred under daylight conditions while 44 crashes (28%) occurred during nighttime. The percentage of nighttime crashes is lower than the statewide average of 33%. Poor surface conditions contributed only slightly to the number of crashes recorded over the five-year period as 128 (80.3%) of the total crashes occurred on dry pavement surface. 19.7% of crashes (31) occurred on wet pavement. This is higher than the statewide average of 15%.

No fatal crashes occurred within the study limits during the five-year period. Property damage Only (PDO) crashes accounted for 83 (52.9%) of all crashes and 74 crashes (47.1%) resulted in injury. Among the contributing causes documented in the crash data, ‘carelessness or negligent manner’ (61 crashes, 39%), ‘other contributing action’ (41 crashes, 26%) and ‘no contributing action’ (12 crashes, 8%) were among the highest. Other contributing causes include ‘followed too closely’ (11 crashes, 7%), ‘ran red light’ (11 crashes, 4%), ‘drove to fast for conditions’ (6 crashes, 4%), and ‘improper passing’ (4 crashes, 3%). **Table 3-11** and **Figure 3-16** show the crash summary at SR 9/I-95 and Lantana Road.

Table 3-11 SR 9/I-95 Ramps at Lantana Road Crash Summary Statistics

I-95 Ramps at Lantana Road		Number of Crashes Year					5 Year Total Crashes	Mean Crashes Per Year	%
		2014	2015	2016	2017	2018			
CRASH TYPE	Rear End	30	19	20	15	12	96	23	61.1%
	Head On	0	0	0	0	0	0	0	0.0%
	Angle	3	4	4	4	4	19	4	12.1%
	Left-turn	0	0	0	0	0	0	0	0.0%
	Right-turn	0	0	0	0	0	0	0	0.0%
	Sideswipe	3	2	5	2	5	17	3	10.8%
	Backed Into	0	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	0	0	0	0.0%
	Bicycle	0	0	3	3	1	7	1	4.5%
	Fixed Object	*5*	*0*	*3*	*1*	*2*	*11*	*3*	*7.0%*
	Impact Attenuator/Crash Cushion	1	0	0	0	0	1	0	0.6%
	Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
	Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
	Bridge Rail	0	0	0	0	1	1	0	0.6%
	Culvert	0	0	0	0	0	0	0	0.0%
	Curb	0	0	0	0	0	0	0	0.0%
	Ditch	0	0	0	0	0	0	0	0.0%
	Embankment	0	0	0	0	0	0	0	0.0%
	Guardrail Face	0	0	0	0	0	0	0	0.0%
	Guardrail End	0	0	0	0	0	0	0	0.0%
	Cable Barrier	0	0	0	0	0	0	0	0.0%
	Concrete Traffic Barrier	2	0	1	1	0	4	1	2.5%
	Other Traffic Barrier	0	0	0	0	0	0	0	0.0%
	Tree (Standing)	0	0	0	0	0	0	0	0.0%
	Utility Pole/Light Support	2	0	1	0	1	4	1	2.5%
	Traffic Sign Support	0	0	0	0	0	0	0	0.0%
	Traffic Signal Support	0	0	0	0	0	0	0	0.0%
	Other Post, Pole or Support	0	0	0	0	0	0	0	0.0%
	Fence	0	0	0	0	0	0	0	0.0%
	Mailbox	0	0	0	0	0	0	0	0.0%
	Other Fixed Object	0	0	1	0	0	1	0	0.6%
	Other Non-Fixed Object Collisions	*1*	*0*	*1*	*0*	*0*	*2*	*0*	*1.3%*
	Railway Vehicle (Train, Engine)	0	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0	0.0%
	Motor Vehicle in Transport	0	0	0	0	0	0	0	0.0%
	Parked Motor Vehicle	1	0	0	0	0	1	0	0.6%
	Work Zone/Maintenance Equip.	0	0	0	0	0	0	0	0.0%
	Struck by Falling/Shifting Cargo	0	0	1	0	0	1	0	0.6%
	Other Non-Fixed Object	0	0	0	0	0	0	0	0.0%
	Non-Collisions	*0*	*1*	*0*	*2*	*2*	*5*	*1*	*3.2%*
	Overturn/Rollover	0	0	0	1	0	1	0	0.6%

Table 3-11 SR 9/I-95 Ramps at Lantana Road Crash Summary Statistics

I-95 Ramps at Lantana Road		Number of Crashes Year 2014	2015	2016	2017	2018	5 Year Total Crashes	Mean Crashes Per Year	%
	Fire/Explosion	0	0	0	0	0	0	0	0.0%
	Immersion	0	0	0	0	0	0	0	0.0%
	Jackknife	0	0	0	1	0	1	0	0.6%
	Cargo/Equipment Loss or Shift	0	1	0	0	0	1	0	0.6%
	Fell/Jumped from Motor Vehicle	0	0	0	0	0	0	0	0.0%
	Thrown or Falling Object	0	0	0	0	0	0	0	0.0%
	Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	2	2	0	1.3%
	Others	0	0	0	0	0	0	0	0.0%
	Total Crashes	**42**	**26**	**36**	**27**	**26**	**157**	**31**	**100.0%**
SEVERITY	PDO Crashes	23	16	18	13	13	83	17	52.9%
	Fatal Crashes	0	0	0	0	0	0	0	0.0%
	Injury Crashes	19	10	18	14	13	74	15	47.1%
LIGHTING CONDITIONS	Daylight	26	22	25	16	18	107	21	68.2%
	Dusk	1	0	0	2	0	3	1	1.9%
	Dawn	3	0	0	0	0	3	1	1.9%
	Dark	12	4	11	9	8	44	9	28.0%
	Unknown	0	0	0	0	0	0	0	0.0%
SURFACE CONDITIONS	Dry	33	19	28	24	22	126	25	80.3%
	Wet	9	7	8	3	4	31	6	19.7%
	Others	0	0	0	0	0	0	0	0.0%
MONTH OF YEAR	January	2	2	2	3	3	12	2	7.6%
	February	0	2	7	2	2	13	3	8.3%
	March	5	2	3	1	2	13	3	8.3%
	April	7	0	4	2	1	14	3	8.9%
	May	3	4	2	3	3	15	3	9.6%
	June	4	0	5	2	6	17	3	10.8%
	July	2	3	3	1	0	9	2	5.7%
	August	4	1	1	4	3	13	3	8.3%
	September	6	4	5	2	2	19	4	12.1%
	October	3	4	1	0	2	10	2	6.4%
	November	1	4	2	1	0	8	2	5.1%
	December	5	0	1	6	2	14	3	8.9%
DAY OF WEEK	Monday	8	7	2	4	2	23	5	14.6%
	Tuesday	7	6	7	2	3	25	5	15.9%
	Wednesday	7	3	4	6	6	26	5	16.6%
	Thursday	4	1	6	5	1	17	3	10.8%
	Friday	6	5	8	4	6	29	6	18.5%
	Saturday	7	2	4	5	4	22	4	14.0%
	Sunday	3	2	5	1	4	15	3	9.6%
HOUR OF DAY	00:00-06:00	5	1	2	3	3	14	3	8.9%
	06:00-09:00	8	3	3	4	0	18	4	11.5%

Table 3-11 SR 9/I-95 Ramps at Lantana Road Crash Summary Statistics

I-95 Ramps at Lantana Road		Number of Crashes Year					5 Year Total Crashes	Mean Crashes Per Year	%
		2014	2015	2016	2017	2018			
	09:00-11:00	2	3	1	2	4	12	2	7.6%
	11:00-13:00	1	2	3	1	2	9	2	5.7%
	13:00-15:00	7	4	2	2	2	17	3	10.8%
	15:00-18:00	8	7	11	6	8	40	8	25.5%
	18:00-24:00	11	6	14	9	7	47	9	29.9%
CONTRIBUTING CAUSES (VEHICLE ONLY)	No Contributing Action	4	2	2	1	3	12	2	7.6%
	Careless or Negligent Manner	20	13	13	9	6	61	12	38.9%
	Failed to Yield Right of way	0	0	0	0	1	1	0	0.6%
	Improper Backing	0	0	0	1	0	1	0	0.6%
	Improper Turn	0	0	1	2	0	3	1	1.9%
	Followed too Closely	1	1	2	2	5	11	2	7.0%
	Ran Red Light	0	1	1	3	2	7	1	4.5%
	Drove too Fast for Conditions	1	3	1	0	1	6	1	3.8%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	0	2	1	0	1	4	1	2.5%
	Exceed Posted Speed	0	0	0	0	0	0	0	0.0%
	Wrong Side or Wrong Way	0	0	0	0	0	0	0	0.0%
	Failed to Keep in Proper Lane	0	0	2	1	0	3	1	1.9%
	Ran Off Roadway	1	0	0	0	1	2	0	1.3%
	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	0	0	0	1	0	1	0	0.6%
	Swerved or Avoided	0	0	1	0	0	1	0	0.6%
	Erratic, Reckless or Aggressive	2	0	1	0	0	3	1	1.9%
	Other Contributing Action	13	4	11	7	6	41	8	26.1%
WEATHER CONDITIONS	Clear	25	12	22	21	17	97	19	61.8%
	Cloudy	15	10	9	6	8	48	10	30.6%
	Rain	2	4	5	0	1	12	2	7.6%
	Fog, Smog, Smoke	0	0	0	0	0	0	0	0.0%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

Figure 3-16 SR 9/I-95 Ramps at Lantana Road Crash Summary Histogram

3.6.2.3 Lantana Road

Based on the crash analysis, a total of 172 crashes occurred on Lantana Road within the study limits from 2014 to 2018. Except for 2018 which saw a decline from the previous years' crashes, all the other years recorded a gradual increase in crashes.

The predominant crash types recorded include rear-end crashes, (90 crashes, 52%), angle crashes (51 crashes, 30%), and sideswipe crashes (14 crashes, 8%). Majority of the crashes (133 crashes, 77%) occurred under daylight conditions with only 32 crashes (19%) occurring during nighttime. The percentage of nighttime crashes is lower than the statewide percent of 33%. 138 (80%) of the total crashes occurred during clear weather conditions and 146 (85%) on dry pavement surface. 15% of crashes (26) occurred on wet pavement.

No fatal crashes occurred within the study limits during the five-year period. Property Damage Only (PDO) crashes accounted for 103 (60%) of all crashes and 69 crashes (40%) resulted in injury. Among the contributing causes documented in the crash data, 'carelessness or negligent manner' (39 crashes, 23%), 'followed too closely' (37 crashes, 22%), 'other contributing action' (35 crashes, 20%) and 'failed to yield right of way ' (26 crashes, 15%) were among the highest. Other contributing causes include 'ran red light' (13 crashes, 8%),'no contributing action' (7 crashes, 4%), 'improper turn' (5 crashes, 3%) and 'failed to keep in proper lane' (4 crashes, 2%). **Table 3-12** and **Figure 3-17** show the crash summary along Lantana Road within the study area.

Table 3-12 Lantana Road Crash Summary Statistics

Lantana Road		Number of Crashes by Year					5 Year Total Crashes	Mean Crashes Per Year	%
		2014	2015	2016	2017	2018			
CRASH TYPE	Rear End	11	16	20	21	22	90	16	52.3%
	Head On	0	0	0	0	0	0	0	0.0%
	Angle	6	9	12	13	11	51	9	29.7%
	Left-turn	0	0	0	0	0	0	0	0.0%
	Right-turn	0	0	0	0	0	0	0	0.0%
	Sideswipe	1	2	6	2	3	14	3	8.1%
	Backed Into	0	0	0	0	0	0	0	0.0%
	Pedestrian	0	0	0	0	1	1	0	0.6%
	Bicycle	0	0	0	0	0	0	0	0.0%
	Fixed Object	*0*	*0*	*0*	*1*	*0*	*1*	*0*	*0.6%*
	Impact Attenuator/Crash Cushion	0	0	0	0	0	0	0	0.0%
	Bridge Overhead Structure	0	0	0	0	0	0	0	0.0%
	Bridge Pier or Support	0	0	0	0	0	0	0	0.0%
	Bridge Rail	0	0	0	0	0	0	0	0.0%
	Culvert	0	0	0	0	0	0	0	0.0%
	Curb	0	0	0	0	0	0	0	0.0%

Table 3-12 Lantana Road Crash Summary Statistics

Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
	Ditch	0	0	0	0	0	0	0	0.0%
	Embankment	0	0	0	0	0	0	0	0.0%
	Guardrail Face	0	0	0	0	0	0	0	0.0%
	Guardrail End	0	0	0	0	0	0	0	0.0%
	Cable Barrier	0	0	0	0	0	0	0	0.0%
	Concrete Traffic Barrier	0	0	0	0	0	0	0	0.0%
	Other Traffic Barrier	0	0	0	0	0	0	0	0.0%
	Tree (Standing)	0	0	0	0	0	0	0	0.0%
	Utility Pole/Light Support	0	0	0	0	0	0	0	0.0%
	Traffic Sign Support	0	0	0	0	0	0	0	0.0%
	Traffic Signal Support	0	0	0	0	0	0	0	0.0%
	Other Post, Pole or Support	0	0	0	1	0	1	0	0.6%
	Fence	0	0	0	0	0	0	0	0.0%
	Mailbox	0	0	0	0	0	0	0	0.0%
	Other Fixed Object	0	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object Collisions	*0*	*1*	*0*	*0*	*0*	*1*	*0*	*0.6%*
	Railway Vehicle (Train, Engine)	0	0	0	0	0	0	0	0.0%
	Animal	0	0	0	0	0	0	0	0.0%
	Motor Vehicle in Transport	0	0	0	0	0	0	0	0.0%
	Parked Motor Vehicle	0	1	0	0	0	1	0	0.6%
	Work Zone/Maintenance Equip.	0	0	0	0	0	0	0	0.0%
	Struck by Falling/Shifting Cargo	0	0	0	0	0	0	0	0.0%
	Other Non-Fixed Object	0	0	0	0	0	0	0	0.0%
	Non-Collisions	*0*	*1*	*0*	*0*	*0*	*1*	*0*	*0.6%*
	Overturn/Rollover	0	0	0	0	0	0	0	0.0%
	Fire/Explosion	0	0	0	0	0	0	0	0.0%
	Immersion	0	0	0	0	0	0	0	0.0%
	Jackknife	0	1	0	0	0	1	0	0.6%
	Cargo/Equipment Loss or Shift	0	0	0	0	0	0	0	0.0%
	Fell/Jumped from Motor Vehicle	0	0	0	0	0	0	0	0.0%
	Thrown or Falling Object	0	0	0	0	0	0	0	0.0%
	Ran into Water/Canal	0	0	0	0	0	0	0	0.0%
	Other Non-Collision	0	0	0	0	0	0	0	0.0%
	Others	0	0	2	7	4	13	3	7.6%
	Total Crashes	**18**	**29**	**40**	**44**	**41**	**172**	**34**	**100.0%**
SEVERITY	PDO Crashes	8	14	26	28	27	103	21	59.9%
	Fatal Crashes	0	0	0	0	0	0	0	0.0%
	Injury Crashes	10	15	14	16	14	69	14	40.1%
LIGHTING CONDITIONS	Daylight	17	28	28	33	27	133	27	77.3%
	Dusk	1	0	2	1	2	6	1	3.5%
	Dawn	0	0	1	0	0	1	0	0.6%
	Dark	0	1	9	10	12	32	6	18.6%
	Unknown	0	0	0	0	0	0	0	0.0%

Table 3-12 Lantana Road Crash Summary Statistics

Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
SURFACE CONDITIONS	Dry	16	27	33	35	35	146	29	84.9%
	Wet	2	2	7	9	6	26	5	15.1%
	Others	0	0	0	0	0	0	0	0.0%
MONTH OF YEAR	January	3	2	6	2	2	15	3	8.7%
	February	2	2	2	1	1	8	2	4.7%
	March	1	3	2	2	4	12	2	7.0%
	April	2	4	6	2	7	21	4	12.2%
	May	1	2	1	5	2	11	2	6.4%
	June	1	2	2	2	5	12	2	7.0%
	July	3	3	4	4	4	18	4	10.5%
	August	0	2	3	8	2	15	3	8.7%
	September	1	3	1	3	3	11	2	6.4%
	October	0	3	3	6	2	14	3	8.1%
	November	3	2	3	6	8	22	4	12.8%
	December	1	1	7	3	1	13	3	7.6%
DAY OF WEEK	Monday	3	7	6	8	7	31	6	18.0%
	Tuesday	4	5	5	8	7	29	6	16.9%
	Wednesday	2	3	6	9	6	26	5	15.1%
	Thursday	1	6	8	5	8	28	6	16.3%
	Friday	4	4	10	5	6	29	6	16.9%
	Saturday	4	3	1	4	6	18	4	10.5%
	Sunday	0	1	4	5	1	11	2	6.4%
HOUR OF DAY	00:00-06:00	0	0	3	1	0	4	1	2.3%
	06:00-09:00	3	4	5	7	6	25	5	14.5%
	09:00-11:00	1	3	2	4	2	12	2	7.0%
	11:00-13:00	3	5	4	4	6	22	4	12.8%
	13:00-15:00	2	8	4	4	3	21	4	12.2%
	15:00-18:00	8	7	11	13	10	49	10	28.5%
	18:00-24:00	1	2	11	11	14	39	8	22.7%
CONTRIBUTING CAUSES (VEHICLE ONLY)	No Contributing Action	0	0	2	4	1	7	1	4.1%
	Careless or Negligent Manner	7	9	11	7	5	39	8	22.7%
	Failed to Yield Right of way	0	8	5	5	8	26	5	15.1%
	Improper Backing	1	0	0	0	0	1	0	0.6%
	Improper Turn	1	0	1	2	1	5	1	2.9%
	Followed too Closely	4	7	7	8	11	37	7	21.5%
	Ran Red Light	2	2	2	1	6	13	3	7.6%
	Drove too Fast for Conditions	0	0	0	2	0	2	0	1.2%
	Ran Stop Sign	0	0	0	0	0	0	0	0.0%
	Improper Passing	0	0	0	1	0	1	0	0.6%
	Exceed Posted Speed	0	0	0	0	0	0	0	0.0%
	Wrong Side or Wrong Way	0	0	1	0	0	1	0	0.6%
	Failed to Keep in Proper Lane	0	0	3	0	1	4	1	2.3%
	Ran Off Roadway	0	0	0	0	0	0	0	0.0%

Table 3-12 Lantana Road Crash Summary Statistics

Lantana Road		Number of Crashes					5 Year Total Crashes	Mean Crashes Per Year	%
		Year							
		2014	2015	2016	2017	2018			
	Disregarded Other Traffic Sign	0	0	0	0	0	0	0	0.0%
	Disregarded other Road Markings	0	0	0	0	0	0	0	0.0%
	Over-Correcting/Over-Steering	0	0	0	0	0	0	0	0.0%
	Swerved or Avoided	0	0	0	1	0	1	0	0.6%
	Erratic, Reckless or Aggressive	0	0	0	0	0	0	0	0.0%
	Other Contributing Action	3	3	8	13	8	35	7	20.3%
WEATHER CONDITIONS	Clear	12	25	32	35	34	138	28	80.2%
	Cloudy	5	3	1	4	4	17	3	9.9%
	Rain	1	1	7	5	3	17	3	9.9%
	Fog, Smog, Smoke	0	0	0	0	0	0	0	0.0%
	Sleet/Hail/Freezing Rain	0	0	0	0	0	0	0	0.0%
	Blowing Sand, Soil, Dirt	0	0	0	0	0	0	0	0.0%
	Severe Crosswinds	0	0	0	0	0	0	0	0.0%
	Other	0	0	0	0	0	0	0	0.0%

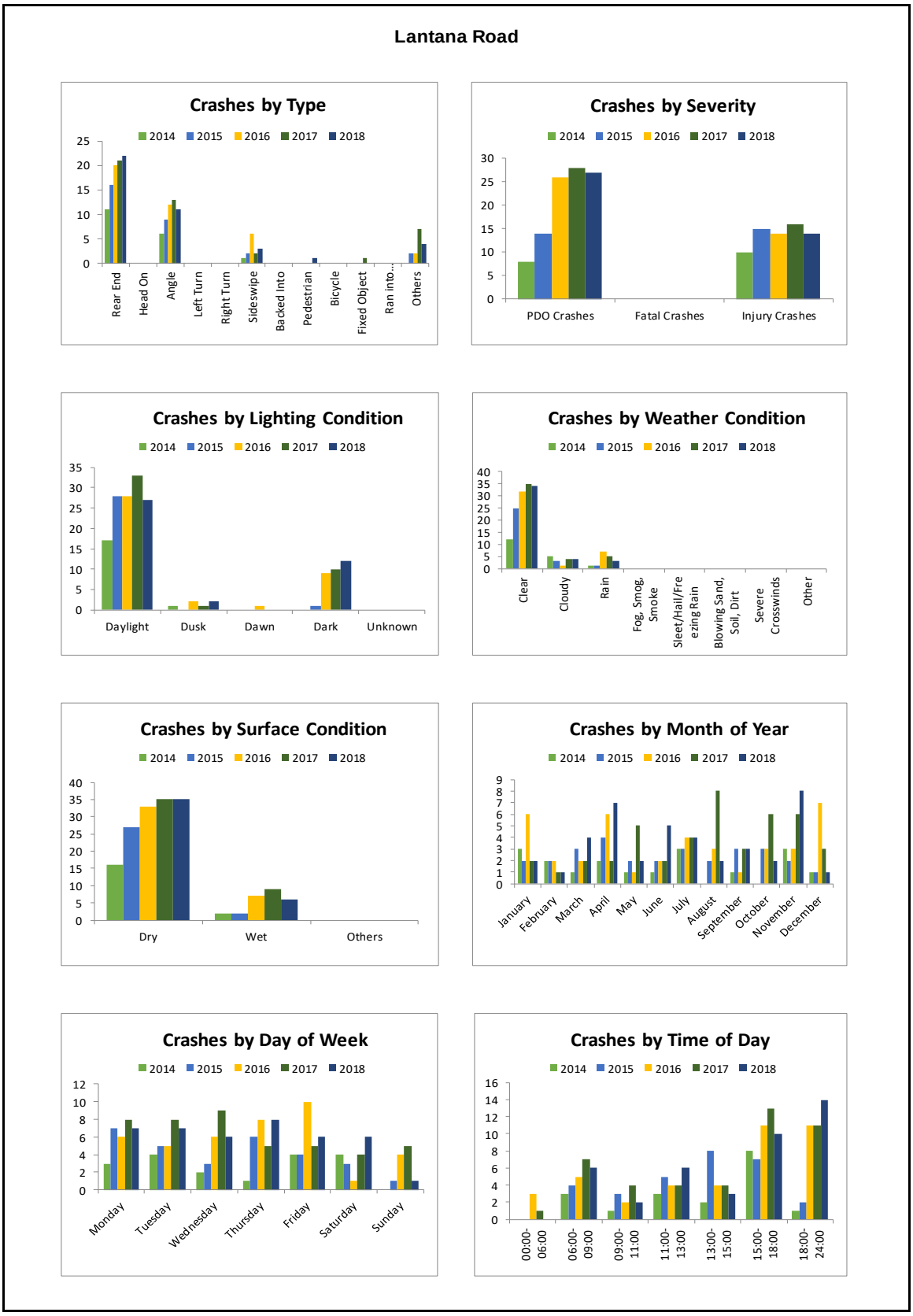


Figure 3-17 Lantana Road Crash Summary Histogram

3.6.3 Crash Hotspots

A crash accumulation analysis was conducted along Lantana Road to identify specific segments or intersections with high crash frequencies and identify possible roadway deficiencies that can be improved. The crash accumulation analysis is graphically illustrated in **Figure 3-18.** Based on analysis, the following locations were identified as high crash frequency locations i.e. greater than 10 crashes for the five-year.

1. Lantana Road at High Ridge Road and Sunset Road (MP: 2.861 – MP 2.901)
2. Lantana Road at Andrew Redding Road (MP:3.421-4.440)

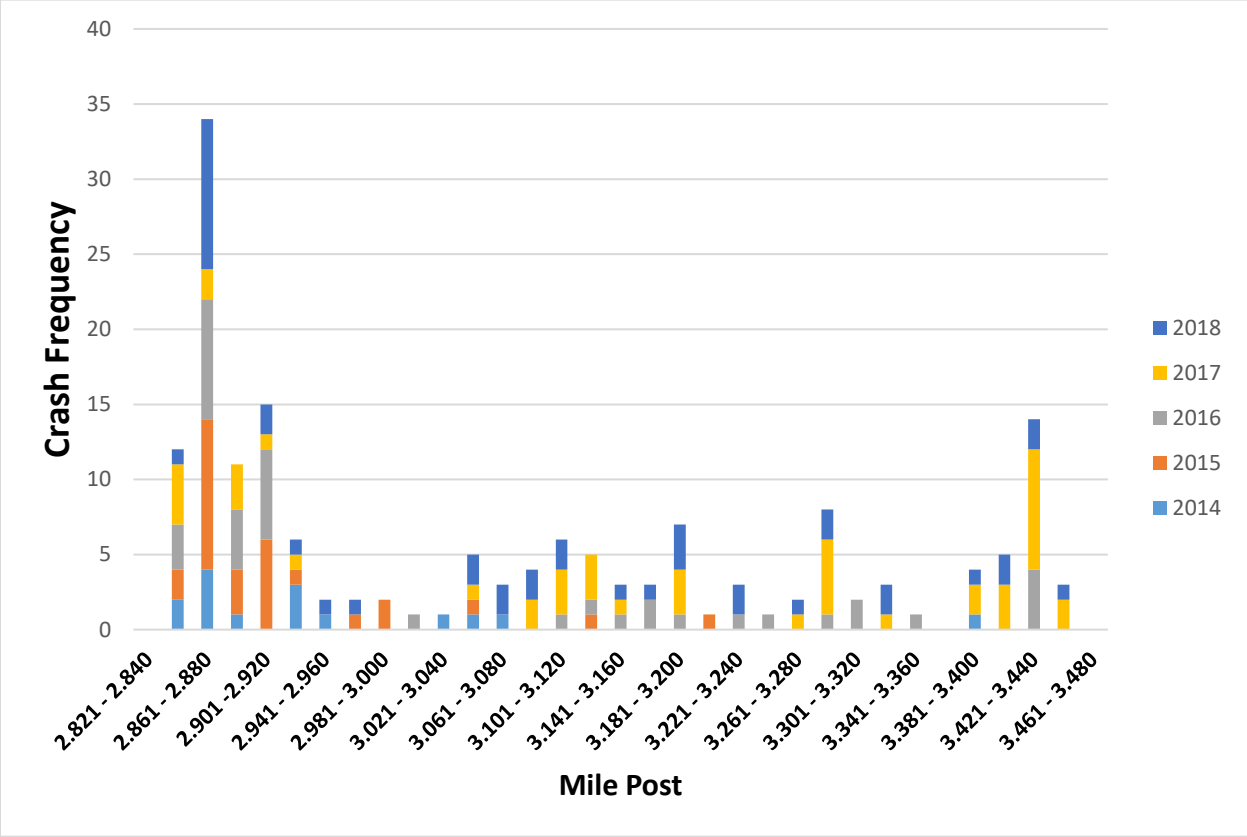


Figure 3-18 Safety Hotspots along Lantana Road

High Ridge Road provides access to the Costco Wholesale as well as several residential neighborhoods, businesses, and schools (Sunshine Park Academy and Northern Private School). Sunset Road provide access to Costco Wholesale and the Palm Beach County Solid Waste Authority (SWA) Central Transfer Station. Andrew Redding Road provides access to the new Water Tower Commons Mixed Use development as well as several residential and businesses.

Based on the crash analysis, a total of 169 crashes occurred within this hot spot areas identified from 2014 to 2018. Rear-end crashes were the predominant crash type accounting for 87 crashes (51%) of the total crashes followed by 51 angle crashes (30%), 14 sideswipe crashes (8%), 1 pedestrian (1%) crash, and 1 fixed object crash (1%). Among the contributing causes documented in the crash data, 'carelessness or negligent manner' (39 crashes, 23%), 'failed to yield right of way ' (26 crashes, 15%), 'no contributing action' (35 crashes, 21%), 'followed too Closely' (35 crashes, 21%), 'improper turn' (5 crashes, 3%) and 'ran red light' (13 crashes, 8%) were among the highest.

Most of the angle crashes occurring at High Ridge Road intersection were mainly due to drivers running the red light which may be attributed to inadequate signal timing for this intersection. At Sunset Road intersection, most of the angle crashes were attributed to 'failed to yield right of way ' which could also be due to the difficulty in judging correctly adequate gaps for the downhill traffic stream in order to make the left-turn maneuver at this intersection. The results also show most crashes occurred between the hours of 15:00 – 18:00 (48 crashes), which corresponds with the peak traffic and a high activity period for the Costco Wholesale which has access from both High Ridge Road and Sunset Road.

At Andrew Redding Road intersection, most of the observed crashes were rear-end and angle crashes attributed mostly to following too closely and failing to yield the right of way. This may be attributed to poor signal timing and coordination. **Figure 3-19** show, the crash summary at the crash hotspots.

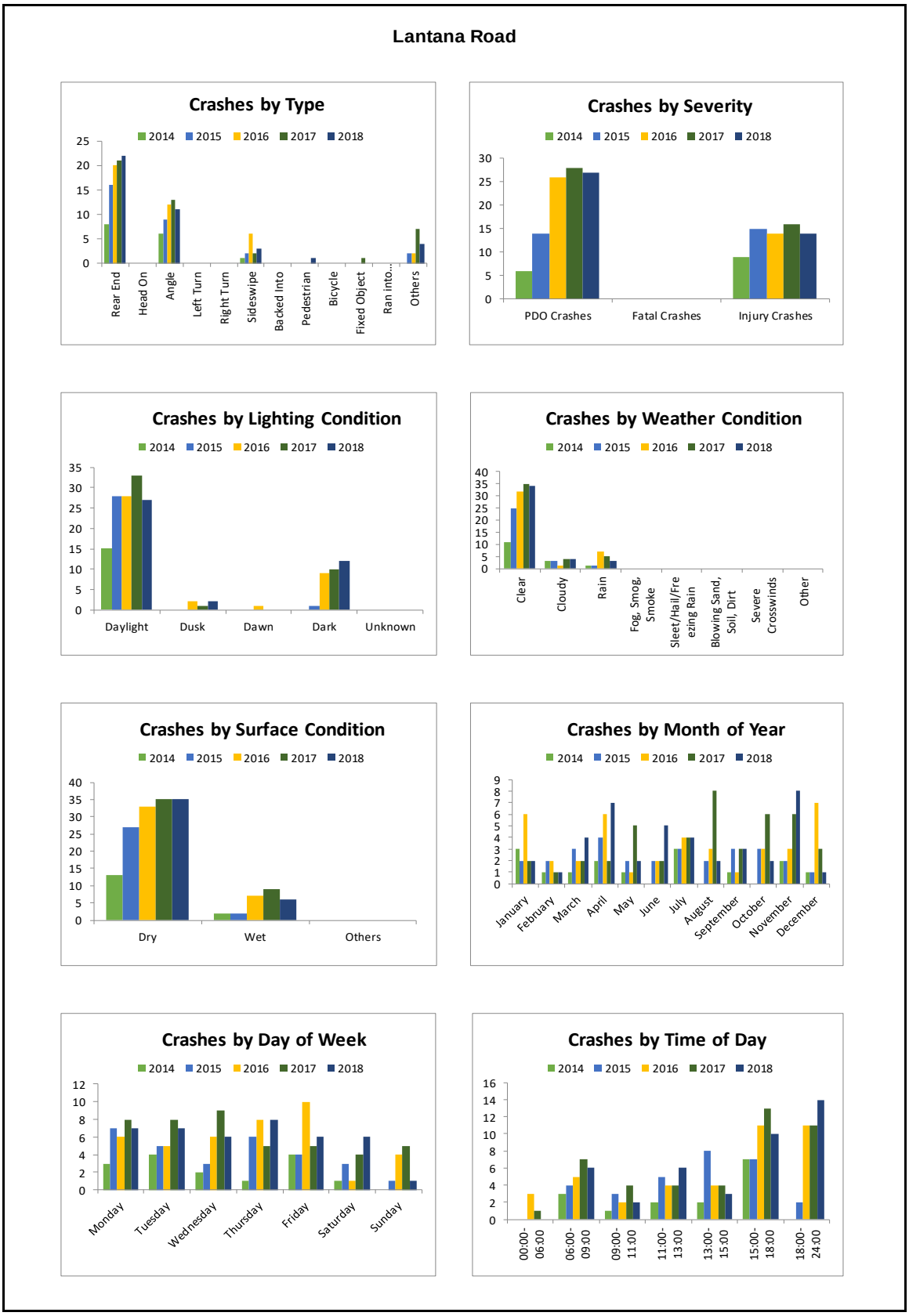


Figure 3-19 Crash Summary at Hotspots Locations along Lantana Road

3.6.4 Fatal Crashes

Fatal crashes are a major concern in roadway safety analysis. Based on the crash data, there were a total of 2 fatal crashes within the study area. All fatal crashes occurred on SR 9/I-95. There were no fatal crashes on Lantana Road.

