PRELIMINARY ENGINEERING REPORT

Florida Department of Transportation

District 5

LPGA Boulevard Project Development and Environment (PD&E) Study

From US 92 to Williamson Boulevard

Volusia County, Florida

Financial Management Number: 448456-1

ETDM Number: 14332

August 16, 2023

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022, and executed by the Federal Highway Administration and FDOT.



LPGA BOULEVARD FROM US 92 (SR 600) TO WILLIAMSON BOULEVARD PD&E STUDY

FPID: 448456-1-22-01

Preliminary Engineering Report

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August 16, 2023 **DRAFT**

FDOT

PROFESSIONAL ENGINEER CERTIFICATION

PRELIMINARY ENGINEERING REPORT

Project: LPGA Boulevard Project Development and Environment (PD&E) Study

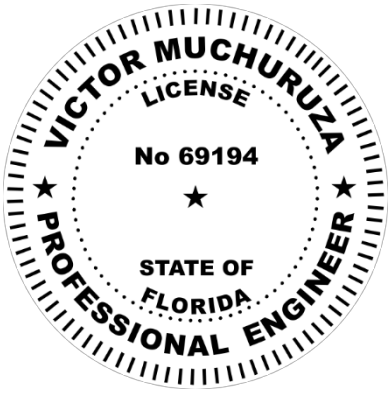
ETDM Number: 14332

Financial Project ID: 448456-1-22-01

Federal Aid Project Number: D521-091-B

This preliminary engineering report contains engineering information that fulfills the purpose and need for the LPGA Boulevard Project Development and Environment Study from US 92 to Williamson Boulevard 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 HDR, and that I have prepared or approved the evaluation, findings, opinions, conclusions, or technical advice for this project.



This item has been digitally signed and sealed by Victor Muchuruza, PE on the date adjacent to the seal.

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Appendix I. Constructability and Maintenance of Traffic

List of Acronyms

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APE	Area of Potential Effect
APS	Accessible Pedestrian Signal
ASWT	Average Seasonal Water Table
ATSPM	Advanced Traffic Signal Performance Measures
BEBR	Bureau of Economic and Business Research
BFE	Base Flood Elevation
BMP	Best Management Practices
BPAC	Bicycle/Pedestrian Advisory Committee
CAC	Citizen Advisory Committee
CAP-X	Capacity Analysis for Planning of Junctions
CAR	Crash Analysis Reporting
CCTV	Closed-circuit television
CD	Collector-Distributor
CE	Categorical Exclusion
CFRPM	Central Florida Regional Planning Model
CRAS	Cultural Resource Assessment Survey
CSER	Contamination Screening Evaluation Report
DCIC	District Contamination Impact Coordinator
DDHV	Directional Design Hour Volume
DDI	Diverging Diamond Interchange
DIRC	District Interchange Review Coordination
DMS	Dynamic Message Signing
EEL	Environmental Endangered Lands
EFH	Essential Fish and Habitat
ERP	Environmental Resource Permit
ETDM	Efficient Transportation Decision Making
FDM	FDOT Design Manual
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FGDL	Florida Geographical Database Library
FHWA	Federal Highway Administration
FIB	Florida I-Beam
FOC	Fiber Optic Cable
FPC	Floodplain Compensation
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
HCM	Highway Capacity Manual
HDPE	High Density Polyethylene
HOA	Homeowners Association
ICE	Intersection Control Evaluation
IMR	Interchange Modification Report
ITS	Intelligent Transportation Systems
LED	Light-Emitting Diode
LiDAR	Light Detection and Ranging
LOS	Levels of Service
LRE	Long-Range Estimating System
LRTP	Long Range Transportation Plan
MANLAA	May Affect, Not Likely to Adversely Affect
MOT	Maintenance of Traffic
MPH	Miles per Hour
MSE	Mechanically Stabilized Earth
MVMT	Million Vehicle Miles Traveled
NAC	Noise Abatement Criteria
NAVD	North American Vertical Datum
NBI	National Bridge Inventory
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service

NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NRE	Natural Resources Evaluation
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWI	National Wetland Inventory
O-D	Origin-Destination
OEM	Office of Environmental Management
OFW	Outstanding Florida Water
PAG	Project Advisory Group
PD&E	Project Development and Environment
PIP	Public Involvement Plan
PSR	Pond Siting Report
PTAR	Project Traffic Analysis Report
PTAR	Project Traffic Analysis Report
QLOS	Quality/Level of Service
RCUT	Restricted Crossing U-Turn
RHPZ	Riparian Habitat Protection Zone
SHS	State Highway System
SIS	Strategic Intermodal System
SJRWMD	St. Johns River Water Management District
SPICE	Safety Performance of Intersection Control Evaluations
SPUI	Single Point Urban Interchange
SR	State Road
SUE	Subsurface Utility Engineering
TAZ	Traffic Analysis Zone
TBSF	Tiger Bay State Forest
TCC	Technical Coordinating Committee
TIA	Traffic Impact Analysis
TIP	Transportation Improvement Program
TMV	Turning Movement Volume
TSM&O	Transportation Systems Management and Operations
TTC	Temporary Traffic Control
UAO	Utility Agency/Owners
UMAM	Uniform Mitigation Assessment Method
USCG	United States Coast Guard
USGS	United States Geological Survey
VOTRAN	Volusia County Transit System
VPHPL	Vehicles Per Hour Per Lane
VVH	Verified Vertical and Horizontal
WAN	Wide Area Network
WMA	Wildlife Management Area
WQIE	Water Quality Impact Evaluation

1.0 Project Summary

This introductory Section summarizes the PD&E study being conducted for the proposed project by defining the project, explaining why the project is needed, briefly describing the alternative evaluation conducted, and providing a description of the Preferred Alternative.

1.1 Project Description

This project involves widening of LPGA Boulevard from a two-way, two-lane roadway to a four-lane and six-lane divided roadway with raised median, and addition of bicycle and pedestrian facilities in the form of shared-use paths from US 92 (SR 600) to Williamson Boulevard, a distance of approximately 6.2 miles, in the City of Daytona Beach, Volusia County. The project also includes modifications to the LPGA Boulevard/ Interstate-95 (I-95) interchange (Exit 265) to a Signalized Turbine Interchange concept, replacement and widening of the Tomoka River Bridge (Bridge Number 794038) from two lanes to six lanes, addition of stormwater ponds, and access management changes as the result of roadway widening. The Tomoka River at the project area is not navigable.

The existing LPGA Boulevard is a two-lane rural roadway from US 92 to Tomoka Farms Road (east of the Tomoka River), a four-lane suburban roadway from Tomoka Farms Road to the I-95 Southbound Ramps, and a six-lane suburban roadway from the I-95 Southbound Ramps to Williamson Boulevard. There are 13 intersections along the PD&E Study limits including ramp terminals at the I-95 interchange, nine of which are signalized.

LPGA Boulevard is a county road maintained by Volusia County, except between Tomoka Farms Road and Technology Boulevard/Outlet Boulevard where FDOT maintains the limited access right of way to the I-95 interchange. Most of LPGA Boulevard does not have paved shoulders and there are only limited areas of sidewalks between Tymber Creek Road and Williamson Boulevard.

I-95 is a six-lane, Strategic Intermodal System (SIS) facility. The I-95 interchange at LPGA Boulevard is a partial cloverleaf interchange, or parclo interchange, with six on and off ramps. This interchange is located approximately 3.5 miles north of the I-95 and US 92 interchange and approximately 2.6 miles south of the I-95 and State Road (SR) 40 interchange.

Both LPGA Boulevard and I-95 are designated as emergency evacuation routes.

Figure 1-1 shows the project location map.

1.2 Project Purpose and Need

1.2.1 Purpose

The purpose for improving LPGA Boulevard from US 92 to Williamson Boulevard is to accommodate future transportation demand from approved developments and enhance safety for the corridor and the I-95 interchange.



Figure 1-1. Project Location Map

1.2.2 Need

The need for the project is based on existing and future transportation demand and safety along the LPGA Boulevard corridor and at the interchange area.

1.2.2.1 Transportation Demand

LPGA Boulevard from US 92 to Williamson Boulevard is currently operating near capacity. A review of existing (2021) traffic volumes in the project area showed an Annual Average Daily Traffic (AADT) of 12,000 vehicles per day for LPGA Boulevard from US 92 to Tomoka Farms Road and an AADT of up to 44,000 vehicles per day from Tomoka Farms Road through the I-95 interchange to Williamson Boulevard. Large, approved developments and active construction projects (such as LPGA Preserve, Indian Road Warehouse, and Tomoka Village), in combination with additional planned growth in the vicinity of LPGA Boulevard, are expected to increase traffic to levels that would exceed maximum service volumes for two-lane and six-lane, non-state, signalized roadways per the 2023 FDOT Quality/Level of Service (QLOS) Handbook. Future (2050) travel demands along LPGA Boulevard are expected to double or triple in some locations. The AADT between US 92 and Tymber Creek Road is expected to reach 36,000 vehicles per day. Heavy volumes are expected east of the I-95 interchange where AADT will reach 78,000 vehicles per day in 2050. These volumes are expected to significantly exceed the existing roadway capacity and cause LPGA Boulevard to operate at LOS F.

The target LOS for I-95 and LPGA Boulevard is LOS D per the FDOT Level of Service Policy (Topic Number 000-525-006) and LOS E for Volusia County. The I-95 freeway segment approaching LPGA Boulevard currently functions at LOS D or better. Based on anticipated growth, the quality of traffic flow on I-95 and LPGA Boulevard in the study area is expected to decline in future years. Without improvements to the LPGA Boulevard corridor, the intersections on LPGA Boulevard as well as the I-95 off-ramps are anticipated to operate over capacity in the future resulting in longer travel times to reach workplaces, schools, and businesses.

1.2.2.2 Safety

A review of crash data reported in the project study area for the five-year period from January 1, 2015 to December 31, 2019 indicated there were 1,354 crashes; an average of 270 crashes per year. The most predominant crash type reported for the overall study area was rear-end crashes (37%). There were 11 reported fatal crashes, 414 injury crashes, and 929 property-damage-only crashes reported for the overall study area.

The highest numbers of crashes correspond to the locations with deficient LOS. These include the I-95 northbound off-ramp to LPGA Boulevard with crashes during the intersection's right turn on red condition; the I-95 southbound loop on-ramp from LPGA Boulevard westbound; and the eastbound approach of LPGA Boulevard to Williamson Boulevard. There are also high numbers of crashes at the intersections and uncontrolled access points along LPGA Boulevard. Most of LPGA Boulevard lacks pedestrian and bicycle facilities, which creates unsafe conditions for nonmotorized users. Between 2015 and 2019 six pedestrian/bicycle crashes were reported within the PD&E Study area.

A review of the project study area's crash rates calculated in crashes per million vehicle miles traveled showed that LPGA Boulevard from I-95 Southbound off ramp to I-95 Northbound off ramp has the highest crash rate for the study area with a rate of 3.42. This crash rate is lower than the statewide average crash rate (3.654) for similar facilities. The crash rates for the remaining sections of LPGA Boulevard range between 0.11 to 0.97. The section of I-95 south of LPGA Boulevard has the highest crash rate on I-95 sections is 1.18 which is higher than the statewide average crash rate (0.976) for similar facilities. I-95 section north of LPGA Boulevard has a crash rate of 0.50. The intersections that have crash rates higher than the statewide average rates for similar facilities are US 92 (0.69), Tournament Drive (1.17), Tomoka Farms Road (0.52) and Williamson Boulevard (0.74). The corresponding statewide averages for these intersections are 0.333, 0.367, 0.367, and 0.623.

Without improvements to the LPGA Boulevard corridor and at the I-95 interchange, the number of crashes is expected to continue to rise as future traffic volumes increase, compromising the safety of both vehicular and nonmotorized users.

1.2.3 Project Status

The project is within the jurisdiction of the River to Sea Transportation Planning Organization (R2CTPO), which covers Volusia County and parts of Flagler County. The proposed improvements for this project are listed in the R2CTPO Connect 2045 Long Range Transportation Plan (LRTP) and Fiscal Year (FY) 2022/23 to FY 2026/27 Transportation Improvement Program (TIP). Currently the PD&E and Design phases for this project are funded in FY 2021/2022 FDOT Work Program. The right of way phase is partially funded in FY 2026/2027. The construction phase is not currently funded. **Table 1-1** summarizes the funding status from the FDOT Work Program for this project.

Table 1-1. Project Funding Status in the FDOT Work Program

Phase	Funding	Amount
PD&E Study	Ongoing: Completion Fall 2023	$3.7 Million
Design*	Funded: Spring 2022	$7 Million
Right of Way**	Partially Funded: 2027	$4 Million
Construction	Unfunded	-

*Design is being conducted concurrently with the PD&E Study
**All proposed improvements are expected to be within the existing right of way except stormwater management ponds between Tomoka Farms Road and Tymber Creek Road. Actual cost of stormwater management ponds will be determined at the conclusion of PD&E Study

1.3 Commitments

The FDOT commits to implementing the following measures during the final design, permitting, and construction phases of this project:

- FDOT will adhere to the most current version of USFWS Standard Protection Measures for the Eastern Indigo Snake during construction and inspect potential eastern indigo snake refugia prior to construction.
- If the listing status of the tri-colored bat is elevated by USFWS during to Threatened or Endangered prior to construction and the Preferred Alternative is located within the consultation area, FDOT commits to initiating consultation with the USFWS to determine the appropriate survey methodology and to address USFWS regulations regarding the protection of the tri-colored bat.
- Florida black bear regulations as documented in the Florida Black Bear Management Plan, including the Bear Conservation Rule and the Bear Feeding Rule, will be followed during the construction phases of the project.
- FDOT will survey for the presence of the hooded pitcher plant within the project area prior to the construction phase and coordinate the results with the Florida Department of Agriculture and Consumer Services (FDACS) regarding this species to identify opportunities to reduce impacts to it.
- Wildlife shelves will be included in the bridge replacement.
- If the listing status of the monarch is elevated to Threatened or Endangered, FDOT commits to re-initiating consultation with the USFWS to determine the appropriate measures regarding the protection of the Monarch butterfly.

Additional commitments may be added as the Study progresses.

1.4 Alternatives Analysis Summary

An alternatives analysis was conducted for typical sections, interchange concepts, and intersection concepts within the PD&E Study limits. The alternative analysis was conducted in a two-phase approach. Phase 1 was initial planning (sketch level planning) where different improvement concepts and solutions were evaluated with respect to several measures including purpose and need, costs, constructability, and potential environmental fatal flaws. Concept development was iterative and considered various typical sections, interchange, and intersections and their abilities to address the project needs. Phase 2 was a detailed evaluation of the concepts that passed Phase 1 with respect to engineering, traffic, and environmental measures. Specific mitigation measures for potential environmental impacts were determined during the Phase 2 evaluation and documented in the technical reports.

The proposed concepts from Phase 2 became the Build Alternative. An evaluation matrix was prepared to compare the No-Build Alternative and Build Alternative with respect to traffic, environmental and cost measures.

1.4.1 No-Build Alternative

The No-Build Alternative (No-Action Alternative) maintains the existing roadway and loop ramp interchange configuration for LPGA Boulevard. The advantages of the No-Build Alternative include no new expenditures for roadway construction and right of way acquisition and no

impacts to the environment. The disadvantages of the No-Build Alternative are not addressing the purpose and need for the project and hence the increase in user delays and crashes associated with congestion and the growth of travel demand. Additionally, the No-Build Alternative does not provide accommodation for users that are walking or biking along LPGA Boulevard.

1.4.2 Typical Sections

Two project segments were identified based on land use context and projected traffic volumes:

- Segment 1: From US 92 to Tymber Creek Road
- Segment 2: From Tymber Creek Road to Williamson Boulevard

The alternatives analysis was conducted for each segment and associated intersections. To accommodate the future travel demand projected to use LPGA Boulevard in the design year (2050), Segment 1 will require four lanes and Segment 2 will require six lanes with auxiliary turn lanes between some intersections. Typical section options were later developed using these lane requirements. Segment 1 typical section options included a curb and gutter section and a high-speed urban (with flush shoulder treatment) section. The curb and gutter section was chosen for detailed evaluation because it is consistent with the future land use and the suburban residential (C3R) roadway context classification. The Segment 2 typical section analysis concentrated on intersection and interchange improvements to add additional turn lanes because the operational efficiency and safety of this segment are influenced by the intersections (including ramp terminal intersections) which are very closely spaced. The curb and gutter typical section was chosen for detailed evaluation.

1.4.3 Interchange Concept

The interchange alternatives analysis was conducted simultaneously with the typical section analysis. The interchange control options that would provide better coordination of traffic progression along LPGA Boulevard are those which have a fewer number of signals and have two-phase signal operations at the ramp terminals. As a result, innovative interchange options such as Diverging Diamond Interchange (DDI), Signalized Turbine Interchange, Displaced Left Diamond Interchange Concept, Grade Separated Modified Diamond Interchange, and an Echelon Corridor were initially considered. Images and descriptions of these options are shown in **Section 5.0** (Alternatives Analysis) of this report. Traditional options such as Parclo, Full Cloverleaf, Diamond, and Single Point Urban Interchange (SPUI) were dismissed because of their inability to serve projected travel demand volumes. FDOT chose the Signalized Turbine Interchange concept for detailed evaluation in the Build Alternative. The Signalized Turbine Interchange concept spreads the traffic across westbound and eastbound LPGA Boulevard and, as a result, it moves high volumes and provides enough queue storage between signalized ramp terminals. This concept would provide better safety and operational benefits than the other concepts during the design year (2050). Additionally, the Signalized Turbine Interchange can be easily expanded (by adding lanes on the bridges) if necessary, in the future (beyond 2050). The analysis of the proposed interchange concepts is documented in the Interchange Modification

Report (IMR) which received the Federal Highway Administration's (FHWA's) determination of safety, operational, and engineering acceptability in June 2023.

1.4.4 Intersection Concepts

The intersection control evaluation (ICE) was conducted to analyze the intersections in the project area. The ICE analysis included completing Stage 1 screening using the Capacity Analysis for Planning of Junctions (CAP-X) and the Safety Performance of Intersection Control Evaluations (SPICE). The Stage 1 evaluation recommended the traffic signal control at US 92, Tournament Drive, Tymber Creek Road, Champions Drive, Tomoka Farms Road, Outlet Boulevard/Technology Boulevard and Williamson Boulevard intersections. Additionally, the ICE analysis recommended innovative intersection concepts at Tomoka Farms Road and Outlet Boulevard/Technology Boulevard, however after coordination with local agency and the public the innovative concepts were dropped from further considerations. Roundabouts were recommended at Welshinger-Butler Circle South, Welshinger-Butler Circle North, and International Golf Drive/International Tennis Drive intersections.

1.4.5 Evaluation Matrix

The comparatives analysis included the purpose and need (traffic measures), cost, and environmental evaluation measures for Build and No-Build Alternatives as presented in **Table 5-6**. The Build Alternative addressed the purpose and need for the project, but it may have potential environmental impacts. The No-Build Alternative did not show any environmental impacts. However, the No-Build Alternative cannot accommodate future traffic demand and improve safety along LPGA Boulevard and the I-95 interchange. The estimated construction cost of the Build Alternative is $260.667 Million.

1.4.6 Summary of Public Involvement

The alternatives analysis and selection of the Preferred Alternative considered input and feedback received from agency coordination and public engagement, including the Efficient Transportation Decision Making (ETDM) process, meetings with local governments, and comments received in the Alternatives Public Open House.

1.5 Description of the Preferred Alternative

The Build Alternative was selected to be the Preferred Alternative because it addresses the purpose and need for the project by adding capacity to LPGA Boulevard and the I-95 interchange thereby accommodating future (design year 2050) traffic growth in the project area. The Build Alternative improves traffic flow by accommodating high volumes of traffic with the addition of new lanes, changes to the intersection and interchange geometry, and reduction of conflict points at the I-95 interchange. Furthermore, the Build Alternative adds shared-use paths on both sides of the road that enhance safety and travel comfort for pedestrians and bicyclists using this corridor.

The Preferred Alternative includes widening of LPGA Boulevard, adding shared-use paths on both sides of the road, modifying the I-95 interchange to a Signalized Turbine Interchange, replacing the Tomoka River bridge, and modifying intersection configurations. The additional roadway capacity (in terms of widening and intersection/interchange improvements) and shared-use paths are expected to accommodate future travel demand, including pedestrians and bicyclists. A high-resolution of the rendered concept layout is shown in **Appendix A** and conceptual roadway plans are shown in **Appendix B.**

The details of the approved Preferred Alternative typical cross sections are shown in **Appendix C.** The cross sections are generally described depicted in **Figure 1-2** and **Figure 1-3** and as follows:

- From US 92 to Tymber Creek Road: Four-lane divided roadway within the existing 200' right of way, except at a future location of Dunn Avenue extension intersection where minor corner clip (4,050 square feet) will be needed to accommodate a northbound right turn lane. This segment includes two 12' lanes in both directions, a variable width (40' - 70') median, curb and gutter, and 14' shared-use paths on both sides of the roadway.
- From Tymber Creek Road to Williamson Boulevard, including the Tomoka River Bridge: Six-lane divided roadway within the existing 185' to 320' right of way, except at two locations where minor right of way (2,250 square feet) is needed to connect the shared-use path to the existing sidewalk and corner clip at Williamson Boulevard to install a signal mast arm. The segment includes three 11' lanes in both directions (not including auxiliary or turn lanes), a variable median width (30' minimum), curb and gutter, and 12' shared-use paths on both sides of the roadway. LPGA Boulevard bridges over I-95 has four 11' lanes (the additional lane will be stripped out for future use) and a 12' shared-use path (**Figure 1-4** and **Figure 1-5**). The I-95 bridges have been located such that future widening beyond these improvements (if warranted by traffic demand) can be accommodated without reconstruction of the embankments.

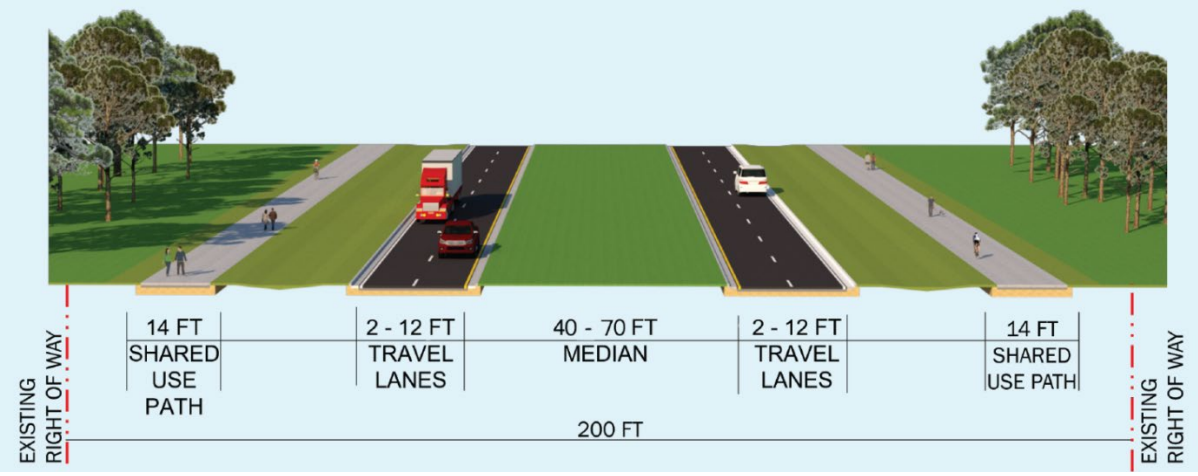


Figure 1-2. Typical Section between US 92 and Tymber Creek Road

The Preferred Alternative will replace the existing Tomoka River bridge with a 340-foot long, 4 spans bridge that is raised to improve water flows. The bridge will carry a 6-lane divided roadway composed of three 11' lanes in both directions (not including auxiliary turn lanes), 26.5' median and 12' shared-use path on both sides of the roadway, barrier-separated from the travel lanes. All proposed bridge improvements will be within the existing right of way. The vertical profile of the bridge will accommodate bridge drainage and the 6' of clearance to the wildlife paths located on both sides of the river channel.

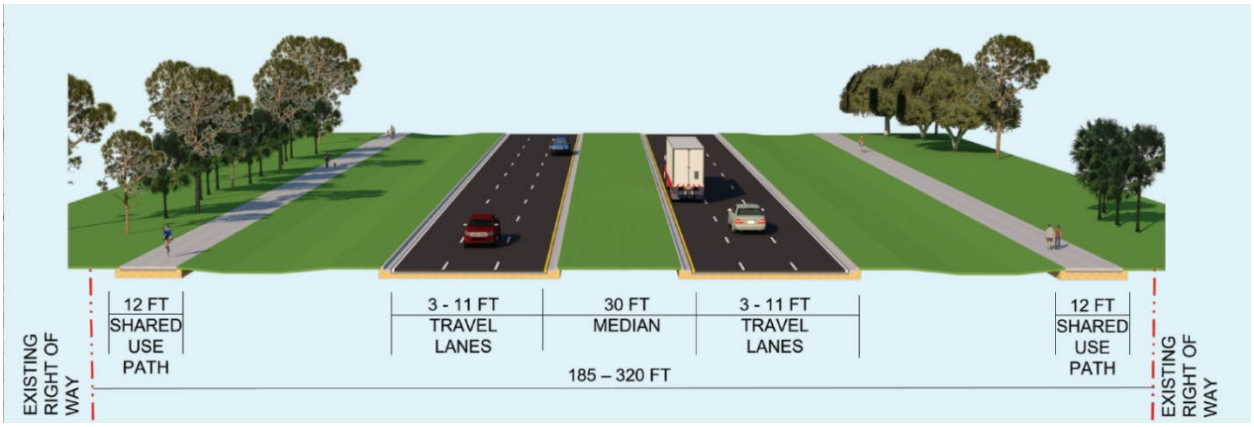


Figure 1-3. Typical Section between Tymber Creek Road and Williamson Boulevard



Figure 1-4. Conceptual View of LPGA Boulevard at I-95 Westbound Bridge

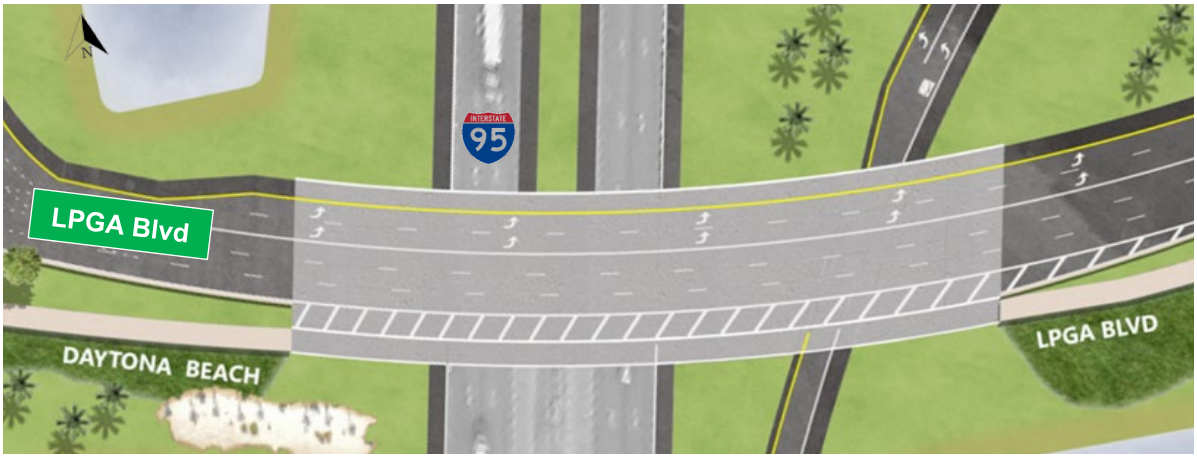


Figure 1-5. Conceptual View of LPGA Boulevard at I-95 Eastbound Bridge

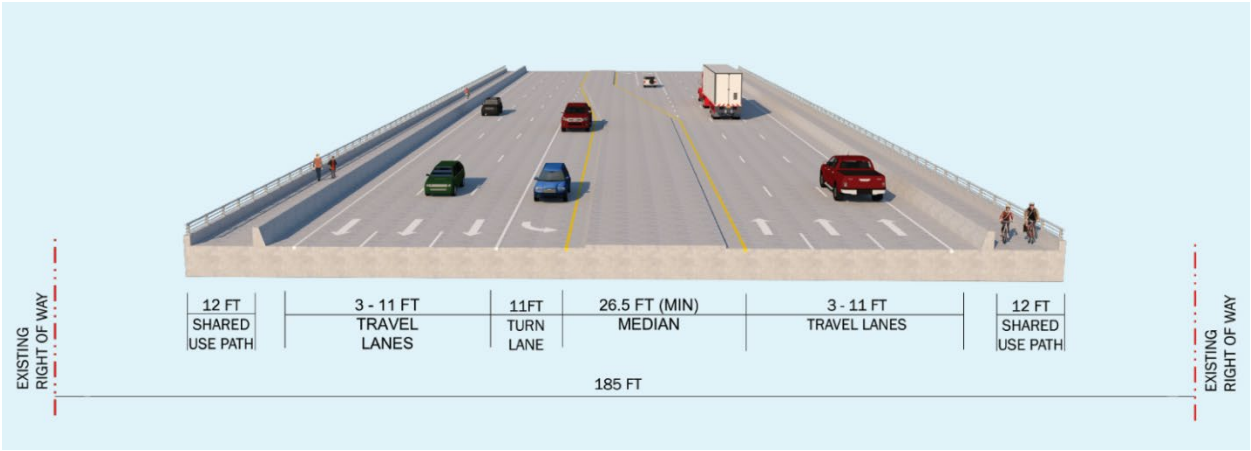


Figure 1-6. Typical Section at Tomoka River Bridge

The Preferred Alternative interchange configuration is the Signalized Turbine Interchange, conceptually shown in **Figure 1-7**. The interchange concept spreads the traffic across westbound and eastbound LPGA Boulevard and, as a result, it moves high volumes efficiently and provides enough queue storage between signalized ramp terminals. This concept would provide better safety and operational benefits than the other concepts evaluated early in the Study process. It also can be widened (by adding lanes) in the future if warranted without reconstructing the bridges. Refer to the IMR located in the project file, for more details.



Figure 1-7. Conceptual View of the Signalized Turbine Interchange

The Preferred Alternative's intersection control types are as follows:

- US 92 – Signalized Intersection (same as existing).
- Welshinger-Butler Circle (South Intersection) – Roundabout (changed from two-way stop control).
- Welshinger-Butler Circle (North Intersection) – Roundabout (changed from two-way stop control).
- International Tennis Drive / International Golf Drive – Roundabout (changed from two-way stop control).
- Tournament Drive – Signalized Intersection (same as existing).
- Tymber Creek Road – Signalized Intersection (same as existing).
- Champions Drive – Signalized Intersection (same as existing).
- Tomoka Farms Road – Signalized (same as existing).
- I-95 Southbound Ramps – Signalized Intersection (same as existing).
- I-95 Northbound Ramps – Signalized Intersection (same as existing).
- Technology Boulevard – Signalized Intersection (same as existing).
- Williamson Boulevard – Signalized Intersection (same as existing).
- Concierge Boulevard – Unsignalized Intersection (changed to right-in right-out only).
- As the result of widening of LPGA Boulevard, intersection configurations (lane geometry) for all intersections in the Preferred Alternative were changed.

- As noted above, most roadway improvements are proposed to occur within the existing right of way except at Welshinger-Butler Circle South intersection and Williamson Boulevard intersection which will require minor clipping of the right of way to accommodate a right turn lane and signal poles, respectively.
- Currently, the construction year for the Preferred Alternative is unknown as the project is not funded for construction.

1.6 List of Technical Reports

The purpose of the PD&E study is to evaluate engineering and environmental data and record information that will help the FDOT Office of Environmental Management (OEM) in determining the type, preliminary design, and location of the proposed improvements.

The technical reports that have been completed during this study are listed in **Table 1-2**.

Table 1-2. List of Technical Reports

Report Title	Date	Status
Public Involvement Plan	Dec 2021	Final
Intersection Control Evaluation (ICE) Stage 1	Aug 2023	Final
Project Traffic Analysis Report (PTAR)	Jun 2023	Final
Transportation Systems Management and Operations (TSM&O) Opportunities	Jun 2023	Final
Concept of Operations (ConOps)	Jun 2023	Final
Interchange Modification Report (IMR)	May 2023	Final
Pond Siting Report	Mar 2023	Draft
Preliminary Geotechnical Report	Mar 2023	Final
Location Hydraulics Report	Feb 2023	Final
Bridge Hydraulic Report	Jun 2023	Final
Bridge Analysis Report	Feb 2023	Draft
Typical Section Package	Jun 2023	Final
Utility Assessment Package	Mar 2023	Draft
Level I Contamination Screening Evaluation Report (CSER)	Feb 2023	Final
Cultural Resource Assessment Survey (CRAS)	May 2023	Final
Noise Study Report	Apr 2023	Final
Natural Resources Evaluation (NRE)	Jun 2023	Final
Water Quality Impact Evaluation (WQIE)	Apr 2023	Final
Type 2 Categorical Exclusion	Jun 2023	Draft

2.0 Existing Conditions

This Section summarizes the existing roadway and environmental characteristics for the project study area.

2.1 Previous Planning Studies

In 2016 an interchange operational analysis was conducted to evaluate alternatives to improve operations of the I-95 interchange at LPGA Boulevard. In 2017 FDOT started an interchange design project (FPID 439220-1) which prepared a draft IMR in 2020. The IMR compared a No-Build Alternative and a DDI. However, the report was not finalized because the traffic analysis indicated a need for regional or network solutions that are beyond the I-95 interchange ramp terminals. In the initial stages of the PD&E Study, the draft technical reports from the interchange design project were reviewed before preliminary concepts and options were developed.

Minor roadway improvements to LPGA Boulevard and the I-95 have occurred over the past five years, including the following:

- Technical reports prepared for the previous I-95 interchange design project.
- Resurfacing of I-95 which improved the southbound off-ramp.
- Widening of LPGA Boulevard between I-95 northbound ramp terminal intersection and Technology Boulevard.
- Widening Williamson Boulevard north of LPGA Boulevard to four lanes.
- Adding a north leg to the Champions Drive intersection and sidewalk on the north side of LPGA Boulevard between Champions Drive and Tymber Creek Road.
- Developers of lands have conducted various traffic impact analyses (TIA) adjacent to LPGA Boulevard which were reviewed as part of the project traffic development process and were checked against the projected demand volumes.
- Resurfacing of US 92 westbound lanes.

These improvements were incorporated into the development of the project design traffic and alternatives analysis.

2.1.1 Related Projects

The following projects are being conducted within the vicinity:

- I-95 at US 1 Interchange PD&E Study (419772-2).
- SR 40 from Breakaway Trail to Williamson Boulevard (428947-1).
- US 92 from I-4 eastbound ramp to Tomoka Farms Road widening (422627-1).

The development of the design traffic was coordinated with these projects.

2.2 Existing Roadway Conditions

2.2.1 Existing Typical Sections

The existing roadway typical sections for LPGA Boulevard, I-95, and the I-95 ramps are discussed and presented in the next subsections.

2.2.1.1 LPGA Boulevard

The existing typical sections for LPGA Boulevard are illustrated in **Figure 2-1** and **Figure 2-2**. Note there is no typical section from Tomoka Farms Road to the I-95 Southbound Ramps as this is a short (about 1,000') transition segment from the two-lane segment west of Tomoka Farms Road to the six-lane segment east of the I-95 Southbound Ramps.

From US 92 to Tomoka Farms Road, LPGA Boulevard is a two-lane two-way roadway with 12' wide lanes. There are no paved shoulders in this section. The design and posted speed for this section is 55 mph. This typical section is shown in **Figure 2-1**. This section includes the Tomoka River bridge.

From I-95 southbound ramp terminal intersection to Williamson Boulevard, LPGA Boulevard is a six-lane roadway with a variable width raised median. North of the LPGA Boulevard I-95 has auxiliary lanes on both directions which connect with the I-95/SR 40 interchange. There are ditches on both sides of the road that convey stormwater runoff from the road and adjacent properties. The ditch on the south side of the road is part of the 11th Canal. Between I-95 northbound ramp terminal intersection and Technology Boulevard there are treatment swales on both sides of the road. This typical section is shown in **Figure 2-2.** This section includes the LPGA bridge over I-95.

2.2.1.2 Interstate 95

The existing typical section for I-95 is illustrated in **Figure 2-3**. The typical section for I-95 at the interchange with LPGA Boulevard consists of a six-lane divided interstate located within a minimum of 300 feet of right of way. Between LPGA Boulevard and SR 40 interchanges, I-95 has an auxiliary lane in each direction. This typical section includes 40-foot median, 12-foot inside shoulders (10-foot paved), three 12-foot travel lanes in both directions, and 12-foot outside shoulders (10-foot paved). The I-95 design is 70 mph and posted speed is 65 mph.

2.2.1.3 Ramps

The existing typical section for the I-95 ramps is illustrated in **Figure 2-4**. The ramps connecting LPGA Boulevard to I-95 include a six-foot inside shoulder (two-foot paved), one 15- to 16-foot lane, and a six-foot outside shoulder (four-foot paved).

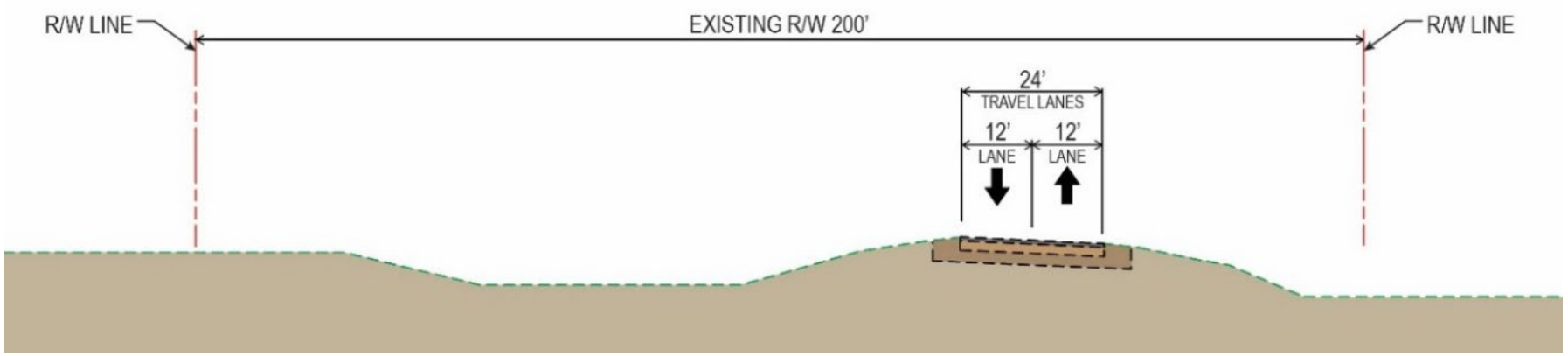


Figure 2-1. Existing Typical Section from US 92 to Tomoka Farms Road

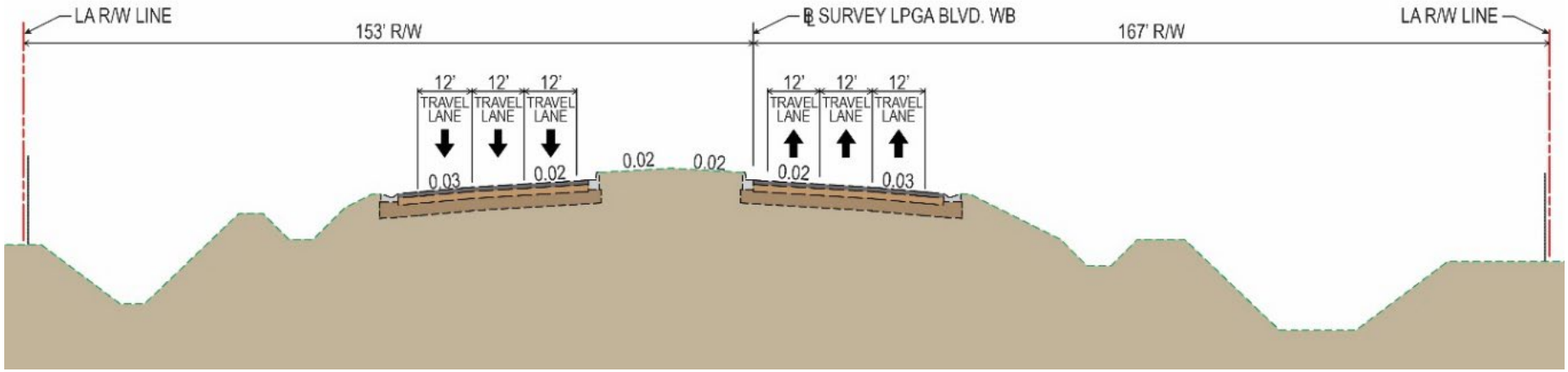


Figure 2-2. Existing Typical Section from I-95 Southbound Ramps to Williamson Boulevard

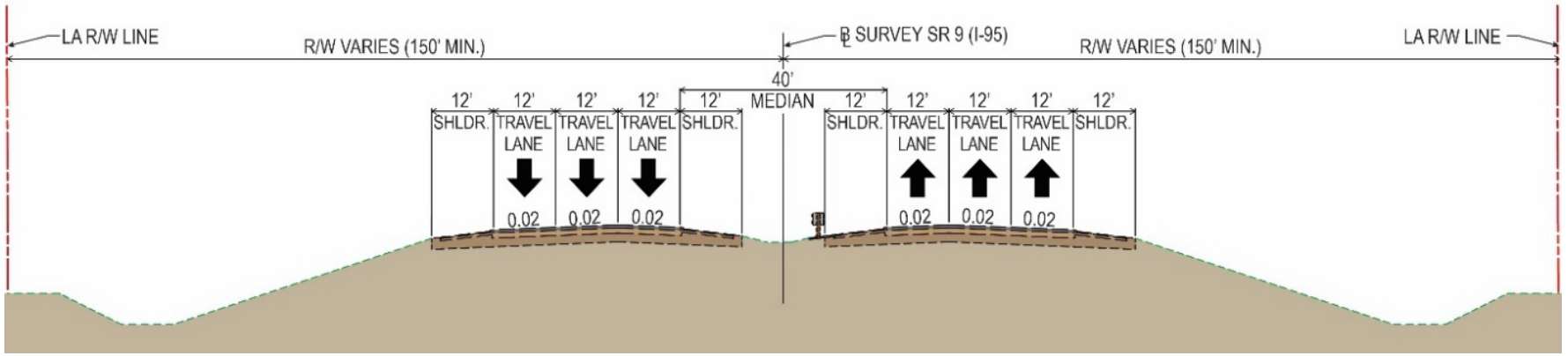


Figure 2-3. Existing Typical Section Along Interstate-95

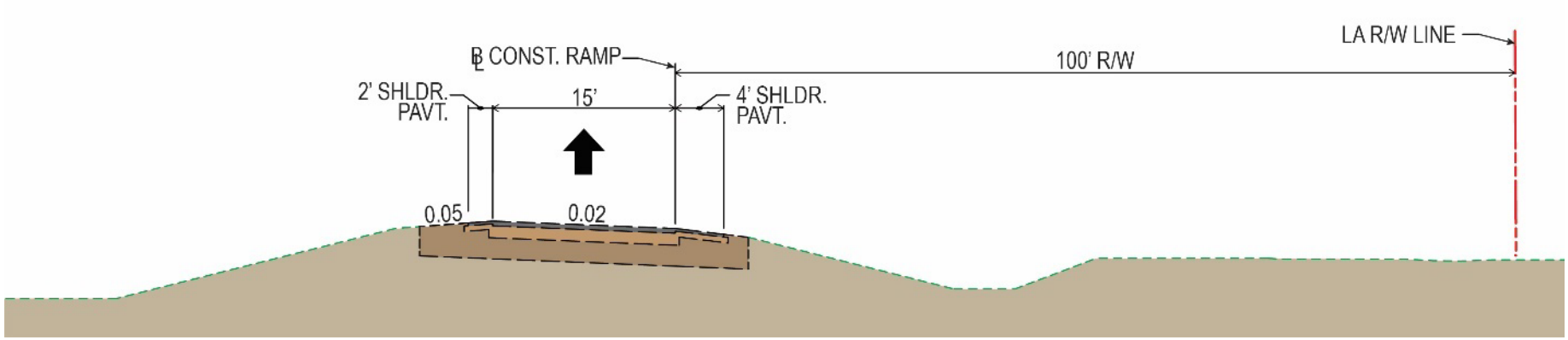


Figure 2-4. Existing Typical Section Along Ramps

2.2.2 Roadway Classification and Context Classification

2.2.2.1 Functional Classification

In the study area, I-95 is a north/south limited access facility with a functional classification of Urban Principal Arterial-Interstate and is an integral part of the Florida State Highway System (SHS) and the SIS. LPGA Boulevard is functionally classified as an Urban Minor Arterial based on FDOT review and approved Census 2010 Functional Classification. Additionally, the Volusia County Comprehensive Plan classifies LPGA Boulevard as a Thoroughfare-Arterial. Both I-95 and LPGA Boulevard are designated hurricane evacuation routes.

