



I-95/SR 9 Interchange at 45th Street

Project Development and Environment (PD&E) Study

(Mile Post 31.040)

Palm Beach County, Florida

FPID No.: 436519-1-22-01 | FAP No.: 0951-682-1 | ETDM No.: 14225



PRELIMINARY ENGINEERING REPORT

May 2018

Prepared for:
Florida Department of Transportation
District Four

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.

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Florida Department of Transportation
District Four

Palm Beach County, Florida

Prepared by:

Hanson Professional Services Inc.

May 2018

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Hanson Professional Services Inc., authorized under Section 471.023, Florida Statutes, to offer engineering services to the public through a Professional Engineer, duly licensed under Chapter 471, Florida Statutes, Certificate of Authorization (CA) No. 7961, by the State of Florida Department of Professional Regulation, Board of Professional Engineers, and that I prepared or approved the evaluation, findings, opinions, conclusions, or technical advice hereby reported for:

FPID No.: 436519-1-22-01

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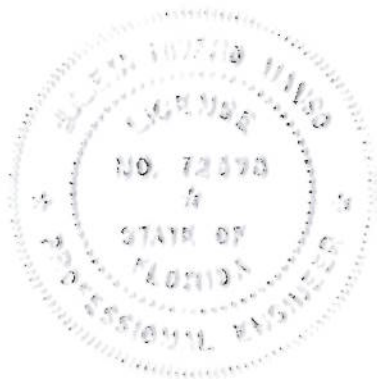
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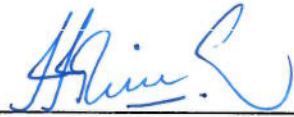
Project: I-95/SR 9 Interchange at 45th Street
Project Development and Environment
(PD&E) Study

County: Palm Beach

FDOT Project Manager: Robert Lopes, P.E.

I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgement and experience.



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- Appendix D – Typical Section Package
- Appendix E – Cost Estimate
- Appendix F – Public Hearing Transcript

1 SUMMARY OF PROJECT

This preliminary engineering report contains detailed engineering information that fulfills the purpose and need for the SR 9/I-95 from South of 45th Street to North of 45th Street Project Development and Environment (PD&E) Study (Mile Post 31.040). 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 February 2, 2016 and can be viewed under the ETDM # 14225. The Advance Notification (AN) was distributed on May 1, 2015.

1.1 Project Description

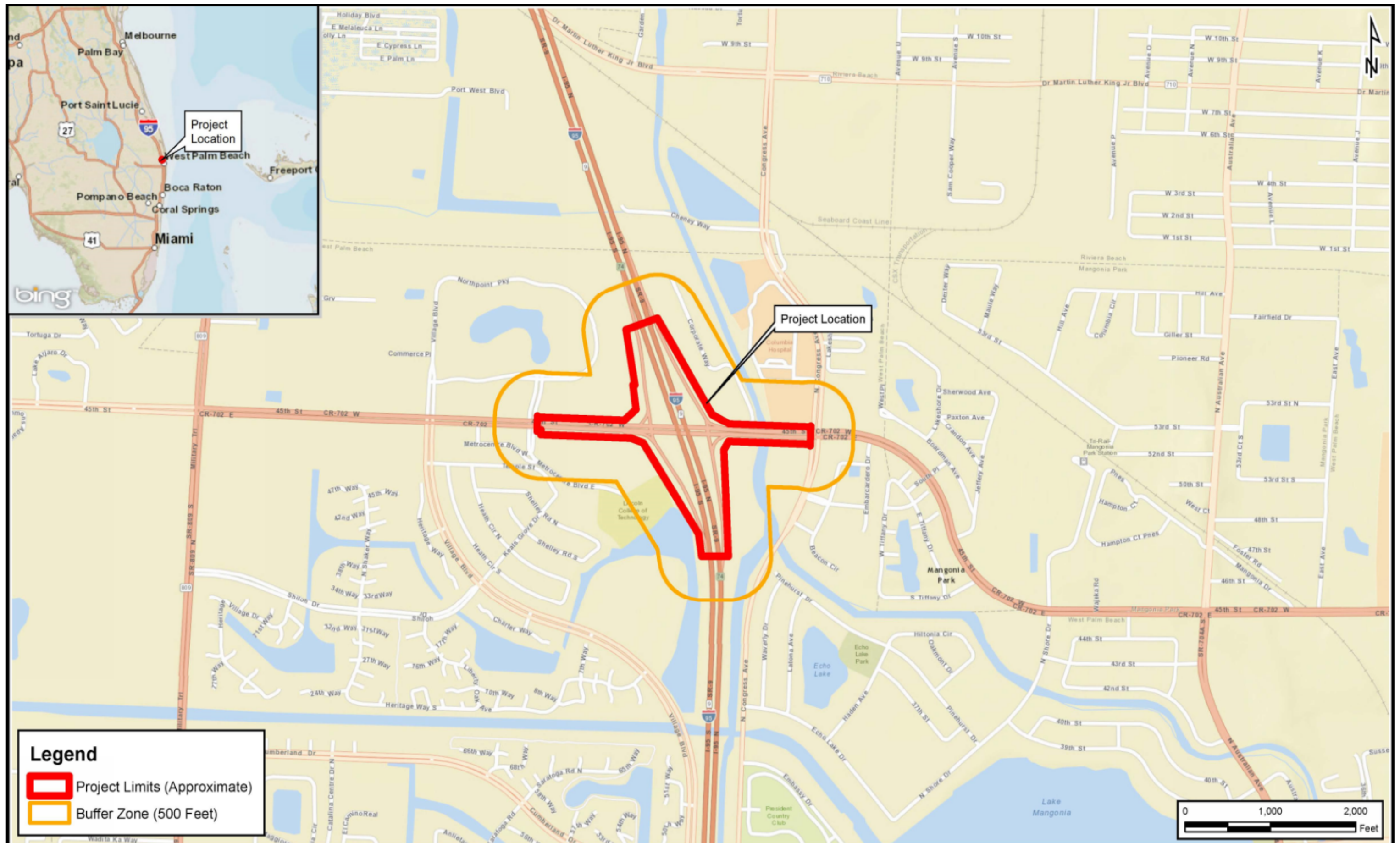
The FDOT, District Four is conducting a PD&E Study to identify short-term and long-term needs of I-95 and develop design concepts to address traffic spillback onto I-95, improve interchange operations, reduce congestion, and increase safety at the study interchange. This study will also consider Strategic Intermodal System (SIS) connector improvements needed within the project area and is consistent with plans for the I-95 mainline, including the potential extension of I-95 Express lanes through Palm Beach County. This proposed study will investigate alternatives to improve the overall operating conditions and enhance safety within the interchange.

The improvements to the I-95 Interchange at 45th Street will provide additional capacity for vehicles travelling east-west as well as operational improvements north-south through the interchange. Local and network connectivity for the City of West Palm Beach, the Town of Mangonia Park and Palm Beach County will be improved.

The 45th Street interchange of I-95 is a diamond interchange located in City of West Palm Beach, and in close proximity to the Town of Mangonia Park and the City of Riviera Beach in North Palm Beach County, Florida (Figure 1-1). The intersections in the area of influence of the interchange are Village Boulevard and Northpoint Boulevard on the west and Corporate Way and North Congress Avenue on the east. The adjacent interchanges are Blue Heron Boulevard interchange to the north (1.75 miles) and the Palm Beach Lakes Boulevard interchange to the south (2.80 miles). I-95 is a ten-lane divided interstate freeway providing four general purpose lanes and one high occupancy vehicle (HOV) lane in each direction. Auxiliary lanes are provided on both the northbound and southbound directions between 45th Street and Blue Heron Boulevard to the north. Within the study segment, I-95 passes over 45th Street on a bridge that accommodates ten lanes (Figure 1-2). I-95 is a designated SIS highway corridor. Both I-95 and 45th Street are designated as evacuation routes. 45th Street is a six-lane divided roadway with a raised landscape median within the vicinity of the I-95 interchange. Sidewalks are provided along both sides of 45th Street throughout the study area. Additionally, a bicycle lane is provided in both directions along 45th Street starting at the Harley Davidson entrance (west of I-95) to Corporate Way (east of I-95). There are two dedicated left-turn lanes in each direction to access the I-95 on-ramps and three through lanes in each direction. A single free-flow right-turn lane is provided on both eastbound and westbound along 45th Street to serve the I-95 on-ramps.



Figure 1-1
I-95 looking north just south of 45th Street.



Legend

- Project Limits (Approximate)
- Buffer Zone (500 Feet)



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



I-95/SR 9 Interchange at 45th Street
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TITLE:

Project Location Map

FIGURE:

1-2

The land use adjacent to the interchange is mainly residential, commercial, institutional and industrial. Commercial and industrial uses are predominant on the west side of I-95, while commercial and healthcare properties are along the east side of I-95. The South Florida Rail Corridor (SFRC)/CSX Railroad passes under I-95 in this area approximately one mile northwest of the 45th Street interchange. The adjacent signalized intersections are: Village Boulevard and Northpoint Boulevard/Metrocentre Boulevard west of the I-95 southbound ramps, and Corporate Way and N. Congress Avenue east of the I-95 northbound ramps.

Improvement to the I-95 interchange at 45th Street is consistent with the Cost Feasible Plan of the Palm Beach County Metropolitan Planning Organization (MPO)'s 2045 Long Range Transportation Plan (LRTP). *"The purpose is to improve interchange operations and reduce congestion, reduce potential for traffic spillback onto I-95, and increase safety. The improvements are needed to ensure that the I-95 interchange will meet FDOT Level-of-Service standards through year 2040."*

1.2 Background

The FDOT made improvements to the I-95 mainline in Palm Beach County in the 1990s and 2000s, adding a High Occupancy Vehicle (HOV) lane and auxiliary lanes from south of Linton Boulevard to north of PGA Boulevard. Minor interchange improvements were also made to eight of the existing 18 interchanges along this section of the corridor. At the time of the project, FDOT committed to re-examine the need for short-term and long-term interchange improvements at the interchanges that were not improved as part of that I-95 mainline project. FDOT District Four also identified the need to re-examine the 2003 I-95 Master Plan Study for Palm Beach County to develop new improvements to interchanges based on changes in traffic volumes and updated design standards since the Master Plan was developed.

A Concept Development Report (CDR) was prepared by the FDOT District Four Office of Planning and Environmental Management in August of 2014. The following are the recommendations identified for short-term and long-term improvements:

CDR Short Term Improvements:

- Third southbound left-turn lane at the I-95 southbound ramp;
- Third northbound left-turn lane and third right-turn lane at the I-95 northbound ramp;
- Additional westbound through lane from Congress Avenue to the I-95 northbound ramps.

CDR Long Term Improvements:

- Fourth through lane on eastbound 45th Street between Village Boulevard and Northpoint Boulevard;
- Fourth through lane on westbound 45th Street east of Congress Avenue;
- Fourth southbound left-turn lane at the I-95 southbound ramp;
- Fourth northbound left-turn lane at the I-95 northbound ramp.

Based on the benefits identified by the proposed improvements listed in the Concept Development Report, it was recommended that FDOT implement this package of proposed improvements to address operational and safety issues/deficiencies through 2040. Due to the proposed impacts and costs associated with the proposed improvements, a PD&E Study was recommended prior to design and project implementation.

1.3 Purpose and Need

The purpose of the study is to identify the short-term and long-term needs of I-95 and develop design concepts to address traffic spillback onto I-95, improve interchange operations, reduce congestion, and increase safety at the study interchange. This study will also consider SIS connector improvements needed within the project area and is consistent with plans for the I-95 mainline, including the potential extension of I-95 Express lanes through Palm Beach County.

Additional considerations for the purpose and need for this project include Capacity, Transportation Demand, Safety, Planning Consistency, Social Demands/Economic Development, Modal Interrelationships, and System Linkage.

Capacity

Traffic operational analyses were conducted at six study intersections on 45th Street to determine the existing delay and Level of Service (LOS).

During the AM and PM peak hours, the existing conditions (2016) are as follows for the following intersections on 45th Street [Name of intersection, overall LOS (AM/PM)]:

- Village Boulevard: (C/C)
- Northpoint Boulevard: (C/C)
- I-95 southbound ramps: (C/C)
- I-95 northbound ramps: (C/C)
- Corporate Way: (C/C)
- Congress Avenue: (C/D)

Operational analyses were conducted to evaluate for year 2040 No Build conditions (without roadway improvements) at the six intersections for AM and PM peak hours. The 2040 No Build conditions are predicted as follows: [Name of intersection, overall LOS (AM/PM)]:

- Village Boulevard: (D/D)
- Northpoint Boulevard: (D/D)
- I-95 southbound ramps: (F/C)
- I-95 northbound ramps: (F/D)
- Corporate Way: (C/B)
- Congress Avenue: (D/E)

Under the existing conditions scenarios, most of the intersections operate at LOS C. Under the project 2040 No Build conditions, most intersections operate at LOS D or worse. If no improvements are made by 2040, all intersections will experience excessive delays and queuing and operate below acceptable LOS standards (LOS D) during both the AM and PM peak periods.

Transportation Demand

According to the US Census, the county experienced a population growth from 1,320,134 in 2010 to 1,372,171 in 2013, representing an increase of 3.94%. Evaluating the population growth for the City of West Palm Beach, the City has grown from a population of 99,919 in 2010 to 102,436 in 2013 representing an increase of 2.52%. The population of Palm Beach County is projected to increase from 1,372,171 in 2013 to 1,715,300 in 2040 (US Census), representing an increase of 25%. The commercial areas along 45th Street and the new businesses taking advantage of areas designated as special impact zones will further increase the transportation demand along the proposed project area that will contribute to congested conditions. As the population of the county and city increases, developments in the county will continue to grow thereby increasing the amount of traffic. Improvements to the existing interchange is expected to provide mobility to the residents and commuters in this area.

Traffic Safety

The crash analysis results reveal that there was a total of 869 crashes on I-95 from Palm Beach Lakes Boulevard to Blue Heron Boulevard during the four study years (2011-2014). Of these 869 crashes, rear end crashes were the most common type of crash accounting for 37.5% of total crashes followed by sideswipe crashes accounting for 16.3% of total crashes. The 869 crashes included 1,671 vehicles. There were 627 injuries, 58 severe injuries and 10 fatalities. The average crash rate for the I-95 mainline segment within the study limits is 0.06 and is lower than the statewide average crash rate of 0.75 for similar interstate facilities. Summaries of the crash analysis are provided in [Table 1-1](#).

The crash analysis results reveal that there was a total of 174 crashes on 45th Street from Village Boulevard to Congress Avenue during the four study years (2011-2014). Of these 174 crashes, rear end crashes were the most common type of crash accounting for 48.3% of total crashes followed by angled crashes accounting for 25.9% of total crashes. The 174 crashes included 378 vehicles, 4 pedestrians and 2 cyclists. There were 164 injuries, 14 severe injuries and 1 fatality. The average crash rate for 45th Street within the study limits is 2.72 and is lower

than the statewide average crash rate of 3.20 for similar arterial facilities. Summaries of the crash analysis are provided in [Table 1-2](#).

Table 1-1: I-95 Crash Summary (2011 to 2014)

Crash Type	Number of Crashes				4-Year Total Crashes	Percent of Total	Mean Crashes Per Year
	Year						
	2011	2012	2013	2014			
Front to Rear (Rear End)	71	67	75	113	326	37.5%	81.5
Front to Front	2	0	1	4	7	0.8%	1.75
Angle	17	28	21	28	94	10.8%	23.5
Sideswipe, same direction	31	31	26	54	142	16.3%	35.5
Sideswipe, opposite direction	2	0	3	0	5	0.6%	1.25
Rear to Side	0	0	0	0	0	0.0%	0
Rear to Rear	0	0	1	0	1	0.1%	0.25
Other	54	60	73	79	266	30.6%	66.5
Unknown	5	5	4	14	28	3.2%	7
Total Crashes	182	191	204	292	869	100.0%	217.25

Table 1-2: 45th Street Crash Summary (2011 to 2014)

Crash Type	Number of Crashes				4-Year Total Crashes	Percent of Total	Mean Crashes Per Year
	Year						
	2011	2012	2013	2014			
Front to Rear (Rear End)	12	13	29	30	84	48.3%	21
Front to Front	1	4	0	3	8	4.6%	2
Angle	8	12	10	15	45	25.9%	11.25
Sideswipe, same direction	0	3	0	6	9	5.2%	2.25
Sideswipe, opposite direction	0	0	1	0	1	0.6%	0.25
Rear to Side	0	0	0	1	1	0.6%	0.25
Rear to Rear	0	0	0	0	0	0.0%	0
Other	2	0	5	4	11	6.3%	2.75
Unknown	12	0	0	3	15	8.6%	3.75
Total Crashes	35	32	45	62	174	100.0%	43.5

Plan Consistency

The Palm Beach County MPO 2040 Long Range Transportation Plan (LRTP) identified the I-95 at 45th Street Interchange as a Local Stakeholder Project Request. The Master Comprehensive Bicycle Transportation Plan (MCBTP) - Bicycle Facility Recommendation Map designates 45th Street, both east and west of the I-95 interchange, as a "Re-Stripe Candidate" and the Bicycle Needs Map designates 45th Street, both east and west of I-95 interchange, as

"Enhanced Priority, Needs Improvement" (Bike LOS C). These designations will be taken into consideration during the PD&E phase such that the designated bicycle lanes can be provided whenever possible.

The FDOT Five-Year Work Program identifies a traffic operations project to install a new dynamic message sign (DMS) on 45th Street east and west of the I-95 interchange.

Social Demand and Economic Development

The Future Land Use Plan for the City of West Palm Beach (June, 2013) identifies the areas north of the interchange to be Industrial uses in a Special Impact Zone to the west of the interchange and Industrial, Conservation and Community Service to the east. Areas to the south of the interchange are identified to be Commercial in a Special Impact Zone and single family to the west of the interchange, and Conservation, Commercial in Special Impact Zone, and Single Family to the west. Special Impact Zones (SIZ) are areas where the City denotes heighten site plan review and compatibility analysis to reduce potential land use incompatibilities. The proposed improvements at the I-95 and 45th Street interchange will improve mobility and support the economic development of the local businesses as well as stimulate major construction activities that will contribute to the economic growth within the area.

The Florida Division of Emergency Management designates specific routes that residents and visitors can use in case of emergency situations to vacate specific areas. Based on Palm Beach County's Evacuation Routes and Zones Map, 45th Street is classified as an evacuation route from SR 809 to SR A1A, which includes the section of 45th Street in the vicinity of I-95. Serving as part of the evacuation route network, I-95 and 45th Street play an important role in facilitating traffic movement during emergency evacuation periods. As the population of the County continues to increase, the proposed improvements on the I-95 and 45th Street interchange will enhance capacity and mobility for residents during evacuation.

Currently, along 45th Street are commercial properties consisting of retail and professional offices with a few industrial and non-residential properties. To the north are retail/offices such as North Village Square, Lockheed Martin, Boys & Girls Club, and various corporate plazas

that house different commercial establishments. To the south are also mainly hotel and commercial and food establishments, and an educational facility, Lincoln College of Technology. There is a residential area in the southwest portion of the interchange.

Modal Interrelationships

Currently, there are sidewalks and crosswalks along both sides of 45th Street within the vicinity of the interchange; however, not all sidewalks and crosswalks meet the Americans with Disabilities Act (ADA) requirements. Bicycle lanes are currently provided along 45th Street from Corporate Way and continuing west through Village Boulevard, except for a missing section just east of Northpoint Boulevard. As part of the proposed improvements for the interchange, sidewalks and crosswalks within the limits of construction shall be upgraded to meet ADA standards. Bicycle lanes are recommended in conjunction with the recommended lane widening both east of Corporate Way as well as the missing section east of Northpoint Boulevard.

The Mangonia Park Tri-Rail Station is located on 45th Street, approximately 1.3 miles east of the I-95 interchange. The station provides 272 parking spaces and also provides a park-and-ride designated area. The Mangonia Park Tri-Rail Station is accessed by Palm Beach County Transit, Palm Tran, Routes 2, 31, and 33. 45th Street in the vicinity of the I-95 interchange is served by Palm Tran Route 31. Congress Avenue and 45th Street are also served by transit routes. 45th Street is designated as a SIS Connector from I-95 to the Tri-Rail Station. The proposed improvements on the I-95 and 45th Street interchange will improve access to the Tri-Rail Station thus encouraging ridership.

System Linkage

The proposed project at I-95 and 45th Street will help improve connectivity and capacity within the roadway network by addressing traffic spillback onto I-95 and improving interchange connections. The proposed project enhances mobility to the residential and commercial areas along 45th Street, which provides east-west access in North West Palm Beach and Palm Beach County.

The primary need of the project is to alleviate existing and future traffic congestion thereby improving safety at the interchange. Recent studies completed in the region such as the I-95 Interchange at 45th Street Interchange Concept Development Report completed in 2014 identified operational deficiencies at ramps, the terminal intersections, and the adjacent intersections. Existing observations also show increased truck traffic from I-95 to Congress Avenue heading to the Port of Palm Beach contributing to the congestions in the study area. If no operational and safety improvements are made within the interchange area, conditions will become progressively worse as traffic volumes continue to increase, thereby increasing the number of crashes and deteriorating access of this interchange.

1.4 Related Projects within the Study Area

Coordination with both state and local transportation agencies was maintained throughout the PD&E Study to assure that recently completed, ongoing, and programmed study and design efforts affecting other components of the regional transportation network were incorporated into this study's findings. A great emphasis was placed on identifying those efforts undertaken by others that would be influenced by, or that could influence, the I-95 at 45th Street PD&E Study effort. This held true for both short-term and long-term transportation network improvements intersecting and/or influencing traffic volumes within the study corridor. There are no major project improvements planned within the Study Area.

1.5 Public Outreach

Florida Department of Transportation (FDOT), District Four recognizes that the success of any transportation improvement is dependent upon a proactive and consistent successful public outreach effort. As such, FDOT is committed to conducting a Public Involvement Program that focuses on soliciting community interaction and incorporates an extensive evaluation of community impacts and opinions throughout the public involvement process. The positive value of implementing a strong and proactive public involvement effort generally results in public awareness of the project, as well as support for the project.

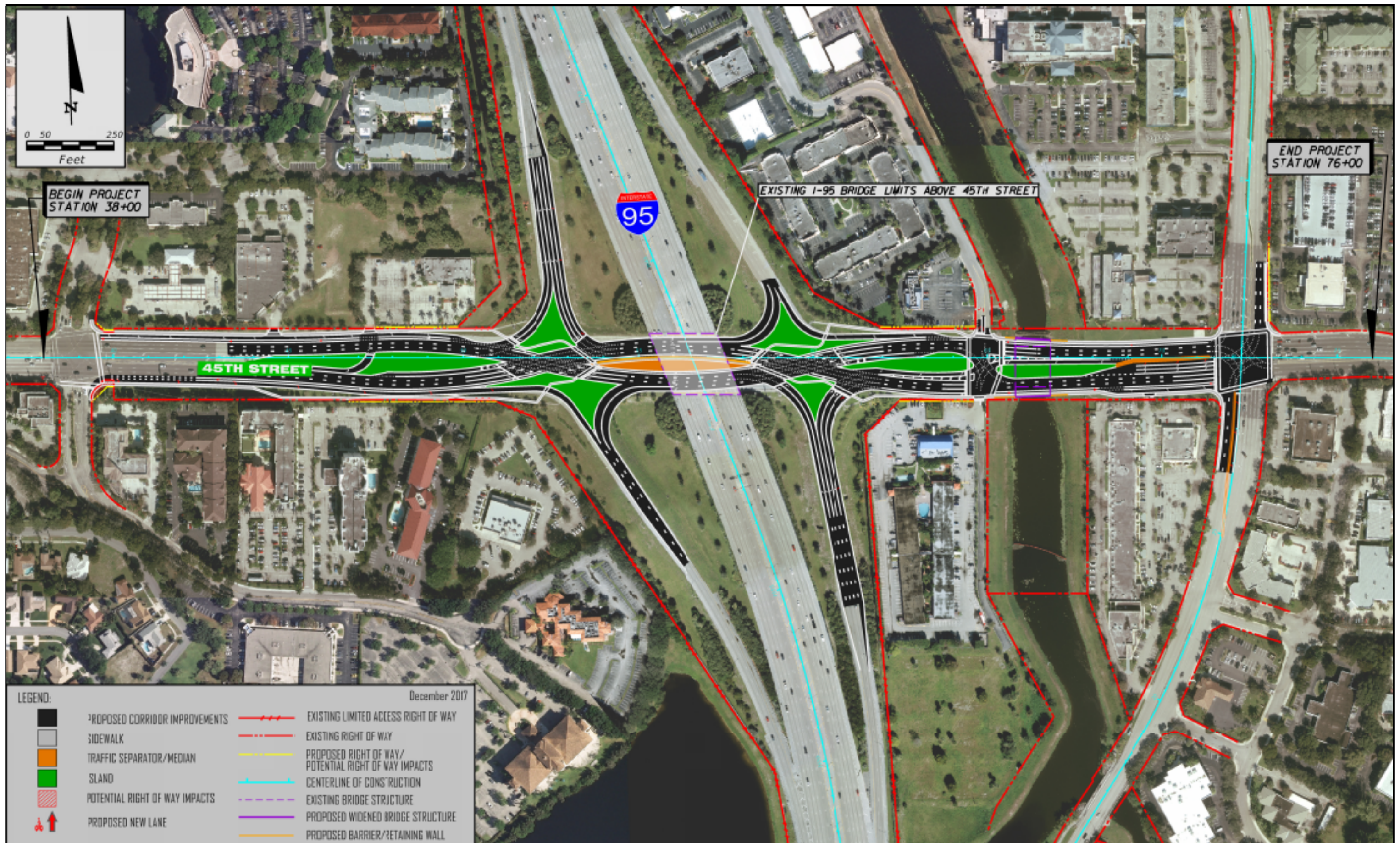
The Public Involvement Program is a working document which will be updated and amended throughout the project development process to incorporate the latest public involvement policies and techniques as they evolve during the life of the project. The Program outlines the public involvement approach and activities required to be undertaken with the project, including lists of the contact persons, such as concern citizens, private groups (residential/business), officials, agencies, and media, and the means used to involve them in the process. The collection of public input occurs throughout the entire project duration.

The program is in compliance with the FDOT's, Project Development and Environment (PD&E) Manual, Part I, Chapter 11, Section 339.155, Florida Statutes, Executive Orders 11990 & 11988, Council on Environmental Quality Regulation for implementing the procedural provisions of the National Environmental Policy Act (NEPA) and 23 Code of Federal Regulation Part 771. FDOT is dedicated to implementing a Public Involvement Program that will successfully obtain community input and at the time is flexible to change during the PD&E process if warranted by the community's changing needs.

1.6 Recommendation

Based on a comprehensive comparative analysis (see Section 5), which considered impacts to the natural, physical, and social environment, input from the local community and local government, operational and engineering issues, and construction cost, the project team selected Alternative 2, implementation of a Diverging Diamond Interchange, as the Recommended Alternative. The recommended alternative will meet the purpose and need of the project, have minimal environmental impacts, requires minimal amount of right-of-way, and is the most acceptable to the community. The construction cost for this alternative is approximately \$14,919,000.

The following describes the proposed improvements for the recommended alternative (Figure 1-3):



December 2017

LEGEND:

	PROPOSED CORRIDOR IMPROVEMENTS		EXISTING LIMITED ACCESS RIGHT OF WAY
	SIDEWALK		EXISTING RIGHT OF WAY
	TRAFFIC SEPARATOR/MEDIAN		PROPOSED RIGHT OF WAY/POTENTIAL RIGHT OF WAY IMPACTS
	ISLAND		CENTERLINE OF CONSTRUCTION
	POTENTIAL RIGHT OF WAY IMPACTS		EXISTING BRIDGE STRUCTURE
	PROPOSED NEW LANE		PROPOSED WIDENED BRIDGE STRUCTURE
			PROPOSED BARRIER/RETAINING WALL

- Modify the existing Diamond Interchange to a Diverging Diamond Interchange (DDI) configuration, which provides three continuous through lanes through the interchange with two free-flow left-turn lanes into the I-95 on ramps;
- Provide one bike lane in each direction from Northpoint Boulevard to Congress Avenue;
- Extend the 45th Street eastbound to I-95 southbound on-ramp to start at Northpoint Boulevard;
- Provide one additional left-turn lane at the I-95 southbound off-ramp intersection;
- Provide new overhead signage at the I-95 southbound off-ramp to indicate three lanes to East 45th Street and two lanes to West 45th Street;
- Provide one additional right-turn lane at the I-95 northbound off-ramp intersection;
- Provide new overhead signage at the I-95 northbound off-ramp to indicate two lanes to West 45th Street, one lane to North Congress Avenue, and two lanes to East 45th Street;
- Widen the existing bridge along 45th Street over the C-17 Canal to accommodate one bike lane and one sidewalk in each direction;
- Add one additional left-turn lane from eastbound 45th Street to northbound Congress Avenue to provide triple left turns at the intersection;
- Add one additional left-turn lane from northbound Congress Avenue to westbound 45th Street to provide triple left turns at the intersection;
- Provide travel information system;
- Develop coordinated signal system strategies at the interchange.

1.7 Commitments

The following commitments have been made by FDOT and will be adhered to during the final design and/or construction phases:

1. The Department committed to the City of West Palm Beach to extend the bicycle lanes along the project study limits, over the C-17 Canal to Congress Avenue.
2. The Department committed to the Town of Mangonia Park and the City of West Palm Beach to reduce the right-of-way impacts associated with the proposed improvements as much as possible.
3. FDOT commits to adhere to the most recent version of the US Fish and Wildlife Service's "Standard Protection Measures for Eastern Indigo Snake" during construction to prevent impacts to species.

2 EXISTING CONDITIONS

The following section summarizes the existing conditions within the project study limits.

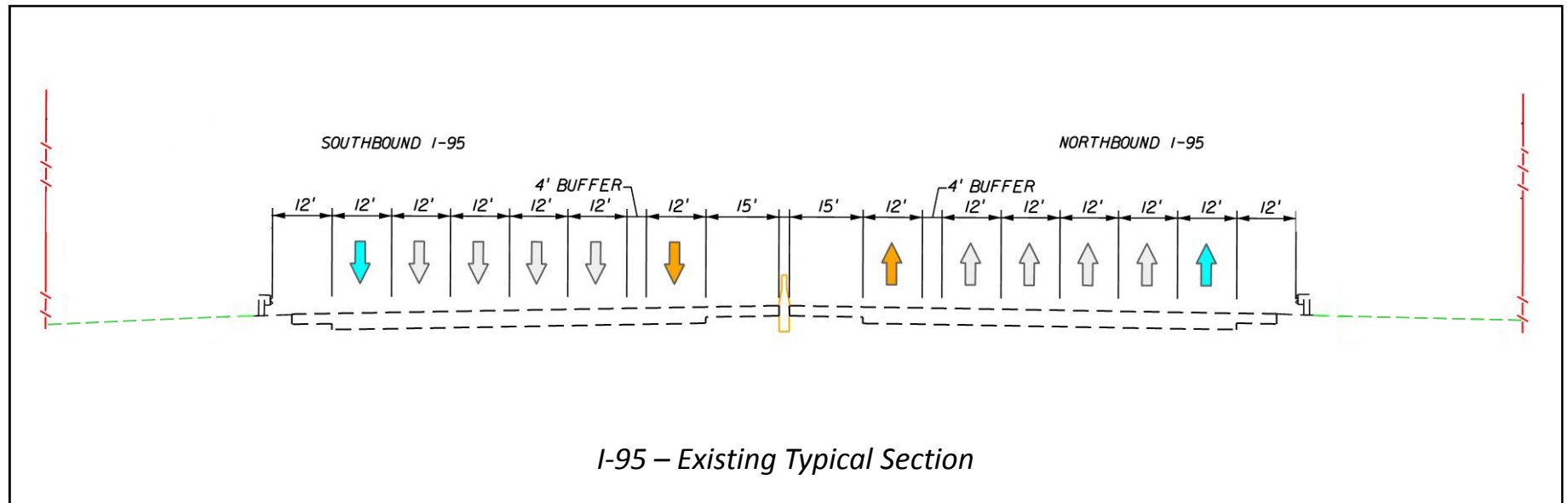
2.1 Functional Classification

I-95 within the project limits is a ten-lane Urban Principal Arterial Interstate. I-95, between the ramps at 45th Street, has four general purpose lanes and one High Occupancy Vehicle (HOV) lane in each direction. The HOV lanes are utilized from Monday through Friday from 7:00-9:00 AM and 4:00-6:00 PM; all other times the HOV lanes can be used as general purpose lanes. Auxiliary lanes are provided on the both northbound and southbound directions between 45th Street and Blue Heron Boulevard to the north. 45th Street is classified as a six-lane divided Urban Minor Arterial, and is maintained by Palm Beach County. It is categorized as a FDOT Class I arterial with posted speed limit of 45 mph west of the interchange and 40 mph east of the interchange.

2.2 Typical Sections

I-95 Typical Section: The I-95 typical section, between the ramps at 45th Street, consists of a ten-lane divided section providing four general purpose lanes and one HOV lane in each direction with inside and outside shoulders. Auxiliary lanes are provided on the both northbound and southbound directions between 45th Street and Blue Heron Boulevard to the north. Within the study segment, I-95 passes over 45th Street on a bridge that accommodates ten lanes. **Figure 2-1** depicts the typical sections for I-95.

45th Street Typical Section: The 45th Street typical section within the limits of the limited access right-of-way is a six-lane urban divided roadway with a raised landscaped median. There are two dedicated left-turn lanes to access the I-95 on-ramps and three through lanes in each direction underneath the I-95 overpass. The EB and WB lanes are separated by median containing a raised concrete barrier wall as well as support piers for the I-95 overpass. **Figure 2-2** depicts the typical sections for 45th Street.



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



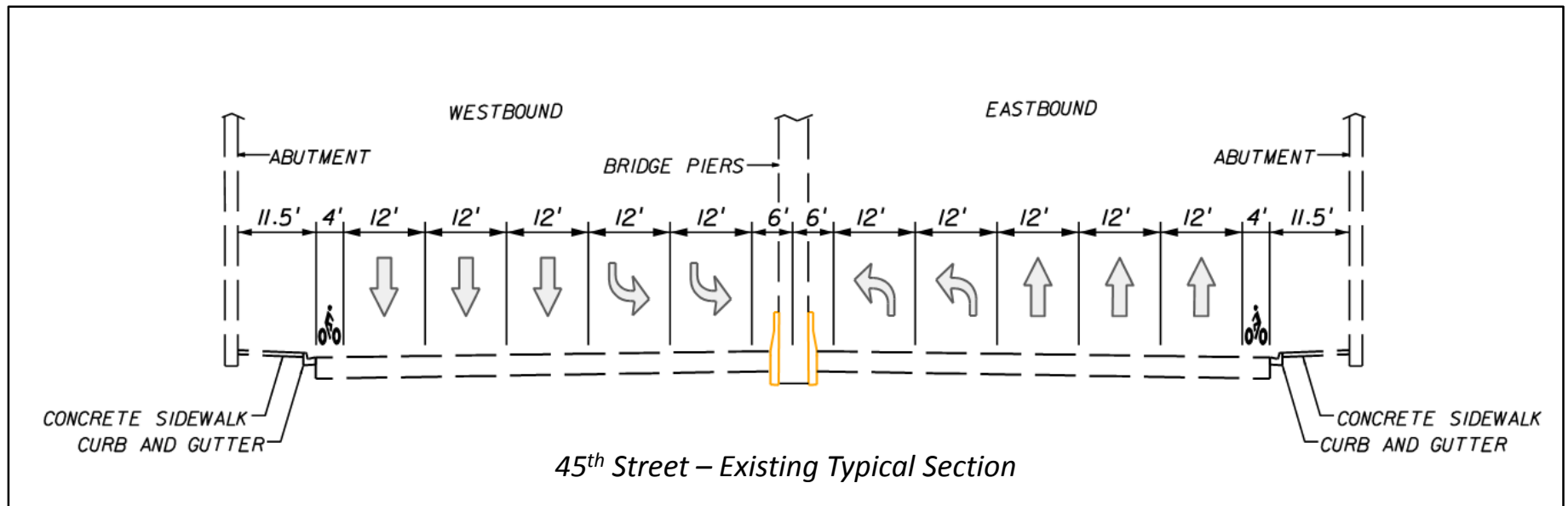
I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

I-95 – Existing Typical Section

FIGURE:

2-1



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

45th Street – Existing Typical Section

FIGURE:

2-2

2.3 Right-of-Way

The existing limited access right-of-way along the I-95 mainline is typically 300-ft. The existing right-of-way along 45th street varies between Village Boulevard and Congress Avenue. [Table 2-1](#) shows the existing right-of-way along the study corridors.

Table 2-1: Existing Right-of-Way

ROADWAY	SEGMENT	R/W WIDTH
I-95	Mainline	300-ft
45 th Street	Village Boulevard to Northpoint Boulevard	128-ft
45 th Street	Northpoint Boulevard to I-95 southbound ramps	200-ft
45 th Street	Underneath the I-95 overpass	160-ft
45 th Street	I-95 northbound ramps to Congress Avenue	200-ft
45 th Street	East of Congress Avenue	130-ft

2.4 Pedestrian Accommodations

Florida Statute Title XXIII, Chapter 316, Section 316.091, prohibits pedestrians and bicycles from operating and/or traveling on any limited access facilities. As such, there are no pedestrian or bicycle facilities along I-95 and ramp connectors within the interchange areas. However, the I-95 interchange at 45th Street accommodates east-west sidewalks on the north and south sides of 45th Street from Village Boulevard to Congress Avenue.

Crosswalks are provided at the interchange between all east-west sidewalks crossing the I-95 northbound and southbound on- and off-ramps. Crosswalks at the northbound and southbound on- and off-ramps are two-stage, providing a travel way across the left-turn lanes to a raised concrete island and then across the right-turn lane to the sidewalk along 45th Street. Pedestrian signal heads are provided at the crosswalks across the left-turn lanes for both the on- and off-ramps, and for the channelized right-turn lanes at the I-95 northbound and southbound off-ramps.

The Northpoint Boulevard, Corporate Way, and Congress Avenue intersections have crosswalks on all four approaches. The intersection of Village Boulevard at 45th Street has crosswalks on the north, south, and west approaches. Pedestrian signal heads without the countdown feature are provided at all crosswalks at the intersections of Village Boulevard, Northpoint Boulevard, and Corporate Way along 45th Street. The intersection of Congress Avenue along 45th Street has pedestrian countdown signal heads at all the crosswalks. The Northpoint Boulevard, Village Boulevard, and Congress Avenue intersection sidewalk approaches do not have tactile domes. The Corporate Way intersection sidewalk approaches have tactile domes cast in the concrete which do not meet the ADA requirements. However, as part of the proposed improvements for the interchange, sidewalks and crosswalks within the limits of construction shall be updated to meet ADA standards.

2.5 Bicycle Facilities

45th Street provides designated bicycle lanes in the eastbound and westbound directions from just west of the I-95 interchange to Corporate Way. Undesignated bicycle lanes are provided west of Northpoint Boulevard and extend west beyond Village Boulevard. Bicycle lanes are recommended as part of the proposed improvements within the limits of construction.

2.6 Geometric Elements

The existing geometric elements for the major transportation corridor and interchange ramps were reviewed from the available as-built plans obtained from the FDOT District Four.

2.6.1 Horizontal Alignment

A review of the existing horizontal geometry for the major roadway segments and ramps was performed as part of this PD&E Study. The existing horizontal alignment of I-95 was evaluated to determine if the existing facility meets the current design standards for horizontal curve and sight distance. The design elements evaluated included: curve radius, curve length, stopping sight distance (SSD), and superelevation of the roadway surface.

The mainline alignment contains one horizontal curve within the study limits. The radius of this horizontal curve meets current FDOT and American Association of State Highway and Transportation Officials (AASHTO) criteria for a 70 MPH design speed. [Table 2-2](#) summarizes the geometric characteristics of the existing horizontal alignment.

2.6.2 Vertical Alignment

The existing vertical alignment was evaluated to determine if the existing facilities meet the current design standards for vertical curve and sight distance. The design elements evaluated included: percent grade, change in grade, SSD, length of vertical curve, and K value.

The K value of a vertical curve can be determine as the length of the curve divided by the change in grade of the curve. The minimum K value according to the Plans Preparation Manual (PPM) Volume I, Chapter 2, Section 2.8.2, is based on a minimum SSD requirement. If the curve K meets the minimum criteria, the SSD criterion is also met. The minimum K value assign to the crest vertical curve is based on the headlight illumination distance. The minimum length of the vertical curves and the percent grades were also verified against the criteria in Section 2.8.2 of the PPM. [Table 2-3](#) summarizes the vertical alignment data.

Table 2-2: Existing Horizontal Alignment Characteristics

Location	PI Station	Radius of Curve (ft)	Length of Curve (ft)	Degree of Curve (D)	Deflection Angle (Δ)	Super-elevation (e)	SSD Value	SSD Required by PPM		SSD Required by AASHTO		Length of Curve Required (ft) By PPM	
I-95	1649+06.05	4,583.75	1,771.89	1° 15' 00"	22° 08' 53" (LT)	0.046	761*	820	✖	730	✓	1,050	✓
SB I-95 on ramp from 45 th Street	-	2,250.00	1,109.38	2° 32' 47"	28° 15' 00" (LT)	0.086	538	425	✓	425	✓	400	✓
SB I-95 off ramp to 45 th Street	-	3,863.15	647.52	1° 28' 59"	9° 36' 13" (LT)	0.031	704	425	✓	425	✓	400	✓
NB I-95 off ramp to 45 th Street	-	2,388.98	404.45	2° 23' 54"	9° 42' 01" (LT)	0.047	580	425	✓	425	✓	400	✓
NB I-95 on ramp from 45 th Street	-	7,639.00	1,336.33	0° 45' 00"	10° 01' 23" (RT)	0.028	1,020	425	✓	425	✓	400	✓
WB 45 th Street east of I-95	60+68.76	5,704.74	367.89	1° 00' 16"	3° 41' 42" (RT)	NC	-	-	-	-	-	400	✖
WB 45 th Street east of I-95	64+04.40	5,704.74	303.45	1° 00' 16"	3° 02' 52" (LT)	NC	-	-	-	-	-	400	✖

NC = Normal Crown

*Minimum SSD along SB outside lane

Table 2-3: Existing Vertical Alignment Characteristics

Location	Type of Curve	VPI Station	VPI Elevation (ft)	Grade (back) %	Grade (ahead) %	Length of Curve (ft)	K-Value	K-Value Required By PPM		K-Value Required By AASHTO		Length of Curve Required (ft) By PPM	
I-95 at 45 th Street	Sag	1649+81.46	20.38	(+) 0.000	(+) 3.000	560	187	206	✖	181	✓	800	✖
I-95 at 45 th Street	Crest	1661+81.46	56.38	(+) 3.000	(-) 3.000	1,800	300	506	✖	247	✓	1,800	✓
I-95 at 45 th Street	Sag	1674+71.46	17.68	(-) 3.000	(-) 0.100	560	280	206	✓	181	✓	800	✖
SB I-95 on ramp from 45 th Street	Crest	-	19.67	(+) 1.060	(-) 0.088	200	174	136	✓	84	✓	150*	✓
SB I-95 off ramp to 45 th Street	Crest	-	19.75	(+) 0.415	(-) 1.300	230	134	136	✖	84	✓	150*	✓
NB I-95 off ramp to 45 th Street	Crest	-	25.63	(+) 1.406	(-) 1.024	320	132	136	✖	84	✓	150*	✓
NB I-95 off ramp to 45 th Street	Sag	-	19.18	(-) 1.024	(-) 0.500	100	191	96	✓	96	✓	150*	✖
NB I-95 on ramp from 45 th Street	Crest	-	19.33	(+) 0.261	(-) 1.200	200	137	136	✓	84	✓	150*	✓

*3 X design speed

2.7 Design and Posted Speed

According to FDOT roadway plans for the existing facility, the design speed along I-95 within the project limits is 70 MPH, and the existing posted speed limit is 65 MPH. The existing design speed for 45th Street is 40 MPH east of I-95 and 45 MPH west of I-95, with a posted speed limit of 40 MPH east of I-95 and 45 MPH west of I-95.

2.8 Lighting

Dual arm, conventional cobrahead lighting is provided in the median of the I-95 mainline. Conventional cobrahead lighting is provided along the outside shoulder of the on- and off-ramps. Additionally, conventional cobrahead lighting is provided along both sides of 45th Street within the interchange area, however, lighting is sparsely provided between Northpoint Boulevard/Metrocentre Boulevard and the I-95 southbound off-ramps.

2.9 Existing Intersections and Traffic Signals

Six intersections were analyzed along 45th Street within the project limits. All six intersection and signal controlled. The existing intersections within the corridor are listed below:

- Village Boulevard
- Northpoint Boulevard
- I-95 southbound ramps
- I-95 northbound ramps
- Corporate Way
- Congress Avenue

2.10 Existing Roadway Signage

An existing corridor sign inventory was performed within the study limits. Signs are typically classified as guide signs, motorist information signs (general service signs), and Intelligent Transportation System (ITS) signs. As part of the documentation effort, each major roadway sign was photographed, inventoried, numbered, classified, and located on aerial photography.

The sign structure numbers were also collected where available. The Existing Sign Inventory can be found on [Appendix A](#).