The police reports for these crashes were obtained from the FDOT and reviewed to identify specific contributing factors that may have caused or influenced these fatal crashes. Fatal crash descriptions, as obtained from the crash reports, are presented below.

On 11/10/2014, a vehicle traveling NB (north of Lantana Road), lost control while changing lanes, ran off road, and hit the concrete median barrier. The driver of this vehicle died due to the impact. This crash occurred under wet surface conditions and during the daytime.

On 5/6/2015, a vehicle traveling NB (south of Lantana Road), lost control due to an unknown vehicle cut off, oversteered, and overturned 3 times on the travel way. The driver got ejected while the vehicle was overturning. This crash occurred under dry surface conditions and during daytime.

Figure 3-20 shows the fatal crash locations that were identified within the study area.

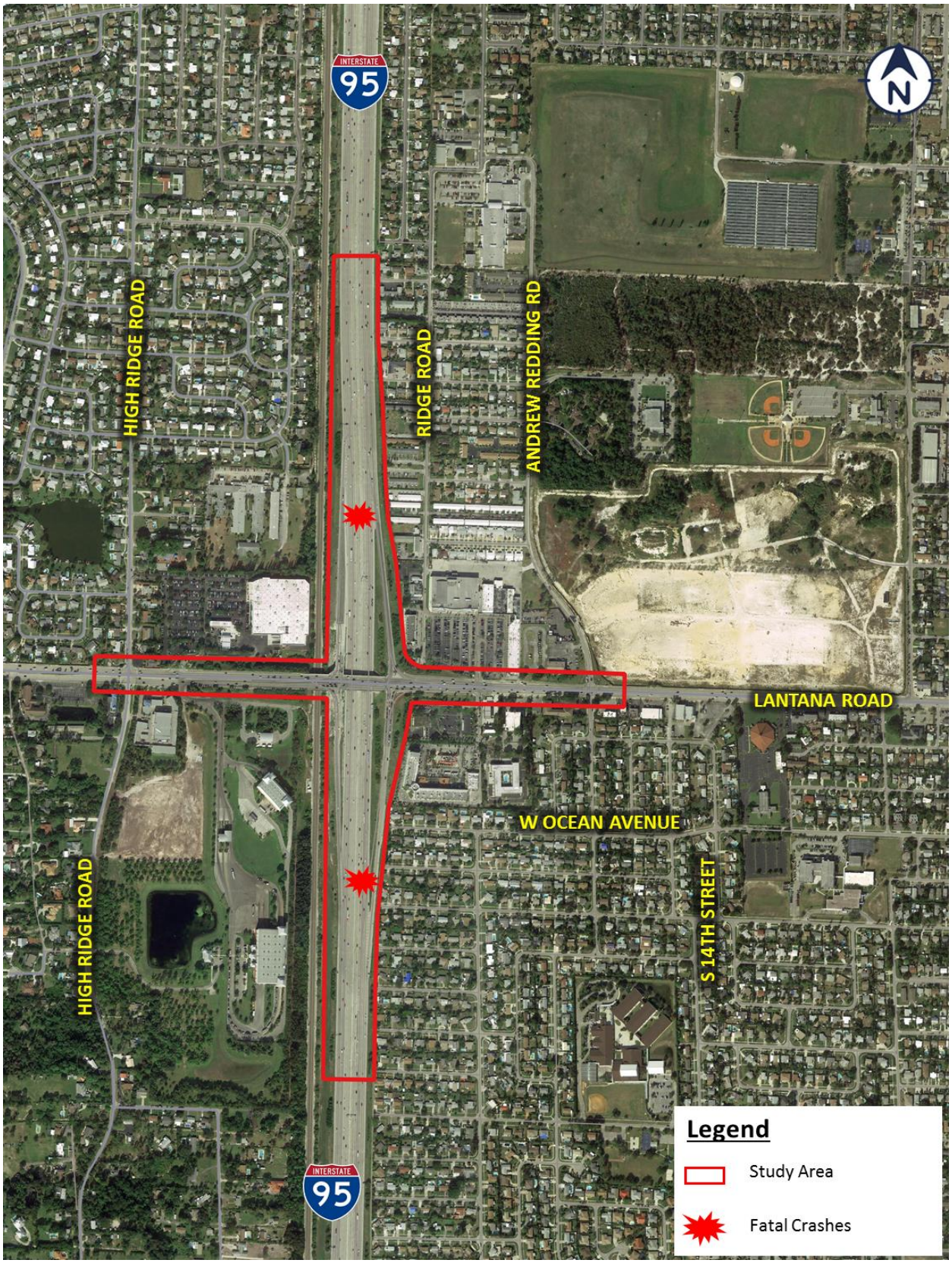


Figure 3-20 Fatal Crashes within Study Area

3.6.5 Crash Frequencies and Rates

SR 9/I-95 and Lantana Road within the study area were segmented into 17 areas as presented in **Figure 3-21,** This was done to further analyze the crash frequencies and rates at different sections of the roadway within the project limits to provide a better understanding of the existing crash patterns. **Table 3-13** provides the existing crash frequencies and rates along the different roadway sections as described in **Figure 3-21.**

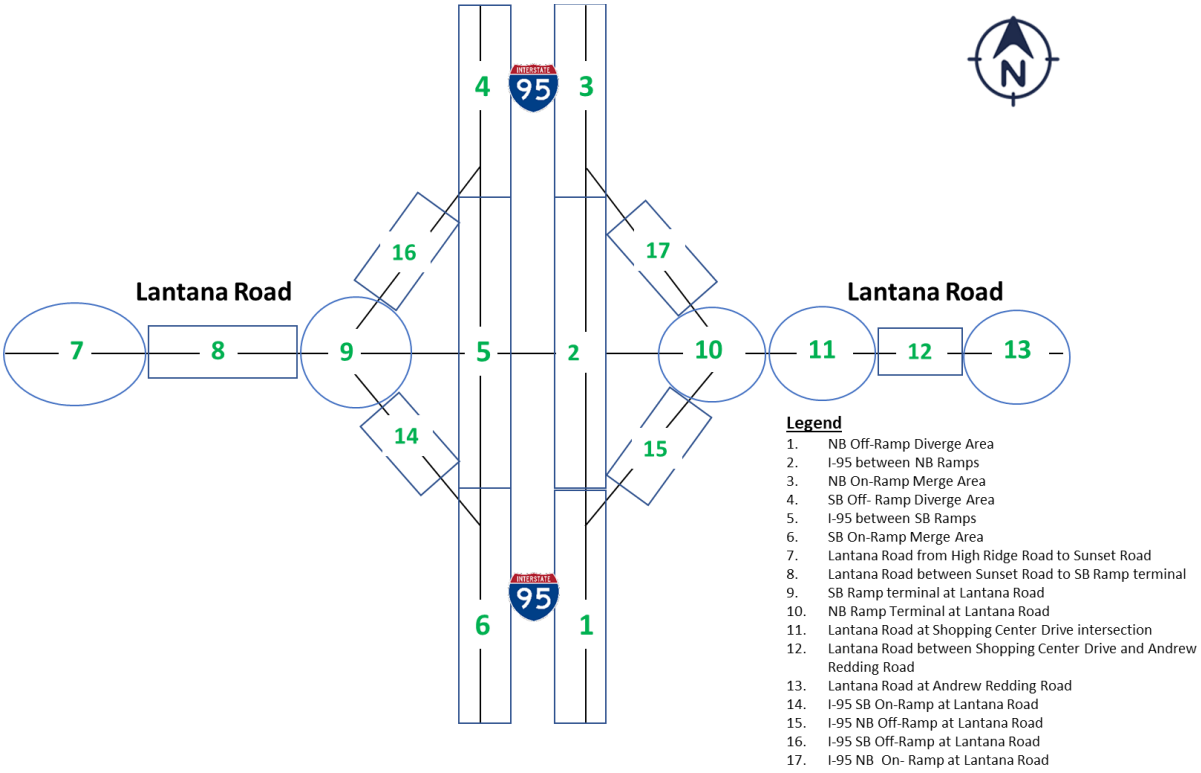


Figure 3-21 Roadway Segmentation for Crash Analysis

Based on the analysis presented in **Table 3-13**, on Lantana Road, Section 16 has the highest crash rate of 8.54 crashes per million vehicle miles travelled whilst Section 11 has the lowest with a crash rate of 0.18 crashes per million vehicle miles travelled. On SR 9/I-95, Section 4, is identified as having the highest crash rate of 1.80 crashes per million vehicle miles travelled whilst Section 3 has the lowest crash rate of 0.56 crashes per million vehicle miles travelled. Comparing the crash rates at both ramp terminals also shows the SB ramp terminal has a higher crash rate of 0.62 crashes per million vehicle miles travelled as compared to 0.48 crashes per million vehicle miles travelled on the NB ramp terminal.

Table 3-13 Existing Crash Frequencies and Rates

Seg	Description	Number of Crashes			Traffic Volume (vpd)	Segment Length (ft.)	Crash Frequency (Crash/yr)	Crash Rate (Crash/ MVMT)	Statewide Avg. Crash Rates (Crash/ MVMT)
1	NB Off-Ramp Diverge Area	Total		52	128,000	950	10.4	1.24	2.64
		Fatal	1	25					
		Injuries	24						
		PDO	28	28					
2	I-95 between NB Ramps	Total		68	115,000	2,000	13.6	0.86	2.64
		Fatal	0	32					
		Injuries	32						
		PDO	36	36					
3	NB On-Ramp Merge Area	Total		20	125,000	820	4	0.56	2.64
		Fatal	1	13					
		Injuries	12						
		PDO	7	7					
4	SB Off- Ramp Diverge Area	Total		52	102,000	820	10.4	1.80	2.64
		Fatal	0	26					
		Injuries	26						
		PDO	26	26					
5	I-95 between SB Ramps	Total		92	93,000	2,000	18.4	1.43	2.64
		Fatal	0	47					
		Injuries	47						
		PDO	45	45					
6	SB On-Ramp Merge Area	Total		34	107,000	950	6.8	0.97	2.64
		Fatal	0	14					
		Injuries	14						
		PDO	20	20					
7	Lantana Road at High Ridge Road &Sunset Road intersection	Total		85	48,000	-	17	0.97	1.06
		Fatal	0	46					
		Injuries	46						
		PDO	39	39					
8	Lantana Road between Sunset Road to SB Ramp terminal	Total		10	46,000	520	2	1.21	12.87
		Fatal	0	4					
		Injuries	4						
		PDO	6	6					

Table 3-13 Existing Crash Frequencies and Rates									
Seg	Description	Number of Crashes			Traffic Volume (vpd)	Segment Length (ft.)	Crash Frequency (Crash/yr)	Crash Rate (Crash/ MVMT)	Statewide Avg. Crash Rates (Crash/ MVMT)
9	SB Ramp terminal at Lantana Road	Total		53	46,500	-	10.6	0.62	2.05
		Fatal	0	22					
		Injuries	22						
		PDO	31	31					
10	NB Ramp Terminal at Lantana Road	Total		38	43,000	-	7.6	0.48	2.05
		Fatal	0	14					
		Injuries	14						
		PDO	24	24					
11	Lantana Road at Shopping Center Drive intersection	Total		13	39,000	-	2.6	0.18	1.06
		Fatal	0	2					
		Injuries	2						
		PDO	11	11					
12	Lantana Road between Shopping Center Drive and Andrew Redding Road	Total		6	39,000	365	1.2	1.22	7.71
		Fatal	0	0					
		Injuries	0						
		PDO	6	6					
13	Lantana Road at Andrew Redding Road intersection	Total		27	34,000	-	5.4	0.44	1.35
		Fatal	0	7					
		Injuries	7						
		PDO	20	20					
14	I-95 SB On-Ramp at Lantana Road	Total		7	14,000	800	1.4	1.81	-
		Fatal	0	3					
		Injuries	3						
		PDO	4	4					
15	I-95 NB Off-Ramp at Lantana Road	Total		34	13,000	1,300	6.8	5.82	-
		Fatal	0	13					
		Injuries	13						
		PDO	21	21					
16	I-95 SB Off-Ramp at Lantana Road	Total		38	14,000	920	7.6	8.54	-
		Fatal	0	21					
		Injuries	21						
		PDO	17	17					
17	I-95 NB On-Ramp at Lantana Road	Total		4	9,700	750	0.8	1.59	-
		Fatal	0	4					
		Injuries	4						
		PDO	0	0					

4.0 FUTURE CONDITIONS

4.1 TRAVEL DEMAND MODEL

The travel demand modeling and future year AADT forecasts for this study were developed under a separate study – *Traffic Data Collection and Traffic Projections for SR 9/I-95 at Lantana Road PD&E Study, dated December 2017* and provided in **Appendix J**. The Southeast Regional Planning Model (SERPM) version 7.062 with base year 2010 and horizon year 2040 was used to estimate the future years daily forecasts for the study area. The SERPM model is based on the Florida Standard Urban Transportation Modeling Structure (FSUTMS) and is recognized by both FDOT District Four, as well as the Palm Beach Transportation Planning Agency (TPA) as an acceptable travel demand forecasting tool which has been used to develop Design Traffic for several recent interchange improvement projects. No further modifications or validation of the travel demand model was done as part of this IMR. However, the future daily volumes and travel patterns were checked for reasonableness.

4.2 PROJECT TRAFFIC DEVELOPMENT

4.2.1 Future Annual Average Daily Traffic (AADT) Volumes

The AADT forecast volumes for this IMR Study was developed under a separate study – *Traffic Data Collection and Traffic Projections for SR 9/I-95 at Lantana Road PD&E Study, dated December 2017* (See **Appendix J**). The traffic forecasting methodology used for each intersection approach was based on the 2017 AADT obtained from the field as well as 2010 and 2040 SERPM 7.062 model volumes.

The 2017 model volume was interpolated using 2010 and 2040 model volumes. Then the percentage differences of the 2017 field AADT and the interpolated 2017 forecasted AADT from the model was calculated. The recommended 2040 AADTs were calculated by applying this percentage difference to the 2040 SERPM 7.062 model volumes. The 2020 and 2030 volumes were then interpolated using the 2017 AADT and the recommended 2040 volumes. The 2045 design year volumes were obtained by extrapolation using the 2017 AADT and the recommended 2040 AADT volumes. The 2025 opening year volumes was obtained by interpolation using 2017 AADT and recommended 2040 volumes.

For the roadway segments where the SERPM 7.062 2040 model volumes are lower than the SERPM 7.062 2010 model volumes or are not included in the SERPM 7.062 network, the future 2020, 2030, 2040 and 2045 AADTs were calculated using 2017 AADT and a compound growth

factor of 0.5% based on consideration of historical growth rates from the FDOT traffic count stations as well as the socioeconomic growth rates for the SERPM 7.062 Traffic Analysis Zones (TAZs) within 2-mile buffer of the study area. Details on the growth rates can be found in **Appendix K**.

Figure 4-1 and **Figure 4-2** show the future segment AADT volumes for the 2025 opening year and 2045 design year respectively.

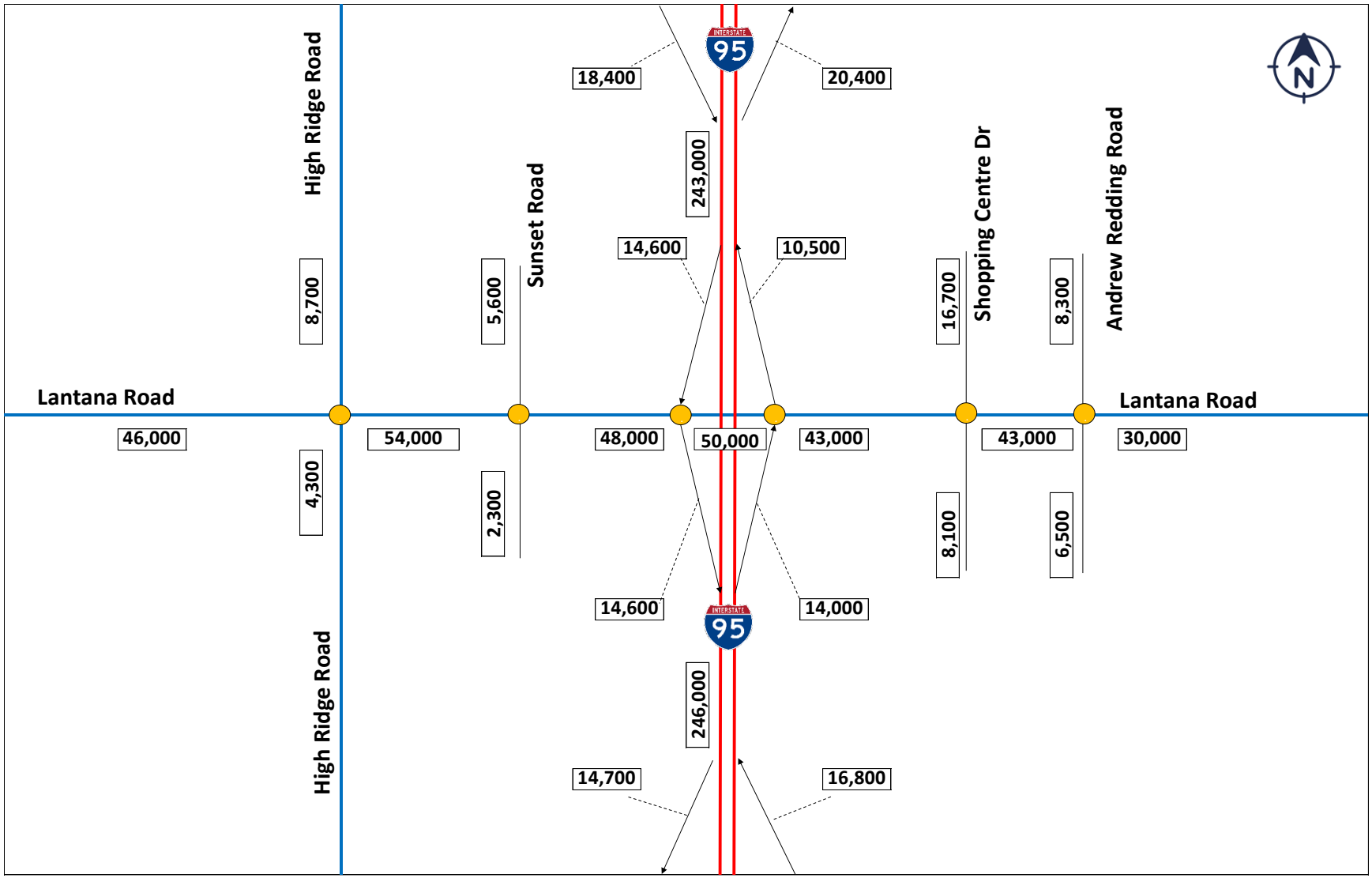


Figure 4-1 2025 Future Segment AADT Volumes

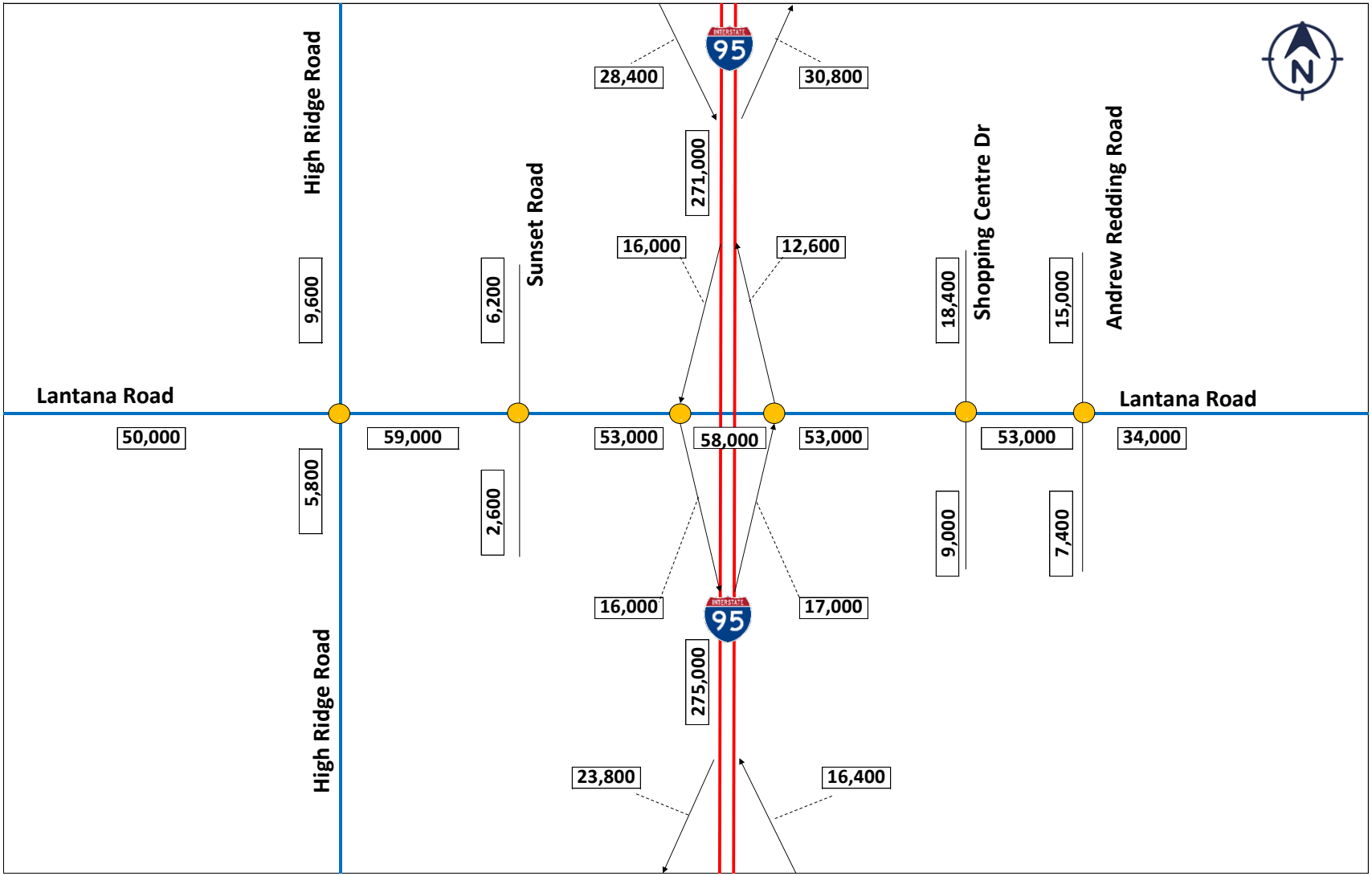


Figure 4-2 2045 Future Segment AADT Volumes

4.2.2 Future Freeway and Arterial Design Hour Traffic Volumes

The future Directional Design Hour Volumes (DDHV) for the freeways, ramps and arterial segments were calculated from the future AADTs previously discussed, using the recommended D-factor and the standard K-factor and applying the formula DDHV = AADT x K x D. The existing ratio of AM to PM peak hour volumes were maintained for future years. The Directional Design Hour Volumes (DDHV) obtained were then balanced and smoothened to ensure consistency between the freeways, ramp, and intersection volumes.

Table 4-1 shows the 2025 and 2045 DDHVs for the Lantana Road arterial segments while **Table 4-2** shows the DDHVs for the SR 9/I-95 freeway mainline segments and ramps. **Figure 4-3** and **Figure 4-4** show the DDHVs for the SR 9/I-95 freeway mainline and ramps for the 2025 opening year and 2045 design year respectively.

Table 4-1 2025 & 2045 Directional Design Hour Volume (DDHV) for Lantana Road

Roadway Segment			AADT		Standard K Factor	Recommended D Factor	Peak Period	Peak Direction During Peak Period	2025 DDHV				2045 DDHV			
			2025	2045					AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
									EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB
1	Lantana Road	West of High Ridge Road	46,000	50,000	9.0%	57.9%	AM	EB	2,433	1,648	1,564	2,220	2,759	1,907	1,803	2,927
2		High Ridge Road to Sunset Road	54,000	59,000	9.0%	57.9%	AM	EB	2,655	1,702	1,699	2,264	3,074	2,053	2,030	2,927
3		Sunset Road to I-95 SB Ramps	48,000	53,000	9.0%	57.9%	AM	EB	2,612	1,698	1,671	2,322	3,013	2,006	1,951	2,959
4		I-95 SB Ramps to I-95 NB Ramps	50,000	58,000	9.0%	57.9%	AM	EB	2,128	1,579	1,604	1,822	2,431	2,049	1,850	2,572
5		I-95 NB Ramps to Shopping Centre Drive	43,000	53,000	9.0%	57.9%	PM	WB	1,683	1,673	1,629	1,759	2,089	2,227	2,045	2,574
6		Shopping Centre Drive to Andrew Redding Road	43,000	53,000	9.0%	57.9%	PM	EB	1,374	1,421	1,427	1,513	1,812	1,958	1,852	2,291
7		East of Andrew Redding Road	30,000	34,000	9.0%	57.9%	PM	WB	1,101	1,106	1,159	1,255	1,495	1,570	1,475	1,928
8	High Ridge Road	North of Lantana Road	8,700	9,600	9.0%	56.2%	PM	SB	243	393	338	438	366	447	409	501
9		South of Lantana Road	4,300	5,800	9.0%	56.2%	AM	NB	199	180	156	166	323	234	223	221
10	Sunset Road	North of Lantana Road	5,600	6,200	9.0%	60.8%	PM	NB	95	81	285	168	114	119	325	186
11		South of Lantana Road	2,300	2,600	9.0%	60.8%	AM	SB	51	76	73	43	70	89	91	63
12	Shopping Centre Drive	North of Lantana Road	16,700	18,400	9.0%	57.4%	PM	SB	180	157	277	344	215	195	316	420
13		South of Lantana Road	8,100	9,000	9.0%	57.4%	AM	SB	364	398	275	298	469	457	342	356
14	Andrew Redding Road	North of Lantana Road	8,300	15,000	9.0%	55.1%	PM	SB	242	220	228	205	302	296	341	364
15		South of Lantana Road	6,500	7,400	9.0%	55.1%	PM	SB	304	240	271	218	356	279	350	387

Table 4-2 Directional Design Hour Volume (DDHV) for I-95 Mainline and Ramps

Roadway Segment			2025 AADT	2045 AADT	Standard K Factor	Recommended D Factor	Peak Period	Peak Direction During Peak Period	2025 DDHV[1,2]				2045 DDHV[1,2]			
									AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
									NB	SB	NB	SB	NB	SB	NB	SB
1	I-95 Mainline	North of Lantana Road	243,000	271,000	8.0%	54.3%	PM	NB	10,275	8,695	10,605	9,080	11,400	9,625	11,765	10,100
2		South of Lantana Road	246,000	275,000			PM	NB	9,735	9,065	10,695	8,650	10,880	10,250	11,955	9,815
3	Lantana Road Ramps	NB On-Ramp	10,500	12,600	8.0%	100.0%	AM	NB	1,380	-	990	-	1,600	-	1,185	-
4		NB Off-Ramp	14,000	17,000			PM	NB	840	-	1,080	-	1,080	-	1,375	-
5		SB Off-Ramp	14,600	16,000	8.0%	100.0%	PM	SB	-	1,035	-	1,390	-	1,200	-	1,540
6		SB On-Ramp	14,600	16,000			AM	SB	-	1,405	-	960	-	1,825	-	1,255
7	Hypoluxo Road Ramps	NB On-Ramp	16,800	18,800	8.0%	100.0%	AM	NB	1,670	-	955	-	1,870	-	1,070	-
9		SB Off-Ramp	14,700	16,400	8.0%	100.0%	PM	SB	-	980	-	1,470	-	1,090	-	1,635
12	6th Avenue S Ramps	NB Off-Ramp	20,400	30,800	8.0%	100.0%	PM	NB	1,285	-	1,660	-	1,665	-	2,190	-
14		SB On-Ramp	18,400	28,400	8.0%	100.0%	AM	SB		1,750		1,175		2,275	-	1,540

Notes:

