Roadway Conceptual Analysis

for

Avalon Road (CR 545)

From US 192 to Hartzog Road

Prepared for

Orange County Public Works

Prepared by

March, 2024

ROADWAY CONCEPTUAL ANALYSIS

FOR

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Orange County Project Number: Y20-835

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I am a registered professional engineer in the State of Florida practicing with JMT, Inc., and that I have supervised the preparation of and approved the analysis, findings, opinions, conclusions, and technical advice reported in:

REPORT: Roadway Conceptual Analysis Report

PROJECT LOCATION: Avalon Road From US 192 to Hartzog Road

CLIENT: Orange County, Florida

The following duly authorized engineering business performed the engineering work represented by this report:

JMT, Inc.
400 Colonial Center Parkway, Suite 100
Lake Mary, FL 32746
Florida Certificate of Authorization: 5917

This report includes a summary of data collection efforts, corridor analysis, and conceptual design analysis for Avalon Road from US 192 to Hartzog Road in Orange 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 design standards and criteria set forth by the federal, state, and local regulatory agencies as well as professional judgment and experience.

Signature:

Name: Greg T. Smith, PE
FL PE 39087

Date: MARCH 11, 2024

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EXECUTIVE SUMMARY

ES.1 Introduction

Orange County has prepared a Roadway Conceptual Analysis (RCA) for the Avalon Road (CR 545) corridor from US 192 to Hartzog Road in southwest Orange County. The project location is shown on Figure 1-1. The objective of the RCA is to identify the preferred improvements needed to address the current and future transportation needs along the corridor.

The preferred improvements identified in this report will serve as the basis for the subsequent design and construction of these facilities. This RCA report summarizes the essential components of the study, including public involvement, data collection, traffic analysis, roadway design, drainage design, and environmental impacts.

ES.2 Purpose and Need for Improvement

The purpose and need for this project are based on several factors including forecasted traffic demands, the need for multi-modal improvements to accommodate pedestrians and bicyclists, provisions for safety enhancements, and consistency with the County's long range transportation plans.

The need to improve Avalon Road is based on the anticipated future traffic demands and crash data experienced in the area. Avalon Road serves as a major north-south corridor in west Orange County. Land use along the corridor currently consists primarily of open land, though the area is developing rapidly with most of the corridor expected to be built out in the near future. The existing year 2021 traffic volumes along Avalon Road range from approximately 15,700 AADT to 16,200 AADT. Future traffic demands are expected to worsen if no improvements are made, thus necessitating the need to provide additional capacity.

Portions of Avalon Road within the project limits are currently operating at an unacceptable Level of Service (LOS) F and roadway widening is needed to improve traffic operations. This expansion of Avalon Road is also consistent with the Orange County Comprehensive Plan.

Crash reports for the five-year time period between January, 2016 and December, 2020 were obtained and reviewed. One hundred and forty-nine crashes occurred along the project over this five-year period. There were 34 injury crashes, 115 property damage crashes, and no fatalities recorded.

A heat map at the right depicts the concentration of the crashes along the study corridor with the brightest colors indicating the locations with the high concentration of crashes.

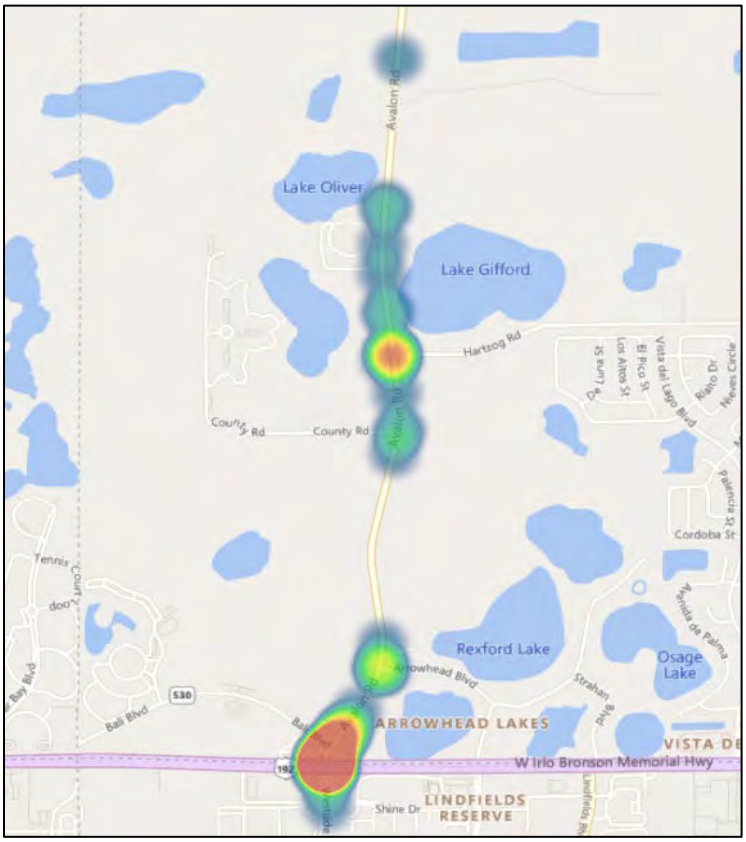


Figure ES 1-1 – Concentration of Crashes

ES.3 Existing Conditions

Avalon Road (CR 545) is a critical roadway in west Orange County's existing transportation network since it provides for continuous north-south traffic throughout the western limits of the County from the south County line to Winter Garden, a distance of 17 miles. Besides serving as a major transportation element in west Orange County, Avalon Road also provides a parallel north-south alternative in lieu of using US 27 and SR 429 while providing critical connections to neighboring Osceola, Polk, and Lake Counties. CR 545 not only provides regional mobility, but also enables important local access to major developments in the area such as Horizon West and Walt Disney World via Western Way.

Within the project limits, Avalon Road is a two-lane collector roadway constructed as a rural section with shoulders, drainage ditches, and right/left turn lanes at selected intersections. At the south end of the project limits, US 192 is designated as an urban arterial and also serves as the boundary between Orange County and Osceola County. At the north end of the project limits, Hartzog Road has recently been constructed to the east as a two-lane urban facility, though it has been designed to provide a future four-lane, divided urban collector. The speed limit throughout the Avalon Road corridor is 55 miles per hour (mph), though 40 mph advisory speed plates have been placed on several horizontal curves.

There are limited sidewalks along the project except for an area from Grove Blossom Way to north of the Palisades Condominiums along the west side of Avalon Road. There are no dedicated bicycle facilities along Avalon Road. The only signal along the corridor is at US 192, and crosswalks and pedestrian signals have been provided at this intersection.

The existing right-of-way varies throughout the project corridor from 66-110 feet in width. Draft preliminary existing right-of-way maps have been included in Appendix B.

Avalon Road's horizontal alignment has four horizontal curves along the project limits including a heavily skewed alignment at the north approach of the US 192 intersection. The vertical profile of Avalon Road is relatively flat throughout the study area.

The County's nearest trail is the Horizon West Trail which is located several miles from the project limits. In August, 2015, Orange County completed a study which identified an existing/future trail from south of Lake Gifford Road to the north along Avalon Road which would incorporate the existing sidewalks near the Palisades. The only nearby transit facility is LYNX Bus Route 55 which travels along US 192 and provides a connection from the Four Corners/US 27 area to downtown Kissimmee. LYNX does not provide service along Avalon Road.

Improvements to Avalon Road are included in the Orange County's long term 10-year schedule of capital improvements. The County's Transportation Element Future Conditions Number of Lanes 2030 Map indicates Avalon Road is to be improved to a four-lane section.

With the exception of the current lighting at US 192, there are no existing street lights along Avalon Road. To the north of Hartzog Road, the planned Avalon Road improvements will include lighting.

Twelve Utility Agency/Owners (UAO) have been identified within the project area through the Sunshine 811 Design Ticket and utility coordination efforts. There are numerous existing utilities within the project corridor including overhead and underground electric, water and wastewater mains, and communication lines.

The Avalon Road project area is located within the jurisdiction of the South Florida Water Management District (SFWMD). Stormwater runoff from the existing roadway is collected in roadside swales and then

discharged into adjacent wetlands and drainage systems. As part of the proposed improvements, a storm sewer system will be installed with dedicated ponds which is expected to reduce maintenance issues along the corridor and improve overall treatment of the stormwater runoff.

ES.4 Traffic Analysis

Detailed project traffic analyses are provided in the Design Traffic Technical Memorandum (see Appendix G) and the Design Traffic Engineering Report. These documents include an analysis of the existing traffic conditions of the area as well as Year 2048 forecasts of future traffic demands. Based on these demands, four-lane roadway improvements are recommended by improve overall traffic operations by providing an acceptable level of service along the corridor. A summary of the traffic analyses is included in Section 5 of this report and the DTTM has been included in the appendices.

ES.5 Alternatives

The proposed widening improvements along Avalon Road will require additional right-of-way to accommodate the proposed four-lane, urban, divided section. As part of the study, traditional right/left/center evaluations were conducted to arrive at a preferred alignment.

The West Alignment was prepared which essentially holds the existing west right-of-way line and an analysis was undertaken to determine the impacts needed to provide a total right-of-way width of 120 feet with the needed right-of-way to be acquired from the east. Conversely, an East Alignment alternative was also examined which holds the existing east right-of-way line with necessary acquisitions from the west to arrive at a proposed 120-foot total right-of-way.

Both of these alternative alignments were found to generate substantial right-of-way impacts at certain locations along the project such as existing properties including the WaWa station and Palisades, as well as with future developments that have already dedicated right-of-way and/or are underway with the build-out of their facilities.

As another alternative, a hybrid alignment was developed which minimizes the drawbacks of the above two alternatives to arrive at a preferred compromise that minimizes impacts. An evaluation matrix has been developed to compare the pros and cons of the No Build alternative vs the above alternative alignments. This matrix, shown in Table ES-1-1, considers the social, natural, and physical impacts, as well as the costs of the preferred alternative. This hybrid alternative is recommended for this project since it minimizes impacts to existing/planned developments along the corridor while addressing future traffic demands, drainage needs and stormwater treatment, and multi-modal accommodations.

The proposed typical section elements are recommended to include an urban section with two 12-foot travel lanes in each direction separated by a 22-foot raised median. Type E curb and gutter will be used along the median and Type F curb and gutter is proposed along the outside lanes. These improvements will require the full reconstruction of Avalon Road.

The proposed typical will also include several multi-modal improvements including a six-foot sidewalk on the east side of the roadway and a 10-foot path on the west side of Avalon Road which will match the future path/sidewalk improvements proposed for Avalon Road to the north of Hartzog Road thus providing overall continuity and consistency. The proposed typical section will require a minimum right-of-way width of 120 feet.

The project will have three stormwater ponds (Ponds 2A, 3A, and 3B) and one floodplain compensation pond (see Figure 7-2). Pond 2A is proposed as a joint use pond and is planned to be integrated into the property owner's (Westgate) proposed drainage system.

Table ES-1-1
Alternatives
Evaluation Matrix
Avalon Road

Evaluation Criteria	No-Build Alternative	West Alignment Alternative	East Alignment Alternative	Preferred Alignment Alternative
	No Improvements	Four-Lane Urban Section with 6' SW and 10' Path	Four-Lane Urban Section with 6' SW and 10' Path	Four-Lane Urban Section with 6' SW and 10' Path
Relocations				
Number of Residential Acquisitions	None	None	None	None
Number of Business Acquisitions	None	None	None	None
Number of Parcels Impacted	None	36	31	40
Right-of-Way Impacts (Acres) (1)	None	17.8	18	17.9
Social, Natural and Physical Impacts				
Social and Neighborhood	None	None	None	None
Archeological/Historic Sites	None	None	None	None
Threatened and Endangered Species (2)	None	Moderate	Moderate	Moderate
Wetland Impacts - Roadway and Ponds Ac)	None	1.04	1.06	1.74
RHPZ Uplands (Acres)	None	None	None	None
Floodplains (Acres)	None	5.05	4.63	5.25
Potential High or Medium Ranked Contamination Sites	None	None	None	None
Estimated Costs (Present Day Costs)				
Estimated Construction Costs	No Cost	$ 25,974,295	$ 25,954,417	$ 25,995,128
Design and Admin Costs (10% of Construction)	No Cost	$ 2,597,429	$ 2,595,442	$ 2,599,513
CEI (12% of Construction)	No Cost	$ 3,116,915	$ 3,114,530	$ 3,119,415
Right-of-Way Acquisition (3)	No Cost	$ 3,295,314	$ 3,332,340	$ 3,313,827
Wetland Mitigation	No Cost	$ 98,000	$ 100,000	$ 164,000
RHPZ Uplands Mitigation	No Cost	None	None	None
Reimbursable Utility Relocation	No Cost	$ 2,986,000		$ 2,986,000
Subtotal		$ 38,067,954	$ 35,096,729	$ 38,177,883
Contingencies (20%)		$ 7,613,591	$ 7,019,346	$ 7,635,577
TOTAL ESTIMATED COSTS		***$ 45,681,544***	***$ 42,116,075***	***$ 45,813,460***

(1) Right-of- Way Requirements Reflect the Required Right-of-Way fro the Each Roadway Alternative Combined with the Right-of-Way Needed for the Recommended Ponds

(2) All Roadway Alignments Have Low Wildlife Impacts, Though When Combined with the Recommended Ponds 2A, 3A, and 3B, the Overall Rating is Raised to Moderate to Recognize Habitat that is Present and Suitable for Inhabiting Wildlife Species (ie, Gopher Tortoise, Burrowing Owl, Sand Skink, Florida Scrub Jay, Crested Caracara.

(3) Does Not Include Business Damages

ES.6 Recommended Alternative

The preferred typical section is shown in Figure ES-1-2 and contains the following design elements:

- An urban section with four 12-foot travel lanes and a 22-foot median
- Type E curb and gutter along the inside lanes, Type F curb and gutter along the outside lanes
- Multi-modal improvements consisting of a six-foot sidewalk on the east side of the roadway and a 10-foot path on the west side
- Four-foot utility strips between the Type F curb and the sidewalk or path
- A proposed minimum right-of-way of 120 feet

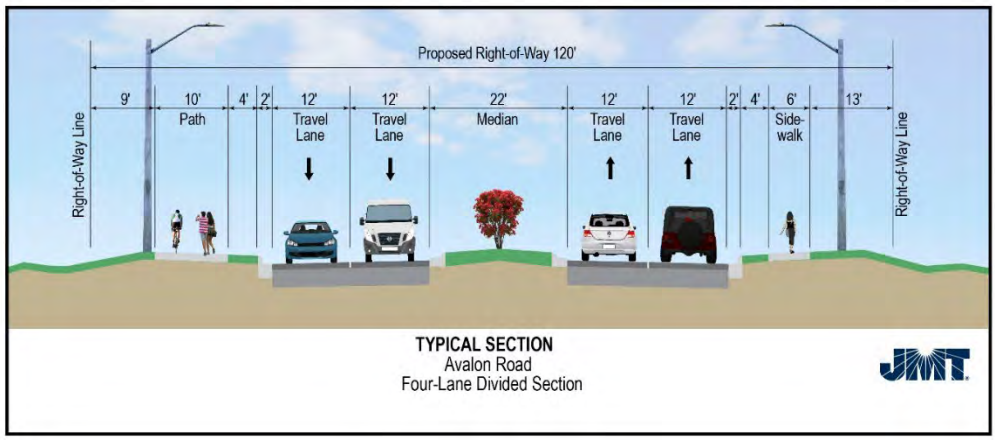


Figure ES 1-2 – Avalon Road Proposed Typical Section

The preferred alignment alternative minimizes right-of-way impacts to existing/proposed developments as well as social impacts as measured by relocations. The Preferred Alternative is shown on the concept plans located in Appendix A and is described in more detail in Section 7 Preferred Alternative. The right-of-way identification maps can be found in Appendix B.

ES.7 Public Involvement

Critical to the success of this project is the feedback received from the local community. Two community meetings have been held thus far and additional meetings have been conducted with the County's LPA and Board of County Commissioner's. The overall public consensus is strong support for this project given the present traffic congestion and worsening conditions in the future if no improvements are made. A summary of the Public Involvement documents is contained in Appendix C.

ES.8 Conclusions and Recommendations

The objective of the Avalon Road RCA is to develop and evaluate alternatives for needed improvement of Avalon Road from US 192 to Hartzog Road. This process incorporates the insights from planning, engineering, and the public involvement activities to refine the alternatives, and ultimately advances a preferred alternative into the design phase.

It is recommended that the preferred alternative as detailed in Section 7 of this report be advanced by Orange County into further implementation. The following table indicates the estimated schedule for design, right-of-way, and construction phases of this project.

	2023	2024	2025	2026	2027	2028	2029
RCA							
DESIGN							
ROW							
CONSTRUCTION							

1 INTRODUCTION

1.1 Introduction and Study Area

Orange County is conducting a Roadway Conceptual Analysis (RCA) for Avalon Road (CR 545) from US 192 to Hartzog Road which is located in southwest Orange County (Figure 1-1). The study area covers a distance of 1.6 miles in length.

Existing Avalon Road is a two-lane, collector roadway in southwest Orange County Commission District One. The roadway alignment is generally curvilinear and the corridor is largely surrounded by open, undeveloped tracts, though there are some commercial activities and scattered residential properties near the southern end of the corridor at US 192. Near the middle of the project, the Palisades condominiums can be found.

Figure 1-1 - Location Map

Orange County's RCA process applies a comprehensive interdisciplinary approach, combining the strengths of engineering and transportation planning disciplines in the initial development phases of Orange County's major roadway improvement projects.

The interdisciplinary approach also seeks to assure early and systematic coordination with all affected County Departments and Divisions, the appropriate state and local entities, and the citizenry.

The resulting effort is to accurately gather and convey information pertinent to the development of the project, thereby identifying viable opportunities to expedite or advance the project design and construction phases.

This contract also includes a commensurate public involvement effort to provide citizens with clear and concise information regarding the overall improvements including roadway and drainage alternatives. This RCA documents the existing conditions along the Avalon Road and identifies various characteristics within the study area that may influence the development of the alternatives and proposed improvements. The corridor analysis activities include an examination of existing traffic demands, land use and development

patterns, and the presence of any environmental, cultural, archaeological/historical, hydrologic, and natural sensitive areas within the corridor.

The existing traffic volumes along Avalon Road range from approximately 15,700 AADT to 16,200 AADT, and most of the roadway operate at Level of Service (LOS) F (see Section 5). Traffic is expected to grow substantially in the future influenced in part by new developments along the corridor including Registry on Grass Lake, PRS Properties, Grove Resort, Avalon Groves, Avalon Point, Serenade, Karr PD, and Horizon West, Village I.

By Year 2048, traffic is forecasted to reach over 34,000 AADT and continue to operate under congested conditions if no improvements are made. These traffic demands on Avalon Road currently exceed the capacity of the present two-lane facility and operating conditions are expected to worsen given plans for future development in the corridor.

1.2 Purpose of Report

The purpose of this RCA Report is to present an overview of existing conditions, document the findings of the engineering and environmental studies conducted for this project, summarize the results of the alternatives evaluation, and provide the identification of and the justification for the recommended improvements. Additional information will be provided regarding the determinations made regarding typical roadway cross sections, a summary of existing and future traffic conditions, and a comparative analysis of improvement alternatives that would satisfy existing and future transportation demands.

Potential typical section and alignment alternatives were developed based upon the engineering and environmental data collected, a review of Orange County Comprehensive Plan 2010-2030 Goals and the application of current roadway design standards. The alternatives were evaluated based on impacts resulting from the alignment locations and configurations. Each alternative was assessed using evaluation criteria developed for that purpose. From that comparative evaluation, the preferred typical section, roadway alignment, pedestrian/bicycle accommodations, and stormwater management system improvements were identified.

This RCA Study includes an analysis of existing and projected traffic conditions, development of alignment and typical section alternatives, an evaluation of impacts to the social, natural, and physical environment, and a public involvement program. This report has been prepared to assist Orange County in identifying a recommended design concept alternative and will serve as the document of record for support of subsequent engineering decisions for the final design, right-of-way acquisition, and construction phases that follow.

The recommended conceptual roadway alignment plans have been included in Appendix A, and the right-of-way identification maps are located in Appendix B. The plans reflect specific details concerning each area of the project and will supplement information that is contained in this report.

2 PURPOSE AND NEED FOR PROJECT

The purpose and need for the proposed project improvements are determined based on several factors including traffic capacity, land use, demographics, social/economic demands, consistency with transportation plans, and safety considerations. Each of these factors are discussed below.

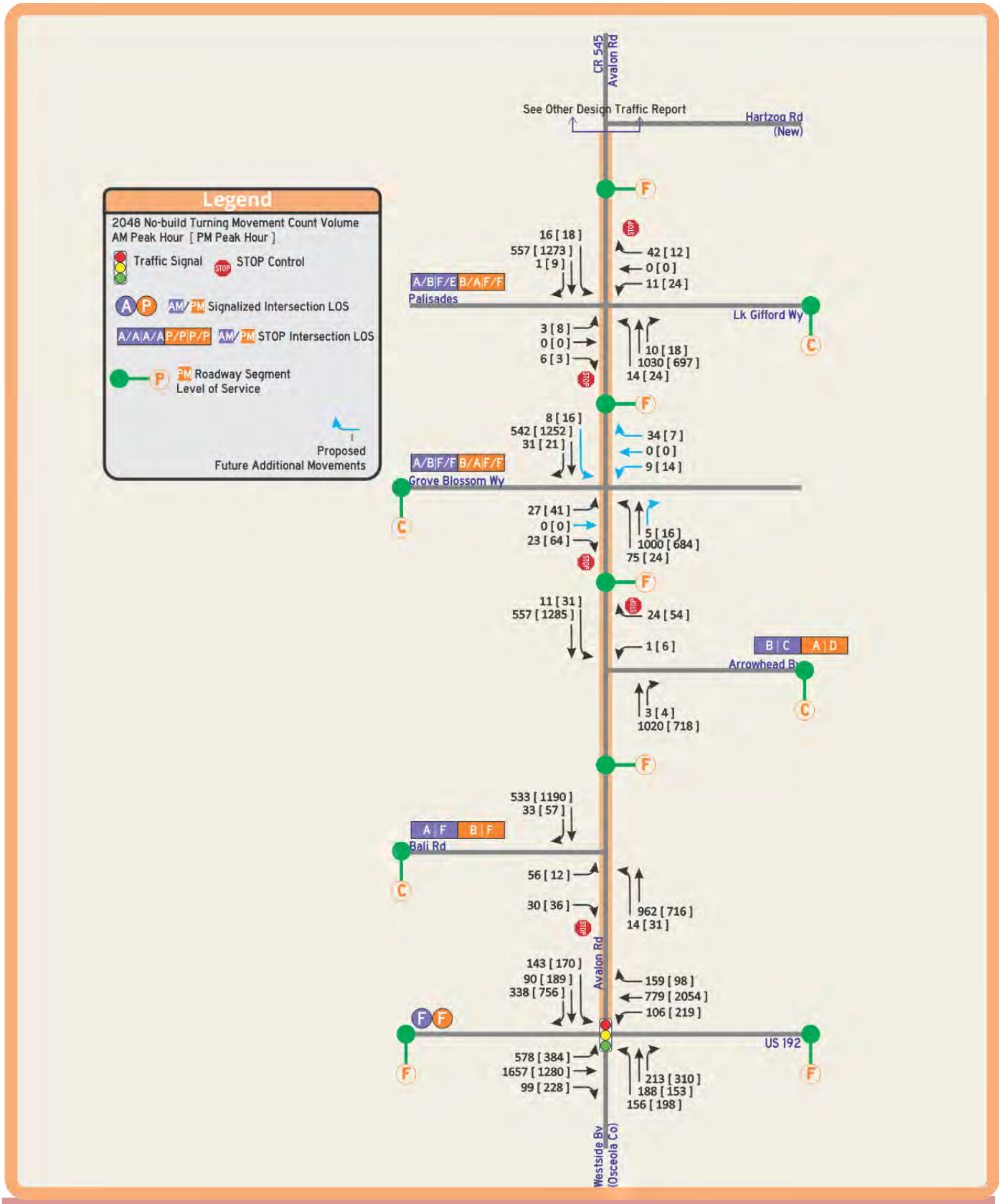
Avalon Road (CR 545) is an important component in Orange County's transportation network since it provides primary north/south access for many residents and businesses in west Orange County. Not only does this roadway serve local demands in the area, but also is a critical element of the regional road system since it provides continuity and access between Orange County and neighboring Osceola County, as well as offering a parallel, alternative route to US 27 in nearby Lake County as well as SR 429.

With future traffic demands nearing the capacity of a two-lane roadway and the County's desire to provide a complete multi-modal facility serving motorists, pedestrians, and bicyclists, strong consideration should be given to widening existing two-lane Avalon Road and providing complimentary context sensitive improvements such as sidewalks and bicycle accommodations in the corridor.

2.1 Traffic Capacity

A Design Traffic Technical Memorandum (DTTM)(see Appendix G) was developed to estimate future traffic demands under certain conditions. Several scenarios were prepared for the No Build and Build conditions for the years 2028, 2038, and 2048.

Without improvements, Avalon Road will continue to operate at an unacceptable LOS F as depicted in Figure 2-1 (next page) for the No Build conditions . The roadway segments were analyzed using the procedures of the Highway Capacity Manual for signalized and unsignalized intersections. The No Build analysis used forecasted traffic volumes applied against the existing travel lane conditions. The outcome of this analysis indicates capacity improvements are needed to achieve an acceptable level of service along Avalon Road.



Avalon Road from US 192 to Hartzog Road

RCA – Design Traffic Report

Figure 2-1

No-Build 2048 Segment and Intersection Analysis

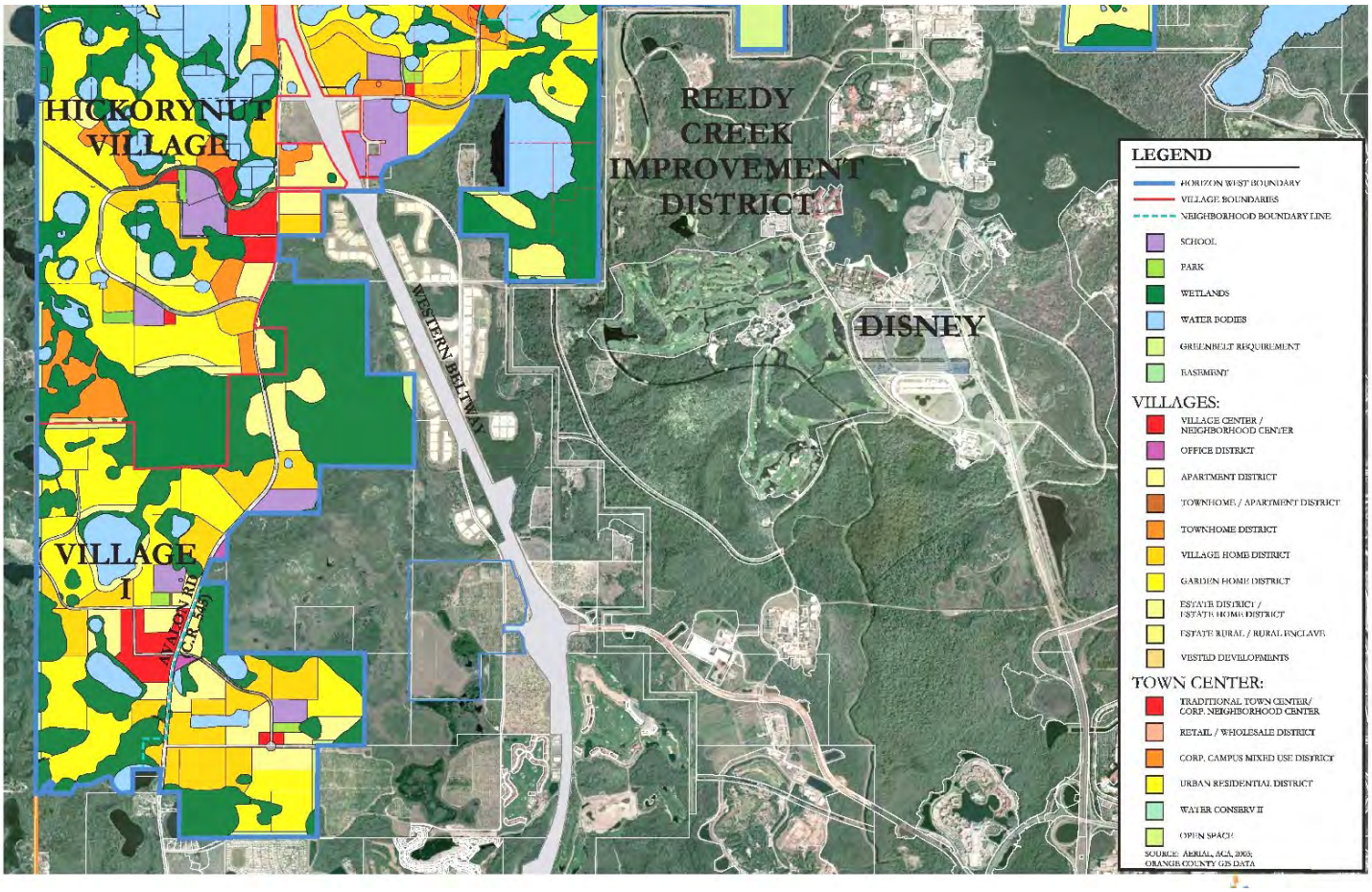
2.2 Land Use

The 2010-2030 Orange County Comprehensive Plan indicates the project corridor currently consists predominantly of open areas, wetlands, and floodplains. Limited development can be found at the south end of the project at US 192, and at the Palisades Condominiums near the center of project. In addition to these properties, there are some low density, single family housing found along Arrowhead Boulevard as well as Lake Gifford Road. The nearest development is Vista Del Lago located to the east of the project corridor.

2.2.1 Future Lane Use

Much of the future land use along the Avalon Road study area is to conform to the Horizon West Land Use Plan (see Figure 2-2) which overlaps the project corridor from Lake Gifford Road to the north. Portions of Village I are planned along the northern limits of Avalon Road.

Figure 2-2
Horizon West Land Use Plan



2.3 Demographics and Socio/Economic Data

Socioeconomic data for the project area were pulled using census tract-level data. The most recent data were used for each socioeconomic indictor. In 2019 data, the project lies entirely within Census Tract 171.03 in Orange County, Florida (Figure 2-3). With the 2020 data, the project now is entirely within Census Tract 171.11 in Orange County, Florida. The area formerly covered by 171.03 (Figure 2-3) is now covered by 171.10, 171.11, and 171.12, although the majority of the project area is within 171.11 (Figure 2-4).

The project is located in southwest Orange County. The data obtained included general population, demographics, environmental justice, English proficiency, and access to personal vehicle data.

Figure 2-3
Census Tract 171.03 (2019)

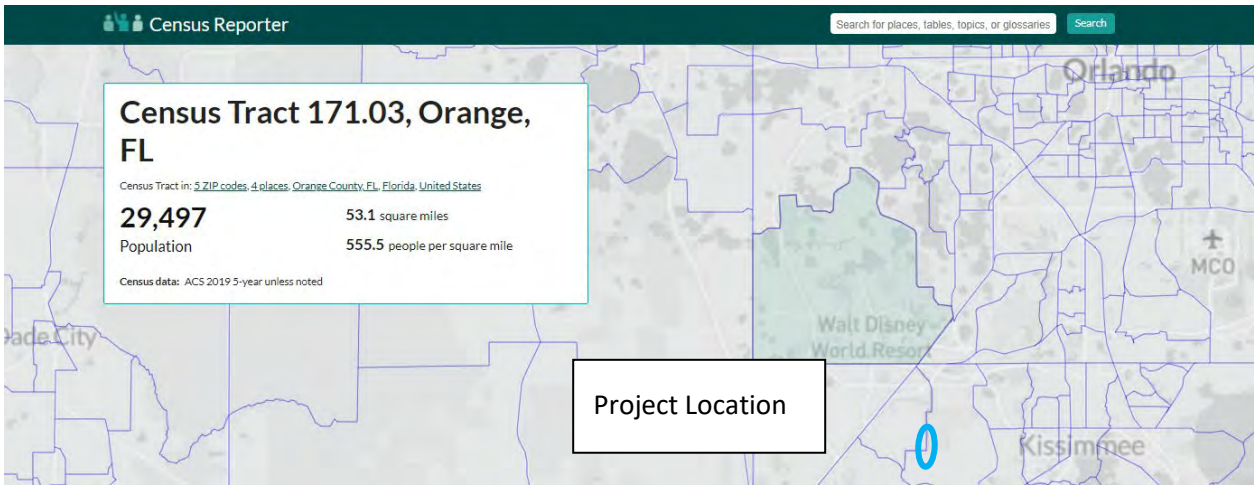
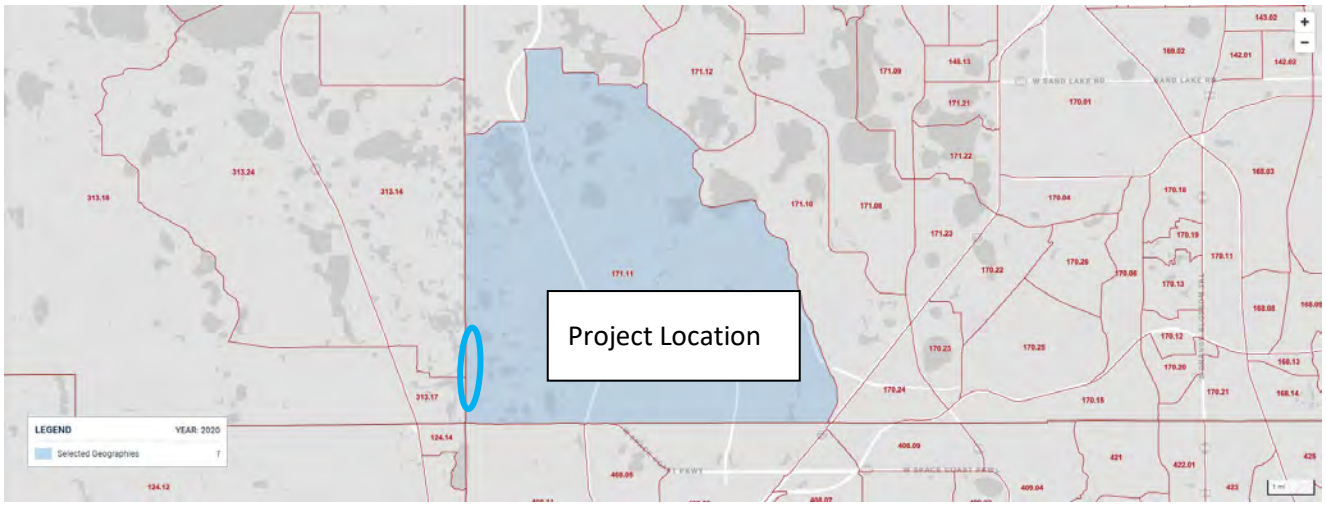


Figure 2-4
Census Tract 171.11 (2020)



General Population, Economics, and Housing Data

The above data were pulled from the 2019 American Community Survey (ACS) 5-year estimates for Census Tract 171.03, via Census Reporter. The data include information such as the median age, percentage of population below the poverty line, median household income, number of persons per household, occupation of housing units, and percentage of population born outside of the United States:

- The median age is 34.1 years old.
- 11.8% of the population is below the poverty line.
- The median household income is $78,291.
- There are an average of 2.9 persons per household.
- 88% of households are occupied.
- 25.6% of the population was born outside of the United States.

Environmental Justice (EJ) Community Status

These data were pulled from the 2019 American Community Survey (ACS) 5-year estimates for Census Tract 171.03 and include information such as the percentage of the population who are people of color, below poverty level, limited English-speaking, or who have less than a high school education:

- 43.8% of the population is a person of color (from the 2020 census redistricting data for Census Tract 171.11).
- 11.8% of the population is below poverty level (Table S1701).
- 5.2% of households are limited English-speaking households (Table S1602).
- 3.3% of population 25 years and over has less than a high school education (Table S1501).

Limited English Proficiency (LEP)

These data were pulled from the 2019 American Community Survey (ACS) 5-year estimates, Table S1601, for Census Tract 171.03. These data indicate that 8.9% of adults have limited English proficiency (LEP), that is, who speak English less than “very well.” Of those adults with LEP, 77.0% speak Spanish and 23.0% speak other languages.

Personal Vehicle Access

These data were pulled from the 2019 American Community Survey (ACS) 5-year estimates, Table S2504, for Census Tract 171.03. These data indicate that 0.8% of households have no access to a personal vehicle, 37.4% have access to one personal vehicle, 47.0% have access to two personal vehicles, and 14.9% have access to three or more personal vehicles.

2.4 Consistency with Transportation Plans

The widening of Avalon Road, from US 192 to Hartzog Road, is included in the County’s Long Range Transportation Plan. These improvements to Avalon Road are consistent with the goals, objectives, and policies of the adopted 2010-2030 Orange County Comprehensive Plan. Improvements to Avalon Road are included in the Orange County’s long-term 10-year schedule of capital improvements.

The County's Transportation Element Future Conditions Number of Lanes 2030 Map indicates Avalon Road is to be improved to a four-lane section. Other planned transportation improvements in the vicinity of the study corridor include:

- Avalon Road - Hartzog Road to Water Spring Boulevard, widen to four lanes
- Avalon Road - Schofield Road to McKinney Road, widen to four lanes
- Hartzog Road – Two miles of two-lane, urban improvements on new alignment to the east of Avalon Road (ultimate plans provide for a four-lane section)
- Seidel Road - Main Collector through Village "F", Widen to four lanes
- Ficquette Road - Ingelnook Drive to south of Summerlake Park Boulevard, widen to four lanes
- Flemings Road - CR 545 to West County line, widen to four lanes

The Horizon West CFRPM also includes a number of nearby roadway improvements in Lake and Orange Counties, as noted below:

- New Independence Parkway - US 27 to Avalon Road, new four-lane roadway
- CR 455 - Marsh Road to Sawgrass Bay Boulevard, new four-lane roadway
- Sawgrass Bay Boulevard - US 27 to CR 455, upgrade to four-lane roadway
- Old YMCA Road - CR 455 to CR 545, new two-lane roadway

2.5 Safety

Crash reports for the five-year time period between January 2016 and December 2020 were obtained and reviewed. Intersection and segment crashes, classified as those which occurred along the roadway corridor within the 500-foot intersection radius, are detailed in the Existing Conditions Report.