2.11 Intelligent Transportation System

ITS components within the I-95 limits include Closed Circuit Television (CCTV) cameras, Road Weather Information System (RWIS) and Highway Advisory Radio (HAR) transmitters with beacons typically spaced at 1.5-mile intervals and generally located on the east side of the corridor. Non-intrusive vehicle detectors are installed along the corridor and are spaced at one mile intervals generally on the east side of the corridor.

Dynamic Message Signs (DMS) exist on overhead structures in both the northbound and southbound travel directions of I-95 between 45th Street and Palm Beach Lake Boulevard interchanges. Wireless components are installed on the CCTV/ Microwave Vehicle Detection System (MVDS)/Voice over IP (VoIP) concrete poles to provide communications for Road Ranger mobile access and VoIP applications. These field elements are connected to District Four's SMART SunGuide® Transportation Management Center via the fiber optic based Ethernet communication network along I-95. The existing underground infrastructure consists of one 144-count single-mode fiber optic cable in one 2" High Density Polyethylene (HDPE) conduit, one 2" HDPE spare conduit, and one 2" HDPE conduit with electrical service conductors.

There is one DMS structure on the south side of 45th Street just east of Northpoint Boulevard. No other ITS signs are located along 45th Street.

2.12 Existing Drainage

The project is located within boundaries of the South Florida Water Management District (SFWMD) and as such SFWMD will be the principal permitting agency. The existing stormwater management facilities that serve I-95 were permitted in 2003 under the I-95 HOV lane project from North of Palm Beach Lakes Boulevard to South of Northlake Boulevard. The

HOV Lane project modified the original permit (SFWMD ERP 50-03525-S) that was issued for the I-95 Auxiliary Lanes between 45th Street and Blue Heron Boulevard in September of 1995.

The existing terrain is relatively flat and as expected for coastal areas of South Florida. Runoff is collected in collection systems and piped to swales within the right-of-way. Some of these are treatment swales and some are conveyance swales. They are connected together within the right-of-way until they are discharged through a control structure into the receiving water. The C-17 Canal for the north half of the interchange and the EPB 10 Canal for the southern half. Existing stormwater systems were designed to provide water quality treatment in infield dry detention basins based on 2.5 inches over the impervious area and limiting post discharge to pre-development levels.

All drainage design and analysis completed for and reported within this report is based on the North American Vertical Datum, 1988 (NAVD 88). The conversion from National Geodetic Vertical Datum of 1929, which some older reference documents and permits utilize, is: NGVD -1.545 = NAVD

According to current National Oceanic and Atmospheric Administration (NOAA) precipitation frequency estimates the 25-year, 72-hour rainfall total for the project area is 13.5 inches. Current permit documentation indicates that the existing systems were designed using 14 inches of rainfall for the same event. For the purpose of this analysis the permitted condition rainfall amount was utilized. Copies of the NOAA data are included in the Drainage and Pond Siting Report prepared for this project.

The 45th Street interchange lies within Basins C and D as previously permitted. As such, runoff from the interchange discharges to the C-17 Canal and the EPB 10 Canal and will be required to meet SFWMD quantity and quality criteria.

Basin B was modeled with Basin C as they share an outfall. The allowable discharge for the combined basin is 70.2 cfs and the permitted peak discharge from the system is 42.61cfs with a peak stage of 13.9 (NGVD). The required TV in basin C was 2.36 ac-ft. and 4.5 ac-ft. were provided within the dry detention ponds. Leaving an excess TV of 2.14 ac-ft., Basin D has an allowable discharge of 78.2 cfs and a permitted peak discharge of 67.2 cfs with a peak stage

of 13.81. Basin D has an excess treatment volume of 9.61 ac-ft. provided in the dry detention systems.

2.13 Existing Geotechnical Characteristics

Soils within the project area are primarily classified as urban land complexes consisting largely of Basinger, Myakka, Immokalee and Arents type map units consisting of low slope fine sands, with some organics and muck. A copy of a USGS Web Soil Survey (WSS) report is included in the Drainage and Pond Siting Report prepared for this project.

The *Soil Survey of Palm Beach County Area, Florida*, published by the United States Department of Agriculture (USDA), was reviewed for general near-surface soil information within the general project vicinity.

2.14 Utilities

All Utility Agency/Owners (UAO) as listed on the design ticket obtained via Sunshine 811 have been contacted and have provided either marked plans, as-built/record information, or “no conflict” / “no facilities” letters. The involved utilities are listed in [Table 2-4](#).

Overhead utilities are provided beginning just west of the I-95 southbound ramps intersection and continue west along the eastbound lanes of 45th Street. Overhead utilities are also provided beginning just east of I-95 northbound ramps intersection and continue east along the eastbound lanes of 45th Street. An overhead power line utility also crosses the 45th Street eastbound and westbound lanes just west of the I-95 southbound ramps intersection. High voltage electrical transmission lines cross I-95 approximately 2,300 feet north of 45th Street.

Table 2-4: Existing Utilities

Utility Company / Contact Person	Address	Phone / Email
Comcast - Boca/Delray Tony Springsteel	1495 NW Britt Rd Stuart, FL 34944	561-804-0973 anthony_springsteel@cable.comcast.com
American Traffic Solutions Santiago Martinez	1150 N Alma School Rd Mesa, AZ 85201	480-596-4595 santiago.martinez@atsol.com
City of Riviera Beach Utility District Leighton Walker	600 West Blue Heron Blvd Riviera Beach, FL 33404	n/a n/a
FDOT Palm Beach Katherine Rico	2300 N Jog Rd, Suite 4E 41E West Palm Beach, FL 33411	954-847-2680 n/a
Florida Gas Transmission Company Joseph E. Sanchez	2405 Lucien Way, Suite 200 Maitland FL, 32751	407-838-7171 joseph.e.sanchez@energytransfer.com
Florida Public Utilities Co Dale M Butcher	209 N Sapodilla Ave West Palm Beach, FL 33401	561-366-1635 dbutcher@fpuc.com
FPL Fibernet LLC Danny Haskett	9250 W Flagler St Miami, FL 33174	305-552-2931 danny.haskett@fpl.com
FPL Distribution Bill Thomas	810 Charlotte Ave. West Palm Beach, FL 33401	561-616-1628 w.g.thomas@fpl.com
FPL Transmission George Beck	700 Universe Blvd., TS4/JW Juno Beach, FL 33408	(561) 904-3604 george.beck@fpl.com
Level 3 Communications LLC	1025 Eldorado Blvd Broomfield, CO 80021	877-366-8344 ext. 2 n/a
Crown Castle NG Bryant Lowe	2000 Corporate Dr Canonsburg, FL 15317	724-416-2193 n/a
Palm Beach County Traffic Operations Rod Friedel	2300 Jog Rd West Palm Beach, FL 33411	561-681-4371 rfriedel@pbcgov.org
AT&T Distribution Dino Farruggio	1120 S Rogers Cir Boca Raton, FL 33487	561-997-0240 n/a
Sprint Nextel Mark Caldwell	851 Rafalgar Ct., Suite 300 Maitland FL, 32751	321-287-9942 mark.d.caldwell@sprint.com
City of West Palm Stormwater Tracy Ward	401 Clematis St West Palm Beach, FL 33401	561-494-1040 n/a
City of West Palm Beach Brian Collins	401 Clematis St West Palm Beach, FL 33401	561-494-1026 n/a
FPL Gas Kevin Gordon	2400 Port West Blvd West Palm Beach, FL 33407	561-845-4875 n/a

2.15 Railroads

A CSX/SFRC Railroad is located to the north of 45th Street along SR 710/Beeline Highway. This project will not be affected by the railroad.

2.16 Pavement Conditions

FDOT Office of Transportation Statistics Road Data Shape Files in GIS were reviewed and field observations confirmed the existing condition of the pavement. Based upon the research, the following values were obtained.

Roadway	Score
I-95 Mainline	4.0
I-95 Northbound Off-Ramp	4.0
I-95 Northbound On-Ramp	3.5
I-95 Southbound Off-Ramp	3.5
I-95 Southbound On-Ramp	3.5
45 th Street	3.0

The value depicted is based upon an overall pavement condition score as follows.

Value	Condition
<1.0	Very Poor (Virtually impassable)
1.0 to 2.0	Poor (Large potholes, deep cracks exists)
2.0 to 3.0	Fair (Rutting, cracking and extensive patching)
3.0 to 4.0	Good (First class ride, slight deterioration)
4.0 to 5.0	Very Good (New or nearly new)

2.17 Transit Service Network

The Mangonia Park Tri-Rail Station is located on 45th Street, approximately 1.3 miles east of the I-95 interchange. The station provides 272 parking spaces and also provides park-and-ride designated area. The Mangonia Park Tri-Rail station is accessed by Palm Beach County Transit (Palm Tran) Routes 20, 31, and 33.

45th Street in the vicinity of the I-95 interchange is served by Palm Tran Route 31. Route 31 runs along 45th Street from Haverhill Road to Australian Avenue. Additionally, Congress Avenue is served by Palm Tran Route 2. Route 2 runs along Congress Avenue from Blue

Heron Boulevard to Palm Beach Lakes Boulevard. Within the study limits, bus stops servicing Palm Tran Route 31 are located on the north and south sides of 45th Street between Village Boulevard and Congress Avenue. Bus stops servicing Palm Tran Route 2 are located on the east and west sides of Congress Avenue north and south of 45th Street (Figure 2-3).

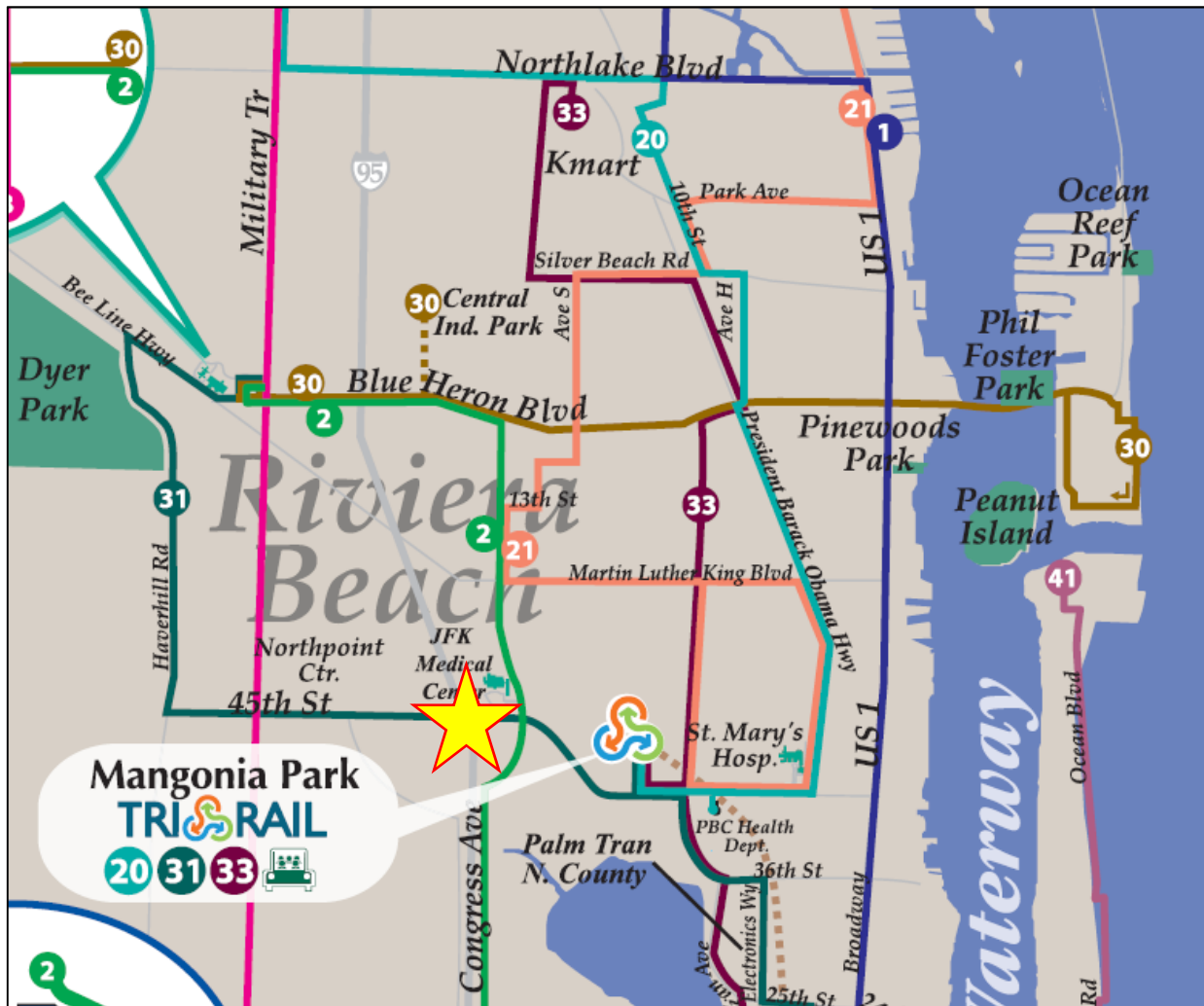


Figure 2-3
Existing Transit Routes along the Study Area

2.18 Existing Traffic

The primary sources of the traffic for project are field traffic counts, 2015 FTI DVD, and the SERPM model with base year 2010 and horizon year 2040.

The traffic data used for this study was collected in October 2015 on typical weekdays (Tuesday, Wednesday, and Thursday) at the intersections within the vicinity of the I-95 at 45th Street interchange. This data collection effort was performed during the peak season for traffic. In general, the traffic data for each intersection included 6-hour turning movement counts (6:00 AM to 9:00 AM, and 4:00 PM to 7:00 PM), including the Right-Turn-On-Red (RTOR) volumes, for three consecutive weekdays, 72-hour approach/departure machine counts for all the approaches, and vehicle classification counts for selected approaches at selected intersections.

In addition, the 72-hour classification counts from Tuesday to Thursday were collected for all the I-95 on and off ramps. As part of this study, traffic data for I-95 mainline were obtained from the District Statistics Unit, where the 2015 count data is available from FDOT's annual traffic data collection program.

Information from the 2014/2015 FTI DVD was used to obtain the remaining mainline and ramps traffic data and also to check reasonableness with previous studies volumes. Information from the 2014/2015 FTI DVD was used to confirm the growth rate used to develop future traffic. Adjustments were made if necessary to ensure that turning movement volumes at ramp terminals sum to the peak hour ramp volumes.

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

- The K factor is the proportion of the AADT occurring during the peak hour of the design year, depending upon the area type and facility type.
- The D factor is the proportion of the 30th highest hour of the design year traveling in the peak direction.

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

The traffic factors from the approved MLOU are recommended for use are presented in [Table 2-5](#). Additional details regarding development of traffic factors can be found in the *Project Traffic Forecast Memorandum*.

Table 2-5: Summary of Traffic Factors

Roadway	K	D	T_{24}	DHT	PHF
I-95 Mainline	9.0%	58.0%	8%	4%	0.95
Ramps	9.0%	100.0%	8%	4%	0.95
Study Arterials	9.0%	58.0%	8%	4%	0.95

Source: 2015 FDOT FTI DVD

A driver population factor (f_p) of 1.0 was used in the analysis due to the fact that the traffic stream characteristics within the study area are known to be representative of regular truck drivers and commuters who are familiar with the facilities.

2.18.1 Existing Operational Analysis

A detailed operational analysis for the Existing Year 2015 performed for individual roadway elements, i.e., mainline segments, ramp junctions, and study intersections.

HCS 2010 was used for the operational analysis of mainline segments. Ramp analysis was performed by calculating the v/c ratio at the study ramps. Synchro 9.0 was used for the analysis of study intersections. Documentation for the Existing Conditions analysis can be found in the Interchange Modification Report (IMR) prepared for this project.

Mainline Analysis

The Existing Year 2015 mainline analysis results are summarized in [Table 2-6](#). The results of the operational analysis show that all the mainline segments operate at an acceptable LOS in both the 2015 AM and PM peak hours. All segments operate at LOS of D or better. [Figure 2-4](#) illustrates the peak hour volumes and LOS results for the Existing Year 2015 mainline analysis.

Table 2-6: Existing Year 2015 Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density ¹	LOS	Volume	Density ¹	LOS
I-95 South of 45 th Street	NB	5	9,786	34.7	D	7,114	22.2	C
	SB	5	8,849	29.5	D	7,559	23.9	C
I-95 North of 45 th Street	NB	6	9,083	23.9	C	6,869	17.6	B
	SB	6	9,064	23.9	C	7,061	18.1	C

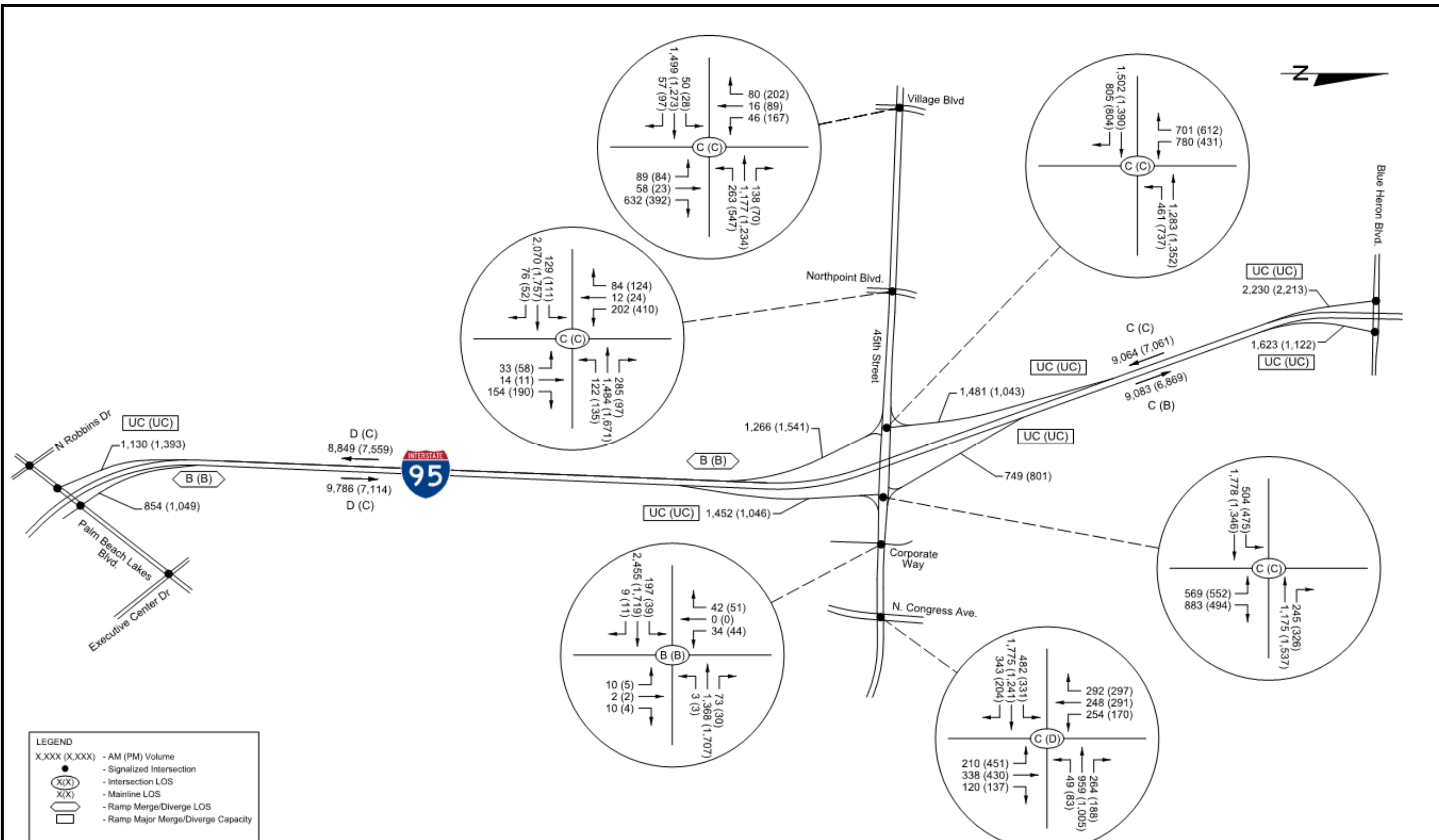
1. Density = passenger cars/mile/lane

Ramp Analysis

The Existing Year 2015 ramp analysis results are summarized in [Table 2-7](#). The results of the operational analysis show that all study ramps have adequate capacity based on the volume. [Figure 2-4](#) illustrates the peak hour volumes and v/c ratios for the Existing Year 2015 ramp analysis.

Table 2-7: Existing Year 2015 Ramp Analysis Summary

Interchange	Ramp	AM Peak Hour		PM Peak Hour	
		Volume	V/C	Volume	V/C
I-95 at Palm Beach Lakes Boulevard	NB On	854	0.21	1,049	0.26
	SB Off	1,130	0.28	1,393	0.35
I-95 at 45 th Street	NB Off	1,452	0.36	1,046	0.26
	NB On	749	0.19	801	0.20
	SB Off	1,481	0.37	1,043	0.26
	SB On	1,266	0.32	1,541	0.39
I-95 at Blue Heron Boulevard	NB Off	1,623	0.41	1,122	0.28
	SB On	2,230	0.56	2,213	0.55



Intersection Analysis

The Existing Year 2015 intersection analysis results are summarized in [Table 2-8](#). The intersections were analyzed using field signal timing and phasing plans. No signal optimization was performed when analyzing Existing Year 2015 conditions. In Existing Year 2015, there are no intersections within the study area that operate below the LOS standard. [Figure 3-4](#) illustrates the peak hour volumes and LOS results for the Existing Year 2015 intersections analysis.

Table 2-8: Existing Year 2015 Intersection Analysis Summary

Interchange	AM Peak Hour		PM Peak Hour	
	Delay ¹	LOS	Delay ¹	LOS
45 th Street at Village Boulevard	27.6	C	31.0	C
45 th Street at Northpoint Boulevard	24.0	C	30.5	C
45 th Street at SB Ramp Terminal	26.8	C	22.2	C
45 th Street at NB Ramp Terminal	34.9	C	30.1	C
45 th Street at Corporate Way	14.3	B	10.2	B
45 th Street at Congress Avenue	33.8	C	41.3	D

1. Density = passenger cars/mile/lane

In the existing year, the existing storage accommodates the 95th Percentile queue at all intersection approaches except the following:

- Southbound left turn at 45th Street at Northpoint Boulevard (PM Peak Hour)
- Northbound left turn at 45th Street at Congress Avenue (PM Peak Hour)

[Table 2-9](#) summarizes the queue analysis for Existing Year 2015.

Table 2-9: 95th Intersection Percentile Queue Length Summary – Existing Year 2015

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	48	486	1	174	29	0	132	136	-	45	-	-
	PM Peak	31	412	31	#414	42	m0	103	105	-	126	-	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	-	-
45 th Street at Northpoint Boulevard	AM Peak	m102	262	m7	100	472	19	36	-	153	150	-	-
	PM Peak	94	281	m0	m114	615	m11	54	-	156	268	-	-
	Existing Storage (feet)	475	1,000	275	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	357	69	154	166	-	-	-	-	270	-	248
	PM Peak	-	345	81	187	140	-	-	-	-	121	-	209
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	m125	218	-	-	248	0	190	-	361	-	-	-
	PM Peak	78	72	-	-	257	0	179	-	172	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m223	108	-	m7	198	-	-	-	-	72	-	-
	PM Peak	m36	104	-	m5	303	-	-	-	-	87	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	275	389	147	48	-	108	153	-	68	177	-	78
	PM Peak	143	257	87	72	-	56	#313	-	81	127	-	72
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

2.19 Safety Analysis

Vehicular crash data along 45th Street and I-95 were obtained from the FDOT Crash Analysis Reporting System (CARS). CARS is a database maintained annually by FDOT for crashes reported along state highway facilities. The database provides information on various characteristics associated with each crash including: collision type, severity, weather conditions, road surface conditions and date/time information. The crash data was collected for the most recent years available (2011-2014). The crashes were analyzed to make an assessment of safety conditions along I-95 and arterial roadways within the project limits and study interchanges.

The 'Average Crash Rate Method' of crash analysis, based on segment length, AADT, and number of crashes occurred, was used for calculating actual crash rate for the roadway segments. The actual crash rate for the study corridors from year 2011 to 2014 was compared with the statewide average crash rate for the same type of facility. No location in the study area is deemed a FDOT High Crash Location.

The crash analysis results reveal that there was a total of 869 crashes on I-95 from Palm Beach Lakes Boulevard to Blue Heron Boulevard during the four study years (2011-2014). Of these 869 crashes, rear end crashes were the most common type of crash accounting for 37.5% of total crashes followed by sideswipe crashes accounting for 16.3% of total crashes. The 869 crashes included 1,671 vehicles, 2 pedestrians and 1 cyclists. There were 627 injuries, 58 severe injuries and 10 fatalities. The average crash rate for the I-95 mainline segment within Palm Beach County is 0.06 and is lower than the statewide average crash rate of 0.75 for similar interstate facilities. Summaries of the crash analysis are provided in [Table 2-10](#) and [Table 2-11](#).

Table 2-10: I-95 Crash Summary (2011 to 2014)

Crash Type	Number of Crashes				4-Year Total Crashes	Percent of Total	Mean Crashes Per Year
	Year						
	2011	2012	2013	2014			
Front to Rear (Rear End)	71	67	75	113	326	37.5%	81.5
Front to Front	2	0	1	4	7	0.8%	1.75
Angle	17	28	21	28	94	10.8%	23.5
Sideswipe, same direction	31	31	26	54	142	16.3%	35.5
Sideswipe, opposite direction	2	0	3	0	5	0.6%	1.25
Rear to Side	0	0	0	0	0	0.0%	0
Rear to Rear	0	0	1	0	1	0.1%	0.25
Other	54	60	73	79	266	30.6%	66.5
Unknown	5	5	4	14	28	3.2%	7
Total Crashes	182	191	204	292	869	100.0%	217.25

Table 2-11: I-95 Crash Severity Summary (2011 to 2014)

Injury Type	Year				4-Year Total	Percent of Total
	2011	2012	2013	2014		
Property Damage Only Crash	84	95	108	156	443	51.0%
Injury Crash	97	95	92	133	417	48.0%
Fatal Crash	1	1	4	3	9	1.0%
Total Crash	182	191	204	292	869	100.0%

The crash analysis results reveal that there was a total of 174 crashes on 45th Street from Village Boulevard to Congress Avenue during the four study years (2011-2014). Of these 174 crashes, rear end crashes were the most common type of crash accounting for 48.3% of total crashes followed by angled crashes accounting for 25.9% of total crashes. The 174 crashes included 378 vehicles, 4 pedestrians and 2 cyclists. There were 164 injuries, 14 severe injuries and 1 fatality. The average crash rate for 45th Street within Palm Beach County is 2.72 and is lower than the statewide average crash rate of 3.20 for similar arterial facilities. Summaries of the crash analysis are provided in [Table 2-12](#) and [Table 2-13](#).

Table 2-12: 45th Street Crash Summary (2011 to 2014)

Crash Type	Number of Crashes				4-Year Total Crashes	Percent of Total	Mean Crashes Per Year
	Year						
	2011	2012	2013	2014			
Front to Rear (Rear End)	12	13	29	30	84	48.3%	21
Front to Front	1	4	0	3	8	4.6%	2
Angle	8	12	10	15	45	25.9%	11.25
Sideswipe, same direction	0	3	0	6	9	5.2%	2.25
Sideswipe, opposite direction	0	0	1	0	1	0.6%	0.25
Rear to Side	0	0	0	1	1	0.6%	0.25
Rear to Rear	0	0	0	0	0	0.0%	0
Other	2	0	5	4	11	6.3%	2.75
Unknown	12	0	0	3	15	8.6%	3.75
Total Crashes	35	32	45	62	174	100.0%	43.5

Table 2-13: 45th Street Crash Severity Summary (2011 to 2014)

Injury Type	Year				4-Year Total	Percent of Total
	2011	2012	2013	2014		
Property Damage Only Crash	7	9	14	34	64	36.8%
Injury Crash	28	23	30	28	109	62.6%
Fatal Crash	0	0	1	0	1	0.6%
Total Crash	35	32	45	62	174	100.0%

The most common crash types within the project study area are rear end, angle, and sideswipe collisions. The high percentage of rear-end collisions within the study area are typical for roadway conditions where traffic congestion is a probable contributing cause. Angle or sideswipe collisions are lead indicators of inadequate gaps for left turning movements, inadequate clearance intervals, red light running, or aggressive driving maneuvers performed by excessively delayed drivers. [Table 2-14](#) summarizes the potential countermeasures that can be applied to the predominant crash types observed for the study area.

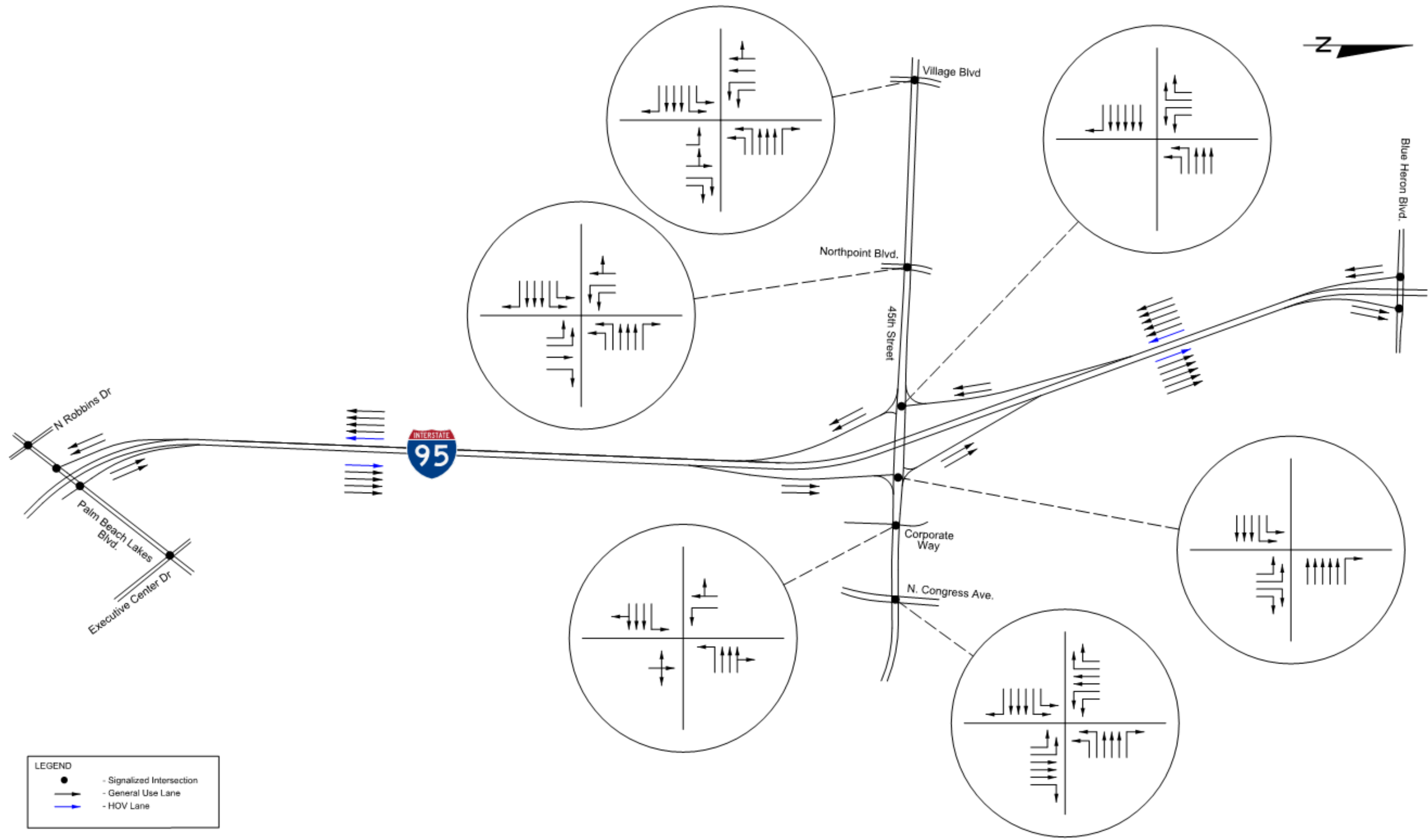
Table 2-14: Potential Countermeasures for Predominant Crash Types

Crash Type	Potential Countermeasures
Rear End	Improve signal visibility (e.g. replace signal bulbs, install advanced warning signs/flashers, etc.)
	Improve roadway surface
	Modify signal timing patterns (e.g. phasing, all red and clearance interval timings, etc.)
Angle	Decrease distance between interchange ramps along the arterial
	Improve signal visibility (e.g. replace signal bulbs, install advanced warning signs/flashers, etc.)
	Increase capacity and enhance intersection operations
Sideswipe	Improve lane alignment and markings
	Increase capacity and enhance intersection operations

2.20 Interchanges, Intersections and Signalization

The study interchange is a diamond interchange. The southbound/northbound off-ramps to 45th Street are two lane ramps, that provide dual left and right turns to access 45th Street. The southbound/northbound on-ramps from 45th Street are two lane ramps where one lane becomes an auxiliary lane on I-95 and the other merges with the auxiliary lane. (See [Figure 2-5](#))

Village Boulevard: The intersection of Village Boulevard and 45th Street is a four-leg actuated-coordinated signalized intersection. The intersection utilizes a span wire assembly with strain poles located in all four corners of the intersection.



Northpoint Boulevard: The intersection of Northpoint Boulevard and 45th Street is a four-leg actuated-coordinated signalized intersection. The intersection utilizes a span wire assembly with strain poles located in all four corners of the intersection.

Southbound Ramp Terminal: The I-95 southbound ramps intersection is a four-leg actuated-coordinated signalized intersection. The intersection utilizes mast arms assemblies. The southbound ramp operates as an actuated-coordinated signal. The intersection has the following lane configuration:

- Northbound Approach: I-95 On-Ramp
- Southbound Approach: dual left-turn lanes (1,900 feet of storage) and dual right-turn lanes (1,900 feet of storage),
- Eastbound Approach: five through lanes (two with 425 feet of storage) and one right-turn lane (750 feet of storage),
- Westbound Approach: dual left-turn lanes (340 feet of storage) and three through lanes.

Northbound Ramp Terminal: The I-95 northbound ramps intersection is a four-leg actuated-coordinated signalized intersection. The intersection utilizes mast arms assemblies. The northbound ramp operates as an actuated-coordinated signal. The intersection has the following lane configuration:

- Northbound Approach: dual left-turn lanes (2,100 feet of storage) and dual right-turn lanes (2,100 feet of storage),
- Southbound Approach: I-95 On-Ramp,
- Eastbound Approach: dual left-turn lanes (340 feet of storage) and three through lanes,
- Westbound Approach: five through lanes (two with 240 feet of storage) and one right-turn lane (315 feet of storage).

Corporate Way: The Corporate Way intersection is a four-leg actuated-coordinated signalized intersection. The intersection utilizes mast arm assemblies.

Congress Avenue: The Congress Avenue intersection is a four-leg actuated-coordinated signalized intersection. The intersection utilizes a span wire assembly with strain poles located in all four corners of the intersection.

2.21 Existing Structural Characteristics

Basic information pertaining to each existing bridge is summarized in this section. It was obtained from the latest available bridge inspection reports, bridge construction plans, and on-site field reviews. The following details are provided for each bridge, where appropriate:

- Type of Structure
- Condition of Existing Structures
- Horizontal and Vertical Clearances
- Span Arrangement
- Channel Data
- Historical Significance

2.21.1 Types of Structures

There are two existing bridges within this interchange; I-95 over 45th Street (Bridge #930520) and 45th Street over the C-17 Canal (Bridge #934100).

2.21.2 Condition of Existing Structures

The Following was obtained from the Bridge Inspection Report (BIR) which was obtained from the District Structures and Facilities library for the structure.

The existing bridge I-95 over 45th Street (Bridge # 930520), constructed in 2007, is a pre-stressed concrete – stringer/girder type structure. It is comprised of two spans with maximum span length of 94-ft 10-in. The overall length of bridge is 189-ft 9-in. The total bridge width is 183-ft 1-in. The bridge currently carries five through lanes, with approximately a 10-ft outside shoulder and a 15-ft inside shoulder in each direction. Each side is contained by concrete bridge railing, and the two directions are divided by a raised concrete barrier. The minimum vertical clearance is 16-ft 6-in. The reports also provided descriptions and pictures of the deficiencies that exist on these bridges. District IV's Structures and Facility Maintenance Offices Bridge Inspection Reports indicate a very good to excellent overall NBI ratings for bridge # 930520. The sufficiency rating is 98.0 out of 100 possible points, whereas the health index is 99.33 out of 100 possible points.

The existing 45th Street bridge over the C-17 Canal (Bridge #934100), originally constructed in 1966, and reconstructed in 1983, is a pre-stressed concrete – slab type structure. It is comprised of four spans with maximum span length of 29-ft 11-in. The overall length of bridge is 105-ft. The total bridge width is 114-ft 6-in. The bridge currently carries three through lanes and a 6-ft sidewalk in the eastbound direction and three through lanes, a left turn lane and a 6-ft sidewalk in the westbound direction. Each side is contained by concrete bridge railing, and the two directions are divided by a 9-ft raised concrete median. The minimum vertical clearance is 4.7-ft. The reports also provided descriptions and pictures of the deficiencies that exist on these bridges. District Four's Structures and Facility Maintenance Offices Bridge Inspection Reports indicate a very good to excellent overall NBI ratings for bridge # 934100. The sufficiency rating is 93.0 out of 100 possible points, whereas the health index is 88.74 out of 100 possible points.

3 PLANNING PHASE/CORRIDOR EVALUATION

The proposed improvements at the I-95 interchange at 45th Street is consistent with the Cost Feasible Plan of the Palm Beach County Metropolitan Planning Organization (MPO)'s 2045 Long Range Transportation Plan (LRTP). This project is also included in the FDOT District Four SIS Cost Feasible Plan.

A Concept Development Report (CDR) was prepared by the FDOT District Four Office of Planning and Environmental Management in August of 2014. The following are the recommendations identified for short-term and long-term improvements:

CDR Short Term Improvements:

- Third southbound left-turn lane at the I-95 southbound ramp;
- Third northbound left-turn lane and third right-turn lane at the I-95 northbound ramp;
- Additional westbound through lane from Congress Avenue to the I-95 northbound ramps.

CDR Long Term Improvements:

- Fourth through lane on eastbound 45th Street between Village Boulevard and Northpoint Boulevard;
- Fourth through lane on westbound 45th Street east of Congress Avenue;
- Fourth southbound left-turn lane at the I-95 southbound ramp;
- Fourth northbound left-turn lane at the I-95 northbound ramp.

Based on the benefits identified by the proposed improvements listed in the Concept Development Report, it was recommended that FDOT implemented this package of proposed improvements to address operational and safety issues/deficiencies through 2040. Due to the proposed impacts and costs associated with the proposed improvements, a PD&E Study was recommended prior to design and project implementation.

4.0 PROJECT DESIGN STANDARDS

Design and operational standards are well defined for Florida's limited-access facilities. Design standards and criteria provide the framework for evaluating current geometric and operational deficiencies and future designs to meet mobility needs. Specifically, they help establish the roadway typical section, cross-sections, and acceptable interchange configurations.

4.1 Design Criteria

Several design standards and manuals were consulted to establish the final design criteria for this PD&E Study. The design criteria are based on design parameters outlined in the current editions of the following publications:

- A Policy on Geometric Design of Highways and Streets, American Association of State Highway Transportation Officials (AASHTO), 2011
- Computer-Aided Design and Drafting (CADD) Structures Standards and Guidelines, FDOT, 2013
- Design Standards, FDOT, 2017-18
- Drainage Manual, FDOT, 2017
- Flexible Pavement Design Manual, FDOT, 2016
- Rigid Pavement Design Manual, FDOT, 2009
- Pavement Type Selection Manual, FDOT, 2013
- Highway Capacity Manual, Transportation Research Board, 2010
- Highway Safety Manual, Transportation Research Board, 2010
- Manual of Uniform Minimum Standards for Design, Construction and Maintenance of Streets and Highways (Florida Green Book), FDOT, 2013
- Manual of Uniform Traffic Control Devices (MUTCD), FHWA, 2009
- Florida Intersection Design Guide, FDOT 2015
- Project Development and Environment Manual, FDOT, 2012
- Project Traffic Forecasting Handbook, FDOT, 2012
- Roadside Design Guide, AASHTO, 2011
- Plans Preparation Manual, FDOT, January 2017
- Standard Specifications for Road and Bridge Construction, FDOT, July 2017

- Structures Design Guidelines, FDOT, 2014
- The Interchange Handbook, FDOT, 2002
- Utility Accommodation Manual, FDOT, 2010

4.1.1 Roadway Design Criteria

Design control and standards used to develop typical sections, horizontal and vertical alignments, and other design features are summarized in the following sections. The criteria are those specified by the FDOT for state roadways. [Table 4-1](#) summarizes the roadway and design criteria for the proposed improvements along the corridor. [Table 4-2](#) summarizes the flyovers, connectors and ramps design criteria.

Table 4-1: Roadway Design Criteria

Design Element	Design Value	Source
Facility Type	SIS / Urban Arterial	Straight Line Diagram
Design Speed	45 mph	As-Built Plans 250105-2-52-01 PPM (2017) I, Table 1.9.2
Posted Speed	40 mph	As-Built Plans 250105-2-52-01
Design Vehicle	WB-62FL	PPM (2017) I, Section 1.12
Minimum Lane Widths	11 ft.	PPM (2017) I, Table 2.1.1
Median Widths	19.5 ft.	PPM (2017) I, Table 2.2.1
Border Widths	14 ft.	PPM (2017) I, Table 2.5.2
Grades	6% max	PPM (2017) I, Table 2.6.1
Max. Change in Grade w/o VC	0.70%	PPM (2017) I, Table 2.6.2
Pavement Cross Slope (Tangent)	2% min. / 4% max.	PPM (2017) I, Figure 2.1.1
Roadway Base Clearance	1 ft. above Base Clearance Water Elevation	PPM (2017) I, Table 2.6.3
Min. distance required between VPIs	250 ft.	PPM (2017) I, Table 2.6.4
Minimum Grade	0.3%	PPM (2017) I, Table 2.6.4
Min. Stopping Sight Distance	360 ft.	PPM (2017) I, Table 2.7.1
Min. Length of Horizontal Curve	400 ft.	PPM (2017) I, Table 2.8.2a
Max. Curvature with Curb & Gutter	8° 15" deg. Max, e = .05	PPM (2017) I, Table 2.8.3
Max. Degree Curvature w/o Superelevation	2° 45"	PPM (2017) I, Table 2.8.4
Max. Deflection w/o Curve	1° 00' 00"	PPM (2017) I, Table 2.8.1a
Max. Deflection for through lanes through an Intersection	3° 00' 00"	PPM (2017) I, Table 2.8.1b
Crest Vertical Curve	K = 98, (Min. = 3V)	PPM (2017) I, Table 2.8.5
Sag Vertical Curve	K = 79, (Min. = 3V)	PPM (2017) I, Table 2.8.6

Design Element	Design Value	Source
Superelevation	8° 15" deg. Max, e = 0.05; Transition Slope Rate = 1:150	PPM (2017) I, Table 2.9.2 & Table 2.9.3
Minimum Vertical Clearance	16 ft. – 6 in. (Roadway over Roadway)	PPM (2017) I, Table 2.10.1
Minimum Lateral Offset	4 ft. Behind Face of Curb.	PPM (2017) I, Table 4.2.3

Table 4-2: Flyovers, Connectors and Ramps Design Criteria

Design Element	Design Value	Source
Design Vehicle	WB-62FL	PPM (2017) I, Section 1.12
Design Speed/Posted Speed		
Flyover & Connector Ramps	40-50 mph (Middle-Upper Range)	AASHTO 2011 Table 10-1
Loop and Other Ramps	30 mph (Lower Range)	
Lane Widths		
One-Lane Ramps	15-ft	PPM (2017) I, Table 2.1.3 & Table 2.14.3
Two-Lane Ramps	24-ft (12-ft each)	
Shoulder Width		
Outside / Right Shoulder	One-Lane Ramps: 6-ft (4-ft paved) – Interstate and Non-interstates Two-Lane Ramps: 12-ft (10-ft paved) – Interstates; 10-ft (8-ft paved) – Non-interstates	PPM (2017) I, Table 2.3.1
Inside / Left Shoulder	6-ft (2-ft paved) – One Lane Ramps 8-ft (4-ft paved) – Two Lane Ramps	
Bridge Width		
One-Lane Ramps	Travel Lanes + 6-ft Shoulders	PPM (2017) I, Figure 2.11.1
Multi-Lane Ramps	Travel Lanes + 10-ft Outside and 6-ft Inside Shoulders	
Structural Capacity	HL-93 Design Load	AASHTO LRFD 2010
Vertical Clearance		
Ramp over Roadway	16-ft – 6 inch	PPM (2017) I, Table 2.10.1
Ramp Over Railroad	23-ft – 6 inch	PPM (2017) I, Table 2.10.1
Overhead Sign Structure	17-ft – 6 inch	PPM (2017) I, Table 2.10.2
Ramp Over Canal	2-ft Min from Design Flood Stage and Bridge Low Member Elev. & 6-ft above Normal High Elevation or control elevation	PPM (2017) I, Section 2.10.1
Grades	6% max	PPM (2017) I, Table 2.6.1
Cross Slopes		
Travel Lanes	2% Min, varies for superelevation segments	PPM (2017) I, Figure 2.1.1
Outside / Right Shoulder	6%	PPM (2017) I, Table 2.3.1
Inside / Left Shoulder Width	5%	
Maximum Shoulder Cross Slope Break	7%	PPM (2017) I, Figure 2.3.1.A
Superelevation (e)		
Maximum Superelevation	emax = 10%	PPM (2017) I, Table 2.9.1
Superelevation Transition Rate	1:175 –Ramp (Design Speed 35 mph)	PPM (2017) I, Table 2.9.3
Superelevation Ratio	20% on curve; 80% on tangent preferred	PPM (2017) I, Section 2.9
Horizontal Alignment		
Min. Length of Horizontal Curves	15V Min (preferred), 400-ft Min	PPM (2017) I, Table 2.8.2a
Maximum Curvature	13°15'00" (40 mph) 17°45'00" (35 mph)	PPM (2017) I, Table 2.8.3
Exit Ramp Taper Angle	4°±	Design Stand. (FY 2017-18) Index 525

Design Element	Design Value	Source
Ramp Entrance Taper Length	1:50	Design Stand. (FY 2017-18) Index 525
Auxiliary Lane Drop Taper	1:50 min., 1:70 Desirable	AASHTO 2011 Figure 10-52
Ramp Terminal Spacing		
Entrance – Entrance or Exit – Exit	1000-ft for freeways 800-ft for C-D Road system	AASHTO 2011 Figure 10-68
Exit – Entrance	500-ft for freeways 400-ft for C-D Road system	
Turning Roadways	800-ft for system interchange 600-ft for service interchange	
Entrance – Exit	2000-ft for system to service – freeways 1600-ft for service to service – freeways 1600-ft for system to service – C-D Road 1000-ft for service to service – C-D Road	
Vertical Alignment		
Max Change in Grade w/o Curve	0.8% - (Design Speed 40 mph) 0.9% - (Design Speed 35 mph)	PPM (2017) I, Table 2.6.2
Min Length of Crest Curve	3 times design speed for < 50 mph	PPM (2017) I, Table 2.8.5
Minimum Length of Sag Curve	3 times design speed for < 50 mph	PPM (2017) I, Table 2.8.6
Minimum Crest K-Value	70 (40 mph) 47 (35 mph)	PPM (2017) I, Table 2.8.5
Minimum Sag K-Value	64 (40 mph) 49 (35 mph)	PPM (2017) I, Table 2.8.6
Stopping Sight Distance	250-ft (35 mph)	PPM (2017) I, Table 2.7.1
Lateral Offset		
Bridge Piers	Outside Clear Zone	PPM (2017) I, Table 4.2.3 and Table 4.2.1
Above ground fixed objects (e.g. utility poles and other obstacles)	Outside Clear Zone	PPM (2017) I, Table 4.2.3 and Table 4.2.1
Light Poles	Smallest of 20-ft from travel lanes, 14-ft from auxiliary lanes or clear zone	PPM (2017) I, Table 4.2.3
Drop-off and Canal Hazards	50-ft from travel lanes (<45mph)	PPM (2017) I, Section 4.3.2
Border Width	94-ft	PPM (2017) I, Table 2.5.3
Recoverable Terrain	10-ft – One-Lane Ramps (<45 mph) 18-ft – Two-Lane Ramps (<45 mph)	PPM (2017) I, Table 4.2.1
Roadway Base Clearance		
Ramp Proper	2.0-ft above Base Clearance Water Elevation	PPM (2017) I, Table 2.6.3
Low Point on Ramp at Cross Roads	1.0-ft above Base Clearance Water Elevation	

4.1.2 Drainage Design Criteria

Drainage design and construction criteria for the proposed improvements will adhere to FDOT Standards and will comply with the recommended standard practice as set forth in [Table 4-3](#).