1. Freeway DDHVs adjusted and balanced
2. Ramp DDHVs adjusted and balanced for consistency with ramp terminal volumes

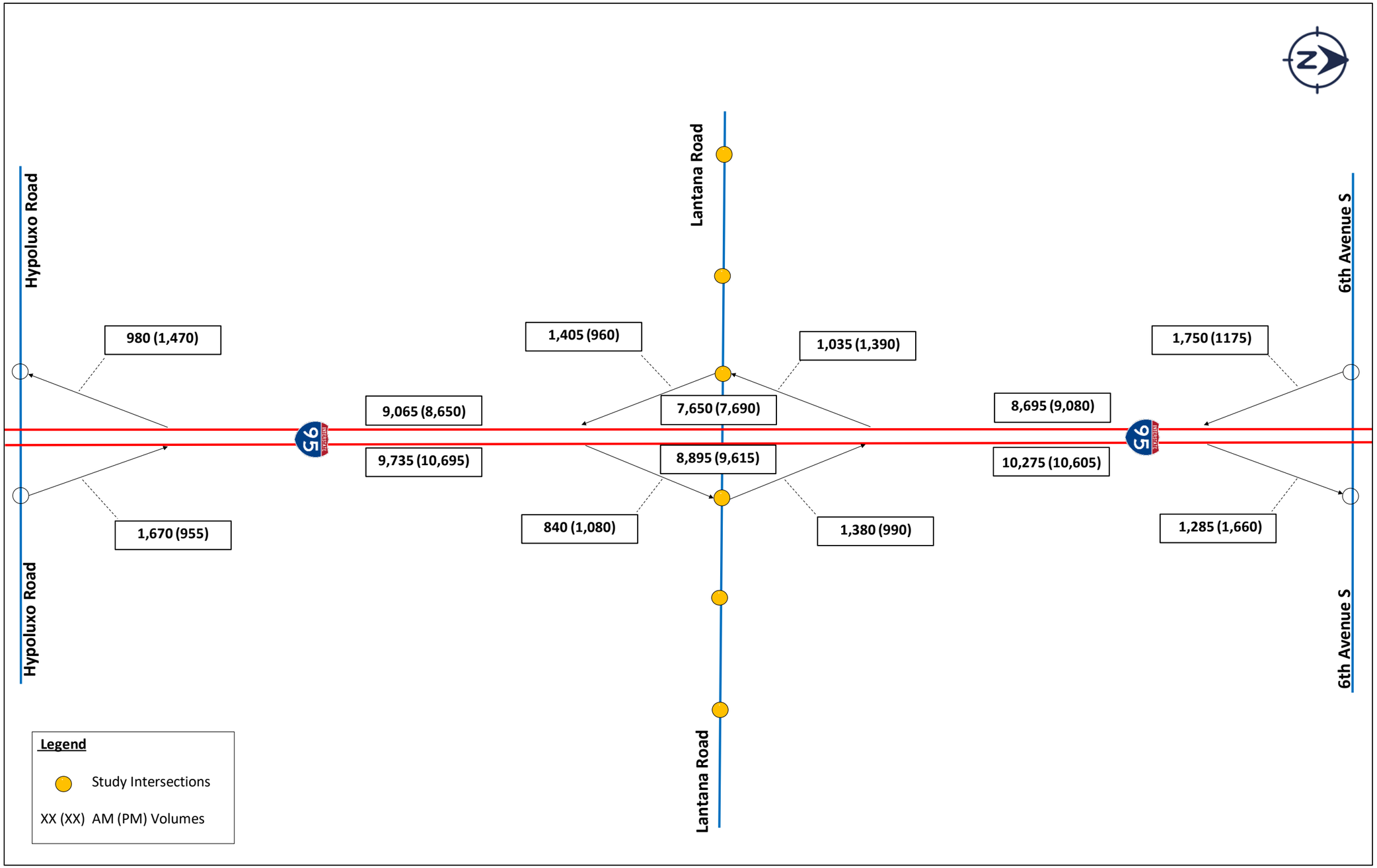


Figure 4-3 2025 DDHVs for I-95 Mainline and Ramps

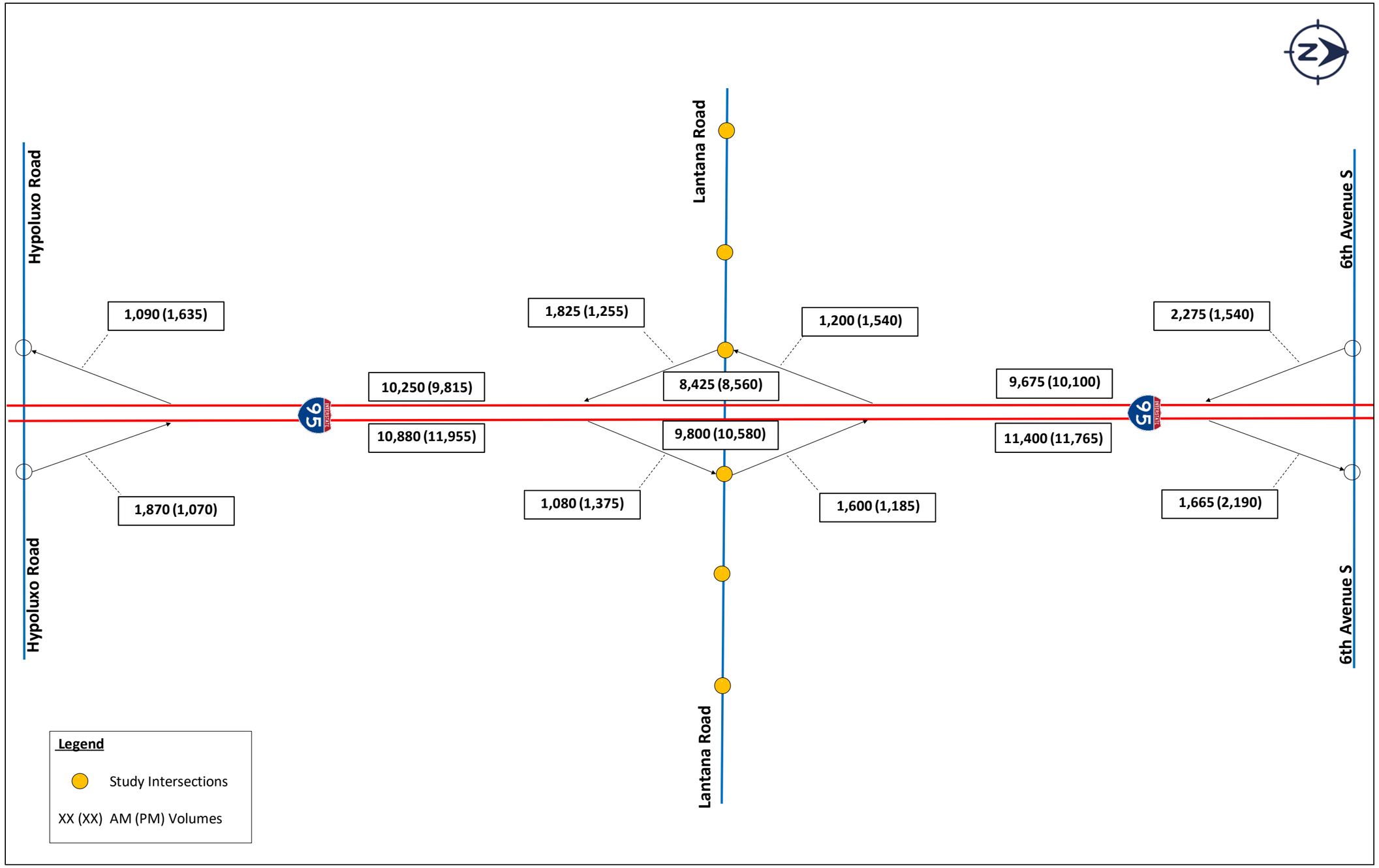


Figure 4-4 2045 DDHVs for I-95 Mainline and Ramps

4.2.3 Future Intersection Turning Movement Volumes

The development of future year turning movement volumes (TMV) for the study intersections were based on the existing turning movement percentages obtained from the field. The latest TMTOOL spreadsheet (Version 2) was used to estimate turning movement volumes for the opening and design years based on projected link volumes and existing turning movements. The turning movement volumes obtained were then balanced and smoothened to ensure consistency between the adjacent intersections as well as taking into consideration the trip distribution from the adjacent Water Tower Commons Development. The TMTOOL spreadsheet outputs are provided in **Appendix L**.

Figure 4-5 to **Figure 4-8** show the TMVs at the study intersections for the 2025 opening year and 2045 AADT design year.

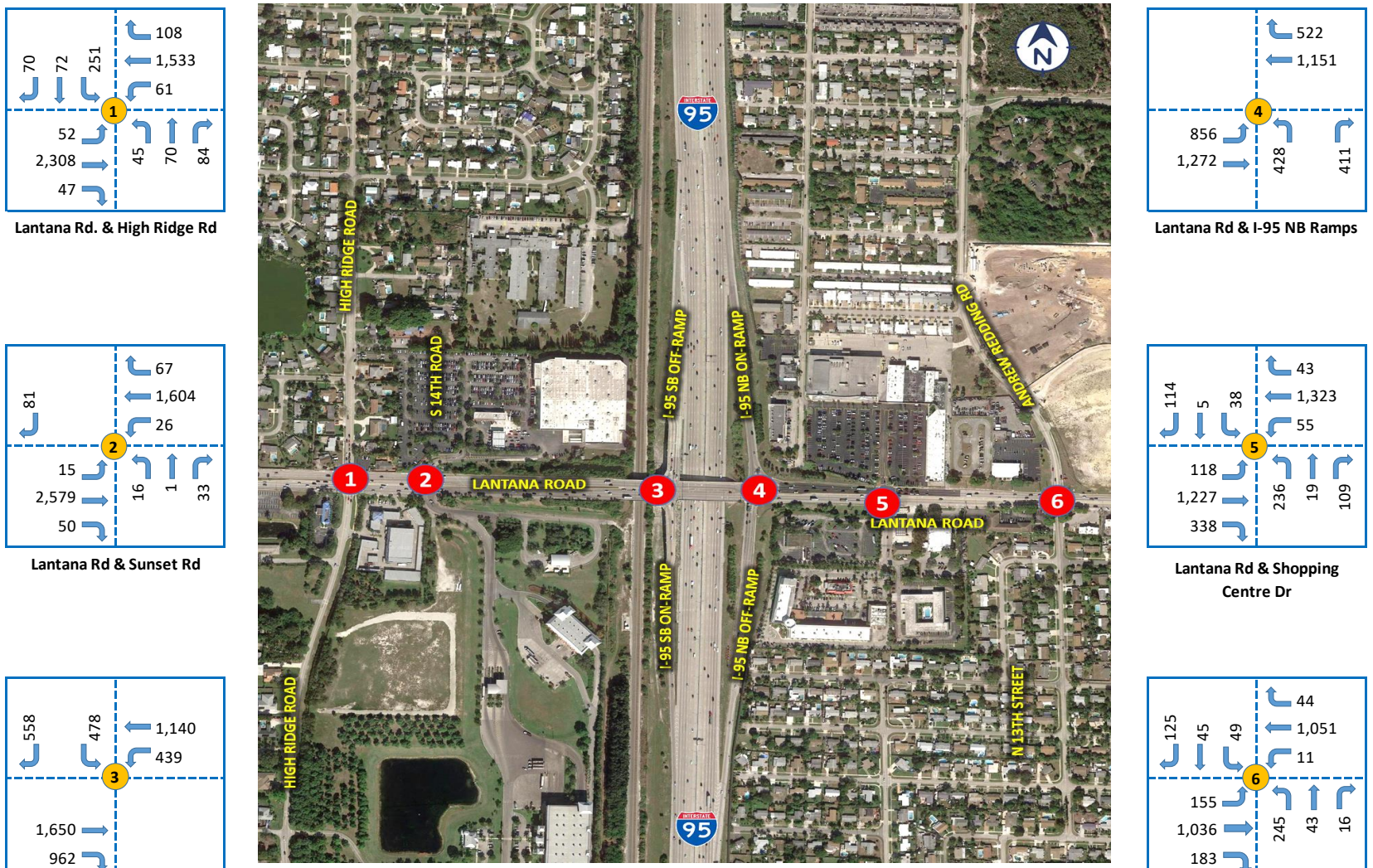


Figure 4-5 2025 Future Intersection Turning Movement Volumes – AM Peak Hour

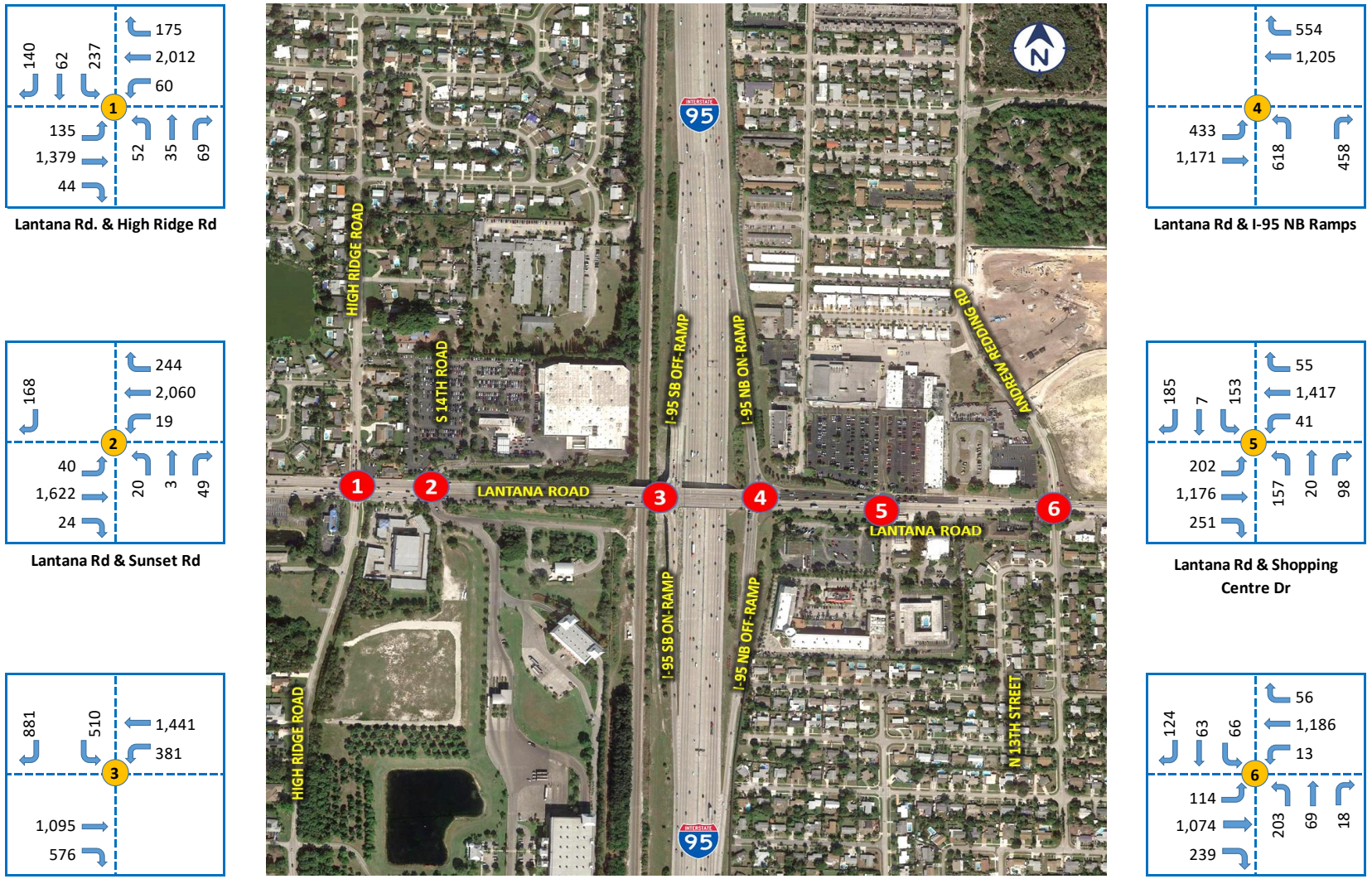


Figure 4-6 2025 Future Intersection Turning Movement Volumes – PM Peak Hour

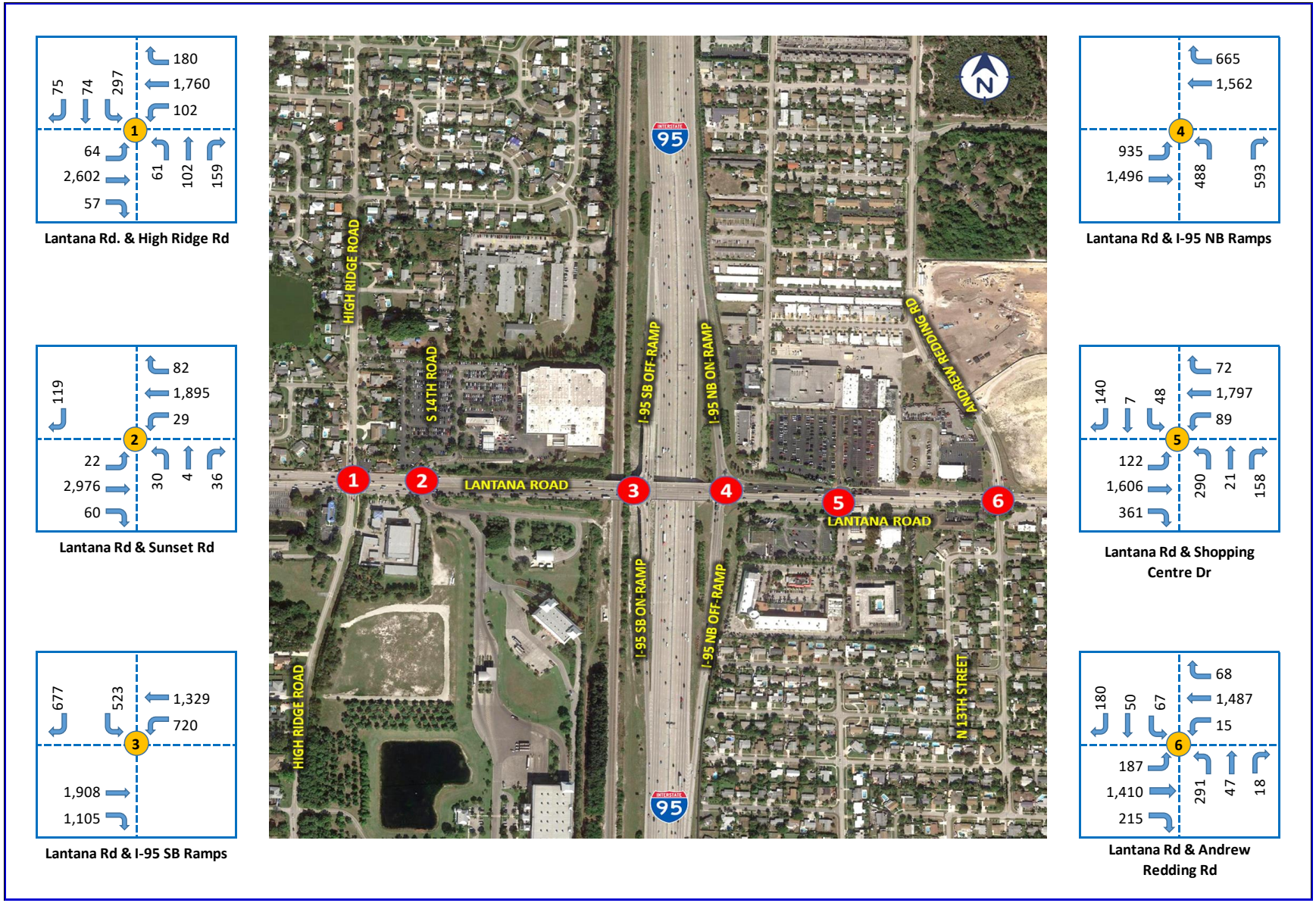


Figure 4-7 2045 Future Intersection Turning Movement Volumes – AM Peak Hour

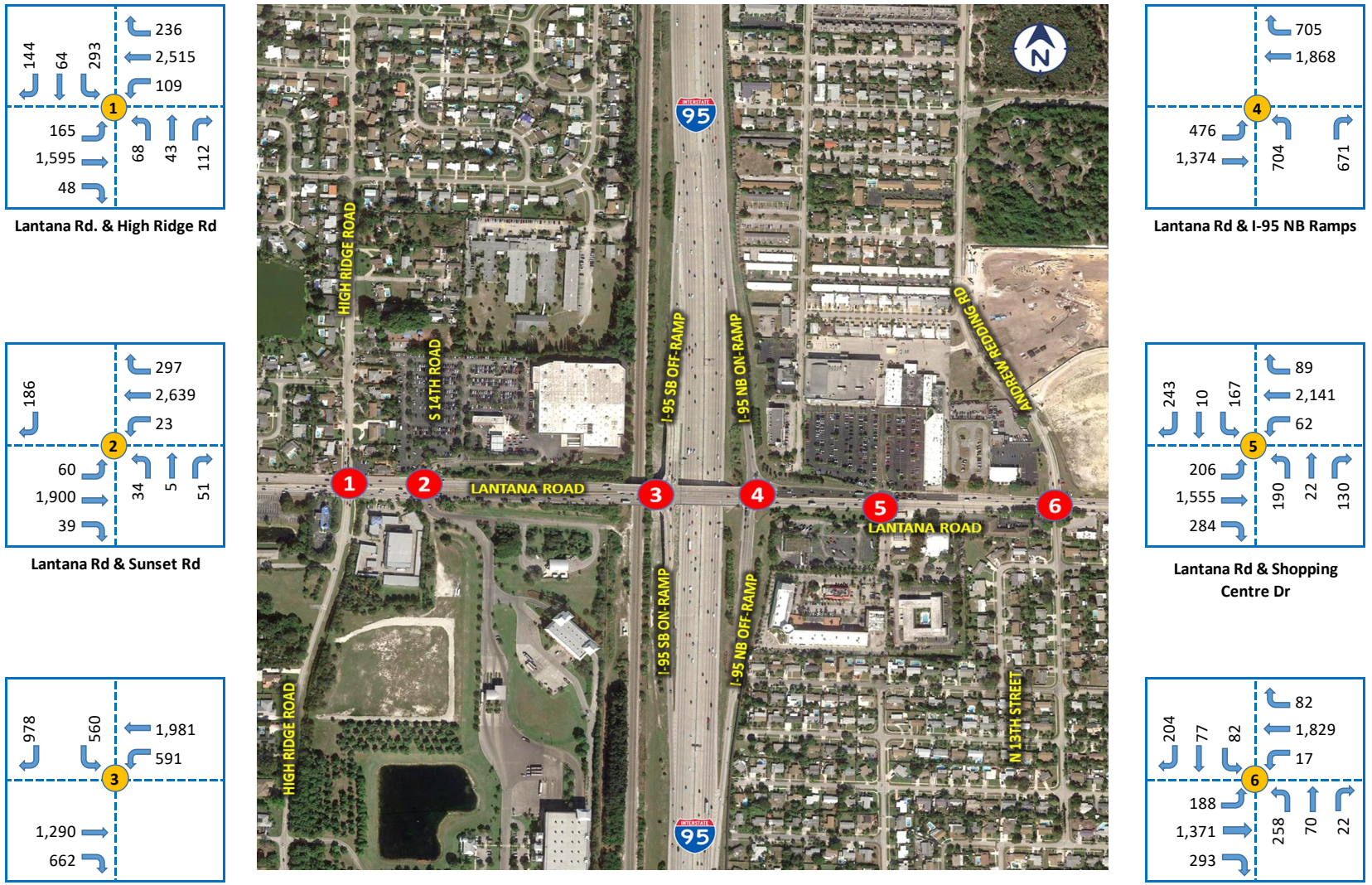


Figure 4-8 2045 Future Intersection Turning Movement Volumes – PM Peak Hour

4.2.4 Traffic Volume Redistribution

As part of the proposed improvements under the build alternatives, access management modifications were provided at the Lantana Road and Sunset Road intersection to mitigate the safety concerns at this location as follows.

Build Alternative 1 eliminates the existing eastbound left-turn and northbound thru movements into the Costco Warehouse at the Lantana Road and Sunset Road unsignalized intersection. Consequently, the eastbound left-turn movement traffic volume at Sunset Road was combined with the eastbound left-turn traffic volume at High Ridge Road signalized intersection which also provides access to the Costco Warehouse. The northbound thru movement was combined with the northbound left-turn movement. **Table 4-3** shows the traffic volume redistribution at the Sunset Road and High Ridge Road intersections under Build Alternative 1.

For Build Alternatives 2 and 3, an underpass service road connecting Sunset Road and the existing Solid Waste Authority (SWA)service road underneath the new bridge over the SFRC/CSX Railroad is proposed. This enables the existing eastbound left-turn as well as the northbound left-turn and thru movements to be eliminated, further enhancing the operations and safety at this intersection. Consequently, the eastbound left-turn movement traffic volume at Sunset Road was combined with the eastbound right-turn movement to access the Costco Warehouse via the underpass service road. The northbound left-turn traffic volume was combined with the southbound right-turn traffic volume to access westbound Lantana Road via the underpass service road.

Based on the existing traffic count data, approximately 22% of the westbound left-turn traffic volume at the High Ridge Road intersection are motorists from the Costco Warehouse making a U-turn to access I-95. With the new underpass service roadway, this movement from the Costco Warehouse to I-95 can be made via the northbound right-turn at the Sunset Road intersection. As such, the traffic volumes for westbound left-turn at High Ridge Road was reduced by 22%. This volume was also subtracted from the southbound right-turn traffic volume and added to the northbound right-turn traffic volume at Sunset Road. **Table 4-4** shows the traffic volume redistribution at the Sunset Road and High Ridge Road intersections under Build Alternatives 2 and 3.

Table 4-3 Traffic Volume Redistribution for Build Alternative 1

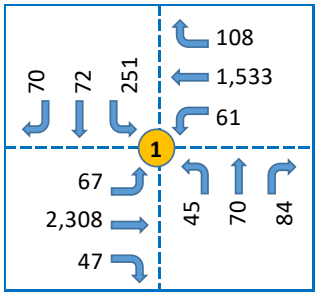
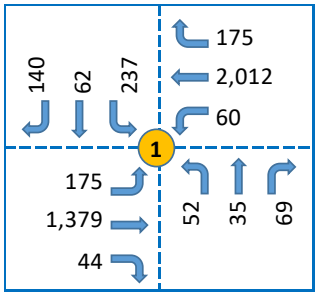
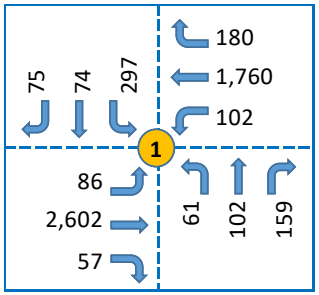
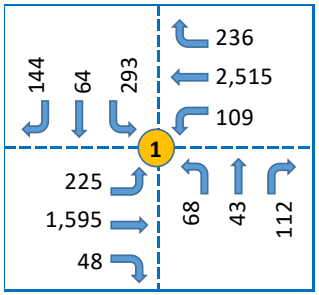
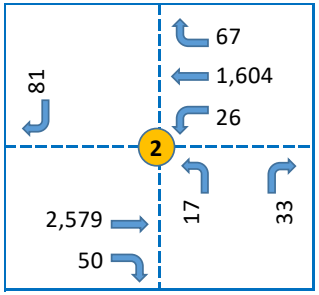
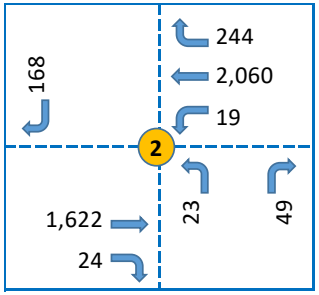
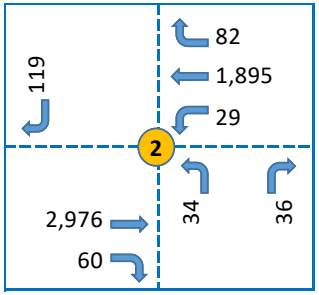
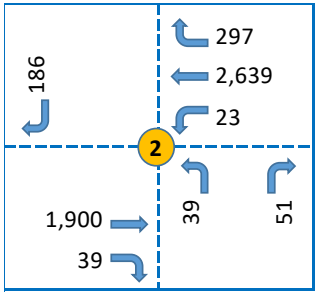
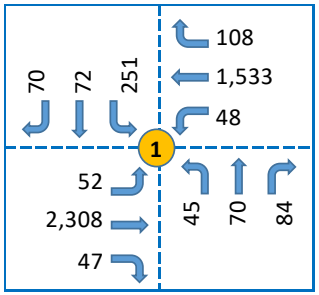
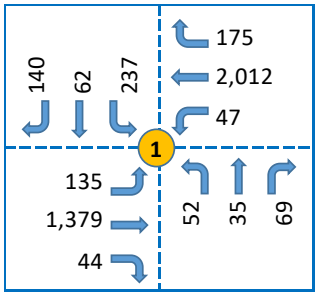
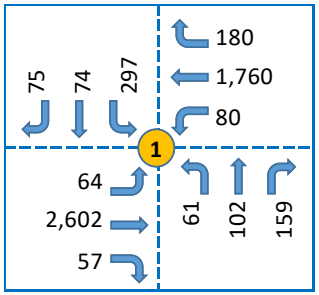
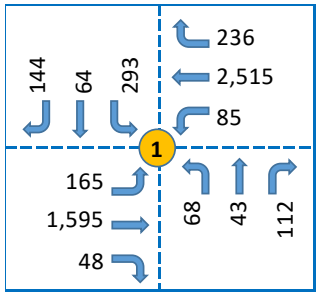
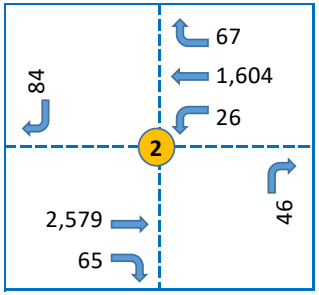
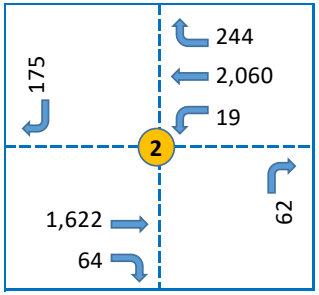
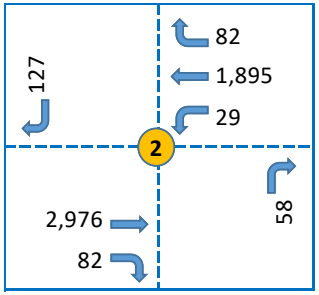
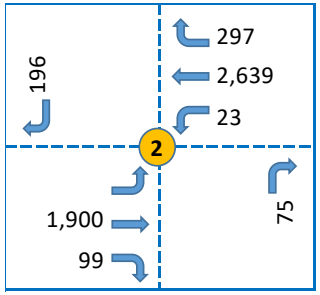
Intersection	2025 Opening Year		2045 Design Year	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Lantana Rd. & High Ridge Rd.				
Lantana Rd & Sunset Rd				

Table 4-4 Traffic Volume Redistribution for Build Alternatives 2 and 3

Intersection	2025 Opening Year		2045 Design Year	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Lantana Rd. & High Ridge Rd.				
Lantana Rd & Sunset Rd				

5.0 CONSIDERED ALTERNATIVES

The alternatives considered as part of the SR 9/I-95 at Lantana Road PD&E Study include a No-Action Alternative, Transportation System Management & Operations (TSM&O) Alternative, and three Build Alternatives. The Alternatives are described below:

5.1 NO-ACTION ALTERNATIVE

The No-Action Alternative assumes no proposed improvements to the study interchange and serves as a baseline for comparison against the Build Alternatives. The No-Action Alternative includes consideration for the Water Tower Commons Development located in the northeast quadrant of Lantana Road and Andrew Redding Road Intersection. This is a 73-acre mixed-use development with 1,100 residential units and 209,000 square feet of commercial space for offices, retail stores and restaurants.

5.2 TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSM&O)

The TSM&O Alternative considers minor improvements to enhance operations and safety without the addition of through lanes. TSM&O includes low-cost improvements such as adding turn lanes at intersections, adjusting signal phasing and timings, and considering opportunities to enhance alternative travel modes. It also includes implementation of intelligent transportation systems (ITS) technologies. The Build Alternatives developed for this IMR also incorporate TSM&O improvements. The proposed TSM&O improvements to be incorporated as part of the Build Alternatives include:

- Incident Management CCTV Cameras
- Wrong Way Detection Technology
- Vehicle Detection System
- Dynamic Message Signs on Lantana Road east and west of I-95

TSM&O improvements will only alleviate some operational, geometric and safety deficiencies along some portions of the study area. Their implementation alone does not meet the purpose and need for this project. TSM&O improvements are only viable in combination with the Build Alternatives that are discussed in the next section of this report.

5.3 BUILD ALTERNATIVES

5.3.1 Build Alternative 1

Build Alternative 1 considered for this IMR Study is generally based on the preliminary conceptual design recommended as part of the I-95 Interchange Master Plan Study and described in Section 1.1. This Alternative maintains the existing Tight Urban Diamond Interchange (TUDI) configuration; however, additional improvements were incorporated into the original concept from the I-95 Interchange Master Plan Study to better accommodate the design year traffic demand. The following improvements are proposed under Build Alternative 1 (See **Figure 5-1**):

- Widen Lantana Road to provide 3 lanes in each direction from High Ridge Road to Andrew Redding Road.
- Widen the existing Lantana Road bridge over I-95 and the two ramp bridges.
- Provide triple right-turn lanes and dual left-turn lanes for the SR 9/I-95 northbound and southbound off-ramps.
- Provide dual eastbound and westbound right-turn lanes onto I-95 southbound and northbound on-ramps, respectively.
- Provide dual eastbound and westbound left-turn lanes from Lantana Road to the I-95 southbound and northbound on-ramps, respectively.
- Eliminate eastbound left-turn movement and provide directional median opening at the Sunset Road intersection.
- Provide exclusive southbound and northbound right-turn lane along High Ridge Road and extend the EB left urn storage from 200 ft to 300 ft.
- Widen right-turn lane at Sunset Road to accommodate WB62FL Design Vehicles.
- Provide 7 ft buffered bicycle lanes and 6 ft sidewalks along Lantana Road in both directions.

These improvements are necessary to enhance the operations of the intersections within the interchange influence area. The proposed improvements under this alternative will also require right of way impacts to 9 commercial properties along Lantana Road.