2.2.2.2 Roadway Context Classification

Context classification is a design control that determines key design elements for arterials and collectors. Design criteria for limited access facilities, such as I-95 do not use context classification. Context Classification for a roadway is defined by its characteristics, primary measures, and secondary measures of the roadway, and it informs project design criteria. The roadway context classification for LPGA Boulevard within the project limits based on future land use is as follows:

- The future Roadway Context Classification for the LPGA Boulevard segment from US 92 to Champions Drive is C3R – Suburban Residential; typical land use is primarily single family residential.
- The future Roadway Context Classification for the segment from Champions Drive to Williamson Boulevard is C3C – Suburban Commercial; typical land uses include retail, office, business, multi-family residential, institutional, or industrial.

2.2.3 Access Management Classification

Based on the 2022 FDOT Design Manual (FDM) Section 201.4, access management is a regulation reserved for the SHS. The existing Access Classes are shown in **Table 2-1**. LPGA Boulevard is a designated county road. County roads are governed by the Manual of Uniform Minimum Standards for Design, Construction and Maintenance (Florida Greenbook) which uses the title 'Access Control.' However, using FDM access management guidelines, LPGA Boulevard from US 92 to Tomoka Farms Road most closely resembles Access Class 4 (non-restrictive median type). Beginning at Tomoka Farms Road (where widening for the I-95 interchange begins), the roadway classification most closely resembles Access Class 3 (restrictive median type).

Table 2-1. Existing Access Classifications

LPGA Segment	Existing Conditions
I-95	Access Class 1
US 92 to Tomoka Farms Rd	Access Class 4 (Non-Restrictive Median Type)
Tomoka Farms Rd to Williamson Blvd	Access Class 3 (Restrictive Median Type)

Table 2-2 summarizes existing median openings within the project limits. There are five existing median openings from Tomoka Farms Road to Clyde Morris Boulevard located at the I-95 ramp terminal intersections, Technology Boulevard/Outlet Boulevard, and Williamson Boulevard. The minimum median opening spacing and signal spacing standard of 2,640' is not met throughout this segment.

Table 2-2. Existing Median Openings

Location (Intersecting Street)	Posted Speed miles per hour (mph)	Access Class/Type	Distance from Previous Opening (feet)
I-95 Southbound Exit Ramp	45	3/ Signal	659
I-95 Northbound Exit Ramp	45	3/ Signal	1398
Outlet Boulevard	45	3/ Signal	1124
Williamson Boulevard	45	3/ Signal	1106
Concierge Boulevard	45	3/ Full	679

2.2.4 Right of Way

The existing right of way information is based on data gathered from FDOT, Volusia County Property Appraiser, and Florida Geographical Database Library (FGDL). **Table 2-3** shows the approximate right of way widths in the project corridor. Along I-95, the right of way width is approximately 300' north and south of the interchange. Along LPGA Boulevard, the right of way varies between 185' and 320'. Between US 92 and Champions Drive, the right of way is approximately 200'. From Champions Drive to the Tomoka River Bridge, the right of way is approximately 185'. Between east of the Tomoka River Bridge and Williamson Boulevard the right of way varies between 285' and 320'.

Table 2-3. Existing Right of Way

LPGA Boulevard Segment	Right of Way Width (feet)
US 92 to Champions Drive	200
Champions Drive to Tomoka River Bridge	185
Tomoka River to I-95	320
I-95 to Williamson Boulevard	285

2.2.5 Existing Land Use

The existing land uses within a 500' buffer of the study area are summarized in **Table 2-4**. Existing land uses surrounding LPGA Boulevard are mainly public/semipublic and recreation, vacant, and agricultural. The existing land use map is shown in **Figure 2-5**. The portion of the study area, south of International Tennis Drive/International Golf Drive, is surrounded by agricultural and public/semipublic and recreational land uses. Between International Tennis Drive/International Golf Drive and I-95, LPGA Boulevard transitions to residential with pockets of vacant and public/semipublic and recreation uses. The area surrounding the I-95 interchange and east of I-95 to Williamson Boulevard is mainly commercial, institutional, and vacant land. However, some of the vacant lands have been developed since the county adopted its land use map in 2019.

Table 2-4. Existing Land Use

Land Use	Acres within 500'	Percent of 500' Study Area
Transportation	530.30	35.08%
Public/Semi-Public & Recreation	230.08	15.22%
Vacant	205.68	13.61%
Agricultural	145.75	9.64%
Other/No Data	126.59	8.38%
Commercial	106.75	7.06%
Residential	86.82	5.74%
Institutional	39.13	2.59%
Industrial	34.89	2.31%
Water	5.52	0.37%

Source: FDOT, District 5, 2019 Generalized Land Use

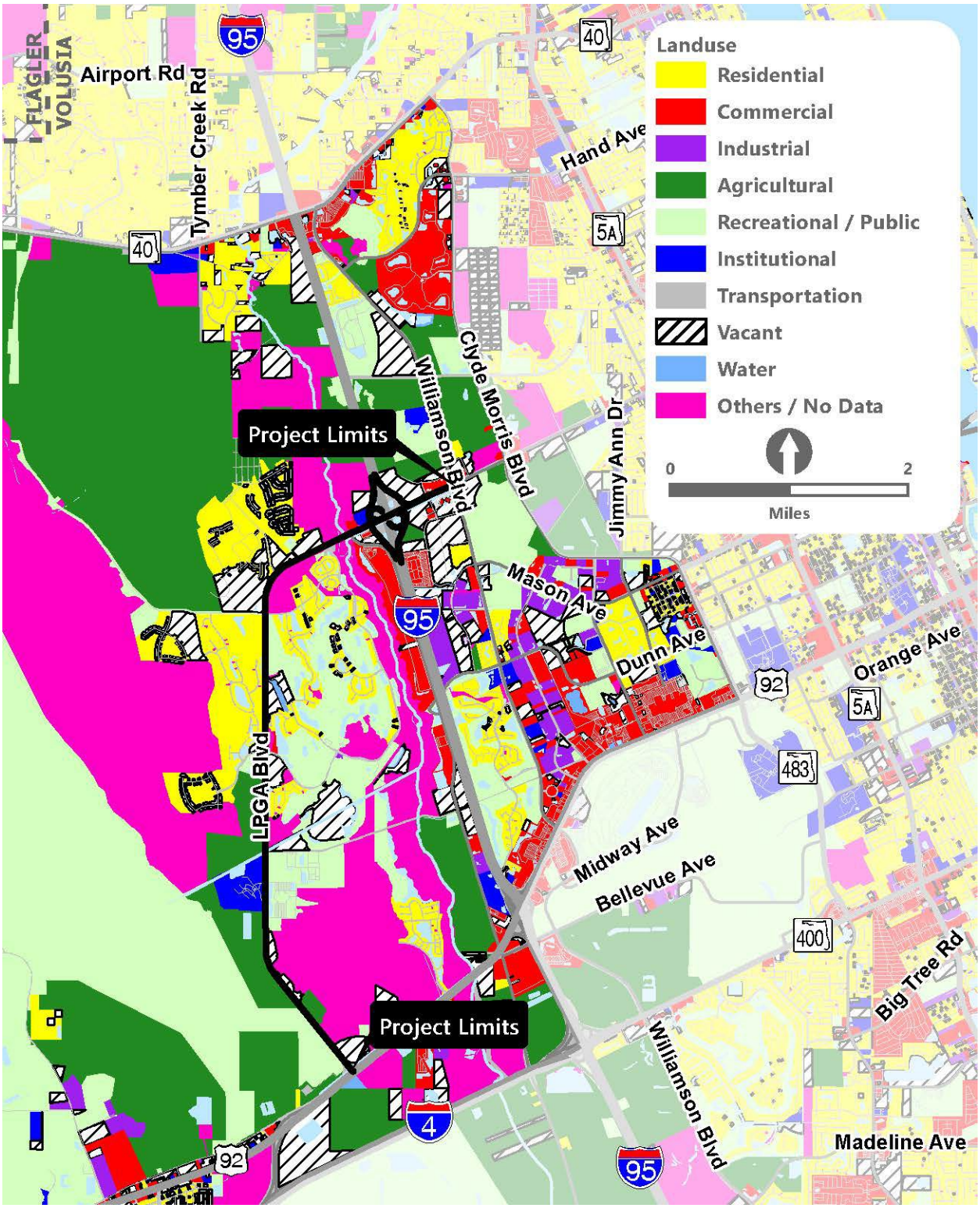


Figure 2-5. Existing Land Use (2019)

2.2.6 Pavement Type and Conditions

Pavement conditions on LPGA Boulevard are rated “Good” or better, with a few “Fair” segments. I-95 mainline and ramps within the project area were resurfaced in 2022.

2.2.7 Posted Speed Limit

The posted speed limits along LPGA Boulevard are 55 mph between US 92 and Tymber Creek Road and 45 mph between Tymber Creek Road and Williamson Boulevard. Within the study area the posted speed limit on I-95 is 65 mph.

2.2.8 Horizontal Alignment

The horizontal curve data was obtained from original design plans for LPGA Boulevard. There are three curves along LPGA Boulevard, two of them making up a compound curve. **Table 2-5** identifies the existing curve data.

Table 2-5. Existing Horizontal Curvature – LPGA Boulevard

Location	Station	Curve Length (ft)	Radius (ft)	Design Speed (mph)	Existing Superelevation (ft/ft)
Royal County Blvd	71+36.34	1298.19	1909.86	65	0.087
Tymber Creek Rd	239+67.09	1474.87	1877.86	65	0.087
Tymber Creek Rd	250+82.27	828.23	2437.72	65	0.077

The existing geometry of I-95 within the study limits is linear and contains no horizontal curves. The I-95/LPGA Boulevard Interchange is a partial cloverleaf design with loop ramps for the eastbound to northbound and westbound to southbound I-95 entrance ramps. **Table 2-6** identifies the existing curve data obtained from the original design plans.

Table 2-6. Existing Horizontal Curvature – I-95/LPGA Boulevard Interchange Ramps

Location	Station	Curve Length (ft)	Radius (ft)	Design Speed (mph)	Existing Super elevation (ft/ft)
NB Exit Ramp Curve 1	215+24.91	740.79	1179.00	50	0.080
NB Exit Ramp Curve 2	225+39.04	362.11	731.00	40	0.050
EB to NB Entrance Ramp Curve 1	704+05.00	577.35	320.00	35	0.090
EB to NB Entrance Ramp Curve 2	709+82.35	577.35	320.00	35	0.090
EB to NB Entrance Ramp Curve 3	714+67.09	540.32	430.00	35	0.095
WB to NB Entrance Ramp Curve 1	305+80.72	420.47	310.00	35	0.050
WB to NB Entrance Ramp Curve 2	310+47.36	289.77	731.00	35	0.050

Location	Station	Curve Length (ft)	Radius (ft)	Design Speed (mph)	Existing Super elevation (ft/ft)
WB to NB Entrance Ramp Curve 3	317+70.23	514.44	1179.00	50	0.082
WB to NB Entrance Ramp Curve 4	323+63.13	674.32	2195.46	50	0.052
SB Exit Ramp Curve 1	405+22.13	273.49	424.41	35	0.050
SB Exit Ramp Curve 2	413+65.98	712.75	1179.00	50	0.082
WB to SB Entrance Ramp Curve 1	902+46.04	382.96	240.00	30	0.087
WB to SB Entrance Ramp Curve 2	906+69.92	419.65	240.00	30	0.087
WB to SB Entrance Ramp Curve 3	911+06.99	486.65	320.00	30	0.093
EB to SB Entrance Ramp Curve 1	515+18.93	673.48	2192.73	50	0.050
EB to SB Entrance Ramp Curve 2	519+37.00	167.71	1179.00	50	0.082
EB to SB Entrance Ramp Curve 3	528+81.14	189.51	731.00	35	0.050
EB to SB Entrance Ramp Curve 4	532+89.68	226.99	150.00	25	0.050

2.2.9 Vertical Alignment

The existing vertical alignment of LPGA Boulevard was obtained from the original design plans. For most of LPGA Boulevard, the profile is nearly flat with vertical deflections of less than 0.2%. There are three vertical curves at the existing I-95 Interchange as identified in **Table 2-7** and shown to meet FDOT criteria for the existing design speed of 55 mph. The existing vertical geometry of I-95 within the study limits is nearly flat and contains no vertical curves.

Table 2-7. Existing Vertical Alignment - LPGA Boulevard

Location	PVI Station	Type of Curve	Grade Diff. (%)	Grade In (%)	Grade Out (%)	K Val	Curve Len (feet)	Req. K Val	Req. Curve Len (feet)	Meets FDOT Criteria
Sag west of I-95	112+00	Sag	2.7346	0.2654	3.0000	292.55	800	96	200	Yes
Crest over I-95	125+00	Crest	6.0000	3.0000	-3.0000	233.33	1400	136	300	Yes
Sag east of I-95	136+50	Sag	2.9497	-3.0000	0.0503	271.21	800	96	200	Yes

2.2.10 Multimodal Facilities

2.2.10.1 Pedestrian Accommodations

LPGA Boulevard currently has minimal pedestrian facilities. There is a sidewalk located near the end of the project on both sides of LPGA Boulevard beginning at Technology Boulevard/Outlet Boulevard and ending at Williamson Boulevard. These two intersections have crosswalks (three legs at Technology Boulevard/Outlet Boulevard and four legs at Williamson Boulevard). A new sidewalk has also been recently constructed on the north side of LPGA Boulevard between Tymber Creek Road and Champions Drive. The intersection with Champions Drive has crosswalks on all approaches. The intersection with Tymber Creek Road has a crosswalk only on the north approach. The intersection with Tournament Drive has crosswalks on the western and southern approaches while the International Tennis Drive/International Golf Drive intersection has pedestrian crosswalks on the western leg only. There are no pedestrian features at I-95 Northbound and Southbound Ramps, Tomoka Farms Road, Welshinger-Butler Circle, and US 92 intersections. Existing paved shoulders are intermittent along the roadway. Additionally, the existing shoulders do not all meet Americans with Disabilities Act (ADA) requirements for pedestrian use.

2.2.10.2 Bicycle Facilities

LPGA Boulevard currently has no designated bicycle lanes within the project limits. There are intermittent paved shoulders that can be used as a bicycle lane. Also, per Florida Statutes (Chapter 316.2065), bicycles may use travel lanes when a designated bicycle lane or paved shoulder is not present for either county or state roadways. However, the existing posted speed limits (45 mph and 55 mph, respectively) pose danger to any bicyclist that intends to share the roadway within the project area.

2.2.10.3 Transit Facilities

The Volusia County transit system (VOTRAN) service map is shown in **Figure 2-6**. VOTRAN does not currently have a bus service within the project limits. Bus service is available along Williamson Boulevard but does not exist west of the intersection with LPGA Boulevard. VOTRAN Route 60 (East/West Connector) uses US 92 from DeLand to Daytona Beach. There is an existing bus stop on US 92 at the LPGA Boulevard intersection but based on current VOTRAN Route 60 map information, the bus stop does not appear to be in use. Additionally, there are no transfer stations or park-and-ride facilities within the project limits. VOTRAN's 10-Year Transit Development Plan includes recommendations for implementation of a future I-95 West & Beach Connector route that would provide another east-west connection, traveling primarily on LPGA Boulevard and Mason Avenue with 60-minute frequencies.

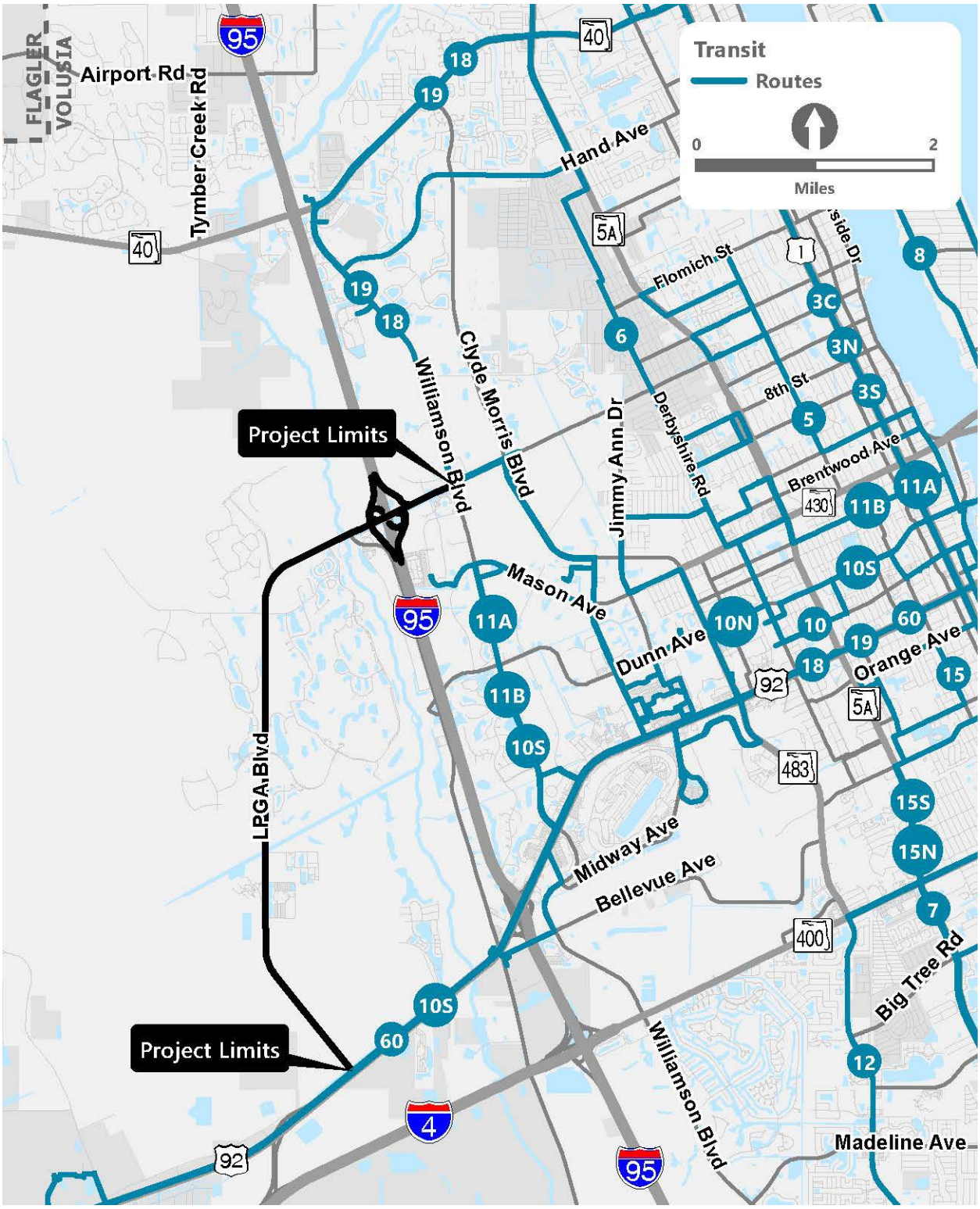


Figure 2-6. Existing Transit

2.2.11 Intersections

There are 14 intersections within the project analysis area of which 10 are signalized and four are unsignalized. The traffic signals are located at US 92, Tournament Drive, Tymber Creek Road, Champions Drive, Tomoka Farms Road, I-95 Southbound, I-95 Northbound, Technology Boulevard/Outlet Boulevard, Williamson Boulevard, and Clyde Morris Boulevard. Clyde Morris Boulevard is outside the limits of the proposed improvements; however, it was added for traffic analysis purposes. The unsignalized intersections are located at International Tennis Drive/International Golf Drive and Welshinger-Butler Circle North and South intersections. There is one emergency signal which serves the fire station located between Tymber Creek Road and Champions Drive. Additionally, Concierge Boulevard is an unsignalized intersection located immediately east of the limits of the project. The intersection control types are shown in **Figure 2-7**. The existing intersection lane configurations are shown in **Figure 2-8**.

2.2.12 Physical or Operational Restrictions

The existing Tomoka River bridge is a bottleneck and affects traffic movements between Champions Drive intersection and Tomoka River intersection.

2.2.13 Traffic Volumes

Existing Year 2021 AM and PM peak hour volumes were derived from the peak hour turning movement counts collected at the study area intersections. At each intersection, the AM and PM peak hour volumes were established by identifying the highest hourly volume (highest volume for four consecutive 15-minue intervals) for each period. These counts were seasonally adjusted based on the date and location of the count. The seasonally adjusted peak hour intersection volumes entering and exiting adjacent intersections along LPGA Boulevard were compared and adjusted for the AM and PM peak hours to provide a balanced flow over the network. This process was necessary due to the differences in traffic volumes between intersections caused by the different peak hour periods and varying days of the data collection. Adjustments considered existing land use and any access points/intersections/driveways between intersections that could have an impact on network traffic flow. The final balanced Existing Year 2021 AM/PM peak hour turning movement volumes (TMV) are shown in **Figure 2-9** while the Existing Year 2021 Annual Average Daily Traffic (AADT) and Directional Design Hour Volume (DDHV) are in **Figure 2-10**.

2.2.14 Traffic Operational Analysis

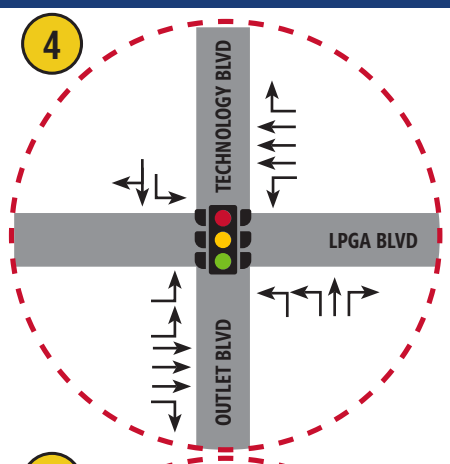
The analysis methodology follows the *2021 FDOT Traffic Analysis Handbook* and the Traffic Analysis Methodology documented in the PTAR.

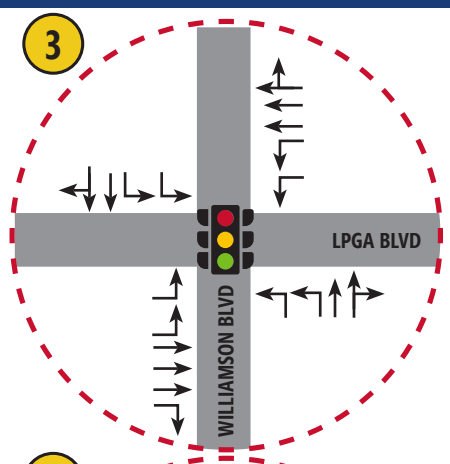
- Synchro software was used for the intersection analysis between US 92 and Tournament Drive because traffic characteristics are mostly undersaturated with spaced intersections.
- Vissim software was used to evaluate the LPGA Boulevard segment between Tournament Drive and Clyde Morris Boulevard as documented in the IMR prepared for this PD&E Study. The Vissim model was calibrated to 2019 conditions.

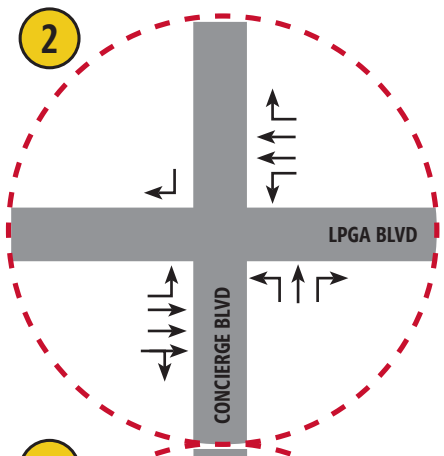


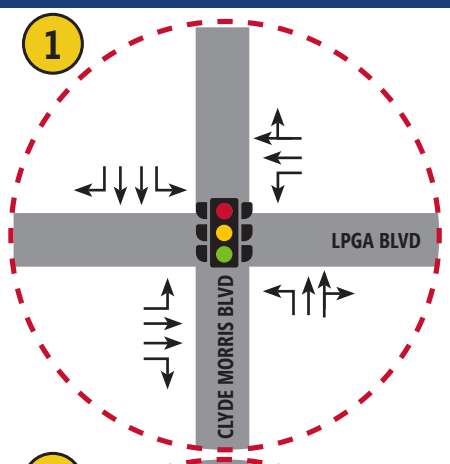
Figure 2-7 Intersections in the Study Area

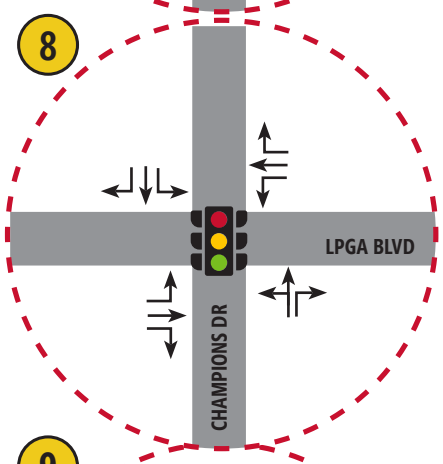
** Clyde Morris Boulevard included for traffic analysis*

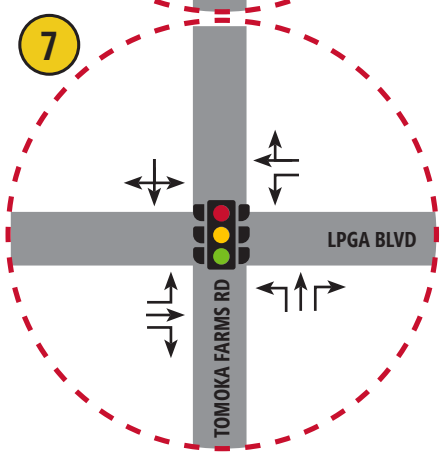


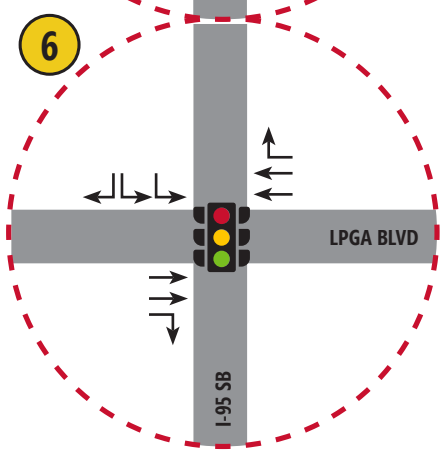


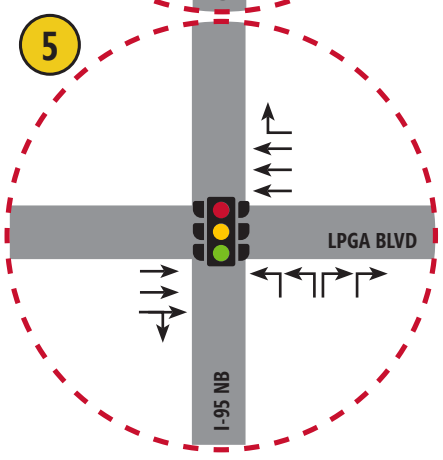


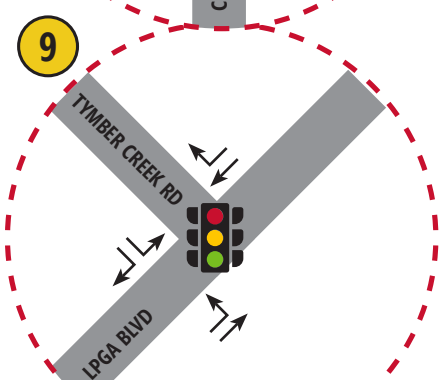


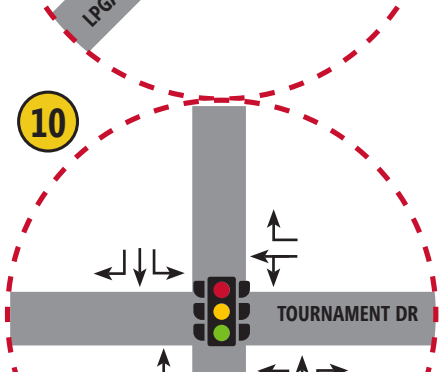












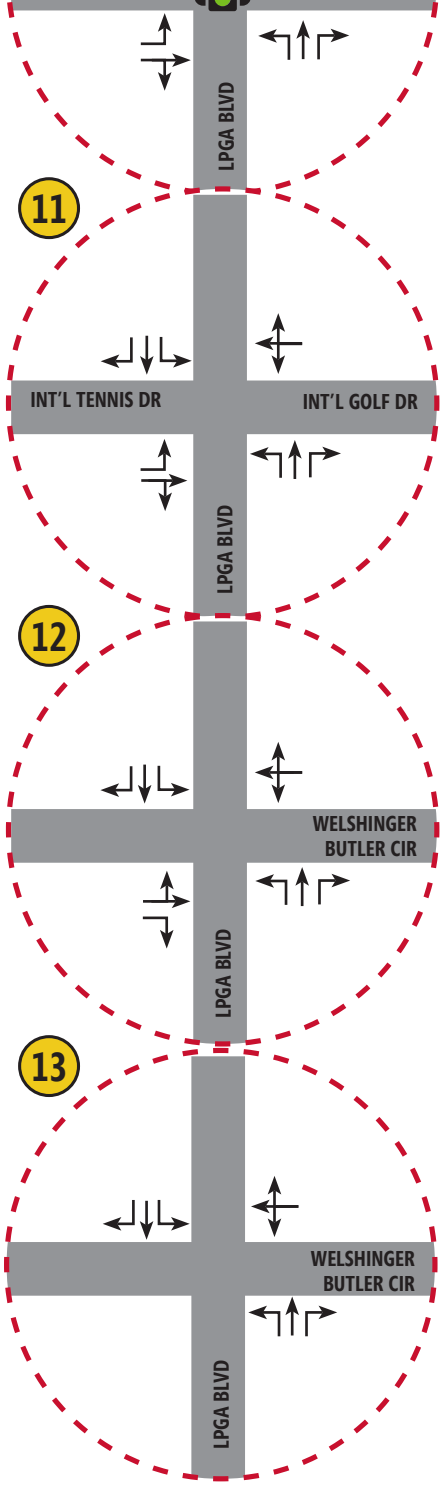




Figure 2-8. Existing (2021) Lane Configurations

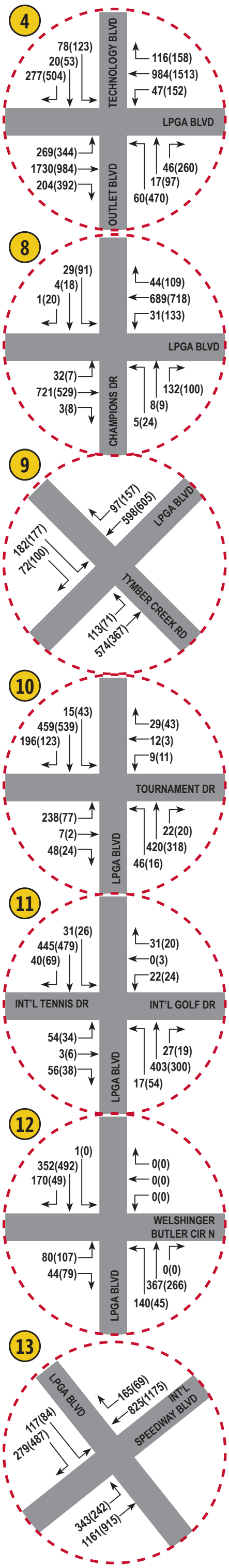


Figure 2-9. Existing Year 2021 TMVs

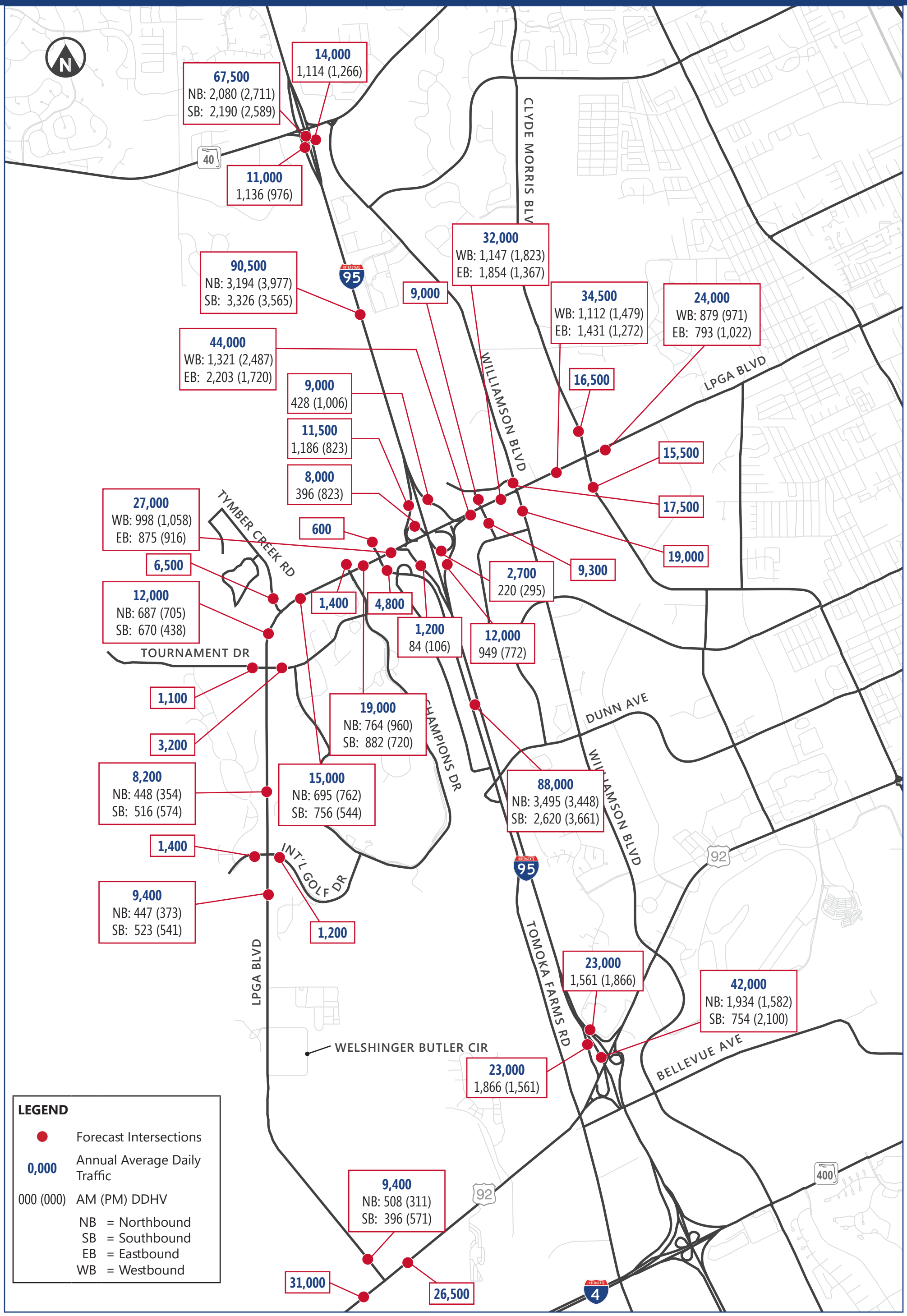


Figure 2-10. Existing Year 2021 AADT and DDHV

Table 2-8 shows the delay and LOS results based on the Highway Capacity Manual Version 6 (HCM 6) for each study intersection. Travel time and speed results are in **Table 2-9**.

Table 2-8. Existing Year (2021) Intersections Traffic Operational Results

Intersection	Measurement Location	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
US 92*	Intersection	14.4	B	25.1	C
Welshinger-Butler Circle (North Intersection) **	Eastbound Left Through	102.1	F	54.1	F
International Tennis Drive / International Golf Drive**	Eastbound Left	34.8	D	28.9	D
	Westbound Left	30.7	D	30.9	D
Tournament Drive***	Intersection	30.4	C	12.7	B
Tymber Creek Road***	Intersection	25.3	C	16.2	B
Champions Drive***	Intersection	46.7	D	19.6	B
Tomoka Farms Road***	Intersection	32.2	C	40.4	D
I-95 Southbound Ramps***	Intersection	32.4	C	26.5	C
I-95 Northbound Ramps***	Intersection	22.4	C	29.5	C
Technology Boulevard***	Intersection	20.5	C	51.0	D
Williamson Boulevard***	Intersection	53.4	D	64.3	E
Concierge Boulevard****	Northbound Left	17.0	C	29.5	D
	Southbound Right	10.6	B	100.0	F
Clyde Morris Boulevard***	Intersection	38.1	D	47.4	D

*Signalized intersection, HCM 6 Signalized intersections results reported.
**Unsignalized intersection, HCM 6 Two-Way STOP-Controlled intersections (TWSC) results reported for minor roadway critical movements.
***Vissim intersection delay reported, LOS estimated using HCM 6 thresholds.
****Vissim TWSC, critical minor movements delay reported, LOS estimated used HCM 6 thresholds.

Table 2-9. LPGA Boulevard Existing Year (2021) Travel Time and Speed

Direction	LPGA Blvd Segment	Distance	AM Peak Hour		PM Peak Hour	
			Travel Time	Avg Speed	Travel Time	Avg Speed
Northbound	From US 92 to Tournament Drive	4.2 mi	296.9 s	50 mph	285.1 s	52 mph
Southbound	From Tournament Drive to US 92	4.2 mi	332.4 s	45 mph	332.4 s	45 mph
Eastbound	From Tournament Dr to Clyde Morris Blvd	2.5 mi	7.7 min	19.6 mph	5.9 min	25.5 mph
Westbound	From Clyde Morris Blvd to Tournament Dr	2.5 mi	5.8 min	26.0 mph	7.2 min	20.9 mph

2.2.15 Managed Lanes

Not present in the project limits.

2.2.16 Crash Data and Safety Analysis

Five (5) years of crash data (from January 1, 2015 to December 31, 2019) was obtained from the FDOT Crash Analysis Reporting (CAR) System database and University of Florida's Signal Four Analytics database. A review of the data reported in the study area indicates there were 1,354 crashes in that five-year period. A detailed crash analysis is found in the PTAR.

Table 2-10 shows a summary of the crashes by severity. On average, about 270 crashes occurred per year during the five-year period. Of the 1,354 reported crashes, 11 of them involved fatalities and 414 involved injuries.

Table 2-10. Overall Study Area Crash Severity

Crash Severity	Year					Total
	2015	2016	2017	2018	2019	
Number of Fatal Crashes	2	2	2	2	3	**11**
Number of Injury Crashes	68	89	72	102	83	**414**
Number of Property Damage Only Crashes	139	184	187	205	214	**929**
Total Crashes	***209***	***275***	***261***	***309***	***300***	***1,354***

A detailed review was performed for the crash data on LPGA Boulevard, on I-95 at the LPGA Boulevard interchange ramps, and on the I-95 mainline within the study limits.

The five-year crash data showed 583 total crashes were reported to occur on LPGA Boulevard within the study area. Of the 583 crashes, six were fatal crashes, 180 were injury crashes and 397 were property damage only crashes (**Table 2-11**). The fatal crashes that occurred along LPGA Boulevard are summarized in **Table 2-12**.

Table 2-11. Crash Severity along LPGA Boulevard

Severity	Year					Total
	2015	2016	2017	2018	2019	
Number of Fatal Crashes	1	0	2	0	3	**6**
Number of Injury Crashes	28	39	27	44	42	**180**
Number of Property Damage Only Crashes	60	75	78	90	94	**397**
Total Crashes	***89***	***114***	***107***	***134***	***139***	***583***

Table 2-12. Summary of Fatal Crashes Occurred Along LPGA Boulevard

Year	Location	Crash Type	Road Conditions	Cause of Crash
2015	US 92 / International Speedway	Rear-End	Daylight/Dry	Motor vehicle in transport
2017	Clyde Morris Boulevard	Left Turn	Daylight/Dry	Motor vehicle in transport
2017	US 92/LPGA Boulevard	Angle	Daylight/Dry	Operated in a careless or negligent manner
2019	Williamson Boulevard	Right Angle	Dark/Dry	Motor vehicle in transport
2019	Clyde Morris Boulevard	Left Turn	Daylight/Dry	Motor vehicle in transport
2019	Welshinger-Butler Circle	Single Vehicle-Other*	Daylight/Dry	Other non-fixed object

* This crash also involved a pedestrian, who died.

The crash severity and crash type recorded for each ramp (two off-ramps and four on-ramps) during the five-year period is shown in **Table 2-13**. This analysis includes crashes that occurred on the ramp segments and not the ramp terminal intersections since ramp terminal intersection crashes are included in LPGA Boulevard crash analysis. The I-95 southbound off-ramp had the highest number of reported crashes with 34 total crashes and 12 injury crashes. The I-95 northbound off-ramp had the second highest number of reported crashes with 22 total crashes and nine injury crashes. The ramps with the least number of reported crashes were the I-95 southbound on-ramp from eastbound LPGA Boulevard and I-95 northbound on-ramp from westbound LPGA Boulevard with two reported crashes each. This crash pattern could be attributed to traffic operations along LPGA Boulevard as off-ramps experience more congestion than on-ramps.

Table 2-13. Crash Severity On I-95 at LPGA Boulevard Ramps

Location	Severity/Crash Type		Year					Total
			2015	2016	2017	2018	2019	
I-95 Northbound Off Ramp	***Total Crashes***		***2***	***5***	***3***	***8***	***4***	***22***
	Severity	Injury	0	4	1	2	2	**9**
		Property Damage Only	2	1	2	6	2	**13**
	Crash Type	Angle	0	1	0	0	0	**1**
		Head On	0	1	0	0	0	**1**
		Rear-End	2	0	2	6	4	**14**
		Rollover	0	0	1	2	0	**3**
		Off Road	0	3	0	0	0	**3**
I-95 Southbound On Ramp[1]	***Total Crashes***		***1***	***1***	***0***	***0***	***0***	***2***
	Severity	Property Damage Only	1	1	0	0	0	**2**
	Crash Type	Off road	1	1	0	0	0	**2**
I-95 Northbound On Ramp[2]	***Total Crashes***		***0***	***1***	***1***	***1***	***0***	***3***
	Severity	Injury	0	0	0	1	0	**1**
		Property Damage Only	0	1	1	0	0	**2**
	Crash Type	Angle	0	0	0	1	0	**1**

Location	Severity/Crash Type		Year					Total
			2015	2016	2017	2018	2019	
		Rollover	0	1	0	0	0	**1**
		Rear-End	0	0	1	0	0	**1**
I-95 Southbound On Ramp	***Total Crashes***		***0***	***2***	***2***	***0***	***1***	***5***
	Severity	Property Damage Only	0	2	2	0	1	**5**
	Crash Type	Rollover	0	1	0	0	0	**1**
		Off road	0	1	2	1	0	**4**
I-95 Southbound Off Ramp	***Total Crashes***		***2***	***10***	***5***	***10***	***7***	***34***
	Severity	Injury	1	4	3	4	0	**12**
		Property Damage Only	1	6	2	6	7	**22**
	Crash Type	Angle	0	1	0	1	0	**2**
		Off road	0	1	1	1	2	**5**
		Rear-End	1	4	2	4	5	**16**
		Rollover	1	1	2	1	0	**5**
		Sideswipe	0	2	0	3	0	**5**
		Unknown	0	1	0	0	0	**1**
I-95 Northbound On Ramp[2]	***Total Crashes***		***0***	***0***	***1***	***1***	***0***	***2***
	Severity	Property Damage Only	0	0	1	1	0	**2**
	Crash Type	Rear-End	0	0	1	1	0	**2**
		Sideswipe	0	0	1	0	0	**1**

[1] Eastbound LPGA Boulevard *[2] Westbound LPGA Boulevard*

As shown on **Table 2-14** 694 total crashes were reported along the I-95 mainline within the study limits. Of the 694 reported crashes on I-95 mainline, five were fatal crashes, 208 were injury crashes, and 481 were property damage only crashes.

Table 2-14. I-95 Mainline Crash Severity

Crash Severity	Year					Total
	2015	2016	2017	2018	2019	
Number of Fatal Crashes	1	2	0	2	0	**5**
Number of Injury Crashes	39	42	40	48	39	**208**
Number of Property Damage Only Crashes	73	97	101	101	109	**481**
Total Crashes	***113***	***141***	***141***	***151***	***148***	***694***

The fatal crashes that occurred along I-95 mainline are summarized in **Table 2-15**.

Table 2-15. I-95 Mainline Fatal Crash Summary

Year	Location	Crash Type	Road Conditions	Cause of Crash
2015	I-95 northbound	Rollover	Wet	Swerved or avoided
2016	I-95 southbound	Pedestrian	Dark	No contributing action reported for driver of vehicle one
2016	I-95 northbound	Off road	Wet	Failed to keep in proper lane
2018	I-95 southbound	Rear-end	Dark	Operated motor vehicle in a careless or negligent manner
2018	I-95 southbound	Sideswipe	Dark	Failed to keep in proper lane

The five-year crash data analysis found nine (9) total reported crashes for the US 92 roadway segment (**Table 2-16**), within the area of influence, which does not include the crashes at the LPGA Boulevard intersection.

