KITTELSON & ASSOCIATES

FISKE BOULEVARD & ROY WALL BOULEVARD INTERSECTION ANALYSIS

ROCKLEDGE, FLORIDA

June 2023

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Rockledge, Florida

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INTRODUCTION

PROJECT BACKGROUND

The Space Coast Transportation Planning Organization (SCTPO) retained Kittelson & Associates, Inc. to perform an Intersection Control Evaluation (ICE) for the intersection of SR 519/Fiske Boulevard (referred to as Fiske Boulevard throughout the remainder of the technical memorandum) and Roy Wall Boulevard/Martin Road in Rockledge, Florida. The study intersection is located approximately 0.70 miles north of Interstate 95 (I-95). **Figure 1** displays the location of the study intersection.

Intersection improvements at the Fiske Boulevard/Roy Wall Boulevard/Martin Road intersection were proposed as part of the SR 519/Fiske Boulevard Corridor Planning Study. Based on follow up discussions between the SCTPO, the Florida Department of Transportation (FDOT), Brevard County, and the City of Rockledge, a traffic signal was desired as the preferred alternative at this intersection. FDOT performed a signal warrant analysis on behalf of the City of Rockledge and a signal was warranted, but only under a three-leg configuration with Fiske Boulevard and Roy Wall Boulevard.

It was desired by the City of Rockledge to re-align Martin Road to tie in at the existing Fiske Boulevard & Roy Wall Boulevard intersection location, resulting in a four-leg configuration. This change in alignment initiated a re-evaluation of the proposed intersection control. The resulting ICE analysis for the intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road is summarized in this technical memorandum.

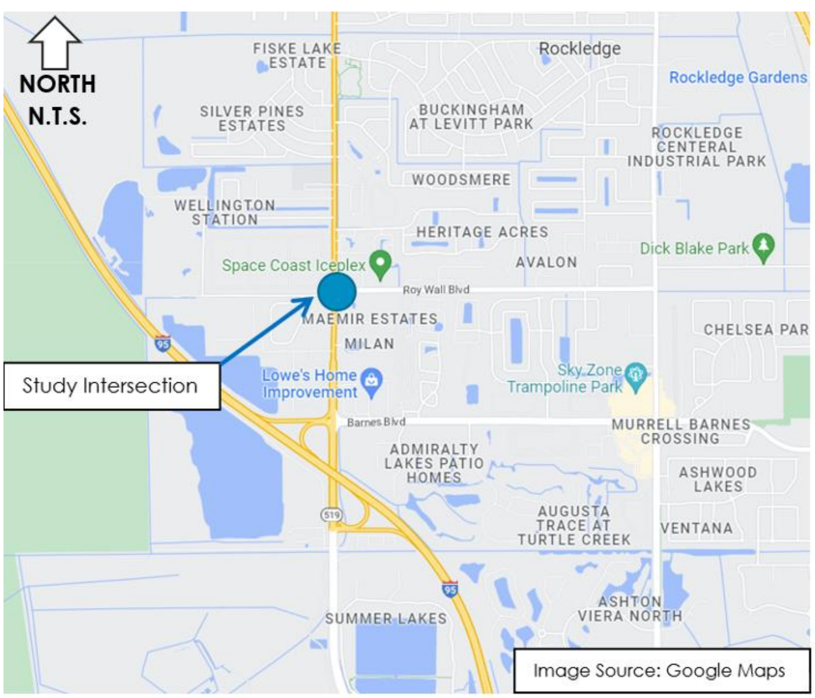


Figure 1: Fiske Boulevard & Roy Wall Boulevard/Martin Road Location

STUDY LOCATION CHARACTERISTICS

Fiske Boulevard is a five-lane undivided roadway, oriented north-south through the study intersection. Fiske Boulevard is classified as an "Urban Principal Arterial – Other", as defined in the Florida Traffic Online database. The typical section includes curb and gutter to the outside north of Roy Wall Boulevard, and paved shoulders with no curb and gutter south of Roy Wall Boulevard. The posted speed limit along Fiske Boulevard is 45 miles per hour (MPH). The 2020 annual average daily traffic (AADT) along Fiske Boulevard is 27,750 according to the SCTPO traffic count database. At the time of this analysis, 2020 traffic data was the most readily available for the study intersection.

Roy Wall Boulevard is a two-lane roadway which begins at Fiske Boulevard and continues east, terminating at Murrell Road. Roy Wall Boulevard is classified as an "Urban Major Collector" with a typical section that includes curb and gutter to the outside on both sides of the road. The posted speed limit along Roy Wall Boulevard is 35 MPH and the 2020 AADT is 5,800, according to the Florida Traffic Online database. Martin Road is a two-lane roadway which begins at Fiske Boulevard and continues west, accessing residential parcels before terminating at Rock Lake Lane. The typical section includes no paved shoulders or curb and gutter on either side of the road. The posted speed limit along Martin Road is 25 MPH.

The parcels immediately adjacent to the study intersection include the Tree House Learning Academy on the southwest corner of the intersection, the Phillips Landings subdivision in the northwest corner, the Health First Business Center in the northeast corner, and Alura Senior Living in the southeast corner of the intersection. **Figure 2** displays the lane configurations of the intersection and the adjacent land uses.

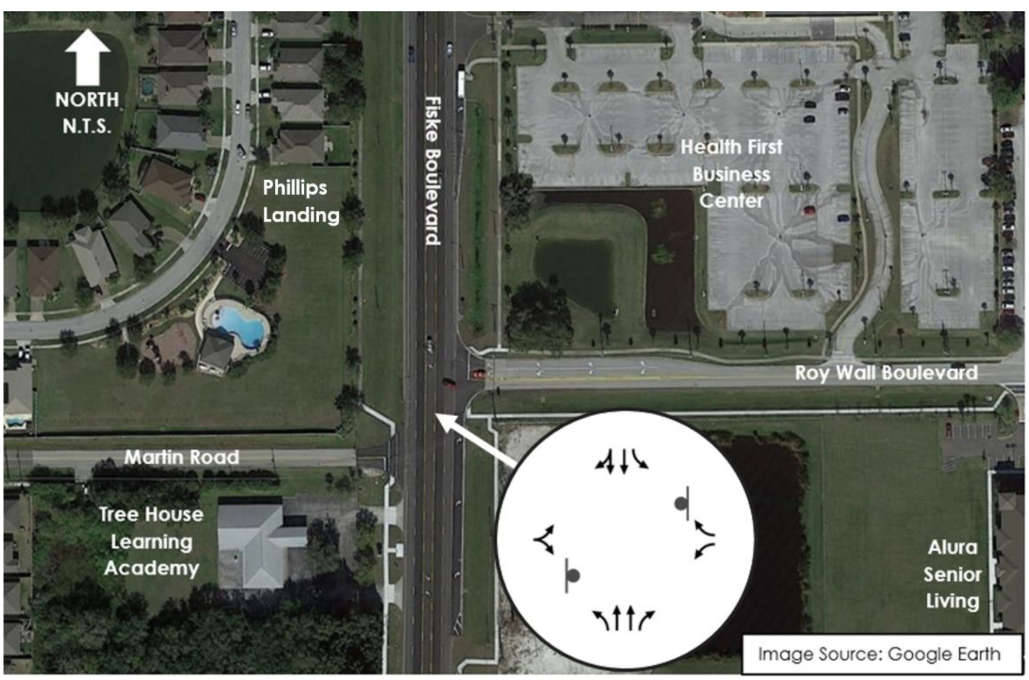


Figure 2: Intersection Layout and Site Vicinity

Section 2
Existing Conditions

EXISTING CONDITIONS

TRAFFIC COUNT COLLECTION

Twelve-hour turning movement counts were collected on Wednesday, February 23 and Wednesday, March 2, 2022 at the study intersection. The collected traffic counts were then seasonally adjusted for use in the study. The seasonally adjusted existing AM and PM peak hour turning movement volumes used in the analysis are presented in **Figure 3**. The raw traffic counts are provided in **Appendix A.**

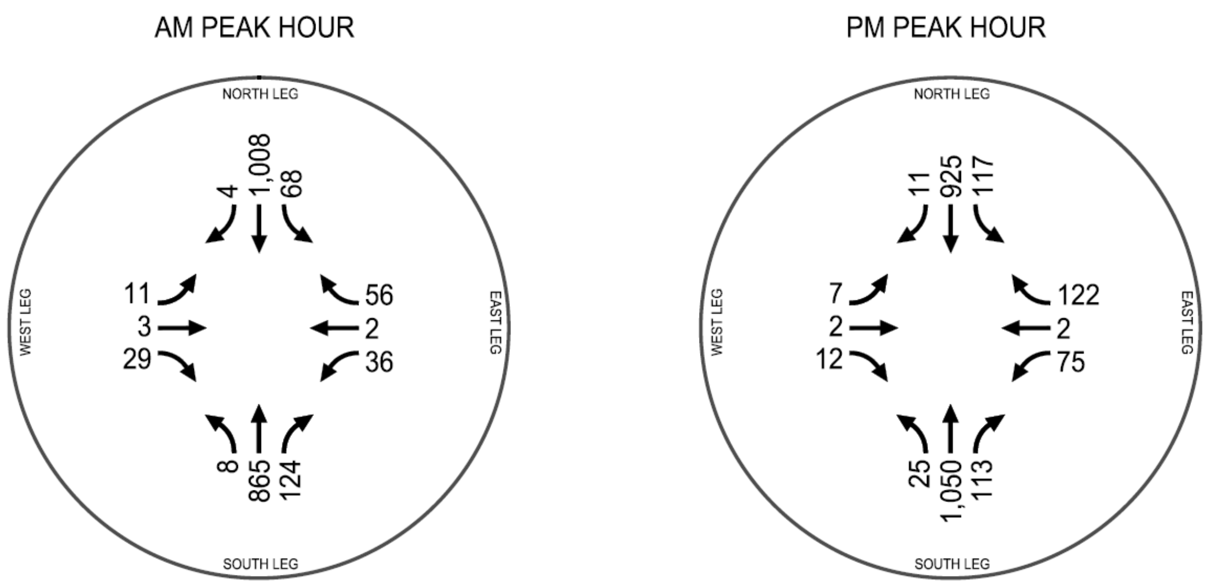


Figure 3: Existing AM and PM Peak Hour Turning Movement Volumes

FIELD REVIEW

A peak hour field review of the study intersection was conducted on March 2, 2022 to observe existing traffic operations and potential safety issues. During the AM and PM peak hours, traffic conditions were acceptable along Fiske Boulevard and queue lengths were within the existing turn lane lengths. Northbound and southbound left-turning vehicles were observed staging in the center turn lane on Fiske Boulevard, as shown in **Figure 4**.

Figure 4: Left-Turning Vehicles Staging in Center Turn Lane on Fiske Boulevard

The Study Team observed instances of near miss crashes between opposing left turn movements. This conflict point is shown in **Figure 5**.

Figure 5: Opposing Left Turn Movements at Study Intersection

DRAINAGE CONDITIONS

The intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road is located within the jurisdiction of the St. Johns River Water Management District (SJRWMD). There are no existing stormwater management facilities within the project limits. Stormwater ultimately outfalls to St. Johns River and the Indian River Lagoon.

The study intersection is comprised of five basins described below and shown in **Figure 6**.

- Basin 1 starts at the intersection of Fiske Boulevard & Roy Wall Boulevard and extends to approximately 1,000 feet to the east. This basin consists of a curb and gutter typical section. Stormwater runoff is conveyed in a closed storm drain system that discharges to roadside ditches on Roy Wall Boulevard flowing east of the project limits.
- Basin 2 includes the northbound lanes of Fiske Boulevard starting at approximately 100 feet north of Hemingway Boulevard and ending 200 feet south of Maemir Way. Stormwater runoff is collected in a closed storm drain system that discharges to a wet ditch located to the east of Fiske Boulevard flowing south. In addition, part of this basin drains directly to the wet ditch as the curb and gutter end approximately 300 feet north of Maemir Way.
- Basin 3 consists of the southbound lanes of Fiske Boulevard starting at the intersection with Roy Wall Boulevard and ending approximately 100 feet north of Hemingway Boulevard. Stormwater runoff is conveyed in a roadside swale to the west of Fiske Boulevard via flumes. Runoff flows to the north to discharge to an existing canal located north of the Phillips Landing parcel.
- Basin 4 consists of runoff from Martin Road. This basin starts at the intersection of Fiske Boulevard & Martin Road. Stormwater runoff sheet flows to the roadside swale and flows west on Martin Road.
- Basin 5 includes the southbound lanes of Fiske Boulevard starting at the intersection with Martin Road and ending 200 feet south of Maemir Way. Stormwater runoff sheet flows to the private properties located in the southwest quadrant of the intersection. There is no curb and gutter or ditch in this basin.

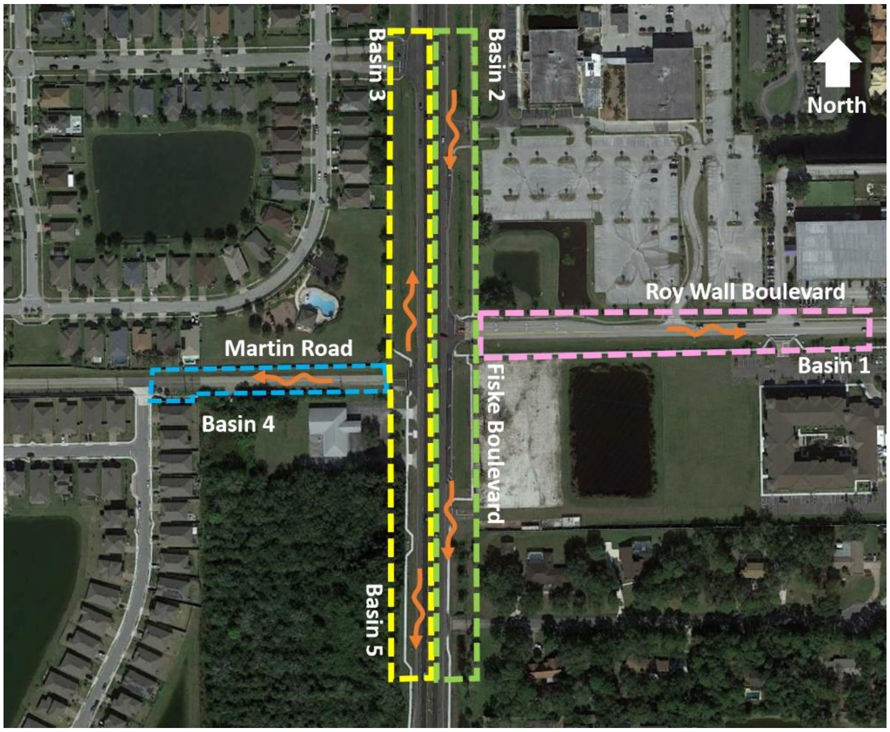


Figure 6: Existing Roadway Drainage Basins

Most of the project is outside the Federal Emergency Management Agency (FEMA) floodplain, as shown in **Figure 7**, but Martin Road extends approximately 480 feet into zone AE (elevation 17 NAVD'88).

Figure 7: FEMA Floodplain Review

Several SJRWMD permits were reviewed within the study limits and the vicinity, as shown in **Table 1** and **Figure 8**. Martin Road experienced flooding issues in the early 1990s and Brevard County constructed berms on the south and west boundaries of the Phillips Landing parcel (located south of Martin Road) to prevent flooding of the roadway. This was shown in the SJRWMD Permit No. 85869-1.

It was concluded that no stormwater management facilities exist for Fiske Boulevard, Roy Wall Boulevard, and Martin Road. However, offsite developments provide treatment and attenuation in ponds that discharge to the ditches on Fiske Boulevard.

Table 1: SJRWMD Permit Review

Permit Number	Project Name	Decision Date
3433-1	Roy Wall Boulevard (Section I)	8/11/1994
85869-1	Phillips Landing	5/13/2003
94208-1	Milan Subdivision	4/12/2005
101289-1	The Lofts at Bayside South	4/24/2006
90079-2	Mystic Lakes/Fiske Commons Phase I and II	9/21/2006
15895-6	The Estates at Rockledge	3/26/2007
104774-1	Twin Oaks	5/2/2007
111988-1	City of Cocoa South Mainland Pipeline	12/11/2007
152960-2	Rockledge Senior Community	8/9/2019
160544-1	SR 519 Resurfacing from Barnes Boulevard/I-95 NB ramp to SR 520	3/20/2020
152960-3	Rockledge Senior Community	4/22/2021
90079-4	Palm Cove (Transfer)	5/11/2022

Figure 8: Offsite Basins Permit Review

The U.S. Department of Agriculture (USDA) Web Soil Survey was reviewed to determine the characteristics of the soils within the study limits. Most soils are Malabar sand and Pineda sand. The characteristics of Malabar sand are poorly drained with high runoff capacity with hydrologic soil group A/D. Pineda sands are poorly drained with very high runoff capacity with hydrologic group C/D. The soils found in the study limits and the vicinity are shown in **Figure 9**.

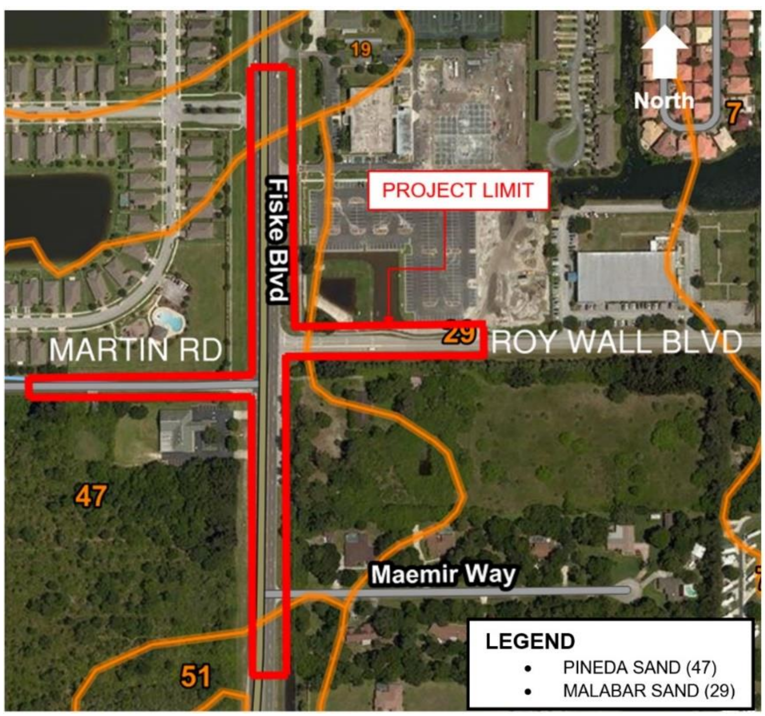


Figure 9: Study Intersection Soils Map

A field visit was conducted on September 14, 2022. The existing conditions were evaluated during dry conditions and after a mild storm. All drainage patterns mentioned above were confirmed during the storm and no flooding issues were observed that day.

SAFETY ANALYSIS

Crash records were obtained for the study intersection for the most recent five-year period on record (2017-2021) from the FDOT Crash Analysis Reporting (CAR) system. **Figure 10** displays a summary of crash frequency by year along with their respective severity from 2017 to 2021. A total of 23 crashes were reported during this period, six of which resulted in at least one injury and no reported fatal crashes. Of the six injury crashes, two were rear end related, two were left turn related, one was angle related, and one was head-on related. As displayed in **Figure 10**, the crashes per year at the intersection have decreased from 2018 to 2021 likely due to the general decrease in traffic volumes along Fiske Boulevard and travel impacts from the COVID-19 pandemic.

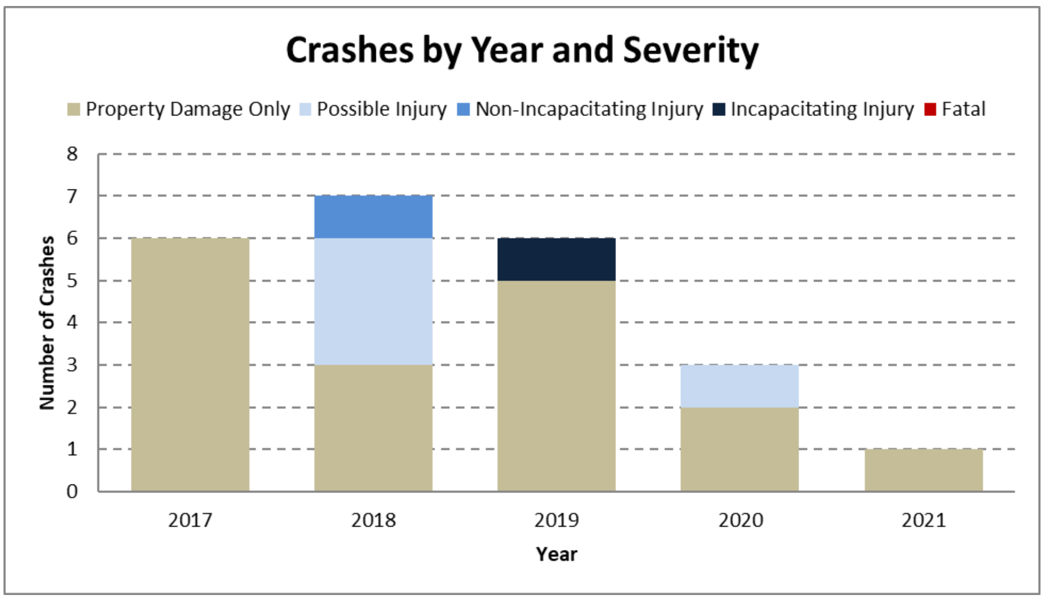


Figure 10: Intersection Crashes Per Year

Figure 11 displays the crashes at the intersection by type and severity for the five-year study period. Rear end crashes were the most common crash type at the intersection (11 crashes) and left turn crashes were the second highest crash type (five crashes).

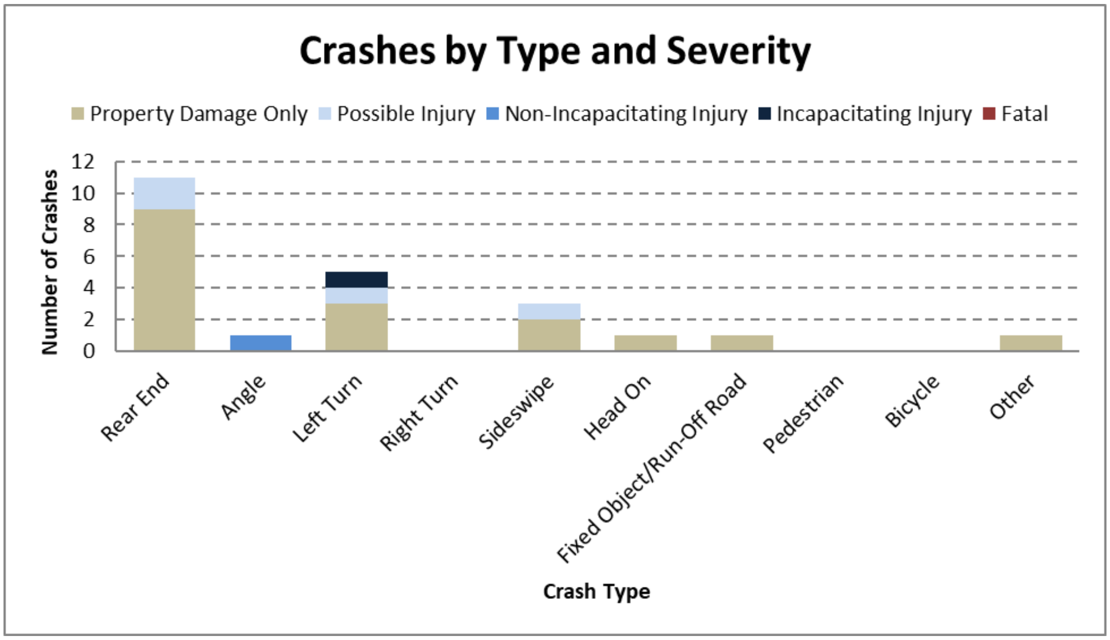


Figure 11: 2017-2021 Crashes by Type and Severity

Section 3
Signal Warrant Analysis

SIGNAL WARRANT ANALYSIS

Prior to initiating the ICE, a signal warrant analysis was performed to determine if a traffic signal is warranted at the study intersection. If a signal is warranted, signalized intersection forms can be explored in the ICE. The remainder of this section summarizes the results of the signal warrant analysis.

The seasonally adjusted turning movement volumes presented in the **Traffic Count Collection** section were evaluated under Warrant 1 – Eight-Hour Vehicular Volume and Warrant 2 – Four-Hour Vehicular Volume, as outlined in the 2021 FDOT Manual on Uniform Traffic Studies (MUTS) and the 2009 Manual on Uniform Traffic Control Devices (MUTCD).

WARRANT 1 – EIGHT-HOUR VEHICULAR VOLUME

The intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road has the following characteristics utilized in the signal warrant analysis:

- Major Street: Fiske Boulevard (two lanes in each direction)
- Minor Streets: Roy Wall Boulevard (two lanes in approach), Martin Road (one lane in approach)
- Posted Speed Limit Along Major Street: 45 MPH

As the posted speed limit along Fiske Boulevard exceeds 40 MPH, the intersection volumes can be assessed by the 70 percent volume thresholds in the signal warrant analysis. The seasonally adjusted turning movement volumes were compared against the 70 percent thresholds for Warrant 1 Condition A – Minimum Vehicular Volume, as shown in **Table 2**. In this condition, only two of the eight hours exceed the 70 percent volume thresholds for both the major and minor roads, thus Warrant 1 Condition A is not satisfied.

Table 2: Warrant 1 Condition A – Fiske Boulevard & Roy Wall Boulevard/Martin Road

Selected Hour	Vehicles Per Hour on Major Street	Vehicles Per Hour on Minor Street	Warrant 1 Major Street Volume 70% Threshold	Warrant 1 Minor Street Volume 70% Threshold	Is Warrant Met?
7:00 - 8:00 AM	1,967	92	420	140	No
8:00 - 9:00 AM	1,854	97	420	140	No
9:00 - 10:00 AM	1,672	79	420	140	No
12:00 - 1:00 PM	1,584	118	420	140	No
2:00 - 3:00 PM	1,664	118	420	140	No
3:00 - 4:00 PM	1,879	137	420	140	No
4:00 - 5:00 PM	2,119	189	420	140	Yes
5:00 - 6:00 PM	2,184	190	420	140	Yes

As Warrant 1 Condition A was not satisfied, the intersection was then evaluated against the 70 percent thresholds for Warrant 1 Condition B – Interruption of Continuous Traffic as shown in **Table 3**. In this condition, all eight of the selected hours exceeded the 70 percent volume thresholds for both the major and minor roads, thus Warrant 1 Condition B is satisfied.

Under the FDOT MUTS and MUTCD, Warrant 1 is satisfied by meeting the volume thresholds for either Condition A or Condition B. As a result, the intersection turning movement volumes satisfy Warrant 1.

Table 3: Warrant 1 Condition B – Fiske Boulevard & Roy Wall Boulevard/Martin Road

Selected Hour	Vehicles Per Hour on Major Street	Vehicles Per Hour on Minor Street	Warrant 1 Major Street Volume 70% Threshold	Warrant 1 Minor Street Volume 70% Threshold	Is Warrant Met?
7:00 - 8:00 AM	1,967	92	630	70	Yes
8:00 - 9:00 AM	1,854	97	630	70	Yes
9:00 - 10:00 AM	1,672	79	630	70	Yes
12:00 - 1:00 PM	1,584	118	630	70	Yes
2:00 - 3:00 PM	1,664	118	630	70	Yes
3:00 - 4:00 PM	1,879	137	630	70	Yes
4:00 - 5:00 PM	2,119	189	630	70	Yes
5:00 - 6:00 PM	2,184	190	630	70	Yes

WARRANT 2 – FOUR-HOUR VEHICULAR VOLUME

The intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road was also evaluated under Warrant 2 – Four-Hour Vehicular Volume. The seasonally adjusted turning movement volumes were compared to the 100 percent volume thresholds as shown in **Figure 12** and **Table 4** below.

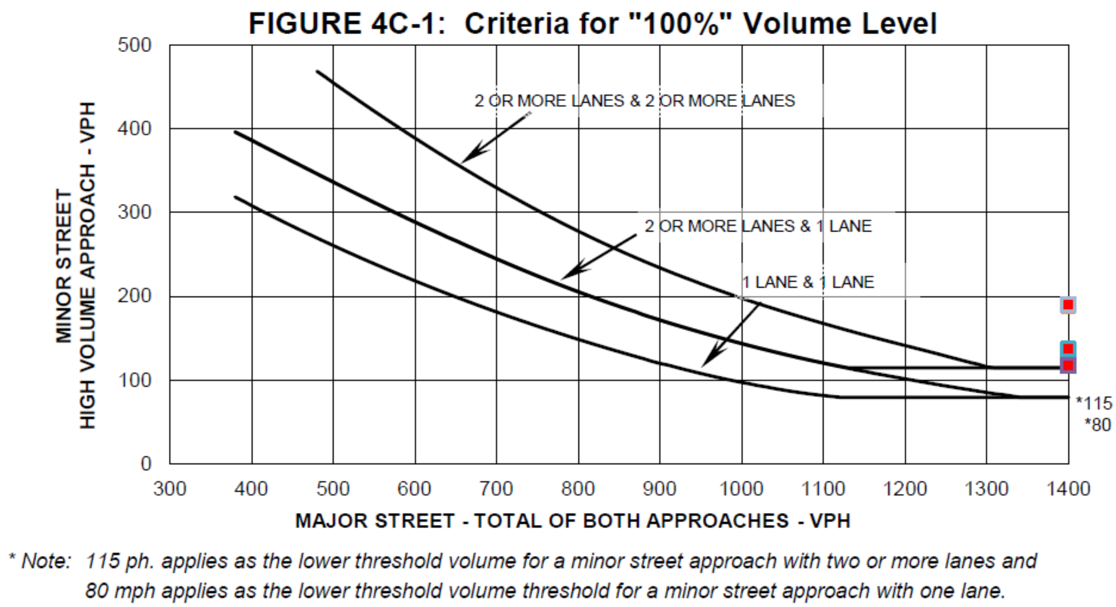


Figure 12: Warrant 2 Criteria for 100% Volume Level

Table 4: Warrant 2 – Fiske Boulevard & Roy Wall Boulevard/Martin Road

Selected Hour	Vehicles Per Hour on Major Street	Vehicles Per Hour on Minor Street	Warrant 2 Major Street Volume 100% Threshold	Warrant 2 Minor Street Volume 100% Threshold	Is Warrant Met?
2:00 - 3:00 PM	1,664	118	1,400	115	Yes
3:00 - 4:00 PM	1,879	137	1,400	115	Yes
4:00 - 5:00 PM	2,119	189	1,400	115	Yes
5:00 - 6:00 PM	2,184	190	1,400	115	Yes

Under the FDOT MUTS and MUTCD, Warrant 2 is satisfied by meeting the four-hour volume thresholds.

SIGNAL WARRANT CONCLUSION

Under the FDOT MUTS and MUTCD, Warrant 1 is satisfied by meeting the volume thresholds for Condition B. Warrant 2 is also satisfied by meeting the four-hour volume thresholds.

The MUTCD specifies only one warrant needs to be met, thus signalized intersection forms can be explored in the ICE for the Fiske Boulevard & Roy Wall Boulevard/Martin Road intersection. The FDOT Traffic Signal Warrant Summary forms, showing the results for Warrants 1 and 2, are provided in **Appendix B**.

Section 4
Future Volume Development

TRAFFIC FORECASTING

METHODOLOGY

Traffic volumes were developed for the opening year of 2030 and a design year of 2050 to be used in the analysis. Historical volume trends, forecasted regional population growth trends, and model growth rates were reviewed to determine a growth rate that could be applied to forecast future traffic volumes at the study intersection. Future intersection volumes were forecasted by applying the selected growth rate to existing year volumes (2022). As noted in the **Study Location Characteristics** section, historical traffic count data was only available up through 2020 at the time of this analysis.

HISTORIC GROWTH RATES

Historical AADT data was obtained from both the SCTPO traffic count database and the Florida Traffic Online database for Fiske Boulevard. Historical AADT data from the Florida Traffic Online database was obtained for Roy Wall Boulevard as well. Historical AADT data from the SCTPO traffic count database was not available for Roy Wall Boulevard or Martin Road.

The AADT from 2010 to 2020 and the resulting historical linear growth rates are summarized in **Table 5**. The historical growth along Fiske Boulevard and Roy Wall Boulevard displayed similar trends from 2010 to 2020. Fiske Boulevard observed historical linear growth rates of approximately 3.0 percent and Roy Wall Boulevard observed a historical linear growth rate of approximately 2.8 percent. The historical AADT reports, and the historical trend analyses are included in **Appendix C**.

Table 5: Summary of Historic Growth Rates

Year	Fiske Boulevard SCTPO Counts	Fiske Boulevard FDOT Counts	Roy Wall Boulevard FDOT Counts
2020	27,751	25,500	5,800
2019	27,300	26,500	6,000
2018	25,820	31,500	6,000
2017	24,180	27,500	5,400
2016	25,080	25,500	5,200
2015	24,690	23,500	5,000
2014	22,160	24,500	4,800
2013	21,880	24,000	4,800
2012	21,060	23,000	4,900
2011	21,050	22,500	4,900
2010	23,200	22,000	-
Annual Linear Growth Rate	3.0%	2.9%	3.1%
R^2	79.0%	54.7%	81.2%

POPULATION PROJECTIONS

The University of Florida's Bureau of Business and Economic Research (BEBR) population projections were obtained for Brevard County. BEBR projects population growth for each county in Florida in five-year increments for low, medium, and high growth scenarios.

The BEBR growth rates developed from these population forecasts are only applicable at the countywide level and do not account for development specifically at the study intersection or future planned roadways in the study area. However, they can provide a useful reference as to whether historical traffic growth is realistic for use in future traffic forecasting.

The BEBR population projections show an estimate for 2021 and projections for 2050. The low, medium, and high projections for 2050 are summarized in **Table 6**. Brevard County population growth rates range between -0.1 and 1.6 percent. BEBR population study data is provided in **Appendix C**.

Table 6: BEBR Population Growth Rates

Brevard County Estimation	2021 Estimate	2050 Projection	Annual Growth Rate, Growth/Year (%)
Low	616,742	603,600	-453 (**-0.1%**)
Medium	616,742	754,500	4,750 (**0.8%**)
High	616,742	905,400	9,954 (**1.6%**)
Note: Volume 55, Bulletin 192, February 2022			

MODEL GROWTH RATES

The Central Florida Regional Planning Model (CFRPM) v7.0 (base year 2015/horizon year 2045) was used to determine model growth rates. A sub-area validation was not completed as part of this study. Model growth rates were calculated for Fiske Boulevard south of Martin Road and north of Roy Wall Boulevard. Model growth rates were also calculated for Roy Wall Boulevard east of Fiske Boulevard. The travel demand model did not include Martin Road, thus no model growth rates were calculated for this leg of the intersection. The linear annual model growth rates are summarized in **Table 7**. Model plots are provided in **Appendix C**. The model plots show peak season weekday average daily traffic (PSWADT) volumes.

Table 7: Model Growth Rate Summary

Roadway Segment	Base Year (2015) Volume	Horizon Year (2045) Volume	Linear Annual Growth Rate
Fiske Blvd – South of Martin Rd	33,095	37,467	0.4%
Fiske Blvd – North of Roy Wall Blvd	31,851	35,711	0.4%
Roy Wall Blvd – East of Fiske Blvd	3,148	3,645	0.5%

SELECTED GROWTH RATES

The historical, population, and model growth rate data was presented at Consensus Building Meeting #1 on June 13, 2022. A summary of the meeting is provided in **Appendix D.** The Study Team recommended selecting annual growth rates for each intersection approach. As Fiske Boulevard and Roy Wall Boulevard observed similar historical and model growth rates, a 0.5 percent growth rate was recommended for the northbound, southbound, and westbound approaches at the intersection. For Martin Road, collected traffic counts included the recently completed Palm Cove community and no future development or roadway connection plans were identified. As a result, no growth was recommended on the eastbound approach at the study intersection. The attendees of Consensus Building Meeting #1 supported the recommended growth rates for each intersection approach.

FUTURE TRAFFIC VOLUMES

The selected annual growth rates were applied to the 2020 historical AADT volumes along Fiske Boulevard and Roy Wall Boulevard to forecast opening year (2030) and design year (2050) AADT volumes. Opening year and design year AADT volumes are summarized in **Table 8**.

Table 8: Future Year (2030/2050) AADTs

Roadway	2020 Traffic Volumes	Annual Growth Rate	2030 Traffic Volumes	2050 Traffic Volumes
Fiske Boulevard	27,750	0.50%	29,500	32,500
Roy Wall Boulevard	5,800	0.50%	6,500	7,000

The selected annual growth rates were also applied to the existing 2022 turning movement volumes at each intersection approach to forecast 2030 and 2050 turning movement volumes. Opening year and design year turning movement volumes are shown in **Figure 13** and **Figure 14**.

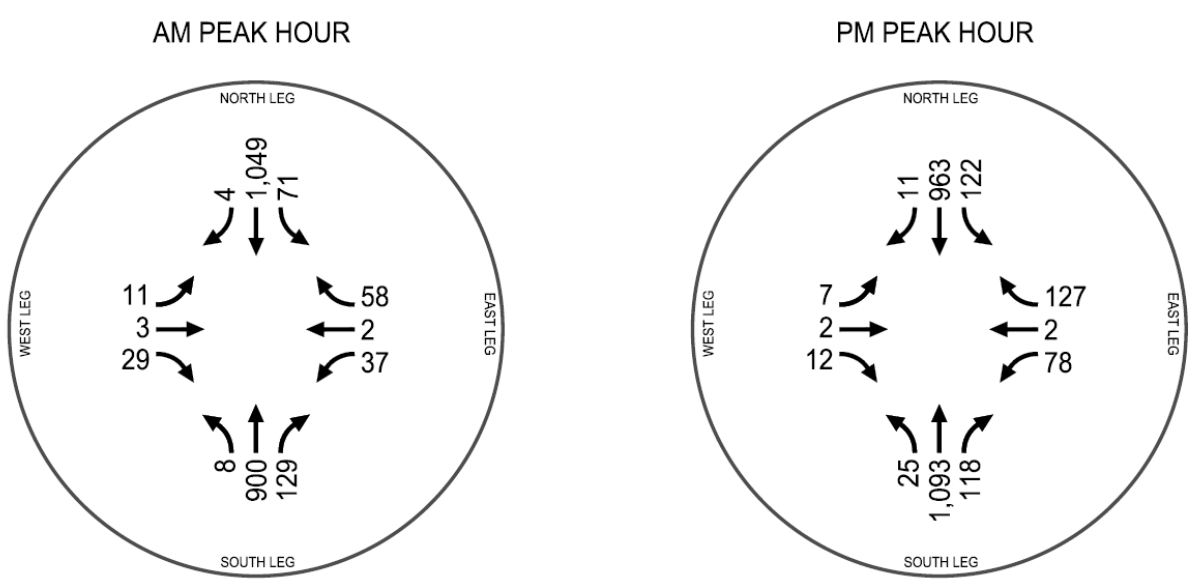


Figure 13: Opening Year 2030 AM and PM Peak Hour Turning Movement Volumes

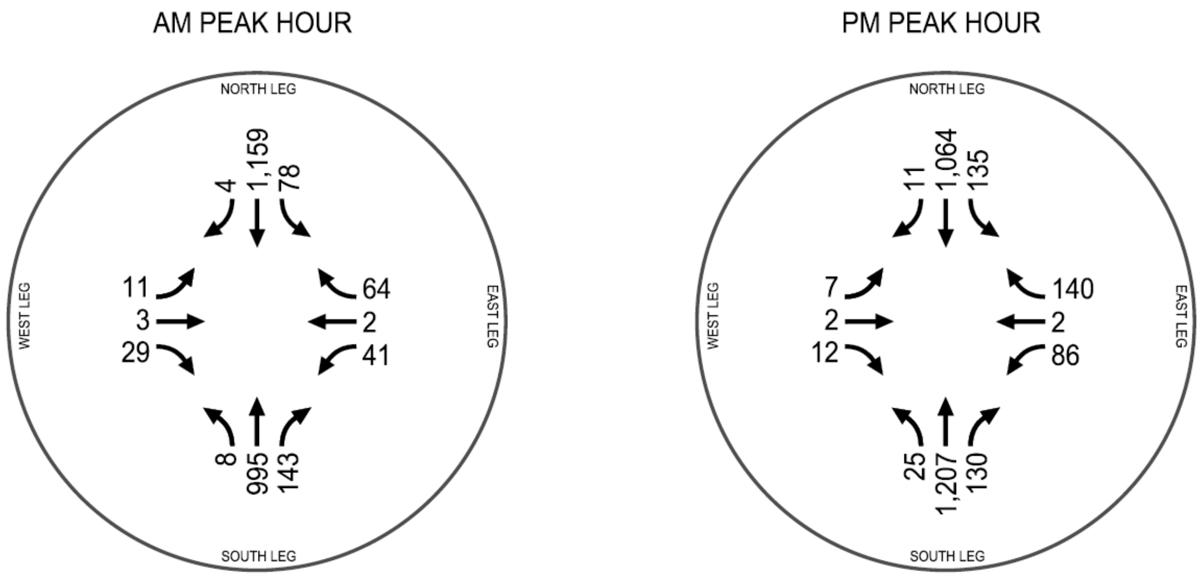


Figure 14: Design Year 2050 AM and PM Peak Hour Turning Movement Volumes

Section 5
Stage 1 ICE

STAGE 1 ICE

Stage 1 ICE involves two analysis components: 1. A planning level volume-to-capacity (v/c) ratio assessment; and 2. A planning level safety assessment. These assessments are high level in nature, due to the potentially numerous intersection control types that need to be reviewed during the Stage 1 ICE. For challenging sites with operational and safety issues such as this intersection, two to four control types were anticipated to move into Stage 2, where a more detailed operational, safety, and benefit/cost analysis can take place. The remainder of this section reviews the Stage 1 evaluation and the control types that were recommended to move into Stage 2.

CAPACITY ANALYSIS FOR PLANNING OF JUNCTIONS (CAP-X)

The Capacity Analysis for Planning of Junctions (CAP-X) spreadsheet was developed by the Federal Highway Administration (FHWA) and customized by the FDOT for use in ICE. The basic inputs into the CAP-X spreadsheet are as follows:

- Basic Project Information
- Number of Intersection Legs
- Major Street Direction
- Design Year (2050) AM/PM Peak Hour Turning Movement Volumes and Heavy Vehicles Percentages
- Context Classification
- Number of Lanes for Each Intersection Approach

The analysis results in a v/c ratio and multi-modal score for each intersection control type selected to evaluate. In the CAP-X spreadsheet, the user has the option to select (or unselect) various intersection control types to analyze. For the purposes of the Fiske Boulevard & Roy Wall Boulevard/Martin Road ICE, the following intersection control types were not selected for the analysis for the reasons noted:

- All-Way Stop Control (AWSC) – The existing intersection meets signal warrants.
- Continuous Green T – The existing intersection has four legs.
- Quadrant Roadway/Jughandle – Due to the surrounding land uses and limited roadway network around the intersection, quadrant roadway alternatives were not deemed feasible for analysis.
- Displaced Left-Turn – The existing left turn volumes are too low at the intersection to justify a displaced left-turn alternative.

Table 9 provides the Stage 1 CAP-X results for the remaining control types.

Table 9: Stage 1 CAP-X Results

Control Strategy	Weekday AM Peak V/C Ratio	Weekday PM Peak V/C Ratio	Multi-Modal Score
Partial / Full Median U-Turn (PMUT / MUT)	0.42 / 0.43	0.48 / 0.50	6.3
Signalized Restricted Crossing U-Turn (RCUT)	0.39	0.50	6.3
Traffic Signal	0.39	0.51	4.8
2x1 / 2x2 Roundabout	0.53	0.62	5.6
Two-Way Stop Control	2.06	6.37	3.7

As displayed in **Table 9**, the signalized RCUT and traffic signal are anticipated to provide the lowest v/c while the existing two-way stop control (TWSC) is anticipated to provide the highest. The v/c ratios for the PMUT, MUT, RCUT, traffic signal, and roundabout are in the range of 0.39 to 0.62 in the AM and PM peak hours. The PMUT, MUT, and RCUT have the highest multi-modal score of 6.3 whereas the existing TWSC has the lowest at 3.7.

The Stage 1 AM/PM CAP-X summaries are provided in **Appendix E**.

SAFETY PERFORMANCE FOR INTERSECTION CONTROL EVALUATION (SPICE)

The Safety Performance for Intersection Control Evaluation (SPICE) spreadsheet was developed by the FHWA and customized by the FDOT for use in ICE. The basic inputs into the SPICE spreadsheet for Stage 1 ICE are as follows:

- Basic Project Information
- Intersection Type
- Analysis Years
- Facility Type and Number of Legs
- Whether the Roadway is One-Way or Two-Way
- Number of Major Street Lanes and Speed
- Opening and Design Year AADT for the Major and Minor Streets

The analysis results in an opening year and design year crash prediction for each intersection control type selected during the CAP-X analysis. Note, this is a future year analysis that utilizes opening and design year volumes to generate the crash prediction values.

Table 10 provides the Stage 1 SPICE results for the selected control types.

