PRELIMINARY ENGINEERING REPORT

Florida Department of Transportation
District Five

I-95 at Pioneer Trail Interchange

Project Limits: I-95 at Pioneer Trail from Williamson Boulevard to Turnbull Bay Road Volusia County, Florida

Financial Management No.: 436292-1-22-01
ETDM Number: 14193

January 2021

FDOT District 5

719 South Woodland Boulevard,
DeLand, Florida 32720

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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 Federal Highway Administration and FDOT.

PROFESSIONAL ENGINEER CERTIFICATION

PRELIMINARY ENGINEERING REPORT

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ETDM Number: 14193

Financial Project ID: 436292-1-22-01

Federal Aid Project Number: N/A

This preliminary engineering report contains engineering information that fulfills the purpose and need for the I-95 at Pioneer Trail Interchange Project Development & Environment Study from Williamson Boulevard to Turnbull Bay Road in Volusia County, Florida. 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 judgment and experience.

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Stantec Consulting Services Inc., and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice for this project.

Deepika Fields

Digitally signed by Deepika Fields
Date: 2021.01.26 15:45:17 -05'00'

Deepika Kumar Fields, Professional Engineer, State of Florida, License No. 58954

This item has been digitally signed and sealed by Deepika Kumar Fields, PE on 01/26/2021.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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1 SUMMARY OF PROJECT

1.1 PROJECT DESCRIPTION

The Florida Department of Transportation (FDOT) is conducting a Project Development and Environment (PD&E) Study for a new interchange on Interstate 95 (I-95) at Pioneer Trail (CR 4118). The purpose of this Preliminary Engineering Report (PER) is to document the potential benefits and impacts of a proposed interchange on I-95 at Pioneer Trail near Milepost (MP) 19.032, located in Volusia County, Florida. The proposed interchange is located between two existing interchanges on I-95: SR 421 at MP 23.300 to the north and SR 44 at MP 16.287 to the south. **Figure 1-1** shows the location of the proposed interchange.

1.2 PURPOSE AND NEED

The purpose of the proposed interchange at I-95 and Pioneer Trail is to relieve traffic congestion on the two adjacent interchanges north and south of the project: I-95 at State Road 421 (SR 421)/Dunlawton Avenue and I-95 at State Road 44 (SR 44)/Lytle Avenue. The project also aims to support economic development associated with existing and approved developments, including three Developments of Regional Impact (Farmton, Restoration and Pavilion at Port Orange).

The objective of the study is to evaluate roadway and interchange alternatives associated with a new interchange at I-95 and Pioneer Trail. The study will analyze and assess the proposed project's impact on the social, economic, cultural, natural, and physical environment, in order to develop the location and design concept of the project in accordance with FDOT policy, procedures and requirements.

The need for the project was identified in the previously approved Interchange Justification Report (IJR, April 2017) and IJR Reevaluation (October 2020) prepared by FDOT and can be summarized into four primary categories:

- Reduce congestion at adjacent interchanges
- Regional mobility
- Emergency evacuation
- Support economic viability associated with future development

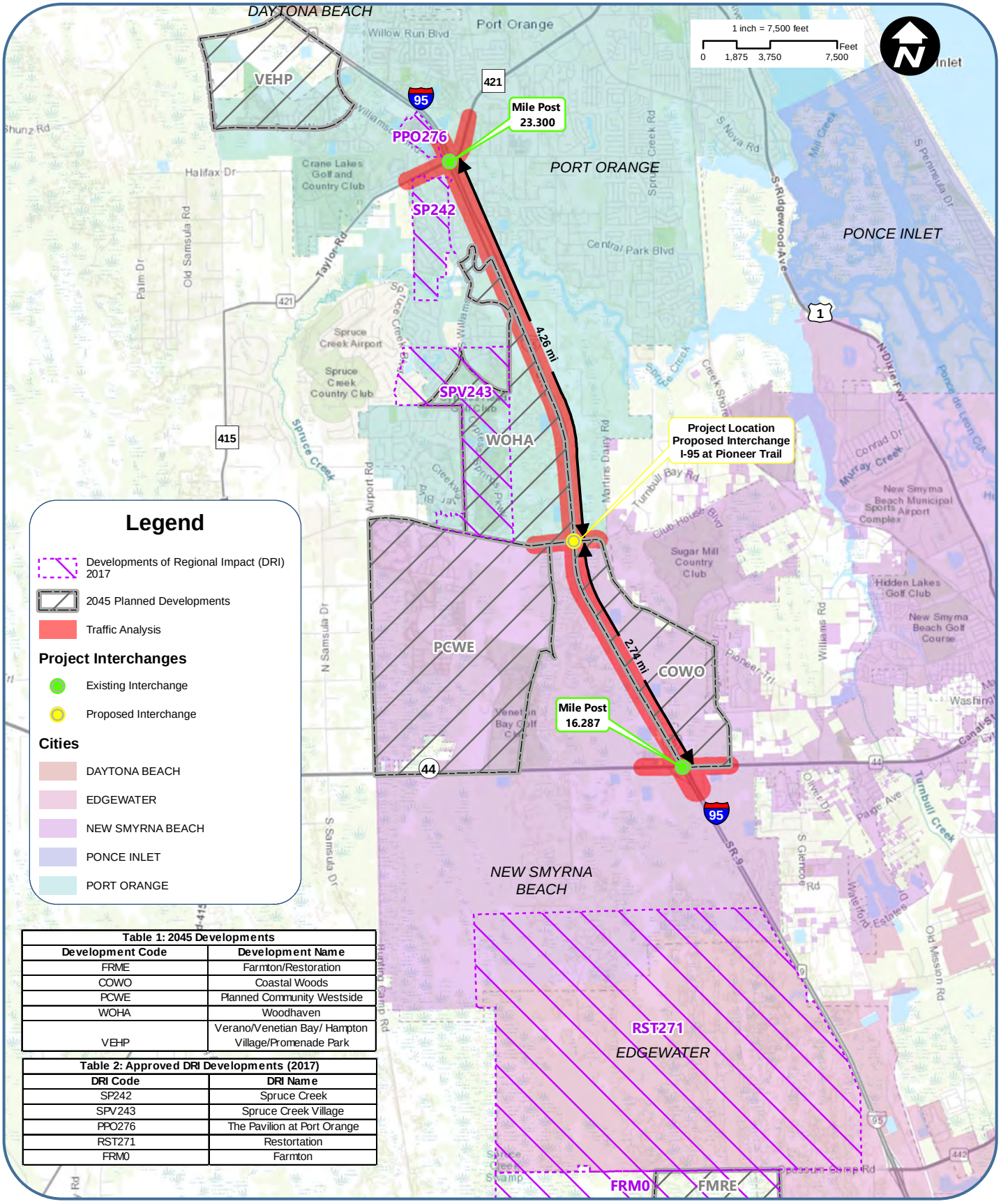


Table 1: 2045 Developments	
Development Code	**Development Name**
FRME	Farmton/Restoration
COWO	Coastal Woods
PCWE	Planned Community Westside
WOHA	Woodhaven
VEHP	Verano/Venetian Bay/ Hampton Village/Promenade Park

Table 2: Approved DRI Developments (2017)	
DRI Code	**DRI Name**
SP242	Spruce Creek
SPV243	Spruce Creek Village
PPO276	The Pavilion at Port Orange
RST271	Restortation
FRM0	Farmton

1.2.1 Traffic Congestion

Within Volusia County and the cities of Port Orange and New Smyrna Beach, a significant number of development plans have already been identified. As of the latest available development activity reports (December 2020) there were 49 projects and 73 projects in various stages of development in the City of Port Orange and City of New Smyrna Beach, respectively. This growth is projected to place a burden on the existing regional roadway system including the adjacent interchanges of SR 421 and SR 44. SR 421 to the north is currently operating at or near capacity with extended queues during the peak hours and is constrained in terms of possible improvements to the existing configuration. The SR 44 interchange to the south is identified as one of the highest crash locations in Volusia County. A new interchange at Pioneer Trail would be located midway between existing interchanges and is projected to provide relief to the existing operation conditions at the SR 421 interchange and serve as an alternative to both the SR 421 and SR 44 interchanges in the future.

1.2.2 Regional Transportation Need

The I-95 at Pioneer Trail interchange has a long history of being identified as a regional transportation need. It was included in the 2025 Cost Feasible Roadway projects and the 2035 Needs Plan of the Volusia County Long Range Transportation Plan (LRTP). The proposed interchange was also identified in the 2040 River-to-Sea LRTP SIS Cost Feasible Plan. Several previously conducted studies demonstrated the importance and need for the Pioneer Trail interchange.

- The "Pioneer Trail Feasibility Study" conducted in 2005 as part of the I-95 Systems Operational Analysis Report study concluded that the proposed interchange at Pioneer Trail would serve the regional trips and would not have adverse impacts on mainline operations. The new interchange would alleviate traffic on the adjacent interchanges.

- The "SR 421/I-95 Interchange Analysis" study conducted by the City of Port Orange in 2009 studied the Pioneer Trail interchange as part of an alternate corridor evaluation and concluded that the Pioneer Trail interchange would provide relief to the critical SR 421 interchange.

- The April 2017 "I-95 at Pioneer Trail Interchange Justification Report" determined that not only would the interchange reduce congestion through the SR 421 interchange area, it would also support the economic vitality and approved future development of the area.

1.2.3 Emergency Evacuation

Pioneer Trail contributes to the regional network and provides direct and indirect connections to all of the major arterials in the surrounding area. This includes SR 421 to the north, US 1 to the east, SR 44 to the south, Tomoka Farms Road to the west, and I-4 using SR 44 to the west. An interchange at Pioneer Trail would provide easily accessible interchange termini and improved evacuation capacity to the area. This additional access has the potential to save valuable time for evacuating residents by providing additional access to the interstate system.

1.2.4 Economic Development

An economic impact analysis was completed as part of the initial IJR to determine the economic impacts and associated effects of the construction of the proposed interchange. These impacts include short-term construction impacts as well as long-term benefits created from the permanent infrastructure improvement including jobs, wages and total economic output or activity, for direct, indirect and induced economic effects. The economic benefits due to the proposed interchange were quantified as follows:

- Add $2.5 billion to the local economy due to construction activity,
- Employ approximately 700 construction and construction-related workers during the development horizon,
- Support approximately 13,000 permanent jobs, and
- Increase in spending up to $775 million per year associated with new household operations and additional office, retail, and hotel employment

The County's long-term planning and commitment for development on the west side of the City of Port Orange is evident with the socioeconomic data identified in the 2040 LRTP and development projects included in the City of Port Orange and New Smyrna Beach future land use plans. The increased access provided by a proposed Pioneer Trail interchange would greatly improve the economic development potential of the entire area surrounding the Pioneer Trail corridor.

1.3 COMMITMENTS

FDOT has made the following commitments during the project PD&E phase:

1. The Standard Protection Measures for the Eastern indigo snake will be implemented during construction.

2. A federally listed plant survey will be conducted during the design phase.

1.4 ALTERNATIVES ANALYSIS SUMMARY

The Alternatives Analysis identified the project alternatives that were to be evaluated in the PD&E Study. For this project, the following alternatives were reviewed: No-Build, Transportation Systems Management and Operations (TSM&O) and Build. Neither the No-Build nor the TSM&O Alternatives met the purpose and need of the project; however, the No-Build Alternative was carried through the study as a basis for comparison to the Build Alternatives.

Three Build Alternatives were developed in this PD&E Study: Interchange Build Alternative 1 (Diamond), Interchange Build Alternative 2 (Partial Cloverleaf 1) and Interchange Build Alternative 3 (Partial Cloverleaf 2). All three of the interchange alternative designs provide for full access to and from I-95 and feature parallel type acceleration and deceleration lanes for entry to and exit from the freeway. Two future signalized intersections are provided at the ramp terminals in all three alternatives.

Each of the three Build alternatives was evaluated based on engineering and environmental considerations and public/ stakeholder input. The alternatives evaluation matrix showed that the Diamond and Partial Cloverleaf 2 alternatives overall had a similar ranking with a few factors that ranked highest; whereas, the Partial Cloverleaf 1 had several factors that ranked the lowest. The pros of the Diamond Alternative included lower right of way, wetlands and floodplain impacts. The pros of the Partial Cloverleaf 2 Alternative included moderate right of way impacts, lower involvement with contamination sites, best traffic operations, lower construction costs and highest public support/ preference.

1.5 DESCRIPTION OF THE PREFERRED ALTERNATIVE

Based on the engineering and environmental factors and public and agency input, the preferred alternative is the Partial Cloverleaf 2 Alternative as it provides the best balance between improved transportation service and minimization of the social, physical and natural impacts associated with the proposed roadway improvements while gaining the most public support. The Partial Cloverleaf 2 Alternative features single-lane, parallel type diagonal entry and exits ramps that connect to I-95 in three quadrants of the interchange, while there are no ramps located in the southeast quadrant. Two additional loop ramps are provided. The loop ramp in the southwest quadrant is for I-95 southbound to Pioneer Trail eastbound traffic, eliminating the need for a left turn movement from the Southbound ramp terminal. The loop ramp in the northeast quadrant is for I-95 northbound traffic exiting to Pioneer Trail and will allow for left and right turn movements at the Northbound ramp terminal intersection. Provision of the northeast quadrant loop ramp reduces right of way impacts in the southeast quadrant of the interchange.

1.6 LIST OF TECHNICAL REPORTS COMPLETED FOR THE PROJECT

The following reports were prepared as part of the engineering and environmental analysis required during the PD&E process:

• Contamination Screening Evaluation Report	May 2019, Rev. January 2020
• Cultural Resources Assessment Survey	May 2019, Addendum August 2020
• Indirect and Cumulative Effects Evaluation Technical Memorandum	October/ November 2020
• Interchange Justification Report Reevaluation	August 2020
• Landscape Opportunity & Preservation Analysis	February 2020
• Natural Resources Evaluation Report	October 2020
• Noise Study Technical Memorandum	January 2020
• Pond Siting Report	October 2020
• Project Traffic Analysis Report	June 2019
• Report of Roadway Soil Survey	August 2020
• Value Engineering Report	October 2019

2 EXISTING CONDITIONS

Existing conditions in the I-95 at Pioneer Trail Interchange PD&E study area were evaluated based on review of existing plans and documents, desktop and geospatial data analysis, field reviews and coordination with regulatory agencies. Data collection included identifying existing roadway, interchange and intersection configurations and obtaining vehicular traffic volumes throughout the I-95 and Pioneer Trail PD&E study area.

2.1 EXISTING ROADWAY NETWORK

The I-95 Interchange at Pioneer Trail PD&E study area is designated by FDOT as within the Urban Boundary of Volusia County. The study's area of influence (AOI) extends approximately seven miles along I-95, from the SR 44 interchange to the south and to the SR 421 interchange to the north. In addition, the traffic analysis area includes the adjacent intersections along SR 44 from Williamson Boulevard to Sugar Mill Drive, Pioneer Trail between Williamson Boulevard and Turnbull Bay Road and SR 421 from Williamson Boulevard to Taylor Branch Road.

Interstate 95 (I-95)

Interstate 95 (I-95) is part of Florida's Strategic Intermodal System (SIS) and is functionally classified as an urban principal arterial interstate. Within the AOI, I-95 is a six-lane median divided limited access facility that has three 12-foot travel lanes with paved inside and outside shoulders in each direction from south of SR 44 to the north of SR 421. The posted speed limit is 70 miles per hour (mph) within the study area.

State Road 44 (SR 44)

SR 44 is an east-west four-lane divided roadway that is classified as an urban principal arterial between MP 22.463 and MP 25.578, which includes the study section. To the west of the study area, the functional class is rural principal arterial. SR 44 forms a partial cloverleaf interchange with a southbound exit (loop ramp) with I-95 located approximately 2.74 miles south of Pioneer Trail. The posted speed limit decreases along the SR 44 corridor from west to east; it is 65 mph west of Williamson Boulevard, 55 mph within the study section limits and 45 mph to the east of the study area.

Pioneer Trail (CR 4118)

Pioneer Trail is a County-maintained two-lane undivided urban major collector oriented east-west and spans over I-95. The posted speed limit is 45 mph within the study section between Williamson Boulevard and Turnbull Bay Road. To the east of I-95, Pioneer Trail turns the bend at the junction of Turnbull Bay Road and continues southeast with a decreased speed of 40 mph. Turnbull Bay Road extends east from the

Pioneer Trail junction as a two-lane urban major collector with a posted speed limit of 30 mph, serving several residential subdivisions.

State Road 421 (SR 421)/CR 421

SR 421 is a six-lane divided urban principal arterial that follows a southwest to northeast alignment in the project study area. To the west of Williamson Boulevard, it becomes CR 421. CR 421 is a four-lane divided urban arterial to Summer Trees Road that narrows down further to a two-lane arterial to the west. SR 421 forms a diamond-type interchange with I-95 located approximately 4.26 miles north of Pioneer Trail. Within the interchange area, SR 421 has a five-lane cross-section with three eastbound lanes and two westbound lanes with a concrete traffic separator west of I-95 and a raised grass median east of I-95. The posted speed limit is 45 mph in the study section between Williamson Boulevard (MP 0.053) and Taylor Branch Road (MP 0.413), increasing to 50 mph east of Taylor Branch Road.

Williamson Boulevard (County Road 4009)

Williamson Boulevard is a County-maintained north-south roadway that is functionally classified as an urban principal arterial. Within the study area, Williamson Boulevard is a four-lane divided roadway that generally follows a north/south alignment that parallels the west side of I-95. The posted speed limit is 35 mph near SR 421 and increases to 45 mph south of Airport Road. The road is discontinuous in the project study area, extending from north of SR 421 and terminating at Pioneer Trail. Near the south end of the study area, Williamson Boulevard extends from approximately one-half mile north of SR 44 to just south of SR 44, providing access to recently developed commercial properties.

Interchanges

There are currently two interchanges located along I-95 within the project study area as described below:

- I-95 at SR 44 (Mile Post 16.287) is a partial cloverleaf interchange with a loop ramp in the southwest quadrant from I-95 southbound to SR 44 eastbound. The northbound ramp terminal intersection is signalized, the southbound diagonal ramp to SR 44 westbound is under stop control and the southbound loop ramp to SR 44 eastbound is under yield control. All ramps feature single-lane ramps. The FDOT, the City of New Smyrna Beach, and Volusia County have made various improvements to the I-95 and SR 44 interchange to address the increase in congestion that has occurred in this area over the years.
- I-95 at SR 421 (Mile Post 23.300) is a diamond-type interchange with single-lane diagonal ramps in all four quadrants of the interchange that flare to include additional lanes at the ramp terminals. Both northbound and southbound ramp

terminal intersections are signalized. The FDOT, the City of Port Orange, and Volusia County have made numerous improvements to the I-95 and SR 421 interchange to address the increase in congestion that has occurred in this area over the years.

2.2 TYPICAL SECTION

Within the study area, I-95 is a six-lane divided, limited access facility. Pioneer Trail is a two-lane undivided arterial road. The existing typical sections for I-95 and Pioneer Trail are described below.

Interstate 95

Figure 2-1 depicts the existing roadway typical section for I-95 in the vicinity of Pioneer Trail. This section provides three 12-foot wide travel lanes with 12-foot inside and outside shoulders (10 feet paved) in each direction. The northbound and southbound lanes are separated by a grassed median that varies in width but is typically 100 feet. The right of way width is typically 350 feet.

Pioneer Trail

Figure 2-2 depicts the existing roadway typical section for Pioneer Trail approaching the bridge over I-95. Two 11-foot lanes with 8-foot wide shoulders are provided. The total width of the typical section for this segment of Pioneer Trail varies but is typically 120 feet.

Pioneer Trail Bridge over I-95

Figure 2-3 depicts the existing bridge typical section for the Pioneer Trail Bridge over I-95. Two 11- foot lanes with 4-foot wide shoulders are provided. The total width of the existing bridge is 32 feet.

2.3 RIGHT OF WAY

According to the *I-95 Widening (SR 44 to US 92)* construction roadway plans (FPID 242715-2-52-01), the existing I-95 mainline limited access right of way is typically 350 feet. The existing right of way width along Pioneer Trail varies. Near the begin limits of the project corridor at Williamson Boulevard it is approximately 130 feet, increases to approximately 200 feet near the I-95 overpass, varies between 140’ and 180’ west of Turnbull Bay Road and decreases near the end limits of the project corridor with varying width between 70’ to 90’ east of Turnbull Bay Road.

2.4 ROADWAY CLASSIFICATION

I-95 is classified as an urban principal arterial-interstate and Pioneer Trail is classified as an urban major collector roadway within the project study area.

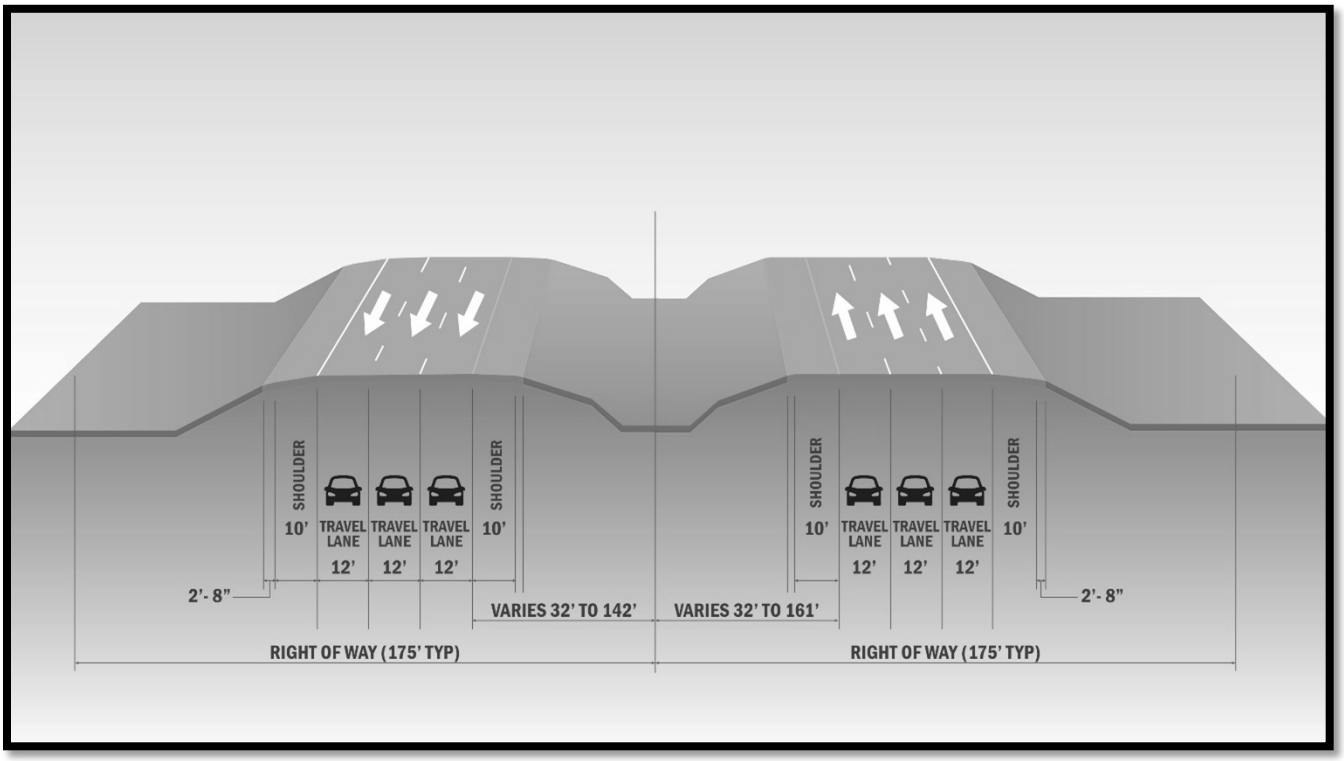


Figure 2-1: Existing I-95 Roadway Typical Section

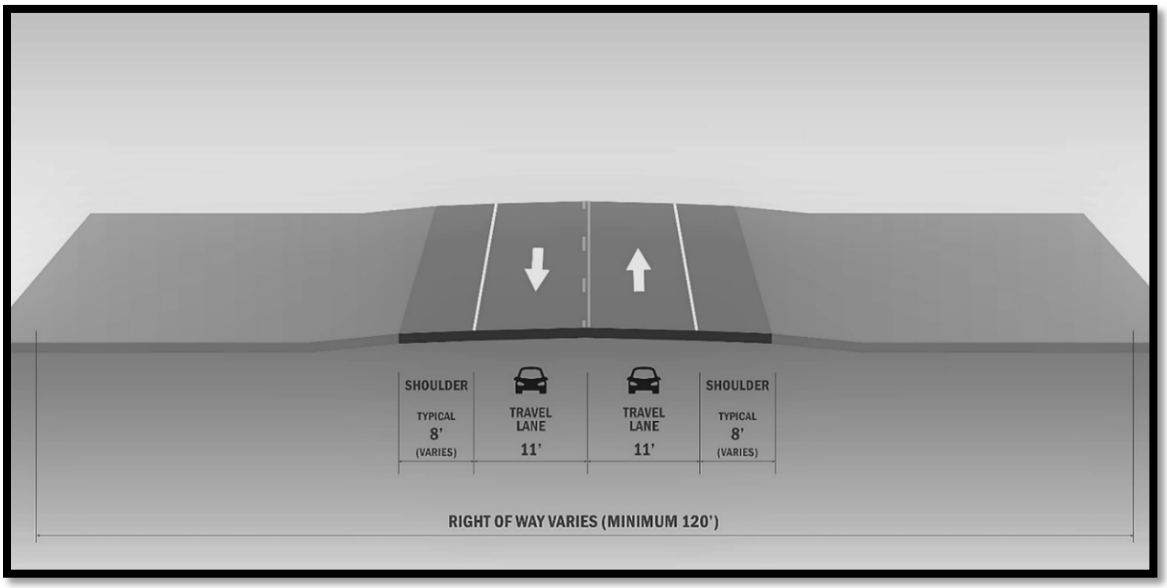


Figure 2-2: Existing Pioneer Trail Typical Section

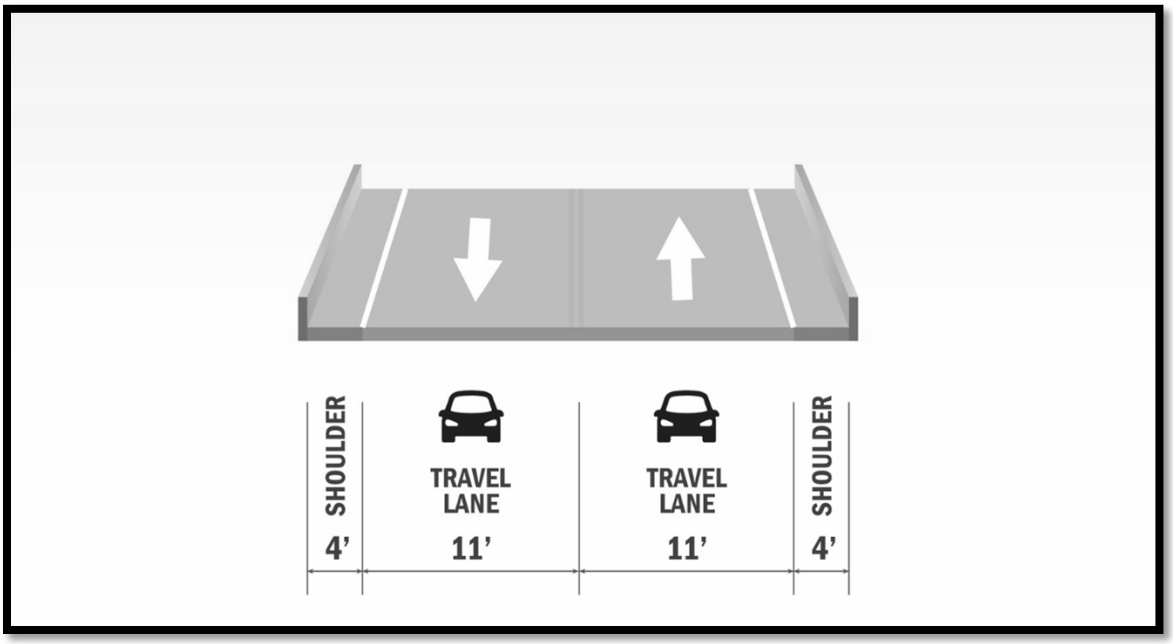


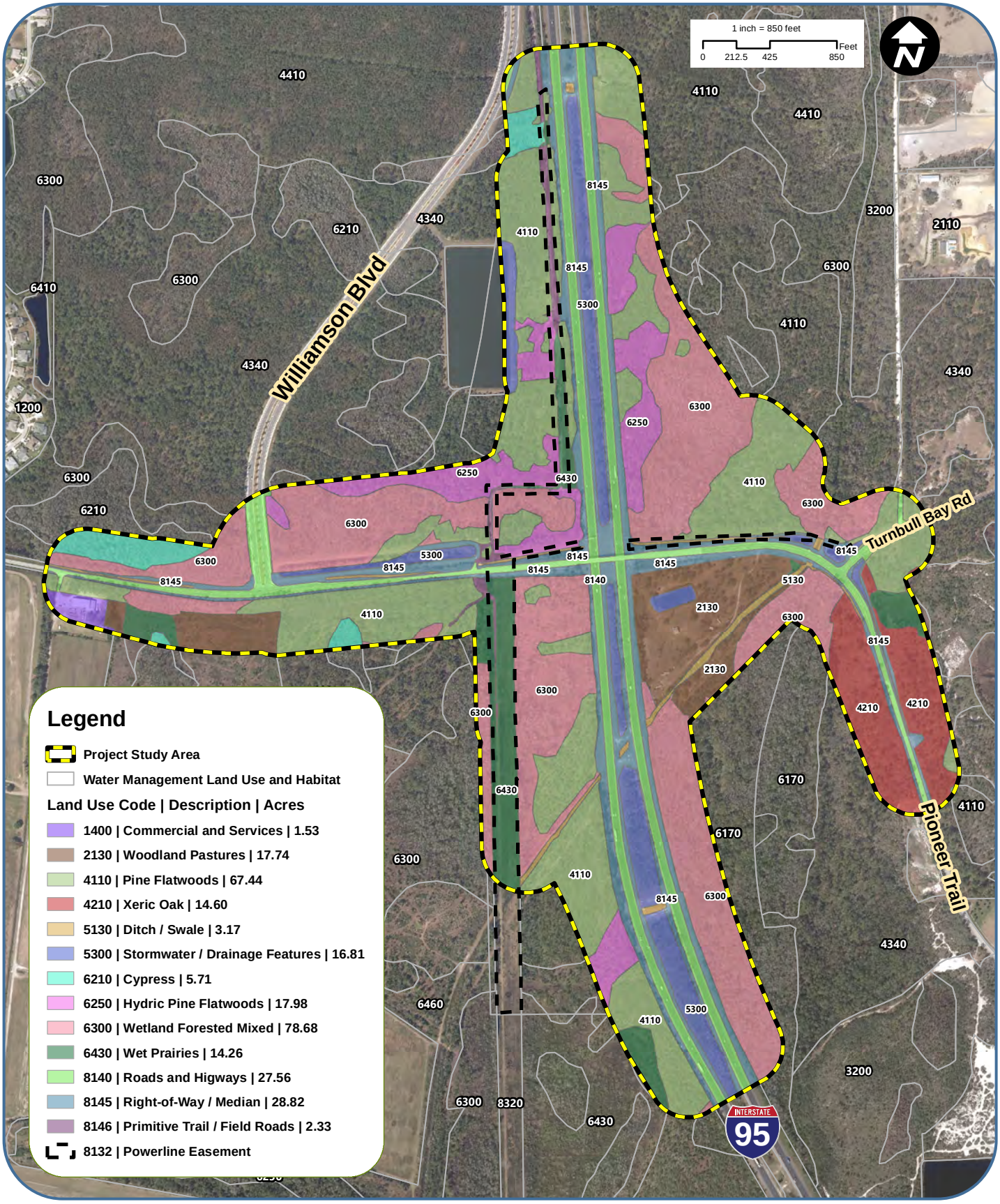
Figure 2-3: Existing Pioneer Trail Bridge over I-95 Typical Section

2.5 ADJACENT LAND USE

The area immediately surrounding the Pioneer Trail corridor near I-95 is largely undeveloped. As shown in **Figure 2-4**, the project study area as a whole encompasses a mixture of land use classifications including: agricultural, public/semi-public, residential, vacant residential, vacant non-residential and retail/office. The current development within the study area is sparse, mainly open space/vacant land interspersed with residential uses. More dense development with commercial uses occurs near the existing interchanges at SR 421 and SR 44 to the north and south, respectively.

2.6 DESIGN AND POSTED SPEEDS

According to FDOT roadway plans for the existing facility, the design speed along I-95 within the project limits is 70 MPH; the existing posted speed is 70 MPH. The design speed on Pioneer Trail is 45 MPH. The posted speed on Pioneer Trail is 45 mph from the begin project limits west of Williamson Boulevard to Turnbull Bay Road where it decreases to 40 MPH.


1 inch = 850 feet
0 212.5 425 850 Feet
N
Williamson Blvd
Turnbull Bay Rd
Pioneer Trail
INTERSTATE 95
Legend
Project Study Area
Water Management Land Use and Habitat
Land Use Code | Description | Acres
1400 | Commercial and Services | 1.53
2130 | Woodland Pastures | 17.74
4110 | Pine Flatwoods | 67.44
4210 | Xeric Oak | 14.60
5130 | Ditch / Swale | 3.17
5300 | Stormwater / Drainage Features | 16.81
6210 | Cypress | 5.71
6250 | Hydric Pine Flatwoods | 17.98
6300 | Wetland Forested Mixed | 78.68
6430 | Wet Prairies | 14.26
8140 | Roads and Higways | 27.56
8145 | Right-of-Way / Median | 28.82
8146 | Primitive Trail / Field Roads | 2.33
8132 | Powerline Easement

2.7 HORIZONTAL AND VERTICAL ALIGNMENTS

Horizontal Alignment

The centerline horizontal alignment data for I-95 was obtained from the *State Road No. 9 (I-95) Widening-SR 44 to US 92 (March 2015, FPID 242715-2-52-01)* construction roadway plans. I-95 follows a southeast to northwest alignment in the PD&E study area. There are three existing horizontal curves along the Interstate connected by long tangential segments.

