SR 519 (FISKE BOULEVARD) CONCEPT DEVELOPMENT AND EVALUATION STUDY

CONCEPT DEVELOPMENT AND EVALUATION REPORT

FINANCIAL PROJECT NO. 437241-1-12-01

SEPTEMBER 2018

FDOT

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Chapter 1: Introduction

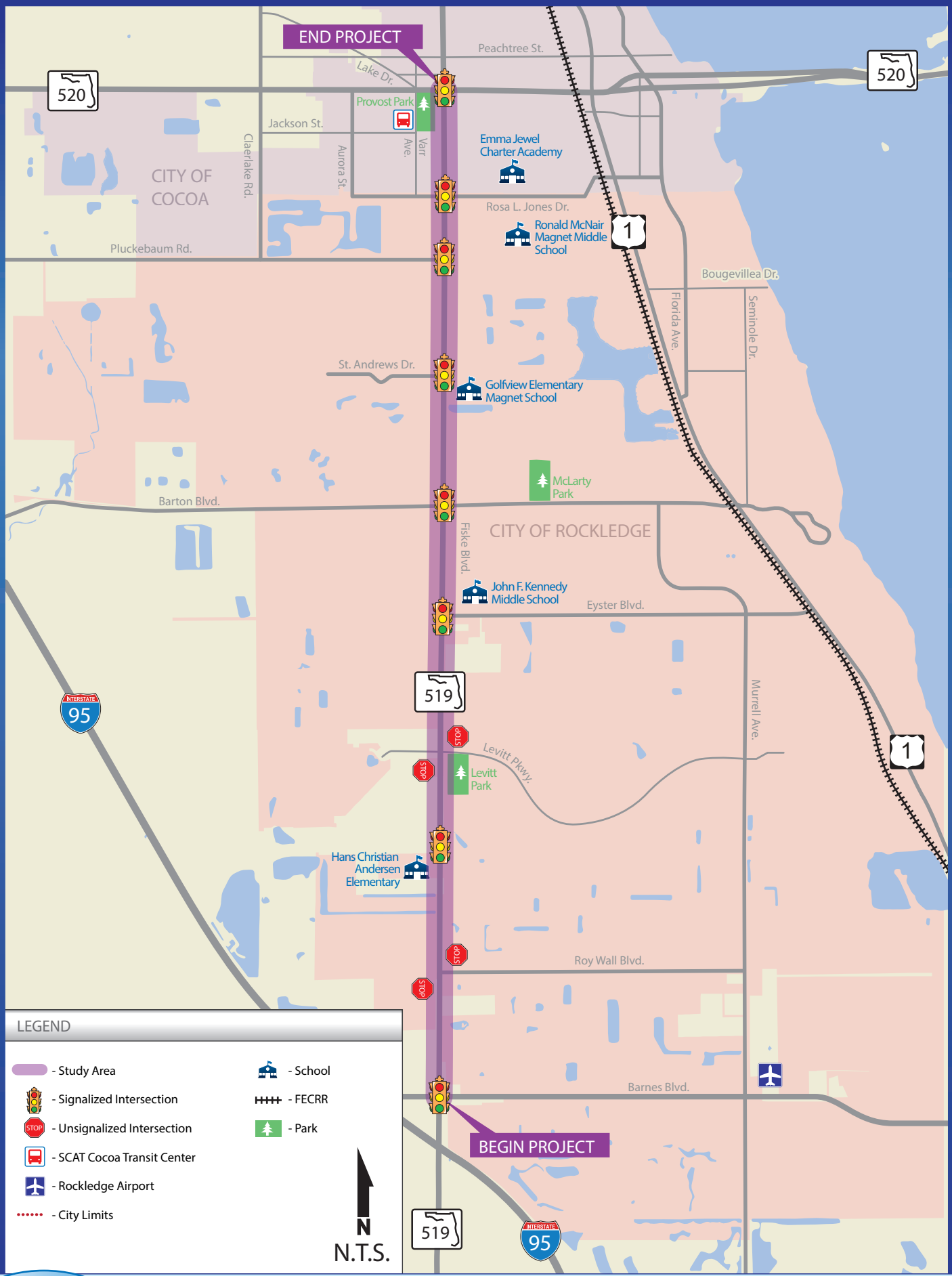
1.1 Report Purpose

In January 2015, the Florida Department of Transportation (FDOT) began a corridor planning study on State Road (S.R.) 519 (Fiske Boulevard) from County Road (C.R.) 502 (Barnes Boulevard)/I-95 Northbound Ramps to S.R. 520 (King Street). Figure 1 illustrates the study area.

This corridor study was an evaluation of safety, environmental, and geometric concerns along S.R. 519 (Fiske Boulevard) to identify possible improvement options and planning level cost estimates. The study aimed to develop a multimodal vision for the corridor, determine how best to meet the needs of the current and future end users of the corridor, and establish a long-term plan to guide evolution of the corridor. Multimodal corridor projects are essential to network efficiency, safety, and livability within the context of future transportation needs.

This concept development study is a continuation of the corridor planning study. The objective of this study is to further develop and refine the alternatives identified during the previous study.

The purpose of this Alternatives, Strategies, and Corridor Assessment Report is to define and evaluate alternatives in order to select the preferred alternative for S.R. 519 (Fiske Boulevard). Chapter 2 will present the three alternatives that were evaluated. Chapter 3 will present the roundabout evaluation methodology and results. Chapter 4 will present the improvements that are not specific to any alternative. Chapter 5 will show the results of the evaluation, ultimately identifying the preferred alternative. Chapter 6 of this report will discuss the refinement of the preferred alternative, which includes a summary of the coordination amongst the various stakeholders. Finally, Chapter 7 summarizes the findings for this Study and highlights the next steps to implement the identified project.



FISKE BLVD Concept Development and Evaluation Study

SR 519 Concept Development & Evaluation
Barnes Boulevard to SR 520

FDOT

FIGURE 1
Study Area Map

1.2 Project Background and Purpose

This project has been requested by the cities of Cocoa and Rockledge through the Space Coast Transportation Planning Organization (SCTPO) to coordinate the development of a multimodal vision for the S.R. 519 (Fiske Boulevard) corridor. This study involved the evaluation of future transportation needs on S.R. 519 (Fiske Boulevard) to establish a long-term plan to guide evolution of the corridor which appropriately correlates the balance between land use and transportation planning. This project was coordinated with local and regional agency partners, such as the SCTPO, Brevard County, the cities of Cocoa and Rockledge, Space Coast Area Transit (SCAT), and the City of Cocoa Diamond Square Community Redevelopment Area (CRA), to develop potential solutions which establish a more multimodal urban environment utilizing a context-sensitive approach.

As identified within the previous reports, the subject corridor involves a 4.2-mile section of S.R. 519 (Fiske Boulevard) between the Barnes Boulevard / I-95 northbound ramps and S.R. 520 (King Street) in Brevard County, Florida. The existing roadway is a five (5) lane major arterial with varying cross-sections including paved shoulders and curb and gutter, paved shoulder and no curb/gutter or open swale drainage. The corridor is located within the Cities of Rockledge and Cocoa, with a posted speed limit of 45 miles per hour (mph) from Barnes Boulevard/I-95 Northbound Ramps to south of Cardinal Avenue and 40 mph for the remainder of the corridor. Travel lanes vary from 12 to 13-feet in each direction and are separated by a center two-way left turn lane which varies from 12 to 18-feet.

The character of the corridor mostly urban with varying land uses. The predominant land use is residential, followed by public/institutional and commercial uses. The residential subdivisions are located on both sides of the corridor; a majority with consolidated primary access to S.R. 519 (Fiske Boulevard). In addition, there are seven churches, two parks (Schultz Park and Provost Park), and three public schools (J.F.K. Middle School, Hans Christian Andersen Elementary, and Golfview Elementary Magnet School) along this corridor, with additional parks and schools located in close proximity. There are seven (7) signalized intersections:

1. Barnes Boulevard / I-95 Northbound Ramps
2. Eyster Boulevard
3. Barton Boulevard
4. St. Andrews Drive
5. Pluckebaum Road
6. Rosa L. Jones Boulevard
7. S.R. 520 (King Street)

There are mostly continuous undersized sidewalks (4 feet) along both sides of the corridor with a few gaps, as well as no designated bicycle lane. Space Coast Area Transit (SCAT) operates two routes within this corridor, Route 1 and Route 6. Transit stops are typically marked with signage, and in many cases, include benches. Many of the transit stops along S.R. 519 (Fiske Boulevard) consist of a bus stop marker only and have accessibility challenges such as no sidewalk connectivity and missing ADA landing pads.

S.R. 519 (Fiske Boulevard) is a primary north-south route between Viera, I-95 and S.R. 520 (King Street), serving local traffic as well as many visitors. Based on input from agency partners, this study will also consider the pedestrian interactions between the schools and neighborhoods, as well as the Provost Park and neighborhoods to the north.

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Chapter 2: Typical Section Alternatives

2.1 Introduction

This chapter describes the recommended improvement strategies identified in the previous corridor planning study and in the updated existing and future condition reports of the concept development study. The recommended improvement strategies were further developed and refined into three corridor wide alternatives, access management, and intersection improvement strategies that consider the installation of a traffic signal and/or roundabout. The conceptual plans containing the proposed alternatives can be observed in **Appendices A, B, and C**.

2.2 Design Standards

The corridor alternative concept was developed to be consistent with the FDOT Design Manual (FDM). The first step to defining the design criteria is to determine the context classification. The FDOT Context Classification (August 2017) guidebook provides detailed criteria to determine the context classification along state roadways. As part of a Department Resurfacing, Restoration, and Rehabilitation (3R) project, the Department identified the context classification within a memorandum dated April 26, 2018. The context classification memorandum can be observed in **Appendix D**. The identified context classification can be observed in .

Table 1: S.R. 519 (Fiske Boulevard) Context Classification

Segment Limits	Context Class
Barnes Boulevard to Ferndale Avenue	C3R / C3C
Ferndale Avenue to S.R. 520 (King Street)	C4

The design criteria are determined by the assigned context classification as defined in the 2018 FDOT Design Manual. provides the design criteria applicable for the S.R. 519 (Fiske Boulevard) study corridor.

Table 2: 2018 Florida Design Manual Design Criteria

Design Control		C3	C4	Source
Allowable Design Speed Range		35-55 mph	30-45 mph	FDM, Table 201.4.1
Minimum Lane Widths	Travel	11 ft		FDM, Table 210.2.1
	Auxiliary	11 ft		
	Two-Way Left Turn	12 ft[1]		
Median Width		22 ft		FDM, Table 210.3.1
Sidewalk Width		6 ft[2]		FDM, Table 222.1.1
Shoulder Width	without gutter (full width)	10 ft		FDM, Table 210.4.1
	without gutter (paved)	5 ft		
	with gutter (full width)	15.5 ft		
	with gutter (paved)	8 ft		
Bicycle Lanes		Prioritize from buffered 7 ft to 4 ft (if using existing curb line)		FDM, Section 223.2
Intersection Lane Shifts	Max Off-set	6 ft		FDM, Section 212.7
	Max Deflection Angle Through Intersection	40 mph: 5 degrees 45 mph: 3 degrees		
Curb & Gutter Type		n/a[3]	Type F Median: Type E	FDM, Section 210.5

[1] The Department's Resurfacing, Rehabilitation, and Restoration (3R) project will design and construct a two-way center left turn lane width of 11 feet, consistent with the exceptions of the FDM design standards. Whereas, the long-term alternative of this corridor study will require a center two-way left turn lane width of 12 feet.

[2] Sidewalk width may be increased up to 8 feet when the demand is demonstrated.

[3] The section of S.R. 519 (Fiske Boulevard) identified as Context Class 3 currently has an open drainage system with no curb and gutter.