Table 10: Stage 1 SPICE Results

Control Strategy	Crash Type	Opening Year Crash Frequency	Design Year Crash Frequency	Total Project Life Cycle
PMUT/MUT	Total	10.9	12.2	242.3
	Fatal & Injury	3.1	3.6	70.2
Traffic Signal	Total	12.8	14.4	285.1
	Fatal & Injury	4.5	5.1	100.2
2-Lane Roundabout	Total	15.2	16.9	337.6
	Fatal & Injury	2.8	3.2	63.0
Signalized RCUT	Total	17.4	20.0	392.4
	Fatal & Injury	3.8	4.4	85.2
TWSC	Total	4.9	5.4	108.4
	Fatal & Injury	2.2	2.4	47.6

As displayed in **Table 10**, the MUT is anticipated to have the least number of crashes over the life cycle of the project whereas the signalized RCUT is anticipated to experience the most. The roundabout is anticipated to experience the least number of fatal and injury crashes over the life cycle of the project.

The Stage 1 SPICE summary is provided in **Appendix E**.

STAGE 1 RECOMMENDATIONS

The following summarizes the control types analyzed as part of the Stage 1 evaluation and provides the recommendations for which types should be assessed in Stage 2:

- **TWSC: Move into Stage 2 Analysis** – The existing TWSC will move forward into Stage 2 as the future no-build condition. This will provide a baseline for benefit/cost comparison for other control types.
- **Traffic Signal: Move into Stage 2 Analysis** – The traffic signal alternative has a high performing v/c.
- **2x1 Roundabout: Move into Stage 2 Analysis** – The roundabout alternative has an acceptable v/c and is anticipated to experience the least number of fatal and injury crashes.
- **Partial MUT /** Full MUT: **Move PMUT into Stage 2 Analysis** – Both Median U-Turn alternatives provide a high performing v/c with added safety benefits. The minor approaches at the intersection observe more left turns than through vehicles. The

PMUT configuration will advance to Stage 2 because it facilitates left turn movements from the minor streets.

- **Signalized RCUT: Move into Stage 2 Analysis** – The signalized RCUT provides similar capacity and is predicted to have less fatal and sever injury crashes when compared to the traffic signal.

The Stage 1 ICE Forms are provided in **Appendix E**. The recommended control types to advance to Stage 2 were presented at the Consensus Building Meeting #1 on June 13, 2022. The attendees of the meeting supported advancing the control types listed above to Stage 2 ICE.

Section 6
Stage 2 ICE

STAGE 2 ICE

Stage 2 ICE involves three analysis components: 1. A refined safety assessment, 2. A detailed operational assessment; and 3. Concept generation and planning level cost estimates. These assessments are more detailed than in the Stage 1 analysis to provide enough information to calculate a benefit/cost for the control types relative to the existing intersection control type. The remainder of this section reviews the Stage 2 evaluation.

SPICE

The Stage 2 SPICE analysis provides a refined safety evaluation of the control types recommended to move forward from Stage 1. For this analysis, the inputs needed to compute Highway Safety Manual (HSM) Part C crash modification factors (CMFs) for the signalized intersection, roundabout, and signalized RCUT were input. In addition to the HSM CMFs, historical crash data was utilized for Empirical Bayes computations. FDOT crash costs were also applied to the predicted number of crashes over the project life cycle to calculate a total "cost to society" of future crashes. **Table 11** provides the Stage 2 SPICE results for the analyzed control types.

Table 11: Stage 2 SPICE Results

Control Strategy	Crash Type	Opening Year Crash Frequency	Design Year Crash Frequency	Total Project Life Cycle	Fatal & Injury Crash Cost
PMUT	Total	9.49	10.68	211.68	$25,200,00
	Fatal & Injury	2.78	3.15	62.25	
Traffic Signal	Total	11.16	12.56	249.04	$36,000,000
	Fatal & Injury	3.97	4.50	88.93	
2-Lane Roundabout	Total	9.97	11.11	221.29	$17,300,000
	Fatal & Injury	1.92	2.16	42.77	
Signalized RCUT	Total	19.57	22.48	441.29	$42,300,000
	Fatal & Injury	4.61	5.34	104.39	
TWSC	Total	4.70	5.17	103.69	-
	Fatal & Injury	3.97	1.82	36.34	

As displayed in **Table 11**, the PMUT is anticipated to experience approximately 210 crashes over the life cycle of the project whereas the signalized RCUT is anticipated to experience approximately 440 crashes. Regarding crash cost, the roundabout is anticipated to have the lowest number of fatal and serious injury crashes (and as a result the lowest crash costs over the project life cycle), while the RCUT is anticipated to have the highest. The Stage 2 SPICE summary and crash cost calculations are provided in **Appendix F**.

OPERATIONAL ANALYSIS

A detailed operational analysis for each intersection control type for the opening (2030) and design (2050) years for the AM and PM peak hours was performed. The intersection delay and Level of Service (LOS) was analyzed using Highway Capacity Manual (HCM) methodologies as implemented by Synchro 11. The FDOT ICE Tool was used to post-process Synchro results and compute the intersection delay for the RCUT and PMUT control strategies.

Table 12 and **Table 13** provide the Stage 2 operational analysis results for the analyzed control types.

Table 12: Stage 2 Operational Results – Opening Year 2030

Control Type	AM Peak Hour		PM Peak Hour	
	Delay (s)	LOS	Delay (s)	LOS
TWSC	8.1	A	39.7	D
Traffic Signal	8.3	A	17.8	B
Roundabout	7.8	A	8.7	A
PMUT	7.8	A	14.9	B
RCUT	9.8	A	13.6	B

Table 13: Stage 2 Operational Results – Design Year 2050

Control Type	AM Peak Hour		PM Peak Hour	
	Delay (s)	LOS	Delay (s)	LOS
TWSC	16.1	B	74.5	F
Traffic Signal	8.9	A	19.3	B
Roundabout	8.7	A	10.1	B
PMUT	8.2	A	16.1	B
RCUT	10.0	B	14.1	B

As displayed in **Table 12** and **Table 13**, the traffic signal, roundabout, PMUT, and RCUT are anticipated to operate with a lower delay than the TWSC in the 2050 AM/PM peak hours.

The roundabout is anticipated to operate with the lowest delay out of each of the Stage 2 intersections. Detailed Synchro outputs are provided in **Appendix F**.

INTERSECTION CONCEPTS

Concepts were created for the traffic signal, roundabout, PMUT and RCUT alternatives. These concepts helped inform the lane configurations that were assessed for the operational analysis. Planning level cost estimates were also generated for each of the concepts. The lane configurations for the Stage 2 ICE intersection alternatives are shown in **Figure 15** through **Figure 19**. The following describes the considerations for the TWSC and traffic signal, roundabout, PMUT, and RCUT concepts at the Fiske Boulevard and Roy Wall Boulevard/Martin Road intersection:

- TWSC (shown in **Figure 15**)
    - Maintained existing lane configurations
    - No pedestrian crossings are present across Fiske Boulevard in the future no-build
    - Existing drainage concerns along Martin Road
- Traffic signal (shown in **Figure 16**)
    - Martin Road realigned to tie-in with Roy Wall Boulevard
        - To accommodate the realignment of Martin Road, the City of Rockledge acquired right-of-way from the Phillips Landing subdivision in the northwest corner of the intersection of Fiske Boulevard and Martin Road
    - Enhanced pedestrian crossings are added to the four approaches at the intersection
- Roundabout (shown in **Figure 17**)
    - Full rebuild of the intersection within the roundabout area will likely be needed
    - Enhanced pedestrian crossings are added to the four approaches at the intersection
    - Minor right-of-way taking in the northwest corner of the intersection
- PMUT (shown in **Figure 18**)
    - Martin Road realigned to tie-in with Roy Wall Boulevard
    - PMUT configuration
        - Restricts northbound and southbound left turns with those movements being accommodated at new U-turn locations north and south of the intersection along Fiske Boulevard
        - New median added between U-turn locations
        - Field review identified a school bus as the design vehicle, and bulb-outs were added at the U-turn locations to accommodate the design vehicle turning movements

- Enhanced pedestrian crossings are added to the four approaches at the intersection
- RCUT (shown in **Figure 19**)
  - Martin Road realigned to tie-in with Roy Wall Boulevard
  - RCUT configuration
    - Restricts eastbound and westbound left turns with those movements being accommodated at new U-turn locations north and south of the intersection along Fiske Boulevard
    - New traffic separator added between U-turn locations
    - Field review identified a school bus as the design vehicle, and bulb-outs were added at the U-turn locations to accommodate the design vehicle turning movements
  - Enhanced pedestrian crossings are added to the four approaches at the intersection

N

0 20 100
Feet

PROPERTY LINE

AERIAL PHOTO ACQUIRED 2021

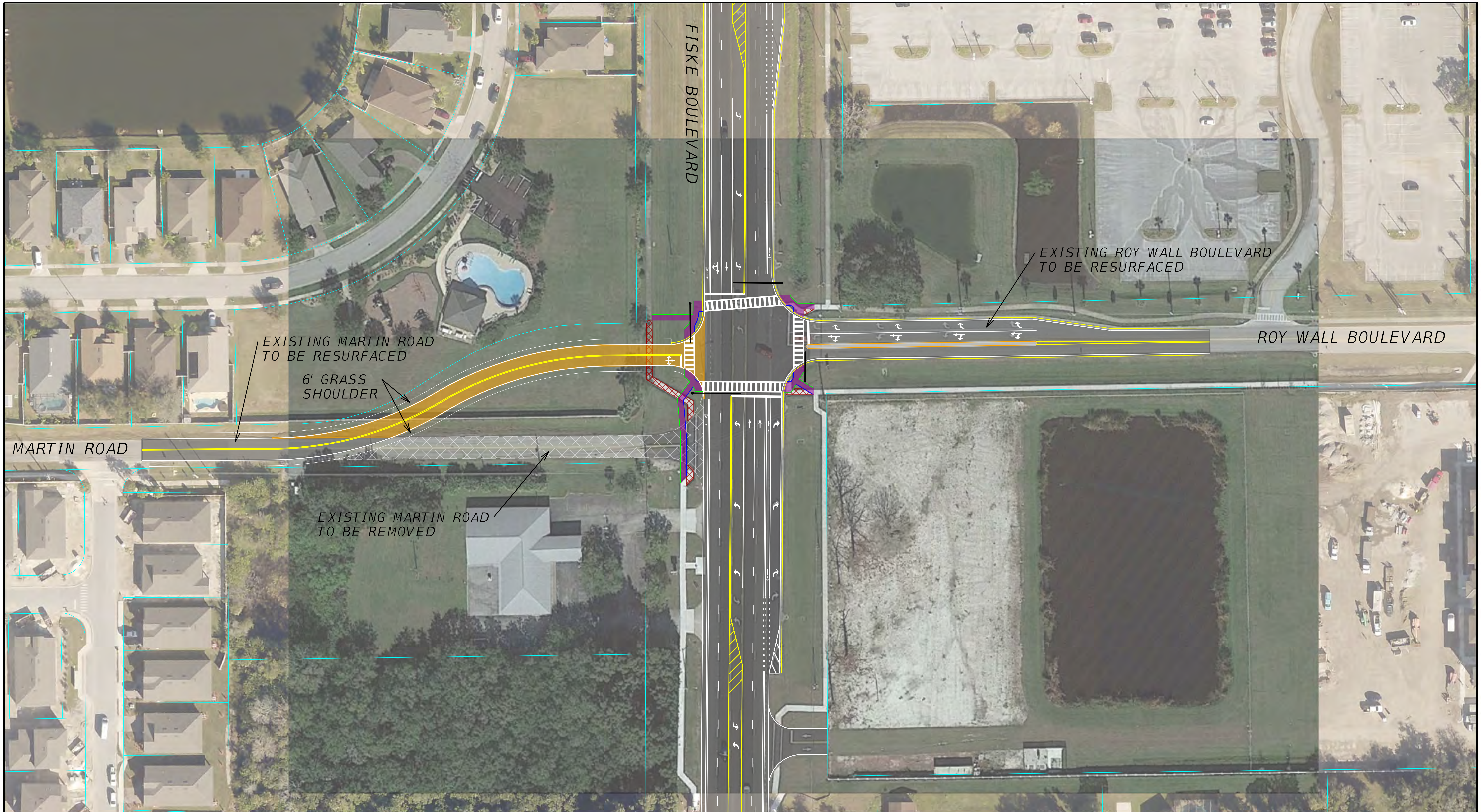
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road TWSC Future No-Build

Figure No. 15



N

0 20 100
Feet

PROPERTY LINE
CURB BACK
SIDEWALK FRONT
SIDEWALK BACK
EXISTING PAVEMENT
NEW PAVEMENT
NEW SIDEWALK
TRAFFIC SEPARATOR
PAVEMENT REMOVAL
SIDEWALK REMOVAL

AERIAL PHOTO ACQUIRED 2021 & 2022

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road Traffic Signal Alternative

Figure No. 16

PROPERTY LINE	SIDEWALK FRONT	EXISTING PAVEMENT	CURB BACK	NEW SOD
PROPOSED R/W	SIDEWALK BACK	NEW PAVEMENT	NEW SIDEWALK	PAVEMENT REMOVAL

0 20 100
Feet

AERIAL PHOTO ACQUIRED
2021 & 2022

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast
Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road Roundabout Alternative

Figure No.
17
(1 of 3)

N

0 20 100
Feet

PROPERTY LINE
PROPOSED R/W
SIDEWALK FRONT
SIDEWALK BACK
EXISTING PAVEMENT
NEW PAVEMENT
CURB BACK
NEW SIDEWALK
NEW SOD
PAVEMENT REMOVAL

AERIAL PHOTO ACQUIRED
2021 & 2022

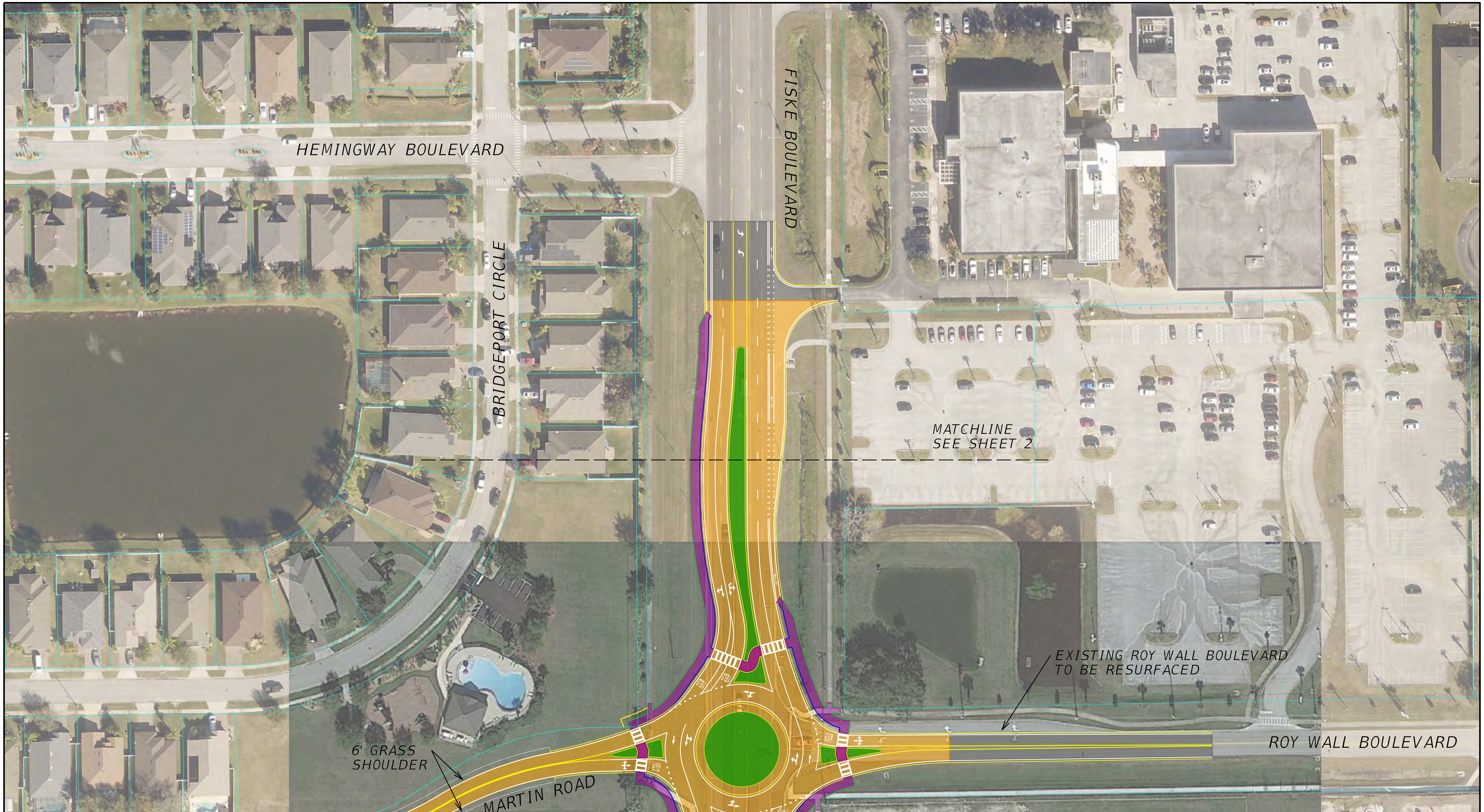
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast
Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road Roundabout Alternative

Figure No.
17
(2 of 3)



N

0 20 100
Feet

PROPERTY LINE
PROPOSED R/W
SIDEWALK FRONT
SIDEWALK BACK
EXISTING PAVEMENT
NEW PAVEMENT
CURB BACK
NEW SIDEWALK
NEW SOD
PAVEMENT REMOVAL

AERIAL PHOTO ACQUIRED
2021 & 2022

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

SPACE COAST
TRANSPORTATION PLANNING ORGANIZATION

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road Roundabout Alternative

Figure No.
17
(3 of 3)

0 20 100
Feet

PROPERTY LINE	CURB BACK
SIDEWALK FRONT	SIDEWALK BACK
EXISTING PAVEMENT	NEW PAVEMENT
NEW SIDEWALK	TRAFFIC SEPARATOR
PAVEMENT REMOVAL	SIDEWALK REMOVAL
NEW SOD	

AERIAL PHOTO
ACQUIRED
2021 & 2022

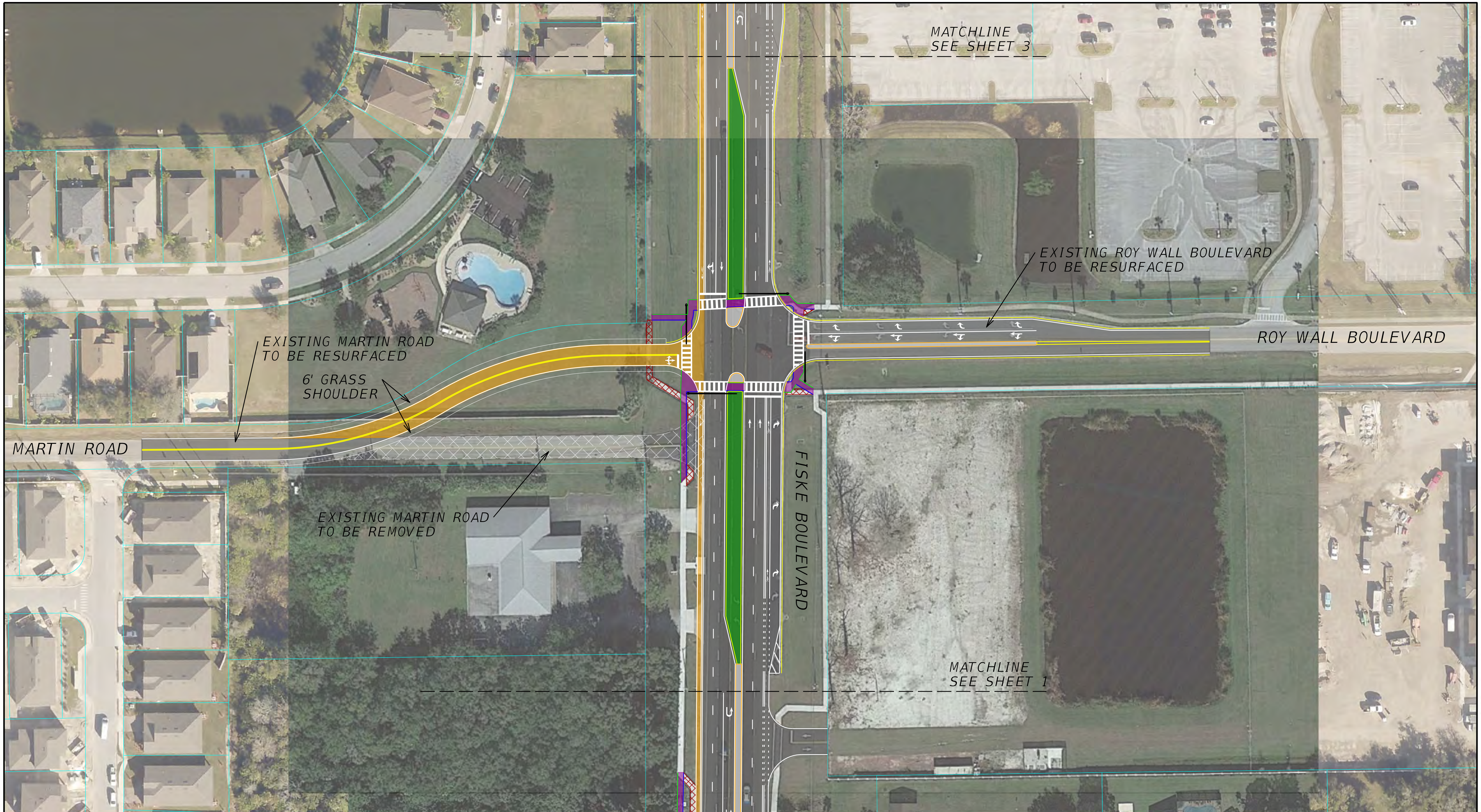
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast
Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road PMUT Alternative

Figure No.
18
(1 of 3)



0 20 100
Feet

PROPERTY LINE
CURB BACK
SIDEWALK FRONT
SIDEWALK BACK
EXISTING PAVEMENT
NEW PAVEMENT
NEW SIDEWALK
TRAFFIC SEPARATOR
PAVEMENT REMOVAL
SIDEWALK REMOVAL
NEW SOD

AERIAL PHOTO ACQUIRED 2021 & 2022

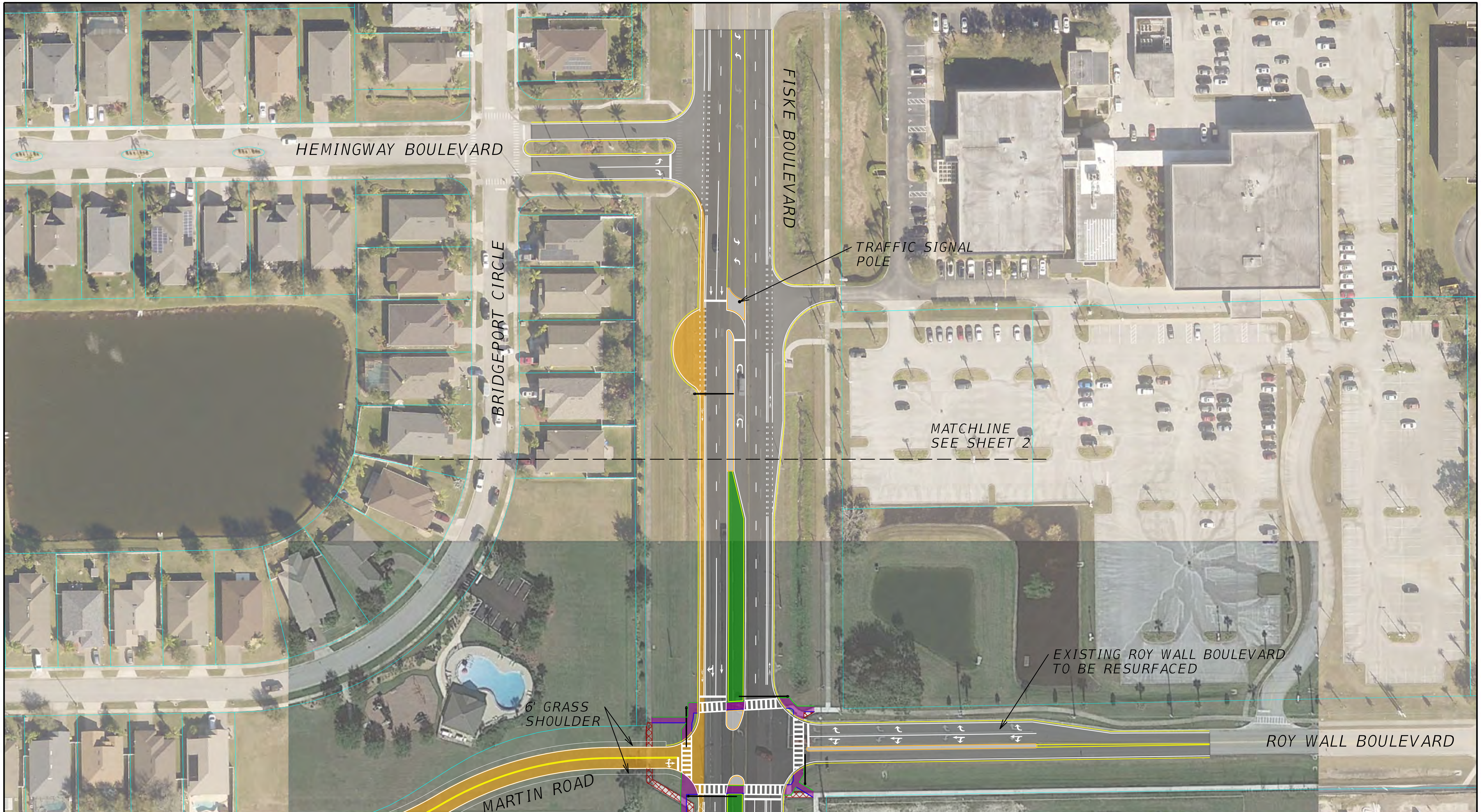
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road PMUT Alternative

Figure No. 18 (2 of 3)



N

0 20 100
Feet

PROPERTY LINE
CURB BACK
SIDEWALK FRONT
SIDEWALK BACK
EXISTING PAVEMENT
NEW PAVEMENT
NEW SIDEWALK
TRAFFIC SEPARATOR
PAVEMENT REMOVAL
SIDEWALK REMOVAL
NEW SOD

AERIAL PHOTO ACQUIRED 2021 & 2022

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Space Coast Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road PMUT Alternative

Figure No.

18
(3 of 3)

0 20 100
Feet

N

PROPERTY LINE	CURB BACK
SIDEWALK FRONT	SIDEWALK BACK
EXISTING PAVEMENT	NEW PAVEMENT
NEW SIDEWALK	TRAFFIC SEPARATOR
PAVEMENT REMOVAL	SIDEWALK REMOVAL

AERIAL PHOTO ACQUIRED
2021 & 2022

REVISIONS

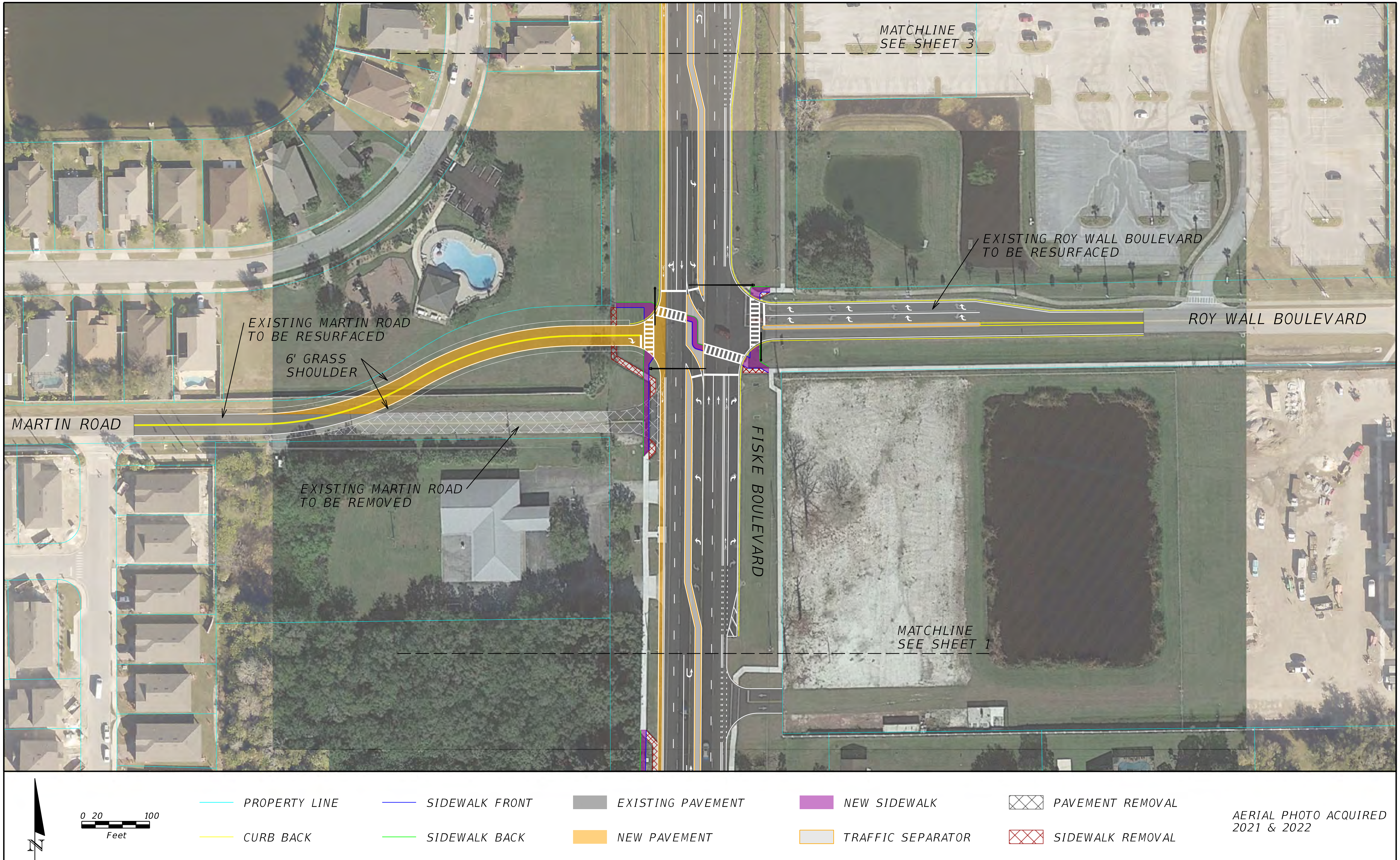
DATE	DESCRIPTION	DATE	DESCRIPTION

SPACE COAST
TRANSPORTATION PLANNING ORGANIZATION

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road RCUT Alternative

Figure No.
19
(1 of 3)



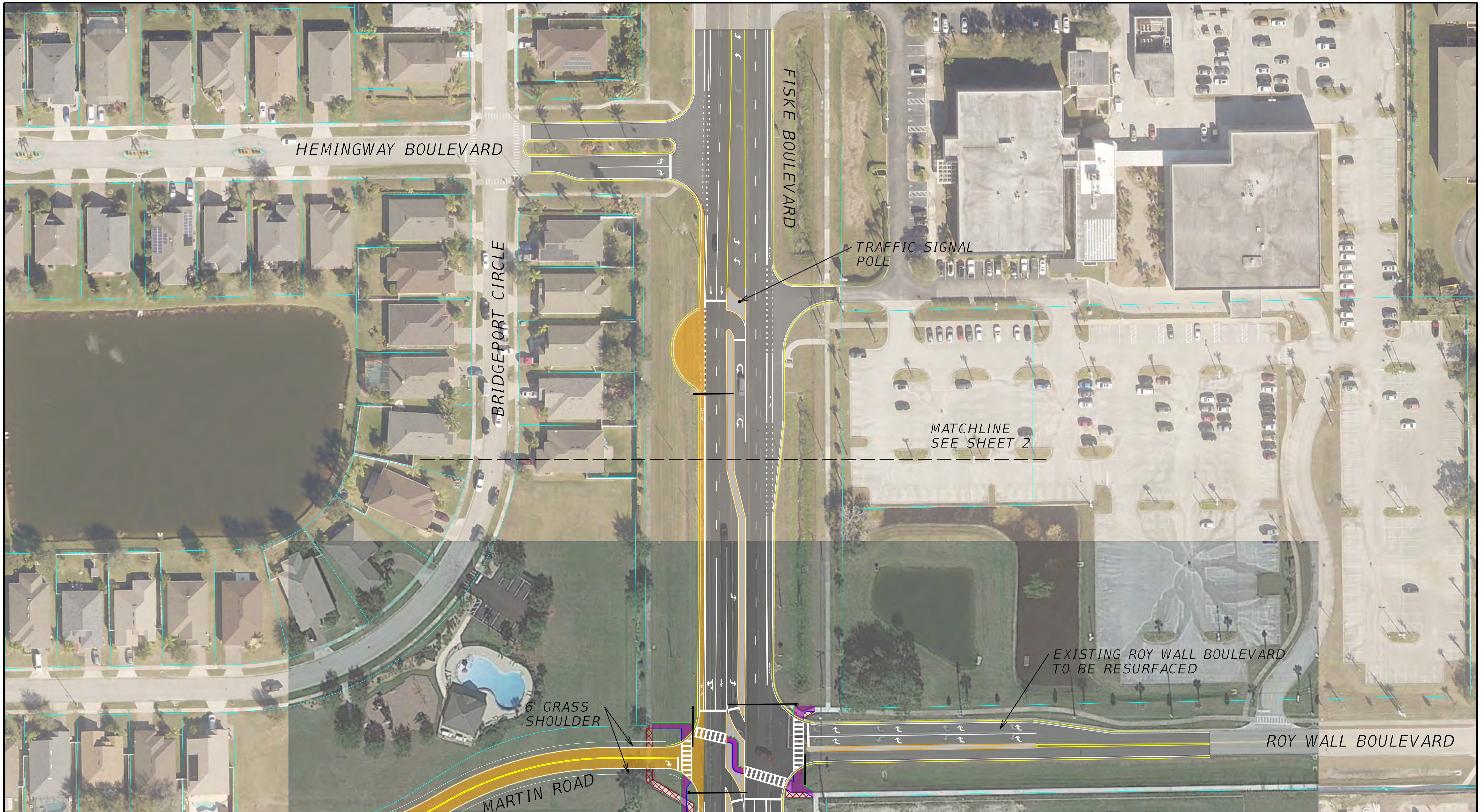
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

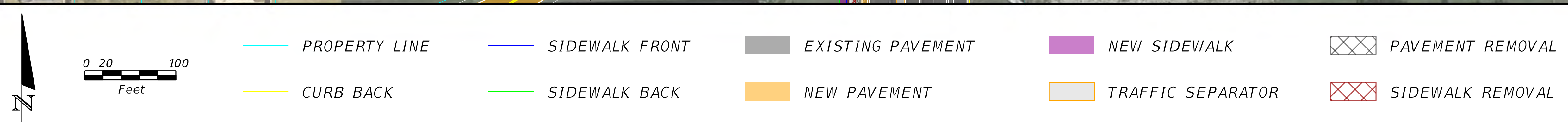
Space Coast
Transportation Planning Organization

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road RCUT Alternative

Figure No.
19
(2 of 3)





AERIAL PHOTO ACQUIRED 2021 & 2022

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

SPACE COAST TRANSPORTATION PLANNING ORGANIZATION

ROAD NO.	COUNTY	PROJECT NUMBER
519	BREVARD	20741.14

Fiske Boulevard and Roy Wall Boulevard/Martin Road RCUT Alternative

Figure No.

19

(3 of 3)

DRAINAGE ANALYSIS

As noted in the previous section, there are existing drainage issues along Martin Road. The intersection control types advanced to Stage 2 ICE will likely add additional impervious area to the intersection. In order to consider the feasibility of these alternatives, a detailed drainage analysis was completed. The details of this drainage analysis are discussed in this section.

DESIGN CRITERIA

Design criteria of several government agencies may apply to this project, including the SJRWMD, Brevard County, City of Rockledge, and Florida Department of Environmental Protection (FDEP). The SJRWMD requires that water quality be provided for one inch of runoff from the total drainage area or 1.25 inches of runoff from the impervious area, whichever is greater. Treatment volume must recover in 72 hours. In addition, the post development discharge cannot exceed the pre-development discharge for the 25-year / 24-hour storm event. However, since the proposed improvements at the intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road are considered a safety project, it is anticipated that no water quality and quantity will be required, and the project would be exempt from permitting. In lieu of the exemption, the SJRWMD may require a net improvement for the project in terms of water quality and quantity. A summary of the meetings with FDOT District 5 drainage and the SJRWMD are provided in **Appendix D.**

This project was evaluated on the conservative assumption that at a minimum the new impervious area will be treated and attenuation for the 25-year / 24-hour storm event.

PROPOSED CONDITIONS

The four proposed Stage 2 ICE control types can be summarized into two drainage alternatives based on anticipated impacts:

- Alternative 1 – Full reconstruction of drainage facilities along Fiske Boulevard within the study intersection area
    - Roundabout
- Alternative 2 – Minor impacts to drainage facilities along Fiske Boulevard within the study intersection area
    - 2A – Traffic signal
    - 2B – PMUT
    - 2C – RCUT

For the roundabout (Alternative 1), as there are landscape opportunities in the splitter islands and the center island, there will be a negligible decrease in the total impervious area within the study intersection (0.01 acres). An additional 0.26 acres of impervious area is anticipated to be added for the traffic signal (Alternative 2A), and 0.44 acres of impervious area is expected to be added for the PMUT and RCUT (Alternatives 2B and 2C). A summary of the net difference in impervious area versus the existing condition for each alternative is shown in **Table 14**.

Table 14: Impervious Areas for Proposed Alternatives

Concept Area Takeoffs	Alternative 1 Roundabout	Alternative 2A Signal	Alternative 2B PMUT	Alternative 2C RCUT
Existing Impervious Area	4.97 acres	4.97 acres	4.97 acres	4.97 acres
Proposed Impervious Area	4.96 acres	5.41 acres	5.23 acres	5.41 acres
Impervious Area Difference (Proposed – Existing)	**-0.01 acres**	**0.44 acres**	**0.26 acres**	**0.44 acres**

Even though it is anticipated the project will be exempt from permitting, a dry retention pond is proposed to treat the new impervious area, provide attenuation, and to mitigate flooding along Martin Road. The dry pond is recommended for the traffic signal, PMUT, and RCUT alternatives. No pond will be required for the roundabout alternative. The dry retention pond will provide a drainage condition where the post-development discharge does not exceed the pre-development discharge in the 25-year / 24-hour storm event. In addition, the pond will provide water quality treatment along Martin Road for the excess of impervious area added in the proposed conditions. An emergency outfall for the pond will discharge to the swale north of Martin Road to maintain the existing drainage patterns. This outfall, and any improvements associated with this project, will not exacerbate any existing flooding issues along Martin Road. **Figure 20** shows a depiction of the pond located to the south of the new Martin Road alignment.

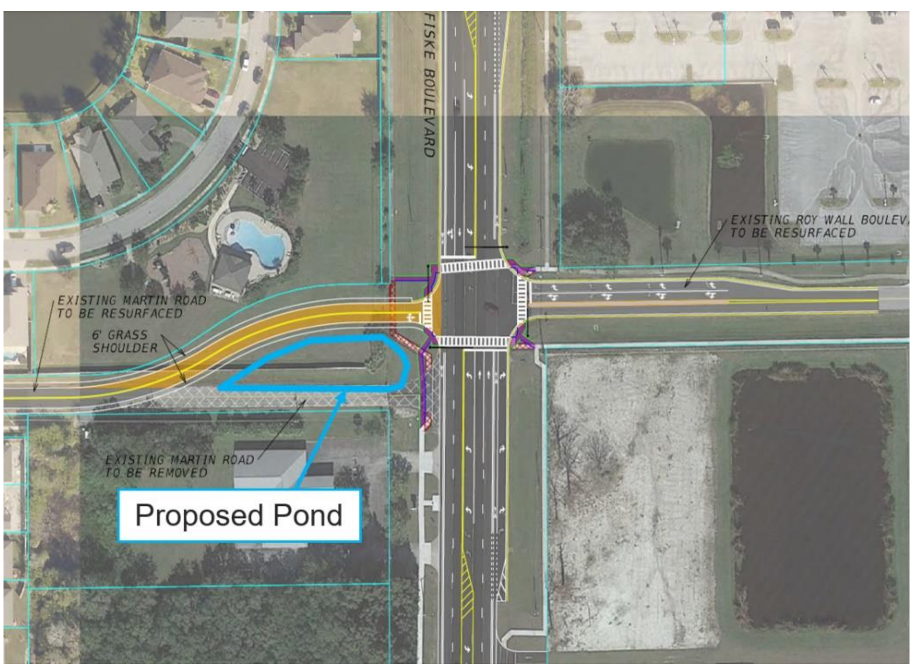


Figure 20: Proposed Pond

Floodplain impacts are not anticipated for this project if the proposed Martin Road realignment is kept at grade. However, if floodplain impacts cannot be avoided, mitigation will be provided in the proposed pond for the traffic signal, PMUT, and RCUT alternatives.

100-YEAR STORM ANALYSIS FOR MARTIN ROAD FLOODING

During the Consensus Building Meeting #2 on December 12, 2022, it was noted by attendees that the 100-year storm event should be evaluated for each of the Stage 2 alternatives. A detailed summary of this meeting is provided in **Appendix D**.

Currently, Martin Road experiences flooding during normal day to day storm events. Brevard County required that no additional volume be discharged to Martin Road as a result of this project. The proposed pond for the traffic signal, PMUT, and RCUT alternatives will serve to retain the additional discharge volume and not allow additional flooding to occur along Martin Road. Stage storage calculations, provided in **Appendix G**, show that the proposed pond will retain the difference in volume for the 100-year storm event and no additional volume will be discharged along Martin Road. Additionally, existing runoff may be retained, providing for an improvement in the flooding condition.

The 100-year storm event analysis and results were presented to Brevard County staff on March 28, 2023. During this meeting, County staff agreed with the approach and results of the 100-year storm event analysis. A detailed summary of this meeting is provided in **Appendix D**.

COST ESTIMATES

Planning-level cost estimates were developed for each of the Stage 2 ICE alternatives. Cost estimates were developed utilized FDOT historical costs from September 2021 to August 2022, which are provided in **Appendix H**. Construction costs were developed for the following project components:

- Roadway – This includes work such as new pavement, median treatments, pavement markings, and sidewalk improvements.
- Drainage – This includes work on the roadway drainage facilities such as curb and gutter and drainage inlets.
- Pond – This includes the dry retention pond discussed in the drainage analysis.
- Signalization – This includes work to add signalization in the study area such as new mast arms, signal heads, traffic controller, etc.

The construction costs for each component also include the following soft costs:

- Maintenance of Traffic: 10 percent of total component pay item costs;

- Mobilization: 10 percent of total component pay items costs plus Maintenance of Traffic; and
- Additional Contingency for Project Unknowns: 20 percent of total component pay item costs plus Maintenance of Traffic and Mobilization.

As the roundabout alternative includes a right-of-way take, a preliminary right-of-way cost was developed with an assumed land cost of $100 per square-foot. **Table 15** summarizes the planning level construction costs for the Stage 2 ICE alternatives.

Table 15: Stage 2 ICE Alternatives Cost Estimate

Control Strategy	Roadway	Drainage	Pond	Signalization	Right-of-Way	Total Cost
TWSC	-	-	-	-	-	**-**
Traffic Signal	$363,500	$64,600	$47,000	$527,400	-	**$1,002,500**
Roundabout	$2,375,900	$668,800	-	-	$38,000	**$3,082,700**
PMUT	$725,000	$154,100	$47,000	$997,300	-	**$1,923,400**
RCUT	$810,300	$100,000	$47,000	$1,068,600	-	**$2,025,900**

As shown in the table above, the traffic signal is the lowest cost alternative at approximately $1 million, while the roundabout alternative is the highest cost alternative at approximately $3 million. It should be noted that because these construction cost estimates were performed in late Summer 2022, they do not include the significant increases in materials and labor that have been observed in the early part of 2023. The construction cost estimate will be revised to reflect current market conditions during the design phase taking place in 2023/2024.

STAGE 2 RESULTS

The results from the operational and safety analyses for the Stage 2 alternatives were compared against the future no-build TWSC to determine the benefit of the improvements. The construction costs of these improvements were taken into consideration to calculate a benefit/cost ratio of improvement for each alternative, as shown in **Table 16**. The output sheet from the FDOT Stage 2 ICE Tool is provided in **Appendix H**.

Table 16: Stage 2 ICE Benefit/Cost

Control Strategy	Total Estimated Construction Cost	Benefit/Cost Ratio
TWSC	-	-
Traffic Signal	$1.0 Million	7.8
2x1 Roundabout	$3.1 Million	6.6
PMUT	$1.9 Million	7.2
Signalized RCUT	$2.0 Million	1.9

As shown in the table above, the benefit/cost ratios of the proposed alternatives exceed 1.0, and the roundabout, traffic signal, and PMUT alternatives each have benefit-cost ratios exceeding 6.0.