The horizontal alignment data for Pioneer Trail was obtained from the *South Williamson Blvd. Extension for Pioneer CDD (March 2014)* roadway concept plans and *Pioneer Trail Curve Realignment (September 2009, Volusia County Project No. P-5011)* plans. In the project study area, Pioneer Trail follows a west to east alignment, forming a bend at Turnbull Bay Road and continuing to the southeast. The curve at Turnbull Bay Road was flattened as part of the realignment/reconstruction in 2016. The available existing horizontal alignment data is summarized in **Table 2-1**. The existing curves along I-95 and Pioneer Trail are consistent with current standards.

Table 2-1: Horizontal Alignment Data

Location	PI Station	Degree of Curvature	Radius (ft)	Length (ft)	Super-elevation (e)
I-95 (SR 9)					
I-95, just south of Pioneer Trail	4686+77.71	1°30'00"	3,819.83	1,691.11	0.054
I-95, just north of Pioneer Trail	4774+39.00	0°59'59"	5,730.75	1,887.75	n/a
I-95, just north of SR 421	4962+24.95	1°30'02"	3,818.60	2,133.40	n/a
Pioneer Trail (CR 4118)					
Pioneer Trail at Williamson Blvd.	20+82.63	2°17'31"	2,500.00	647.24	0.46
Pioneer Trail at Turnbull Bay Rd.	23+18.88	8°11'06"	700.00	949.02	0.096

Vertical Alignment

Existing vertical curve data was obtained from *State Road No. 9 (I-95) (May 2016, FPID 406869-8-52-01)* final as-build plans, *State Road No. 9 (I-95) Widening-SR 44 to US 92 (March 2015, FPID 242715-2-52-01)* construction roadway plans and *Pioneer Trail Curve Realignment (September 2009, Volusia County Project No. P-5011)* plans.

The I-95 corridor in the study area has gently rolling vertical geometry with crest and sag vertical curves joining tangent segments where the change in grade exceeds the maximum FDOT design requirements (0.2 for 70 mph design speed). The Pioneer Trail corridor has predominantly level terrain within the project study limits with sag vertical curves on the approaches to the existing bridge over I-95. The available existing vertical alignment data is summarized in **Table 2-2**.

Table 2-2: Vertical Alignment Data

Location	VPI Station	Sag/Crest	G1/G2	K	Length (ft)
I-95 (SR 9)					
I-95 at SR 44	5557+28.29	Sag	+0.000/+2.900	185	536
I-95 NB, north of Pioneer Trail	1849+80.00	Crest	+0.036/-0.455	2037	1,000
I-95 NB, south of Spruce Creek	1864+83.00	Sag	-0.455/+0.881	599	800
I-95 NB, at Spruce Creek	1875+00.00	Crest	+0.881/-0.981	537	1,000
I-95 NB, north of Spruce Creek	1883+00.00	Sag	-0.981/+0.700	476	800
I-95 NB, south of SR 421	1897+75.00	Crest	+0.700/+0.179	1921	1,000
I-95 NB, south of bridge over SR 421	1919+72.65	Sag	+0.179/+2.400	360	800
I-95 NB, north of bridge over SR 421	1952+02.65	Sag	-2.400/+0.052	326	800
Pioneer Trail					
Pioneer Trail east of I-95	16+50.00	Sag	-2.48/+0.20	93	250

2.8 PEDESTRIAN ACCOMMODATIONS

Florida Statutes 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. Pedestrian facilities currently do not exist on Pioneer Trail within the study limits.

2.9 BICYCLE FACILITIES

Bicyclists are not permitted on limited access roadways. Accordingly, no bicycle facilities exist on I-95. No designated bicycle lanes are present on connecting roadways within the project limits. However, paved shoulders that could be used by bicycles do occur along Williamson Boulevard and Pioneer Trail.

2.10 TRANSIT FACILITIES

There are no existing transit facilities along Pioneer Trail within the limits of the project.

2.11 EXISTING INTERSECTIONS AND TRAFFIC SIGNALS

There are three crossroads along I-95 with a total of ten existing intersections within the I-95 at Pioneer Trail interchange project traffic analysis area, as shown in **Table 2-3**. All of the intersections along the SR 421 corridor are signalized, three of the four intersections along SR 44 are signalized and both of the Pioneer Trail intersections are currently unsignalized.

Table 2-3: Existing Signalized Intersections

Intersection	Signalized (Yes/No)
SR 44 and Williamson Boulevard/Ocean Gate Boulevard	Yes
SR 44 and I-95 Southbound Ramps	No
SR 44 and I-95 Northbound Ramps	Yes
SR 44 and Sugar Mill Drive	Yes
Pioneer Trail and Williamson Boulevard	No
Pioneer Trail and Turnbull Bay Road	No
SR 421 (Dunlawton Avenue/Taylor Road) and Williamson Boulevard	Yes
SR 421 and I-95 Southbound Ramps	Yes
SR 421 and I-95 Northbound Ramps	Yes
SR 421 and Taylor Branch Road	Yes

2.12 RAILROAD CROSSINGS

There are no existing railroad crossings within the project limits.

2.13 TRAFFIC DATA

A detailed traffic analysis was conducted as part of the *Project Traffic Analysis Report (PTAR, June 2019) and Interchange Justification Report (IJR) Reevaluation (October 2020)* prepared for this project concurrent with this PD&E study. An analysis of existing traffic operations included the collection of geometric conditions, daily traffic volumes on the I-95 mainline, ramp, and arterials and AM and PM peak hour turning movements at key study intersections.

A detailed AM and PM peak hour capacity and Level of Service (LOS) analysis of the study intersections was performed using SYNCHRO software. Freeway segment and ramp merge/diverge analysis was conducted using HCS software to evaluate the existing operating conditions.

Based on the existing operational analysis, the majority of the freeway segments within the study area limits operate at LOS A during both peak hours. The I-95 northbound segment north of SR 421 operates at LOS B during the AM peak hour and the I-95 southbound segment north of SR 421 operates at LOS B during the PM peak hour. **Table 2-4** provides a summary of the existing freeway segment operational analysis.

The analysis of the I-95 ramp merge and diverge areas within the study area limits shows that the majority of the ramp segments operate at LOS A during both peak hours, with four ramps operating at LOS B. **Table 2-5** provides a summary of the existing ramps operational analysis.

Table 2-4: Existing Peak Hour Freeway Level of Service Analysis

Freeway Segment	AM Peak Hour			PM Peak Hour		
	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 Northbound						
South of SR 44	1,415	7.4	A	1,370	7.2	A
North of SR 44	1,762	8.9	A	1,478	7.5	A
North of SR 421	2,636	14.8	B	1,769	10.0	A
I-95 Southbound						
South of SR 44	1,050	5.6	A	1,638	8.8	A
North of SR 44	1,100	5.7	A	1,930	10.0	A
North of SR 421	1,463	8.2	A	2,607	14.7	B

Table 2-5: Existing Peak Hour Ramp Merge/Diverge Analysis

Ramp Segment			AM Peak Hour			PM Peak Hour	
	Ramp Type	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS	Demand Volume (veh/hr)	Density (pc/mi/ln)	LOS
I-95 and SR 44 Interchange							
I-95 NB off ramp to SR 44	Diverge	375	10.6	B	394	10.3	B
I-95 NB on ramp from SR 44	Merge	722	9.7	A	502	7.6	A
I-95 SB off ramp to SR 44	Diverge	70	6.3	A	174	11.8	B
I-95 SB off ramp to SR 44 (loop ramp)	Diverge	292	3.1	A	519	8.3	A
I-95 SB on ramp from SR 44	Merge	312	3.6	A	401	6.9	A
I-95 and SR 421 Interchange							
I-95 NB off ramp to SR 421	Diverge	422	6.0	A	461	4.3	A
I-95 NB on ramp from SR 421	Merge	1,296	15.4	B	752	9.4	A
I-95 SB off ramp to SR 421	Diverge	668	5.2	A	1,112	13.2	B
I-95 SB on ramp from SR 421	Merge	305	4.7	A	435	9.4	A

All of the signalized intersections operate at LOS D or better during both peak hours except for the SR 421 and Yorktowne Boulevard intersection which operates at LOS E during both AM and PM peak hours. The critical turning movements at the two Pioneer Trail unsignalized intersections operate at LOS B during both peak hours. **Table 2-6** provides a summary of the existing intersection operational analysis.

Table 2-6: Existing Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
CR 421 and Summer Trees Road	30.4	C	33.1	C
SR 421 and Williamson Boulevard	51.1	D	44.5	D
SR 421 and I-95 Southbound	20.1	C	30.7	C
SR 421 and I-95 Northbound	16.1	B	12.3	B

Table 2-6: Existing Peak Hour Intersection Level of Service

SR 421 and Taylor Branch Road	0.7	A	1.3	A
SR 421 and Yorktowne Boulevard	63.0	E	58.2	E
SR 44 and Williamson Boulevard	22.3	C	25.7	C
SR 44 and I-95 Northbound	22.6	C	17.5	B
SR 44 and Sugar Mill Drive	14.7	B	8.9	A
Unsignalized Intersection*	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
SR 44 and I-95 Southbound**	13.0	B	16.4	C
Pioneer Trail and Williamson Boulevard	12.3	B	14.5	B
Pioneer Trail and Turnbull Bay Road	12.7	B	14.5	B

*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn)
**Unsignalized intersection delay/LOS reported for southbound right; there is no left turn movement from off ramp

2.14 CRASH DATA AND SAFETY ANALYSIS

Crash data analysis was performed for the five-year period between January 2013 - December 2017 from FDOT's Crash Analysis Reporting (CAR) system database for the I-95 mainline, SR 421 and SR 44. Crash data for the Pioneer Trail corridor from west of Williamson Boulevard to Turnbull Bay Road was obtained from the Signal Four Analytics database developed by the University of Florida Geoplan Center.

I-95 Mainline

During the most recent five-year period from 2013-2017, there was a total of 475 crashes along the I-95 mainline from south of SR 44 to north of SR 421. As shown in **Figure 2-5**, the highest crash location in the study corridor was around the I-95 and SR 421 interchange (154 crashes, 32%). The most frequently occurring crash types were collision with a fixed object (147 crashes, 31%), rear-end (100 crashes, 21%) and sideswipes (64 crashes, 14%). Crashes in the "Other" category included collisions with non-fixed objects and non-collision events (rollovers, jackknife, cargo loss, etc.) and comprised 138 crashes (29%). The existing crash type distribution is illustrated in **Figure 2-6** and the yearly crash type summary is provided in **Table 2-7**.

Of the 475 total crashes occurring along I-95 there were 287 property damage only crashes resulting in $68,651 in damages, 179 injury crashes with 255 injuries and nine fatal crashes with 11 fatalities.[1] Of the nine fatal crashes, the majority (five crashes) involved drugs and/or alcohol. Five of the nine fatal crashes involved collisions with fixed objects. Four of the fatal crashes occurred under daylight lighting conditions, four under dark and one under dusk. **Table 2-8** provides a summary of the crashes by severity during the five-year period along I-95.

[1]Property damage amounts in the FDOT CAR data are the officer-estimated damage amounts as reported in the Florida traffic crash report forms.

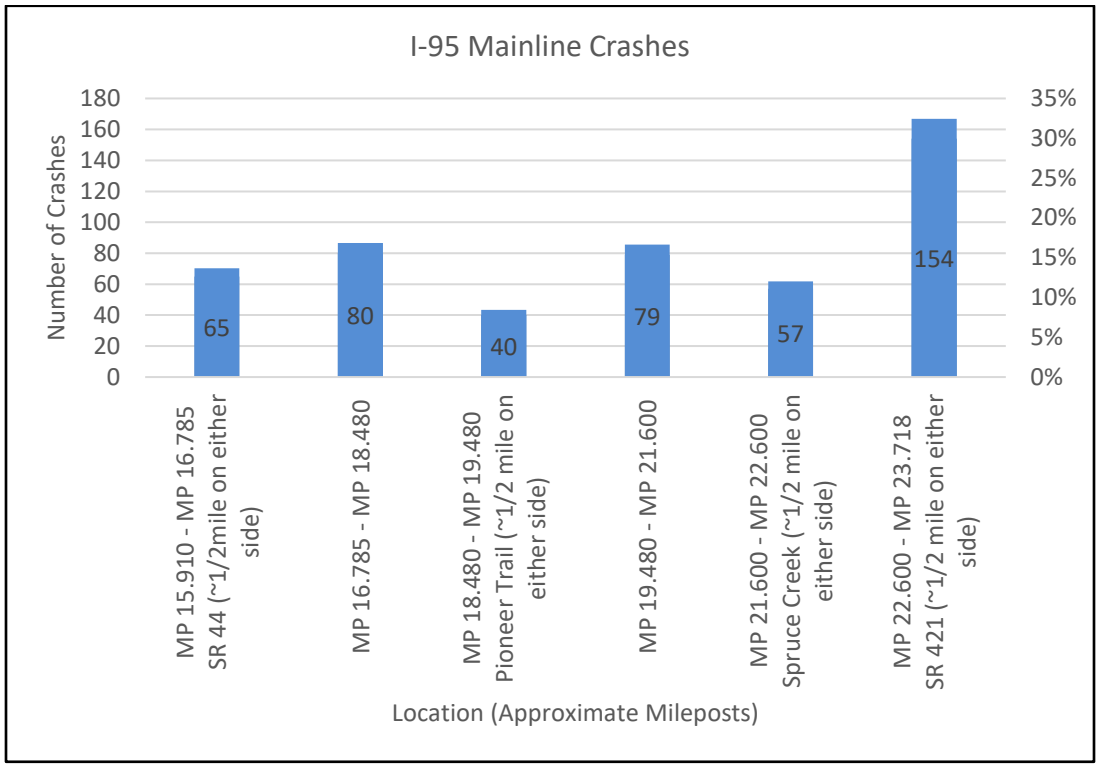


Figure 2-5: Existing Crash Locations (I-95 Mainline)

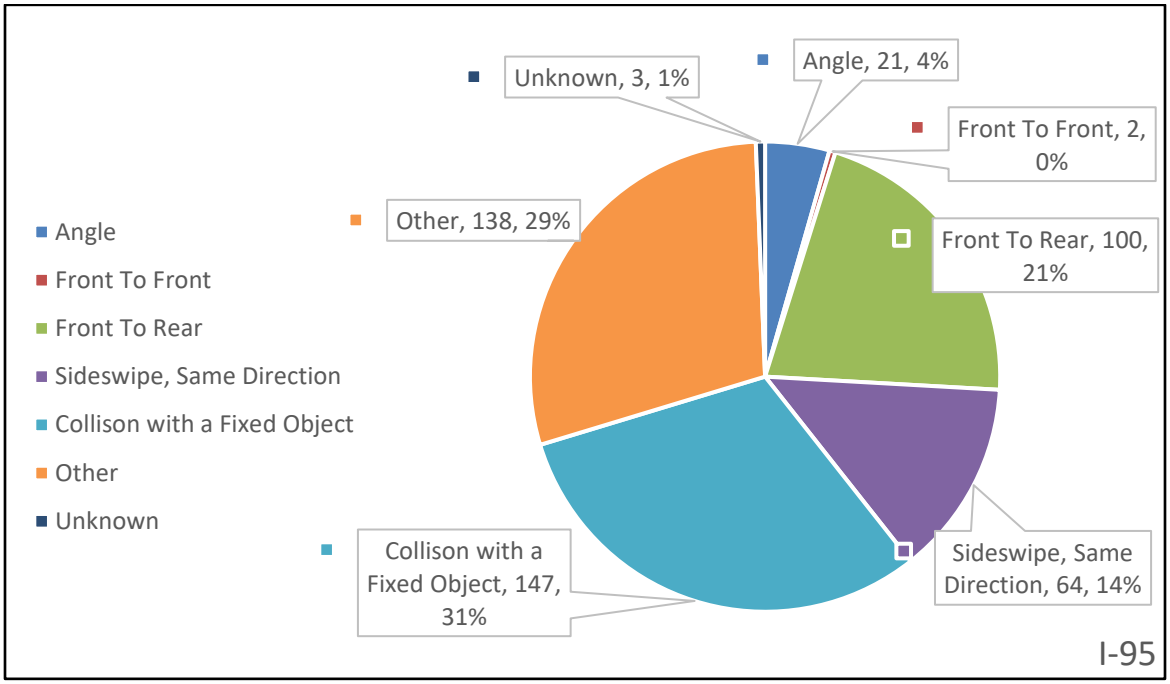


Figure 2-6: Existing Crash Type Distribution (I-95 Mainline)

Table 2-7: Existing Crash Type Summary (I-95 Mainline)

Crash Type	2013	2014	2015	2016	2017	Total
Angle	3	5	0	8	5	**21**
Front to Front	1	0	1	0	0	**2**
Front to Rear	11	19	21	25	24	**100**
Sideswipe, Same Direction	8	10	17	10	19	**64**
Collison with a Fixed Object						
Bridge Overhead Structure	0	1	0	0	0	1
Bridge Rail	1	2	4	0	0	7
Concrete Traffic Barrier	3	3	3	8	4	21
Culvert	0	0	0	1	0	1
Ditch	1	1	4	2	3	11
Embankment	0	0	2	0	0	2
Fence	0	0	0	0	1	1
Guardrail End	0	0	0	1	1	2
Guardrail Face	3	5	2	1	4	15
Impact Attenuator/Crash Cushion	0	0	1	6	7	14
Other Fixed Object (Wall, Building, etc.)	0	0	1	0	0	1
Other Traffic Barrier	0	0	1	0	0	1
Traffic Sign Support	1	0	0	0	0	1
Tree (Standing)	17	17	24	2	9	69
Collison with a Fixed Object Subtotal	**26**	**29**	**42**	**21**	**29**	**147**
Other						
Animal	1	1	2	1	0	5
Cargo/Equipment Loss or Shift	0	1	0	0	1	2
Fire/Explosion	0	1	0	0	0	1
Jackknife	0	0	0	1	0	1
Motor Vehicle in Transport	2	1	2	4	1	10
Other Non-Collision	1	10	2	3	5	21
Other Non-Fixed Object	2	3	4	2	5	16
Overturn/Rollover	13	20	18	17	1	69
Struck by Falling, Shifting Cargo	1	1	0	1	4	7
Thrown or Falling Object	0	0	0	1	0	1
Work Zone/Maintenance Equipment	0	1	2	2	0	5
Other Subtotal	**20**	**39**	**30**	**32**	**17**	**138**
Unknown	1	1	0	0	1	3
Total	**70**	**103**	**111**	**96**	**95**	**475**

Table 2-8: Existing Crashes by Severity (I-95 Mainline)

Crash Severity	2013	2014	2015	2016	2017	Total
Fatal	2	0	3	2	2	**9**
Injury	26	46	36	40	31	**179**
Property Damage	42	57	72	54	62	**287**
Total	**70**	**103**	**111**	**96**	**95**	**475**

SR 44

During the most recent five-year period from 2013-2017, there was a total of 160 crashes along SR 44 from west of Williamson Boulevard to east of Sugar Mill Drive. As shown in **Figure 2-7,** the highest crash location in the study corridor was around the I-95 and SR 44 interchange (83 crashes, 52%). The most frequently occurring crash types were rear-end (93 crashes, 58%) and angle collisions (28 crashes, 17%). Crashes in the "Other" category included collisions with non-fixed objects, and non-collision events (rollovers, jackknife, cargo loss, etc.) and comprised 25 crashes (16%). The existing crash type distribution is illustrated in **Figure 2-8** and the yearly crash type summary is provided in **Table 2-9**.

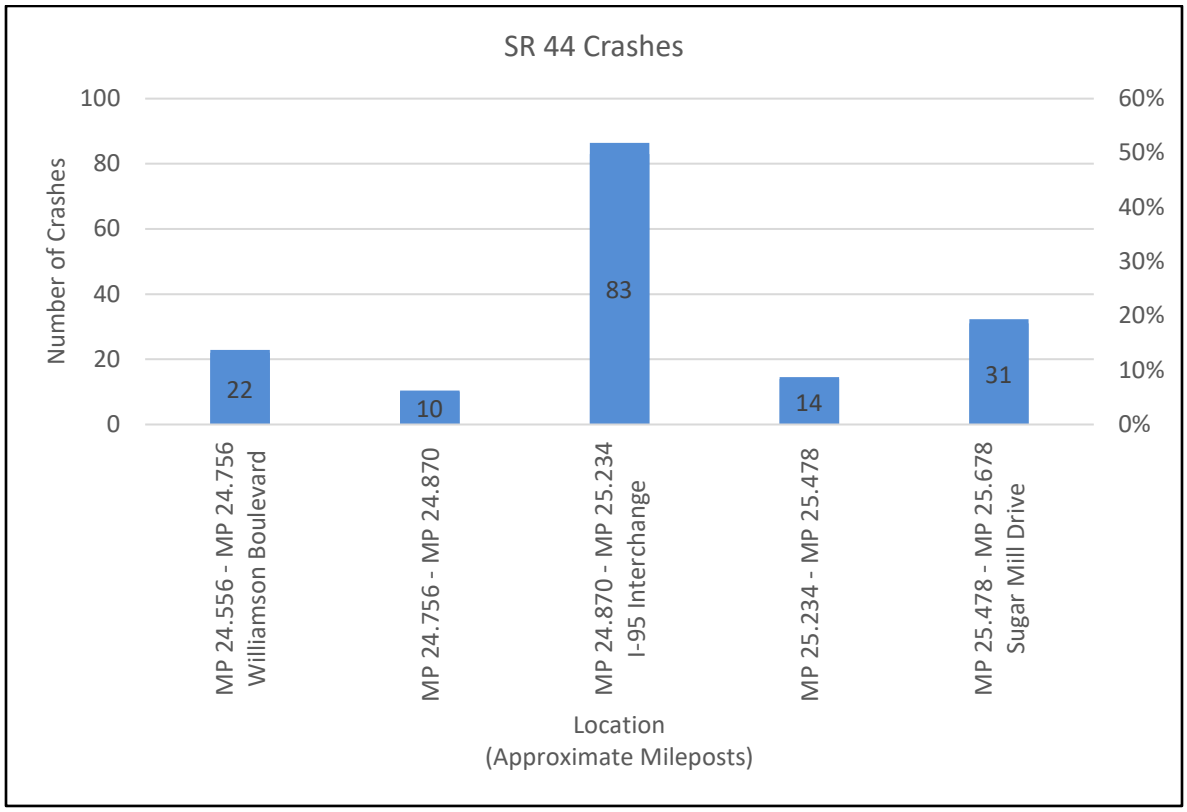


Figure 2-7: Existing Crash Locations (SR 44)

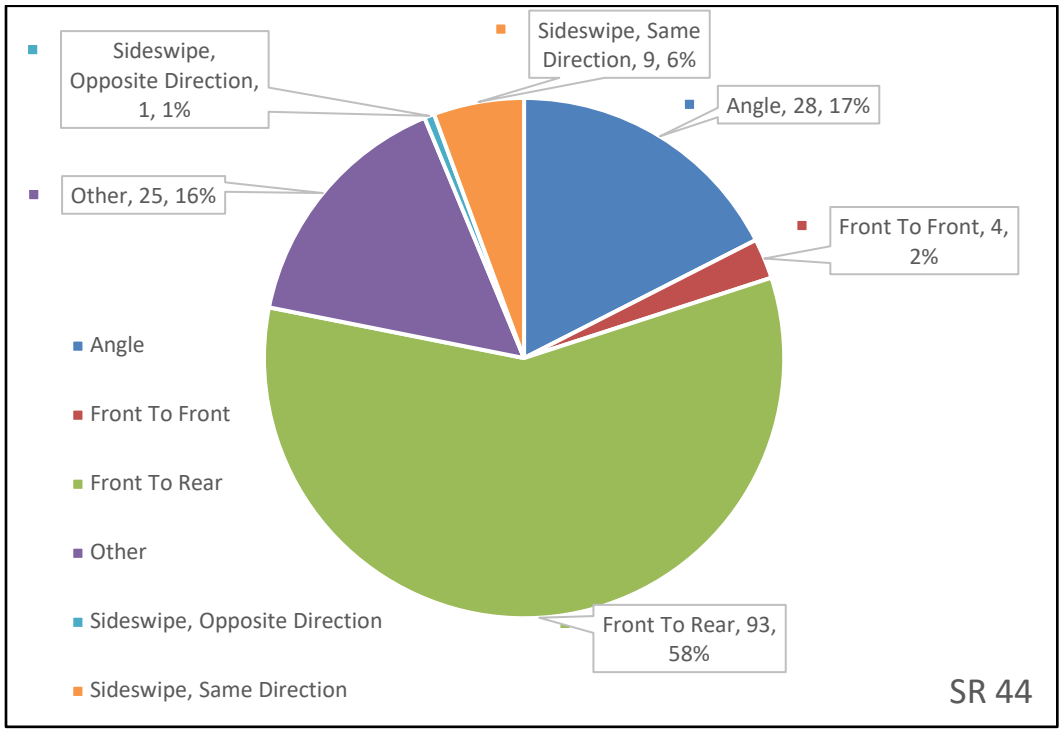


Figure 2-8: Existing Crash Type Distribution (SR 44)

Table 2-9: Existing Crash Type Summary (SR 44)

Crash Type	2013	2014	2015	2016	2017	Total
Angle	4	3	7	5	9	**28**
Front to Front	0	1	1	1	1	**4**
Front to Rear	22	25	17	10	19	**93**
Sideswipe, Opposite Direction	0	0	1	0	0	**1**
Sideswipe, Same Direction	2	3	1	2	1	**9**
Other						
Animal	0	0	0	0	1	1
Ditch	1	0	0	0	0	1
Embankment	0	0	0	0	1	1
Guardrail End	0	1	0	0	0	1
Guardrail Face	0	0	1	0	0	1
Impact Attenuator/Crash Cushion	0	1		0	0	1
Motor Vehicle in Transport	2	1	2	3	1	9
Other Fixed Object (Wall, Building, etc.)	0	1	0	0	0	1
Other Non-Collision	0	1	0	0	0	1
Overturn/Rollover	1	0	1	0	0	2

Table 2-9: Existing Crash Type Summary (SR 44)

Crash Type	2013	2014	2015	2016	2017	Total
Parked Motor Vehicle	1	0		0	0	1
Traffic Sign Support	0	1	1	0	0	2
Traffic Signal Support	0	0	0	1	0	1
Tree (Standing)	1	0	0	0	0	1
Utility Pole/Light Support	0	0	0	0	1	1
Other Subtotal	**6**	**6**	**5**	**4**	**4**	**25**
Total	**34**	**38**	**32**	**22**	**34**	**160**

The total crashes by severity were evaluated for SR 44. Of the 160 total crashes occurring along SR 44 there were 83 property damage only crashes resulting in $29,952 in damages, 74 injury crashes with 100 injuries and three fatal crashes with three fatalities. Of the three fatal crashes, two were angle collisions and one was a head-on collision. **Table 2-10** provides a summary of the crashes by severity during the five-year period along SR 44.

Table 2-10: Existing Crashes by Severity (SR 44)

Crash Severity	2013	2014	2015	2016	2017	Total
Fatal	0	0	1	0	2	**3**
Injury	14	24	12	9	15	**74**
Property Damage	20	14	19	13	17	**83**
Total	**34**	**38**	**32**	**22**	**34**	**160**

SR 421

During the most recent five-year period from 2013-2017, there was a total of 319 crashes along SR 421 from west of Williamson Boulevard to east of Yorktowne Boulevard. As shown in **Figure 2-9,** the highest crash location in the study corridor was around the I-95 and SR 421 interchange (104 crashes, 33%). The most frequently occurring crash types were rear-end (181 crashes, 57%) and angle collisions (63 crashes, 20%). Crashes in the "Other" category included collisions with non-fixed objects, and non-collision events (overturn/ rollovers, etc.) and comprised 33 crashes (10%). The existing crash type distribution is illustrated in **Figure 2-10** and the yearly crash type summary is provided in **Table 2-11.**

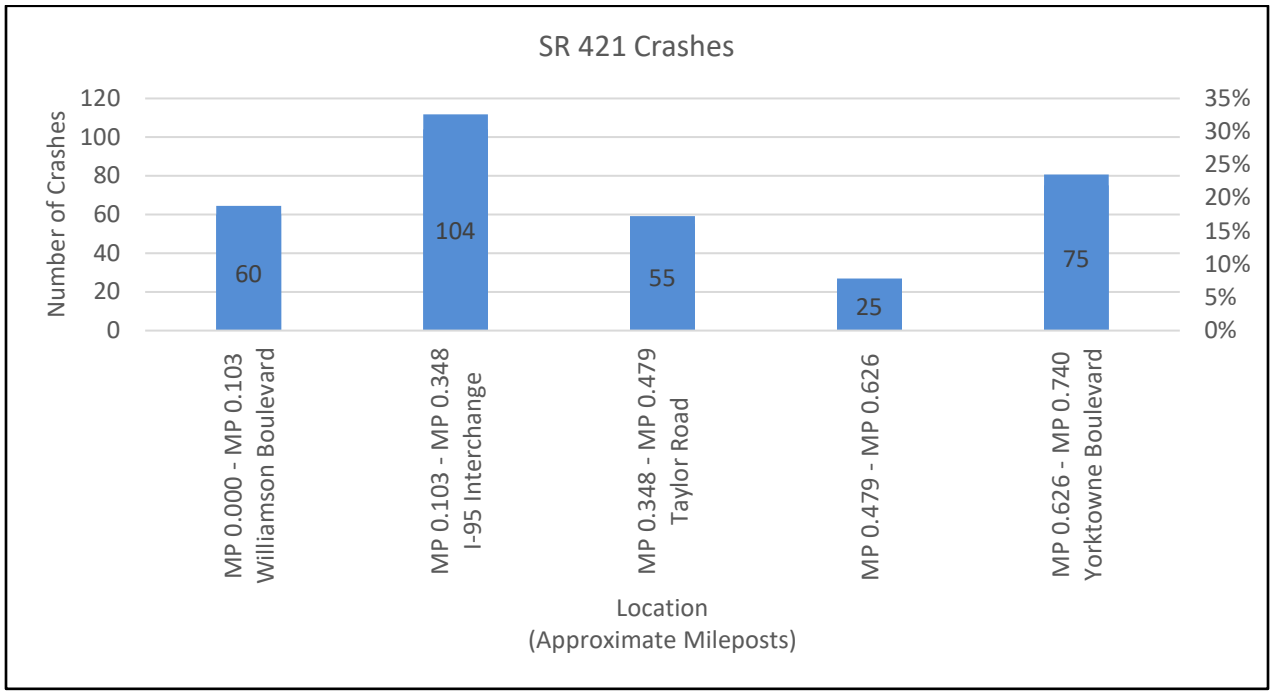


Figure 2-9: Existing Crash Locations (SR 421)

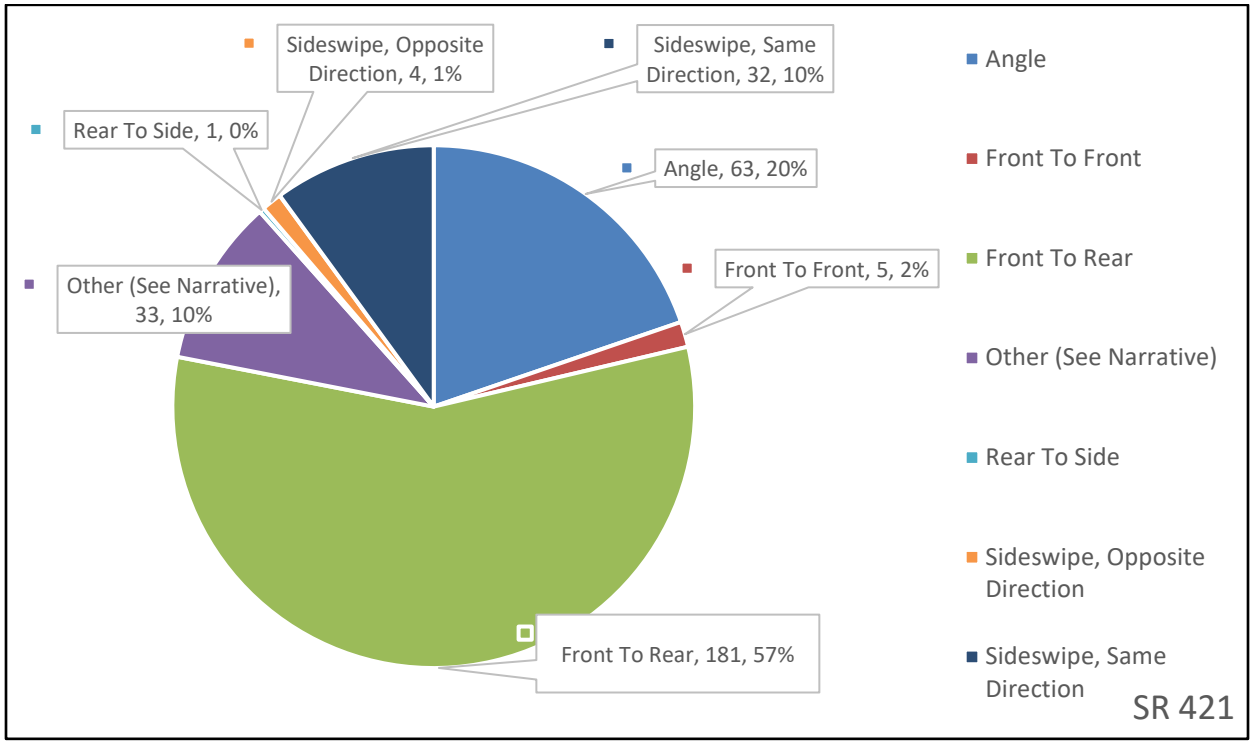


Figure 2-10: Existing Crash Type Distribution (SR 421)

Table 2-11: Existing Crash Type Summary (SR 421)

Crash Type	2013	2014	2015	2016	2017	Total
Angle	9	14	12	14	14	**63**
Front to Front	1	0	1	2	1	**5**
Front to Rear	25	27	41	39	49	**181**
Rear to Side	0	0	0	0	1	**1**
Sideswipe, Opposite Direction	1	0	2	1	0	**2**
Sideswipe, Same Direction	3	6	7	7	9	**14**
Other						
Bridge Overhead Structure	0	0	0	0	1	1
Curb	0	1	0	0	1	6
Motor Vehicle in Transport	4	3	3	0	4	1
Other Post, Pole, or Support	1	0	0	0	0	1
Overturn/Rollover	2	2	0	1	1	1
Pedal cycle	1	0	0	0	0	4
Pedestrian	0	0	1	0	0	1
Ran into Water/Canal	0	0	0	0	1	1
Traffic Sign Support	0	0	2	0	2	1
Tree (Standing)	0	0	1	0	0	4
Utility Pole/Light Support	0	0	1	0	0	32
Other Subtotal	**8**	**6**	**8**	**1**	**10**	**33**
Total	**47**	**53**	**71**	**64**	**84**	**319**

The total crashes by severity were evaluated for SR 421. Of the 319 total crashes occurring along SR 421 there were 156 property damage only crashes resulting in $55,301 in damages, 160 injury crashes with 209 injuries and three fatal crashes with four fatalities. All three fatal crashes were angle collisions. **Table 2-12** provides a summary of the crashes by severity during the five-year period along SR 421.