Table 2-16. US 92 Crash Severity

Crash Severity	Year					Total
	2015	2016	2017	2018	2019	
Number of Fatal Crashes	0	0	0	0	0	0
Number of Injury Crashes	0	0	1	3	0	4
Number of Property Damage Only Crashes	2	1	0	1	1	5
Total Crashes	***2***	***1***	***1***	***4***	***1***	***9***

2.2.16.1 Summary by Crash Type

Crash types for the overall study area are shown in **Table 2-17**. The most predominant crash type reported for the overall study area is rear-end crashes (37%) with off road (16%) and sideswipe crashes (16%) tied for the second most predominant crash types. Six pedestrian/ bicycle crashes were reported in the five-year period.

Table 2-17. Overall Study Area Crash Types

Crash Type	Year					Total	Percentage
	2015	2016	2017	2018	2019		
Angle	15	21	19	24	22	101	**7.5%**
Animal	4	3	4	3	2	16	**1.2%**
Head On	1	2	4	4	2	13	**1.0%**
Left turn	9	12	15	12	15	63	**4.7%**
Off Road	42	47	44	46	40	219	**16.2%**
Pedestrian/Bicycle	0	3	1	1	1	6	**0.4%**
Rear-End	71	95	91	122	125	501	**37.2%**
Right Turn	1	0	0	0	0	1	**0.1%**
Roll over	11	12	7	14	10	54	**4.0%**
Sideswipe	24	51	46	47	49	217	**16.0%**
Other/Unknown	31	29	30	36	34	160	**11.7%**
Total Crashes	**209**	**275**	**261**	**309**	**300**	**1354**	**100%**

2.2.16.2 Crash Rates

Crash rates for the study area were calculated in crashes per million vehicle miles traveled and then compared to statewide crash rate averages for similar facilities. The segment and

intersections crash rates calculated for LPGA Boulevard are documented in detail in the *IMR* dated May 2023 and *PTAR* dated June 2023 and summarized as follows.

- LPGA Boulevard from I-95 Southbound off ramp to I-95 Northbound off ramp has the highest crash rate for the study area with a rate of 3.42. This crash rate is lower than the statewide average crash rate (3.654) for similar facilities.
- The highest crash rate on I-95 sections is 1.18 which is higher than the statewide average crash rate (0.976) for similar facilities.
- The intersections that have crash rates higher than the statewide average rates for similar facilities are US 92 (0.69), Tournament Drive (1.17), Tomoka Farms Road (0.52) and Williamson Boulevard (0.74). The corresponding statewide averages for these intersections are 0.333, 0.367, 0.367, and 0.623.

2.2.17 Railroad Crossings

There are no railroads within the study limits.

2.2.18 Drainage

This project is within the limits of the Tomoka River Watershed. The existing drainage characteristics vary throughout the corridor and can be divided into three segments and 20 basins created by existing drainage divides and on existing drainage features. The three distinct LPGA Boulevard drainage segments are from US 92 to the Tomoka River; I-95 Interchange (from Tomoka Farms Road to Technology Boulevard/Outlet Boulevard); and from Technology Boulevard/Outlet Boulevard to Williamson Boulevard

2.2.18.1 Basins

Basin characteristics are described below, and a basin map is shown in **Appendix D.**

LPGA Boulevard from US 92 to the Tomoka River

The existing drainage system in this segment consists of open shoulders and roadside ditches. A total of 199.22 acres of off-site area from the west side of the corridor have been identified. This off-site runoff sheet flows into the ditches on the west and is conveyed through cross drains into the wetlands on the east side, eventually discharging into the Tomoka River without any water quality treatment. Basins 1-13 have been identified in this area. The Tomoka River is an Outstanding Florida Water (OFW).

I-95 Interchange (From Tomoka Farms Road to Technology Boulevard/Outlet Boulevard)

The interchange is divided into four basins associated with the four quadrants (Basins 14-17). Runoff is collected by ditches and infield ponds. The basins primarily discharge to the 11th Street Canal, however Basin 16 in the northeast quadrant on the interchange has an outfall location on the north side of LPGA Boulevard and on the east side of the I-95 northbound on-ramp. Basins 19 and 20 are associated with the I-95 northbound and southbound lanes south of the interchange and discharge into the relocated 11th Street Canal.

LPGA Boulevard from Technology Boulevard to N. Williamson Boulevard

Basin 18 was identified in this area and discharges into the ditch along the south side of the corridor for treatment prior to final discharge into the 11th Street Canal.

2.2.18.2 Historical Flooding

No flooding issues were reported along the project corridor. However, during Hurricane Ian in September 2022, the eastbound lanes of US 92 and a short section of LPGA Boulevard connecting to US 92 were flooded. Tomoka River bridge was not overtopped during the hurricane according to the records of USGS gage immediately downstream the bridge (**Figure 2-11**).

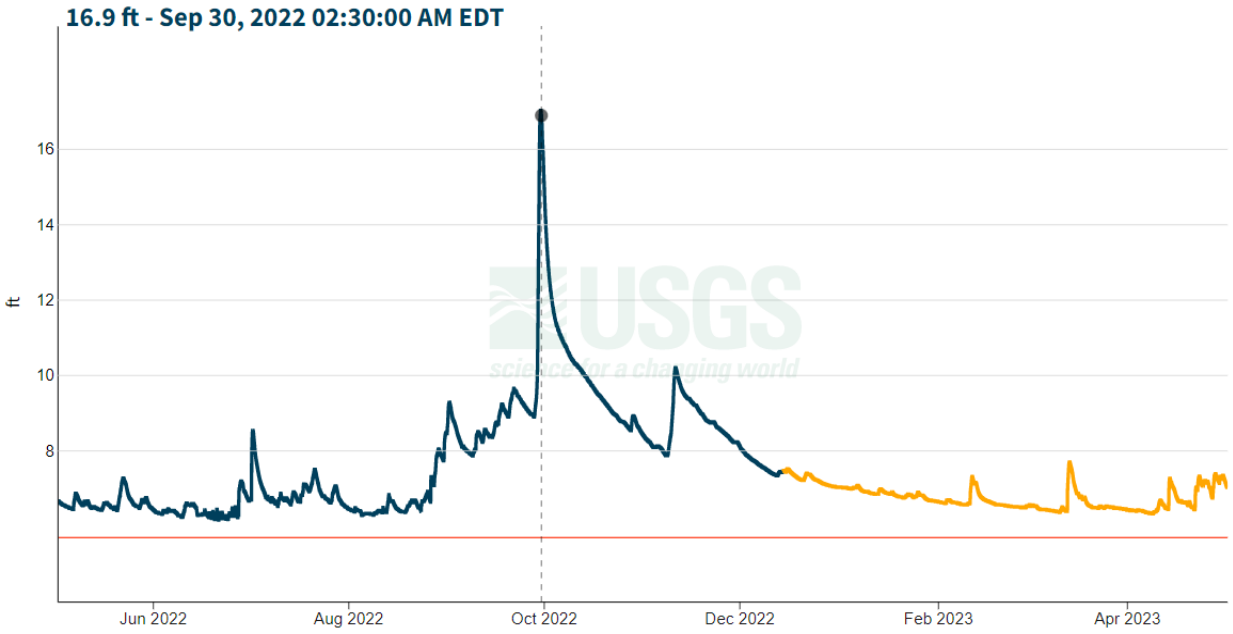


Figure 2-11. Tomoka River Gage Height at the LPGA Boulevard Bridge

2.2.18.3 Existing Cross Drains

There are 22 cross drains and one bridge identified within the project limits as shown in **Table 2-18** . Cross drains 1 through 16 were installed in the 1970s as part of the original road construction to allow runoff from the west of the corridor into the wetlands on the east. Although the as-built plans for these improvements reflect a cross-drain at station 518+00, it appears that it was either removed or not installed; therefore, runoff in that area sheet flows to the wetlands in the west. There have been several developments in the area since then, thus altering flow patterns and routing runoff outside of the public right of way. Many of these existing cross drains no longer serve the original purpose intended due to changes of drainage patterns as the result of developments adjacent to LPGA Boulevard.

Table 2-18. Existing Cross Drain and Bridges

Cross Drain No.	Station	Size (Type)	Length (ft)	Flow Direction
1	301+14.00	2-7'X5' BC	92'	Northeast
2	318+97.00	2-30" RCP	86'	Northeast
3	329+97.00	2-30" RCP	86'	Northeast
4	343+97.00	2-24" RCP	86'	Northeast
5	357+00.00	2-24" RCP	86'	Northeast
6	377+07.00	2-30" RCP	93'	East
7	384+08.00	2-30" RCP	102'	East
8	400+08.00	2-30" RCP	106'	East
9	412+00.00	2-6'X7' BC	110'	Northeast
10	422+10.00	2-36" RCP	86'	East
11	442+10.00	2-30" RCP	86'	East
12	456+10.00	2-24" RCP	100'	East
13	473+10.00	2-36" RCP	85'	East
14	489+10.00	2-24" RCP	85'	East
15	500+10.00	1-24" RCP	89'	East
16	540+35.00	2-36" RCP	110'	South
17	560+84.00	2-48" RCP	96'	South
18	Exist. Ramp D	2-8'x6' BC	120	West
19	I-95	2-8'x6' BC	210	West
20	Exist. Ramp B	1-6'x5' RCP	90'	South
21	596+42.00	1-6'x5' RCP	215'	South
22	608+20.00	2-48" RCP	176'	Northeast

2.2.18.4 Environmental Resource Permits

Table 2-19 summarizes the existing environmental resources permits for LPGA Boulevard within the study corridor. Environmental permits to construct the LPGA Boulevard in 1978 were not found.

Table 2-19. Environmental Resource Permit

Permit Number	Location
ERP No. 23036-1 & 23036-2	I-95 and 11th St (LPGA Boulevard) Interchange

USACE 199201907 (IP-BL)	
ERP No. 23036-13	LPGA Boulevard from I-95 to Williamson Blvd

2.2.19 Lighting

The LPGA Boulevard corridor has existing roadway lighting in the vicinity of the Daytona Stadium and in the I-95 Interchange between Tomoka Farms Road and Outlet Boulevard/Technology Boulevard. The Daytona Stadium lighting system consists of concrete poles with light-emitting diode (LED) luminaires fed with overhead conductors on the northbound shoulder (**Figure 2-12**).

The LPGA Boulevard section (in the I-95 interchange area) between Tomoka Farms Road and Outlet Boulevard lighting system consists of conventional aluminum LED light poles on the outside shoulders along both sides of the facility (**Figure 2-13**). This lighting system was recently installed by FDOT District 5.

Additionally, the following intersections have streetlights with LED luminaires mounted on signal poles (**Figure 2-14)**: Tournament Drive, Tymber Creek Road, Champions Drive, Tomoka Farms Road, and Williamson Boulevard.

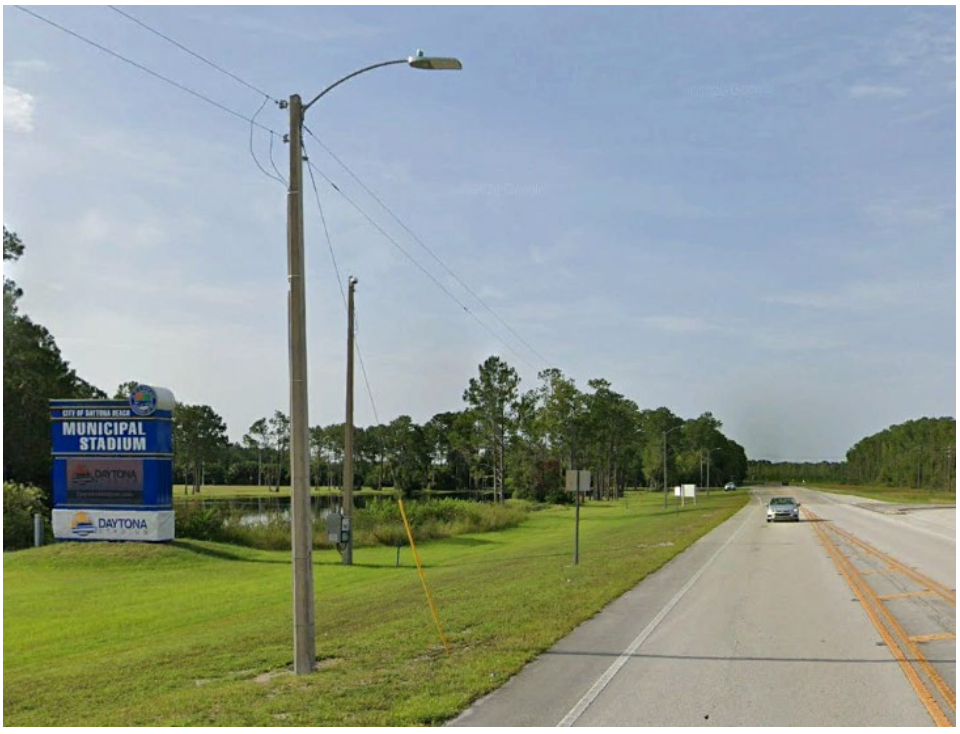


Figure 2-12. Streetlight near Daytona Stadium



Figure 2-13. Streetlight near interchange area



Figure 2-14. Intersection Lighting

2.2.20 Utilities

Existing Utility Agency/Owners (UAO) within the project limits are shown in **Table 2-20** along with their respective contact information. Preliminary utility coordination with the UAO was initiated through written communication. Through the communication, FDOT informed the UAO of the LPGA Boulevard PD&E Study and requested that they provide documentation showing existing and proposed facilities within the limits of the project. They were also requested to submit any general concerns and/or comments that would be useful in the project evaluation process. All UAO contacted have responded and provided as-builts, marked plans, or a letter indicating they have no facilities in the area.

Table 2-20. Utility Contact List

Utility Agency/Owner	Facility Type	Contact Person	Phone Number	Email
AT&T - Distribution	Telephone	Kirby Spencer	(386) 281-6957	ks2488@att.com
ATT Transmission /PEA	Communication Lines, Fiber	Stefan Erikson	(850) 826-0846	seriksson@pea-inc.net
Bright House Networks dba Charter/Spectrum	Cable, CATV, Fiber	Jerrold Kaiser	(321) 338-1928	Jerrold.Kaiser@charter.com Stacy.Stafford@charter.com ronald.tyness@charter.com
CenturyLink FKA Level 3	Fiber	Eric Walls Francisco Azuri	(786) 266-1713	francisco.azuri@lumen.com relocations@lumen.com relocations@centurylink.com Eric.Walls1@lumen.com
City of Daytona Beach Traffic Signals, Fiber & Lighting	Fiber, Traffic Lights, Traffic Signals	Darren Greer	(386) 671-8653	greerdarren@codb.us
City of Daytona Beach W&S	Sewer, Stormwater, Water	James Pekala	(386) 671-8827	pekalajames@codb.us
City of Holly Hill	Sewer, Water	Shawn Hebert	(386) 248-9456	shebert@hollyhillfl.org
Crown Castle (FiberNet Direct)	Fiber	Christopher Perkins	(786) 610-7073 (786) 246-7827	Christopher.Perkins@crowncastle.com
Duke Energy Transmission	Electric	Scott Van Velzor	(407) 942-9498	DEFTransmissionGov@duke-energy.com Scott.VanVelzor@duke-energy.com.
Florida Gas Transmission	Gas	Joseph E. Sanchez	(407) 838-7171	Joseph.E.Sanchez@energytransfer.com
Florida Power & Light - Distribution	Electric	Christopher Buonanni	(407) 328-1911	christopher.buonanni@fpl.com
Florida Power & Light - Transmission	Electric	Beau Bentley	(803) 835-5982	Beau.Bentley@fpl.com tricia.taliercio@fpl.com
Teco Peoples Gas	Gas	Bruce Stout	(904) 443-7365	rjmorig@tecoenergy.com bstout@tecoenergy.com
Uniti Fiber LLC	Fiber	George Travis	(904) 683-2729	travis.george@uniti.com

2.2.21 Soil Classifications

Based on the Natural Resources Conservation Service (NRCS) Web Soil Survey, soil in the area is predominantly sandy with a small portion of muck in the lower areas. These soils have a groundwater depth of approximately 1' below the ground surface except for the area just west of the Tomoka River, where the groundwater is approximately 4' below the existing ground surface. **Table 2-21** defines the corresponding soil classification shown in the project area soil classification map (**Figure 2-15**).

Table 2-21. Soil Classifications

Map Unit Symbol	Map Unit Name	Hydrological Group
3	Arents	A/D
8	Basinger fine sand, frequently ponded, 0 to 1 percent slopes	A/D
17	Daytona sand, 0 to 5 percent slopes	A
23	Farmton fine sand	B/D
24	Fluvaquents	D
25	Gator muck, 0 to 1 percent slopes, frequently flooded	C/D
29	Immokalee sand	B/D
32	Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	A/D
37	Orsino fine sand, 0 to 5 percent slopes	A
42	Paola fine sand, 0 to 8 percent slopes	A
45	Pineda-Pineda, wet, fine sand, 0 to 2 percent slopes	A/D
49	Pomona fine sand	A/D
50	Pomona fine sand, depressional, 0 to 2 percent slopes	A/D
51	Pomona-St. Johns complex	A/D
53	Pompano-Placid complex	A/D
56	Samsula muck, frequently ponded, 0 to 1 percent slopes	A/D
60	Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes	A/D
54	Troup-Poarch complex, 8 to 12 percent slopes	A
56	Troup-Poarch complex, 5 to 8 percent slopes	A
60	Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes	A/D
63	Tavares fine sand, 0 to 5 percent slopes	A
64	Tequesta muck, frequently ponded, 0 to 1 percent slopes	A/D
65	Terra Ceia muck, frequently ponded, 0 to 1 percent slopes	A/D
75	Wauchula fine sand	A/D

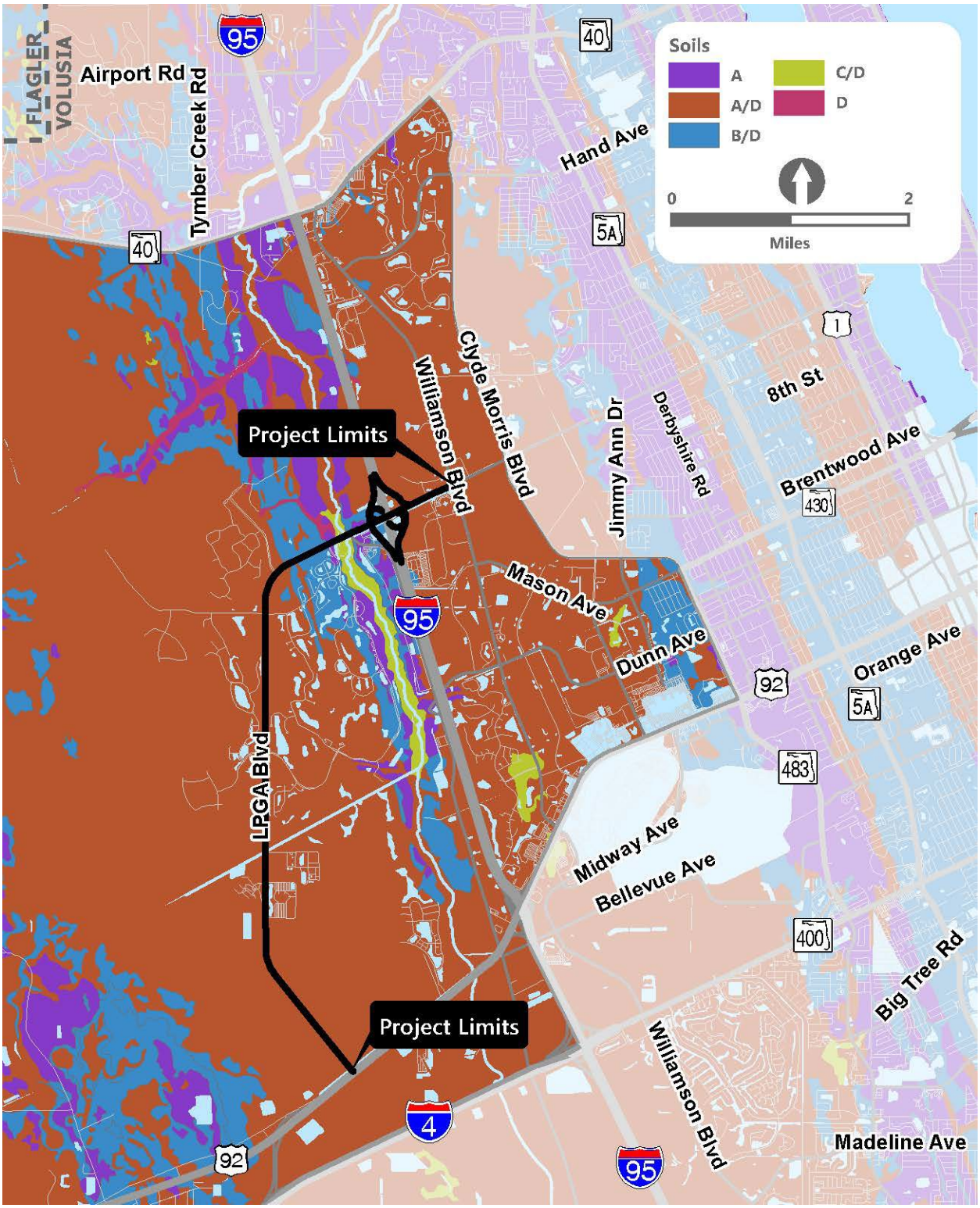


Figure 2-15. Soil Classifications

2.2.22 Aesthetic Features

Aesthetic features consisting of landscape plantings exist near the I-95 interchange area. The entrances to the communities abutting LPGA Boulevard (at International Golf/Tennis Drive, Tournament Drive, Tymber Creek Road, and Champions Drive) have landscape plantings mainly consisting of palm trees. Palm trees are also located at the following intersections: Tomoka Farms Road, Technology Boulevard, and Williamson Boulevard. Example landscape plantings at an intersection is shown in **Figure 2-16**.



Figure 2-16. I-95 Landscape at the LPGA International Entrance (Champions Drive)

The I-95 interchange has landscaping including Washington palm trees (Washingtonia robusta) which are illuminated by several up-lights. The quadrants of the I-95 interchange have “LPGA BLVD” and “DAYTONA BEACH” inscriptions made of metal edging and white granite gravel and are illuminated by up-lights (**Figure 2-17**). The interchange also has plant material consisting of cordgrass (Spartina bakeri) in white sand.

A small section of the median of LPGA Boulevard east of the northbound ramp terminal has plantings consisting of Fakahatchee grass (Tripsacum floridanum) and crape myrtles.

There are no Scenic Highways within 500’ of the project.



Figure 2-17. I-95 Interchange Aesthetic Features

2.2.23 Signs

Figure 2-18 shows locations of the existing roadway guide signage within the study area.

2.2.24 Noise Walls

Not present in the project limits.

2.2.25 Intelligent Transportation Systems

The existing Intelligent Transportation Systems (ITS) infrastructure along I-95 and LPGA Boulevard within the project area is owned by FDOT District 5, Volusia County, and the City of Daytona Beach. The existing signal system on LPGA Boulevard is an adaptive system from Tournament Drive to Clyde Morris Boulevard.

FDOT

The FDOT ITS Strategic Plan includes fiber optic cable (FOC) trunklines for data communications, four Dynamic Messaging Signs to convey information to local drivers, and numerous Closed-circuit television (CCTV) cameras to monitor traffic flows and congestion as planned deployments to enhance operations, expand coverage, and provide infrastructure for Wide Area Network (WAN) integration of the local partners.



Figure 2-18. Existing Guide Signs

Volusia County

Independently owned FOC provides the primary medium through which regional communications are transferred and leverages FDOT FOC in various locations to establish redundancy for system efficiency and security. Volusia County has both system connections to subsystem elements (e.g., traffic signals) and FOC WAN with FDOT. Volusia County maintains a separate system of other ITS-related subsystems throughout the county such as CCTV cameras, Dynamic Message Signing (DMS), and Travel Time that are also shared with FDOT in support of regional partnering practices. There are four existing network-connected intersections and microwave vehicle detection systems along the corridor at US 92, I-95 southbound off ramp, I-95 northbound on ramp, and Williamson Boulevard that are monitored by Volusia County.

City of Daytona Beach

The City of Daytona Beach owns and operates an FOC communications network that routes several critical data communications for various systems. Transportation Systems Management and Operations (TSM&O) related systems include traffic system monitoring and real-time data analytics. The city has expanded fiber interconnection, from US 92 to International Tennis Drive along LPGA Boulevard, supplementing state, and county infrastructure to accommodate the increasing traffic growth forecasted for the region investing in ITS infrastructure along city-maintained roadways establishing spur connections to both county and state systems for the same reasons. The data collected through the interconnected networks assists the city directly in handling traffic constraints on local roadways and is a vital function of their system as hosts to large recurring events throughout the year. The city's continual investment in ITS infrastructure is currently limited to providing spur connections between various major trunklines. Event management operations contain all aspects of the TSM&O program involving all stakeholders of the region. Continued improvements are an ongoing commitment for the city and their regional TSM&O stakeholders.

2.3 Existing Structures

There are two bridges and six culverts within the project corridor as shown in **Figure 2-19**. Bridge number 790171 carries LPGA Boulevard over I-95 at milepost 5.479 in Volusia County, approximately 4.8 miles north of the I-4 and I-95 interchange. Bridge number 794038 carries LPGA Boulevard over the Tomoka River, approximately 0.4 mile west of I-95. Three double barrel box culverts and one double barrel pipe culvert are located on the south side of LPGA Boulevard underneath Tomoka Farms Road, I-95, and various ramps. Two concrete box culverts drain the area to the northeast of the interchange under the I-95 northbound on-ramp and LPGA Boulevard.

The condition of the existing structures is described using "Sufficiency Rating" and "Health Index" factors. The "Sufficiency Rating" determines whether a bridge that is structurally deficient or functionally obsolete should be repaired or just replaced. The sufficiency ratings for bridges are

part of a formula used by the FHWA when it allocates federal funds to the states for bridge replacement.

The “Health Index” measures the overall condition of a bridge. A lower health index means that more work would be required to improve the bridge to an ideal condition. A health index below 85 generally indicates that some repairs are needed, although it does not mean the bridge is unsafe. A low health index may also indicate that it would be more economical to replace the bridge than to repair it.

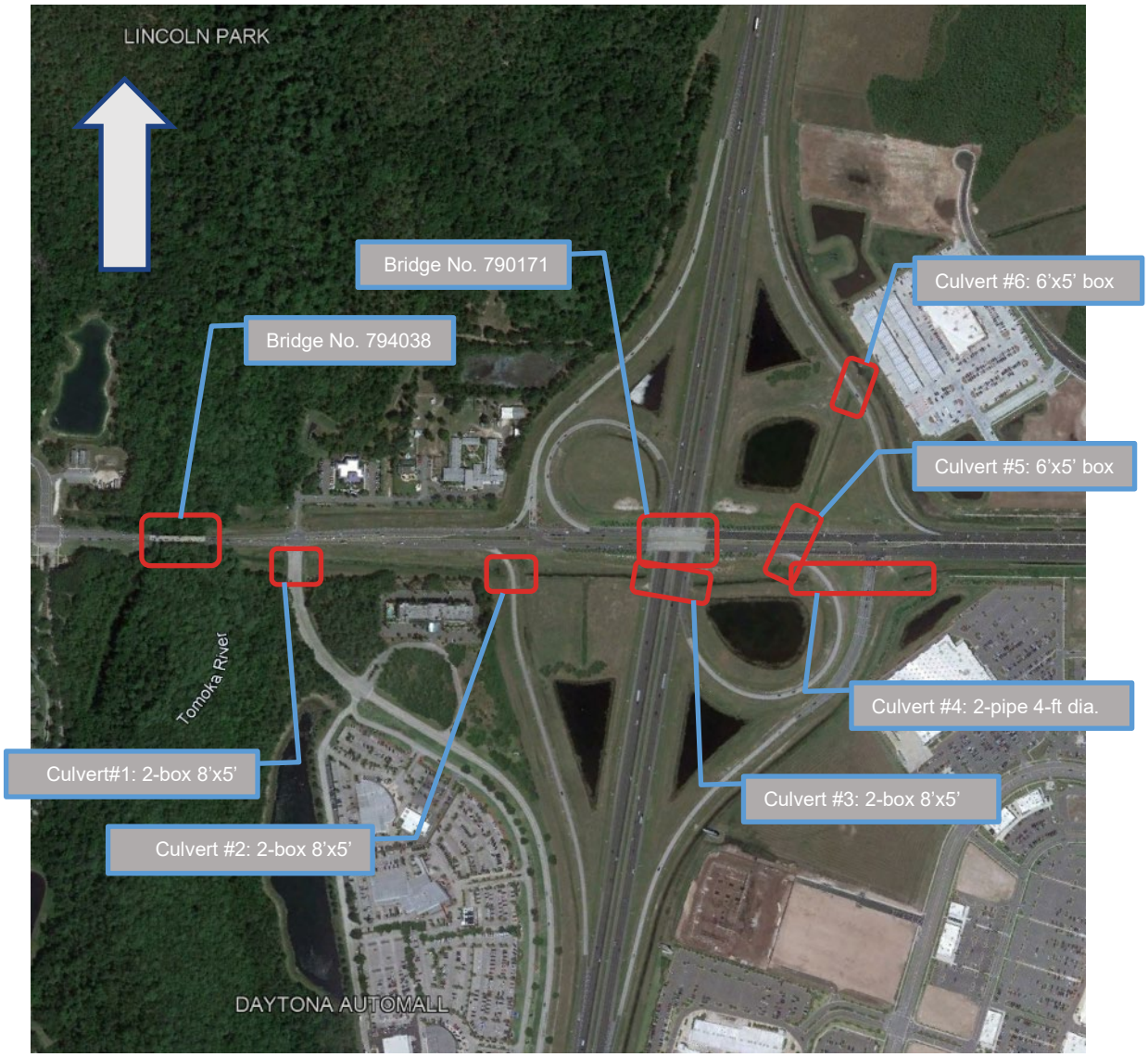


Figure 2-19. Existing Structure Locations and Summary Information

Table 2-22 summarizes bridge characteristics, and the subsequent sections describe the existing structures in detail, including their current condition based on the most recent FDOT inspection reports.

Table 2-22. Bridge Characteristics

Bridge Element	Bridge No. 790171 (B2) Over I-95	Bridge No. 794038 (B1) Over Tomoka River
Year Opened to Traffic	1995	1968
Type of Construction	Florida Bulb-T 72 Prestressed Concrete	AASHTO Type II Prestressed Concrete
Number of Spans	2	5
Maximum Span Length	111.25-ft	50.2-ft
Number of Intermediate Piers or Bents	1	4
Total Bridge Length	222.5-ft	250-ft
Overall Bridge Width (out-to-out)	109.1-ft	32.7-ft
Minimum Horizontal Clearance	18-ft	n/a
Minimum Vertical Clearance	15.9-ft	2-ft
Lane Widths	(6) 12-ft	(2) 12-ft
Shoulder Widths	6-ft outside, 1.5-ft inside	2-ft outside
Sufficiency Rating	92.5	72.8
Health Index	98.95	95.69

2.3.1 I-95 Bridge (Bridge No. 790171)

Bridge No. 790171 was built in 1995, replacing a previous bridge that was built in 1963. It currently carries two through lanes and an auxiliary lane of LPGA Boulevard in each direction. The lanes are 12'-0" wide with 6'-0" outside shoulders, 1'-6" inside shoulders, and a 19'-0" wide raised median as shown in the in **Figure 2-20**. A pictorial view of this bridge is shown in **Figure 2-21**.

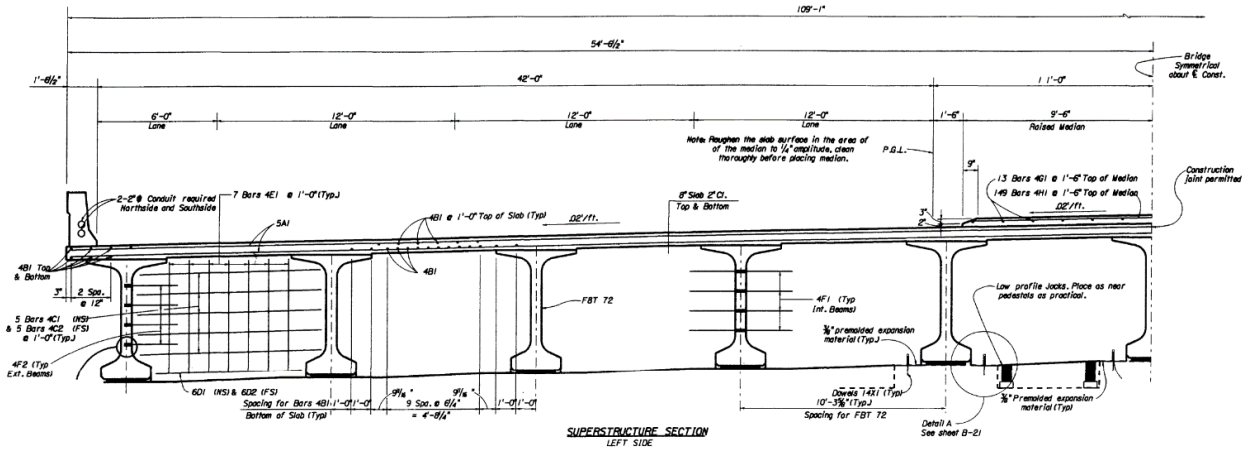


Figure 2-20. Cross Section of Bridge No. 790171



Figure 2-21. Existing Bridge No. 790171 (Picture Taken from South Looking North)

2.3.1.1 Type of Structure

The existing LPGA Boulevard bridge over I-95 is 222'-6" inches long, and 109'-1" wide with an approximately 81-degree skew and no horizontal curvature. It is comprised of two simple spans of equal length with 11 Florida Bulb-T 72" prestressed concrete beams supporting an 8" thick deck. The traffic railings on the outside are 32" F-shapes and the raised median is 5" high. The single intermediate pier has four 3'-0" diameter round columns on isolated footings with four 24" square prestressed concrete piles. The base of the columns is surrounded by a split 32" F-shape concrete median barrier. The end bents have nine 24" square prestressed concrete piles each

and are wrapped with mechanically stabilized earth (MSE) retaining walls. The wings of the MSE walls extend out at approximately 45-degree angles from the bridge. There are 20' long approach slabs at each end of the bridge. The current bridge previously replaced a four-span bridge on the site which had 14" square concrete piles and steel H-piles.

2.3.1.2 Horizontal and Vertical Alignment and Clearances

The horizontal alignment of the bridge is located on a tangent portion of LPGA Boulevard and traverses at approximately a 9-degree skew over a tangent portion of the I-95 below. I-95 is a divided highway below the bridge with three 12' wide through lanes, a variable width auxiliary lane, and paved shoulders under each span. The inside shoulders are approximately 18' wide and completely paved up to the median barrier. The outside shoulders are paved for approximately 10' and have a minimum horizontal clearance to the face of the MSE wall of approximately 30' in height.

The bridge is nearly centered at the crest of a 1,400' vertical curve of LPGA Boulevard. According to the recent Inspection Reports, the minimum vertical clearance is only 15.9', which is less than the current FDOT requirement of 16.5'. While the original plans show minimum vertical clearances of greater than 16.5' at the inside lane line, those clearances are measured 30'-3" clear of the interior pier, which is where the original inside lane line was located with the shoulder sloping down. However, the inside lane has since been shifted (by previous I-95 widening) closer to the pier and extending the rising cross-slope.

2.3.1.3 Bridge Conditions

There is no load restriction posting on the bridge. The bridge was previously load rated in 1999 with the Load Factor Method and the most recent Inspection Report determined that there was no reason to reevaluate that Load Rating. The bridge is not considered Structurally Deficient nor Functionally Obsolete.

The existing bridge was built in 1995, making it 27-years old as of 2022, and is within its design service life. The most recent inspection of the bridge was performed on August 26, 2021, and reported overall National Bridge Inventory (NBI) Ratings of 7-Good for the Deck, Superstructure, and Substructure. The Deck Geometry is rated 6-Equal to Minimum Criteria and the Approach Alignment is 8-No Speed Red through Curve. The Bridge Railings and Approach Guardrail are rated 1-Meet Standards, but the Bridge Railing Transitions and Approach Guardrail Ends are 0-Substandard. The Performance Rating was listed as good with a Sufficiency Rating and Health Index of 92.5 and 98.95, respectively.

The bridge superstructure has a past collision history that damaged the beams in the west span above the I-95 southbound roadway. The most recent Inspection Report indicates both exterior beams have repair patches and epoxy injections up to 20' long for the full beam height to repair past impact damage as seen in **Figure 2-22**. Additionally, the bottom flange of beam 1-2 – the second beam from the north in the west span – is indicated to have a few smaller spalls over the outermost southbound lane and there are previous patch repairs to the flanges of beams 1-1, 1-2, 1-3, and 1-5. The Inspection Report also notes spalls and delamination needing repair in the beam diaphragms. Special-Accident Damage inspections were conducted in December 1997, March 2004, and August 2016 because of similar vehicular impacts to the beams.



Figure 2-22. Beam 1-1 Damage

The most recent Inspection Report also indicated that the deck's pourable joint seal was previously repaired, but that repair has failed. The pier columns are noted as having several scrapes in the columns due to passing traffic and the MSE walls are noted to have multiple cracks and spalls in the copings and panels including one with exposed steel that needed repairing. Additionally, there are significant vegetation issues in the joints of the MSE wall panels.

2.3.1.4 Historical Significance

The LPGA Boulevard Bridge over I-95 is excluded from Section 106 consideration under the National Historic Preservation Act. Please refer to the CRAS located in the project file for additional information.

2.3.2 Tomoka River Bridge (Bridge No. 794038)

Bridge No. 794038 was built in 1968. It is currently striped for one through lane of LPGA Boulevard in each direction. It has two 12' lanes with 2' outside shoulders. Its west approach is shown in **Figure 2-23**.



Figure 2-23. Bridge No. 794038 (Picture Take from West Approach Looking East)

2.3.2.1 Type of Structure

The existing Tomoka River bridge is 250’ long and 32.7’ wide with no skew. It is comprised of five simple spans of equal length with four AASHTO Type II prestressed concrete beams supporting a concrete deck. The traffic railings on the outside are an outdated post-and-beam style on a raised 1’-6” wide safety curb on the deck, common to the era it was built. The four intermediate pile bents have four 18” square prestressed concrete piles each with the outer two piles battered. At a site visit conducted on January 7, 2022, only Intermediate Bent 2 between spans 1 and 2 had its piles in the water. The end bents are pile-supported with concrete bag slope protection as shown in **Figure 2-24** through **Figure 2-27**.

2.3.2.2 Horizontal and Vertical Alignment and Clearances

The horizontal alignment of the bridge is located on a tangent section of LPGA Boulevard shortly before it widens from a two-lane road to a six-lane divided boulevard. The Tomoka River is unnavigable at the location.

The original construction plans indicate that the bridge is flat over the river with a 2’ minimum vertical clearance over the Extreme High Water and a minimum vertical clearance of 8.5’ over the Normal Water Elevation.



Figure 2-24. South Elevation, Span 5



Figure 2-26. Pier 2 Elevation



Figure 2-25. North Elevation, Span 5



Figure 2-27. End Bent 6 Elevation

2.3.2.3 Condition

There is no load restriction posting on the bridge. The bridge was previously load rated in 1994 with the Load Factor Method and the recent Inspection Report determined that there was no reason to reevaluate that Load Rating. The bridge is not considered Structurally Deficient; however, it is listed as Functionally Obsolete.

The existing bridge is 54-years old as of 2022, which is nearing the end of its design service life. The most recent inspection of the bridge was performed on April 28, 2020, and reported overall NBI Ratings of 7-Good for the Deck, Superstructure, and Substructure. The Approach Alignment is 8-No Speed Red through Curve; however, the Deck Geometry is rated 3-Intolerable. The Bridge Railings, Bridge Railing Transitions, Approach Guardrail, and Approach Guardrail Ends are all rated 0-Substandard. The Performance Rating was listed as good with a Sufficiency Rating and Health Index of 72.8 and 95.69, respectively.

The piles on Bents 2 and 3 have notable scaling from the high-water mark down to the groundline. There are notes in the most recent Inspection Report of several spalls on the piles with no exposed reinforcement steel. It also notes that the joints all have either heavy deterioration or have failed.

There are multiple utilities attached to the bridge. Continuous in all spans, a utility is attached to the north face of Beam 1, a utility hangs from the deck along the south side of the bridge, and four utilities are attached to the diaphragm in bay 3. Approximately 25' north of the existing bridge is an overhead electric line and a fiber optic cable. Additionally, a stream gauge water control is attached on the north side of Bent 2.

2.3.2.4 Channel Data

An un-maintained channel runs predominantly under spans one and two with the centerline of the channel located in span 2 as seen in **Figure 2-28** and **Figure 2-29**. The most recent Inspection Report noted that the water depth of the Channel was less than 3'. The Extreme High Water is elevation +14.5' and the Normal High Water is elevation +8.0' according to existing plan information [National Geodetic Vertical Datum of 1929 (NGVD-29)]. **Figure 2-30** shows a profile plot showing changes in the ground line along the channel bottom between 1988 and 2020.

The Inspection Report Identifies the Bridge as Scour Critical. The NBI Ratings for the Channel and Waterway are 6-Bank Slumping and 8-Equal Desirable, respectively.



Figure 2-28. Downstream River



Figure 2-29. Upstream River

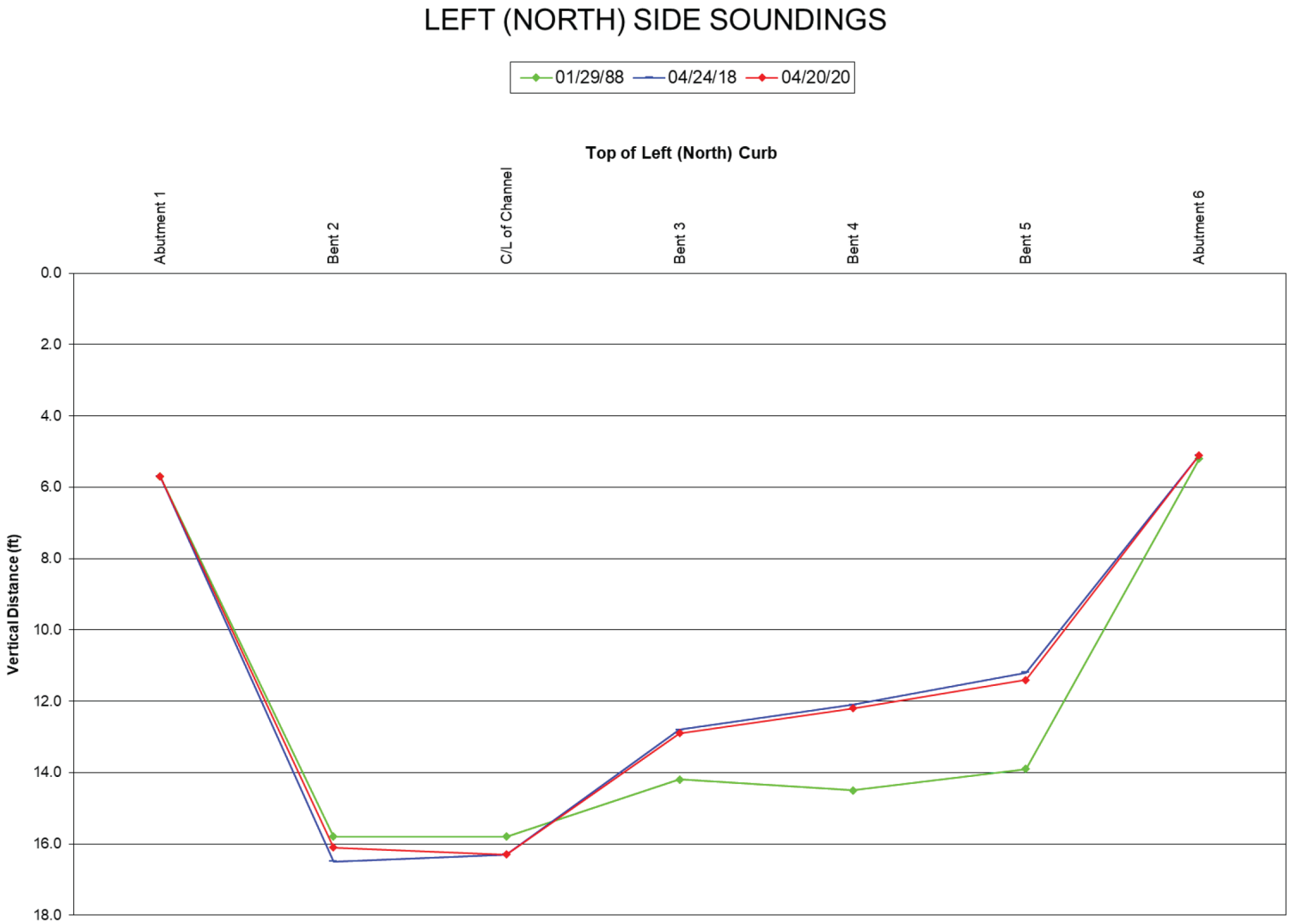


Figure 2-30. Bridge No. 794038 Inspection Soundings (N.T.S.)

2.3.2.5 Ship Impact Data

Through coordination with the United States Coast Guard (USCG), Tomoka River, at the site of this project, is a non-navigable waterway of the U.S. and is not subjected to USCG jurisdiction.

2.3.2.6 Historical Significance

This bridge is excluded from Section 106 consideration under the National Historic Preservation Act. Please refer to the CRAS located in the project file for additional information.