Section 7
Summary

SUMMARY

An Intersection Control Evaluation (ICE) was completed for the intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road to support a future realignment of Martin Road. The conclusions of the ICE analysis are summarized below:

- The signal warrant analysis at the intersection was refreshed with collected traffic counts from 2022. This analysis showed that the intersection of Fiske Boulevard & Roy Wall Boulevard/Martin Road meets signal warrants.
- The drainage analysis found that no extra discharge is anticipated along Martin Road for the proposed alternatives in either the 25-year or 100-year storm event. The traffic signal, PMUT, and RCUT will require a new dry retention pond, while the roundabout will need a full rebuild of drainage facilities along Fiske Boulevard.
- The ICE Stage 2 alternatives were evaluated for traffic operations in the opening (2030) and design year (2050) and were found to operate acceptably except for the existing TWSC, which is anticipated to operate at LOS F in the design year.
- From the ICE Stage 2 safety analysis, the roundabout was found to have to lowest number of fatal/injury crashes and the lowest crash cost over the life cycle of the project (approximately $17 million). The traffic signal, PMUT, and RCUT had projected crash costs ranging from approximately $25 million to $43 million.
- The construction costs for the Stage 2 alternatives range from $1 million (traffic signal) to $3.1 million (roundabout). The benefit-cost ratios for each alternative exceeds 1.0, with the traffic signal, roundabout, and PMUT alternatives having the highest benefit-cost ratios, exceeding 6.0.

The results of these analyses were presented at the Consensus Building Meeting #3 on May 5, 2023. The meeting summary is provided in **Appendix D**.

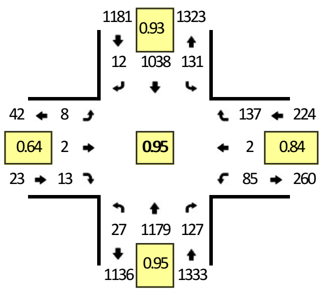
RECOMMENDATION

The Stage 2 ICE intersection alternatives are anticipated to operate acceptably with a benefit/cost ratio higher than 1.0. The roundabout alternative has the lowest number of predicted fatal/injury crashes, and the traffic signal has the highest benefit/cost ratio. Due to the safety benefits, the SCTPO recommends the roundabout alternative, but will support the City of Rockledge if the traffic signal alternative is preferred.

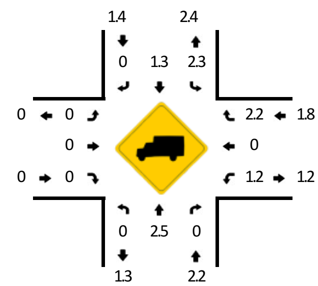
This project was presented to Rockledge City Council on June 21, 2023 and the presentation is provided in **Appendix I**.

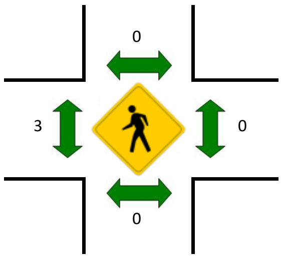
Appendix A
Field Collected Turning Movement Counts

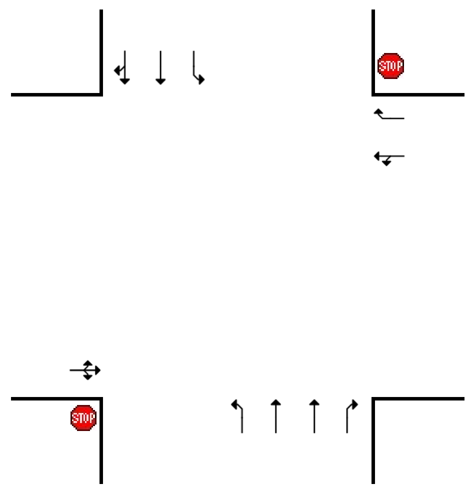
LOCATION: S Fiske Blvd -- Martin Rd/Roy Wall Blvd **QC JOB #:** 15705401
CITY/STATE: Rockledge, FL **DATE:** Wed, Feb 16 2022

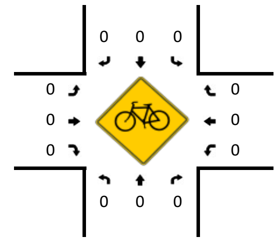


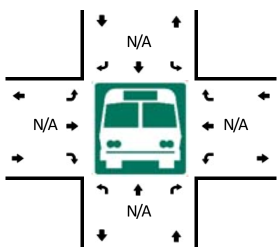
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

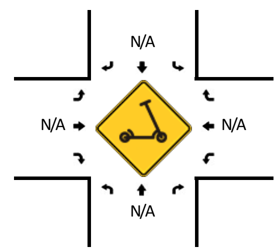












15-Min Count Period Beginning At	S Fiske Blvd (Northbound)				S Fiske Blvd (Southbound)				Martin Rd/Roy Wall Blvd (Eastbound)				Martin Rd/Roy Wall Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	47	6	0	7	94	0	0	0	0	0	0	5	0	0	0	159	
6:15 AM	1	70	9	0	14	127	0	0	0	0	1	0	6	0	6	0	234	
6:30 AM	0	102	14	0	13	190	1	0	0	0	3	0	8	0	8	0	339	
6:45 AM	4	144	22	0	25	230	0	0	1	1	5	0	14	0	10	0	456	1188
7:00 AM	1	122	15	0	21	269	0	0	1	0	3	0	16	0	12	0	460	1489
7:15 AM	2	171	30	0	22	304	1	0	3	0	6	0	10	0	12	0	561	1816
7:30 AM	1	220	25	0	21	297	1	0	3	0	12	0	17	1	10	0	608	2085
7:45 AM	2	307	46	0	15	265	2	0	2	2	9	0	7	0	16	0	673	2302
8:00 AM	3	253	35	0	16	242	0	0	3	1	5	0	7	1	23	0	589	2431
8:15 AM	5	217	26	0	34	223	2	0	2	1	8	0	7	0	15	0	540	2410
8:30 AM	0	187	31	0	14	280	0	0	1	0	7	0	11	0	18	0	549	2351
8:45 AM	2	207	26	0	17	217	0	0	2	1	4	0	7	0	19	0	502	2180
9:00 AM	7	210	28	0	15	220	0	0	2	0	7	0	10	0	19	0	518	2109
9:15 AM	5	204	16	0	15	215	2	0	3	0	3	0	8	0	11	0	482	2051
9:30 AM	4	195	18	0	12	229	1	0	2	0	5	0	8	0	13	0	487	1989
9:45 AM	4	198	15	0	15	206	2	0	0	1	3	0	9	0	10	0	463	1950
10:00 AM	4	173	19	0	7	163	4	0	2	0	6	0	7	1	10	0	396	1828
10:15 AM	3	175	21	0	10	173	3	0	1	1	3	0	13	0	11	0	414	1760
10:30 AM	4	171	18	0	9	184	2	0	1	0	5	0	10	0	14	0	418	1691
10:45 AM	6	182	24	0	12	182	0	0	1	2	2	0	6	0	7	0	424	1652
11:00 AM	5	133	19	0	14	153	1	0	3	0	7	0	2	0	8	0	345	1601
11:15 AM	4	191	17	0	6	180	0	0	0	1	3	0	14	2	13	0	431	1618
11:30 AM	3	204	21	0	16	158	2	0	0	0	2	0	8	0	10	0	424	1624
11:45 AM	6	215	26	0	18	172	0	0	3	1	3	0	15	0	9	0	468	1668
12:00 PM	2	202	20	0	15	175	4	0	6	0	2	0	11	0	18	0	455	1778
12:15 PM	3	196	19	0	11	192	3	0	3	1	4	0	21	0	13	0	466	1813
12:30 PM	2	190	25	0	13	223	4	0	3	0	4	0	11	1	26	0	502	1891
12:45 PM	3	215	27	0	24	210	0	0	3	1	3	0	14	0	17	0	517	1940
1:00 PM	3	180	23	1	16	193	3	0	1	2	4	0	14	0	13	0	453	1938
1:15 PM	2	181	27	0	14	178	0	0	1	1	5	0	11	0	8	0	428	1900
1:30 PM	5	197	34	0	10	166	3	1	1	0	3	0	7	1	6	0	434	1832
1:45 PM	4	207	30	1	18	173	3	0	0	0	5	0	13	0	13	0	467	1782
2:00 PM	5	218	19	1	12	190	0	0	2	0	4	0	12	0	16	0	479	1808
2:15 PM	1	230	21	0	11	203	2	0	1	0	4	0	13	0	19	0	505	1885
2:30 PM	6	222	13	0	12	213	0	0	4	0	3	0	9	0	18	0	500	1951
2:45 PM	0	258	23	0	13	191	2	0	1	0	2	0	20	1	24	0	535	2019
3:00 PM	5	260	25	0	19	192	3	0	3	0	1	0	14	0	22	0	544	2084
3:15 PM	6	264	25	0	22	211	4	0	1	0	3	0	13	0	20	0	569	2148
3:30 PM	6	249	31	0	19	197	6	0	4	0	1	0	16	0	24	0	553	2201

15-Min Count Period Beginning At	S Fiske Blvd (Northbound)				S Fiske Blvd (Southbound)				Martin Rd/Roy Wall Blvd (Eastbound)				Martin Rd/Roy Wall Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:45 PM	5	275	17	0	16	253	2	0	1	0	5	0	11	0	34	0	619	2285
4:00 PM	6	282	24	0	20	255	4	0	3	0	6	0	21	0	27	0	648	2389
4:15 PM	7	288	17	0	19	266	7	0	2	0	3	0	17	0	30	0	656	2476
4:30 PM	3	298	21	0	21	256	3	0	2	1	5	0	27	0	36	0	673	2596
4:45 PM	9	274	29	0	31	239	0	0	1	1	2	0	24	1	29	0	640	2617
5:00 PM	4	298	34	0	17	293	5	0	0	0	5	0	31	1	35	0	723	2692
5:15 PM	10	286	40	0	48	266	3	0	1	1	3	0	14	0	29	0	701	2737
5:30 PM	4	321	24	0	35	240	4	0	5	0	3	1	16	0	44	0	697	2761
5:45 PM	6	241	20	0	22	228	2	0	0	0	6	0	22	0	21	0	568	2689

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	1192	136	0	68	1172	20	0	0	0	20	0	124	4	140	0	2892
Heavy Trucks	0	12	0		0	4	0		0	0	0		0	0	8		24
Buses																	
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments: 6:00 AM - 10:00 AM filmed on 3/2/2022.

Report generated on 3/3/2022 1:37 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix B
FDOT Traffic Signal Warrant Analysis Forms

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

City: **Rockledge, FL**
County: **70 – Brevard**
District: **Five**

Engineer: **KAI**
Date: **March 23, 2022**

Major Street: **Fiske Boulevard** Lanes: **4** Major Approach Speed: **45**
Minor Street: **Roy Wall Boulevard** Lanes: **2** Minor Approach Speed: **35**

MUTCD Electronic Reference to Chapter 4: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf

Volume Level Criteria

1. Is the posted speed or 85th-percentile of major street > 40 mph? ☑ Yes ☐ No
2. Is the intersection in a built-up area of an isolated community with a population < 10,000? ☐ Yes ☑ No

"70%" volume level **may** be used if Question 1 **or** 2 above is answered "Yes" ☐ MAY ☑ 70% ☐ 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

*Warrant 1 is satisfied if Condition A **or** Condition B is "100%" satisfied for eight hours.* ☐ Yes ☑ No

*Warrant 1 is also satisfied if both Condition A **and** Condition B are "80%" satisfied (should only be applied after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems).* ☐ Yes ☑ No

*Warrant 1 is satisfied if Condition A **or** Condition B is "70%" satisfied for eight hours.* ☑ Yes ☐ No

Condition A - Minimum Vehicular Volume

Condition A is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Applicable: ☑ Yes ☐ No
100% Satisfied: ☐ Yes ☑ No
80% Satisfied: ☐ Yes ☑ No
70% Satisfied: ☐ Yes ☑ No

Number of Lanes for moving traffic on each approach		Vehicles per hour on major-street (total of both approaches)			Vehicles per hour on minor-street (one direction only)		
Major	**Minor**	**100%[a]**	**80%[b]**	**70%[c]**	**100%[a]**	**80%[b]**	**70%[c]**
1	1	500	400	350	150	120	105
2 or more	1	600	480	420	150	120	105
2 or more	2 or more	600	480	420	200	160	140
1	2 or more	500	400	350	200	160	140

[a] Basic Minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Record 8 highest hours and the corresponding major-street and minor-street volumes in the Instructions Sheet.

Street	Eight Highest Hours							
	7:00 - 8:00 AM	8:00 - 9:00 AM	9:00 - 10:00 AM	12:00 - 1:00 PM	2:00 - 3:00 PM	3:00 - 4:00 PM	4:00 - 5:00 PM	5:00 - 6:00 PM
Major	1,967	1,854	1,672	1,584	1,664	1,879	2,119	2,184
Minor	92	97	79	118	118	137	189	190

Existing Volumes

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

Condition B - Interruption of Continuous Traffic

Condition B is intended for application where Condition A is not satisfied and the traffic volume on a major street is so heavy that traffic on the minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

Applicable:	☑ Yes	☐ No
100% Satisfied:	☐ Yes	☑ No
80% Satisfied:	☐ Yes	☑ No
70% Satisfied:	☑ Yes	☐ No

Number of Lanes for moving traffic on each approach		Vehicles per hour on major-street (total of both approaches)			Vehicles per hour on minor-street (one direction only)		
Major	Minor	100%[a]	80%[b]	70%[c]	100%[a]	80%[b]	70%[c]
1	1	750	600	525	75	60	53
2 or more	1	900	720	630	75	60	53
2 or more	2 or more	900	720	630	100	80	70
1	2 or more	750	600	525	100	80	70

[a] Basic Minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Record 8 highest hours and the corresponding major-street and minor-street volumes in the Instructions Sheet.

Eight Highest Hours								
Street	7:00 - 8:00 AM	8:00 - 9:00 AM	9:00 - 10:00 AM	12:00 - 1:00 PM	2:00 - 3:00 PM	3:00 - 4:00 PM	4:00 - 5:00 PM	5:00 - 6:00 PM
Major	1,967	1,854	1,672	1,584	1,664	1,879	2,119	2,184
Minor	92	97	79	118	118	137	189	190

Existing Volumes

State of Florida Department of Transportation

TRAFFIC SIGNAL WARRANT SUMMARY

City: **Rockledge, FL**
County: **70 – Brevard**
District: **Five**

Engineer: **KAI**
Date: **March 23, 2022**

Major Street: **Fiske Boulevard** Lanes: **4** Major Approach Speed: **45**
Minor Street: **Roy Wall Boulevard** Lanes: **2** Minor Approach Speed: **35**

MUTCD Electronic Reference to Chapter 4: http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf

Volume Level Criteria

1. Is the posted speed or 85th-percentile of major street > 40 mph? ☑ Yes ☐ No
2. Is the intersection in a built-up area of an isolated community with a population < 10,000? ☐ Yes ☑ No

"70%" volume level **may** be used if Question 1 **or** 2 above is answered "Yes" ☐ MAY ☑ 70% ☐ 100%

WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

If all four points lie above the appropriate line, then the warrant is satisfied.

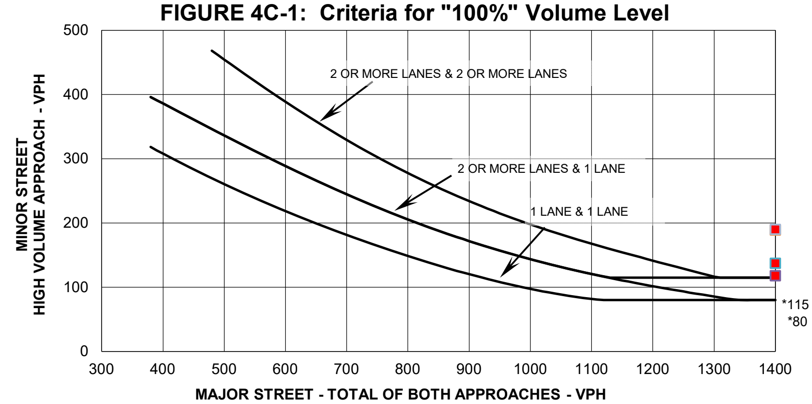
Applicable: ☑ Yes ☐ No
Satisfied: ☑ Yes ☐ No

Plot four volume combinations on the applicable figure below.

100% Volume Level

Four Highest Hours	Volumes	
	Major Street	Minor Street
2:00 - 3:00 PM	1664	118
3:00 - 4:00 PM	1879	137
4:00 - 5:00 PM	2119	189
5:00 - 6:00 PM	2184	190

FIGURE 4C-1: Criteria for "100%" Volume Level



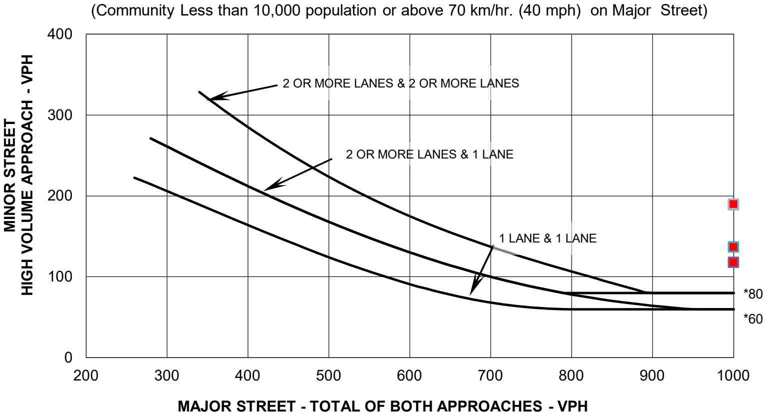
** Note: 115 ph. applies as the lower threshold volume for a minor street approach with two or more lanes and 80 mph applies as the lower threshold volume threshold for a minor street approach with one lane.*

70% Volume Level

Four Highest Hours	Volumes	
	Major Street	Minor Street
2:00 - 3:00 PM	1664	118
3:00 - 4:00 PM	1879	137
4:00 - 5:00 PM	2119	189
5:00 - 6:00 PM	2184	190

FIGURE 4C-2: Criteria for "70%" Volume Level

(Community Less than 10,000 population or above 70 km/hr. (40 mph) on Major Street)



** Note: 80 ph. applies as the lower threshold volume for a minor street approach with two or more lanes and 60 ph. applies as the lower threshold volume threshold for a minor street approach with one lane.*

Appendix C
Traffic Forecasting Supporting Details

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 70 - BREVARD

SITE: 0431 - ON SR-519, 0.628 MI. N OF I-95 (UCLP)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	25500 F	N 12500	S 13000	9.00	55.00	8.30
2019	26500 C	N 13000	S 13500	9.00	54.70	8.30
2018	31500 C	N 17500	S 14000	9.00	54.10	4.30
2017	27500 C	N 14000	S 13500	9.00	54.30	2.60
2016	25500 C	N 13000	S 12500	9.00	53.40	5.90
2015	23500 C	N 12000	S 11500	9.00	53.80	3.90
2014	24500 C	N 12500	S 12000	9.00	53.80	3.30
2013	24000 C	N 12000	S 12000	9.00	54.20	3.50
2012	23000 C	N 11500	S 11500	9.00	53.60	26.80
2011	22500 C	N 11000	S 11500	9.00	54.30	3.30
2010	22000 C	N 11000	S 11000	10.91	56.02	5.00
2009	22000 C	N 11000	S 11000	11.80	61.02	4.40
2008	21000 C	N 10000	S 11000	11.37	57.79	4.80
2007	21500 C	N 10500	S 11000	9.20	54.21	5.40
2006	24000 C	N 12000	S 12000	11.35	57.22	5.40
2005	19200 C	N 9500	S 9700	11.30	53.80	5.90

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2020 HISTORICAL AADT REPORT

COUNTY: 70 - BREVARD

SITE: 8073 - GUS HIPP BLVD., EAST OF S.R. 519 / FISKE BLVD. - OFF SYSTEM

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
2020	5800 S	E 2600	W 3200	9.00	55.00	4.60
2019	6000 F	E 2700	W 3300	9.00	54.70	4.40
2018	6000 C	E 2700	W 3300	9.00	54.10	4.20
2017	5400 R	E 2600	W 2800	9.00	54.30	5.00
2016	5200 T	E 2500	W 2700	9.00	53.40	5.60
2015	5000 S	E 2400	W 2600	9.00	53.80	6.20
2014	4800 F	E 2300	W 2500	9.00	53.80	4.90
2013	4800 C	E 2300	W 2500	9.00	54.20	3.80
2012	4900 F	E 2300	W 2600	9.00	53.60	4.50
2011	4900 C	E 2300	W 2600	9.00	54.30	3.70

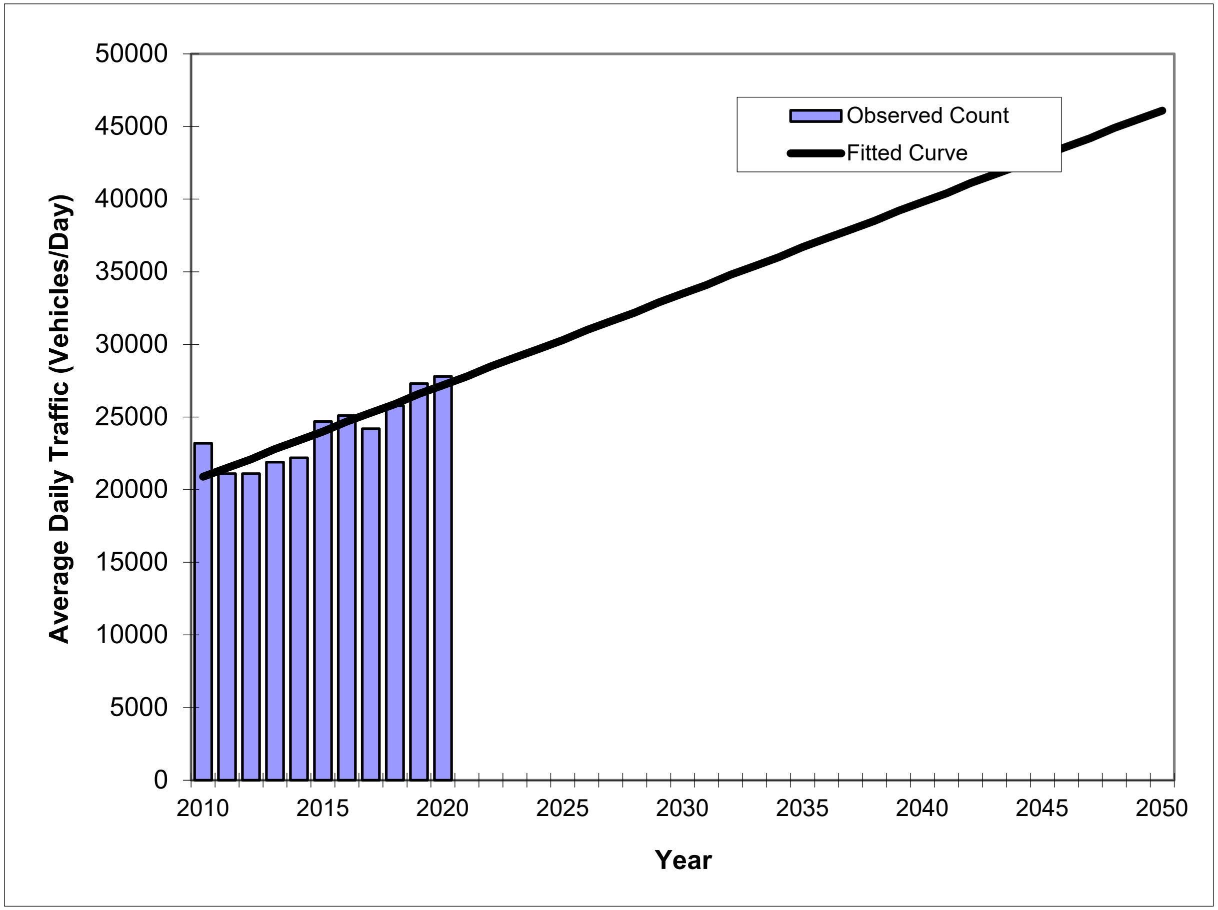
AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE
S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE
V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN
*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

Traffic Trends - V03.a

FISKE BLVD --

FIN#	1234
Location	1

County:	Brevard (70)
Station #:	0
Highway:	FISKE BLVD



Year	Traffic (ADT/AADT) Count*	Trend**
2010	23200	20900
2011	21100	21500
2012	21100	22100
2013	21900	22800
2014	22200	23400
2015	24700	24000
2016	25100	24700
2017	24200	25300
2018	25800	25900
2019	27300	26600
2020	27800	27200
2030 Opening Year Trend		
2030	N/A	33500
2040 Mid-Year Trend		
2040	N/A	39800
2050 Design Year Trend		
2050	N/A	46100
TRANPLAN Forecasts/Trends		

*Axle-Adjusted

** Annual Trend Increase:	631
Trend R-squared:	79.03%
Trend Annual Historic Growth Rate:	3.01%
Trend Growth Rate (2020 to Design Year):	2.32%
Printed:	20-May-22

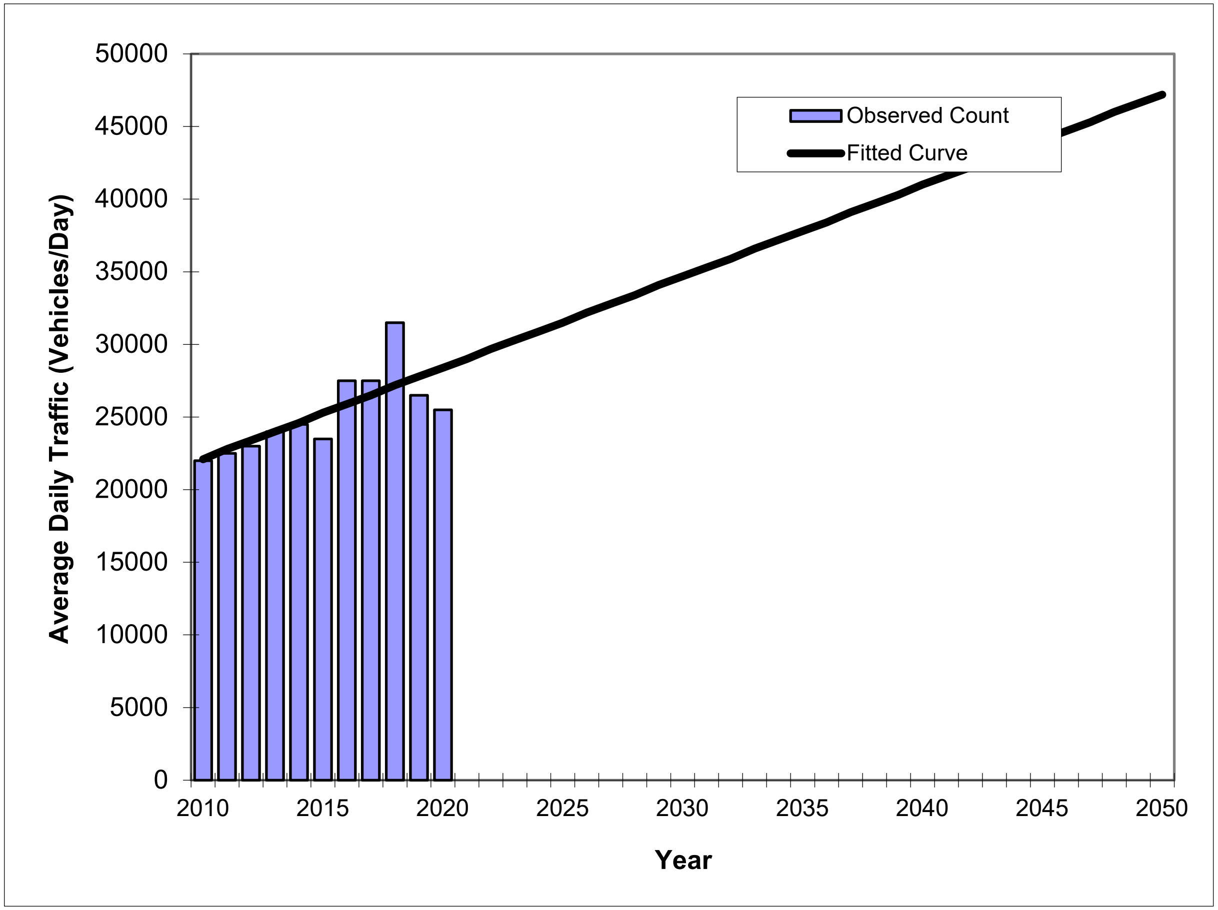
Straight Line Growth Option

Traffic Trends - V03.a

FISKE BLVD --

FIN#	1234
Location	1

County:	Brevard (70)
Station #:	0
Highway:	FISKE BLVD



Year	Traffic (ADT/AADT) Count*	Trend**
2010	22000	22100
2011	22500	22800
2012	23000	23400
2013	24000	24000
2014	24500	24600
2015	23500	25300
2016	27500	25900
2017	27500	26500
2018	31500	27200
2019	26500	27800
2020	25500	28400
2030 Opening Year Trend		
2030	N/A	34700
2040 Mid-Year Trend		
2040	N/A	41000
2050 Design Year Trend		
2050	N/A	47200
TRANPLAN Forecasts/Trends		

*Axle-Adjusted

** Annual Trend Increase:	627
Trend R-squared:	54.66%
Trend Annual Historic Growth Rate:	2.85%
Trend Growth Rate (2020 to Design Year):	2.21%
Printed:	20-May-22

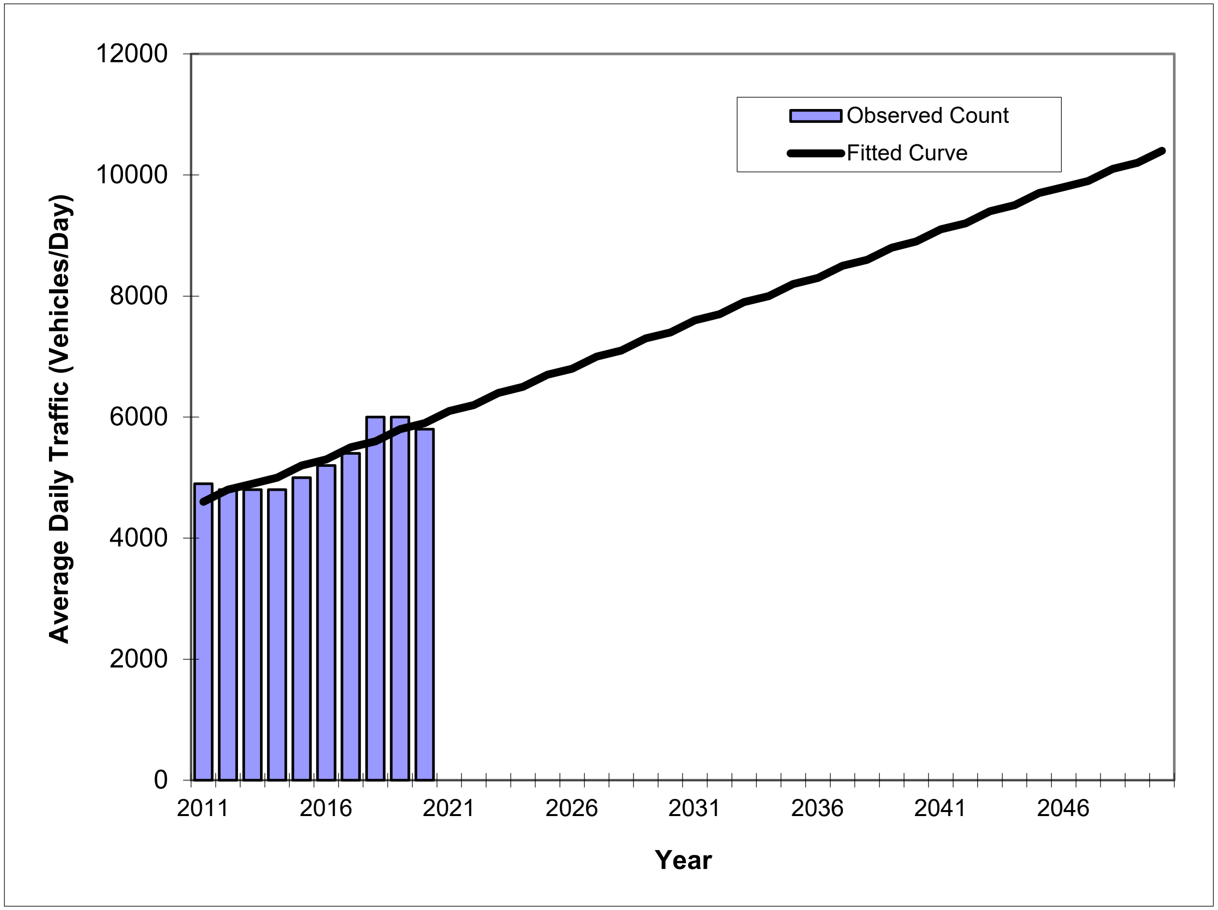
Straight Line Growth Option

Traffic Trends - V03.a

ROY WALL BLVD --

FIN#	1234
Location	1

County:	Brevard (70)
Station #:	0
Highway:	ROY WALL BLVD



Year	Traffic (ADT/AADT) Count*	Trend**
2011	4900	4600
2012	4800	4800
2013	4800	4900
2014	4800	5000
2015	5000	5200
2016	5200	5300
2017	5400	5500
2018	6000	5600
2019	6000	5800
2020	5800	5900
2030 Opening Year Trend		
2030	N/A	7400
2040 Mid-Year Trend		
2040	N/A	8900
2050 Design Year Trend		
2050	N/A	10400
TRANPLAN Forecasts/Trends		

*Axle-Adjusted

** Annual Trend Increase:	148
Trend R-squared:	81.17%
Trend Annual Historic Growth Rate:	3.14%
Trend Growth Rate (2020 to Design Year):	2.54%
Printed:	5-Jun-23

Straight Line Growth Option

College of Liberal Arts and Sciences
Bureau of Economic and Business Research

Florida Population Studies

Volume 55, Bulletin 192
February 2022

Projections of Florida Population by County, 2025–2050, with Estimates for 2021

Stefan Rayer, Population Program Director
Ying Wang, Research Demographer

The Bureau of Economic and Business Research (BEBR) has been making population projections for Florida and its counties since the 1970s. This report presents our most recent set of projections and describes the methodology used to construct those projections. To account for uncertainty regarding future population growth, we publish three series of projections. We believe the medium series is the most likely to provide accurate forecasts in most circumstances, but the low and high series provide an indication of the uncertainty surrounding the medium series. It should be noted that these projections refer solely to permanent residents of Florida; they do not include tourists or seasonal residents.

State Projections

The starting point for the state-level projections was the decennial census count for April 1, 2020. Because the detailed census counts by age and sex are not yet available, we used the BEBR age and sex estimates for April 1, 2020, which were controlled to the Census 2020 count of total population. Projections were made in one-year intervals using a cohort-component methodology in which births, deaths, and migration are projected separately for each age-sex cohort in Florida. We applied three different sets of assumptions to provide low, medium, and high series of projections. Although the low and high series do not provide absolute bounds on future population change, they provide a reasonable range in which Florida's future population is likely to fall.

Survival rates were applied by single year of age and sex to project future deaths in the population. These rates were based on Florida Life Tables for 2012–2018, using mortality data published by the Office of Vital Statistics in the Florida Department of Health. We adjusted the survival rates for 2020–2026 to make them consistent with recent mortality trends, and to align the projected deaths with those from the State of Florida's Demographic Estimating Conference (DEC) held December 13, 2021. After 2026, we made small adjustments to the survival rates based on projected changes in survival rates released by the U.S. Census Bureau. We used the same mortality assumptions for all three series of projections.

Domestic migration rates by age and sex were based on Public Use Microdata Sample (PUMS) files from the 2011–2019 American Community Survey (ACS) 1-year estimates and 2015–2019 ACS 5-year estimates. We calculated an average of those two sets of migration estimates; projections based on input data from more than one time period tend to be more accurate than those based on a single time period. By combining 1-year ACS estimates, which are more current, with 5-year ACS estimates, which are more stable, we make use of the different strengths of each type of ACS data.

We applied smoothing techniques to the age/sex-specific migration rates to adjust for data irregularities caused by small sample size. The smoothed in- and out-migration rates were weighted to account for recent changes in Florida's population growth rates. Projections of domestic in-migration were made by applying weighted in-migration rates to the projected population of the United States (minus Florida), using the most recent set of national projections produced by the U.S. Census Bureau. Projections of out-migration were made by applying weighted out-migration rates to the Florida population. In both instances, rates were calculated separately for males and females for each age up to 90 and over.

For the medium projection series, in-migration weights for total population varied from 1.26 to 1.01, and out-migration weights varied from 0.97 to 1.00. For the low projection series, the in-migration weights described above were lowered over time – from 7.6% in 2022 to 11% in 2050; the out-migration weights were raised by the same margins. For the high projection series, the in-migration weights described above were raised over time – from 7.6% in 2022 to 11% in 2050; the out-migration weights were lowered by the same margins.

The distribution of foreign immigrants by age and sex was also based on averages of the patterns observed over the same time periods using the same ACS data sets as for domestic migration. Again, we smoothed the estimates to account for irregularities in the age/sex distribution of immigrants. For the medium projection series, we held foreign immigration at an average of the observed levels, with some short-term adjustments based on recent trends. For the low series, foreign immigration was projected to decrease by 2,900 per year from the average of the observed levels; for the high series, foreign immigration was projected to increase by 2,500 per year. Foreign emigration was assumed to equal 25% of foreign immigration for each series of projections.

Projections were made in one-year intervals, with each projection serving as the base for the following projection. Projected in-migration for each one-year interval was added to the survived Florida population at the end of the interval and projected out-migration was subtracted, giving a projection of the population age one and older.

Births were projected by applying age-specific birth rates (adjusted for child mortality) to the projected female population. These birth rates were based on Florida birth data for 2012–2018 published by the Office of Vital Statistics in the Florida Department of Health. They imply a total fertility rate (TFR) of 1.75 births per woman for total population. These rates were reduced in the short-term projections to about 1.66 births per woman to make them consistent with recent fertility trends, and to align the projected births with those from the December 13, 2021 DEC. After 2026, we raised birth rates gradually; the projections from 2034 to 2050 imply about 1.78 births per woman.

The medium projections of total population for 2022–2026 were adjusted to be consistent with the state population forecasts for those years produced by the December 13, 2021 DEC. None of the projections after 2026 had any further controls. In this publication, we provide projections for 2025, 2030, 2035, 2040, 2045, and 2050. State projections for other years are available by request.

County Projections

The cohort-component method is a good way to make population projections at the state level but is not necessarily the best way to make projections at the county level. Many counties in Florida are so small that the number of persons in each age-sex category is inadequate for making reliable cohort-component projections, given the lack of detailed small-area data. Even more important, county growth patterns are so volatile that a single technique based on data from a single time period may provide misleading results. We believe more useful projections of total population can be made by using several different techniques and historical base periods.

For counties, we started with the population estimate constructed by BEBR for April 1, 2021. We made projections for each county using five different techniques in five-year increments. The five techniques were:

1. Linear – the population will change by the same number of persons in each future year as the average annual change during the base period.

2. Exponential – the population will change at the same percentage rate in each future year as the average annual rate during the base period.

3. Share-of-growth – each county's share of state population growth in the future will be the same as its share during the base period.

4. Shift-share – each county's share of the state population will change by the same annual amount in the future as the average annual change during the base period.

5. Constant-share – each county's share of the state population will remain constant at its 2021 level.

For the linear and share-of-growth techniques we used base periods of two, ten, and twenty years (2019–2021, 2011–2021, and 2001–2021), yielding three sets of projections for each technique. For the exponential and shift-share techniques we used base periods of five and fifteen years (2016–2021 and 2006–2021), yielding two sets of projections for each technique. The constant-share method was based on data for a single year (2021).

This methodology produced eleven projections for each county for each projection year (2025, 2030, 2035, 2040, 2045, and 2050). From these, we calculated five averages: one using all eleven projections (AVE-11), one that excluded the highest and lowest projections (AVE-9), one that excluded the two highest and two lowest projections (AVE-7), one that excluded the three highest and three lowest projections (AVE-5), and one that excluded the four highest and four lowest projections (AVE-3). Based on the results of previous research, we designated the average that excluded the three highest and three lowest projections (AVE-5) as the default technique for each county. We evaluated the resulting projections by comparing them with historical population trends and with the level of population growth projected for the state as a whole. For counties in which AVE-5 did not provide reasonable projections, we selected the technique producing projections that fit most closely with our evaluation criteria.

For 56 counties we selected AVE-5, the average in which the three highest and three lowest projections were excluded. In the remaining 11 counties, we selected projections made from an individual technique or calculated a custom average (e.g., an average of two individual techniques). These include Bay, Calhoun, Gadsden, Glades, Hardee, Holmes, Jackson, Liberty, Madison, Monroe, and Okeechobee counties.

We also made adjustments in several counties to account for changes in institutional populations such as university students and prison inmates. Adjustments were made only in counties in which institutional populations account for a large proportion of total population or where changes in the institutional population have been substantially different than changes in the rest of the population. In the present set of projections, adjustments were made for Alachua, Baker, Bradford, Calhoun, Columbia, DeSoto, Dixie, Franklin, Gadsden, Gilchrist, Glades, Gulf, Hamilton, Hardee, Hendry, Holmes, Jackson, Jefferson, Lafayette, Leon, Liberty, Madison, Okeechobee, Santa Rosa, Sumter, Suwannee, Taylor, Union, Wakulla, Walton, and Washington counties.

Range of County Projections

The techniques described in the previous section were used to construct the medium series of county projections. This is the series we believe will generally provide the most accurate forecasts of future population change. We also constructed low and high projections to provide an indication of the uncertainty surrounding the medium county projections. The low and high projections were based on analyses of past population forecast errors for counties in Florida, broken down by population size and growth rate. They indicate the range into which approximately three-quarters of future county populations will fall, if the future distribution of forecast errors is similar to the past distribution.

The range between the low and high projections varies according to a county's population size in 2021 (less than 30,000; 30,000 to 199,999; and 200,000 or more), rate of population growth between 2011 and 2021 (less than 7.5%; 7.5–15%; 15–30%; and 30% or more), and the length of the projection horizon (on average, projection errors grow with the length of the projection horizon). Our studies have found that the distribution of absolute percent errors tends to remain fairly stable over time, leading us to believe that the low and high projections provide a reasonable range of errors for most counties. It must be emphasized, however, that the actual future population of any given county could be below the low projection or above the high projection.

For the medium series of projections, the sum of the county projections equals the state projection for each year (except for slight differences due to rounding). For the low and high series, however, the sum of the county projections does not equal the state projection. The sum of the low projections for counties is lower than the state's low projection and the sum of the high projections for counties is higher than the state's high projection. This occurs because potential variation around the medium projection is greater for counties than for the state as a whole.

Note

For this set of population projections, we did not make specific adjustments related to the ongoing COVID-19 pandemic. The estimated statewide population growth from April 1, 2020 to April 1, 2021 of about 360,000 persons was comparable to annual population changes in the late 2010s. Furthermore, the most recent state projections from the December 13, 2021 DEC, to which these county projections are controlled, show similar statewide growth over the next five years as the state projections adopted at the December 3, 2019 DEC before the pandemic. Consequently, while the pandemic has to some extent impacted the components of Florida's population change – especially natural increase, which has been negative since 2020 – we currently expect no particular changes to the projected population levels for 2025 and beyond.

Acknowledgement

Funding for these projections was provided by the Florida Legislature.