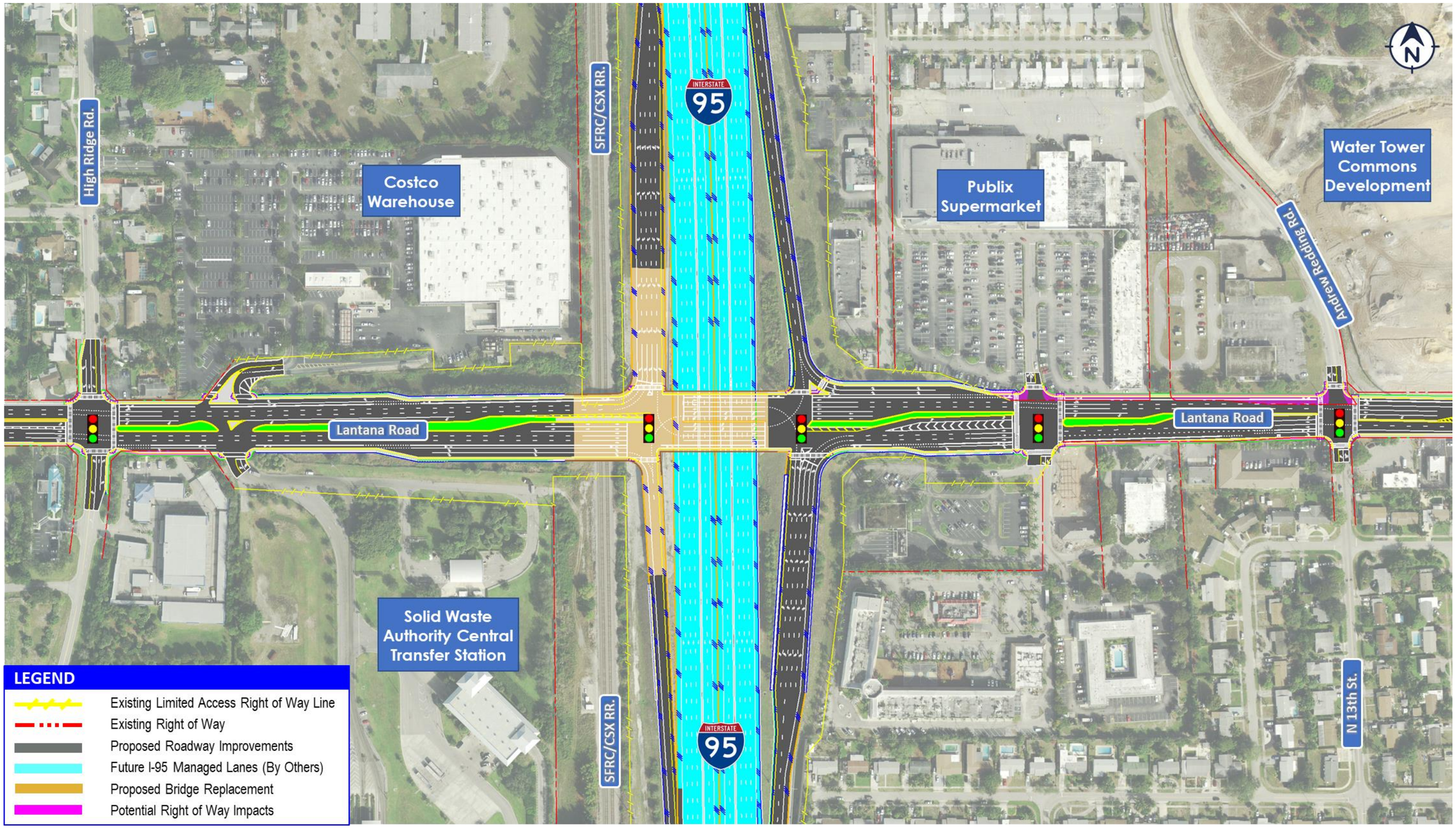


Figure 5-1 Build Alternative 1: Tight Urban Diamond Interchange (TUDI)

5.3.2 Build Alternative 2

Build Alternative 2 reconfigures the existing Tight Urban Diamond Interchange into a Diverging Diamond Interchange (DDI) configuration (See **Figure 5-2**). The diverging diamond concept requires drivers to briefly cross to the left, or opposite side of the road at carefully designed crossover intersections. Drivers travel for a short distance, then cross back to the traditional or right side of the road. This unconventional design allows movements for the left and right-turns to and from the I-95 ramps onto Lantana Road without crossing the path of opposing traffic. The crossover is made at the signal where the opposing traffic flows split the signal green time. The major advantage of this type of interchange is that the left-turning vehicles do not require a signal phase which makes this a two-phased signal system with more green time for the opposing traffic. In addition, the DDI has fewer conflict points (i.e. 14 for DDI, 26 for TUDI) resulting in significant safety and operational improvement at the interchange. The following improvements are proposed to accommodate the design year traffic demand under Build Alternative 2:

- Widen Lantana Road to provide 3 lanes in each direction between High Ridge Road and Andrew Redding Road.
- Replace the existing single Lantana Road bridge over I-95 and SFRC/CSX Railroad with two separate bridges over SR 9/I-95 and SFRC/CSX Railroad.
- Replace the existing ramp bridges for the southbound on and off ramps with embankment and MSE walls.
- Provide dual right-turn lanes and dual left-turn lanes for the SR 9/I-95 northbound and southbound off-ramps.
- Provide dual eastbound and westbound right-turn lanes from Lantana Road onto I-95 southbound and northbound on-ramps, respectively.
- Provide dual eastbound and westbound left-turn lanes from Lantana Road onto the I-95 northbound and southbound on-ramps.
- Eliminate the eastbound left-turn, northbound left-turn and thru movements and provide a directional median opening at the Sunset Road intersection.
- Widen westbound right-turn lane at Sunset Road to accommodate WB62FL Design Vehicles.
- Provide an underpass road that connects Sunset Road and the existing Solid Waste Authority (SWA) service road underneath the reconstructed Lantana Road Bridge over SFRC/CSX Railroad.
- Provide exclusive southbound and northbound right-turn lane along High Ridge Road.

- Provide 7-ft buffered bicycle lanes and 6-ft sidewalks along Lantana Road in both directions.

These improvements are necessary to enhance the operations of the intersections within the interchange influence area. The proposed improvements under this alternative will also require right of way impacts to 6 commercial properties along Lantana Road.

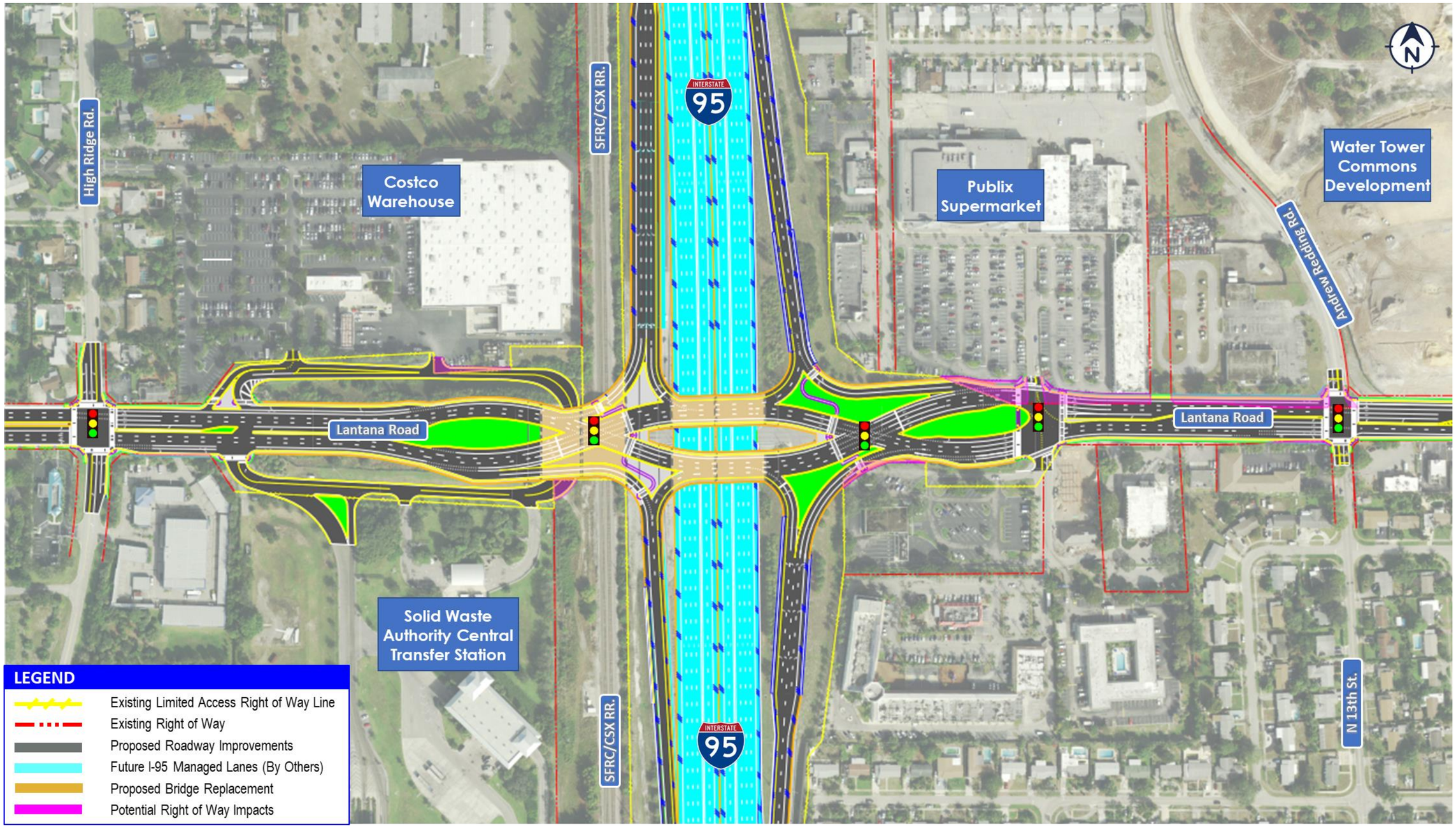


Figure 5-2 Build Alternative 2: Diverging Diamond Interchange (DDI)

5.3.3 Build Alternative 3

Build Alternative 3 reconfigures the existing Tight Urban Diamond Interchange into a Single Point Urban Interchange (SPUI) configuration (See **Figure 5-3**). The SPUI concept consolidates the two intersections of a TUDI into one single intersection. This allows left-turning traffic from both directions of the intersecting roadways to turn simultaneously without crossing the path of the opposing left-turns. Since traffic passing through the SPUI is controlled by a single signal, vehicles can clear the intersection much more quickly compared to a TUDI. The major advantages of SPUI are improved operational efficiency and safety. This can be attributed to the single, three-phase traffic signal and less conflict points compared to the TUDI. In addition, the SPUI also allows for wider turns, easing movement for heavy trucks. The following improvements are proposed to accommodate the design year traffic demand under Build Alternative 3:

- Widen Lantana Road to provide 3 lanes in each direction from High Ridge Road to Andrew Redding Road
- Replace the existing Lantana Road bridge over I-95 and the two ramp bridges
- Provide triple right-turn lanes and dual left-turn lanes for the SR 9/I-95 northbound and southbound off-ramps.
- Provide dual eastbound and westbound right-turn lanes onto I-95 southbound and northbound on-ramps, respectively.
- Provide dual eastbound and westbound left-turn lanes from Lantana Road to the I-95 southbound and northbound on-ramps, respectively.
- Provide dual eastbound and westbound left-turn lanes from Lantana Road to the I-95 southbound and northbound on-ramps, respectively.
- Eliminate the eastbound left-turn, northbound left-turn and thru movements and provide a directional median opening at the Sunset Road intersection with an underpass access road.
- Provide exclusive southbound and northbound right-turn lane along High Ridge Road
- Widen right-turn lane at Sunset Road to accommodate WB62FL Design Vehicles
- Provide 7 ft buffered bicycle lanes and 6 ft sidewalks along Lantana Road in both directions.

These improvements are necessary to enhance the operations of the intersections within the interchange influence area. The proposed improvements under this alternative will also require right of way impacts to 9 commercial properties along Lantana Road.

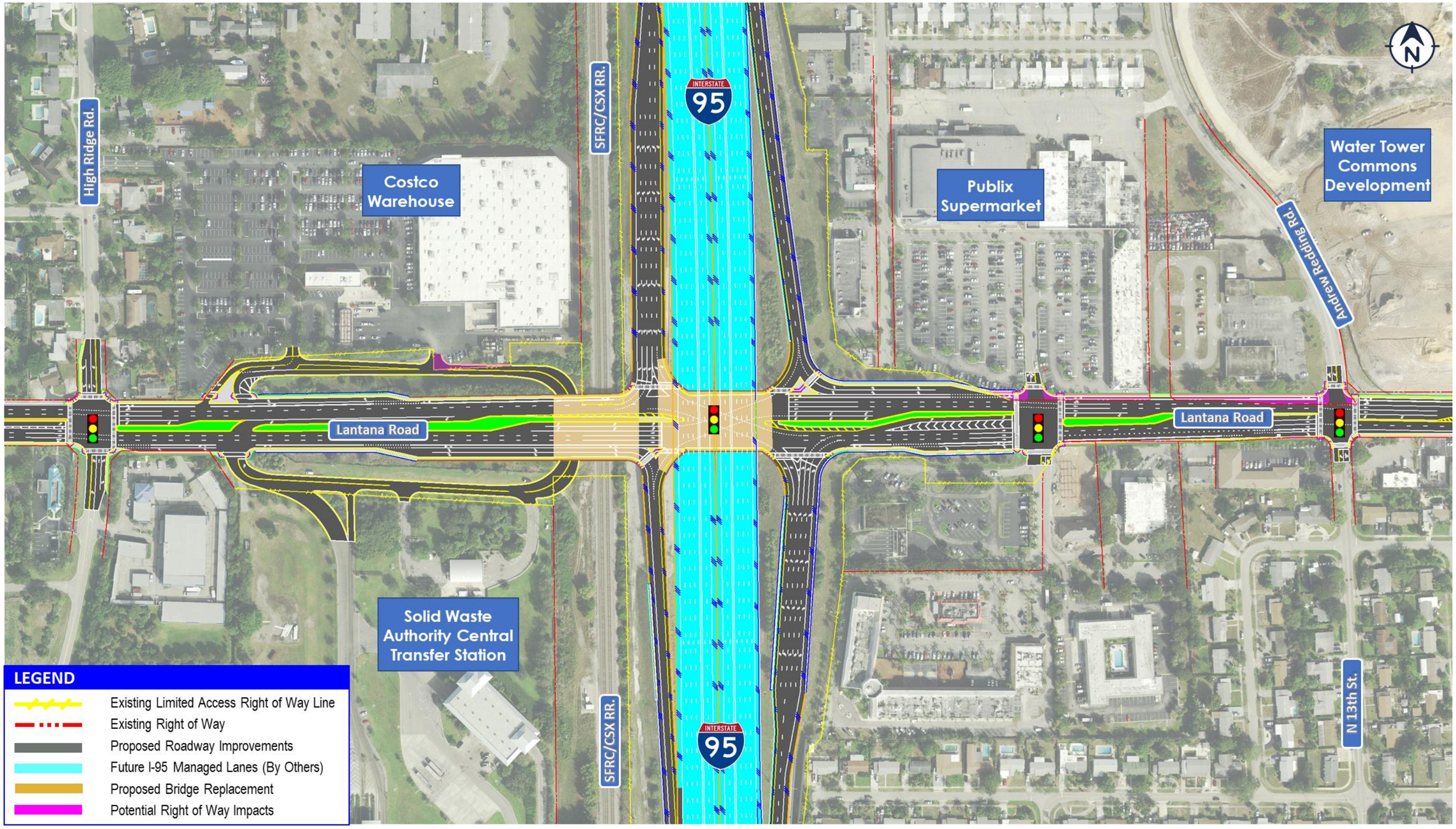


Figure 5-3 Build Alternative 3: Single Point Urban Interchange (SPUI)

6.0 ALTERNATIVES EVALUATION

6.1 FUTURE TRAFFIC OPERATIONAL ANALYSIS

6.1.1 No-Action Alternative

6.1.1.1 Freeway and Ramps

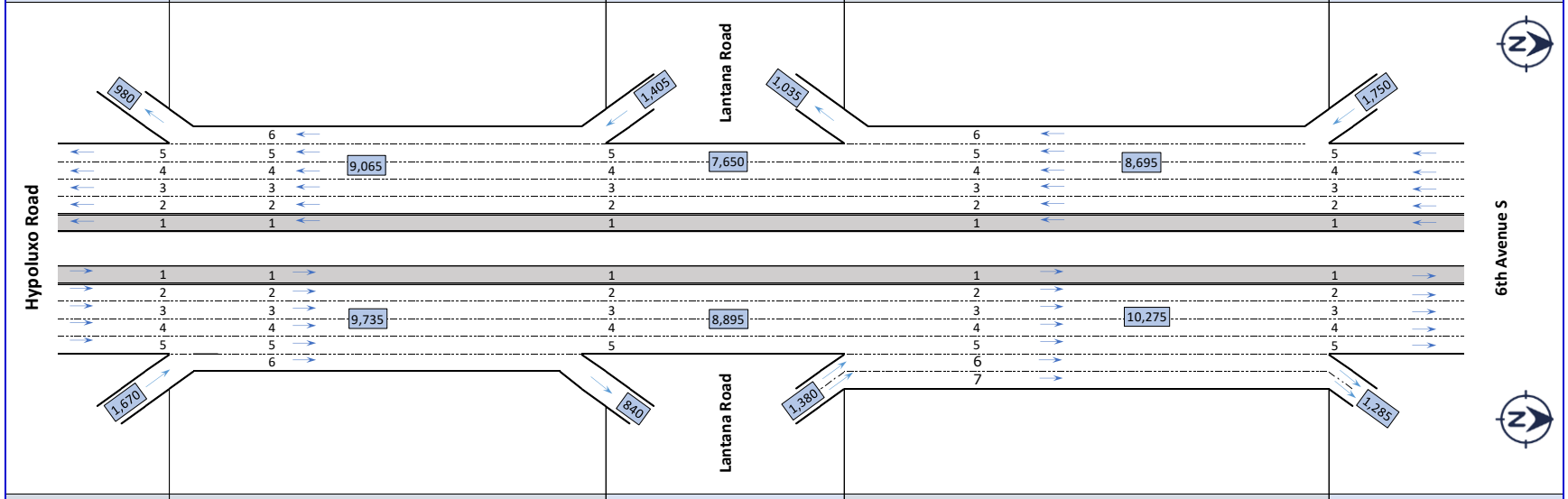
The 2025 and 2045 No-Action conditions for the I-95 freeway segments between the ramps and weaving segments between the adjacent interchanges were analyzed using Highway Capacity Software (HCS 7). The High Occupancy Vehicle (HOV) lane along the I-95 mainline was analyzed as a Continuous Access Managed Lane as per HCM 6 methodologies for managed lanes. **Figure 6-1** through **Figure 6-4** show the density, speed, and level of service for the freeway segments as well as the weaving segments for the AM and PM peak periods respectively.

Based on the analysis, most of the weaving segments along SR 9/I-95 operate at LOS F under the 2025 No-Action conditions during both the AM and PM peak periods, except the section of I-95 from Hypoluxo Road to Lantana Road northbound direction which operates at LOS E during the PM peak period. The I-95 basic freeway segment between the Lantana Road SB off-ramp and SB on-ramp operates at LOS C during both the AM and PM peak periods, while the I-95 basic freeway segment between the Lantana Road NB off-ramp and NB on-ramp operates at LOS D and LOS E during the AM and PM peak periods, respectively.

Under the 2045 No-Action conditions, all the weaving segments along SR 9/I-95 operate at LOS F during both the AM and PM peak periods in both directions. The I-95 basic freeway segment between the Lantana Road SB off-ramp and SB on-ramp operates at LOS D during both the AM and PM peak periods, while the I-95 basic freeway segment between the Lantana Road NB off-ramp and NB on-ramp operates at LOS E and LOS F during the AM and PM peak periods, respectively.

The details of the freeway and weaving analysis results for the No-Action conditions are included in **Appendix M.**

I-95 Southbound				
Length	2,165-ft	3,065-ft	4,375-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	-	25.6 pc/mi/ln	-	
Speed	-	65.0 mph	-	
V/C Ratio	**1.04**	**0.70**	**1.20**	
LOS	**F**	**C**	**F**	



Length	2,265-ft	3,165-ft	4,445-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	-	33.1 pc/mi/ln	-	
Speed	-	60.5 mph	-	
V/C Ratio	**1.08**	**0.85**	**1.16**	
LOS	**F**	**D**	**F**	
I-95 Northbound				

Figure 6-1 2025 No-Action Freeway Analysis – AM Peak

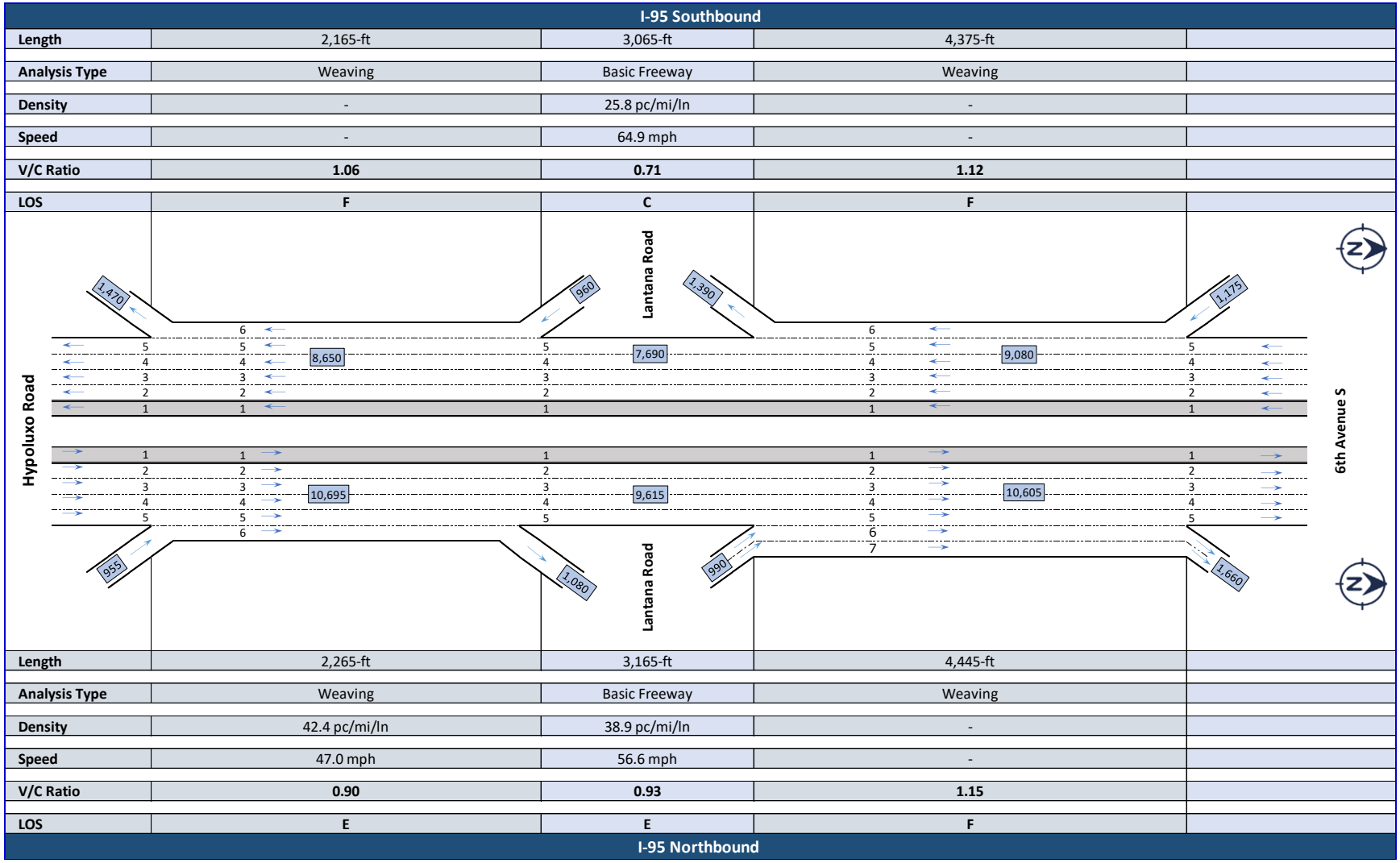


Figure 6-2 2025 No-Action Freeway Analysis – PM Peak

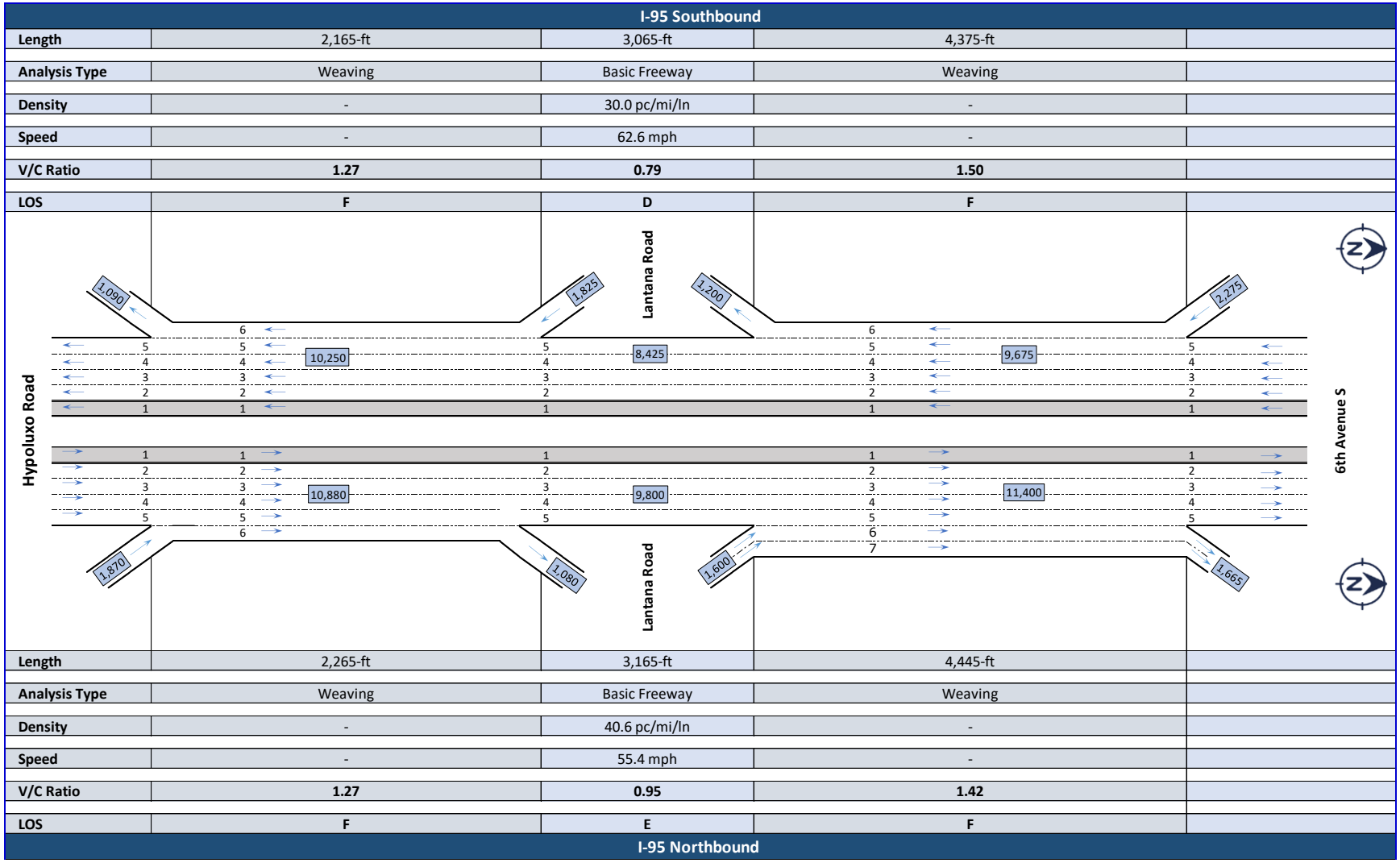


Figure 6-3 2045 No-Action Freeway Analysis – AM Peak

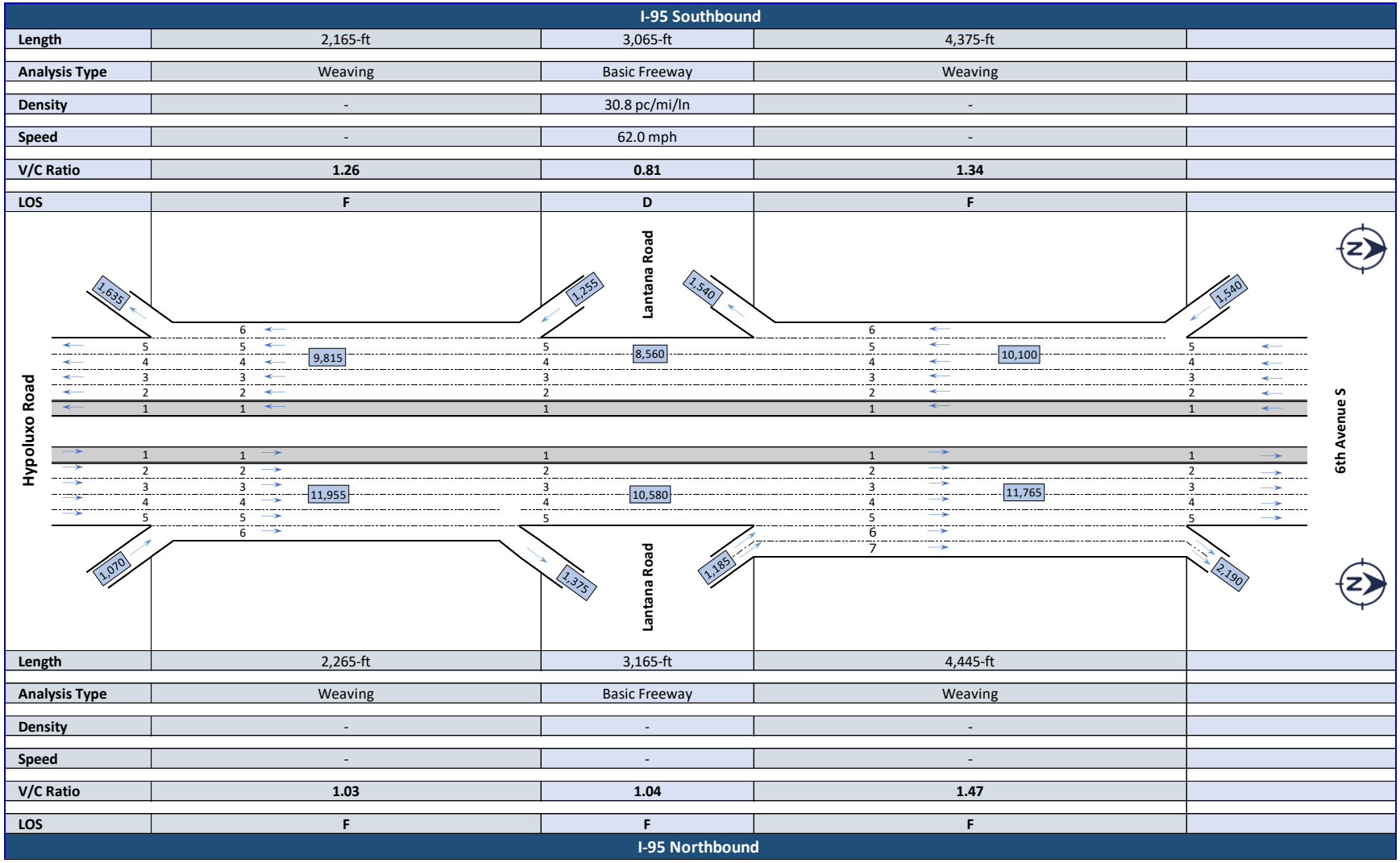


Figure 6-4 2045 No-Action Freeway Analysis – PM Peak

6.1.1.2 Intersection Operations

Table 6-1 through **Table 6-4** show the Future No-Action conditions LOS analysis results for the signalized intersections within the study area. The existing signal timings were optimized for the No-Action analysis to account for traffic growth and demand.