2.3 Typical Section Alternatives

Three corridor wide alternatives were developed to improve safety, reduce congestion, and improve the level of service deficiencies of the roadway for all road users:

- Alternative 1 – Maintain 5-lane Typical Section with Addition of Bike Lane
- Alternative 2 – Add Raised Median
- Alternative 3 – Raised Landscape Islands

The alternatives were designed to maximize opportunities for utilization of alternative transportation modes such as bicycle, pedestrian, and transit.

The three alternatives have several common elements. The common elements are presented below while the primary differences between the three alternatives are presented in the following narratives for each alternative. Each alternative includes the addition of sidewalk to complete the network and fill gaps. Each alternative has bicycle lanes and improves transit accessibility. Each alternative includes improvements to the intersections at Levitt Parkway, Roy Wall Boulevard, and Barnes Boulevard. The Brevard Zoo Trail will be expanded from Barnes Boulevard to Eyster Boulevard. Curb and gutter is proposed to be added to the cross section for each alternative north of Rosa Jones Drive. The final common improvement will be a pedestrian refuge north of Barbara Jenkins Street to connect the City of Cocoa's future improvements to Provost Park to the residential areas wishing to make use of the space.

As identified within the Existing Conditions Report (Section 2.6.2), the right-of-way (ROW) varies throughout the corridor. **Table 3** below highlights the ROW limits inventoried using available data. Note, the conceptual plans described in the subsequent sections will utilize the existing ROW; however, the typical sections below will show the ROW as varying.

Table 3: Right-of-Way Summary

Roadway	Roadway ID	From	To	ROW Width (Feet)
SR 519	70014000	Barnes Blvd	Tuckaway Dr	188 to 316
		Tuckaway Dr	Martin Rd	188 to 190
		Martin Rd	Levitt Pkwy	190 to 200
		Levitt Pkwy	Kings Post Rd	150 to 200
		Kings Post Rd	Eyster Blvd	150
		Eyster Blvd	Pennsylvania Ave	117 to 167
		Pennsylvania Ave	Barton Blvd	130
		Barton Blvd	Pluckebaum Rd	100 to 134
		Pluckebaum Rd	Barbara Jenkins St	100 to 118
		Barbara Jenkins St	SR 520	115 to 120

Source: FDOT 3R Files

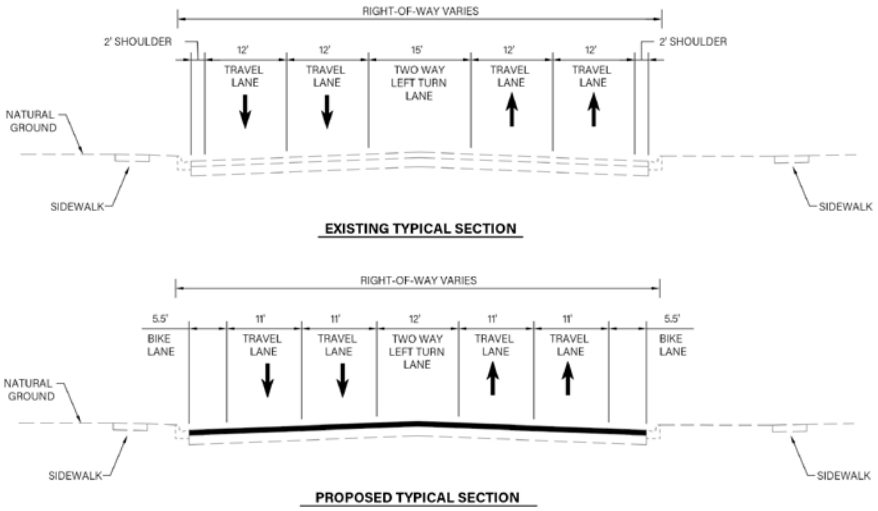
Alternative 1 – Maintain 5-lane Typical Section with Addition of Bike Lane

As noted previously, the three alternatives have a number of common elements. In this section, the elements that make Alternative 1 different from Alternatives 2 and 3 are presented. Currently the roadway is generally 67 feet across and consists of five lanes of travel with two in each direction and one in the middle that facilitates left turns in both directions. Each travel lane is 12 feet wide with the two-way left turn lane being generally 15 feet wide (from 12 to 18 feet). There are two-foot shoulders on both sides of the roadway.

Under Alternative 1, the roadway would maintain the five lanes with two in each direction and one in the middle for left turns. All lane widths would be reduced to 11 feet wide while the center lane will be 12 feet wide. Five and a half-foot bike lanes would be added to both sides of the roadway. The total width remains at 67 feet across from curb to curb.

The cross section at individual intersections may vary from this format to accommodate the needs of the intersection, as shown within Figure 2 on the following page. The conceptual plan containing the proposed alternative can be observed in **Appendix A**.

Figure 2: Alternative 1 - Maintain 5-lane Cross Section with Addition of Bike Lane



Alternative 2 – Add Raised Median

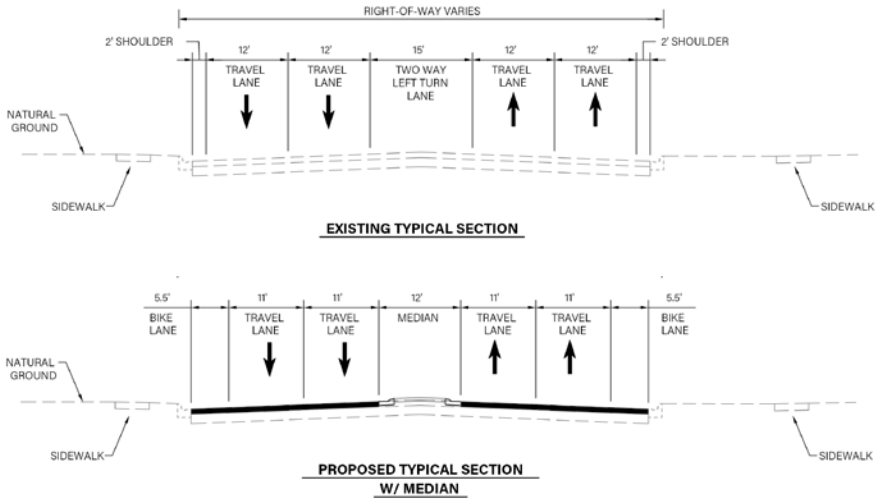
Under Alternative 2, two lanes of travel will be maintained in each direction. Instead of a turn lane in the center, a median would be constructed in the center. The four travel lanes and median would all be 11 feet wide. Five and a half-foot bike lanes would be added to both sides of the roadway. The total width remains at 67 feet across from curb to curb.

The cross section at individual intersections may vary from this format to accommodate the needs of the intersection. The median will also have breaks in it to facilitate traffic crossing when necessary. Figure 3 on the following pages shows the typical section for alternative 2.

The median offers a pedestrian refuge for those crossing the street as well as decreasing areas of conflict by removing the bi-directional turn lane. The conceptual plan containing the proposed alternative can be observed in **Appendix A**.

At the March 26, 2018 Project Visioning Team (PVT) meeting, the alternatives were discussed with all attendees. The data show that there would not be a sufficient turning radius for vehicles wishing to make a U-turn, a raised median will limit access to adjacent properties and local streets, and the minimum design standard for a median of 22-feet would not be met. Based on these considerations, the Raised Median alternative was removed from further consideration.

Figure 3: Alternative 2 - Add Raised Median



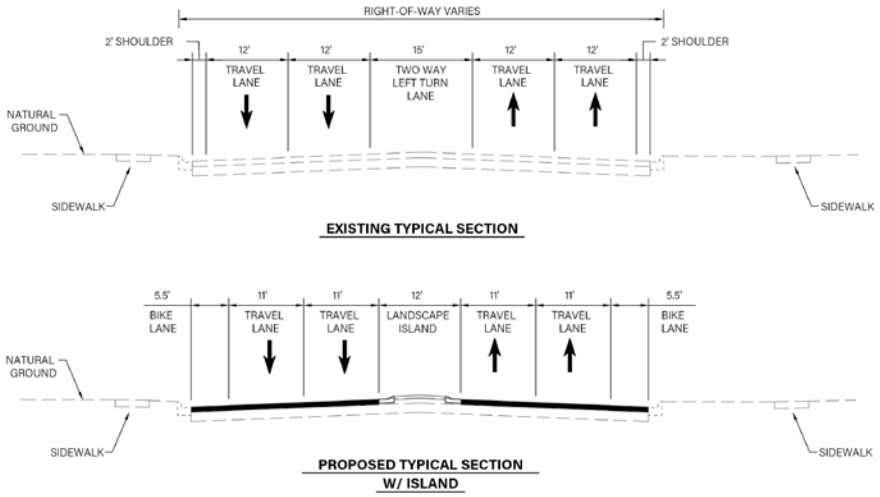
Alternative 3 – Raised Landscape Islands

Under Alternative 3, two lanes of travel will be maintained in each direction. Generally, a left-turn lane would remain in the middle. Raised landscaped islands would be strategically placed throughout the corridor, where appropriate, to avoid a continuous center two-way left turn lane. The raised landscaped islands were strategically located to limit the impacts to access management and would be finalized within the future design phase. The four travel lanes would all be 11-feet wide and the left-turn lanes/median would generally be 12-feet wide. Five and a half-foot bike lanes would be added to both sides of the roadway. The total width remains at 67 feet across from curb to curb.

The cross section at individual intersections may vary from this format to accommodate the needs of the intersection. The conceptual plan and sheets containing the proposed alternative can be observed in **Appendix B** and **Appendix C**. Note, the roll plots are consistent with the concepts shown at the public meeting; however, based on the feedback received, some additional minor modifications were made and included as part of the final conceptual plan sheets included within Appendix C.

After the PVT removed Alternative 2 from further consideration, Alternative 3 was given priority because it would reduce left-turn conflicts when compared against Alternative 1 by providing enhancing access management along the corridor. Furthermore, the landscaped islands will provide traffic calming opportunities along the corridor, as shown in **Figure 4** on the next page.

Figure 4: Alternative 3 - Raised Landscape Islands



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Chapter 3: Traffic Signal and Roundabout Alternatives

3.1 Introduction

Two intersections were identified in the precursor Corridor Planning Study as potential locations to replace the existing two-way stop controlled intersection with a traffic signal and/or roundabout. In either improvement scenario, these two locations will require a realignment. The two locations further evaluated as part of this study are:

- S.R. 519 (Fiske Boulevard) and Roy Wall Boulevard/Martin Road
- S.R. 519 (Fiske Boulevard) and Levitt Parkway/Lakemoor Boulevard

3.2 Traffic Signal Alternative

A traffic signal alternative was considered at the intersections of S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard/Martin Road and at Levitt Parkway/Lakemoor Boulevard based on field observations, high operating speeds on S.R. 519 (Fiske Boulevard), lack of gaps available in the S.R. 519 (Fiske Boulevard) traffic flow, and excessive delays for motorists and/or pedestrians/bicyclists to enter and cross S.R. 519 (Fiske Boulevard). During the numerous public meetings held as part of these studies, local residents, and business owners expressed their desires for a traffic signal to be installed at the intersections. Traffic signals, when designed properly and installed at the appropriate location, can ensure orderly flow of traffic providing opportunity for motorist and/or pedestrians/bicyclists to cross an intersection and help reduce the number of conflicts. Traffic signals do not eliminate all conflicts and are not an answer for every problem intersection. Installing a traffic signal at the wrong location can contribute to excessive delays and congestion, increase in rear-end collisions, and unnecessary shift in traffic on alternate routes.

Using a methodology consistent with the *Manual on Uniform Traffic Control Devices* (MUTCD 2009 Edition), traffic counts were collected, and signal warrant analyses were conducted. A signal warrant analysis assesses certain factors to determine if a traffic signal is needed in a particular location. Just because a warrant is satisfied does not mean that a traffic signal is required. Note, for the purpose of this study, only warrants 1 and 2 were assessed and applicable for the two identified intersections. The nine factors that are analyzed in a signal warrant study are listed on the following page.