Table 4-3: Drainage Design Criteria

Design Element	Design Value	Source
Design Frequency		
Storm Drains	10-Year design frequency standard (1, 8, 24-hour) Check 100-Year storm (1,8, 24 hour) 50-Year design frequency for interstate facility sag vertical curves which have no outlet other than	D.M. Section 3.3
Cross Drains	50-Year design frequency	D.M. Section 4.3
Design Tailwater		
All Conditions	Conditions vary with outfall type	D.M. Section 3.4
Time Of Concentration (TOC)	Minimum TOC of 10 Minutes Other TOC calculations to follow NRCS TR-55	D.M. Section 3.5.1
Pipe Slopes		
Minimum	Min. slope to produce v=2.5-ft./sec flowing full	D.M. Section 3.6.1
Manning's "n" Coefficient		
Pipes	0.012 (smooth pipes) 0.024 (corrugated pipe)	D.M. Section 3.6.4
Asphalt (rough texture)	0.016 Asphalt Pavement	S.D. Table 3-2
Grades		
Longitudinal Gutter Grade	minimum longitudinal gutter grade is 0.3%	D.M. Section 3.8.1
Spread Standards		
Design Speed ≤ 45	Keep ½ lane clear	D.M. Section 3.9
45 < Design Speed ≤ 55	Keep 8-ft. of lane clear	
Design Speed >55	No encroachment	
Pipe Size And Length		
Trunk Line	18-in. Minimum Diameter.	D.M. Section 3.10.1
Length Between Structure	18-in. Pipe=300-ft., 24-in. – 36-in.=400-ft.,>42-in.	D.M. Section 3.10.1
Exfiltration Trench		
Pipe Diameter	24-in. minimum	D.M. Section 3.10.1
Pipe Lengths	Access through both ends: 300-ft. 24-in to 30-in pipes; 400-ft. for 36-in and larger pipes. Access through only one end: 150ft. 24-in to 30-in pipes; 200-ft. 36-in and larger pipes	D.M. Section 3.10.1
Pipe Perforations	Perforated pipes preferred in District 6	E.T.R.M Section 3.1
Skimmers/Baffles	Required at each entrance to exfiltration trench	
Trench Width	Minimum 4-ft. , maximum 8-ft.	
Trench Depth	Maximum of 20-ft.	
Drainage Structures	2-foot sediment sump for inlets and catch basins	
Other District 6 Preferences	FDOT District 6 Exfiltration Trench Reference Manual	

Design Element	Design Value	Source
Ground Water Clearance		
Dry Retention	Pond bottom minimum 1-ft. above SHGWT	B.M.P. Section VIII
Freeboard		
Storm Drain	Hydraulic Gradeline Minimum 1-ft. below theoretical gutter elevation 1.13-ft. below E.O.P. for Types E & F curb and gutter 1-ft. below grate elevation for inlets Standard Index, 220-221, 230-235, 217-219.	S.D. Section 5.0
Ponds	Minimum 1-ft. above peak design stage, measured from the inside edge of the maintenance berm.	D.M. Section 5.3.4.2
Permanent Pool Pond Depth		
Wet Detention	4-ft. minimum depth, 8-ft. maximum depth	S.M.F. Section 3.1.1
Stormwater Management System		
Water Quality	Water quality standards, as set forth in Chapter 62-302, Florida Administrative Code.	V - IV Section 5.0
Discharge Limitations	Historic Discharges, Post <= Pre	V - IV Section 6.1
Bridge Clearances		
Horizontal	Center span – 25-ft. clear bent spacing, measured perpendicular to the channel. Approach bents – 20-ft. between faces of bents.	V - V Section IX B
Vertical	6-ft. above seasonal high optimum water control elevation, or 2-ft. above the design water surface, whichever produces the greater elevation.	
Bridge Clearances (continued)		
Vertical	2-ft. minimum clearance between design flood stage and the low member of bridge to allow for debris passage. 6-ft. above Normal High Water for controlled	P.P.M. 2.10.1
▪ Abbreviations D.M. FDOT Drainage Manual; January 2017 E.T.R.M FDOT District 6 Exfiltration Trench Reference Manual; January 2008 P.P.M. Plans Preparation Manual Volume 1, January 2017 S.D. FDOT Storm Drain Handbook; January 2012 S.M.F. FDOT Stormwater Management Facility Handbook; January 2004 V-IV SFWMD Permit Information Manual Volume IV; 2012 V-V SFWMD Permit Information Manual Volume V; 1999 B.M.P SFWMD Best Management Practices for South Florida Urban Stormwater Management Systems; April 2002		

5 ALTERNATIVES ALIGNMENT ANALYSIS

The purpose of this chapter is to discuss all concepts developed during the PD&E study. The concepts were evaluated and analyzed in order to select a recommended alternative. The concepts developed were further refined with the objective of elimination and reduction of impacts. The engineering decisions to achieve this objective are thoroughly documented in this report as well as in the Categorical Exclusion-Type 2 (CATEX), a companion document to this report.

5.1 No Build Alternative

The No Build Alternative proposes to keep the existing interchange roadway network into the future without improvements. This alternative is considered to be a viable alternative during the public hearing and final selection phase to serve as a comparison to the study alternatives.

The 45th Street typical section within the project limits consists of a six-lane urban divided roadway with a raised landscaped median. There are two dedicated left-turn lanes to access the I-95 on-ramps and three through lanes in each direction underneath the I-95 overpass. The eastbound and westbound lanes are separated by a median containing a raised concrete barrier wall as well as support piers for the I-95 overpass.

The No Build Alternative has a number of positive aspects, since it would not require expenditure of public funds for design, right-of-way acquisition, construction, or utility relocation. Traffic would not be disrupted due to construction, therefore, avoiding inconveniences to local residents and businesses. Also, there would be no direct or secondary impacts to the environment, the socio-economic characteristics, or community cohesion of the area.

However, the No Build Alternative fails to fulfill the purpose and need of the project. Operational and safety conditions within the interchange area will become progressively worse as traffic volumes continue to increase, thereby increasing the number of crashes and deteriorating access of this interchange.

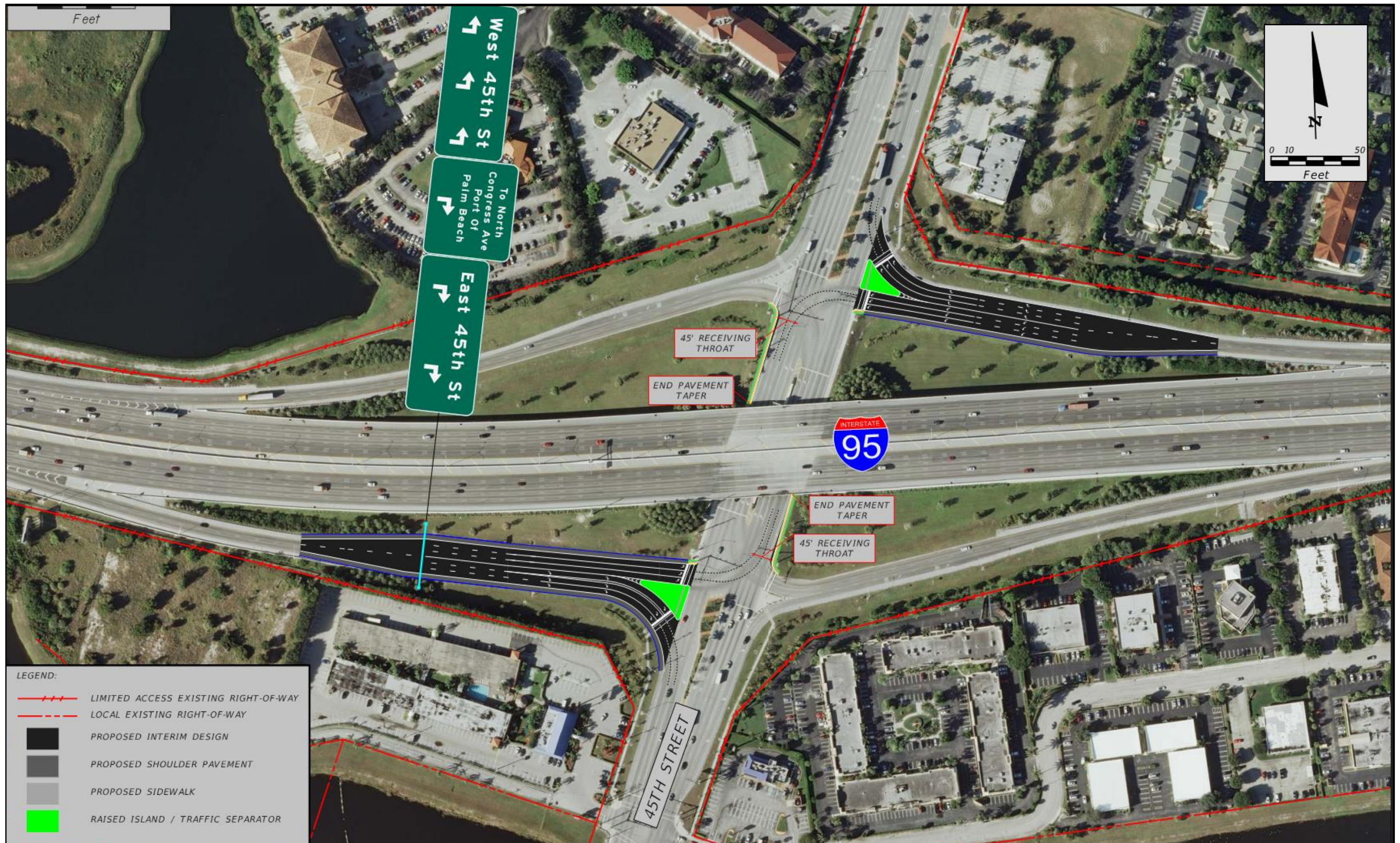
5.2 Transportation System Management and Operations Alternative

The Transportation Systems Management and Operations (TSM&O) alternative is comprised of minor improvement options that are typically developed to alleviate specific traffic congestion/safety problems, or to get the maximum utilization out of the existing facility by improving operational efficiency. TSM&O alternatives may include intersection improvements such as increasing turning radii, adding turn-lanes, increasing turn-lane lengths, or intelligent transportation system (ITS) enhancements such as closed circuit television (CCTV), dynamic message signs (DMS) with real-time driver information or signalization upgrades and/or optimization.

The following includes the proposed improvements that are included with the TSM&O options. See [Figures 5-1](#) and [5-2](#) for more details.

- Provide one additional right-turn lane and one additional left-turn lane at the I-95 southbound off-ramp intersection;
- Provide new overhead signage at the I-95 southbound off-ramp to indicate 3 lanes to East 45th Street and 3 lanes to West 45th Street;
- Provide one additional right-turn lane and one additional left-turn lane at the I-95 northbound off-ramp intersection;
- Provide new overhead signage at the I-95 northbound off-ramp to indicate 3 lanes to West 45th Street, 1 lane to North Congress Avenue, and 2 lanes to East 45th Street;
- Provide travel information system;
- Develop signal system strategies.

The TSM&O Alternative would provide some short-term relief for the capacity and safety issues at the interchange. However, the TSM&O Alternative alone would not be consistent with the purpose and need of this project. TSM&O improvements are only viable in combination with the Build Alternatives that are discussed in the next section of this report.



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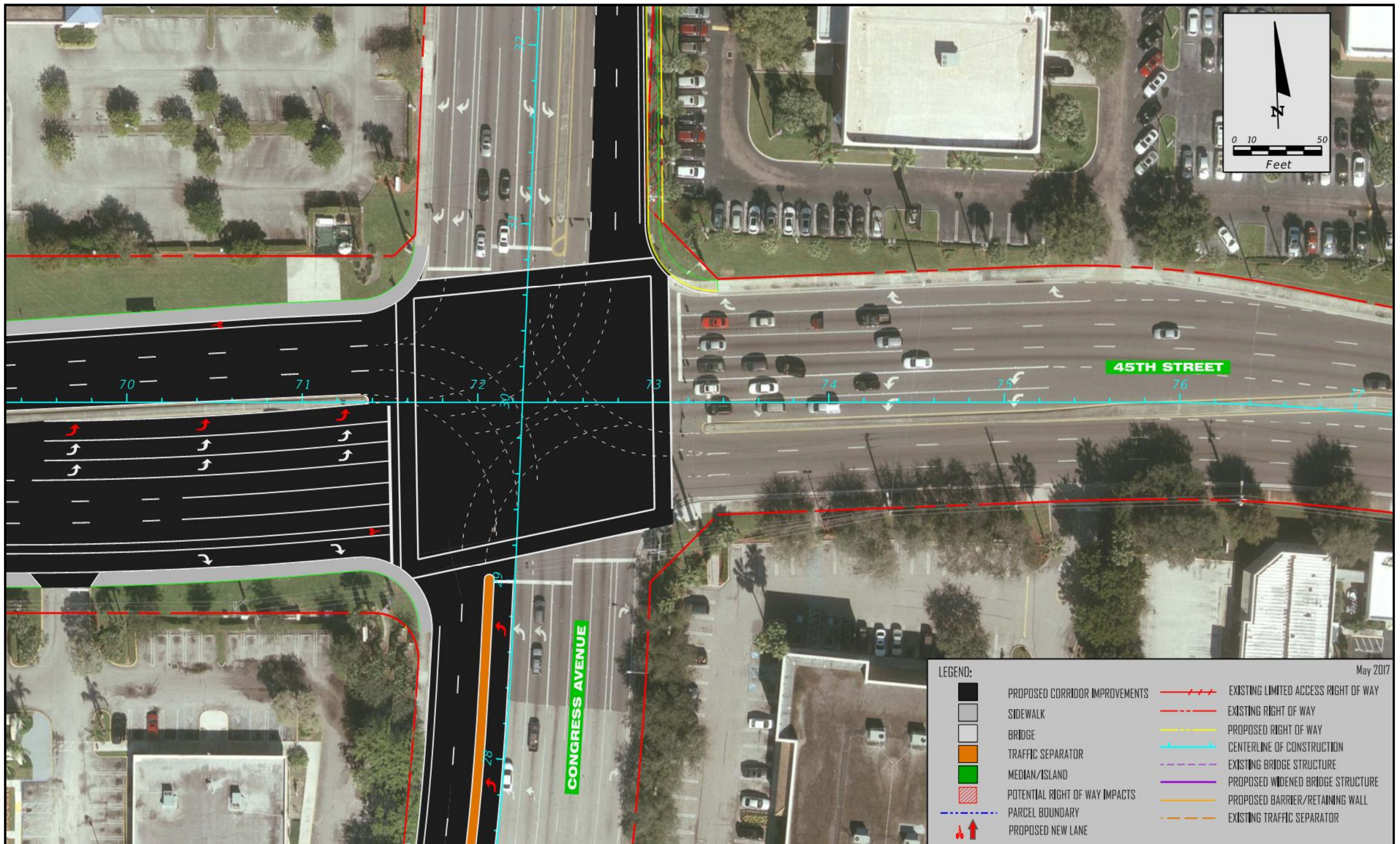
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TITLE:

TSM&O Improvements

FIGURE:

5-1



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TITLE:

TSM&O Improvements

FIGURE:

5-2

May 2017

5.3 Build Alternatives

The purpose of this section is to discuss the build alternatives that were developed during the study. I-95 is a designated SIS Highway Corridor and 45th Street is a designated SIS Highway Connector east of I-95. Both corridors are designated as evacuation routes. The primary purpose and need of this project is to enhance overall traffic operations by providing improvements at the I-95 and 45th Street interchange. All conceptual build alternatives were evaluated in a general manner and analyzed in order to select the recommended Build Alternative that would meet the purpose and need for this project.

A Concept Development Report was completed in August of 2014. The recommendations from this report included widening of 45th Street from Village Boulevard to Congress Avenue to accommodate four lanes in each direction. This alternative was refined and became build Alternative 1 of our analysis.

5.3.1 Alternative 1

The following includes the proposed improvements that are included with Alternative 1. See [Figure 5-3](#) for more details.

- Widen 45th Street to add one through lane in each direction from Northpoint Boulevard to Congress Avenue;
- Provide one bicycle lane in each direction from Northpoint Boulevard to Congress Avenue;
- Extend the eastbound to southbound on-ramp to start just east of Northpoint Boulevard;
- Provide one additional right-turn lane and one additional left-turn lane at the I-95 southbound off-ramp intersection;
- Provide new overhead signage at the I-95 southbound off-ramp to indicate 3 lanes to East 45th Street and 3 lanes to West 45th Street;



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TITLE:

Alternative 1 – Proposed Improvements

FIGURE:

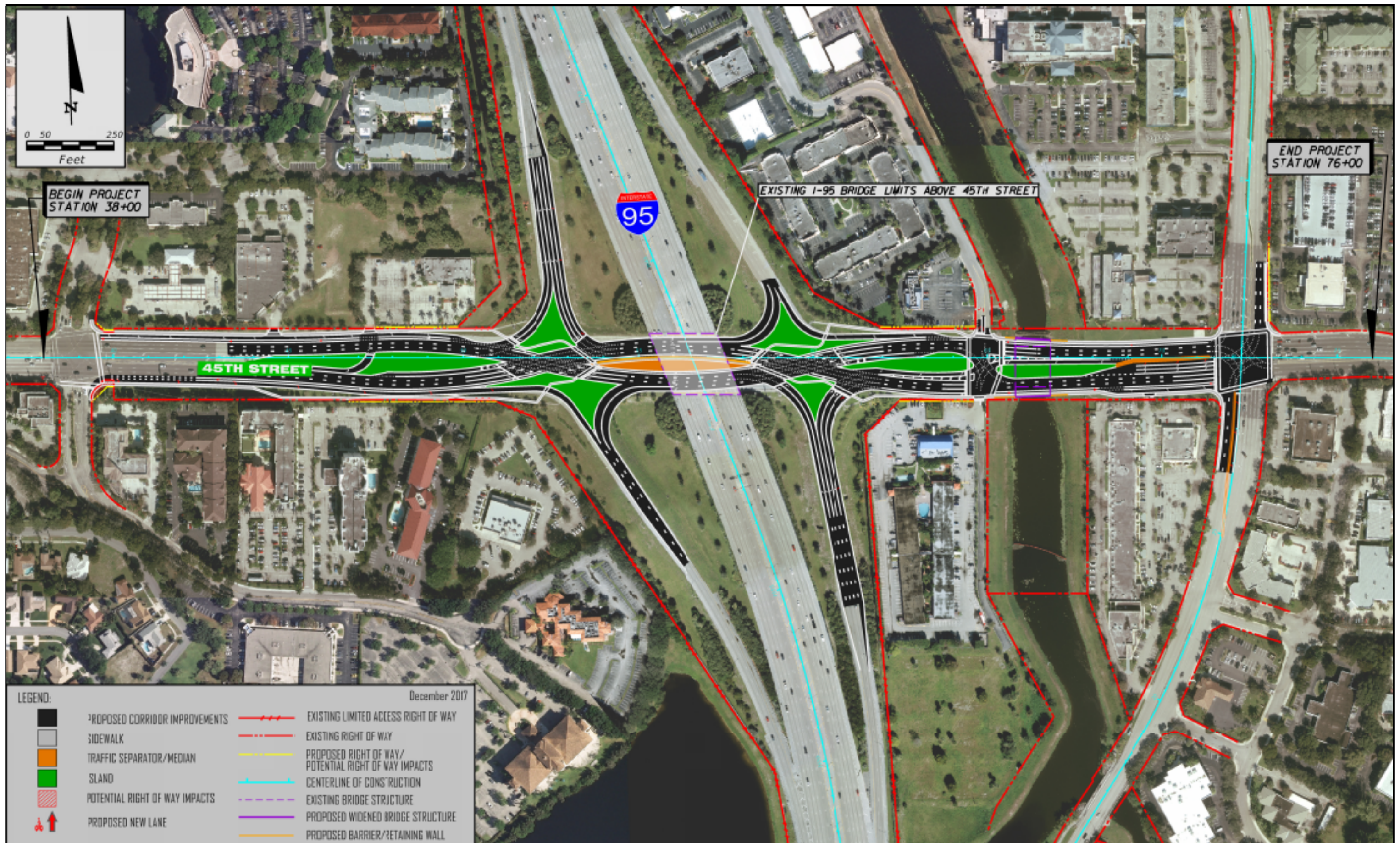
5-3

- Provide one additional right-turn lane and one additional left-turn lane at the I-95 northbound off-ramp intersection;
- Provide new overhead signage at the I-95 northbound off-ramp to indicate 3 lanes to West 45th Street, 1 lane to North Congress Avenue, and 2 lanes to East 45th Street;
- Widen the existing bridge along 45th Street over the C-17 Canal to accommodate one additional through lane and one bicycle lane in each direction;
- Add one additional left-turn lane from eastbound 45th Street to northbound Congress Avenue to provide triple left turns at the intersection;
- Add one additional left-turn lane from northbound Congress Avenue to westbound 45th Street to provide triple left turns at the intersection;
- At Congress Avenue, restriped the existing 45th Street westbound right-turn lane to a shared through and right;
- Provide travel information system;
- Develop signal system strategies.

5.3.2 Alternative 2

The following includes the proposed improvements that are included with Alternative 2. See [Figure 5-4](#) for more details.

- Modify the existing Diamond Interchange to a Diverging Diamond Interchange (DDI) configuration, which provides 3 continuous through lanes through the interchange with 2 free flow left-turn lanes into the I-95 on-ramps;
- Provide one bicycle lane in each direction from Northpoint Boulevard to Congress Avenue;
- Extend the 45th Street eastbound to I-95 southbound on-ramp to start at Northpoint Boulevard;
- Provide one additional left-turn lane at the I-95 southbound off-ramp intersection;
- Provide new overhead signage at the I-95 southbound off-ramp to indicate 3 lanes to East 45th Street and 2 lanes to West 45th Street;
- Provide one additional right-turn lane at the I-95 northbound off-ramp intersection;
- Provide new overhead signage at the I-95 northbound off-ramp to indicate 2 lanes to West 45th Street, 1 lane to North Congress Avenue, and 2 lanes to East 45th Street;
- Widen the existing bridge along 45th Street over the C-17 Canal to accommodate one bicycle lane and one sidewalk in each direction;
- Add one additional left-turn lane from eastbound 45th Street to northbound Congress Avenue to provide triple left turns at the intersection;
- Add one additional left-turn lane from northbound Congress Avenue to westbound 45th Street to provide triple left turns at the intersection;
- Provide travel information system;
- Develop coordinated signal system strategies.



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Alternative 2 – Proposed Improvements

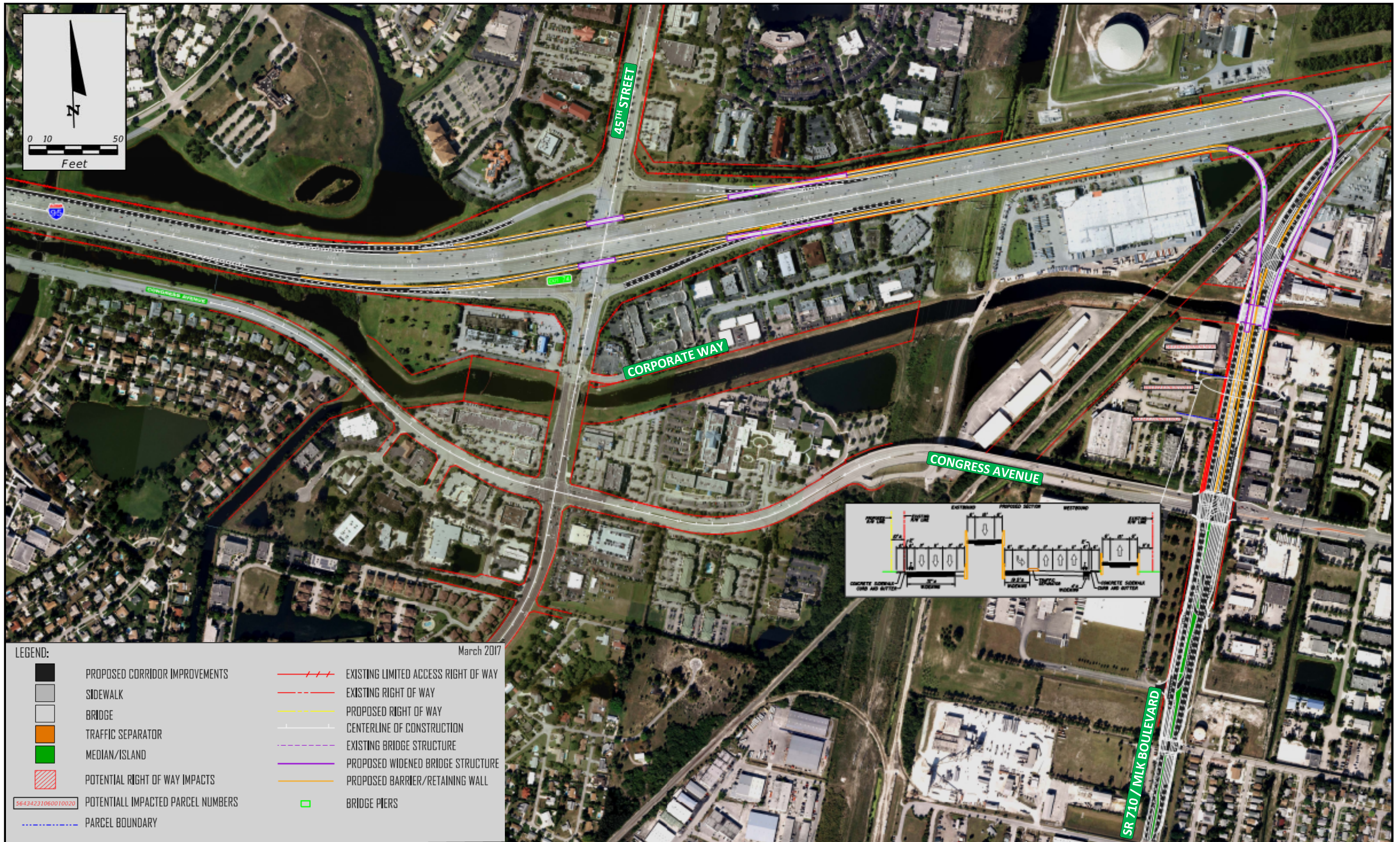
FIGURE:

5-4

5.3.3 Alternative 3

The following includes the proposed improvements that are included with Alternative 3. See [Figure 5-5](#) for more details.

- Provide a one lane direct connect ramp from northbound I-95 to eastbound SR 710/MLK Boulevard. Northbound traffic on I-95 traveling to SR 710 would exit at the existing 45th Street exit ramp. A one-lane ramp roadway would be constructed over 45th Street adjacent to I-95 and continue north to flyover the CSX Railroad and connect to the inside of eastbound SR 710 at just west of Congress Avenue. Eastbound SR 710 would be realigned to the south to accommodate the new ramp.
- Provide a one lane direct connect ramp from westbound SR 710 to southbound I-95. Westbound traffic on SR 710 traveling to southbound I-95 would exit SR 710 just west of Congress Avenue on a one-lane ramp that would flyover I-95 to connect south to a ramp roadway adjacent to the I-95 mainline. SR 710 traffic would enter southbound I-95 at the existing 45th Street entrance ramp.
- Modify the existing SR 710 and Congress Avenue intersection to accommodate the new ramps;
- Provide one additional right turn lane and one additional left turn lane at the I-95 southbound off-ramp intersection;
- Provide one additional right turn lane and one additional left turn lane at the I-95 northbound off-ramp intersection;
- Provide travel information system;
- Develop signal system strategies.



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TITLE:

Alternative 3 – Proposed Improvements

FIGURE:

5-5

5.3.4 Alternative 4

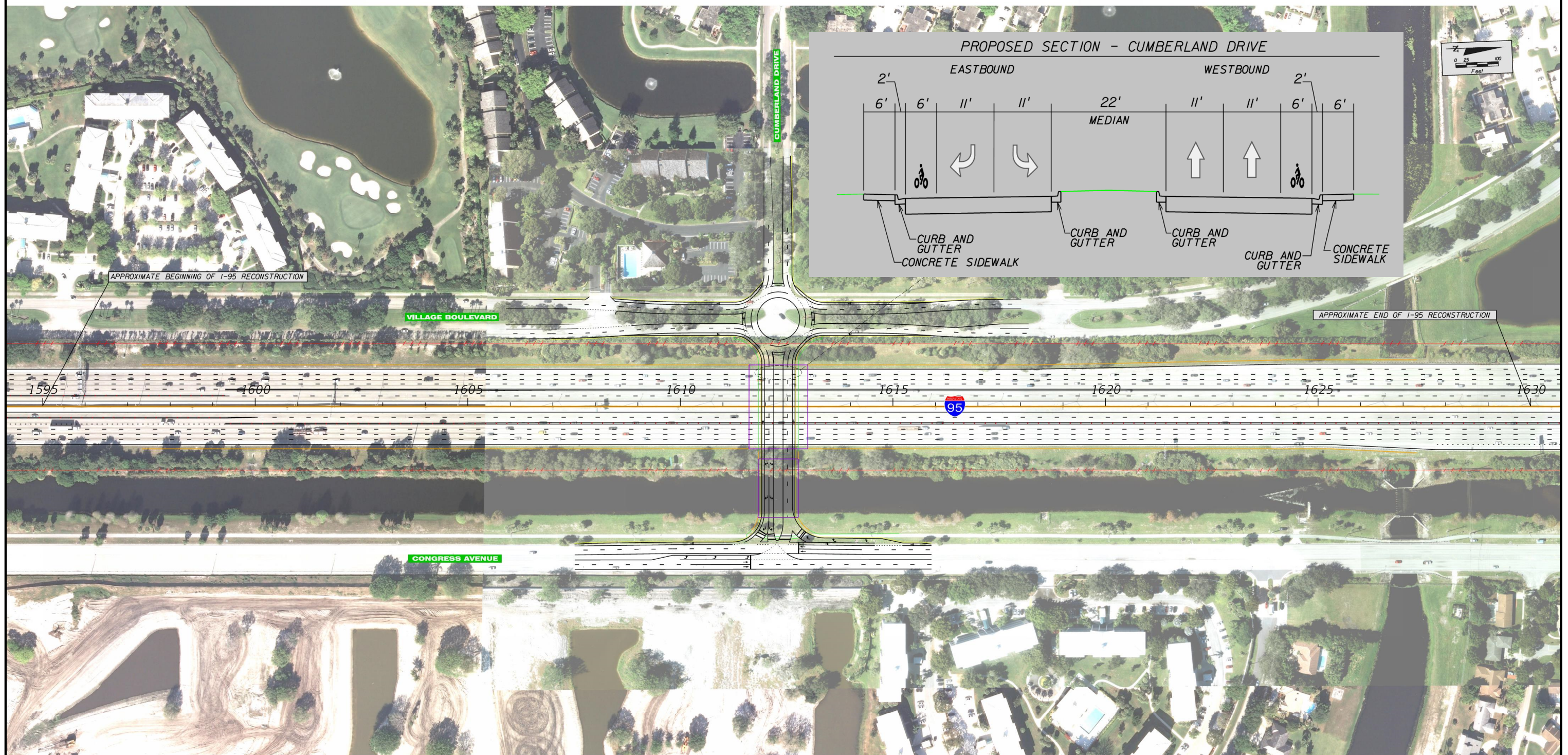
Alternative 4 was evaluated as a request from the City of West Palm Beach. The Department committed to evaluate the extension of Cumberland Drive under I-95 as one of the build alternatives for this study. The following includes the proposed improvements that are included with Alternative 4. See [Figure 5-6](#) for more details.

- Extend Cumberland Drive from Village Boulevard to Congress Avenue under I-95;
- A roundabout would be implemented at the intersection of Cumberland Drive and Village Boulevard;
- The intersection of Cumberland Drive and Congress Avenue would be a signalized T-intersection;
- I-95 would be reconstructed from about 1,500-ft south of Cumberland Drive to 1,500-ft north of Cumberland Drive with a bridge to overpass Cumberland Drive;
- Cumberland Drive would connect with Congress Avenue with a flat slab bridge over the C-17 Canal.

5.4 Proposed Typical Section

5.4.1 Proposed Typical Sections – Alternative 1

[Figure 5-7](#) shows the proposed typical sections for Alternative 1. From Northpoint Boulevard to the I-95 southbound ramp terminals 45th Street would provide four 12-ft through lanes, two 11-ft left turn lanes and one 12-ft right turn lane in each direction with a 6.5-ft traffic separator. From the southbound ramp terminal to the northbound ramp terminals this section would provide four 11-ft through lanes and two 10-ft left turn lanes in each direction with a 12-ft barrier. From the northbound ramp terminals to Congress Avenue 45th Street would provide four 12-ft through lanes and one 12-ft left-turn lane, with triple left-turn lanes at Congress Avenue. This section would also include continuous 4-ft bicycle lanes and 6-ft sidewalks on each side of the roadway.



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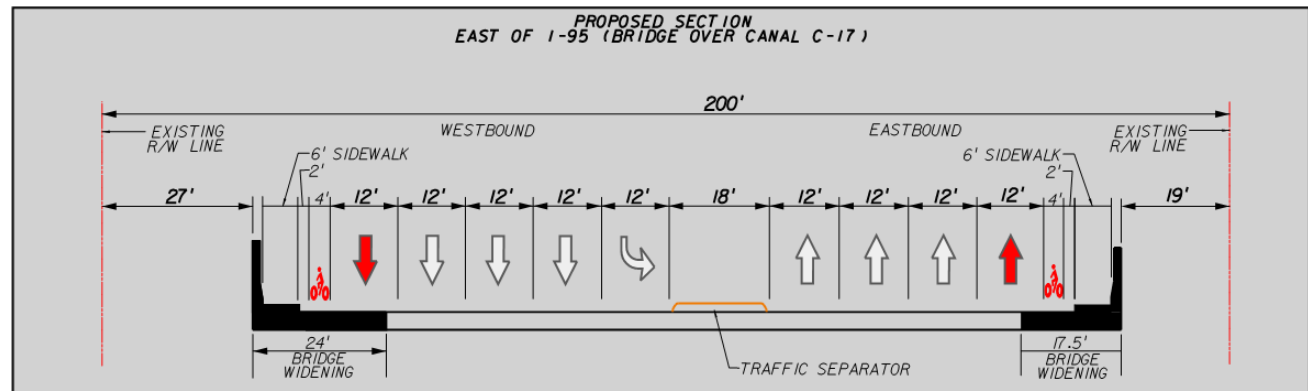
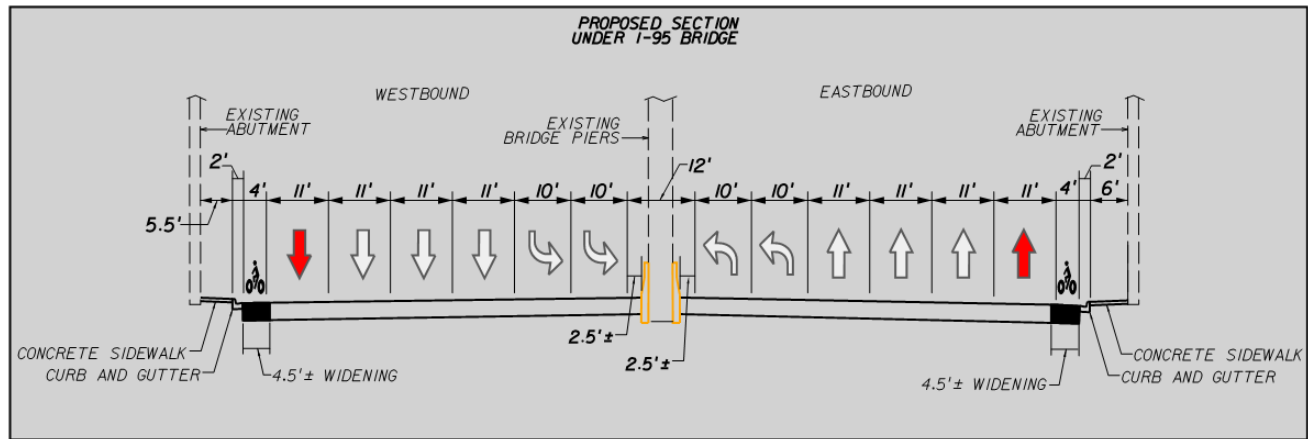
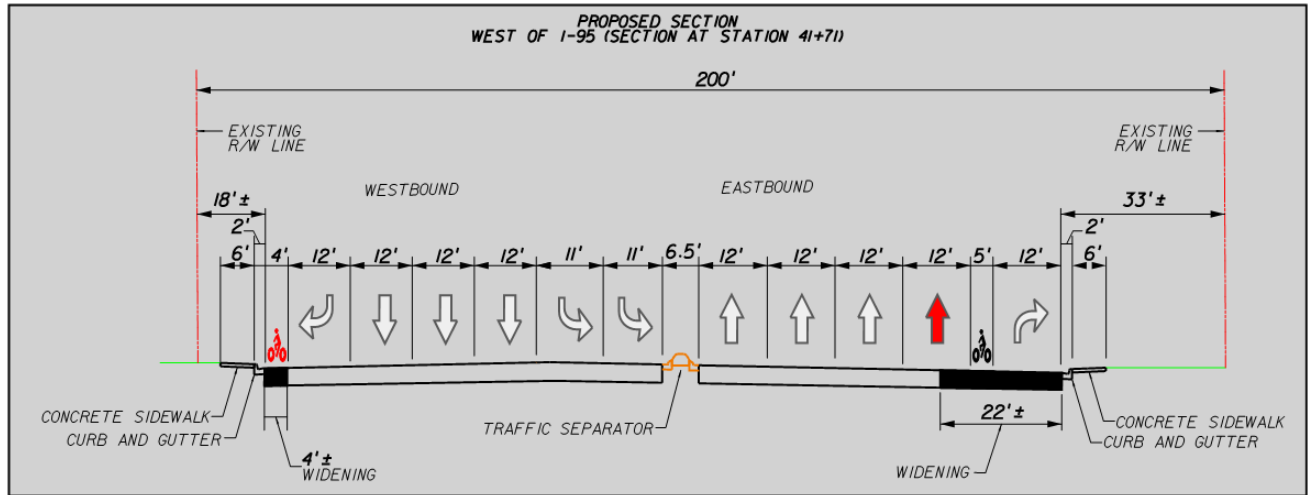
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TITLE:

Alternative 4 – Proposed Improvements

FIGURE:

5-6



45th Street – Proposed Typical Section



5.4.2 Proposed Typical Section – Alternative 2

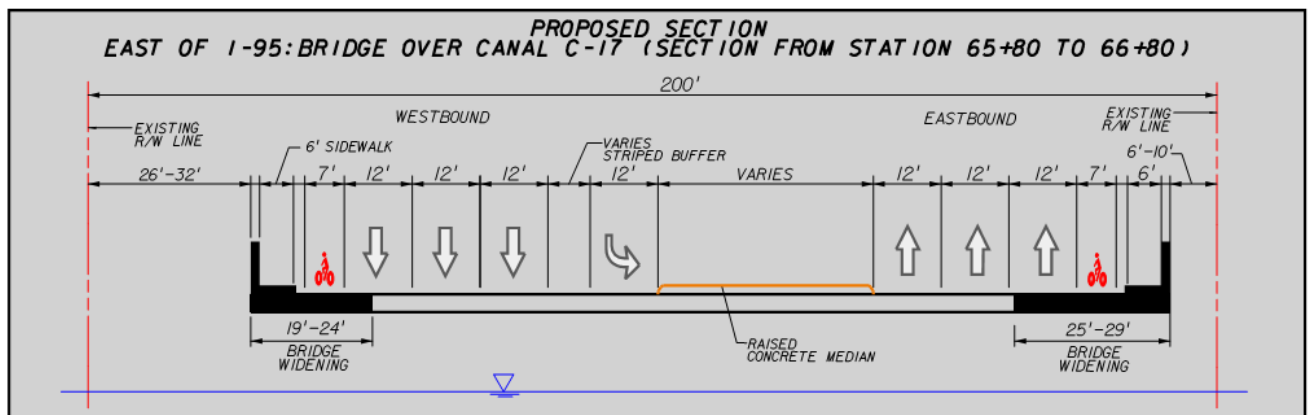
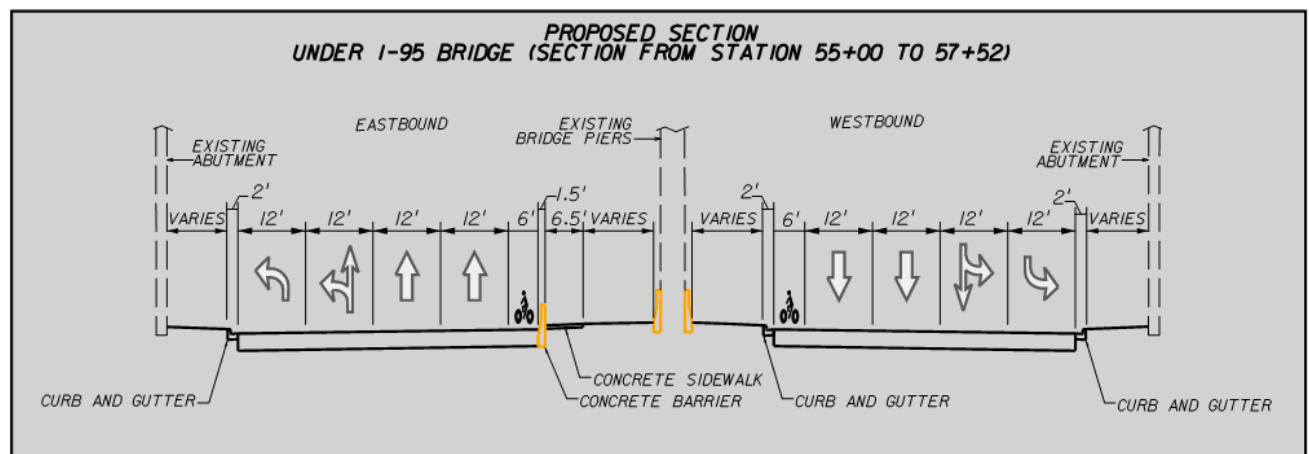
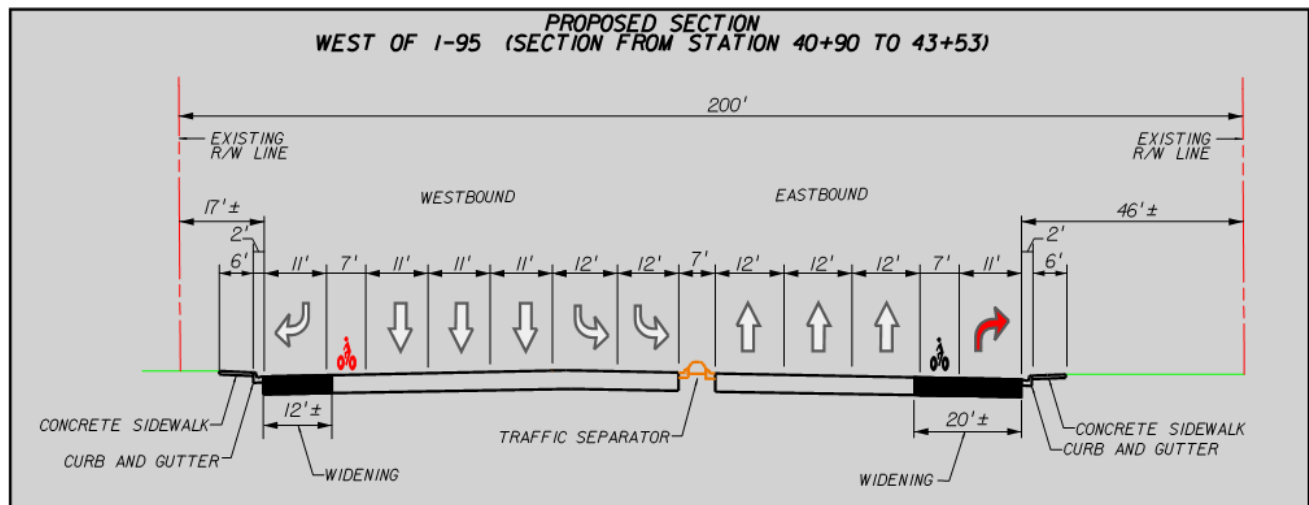
Figure 5-8 shows the proposed typical sections for Alternative 2. From Northpoint Boulevard to the I-95 southbound ramp terminals 45th Street would provide three 12-ft through lanes, two 11-ft left turn lanes and one 12-ft right turn lane in each direction with a 7-ft traffic separator. From the southbound ramp terminal to the northbound ramp terminals this section would provide two 12-ft through lanes, one 12-ft shared through-left lane, and one 12-ft left-turn lane in each direction with a 12-ft barrier. From the northbound ramp terminals to Congress Avenue 45th Street would provide three 12-ft through lanes and one 12-ft left-turn lane, with triple left turn lanes at Congress Avenue. This section would also include 6-ft bicycle lanes and 6-ft sidewalks.