The breakdown of the total crashes within the study limits for the last available five years along Avalon Road by crash type and contributing cause is shown in Table 2-1.

Table 2-1
Summary of Crash Analysis

Crash Type	Year					Total	Percent of Total	Mean Crashes Per Year
	2016	2017	2018	2019	2020			
Rear End	11	13	16	23	14	77	52%	15.4
Left Turn	7	5	8	5	2	27	18%	5.4
Sideswipe	2	2	3	3	2	12	8%	2.4
Angle	0	0	3	4	0	7	5%	1.4
Off Road	0	2	2	2	4	10	7%	2.0
Right Turn	4	0	0	2	1	7	5%	1.4
Head On	1	1	0	0	0	2	1%	0.4
Ped/Bike	0	1	0	0	0	1	1%	0.2
Rollover	1	0	0	0	0	1	1%	0.2
Backed Into	0	0	2	1	1	4	3%	0.8
Hit Fixed Object	0	0	0	1	0	1	1%	0.2
Total	**26**	**24**	**34**	**41**	**24**	**149**	**-**	**29.8**

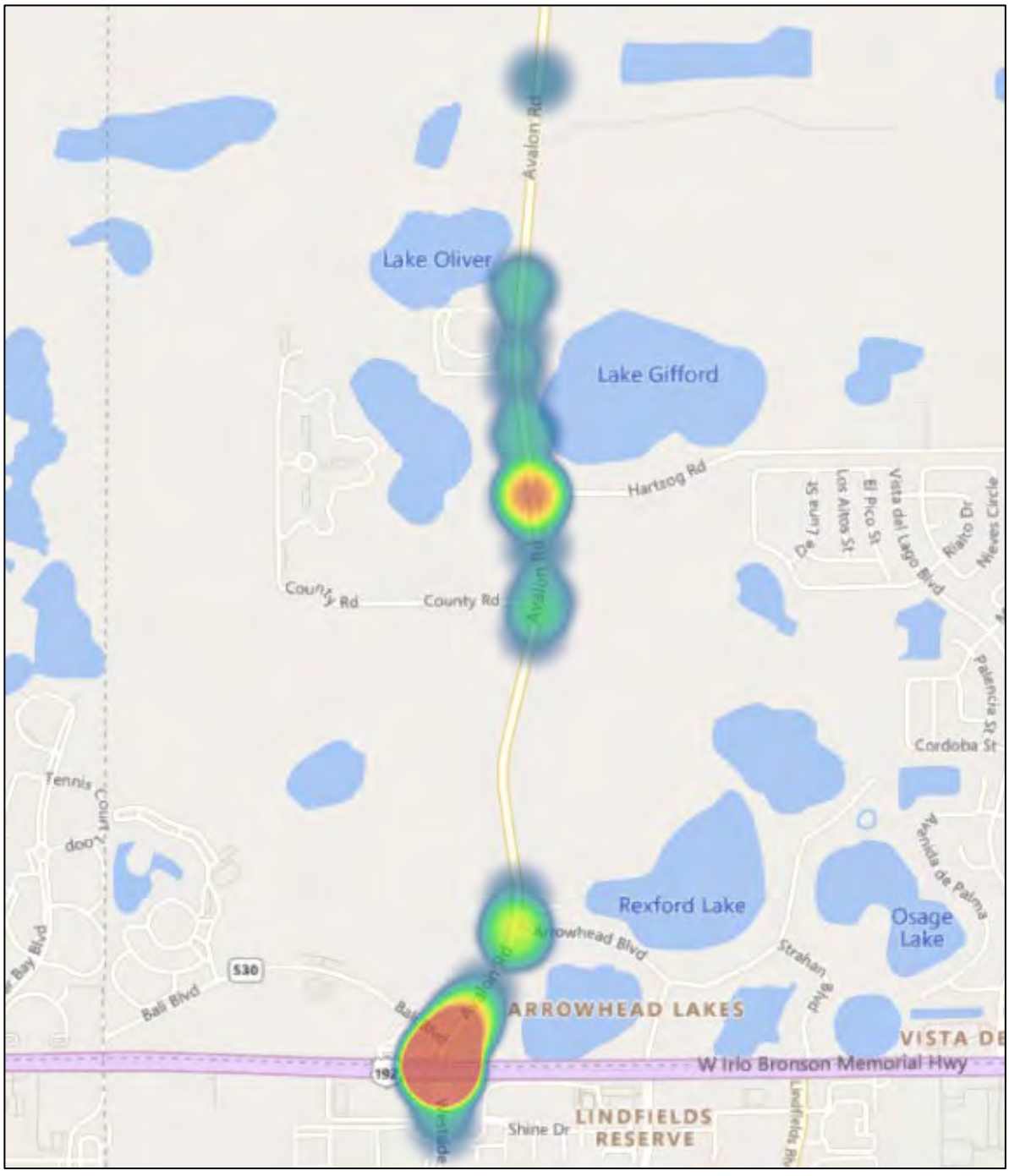
Contributing Cause	Year					Total	Percent of Total	Mean Crashes Per Year
	2016	2017	2018	2019	2020			
Failed to Yield Right-of-Way	7	2	9	6	3	27	18%	5.4
Operated MV in Careless or Negligent Manner	9	13	16	24	14	76	51%	15.2
Failed to Keep in Proper Lane	3	2	1	2	2	10	7%	2
Other Contributing Action	3	3	2	3	1	12	8%	2.4
Ran Stop Sign	0	1	1	1	0	3	2%	0.6
Improper Passing	1	0	0	0	0	1	1%	0.2
Ran Red Light	1	0	0	2	0	3	2%	0.6
Ran Off Roadway	0	0	0	0	2	2	1%	0.4
Improper Backing	0	0	2	1	1	4	3%	0.8
Swerved or Avoided	0	0	0	0	1	1	1%	0.2
Followed too Closely	0	1	1	2	0	4	3%	0.8
Improper Turn	1	0	0	0	0	1	1%	0.2
DUI	1	0	1	0	0	2	1%	0.4
Wrong Side or Wrong Way	0	0	1	0	0	1	1%	0.2
In Roadway Improperly	0	1	0	0	0	1	1%	0.2
Total	**26**	**24**	**34**	**41**	**24**	**149**	**-**	**29.8**

A heat map depicting the concentration of the crashes along the study corridor is shown in Figure 2-5. The plot indicates that the locations with a high concentration of crashes are:

- Avalon Road at US 192 – 111 crashes
- Avalon Road at Lake Gifford Road (formerly Hartzog Road) – 18 crashes
- Avalon Road at Arrowhead Boulevard – 10 crashes
- Avalon Road at Grove Blossom Way – 3 crashes
- Other Areas – 7 crashes

Figure 2-5

Concentration of Crashes Along Avalon Road



3 EXISTING CONDITIONS

This section of the RCA presents an overview of the existing physical characteristics and conditions of the Avalon Road study corridor.

3.1 Roadway Characteristics

3.1.1 Functional Classification

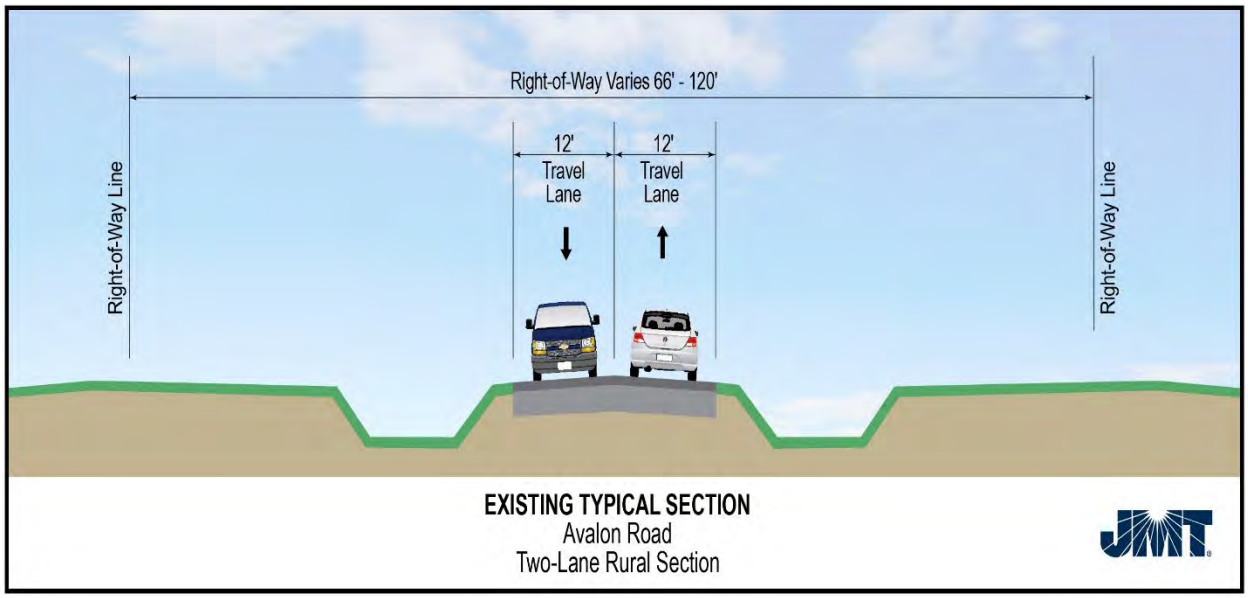
Within the project limits, Avalon Road currently is a two-lane collector roadway constructed as a rural section with limited shoulders and drainage ditches. At the south end of the corridor, US 192 is designated as an urban arterial. At the north end of the project limits, Hartzog Road is designated as an urban collector to the east. The speed limit throughout the Avalon Road corridor is 55 miles per hour (mph), though 40 mph advisory speed plates have been placed on several curves along the project.

3.1.2 Typical Section

Avalon Road is a two-lane undivided rural roadway with roadside swales that collect stormwater. The existing typical section has two, 12-foot asphalt paved lanes with grass shoulders on the outsides (see Figure 3-1). Left turn lanes have been provided at US 192, Grove Blossom Way, and Lake Gifford Road.

Figure 3-1

Avalon Road Existing Typical Section



3.1.3 Pedestrian and Bicycle Facilities

There are limited sidewalks along the project except for an area from Grove Blossom Way to north of the Palisades Condominiums along the west side of Avalon Road. There are no dedicated bicycle facilities along Avalon Road. The only signal along the corridor is at US 192, and crosswalks and pedestrian signals have been provided at this intersection.

3.1.4 Existing Right-of-Way

The existing right-of-way varies throughout the project corridor as indicated on Table 3-1 below. Draft preliminary existing right-of-way maps have been included in Appendix B. Final right-of-way identification plans will be prepared after the preferred right-of-way has been identified.

Table 3-1

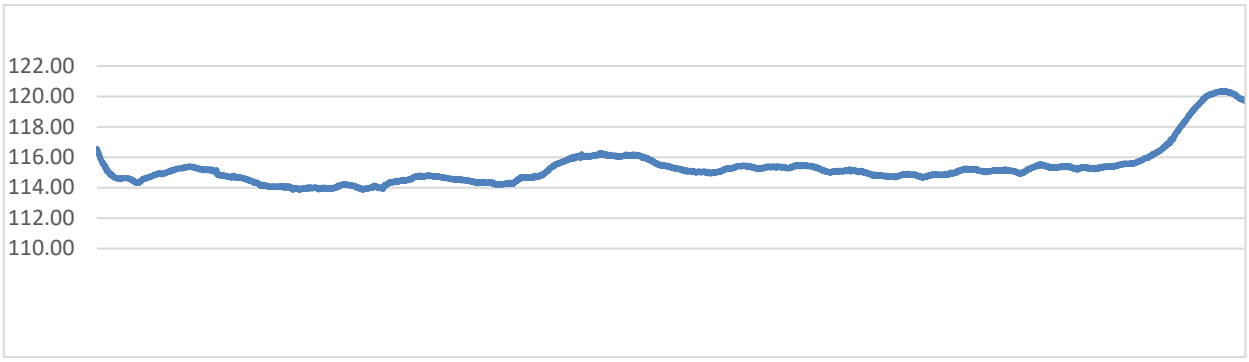
Avalon Road Existing Right-of-Way Widths

BEGIN	END	SEGMENT LENGTH (FT)	TYPICAL WIDTH (FT)
US 192	930’ North of US 192	930	110
930’ North of US 192	Arrowhead Boulevard	500	100
Arrowhead Boulevard	600’ North of Arrowhead Boulevard	500	66
600’ North of Arrowhead Boulevard	1500’ North of Arrowhead Boulevard	900	Varies 66-98
1500’ North of Arrowhead Boulevard	Grove Blossom Way	1,400	66
Grove Blossom Way	Lake Gifford Road	950	Varies 120-140
Lake Gifford Road	1,750' North of Lake Gifford Road	1,750	88
1,750' North of Lake Gifford Road	Hartzog Road	1,350	66
	Total Project Length	**1.6 Mi**	

3.1.5 Existing Horizontal and Vertical Alignment

Avalon Road’s horizontal alignment has four horizontal curves throughout the project limits, some of which are signed with advisory speed plates of 40 mph (see existing right-of-way plans in Appendix B for curve data). The vertical profile of Avalon Road is reflected on Figure 3-2 which indicates a starting elevation of approximately 117 feet at US 192 with the remainder of the project relatively flat.

Figure 3-2
Existing Roadway Profile From LiDAR, US 192 to Hartzog Road



3.1.6 Signalized Intersections

The project corridor has only one signalized intersection at US 192 with span wires used to support the traffic signals. Pedestrian signals have been provided on separate poles at this location. As part of the future improvements along the corridor, the intersections with Grove Blossom Trail and Hartzog Road will be signalized by others as traffic develops.

3.2 Crash Data

Crash information was obtained for Avalon Road from the Signal4 crash database system for the period between January 2016 and December 2020. This information is summarized in Table 3-2.

The tables include the total number of crashes as well as fatalities and injuries. Crashes are also summarized by crash type and include a tabulation of DUI or failure to yield right-of-way crashes as well. One hundred and forty-two (142) crashes occurred at the study intersections over the five-year period. Seven crashes also occurred along the segments within the study limits.

One hundred and eleven crashes occurred at the intersection of Avalon Road at US 192 over the five-year period with twenty occurring in 2016, twenty-two occurring in 2017, twenty-three occurring in 2018, twenty-seven occurring in 2019, and nineteen occurring in 2020. There were thirty-four injury crashes, no fatalities, and property damage was estimated at $396,755. One crash involved a DUI and fifteen were failure to yield right-of-way.

Table 3-2
Avalon Road Corridor Crash Summary

Major Route: Avalon Road												
Segment Limits: From US 192 to 1.6 miles north of US 192									**County:** Orange/Osceola			
Study Period: 1/1/2016		To	12/31/2020						**Engineer:** JMT			
				CRASH TYPE								
Total Crashes	**Fatal**	**Injury**	**Property Damage**	**Ped/Bike**	**Angle**	**Left Turn**	**Right Turn**	**Rear End**	**Sideswipe**	**Ran Off Road**	**Backed Into**	**Rollover**
149	0	34	115	1	7	27	7	77	12	10	4	1
100%	0%	23%	77%	1%	5%	18%	5%	52%	8%	7%	3%	1%
CRASH TYPE						**CONTRIBUTING CAUSE**						
Hit Fixed Object	**Head On**	**Time of Day**		**Road Condition**		**Improper Passing**	**Improper Backing**	**Improper Turn**	**Ran Red Light**	**Ran Stop Sign**	**Followed Too Closely**	**Operated MV in Careless or Neglignt Manner**
		Day	**Night**	**Wet**	**Dry**							
1	2	109	40	13	136	1	4	2	3	3	4	76
1%	1%	73%	27%	9%	91%	1%	3%	1%	2%	2%	3%	51%
CONTRIBUTING CAUSE												
Failed to Yield Right-of-Way	**Ran Off Roadway**	**Swerved or Avoided**		**Failed to Keep in Proper Lane**		**Other Contributing Action**			**DUI**	**Wrong Side or Wrong Way**		**In Roadway Improperly**
27	2	1		10		12			2	1		1
18%	1%	1%		7%		8%			1%	1%		1%

3.3 Existing Transportation Network

Avalon Road is designated as a collector road and is a critical element in the metro area's existing transportation network since it provides for north-south access throughout most of western Orange County as well as connections to neighboring Osceola, Polk, and Lake Counties (the latter two via US 192). CR 545 parallels other major north-south roadways such as US 27 and SR 429 and provides not only regional mobility, but also important local access to Horizon West, Walt Disney World via Western Way, numerous developments, and agricultural tracts in the area.

There is only a short section of sidewalks north of Grove Blossom Way and no bicycle, or trail facilities in the project corridor. The County's nearest trail is several miles away.

The only nearby transit facility is LYNX Bus Route 55 which travels along US 192 and provides a connection from the Four Corners/US 27 area to downtown Kissimmee. LYNX does not provide service along Avalon Road.

3.4 Long Range Transportation Improvements

Improvements to Avalon Road are consistent with the goals, objectives, and policies of the adopted 2010-2030 Orange County Comprehensive Plan. Improvements to Avalon Road are included in the Orange County's long term schedule of capital improvements which indicates future widening to a four-lane section.

Other planned transportation improvements in the vicinity of the study corridor include:

- Avalon Road - Hartzog Road to Water Spring Boulevard, widen to four lanes
- Avalon Road - Schofield Road to McKinney Road, widen to four lanes
- Hartzog Road – Two miles of two-lane improvements on new alignment to the east of Avalon Road (ultimate plans provide for a four-lane section)
- Seidel Road - Main Collector through Village "F", Widen to four lanes
- Ficquette Road - Ingelnook Drive to south of Summerlake Park Boulevard, widen to four lanes
- Flemings Road - CR 545 to West County line, widen to four lanes

The Horizon West CFRPM also includes a number of roadway improvements providing connections between Lake and Orange Counties, as noted below:

- New Independence Parkway - US 27 to Avalon Road, new four-lane roadway
- CR 455 - Marsh Road to Sawgrass Bay Boulevard, new four-lane roadway
- Sawgrass Bay Boulevard - US 27 to CR 455, upgrade to four-lane roadway
- Old YMCA Road - CR 455 to CR 545, new two-lane roadway

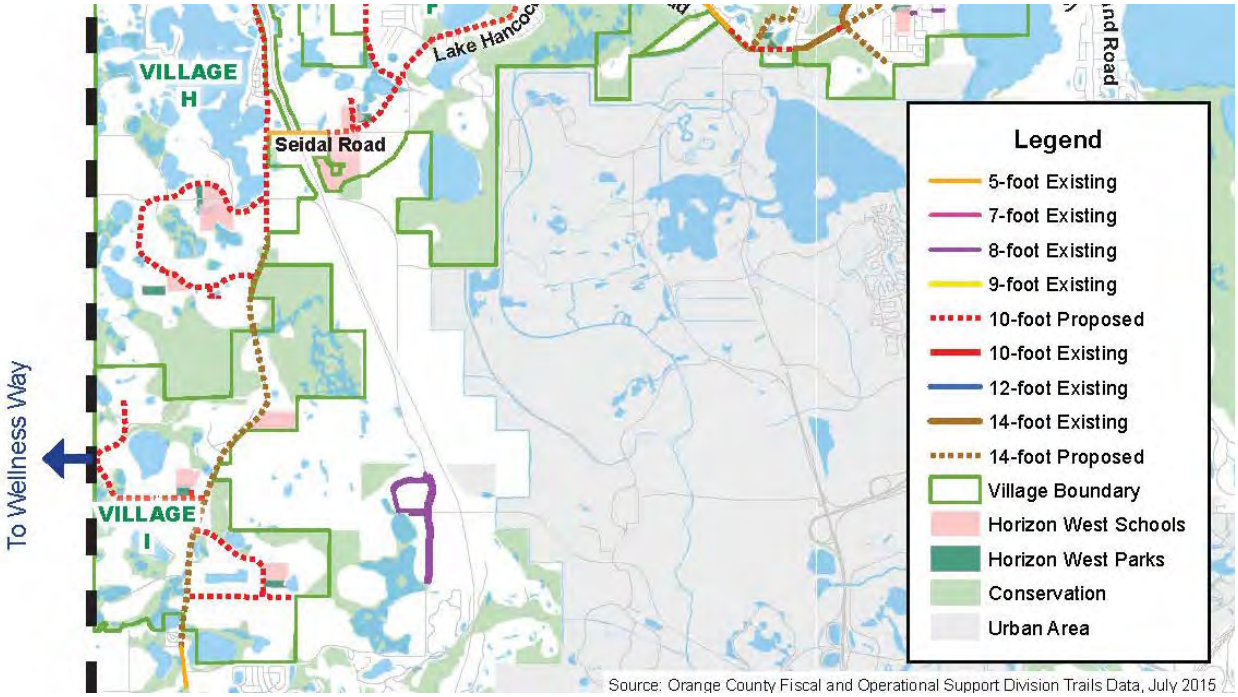
In addition, FDOT was contacted regarding their plans for future improvements to US 192 and they indicated that no capacity plans are programmed at this time for this roadway. Also, Osceola County was contacted regarding potential widening of Westside Boulevard, and they indicated no capacity improvements were planned as well. It is also noted that Orange County intends to terminate Lake Gifford Road (formerly Hartzog Road) to the east of Avalon Road in the future.

In August, 2012, Orange County completed a Trails Master Plan which indicated provisions for a future trail in west Orange County named the Horizon West Trail, which is several miles to the north of the project corridor. In August, 2015, Orange County completed the Horizon West Trail Study which indicated an existing/future arterial trail from south of Lake Gifford Road to the north along Avalon Road which would incorporate the existing sidewalks near the Palisades (see Figure 3-3) .

The study indicated provisions for a future 14-foot wide trail, although construction plans now being completed for the section of Avalon Road to the north of Hartzog Road only provides for a 10-foot path. Also, as indicated in the Horizon West Trail Study, a 10-foot proposed trail is planned along Hartzog Road.

Figure 3-3

Future Trail System



3.5 Lighting

With the exception of existing lighting at US 192, there are no existing street lights along Avalon Road. The planned widening of Avalon Road north of Hartzog Road will include lighting as part of the overall improvements.

3.6 Existing Utilities

There are 11 Utility Agency/Owners (UAO) within the project area as obtained through the Sunshine 811 Design Ticket and utility coordination efforts. There are numerous existing utilities within the project corridor including overhead and underground electric, water and wastewater mains, and communication lines. Details of the UAOs contacted on the project and a description of the facilities identified within the corridor is summarized in Table 3-3.

Table 3-3
Avalon Existing Utilities Summary

Utility Company	Facility Type	Description
ATT Florida	Fiber	Fiber along Avalon Road. and Hartzog
BrightHouse/Charter	N/A	No response to date
CenturyLink	BFOC	Underground fiber throughout the corridor
Comcast	BFOC	One 3" conduit running along US192 on the north side
Duke Energy Distribution		Overhead lines on the east side of Avalon Road. 12.47/7.2 kV 3 phase
Duke Energy Transmission	Buried Electric	69kV line running along the south side of US192
Orange County Utilities	Water/Sewer/Reuse	12" PVC reuse & 16" PVC sewer along Grove Blossom Way. 20" DIP reuse & 24" DIP water along Avalon Road along with 20" & 24" HDPE reuse. There is also a 12" PVC and 16" DIP force main along Lake Gifford Road
Reedy Creek Energy	N/A	No Facilities
Smart City Telcom	Fiber	Direct buried fiber on the north side of US192, transitions to aerial on Avalon Road and runs north on Duke Distribution poles
Summit Broadband	Aerial Fiber	Aerial fiber throughout the corridor
TECO Gas	Gas	4" Coated Steel gas main along the north side of US192
TOHO Water	Water/Wastewater	20" & 16" FM on the east side. 8"- 24" watermain running along Avalon Road. Much of the waterline is in a separate easement abutting to the Avalon Road right-of-way.
Uniti Fiber	Fiber	1 – 1.25" duct with ¾" fiber crosses US192 on the east side of Avalon.

AT&T – AT&T owns and maintains fiber running along Avalon Road that turns east along Lake Gifford Road. AT&T is currently finalizing a relocation project that will utilize the Duke power poles along the east side of Avalon Road.

CenturyLink - CenturyLink owns and maintains underground fiber running along the south side of US192, which crosses on the west side of Avalon Road. They have buried fiber running west along Bali Boulevard and have a buried fiber crossing Avalon Road at Bali Boulevard. They have two sets of fiber

running along Avalon Road on the east and west sides. The buried fiber along the west side of Avalon Road. crosses to the east, just south of Grove Blossom Way and continues north. Their fiber runs along the south side of Lake Gifford to the east.

Comcast - Comcast owns and maintains a buried fiber optic cable in a three-inch conduit running along the north side of US192 at Avalon Road.

Duke Energy Distribution - Duke Energy Distribution owns and maintains overhead 12.47/7.2 kV, 3 phase electric lines running along the east side of Avalon Road. There are also multiple overhead and underground crossings. One overhead crossing is at Bali Boulevard with several others feeding residents. Underground crossings are located at Grove Blossom Way and Lake Gifford Road.

Duke Energy Transmission - Duke Energy Transmission owns and maintains a buried 69kV line on the south side of US192.

Orange County Utilities (OCU) – OCU owns and maintains a 12-inch PVC reuse and 16-inch Sewer PVC force main running along Grove Blossom Way to Avalon Road. At Avalon Road, the 12-inch PVC reuse main crosses Avalon Road, changes to a 20-inch DIP reuse main and runs north along the east side of the road to just north of Lake Gifford Road.

There is a 24-inch DIP water main that also runs along Grove Blossom way to Avalon Road, then turns north and runs along the west side of Avalon Road. There does appear to be a Utility Easement on the west side of Avalon Road across from Lake Gifford Road. At Lake Gifford Road, there is a 16-inch DIP reuse main on the north side that crosses Avalon Road, then turns north, changes to a 20-inch DIP & 24-inch HDPE reuse and is an easement. There is also a 12" PVC force main on the south side of Lake Gifford Road that appears to be in an easement which crosses Avalon Road and runs north, in another easement on the west side of Avalon Road.

Smart City Telcom - Smart City Telcom owns and maintains direct buried fiber on the north side of US192. This transitions to aerial fiber and runs on Duke Distribution poles and runs north on the east side of Avalon Road.

Summit Broadband - Summit Broadband owns and maintains a 48ct aerial fiber running along the east side of Avalon Road. from US192 to Lake Gifford Road. Fiber continues east along Lake Gifford Road. Summit also has a fiber crossing at Bali Boulevard.

TECO Gas - TECO Gas owns and maintains a four-inch coated steel gas main running east and west on the north side of US192.

TOHO Water - TOHO Water owns and maintains a 20-inch wastewater force main that crosses US 192, an continues north along the east side of Avalon Road until reaching Grove Blossom Way where it crosses Avalon Road and heads west along the north side of the road. An eight-inch wastewater force main crosses Avalon Road at Bali Boulevard on the south side and continues west. There is a wastewater FM (varying sizes 8", 12" and 24") in a separate easement abutting the Avalon Road east right-of-way line that runs along the project from US 192 to Lake Gifford Road. Note, Toho has not been able to provide documentation regarding their easement for the wastewater lines along the east side of Avalon Road.

Uniti Fiber - Uniti Fiber owns and maintains (1) 1.25" duct with a ¾" fiber cable that crosses US192 on the east side of Avalon Road. This transitions to aerial fiber and runs north along the east side of Avalon Road. to Hartzog, then heads east along Hartzog Road.

Site plans for the Registry on Grass Lake adjacent to Avalon Road indicate there will be certain utilities to be installed in the future. These new lines are expected to be provided by TOHO Water, TECO Gas, Duke and AT&T.

3.7 Geotechnical Exploration

This section presents a summary of the preliminary geotechnical evaluations for the Avalon Road RCA study. The entire Roadway Soils Report is contained in Appendix D.

3.7.1 Soil Exploration

The "Lake Louisa SW, FL" USGS topographic map issued in 2021, in the vicinity of the Avalon Road was reviewed for the project corridor as presented below. The topographic map shows the terrain in the project corridor as a series of low knolls separated by areas of wetlands and marsh. The map shows the ground surface elevation in the project vicinity to range from approximately +110 to +125 feet, North American Vertical Datum of 1988 (NAVD-88).

The Orange County Soil Survey published by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) is a comprehensive publishes source of information regarding near-surface soil and surficial groundwater depth. The NRCS Orange County Soil Survey was reviewed for information regarding near-surface soil conditions within the study corridor. The Orange County soil survey identified the following seven (7) primary mapping soil units within the limits of the project corridor.

Table 3-4

USDA / NRCS Soil Survey Summary

Soil Unit	Depth (inches)	Soil Description	AASHTO*	Hydrologic Soil Group	SHGWT Depth (ft.)
Archbold (2)	0 - 80	Fine sand	A-3	A	3.5 – 6.0
Basinger (3)	0 - 7	Fine sand	A-3	A/D	+2 – 1.0
	7 - 32	Sand, fine sand	A-3, A-2-4		
	32 - 47	Sand, fine sand	A-3, A-2-4		
	47 - 80	Sand, fine sand	A-3, A-2-4		
Immokalee (20)	0 – 5	Fine sand	A-3	A	0 – 1.0
	5 - 35	Fine sand, sand	A-3		
	35 - 67	Fine sand, sand	A-3, A-2-4		
	67 - 80	Fine sand, sand	A-3		
Sanibel (42)	0 – 11	Muck	A-8	B/D	+1 – 1.0
	11 – 15	Sand, fine sand, mucky fine sand	A-3		
	15 - 80	Sand, fine sand	A-3		
St. Lucie (43)	0 – 4	Fine sand	A-3, A-2-4	A	> 6.0
	4 – 80	Fine sand	A-3, A-2-4		
Tavares (46)	0 – 6	Fine sand	A-3	A	3.5 – 6.0
	6 – 80	Sand, fine sand	A-3		
Tavares (47)	0-6	Fine sand	A-3	A	3.5 - 6.0
	6-80	Sand, fine sand	A-3		

Millhopper (47)	0-64	Fine sand	A-3, A-2-4		
	64-76	Loamy sand, loamy fine sand	A-2-4		
	76-80	Sandy loam, fine sandy loam, sandy clay loam	A-2-4, A-4		

Refer Appendix D for a reproduction of the USDA NRCS Soil Survey map for the project area. The NCRS Soil Survey generally identifies these soil types with very poorly to excessively well drained soil, with permeability ranging from moderately high to very high. The NRCS Soil Survey predicts the groundwater levels for these soil types to range from the natural ground surface to 80 inches below the natural ground surface.

Information from the NCRS Soil Survey is very general and may be outdated due to recent developments in the project site vicinity. Therefore, it may not reflect the actual soil and groundwater conditions, particularly if development has modified the natural soil conditions or surface and near surface drainage. Refer to Appendix D for a reproduction of the USDA, NRCS Orange County Soil Survey maps for the project area. The NCRS Soil Survey generally identifies these soil types with poorly to moderately well drained soil, with permeability ranging from poorly to very high. The NRCS Soil Survey predicts the groundwater levels for these soil types to range from the natural ground surface to 72 inches below the natural ground surface.

3.7.2 Field Exploration Program

The subsurface exploration for this preliminary evaluation consisted of 39 auger borings to a depth of five (5) feet each and two (2) Standard Penetration Test (SPT) borings to a depth of 20 feet, at 200-foot interval as requested by Orange County. The borings were established in the unpaved areas along the northbound and southbound shoulders of Avalon Road. All borings were staked in the field by a representative of NADIC with the aid of a Global Positioning System (GPS) device.

Approximate boring locations are shown in Appendix D along with the results of the exploration program.

Hand Auger Borings

Hand auger borings were performed to a general depth of five (5) feet below the existing grade by manually twisting and advancing a bucket auger, three-inch diameter, six-inch long into the ground in four (4) to six (6) inch increments. These borings were performed in general accordance with the American Society of Testing and Materials (ASTM) Test Designation D-1452. Groundwater levels were measured in the borings upon completion and 24 hours later; each borehole was sealed with native soils.

Standard Penetration Test Borings (SPT)

The SPT borings performed were conducted in general conformance with the American Standard Testing Method (ASTM) test designation D-1586. The borings were advanced by the rotary wash method with bentonite-based mud as the circulating fluid to stabilize the borehole. The SPT borings were generally performed continuously from the ground surface to 10.5 feet and at 5-foot depth intervals thereafter.

After seating the sampler six inches, the number of successive blows required to drive the sampler 12 inches into the soil constitutes the test result commonly referred to as the “N” value. Adjacent to the SPT boring profiles are the “N” values. The “N” value has been empirically correlated with various soil properties and is considered indicative of the relative density of cohesionless soils and the consistency of cohesive soils. All recovered samples were visually classified in the field with representative portions

of the samples placed in airtight jars and transported to our office for review by a Geotechnical Engineer for confirmation of the field classification and laboratory testing. Groundwater levels were measured in the borings and upon completion, each borehole was sealed with native soils.

3.7.3 General Subsurface Conditions

The soils encountered along the project alignment are shown in Appendix D. The soil survey encountered two (2) generalized soil strata within the project limits to the maximum depth explored in the boring. The soils encountered in the borings are classified using the AASHTO Soil Classification System (i.e. A-3, A-2-4, etc.). Soil classification and stratification are based on visual examination, interpretation of the boring logs by a geotechnical engineer and laboratory results of selected soil samples. The soil profiles indicate subsurface conditions encountered only at the specific boring locations at the time of the field exploration.

The soil borings encountered two (2) generalized soil strata within the project limits to the maximum depth explored in the borings. The soil strata encountered as well as soil descriptions, AASHTO classifications and FDOT 505 Embankment Soil Utilization designations are summarized below:

Table 3-5
General Subsurface Conditions

Stratum	Soil Description	AASHTO Soil Classification	Embankment Soil Utilization Classification (FDOT Index 505)
1	Brown to yellowish brown fine SAND to fine SAND with silt/clay, occasionally with roots, limerock and shell fragments (Fill)	A-3, A-2-4	Select (S)
2	Brown to gray fine SAND to fine SAND with silt	A-3	Select (S)

The above subsurface condition is only general descriptions. For further details at individual boring locations, refer to the Report of Roadway Borings in Appendix D.

Groundwater

Groundwater levels measured in the open borings during the geotechnical explorations indicate that the groundwater elevation ranges from about +106 to +113.5 feet NAVD'88 (taken November 2021 and April 2022). Both encountered and estimated seasonal groundwater levels are shown adjacent to the boring profiles, where applicable (see Appendix D). Groundwater conditions may vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as swales, drainage ponds, underdrains, and areas of covered soil (roadways, sidewalks, etc.).

For the purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season of a "normal rainfall year" under current site conditions. "Normal rainfall year' is defined as a year in which rainfall quantity and distribution were at or near historical rainfall averages. The estimated seasonal high groundwater levels presented next to the boring profiles (see Appendix D) are based on the soil stratigraphy, measured groundwater levels, USDA/NRCS information, review of roadway plans, and past experience with similar soil conditions. In general, the estimated seasonal high groundwater level is not intended to define a limit or ensure future seasonal fluctuations in groundwater levels will not exceed the estimated levels. Post-development groundwater levels could exceed the seasonal high groundwater level estimates as a result of a series of rainfall events, changed conditions at the site which alter surface water drainage characteristics, or variations in the duration, intensity, or total volume of rainfall.

3.8 Potential Contamination Issues

A CRPR was assigned to each potentially contaminated site in the project corridor, as determined by the public records review, historical aerial photograph review, site reconnaissance, and interviews. The CRPR system was developed by FDOT (Part 2, Chapter 20 PD&E, dated July 1, 2020) and is defined by four categories:

The risk ratings are defined as follows:

- No Risk: After review of all available information on the property, there is no indication contamination would be a problem at the facility. It is possible that contaminants could have been handled on the property; however, all available information (FDEP, monitoring wells, water and soil samples, etc.) indicate problems should not be expected.
- Low Risk: The former or current site operation has hazardous waste generator identification (ID) number, or deals with hazardous materials; however, based on all available information, including sampling and test results, there is no reason to believe there would be any involvement with contamination in relation to this project.
- Medium Risk: The subject property is located near or at the same location of as a known contaminated site, and there is a record shown that a cleanup effort has performed in the vicinity. If there is insufficient information (such as a lack of regulatory records or site historical documents) to make a determination as to the potential for contamination impact, and there is reasonable suspicion that contamination may exist, the property should be rated at least as a "Medium." Properties used historically as gasoline stations that have not been evaluated or assessed by regulatory agencies and sites with abandoned-in-place underground petroleum storage tanks or currently operating gasoline stations should receive this rating. Included within this risk rating are sites which present a moderate degree of concern regarding contamination but do not have sufficient indications of contaminations to be included in high-risk category.
- High Risk: After a review of all available information, there is a definite potential for contamination problems. Further assessment will be required to determine the actual presence and/or levels of contamination and the need of remedial action. Included in this category is a facility located in the same location of known contaminated sites that has no record of a cleanup effort.

The CRPRs are based on current conditions and may not reflect conditions that may exist in the future. Based on the criteria established above, the facilities are grouped as follows:

Six (6) potentially contaminated sites were identified within the study corridor and were assigned a No Risk or Low Risk rating. None of the sites identified was assigned a rating of Medium or High Risk. Table 3-6 lists the sites identified in the study corridor and presents a summary of associated public records reviews and site reconnaissance observations. Appendix F illustrates the location of the Potential

Contaminated Sites with the study corridor. Documents obtained from the public record search for various sites are included in Appendix F as well.