2.3.3 Culverts

Four culverts carry a ditch under the adjacent roadways along the south side of LPGA Boulevard from east to west toward the Tomoka River as seen in **Figure 2-31** through **Figure 2-34**. The westernmost culvert, #1, is approximately 100' long and goes under North Tomoka Farms Road. Culvert #2 is approximately 120' long and goes under the I-95 southbound on-ramp from LPGA Boulevard. Culvert #3 is about 210' long and goes under I-95 both southbound and northbound. The easternmost culvert, #4, is a pair of concrete pipes that go under both the I-95 northbound off-ramp and the I-95 northbound loop on-ramp from LPGA Boulevard eastbound. There is a drainage inlet into one of the pipes in between the ramps. Two more culverts drain the area to the northeast of the intersection into the ditch parallel to LPGA Boulevard. Culvert #5 is approximately 226' under LPGA Boulevard and Culvert #6 is approximately 45' under the I-95 northbound on-ramp. A summary of the culverts can be found in **Table 2-23**.

Table 2-23. Culvert Characteristics

Culvert Element	Culvert #1	Culvert #2	Culvert #3	Culvert #4	Culvert #5	Culvert #6
Type of Construction	Conc. Box	Conc. Box	Conc. Box	Conc. Pipe	Conc. Box	Conc. Box
Intersecting Element	North Tomoka Farms Rd	I-95 SB on-ramp	I-95	I-95 NB ramps	LPGA Blvd.	I-95 NB on-ramp
Number of Barrels	2	2	2	2	1	1
Barrel Size	8'x5'	8'x6'	8'x6'	4'-dia.	6'x5'	6'x5'
Interior Wall Thickness	18"	10"	10"	Unknown	Unknown	Unknown
Total Span	17.5'	17'	17'	10'	6'	6'
Culvert Length	100'	120'	210'	436'	226'	45'
Skew	0°	30°	0°	0° (US) 45° (DS)	30° (US) 0° (DS)	38°

2.3.3.1 Type of Structure

Culverts 1, 2, and 3 are double-barrel concrete box culverts with 8’ wide by 5’ tall barrels. Field Measurements show the interior wall thicknesses for Culverts 2 and 3 are approximately 10” while it is approximately 18” at Culvert 1. Culvert 2 has its headwalls at an approximately 30-degree skew. The downstream headwall for Culvert 4 is at about a 45-degree skew. The remaining headwalls are all normal to the barrels. See pictorial elevations in **Figure 2-31** through **Figure 2-34**.

2.3.3.2 Culvert Condition

Following a site visit on January 7, 2022, the culverts all appear to be in reasonably good structural condition. Culvert #2 has a utility conduit lying in front of it on the upstream side as seen in **Figure 2-33**. Vegetation obscures the downstream side of all the culverts and the upstream side of Culvert 4. There are no load restriction postings on any of the culverts.



Figure 2-31. Culvert #1 Downstream



Figure 2-33. Culvert #2 Upstream



Figure 2-32. Culvert #3 Downstream



Figure 2-34. Culvert #4 Downstream

2.4 Existing Environmental Features

An environmental resources review was performed as part of the PD&E Study to identify resources early in the process to avoid fatal flaws and to consider sensitive environmental resources during the development and evaluation of alternatives. The environmental resources review is summarized in this Section. Additionally, the Efficient Transportation Decision Making (ETDM) Programming Screen Summary Report for this project (ETDM project number 14332) was consulted.

The following resources are not present in the project area and are therefore not discussed: aquatic preserves, coastal barrier resources, essential fish habitat, wild and scenic rivers, and railroads.

2.4.1 Social and Economic

The LPGA Boulevard corridor intersects six census block groups (**Figure 2-35**), which are considered the study area for the purposes of social analysis. The demographic characteristics of the study area are compared to Volusia County in **Table 2-24.** The median household income is approximately $12,000 higher within the study area and the average median age is lower than the rest of Volusia County. The minority population is 28% compared to 16.7% for Volusia County.

Table 2-24. Demographic Characteristics

Geography	2019 Population	Median Household Income	Below Poverty	Minority	Avg. Median Age	With Disability
Study Area	24,468	$61,901	13%	28%	43	11%
Volusia County	536,487	$49,494	14.3%	16.7%	47	17.6%

Source: ACS 2019 5-Year Estimates

2.4.2 Recreation Areas and Section 4(f) Resources

There are six potential recreational resources protected by Section 4(f) U.S. Department of Transportation Act of 1966 that cross or are adjacent to the project right of way. These are:

1. Tiger Bay State Forest
2. Tiger Bay Wildlife Management Area (WMA) Rima Ridge Unit
3. St. Johns River Water Management District Water Management Area
4. Daytona Beach Municipal Stadium and Larry Kelly Field
5. Florida Tennis Center
6. Indigo Community Development District Passive Park/Buffer Area

These resources are shown in **Figure 2-36**.

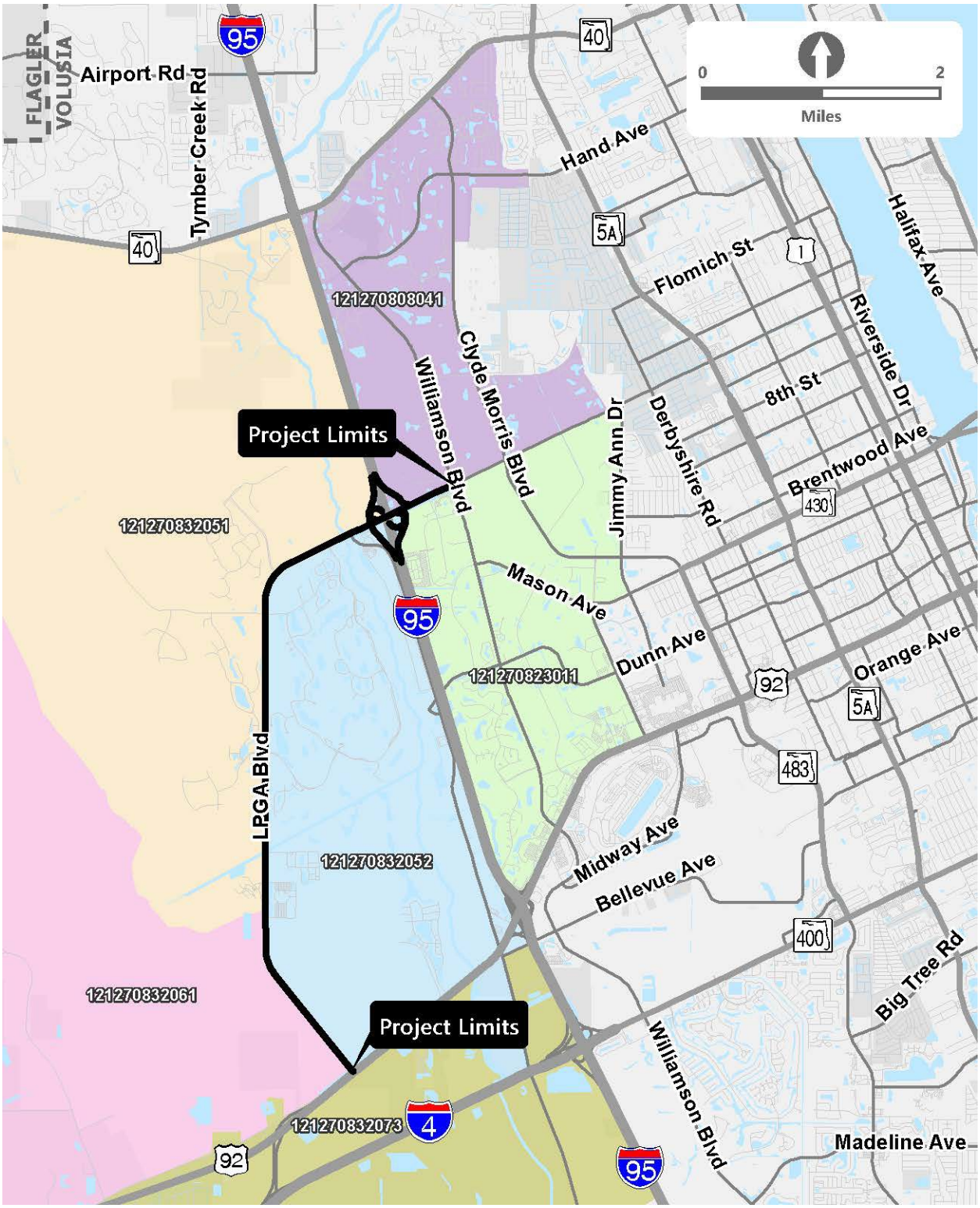


Figure 2-35. Study Area Census Block Groups

2.4.2.1 Tiger Bay State Forest

The Tiger Bay State Forest (TBSF) is located adjacent to the project area west of LPGA Boulevard and north of US 92. The TBSF was acquired through the Environmental Endangered Lands (EEL)Program, Preservation 2000, Florida Forever, and the Save Our Rivers Program, and is comprised of approximately 27,311 acres. The City of Daytona Beach shows the future land use zoning for this property as CONSV (Conservation). The TBSF and contiguous conservation lands protect unique features critical to the region including the Volusia Water Recharge Area.

2.4.2.2 Tiger Bay Wildlife Management Area Rima Ridge Unit

The 11,438-acre Rima Ridge Unit of Tiger Bay WMA located between SR 40 and US 92 is a Cooperative Area of the Florida Fish and Wildlife Conservation Commission, managed in cooperation with the Florida Forest Service and the St. Johns River Water Management District. The Ridge Unit is part of the broader Tiger Bay WMA in north central Volusia County, near Daytona Beach. The area is also part of the TBSF.

2.4.2.3 St. Johns River Water Management District Water Management Area

St. Johns River Water Management District (SJRWMD) Water Management Area is 11,155 acres of land located within the TBSF. SJRWMD cooperatively manages this area in coordination with the TBSF and Florida Fish and Wildlife Conservation Commission Wildlife Management Area.

2.4.2.4 Daytona Beach Municipal Stadium and Larry Kelly Field

The Daytona Beach Municipal Stadium and Larry Kelly Field is a multipurpose stadium with 10,000 seats, located east of LPGA Boulevard with access via Welshinger-Butler Circle. The stadium hosts sports and entertainment events. It is home to the Bethune-Cookman University Wildcats football team and hosts home games for the Mainland High School and Seabreeze High School football teams. The stadium is named in honor of former City of Daytona Beach Mayor Lawrence J. Kelly.

2.4.2.5 Florida Tennis Center

The Florida Tennis Center is located west of LPGA Boulevard with access via International Tennis Drive. The center hosts major United States Tennis Association tennis tournaments annually. It has 24 clay hydro-courts and 20 lighted courts for night play.

2.4.2.6 Indigo Community Development District Passive Park/Buffer Area

The Indigo Community Development District comprises approximately 2,484 acres and is located west of I-95 and is generally bounded by LPGA Boulevard to the north and west and International Speedway Boulevard to the south. The district maintains a conservation easement as a passive park/buffer area adjacent to the Tomoka River.

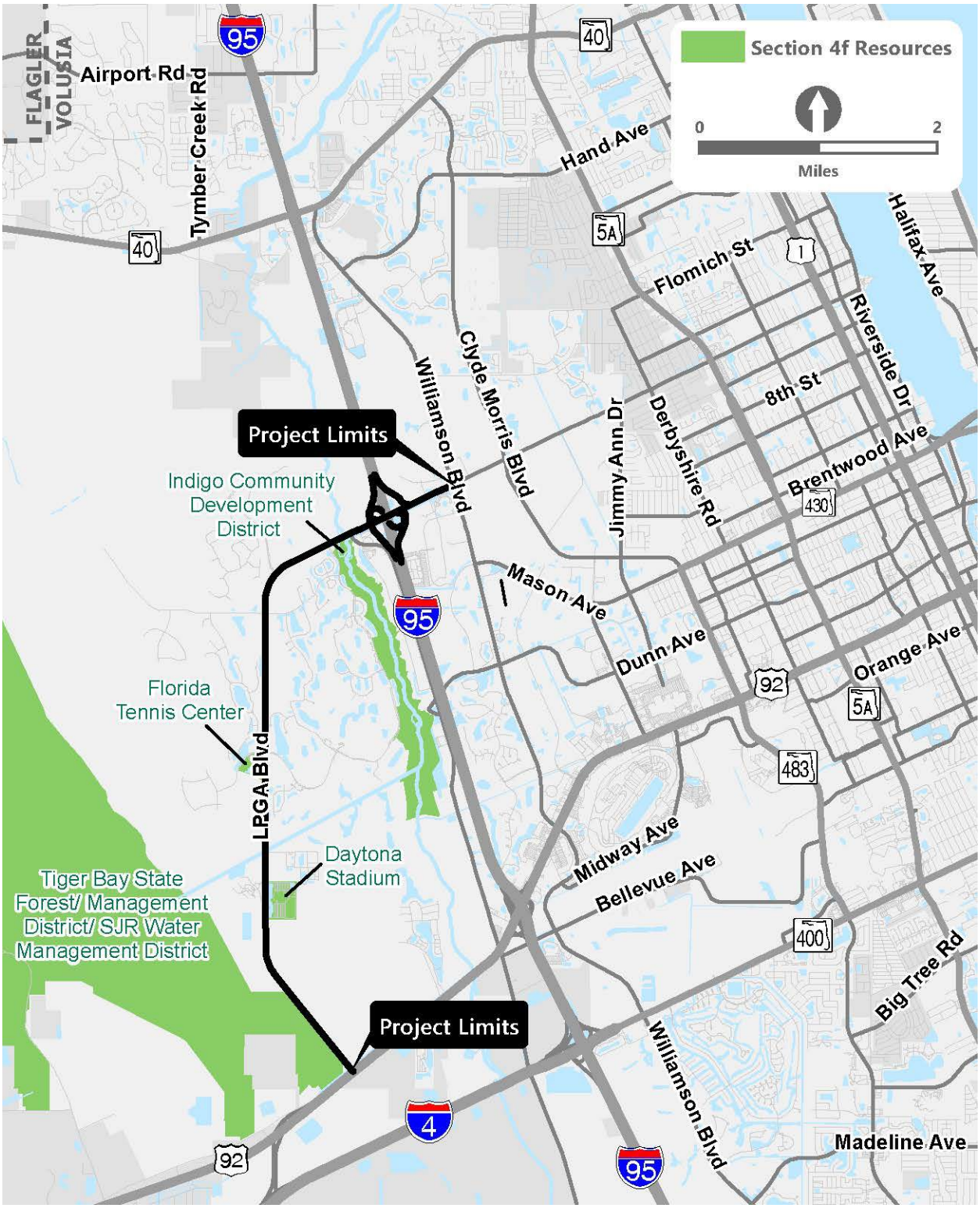


Figure 2-36. Section 4(f) Resources

2.4.2.7 Water Management District Owned Lands

There are approximately 24.4 acres of palustrine wetlands surrounding the study corridor. The wetlands and uplands which are within 50' landward of the landward extent of wetlands abutting the Tomoka River are considered Riparian Habitat Protection Zone (RHPZ) by SJRWMD.

2.4.3 Wetlands and Other Surface Water

Wetlands in the project area are composed of palustrine wetlands, including cypress, hydric pine flatwoods, mixed forested wetland, mixed hardwood wetland, and mixed scrub-shrub wetlands adjacent to the project area. The wetland map based on the National Wetland Inventory (NWI) data is shown in **Figure 2-37**. Wetlands are important because they are a critical natural resource and serve several functions including filtration and treatment of surface water runoff, store flood waters, provide erosion control, groundwater recharge and discharge, and protect and provide fish and wildlife habitats.

The field assessments confirmed the presence of three to four times the wetland coverage as estimated by the SJRWMD land use and NWI mapping, respectively. Within the roadway study area 112 wetlands and 25 surface waters were identified. The wetlands total 92.19 acres and the surface waters total 17.90 acres. These wetlands are within the existing roadway right of way and consist of the adjacent swales. Within the preferred pond and floodplain compensation (FPC) sites 10 wetlands were identified totaling 13.20 acres. **Table 2-25** summarizes the number of wetland types and other surface waters identified with total acreages. Refer to **Appendix E** for delineated wetlands and other surface water in the study areas over an aerial photography.

The project corridor traverses the Tomoka River, which is listed as Outstanding Florida Water. The entire project corridor falls within the Tomoka River Mitigation Basin (as defined by the SJRWMD, Chapter 40C-41 F.A.C.), within which, wetlands and uplands abutting the Tomoka River are designated RHPZ, and any construction activity must follow the SJRWMD Riparian Wildlife Habitat Standard. The Tomoka River is also listed as part of the Nationwide Rivers Inventory (NRI) in Florida.

Table 2-25. Wetland and Other Surface Waters within the Study Area

Wetland Type	Number of Wetlands	Total Acreage
Roadway		
Forested Wetland	34	37.34
Herbaceous Wetland	76	54.40
Shrub Wetland	2	0.45
Surface Water	25	17.90
Preferred Pond and Floodplain Compensation Sites		
Forested Wetland	6	6.04
Herbaceous Wetland	4	7.16

2.4.4 Floodplains

The project is partially located within areas identified as Flood Hazard Zones A, and AE; 100-year floodplains; and floodways associated with the Tomoka River as shown in **Figure 2-38**.

The Tomoka River Floodplain is a 'conveyance' floodplain and has been designated as a Federal Emergency Management Agency (FEMA) Floodway and the second floodplain is a "storage" floodplain associated with the US 92 Canal, Thayer Canal, and the existing wetlands.

No flooding issues were reported along the project corridors.

2.4.5 Protected Species and Habitats

Twenty six (26) listed species and one candidate species have the potential to occur within the project area. Eight of the listed species have a moderate or high potential of occurrence and three species (the Florida sandhill crane, the gopher tortoise, and the hooded pitcher plant) were observed within the project area. The protected species map is shown in **Figure 2-39**.

2.4.6 Contamination Sites

A contamination site map (**Figure 2-40**) was prepared through an environmental database search which identified sites, facilities, or listings within the study area containing documented or suspected petroleum contamination or other hazardous materials. The database search utilized the 500' search distance as requested by the District Contamination Impact Coordinator (DCIC). Historical aerial photographs and United States Geological Survey (USGS) topographic maps were reviewed to understand previous land uses that may indicate contamination concerns.

Twenty one (21) potential contamination sites were identified within the 500' buffer area. These sites include gas stations, underground gas tanks, wastewater treatment area, brownfiled area, and a location of the former railroad. The potential level of impact with respect to the project was evaluated and the sites were assigned low and medium levels as shown in **Figure 2-40.** The **Table 2-26** presents a summary of the risk ratings assigned for each potential contamination site.

Table 2-26. Summary of Risk Ratings for Potential Contamination Sites

High	Medium	Low	No
0	4	15	2

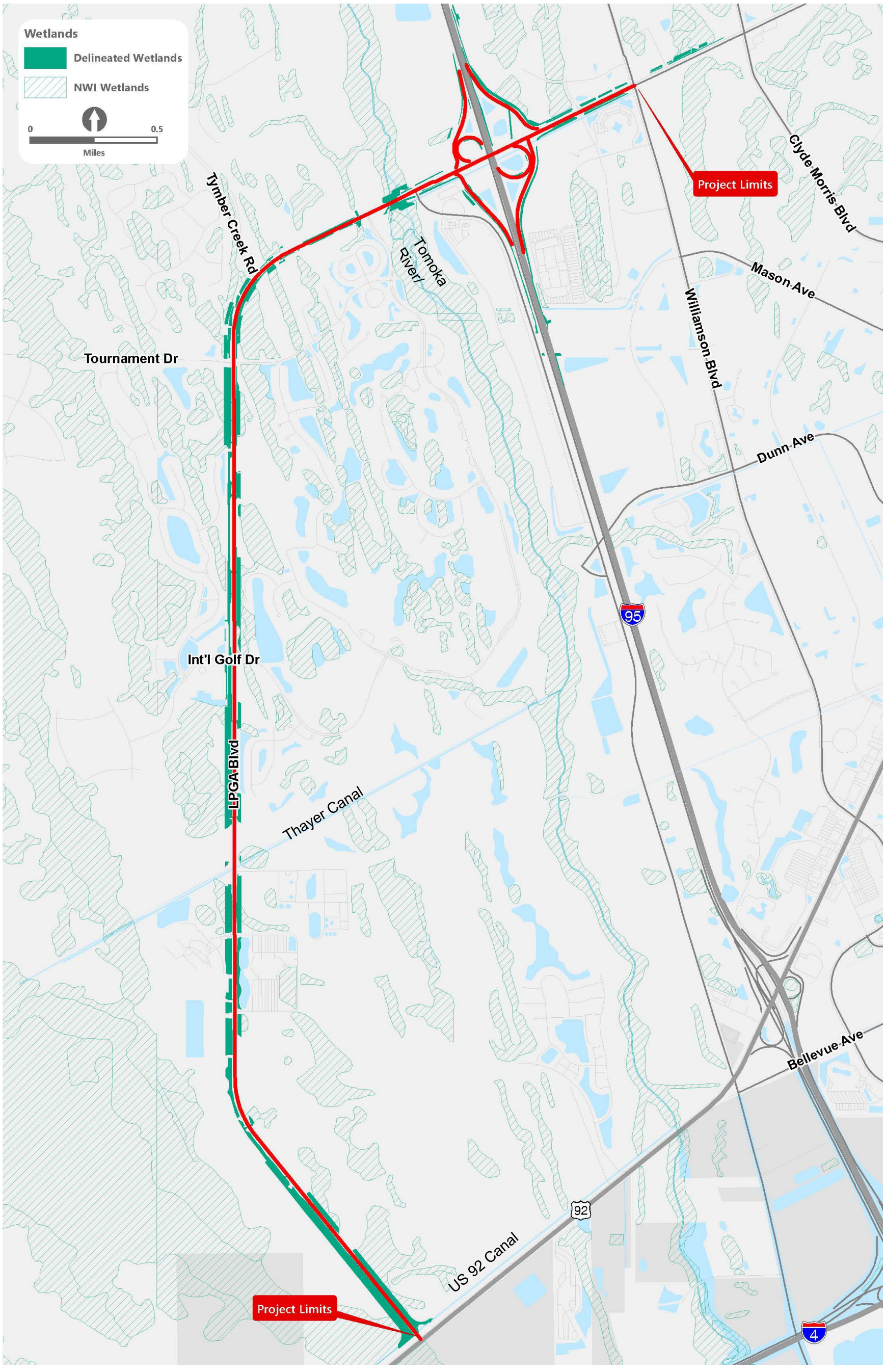


Figure 2-37. Wetlands

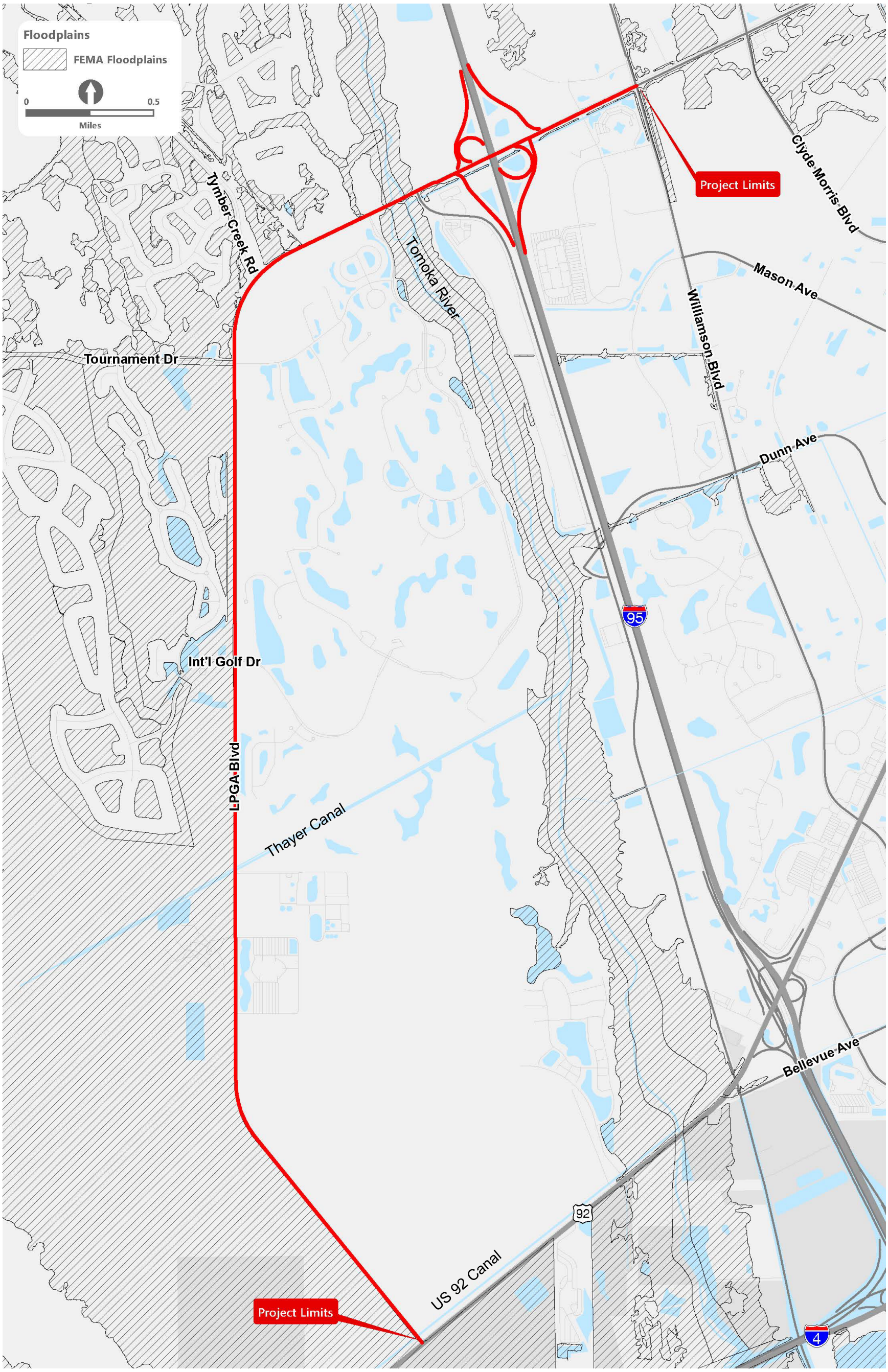


Figure 2-38. Floodplains

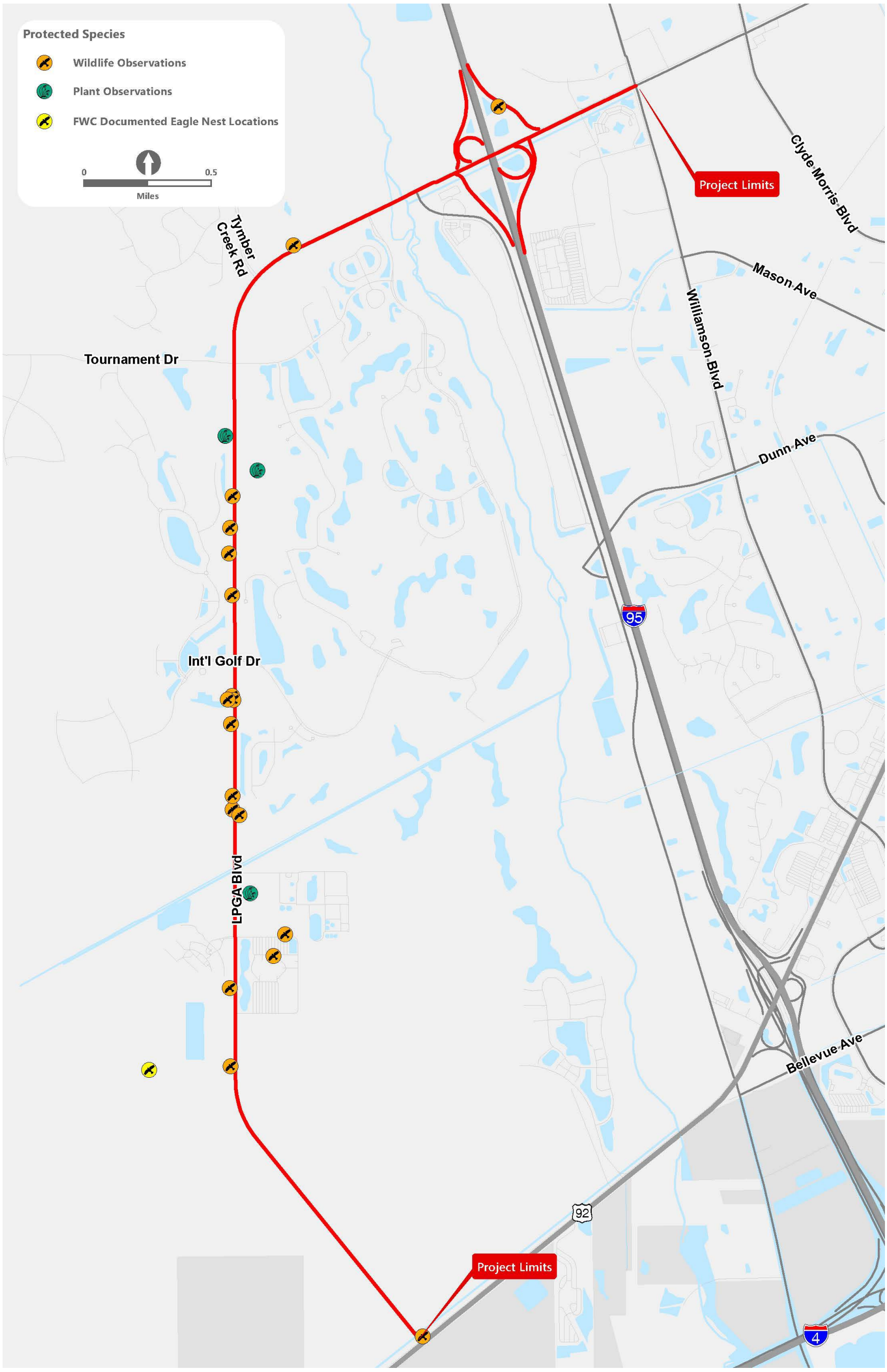


Figure 2-39. Protected Species

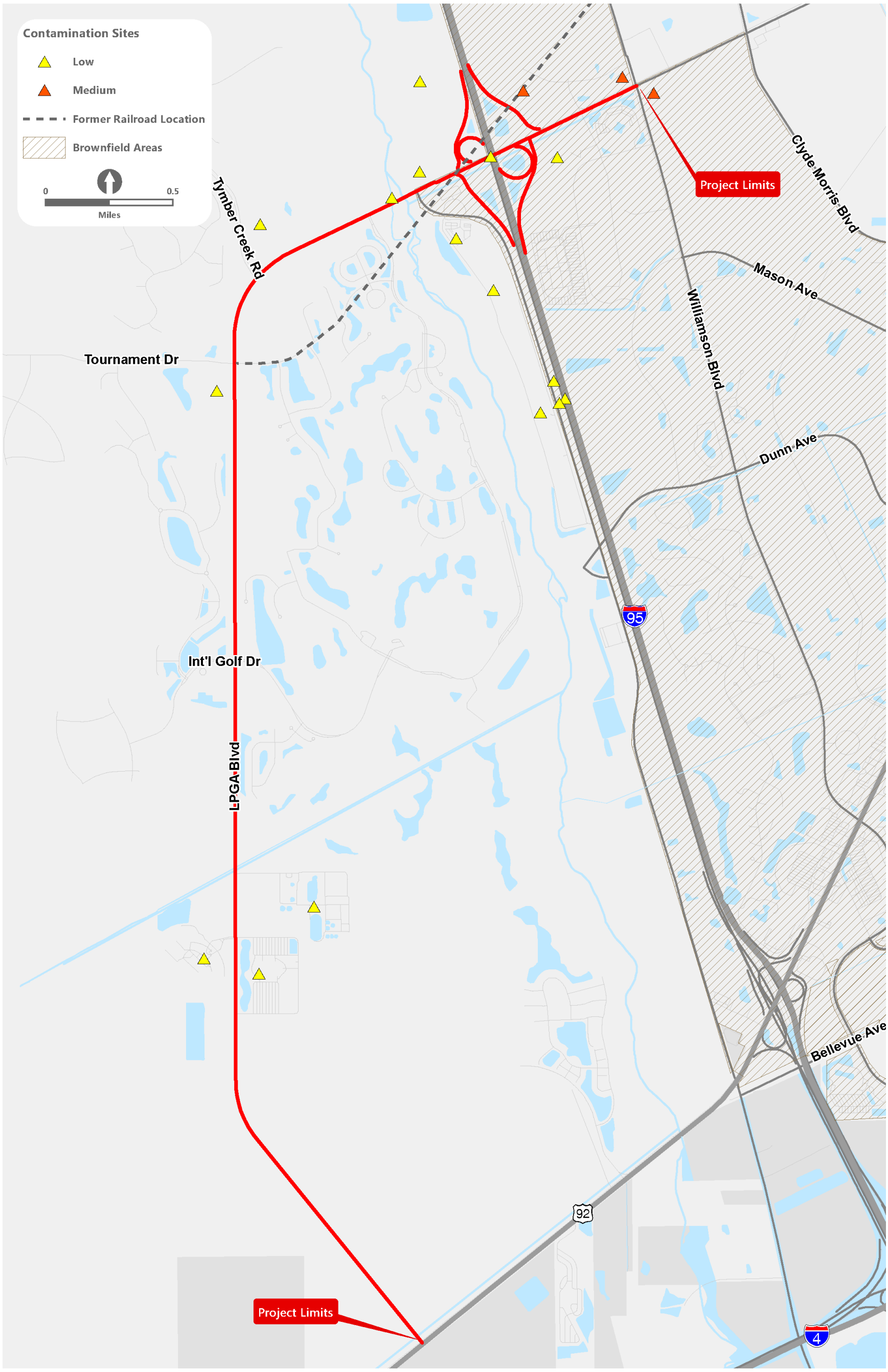


Figure 2-40. Potential Contamination Sites

3.0 Future Conditions

This Section provides information about the future conditions, including how future demand volumes and design traffic were developed. IMR and PTAR should be consulted for more detailed technical analysis.

3.1 Project Traffic

Future forecasted traffic volumes were developed based on procedures contained in the *2019 FDOT Project Traffic Forecasting Handbook* using the Central Florida Regional Planning Model Version 7 (CFRPM 7). The project traffic volumes were developed for the opening year (2030) and design year (2050), and their analysis results are summarized in the PTAR.

Development of project traffic volumes involved the following:

- Review of the CFRPM 7 model in coordination with the City of Daytona Beach, Volusia County, and R2CTPO planning staff. A review of CFRPM 7 was done to confirm reasonableness between the model and the 2015 field conditions. Population, population density, employment and employment density were inspected by using Google Earth imagery for each traffic analysis zone (TAZ) within the study area. Upon review, it was determined that the model showed reasonableness within the study area and no changes were necessary for the year 2015 CFRPM model socioeconomic data.
- Review of population and employment data from the 2045 CFRPM model were also compared with the 2015 base year data to check for any discrepancies. The 2045 socioeconomic data for the 15 TAZs were updated in the 2045 model based on the coordination with the City of Daytona Beach, City of Ormond Beach, and Volusia County planning staff.
- Review of connectivity, area type, functional classification, number of lanes and turn prohibitors in the CFRPM 7 model. The model was checked against the 2045 R2CTPO Cost Feasible Plan and the roadway network was adjusted as appropriate.
- Validation of the base year (2015) model outputs at the regional and project levels using the criteria provided in the *2019 FDOT Project Traffic Forecasting Handbook*.
- Development of the growth curves utilizing the 2015 model and 2045 model outputs, historical/trend analysis, and the Bureau of Economic and Business Research (BEBR) growth rates.
- Development of 2030 and 2050 traffic volumes using the existing year (2021) traffic counts and the growth rates.

Design year (2050) traffic volumes (AADTs, DDHVs, and TMVs) are shown in **Figure 3-1** through **Figure 3-3**.

3.2 Future Land Use

Future land uses include Mixed-Use, Low-Intensity Urban Residential; Level 1 and 2 Residential; Commercial, Retail, Office Transition, Existing Park and Passive Park, Government/Institution, and Conservation. The future land use includes increased residential

and mixed-use developments (**Figure 3-4**) when compared to the existing land use. Most new development is concentrated west of I-95 and includes low to medium density residential and mixed-use developments. Future land use will not affect the roadway context classifications discussed in **Section 2.2.2.2**.

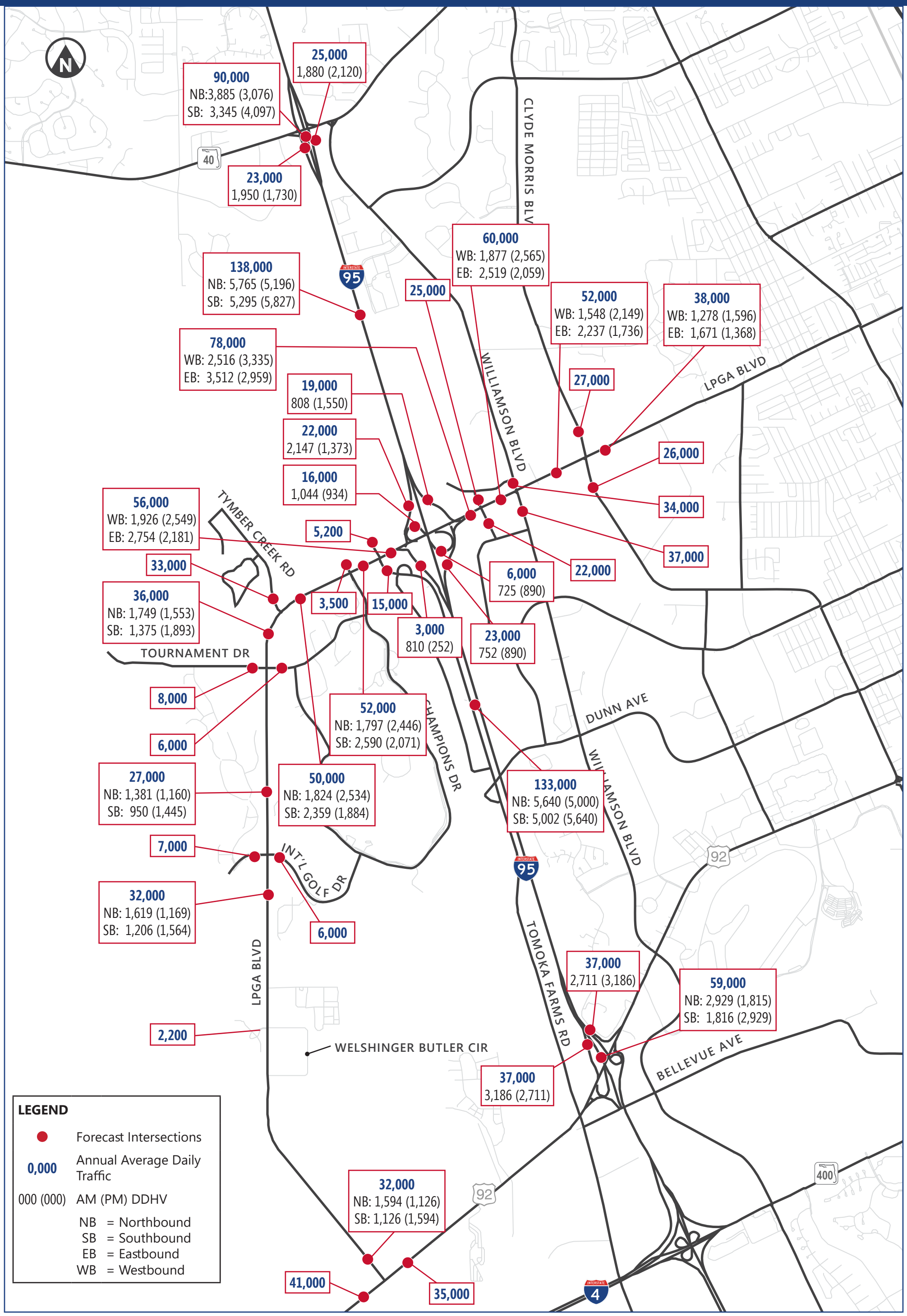
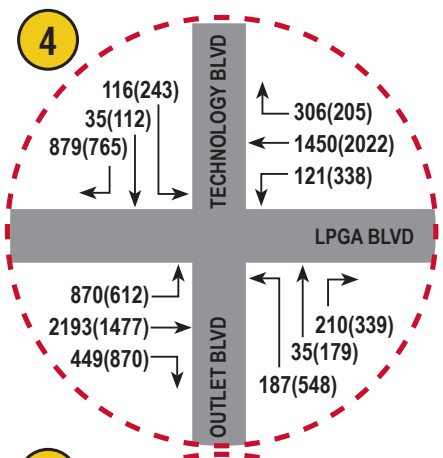
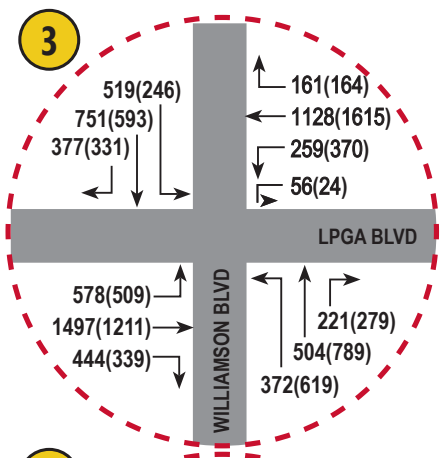
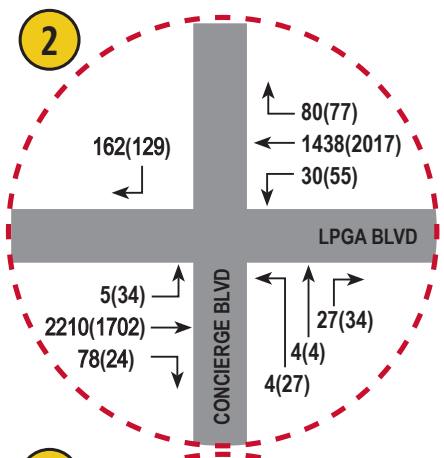
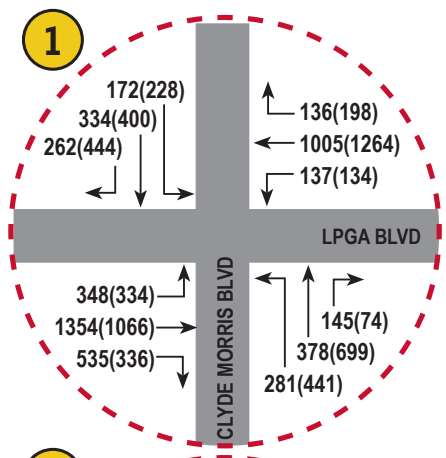


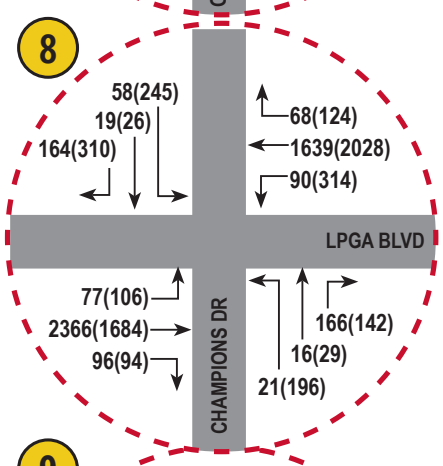
Figure 3-1. Design Year 2050 AADT and DDHV