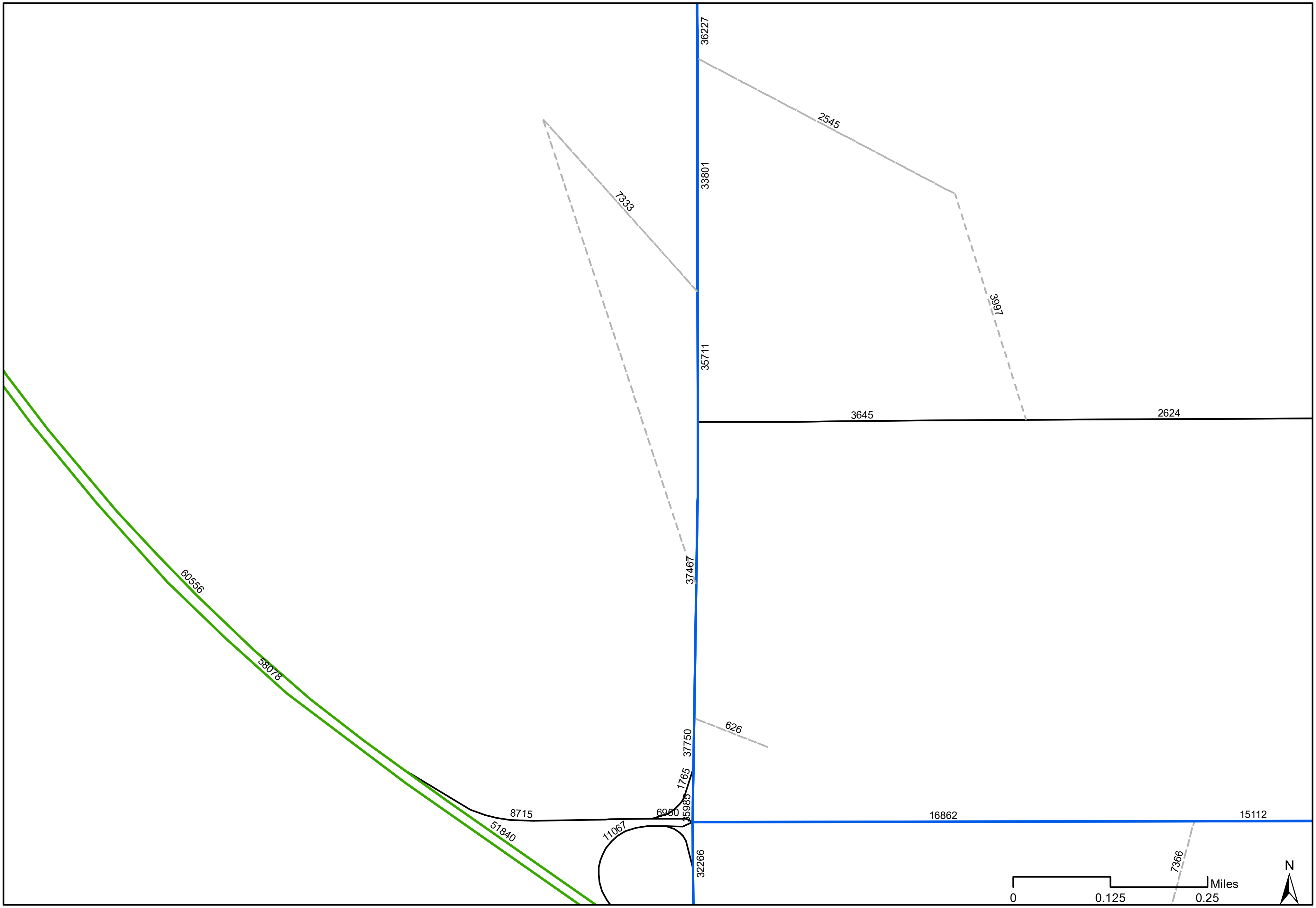
Projections of Florida Population by County, 2025–2050, with Estimates for 2021

County and State	Estimates April 1, 2021	Projections, April 1 2025	2030	2035	2040	2045	2050
ALACHUA	284,607						
Low		282,700	284,200	283,200	280,300	276,900	273,400
Medium		297,600	310,600	320,900	328,800	335,600	341,800
High		312,500	337,000	358,600	377,300	394,300	410,200
BAKER	28,692						
Low		28,000	27,800	27,400	26,800	26,200	25,600
Medium		29,800	30,900	31,700	32,400	33,000	33,500
High		31,600	34,000	36,100	38,000	39,700	41,300
BAY	178,282						
Low		177,000	177,300	175,800	173,300	170,400	167,500
Medium		186,300	193,800	199,200	203,200	206,500	209,400
High		195,600	210,300	222,600	233,200	242,700	251,300
BRADFORD	27,955						
Low		26,700	25,900	25,000	24,100	23,300	22,500
Medium		28,400	28,800	29,000	29,100	29,300	29,400
High		30,100	31,700	33,000	34,200	35,300	36,400
BREVARD	616,742						
Low		615,600	620,700	619,600	615,500	609,800	603,600
Medium		648,000	678,300	702,000	722,000	739,100	754,500
High		680,400	736,000	784,500	828,500	868,400	905,400
BROWARD	1,955,375						
Low		1,921,400	1,912,800	1,893,200	1,868,600	1,842,300	1,816,600
Medium		2,022,500	2,090,400	2,145,200	2,191,900	2,233,100	2,270,700
High		2,123,700	2,268,100	2,397,300	2,515,300	2,623,800	2,724,900
CALHOUN	13,683						
Low		13,100	12,700	12,300	11,800	11,400	11,000
Medium		14,000	14,100	14,200	14,300	14,300	14,400
High		14,800	15,500	16,200	16,800	17,300	17,800
CHARLOTTE	190,570						
Low		188,800	190,900	190,200	188,000	185,100	181,600
Medium		203,000	215,700	225,800	234,300	241,900	248,800
High		217,200	240,500	261,400	280,600	298,800	315,900
CITRUS	155,615						
Low		152,800	152,300	150,800	148,600	145,800	143,000
Medium		162,500	169,200	174,900	179,500	183,500	187,000
High		172,300	186,200	198,900	210,500	221,100	230,900
CLAY	221,440						
Low		220,700	224,100	225,000	223,700	221,200	218,300
Medium		234,800	249,000	260,900	270,300	278,300	285,400
High		248,900	273,900	296,800	316,900	335,300	352,500
COLLIER	382,680						
Low		383,700	390,500	392,500	391,100	387,600	383,300
Medium		408,200	433,900	455,100	472,700	487,600	501,000
High		432,700	477,300	517,700	554,200	587,600	618,800
COLUMBIA	69,809						
Low		68,900	68,400	67,300	66,000	64,800	63,700
Medium		72,500	74,700	76,200	77,500	78,600	79,600
High		76,200	81,100	85,200	88,900	92,300	95,500
DESOTO	34,031						
Low		32,700	31,700	30,700	29,800	29,000	28,200
Medium		34,400	34,600	34,800	35,000	35,100	35,200
High		36,100	37,600	38,900	40,100	41,200	42,300
DIXIE	16,804						
Low		16,000	15,700	15,200	14,700	14,200	13,800
Medium		17,100	17,400	17,600	17,700	17,900	18,000
High		18,100	19,100	20,000	20,800	21,500	22,200

Legend

- Centroid Connector
- One Lane Per Direction
- Two Lanes Per Direction
- Three Lanes Per Direction
- Four Lanes Per Direction
- More Than Four Lanes Per Direction

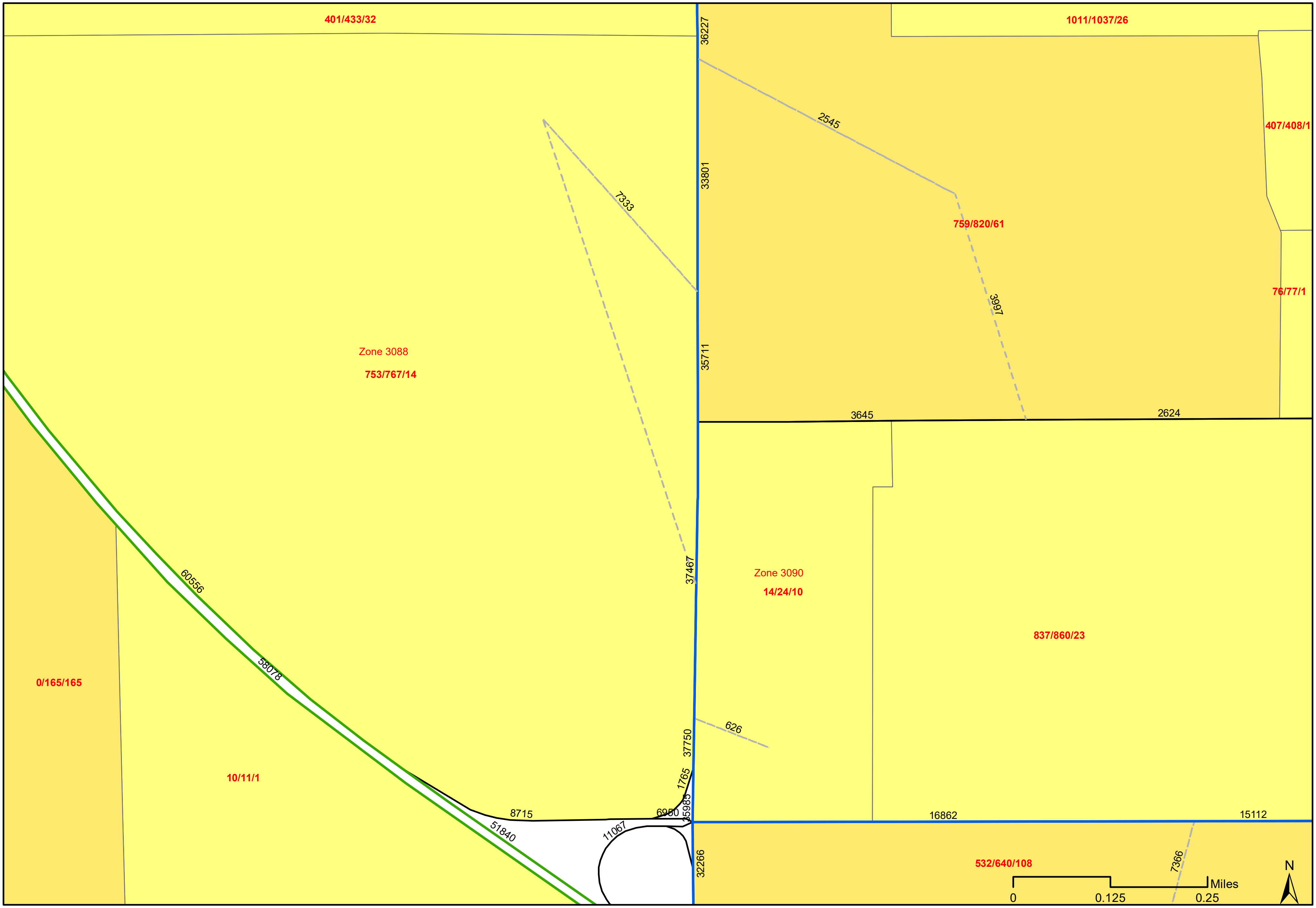
CFRPM Version 7
2015 Peak Season Average Daily Traffic



Legend

- Centroid Connector
- One Lane Per Direction
- Two Lanes Per Direction
- Three Lanes Per Direction
- Four Lanes Per Direction
- More Than Four Lanes Per Direction

CFRPM Version 7
2045 Peak Season Average Daily Traffic



Legend

- Centroid Connector
- One Lane Per Direction
- Two Lanes Per Direction
- Three Lanes Per Direction
- Four Lanes Per Direction
- More Than Four Lanes Per Direction

CFRPM Version 7 Dwelling Unit Comparison
2015 Data/2045 Data/Difference

Appendix D
Meeting Summaries

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #1 Agenda

June 13, 2022

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

1:30 PM – 3:00 PM

1. Project Background and Schedule
2. Signal Warrant Analysis
    a. Field Review
    b. Existing Traffic Counts and Safety
    c. Signal Warrant Analysis Results
3. Growth Rate Analysis
4. ICE Process Overview
5. ICE Stage 1 Results
    a. CAP-X and SPICE Results
    b. Strategies to be advanced to Stage 2
6. Next Steps
    a. ICE Stage 2 and Drainage Analysis
    b. Next Consensus Building Meeting – October 2022

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #1 Summary

June 13, 2022

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

1:30 PM – 3:00 PM

A Consensus Building Meeting was held to review the background of the study intersection and discuss the alternatives of the Stage 1 Intersection Control Evaluation (ICE). The sign in sheet and presentation materials can be found attached to these meeting notes. The following organizations and individuals attended the meeting:

- VJ Karycki, Michael Jarusiewicz, and Brenda Fettrow – City of Rockledge
- Marc Bernath and Corrina Gumm – Brevard County
- Steven Buck (via Microsoft Teams) – Florida Department of Transportation – District 5
- Sarah Kraum and Georganna Gillette – Space Coast Transportation Planning Organization (SCTPO)
- Travis Hills and Daniel Torre – Kittelson & Associates, Inc.
- David Bennett – CONSOR Engineers, LLC

The following are comments, general notes, and questions from the Consensus Building Meeting:

1. Travis provided an overview on project background and study objectives. This included a discussion on the previous recommendations for the intersection of Fiske Boulevard and Roy Wall Boulevard/Martin Road. The purpose of the study is to identify an intersection alternative which satisfies both the FDOT ICE process and potential drainage concerns prior to the project advancing into design. The project schedule was also discussed.

2. Daniel presented the existing traffic and safety conditions observed at the study intersection. The completed Signal Warrant Analysis was also discussed. The existing traffic volumes at the intersection satisfies signal warrants.

3. Daniel discussed the growth rate analysis, which reviewed estimated population growth in Brevard County, historical traffic growth on the study roadways, and future traffic via travel demand modeling. A 0.5 percent annual growth rate was recommended for the north, south, and east legs of the study intersection, and no growth was recommended for the west leg.

4. Travis provided an overview of the ICE process. Sample intersection alternatives were discussed, such as a Median U-Turn (MUT), Partial Median U-Turn (PMUT), and Restricted Crossing U-Turn (RCUT).

5. The Stage 1 ICE capacity and safety analysis results were discussed. The following intersection alternatives were recommended to be advanced to Stage 2.

    a. Two-Way Stop Controlled (Future No-Build Alternative)
    b. Signalized Control
    c. 2x1 Roundabout
    d. Partial MUT
    e. Signalized RCUT

6. Open Discussion

    a. City of Rockledge staff asked if there is a typical distance between the U-turn locations in the MUT, PMUT, and RCUT alternatives.

        i. Travis provided background on existing applications for PMUTs and RCUTs.

        ii. The FDOT *Manual on Intersection Control Evaluation* notes a U-turn location for a RCUT is spaced 400 to 1,000 feet from the main intersection.

    b. The Study Team was asked if conceptual layouts will be developed for the Stage 2 alternatives.

        i. The Study Team confirmed concept development is a component of the Stage 2 ICE process.

    c. The group noted the PMUT and RCUT alternatives would require the construction of a median within the influence area of the intersection. The Study Team was asked for the minimum allowable median widths and if there are any future plans for the construction of a median along Fiske Boulevard.

        i. Steven confirmed the FDOT preferred median width is 22-feet-wide, while the minimum is 19.5-feet-wide.

        ii. The Study Team is not aware of any future plans for a median along Fiske Boulevard.

    d. The Study Team was asked if the proposed alternatives would trigger the need for a public meeting during a future design phase.

        i. Steven noted since the access along the roadway will be changed as part of the proposed alternatives, then a public meeting will be required during the design phase.

    e. Sarah noted the Study Team can present analysis findings and recommendations to other groups, such as Rockledge City Council, if desired.

    f. Steven asked the Study Team if the Stage 1 ICE alternatives were ranked and if there were other considerations for narrowing the Stage 2 recommended list further.

        i. Travis noted there were intersection alternatives evaluated in Stage 1 ICE that were not recommended to advance to Stage 2. Eight alternatives were evaluated in Stage 1 ICE and five were recommended for Stage 2. It was also noted the Stage 1 ICE results were similar between the recommended alternatives.

ii. It is important to note that numerous intersection alternatives (e.g. displaced left turn, quadrant roadway) were not considered in the Stage 1 analysis due to fatal flaws in regards to right-of-way, operations, etc. The alternatives not considered in Stage 1 are discussed in the Stage 1 ICE Forms.

g. The group was agreeable to advancing the recommended intersection alternatives to Stage 2 ICE.

   i. Two-Way Stop Controlled (Future No-Build Alternative)
   ii. Signalized Control
   iii. 2x1 Roundabout
   iv. Partial MUT
   v. Signalized RCUT

The following are the next steps to be completed by the Study Team prior to the next Consensus Building Meeting:

- Stage 2 ICE
  - Detailed operational and safety analyses
  - Conceptual development
  - Benefit/cost analysis
- Detailed drainage analysis
- Next Consensus Building Meeting – October 2022

These meeting notes are Daniel Torre's interpretation of the comments, requests, and discussion during the meeting. Question, additions, and/or clarifications should be directed to him at 407-373-1121 or dtorre@kittelson.com.

Fiske Blvd and Roy Wall Blvd Intersection Analysis - Consensus Building Meeting 1 - June 13, 2022

Name	Agency/Firm	E-mail	Phone
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Daniel Torre	KAI		
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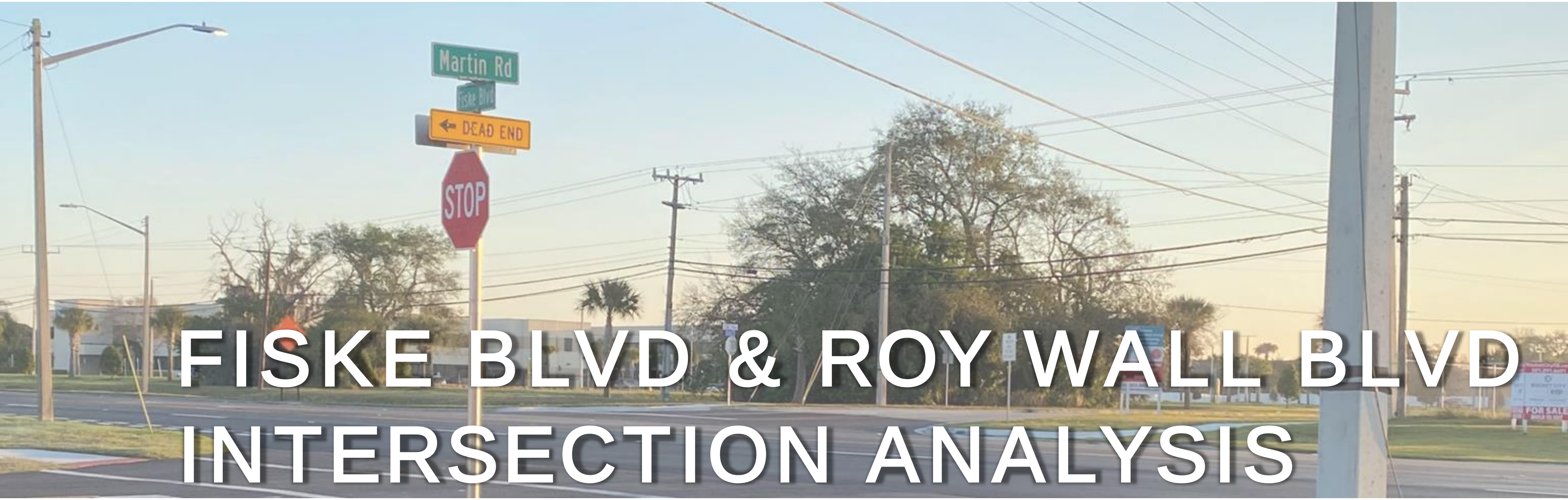
Michael Jarosiewicz	Rockledge	mjpw@cityofrockledge.org	" " "
Georganna Gillette	SCTPO	georganna.gillette@sctpo.com	
Brenda Fettrow	City	bfettrow@cityofrockledge.org	321.221-7540
Corrina Gumm	BCPW	corrina.gumm@BrevardFL.gov	
David Barrett	Wuesa		
Marc Bernath	Brevard County pw	marc.bernath@brevardfl.gov	

DATE 6/13/2022



FISKE BLVD & ROY WALL BLVD INTERSECTION ANALYSIS

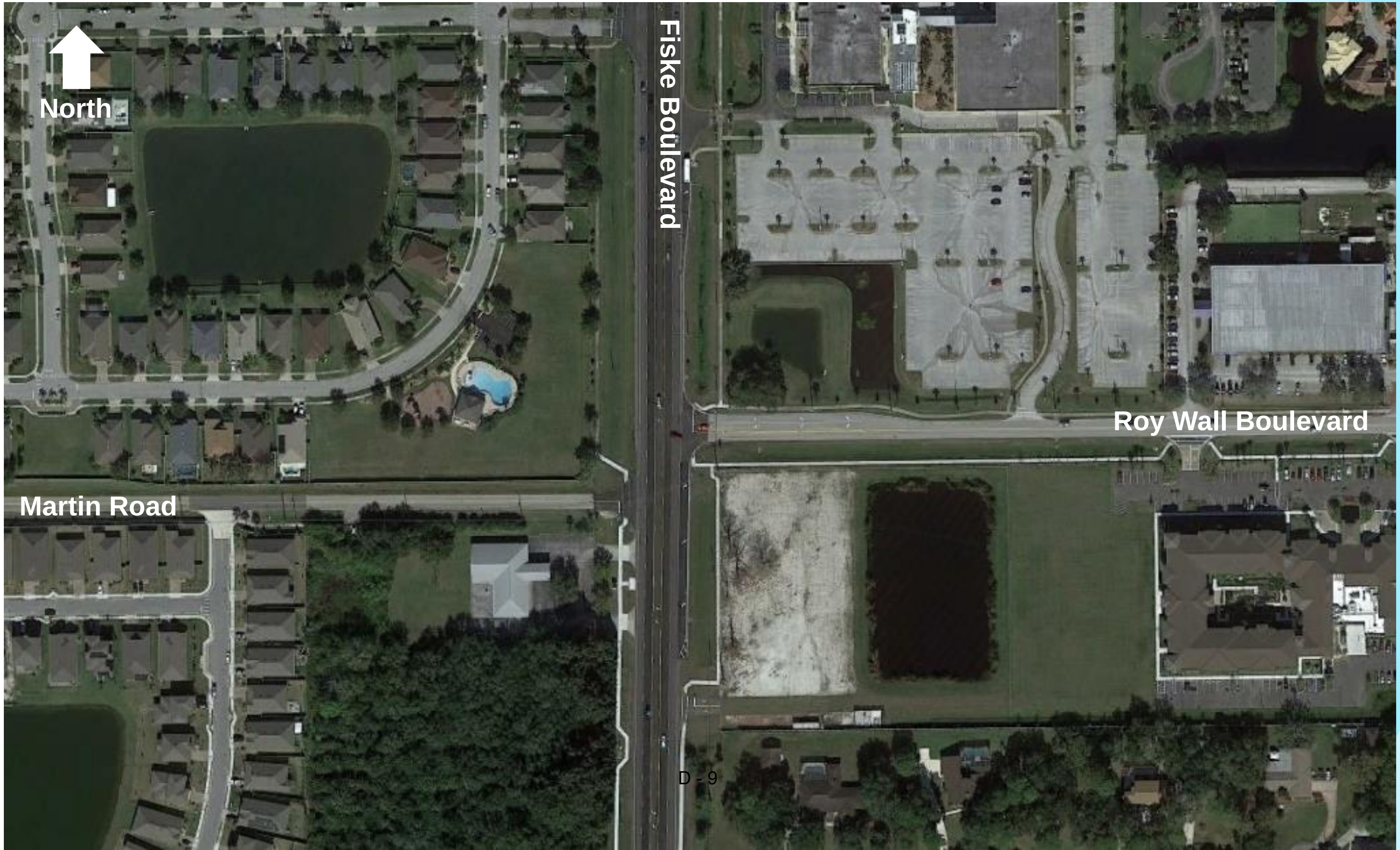
CONSENSUS BUILDING MEETING #1

SPACE COAST TPO
KITTELSON & ASSOCIATES
CONSOR

Meeting Agenda

- Project Background and Schedule
- Signal Warrant Analysis
- Growth Rate Analysis
- ICE Process Overview
- ICE Stage 1 Results
- Next Steps

Project Location



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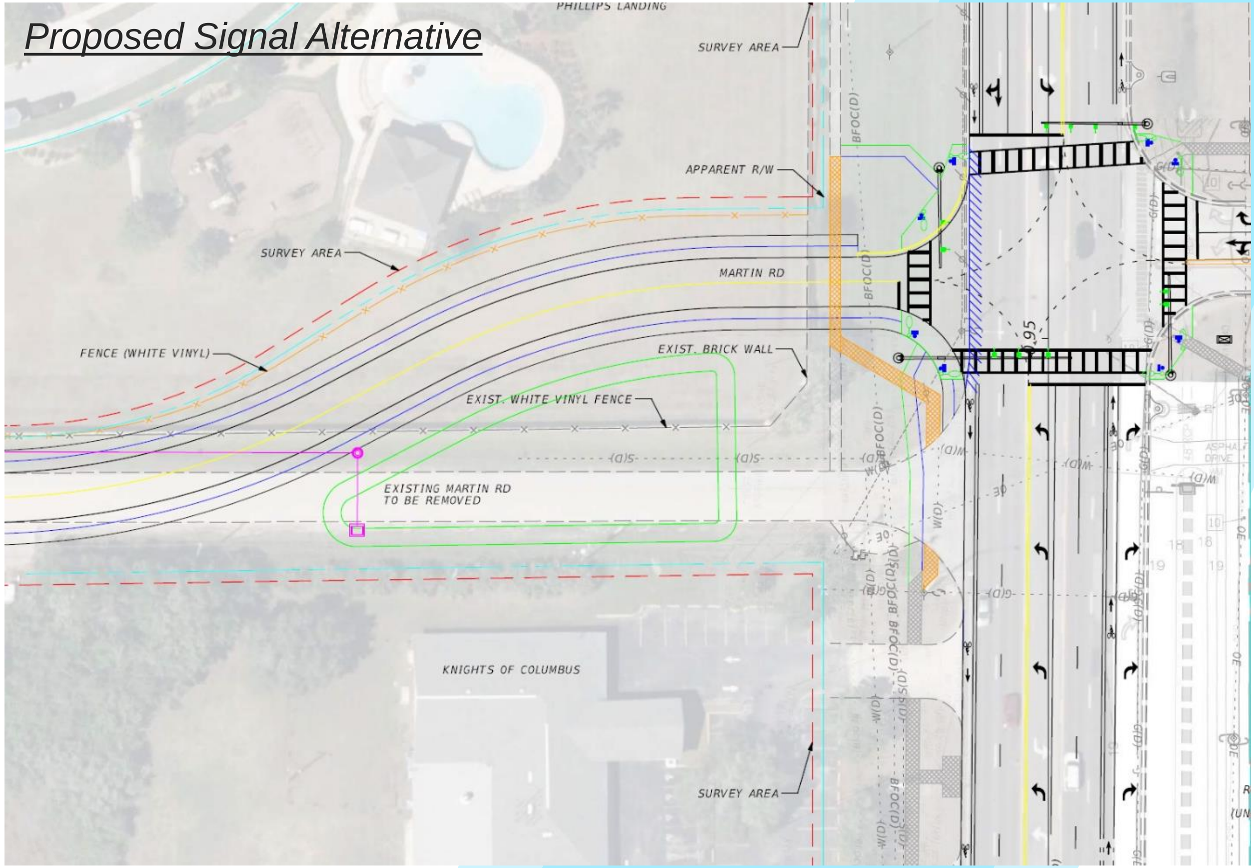
Project Background

- Improvements proposed from SR 519/Fiske Blvd Corridor Planning Study

- Martin Road Realignment
  - Tie into Fiske and Roy Wall intersection
  - Change in drainage patterns

- Analyses needed prior to design
  - Intersection Control Evaluation (ICE)
  - Drainage Analysis



Project Schedule

March to May 2022	June 2022	July to September 2022	October 2022	November to December 2022	January 2023
Data Collection Field Review Signal Warrant Analysis Growth Rate Analysis **Stage 1 ICE**	**Consensus Building Meeting #1**	Drainage Analysis **Stage 2 ICE**	**Consensus Building Meeting #2**	Draft Summary Technical Memorandum SCTPO/Partner Agency Review **Final Summary Technical Memorandum**	**Final Consensus Building Meeting (If Necessary)**

Field Review

- Conducted March 2022
- Observed conflicts/near miss crashes between opposing left-turn movements

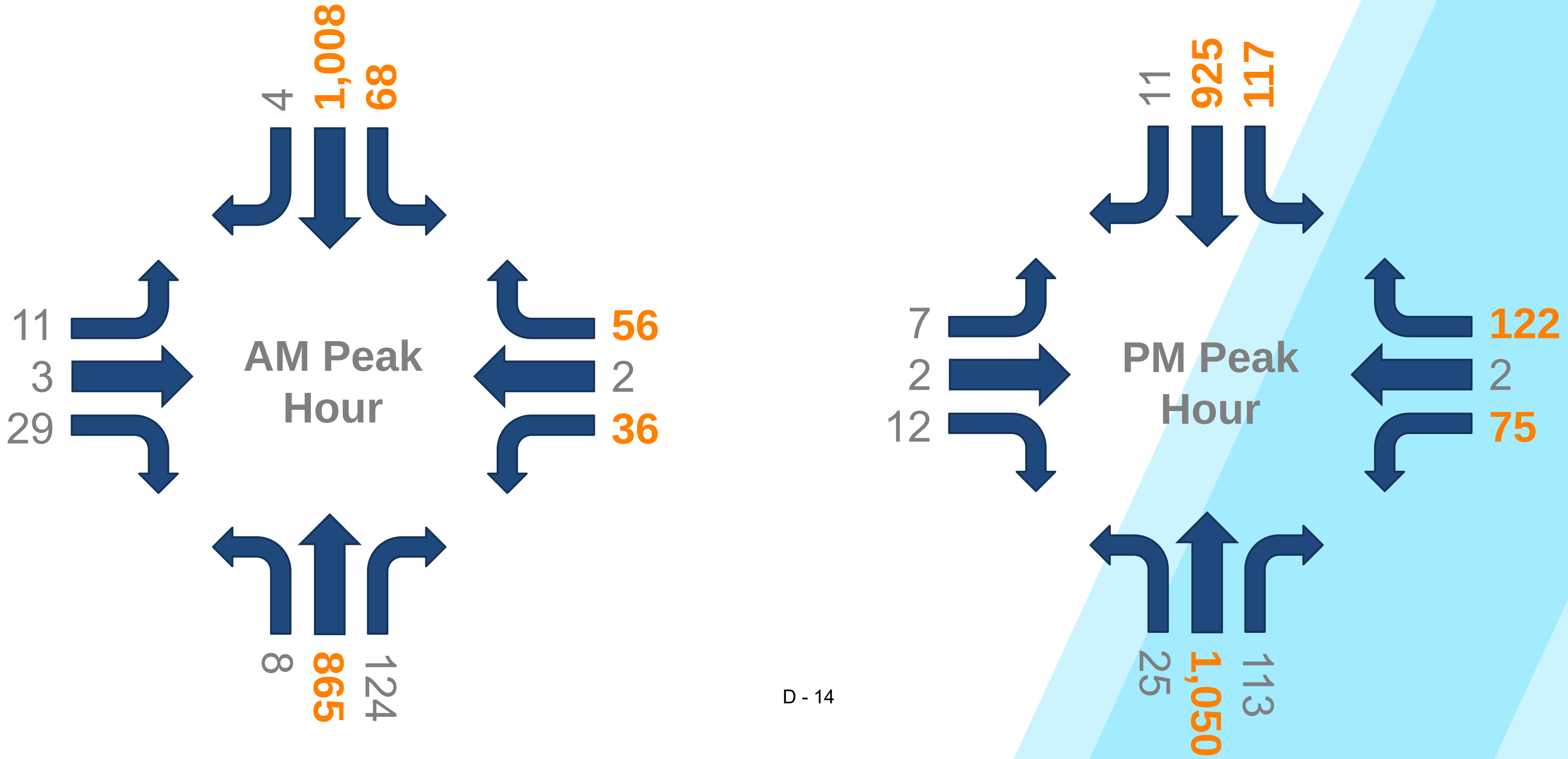
Safety Analysis

- Crash data collected from 2017-2021
  - 23 Total Crashes
  - 6 Injury Crashes, 0 Fatal
    - 2 rear ends, 2 left turn, 1 angle, and 1 head-on
  - Rear end was the most common crash type (11 crashes)
  - Left turn was the second highest crash type (5 crashes)

- Multiple near miss left turn crashes observed in field

Collected Turning Movement Counts

Turning movement counts collected Spring 2022



Signal Warrant Analysis

- Traffic volumes meet following signal warrants:
  - Warrant 1: Eight-Hour Vehicular Volume
  - Warrant 2: Four-Hour Vehicular Volume

- Conclusion consistent with FDOT signal warrant analysis

Growth Rate Analysis

- Bureau of Economic and Business Research (BEBR) Brevard County Population Data
- SCTPO and FDOT Historical Traffic Counts (2010-2020)
- Future Traffic via CFRPM v7.0 Modeling

BEBR Population Growth Rate

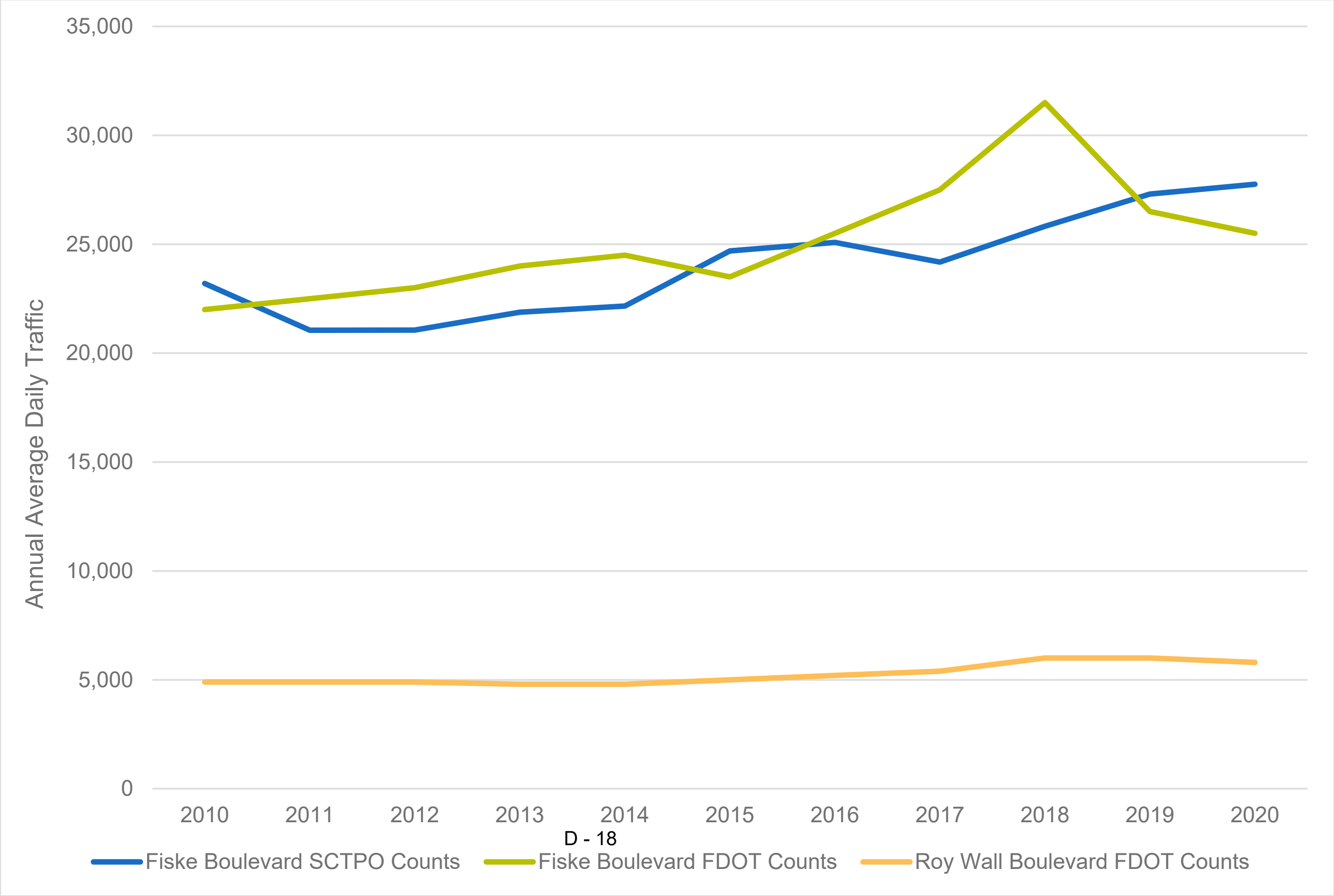
Brevard County Estimation	2021 Estimate	2050 Projection	Annual Growth Rate, Growth/Year (%)
Low	616,742	603,600	-453 (**-0.07%**)
Medium	616,742	754,500	4,750 (**0.77%**)
High	616,742	905,400	9,954 (**1.61%**)
Note: Volume 55, Bulletin 192, February 2022			

Historical Traffic Counts 2010-2020

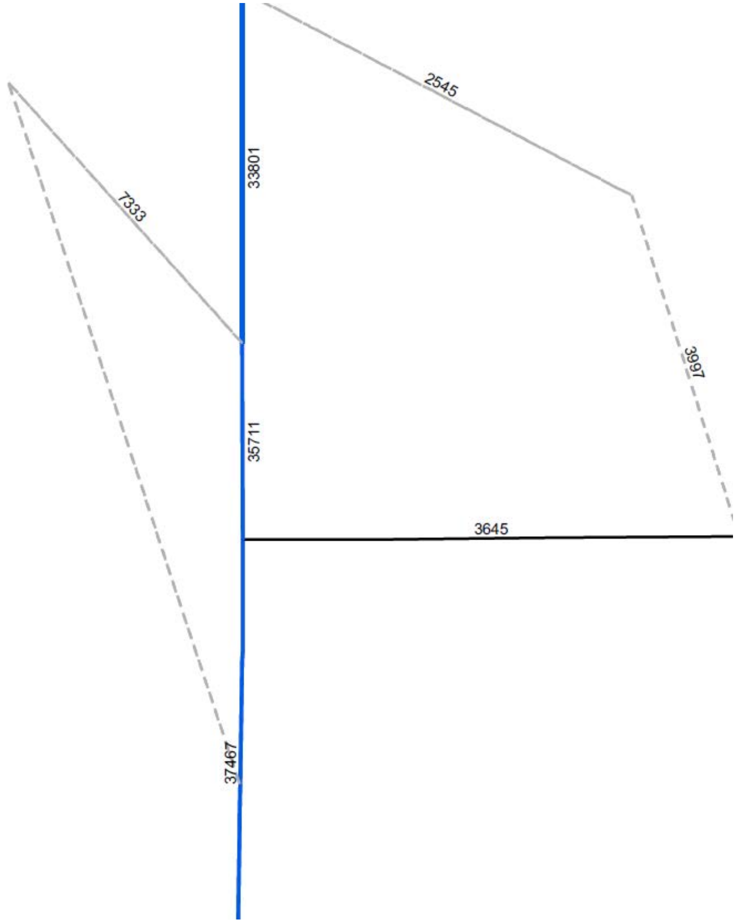
<u>2010-2020 Growth Rates</u>

Fiske Boulevard
Approx. 3.0%

Roy Wall Boulevard
2.8%



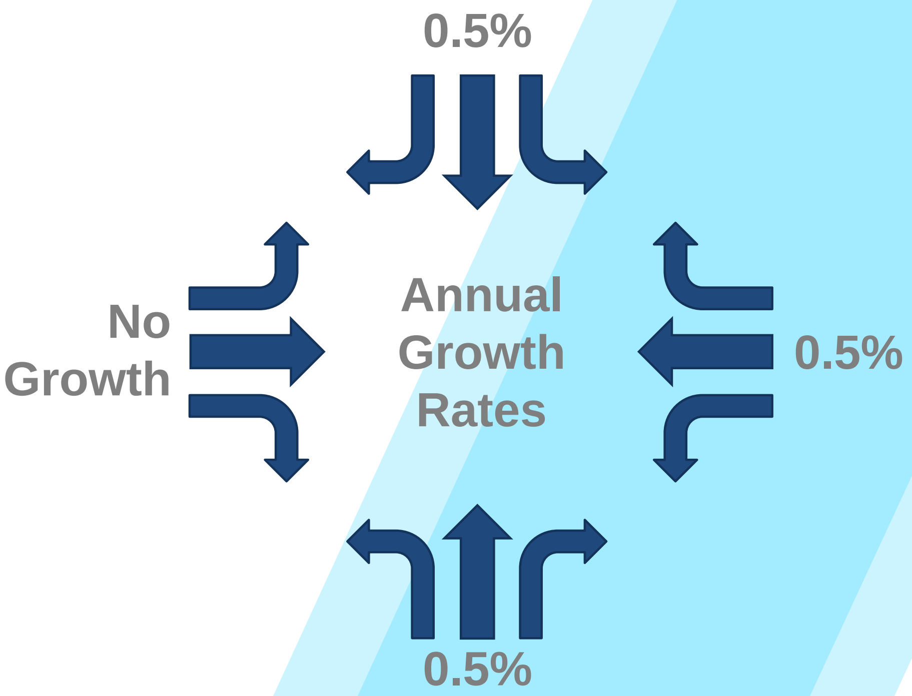
CFRPM v7.0 Modeling



Roadway Segment	Base Year (2015) Volume	Horizon Year (2045) Volume	Linear Annual Growth Rate
Fiske Blvd – South of Martin Rd	33,095	37,467	**0.44%**
Fiske Blvd – North of Roy Wall Blvd	31,851	35,711	**0.40%**
Roy Wall Blvd – East of Fiske Blvd	3,148	3,645	**0.53%**

Selected Growth Rates

- Annual growth rates selected for each intersection approach
- AADTs and turning volumes forecast to 2030 (opening year) and 2050 (design year)
- Martin Road
  - Traffic counts include completed Palm Cove community
  - No future development or roadway connection plans identified



Future AADTs

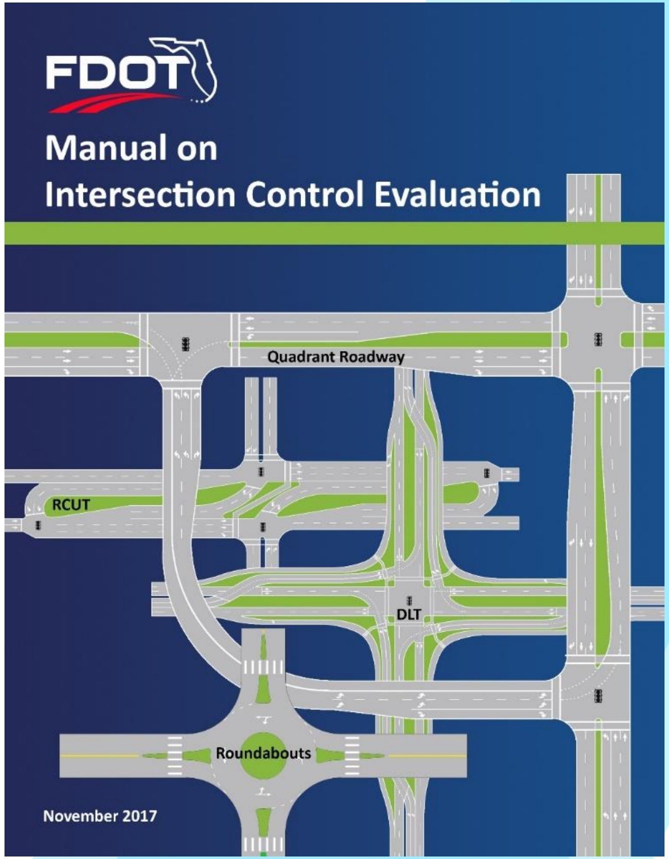
Roadway	2020 Traffic Volumes	Annual Growth Rate	2030 Traffic Volumes	2050 Traffic Volumes
Fiske Boulevard	27,750	0.50%	29,500	32,500
Roy Wall Boulevard	5,800	0.50%	6,500	7,000

Intersection Control Evaluation

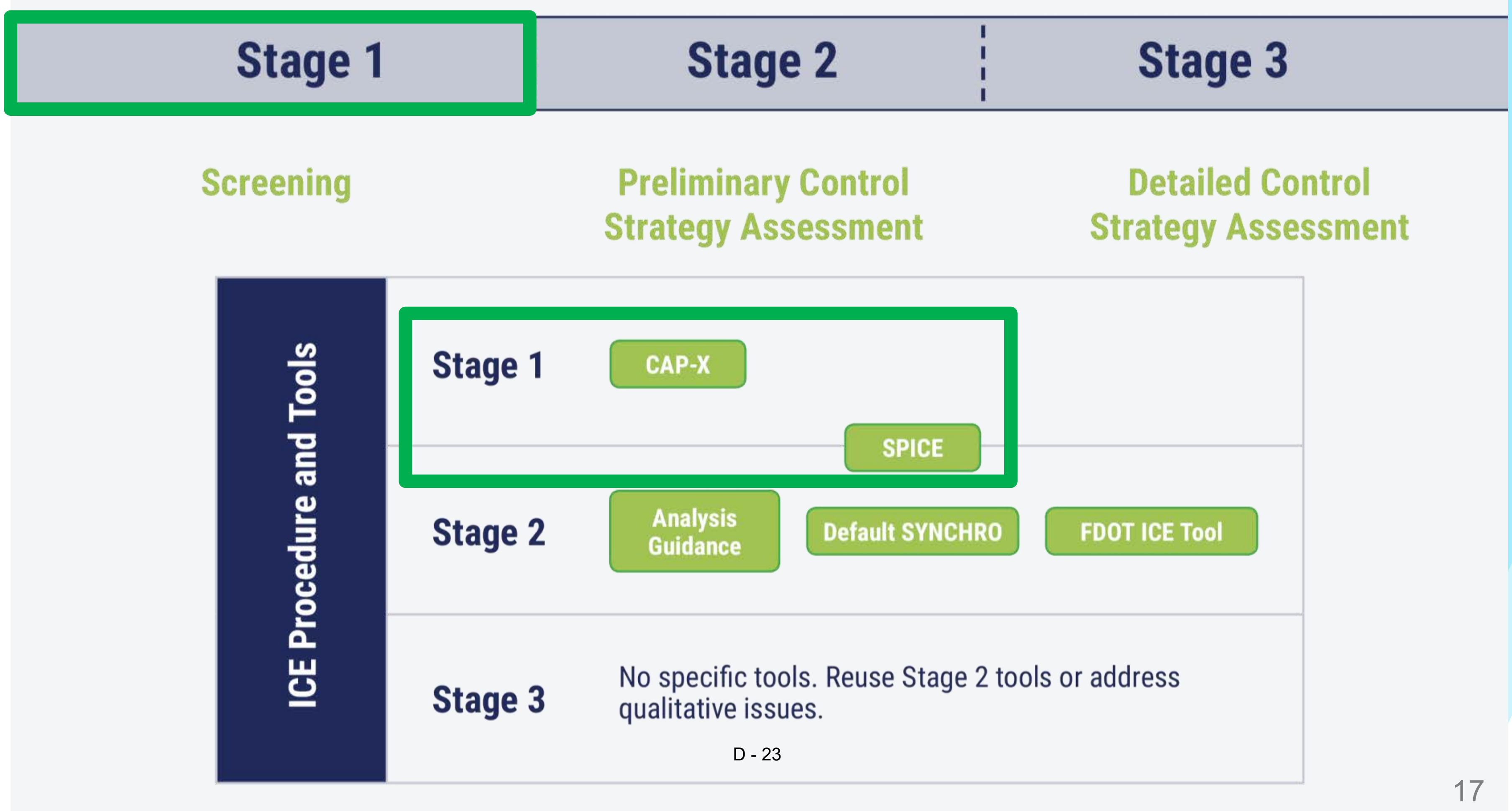
Adopted November 2017

ICE is required when

- **<u>New signalization is proposed</u>**
- Major reconstruction of existing signalized intersection is proposed
- Conversion of a direction/bi-directional median opening to a full median opening is proposed
- District Design Engineer (DDE) and District Traffic Operations Engineer (DTOE) consider an ICE a good fit for the project