Based on the analysis results, during the AM and PM peak periods, most of the study intersections will operate at LOS D or better in the 2025 opening year with the exception of the Lantana Road and I-95 southbound ramp terminal intersection which will operate at LOS E. In addition, 9 intersection movements and approaches will operate at LOS F during the AM peak period, while 18 intersection movements and approaches will operate at LOS F during the PM peak period.

For the 2045 design year, most of the study intersections will operate at LOS E or worse during the AM peak period except for the Lantana Road at Shopping Center Drive and Andrew Redding Road intersections which will operate at LOS D or better. During the PM peak periods, five out of the six study intersections will operate at LOS E or worse. In addition, 26 intersection movements and approaches will operate at LOS F during the AM peak period, while 40 intersection movements and approaches will operate at LOS F during the PM peak period.

For the 2025 opening year, the I-95 northbound ramp terminal intersection will operate at LOS D while the southbound ramp terminal intersection will operate at LOS E during the AM and PM peak periods. For the 2045 design year, both the I-95 northbound and southbound ramp terminal intersections will operate at LOS F during both AM and PM peak periods with most of the approaches also operating at LOS F.

It should be noted that the northbound left-turn movement for the Lantana Road at Sunset Road unsignalized intersection is overcapacity due excessive delays from lack of gaps in the east-west traffic stream. As such, the HCS methodology does not provide any delay values for the northbound left-turn movement. This impacts the combined delays for the northbound approach as well as the overall intersection delays. Consequently, the northbound approach delay and overall intersection delay and LOS for the Lantana Road at Sunset Road unsignalized intersection was omitted from the results table.

The detailed results of the 2025 opening year and 2045 design year No-Action future conditions analysis for the signalized intersections within the project limits are provided in **Appendix N**.

Table 6-1 2025 No-Action Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	15.6	B	33.4	C	62.1	E	169.2	F	34.3	C
			T	25.6	C	19.0	B	77.4	E	47.5	D		
			R	28.4	C	20.0	B						
			App	26.4	C	19.8	B	74.0	E	125.1	F		
2	Lantana Rd & Sunset Rd.	AM	L	15.9	C	147.5	F	OC	F	-	-	-	-
			T	-	-	-	-	48.3	E	-	-		
			R	-	-	-	-			21.3	C		
			App	-	-	-	-	OC	F	21.3	C		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	23.2	C	-	-	172.8	F	71.0	E
			T	61.9	E	3.1	A	-	-	-	-		
			R	109.2	F	-	-	-	-	52.8	D		
			App	79.3	E	8.7	A	-	-	144.7	F		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	86.5	F	-	-	64.4	E	-	-	46.8	D
			T	0.8	A	72.0	E	-	-	-	-		
			R	-	-	0.4	A	76.5	E	-	-		
			App	35.3	D	49.7	D	70.3	E	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	15.9	B	12.8	B	55.5	E	54.9	D	21.1	C
			T	15.1	B	17.6	B	40.7	D				
			R	12.3	B	10.5	B			57.8	E		
			App	14.6	B	17.2	B	50.3	D	57.0	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	25.4	C	33.3	C	54.4	D	51.9	D	31.6	C
			T	22.1	C	32.8	C	34.9	C	58.6	E		
			R	22.2	C	32.7	C						
			App	22.5	C	32.8	C	50.6	D	57.1	E		

Note: OC = Overcapacity

Table 6-2 2025 No-Action Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.0	Lantana Rd. & High Ridge Rd.	PM	L	83.9	F	44.9	D	75.0	E	83.9	F	38.1	D
			T	21.1	C	35.9	D	69.7	E	52.2	D		
			R	21.8	C	40.1	D						
			App	26.8	C	37.5	D	71.5	E	69.3	E		
2.0	Lantana Rd & Sunset Rd.	PM	L	29.4	D	29.1	D	OC	F	-	-	-	-
			T	-	-	-	-	1576.7	F	-	-		
			R	-	-	-	-			73.7	F		
			App	-	-	-	-	OC	F	73.7	F		
3.0	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	20.3	C	-	-	144.4	F	62.1	E
			T	70.0	E	4.1	A	-	-	-	-		
			R	23.0	C	-	-	-	-	65.6	E		
			App	53.8	D	7.5	A	-	-	143.5	F		
4.0	Lantana Rd & I-95 NB Off-Ramp and On-Ramp Terminal	PM	L	14.6	B	-	-	119.5	F	-	-	39.1	D
			T	2.9	A	54.0	D	-	-	-	-		
			R	-	-	0.4	A	54.2	D	-	-		
			App	6.1	A	37.1	D	91.7	F	-	-		
5.0	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	250.3	F	42.7	D	78.8	E	138.3	F	50.7	D
			T	24.8	C	34.9	C	46.0	D				
			R	19.1	B	19.6	B			75.1	E		
			App	51.9	D	34.5	C	64.8	E	104.3	F		
6.0	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	76.2	E	88.3	F	164.9	F	62.5	E	36.0	D
			T	15.0	B	23.9	C	44.8	D	81.7	F		
			R	15.2	B	23.9	C						
			App	20.0	B	24.6	C	128.8	F	76.7	E		

Note: OC = Overcapacity

Table 6-3 2045 No-Action Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	29.1	C	146.9	F	53.9	D	259.7	F	62.7	E
			T	56.9	F	30.1	C	87.8	F	39.9	D		
			R	66.8	F	32.9	C						
			App	59.7	E	36.8	D	81.4	F	186.2	F		
2	Lantana Rd & Sunset Rd.	AM	L	20.3	C	383.8	F	OC	F	-	-	-	-
			T	-	-	-	-	83.3	F	-	-		
			R	-	-	-	-			35.3	E		
			App	-	-	-	-	OC	F	35.3	E		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	163.3	F	-	-	247.3	F	123.4	F
			T	110.4	F	6.0	A	-	-	-	-		
			R	177.6	F	-	-	-	-	56.4	E		
			App	135.1	F	61.3	E	-	-	199.9	F		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	132.7	F	-	-	73.5	E	-	-	104.4	F
			T	2.9	A	194.6	F	-	-	-	-		
			R	-	-	0.3	A	220.6	F	-	-		
			App	52.8	D	136.6	F	154.1	F	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	63.1	E	32.7	C	87.7	F	55.6	E	38.8	D
			T	30.0	C	39.4	D	45.9	D				
			R	19.4	B	16.7	B			60.7	E		
			App	30.1	C	38.3	D	71.8	E	59.3	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	101.9	F	55.5	E	121.4	F	52.8	D	54.0	D
			T	27.0	C	60.9	E	35.1	D	72.1	E		
			R	28.0	C	61.9	E						
			App	35.2	D	61.4	E	105.7	F	67.7	E		

Note: OC = Overcapacity

Table 6-4 2045 No-Action Intersections Level of Service - PM Peak Period													
No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1.0	Lantana Rd. & High Ridge Rd.	PM	L	95.6	F	66.7	E	88.1	F	178.9	F	75.9	E
			T	27.1	C	86.2	F	77.5	E	50.8	D		
			R	28.4	C	109.8	F						
			App	33.8	C	93.5	F	80.8	F	125.7	F		
2.0	Lantana Rd & Sunset Rd.	PM	L	85.7	F	43.2	E	OC	F	-	-	-	-
			T	-	-	-	-	29.3	D	-	-		
			R	-	-	-	-			319.4	F		
			App	-	-	-	-	OC	F	319.4	F		
3.0	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	23.3	C	-	-	186.5	F	84.8	F
			T	132.3	F	16.1	B	-	-	-	-		
			R	24.7	C	-	-	-	-	81.8	F		
			App	95.8	F	17.8	B	-	-	182.8	F		
4.0	Lantana Rd & I-95 NB Off-Ramp and On-Ramp Terminal	PM	L	15.5	B	-	-	172.5	F	-	-	104.1	F
			T	5.4	A	196.6	F	-	-	-	-		
			R	-	-	0.1	A	149.3	F	-	-		
			App	8.0	A	142.8	F	161.2	F	-	-		
5.0	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	253.9	F	42.9	D	111.9	F	230.4	F	98.7	F
			T	32.5	C	137.2	F	46.8	D				
			R	20.6	C	20.3	C			112.0	F		
			App	53.2	D	130.1	F	83.0	F	162.0	F		
6.0	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	243.8	F	95.5	F	306.3	F	56.5	E	80.9	F
			T	23.9	C	80.7	F	39.0	D	102.7	F		
			R	25.3	C	85.5	F						
			App	46.9	D	83.3	F	236.0	F	92.3	F		

Note: OC = Overcapacity

6.1.1.3 Arterial Operations

Table 6-5 to **Table 6-8** show the 2025 opening year and 2045 design year No-Action LOS along the study arterials. The results indicate that for the 2025 opening year, the Lantana Road corridor will operate at an overall LOS F in both the eastbound and westbound directions with an average speed of 12.7 mph and 12.0 mph respectively during the AM peak period. During the PM peak period, Lantana Road will operate at LOS E in the eastbound direction with an average speed of 13.8 mph and LOS F in the westbound direction with an average speed 11.4 mph.

Table 6-5 2025 No-Action Arterial Level of Service - AM Peak Period

Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	58.0	12.1	F	51.4	17.3	D
I-95 SB On-Ramp/I-95 SB Off-Ramp	88.7	10.0	F	12.5	22.9	C
I-95 NB On-Ramp/I-95 NB Off-Ramp	10.0	28.6	B	84.5	4.6	F
Shopping Centre Dr	32.8	11.8	F	33.2	15.3	E
Andrew Redding Road / N 13th St.	29.5	17.2	D	58.4	13.9	E
Total	**219**	**12.7**	F	**240.0**	**12.0**	F

Table 6-6 2025 No-Action Arterial Level of Service - PM Peak Period

Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	41.8	16.8	E	66.6	13.3	E
I-95 SB On-Ramp/I-95 SB Off-Ramp	97.9	9.1	F	13.5	21.2	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	12.1	23.7	C	67.5	5.7	F
Shopping Centre Dr	16.7	23.2	C	53.8	9.4	F
Andrew Redding Road / N 13th St.	33.2	15.3	E	51.0	16.0	E
Total	**201.7**	**13.8**	E	**252.4**	**11.4**	F

For the 2045 design year, the Lantana Road corridor will operate at an overall LOS F in the eastbound and westbound directions during the AM peak period with an average speed of 8.6 mph and 7.1 mph, respectively. During the PM peak period, Lantana Road will operate at LOS F in both the eastbound and westbound directions with an average speed of 10.0 mph and 4.8 mph, respectively.

Table 6-7 2045 No-Action Arterial Level of Service - AM Peak Period

Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	103.9	6.8	F	59.3	15.0	E
I-95 SB On-Ramp/I-95 SB Off-Ramp	133.3	6.7	F	15.3	18.7	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	12.1	23.7	C	195.0	2.0	F
Shopping Centre Dr	41.9	9.2	F	50.6	10.0	F
Andrew Redding Road / N 13th St.	32.3	15.7	E	84.7	9.6	F
Total	**323.5**	**8.6**	F	**404.9**	**7.1**	F

Table 6-8 2045 No-Action Arterial Level of Service - PM Peak Period

Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	48.6	14.5	E	108.0	8.2	F
I-95 SB On-Ramp/I-95 SB Off-Ramp	150.8	5.9	F	25.7	11.1	F
I-95 NB On-Ramp/I-95 NB Off-Ramp	14.6	19.6	D	199.0	1.9	F
Shopping Centre Dr	19.9	19.5	D	156.9	3.2	F
Andrew Redding Road / N 13th St.	42.8	11.9	F	111.8	7.3	F
Total	**276.7**	**10.0**	F	**601.4**	**4.8**	F

6.1.1.4 Intersection Queue Lengths

A queuing analysis for the 2045 No-Action future condition was performed as part of the study to determine the adequacy of the existing left-turn storage lengths for the intersections along the corridor using Synchro 10. The 95th percentile vehicular queue length in feet for the left-turn and right-turn movements at each of the study intersections were obtained. These were compared against the existing storage lengths to identify storage deficiencies where the estimated queue exceeds the storage capacity. The queue analysis results for the 2045 No-Action conditions are shown in **Table 6-9.**

Based on the analysis, 10 out of the 20 (50%) locations with existing turn storages have deficient storage lengths. The queue analysis also indicated that both the right-turn of the northbound off-ramp and left-turn of the southbound off-ramp approaches experience queue spillovers during the AM and PM peak periods onto the I-95 mainline. It is anticipated that the northbound off-ramp will exceed the existing ramp storage by 27% while the southbound off-ramp will exceed the existing storage by 9%. In addition, the eastbound and westbound left-turns at the ramp terminals will exceed the existing storage by 79% and 49%, respectively. It should be noted that the results from the SYNCHRO analysis only show the maximum queues after two cycles. However, the queues may be longer due to residual queues remaining after each cycle as a result of the traffic congestion. Further analysis using the SIMTRAFFIC microsimulation tool indicated that the queues for the SB ramp terminal intersection will extend beyond the gore point during the AM peak period. The detailed queue analysis results are provided in **Appendix O**.

Table 6-9 2045 No-Action Alternative Queue Length Analysis

No.	Intersection	Approach		AM	PM	Max Queue Length (ft)	Existing Storage (ft)	Storage Deficiency	Over Existing Storage
1	High Ridge Road	EB	L	#69	#301	301	200	Yes	51%
		WB	L	m#162	m49	162	250	No	-
		NB	L	101	133	133	200	No	-
		SB	L	#491	#488	491	500	No	-
3	I-95 SB Off-Ramp	WB	L	m#717	m189	717	480	Yes	49%
		SB	L	#834	#1015	1015	930	Yes	9%
			R	234	#612	612	930	No	-
4	I-95 NB Off-Ramp	EB	L	m#877	m117	877	490	Yes	79%
		NB	L	#353	#644	644	940	No	-
			R	#1041	#1191	1191	940	Yes	27%
5	Shopping Center Drive	EB	L	m#139	m#369	369	270	Yes	37%
			R	m162	m32	162	280	No	-
		WB	L	m56	#70	70	400	No	-
			R	m26	83	83	365	No	-
		NB	L	#425	257	425	200	Yes	113%
		SB	R	199	#452	452	120	Yes	277%
6	Andrew Redding Road	EB	L	m#238	#376	376	120	Yes	213%
		WB	L	35	34	35	200	No	-
		NB	L	#395	#468	468	150	Yes	212%
		SB	L	111	132	132	200	No	-

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.

6.1.2 Build Alternatives

6.1.2.1 Freeway and Ramps

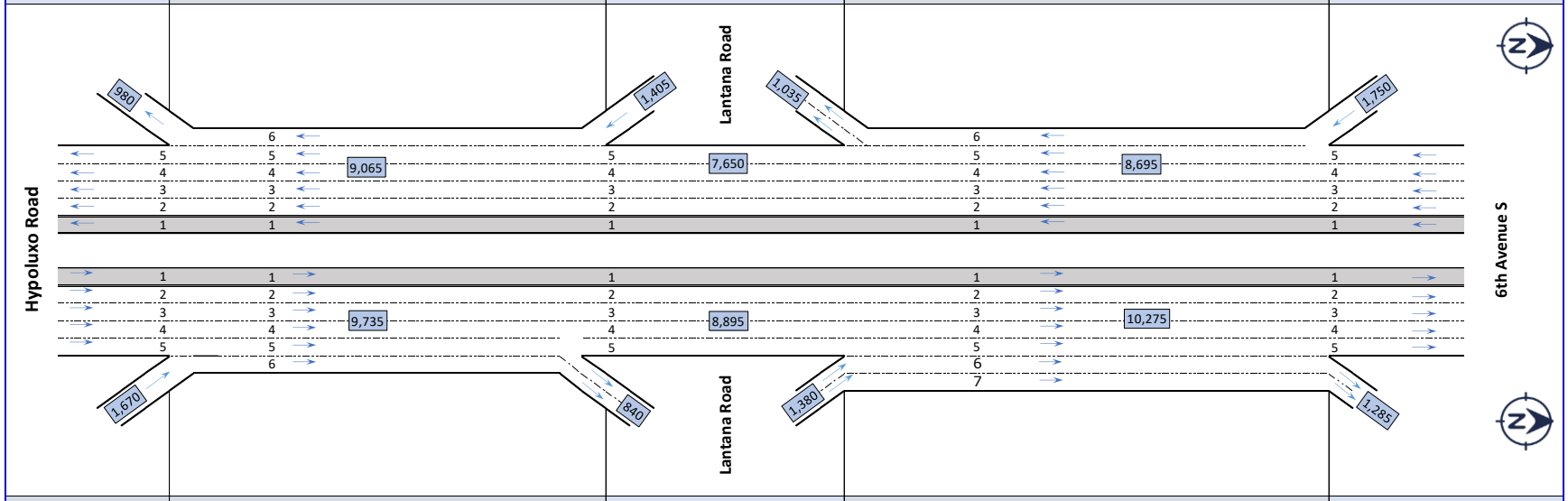
As part of the Build Alternatives analysis, an additional exit lane was added to the northbound and southbound off-ramps to Lantana Road. An evaluation of the proposed configuration was performed using Highway Capacity Software (HCS 7) for the 2025 opening year and 2045 design year during the AM and PM peak periods. The High Occupancy Vehicle (HOV) lane along the I-95 mainline was analyzed as a Continuous Access Managed Lane as per HCM 6 methodologies for managed lanes. **Figure 6-5** through **Figure 6-8** show the density, speed, and level of service for the freeway segments as well as the weaving segments for the AM and PM peak periods respectively.

Based on the analysis results, overall, the proposed additional lanes for the off-ramps improve the volume to capacity ratios along the freeway. During the 2025 opening year, the additional exit lane improves the weaving segment from 6th Avenue S southbound on-ramp to Lantana Road southbound off-ramp from LOS F to LOS D during the AM peak period. The weaving segment from Hypoluxo Road northbound on-ramp to Lantana Road northbound off-ramp also improves from LOS F to LOS E during the AM peak period. During the PM peak period, the weaving segment from 6th Avenue S southbound on-ramp to Lantana Road southbound off-ramp improves from LOS F to LOS D while the weaving segments from Hypoluxo Road northbound on-ramp to Lantana Road northbound off-ramp remains at LOS E; however, the v/c ratio improves from 0.90 to 0.85. The basic freeway segment between the Lantana Road ramps in both directions will maintain the No-Action LOS conditions since no capacity improvements are being proposed along I-95.

During the 2045 design year, most of the weaving segments will operate at a LOS F during both AM and PM peak periods except the northbound weaving segment from Hypoluxo Road to Lantana Road, and the southbound weaving segment from 6th Avenue S to Lantana Road which will operate at LOS E during the AM and PM peak periods, respectively. However, the volume to capacity ratios for the weaving segments are better compared to the No-Action conditions. The basic freeway segment between the Lantana Road ramps in both directions will maintain the No-Action LOS conditions since no capacity improvements are being proposed along I-95. It should be noted that, additional future mainline improvements are planned along I-95 to improve the corridor level of service (FM# 444202-1 and FM# 444202-2).

The details of the freeway analysis results for the build conditions are included in **Appendix P.**

I-95 Southbound				
Length	2,165-ft	3,065-ft	4,375-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	-	25.6 pc/mi/ln	29.6 pc/mi/ln	
Speed	-	65.0 mph	52.4 mph	
V/C Ratio	**1.04**	**0.70**	**0.83**	
LOS	**F**	**C**	**D**	



Length	2,265-ft	3,165-ft	4,445-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	35.1 pc/mi/ln	33.1 pc/mi/ln	-	
Speed	50.7 mph	60.5 mph	-	
V/C Ratio	**0.78**	**0.85**	**1.16**	
LOS	**E**	**D**	**F**	
I-95 Northbound				

Figure 6-5 2025 Build Freeway Analysis – AM Peak

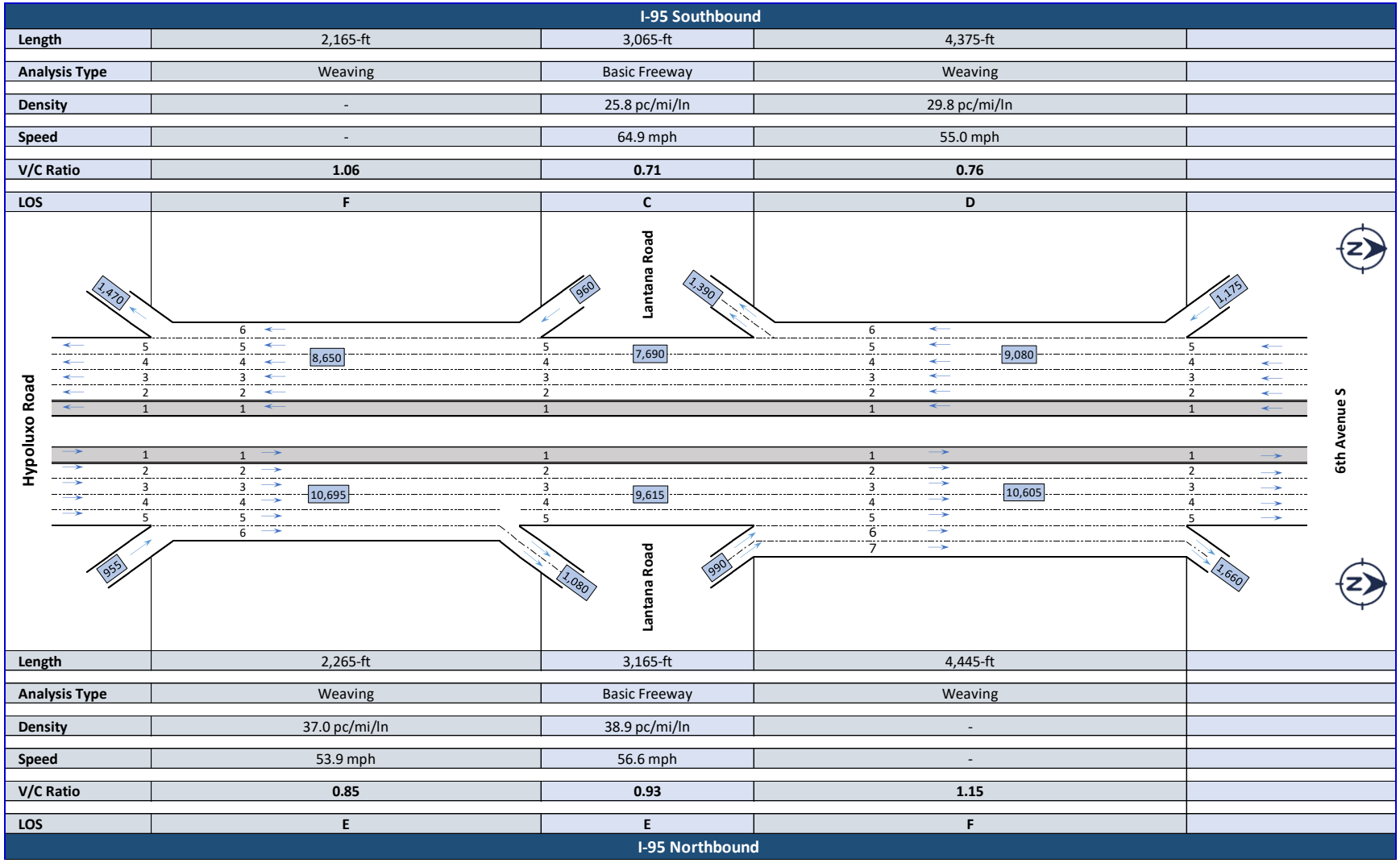


Figure 6-6 2025 Build Freeway Analysis – PM Peak

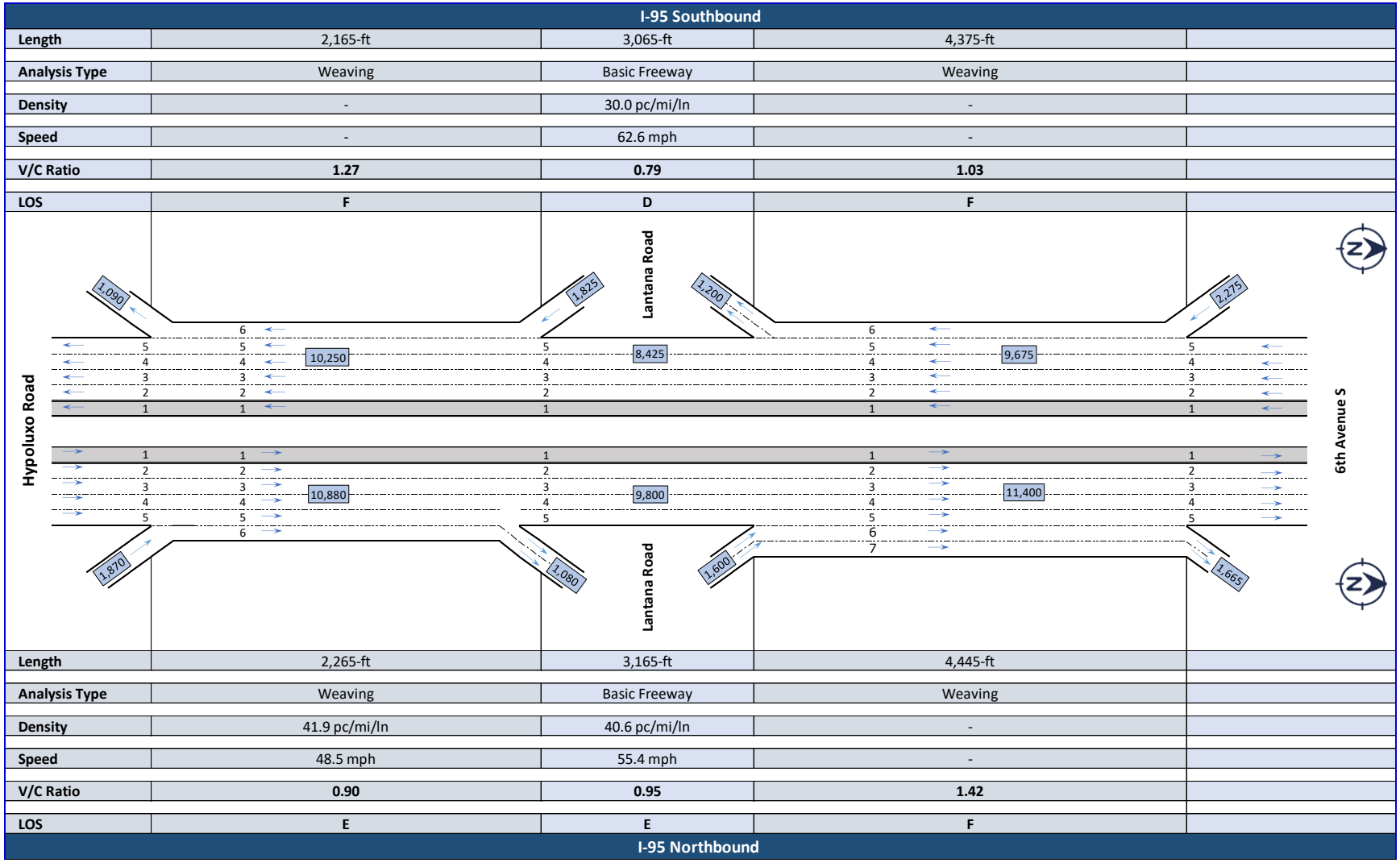
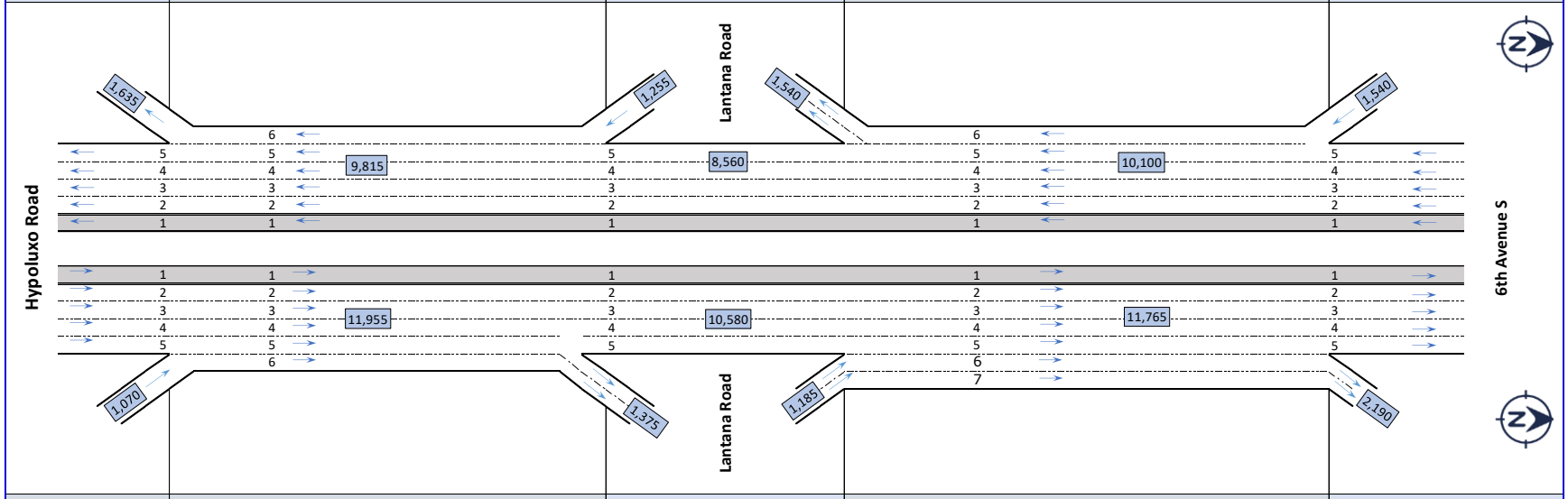


Figure 6-7 2045 Build Freeway Analysis – AM Peak

I-95 Southbound				
Length	2,165-ft	3,065-ft	4,375-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	-	30.8 pc/mi/ln	35.6 pc/mi/ln	
Speed	-	62.0 mph	52.2 mph	
V/C Ratio	**1.26**	**0.81**	**0.92**	
LOS	**F**	**D**	**E**	



Length	2,265-ft	3,165-ft	4,445-ft	
Analysis Type	Weaving	Basic Freeway	Weaving	
Density	43.6 pc/mi/ln	-	-	
Speed	52.0 mph	-	-	
V/C Ratio	**0.97**	**1.04**	**1.47**	
LOS	**F**	**F**	**F**	
I-95 Northbound				

Figure 6-8 2045 Build Freeway Analysis – PM Peak

6.1.2.2 Intersection Operations

6.1.2.2.1 Build Alternative 1

Figure 6-9 shows the intersection configuration for the proposed improvements under Build Alternative 1. **Table 6-10** through **Table 6-13** show the future LOS analysis results for the signalized intersections under Build Alternative 1. The detailed results of the 2025 opening year and 2045 design year Build Alternative 1 future conditions analysis for the signalized intersections within the project limits are provided in **Appendix Q**.

Based on the analysis results, during the AM and PM peak periods, all the study intersections will operate at overall LOS D or better in the 2025 opening year. However, 4 intersection movements and approaches will operate at LOS F during the AM peak period, while 5 intersection movements and approaches will operate at LOS F during the PM peak period. For the 2045 design year, all the study intersections will operate at LOS D or better during both the AM and PM peak periods. However, 7 intersection movements and approaches will operate at LOS F during the AM peak period, while 13 intersection movements and approaches will operate at LOS F during the PM peak period.

Most of the intersection movement and approaches operating at LOS F during the 2025 opening year and 2045 design year occur along the northbound and southbound approaches at the side streets. This may be attributed to the fact that the signals along Lantana Road are coordinated and configured to favor the east-west movements sometimes resulting in significant delays for the minor side streets. Given that the volume of traffic on these minor side streets is relatively small compared to the volume along Lantana Road, the delays do not significantly affect the entire intersection operation.

Build Alternative 1 includes access modifications at Lantana Road at Sunset Road unsignalized intersection which eliminates the eastbound left-turn movement. However, the northbound left-turn movement for this unsignalized intersection is overcapacity due excessive delays from lack of gaps in the east-west traffic stream. As such, the HCS methodology does not provide any delay values for the northbound left-turn movement. This impacts the combined delays for the northbound approach as well as the overall intersection delays. Consequently, the northbound approach delay and overall intersection delay and LOS for the Lantana Road at Sunset Road unsignalized intersection was omitted from the results table.