Table 2-12: Existing Crashes by Severity (SR 421)

Crash Severity	2013	2014	2015	2016	2017	Total
Fatal	1	0	0	2	0	**3**
Injury	21	28	37	29	45	**160**
Property Damage	25	25	34	33	39	**156**
Total	**47**	**53**	**71**	**64**	**84**	**319**

Pioneer Trail

Pioneer Trail Crash Data

During the five-year period from 2013-2017, there was a total of 11 collisions along Pioneer Trail between Williamson Boulevard and Turnbull Bay Road, as shown in **Table 2-13**. As illustrated in **Figure 2-11,** the majority of collision types were off-road (4 crashes, 37%).

Table 2-13: Existing Collision Type Summary (Pioneer Trail)

Crash Event Type	2013	2014	2015	2016	2017	Total
Angle	0	0	1	0	0	1
Off Road	1	1	1	0	1	4
Other	0	0	0	2	1	3
Pedestrian	0	0	0	1	0	1
Rollover	0	0	1	0	0	1
Sideswipe	0	0	0	1	0	1
Total	**1**	**1**	**3**	**4**	**2**	**11**

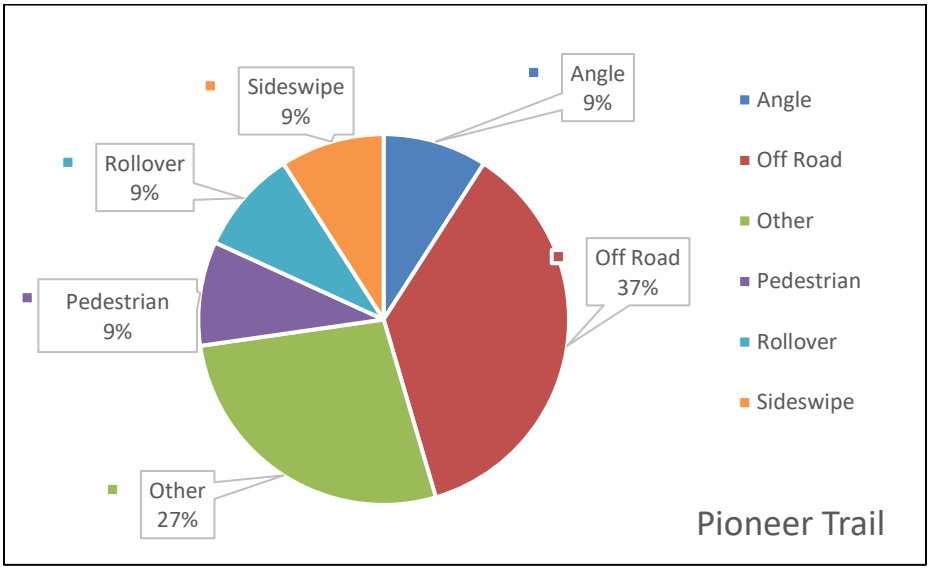


Figure 2-11: Existing Crash Type Distribution (Pioneer Trail)

Of the 11 collisions occurring along Pioneer Trail during the five-year period there were five injury collisions with six injuries and no fatalities and six property damage only collisions resulting in an estimated $55,400 in damages. The majority of the collisions (7 crashes) occurred under dark-not lighted conditions and clear weather conditions (8 crashes). **Table 2-14** provides a summary of the collisions by severity along Pioneer Trail.

Table 2-14: Existing Collisions by Severity (Pioneer Trail)

Crash Severity	2013	2014	2015	2016	2017	Total
Injury	1	1	1	1	1	5
Property Damage Only	0	0	2	3	1	6
Total	**1**	**1**	**3**	**4**	**2**	**11**

High Crash Roadway Segments

The FDOT high crash roadway segments list for the most recent five-year period (2013-2017) for which data has been compiled was reviewed. FDOT provided crash data for the cumulative 5-year period and districtwide averages. The I-95 segments within one-half mile north of the existing interchanges at SR 44 (MP 16.290) and SR 421 (MP 23.275) appear on the list with the actual crash rates of 1.719 and 2.467, respectively, nearly two to three times the average districtwide crash rate for an urban interstate facility type. The other high crash segments along I-95 include two segments located between SR 44 and Pioneer Trail (MP 17.302 and MP 18.302) and one segment just north of the Spruce Creek bridge (MP 22.302) with crash rates of 2.501, 2.970 and 1.876, respectively. The high crash segment near MP 18.302 includes a section of I-95 that is within the horizontal curve just south of Pioneer Trail.

Along the I-95 crossroads in the study area, three segments along SR 44 appear on the high crash segment list: Williamson Boulevard (near MP 24.656), I-95 interchange area (MP 24.994) and Sugar Mill Drive (near MP 25.578) with crash rates nearly three to four times the average districtwide crash rate for a suburban 4-5 lane, 2-way divided facility type. The high crash segments along SR 421 include the section from west of Williamson Boulevard to the I-95 northbound off ramp (MP 0.000) and the section around the Yorktowne Boulevard intersection (MP 0.726) with crash rates of 6.380 and 4.934 for the respective facility types. **Table 2-15** provides a summary of the historical high crash segment locations for the cumulative 5-year period and compares the segments' average crash rates to the districtwide average crash rate for each facility type within the project study area.

Table 2-15: High Crash Roadway Segments (5-Year, 2013-2017)

Begin Milepost	End Milepost	Total Number of Crashes	ADT	Crash Rate	Average Districtwide Crash Rate
I-95 Mainline (Interstate Urban)					
16.402	16.702	33	35,049	1.719	0.867
17.302	17.402	16	35,050	2.501	
18.302	18.402	19	35,050	2.970	
22.302	22.602	36	35,049	1.876	
23.302	23.802	107	47,524	2.467	

Table 2-15: High Crash Roadway Segments (5-Year, 2013-2017)

Begin Milepost	End Milepost	Total Number of Crashes	ADT	Crash Rate	Average Districtwide Crash Rate
SR 44 (Suburban 4-5 Lane, 2 Way Divided, Raised)					
24.594	24.694	17	19,380	4.807	1.614
24.994	25.394	62	27,345	3.106	
25.494	25.594	20	30,500	3.593	
SR 421 (Suburban 6+ Lane, 2 Way Divided, Raised)					
0.000	0.111	61	47,198	6.380	3.165
SR 421 (Urban 6+ Lane, 2 Way Divided, Raised)					
0.611	0.811	85	47,200	4.934	3.478

When evaluating crash rates, the critical crash rate should be reviewed in addition to the observed/ actual crash rate. The critical crash rate method uses a weighted average rate for similar segment types and provides a statistical threshold for screening sites of potential safety concern. The data analysis shows that for two of the three study segments (I-95 & SR 421), the observed crash rate is less than the critical crash rate, while it is slightly higher for SR 44. The computed critical safety index for each segment is: 0.740 for I-95, 0.923 for SR 421 and 1.183 for SR 44. Typically, a critical safety index greater than one indicates the location should be investigated further for potential safety concerns. The SR 44 corridor has a Local Agency Program (LAP) project currently under design that will enhance the safety through the interchange area by providing an auxiliary lane from the I-95 southbound off ramp to SR 44 eastbound and extending the SR 44 westbound to I-95 northbound right turn lane.

2.15 DRAINAGE

The project is within the jurisdiction of the St. Johns River Water Management District (SJRWMD) and lies within the Spruce Creek Hydrologic basin. The existing stormwater management system running along I-95 consists of median swales that collect the runoff from the road and conveys it outside using drainage culverts before ultimately discharging to Spruce Creek, a designated “Special Water” Outstanding Florida Water. There is a system of two cross drains, one under I-95 northbound and one under I-95 southbound, that convey on-site and off-site runoff under the roadway. The existing roadway median is comprised of low-quality wetlands. The existing cross drains discharge to low-lying wetlands before ultimately discharging to Spruce Creek.

The existing stormwater management system running along Pioneer Trail consists of swales that collect the runoff from the road and conveys it toward multiple existing ponds. West of I-95, there is a wet pond running along Pioneer Trail on the north side of

the road. East of I-95, there are 3 wet ponds located at the intersection of Turnbull Bay Road. All the stormwater runoff is collected in the roadside swales and routed to existing ponds using drainage culverts, then discharges into an unnamed canal that connects into Spruce Creek.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 12127C0517J dated February 19, 2014 for Volusia County was used to identify the floodplain and floodway limits associated with this project. FEMA Flood Zone A intermittently encroaches throughout the project area. Special Flood Hazard Zone A is defined as "No base flood elevation determined". Zone A are areas that have a 1% probability of flooding every year (also known as the "100-year floodplain"), and where predicted flood water elevations have not been established. Properties in Zone A are considered to be at high risk of flooding under the National Flood Insurance Program (NFIP). Portions of the project area are within the 100-year floodplain, as shown in **Figure 2-12**.

2.16 SOILS AND GEOTECHNICAL DATA

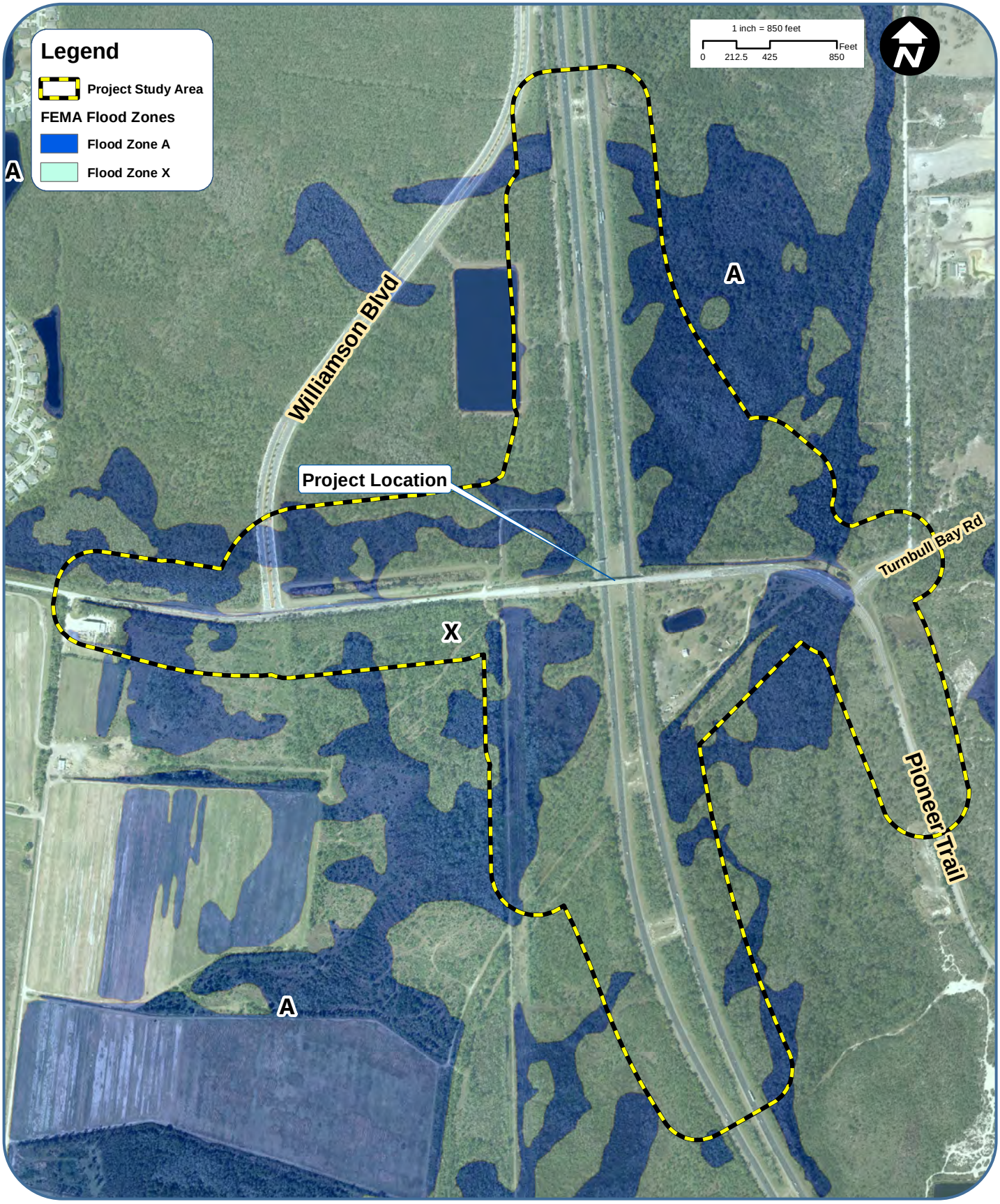
Soils on the project site provide insight into historic vegetation patterns and potential land uses. Based on the data obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey of Volusia County, the interchange study area contains typically sandy soils. The majority of the project study area is comprised of Pomona Fine Sand (soil map unit code 49) and Pomona-St. Johns Complex (soil map unit code 51). Of the ten soil types identified, only three are classified as hydric soils. The soil types identified are described in **Table 2-16** and depicted on **Figure 2-13**.

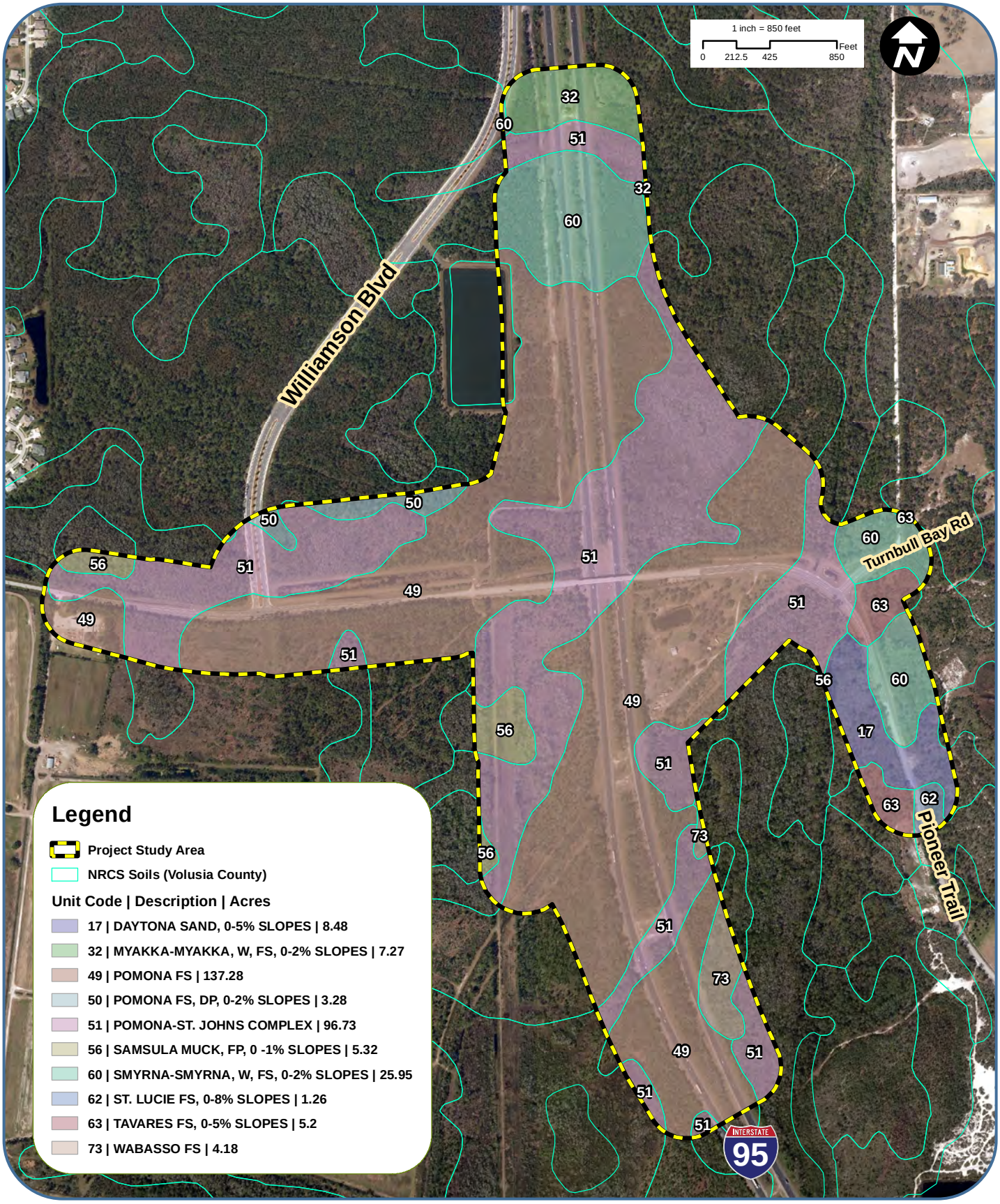
Table 2-16: Soil Survey Data

Soil Name (NRCS Map Unit)	Description	Seasonal High-Water Table		Historic Vegetation	Hydrologic Soil Group
		Depth (inches)	Duration (months)		
Daytona sand, 0-5% slopes (17)	Moderately well drained; nearly level to gently sloping	40-50	1-4	Sand pine, scrub oak, fetterbush, saw palmetto	A
Myakka-Myakka, Wet, Fine Sands, 0-2% slopes (32)	Poorly drained, nearly level	<12 <40	6 6	Slash pine, longleaf pine, saw palmetto	A/D

Table 2-16: Soil Survey Data

Soil Name (NRCS Map Unit)	Description	Seasonal High-Water Table		Historic Vegetation	Hydrologic Soil Group
		Depth (inches)	Duration (months)		
Pomona Fine sand (49)	Poorly drained, nearly level	<10 10-40	1-3 6	Slash pine and saw palmetto, gallberry, fetterbush, pineland threeawn, and broomsedge	A/D
Pomona Fine sand, Depressional 0-2% slopes (50)	Poorly drained, nearly level	<10	4-6	Gallberry, wax myrtle, fetterbush and to a lesser extent saw palmetto	A/D
Pomona-St. Johns Complex(51)	Poorly drained, nearly level	<10	6	Hydric forest, abundant in bald cypress with scattered pond pine, sweetgum, loblolly bay and slash pine	A/D
Samsula Muck, Frequently Ponded, 0-1% slopes (56)	Poorly drained, nearly level	0	12	Wetland grasses to dense swamps of cypress and/or wetland hardwoods and longleaf pine	A/D
Smyrna-Smyrna, Wet Fine Sand, 0-2% slopes(60)	Poorly drained, nearly level	<10 10-40	1-4 >6	Slash pine flatwoods with saw palmetto and pineland threeawn	A/D
St. Lucie Fine Sand, 0-8% slopes (62)	excessively drained, nearly level to moderately sloping	72-120	4-5	Live oak, slash pine and saw palmetto	A
Tavares Fine Sand, 0-5% slopes (63)	moderately well drained, nearly level to gently sloping	40-60	4-5	Longleaf pine and turkey oak with a scattering of saw palmetto and pineland threeawn	A
Wabasso Fine Sand (73)	Poorly drained, nearly level	<10 10-40	1-4 6	slash pine and cabbage palmetto, with an understory of saw palmetto, gallberry, runner oak, and fetterbush	B/D


Legend
Project Study Area
FEMA Flood Zones
Flood Zone A
Flood Zone X
1 inch = 850 feet
0
212.5
425
850
Feet
N
A
A
A
X
Williamson Blvd
Project Location
Turnbull Bay Rd
Pioneer Trail


1 inch = 850 feet
0 212.5 425 850 Feet
N
Williamson Blvd
Turnbull Bay Rd
Pioneer Trail
INTERSTATE 95
Legend
Project Study Area
NRCS Soils (Volusia County)
Unit Code | Description | Acres
17 | DAYTONA SAND, 0-5% SLOPES | 8.48
32 | MYAKKA-MYAKKA, W, FS, 0-2% SLOPES | 7.27
49 | POMONA FS | 137.28
50 | POMONA FS, DP, 0-2% SLOPES | 3.28
51 | POMONA-ST. JOHNS COMPLEX | 96.73
56 | SAMSULA MUCK, FP, 0 -1% SLOPES | 5.32
60 | SMYRNA-SMYRNA, W, FS, 0-2% SLOPES | 25.95
62 | ST. LUCIE FS, 0-8% SLOPES | 1.26
63 | TAVARES FS, 0-5% SLOPES | 5.2
73 | WABASSO FS | 4.18

2.17 UTILITIES

The existing utilities within the Pioneer Trail right of way were identified for the project study area through Sunshine State One-Call of Florida. The existing major utilities and contact information is provided in **Table 2-17**.

Table 2-17: Existing Utilities

Utility Type	Utility Owner	Contact Information		Description
Electric	City of New Smyrna Beach, Utilities Commission	Randy Walter 200 Canal St New Smyrna Beach, FL 32168	rwalter@ucnsb.org 386-424-3026	Overhead electric along the south side of Pioneer Tr. from West of Williamson Blvd. to East of Turnbull Bay Rd.; south side of Turnbull Bay Rd. east of Pioneer Tr.
Electric	Florida Power and Light (FPL), Volusia	Nicholas Minno 3000 Spruce Creek Rd Port Orange, FL 32129	Ralph.Diaz@fpl.com 386-322-3418 Beverly.K.Hutto@fpl.com 386-322-3418	Overhead distribution lines on the north side of Pioneer Tr. from West of Williamson Blvd. to East of Turnbull Bay Rd. Overhead transmission line on the west side of I-95, north of Pioneer Tr.
Fiber	Crown Castle Sunesys, LLC	Fiber Dig Team Nicholas Belinsky 2000 Corporate Dr. Canonsburg, PA 15317	Fiber.dig@crowncastle.com 724-416-2449 888-632-0931 (Option 2)	Underground conduit along south side of Pioneer Tr. from ~350 ft. East of Williamson Blvd. to ~100 ft. East of I-95.
Fiber	Uniti	Michel-Lee Chapuseaux 107 St. Francis Street, Suite 1600 Mobile, AL 36602	Michel-Lee.Chapuseaux@uniti.com (352) 256-1524 Bob.Mensching@uniti.com 904-718-8152	Three 1 1/4 – inch ducts with fiber along the north side of Pioneer Tr. from West of Williamson Blvd. to Turnbull Bay Rd., crossing Turnbull Bay Rd and then crossing again across Pioneer Tr. to continue south on the west side of Pioneer Tr.
Water, Wastewater	City of New Smyrna Beach, Utilities Commission	Randy Walter 200 Canal St New Smyrna Beach, FL 32168	rwalter@ucnsb.org 386-424-3026 386-424-3037	No utilities within study area.

Table 2-17: Existing Utilities

Utility Type	Utility Owner	Contact Information		Description
Water, Sewer, Reclaimed Water	City of Port Orange	Junos Reed 1395 Dunlawton Avenue Port Orange, FL 32129	jureed@port-orange.org 386-506-5754	No utilities within study area.
Water, Sewer, Reuse Mains	Volusia County Water & Utility Service	Alan Ferguson 3151 East New York Ave. DeLand, FL 32724	Aferguson@volusia.org 386-822-6465	No utilities within study area.
Telephone	AT&T Distribution	Dino Farruggio 1120 S. Rogers Cr. Boca Raton, Fl 33487 Kirby Spencer 268 N Ridgewood Ave, Room 230, Daytona Beach, FL 32114	df1979@att.com 561-997-0240 ks2488@att.com 386.366.4588	Live buried 200pr copper wire on north side of Pioneer Tr. from East of I-95 to Turnbull Bay Rd. turning into 50pr copper along west side of Turnbull Bay Rd.; live buried 200pr copper & live buried 24 fiber along south side of Turnbull Bay Rd continuing south on the east side of Pioneer Tr.; dead buried 150pr copper on the north side of Pioneer Tr. west of I-95.
CATV	Bright House Networks LLC dba Charter/ Spectrum	Richard Strader 1195 S. Woodland Blvd. DeLand, FL 32720	386-872-6953 Richard.Strader@charter.com	Fiber optic cable on the New Smyrna Beach utilities overhead electric pole line on the south side of Pioneer Tr. from approximately ½ mile west of Williamson Blvd. to south of Turnbull Bay Rd.

2.18 LIGHTING

There is no existing lighting along the Pioneer Trail corridor. Along I-95, conventional lighting consisting of luminaires mounted on metal poles and spaced approximately 200'-240' apart exists adjacent to the outside shoulders along I-95 in the vicinity of the two existing interchanges at SR 44 and SR 421. No other lighting is present along I-95.

2.19 EXISTING BRIDGES

The existing CR 4118/Pioneer Trail bridge information was obtained from the FDOT Bridge Management System (BMS)data inventory, existing bridge inspection reports and review of existing construction plans. There is one existing bridge structure on Pioneer Trail that crosses over I-95 (Bridge No. 790066). Additionally, within the project study area, the other bridge crossings along I-95 are as follows: Bridge No. 790064 - I-95 Southbound over SR 44, Bridge No. 790065 - I-95 Northbound over SR 44, Bridge No. 790226 - I-95 Southbound over Spruce Creek, Bridge No. 790227 - I-95 Northbound over Spruce Creek, Bridge No. 790228 - I-95 Southbound over SR 421 and Bridge No. 790229 - I-95 Northbound over SR 421.

The CR 4118/ Pioneer Trail structure over I-95 was built in 1969. The existing Pioneer Trail bridge typical section, previously illustrated in **Figure 2-3**, consists of two 11' travel lanes and 4-foot outside shoulders with concrete traffic railing on both sides. The total bridge width is 35.3 feet. Based on the latest bridge inspection report, the sufficiency rating is 90.9. Detailed structure data for the Pioneer Trail bridge is shown in **Table 2-18.**

Table 2-18: Existing Pioneer Trail Bridge Data

Structure Identification Information	**FDOT Bridge Number**	790066
	Description	CR 4118/ Pioneer Trail over I-95
	Facility Crossed	Interstate 95
Structure Type	**Superstructure Type**	Prestressed Concrete Stringer/ Girder
	Substructure Type	Concrete Column/Abut/Pier Cap
Geometrics	**Bridge Deck Width**	35.3 feet
	Bridge Length	335 feet
	Number of Spans	5
	Maximum Span Length	87 feet
	Minimum Vertical Clearance	16.1 feet (Under)
	Minimum Lateral Clearance	Right Side: 28.2 ft. Left Side: 16.1 ft.
Overall NBI Condition Ratings	**Sufficiency rating**	90.9
	Deck	7 (Good)
	Superstructure	7 (Good)
	Substructure	7 (Good)
	Performance	Good
	Structural Evaluation	7 (Above Min. Criteria)
	Deficiency	Not Deficient
Source: FDOT BMS Inspection/ CIDR Report – Inspection Date: 3/18/2019		

2.20 ENVIRONMENTAL CHARACTERISTICS

Existing environmental characteristics and resources include the physical, cultural, natural and social and economic environment. The project's immediate study area for the Natural Resources Evaluation (NRE) included the existing Pioneer Trail overpass at I-95 and the immediate surrounding area which encompasses an approximate 300-foot buffer around the proposed interchange improvements. The larger area of influence as determined for traffic analysis purposes included the segment of I-95 between SR 44 and SR 421. The environmental characteristics in the project area are described in the following sections.

2.20.1 Cultural Features and Community Services

Cultural features and community services were identified through field review and desktop analysis of GIS data. The Pioneer Trail corridor in the immediate vicinity of the Interstate is largely undeveloped; therefore, there are no existing cultural features or community facilities along the study roadway segment between Williamson Boulevard and Turnbull Bay Road. The existing interchanges at SR 421 and SR 44 have some existing community facilities and cultural sites such as medical facilities/hospitals, fire, police and rescue services, VFW veterans' organization post, religious centers and other types of cultural features.

Parks and Recreational Facilities

Several recreational facilities exist surrounding the project study area; these are associated with private residential communities and include: Venetian bay Golf Club and Cypress Head Golf Club. No public parks were identified in the immediate vicinity of the project study area.

Schools

The schools in closest proximity to the project study area include: Cypress Creek Elementary and Spruce Creek High. Both are located near the I-95 and SR 421 interchange.

Religious Institutions

Religious facilities exist in the project study area include Restoration Church and Port Orange Christian Church near the SR 421 interchange and Venetian Bay Methodist Church and Kingdom Hall of Jehovah's Witnesses near the SR 44 interchange.

Medical and Emergency Health

Numerous medical facilities with varying levels of care and service exist near the SR 421 interchange. Advent Health New Smyrna Beach Medical Plaza is located adjacent to the southeast quadrant of I-95 and SR 44. No major emergency facilities were identified in the study area.

Fire, Rescue, & Police

The New Smyrna Beach Fire Department's Station 51 is located just west of the I-95 and SR 44 interchange. No other fire or police services were identified in the project study area.

Other Public Buildings/Facilities

No other public/municipal buildings or facilities were identified in the project study area.

Evacuation Routes/Emergency Services

The Florida Division of Emergency Management's State Emergency Response Team (SERT) provides disaster assistance to Florida residents. FSERT had identified two areas within and surrounding the project study area; these include Spruce Creek which is designated as hurricane evacuation Zone A and the area immediately surrounding the Spruce Creek crossing at I-95 designated as Zone E. The designated evacuation routes for this area include I-95, SR 421, Pioneer Trail and SR 44.

2.20.2 Archaeological and Historical Sites

A *Cultural Resource Assessment Survey (CRAS, May 2019)* and *CRAS Update (August 2020)* was completed as part of this PD&E Study (Florida Master Site File (FMSF) Survey No. 26148). The CRAS included archaeological and architectural survey within the Area of Potential Effect (APE). The APE for this project was defined as the existing and proposed right of way for the interchange alternatives with a buffer extending to the back or side of property lines or a distance no greater than 330 feet. The APE also included proposed pond sites with a 100-foot buffer.

The archeological survey included excavation of 58 shovel tests within the I-95 at Pioneer Trail APE (combined 2019 & 2020 surveys). No artifacts were recovered, and no archeological sites or occurrences were identified within the APE.

The architectural survey resulted in the identification and evaluation of two previously recorded historic linear resources: Fort Kingsbury to New Smyrna Road and Pioneer Trail. Both of these resources are segments used as pioneer trails during the settlement and development of Volusia County during the Seminole Wars and follow the same route in the project APE. Although they are locally significant under the National Register of Historic Places (NRHP) criterion A, they lack the necessary historic integrity to convey significance and therefore, were recommended ineligible for listing in the NRHP based on the results of the current survey.

As a result of the CRAS addendum survey in August 2020, one historic-aged bridge was identified within the APE. FDOT bridge number 790066 over I-95 (Pioneer Trail/ CR4118 overpass) is a concrete stringer bridge built in 1969. The bridge is a post-1945

concrete bridge excluded from Section 106 consideration, and as such, the bridge was not recorded or evaluated in the present study.

2.20.3 Wetlands and Surface Waters

Wetland and other surface waters are an important feature of the natural environment and serve important functions such as: providing wildlife habitat, storing floodwaters and protecting and improving water quality. As such, permitting regulations have been established by the Environmental Protection Agency (Section 404 Clean Water Act administered by the US Army Corps of Engineers), Florida Department of Environmental Protection (FDEP) and the Water Management Districts (WMDs) to assure protection, preservation and enhancement of wetlands to the fullest extent practicable. The project area was reviewed to identify, map and assess wetlands and surface waters within the study area. Field reviews were conducted to delineate and record wetland and other surface water communities and classify them according to the FDOT Florida Land Use, Cover and Forms Classification System (FLUCCS). The wetland communities within the project study area consist of hydric pine flatwoods, forested mixed wetlands, wet prairies and cypress systems. The other surface waters include stormwater/drainage facilities such as open water ponds with cattail edges, interconnected stormwater ponds and linear roadside ditches/swales. A total of 20 individual wetlands (122.41 acres) and 11 other surface waters (22.22 acres) were located within the NRE study area as depicted in **Figure 2-14**.