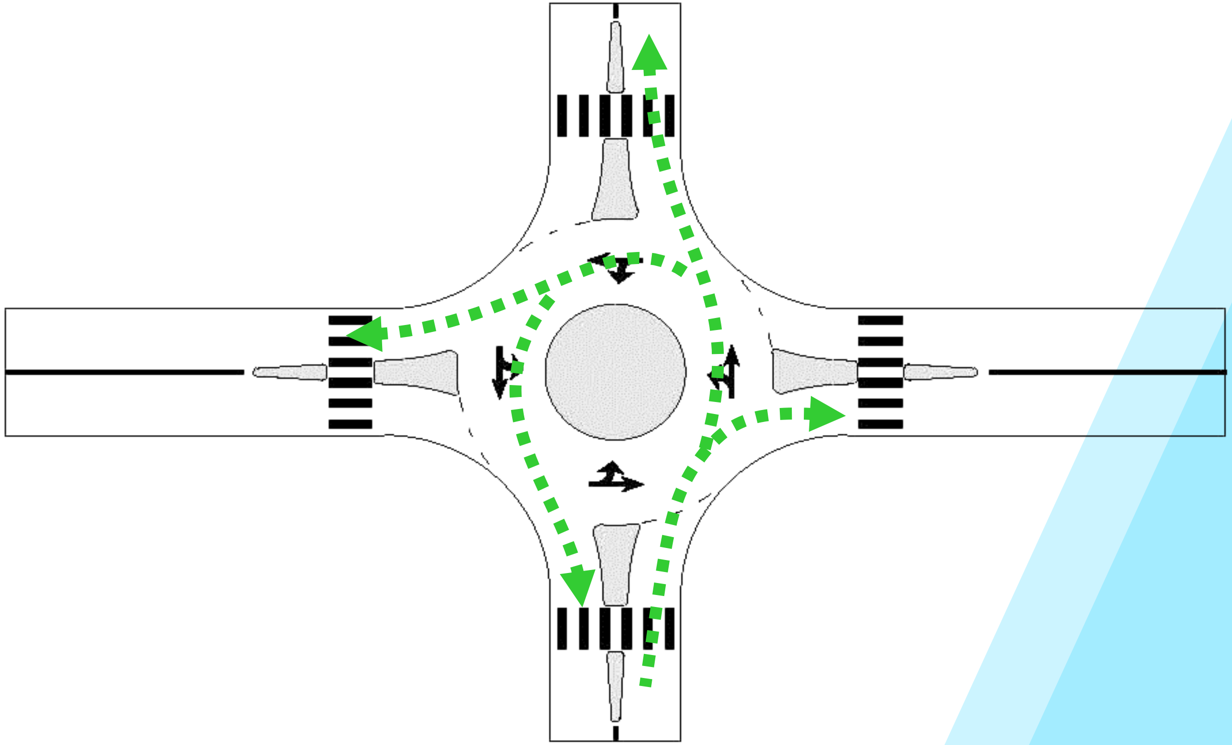


Stages of ICE



Stage 1 ICE Alternatives

Roundabout



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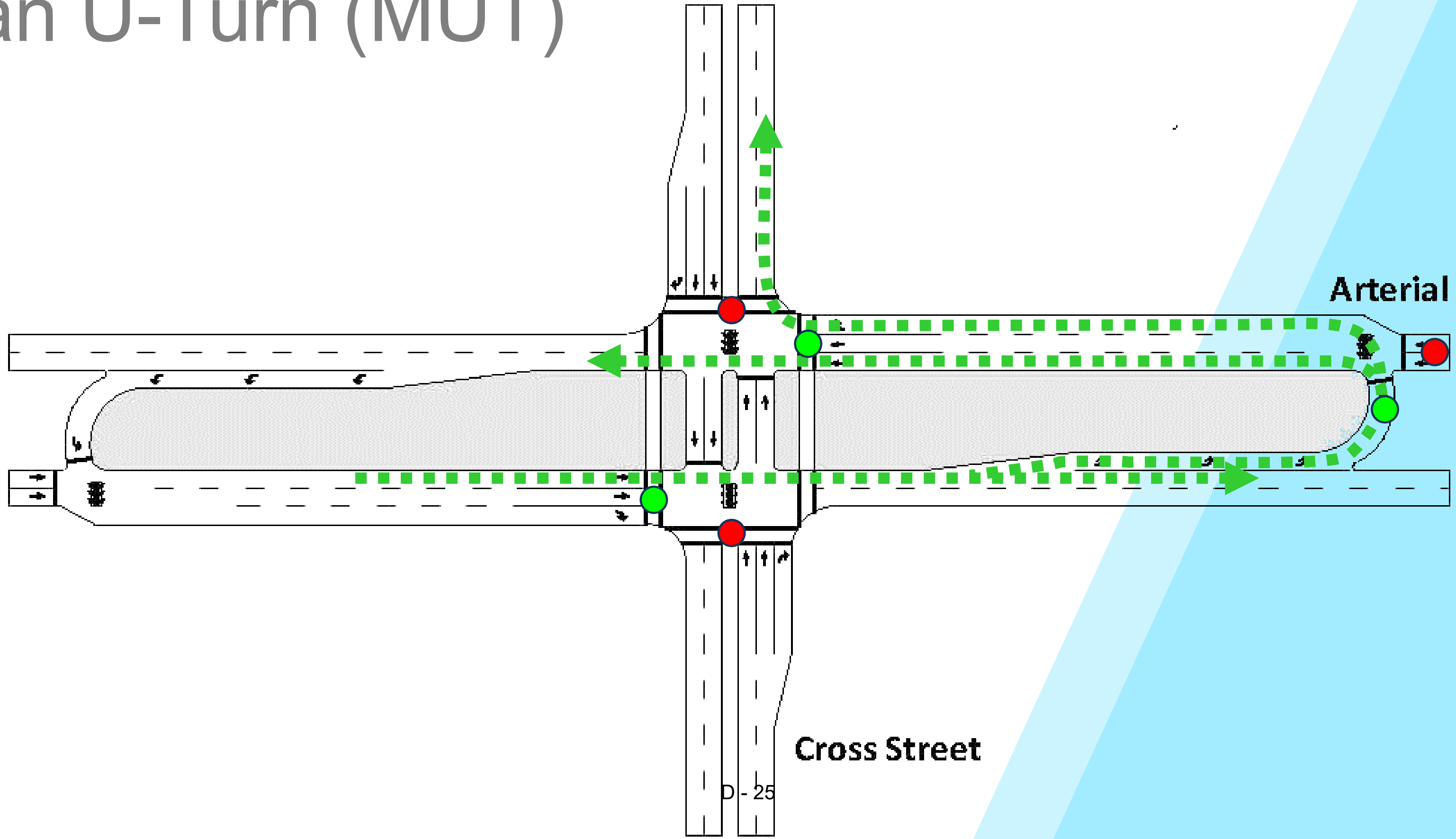
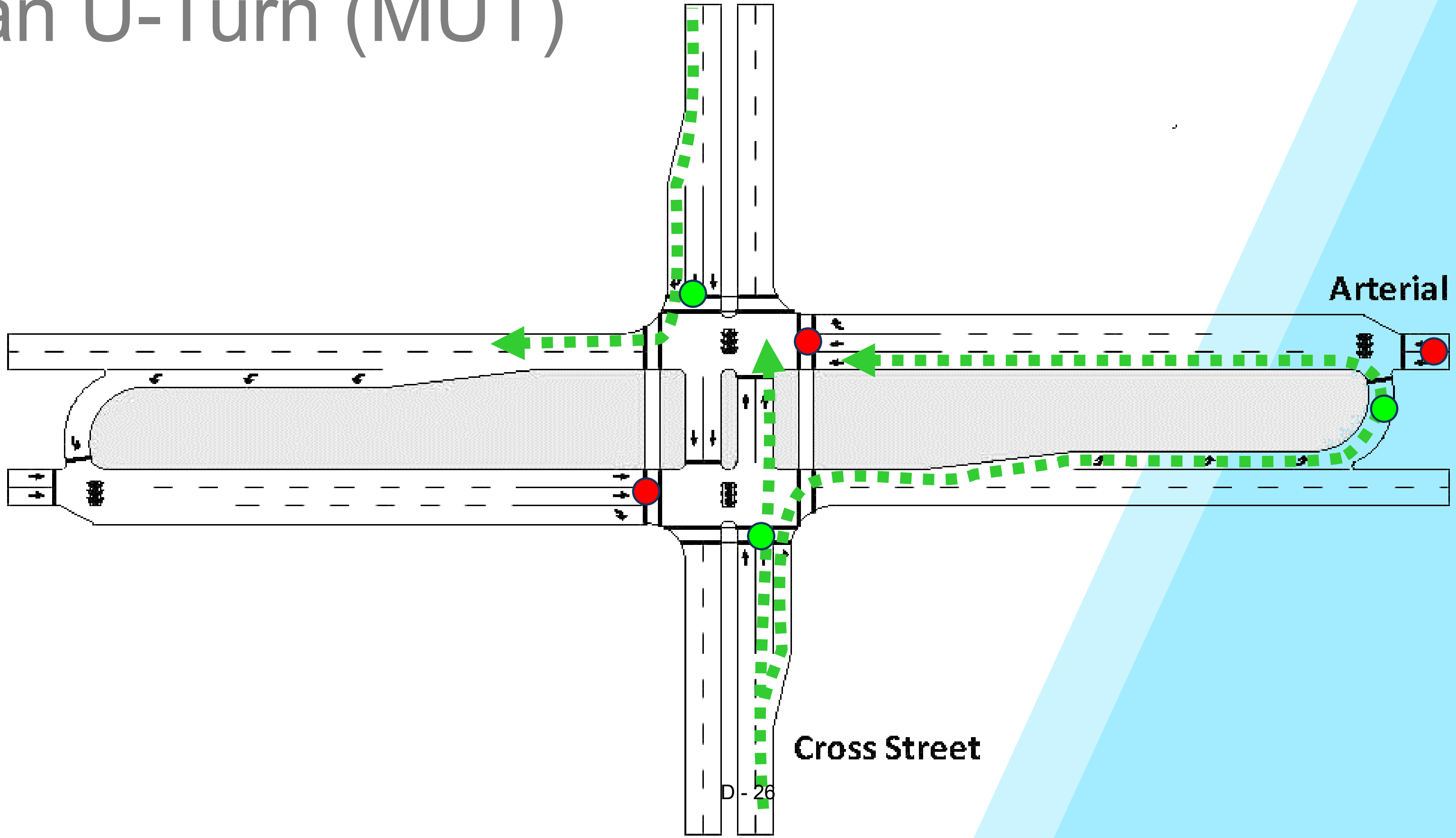
Stage 1 ICE Alternatives

Median U-Turn (MUT)



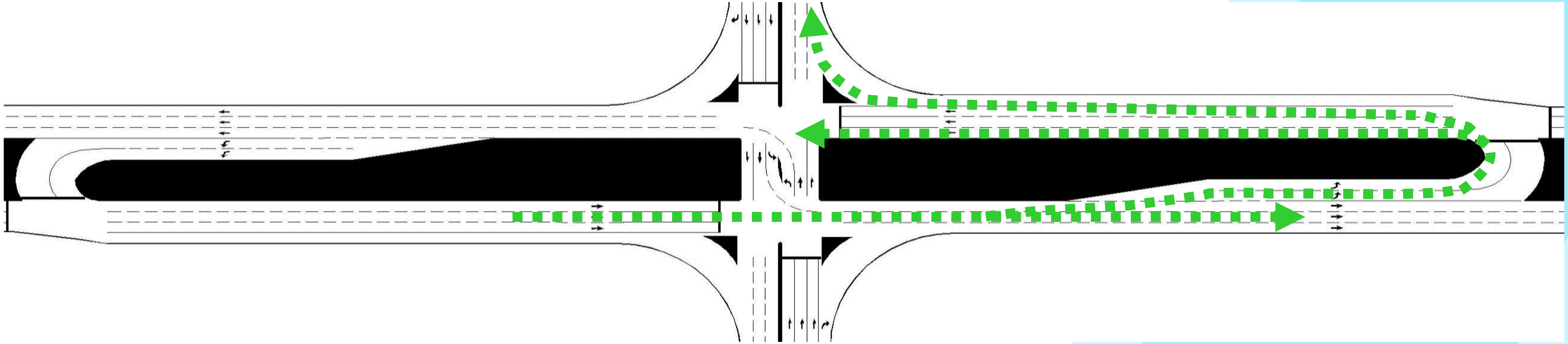
Stage 1 ICE Alternatives

Median U-Turn (MUT)



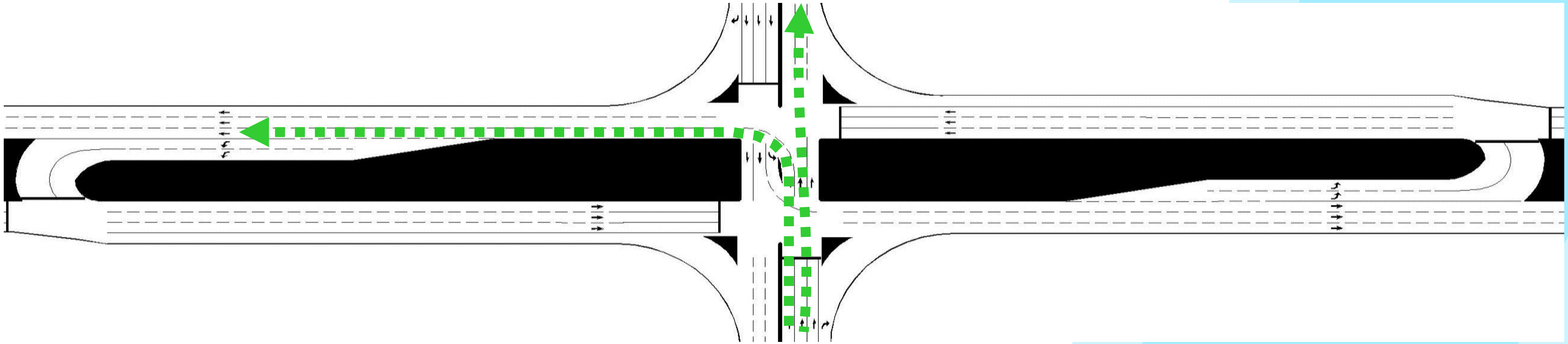
Stage 1 ICE Alternatives

Partial Median U-Turn (PMUT)



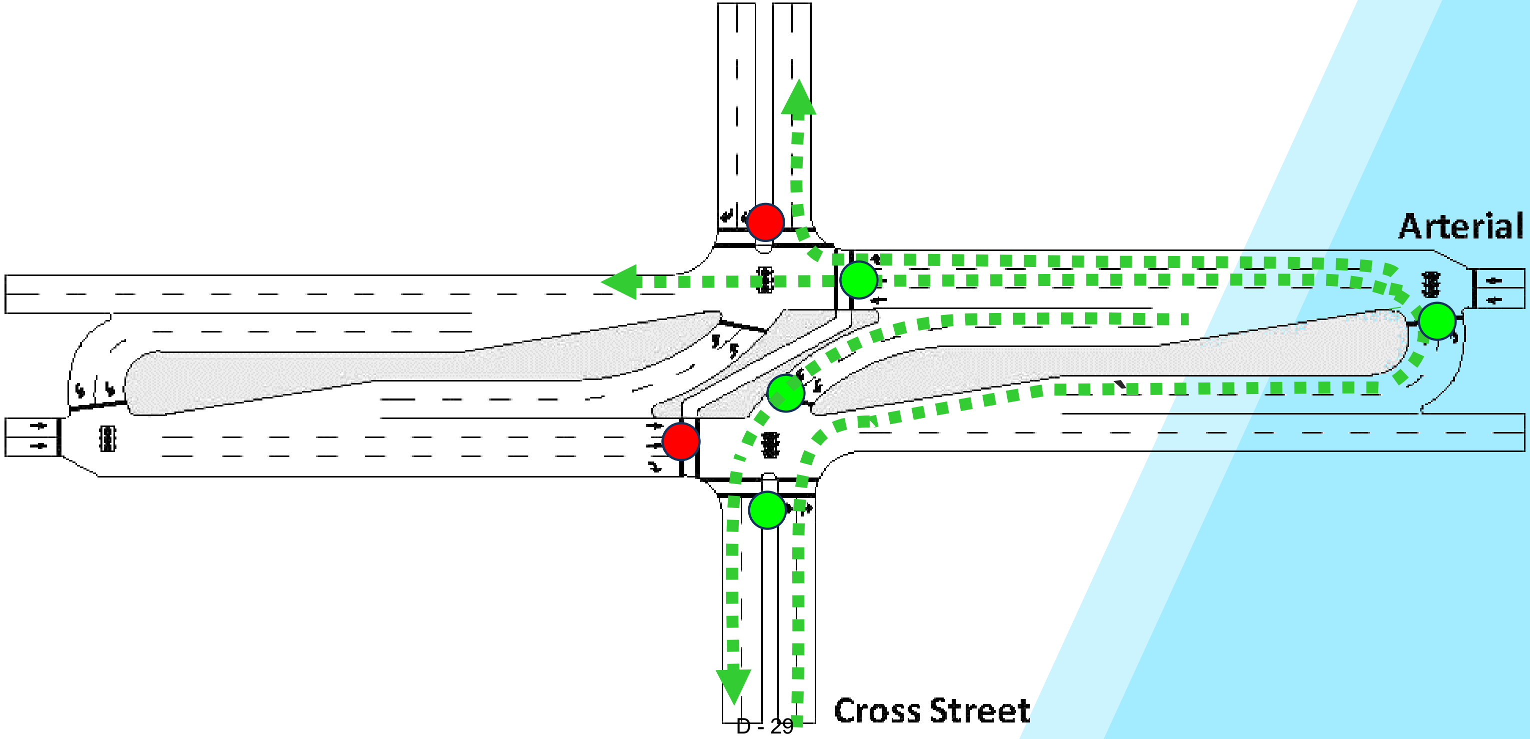
Stage 1 ICE Alternatives

Partial Median U-Turn (PMUT)



Stage 1 ICE Alternatives

Restricted Crossing U-Turn (RCUT)



Stage 1 ICE Analysis

- CAP-X
  - Capacity analysis based on 2050 turning volumes
  - Output: Intersection volume to capacity ratio (V/C)

- SPICE
  - Safety analysis based on 2050 AADTs
  - Output: Number of predicted crashes

CAP-X Results

Control Strategy	Weekday AM Peak V/C Ratio	Weekday PM Peak V/C Ratio
Partial / Full MUT	0.42 / 0.43	0.48 / 0.50
Signalized RCUT	0.39	0.50
Signalized Control	0.39	0.51
2x1 / 2x2 Roundabout	0.53	0.62
Two-Way Stop Control	2.06	6.37

SPICE Results

Control Strategy	20 Year Total Predicted Crashes	20 Year Fatal & Injury Predicted Crashes
2-Lane Roundabout	338	63
MUT	242	70
Signalized RCUT	392	85
Signalized Control	285	100

Stage 1 ICE Summary

Control Strategy	Strategy to Be Advanced to Stage 2?
Two-Way Stop Controlled	Yes (Future No-Build)
Signalized Control	Yes
2x1 Roundabout	Yes
2x2 Roundabout	No
Partial MUT	Yes
MUT	No
Signalized RCUT	Yes

Project Schedule

March to May 2022	June 2022	July to September 2022	October 2022	November to December 2022	January 2023
Data Collection Field Review Signal Warrant Analysis Growth Rate Analysis **Stage 1 ICE**	**Consensus Building Meeting #1**	Drainage Analysis **Stage 2 ICE**	**Consensus Building Meeting #2**	Draft Summary Technical Memorandum SCTPO/Partner Agency Review **Final Summary Technical Memorandum**	**Final Consensus Building Meeting (If Necessary)**

Next Steps

- Stage 2 ICE
  - Detailed operational analysis
  - Detailed safety analysis
  - Conceptual development
  - Benefit/cost analysis

- Detailed Drainage Analysis

Questions/Contact Information

SCTPO Project Manager

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Building B, Room 105
Melbourne, FL 32940
Phone: 321-690-6890
Sarah.Kraum@sctpo.com

Kittelson Project Manager

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225 East Robinson Street
Suite 355
Orlando, FL 32801
Phone: 407-540-0555
thills@kittelson.com

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #2 Agenda

December 12, 2022

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

1:30 PM – 3:30 PM

1. ICE Stage 1 Recap
    a. Project Schedule and Background
    b. Alternatives Advanced to ICE Stage 2
2. ICE Stage 2 Overview
3. Alternatives Discussion
    a. Operational and Safety Analyses
    b. Conceptual Layouts
    c. Drainage Analysis
    d. Cost Estimates
    e. Benefit/Cost Analysis
4. Conclusions
5. Next Steps
    a. Final Summary Technical Memorandum
    b. Future Presentations and Meetings

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #2 Summary

December 12, 2022

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

1:30 PM – 3:30 PM

A Consensus Building Meeting was held to discuss the alternatives of the Stage 2 Intersection Control Evaluation (ICE). The sign in sheet and presentation materials can be found attached to these meeting notes. The following organizations and individuals attended the meeting:

- VJ Karycki, Michael Jarusiewicz, John Cooper, and Brenda Fettrow – City of Rockledge
- Marc Bernath, Rachel Gerena, and Corrina Gumm – Brevard County
- Steven Buck and Kellie Smith – Florida Department of Transportation – District 5
- Georganna Gillette, Sarah Kraum, and Debbie Flynn– Space Coast Transportation Planning Organization (SCTPO)
- Travis Hills and Daniel Torre – Kittelson & Associates, Inc.
- Francina Gil and Yukiyo Stanek – CONSOR Engineers, LLC

The following are comments, general notes, and questions from the Consensus Building Meeting:

1. Travis provided a review of the analysis completed as part of Stage 1 ICE and the alternatives which were advanced to Stage 2 ICE. An overview of the elements included as part of the Stage 2 ICE analysis and the project schedule were also discussed. The Stage 2 ICE alternatives included:

    a. Two-Way Stop Control (Future No-Build)
    b. Signalized Control
    c. Roundabout
    d. Partial Median U-Turn (PMUT)
    e. Signalized Restricted Crossing U-Turn (RCUT)

2. Daniel presented the 2050 traffic operational analysis results, which showed each of the Stage 2 ICE alternatives operating acceptably. The 20-year project lifecycle safety analysis results were also presented, which showed the roundabout having the lowest number of predicted fatal and injury crashes. Conceptual layouts for the Stage 2 ICE alternatives were presented and discussed.

3. Francina provided an overview of the drainage analysis completed for the Stage 2 ICE alternatives. The drainage analysis concluded no extra discharge is anticipated along Martin Road in the proposed alternatives. The signal, PMUT, and RCUT will have minimal impacts to the existing drainage facilities but will also need a new pond. The roundabout

will not need a pond but will instead need the drainage facilities along Fiske Boulevard to be rebuilt.

4. Daniel presented the estimated costs for the Stage 2 ICE alternatives and discussed the results of the benefit/cost analysis. The Stage 2 alternatives have benefit/cost ratios above 1.0.

5. Open Discussion

    a. The SCTPO stated their recommended intersection alternative would be a roundabout due to the safety benefits it would provide. However, understanding the needs of the County and the City, the SCTPO will support the preferred alternative of their choice.

        i. City of Rockledge staff informed the group that City Council will most likely recommend moving forward with the signal alternative.

    b. The County noted their concern with the west end of Martin Road flooding during large storm events. The Study Team was asked what kind of storm event was modeled in the drainage analysis.

        i. Francina noted an ICPR model was run for a 25-year/24-hour storm event.

        ii. The City supports the County's concerns regarding drainage. FDOT also noted the State would not want to advance to project into the design phase without a commitment from the County that it will then move into construction.

        iii. The County is not comfortable approving the project for construction unless they are certain the drainage will not be impacted by the 100-year storm event.

        iv. The group was asked if the current drainage to Martin Road can be discharged to Fiske Boulevard instead.

            1. FDOT noted there would likely be permitting issues with the St. Johns River Water Management District (SJRWMD).

            2. Francina also noted the discharge on Fiske Boulevard cannot exceed the build conditions.

        v. The group was asked if additional drainage treatments are needed to meet SJRWMD requirements.

            1. Based on the information available at this stage of the project, no additional treatments are anticipated to be needed.

2. FDOT noted the SJRWMD has also exempted roundabouts from needing additional treatments in the past.

c. The group was asked if the 100-year storm event analysis should be a required part of the future design phase or performed as part of this study.

    i. The City and County expressed interest in evaluating both the signal and roundabout alternatives for the 100-year storm. While City Council will likely prefer the traffic signal, the roundabout may move forward faster than a signal due to advantages from a drainage perspective.

    ii. FDOT noted a concern where the 100-year storm event is not accommodated and then the City and County do not advance the project to construction. Also noted public consideration is a part of the design phase and could get elongated if the preferred alternatives do not accommodate the 100-year storm event.

    iii. The City, County, and FDOT expressed interest in evaluating the 100-year storm event as part of this study, if feasible.

d. The group was asked if additional meetings and presentations are needed.

    i. Another Consensus Building Meeting will be needed to discuss the results of the 100-year storm event analysis.

    ii. City of Rockledge staff would prefer the Study Team present to City Council.

    iii. The County noted no presentation to the SCTPO Governing Board is needed for County officials.

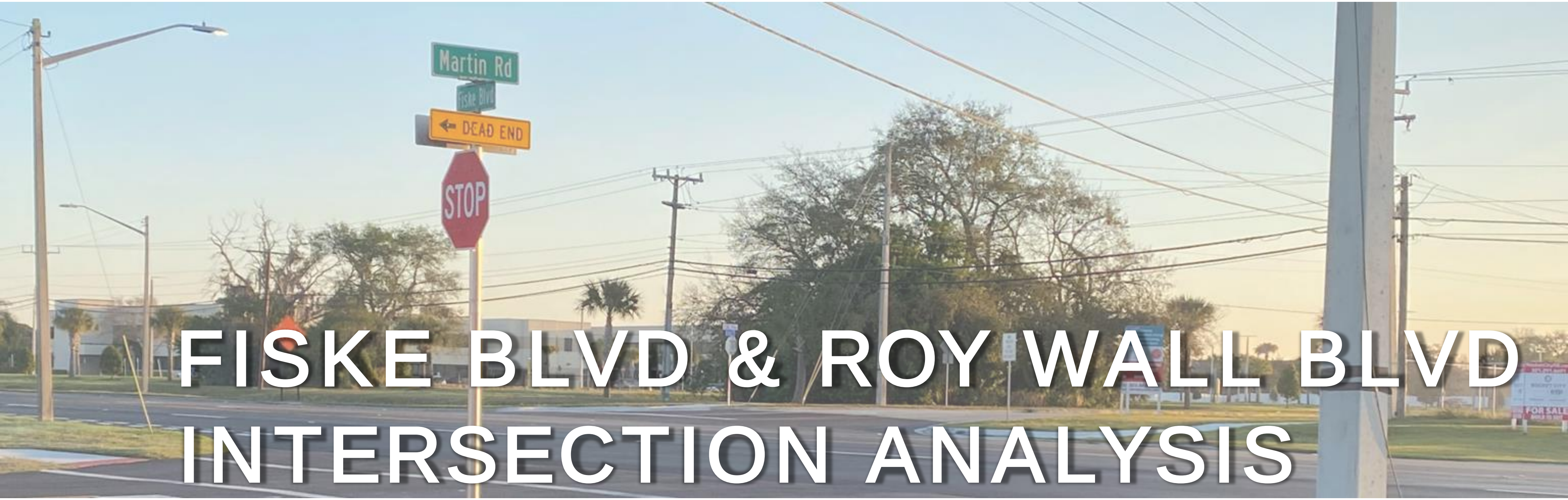
The following are the next steps to be completed by the Study Team prior to the next Consensus Building Meeting:

- Complete 100-year storm event supplemental analysis
- Next Consensus Building Meeting – To Be Determined
- Presentation to Rockledge City Council – To Be Determined

These meeting notes are Daniel Torre's interpretation of the comments, requests, and discussion during the meeting. Question, additions, and/or clarifications should be directed to him at 407-373-1121 or dtorre@kittelson.com.

Fiske Blvd and Roy Wall Blvd Intersection Analysis - Consensus Building Meeting 2 - December 12, 2022

Name	Agency/Firm	E-mail	Phone
VJ Karycki	Rockledge	vkaryckipw@cityofrockledge.org	321-221-7540 x 3
Michael Jarusiewicz	City of Rockledge	mjpw@cityofrockledge.org	" " "
Travis Hills	KAI		
Daniel Turner	KAI		
Sarah Kraum	SCTPO		
Yukiyo Stanek	Consor Engineers	yukiyo.johnson@consoreng.com	
Francina Gil	CONSOR Engineers	fgil.francina@consoreng.com	(201) 355-6604
STEVEN Buck	FDOT	STEVEN.BUCK@DOT...	386-943-517
Georganna Gillette	SCTPO	georganna.gillette@sctpo.com	321-690-1890
Kellie Smith	FDOT	kellie.smith@dot.state.fl.us	386 943 5427
Debbie Flynn	SCTPO	debbie.flynn@sctpo.com	
Brenda Fettrow	Rockledge	bfettrow@cityofrockledge.org	321-221-7540
John W. Cooper	Rockledge	JCooper@cityofrockledge.org	321-221-7540
Marc Bernath	Brevard County	marc.bernath@brevardfl.gov	321-~~[illegible]~~ 7202
Rachel Gavena	"		
Georgina Gunim	"		



FISKE BLVD & ROY WALL BLVD INTERSECTION ANALYSIS

CONSENSUS BUILDING MEETING #2

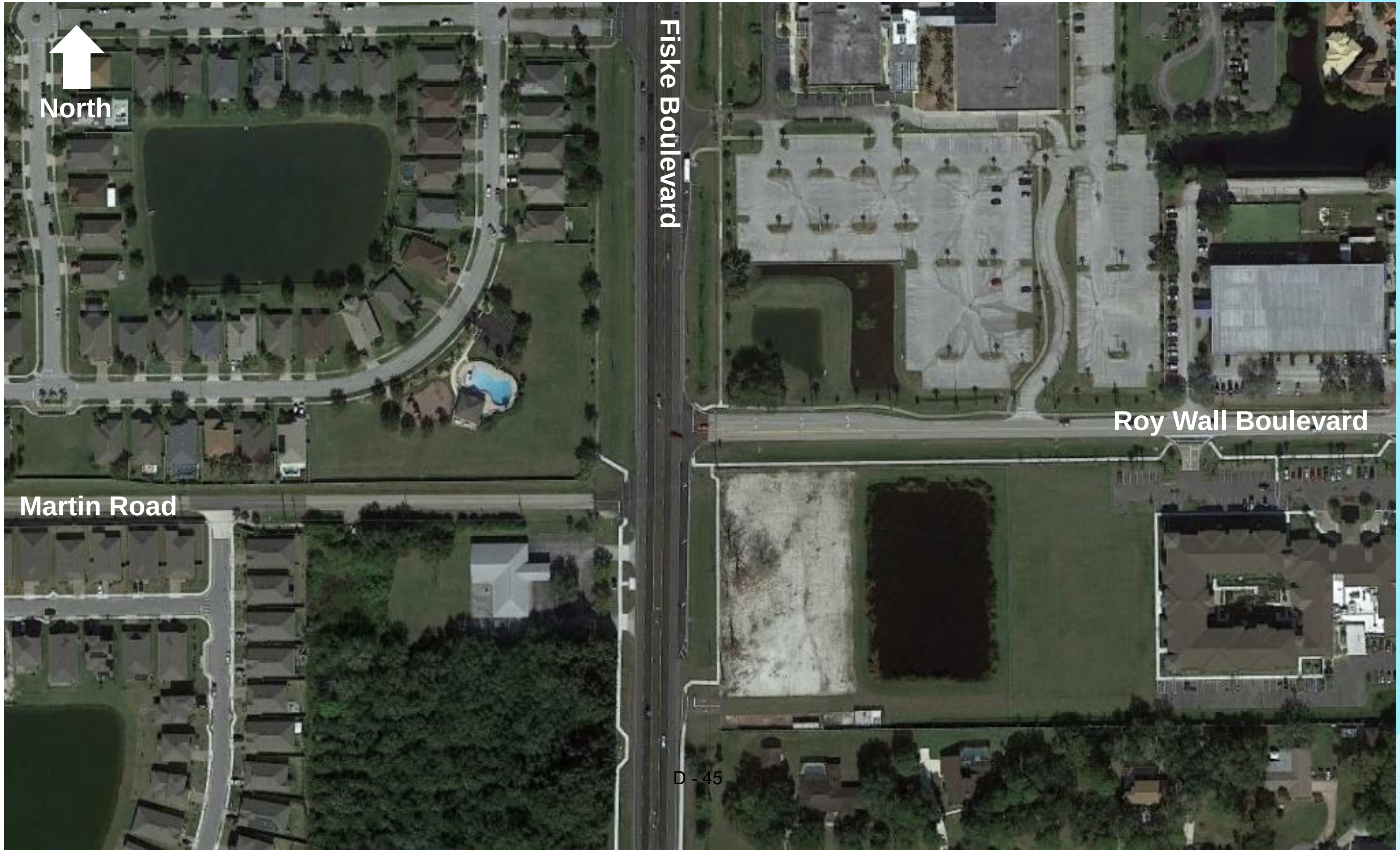
Meeting Agenda

- ICE Stage 1 Recap
- ICE Stage 2 Overview
- Alternatives Discussion
  - Drainage Analysis
- Recommendations
- Next Steps

Project Schedule

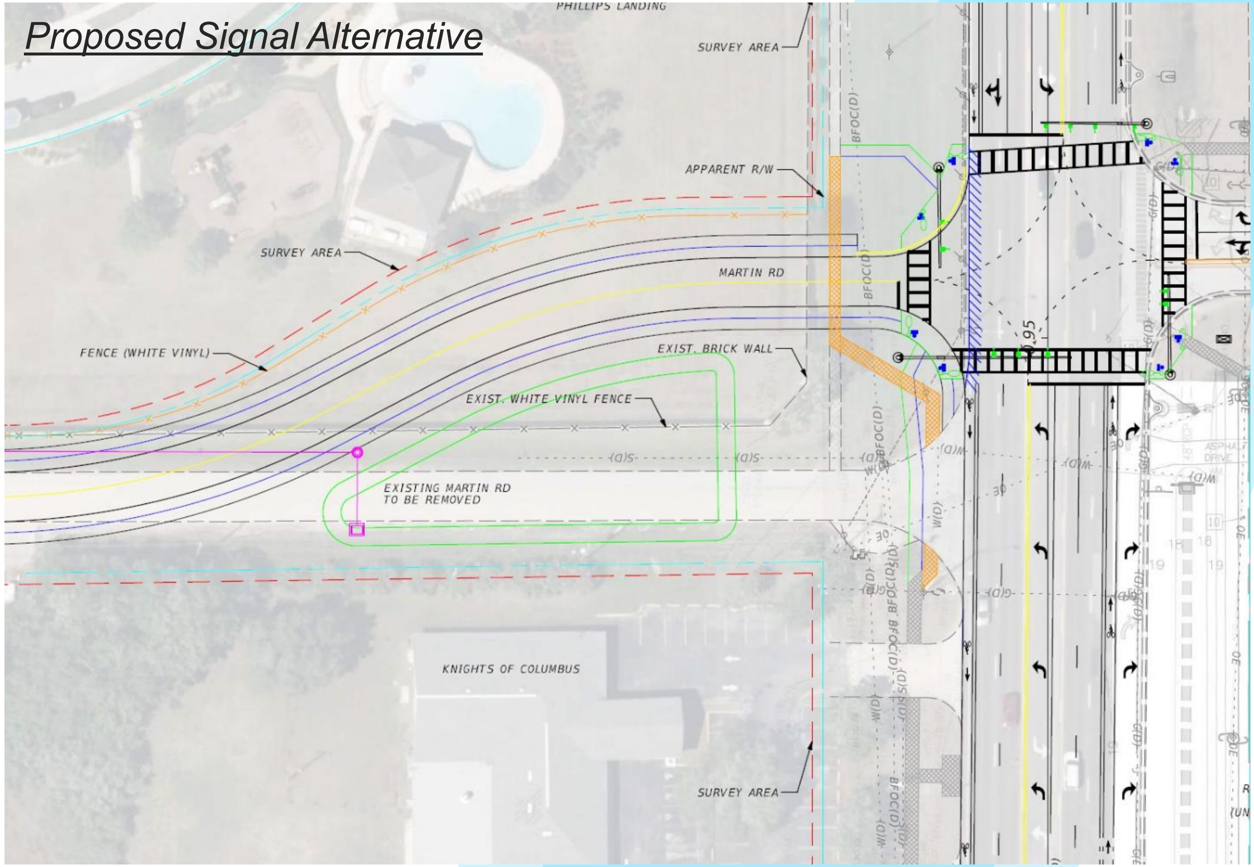
March to May 2022	June 2022	July to November 2022	December 2022	January 2023
Data Collection Field Review Signal Warrant Analysis Growth Rate Analysis **Stage 1 ICE**	**Consensus Building Meeting #1**	Drainage Analysis **Stage 2 ICE**	**Consensus Building Meeting #2** Draft Summary Technical Memorandum SCTPO/Partner Agency Review	**Final Summary Technical Memorandum** **Final Consensus Building Meeting (If Necessary)**

Project Location



Project Background

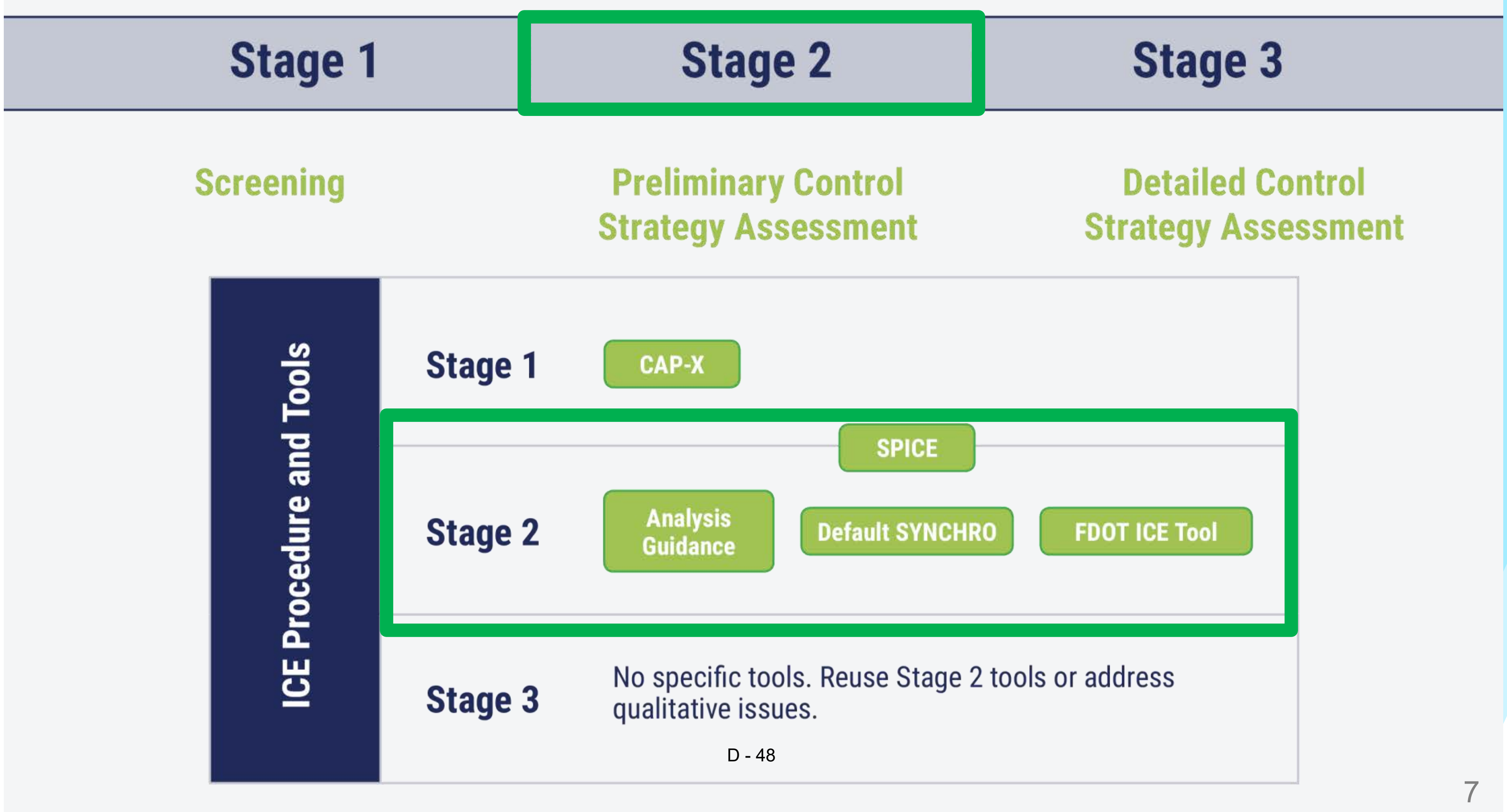
- Improvements proposed from SR 519/Fiske Blvd Corridor Planning Study
- Martin Road Realignment
  - Tie into Fiske and Roy Wall intersection
  - Change in drainage patterns
- Analyses needed prior to design
  - Intersection Control Evaluation (ICE)
  - Drainage Analysis



Stage 1 ICE Recap

Control Strategy	Strategy to Be Advanced to Stage 2?
Two-Way Stop Controlled	Yes (Future No-Build)
Signalized Control	Yes
2x1 Roundabout	Yes
2x2 Roundabout	No
Partial MUT	Yes
MUT	No
Signalized RCUT	Yes

Stages of ICE



Stage 2 ICE Analysis

- Intersection Operational Analysis
  - Highway Capacity Manual based analysis with 2050 turning volumes
  - Output: Intersection Delay

- SPICE
  - Safety analysis based on 2050 AADTs and historical 5-year crash history
  - Output: Number of Predicted Crashes

Stage 2 ICE Analysis

- Conceptual Layout
  - CADD concept of alternatives and potential impacts
  - Drainage improvements needed
  - Output: Anticipated Impacts and Cost Estimates

- **Benefit/Cost Analysis**
  - Benefit is estimated based on the results of SPICE and the Operational Analysis
  - Output: B/C Ratio for Each Alternative

Design-Year 2050 Operational Analysis Results

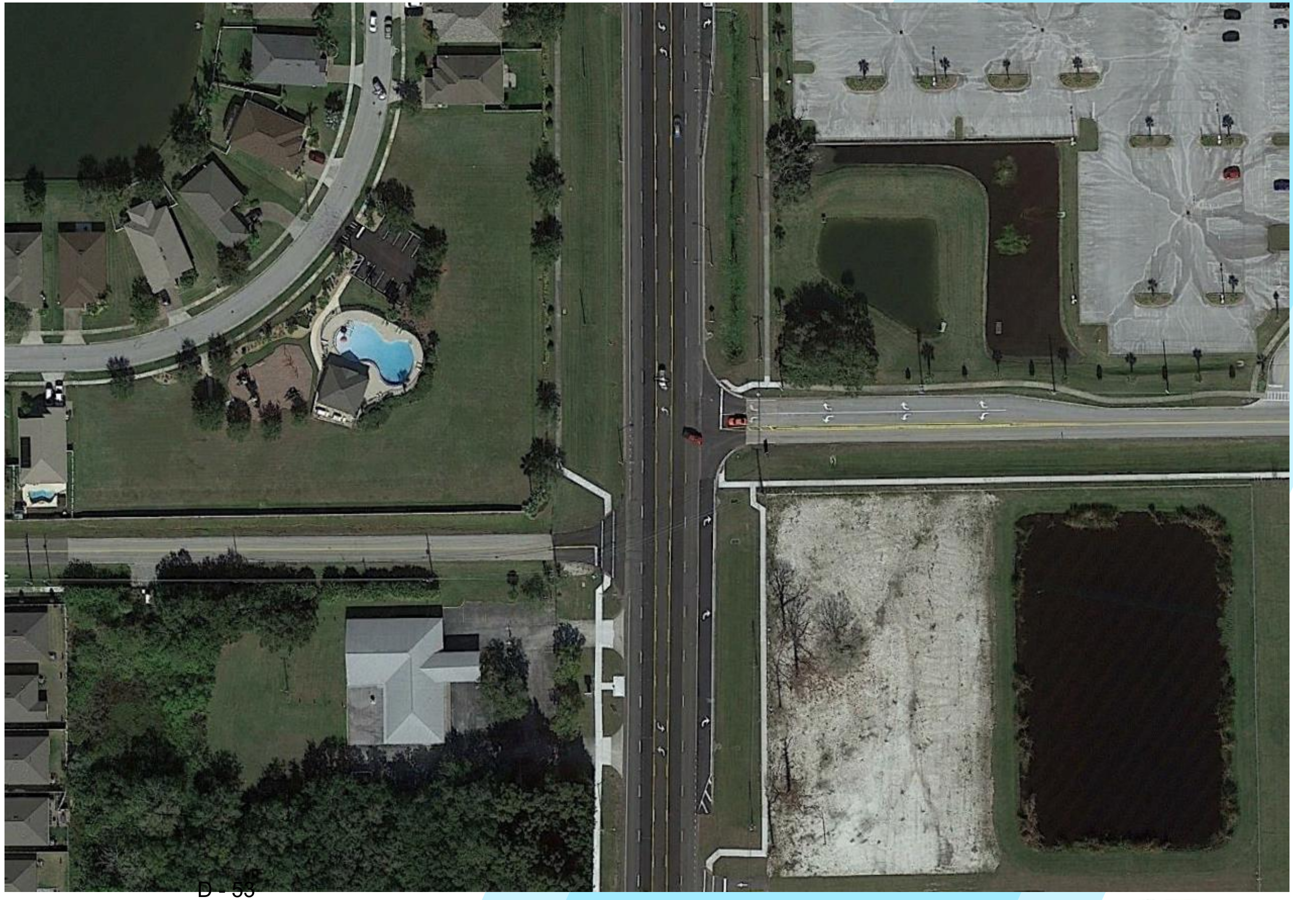
Control Strategy	PM Peak Hour Intersection Delay (sec)	Level of Service
Signalized Control	19.3	B
2x1 Roundabout	10.1	B
Partial MUT	16.5	B
Signalized RCUT	13.8	B