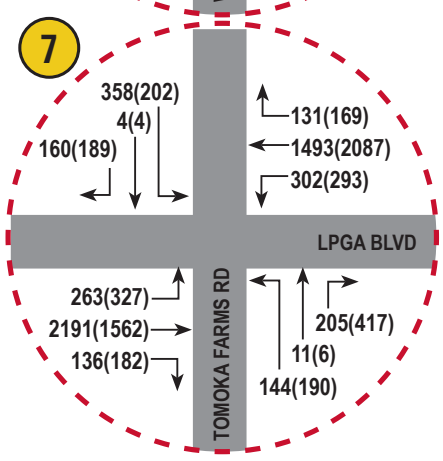


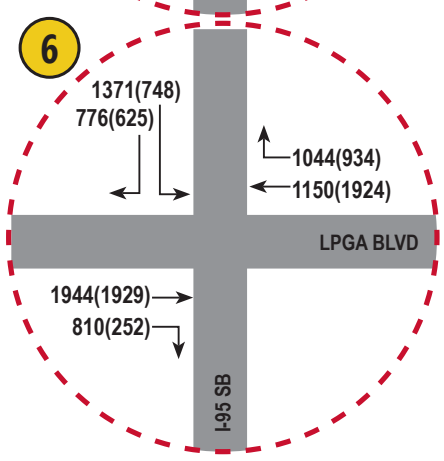


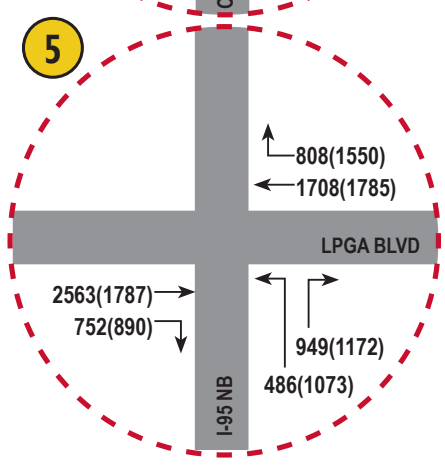


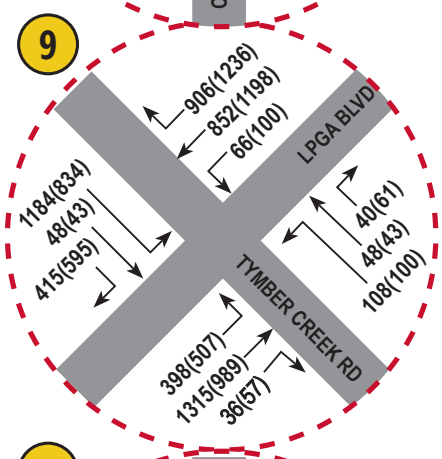


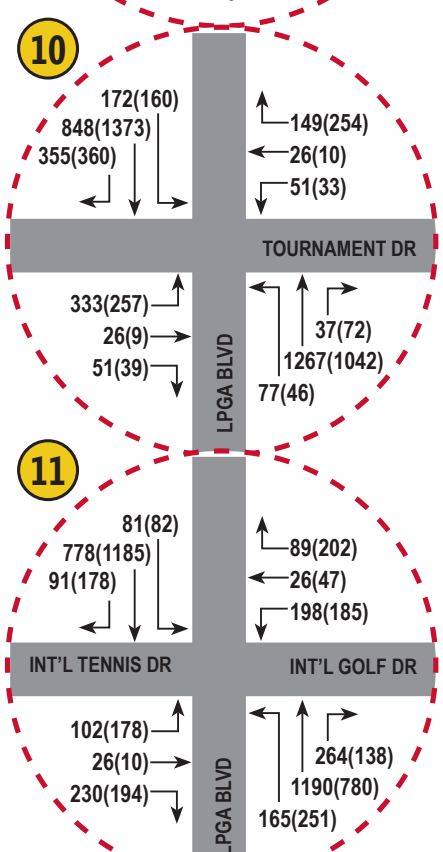


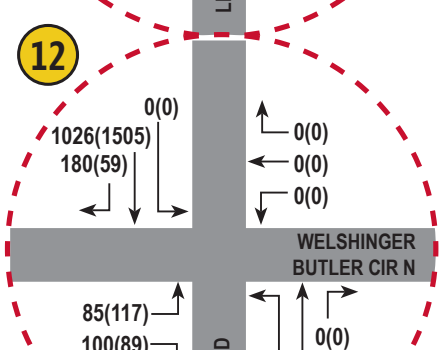


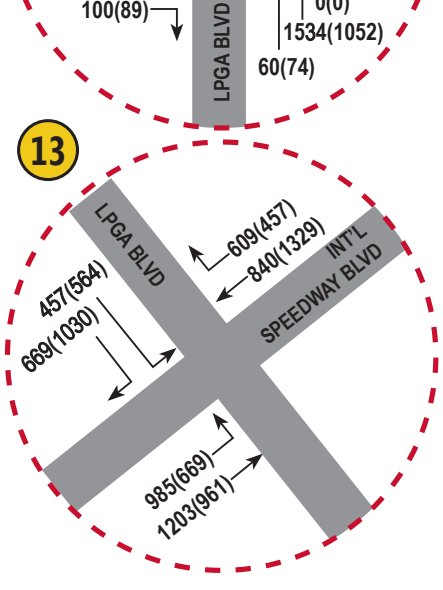












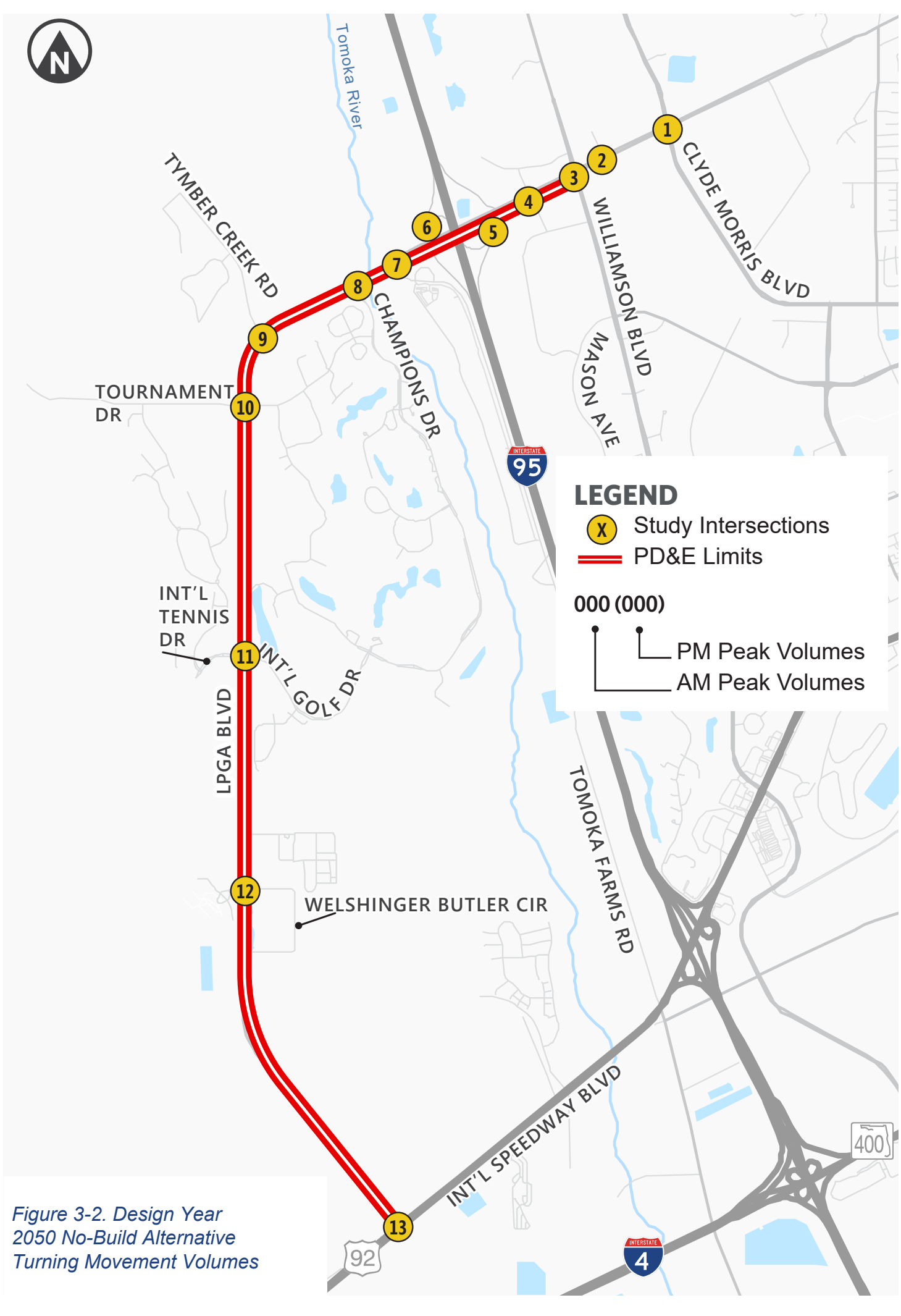
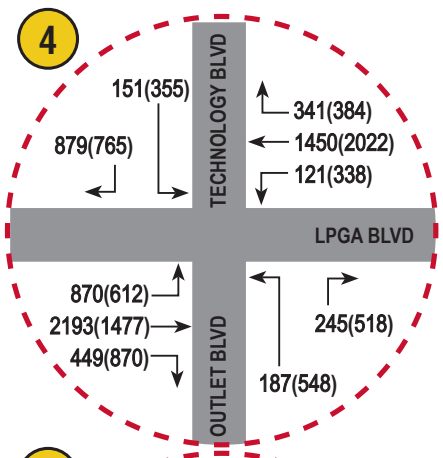
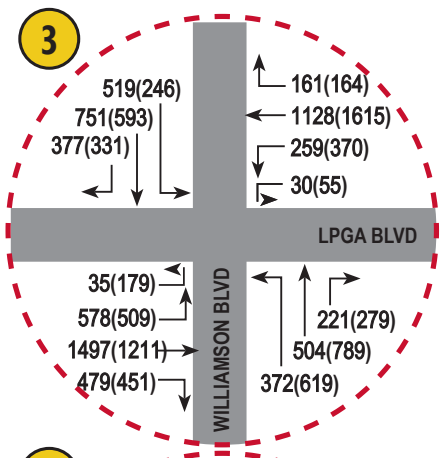
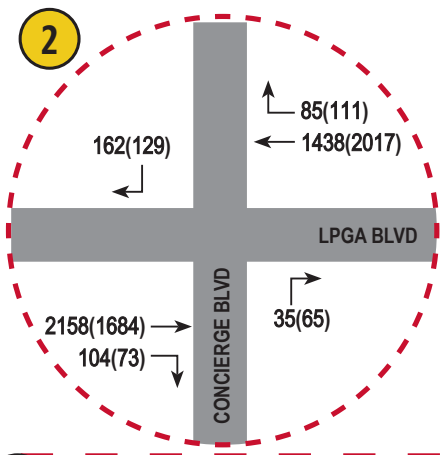
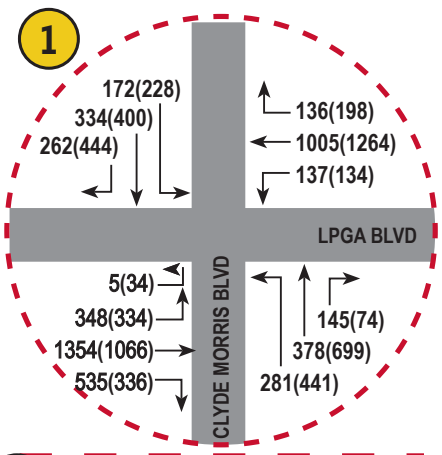


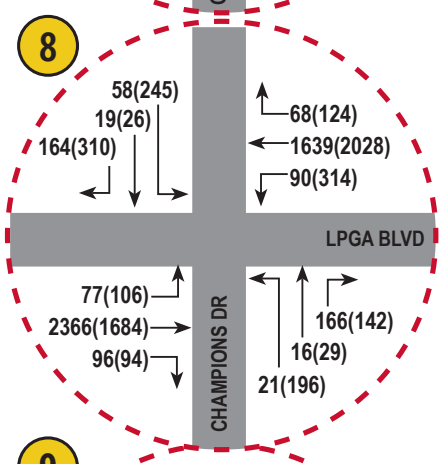
Figure 3-2. Design Year 2050 No-Build Alternative Turning Movement Volumes

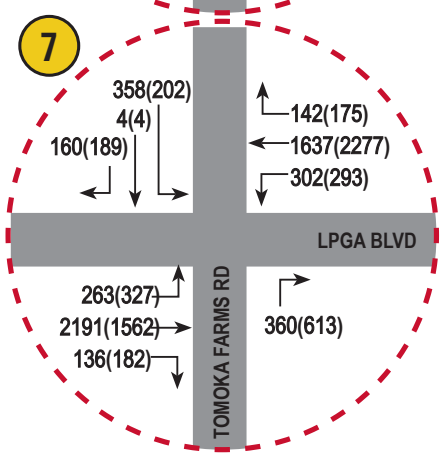


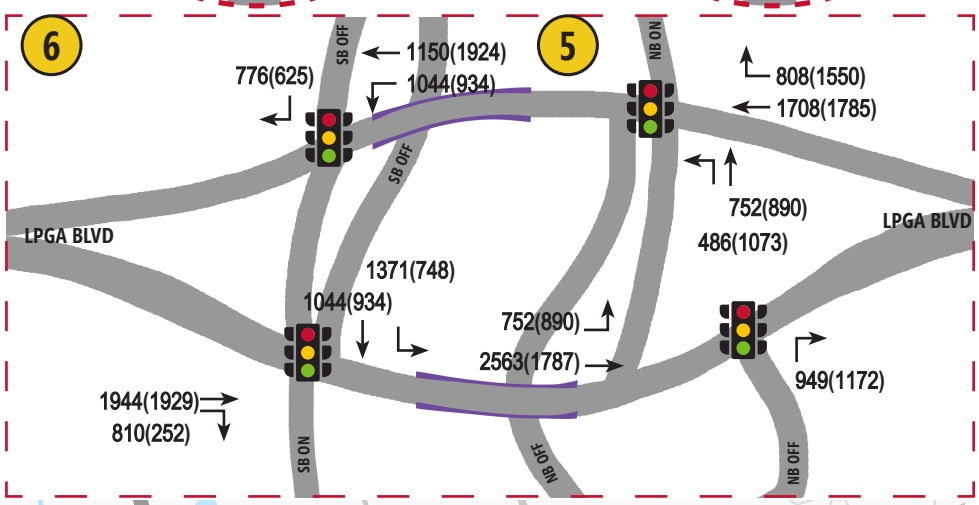


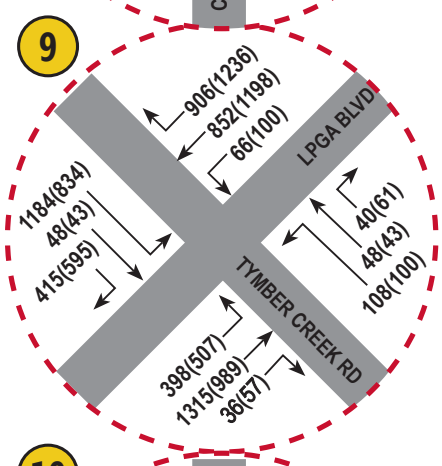


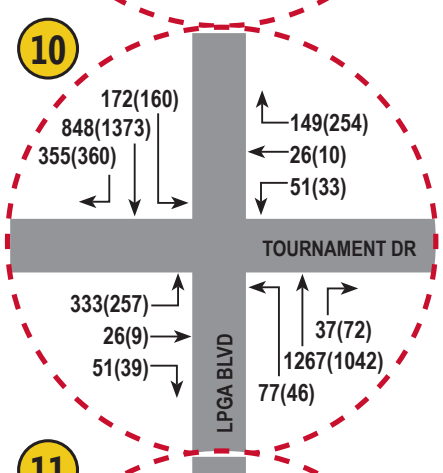


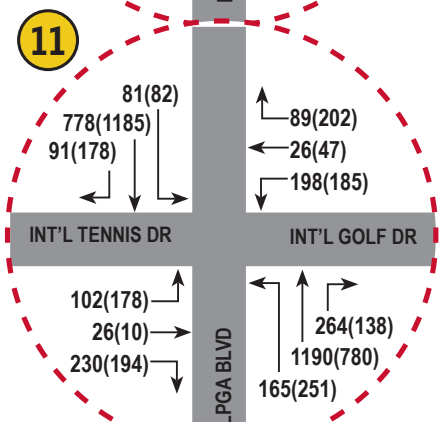


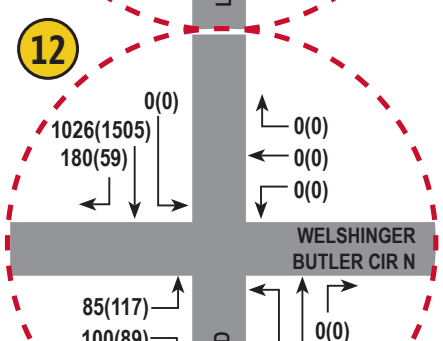


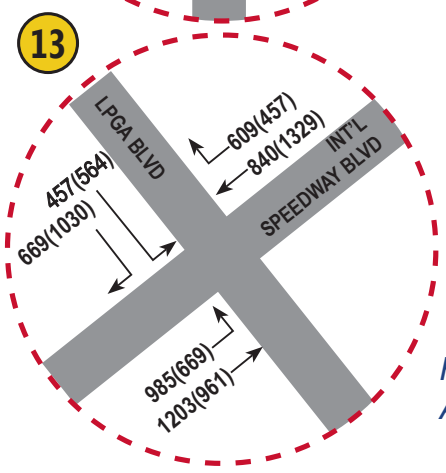












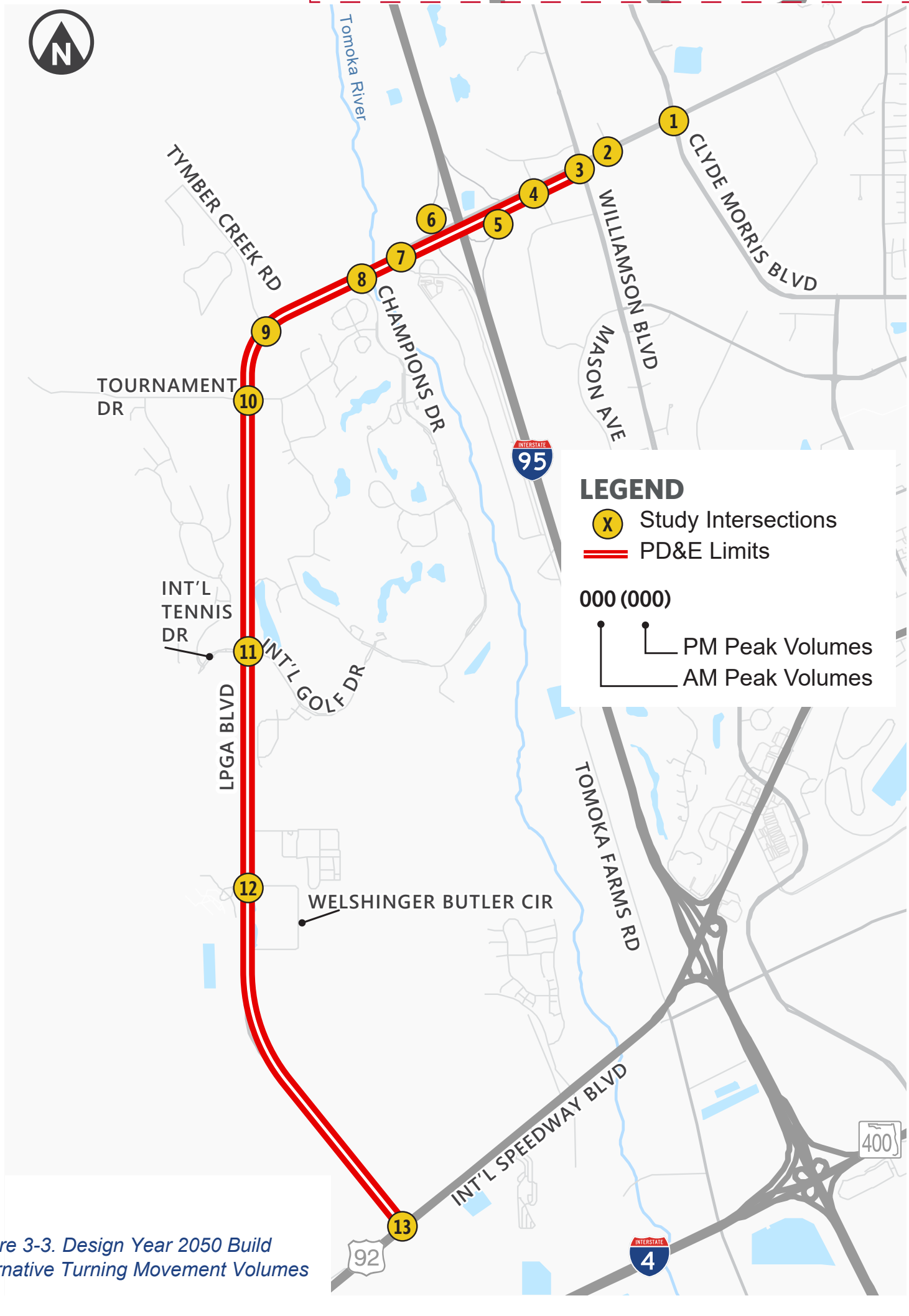


Figure 3-3. Design Year 2050 Build Alternative Turning Movement Volumes

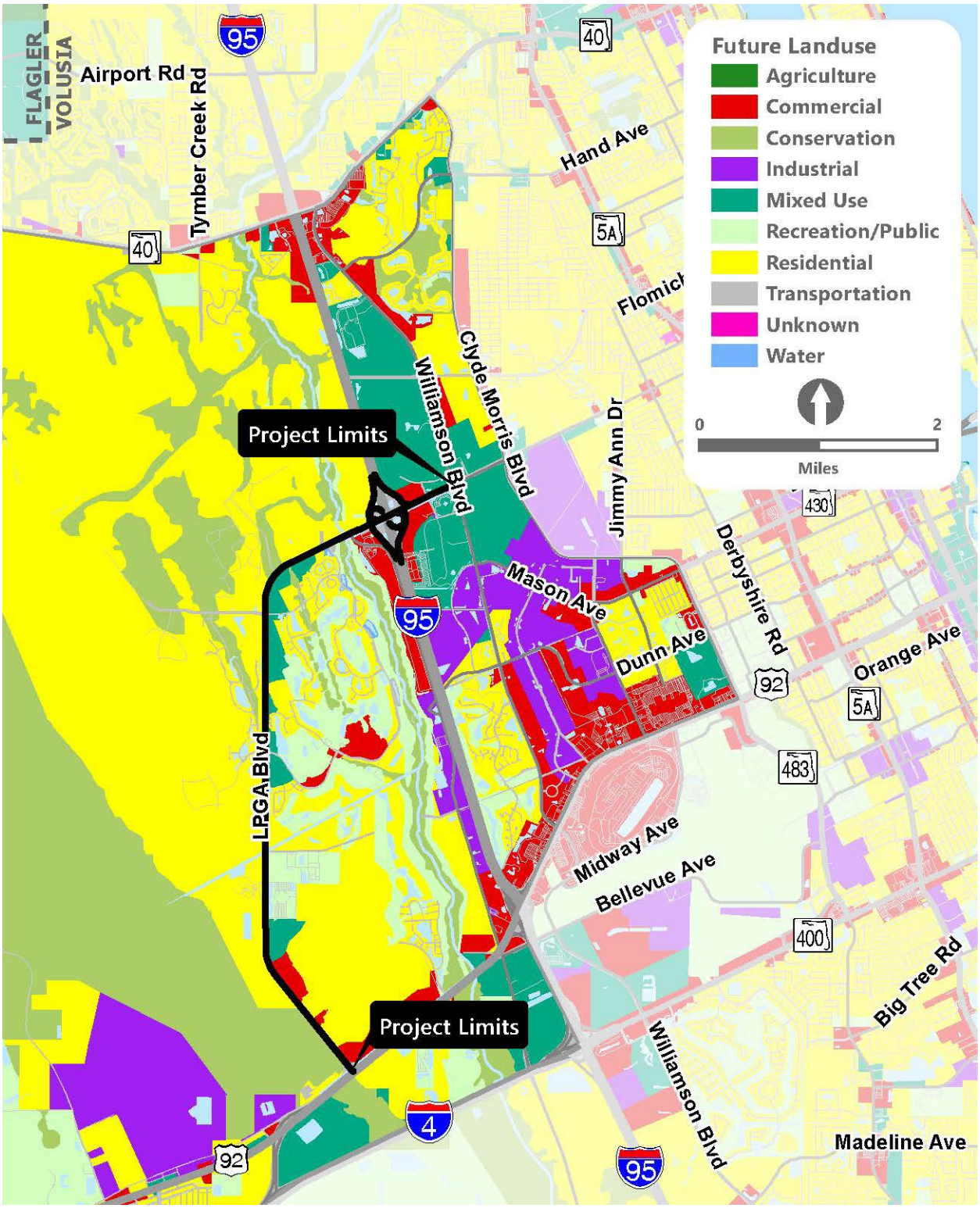


Figure 3-4. Future Land Use

4.0 Project Design Controls and Criteria

This Section provides information about design controls and criteria used to develop the Build Alternative.

4.1 Design Controls

4.1.1 Roadway Context Classification

As discussed in **Section 2.2.2.2**, the roadway context classification for LPGA Boulevard is as follows: C3R (Suburban Residential) from US 92 to Tymber Creek Road, and C3C (Suburban Commercial) from Tymber Creek Road to Williamson Boulevard.

4.1.2 Target Speed and Design Speed

The land use adjacent to the project area is evolving to suburban residential and suburban commercial, and the consensus is that a lower target speed on LPGA Boulevard is appropriate to address both mobility and safety needs of all users. Based on a review of existing and future land uses as well as future roadway context classifications, FDOT has set the target speeds (which matches the design speed) for LPGA Boulevard as follows:

- 45 mph from US 92 to Tymber Creek Road, and
- 35 mph from Tymber Creek Road to Williamson Boulevard.

4.1.3 Right of way Constraints

The existing right of way along LPGA Boulevard varies between 185’ to 320’. The right of way is constrained at 185’ in the Tomoka River bridge. All proposed roadway improvements will occur within the existing right of way except at intersections where minor clipping of parcels may be needed to locate right turn lanes, or traffic signal poles.

4.1.4 Stormwater Management Facilities

The project is located within the authority of the SJRWMD, as such the improvements will be designed to meet the environmental permit requirements of the SJRWMD, as well as the drainage requirements contained in the FDOT Drainage Manual.

4.2 Design Criteria

The general roadway design criteria that are applicable to this project are given in **Table 4-1** through **Table 4-3**. They are based primarily on the FDM (2023), FDOT Structures Manual (2023), Florida Greenbook (2018) and the AASHTO A Policy of Geometric Design of Highways and Streets, and A Policy on Design Highways Interstate System, FDOT Standard Plans for Road and Bridge Construction and the January 2023 FDOT Standard Specifications for Road and Bridge Construction.

Table 4-1. Design Criteria (LPGA Boulevard from US 92 to Tymber Creek Road)

Design Element	Design Value	Source
Facility Type	Urban Arterial	Straight Line Diagram
Design Speed	45 mph	Florida Greenbook (FGB), Table 3.1, pg. 3-6
Target Speed	45 mph	Context Classification Report
Posted Speed	45 mph	Target Speed Recommendation Report (refer to Appendix F)
Context Classification	C3R - Suburban Residential	Context Classification Report
Access Management	Class 5/ 245' Connection Spacing Median Opening Spacing- 660' (Directional), 1320' (Full) Signal Spacing – 1320'	FDM, Table 201.4.2 pg. 201-6
Design Vehicle	WB-62FL Large Semi-Trailer	FGB, Table 3-2, pg. 3-8
Lane Width	12' Travel Lanes 12' Auxiliary Lanes	FGB, table 3-20, pg. 3-47
Shared-Use Path Width	10' – 14'	FDM 224.4
Pavement Cross Slope	2 lanes at 2%, 3rd lane at 3%, cross slope ≥ 1.5% and ≤ 4.0%	FGB, pg. 3-49
Median Width	22' Minimum (19.5' for right of way constrained project)	FGB, Table 3-23, pg. 3-55
Shoulder Width	For suburban high speed typical • Outside 10' (flush shoulder) • Median 6' (flush shoulder) • 5' (Curbed section where bicyclists to be accommodated)	FGB, Table 3-21, pg. 3-50
Shoulder Cross Slope	2% to 6% (paved)	FGB, Table 3-22, pg. 3-51
Grade Criteria – Curb and Gutter	Minimum Grade – 0.30% (flat terrain), 0.50% (rolling terrain)	FGB Section C.5.b, pg. 3-38
Maximum Change in Grade Without Vertical Curve	0.70% without vertical curve	FGB Table 3-17, pg. 3-40
Maximum Grade	6%	FGB Table 3-16, pg. 3-38
Roadway Base Clearance	3' above Base Clearance Water Elevation	Flexible Pavement Design Manual, pg. 5-2
Minimum Stopping Sight Distance	360' (≤ 2%)	FGB, Table 3-4, pg. 3-13
Maximum Deflection w/o Horizontal Curve	Curbed roadway with design speed of 45 mph is 1°00'00". Flush shoulder Roadway with design speed of 45 mph is 0°45'00".	FGB Section C.4.b, pg. 3-18
Horizontal Curve	Desired Length – 675', Min 400' Minimum Radius for Normal Crown – 2,083'	FGB Table 3-8, pg. 3-21 FGB Table 3-11, pg. 3-25
Vertical Curve	Minimum Sag Length – 300' Minimum Crest Length – 200'	FGB Table 3-18, pg. 3-41
Vertical Curve Minimum "K" Value Crest	K = 61	FGB Table 3-18, pg. 3-41
Vertical Curve Minimum "K" Value Sag	K = 79	FGB Table 3-18, pg. 3-41
Superelevation	e max = 0.05 D max = 8°15'00"	FGB Section C.4.c.2, pg. 3-23 FGB Table 3-11, pg. 3-25
Superelevation Transition	1:150 (Low Speed Roadway, DS=45)	FGB Table 3-13, pg. 3-29
Minimum Border Width	14' Curbed 33' Flush Shoulder	FDM Table 210.7.1, pg. 210-49
Clear Zone Width (New Construction)	24' Travel Lanes and Multilane Ramps 14' Auxiliary Lanes and Single Lane Ramps	FGB Table 4-1, pg. 4-5
Lateral Offset	Above Ground Objects – 4ft from face of curb Drop off Hazards – Clear zone width Water Bodies – Clear zone width Canal Hazards – 40 ft for curb roadways with design speeds of 45 mph or less	FGB Table 4-2, pg. 4-12
Roadside Slope	Front Slopes: 1:4, desirably flatter than 1:6 within Clear Zone	FGB Section B.1.a, pg. 4-3
Control Radii for Minimum Speed Turn	Predominant – P, 50' (40' min.) Occasional – WB-62FL, 75'	FDM Table 212.9.2, pg. 212-17

Table 4-2. Design Criteria (Tymber Creek Road to Williamson Boulevard)

Design Element	Design Value	Source
Facility Type	Urban Arterial	Straight Line Diagram
Design Speed	35 mph	FDM, Table 201.5.1, 201-11
Posted Speed	35 mph	Target Speed Recommendation Report
Context Classification	C3C - Suburban Commercial	Context Classification Report
Access Management	Class 3/ 440' Connection Spacing Median Opening Spacing- 1320' (Directional), 2640' (Full) Signal Spacing – 2640'	FDM, Table 201.4.2 pg. 201-6
Design Vehicle	WB-62FL Large Semi-Trailer	FDM, Section 201.6
Lane Width	11' Travel Lanes 11' Auxiliary Lanes	FDM, Table 210.2.1, pg. 210-3
Bridge Width	Partial Bridge Sections: Travel Lanes + Shoulder Width (Varies)	FDM Figure 260.1.3
Shared-Use Path Width	10' -14'	FDM, Section 224.4, pg. 224-5
Pavement Cross Slope	2 lanes at 2%, 3rd-4th lane at 3%, 5th lane at 3.5% Max number of lanes sloped in one direction – 5 (for longitudinal grades < 5%)	FDM. Figure 210.2.1, pg. 210-6
Grade Criteria – Curb and Gutter	Minimum Distance for VPI's – 250' Minimum Grade – 0.30%	FDM Section 210.10.1.1, pg. 210-60
Maximum Change in Grade	0.90% without vertical curve	FDM Table 210.10.2, pg. 210-60
Maximum Grade	7% 4% when truck volume > 10%	FDM Table 210.10.1, pg. 210-59
Roadway Base Clearance	3' above Base Clearance Water Elevation	FDM Section 210.10.3, pg. 210-62
Minimum Stopping Sight Distance	Downgrade: 250' (≤ 2%) Upgrade: 250' (≤ 2%)	FDM Table 210.11.1, pg. 210-65
Maximum Deflection w/o Horizontal Curve	Curbed roadway with design speed of 45 mph is 1°00'00".	FDM Section 210.8.1, pg. 210-50
Horizontal Curve	Desired Length – 525', Min 400' Minimum Radius for Normal Crown – 1,146' (e max = 0.05)	FDM Table 210.8.1, pg. 210-51 FDM Table 210.9.2, pg. 210-57
Vertical Curve	Minimum Sag Length – 105' Minimum Crest Length – 105'	FDM Table 210.10.4, pg. 210-61
Vertical Curve Minimum "K" Value Crest	K = 47	FDM Table 210.10.3, pg. 210-61
Vertical Curve Minimum "K" Value Sag	K = 49	FDM Table 210.10.3, pg. 210-61
Superelevation	e max = 0.05 D max = 14°15'00"	FDM Table 210.9.1, pg. 210-56 FDM Table 210.9.2, pg. 210-57
Superelevation Transition	1:100	FDM Table 210.9.3, pg. 210-58
Median Width	22' (Minimum)	FDM Table 210.3.1, pg. 210-18
Minimum Border Width	14' Curbed 33' Flush Shoulder	FDM Table 210.7.1, pg. 210-49
Clear Zone Width (New Construction)	14' Travel Lanes and Multilane Ramps 10' Auxiliary Lanes and Single Lane Ramps	FDM Table 215.2.1, pg. 215-4
Lateral Offset	Light Poles – 1.5' (conventional) Outside Clear Zone (High Mast) Signal Poles – 1.5' Trees – 1.5' Aboveground Utilities – 1.5' ITS Poles – 1.5' Signs – 1.5' Canal and Drop Off Hazards – 50' (Flush Shoulder) 40' (Curbed) Concrete Box Culvert- End Treatments- Outside Clear Zone Ditch Bottom Inlet- Type H w/ Slot – Outside Clear Zone Ditch Bottom Inlet Type K – Outside Clear Zone U-Type Concrete Endwalls Energy Dissipater – 30" to 72" Pipe – Outside Clear Zone Flared End Section > 15" Diameter – Outside Clear Zone Cross Drain Mitered End Section > 24" – Outside Clear Zone Straight Concrete Endwalls – Outside Clear Zone Winged Concrete Endwalls-Single Round Pipe- Outside Clear Zone	FDM Table 215.2.2, pg. 215-7 Drainage Manual, Table 3.4, pg. 3-12
Structure Capacity	HL-93 Design Load	AASHTO LRFD
Minimum Vertical Clearance	Bridge Over Roadway – 16.5' Overhead Sign Structure – 17.5' Dynamic Message Sign – 19.5' Low member of bridge and design flood elevation – 2' or above normal high water – 6'	FDM Table 260.1 FDM Section 210.10.3 FDM Section 210.10.3 FDM Section 260.8.1
Roadside Slope	Front Slopes: 1:2 or to suit property owner, not flatter than 1:6 (Fill Height – 0-5') Front Slopes: 1:3 or to suit property owner, not flatter than 1:6 (Fill Height 5'-20') Back Slopes: 1:2 or to suit property owner, not flatter than 1:6 Traverse Slope: 1:4	FDM Table 215.2.3, pg. 215-16
Control Radii for Minimum Speed Turn	Predominant – P, 50' (40' min.) Occasional – WB-62FL, 130'	FDM Table 212.9.2, pg. 212-17

Table 4-3. Design Criteria (Interstate 95 Interchange Ramp)

Design Element	Design Value	Source
Facility Type	Interstate Ramp	Straight Line Diagram
Design Speed	45 mph/35 mph	FDM, Table 201.5.1, pg. 201-11
Posted Speed	45 mph/35mph	Target Speed Recommendation Report
Design Vehicle	WB-62FL Large Semi-Trailer	FDM, Section 201.6
Ramp Width	15’ Travel Lane (one lane) 12’ Travel Lanes (two lane)	FDM, pg. 211-2
Shoulder Width (Outside or Right)	6’ (4’ Paved) (1 lane ramp) 12’ (10’ Paved) (2 lane ramp)	FDM, Table 211.4.1, pg. 211-19
Shoulder Width (Median or Left)	6’ (2’ paved) (1 lane ramp) 8’ (4’ paved) (2 lane ramp)	FDM, Table 211.4.1, pg. 211-19
Pavement Cross Slope	2 lanes at 2%	FDM. Figure 211.2.1
Maximum Change in Grade	0.70% without vertical curve	FDM Table 210.10.2, pg. 210-60
Maximum Grade	5% 4% when truck volume > 10%	FDM Table 211.9.1
Roadway Base Clearance	3’ above Base Clearance Water Elevation (May be reduced to 2’ with reduction in resilient modulus)	FDM Section 210.10.3, pg. 210-62
Minimum Stopping Sight Distance	Downgrade: 360’ (≤ 2%) Upgrade: 360’ (≤ 2%)	FDM Table 211.10.2
Maximum Deflection w/o Horizontal Curve	Design speed of 45 mph is 0°45’00”.	FDM Section 211.7.1
Horizontal Curves	Desired Length – 675’, Min 400’ Minimum Radius for Normal Crown – 6,878’ (e max = 0.10)	FDM Table 211.7.1 FDM Table 210.9.1, pg. 210-56
Vertical Curves	Minimum Sag Length – 135’ Minimum Crest Length – 135’	FDM Table 211.9.3
Vertical Curve Minimum “K” Value Crest	K = 98	FDM Table 211.9.2
Vertical Curve Minimum “K” Value Sag	K = 79	FDM Table 211.9.2
Superelevation	e max = 0.10 D max = 10°15’00”	FDM Table 210.9.1, pg. 210-56 FDM Table 210.9.2, pg. 210-57
Superelevation Transition	1:200	FDM Table 210.9.3, pg. 210-58
Minimum Border Width	94’	FDM 211.6
Clear Zone Width (New Construction)	24’ Multilane Ramps 14’ Single Lane Ramps	FDM Table 215.2.1, pg. 215-4
Roadside Slope	Front Slopes1:2 or to suit property owner, not flatter than 1:6 (Fill Height – 0-5’) Front Slopes: 1:3 or to suit property owner, not flatter than 1:6 (Fill Height 5’-20’) Back Slopes: 1:2 or to suit property owner, not flatter than 1:6 Traverse Slope: 1:4	FDM Table 215.2.3, pg. 215-16
Control Radii for Minimum Speed Turn	Predominant – P, 50’ (40’ min.) Occasional – WB-62FL, 130’	FDM Table 212.9.2, pg. 212-17

5.0 Alternatives Analysis

This Section describes the PD&E Study's alternative analysis, how it was conducted, how the alternatives were compared, refinements made, and selection of the Preferred Alternative.

Two project segments were identified based on land use context and projected traffic volumes. An alternatives analysis was conducted for the No-Build Alternative and the Build Alternative that included these segments and associated intersections:

- Segment 1: From US 92 to Tymber Creek Road.
- Segment 2: From Tymber Creek Road to Williamson Boulevard.

5.1 No-Build (No-Action) Alternative

The No-Build Alternative (No-Action Alternative) maintains the existing roadway and loop ramp interchange configuration for LPGA Boulevard. The following features were added to the No-Build Alternative: adding a fourth leg to Tymber Creek Road to match the Tymber Creek Village development site plan and ongoing (2022) construction and relocating the Welshinger-Butler Circle south intersection to match the future location of the Dunn Avenue extension which will be built by others. Other planned developments either do not have site plans or do not affect the No-Build Alternative lane configurations.

The No-Build Alternative has advantages and disadvantages. The advantages of the No-Build Alternative include no new expenditures for roadway construction and right of way acquisition and no impacts to the environment. The disadvantages of the No-Build Alternative are not addressing the purpose and need for the project and hence the increase in user delays and crashes associated with congestion and the growth of travel demand. Additionally, the No-Build Alternative does not provide accommodation for users that are walking or biking along LPGA Boulevard.

Due to traffic operations and safety concerns related to the capacity of LPGA Boulevard including the Tomoka River Bridge and I-95 interchange, the No-Build Alternative is neither a viable nor a practical alternative but was fully evaluated throughout the PD&E Study process as a baseline for comparison.

A No-Build traffic analysis was conducted for the opening year (2030) and design year (2050), morning (AM) and evening (PM) peak periods. The future year No-Build geometry and traffic control as well as signal timings are the same as the existing conditions, except with the modification noted above. The operational analysis results show that during design year, all study intersections in the No-Build Alternative are expected to operate at LOS F (**Table 5-1**). This caused gridlocks throughout the entire network resulting in longer travel times (**Table 5-2**).

Table 5-1. Year 2050 No-Build Peak Hour Intersection Level of Service

Intersection	Measurement Location	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
US 92*	Intersection	119.6	F	167.5	F
Welshinger-Butler Circle (North Intersection)**	Eastbound Left Through	3880.2	F	6516.0	F
International Tennis Drive / International Golf Drive**	Eastbound Left	-*****	-*****	-*****	-*****
	Westbound Left	-*****	-*****	-*****	-*****
Tournament Drive***	Intersection	362.5	F	1000.4	F
Tymber Creek Road***	Intersection	238.0	F	1019.2	F
Champions Drive***	Intersection	271.7	F	1559.4	F
Tomoka Farms Road***	Intersection	302.3	F	1593.1	F
I-95 Southbound Ramps***	Intersection	401.8	F	1547.8	F
I-95 Northbound Ramps***	Intersection	184.6	F	2015.3	F
Technology Boulevard***	Intersection	146.8	F	1723.2	F
Williamson Boulevard***	Intersection	166.1	F	1726.5	F
Concierge Boulevard******	Northbound Left	140.9	F	5178.7	F
	Southbound Right	598.5	F	7538.8	F
Clyde Morris Boulevard***	Intersection	131.8	F	1564.9	F

*Signalized intersection, HCM 6 Signalized intersections results reported.
**Unsignalized intersection, HCM 6 Two-Way STOP-Controlled intersections (TWSC) results reported for minor roadway critical movements.
***Vissim intersection delay reported, LOS estimated used HCM 6 thresholds.
****Vissim TWSC, critical minor movements delay reported, LOS estimated used HCM 6 thresholds.
*****Synchro, HCM 6 methodology did not produce results due to excessive delay.

Table 5-2. Year 2050 No-Build Travel Time and Speed

Direction	LPGA Blvd Segment	Distance	AM Peak Hour		PM Peak Hour	
			Travel Time	Avg Speed	Travel Time	Avg Speed
Northbound	From US 92 to Tournament Drive	4.2 mi	416.4 s	36 mph	319.5 s	46 mph*
Southbound	From Tournament Drive to US 92	4.2 mi	449.9 s	33 mph	550.0 s	27 mph*
Eastbound	From Tournament Dr to Clyde Morris Blvd	2.5 mi	14.4 min	10.4 mph	60.1 min	2.5 mph
Westbound	From Clyde Morris Blvd to Tournament Dr	2.5 mi	22.1 min	6.8 mph	107.3 min	1.4 mph

* Volumes are metered at the Tournament Drive and US 92 intersections due to congestion at these intersections, which is causing high arterial speed and low travel time (1,000+ vehicles denied entry)

5.2 Transportation System Management and Operations Alternative

Transportation Systems Management and Operations (TSM&O) strategies for safety and congestion management, such as addition of turn lanes and storage lengths, signal timing

optimization, auxiliary lanes, premium transit, and technology improvements were considered. However, these improvements by themselves would not address the levels of traffic demand projected to use LPGA Boulevard and the I-95 interchange in the design year (2050). It is noted that ramp signals were identified and included in the Build Alternative. As part of design and operational optimization of the proposed improvements, applicable TSM&O strategies will be evaluated and included in the Build Alternative during the Design phase.

5.3 Multimodal Alternative

Multimodal features in terms of shared-use paths will be added on both sides of the LPGA Boulevard corridor throughout the limits of the PD&E Study. The existing sidewalks between Tymber Creek Road and Champions Drive will be widened to form a shared-use path. Additionally, the existing sidewalk (on the south side) east of the interchange will be widened to a shared-use path.

5.4 Build Alternatives

The build alternatives were developed considering the options or concepts that fulfill the purpose and need for this project and meet the objective of accommodating motorized vehicles, pedestrians, and bicyclists in a safe and efficient manner.

Development of improvement alternatives for this project followed a two-phase approach:

- Phase 1 – Concept screening or initial planning
- Phase 2 – Detailed operational analysis

Phase 1 was the initial planning which included environmental constraints analysis, traffic analysis, and preliminary alternative concept analysis to reach viable alternatives—the HCM refers to this analysis level as a planning level analysis. Phase 1 analysis also evaluated various typical sections and interchange concepts through a high-level planning analysis which helped to identify fatal flaws in the potential preliminary concepts. A detailed analysis was conducted in Phase 2 of the PD&E Study and the IMR process for the viable alternatives and No-Build Alternative.

5.4.1 Typical Sections

The design controls and criteria presented in **Section 4.0** were used as the reference when developing various typical sections for this project. Based on the roadway context classification, the cross section for this project is divided into two segments: from US 92 to Tymber Creek Road and from Tymber Creek Road to Williamson Boulevard.

5.4.1.1 LPGA Boulevard from US 92 to Tymber Creek Road

Based on the design year (2050) travel demand projections, the section between US 92 and Tymber Creek Road will require four lanes to achieve an LOS D. It is anticipated that the increasing traffic volumes and current and expected future development will serve to further urbanize this environment which will influence the operating speed of LPGA Boulevard.

The typical section on this segment was designed to allow expansion to a four-lane corridor in the future. Both existing lanes are sloped in one direction to become the ultimate northbound lanes when the roadway is widened to four lanes in the future. Additionally, the existing right of way width is wide enough to build additional two lanes. As such, in this segment various four-lane typical section configurations were initially considered:

- Option 1 – 12' lanes, 30' median, curb and gutter, 7' buffered bike lanes, 14' wide shared-use paths.
- Option 2 – 12' lanes, 22' median, 8' shoulder (2' paved), 14' wide shared-use paths.
- Option 3 – 12' lanes, 30' median, curb and gutter, 14' wide shared-use paths
- Option 4 – 12' lanes, 30' median, 8' shoulder (2' paved), 14' wide shared-use paths.