- Warrant 1, Eight-Hour Vehicular Volume
- Warrant 2, Four-Hour Vehicular Volume
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

The Roy Wall Boulevard westbound approach (eastern leg) consist of an exclusive left and right-turn lane. Based on the relatively high left turn traffic volumes from Roy Wall Boulevard, the intersection of S.R. 519 (Fiske Boulevard) and Roy Wall Boulevard/Martin Road met Warrants 1 and 2.

Because the Levitt Parkway westbound approach (eastern leg) consists of one wide approach lane, the effects of the right-turn vehicles from Levitt Parkway were evaluated against the signal warrant. Based on the left-turn and through vehicles, the intersection of S.R. 519 (Fiske Boulevard) and Levitt Parkway/Lakemoor Bouelvard only met Warrant 2.

Meeting a signal warrant does not require that a signal be installed, however provides information which assist in making a decision about installing a signal. Copies of the traffic signal warrant spreadsheets are included in **Appendix E**.

3.3 Roundabout Alternative

A roundabout is a type of circular intersection in which traffic travels counterclockwise around a central island and entering traffic must yield to circulating traffic. When designed properly, the geometric features of channelization at the entrance and deflection around a central island ensure a low-speed environment, improving safety for all users. Yield control for vehicles entering the roundabout improves efficiency and reduces delay and queuing at the intersection.

The observed safety and operational performance of roundabouts has been well documented by the Federal Highway Administration (FHWA). Roundabouts are recommended as a significant safety countermeasure by FHWA and when implemented and designed efficiently at an existing two-way stop control location, can result in an 82 percent reduction in severe (injury/fatal) crashes and a 44 percent reduction in overall crashes.

Under FDOT Design Bulletin 15-07, a roundabout alternative must be evaluated for projects that propose new signalization or require a change in an un-signalized intersection control. FDOT has implemented a three-step roundabout evaluation process to determine if a roundabout is the appropriate control measure for a proposed intersection improvement. These steps were followed when evaluating the feasibility of a roundabout at the two locations, which is documented in the following section.

3.3.1 Step 1 – Roundabout Screening

A review of the Step 1 – Roundabout Screening criteria conducted in January 2018 indicated that there were no significant physical or geometric constraints that would be inconsistent with the installation and/or

operation of a roundabout at either Roy Wall Boulevard/Martin Road or Levitt Parkway/Lakemoor Boulevard. The results of Step 1 – Roundabout Screening was presented to FDOT and the decision was made to advance the roundabout alternatives to be further evaluated to determine if roundabouts are feasible for these two locations.

A completed standard form including the screening criteria is included in **Appendix F.**

3.3.2 Step 2 – Roundabout b/c Evaluation

The Step 2 – Roundabout Benefit-to-Cost (b/c) Evaluation analysis provides a benefit to cost ratio that gives an indication as to whether or not the roundabout alternative delivers a superior return on investment (ROI). This step utilizes planning-level costs associated with safety, operations, maintenance, and construction to evaluate b/c. Since a detailed operational analysis and preliminary roundabout design will be conducted in the proceeding Step 3, the standard spreadsheet will be filled out and discussed in a later section of this report when the costs associated with the delay (delay reduction benefit of roundabout) and the costs to construct a roundabout are determined.

3.3.3 Step 3 – Geometric and Operational Analysis

In Step 3 – Geometric and Operational Analysis, the roundabout operational analysis was completed to determine if the roundabouts will accommodate traffic volumes in projected 2040 conditions (long term design horizon) at an acceptable level of service. In addition, a preliminary roundabout design was developed for both locations and discussed in the following section.

3.4 **Operational** Analysis

An operational analysis for the projected future year 2040 (long term) peak hour traffic volumes was conducted for the existing TWSC, signal, and roundabout alternatives. Both unsignalized (TWSC) and signalized intersection alternatives were analyzed based on the Highway Capacity Manual 2010 methodologies using Synchro 9 software package. The roundabout alternative was analyzed based on the SIDRA standard roundabout model with an environmental factor of 1.1 using SIDRA 7 software package. The results of the operational analysis were presented in terms of volume-to-capacity ratio, average control delay, level of service, and 95th percentile queue. The operational analysis worksheets are included in **Appendix G5.** The unsignalized intersection alternatives were evaluated in the Future Conditions Report and the detailed findings can be found in that report.

3.4.1 Signalized Intersection Operational Analysis

The traffic signal alternatives were evaluated for both Roy Wall Boulevard/Martin Road and Levitt Parkway/Lakemoor Boulevard intersections assuming that the intersection would be realigned to remove the existing east-west direction offset. The Martin Road eastbound approach would be realigned to match the exiting Roy Wall Boulevard while the Levitt Parkway would be realigned to match the existing Lakemoor Boulevard. The lane configurations at the intersections would be re-configured as follows:

- Roy Wall Boulevard/Martin Road
    - Northbound left, two through lane, and a right turn lane
    - Southbound left, a through, and a shared through/right turn lane
    - Westbound left and a shared through/right turn lane
    - Eastbound shared left/through/right turn lane
- Levitt Parkway/Lakemoor Boulevard
    - Northbound left, a through, and a shared through/right turn lane
    - Southbound left, a through, and a shared through/right turn lane
    - Westbound shared left/through/right turn lane
    - Eastbound left and a shared through/right turn lane

Signal timings would be optimized for the new configuration and bicycle/pedestrian improvements such as bicycle lanes, sidewalks, crosswalks, and ADA compliant landings would be installed similar to other intersection recommendations along the corridor. The results of the signalized intersection operational analysis are presented in **Table 4**.

As shown in **Table 4**, the results of the operational analysis at both intersections revealed that while most movements operate at an acceptable LOS D or better, there are failing movements operating at LOS E or worse. The v/c ratios for both intersections generally remains below 0.80; however, there are movements which exceed 0.80 in both the AM and PM peak hours. It should be noted that all movements, at both intersections, are anticipated to operate at v/c ratios significantly lower than 1.0. The Synchro 9 HCM 2010 LOS reports are included in **Appendix G.**

Table 4: Signalized Intersection Capacity Analysis Results (2040)

Intersection	Movement	AM Peak			PM Peak		
		v/c[1]	Delay[2]	LOS[3]	v/c[1]	Delay[2]	LOS[3]
S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard/Martin Road	EBL/T/R	0.62	89.9	F	0.68	82.8	F
	WBL/T	0.59	41.7	D	0.76	42.9	D
	WBR	0.77	48.8	D	0.86	53.1	D
	NBL	0.02	15.5	B	0.10	18.4	B
	NBT	0.60	17.4	B	0.93	35.7	D
	NBR	0.37	15.0	B	0.26	16.7	B
	SBL	0.58	15.3	B	0.75	28.6	C
	SBT/R	0.82	22.8	C	0.83	28.2	C
	Overall	**0.82**	**22.0**	**C**	**0.93**	**33.5**	**C**
S.R. 519 (Fiske Boulevard) at Levitt Parkway/Lakemoor Boulevard	EBL	0.45	49.1	D	0.37	55.2	E
	EBT/R	0.30	45.2	D	0.37	59.0	E
	WBL/T/R	0.83	47.7	D	0.80	50.7	D
	NBL	0.00	18.4	B	0.08	12.4	B
	NBT/R	0.68	21.2	C	0.75	20.4	C
	SBL	0.15	13.2	B	0.45	16.4	B
	SBT/R	0.64	14.6	B	0.74	18.0	B
	Overall	**0.83**	**20.2**	**C**	**0.80**	**20.5**	**C**

Source: Compiled by VHB using Synchro 9 software.
1 v/c = Volume to capacity ratio
2 Delay = Vehicle delay expressed in seconds per vehicle
3 LOS = Level of service
Note: Shaded cells denote unacceptable LOS (LOS E or F) conditions.

3.4.2 Roundabout Intersection Operational Analysis

As illustrated in **Figure 5** and **Figure 6,** a two-lane roundabout configuration was evaluated at both intersections. In order to minimize the delays and queues on the Roy Wall Boulevard westbound approach, a shared left/through and an exclusive right-turn lane are recommended. The results of the roundabout operational analysis are presented in **Table 5**. The SIDRA lane summary printouts are provided in **Appendix G**.

Figure 5: Preliminary Roundabout Configuration at Roy Wall Boulevard/Martin Road

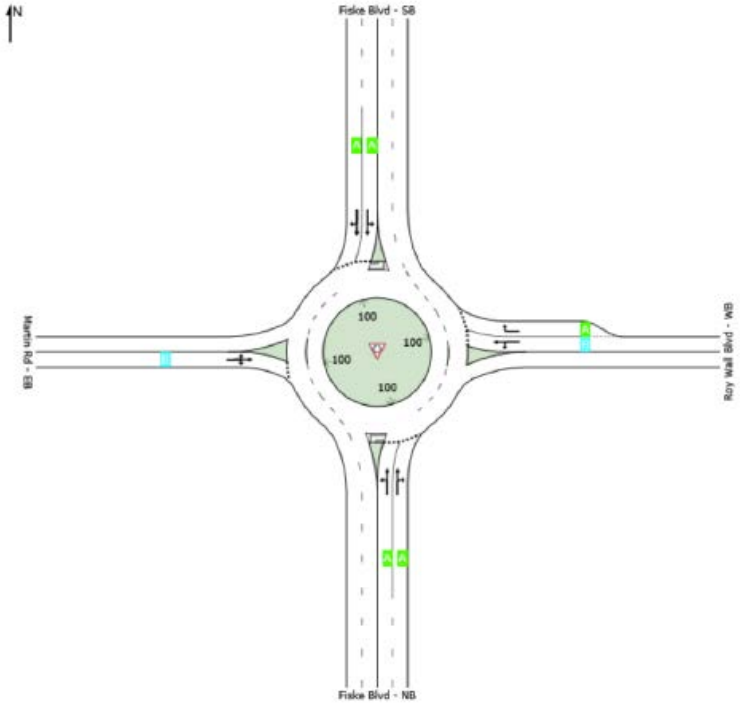

Figure 6: Preliminary Roundabout Configuration at Levitt Parkway/Lakemoor Boulevard

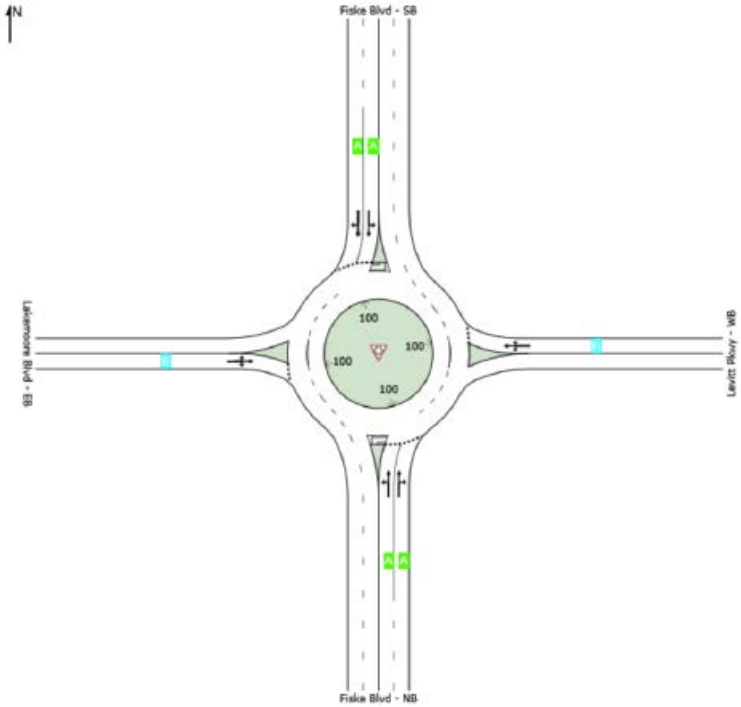

Table 5: Roundabout Capacity Analysis Results (2043)