Table 3-6

Potential Contamination Sites

Site No.	Map ID	Facility ID	Site Name	Site Address	Source/ Database	Risk Rating	Comments
1	**1**	FDEP # 9804761	Callahan Property	Avalon Road. 1.6miles north US 192, Orange County, FL. 348878	**LST, AST**	**Low**	This facility was a 50-site operated as a borrow pit. An AST was discovered in January 2002 which had not been used since 1980's but OVA screening indicated OVA readings ranging from 10 to 900 ppm. Discharge was reported to OCEPD on 2/26/2002. 311.77 tons of contaminated soils and the tank were removed by 6/02/2002. OVA reading after excavation were below detection levels. The discharge was granted No Further Assessment or remediation will be required with respect to the reported discharge on 7/26/2002. Facility is closed.
2	**2**	Incident No. 23337		Avalon Road and Hartzog Road	**SPILLS**	**No**	Diesel fuel spill at Avalon Road and Hartzog after vehicle accident on 6/16/2003. Based on records review and site reconnaissance, a risk of no was assigned.
3	**6**	9101558	Winter Garden Citrus Growers-1st Grove	14472 Hartzog Road, Winter Garden FL. 34787	**UST**	**Low**	This facility is located about 990 feet northeast of the project corridor ROW. It had two (2) 4,000-gallon USTs removed on 03/07/1991 and on 09/10/1992. Based on the records reviewed, the site is assigned a risk rating of Low
4	**7**	9814177	WAWA #5119	8849 W. Irlo Bronson Hwy Winter Garden FL 34777	**RCRA VSQG, UST**	**Low**	This facility had three (3) 20,000-gallon USTs installed 12/01/2012. As of August 2021, there are no Compliance Monitoring and Enforcement (violation) records associated with this facility. Based on the records reviewed, the site is assigned a risk rating of Low
5	**5**	6818754	Gifford Substation	13046 Hartzog Road, Winter Garden, FL.34787	**Tier2**	**No**	This facility is located about 400 feet north east of the project corridor ROW. It is identified as a Substation operated by Duke Energy Florida, LLC. Based on records review and site reconnaissance, the facility was assigned a risk rating of no.
6	**8**	6814425	AdventHealth Four Corners ER	17430 Bali Blvd. Winter Garden FL 34787	**AST/Tier 2**	**Low**	This facility has one (1) 2,644-gallon AST (an emergency diesel. generator). As of December 12, 2019, there are no open violations and no discharge information reported Based on records review and site reconnaissance, the facility was assigned a risk rating of Low.

AST: Aboveground Storage Tank	RCRA: Resource Conservation and Recovery Act
FDEP: Florida Department of Environmental Protection	ROW: Right-of-Way
LST: Leaking Storage Tank	SPILLS: A discharge of one or more hazardous substances that adversely impact, or threaten to adversely impact
Map ID: Figure 5 Potential Contamination Site Map	Tier 2: An annual federal report that is mandatory for companies that store hazardous materials.
OCEPA: Orange County Environmental Protection Agency	VSQG: Very Small Quantity Generators
OVA: Organic Vapor Analyzer	UST: Underground Storage Tank

3.9 Land Use and Current Development Plans

3.9.1 Existing Land Use

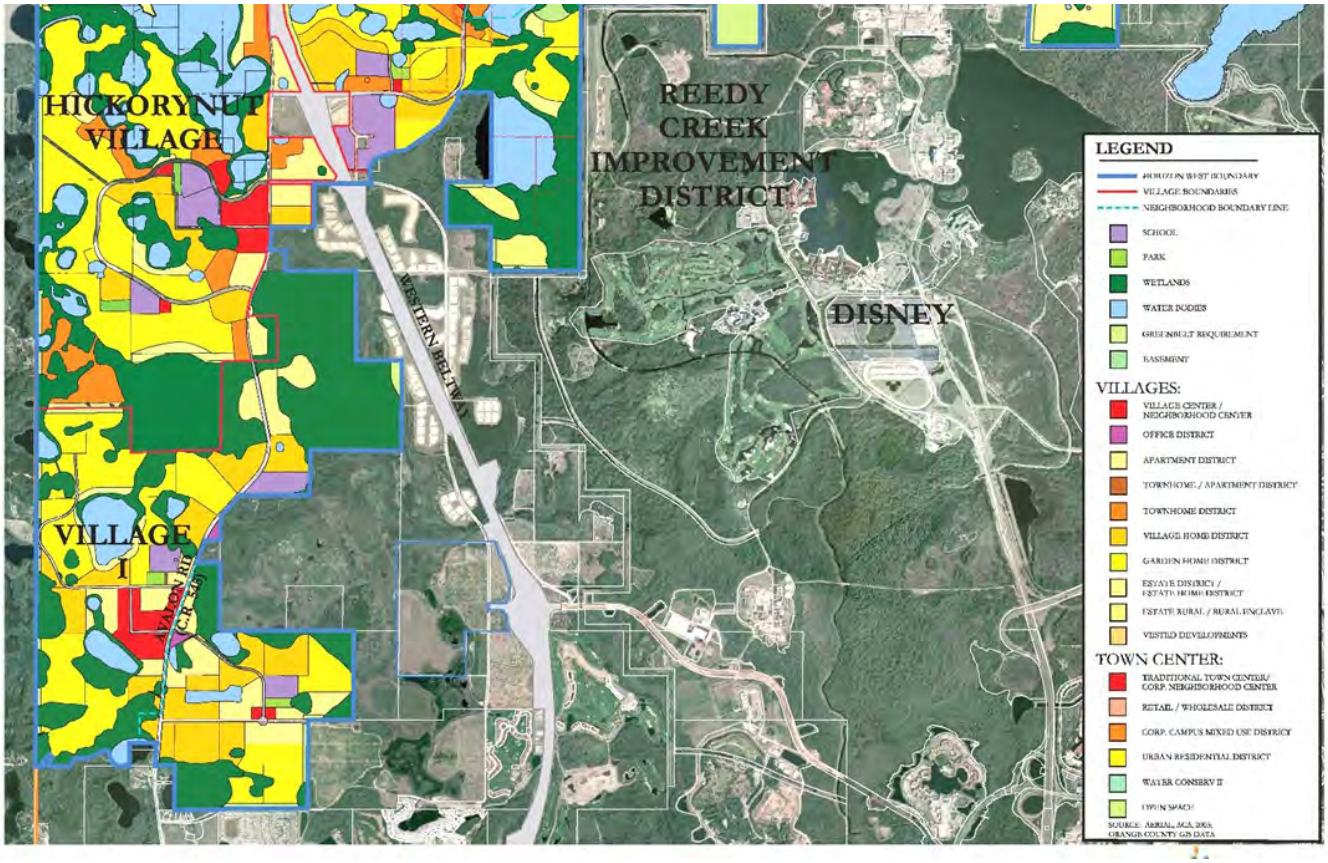
The 2010-2030 Orange County Comprehensive Plan indicates the project corridor currently consists predominantly of open areas, wetlands, and floodplains. Limited development can be found at the south end of the project at US 192 and the Palisades Condominiums near the center of project. In addition to these commercial/institutional properties, there are some low density, single family housing found along Arrowhead Boulevard as well as Lake Gifford Road. The nearest development is Vista Del Lago located to the east of the project corridor.

3.9.2 Future Land Use

Much of the future land use along the Avalon Road study area is to conform to the Horizon West Land Use Plan (see Figure 3-6) which covers the project corridor from Lake Gifford Road to the north. This area is designated as Village I as shown below.

Figure 3-4

Horizon West Land Use Plan



At this time, there are a number of new developments planned along or near the project corridor including Liki Tiki Village, Registry on Grass Lake (residential, preliminary approvals received), PRS Properties (under review), Grove Resort (under review), Avalon Grove, Avalon Pointe (under construction), Karr PD (apartments, residential, under review), Serenade (apartments, residential, under review), and Village I.

3.10 Cultural Features

The following cultural features can be found in Avalon Road corridor.

Religious Institutions - There are no religious institutions located along the project corridor.

Schools - There are no schools located in the project corridor. The nearest school is Water Spring Elementary located approximately three miles north of this project.

Police/Fire Protection - There are no police or fire protection facilities located adjacent to Avalon Road within the project limits.

Community Centers - There are no community service facilities located adjacent to Avalon Road within the project limits.

Hospitals - The Advent Four Corners Hospital is located at the south end of the project corridor and west of Avalon Road along Bali Boulevard.

Cemeteries - There are no cemeteries located adjacent to Avalon Road within the project limits.

Parks and Trails - There are no public parks or trails located within the project limits. The nearest parks are Tibet-Butler Preserve and West Beach Park, both of which are several miles northeast from the project corridor. As noted in Section 2.4, the County has future, long range plans for trails along Avalon Road as well as Hartzog Road.

3.11 Archaeological and Historic Features

A cultural resource assessment desktop analysis was performed for the Avalon Road study area to identify any cultural and historic resources that may be impacted by the project. This analysis was completed in 2021. Based on this analysis, there are no cultural resources listed, determined eligible, or appear to be potentially eligible for listing in the National Register of Historic Places (NRHP). Historic resources will not be an issue for this project.

3.12 Hydrologic and Natural Features

3.12.1 Existing Drainage Features

The Avalon Road project area is located in the Reedy Creek Basin within the jurisdiction of the South Florida Water Management District (SFWMD). Avalon Road consists of a two-lane, rural collector roadway with turn lanes at side streets. Generally, stormwater flows off the roadway into roadside ditches, which convey the storm water to wetlands or adjacent properties. The wetlands primarily drain to either Lake Gifford or Mudd Lake. For a depiction of the existing drainage features, please refer to the Hydrologic & Natural Features Map shown on Figure 1 in Appendix E.

3.12.2 Water Quality

There are three receiving water bodies in this corridor that have an FDEP WBID, Lake Gifford, Lake Oliver, and Davenport Creek Headwaters. Runoff from Avalon Road drains to several water bodies without a WBID as well, including Mudd lake, Grass Lake, Lake Austin, and Lake Chapin. These lakes are all included within the Davenport Creek Headwaters WBID.

Please refer to Table 3-7 for a summary of the routine samples taken at approximately 0.5 meters depth within the lakes. According to the sample results these lakes are not classified as an impaired water body by the Florida Department of Environmental Protection (FDEP).

The Avalon Road project area is located in the Reedy Creek Basin within the jurisdiction of the South Florida Water Management District (SFWMD). None of the waterbodies are listed as outstanding Florida waters (OFW), but the project area is within the Lake Okeechobee BMAP. Per the SFWMD Applicant Handbook Volume II, the district will determine whether or not this project will require the 50% additional water quality volume. Currently, the ponds are sized to account for a 50% additional water quality volume requirement.

Table 3-7
Water Quality

Station ID	Lake Name	WBID	Category	Characteristic	Result Value	Result Units	Analysis Date
RC8	Lake Gifford	3170FB	Routine Sample	Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	9.00	ug/l	3/16/2021
RC8	Lake Gifford	3170FB	Routine Sample	pH	6.30		3/16/2021
RC8	Lake Gifford	3170FB	Routine Sample	Phosphorus as P	11.00	ug/l	3/16/2021
RC8	Lake Gifford	3170FB	Routine Sample	Sulfur, sulfate (SO4) as SO4	5.73	mg/l	3/16/2021
RC8	Lake Gifford	3170FB	Routine Sample	Total Suspended Solids (TSS)	1.00	mg/l	3/16/2021
RC8	Lake Gifford	3170FB	Routine Sample	Turbidity	0.75	NTU	3/16/2021
52059	Lake Austin	3170F5	Routine Sample	Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	4.00	ug/l	9/27/2017
52059	Lake Austin	3170F5	Routine Sample	Phosphorus as P	25.00	ug/l	9/27/2017
52059	Lake Austin	3170F5	Routine Sample	Sulfur, sulfate (SO4) as SO4	2.60	mg/l	9/27/2017
52059	Lake Austin	3170F5	Routine Sample	Total Suspended Solids (TSS)	2.00	mg/l	9/27/2017

Station ID	Lake Name	WBID	Category	Characteristic	Result Value	Result Units	Analysis Date
52059	Lake Austin	3170F5	Routine Sample	Turbidity	0.70	NTU	9/27/2017
45889	Lake Chapin	3170F5	Routine Sample	pH	6.70		9/23/2014
45889	Lake Chapin	3170F5	Routine Sample	Sulfur, sulfate (SO4) as SO4	0.75	mg/l	9/23/2014
45889	Lake Chapin	3170F5	Routine Sample	Total Suspended Solids (TSS)	10.00	mg/l	9/23/2014
45889	Lake Chapin	3170F5	Routine Sample	Turbidity	3.20	NTU	9/23/2014
160005	Lake Davenport	3170F5	Routine Sample	Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	10.00	ug/l	10/27/2021
160005	Lake Davenport	3170F5	Routine Sample	pH	6.79		10/27/2021
160005	Lake Davenport	3170F5	Routine Sample	Phosphorus as P	21.00	ug/l	10/27/2021
160005	Lake Davenport	3170F5	Routine Sample	Sulfur, sulfate (SO4) as SO4	13.70	mg/l	10/27/2021
160005	Lake Davenport	3170F5	Routine Sample	Total Suspended Solids (TSS)	2.00	mg/l	10/27/2021
160005	Lake Davenport	3170F5	Routine Sample	Turbidity	1.50	NTU	10/27/2021
RC20	Lake Oliver	3170FA	Routine Sample	Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	9.00	ug/l	3/16/21
RC20	Lake Oliver	3170FA	Routine Sample	Phosphorus as P	6.00	ug/l	3/16/2021
RC20	Lake Oliver	3170FA	Routine Sample	Turbidity	0.50	NTU	3/16/2021
RC20	Lake Oliver	3170FA	Routine Sample	Total Suspended Solids (TSS)	1.00	mg/l	3/16/2021
RC20	Lake Oliver	3170FA	Routine Sample	Sulfur, sulfate (SO4) as SO4	1.50	mg/l	3/16/2021
RC20	Lake Oliver	3170FA	Routine Sample	pH	4.00		3/16/2021
RC20	Lake Oliver	3170FA	Routine Sample	Phosphorus as P	9.00	mg/l	3/16/2021

3.12.3 Existing Permits

Over fifteen permits were researched to obtain stormwater and environmental design information for existing systems within the project corridor. Please refer to Table 3-8 for a summary of permits referenced during the development of the proposed stormwater management systems for properties along the project corridor.

Table 3-8

Existing Permits

Project Name	Agency/Permit Type	Permit No.	Date Issued	Description
Western Way Extension	SFWMD/ Environmental Resources Construction/Operation Modification	48-00714-P	11/02/2018	Residential development and road extension
Section 30 Excavation	SFWMD/ Surface Water Management Permit	48-00786-S	6/9/1994	Construction and operation of a surface water management system to serve an expansion of an existing borrow pit site with total on-site retention
Cassis Planned Development Phase I	SFWMD/ Environmental Resource Permit	48-01048-P	4/6/1999	Development of hotel and water park
Heart of Florida Hospital Free Standing Emergency Department	SFWMD/ Environmental Resource Permit	48-01782-P	7/26/2018	Construction of a project including a stormwater management system serving Heart of Florida Hospital FSED
Hartzog Road Avalon Road to Disney Property	SFWMD/ Individual Environmental Resource Permit	48-01974-P	8/31/2021	New road construction
Wawa Avalon Road Convenience Store	SFWMD/ Environmental Resource Permit	48-02169-P	7/16/2012	Construction of surface water management system to serve Wawa
Horizon West Village I – Withers Parcels	SFWMD/ Water Use Individual Permit	48-02754-W	12/30/2020	Dewater aquifer for installation of proposed stormwater management system
Project Name	**Agency/Permit Type**	**Permit No.**	**Date Issued**	**Description**
Avalon Pointe	SFWMD Water Use Individual Permit	48-02757-W	3/4/2021	Dewatering of water table aquifer for installation of stormwater management system for Avalon Point

Bb Groves (Aka Ayers Parcels)	SFWMD/ Formal Determination of Wetlands and Surface Waters	48-102794-P	1/29/2020	Determination of wetland and surface water boundaries
Horizon West Village I – Jaffers PS – Phase 3 Parcel W-17	SFWMD/ Environmental Resource Permit	48-102896-P	11/19/2020	Continued development of Horizon West Village
Avalon Pointe Apartments (Avalon Grove PD)	SFWMD/ Environmental Resource Permit	48-103624-P	12/20/2021	Site development and stormwater management facility
Withers PD Phase 1	SFWMD/ Individual Environmental Resource Permit	48-104373-P	4/12/2021	Construction of stormwater management system serving residential development Withers PD Phase 1
Karr Sp Mass Grading	SFWMD/ Individual Environmental Resource Permit	48-105378-P	8/13/2021	Construction of stormwater management system serving 36 acres of mass grading known as Karr SP Property
Registry at Grass Lake	SWFWMD/ Individual Environmental Resource Permit	48-105977-P	In process	Residential development in process
State Road 530 (US 192) Widening	SFWMD/ Individual Environmental Resource Minor Mod	49-00956-P	9/19/2012	Construction of surface water management system to serve 51.7 acres of SR 530 widening

3.12.4 Floodplains and Floodways

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM's), portions of the study area are located within Zone AE (100 Year) floodplain. The Zone AE floodplains impacted by the Avalon Road project are located:

- East of Grass Lake and west of Avalon Road (El. 113.1)
- East of Mud Lake and west of Avalon Road (El. 113.1)
- West of Ponding Area No. 51 and east of Avalon Road (El. 113.1)
- East of Lake Austin and west of Avalon Road (El. 113.3)
- Along Hartzog Road (El. 113.1)
- West of Lake Gifford and east of Avalon Road (El. 113.1)
- East of Lake Oliver and west of Avalon Road (El. 113.3)

Please refer to Appendix H for a depiction of the floodplains in the study area. There are no floodways within the project limits. There will be floodplain impacts within the project corridor that will be mitigated by providing compensatory volume in proposed floodplain compensation ponds.

3.12.5 Existing Cross Drains

Three existing cross drains are located within the study area are indicated in Table 3-9 below.

Table 3-9
Existing Cross Drains

Culvert	Station	Number of Pipes	Size / Type
CD #1	47+90	1	18” RCP
CD #2	59+50	1	18” CMP
CD #3	97+30	2	24” CMP

3.12.6 Drainage Basin Descriptions

Four existing roadway basins have been delineated along the corridor. These basins generally outfall into roadside ditches which convey the stormwater to adjacent wetlands or may pond in open areas.

These existing drainage systems generally provide positive outfalls for the basins, though as noted, there may be some ponding in areas outside the roadway given the generally flat conditions and/or general lack of nearby cross-culverts.

There is no existing stormwater treatment or attenuation of flows in any basin. Basin 1 drains along US 192 ultimately to either Old Lake Davenport or Lake Chapin (both of which are also part of the Davenport Creek Headwaters WBID).

Runoff from Basin 2 ultimately is conveyed to both Mudd Lake and Grass Lake (both of which are part of the Davenport Creek Headwaters WBID). Runoff from Basin 3 is ultimately conveyed to Lake Gifford while Basin 4 is ultimately conveyed to Lake Oliver.

For more information on drainage basin characteristics, see Appendix H.

3.12.6.1 Basin 1

Basin 1 begins at the US 192 and Avalon Road intersection and extends to the north end of the Wawa property. This basin includes both the northbound and southbound lanes as well as the grassed right-of-way containing 2.02 acres of total right-of-way The soil in this basin is classified as HSG A with a SHWT depth of two feet or less based on the preliminary roadway borings.

County LiDAR indicates that Basin 1 ranges in elevation from 112 feet to 115 feet (mean 113.5 feet). Stormwater sheet flows off the road to the roadside where it eventually flows south into the existing FDOT's US 192 storm drain system which ultimately outfalls to Lake Chapin on the east side of Avalon Road. On the west side of the Avalon Road, runoff drains to an unnamed wetland area between Bali Boulevard and US 192. Both of these areas ultimately discharge towards the Davenport Creek. There is no existing stormwater attenuation or water quality treatment in this basin.

Figure 3-5
Roadside Ditch Facing North

3.12.6.2 Basin 2

Basin 2 consists of the paved travel lanes and grassed right-of-way starting at station 14+58 extending to station 52+40. This basin contains 9.06 acres of right-of-way. The soil in this basin is primarily classified as HSG A. The SWHT depth of this basin is estimated to be 2.0 feet or less based on the preliminary roadway borings. County LiDAR indicates that Basin 2 ranges in elevation from 112 feet to 115 feet (mean 113.5). Stormwater runoff sheet flows off the road onto the roadside right-of-way flowing towards existing cross drain CD-1.

These cross drains connect the wetlands of Mudd lake, Grass Lake, and Rexford Lake on either side of Avalon Road, allowing overflow to move freely between the wetlands. There is no existing stormwater attenuation or water quality treatment in this basin.

Figure 3-6
Existing Cross Drain, CD #1

Figure 3-7
Roadside Ditch Facing North

3.12.6.3 Basin 3

Basin 3A

Basin 3A addresses the southbound travel lane and western right-of-way near the Palisades. This basin contains 3.18 acres of right-of-way. The soil is classified as HSG A with portions of B/D soil. The SWHT depth of this basin is estimated to be 2.0 feet or less based on the preliminary roadway borings. County LiDAR indicates that Basin 3A ranges in elevation from 113 feet to 116 feet (mean 114.5 feet).

Stormwater runoff sheet flows off the road onto the roadside right-of-way running west towards the existing wetlands and ultimately to Lake Austin. There is no existing stormwater attenuation or water quality treatment in this basin.

Basin 3B

Basin 3B consists of the northbound travel lane and eastern right-of-way opposite Basin 3A. This basin contains 7.04 acres of right-of-way. The soil is classified as HSG A with portions of B/D soil.

The SWHT depth of this basin is estimated to be 2.0 feet or less based on the preliminary roadway borings. County LiDAR indicates that basin 3A ranges in elevation from 113 feet to 116 feet (mean 114.5 feet). Stormwater runoff sheet flows onto the roadside right-of-way running east towards the existing wetlands and ultimately Lake Gifford. Additional stormwater runoff from a portion of the west side of Avalon Road is conveyed through a ditch to the existing cross drain (CD-3). The cross drain connects the west side of Avalon to the wetlands of Lake Gifford on the east side of Avalon Road. There is no existing stormwater attenuation or water quality treatment in this basin.

Figure 3-8
Roadway Facing North

Figure 3-9
Existing Cross Drain (CD #3)

3.12.6.4 Basin 4

Basin 4 covers the end of the project corridor and consists of the travel lanes and right-of-way, a total of 1.82 acres of right-of-way. The soil is classified as HSG A.

The SWHT depth of this basin is estimated to be 2.0 feet or less based on the soil types. County LiDAR indicates that Basin 4 ranges in elevation from 113 feet to 122 feet (mean 117.5 feet).

Runoff sheet flows from the west side of Avalon Road to a wetland area and ultimately to Lake Oliver. There is no existing stormwater attenuation or water quality treatment in this basin.

Figure 3-10 Roadside Facing North Near Hartzog Road

3.13 Wetlands and Species

A Ecological Summary Report (ESR) has been prepared separately as part of the Avalon Road RCA Study and is contained in Appendix E. The ESR documents ecological features located within the study corridor, such as wetland and/or other surface water communities and the occurrence or potential for occurrence of federally and/ or state-protected wildlife species and their habitat, and the likelihood of involvement of such features during project implementation.

3.13.1 Wetlands and Surface Waters

The NWI and FDEP's Statewide Land Use databases were reviewed for jurisdictional wetlands and/or other surface waters within the study corridor. Each wetland and/or other surface water was field verified, and their dominant vegetative species were recorded. Wetlands were then classified using Florida Land Use Cover and Forms Classification (FLUCFCS) codes to FLUCFCS Level III for specific identification of habitat based on dominant vegetation. Wetland systems and other surface waters were identified from south to north along the north-bound travel lane, and north to south along the south-bound travel lane (Figures 6-1 and 6-2). The wetland and surface water systems delineated are discussed below:

FLUCFCS 5200 – Lakes – This land use best describes SW-1 and SW-2, located east of Avalon Road and north of Lake Gifford Road and west of Avalon Road and north of Lake Gifford Road, respectively. These land uses are mostly open water systems.

FLUCFCS 6170 – Mixed Wetland Hardwoods – This land use best describes WL-8 located west of Avalon Road and northwest of Lake Gifford Road. This system is vegetatively comprised of cypress (Taxodium spp.), sweet bay (Magnolia virginiana) and Florida willow (Salix floridana).

FLUCFCS 6172 – Mixed Shrubs – This land use best characterizes WL-9 located north of Grove Blossom Way and west of Avalon Road. Vegetation present includes cypress, Florida willow, Carolina willow (Salix caroliniana), red maple, wax myrtle (Myrica cerifera) and sweet bay.

FLUCFCS 6210 – Cypress – This land use best describes WL-2, located east of Avalon Road, north of US 192 and WL-6 located east of Avalon Road, north of Lake Gifford Road. These systems consist of the forested fringe of open water systems and are vegetated with a canopy of cypress with an understory of scattered sweet bay, red bay (Persea borbonia), wax myrtle, Virginia chain fern (Woodwardia virginica), and Carolina willow.

FLUCFCS 6300 – Wetland Forested Mixed – This land use best describes WL-1 located north of US 192, east of Avalon Road. This system consists of the forested fringe of an open water system and is vegetatively comprised of slash pine (Pinus elliotti), sweet bay, red bay, Florida willow, oaks, wax myrtle, cogongrass (Imperata cylindrica) and saw palmetto.

FLUCFCS 6410 – Freshwater Marshes – This land use best characterizes WL-3, WL-4, WL-4A, WL-5, WL-7, WL-10, and WL-11, located east and west of Avalon Road. These systems are vegetatively comprised of cypress, dahoon holly sweet bay, bulrush (Scirpus spp.) and water lilies (Nuphar spp.).

Secondary Impacts

Federal, state, and local regulatory agencies with jurisdiction over the proposed wetland impacts evaluate potential secondary impacts to wetlands and wildlife during the permitting process. Secondary impacts from project implementation may include lighting, increase in collisions with wildlife from vehicles, and edge effect to remaining wetlands.

Generally, secondary impacts to the habitat function of wetlands will not be considered adverse if buffers, with a minimum width of 15 feet and an average width of 25 feet, are provided adjacent to the wetlands that will remain. Buffers must be maintained in their natural/undisturbed condition, provided the construction or use of these features does not adversely impact wetlands. Wetlands or other surface waters cannot be filled to create upland buffers.

Secondary impacts associated with stormwater pond locations and roadway alignment will need to be evaluated during the final design phase to ensure the proposed hydroperiod of the stormwater management system does not adversely affect the hydrology of an adjacent wetland system.

Estimated Wetland and RHPZ Impacts

This RCA corridor lies within the Reedy Creek Drainage Basin. Impacts to wetland systems associated with roadway alignment and stormwater pond locations are identified in Table 3-10.

Table 3-10, Approximate Wetland and Other Surface Water Impacts

Wetland/Other Surface Water ID	FLUCFCS Code	Preferred Alignment Impact (ac)*	East Alignment Impact (ac)	West Alignment Impact (ac)	Proposed Pond ID	Proposed Pond Impact (ac)*
WL-3	6410	0.12	--	0.12		
WL-6	6210	0.56	--	0.56	FC2	0.36
WL-7A	6300	0.28	0.28	--		
WL-10	6410	0.42	0.42			
TOTAL		1.38	0.70	0.68		0.36

* Impact acreages are based on approximate limits through aerial interpretation and limited ground-truthing activities.

Wetlands and other surface waters are regulated by federal, state, and local government policies. Impacts to jurisdictional wetlands and other surface waters will require coordination with regulatory agencies during the permitting of the proposed project and may require mitigation to offset unavoidable adverse impacts. Mitigation credits are available through several mitigation banks within the Reedy Creek drainage basin (summary of currently available mitigation is provided in Table 3-10).

Table 3-11

Summary of Available Mitigation Credits within Reedy Creek Basin

Mitigation Bank	Bank Service Area	*Credits Available
Southport Ranch	Reedy Creek, Shingle Creek, Part of Boggy Creek, Part of Lake Hart, Lake Tohopekaliga, Lake Gentry, Part of Lake Hatchineha, Part of Lake Kissimmee	State 156.25 (Forested) 0.94 (Herbaceous) Federal 15.78 (Forested) 7.0 (Herbaceous)
Reedy Creek	Reedy Creek, Shingle Creek, Boggy Creek, Lake Hart, E Lake Tohopekaliga, Lake Hatchineha, Lake Pierce, Lake Kissimmee, Lake Myrtle, Alligator Lake, Lake Gentry, S-63A, Canoe Creek, Lake Cypress, Horse Creek	State 33.72 (Forested) Federal 69.75 (Forested)
Florida (WRAP)	Shingle Creek, Lake Tohopekaliga, Reedy Creek	State 2.49 (Forested) Federal 222.39 (Forested) 107.75 (Herbaceous)
Bullfrog Bay	Reedy Creek, Lake Tohopekaliga, Lake Hart, Alligator Lake, Lage Gentry, Lake Cypress, Lake Kissimmee	State: 11.61 (Forested) 14.28 (Herbaceous)

3.13.2 Federal and State Listed Flora

FNAI is a non-profit conservation organization that maintains a database of recorded occurrences of rare habitat types and imperiled plant and wildlife species. FNAI classifies imperiled species on a five-tiered rarity ranking system, both globally and state-wide, and includes federal and state protection statuses for such species. FNAI is not a regulatory or law enforcement agency; however, FNAI's database was consulted for this study due to their comprehensive records of species occurrence.

The Florida Department of Agriculture and Consumer Services (FDACS) lists and regulates the economic use of flora identified as E, T, or commercially exploited. Typical economic uses include gathering live wild plants for resale as ornaments or harvesting of plant material (e.g., saw palmetto berries) for resale. Incidental destruction of rare flora caused by land clearing associated with construction or agriculture is not regulated or prohibited by FDACS.

The FNAI and FDACS lists of protected and commercially exploited flora were reviewed for species known to occur within Orange County, Florida, and for the potential for such species to inhabit the study corridor. Protected flora species are those categorized by FWS and/or FWC as T, E, or exploited, thereby receiving a level of protection because of their status. The potential occurrence of protected flora species identified within the study corridor is based on the type of vegetative communities present. The probability of each species occurring within the study corridor is ranked using the following requirements:

- **No** – indicates no suitable habitat is present. Suitable habitat is defined as intact natural land that is typically used by the species under consideration.
- **Low** – indicates that marginally suitable habitat may exist within the study corridor, but the species was not observed during field observations. "Marginal" describes natural land that has been altered from its native state due to human activity, ecological succession, or conversion; however, the species under consideration could still inhabit the area.

- **Moderate** – indicates that suitable habitat exists within the study corridor, but the species was not observed during field observations.
- **High** – indicates that suitable habitat exists within the study corridor and the species of interest was observed during field observations.

Table 3-12 lists the federally and/or state-protected flora species known to occur in Orange County, Florida, and their potential for occurrence within the study corridor.

Table 3-12: Federally and State-Protected Flora Known to Occur within Orange County, Florida, and Avalon Road Study Corridor

Scientific Name	Common Name	FWS Status	FWC Status	Occurrence Potential	Habitat
Bonamia grandiflora	Florida bonamia	T	E	Moderate	Openings or disturbed areas in white sand scrub on central Florida ridges, with scrub oaks, sand pine, and lichens
Calopogon multiflorus	Many-flowered grass-pink	--	T	Moderate	Dry to moist flatwoods with longleaf pine, wiregrass, and saw palmetto
Centrosema arenicola	Sand butterfly pea	--	E	Moderate	Sandhill, scrubby flatwoods, and dry upland woods
Clitoria fragrans	Scrub pigeonwing	T	E	Moderate	Turkey oak barrens with wire grass, bluejack, and turkey oak; scrub; and scrubby high pine
Coelorachis tuberculosa	Piedmont jointgrass	--	T	Low	Ephemeral ponds and margins of sandhill upland lakes or depression marshes with sandy peat or sandy muck-peat
Coleataenia abscissa	Cutthroatgrass	--	E	Moderate	Wet flatwoods, prairies, and seepage areas
Deeringothamnus pulchellus	Beautiful pawpaw	E	E	Low	Open slash or longleaf pine flatwoods with wiregrass and dwarf live oak understory
Eriogonum longifolium var. gnaphalifolium	Scrub buckwheat	T	E	Low	Sandhill, oak-hickory scrub on yellow sands, high pineland between scrub and sandhill, and turkey oak barrens
Illicium parviflorum	Star anise	--	E	Low	Banks of spring-run or seepage streams, bottomland forest, hydric hammock, and baygall dominated by red maple and sweet bay
Lechea cernua	Nodding pinweed	--	T	Moderate	Open, unshaded white sands of scrub and scrubby flatwoods; often associated with Florida rosemary (*Ceratiola ericoides*)
Lechea divaricata	Pine pinweed	--	E	Moderate	Scrub and scrubby flatwoods
Lupinus aridorum	Scrub lupine	E	E	Moderate	Openings in sand pine and rosemary scrub
Lythrum flagellare	Florida loosestrife	--	E	Low	Seasonally inundated areas, such as wet prairies, floodplain marshes, and roadside ditches, in mucky or peat muck soils
Matelea floridana	Florida spiny-pod	--	E	Moderate	Sandhill, upland pine, and dry hammock
Najas filifolia	Narrowleaf naiad	--	T	Low	Floating annual plant, prefers dark water less than 2 meters deep
Nemastylis floridana	Celestial lily	--	E	Moderate	Wet flatwoods (often in cabbage palm flatwoods variant), prairies, marshes, and cabbage palm hammock edges
Nolina atopocarpa	Florida beargrass	--	T	Low	In grassy areas of mesic and wet flatwoods
Nolina brittoniana	Britton's beargrass	E	E	Moderate	Scrub, sandhill, scrubby flatwoods, and xeric hammock
Ophioglossum palmatum	Hand fern	--	E	Low	Old leaf bases of cabbage palms in maritime hammocks and wet hammocks

Scientific Name	Common Name	FWS Status	FWC Status	Occurrence Potential	Habitat
Paronychia chartacea	Paper-like nailwort	T	E	Moderate	Sandy openings around sandhill upland lakes and karst ponds; Lake Wales Ridge scrub
Pecluma plumula	Plume polypody	--	E	Moderate	Wet hammocks and swamps; epiphytes on live oaks
Pecluma ptilota	Comp polypody	--	E	Low	Rockland hammocks, strand swamps, and wet woods at the base of trees and fallen logs
Platanthera integra	Yellow fringeless orchid	--	E	Moderate	Open wet prairies, wet flatwoods, bogs, and seepage slopes
Polygonum dentoceras	Small's jointweed	E	E	Moderate	Open, sandy areas within scrub, mostly white sand
Prunus geniculata	Scrub plum	E	E	Moderate	Sandhill and oak scrub
Orthochilus ecristatus	Giant orchid	--	T	Low	Sandhill, scrub, pine flatwoods, and pine rocklands
Salix floridana	Florida willow	--	E	Low	Wet, mucky soils in bottomland forests, floodplains, hydric hammocks, swamps, edges of spring-runs, and streams
Schizachyrium niveum	Pinescrub bluestem	--	E	Moderate	White sand patches in rosemary scrub, sand pine scrub, and oak scrub
Stylisma abdita	Scrub stylisma	--	E	Moderate	Dry sandy soils in scrub and sandhills
Warea amplexifolia	Clasping warea	E	E	Moderate	Limited to sunny openings with exposed sand in longleaf pine/turkey oak/wiregrass sandhills
Zephyranthes simpsonii	Redmargin zephyrlily	--	T	Moderate	Wet flatwoods and meadows, ditches, and wet pasturelands
Commercially Exploited					
Encyclia tampensis	Butterfly orchid	--	--	Moderate	Epiphytic perennial in mesic hammocks, hardwood swamps, and mangrove forests; found on old live oaks, bald cypress, mangroves, and pond apples
Epidendrum conopseum	Green-fly orchid	--	--	Moderate	On trees in moist hammocks, cypress, and hardwood swamps
Lycopodiella cernua	Staghorn clubmoss	--	--	Moderate	damp areas, on ground, in full sun to shade
Osmunda cinnamomea	Cinnamon fern	--	--	Moderate	Swamps and wetlands
Osmunda regalis	Royal fern	--	--	Moderate	Swamps and wetlands
Rhapidophyllum hystrix	Needle palm	--	--	No	Moist-wet sites, seepage slopes, regularly but shallowly inundated floodplains, seepage swamps (especially associated with springs), hydric seepage slopes, and at times, some of the adjacent non-hydric slope, hydric hammock, and moist upland bluffs adjacent to rivers
Serenoa repens	Saw palmetto	--	--	High	Wet to dry flatwoods and hammocks

E = Endangered, T = Threatened, SSC= Species of Special Concern, T S/A = Threatened Similar in Appearance

Data Source: FNAI Tracking List Orange County, Florida (FNAI 2022) Plants Institute for Systematic Botany (Wunderlin, Franck and Essig 2021); Florida Department of Agriculture (FDA) Endangered, Threatened, and Commercially Exploited Species (Florida Department of Agriculture and Consumer Services 2020-2021);

3.13.3 Federal and State Agencies Listed Wildlife Species

Literature reviews and database queries were conducted to identify federally and/or state-protected wildlife species known to occur in Orange County, Florida, and the potential occurrence of such species to inhabit the study corridor. Federally and/or state-protected wildlife species are those categorized by FWS and/or FWC as T, E, or SSC, thereby receiving a level of protection due to their listed status. The potential occurrence of protected wildlife species within the study corridor is based on the and the type and quality of vegetative communities present. The probability of each wildlife species occurring within the study corridor is ranked using the following requirements:

- **No** – Indicates no suitable habitat is present. Suitable habitat is defined as intact natural land that is typically used by a species under consideration.
- **Low** – Indicates marginally suitable habitat may exist within the study corridor, but the species was not observed during field observations. "Marginal" describes natural land that a species under consideration could inhabit but that has been altered from its native state due to human activity, ecological succession, or conversion.
- **Moderate** – Indicates suitable habitat exists within the study corridor, but the species was not observed during field observations.
- **High** – Indicates suitable habitat exists within the study corridor, and the species of interest was observed during field observations.

Table 3-13 provides a summary of federally and/or state-protected species known to occur in Orange County, Florida, and their potential for occurrence within the study corridor. Protected wildlife species that have moderate or high potentials to occur within the study corridor are discussed in detail in the following paragraphs, as are species whose consultation areas fall within the study corridor.