20-Year Project Lifecycle Safety Analysis Results

Control Strategy	Predicted Fatal & Injury Crashes	Predicted Total Crashes	Fatal & Injury Crash Cost
Signalized Control	89	249	$36,000,000
2x1 Roundabout	43	221	$17,300,000
Partial MUT	62	212	$25,200,000
Signalized RCUT	104	441	$42,300,000

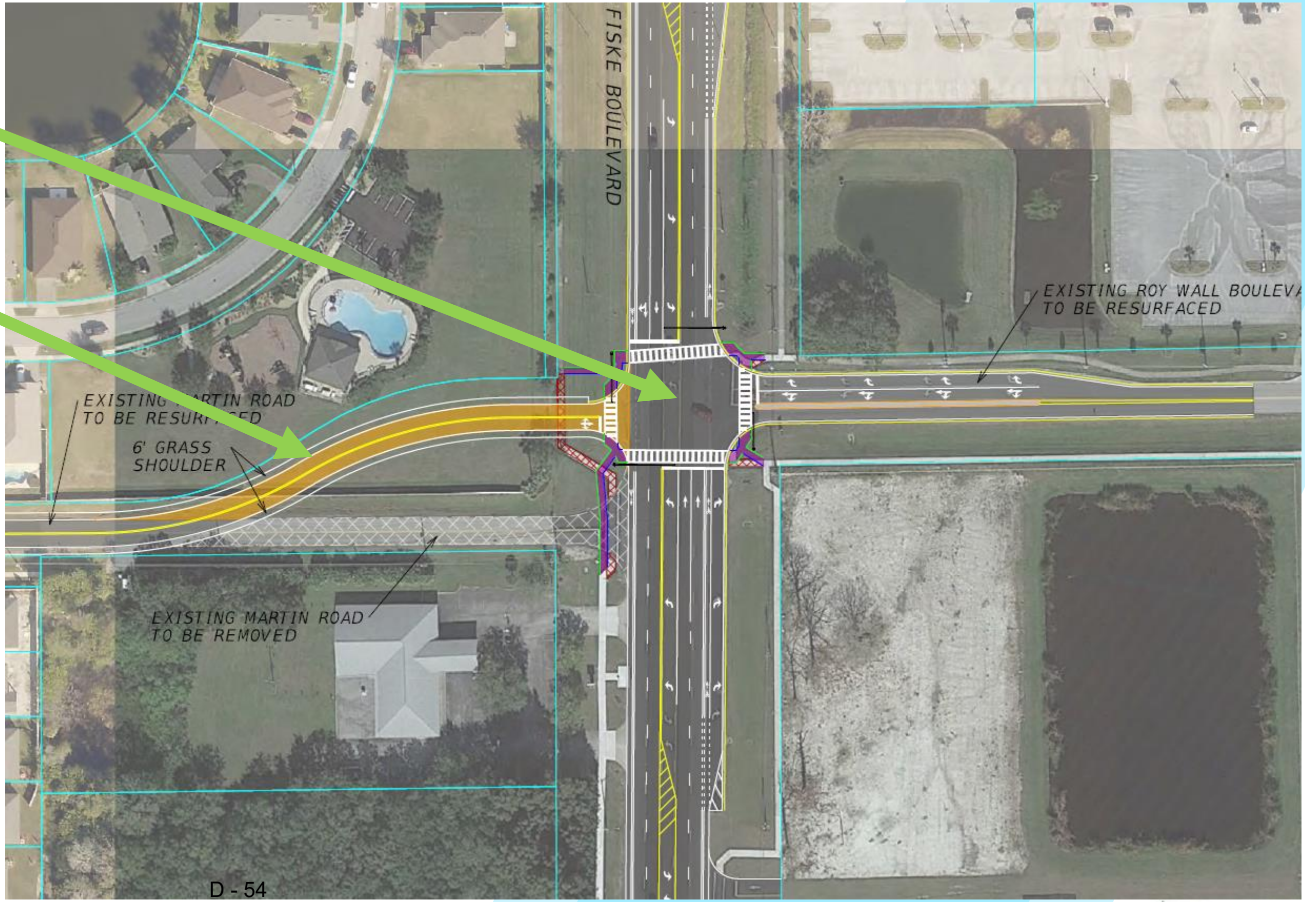
Two-Way Stop Controlled (No-Build)

- No pedestrian crossings across Fiske Boulevard
- Existing drainage concerns along Martin Road



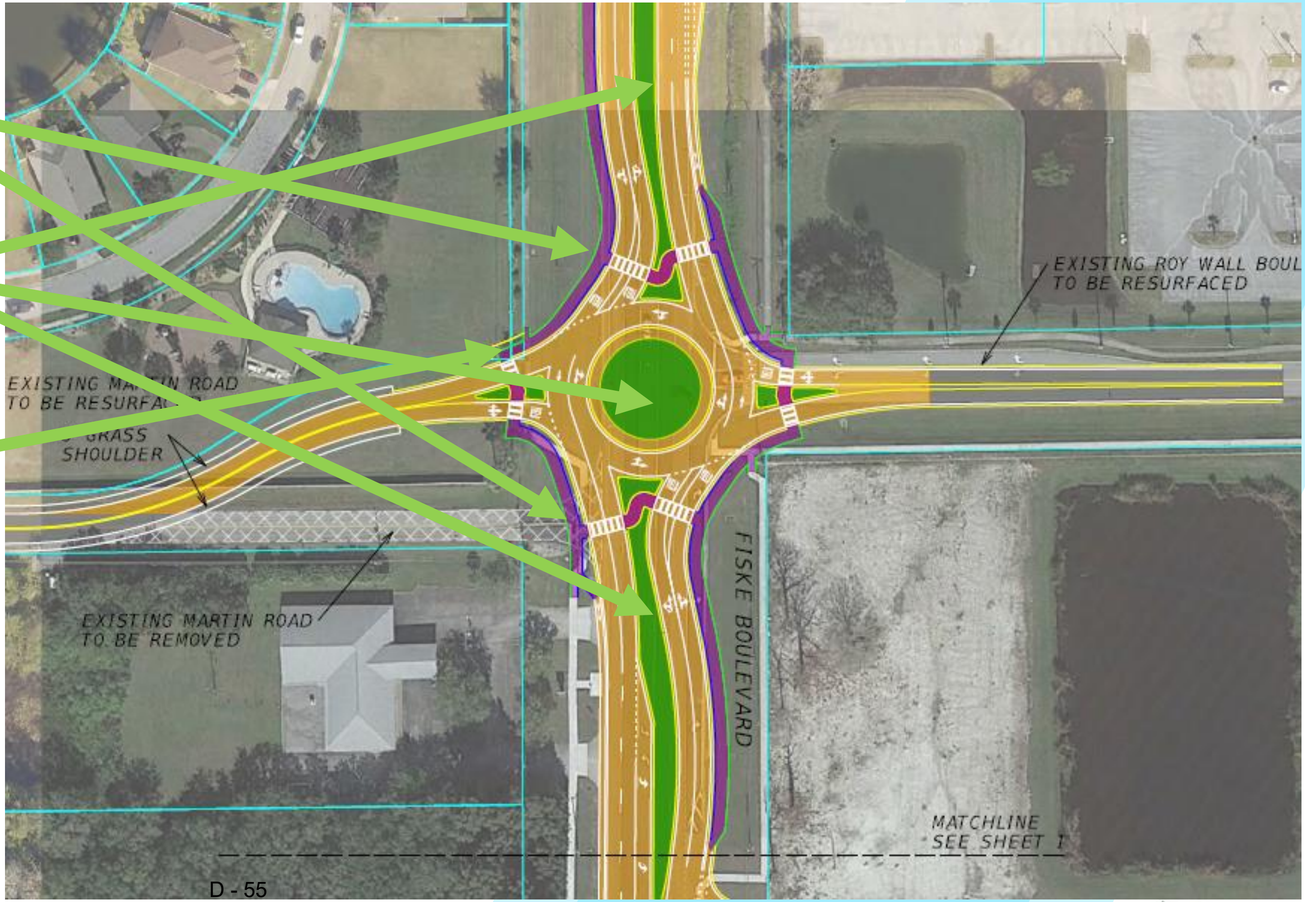
Signalized Control

- Adds enhanced pedestrian crossings at intersection
- New pavement needed for Martin Road realignment
- Traffic separators along Fiske Boulevard approaches can be added



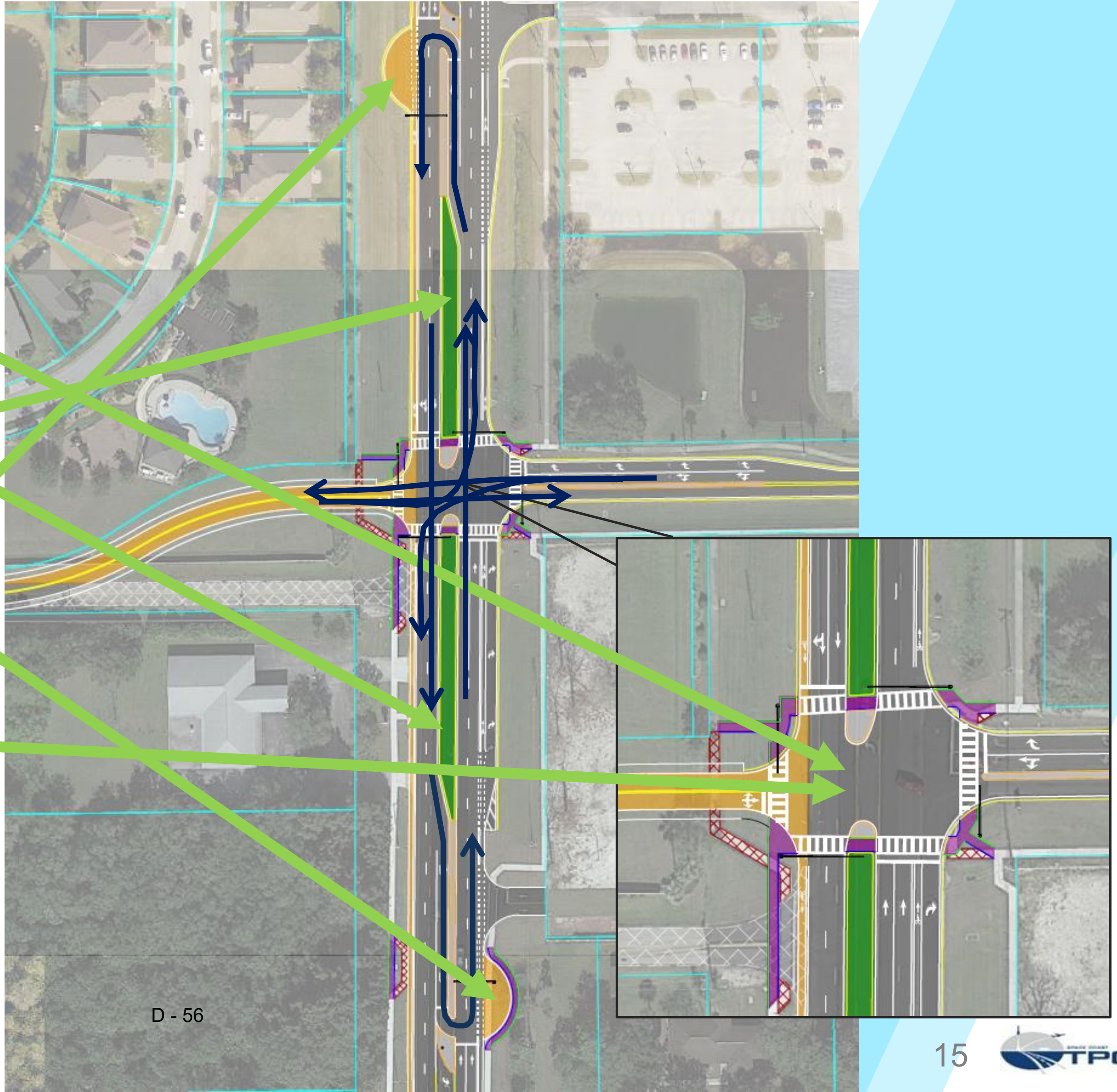
2x1 Roundabout

- Adds enhanced pedestrian crossings at intersection
- Opportunity for landscaping at splitter islands and central island
- Minor right-of-way taking in NW corner
- Assumed full rebuild



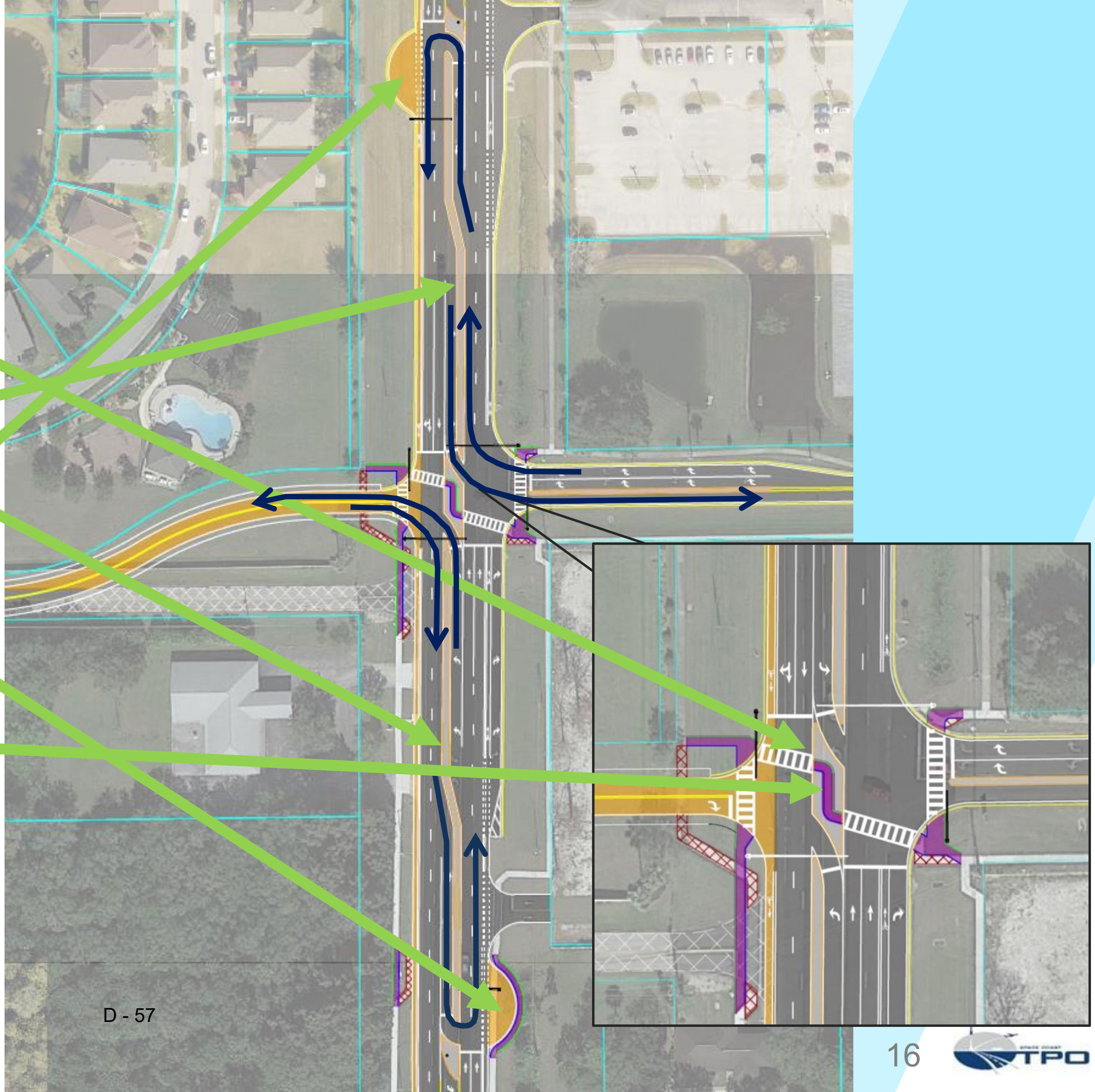
Partial MUT

- Restricts northbound and southbound left turns
- New median added between U-turn locations
- Bulb-outs added at U-turns to accommodate school bus
- Adds enhanced pedestrian crossings at intersection



Signalized RCUT

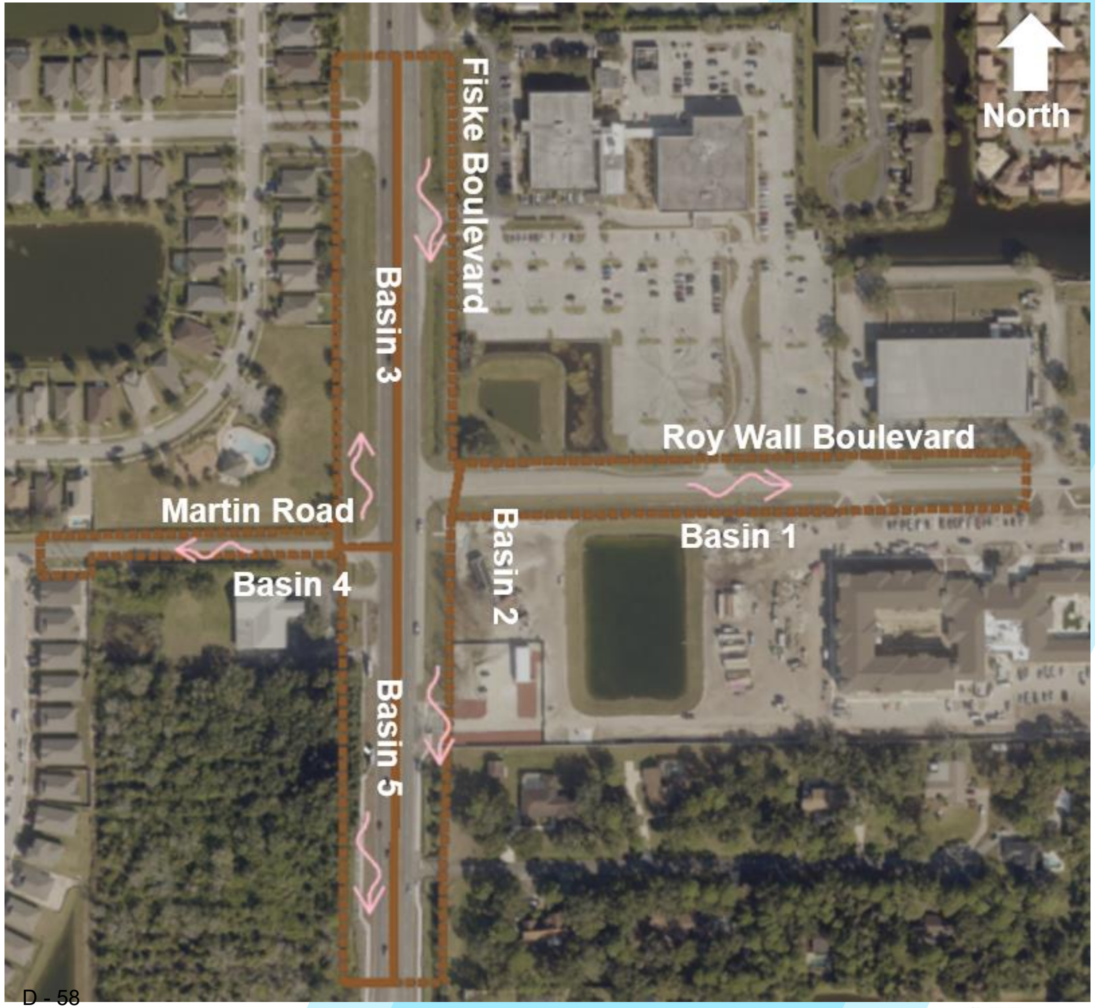
- Restricts eastbound and westbound left turn and thru movements
- New traffic separator added between U-turn locations
- Bulb-outs added at U-turns to accommodate school bus
- Adds enhanced pedestrian crossings at intersection



Drainage Analysis

<u>Existing Roadside Basins</u>

- Intersection under jurisdiction of St. Johns River Water Management District (SJRWMD)
- Stormwater runoff discharges to roadside ditches
- No existing stormwater management facilities (ponds)



Drainage Analysis

<u>Field Review – Fiske Boulevard</u>

- Shallow, dry swales on west side of Fiske Boulevard, north leg
- No swales on west side of Fiske Boulevard, south leg
- Deep wet ditches on east side of Fiske Boulevard

Drainage Analysis

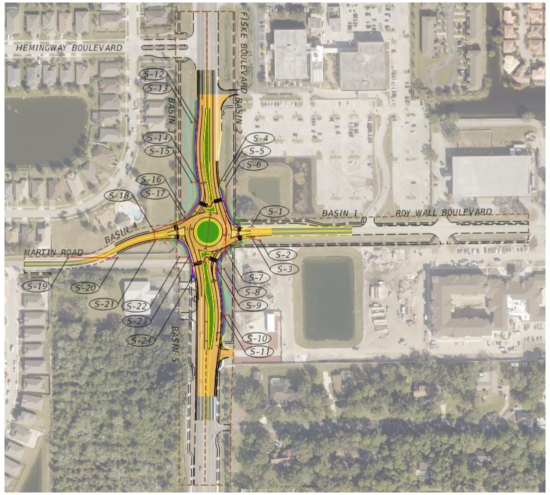
Field Review – Martin Road

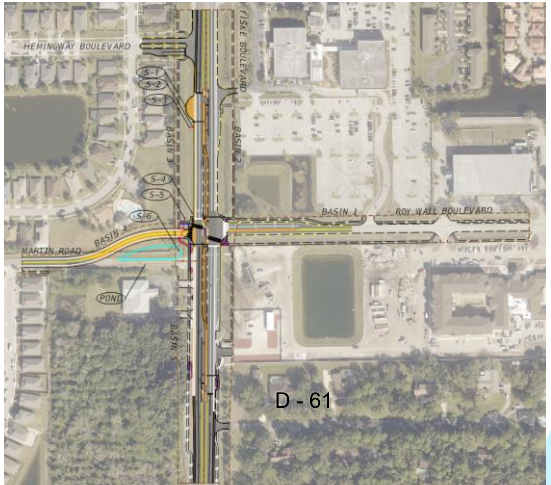
- Dry swales along south side of Martin Road

Drainage Analysis

<u>*Proposed Conditions*</u>

- **Alternative 1**
  - Roundabout
- **Alternative 2**
  - 2A: Signal
  - 2B: PMUT
  - 2C: RCUT





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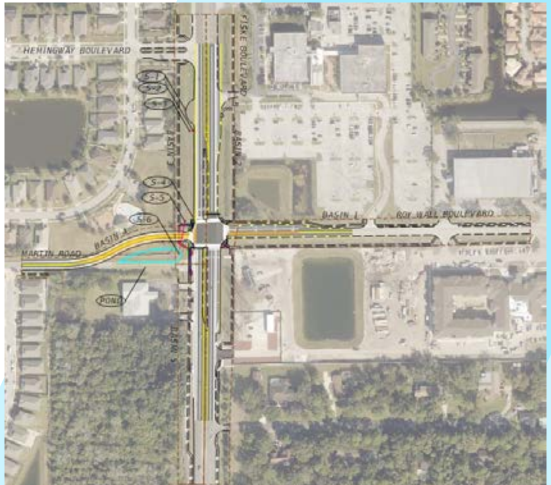


Drainage Evaluation Matrix/Impacts

Concept Area Takeoffs	Alternative 1 Roundabout	Alternative 2A Signal	Alternative 2B PMUT	Alternative 2C RCUT
Existing Impervious Area	4.97 acres	4.97 acres	4.97 acres	4.97 acres
Proposed Impervious Area	4.96 acres	5.41 acres	5.23 acres	5.41 acres
Impervious Area Difference (Proposed – Existing)	-0.01 acres	0.44 acres	0.26 acres	0.44 acres

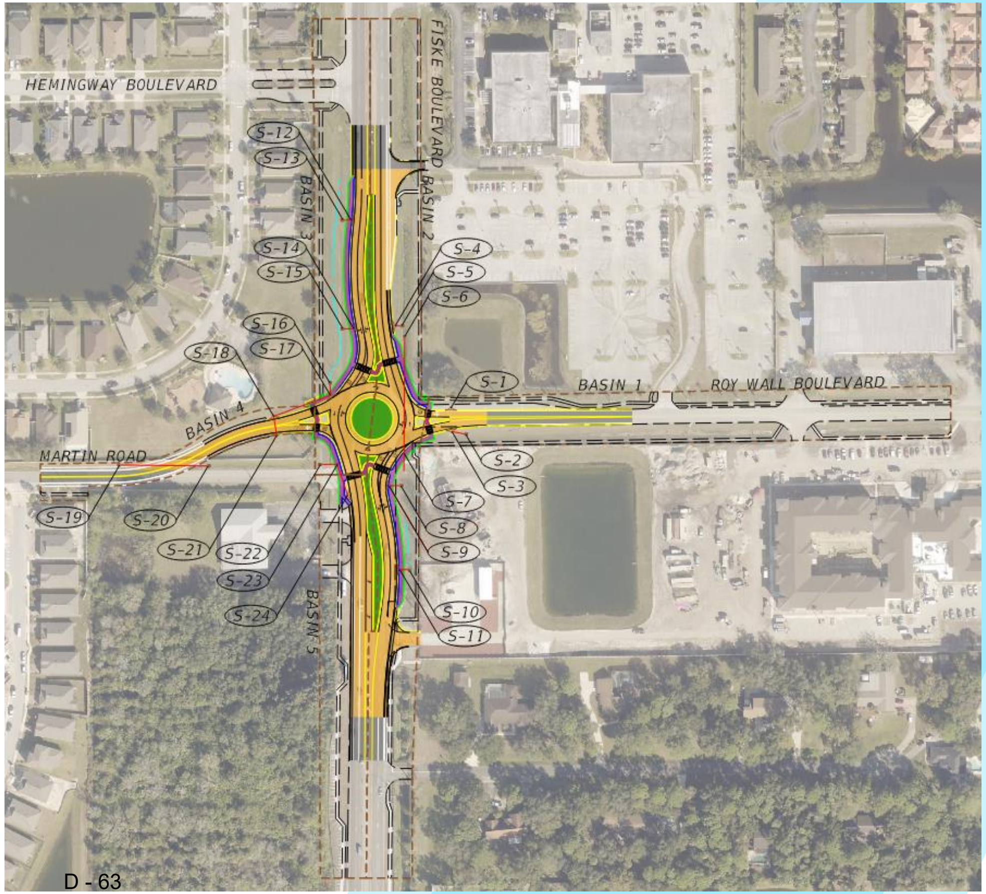
Stormwater Management Facility NOT Required

Stormwater Management Facility Required

Drainage Analysis

<u>Alternative 1 – Roundabout</u>

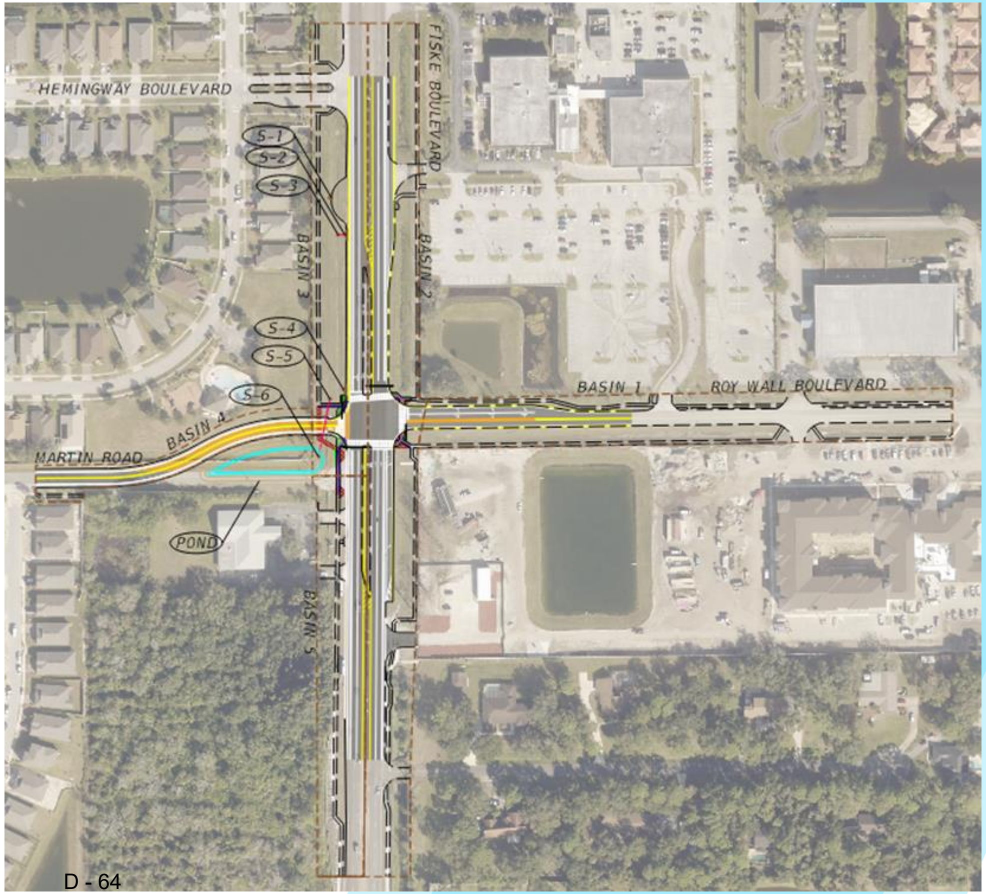
- No additional stormwater management facility required
- Major disruption to existing storm drain system anticipated



Drainage Analysis

<u>Alternatives 2A-C – Signal, PMUT, RCUT</u>

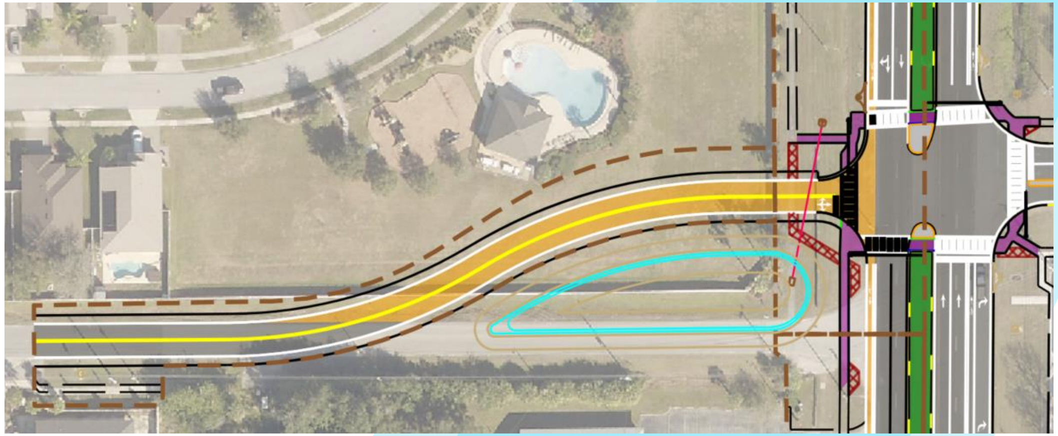
- Additional stormwater management facility required
- Minor disruption to existing storm drain system anticipated



Drainage Analysis

Martin Road Impacts

- New pond in SW corner for Signal, PMUT, and RCUT
- Martin Road Discharge:
  - No-Build Discharge: 5.14 cubic feet per second
  - Build Discharge: 1.97 cubic feet per second
- No additional discharge anticipated along Martin Road
- Pre-application meeting with SJRWMD requested



Cost Estimates

- FDOT historical costs utilized
  - September 2021 to August 2022
- Construction costs also include –
  - Maintenance of Traffic
  - Mobilization
  - Additional contingency for project unknowns

Cost Estimates

Control Strategy	Roadway	Drainage	Pond	Signalization	Right-of-Way	Total Cost
Two-Way Stop Controlled	-	-	-	-	-	**-**
Signalized Control	$363,500	$64,600	$47,000	$527,400	-	**$1,002,500**
2x1 Roundabout	$2,375,900	$668,800	-	-	$38,000	**$3,082,700**
Partial MUT	$725,000	$154,100	$47,000	$997,300	-	**$1,923,400**
Signalized RCUT	$810,300	$100,000	$47,000	$1,068,600	-	**$2,025,900**

Design-Year 2050 Operational Analysis Results

Control Strategy	PM Peak Hour Intersection Delay (sec)	Level of Service
Signalized Control	19.3	B
2x1 Roundabout	10.1	B
Partial MUT	16.5	B
Signalized RCUT	13.8	B

20-Year Project Lifecycle Safety Analysis Results

Control Strategy	Predicted Fatal & Injury Crashes	Predicted Total Crashes	Fatal & Injury Crash Cost
Signalized Control	89	249	$36,000,000
2x1 Roundabout	43	221	$17,300,000
Partial MUT	70	239	$25,200,000
Signalized RCUT	104	441	$42,300,000

Stage 2 ICE Summary

Control Strategy	Total CST Cost	B/C Ratio
Two-Way Stop Controlled	-	-
Signalized Control	$1,002,500	7.77
2x1 Roundabout	$3,082,700	6.55
Partial MUT	$1,923,400	7.17
Signalized RCUT	$2,025,900	1.92

Conclusions

- Traffic Operations
  - Stage 2 alternatives anticipated to operate acceptably
- Safety Analysis
  - Roundabout has lowest number of predicted crashes
  - 20-Year lifecycle fatal & injury crash costs:
    - Roundabout: ~$17 million
    - Signal, PMUT, RCUT: ~$25 million - ~$43 million

Conclusions

- Drainage Considerations
  - No extra discharge anticipated along Martin Road
  - Signal, PMUT, and RCUT need new pond
  - Roundabout needs drainage facilities rebuild along Fiske
- Benefit/Cost
  - Stage 2 alternatives have benefit/cost ratios > 1.0

Next Steps

March to May 2022
- Data Collection
- Field Review
- Signal Warrant Analysis
- Growth Rate Analysis
- **Stage 1 ICE**

June 2022
- **Consensus Building Meeting #1**

July to November 2022
- Drainage Analysis
- **Stage 2 ICE**

December 2022
- **Consensus Building Meeting #2**
- Draft Summary Technical Memorandum
- SCTPO/Partner Agency Review

January 2023
- **Final Summary Technical Memorandum**
- **Final Consensus Building Meeting (If Necessary)**

Next Steps

- Future presentations and meetings:
  - Do we need an additional Consensus Meeting?
  - Presentation to Rockledge City Council?
    - Kittelson or SCTPO Staff?
  - Presentation to SCTPO Governing Board?

- $1.3 Million in Design Funds has been requested

Questions/Contact Information

SCTPO Project Manager

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Orlando, FL 32801
Phone: 407-540-0555
thills@kittelson.com

Meeting Minutes with Florida Department of Transportation (FDOT) District 5 (D5)

Project: SR519 at Roy Wall Boulevard Intersection Improvements
Subject: Roy Wall/Fiske Feasibility Study – Criteria Discussion
Data and time: February 9, 2023, at 2:00 PM
Meeting place: Virtual (Teams) **Minutes by:** CONSOR Engineers, LLC
Present: FDOT: Ferrell Hickson
SCTPO: Sarah Kraum
Kittleson & Associates, Inc.: Travis Hills, Daniel Torre
Consor: David Bennett, Yukiyo Stanek

Notes

David Bennett, who requested the meeting with the FDOT D5, led the discussion by introducing the purpose of the meeting which was to obtain input on FDOT criteria. Criteria as it relates to the 100-year storm event was emphasized. Ferrell stated that the FDOT has no criteria for the 100-year storm except as it pertains to floodplain encroachment. The Department has no criteria for 100-year attenuation. He stated that if the County had such criteria which would lead to larger stormwater facilities, then the County would have to provide ROW. Ferrell also stated that safety projects such as intersection improvement are exempt from permitting. He also stated that the roundabout option should also be exempt from permitting. Ferrell will provide documentation on this topic.

Following-up email from Ferrell on 2/10/23:

From: Hickson, Ferrell <Ferrell.Hickson@dot.state.fl.us>
Sent: Friday, February 10, 2023 1:54 PM
To: David A. Bennett <dbennett@consoreng.com>
Subject: FW: roundabout exemption

See below…

Ferrell

Ferrell L. Hickson, Jr. P.E.
District Drainage Design Engineer, District Five
Florida Department of Transportation
719 South Woodland Boulevard, MS 2-553
DeLand, FL 32720
Office (386) 943-5433
Cell (386) 956-5087

From: Gary Haddle <ghaddle@inwoodinc.com>
Sent: Thursday, February 9, 2023 2:52 PM
To: Hickson, Ferrell <Ferrell.Hickson@dot.state.fl.us>
Subject: roundabout exemption

Ferrell, as long as all the exemptions are met in the language below, a roundabout should meet the exemption in 62-330.051(4)(c) F.A.C. The roundabout was specifically mentioned in a draft of the 62-330 rule during rulemaking, but it was removed at the last minute so that part of the rule would be more vague. They didn't want to specifically exempt roundabouts because you still cannot impact wetlands or wetland-cut ditches, and the capacity of existing ditches and swales, etc. Also, they didn't want to make the rule too specific. Entire rule is attached, and highlighted excerpt is below.

62-330.051 Exempt Activities.

The activities meeting the limitations and restrictions below are exempt from permitting. However, if located in, on, or over state-owned submerged lands, they are subject to a separate authorization under Chapters 253 and 258, F.S., as applicable.

(1) Activities conducted in conformance with the District-specific exemptions in section 1.3 of Volume II applicable to the location of the activity.

(2) Activities conducted in conformance with the exemptions in Section 373.406, or 403.813(1), F.S.

(3) Aquatic Plant and Organic Detrital Control and Removal –

(a) Disking and tilling of exposed lake bottoms in accordance with a permit issued by the Florida Fish and Wildlife Conservation Commission or an exemption under Chapter 369, F.S.

(b) Organic detrital material removal in accordance with Section 403.813(1)(r) or (u), F.S.

(c) Aquatic plant control where the activity qualifies for an exemption authorized under Section 369.20, F.S., or in a permit from the Florida Fish and Wildlife Conservation Commission under Section 369.20 or 369.22, F.S.; and the harvested plant material is not disposed of in wetlands or other surface waters, or in a manner that adversely affects water quality or flood control.

(d) The mechanical harvesting or shredding of aquatic plants and incidentally associated sediments, including subsequent side casting of the harvested or shredded material, provided:

1. The activity is authorized and conducted by the Florida Fish and Wildlife Conservation Commission, under Section 369.20 or 369.22, F.S.;

2. The work involves no dredging and is the minimum amount necessary for maintaining existing navigation corridors and preventing flooding, and in no case shall exceed five total acres of harvesting, shredding, and sidecasting;

3. The work is performed in a manner that does not adversely affect water quality or flood control; and

4. Notice of intent to use this exemption is provided to the Agency five days before performing any work.

(4) Bridges, Driveways, and Roadways –

(a) The replacement and repair of existing open-trestle foot bridges and vehicular bridges in accordance with Section 403.813(1)(l), F.S.

(b) Construction, alteration, or maintenance, and operation, of culverted driveway or roadway crossings and bridges of wholly artificial, non-navigable drainage conveyances, provided:

1. The construction project area does not exceed one acre and is for a discrete project that is not part of a larger plan of development that requires permitting under this chapter. However, these limitations shall not preclude use of this exemption to provide access to activities that qualify for the general permit in Section 403.814(12), F.S.;

2. The culvert or bridge shall be sized and installed to pass normal high water stages without causing adverse impacts to upstream or downstream property;

3. Culverts shall not be larger than one, 24-inch diameter pipe, or its hydraulic equivalent, and must not reduce the upstream hydraulic discharge capacity;

4. The crossing shall not:

a. Be longer than 30 feet from top-of-bank to top-of-bank;

b. Have a top width of more than 20 feet or a toe-to-toe width of more than 40 feet; and,

c. Have side slopes steeper than three feet horizontal to one foot vertical;

5. There are no more than two crossings on any total land area, with a minimum distance of 500 feet between crossings;

6. If dewatering is performed, all temporary work and discharges must not cause flooding or impoundment, downstream siltation, erosion, or turbid discharges that violate state water quality standards;

7. Any temporary work shall be completely removed and all upstream and downstream areas that were disturbed shall be restored to pre-work grades, elevations and conditions; and,

8. All work shall comply with subsection 62-330.050(9), F.A.C.

(c) Minor roadway safety construction, alteration, maintenance, and operation, provided:

1. There is no work in, on, or over wetlands other than those in drainage ditches constructed in uplands;

2. There is no reduction in the capacity of existing swales, ditches, or other systems legally in existence under Chapter 403 or Part IV of Chapter 373, F.S.;

3. All work is conducted in compliance with subsection 62-330.050(9), F.A.C.; and

4. The work is limited to:

a. Sidewalks having a width of six feet or less;

b. Turn lanes less than 0.25 mile in length, and other safety-related intersection improvements; and

c. Road widening and shoulder paving that does not create additional traffic lanes and is necessary to meet current, generally accepted roadway design and safety standards.

(d) Resurfacing and repair of existing paved roads, and grading of existing unpaved roads, provided:

1. Travel lanes are not paved that are not already paved;

2. No substantive changes occur to existing road surface elevations, grades, or profiles; and

3. All work is conducted in compliance with subsection 62-330.050(9), F.A.C.

Gary Haddle
Chief Ecologist
FWC Authorized Gopher Tortoise Agent
INWOOD CONSULTING ENGINEERS, INC.
3000 Dovera Dr., Suite 200, Oviedo, FL 32765
P: 407-971-8850
Inwoodinc.com

Meeting Minutes with SJRWMD

Project: SR519 at Roy Wall Boulevard Intersection Improvements
Subject: Fiske Blvd and Roy Wall Blvd Feasibility Study - SJRWMD Meeting
Data and time: February 15, 2023, at 9:00 AM
Meeting place: Virtual (Teams) **Minutes by:** CONSOR Engineers, LLC
Present: SJRWMD: Perry Jennings
SCTPO: Sarah Kraum
Kittleson & Associates, Inc.: Travis Hills, Daniel Torre
Consor: David Bennett, Yukiyo Stanek

Notes

The purpose of the meeting was to clarify permitting criteria. David introduced the project and discussed permitting criteria as he understands it. He stated that this project should be exempt from permitting due to the project being a safety improvement project. He added that if treatment volume was required then it should only be for the new impervious area. Perry was unsure and requested time to meet with his supervisor for clarification. He would email the results and a follow up meeting to discuss would be scheduled if needed.

Following-up email from Perry on 2/15/23:

From: Perry J Jennings <pjenning@sjrwmd.com>
Sent: Wednesday, February 15, 2023 11:10 AM
To: David A. Bennett <dbennett@consoreng.com>
Subject: Realignment of roadway

Hi David,
May not have to have the meeting on the 22nd if the new TPM says that the improvement is "safety related"(see below). As an aside did discuss the points of disagreement w/treating existing impervious if drains to new system for new imp and also if existing imp is discounted from new. The Supvr. agreed that both interpretations of the rule were correct.
Best regards,
Perry.

Perry J. Jennings
Professional Engineer
Bureau of Environmental Regulation/Palm Bay Service Center
St. Johns River Water Management District
P.O. Box 1429 ● Palatka, FL 32178-1429
Office: (321) 409-2185
Email: pjenning@sjrwmd.com

Website: www.sjrwmd.com
Connect with us: Newsletter, Facebook, Twitter, Instagram, YouTube, Pinterest

www.sjrwmd.com/ePermit

From: Marjorie Cook <MCook@sjrwmd.com>
Sent: Wednesday, February 15, 2023 10:44 AM
To: David Miracle <dmiracle@sjrwmd.com>
Cc: Perry J Jennings <pjenning@sjrwmd.com>
Subject: Realignment of roadway

Good morning David –

The City and/or County is proposing to realign an existing roadway that does not have a District permit. The realignment will not create additional traveled lanes and it appears the purpose of the realignment is to line up with the existing road on the other side of the intersection. The project exceeds a permitting threshold of constructing more than 4000 sf of impervious area subject to vehicular traffic.