Intersection	Movement	AM Peak			PM Peak		
		v/c[1]	Delay[2]	LOS[3]	v/c[1]	Delay[2]	LOS[3]
S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard/Martin Road	NB L/T (Lane 1)	0.530	5.6	A	0.648	5.8	A
	NB T/R (Lane 2)	0.530	5.3	A	0.648	5.3	A
	WB L/T (Lane 1)	0.211	13.8	B	0.641	20.2	C
	WB R (Lane 2)	0.208	7.3	A	0.522	10.8	B
	SB L/T (Lane 1)	0.684	6.7	A	0.737	10.2	B
	SB T/R (Lane 2)	0.684	5.1	A	0.737	7.8	A
	EB L/T/R	0.034	13.3	B	0.065	14.5	B
	Overall Intersection	**0.684**	**6.0**	**A**	**0.737**	**8.4**	**A**
S.R. 519 (Fiske Boulevard) at Levitt Parkway/Lakemoor Boulevard	NB L/T (Lane 1)	0.407	4.5	A	0.577	5.3	A
	NB T/R (Lane 2)	0.407	4.4	A	0.577	4.9	A
	WB L/T/R	0.394	13.7	B	0.339	13.0	B
	SB L/T (Lane 1)	0.541	5.6	A	0.608	5.6	A
	SB T/R (Lane 2)	0.541	5.0	A	0.608	4.7	A
	EB L/T/R	0.095	14.3	B	0.064	15.0	C
	Overall Intersection	**0.541**	**5.7**	**A**	**0.608**	**5.5**	**A**

Source: SIDRA 7.0 Intersection Lane Summary Report.
1 v/c = Volume to capacity ratio
2 Delay = Vehicle delay expressed in seconds per vehicle
3 LOS = Level of service

As shown in the previous **Figure 5** and **Figure 6**, as well as summarized in **Table 5**, the two-lane proposed roundabouts at Roy Wall Boulevard/Martin Road and Levitt Parkway/Lakemoor Boulevard are expected to operate at LOS A during the 2040 future conditions. In addition, the side street approaches are expected to operate at LOS C or better.

3.5 Preliminary Roundabout Design

The preliminary roundabout design was developed in accordance with the design guidelines and principles outlined in the NCHRP Report 672, Roundabouts: An Informational Guide – 2nd Edition and the Florida Intersection Design Guide. Roundabout design is an iterative process. The preliminary roundabout design concept presented in this study was developed based on a holistic approach of balancing safety, mobility, and accessibility for all roadway users. A modern roundabout is a circular intersection in which traffic travels counterclockwise around a central island and entering traffic must yield to circulating traffic. One of the key design features of the modern roundabout is the alignment of the entry lane with receiving circulatory roadway. Additional design features include:

- Roundabout must be evaluated when a new signal or major reconstruction of an existing signal is proposed, and/or a change in an un-signalized intersection control is required.
- To construct a roundabout the intersection must: meet the traffic signal warrants 1 or 2, contain and document a high frequency of severe crashes, be in context with a low speed facility, OR be needed as speed management within a transitioning context classification.

- Be designed with a WB-62FL design vehicle.
- Be designed and analyzed within AUTOTURN to determine the swept path.
- Control vehicular speeds via prominent landscaping, raised splitter islands or hard geometry.
- Entry speed for a single-lane approach is restricted to 25 mph or less. Entry speed for a 2-lane approach is restricted to 30 mph or less. The relative difference between entry and exit speeds is to be no more than 10 mph.
- At each crosswalk location provide a minimum 6-foot wide and 10-foot long pedestrian refuge area within the splitter island. Locate the refuge area approximately 20 feet from the outside edge of the circulatory roadway.
- For 2-lane roundabouts, terminate bicycle lanes or shoulders approximately 100 feet from the circulatory roadway and provide bail-out ramps. Installation of bicycle bail-out ramps is optional for single-lane roundabouts. When bicycle bail-out ramps are provided, the desired sidewalk width is 10 feet, but should not be less than 8 feet.
- Provide raised splitter islands that are a minimum 100 feet in length and a minimum of 6 feet wide at the crosswalks. An island less than 100 feet in length, but not less than 50 feet, may be considered for roundabouts located on a highway with a design speed of 35 mph or less. Provide an island at least 150 feet in length for roundabouts located on a highway with a design speed of 50 mph or greater.
- Use the standard truck apron design. When circulatory lanes are concrete pavement, use red color additive to the concrete truck apron to provide a contrast.
- Use the standard left-turn arrow with a circular dot on the left-most lane of the approach to multi-lane roundabouts as shown in Standard Plans, Index 711-001. Use standard arrows within the circulatory roadway.

Each of the principles and objectives described above affects the safety and operation of the roundabout. When designed properly, the geometric features of channelization at the entrance and deflection around a central island forces traffic to enter and circulate at slow speeds, creating substantial safety advantages for all users. Entering traffic yields to vehicles in the circulatory roadway, leading to excellent operational performance.

The conceptual level geometric layout and alignment of the circulatory roadway and approach have been developed in CAD and superimposed on a combination of a scaled aerial, available topographic map, and ROW/utility surveys. A review of vertical geometry, drainage design, and utility relocations are not included in this study. The preliminary roundabout design concept presented in this report represents one possible alternative of laying out the geometry and alignment of the circulatory roadway and approaches that meet the design principles and objectives.

As part of the concepts, a two-lane roundabout configuration with a 185-foot inscribed circle diameter was laid out first to determine the potential impacts and the required pavement to accommodate the future widening. As illustrated in **Figure 7** and **Figure 8**, the proposed roundabouts at Roy Wall Boulevard/Martin Road and Levitt Parkway/Lakemoor Boulevard were conceptual designed with a 175-foot and 166-foot diameter, respectively. Note, the lane widths, within the circulatory roadway, for both proposed roundabouts are 15-feet.

The following sections provide summary of the design considerations and potential impacts.

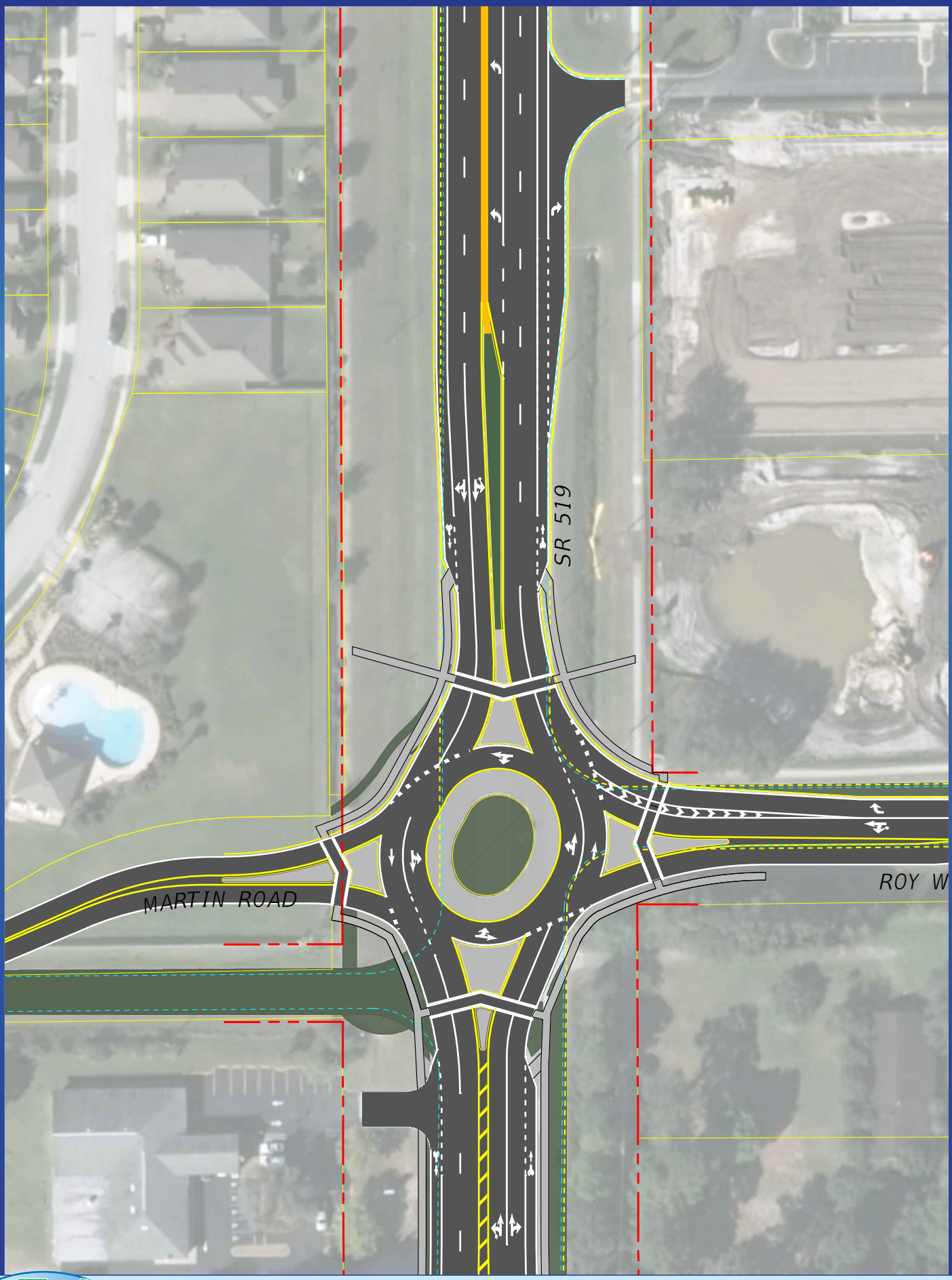

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FIGURE 7
Roy Wall Boulevard Roundabout