2.20.4 Protected Species and Habitat

An evaluation of protected species and habitat within the study area was conducted based on guidance in the FDOT PD&E Manual, Part 2, Chapter 16 (Eff. January 14, 2019) to ensure compliance with the Endangered Species Act (ESA) of 1973, as amended, and the Florida Endangered and Threatened Species Act, Section 379.2291, Florida Statutes (F.S.). Initial screening and document research indicate that several animal and/or plant species have the potential to occur in or near the project area. Field surveys, including ground-based biological surveys, were conducted to identify natural habitat types, anthropogenic land use types and to investigate wildlife occurrence along the project corridor. According to the U.S. Fish and Wildlife Service (FWS) Information Planning and Consultation (IPaC) online system, there are six federally listed wildlife species and three federally listed plant species with potential to occur within the project area as shown in **Table 2-19**.

State listed animal and plant species are regulated by the Florida Fish and Wildlife Conservation Commission (FWC) and the Florida Department of Agriculture & Consumer Services (FDACS), respectively. Documented occurrences of State listed species within eastern Volusia County were available from Florida Natural Areas Inventory (FNAI). Numerous species of state listed wildlife and plants have the potential to occur in the project study area as shown in **Table 2-20.**

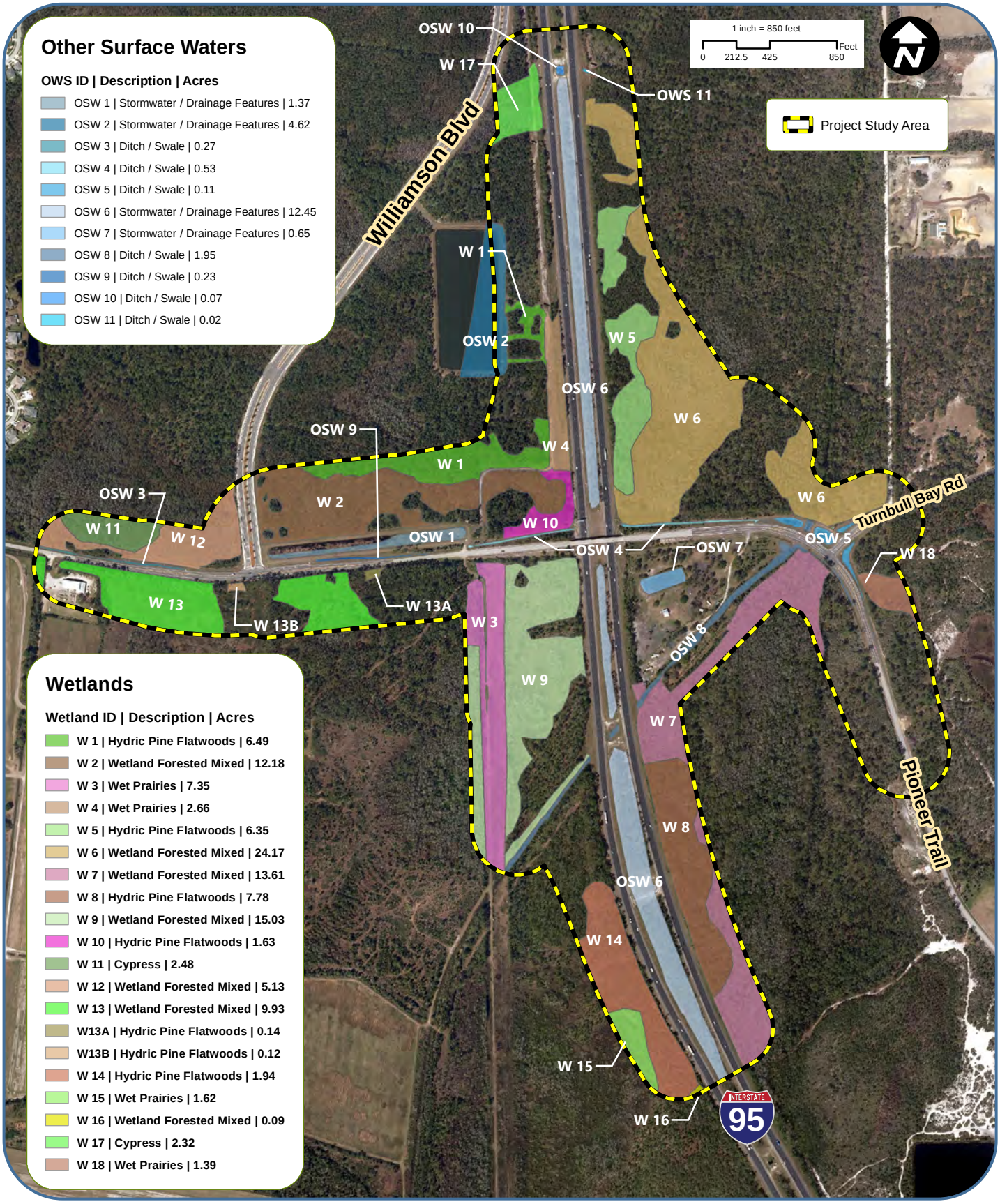

Other Surface Waters
OWS ID | Description | Acres
OSW 1 | Stormwater / Drainage Features | 1.37
OSW 2 | Stormwater / Drainage Features | 4.62
OSW 3 | Ditch / Swale | 0.27
OSW 4 | Ditch / Swale | 0.53
OSW 5 | Ditch / Swale | 0.11
OSW 6 | Stormwater / Drainage Features | 12.45
OSW 7 | Stormwater / Drainage Features | 0.65
OSW 8 | Ditch / Swale | 1.95
OSW 9 | Ditch / Swale | 0.23
OSW 10 | Ditch / Swale | 0.07
OSW 11 | Ditch / Swale | 0.02
Wetlands
Wetland ID | Description | Acres
W 1 | Hydric Pine Flatwoods | 6.49
W 2 | Wetland Forested Mixed | 12.18
W 3 | Wet Prairies | 7.35
W 4 | Wet Prairies | 2.66
W 5 | Hydric Pine Flatwoods | 6.35
W 6 | Wetland Forested Mixed | 24.17
W 7 | Wetland Forested Mixed | 13.61
W 8 | Hydric Pine Flatwoods | 7.78
W 9 | Wetland Forested Mixed | 15.03
W 10 | Hydric Pine Flatwoods | 1.63
W 11 | Cypress | 2.48
W 12 | Wetland Forested Mixed | 5.13
W 13 | Wetland Forested Mixed | 9.93
W13A | Hydric Pine Flatwoods | 0.14
W13B | Hydric Pine Flatwoods | 0.12
W 14 | Hydric Pine Flatwoods | 1.94
W 15 | Wet Prairies | 1.62
W 16 | Wetland Forested Mixed | 0.09
W 17 | Cypress | 2.32
W 18 | Wet Prairies | 1.39
1 inch = 850 feet
0 212.5 425 850 Feet
N
Project Study Area
Williamson Blvd
Turnbull Bay Rd
Pioneer Trail
INTERSTATE 95

Table 2-19: Federally Listed Species and Potential for Occurrence

Species Common Name	Listing Status	Habitat Type	Habitat Onsite
Wildlife Species			
Eastern indigo snake	T	Pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, freshwater marshes, gopher tortoise burrows	Yes
Florida scrub-jay	T	Xeric oak scrub, sand pine scrub, xeric pines, agricultural/ residential lands with scrub oaks	Yes
Bald eagle	N/A*	Nests in pine trees	Yes
Wood stork	T	forested wetlands, freshwater marshes, swamps, lagoons, ponds, tidal creeks, flooded pastures and ditches	Yes
Red-cockaded woodpecker	E	open pine woodlands and savannahs with large old pines for nesting and roosting habitat	No
Everglade Snail kite	E	freshwater marshes and the shallow-vegetated littoral zones along the edges of lakes	No
Plant Species			
Rugel's pawpaw	E	open slash pine or longleaf pine flatwoods with wiregrass and saw palmetto in the understory	Yes
Okeechobee Gourd	E	within pond apple swamps and mucky soils, floodplain forests	Yes
Fragrant prickly apple	E	coastal hammocks and shell middens	No

*Protected under the bald and golden eagle protection act and migratory bird treaty.
E - Endangered, T - Threatened

Table 2-20: State Listed Species and Potential for Occurrence

Species Common Name	Listing Status	Habitat Type	Habitat Onsite
Wildlife Species			
Gopher tortoise	T	xeric oak, sandhills, dry pine flatwoods, scrub habitats as well as old fields, pastures and roadsides	Yes
Southeastern American kestrel	T	dry prairies and open mixed pine, open pine scrub, hardwood forests, and pine flatwoods (with open patches of grass)	Yes
Florida sandhill crane	T	shallow non-forested freshwater wetlands (marsh and prairies), pastures, and open woods and other open habitat	Yes
Florida burrowing owl	T	prairies, sandhills, farms, or airfields	Yes
Roseate spoonbill	T	shallow water of variable salinity, marine tidal flats and ponds, coastal marshes, mangrove-dominated inlets and pools, and freshwater sloughs and marshes	Yes
Little blue heron	T	fresh- and saltwater mudflats and marshes, coastal beaches, mangrove swamps, cypress swamps, hardwood swamps, wet prairies and bay swamps	Yes

Table 2-20: State Listed Species and Potential for Occurrence

Species Common Name	Listing Status	Habitat Type	Habitat Onsite
Tricolored heron	T	fresh- and saltwater marshes and mudflats, brackish marshes, coastal beaches, mangrove swamps, hardwood and cypress swamps, and wet prairies	Yes
Least tern	T	coastal beaches, open fresh and saltwater, fresh and saltwater marshes, wet prairies, and agricultural environments	No
Plant Species			
Golden leather fern	T	mangrove and other forested wetland areas	Yes
American toothed spleenwort	E	tropical hardwood hammocks and on limestone outcrops and walls of limesinks	Yes
Auricled spleenwort	E	tree trunks and logs in swamps and hammocks	Yes
American bird's nest fern	E	tree branches on fallen logs, stumps, and tree trunks in cypress swamps and tropical rockland hammocks	Yes
Ashe's savory	E	well-drained sandy soils predominately on Florida's sand ridges	Yes
Sand butterfly pea	E	sandhill, scrubby flatwoods, and dry upland woods	Yes
Sand-dune spurge	E	dunes and scrub	Yes
Large-flowered rosemary	T	well drained sandy soils in coastal shrub	Yes
Coastal vervain	E	dunes and coastal pinelands	Yes
Tampa vervain	E	moist hammocks	Yes
Hartwrightia	T	seepage slopes, edges of bayheads and spring runs, wet prairies, and flatwoods with wet, peaty soils	Yes
Lake-side sunflower	E	wet prairies and flatwoods	Yes
Star anise	E	banks of spring-runs, bottomland forest, hydric hammock, and bayheads dominated by red maple and sweet bay	Yes
Atlantic Coast Florida lantana	E	dry habitats along coastal Florida	Yes
Nodding pinweed	T	scrub and scrubby flatwoods	Yes
Pygmy pipes	E	upland forests, mesic and xeric hammocks, sand pine, and oak scrub	Yes
Narrowleaf naiad	T	freshwater ponds	Yes
Celestial lily	E	wet flatwoods, prairies, marshes, and cabbage palm hammocks edges	Yes
Florida beargrass	T	flatwoods	Yes
Hand fern	E	detritus-filled base of cabbage palm trees in low, moist, shaded hammocks	Yes
Widespread polypody	E	limestone outcrops and hammocks	Yes
Plume polypody	E	hammock trees	Yes
Comb polypody	E	moist woods and hammocks	Yes
Terrestrial peperomia	E	shell mounds and limestone outcrops in mesic hammocks, coastal berms, and cypress swamps	Yes

Table 2-20: State Listed Species and Potential for Occurrence

Species Common Name	Listing Status	Habitat Type	Habitat Onsite
Giant orchid	T	sandhills, pinelands, and oak hammocks	Yes
Chaffseed	E	moist pond edges within sandhill and flatwoods	Yes
Buckthorn	E	hammocks and floodplain forests	Yes
Pinkroot	E	hammocks and floodplain forests	Yes
Coastal hoary-pea	E	coastal strands	No
Variable-leaf crownbeard	E	mesic flatwoods	Yes
Ocala vetch	E	mesic flatwoods	Yes
Redmargin Zephyrlily	T	flatwoods and meadows	Yes
E - Endangered, T - Threatened			

2.20.5 Farmland

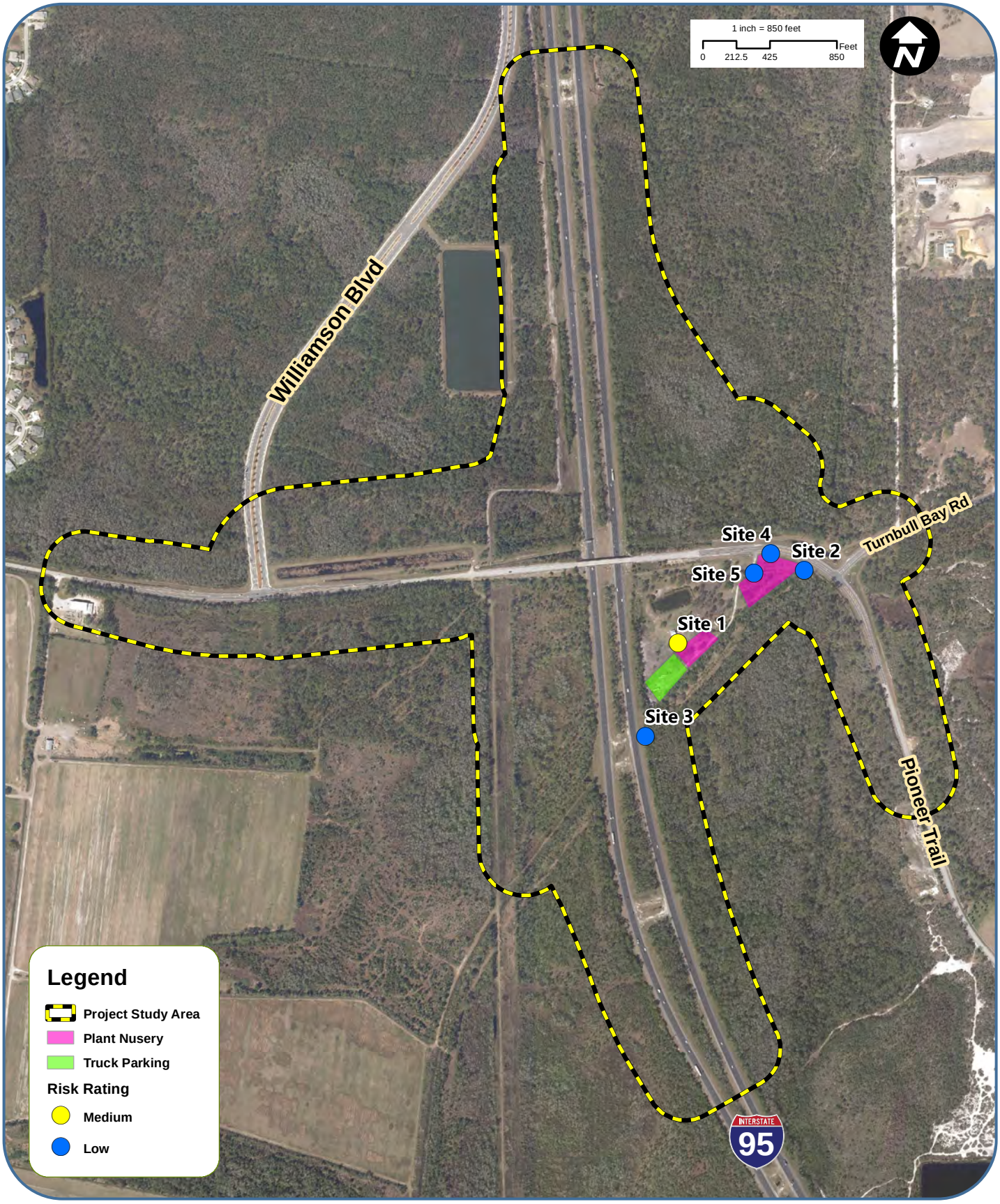
A review of the Efficient Transportation Decision Making (ETDM) environmental screening tool run in June 2017 and current NRCS soil map for the project show that there are no prime, unique or locally important farmland soils within the study area.

2.20.6 Contamination

A *Contamination Screening Evaluation Report (CSER, May 2019, Rev. Jan. 2020)* was prepared to assess the risk of encountering petroleum or hazardous substance contamination of soil, groundwater, surface water or sediment that could adversely affect this project. The study activities included review of existing regulatory files and historical data in addition to field reconnaissance within the project study area. A total of five sites were identified and assigned contamination risk ratings; the potential contamination locations are summarized in **Table 2-21** and illustrated in **Figure 2-15**.

Table 2-21: Potential Contamination Sites

Site Number (see Map, Figure 2-15)	Site Name	Site Location	Risk Potential
1	Tornelli Property	3160 Pioneer Trail	Medium
2	Sampling Station #27080084	Pioneer Trail at Unnamed Ditch	Low
3	Sampling Station #27080085	I-95 at Unnamed Ditch	Low
4	USGS Site 1	Pioneer Trail	Low
5	USGS Well #8455	Pioneer Trail	Low



Data provided by Geotechnical and Environmental Consultants, Inc.

2.20.7 Noise Sensitive Sites

Noise sensitive receptor sites include areas where frequent exterior human use occurs and where a reduced noise level would be beneficial. Included are lands which require quiet (Activity Category A), residential areas (Activity Category B), a variety of non-residential land uses such as parks, schools, places of worship, and medical facilities (Activity Category C), and commercial properties with areas of exterior use such as restaurants, hotels, and other places of business (Activity Category E). Activity Category D includes noise sensitive sites that have interior uses but no exterior activities such as hospitals, libraries, recording studios, television studios, and public meeting rooms. Activity Categories F (industrial and retail facilities) and G (undeveloped lands) have no exterior uses and are not considered noise sensitive and thus do not have any noise abatement criteria. Because the project study area only contains land uses in Categories F and G, there are no noise sensitive areas with any noise abatement criteria within the project study area (i.e. no noise receptors or land uses that would be considered noise sensitive areas).

3 DESIGN CONTROLS AND CRITERIA

3.1 ROADWAY CONTEXT CLASSIFICATION

The context classification for Pioneer Trail was determined based on the framework provided in *FDOT Context Classification (August 2017).* Based on the distinguishing characteristics of the area, the Pioneer Trail corridor within the limits of improvements has a C2T-Rural Town context classification under existing conditions. With the future proposed developments and future land use plans, the area characteristics are anticipated to change potentially resulting in a C3R-Suburban Residential classification.

3.2 ROADWAY DESIGN CRITERIA

The Design standards utilized in the preliminary design of the alternatives for this project include:

1. Florida Department of Transportation (FDOT) Design Manual (FDM), January 2020
2. AASHTO Green Book, A Policy on Geometric Design of Highway and Streets, 6th edition, 2011

The project design standards are based on I-95 being considered as an SIS facility with a functional classification of Urban Principal Arterial Interstate with a design speed of 70 mph and Pioneer Trail as an Urban Collector with a 45-mph design speed. The design criteria used for I-95, the interchange ramps, and Pioneer Trail are summarized in **Table 3-1, Table 3-2** and **Table 3-3,** respectively.

Table 3-1: Roadway Design Criteria for Interstate

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Functional Classification	Urban Principal Arterial/ Interstate	FDOT Straight Line Diagram	Urban Principal Arterial	Section 1-3
Access Classification / Interchange Spacing	Class 1 (Area Type 3) / 3 miles	Table 201.4.1, Chp 201	-	-
Design Vehicle	WB-62 FL	Section 201.6, Chp 201	WB-62FL	Table 2-1b
Controlling Design Elements				
Design Speed	70 mph	Table 201.5.1, Chp 201	50 mph (Min.)	Section 8.2.1
Lane Widths				
Thru Lane	12-ft	Section 211.2, Chp 211	12-ft	Section 8.2.4
Auxiliary Lane				
Shoulder Width				
Mainline	Inside and outside - 12-ft (10-ft paved) for 3 or more lanes	Table 211.4.1, Chp 211	inside (outside) - 10-ft (12-ft paved) for 6 or more lanes	Section 8.2.4
Aux Lanes	12-ft (10-ft paved)		6-ft (min)	Page 10-76
Horizontal Curve Radius				
Minimum Radius	1637	Tables 210.8.2 and 210.9.1, Chp 210	-	-
Min. Length of Horizontal Curves	15V (minimum) = 1050-ft	Table 211.7.1, Chp 211	15V min	Section 3.3.13
Max. Length of Horizontal Curves	30V (desirable) = 2100-ft		30V preferred	
Maximum deflection without curve	0° 45' 00"	Section 211.7.1, Chp 211	-	-
Superelevation Rate (e)				
Maximum Superelevation Rate	e_{max} = 10%	Table 210.9.1, Chp 210	e_{max} = 12%	Section 8.2.6
Superelevation Transition Slope Rates	1:250 (1 & 2 Lane) 1:200 (3 lane)	Table 210.9.3, Chp 210	-	-
Superelevation Ratio	20:80 Preferred	Section 210.9.1, Chp 210	-	-
Stopping Sight Distance	820-ft	Table 211.10.1, Chp 211	730-ft + adjustments	Table 3-1
Maximum Grade				
Mainline	3%	Table 211.9.1, Chp 211	3% (1% steeper if ROW constraints)	Table 8-1
Cross Slope				
Travel Lanes	2 Lanes @ 0.02	Figure 211.2.1, Chp 211	Min=0.015 - Max.=0.03	Sections 3.3.3 & 4.2.2
	3rd & 4th Lane @ 0.03			
Outside / Right Shoulder	0.06	Table 211.2.3, Chp 211	Min= 0.02 Max.= 0.06	Section 4.4.3
Median/ left shoulder	0.05			
Max algebraic difference between adjacent through lanes	4%	Section 211.2.2, Chp 211	-	-
Max algebraic difference at Turning Road Terminals	5%	Table 211.2.2, Chp 211	4 to 5%	Table 9-20
Vertical Clearance				
Roadway over Roadway	16-ft - 6-inch	Table 260.6.1, Chp 260	16-ft	Section 8.2.9
Overhead Sign Structures	17-ft - 6-inch	Section 210.10.3, Chp 210	17-ft	Section 8.2.9
Overhead Dynamic Message Sign Structures	19-ft - 6-inch		-	-
Signals on Span Wires, Mast Arms, or Other Structures	17-ft - 6-inch			

Table 3-1: Roadway Design Criteria for Interstate

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Other Design Elements				
Median Width	64-ft Min.(Interstate Without Barrier) 26-ft Min. (With Barrier)	Table 211.3.1, Chp 211	22-ft Min.	Section 8.4.2
Vertical Alignment				
Maximum Grade	3%	Table 211.9.1, Chp 211	3%	Table 8-1
Max Change in Grade w/o Curve	0.2	Table 210.10.2, Chp 210	-	-
Min. Length of Crest Curve (Open Highway)	1000-ft	Table 211.9.3, Chp 211	L=KA	Section 3.4.6
Min. Length of Crest Curve (Interchange)	1800-ft		L=KA	
Minimum Length of Sag Curve	800-ft		L=KA	
Minimum Crest K-Value New Construction/(Resurfacing)	506 / (312)	Table 211.9.2, Chp 211	247	Table 3-34
Minimum Sag K-Value	206		181	Table 3-36
Horizontal Clearance				
Clear Zone Width Requirements	14-24 ft	Table 215.2.1, Chp 215	6-ft (min)	Section 8.2.10 & AASHTO Roadside Design Guide Section, Chapter 4
Bridge Piers	Outside Clear Zone	Table 215.2.2, Chp 215	Outside Clear Zone	Section 8.2.10
Fixed Objects	Outside Clear Zone			AASHTO Roadside Design Guide Section, Chapter 4
Light Poles	20-ft from travel lanes 14-ft from auxiliary lanes 4-ft minimum behind guardrail			
ITS Poles and Related Items	Outside Clear Zone			
Aboveground Fixed Utilities (AFU)	Outside Clear Zone and as close to R/W as practical			
Drop-off Hazards	6-ft from travel lanes	Section 215.3.3	-	-
Border Width	94-ft (Edge of traffic Lane to L/A RW Line including interchange ramps)	Section 211.6, Chp 211	-	-
Roadway Base Clearance				
Mainline	3.0-ft above Seasonal High Ground Water Table Elevation (SHGWT)	Section 210.10.3, Chp 210	-	-
Ramp	2-ft above SHGWT		-	-
Low point on ramps at Crossroads	1-ft above SHGWT		-	-
Roadside Slopes				
Front Slope	1:6 for fills less than 5-ft 1:6 to Edge of CZ then 1:4 for fills 5-ft to 10-ft 1:6 to Edge of CZ then 1:3 for fills 10-ft to 20-ft 1:2 (with guardrail for fills more than 20-ft)	Table 215.2.3, Chp 215	-	-
Back Slope	1:3 or 1:4			
Transverse	1:10 or Flatter (freeway & interstate) 1:4 (others)			

Table 3-2: Design Criteria for Interchange Ramps

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Design Vehicle	WB-62 FL	Section 201.5, Chp 201	WB-62	Table 2-1b
Controlling Design Elements				
Design Speed				
Straight Ramps	40 - 50 mph	Table 201.5.2, Chp 201	50 mph	Section 10.9.6 and Table 10-1
Loop Ramps	30 mph		30 mph	
Lane Widths				
One-Lane Ramp	15-ft	Section 211.2.1, Chp 211	15-ft	Section 10.9.6 and Table 3-29
Two-Lane Ramp	24-ft (12-ft each)		24-ft	
Shoulder Width				
Outside/Right Shoulder Width	6-ft (4-ft paved) – One-Lane Ramps	Table 211.4.1, Chp 211	10-ft combined min. (left 2'-paved) (right 8'-paved)	Section 10.9.6
	10-ft (8-ft paved) – Two-Lane Ramps			
Inside/Left Shoulder Width	6-ft (2-ft paved) – One-Lane Ramps			
	8-ft (4-ft paved) – Two-Lane Ramps			
Horizontal Curve Radius				
Minimum Radius	200-ft Loop ramp and 716-ft – Other Ramp,	Table 210.9.1, Chp 210	-	-
Min. Length of Horizontal Curves	Desirable = 600-ft Minimum = 400-ft Straight Ramps	Table 211.7.1, Chp 211	15V min	Section 3.3.13
	Desirable = 450-ft Minimum = 400-ft Loop Ramps			
Maximum deflection without curve	≤40 mph 2°00'00" ≥45 mph 00°45'00"	Section 211.7.1	-	-
Exit Ramp Taper Angle	4°	Design Standards (Index 525)	2°-5°	Figure 10-70
Superelevation Rate (e)				
Maximum Superelevation Rate	emax = 10%	Table 210.9.1 and Section 211.8, Chp 210/211	emax = 12%	Section 8.2.6
Superelevation Transition Rate	1:200 for 45-50 mph	Table 210.9.3, Chp 210	1:200 for 50 mph; 1:185 for 45 mph; 1:172 for 40 mph; 1:161 for 35 mph; 1:152 for 30 mph	Table 3-15
	1:175 for 25-40 mph			
	1:100 for Loop Ramps			
Grades	8% for D.S. ≤ 20 mph	Table 211.9.1, Chp 211	3% to 5% for 45 to 50 mph	Table 8-1 and Section 10.9.6
	7% for D.S. = 25 to 30 mph		4% to 6% for 40 mph	
	6% for D.S. = 35 to 40 mph		5% to 7% for 25 to 30 mph	
	5% for D.S. = 45 to 50 mph		6% to 8% for 15 to 25 mph	
Cross Slopes				
Travel Lanes	2% Min, varies for superelevated segments	Figure 211.2.1, Chp 211	1.5% -2%	Section 10.9.6

Table 3-2: Design Criteria for Interchange Ramps

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Outside/Right Shoulder	6%	Figure 211.4.1 and 211.4.2 Chp 211	Max=0.06, Min= 0.02	
Inside/Left Shoulder	5%			
Maximum Shoulder Cross Slope Break	7%		-	-
Vertical Clearance				
Ramp over Roadway	16-ft - 6-inch	Table 260.6.1, Chp 260	16-ft	Section 8.2.9
Ramp over Railroad	23-ft - 6-inch			
Roadway over Roadway	16-ft - 6-inch		16-ft	
Roadway over Railroad	23-ft - 6-inch		-	-
Pedestrian over Railroad	23-ft - 6-inch		-	-
Pedestrian over Roadway	17-ft - 6-inch		17-ft	Section 8.2.9
Roadway over Canal	2-ft Min from Design Flood Stage and Bridge Low Member Elev. & 6-ft above Normal High Elevation or control elevation	Section 260.8.1, Chp 260	-	-
Overhead Sign Structures	17-ft – 6-inch 17-ft (Exist. Sign)	Section 210.10.3, Chp 210	17-ft	Section 8.2.9
Overhead Dynamic Message Sign Structures	19-ft - 6-inch (New Sign) 19-ft (Exist. Sign)		-	-
Signals on Span Wires, Mast Arms, or Other Structures	17-ft – 6-inch 17-ft (Exist. Sign)			
Design Loading Structural Capacity	HL 93 & FL-120 Trucks	Bridge Load Rating Manual 2017	HL 93	Section 8.2.8 (AASHTO Manual for Bridge Evaluation with 2011-2016 Interim Revisions)
Other Design Elements				
Ramp Terminal Spacing				
Entrance-Entrance/Exit-Exit	LA Facility 1000 ft. C-D Road 800 ft.	Figure 211.12.1, Chp 211	Full Freeway: 1000-ft Collector Distributor Road or Freeway Distributor Road: 800-ft	Figure 10-68
Exit-Entrance	LA Facility 500 ft. C-D Road 400 ft.		Full Freeway: 500-ft Collector Distributor Road or Freeway Distributor Road: 400-ft	
Entrance- Exit (Weaving)	A 2000 ft. B or C 1500 ft. D 1000 ft.		System to Service Interchange: Full Freeway: 2000-ft Collector Distributor Road or Freeway Distributor Road: 1600-ft	
			Service to Service Interchange: Full Freeway: 1600-ft Collector Distributor Road or Freeway Distributor Road: 1000-ft	
Vertical Alignment				
Max Change in Grade w/o Curve	0.6% - Straight Ramps	Table 210.10.2	0.30%	Section 3.4
	1.0% - Loop Ramps			
Min. Length of Crest Curve	Varies, L=KA, but not less than 300-ft	Tables 211.9.2 and 211.9.3, Chp 211	L=KA	
Minimum Length of Sag Curve	Varies, L=KA, but not less than 200-ft			

Table 3-2: Design Criteria for Interchange Ramps

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Minimum Crest K-Value	84 -136-ft Connector Ramps 31-ft Loop Ramps	Table 211.9.2	84-ft Connector Ramps 19-ft Loop Ramps	Table 3-34
Minimum Sag K-Value	79 – 96-ft Connector Ramps 37-ft Loop and other Ramps		96-ft Connector Ramps 37-ft Loop Ramps	Table 3-36
Stopping Sight Distance	360 – 425-ft Connector Ramps 200-ft - Loop Ramps	Tables 211.10.1 and 211.10.2, Chp 211	425-ft - Connector Ramps 200-ft - Loop Ramps	Tables 3-1 and 3-34
Horizontal Clearance				
Clear Zone Width Requirements	24-ft	Table 215.2.1, Chp 215,	Outside Clear Zone	Section 8.2.10 & AASHTO Roadside Design Guide Section, Chapter 4
Bridge Piers	Outside Clear Zone	Table 215.2.2, Chp 215		
Fixed Objects	Outside Clear Zone			
Light Poles	20-ft from travel lanes 14-ft from auxiliary lanes 4-ft minimum behind guardrail			
ITS Poles and Related Items	Outside Clear Zone			
Aboveground Fixed Utilities (AFU)	Outside Clear Zone and as close to R/W as practical			
Canal Hazards	60-ft from travel lanes (≥50 mph) 50-ft from travel lanes (≤ 45 mph)	Section 215.3.2, Chp 215,	-	-
Drop-off Hazards	6-ft or more with slope more than 1:3			
Border Width	94-ft	Section 211.6, Chp 211		
Roadway Base Clearance				
Ramp Proper	2.0-ft above Seasonal High Ground Water Table Elevation (SHGWT)	Section 210.10.3, Chp 210	-	-
Low Point on-ramps at Crossroads	1.0-ft above SHGW Elev.			