What are your thoughts in processing this as an exempt activity in accordance with Section 62-330.051(4)(c), F.A.C. as the work appears to be "safety related intersection improvements".

(4)(c) Minor roadway safety construction, alteration, maintenance, and operation, provided:

1. There is no work in, on, or over wetlands other than those in drainage ditches constructed in uplands;

2. There is no reduction in the capacity of existing swales, ditches, or other systems legally in existence under chapter 403 or Part IV of chapter 373, F.S.;

3. All work is conducted in compliance with subsection 62-330.050(9), F.A.C.; and

4. The work is limited to:

a. Sidewalks having a width of six feet or less;

b. Turn lanes less than 0.25 mile in length, and other safety-related intersection improvements; and

c. Road widening and shoulder paving that does not create additional traffic lanes and is necessary to meet current, generally

Another option is a round about.

Thanks for your input.
Margie

Marjorie D. Cook, P.E.
Supervising Professional Engineer
Division of Regulatory Services
St. Johns River Water Management District
2501 S. Binion Road
Apopka FL 32703
Office: (407)659-4837
Email: mcook@sjrwmd.com
Website: www.sjrwmd.com
Connect with us: Newsletter, Facebook, Twitter, Instagram, YouTube, Pinterest

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Drainage Meeting with Brevard County Summary

March 28, 2023

Space Coast TPO Conference Room

2725 Judge Fran Jamieson Way, Melbourne, FL 32940

1:00 PM – 2:00 PM

A meeting with Brevard County staff was held to review the results of the 100-year storm event drainage analysis at the study intersection. The presentation materials can be found attached to these meeting notes. The following individuals attended the meeting in-person unless otherwise noted:

- Georganna Gillette, Sarah Kraum, and Debbie Flynn – Space Coast Transportation Planning Organization (SCTPO)
- Marc Bernath, Corrina Gumm, and Rachel Gerena – Brevard County
- Travis Hills and Daniel Torre (virtual) – Kittelson & Associates, Inc.
- David Bennett and Yukiyo Stanek (virtual) – CONSOR Engineers, LLC
- Francina Gil – Vortex Company, LLC

The following are comments, general notes, and questions from the Meeting:

1. David presented a review of the drainage analysis previously completed at the intersection for the 25-year / 24-hour storm event. A dry retention pond was recommended for the traffic signal, partial median U-turn (PMUT), and restricted crossing U-turn (RCUT) alternatives. The pond was not needed for the roundabout alternative.

2. David presented to the group a summary of meetings with FDOT District 5 drainage staff and the St. Johns River Water Management District (SJRWMD) staff on permitting requirements for the recommended alternatives at the intersection. SJRWMD noted as these improvements will be implemented as a safety project, they are anticipated to be exempt from permitting requirements.

3. David presented the methodology and results of the 100-year storm event drainage analysis previously requested by Brevard County staff. The objective of the analysis was to determine if the proposed drainage improvements in the Stage 2 ICE alternatives can accommodate the additional volume anticipated with a 100-year storm event.
    a. The analysis showed the proposed dry retention pond will be able to accommodate the added volume anticipated with a 100-year storm event.
    b. Brevard County staff agreed with the methodology and results of the analysis and expressed support for the drainage elements included in the proposed improvements.

The following are the next steps to be completed by the Study Team discussed in the meeting:

- Consensus Building Meeting scheduled for May 5, 2023

These meeting notes are Daniel Torre's interpretation of the comments, requests, and discussion during the meeting. Question, additions, and/or clarifications should be directed to him at 407-373-1121 or dtorre@kittelson.com.

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #3 Agenda

May 5, 2023

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

10:00 – 11:30 AM

1. ICE Stage 2 Recap
    a. Project Schedule and Background
    b. ICE Stage 2 Results
2. Additional Drainage Analysis
3. Recommendation
4. Next Steps
    a. Summary Technical Memorandum
    b. Presentation to Rockledge City Council

Fiske Boulevard & Roy Wall Boulevard Intersection Analysis

Consensus Building Meeting #3 Summary

May 5, 2023

Florida Room, Building C, Brevard County Government Center

2725 Judge Fran Jamieson Way, Melbourne, FL 32904

10:00 AM – 11:30 AM

A Consensus Building Meeting was held to discuss the results of the 100-year storm event drainage analysis at the study intersection. The sign in sheet and presentation materials can be found attached to these meeting notes. The following organizations and individuals attended the meeting:

- VJ Karycki, Michael Jarusiewicz, John Cooper, and Brenda Fettrow – City of Rockledge
- Marc Bernath, Rachel Gerena, and Corrina Gumm – Brevard County
- Steven Buck and Kellie Smith – Florida Department of Transportation – District 5
- Sarah Kraum and Debbie Flynn– Space Coast Transportation Planning Organization (SCTPO)
- Travis Hills and Daniel Torre – Kittelson & Associates, Inc.
- David Bennett and Francina Gil – Vortex Company

The following are comments, general notes, and questions from the Consensus Building Meeting:

1. Travis provided a review of the analysis completed as part of Stage 2 ICE and the project schedule. The traffic operations, safety, drainage, and benefit-cost analysis results were presented to the group. The Stage 2 ICE alternatives included:

    a. Two-Way Stop Control (Future No-Build)
    b. Signalized Control
    c. Roundabout
    d. Partial Median U-Turn (PMUT)
    e. Signalized Restricted Crossing U-Turn (RCUT)

2. David presented to the group a summary of meetings with FDOT District 5 drainage staff and the St. Johns River Water Management District (SJRWMD) staff on permitting requirements for the recommended alternatives at the intersection. SJRWMD noted as these improvements will be implemented as a safety project, they are anticipated to be exempt from permitting requirements.

3. David presented the methodology and results of the 100-year storm event drainage analysis previously requested by Brevard County staff. The objective of the analysis was to determine if the proposed drainage improvements in the Stage 2 ICE alternatives can accommodate the additional volume anticipated with a 100-year storm event.

   a. The analysis showed the proposed dry retention pond will be able to accommodate the added volume anticipated with a 100-year storm event.

   b. Brevard County and City of Rockledge staff agreed with the methodology and results of the analysis, and expressed support for the drainage elements included in the proposed improvements.

4. Sarah discussed the recommendations from the study. While each Stage 2 alternative has a benefit-cost ratio exceeding 1.0, the roundabout alternative had the best predicted safety results. Based on the safety benefits, the SCTPO formally recommends the roundabout alternative, but will be supportive of the alternative selected by the City of Rockledge.

   a. City of Rockledge staff noted the City Council will most likely recommend moving forward with the signal alternative.

5. The Study Team will be tentatively scheduled to present the findings and recommendations to the Rockledge City Council at their June 21, 2023 meeting.

6. Open Discussion

   a. Kellie noted construction costs have increased in the last year, as some pay items have doubled and tripled in cost. FDOT recommended the Study Team update the cost estimates for the Stage 2 ICE alternatives as the study is finalized.

   b. Overall project next steps:

      i. $1.3 million is ready to fund the design phase of the project.

      ii. FDOT is ready to begin the process to procure a design firm for the design phase on July 1st if there is agreement on the preferred alternative.

      iii. The construction phase is not funded at this time. FDOT noted that design will likely take two years and right-of-way could take another two years, resulting in the construction phase likely being four or more years away. The current target is to have construction funds ready for FY29.

The following are the next steps to be completed by the Study Team:

- Presentation to Rockledge City Council – Tentatively June 21, 2023
- Final technical memorandum summary study results – June 30, 2023

These meeting notes are Daniel Torre's interpretation of the comments, requests, and discussion during the meeting. Question, additions, and/or clarifications should be directed to him at 407-373-1121 or dtorre@kittelson.com.

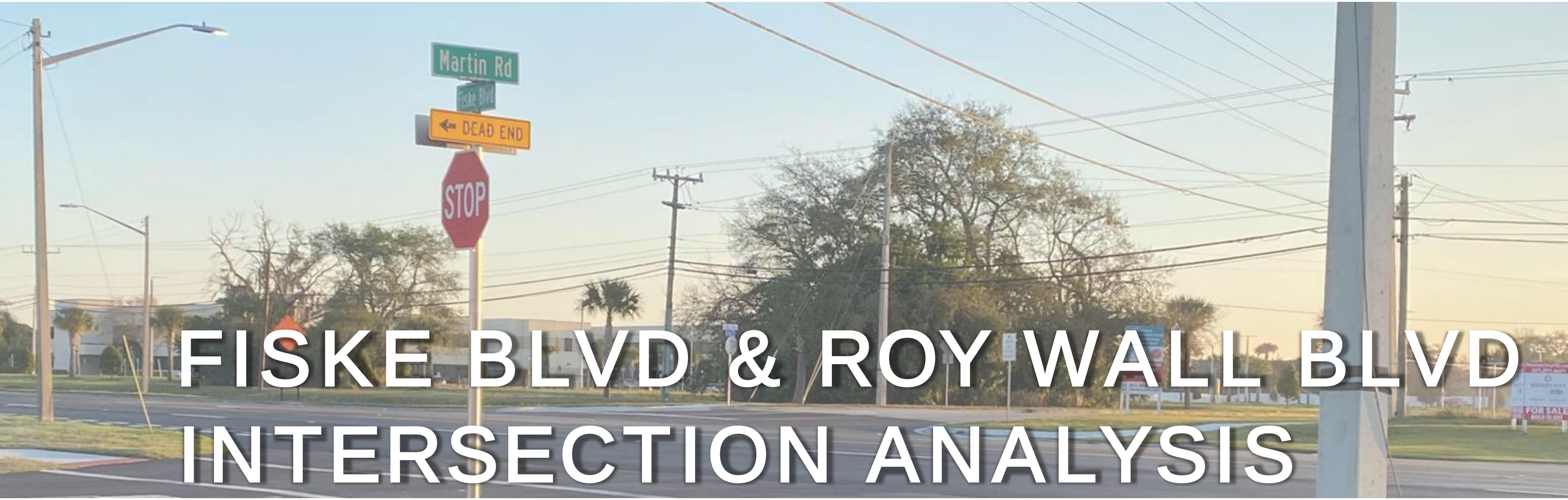
Fiske Blvd and Roy Wall Blvd Intersection Analysis - Consensus Building Meeting 3 - May 5, 2023

Name	Agency/Firm	E-mail	Phone
Brenda Fettrow	Rockledge		
VJ Karynet	" "		
Michael Jarusiewicz	City of Rockledge PW's		
Debbie Flynn	SCTPO		
John W Cope	Rockledge		
Corrina Gumm	Brevard Co PW		
Rachel Gerena	BC PW		
Marc Beth	BC PW		

Fiske Blvd and Roy Wall Blvd Intersection Analysis - Consensus Building Meeting 3 - May 5, 2023

Name	Agency/Firm	E-mail	Phone
Travis Mills	Kittelson		
Daniel Torre	"		
Sarah Kramer	SCTPO		
Debbie Flynn	"		
David Bennett	Vertex		
Fernando Gil	"		
Steven Buck	FDOT		
Kellie Smith	"		

DATE 05/05/2023



FISKE BLVD & ROY WALL BLVD INTERSECTION ANALYSIS

CONSENSUS BUILDING MEETING #3

SPACE COAST TPO
KITTELSON & ASSOCIATES
consor

Meeting Agenda

- ICE Stage 2 Recap
- Additional Drainage Analysis
- Recommendation
- Next Steps

Project Schedule

March to May 2022
- Data Collection
- Field Review
- Signal Warrant Analysis
- Growth Rate Analysis
- Stage 1 ICE

June 2022
- Consensus Building Meeting #1

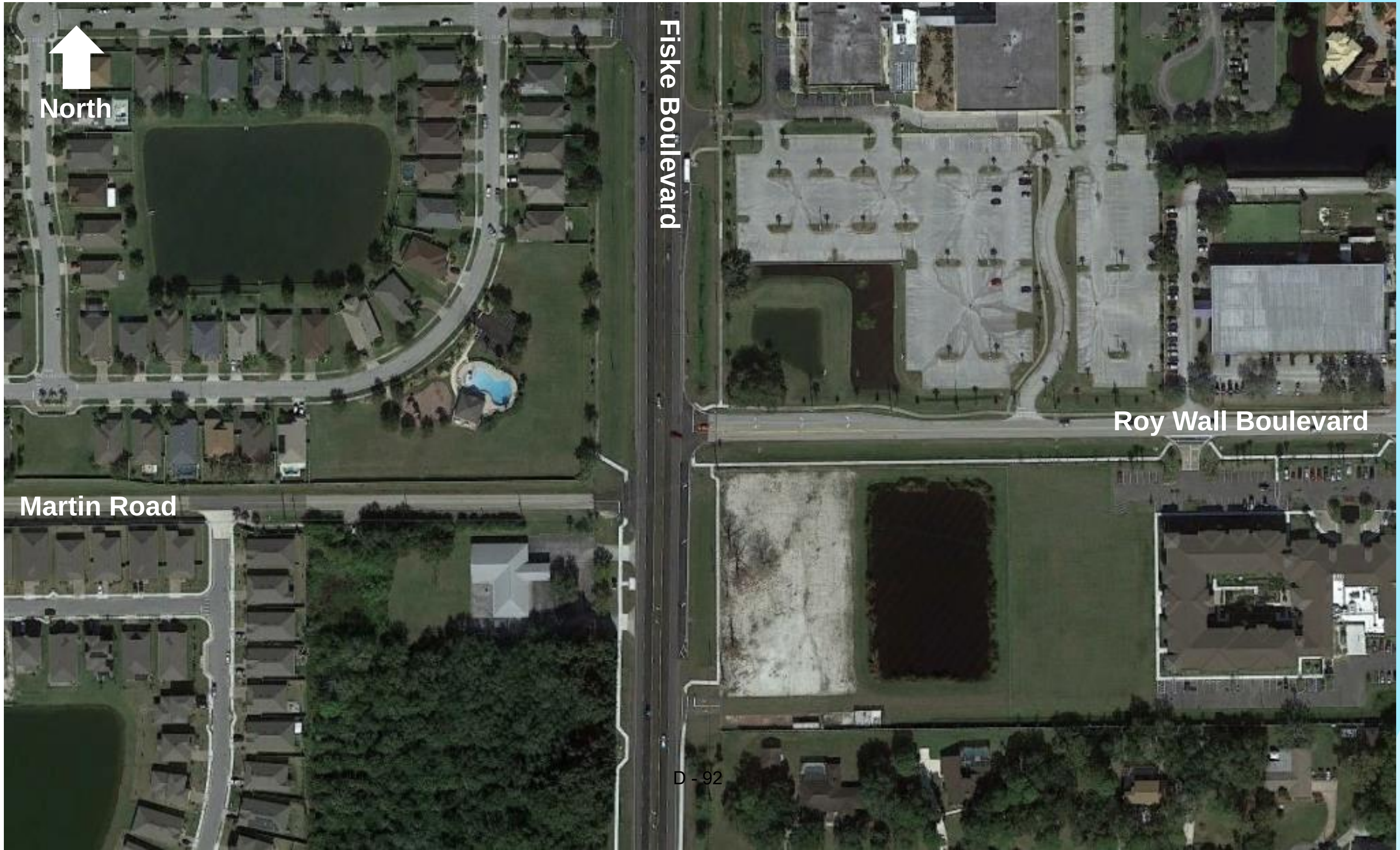
July to November 2022
- Drainage Analysis
- Stage 2 ICE

December 2022
- Consensus Building Meeting #2

January to March 2023
- Additional Drainage Analysis and Coordination

April to May 2023
- Consensus Building Meeting #3
- Summary Technical Memorandum
- Presentation to Rockledge City Council

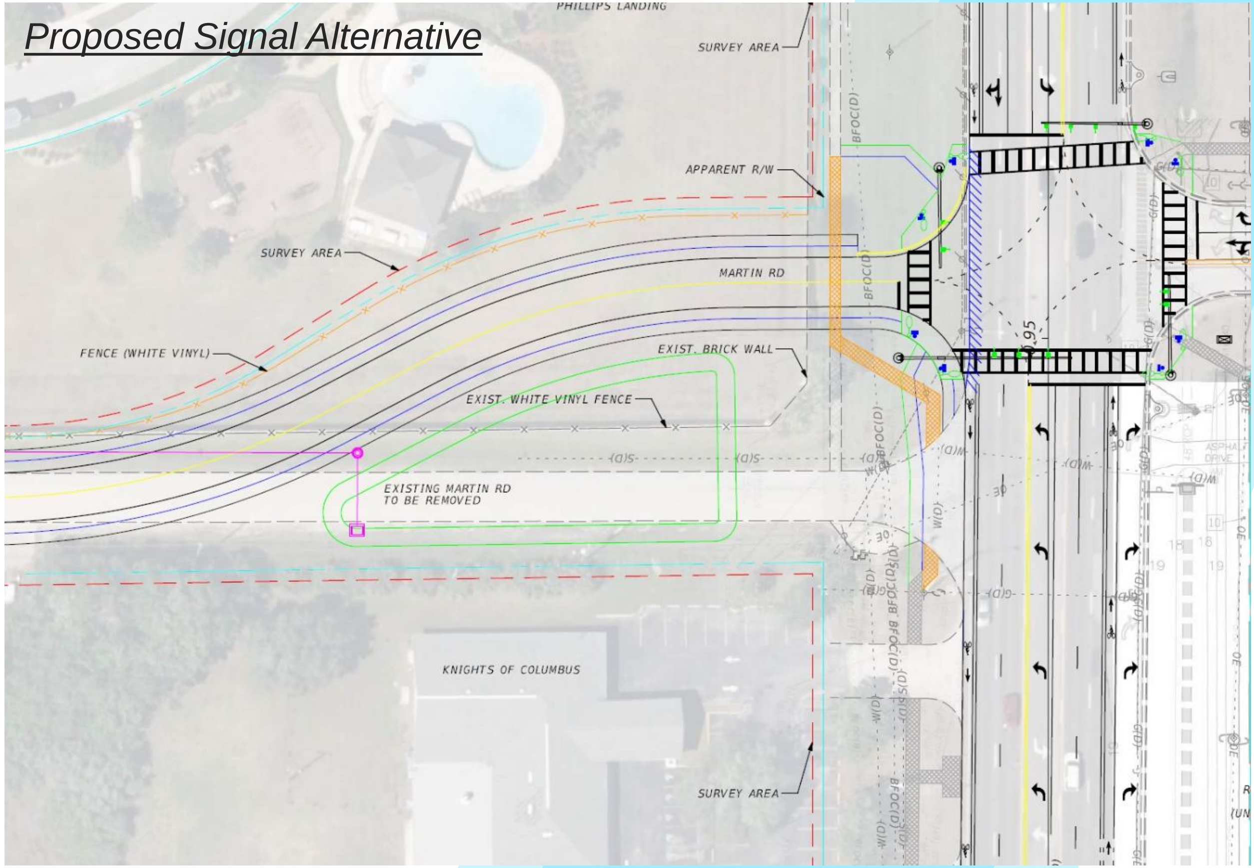
Project Location



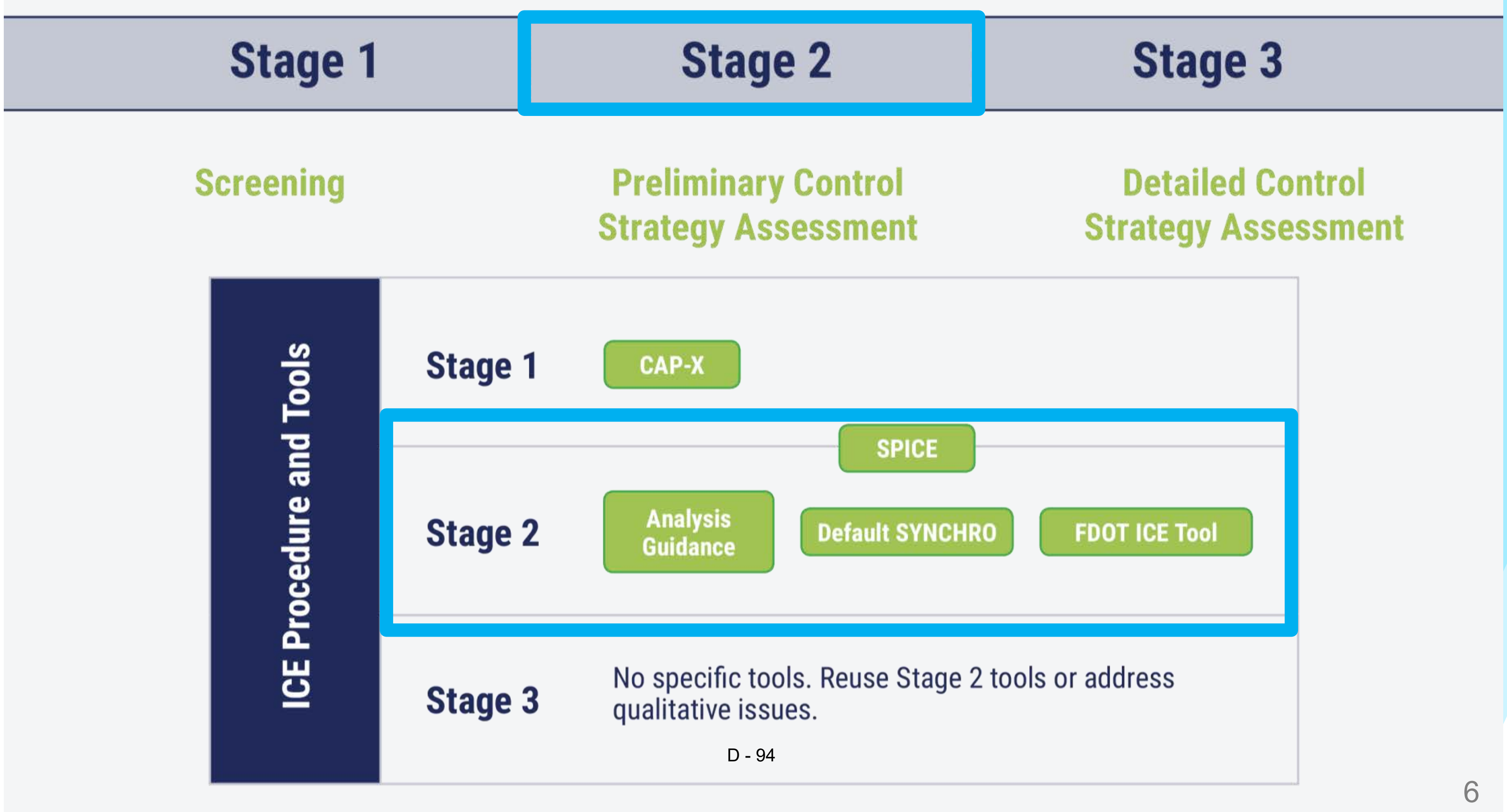
Project Background

- Improvements proposed from SR 519/Fiske Blvd Corridor Planning Study
- Martin Road Realignment
  - Tie into Fiske and Roy Wall intersection
  - Change in drainage patterns
- Analyses needed prior to design
  - Intersection Control Evaluation (ICE)
  - Drainage Analysis

Proposed Signal Alternative



Stages of ICE



Stage 2 ICE Summary

Control Strategy	Total CST Cost	B/C Ratio
Two-Way Stop Controlled	-	-
Signalized Control	$1,002,500	7.77
2x1 Roundabout	$3,082,700	6.55
Partial MUT	$1,923,400	7.17
Signalized RCUT	$2,025,900	1.92

Stage 2 ICE Conclusions

- Traffic Operations
  - Stage 2 alternatives anticipated to operate acceptably

- Safety Analysis
  - Roundabout has lowest number of predicted crashes
  - 20-Year lifecycle fatal & injury crash costs:
    - Roundabout: ~$17 million
    - Signal, PMUT, RCUT: ~$25 million - ~$43 million

Stage 2 ICE Conclusions

- Drainage Considerations
  - No extra discharge anticipated along Martin Road
  - Signal, PMUT, and RCUT need new pond
  - Roundabout needs drainage facilities rebuild along Fiske

- Benefit/Cost
  - Stage 2 alternatives have benefit/cost ratios > 1.0

Additional Drainage Analysis

- Coordination w/FDOT, SJRWMD, and Brevard County
- Drainage analysis for 100-year storm event

Drainage Coordination

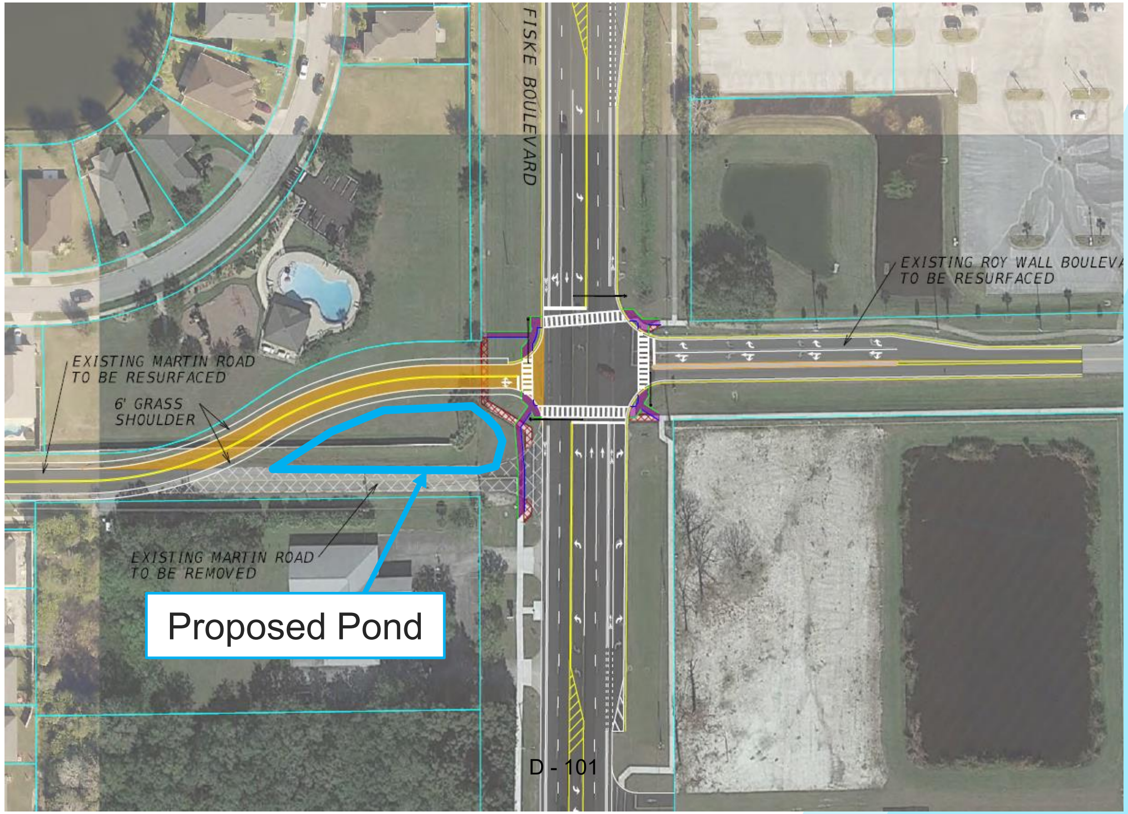
- Met w/FDOT District Drainage Engineer to discuss FDOT criteria 2/9/23
  - Does not require the 100-year storm event
  - No impacts to 100-year floodplain
  - If the County's drainage requests cannot be met, may be required to provide R/W for larger stormwater pond
- Met w/SJRWMD to discuss permitting criteria 2/15/23
  - Project likely to be exempt from permitting because it is a safety project
  - If needed, treatment volume will only be the new impervious
  - If needed, attenuation will be proved for the 25-year, 24-hour storm event
- Met w/Brevard County to discuss 100-year storm event analysis 3/28/23
  - Concurrence on analysis results
  - County satisfied proposed improvements would not negatively impact Martin Road

Drainage Discussion

- Existing Conditions

Drainage Discussion

- Proposed Conditions



Drainage Discussion

- Design Criteria
  - Only treat the new impervious area (confirmed with SJRWMD)
  - Attenuate the 25-year/24-hour storm
  - No net impact to the 100-year floodplain (confirmed with FDOT)
  - No additional volume is to discharged to Martin Road (confirmed with Brevard County)

Drainage Discussion

	Pre-development Volume	Post-development Volume	Volume to be Retained
100 Year Storm Event	6.8 ac-ft	6.9 ac-ft	0.1 ac-ft

Elevation	Area	Storage	
19.00	0.34	0.39	Out-Berm
18.75	0.28	0.29	
18.50	0.23	0.21	In-Berm
18.25	0.22	0.15	
18.00	0.21	0.10	100 Year Volume to be Retained
17.77	0.19	0.05	Treatment Volume
17.50	0.18	0.00	Pond Bottom

Drainage Discussion

- 100-Year Storm Event Analysis Results
  - Proposed pond will provide for treatment and attenuation for the project
  - Proposed pond will retain the difference in volume from the existing and proposed condition for the 100-year storm event
  - No additional volume is discharged to Martin Road R/W
  - Pond has some capacity to retain more volume from the 100-year storm event than required
    - May be used to improve the flooding along Martin Road
  - Pond will provide any floodplain mitigation

Recommendation

- Each Stage 2 alternative anticipated to operate acceptably
- Roundabout has best predicted safety results
- Traffic signal is desired by City

- Do we recommend roundabout or signal?

Next Steps

- Summary Tech Memo under development
  - TPO review in May
  - Final Tech Memo complete by June

- Presentation to Rockledge City Council
  - Kittelson or SCTPO Staff?
  - When do you want us to present?

- $1.3 Million in Design Funds has been allocated

Questions/Contact Information

SCTPO Project Manager

Sarah Kraum
2725 Judge Fran Jamieson Way
Building B, Room 105
Melbourne, FL 32940
Phone: 321-690-6890
Sarah.Kraum@sctpo.com

Kittelson Project Manager

Travis Hills, PE, RSP[1]
225 East Robinson Street
Suite 355
Orlando, FL 32801
Phone: 407-540-0555
thills@kittelson.com

Appendix E
Stage 1 ICE Supporting Details

Capacity Analysis for Planning of Junctions

Project Name:	Fiske Boulevard at Roy Wall Boulevard/Martin Road
Project Number:	Work Order 22-14K
Location:	Rockledge, FL
Date:	2050 AM
Number of Intersection Legs:	4
Major Street Direction:	North-South

Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn	**Left**	**Thru**	**Right**	Heavy Vehicles	Volume Growth
Eastbound	0	11	3	29	2.02%	0.00%
Westbound	0	41	2	64	3.54%	0.00%
Southbound	0	78	1159	4	4.85%	0.00%
Northbound	0	8	995	143	3.44%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		

Truck to PCE Factor	**Suggested = 2.00**	2.00
FDOT Context Zone	**C3C-Suburban Commercial**	

Critical Lane Volume Threshold	2-phase signal	**Suggested = 1800**	**1800**
	3-phase signal	**Suggested = 1750**	**1750**
	4-phase signal	**Suggested = 1700**	**1700**

Capacity Analysis for Planning of Junctions

Number of Lanes for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Northbound				Southbound				Eastbound				Westbound			
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Traffic Signal	FULL		1	2	1		1	2	0		0	1	0		0	1	1
Two-Way Stop Control	N-S		1	2	1		1	2	0		0	1	0		0	1	1
Signalized Restricted Crossing U-Turn	N-S	1	1	2	1	1	1	2	0				1				1
Median U-Turn	N-S	1		2	1	1		2	0			1	0			1	1
Partial Median U-Turn	N-S	1		2	1	1		2	0		0	1	0		0	1	1
Signalized ThruCut	N-S		1	2	1		1	2	0		1		1		1		1

Number of Lanes for Interchanges

TYPE OF INTERCHANGE	Sheet	Northbound				Southbound				Eastbound				Westbound			
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R

Capacity Analysis for Planning of Junctions

Results for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Zone 1 (North)		Zone 2 (South)		Zone 3 (East)		Zone 4 (West)		Zone 5 (Center)		Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
		CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C				
Traffic Signal	FULL									662	0.39	0.39	Fair	Fair	Good
Two-Way Stop Control	N-S									--	2.06	2.06	Poor	Fair	Good
Signalized Restricted Crossing U-Turn	N-S	706	0.39	610	0.34	649	0.36	680	0.38			0.39	Good	Good	Fair
Median U-Turn	N-S	713	0.40	709	0.39					778	0.43	0.43	Good	Good	Fair
Partial Median U-Turn	N-S	661	0.37	695	0.39					728	0.42	0.42	Good	Good	Fair
Signalized ThruCut	N-S									692	0.52	0.52	Fair	Good	Fair

Results for Roundabouts

TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3				
2NS X 1EW	0.50	0.53		0.10			0.47	0.51		0.20			0.53	Fair	Good	Good
2 X 2	0.50	0.53		0.09	0.12		0.47	0.51		0.04	0.07		0.53	Fair	Good	Good

Results for Interchanges

TYPE OF INTERCHANGE	Sheet	Zone 1 (Rt Mrg)		Zone 2 (Lt Mrg)		Zone 3 (Ctr. 1)		Zone 4 (Ctr. 2)		Zone 5 (Lt Mrg)		Zone 6 (Rt Mrg)		Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
		CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C				

Capacity Analysis for Planning of Junctions

Project Name:	Fiske Boulevard at Roy Wall Boulevard/Martin Road
Project Number:	Work Order 22-14K
Location:	Rockledge, FL
Date:	2050 PM
Number of Intersection Legs:	4
Major Street Direction:	North-South

Traffic Volume Demand

	Volume (Veh/hr)				**Percent (%)**	
	U-Turn	**Left**	**Thru**	**Right**	Heavy Vehicles	Volume Growth
Eastbound	1	7	2	12	0.00%	0.00%
Westbound	0	86	2	140	1.61%	0.00%
Southbound	0	135	1064	11	2.09%	0.00%
Northbound	0	25	1207	130	2.65%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		

Truck to PCE Factor		**Suggested = 2.00**	2.00
FDOT Context Zone	**C3C-Suburban Commercial**		
Critical Lane Volume Threshold	2-phase signal	**Suggested = 1800**	**1800**
	3-phase signal	**Suggested = 1750**	**1750**
	4-phase signal	**Suggested = 1700**	**1700**

Number of Lanes for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Northbound				Southbound				Eastbound				Westbound			
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Traffic Signal	FULL		1	2	1		1	2	0		0	1	0		0	1	1
Two-Way Stop Control	N-S		1	2	1		1	2	0		0	1	0		0	1	1
Signalized Restricted Crossing U-Turn	N-S	1	1	2	1	1	1	2	0				1				1
Median U-Turn	N-S	1		2	1	1		2	0			1	0			1	1
Partial Median U-Turn	N-S	1		2	1	1		2	0		0	1	0		0	1	1
Signalized ThruCut	N-S		1	2	1		1	2	0		1		1		1		1

Number of Lanes for Interchanges

TYPE OF INTERCHANGE	Sheet	Northbound				Southbound				Eastbound				Westbound			
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R

Capacity Analysis for Planning of Junctions

Results for Non-roundabout Intersections

TYPE OF INTERSECTION	Sheet	Zone 1 (North)		Zone 2 (South)		Zone 3 (East)		Zone 4 (West)		Zone 5 (Center)		Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
		CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C				
Traffic Signal	FULL									863	0.51	0.51	Fair	Fair	Good
Two-Way Stop Control	N-S									--	6.37	6.37	Poor	Fair	Good
Signalized Restricted Crossing U-Turn	N-S	729	0.40	712	0.40	895	0.50	615	0.34			0.50	Good	Good	Fair
Median U-Turn	N-S	760	0.42	882	0.49					902	0.50	0.50	Good	Good	Fair
Partial Median U-Turn	N-S	651	0.36	872	0.48					801	0.46	0.48	Good	Good	Fair
Signalized ThruCut	N-S									858	0.65	0.65	Fair	Good	Fair

Capacity Analysis for Planning of Junctions

Detailed Report - Page 4 of 4

Results for Roundabouts

TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3				
2NS X 1EW	0.50	0.54		0.05			0.59	0.62		0.51			0.62	Fair	Good	Good
2 X 2	0.50	0.54		0.22	0.31		0.59	0.62		0.03	0.03		0.62	Fair	Good	Good

Results for Interchanges

TYPE OF INTERCHANGE	Sheet	Zone 1 (Rt Mrg)		Zone 2 (Lt Mrg)		Zone 3 (Ctr. 1)		Zone 4 (Ctr. 2)		Zone 5 (Lt Mrg)		Zone 6 (Rt Mrg)		Overall v/c Ratio	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
		CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C				

Federal Highway Administration (FHWA)			
Safety Performance for Intersection Control Evaluation Tool			
Results			
Summary of crash prediction results for each alternative			
Project Information			
Project Name:	Fiske Blvd. and Roy Wall Blvd. Intersection Analysis	**Intersection Type**	At-Grade Intersections
Intersection:	Fiske Boulevard at Roy Wall Boulevard/Martin Road	**Opening Year**	2030
Agency:	Space Coast Transportation Planning Organization	**Design Year**	2050
Project Reference:	Work Order 22-14K	**Facility Type**	On Urban and Suburban Arterial
City:	Rockledge	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	3/24/2022	**# of Major Street Lanes (both directions)**	5 or fewer
Analyst:	KAI	**Major Street Approach Speed**	Less than 55 mph

Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?	Source of Prediction	SSI Score Open Year	SSI Score Design Year	SSI Score Rank
Traffic Signal	Total	12.78	14.38	285.09	5	Yes	Calibrated SPF	97	97	5
	Fatal & Injury	4.47	5.07	100.21						
Minor Road Stop	Total	4.92	5.41	108.44	1	No	Calibrated SPF	94	94	6
	Fatal & Injury	2.15	2.38	47.57						
2-lane Roundabout	Total	15.21	16.94	337.55	2	No	Uncalibrated SPF	99	98	2
	Fatal & Injury	2.82	3.18	62.98						
Median U-Turn (MUT)	Total	10.86	12.23	242.33	3	N/A	CMF	99	99	1
	Fatal & Injury	3.13	3.55	70.15						
Signalized RCUT	Total	17.40	19.99	392.35	4	Yes	Uncalibrated SPF	98	98	4
	Fatal & Injury	3.76	4.36	85.17						
Signalized Thru-Cut	Total	No SPF	No SPF	No SPF	--	N/A	N/A	99	98	3
	Fatal & Injury	No SPF	No SPF	No SPF						

Florida Department of Transportation
Intersection Control Evaluation (ICE) Form
Stage 1: Screening

To fulfill the requirements of Stage 1 (Screening) of FDOT's ICE procedures, complete the following form and append all supporting documentation. Completed forms can be submitted to the District Traffic Operations Engineer (DTOE) and District Design Engineer (DDE) for the project's approval. Selections must be made in the "Intersection Type" and "Project Funding Source" cells below for the appropriate Stage 1 and Stage 2 forms to fully populate.

Project Name	Fiske Blvd/Roy Wall Blvd Intersection Analysis		FDOT Project #	-	
Submitted By	Kittelson & Associates, Inc.	Agency/Company	Space Coast TPO	Date	5/20/2022
Email	dtorre@kittelson.com	FDOT District	District 5	County	Brevard
Project Locality (*City/Town/Village*)	Rocklege				
Intersection Type	At-Grade Intersection	FDOT Context Classification	C3C - Suburban Commercial		
Project Funding Source	Federal	Project Type	Congestion Mitigation Project		
Project Purpose (*What is the catalyst for this project and why is it being undertaken?*)	Intersection improvements at the Fiske Boulevard/Roy Wall Boulevard/Martin Road intersection were proposed as part of the SR 519/Fiske Boulevard Corridor Planning Study. Based on follow up discussions between the Space Coast Transportation Planning Organization, the Florida Department of Transportation District 5, Brevard County, and the City of Rockledge, it is desired to re-align Martin Road to tie in at the existing Fiske Boulevard/Roy Wall Boulevard intersection, making this a 4-leg intersection.				
Project Setting Description (*Describe the area surrounding the intersection*)	The surrounding land use is largely residential, with an office park located in the northeast quadrant.				
Multimodal Context (*Describe the pedestrian, bicycle, and transit activity in the area and the potential for activity based on surrounding land uses and development patterns*)	There are 5' to 6' wide sidewalks on both sides of Fiske Boulevard and Roy Wall Boulevard in the study area. There are no sidewalks on either side of Martin Road. There are on-street bicycle lanes along Fiske Boulevard, but no bicycle lanes along Roy Wall Boulevard or Martin Road. Space Coast Area Transit Route 1 operates along Fiske Boulevard in the study area.				

Major Street Information

Route #:	SR 519	Route Name(s)	Fiske Boulevard		Milepost	0.948
Existing Control Type	Two-way Stop-Control	Existing AADT	27,750		Design Year AADT	32,500
Design Vehicle	Florida Interstate Semitrailer (WB-62FL)	Control Vehicle	Florida Interstate Semitrailer (WB-62FL)			
Primary Functional Classification	Urban Principal Arterial - Other				Design Speed (mph)	45
Secondary Functional Classification (if app.)					Target Speed (mph) [if app.]	45

Approach			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
Approach #1	Direction	Northbound						
	Sidewalks along	Both sides of the approach	Left-Turn	0				
	Crosswalk on Approach?	No	Left-Through	0	Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	Yes	Through	2	Left	8	Left	25
	Multi-Use Path?	No	Left-Through-Right	0	Through	865	Through	1,050
	Scheduled Bus Service?	Yes	Through-Right	0	Right	124	Right	113
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		4.2%	
Approach #2	Direction	Southbound						
	Sidewalks along:	Both sides of the approach	Left-Turn	0				
	Crosswalk on Approach?	No	Left-Through	0	Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	Yes	Through	1	Left	68	Left	117
	Multi-Use Path?	No	Left-Through-Right	0	Through	1,008	Through	925
	Scheduled Bus Service?	Yes	Through-Right	1	Right	4	Right	11
	Bus Stop on Approach?	No	Right-Turn	0	Daily Truck %		3.9%	

Minor Street Information							
Route #:		Route Name(s)	Roy Wall Boulevard/Martin Road			Milepost (if app.)	
Existing Control Type	Two-way Stop-Control	Existing AADT	5,800			Design Year AADT	7,000
Design Vehicle	School Bus (S-BUS-36)	Control Vehicle	School Bus (S-BUS-36)				
Primary Functional Classification	Urban Major Collector					Design Speed (mph)	35 / 25
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]	35 / 25

Approach			Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
Approach #1	Direction	Eastbound						
	Sidewalks along:	Neither side of the approach	Left-Turn	0				
	Crosswalk on Approach?	Yes	Left-Through	0	Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	0	Left	11	Left	7
	Multi-Use Path?	No	Left-Through-Right	1	Through	3	Through	2
	Scheduled Bus Service?	No	Through-Right	0	Right	29	Right	12
	Bus Stop on Approach?	No	Right-Turn	0	Daily Truck %		3.6%	
Approach #2	Direction	Westbound						
	Sidewalks along:	Both sides of the approach	Left-Turn	0				
	Crosswalk on Approach?	No	Left-Through	1	Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	0	Left	36	Left	75
	Multi-Use Path?	No	Left-Through-Right	0	Through	2	Through	2
	Scheduled Bus Service?	No	Through-Right	0	Right	56	Right	122
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		3.7%	
Approach #3	Direction							
	Sidewalks along:		Left-Turn					
	Crosswalk on Approach?		Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?		Through		Left		Left	
	Multi-Use Path?		Left-Through-Right		Through		Through	
	Scheduled Bus Service?		Through-Right		Right		Right	
	Bus Stop on Approach?		Right-Turn		Daily Truck %			

Crash History (Existing Intersections Only)
Append the most recent five-years of crash data for the intersection from the CAR System. If the crash data evidences any issues relating to safety performance, discuss briefly here:
The most recent five years of crash data on record (2017-2021) was collected for the study intersection. Over the five year history, 23 total crashes occurred with 6 resulting in at least one injury and no fatal crashes. Of the 6 injury crashes, 2 were rear ends, 2 were left turn, 1 was angle, and 1 was head-on. Rear end was the most common crash type with 11 crashes, followed by left turn with 5 crashes and sideswipe with 3 crashes. Of the 23 crashes, 12 (52 percent) occurred from 7-9 AM and 4-6 PM.