For both the 2025 opening year and 2045 design year, the I-95 northbound ramp terminal intersection will operate at LOS C during both the AM and PM peak periods while the southbound ramp terminal intersection will operate at LOS C and LOS D during the AM and PM peak periods,

respectively. However, for the 2045 design year, the northbound approach, and movements as well as the southbound approach and movements will operate at LOS E during both the AM and PM peak periods which does not meet the FDOT LOS targets.

Further evaluation of Build Alternative 1 was also performed with the option of providing three left-turn and right-turn lanes at the southbound and northbound off-ramp terminal intersections. The objective of the additional evaluation was to determine if the additional turn lanes will mitigate the deficient LOS at the ramp terminal intersections. The results of the evaluation is provided in **Appendix R**. Based on the analysis and evaluation conducted, the addition of a third left-turn lane to the off-ramps at both the northbound and southbound ramp terminal intersections provide very little improvement to the overall LOS and delays at the ramp terminals. In addition, the northbound and southbound approaches continue to operate at a LOS E which does not meet the FDOT LOS targets even with triple left and right-turn lanes. Furthermore, the additional cost for the triple right and triple left configuration results in a benefit-cost ratio of 0.99. Consequently, it was eliminated from further consideration.

Figure 6-9 Intersection Configuration – Build Alternative 1

Table 6-10 2025 Alternative 1 Intersections Level of Service - AM Peak Period													
No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	13.0	B	27.0	C	62.8	E	104.3	F	26.5	C
			T	20.0	C	15.7	B	71.6	E	57.9	E		
			R	21.3	C	16.5	B	68.9	E	54.8	D		
			App	20.3	C	16.4	B	68.5	E	86.9	F		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	147.5	F	OC	F	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	47.8	E	25.2	D		
			App	-	-	-	-	OC	F	25.2	D		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	19.3	B	-	-	48.0	D	26.9	C
			T	28.1	C	6.1	A	-	-	-	-		
			R	31.0	C	-	-	-	-	46.5	D		
			App	29.2	C	9.8	A	-	-	47.2	D		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	11.2	B	-	-	54.6	D	-	-	26.7	C
			T	5.1	A	43.2	D	-	-	-	-		
			R	-	-	27.1	C	50.3	D	-	-		
			App	7.5	A	38.2	D	52.5	D	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	24.2	C	21.8	C	59.2	E	65.2	E	30.1	C
			T	25.4	C	29.6	C	51.8	D				
			R	7.4	A	30.7	C			62.8	E		
			App	21.7	C	29.7	C	56.6	E	63.5	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	21.3	C	30.1	C	64.0	E	68.2	E	30.2	C
			T	20.1	C	27.9	C	49.0	D				
			R	15.7	B	28.8	C			60.3	E		
			App	19.7	B	28.3	C	61.1	E	63.7	E		

Note: OC = Overcapacity

Table 6-11 2025 Alternative 1 Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	53.4	D	10.2	B	68.4	E	123.9	F	27.4	C
			T	11.6	B	20.0	C	74.2	E	66.8	E		
			R	11.7	B	16.8	B	74.4	E	62.9	E		
			App	16.2	B	18.7	B	72.4	E	96.4	F		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	29.1	D	OC	F	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	22.4	C	113.4	F		
			App	-	-	-	-	OC	F	113.4	F		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	12.7	B	-	-	46.6	D	32.8	C
			T	54.4	D	4.8	A	-	-	-	-		
			R	30.0	C	-	-	-	-	54.5	D		
			App	46.0	D	6.4	A	-	-	51.6	D		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	7.5	A	-	-	54.1	D	-	-	31.6	C
			T	7.3	A	45.0	D	-	-	-	-		
			R	-	-	35.4	D	46.4	D	-	-		
			App	7.4	A	42.0	D	50.8	D	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	32.0	C	20.1	C	74.3	E	75.7	E	32.6	C
			T	21.6	C	29.9	C	70.2	E				
			R	8.8	A	31.0	C			60.9	E		
			App	20.9	C	30.0	C	72.5	E	67.7	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	22.4	C	33.5	C	61.2	E	78.4	E	31.7	C
			T	21.7	C	29.0	C	52.9	D				
			R	17.5	B	30.0	C			66.8	E		
			App	21.1	C	29.4	C	58.7	E	72.7	E		

Note: OC = Overcapacity

Table 6-12 2045 Alternative 1 Intersections Level of Service - AM Peak Period													
No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	24.3	C	71.4	E	56.0	E	116.6	F	40.4	D
			T	37.4	D	23.4	C	64.1	E	52.7	D		
			R	44.2	D	25.3	C	65.4	E	48.8	D		
			App	39.3	D	26.4	C	63.2	E	94.6	F		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	383.8	F	OC	F	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	77.7	F	45.9	E		
			App	-	-	-	-	OC	F	45.9	E		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	20.2	C	-	-	61.6	E	27.6	C
			T	25.9	C	3.2	A	-	-	-	-		
			R	28.0	C	-	-	-	-	60.8	E		
			App	26.7	C	9.2	A	-	-	61.1	E		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	15.5	B	-	-	63.4	E	-	-	27.2	C
			T	3.6	A	37.4	D	-	-	-	-		
			R	-	-	16.9	B	60.4	E	-	-		
			App	8.1	A	31.3	C	61.7	E	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	41.6	D	27.5	C	81.3	F	63.4	E	35.7	D
			T	29.0	C	33.5	C	62.1	E				
			R	9.2	A	35.2	D			62.2	E		
			App	26.3	C	33.8	C	74.0	E	62.6	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	43.7	D	52.8	D	73.3	E	63.7	E	39.4	D
			T	28.7	C	39.6	D	49.3	D				
			R	18.5	B	42.5	D			56.7	E		
			App	29.1	C	40.8	D	68.9	E	59.5	E		

Note: OC = Overcapacity

Table 6-13 2045 Alternative 1 Intersections Level of Service - PM Peak Period													
No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	91.2	F	16.6	B	65.2	E	156.0	F	53.0	D
			T	16.1	B	54.4	D	69.6	E	62.7	E		
			R	16.3	B	73.5	F	68.9	E	49.7	D		
			App	25.2	C	59.4	E	67.9	E	113.5	F		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	43.2	E	OC	F	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	28.5	D	437.0	F		
			App	-	-	-	-	OC	F	437.0	F		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	15.0	B	-	-	51.8	D	35.8	D
			T	57.9	E	7.3	A	-	-	-	-		
			R	25.6	C	-	-	-	-	74.9	E		
			App	46.9	D	9.1	A	-	-	66.5	E		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	9.3	A	-	-	67.7	E	-	-	32.4	C
			T	8.0	A	41.9	D	-	-	-	-		
			R	-	-	13.5	B	55.6	E	-	-		
			App	8.3	A	34.1	C	61.8	E	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	76.7	E	18.5	B	136.4	F	116.8	F	40.8	D
			T	19.4	B	34.3	C	112.1	F				
			R	8.4	A	36.1	D			70.4	E		
			App	23.6	C	34.5	C	125.6	F	90.0	F		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	73.7	E	50.9	D	78.6	E	73.1	E	46.8	D
			T	27.6	C	51.4	D	57.0	E				
			R	19.6	B	58.0	E			58.4	E		
			App	31.0	C	53.7	D	72.9	E	64.8	E		

Note: OC = Overcapacity

6.1.2.2.2 Build Alternative 2

Figure 6-10 shows the intersection configuration for the proposed Diverging Diamond Interchange configuration under Build Alternative 2. This unconventional design allows movements for the left and right-turns to and from the I-95 ramps onto Lantana Road without crossing the path of opposing traffic. The crossover is made at the signal where the opposing traffic flows split the signal green time. The major advantage of this type of interchange is that the left-turning vehicles do not require a signal phase which makes this a two-phased signal system with more green time for the opposing traffic. In addition, the DDI has fewer vehicular conflict points (i.e. 14 for DDI, 26 for TUDI) resulting in significant safety and operational improvement at the interchange.

The pedestrian sidewalks for the DDI utilizes the inside walkway configuration. For this configuration, the sidewalks transition from the outside into the median within the interchange area. This create 8 signalized conflict points for the DDI compared to 6 signalized conflict points for the TUDI Alternative. However, the crossing along the DDI are shorter. In addition, the DDI enables crossing of Lantana Road from the north side to the south side and vice versa.

The following movements are signalized at the DDI Ramp terminal intersections.

SB Ramp Terminal

- SB Right-turn
- SB Left-turn
- EB Through
- WB Through
- EB right-turn

NB Ramp Terminal

- NB Right-turn
- NB Left-turn
- EB Through
- WB Through
- WB right-turn

Table 6-14 through **Table 6-17** show the future LOS analysis results for the signalized intersections under Build Alternative 2. The detailed results of the 2025 opening year and 2045 design year Build Alternative 2 future conditions analysis for the signalized intersections within the project limits are provided in **Appendix Q.**

Based on the analysis results, during the AM and PM peak periods, all the study intersections will operate at overall LOS D or better in the 2025 opening year. However, 4 intersection movements and approaches will operate at LOS F during the AM peak period, while 3 intersection movements and approaches will operate at LOS F during the PM peak period. For the 2045 design year, all the study intersections will operate at LOS D or better during both the AM and PM peak periods. However, 6 intersection movements and approaches will operate at LOS F during the AM peak

period, while 9 intersection movements and approaches will operate at LOS F during the PM peak period.

Similar to Build Alternative 1, most of the intersection movement and approaches operating at LOS F during the 2025 opening year and 2045 design year occur along the northbound and southbound approaches at the side streets. This may be attributed to the fact that the signals along Lantana Road are coordinated and configured to favor the east-west movements, sometimes resulting in delays for the minor side streets. Given that the volume of traffic on these minor side streets is relatively small compared to the volume along Lantana Road, the delays do not significantly affect the entire intersection operation.

Build Alternative 2 includes access modifications at the Sunset Road Intersection which eliminates the northbound left-turn and eastbound left-turn movements and an underpass access road resulting in redistribution of traffic at the Sunset Road and High Ridge Road intersections. As a result, although the some of the movements at Sunset Road indicates LOS F with high delays, the northbound approach under Build Alternative 2 operates better compared to the No-Action Alternative and Build Alternatives 1.

For the 2025 opening year, the I-95 northbound ramps crossover intersection will operate at LOS B and LOS C during the AM and PM peak periods, respectively, while the southbound ramps crossover intersection will operate at LOS C during both the AM and PM peak periods. For the 2045 design year, both the I-95 northbound and southbound ramps crossover intersections will operate at LOS C for both the AM and PM peak periods. In addition, all the signalized movements within the diverging diamond interchange will operate at LOS C or better for both the 2025 opening year and 2045 design year.

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Figure 6-10 Intersection Configuration – Build Alternative 2

Table 6-14 2025 Alternative 2 Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	12.9	B	24.6	C	62.8	E	92.5	F	26.3	C
			T	20.7	C	16.1	B	71.6	E	57.0	E		
			R	22.1	C	16.9	B	69.3	E	54.2	D		
			App	21.0	C	16.6	B	68.6	E	79.1	E		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	152.4	F	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	55.3	F	25.6	D		
			App	-	-	-	-	55.3	F	25.6	D		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	-	-	-	-	19.5	B	21.8	C
			T	21.5	C	22.2	C	-	-	-	-		
			R	-	-	-	-	-	-	15.5	B		
			App	21.5	C	22.2	C	-	-	19.5	B		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	-	-	14.7	B	-	-	18.9	B
			T	19.9	B	17.8	B	-	-	-	-		
			R	-	-	-	-	13.7	B	-	-		
			App	19.9	B	17.8	B	14.7	B	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	23.9	C	20.7	C	59.2	E	65.3	E	26.7	C
			T	16.1	B	29.6	C	51.8	D				
			R	4.8	A	30.7	C			62.8	E		
			App	14.3	B	29.6	C	56.6	E	63.5	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	21.3	C	30.1	C	64.0	E	68.2	E	30.2	C
			T	20.1	C	27.9	C	49.0	D				
			R	15.7	B	28.8	C			60.3	E		
			App	19.7	B	28.3	C	61.1	E	63.7	E		

Table 6-15 2025 Alternative 2 Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	41.6	D	10.8	B	69.5	E	90.0	F	26.2	C
			T	12.9	B	20.1	C	74.2	E	62.8	E		
			R	13.0	B	22.0	C	74.9	E	61.7	E		
			App	15.4	B	20.5	C	72.9	E	77.1	E		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	30.5	D	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	23.6	C	124.4	F		
			App	-	-	-	-	23.6	C	124.4	F		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	-	-	-	-	23.6	C	20.3	C
			T	13.4	B	25.4	C	-	-	-	-		
			R	-	-	-	-	-	-	18.3	B		
			App	13.4	B	25.4	C	-	-	23.6	C		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	-	-	14.0	B	-	-	22.0	C
			T	24.2	C	19.9	B	-	-	-	-		
			R	-	-	-	-	45.7	D	-	-		
			App	24.2	C	19.9	B	14.0	B	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	31.3	C	19.5	B	74.3	E	75.7	E	29.4	C
			T	11.9	B	30.1	C	70.2	E				
			R	5.0	A	31.1	C			60.7	E		
			App	13.2	B	30.1	C	72.5	E	67.7	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	22.4	C	33.5	C	61.2	E	78.4	E	31.7	C
			T	21.7	C	29.0	C	52.9	D				
			R	17.5	B	30.0	C			66.8	E		
			App	21.1	C	29.4	C	58.7	E	72.7	E		

Table 6-16 2045 Alternative 2 Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	21.4	C	58.2	E	55.9	E	115.4	F	38.6	D
			T	34.9	C	22.7	C	63.9	E	52.6	D		
			R	40.9	D	24.5	C	69.1	E	49.6	D		
			App	36.6	D	24.7	C	64.9	E	93.9	F		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	405.8	F	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	117.0	F	49.5	E		
			App	-	-	-	-	117.0	F	49.5	E		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	-	-	-	-	19.4	B	23.0	C
			T	25.7	C	19.3	B	-	-	-	-		
			R	-	-	-	-	-	-	18.6	B		
			App	25.7	C	19.3	B	-	-	19.4	B		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	AM	L	-	-	-	-	18.2	B	-	-	20.5	C
			T	19.0	B	21.9	C	-	-	-	-		
			R	-	-	-	-	12.8	B	-	-		
			App	19.0	B	21.9	C	18.2	B	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	42.9	D	24.3	C	81.3	F	63.4	E	31.8	C
			T	18.5	B	33.6	C	62.1	E				
			R	5.9	A	35.2	D			62.1	E		
			App	17.8	B	33.7	C	74.0	E	62.5	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	43.7	D	52.8	D	73.3	E	63.7	E	39.4	D
			T	28.7	C	39.6	D	49.3	D				
			R	18.5	B	42.5	D			56.7	E		
			App	29.1	C	40.8	D	68.9	E	59.5	E		

Table 6-17 2045 Alternative 2 Intersections Level of Service - PM Peak Period													
No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	77.8	E	15.3	B	65.1	E	139.1	F	44.2	D
			T	15.9	B	41.5	D	69.5	E	61.6	E		
			R	16.1	B	56.8	E	70.8	E	53.8	D		
			App	21.6	C	46.0	D	68.8	E	104.6	F		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	47.2	E	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	32.9	D	476.7	F		
			App	-	-	-	-	32.9	D	476.7	F		
3	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	-	-	-	-	24.2	C	23.2	C
			T	17.3	B	27.1	C	-	-	-	-		
			R	-	-	-	-	-	-	24.9	C		
			App	17.3	B	27.1	C	-	-	24.9	C		
4	Lantana Rd & I-95 SB Off-Ramp and On-Ramp Terminal	PM	L	-	-	-	-	19.4	B	-	-	24.0	C
			T	21.9	C	25.6	C	-	-	-	-		
			R	-	-	-	-	16.8	B	-	-		
			App	21.9	C	25.6	C	19.4	B	-	-		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	79.2	E	17.5	B	121.1	F	116.8	F	37.3	D
			T	9.3	A	35.4	D	102.4	F				
			R	4.1	A	37.4	D			70.2	E		
			App	15.6	B	35.6	D	112.8	F	89.9	F		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	73.5	E	50.9	D	78.6	E	73.1	E	46.7	D
			T	27.6	C	51.4	D	57.0	E				
			R	19.6	B	58.0	E			58.4	E		
			App	31.0	C	53.7	D	72.9	E	64.8	E		

6.1.2.2.3 Build Alternative 3

Figure 6-11 shows the intersection configuration for the proposed improvements for the proposed Single Point Urban Interchange (SPUI) configuration under Build Alternative 3. The single point urban interchange is similar to the Tight Urban Diamond Interchange (TUDI) under Build Alternative 1; however, the two intersections of the Tight Urban Diamond Interchange are combined into one single intersection. This allows the opposing left-turns to proceed simultaneously resulting in improved operation efficiency and safety.

Table 6-18 through **Table 6-21** show the future LOS analysis results for the signalized intersections under Build Alternative 3. The detailed results of the 2025 opening year and 2045 design year Build Alternative 3 future conditions analysis for the signalized intersections within the project limits are provided in **Appendix Q.**

Based on the analysis results, during the AM and PM peak periods, all the study intersections will operate at overall LOS D or better in the 2025 opening year. However, 4 intersection movements and approaches will operate at LOS F during the AM peak period, while 3 intersection movements and approaches will operate at LOS F during the PM peak period. For the 2045 design year, all the study intersections will operate at LOS D or better during both the AM and PM peak periods. However, 6 intersection movements and approaches will operate at LOS F during the AM peak period, while 9 intersection movements and approaches will operate at LOS F during the PM peak period.

Similar to Build Alternatives 1 and 2, most of the intersection movement and approaches operating at LOS F during the 2025 opening year and 2045 design year occur along the northbound and southbound approaches at the side streets. This may be attributed to the fact that the signals along Lantana Road are coordinated and configured to favor the east-west movements, sometimes resulting in delays for the minor side streets. Given that the volume of traffic on these minor side streets is relatively small compared to the volume along Lantana Road, the delays do not significantly affect the entire intersection operation.

Build Alternative 3 also includes access modifications at the Sunset Road Intersection which eliminates the northbound left-turn and eastbound left-turn movements and an underpass access road resulting in redistribution of traffic at the Sunset Road and High Ridge Road intersections. As a result, although the some of the movements at the Sunset Road indicate LOS F with high delays, the northbound approach under Build Alternative 3 operates better compared to the No-Action Alternative and Build Alternatives 1.

For both the 2025 opening year and 2045 design year, the combined I-95 northbound and southbound ramp terminal intersection will operate at LOS C during both the AM and PM peak periods. However, the northbound and southbound left-turn movements as well as the eastbound left-turn movement will operate at LOS E during the PM peak period. Build Alternative 3 provides significant operational improvements compares to Build Alternative. However, its operational performance is less than that of Build Alternative 2.

Figure 6-11 Intersection Configuration – Build Alternative 3

Table 6-18 2025 Alternative 3 Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	12.9	B	24.6	C	62.8	E	92.5	F	26.3	C
			T	20.7	C	16.1	B	71.6	E	57.0	E		
			R	22.1	C	16.9	B	69.3	E	54.2	D		
			App	21.0	C	16.6	B	68.6	E	79.1	E		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	152.4	F	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	55.3	F	25.6	D		
			App	-	-	-	-	55.3	F	25.6	D		
3	Lantana Rd & I-95 NB and SB Off-Ramp and On-Ramp Terminal	AM	L	25.1	C	23.9	C	50.9	D	52.5	D	24.6	C
			T	25.2	C	30.9	C	-	-	-	-		
			R	9.0	A	14.3	B	17.8	B	12.5	B		
			App	19.2	B	23.9	C	34.7	C	31.0	C		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	24.1	C	21.8	C	59.2	E	65.2	E	30.1	C
			T	25.4	C	29.6	C	51.8	D				
			R	7.4	A	30.7	C			62.8	E		
			App	21.7	C	29.7	C	56.6	E	63.5	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	21.3	C	30.1	C	64	E	68.2	E	30.2	C
			T	20.1	C	27.9	C	49.0	D				
			R	15.7	B	28.8	C			60.3	E		
			App	19.7	B	28.3	C	61.1	E	63.7	E		

Table 6-19 2025 Alternative 3 Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	41.6	D	10.8	B	69.5	E	90.0	F	26.2	C
			T	12.9	B	20.1	C	74.2	E	62.8	E		
			R	13.0	B	22.0	C	74.9	E	61.7	E		
			App	15.4	B	20.5	C	72.9	E	77.1	E		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	30.5	D	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	23.6	C	124.4	F		
			App	-	-	-	-	23.6	C	124.4	F		
3	Lantana Rd & I-95 NB and SB Off-Ramp and On-Ramp Terminal	PM	L	58.8	E	24.7	C	63.4	E	56.9	E	30.4	C
			T	33.0	C	11.1	B	-	-	-	-		
			R	7.9	A	0.6	A	22.3	C	34.4	C		
			App	31.0	C	10.7	B	45.9	D	42.7	D		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	31.8	C	20.1	C	74.3	E	75.7	E	32.6	C
			T	21.6	C	29.9	C	70.2	E				
			R	8.8	A	31.0	C			60.9	E		
			App	20.9	C	30.0	C	72.5	E	67.7	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	22.4	C	33.5	C	61.2	E	78.4	E	31.7	C
			T	21.7	C	29	C	52.9	D				
			R	17.5	B	30	C			66.8	E		
			App	21.1	C	29.4	C	58.7	E	72.7	E		

Table 6-20 2045 Alternative 3 Intersections Level of Service - AM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	AM	L	21.4	C	58.2	E	55.9	E	115.4	F	38.6	D
			T	34.9	C	22.7	C	63.9	E	52.6	D		
			R	40.9	D	24.5	C	69.1	E	49.6	D		
			App	36.6	D	24.7	C	64.9	E	93.9	F		
2	Lantana Rd & Sunset Rd.	AM	L	-	-	405.8	F	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	117.0	F	49.5	E		
			App	-	-	-	-	117.0	F	49.5	E		
3	Lantana Rd & I-95 NB and SB Off-Ramp and On-Ramp Terminal	AM	L	31.5	C	28.4	C	50.9	D	52.2	D	25.5	C
			T	26.5	C	31.6	C	-	-	-	-		
			R	6.1	A	17.2	B	18.0	B	13.0	B		
			App	20.6	C	26.3	C	32.9	C	30.1	C		
5	Lantana Rd & Lantana Shopping Centre Dr.	AM	L	41.5	D	27.5	C	81.3	F	63.4	E	35.6	D
			T	28.9	C	33.5	C	62.1	E				
			R	9.2	A	35.2	D			62.2	E		
			App	26.3	C	33.8	C	74.0	E	62.6	E		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	AM	L	43.7	D	52.8	D	73.3	E	63.7	E	39.4	D
			T	28.7	C	39.6	D	49.3	D				
			R	18.5	B	42.5	D			56.7	E		
			App	29.1	C	40.8	D	68.9	E	59.5	E		

Table 6-21 2045 Alternative 3 Intersections Level of Service - PM Peak Period

No	Intersection	Time	Move-ment	Approach Delay (s/veh)/LOS								Intersection Control Delay (s/veh)/ LOS	
				EB		WB		NB		SB			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Lantana Rd. & High Ridge Rd.	PM	L	77.8	E	15.3	B	65.1	E	139.1	F	44.2	D
			T	15.9	B	41.5	D	69.5	E	61.6	E		
			R	16.1	B	56.8	E	70.8	E	53.8	D		
			App	21.6	C	46.0	D	68.8	E	104.6	F		
2	Lantana Rd & Sunset Rd.	PM	L	-	-	47.2	E	-	-	-	-	-	-
			T	-	-	-	-	-	-	-	-		
			R	-	-	-	-	32.9	D	476.7	F		
			App	-	-	-	-	32.9	D	476.7	F		
3	Lantana Rd & I-95 NB and SB Off-Ramp and On-Ramp Terminal	PM	L	64.9	E	30.8	C	64.3	E	55.1	E	32.3	C
			T	43.5	D	17.5	B	-	-	-	-		
			R	13.4	B	4.8	A	20.4	C	32.3	C		
			App	38.5	D	17.1	B	42.9	D	40.6	D		
5	Lantana Rd & Lantana Shopping Centre Dr.	PM	L	77.2	E	18.5	B	136.4	F	116.8	F	40.8	D
			T	19.4	B	34.3	C	112.1	F				
			R	8.4	A	36.1	D			70.4	E		
			App	23.7	C	34.5	C	125.6	F	90.0	F		
6	Lantana Rd & Andrew Redding Rd./ N 13th St.	PM	L	73.7	E	50.9	D	78.6	E	73.1	E	46.8	D
			T	27.6	C	51.4	D	57.0	E				
			R	19.6	B	58	E			58.4	E		
			App	31.0	C	53.7	D	72.9	E	64.8	E		

6.1.2.3 Arterial Operations

Arterial operational analysis was performed for the three Build Alternatives under evaluation for comparison to the No-Action Alternative. The three Build Alternatives have different configurations particularly between the interchange ramp terminals due to the different interchange configurations. In addition, the signal timings and coordination, which is different for all the alternatives also accounts for differences in the delays and travel speed. As such, the comparison of the arterial travel speed among the alternatives was based on the entire Lantana roadway segment within the project limits.

6.1.2.3.1 Build Alternative 1

Table 6-22 to Table 6-25 show the 2025 opening year and 2045 design year Build Alternative 1 LOS along the study arterials. The results indicate that for the 2025 opening year, the Lantana Road corridor will operate at an overall LOS E in both the eastbound and westbound directions with an average speed of 15.5 mph in the eastbound and 13.4 mph in the westbound directions during the AM peak period. Similarly, during the PM peak period, Lantana Road will operate at LOS E in both the eastbound and westbound directions with an average speed of 15.5 mph and 13.3 mph in the eastbound and westbound directions, respectively.

For the 2045 design year, the Lantana Road corridor will operate at an overall LOS E in the eastbound direction and LOS F in the westbound direction with an average speed of 13.3 mph and 12.6 mph, respectively, during the AM peak period. During the PM peak period, Lantana Road will operate at LOS E in the eastbound direction with an average speed of 14.1 mph and LOS F in the westbound direction with an average speed of 10.4 mph. Compared to the No-Action Alternative, Build Alternative 1 provides a 35% and 43% reduction in the overall travel time in the eastbound and westbound directions, respectively, in the AM peak period. During the PM peak period, Build Alternative 1 provides a 29% and 54% reduction in the overall travel time in the eastbound and westbound directions, respectively.

Table 6-22 2025 Build Alternative 1 Arterial Level of Service - AM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	50.6	13.9	E	32.8	27.1	C
I-95 SB On-Ramp/I-95 SB Off-Ramp	55.4	16.0	E	15.4	18.6	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	14.5	19.7	D	56.9	6.8	F
Shopping Centre Dr	25.3	15.3	E	53.5	9.5	F
Andrew Redding Road / N 13th St.	33.0	15.4	E	56.7	14.4	E
Total	**178.8**	**15.5**	**E**	**215.3**	**13.4**	**E**

Table 6-23 2025 Build Alternative 1 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	35.6	19.8	D	47.8	18.6	D
I-95 SB On-Ramp/I-95 SB Off-Ramp	81.7	10.9	F	14.2	20.2	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	16.8	17.0	D	58.6	6.6	F
Shopping Centre Dr	21.4	18.1	D	35.3	14.4	E
Andrew Redding Road / N 13th St.	23.1	22.0	D	60.4	13.5	E
Total	**178.6**	**15.5**	**E**	**216.3**	**13.3**	**E**

Table 6-24 2045 Build Alternative 1 Arterial Level of Service - AM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	71.7	9.8	F	36.6	24.3	C
I-95 SB On-Ramp/I-95 SB Off-Ramp	53.3	16.7	E	12.4	23.1	C
I-95 NB On-Ramp/I-95 NB Off-Ramp	12.9	22.2	C	50.8	7.6	F
Shopping Centre Dr	37.7	10.3	F	59.9	8.5	F
Andrew Redding Road / N 13th St.	33.6	15.1	E	69.6	11.7	F
Total	**209.2**	**13.3**	**E**	**229.3**	**12.6**	**F**

Table 6-25 2045 Build Alternative 1 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	39.2	18.0	D	90.1	9.9	F
I-95 SB On-Ramp/I-95 SB Off-Ramp	85.2	10.4	F	16.7	17.1	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	17.4	16.5	E	55.0	7.0	F
Shopping Centre Dr	30.8	12.6	F	32.8	15.5	E
Andrew Redding Road / N 13th St.	23.6	21.5	D	81.4	10.0	F
Total	**196.2**	**14.1**	**E**	**276.0**	**10.4**	**F**

6.1.2.3.2 Build Alternative 2

Table 6-26 to **Table 6-29** show the 2025 opening year and 2045 design year Build Alternative 2 LOS along the study arterials. The results indicate that for the 2025 opening year, the Lantana Road corridor will operate at an overall LOS D in the eastbound direction and LOS E in the westbound directions with average speeds of 17.7 mph and 15.5 mph, respectively, during the AM peak period. During the PM peak period, the Lantana Road corridor will operate at an overall LOS D in both the eastbound direction and LOS E in the westbound directions with average speeds of 18.6 mph and 14.0 mph, respectively.

For the 2045 design year, the Lantana Road corridor will operate at an overall LOS E in both the eastbound and westbound directions with average speeds of 15.8 mph and 14.2 mph, respectively, during the AM peak period. During the PM peak period, Lantana Road will operate at LOS E in both the eastbound and westbound directions with average speeds of 16.9 mph and 13.1 mph, respectively. Compared to the No-Action alternative, Build Alternative 2 provides a 41% and 50% reduction in the overall travel time in the eastbound and westbound directions respectively during the AM peak period. During the PM peak period, Build Alternative 2 provides a 36% and 62% reduction in the overall travel time in the eastbound and westbound directions, respectively.

Table 6-26 2025 Build Alternative 2 Arterial Level of Service - AM Peak Period

Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	46.0	15.7	E	32.9	21.9	D
I-95 SB On-Ramp/I-95 SB Off-Ramp	44.0	20.5	D	44.7	20.1	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	27.1	10.6	**F**	25.0	11.5	**F**
Shopping Centre Dr	28.6	13.8	E	32.6	12.1	**F**
Andrew Redding Road / N 13th St.	18.2	27.7	C	43.4	11.6	**F**
Total	**163.9**	**17.7**	**D**	**178.6**	**15.5**	**E**

Table 6-27 2025 Build Alternative 2 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	32.0	22.5	C	39.2	18.4	D
I-95 SB On-Ramp/I-95 SB Off-Ramp	35.9	25.1	C	47.9	18.8	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	31.4	9.2	F	27.1	10.6	F
Shopping Centre Dr	23.1	17.1	D	35.0	11.3	F
Andrew Redding Road / N 13th St.	26.3	19.2	D	47.0	10.7	F
Total	**148.7**	**18.6**	**D**	**196.2**	**14.0**	**E**

Table 6-28 2045 Build Alternative 2 Arterial Level of Service - AM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	65.9	10.9	F	36.5	19.7	D
I-95 SB On-Ramp/I-95 SB Off-Ramp	48.2	18.7	D	41.8	21.5	D
I-95 NB On-Ramp/I-95 NB Off-Ramp	26.2	11.0	F	29.1	9.9	F
Shopping Centre Dr	29.9	13.2	E	37.0	10.7	F
Andrew Redding Road / N 13th St.	20.1	25.1	C	56.2	9.0	F
Total	**190.3**	**15.8**	**E**	**200.6**	**14.2**	**E**

Table 6-29 2045 Build Alternative 2 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	33.9	21.2	D	57.6	12.5	F
I-95 SB On-Ramp/I-95 SB Off-Ramp	44.9	20.0	D	55.2	16.3	E
I-95 NB On-Ramp/I-95 NB Off-Ramp	30.3	9.5	F	27.3	10.5	F
Shopping Centre Dr	47.9	8.3	F	21.4	18.5	D
Andrew Redding Road / N 13th St.	20.0	25.2	C	68.1	7.4	F
Total	**177.0**	**16.9**	**E**	**229.6**	**13.1**	**E**

6.1.2.3.3 Build Alternative 3

Table 6-30 to **Table 6-33** show the 2025 opening year and 2045 design year Build Alternative 3 LOS along the study arterials. The results indicate that for the 2025 opening year, the Lantana Road corridor will operate at an overall LOS E in the eastbound and westbound directions with an average speed of 16.7 mph and 15.6 mph, respectively, during the AM peak period. During the PM peak period, Lantana Road will operate at LOS E in both the eastbound and westbound directions with an average speed of 16.3 mph and 16.1 mph, respectively.