5.4.3 Proposed Typical Section – Alternative 3

Figure 5-9 shows the proposed typical sections for Alternative 3. This section implements a new ramp that would provide a 15-ft lane with 6-ft inside and outside shoulders. This ramp will merge into SR 710 which would accommodate three 11-ft through lanes with one 12-ft left-turn lane, 6-ft bicycle lanes and 6-ft sidewalks in each direction.

5.4.4 Proposed Typical Section – Alternative 4

Figure 5-10 shows the proposed typical sections for Alternative 3. The new section of Cumberland Drive would provide two 11-ft through lanes, with 6-ft buffered bicycle lane and 6-ft sidewalk in each direction separated by a 22-ft raised median.



45th Street – Proposed Typical Section



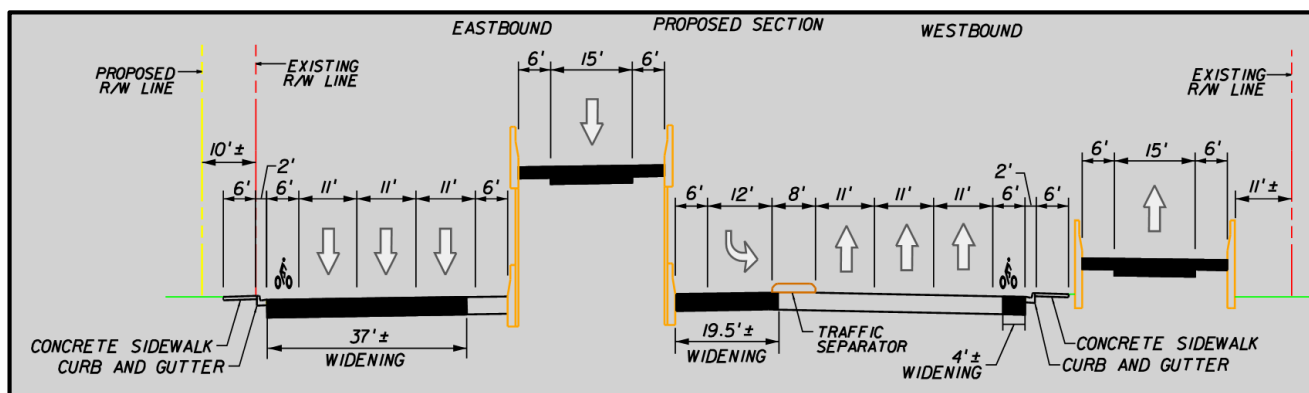
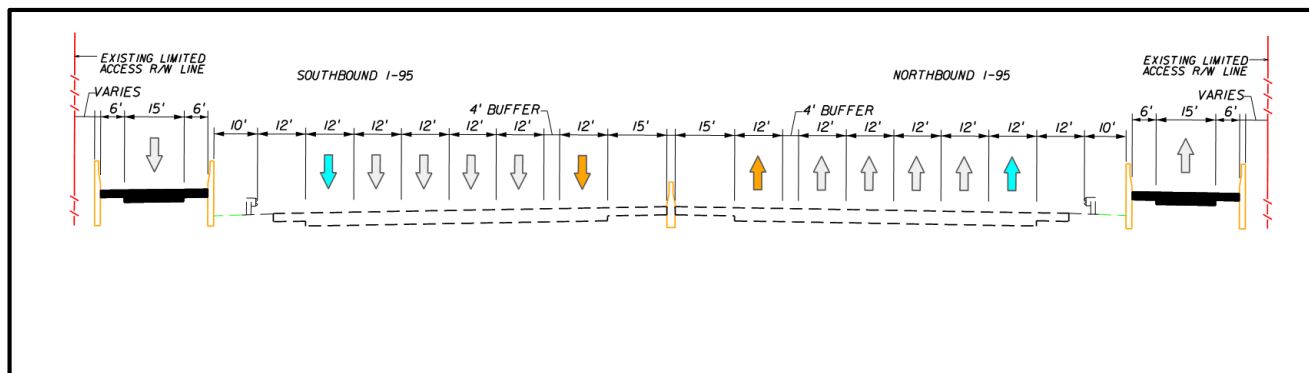
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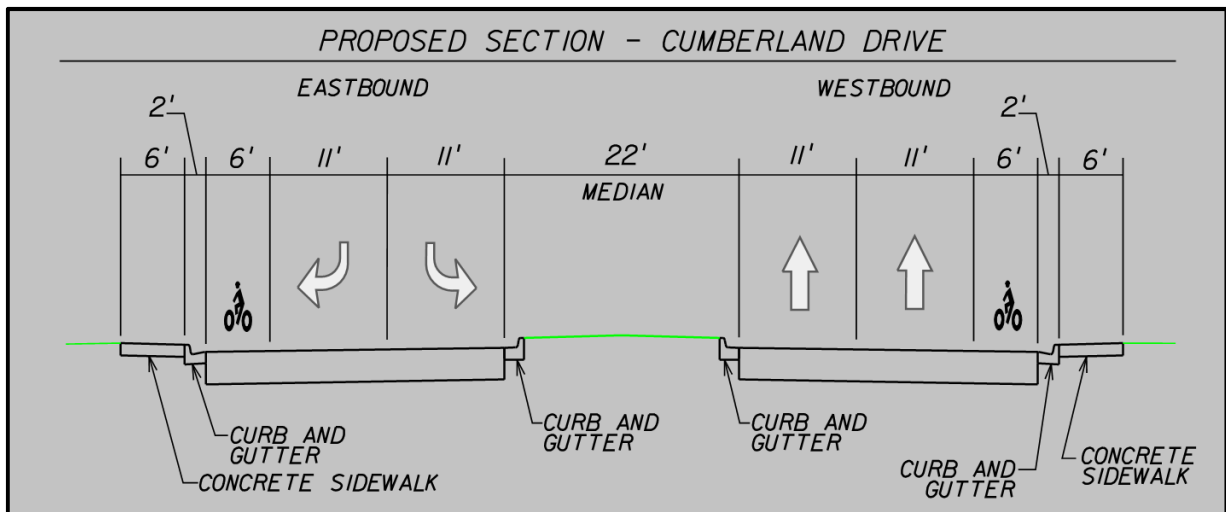
TITLE:

Typical Section – Alternative 2

FIGURE:

5-8





Cumberland Drive – Proposed Typical Section



5.5 Future Traffic Operations Analysis

The study intersections were evaluated using the latest version of Synchro 9.0. The evaluated alternatives were consistent with the FDOT Traffic Analysis Handbook. Traffic operational analysis was performed for future No Build, TSM&O, and Build Alternatives. Delay, LOS, and 95th percentile queue lengths at ramp terminal intersections were evaluated as Measures of Effectiveness (MOEs). LOS assessments were based on the Highway Capacity Manual (HCM), 2010 Edition obtained from Synchro. The Synchro operations analysis was performed for the following conditions:

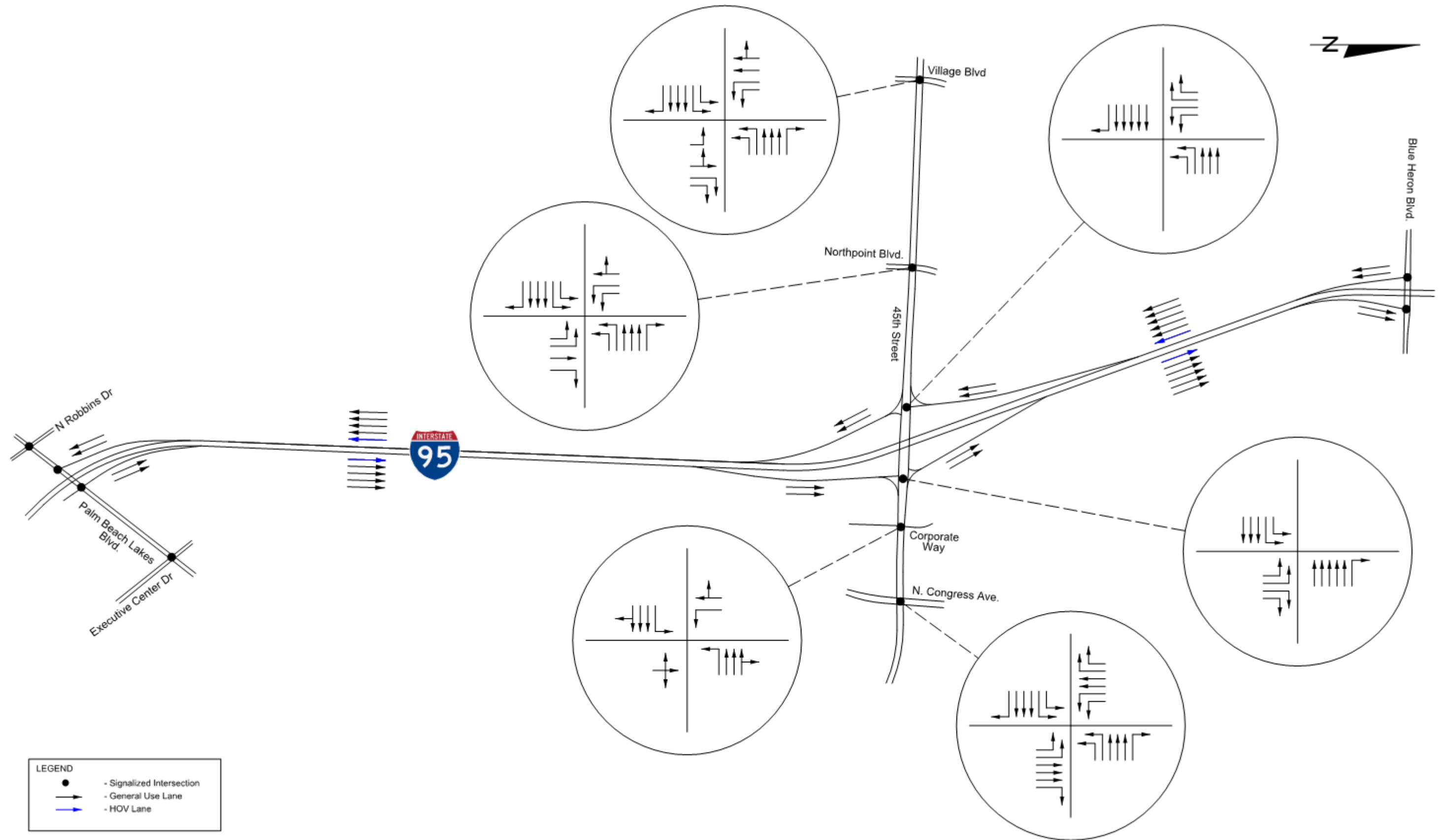
- Opening Year 2020 conditions for No Build, TSM&O, and Build Alternatives, AM and PM
- Design Year 2040 conditions for No Build, TSM&O, and Build Alternatives, AM and PM

A more detail description of the travel demand projection methodology and traffic operations analysis is contained in the Project Traffic Technical Memorandum (PTTM) and the Interchange Modification Report (IMR) prepared for this study which are companion documents to this report.

5.5.1 No Build Analysis

5.5.1.1 2020 No Build Conditions

This section documents the future conditions within the I-95 at 45th Street interchange study area of influence for the No Build Alternative. The No Build Alternative assumes the existing plus committed roadway network. At this time, there are no committed roadway projects, so, the No Build will match existing conditions. The analysis years considered under the No Build Alternative are Opening Year 2020 and Design Year 2040. The operational analysis includes the future year peak hour traffic forecasts for the area of influence. The primary objective of this analysis was to establish the No Build operational conditions along I-95 and at the study interchange and intersections. The No Build lane configuration is provided in [Figure 5-11](#).



Mainline Analysis

The Opening Year 2020 No Build mainline analysis is summarized in [Table 5-1](#). The results of the operational analysis show that all the mainline segments operate at an acceptable LOS in both the 2020 No Build AM and PM peak hours except I-95 northbound south of 45th Street. In the AM Peak Hour, this freeway segment operates at a LOS E. [Figure 5-12](#) illustrates the peak hour volumes and LOS results for the 2020 No Build mainline analysis.

Table 5-1: Opening Year 2020 No Build Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density ¹	LOS	Volume	Density ¹	LOS
I-95 South of 45 th Street	NB	5	10,102	36.7	E	7,358	23.1	C
	SB	5	9,225	31.5	D	8,358	27.2	D
I-95 North of 45 th Street	NB	6	9,477	25.3	C	7,218	18.5	C
	SB	6	9,159	24.2	C	7,749	19.9	C

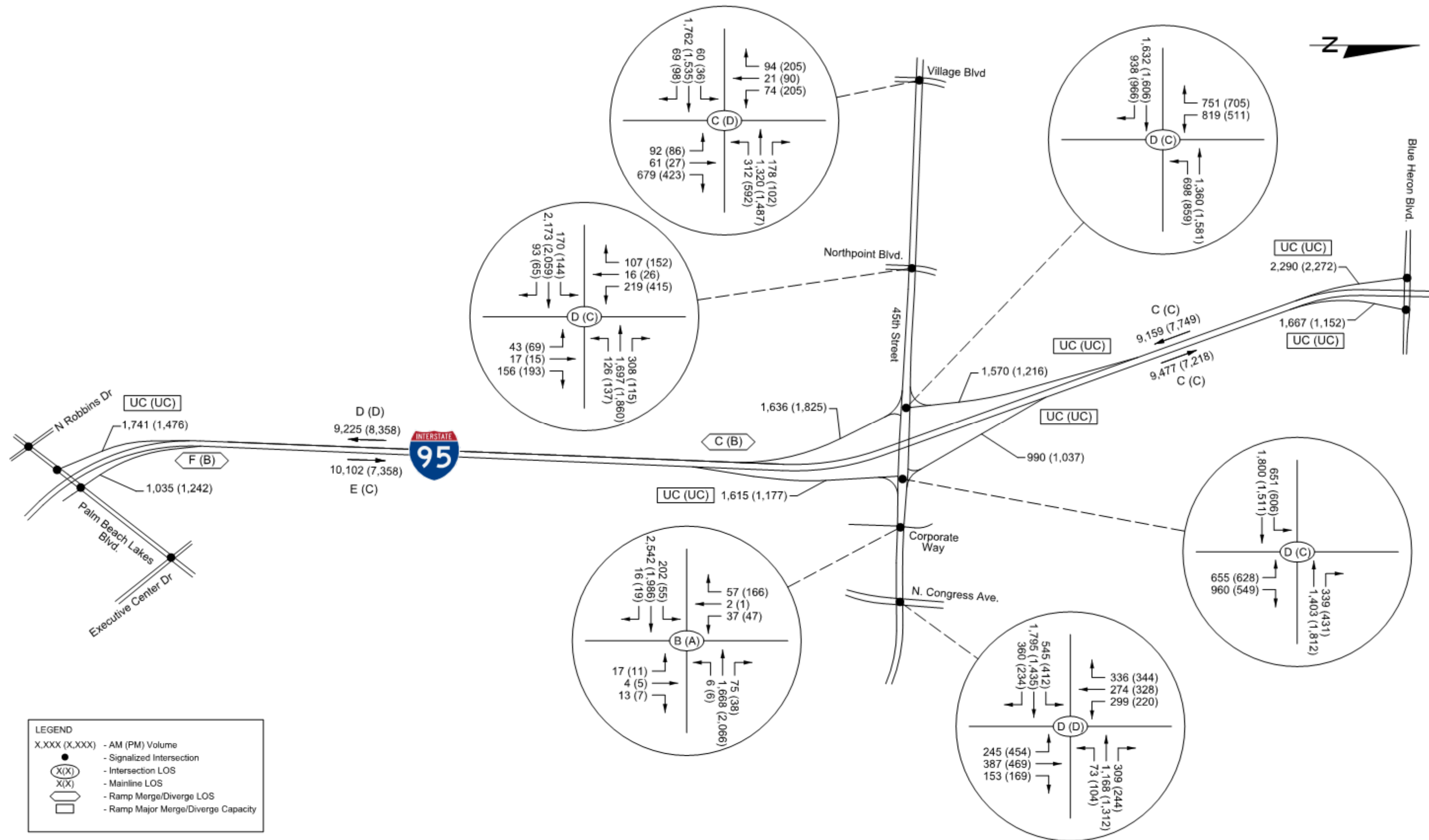
1. Density = passenger cars/mile/lane

Ramp Analysis

The Opening Year 2020 ramp analysis results are summarized in [Table 5-2](#). The results of the operational analysis show that all study ramps have adequate capacity based on the volume. [Figure 5-12](#) illustrates the peak hour volumes and v/c ratios for the Opening Year 2020 No Build ramp analysis.

Table 5-2: Opening Year 2020 No Build Ramp Analysis Summary

Interchange	Ramp	AM Peak Hour		PM Peak Hour	
		Volume	V/C	Volume	V/C
I-95 at Palm Beach Lakes Boulevard	NB On	1,035	0.26	1,242	0.31
	SB Off	1,741	0.44	1,476	0.37
I-95 at 45 th Street	NB Off	1,615	0.40	1,177	0.29
	NB On	990	0.25	1,037	0.26
	SB Off	1,570	0.39	1,216	0.30
	SB On	1,636	0.41	1,825	0.46
I-95 at Blue Heron Boulevard	NB Off	1,667	0.42	1,152	0.29
	SB On	2,290	0.57	2,272	0.57



Intersection Analysis

The Opening Year 2020 No Build intersection analysis results are summarized in [Table 5-3](#). In Opening Year 2020, there are no intersections within the study area that operate below the LOS standard. However, there are several individual movements at study intersections that operate at LOS F. [Figure 5-12](#) illustrates the peak hour volumes and LOS results for the Opening Year 2020 intersections analysis.

In the Opening Year, the 95th Percentile queue length exceeds the storage at the following intersection approaches:

- Southbound left at 45th Street at Northpoint Boulevard (PM Peak Hour)
- Westbound through at 45th Street at I-95 Southbound Ramp Terminal (AM Peak Hour)
- Westbound through at 45th Street at I-95 Northbound Ramp Terminal (PM Peak Hour)
- Eastbound left at 45th Street at Congress Avenue (AM and PM Peak Hours)
- Eastbound through at 45th Street at Congress Avenue (AM Peak Hour)
- Northbound left at 45th Street at Congress Avenue (PM Peak Hour)

[Table 5-4](#) summarizes the queue analysis for Opening Year 2020 No Build Alternative.

Table 5-3: Opening Year 2020 No Build Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	72.9 (71.9)	E (E)	30.0 (35.2)	C (D)
		Through	32.0 (39.4)	C (D)		
		Right	19.7 (26.2)	B (C)		
	Westbound	Left	41.9 (65.1)	D (E)		
		Through	1.5 (3.4)	A (A)		
		Right	0.3 (0.3)	A (A)		
	Northbound	Left	77.9 (71.4)	E (E)		
		Through	77.4 (71.3)	E (E)		
		Right	57.8 (42.9)	E (D)		
Southbound	Left	70.8 (77.3)	E (E)			
	Through/Right	69.4 (70.8)	E (E)			
45 th Street at Northpoint Boulevard	Eastbound	Left	64.6 (54.6)	E (D)	40.8 (31.6)	D (C)
		Through	18.3 (14.8)	B (B)		
		Right	4.7 (2.4)	A (A)		
	Westbound	Left	61.5 (92.6)	E (F)		
		Through	41.8 (19.2)	D (B)		
		Right	132.7 (13.7)	F (B)		
	Northbound	Left	69.7 (70.6)	E (E)		
		Through	66.5 (66.3)	E (E)		
		Right	58.5 (58.2)	E (E)		
Southbound	Left	78.0 (118.3)	E (F)			
	Through/Right	65.1 (61.9)	E (E)			
45 th Street at Southbound Ramp Terminal	Eastbound	Through	77.4 (28.9)	E (C)	38.2 (25.4)	D (C)
		Right	1.2 (1.2)	A (A)		
	Westbound	Left	20.5 (32.6)	C (C)		
		Through	20.7 (11.1)	C (B)		
	Southbound	Left	49.7 (67.6)	D (E)		
45 th Street at Northbound Ramp Terminal	Eastbound	Left	30.4 (18.8)	C (B)	46.5 (27.3)	D (C)
		Through	32.2 (10.2)	C (B)		
	Westbound	Through	82.6 (34.6)	F (C)		
		Right	0.3 (0.4)	A (A)		
	Northbound	Left	47.8 (60.9)	D (E)		
45 th Street at Corporate Way	Eastbound	Left	49.9 (95.7)	D (F)	15.5 (9.8)	B (A)
		Through/Right	11.3 (6.1)	B (A)		
	Westbound	Left	95.2 (66.6)	F (E)		
		Through/Right	13.9 (5.3)	B (A)		
	Northbound	Left/Through/Right	62.6 (59.3)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	54.9 (72.5)	D (E)	45.3 (48.8)	D (D)
		Through	33.5 (25.8)	C (C)		
		Right	18.0 (1.0)	B (A)		
	Westbound	Left	70.7 (69.7)	E (E)		
		Through	53.0 (47.0)	D (D)		
Right		30.8 (26.1)	C (C)			
Northbound	Left	74.4 (113.6)	E (F)			
	Through	59.9 (57.4)	E (E)			
	Right	46.7 (43.1)	D (D)			
Southbound	Left	73.6 (74.5)	E (E)			
	Through	57.8 (65.2)	E (E)			
	Right	29.9 (38.6)	C (D)			

Table 5-4: 95th Intersection Percentile Queue Length Summary – Opening Year 2020 No Build

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	59	585	12	227	36	0	146	151	-	70	-	-
	PM Peak	40	566	12	#427	66	m0	115	116	-	161	-	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	-	-
45 th Street at Northpoint Boulevard	AM Peak	m131	554	m0	102	674	163	45	-	171	172	-	-
	PM Peak	m116	272	m0	m114	468	m16	66	-	104	#363	-	-
	Existing Storage (feet)	475	1,000	275	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	#533	533	m411	m604	-	-	-	-	476	-	419
	PM Peak	-	m372	m167	#468	201	-	-	-	-	180	-	264
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	m151	#389	-	-	#443	0	204	-	413	-	-	-
	PM Peak	124	107	-	-	527	0	227	-	211	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m208	583	-	m11	226	-	-	-	-	77	-	-
	PM Peak	m90	121	-	m9	m117	-	-	-	-	91	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	337	626	125	69	-	140	181	-	116	212	-	90
	PM Peak	307	542	0	87	-	77	#388	-	94	166	-	173
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longerm: Volume for 95th percentile queue is metered by upstream signal

5.5.1.2 2040 No Build Conditions

Mainline Analysis

The Design Year 2040 No Build mainline analysis is summarized in [Table 5-5](#). The results of the operational analysis show that all the mainline segments operate at an acceptable LOS in both the 2040 No Build AM and PM peak hours except I-95 South of 45th Street. In the AM Peak Hour, I-95 NB operates at a LOS F and in the PM Peak Hour, I-95 SB operates at a LOS E. [Figure 5-13](#) illustrates the peak hour volumes and LOS results for the 2040 No Build mainline analysis.

Table 5-5: Design Year 2040 No Build Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density ¹	LOS	Volume	Density ¹	LOS
I-95 South of 45 th Street	NB	5	11,579	48.9	F	8,010	25.7	C
	SB	5	9,807	34.8	D	11,083	44.2	E
I-95 North of 45 th Street	NB	6	11,123	31.7	D	8,336	21.6	C
	SB	6	9,481	25.3	C	10,538	29.2	D

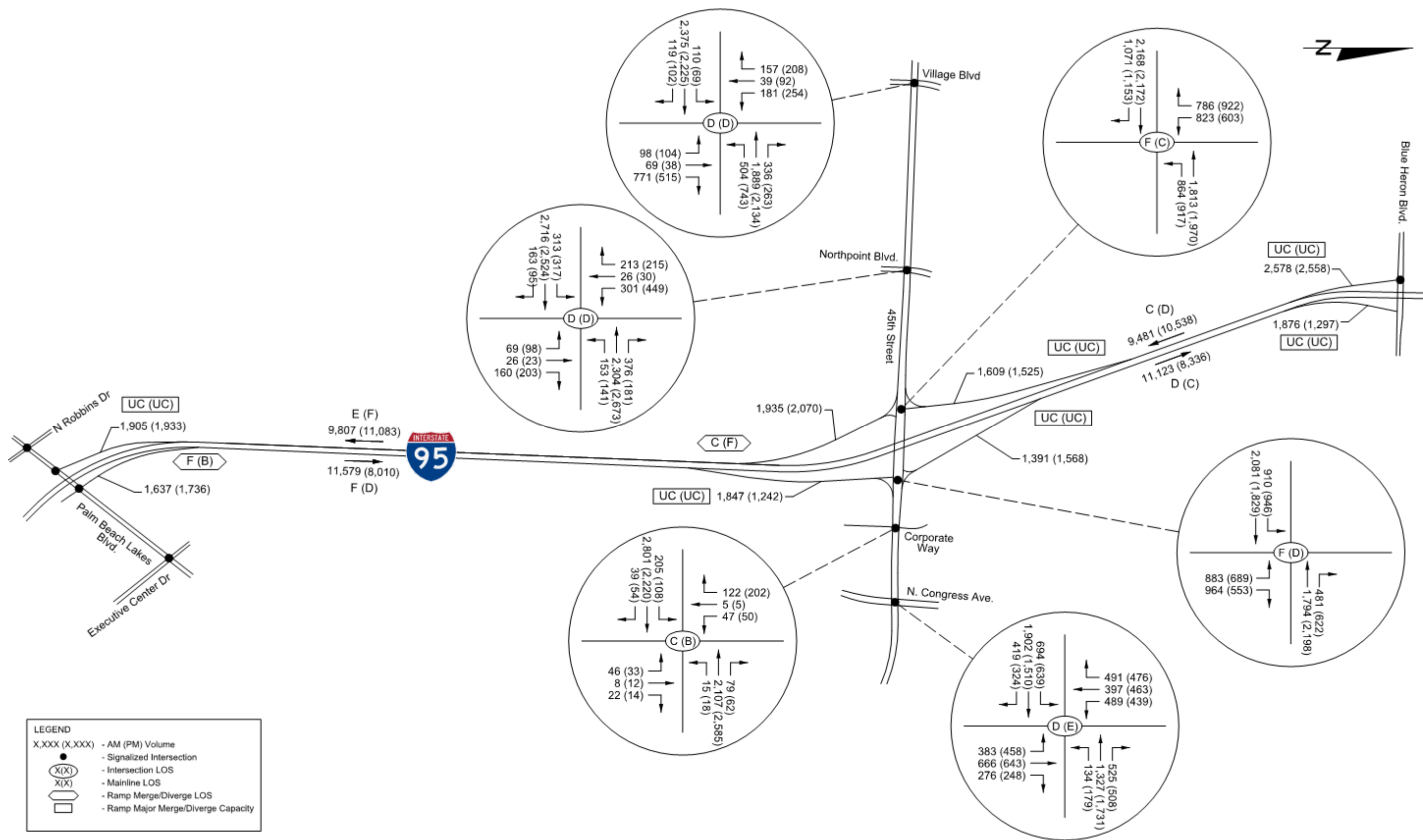
1. Density = passenger cars/mile/lane

Ramp Analysis

The Design Year 2040 ramp analysis results are summarized in [Table 5-6](#). The results of the operational analysis show that all study ramps have adequate capacity based on the volume. [Figure 5-13](#) illustrates the peak hour volumes and v/c ratios for the Design Year 2040 No Build ramp analysis.

Table 5-6: Design Year 2040 No Build Ramp Analysis Summary

Interchange	Ramp	AM Peak Hour		PM Peak Hour	
		Volume	V/C	Volume	V/C
I-95 at Palm Beach Lakes Boulevard	NB On	1,637	0.41	1,736	0.43
	SB Off	1,905	0.48	1,933	0.48
I-95 at 45 th Street	NB Off	1,847	0.46	1,242	0.31
	NB On	1,391	0.35	1,568	0.39
	SB Off	1,609	0.40	1,525	0.38
	SB On	1,935	0.48	2,070	0.52
I-95 at Blue Heron Boulevard	NB Off	1,876	0.47	1,297	0.32
	SB On	2,578	0.64	2,558	0.64



Intersection Analysis

The Design Year 2040 No Build intersection analysis results are summarized in [Table 5-7](#). In Design Year 2040, 45th Street at the ramp terminal intersections operates at LOS F in the AM peak hour. 45th Street at Congress Avenue operates at LOS E in the PM peak hour. In addition, there are several individual movements at the adjacent and ramp intersections that operate at LOS F in the Design Year 2040. These movements are listed below:

Village Boulevard

- Eastbound through
- Westbound left
- Northbound left
- Southbound left

Northpoint Boulevard

- Eastbound left
- Westbound left
- Westbound right
- Southbound left
- Southbound through/right

SB Ramp Terminal

- Eastbound through
- Southbound left

NB Ramp Terminal

- Eastbound through
- Westbound through

Corporate Way

- Eastbound left
- Westbound left

Congress Avenue

- Eastbound left
- Northbound left
- Northbound through
- Southbound left
- Southbound through

[Figure 5-13](#) illustrates the peak hour volumes and LOS results for the Design Year 2040 intersections analysis.

Table 5-7: Design Year 2040 No Build Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	72.2 (70.6)	E (E)	41.5 (51.9)	D (D)
		Through	53.2 (80.6)	D (F)		
		Right	20.8 (26.0)	C (C)		
	Westbound	Left	70.9 (101.2)	E (F)		
		Through	3.6 (4.7)	A (A)		
		Right	0.5 (0.2)	A (A)		
	Northbound	Left	80.2 (76.3)	F (E)		
		Through	79 (76.3)	E (E)		
		Right	73.1 (45.7)	E (D)		
	Southbound	Left	75.1 (85.6)	E (F)		
Through/Right		68.1 (72.1)	E (E)			
45 th Street at Northpoint Boulevard	Eastbound	Left	68.9 (91.8)	E (F)	48.5 (50.3)	D (D)
		Through	22.1 (15.2)	C (B)		
		Right	1.6 (0.7)	A (A)		
	Westbound	Left	75.4 (84.1)	E (F)		
		Through	52.5 (61.4)	D (E)		
		Right	121.6 (22.4)	F (C)		
	Northbound	Left	70.6 (71.6)	E (E)		
		Through	67.4 (67.1)	E (E)		
		Right	58.56 (58.7)	E (E)		
	Southbound	Left	118.8 (144.2)	F (F)		
		Through/Right	80.5 (68.0)	F (E)		
	45 th Street at Southbound Ramp Terminal	Eastbound	Through	216.9 (29.9)		
Right			1.0 (1.5)	A (A)		
Westbound		Left	21.7 (37.5)	C (D)		
		Through	24.8 (20.2)	C (C)		
Southbound		Left	49.6 (84.9)	D (F)		
45 th Street at Northbound Ramp Terminal	Eastbound	Right	35.6 (58.7)	D (E)	83.1 (41.9)	F (D)
		Left	31.1 (36.1)	C (D)		
	Westbound	Through	89.9 (14.4)	F (B)		
		Through	160.0 (66.8)	F (E)		
	Northbound	Right	0.3 (0.4)	A (A)		
45 th Street at Corporate Way	Eastbound	Left	53.2 (78.1)	D (E)	22.0 (13.4)	C (B)
		Right	43.2 (45.0)	D (D)		
	Westbound	Left	50.8 (95.4)	D (F)		
		Through/Right	17.2 (6.5)	B (A)		
	Southbound	Left	85.8 (56.0)	F (E)		
45 th Street at Congress Avenue	Eastbound	Through/Right	19.9 (9.3)	B (A)	54.3 (62.9)	D (E)
		Left	79.4 (79.0)	E (E)		
		Left	67.0 (63.3)	E (E)		
	Westbound	Through/Right	62.2 (65.1)	E (E)		
		Left	70.6 (100.9)	E (F)		
		Through	32.3 (22.7)	C (C)		
	Northbound	Right	11.9 (1.6)	B (A)		
		Left	74.1 (67.8)	E (E)		
		Through	85.9 (69.1)	E (E)		
	Southbound	Right	35.4 (29.8)	D (C)		
Left		85.1 (115.9)	F (F)			
Through		91.8 (87.3)	F (F)			
Right		56.2 (50.9)	E (D)			
	Southbound	Left	87.9 (104.3)	F (F)		
		Through	68.3 (98.9)	E (F)		
		Right	35 (40.8)	C (D)		

In the Design Year 2040, the 95th Percentile queue length exceeds the storage at the following intersection approaches:

- Eastbound through at Village Boulevard (AM and PM Peak Hours)
- Westbound through at Northpoint Boulevard (PM Peak Hour)
- Southbound left at Northpoint Boulevard (PM Peak Hour)
- Westbound through at I-95 Southbound Ramp Terminal (AM Peak Hour)
- Eastbound left at I-95 Northbound Ramp Terminal (PM Peak Hour)
- Westbound through at I-95 Northbound Ramp Terminal (AM and PM Peak Hour)
- Eastbound through at Corporate Way (AM Peak Hour)
- Eastbound left at Congress Avenue (AM and PM Peak Hours)
- Eastbound through at Congress Avenue (AM Peak Hour)
- Westbound right at Congress Avenue (AM Peak Hour)
- Northbound left at Congress Avenue (PM Peak Hour)
- Southbound left at Congress Avenue (AM and PM Peak Hours)

Table 5-8 summarizes the queue analysis for Design Year 2040 No Build Alternative.

Table 5-8: 95th Intersection Percentile Queue Length Summary – Design Year 2040 No Build

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	96	#1078	49	m#380	90	m0	158	162	-	144	-	-
	PM Peak	66	#1068	15	m#464	m117	m0	137	142	-	#209	-	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	-	-
45 th Street at Northpoint Boulevard	AM Peak	m189	m730	m0	m111	956	m200	66	-	175	#278	-	-
	PM Peak	m#204	m263	m0	m91	#1254	m19	87	-	115	#407	-	-
	Existing Storage (feet)	475	1,000	275	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	m#809	m595	m432	m656	-	-	-	-	479	-	445
	PM Peak	-	m508	m169	m266	m239	-	-	-	-	#268	-	#513
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	m135	m285	-	-	#643	m0	295	-	415	-	-	-
	PM Peak	m#614	264	-	-	#707	m0	#310	-	212	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m176	m569	-	m23	444	-	-	-	-	94	-	-
	PM Peak	m157	119	-	m22	m250	-	-	-	-	96	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	#520	642	171	114	-	302	#299	-	284	#384	-	148
	PM Peak	#517	490	3	140	-	237	#393	-	168	#369	-	255
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

5.5.2 TSM&O Analysis

The TSM&O Alternative analyzed for this project included the efficient use of the existing roadway system with some lane additions at the ramp terminal intersections and Congress Avenue.

The TSM&O Alternative includes the following lane additions:

- An additional northbound left-turn lane at the ramp terminal intersections
- An additional southbound right-turn lane at the ramp terminal intersections
- An additional eastbound left-turn lane at Congress Avenue
- An additional northbound left-turn lanes at Congress Avenue

The TSM&O Alternative also included improvements that did not add capacity. The following improvements were made:

- Signal timing optimization
- Coordinated signal systems
- Optimization of splits and offsets for signals

The TSM&O Alternative was only analyzed for the Design Year 2040.

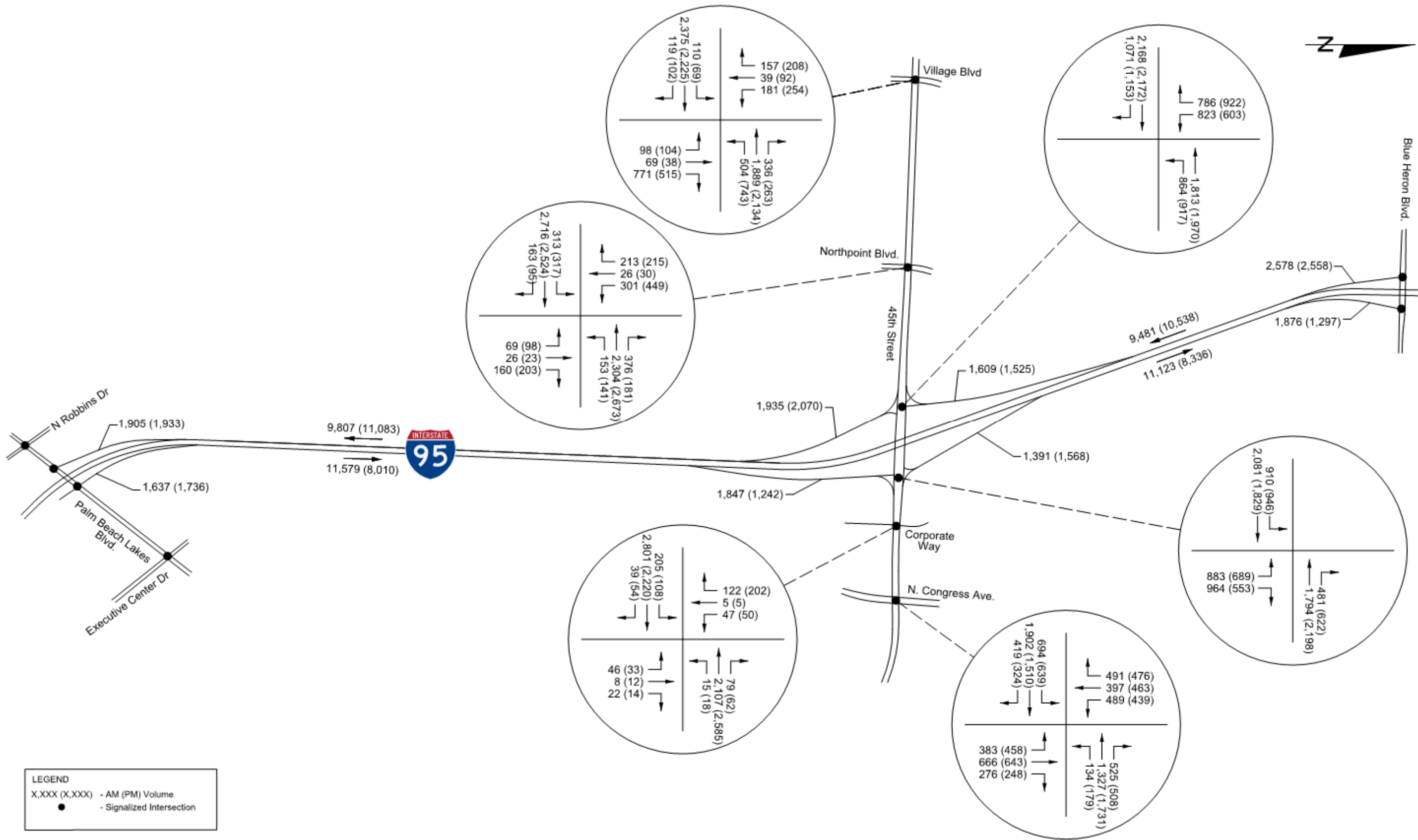
5.5.2.1 2040 TSM&O Conditions

Intersection Analysis

The Design Year 2040 TSM&O Alternative intersection analysis results are summarized in [Table 5-9](#). In Opening Year 2020, there are no intersections within the study area that operate below the LOS standard. [Figure 5-14](#) illustrates the peak hour volumes and LOS results for the Design Year 2040 intersections analysis.

Table 5-9: Design Year 2040 TSM&O Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	71.9 (70.6)	E (E)	42 (51.9)	D (D)
		Through	54.0 (80.6)	D (F)		
		Right	20.9 (26.0)	C (C)		
	Westbound	Left	69.4 (101.2)	E (F)		
		Through	4.8 (4.7)	A (A)		
		Right	0.8 (0.2)	A (A)		
	Northbound	Left	80.2 (76.3)	F (E)		
		Through	79.0 (76.3)	E (E)		
		Right	73.1 (45.7)	E (D)		
	Southbound	Left	74.5 (85.6)	E (F)		
		Through/Right	67.9 (72.1)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	69.6 (91.8)	E (F)	36.2 (50.2)	D (D)
		Through	31.0 (15.2)	C (B)		
		Right	3.4 (0.7)	A (A)		
	Westbound	Left	87.3 (86.7)	F (F)		
		Through	23.9 (60.8)	C (E)		
		Right	8.7 (23.4)	A (C)		
	Northbound	Left	70.6 (71.6)	E (E)		
		Through	67.4 (67.1)	E (E)		
		Right	58.1 (58.7)	E (E)		
	Southbound	Left	118.8 (144.2)	F (F)		
		Through/Right	69.4 (68.0)	E (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through	47.5 (29.9)	D (C)	34.7 (29.3)	C (C)
		Right	1.0 (1.5)	A (A)		
	Westbound	Left	35.3 (43.0)	D (D)		
		Through	23.4 (22.3)	C (C)		
	Southbound	Left	59.2 (60.6)	E (E)		
45 th Street at Northbound Ramp Terminal	Eastbound	Left	24.9 (37.89)	C (D)	40.1 (39.6)	D (D)
		Through	20.2 (15.3)	C (B)		
	Westbound	Through	66.6 (65.8)	E (E)		
		Right	0.3 (0.4)	A (A)		
	Northbound	Left	63.3 (57.0)	E (E)		
45 th Street at Corporate Way	Eastbound	Left	47.1 (96.7)	D (F)	18.0 (13.5)	B (B)
		Through/Right	11.6 (6.0)	B (A)		
	Westbound	Left	101.4 (57.9)	F (E)		
		Through/Right	17.4 (9.8)	B (A)		
	Northbound	Left/Through/Right	79.4 (79)	E (E)		
		Left	79.4 (79.0)	E (E)		
	Southbound	Through/Right	62.2 (65.1)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	62.9 (76.3)	E (E)	50.5 (53.0)	D (D)
		Through	37.3 (27.8)	D (C)		
		Right	19.8 (4.7)	B (A)		
	Westbound	Left	73.4 (65.9)	E (E)		
		Through	50.9 (61.2)	D (E)		
		Right	29.2 (26.1)	C (C)		
	Northbound	Left	69 (73.8)	E (E)		
		Through	78.3 (78.9)	E (E)		
		Right	53.85 (49.5)	D (D)		
	Southbound	Left	77.0 (75.6)	E (E)		
		Through	60.4 (67.7)	E (E)		
	Southbound	Right	36.9 (40.8)	D (D)		



In summary, TSM&O improvements alone would not adequately accommodate the future year traffic volumes within the project's area of influence. The TSM&O Alternative alone is not considered a viable alternative. However, the Build Alternatives developed will incorporate viable TSM&O improvements.