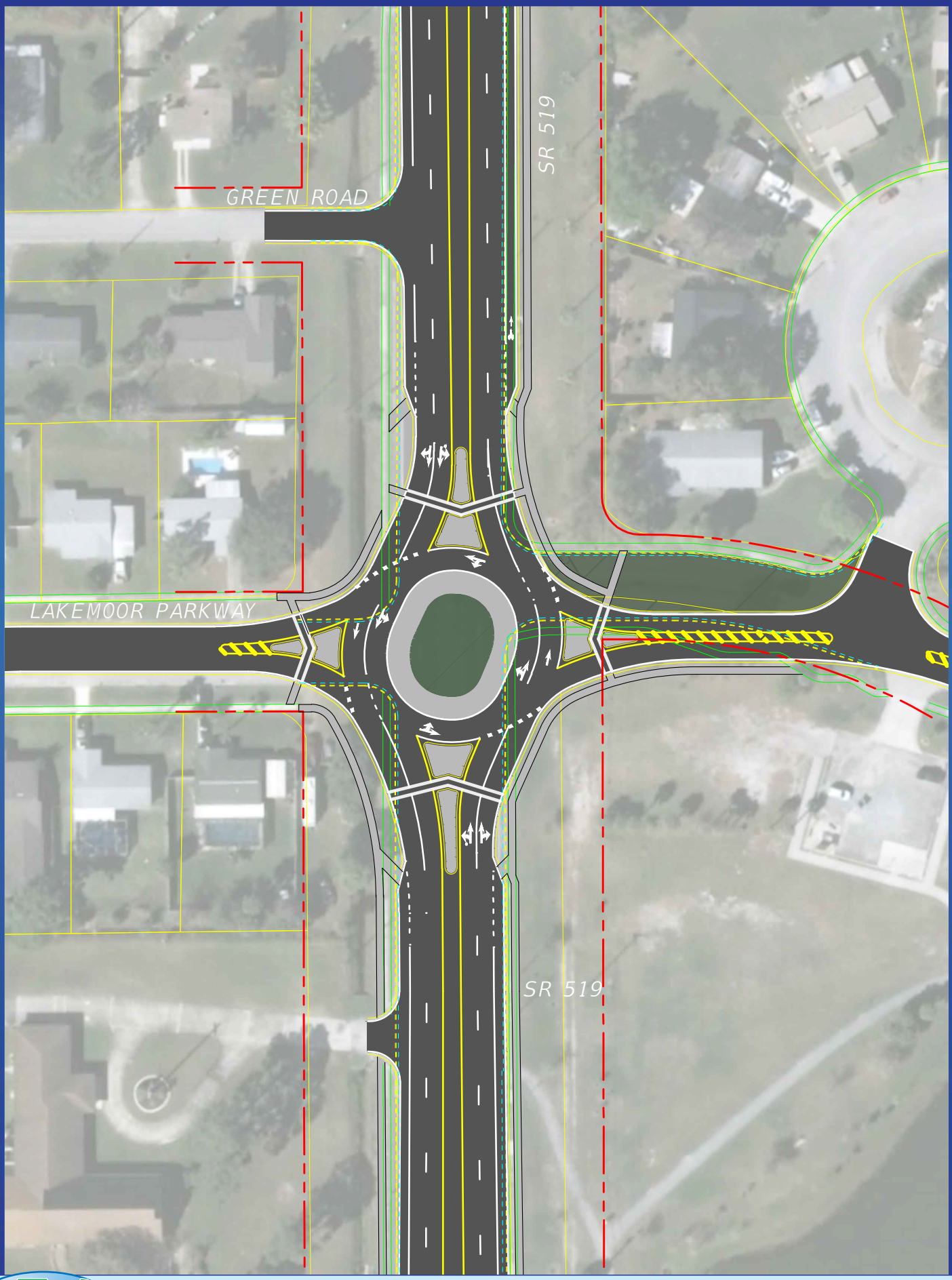

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FIGURE 8
Levitt Parkway Roundabout

3.6 Design Environment and Context

S.R. 519 (Fiske Boulevard) serves as a parallel arterial with I-95 and providing access to the cities of Rockledge and Cocoa. Based on field observations, the operating speed to and from I-95 tend to be higher than the posted speed as the roadway characteristics transitioning from an Interstate interchange area with wide grass median and shoulder to a more suburban commercial/residential area (C3R/C3C) with curb and gutter just south of Roy Wall Boulevard and continue to transition to more urban area (C4) near Levitt Parkway. Providing low and consistent speeds at entry and through the intersection is a critical design objective. The low speed environment makes roundabouts easier and safer to use and more comfortable for pedestrians and bicyclists as new sidewalks and Brevard Zoo Trail are being proposed in the area.

3.7 Speed Management

Achieving appropriate vehicular speed for entering and circulating the roundabout is a critical design objective as it has profound impacts on safety of all users. When designed properly, the geometric features of channelization at the entrance and deflection around a central island forces traffic to enter and circulate at slow speeds, creating substantial safety advantages for all users. In accordance with the FDOT roundabout policy, two-lane roundabouts must be designed for operating speeds between 25 and 30 mph. As noted above, because of the observed high traveling speed along S.R. 519 (Fiske Boulevard), the roundabout concepts were developed to maintain a low-speed environment with 30 mph or less for vehicles entering and traversing through the roundabout.

At part of the final design, the roundabout should be designed to check for the vehicle performance regarding the fastest path to assure that the speeds are within 25 mph and 30 mph parameters.

3.8 Design Vehicle

The design vehicle is by far one of the most important design considerations of a roundabout as the maneuvering requirements of the design vehicle have significant impacts on many of the roundabout's geometric features. In accordance with the FDOT roundabout policy, roundabouts on state roads must accommodate a WB-62FL truck. Other roadways should accommodate, at a minimum, school buses, moving vans, garbage trucks, fire trucks, and other emergency vehicles. The preliminary roundabout design has been developed to accommodate WB-62FL trucks and their swept path/movements.

3.9 Sight Distance and Visibility

The visibility of the roundabout as vehicles approach the intersection and the sight distance for viewing vehicles already operating within the roundabout are key components for providing safe roundabout operations. The line of sight at each roundabout approach is adequate for motorists to react and stop when potential conflicts arise within the roadway under the low speed environment.

3.10 Pedestrians and Cyclists

The design criteria to accommodate pedestrians and cyclists have been considered and incorporated in the roundabout concepts. For the purposes of these concepts, bike ramps approaching and departing the roundabout were included. Splitter islands and crosswalks are provided on all four legs of the intersections.

3.11 Site-Specific Physical and Geometric Impacts

In order to assess the potential physical and geometric impacts, the conceptual level geometric layout and alignment of the circulatory roadway and approaches have been developed in CAD and superimposed on a combination of scaled aerial and available right-of-way (ROW) information. A review of the ROW information indicates the following:

- Roy Wall Boulevard: no additional ROW, to the one needed to re-align Martin Road/Roy Wall Boulevard would be needed. The City of Rockledge already owns the ROW that would be required to re-align the road; therefore, at the time of designing the roundabout, and agreement between FDOT D5 and the City of Rockledge would be needed so the ROW can be transferred to the Department.
- Levitt Parkway: no additional ROW, to the one needed to re-align Lakemoor Boulevard/Levitt Parkway would be needed. In order to re-align Levitt Parkway to the south, ROW that is currently part of the Levitt Park will be needed. This park is currently owned by the City of Rockledge; therefore, at the time of designing the roundabout, and agreement between FDOT D5 and the City of Rockledge would be needed so the ROW can be transferred to the Department.

3.12 Safety Considerations

When implemented and designed properly at an existing two-way stop control location, roundabouts can reduce severe (injury/fatal) crashes at an intersection by 82 percent and overall crashes by 44 percent. As outlined in the NCHRP 672 Report, the reasons for the increased safety level at roundabouts are:

- Roundabouts have fewer vehicular conflict points in comparison to conventional intersections. The potential for high-severity conflicts, such as right angle and left-turn head-on crashes, is greatly reduced with roundabout use.
- Low speeds generally associated with roundabouts allow drivers more time to react to potential conflicts, also helping to improve the safety performance of roundabouts. Low vehicle speeds help reduce crash severity, making fatalities and serious injuries uncommon at roundabouts.
- Since most road users travel at similar speeds through roundabouts (i.e., have low relative speeds), crash severity can be reduced compared to some traditionally controlled intersections.
- Pedestrians need to cross only one direction of traffic at a time at each approach as they traverse roundabouts (i.e., crossing in two stages), as compared with many traditional intersections. From a pedestrian's perspective, conflicting vehicles come from fewer directions.

- The speeds of motorists entering and existing a roundabout are reduced with good design, increasing the time available for motorists to react and reducing potential crash severity. While multilane crossings still present a multiple threat challenge for pedestrians, the overall lower speed environment helps to reduce the likelihood of collisions. As with other crossings requiring acceptance of gaps, roundabouts present visually impaired pedestrians with unique challenges.

To predict the crash frequency and severity at the intersections, the crash prediction methodology from the Highway Safety Manual (HSM) was used. Crash frequency and severity at intersections is predicted using safety performance functions (SPFs). The SPFs are regression equations that estimate the frequency and severity of crashes based on multiple factors including intersection geometry, lane configuration, and traffic volumes. As part of Step 2 - Roundabout b/c Evaluation, FDOT has developed a spreadsheet that includes this crash prediction methodology based on multiple input parameters.

As shown in **Table 6**, the predicted annual crashes on implementing the traffic signal alternative would result in a total of 3.74 and 3.22 crashes at the Roy Wall Boulevard and Levitt Parkway intersections, respectively. With the implementation of roundabouts, the predicted annual crashes would be significantly less than the traffic signal alternative with only 2.96 and 2.77 crashes. It should be noted that the predicted annual crashes for fatal/injury were significant less. Over the course of the 20-year period, the total predicted crashes for fatal/injury under the roundabout alternative are expected to be 59.21 and 55.53 crashes compared to 74.64 and 64.34 crashes under the signal alternative at the Roy Wall Boulevard and Levitt Parkway intersections, respectively.

Table 6: Crash Prediction Summary

Predicted Annual Crashes				
	S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard		S.R. 519 (Fiske Boulevard) at Levitt Parkway	
	Roundabout Alternative	Signal Alternative	Roundabout Alternative	Signal Alternative
Predicted Fatal/Injury Crashes	0.35	1.32	0.32	1.13
Predicted PDO Crashes	2.61	2.42	2.45	2.09
Total Crashes	**2.96**	**3.74**	**2.77**	**3.22**
Total Predicted Crashes between 2023 and 2043				
	S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard		S.R. 519 (Fiske Boulevard) at Levitt Parkway	
	Roundabout Alternative	Signal Alternative	Roundabout Alternative	Signal Alternative
Predicted Fatal Injury Crashes	6.91	26.31	6.42	22.61
Predicted PDO Crashes	52.30	48.33	49.11	41.73
Total Crashes	**59.21**	**74.64**	**55.53**	**64.34**

Source: FDOT Step 2 Roundabout b/c Evaluation spreadsheet.

3.13 Benefit-to-Cost (b/c) Evaluation

The planning level construction cost estimates have been developed based on the required number and configuration of lanes on each approach, and the potential impacts identified when developing the preliminary roundabout conceptual design for the ultimate configuration. Without a survey of the interchange, the cost estimate associated with the impacts to the existing drainage structures and utilities relocation are preliminary and are based on the FDOT's LRE Cost-Per-Mile model.

The planning level construction cost estimates for the two-lane roundabout configuration are $875,299 for Roy Wall Boulevard and $920,482 for Levitt Parkway, respectively. The cost for the traffic signal alternative is assumed to be approximately $340,000 (each). Note, the cost estimates are for construction only and does not include the design costs.

The results of the operations and safety performance and the planning level construction cost estimates have been entered in the Step 2 – Roundabout b/c Evaluation spreadsheet and the life cycle benefit/cost ratio of a roundabout compared to a traffic signal is summarized in **Table 7**. The total benefits of implementing a roundabout at the Roy Wall Boulevard intersection are approximately $5,223,510. The added capital and operations/maintenance costs are approximately $494,138. This resulted in the life cycle benefit/cost ratio of 10.6. As for the Levitt Parkway intersection, the total benefits of implementing a roundabout are approximately $4,336,655. The added capital and operations/maintenance costs are approximately $539,321. The life cycle benefit/cost ratio for the eastbound ramp terminal is 8.0.

These results indicate that the investment in installing roundabouts at the intersections is the preferred alternative when compared to the traffic signal alternative. The results of the life cycle b/c ratio and standard form are included in **Appendix F.**

Table 7: Life Cycle Benefit/Cost Ratio Roundabout Compared to Traffic Signal

	S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard	S.R. 519 (Fiske Boulevard) at Levitt Parkway
Safety Benefit of a Roundabout	5,223,510	4,336,655
Delay Reduction Benefit of a Roundabout	-	-
Total Benefits	**5,223,510**	**4,336,655**
Added Operations & Maintenance Costs of a Roundabout	(41,161)	(41,161)
Added Capital Costs of a Roundabout	535,299	580,482
Total Costs	**494,138**	**539,321**
Life Cycle Benefit/Cost Ratio	10.6	8.0

Source: FDOT Step 2 Roundabout b/c Evaluation spreadsheet.

4

Chapter 4: Corridor-Wide Improvements and Considerations

4.1 Introduction

Beyond the identified cross-section alternatives for S.R. 519 (Fiske Boulevard), there were several corridor-wide improvements identified. These improvements are presented in eight subsequent sections: access management, bicycle/pedestrian, transit, TSM&O, drainage, utility verification, right of way, and environmental.