Selected Typical Section for Detailed Analysis

Each option improves mobility and accommodates pedestrian mobility and safety. However, based on the roadway context classification and target speed (shown in **Table 4-1**) for the LPGA segment between US 92 and Tymber Creek Road, Option 3 (12' lanes, 30' median, curb and gutter, 14' wide shared-use paths) was chosen for detailed evaluation. To achieve a target speed of 45 mph, FDOT recommended the speed management measures such as horizontal deflections and modern roundabouts as warranted by the ICE process to be included with the typical section.

Upon coordination with the City of Daytona Beach and Volusia County, it was decided that the roadway typical section be designed to allow future expansion to six lanes (adding one additional lane in each direction) when needed without reconstructing the entire roadway. Upon evaluating the feasibility of the expansion, additional lanes could be provided in the median. This will allow shared-use path and drainage features to be constructed in their final locations and would reduce roadway construction throw-aways. In concept, this would require Option 3 to have a minimum of 40' median for the proposed improvements to be within the existing right of way, including the area required for tie-in slopes.

5.4.1.2 Tymber Creek Road to Williamson Boulevard

Proximity of adjacent intersections in the I-95 interchange area made it necessary to evaluate intersection concepts first as they would control the operational capacities of the segments between intersections. The typical section was developed considering the following factors: future demand volumes, accommodation of shared-use paths, right of way constraints near Tomoka River bridge, and the need for stormwater treatment swales.

Selected Typical Section for Detailed Analysis

Based on these factors a six-lane typical section was needed to accommodate through traffic demand. It should be noted that the section between Tymber Creek Road and Williamson Boulevard has heavy turning traffic volumes, and an appropriate number of auxiliary lanes were added to accommodate turning traffic demand.

The width of the shared-use path was reduced to 12' from the Tomoka River Bridge to Williamson Boulevard to provide enough area for stormwater treatment swales. Currently, stormwater swales exist between the I-95 interchange and Williamson Boulevard. Additionally,

the northern shared-use path between the I-95 and Outlet Boulevard was located closer to the road to utilize the existing swale which is used to treat stormwater runoff. Per FDM Table 210.2.1 (Minimum Travel and Auxiliary Lane Widths), 11' lanes were provided on this segment because it traverses through C3C context classification, and the design speed is 35 mph.

5.4.2 Interchange

Due to the heavy travel demand volumes projected to use the interchange in the design year (2050), the interchange control options that would provide better coordination of traffic along LPGA Boulevard are those which have a fewer number of signals and have two-phase signal operations at the ramp terminals. As a result, the following interchange configurations were considered with respect to constructability and right of way needs, traffic operations, structure cost, and operational resilience (the ability of the concept to be further expanded in the event of additional traffic demand):

- Diverging Diamond Interchange
- Signalized Turbine Interchange
- Grade Separated Modified Diamond Interchange
- Echelon Corridor
- Displaced Left Diamond Interchange Concept

Traditional options such as Parclo, Diamond, and SPUI were considered and dismissed because of their inability to serve projected travel demand volumes. The interchange concept analysis summary is in **Table 5-3**. In coordination with District 5, the Signalized Turbine Interchange concept was the selected Build Alternative. This concept moves high volumes of traffic and provides enough queue storage between signalized ramp terminals. Additionally, this concept is expected to provide better safety and operational benefits than the other concepts evaluated during the design year.

The following sections provide a narrative discussion of each concept evaluated.

5.4.2.1 Diverging Diamond Interchange

This concept crosses the arterial through traffic between the ramp terminals to better facilitate left turns to and from the I-95 ramps. This concept eliminates the need for left turn phases at the ramp terminals (**Figure 5-1**). The previous design project (FPID 439220-1) included a DDI in the evaluation but did not address needed improvements at adjacent intersections and, as a result, the operation of the DDI failed.

Implementation of a DDI would result in shorter queue storage for westbound traffic at Tomoka Farms Road intersection. A modification was made to restrict westbound left turn movement at Tomoka Farms Road by creating a loop ramp from the west DDI terminal that will intersect with Tomoka Farms Road about 700' south of the Auto Mall entrance.

Although DDIs function well with high left turning volumes, their improved efficiency relative to other interchange types begins to wane when through volumes are high. The DDI requires at least 10 through lanes (five in each direction) within the interchange core. A rough rule of thumb of 750 vehicles per hour per lane (vphpl) shows that the crossovers need to be at least five lanes

and both left turn lanes to the ramps need to be two lanes. This may result in a need for a five-lane section to a four-lane/two-lane split going through and out of the interchange core.

5.4.2.2 Signalized Turbine Interchange

This concept is a modified turbine interchange with two levels and its ramps are curved to connect along LPGA Boulevard with two-phase signals (**Figure 5-2**). It is a variant of a configuration that is common in system interchanges. This service interchange version is modified with lower speed movements and signalized ramp connections.

The Signalized Turbine Interchange concept spreads the traffic across westbound and eastbound LPGA Boulevard by utilizing a split roadway concept, and as a result it moves high volumes of traffic and provides enough queue storage between signalized ramp terminals. A spur ramp in the southwest quadrant was evaluated to allow for the removal of the at-grade westbound left turn at Tomoka Farms Road. However, the spur ramp was later dropped from further consideration due to potential right of way impacts. This concept would provide better safety and operational benefits than the other concepts evaluated during the design year. Additionally, the Signalized Turbine Interchange can more easily allow for expansion if needed in the future.

5.4.2.3 Grade Separated Modified Diamond Interchange

This concept would modify the typical diamond interchange by incorporating elements of an echelon intersection into the ramp terminals (**Figure 5-3**). This results in elevating segments of LPGA Boulevard at the ramp terminals to grade separate on/off ramp movements as follows:

- Southbound left turn from I-95 off-ramp to LPGA Boulevard separated from eastbound movement.
- Northbound left turn from I-95 off-ramp into LPGA Boulevard separated from westbound movement.
- Eastbound left turn from LPGA Boulevard to I-95 on-ramp separated from westbound movement.
- Westbound left turn from LPGA Boulevard to I-95 on-ramp separated from eastbound movement.

Grade separation of critical movements would improve the operations of the interchange as fewer signals will be used and more queue storage length will be available along LPGA Boulevard. Although operationally this concept would work best, it requires an excessive number of structures (bridges) and may require vertical profiles that are not conducive to heavy vehicles along LPGA Boulevard. Consequently, this option was eliminated from further consideration.

5.4.2.4 Echelon Corridor

This concept would split traffic into three levels and create grade separated one-way streets. A primary goal in the development of this interchange concept was the desire to provide a highly efficient interchange that will improve traffic flow and safety. This goal led to elevating the entire LPGA Boulevard segment between Tomoka Farms Road and Williamson Boulevard (**Figure 5-4**). The number in the figure denotes the proposed number of lanes in each link. This

configuration would have three levels at the I-95 mainlines. On the figure red links are the third level.

The echelon corridor would result in better LOS (B and C) at the ramp terminals and adjacent intersections relative to other concepts evaluated during the design year. However, based on preliminary analysis, it was determined that implementation of this concept would be costly due to the number of bridges and elevated roadway sections. Additionally, the echelon concept was determined to be overly complex and would not be compatible with the land use context of the area. Consequently, this option was eliminated from further consideration.

5.4.2.5 Displaced Left Diamond Interchange Concept

This interchange concept would eliminate the left turn phase by displacing the westbound left turn movement to southbound I-95 (**Figure 5-5**). The concept would construct an auxiliary bridge to serve the displaced traffic movements. However, based on preliminary analysis, it was found that four out of five movements would fail operationally. The west ramp terminal v/c ratio is estimated to exceed 1.41. Consequently, this option was eliminated from further consideration.

5.4.2.6 Selected Alternative for Detailed Analysis

After consideration of the future demand volumes, potential future growth in the LPGA Boulevard area, and coordination with FDOT District 5, the Signalized Turbine Interchange concept was proposed to be evaluated in detail in Phase 2. This concept is a modified turbine interchange with two levels and its ramps are curved to connect along LPGA Boulevard with two-phase signals. It is a variant of a configuration that is common in system-to-system interchanges. This service interchange version is modified with lower speed movements and signal control at ramp terminal intersections. The other options were eliminated for the following reasons:

- Diverging Diamond Interchange – cannot address traffic demand and project need.
- Grade Separated Modified Diamond – numerous new structures and vertical profiles not conducive to heavy vehicles.
- Echelon Corridor – cost prohibitive due to multiple bridges and elevated sections, inconsistent with land uses.
- Displaced Left Interchange Concept – cannot address traffic demand and project need.

The Signalized Turbine Interchange concept spreads the traffic across westbound and eastbound LPGA Boulevard and, as a result, it moves high volumes and provides enough queue storage between signalized ramp terminals. This concept would provide better safety and operational benefits than the other concepts evaluated during the design year. Additionally, the concept can more easily be expanded should the future traffic needs (beyond the design year 2050) require without reconstructing the roadway. The Signalized Turbine Interchange geometry was later modified such that the bridges and approach roadway could be at their ultimate locations to prevent modification to the landscape and hardscape that will be placed within the interchange. The Phase 1 evaluation results including the selection of the Signalized Turbine Interchange were presented to the District Interchange Review Coordination (DIRC) meeting on May 24, 2021. The Signalized Turbine Interchange concept was the selected Build Alternative for detailed analysis.

Table 5-3. Summary of Interchange Concept Evaluation

Interchange Concept	Figure Number	Advantages	Disadvantages	Remarks
Diverging Diamond Interchange	**Figure 5-1**	• Allows free-flowing turning movements when entering and exiting I-95. • Reduces conflict points. • Moves high volumes of traffic. • Uses the existing bridge structure. • Uses the existing right of way except on a spur ramp in the southwest quadrant and U-turn movement to serve Tomoka Farms Road. • Improves bicycle and pedestrian accessibility.	• Difficult to expand in the future without major reconstruction. • Spur ramp requires new right of way. • Proximity of western terminal affects the operation of Tomoka Farms Road intersection.	Due to heavy and unbalanced volumes, the concept would need a 5-lane section to a 4-lane/2-lane split going through and out of the interchange core to function properly. Because of larger footprint, limitation to expand, and potential operational issues at Tomoka Farms Road intersection, this concept was eliminated from further consideration.
Signalized Turbine Interchange	**Figure 5-2**	• Improves operations by spreading traffic across the interchange area. • Reduces conflict points. • Moves high volumes of traffic. • Easier to expand in the future. • Uses the existing right of way except on a spur ramp in the southwest quadrant and U-turn movement to serve Tomoka Farms Road. • Improves bicycle and pedestrian accessibility.	• Requires construction of new bridges. • Spur ramp requires new right of way.	This concept needed refinement to minimize the need for a new right of way at the southwest quadrant. This includes an interim solution where the concept can operate without the spur ramp.
Grade Separated Modified Diamond	**Figure 5-3**	• Reduces conflict points. • Improves bicycle and pedestrian accessibility.	• Difficult to expand in the future without major reconstruction. • Expensive to construct. • Potential for impacts to heavy vehicles operation due to steep grades.	Traffic analysis indicated this concept would operate well in the design year by meeting the LOS targets. However, vertical design issues that may limit operation of heavy vehicles led to elimination of this alternative.
Echelon Corridor	**Figure 5-4**	• Reduces conflict points. • Grade separation of main movements and hence improve traffic flow. • Improves bicycle and pedestrian accessibility.	• Expensive to construct. • Requires complex maintenance of traffic during construction. • May be difficult to expand in the future. • Incompatible with the adjacent land use context adjacent.	This alternative would operate with the best LOS (C or better) at the intersections. However, implementation of this concept would be very costly and may not be compatible with the existing context of LPGA Boulevard. As a result, this concept was eliminated from further consideration.
Displaced Left Interchange Concept	**Figure 5-5**	• Moves higher volume of traffic. • Improve left turn capacity at one movement.	• Difficult to expand in the future without major reconstruction. • Need a new auxiliary bridge to serve displaced left movement.	This concept would be implemented without a need for new right of way. However, preliminary traffic analysis indicated that some future movements would operate at LOS F in the future and hence it was eliminated from further consideration.



Figure 5-1. Diverging Diamond Interchange

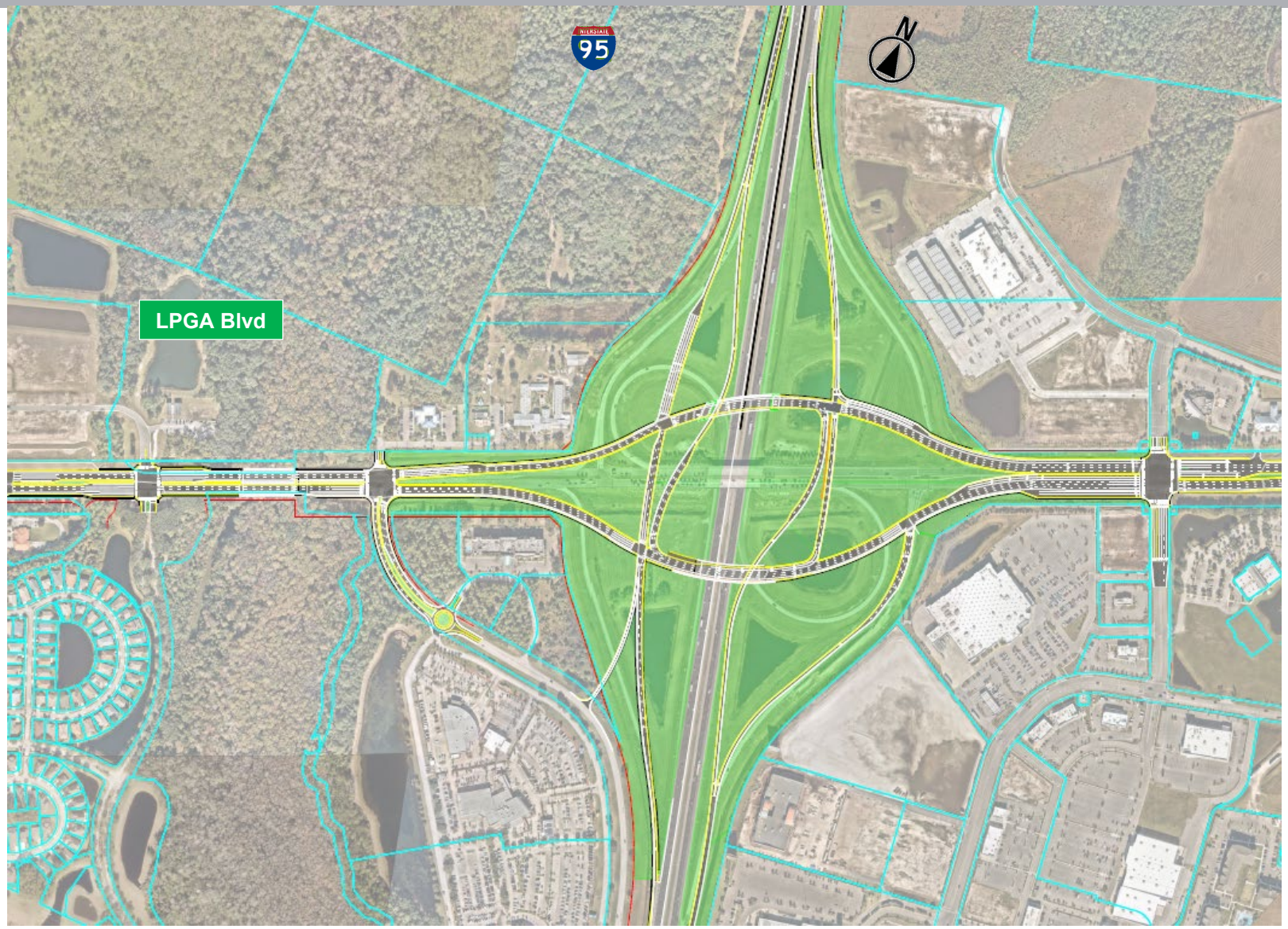


Figure 5-2. Signalized Turbine Interchange Initial Planning Concept



Figure 5-3. Grade Separated Modified Diamond Interchange

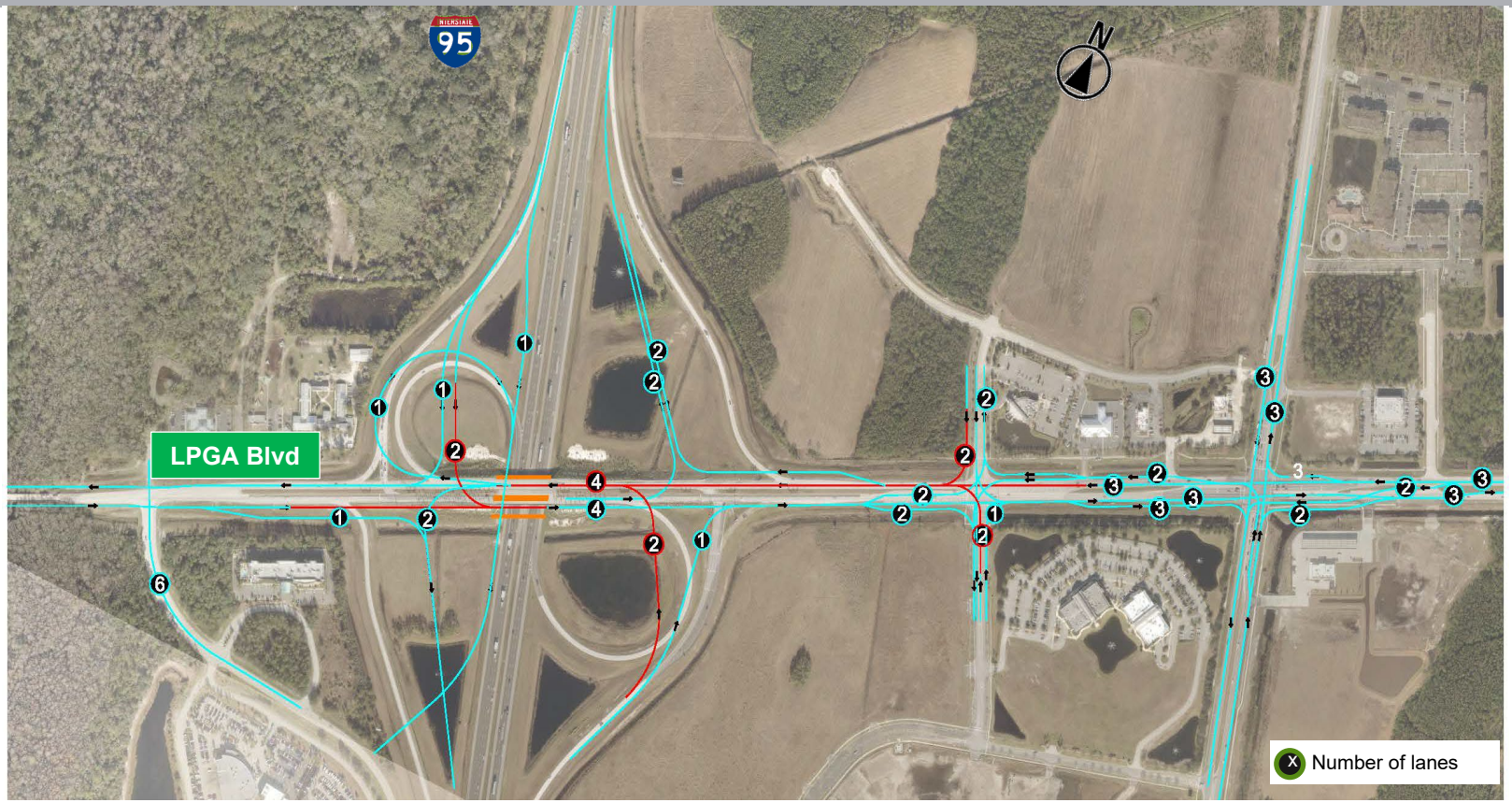


Figure 5-4. Echelon Corridor



Figure 5-5. Displaced Left Diamond Interchange

5.4.3 Intersections

The ICE was conducted to analyze the intersections in the project area. The ICE analysis included completing Stage 1 screening using the CAP-X and the SPICE. The Stage 1 evaluation recommended the following control strategies to be advanced for the PD&E Study traffic analysis. The evaluation of the intersection control types was coordinated internally within District 5 and upon considering the feedback from Volusia County and the City of Daytona Beach as well as public comments, the following intersection control types were recommended:

- US 92: Signalized Intersection (keep existing)
- Welshinger-Butler Circle South: Roundabout (change from unsignalized control)
- Welshinger-Butler Circle North: Roundabout (change from unsignalized control)
- International Tennis/Golf Drive: Roundabout (change from unsignalized control)
- Tournament Drive: Signalized Intersection (keep existing)
- Tymber Creek Road: Signalized Intersection (keep existing)
- Champions Drive: Signalized Intersection (keep existing)
- Tomoka Farms Road: Signalized Intersection (keep existing)
- Outlet Boulevard/Technology Boulevard: Signalized Intersection (keep existing)
- Williamson Boulevard: Signalized Intersection (keep existing)

5.4.4 Future Year Traffic Operation Analysis

The Build analyses for opening year (2030) and design year (2050) are documented in detail in the PTAR and IMR.

Table 5-4 summarizes the delay and LOS results for each study intersection for the design year 2050. Under the Build Alternative, the ramp terminal intersections are projected to operate at LOS C or better in all analysis hours except the third hour of the PM peak period where one terminal operates at LOS D. Several intersections are projected to operate at LOS F due to poor minor street operations affecting the overall intersection.

Table 5-4. Year 2050 Build Peak Hour Intersection Level of Service

Intersection	Measurement Location	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
US 92*	Intersection	36.9	D	46.3	D
Welshinger-Butler Circle (North Intersection)*	Intersection	11	B	11.5	B
International Tennis Drive / International Golf Drive** Tournament Drive***	Intersection	17.8	C	23.7	C
	Intersection	42.8	D	34.0	C
Tymber Creek Road***	Intersection	74.5	E	79.3	E
Champions Drive***	Intersection	16.3	B	43.5	D
Tomoka Farms Road***	Intersection	47.7	D	62.8	E
I-95 Southbound Ramps (northwest)***	Intersection	32.7	C	24.8	C

Intersection	Measurement Location	AM		PM	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
I-95 Southbound Ramps (southwest)***	Intersection	23.5	C	25.3	C
I-95 Northbound Ramps (southeast)***	Intersection	26.5	C	27.0	C
I-95 Northbound Ramps (northeast)***	Intersection	18.8	B	29.5	C
Technology Boulevard***	Intersection	27.8	C	.368	E
Williamson Boulevard***	Intersection	97.4	F	134.0	F
Concierge Boulevard****	Northbound Right	8.2	A	215.3	F
Concierge Boulevard****	Southbound Right	21.0	C	11.1	B
Clyde Morris Boulevard***	Intersection	63.2	E	269.9	F

*Signalized intersection, HCM 6 Signalized intersections results reported.
**Unsignalized intersection, HCM 6 Two-Way STOP-Controlled intersections (TWSC) results reported for minor roadway critical movements.
***Vissim intersection delay reported, LOS estimated used HCM 6 thresholds.
****Vissim TWSC, critical minor movements delay reported, LOS estimated used HCM 6 thresholds.

The segment speed and travel times are shown in **Table 5-5**. Between US 92 and Tournament Drive, LPGA Boulevard is anticipated to have less average network vehicle denied entry compared to the No-Build Alternative. From Tournament Drive to Clyde Morris Boulevard, speeds are greatly improved compared to the No-Build Alternative.

Table 5-5. Year 2050 Build Travel Time and Speed

Direction	LPGA Blvd Segment	Distance	AM Peak Hour		PM Peak Hour	
			Travel Time	Avg Speed	Travel Time	Avg Speed
Northbound	From US 92 to Tournament Drive	4.2 mi	414.9 s	36 mph	391.5 s	38 mph
Southbound	From Tournament Drive to US 92	4.2 mi	450.3 s	33 mph	488.5 s	30 mph
Eastbound	From Tournament Dr to Clyde Morris Blvd	2.5 mi	8.5 min	17.6 mph	11.6 min	13.0 mph
Westbound	From Clyde Morris Blvd to Tournament Dr	2.5 mi	7.2 min	20.7 mph	5.2 min	14.8 mph

5.5 Comparative Alternatives Evaluation

The No-Build and the Build Alternatives were evaluated on several elements including the purpose and need for the project, social, cultural, physical, and natural and social environment, and cost. A summary of the findings is presented in **Table 5-6**.

5.5.1 Purpose and Need

While the Build Alternative meets the purpose and need of accommodating future travel demand and providing pedestrian and bicyclist features, the No-Build Alternative does not address future traffic needs.

5.5.2 Social and Economic

No changes to population or demographic characteristics of the study area are anticipated from the implementation of the Build Alternative. Roadway improvements for the Build Alternative will be implemented within the existing right of way except at two intersections (the future location of Dunn Avenue extension and Williamson Boulevard) where minor rights of way (corner clips) are needed. Additional right of way will be needed for stormwater management facilities and FPC sites which have been placed on vacant parcels. The Build Alternative will not cause any business or residential relocation. Based on the sociocultural analysis for this PD&E Study, proposed improvements will not affect any minority or low-income populations.

Table 5-6. Comparative Evaluation Matrix

Evaluation Criteria	No-Build Alternative	Build Alternative
Purpose and Need		
Accommodate Future Travel Demand	No	Yes
Accommodate Pedestrians and Bicyclists	No	Yes
Improve Safety	No	Yes
Social and Economic		
Number of Parcels Impacted	0	14
Number of Residential Relocations	0	0
Number of Business Relocations	0	0
Cultural Resources		
Archaeological Potential	None	Low
Historic Sites	None	None
Public Lands (Acres)	No	0
Natural Resource		
Wetlands (Acres)	None	75.85
Protected Species	None	Low
Floodplains (Acres)	None	5.70
Physical Resources		
Contamination Sites (Medium or High Rank)	None	4
Noise Sensitive Sites	None	135
Utility Conflicts	None	Medium
Estimated Costs in Millions (Present Day Costs)		
Roadway Right of Way	$0	24.293
Wetland Mitigation	$0	$3.554
Construction Costs	$0	$217.590
Construction Engineering Inspection	$0	$15.231
Total Estimated Project Cost	$0	$260.667

5.5.3 Cultural Resources

5.5.3.1 Historical and Archaeological Resources

The project archaeological Area of Potential Effect (APE) was defined as the existing LPGA Boulevard right of way from US 92 to Williamson Boulevard, a 0.61-mile section of Williamson Boulevard at LPGA Boulevard, a 1.7-mile section of the I-95 corridor, a 0.07-mile section of Tomoka Farms Road at LPGA Boulevard, and a 0.60-mile section of US 92. The architectural history APE was extended to the back or side property lines of parcels adjacent to the right of way or no more than 330' from the right of way line to consider viewshed effects to aboveground resources.

The archaeological survey recorded three archaeological sites and two archaeological occurrences. However, these sites are ineligible for listing on the National Register of Historic Places (NRHP) due to site disturbance, absence of dense cultural deposits and features, small and ubiquitous artifact assemblages, and lack of research potential to significantly contribute to the archaeological record of the region. No further archaeological survey is recommended for sites in support of the implementation of the Build Alternative.

The architectural survey resulted in the identification and evaluation of one historic resource within the APE, Tomoka River to Bennett Swamp Canal. Due to its commonality and lack of notable engineering features or historical associations, the Tomoka River to Bennett Swamp Canal is recommended ineligible for listing in the NRHP. No further architectural history survey is required.

As documented in the CRAS, the Build Alternative will have no impact on historical and archaeological resources.

5.5.3.2 Public Lands and Section 4(f) Resources

The Build Alternative will utilize the existing right of way and will avoid impact on recreational areas.

5.5.4 Natural Resources

5.5.4.1 Wetlands

The Build Alternative is expected to result in unavoidable wetland and other surface water impacts to all wetlands and other surface waters within the existing right of way. The direct and indirect wetland impacts associated with the build alternative are listed in **Table 5-7**. The anticipated total direct wetland impacts for the proposed build alternative are 60.65 acres consisting mostly of low quality mowed and maintained herbaceous wetlands. Most of the wetlands are swales within the existing roadway right of way. The anticipated surface water impacts are 15.20 acres consisting mostly of open water ponds.

Short-term and long-term impacts to water quality, and the resultant effects on wetland resources caused by construction and the final project are anticipated to be low with the use of Best Management Practices (BMP) during construction. The proposed roadway improvements and widening are those safety improvements determined to be necessary based on the development that has already occurred within the region. Every effort has been made during the preliminary

design to minimize and retain impacts within the existing FDOT right of way where wetland and upland habitats only provide minimal habitat values. Impacts to wetlands will be mitigated within the basin and therefore cumulative effects are expected to be insignificant.

Table 5-7. Potential Wetland Impacts and Functional Loss from the Build Alternative

Wetland Type	Number of Impact Areas	Total Impact Acreage	UMAM Functional Loss[1]
Within Existing Right of Way			
Forested Wetland	28	3.26	1.62
Herbaceous Wetland	67	47.65	17.02
Shrub Wetland	2	0.19	0.07
Surface Water	19	15.20	NA
Preferred Pond and Floodplain Compensation Sites			
Forested Wetland	10	5.68	2.78
Herbaceous Wetland	7	3.94	1.84
Surface Water	3	0.03	NA

[1]*The Uniform Mitigation Assessment Method (UMAM) provides a standardized procedure for assessing the ecological functions provided by wetlands and other surface waters, the amount that those functions are reduced by a proposed impact, and the amount of mitigation necessary to offset that loss.*

5.5.4.2 Protected Species

Twenty-six (26) listed species and one candidate species have the potential to occur within the project area. Eight of the listed species have a moderate or high potential of occurrence. No designated critical habitat is located within the Build Alternative. **Table 5-8** provides the list of federal listed species that were identified as having the potential to occur within the study area and their corresponding effect determination.

Table 5-8. Federal Listed Species Potentially Occurring within the Study Area

Scientific Name	Common Name	Status	Probability of Occurrence in Project Area	Effect Determination
Mammals				
Perimyotis subflavus*	Tricolored bat	Proposed Endangered	Low	NA
Birds				
Aphelocoma coerulescens	Florida scrub-jay	Threatened	Low	No Effect
Dryobates borealis	Red-cockaded woodpecker	Endangered	Low	No Effect
Laterallus jamaicensis	Eastern black rail	Threatened	Low	No Effect
Mycteria americana	Wood stork	Threatened	Moderate	MANLAA
Reptiles				
Caretta caretta	Loggerhead sea turtle	Threatened	None	No Effect

Scientific Name	Common Name	Status	Probability of Occurrence in Project Area	Effect Determination
Chelonia mydas	Green sea turtle	Threatened	None	No Effect
Dermochelys coriacea	Leatherback sea turtle	Endangered	None	No Effect
Drymarchon corais couperi	Eastern indigo snake	Threatened	Moderate	MANLAA
Eretmochelys imbricata	Hawksbill sea turtle	Endangered	None	No Effect
Insects				
Danaus plexippus*	Monarch butterfly	Candidate	Moderate	NA
Plants				
Deeringothamnus rugelii	Rugel's pawpaw	Endangered	None	No Effect

** Effect determinations are not applicable to candidate species.*
MANLAA = May Affect, Not Likely to Adversely Affect—it means the species is found within the study area, suitable habitat is present, and all potential direct and indirect effects are discountable, insignificant, or beneficial.

Table 5-9 provides the list of state-listed species that were identified as having the potential to occur within the study area and their corresponding effect determination.

Table 5-9.State Listed Species Potentially Occurring within the Study Area

Scientific Name	Common Name	Status	Probability of Occurrence in Project Area	Effect Determination
Birds				
Antigone canadensis pratensis*	Florida sandhill crane	Threatened	High	No Adverse Effect Anticipated
Reptiles				
Gopherus polyphemus*	Gopher tortoise	Threatened	High	No Adverse Effect Anticipated
Plants				
Arnoglossum diversifolium	Variable-leaved Indian-plantain	Threatened	Low	No Effect Anticipated
Calopogon multiflorus	Many-flowered grass- pink	Threatened	Low	No Effect Anticipated
Carex chapmanii	Chapman's sedge	Threatened	Moderate	No Adverse Effect Anticipated
Centrosema arenicola	Sand butterfly pea	Endangered	Low	No Effect Anticipated
Conradina grandiflora	Large-flowered rosemary	Threatened	Low	No Effect Anticipated
Illicium parviflorum	Star anise	Endangered	Moderate	No Adverse Effect Anticipated
Lechea cernua	Nodding pinweed	Threatened	Low	No Effect Anticipated
Matelea floridana	Florida spiny-pod	Endangered	Low	No Effect Anticipated
Nemastylis floridana	Celestial lily	Endangered	Low	No Effect Anticipated

Scientific Name	Common Name	Status	Probability of Occurrence in Project Area	Effect Determination
Nolina atopocarpa	Florida beargrass	Threatened	Low	No Effect Anticipated
Orthochilus ecristatus	Giant orchid	Threatened	Low	No Effect Anticipated
Pycnanthemum floridanum	Florida mountain-mint	Threatened	Moderate	No Adverse Effect Anticipated
Salix floridana	Florida willow	Endangered	Low	No Effect Anticipated
Sarracenia minor*	Hooded pitcher plant	Threatened	High	No Adverse Effect Anticipated

** Species with documented occurrences within the study areas during the PD&E field reconnaissance.*

5.5.4.3 Essential Fish and Habitat

Based on the location of the project, review of the Inland Essential Fish and Habitat (EFH) Mapper, field review, and email confirmation from the National Marine Fisheries Service (NMFS) that is documented in the NRE, the project has no involvement with EFH.

5.5.5 Physical Resources

5.5.5.1 Noise

Throughout the project area, 135 receptors representing 135 noise sensitive sites were evaluated and documented in the NSR (included in the project file). Most of these sites are single family homes where frequent human use would commonly occur, and all these receptors were evaluated under Activity Category B of the Noise Abatement Criteria (NAC). One school, four tennis courts and two outdoor boarding and grooming areas at the Halifax Humane Society were evaluated under Activity Category C of the NAC. One hotel pool, one outdoor office seating area and two restaurant patios were evaluated under Activity Category E of the NAC.

Predicted traffic noise levels resulting from the design year (2050) No-Build Alternative are expected to increase up to 2.0 dB(A) over the (2021) existing condition. As a result of the (2050) Build Alternative, traffic noise levels are not predicted to approach or exceed the NAC. Predicted noise levels resulting from the design year (2050) Build Alternative are expected to increase up to 3.7 dB(A) over the (2021) existing condition.

Noise impacts also occur when future noise levels are predicted to increase substantially over the existing noise levels even if resulting noise levels do not approach or exceed the FHWA NAC. A substantial noise increase occurs when the existing noise level is predicted to increase by 15 dB(A) or more because of the proposed transportation improvement project. These impacts occur primarily when proposed roadway improvements are planned in the vicinity of noise sensitive areas, where existing noise levels are relatively low. A review of the predicted noise levels in the NSR indicates that the implementation of the Build Alternative would not cause substantial noise level increases.

5.5.5.2 Contamination

The risk ratings for the 21 potential contamination sites identified for this project were No Risk (2), Low Risk (15), Medium Risk (4), High Risk (0) and documented in the CSER (included in the project file). Of the medium risk sites, three are gas stations and one is an area which used to be a railroad in the past.

5.5.5.3 Utilities

Table 5-10 provides a list of the UAOs with a description of their potential conflict with the proposed improvements along LPGA Boulevard. This is a preliminary evaluation of potential utility conflicts within the project corridor based on proposed improvements under the Build Alternative. Additional conflicts may be identified during the final design. Subsurface Utility Engineering (SUE) for verified vertical and horizontal (vvh) information on existing utilities is required to advance the utility coordination efforts. Obtaining vvh information will also help to guide the Design phase to ensure that informed and intelligent decisions are made where practical to reduce potential utility relocations.

Table 5-10. Potential Utility Impacts

Utility Agency/Owner	Facility Type	Potential Impacts
ATT Transmission and Distribution PEA	Communication Lines, Fiber	No facilities within the project limits along LPGA Boulevard.
Bright House Networks dba Charter/Spectrum	Cable, CATV, Fiber	Aerial cable running along the west side of LPGA Boulevard from US 92/SR 600 to Champions Drive Underground cable from Champions Drive to Tomoka Farms Road
CenturyLink FKA Level 3	Fiber	Buried FOC 144 (3) 1.25” High Density Polyethylene (HDPE) running along the east side of LPGA Boulevard from I-95 interchange to Williamson Boulevard
City of Daytona Beach Traffic Signals, Fiber and Lighting	Fiber, Traffic Lights, Traffic Signals	Fiber aerial running along the west side of LPGA Boulevard from US 92 to Welshinger-Butler Circle Fiber running underground along the east side of LPGA Boulevard
City of Daytona Beach Water and Sewer	Sewer, Stormwater, Water	Well lines (36”) and water mains (24”) running along the west side of LPGA Boulevard Reuse water mains (20”) and sanitary force mains (16”) running along the east side of LPGA Boulevard
City of Holly Hill	Sewer, Water	Well fields, one 12" raw water main running east on LPGA Boulevard
Crown Castle (FiberNet Direct)	Fiber	Aerial strand and FOC J/U pole running along the west side of LPGA Boulevard from US 92/SR 600 to Tournament Drive No facilities from Tournament Drive to Williamson Boulevard Underground HDPE (2) 1.5” with FOC and tracer wire running along the east side of Williamson Boulevard
Duke Energy Transmission	Electric	No facilities within the project limits
Florida Gas Transmission	Gas	Existing 6.625" O.D. x 0.188" W.T., grade B, natural gas transmission pipeline running underground along the north side of US 92

Utility Agency/Owner	Facility Type	Potential Impacts
Florida Power and Light - Distribution	Electric	Overhead and underground electric lines 23.2 KVA running along the west side of LPGA Boulevard and few locations crossing the road
Florida Power and Light - Transmission	Electric	Overhead electric 230kV TX line crossing LPGA Boulevard approximately 1,022' north of Tymber Creek Road
Teco People Gas	Gas	Steel gas main (6") running along the east side of LPGA Boulevard
Uniti Fiber LLC	Fiber	No facilities within the project limits along LPGA Boulevard HDPE conduits (1.25") running along the east side of Williamson Boulevard

5.5.6 Cost Estimates

The FDOT Long Range Estimates (LRE) system was used to estimate construction costs. **Table 5-6** includes a summary of the costs for the Build Alternative. Detailed LRE are included in **Appendix G**. Wetland mitigation costs were estimated using the total UMAM functional loss of 23.33 from the NRE multiplied by current bid price for basin 17 mitigation credits. Also, an additional $520,000 was estimated to mitigate RHPZ impacts. Construction Engineering and Inspection costs were estimated using 7 percent of the construction costs.

5.6 Selection of the Preferred Alternative

After consideration of the technical information discussed in this Section, the outcome of the comparative alternative analysis, and the comments received during the study development process, FDOT selected the Build Alternative as the Preferred Alternative. Key factors that led to this selection are summarized as follows.

The Build Alternative addresses the purpose and need for the project by adding capacity to LPGA Boulevard and the I-95 interchange thereby accommodating future traffic growth in the project area. The improvements in the Build Alternative improves traffic flow by accommodating high volumes of traffic with addition of new lanes, changes to the intersection and interchange geometry, and reduction of conflict points at the I-95 interchange.

The Build Alternative enhances safety by incorporating speed management measures throughout the corridor consistent with the land use and roadway context classification. Furthermore, the Build Alternative adds shared-use paths on both sides of the road that enhance safety and travel comfort for pedestrians and bicyclists using this corridor.

Additionally, public input and support informed the selection of the Build Alternative as the Preferred Alternative. Residents and other stakeholders support proposed improvements over the No-Build Alternative.

Most of the roadway improvements in the Build Alternative are within the existing right of way to minimize potential environmental impacts. Additional right of way will be needed for stormwater management facilities and FPC sites which have been placed on vacant parcels.

Mitigation measures for potential environmental impacts that would result from implementation of the Build Alternative are discussed in the environmental technical reports and summarized in the Type 2 CE document.

The Preferred Alternative will be presented to the Public Hearing for this project.

6.0 Agency Coordination and Public Involvement

This Section provides information on how the agency coordination and public and stakeholder engagement are being conducted for the LPGA Boulevard PD&E Study.

6.1 Agency Coordination

Agency coordination was conducted throughout the PD&E Study. Several coordination meetings between FDOT, the City of Daytona Beach, and Volusia County were conducted to discuss the proposed improvements and project status.

Presentations were also given to local officials and agencies to share the project status, specific location, and design concepts, and to receive feedback.

6.1.1 Advance Notification and Efficient Transportation Decision Making

This project was reviewed through the ETDM process where stakeholders provided input that informed the scope of the PD&E Study and helped FDOT with early identification of potential project effects as well as avoidance, minimization, and mitigation opportunities. The ETDM Programming Screen Summary Report was published on June 11, 2021, and can be found at https://etdmpub.fla-etat.org/est/ (under ETDM project number 14332). ETDM comments helped FDOT to determine the feasibility of a proposed alternatives, optimize the locations of proposed roadway and bridge features to be within the existing right of way, focus the issues to be addressed during the PD&E phase, allow for early identification of potential avoidance, minimization, and mitigation opportunities, and promote efficiency and consistency during project development.

6.1.2 Agency Project Kick-Off Meeting

An agency kickoff meeting was conducted on January 18, 2022. In addition to FDOT, attendees included the City of Daytona Beach, City of Holly Hill, Daytona Regional Chamber of Commerce, R2CTPO, SJRWMD, Volusia County, Volusia County Public Schools, Volusia County Public Transportation System, and Volusia County Sheriff's Office. The purpose of the meeting was to introduce the project to stakeholders, discuss the schedule, and listen to the stakeholder input about the needs for the project.

6.1.3 Environmental Look Around Meeting

A technical meeting was held with SJRWMD, Volusia County and City of Daytona Beach as part of the coordination efforts for this project on October 28, 2022. During this meeting, the following were discussed:

- Potential opportunities for implementing regional stormwater facilities. Although SJRWMD was open to the use of regional ponds, no specific opportunities were found feasible.
- Opportunities for joint use ponds in parcels owned by the City of Daytona Beach.
- Innovative water quality treatment alternatives within the existing right of way.
- Discharge into the Bennett Swamp which is located within the TBSF.

6.1.4 Project Advisory Group

At the beginning of the project a Project Advisory Group (PAG) was formed with assistance from local governments within the project area. The PAG is composed of local citizens having an active role in the community, such as representatives from impacted/interested cities, county, regional agencies, committees, and neighborhood associations or other groups within the project area.

Three PAG meetings were conducted (or plan to be conducted):

- Meeting #1 – March 23, 2022, Virtual
    - The purpose of the meeting was to introduce Project Advisory Group (PAG) members to the project and the team, highlight the project purpose and considerations, discuss the needs for the project, and begin dialogue with PAG members.
- Meeting #2 – To be scheduled.
- Meeting #3 – To be scheduled.

6.1.5 R2CTPO

- FDOT presented the project to the R2CTPO Bicycle/Pedestrian Advisory Committee (BPAC) on February 8, 2023; Citizens' Advisory Committee (CAC) and Technical Coordinating Committee (TCC) on February 21, 2023, and the Board on February 22, 2023. Members discussed funding for different phases of the project, the need for accessible pedestrian signals (APS), and bicycle components of the project.

6.2 Public Involvement

FDOT conducted an extensive public outreach program to listen to the community, business owners, and homeowners associations (HOA) to better understand the public's concerns regarding LPGA Boulevard. Outreach efforts included one-on-one meetings with stakeholders and homeowners, attending and presenting at the scheduled community meetings, discussing the project with elected officials, and virtual meetings with concerned citizens, business owners, and property owners.

Two public meetings are being conducted for this study: an Alternatives Public Open House and a Public Hearing. The following sections provide summaries of these meetings. The Comments and Coordination Report, available under separate cover, contains a more detailed summary of each meeting and includes the public comments from each meeting.

6.2.1 Project Kick-off Notification

A project kickoff notification and project information handout were sent to all property owners, business owners, and organizations along the corridor on January 26, 2022.

6.2.2 Alternatives Public Open House

A hybrid Alternatives Public Open House was held on February 28, 2023, from 5:30 p.m. to 7:30 p.m. at The Crisp Meeting Room (located at LPGA International Clubhouse, 1000 Champions

Drive, Daytona Beach, FL). The Open House offered in-person and virtual attendance options (webinar viewing or phone call in listen only mode). Pictures taken at the in-person Open House are shown in **Figure 6-1**.



Figure 6-1. Pictures Taken at the February 28, 2023 Alternatives Public Open House

A PowerPoint presentation and display boards were used at the Open House. The board displays included:

- Welcome Board
- Title VI Board
- Project Overview
- Proposed Improvement Concept Layout
- Proposed Tomoka River Bridge Rendering
- Proposed I-95 Interchange Rendering
- Evaluation Matrix
- Project Schedule
- Thank You

The notice of the meeting was advertised in the Daytona News Journal, Florida Administrative Register (FAR), press release, and the FDOT Public Notices Website. Meeting notifications were sent to 786 people including property owners, tenants, elected officials, government officials, environmental resource agencies, and other interested parties. 263 people attended the meeting in-person and 88 virtually. There were 110 comments submitted during the 10-day public comment period. 48 comments were submitted during the in-person Open House, 14 during the virtual meeting and 48 through email or mail after the meeting during the public comment period.