In the Design Year 2040, there are several individual movements at the adjacent and ramp intersections that operate at LOS F. These movements are listed below:

Village Boulevard

- Eastbound through
- Westbound left
- Northbound left
- Southbound left

Northpoint Boulevard

- Eastbound left
- Westbound left
- Southbound left

NB Ramp Terminal

- Westbound through

Corporate Way

- Eastbound left
- Westbound left

Congress Avenue

- Southbound left

In the Design Year, the 95th Percentile queue length exceeds the storage at the following intersection approaches:

- Eastbound through at Village Boulevard (AM and PM Peak Hours)
- Southbound left at Village Boulevard (AM Peak Hour)
- Eastbound through at Northpoint Boulevard (AM Peak Hour)
- Westbound through at Northpoint Boulevard (PM Peak Hour)
- Southbound left at Northpoint Boulevard (AM and PM Peak Hour)
- Eastbound right at I-95 Southbound Ramp Terminal (AM Peak Hour)
- Eastbound left at I-95 Northbound Ramp Terminal (PM Peak Hour)
- Westbound through at I-95 Northbound Ramp Terminal (AM and PM Peak Hour)
- Eastbound left at Congress Avenue (AM and PM Peak Hours)
- Eastbound through at Congress Avenue (AM Peak Hour)
- Southbound left at 45th Street at Congress Avenue (AM and PM Peak Hours)

Table 5-10 summarizes the queue analysis for Design Year 2040 TSM&O Alternative.

Table 5-10: 95th Intersection Percentile Queue Length Summary – Design Year 2040 TSM&O

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	95	#1090	50	#376	109	m0	158	162	-	#563	143	-
	PM Peak	66	#1068	15	m#464	m117	m0	137	142	-	#209	144	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m189	m1127	m1	m125	554	20	66	-	109	#278	-	-
	PM Peak	m#204	m263	m0	m102	#1250	m24	87	-	115	#407	-	-
	Existing Storage (feet)	475	1,000	275	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	m632	m842	m352	m228	-	-	-	-	173	-	208
	PM Peak	-	m508	m169	m282	m248	-	-	-	-	137	-	255
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	m250	m248	-	-	#490	m0	204	-	317	-	-	-
	PM Peak	#630	269	-	-	#707	m0	145	-	152	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m222	627	-	m26	281	-	-	-	-	94	-	-
	PM Peak	m157	110	-	m24	359	-	-	-	-	96	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	#330	704	163	113	-	236	185	-	279	#341	-	231
	PM Peak	#319	583	30	138	-	210	220	-	181	306	-	255
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longerm: Volume for 95th percentile queue is metered by upstream signal

5.5.3 Build Alternatives Analysis

The Build Alternatives Design Traffic for Opening Year 2020 and Design Year 2040 was developed by keeping the same volumes for the freeway, ramps and turning volumes at the intersections as the No Build Alternative.

5.5.3.1 2020 Build Analysis

Mainline Analysis

The Opening Year 2020 Build mainline analysis is summarized in [Table 5-11](#). The results of the operational analysis show that all the mainline segments operate at an acceptable LOS in both the 2020 Build AM and PM peak hours except I-95 NB south of 45th Street. In the AM Peak Hour, this freeway segment operates at a LOS E. The Build mainline analysis results are the same as the No Build condition.

Table 5-11: Opening Year 2020 Alternative 1 and Alternative 2 Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density ¹	LOS	Volume	Density ¹	LOS
I-95 South of 45 th Street	NB	5	10,102	36.7	E	7,358	23.1	C
	SB	5	9,225	31.5	D	8,358	27.2	D
I-95 North of 45 th Street	NB	6	9,477	25.3	C	7,218	18.5	C
	SB	6	9,159	24.2	C	7,749	19.9	C

1. Density = passenger cars/mile/lane

Ramp Analysis

The Opening Year 2020 ramp analysis results are summarized in [Table 5-12](#). The results of the operational analysis show that all study ramps have adequate capacity based on the volume. The Build ramp analysis results are same as the No Build condition.

Table 5-12: Opening Year 2020 Alternative 1 and Alternative 2 Ramp Analysis Summary

Interchange	Ramp	AM Peak Hour		PM Peak Hour	
		Volume	V/C	Volume	V/C
I-95 at Palm Beach Lakes Boulevard	NB On	1,035	0.26	1,242	0.31
	SB Off	1,741	0.44	1,476	0.37
I-95 at 45 th Street	NB Off	1,615	0.40	1,177	0.29
	NB On	990	0.25	1,037	0.26
	SB Off	1,570	0.39	1,216	0.30
	SB On	1,636	0.41	1,825	0.46
I-95 at Blue Heron Boulevard	NB Off	1,667	0.42	1,152	0.29
	SB On	2,290	0.57	2,272	0.57

Intersection Analysis

The Opening Year 2020 Build intersection analysis results for Alternatives 1 and 2 are summarized in [Table 5-13](#) and [Table 5-14](#). In Opening Year 2020 Build Alternatives 1 and 2 operate at acceptable LOS at all study intersections. There is one individual movement that is failing in the Opening Year for both Build Alternatives. The eastbound left at Corporate Way operates at LOS F in the AM Peak Hour for Build Alternative 1, and the westbound left at Corporate Way operates at LOS F in the PM Peak Hour. These failing movements occur along the minor street where traffic volumes are much lower. (Alternatives 3 and 4 were not analyzed for Opening Year 2020).

[Figures 5-15](#) and [5-16](#) illustrates the peak hour volumes and LOS results for the Opening Year 2020 intersections analysis for Alternatives 1 and 2.

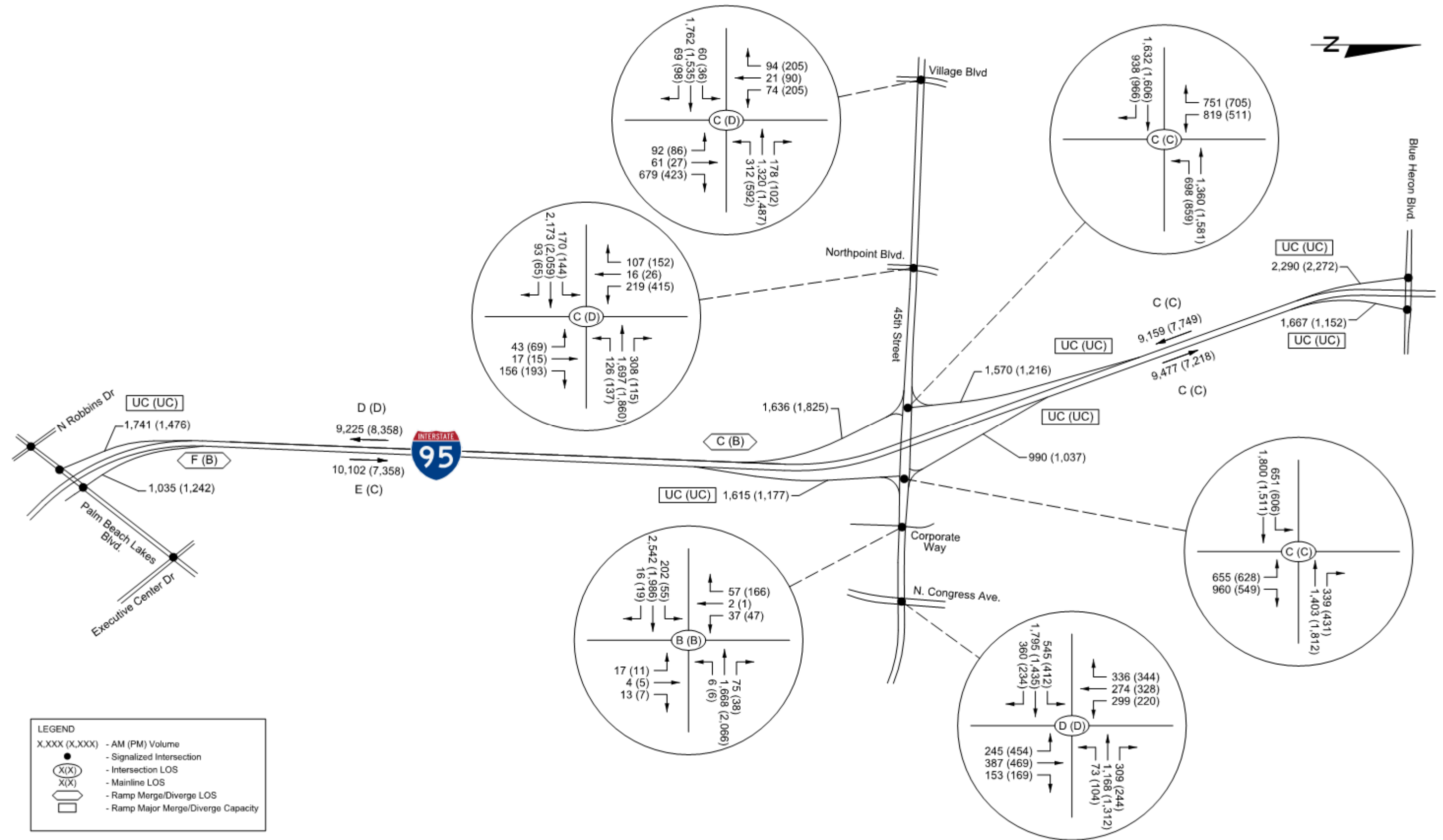
[Table 5-15](#) and [Table 5-16](#) summarize the queue analysis for Opening Year 2020 Build Alternatives 1 and 2 respectively.

Table 5-13: Opening Year 2020 Alternative 1 Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	67.7 (66.8)	E (E)	29.4 (39.3)	C (D)
		Through	36.8 (42.4)	D (D)		
		Right	22.0 (27.5)	C (C)		
	Westbound	Left	32.4 (56.9)	C (E)		
		Through	2.0 (19.7)	A (B)		
		Right	0.3 (13.8)	A (B)		
	Northbound	Left	71.1 (71.2)	E (E)		
		Through	70.6 (70.9)	E (E)		
		Right	48.0 (38.0)	D (D)		
	Southbound	Left	65.6 (68.8)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Through/Right	64.3 (64.6)	E (E)	23.0 (42.4)	C (D)
		Left	55.1 (67.1)	E (E)		
	Westbound	Through/Right	15.2 (35.3)	B (D)		
		Left	62.5 (66.8)	E (E)		
		Through	18.4 (39.0)	B (D)		
	Northbound	Right	8.4 (22.7)	A (C)		
		Left	67.0 (63.5)	E (E)		
		Through	61.3 (60.0)	E (E)		
	Southbound	Right	53.2 (50.7)	D (D)		
		Left	62.3 (69.9)	E (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through/Right	53.8 (54.5)	D (D)	25.1 (25.9)	C (C)
		Left	28.6 (44.8)	C (D)		
	Westbound	Right	1.4 (2.1)	A (A)		
		Left	21.0 (22.2)	C (C)		
	Southbound	Through	15.1 (11.3)	B (B)		
		Left	53.1 (49.2)	D (D)		
45 th Street at Northbound Ramp Terminal	Eastbound	Right	38.7 (35.6)	D (D)	24.4 (26.7)	C (C)
		Left	20.8 (27.0)	C (C)		
	Westbound	Through	13.4 (8.2)	B (A)		
		Through	27.9 (36.1)	C (D)		
	Northbound	Right	0.3 (0.4)	A (A)		
		Left	45.4 (51.8)	D (D)		
45 th Street at Corporate Way	Eastbound	Right	36.4 (37.8)	D (D)	11.7 (12.5)	B (B)
		Left	80.1 (52.9)	F (D)		
	Westbound	Through/Right	4.9 (3.5)	A (A)		
		Left	55.2 (73)	E (E)		
	Northbound	Through/Right	10.2 (14.7)	B (B)		
		Left/Through/Right	58.5 (56.2)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	60.7 (59.5)	E (E)	42.0 (42.9)	D (D)
		Through/Right	57.1 (56.6)	E (E)		
		Left	63.0 (60.0)	E (E)		
	Westbound	Through	28.3 (24.7)	C (C)		
		Right	23.1 (30.3)	C (C)		
		Left	65.6 (65.4)	E (E)		
	Northbound	Through/Right	37.8 (39.9)	D (D)		
		Left	60.8 (69.0)	E (E)		
		Through	59.7 (52.5)	E (D)		
	Southbound	Right	45.8 (39.2)	D (D)		
		Left	68.9 (68.6)	E (E)		
		Through	60.9 (56.6)	E (E)		
		Right	38.9 (38.5)	D (D)		

Table 5-14: Opening Year 2020 Alternative 2 Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	67.7 (66.8)	E (E)	36.0 (31.3)	D (C)
		Through	36.8 (42.4)	D (D)		
		Right	22.0 (27.5)	C (C)		
	Westbound	Left	55.9 (35.9)	E (D)		
		Through	18.2 (3.0)	B (A)		
		Right	14.0 (0.3)	B (A)		
	Northbound	Left	70.1 (71.2)	E (E)		
		Through	69.8 (70.9)	E (E)		
		Right	48.3 (38.0)	D (D)		
	Southbound	Left	65.6 (68.8)	E (E)		
		Through/Right	64.3 (63.8)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	64.2 (49.0)	E (D)	34.8 (30.4)	C (C)
		Through/Right	27.7 (14.4)	C (B)		
	Westbound	Left	69.7 (77.4)	E (E)		
		Through	31.7 (30.0)	C (C)		
		Right	22.9 (6.5)	C (A)		
	Northbound	Left	65.9 (61.4)	E (E)		
		Through	59.7 (64.2)	E (E)		
		Right	52.9 (53.8)	D (D)		
	Southbound	Left	72.0 (69.0)	E (E)		
		Through/Right	58.7 (59.4)	E (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through	31.8 (37.2)	C (D)	28.7 (29.2)	C (C)
	Westbound	Through	24.9 (21.0)	C (C)		
	Southbound	Left	26.4 (18.0)	C (B)		
		Right	34.1 (43.8)	C (D)		
45 th Street at Northbound Ramp Terminal	Eastbound	Through	35.0 (31.7)	D (C)	41.5 (35.1)	D (D)
	Westbound	Through	49.8 (37.9)	D (D)		
	Northbound	Left	28.9 (37.0)	C (D)		
		Right	31.6 (19.4)	C (B)		
45 th Street at Corporate Way	Eastbound	Left	57.7 (42.1)	E (D)	17.1 (9.4)	B (A)
		Through/Right	8.2 (3.3)	A (A)		
	Westbound	Left	77.0 (96.3)	E (F)		
		Through/Right	21.9 (8.8)	C (A)		
	Northbound	Left/Through/Right	59.5 (56.2)	E (E)		
	Southbound	Left	61.9 (59.5)	E (E)		
		Through/Right	58.0 (57.2)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	64.6 (41.2)	E (D)	43.5 (39.5)	D (D)
		Through	35.6 (17.8)	D (B)		
		Right	16.5 (5.7)	B (A)		
	Westbound	Left	66.1 (65.8)	E (E)		
		Through	37.2 (42.8)	D (D)		
		Right	30.3 (31.9)	C (C)		
	Northbound	Left	64.9 (67.5)	E (E)		
		Through	61.5 (61.6)	E (E)		
		Right	47.2 (45.1)	D (D)		
	Southbound	Left	68.4 (57.9)	E (E)		
		Through	57.8 (257.6)	E (E)		
		Right	37.6 (37.3)	D (D)		



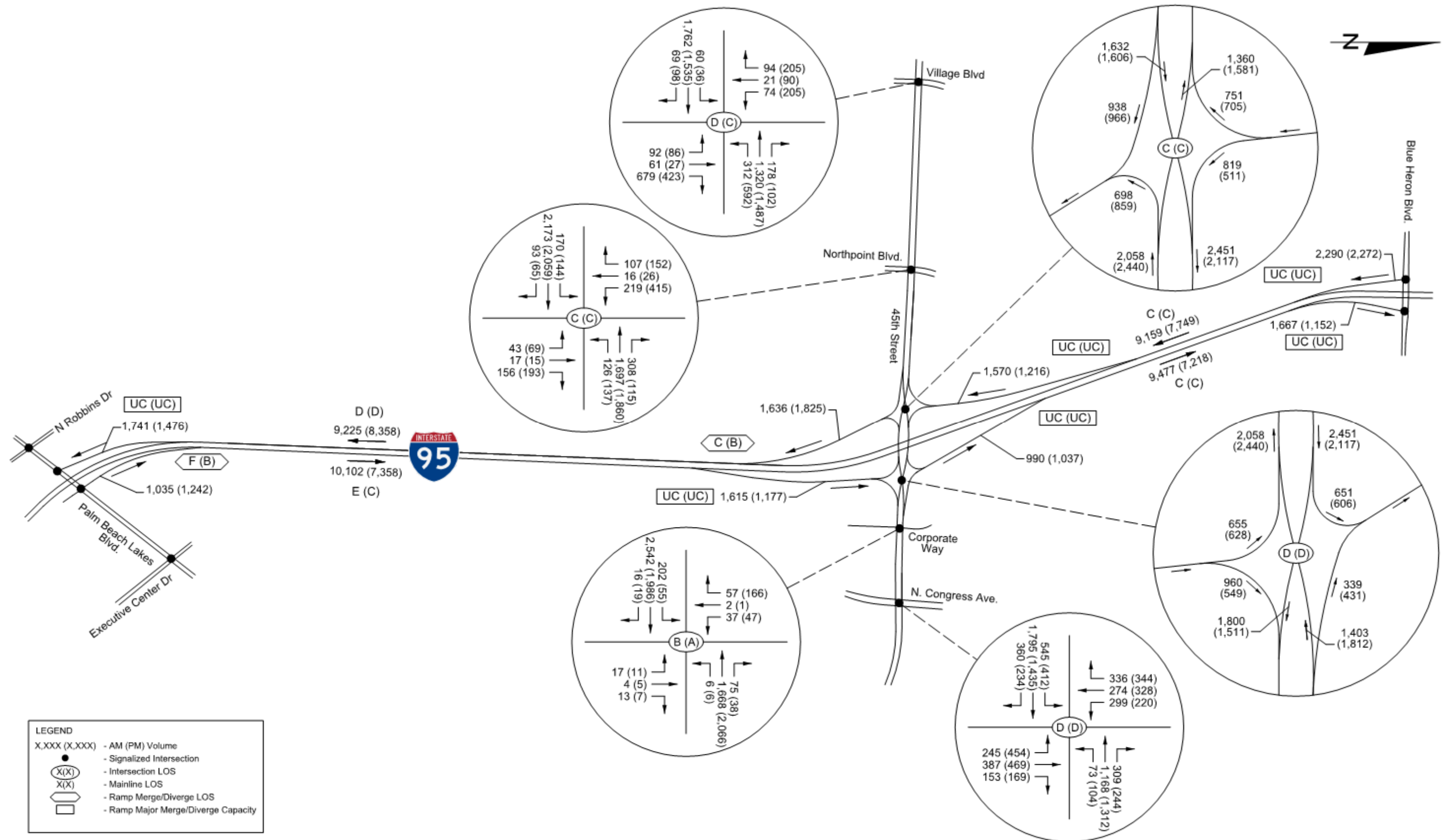


Table 5-15: 95th Intersection Percentile Queue Length Summary – Opening Year 2020 Alternative 1

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	55	607	10	206	35	m0	138	143	-	360	65	-
	PM Peak	38	578	36	370	403	28	110	111	-	193	148	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m119	227	-	103	472	21	43	-	154	158	-	-
	PM Peak	112	588	-	107	703	21	60	-	157	277	-	-
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	357	573	158	86	-	-	-	-	155	-	191
	PM Peak	-	343	0	523	452	-	-	-	-	200	-	296
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	155	120	-	-	232	0	126	-	271	-	-	-
	PM Peak	120	136	-	-	461	0	123	-	142	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m247	222	-	m10	182	-	-	-	-	73	-	-
	PM Peak	104	384	-	m8	354	-	-	-	-	86	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	190	681	226	65	-	-	110	-	70	201	-	84
	PM Peak	187	476	85	84	-	-	203	-	82	157	-	119
	Existing Storage (feet)	300	600	270	300	-	-	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

Table 5-16: 95th Intersection Percentile Queue Length Summary – Opening Year 2020 Alternative 2

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	55	607	0	204	321	34	138	143	-	367	65	-
	PM Peak	38	578	36	395	64	m1	110	111	-	193	148	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	129	531	-	105	547	93	42	-	126	162	-	-
	PM Peak	m100	447	-	m111	503	m4	60	-	269	101	-	-
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	401	-	-	282	-	-	-	-	225	-	413
	PM Peak	-	469	-	-	321	-	-	-	-	117	-	435
	Existing Storage (feet)	-	1,300	800		500	-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	-	550	-	-	396	-	294	-	378	-	-	-
	PM Peak	-	311	-	-	456	-	320	-	165	-	-	-
	Existing Storage (feet)	-	500	-	-	450	-	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m#302	361	-	21	427	-	-	-	-	74	-	-
	PM Peak	m74	119	-	m10	199	-	-	-	-	86	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	229	661	85	85	-	73	115	-	73	203	-	101
	PM Peak	183	218	18	85	-	73	200	-	119	148	-	164
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

5.5.3.2 2040 Build Analysis

Mainline Analysis

The Design Year 2040 Build mainline analysis is summarized in [Table 5-17](#). The results of the operational analysis show that all the mainline segments operate at an acceptable LOS in both the 2040 Build AM and PM peak hours except I-95 South of 45th Street. In the AM Peak Hour, I-95 NB operates at a LOS F and in the PM Peak Hour, I-95 SB operates at a LOS E. The Build mainline analysis results are same as the No Build condition.

Table 5-17: Design Year 2040 Build Alternatives Mainline Capacity Analysis Summary

Freeway Segment	Direction	Number of Lanes	AM Peak Hour			PM Peak Hour		
			Volume	Density ¹	LOS	Volume	Density ¹	LOS
I-95 South of 45 th Street	NB	5	11,579	48.9	F	8,010	25.7	C
	SB	5	9,807	34.8	D	11,083	44.2	E
I-95 North of 45 th Street	NB	6	11,123	31.7	D	8,336	21.6	C
	SB	6	9,481	25.3	C	10,538	29.2	D

1. Density = passenger cars/mile/lane

Ramp Analysis

The Design Year 2040 ramp analysis results are summarized in [Table 5-18](#). The results of the operational analysis show that all study ramps have adequate capacity based on the volume. The Build ramp analysis results are same as the No Build condition.

Table 5-18: Design Year 2040 Build Alternatives Ramp Analysis Summary

Interchange	Ramp	AM Peak Hour		PM Peak Hour	
		Volume	V/C	Volume	V/C
I-95 at Palm Beach Lakes Boulevard	NB On	1,637	0.41	1,736	0.43
	SB Off	1,905	0.48	1,933	0.48
I-95 at 45 th Street	NB Off	1,847	0.46	1,242	0.31
	NB On	1,391	0.35	1,568	0.39
	SB Off	1,609	0.40	1,525	0.38
	SB On	1,935	0.48	2,070	0.52
I-95 at Blue Heron Boulevard	NB Off	1,876	0.47	1,297	0.32
	SB On	2,578	0.64	2,558	0.64

Intersection Analysis

The Design Year 2040 Build intersection analysis results for Alternatives 1 through 4 are summarized in [Tables 5-19](#) through [5-22](#). In Design Year 2040 Build Alternatives 1 and 2 operate at acceptable LOS at all study intersections. There are a few individual movements that are failing in the Design Year for both Build Alternatives. The westbound left at Village Boulevard operates at LOS F in the PM Peak Hour for Build Alternative 1, and the westbound left at Village Boulevard and Corporate Way operate at LOS F in the PM Peak Hour. These failing movements occur along the minor streets where traffic volumes are much lower.

Alternative 3 operates at acceptable LOS at all study intersections for the Design Year 2040 with no individual movements failing along the study area, which indicates that operationally Alternative 3 is the best alternative.

Alternative 4 shows the intersection of 45th Street and Congress Avenue failing in the Design Year 2040. There are 19 overall individual movements failing along the study corridor.

[Figures 5-17](#) to [5-20](#) illustrates the peak hour volumes and LOS results for the Design Year 2040 intersections analysis for Alternatives 1 to 4.

[Table 5-23](#) to [Table 5-26](#) summarize the queue analysis for Design Year 2040 Build Alternatives.

Table 5-19: Design Year 2040 Alternative 1 Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	66.8 (65.4)	E (E)	43.2 (48.1)	D (D)
		Through	61.5 (77.1)	E (E)		
		Right	20.9 (24.3)	C (C)		
	Westbound	Left	70.7 (89.4)	E (F)		
		Through	4.2 (3.5)	A (A)		
		Right	0.5 (0.2)	A (A)		
	Northbound	Left	73.0 (78.2)	E (E)		
		Through	72.1 (78.2)	E (E)		
		Right	65.6 (44.5)	E (D)		
	Southbound	Left	69.0 (74.0)	E (E)		
		Through/Right	63.3 (64.4)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	64.0 (76.2)	E (E)	29.5 (46.7)	C (D)
		Through/Right	19.7 (12.9)	B (B)		
	Westbound	Left	56.0 (66.6)	E (E)		
		Through	26.4 (70.6)	C (E)		
		Right	8.2 (9.9)	A (A)		
	Northbound	Left	65.4 (66.3)	E (E)		
		Through	66.7 (69.6)	E (E)		
	Southbound	Right	52.4 (57.2)	D (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Left	72.7 (69.9)	E (E)	26.0 (23.3)	C (C)
		Through/Right	65.0 (63.4)	E (E)		
	Westbound	Through	31.3 (30.1)	C (C)		
		Right	1.4 (2.3)	A (A)		
	Southbound	Left	25.8 (22.6)	C (C)		
45 th Street at Northbound Ramp Terminal	Westbound	Through	15.6 (13.1)	B (B)	31.8 (30.6)	C (C)
		Left	53.8 (49.3)	D (D)		
	Northbound	Right	40.3 (38.6)	D (D)		
		Left	33.6 (39.4)	C (D)		
		Through	16.6 (10.5)	B (B)		
45 th Street at Corporate Way	Eastbound	Through	45.6 (42.3)	D (D)	20.7 (18.2)	C (B)
		Right	0.4 (0.6)	A (A)		
	Westbound	Left	49.3 (55.3)	D (E)		
		Right	36.7 (39.4)	D (D)		
	Northbound	Left/Through/Right	76.9 (60.4)	E (E)		
		Left	64.0 (55.5)	E (E)		
45 th Street at Congress Avenue	Eastbound	Through/Right	59.0 (56.8)	E (E)	54.0 (53.7)	D (D)
		Left	70.4 (78.4)	E (E)		
		Through	44.4 (20.7)	D (C)		
	Westbound	Right	16.8 (17.9)	B (B)		
		Left	68.1 (72.5)	E (E)		
		Through/Right	52.7 (58.1)	D (E)		
	Northbound	Left	67.9 (62.5)	E (E)		
		Through	77.8 (74.7)	E (E)		
		Right	50.5 (50.1)	D (D)		
	Southbound	Left	77.3 (77.0)	E (E)		
		Through	56.8 (77.1)	E (E)		
		Right	34.7 (42.8)	C (D)		

Table 5-20: Design Year 2040 Alternative 2 Intersection Analysis Summary

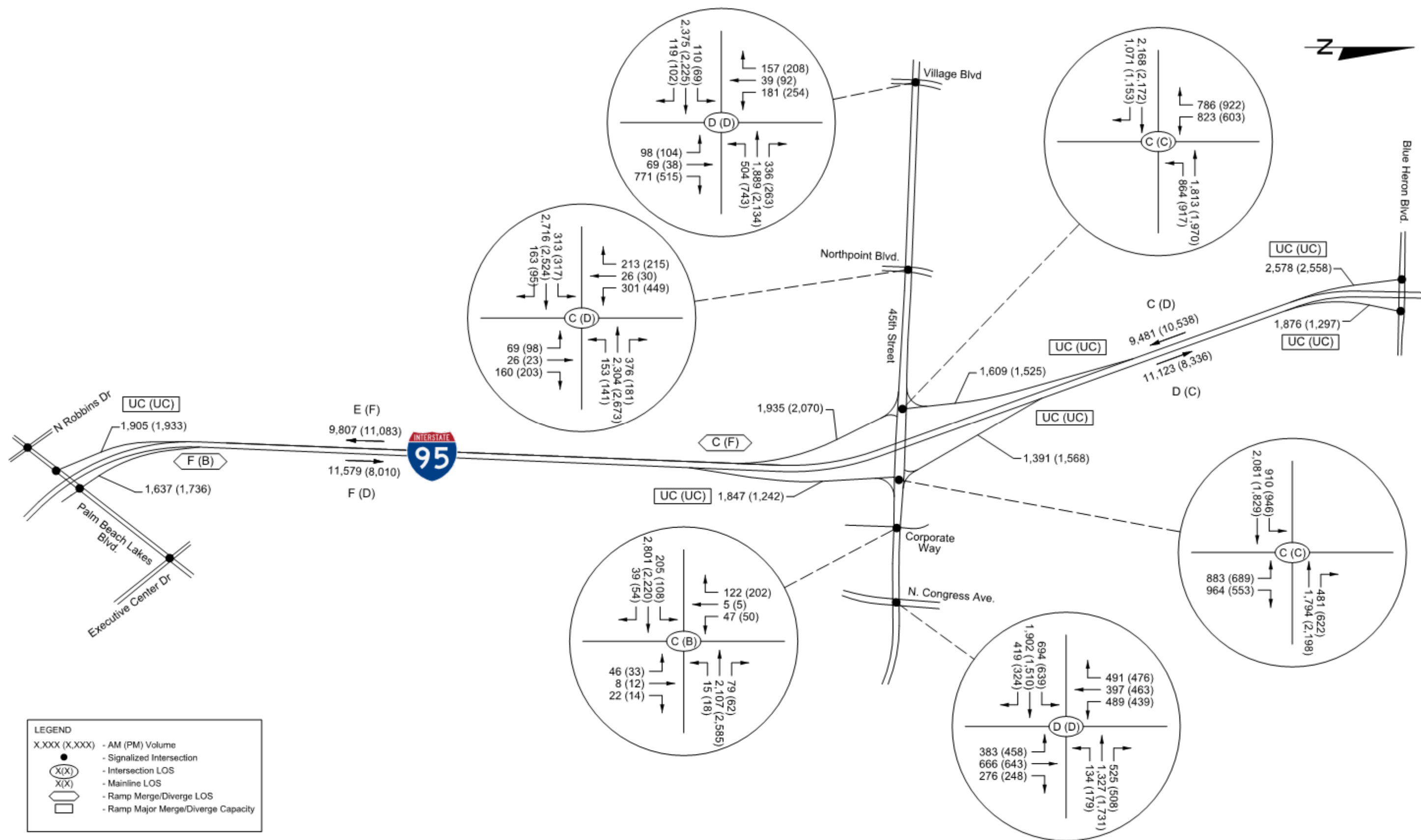
Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	66.8 (65.4)	E (E)	46.8 (48.2)	D (D)
		Through	61.5 (77.1)	E (E)		
		Right	20.9 (24.3)	C (C)		
	Westbound	Left	77.1 (89.6)	E (F)		
		Through	13.2 (3.6)	B (A)		
		Right	12.3 (0.2)	B (A)		
	Northbound	Left	73.0 (78.2)	E (E)		
		Through	72.1 (78.2)	E (E)		
		Right	65.6 (44.5)	E (D)		
	Southbound	Left	69.0 (74.0)	E (E)		
		Through/Right	63.3 (64.4)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	67.6 (76.7)	E (E)	33.4 (48.4)	C (D)
		Through/Right	24.4 (10.4)	C (B)		
	Westbound	Left	63.3 (71.4)	E (E)		
		Through	30.9 (75.4)	C (E)		
		Right	9.2 (16.0)	A (B)		
	Northbound	Left	65.4 (68.8)	E (E)		
		Through	66.7 (71.6)	E (E)		
		Right	52.4 (60.0)	D (E)		
	Southbound	Left	72.7 (74.5)	E (E)		
		Through/Right	65.0 (67.0)	E (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through	21.1 (33.1)	C (C)	26.4 (28.1)	C (C)
	Westbound	Through	32.7 (22.6)	C (C)		
	Southbound	Left	26.4 (18.5)	C (B)		
		Right	35.0 (60.9)	D (E)		
45 th Street at Northbound Ramp Terminal	Eastbound	Through	42.7 (63.0)	D (E)	38.2 (49.5)	D (D)
	Westbound	Through	32.9 (38.2)	C (D)		
	Northbound	Left	32.2 (38.1)	C (D)		
		Right	31.6 (19.4)	C (B)		
45 th Street at Corporate Way	Eastbound	Left	45.6 (42.7)	D (D)	21.9 (15.4)	C (B)
		Through/Right	8.9 (3.4)	A (A)		
	Westbound	Left	69.2 (82.1)	E (F)		
		Through/Right	31.4 (18.2)	C (B)		
	Northbound	Left/Through/Right	76.9 (76.8)	E (E)		
	Southbound	Left	64.0 (60.1)	E (E)		
		Through/Right	59 (61.7)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	71.1 (51.7)	E (D)	51.8 (50.2)	D (D)
		Through	37.1 (21.8)	D (C)		
		Right	21.0 (12.1)	C (B)		
	Westbound	Left	69.4 (68.7)	E (E)		
		Through	51.0 (62.8)	D (E)		
		Right	46.0 (39.7)	D (D)		
	Northbound	Left	60.6 (66.3)	E (E)		
		Through	77.8 (74.2)	E (E)		
		Right	53.4 (47.7)	D (D)		
	Southbound	Left	74.3 (72.4)	E (E)		
		Through	62.4 (66.8)	E (E)		
		Right	37.5 (39.4)	D (D)		

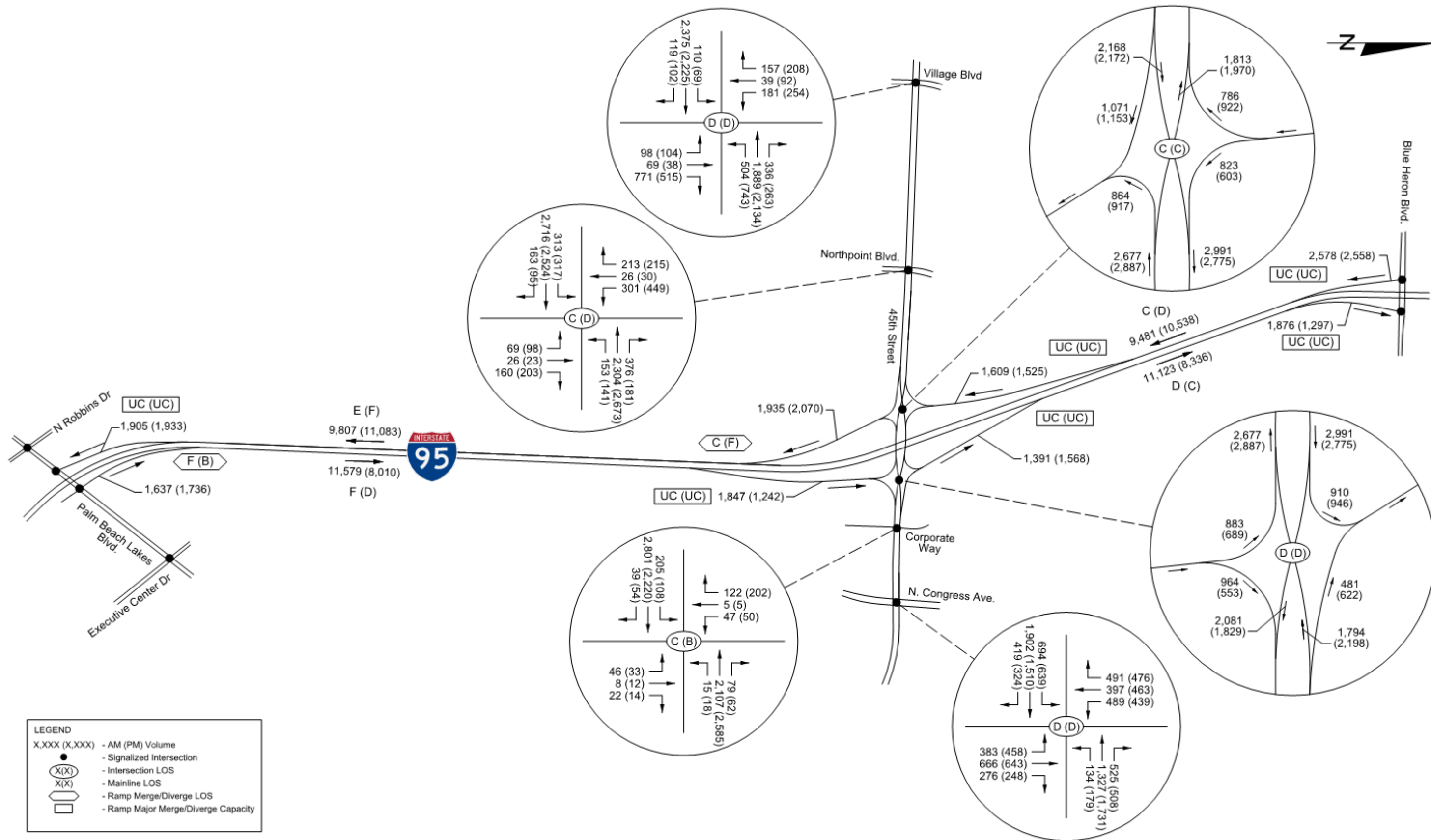
Table 5-21: Design Year 2040 Alternative 3 Intersection Analysis Summary

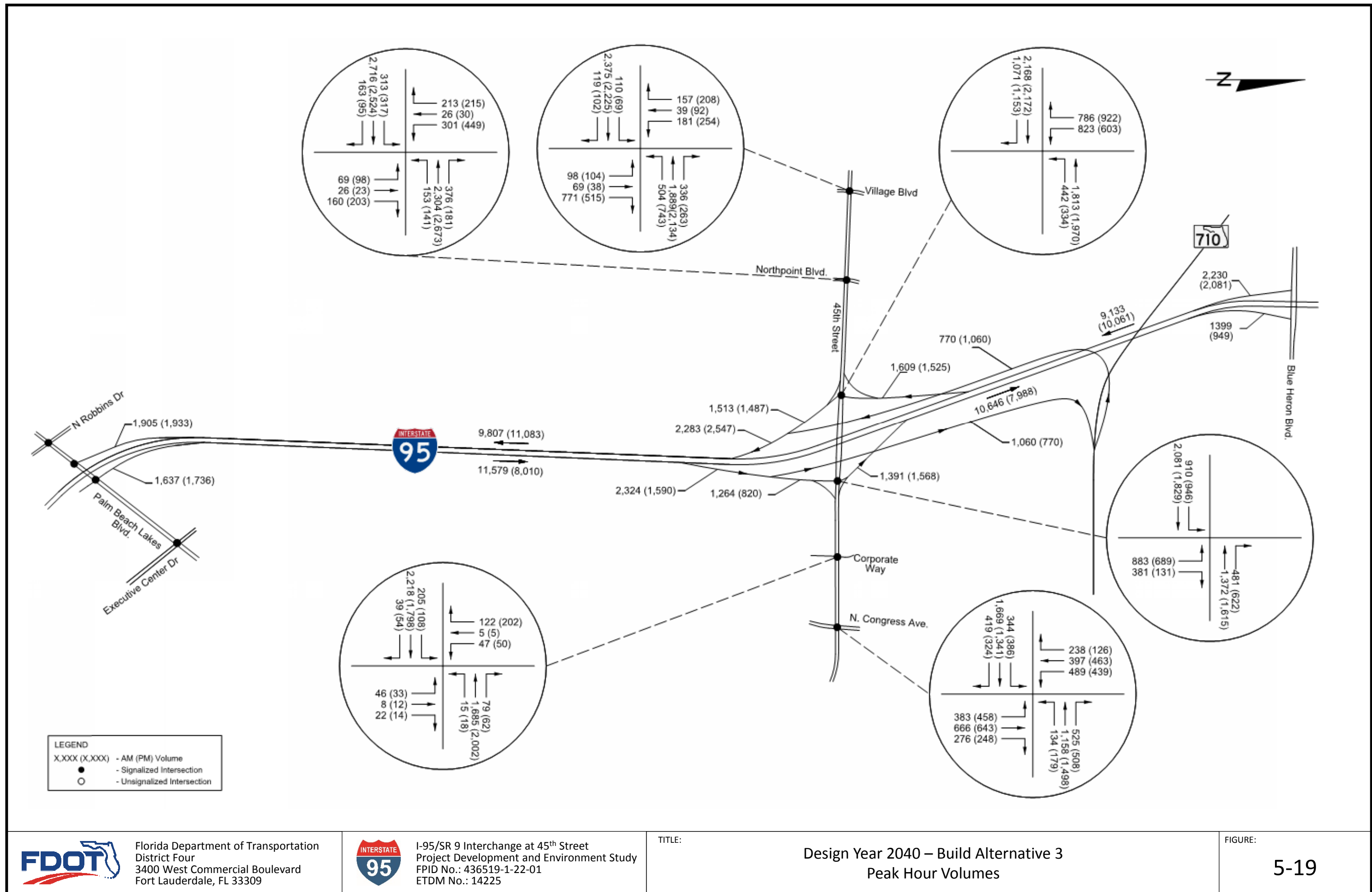
Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	72.2 (70.6)	E (E)	38.9 (39.5)	D (D)
		Through/Right	46.9 (59.9)	D (E)		
	Westbound	Left	54.6 (47.4)	D (D)		
		Through	11.7 (7.1)	B (A)		
		Right	6.6 (2.1)	A (A)		
	Northbound	Left	77.2 (76.3)	E (E)		
		Through	76.5 (76.3)	E (E)		
		Right	55.3 (41.7)	E (D)		
	Southbound	Left	74.5 (77.0)	E (E)		
		Through	68.6 (69.3)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	55.2 (69.1)	E (E)	34.7 (35.4)	C (D)
		Through/Right	21.4 (12.6)	C (B)		
	Westbound	Left	79.3 (69.8)	E (E)		
		Through/Right	35.2 (38.9)	D (D)		
		Left	70.6 (70.0)	E (E)		
	Northbound	Through	63.8 (67.1)	E (E)		
		Right	52.1 (57.4)	D (E)		
		Left	75.4 (79.5)	E (E)		
	Southbound	Through	56.6 (56.0)	E (E)		
		Right	57.7 (60.0)	E (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through	30.3 (25.2)	C (C)	33.3 (27.1)	C (C)
		Right	1.5 (2.2)	A (A)		
	Westbound	Left	31.3 (23.5)	C (C)		
		Through	41.4 (26.2)	D (C)		
	Southbound	Left	59.6 (60.6)	E (E)		
45 th Street at Northbound Ramp Terminal	Eastbound	Left	21.2 (26.4)	C (C)	28.2 (22.7)	C (C)
		Through	15.1 (10.9)	B (B)		
	Westbound	Through	36.8 (25.0)	D (C)		
		Right	0.4 (0.6)	A (A)		
	Northbound	Left	63.3 (60.6)	E (E)		
45 th Street at Corporate Way	Eastbound	Left	75.2 (70.9)	E (E)	22.7 (14.9)	C (B)
		Through/Right	13.6 (12.9)	B (B)		
	Westbound	Left	78.8 (61.7)	E (E)		
		Through/Right	21.8 (6.3)	C (A)		
	Northbound	Left/Through/Right	73.0 (66.5)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	64.3 (59.9)	E (E)	42.8 (45.6)	D (D)
		Through/Right	60.4 (58.9)	E (E)		
		Left	46.7 (65.4)	D (E)		
	Westbound	Through	21.1 (20.3)	C (C)		
		Right	5.5 (2.8)	A (A)		
		Left	72.4 (69.0)	E (E)		
	Northbound	Through	40.4 (49.3)	D (D)		
		Right	22.1 (25.5)	C (C)		
		Left	74.0 (71.0)	E (E)		
	Southbound	Through	75.7 (63.5)	E (E)		
		Right	54.8 (45.9)	D (D)		
		Left	75.8 (72.4)	E (E)		
	Southbound	Through	56.5 (58.1)	E (E)		
		Right	49.0 (48.0)	D (D)		