It should be noted that bicycle, pedestrian, and transit improvements were identified using a more qualitative approach based on stakeholder feedback and field review while ensuring that existing infrastructure was brought up to current standards.

4.2 Access Management

Access management was identified as a concern throughout the corridor; therefore, addressing this concern was considered in all the alternatives. The corridor includes several residential neighborhoods, driveway access to multiple commercial properties, as well as direct access to some residential homes. As part of the analysis process, the study team evaluated the corridor to determine if access could be modified to improve safety and/or address operational concerns, via modifying existing driveways (such as consolidation, re-alignments, etc.) or adding a median with openings.

The Department adheres to the access management guidelines identified within the Florida Administrative Code (FAC) 14-97, as shown in **Table 5** on the following page. As highlighted within the previous section 2.2, adding a median, throughout the corridor with openings, was part of the Alternative 2. While, full median access is typically reserved for signalized intersection, the location of the signals, as well as the type of median (directional or full) are determined and designed based on the standards outlined in the Florida Administrative Code (F.A.C.).

The specific circumstances that allows for a full median or a directional median opening is determined based on engineering judgement and coordination with the local stakeholders/public. The directional median openings allow for left turns from the major street onto the minor street but prevent left turns from the minor street onto the major street. By limiting the number of allowed turning movements, a directional median

opening reduces the number of conflict points; therefore, reduces the potential for crashes and eliminates the two-way left turn lane. The spacing standards for the controlled access facilities can be found within **Table 8**.

Table 8: Access Management Standards for Controlled Access Facilities (14-97, FAC)

Access Class	Median	Median Opening Spacing Standard (feet)		Signal Spacing Standard (feet)	Connection Spacing Standard (feet)		
		Full	Directional		Posted Speed > 45 MPH	Posted Speed ≤ 45 MPH	
2	Restrictive	2,640	1,320	2,640	1,320	660	
3	Restrictive	2,640	1,320	2,640	660	440	
4	Non-Restrictive			2,640	660	440	
5	Restrictive	2,640			2,640		*Posted > 45 MPH*
		1,320			1,320		*Posted ≤ 45 MPH*
6	Non- Restrictive			1,320	440	245	
7	Both Median Types	660	330	1,320	125	125	

The existing access management conditions are discussed in the Existing Conditions Report. As identified within the previous report, the corridor is currently an Access Class 4. This access class would remain for Alternatives 1 and 3; however, within Alternative 2, the access class would require a change to a Class 3. However, as previously identified, Alternative 2 was determined to not be a viable solution; therefore, the access classification would remain an Access Class 4.

In addition, the driveways were reviewed throughout the corridor and evaluated based on the connection spacing standards. The FDOT standard driveway width for bi-directional driveways is a minimum 24-feet, with a maximum 36 feet. As shown within the preferred alternative concepts, some driveways were modified to meet the minimum and maximum width requirement to reduce driver confusion and allow a more defined sidewalk to increase pedestrian safety along the corridor.

4.3 Bicycle / Pedestrian Improvements

As part of the corridor evaluation, the existing infrastructure for the bicycle and pedestrian was assessed and improvements were identified. Improvements for the bicycle/pedestrian network include the following:

- Filling in the existing sidewalk gaps that were identified in the Existing Conditions Report.
- Replacing and widening the existing sidewalk to meet current FDOT design standards (6 feet). It should be noted that this was done for sections were the sidewalks were 4-foot wide; however, at sections were sidewalk width was 5 feet n improvement was proposed.
- Complete the missing segments of the Brevard Zoo Trail which runs along the east side of S.R. 519 (Fiske Boulevard). The extension would run north along the study corridor from Barnes Boulevard to Eyster Boulevard and provide connectivity for both, pedestrians and bicyclists.
- Install 5.5-foot bicycle lanes throughout the study corridor. This width may vary to accommodate the needs of specific intersections.

- Ensure all intersections and crossings meeting standards including the installation of raised ADA pads by providing tactile warning surfaces.
- A landscaped island would also serve as a pedestrian refuge south of Barbara Jenkins Street to facilitate access between Provost Park and area residential on the east side of S.R. 519 (Fiske Boulevard).

4.4 Transit Improvements

Space Coast Area Transit runs two routes through the study area. In coordination with Space Coast Area Transit, the following improvements to the transit network were proposed:

- Bring transit stops into ADA compliance by installing landing pads at all transit stops in the study area. For instance, the transit stop at Barton Boulevard will be relocated to allow the construction of a retaining wall. This will allow the bus stop to be reconstructed at grade and meet ADA compliance standards.
- Provide pedestrian connections (i.e., extend sidewalk) between sidewalks and bus stops.
- Install additional amenities such as bicycle racks.

4.5 TSM&O Strategies

The Transportation Systems Management & Operations (TSM&O) strategy development is a state and districtwide initiative evaluating performance with the goal of increasing capacity and reducing crashes along the state's roadways. As part of the District 5 initiative, this corridor was evaluated using the TSM&O Strategy Guide through coordination with the district's TSM&O team. As such, the following items were identified with potential recommendations:

- Suggest installation of Dynamic Message Signs (DMS) along corridor to support facility's designation as an alternate route for I-95 and identification as Active Arterial Management (AAM) route. Include as part of future corridor improvement project with installation of Bluetooth devices.
- The corridor has been identified as a Connected Vehicle corridor with suggestion to install additional technology devices along corridor and/or at the corridor intersections.
- All communications are currently overhead with no underground lines. Potential undergrounding and installation of communication fiber lines as part of future corridor improvement project.
- Current FDOT Emergency Operations Center is located east of Fiske Boulevard. Potential relocation or renovation would be recommended.
- Identified as Priority #23 within the Space Coast TPO Master Plan is the installation of 5.9 miles of new fiber from Barton Boulevard to Summer Path. The identified schedule in the Master Plan is mid-range timeframe (6-10 years).

The above recommendations should be considered as part of future corridor improvement projects.

4.6 Drainage Analysis

This corridor was originally constructed as a Brevard County road and transfer to the State in the 1980's. However, no as-built plans were included as part of the jurisdictional transfer; therefore, the are no documentation regarding drainage infrastructure along this corridor. The study team conducted some research and filed observations and, based on these, it was able to identify the following:

The general stormwater conveyance system which serves S.R. 519 (Fiske Boulevard) is curb and gutter along the roadway with storm pipes directing runoff from the roadway to localized storm drainage retention ponds. The curb and gutter typical section transitions to an open swale system just north of I-95 to Roy Wall Boulevard and from Rosa L. Jones Drive/Boulevard to the northern limits at S.R. 520 (King Street). S.R. 519 (Fiske Boulevard) is generally flat; however, elevations decrease as the corridor approaches the southern limits. The United States Geological Survey (USGS) maps indicate a high point at S.R. 520 (King Street) to the National Geodetic Vertical Datum (NGVD). The roadway elevation is approximately 24 NGVD at this point and tapers to 18 NGVD at the southern limit of the study area. There are other local low points to facilitate drainage within the closed drainage system.

According to the Federal Emergency Management Agency (FEMA) Federal Insurance Rate Maps (FIRMS) for Brevard County (community panels 12009C0430G and 12009C0440G dated March 2014), the S.R. 519 (Fiske Boulevard) study area is not located within any flood zones.

Any improvements to Fiske Boulevard will be subject to the St. John's River Water Management District criteria, which are current at the time of the improvement. In addition, the FDOT Drainage Manual currently requires roadway projects comply with the Department's drainage connection rule.

Based on the existing stormwater regulations of these agencies, and lack of information regarding drainage infrastructure, it is the recommendation of this study to perform a detailed Drainage Study before making improvements that would impact the drainage existing drainage system (e.g., adding curb and gutter to the norther section of the corridor).

4.7 Utility Verification

As documented in the Exiting Conditions Report, a Sunshine One Call ticket was processed in July 2017 to identify a list of potential utility providers within the corridor. A 500-foot buffer was used around S.R. 519 (Fiske Boulevard) to understand the utility companies which are located within and adjacent to the corridor.

Table 9 presents the utility companies and agencies which have facilities located within the study area.

Table 9: Utility Agencies and Contact Information

Utility/Agency	Utility Type	Contact Person	Contact Number
Brevard County Water Resources	Water & Sewer	Tammy Hurley	321-633-2089
City of Cocoa	Water & Sewer	George Toler	321-433-8797
City of Rockledge	Water & Sewer	James Elmore	321-221-7540 Ext: 6
Florida City Gas	Gas	Ron Muller	321-638-3424
Florida Power & Light	Electric	Joel Bray	954-581-3088
Level 3 Communications LLC	Fiber Optic / Communications	Network Relations	877-366-8344 Ext: 2
AT&T/Distribution	Fiber Optic / Communications	Bryan Coughlin	321-258-9244
Tower Cloud, Inc.	Fiber Optic / Communications	James Davis	904-813-2063
Transcore	Electric & Fiber	Tushar Patel	386-943-5315
Bright House Networks, LLC	Communications / Fiber Optic	Mike Isom	321-757-6451

Source: Sunshine 811. Data was aggregated to reflect study area section limits.

The listed facilities in the Sunshine ticket do not indicate a definite presence within the corridor. Above ground utilities (i.e., pole type, etc.) are identified in the concept plans presented in **Appendix B** and **Appendix C**.

It should be noted that based on this Concept Development preferred alternatives, no utilities are anticipated to need relocation based on the coordination with the above listed utilities/agencies. The precise impacts to utilities will be confirmed when a detailed survey is conducted and the final alternative is designed at a later phase.

4.8 Right-of-Way Estimates

As identified by the alternatives presented, the corridor has sufficient right-of-way for the existing infrastructure and does not need to be widened. As the improvements stay within the existing curb line, no significant right-of-way is required. It should be noted that for those locations where additional asphalt would be needed along the northern section of the corridor; additional right-of-way would not be required.

However, additional right-of-way would be required to accommodate the potential re-alignment of Martin Road and Levitt Parkway. Martin Road, west of S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard, and Levitt Parkway, east of S.R. 519 (Fiske Boulevard) would require a re-alignment for either a roundabout or signal installation. Note, this right-of-way, required for the re-alignment, is currently owned by the City of Rockledge. No additional right-of-way would be required. However, the right-of-way impacts would be finalized during the future design phase. It should be noted that there currently is no funding for design and/or construction.

4.9 Environmental Evaluations

As part of the existing condition evaluation, exiting environmental information for the study area was extracted from Geographical Information System (GIS) datasets maintained by the Florida Geographic Data Library (FGDL), and documented in the Exiting Condition Report. For purposes of this environmental analysis, a buffer of 300 feet was used for the study area.

The following were examined as part of this review:

- Cultural Resources
- Social Resources
- Wetlands
- Floodplains
- Contamination
- Soils
- Threatened and Endangered Species

Section 4(f) of the Department of Transportation Act of 1966 (Pub. L. 89-670, 80 Stat. 931), now codified at 23 U.S.C. § 138 and 49 U.S.C. § 303, governs the use of publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites for U.S. Department of Transportation (USDOT) transportation projects. These resources are referred to as Section 4(f) protected properties.

There are two locations located immediately adjacent to the project corridor where Section 4(f) could apply. The Larry L. Schultz Park (Levitt Park) is a 7.5-acre park owned and maintained by the City of Rockledge and located at the southeast quadrant of S.R. 519 (Fiske Boulevard) and Levitt Parkway/Lakemoor Boulevard. Provost Park is a 20-acre community park owned and maintained by City of Cocoa and located at the southwest quadrant of S.R. 519 (Fiske Boulevard) and S.R. 520 (King Street).