Table 3-3: Design Criteria for Arterials

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Functional Classification	Urban Collector	SLD	Urban Collector	Section 1-3
Design Vehicle	WB-62FL	Section 201.5, Chp 201	WB-62	Table 2-1b
Controlling Design Elements				
Design Speed	45 mph	Table 201.5.1, Chp 201	Min.= 30 mph	Section 6.3.1 and 2.3.6
Lane Widths				
Travel Lane	11-ft	Table 210.2.1, Chp 210	10-ft to 12-ft	Section 6.3.2
Auxiliary Lane	11-ft			
Shoulder Width	Outside 10-ft (5-ft Paved) Inside 8-ft	Table 210.4.1, Chp 210	2-ft to 8-ft	Table 6-5
Horizontal Curve Radius				
Minimum Radius	694-ft	Table 210.9.2, Chp 210	-	-
Min. Length of Horizontal Curves	400-ft	Table 210.8.1, Chp 210	15V min	Section 3.3.13
Maximum Deflection Without a Curve	1º00'00" with C&G and 0º45'00" flush shoulders for 45 mph or greater and 2º00'00" for 40 mph or less	Section 210.8.1, Chp 210	-	-
Deflection Through Intersections	3º00' for 45 mph	Table 212.7.1, Chp 212	-	-
Superelevation	emax = 5%	Section 210.9 and Table 210.9.2, Chp 210	emax =6%	Page 3-31
Stopping Sight Distance	360-ft for 45 mph	Table 210.11.1, Chp 210	360-ft for 45 mph	Table 6-3
Maximum Grade	6% for 45 mph	Table 210.10.1, Chp 210	8%	Table 6-8
Cross Slopes	2% to 3%	Figure 211.2.1, Chp 211	1.5 % to 3%	Page 6-13
Vertical Clearance				
Roadway over Roadway	16-ft - 6-inch	Table 260.6.1, Chp 260	16-ft; min. clearance of 14-ft may be provided if alternate route with 16-ft clearance	Section 7.3.5
Pedestrian over Roadway	17-ft - 6-inch		17-ft	Section 8.2.9
Overhead Sign Structures	17-ft - 6-inch	Section 210.10.3, Chp 210	17-ft	Section 7.3.5
Overhead Dynamic Message Sign Structures	19-ft - 6-inch		-	-
Signals on Span Wires, Mast Arms, or Other Structures	17-ft - 6-inch			
Design Loading Structural Capacity	HL 93 & FL-120 Trucks	Bridge Load Rating Manual 2017	HL 93	Section 8.2.8 (AASHTO Manual for Bridge Evaluation with 2011-2016 Interim Revisions)
Other Design Elements				
Bike Lane Width	7-ft Buffered Bike Lanes	Section 223.2.1.1, Chp 223	-	-
Median Width	22-ft	Table 210.3.1, Chp 210	18-ft to 25-ft	Section 6.3.2
Vertical Alignment				
Minimum Crest K-Value	61	Table 210.10.3, Chp 210	61	Table 6-3
Minimum Sag K-Value	79		79	
Minimum Curve Lengths	135-ft	Table 210.10.4,Chp 210	-	-

Table 3-3: Design Criteria for Arterials

Design Elements	FDOT DESIGN MANUAL 2020		AASHTO 2011	
	Criteria	Source	Criteria	Source
Horizontal Clearance				
Fixed Objects	Outside Clear Zone	Table 215.2.2, Chp 215	Outside Clear Zone and as close to R/W as practical	AASHTO Roadside Design Guide 2011, Section 4.2
Light Poles	20-ft from travel lanes		Outside Clear Zone	AASHTO Roadside Design Guide 2011, Section 4.5.2
	14-ft from auxiliary lanes			
	4-ft from curb			
ITS Poles and Related Items	Outside Clear Zone			
Aboveground Fixed Utilities (AFU)	Outside Clear Zone and as close to R/W as practical			AASHTO Roadside Design Guide 2011, Section 4.8
Drop-off Hazards	For DS ≤ 45 mph a slope steeper that 1:3 with a depth of 6-ft or more with 22-ft of traveled way	Section 215.3.1, Chp 215	-	-
Canal Hazards	Flush Shoulder DS ≤ 45 mph- 50-ft ; Curb & Gutter Roadway- 40-ft	Section 215.3.2, Chp 215		
Conventional Lighting	Urban C & G (D.S. < or= 45 mph) 4-ft behind face of Curb	Table 215.2.2, Chp 215	Outside the clear zone	Section 4.6.1and AASHTO Roadside Design Guide 2011 Section 4.5.2
Bridge Piers	Urban C & G (D.S. < or= 45 mph)		Urban C & G - 1.5-ft from Face of Curb, w/ 3-ft at intersections; No C & G - 4-ft from edge of traveled way for shoulder < 4-ft	Section 7.3.4
	16-ft from Edge of Travel Lane			
	4-ft from Face of Outside Curbs			
	6-ft from the Edge of Inside Traffic Lane			
Border Width	14-ft Curbed Roadways	Table 210.7.1, Chp 210	-	-
	33-ft Flush Shoulders			
Sidewalk	6-ft	Table 222.1.1, Chp 222	Varies 4 to 8-ft; Less than 5-ft requires passing section every 200-ft; Adjacent to curb add 2-ft to min. required width	Section 4.17.1

3.3 DRAINAGE DESIGN CRITERIA

The design of stormwater management facilities for this project is governed by the rules and criteria set forth by the St. Johns River Water Management District, Florida Department of Environmental Protection (FDEP), Volusia County and FDOT. The project area is within the Spruce Creek Hydrologic basin and will drain to the Spruce Creek, an impaired water body and an Outstanding Florida Water. The project occurs in SJRWMD Regulatory Mitigation Basin 17 (Halifax River). Background information was gathered from design and permit documentation, technical reports that cover the study area and field reconnaissance. Regulatory agency guides and manuals referenced are as follows:

1. FDOT Drainage Manual, 2020
2. FDOT Drainage Design Guide, 2020
3. SJRWMD Applicant's Handbook, Volume I, June 2018
4. SJRWMD Permit Information (6/2018)

The proposed stormwater management system was designed to minimize offsite impacts. Minimization of impacts includes prevention of damage to critical environmental resources and protection of existing developed areas from flooding. As proposed, the drainage design approach is to maximize onsite retention of runoff within the project's limits or the proposed Limited Access Right of Way. The following design criteria apply to the proposed ponds for this project which are proposed to be wet detention ponds.

1. **Stormwater Treatment**
    a. Wet Detention: The greater of; Treatment of 1" of runoff from the contributing area or 2.5" times the percent impervious area.
    b. Projects draining to Outstanding Florida Waters add an additional 150% of the treatment volume.
    c. Treatment Volume Recovery: For wet detention, the outfall structure shall be designed to drawdown one-half the required treatment volume within 24 and 30 hours following a storm event, but no more than one half of the required treatment volume will be discharged prior to 24 hours.
    d. Nutrient Loading: Discharge to FDEP designated impaired water. The required level of average annual load reduction is whichever is the least: 85% or post-development = pre-development.
    e. Skimmers: Systems which receive stormwater from areas with a greater than 50 percent impervious area (excluding water bodies) must include a skimmer, baffle, grease trap or other mechanism.

2. **Stormwater Attenuation**
   a. Open Basin (Positive Outfall):
      i. Post-development peak discharge rate is not to exceed pre-development peak discharge rate.
      ii. SJRWMD – 25-year, 24-hour and mean annual storm events
   b. Attenuation Volume Recovery: For wet Detention: Recovery of SJRWMD 25-year, 24-hour storm event within 14 days

3. **Pond Geometry**
   a. Slopes (Wet Detention):
      i. Side slopes 1:6 (Std.) 1:4 (Max>) to 2' below control elevation
      ii. Maintenance Berm: 20' (Min.) measured from control elevation to right of way line. Maintenance Berm shall be at least 15 feet with a slope of 1:8 or flatter.
      iii. 1-foot free board below low point of maintenance berm to D.H.W.
      iv. Corners of ponds shall be rounded to prove an acceptable turning radius for maintenance equipment.
      v. Pond ratio at least 2:1 (length:width)
   b. Pond Depth (Wet Detention):
      i. Maximum pond depth of 12 feet
      ii. Mean depth between 2 and 8 feet

4. **Floodplain**
   Demonstrate no adverse impacts to the 100-year flood stage

5. **Base Clearance**
   a. Freeways and Rural Multilane Mainline; required clearance 3 feet
   b. Ramps; required clearance 2 feet

6. **Ditches and Swales**
   a. Design frequency for roadside, median and interceptor ditches or swales is 10 years
   b. Design frequency for outfall ditches and canals is 25 years
   c. Minimum slope for ditches where positive flow conditions are required is 0.05%

4 ALTERNATIVES ANALYSIS

The Alternatives Analysis provides the engineering and environmental basis for development of project alternatives as well as selection of the preferred build alternative for the proposed improvements. Additionally, the No-Build and Transportation Systems Management and Operations (TSM&O) alternatives are addressed in this part of the PD&E study.

4.1 NO-BUILD ALTERNATIVE

The No-Build Alternative assumes that no improvements will be made at I-95 and Pioneer Trail and that the existing operational, mobility and safety deficiencies previously identified will remain in the project's study area. The advantages of the No-Build alternative include:

- no capital improvement costs,
- no right of way impacts and
- no direct environmental impacts.

The disadvantages of the No-Build alternative are:

- Increase in user costs due to oversaturated traffic conditions at adjacent interchanges
- Lack of regional connectivity for a largely developing area
- No improvement in emergency vehicle response or hurricane evacuation times
- No additional access for future planned developments along the Pioneer Trail corridor
- No improvements for bicycle or pedestrian traffic
- Inconsistent with the regional transportation plans

Although the No-Build alternative does not meet the Purpose and Need for the project, it is carried through in the alternatives analysis to provide a baseline for comparison with the project Build alternatives.

4.2 TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSM&O) ALTERNATIVE

The Transportation Systems Management and Operations (TSM&O) Alternative typically consists of improvement strategies that optimize existing infrastructure as an alternative to capacity-adding projects. TSM&O strategies typically include, but are not limited to:

- work zone management,
- traffic incident management,
- traffic signal coordination,
- congestion pricing,
- ramp metering,
- traveler information systems, and
- transit management.

As established in the Purpose and Need for this project, there are four main goals associated with the new interchange at I-95 and Pioneer Trail. These include:

- congestion relief at adjacent interchanges,
- long-term mobility,
- emergency evacuation and
- enhance the area's economic viability.

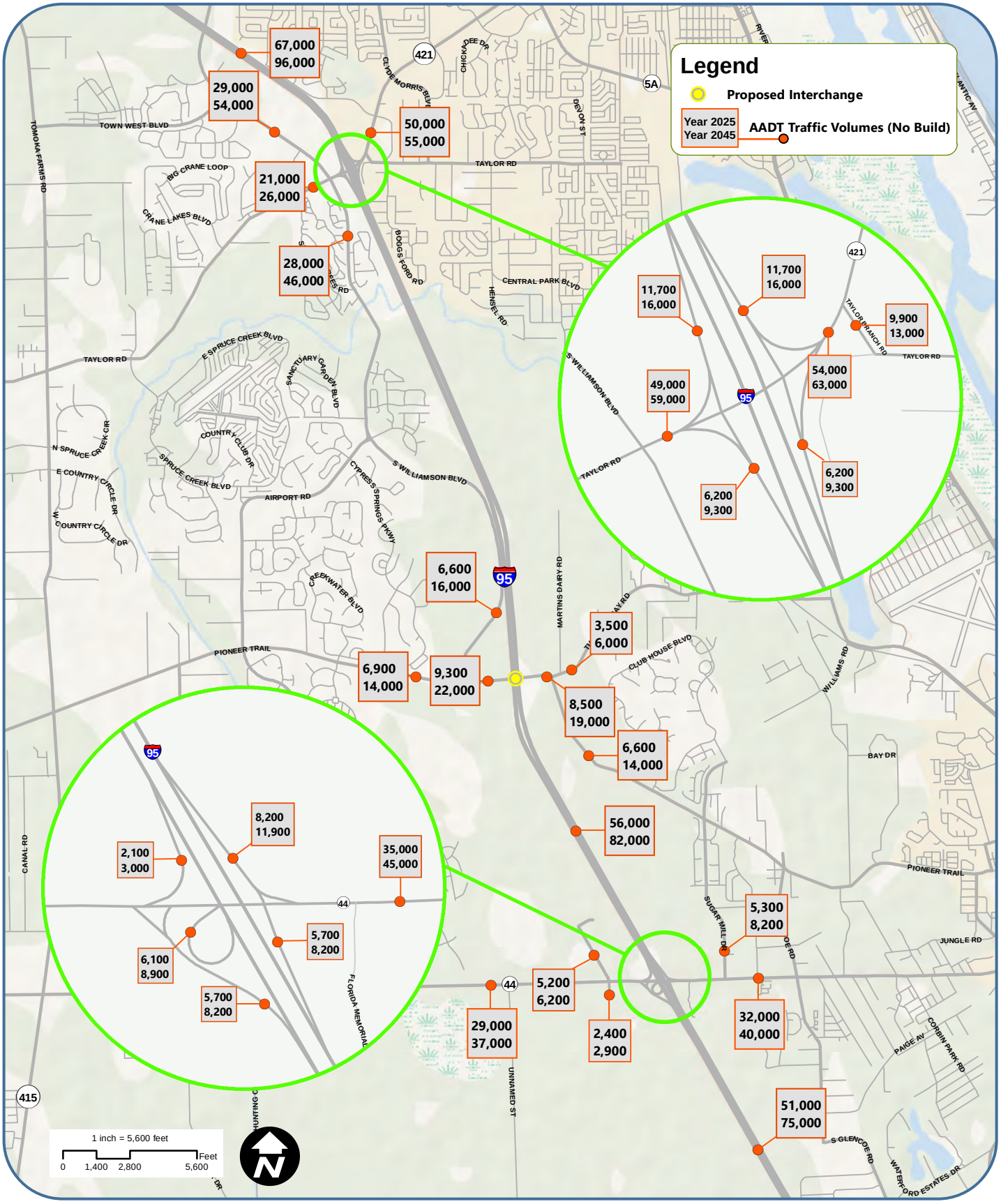
Over the years, FDOT, Port Orange and Volusia County have evaluated operating conditions and made numerous improvements to the adjacent interchanges on I-95 at SR 44 and I-95 at SR 421. Local agencies have conducted numerous studies that indicate that short-term improvements may provide relief in the near future, but an ultimate solution to reduce vehicular demand at these interchanges is needed in the long term. Employment of TSM&O strategies for the I-95 limited access facility and the adjacent interchanges would not address the primary objectives of the proposed improvement project. TSM&O strategies alone would not provide a long-term solution for the regional transportation network and do not meet the purpose and Need for the project; therefore, the TSM&O alternative is not considered a viable alternative.

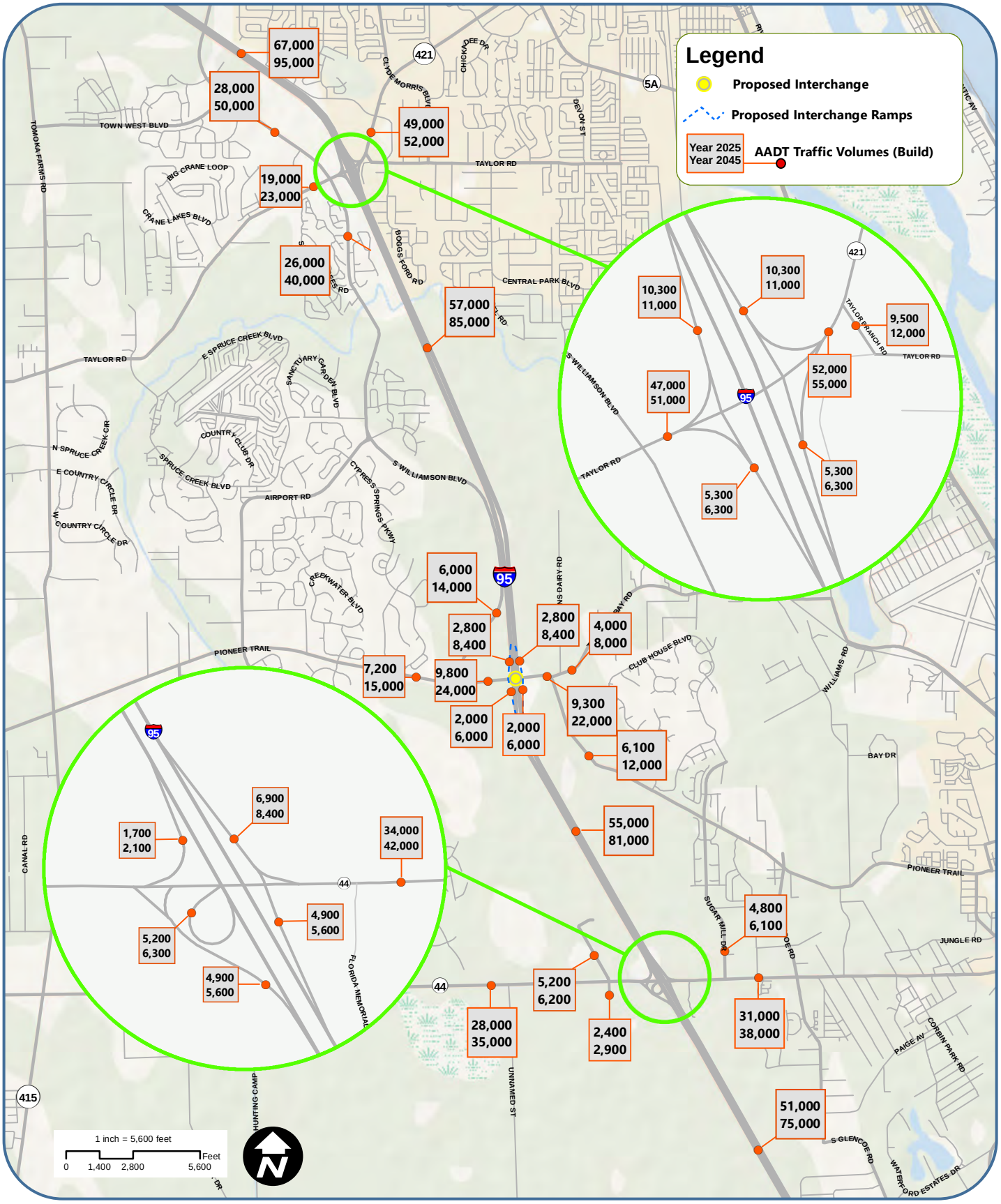
4.3 DESIGN YEAR TRAFFIC

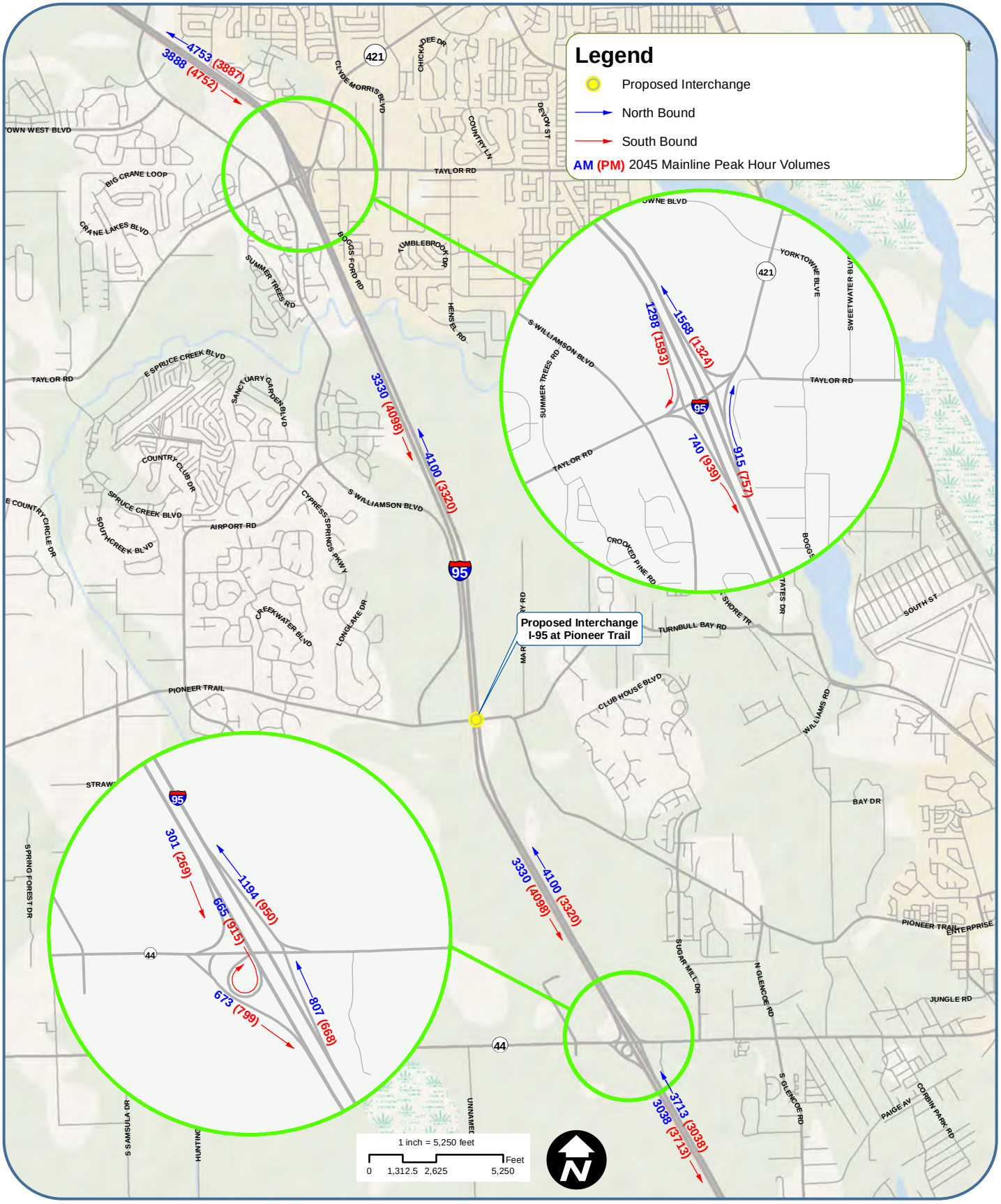
A *Project Traffic Analysis Report (PTAR, June 2019)* and *Interchange Justification Report Reevaluation (IJR, October 2020)* was prepared to evaluate the proposed interchange's impacts on the surrounding study area, including the two adjacent interchanges on I-95. The *PTAR* was completed as part of the PD&E Study to support project-level engineering and environmental analyses. The *PTAR* included the development of No-Build and Build future year traffic volumes and traffic operations analyses for opening year 2025 and design year 2045. The *IJR Reevaluation* was precipitated due to the proposed change in the preferred design concept in the current PD&E Study compared to the originally approved design concept in the 2017 IJR. This PER summarizes the results for No-Build and Build Alternatives in design year 2045. Detailed methodology, assumptions and analyses are provided in the supplemental *PTAR* and *IJR Reevaluation* provided under separate covers.

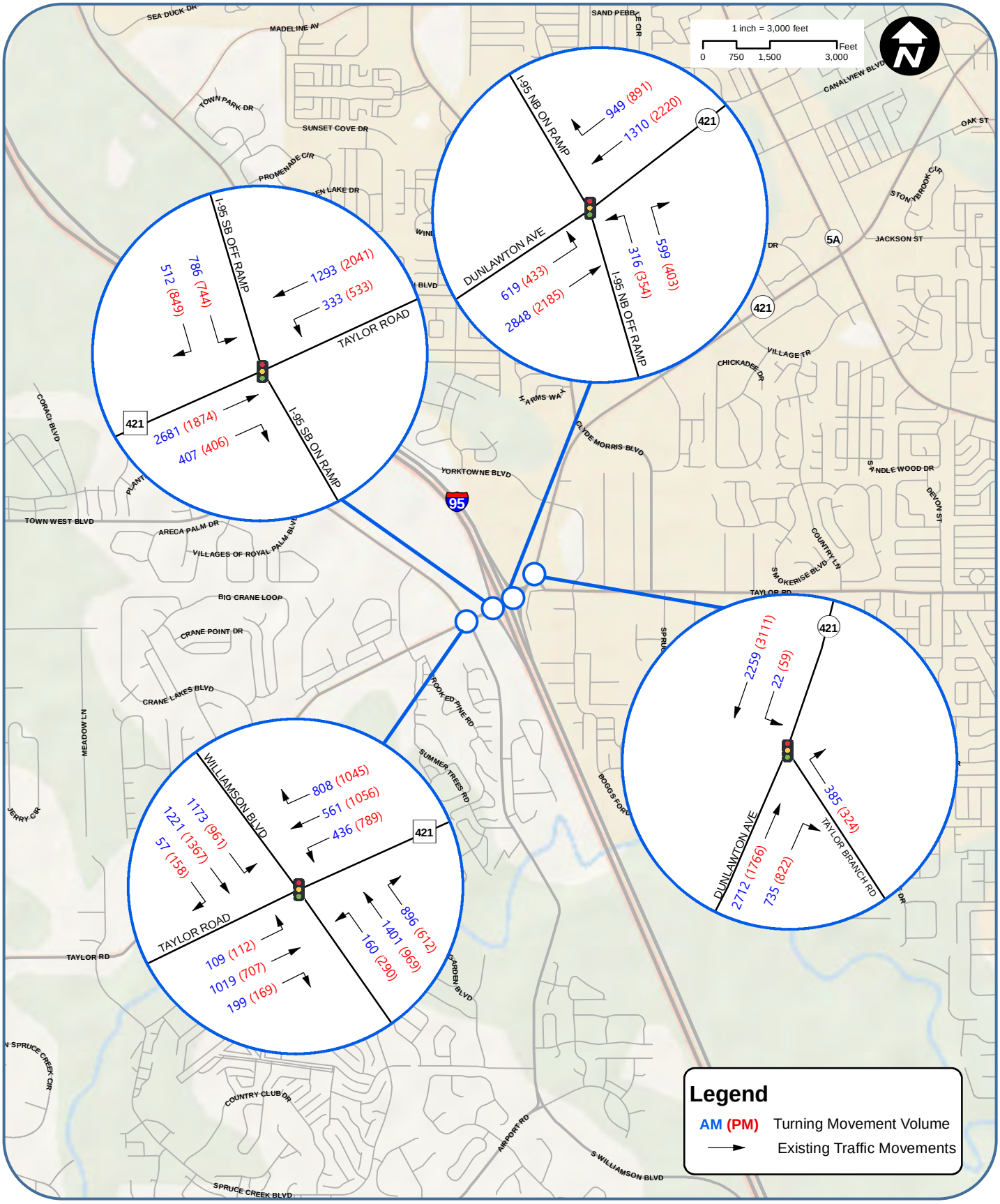
4.3.1 Future Year Traffic Volumes

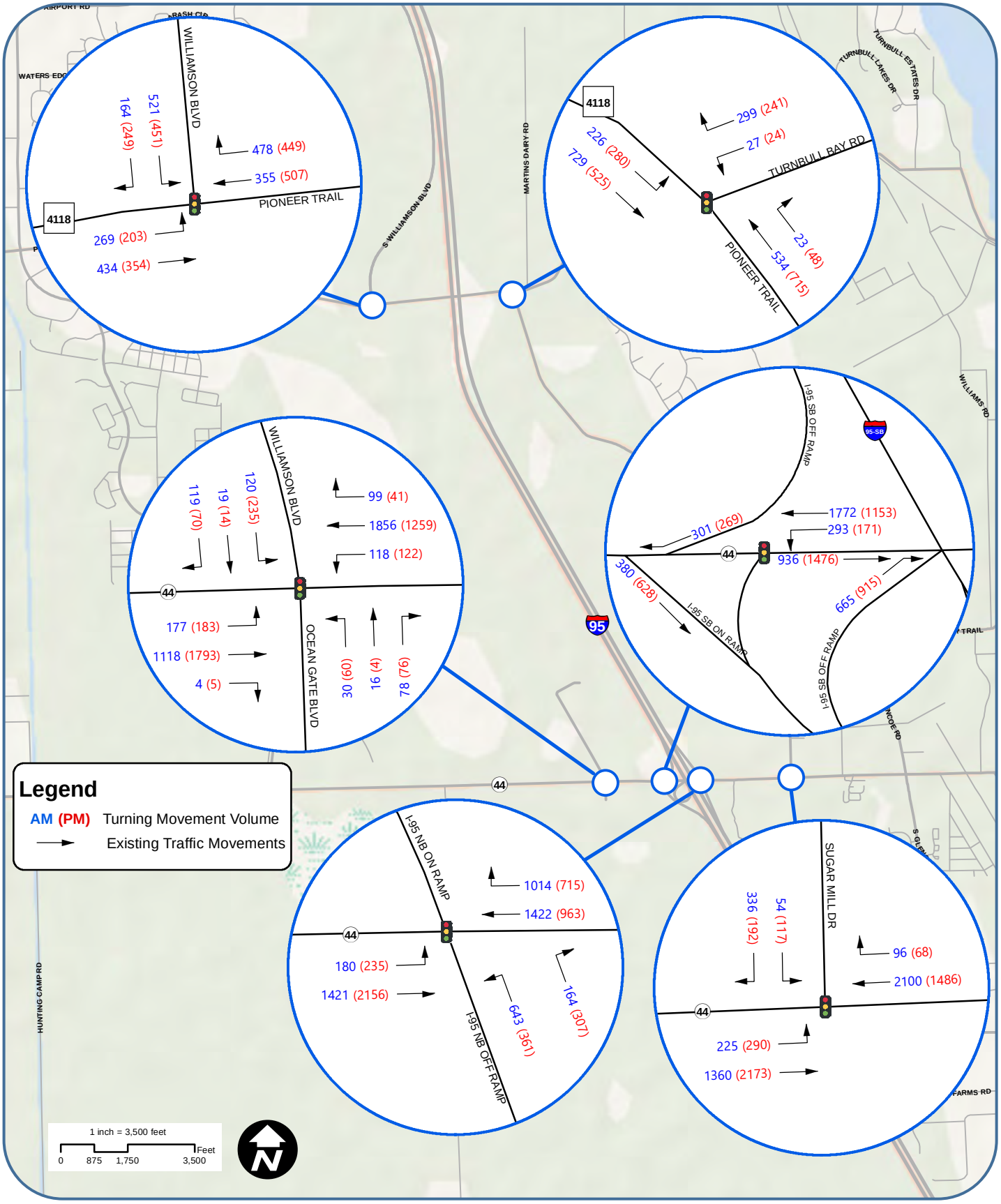
The Central Florida Regional Planning Model (CFRPM V5.1) travel demand model was used to forecast volumes for this project located in Volusia County. The CFRPM 5.1 has been calibrated and validated for a base year of 2015 with a horizon year of 2035; for this study, the socioeconomic data was updated to reflect future 2045 conditions. Traffic volumes from the travel demand model were utilized to develop the future year No-Build and Build Alternatives' daily traffic volumes in the project's traffic analysis area. The model-produced traffic growth and volumes were checked for reasonableness by comparing them to historical traffic trends and population growth for the region. The resulting Annual Average Daily Traffic (AADT) is shown in **Figure 4-1** and **Figure 4-2** for No-Build and Build Alternatives, respectively. Directional design hour volumes (DDHVs) for No Build and Build alternatives were developed by applying design traffic factors (K and D) to the model- derived AADTs. The resulting future peak hour volumes along the I-95 mainline and turning movement volumes at study area intersections are depicted in **Figure 4-3** through **Figure 4-9**.