Comments pertained to various topics such as need to address congestion and traffic growth, schedule and timeline of construction, construction cost, widening of the Tomoka River bridge, speed limit along LPGA Boulevard, roundabouts, proposed innovative intersection concepts at Tomoka Farms Road and Technology/Outlet Boulevard intersections, proposed interchange concept, improvement to local road network such as Dunn Avenue and Tymber Creek Road, pedestrian and bicycle accommodation, public meeting, use of golf carts, and noise abatement.

After the Alternatives Public Open House FDOT revised the LPGA Boulevard at Tomoka Farms Road intersection concept from a restricted crossing U-turn (RCUT) to a traditional signalized intersection. Additionally, FDOT revised the LPGA Boulevard at Technology Boulevard/Outlet Boulevard intersection from a “thru-cut” concept to a traditional signalized intersection.

6.2.3 Public Hearing

A Public Hearing is scheduled in October 2023.

7.0 Preferred Alternative

This Section describes design features of the Preferred Alternative whose concept plans are shown in **Appendix B**. The Preferred Alternative involves widening of LPGA Boulevard and modification to the I-95 interchange to the Signalized Turbine Interchange concept. The Preferred Alternative is divided into two segments based on the roadway context classification.

- Segment 1: LPGA Boulevard from US 92 to Tymber Creek Road
- Segment 2: From Tymber Creek Road to Williamson Boulevard

7.1 Typical Sections

The typical sections per LPGA Boulevard segment are summarized below. Details of the proposed typical sections for roadway, side streets, and bridges are presented in **Appendix B**.

- Segment 1: LPGA Boulevard from US 92 to Tymber Creek Road (**Figure 7-1**) is a four-lane divided corridor located within the existing 200 feet of right of way. This typical section includes a divided roadway with two 12' lanes in both directions, curb and gutter, a variable (40' – 70') median, and 14' shared-use paths on both sides of the roadway. This typical section provides the opportunity for inside widening in the future.

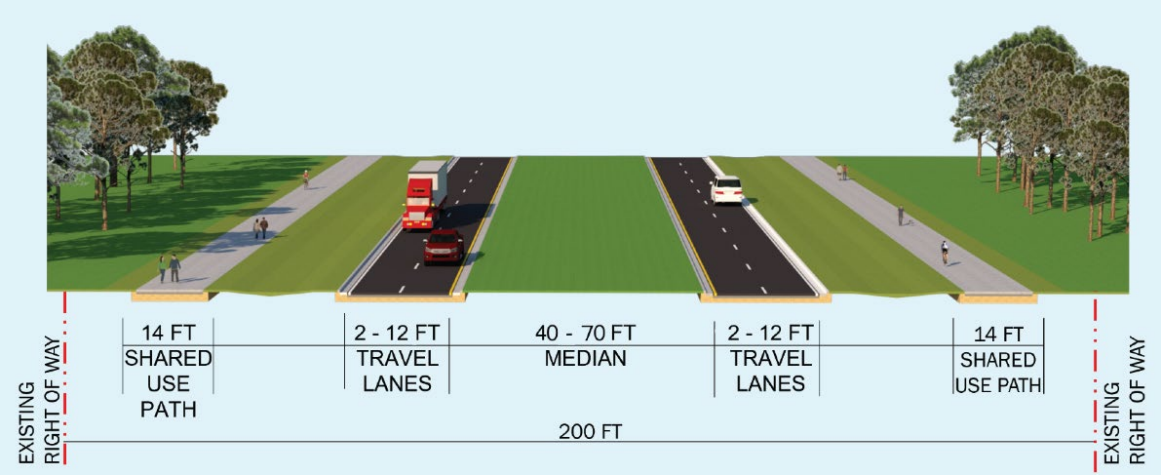


Figure 7-1. Proposed Typical Section from US 92 to Tymber Creek Road

- Segment 2: From Tymber Creek Road to Williamson Boulevard (**Figure 7-2**) is a six-lane divided corridor located within the existing right of way which varies from 185' to 320'. This typical section includes three 11' lanes in both directions, curb and gutter, and 12' shared-use paths on both sides of the roadway. The width of the shared-use paths was reduced to 12' because of the right of way constraints near the Tomoka River and the need to accommodate ditches east of the Tomoka River bridge. The roadway has a variable median width (30' minimum) and the eastbound and westbound are separated into two one-way roads at the I-95 interchange (**Figure 7-3**). Additionally, east of the I-95 interchange area the roadway has auxiliary lanes that serve turning traffic and connects

between signalized intersections. The locations and details of the auxiliary lanes are shown in **Appendix B**. This typical section provides the opportunity for outside widening in the future.

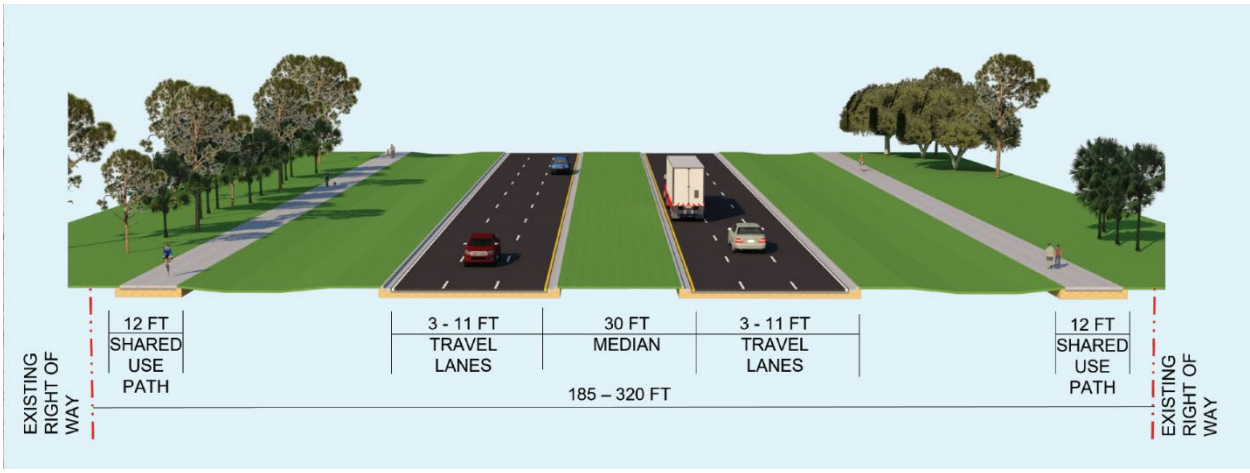


Figure 7-2. Proposed Typical Section from Tymber Creek Road to Williamson Boulevard



Figure 7-3. Proposed I-95 Interchange Concept (Signalized Turbine Interchange)

- The Preferred Alternative replaces the existing Tomoka River Bridge with a 340’ long, 4-spans new bridge that will be constructed within the existing 185’ right of way. The new bridge carries a 6-lane divided corridor with three 11’ travel lanes and two left turn lanes in each direction which are separated by a 26.5’ median (**Figure 7-4**). The proposed bridge has 12’ shared-use paths on both sides of the roadway and are barrier-separated from the roadway.

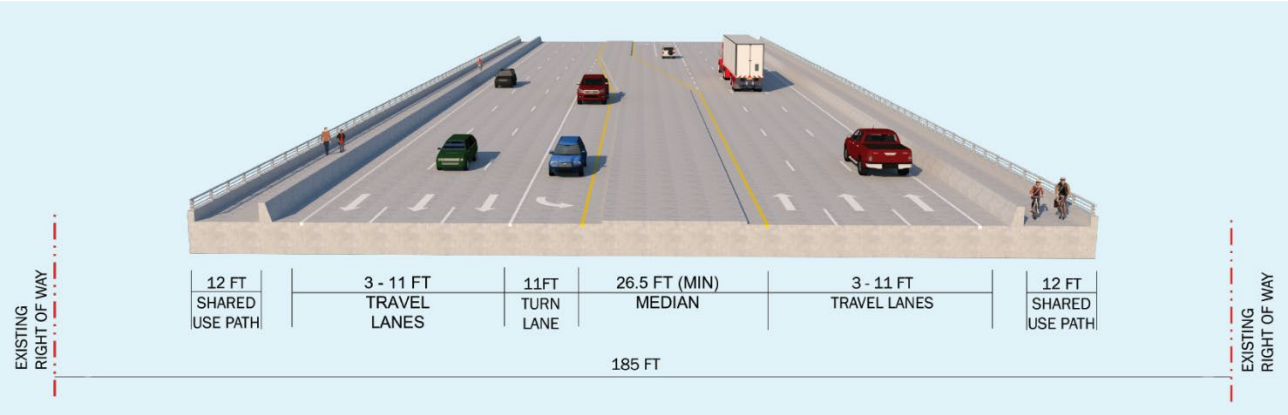


Figure 7-4. Proposed Typical Section for the Tomoka River Bridge

7.2 Bridges and Structures

Both the I-95 bridge, and the Tomoka River Bridge are proposed to be replaced, with neither of the existing bridges to remain in service at the completion of the project. Detailed discussion of bridge analysis is documented in the *Structure Analysis Memorandum* (February 2023) included in **Appendix H**.

7.2.1 I-95 Bridge

The existing I-95 bridge is to be replaced with separate eastbound and westbound bridges. Each bridge will have three spans. The horizontal curvature of the proposed I-95 bridges is within the acceptable limits for the use of straight, chorded Florida I-Beams (FIB).

The proposed horizontal and vertical geometry of the I-95 bridges will also allow for one additional lane to be placed on the bridge without the need for widening, reconstruction, or rehabilitation of the bridge or walls.

With I-95 in its current state, the proposed piers and walls will be parallel to the interstate and provide 101.5’ of clear distance for the two spans over I-95. This clear distance accounts for the current through lanes on I-95 and provides for a single 12’ lane widening. The proposed placement of the bridge’s substructure and walls are outside of the 36’ clear zone as required by FDM Table 215.2.1 (Clear Zone Width Requirements). The third span of the proposed I-95 bridges will span over the off-ramp with the substructure placed outside of the 14’ clear zone as required by FDM Table 215.2 (Minimum Lateral Offset Criteria). The proposed horizontal geometry and 101.5’ clear distance will accommodate the future widening of I-95 by three lanes in each direction, for a total of six lanes in each direction with two full 12’ shoulders and 2’ pier protection barriers.

Details of the eastbound and westbound I-95 bridges include:

- Westbound LPGA Boulevard over the I-95 bridge.
  - Length of 323’-3”

  - Width of 83’-2" (clear roadway width of 67’-6” with a separated 12’-0” shared-use path on the outside of the bridge)
  - Standard curved-top fencing

- Eastbound LPGA Boulevard over the I-95 bridge.
  - Length of 323’-9⅞”
  - Width of 94’-2”
  - Clear roadway width of 78’-6” with a separated 12’-0” shared-use path on the outside of the bridge
  - Standard curved-top fencing

During the Design phase different curved-top fencing options will be evaluated.

The preliminary horizontal and vertical geometry are shown in **Figure 7-5** and **Figure 7-6**.

7.2.2 Tomoka River Bridge

The vertical profile of the proposed Tomoka River Bridge is set to accommodate the 2’ vertical clearance between the low member of the bridge and the design flood stage or 6’ above the normal high water as required by FDM Section 260.8.1 (Vertical Clearance). The vertical curve will also accommodate bridge drainage and the 6’ of clearance to the wildlife path.

The horizontal alignment of the proposed Tomoka River Bridge is set to fit within the existing right of way. This is accomplished in part by placing the eastern end within an area with a wider existing right of way and using a retaining wall on the west end, south side.

Except for the south side of the west end, the proposed bent placement allows for the use of standard riprap slope details. Maximizing the use of standard riprap slope details is preferred over the use of walls which are more costly and more demanding to maintain. The western end bent was placed outside the limits of the existing wetlands to mitigate the impact on the environmentally sensitive lands.

Details of the Tomoka River Bridge include:

- Length of 340’-0”
- Width of 137'-2"
- 2’-6” outside shoulder and 12’-0” shared-use path in each direction.
- The shared-use path has a standard 9½” wide, 42” tall pedestrian/bicycle parapet on the outside.

The preliminary horizontal and vertical geometry are shown in **Figure 7-7**.

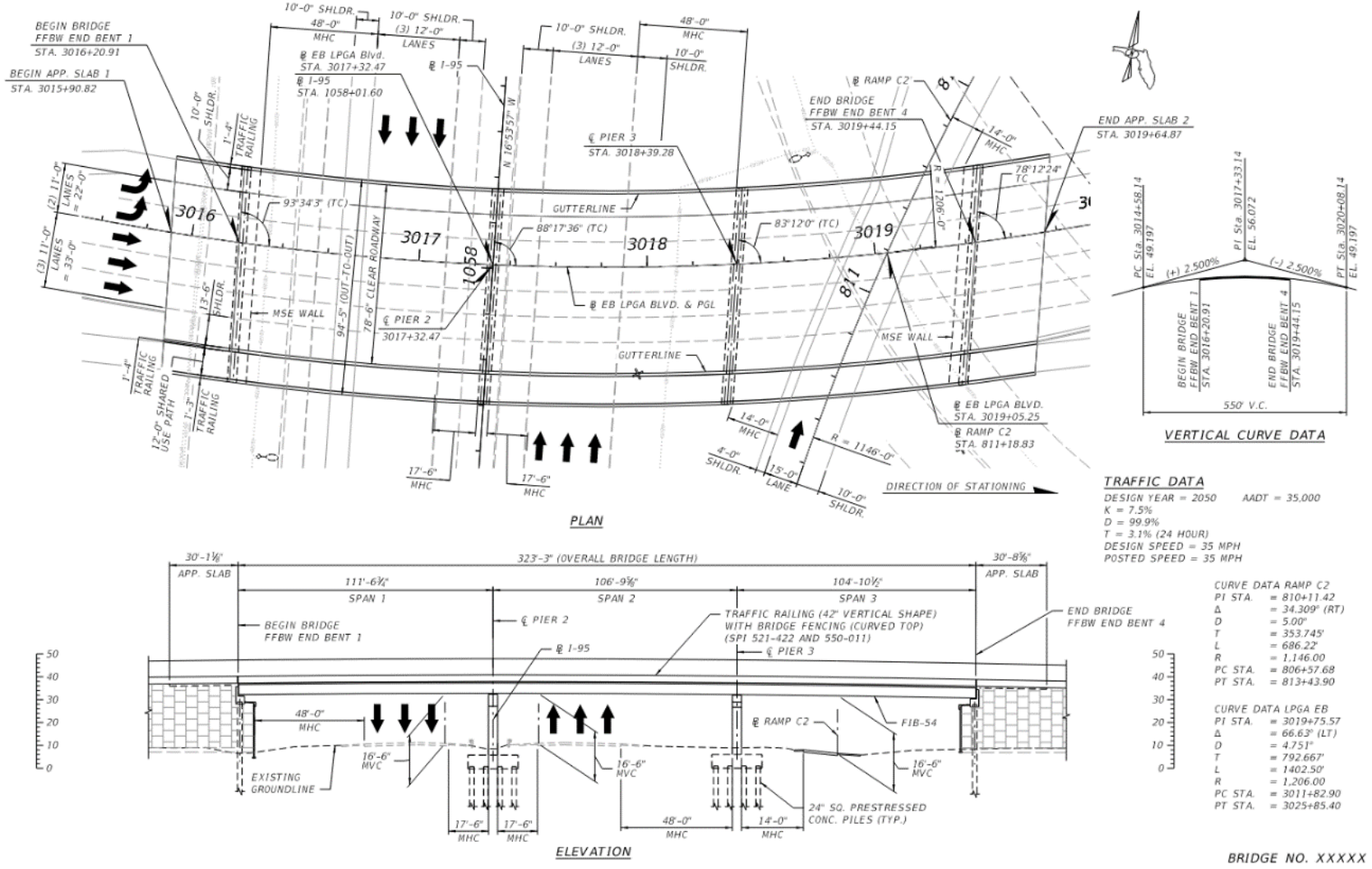


Figure 7-5. LPGA Boulevard Eastbound over I-95 Horizontal and Vertical Geometry

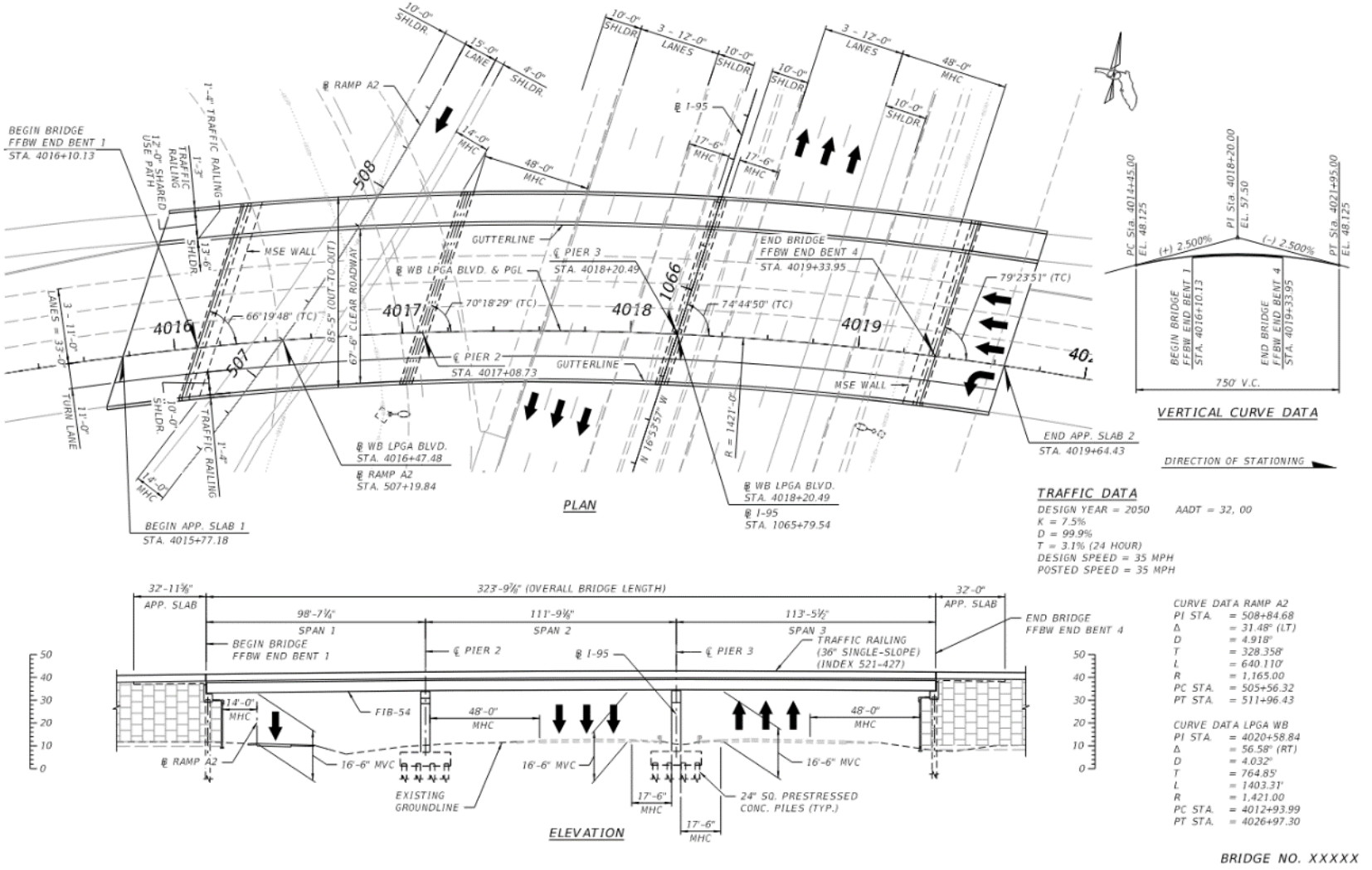


Figure 7-6. LPGA Boulevard Westbound over I-95 Horizontal and Vertical Geometry

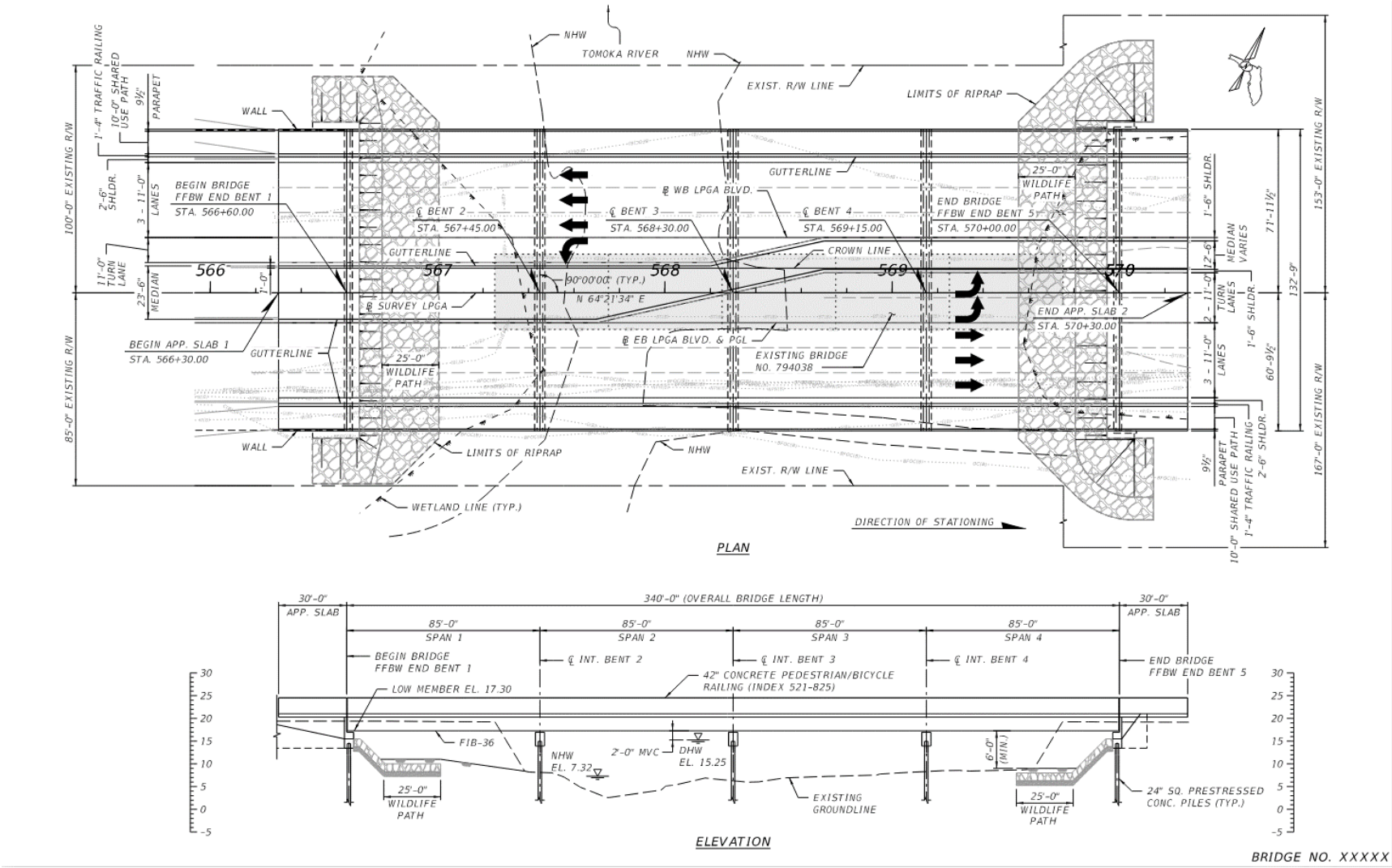


Figure 7-7. Tomoka River Bridge Horizontal and Vertical Geometry

7.3 Access Management

Table 7-1 summarizes proposed median openings on the Preferred Alternative. The roadway access classification for LPGA Boulevard, west of Tymber Creek Road will change from Access Class 4 (non-restrictive median type) to Access Class 5 (restrictive median type) and Class 3 (restrictive median type) since the roadway will be widened and a raised median added. Likewise, the access classification from Tymber Creek Road to Tomoka Farms Road will change from Access Class 4 to Access Class 3 (restrictive median type). The Access Class 3 designation will not change from Tomoka Farms Road to Williamson Boulevard.

On I-95, no new interchanges are proposed in the Preferred Alternative and the access classification will remain to be Access Class 1 (Area Type 3).

Table 7-1. Median Openings in the Preferred Alternative

Location	Posted Speed	Access Class/Type	Intersecting Street/Development	Signal (Y or N)	Distance from Previous Opening (ft.)
315+41.26	45	5 Full	Median Opening	N	2754
359+78.08	45	5 Full	Royal County Boulevard	N	4437
381+40.42	45	5 Roundabout	Welshinger-Butler Cir	N[1]	2022
397+45.62	45	5 Roundabout	Welshinger-Butler Cir	N[1]	1475
410+77.09	45	5 Full	City of Daytona Water	N	1203
433+04.80	45	5 Directional	Median Opening	N	2141
455+20.36	45	5 Roundabout	International Golf Dr	N[1]	2127
487+85.94	45	5 Full	Median Opening	N	3266
516+78.51	45	5 Signal	Tournament Dr	Y	1954
535+99.08	35	3 Signal	Tymber Creek Rd	Y	1749
555+51.29	35	3 Signal	Fire Station # 7	Y[2]	1806
562+68.83	35	3 Signal	Champions Dr	Y	584
573+93.64	35	3 Signal	Tomoka Farms Rd	Y	995
586+96.84	35	3 Signal	I95 SB Ramps	Y	1217
595+42.12	35	3 Signal	I95 NB Ramps	Y	829
611+73.81	35	3 Signal	Outlet Blvd	Y	1514
624+29.73	35	3 Signal	Williamson Blvd	Y	1106

[1]*Roundabout*

[2]*Emergency Signal to a fire station*

Additionally, the Preferred Alternative proposes to close the median opening at Concierge Boulevard intersection for safety and operational reasons as the current opening conflicts with westbound left turning vehicles at Williamson Boulevard intersection. FDOT will notify affected

property owners, the City of Daytona Beach and Volusia County and solicit comments regarding the potential impact of this change in the Design phase for this project.

7.4 Right of Way Needs and Relocation

The Preferred Alternative roadway improvements and proposed stormwater ponds shown in **Appendix B** impact 14 parcels, affecting 12 property owners, for a total of approximately 25 acres. Two of the 14 parcels (at the Dunn Avenue extension intersection and Williamson Boulevard intersection) will be corner clips and the rest are for stormwater management ponds.

The proposed improvements will not result in any business or residential relocations.

7.5 Horizontal and Vertical Geometry

7.5.1 Horizontal Alignment

The proposed horizontal alignment of LPGA Boulevard generally follows the existing alignment from US 92 to Tomoka Farms Road. In the I-95 interchange area, the eastbound and westbound directions separate via reverse curves into two one-way pairs. Eastbound and westbound LPGA Boulevard then come back together prior to Outlet Boulevard. **Table 7-2** identifies the proposed curve data. In the proposed conditions, the horizontal alignment of I-95 remains unchanged. It is straight with no horizontal curves within the study area. Details of the curve data are shown in **Appendix B**.

Table 7-2. Proposed Horizontal Curvature – LPGA Boulevard

LPGA Blvd Location	Station	Curve Length (ft)	Radius (ft)	Design Speed (mph)	Superelevation (ft/ft)
Royal County Blvd	361+42.75	1319.758	1941.86	45	RC
Tymber Creek Rd	534+01.63	2148.992	1909.86	45	RC
EB, west of I-95	3008+14.14	700.000	1206.000	35	NC
EB, over I-95	3019+75.57	1402.502	1206.000	35	NC
EB, east of I-95	3030+18.28	700.000	1206.000	35	NC
WB, west of I-95	4010+06.06	585.991	1300.000	35	NC
WB, over I-95	4020+58.84	1403.310	1421.000	35	NC
WB, east of I-95	4029+94.66	582.182	1160.000	35	NC

7.5.2 Vertical Profile

Like the existing profile, the proposed LPGA Boulevard vertical alignment is relatively flat utilizing only vertical deflections from US 92 to the Tomoka River Bridge. However, additional vertical clearance is needed for the bridge over Tomoka River. Therefore, vertical curves were introduced to achieve this. Additionally, the eastbound and westbound bridges over I-95 require vertical curves as well. **Table 7-3** summarizes the vertical curve data on LPGA Boulevard.

Table 7-3. Proposed Vertical Profile – LPGA Boulevard

Location	PVI Station	Type of Curve	Grade Diff. (%)	Grade In (%)	Grade Out (%)	K	Curve Len (feet)	Req. K	Req. Curve Len (feet)
West of Tomoka River	562+40.80	Sag	1.050	-0.350	0.700	100.00	105	49	105
Crest over Tomoka River	568+42.06	Crest	1.400	0.700	-0.700	96.429	135	47	105
East of Tomoka River	573+31.49	Sag	1.000	-0.700	0.300	105.00	105.00	49	105
EB, west of I-95	3003+68.07	Sag	2.200	0.300	2.500	81.82	180	49	105
EB, over I-95	3017+33.10	Crest	5.000	2.500	-2.500	110	550	47	105
EB, east of I-95	3027+67.36	Sag	2.200	-2.500	-0.300	227.27	500	49	105
WB, west of I-95	4004+50.95	Sag	2.200	0.300	2.500	250.00	550	49	105
WB, over I-95	4018+20.00	Crest	5.000	2.500	-2.500	150.00	750	47	105
WB, east of I-95	4028+99.80	Sag	2.200	-2.500	-0.300	81.82	180	49	105

PVI = Point of Vertical Intersection; Diff. = Difference; Req. = Required; Len = Length; K = A coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve that will provide minimum sight distance.

7.6 Design Exceptions and Variations

There are no Design Exceptions and Design Variations proposed in the Preferred Alternative.

7.7 Multimodal Accommodations

7.7.1 Bicycle and Pedestrian Facilities

The proposed improvements will add shared-use paths on both sides of the road to serve people who are walking and biking. At the intersections, crosswalks will be provided, and signalization will account for proper pedestrian crossing times. During the Design phase of this project, APS that communicate information about the WALK and DON'T WALK intervals at signalized intersections in non-visual to pedestrians who are blind or who have low vision will be evaluated.

7.7.2 Transit Accommodations

As mentioned in **Section 2.2.10**, VOTRAN does not operate along LPGA Boulevard within the PD&E Study limits. The Preferred Alternative does not propose any changes to transit routes.

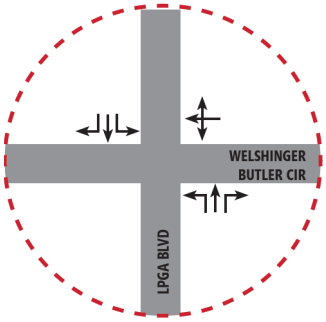
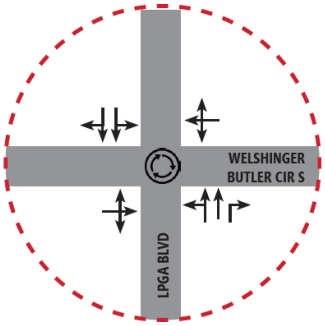
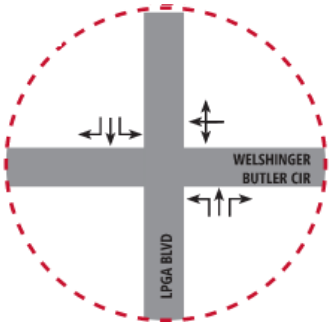
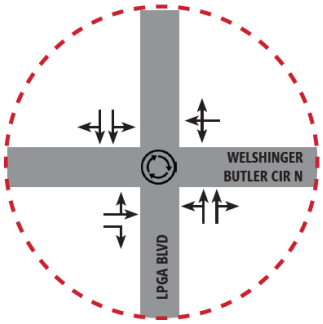
Furthermore, the Preferred Alternative does not prevent any future improvements to add the bus stops or accommodate transit.

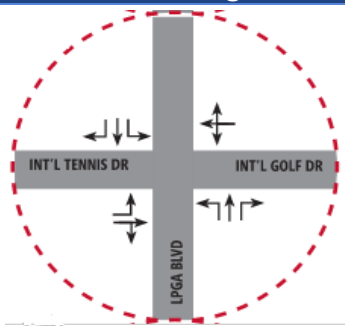
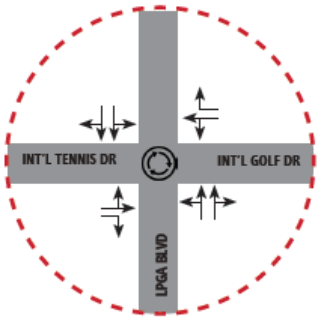
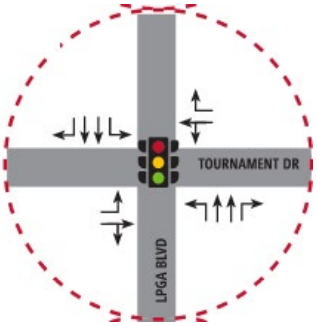
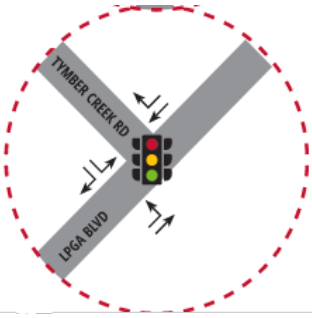
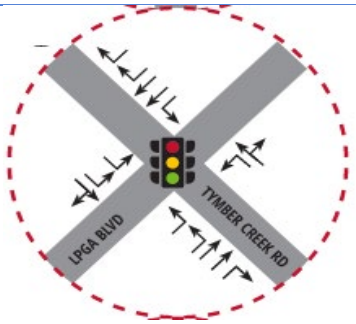
7.8 Intersection and Interchange Concepts

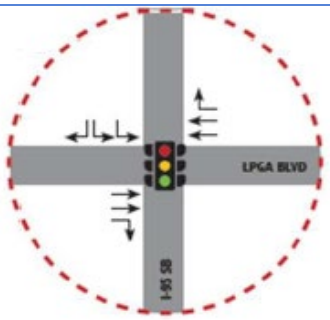
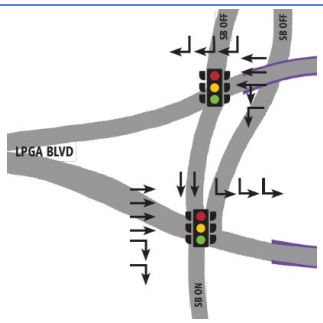
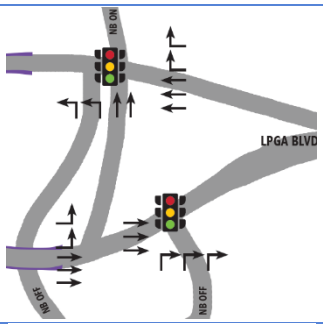
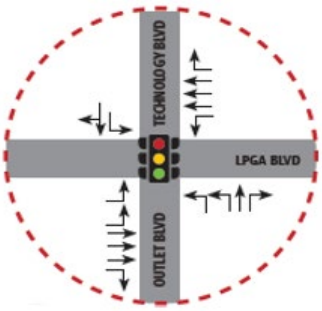
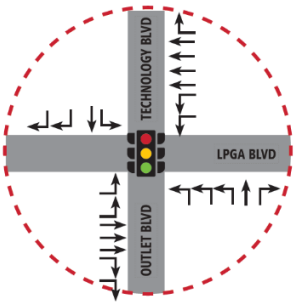
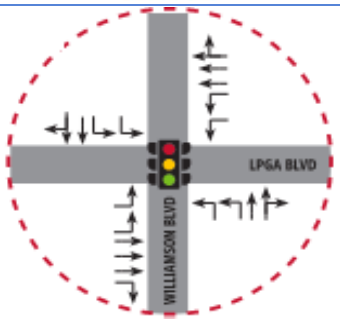
7.8.1 Intersections

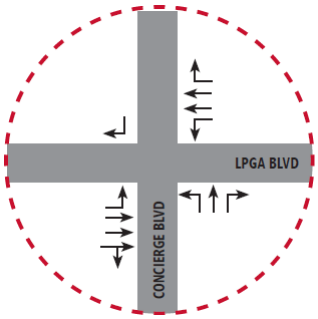
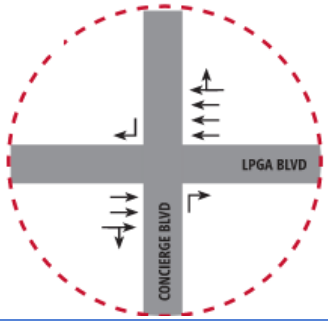
The Preferred Alternative proposes modifications to major intersections within the study area as shown in **Table 7-4** and **Table 7-5**. The existing intersection controls are proposed to change from unsignalized intersection to roundabout at Welshinger-Butler Circle north and south intersections, and International Golf Drive/International Golf Drive intersection. Refer to **Appendix B** for conceptual plan details.

Table 7-4. Comparison of Existing and Proposed Intersection Lane Configurations

Intersection*	Existing	Proposed
US 92 / Int'l Speedway Blvd		
Welshinger-Butler Circle (South Intersection)		
Welshinger-Butler Circle (North Intersection)		

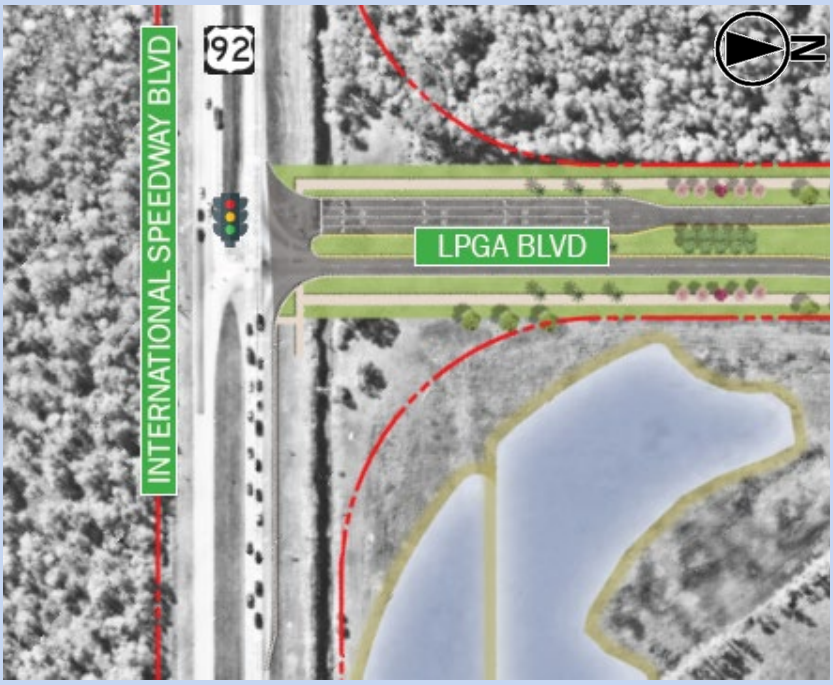
Intersection*	Existing	Proposed
International Tennis Drive / International Golf Drive		
Tournament Drive		
Tymber Creek Road		 Note: 4th leg being constructed by developer
Champions Drive		

Intersection*	Existing	Proposed
Tomoka Farms Road		
I-95 Southbound Ramps		
I-95 Northbound Ramps		
Technology Boulevard		
Williamson Boulevard		

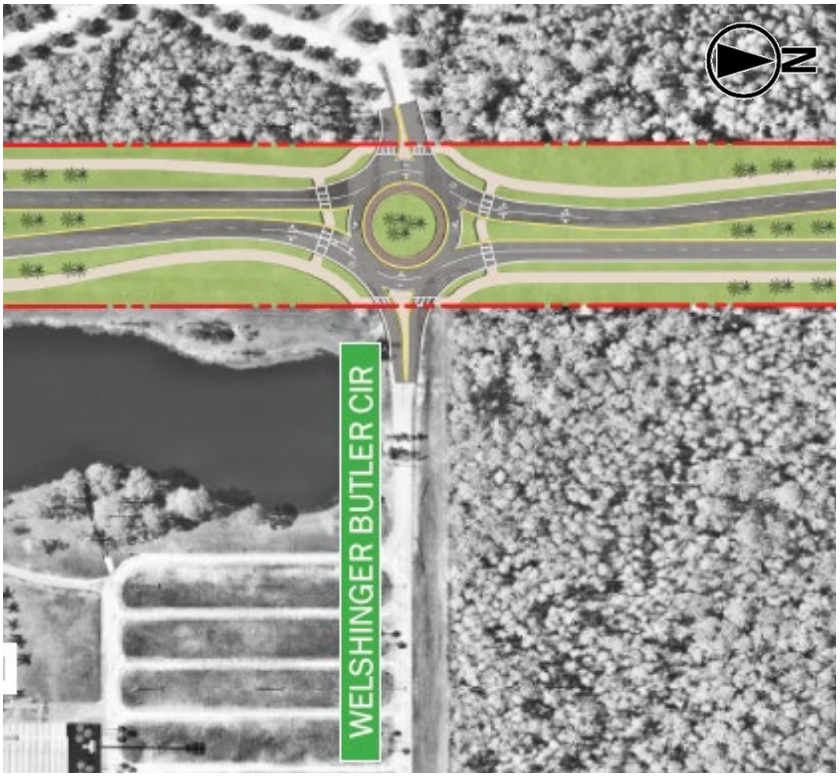
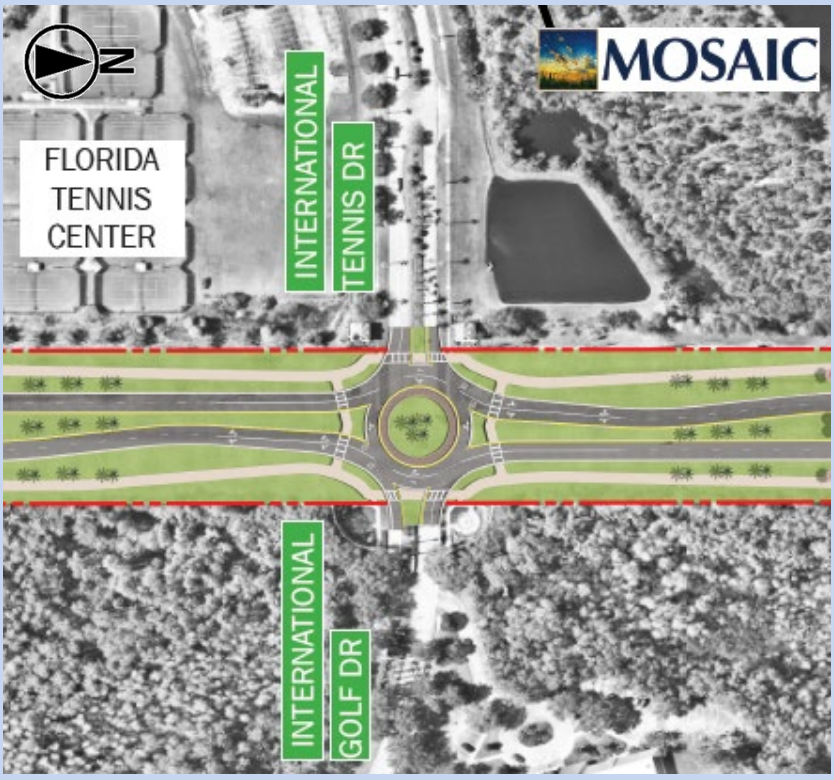
Intersection*	Existing	Proposed
Concierge Boulevard		