For the 2045 design year, the Lantana Road corridor will operate at an overall LOS E in both the eastbound and westbound directions with an average speed of 14.8 mph and 14.2 mph, respectively, during the AM peak period. During the PM peak period, Lantana Road will operate at LOS E in the eastbound direction with an average speed of 15.8 mph and LOS F in the westbound direction with an average speed of 13.0 mph. Compared to the No-Action Alternative, Build Alternative 3 provides a 42% and 50% reduction in the overall travel time in the eastbound and westbound directions, respectively, in the AM peak period. During the PM peak period, Build Alternative 3 provides a 37% and 63% reduction in the overall travel time in the eastbound and westbound directions, respectively.

Table 6-30 2025 Build Alternative 3 Arterial Level of Service - AM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	50.9	13.8	E	39.6	25.9	C
I-95 SB On-Ramp/I-95 SB Off-Ramp	54.6	18.8	D	48.1	11.1	F
Shopping Centre Dr	37.4	14.3	E	40.4	12.6	F
Andrew Redding Road / N 13th St.	22.8	22.2	C	56.7	14.4	E
Total	**165.7**	**16.7**	**E**	**184.8**	**15.6**	**E**

Table 6-31 2025 Build Alternative 3 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	37.0	19.0	D	46.5	22.1	C
I-95 SB On-Ramp/I-95 SB Off-Ramp	63.0	16.3	E	28.9	18.5	D
Shopping Centre Dr	37.5	14.3	E	43.5	11.7	F
Andrew Redding Road / N 13th St.	32.8	15.5	E	60.4	13.5	E
Total	**170.3**	**16.3**	**E**	**179.3**	**16.1**	**E**

Table 6-32 2045 Build Alternative 3 Arterial Level of Service - AM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	66.5	10.6	F	39.4	26.1	C
I-95 SB On-Ramp/I-95 SB Off-Ramp	55.7	18.4	D	48.9	11.0	F
Shopping Centre Dr	40.1	13.4	E	45.5	11.1	F
Andrew Redding Road / N 13th St.	25.7	19.7	D	69.6	11.7	F
Total	**188.0**	**14.8**	**E**	**203.4**	**14.2**	**E**

Table 6-33 2045 Build Alternative 3 Arterial Level of Service - PM Peak Period						
Cross Street	Eastbound			Westbound		
	Travel Time (s)	Speed (mph)	LOS	Travel Time (s)	Speed (mph)	LOS
High Ridge Road	38.6	18.2	D	71.7	14.3	E
I-95 SB On-Ramp/I-95 SB Off-Ramp	73.4	14.0	E	35.2	15.2	E
Shopping Centre Dr	32.6	16.4	E	32.8	15.5	E
Andrew Redding Road / N 13th St.	30.8	16.5	E	81.4	10.0	F
Total	**175.4**	**15.8**	**E**	**221.1**	**13.0**	**E**

6.1.2.4 Intersection Queue Lengths

A queuing analysis for Build Alternatives 1, 2 and 3 was performed for the 2045 design year for comparison among the Build Alternatives using Synchro 10. The 95th percentile vehicular queue length in feet for the left-turn and right-turn movements at each of the study intersections were obtained. As part of the alternatives development process, additional storage improvements for were evaluated for the Build Alternatives were feasible while taking into consideration various constraints such as location of preceding left turn storage, location of adjacent intersection, driveways, utilities and right of way. The queue analysis results for the 2045 Build Alternatives are shown in **Table 6-34** through **Table 6-36.**

For Build Alternative 1, 6 out of the 23 (26%) locations with turn storages have deficient storage lengths. For the I-95 NB and SB off-ramp terminals, analysis results show a reduction of up to 47% and 59% reduction in maximum queue lengths at the I-95 SB and NB ramp terminals respectively compared to the No-Action Alternative. However, these results are based on deterministic analysis that only show the maximum queues after two cycles. Further analysis using the SIMTRAFFIC microsimulation tool indicated that the queues for the SB ramp terminal intersection may be longer due to residual queues remaining after each cycle which may extend beyond the gore point during the AM peak period.

For Build Alternative 2, 5 out of the 21 (24%) locations with turn storages have deficient storage lengths. For the I-95 NB and SB off-ramp terminals, the queue lengths can be adequately accommodated along the ramps without any spillback onto the I-95 mainline. Build Alternative 2 also results in up to 74% and 88% reduction in maximum queue lengths at the I-95 SB and NB ramp terminals respectively compared to the No-Action Alternative.

For Build Alternative 3, 6 out of the 23 locations (26%) locations with turn storages have deficient storage lengths. For the I-95 NB and SB off-ramp terminals, the queue lengths can be adequately accommodated along the ramps without any spillback onto the I-95 mainline. Build Alternative 3 also results in up to 66% and 62% reduction in queue length at the I-95 SB and NB ramp terminals, respectively, compared to the No-Action Alternative.

The detailed queue analysis results for the Build Alternatives are provided in **Appendix S.**

Table 6-34 2045 Build Alternative 1 Queue Length Analysis

No.	Intersection	Approach		AM	PM	Max Queue Length (ft)	Storage (ft)	Storage Deficiency	% Over Storage
1	High Ridge Road	EB	L	98	291	291	350	No	-
		WB	L	m#147	m43	147	200	No	-
		NB	L	88	112	112	200	No	-
			R	119	34	119	150	No	-
		SB	L	#520	#612	612	500	Yes	22%
			R	50	128	128	150	No	-
3	I-95 SB Off-Ramp	EB	R	m248	m256	256	500	No	-
		WB	L	m304	m124	304	450	No	-
		SB	L	335	347	347	1200	No	-
			R	291	#534	534	1200	No	-
4	I-95 NB Off-Ramp	EB	L	507	m134	507	565	No	-
		WB	R	m289	m167	289	300	No	-
		NB	L	315	#488	488	1150	No	-
			R	257	303	303	1150	No	-
5	Shopping Center Drive	EB	L	m127	#325	325	300	Yes	8%
			R	150	38	150	250	No	-
		WB	L	m88	m11	88	200	No	-
		NB	L	#470	#398	470	200	Yes	135%
		SB	R	135	278	278	120	Yes	132%
6	Andrew Redding Road	EB	L	#273	m#305	305	340	No	-
		WB	L	34	35	35	180	No	-
		NB	L	#449	#427	449	150	Yes	199%
		SB	R	168	218	218	200	Yes	9%

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.

Table 6-35 2045 Build Alternative 2 Queue Length Analysis

No.	Intersection	Approach		AM	PM	Max Queue Length (ft)	Storage (ft)	Storage Deficiency	% Over Storage
1	High Ridge Road	EB	L	63	211	211	350	No	-
		WB	L	#133	m35	133	200	No	-
		NB	L	88	112	112	200	No	-
			R	121	35	121	150	No	-
		SB	L	#520	#601	601	500	Yes	20%
			R	51	131	131	150	No	-
3	I-95 SB Off-Ramp	EB	R	m213	m128	213	400	No	-
		SB	L	112	84	112	1200	No	-
			R	104	264	264	1200	No	-
4	I-95 NB Off-Ramp	WB	R	m116	m113	116	350	No	-
		NB	L	80	185	185	1100	No	-
			R	97	140	140	1200	No	-
5	Shopping Center Drive	EB	L	135	#340	340	250	Yes	36%
			R	115	98	115	130	No	-
		WB	L	m77	m13	77	200	No	-
		NB	L	89	#387	387	200	Yes	94%
		SB	R	135	278	278	120	Yes	132%
6	Andrew Redding Road	EB	L	#273	m#299	299	340	No	-
		WB	L	34	35	35	180	No	-
		NB	L	#449	#427	449	150	Yes	199%
		SB	R	168	133	168	200	No	-

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.

Table 6-36 2045 Build Alternative 3 Queue Length Analysis

No.	Intersection	Approach		AM	PM	Max Queue Length (ft)	Storage (ft)	Storage Deficiency	% Over Storage
1	High Ridge Road	EB	L	63	211	211	350	No	-
		WB	L	m#111	m40	111	200	No	-
		NB	L	88	112	112	200	No	-
			R	121	35	121	150	No	-
		SB	L	#520	#601	601	500	Yes	20%
			R	51	131	131	150	No	-
3	I-95 SB and NB Off-Ramps	EB	L	m443	m313	443	320	Yes	-
			R	m83	m200	200	500	No	-
		SB	L	317	343	343	1200	No	-
			R	143	332	332	1200	No	-
		NB	L	294	448	448	1150	No	-
			R	150	171	171	1150	No	-
		WB	L	m349	m282	282	300	No	-
			R	m311	m163	311	320	No	-
5	Shopping Center Drive	EB	L	m159	#336	336	250	Yes	34%
			R	60	71	71	250	No	-
		WB	L	m80	m11	80	200	No	-
		NB	L	#470	#398	470	200	Yes	135%
		SB	R	135	278	278	120	Yes	132%
6	Andrew Redding Road	EB	L	#272	m#306	306	340	No	-
		WB	L	34	35	35	180	No	-
		NB	L	#449	#427	449	150	Yes	199%
		SB	R	168	218	218	200	Yes	9%

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.
m - Volume for 95th percentile queue is metered by upstream signal.

6.1.3 Comparison of Build Alternatives

Table 6-37 and **Table 6-38** show a comparison of the operational analysis results between the No-Action Alternative and the three Build Alternatives for the 2045 design year during the AM and PM peak periods. The results indicate that during both the AM and PM peak periods, the SR 9/I-95 ramp terminals will operate at LOS F under the No-Action Alternative with queues in excess of 1,000 ft. However, these conditions improve under all three Build Alternatives to provide acceptable level of service for the ramp terminal intersections.

The SR 9/I-95 ramp terminals will operate at LOS C or D during the AM and PM peak periods in Build Alternative 1. However, the northbound approach and movements as well as the southbound approach and movements will operate at LOS E during both the AM and PM peak periods which does not meet the FDOT LOS targets. For Build Alternative 2 and Build Alternative 3, the SR 9/I-95 SB ramp terminal will operate at LOS C during both the AM and PM peak periods. It is anticipated that the Build Alternatives will provide 78% to 81% and 58% to 73% reduction in delays for the I-95 SB ramp terminal during the AM and PM peak periods, respectively, compared to the No-Action Alternative. At the I-95 NB ramp terminal, the Build Alternatives will provide 74% to 80% and 69% to 77% reduction in delays during the AM and PM peak periods, respectively, compared to the No-Action Alternative. Alternative 2 provides the best operations at the ramp terminals compared to the other Alternatives due to the DDI configuration which reduces the number of signal phases.

A comparison of the queue lengths at the ramp terminal approaches indicate that all the Build Alternatives provide significant reduction in queues compared to the No-Action Alternative. It is anticipated that the Build Alternatives will result in a 47% to 74% reduction in queue length at the I-95 SB off-ramp and 59% to 88% reduction in queue length at the I-95 NB off-ramp. However, for Build Alternative 1, the queue lengths may be longer as indicated in the table below due to residual queues remaining after each cycle which may extend beyond the gore point. Further analysis using the SIMTRAFFIC microsimulation tool indicated that the queues for the SB ramp terminal intersection may be longer due to residual queues remaining after each cycle which may extend beyond the gore point during the AM peak period.

Table 6-37 Comparison of Alternatives – SR 9/I-95 Ramps					
Performance Criteria		**No-Action Alternative**	**Build Alternative 1 - TUDI**	**Build Alternative 2 – DDI**	**Build Alternative 3 - SPUI**
I-95 SB Ramp Terminal	**LOS (AM/PM)**	F/F	C/D	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 123.4 PM: 84.8	AM: 27.6 PM: 35.8	AM: 23.0 PM: 23.2	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 78% PM: 58%	AM: 81% PM: 73%	AM: 79% PM: 62%
	Maximum Queue Length (ft)	#1,015	#534	264	343
	Storage Deficiency	Yes (9%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-47%	-74%	-66%
I-95 NB Ramp Terminal	**LOS (AM/PM)**	F/F	C/C	C/C	C/C
	Maximum Intersection Overall Delay (s)	AM: 104.4 PM: 104.1	AM: 27.2 PM: 32.4	AM: 20.5 PM: 24.0	AM: 25.5 PM: 32.3
	Delay Reduction over No-Action Alternative	-	AM: 74% PM: 69%	AM: 80% PM: 77%	AM: 76% PM: 69%
	Maximum Queue Length (ft)	#1,191	#488	140	448
	Storage Deficiency	Yes (27%)	No	No	No
	Queue Length Reduction over No-Action Alternative	-	-59%	-88%	-62%

- 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after two cycles.

A comparison of the six intersections within the study area shows LOS improvements at all six intersections under the three Build Alternatives. The intersection of Lantana Road and High Ridge Road will improve from LOS E conditions under the No-Action Alternative to LOS D under the Build Alternatives during both the AM and PM peak periods. Similarly, LOS F conditions under the No-Action Alternative at the SR 9/I-95 ramp terminals will improve under the Build Alternatives to LOS D or better during both the AM and PM peak periods. At the Shopping Center Drive and Andrew Redding Road intersection, LOS D and F conditions under the No-Action Alternative will improve to LOS D conditions under the Build Alternatives during the AM and PM peak periods.

Overall, Build Alternative 2 provides the best results from a traffic operations perspective.

Table 6-38 Comparison of Alternatives – 2045 Future Intersection Analysis

#	Intersection	No-Action Alternative				Build Alternative 1				Build Alternative 2				Build Alternative 3			
		AM		PM		AM		PM		AM		PM		AM		PM	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
1	Lantana Rd and High Ridge Rd	62.7	E	75.9	E	40.4	D	53.0	D	36.8	D	44.2	D	36.8	D	44.2	D
2	Lantana Rd & Sunset Rd[1]	OC[2]	F	OC[2]	F	OC[2]	F	OC[2]	F	117.0	F	32.9	D	117.0	F	32.9	D
3	Lantana Rd & I-95 SB Ramps	123.4	F	84.8	F	27.6	C	35.8	D	23.0	C	23.2	C	25.5	C	32.3	C
4	Lantana Rd & I-95 NB Ramps	104.4	F	104.1	F	27.2	C	32.4	C	20.5	C	24.0	C				
5	Lantana Rd & Shopping Centre Dr.	38.8	D	98.7	F	35.7	D	40.8	D	31.8	C	37.3	D	35.6	D	40.8	D
6	Lantana Rd & Andrew Redding Rd	54.0	D	80.9	F	39.4	D	46.8	D	39.4	D	46.7	D	39.4	D	46.8	D

Notes:
1: Delays and LOS based on northbound approach at Lantana Road and Sunset Road intersection
2: OC = Overcapacity, HCM methodology does not provide delays

6.2 QUANTITATIVE SAFETY ANALYSIS

A future crash prediction analysis was conducted for the SR 9/I-95 ramp terminals at Lantana Road, interchange ramp segments and the section of SR 9/I-95 and Lantana Road within the interchange influence area under the various project alternatives. The HSM Enhanced Interchange Safety Analysis Tool (ISATe) used for the safety analysis does not predict more than 23 years beyond the first year of the existing crash data (2014). Hence the 10-year period from the opening year (2025-2034) was used. The crash prediction analysis follows the methodology outlined in the Highway Safety Manual (HSM).

Expected crashes were predicted for the No-Action Alternative during the 10-year crash analysis period from the 2025 opening year to 2034 using the HSM Enhanced Interchange Safety Analysis Tool (ISATe). The expected crashes along the arterials for 2025 opening year and 2045 design year were also estimated for the No-Action Alternative using the HSM predictive spreadsheets for urban arterials. Both crash prediction spreadsheets implement the Empirical Bayesian Analysis methodology which combines the predicted crashes from the safety performance functions with the historical crash data to obtain the expected crashes.

For the arterial predictive analysis, since the spreadsheet does not include crash analysis over a period, a straight-line interpolation between the expected crashes for 2025 and 2045 was used to estimate the expected crashes for the 10-year period from 2025 to 2034. Based on the analysis, the estimated average crashes on the arterials was 31.0 crashes per year and 113.2 crashes per year within the interchange during the 10-year analysis period.

To obtain the expected crashes for the various Build Alternatives, Crash Modification Factors (CMF) obtained from the Federal Highway Administration (FHWA) CMF Clearinghouse was applied to the expected crashes for the No-Action Alternative. For Build Alternative 1, a CMF of 0.85 (15% crash reduction) for roadway capacity improvements from 4 lanes to 6 lanes (CMF ID: 7924) was utilized. For Build Alternative 2, a CMF of 0.592 (40.8% crash reduction) for converting a tight urban diamond interchange to a diverging diamond interchange (CMF ID: 9104) was utilized. In addition, a CMF of 0.85 (15% crash reduction) for roadway capacity improvements from 4 lanes to 6 lanes (CMF ID: 7924) was utilized for the Lantana Road widening. The crash reduction from these two improvements were then combined to obtain a composite CRF of 35.6%.

There is no CMF for Single Point Urban Interchanges (SPUI) available from the FHWA CMF Clearinghouse. A search through existing literature on SPUIs suggests that there is no significant difference in crash reduction between the Tight Urban Diamond interchange (TUDI) and SPUI configurations. However, the SPUIs were found to be safer than the comparable TUDIs for

injury/fatality crashes (Bared et al, 2005). Using a conservative approach, the same CMF for Build Alternative 1 was applied to Build Alternative 3.

All three Build Alternatives include providing additional lanes for the northbound and southbound off-ramps as well as access modifications to the Lantana road at Sunset Road intersection. These improvements are anticipated to further enhance safety within the interchange influence area by easing congestion and reducing conflict points.

Table 6-39 shows the average predicted crashes per year at the Lantana Road interchange and arterial segments. The detailed crash prediction analyses are provided in **Appendix T**.

Table 6-39 Predicted Crashes at Lantana Interchange

Segment	Crash Severity	Expected Crash Frequency				% Change from No-Action		
		No-Action	Build Alt. 1	Build Alt. 2	Build Alt. 3	Build Alt. 1	Build Alt. 2	Build Alt. 3
Interchange	Fatal & Injury	53	45	31	45	-15.0%	-40.8%	-15.0%
	Property Damage Only	61	52	36	52			
Arterial	Fatal & Injury	11	9	9	9	-15.0%	-15.0%	-15.0%
	Property Damage Only	21	18	18	18			
Total		**146**	**124**	**94**	**124**	**-15.0%**	**-35.6%**	**-15.0%**

Based on the results shown in **Table 6-39,** Build Alternative 2 results in the lowest number of expected total crashes with an overall crash reduction of 35.6% compared to the No-Action Alternative at the Lantana Road Interchange. Build Alternative 1 and Build Alternative 3 provide similar overall crash reduction of 15% compared to No-Action Alternative at the Lantana Road Interchange.

6.3 ENGINEERING EFFECTS

6.3.1 Geometric Compliance to Design Controls

The No-Action Alternative has several geometric design deficiencies. The horizontal curve length for the interchange ramps and the vertical alignment along the existing ramps and Lantana Road do not meet the current FDOT Design Manual (FDM) requirements. In order to maintain the existing conditions, vertical alignment design variations would be required for the SR 9/I-95 northbound on-ramp for substandard vertical cure length. For the southbound off-ramp, a design variation for substandard maximum grade, substandard k-value and substandard vertical curve length will be required. Along Lantana Road, design variations would be required for substandard K-Value, vertical stopping sight distance and vertical curve length under the No-Action Alternative. In addition, the vertical clearance of Lantana Road over the SFRC/CSX railroad does not meet the required minimum vertical clearance.

Build Alternative 1 includes widening of the Lantana Road Bridge over SR 9/I-95 and reconstruction of the interchange ramps. The proposed improvements under Build Alternative 1 will address the horizontal and vertical alignment along the interchange ramps. However, it does not resolve the vertical alignment and vertical clearance deficiencies along Lantana Road.

Build Alternatives 2 and 3 correct the vertical and horizontal clearance deficiencies that will persist under the No-Action Alternative and Build Alternative 1. Both Build Alternatives 2 and 3 propose replacement of the existing Lantana Road Bridge over SR 9/I-95 with a separate bridge over the SFRC/CSX Railroad as well as replacement of the existing ramp bridges with MSE walls. The proposed new bridges meet both FDM standards and AASHTO requirements for geometric compliance. Hence, no design variations would be required for Build Alternatives 2 and 3.

6.3.2 Utility Impacts

No utility impacts are anticipated with the No-Action Alternative, as no roadway modifications are proposed. The existing utility facilities along the corridor are to remain. The proposed Build Alternatives will however impact the following utilities within the study limits:

- AT &T Florida
  - A 6-4" PVC duct bank along the south R/W of Lantana Rd. east of I-95 may conflict with roadway widening.
  - Manhole located northeast of northbound off-ramp from I-95
  - Buried copper and fiber facilities crossing southbound on-ramp to I-95

- City of Lake Worth Water & Sewer
  - 12" PVC WM and 3" PVC FM east of High Ridge Road
  - Private lift station and 3” PVC FM interconnect within the adjacent property
- Comcast
  - Aerial Cables
- Crown Castle Fiber
  - Handholes along Lantana Road
- Florida Public Utilities Co.
  - 6" PE and 6" Steel GM are generally present in these areas.
- Florida Power & Light Distribution
  - Pole (13kV conductors) located at the southeast corner of the intersection of High Ridge Road
  - Poles (13kV conductors) at the entrance to Sunset Road
  - 5 poles (13kV) immediately to the west of Andrew Redding Road
- Town of Lantana Water & Sewer
  - 6" PVC FM generally present at back of north sidewalk from Publix Shopping Center entrance to east of Andrew Redding Rd.
  - 6" WM also located within the same area
  - Town-owned lift station and control panel
  - Abandoned 6" FM
  - An 8" DIP FM (in 18" Steel casing) and a 12" DIP WM (in 24" Steel casing) cross the I-95 on/off-ramps and mainline just north of the Lantana Road bridge over I-95.
  - A 4" DIP FM (in 20" Steel casing) crosses Lantana Rd. near the Solid Waste site west of I-95.
  - 12" DIP WM (in 24" Steel casing) that crosses I-95 approx. 1,000 ft south of Lantana Rd. (at W. Mango St).
- Verizon/MCI
  - Existing buried fiber lines within railroad R/W.

Build Alternatives 1 and 3 have similar utility impacts. However, Build Alternative 2 has an additional impact to the City of Lake Worth Electric Transmission facility. A 138kV Transmission facility runs north-south along the SFRC/CSX railroad right of way within the study area. These transmission poles will be directly impacted by the proposed Diverging Diamond Interchange configuration proposed under Build Alternative 2. The transmission poles will need to be relocated to accommodate the new ramps. The cost for the relocation of the transmission poles is approximately $800,000.

6.3.3 Multi-modal (Transit/Pedestrian/Bicycle Facilities)

The No-Action Alternative does not propose any improvements to the existing multimodal facilities within the study area. The existing sub-standard ADA curb ramps at the intersections of High Ridge Road and Andrew Redding Road will remain under the No-Action Alternative. In addition, there are no bicycle lanes along Lantana Road, and none are proposed under the No-Action Alternative.

All three Build Alternatives provide improved multimodal facilities including 7 ft bicycle lanes along the Lantana Road corridor. The deficient ADA curb ramps at the intersection of High Ridge Road and Andrew Redding Road will be upgraded to ADA compliant curb ramps under all three Build Alternatives. In addition, all three Build Alternatives provide high emphasis crosswalks at all signalized intersections within the study limits to offer protected pedestrian movements. All sidewalks impacted by widening along Lantana Road will be relocated along the roadway under all the Build Alternatives. The existing transit infrastructure along the study corridor would not be impacted by any of the three Build Alternatives.

Compared to the No-Action Alternative, the three Build Alternatives provide bicycle facilities and improve on the existing pedestrian features within the study limits. Build Alternatives 1 and 3 have 6 signalized pedestrian crossings. For Build Alternative 2 with Diverging Diamond Interchange configuration, the pedestrian sidewalks utilize the inside walkway configuration. For this configuration, the sidewalks transition from the outside into the median within the interchange area. This create 8 signalized conflict points for the DDI compared to 6 signalized conflict points for Build Alternatives 1 and 3. However, the crossing along the DDI are shorter. In addition, the DDI enables crossing of Lantana Road from north side to the south side and vice versa.

6.3.4 Access Modifications

The No-Action Alternative does not propose any modifications to the existing access management classification or access locations as no roadway modifications are proposed along Lantana Road and SR 9/I-95.

All three Build Alternatives on the other hand propose access modifications along Lantana Road at the Sunset Road intersection. This includes eliminating the existing eastbound left-turn at the median opening to Sunset Road. The existing westbound left-turn to the Solid Waste Authority transfer station would remain. This proposed access modification is expected to reduce the existing conflict at the Sunset Road Intersection and thereby improve safety conditions.

For Build Alternatives 2 and 3, the replacement of the Lantana Road Bridge over SR 9/I-95 and the SFRC/CSX railroad provides the opportunity to accommodate an underpass road that would connect Sunset Road and the existing Solid Waste Authority (SWA) service road. This proposed underpass road enables the existing northbound left-turn to be eliminated while providing alternative access for several movements at this intersection as follows:

From Costco Wholesale to SR 9/I-95

Motorists traveling from Costco Wholesale to SR 9/I-95 currently have two travel options. The first is to exit Costco along High Ridge Road, turn left at the Lantana Road intersection, and proceed towards the SR 9/I-95 ramps via Lantana Road. The second option is to exit Costco along Lantana Road, weave through 3 lanes of traffic, and make a westbound U-turn at High Ridge Road. This movement was observed as one of the safety concerns at this location. The proposed improvement maintains the southbound left-turn at High Ridge Road onto Lantana Road but restricts the westbound U-turn at High Ridge Road. Motorist travelling from Costco to SR 9/I-95 can use the proposed service road underneath the bridge to the intersection of Lantana Road and the SWA service road and make a right-turn onto eastbound Lantana Road to access the SR 9/I-95 ramps.

From Eastbound Lantana Road to Costco Wholesale

In the existing conditions, motorists traveling along eastbound Lantana Road can make a left-turn at the median opening at Sunset Road to Costco. The proposed directional median opening eliminates this movement. In order to access the Costco from eastbound Lantana Road, motorists would make a right-turn onto the SWA service road, make a loop underneath the Lantana Road bridge over the SFRC/CSX railroad, and connect to Costco.

From SWA to Westbound Lantana Road

Under the existing conditions, motorists from the SWA can make a left-turn at the median opening at the Sunset Road intersection by crossing over three eastbound lanes to access westbound Lantana Road. The proposed directional median opening eliminates this movement. Motorists would be required to travel east along the proposed service road, make the loop underneath the Lantana Road bridge over the SFRC/CSX railroad, and connect to westbound Lantana Road via the Costco exit along Lantana Road.

The configuration of the proposed service road connection is illustrated in **Figure 6-12**. Although the access modifications proposed with the Build Alternatives will alter existing commute patterns, the new underpass road accommodates all the existing movements at the Sunset Road Intersection while enhancing the safety and operations within this segment of Lantana Road. In

addition, it also eliminates traffic from the adjacent residential communities. Other improvements include providing exclusive northbound and southbound right-turn lanes at the High Ridge Road intersection and extending the eastbound left-turn storage length at High Ridge Road. The existing access management classifications within the study limits would remain unchanged with all three Build Alternatives.

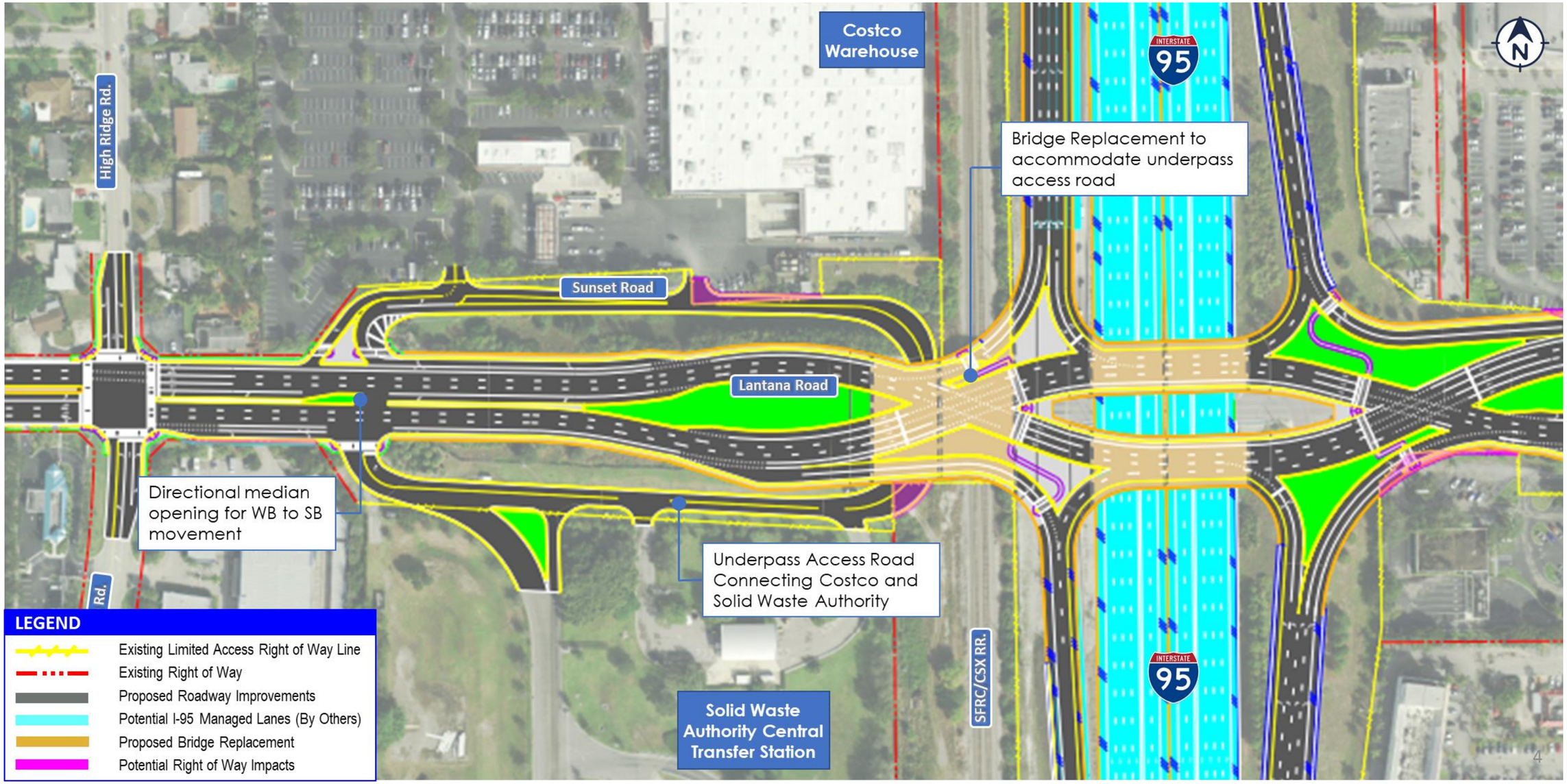

Figure 6-12 Proposed Underpass Service Road

6.4 ENVIRONMENTAL EFFECTS

An evaluation of the potential impacts to the social, cultural, natural, and physical environment associated with the proposed improvements was performed as part of this study. The findings are summarized in the following sections:

6.4.1 Socioeconomic

Land use in the project area encompasses mainly non-public land uses consisting of a mix of institutional areas, industrial areas, residential areas, retail/office areas, and vacant use areas. There are areas of public/semi-public land uses directly to the west of I-95 which include the CSX Railroad and the Solid Waste Authority Central Transfer Station. No right of way impacts to residential properties are anticipated. However, impacts to adjacent businesses are anticipated. Build Alternatives 1 and 3 will impact 9 businesses while Build Alternative 2 will impact 6 businesses. Build Alternative 2 has no impacts to the Shell gas station (1320 W. Lantana Road). However, it will impact the Wells Fargo Bank ATM driveway. All three Build Alternatives will prevent eastbound motorists from making a left onto Sunset Road to access Costco due to the proposed directional median modification. However, Build Alternatives 2 and 3 provide an underpass access road that enables alternative access for several movements at this intersection.