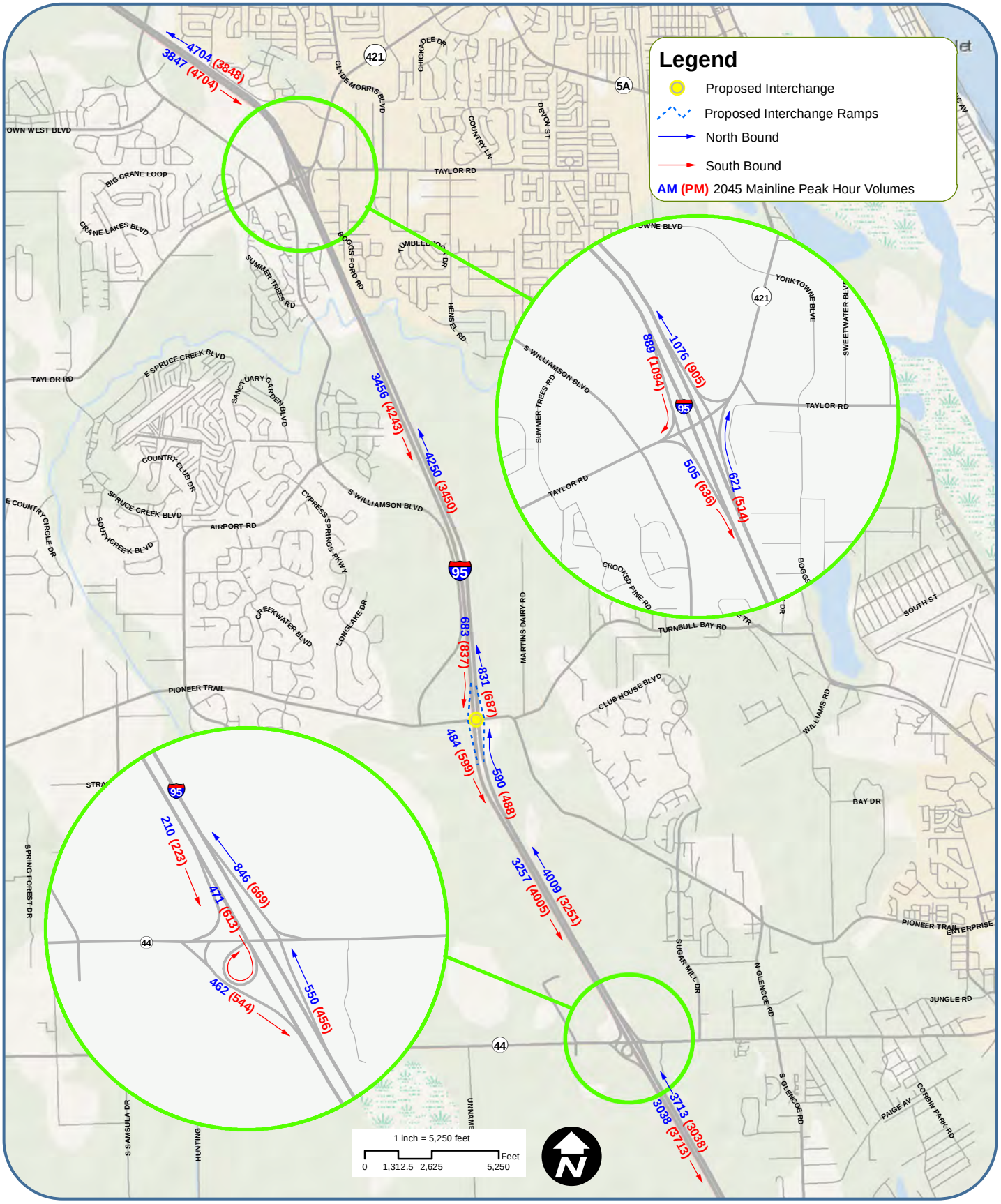

Legend
Proposed Interchange
Year 2025
Year 2045
AADT Traffic Volumes (No Build)
67,000
96,000
29,000
54,000
50,000
55,000
21,000
26,000
28,000
46,000
11,700
16,000
11,700
16,000
9,900
13,000
54,000
63,000
49,000
59,000
6,200
9,300
6,200
9,300
6,600
16,000
3,500
6,000
6,900
14,000
9,300
22,000
8,500
19,000
6,600
14,000
56,000
82,000
2,100
3,000
8,200
11,900
35,000
45,000
5,700
8,200
6,100
8,900
5,700
8,200
5,300
8,200
5,200
6,200
29,000
37,000
2,400
2,900
32,000
40,000
51,000
75,000
TOWN WEST BLVD
TOMOKA FARMS RD
BIG CRANE LOOP
CRANE LAKES BLVD
TAYLOR RD
CLYDE MORRIS BLVD
CHICKADEE DR
DEVON ST
BOGGS FORD RD
CENTRAL PARK BLVD
HENSEL RD
E SPRUCE CREEK BLVD
SANCTUARY GARDEN BLVD
COUNTRY CLUB DR
N SPRUCE CREEK CIR
E COUNTRY CIRCLE DR
W COUNTRY CIRCLE DR
SPRUCE CREEK BLVD
AIRPORT RD
CYPRESS SPRINGS PKWY
S WILLIAMSON BLVD
CREEKWATER BLVD
PIONEER TRAIL
MARTINS DAIRY RD
CLUB HOUSE BLVD
WILLIAMS RD
BAY DR
SUGAR MILL DR
JUNGLE RD
FLORIDA MEMORIAL
UNNAMED ST
CANAL RD
PAIGE AV
CORBIN PARK RD
S GLENCOE RD
WATERFORD ESTATES DR
TAYLOR BRANCH RD
421
5A
95
44
415
1 inch = 5,600 feet
0
1,400
2,800
5,600
Feet
N

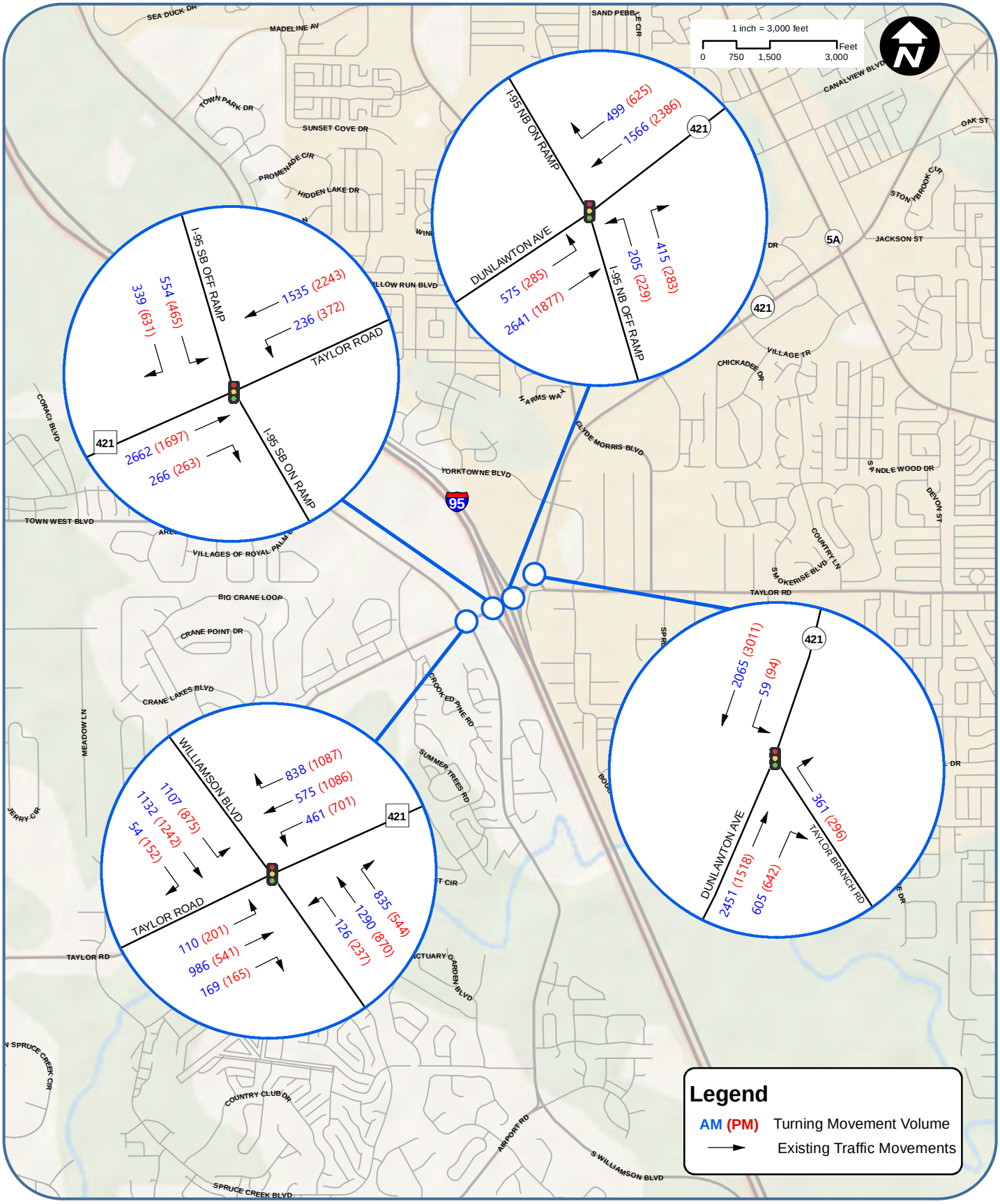

Legend
Proposed Interchange
Proposed Interchange Ramps
Year 2025
Year 2045
AADT Traffic Volumes (Build)
67,000
95,000
28,000
50,000
49,000
52,000
19,000
23,000
26,000
40,000
57,000
85,000
10,300
11,000
10,300
11,000
9,500
12,000
52,000
55,000
47,000
51,000
5,300
6,300
5,300
6,300
6,000
14,000
2,800
8,400
2,800
8,400
4,000
8,000
7,200
15,000
9,800
24,000
2,000
6,000
2,000
6,000
9,300
22,000
6,100
12,000
55,000
81,000
6,900
8,400
1,700
2,100
34,000
42,000
4,900
5,600
5,200
6,300
4,900
5,600
5,200
6,200
2,400
2,900
28,000
35,000
4,800
6,100
31,000
38,000
51,000
75,000
TOWN WEST BLVD
TOMOKA FARMS RD
BIG CRANE LOOP
CRANE LAKES BLVD
CLYDE MORRIS BLVD
CHICKADEE DR
DEVON ST
TAYLOR RD
BOGGS FORD RD
CENTRAL PARK BLVD
E SPRUCE CREEK BLVD
SANCTUARY GARDEN BLVD
COUNTRY CLUB DR
N SPRUCE CREEK CIR
E COUNTRY CIRCLE DR
W COUNTRY CIRCLE DR
SPRUCE CREEK BLVD
AIRPORT RD
CYPRESS SPRINGS PKWY
S WILLIAMSON BLVD
CREEKWATER BLVD
PIONEER TRAIL
CLUB HOUSE BLVD
WILLIAMS RD
BAY DR
CANAL RD
FLORIDA MEMORIAL
HUNTING CAMP
UNNAMED ST
SUGAR MILL DR
JUNGLE RD
PAIGE AV
CORBIN PARK RD
S GLENCOE RD
WATERFORD ESTATES DR
TAYLOR BRANCH RD
421
5A
95
44
415
1 inch = 5,600 feet
0
1,400
2,800
5,600
Feet

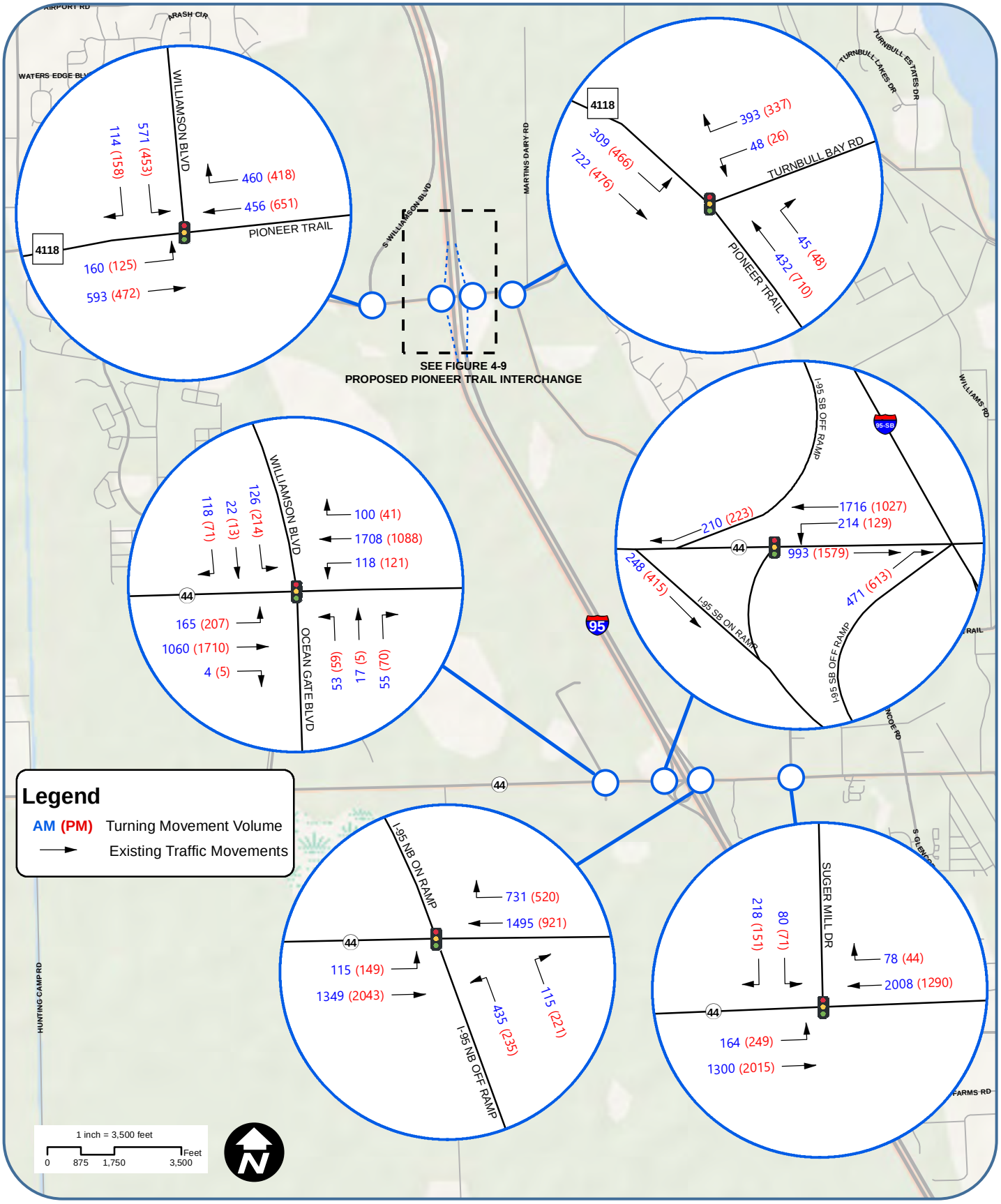

Legend
Proposed Interchange
North Bound
South Bound
AM (PM) 2045 Mainline Peak Hour Volumes
4753 (3887)
3888 (4752)
3330 (4098)
4100 (3320)
1298 (1593)
1568 (1324)
740 (939)
915 (757)
301 (269)
1194 (950)
665 (915)
673 (799)
807 (668)
3713 (3038)
3038 (3713)
Proposed Interchange
I-95 at Pioneer Trail
1 inch = 5,250 feet
0 1,312.5 2,625 5,250 Feet
TAYLOR RD
PIONEER TRAIL
TURNBULL BAY RD
CLUB HOUSE BLVD
S WILLIAMSON BLVD
BOGGS FORD RD
CLYDE MORRIS BLVD
CHICKADEE DR
COUNTRY LN
DEXTON ST
BIG CRANE LOOP
CRANE LAKES BLVD
SUMMER TREES RD
TUMBLEBROOK DR
HENSEL RD
E SPRUCE CREEK BLVD
SANCTUARY GARDEN BLVD
COUNTRY CLUB DR
SPRUCE CREEK BLVD
SOUTHCREEK BLVD
AIRPORT RD
CYPRESS SPRINGS PKWY
CREEKWATER BLVD
LONGLAKE DR
CROOKED PINE RD
YORKTOWNE BLVD
SWEETWATER BLVD
TATES DR
SOUTH ST
WILLIAMS RD
BAY DR
SUGAR MILL DR
N GLENCOE RD
S GLENCOE RD
JUNGLE RD
PIONEER TRAIL
ENTERPRISE
PAIGE AV
CORBIN PARK RD
SPRING FOREST DR
S SAMSULA DR
421
44
95

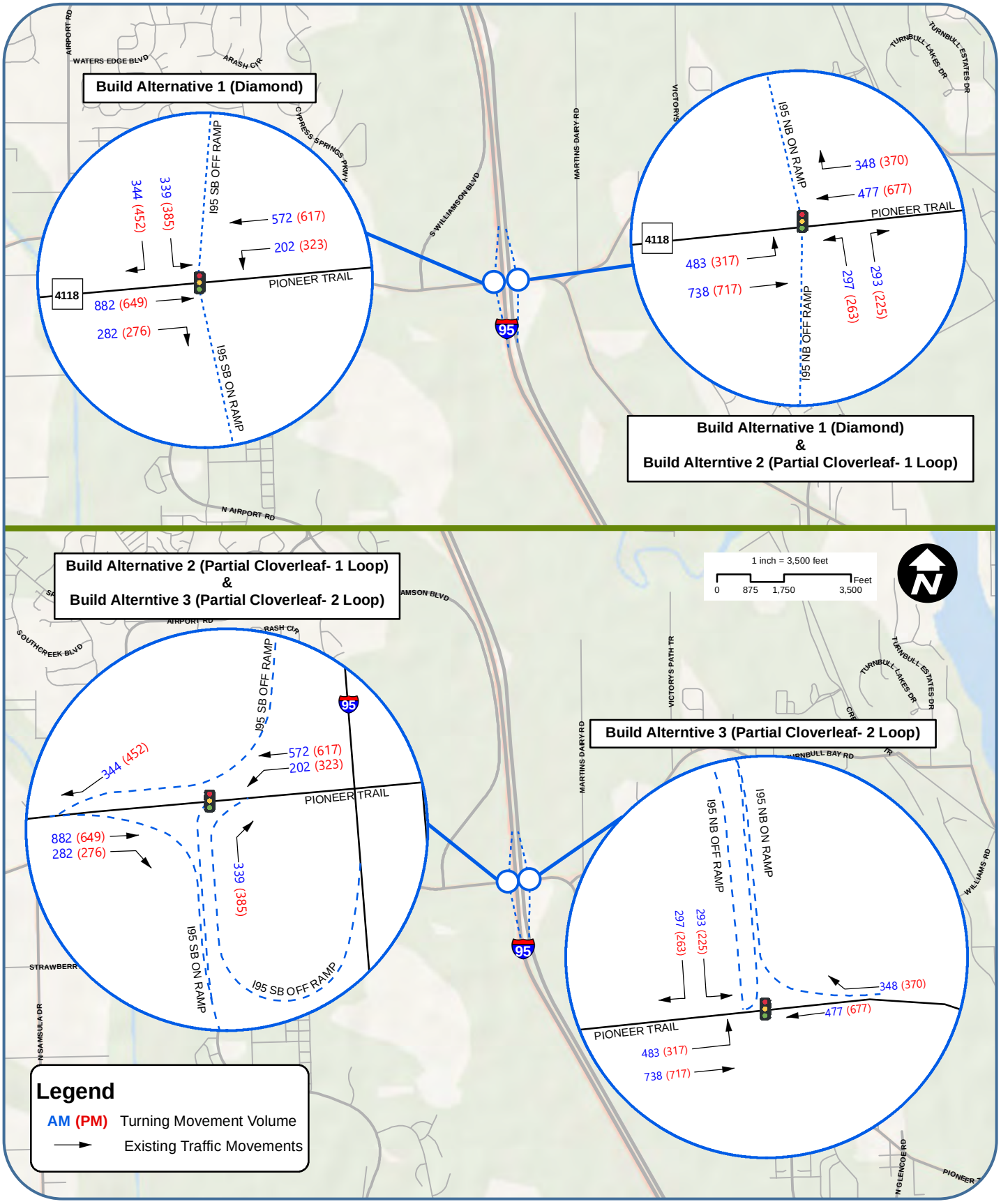

1 inch = 3,000 feet
0 750 1,500 3,000 Feet
I-95 NB ON RAMP
949 (891)
1310 (2220)
DUNLAWTON AVE
619 (433)
2848 (2185)
316 (354)
599 (403)
I-95 NB OFF RAMP
I-95 SB OFF RAMP
1293 (2041)
333 (533)
786 (744)
512 (849)
TAYLOR ROAD
2681 (1874)
407 (406)
I-95 SB ON RAMP
WILLIAMSON BLVD
808 (1045)
561 (1056)
436 (789)
1173 (961)
1221 (1367)
57 (158)
TAYLOR ROAD
109 (112)
1019 (707)
199 (169)
896 (612)
1401 (969)
160 (290)
2259 (3111)
22 (59)
DUNLAWTON AVE
2712 (1766)
735 (822)
385 (324)
TAYLOR BRANCH RD
421
5A
95
SEA DUCK DR
MADELINE AV
TOWN PARK DR
SUNSET COVE DR
PROMENADE CIR
SAND PEBBLE CIR
CANALVIEW BLVD
OAK ST
STONYBROOK CIR
JACKSON ST
VILLAGE TR
CHICKADEE DR
HARMS WAY
CLYDE MORRIS BLVD
YORKTOWNE BLVD
SANDLEWOOD DR
DEVON ST
COUNTRY LN
SMOKERISE BLVD
TAYLOR RD
TOWN WEST BLVD
ARECA PALM DR
VILLAGES OF ROYAL PALM BLVD
BIG CRANE LOOP
CRANE POINT DR
CRANE LAKES BLVD
MEADOW LN
JERRY CIR
CORAL BLVD
COOKED PINE RD
SUMMER TREES RD
BOGGS FORD
CARDEN BLVD
AIRPORT RD
S WILLIAMSON BLVD
SPRUCE CREEK BLVD
COUNTRY CLUB DR
N SPRUCE CREEK CIR
Legend
AM (PM) Turning Movement Volume
Existing Traffic Movements


WILLIAMSON BLVD
164 (249)
521 (451)
478 (449)
355 (507)
4118
PIONEER TRAIL
269 (203)
434 (354)
S WILLIAMSON BLVD
MARTINS DAIRY RD
4118
299 (241)
27 (24)
226 (280)
729 (525)
TURNBULL BAY RD
23 (48)
534 (715)
PIONEER TRAIL
WILLIAMSON BLVD
119 (70)
19 (14)
120 (235)
99 (41)
1856 (1259)
118 (122)
44
177 (183)
1118 (1793)
4 (5)
OCEAN GATE BLVD
30 (60)
16 (4)
78 (76)
I-95 SB OFF RAMP
95-SB
1772 (1153)
293 (171)
301 (269)
44
936 (1476)
380 (628)
665 (915)
I-95 SB ON RAMP
I-95 SB OFF RAMP
95
44
I-95 NB ON RAMP
1014 (715)
1422 (963)
44
180 (235)
1421 (2156)
643 (361)
164 (307)
I-95 NB OFF RAMP
SUGAR MILL DR
336 (192)
54 (117)
96 (68)
2100 (1486)
44
225 (290)
1360 (2173)
Legend
AM (PM) Turning Movement Volume
Existing Traffic Movements
1 inch = 3,500 feet
0 875 1,750 3,500 Feet


Legend
Proposed Interchange
Proposed Interchange Ramps
North Bound
South Bound
AM (PM) 2045 Mainline Peak Hour Volumes
4704 (3848)
3847 (4704)
3456 (4243)
4250 (3450)
683 (837)
831 (687)
484 (599)
590 (488)
3257 (4005)
4009 (3251)
3713 (3038)
3038 (3713)
889 (1084)
1076 (905)
505 (636)
621 (514)
210 (223)
846 (669)
471 (513)
462 (544)
550 (456)
1 inch = 5,250 feet
0 1,312.5 2,625 5,250 Feet


1 inch = 3,000 feet
0 750 1,500 3,000 Feet
I-95 NB ON RAMP
499 (625)
1566 (2386)
421
DUNLAWTON AVE
575 (285)
2641 (1877)
205 (229)
415 (283)
I-95 NB OFF RAMP
I-95 SB OFF RAMP
339 (631)
554 (465)
1535 (2243)
236 (372)
TAYLOR ROAD
421
2662 (1697)
266 (263)
I-95 SB ON RAMP
2065 (3011)
59 (94)
421
DUNLAWTON AVE
2451 (1518)
605 (642)
361 (296)
TAYLOR BRANCH RD
WILLIAMSON BLVD
838 (1087)
575 (1086)
461 (701)
421
1107 (875)
1132 (1242)
54 (152)
TAYLOR ROAD
110 (201)
986 (541)
169 (165)
835 (544)
1290 (870)
126 (237)
Legend
AM (PM) Turning Movement Volume
Existing Traffic Movements


WILLIAMSON BLVD
114 (158)
571 (453)
460 (418)
456 (651)
PIONEER TRAIL
4118
160 (125)
593 (472)
4118
393 (337)
48 (26)
309 (466)
722 (476)
TURNBULL BAY RD
PIONEER TRAIL
45 (48)
432 (710)
SEE FIGURE 4-9
PROPOSED PIONEER TRAIL INTERCHANGE
WILLIAMSON BLVD
126 (214)
22 (13)
118 (71)
100 (41)
1708 (1088)
118 (121)
44
165 (207)
1060 (1710)
4 (5)
OCEAN GATE BLVD
53 (59)
17 (5)
55 (70)
I-95 SB OFF RAMP
95-SB
1716 (1027)
214 (129)
210 (223)
44
993 (1579)
248 (415)
471 (613)
I-95 SB ON RAMP
I-95 SB OFF RAMP
95
Legend
AM (PM) Turning Movement Volume
Existing Traffic Movements
I-95 NB ON RAMP
731 (520)
1495 (921)
44
115 (149)
1349 (2043)
435 (235)
115 (221)
I-95 NB OFF RAMP
SUGER MILL DR
218 (151)
80 (71)
78 (44)
2008 (1290)
44
164 (249)
1300 (2015)
1 inch = 3,500 feet
0 875 1,750 3,500 Feet


Build Alternative 1 (Diamond)
I95 SB OFF RAMP
344 (452)
339 (385)
572 (617)
202 (323)
4118
PIONEER TRAIL
882 (649)
282 (276)
I95 SB ON RAMP
Build Alternative 1 (Diamond)
&
Build Alterntive 2 (Partial Cloverleaf- 1 Loop)
I95 NB ON RAMP
348 (370)
477 (677)
483 (317)
738 (717)
297 (263)
293 (225)
I95 NB OFF RAMP
Build Alternative 2 (Partial Cloverleaf- 1 Loop)
&
Build Alterntive 3 (Partial Cloverleaf- 2 Loop)
Build Alterntive 3 (Partial Cloverleaf- 2 Loop)
1 inch = 3,500 feet
0 875 1,750 3,500 Feet
Legend
AM (PM) Turning Movement Volume
Existing Traffic Movements

4.4 NO-BUILD ALTERNATIVE TRAFFIC OPERATIONAL ANALYSIS

The No-Build scenario reflects future growth in traffic due to population growth and planned future development. Roadway geometry, traffic control and signal timings used in the analysis are consistent with the existing conditions; no improvements or changes in roadway configurations are assumed for the No-Build condition.

Level of service for the I-95 freeway and ramps in the project corridor were computed using the basic freeway segment and ramp merge/diverge modules of the Highway Capacity Software (HCS7). The results of the peak hour operational analyses indicate that all freeway segments are anticipated to operate at LOS C or better except the segment north of SR 421 which is anticipated to operate at LOS D. All of the entrance and exit ramps are anticipated to operate at LOS C or better under No-Build conditions in design year 2045.

Intersection operational analyses were completed for No Build peak hour conditions using Synchro software. A peak hour factor of 0.95 for all intersections was used along with the existing geometry and traffic control data. For future year 2045, the SR 44 and I-95 Southbound ramp terminal is assumed to be signalized as recommended in the long-term improvements identified in the *SR 44 Corridor Management Plan (August 2013)*. **Table 4-1** illustrates the projected 2045 No-Build levels of service for the study area intersections. The results of the operational analyses show that the majority of the study area intersections are anticipated to operate below the target LOS in design year 2045 under future No-Build conditions.

Table 4-1: Year 2045 No Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SR 421 and Williamson Boulevard	285.0	F	315.5	F
SR 421 and I-95 Southbound	78.9	E	57.6	E
SR 421 and I-95 Northbound	42.8	D	26.2	C
SR 421 and Taylor Branch Road	28.3	C	24.6	C
SR 44 and Williamson Boulevard	50.6	D	62.8	E
SR 44 and I-95 Southbound	1.7	A	0.3	A
SR 44 and I-95 Northbound	97.8	F	26.1	C
SR 44 and Sugar Mill Drive	71.1	E	20.3	C
Unsignalized Intersection*	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**
Pioneer Trail and Williamson Boulevard	>300s	F	>300s	F
Pioneer Trail and Turnbull Bay Road	100.1	F	144.1	F

*Unsignalized intersection delay/LOS reported for worst case movement (minor street left turn)

4.5 BUILD ALTERNATIVES

Three alternative design concepts were developed for the proposed improvements to I-95 at Pioneer Trail. These interchange configurations were developed with consideration to engineering design elements, right of way impacts, environmental constraints and construction costs. The following sections describe the proposed Build Alternatives.

4.5.1 Interchange Build Alternative 1 – Diamond

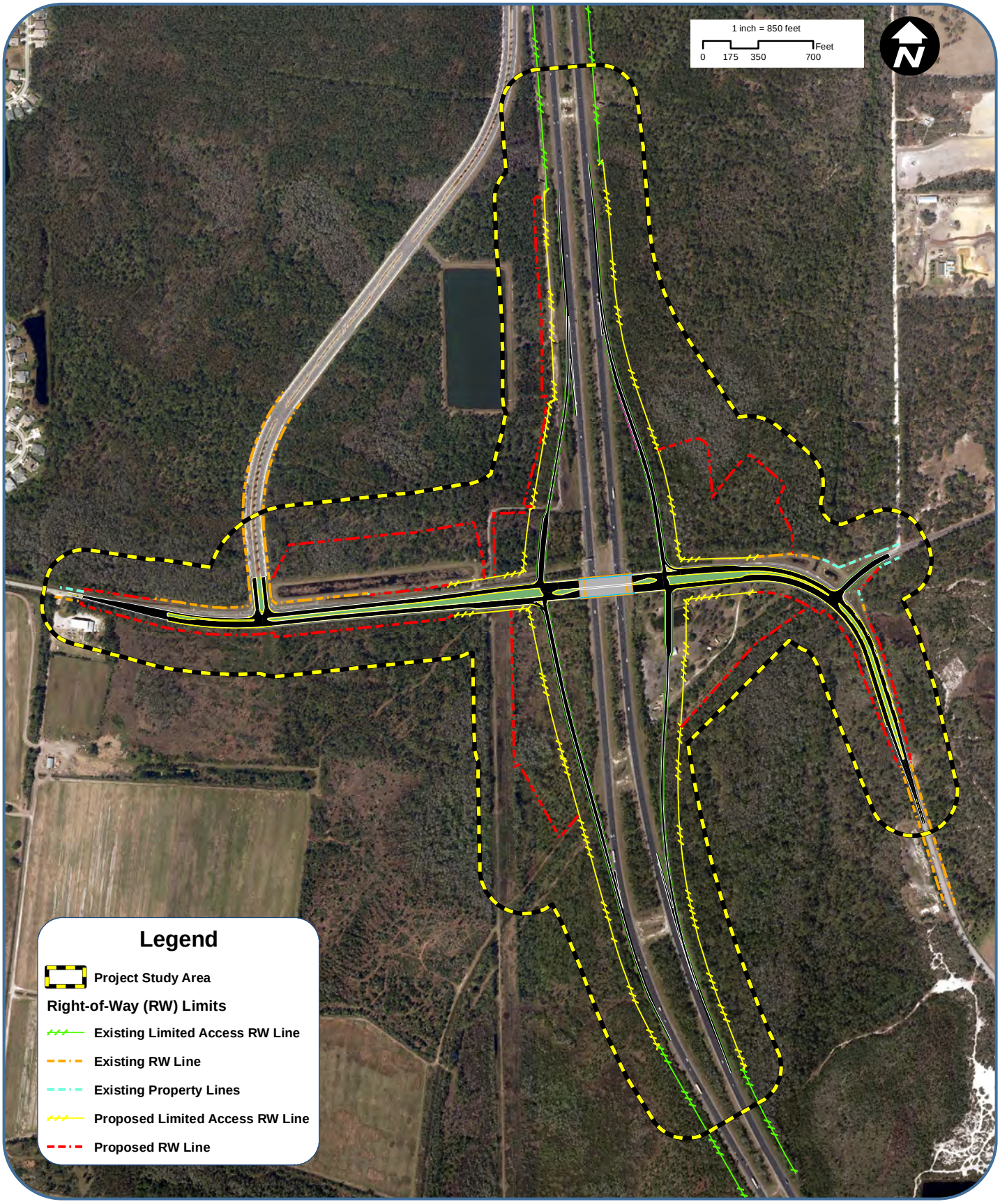
Interchange Build Alternative 1 proposes a diamond interchange that provides full movements. The Diamond Alternative configuration features parallel type, single lane diagonal entry ramps in the northeast and southwest quadrant that merge onto I-95 and single-lane diagonal exit ramps in the northwest and southeast quadrants. Future signalized intersections spaced approximately 740 feet apart are provided at the ramp terminals. Build Alternative 1 is illustrated in **Figure 4-10**.