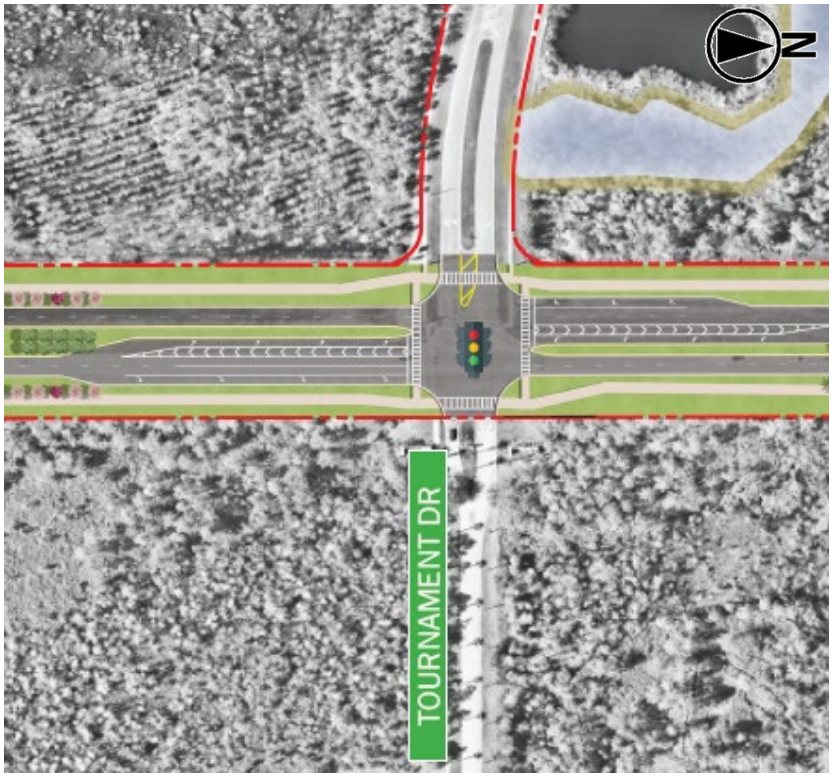
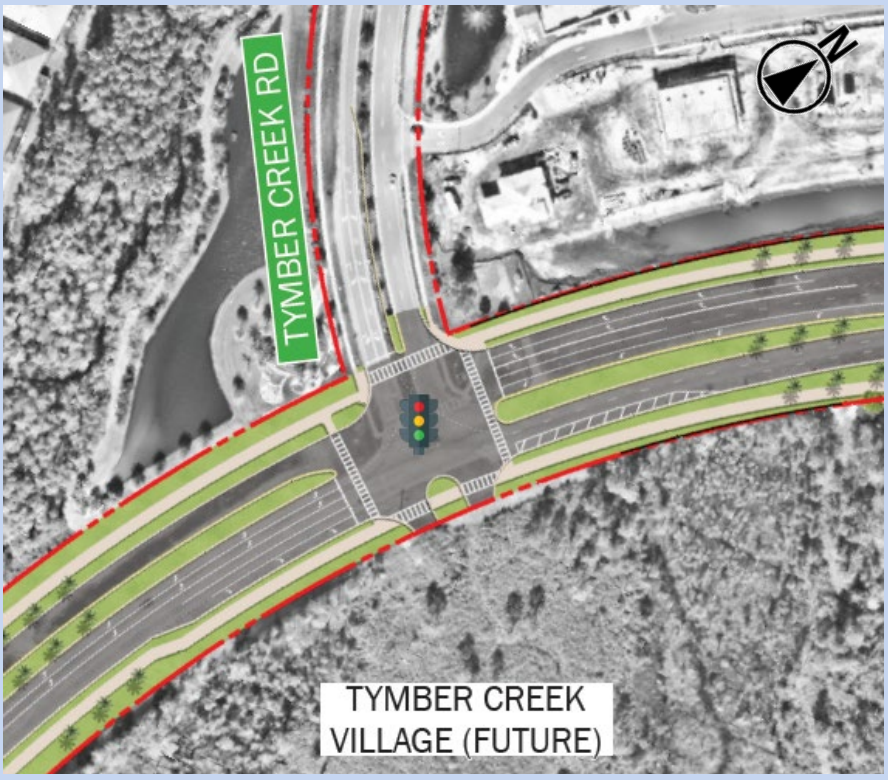
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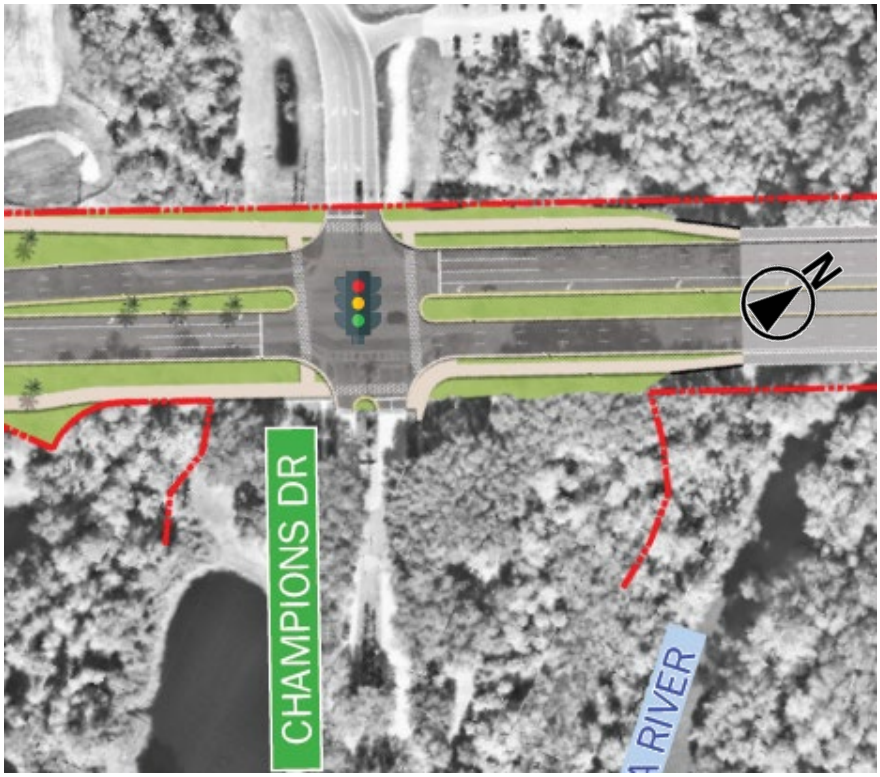
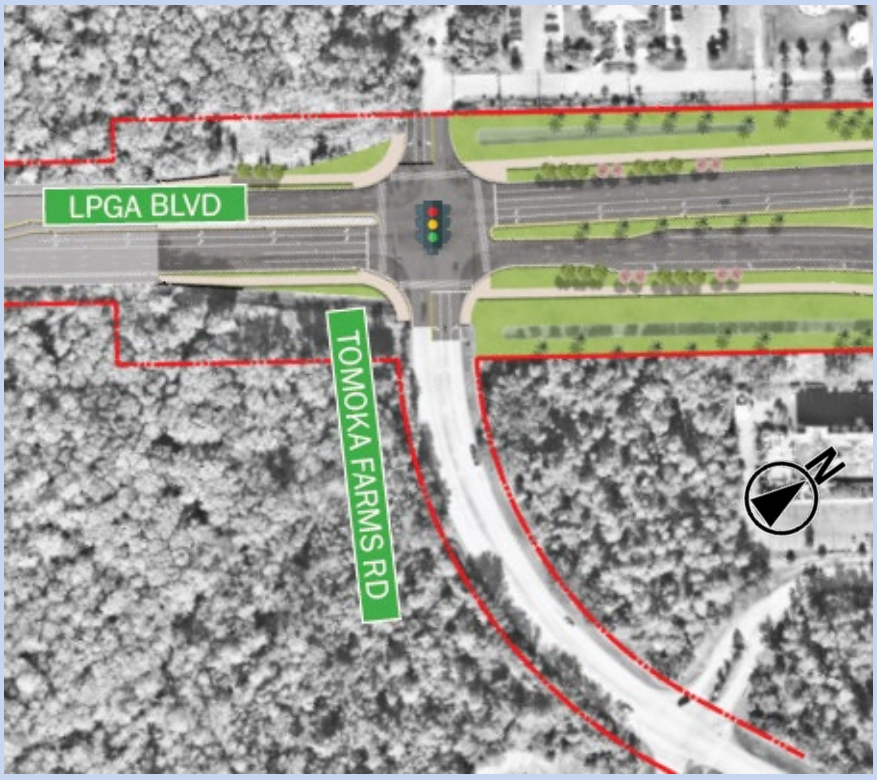
Table 7-5. Proposed Intersection Concepts

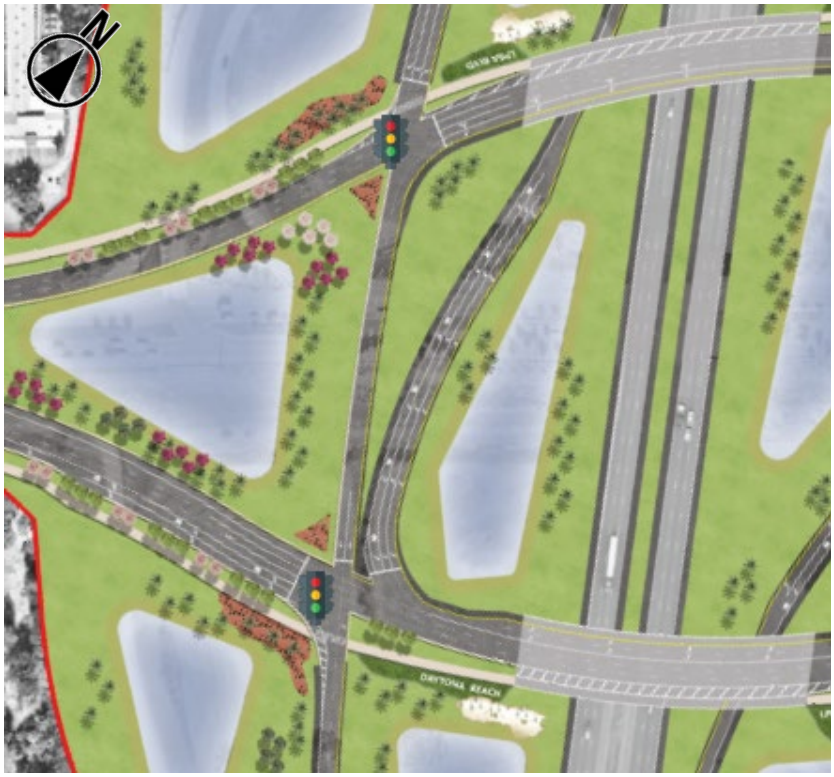
Intersection	Concept
LPGA Boulevard and U.S. 92	

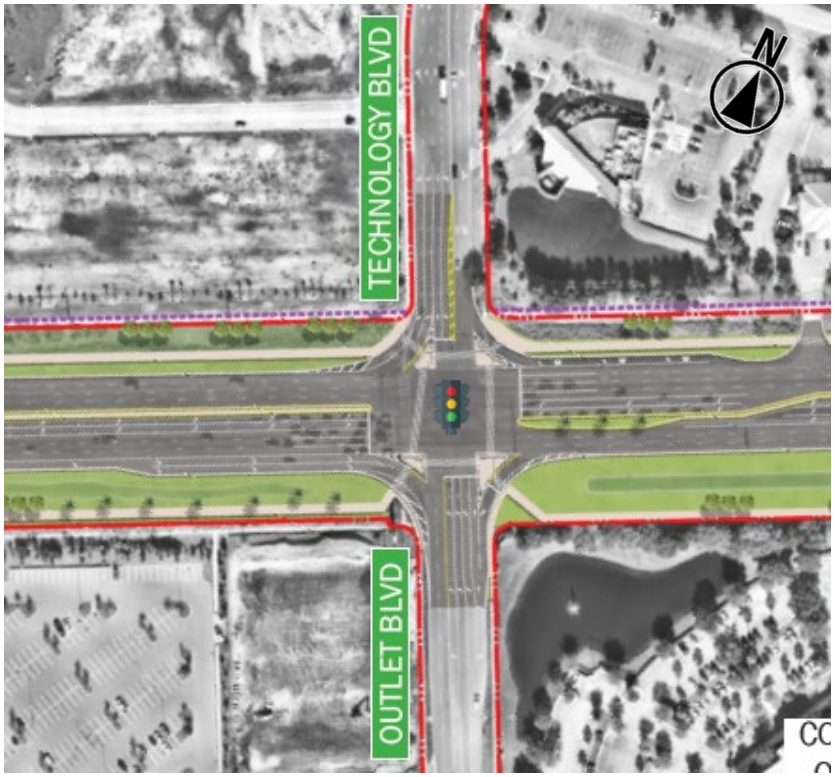
Intersection	Concept
LPGA Boulevard and Royal County Boulevard	
LPGA Boulevard and Pamona Drive/ Welshinger-Butler Circle	

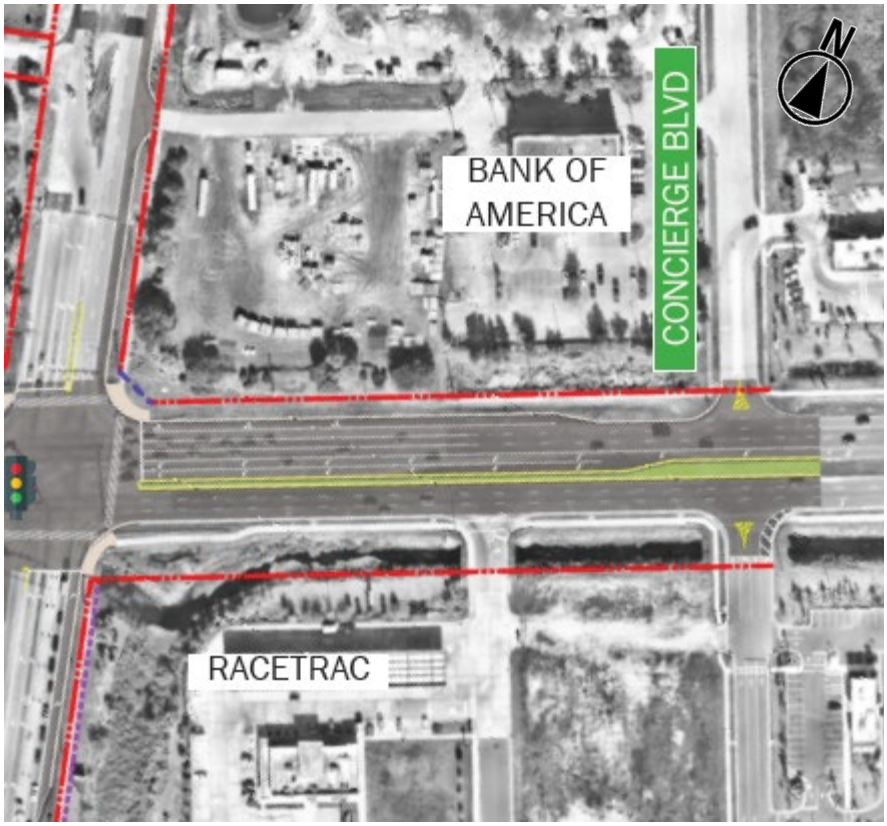
Intersection	Concept
LPGA Boulevard and Welshinger-Butler Circle	
LPGA Boulevard and International Tennis/Golf Drive	

Intersection	Concept
LPGA Boulevard and Tournament Drive	
LPGA Boulevard and Tymber Creek Road	

Intersection	Concept
LPGA Boulevard and Champions Drive	
LPGA Boulevard and Tomoka Farms Road	

Intersection	Concept
LPGA Boulevard and I-95 Southbound Ramps	
LPGA Boulevard and I-95 Northbound Ramps	

Intersection	Concept
LPGA Boulevard and Technology/Outlet Boulevard	
LPGA Boulevard and Williamson Boulevard	

Intersection	Concept
LPGA Boulevard and Concierge Boulevard	

7.8.2 I-95 Interchange Concept

The Signalized Turbine Interchange layout shown in **Figure 7-8** spreads the traffic across westbound and eastbound LPGA Boulevard and as a result, it moves high volumes and provides enough queue storage between signalized ramp terminals. This concept would provide better safety and operational benefits than the other concepts evaluated during the design year. Additionally, the Signalized Turbine Interchange can be easily expanded in the future without major reconstruction.

As shown in **Table 7-4** and **Table 7-5** both northbound and southbound ramp terminal intersections will be signalized and will operate with two-phase signals. Both on-ramp and off-ramps of the interchange have two lanes. However, because of the capacity constraints downstream of southbound on-ramp near the US 92/I-4 Collector-Distributor (CD) system diverge area, a ramp signal is proposed at the southbound on-ramp and the number of lanes at the entrance is reduced to one to further manage the demand from LPGA Boulevard into the I-95 southbound lanes. This operational modification seems to extend the operational life of the CD diverge area to 2045 as described in the IMR.

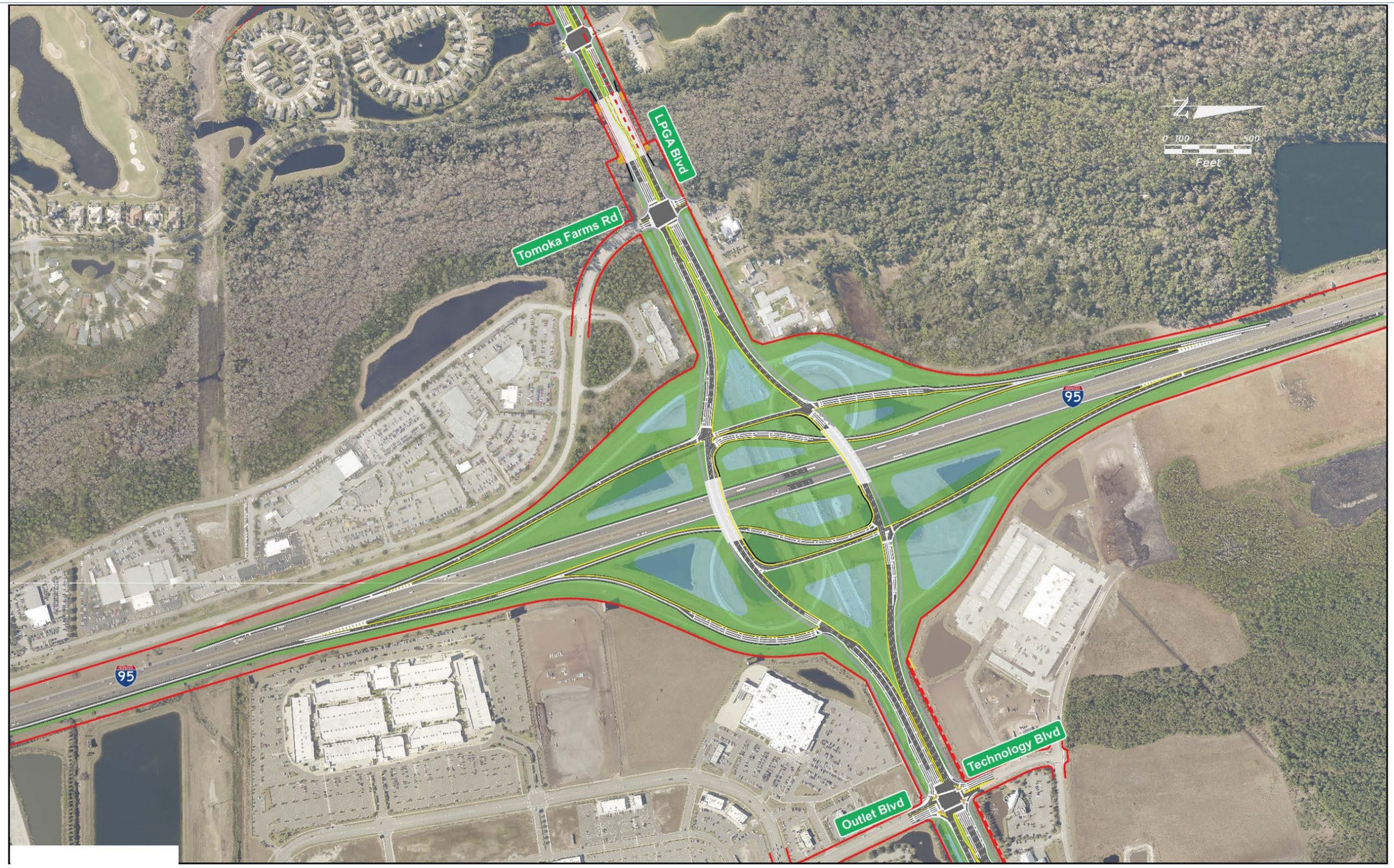


Figure 7-8. I-95 at LPGA Boulevard Signalized Turbine Interchange Concept

7.9 TSM&O Strategies and Technology

The implementation of TSM&O strategies will aid in intersection safety and is reflected in the Preferred Alternative. The integration of TSM&O strategies will continue to be evaluated in final design. The following strategies are being considered:

- Wrong Way Driving Detection – Installation of vehicle detection systems at off-ramps that monitor traffic flow for the presence of vehicles traveling in the wrong direction.
- Network Integration – Establishing and implementing collaborative standard network architecture where possible.
- Advanced Traffic Signal Performance Measures (ATSPM) – Collect a myriad of base data such as speed, volume, and occupancy and report back data metrics such as turning movements, travel time, and Origin-Destination (O-D). ATSPM and Smart Signals include standardized practices such as monitoring intersections via CCTVs and automating data processing.
- Ramp Metering – Along I-95 on-ramps for emergency and incident management.
- Route Notification and Diversion – Vehicle detection systems upstream and downstream of LPGA Boulevard, which monitors traffic congestion and triggers predetermined diversion routes and management operations.
- Event Management – Solutions to address event management include notifications, development of specific timing patterns, deployment of temporary traffic control (TTC) designs, coordination of law enforcement personnel, real-time monitoring from traffic management centers, and response efforts inevitably encountered during events.
- Connected and Autonomous Vehicles – Initiatives that would improve traffic flow using different technology applications.
- Travel Time Information– Supplemental DMS with travel time information along LPGA Boulevard.

TSM&O Narrative and Draft Concept of Operation (ConOps) for this project have been prepared and included in the project file.

7.10 Landscape Opportunities

Landscape opportunities were evaluated, and a conceptual landscape design is incorporated in the rendering concept of the Preferred Alternative (**Appendix A**). The goal of the proposed landscape architectural concept is to provide a complete corridor that is functional and aesthetically pleasing. The concept emphasizes providing the following:

- Safe and comfortable pedestrian/bicyclist routes along the corridor. The shared-use paths are designed to be buffered by a planting strip.
- Maximizing the opportunity to plant shade trees along the pedestrian/bicyclist routes.
- While providing the necessary clear sight lines the design provides tree enclosure to encourage drivers to abide by the target speed.
- Bold landscape at the intersections and interchange to attract visitors, developers, and citizens.

- Provide an easy-to-maintain landscaping scene that is adapted to the environment and tailored to the maintenance capabilities of the maintaining agency.
- Stormwater ponds are surrounded by aesthetically pleasing tree planting.

Landscape needs will continue to be discussed and refined during the Design phase where a landscape opportunity plan will be developed.

7.11 Lighting

The roadway widening and modification to the I-95 interchange will trigger the relocation of the existing lighting system where currently present. Additionally, the project may require new lighting systems which will be designed to conform with the latest FDM requirements. A lighting justification study for the entire corridor will be conducted during the Design phase.

7.12 Wildlife Crossings

The Preferred Alternative will enhance wildlife habitat connectivity by adding two (25' wide) wildlife paths beneath the Tomoka River bridge (**Figure 7-7**). The wildlife paths will provide healthier and safer landscapes for ecological communities. The path may also prevent wildlife-vehicle conflicts caused by animals attempting to cross the bridge to reach important habitats.

7.13 Utilities

The Preferred Alternative may require relocation of utility lines currently located within the roadway right of way. Potential impacts are summarized in **Table 5-7** and the details of utility locations are marked up in the Utility Assessment Package (included in the project file). Most of the UAOs have the capability to adjust their facilities without causing major inconvenience to their customers. Mitigation measures will include minimizing service disruptions, allowing service disruptions only during periods of minimum usage, and installing an alternative or new service before disconnecting the existing service. The cost of utility relocations will be developed as part of the Design phase for this project.

7.14 Drainage and Stormwater Management

Drainage patterns in the Preferred Alternative's post-development conditions will remain generally similar as in the pre-development conditions in terms of basin limits and the ultimate discharge points. A closed storm drain system will be installed throughout the corridor to collect and convey the roadway runoff to the stormwater management facilities. Offsite runoff will be bypassed and routed to their current outfall locations. Additionally, open ditch systems east of the Tomoka River bridge will be maintained to convey offsite runoff.

Water quality treatment will be provided for the entire project area with wet detention ponds as the proposed alternative for treatment and attenuation. Between Tomoka River bridge and I-95 southbound ramps an underdrain filtration system will be evaluated in the Design phase. Pre-development and post-development analysis will be compared to ensure the peak rate of discharge for the 25-year frequency; 24-hour duration storm is not exceeded in the proposed conditions.

LPGA Boulevard from US 92 to the Tomoka River

- Basins 1-13 – To accommodate the proposed roadway improvements, length, locations, and size of the cross drains shall be modified during the Design phase. There is no anticipated off-site runoff from the west with the extension of the culvert crossings. Water quality treatment and flood attenuation will be provided with wet detention ponds prior to ultimate discharge into the Tomoka River.

I-95 Interchange

- Basins 14-17 – Water quality treatment and flood attenuation will be provided in the I-95 interchange infield areas. The existing roadside ditch in the northeast quadrant along the north side of LPGA Boulevard will be impacted with the proposed roadway widening. Off-site runoff from the 18.67 acres currently discharging into this ditch will be collected and conveyed as part of the proposed roadway drainage system and will be conveyed to the infield areas. Impacts to the 11th Street Canal consisting of culvert installation and canal realignment are anticipated to accommodate the proposed interchange and roadway reconstruction.

Technology Boulevard to N. Williamson Boulevard

- Basin 18 – Proposed drainage improvements in this basin will consist of relocation and adjustment of existing drainage features. Swales on the northside of the road will be maximized to provide runoff treatment if applicable. Additionally, compensatory water quality treatment will be provided in the I-95 interchange infield areas.

7.14.1 Proposed Cross Drains

Most of the existing culverts have exceeded the 50-year service life. All the existing culverts are recommended to be replaced with the reconstruction of LPGA Boulevard. The culvert at US 92 Canal and Thayer Canal are also recommended to be replaced with larger hydraulic openings. The larger opening will be designed to convey the 50-year storm event while reducing existing head water stages. The detailed design of the bridge culverts replacement will be conducted in the Design phase.

7.14.2 Proposed Pond Sites

The available pond depth, including storage depth and freeboard, for the proposed stormwater management facilities were sized based on the estimated average seasonal water table (ASWT) from NRCS soil data and ground surface elevations obtained from National Oceanic and Atmospheric Administration (NOAA) light detection and ranging (LiDAR). The required storage volume within the pond includes the treatment volume as well as the difference between the pre-development and post-development runoff volumes. Alternative pond sites were identified based on available information including factors such as hydraulic feasibility, environmental resource impacts, floodplain impacts, potential for utility impacts, right of way needs, and potential for joint-use pond and/or regional pond projects

Three (3) pond site alternatives were considered and evaluated for each basin and documented in the *PSR* that has been prepared as part of this PD&E Study. The proposed pond site locations map is shown in **Figure 7-9**. Detailed locations for the preferred stormwater pond sites are shown in **Appendix B**.

7.15 Floodplains

Roadway improvements are proposed within the existing right of way. The floodplains within the right of way are mostly localized depressional areas, less than 1' deep. There is no feasible alternative improvement that better avoids floodplain encroachments within the existing right of way. Consequently, the proposed roadway widening, and the I-95 interchange reconfiguration from project improvements will result in impacts to the adjacent FEMA floodplains. The anticipated floodplain impacts due to the proposed roadway widening were calculated and FPC sites were identified in the PSR. The total floodplain acreage within each floodplain area is listed in **Table 7-6**. Most of the floodplain impacts are expected to occur in areas 1 and 3. The floodplain impacts in other areas are minimal.

Table 7-6. Floodplain Limit, 100 Year Flood Elevation, and Potential Impact Area

Area No.	From Station	To Station	From (Road or Canal)	To (Road or Canal)	100 Year Elevation (NAVD)	Impact Area (AC)
1	300+00.00	412+00.00	US 92 Canal	Thayer Canal	27	2.41
2	412+00.00	455+00.00	Thyer Canal	International Tennis Dive	26	0.18
3	455+00.00	517+00.00	International Tennis Drive	Tournament Drive	25	2.07
4	517+00.00	562+66.00	Tournament Drive	Champions Drive	23	0.73
5	562+66.00	574+00.00	Champions Drive	Tomoka Farms Road	15	0.00
6	574+00.00	586+00.00	Eastbound LPGA Boulevard at the east of Tomoka Farms Road		17	0.31
				Total Acreage of Potential Impact		**5.70**

The potential floodplain impacts will be compensated in two ways: (1) using FPC shown in **Figure 7-10** and in **Appendix B**; and (2) utilizing roadside ditches. As the existing floodplain depth is very shallow with limited storage, a roadside ditch with a bottom elevation below the existing ground surface will provide an effective method for floodplain compensation storage.

The floodplain impact calculations are conservative and will be revisited during the Design phase when survey, geotechnical data, and proposed cross sections are available. During the Design phase, the conveyance ditches will be optimized within the right of way to provide the maximum allowable floodplain compensation volume to reduce the need for FPC sites. Additionally, infield areas and proposed stormwater management facilities will be maximized to the extent possible to minimize the need for off-site FPC sites.

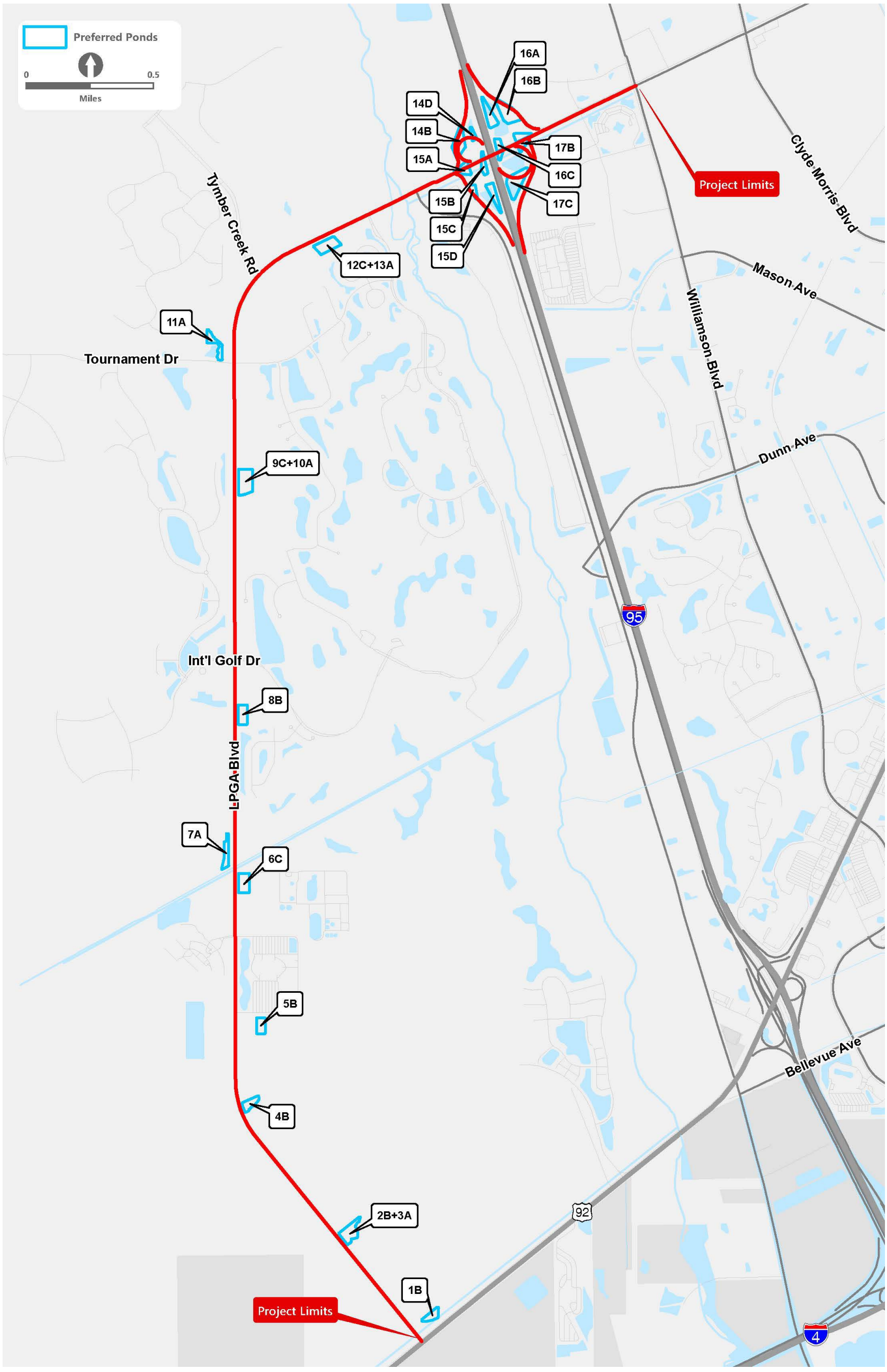


Figure 7-9. Proposed Pond Sites

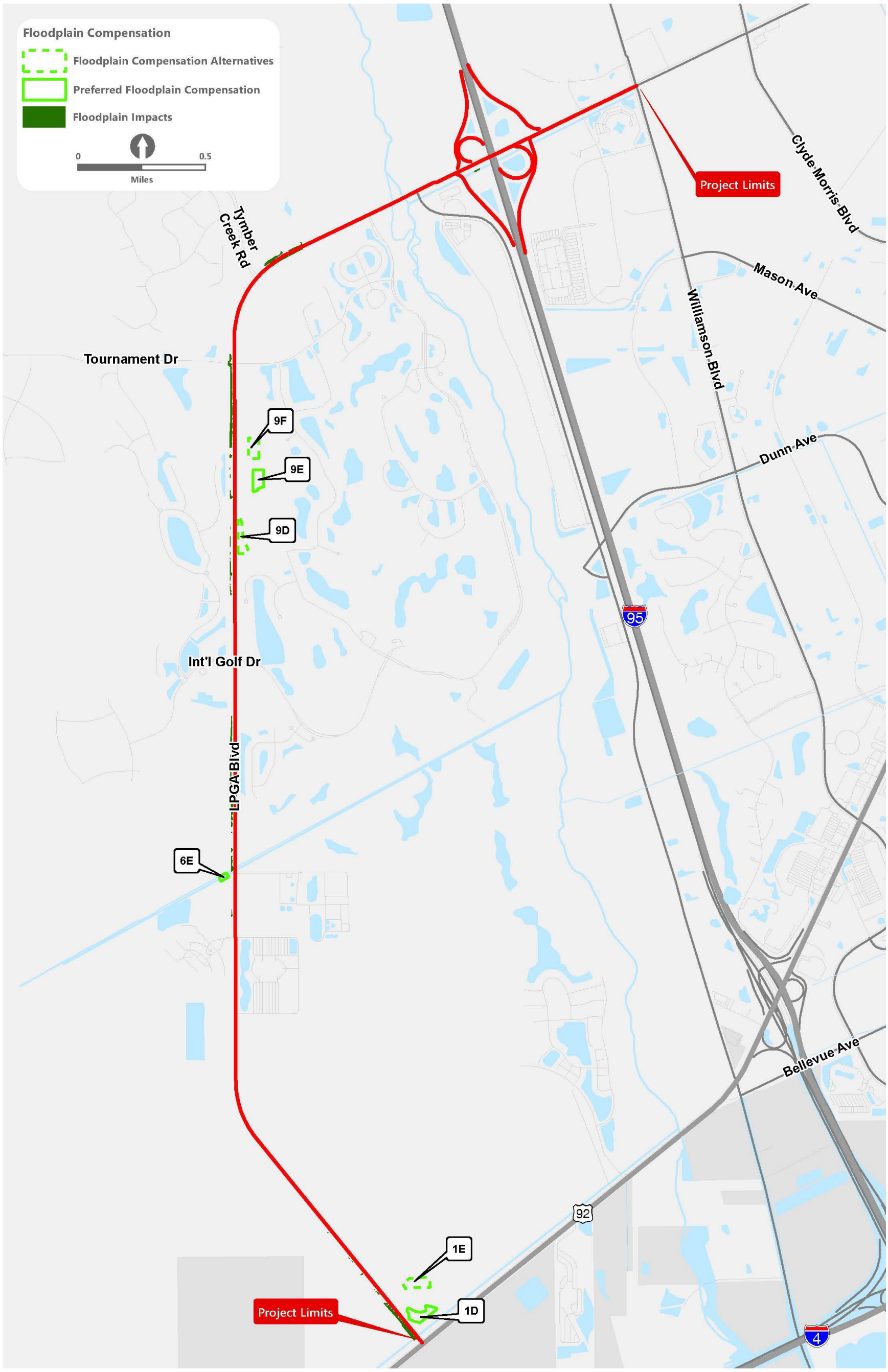


Figure 7-10. Floodplain Compensation Sites

7.16 Permits

The implementation of the Preferred Alternative will require the following permits:

- USACE Section 10 or Section 404 Permit
- SJRWMD Environmental Resource Permit (ERP)
- DEP National Pollutant Discharge Elimination System Permit
- FWC Gopher Tortoise Relocation Permit
- State 404 Permit

7.17 Transportation Management Plan

The implementation of the Preferred Alternative will require a complete reconstruction of the existing roadway between US 92 and Tomoka Farms Road as opposed to simply widening. Similarly, the I-95 interchange will also be completely reconstructed to the Signalized Turbine Interchange concept.

The conceptual traffic control during construction phasing plan considered for this PD&E Study consists of four phases discussed below. The initial phasing plans are provided in the *Constructability and Maintenance of Traffic (MOT) Memorandum* dated April 2024 (**Appendix I**). The phasing plans will be refined during the Design phase for this project.

Currently, pedestrian facilities on the corridor are limited. Pedestrian crossings on LPGA Boulevard will be maintained throughout construction activities and sidewalks where they are currently present by following guidance provided in the FDM Section 240.2.1.9 (Bicycle, Pedestrian, and Transit Accommodation).

Implementation of transportation operations strategies include event management will follow FDM Table 240.3.1 (Transportation Operations Strategies). A key component of the transportation operations strategies is the event management including providing appropriate travel information, coordinating with the City of Daytona Beach, and monitoring and closing of intersections. As part of the Public Involvement Plan (PIP) for this project, public outreach activities will continue by communicating affected residents, businesses, stakeholders before and during construction.

7.17.1.1 Phase I – Bridges & Initial Interchange Ramps

The first phase constructs the bridges on LPGA Boulevard over I-95 and some directional ramps from the Signalized Turbine Interchange. Phase I proposes:

- Permanent closure and demolition of the existing loop ramps. Traffic would be rerouted to the respective directional ramps (widened with temporary pavement) and signalization modifications.
- To perform the bridge pier construction at the I-95 median, the northbound and southbound I-95 mainline traffic will be shifted to the outside, allowing adequate space to work in the median. For the overhead bridge work activities such as beam installation over the I-95 mainline, nighttime off-peak hours closures of the mainline are required.

- Construction of stormwater management ponds along LPGA Boulevard and in the outer ponds within the I-95 infield areas.

7.17.1.2 Phase II – LPGA Boulevard

The second major phase of the project addresses the construction of LPGA Boulevard from West International Speedway Boulevard (US 92) to east of N Williamson Boulevard. The existing LPGA Boulevard two-lane traffic configuration is maintained west of the interchange. East of the interchange, lane widths are reduced to 10' and the entire traffic is shifted to the south over temporary pavement to provide sufficient space for the future westbound LPGA Boulevard roadway construction.

7.17.1.3 Phase III – LPGA Boulevard

The third phase shifts the LPGA Boulevard traffic to the newly constructed roadway portions. From the LPGA Boulevard/US 92 intersection, the existing LPGA Boulevard two-way traffic is shifted to the new roadway and the future northbound and eastbound LPGA Boulevard roadway is now under construction in this phase.

7.17.1.4 Phase IV – Median Work and Final Interchange Ramps

The final phase places traffic on final corresponding roadways while proposed median roadway improvements, including any remaining eastbound and westbound roadway section, traffic separators and curb and gutter is under construction. Phase IV also completes the remaining work for the interchange ramps.

7.18 Construction Impacts

The construction of the Preferred Alternative would result in temporary noise and vibration increases within the project area. The noise and vibration would be generated primarily from heavy equipment used in hauling materials and building the roadway improvements. Sensitive areas located close to the construction area may temporarily experience increased noise and vibration levels. Based on FDOT's listing of construction noise and vibration sensitive sites, the Father Lopez High School has been identified as being a potential construction noise and vibration sensitive sites that exists along the project corridor.

Construction and demolition noise will be minimized to the greatest extent practicable through the adherence to controls listed in the latest edition of the FDOT's Standard Specifications for Road and Bridge Construction.

Potential impacts resulting from the actual construction of the Preferred Alternative with respect to water resources, access to businesses and residences, stockpiling of construction materials, disposal of debris will be avoided or minimized by following the standard construction practices and the FDOT Standard Specifications for Road and Bridge Construction, and obtaining and adhering to relevant environmental permits.

7.19 Special Features

The project area is near the Daytona Beach International Airport; however, the proposed construction activity will not exceed the Federal Aviation Administration Notice criteria.

No noise walls are proposed for this project. More information about noise is in **Section 5.5.5.1** of this report.

Wrap-around MSE walls are proposed at the start and end of bridge abutments at each of the proposed bridge locations. Each wrap-around MSE wall will be installed inside the right of way and is proposed to turn back along each side of the approach roadway as required to contain the embankment material.

7.20 Cost Estimates

The engineer's opinion of the project costs is summarized in **Table 7-7**. The Preferred Alternative LRE estimates are included in **Appendix G**. Wetland mitigation costs were estimated using the cost per acre published in the FDOT Work Program Instructions.

Table 7-7. Estimated Project Costs

Phase	Amount	Notes
Construction	$156.3 M	LRE costs
MOT	$15.6 M	10% of Construction
Mobilization	$17.2 M	10% of Construction + MOT
Unknowns	$28.3 M	15% of Construction + MOT + Mobilization
Construction Total	$217.6 M	Construction + MOT + Mobilization + Unknowns
Right of Way	24.3 M	
Wetland Mitigation	$9.6 M	Derived from the Work Program Instructions
Construction Engineering and Inspection	$15.2 M	7% of construction total

7.21 Summary of Potential Environmental Impacts

This section provides a summary of environmental issues and features that may affect the development of the Preferred Alternative. Detailed descriptions of the impacts discussed in individual subsections are contained in the corresponding technical reports.

7.21.1 Social and Economic

7.21.1.1 Community Resources

Throughout the project development process community outreach and engagement was conducted to listen and understand community needs and discuss how the proposed improvements would address those needs. The Preferred Alternative will not impact any community facility within the project study area.

7.21.1.2 Future Land Use

The Preferred Alternative does not propose any change to future land use. Implementation of the Preferred Alternative would neither conflict with the local land use plans.

7.21.1.3 Mobility

The Preferred Alternative will add capacity along LPGA Boulevard and the I-95 interchange and hence enhance movement of people and freight within the project limits. Additionally, proposed shared-use paths will enhance accessibility and connectivity for users who are walking and biking within the project limits.

7.21.1.4 Aesthetics Effects

The Preferred Alternative has been developed to match the roadway context classification—C3R (from US 92 to Tymber Creek Road) and C3C (from Tymber Creek Road to Williamson Boulevard). Landscape opportunities have been identified to match the existing community character. The I-95 interchange plantings will match the existing landscape and hardscape.

7.21.1.5 Relocation Potential

No residences, businesses, or institutional/community facilities will require relocation to accommodate the Preferred Alternative.

7.22 Cultural Resources

Both archaeological survey and architectural survey conducted for this project and documented in the CRAS did not recommend sites for listing in the NRHP. The Florida State Historic Preservation Officer concurred with the CRAS recommendations and findings on April 7, 2023.

7.22.1.1 Section 4(f) Resources

Determinations of applicability were prepared for each resource discussed in **Section 2.4.2** and approved by the FDOT Office of Environmental Management. Additional details about each property are contained in the determinations of applicability and in the Type 2 Categorical Exclusion (CE), located in the project file. All properties were determined to have “No Involvement” or “No Use.”

7.22.2 Natural Resources

7.22.2.1 Wetlands

The Preferred Alternative would result in impacts to all wetlands and other surface waters occurring within the existing right of way and within the preferred pond and FPC sites. The proposed roadway widening, and pond sites associated with the LPGA Boulevard/I-95 interchange modifications occur would result in direct permanent impacts to 75.85 acres of wetlands. Most of the wetlands are swales within the existing roadway right of way.

The Preferred Alternative was evaluated in accordance with Federal Executive Order 11990. Based on preliminary design, it was determined that there are no practical alternatives to the proposed construction in areas of wetlands and other surface waters. Avoidance of these

resources has been maximized to the greatest extent possible and the design has been limited to the existing right of way to avoid and minimize impacts to higher quality wetlands outside the right of way. Further impact minimization will occur during the Design phase and permitting process for this project. The use of BMP including the use of silt screens, floating turbidity barriers, and other discharge prevention measures during construction will minimize impacts to adjacent wetlands and other surface waters within the vicinity of the project. Impacts to wetlands will be mitigated pursuant to Section 373.4137 Florida Statutes through either the purchase of mitigation bank credits from an appropriate mitigation bank or other mitigation options as discussed in the NRE.

Considering that the Tomoka River is an OFW, the project will adhere to the strict SJRWMD water quality standards associated with OFWs during construction.

7.22.2.2 Protected Species

As discussed in **Section 5.5.4.2** the Preferred Alternative has a low potential to impact federal and state listed species that were identified as having the potential to occur within the study area.

7.22.3 Physical Resources

7.22.3.1 Noise

As noted in **Section 5.5.5.1** the implementation of the Preferred Alternative would not cause substantial noise level increases that may require consideration of noise abatement measures.

7.22.3.2 Contamination

The Preferred Alternative has a potential to impact three active retail gas stations and a historical railroad location (no evidence of railroad grade, rails, ties, or associated items were observed onsite) which were assigned a medium rating in accordance with Chapter 20 of the PD&E Manual. The three active retail gas stations that received a median rating will be further considered for a Level II assessment during the Design phase..

Appendix A Rendered Concept

Appendix B Preferred Alternative Concept Plan

Appendix C Typical Section Package

Appendix D Drainage Basin

Appendix E Wetlands

Appendix F Target Speed Recommendation Report

Appendix G LRE Cost Estimates

Appendix H Structure Analysis Memo

Appendix I Constructability and Maintenance of Traffic



Florida Department of Transportation District 5

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