Access to residences and businesses could temporarily be affected, and in some cases permanently modified, by the proposed improvements. The overall impacts on the social environment and community cohesion are anticipated to be minimal.

Lantana Road is a major east-west corridor in Palm Beach County that provides access to local and commercial businesses, residential communities, religious centers, schools, parks, health facilities and I-95. Aesthetics, mobility, and the overall economic effects are expected to be enhanced by the implementation of the proposed improvements along Lantana Road and at the I-95 interchange.

6.4.2 Cultural, Historical and Archeological

Fifteen historic resources were identified within the study limits. Of the fifteen, one is previously recorded and fourteen are newly recorded. The previously recorded resource has been determined National Register–eligible outside of the current project APE: Seaboard Air Line Railroad (8PB12917) within the current project APE. The segment of this resource, within the project APE was recorded in 2010 but was not evaluated by the SHPO. Therefore, an updated FMSF form was completed for this resource and is included in the Cultural Resource Assessment

Survey (CRAS). The current survey considers the segment of the Seaboard Air Line Railroad (8PD12917) within the current project APE to be National Register–eligible under Criterion A in the categories of Transportation and Community Planning and Development.

The fourteen newly recorded resources (8PB18592-8PB18605) were identified. Of those, thirteen are Masonry Vernacular style buildings and one is Mid-Century Modern. Only one of the fourteen newly recorded resources is considered to be National Register-eligible: First Federal Savings and Loan Association (Chase Bank) (8PB18601) at 1300 W Lantana Road. This building is a well-intact example of Mid-Century Modern architecture. It is a rare example of this style of architecture within the Lantana area, in which there are few well-intact Mid-Century Modern style structures. Due to its high integrity and significance as a rare example of this style of architecture in the area, the First Federal Savings and Loan Association (Chase Bank) (8PB18601) at 1300 W Lantana Road is considered eligible for listing in the National Register under Criterion C in the area of Architecture. . A sliver of right of way is required along the roadway adjacent to the Chase Bank only for Build Alternatives 1 and 3, but not Build Alternative 2. However, no impacts to the building would occur. The other resources within the study area have been determined to be National Register ineligible.

No newly or previously recorded archaeological resources were identified within or adjacent to the project APE. No major impacts are anticipated to either of the resources discussed above.

6.4.3 Section 4(f)

There are no Section 4(f) properties are located within or adjacent to the project limits and no use of Section 4(f) properties is expected.

6.4.4 Threatened & Endangered Species

The project lies within the United States Fish and Wildlife Service (USFWS) Consultation Area for the Florida Scrub Jay (*Aphelocoma coerulescens*) and within the Core Foraging Area (CFA) for four (4) wood stork (*Mycteria Americana*) rookeries. The project is not within USFWS designated Critical Habitat; however, Lake Osborne to the west of the project is a Critical Habitat for the West Indian manatee (*Trichechus manatus*). The Eastern indigo snake also has the potential to occur within the project area. The project area is commercially developed and there is little to no suitable habitat or resources for these species and no in-water work is proposed. Therefore, no involvement regarding these protected species is anticipated.

Gopher tortoises (*Gopherus polyphemus*) were observed during the field review along the west side of the railway and south side of Lantana Boulevard, on the property located at 1810 Lantana Road. All three Alternatives include widening to the south of the railway to accommodate additional lanes to the I-95 southbound on-ramp. An updated gopher tortoise survey is required prior to construction.

A detailed evaluation of protected species in the project area is included in the Protected Species and Habitat Evaluation section of the Natural Resources Evaluation (NRE) report.

6.4.5 Essential Fish Habitat

The project area does not include any essential fish habitat (EFH) or any critical habitat under the purview of the National Marine Fisheries Service (NMFS). Therefore, no impacts to EFH are anticipated.

6.4.6 Wetlands and Other Surface Waters

There are several man-made drainage features within the I-95 right of way, including one dry detention pond located under the I-95 southbound off-ramp to Lantana Road. These drainage features, which are permitted for stormwater management, may be inundated during the rainy season and after heavy storm events and may include herbaceous, hydrophytic, emergent vegetation. However, there are no naturally occurring wetlands within the project limits. A detailed evaluation is included in the wetlands section of the NRE prepared as part of the PD&E Study.

6.4.7 Water Quality

No impaired waters are located within the project area. However, the project discharges to Lake Osborne (WBID 3265A) which is impaired for nutrients. Also, the E-4 Canal (WBID 3262), which is impaired for nutrients, runs through Lake Osborne. A Water Quality Impact Evaluation was conducted as part of the PD&E Study. Based on the evaluation, minimal involvement regarding water quality and quantity is anticipated for the following reasons:

1. Additional stormwater treatment is included for additional impervious area.
2. The project is designed to meet state water quality and quantity standards; and,
3. Construction related disturbances are anticipated to be minimal and temporary and best management practices will be utilized during construction.

6.4.8 Contamination

Contamination Screening Evaluation Report was prepared as part of the PD&E Study. Several potential hazardous material sites were identified within the vicinity of the SR-9/I-95 and Lantana Road Interchange. Eight potentially contaminated sites within the screening area. A 500-foot buffer was utilized to search for registered facilities and potential contamination sources, a 1000-foot buffer was used for non-landfill solid waste sites (such as recycling facilities, transfer stations and debris placement areas), and a 1/2-mile buffer was utilized for CERCLA, National Priorities List (NPL) Superfund sites, and landfill sites. All sites were evaluated separately and adjacent activities and conditions, such as surface water and groundwater flows, were considered for each location.

The evaluated sites and associated preliminary risk ratings are shown in **Table 6-40.** Risk rating criteria was followed as set per the PD&E Manual (January 14, 2019). Risk ratings were assigned to parcels based on contamination history, contamination type and proximity to the interchange and proposed improvements. For properties that have more than one facility identification number, the risk rating was assigned for the entire property based on the site's overall contamination history.

One High Risk, two Medium Risk, and four Low Risk potentially contaminated sites were identified. One site evaluated was determined to be No Risk. The Low Risk sites are primarily sites listed as petroleum spills, hazardous waste sites, or sites with storage tanks which are not anticipated to have contamination impacts based on regulatory record review and/or distance from the project area. The Medium Risk sites are sites which have received Notice of Violations (NOVs) or for which there is unknown information to determine the potential for contamination impacts. The High-Risk site is a gas station and convenience store with proposed right of way acquisition and the potential to impact existing underground storage tanks under Build Alternatives 1 and 2. The High and Medium Risk sites should be further evaluated during subsequent phases to determine if contaminants may be disturbed during project activities.

Table 6-40 Contaminated Sites Ranking				
Site #	**Site Name (Facility ID)**	**Site Address**	**Risk/Database(s)**	**Risk Rating**
1	Lake Worth Sanitary Landfill (65859)	1699 Wingfield Street Lake Worth, FL 33460	Inactive Landfill/No Regulatory Files	Medium
2	Publix Store (9808145)	1589 W Lantana Road Lantana, FL 33462	Above Ground Storage Tank for Generator/FDEP OCULUS, CINEMA	Low
3	Costco Gasoline (9701062)	1873 W Lantana Road Lantana, FL 33462	Underground Storage Tanks (Petroleum)/FDEP OCULUS, CINEMA	Medium
4	R&R Transportation Spill (9803549)	I-95 Northbound Lane at Lantana Road (26.588687, -80.069011))	Petroleum Spill/FDEP OCULUS, CINEMA	Low
5	Waste MGMT Truck Spill (9803570)	I-95 Southbound Lane at Lantana Road in railroad ROW (26.586821, -80.069739)	Petroleum Spill/FDEP OCULUS, CINEMA	Low
6	Shell Station (8732176)	1320 Lantana Road Lantana, FL 33462	Underground Storage Tanks (petroleum)/FDEP OCULUS, CINEMA	**High**
7	Palm Beach Cleaners (9600101)	NA	Former dry cleaner/No regulatory files	No
8	Solid Waste Authority of PBC-Central County Transfer Station (65564)	1810 Lantana Road Lantana, FL 33462	Storage Tanks (diesel)/FDEP OCULUS, CINEMA Solid Waste/FDEP OCULUS, CINEMA	Low

There are three existing bridge structures within the project limits. Bridge 930274 is the southbound SR 9/I-95 off-ramp onto Lantana Road, Bridge 930275 is the southbound I-95 on-ramp from Lantana Road, and Bridge 930276 is Lantana Road over SR 9/I-95 & SFRC/CSX Railroad. The superstructure for each of the three bridges consists of a cast-in-place (CIP) deck supported on AASHTO beams. The substructures for the bridges consist of multicolumn piers or pile bents supported by squares pre-stressed 18” concrete piles. In accordance with the National Emission Standards for Hazardous Air Pollutants regulations, further investigation of the likelihood of encountering asbestos during demolition, construction, or reconstruction of bridge structure should be conducted during the design phase.

Lead-based paint was used on steel bridges, towers, storage tanks, buildings, and other facilities through the 1980s, and in some cases into the 1990s. Lead based paint may have to be removed during facility maintenance or when buildings or structures are being demolished, restored, or renovated. Lead is a serious health hazard if it is inhaled or ingested. Scraping or sanding lead based paint creates paint particles that are a hazardous waste and can be a health hazard if proper safety precautions are not taken (USDA, 2007). Further investigation into the likelihood

of encountering lead based paint during demolition, construction, or reconstruction of bridge structure should be conducted during the design phase.

6.4.9 Noise

Noise sensitive receptors are found along most of the east side of the I-95 project limits and north of Lantana Road west of I-95. Most of these noise sensitive receptors are single-family homes and smaller apartment buildings where the noise sensitive areas are primarily yards and patios. These residences are generally all located behind one of three noise barriers found along I-95 within the project limits: two east of I-95 and one west of I-95. An assisted living facility, a private school and an outdoor seating area at a restaurant are also found within approximately 500 ft of I-95. Noise sensitive receptors along Lantana Road include a single-family home, medical offices, and a preschool. Other land uses within the project study area include office buildings, commercial use and industrial/light industrial enterprises that are not considered noise sensitive.

Due to the nature of the planned improvements and the presence of noise barriers adjacent to most of the noise sensitive receptors, noise and vibration related impacts due to the planned improvements are anticipated to be minor and no additional noise walls are recommended. During construction of the project, there is the potential for noise and vibration impacts to be substantially greater than those resulting from normal traffic operations due to the heavy equipment typically used to build roadways. The detailed traffic noise impact and abatement analysis are provided in the Noise Study Report prepared as part of the PD&E Study.

6.5 PROJECT COSTS AND BENEFITS

6.5.1 Project Cost Estimate

The estimated construction costs were developed for the Lantana Road Interchange Alternatives using the FDOT Long Range Estimates (LRE) Program. Design Engineering Costs were estimated at 12% of the total construction cost and Construction Engineering Inspection (CEI) were estimated at 12.5%. Right of way costs were provided by FDOT and include right of way acquisition and business damages. **Table 6-41** reflects the estimated project costs for the Lantana Road Interchange Alternatives.

Table 6-41 Estimated Project Costs for Lantana Road Interchange Alternatives				
Costs	**No-Action**	**Build Alternative 1**	**Build Alternative 2**	**Build Alternative 3**
Roadway Construction Costs	$0.00	$18,400,000	$32,700,000	$30,700,000
Design Engineering Costs (12%)	$0.00	$2,200,000	$3,900,000	$3,700,000
CEI Costs (12.5%)	$0.00	$2,300,000	$4,100,000	$3,800,000
Right of Way Costs	$0.00	$13,300,000	$12,800,000	$13,300,000
Utility Relocation Cost	$0.00	$0.00	$800,000	$0.00
Total Alternative Cost	**$0.00**	**$36,200,000**	**$54,300,000**	**$51,500,000**

6.5.2 Benefit-Cost Analysis

A Benefit to Cost (B/C) Analysis of the proposed improvements was completed for safety and operational benefits. The B/C analysis evaluates the ratio of the cost savings associated with implementation of the proposed improvements over a 20-year life cycle versus the present value construction cost of the proposed improvements.

The cost component represents the total project cost including construction cost, utility relocation costs, right of way costs as well as the design and construction engineering supervision costs. The benefit component represents the savings associated with the projected reduction in crashes due to the proposed improvements. The Crash Reduction Factors (CRF) obtained from the FHWA CMF Clearing house was used to estimate the potential crash savings which was then monetized by applying the average crash cost obtained from the FDM Table 122.6.1. Due to the relatively short arterial segment under consideration, with closely spaced signalized intersections, the potential benefits from travel time savings was not considered.

A 4%-time value for money was utilized to discount and annualize the future costs and benefits over the design periods for the various cost components**. Table 6-42** shows the benefit cost analysis for the different Build Alternatives.

Table 6-42 Benefit Cost Analysis for Lantana Road Interchange Alternatives				
Alternative	**Annual Cost**	**Annual Benefit**	**Benefit Cost Ratio (B/C)**	**Net Present Value (NPV)**
Build Alternative 1	$2,302,149.20	$2,675,278.71	1.16	$5,070,951.81
Build Alternative 2	$3,708,073.85	$6,288,221.29	1.70	$35,065,045.73
Build Alternative 3	$3,478,342.85	$2,675,278.71	0.77	-$10,913,903.74

Based on the results of the benefit-cost analysis, Build Alternative 2 has the best benefit-cost ratio of 1.70. Build Alternative 1 is next with a benefit-cost ratio of 1.16 and finally Build Alternative 3 with a benefit-cost ratio of 0.77. The detailed benefit cost analysis including the specific CRF used for the analysis are provided in **Appendix U.**

6.6 EVALUATION OF ALTERNATIVES

6.6.1 Comparative Analysis

A comparative (qualitative) analysis of the advantages and disadvantages for the No-Action and Build Alternatives was conducted based on the engineering and environmental impacts of the Alternatives discussed previously. **Table 6-43** presents a summary of this analysis.

6.6.2 Evaluation Matrix

The quantitative evaluation of the Lantana Road Interchange Alternatives was performed based on the multi-criteria evaluation methodology. This methodology involves quantitative analysis to combine the different impacts for each Alternative. These performance criteria are not all monetized and usually have different dimensions (units). Therefore, a ranking scale number was assigned for each evaluation criteria for all Alternatives. The ranking scale used is as follows:

1 = Substantial Negative Effect or Worse Alternative
2 = Generally Negative Effect or Inferior Alternative
3 = Generally No Effect or Moderate Alternative
4 = Generally Positive Effect or Good Alternative
5 = Substantial Positive Effect or Best Alternative

Based on the analysis and evaluation of several key evaluation parameters including traffic operations, safety benefits, access impacts, utility impacts, right of way impacts, environmental impacts, construction costs as well as public comments, Build Alternative 2 with the Diverging

Diamond Interchange (DDI) configuration had the highest score due to the significantly higher safety and traffic operational benefits it provides to offset its relatively higher construction cost. The No-Action Alternative had the least score from the evaluation matrix. **Table 6-44** shows the evaluation matrix for the Lantana Road Interchange Alternatives.

Table 6-43 Evaluation Matrix

	Evaluation Factors	No-Action Alternative	Build Alternative 1	Build Alternative 2	Build Alternative 3
Traffic & Safety	**Level of Service I-95 Ramp terminals**	Overall **LOS F** (NB & SB) SB and NB approaches operate at **LOS F**	Overall LOS C (NB) and LOS D (SB). NB and SB approaches operate at **LOS E**	Overall LOS C (NB & SB)	Overall LOS D (NB) and LOS C (SB)
	Queue Spillback onto I-95 Mainline	NB and SB Ramp queue spillback onto I-95 mainline	Potential queue spillback for NB off-ramp	No queue spillback of NB and SB off-ramp	No queue spillback of NB and SB off-ramp
	Safety Benefits	Potential for increased crashes due to congestion	15% reduction in crashes	36% reduction in crashes	15% reduction in crashes
Engineering	**Geometric Compliance to Design Controls**	Several geometric design deficiencies	Design Exceptions required for vertical clearance and vertical alignment	No Design Exceptions required	No Design Exceptions required
	Utility Impacts	None	Impacts to 9 Utilities	Impacts to 10 Utilities. Requires relocation of 2 transmission poles	Impacts to 9 Utilities
	Multi-Modal (Transit/ Ped/ Bike)	None	Provides Bicycle Lanes along Lantana Road	Provides Bicycle Lanes along Lantana Road	Provides Bicycle Lanes along Lantana Road
			Upgrades deficient ADA curb ramps at High Ridge Rd	Upgrades deficient ADA curb ramps at High Ridge Rd	Upgrades deficient ADA curb ramps at High Ridge Rd
	Access Modifications	Maintains existing access and travel patterns	Access impacts to Sunset Road intersection	Access impacts to Sunset Road intersection with new underpass service road	Access impacts to Sunset Road intersection with new underpass service road
	Maintenance of Traffic	None	Minimum MOT required for bridge widening over SFRC/CSX Railroad	Moderate MOT required to replace bridge over SFRC/CSX Railroad	High MOT required to replace bridge over SFRC/CSX Railroad

Table 6-43 Evaluation Matrix					
Evaluation Factors		**No-Action Alternative**	**Build Alternative 1**	**Build Alternative 2**	**Build Alternative 3**
Socio-Economic	**R/W & Property Impacts**	None	**9 properties impacted**	**6 properties impacted**	**9 properties impacted**
	Social and Neighborhood Impacts	None	Loss of 16 parking spots at Lantana Shopping Center	Loss of 24 parking spots at Lantana Shopping Center	Loss of 16 parking spots at Lantana Shopping Center
	Economic and Employment Opportunity	None	Enhanced development opportunities with improved mobility	Enhanced development opportunities with improved mobility	Enhanced development opportunities with improved mobility
	Visual & Aesthetic Impacts	None	Low landscape opportunity along roadway embankment	High opportunity for landscape within median	Moderate landscape opportunity along roadway embankment
	Public Comments	None	**Least preferred**	**Most preferred**	**Moderately preferred**
Environment	**Threatened & Endangered Species**	None	No involvement regarding protected species	No involvement regarding protected species	No involvement regarding protected species
	Wetland & Surface Waters	None	None	None	None
	Water Quality	None	Minimal impacts to water quality	Minimal impacts to water quality	Minimal impacts to water quality
	Contamination	None	1 High Risk Location (Shell Gas Station)	1 High Risk Location (Shell Gas Station)	1 High Risk Location (Shell Gas Station)
	Noise	None	Minimal traffic noise	Minimal traffic noise	Minimal traffic noise
Project Cost	**R/W Cost**	None	**$13.3 Million**	**$12.8 Million**	**$13.3 Million**
	Construction Cost	None	**$18.4 Million**	**$32.7 Million**	**$30.7 Million**

Table 6-44 Alternatives Evaluation Matrix

Evaluation Factors		Alternatives			
		No-Action	Build Alternative 1	Build Alternative 2	Build Alternative 3
Traffic	Level of Service	1	3	5	4
	Delay / Queue Removed from I-95 Mainline	1	4	5	4
	Safety Benefits	1	3	5	3
Engineering	Geometric Compliance to Design Controls	1	3	4	4
	Utility Impacts	3	2	1	2
	Multi-modal (Transit/Pedestrian /Bicycle)	1	4	4	4
	Access Modifications	3	2	3	3
	Maintenance of Traffic	3	2	2	1
Socio-Economic	R/W and Property Impacts	3	1	2	1
	Social & Neighborhood Impacts	3	2	1	2
	Economic & Employment Impacts	3	4	4	4
	Community Services/ Features	3	3	3	3
	Visual & Aesthetics Impacts	3	3	5	4
	Public Comments	1	2	5	3
Environment	Threatened & Endangered Species	3	3	3	3
	Wetland / Surface Water Impacts	3	3	3	3
	Water Quality	3	2	2	2
	Contamination	3	2	2	2
	Noise	3	2	3	2
Cost	R/W Cost	3	1	2	1
	Construction Cost	3	2	1	2
SCORE		**51**	**53**	**65**	**57**
RANKING		**4**	**3**	**1**	**2**

7.0 OTHER CONSIDERATIONS

7.1 CONFORMANCE WITH TRANSPORTATION PLANS

The proposed improvements at the SR 9/I-95 at Lantana Road Interchange is identified in the Palm Beach County Transportation Planning Agency (TPA) 2040 Long Range Transportation Plan (LRTP) with $86,700,000 funding allocated for Design, Right of Way and Construction. Funding for Design and Right of Way is planned to be available in year 2026-2030 and Construction in year 2031-2040. The proposed project is also identified in the Palm Beach County Transportation Improvement Program (TIP) – FY 2020-2024 (FPID: 413258-1) with funding for the Preliminary Engineering and Right of Way in 2022-2024 and the construction phase beyond the TIP five-year horizon. Additionally, the project is included in the FDOT 2040 Strategic Intermodal System (SIS) Cost Feasible Plan 2024-2040 and the I-95 Interchange Master Plan. The project (FPID 413258-1) is also included in the FDOT District Four Five-Year Work Program with funding allocated preliminary design in 2021, right of way in 2022 and construction in 2029.

7.2 COORDINATION

The proposed IMR study coordinated with the I-95 at 6th Avenue South Project Development and Environment (PD&E) Study (FM: 436963-1) and I-95 at Hypoluxo Road PD&E Study (FM: 413257-1). Both projects are currently on-going by FDOT District Four. The study also coordinated with the following ongoing and planned projects:

- FM: 427516-2 – SR 9/I-95 from Gateway Boulevard to Lantana Road resurfacing project.
- FM: 444202-1 – I-95 Managed Lanes from Linton Boulevard to 6th Avenue South PD&E Study
- FM:202300-1 Lantana Road from Hagen Ranch Road to SR 9/I-95 resurfacing project
- Water Town Commons Development

Two coordination meetings were held with the District Four Interchange Review Coordinator (DIRC). **Appendix V** includes the meeting notes from the DIRC Meetings and the review comments from the DIRC.

- On March 28,2019, the MLOU parameters were discussed.
    - Three Build Alternatives that incorporate TSM&O improvements will be developed for the study.

  - The DIRC recommended a 5mph reduction in the design speed for the Diverging Diamond Interchange Alternative to accommodate the curves.

- On September 26, 2019, the proposed Alternatives were discussed
  - The alternatives analysis of the three Build Alternatives was discussed as they related to the purpose and need of the study.

Several Public Meetings were conducted during the study.

- On May 10, 2019, the project was presented to the Town of Lantana Mayor and Town Manager
- On May 15, 2019 the Public, Agencies and Elected Officials Kickoff Meetings were held. A brief presentation provided the project overview, purpose and need and allowed interested attendees to interact with the project team.
- On September 16, 2019, the project was presented to the South Florida Water Management District.
- On October 10, 2019, the proposed Alternatives were presented to the Greater Lantana Chamber of Commerce.
- On October 24, 2019, The Town of Lantana Mayor & Manger were briefed about the proposed Alternatives.
- On November 4, 2019, Mayor Mack Bernard, Palm Beach County Mayor was briefed about the proposed Alternatives.
- On November 13, 2019, the Alternatives Public Workshop was held in Lantana to present the proposed Alternatives to the public.
- On December 18, 2019, A meeting with the FDOT District Four was held for the selection of the Preferred Alternative
- On January 29, 2019, The Palm Beach County TPA staff was briefed about the proposed alternatives.
- On February 13, 2020, Key Palm Beach County Departments were briefed about the proposed Alternatives
- On March 4, 2020, the proposed alternatives were presented to the Palm Beach TPA Technical Advisory Committee (TAC) and Citizens Advisory Committee (CAC).

- On March 5, 2020, the project team presented the proposed alternatives to the Palm Beach TPA Bicycle Trails and Pedestrians Advisory Committee (BTPAC)
- On April 7, 2020, the project team briefed the Palm Beach Solid Waste Authority about the proposed alternatives
- On April 16, 2020, the project team presented the proposed alternatives to the Palm Beach TPA Governing Board
- On April 30, 2020, Mayor Dave Kenner, the newly elected Palm Beach County Mayor was briefed about the project and the proposed alternatives

7.3 ENVIRONMENTAL DOCUMENTATION

A PD&E Study is being conducted for the proposed improvements to the SR 9/ I-95 interchange at Lantana Road that will fully evaluate viable alternatives included in this IMR Study. The proposed Class of Action and National Environmental Policy Act (NEPA) environmental document is a Type 2 Categorical Exclusion.

7.4 CONCEPTUAL SIGNING PLAN

A conceptual signing plan was developed for the Preferred Alternative. See **Appendix W** for the attached signing plan.

8.0 FUNDING PLAN & SCHEDULE

8.1 PROJECT FUNDING

The SR 9/I-95 at Lantana Road PD&E Study (FPID 413258-1) is included in the FDOT District Four Five-Year Work Program with funding allocated as follows:

Table 8-1 Project Funding Plan

Phase	Fiscal Year	Funding
Preliminary Engineering	2021	$2,030,000
Right of way	2022	$7,834,916
Construction	2029	$23,748,509
TOTAL		**$33,613,425**

8.2 PROJECT SCHEDULE

The PD&E Phase of this project commenced in Winter 2019 and is anticipated to be completed by Spring 2021 with the approval of the Location Design Concept and Acceptance (LDCA). The right of way acquisition and final design phase are anticipated to be completed by Fall 2023. Construction is anticipated to begin in Summer 2029.

Table 8-2 Interchange Access Request Schedule

Milestone Activity	Date
Begin PD&E Study	February 2019
Prepare MLOU	February 2019
Approval of MLOU	September 2019
Agency/Public Kick-Off Meeting	May 2019
Traffic Operational Analysis	June 2019
Alternatives Evaluation	July 2019
Draft SO&E Report	October 2019
Alternatives Public Workshop	November 2019
Draft Environmental & Engineering Documents	February 2020
Final SO&E Report	June 2020
Approval of SO&E Report	July 2020
Public Hearing	August 2020
Final Environmental & Engineering Documents	March 2021
Location & Design Concept Acceptance (LDCA)	May 2021
Approval Decision of IMR	May 2021
Final Design	FY 2021
Construction	FY 2029

9.0 RECOMMENDATIONS

The PD&E study process analyzed several factors related to the travel demand, traffic operations, safety benefits, access impacts, utility impacts, right of way impacts, environmental impacts, construction costs, as well as public comments. Based on the comprehensive evaluation presented in this IMR study, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the Preferred Alternative due to the significantly higher safety and traffic operational benefits it provides compared to the other Alternatives. Build Alternative 2 also satisfies the purpose and need of this project and provides the highest benefit-cost ratio making it the most cost-effective alternative. In addition, it provides opportunity for additional landscape and aesthetic improvements and has the highest public support.

The recommended Build Alternative 2 includes the following improvements or modifications.

- Reconfigure existing Interchange into a Diverging Diamond Interchange (DDI) Configuration
- Widen Lantana Road to provide 3 lanes in each direction between High Ridge Road and Andrew Redding Road.
- Replace the existing single Lantana Road bridge over I-95 and SFRC/CSX Railroad with two separate bridges over SR 9/I-95 and SFRC/CSX Railroad.
- Replace the existing ramp bridges for the southbound on and off-ramps with embankment and MSE walls.
- Provide dual right-turn lanes and dual left-turn lanes for the SR 9/I-95 northbound and southbound off-ramps.
- Provide dual eastbound and westbound right-turn lanes from Lantana Road onto I-95 southbound and northbound on-ramps, respectively.
- Provide dual eastbound and westbound left-turn lanes from Lantana Road onto the I-95 northbound and southbound on-ramps.
- Eliminate the eastbound left-turn, northbound left-turn and thru movements and provide a directional median opening at the Sunset Road intersection with an underpass access road.
- Provide exclusive southbound and northbound right-turn lane along High Ridge Road.
- Widen westbound right-turn lane at Sunset Road to accommodate WB62FL Design Vehicles.
- Provide 7 ft buffered bicycle lanes and 6 ft sidewalks along Lantana Road in both directions.
- Provide an underpass road that connects Sunset Road and the existing Solid Waste Authority service road underneath the reconstructed Lantana Road Bridge over SFRC/CSX Railroad.
- Provide ITS improvements including Arterial Dynamic Message Signs (ADMS), Surveillance and verification CCTV cameras and Wrong way detection system for the interchange ramps.

10.0 CONCLUSIONS

This IMR Study documented the analysis methodology, traffic forecasting, and operational analysis for existing and future conditions for SR 9/I-95 at Lantana Road PD&E Study. It also addresses the FHWA 2 policy points to demonstrate that the proposed modification for the SR 9/I-95 at Lantana Road interchange is viable based on the conceptual analysis performed.

Policy Point 1: No significant adverse impact on the operation and safety of the freeway system

As part of this study, an in-depth operational and safety analysis was conducted to study the impacts of the proposed improvements. Several performance measures were used to compare the operations and safety of the existing system under the No-Action and Build conditions. Key measures included freeway densities, freeway V/C ratios, intersection delays, level of service and 95th percentile queue lengths, crash rates and frequency, predominant crash patterns, expected crashes, and potential crash reduction using crash modification factors. Based on the results of this comprehensive evaluation, Build Alternative 2 with the Diverging Diamond Interchange (DDI) configuration was selected as the preferred alternative due to the significantly higher safety and traffic operational benefits it provides to offset its relatively higher construction cost.

From an operational perspective, the traffic analysis performed for the study indicated that Build Alternative 2 performs substantially better than the No-Action Alternative for all future year scenarios, particularly for the SR 9/I-95 ramp terminal intersections, which are the primary focus for this study. Under Build Alternative 2, both SR 9/I-95 ramp terminals will operate at LOS C during both the AM and PM peak periods for the 2045 design year compared to LOS F for the No-Action Alternative. The southbound ramp terminal intersection will experience 81% and 73% reduction in delay for the AM and PM peak periods, respectively, whereas the northbound ramp terminal will experience 80% and 77% reduction in delay during the AM and PM peak periods, respectively compared to the No-Action Alternative. Build Alternative 2 also results in 74% and 88% reduction in queue length at the I-95 southbound and northbound off-ramp approaches, respectively, with no spillback onto the I-95 mainline compared to the No-Action Alternative. The No-Action Alternative will exceed the existing ramp storage by 9% and 27% at the southbound and northbound off-ramp approaches, respectively.

From a safety perspective, a total of 470 crashes occurred along I-95 and the ramps at Lantana Road within the study area from 2014 to 2018. and a total of 172 crashes occurred along Lantana Road within the same period. The predominant crash types that occurred within the study area were rear-end collisions, sideswipe collisions and angled collisions. Crashes of these types are typically attributed to congested conditions along the arterials and interchange ramps and

terminals. The proposed improvements under Build Alternative 2 is anticipated to result in an overall crash reduction of 35.6% compared to the No-Action Alternative due to the significant reduction in delays and improved mobility resulting from the DDI configuration. This will significantly enhance safety within the interchange area. In addition, Build Alternative 2 provides access management improvements along Lantana Road by closing the eastbound left-turn at Sunset Road and providing a new access road underneath the reconstructed Lantana Road bridge over the SFRC/CSX Railroad. This proposed underpass road provides an alternative access for the existing movements at the Sunset Road Intersection. It also improves traffic operations and safety along Lantana Road by eliminating some of the vehicle conflicts at the intersection. In addition, it also eliminates traffic from the Costco to the adjacent residential communities.

Policy Point 2: Proposed access connects to public road only and provide all traffic movements

The proposed improvements to the I-95 at Lantana Road interchange and adjacent intersections will provide full access and accommodates all traffic movements from Lantana Road to and from SR 9/I-95. Lantana Road is a County Road and no private-only access is being sought on this interchange modification.