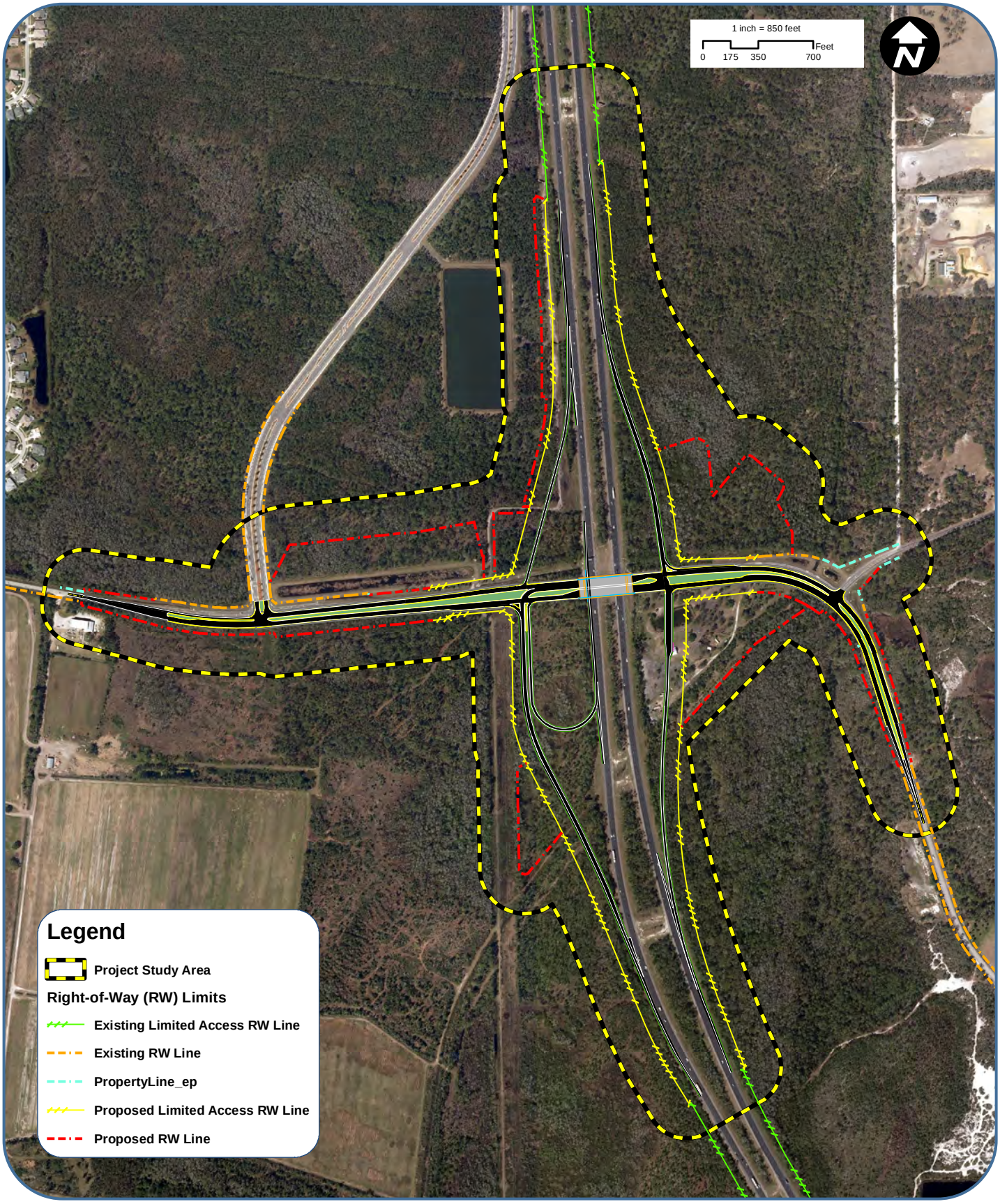
4.5.2 Interchange Build Alternative 2 – Partial Cloverleaf 1

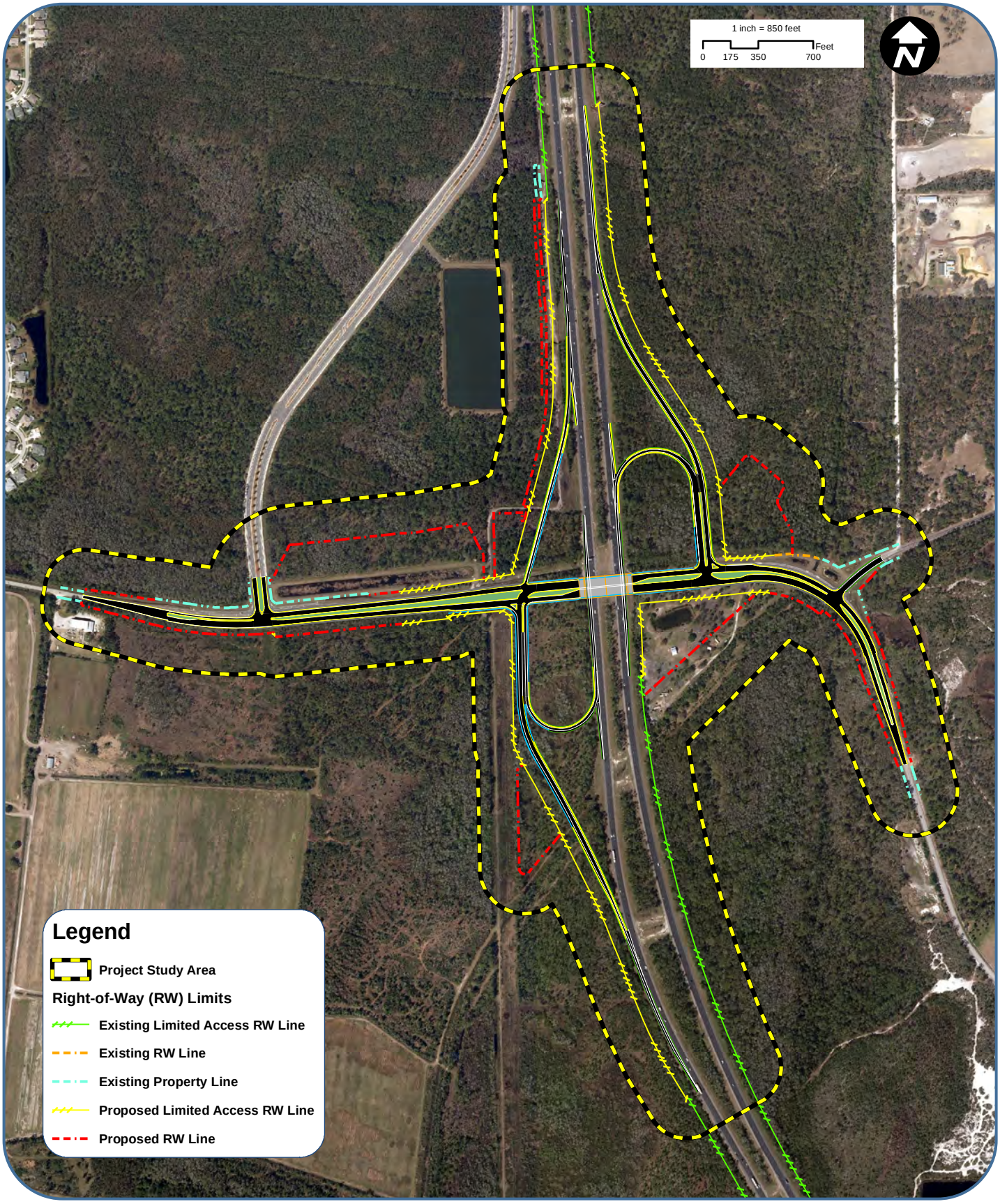
Interchange Build Alternative 2 proposes a partial cloverleaf interchange that provides full access. The Partial Cloverleaf 1 Alternative configuration features parallel type, single-lane diagonal entry ramps in the northeast and southwest quadrant that merge onto I-95 and single-lane diagonal exit ramps in the northwest and southeast quadrants. An additional loop ramp is provided in the southwest quadrant for the I-95 southbound traffic exiting to Pioneer Trail eastbound. This loop ramp eliminates the need for a left turn movement at the I-95 southbound ramp terminal. Future signalized intersections spaced approximately 860 feet apart are provided at the ramp terminals. Build Alternative 2 is illustrated in **Figure 4-11**.

4.5.3 Interchange Build Alternative 3 – Partial Cloverleaf 2

Interchange Build Alternative 3 proposes a partial cloverleaf interchange that provides full access. The Partial Cloverleaf 2 Alternative configuration features parallel type, single-lane diagonal entry ramps in the northeast and southwest quadrant that merge onto I-95 and a single-lane diagonal exit ramp in the northwest quadrant. Two loop ramps are provided in this configuration. The southwest quadrant loop ramp is for the I-95 southbound traffic exiting to Pioneer Trail eastbound, eliminating the need for a left turn movement at the I-95 southbound ramp terminal. The northeast quadrant loop ramp is for the I-95 northbound traffic exiting to Pioneer Trail (eastbound and westbound); this design reduces the right of way impacts in the southeast quadrant. Future signalized intersections spaced approximately 1,160 feet apart are provided at the ramp terminals. Build Alternative 3 is illustrated in **Figure 4-12.**


1 inch = 850 feet
0 175 350 700 Feet
N
Legend
Project Study Area
Right-of-Way (RW) Limits
Existing Limited Access RW Line
Existing RW Line
Existing Property Lines
Proposed Limited Access RW Line
Proposed RW Line


1 inch = 850 feet
0 175 350 700
Feet
N
Legend
Project Study Area
Right-of-Way (RW) Limits
Existing Limited Access RW Line
Existing RW Line
PropertyLine_ep
Proposed Limited Access RW Line
Proposed RW Line


1 inch = 850 feet
0 175 350 700 Feet
N
Legend
Project Study Area
Right-of-Way (RW) Limits
Existing Limited Access RW Line
Existing RW Line
Existing Property Line
Proposed Limited Access RW Line
Proposed RW Line

4.6 BUILD ALTERNATIVE TRAFFIC OPERATIONAL ANALYSIS

The Build scenario reflects future growth in traffic due to population growth and planned future development and assumes construction of a new interchange at I-95 and Pioneer Trail, along with widening of Pioneer Trail from two to four lanes between Williamson Road and Turnbull Bay Road. Three preliminary design concepts were developed for the I-95 at Pioneer Trail interchange: a diamond configuration and two variations of a partial cloverleaf configuration as previously described in Section 4.5 of this report.

The results of the Build Alternative freeway operational analyses indicate that all freeway segments are anticipated to operate at LOS C or better during both AM and PM peak hours in design year 2045. Additionally, all of the entrance and exit ramps are anticipated to operate at LOS C or better during both AM and PM peak hours under build conditions in design year 2045.

The results of the Build Alternative intersection operational analyses as shown in **Table 4-2** indicates that all intersections are anticipated to operate at LOS D or better during both peak hours in the design year 2045 except for the SR 421 and Williamson Boulevard intersection which is projected to operate at LOS F during both peak hours. Although this intersection is anticipated to operate below the target LOS for the projected future demand, the provision of a new access connection at Pioneer Trail would provide needed relief and benefits by reducing overall traffic demand. An anticipated decrease in intersection delay of approximately 43% during the AM peak and 55% during the PM peak in design year 2045 under the Build Alternative when compared to the No-Build Alternative is expected.

Table 4-2: Year 2045 Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SR 421 and Summer Trees Road	31.6	C	64.1	E
SR 421 and Williamson Boulevard	161.9	F	141.2	F
SR 421 and I-95 Southbound	23.3	C	21.9	C
SR 421 and I-95 Northbound	14.6	B	12.8	B
SR 421 and Taylor Branch Road	1.3	A	2.0	A
SR 44 and Williamson Boulevard	41.6	D	35.4	D
SR 44 and I-95 Southbound	1.5	A	0.4	A
SR 44 and I-95 Northbound	24.4	C	19.2	B
SR 44 and Sugar Mill Drive	34.0	C	12.1	B
Pioneer Trail and Williamson Boulevard	19.3	B	20.5	C
Pioneer Trail and Turnbull Bay Road	16.6	B	19.9	B
Pioneer Trail and I-95 Southbound (Diamond Alt. 1)	15.0	B	28.5	C

Table 4-2: Year 2045 Build Peak Hour Intersection Level of Service

Signalized Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Pioneer Trail and I-95 Northbound (Diamond Alt. 1)	28.9	C	21.0	C
Pioneer Trail and I-95 Southbound (Partial Cloverleaf 1)	3.4	A	29.3	C
Pioneer Trail and I-95 Northbound (Partial Cloverleaf 1)	26.2	C	25.1	C
Pioneer Trail and I-95 Southbound (Partial Cloverleaf 2)	7.9	A	18.3	B
Pioneer Trail and I-95 Northbound (Partial Cloverleaf 2)	22.1	C	15.6	B

The SR 421 and Williamson Boulevard intersection was thoroughly evaluated in detail in several previous studies completed for the corridor. Numerous alternatives ranging from additional lanes, movement restrictions and various interchange configurations such as Diverging Diamond and Single Point Urban Interchange were evaluated for the I-95 and SR 421 interchange and nearby intersections along the SR 421 corridor. All evaluated alternatives in the previous studies resulted in failing LOS at the SR 421 and Williamson Boulevard for the future projected demand. With the recent widening of I-95 to provide additional capacity and improved mobility in the area, the ability to provide adequate access connections that meet the needs of the region is critical. As previously determined in the approved IJR, a new access connection at Pioneer Trail would provide benefits through decreased delays resulting from reduced vehicle demands in the vicinity of the I-95 at SR 421 interchange including the SR 421 and Williamson Boulevard intersection. **Table 4-3** and **Table 4-4** show the projected decrease in traffic demand and reduced delays with the I-95 at Pioneer Trail Interchange Build Alternative.

Table 4-3: Year 2045 No Build vs. Build Peak Hour Demand Volumes

Intersection	Total Volume Entering Intersection				% Decrease in Total Entering Volume	
	2045 No Build		2045 Build			
	AM	PM	AM	PM	AM	PM
SR 421 and Williamson	8,040	8,235	7,683	7,701	-4%	-6%
SR 421 and I-95 Southbound	6,012	6,447	5,592	5,671	-7%	-12%
SR 421 and I-95 Northbound	6,641	6,486	5,901	5,685	-11%	-12%
SR 421 and Taylor Branch Road	6,113	6,082	5,541	5,561	-9%	-9%
SR 44 and Williamson Boulevard	3,754	3,862	3,546	3,604	-6%	-7%
SR 44 and I-95 Southbound	4,347	4,612	3,852	3,986	-11%	-14%
SR 44 and I-95 Northbound	4,844	4,737	4,240	4,089	-12%	-14%
SR 44 and Sugar Mill Drive	4,171	4,326	3,848	3,820	-8%	-12%

Table 4-4: Year 2045 No Build vs. Build Peak Hour Intersection Delay

Intersection	Total Intersection Delay (sec/veh)				% Decrease in Total Intersection Delay	
	2045 No Build		2045 Build			
	AM	PM	AM	PM	AM	PM
SR 421 and Williamson	285.0	315.5	161.9	141.2	-43%	-55%
SR 421 and I-95 Southbound	78.9	57.6	23.3	21.9	-70%	-62%
SR 421 and I-95 Northbound	42.8	26.2	14.6	12.8	-66%	-51%
SR 421 and Taylor Branch Road	28.3	24.6	1.3	2.0	-95%	-92%
SR 44 and Williamson Boulevard	50.6	62.8	41.6	35.4	-18%	-44%
SR 44 and I-95 Southbound	1.7	0.3	1.5	0.4	-12%	33%
SR 44 and I-95 Northbound	97.8	26.1	24.4	19.2	-75%	-26%
SR 44 and Sugar Mill Drive	71.1	20.3	34.0	12.1	-52%	-40%

4.7 ALTERNATIVES COMPARISON

The proposed interchange Build Alternatives along with the No-Build Alternative were evaluated based on a variety of factors and potential impacts were quantified with respect to engineering and environmental considerations, right of way requirements, public and stakeholder input, relocation potential and roadway construction costs. The key engineering and environmental elements that form the basis for the alternatives comparison included:

Socio-Economic Environment

Community impacts anticipated from the proposed improvements may include potential relocations of residences and businesses and impacts to existing community centers/service; parcels that will be directly impacted are identified and quantified.

Cultural Environment

A cultural resources survey was conducted to identify historic sites in the study corridor and archaeological resources within proposed pond locations. The architectural survey further assessed historic sites for their potential for listing in the NRHP.

Natural Environment

The Natural Resource Evaluation (NRE) for this project included a wildlife assessment that documented the potential occurrence of natural habitats and wildlife within the proposed project corridor and recommended actions to avoid and/or minimize impacts to protected species to the greatest practicable extent. The NRE also identified existing wetlands and surface water communities based on USFWS classification and functionality. Potential impacts to wetlands, surface waters and floodplains that may be associated with the construction of this project were quantified.

Physical Environment

Existing utilities within the project area are described in Table 2-17 and include overhead electric/ power lines, underground ITS/ fiber optic and underground telephone and cable conduits. Relocation of these utilities may be required to accommodate the proposed improvements based on the location and/or depth of these utilities. Additionally, a City of New Smyrna beach Utilities Commission power easement exists in the southwest quadrant of the proposed interchange. A design variation is anticipated for the proposed loop ramp in the southwest quadrant in order to avoid the utility easement. Further coordination during design and construction will be required to determine the need for potential relocation or replacement of any utilities that are in conflict with the proposed design.

The contamination screening evaluation was completed to identify the number, location and risk potential of known or potentially hazardous waste sites along the corridor. Additional physical environmental impacts include identifying noise sensitive areas, air quality and bicycle and pedestrian impacts along the project corridor.

Construction Cost

The average unit costs per centerline mile associated with new construction roadway projects was obtained from the FDOT Long Range Estimating (LRE) System. The construction costs were then estimated for roadway construction, engineering design and construction engineering and inspection for each of the three interchange alternatives.

4.8 EVALUATION OF ALTERNATIVES

An alternatives evaluation matrix was completed to summarize the potential impacts and other factors associated with each proposed alternative. Each Build alternative and the resulting evaluations were presented at the Alternatives Public Meeting on April 30, 2019 to area residents, public officials and other project stakeholders. The evaluation matrix, shown in **Table 4-5**, includes a summary of the engineering and environmental characteristics and provides qualitative and quantitative impacts associated with each factor for each interchange Build alternative and compares them side by side with the No-Build alternative.

The NRE prepared for this project evaluated the natural environmental factors related to protected species, habitat and wetlands. The NRE analyzed the potential for six federally protected animals and three federally protected plants to occur within the study area. A “May Affect, but not Likely to Adversely Affect” determination was made for four of the animal species (eastern indigo snake, Florida scrub-jay, bald eagle, and wood stork) and for two of the plant species (Rugel’s pawpaw and Okeechobee gourd). A “no effect” determination was made for the Everglade snail

Table 4-5: Alternatives Evaluation Matrix

EVALUATION FACTORS	ALTERNATIVE							
	NO BUILD		DIAMOND		PARTIAL CLOVERLEAF 1		PARTIAL CLOVERLEAF 2	
Planning Consistency								
Consistency with Long Range Transportation Plan	No		Yes		Yes		Yes	
Social Environment								
# of Parcels Impacted	N/A		16		16		16	
# of Potential Relocations	N/A		1		1		1	
Total Right of Way Required (Acres)	N/A		81.51		85.11		79.48	
Physical Environment								
Potentially Contaminated Sites	N/A		4 – Low, 1 - Medium		4 – Low, 1 - Medium		3 – Low, 1 - Medium	
Natural Environment								
Wetland Impacts (Acres)	N/A		45.96		47.29		46.96	
Floodplain Encroachment (Acre-Feet)	N/A		7.58		7.67		7.67	
Floodplain Compensation (Acre-Feet)	N/A		8.07		8.75		8.72	
Wildlife Impacts[1]	N/A		-		-		-	
Cultural Impacts								
Archeological Sites	N/A		0		0		0	
Historic Sites/ Districts[2]	N/A		0		0		0	
Engineering Analysis								
Traffic Operations – Delay[3]	AM	PM	AM	PM	AM	PM	AM	PM
S.R. 421 – Dunlawton Avenue (Sec/Veh)	78.9	57.6	23.3	21.9	23.3	21.9	23.3	21.9
Pioneer Trail (Sec/Veh)	N/A	N/A	28.9	21.0	26.3	25.2	22.2	15.6
S.R. 44 (Sec/Veh)	97.8	26.1	24.4	19.2	24.4	19.2	24.4	19.2
Bicycle/Pedestrian/ADA[4]	No Improvements		Bicycle Lanes & Sidewalks		Bicycle Lanes & Sidewalks		Bicycle Lanes & Sidewalks	
Emergency Evacuation	No Improvements		Better – Additional Access		Better – Additional Access		Better – Additional Access	
Estimated Construction Costs[5]								
a) Roadway Construction Cost (LRE Subtotal)	$ 0		$ 31,330,000		$ 32,411,000		$ 28,855,000	
b) Maintenance of Traffic (MOT) - 6% of a	$ 0		$ 1,880,000		$ 1,945,000		$ 1,731,000	
c) Mobilization - 12% of a	$ 0		$ 3,985,000		$ 4,123,000		$ 3,670,000	
d) Construction Subtotal = a+b+c	$ 0		$ 37,195,000		$ 38,479,000		$ 34,257,000	
e) Contingency - 7% of d	$ 0		$ 2,604,000		$ 2,694,000		$ 2,398,000	
f) Initial Contingency Amount	$ 0		$ 150,000		$ 150,000		$ 150,000	
g) Total Construction Cost (LRE Project Grand Total) = d+e+f	**$ 0**		**$ 39,949,000**		**$ 41,322,000**		**$ 36,805,000**	
h) Construction Engineering & Inspection Cost (10% of g)	$ 0		$ 3,995,000		$ 4,132,000		$ 3,681,000	
i) Total Construction Cost (with Contingencies & CEI) = g+h	**$ 0**		**$ 43,950,000**		**$ 45,460,000**		**$ 40,490,000**	
j) Engineering Design Cost - 10% of i	$ 0		$ 4,395,000		$ 4,546,000		$ 4,049,000	

Notes:
1. No critical habitat and no listed species involvement are anticipated in the project study area. The NRE (October 2020) for the project contains detailed data and information regarding individual species and habitat. The wildlife factors are assumed to be equal for all three alternatives and thus, not a factor for consideration in selection of alternative.
2. No effect on NRHP-listed or -eligible historic properties
3. A measure of the increase in travel time that a vehicle experiences due to the intersection control.
4. Pioneer Trail roadway typical section includes 5-foot paved shoulders (bridge section – 6.5-foot shoulders) to be used as undesignated bike lanes per County preference.
5. Costs rounded to nearest $1K, except Line i which is rounded up to the nearest $10K. Excludes utility relocation cost; final utility relocations/ costs will be determined in the Design phase of the project.
6. Utility impacts are assumed to be equal for all three alternatives and thus, not a basis for selection. Utility/ reimbursement costs for the FPL easement are dependent on the size and quantity of structures impacted; the extent of utility impacts will be determined during the design phase of the project.

kite, red-cockaded woodpecker and fragrant prickly apple. The project study area also potentially contains nine state protected animals and 32 state protected plants. No adverse effects are anticipated with any state protected animal or plant. The evaluation of species and habitat was conducted for a generalized project study area that encompassed all three potential interchange alternatives. Thus, any potential impacts to species and habitat were assumed to be equal for all alternatives and not a factor in selection.

The NRE also evaluated potential impacts to wetlands within the project study area. Of the 20 individual wetlands and 11 OSWs identified, 17 wetlands and seven OSWs are anticipated to be affected by at least one of the proposed roadway improvement alternatives. All three alternatives are expected to impact the same number of wetlands in the study area, with the Diamond Alternative impacting the least acreage and Partial Cloverleaf 2 impacting the most.

Potential floodplain impacts were reviewed in the *Pond Siting Report (PSR, October 2020)* prepared for this project and located in the project file. The FEMA website was consulted for the latest Flood Insurance Rate Maps in Volusia County. Portions of the proposed alignment encroach the Special Flood Hazard Zone A throughout the project study area, which are areas in the 100-year floodplain. Some encroachment is anticipated with each of the three interchange alternatives as shown in **Table 4-5**. All three alternatives are expected to require similar compensatory storage: 8.1 Ac-ft. for the Diamond Interchange Alternative, 8.8 Ac-ft. for the Partial Cloverleaf 1 Alternative and 8.7 Ac-ft. for the Partial Cloverleaf 2 Alternative.

The potential Right of Way impacts for all three alternatives were evaluated. The Diamond, Partial Cloverleaf 1 and Partial Cloverleaf 2 Alternatives all may potentially impact 16 parcels. The Diamond Alternative is expected to require the least amount of right of way acquisition while the Partial Cloverleaf 1 Alternative would require the most.

Relocation potential was reviewed for all three alternatives. The Diamond, Partial Cloverleaf 1 and Partial Cloverleaf 2 Alternatives all are expected to involve one potential relocation due to the proposed I-95 Northbound off ramp in the Southeast quadrant of the interchange.

The Contamination Screening Evaluation Report prepared for this project identified five sites with potential to have contamination impacts to this project. The Diamond Interchange and Partial Cloverleaf 1 Alternatives are anticipated to have potential involvement with 1 Medium Risk and 4 Low Risk contamination sites, while the Partial Cloverleaf 2 Alternative may involve 1 Medium Risk and 3 Low Risk sites.

The proposed improvements along Pioneer Trail include a typical section design that accommodates multi-modal facilities. All three of the proposed interchange alternatives propose the same typical section which features sidewalks on both sides of Pioneer Trail and paved shoulders which may be used by bicycles.

As part of the alternatives evaluation process a Value Engineering (VE) Study was conducted between July 8-12, 2019. The VE process employs a multi-disciplinary team approach to analyze and improve the value of the proposed project. Using a Function Analysis System Technique (FAST), the VE team comprised of FDOT staff and consultants, identified key areas of focus and investigation for improvement alternatives that were subsequently evaluated using criteria such as: costs, operations, safety, constructability, maintenance, environment and aesthetics. As a result of the VE process, the VE Study team identified nine alternatives for consideration in the following areas: grade separation (bridge), typical section, drainage/environmental protection, retaining walls, signalization and interchange configuration. The study team concluded the VE process by conducting a VE resolution meeting that resulted in recommendation of alternatives for implementation. Details of the VE process are included in the VE Study report under separate cover.

4.9 SELECTION OF PREFERRED ALTERNATIVE

The preceding data and analyses from various reports and technical memorandums for this project along with potential impacts and other factors associated with each proposed alternative have been summarized in the alternatives evaluation matrix. Each Build alternative and the resulting evaluations were presented at the Alternatives Public Meeting on April 30, 2019 to area residents, public officials and other project stakeholders.

Although the No-Build Alternative would result in no direct impacts to the cultural, natural, and physical environment and would require no right of way acquisitions or relocations, it would not meet the purpose and need of the project. The No-Build Alternative would not address the existing and future traffic congestion levels at the adjacent interchanges along I-95. Additionally, the No-Build Alternative does not address regional mobility and evacuation needs due to the large spacing between the existing interchanges. Continued development and future growth is anticipated to occur in the region and without transportation improvements, slow travel speeds and safety concerns associated with the No-Build Alternative would have the potential to increase road users costs and transportation costs for local businesses and industries, potentially contributing to a decrease in economic stability for the area.

The alternatives evaluation matrix along with public and stakeholder input formed the basis of selection for the preferred Build alternative. Categories in the matrix that were

expected to have equal or no impact among the three alternatives were eliminated from consideration. The alternatives evaluation matrix showed that the Diamond and Partial Cloverleaf 2 alternatives overall had a similar ranking with a few factors that ranked highest; whereas, the Partial Cloverleaf 1 had several factors that ranked the lowest. The pros of the Diamond Alternative included lower right of way, wetlands and floodplain impacts. The pros of the Partial Cloverleaf 2 Alternative included moderate right of way impacts, lower involvement with contamination sites, best traffic operations, lower construction costs and highest public support/ preference.

Based on the engineering and environmental factors and public and agency input, the preferred alternative is the Partial Cloverleaf 2 Alternative as it provides the best balance between improved transportation service and minimization of the social, physical and natural impacts associated with the proposed roadway improvements while gaining the most public support.

5 PUBLIC INVOLVEMENT

Public involvement activities have been integrated into the PD&E study process, providing the opportunity for property owners, residents, businesses, government entities and agencies to share their ideas and concerns with the study team. This input has been used as data collection activities were completed, as alternative concepts were developed and in making recommendations.

5.1 PROJECT WEBSITE

Project details including contact information and study documents were made available on the website set up at the start of this PD&E Study: http://www.cflroads.com/project/436292-1/I-95_Interchange_at_Pioneer_Trail

5.2 KICKOFF MEETING

The kickoff meeting for the I-95 at Pioneer Trail Interchange PD&E Study was held on Wednesday, June 13, 2018, from 5:30 p.m. to 7:30 p.m. at the Sugar Mill Country Club, New Smyrna Beach, Florida. This meeting was the first public meeting held for the study. Meeting invitations were sent by email to elected and appointed officials and via mail to property owners/residents. Invitations included dates, times and location for the meeting. The meeting was also advertised in advance with a display ad in the News Journal. A press release was distributed by FDOT to major local media outlets.

The meeting was conducted in an open house format. The public was invited to attend at any time between 5:30 p.m. and 7:30 p.m. A handout with project information and details was prepared and distributed to attendees. No formal presentation was provided. Ninety-eight (98) attendees (including City and County representatives) and 24 project team members signed in at the public meeting. Projects team attendees included the FDOT Project Manager, Right of Way and Environmental Management Office (EMO) staff and the project consultants. Forty-one (41) comments were received during and after the public meeting. These comments included the following:

- Opposed to the project (17),
- In support of the project, additional access and emergency route availability (11), and
- No preference or had additional questions/ comments (13)

Verbal comments/questions received during the public meeting consisted of discussions of future developments, other roadway improvement projects and the study schedule.

5.3 ALTERNATIVES PUBLIC MEETING

The alternatives public meeting for the PD&E Study was held on Tuesday, April 30, 2019, from 5:30 p.m. to 7:30 p.m. at the Brannon Center, New Smyrna Beach, Florida. This meeting was the second public meeting held for the study. The same notification process to the public and media was implemented as with the initial kickoff public meeting. The meeting was conducted in an open house format with a looping presentation provided for public viewing at any time. The public was invited to attend at any time between 5:30 p.m. and 7:30 p.m. A handout with project information and details was prepared and distributed to attendees. In addition, several display boards were available for public review and discussion. One hundred and fifty-five (155) attendees (including City and County representatives) and 20 project team members signed in at the public meeting. Projects team attendees included the FDOT Project Manager, Right of Way and EMO staff and the project consultants. Ninety-nine (99) comment forms were received during and after the public meeting. These comments included the following:

- 61 in support of an interchange
  - 12 Diamond
  - Zero Partial Cloverleaf #1
  - 43 Partial Cloverleaf #2
  - 6 no preferred alternative
- 28 in support of the No Build alternative
- 10 other comments

Other comments received were related to environmental or wildlife impacts with the interchange, stating other roadways (Pioneer Trail and Williamson Boulevard) should be widened or extended and comments regarding the developments in the area. Verbal comments/questions received during the public meeting consisted of discussions of future developments and other roadway improvement projects and the study schedule.

5.4 PUBLIC HEARING

The public hearing for the I-95 at Pioneer Trail PD&E Study was held on Wednesday, September 30, 2020, from 5:30 p.m. to 7:30 p.m. at the Brannon Center, New Smyrna Beach, Florida. This meeting was the third public meeting held for the study. The same notification process to the public and media was implemented as with the initial kickoff public meeting and the alternatives public meeting. Due to the Covid-19 pandemic, the hearing was conducted in a "hybrid" format, offering an in-person

hearing as well as an online Virtual Public Hearing. Prior to the public hearing, 43 people RSVP'd to attend the public hearing in-person and 157 people registered to attend via the virtual platform. Sixteen project team members signed in at the public hearing, including the FDOT Project Manager, Right of Way and EMO staff and the project consultants. A total of 167 people (including City and County representatives) attended the public hearing:

- 57 people attended in-person (37 RSVPs and 20 non-RSVP)
- 110 people attended virtually

The hearing presentation began at 5:45 p.m. and was narrated live by the FDOT and Consultant Project Managers, followed by a public comment period, where 14 of the in-person and 11 of the virtual attendees made a public comment. Due to the hybrid format of this hearing, the public comment period was extended to 21 days. A total of 417 comments were received during the 21-day comment period following the public hearing regarding the I-95 at Pioneer Trail Interchange PD&E Study. An additional 83 comments were received after the comment period closed.

Comments received showed both support and opposition. Those who opposed the project referenced concerns for wildlife and environmental impacts with the interchange, stated that other roadways (Pioneer Trail and Williamson Boulevard) should be widened or extended, and/or commented on the future developments in the area.

As the proposed project is located near the Spruce Creek Basin, an Outstanding Florida Water, and the Doris Leeper Spruce Creek Preserve, additional environmental considerations were given for this area. The PD&E Study included an assessment of potential impacts to protected species as part of the Natural Resources Evaluation Report and no adverse effects are anticipated to protected species and habitat from the project. It is important to note federal and state agencies with jurisdiction over natural resources did not identify a concern with regards to wildlife and environmental impacts and the construction of the proposed interchange is not anticipated to alter the existing conditions along the I-95 corridor.

The surrounding roadway network is comprised mostly of two-lane roadways maintained by local agencies (Volusia County or the Cities of New Smyrna Beach and Port Orange). The local agencies monitor these roadways and as future developments occur in the surrounding area, these roadways will be considered for improvement.

Of the total 417 comments received during the comment period, 313 comments were received through a third-party email service and are viewed as opposing the build alternative. An additional 80 comments were received through the third-party email service after the comment period closed.

An additional 107 comments were received, 104 prior to the closing of the comment period and three (3) after the comment period closed. These comments ranged from showing support (46 comments), opposing (59 comments) and no preference (two comments).

6 DESIGN FEATURES OF PREFERRED ALTERNATIVE

The engineering and environmental analysis, agency coordination and public involvement phases of this PD&E study resulted in the selection and identification of the Partial Cloverleaf 2 Alternative as the preferred alternative. Details of the preferred alternative are described in this section of the report.

6.1 ENGINEERING DETAILS OF THE PREFERRED ALTERNATIVE

6.1.1 Typical Section

The preferred alternative typical section for Pioneer Trail consists of a four-lane, divided urban collector roadway with two 12-foot travel lanes, 5-foot paved shoulders, curb and gutter and a sidewalk in each direction separated by a variable width median. The design speed is 45 mph. An 8-foot sidewalk is provided on the north side and a 5-foot sidewalk is provided on the south side of the roadway. The right of way varies but is typically a minimum 120 feet. The Pioneer Trail bridge section over I-95 will feature two 11-foot left turn lanes, two 12-foot travel lanes and 6.5-foot paved shoulders in each direction separated by an 11-foot median. An 8-foot sidewalk on the north side and a 5-foot sidewalk on the south side with concrete traffic railing separating the sidewalk from the shoulder are also provided. The proposed roadway and bridge typical sections are shown in **Figure 6-1** and **Figure 6-2,** respectively. The approved typical section package is included in Appendix A.

6.1.2 Right of Way and Relocations

The preferred alternative for Pioneer Trail is anticipated to impact 16 parcels totaling approximately 79.5 acres of right of way, of which approximately 42.3 acres are required for the roadway improvements and approximately 37.2 acres are for stormwater and/ or floodplain compensation ponds. There is some overlap in impacts with eight of the 16 parcels being required for both roadway and pond improvements. The proposed project, as presently conceived, may potentially impact one parcel which may require relocation of an existing business or residence. FDOT will carry out a Right of Way and Relocation Assistance Program in accordance with Florida Statute 421.55, Relocation of displaced persons, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646 as amended by Public Law 100-17).