Table 3-13, Federally and State-Protected Wildlife Species Known to Occur in Orange County, Florida, and the Avalon Road Study Corridor

Scientific Name	Common Name	Protection Status	Occurrence Potential	Consultation Area	Habitat
Fish					
Pteronotropis welaka	Bluenose shiner	ST	No	--	Quiet backwaters, pools of blackwater streams, rivers, and spring runs; usually with thick vegetation nearby
Reptiles					
Alligator mississippiensis	American alligator	FT(S/A)	Low	--	Various aquatic habitats
Drymarchon corais couperi	Eastern indigo snake	FT	Moderate	--	Wide variety of habitats
Plestiodon reynoldsi	Sand Skink	FT	Moderate	Yes	Rosemary scrub, scrubby flatwoods, sand pine, oak scrub
Gopherus polyphemus	Gopher tortoise	ST/FC	High	--	Sandhills, scrub, hammocks, dry prairies, flatwoods, mixed forests
Pituophis melanoleucus mugitus	Florida pine snake	ST	Low	--	Sandhills, scrubby flatwoods, xeric hammocks, ruderal areas
Lampropeltis extenuate	Short-tailed snake	ST	Low	--	Longleaf pine and xeric oak sandhills
Birds					

Scientific Name	Common Name	Protection Status	Occurrence Potential	Consultation Area	Habitat
Haliaeetus leucocephalus	*Bald eagle	--	Moderate	--	Forested areas adjacent to bodies of water
Polyborus plancus audubonii	Audubon's crested caracara	FT	Moderate	Yes	Open country, dry prairie, and ruderal areas
Laterallus jamaicensis	Eastern black rail	FT	Low	--	Salt and freshwater marshes
Rostrhamus sociabilis plumbeus	Snail kite	FE	Moderate	Yes	Freshwater marshes, vegetated fringes of shallow lakes, and ponds
Aphelocoma coeruluscens	Florida scrub-jay	FT	Moderate	Yes	Scrub, scrubby flatwoods
Picoides borealis	Red-cockaded woodpecker	FE	Low	Yes	Open, mature pine flatwoods
Mycteria americana	Wood stork	FT	Moderate	--	Fresh and brackish forested wetlands, swamps, ponds, and marshes
Antigone canadensis pratensis	Florida sandhill crane	ST	High	--	Shallow wetlands, freshwater marshes, wet prairies
Egretta caerulea	Little blue heron	ST	Moderate	--	Marshes, ponds, and rivers
Egretta tricolor	Tricolored heron	ST	Moderate	--	Marshes, ponds, and rivers
Platalea ajaja	Roseate spoonbill	ST	Low	--	Coastal mangroves, Brazilian pepper on man-made dredge spoil islands, and willow heads of freshwater
Athene cunicularia floridana	Florida burrowing owl	ST	Moderate	--	Sparsely vegetated sandhills, dry prairies, and ruderal areas

Occurrence Potential = No, Low, Moderate, High
Consultation Area = Identified as depicted by FWS and/or FWC GIS Data
Code Key: FE = Federally Designated Endangered, ST = State-Designated Threatened, FT = Federally Designated Threatened, FT S/A = Federally Designated Threatened due to Similar in Appearance, FC = Federal Candidate
Data Source: FWS ECOS (FWS 2021a); FNAI (Woolfenden and Fitzpatrick 1996)
Florida's Endangered and Threatened Species (FWC Updated 2021)
*Protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act

Bald Eagle

Although the bald eagle (Haliaeetus leucocephalus) is delisted, the species remains protected through the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Florida has one of the densest concentrations of nesting bald eagles in the lower 48 states, with several clustered around significant lake, river, and coastal systems throughout the state (FWC 1999–2021). Bald eagles typically nest and roost in forested habitats that consist of mature canopy trees along habitat edges, allowing an unobstructed view of surrounding areas. Daytime roosts are often found in the highest trees and adjacent to shorelines. High-quality foraging habitat for bald eagles has a diversity and abundance of prey, access to shallow water, and tall trees or structures (FWC 1999–2021).

The AEW Program monitors nest sites during nesting season. Data provided on the AEW website is updated through the 2020–2021 nesting season (Audubon Society 2021). MSE biologists queried the AEW database for known bald eagle nest sites within a one-mile radius of the study corridor. No bald eagle nest sites are documented within a 1-mile radius of the study corridor. Additionally, no nest sites or bald eagles were observed during site reviews.

It is anticipated that the proposed project will not adversely impact the bald eagle or nesting trees. It is recommended that the database for documented bald eagle nest sites be queried and that a site review be conducted during the design and permitting phase of this project to verify nesting statuses at that time.

Federally Protected Wildlife Species

Audubon's Crested Caracara

FWS lists the crested caracara (Polyborus plancus audubonii) as threatened. This species is typically found in dry or wet prairies with scattered cabbage palms and improved/unimproved pasturelands (FWS 2019). Nest sites are typically found in the tallest cabbage palm in the area or other structures free of dense vegetation. Caracara birds are opportunistic feeders, with their diets consisting of insects, fish, snakes, turtles, birds, and mammals (rabbits, skunks, prairie dogs).

The study corridor lies within the consultation area of the crested caracara (See Appendix E, Figure 7) and supports suitable habitat. Although suitable habitat consisting of improved pastures and scattered cabbage palms is present, this species was not observed during site reviews. If proposed impacts to cabbage palms are necessary during final design, FWS may request that a formal survey be conducted following FWC's "Recommended Management Practices and Survey Protocols for Audubon's Crested Caracaras (Polyborus plancus audubonii) in Florida" (FWC 2001). Surveys should be conducted between January and March, when nesting is at its peak and adults are likely to be feeding nestlings, or between March and April, when chicks have fledged the nest and adults are active.

No crested caracaras were observed during site review, and it is anticipated that the proposed roadway improvements will not adversely affect the crested caracara. However, additional surveys may be necessary based on final design.

Snail Kite

FWS lists the snail kite (Rostrhamus sociabilis plumbeus) as endangered. The snail kite is found near extensive, open freshwater marshes and lakes with shallow water and a low density of emergent vegetation in natural and artificial systems (FWS 1986). The apple snail (Pomacea paludosa) is the snail kite's primary food source, making the snail kite's survival dependent on the hydrology and water quality of watersheds associated with the Everglades, Lake Okeechobee, Kissimmee Valley, and the upper St. Johns River (FWS 1986).

The study corridor lies within the FWS consultation area for this species; however, it is outside of FWS's designated "critical habitat" (See Appendix E, Figure 8). Neither the snail kite nor apple snails were observed within the study corridor. It is anticipated that the proposed project will not adversely impact the snail kite or its habitat.

Florida Scrub-Jay

FWS lists the Florida scrub-jay (Aphelocoma coerulescens) as threatened. This species is typically found in sand pine, xeric oak scrub, and scrubby flatwoods with sandy soils and fire-dominated habitat types. The scrub-jay's diet consists mainly of acorns, arthropods, berries, seeds, and a wide variety of insects (Woolfenden and Fitzpatrick 1996).

The study corridor lies within the consultation area for the Florida scrub-jay, and suitable habitat may be present within the study corridor (See Appendix E, Figure 9). Although the scrub-jay was not observed during ground-truthing activities, a species-specific survey using FWS South Florida Ecological Services Office's "Florida Scrub-Jay Survey Protocol" (FWS June 28, 2004) (Attachment A) may be necessary based on final project design.

Red-Cockaded Woodpecker

FWS lists the red-cockaded woodpecker (RCW) (Picoides Borealis) as endangered. The RCW is known to inhabit mature pine forests to bore out cavities in living pines (FWS 2020a). Cavity trees can be in clusters of trees found on an average of 10 acres. The size of the RCW's territory is dependent upon habitat suitability. The RCW's diet consists primarily of insects (egg, larval, and adult stages) found on or in pine trees. Large, older pine trees are preferred, as the RCW's foraging method involves flaking away bark and to probe under it (FWS 2020a).

Although the study corridor lies within the RCW consultation area (See Appendix E, Figure 10), no suitable habitat was identified during site reviews. It is anticipated that this species will not be adversely impacted, and formal surveys will likely not be needed.

Wood Stork

FWS lists the wood stork (Mycteria americana) as threatened. This species is typically found in freshwater marshes, swamps, lagoons, ponds, flooded fields, depressions in marshes, and brackish wetlands. The core foraging areas (CFA) for this species include areas of very shallow water, generally 6–10 inches in depth, where there is an abundance of small fishes and other aquatic life. These small fishes may include mosquitofish, sailfin mollies, flagfish, and several species of sunfish. Wood storks may also prey on frogs, salamanders, snakes, crayfish, insects, and baby alligators (Scott 2004). Suitable foraging habitat is defined in the Effect Determination Key for the Wood Stork in Central and North Peninsular Florida" (USACE, FWS, FWC 2018a) as "any area containing patches of relatively open (25% aquatic vegetation), calm water, and having a permanent or seasonal water depth between 2 and 15 inches."

FWS has identified a 15-mile radius CFA around known wood stork colonies. This CFA is deemed essential for reproductive success. The study corridor is within the 15-mile CFA of one wood stork colony (See Appendix E, Figure 11):

- Gatorland – Last active 2019 (FWS 2010-2019), located approximately 14.9 miles east.

Impacts to suitable foraging habitat are not anticipated to result from the proposed project. Using the "Effect Determination Key for the Wood Stork in Central and North Peninsular Florida" (USACE, FWS, FWC 2018b) to evaluate the project's effect on the wood stork, the following were concluded:

- The project corridor is more than 2,500 feet from a colony.
- The proposed work will not affect suitable foraging habitat.

Because of this, the proposed project received a determination of "no effect" (See Appendix E, Attachment B).

Eastern Indigo Snake

FWS lists the eastern indigo snake (*Drymarchon corais couperi*) as threatened. This species occurs in a wide range of upland and lowland habitat, including mesic pine flatwoods, scrubby flatwoods, long leaf sandhills, oak and sand pine scrub, dry prairie, tropical hardwood hammocks, fresh and saltwater marshes and swamps, and some human-altered habitat (agriculture lands) (FWS, Southeast Region 2018). The indigo snake has a large home range, generally 53 to 392 acres in north-central Florida, and 117 to 341 acres in south-central Florida (UF IFAS Extension 2020). This species is known to use gopher tortoise (*Gopherus polyphemus*) burrows as refuge from elements (heat, fires, cold temperatures), as well as stumps, roots, and debris piles.

Using the "Eastern Indigo Snake Programmatic Effect Determination Key" (Key) (USACE, FWS 2013) (See Appendix E, Attachment C) to evaluate the project's effect on the eastern indigo snake, the following were concluded:

- Project is not located in open water or salt marsh.
- The permit should be conditioned for use of the Standard Protection Measures for The Eastern Indigo Snake (See Appendix E, Attachment D) during site preparation and project construction.
- There are gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities.
- The project will impact less than 25 acres of xeric habitat (scrub, sandhill, or scrubby flatwoods) that support less than 25 active and inactive gopher tortoise burrows.
- Any permit will be conditioned such that all gopher tortoise burrows, active or inactive, will be excavated prior to site manipulation in the vicinity of a burrow. If an indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Any permit will also be conditioned such that holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an indigo snake, no work will commence until the snake has vacated the vicinity of the work.

FWS provided the Key to reduce coordination efforts for determination responses. If use of the Key results in a determination of "no effect" or "Not Likely to Adversely Affect," then FWS will concur with the determination, and no additional correspondence is necessary.

Assessing the corridor using the Key, the project has received a determination of Not Likely to Adversely Affect. However, if changes in stormwater pond locations or alignment shifts occur during final design, reassessment and additional surveys may be warranted.

Sand Skink

FWS lists the sand skink (*Plestiodon* [*Neoseps*] *reynoldsi*) as threatened. It is endemic to the sandy ridges of central Florida, occurring in Highlands, Lake, Marion, Orange, Osceola, Polk, and Putnam counties. Principal populations occur on the Lake Wales and Winter Haven Ridges in Highlands, Lake, and Polk counties. The sand skink is a unique lizard adapted to an underground existence and most often occupies ecotonal areas between communities with abundant leaf litter and adjacent open sand (FWS 2021b). Seasonally, sand skinks are most active from mid-February through mid-May and again in late summer/early fall with activity patterns suggesting they are active during mornings and evenings (FWS 1987).

FWS's "Peninsular Florida Species Conservation and Consultation Guide: Sand Skink and Blue-tailed Mole Skink" (FWS 2020b) (See Appendix E, Attachment E) is intended to assist projects in determining if or how a proposed action may affect the sand skink. To be considered potential habitat for the sand skink, a site needs to meet three criteria:

- The sit must be located within the delineated consultation area.
- The site must contain appropriate soil type(s).
- The site must have appropriate elevations (generally 82 feet above mean sea level and higher).

If a site meets these requirements, FWS generally assumes presence of the sand skink, and the potential effects to sand skinks should be considered. To determine occupancy, a sand skink survey is necessary following the FWS's Sand Skinks and Blue-tailed Mole Skinks Survey Protocol Peninsular Florida (FWS 2020c). Surveys can be conducted in a two-tier approach:

- Conduct a visual pedestrian survey to detect sand skink sinusoidal "S" track. This survey can be conducted any time of year, but preferable timing is in the spring (March through May) and fall (October through November) when tracks are most detectable.
    - If the pedestrian survey does not identify sand skink trails, then a coverboard survey is necessary.

- If the visual pedestrian survey does not identify the presence of sand skinks, a coverboard survey is required. Coverboard surveys should be conducted March 1 through May 15, with April 17 as the last day to deploy coverboards. Results outside of this timeframe are not considered adequate to presume absence of the species.

If either survey identifies sand skink trail, an 80-foot radius of suitable habitat as occupied around a sand skink trail is considered occupied by FWS. If proposed projects cannot avoid a "take" of this species and its habitat, either compensation or mitigation is required to offset potential adverse impacts to this species and its habitat. If mitigation credits are available at an FWS-approved conservation bank whose service area covers the project, mitigation can be accomplished through the purchase of an approved number of credits from the bank.

A desktop review concluded the study corridor meets all three criteria (location, soils, and elevation) (See Appendix E, Figures 12-1 and 12-2). Pedestrian surveys conducted during February 2022 identified suitable habitat within the study area; however, "S" tracks were not observed. Following the "Peninsular Florida Species Conservation and Consultation Guide: Sand Skink and Blue-tailed Mole Skink" (FWS 2020b) survey protocols, pedestrian and coverboard surveys should be conducted within areas identified for impacts to this species and its habitat.

State-Protected Wildlife Species

Gopher Tortoise

FWC lists the gopher tortoise (Gopherus polyphemus) as threatened. The gopher tortoise inhabits subterranean burrows in dry upland habitats, such as longleaf pine sandhills, xeric oak hammocks, scrub, pine flatwoods, dry prairies, and coastal dunes. Gopher tortoises can also be found in pastures, ruderal fields, and grassy roadsides. To be suitable for gopher tortoises, the habitat must have well-drained sandy soils for digging burrows, herbaceous plants, and open sunny areas for nesting and basking.

Periodic natural fires play an important role in maintaining tortoise habitat by opening the canopy and promoting growth of herbaceous plants used for forage. If natural fires are suppressed, the habitat becomes unsuitable for gopher tortoises (Cox, Inkley and Kautz December 1987). Gopher tortoise burrows are an important habitat to many native species. It is estimated that 39 invertebrates and 42 vertebrate species use gopher tortoise burrows to some degree (Cox, Inkley and Kautz December 1987). Of those species, protected species that frequently inhabit gopher tortoise burrows include the Florida pine snake, eastern indigo snake, and burrowing owl. This commensal relationship warranted field investigation for such species within the study corridor.

Potentially occupied burrows were observed within the study corridor (See Appendix E, Figure 13). FWC provides four options for landowners to address the presence of gopher tortoises:

- Avoid development.
- Avoid gopher tortoise burrows by a minimum of 25 feet.
- Relocate gopher tortoises onsite (permit required).
- Relocate gopher tortoises offsite (permit required).

Based on final design, and prior to construction activities, it is recommended that a gopher tortoise survey be conducted in accordance with FWC's "Gopher Tortoise Permitting Guidelines" (FWC 2008/Revised Effective July 2020) (Attachment F). If gopher tortoise burrows are identified and cannot be avoided by a minimum of 25 feet, coordination with FWC will be required.

Florida Pine Snake

FWC lists the Florida pine snake (Pituophis melanoleucus mugitus) as threatened. This species is found in sandhills, including old fields and pastures, with a moderate to open canopy and dry sandy soils, in which it burrows. The pine snake is also found in sand pine scrub and scrubby flatwoods; it often coexists with pocket gophers and gopher tortoises (FNAI 2001). The diet of the Florida pine snake primarily consists of moles, rabbits, mice, rats, squirrels, lizards, and other snakes and their eggs (Ernst and Ernst 2003).

FWC considers surveys for pocket gopher mounds and gopher tortoise burrows as meeting guidelines for minimizing impacts to this species (FWC 2018). FWC maintains a Rare Snake Sightings database, updated through 2022 (FWC n.d.), which was reviewed for the study corridor. No Florida pine snakes were identified within a 5-mile radius of the study corridor. Suitable habitat is located within the study corridor; however, conducting gopher tortoise surveys, and relocations, when necessary, within suitable habitat will ensure potential impacts to the species are minimized. Further coordination with regulatory agencies is not anticipated for the Florida pine snake.

Short-Tailed Snake

FWC lists the short-tailed snake (Lampropeltis extenuate) as threatened. This species is primarily fossorial, spending most of its time burrowed in well-drained sandy soils in longleaf pine and xeric oak sandhills, scrubs, and hammock habitats (FWC 2011). This species is considered a cryptic species, meaning it may be difficult to detect due to behavior, habitat, or physical features when using standardized survey techniques (FWC Effective December 2019). Due to low detectability, little is known about the distribution and life history of this species; however, it appears to be most active from March to April and October to November (FWC Effective December 2019). Habitat typically used by this species is found within the project corridor.

Surveys are not required for this species. However, should a short-tailed snake be observed during project implementation, then coordination with FWC is recommended.

Florida Sandhill Crane

FWC lists the Florida sandhill crane (Antigone canadensis pratensis) as threatened. The Florida sandhill crane is a non-migratory bird found in freshwater marshes, prairies, and pastures. Florida sandhill cranes tend to avoid areas with taller vegetation or dense forest canopies and prefer habitat with short vegetation (e.g., less than 20 inches high in uplands) (FWC 2019). The sandhill crane is often found foraging in a variety of open habitats, including roadsides. Their diet consists of berries, seeds, insects, mice, small birds, snakes, lizards, and frogs. Shallow freshwater marshes with an average water depth of 4–13 inches are critical for nesting and roosting (FWC 2019). Additionally, uplands adjacent to nesting marshes are important for young until they can fly (FWC 2019).

Suitable foraging and nesting habitat was found within the study corridor, and the species was observed foraging within uplands and wetlands (WL-1 and WL-3); however, no active nest sites were observed. FWC recommends conducting a survey following the Florida Sandhill Crane Survey Protocol (See Appendix E, Attachment G) between December and August for active nest sites. If no active nests are detected, no additional coordination with FWC is required.

Florida Burrowing Owl

FWC lists the Florida burrowing owl (*Athene cunicularia floridana*) as threatened. This small, ground-dwelling owl prefers sandy, well-drained areas with low vegetation height and good visibility around the burrow, which is necessary for the essential behaviors of breeding, feeding, and sheltering (FWC 2018, updated April 2019). Burrowing owls can be found in dry prairies, mowed grass, vegetative berms, improved pastures, sod farms, and urban areas including yard, cemeteries, golf courses, and other open areas where vegetation is relatively short to provide sufficient foraging habitat. Their diet consists

primarily of insects, but it can include snakes, frogs, small lizards, birds, and rodents (FWC 2018, updated April 2019).

This species typically has a breeding burrow plus one or more satellite burrows for breeding and sheltering. These burrows are used year-round, with roosting in winter and raising young during the breeding season from February to July. During breeding season, this species is typically active during the day rather than at night, but active at night during non-breeding season.

Suitable habitat is present within the study corridor; however, the species was not observed during ground-truth activities. FWC recommends conducting surveys in suitable habitat to determine if the species is present. When a survey is conducted in accordance with FWC's *Florida Burrowing Owl Species Conservation Measures and Permitting Guidelines* (FWC 2018, updated April 2019) (**Attachment H**) and the specie is not present within the project, no further coordination with FWC is required. If the burrowing owl is observed within the proposed project area, the project may avoid an incidental take and permit requirements by adhering to the following:

- Maintaining a minimum of a 10-foot buffer during non-breeding season (July 11–February 14).
- Maintaining a minimum of 33-foot buffer during breeding season (February 14–July 10).
- Avoid impacting greater than 50% of suitable habitat within the proposed project

Based on final design, and prior to construction activities, it is recommended that a survey be conducted for the burrowing owl in accordance with FWC's guidelines.

Wading Birds

FWC lists the little blue heron (Egretta caerulea) and tricolored heron (Egretta tricolor) as threatened. These species are typically found in marshes, ponds, lakes, meadows, mudflats, lagoons, streams, mangrove lagoons, and other bodies of shallow water. Their diet consists of various types of fish, amphibians, and invertebrates. Nesting generally occurs in both coastal and freshwater environments in swamps and mangrove forests. They share nesting sites with other wading birds to form rookery colonies (Rodgers, Jr., Kale, II and Smith 1996).

These species were not observed during ground-truth activities. Measures to mitigate impacts to wetlands can be designed to provide additional benefits to wetland-dependent species potentially impacted by this project.

Non-Protected Wildlife Species

In addition to federally and/or state-protected wildlife species, the study corridor supports other wildlife species. Wildlife species noted during ground-truth activities included: mockingbird (Mimus polyglottos), black vulture (Coragyps atratus), wild turkey (Meleagris gallopavo), and wild boar (Sus scrofa) (rooting). In general, the study corridor provides resting, nesting, and foraging opportunities for a variety of resident and migratory wetland dependent species.

3.13.4 Wetland and/or Surface Water Regulatory Permitting

Federal, state, and local government agencies are charged with protecting jurisdictional wetlands and surface waters, and protected wildlife species, and their habitats. A discussion of each agency's general requirements in protecting such features is provided below.

Federal Requirements

U.S. Army Corps of Engineers

The Department of the Army, through its regulatory division, regulates the discharge of dredge or fill material into waters of the United States (WOTUS) under Section 404 of the Clean Water Act (CWA), and in navigable waters of the United States under Sections 9 and 10 of the Rivers and Harbors Act of 1899 (RHA) (USACE n.d.).

The term "navigable waters of the United States" is defined to include all waters that are subject to the ebb and flow of the tide, and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce (33 Code of Federal Regulations. Part 329. n.d.). Since 1970, the USACE and U.S. Environmental Protection Agency (EPA) have defined wetlands under the CWA as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" and "wetlands [that] generally include swamps, marshes, bogs, and similar areas" (EPA n.d.).

On June 22, 2020, the Navigable Waters Protection Rule (NWPR) became affective codifying the definition of "water of the United States" under the CWA. The NWPR includes four categories of jurisdictional waters and provides specific exclusions for many water features that traditionally had been regulated (Federal Register Vol. 85, No 77. April 21, 2020). In this final rule, "waters of the United States" include the following:

- Territorial seas and traditional navigable waters
- Perennial and intermittent tributaries that contribute surface flow to such waters
- Certain lakes, ponds, and impoundments of jurisdictional waters (dams)
- Wetlands adjacent to other jurisdictional waters

On August 30, 2021, the U.S. District Court for the District of Arizona ordered the June 22, 2020, definition of waters of the United States vacated and remanded the NWPR. With this ruling in place, the EPA and USACE have halted the implementation of the NWPR and are interpreting waters of the United States consistent with the pre-2015 regulatory regime until further notice (EPA 2021a). The term "waters of the United States" pre-2015 meets the following criteria (EPA 2021b):

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.
- All interstate waters including interstate wetlands.
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters:
    - Which are or could be used by interstate or foreign travelers for recreational or other purposes.
    - From which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
    - Which are used or could be used for industrial purposes by industries in interstate commerce.
- All impoundments of waters otherwise defined as waters of the United States under this definition.
- Tributaries of waters identified in paragraphs (1) through (4).
- The territorial sea.
- Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6).
- Waters of the United States do not include:
    - Prior converted cropland.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition).

To determine if a wetland system meets jurisdiction under the USACE rules and regulations, an applicant may submit for an Approved Jurisdictional Determination (AJD). USACE will review wetland and/or other surface water systems within limits of a project and verify presence/absence of waters of the United States under the NWPR. If federal jurisdiction is determined, impacts to wetland systems would require coordination with USACE to obtain one of the following three types of permits (USACE Jacksonville n.d.):

- **Nationwide Permits (NWP)** – NWPs are used to allow filling of wetlands and other jurisdictional waterbodies in situations where impacts to systems will have minimal adverse environmental effect. NWPs allow certain categorical activities to take place so long as the activity does not exceed impact thresholds.
- **NWP 14 – Linear Transportation Projects** – This permit is available for projects such as roadways, highways, railways, trails, airport runways, and taxiways. For issuance of an NWP-14, a project must have 0.5-acre or less of impacts to USACE-regulated waters, for non-tidal waters.
- **General Permits (GP)** – GPs are issued on a nationwide or regional basis for a category of activities that are substantially similar in nature and cause only minimal individual and cumulative impacts. GPs are reviewed every 5 years and have been developed to reduce the burden of the regulatory program on the public and ensure timely issuance of permits.
- **Standard Permits (SP)** – SPs are required when the proposed project does not meet the criteria of a GP or NWP. SPs require a 21-day comment period under public notice.

Federal Delegation

In December 2020, EPA approved FDEP's application to adopt the federal 404 program, known as the "State 404 Program." State assumption over the 404 program intends to streamline permitting procedures, in which both federal and state permits are required for impacts to jurisdictional wetland and surface waters.

FDEP, under Chapter 62-331, FAC assumed jurisdiction over dredging and filling in waters of the United States regulated by the State (Section 373.4145, FS) effective December 22, 2020. Section 404 of the CWA allows FDEP to issue authorization of activities within certain waters (state-assumed waters).

State-assumed waters are all waters of the United States that are not retained by USACE. Retained Waters are "those waters which are presently used or are susceptible to use in their natural condition or by reasonable improvement to transport interstate or foreign commerce shoreward to their ordinary high-water mark, including all waters which are subject to the ebb and flow of the tide shoreward to their mean high-water mark, including wetlands adjacent thereto.

USACE will retain responsibility for permitting for the discharge of dredged or fill material in those waters identified in the Retained Waters List, as well as all waters subject to the ebb and flow of the tide shoreward to their mean high-water mark that are not specifically listed in the Retained Waters List, including wetlands adjacent thereto landward to the administrative boundary.

The administrative boundary demarcating the adjacent wetlands over which jurisdiction is retained by USACE is a 300-foot guideline established from the ordinary high-water mark or mean high tide line of the retained water" (FDEP 2020b).

If impacts to state-assumed wetland systems are proposed, coordination with FDEP would be necessary to obtain the necessary permit; however, regulations should be reviewed during final design and permitting to determine which agency will review the project under federal regulations.

During the design phase, wetlands and other surface water systems will need to be delineated in accordance with federal regulations to accurately determine impacts. Unavoidable direct and secondary impacts to "waters of the United States" may be offset through appropriate mitigation.

U.S. Fish and Wildlife Service

FWS regulates protected wildlife species under the Endangered Species Act (ESA) of 1973. FWS typically becomes involved on projects during the wetland permitting process through a Section 7 Consultation with USACE. In accordance with the Fish and Wildlife Coordination Act (16 USC 661-666c), consultation with FWS and FWC is necessary when "waters of any stream or other body of water are proposed or authorized to be impounded, diverted…or otherwise controlled or modified" under a federal permit.

Section 10 of the ESA is designed to regulate a wide range of activities affecting endangered or threatened organisms and their habitats (protected resources). With some exceptions, the ESA prohibits activities affecting these protected species and their habitats unless authorized by a permit from FWS or the National Marine Fisheries Service. Permitted activities are designed to be consistent with the conservation of the species and this action is undertaken when USACE permitting is not required.

During the Section 7 or Section 10 consultation with FWS, the agency will evaluate the project and provide one of the following determinations for each species identified within the project area:

- No effect – USACE has determined that the project will not adversely impact the species and no further coordination with FWS is required.
- May affect – USACE has determined that the proposed project may impact a protected resource. USACE will consult with FWS to take either of the following actions:
    - Request concurrence with "may affect, but not likely to adversely affect."
    - Request initiation of formal consultation for determinations of "may affect, likely to adversely affect."

Both requests should include written analysis explaining the determination in the form of a Biological Assessment (BA) or a Biological Evaluation (BE) (FWS 2016).

Desktop analysis and site reviews did not identify critical foraging, resting, or nesting habitat within the study corridor for federally protected wildlife. If proposed pond locations or alignment shift during final design, additional site reviews and surveys may be warranted.

State Requirements

South Florida Water Management District

The state of Florida defines wetlands as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soils" (Chapter 62-340.200 FAC). South Florida Water Management District (SFWMD) regulates impacts to wetlands and/or other surface waters, pursuant to Part IV Chapter 373 of the Florida Statute (FS), and in accordance with Chapter 62-330 FAC for area of the Avalon Road RCA. SFWMD requires an Environmental Resource Permit (ERP) that authorizes activities in a manner that prevents flooding, manages surface water, and protects water quality, wetlands, and other surface waters.

Local Government

Orange County Environmental Protection Division

The Orange County Environmental Protection Division (OCEPD) is a local government agency that regulates wetlands pursuant to Article X – Wetland Conservations Areas Section 15 (Orange County Government 2019). This ordinance classifies wetland systems by size, hydrologic connection, and use of

the system by protected wildlife species. All wetland systems within unincorporated Orange County, Florida, are classified using the following criteria:

- Class I – System has a hydrologic connection to natural surface water bodies or a lake littoral zone, is 40 acres or larger in size, or provides critical habitat to federally and/or state-protected wildlife species.
- Class II – System consists of isolated wetlands or formerly isolated wetlands that have been altered to have a direct connection to other surface water drainage, and the system is greater than or equal to 5 acres or is not otherwise classified as a Class I wetland.
- Class III – System is isolated wetland less than 5 acres and does not qualify as a Class I or Class II system.

Class I wetland systems receive the greatest protection and may be impacted only when no alternative exists for the reasonable use of the land where there is an overriding public benefit. Class II wetland systems may be impacted except when contrary to public interest. Class III wetland systems may be impacted in every case.

OCEPD evaluates secondary impacts like that of SFWMD with a 15-foot minimum, 25-foot average width into a system. In addition, direct and secondary impacts may be offset through appropriate mitigation.

3.13.5 Wildlife Corridors

As part of the RCA ecological evaluation, the opportunity of implementing wildlife crossings within the study corridor will be evaluated. Wildlife crossings are most often associated with linear projects where natural habitat is located on both sides of a proposed crossing and where habitat can be protected from site conversion through preservation or conservation. Wildlife crossings allow for terrestrial wildlife to move uninterrupted and safely through a roadway corridor from one side to the other.

Evaluation Criteria

Detailed analysis of the study corridor for wildlife crossing implementation includes review of the following:

- Biodiversity Resource Priorities (BRP)
- Identification and location of conservation lands and/or public lands
- Current and future development plans

The Critical Lands and Waters Identification Project (CLIP) was developed between FNAI, University of Florida GeoPlan Center and Center for Landscape Conservation Planning, and FWC. CLIP is a collection of spatial data that identifies statewide opportunities for protecting biodiversity, landscapes, and water resources in Florida. CLIP may be used as a resource planning tool for state, regional, and local agencies in natural resource protection by providing a broad picture of natural resources to support conservation opportunities (NatureServe 2021).

CLIP is organized into a set of core natural resource data layers that are combined into five resource categories, with the first three making up the Aggregated CLIP Model:

- Biodiversity
- Landscape
- Surface Water
- Groundwater
- Marine

The biodiversity model combines the following four core data included into the Biodiversity Resources Priorities layer (Oetting, Hoctor and Volk 2016) :

- Strategic Habitat Conservation Areas – This identifies suitable habitat for one or more rare or vulnerable vertebrate species. Those species likely require this area in order to maintain viable populations in Florida for the foreseeable future. Highest priorities indicate the rarest or most vulnerable species, but all priority levels have conservation value.

- Potential Habitat Richness – This identifies suitable habitat for one or more rare or vulnerable vertebrate species. "Richness" refers to the number of species overlapping at any location and ranges from 1 to 13. This data layer was created by FWC to identify additional habitat areas important for conservation, beyond those areas identified in the Strategic Habitat Conservation Areas analysis.

- Rare Species Habitat Conservation Priorities – This identifies suitable habitat for one or more rare or vulnerable species that are known to occur in the vicinity. Highest priorities could indicate a single species with very high conservation need, or multiple species with high conservation need. All priorities reflect rare species with conservation need. This layer includes occurrence-based habitat for 281 species with a high conservation need including plants, invertebrates, and vertebrates. This layer prioritizes places on the landscape that would protect both the greatest number of rare species and those species with the greatest conservation need.

- Priority Natural Communities – A given location features one of 12 priority natural community types: upland glades, pine rocklands, seepage slopes, scrub, sandhill, sandhill upland lakes, rockland hammock, coastal uplands, imperiled coastal lakes, dry prairie, upland pine, pine flatwoods, upland hardwood forest, or coastal wetlands. These natural communities are prioritized by a combination of their global status rank and landscape.

The Biodiversity Resources Priorities layer is based upon a location meeting one of the four core data layers to meet that priority class criteria. If a location meets more criteria, then the priority is moved higher for that location. Biodiversity data have been provided in Appendix E, Figure B-13. Areas throughout the study area have been bisected through land development (e.g., roads, residential areas, commercial), suggesting a wildlife crossing location may not be feasible throughout most of the project. This study found little evidence of use by protected wildlife species within the study corridor, although common wildlife such as raccoons, rabbits, opossums, snakes, and turtles are known to occur within the area.

Two critical evaluation criteria should be considered when determining the implementation and placement of wildlife crossings:

- The presence of natural habitat on both sides of the roadway that is protected from site alteration.
- The ability to construct fencing to guide wildlife to that crossing.

Application of Evaluation Criteria to Potential Wildlife Crossing Locations

Wildlife Crossing Location 1 – This location is approximately 500 feet north of US 192. Natural habitat is present consisting of uplands on the west and wetlands on the east of Avalon Road, with the east parcel under conservation. The property located west of Avalon Road is privately owned while the adjacent property has a valid permit for proposed development (Registry on Grass Lake). Avalon Road is proposed to be widened in this area with the addition of stormwater management ponds located between the upland and the wetland east of Avalon Road. In addition, the following findings were noted at this location:

- **BRP** – This area is identified with a ranking of 2.
- **Conservation** – FL-SOLARIS CLEAR data indicates land under conservation easement is east of the study corridor, with the remainder of the location not under conservation.

- **Current and Future Land Use** – This location consists of undeveloped uplands and wetlands; however, the western boundary of uplands is permitted for development, and the conservation area is bordered by existing development to the south.

Wildlife Crossing Location 2 – This location is approximately 1,400 feet south of Grove Blossom Way near STA 59+00 (see Appendix A for Concept Plans). Natural habitat is present consisting of uplands and wetlands on the east and west of Avalon Road, with a culvert connection under Avalon Road at STA 59+50. The properties are privately owned, though PRS Properties on west and Grove Resort on the east side of Avalon Road have indicated development interests. Although the Florida Wildlife Corridor does not include the property located west of Avalon Road, it is within 1,000 feet and includes a portion of the wetland adjacent to the proposed crossing. In addition, the following items were noted at this location:

- **BRP** – This area is identified with rankings between 1 and 4.
- **Conservation** – FL-SOLARIS CLEAR data indicates this area is not under conservation.
- **Current and Future Land Use** – This location currently consists of undeveloped land with uplands and wetlands, though development is anticipated on both sides of Avalon Road.

Wildlife Crossing Summary

Wildlife Crossing Location 1 – Based on the information and analysis presented above, and the wildlife known to inhabit this area, a wildlife crossing is not justified due to the lack of sustainable natural communities and a continuous corridor for wildlife movement. A wildlife crossing in this location may be reconsidered in the future should plans to develop the area west of Avalon Road change.

Wildlife Crossing Location 2 – Based on the information and analysis presented above, and the wildlife known to inhabit this area, a wildlife crossing for herptiles (amphibians and reptiles), and small mammals could be supported at this location under the following conditions. Since both PRS and Grove Resort 5 have not submitted formal development plans, the County may be open to having each developer set aside property at the south end of their respective properties for a wildlife corridor. Location and configuration of the components of a wildlife crossing would be determined during final roadway design. This potential site is shown on Figure B-16-3 in Appendix E.

In summary, the viability of a wildlife corridor or wildlife crossings within the Avalon Road study corridor may be limited using the criteria as outlined above and given the outlook for substantial future development. However, further study will be undertaken to evaluate potential crossing location(s) for small mammals and amphibians.

4 DESIGN CONTROLS AND STANDARDS

4.1 Roadway Design Criteria

Sources used to determine the design criteria for the Avalon Road RCA include the FDOT Design Manual, the FDOT Design Standards for Design, Construction, Maintenance and Utility Operations on the State Highway System, the FDOT Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Greenbook), and the Manual of Uniform Traffic Control Devices (MUTCD). Specific design criteria and typical section elements used for the development of the proposed design are identified below:

- Design Speed: 40 mph (Posted 40 mph) From US 192 to Lake Gifford Road, 45 mph (Posted 45 mph) from Lake Gifford Road to Hartzog Road
- Proposed Maximum Superelevation If Needed = Reverse Crown
- Functional Classification: Urban Collector
- Desired Level of Service: LOS of “D” or better
- Lane Widths: Travel lane - 12 feet
- Sidewalk Width: 6 feet on east side of Avalon Road
- Multiuse Path: 10 feet on west side of Avalon Road
- Median Width: 22 feet, raised
- Curb Type: Type E (median) Type F (outside)
- Border Width: Varies
- Lateral Offset/Utility Strip: Four feet from Back of Curb
- Pavement Design: (to be determined)
- Landscape Budget: (to be determined during design)

4.2 Drainage Design Criteria

The Avalon Road project is located within the Reedy Creek Basin within the jurisdiction of the South Florida Water Management District (SFWMD). The design criteria for the stormwater ponds will follow Orange County, SFWMD, and FDOT guidelines. An environmental resource permit from SFWMD will be required during final design. A pre-app meeting with SFWMD will be held during the design phase to verify that additional criteria are not required.