Proposed improvements, exclusive of the roundabouts, do not impact the Provost Park or Larry L. Schultz Park (Levitt Park). However, if Federal funds are applied to any phase of the project and the roundabout option at S.R. 519 (Fiske Boulevard) and Levitt Parkway/Lakemoor Boulevard is included in the design a determination of Section 4(f) applicability will need to be made for the Larry L. Schultz Park (Levitt Park). This proposed roundabout concept requires right-of-way from the park. In addition, the Levitt Park sign is within the area of proposed right-of-way.

Since the recommended alternative remain in the current right-of-way, no additional environmental analysis is required; however, during discussions with FDOT D5 Brevard County Maintenance it was noted that there's the potential for contamination of the pavement's base and subbase with bituminous materials along the southern portion of the corridor. Brevard Maintenance mentioned that several years ago, when turn lanes were add to S.R. 519, it was found that the base and subbase were contaminated with bituminous materials; therefore, it is reasonable to assume that the potential for contamination still exists. This was communicated to the 3R project team and a decision was made to collect samples of the pavement structure to assess the potential contamination.

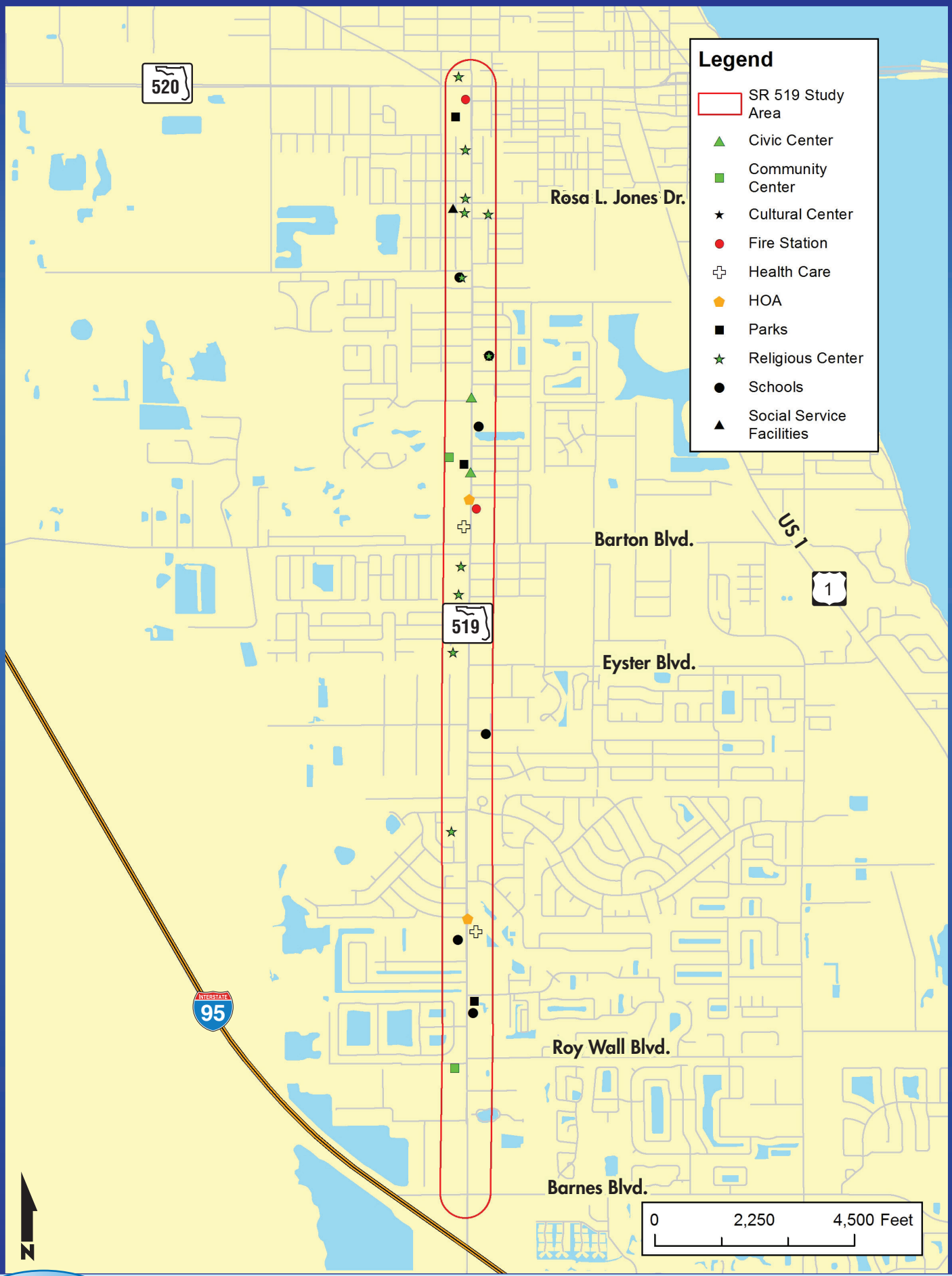

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FIGURE 9
Social Resources

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Chapter 5: Evaluation of Alternatives

5.1 Introduction

This chapter provides a summary of the evaluation measures and process used to compare the three alternatives. It also presents the evaluation measures that were used in the identification of the preferred alternative before presenting the recommended alternative.

5.2 Evaluation Measures

The measures of success were identified in the Future Conditions Summary and are listed in **Table 10**.

Table 10: Measures of Success

Guiding Principle	Objective	Measure
Safety	Providing better pedestrian/vehicle separation	Reduction in sidewalks that are located at the edge of curb
	Install roadway street lighting to improve nighttime visibility	Reduction in miles of roadway without street lighting
	Improve pedestrian crossings	Increase in number of pedestrian facilities and crossings that are ADA compliant
		Increase the visibility of marked crossings
Bike/Pedestrian Mobility	Enhance pedestrian facilities	Eliminate gaps in sidewalks
Bike/Pedestrian Mobility **Design Consistency**	Provide bicycle facilities	Creation of dedicated bicycle lanes
	Complete planned trail facilities	Connect local facilities to existing bicycle lanes and trails
	Provide consistent typical cross sections	Increase numbers of miles with consistent lane geometry
Operations	Improve operational deficiencies	Reduce intersection delay (Level of Service)
		Improve system throughput
Design Consistency **Aesthetics**	Increase level of compliance with access management standards	Update to design and location of connections to bring in compliance with access management standards
	Identify opportunity for improved planning (aesthetic features and maintenance)	Establish partnerships between Cities and business owners (including the Viera development)
Aesthetics **Transit**	Identify opportunity for improved planning (aesthetic features and maintenance) Provide improved bus stop facilities	Develop gateway and themed signage
		Upgrade bus stops to meet ADA standards
Transit	Provide improved bus stop facilities	Provide shelters/benches at bus stops
	Accommodate mode choices	Provide connections from sidewalk to bus stop

5.3 Evaluation Matrix

Table 12 presents a comparison of each alternative's scoring on the evaluation matrix. For each measure, each alternative was assigned either a Yes (coded as a ●), a Partial (coded as a ◐), or a No (coded as a ○). This table also counts up the number of Yes (●) to determine which alternative best meets the given evaluation measure.

Table 11: Scoring Matrix Measures of Success

Measure	Rating Scale ○	◐	●
Reduction in sidewalks that are located at the edge of curb	< 25% reduction in sidewalks at edge of curb.	25-75% reduction in sidewalks at edge of curb.	> 75% reduction in sidewalks at edge of curb.
Reduction in miles of roadway without street lighting	< 25% reduction in miles without street lighting.	25-75% reduction in miles without street lighting.	> 75% reduction in miles without street lighting.
Increase in number of pedestrian facilities and crossings that are ADA compliant	No increase in ADA compliance.	Some increase in ADA compliance.	Majority to full increase in ADA compliance.
Increase the visibility of marked crossings	Minimal increase in visibility.	Moderate increase in visibility.	Substantial increase in visibility.
Reduce intersection delay (Level of Service)	Limited or no reductions in level of service and/or v/c at study intersections.	Moderate reduction in level of service and/or v/c at study intersections.	Limited or no reductions in level of service and/or v/c at study intersections.
Eliminate gaps in sidewalks	< 25% elimination in gaps.	25-75% elimination in gaps.	> 75% elimination in gaps.
Creation of dedicated bicycle lanes	< 25% bicycle lane coverage proposed.	25-75% bicycle lane coverage proposed.	> 75% bicycle lane coverage proposed.
Connect local facilities to existing bicycle lanes and trails	No connections created.	Some connections created.	Full connections created.
Improve system throughput	No impacts to system throughput or negative impacts.	Minor impact to the system throughput.	Moderate to Major impacts to the system throughput.
Increase numbers of miles with consistent lane geometry	< 25% of miles with consistent lane geometry.	25-75% of miles with consistent lane geometry.	> 75% of miles with consistent lane geometry.
Update to design and location of connections to bring in compliance with access management standards	Minimal or no connections updated to compliance.	Some connections updated to compliance.	Majority of connections updated to compliance.
Establish partnerships between Cities and business owners (including the Viera development)	Limited or no partnerships established.	Moderate amount of partnerships established.	Substantial amount of

Table 11: Scoring Matrix Measures of Success

Measure	Rating Scale ○	◐	●
			partnerships established.
Develop gateway and themed signage	Little to no potential for aesthetic improvement.	Some potential for aesthetic improvement.	Multiple locations with potential for aesthetic improvement.
Upgrade bus stops to meet ADA standards	Minimal or no enhancement to bus stops.	Moderate enhancement to bus stops.	Substantial enhancement to bus stops.
Provide shelters/benches at bus stops	No additional shelters/benches provided.	Some additional shelters/benches provided.	Shelters/benches provided at majority of bus stops.
Provide connections from sidewalk to bus stop	No connections from sidewalk to bus stop.	Some connections from sidewalk to bus stop.	Full connection from sidewalk to bus stop.

Table 12: Alternatives Evaluation Ratings Matrix

5.4 Evaluation Results

As shown in previous **Table 12**, Alternative 3 meets the most evaluation measures (14 vs. 10 or 9). Therefore, based on the engineering concepts developed and evaluation metrics, Alternative 3 will be identified as the preferred solution. It should be noted that this evaluation process, and identification of the preferred alternative, was conducted taken into consideration input provided by the Project Visioning Team (PVT). As part of this process, the PVT, unanimously, identified Alternative 3 as the preferred alternative and the one that should move forward.

6

Chapter 6: Preferred Alternative Refinement

6.1 Public Involvement Process

Public involvement was a significant component of the preferred alternative selection process. Throughout the process, FDOT maintained contact with local and regional stakeholders that were part of the Project Visioning Team (PVT). These stakeholders included representatives from groups such as the Cities of Cocoa and Rockledge, Brevard County, the East Central Florida Regional Planning Council, Space Coast TPO, and Space Coast Area Transit.

In addition to the meeting held as part of the Corridor Planning project, during the Concept Development process, two PVT meetings, an FDOT management meeting, and a public meeting were held. Prior to the public meeting, a meeting between FDOT, SCTPO, and the City of Rockledge was held to discuss the proposed roundabouts at Roy Wall Boulevard and Levitt Parkway. The two PVT meetings and the public meeting were held at Rockledge City Hall, located at 1600 Huntington Lane, Rockledge, FL 32955. The public meeting was attended by over 100 members of the public. A total of 27 written comments were received along with numerous informal comments and sticky notes on the roll plots. The public meeting comments are available for viewing in **Appendix H**. All public involvement materials and minutes are provided under a separate cover.

6.1.1 First PVT Meeting

The first PVT meeting was held at 1:30 PM on Monday, March 26, 2018, at Rockledge City Hall in the City Council Chambers. The presentation was given by the FDOT Project Manager and Consultant Project Manager. The presentation focused on the background of the project, an update of the existing and future conditions analyses, and a discussion of the initial concepts for the corridor. Members of the public were present. During this meeting, the initial alternatives were presented to the PVT members and discussion about the proposed alternatives resulted in agreement that the construction of islands (Alternative 3) would be the best option because it would maintain driveway accessibility and create a narrower road, potentially discouraging speeding.