Table 5-22: Design Year 2040 Alternative 4 Intersection Analysis Summary

Intersection	Intersection Approach				Overall Intersection	
	Approach	Movement	Delay (sec)	LOS	Delay (sec)	LOS
			AM (PM)	AM (PM)	AM (PM)	AM (PM)
45 th Street at Village Boulevard	Eastbound	Left	72.2 (70.6)	E (E)	34 (40.6)	C (D)
		Through	43.9 (62)	D (E)		
		Right	22.4 (28.1)	C (C)		
	Westbound	Left	43 (55.7)	D (E)		
		Through	4 (5.4)	A (A)		
		Right	0.6 (0.4)	A (A)		
	Northbound	Left	94.1 (87.8)	F (F)		
		Through	92.6 (86.7)	F (F)		
		Right	54.9 (42.4)	D (D)		
	Southbound	Left	75.1 (85.6)	E (F)		
		Through/Right	68.8 (74.4)	E (E)		
45 th Street at Northpoint Boulevard	Eastbound	Left	69 (92.2)	E (F)	44.8 (37.8)	D (D)
		Through	12.6 (8.7)	B (A)		
		Right	0.5 (0.7)	A (A)		
	Westbound	Left	70.8 (85.7)	E (F)		
		Through	46.7 (31.6)	D (C)		
		Right	131.4 (13.9)	F (B)		
	Northbound	Left	70.6 (71.6)	E (E)		
		Through	67.4 (67.1)	E (E)		
		Right	58.6 (58.7)	E (E)		
	Southbound	Left	118.8 (144.2)	F (F)		
		Through/Right	80 (67.9)	F (E)		
45 th Street at Southbound Ramp Terminal	Eastbound	Through	128.2 (28.4)	F (C)	51.6 (30.5)	D (C)
		Right	1.6 (2.1)	A (A)		
	Westbound	Left	23.8 (40)	C (D)		
		Through	21.1 (12.2)	C (B)		
	Southbound	Left	49.6 (84.9)	D (F)		
45 th Street at Northbound Ramp Terminal	Eastbound	Left	32.5 (27.5)	C (C)	49.4 (29.4)	D (C)
		Through	36.8 (10.6)	D (B)		
	Westbound	Through	93.2 (35.1)	F (D)		
		Right	0.5 (0.6)	A (A)		
	Northbound	Left	53.2 (78.1)	D (E)		
45 th Street at Corporate Way	Eastbound	Left	52.8 (96.4)	D (F)	19.9 (13.2)	B (B)
		Through/Right	14.2 (6.7)	B (A)		
	Westbound	Left	85.1 (57.3)	F (E)		
		Through/Right	17.3 (7.8)	B (A)		
	Northbound	Left/Through/Right	79.4 (79)	E (E)		
45 th Street at Congress Avenue	Eastbound	Left	67 (63.3)	E (E)	61.4 (67.6)	E (E)
		Through/Right	62.2 (64.9)	E (E)		
		Left	61.2 (88.5)	E (F)		
	Westbound	Through	34.4 (24.9)	C (C)		
		Right	11.2 (0.9)	B (A)		
		Left	165.1 (112)	F (F)		
	Northbound	Through	53.8 (54.5)	D (D)		
		Right	35.4 (29.8)	D (C)		
		Left	93.2 (138.8)	F (F)		
	Southbound	Through	117 (100.1)	F (F)		
		Right	60 (52.7)	E (D)		
		Left	87.9 (104.3)	F (F)		
	Southbound	Through	73.4 (126.2)	E (F)		
		Right	34.4 (40)	C (D)		







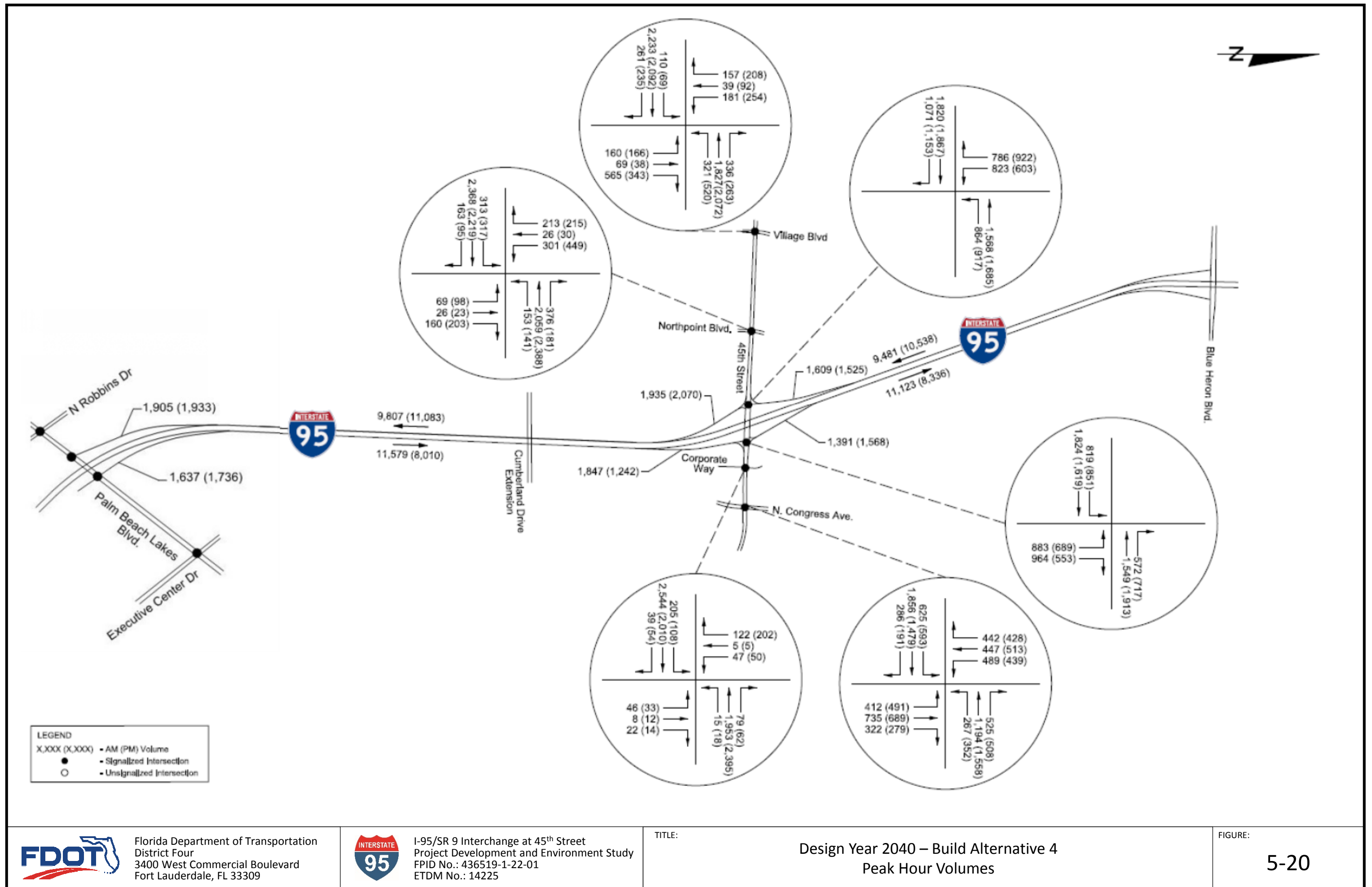


Table 5-23: 95th Intersection Percentile Queue Length Summary – Design Year 2040 Alternative 1

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	91	#1056	46	m#340	93	93	m0	149	-	#519	135	-
	PM Peak	62	#1016	35	m#414	m82	m0	132	135	-	182	122	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m174	m447	-	115	848	47	62	-	158	#213	-	-
	PM Peak	m#186	m217	-	118	#1207	31	82	-	180	#310	-	-
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	472	m284	m212	127	-	-	-	-	156	-	202
	PM Peak	-	464	616	m#574	592	-	-	-	-	228	-	393
	Existing Storage (feet)	-	1,300	800	500		-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	m#393	197	-	-	459	0	176	-	273	-	-	-
	PM Peak	#595	223	-	-	437	0	136	-	142	-	-	-
	Existing Storage (feet)	500		-	-	450	375	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m269	628	-	m23	363	-	-	-	-	89	-	-
	PM Peak	#187	460	-	m23	m421	-	-	-	-	89	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	#329	809	293	107	-	-	175	-	143	#345	-	214
	PM Peak	#331	592	258	136	-	-	200	-	150	#310	-	233
	Existing Storage (feet)	300	600	270	300	-	-	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longerm: Volume for 95th percentile queue is metered by upstream signal

Table 5-24: 95th Intersection Percentile Queue Length Summary – Design Year 2040 Alternative 2

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	91	#1056	46	m#339	245	m34	149	152	-	135	61	-
	PM Peak	62	#1016	35	m#422	m86	m0	132	135	-	182	122	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m174	m750	-	m105	882	m81	62	-	158	#213	-	-
	PM Peak	m#186	m196	-	m92	#1202	m38	84	-	185	#322	-	-
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	589	-	-	m516	-	-	-	-	226	-	439
	PM Peak	-	#658	-	-	m388	-	-	-	-	138	-	#669
	Existing Storage (feet)	-	1,300	-	-	500	-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	-	#865	-	-	361	-	422	-	381	-	-	-
	PM Peak	-	m#790	-	-	563	-	356	-	166	-	-	-
	Existing Storage (feet)	-	500	-	-	450	-	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m226	m364	-	m23	641	-	-	-	-	89	-	-
	PM Peak	m123	m92	-	m25	m330	-	-	-	-	92	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	284	668	m138	108	-	322	168	-	174	#333	-	153
	PM Peak	#301	331	96	135	-	263	202	-	213	289	-	242
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longer
m: Volume for 95th percentile queue is metered by upstream signal

Table 5-25: 95th Intersection Percentile Queue Length Summary – Design Year 2040 Alternative 3

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Throu gh	Righ t	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	96	810	-	m328	640	m23	157	161	487	143	82	40
	PM Peak	66	#837	-	m462	m160	m1	137	142	282	192	161	44
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m196	689	-	m109	844	-	66	60	87	218	56	79
	PM Peak	m#208	m230	-	m100	#980	-	86	55	189	#335	62	134
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	599	m963	m158	298	-	-	-	-	-	194	-	184
	PM Peak	488	770	m106	742	-	-	-	-	-	141	-	260
	Existing Storage (feet)	-	1,300	-	-	500	-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	251	216	-	-	369	0	220	-	119	-	-	-
	PM Peak	315	213	-	-	374	0	157	-	42	-	-	-
	Existing Storage (feet)	-	500	-	-	450	-	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m215	727	-	m29	597	-	-	127	-	92	70	-
	PM Peak	m140	87	-	m28	241	-	-	106	-	94	102	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	157	443	3	111	425	379	186	317	182	#360	265	42
	PM Peak	195	523	23	140	609	224	218	302	168	301	307	32
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longerm: Volume for 95th percentile queue is metered by upstream signal

Table 5-26: 95th Intersection Percentile Queue Length Summary – Design Year 2040 Alternative 4

Intersection	Time Period	95 th Percentile Queue Length (feet)											
		Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
45 th Street at Village Boulevard	AM Peak	96	915	79	m231	96	m0	#231	#232	-	144	77	-
	PM Peak	66	#960	90	m338	181	m0	#197	#192	-	#209	156	-
	Existing Storage (feet)	500	925	380	500	1,000	450	220		-	350	350	
45 th Street at Northpoint Boulevard	AM Peak	m207	253	-	m121	834	182	66	-	175	#278	-	-
	PM Peak	m#218	m188	-	m101	976	m18	87	-	115	#407	-	-
	Existing Storage (feet)	475	1,000	-	400	1,100	1,000	175	-	250	200	-	-
45 th Street at I-95 Southbound Ramp Terminal	AM Peak	-	m#635	-	-	m602	-	-	-	-	479	-	445
	PM Peak	-	m407	-	-	216	-	-	-	-	#268	-	#513
	Existing Storage (feet)	-	1,300	-	-	500	-	-	-	-	580	-	580
45 th Street at I-95 Northbound Ramp Terminal	AM Peak	-	m281	-	-	#507	-	295	-	415	-	-	-
	PM Peak	-	m177	-	-	508	-	#310	-	212	-	-	-
	Existing Storage (feet)	-	500	-	-	450	-	680	-	680	-	-	-
45 th Street at Corporate Way	AM Peak	m201	m572	-	m25	387	-	-	-	-	94	-	-
	PM Peak	m171	119	-	m24	m194	-	-	-	-	96	-	-
	Existing Storage (feet)	340	450	-	275	600	-	-	-	-	150	-	-
45 th Street at Congress Avenue	AM Peak	#419	656	105	#273	-	302	#336	-	355	#384	-	129
	PM Peak	#457	531	2	#312	-	237	#434	-	200	#369	-	224
	Existing Storage (feet)	300	600	270	300	-	290	300	-	325	300	-	300

95th percentile volume exceeds capacity, queue may be longerm: Volume for 95th percentile queue is metered by upstream signal

5.6 Alternatives Evaluation

The operational analysis of the Build Alternatives indicated that Alternatives 1, 2 and 3 provide better overall LOS compared to Alternative 4. [Table 5-27](#) compares the results for the operational analysis of the Build Alternatives.

Table 5-27: Design Year 2040 Build Alternatives Comparison

Intersection	No Build	TSM&O	ALT 1	ALT 2	ALT 3	ALT 4
Village Boulevard	D/D	D/D	C/D	D/C	D/D	C/D
Northpoint Boulevard	D/D	D/D	C/D	C/C	C/D	D/D
SB Ramp Terminal	F/C	C/C	C/C	C/C	C/C	D/C
NB Ramp Terminal	F/D	D/D	C/C	D/D	C/C	D/C
Corporate Way	C/B	B/B	B/B	B/A	C/B	B/B
Congress Avenue	D/E	D/D	D/D	D/D	D/D	E/E

A comparison of the cost for the four Build Alternatives is provided in [Table 5-28](#). Construction cost estimates for all the alternatives were developed from the preliminary concepts prepared for each alternative as part of this study. The estimated construction cost for Alternatives 1 and 2 are substantially lower than the construction cost for Alternatives 3 and 4.

Table 5-28: Preliminary Cost Estimate

Component	TSM&O	ALT 1	ALT 2	ALT 3	ALT 4
Roadway Construction	\$3,880,000	\$9,778,000	\$10,126,000	\$54,207,000	\$26,362,000
Eng/Design (10% Construction)	\$388,000	\$978,000	\$1,013,000	\$5,421,000	\$2,636,000
CEI (15% Construction)	\$582,000	\$1,467,000	\$1,519,000	\$8,131,000	\$3,954,000
Right-of-Way Acquisition	\$0	\$2,261,000	\$2,261,000	\$4,581,000	\$2,000,000
TOTAL COST	\$4,850,000	\$14,484,000	\$14,919,000	\$72,340,000	\$34,952,000

An Alternatives Evaluation Matrix was developed to facilitate comparison of engineering, social-economic, and environmental criteria as well as preliminary project cost. A qualitative scoring system was used to evaluate the criteria. [Table 5-29](#) summarizes the results from the Alternatives Evaluation Matrix.

Table 5-29: Alternatives Evaluation Matrix

PARAMETERS		NO BUILD	TSM&O	ALT 1	ALT 2	ALT 3	ALT 4
Engineering	Geometric Compliance to Design Criteria	3	3	4	5	4	4
	Access Management	3	3	5	5	1	4
	Multimodal (Transit/Pedestrian/Bicycle)	3	3	4	4	3	4
	Mobility	1	2	5	5	4	4
	Safety Impacts	1	2	4	4	4	4
	Utility Impacts	3	3	2	3	1	1
	Maintenance of Traffic	3	3	5	4	2	1
	Meets Purpose & Need	1	2	5	5	2	2
Social-Economic	Social & Neighborhood Impacts	3	3	4	4	2	1
	Relocation Potential	3	3	3	3	1	3
	Community Services Facilities	3	3	3	3	3	3
	Economic & Employment Impacts	3	3	3	3	3	3
	Public Comments	2	3	4	5	3	1
Environmental	Wetlands and Essential Fish Habitat	3	3	2	3	2	2
	Water Quality and Quantity	3	3	4	4	2	3
	Wildlife and Habitat	3	3	3	3	2	3
	Cultural/Historical/Archeological	3	3	3	3	2	2
	Noise Impacts	3	3	4	4	2	1
	Air Quality	2	2	4	4	3	3
	Contamination	3	3	3	3	2	3
Cost	Engineering/CEI/Construction	3	4	5	5	1	2
	Right-of-Way/Business Damages	3	5	3	3	2	3
SCORE		58	65	82	85	51	57
Score Criteria: 1 = Substantial Negative Effect or Worst 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 comparative analysis and evaluation summarized in the Alternatives Evaluation Matrix, Alternatives 1 and 2 provide greater benefits than the improvements from Alternatives 3 and 4. Alternatives 3 and 4 scored lower than the No Build Alternative, which indicates that the proposed improvements are not providing better benefits than the existing conditions. In order for Alternatives 3 or 4 to provide better benefits, these alternatives would require the 45th Street corridor improvements provided with either Alternative 1 or 2.

Since Alternatives 1 and 2 provide the greater benefits for the lowest cost, it was determined that Alternatives 3 and 4 would not be carried forward as part of this PD&E Study.

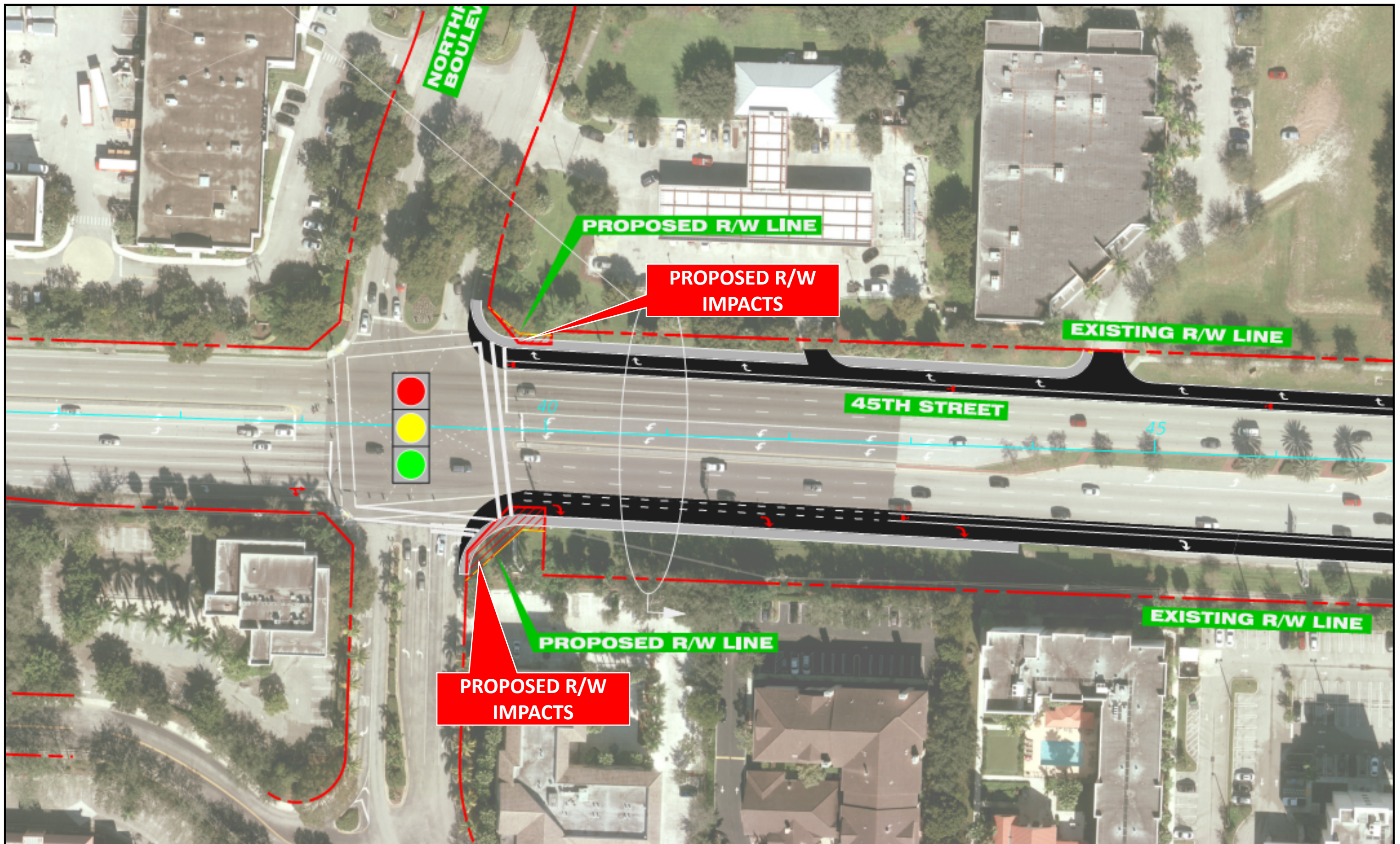
It was also determined that the TSM&O Alternative alone is not a viable alternative. Therefore, the TSM&O improvements would be considered with Alternatives 1 and 2. Both Alternative 1 and Alternative 2 includes the TSM&O improvements in the alternative analysis detailed in the following sections.

5.7 Right-of-Way Impacts

Each of the build alternatives were developed to avoid or minimize right-of-way impacts. Alternatives 1 and 2 require minimal right-of-way in order to improve the operations at Northpoint Boulevard and Congress Avenue. In addition to the permanent right-of-way needs, temporary construction easements could be required that would be coordinated during the design phase for the project. The preliminary drainage analysis indicates that no offsite ponds will be necessary for stormwater drainage. Temporary construction easements could be necessary and would be identified during the design phase for the project. No relocations are anticipated for the project. [Table 5-30](#) summarizes the proposed right-of-way impacts for Alternatives 1 and 2. [Figures 5-21](#) and [5-22](#) show the location of the impacted parcels.

Table 5-30: Proposed Right-of-Way Impacts

Parcel No.	Folio Number	Owner & Address	Proposed Acquisition Area
1	74-43-43-06-10-000-0052	Racetrac Petroleum Inc # 562 PO Box 56607 Atlanta GA 30343	225 SQ.FT.
2	74-43-43-06-12-000-0050	Metrolodging LLC 600 Crestwood CT #613 Royal Palm Beach, FL 33411	1,407 SQ.FT.
3	74-43-43-06-00-000-1100	AN Cadillac of WPB LLC 2101 45 th Street West Palm Beach, FL 33407	1,033 SQ.FT.



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



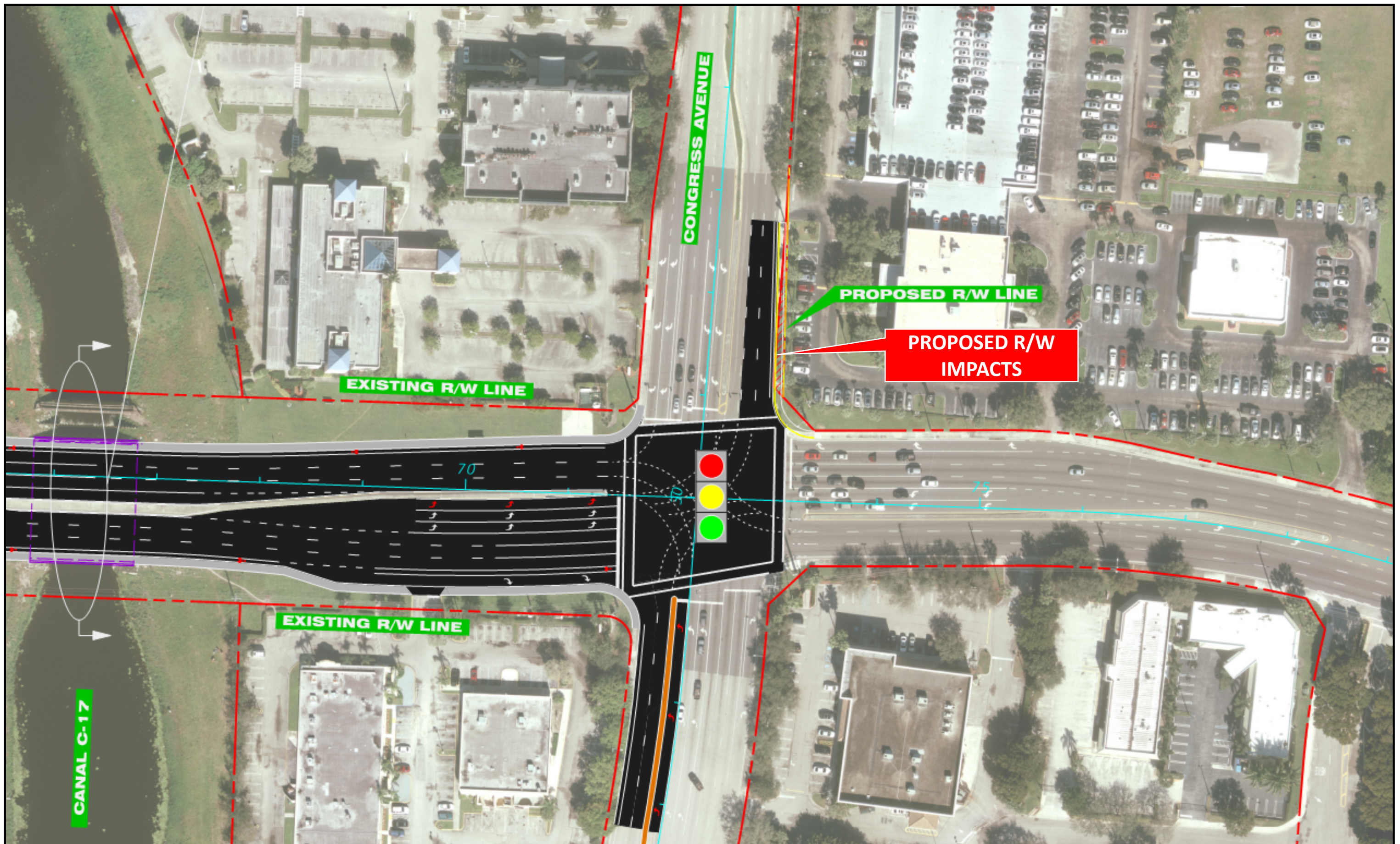
I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

Right-of-Way Impacts

FIGURE:

5-21



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

Recommended Alternative – Right-of-Way Impacts

FIGURE:

5-22

5.8 Preliminary Drainage

FDOT District Four preferences dictate three proposed pond locations are to be selected per drainage basin for each proposed interchange Build Alternative. It proved evident early in the pond siting process that establishing proposed pond sites would be difficult due to the very limited number of feasible undeveloped offsite locations available and that additional treatment/attenuation methods would need to be investigated.

The project area is primarily comprised of dense highly developed commercial land uses from the southern end of the project up to the EPB-10 Canal north of 45th Street (Basins B/C and D) and a mixture of highly developed commercial plus industrial land uses from the EPB-10 Canal to the northern extents of the project area along SR 710 (Basins E, 710 West and 710 East). The three pond siting methodologies used for this investigation are:

Method 1 – Identify new pond site locations for each basin. Pond sites were sized starting with a normal water level (NWL) area of 15% of the contributing areas plus the outward geometric expansion of a 3 foot depth above NWL (1-ft Treatment Volume (TV), 1-ft attenuation, 1-ft freeboard) at a 1:4 side slope, 20-ft maintenance berm, and 20-ft tie-down to existing ground. Any substantial existing pond areas available were then subtracted from this area for a total required parcel size.

Method 2 – Utilize and/or modify existing ponds. Not all existing ponds will be affected by the proposed interchange concepts. Existing ponds were modified as necessary then adjusted to meet TV and modeled to achieve pre/post attenuation.

Method 3 – Utilize alternative treatment methods (compensatory treatment, volume control BMPs, combination Methods 1-3). Method 3 was considered if pond right-of-way acquisition appeared to be impractical or unfeasible. Alternative treatment methodologies include BMP devices for volume control, rate control and/or structural treatment devices.

During the Alternatives evaluation process, Alternatives 3 and 4 were eliminated from further consideration as part of this study. Therefore, Alternatives 3 and 4 were not included in the detailed pond siting analysis.

An analysis was performed to determine Stormwater Management Facility (SMF) sizes required to support the proposed improvements. All basins can be defined as “open” and exhibit a positive outfall. This analysis assumed that all proposed impervious area will require treatment and attenuation.

Based on the preliminary findings of the Drainage and Pond Siting Report prepared for this project, it was determined that either Alternative 1 or 2 can be implemented by modifying the existing stormwater management facilities and have the lowest cost and least impact to the existing stormwater management systems.

5.8.1 Basin B/C

Method 1 – The SMF associated with Method 1 is pond (PS-1) which is located between the southwest quadrant of the I-95/45th Street interchange and the C-17 Canal. MGC West Palm Beach II Corp (Knights Inn of West Palm Beach) is listed in the property appraiser database as the owner of PS-1. This site is the only new pond site considered for the interchange alternatives for Basin B/C. The proposed pond would operate as a wet detention facility attenuating I-95 from 45th Street to the southern project extents and 45th Street from Northpoint Boulevard to the C-17 Canal. The site is located near the natural outfall to C-17 Canal for the southeast interchange quadrant and would likely require collection system modifications to collect runoff from the southwest quadrant.

Method 2 – The existing ponds south of 45th Street can satisfactorily address treatment and attenuation criteria for the proposed improvements for each alternative with minor modifications to the pond control structures. Modified existing ponds were modeled for both alternatives based on preliminary drawings and demonstrated to satisfy stormwater criteria without the need for additional right-of-way.

Method 3 – Since only one proposed pond site could be located in basin B/C, alternative treatment methods were investigated. The existing ponds provide excess TV over the original requirement. Based on the added impervious area and traditional treatment requirements the existing ponds can easily be modified to provide the appropriate TV. Each alternative increases attenuation requirements which could be addressed by modifying the existing control structures

and/or using a rate control BMP, such as a Thirsty Duck floating outlet, at each point discharge outfall location. Should additional nutrient removal be required, the existing facilities could be retrofit using BAM or other pre or post treatment as discussed previously.

5.8.2 Basin D

Method 1 – There are three proposed SMF sites associated with Method 1: PS-2, PS-3, and PS-4. They are described as follows:

PS-2 is located west of the northwest quadrant of the I-95/45th Street Interchange behind Rachel's Gentlemen's Club in the Harley Subdivision and is owned by Passive Income Partners, LLC. Site PS-2 addresses treatment and attenuation for both interchange alternatives for Basin D. The proposed pond would operate as a wet detention facility attenuating I-95 from 45th Street to the EPB-10 Canal and 45th Street from Northpoint Boulevard to C-17 Canal. The site is not ideally located near a natural outfall to EPB 10 Canal and substantial collection system modifications would be required to collect runoff from the northeast quadrant and areas north of the gore areas from the on and off ramps of I-95.

PS-3 is located west of I-95 adjacent to the EPB 10 Canal and is owned by Florida Power & Light Co. Site PS-3 addresses treatment and attenuation for both interchange alternatives. The proposed pond would operate as a wet detention facility attenuating the same basin area as described above. The site is located at the natural outfall to EPB-10 Canal and would require minor collection system modifications to collect runoff from east of I-95.

PS-4 is located east of I-95 adjacent to the EPB 10 Canal and is also owned by Florida Power & Light Co. Site PS-4 addresses treatment and attenuation for both interchange alternatives. The proposed pond would operate as a wet detention facility attenuating the same basin area as described above. The site is located at the natural outfall to EPB 10 Canal and would require minor collection system modifications to collect runoff from west of I-95.

Method 2 – The existing ponds north of 45th Street can satisfactorily address standard treatment and attenuation criteria for the proposed improvements for Alternatives 1 and 2 with minor modifications to the pond control structures. One challenge with both Alternatives is the fact that proposed improvements extend eastward of the C-17 Canal with no means to convey water to the existing interchange ponds. However, the existing ponds can easily accommodate

the TV for this additional area. As a consideration, the post development flow discharged from the existing ponds is also substantially less than allowable predevelopment flow which could allow the proposed widened area to freely discharge to the C-17 Canal as it does in existing conditions. The viability of this compensation method will be pending coordination with SFWMD.

Method 3 – The existing ponds either provide more TV than required by standard treatment rules or can easily be modified to provide the appropriate TV. Similar to Basin B/C, all interchange concepts increase attenuation requirements which could be addressed using a rate control BMP at each point discharge outfall location. Should additional nutrient removal be required, the existing facilities could be retrofit using BAM or other pre or post treatment as discussed previously.

A more detail description of the Drainage Analysis is contained in the *Drainage and Pond Siting Report* that was prepared for this project.

5.9 Utilities and Facilities Impacts

The utility companies with known facilities within the study limits were contacted at the beginning of the PD&E study requesting to provide the FDOT the location of their existing and planned facilities. A preliminary evaluation for potential utility impacts associated with the build alternatives was performed within the project limits. The results indicate that there is potential for involvement with some of these utility companies located within the project area.

There are approximately 13 utility crossings noted within the study limits. The construction associated with the build alternatives could potentially impact some of these utility crossings or at least will require further coordination during the design and construction phases. The potential utility companies and crossing locations are summarized below:

American Traffic Solutions (ATS)

- o Maintain a 2" Polyvinyl Chloride (PVC) directionally bored conduit at the intersection of Village Boulevard and 45th Street on the north, east, and south sides of the road. Some of the facilities in the as-builts provided show connections to cameras, however, per the

American Traffic Solutions representative Santiago Martinez, some of the cameras have been removed.

- o 2" directionally bored PVC conduits to the north, west, and south connected to ITS equipment at Congress Avenue.

AT&T Distribution

- o Along Palm Beach Lakes Boulevard, AT&T has a buried duct on the north side of the road. It begins as a 9-4" PVC duct with two manholes, one to the east (8.5'x4.5'x6') and one to the west (6'x16'x7') on I-95, and turns into a 15-4" PVC duct after the manhole to the east.
- o Along the CSX railway crossing beneath I-95, AT&T has a 1-1" buried copper on the east side of the rail and appears to fall within CSX right of way.
- o AT&T has a duct bank along the south side of Blue Heron Boulevard. Starting from the east, the duct starts as a 9-4" PVC which connects to a 6'x12'x7' manhole. From here the buried facilities contain 7-4" HDPE, 2-4" PVC, and 2-4" TR ducts. This duct connects to another 6'x12'x7' manhole west of I-95. The facility then returns to a 9-4" PVC duct. Near the manhole to the west of I-95, there is a crossing to the north side of the road (4-4" PVC) to another 6'x12'x7' manhole with a 2-4" PVC duct continuing west.
- o On 45th Street, starting at Akers Away MPH, there is a 6-4" PVC conduit on the north side of the road that connects to a 6'x12'x7' manhole. Branching off this line is a 2-4" PVC duct that heads north and connects to a 3'x5' AT&T owned cabinet which has a 1-1" copper cable that appears to service the neighborhood to the east.
- o The 6-4" PVC duct continues east down 45th Street and connects to a 15'x6'x9' manhole on the northwest corner of Village Boulevard and 45th Street. West of this intersection there is a 12'x6'x10' manhole and a 6'x12'x7' manhole in the westbound lane of 45th Street. Along Village Boulevard, there is a 2-4" PVC conduit to the west and to the west. On the northwest corner of Village Boulevard and 45th Street a 1-2" copper branches from the line on the west side of Village Boulevard and runs parallel to the 6-4" PVC duct bank and continues

down 45th Street until about 500' west of the I-95 bridge. The 1-2" copper on the north side converts to a 1-1" copper east of Northpoint Boulevard. On the south side of the road east of this intersection is a 1-1.5" and a 1-1" copper that appear to be out of the right of way and head south down Metrocentre Boulevard.

- o The 6-4" PVC duct on the north side of the road connects to another 6'x12'x7' manhole about 800' east of Village Boulevard.
- o At Northpoint Boulevard north of 45th Street, there is a fiber to the west and a 4-4" buried PVC duct to the east that crosses 45th Street and continues south. From the southeast corner, there is a 4-count fiber that runs about 300' east until crossing back to the north side of 45th Street to a 6'x12'x7' manhole. The 6-4" PVC duct bank converts into a 10-4" PVC duct bank east of Northpoint Boulevard, where it then turns into a 12-4" PVC duct bank and back to a 6-4" PVC duct bank after the 6'x12'x7' manhole. There is a 2-4" PVC duct crossing about 250' east of Northpoint Boulevard.
- o The 1-1" copper on the north side of the street turns north out of right of way west of I-95.
- o West of the westbound I-95 exit lanes, there is a 6'x12'x7' manhole. The 6-4" PVC duct connects to this manhole and converts to a 4-4" PVC duct east of the manhole and continues along 45th Street until east of the northbound I-95 entrance ramps where there is a 6'x12'x7' manhole. East of this manhole, there is a 3-fiber buried cable and a 2-2" buried copper that continue until turning north down Corporate Way.
- o West of Corporate way, there is a crossing of a 1-fiber cable, a 2-2" copper, and a 1-4" PVC duct. The 1-fiber cable and 1-2" copper cables continue east past canal C-17, however, the 1-2" copper turns south past the canal.
- o West of Congress Avenue on the south side of 45th Street, there is also a 2-fiber aerial cable that continues east until Embarcadero Drive.

City of Riviera Beach

- o Own 30" Ductile Iron Pipe (DIP) force main north of the I-95 and 45th Street Interchange, slightly south of Cheney Way.
 - This force main conveys wastewater to the regional wastewater treatment plant in the City of West Palm Beach.

City of West Palm Beach – Water/Sewer (CWP)

- o Starting at Congress Avenue, PBC has a 20" DIP water main on the north side of 45th Street. This line continues down, crossing above the canal and crossing Corporate Way before turning in to a 12" cast iron pipe (CIP). This line continues down 45th Street west out of the project limits. On the east side of Corporate Way, there is a 12" cast iron water main that crosses 45th Street, which appears to serve the building on the southwest corner.
- o On the west side of Congress Avenue, there is a 12" DIP that runs north and south. On the south side of 45th Street at this intersection, a 10" DIP breaks off the 12" and continues west down 45th Street stopping prior to the canal.
- o At Metrocentre Boulevard, there is an 8" DIP that breaks off the 12" cast iron water main on the north side of 45th Street. This 8" PVC water main continues south down the east side of Metrocentre Boulevard.
- o At Village Boulevard, there is another water main that breaks off the 12" main cast iron water main. To the north of the 12", it is a 10" DIP and to the south it is a 10" cast iron. The line runs north and south down the west side of Village Boulevard. Near the southwest corner of 45th Street and Village Boulevard, there is an 8" PVC water main that branches off the 10" cast iron pipe and continues west down the south side of 45th Street past the project limits.
- o There is also a force main that begins west of Congress Avenue on the north side of 45th Street and crosses over to the south side immediately east of Congress. This line continues east down 45th Street. There is a 4" force main crossing east of Corporate Way. There is

also a 4" PVC force main that crosses 45th Street east of the NB I-95 ramps and continues in the middle of the eastbound lane on 45th Street stopping just west of Corporate Way. CWP has a 10" DIP force main that begins just east of Village Boulevard in the middle of the eastbound lanes on 45th Street, which continues west out of the project limits. Finally, there is a 4" DIP force main that runs along the east side of Northpoint Boulevard turns and runs along the north side of 45th Street.

- o CWP has a sanitary gravity main starting on the northeast corner of 45th Street and Congress, with the line continuing north down Congress and West down 45th Street stopping before Corporate Way. There is also a sanitary crossing (N/S) east of Corporate Way. The City also has an 8" PVC sanitary gravity main that begins in the eastbound lanes on 45th Street, west of Village Boulevard and continues west out of the study limits.

Comcast

- o Along the north side of the CSX railway crossing, Comcast has aerial facilities on both the east and west side of I-95 that convert to an underground environment beneath SR9/I-95.
- o Comcast has an underground crossing beneath I-95 about 3500' west of the I-95/45th Street Interchange.
- o Starting at Akers Away MHP, Comcast has an aerial facility on the south side of 45th Street that converts to an underground environment beneath I-95, converts back to overhead west of Corporate Way. It then becomes underground beneath the canal and continues east of the canal as an aerial facility until the east side of Embarcadero Drive, where it then converts back to underground throughout the remainder of the project limits.
- o There is an aerial crossing along the east side of Congress Avenue across 45th Street.
- o Starting at the northwest corner of Village Boulevard and 45th Street, there is an underground Comcast facility crossing to the southwest corner, continuing across Village Boulevard to the southeast corner, and then continues south down the east side of Village Boulevard.

Crown Castle

- o Crown Castle has no facilities near the I-95 interchange, however, they do have facilities to the east and west. Starting at Northpoint Boulevard, Crown Castle has one underground fiber to the south and one bored fiber to the north heading west along 45th Street. To the east of the interchange, again, they maintain one underground fiber to the south and one bored fiber to the north starting slightly west of Congress Avenue continuing east down 45th Street.

Fibernet Direct (formerly FPL Fibernet)

- o Fibernet has an underground fiber that runs along the south side of 45th Street. The underground fiber becomes aerial immediately east and west of the I-95 interchange. It is also aerial immediately west of Congress Avenue until about 800' east, where it converts back to underground. The underground fiber crosses 45th Street at Corporate Way and continues north. It also crosses 45th Street from the south side to the north along the east side of Northpoint Boulevard. There is an aerial crossing to the east side of the C-17 canal from this line as well.
- o At Congress Avenue, there is an underground fiber on the west side of the road running south from the intersection of Congress Avenue and 45th Street.

FPL Distribution

- o Near Palm Beach Lakes Boulevard, FPL Distribution has a 13Kv aerial line that runs along the east and west side of I-95 and appears to be in FDOT right of way. The line to the west appears to continue and serve the adjacent neighborhood outside of the right of way. The line to the east appears to continue north down I-95. This line has two additional Distribution 13Kv that run east and west down Palm Beach Lakes Boulevard, east of I-95. There is also an aerial line crossing I-95 north of Palm Beach Lakes Boulevard near the northbound I-95 entrance ramps.

- o There is a 13Kv aerial line that runs east and west directly south of the FPL power plant on the west side of I-95 in the large Transmission corridor. From here, there is an underground facility on the west side of I-95 that stops immediately north of the power plant.
- o Along the north side of the CSX railway, there is a 13Kv aerial line to the east and west of I-95 that converts to an underground 13Kv line beneath I-95.
- o At I-95 and Blue Heron Boulevard, FPL has 13Kv aerial lines on the west side of the southbound I-95 entrance and exit ramps, however, the lines do not connect nor do they cross Blue Heron Boulevard, but instead feed adjacent neighborhoods. About 1500' south of the interchange there is a buried 13Kv crossing beneath I-95.
- o Along 45th Street, there is a 13Kv aerial facility on the south side of the road that runs from the beginning of the study to the end. This line converts to a 13Kv underground environment underneath the I-95 and 45th Street interchange. There are multiple crossings from this line. West of Village Boulevard, there is a 13Kv aerial crossing that connects to the pole line on the north side of the road. There is also a 13Kv buried line that runs along the east side of Village Boulevard that looks as though it is out of the right of way. About 500' east of Northpoint Boulevard, there is a 13Kv buried line that runs north and south and crosses 45th Street. About 800' west of the I-95 at 45th Street interchange, there is a 13Kv aerial line running northeast/southwest and crosses 45th Street.
- o About 500' east of Akers Away MHP that runs east and west along 45th Street on the north side of the road until Village Boulevard. It connects to the 13Kv aerial line on the south side of the road west of Village Boulevard (previously stated).
- o At the C-17 canal, there is a 13Kv buried line to the west of the canal east of Corporate Way. There is also an aerial crossing to the east of the canal.
- o There is a 13Kv aerial crossing on the east side of Congress Avenue starting at the southeast corner of 45th Street and Congress Avenue and continues north.
- o There is a 13Kv aerial line that begins south of Embarcadero Drive on the east side and continuing north, crossing 45th Street.

FPL Transmission

- o FPL Transmission has large a transmission corridor south of the FPL power plant on the west side of I-95. They have two 230Kv lines, one 138Kv line, and another structure with four 138Kv lines.
- o On 45th Street, there is one 138Kv line on the south side of the road, west of Akers Away MHP, continuing to the west of Village Boulevard, where it continues south. There are also three 138Kv lines on the north side of 45th Street in the same area that also turn and continue south west of Village Boulevard.

FPL Oil/Gas

- o FPL Oil/Gas has one 30" oil line and one 24" natural gas line that falls within the CSX right of way from east to west up to the west side of I-95, where the pipelines turn south to the Martin Fuel Terminal. The lines cross I-95 approximately 2200' north of 45th Street and runs east to the Port of Palm Beach.

Florida Public Utilities (FPU)

- o On Palm Beach Lakes Boulevard, FPU has a 6" steel coated/wrapped gas main on the southern side of the road crossing beneath I-95, ending before the south bound entrance ramp. They also have a 4" Polyethylene (PE) gas main on the northern side of the road, east of the southbound exit ramps.
- o On 45th Street, FPU owns a 6" steel coated/wrapped gas main along the length of the southern side of 45th crossing beneath the interchange. This line has multiple smaller service lines that branch off it. First, there is a 2" PE crossing west of Village Boulevard crossing 45th Street. Next, there is a 4" PE crossing along the east side of Northpoint Boulevard. There is a 1¼" PE crossing approximately 1200' west of the I-95 interchange. Most notably, there is a 4" steel coated/wrapped connected to the mainline that crosses 45th Street east of the northbound I-95 ramps. Connected to this, is a 2" PE gas main on the north side of 45th Street that continues down the road until turning north immediately past

Corporate Way. At Congress Avenue, the 6" steel mainline crosses 45th Street on the east side of Congress and continues north. The line continues down 45th Street until Embarcadero Drive, where it becomes a 4" line and runs north down the west side of Embarcadero Drive.

- o The 6" steel coated and wrapped line crosses from the southeast corner of 45th Street and Congress Avenue across 45th Street along the east side of Congress Avenue.
- o FPU maintains one crossing beneath I-95 south of the FPL power plant. It is a 12" steel coated/wrapped high pressure gas main.

Level 3 Communications

- o Level 3 has an underground facility along the south side of Palm Beach Lakes Boulevard. This facility is a 128 strand Fiber Optic Cable (FOC) that is in a conduit "package" with Fiberlight which has a 432 strand FOC. This conduit is a 4-1.5" HDPE (High Density Polyethylene).
- o They also have an aerial line (24 strand FOC) on the south side of 45th Street, west of Village Boulevard. This line crosses 45th Street on the west side of Village Boulevard, where it drops to an underground facility that is bored across 45th Street in 4-1.5" HDPE conduits.