Water quality and attenuation requirements will be met by providing wet ponds in each drainage basin. Floodplain compensation is anticipated to be provided with additional floodplain compensation areas. The curve number method was used to estimate treatment volume requirements for each drainage basin. The required treatment volume and seasonal high groundwater level elevations were the basis to determine the approximate size each pond needs to be. The following drainage design criteria has been used to estimate the sizes of the proposed stormwater management ponds and floodplain compensation areas:

- Off-site discharge rate is limited to rates not causing adverse impacts to existing off-site properties and (a) historic discharge rates; or (b) rates determined in previous Agency permit actions; or (c) rates specified in District criteria (Section 3.2 SFWMD ERP Applicant’s Handbook Vol II)

- A storm event of 3-day duration and 25-year return frequency shall be used in computing off-site discharge rates (Section 3.3 SFWMD ERP Applicant's Handbook Vol II)
- Where multiple off-site discharges are designed to occur, if the combined discharges meet all other requirements of Chapter 62-330, F.A.C., and discharge to the same receiving waterbody, the Agency will allow the total post-development peak discharge not to exceed the pre-development peak discharge for the combined discharges rather than for each individual discharge (Section 3.3.2 SFWMD ERP Applicant's Handbook Vol II)
- No net encroachment into the floodplain, between the average wet season water table and that encompassed by the 100-year event, which will adversely affect the existing rights of others, will be allowed (Section 3.6 SFWMD ERP Applicant's Handbook Vol. II)
- Detention and control elevations shall be set to a maximum depth of six feet below natural ground (Section 3.11e SFWMD ERP Applicant's Handbook Vol. II)
- Indirect discharges, such as overflow and spreader swales, are required where the receiving water or its adjacent supporting ecosystem might be degraded by a direct discharge. The discharge structure would therefore discharge, for example, into the overflow or spreader swale, which in turn would release the water to the actual receiving water. Such receiving waters include natural streams, lakes, wetlands, and land naturally receiving overland sheetflow. Spreader swales shall be of a length sufficient to reduce discharge velocities to the receiving waters to historic rates or rates less than two feet per second (Section 5.1(g) SFWMD ERP Applicant's Handbook Vol. II)
- Gravity control devices shall have a maximum design discharge of one-half inch of the detention volume in 24 hours (Section 5.2(a) SFWMD ERP Applicant's Handbook Vol. II)
- Wet Retention Area Dimensional Criteria (Section 5.4.2 SFWMD ERP Applicant's Handbook Vol. II)
  - Area – 0.5 acre minimum [Section 5.4.2 (a)]
  - Width – 100' minimum for linear areas in excess of 200 feet length. Irregular shaped areas may have narrower reaches but shall average at least 100 feet. [Section 5.4.2 (b)]
  - Depth – Shallow, littoral areas of 6 feet or less below the control elevation are desirable. The minimum littoral area shall be the lesser of 20% of the wet retention/detention area or 2.5% of the total of the retention/detention area plus the basin contributing area [Section 5.4.2 (c)]
  - Side slopes for wet retention/detention shall be no steeper than 4:1 (H:V) from top of bank out to a minimum depth of two feet below the control elevation. Side slopes shall be topsoiled, and stabilized through seeding or planting from 2 feet below to 1 foot above the control elevation [Section 5.4.2 (d)]
- Minimum perimeter maintenance easements of 20 feet width at slopes no steeper than 4:1 shall be provided beyond the control elevation water line (Section 5.5 SFWMD ERP Applicant's Handbook Vol. II)
- Rainfall intensities are consistent with FDOT Drainage Manual, Appendix B: IDF Curves, Precipitation Data, Rainfall Distributions (Section 5.7.2 SFWMD ERP Applicant's Handbook Vol. II)
- Rational method was used to calculate runoff for water quality retention/detention purposes (Section 5.7.6 SFWMD ERP Applicant's Handbook Vol. II)
- TC values obtained from Federal Highway Administration Kinematic Wave Formula for overland flows and from the Manning Equation for concentrated flows (Section 34-248 Orange County Code)

- A minimum of 50% of the total volume of water required to attenuate the peak discharge of the facility in excess of the pollution abatement volume must be evacuated within 24 hours. The remaining 50% must be evacuated within an additional 72 hours. (Section 34-249(e)(2) Orange County Code)
- The outflow structure shall be designed to skim floating debris, oil, and grease from an elevation six inches below elevation of inflow into the structure to an elevation six inches above the design high water level of the pond (Section 34-249(e)(3) Orange County Code)
- Provide 5-foot chain link fence along right-of-way around perimeter, including maintenance berms (Section 34-250 (h) Orange County Code)

5 TRAFFIC CONDITIONS

This chapter presents a summary of the existing traffic conditions as well as the future traffic projections for the major intersections and roadway segments along Avalon Road as documented within the Design Traffic Technical Memorandum (DTTM) (see Appendix G) developed as part of this study and was completed in May 2022.

In analyzing the existing operating conditions, traffic counts were first conducted at pertinent roadway segments and intersections. The following intersections along Avalon Road were evaluated as part of this study:

- Avalon Road at US 192 (Signalized)
- Avalon Road at Bali Boulevard (Unsignalized)
- Avalon Road at Arrowhead Boulevard (Unsignalized)
- Avalon Road at Grove Blossom Way (Unsignalized)
- Avalon Road at Lake Gifford Road (Unsignalized)

Avalon Road at Hartzog Road was not evaluated as part of this contract since it was not scoped or constructed during the traffic counts phase. However, an independent DTTM has been prepared by others for the County for Avalon Road to the north of this project which includes the new Hartzog Road intersection. Hartzog Road has since been constructed as a two-lane urban section to the east of Avalon Road and this intersection is currently unsignalized though warranted to receive signals at a later date once traffic materializes which will be installed by others.

The current improvements and dedicated right-of-way have been designed to allow an ultimate four-lane urban section. The graphics in this section have been prepared to indicate the approximate location of Hartzog Road for relationship purposes, although all traffic related information is contained in the Avalon Road and Flemings Road PDS DTTM, dated June, 2021, prepared by Traffic and Mobility Consultants.

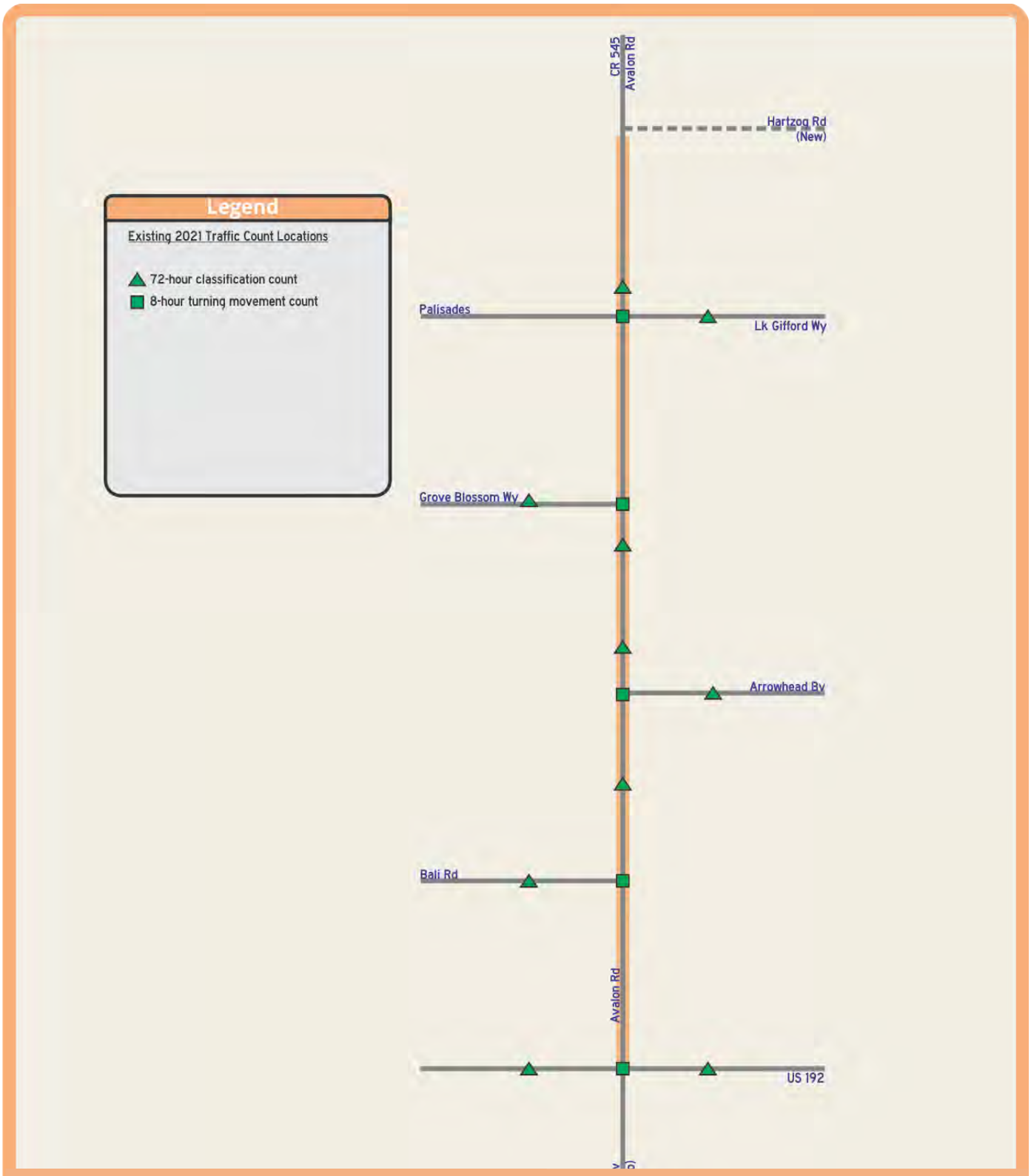
Level of Service (LOS) analyses were then conducted for both intersections and roadway segments using the existing traffic counts, existing signal timing data, and roadway and intersection geometry. The intersection LOS analysis was performed based on the Highway Capacity Manual methodologies as commuted using the Synchro software. The roadway segment LOS analysis was conducted based on the generalized Annual Average Daily Traffic (AADT) volumes for urbanized areas from the latest FDOT Q/LOS Handbook. The following sub-sections describe in more detail the overall process and results.

5.1 Existing Conditions

5.1.1 Traffic Counts

All existing traffic count data was collected during the month of September, 2021. The data collected included 72-Hour Classification Counts (10 locations) and 10-Hour intersection turning movement counts for A.M. and P.M. peak hours (5 intersections).

The weekday turning movement counts were collected for the intersections along Avalon Road between the peak hours of 7:00-9:00 a.m. and 12:00-8:00 p.m. All traffic count data collected were adjusted



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-1

Traffic Count Locations by Type

5.1.2 Traffic Characteristics

The following design traffic characteristics were established using traffic flow characteristics obtained from the traffic count data:

- K30 - represents the relationship between the travel demand occurring during the 30th highest hour of the year and the average annual daily traffic.
- D30 - represents the directional factor occurring in the traffic flow during the 30th highest hour.
- T-factor - represents the percentage composition of medium sized and heavy trucks occurring in the traffic stream.

The existing traffic characteristics were established using the traffic counts collected. Specific traffic characteristics are listed below:

- K – the proportion of AADT occurring during the peak study hour for the study roadway
- D – the proportion of traffic in the design hour of the design year traveling in the peak direction
- T-daily – the percentage of buses and trucks occurring during a day (24-hours)
- T-peak – the percentage of buses and trucks occurring during the design hour

These measured K, D, and T-daily factors are annotated in Table 5-1. This table also includes FDOT and Orange County K and D factors for comparisons purposes. The following design traffic characteristics were established using traffic flow characteristics obtained from the traffic count data and the FDOT Project Traffic Forecasting Handbook (PTFH):

- Standard K – the design peak hour factor utilized for the design traffic volumes within a Large Urbanized Area.
- D - represents the directional factor occurring in the traffic flow during the peak hour.
- T-daily - the percentage of buses and trucks occurring in the traffic stream during a day (24-hours).
- T-peak – the percentage of trucks and buses occurring during the design hour

Table 5-1

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)

Roadway Design Characteristics Comparison

Roadway/Segment	Measured Characteristics			"K" Estimated[1]	FDOT 2020 FTI[2]			Orange County Counts[3]		
	"K"	"D"	"Tdaily"		"K"	"D"	"Tdaily"	"K"	"D"	"Tdaily"
Mainline Characteristics										
Avalon Road (CR 545)										
US 192 to Arrowhead Bv	6.48%	62.31%	4.34%	5.25%	--	--	--	--	--	--
Arrowhead Bv to Grove Blossom Wy	6.55%	63.05%	4.45%	5.31%	--	--	--	7.50%	66.80%	--
Grove Blossom Wy to Lake Gifford Wy	6.41%	63.58%	4.96%	5.20%	--	--	--	--	--	--
Lake Gifford Wy to Hartzog Rd (New)	7.26%	57.74%	4.75%	5.89%	--	--	--	--	--	--
Average	**6.68%**	**61.67%**	**4.63%**	**5.41%**	--	--	--	7.50%	66.80%	--
Side Street Characteristics										
US 192-W. Irlo Bronson Mem. Hwy										
West of CR 545-Avalon Rd	7.03%	59.76%	7.18%	5.70%	9.00%	54.10%	5.20%	--	--	--
East of CR 545-Avalon Rd	6.66%	55.71%	9.56%	5.40%	9.00%	53.00%	7.90%	--	--	--
Bali Bv										
West of CR 545-Avalon Rd	7.63%	71.52%	5.13%	6.19%	--	--	--	8.80%	66.80%	--
Arrowhead Bv										
East of CR 545-Avalon Rd	10.82%	58.46%	3.01%	8.77%	--	--	--	--	--	--
Grove Blossom Wy										
West of CR 545-Avalon Rd	10.49%	55.95%	3.10%	8.51%	--	--	--	--	--	--
Lake Gifford Wy										
East of CR 545-Avalon Rd					--	--	--	--	--	--
Average	**8.53%**	**60.28%**	**5.60%**	**6.91%**	9.00%	53.55%	6.55%	8.80%	66.80%	--

Notes:

1. Estimated K Standard = Measured K * (median of the thirteen highest consecutive peak season factors / median of thirteen lowest consecutive peak season factors).
(0.9 / 1.11) = 0.810811 0.810811

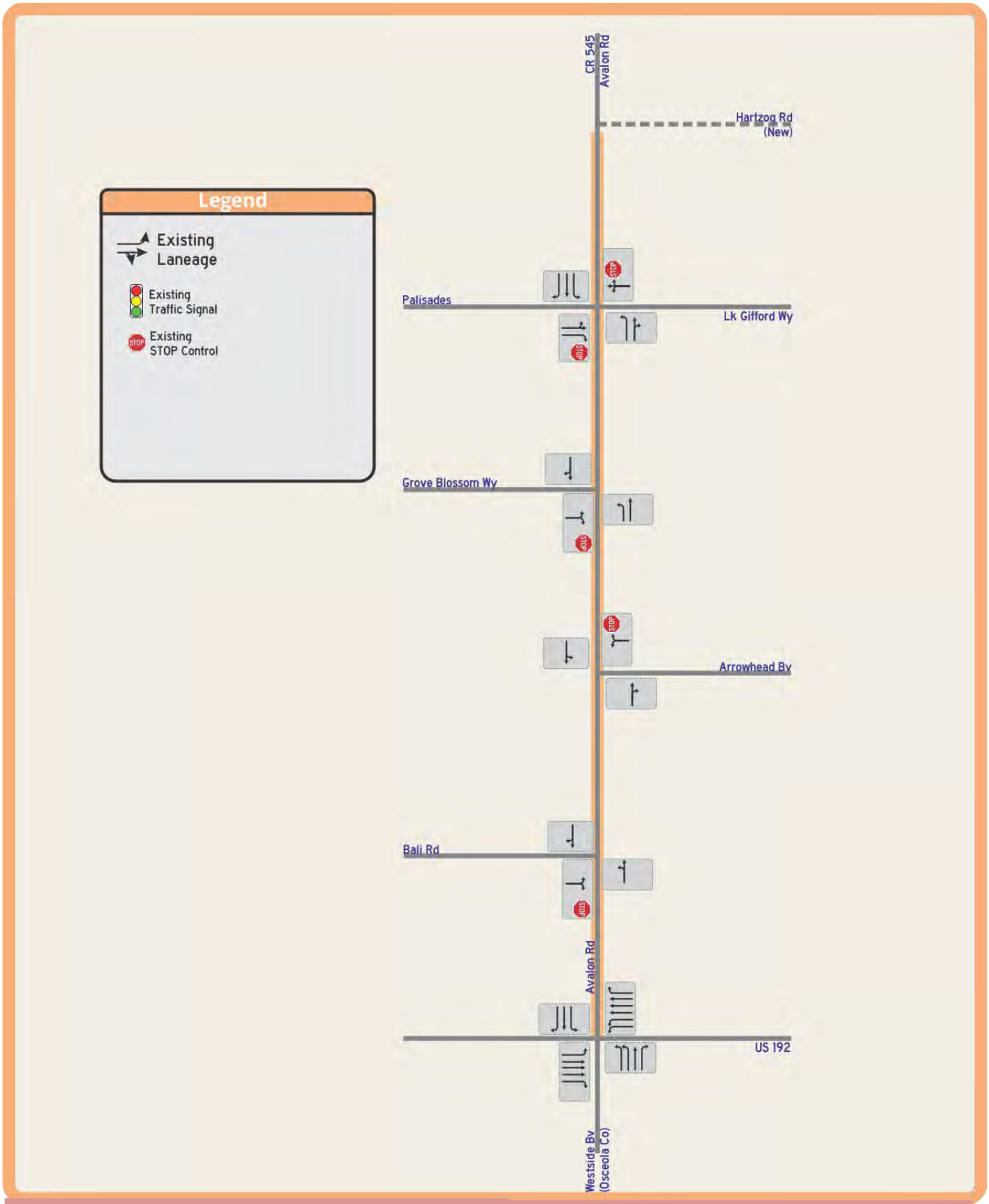
2. FDOT Florida Traffic Online (2020), US 192 West of Avalon Rd is in Osceola & Polk County

3. Orange County Public Works 2020 Traffic Counts

Lake Gifford Way under construction during this analysis.

5.1.3 Existing Geometry

Figure 5-2 provides the current (year 2022) intersection geometry for all the intersections evaluated in the study. The existing intersection geometries were used in evaluating the need for potential geometric improvements to accommodate future travel demand.



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-2
Existing Intersection Geometry

Table 5-2

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)

Recommended Roadway Design Characteristics

Roadway/Segment	Recommended Design Characteristics *			
	"K" Factor	"D" Factor	"Tdaily" Factor	"Tpeak" Factor
Mainline Characteristics				
Avalon Road (CR 545)				
US 192 to Hartzog Rd	9.00%	64.24%	4.63%	2.32%
Side Street Characteristics				
US 192-W. Irlo Bronson Mem. Hwy	9.00%	53.55%	4.63%	2.32%
Arrowhead Bv	9.00%	58.46%	4.63%	2.32%
Grove Blossom Wy	9.00%	55.95%	4.63%	2.32%
Lake Gifford Wy				

Notes:

** K Factor for Avalon Road and side streets are based on FDOT Standard K values recommended for an urban arterial from the **2019 Project Traffic Forecasting Handbook**.*

** D Factor for Avalon Road is based on the average of the field data collected for Avalon Road. 'D' factor calculation is 64.24% = (61.67% + -- + 66.80%) / 3*

** D Factor for US 192 side street is based on the measured values from FDOT.*

** D Factor for the other side streets are based on the measured values for the side street.*

** The Tdaily Factor for Avalon Road and Side Streets are based on the average of the field data collected for Avalon Road.*

** The Tpeak Factor is the Tdaily factor divided by 2*

Lake Gifford Way under construction during this analysis.

Table 5-2 lists the Recommended Design Characteristics for this project. The K factor was based on the *FDOT PTFH Large Urbanized Area Arterials & Highways Standard K* factor. Existing D factors were compared to historical FDOT D factors for Avalon Road for the last six years and also compared to the range of acceptable factors found in the FDOT PTFH. Side street D factors were based on existing D percentages. The Avalon Road T and DHT factors were based on the average of the existing traffic count percentages. Minor street T and DHT factors were also based on the Avalon Road factors.

The recommended D Factor was determined to be 64.24% based on a review of the detailed data collected along Avalon Road per the prescribed RCA scope.

5.1.3 Existing Geometry

The recommended roadway design characteristics as presented in Table 5-2 were used to develop design hour volumes (DHV) and directional design hour volumes (DDHV). The recommended T-daily factor is used to determine the Equivalent Single Axle Loadings (ESALs) for the project corridor for pavement design and the recommended T-peak factor is used in the intersection operational analysis.

5.1.4 Existing Year Traffic Volumes

The adjusted 2021 AADT's for the individual roadway segments within the project study limits are provided in Table 5-3. Figure 5-3 provides the existing AM and PM turning movement counts for each of the intersections counted.

Roadway Segments

Table 5-3 also provides a list of the roadway parameters utilized in this analysis, taken from the Orange County Concurrency Management System. Included in this table are number of lanes, functional classification, adopted Level of Service (LOS) standard, roadway service volumes, a.m. and p.m. peak hour traffic volumes and existing LOS. Based upon this analysis, all Avalon Road roadway segments currently operate at over-capacity LOS.

Table 5-3

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)

Existing Roadway Level Of Service

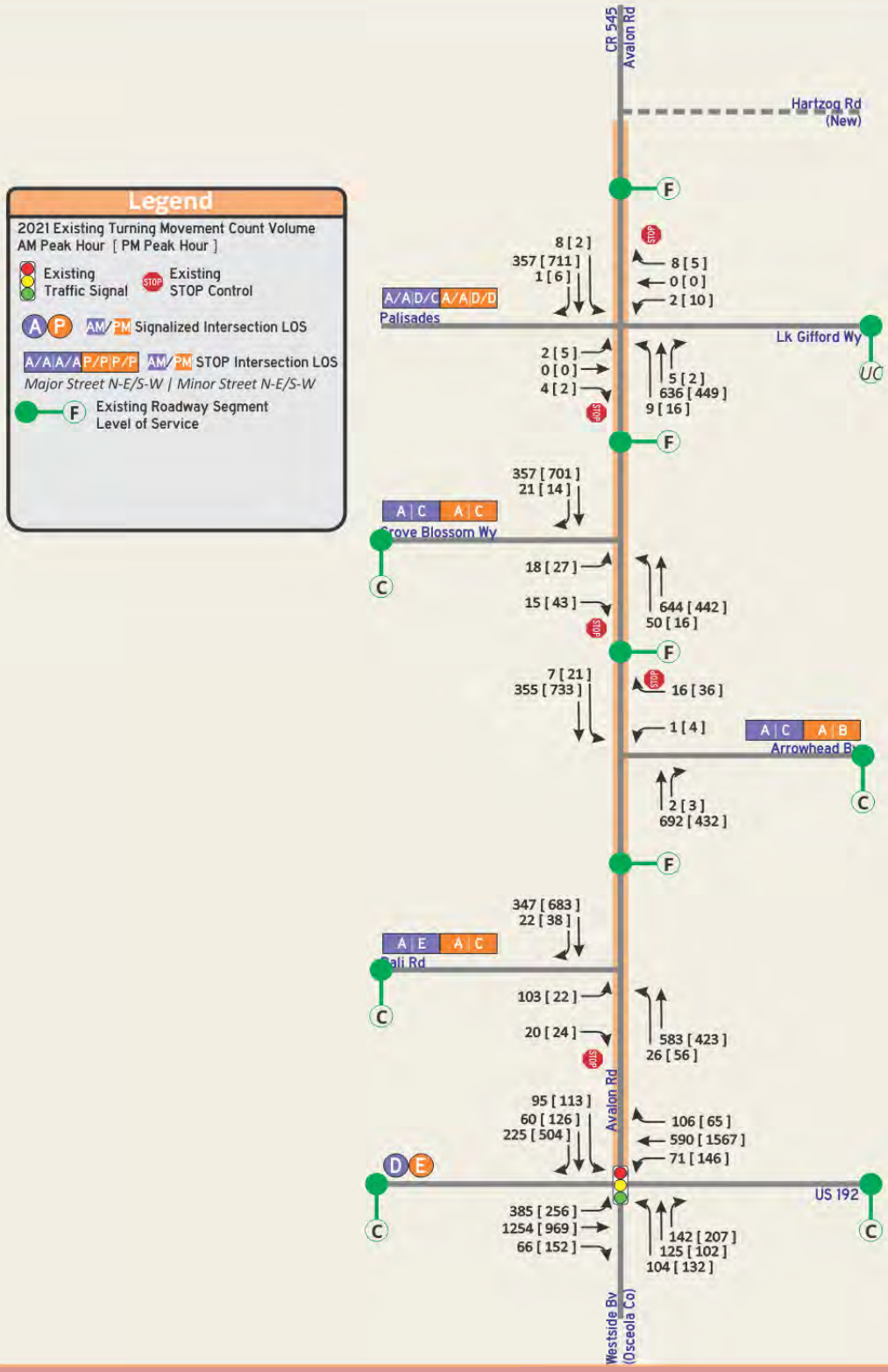
Roadway/Segment	Adopted Functional Class	Adopted LOS	# of Lanes	Roadway Service Volumes Peak Hour / Peak Direction Capacity Table (1)					AADT (2)	Peak Hour Traffic Volumes (2)		Peak Time (2)	LOS
Mainline Characteristics													
Avalon Road (CR 545)				*A*	*B*	*C*	*D*	*E*		*NB*	*SB*		
US 192 to Arrowhead Bv	Collector	E	2	0	0	830	880	880	15,700	505	908	4:30-5:30 PM	F
Arrowhead Bv to Grove Blossom Wy	Collector	E	2	0	0	830	880	880	16,100	931	518	7:45-8:45 AM	F
Grove Blossom Wy to Lake Gifford Wy	Collector	E	2	0	0	830	880	880	16,200	521	937	4:00-5:00 PM	F
Lake Gifford Wy to Hartzog Rd (New)	Collector	E	2	0	0	830	880	880	16,200	937	521	4:00-5:00 PM	F
Side Street Characteristics													
US 192-W. Irlo Bronson Mem. Hwy				*A*	*B*	*C*	*D*	*E*		*EB*	*WB*		
West of CR 545-Avalon Rd	Arterial	D	6	0	0	2,940	3,020	3,020	47,400	1526	2740	5:15-6:15 PM	C
East of CR 545-Avalon Rd	Arterial	D	6	0	0	2,940	3,020	3,020	44,400	1429	2567	5:15-6:15 PM	C
Bali Bv				*A*	*B*	*C*	*D*	*E*		*NB*	*SB*		
West of CR 545-Avalon Rd	Local	E	2	0	0	710	750	750	2,100	121	68	7:00-8:00 AM	C
Arrowhead Bv				*A*	*B*	*C*	*D*	*E*		*EB*	*WB*		
East of CR 545-Avalon Rd	Local	E	2	0	0	710	750	750	600	19	35	5:00-6:00 PM	C
Grove Blossom Wy				*A*	*B*	*C*	*D*	*E*		*EB*	*WB*		
West of CR 545-Avalon Rd	Local	E	2	0	0	710	750	750	1,600	52	92	8:15-9:15 AM	C
Lake Gifford Wy				*A*	*B*	*C*	*D*	*E*		*EB*	*WB*		
East of CR 545-Avalon Rd	Collector	E	2										

Notes:

1. From Orange County Traffic Concurrency Management Program

2. Daily and Peak Hour traffic volumes from Table 1, with recommended "D" applied, and the maximum of either the recommended "D" or the observed "D".

Lake Gifford Way under construction during this analysis.



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-3
A.M. & P.M. Peak Hour Turning Movement Volumes

5.1.5 Existing Condition Level of Service Analysis

Avalon Road and intersecting roadways were evaluated to determine existing operating conditions during AM and PM peak hour periods.

Level of Service (LOS) is a qualitative measure that seeks to describe the operating conditions of a roadway segment or intersection. Various factors such as speed, travel time, traffic delay due to signalization, freedom to maneuver, safety, driving comfort, and convenience play into the determination of LOS. Levels of Service are designated as "A" through "F" as a way to describe the full range of traffic operation conditions. LOS "A" represents virtually free flow conditions and LOS "F" represents constrained or failed conditions.

Intersections

The study intersections were analyzed under existing conditions using the procedures of the Highway Capacity Manual, 6th Edition for signalized and unsignalized intersections. This analysis used existing traffic volumes, existing geometric conditions, and existing signal timings.

Table 5-4 includes the summary results for the a.m. and p.m. peak hour intersection delay and level of service. Analysis sheets are included in Appendix G. As can be seen, all the existing study intersections currently operate at minimum acceptable conditions during the peak hours (LOS E or better). All intersections except for US 192 and Bali Road operate at LOS D or better over the peak hours.

Table 5-4

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)

Existing Intersection Delay and LOS for the Study Intersections

Study Intersections	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Avalon Road					
Lake Gifford Rd	*U/C-STOP* [1]	8.1 / 9.7 | 27.4 / 10.6	A / A | D / C	9.4 / 8.3 | 33.5 / 28.7	A / A | D / D
Grove Blossom Wy	STOP [2]	8.3 | 20.2	A | C	9.5 | 23.0	A | C
Arrowhead Bv	STOP [3]	9.3 | 15.4	A | C	8.3 | 12.9	A | B
Bali Rd	STOP [2]	8.2 | 39.8	A | E	9.4 | 22.9	A | C
US 192	Signal	48.9	D	67.6	E

Notes:

[1] - NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

[2] - NB Left Turn Major Street Movement | EB Minor Street Movement

[2] - SB Left Turn Major Street Movement | WB Minor Street Movement

5.2 Future Analysis Scenarios

5.2.1 Design Period

Orange County estimates that the opening year target for the widening of Avalon Road is 2028. Given this anticipated schedule, the following periods were used to provide design traffic forecasts for the Avalon Road Roadway Conceptual Analysis study:

- Opening Year 2028
- Mid Design Year 2038
- Design Year 2048

5.2.2 Analysis Scenarios

Design traffic volumes were developed for two traffic conditions, No-Build and Build scenarios. The No-Build condition for Avalon Road, between US 192 and Hartzog Road (realigned), assumes that the subject facilities will maintain existing lane geometry and intersection configurations. The Build condition includes Avalon Road from US 192 to Hartzog Road (realigned) being widened to a four-lane roadway.

The build scenario of four-laning Avalon Road between US 192 and Hartzog Road (realigned) (RCA/Study Phase), is included in the adopted Orange County Capital Improvements Plan (CIP).

Based on direction from Orange County staff, the assumptions used in developing the travel forecast model network as part of the Design Traffic Projections for the Avalon Road study Orange County staff's direction was to apply the previously-adopted Central Florida Regional Planning Model (CFRPM 6.1-travel forecast model), rather than CFRPM 7, for completion of the future traffic assignments for development of the design traffic growth rates.

Per that direction, LTEC coordinated with the County and their consultant to obtain the files needed for the modified CFRPM 6.1. This modified CFRPM 6.1 incorporated network and land use coding that was updated to reflect current and future traffic conditions for the Horizon West area, is referred to as the "Horizon West-CFRPM 6.1".

5.3 Future Year Traffic Projections

5.3.1 Future Corridor Travel Demand

The development of traffic projections for Avalon Road requires the examination of historical traffic growth, proposed development within the corridor vicinity, and a basic understanding of the traffic circulation patterns and characteristics of the corridor. In arriving at the volume forecasts for the Avalon Road Corridor, various growth rates were examined. The following sections discuss the resulting growth rates from various methodologies and the recommended growth factor used in this analysis.

5.3.2 Trend Analysis

Traffic projections using historical growth patterns derived from annual traffic count reports form the basis of the Trends Analysis methodology. Trends analysis uses linear regression techniques relating traffic volumes with time. Statistical validity of trends-based analysis increases with increasing number of sample years, and increasing R2 value. R2 values of 70% or greater are recommended. It should be

noted that future travel demand estimated from trends analysis is based solely on historical traffic, economic and development growth patterns. Similarly, the trend analysis method relies on historical traffic counts and does not consider traffic diversion to other roadways due to road capacity improvements within the surrounding roadway system.

The trends growth rate analysis was based on a calculation of historic growth rates from the following Orange County and FDOT traffic count stations:

- #8001 (Orange Co) Avalon Road- Arrowhead Blvd to Blossom Wy
- #8166 (Orange Co) Bali Blvd- west of Avalon Rd
- #11-0470 (FDOT) US 192- west of Avalon Road
- #75-0020 (FDOT) US 192- east of Avalon Road

The historic traffic count showed a 4.3% annual growth rate from year 2016 to year 2019. Count volumes collected over the COVID-19 pandemic conditions for year 2020 were excluded. The trend analysis worksheets are included in Appendix G.

5.3.3 FSUTMS Model

The Horizon West-CFRPM 6.1 travel forecast model was used to produce future traffic volumes for the Avalon Road RCA study corridor. The process to develop the future Horizon West-CFRPM 6.1 traffic volume forecasts included a summary of assumptions associated with the Horizon West-CFRPM 6.1 future year (Year 2025, 2035 & 2045) and network plots showing the number of lanes proposed for the Avalon Road RCA study area for review by Orange County staff. This summary is included in Appendix G.

The Horizon West-CFRPM 6.1 ZDATA (land use data) for years 2025, 2035, and 2045 was also incorporated into the model assignments. The Horizon West-CFRPM 6.1 includes updated ZDATA files for the future years, as developed by the County consultant through the Horizon West study. The major future land use development within the Avalon Road study area is Horizon West plan. The Horizon West plan included in the previous two MetroPlan Orlando model versions and has been updated in the Horizon West CFRPM model within the last year. The Walt Disney World resort uses a specialized model, with separate individual variables for theme park attendees (via hotels, via local residents, and other), hotel guests, and cast members. These variables are coded into the model data and are preset.

These land use and network assumptions are consistent with the Horizon West-CFRPM 6.1, with the exception of the Lake-Orange Connector (CFX), which was omitted from the future networks. This is the same model dataset used to develop design traffic volumes for Avalon Road north of Hartzog Road.

Model assignments were completed for the Avalon Road Build networks through year 2045 for the Build and No Build Alternatives. As produced by the Horizon West-CFRPM 6.1, the average growth rate for the Build Alternative to Opening Year 2028 was 8.98% per year, decreasing to 4.28% per year by mid-year 2038, and 4.09% per year for Design Year 2048. The growth rates are based on the existing traffic counts, e.g., the growth rate from 2021 to 2048 was 4.09% per year for a total growth of 110.31%.

The average growth rate for the No Build Alternative produced by the Horizon West-CFRPM 6.1 assignments were 5.31% per year to Opening Year 2028, decreasing to 2.28% per year by mid-year 2038, and 1.85% per year for Design Year 2048.

The summary of the development of the recommended future traffic growth rates for the Avalon Road RCA Design Traffic submitted for interim review by Orange County is included in Appendix G.

Bureau of Economic and Business Research (BEBR)

Population projection data obtained from BEBR published by the University of Florida were also used for comparison purposes. The BEBR population projections suggest limited growth over the long-range horizon in the Avalon Road corridor or Orange County. The Orange County-wide estimate obtained from BEBR reported an annual growth rate of 2.03% to year 2025, 1.71% per year through year 2035, and 1.49% per year through year 2045.