6.1.2 Second PVT Meeting

The second PVT meeting was held at 1:30 PM on Thursday, June 21, 2018, at Rockledge City Hall in the City Council Chambers. The presentation was given by the FDOT Project Manager, the Consultant Project Manager, and the Consultant Project Engineer. The presentation focused on the background of the project, conditions analysis, and

discussion of the preferred alternative for the corridor. During this meeting, the preferred alternative was shown to the stakeholders and the further discussion occurred on refining the proposed concepts.

6.1.3 Public Meeting

The public meeting was held at 6:00 PM on Thursday, June 28, 2018, at Rockledge City Hall in the City Council Chambers. The meeting presented the preferred alternative and received input from residents on the preferred alternative. The public meeting was held in an open house style format. The room was laid out with six workshop stations:

1. Welcome Table
2. Presentation Video
3. Existing and Future Conditions
4. Roundabouts
5. Corridor-Wide Conceptual Roll Plot
6. Comments

A large plot of the corridor, showing existing conditions and the preferred alternative was on a table (Station #5) where attendees could make notes of issues, concerns, and comments. Attendees were encouraged to discuss their thoughts and concerns about the preferred alternative with the project team who were stationed throughout the meeting space.

Over 100 attendees participated in the public meeting and provided feedback on the preferred alternative to members of the project team. There was a total of 27 formal comments provided during the public meeting and comment period. Additionally, many attendees expressed their feedback directly on the corridor roll plots via sticky notes. The project team reviewed all provided comments and addressed them as applicable.

6.2 Design Exceptions and Variations

As the alternatives are refined through the corridor development process, there is the potential for the design standards to not be met. Throughout the process, the study team has coordinated with the District's Design and Operations Engineer to identify possible exceptions and variations which may result as part of the alternatives development process. Based on this coordination, the following potential exceptions and variations were identified:

- The standard sidewalk minimum width of 6 feet was applied to the majority of the corridor, as the majority of the corridor sidewalks range between 4 and 8 feet. However, a potential exception and variation will be required so the existing sidewalk remain where a 5-foot sidewalk currently exist. It was determined that the cost of removing the 5-foot sidewalk and reconstructing a 6-foot sidewalk (complete reconstruction to add one foot) was not cost effective.
- The existing curb line was maintained throughout the corridor, if one existed. However, intersection lane shifts were modified to accommodate the additional bike lane and lane widths. One of the intersections, S.R. 519 (Fiske Boulevard) at Barton Boulevard, was challenging due to the number of auxiliary lanes and lack of right-of-way availability. Therefore, a design exception and variation were requested regarding the intersection off-set and deflection angle through the intersection, as such:

- Off-set: 10.92 feet (standard: 6 feet)
- Deflection Angle: 3.8 degrees (standard: 5 degrees)

Note, the preferred alternative includes raised landscaped islands to avoid access management impacts and need for u-turns/rerouting. However, the width of the islands will be 12-feet wide, the same as the center two-way left turn lane. Since there will be no left turns and/or u-turns needed or allowed, no variation would be needed (as it would have been required for Alternative #2, if moved forward). It should be noted that the specific locations of the raised landscaped islands will be verified during the design phase.

6.3 Cost Estimates

Utilizing the FDOT District 5 Engineer's Cost Estimate tool, a cost estimate for constructing the preferred alternative, was developed. This cost estimate includes all costs to construct this alternative; however, they do not include costs associated with the following:

- Drainage Study and potential drainage improvements that may be needed as a result of the study findings.
- Pavement reconstruction that may be needed if contamination is found to be present

The improvements were designed in a manner to avoid as much right-of-way acquisition as possible; however, the proposed roundabouts at the S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard and S.R. 519 (Fiske Boulevard) at Levitt Parkway intersection will require additional right-of-way. It should be noted that, even if instead of roundabouts, traffic signals are proposed, additional right-of-way would still be required to address the current east-west approaches off-set. The right-of-way required to accommodate the preferred alternative at these two intersections is currently owned by the City of Rockledge; therefore, no cost associated with right-of-way acquisition has been included in the cost estimate.

Table 13 details the cost for the various components of the preferred alternative. As can be seen, the total construction cost for the project is $10,119,008.62. This amount includes $473,805.17 for project unknowns and an additional $169,100.00 contingency cost. The detailed project cost estimate including each unit cost and pay item is included in **Appendix I**.

Table 13: Project Cost Estimate

Component Groups	Cost
Roadway	$6,994,423.25
Signing and Pavement Markings	$141,043.79
Lighting	$345,492.64
Signalization	$347,684.32
Utilities	$2,846.46
Component Sub-total	*$7,831,490.45*
Maintenance of Traffic (10%)	$783,149.055
Sub-total	*$8,614,639.50*
Mobilization (10%)	$861,463.95
Sub-total	*$9,476,103.45*
Project Unknowns (5%)	$473,805.17
Sub-total	*$9,949,908.62*
Initial Contingency	$169,100.00
Project Grand Total	**$10,119,008.62**

Source: Florida Department of Transportation District 5 Engineer's Cost Estimate

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Chapter 7: Next Steps

7.1 Next Steps

After selecting the Alternative 3 as the preferred alternative, the next steps to follow this effort were identified, these efforts are discussed in the sections that follow.

7.1.1 Short Term Projects

There are several projects in the short term that will follow the Concept Development and Evaluation study. These projects are as follows:

- A Resurfacing, Restoration, and Rehabilitation (3R) project is programmed in Fiscal Year (F.Y.) 2020-2021 that would include a complete milling and re-pavement of the roadway surface. The project would add bicycle lanes and close identified sidewalk gaps.
- A project would add double-left turning and receiving lanes at the C.R. 502 (Barnes Boulevard)/I-95 northbound ramps intersection (northbound and westbound approach), resulting in dual left turn lanes at all approaches. This project is not currently on the Work Program list; however, it will be added to a future Work Program.
- An FDOT Traffic Operations study on the intersections of S.R. 519 (Fiske Boulevard) at Roy Wall Boulevard/Martin Road and Levitt Parkway/Lakemoor Boulevard will collect updated traffic volumes at those intersections and study the best alternative to address the challenges currently present at those intersections.

7.1.2 Short Term Improvements

This Concept Development and Evaluation Study identified short term improvements that could be implemented. Most of these short-term improvements are being realized as a part of the 3R project. The list of identified short term improvements shown within the Proposed Alternative Concept Plans is the following:

- Construct bicycle lanes throughout the length of the corridor.
- Close sidewalk gaps throughout the corridor.

- Upgrade all pedestrian crossings (crosswalks and transit stops) to be ADA compliant and install ADA pads to provide detectable warnings to alert the visually impaired to upcoming intersection crossings and grade changes.
- Construct raised landscape islands at strategic locations throughout the corridor to improve access management.
- Construct a pedestrian refuge south of Barbara Jenkins Street to provide access to residents wishing to utilize Provost Park.
- Improve the Roy Wall Boulevard, Levitt Parkway, and Barnes Boulevard intersections, as identified in the previous section.
- Existing drainage conditions will remain (open swale or closed drainage).

7.1.3 Long Term Improvements

Long term improvements identified for the corridor are grouped into two categories: Needed and Desired. Those in the needed category are required by FDOT policies or laws (i.e., ADA improvements, etc.) while those in the desired category will require significant funding and have many unknown variables. The list of identified long term improvements is the following:

Long Term – Needed

- Construct widened sidewalks (6 feet) where possible.
- Modify driveways through removal, relocation, and/or width size modification to meet design standards and assist with access management. An access management study will be needed to confirm initial findings and coordinate with local property owners.
- Improve transit accessibility through the construction of ADA landing pads.
- Extend the Brevard Zoo Trail north to Eyster Boulevard to complete the trail loop.

Long Term – Desired

- Construct curb and gutter north of Barbara Jenkins Street. Conduct an area wide drainage study to gain a better understanding of drainage facilities and utilities. No documentation currently exists of what was constructed below ground.

7.2 Candidate Technical Design Scope

State Road Number: 519
Section Number: 70014-000
County: Brevard
Project Limits: From Barnes Boulevard to S.R. 520 (King Street)
Begin MP / End MP: 0.460 to 4.604 (length: 4.144 miles)
FM#: 437241-1

1.	Existing R/W Map Project Numbers:	427492-1 (2011): MP 0.445 to MP 3.848; Width varies 35-ft LT & 71.5-ft RT (Min.) 70220-405506-5 (2005): MP 0.235 to MP 0.445; 70220-2414 (1969): MP 0.235 to MP 0.447; Width varies 120-ft LT & 150-ft RT (Typ.) *Map coverage not available for MP 3.848 to MP 4.604
2.	Old Construction Project Numbers:	435055-1 (2016): (70220) MP 0.238, I-95 Interchange Lighting 424744-1 (2012): MP 2.962 to MP 3.854, Drainage Improvements 422930-1 (2009): MP 3.812 to MP 4.438, Drainage Improvements 330401 (2007): MP 0.439 to MP 0.445, Ramp Widening 409167-1 (2003): MP 0.000 to MP 4.651, Resurfacing 237628-1 (1996): MP 2.427, Signalization * Existing roadway plans have not been located for a majority of the project, believed to have been constructed prior to incorporation into the State Highway System.
3.	Additional R/W Required?	No
4.	Level of Community Awareness Plan:	Level 2.
5.	Are there any bridges within the limits?	#700126 NB SR 519 Over I-95, 16.1-ft #700176 SB SR 519 Over I-95, 16.1-ft
6.	Are there any RR Crossings within the project limits or in the vicinity?	No. FEC RR Crossing #272097Y is located 0.55 miles east of the end project limit on SR 520.
7.	Are there any Airports within 5-miles?	Yes. Merritt Island Airport is 3.1 miles E, Rockledge Airport is 1.4 miles E and the VA Outpatient Clinic Heliport is 2.4 miles S.
8.	Storm Water Management Jurisdiction:	SJRWMD.
9.	Is the Project within CCCL *(Coastal Construction Control Line)* ?	No.
10.	Is the project near a significant archaeological site?	This project was reviewed by EMO and no concerns were noted.
11.	Existing Utilities per Sunshine One Call: 13 Estimated number of underground: 10	AT&T Florida Brevard County – Sewer Brevard County – Water Brevard County Charter Communications City of Cocoa – Sewer City of Cocoa – Water City of Rockledge – Reclaimed Water City of Rockledge – Sewer Florida City Gas Florida Gas Transmission Florida Power & Light - Distribution Level 3 Communications
12.	Any Special MOT concerns?	None.

13.	Any Construction Concerns?	Florida Gas Transmission is within the project limits. Coordinate milling limits with Brevard County for begin/end project limits outside the State Road limits. Rockledge Fire Department Station 2 and Cocoa Fire Department Station 2 are within the project limits. Coordinate lane closures and traffic control plan accordingly. PVT identified that the Cocoa Fire Department Station 2 is being relocated along the E side of 519, N of Barton Boulevard. The current station will be converted to EMT only. Coordinate lane closures and traffic control plan accordingly. Contamination sites are present, see Permitting Scope Items.
14.	Posted/Design Speed Limits:	<u>Design</u> / <u>Posted</u> MP 0.460 to MP 1.100 SB: 45 mph / 35 mph MP 0.460 to MP 1.100 NB: 45 mph / 45 mph MP 1.100 to MP 2.800: 45 mph / 45 mph MP 2.800 to MP 4.604: 45 mph / 40 mph
15.	Design Criteria and Highway System	SHS, RRR
16.	Lump Sum or Pay Item?	Lump Sum.
17.	Proposed Design Schedule:	TBD: Based on project specifics, as roundabouts would require R/W

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