6.1.3 Horizontal and Vertical Geometry

The horizontal and vertical alignment for the preferred alternative is shown on the plan and profile sheets in the Concept Plans provided in Appendix B of this report. The horizontal curve data is summarized in **Table 6-1**. The vertical profile for Pioneer Trail will be raised to adhere to FDM minimum base clearance and vertical profile

Table 6-1: Preferred Alternative Horizontal Alignment Data

Curve No.	Line	PC Station	PI Station	PT Station	Delta	Degree	Length (ft)	Radius (ft)	Super-elevation (e)	Design Speed (mph)
CL_PT-1	CL_PT	22+16.42	25+44.86	28+68.02	17°46'4 l .5"	2°43'42. l"	651.61	2100	0.040	45
CL_PT-2		59+03 .14	65+11.99	69+28.28	77°41'36.3"	7°34'43.7"	1025.14	756	0.089	45
BL_RAMP_E-1	RAMP_E	500+00.00	502+60.56	505+20.35	7°36'24.9"	1°27'42.8"	520.35	3919	0.031	50
BL_RAMP_E-2		505+20.35	507+77.06	510+33.61	3°31'56.8"	0°41'17.7"	513.26	8325	RC	50
BL_R AM P_E-3		510+33 . 6l	515+44.39	520+53.90	7°00'42.9"	0°41'14. l"	1020 .2 9	8337	NC	40
BL_R AM P_E-4		520+53.90	522+63.89	524+64.61	29°24'52.7"	7°09'43.17"	410.71	800	0.070	35
BL_RAM P_F-1	RAMP_F	602+02.35	603+48.14	604+64.16	62°45'52.2"	23°58'23.3"	261.81	239	0.100	30
BL_R AM P_F-2		604+88.63	608+09.65	608+88.63	118°38'00.6"	27°56'56.98"	424.46	205	0.100	30
BL_RAM P_G-1	RAMP_G2	702+00.03	782+99.93	709+36.77	176°37'11.2"	23°58'23.3"	736.74	239	0.100	30
BL_RAM P_H-1	RAMP_H2	809+38.76	807+42.83	809+38.76	27°58'59.8"	6°59'45.0"	400.00	819	0.078	40
BL_RAMP_H-2		814+03.54	818.92 .85	823+6 l .56	28°44'18.3"	2°59'59.2"	958.02	1910	0.057	50
BL_R AM P_I-1	RAMP_I	909+33.32	911+53.78	913+71.70	15°20' 50.0"	3°30'00.2"	438.49	1637	0.055	45

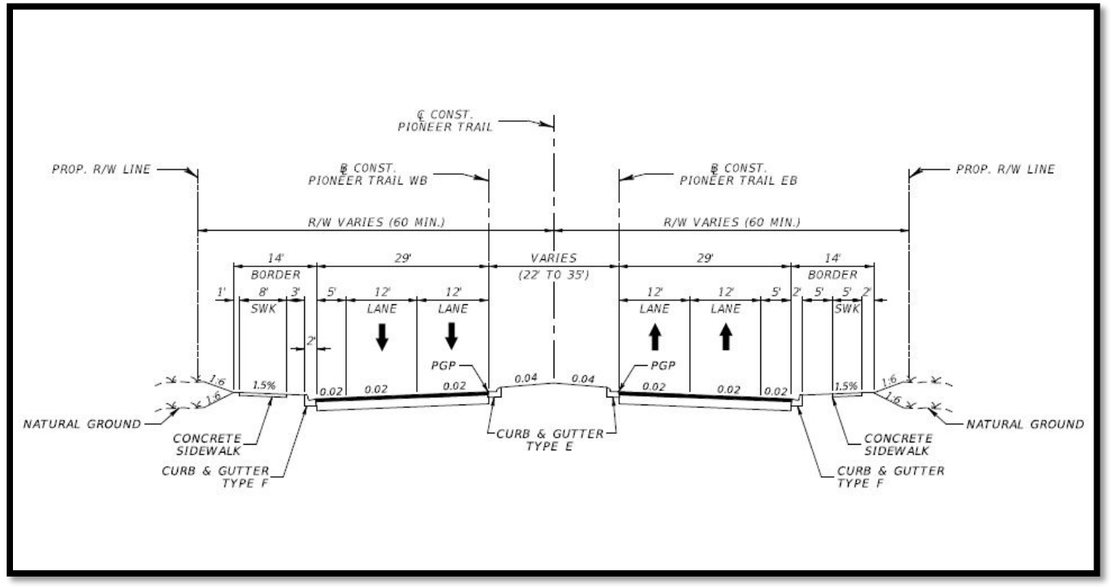


Figure 6-1: Preferred Alternative - Pioneer Trail Typical Section

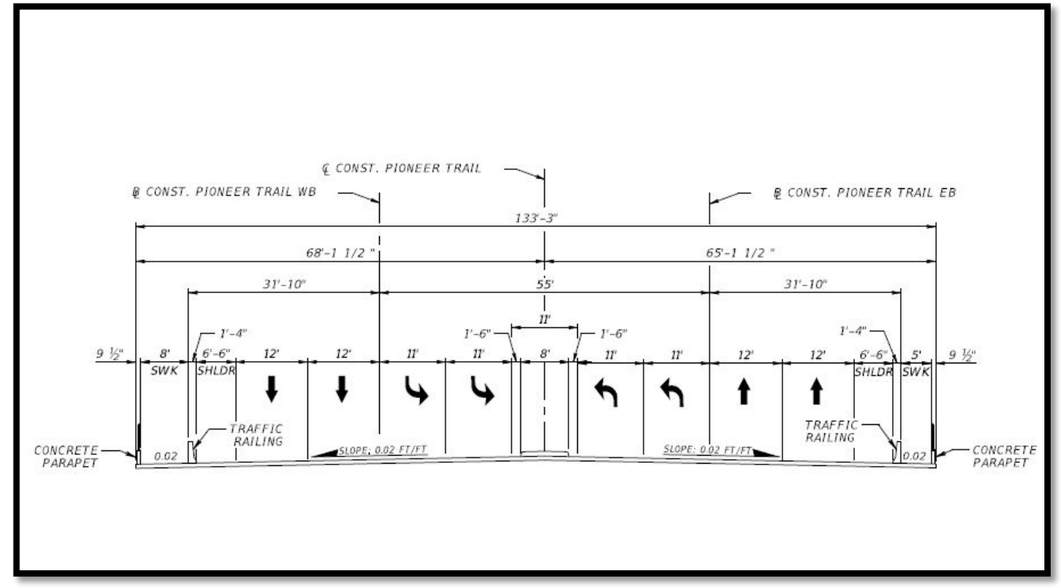


Figure 6-2: Preferred Alternative - Bridge Typical Section

criteria. In addition, the proposed bridge structure over I-95 will be approximately 4 feet higher than the existing 2-lane bridge structure and required additional profile elevation change for the approaching roadway to the proposed bridge.

6.1.4 Bicycle and Pedestrian Accommodations

The preferred alternative for Pioneer Trail features 5-foot paved shoulders on both sides of the roadway that may be used as undesignated bicycle lanes. An 8-foot sidewalk is provided on the north side and a 5-foot sidewalk is provided on the south side of the roadway. Along the bridge section over I-95, 6.5-foot paved shoulders are provided in each direction. The same sidewalk widths are maintained; however, a concrete traffic railing separates the sidewalk from the shoulder.

6.1.5 Intersection and Interchange Concepts

The preferred alternative interchange is a partial cloverleaf design with loop ramps in the southwest and northeast quadrants. The improvements also include future signalized intersections at the following four locations along Pioneer Trail: Williamson Boulevard, I-95 Southbound Ramp, I-95 Northbound Ramp and Turnbull Bay Road. The Concept Plans provided in Appendix B show the geometry at the intersections and along the Pioneer Trail study corridor.

6.1.6 Utilities

Potential utilities within the project limits and utility contacts were previously identified in Section 2.17 of this report. The majority of the utilities are located within the existing right of way by permit and the Florida Power and Light facility is an existing easement. The preferred alternative was designed to minimize impacts to existing utilities located within easements. The extent of utility impacts will be determined during the design phase of the project; further coordination with utility owners during the design phase will assist in minimizing impacts.

6.1.7 Drainage and Stormwater Management Facilities

The stormwater management system for the interchange improvements associated with the preferred alternative was designed to satisfy current FDOT and SJRWMD criteria while minimizing offsite impacts. The proposed drainage and stormwater facilities consist of six new wet detention ponds and modification of an existing wet pond. The required treatment volume and attenuation volume were based on the 24-hour, 25-year storm event for wet detention ponds. In addition to the detention system providing the capacity for the appropriate treatment volume of stormwater specified, the ponds do not drawdown more than one-half of this volume within the first 24 hours. The wet ponds proposed also meet the maximum pond depth of 12 feet with a mean

depth between 2 to 8 feet as required by the SJRWMD rules for wet detention systems. The existing wet pond located partially within and to the west of the northwest quadrant of the interchange will need to be modified and the cross drains under I-95 and Pioneer Trail will be abandoned. The off-site flow from west to east will be diverted to the north in the post-development conditions via proposed new roadside ditches and new cross culverts under I-95 and discharge to the Cypress Head to the east before ultimately discharging to Spruce Creek. The existing eastbound and westbound ditches will also be regraded to provide truck access to the FPL powerlines. **Figure 6-3** Illustrates the proposed pond sites for the project; detailed methodology, calculations and analysis are provided in the Pond Siting Report (PSR, October 2020) under separate cover.

6.1.8 Floodplain Analysis

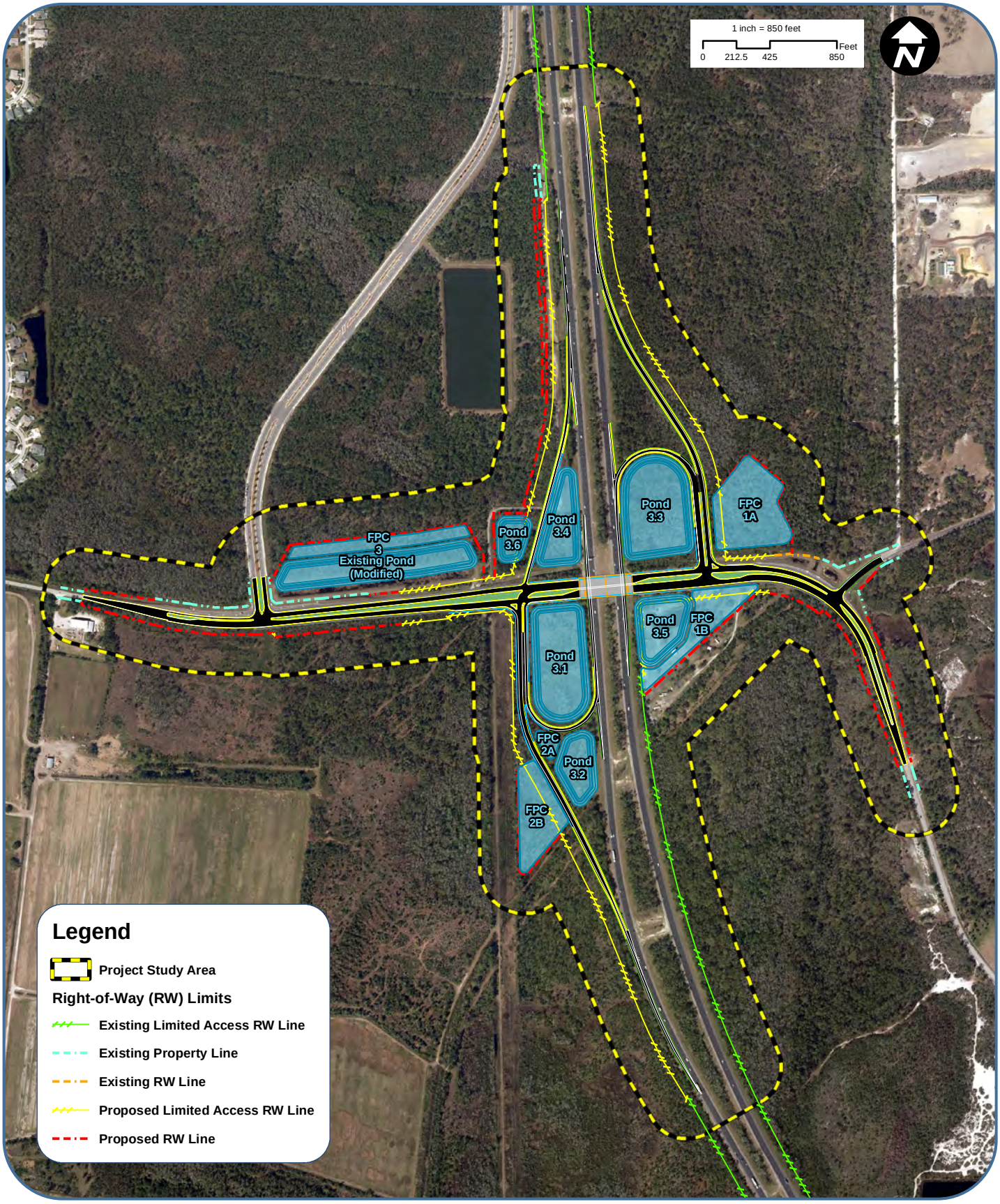
The project is within the jurisdiction of the SJRWMD. The FEMA FIRM map (Number 12127C0517J dated February 19, 2014) for Volusia County was used to identify the floodplain and floodway limits associated with this project. Portions of the project area are within the 100-year floodplain. The 1% annual chance flood (100-year or Base Flood) in Zone A has no estimated Base Flood Elevations determined. Most of the proposed alignment is located within the Special Flood Hazard Zone A. Five Floodplain Compensation (FPC) sites are proposed for volume compensation for all floodplain impacts as a result of the floodplain encroachments as shown in **Figure 6-3**.

6.1.9 Landscape Analysis

Landscape design opportunities for the proposed improvements were evaluated as part of this PD&E Study. The analysis identified existing soils and drainage patterns that would support a variety of landscape plantings. A recommended plant list was developed with consideration to local preferences of Volusia County and the City of New Smyrna Beach. Plant species were also selected based on characteristics such as appearance, size, hardiness and maintenance requirements. The detailed analysis including a landscape opportunity diagram is provided in the *Landscape Opportunity & Preservation Analysis (February 2020)* prepared for this project.

6.1.10 Design Variations and Exceptions

The PD&E preferred design concept was developed utilizing the FDM. The FDM design criteria and standards are within the desirable ranges established by the American Association of State Highway and Transportation Officials (AASHTO) and have been accepted by the Federal Highway Administration (FHWA). A design variation is required when the design deviates from the FDOT criteria. One design variation is anticipated for the proposed preferred alternative: border width. Per FDM Section 211.6, for new construction the required border width is 94-feet, which is measured


1 inch = 850 feet
0
212.5
425
850
Feet
N
FPC 3 Existing Pond (Modified)
Pond 3.6
Pond 3.4
Pond 3.3
FPC 1A
Pond 3.5
FPC 1B
Pond 3.1
FPC 2A
Pond 3.2
FPC 2B
Legend
Project Study Area
Right-of-Way (RW) Limits
Existing Limited Access RW Line
Existing Property Line
Existing RW Line
Proposed Limited Access RW Line
Proposed RW Line

from the outside edge of traveled way to the right of way line. A design variation will be required for the border width between the proposed outer connector ramp and the proposed limited access right of way in the northwest and southwest quadrants of the interchange. The border width in these two locations will need to be reduced in order to avoid impacting the utility easement that runs parallel to the interstate and located west of the proposed interchange ramps.

6.1.11 Transportation Management Plan

A Conceptual Transportation Management Plan (TMP) that will include traffic control and potential work zone management strategies will be developed during the design phase, specifically:

- Temporary Traffic Control Plan
- Transportation Operations Plan
- Public Information Plan

A Temporary Traffic Control Plan will be developed during final design of this project following current FDM and Standard plans criteria and will address:

- Lane closure analysis identifying restrictions for I-95 and Pioneer Trail travel lane closures during work hours, holidays and special events.
- Detailed traffic control schemes addressing bridge demolition and new bridge construction including detour plans.
- Temporary drainage elements that allow for continuous stormwater conveyance during construction
- Emergency Shoulder Use (ESU) for evacuation using I-95 northbound outside shoulders during all temporary traffic control phases.

The project Transportation Operations Plan will address maintaining I-95 ESU during all phases of temporary traffic control, proper signing of travel lanes and shoulders within work zone, construction traffic ingress and egress from work areas to travel lanes and coordination of crane activities with New Smyrna Beach Municipal Airport.

The project construction Public Information Plan will address coordination with the FDOT public information office to disseminate information to the traveling public regarding construction activities that impact traffic flow through the project construction limits. Information to be made available to the public will include project begin and end construction dates, lane closure dates and times, detour of I-95 or Pioneer Trail traffic for the purpose of bridge demolition or bridge beam placement, at

a minimum. Notice of construction activities will be provided to Volusia County emergency management, Volusia County School Board and Volusia County Public Works Department.

6.1.12 Constructability

This project includes a new overpass of Pioneer Trail over I-95, new interchange ramp movements, reconstruction of Pioneer Trail and the addition of auxiliary lanes along I-95 at Pioneer Trial. The alignment of Pioneer Trail allows for the construction of the southern portion (eastbound lanes) of Pioneer Trail as an urban facility (2 lanes) while maintaining existing Pioneer Trail travel. Once the southern roadway and bridge structure are complete, Pioneer Trail traffic can be diverted to the new Pioneer Trail pavement and the remaining Pioneer Trail northern portion (westbound lanes) and bridge can be completed. During bridge demolition and construction, the contractor will be required to coordinate activities with FPL and avoid the FPL transmission power lines just north of the existing Pioneer Trail bridge over I-95.

I-95 traffic can be diverted to the median of I-95, using temporary pavement, for the construction of interchange ramps and auxiliary lanes. Lane closures and detouring of I-95 traffic is expected in order to accommodate pavement construction, bridge demolition and new bridge beam placement. Lane closures for cantilever sign structures is also anticipated.

As a hurricane evacuation route, I-95 will require a ten-foot paved outside shoulder be maintained for the northbound travel direction during all phases of temporary traffic control.

6.1.13 Cost Estimates

The estimated cost of the preferred alternative is approximately $40.5 million, which includes construction, CEI and contingency costs as previously shown in Table 4-5. The construction costs were estimated using the unit costs per centerline mile for new roadway construction found in the FDOT Long Range Estimates (LRE) system. A copy of the LRE is provided in Appendix C.

6.2 SUMMARY OF ENVIRONMENTAL IMPACTS OF THE PREFERRED ALTERNATIVE

This PD&E evaluated the social, natural, cultural and physical environment as part of the engineering and environmental analysis. A Natural Resources Evaluation (NRE, October 2020) was prepared as part of this PD&E Study to document species impacts with effect determinations and wetland impacts in the project study area. The following provides a summary of the results of the environmental analyses completed for the preferred alternative.

6.2.1 Future Land Use

Based on the comprehensive plans available, the area surrounding the proposed interchange is planned for the following future land uses:

- City of Port Orange (north side of Pioneer Trail, east and west of I-95) - mixed-use center, rural transition, suburban residential, and conservation.
- City of New Smyrna Beach (north side of Pioneer Trail, east and west of I-95) – sustainable community development, low density residential, conservation, agricultural and residential estate.
- Volusia County – North side of Turnbull Bay Road, east of Pioneer Trail – rural, conservation, environmental systems corridor

Based on the type and density of land uses planned along Pioneer Trail (residential communities along with supporting commercial and retail uses), the project is anticipated to benefit the surrounding area with improved access and additional travel options provided by the new interchange and is expected to be compatible with the proposed nearby land uses. The zoning and land use development codes implemented by the Cities and County in the project's jurisdiction have development requirements including mitigation measures that will be incorporated into the project intended to mitigate any potential incompatibility.

6.2.2 Cultural Resources

A *Cultural Resource Assessment Survey (CRAS, May 2019 & CRAS Update, August 2020)* was completed as part of this PD&E Study to identify cultural resources within the project APE. The archaeological survey included the excavation of 58 shovel tests within the project APE. No artifacts were recovered, and no archaeological sites or occurrences were identified within the APE. No further archaeological survey was recommended in support of the proposed project.

The architectural survey resulted in the identification and evaluation of two previously recorded historic linear resources within the I-95 at Pioneer Trail APE: Fort Kingsbury to New Smyrna Road (8VO07656) and Pioneer Trail (8VO07660). These resources follow the same route in the project APE. Based on the results of the current survey, the segments of resources 8VO07656 and 8VO07660 within the I-95 at Pioneer Trail APE are locally significant under Criterion A but lack the necessary historic integrity to convey their significance. Therefore, both are recommended ineligible for listing in the NRHP. The FDOT submitted the CRAS report along with the District's opinion that the proposed project will have no effect on NRHP-listed or -eligible historic properties to the State Historic Preservation Office (SHPO). SHPO issued their concurrence on July 1, 2019. As part of the CRAS Addendum prepared in August 2020, one historic-aged bridge was

identified within the APE. FDOT bridge number 790066 over I-95 (Pioneer Trail/ CR4118 overpass) is a post-1945 concrete bridge excluded from Section 106 consideration, and as such, the bridge was not recorded or evaluated in the present study. No additional architectural history survey was recommended.

6.2.3 Wetlands

The NRE report prepared for this project identified a total of 17 wetlands (46.96 acres) and eight other surface waters (5.23 acres) that may be impacted by the proposed interchange project; **Table 6-2** provides a summary of the potential impacts.

Table 6-2: Wetland and Surface Water Impacts

Wetland or Surface Water Number (see Map, Figure 2-14)	Habitat Type	Wetland or Surface Water Impacts (Acres)
Wetlands		
1	Hydric Pine Flatwoods	1.25
2	Wetland Forested Mixed	6.96
3	Wet Prairie	0.34
4	Wet Prairie	2.62
5	Hydric Pine Flatwoods	5.23
6	Wetland Forested Mixed	10.08
7	Wetland Forested Mixed	1.17
8	Hydric Pine Flatwoods	1.38
9	Wetland Forested Mixed	11.46
10	Hydric Pine Flatwoods	1.63
11	Cypress	0.00
12	Wetland Forested Mixed	0.07
13	Wetland Forested Mixed	2.52
13A	Hydric Pine Flatwoods	0.14
13B	Hydric Pine Flatwoods	0.12
14	Hydric Pine Flatwoods	1.69
15	Wet Prairie	0.00
16	Wetland Forested Mixed	0.00
17	Cypress	0.29
18	Wet Prairie	0.005
	Wetlands Subtotal	**46.96**

Table 6-2: Wetland and Surface Water Impacts

Wetland or Surface Water Number (see Map, Figure 2-14)	Habitat Type	Wetland or Surface Water Impacts (Acres)
Surface Waters		
1	Stormwater / Drainage Features	2.15
2	Stormwater / Drainage Features	0.00
3	Ditch / Swale	0.19
4	Ditch / Swale	0.53
5	Ditch / Stormwater / Drainage Features	0.81
6	Stormwater / Drainage Features	0.00
7	Stormwater / Drainage Features	0.65
8	Ditch / Swale	0.65
9	Ditch / Swale	0.23
10	Ditch / Swale	0.00
11	Ditch / Swale	0.02
	Surface Waters Subtotal	**5.23**
	Wetlands and Surface Waters Total	**52.19**

The Uniform Mitigation Assessment Methodology (UMAM) was developed to establish a consistent method of assessment to determine the amount of mitigation needed to offset adverse impacts to wetlands. It is designed to assess the functions provided by wetlands, the amount that those functions are reduced by a proposed impact, and the amount of mitigation necessary to offset these functional losses. This method is also used to determine the degree of improvement in ecological value created by mitigation activities. A UMAM assessment of the surface water impacts was not undertaken as impacts to these systems do not typically require mitigation. **Table 6-3** provides the existing score of each wetland found within the project corridor and estimates a total functional loss of 27.53 units from the preferred alternative.

Table 6-3: UMAM Analysis Results

Wetland Number	Habitat Type	UMAM Components			UMAM Score	Impact (Ac)	Functional Loss
		Location & Support	Water Environment	Vegetation			
1	Hydric Pine Flatwoods	3	7	7	0.57	1.25	0.71
2	Wetland Forested Mixed	3	7	8	0.60	6.96	4.18
3	Wet Prairie	3	6	6	0.50	0.34	0.17
4	Wet Prairie	3	6	6	0.50	2.62	1.31
5	Hydric Pine Flatwoods	3	7	7	0.57	5.23	2.98
6	Wetland Forested Mixed	3	7	8	0.60	10.08	6.05
7	Wetland Forested Mixed	3	7	8	0.60	1.17	0.70
8	Hydric Pine Flatwoods	3	7	7	0.57	1.38	0.79
9	Wetland Forested Mixed	3	7	8	0.60	11.46	6.88
10	Hydric Pine Flatwoods	3	7	7	0.57	1.63	0.93
12	Wetland Forested Mixed	3	7	8	0.60	0.07	0.04
13	Wetland Forested Mixed	3	7	8	0.60	2.52	1.51
13A	Hydric Pine Flatwoods	3	7	7	0.57	0.14	0.08
13B	Hydric Pine Flatwoods	3	7	7	0.57	0.12	0.07

Table 6-3: UMAM Analysis Results

Wetland Number	Habitat Type	UMAM Components			UMAM Score	Impact (Ac)	Functional Loss
		Location & Support	Water Environment	Vegetation			
14	Hydric Pine Flatwoods	3	7	7	0.57	1.69	0.96
17	Cypress	3	7	8	0.60	0.29	0.17
18	Wet Prairie	3	6	6	0.50	0.005	0.00
					Total	**46.96**	**27.53**

Mitigation options to offset wetland impacts may include the purchase of credits from a mitigation bank or, the preservation, enhancement or creation of similar type systems sponsored either directly by FDOT or the SJRWMD FDOT Mitigation plan. The study area is wholly within the Daytona-St. Augustine 8-digit Hydrologic Unit Code (HUC) 0308201. At the time of this PD&E study, there are two permitted mitigation banks that meet both state and federal criteria to offset impacts associated with this project. FDOT will prepare a mitigation plan that meets the regulatory goals for both the federal and state programs during permitting. In accordance with the State of Florida's established cumulative impact requirements (subsections 373.414(8)(a), F.S., 40C-4.301 (3), F.A.C., and 12.28, ERP A.H.), the wetland impacts associated with this project will be offset within the same regulatory mitigation basin (Halifax River Basin) therefore meeting cumulative impact criteria.

6.2.4 Protected Species and Habitat

The NRE prepared for this project analyzed the potential for six federally protected animals and three plants to occur within the study area. A "May Affect, but not Likely to Adversely Affect" determination was made for four of the animal species (eastern indigo snake, Florida scrub-jay, bald eagle, and wood stork) and for two of the plant species (Rugel's pawpaw and Okeechobee gourd). A "no effect" determination was made for the Everglade snail kite, red-cockaded woodpecker and fragrant prickly apple. The project study area also potentially contains nine state protected animals and 32 state protected plants. No adverse effects are anticipated with any state protected animal or plant. Agency coordination consisted of letters to the US Fish and Wildlife Service (USFWS) North Florida Ecological Services Office and to the Florida Fish and Wildlife Conservation Commission (FWC) Office of Conservation Planning Service,

requesting concurrence with FDOT's determinations of effect for listed species involvement within the project study area. FWS concurred with FDOT's effect determinations on March 26, 2020, and again in September 2020 upon submittal of the final NRE.

Avoidance and minimization measures are intended to avoid and/or reduce the adverse impacts of an action to wildlife and their habitat. In the case of this study, the NRE analysis determined that no federally or state listed wildlife species were identified within the project area, and limited suitable habitat is available. The preferred alternative is following the avoidance and minimization procedures to limit the footprint of the project and therefore the potential impacts to habitat. Primarily this involves impacts to wetlands that could serve as foraging habitat for wading birds including the wood stork, though there is no shortage of available foraging habitat in the surrounding area. Wetland mitigation for unavoidable impacts will be provided to satisfy the state and federal regulatory program guidelines which in turn can provide habitat suitable for wood stork.

6.2.5 Essential Fish Habitat

The proposed I-95 Interchange at Pioneer Trail does not involve Essential Fish Habitat, thus impacts to this resource are not anticipated.

6.2.6 Critical Habitat Assessment

The project corridor was evaluated for the occurrence of Critical Habitat as defined by the ESA-1973, as amended, and 50 CFR Part 424. The FWS has the authority, as a federal agency, to protect Critical Habitat from destruction or adverse modification of the biological or physical constituent elements essential to the conservation of listed species. Critical Habitat is defined as the specific areas within the geographical area occupied by a species on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection. No Critical Habitat for any federally listed species was identified within the project corridor.

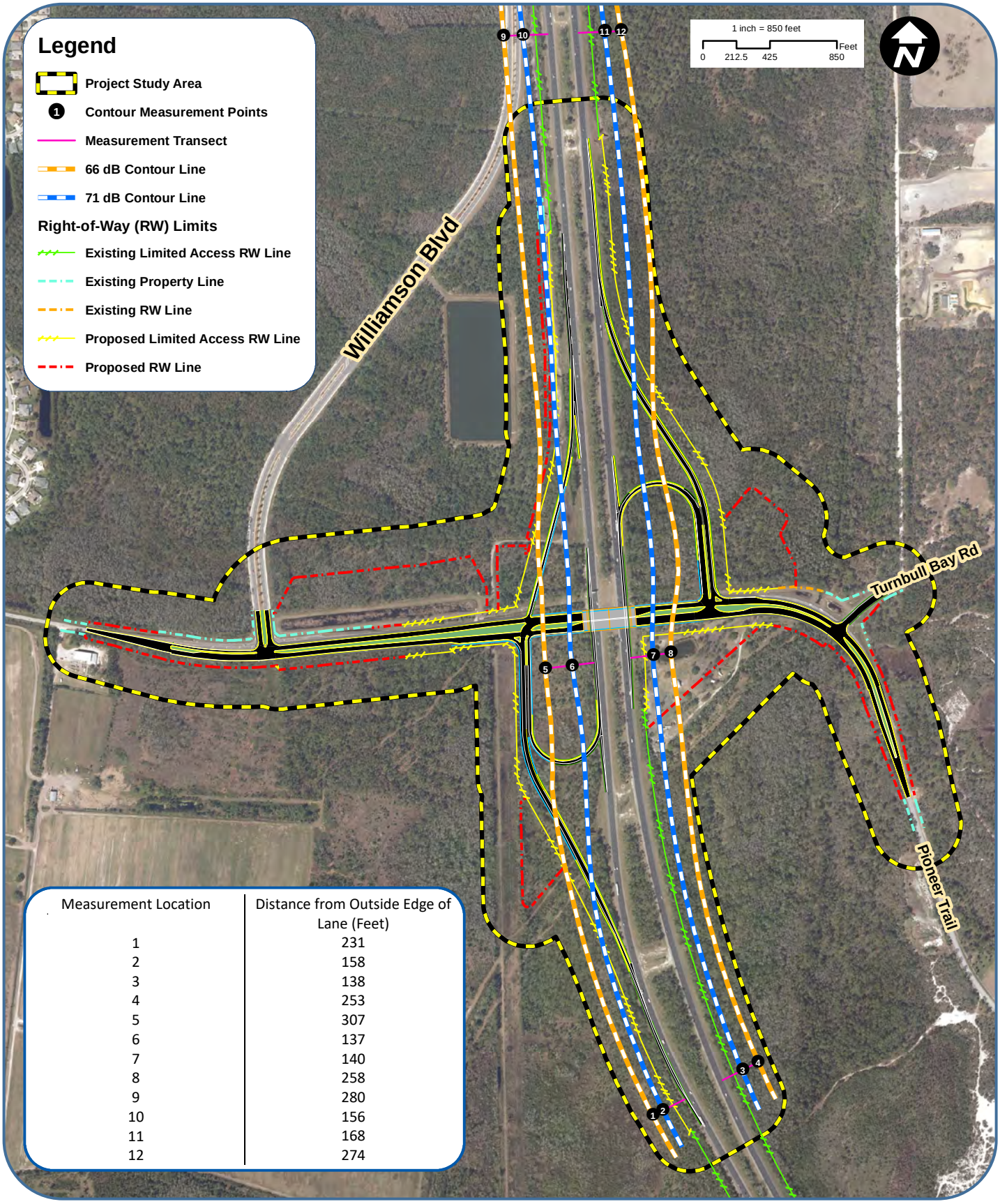
6.2.7 Highway Traffic Noise

A *Noise Study Technical Memorandum (January 2020),* available in the project file, was prepared to evaluate potential noise impacts associated with the project. The existing land uses in the study area fall under FHWA Noise Abatement Criteria (NAC) land use activity categories F (industrial and retail facilities) and G (undeveloped lands). These categories have no exterior uses and are not considered noise sensitive, and thus do not have any noise abatement criteria.

For the purposes of planning, noise contours were developed for future land uses through the traffic noise modeling (TNM) program. To predict the noise contours adjacent to the roadway, traffic data was utilized from the *Project Traffic Analysis Report* prepared for this PD&E study. The data used was the 2045 Peak Volumes for the proposed build alternatives and included traffic on the mainline of I-95, the proposed on and off ramps, and Pioneer Trail. 66 dB(A) and 71 dB(A) noise contour lines, which represent the NAC for Activity Categories B/C (residential/recreation) and E (Hotels, motels, offices, restaurants, etc.), respectively, were depicted on a noise analysis map as shown on **Figure 6-4**. For the preferred alternative, the 66 dB(A) line ranges from 231 feet to 307 feet from the edge of pavement on the westbound side, and from 253 feet to 274 feet on the eastbound side. The 71 dB(A) line ranges from 137 feet to 158 feet from the edge of pavement on the westbound side, and from 138 feet to 168 feet on the eastbound side. Since there are no noise sensitive areas or noise receptors within the project study area, noise impacts were not analyzed, and no noise abatement measures were considered.

6.2.8 Contamination

The *Contamination Screening Evaluation Report (CSER, May 2019, Rev. January 2020)* assessed the risk of encountering petroleum or hazardous substance contamination of soil, groundwater, surface water, or sediment that could adversely affect this project. The CSER identified five sites (1 Medium Risk and 4 Low Risk) with potential to have contamination impacts to this project. The five site locations were previously listed in **Table 2-21** and shown on **Figure 2-15.** Based on the proposed interchange and pond configuration, it is anticipated that the preferred alternative may potentially impact at least four of the sites (1 Medium Risk and 3 Low Risk). Level II Impact to Construction Assessment (ICA) during the design phase appears warranted for the Medium Risk site (Tornelli Property) located at 3160 Pioneer Trail. Additionally, the USGS wells in the southeast quadrant of the proposed interchange should be investigated to determine if they still exist and if they will need to be protected or accommodated during construction activities.



Measurement Location	Distance from Outside Edge of Lane (Feet)
1	231
2	158
3	138
4	253
5	307
6	137
7	140
8	258
9	280
10	156
11	168
12	274

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APPENDICES

(under separate cover)

APPENDIX A
TYPICAL SECTION PACKAGE

APPENDIX B
CONCEPT PLANS

APPENDIX C
LONG RANGE ESTIMATES (LRE)