Traffic Forecasts Utilized for Analysis

The growth rates obtained from the above three sources, combined with the consideration of short-range and long-range development along and surrounding the study corridor, were reviewed to derive the recommended growth rate for the study area. As the result of Orange County staff's review of the summary of the recommended future traffic growth rates to apply for the Avalon Road RCA Design Traffic, direction was provided by Orange County to apply the following:

No Build Alternative

- Existing year 2021 to Opening Year 2028 rate: 1.85% per year traffic growth
- Existing year 2021 to Interim Year 2038 rate: 1.85% per year traffic growth
- Existing year 2021 to Design Year 2048 rate: 1.85% per year traffic

Build Alternative

- Existing year 2021 to Opening Year 2028 rate: 4.05% per year traffic growth
- Existing year 2021 to Interim Year 2038 rate: 4.05% per year traffic growth
- Existing year 2021 to Design Year 2048 rate: 4.05% per year traffic growth

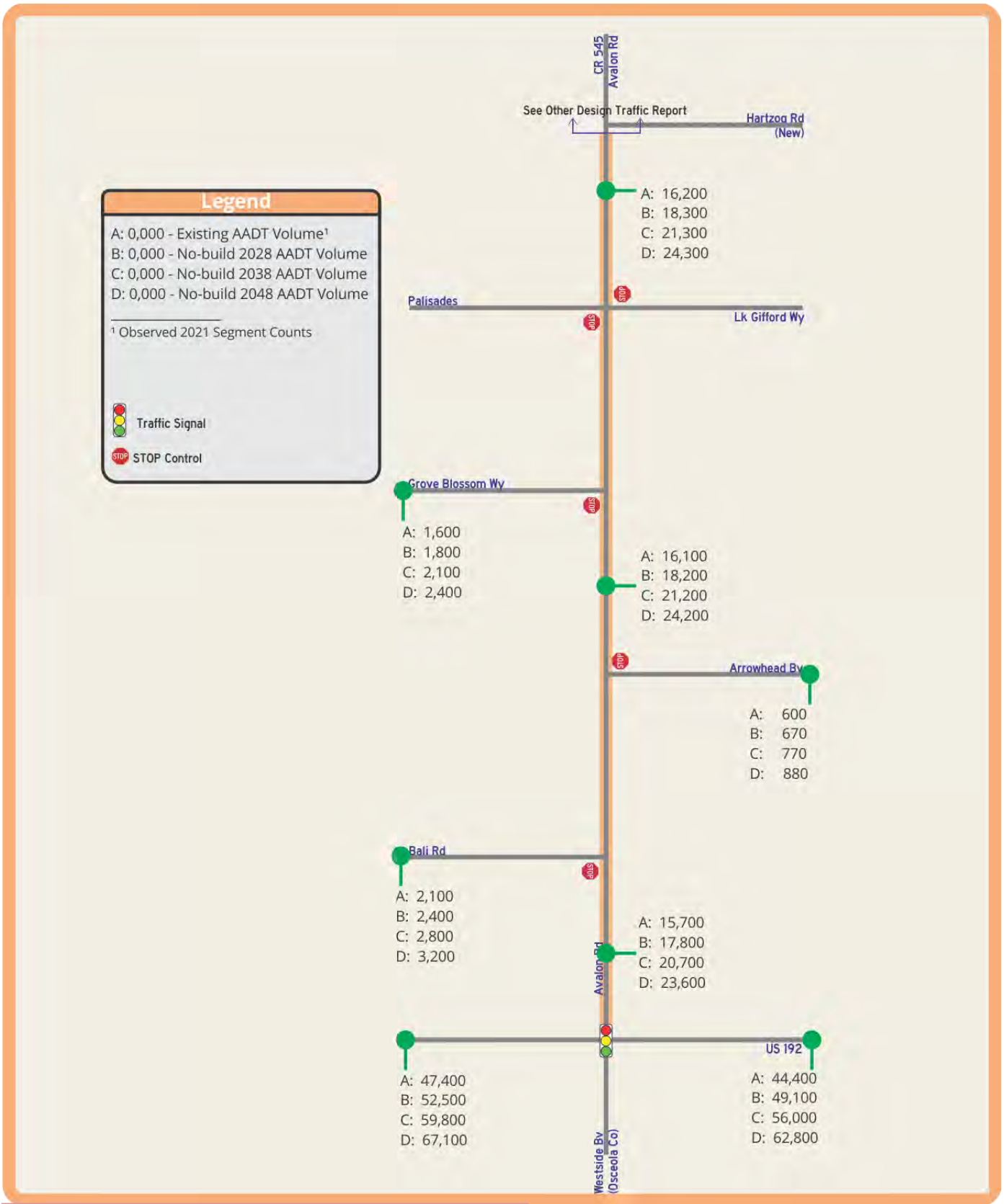
5.3.4 Mainline Traffic Volume Projections

Figure 5-4 and Figure 5-5 show the future year Annual Average Daily Traffic (AADT) traffic projections for the opening year 2028, interim year 2038, and design year 2048 along Avalon Road and the side streets for the No-Build and Build Scenarios, respectively. Information regarding the methodology used to develop future traffic projections are contained within Appendix G.

5.3.5 Intersection Turning Movement Volume Projections

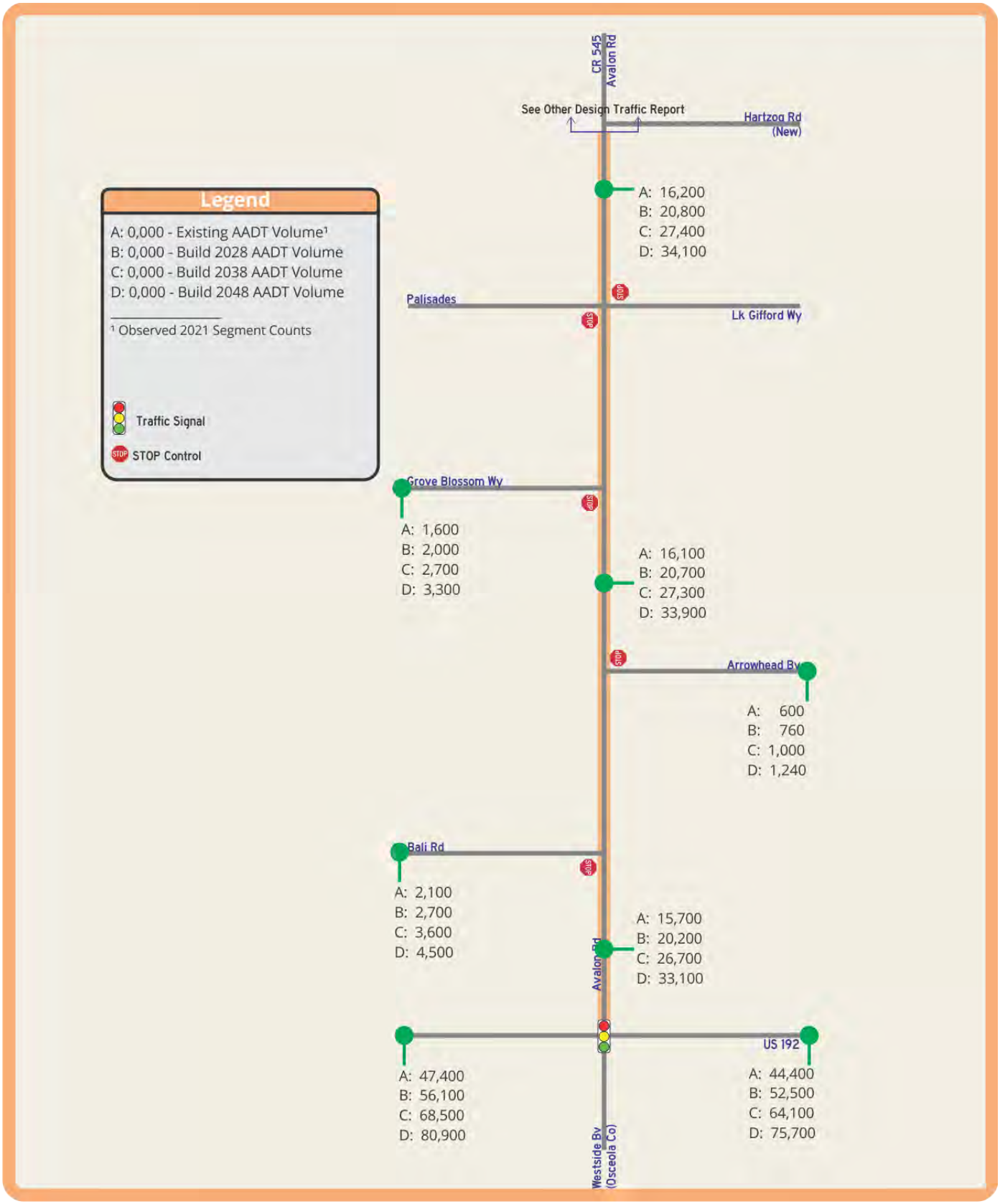
Figures 5-6 to Figure 5-8 show the intersection turning movement volumes projections for the opening year 2028, interim year 2038, and design year 2048 for the No-Build scenario along the Avalon Road study corridor.

Figure 5-9 to Figure 5-11 show the intersection turning movement volumes projected for the opening year 2028, interim year 2038, and design year 2048 for the Build scenario along the Avalon Road study corridor. Information regarding the methodology used to develop future traffic projections is contained within the DTTM.



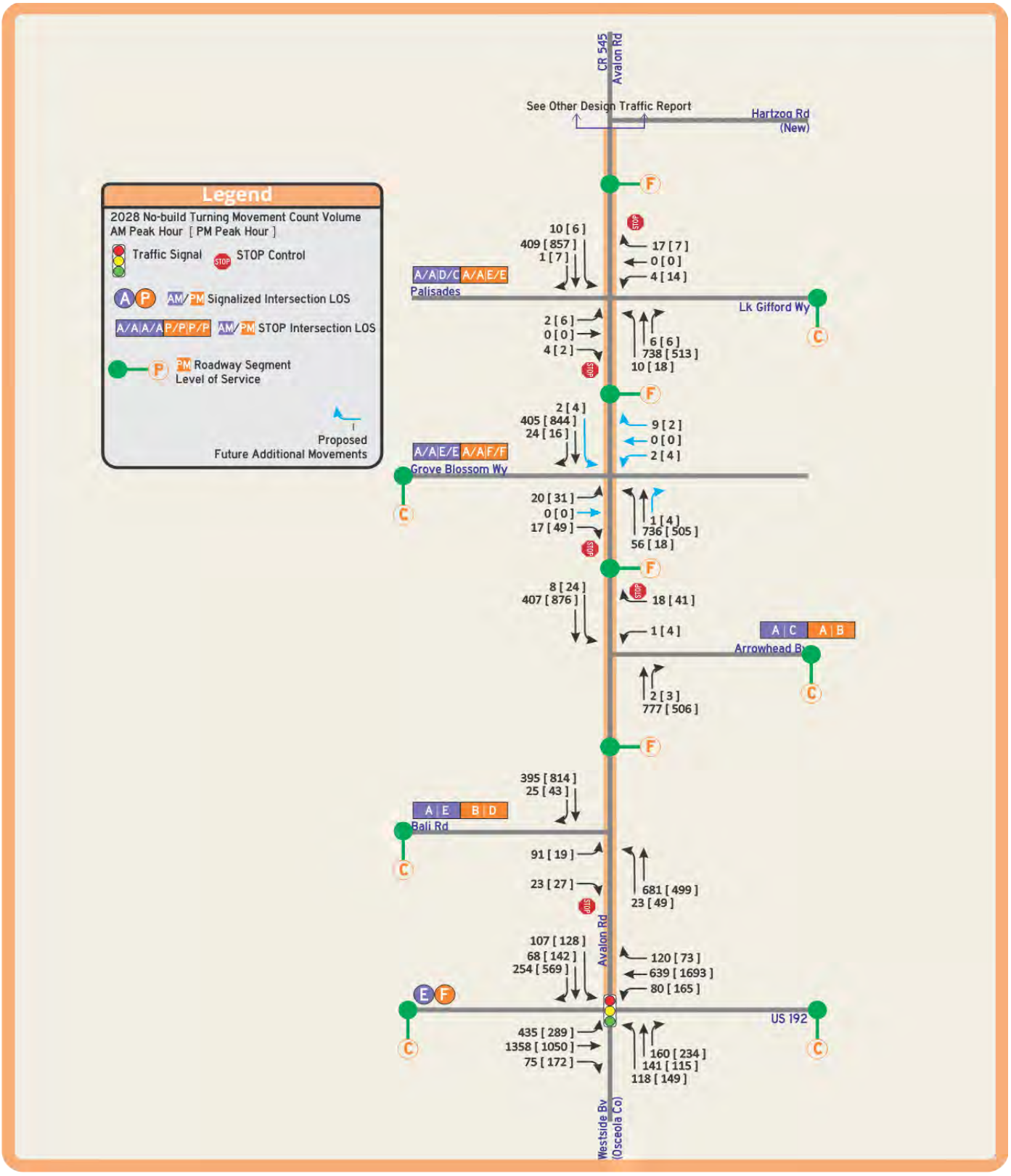
Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-4
No-Build Forecasted AADT Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

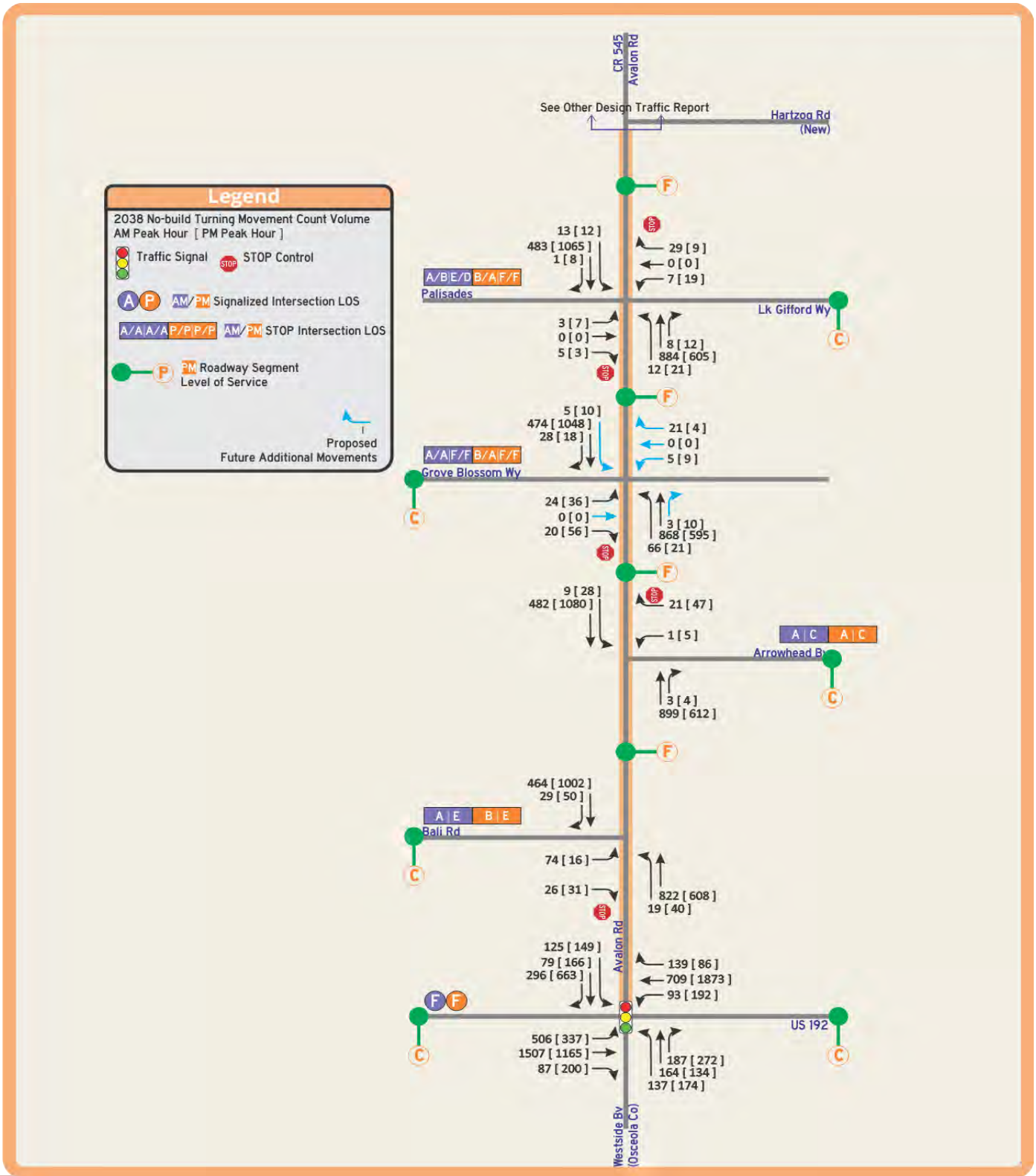
Figure 5-5
Build AADT Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-6

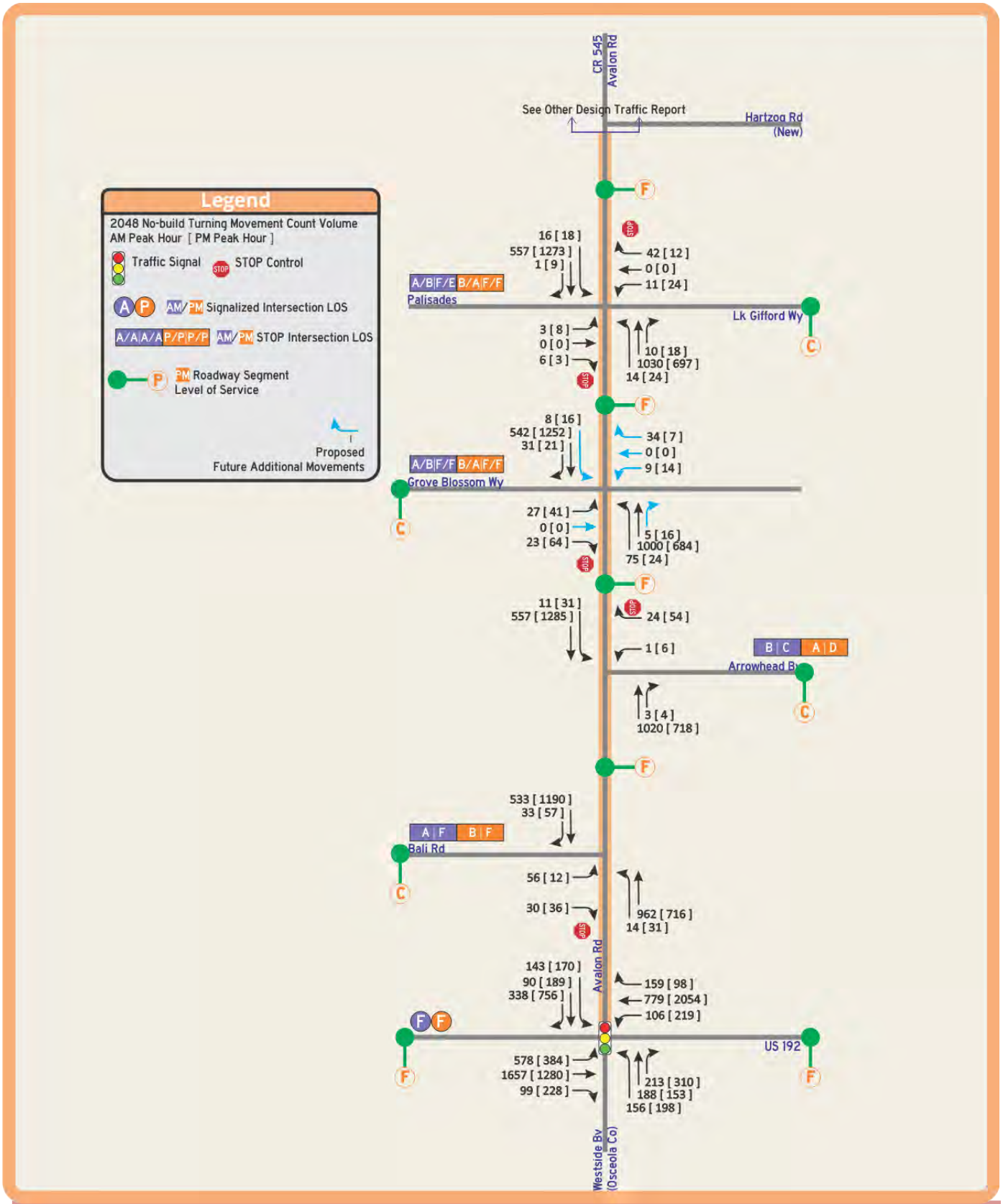
No-Build 2028 Turning Movement Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

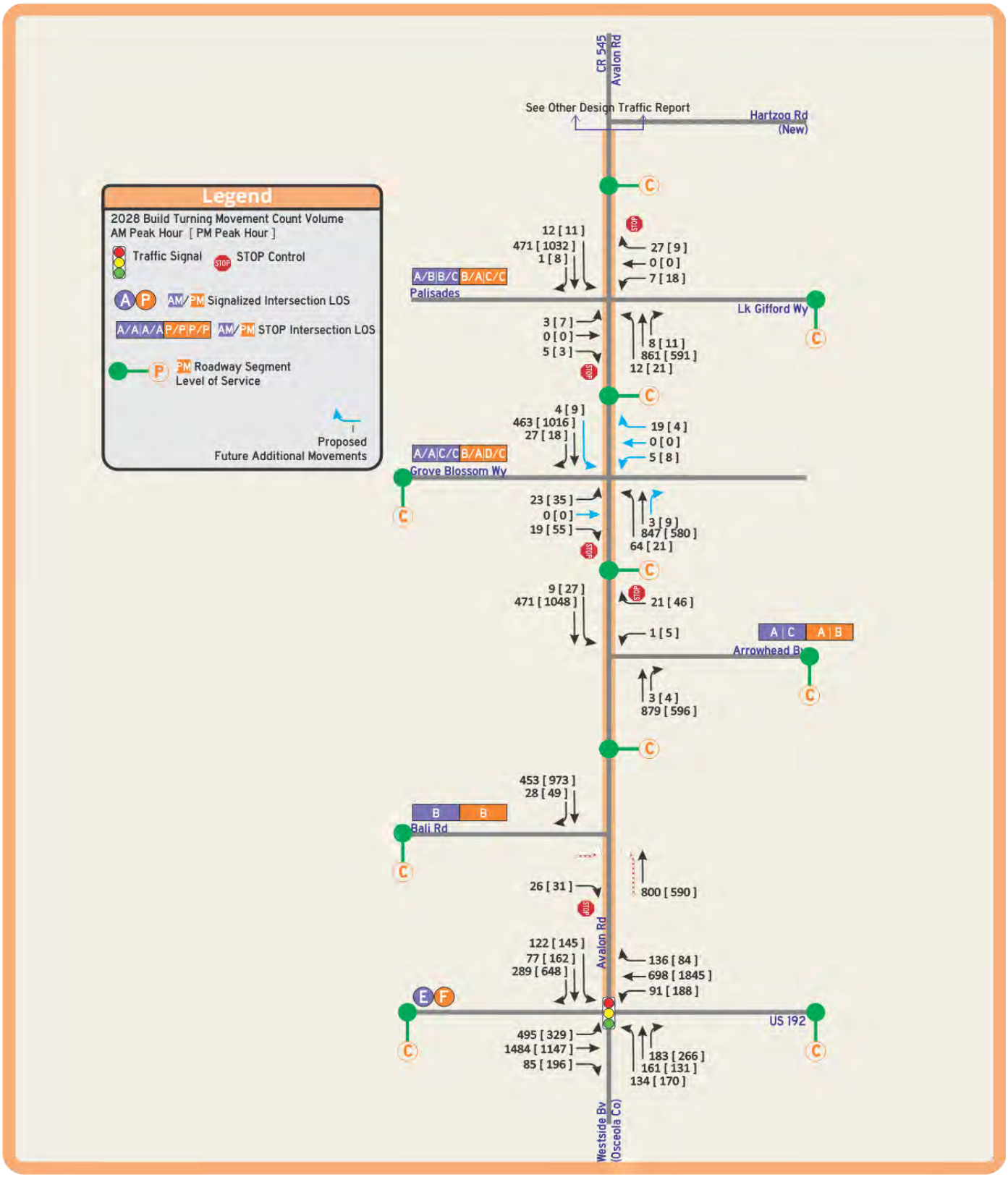
Figure 5-7

No-Build 2038 Turning Movement Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

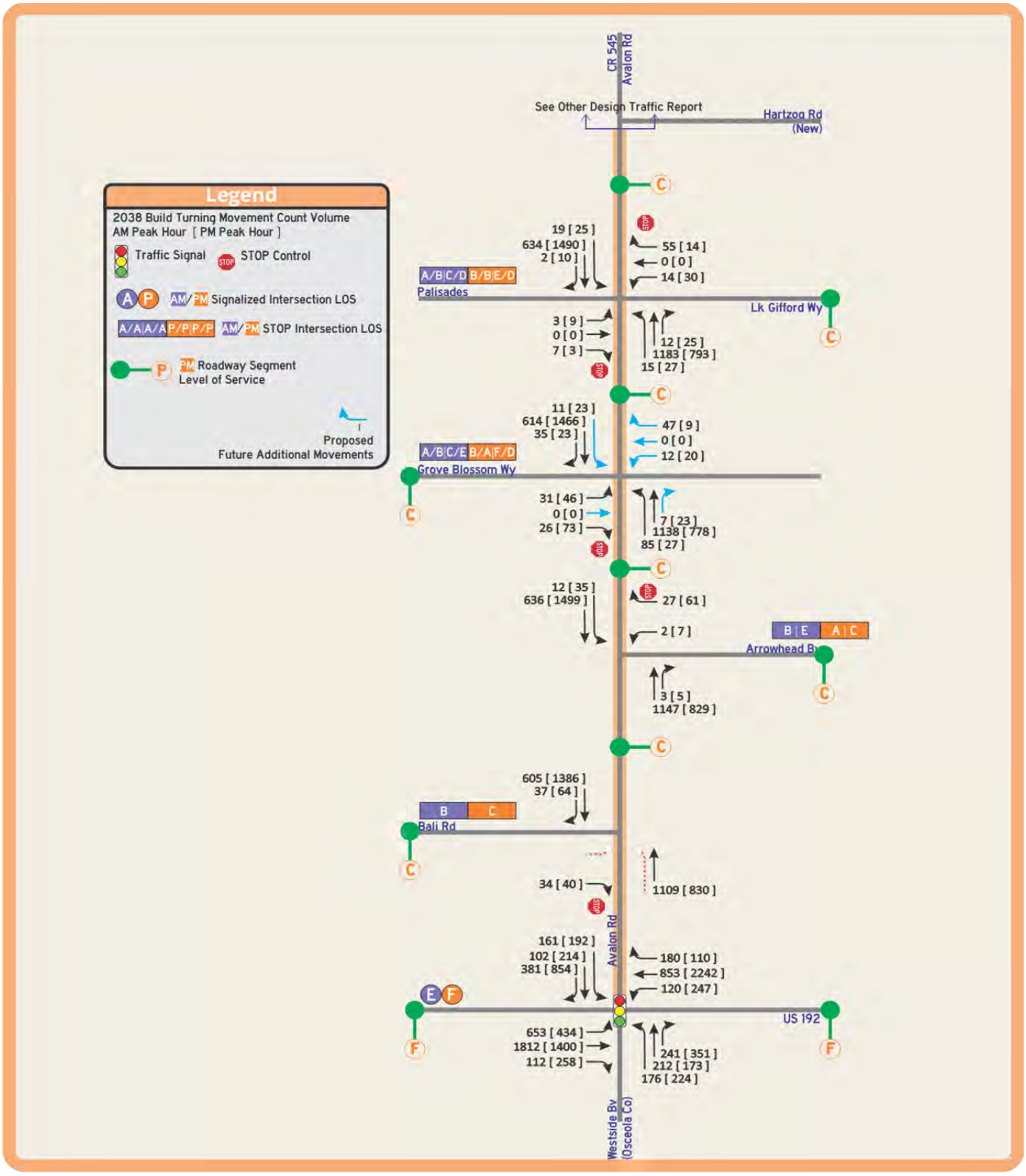
Figure 5-8
No-Build 2048 Turning Movement Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-9

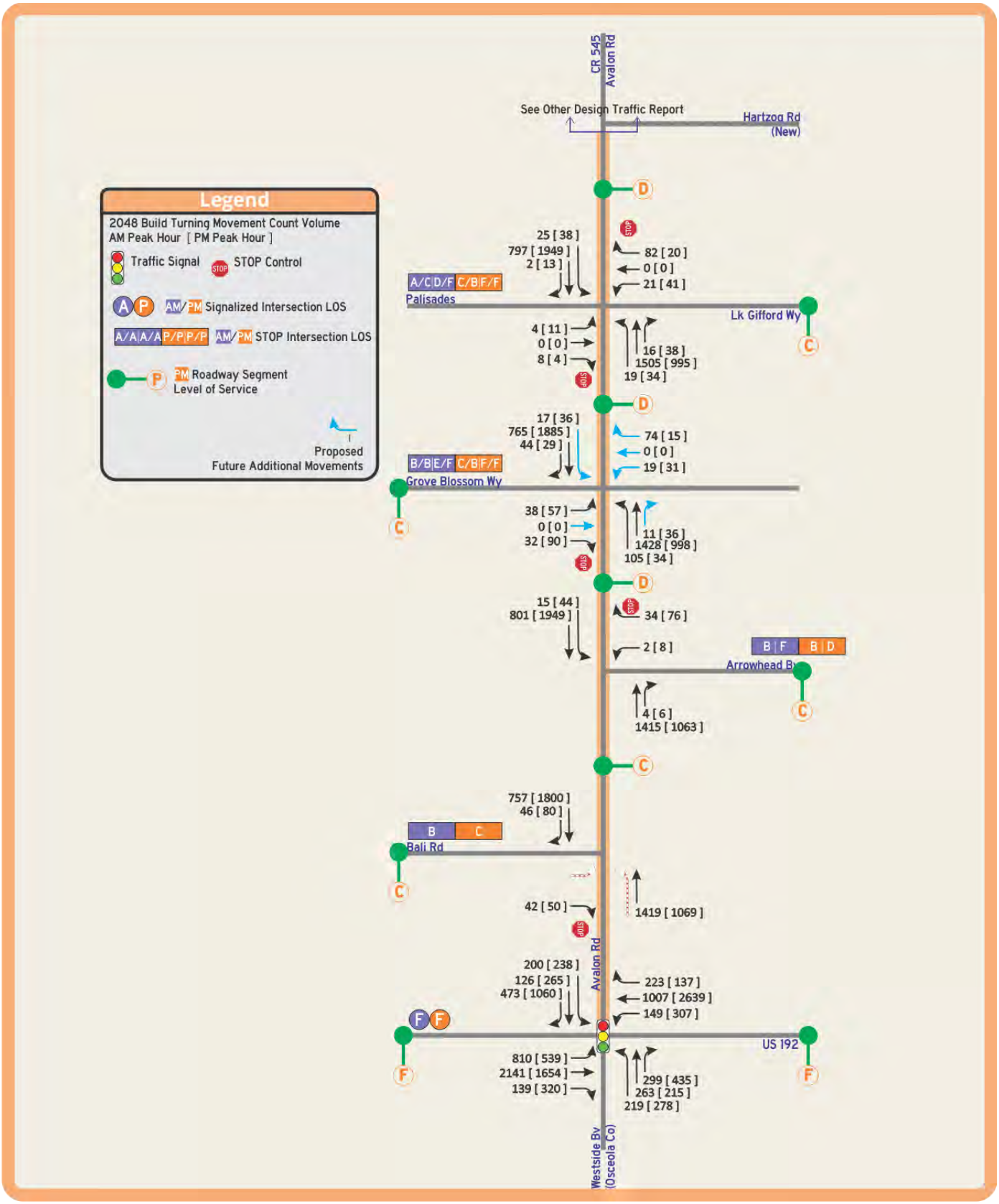
Build 2028 Turning Movement Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-10

Build 2038 Turning Movement Volumes



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-11
Build 2048 Turning Movement Volumes

5.4 Future Year Levels of Service

5.4.1 Future Signal Requirements

Under the No-Build and Build scenarios, the unsignalized intersections along Avalon Road were evaluated for future signal requirements. The need for future signal requirements at these unsignalized locations was assessed using signal warrants #1, #2, #3, #4 and #7 as specified in the latest MUTCD.

The future intersection volumes at the unsignalized intersections were estimated using the same hourly percentages from the existing turning movement counts grown using the projected 2048 design hour volumes for the minor streets and the approved annual growth rates for Avalon Road, to obtain the No-build and Build eight highest hourly volumes.

The future Build Scenario signal warrant summary is provided in Table 5-5. As shown in the table, warrants are not met for the Avalon Road and Arrowhead Boulevard and the Avalon Road and Grove Blossom Way intersections for the design year 2048. Regarding the latter intersection, with future development planned in the area, developers have committed to the County to install signals once traffic demands materialize.

Lake Gifford Road was under construction at the time the traffic data collection, and the eastern leg volumes were assumed based on estimated trip generation of proposed adjacent land use and roadway reconfiguration. Signal warrants were not completed due to these factors, though we understand the County intends to close Lake Gifford Road to the east of Avalon Road at some time in the future, thus it is unlikely that signals will be warranted.

The intersection of Bali Boulevard is too close to the US 192 intersection to consider separate signalization, so warrants were not completed for this intersection.

The summary of the future signal warrant worksheets for the design year 2048 (and 2028 and 2038 where appropriate) are provided in Appendix G.

5.4.2 Operational and Level of Service Analysis

Mainline Level of Service (LOS) analysis was performed for the No-Build and Build scenarios. All conditions were analyzed using the most current adopted procedures as outlined in the Transportation Research Board's - Highway Capacity Manual (HCM), 6th Edition report procedures utilizing the Synchro Software (Version 11).

Specific analysis techniques utilized in this study include unsignalized intersections, signalized intersections and arterial analyses. It should be noted that detailed mainline operational LOS analysis was conducted using the Synchro software which is included in the Final DTTM.

Table 5-5

Signal Justification – Traffic Volume Analysis

Avalon Rd at Arrowhead Bv

Build		Approach Volumes														Qualifying Warrant (1)																	
		Major Roadway																				Minor Street Approach											
2048		Avalon Road								E/W	Arrowhead Boulevard				N/S	Major Street Left Turn Lane						One Lane Analysis (4)						Two Lane Analysis (5)					
Time		Northbound				Southbound				Peds	Westbound				Peds	One Lane Analysis (3)						Left Turn Lane Volume						Total Approach Volume					
From:	To:	Left	Thru	Right	Total	Left	Thru	Right	Total	(2)	Left	Thru	Right	Total	(2)	1A	1B	2	3	4	7	1A	1B	2	3	4	7	1A	1B	2	3	4	7
7	8		1,601	4	1,605	17	877		894	0	10		29	39	2																		
8	9		1,520	4	1,524	21	963		984	0	2		38	40	0																		
12	13		1,245	8	1,253	23	1,203		1,226	0	2		33	35	0																		
13	14		1,162	8	1,170	23	1,169		1,192	0	4		23	27	1																		
14	15		1,286	10	1,296	23	1,314		1,337	0	8		33	41	0																		
15	16		1,074	8	1,082	35	1,601		1,636	0	2		54	56	0																		
16	17		955	4	959	29	1,858		1,887	0	2		33	35	3																		
17	18		1,043	14	1,057	58	1,858		1,916	0	14		88	102	1																		
Warrant 3 Maximum Delay in Vehicle Hours & Warrant 7 Number of Crashes:																																	
Number of hours that a warrant is met:																0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Required Vehicle Hours of Delay / Pedestrians / Accidents to meet warrant:																			4	75	5				4	75	5				5	75	5
Required number of hours to meet warrant:																8	8	4	1	4	8	8	8	4	1	4	8	8	8	4	1	4	8
Minimum Hours of Delay / Pedestrian / Volume Hours Warrant Met?																No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Avalon Rd at Grove Blossom Wy

Build		Approach Volumes																		Qualifying Warrant (1)															
		Major Roadway									Minor Roadway																									
2048		Avalon Road								E/W	Grove Blossom Way								N/S	Major Street Left Turn Lane						Minor Street Approach											
Time		Northbound				Southbound				Peds	Eastbound				Westbound				Peds	One Lane Analysis (3)						One Lane Analysis (4)						Two Lane Analysis (5)					
From:	To:	Left	Thru	Right	Total	Left	Thru	Right	Total	(2)	Left	Thru	Right	Total	Left	Thru	Right	Total	(2)	1A	1B	2	3	4	7	Left Turn Lane Volume						Total Approach Volume					
																										1A	1B	2	3	4	7	1A	1B	2	3	4	7
7	8	105	1,428	11	1,544	17	765	44	826	0	17	0	35	52	7	0	4	11	2	X																	
8	9	90	1,323	10	1,423	21	974	39	1,034	0	27	0	19	46	4	0	7	11	0																	
12	13	40	1,122	40	1,202	25	1,118	16	1,159	0	33	0	49	82	10	0	9	19	0																	
13	14	59	1,015	37	1,111	21	1,121	14	1,156	0	13	0	52	65	11	0	3	14	1																	
14	15	59	1,118	40	1,217	24	1,257	25	1,306	0	31	0	70	101	15	0	8	23	0															X		
15	16	44	999	36	1,079	31	1,619	21	1,671	0	21	0	54	75	11	0	5	16	0																	
16	17	34	998	36	1,068	36	1,885	29	1,950	0	57	0	90	147	31	0	15	46	3		X					X							X	X	X	
17	18	44	986	35	1,065	35	1,848	23	1,906	0	54	0	89	143	19	0	14	33	1		X					X							X	X		
Warrant 3 Maximum Delay in Vehicle Hours & Warrant 7 Number of Crashes:																																			
Number of hours that a warrant is met:																				1	2	0	0	0	0	0	2	0	0	0	0	0	2	3	1	0	0
Required Vehicle Hours of Delay / Pedestrians / Accidents to meet warrant:																							4	75	5				4	75	5				5	75	5
Required number of hours to meet warrant:																				8	8	4	1	4	8	8	8	4	1	4	8	8	8	4	1	4	8
Minimum Hours of Delay / Pedestrian / Volume Hours Warrant Met?																				No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

(1) Posted speed 55 mph, therefore minimum volumes are 70% of the standard requirements.

Warrant 1A - Eight-Hour Minimum Vehicular Volume, Warrant 1B - Eight-Hour Interruption of Continuous Traffic.

Warrant 2 - Four Hour Vehicular Volume (Plotted Point) - Minimum 1-Lane volume - 60 and Minimum 2-Lane volume - 80

*Warrant 3 - Peak Hour Vehicular Volume (Plotted Point) plus Delay Study - Minimum 1-Lane volume - 75 **or** Minimum Delay 4.0 Vehicle Hours*

*Warrant 3 - Peak Hour Vehicular Volume (Plotted Point) plus Delay Study - Minimum 2-Lane volume - 75 **or** Minimum Delay 5.0 Vehicle Hours*

*Warrant 4 - Peak Hour Pedestrian/Bikes Volume crossing **main road** - Minimum Ped/Bike crossing volume - 75*

Warrant 7 - Crash Experience - 80% of Warrant 1 Minimum Threshold Volumes and 5 correctable accidents within a 12 month period.

(2) The Peds column includes pedestrians and bicycle riders. Pedestrians & Bicycle riders under age 12 or adults 65 years or older were doubled.

(3) For the Major Street One Lane Approach Analysis Scenario, the highest northbound or southbound left turn volumes were utilized.

(4) As a conservative analysis, the One Lane Analysis Left Turn Lane Volume utilizes only the Maximum Eastbound or Maximum Westbound left turn volumes for the minor street.

(5) The One lane Analysis utilizes the 100% of the Left turn lane volumes + 100% of the Through lane volumes + 100% of the Right turn volumes.

5.4.3 No-Build Scenario

The No-Build geometry and traffic control for Avalon Road from US 192 to Hartzog Road as shown in Figure 5-12 maintains the same capacity of through-lanes and auxiliary turn lanes as the existing roadway and intersection geometries. Figure 5-4 (presented earlier) provides the No-Build AADT for the study roadway segments.