Palm Beach County Traffic

- o Palm Beach County Traffic has an existing 24 count aerial on the north side of the intersection of Village Boulevard and 45th Street, which crosses to the south side of 45th Street immediately east of Village Boulevard. On the southeast corner of the intersection, the aerial facility drops to a pull box (30"x48"x24") and converts to an underground 24 count cable in a 2" conduit along the south side of 45th Street.
- o The underground facility once again turns aerial at Northpoint Boulevard on a concrete signal pole with a 2" riser conduit. The facility converts back to an underground 2-2" conduit about 450' east. This continues to Congress Avenue.

- o At the intersection of 45th Street and Congress Avenue, the underground conduit converts back to aerial on the southwest corner of the intersection.

5.10 Evaluation of Environmental Impacts

5.10.1 Social Impacts

Transportation improvement projects can impact social issues for adjacent communities. The impacts of the project are a function of the existing communities within the project study area and how the project affects community cohesion, demographics, safety/emergency response times, compatibility with community goals and quality of life.

The proposed roadway improvements will not change or alter the demographic mix of the population along the corridor, as well as the improvements will not impact the interaction between the three communities, the City of Riviera Beach, the City of West Palm Beach, and the Town of Mangonia Park. The recommended alternatives will improve connectivity and ensure that the project corridor continues to meet mobility and safety goals. As FDOT District Four noted in their ETDM summary comment, the FHWA expressed concern about the social impact of potential right-of-way acquisitions and relocations of community facilities or residents. Relocations or acquisitions associated with residents or community facilities are not anticipated based upon the current project design. A public involvement plan is being implemented by FDOT District Four to ensure that both the social and transportation needs of the surrounding communities are not negatively impacted by the project.

During the Sociocultural Effects study, a review of the potential impacts to demographics, community cohesion, safety and community goals/quality of life issues was conducted. The degree of effect assigned to social issues is none.

5.10.2 Economic Impacts

The economic conditions are a key variable in establishing the profile of a community. These economic conditions describe a community's economic history, current economic wellbeing, and future potential. This information takes into account employment levels, types of jobs, per

capita income, poverty, unemployment rates, the range of incomes in the community, and trends in employment opportunities (e.g. family-owned businesses versus national chain businesses).

The proposed improvements for the I-95/45th Street interchange will improve mobility and support the economic development of the local businesses.

During the study, a review of the potential impacts to commerce and tax base issues was conducted. The project will enhance the area as a commercial destination, thus creating jobs and increasing employment rates within the study area. The degree of effect assigned to economic issues was determined to be enhanced.

5.10.3 Land Use

Land use involves the activities that people undertake on a piece of land, particularly developed land. Land use planning provides order and regulates use of land to best meet the needs of the people of a community. Currently, the land use adjacent to the I-95 and 45th Street interchange is mainly residential, commercial, institutional, and industrial. Along the west side of I-95, the land use is primarily commercial and industrial. The east side of I-95 is predominately commercial and healthcare properties. Residential areas are primarily in the southwest. This area includes schools such as the New England Institute of Technology. The following land use were identified within 500 feet of the project limits:

- Residential, Medium Density – 1.0%
- Commercial and Services – 50.0%
- Institutional – 2.53%
- Open Land – 8.5%
- Herbaceous, Dry Prairie (Dry Detention Ponds) – 10.6%
- Channelized Waterways, Canals – 3.57%
- Roads and Highways – 23.8%

The Future Land Use Plan for the City of West Palm, published in June 2013, depicts areas north of the interchange to be industrial in a Special Impact Zone (SIZ) and conservation and community services in the east. SIZ are areas where the city denotes higher site plan review

and compatibility analysis to reduce potential land use incompatibilities. Areas to the south were shown as commercial in a SIZ. The area west of the interchange is depicted as commercial, conservation, commercial in SIZ, and single family.

Both I-95 and 45th Street serve as hurricane evacuation routes, however, the project is not located in an Area of Critical State Concern (ACSC), Coastal High Hazard Area (CHHA), or Military Base.

During the study, a review of the potential impacts to land use patterns, plan consistency and growth trends was conducted and a degree of effect of minimal was assigned.

5.10.4 Mobility

FDOT's mission statement is centered on providing a "safe transportation system that ensures the mobility of people and goods, enhances economic prosperity and preserves the quality of our environment and communities." Mobility is the ability of people to move about freely and it encompasses all modes of travel including pedestrian, bicyclists and transit.

The proposed improvements would upgrade the existing sidewalks and crosswalks located along both sides of 45th Street within the vicinity of the interchange to ADA standards. Bicycle lanes are also currently along 45th Street from Corporate Way and continuing west through Village Boulevard, but bicycle lanes are missing just east of Northpoint Parkway/Metrocentre Boulevard. The proposed improvements would connect the discontinuous bicycle lane between Corporate Way and Congress Avenue.

The Mangonia Park Tri-Rail Station is located on 45th Street east of the I-95 Interchange. With additional mobility and movement of passengers from the proposed improvements, it is anticipated that more residents will be encouraged to use the Tri-Rail System.

During the study, a review of the potential impacts to mobility, accessibility, traffic circulation and public parking was conducted. The degree of effect assigned to mobility is enhanced.

5.10.5 Visual Impacts and Aesthetics

Aesthetic issues, which include how the community is affected by a project in regards to visual and noise/vibration impacts, are subjective. They are best defined by the collective community vision of what constitutes a pleasing environment. It includes actual or perceived impacts to noise/vibration, viewsheds and compatibility of the project with the surrounding area.

The project study area consists of well-developed commercial, community properties, and some residential areas are adjacent to the I-95/45th Street interchange in the southwest portion.

During the study, a review of the potential impacts to visual impacts and noise/vibration, viewshed and compatibility issues was conducted. The degree of effect assigned to aesthetics is minimal.

5.10.6 Relocation Potential

During the study, a review of the potential impacts to residential and non-residential properties was conducted. Right-of-way acquisition is anticipated to be minimal and no relocation is anticipated. Drainage and storm-water analysis have indicated that the existing drainage system will be utilized for drainage improvements. Therefore, the degree of effect assigned to relocation potential is no involvement.

5.10.7 Potential Section 4(f) Lands

During this study, the project area was reviewed for the potential presence of 4(f) resources. Based upon this evaluation it was determined that there is not a direct or indirect use of Section 4(f) resources. There are no existing public parks or recreational lands, wildlife and waterfowl refuge, or historical sites located within the project area that will be affected by the proposed project improvements. A Determination of Applicability (DOA) was prepared for the project to document this process. A DOA Memorandum was prepared on May 16, 2017. An effect determination of none is assigned to this project.

5.10.8 Historic Sites/District

In accordance with the procedures contained in 36 CFR, Part 800, a CRAS, including background research and a field survey coordinated with the SHPO, was performed for the

project. The CRAS was prepared to identify cultural resources within the project area of potential effect (APE) and assess their eligibility for listing in the National Register of Historic Places (National Register) according to criteria set forth in 36 CFR Section 60.4.

The historic resources survey resulted in the identification of one newly recorded historic resource, the Earman River Canal (C-17 Canal) (8PB17116). This resource is considered eligible for inclusion in the National Register of Historic Places under Criteria A and C, in the areas of Community Planning and Development and Engineering.

FDOT submitted a copy of the CRAS to SHPO for their review and to request for SHPO to confirm that the CRAS is complete and sufficient and provide concurrence with the report recommendations and findings. SHPO acknowledged their concurrence of the CRAS on October 12, 2016.

A Section 106 Evaluation and Determination of Effects Case Study Report dated October 2017 was prepared for the project and provided to SHPO for review. The Section 106 Evaluation and Determination of Effects Case Study Report documented the potential effects of the proposed improvements to the National Register-eligible Earman River Canal (C-17) (8PB17116). The Criteria of Effect, as defined in 36 CFR Part 800.5, was applied to this resource. In consideration of available project information, it was determined that the proposed project will have no adverse effect on the Earman River Canal (C-17) (8PB17116), due to the nature of the improvements, which will not impact those essential physical features that qualify the resource for inclusion in the National Register. SHPO provided their concurrence on December 4, 2017. Based upon the current conceptual design plans, adverse effects to the canal are not anticipated and the degree of effect assigned to cultural resources is minimal at this time.

5.10.9 Archaeological Sites

No newly or previously recorded archeological sites were identified within the archaeological APE. Subsurface testing was not feasible within the archaeological APE due to the presence of existing pavement, sidewalks, landscaping, existing retention ponds and canal, berms and buried utilities. A pedestrian survey of the archaeological APE confirmed the developed nature of the project corridor and confirmed the low potential for finding intact archaeological sites. Therefore, the project is anticipated to have no involvement with archaeological sites.

5.10.10 Recreational Areas

The proposed project is anticipated to have no involvement with public parks or recreational land as none exist within the vicinity of the project area.

5.10.11 Wetlands and other Surface Water

Based on the desktop analysis and field reviews, no jurisdictional wetlands are present within the 500-ft buffer zone. The C-17 Canal and an un-named drainage lake along the west side of I-95 are present within the project limits and buffer zone.

Since these bodies of water have steep banks that are too deep to support emergent wetland vegetation, these bodies of water qualify as “other surface waters” and not as “wetlands.” In addition, no freshwater submerged aquatic vegetation was observed within the portions of the C-17 Canal that fall within the project limits and buffer zone. Therefore, no impacts to wetlands are anticipated that would require mitigation from regulatory agencies.

Project construction along the banks of the C-17 Canal will require shoreline stabilization and erosion and sediment control measures to avoid/minimize secondary water quality impacts from project construction.

The impact determination of minimal is assigned to wetlands and other surface waters.

5.10.12 Water Quality and Water Quantity

The project is located in the jurisdiction of the SFWMD. All project located in the jurisdiction of SFWMD are required to meet state water quality standards set forth in Chapter 62-302, Florida Administrative Code (FAC). The approach to meeting water quality requirements is to provide treatment for the increase in impervious area and restore or replace existing permitted treatment facilities impacted by this project. The following methodology was used to determine the treatment volume needed to meet SFWMD requirements:

1. Wet detention volume shall be provided for the first inch of runoff from the developed project, or total runoff of 2.5 inches times the increase in imperviousness, whichever is great.

2. Dry detention volume shall be provided for 75 percent of the above amounts computed for wet detention.
3. Retention volume shall be provided for 50 percent of the above amounts computed for wet detention.
4. Identify and quantify existing treatment impacted by the proposed roadway footprint and replace this treatment within the project area.

The project lies almost entirely within the C-17 Canal segment of the Lake Worth Lagoon, WBID# 3242. This watershed has been classified as verified impaired for Nutrients and Dissolved Oxygen. However, it was delisted for Nutrients in 2016. It is listed on FDEP's Strategic Monitoring Plan to monitor for bacteria and metal by June 2020. Modifications to the stormwater management systems within this impaired waterbody will require an additional 50% water quality treatment volume as well as nutrient loading analysis demonstrating no increase in nutrient loading over the existing condition. Based on the scope of this project, the degree of effect on water quality is minimal for this project.

Existing dry detention ponds associated with the I-95/SR 9 Interchange at 45th Street will be used to treat and attenuate additional runoff associated with the project. Each existing dry detention pond was modeled using Interconnected Channel and Pond Routing (ICPR) version 3.10 Service Pack 10. FDOT and SFWMD design storms were run to insure compliance with applicable design criteria. It was determined that the stormwater for the constructed project may be managed by modifying the existing stormwater management facilities. It is recommended to modify the existing infield dry detention ponds in Basins B, C and D associated with I-95 at the interchange by re-grading the side slopes and minor modification to the control structures. Based on the scope of this project, the degree of effect to water quantity is minimal.

5.10.13 Floodplain

A review of the Flood Insurance Rate Map published by Federal Emergency Management Agency (FEMA) indicates that Zone A, AE, and X500 are within 100 feet of the proposed project. Zone A areas are subject to 1% annual chance flooding. However, since no detailed hydraulic analyses have been performed for this zone, no Base Flood Elevations or flood

depths have been determined. Areas identified in zone AE have a 1% annual change of flooding during the Base Flood (100-year flood) with base elevations ranging from 5.0-ft. to 7.0-ft. NGVD. Areas identified in Zone X500 are estimated to have less than 1 foot or no flooding and are protected by levees from the 100-year flood. A degree of effect of minimal was assigned to Floodplains.

5.10.14 Protected Species and Habitat

A 500-foot buffer zone was used to evaluate the presence of protected wildlife species and their habitats during field reconnaissance conducted May 31, 2016. Protected wildlife species are those listed as “species of Special Concern (SSC),” “threatened,” or “endangered” by the Florida Fish and Wildlife Conservation (FWC) and/or U.S. Fish and Wildlife Service (USFWS).

The majority of the existing land use within the project study area is roads and highways and commercial development. Additional land uses adjacent to the intersection in relatively low abundance include dry detention ponds, open land, medium-density residential development, channelized waterways, institutional, and other roadways. No undeveloped natural areas are present within the project limits or a 500-foot buffer.

During a site visit on May 31, 2016 it was noted that the vast majority of the project corridor consisted of developed land (commercial, residential, and industrial). Small areas of undeveloped uplands were observed within the buffer zone. However, these areas were either actively maintained (i.e. mowed), overgrown with invasive/exotic vegetation, or displayed disturbed soil conditions (i.e. fill materials) and therefore, provide negligible habitat value for protected upland species. Due to the absence of littoral zones and emergent wetland vegetation within the canals, habitat for wetland-dependent protected species is also negligible.

No protected species were observed within the 500-foot buffer zone during the field review. However, the following species have a reasonable likelihood of occurrence within the project study area based on desktop analyses.

Roseate Spoonbill (*Platalea ajaja*)

Roseate spoonbills primarily nest in coastal mangrove islands or in Brazilian pepper on man-made dredge spoil islands near suitable foraging habitat. They typically forage in shallow water of variable salinity, including marine tidal flats and ponds, coastal marshes, mangrove-dominated inlets and pools, and freshwater sloughs and marshes. Habitat for this species is limited due to the steep banks and negligible native shoreline vegetation within the canals and stormwater ponds with the project limits and 500-foot buffer zone. Therefore, it is anticipated that this project may affect, not likely to adversely affect the roseate spoonbill.

Little Blue Heron (*Egretta caerulea*) and Tricolored Heron (*Egretta tricolor*)

These birds feed in shallow freshwater, brackish, and saltwater habitats and nest in a variety of woody vegetation types, including cypress, willow, maple, black mangrove, and cabbage palm. Since habitat for these species is limited due to the steep banks and negligible native shoreline vegetation within the canals and stormwater ponds within the project study area, the project is anticipated to may affect, not likely to adversely affect the little blue or tri-color heron.

Florida Scrub Jay (*Aphelocoma coerulescens*)

The Florida scrub jay prefers low-growing oak scrub habitats, including sand pine and scrubby flatwoods. The proposed project falls within USFWS Consultation Area for this this species, however, no natural, upland scrub habitats suitable for the scrub jay was observed within the project study area. Therefore, it is anticipated that this project is not likely to effect the scrub jay.

Wood Stork (*Mycteria Americana*)

Wood storks are typically found in marshes, cypress swamps, and mangrove swamps, but their presence in artificial ponds and seasonally flooded roadside ditches has become common. A review of the FWC database showed that the project area is located within the 18.6 mile Core Foraging Area (CFA) of one active wood stork colony (BPC-SWA). No wood storks were observed during the May 31, 2016 review and in addition, foraging habitat is limited due to the steep banks within the canals and stormwater ponds within the project study area. Also, per

review of the USFWS Wood Stork Effect Determination Key, projects greater than 0.47 miles from an active colony, and that have an impact area of less than 0.5 acres of suitable foraging habitat (both of which apply to this project) are determined to may affect, not likely to adversely affect wood storks.

5.10.15 Essential Fish Habitat

Per review of the National Oceanic and Atmospheric Administration (NOAA) Essential Fish Habitat (EFH) Mapper (<http://www.habitat.noaa.gov/protection/efh/efhmapper/>), no EFH areas are present within the portion of the C-17 within the project limits and buffer zone. Therefore, an impact determination of no involvement is assigned to EFH.

5.10.16 Noise Impacts

A desktop review was preformed to determine if noise levels will likely increase as a result of the proposed improvements. The Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 (February 2004) was used to predict traffic noise sensitive locations along the project corridor for the existing (2015) conditions and the design year (2040) No Build and recommended build alternative (Alternative 2). Noise sensitive receptor sites represent any property where frequent exterior human use occurs and where lowered noise would benefit, including outdoor uses at restaurant and hotels and interior uses for sites such as medical facilities.

Eleven (11) noise sensitive sites, including nearby hotel pools and patios, medical facilities and a restaurant patio, were identified to be potentially impacted by the proposed improvements along 45th Street near I-95. No other noise sensitive sites were identified to be impacted by the planned improvements.

The worst-case design year traffic noise levels with the Build Alternative are predicted to be no more than 3.2 dB(A) greater than the existing levels and 2.1 dB(A) greater than the expected design year No Build noise levels. The greatest increase in traffic noise level is predicted to occur at the hotel pools on the south side of 45th Street west of I-95. However, the predicted traffic noise levels do not result in any substantial noise increase (i.e. greater than 15 dB[A]

over existing levels). In addition, the nearest residences along the corridor are located more than approximately 750 feet from the planned improvements. Therefore, no noise impacts to residential land use are expected as a result of this project. The degree effect assigned to noise impacts is minimal.

A reassessment of the project corridor for sites particularly sensitive to construction noise and/or vibration will be performed during design to ensure that impacts to such sites are minimized. Coordination between the FDOT and the operators of any construction noise/vibration sensitive locations identified during design should occur and Technical Special Provisions should be developed for the project's contract package in order to ensure that impacts to such businesses are minimized.

5.10.17 Air Quality Impacts

Potential air quality impacts in the area surrounding the project corridor were assessed for all viable project alternatives, including the No Build Alternative, in accordance with the Federal Highway Administration (FHWA) discussion paper Appropriate Level of Highway Air Quality Analysis for a CE/EA/FONSI and EIS and guidelines contained in Part 2, Chapter 19 on the FDOT PD&E Manual (Dated June 14, 2017).

Much of the project corridor is bordered by commercial land use such as hotels, medical offices, restaurants and retail establishments. Areas at these sites that may potentially be impacted by changes to air quality include hotel pools and restaurant patios.

The pollutants of primary concern with roadway traffic are ozone (O₃), oxides of nitrogen (NO_x), hydrocarbons (HC), small particulate matter (PM₁₀) and carbon monoxide (CO). CO is analyzed at a project level since it is a localized pollutant that is emitted directly into the atmosphere. The other pollutants mentioned above are typically analyzed at a program level, unless specific review of an individual project is requested by appropriate reviewing agencies. The National Ambient Air Quality Standard (NAAQS) for CO is 35 parts per million (PPM) for one-hour periods and 9 PPM for eight-hour periods.

The CO screening analysis for this project indicates that the worst-case one-hour CO level is 9.9 PPM during the build year and design year. The predicted worst-case eight-hour CO level is estimated to be 5.9 PPM during the build year and the design year. Therefore, the project is not expected to cause any exceedances of the one-hour or eight-hour NAAQS for CO. An effect determination factor of minimal was therefore, assigned to air quality.

5.10.18 Contamination

A preliminary evaluation of the project was conducted, in accordance with the FDOT PD&E Manual guidelines (Part 2, Chapter 20, effective June 14, 2017), to identify potential contamination within the proposed project limits from properties or operations located within the vicinity of the project. A review of FDOT ETDM Environmental Screening Tool (EST), FDEP records and a field reconnaissance conducted on May 17, 2017 were conducted to identify potential contamination concerns within the vicinity of the project.

This Contamination Screening Evaluation revealed the presence of four low concern sites (Site 1 to Site 4), three medium concern sites (Sites 5 to Site 7) and one high concern site (Site 8). Those sites assigned a medium or high concern level were evaluated to determine if further assessment was deemed necessary to determine the actual presence of contamination that may affect the project area. [Table 5-31](#) presents a summary of project recommendations.

In addition to the recommendations provided in [Table 5-31](#) it should be noted that level II contamination assessment investigations are recommended for any areas that have proposed dewatering or subsurface work activities (e.g. pole foundations, drainage features) occurring at, or adjacent to, medium and high concern rated sites. If dewatering will be necessary during construction, a SFWMD Water Use Permit will be required. The contractor will be held responsible for ensuring compliance with any necessary dewatering permit(s). A dewatering plan may be necessary to avoid potential contamination plume exacerbation. All permits will be obtained in accordance with Federal, State, and local laws and regulations and in coordination with the District Contamination Impact Coordinator (DCIC). The degree effect of minimal is assigned to contamination.

Table 5-31: Contamination

Site ID	Site Name	Recommendation
Medium Concern		
5	7-ELEVEN STORE #37252 ROYAL PALM CLEANERS VILLAGE PROMENADE SHOPPING CNTR VILLAGE CLEANERS 2100 45 TH ST	This property has both an operating gasoline station and historic drycleaner operations. The USTs associated with the gasoline station were installed in 2016 and no contamination associated with these tanks has been documented. The historic dry cleaner operated within the center section of the plaza, approximately 400 feet south of the corridor. The historic dry cleaner does have documented solvent contamination in the soil and groundwater. The proposed work in the project area is limited to lane widening. If invasive work that requires dewatering is proposed, then groundwater assessment would be recommended. If groundwater testing is conducted, laboratory analysis should include volatile organic halocarbons using EPA Test Method 8021.
Medium Concern		
6	RACETRAC # 562 2995 45 TH ST	The southwest corner of this property has been identified for ROW acquisition. The former soil and groundwater petroleum contamination reported at this site was localized in the eastern portion of the property and the contamination has been remediated to achieve regulatory standards, as documented in four consecutive quarters of groundwater monitoring. The facility recently received regulatory closure, releasing the facility for conducting additional assessment or remediation. Based on the historical presence of contamination impacts and the current use of petroleum underground storage tanks at this site as well as the planned ROW acquisition, assessment is recommended to further evaluate potential contamination impacts to the project. If assessment is conducted, it is recommended that the groundwater be tested for the presence of petroleum compounds to include polynuclear aromatic hydrocarbons using EPA Test Method 8260 and 8270, volatile organic aromatics using EPA Test Method 80 total recoverable petroleum hydrocarbons using the Florida Residual Petroleum Organics Method.

Site ID	Site Name	Recommendation
Medium Concern		
7	MAROONE CADILLAC AUTONATION CADILLAC WEST PLAM BEACH 2101 45 TH ST	This site is adjacent to the project corridor and proposed acquisition is limited to a sliver of the southwestern corner of this large property (property size is over 9 acres). Based upon the site reconnaissance and review of regulatory records, the USTs and documented contamination at this facility are located at least 450 feet from the acquisition area. Due to fact that actual contamination has not been documented at this site, the distance between the USTs and the ROW acquisition area and the minimally invasive work anticipated for this portion of the project, additional assessment is not recommended. However, if assessment is conducted, it is recommended that the groundwater be tested for the presence of petroleum compounds to include polynuclear aromatic hydrocarbons using EPA Test Method 8270, volatile organic aromatics using EPA Test Method 8260 and total recoverable petroleum hydrocarbons using the Florida Residual Petroleum Organics Method and volatile organic halocarbons using EPA Test Method 8260.
High Concern		
8	NATIONAL FREIGHT SPILL I-95 AT 45 TH ST	Petroleum contamination is anticipated to exist in the soils beneath the asphalt pavement of the northbound on-ramp to I-95. It is recommended that assessment for the presence of petroleum impacts be conducted or that FDOT assume that contaminated soil will be impacted in this area and that the project incorporate provisions for management of the contaminated soils by the CAR contractor. If assessment is conducted, it is recommended that the soils be tested for the presence of petroleum compounds to include polynuclear aromatic hydrocarbons using EPA Test Method 8270, volatile organic aromatics using EPA Test Method 8260 and total recoverable petroleum hydrocarbons using the Florida Residual Petroleum Organics Method.

5.11 Construction Impacts

Water quality effects resulting from erosion and sedimentation will be controlled in accordance with the FDOT's latest edition of Standard Specifications for Road and Bridge Construction and through the use of BMPs.

Maintenance of traffic and sequence of construction will be planned and scheduled to minimize traffic delays throughout the project. Signing for other pertinent information will be provided to the public. During construction of the project, there is the potential for noise and vibrations impacts because of the heavy equipment typically used to construct roadways. Therefore, early identification of potential noise/vibration sensitive sites along the project corridor is important in minimizing noise/vibration. Noise sensitive medical facilities are located within the project corridor along 45th Street and the northbound I-95 on-ramp from 45th Street. Construction noise and vibration impacts to these sites will be minimized by adherence to the controls listed in the latest edition of the FDOT's Standard Specifications for Road and Bridge Construction.

Short-term air quality impacts within the immediate vicinity of the project may potentially occur due to the construction activities. Temporary increases in air pollutant emissions in the form of dust from earthwork and unpaved roads and smoke from open burning may occur during construction. Such emissions and potential impacts will be minimized by adherence to all applicable State and local regulations and to the FDOT's Standard Specifications for Road and Bridge Construction.

Due to temporary potential impacts to water quality, noise, and air quality, the impact determination for construction is minimal.

5.12 Public Involvement Summary

The Public Involvement Program began in March 2016 and will continue throughout the study. As part of the program, regular project briefings have been given to the three municipalities that border the project: City of West Palm Beach, Town of Mangonia Park and City Riviera Beach, as well as Palm Beach County. In addition, the project website: www.95at45street.com is kept up to date with all project materials.

On September 13, 2016, the Elected Officials/Agency Kick-Off Meeting was conducted at the SpringHill Suites West Palm Beach located at 2437 Metrocentre Boulevard, West Palm Beach, Florida. Invitations were sent to all elected officials within the project area as well as municipalities and permitting agencies. In addition, a newspaper ad with the meeting invitation was placed in the area newspaper, The Palm Beach Post. The project website also contained information about the meeting. The purpose of the meeting was to introduce the project and project team to the local agencies and municipalities within the project area, discuss the purpose and need and the scope of work for the project, and to solicit input on needed improvements. A project fact sheet was available as a handout. A brief presentation along with a questions and answer period was conducted at the end of the meeting.

On September 13, 2016, the Public Kick-Off Meeting was conducted at the SpringHill Suites West Palm Beach located at 2437 Metrocentre Boulevard, West Palm Beach, Florida. Invitation letters were sent to all property owners within 500 feet of the study area limits. In addition, a newspaper ad with the meeting invitation was placed in the area newspaper, The Palm Beach Post. The project website also contained information about the meeting. The purpose of the meeting was to introduce the project and project team, discuss the purpose and need and the scope of work for the project, and to solicit public input on needed improvements. A project fact sheet was available as a handout. Comments cards were available for the public to leave behind or mail in. A brief presentation along with a questions and answer period was conducted at the end of the meeting.

On March 28, 2017, the Alternatives Public Workshop was conducted at the Homewood Suites West Palm Beach located at 2455 Metrocentre Boulevard, West Palm Beach, Florida. Invitation letters were sent to all property owners within 500 feet of the study area limits. In addition, a

newspaper ad with the meeting invitation was placed in the area newspaper, The Palm Beach Post. The project website also contained information about the meeting. The purpose of the meeting was to present the preliminary Build Alternatives developed for the project. Color aerials were on display for each Build Alternatives in workshop format. Comments cards were available for the public to leave behind or mail in. A brief presentation along with a questions and answer period was conducted at the end of the meeting. A questionnaire was included in the comment form to get the public's input on a recommendation based on the alternatives that were presented at the workshop. Six questionnaires were collected after the meeting: four selected Alternative 2 as their preferred alternative, and two did not show a preference.

A Public Hearing was conducted on November 2, 2017 at the Hawthorn Suites West Palm Beach located at 301 Lamberton Drive, West Palm Beach, Florida. The Hearing was conducted in compliance with the Project Development and Environment Manual, 23 CFR 771 and Section 339.155, F.S. The Hearing started at 5:30 PM with an informal open house that contained color exhibits that displayed the proposed improvements associated with the recommended build alternative. Project team members were present to answer questions from the public. A project newsletter was distributed at the Public Hearing. A court reporter was present to record formal comments and a comment box with comment cards were also on display. The formal presentation was presented on video format followed by a public comment period. A copy of the Public Hearing Transcript is included in Appendix F.

During the course of the study, a Public Information Record has been kept, which contains all handouts, databases and project documentation. [Table 5-32](#) is a summary of all meetings to date.

Table 5-32: Public Involvement summary

Date	Meeting
September 13, 2016	Elected Officials/Agency Kick-Off Meeting
September 13, 2016	Public Kick-Off Meeting
March 22, 2017	Briefing with the Town of Mangonia Park
March 23, 2017	Briefing with the City of Riviera Beach
March 23, 2017	Briefing with the City of West Palm Beach
March 24, 2017	Briefing with Palm Beach County
March 28, 2017	Alternatives Public Workshop
April 5, 2017	Palm Beach County MPO – TAC Presentation
April 5, 2017	Palm Beach County MPO – CAC Presentation
April 6, 2017	Palm Beach County MPO – BTPAC Presentation
April 12, 2017	Coordination Meeting with the City of West Palm Beach
May 24, 2017	Coordination Meeting with the City of West Palm Beach
May 26, 2017	Follow-up Conference call with the City of West Palm Beach
July 11, 2017	45 th Street Corridor Summit – Kick-off Discussion
July 12, 2017	Palm Beach County MPO – TAC Presentation
July 13, 2017	Palm Beach County MPO – BTPAC Presentation
July 19, 2017	Briefing with the Port of Palm Beach
July 20, 2017	Palm Beach County MPO Governing Board Presentation
October 4, 2017	Palm Beach County MPO – TAC Presentation
October 4, 2017	Palm Beach County MPO – CAC Presentation
October 5, 2017	Palm Beach County MPO – BTPAC Presentation
October 19, 2017	Palm Beach County MPO Governing Board Presentation
November 2, 2017	Public Hearing

5.14 Selection of a Recommended Alternative

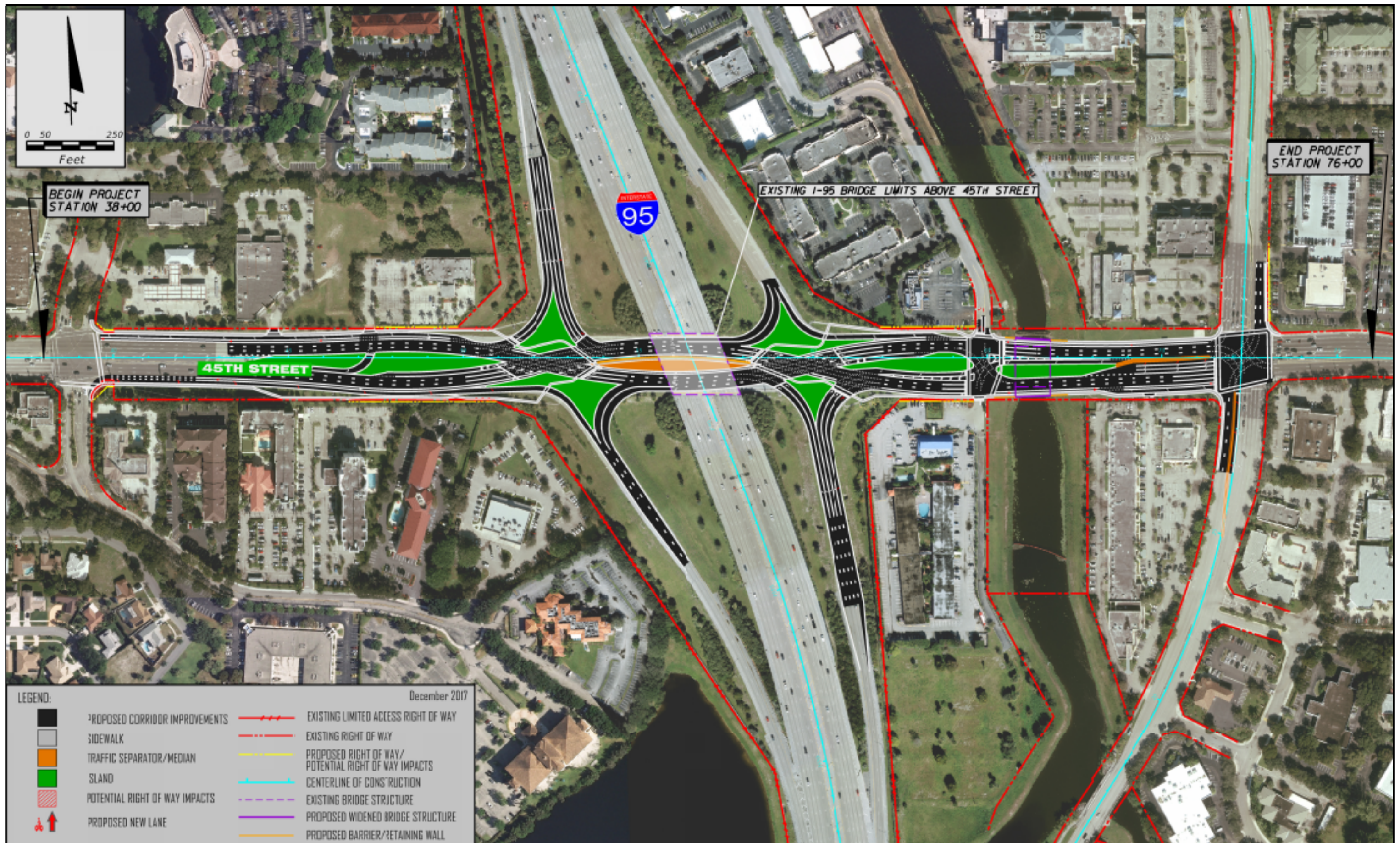
Based on the comparative analysis discussion in Section 5.6 which considered impacts to the natural, physical and social environment, input from the local community and local government, operational and engineering issues, and construction costs, the project team selected Alternative 2, implementation of a Diverging Diamond Interchange, as the Recommended Alternative. The Recommended Alternative will meet the purpose and need of the project, have minimal environmental impacts, requires minimal amount of right-of-way, and it is the most acceptable by the community. The construction cost for this alternative is approximately \$14,711,000.

Section 6 of this report provides additional information about the Recommended Alternative.

6 DESIGN DETAILS OF RECOMMENDED ALTERNATIVE

A detailed description of the proposed improvements for the Recommended Alternative is provided below (see [Figure 6-1](#)). The Preliminary Concept Plans for the Recommended Alternative can be found in [Appendix C](#).

- Modify the existing Diamond Interchange to a Diverging Diamond Interchange (DDI) configuration, which provides three continuous through lanes through the interchange with two free flow left-turn lanes into the I-95 on ramps;
- Provide one bicycle lane in each direction from Northpoint Boulevard to Congress Avenue;
- Extend the 45th Street eastbound to I-95 southbound on-ramp to start at Northpoint Boulevard;
- Provide one additional left-turn lane at the I-95 southbound off-ramp intersection;
- Provide new overhead signage at the I-95 southbound off-ramp to indicate three lanes to East 45th Street and two lanes to West 45th Street;
- Provide one additional right-turn lane at the I-95 northbound off-ramp intersection;
- Provide new overhead signage at the I-95 northbound off-ramp to indicate two lanes to West 45th Street, one lane to North Congress Avenue, and two lanes to East 45th Street;
- Widen the existing bridge along 45th Street over the C-17 Canal to accommodate one bicycle lane and one sidewalk in each direction;
- Add one additional left-turn lane from eastbound 45th Street to northbound Congress Avenue to provide triple left turns at the intersection;
- Add one additional left-turn lane from northbound Congress Avenue to westbound 45th Street to provide triple left turns at the intersection;
- Provide travel information system;
- Develop coordinated signal system strategies.



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

Recommended Alternative

FIGURE:

6-1

6.1 Typical Sections

Figure 6-2 shows the proposed typical sections for the Recommended Alternative. From Northpoint Boulevard to the I-95 southbound ramp terminals 45th Street would provide four 12-ft through lanes, two 11-ft left-turn lanes and one 12-ft right-turn lane in each direction with a 6.5-ft traffic separator. From the southbound ramp terminal to the northbound ramp terminals this section would provide four 11-ft through lanes and two 10-ft left-turn lanes in each direction with a 12-ft barrier. From the northbound ramp terminals to Congress Avenue 45th Street would provide four 12-ft through lanes and one 12-ft left-turn lane, with triple left-turn lanes at Congress Avenue. This section would also include continuous 6-ft bicycle lanes and 6-ft sidewalks on each side of the roadway.

Additional details about the proposed typical section for the Recommended Alternative can be found in the Typical Section Package which is included in [Appendix D](#).

6.2 Horizontal and Vertical Alignment

The horizontal alignment for the Recommended Alternative is provided in [Table 6-1](#).

The proposed vertical alignment has been established considering the existing topography, the minimum required base clearance above the design high water elevation, minimum pavement elevations to accommodate the construction of a close drainage system, and minimum and maximum profile grade criteria.

6.3 Design Variations and Exceptions

As shown in [Table 6-1](#), the proposed horizontal and vertical alignment for the recommended improvements would satisfy FDOT standards. In addition, the proposed typical sections would satisfy all FDOT design criteria. Therefore, no design variations nor exceptions are anticipated for this project.

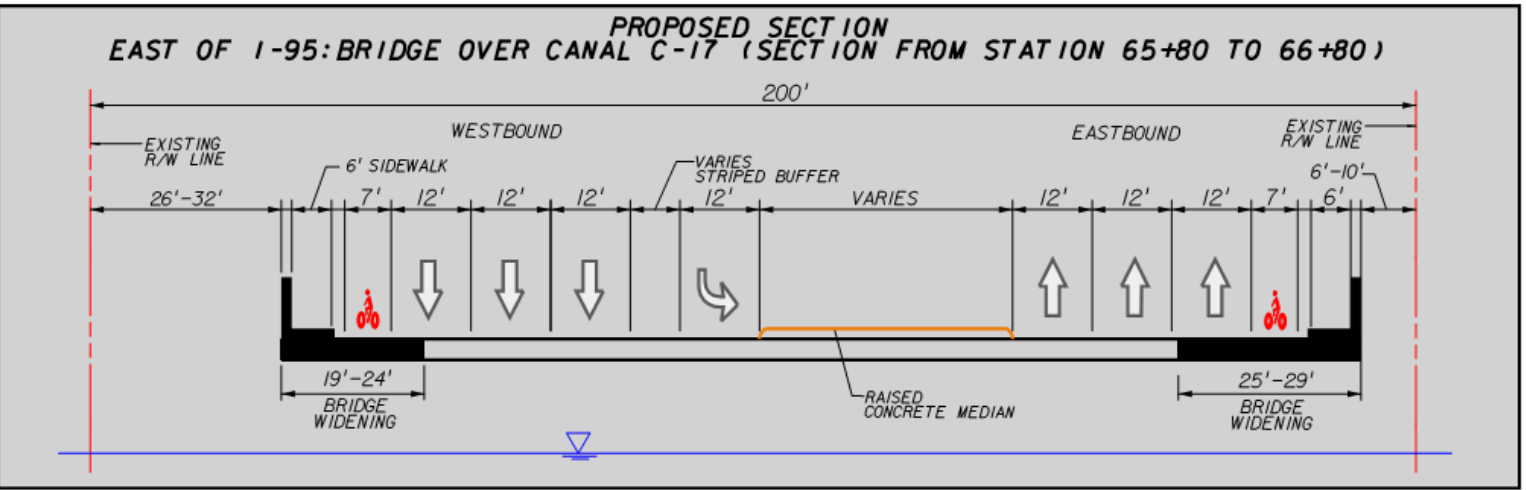
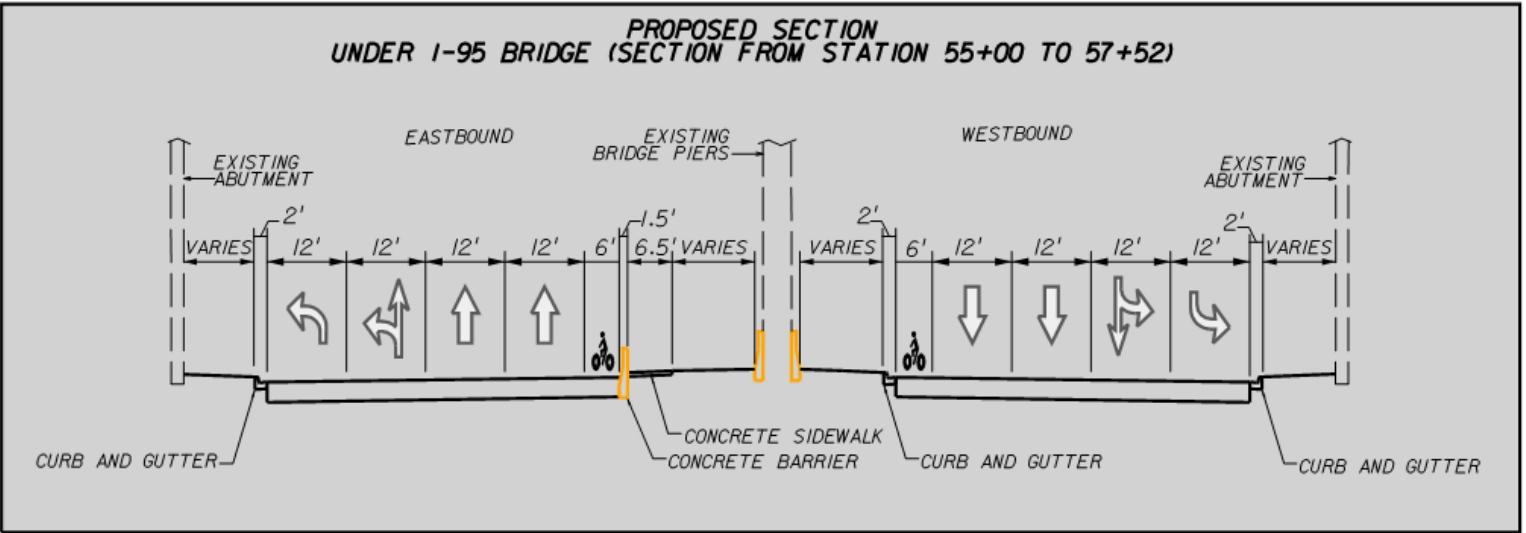
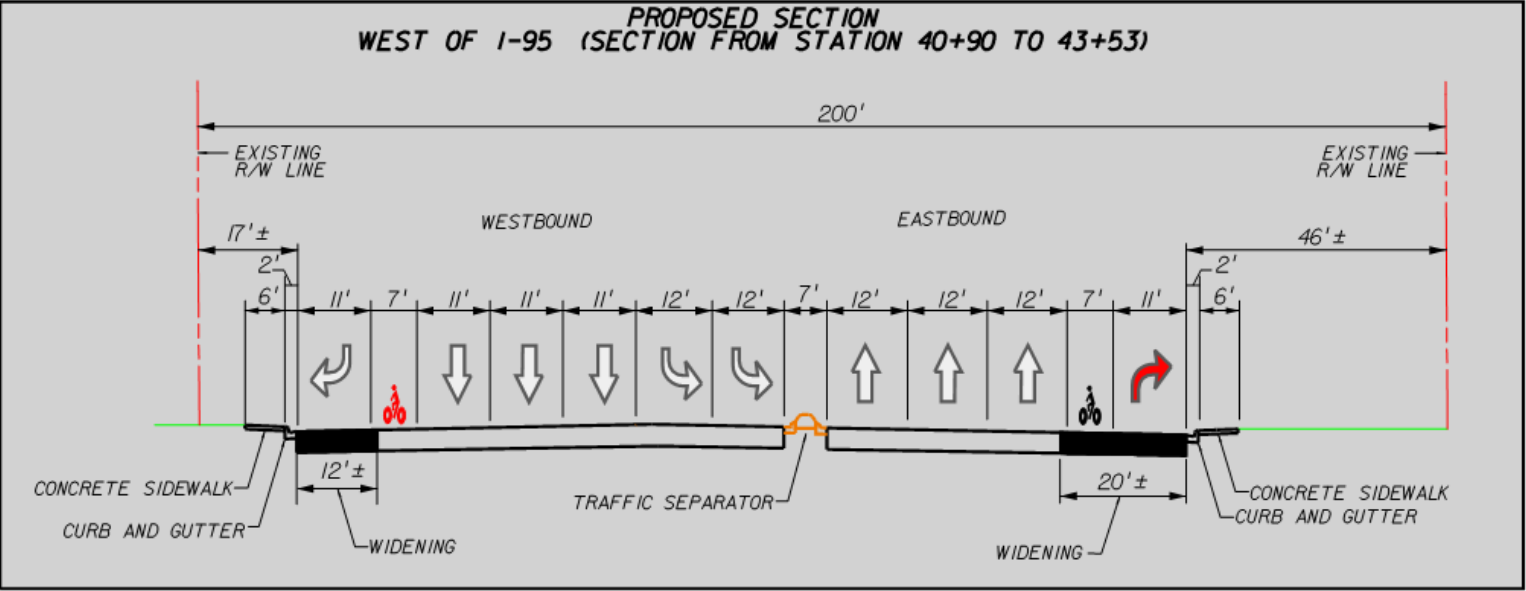