Figure 5-6 to Figure 5-8 (presented earlier) and Table 5-6 show the opening year, interim year, and design year LOS results for the No-Build scenario along the Avalon Road project corridor.

Opening Year 2028

The projected year 2028 LOS for the Avalon Road RCA roadway segments and study intersections are summarized in Figure 5-6 above and Table 5-6 for the peak hour conditions. The US 192 signalized intersection is projected to operate at LOS E for the AM peak hour and at LOS F PM peak hour.

Of the four (4) full access unsignalized intersections, Bali Boulevard, and Arrowhead Boulevard are projected to operate at LOS D or better for the minor street movements, and LOS B or better for the major street movements. The Grove Blossom Way intersection is projected to operate at LOS E or F for the minor street movements, and LOS A for the major street movements. The Lake Gifford Road intersection is projected to operate at LOS D or E for the minor street movements, and LOS A for the major street movements.

Interim Year 2038

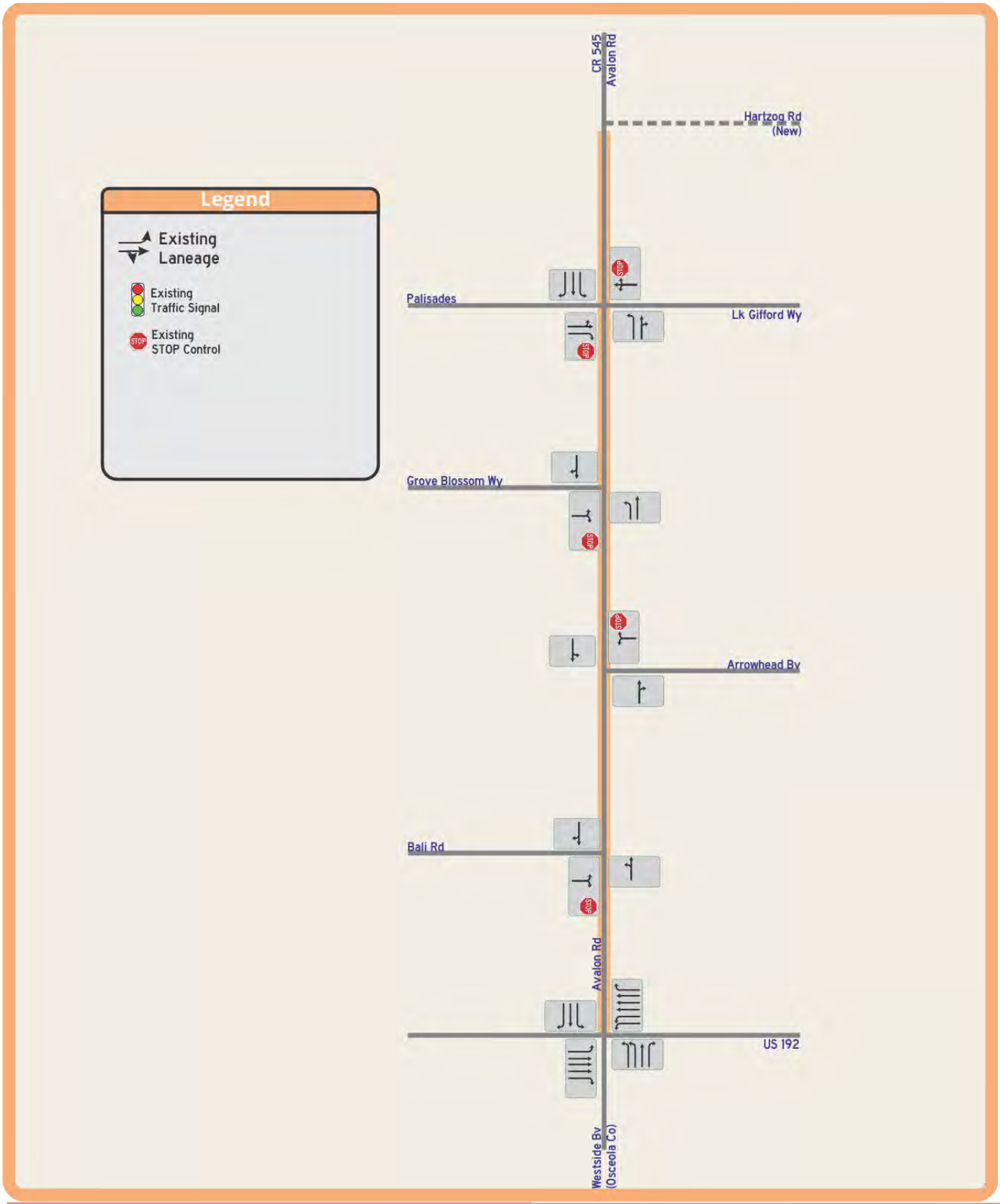
As shown in Figure 5-7 (presented earlier) and Table 5-6, the PM Peak Hour, the US 192 and Avalon Road signalized intersection is projected to operate at LOS F. The unsignalized intersections at Bali Road, Grove Blossom Way, and Lake Gifford Road are projected to operate at LOS E or F for the minor street movements, and LOS A or B for the major street movements over the peak hours.

The Arrowhead Boulevard intersection is projected to operate at LOS C for the minor street movements, and LOS A for the major street movements over the peak hours.

Design Year 2048

The projected year 2048 LOS for the Avalon Road RCA study intersections are summarized in Figure 8 above and Table 5-6 for the peak hour conditions. The US 192 signalized intersection is projected to operate at LOS F for the AM and PM peak hours.

Of the four (4) full access unsignalized intersections, Bali Road, Grove Blossom Boulevard, and Lake Gifford Road are projected to operate at LOS F or better for the minor street movements, and LOS B or better for the major street movements. The Arrowhead Boulevard intersection is projected to operate at LOS C or D for the minor street movements, and LOS B or better for the major street movements.



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-12

No-Build Geometry

Table 5-6

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)
Projected Intersection Delay and LOS for the Study Intersections - No -build Scenarios

Study Intersections	Future Traffic Control	No-build AM Peak Hour - Existing 2-Lane Avalon Road Cross Section					
		Opening Year 2028		Mid Year 2038		Design Year 2048	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Avalon Road							
Lake Gifford Rd	STOP [1]	8.2 / 9.9 | 31.5 / 19.3	A / A | D / C	8.4 / 10.7 | 48.5 / 26.6	A / B | E / D	8.7 / 11.6 | 78.7 / 42.9	A / B | F / E
Grove Blossom Wy	STOP [1]	8.4 / 9.3 | 39.9 / 35.8	A / A | E / E	8.7 / 9.9 | 70.7 / 53.8	A / A | F / F	9.0 / 10.5 | 151.6 / 89.1	A / B | F / F
Arrowhead Bv	STOP [3]	9.4 | 16.2	A | C	10.0 | 18.6	A | C	10.6 | 21.9	B | C
Bali Rd	STOP [4]	8.3 | 36.6	A | E	8.5 | 48.9	A | E	8.7 | 60.1	A | F
US 192	Signal	77.7	E	86.8	F	100.4	F

Study Intersections	Future Traffic Control	No-build PM Peak Hour - Existing 2-Lane Avalon Road Cross Section					
		Opening Year 2028		Mid Year 2038		Design Year 2048	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Avalon Road							
Lake Gifford Rd	STOP [1]	9.9 / 9.0 | 44.3 / 37.4	A / A | E / E	11.0 / 9.4 | 80.3 / 76.8	B / A | F / F	12.3 / 9.8 | 159.9 / 218.5	B / A | F / F
Grove Blossom Wy	STOP [1]	9.9 / 8.5 | 54.7 / 50.7	A / A | F / F	10.9 / 8.8 | 145.1 / 114.1	B / A | F / F	12.3 / 9..2 | *** / ***	B / A | F / F
Arrowhead Bv	STOP [3]	8.5 | 14.9	A | B	8.9 | 19.2	A | C	9.3 | 28.1	A | D
Bali Rd	STOP [4]	10.1 | 29.8	B | D	11.0 | 42.6	B | E	12.2 | 59.6	B | F
US 192	Signal	84.2	F	86.1	F	109.2	F

Notes:

[1] - NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

[2] - NB Left Turn Major Street Movement | EB Minor Street Movement

[3] - SB Left Turn Major Street Movement | WB Minor Street Movement

[4] - EB Minor Street Movement

* Geometry was applied to attempt to achieve adopted level of service. The adopted level of service was not achieved at all intersections.

* A maximum turn lane geometry recommended was dual left turn lanes and/or dual right turn lanes.

* The resultant geometries are shown in the attached figure.

* County may refine the year 2048 build geometries and construct phased improvements between existing and build-out year.

* All roadway segments were verified to operate within adopted LOS capacities for a 4-lane divided arterial.

5.4.4 Build Scenario

The proposed Build geometry and traffic control for Avalon Road from US 192 to Hartzog Road as shown in Figure 5-13 includes an additional through lane for the major street through- movements and turn lanes as required.

Based on the programmed and planned improvements, Avalon Road, between US 192 and Hartzog Road (realigned) is planned to be widened to four lanes by the opening year 2028. Figure 5-5 (presented earlier) provides the Build AADT for the study roadway segments.

Figure 5-9 to Figure 5-11 (presented earlier) and Table 5-7 show the opening year, interim year, and design year LOS results for the No-Build scenario along the Avalon Road project corridor.

Opening Year 2028

The projected year 2028 LOS for the Avalon Road RCA study intersections are summarized in Figure 5-9 and Table 5-7 for the peak hour conditions. The US 192 signalized intersection is projected to operate at LOS E for the AM peak hour and at LOS F for the PM peak hour.

The four (4) full access unsignalized intersections, Bali Boulevard, Arrowhead Boulevard, Grove Blossom Way, and Lake Gifford Road are projected to operate at LOS D or better for the minor street movements, and LOS B or better for the major street movements.

Interim Year 2038

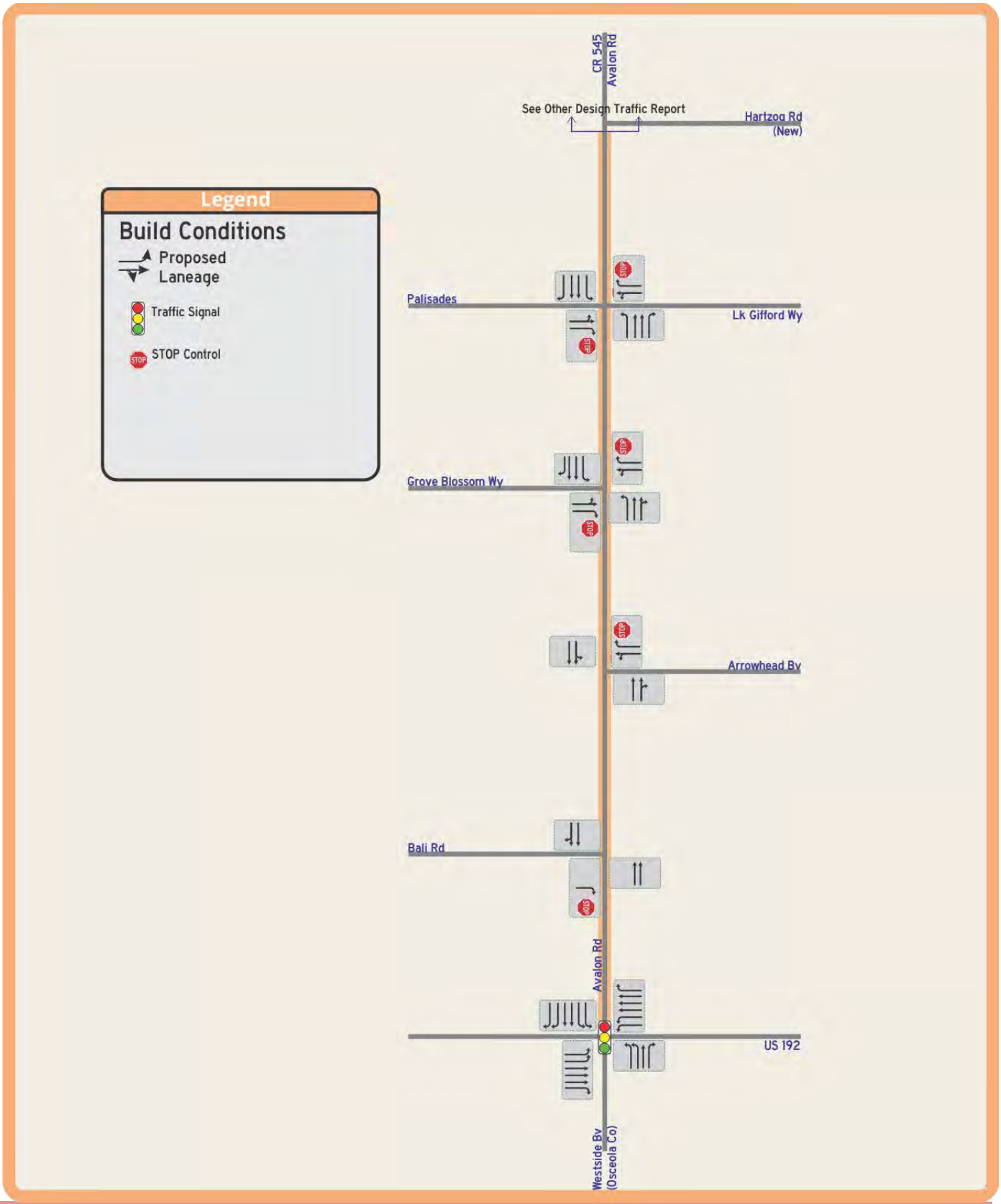
As shown in Figure 5-10 above and Table 5-7, the, the projected year 2038 LOS for the Avalon Road RCA roadway segments and study intersections the US 192 signalized intersection is projected to operate at LOS E for the AM peak hour and at LOS F for the PM peak hour.

Of the four unsignalized intersections, Bali Boulevard (right-in/out only) and Arrowhead Boulevard (full access) are projected to operate at LOS C or better for the minor street movements, and LOS B or better for the major street movements. The Arrowhead Boulevard and Lake Gifford Road unsignalized intersections are projected to operate at LOS E or F for the minor street movements, and LOS B or better for the major street movements.

Design Year 2048

The projected year 2048 LOS for the Avalon Road RCA roadway segments and study intersections are summarized in Figure 5-11 and Table 5-7 for the peak hour conditions. As shown, the year 2048 peak hour conditions, the US 192 signalized intersection is projected to operate at LOS F for the AM and PM peak hours.

Of the four unsignalized intersections, Bali Boulevard (right-in/out only) is projected to operate at LOS C or better for the minor street movement. The Arrowhead Boulevard, Grove Blossom Way and Lake Gifford Road unsignalized intersections are projected to operate at LOS E or F for the minor street movements, and LOS C or better for the major street movements.



Avalon Road from US 192 to Hartzog Road
RCA – Design Traffic Report

Figure 5-13
Build Geometry

Table 5-7

Avalon Road Roadway Conceptual Analysis - From US 192 to Hartzog Rd (New)
Projected Intersection Delay and LOS for the Study Intersections - Build Scenarios

Study Intersections	Future Traffic Control	Build AM Peak Hour - Proposed 4-Lane Avalon Road Cross Section					
		Opening Year 2028		Mid Year 2038		Design Year 2048	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Avalon Road							
Lake Gifford Rd	STOP [1]	8.4 / 11.0 | 14.7 / 9.8	A / B | B / C	8.9 / 13.6 | 19.4 / 293	A / B | C / D	9.6 / 17.6 | 28.6 / 51.5	A / C | D / F
Grove Blossom Wy	STOP [1]	8.6 / 9.8 | 16.5 / 21.9	A / A | C / C	9.3 / 11.4 | 23.9 / 36.2	A / B | C / E	10.2 / 13.6 | 41.4 / 72.0	B / B | E / F
Arrowhead Bv	STOP [3]	9.9 | 16.2	A | C	11.3 / 42.2	B | E	13.2 | 74.4	B | F
Bali Rd	STOP [4]	10.1	B	10.8	B	11.7	B
US 192	Signal	55.6	E	62.8	E	86.6	F

Study Intersections	Future Traffic Control	Build PM Peak Hour - Proposed 4-Lane Avalon Road Cross Section					
		Opening Year 2028		Mid Year 2038		Design Year 2048	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Avalon Road							
Lake Gifford Rd	STOP [1]	10.8 / 9.5 | 23.6 / 17.4	B / A | C / C	14.1 / 10.8 | 46.6 / 26.5	B / B | E / D	20.1 / 12.5 | 120.6 / 50.4	C / B | F / F
Grove Blossom Wy	STOP [1]	10.7 / 8.8 | 26.0 / 17.7	B / A | D / C	14.0 / 9.7 | 72.1 / 26.6	B / A | F / D	19.9 / 10.9 | *** / 81.0	C / B | F / F
Arrowhead Bv	STOP [3]	8.9 | 11.6	A | B	9.9 | 24.6	A | C	11.2 | 25.0	B | D
Bali Rd	STOP [4]	12.9	B	16.8	C	23.5	C
US 192	Signal	85.2	F	145.0	F	166.20	F

Notes:

[1] - NB / SB Left Turn Major Street Movement | EB / WB Minor Street Movements

[2] - NB Left Turn Major Street Movement | EB Minor Street Movement

[3] - SB Left Turn Major Street Movement | WB Minor Street Movement

[4] - EB Minor Street Movement

* Geometry was applied to attempt to achieve adopted level of service. The adopted level of service was not achieved at all intersections.

* A maximum turn lane geometry recommended was dual left turn lanes and/or dual right turn lanes.

* The resultant geometries are shown in the attached figure.

* County may refine the year 2048 build geometries and construct phased improvements between existing and build-out year.

* All roadway segments were verified to operate within adopted LOS capacities for a 4-lane divided arterial.

Based on the intersection level of service analyses, the Build scenario would provide improved traffic flow for the Opening Year 2028, the Mid-Design Year 2038 and the Design Year 2048 volumes.as shown in Table 5-7. The Synchro printouts for the intersection LOS for the Opening Year, the Mid-Design Year, and Design Year for design hour for the No- Build and Build scenarios are provided in Appendix G.

Output from the Synchro 11 analysis completed for the design year 2048 intersection volumes was also utilized to develop the 95th percentile queue lengths for the Avalon Road RCA study intersections. The estimated queue lengths for each study intersection are presented as part of Conclusions and Recommendations section of this report.

5.5 Recommended Improvements

Based on the evaluation of operating conditions for the design year 2048 Build scenario, this study provides the following recommendations to improve traffic flow along Avalon Road from US 192 to Hartzog Road (realigned):

- Widen Avalon Road from US 192 to Hartzog Road to provide a four-lane, divided urban facility

In addition to the above improvements, this study used Synchro to develop the queue length requirements at the signalized intersections along the study corridor. In case of the unsignalized intersections, calculated queue lengths were based on the 95th percentile queue lengths from the Synchro analysis using HCM methods.

Actual design and implementation of these storage length requirements will be a function of design and the physical practicality of their construction. Further information on the intersection storage requirements can be found in DTTM.

6 ALTERNATIVES ANALYSIS

The objective of the alternatives analysis process is to identify technically and environmentally sound alternatives to provide a safe transportation facility that meets the purpose and need of the project, is acceptable to the community, minimizes impacts on the environment, and is cost effective. The process results in the selection of a Preferred Alternative, which can be advanced to the design phase. This section summarizes the alternatives considered for this project.

6.1 Opportunities and Constraints

6.1.1 Right-of-Way Constraints

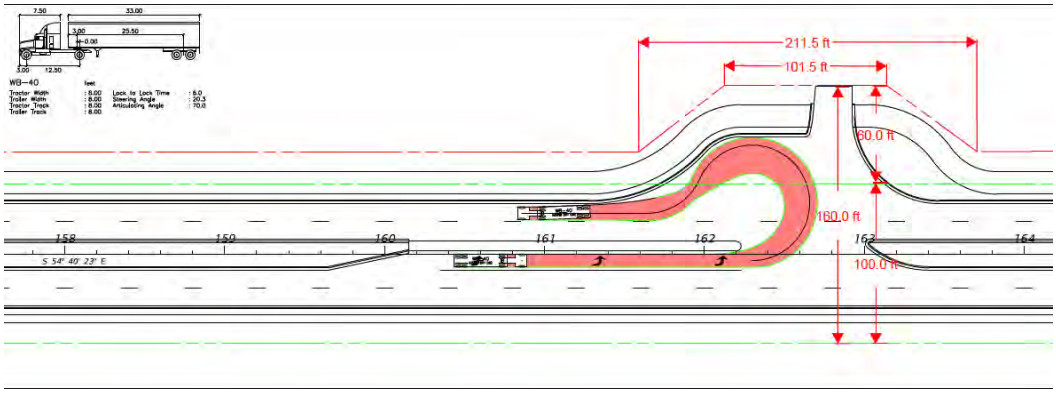
The existing Avalon Road right-of-way varies throughout the project. With new development and dedications, the existing right-of-way has increased in various areas, though a 66-foot right-of-way can still be found on some sections of the project corridor (see existing Right-of-Way Maps, Appendix B).

The project corridor is rapidly developing with several new developments planned in the corridor (see Section 3.9.2, Future Land Use). Some developments have already dedicated right-of-way for future roadway widening (Registry at Grass Lake, Avalon Groves, Avalon Point, Palisades) which in effect provide a constraint against future acquisition along these properties. As a result, if additional right-of-way is needed for the ultimate typical section, it is likely that such acquisition would occur on the opposite side of Avalon Road at these properties to avoid impacting the buildout plans for a given development.

6.1.2 U-turn Accommodations

The County has expressed a desire to provide for the ability of trucks (WB-40) to make U- turns along the corridor. As shown on Figure 6-1, the typical right-of-way width required at a median opening to accommodate this movement is approximately 160 feet.

Figure 6-1: Typical U-turn Layout



However, with six developments planned in the project corridor, there may not be many opportunities to take additional right-of-way to accommodate U-turn movements. Since the County does not wish to acquire additional right-of-way from a property from which right-of-way has already been acquired (or planned to be dedicated), the project improvements will generally be constrained unless additional right-of-way is acquired. Therefore, the ability to provide U- turns along the project may not be feasible for most of this contract.

6.2 Opportunities for Improvement

6.2.1 Bali Boulevard

Bali Boulevard intersects with Avalon Road approximately 155 feet north of US 192. This relatively close separation results in operating and safety issues. Currently, Bali Boulevard carries approximately 2100 vpd, and had 10 crashes over the past five years.

With the future Avalon Road typical section envisioned to include a median throughout Avalon Road, there are several options to consider in developing the Avalon Road improvements while addressing the existing conditions at this intersection:

Option A1, Realign Bali Boulevard – Under this option, Bali Boulevard would be realigned to the north and a full median opening would be provided to also serve this roadway as well as the north driveway of the WaWa station, which is approximately 400 feet north of US 192. Although this option would allow all movements to operate at this intersection, this opening is not consistent with FDOT access management guidelines which require a minimum spacing of 660 feet for Roadway Access Class 7 (least restrictive). For this project, Class 5 is preferred and recommended which requires a 1,320-foot spacing between full median openings.

Advantages

- Provides more separation from US 192 movements with some improvement in operations expected
- Ambulance operations from the Four Corners Advent ER would be able to turn left onto NB Avalon Road

Disadvantages

- Requires property acquisition
- Proposed intersection is still relatively close to US 192 and left turning movements to/from Bali Boulevard would need ***to cross six travel lanes*** along Avalon Road which is expected to result in potential safety issues and create operational issues with nearby US 192.
- The new alignment may encroach into suspected sinkhole remnants.
- Does not meet FDOT access management guidelines.

Option A2, Maintain Current Location of Bali Boulevard – Under this option, Bali Boulevard would maintain its' current location, though a continuous median along Avalon Road would be provided that would result in only right in/right out operations.

Advantages

- Improves operations at US 192 and provides better safety conditions by eliminating an intersection along Avalon Road
- Does not require property acquisition
- Meets FDOT access management guidelines.

Disadvantages

- Provides only right in/right out operations. Currently, over 80% of the traffic movements at Bali Boulevard make a left turn onto NB Avalon Road in the morning. This traffic would need to turn right

onto WB US 192 and utilize a median opening that is 900 feet west of Avalon Road for U-turn operations. In addition, ambulance operations from the Four Corners Advent ER would need to perform the same movement as well.

Given the safety, operational, and access management implications of providing a full median opening, this study recommends that a continuous median be constructed and only right in/right out operations be allowed. See Appendix A, Concept Maps, for the proposed treatment at Bali Boulevard.

6.2.2 Avalon Road/US 192 Intersection

Currently, Avalon Road intersects US 192 at a heavy skew which may create potential sight distance issues for southbound traffic on Avalon Road. Also, the current tight horizontal curvature of the roadway results in substandard vehicle operations with low operating speeds. Some options to address this situation would include the following:

Option B1, Realign Avalon Road to Reduce Skew – Under this option, the Avalon Road alignment would be shifted to the west to allow it to intersect with US 192 at an improved skew angle. However, even with the reduced skew, supplemental signal heads should still be considered to alert oncoming SB Avalon Road movements.

Advantages

- Provides better sight distance with safety benefits and improves Avalon Road operating speeds

Disadvantages

- Requires property acquisition and wetland impact mitigation

Option B2, Maintain Current Location of Avalon Road – Under this option, Avalon Road would maintain its' current location and intersection geometrics configured with a substandard horizontal curve.

Advantages

- Some property acquisition and wetland impacts would occur, though less than the previous alternative.

Disadvantages

- Sight distance issues for SB Avalon Road improvements would remain resulting in potential safety issues, though can be mitigated somewhat with the use of supplemental signal heads at US 192
- Reduced operating speeds can still be expected.

This report recommends that Option B1 be carried forward to provide operational and safety benefits.

6.3 Alternatives Development

The following alternatives were considered during the RCA study:

- No-Build Alternative
- Transportation Systems Management and Operations (TSMO)
- Build Alternatives (Needed if neither of the above alternatives can meet certain project parameters such as traffic demands, etc).

Build Alternatives which will result in right-of-way acquisition will be needed. To arrive at recommended alignment, a conventional left/right/hybrid alignment analysis was conducted to determine the optimum configuration. Three alignment alternatives were prepared to examine a west alignment option, east alignment option and a hybrid option.

- West Alternative Alignment – This alternative would provide for the proposed typical section and would be aligned to hold the existing west right-of-way line. Consequently, the proposed improvements would be located entirely to the east of the west right-of-way line.

- East Alternative Alignment – This alternative would provide for the proposed typical section and would be aligned to hold the existing east right-of-way line. Consequently, the proposed improvements would be located entirely to the west of the east right-of-way line.

- Hybrid Alternative Alignment – This alternative would provide for the proposed typical section and would be aligned to take advantage of current open areas where right-of-way impacts can be minimized and avoid areas where existing or planned developments have already dedicated right-of-way. This hybrid alignment may cross from one side of the corridor to the other where necessary to avoid existing/planned developments that could result in expensive right-of-way impacts.

See Sections 6.3 and 6.4 for further discussion regarding these alternatives.

6.3.1 No-Build Alternative

The No-Build Alternative assumes that no modifications or improvements will be implemented for Avalon Road within the limits of the study. The primary advantages of the No-Build Alternative are that it does not directly require any capital or expenditure of funds and it produces no physical or social impacts.

Certain advantages would be associated with the implementation of the No-Build Alternative:

- No acquisition of right-of-way
- No design, right-of-way, or construction costs
- No inconvenience to the traveling public and property owners during construction
- No impacts to utilities
- No impacts to the adjacent natural, physical, and human environment

The potential disadvantages of the No-Build Alternative include:

- Is not consistent with the Orange County Comprehensive Plan
- Does not improve multimodal mobility, particularly for pedestrians and bicyclists
- Results in reduced LOS and increased traffic congestion
- May increase motor vehicle crashes, property damage, injuries, and fatalities due to increased congestion
- Due to increased congestion, emergency vehicle access may be degraded
- Increased user costs due to higher levels of congestion

6.3.2 Transportation Systems Management and Operations (TSMO)

TSMO alternatives involve low-cost improvements designed to maximize the utilization and efficiency of the existing facility through improved system and demand management. The various TSMO options generally include minor projects such as traffic signal and intersection improvements, access management, and transit improvements.

However, the additional capacity required to meet the projected traffic volumes along Avalon Road in the design year cannot be provided solely through the implementation of TSMO improvements only. Additional capacity is needed by means of expanding the existing section from two lanes to a four-lane facility.

6.3.3 Build Alternatives

The following sections discuss the typical sections and alignment alternatives considered for this project.

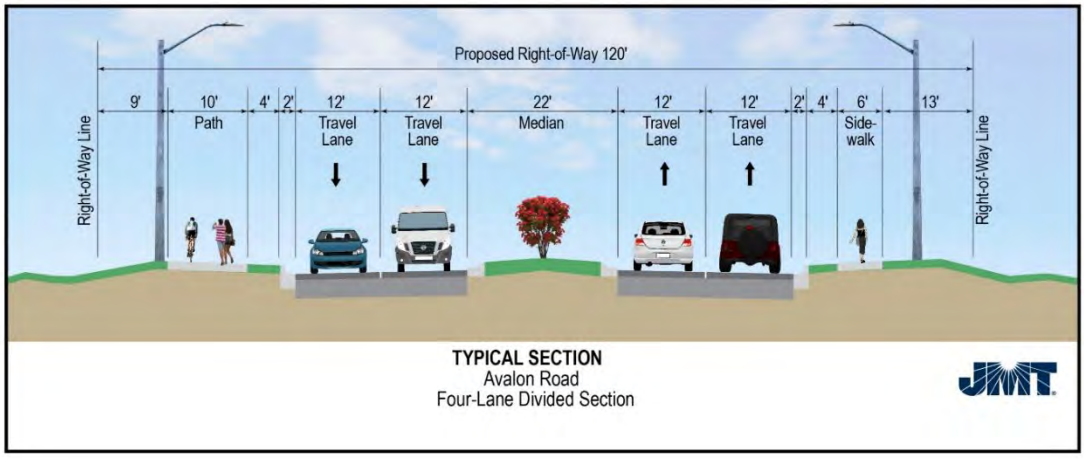
6.3.3.1 Typical Sections

There are a number of factors which were considered during the development of typical sections for this project including the need to address capacity requirements, future traffic needs, input from the public, standard engineering practices, and compliance with requirements of the Americans with Disabilities Act (ADA).

Another key objective was to utilize where possible the typical section that was adopted for the upcoming Avalon Road widening improvements to the north of Hartzog Road for consistency purposes and continuity. This typical section met all of the other objectives of the RCA study by providing the necessary capacity as well as multi-modal accommodations for pedestrians and bicyclists. As a result, the proposed typical section for this study is shown in Figure 6-2 and is almost identical to the typical used to the north of Hartzog Road, with the only difference being the width of the utility strip between the curb and sidewalk/path.

The basic elements of the proposed typical section consist of two 12-foot travel lanes in each direction separated by a 22-foot median with Type E curb and gutter along the inside lanes and Type F curb and gutter is used along the outside lanes. To improve multi-modal travel, a six-foot-wide sidewalk will be provided along east side of Avalon Road while a 10-foot-wide multiuse path will be provided on the west side of the roadway to match the planned path improvements to the north of Hartzog Road. This typical will have a preferred minimum right-of-way width of 120 feet.

Figure 6-2 - Proposed Typical Section



6.4 Evaluation of Alignment Alternatives

Three alignment alternatives were considered for this study and are described further below. For all three alternatives, the alignment from US 192 to north of Arrowhead Boulevard is common and utilized by all three alternatives to reflect the County's wishes to improve the US 192 intersection geometrics by shifting the alignment to the west to reduce the existing severe skew. By shifting the proposed alignment to the west, the resulting horizontal alignment is expected to improve operating speeds and sight distance characteristics.

West Build Alignment

The West Build Alignment holds the existing west right-of-way line to the north of Arrowhead Boulevard and acquires additional right-of-way along the east side of the roadway. This alternative would impact open areas as well as the planned Westgate, Grove Resort Phase 5 and Karr PD Village planned developments. The West Alignment would also impact an existing Toho utility easement along the east side of Avalon Road.

East Build Horizontal Alignment

The East Build Alignment holds the east existing right-of-way line and would acquire the additional right-of-way from the west side of the roadway. This alternative would impact the Registry at Grass Lake and PRS Properties planned developments, and the Palisades existing development, though it would not impact the existing Toho utility easement.

Hybrid Build Alignment

The Hybrid Build Alignment utilizes the existing right-of-way to its fullest extent while minimizing impacts to existing and planned developments along the corridor. The Hybrid Alignment would also impact an existing Toho utility easement in some areas along the east side of Avalon Road.

An evaluation of the alignment alternatives was conducted taking into consideration various impacts including social, natural and physical environmental, including construction and right-of-way costs. The evaluation is summarized in a matrix evaluation as shown in Table 6-1.

6.5 Preferred Alternative

Based on the matrix evaluation and public involvement activities, the preferred alternative is the Hybrid Build Alignment since it minimizes right-of-way impacts to existing/planned developments along the corridor. The Hybrid Alternative also has several advantages over the No Build Alternative since it future traffic demands, improves drainage and stormwater treatment, and provides for multi-modal accommodations.

The Recommended Concept Plans are contained in Appendix A and are described in more detail in this report in Section 7.0 Preliminary Design Analysis. The right-of-way identification maps for the preferred concept are contained in Appendix B.

Table 6-1
Alternative Matrix Evaluation

Evaluation Criteria	No-Build Alternative	West Alignment Alternative	East Alignment Alternative	Preferred Alignment Alternative
	No Improvements	Four-Lane Urban Section with 6' SW and 10' Path	Four-Lane Urban Section with 6' SW and 10' Path	Four-Lane Urban Section with 6' SW and 10' Path
Relocations				
Number of Residential Acquisitions	None	None	None	None
Number of Business Acquisitions	None	None	None	None
Number of Parcels Impacted	None	36	31	40
Right-of-Way Impacts (Acres) (1)	None	17.8	18	17.9
Social, Natural and Physical Impacts				
Social and Neighborhood	None	None	None	None
Archeological/Historic Sites	None	None	None	None
Threatened and Endangered Species (2)	None	Moderate	Moderate	Moderate
Wetland Impacts - Roadway and Ponds Ac)	None	1.04	1.06	1.74
RHPZ Uplands (Acres)	None	None	None	None
Floodplains (Acres)	None	5.05	4.63	5.25
Potential High or Medium Ranked Contamination Sites	None	None	None	None
Estimated Costs (Present Day Costs)				
Estimated Construction Costs	No Cost	$ 25,974,295	$ 25,954,417	$ 25,995,128
Design and Admin Costs (10% of Construction)	No Cost	$ 2,597,429	$ 2,595,442	$ 2,599,513
CEI (12% of Construction)	No Cost	$ 3,116,915	$ 3,114,530	$ 3,119,415
Right-of-Way Acquisition (3)	No Cost	$ 3,295,314	$ 3,332,340	$ 3,313,827
Wetland Mitigation	No Cost	$ 98,000	$ 100,000	$ 164,000
RHPZ Uplands Mitigation	No Cost	None	None	None
Reimbursable Utility Relocation	No Cost	$ 2,986,000		$ 2,986,000
Subtotal		$ 38,067,954	$ 35,096,729	$ 38,177,883
Contingencies (20%)		$ 7,613,591	$ 7,019,346	$ 7,635,577
TOTAL ESTIMATED COSTS		***$ 45,681,544***	***$ 42,116,075***	***$ 45,813,460***

(1) Right-of- Way Requirements Reflect the Required Right-of-Way fro the Each Roadway Alternative Combined with the Right-of-Way Needed for the Recommended Ponds

(2) All Roadway Alignments Have Low Wildlife Impacts, Though When Combined with the Recommended Ponds 2A, 3A, and 3B, the Overall Rating is Raised to Moderate to Recognize Habitat that is Present and Suitable for Inhabiting Wildlife Species (ie, Gopher Tortoise, Burrowing Owl, Sand Skink, Florida Scrub Jay, Crested Caracara.

(3) Does Not Include Business Damages

7 PREFERRED ALTERNATIVE

This section presents the results of the preliminary design analysis that was conducted for the preferred alternative identified in Section 6.4. The proposed project improvements will address the increased mobility demands and safety needs along the corridor, while minimizing impacts to the social, natural, and physical environment.

7.1 Design Traffic Volumes

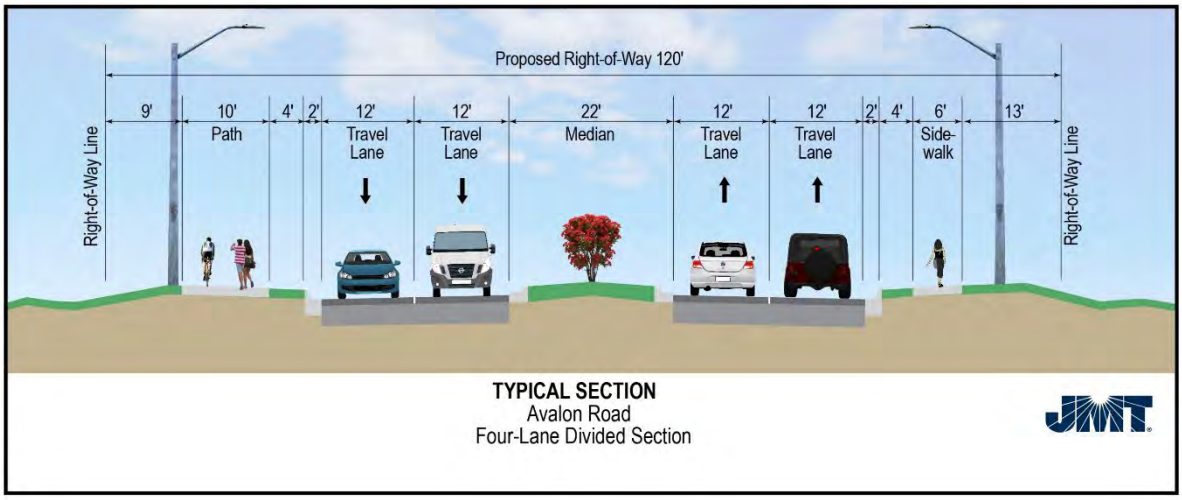
The Avalon Road Roadway Conceptual Analysis Design Traffic Technical Memorandum (DTTM) in Appendix G documents the existing traffic conditions and the analysis of the No-Build and Build scenarios. The existing and future traffic conditions and the associated analyses are summarized in Section 5 of this report. All roadway segments and intersections will operate at an acceptable level of service in the design year of 2048.

7.2 Typical Section and Alignment

The proposed typical section is shown on Figure 7-1 and the preferred alignment is shown on the concept plans contained in Appendix A. The roadway design elements incorporated into the preferred alternative include the following:

- Four 12-foot travel lanes
- Multi-modal accommodations including a six-foot sidewalk located on the east side Avalon Road and a 10-foot path on the west side of Avalon Road which will connect to the planned path north of Hartzog Road
- A 22-foot raised median with Type E curb and gutter.
- Type F curb and gutter along the outside lanes with four-foot utility strips between the back of curb and the sidewalk or path
- The proposed right-of-way is typically 120 feet wide

Figure 7-1
Proposed Typical Section



7.3 Intersection Concepts and Signal Analysis

Within the project limits, there is one existing signalized intersection at US 192, although future signals will be constructed by others at the intersections with Grove Blossom Way and also at Hartzog Road once traffic volumes reach warranted levels. The proposed lane improvements at intersections along the corridor are shown in Appendix A.

7.4 Alignment and Right-of-Way Needs

The preferred alignment is shown in Appendix A. In general, additional right-of-way will be needed to accommodate the proposed typical section. The right-of-way requirements are shown in the concept plans contained in Appendix A and are also displayed on the right-of-way identification maps contained in Appendix B.

7.5 Drainage

7.5.1 Preliminary Design Analysis

The design of the stormwater management facilities for the project is governed by the rules set forth by SFWMD and Orange County. Water treatment and attenuation requirements will comply with the guidelines as defined in the SFWMD ERP Manual. The stormwater management facilities have been sized to meet the criteria of the SFWMD and the Orange County Public Works Department Engineering Manual. The following drainage design criteria has been used for the sizing of the proposed stormwater management ponds:

- For a project or portion of a project located within an open drainage basin, the allowable discharge is based on the SFWMD's 24-hour, 25-year rainfall maps and the NRCS Type II Florida Modified 24-hour rainfall distribution.

- The Orange County Municipal Code indicates that "[f]or predevelopment time of concentration between zero and thirty (30) minutes, use six-hour storm duration for design" and "[f]or predevelopment time of concentration over thirty (30) minutes, use twenty-four-hour storm duration for design." The 25-year 6-hour rainfall total is 5.75 inches, and the 24-year 24-hour rainfall total is 8.4 inches (based on intensity of rainfall derived from FDOT rainfall charts, per municipal code). For this project, a design storm of the 25-year, 24-hour rainfall was used for pond sizing to meet the SFWMD criteria and to be conservative.
- The post-development volume of direct runoff must not exceed the pre-development volume of direct runoff for the 25-year frequency, 96-hour duration storm for systems discharging to landlocked lakes which are adjacent to properties of more than one ownership.
- A stormwater facility shall be designed as an open space amenity which is consistent with the urban design concepts of the particular CVC. Stormwater facilities serving nonresidential development may be located outside of the area designated for commercial or office development.
- Except as stated below, a retention or detention facility shall be designed with a maximum side slope of 5:1, so that fencing is not required. A wet-bottom retention pond with a side slope steeper than 5:1 may be permitted as an integral element of the urban design or architectural theme of the development.
- Pool depths should be a minimum of six feet below the design "normal" water level.
- A wet-bottom retention pond shall be landscaped in accordance with the following criteria:
    - Up to two and one-half acres. At least ten percent of the land above the design high-water level, excluding maintenance berms, shall be landscaped with plant materials other than ground cover over at least fifty percent of the required area, and at least fifty percent of those plant materials

shall be native species; or a littoral zone band at least five feet in width for at least fifty percent of the shoreline shall be established with native aquatic or semi-aquatic plant species.

  - From two and one-half to five acres. At least five percent of the land above the design high-water level excluding maintenance berms shall be landscaped with plant materials other than ground cover over at least fifty percent of the required area, and at least fifty percent of those plant materials shall be native species; or a littoral zone band at least five feet in width for at least thirty-five percent of the shoreline shall be established with native aquatic or semi-aquatic plant species.
  - More than five acres. A littoral zone band at least five feet in width for at least twenty percent of the shoreline shall be established with native aquatic or semi-aquatic plant species.

- A wet-bottom retention pond shall be designed as a barrier-free aesthetic amenity.
- A skimmer shall be provided on a wet-bottom stormwater management facility to minimize the accumulation of trash and pollutants.
- Any wet-bottom retention pond visible from any existing arterial right-of-way shall provide an aquatic planting in a continuous band on the side of the pond remote from the right-of-way to screen the bank area between the normal water elevation and the high-water elevation. This littoral zone planting shall be at least four feet wide and average six feet wide.
- A dry-bottom stormwater management facility shall be designed with at least five percent of the area above the peak stage elevation landscaped with plant materials other than ground cover over at least fifty percent of the required area, and at least fifty percent of those plant materials shall be native species.
- A dry-bottom stormwater management facility shall be unfenced with a maximum side slope of 5:1 and shall be sodded.
- Any dry-bottom stormwater management facility visible from any existing arterial right-of-way shall provide screening in the form of a hedge, berm, wall, or combination in a continuous band on the side of the facility proximate to the right-of-way to screen the bank area of the facility.

7.5.2 Stormwater Management Facilities

The preliminary stormwater ponds have been sized based upon the proposed typical section to determine the impervious surface for each segment of the road. The impervious surface was then used to ascertain the required treatment volume and runoff volume for the basins. The ponds were only sized for the right of way areas that will drain to each pond.

The pond sites were selected based upon several criteria. This criterion included existing land use, right-of-way and drainage easements, topography, wetlands, and flood plains. Topography was reviewed to provide sufficient elevation change for conveyance of the run-off from the roadway to the pond site. Where possible, wetland and flood plain impacts have been avoided.

Existing permits and nearby borings (where possible) adjacent to the preliminary ponds and existing topography were used to determine the seasonal high / control elevations. Top of berm elevations were established using the adjacent existing grade.

The recommended stormwater management facilities and floodplain compensation ponds are shown on Figure 7-2. The preferred ponds were derived based on a number of factors including avoidance of wetlands and conservation areas, hydrologic considerations, and available right-of-way. The preferred pond sites are Pond 2A, Pond 3A, Pond 3B and the reasoning for these recommendations are described below.

Basin 1

The proposed Avalon Road centerline alignment has been shifted to the west to address a severe skew at US 192 which is expected to result in improved traffic operations. Initially, the area between the proposed east right-of-way line and the WaWa property was anticipated to be able to support a pond site, though after further evaluation, this approach was found not to be viable since it would not be able to provide all of the needed pond requirements such as 20-foot maintenance berms. Consequently, Pond 2A has been expanded to include the full treatment requirements of Pond 1B. This change will direct runoff from Basin 1 to Basin 2 for treatment.

Basin 2

Pond 2A is the recommended pond for Basin 2 and it is currently planned to be a joint use pond that will be included in the overall drainage plans for Westgate Resorts LLC. The anticipated footprint of this wet pond is 4.3 acres taking into account the drainage currently assigned to Pond 1B. Pond 2A is expected to have moderate wildlife impacts since it has habitat that is suitable for inhabiting protected wildlife species (e.g., gopher tortoise, burrowing owl, sand skink, Florida scrub-jay, crested caracara)).This pond is adjacent to the preferred alignment, thus readily allowing for conveyance of roadway runoff to the pond for treatment. The proposed outfall from the pond is via a spreader swale to discharge to the surrounding vegetated area.

Pond 2B is the alternative pond for Basin 2. The parcel is also owned by Westgate Resorts LLC but is larger containing approximately 28.4 acres. The anticipated footprint of this wet pond is 2.33 acres. Although the required footprint is estimated to be smaller than Pond 2A, due to a lower SHWT estimated elevation, the pond site is located further from the preferred alignment which would require a longer drainage easement to pipe the runoff to the pond site. Pond 2B has a high wildlife impact rating since protected species were observed around Pond 2B. The proposed outfall from the wet pond is via a spreader swale to discharge to the surrounding open space.

Basin 3A

Pond 3A is the recommended pond for Basin 3A. The parcel is owned by New Dimension Dev. Inc and contains approximately 11.57 acres. The anticipated footprint of this wet pond is 1.4 acres. Pond 3A is also expected to have moderate wildlife impacts since it has habitat that is suitable for protected wildlife species (e.g., gopher tortoise, burrowing owl, sand skink, Florida scrub-jay, crested caracara).

The proposed outfall from the wet pond is via a level spreader swale to discharge to the surrounding vegetated area. The pond site is within close proximity of the preferred alignment, requiring minimal effort to convey roadway runoff into the pond for treatment.

Pond 3A is the only suggested pond to treat the runoff from Basin 3A. The basin is fairly small and constrained by the 100-year floodplain limits, with very little space to provide floodplain compensation. A second site within Basin 3A that was outside of the floodplain limits was evaluated, but an existing permit for Hartzog Road is proposing a treatment pond at this location and a joint use pond is generally not preferred by the County.

Additionally, in the latter stages of this study, it was determined that the above parcel identified for Pond 3A was large enough that it could also more efficiently support the floodplain compensation requirements for this project. Thus, a single floodplain site will be also located on this property and the previous floodplain comp ponds (FC-1 and FC_2) will no longer be considered.

Basin 3B

Pond 3B is the recommended pond for Basin 3B. Acquisitions from two parcels are required for this pond which are owned by PRS Investors Group LLP and Westgate Resorts LTD. The PRS-owned parcel has a total area of 1.83 acres and the Westgate-owned parcel has a total area of 28.4 acres. A small part of the Westgate parcel is expected to be needed to meet the estimated pond size requirements. Note, Westgate owns contiguous parcels that also includes proposed Pond 2A

The calculations estimate 2.1 acres is required to provide the necessary attenuation and water quality treatment for Basin 3B.

Pond 3B is also expected to have moderate wildlife impacts since it has habitat that is suitable for protected wildlife species (e.g., gopher tortoise, burrowing owl, sand skink, Florida scrub-jay, crested caracara)). The proposed outfall from the wet pond is via a level spreader swale to discharge to the surrounding vegetated area. Pond 3B is the only pond suggested to treat this drainage basin due to the rest of the basin being limited by sinkhole areas, future developments within viable areas that already are in the permitting phase, and private properties.

Basin 4

No suitable pond sites were found in Basin 4 and stormwater from this basin is being directed to Basin 3A, where it is proposed to be treated in Pond 3A.

The final design effort will refine the current preliminary ponds based on surveys and additional borings which will provide detailed information to further define the pond elements, determine pond bottom elevations, and pond control elevations. Accordingly, pond sizes and pond configurations may vary from the preliminary ponds based upon final topographic surveys and geotechnical information.

See Pond Siting Report for mapping which reflects all ponds considered for this study.

7.5.3 Cross Drains

The existing cross drains were analyzed, and a preliminary determination was undertaken regarding the need for replacement. This report recommends that the current pipe sizes remain as is, though all culverts are recommended to be replaced with new concrete pipe for future maintenance savings. The proposed cross drains by type and sizes are shown in Table 7-1.

Table 7-1 Proposed Cross Drain Types and Sizes

Culvert	Station	Existing Conditions		Proposed Conditions
		Number of Pipes	Size/ Type	Size/ Type
CD #1	47+90	1	18" RCP	18” RCP
CD #2	59+50	1	18" CMP	18” RCP
CD #3	97+30	2	24” CMP	24” RCP

7.5.4 Floodplain and Floodways

Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM's), portions of the study area are located within Zone AE (100 Year) floodplain. The Zone AE floodplains impacted by the Avalon Road project are located:

- East of Grass Lake and west of Avalon Road (El. 113.1)
- East of Mud Lake and west of Avalon Road (El. 113.1)
- West of Ponding Area No. 51 and east of Avalon Road (El. 113.1)
- East of Lake Austin and west of Avalon Road (El. 113.3)
- Along Hartzog Road (El. 113.1)
- West of Lake Gifford and east of Avalon Road (El. 113.1)
- East of Lake Oliver and west of Avalon Road (El. 113.3)

Please refer to Appendix H for a depiction of the floodplains in the study area. There are no floodways within the project limits.

The proposed improvements will result in floodplain impacts which will need to be mitigated by providing compensatory volume in the proposed floodplain compensation pond located north of Pond 3A (see Figure 7-2). Regarding the proposed site of this floodplain compensation pond, comments were received that this pond may be within floodplains based on the FEMA Firm maps.

Upon further examination and from information obtained from nearby Pond 3A, the existing ground is estimated at around elevation 115 with the floodplain elevation estimated at 113 and the SHW estimated at approximately elevation 110. Based on these data, the proposed pond may not be within floodplains, thus there is an opportunity to utilize this site for a floodplain compensation pond, although further information is needed during final design to verify and determine the extent of the floodplain limits. See the Pond Siting Report for further information and calculations.

Figure 7-2 – Post Development Drainage Map

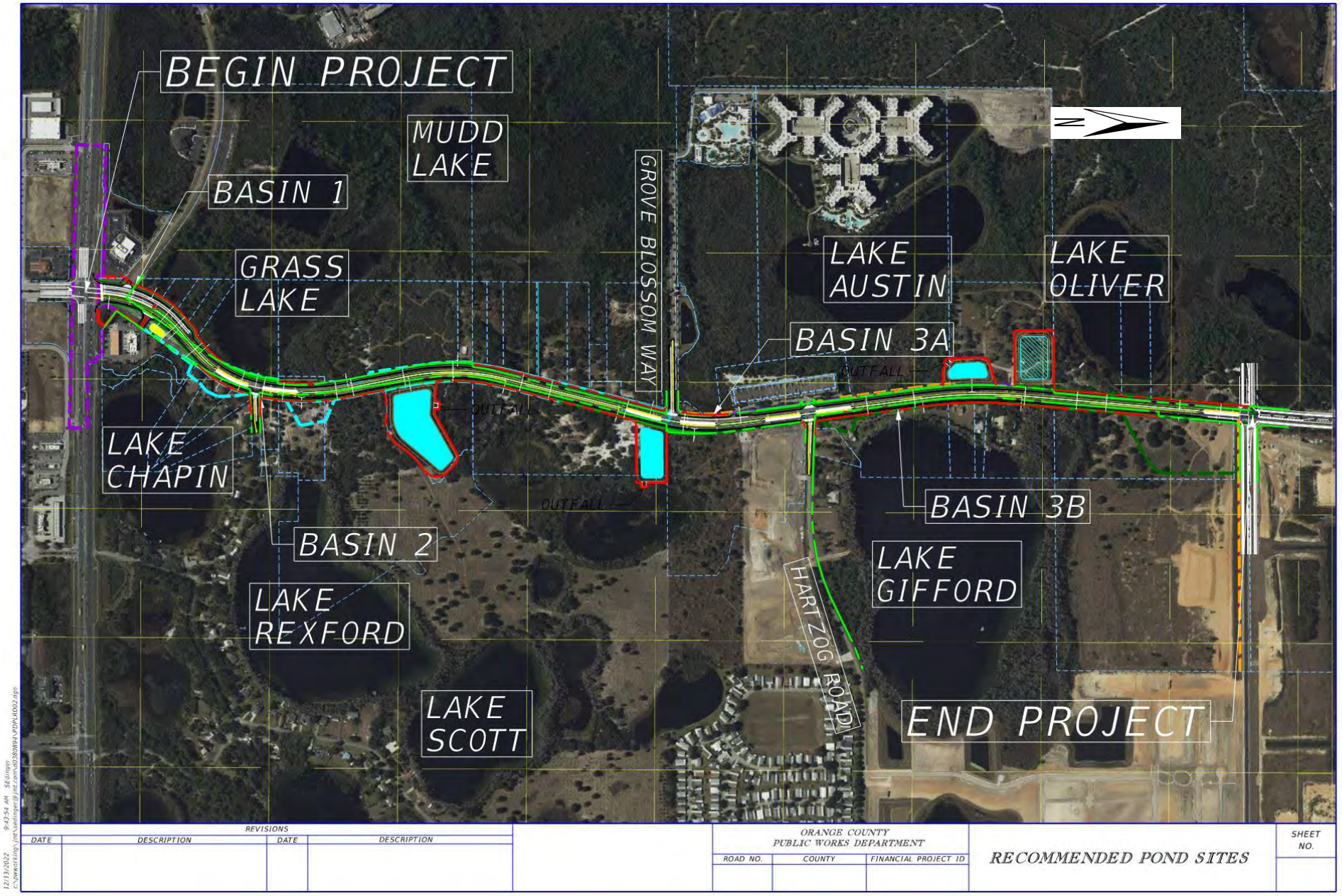


Figure 7-2 – Post Development Drainage Map

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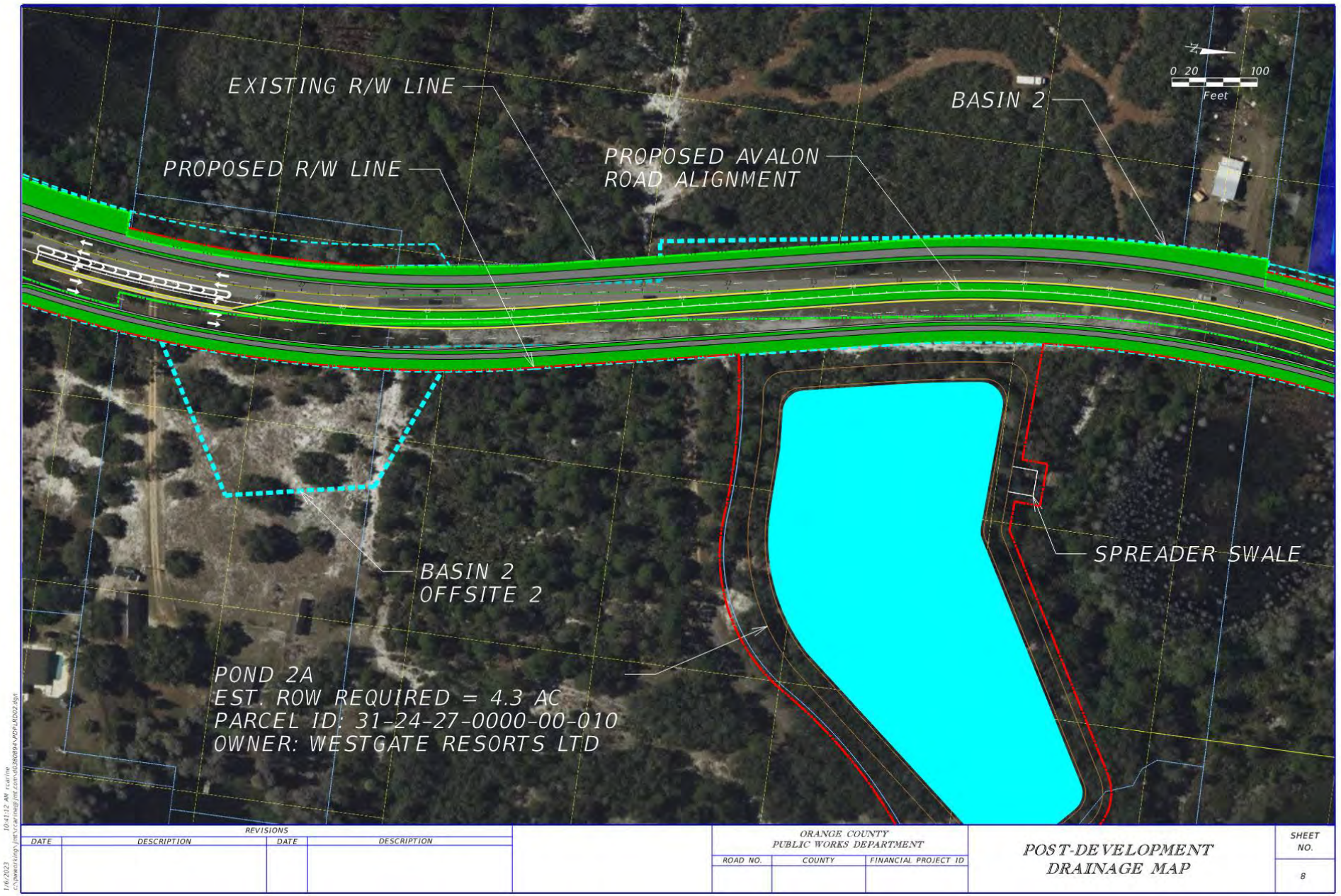

Figure 7-2 – Post Development Drainage Map

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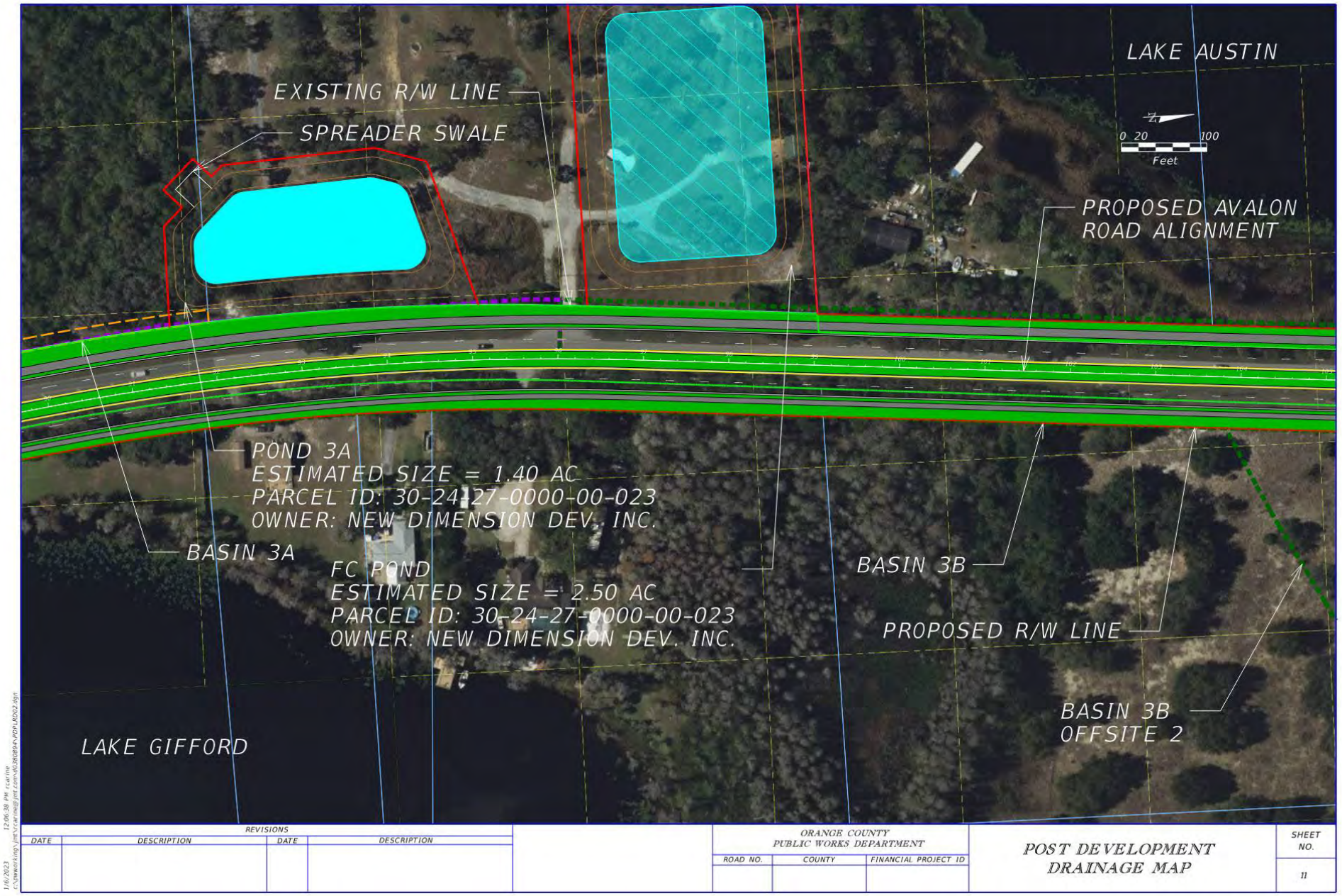

Figure 7-2 – Post Development Drainage Map

7.5.5 Stormwater Permits

Over 15 permits were researched to obtain stormwater and environmental design information for existing systems within the project corridor. Please refer to Table 7-2 for a summary of permits referenced during the development of the proposed stormwater management systems for Avalon RCA.

Table 7-2

Existing Permits

Project Name	Agency/Permit Type	Permit No.	Date Issued	Description
Western Way Extension	SFWMD/ Environmental Resources Construction/Operation Modification	48-00714-P	11/02/2018	Residential development and road extension
Section 30 Excavation	SFWMD/ Surface Water Management Permit	48-00786-S	6/9/1994	Construction and operation of a surface water management system to serve an expansion of an existing borrow pit site with total on-site retention
Cassis Planned Development Phase I	SFWMD/ Environmental Resource Permit	48-01048-P	4/6/1999	Development of hotel and water park
Heart of Florida Hospital Free Standing Emergency Department	SFWMD/ Environmental Resource Permit	48-01782-P	7/26/2018	Construction of a project including a stormwater management system serving Heart of Florida Hospital FSED
Hartzog Road Avalon Road to Disney Property	SFWMD/ Individual Environmental Resource Permit	48-01974-P	8/31/2021	New road construction
Wawa Avalon Road Convenience Store	SFWMD/ Environmental Resource Permit	48-02169-P	7/16/2012	Construction of surface water management system to serve Wawa
Horizon West Village I – Withers PD Parcels 11, 13 and 17	SFWMD/ Water Use Individual Permit	48-02754-W	12/30/2020	Dewater aquifer for installation of proposed stormwater management system
Avalon Pointe	SFWMD Water Use Individual Permit	48-02757-W	3/4/2021	Dewatering of water table aquifer for installation of stormwater management system for Avalon Point
Bb Groves (Aka Ayers Parcels)	SFWMD/ Formal Determination of Wetlands and Surface Waters	48-102794-P	1/29/2020	Determination of wetland and surface water boundaries
Horizon West Village I – Jaffers PS – Phase 3 Parcel W-17	SFWMD/ Environmental Resource Permit	48-102896-P	11/19/2020	Continued development of Horizon West Village
Avalon Pointe Apartments (Avalon Grove PD)	SFWMD/ Environmental Resource Permit	48-103624-P	12/20/2021	Site development and stormwater management facility

Withers PD Phase 1	SFWMD/ Individual Environmental Resource Permit	48-104373-P	4/12/2021	Construction of stormwater management system serving residential development Withers PD Phase 1
Karr Sp Mass Grading	SFWMD/ Individual Environmental Resource Permit	48-105378-P	8/13/2021	Construction of stormwater management system serving 36 acres of mass grading known as Karr SP Property
Registry at Grass Lake	SWFWMD/ Individual Environmental Resource Permit	48-105977-P	In process	Residential development in process
State Road 530 (US 192) Widening	SFWMD/ Individual Environmental Resource Minor Mod	49-00956-P	9/19/2012	Construction of surface water management system to serve 51.7 acres of SR 530 widening

7.6 Displacements

The proposed improvements will not result in any displacements of homes or businesses. However, the Preferred Alternative will impact a garage structure at STA 85+60 Rt belonging to the parcel in the northeast quadrant of Lake Gifford Road and Avalon Road.

7.7 Estimated Project Costs

The estimated project costs for the preferred alternative are under development. At this time, Toho has provided a preliminary estimate of their relocation costs for utilities that are in their easements, assuming that these utilities need to be relocated.

Table 7-3

Total Estimated Project Costs

Project Item	Estimated Costs (Present Day Costs)
Estimated Construction Costs	$ 25,995,128
Design and Admin Costs (10% of Construction)	$ 2,599,513
CEI (12% of Construction)	$ 3,119,415
Right-of-Way Acquisition	$ 3,313,827
Wetland Mitigation	$ 164,000
RHPZ Uplands Mitigation	None
Reimbursable Utility Relocation	$ 2,986,000
Subtotal	$ 38,177,883
Contingencies (20%)	$ 7,635,577
TOTAL ESTIMATED COSTS	***$ 45,813,460***

7.8 Recycling of Salvageable Materials

The opportunity to recycle any salvageable materials by the contractor is encouraged by Orange County. Such materials may include old asphaltic concrete pavement, base material, and drainage structures.

The existing pavement on existing roadways, may be milled for recycling during the construction of the project. Any other salvageable materials will be identified during the design of the project.

7.9 User Benefits

Highway user costs are defined by AASHTO's A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements, 1977, as the sum of (1) motor vehicle running cost, (2) the value of the vehicle user travel time and (3) traffic accident cost. User benefits are the cost reductions and other advantages that occur to highway motor vehicle users through the use of a particular transportation facility as compared with the use of another. Benefits are generally measured in terms of a decrease in user costs.

It is anticipated that the Preferred Alternative will provide user benefits due to a reduction in roadway congestion as compared to the "No Build" alternative. In addition, the proposed typical section and geometric changes at US 192 are expected to improve operations and reduce the crash experience along the roadway as well.

Additional user benefits are expected with the Preferred Alternative by providing multimodal improvements consisting of sidewalks and multi-use path.

7.10 Pedestrian and Bicycle Facilities

A continuous six-foot wide sidewalk will be provided on the east side of Avalon Road and a 10-foot wide multiuse path will be provided on the west side of the roadway to tie into the proposed planned path to the north of Hartzog Road. The sidewalk and the multiuse path will be separated from the roadway by curb and gutter and a four-foot-wide grass/utility strip. Pedestrian features, including crosswalks and pedestrian signals, will be provided at US 182 which is the only signalized intersection on this project. The pedestrian and bicycle facilities will comply with the Americans with Disabilities Act (ADA).

7.11 Environmental Impacts

Detailed studies and evaluations were conducted to determine the potential for adverse impacts that may result from the proposed project. Baseline data, evaluation procedures and analysis of results are contained in the project files and the following reports: "Ecological Summary Report" (see Appendix E) and "Contamination Screening Evaluation Report" (see Appendix F).

7.11.1 Land Use

FDEP's statewide land use database (FDEP 2020a) was used to characterize land use types within the study corridor. The dominant land uses present within the project corridor are described below and further information is also provided in Appendix E. Additional information can be also found in Section 3.9 which describes Orange County's existing and future land use plans.

<u>Uplands - Developed</u>

FLUCFCS 1100, 1130, and 1180 – Low density residential – This land use best describes single-family residential areas within the study corridor.

FLUCFCS 1400 – Commercial and Services – This land use is located east and west of Avalon Road, north of US 192 and best describes commercial businesses.

FLUCFCS 133(9) – Multiple Dwelling Units, Under Construction – This land use is located east of Avalon Road, south of Lake Gifford Road, and is currently under construction.

FLUCFCS 1340 – High Density, Multiple Dwelling Units, High Rise – This land use best describes a condominium located west of the intersection of Lake Gifford Road and Avalon Road.

FLUCFCS 1454 – Campground (Inactive) – This land use type best identifies an inactive campground/outdoor area located west of Avalon Road.

FLUCFCS 8140 – Roads and Highways – This land use type consists of Avalon Road, US 192, Grove Blossom Way, Hartzog Road, and side roads located within the study corridor.

Uplands - Undeveloped

FLUCFCS 1900 – Open Land – This land use type best describes the unimproved pasture located east of Avalon Road at the north end of the study corridor.

FLUCFCS 3210 and 3300 –Palmetto Prairies and Mixed Rangeland – This land use best describes identifies undeveloped, vegetated lands located east and west of Avalon Road.

FLUCFCS 4110 – Pine Flatwoods – This land use describes an undeveloped forested area located within the northwest quadrant of the Avalon Road/Bali Boulevard intersection.

7.11.2 Community Cohesion

The project does not bifurcate any neighborhoods or developments.

7.11.3 Cultural Impacts

Based on the analysis conducted for this study, there are no cultural resources listed, determined eligible, or appear to be potentially eligible for listing in the NRHP. As such, historic resources will not be a critical issue.

7.11.4 Wetlands

The project is anticipated to impact approximately 1.38 acres of wetlands (roadway and ponds). Federal, state, and local government agencies with regulatory authority over wetland and/or other surface waters generally require mitigation to offset unavoidable impacts as a condition of the permit.

Mitigation requirements are based on a compilation of wetland parameters including quality, type, function, and size. Impacts to wetlands and/or other surface waters will be avoided and minimized to the maximum extent possible while maintaining safe and sound engineering and construction practices. Primarily, avoidance and minimization efforts are related to the proposed stormwater management pond locations.

A mitigation plan that adequately offsets adverse impacts will be developed and implemented during the design phase. Adverse wetland impacts that may result from the construction of this project will be mitigated, satisfying the County requirements. Compensatory mitigation for this project will be completed through the use of mitigation banks and/or any other mitigation options that satisfy federal and state requirements.

7.11.5 Wildlife and Habitat

The potential impact to federal and/or state-listed wildlife species was evaluated based upon the occurrence determinations for Orange County, Florida. Further analysis will be required during final design to specifically address quantities of impact, current status of wildlife species, and other design and/or construction measures which can be incorporated to reduce or eliminate potential impacts.

7.12 Utility Impacts

Many of the utilities along the corridor will be affected by the preferred alternative since the proposed improvements will occupy most of the existing right-of-way. In particular, the overhead lines are likely to be affected by the roadway widening, and the underground lines may be affected by the new storm sewer.

Toho has a dedicated 10-foot easement in some areas along the east Avalon Road right-of-way that contains their FM lines between US 192 and Lake Gifford Road. At this time, they have indicated that their preference is to have their lines relocated. Their preliminary relocation cost is shown on Table 7-3.

7.13 Traffic Control Plan

A formal traffic control plan (TCP) will be developed during the final design process. Typically, the TCP staging will include building two new lanes on one side of the road while traffic is carried on the existing travel lanes. Once the new lanes are completed, traffic will be shifted to the completed lanes and work continues on finishing the remaining two lanes of improvements.

7.14 Special Features

7.14.1 Access Management

The access management plan for Avalon Road was developed in general conformance with the Florida Department of Transportation (FDOT) Access Management criteria. By providing the proposed intersection spacing shown on the concept plans in Appendix A, most of the project can attain either Access Class 3 or Access Class 5 designations. However, there is a short section between Grove Blossom Way and Lake Gifford Road that is only 900 feet long, which would fall under Access Class 7.

7.14.2 Wildlife Crossing

The potential of implementing wildlife crossings within the Avalon Road study corridor was evaluated using several criteria, including current ecological conditions, proximity of existing conservation lands, biodiversity matrix, and proposed future development. The study corridor was evaluated at two locations for a potential wildlife crossing:

- Wildlife Crossing Location 1 – This location is approximately 500 feet north of US 192. Based on the information and analysis presented above and the wildlife known to inhabit this area, a wildlife crossing is not justified due to the lack of sustainable natural communities and a continuous corridor for wildlife movement. A wildlife crossing in this location may be reconsidered in the future should plans to develop the area west of Avalon Road change.

- Wildlife Crossing Location 2 – This location is approximately 1,200 feet south of Grove Blossom Way. Based on the information and analysis presented above, and the wildlife known to inhabit this area, a wildlife crossing for herptiles (amphibians and reptiles), and small mammals could be supported at this location. Location and configuration of the components of a wildlife crossing would be determined during final roadway design.

7.14.3 Street Lighting

It is the County's policy to provide street lighting along the corridor as part of the Avalon Road improvements. Street lighting will be further detailed during the design phase.

8 PUBLIC INVOLVEMENT

8.1 Public Involvement Plan

In 2021, a Public Involvement Plan (PIP) was created for the Avalon RCA and implemented into the project's public involvement approach. The PIP identifies key local and state agencies, elected, and appointed officials; and property owners and tenants for the study area, in addition to outlining public outreach strategies.

Specific strategies established in the PIP are project newsletter mailouts, contact with the media; community and small group stakeholder meetings, presentations to Orange County Planning and Zoning Commission/Local Planning Agency, and presentations to the Orange County Board of County Commissioners. All public involvement documents can be found in Appendix C.

8.2 Public Information Distribution

Public information for this project will be dispersed through the following methods:

- Five newsletters were mailed to property owners, tenants, and other interested persons
- Public meeting advertisements were placed in *The Orlando Sentinel*, and *El Sentinel*
- A project website has been assembled by the County which contains information such as project study area map, project schedule, meeting notices, newsletters, and other study documents.

8.3 Coordination and Small Group Meetings

Small group meetings were held with representatives from various property owners, utility companies, and other interested parties.

8.4 Public Meetings

Two community public meetings have been held for this project. The meeting format consisted of an open house that allowed informal discussions between the project team and the public, followed by a presentation and an open question and answer forum. Information from these meetings are contained in Appendix C.

8.5 Local Planning Agency and Board of County Commissioners Meetings

8.5.1 Orange County Planning and Zoning Commission/Local Planning Agency (LPA)

The study's recommendations were presented to the Orange County Planning and Zoning Commission /Local Planning Agency at a workshop on February 6, 2023 and at a public hearing on March 16, 2023. This project was approved to move forward at both the workshop and the public hearing. Information from these meetings are contained in Appendix C.

8.5.2 Orange County Board of County Commissioners

The study's recommendations were presented to the Orange County Board of County Commissioners at a public hearing on April 11, 2023. At this meeting, this project was approved to move forward. Information from this meeting is contained in Appendix C.

9 CONCLUSIONS AND RECOMMENDATIONS

The objective of the Avalon Road RCA is to develop and evaluate alternatives for improvements to Avalon Road from US 192 to Hartzog Road in order to address the current and future transportation needs along the corridor. The preferred improvements identified in this report satisfy the purpose and need for this project, and will serve as the basis for the subsequent design of the roadway improvements.

The development of the proposed improvements collectively includes insights from planning, engineering, and the public to arrive at the preferred alternative. Moving forward, the alternative detailed in Section 7 and Appendix A of this report is recommended to be advanced to the design phase.