Table 6-1: Proposed Horizontal Alignment Characteristics

Location	PI Station, Offset**	Radius of Curve (ft)	Length of Curve (ft)	Degree of Curve (D)	Deflection Angle (Δ)	Super-elevation (e)	SSD Value	SSD Required by PPM		SSD Required by AASHTO		Length of Curve Required (ft) By PPM	
45 th Street EB west of I-95	50+62.73, 74.60 (RT)	1,619.00	400.37	3° 32' 20"	14° 10' 09" (LT)	NC	-	-	-	-	-	400	✓
45 th Street EB within DDI	56+07.21, 49.94 (LT)	1,528.00	702.03	3° 44' 59"	26° 19' 28" (RT)	NC	384*	305	✓	305	✓	400	✓
45 th Street EB east of I-95	60+90.95, 65.67 (RT)	1,564.00	279.34 ⁽¹⁾	3° 39' 48"	10° 14' 00" (LT)	NC	-	-	-	-	-	400	✗
45 th Street EB west of Corporate Way	62+90.93, 76.67 (RT)	1,716.12	120.44 ⁽¹⁾	3° 20' 19"	4° 01' 15" (LT)	NC	-	-	-	-	-	400	✗
45 th Street EB east of Corporate Way	67+44.48, 71.98 (RT)	1,900.00	117.53 ⁽²⁾	3° 00' 56"	3° 32' 40" (RT)	NC	-	-	-	-	-	400	✗
45 th Street EB west of Congress Avenue	69+63.38, 85.54 (RT)	2,119.00	320.45 ⁽²⁾	2° 42' 14"	8° 39' 53" (LT)	NC	-	-	-	-	-	400	✗
45 th Street WB west of Congress Avenue	67+66.41, 22.79 (LT)	2,382.06	154.06 ⁽³⁾	2° 24' 19"	3° 42' 20" (LT)	NC	-	-	-	-	-	400	✗
45 th Street WB east of I-95	61+50.94, 41.11 (LT)	1,564.00	426.56	3° 39' 48"	15° 37' 36" (RT)	NC	-	-	-	-	-	400	✓
45 th Street WB within DDI	55+93.79, 86.92 (RT)	1,528.00	701.52	3° 44' 59"	26° 18' 19" (LT)	NC	-	-	-	-	-	400	✓
45 th Street WB west of I-95	50+50.56, 42.13 (LT)	1,580.00	400.43	3° 37' 35"	14° 31' 15" (RT)	NC	-	-	-	-	-	400	✓

Design speed of 45th Street = 40 mph through the DDI

NC = Normal Crown

- = Not Applicable

*Barrier wall present along this curve

**PI Stations are in reference to the 45th Street Centerline Survey

(1) Compound Curve

(2) Reverse Curve best approximates the Existing Alignment

(3) Curve best approximates the Existing Alignment

6.4 Design Traffic Volumes

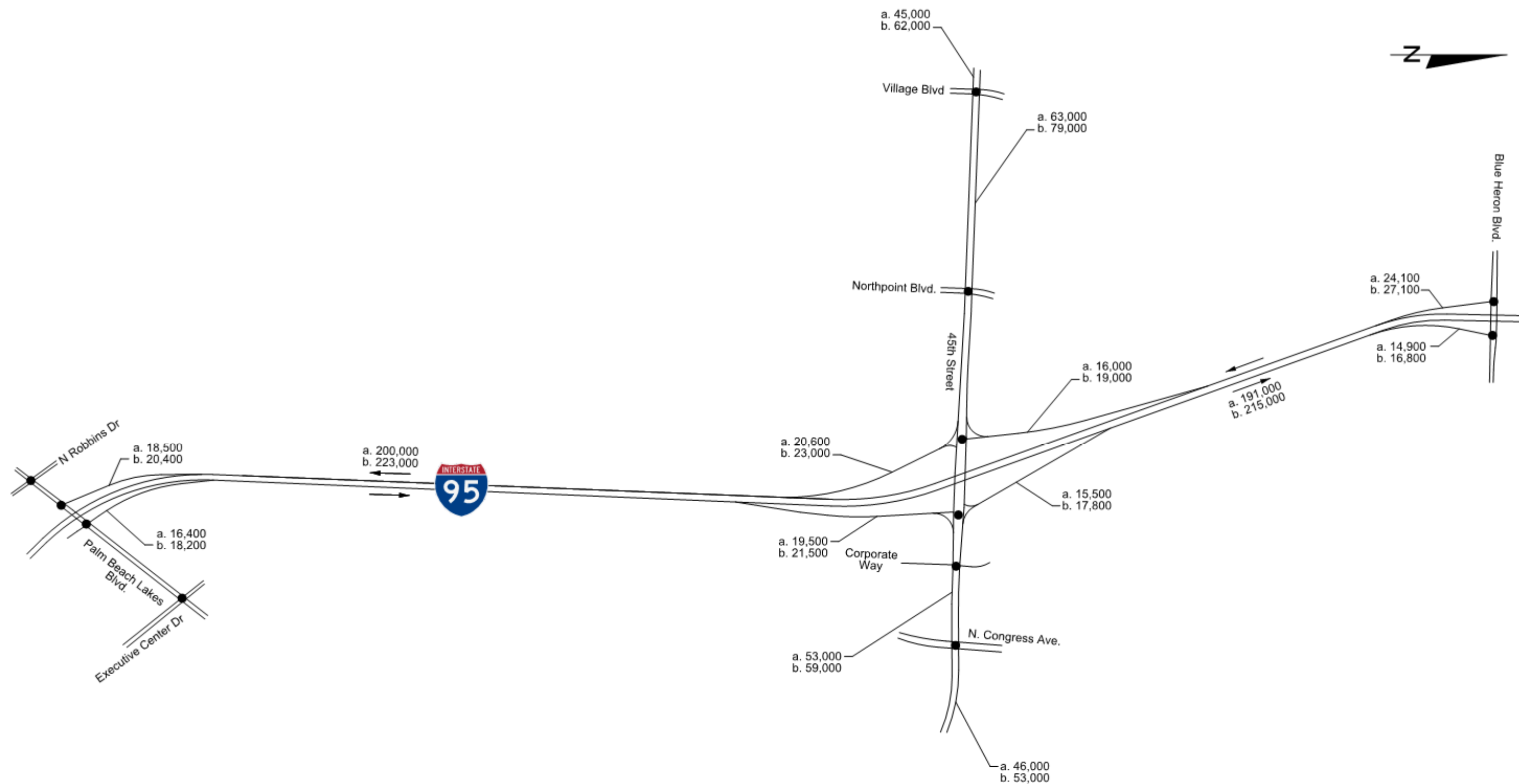
6.4.1 Recommended Alternative – Future Traffic Forecasts

The traffic forecasting methodology used for each approach of each intersection was based on the 2015 AADT (from field), and 2010 and 2040 SERPM 7.0 model volumes. The 2015 model volume was interpolated using 2010 and 2040 model volumes. Then the differences of 2015 AADT and interpolated 2015 forecasted AADT from model was calculated. The recommended 2040 AADT were calculated by applying this difference to the 2040 SERPM 7.0 model volumes. Then the 2020 and 2030 volumes were interpolated using 2015 AADT and recommended 2040 volumes. For the roadway segments where the SERPM 7.0 2040 model volumes are lower than the SERPM 7.0 2010 model volumes, or are not included in the SERPM 7.0 network, the future 2020, 2030, and 2040 AADTs were calculated using 2015 AADT and a compound growth factor of 0.5%. For all the roadway links, the 2015 and 2040 AADT has been compared, and a minimum compound growth rate of 0.5% has been adopted. The Opening and Design Years for this analysis are 2020 and 2040 respectively.

AADT volumes were developed by interpolation for Opening Year of this analysis. The AADT volumes do not change between any of the alternatives. The AADTs for 2020 and 2040 are presented in [Figure 6-3](#).

6.4.2 Recommended Alternative – Level of Service

In Design Year 2040 the Recommended Alternative operates at acceptable LOS D at all study intersections. There are a few individual movements that are failing in the Design Year. The westbound left turn at Village Boulevard and the westbound left turn at Corporate Way operate at LOS F only in the PM Peak Hour. These failing movements occur along the minor streets where traffic volumes are much lower. [Figures 6-4](#) and [6-5](#) summarize the Opening Year 2020 and the Design Year 2040 LOS for the Recommended Alternative.



Florida Department of Transportation
 District Four
 3400 West Commercial Boulevard
 Fort Lauderdale, FL 33309



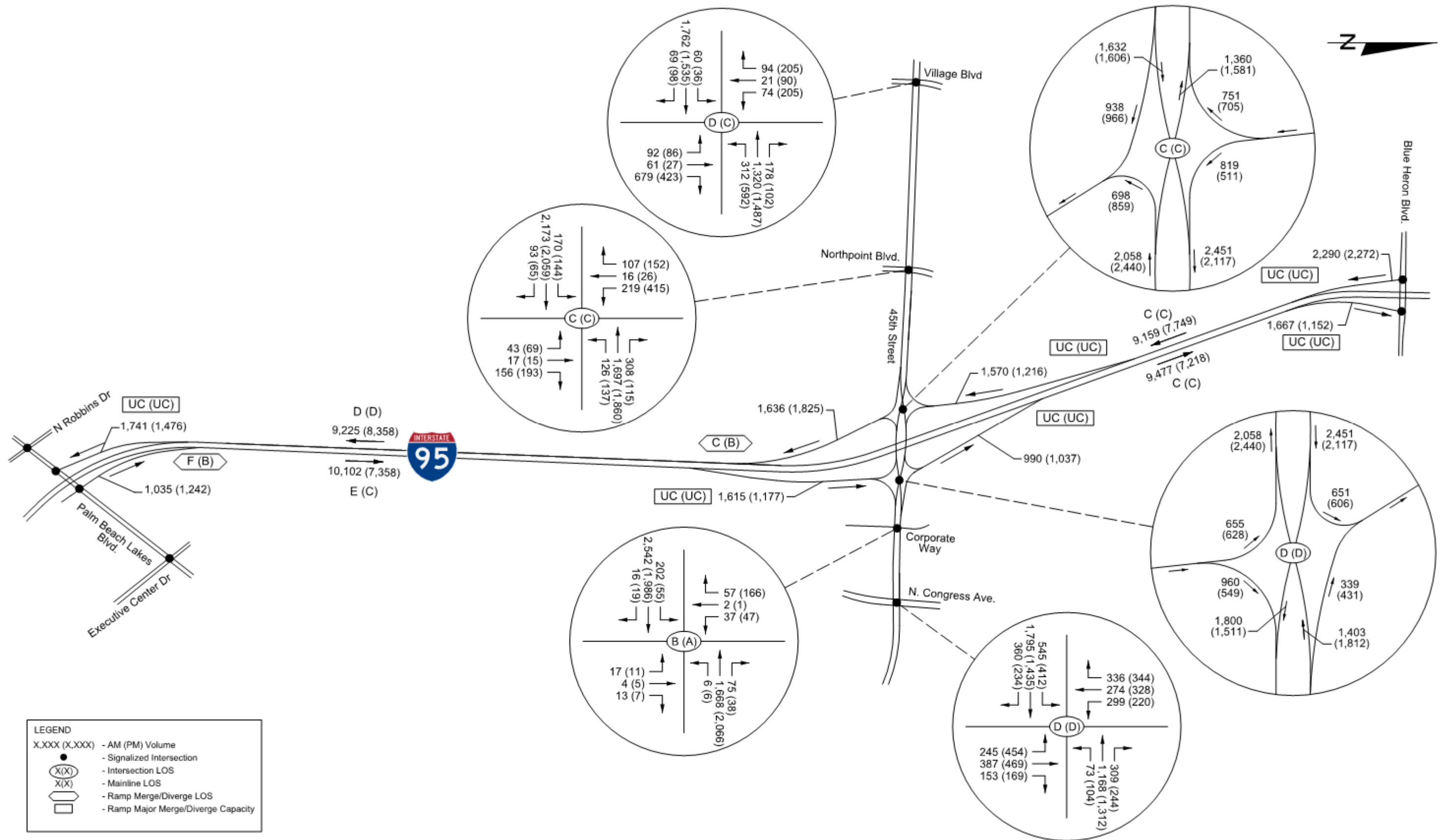
I-95/SR 9 Interchange at 45th Street
 Project Development and Environment Study
 FPID No.: 436519-1-22-01
 ETDM No.: 14225

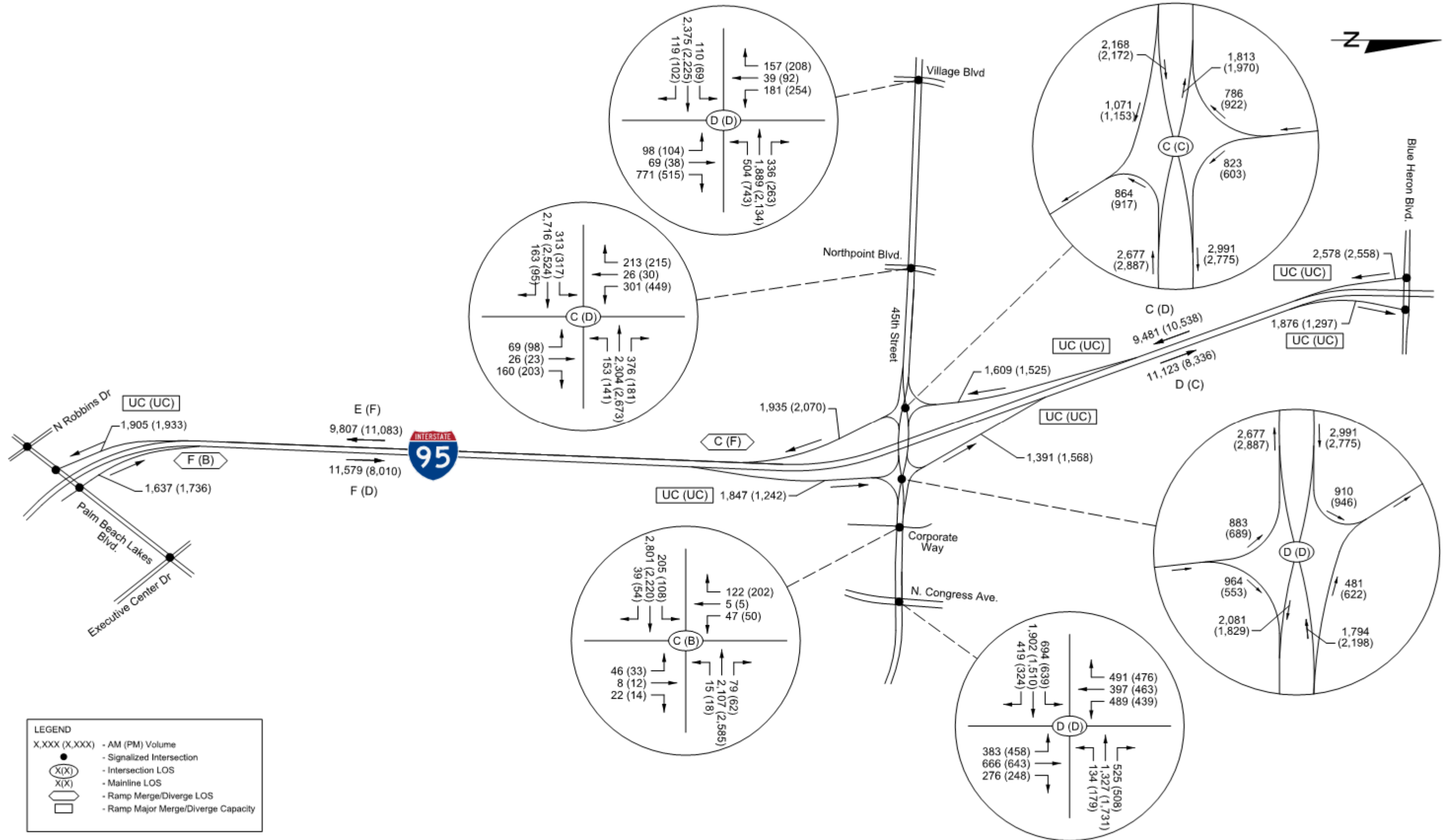
TITLE:

Recommended Alternative
 Opening Year 2020 and Design Year 2040 Annual Average Daily Traffic (AADT)

FIGURE:

6-3





6.5 Right-of-Way Needs and Relocation

The Recommended Alternative require minimal right-of-way in order to improve the operations at Northpoint Boulevard and Congress Avenue. In addition to the permanent right-of-way needs, temporary construction easements could be required that would be coordinated during the design phase for the project. [Figures 6-6](#) and [6-7](#) shows the location of the impacted parcels.

6.6 Preliminary Cost Estimate

[Table 6-2](#) summarizes the Preliminary Cost Estimate for the Recommended Alternative.

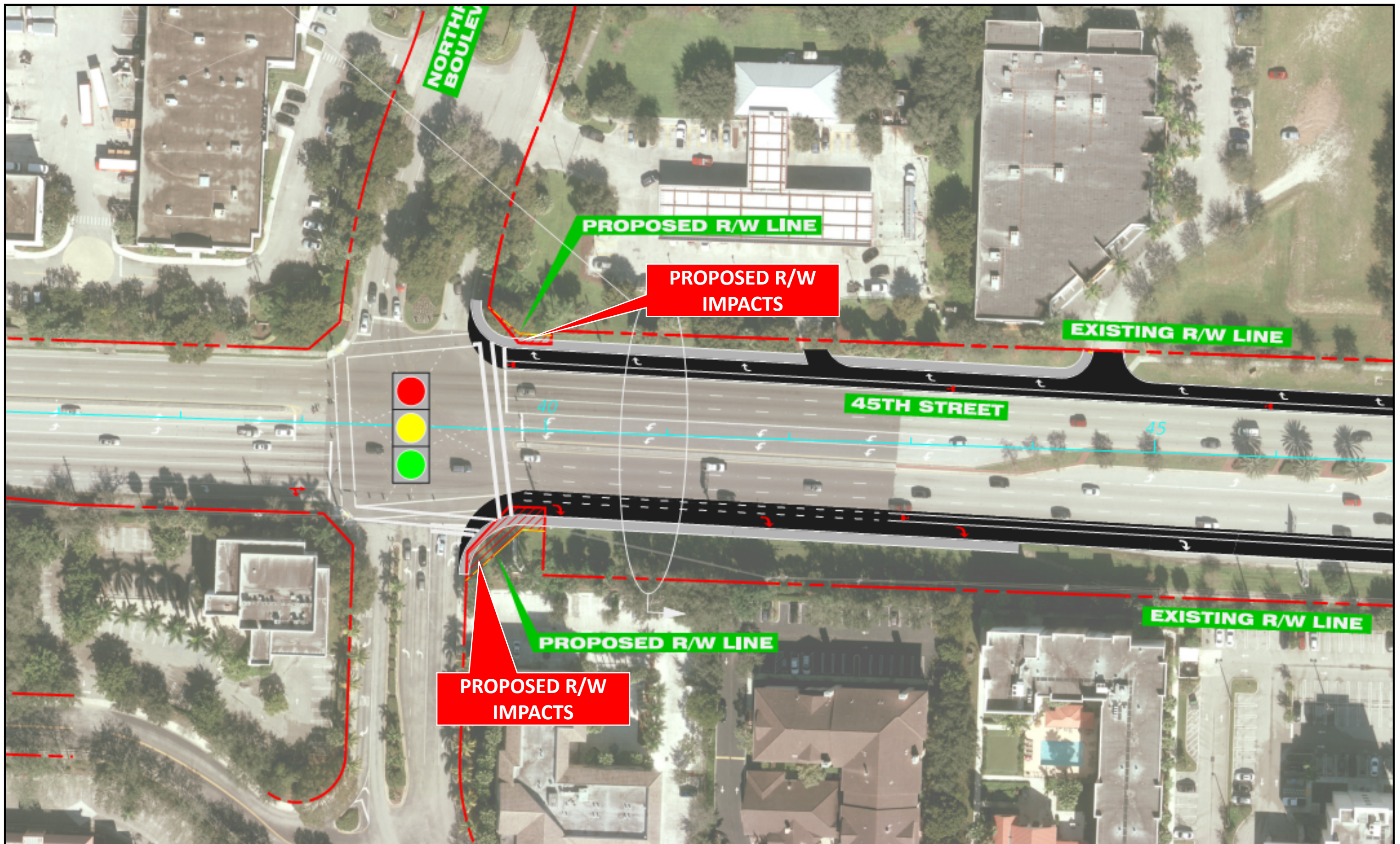
Table 6-2: Preliminary Cost Estimate

Component	Recommended Alternative
Roadway Construction	\$10,126,000
Eng/Design (10% Construction)	\$1,013,000
CEI (15% Construction)	\$1,519,000
Right-of-Way Acquisition	\$2,261,000
TOTAL COST	\$14,919,000

6.6.1 Construction Cost

A preliminary construction cost estimate for the Recommended Alternative was developed from the Preliminary Concept Plans (See [Appendix C](#)). The estimates include major pay items such as embankment, excavation, pavement, drainage, signalization, lighting, mobilization and maintenance of traffic. Other components included are curb and gutter, clearing and grubbing, sodding, and signing and pavement marking. Contingency costs were also included in the estimate. The construction cost for the improvements are estimated to be approximately \$9,295,000.

The detailed Long Range Estimate (LRE) sheets can be found in [Appendix E](#).



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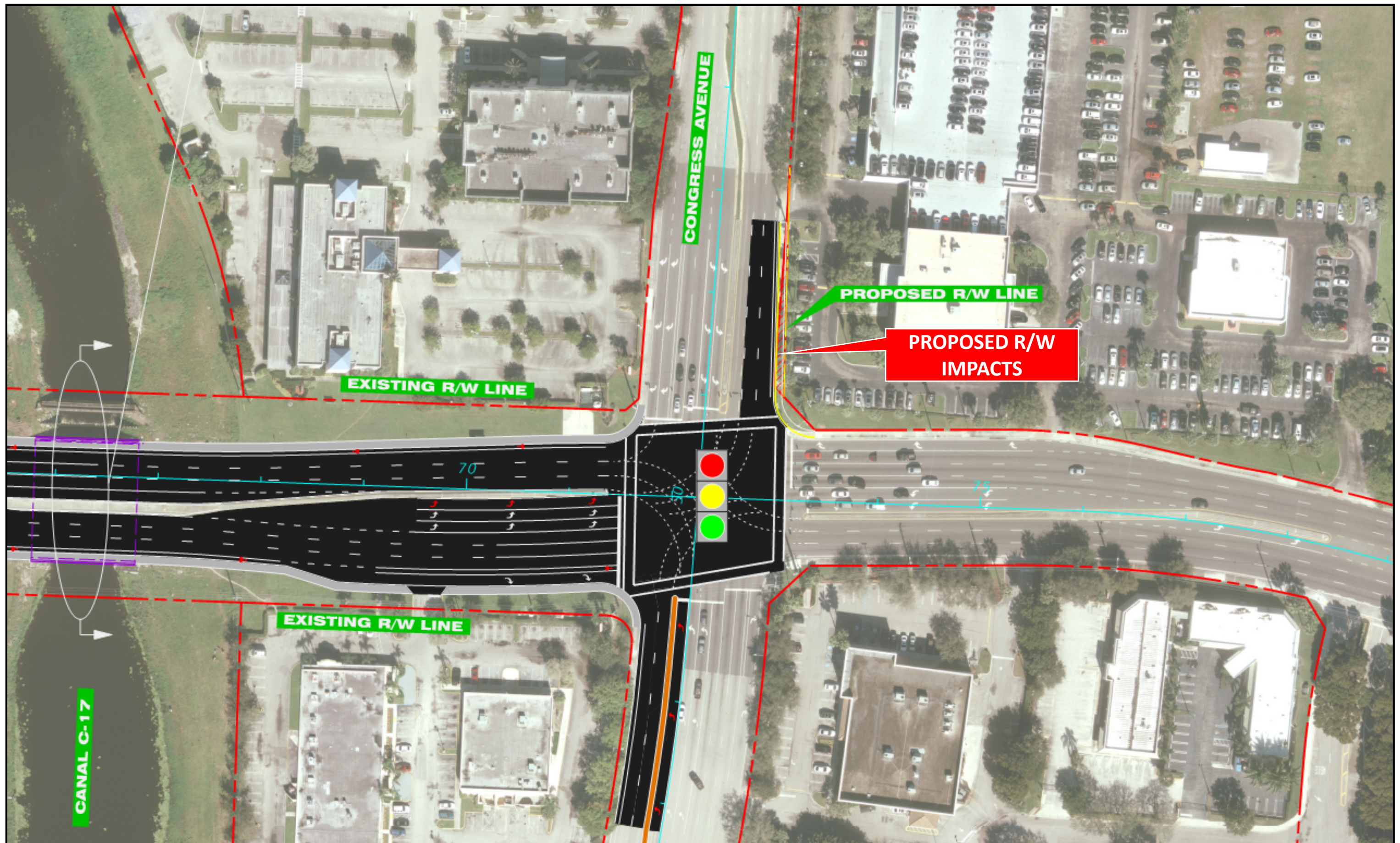
I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

Recommended Alternative – Right-of-Way Impacts

FIGURE:

6-6



Florida Department of Transportation
District Four
3400 West Commercial Boulevard
Fort Lauderdale, FL 33309



I-95/SR 9 Interchange at 45th Street
Project Development and Environment Study
FPID No.: 436519-1-22-01
ETDM No.: 14225

TITLE:

Recommended Alternative – Right-of-Way Impacts

FIGURE:

6-7

6.6.2 Right-of-Way Cost

Bases of the right-of-way impacts identified for the Recommended Alternative ([Figure 6-6](#)), FDOT prepared a preliminary Right-of-Way Cost estimate. The right-of-way cost estimate is \$2,261,000. The detailed right-of-way cost estimate sheet can be found in [Appendix E](#).

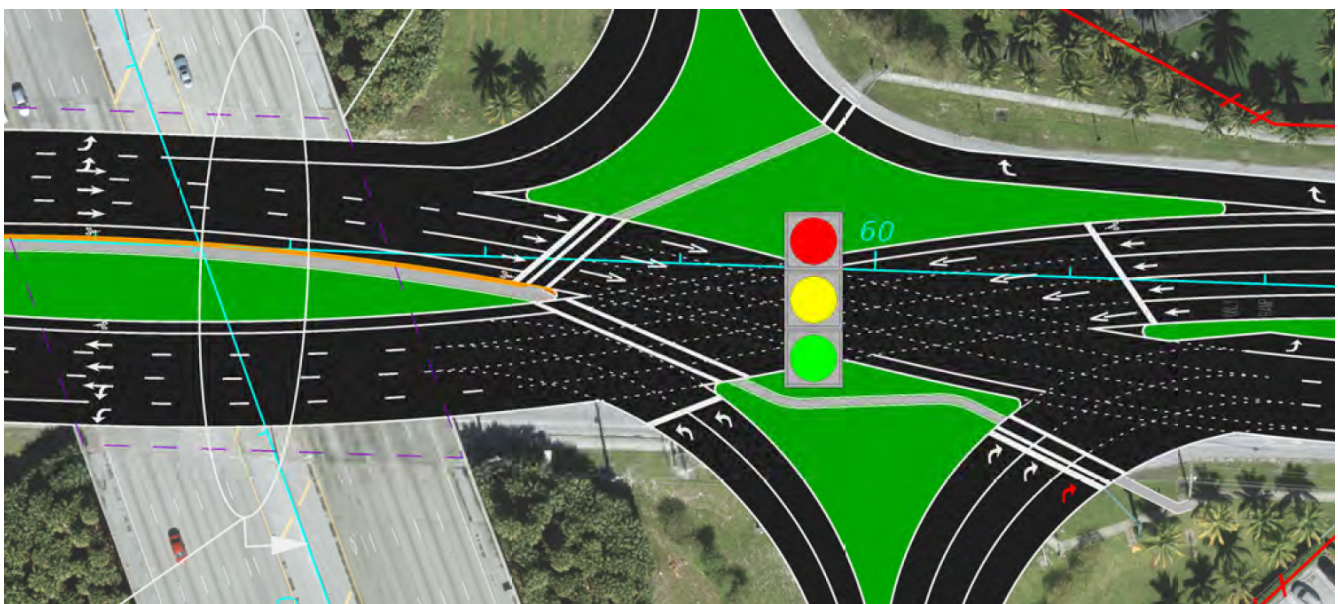
6.7 Pedestrian and Bicycle Facilities

Some of the existing sidewalks and bike lanes throughout the project corridor do not meet ADA requirements, the Recommended Alternative will include improved and upgraded facilities to enhance safety and accommodations for pedestrians and bicyclists.

A visual of the proposed facilities can be seen in [Figure 6-8](#). These facilities include:

- 6-ft bike lanes will be provided;
- Sidewalks throughout the project area including through the median of the DDI;
- Signalized pedestrian crossings;
- Special emphasis pavement markings are proposed at pedestrian crossings at all cross walks.

[Figure 6-8: Pedestrian and Bicycle Accommodations](#)



6.8 Utility Impacts

17 utility companies could potentially be impacted by the proposed improvements or at least will require further coordination during the design and construction phases. Table 6-3 lists all the utility owners with facilities within the project area. Coordination with the utility companies will continue during the PD&E phase. Further refinement of the proposed design and utility field verification will be carried out during the final design phase. Special construction equipment and techniques may be utilized to avoid utility conflicts. In unique locations, where the special construction equipment and techniques cannot avoid utility relocations, the need for relocation of the particular utility and the cost will be determined during the design phase.

Table 6-3: Existing Utilities

Utility Company / Contact Person	Contact Person	Phone / Email
Comcast - Boca/Delray	Tony Springsteel	561-804-0973 anthony.springsteel@cable.comcast.com
American Traffic Solutions	Santiago Martinez	480-596-4595 santiago.martinez@atsol.com
City of Riviera Beach Utility District	Leighton Walker	n/a
FDOT Palm Beach	Katherine Rico	954-847-2680
Florida Gas Transmission Company	Joseph E. Sanchez	407-838-7171 joseph.e.sanchez@energytransfer.com
Florida Public Utilities Co	Dale M Butcher	561-366-1635 dbutcher@fpuc.com
FPL Fibernet LLC	Danny Haskett	305-552-2931 danny.haskett@fpl.com
FPL Distribution	Bill Thomas	561-616-1628 w.g.thomas@fpl.com
FPL Transmission	George Beck	(561) 904-3604 george.beck@fpl.com
Level 3 Communications LLC	n/a	877-366-8344 ext. 2
Crown Castle NG	Bryant Lowe	724-416-2193
Palm Beach County Traffic Operations	Rod Friedel	561-681-4371 rfriedel@pbcgov.org
AT&T Distribution	Dino Farruggio	561-997-0240
Sprint Nextel	Mark Caldwell	321-287-9942 mark.d.caldwell@sprint.com
City of West Palm Stormwater	Tracy Ward	561-494-1040
City of West Palm Beach	Brian Collins	561-494-1026
FPL Gas	Kevin Gordon	561-845-4875

6.9 Drainage

Based on these preliminary findings of the Drainage and Pond Sitting Report prepared for this project, it was determined that the Recommended Alternative can be implemented by modifying the existing stormwater management facilities and has the lowest cost and least impact to the existing stormwater management systems. It is recommended to modify the existing infield dry detention ponds in Basins B, C and D by re-grading the side slopes and minor modification to the control structures. It is recommend to maintain coordination with SFWMD to document the design criteria and identify any concerns of the District that may need to be addressed during the final design.

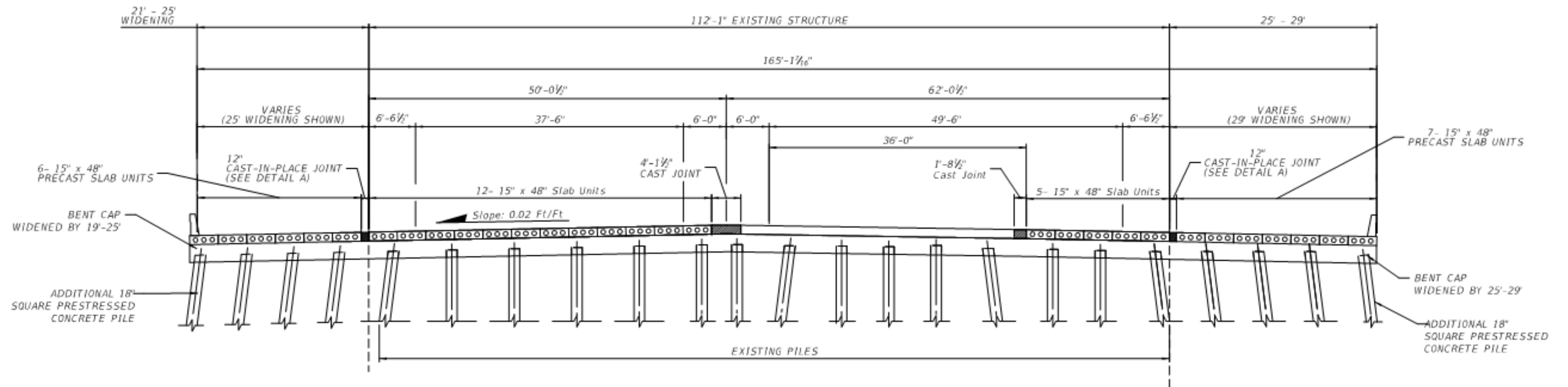
6.10 Bridge Analysis

The proposed improvements will widen the Bridge over the C-17 Canal (Bridge No. 930337) from 21-ft to 29-ft on both sides of the bridge. To accomplish this, six to seven 15-in by 48-in precast panels and three 1-ft cast-in-place joints will be added to both sides of the existing structure. The widening will include four additional 18-in square prestressed concrete piles driven on both sides of the existing structure. See [Figure 6-9](#) for the proposed widening of the Bridge over the C-17 Canal.

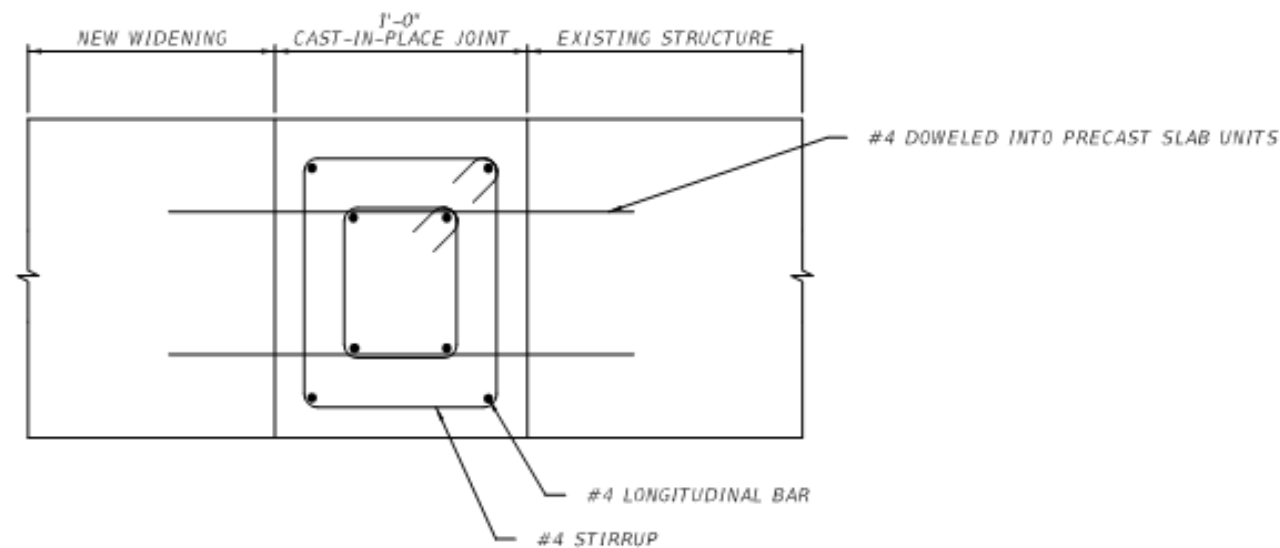
6.10.1 Bridge Construction Sequence

The construction of the widening on both sides of the Bridge over Canal C-17 will be accomplished by driving four new 18-in square piles, and installing six to seven new 4-ft wide precast concrete slab units with three 1-ft wide cast-in-place joints. The operation will not require the canal to be dewatered or the use of barges.

Step 1: Pile drivers will be used to install 65 new 18-in square piles to support the widening of the superstructure deck.



DDI WIDENING FOR THE BRIDGE OVER CANAL C-17



DETAIL A: CAST-IN-PLACE JOINT

Step 2: To create continuity between the existing structure, and the new widening, the new reinforcing is required to lap with the existing reinforcing, this will require the reinforcing in the existing structure to be exposed. Formwork will be used to create the rectangular shape of the bent caps. Once the concrete is poured and cured, the formwork will be removed.

Step 3: The superstructure sections will consist of 4-ft wide precast slab units. The slabs for spans 1, 2 and 3 will be 30-ft long and the slab for span 4 will be 15-ft long. The construction of the superstructure will follow the sequence below.

- Drill and epoxy the #4 dowels into the existing precast slab units.
- Drill and epoxy the #4 dowels into the new precast slab units offset from the existing precast slab unit dowels by 2-in longitudinally.
- Erect the new precast slab units.
- Form the 1-ft cast-in-place joints.
- Place #4 stirrups and longitudinal bars in the cast-in-place joint.
- Cast the 1-ft cast-in-place joint.

6.11 Preliminary Traffic Control Plan

Proper traffic control will be critical in order to minimize impacts to the community and construction cost while keeping construction efficiency at the highest level. Care should be taken to ensure the safety and mobility of both vehicular and pedestrian traffic, and impacts to businesses should be minimized.

Implementing a DDI poses some challenges in maintaining traffic flow during construction; however, the thought processes are really no different than with other designs. Sequencing of construction can use several strategies depending on factors such as the existing roadway conditions, nearby detour routes, and the traffic demands of the facility, to name a few.

During the construction of a DDI, the entire interchange will likely need to be closed for a short period of time. In some designs, the right-turn movements on and off the limited access facility are allowed while the crossovers are tied in and striped. This is usually done in a period of two

to three days over a weekend. A different tie-in method used may include one of the crossovers being closed at a time, allowing one of the left-turn movements from the limited access facility to still take place. When the first crossover is complete, the other crossover is tied in using a similar technique. This method can be employed over a short period of time also, usually a weekend.

A detailed Maintenance of Traffic (MOT) Plan will be developed for the Recommended Alternative as part of the design phase for this project.

6.12 Special Features

There are no special features proposed for this project.

6.13 Access Management

There are no recommended changes in access management as part of the recommended alternative.

6.14 Multimodal Accommodations

Transit service is provided along 45th Street and will not be affected by the proposed design concept. To accommodate bicycle and pedestrian traffic, the proposed improvements would provide 6-ft bicycle lanes and 6-ft sidewalks on each side of 45th Street. The existing bus stops located along 45th Street will not be impacted by the proposed improvements.

6.15 Schedule

This project is funded for design in Fiscal Year (FY) 2017 in FDOT Work Program as Financial Project Identification Number (FIN) 436519-1. The funding for project phases in FDOT Work Program for FY 2017 – FY 2022 is shown in [Table 6-4](#).

Table 6-4: Funding for FIN 436519-1 - I-95 at 45th Street Improvements

Fiscal Year	2017	2018	2019	2020	2021	2022
Highways/PD&E						(On-Going)
Amount:	\$56,692					
Highways/Preliminary Engineering						
Amount:					\$6,000,000	
Highways/Right-of-Way						
Amount:						\$14,917,071
Item Total:	\$56,692				\$6,000,000	\$14,971,071

6.16 Intelligent Transportation Systems

Intelligent Transportation System (ITS) improvements proposed for the Recommended Alternative include:

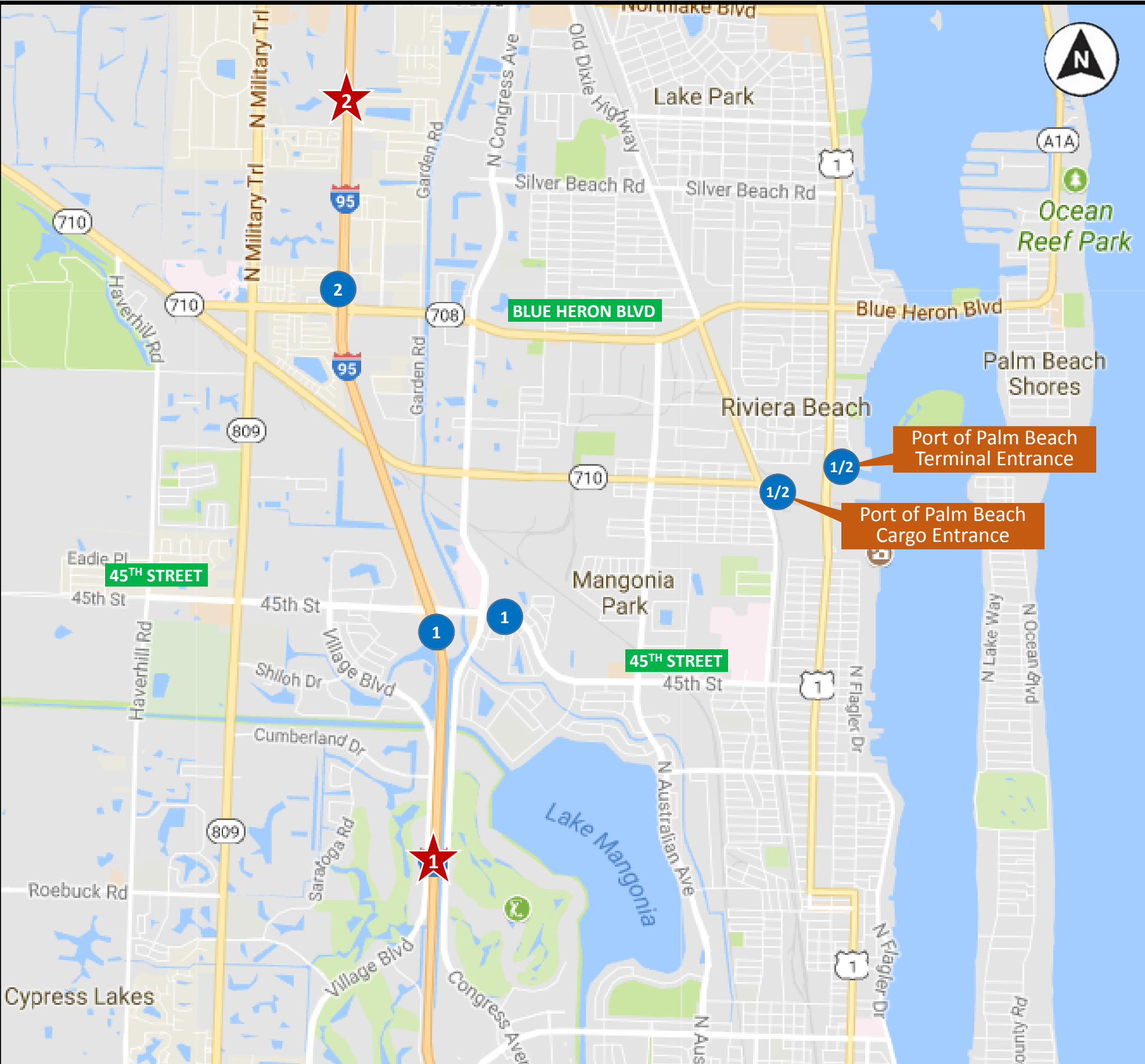
- Driver Information Signs on I-95 with the expected travel times to the Port of Palm Beach using Bluetooth recorders (See illustration of [Figure 6-10](#));
- Adaptive Signal Control Technology at the interchange;
- Vehicle Detection System and CCTV cameras;
- Dynamic Message Signs on 45th Street east and west of I-95.

6.17 Value Engineering

Because the overall Construction Cost of the Recommended Alternative was reduced to less than \$10 Million, it was determined that a Value Engineering and Cost Risk Assessment Workshop was not warranted for this project.

6.18 Conceptual Design Plans

The conceptual layouts that details typical sections, horizontal and vertical alignments, bridge improvements and right-of-way impacts for the Recommended Alternative are provided in the PD&E Conceptual Design Plans prepared for this study and located in [Appendix C](#).



LEGEND:

-  Estimated Travel Time – Sign Locations
-  Bluetooth/WiFi Vehicle Detection Device

**ESTIMATED TRAVEL TIME
TO PORT OF PALM BEACH**

Via 45 th Street	XX	MIN
Via  Blue Heron Blvd	XX	MIN

6.19 List of Technical Reports Completed for the Project

Below is a list of technical studies performed during this PD&E Study and on file at the Florida Department of Transportation, District Four.

Environmental Technical Studies

- Natural Resources Evaluation Technical Memorandum (NRE)
- Contamination Screening Evaluation Report (CSER)
- Sociocultural Effects Technical Memorandum (SCE)
- Noise Study Report (NSR)
- Air Quality Technical Memorandum (AQTM)
- Cultural Resource Assessment Survey (CRAS)
- Water Quality Impact Evaluation (WQIE)

Engineering Technical Studies

- Drainage and Pond Siting Report (DPSR)
- Location Hydraulics Report (LHR)
- Project Traffic Technical Memorandum (PTTM)
- Interchange Modification Report (IMR)

6.20 Next Steps

A resolution from Palm Beach County in support of the Recommended Alternative needs to be requested and documented before the design phase for this project. The following provides a summary of items that need to be evaluated during the design phase:

- Additional coordination with SFWMD will be required to evaluate potential impacts to the existing weir located north of the C-17 Canal.
- Evaluate the possibility of reducing the design speed along 45th Street to 35 MPH throughout the project limits in order to provide more context sensibility in design criteria.
- Evaluate the possibility of combining the commercial driveways along the north side of 45th Street in the northwest quadrant of the interchange.