Control Strategy Evaluation							
Provide a brief justification as to why each of the following control strategies should be advanced or not. Justification should consider potential environmental impacts.							
	CAP-X Outputs			SPICE Outputs			
	V/C Ratio						
Control Strategy	Weekday AM Peak	Weekday PM Peak	Multimodal Score	Crash Prediction Rank	SSI Rank	Strategy to Be Advanced?	Justification
Two-Way Stop-Controlled	2.06	6.37	3.7	1	6	Yes	The existing TWSC condition will move forward as the future no-build for comparison purposes.
All-Way Stop-Controlled	-	-	-	-	-	No	The intersection meets signal warrants.
Signalized Control	0.39	0.51	4.8	5	5	Yes	The signal has a high performing V/C and provides safety benefit over the existing condition.
Roundabout	0.53 (2x1) 0.53 (2x2)	0.62 (2x1) 0.62 (2x2)	5.6	2	2	Yes	The minor approaches were found to not need two lanes. As a result, only the 2x1 configuration will be advanced.
Median U-Turn	0.42 (Partial) 0.43 (Full)	0.48 (Partial) 0.50 (Full)	6.3	3	1	Yes	The minor approaches observe more left turns than thrus. As the partial MUT facilitates left turns, it will be the only MUT configuration to advance.
RCUT (Signalized)	0.39	0.50	6.3	4	4	Yes	The signalized RCUT provides similar capacity and safety benefits as the signal.
RCUT (Unsignalized)	-	-	-	-	-	No	The intersection meets signal warrants.
Jughandle				-	-	No	Not feasible due to surrounding land use.
Displaced Left-Turn	-	-	-	-	-	No	Not feasible because left turn volumes are too low to justify a DLT.
Continuous Green Tee	-	-	-	-	-	No	This is a 4-leg intersection.
Quadrant Roadway	-	-	-			No	Not feasible due to surrounding land use and roadway connectivity.
Thru-Cut	0.52	0.65	5.2	-	3	No	The Thru-Cut ranks last in V/C of the Stage 1 alternatives assessed.
Other 1 (Type)	-	-	-	-	-	No	
Other 2 (Type)	-	-	-	-	-	No	

Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination	Multiple Viable Alternatives Identified: Continue to Stage 2				
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	

Appendix F
Stage 2 ICE Supporting Detail

Federal Highway Administration (FHWA)
Safety Performance for Intersection Control Evaluation Tool
Results
Summary of crash prediction results for each alternative

Project Information

Project Name:	Fiske Blvd. and Roy Wall Blvd. Intersection Analysis	**Intersection Type**	At-Grade Intersections
Intersection:	Fiske Boulevard at Roy Wall Boulevard/Martin Road	**Opening Year**	2030
Agency:	Space Coast Transportation Planning Organization	**Design Year**	2050
Project Reference:	Work Order 22-14K	**Facility Type**	On Urban and Suburban Arterial
City:	Rockledge	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	10/14/2022	**# of Major Street Lanes (both directions)**	5 or fewer
Analyst:	KAI	**Major Street Approach Speed**	Less than 55 mph

Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Crash Prediction Rank	AADT Within SPF Prediction Range?	Source of Prediction	SSI Score		
								Open Year	Design Year	Rank
Traffic Signal	Total	11.16	12.56	249.04	4	Yes	Calibrated SPF	97	97	4
	Fatal & Injury	3.97	4.50	88.93						
Minor Road Stop	Total	4.70	5.17	103.69	1	No	Calibrated SPF w/ EB	94	94	5
	Fatal & Injury	1.64	1.82	36.34						
2-lane Roundabout	Total	9.97	11.11	221.29	2	No	Uncalibrated SPF	99	99	1
	Fatal & Injury	1.92	2.16	42.77						
Median U-Turn (MUT)	Total	9.49	10.68	211.68	3	N/A	CMF	99	99	2
	Fatal & Injury	2.78	3.15	62.25						
Signalized RCUT	Total	19.57	22.48	441.29	5	Yes	Uncalibrated SPF	98	98	3
	Fatal & Injury	4.61	5.34	104.39						

All Roadways and Ramps		0.007	0.041	0.124	0.217	0.611	
Alternative	Total Predicted Crashes	Fatal Distribution	Incapacitating Injury Distribution	Non-Incapacitating Injury Distribution	Possible Injury Distribution	Property Damage Only Distribution	Fatal & Injury Total
Traffic Signal	*88.93*	1.600	9.373	28.348	49.609	160.110	88.930
Roundabout	*42.77*	0.770	4.508	13.634	23.859	178.520	42.770
PMUT	*62.25*	1.120	6.561	19.843	34.726	149.430	62.250
RCUT	*104.39*	1.878	11.003	33.276	58.233	336.900	104.390

All Roadways and Ramps	$10,890,000	$888,030	$180,180	$103,950	$7,700		
Alternative	Fatal Crash Cost	Severe Injury Crash Cost	Moderate Injury Crash Cost	Minor Injury Crash Cost	*Property Damage Only Crash Cost*	*Fatal & Injury Crash Cost*	***Total Crash Cost***
Traffic Signal	$17,427,079.43	$8,323,580.52	$5,107,718.55	$5,156,831.23	*$1,232,847.00*	*$36,015,209.75*	***$37,248,056.75***
Roundabout	$8,381,380.72	$4,003,143.36	$2,456,506.49	$2,480,126.75	*$1,374,604.00*	*$17,321,157.32*	***$18,695,761.32***
PMUT	$12,198,759.64	$5,826,412.77	$3,575,345.55	$3,609,723.88	*$1,150,611.00*	*$25,210,241.84*	***$26,360,852.84***
RCUT	$20,456,683.03	$9,770,590.02	$5,995,667.83	$6,053,318.48	*$2,594,130.00*	*$42,276,259.37*	***$44,870,389.37***

Opening Year (2030)
Operational Analysis - AM Peak Hour

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	3	29	37	2	58	8	900	129	71	1049	4
Future Vol, veh/h	11	3	29	37	2	58	8	900	129	71	1049	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	315	100	-	280	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	3	3	0	4	12	3	6	3	5	0
Mvmt Flow	12	3	32	41	2	64	9	1000	143	79	1166	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1845	2487	585	1761	2346	500	1170	0	0	1143	0	0
Stage 1	1326	1326	-	1018	1018	-	-	-	-	-	-	-
Stage 2	519	1161	-	743	1328	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.96	7.56	6.5	6.98	4.34	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.56	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.56	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.33	3.53	4	3.34	2.32	-	-	2.23	-	-
Pot Cap-1 Maneuver	47	30	452	53	37	511	539	-	-	601	-	-
Stage 1	167	227	-	252	317	-	-	-	-	-	-	-
Stage 2	513	272	-	371	226	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	35	26	452	~ 40	32	511	539	-	-	601	-	-
Mov Cap-2 Maneuver	35	26	-	~ 40	32	-	-	-	-	-	-	-
Stage 1	164	197	-	248	312	-	-	-	-	-	-	-
Stage 2	438	267	-	294	196	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	88.2	144	0.1	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	539	-	-	87	39	511	601	-	-
HCM Lane V/C Ratio	0.016	-	-	0.549	1.111	0.126	0.131	-	-
HCM Control Delay (s)	11.8	-	-	88.2	$ 338.6	13.1	11.9	-	-
HCM Lane LOS	B	-	-	F	F	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	4.3	0.4	0.5	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	3	29	37	2	58	8	900	129	71	1049	4
Future Volume (veh/h)	11	3	29	37	2	58	8	900	129	71	1049	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1856	1856	1900	1841	1722	1856	1811	1856	1826	1900
Adj Flow Rate, veh/h	12	3	32	41	2	64	9	1000	143	79	1166	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	3	3	0	4	12	3	6	3	5	0
Cap, veh/h	97	18	83	227	8	120	19	2246	958	108	2434	8
Arrive On Green	0.08	0.08	0.08	0.08	0.08	0.08	0.01	0.64	0.64	0.06	0.69	0.69
Sat Flow, veh/h	276	230	1079	1421	109	1560	1640	3526	1503	1767	3546	12
Grp Volume(v), veh/h	47	0	0	43	0	64	9	1000	143	79	570	600
Grp Sat Flow(s),veh/h/ln	1585	0	0	1531	0	1560	1640	1763	1503	1767	1735	1824
Q Serve(g_s), s	0.2	0.0	0.0	0.0	0.0	2.4	0.3	8.6	2.3	2.6	9.2	9.2
Cycle Q Clear(g_c), s	1.6	0.0	0.0	1.3	0.0	2.4	0.3	8.6	2.3	2.6	9.2	9.2
Prop In Lane	0.26		0.68	0.95		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	197	0	0	235	0	120	19	2246	958	108	1191	1252
V/C Ratio(X)	0.24	0.00	0.00	0.18	0.00	0.53	0.47	0.45	0.15	0.73	0.48	0.48
Avail Cap(c_a), veh/h	541	0	0	542	0	468	137	2246	958	153	1191	1252
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.3	0.0	0.0	26.2	0.0	26.7	29.5	5.5	4.4	27.7	4.4	4.4
Incr Delay (d2), s/veh	0.6	0.0	0.0	0.4	0.0	3.6	17.1	0.6	0.3	10.2	1.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	0.6	0.0	1.0	0.2	2.4	0.6	1.4	2.5	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	0.0	0.0	26.5	0.0	30.3	46.6	6.2	4.7	37.9	5.8	5.7
LnGrp LOS	C	A	A	C	A	C	D	A	A	D	A	A
Approach Vol, veh/h		47			107			1152			1249	
Approach Delay, s/veh		26.9			28.8			6.3			7.8	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	42.7		9.1	5.2	45.7		9.1
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.2	23.3		18.0	5.0	23.5		18.0
Max Q Clear Time (g_c+I1), s	4.6	10.6		3.6	2.3	11.2		4.4
Green Ext Time (p_c), s	0.0	6.1		0.1	0.0	6.2		0.3

Intersection Summary	
HCM 6th Ctrl Delay	8.3
HCM 6th LOS	A

MOVEMENT SUMMARY

Fiske Boulevard & Roy Wall Boulevard Roundabout Alternative 2030 AM Peak Hour

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Fiske Boulevard														
3	L2	8	12.0	9	12.0	0.458	7.8	LOS A	2.9	73.2	0.33	0.18	0.33	33.6
8	T1	900	3.0	1000	3.0	0.458	7.5	LOS A	2.9	73.2	0.33	0.18	0.33	33.9
18	R2	129	6.0	143	6.0	0.458	7.6	LOS A	2.8	72.9	0.33	0.18	0.33	32.7
Approach		1037	3.4	1152	3.4	0.458	7.6	LOS A	2.9	73.2	0.33	0.18	0.33	33.7
East: Roy Wall Boulevard														
1	L2	37	3.0	41	3.0	0.192	8.9	LOS A	0.7	16.8	0.64	0.64	0.64	32.3
6	T1	2	0.0	2	0.0	0.192	8.7	LOS A	0.7	16.8	0.64	0.64	0.64	32.2
16	R2	58	4.0	64	4.0	0.192	8.9	LOS A	0.7	16.8	0.64	0.64	0.64	31.3
Approach		97	3.5	108	3.5	0.192	8.9	LOS A	0.7	16.8	0.64	0.64	0.64	31.7
North: Fiske Boulevard														
7	L2	71	3.0	79	3.0	0.485	7.8	LOS A	3.2	82.2	0.25	0.11	0.25	33.5
4	T1	1049	5.0	1166	5.0	0.485	7.8	LOS A	3.2	82.2	0.25	0.11	0.25	33.6
14	R2	4	0.0	4	0.0	0.485	7.7	LOS A	3.2	82.0	0.25	0.11	0.25	32.7
Approach		1124	4.9	1249	4.9	0.485	7.8	LOS A	3.2	82.2	0.25	0.11	0.25	33.6
West: Martin Road														
5	L2	11	0.0	12	0.0	0.108	9.5	LOS A	0.3	8.8	0.71	0.71	0.71	32.3
2	T1	3	0.0	3	0.0	0.108	9.5	LOS A	0.3	8.8	0.71	0.71	0.71	32.2
12	R2	29	3.0	32	3.0	0.108	9.7	LOS A	0.3	8.8	0.71	0.71	0.71	31.3
Approach		43	2.0	48	2.0	0.108	9.7	LOS A	0.3	8.8	0.71	0.71	0.71	31.6
All Vehicles		2301	4.1	2557	4.1	0.485	7.8	LOS A	3.2	82.2	0.31	0.17	0.31	33.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	3	0	0	39	58	0	908	200	0	0	0
Future Volume (vph)	11	3	0	0	39	58	0	908	200	0	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.96			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1838			1912	1625		3632	1625			
Flt Permitted		0.88			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1674			1912	1625		3632	1625			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	3	0	0	43	64	0	1009	222	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	40	0	0	27	0	0	0
Lane Group Flow (vph)	0	15	0	0	43	24	0	1009	195	0	0	0
Turn Type	Perm	NA			NA	Perm		NA	Perm			
Protected Phases		4			8			6				
Permitted Phases	4					8			6			
Actuated Green, G (s)		14.6			9.1	9.1		25.1	25.1			
Effective Green, g (s)		15.6			15.6	15.6		26.1	26.1			
Actuated g/C Ratio		0.33			0.33	0.33		0.55	0.55			
Clearance Time (s)		4.0			9.5	9.5		4.0	4.0			
Vehicle Extension (s)		8.0			3.0	3.0		3.2	3.2			
Lane Grp Cap (vph)		547			625	531		1987	889			
v/s Ratio Prot					c0.02			c0.28				
v/s Ratio Perm		0.01				0.01			0.12			
v/c Ratio		0.03			0.07	0.04		0.51	0.22			
Uniform Delay, d1		10.9			11.0	11.0		6.8	5.6			
Progression Factor		0.36			1.00	1.00		0.38	0.14			
Incremental Delay, d2		0.1			0.0	0.0		0.2	0.1			
Delay (s)		4.0			11.1	11.0		2.8	0.9			
Level of Service		A			B	B		A	A			
Approach Delay (s)		4.0			11.0			2.5			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	71	0	0	1037	0	0
Future Volume (vph)	71	0	0	1037	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0			3.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	79	0	0	1152	0	0
RTOR Reduction (vph)	27	0	0	0	0	0
Lane Group Flow (vph)	52	0	0	1152	0	0
Turn Type	Prot			NA		
Protected Phases	3 5			1 7		
Permitted Phases						
Actuated Green, G (s)	9.3			30.4		
Effective Green, g (s)	10.3			31.4		
Actuated g/C Ratio	0.22			0.66		
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	350			2390		
v/s Ratio Prot	c0.03			c0.32		
v/s Ratio Perm						
v/c Ratio	0.15			0.48		
Uniform Delay, d1	15.2			4.1		
Progression Factor	0.42			1.00		
Incremental Delay, d2	0.2			0.2		
Delay (s)	6.5			4.2		
Level of Service	A			A		
Approach Delay (s)	6.5			4.2	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	15.5
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	8	0	0	0	0	1124
Future Volume (vph)	8	0	0	0	0	1124
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0					3.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	9	0	0	0	0	1249
RTOR Reduction (vph)	7	0	0	0	0	0
Lane Group Flow (vph)	2	0	0	0	0	1249
Turn Type	Prot					NA
Protected Phases	3 5					1 7
Permitted Phases						
Actuated Green, G (s)	9.3					30.4
Effective Green, g (s)	10.3					31.4
Actuated g/C Ratio	0.22					0.66
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	350					2390
v/s Ratio Prot	c0.00					c0.34
v/s Ratio Perm						
v/c Ratio	0.01					0.52
Uniform Delay, d1	14.7					4.2
Progression Factor	0.89					1.00
Incremental Delay, d2	0.0					0.2
Delay (s)	13.0					4.5
Level of Service	B					A
Approach Delay (s)	13.0		0.0			4.5
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	15.5
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	14	29	37	2	0	0	0	0	0	1120	12
Future Volume (vph)	0	14	29	37	2	0	0	0	0	0	1120	12
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0						3.0	
Lane Util. Factor		1.00			1.00						0.95	
Frt		0.91			1.00						1.00	
Flt Protected		1.00			0.95						1.00	
Satd. Flow (prot)		1740			1825						3627	
Flt Permitted		1.00			0.80						1.00	
Satd. Flow (perm)		1740			1528						3627	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	16	32	41	2	0	0	0	0	0	1244	13
RTOR Reduction (vph)	0	17	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	31	0	0	43	0	0	0	0	0	1256	0
Turn Type		NA		Perm	NA						NA	
Protected Phases		8			4						2	
Permitted Phases				4								
Actuated Green, G (s)		9.1			14.6						25.1	
Effective Green, g (s)		15.6			15.6						26.1	
Actuated g/C Ratio		0.33			0.33						0.55	
Clearance Time (s)		9.5			4.0						4.0	
Vehicle Extension (s)		3.0			8.0						3.2	
Lane Grp Cap (vph)		569			499						1984	
v/s Ratio Prot		0.02									c0.35	
v/s Ratio Perm					c0.03							
v/c Ratio		0.05			0.09						0.63	
Uniform Delay, d1		11.0			11.1						7.5	
Progression Factor		1.00			0.11						0.28	
Incremental Delay, d2		0.0			0.3						0.6	
Delay (s)		11.0			1.6						2.7	
Level of Service		B			A						A	
Approach Delay (s)		11.0			1.6			0.0			2.7	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	39	0	0	0	0	1124
Future Volume (vph)	39	0	0	0	0	1124
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	43	0	0	0	0	1249
RTOR Reduction (vph)	25	0	0	0	0	0
Lane Group Flow (vph)	18	0	0	0	0	1249
Turn Type	Prot					NA
Protected Phases	4					2
Permitted Phases						
Actuated Green, G (s)	4.7					75.3
Effective Green, g (s)	4.7					75.3
Actuated g/C Ratio	0.05					0.84
Clearance Time (s)	5.0					5.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	84					3038
v/s Ratio Prot	c0.01					c0.34
v/s Ratio Perm						
v/c Ratio	0.22					0.41
Uniform Delay, d1	40.9					1.8
Progression Factor	1.00					1.00
Incremental Delay, d2	1.3					0.4
Delay (s)	42.2					2.2
Level of Service	D					A
Approach Delay (s)	42.2		0.0			2.2
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	3.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR
Lane Configurations											
Traffic Volume (vph)	0	0	43	0	0	0	0	1086	6	8	0
Future Volume (vph)	0	0	43	0	0	0	0	1086	6	8	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0					5.0		5.0	
Lane Util. Factor			1.00					0.95		1.00	
Frt			0.86					1.00		1.00	
Flt Protected			1.00					1.00		0.95	
Satd. Flow (prot)			1654					3629		1816	
Flt Permitted			1.00					1.00		0.95	
Satd. Flow (perm)			1654					3629		1816	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	48	0	0	0	0	1207	7	9	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	48	0	0	0	0	1214	0	9	0
Turn Type			Perm					NA		Prot	
Protected Phases								2		4	
Permitted Phases			8								
Actuated Green, G (s)			7.7					72.3		7.7	
Effective Green, g (s)			7.7					72.3		7.7	
Actuated g/C Ratio			0.09					0.80		0.09	
Clearance Time (s)			5.0					5.0		5.0	
Vehicle Extension (s)			3.0					3.0		3.0	
Lane Grp Cap (vph)			141					2915		155	
v/s Ratio Prot								c0.33		0.00	
v/s Ratio Perm			c0.03								
v/c Ratio			0.34					0.42		0.06	
Uniform Delay, d1			38.8					2.6		37.8	
Progression Factor			1.00					0.70		1.00	
Incremental Delay, d2			1.4					0.4		0.2	
Delay (s)			40.2					2.2		38.0	
Level of Service			D					A		D	
Approach Delay (s)	40.2				0.0			2.2		38.0	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SER
Lane Configurations											
Traffic Volume (vph)	0	0	97	0	911	132	0	0	0	71	0
Future Volume (vph)	0	0	97	0	911	132	0	0	0	71	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0		5.0	5.0				5.0	
Lane Util. Factor			0.88		0.95	1.00				1.00	
Frt			0.85		1.00	0.85				1.00	
Flt Protected			1.00		1.00	1.00				0.95	
Satd. Flow (prot)			2860		3632	1625				1816	
Flt Permitted			1.00		1.00	1.00				0.95	
Satd. Flow (perm)			2860		3632	1625				1816	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	108	0	1012	147	0	0	0	79	0
RTOR Reduction (vph)	0	0	0	0	0	11	0	0	0	0	0
Lane Group Flow (vph)	0	0	108	0	1012	136	0	0	0	79	0
Turn Type			Perm		NA	Perm				Prot	
Protected Phases					6					8	
Permitted Phases			4			6					
Actuated Green, G (s)			11.9		98.1	98.1				11.9	
Effective Green, g (s)			11.9		98.1	98.1				11.9	
Actuated g/C Ratio			0.10		0.82	0.82				0.10	
Clearance Time (s)			5.0		5.0	5.0				5.0	
Vehicle Extension (s)			3.0		3.0	3.0				3.0	
Lane Grp Cap (vph)			283		2969	1328				180	
v/s Ratio Prot					c0.28					c0.04	
v/s Ratio Perm			0.04			0.08					
v/c Ratio			0.38		0.34	0.10				0.44	
Uniform Delay, d1			50.6		2.8	2.2				50.9	
Progression Factor			1.00		0.88	0.85				1.00	
Incremental Delay, d2			0.9		0.3	0.1				1.7	
Delay (s)			51.5		2.7	2.0				52.6	
Level of Service			D		A	A				D	
Approach Delay (s)	51.5				2.7			0.0		52.6	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	14	0	0	1037	0	0
Future Volume (vph)	14	0	0	1037	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	16	0	0	1152	0	0
RTOR Reduction (vph)	16	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1152	0	0
Turn Type	Prot			NA		
Protected Phases	8			6		
Permitted Phases						
Actuated Green, G (s)	2.2			109.8		
Effective Green, g (s)	2.2			109.8		
Actuated g/C Ratio	0.02			0.91		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	29			3323		
v/s Ratio Prot	c0.00			c0.32		
v/s Ratio Perm						
v/c Ratio	0.01			0.35		
Uniform Delay, d1	57.8			0.6		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.1			0.3		
Delay (s)	58.0			0.9		
Level of Service	E			A		
Approach Delay (s)	58.0			0.9	0.0	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	1.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Opening Year (2030)
Operational Analysis - PM Peak Hour

Intersection	
Int Delay, s/veh	39.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	2	12	78	2	127	25	1093	118	122	963	11
Future Vol, veh/h	7	2	12	78	2	127	25	1093	118	122	963	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	315	100	-	280	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	1	0	2	0	3	0	3	2	0
Mvmt Flow	7	2	13	81	2	132	26	1139	123	127	1003	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1886	2577	507	1948	2459	570	1014	0	0	1262	0	0
Stage 1	1263	1263	-	1191	1191	-	-	-	-	-	-	-
Stage 2	623	1314	-	757	1268	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.52	6.5	6.94	4.1	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.52	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.52	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.51	4	3.32	2.2	-	-	2.23	-	-
Pot Cap-1 Maneuver	44	26	516	~ 39	31	465	692	-	-	541	-	-
Stage 1	183	243	-	201	263	-	-	-	-	-	-	-
Stage 2	445	230	-	368	242	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	23	19	516	~ 28	23	465	692	-	-	541	-	-
Mov Cap-2 Maneuver	23	19	-	~ 28	23	-	-	-	-	-	-	-
Stage 1	176	186	-	193	253	-	-	-	-	-	-	-
Stage 2	304	221	-	272	185	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	127.9	$ 468.2	0.2	1.5
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	692	-	-	49	28	465	541	-	-
HCM Lane V/C Ratio	0.038	-	-	0.446	2.976	0.284	0.235	-	-
HCM Control Delay (s)	10.4	-	-	127.9	$ 1186.4	15.8	13.7	-	-
HCM Lane LOS	B	-	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	10	1.2	0.9	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	12	78	2	127	25	1093	118	122	963	11
Future Volume (veh/h)	7	2	12	78	2	127	25	1093	118	122	963	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1900	1870	1900	1856	1900	1856	1870	1900
Adj Flow Rate, veh/h	7	2	12	81	2	132	26	1139	123	127	1003	11
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	0	2	0	3	0	3	2	0
Cap, veh/h	12	3	21	183	5	164	45	2199	1004	155	2471	27
Arrive On Green	0.02	0.02	0.02	0.10	0.10	0.10	0.02	0.62	0.62	0.09	0.69	0.69
Sat Flow, veh/h	566	162	970	1768	44	1585	1810	3526	1610	1767	3601	39
Grp Volume(v), veh/h	21	0	0	83	0	132	26	1139	123	127	495	519
Grp Sat Flow(s),veh/h/ln	1697	0	0	1812	0	1585	1810	1763	1610	1767	1777	1863
Q Serve(g_s), s	1.3	0.0	0.0	4.7	0.0	9.0	1.6	19.8	3.4	7.8	13.3	13.3
Cycle Q Clear(g_c), s	1.3	0.0	0.0	4.7	0.0	9.0	1.6	19.8	3.4	7.8	13.3	13.3
Prop In Lane	0.33		0.57	0.98		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	37	0	0	188	0	164	45	2199	1004	155	1219	1279
V/C Ratio(X)	0.57	0.00	0.00	0.44	0.00	0.80	0.58	0.52	0.12	0.82	0.41	0.41
Avail Cap(c_a), veh/h	278	0	0	296	0	259	95	2199	1004	185	1219	1279
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.3	0.0	0.0	46.3	0.0	48.2	53.1	11.5	8.4	49.3	7.5	7.5
Incr Delay (d2), s/veh	13.4	0.0	0.0	1.6	0.0	9.3	11.1	0.9	0.2	21.6	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	2.2	0.0	4.0	0.8	7.5	1.2	4.3	4.9	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.8	0.0	0.0	47.9	0.0	57.5	64.2	12.4	8.7	70.9	8.5	8.5
LnGrp LOS	E	A	A	D	A	E	E	B	A	E	A	A
Approach Vol, veh/h		21			215			1288			1141	
Approach Delay, s/veh		66.8			53.8			13.1			15.4	
Approach LOS		E			D			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.1	73.1		6.9	7.2	80.0		15.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	11.5	44.5		18.0	5.8	50.2		18.0				
Max Q Clear Time (g_c+I1), s	9.8	21.8		3.3	3.6	15.3		11.0				
Green Ext Time (p_c), s	0.0	9.6		0.0	0.0	8.0		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			17.8									
HCM 6th LOS			B									

Notes

User approved pedestrian interval to be less than phase max green.

MOVEMENT SUMMARY

Fiske Boulevard & Roy Wall Boulevard Roundabout Alternative

2030 PM Peak Hour

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Fiske Boulevard														
3	L2	25	0.0	26	0.0	0.529	8.8	LOS A	3.6	91.1	0.44	0.28	0.44	33.3
8	T1	1093	3.0	1139	3.0	0.529	8.9	LOS A	3.6	91.5	0.44	0.28	0.44	33.2
18	R2	118	0.0	123	0.0	0.529	8.8	LOS A	3.6	91.5	0.44	0.28	0.44	32.2
Approach		1236	2.7	1288	2.7	0.529	8.9	LOS A	3.6	91.5	0.44	0.28	0.44	33.1
East: Roy Wall Boulevard														
1	L2	78	1.0	81	1.0	0.430	14.6	LOS B	1.9	48.4	0.76	0.85	1.08	29.9
6	T1	2	0.0	2	0.0	0.430	14.5	LOS B	1.9	48.4	0.76	0.85	1.08	29.8
16	R2	127	2.0	132	2.0	0.430	14.7	LOS B	1.9	48.4	0.76	0.85	1.08	29.1
Approach		207	1.6	216	1.6	0.430	14.6	LOS B	1.9	48.4	0.76	0.85	1.08	29.4
North: Fiske Boulevard														
7	L2	122	3.0	127	3.0	0.454	7.5	LOS A	2.8	71.9	0.35	0.20	0.35	33.4
4	T1	963	2.0	1003	2.0	0.454	7.5	LOS A	2.8	72.0	0.35	0.20	0.35	33.7
14	R2	11	0.0	11	0.0	0.454	7.4	LOS A	2.8	72.0	0.35	0.20	0.35	32.9
Approach		1096	2.1	1142	2.1	0.454	7.5	LOS A	2.8	72.0	0.35	0.20	0.35	33.6
West: Martin Road														
5	L2	7	0.0	7	0.0	0.044	7.8	LOS A	0.1	3.6	0.66	0.66	0.66	33.0
2	T1	2	0.0	2	0.0	0.044	7.8	LOS A	0.1	3.6	0.66	0.66	0.66	32.9
12	R2	12	0.0	13	0.0	0.044	7.8	LOS A	0.1	3.6	0.66	0.66	0.66	32.0
Approach		21	0.0	22	0.0	0.044	7.8	LOS A	0.1	3.6	0.66	0.66	0.66	32.4
All Vehicles		2560	2.3	2667	2.3	0.529	8.7	LOS A	3.6	91.5	0.43	0.29	0.46	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	2	0	0	80	127	0	1118	240	0	0	0
Future Volume (vph)	7	2	0	0	80	127	0	1118	240	0	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.96			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1840			1912	1625		3632	1625			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1912			1912	1625		3632	1625			
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	7	2	0	0	83	132	0	1165	250	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	34	0	0	32	0	0	0
Lane Group Flow (vph)	0	9	0	0	83	98	0	1165	218	0	0	0
Turn Type	Prot	NA			NA	Perm		NA	Perm			
Protected Phases	7!	4			8!			6				
Permitted Phases						8			6			
Actuated Green, G (s)		23.5			18.0	18.0		25.7	25.7			
Effective Green, g (s)		24.5			24.5	24.5		26.7	26.7			
Actuated g/C Ratio		0.43			0.43	0.43		0.47	0.47			
Clearance Time (s)		4.0			9.5	9.5		4.0	4.0			
Vehicle Extension (s)		8.0			3.0	3.0		3.2	3.2			
Lane Grp Cap (vph)		818			818	696		1695	758			
v/s Ratio Prot		0.00			0.04			c0.32				
v/s Ratio Perm		0.00				c0.06			0.13			
v/c Ratio		0.01			0.10	0.14		0.69	0.29			
Uniform Delay, d1		9.4			9.8	9.9		12.0	9.4			
Progression Factor		0.48			1.00	1.00		0.73	0.52			
Incremental Delay, d2		0.0			0.1	0.1		1.1	0.2			
Delay (s)		4.5			9.8	10.0		9.8	5.1			
Level of Service		A			A	B		A	A			
Approach Delay (s)		4.5			10.0			8.9			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	122	0	0	1236	0	0
Future Volume (vph)	122	0	0	1236	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0			3.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	127	0	0	1288	0	0
RTOR Reduction (vph)	17	0	0	0	0	0
Lane Group Flow (vph)	110	0	0	1288	0	0
Turn Type	Prot			NA		
Protected Phases	3 5			1 7		
Permitted Phases						
Actuated Green, G (s)	11.7			37.5		
Effective Green, g (s)	12.7			38.5		
Actuated g/C Ratio	0.22			0.67		
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	360			2444		
v/s Ratio Prot	c0.07			c0.35		
v/s Ratio Perm						
v/c Ratio	0.31			0.53		
Uniform Delay, d1	18.6			4.7		
Progression Factor	0.33			1.00		
Incremental Delay, d2	0.4			0.2		
Delay (s)	6.4			5.0		
Level of Service	A			A		
Approach Delay (s)	6.4			5.0	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	15.5
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	0	0	0	0	1096
Future Volume (vph)	25	0	0	0	0	1096
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0					3.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	0	0	0	0	1142
RTOR Reduction (vph)	20	0	0	0	0	0
Lane Group Flow (vph)	6	0	0	0	0	1142
Turn Type	Prot					NA
Protected Phases	3 5					1 7
Permitted Phases						
Actuated Green, G (s)	11.7					37.5
Effective Green, g (s)	12.7					38.5
Actuated g/C Ratio	0.22					0.67
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	360					2444
v/s Ratio Prot	c0.00					c0.31
v/s Ratio Perm						
v/c Ratio	0.02					0.47
Uniform Delay, d1	17.4					4.5
Progression Factor	0.37					1.00
Incremental Delay, d2	0.0					0.2
Delay (s)	6.5					4.6
Level of Service	A					A
Approach Delay (s)	6.5		0.0			4.6
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	15.5
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	9	12	78	2	0	0	0	0	0	1085	36
Future Volume (vph)	0	9	12	78	2	0	0	0	0	0	1085	36
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0						3.0	
Lane Util. Factor		1.00			1.00						0.95	
Frt		0.92			1.00						1.00	
Flt Protected		1.00			0.95						1.00	
Satd. Flow (prot)		1759			1823						3615	
Flt Permitted		1.00			0.80						1.00	
Satd. Flow (perm)		1759			1529						3615	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	9	12	81	2	0	0	0	0	0	1130	38
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	15	0	0	83	0	0	0	0	0	1164	0
Turn Type		NA		Prot	NA						NA	
Protected Phases		8!		3!	4						2	
Permitted Phases												
Actuated Green, G (s)		18.0			23.5						25.7	
Effective Green, g (s)		24.5			24.5						26.7	
Actuated g/C Ratio		0.43			0.43						0.47	
Clearance Time (s)		9.5			4.0						4.0	
Vehicle Extension (s)		3.0			8.0						3.2	
Lane Grp Cap (vph)		753			684						1687	
v/s Ratio Prot		0.01			c0.01						c0.32	
v/s Ratio Perm					c0.04							
v/c Ratio		0.02			0.12						0.69	
Uniform Delay, d1		9.4			9.9						12.0	
Progression Factor		1.00			0.62						0.63	
Incremental Delay, d2		0.0			0.3						1.1	
Delay (s)		9.4			6.5						8.6	
Level of Service		A			A						A	
Approach Delay (s)		9.4			6.5			0.0			8.6	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	0	0	0	0	1096
Future Volume (vph)	80	0	0	0	0	1096
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	0	0	0	0	1142
RTOR Reduction (vph)	34	0	0	0	0	0
Lane Group Flow (vph)	49	0	0	0	0	1142
Turn Type	Prot					NA
Protected Phases	4					2
Permitted Phases						
Actuated Green, G (s)	7.2					72.8
Effective Green, g (s)	7.2					72.8
Actuated g/C Ratio	0.08					0.81
Clearance Time (s)	5.0					5.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	130					2937
v/s Ratio Prot	c0.03					c0.31
v/s Ratio Perm						
v/c Ratio	0.38					0.39
Uniform Delay, d1	39.3					2.4
Progression Factor	1.00					1.00
Incremental Delay, d2	1.8					0.4
Delay (s)	41.1					2.8
Level of Service	D					A
Approach Delay (s)	41.1		0.0			2.8
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR
Lane Configurations											
Traffic Volume (vph)	0	0	21	0	0	0	0	1041	13	25	0
Future Volume (vph)	0	0	21	0	0	0	0	1041	13	25	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0					5.0		5.0	
Lane Util. Factor			1.00					0.95		1.00	
Frt			0.86					1.00		1.00	
Flt Protected			1.00					1.00		0.95	
Satd. Flow (prot)			1654					3625		1816	
Flt Permitted			1.00					1.00		0.95	
Satd. Flow (perm)			1654					3625		1816	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	22	0	0	0	0	1084	14	26	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	22	0	0	0	0	1098	0	26	0
Turn Type			Perm					NA		Prot	
Protected Phases								2		4	
Permitted Phases			8								
Actuated Green, G (s)			5.7					74.3		5.7	
Effective Green, g (s)			5.7					74.3		5.7	
Actuated g/C Ratio			0.06					0.83		0.06	
Clearance Time (s)			5.0					5.0		5.0	
Vehicle Extension (s)			3.0					3.0		3.0	
Lane Grp Cap (vph)			104					2992		115	
v/s Ratio Prot								c0.30		c0.01	
v/s Ratio Perm			0.01								
v/c Ratio			0.21					0.37		0.23	
Uniform Delay, d1			40.0					2.0		40.1	
Progression Factor			1.00					0.63		1.00	
Incremental Delay, d2			1.0					0.3		1.0	
Delay (s)			41.0					1.6		41.1	
Level of Service			D					A		D	
Approach Delay (s)	41.0				0.0			1.6		41.1	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SER
Lane Configurations											
Traffic Volume (vph)	0	0	207	0	1100	120	0	0	0	122	0
Future Volume (vph)	0	0	207	0	1100	120	0	0	0	122	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0		5.0	5.0				5.0	
Lane Util. Factor			0.88		0.95	1.00				1.00	
Frt			0.85		1.00	0.85				1.00	
Flt Protected			1.00		1.00	1.00				0.95	
Satd. Flow (prot)			2860		3632	1625				1816	
Flt Permitted			1.00		1.00	1.00				0.95	
Satd. Flow (perm)			2860		3632	1625				1816	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	216	0	1146	125	0	0	0	127	0
RTOR Reduction (vph)	0	0	0	0	0	12	0	0	0	0	0
Lane Group Flow (vph)	0	0	216	0	1146	113	0	0	0	127	0
Turn Type			Perm		NA	Perm				Prot	
Protected Phases					6					8	
Permitted Phases			4			6					
Actuated Green, G (s)			14.9		95.1	95.1				14.9	
Effective Green, g (s)			14.9		95.1	95.1				14.9	
Actuated g/C Ratio			0.12		0.79	0.79				0.12	
Clearance Time (s)			5.0		5.0	5.0				5.0	
Vehicle Extension (s)			3.0		3.0	3.0				3.0	
Lane Grp Cap (vph)			355		2878	1287				225	
v/s Ratio Prot					c0.32					0.07	
v/s Ratio Perm			c0.08			0.07					
v/c Ratio			0.61		0.40	0.09				0.56	
Uniform Delay, d1			49.8		3.8	2.8				49.5	
Progression Factor			1.00		0.94	0.88				1.00	
Incremental Delay, d2			2.9		0.4	0.1				3.2	
Delay (s)			52.7		3.9	2.6				52.7	
Level of Service			D		A	A				D	
Approach Delay (s)	52.7				3.8			0.0		52.7	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	9	0	0	1236	0	0
Future Volume (vph)	9	0	0	1236	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	9	0	0	1288	0	0
RTOR Reduction (vph)	9	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1288	0	0
Turn Type	Prot			NA		
Protected Phases	8			6		
Permitted Phases						
Actuated Green, G (s)	1.1			110.9		
Effective Green, g (s)	1.1			110.9		
Actuated g/C Ratio	0.01			0.92		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	14			3356		
v/s Ratio Prot	c0.00			c0.35		
v/s Ratio Perm						
v/c Ratio	0.01			0.38		
Uniform Delay, d1	58.9			0.5		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.2			0.3		
Delay (s)	59.1			0.9		
Level of Service	E			A		
Approach Delay (s)	59.1			0.9	0.0	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	1.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Design Year (2050)
Operational Analysis - AM Peak Hour

Intersection	
Int Delay, s/veh	16.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	3	29	41	2	64	8	995	143	78	1159	4
Future Vol, veh/h	11	3	29	41	2	64	8	995	143	78	1159	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	315	100	-	280	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	3	3	0	4	12	3	6	3	5	0
Mvmt Flow	12	3	32	46	2	71	9	1106	159	87	1288	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2036	2747	646	1944	2590	553	1292	0	0	1265	0	0
Stage 1	1464	1464	-	1124	1124	-	-	-	-	-	-	-
Stage 2	572	1283	-	820	1466	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.96	7.56	6.5	6.98	4.34	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.56	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.56	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.33	3.53	4	3.34	2.32	-	-	2.23	-	-
Pot Cap-1 Maneuver	34	20	412	~ 39	26	472	482	-	-	540	-	-
Stage 1	137	195	-	217	283	-	-	-	-	-	-	-
Stage 2	477	238	-	333	194	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	23	16	412	~ 26	21	472	482	-	-	540	-	-
Mov Cap-2 Maneuver	23	16	-	~ 26	21	-	-	-	-	-	-	-
Stage 1	134	164	-	213	278	-	-	-	-	-	-	-
Stage 2	394	233	-	252	163	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	184.2	297.4	0.1	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	482	-	-	58	26	472	540	-	-
HCM Lane V/C Ratio	0.018	-	-	0.824	1.838	0.151	0.16	-	-
HCM Control Delay (s)	12.6	-	-	184.2	$ 719.2	14	12.9	-	-
HCM Lane LOS	B	-	-	F	F	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.6	5.8	0.5	0.6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	3	29	41	2	64	8	995	143	78	1159	4
Future Volume (veh/h)	11	3	29	41	2	64	8	995	143	78	1159	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1856	1856	1900	1841	1722	1856	1811	1856	1826	1900
Adj Flow Rate, veh/h	12	3	32	46	2	71	9	1106	159	87	1288	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	3	3	0	4	12	3	6	3	5	0
Cap, veh/h	96	18	83	230	8	122	19	2232	952	113	2431	8
Arrive On Green	0.08	0.08	0.08	0.08	0.08	0.08	0.01	0.63	0.63	0.06	0.69	0.69
Sat Flow, veh/h	267	231	1062	1436	98	1560	1640	3526	1503	1767	3548	11
Grp Volume(v), veh/h	47	0	0	48	0	71	9	1106	159	87	630	662
Grp Sat Flow(s),veh/h/ln	1561	0	0	1533	0	1560	1640	1763	1503	1767	1735	1824
Q Serve(g_s), s	0.2	0.0	0.0	0.0	0.0	2.6	0.3	10.1	2.6	2.9	10.8	10.8
Cycle Q Clear(g_c), s	1.7	0.0	0.0	1.5	0.0	2.6	0.3	10.1	2.6	2.9	10.8	10.8
Prop In Lane	0.26		0.68	0.96		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	197	0	0	237	0	122	19	2232	952	113	1189	1250
V/C Ratio(X)	0.24	0.00	0.00	0.20	0.00	0.58	0.47	0.50	0.17	0.77	0.53	0.53
Avail Cap(c_a), veh/h	538	0	0	543	0	468	137	2232	952	153	1189	1250
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	0.0	26.2	0.0	26.7	29.5	5.9	4.5	27.7	4.7	4.7
Incr Delay (d2), s/veh	0.6	0.0	0.0	0.4	0.0	4.4	17.1	0.8	0.4	15.2	1.7	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	0.6	0.0	1.1	0.2	2.9	0.7	1.6	2.9	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.8	0.0	0.0	26.6	0.0	31.1	46.6	6.7	4.9	42.8	6.4	6.3
LnGrp LOS	C	A	A	C	A	C	D	A	A	D	A	A
Approach Vol, veh/h		47			119			1274			1379	
Approach Delay, s/veh		26.8			29.3			6.7			8.6	
Approach LOS		C			C			A			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	42.5		9.2	5.2	45.6		9.2				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.2	23.3		18.0	5.0	23.5		18.0				
Max Q Clear Time (g_c+I1), s	4.9	12.1		3.7	2.3	12.8		4.6				
Green Ext Time (p_c), s	0.0	6.2		0.1	0.0	6.2		0.3				
Intersection Summary												
HCM 6th Ctrl Delay			8.9									
HCM 6th LOS			A									

MOVEMENT SUMMARY

Fiske Boulevard & Roy Wall Boulevard Roundabout Alternative

2050 AM Peak Hour

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Fiske Boulevard														
3	L2	8	12.0	9	12.0	0.510	8.6	LOS A	3.4	87.8	0.37	0.21	0.37	33.2
8	T1	995	3.0	1106	3.0	0.510	8.4	LOS A	3.4	87.8	0.37	0.21	0.37	33.4
18	R2	143	6.0	159	6.0	0.510	8.5	LOS A	3.4	87.3	0.37	0.21	0.37	32.3
Approach		1146	3.4	1273	3.4	0.510	8.4	LOS A	3.4	87.8	0.37	0.21	0.37	33.3
East: Roy Wall Boulevard														
1	L2	41	3.0	46	3.0	0.233	10.3	LOS B	0.8	20.3	0.68	0.68	0.68	31.6
6	T1	2	0.0	2	0.0	0.233	10.1	LOS B	0.8	20.3	0.68	0.68	0.68	31.6
16	R2	64	4.0	71	4.0	0.233	10.4	LOS B	0.8	20.3	0.68	0.68	0.68	30.7
Approach		107	3.5	119	3.5	0.233	10.3	LOS B	0.8	20.3	0.68	0.68	0.68	31.1
North: Fiske Boulevard														
7	L2	78	3.0	87	3.0	0.537	8.6	LOS A	3.8	99.2	0.29	0.13	0.29	33.0
4	T1	1159	5.0	1288	5.0	0.537	8.7	LOS A	3.8	99.2	0.29	0.13	0.29	33.1
14	R2	4	0.0	4	0.0	0.537	8.6	LOS A	3.8	98.9	0.29	0.13	0.29	32.3
Approach		1241	4.9	1379	4.9	0.537	8.7	LOS A	3.8	99.2	0.29	0.13	0.29	33.1
West: Martin Road														
5	L2	11	0.0	12	0.0	0.122	10.9	LOS B	0.4	9.8	0.74	0.74	0.74	31.7
2	T1	3	0.0	3	0.0	0.122	10.9	LOS B	0.4	9.8	0.74	0.74	0.74	31.5
12	R2	29	3.0	32	3.0	0.122	11.1	LOS B	0.4	9.8	0.74	0.74	0.74	30.7
Approach		43	2.0	48	2.0	0.122	11.0	LOS B	0.4	9.8	0.74	0.74	0.74	31.0
All Vehicles		2537	4.1	2819	4.1	0.537	8.7	LOS A	3.8	99.2	0.35	0.20	0.35	33.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	3	0	0	43	64	0	1003	221	0	0	0
Future Volume (vph)	11	3	0	0	43	64	0	1003	221	0	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.96			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1838			1912	1625		3632	1625			
Flt Permitted		0.87			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1669			1912	1625		3632	1625			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	3	0	0	48	71	0	1114	246	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	41	0	0	27	0	0	0
Lane Group Flow (vph)	0	15	0	0	48	30	0	1114	219	0	0	0
Turn Type	Perm	NA			NA	Perm		NA	Perm			
Protected Phases		4			8			6				
Permitted Phases	4					8			6			
Actuated Green, G (s)		14.6			9.1	9.1		26.2	26.2			
Effective Green, g (s)		15.6			15.6	15.6		27.2	27.2			
Actuated g/C Ratio		0.32			0.32	0.32		0.56	0.56			
Clearance Time (s)		4.0			9.5	9.5		4.0	4.0			
Vehicle Extension (s)		8.0			3.0	3.0		3.2	3.2			
Lane Grp Cap (vph)		533			611	519		2024	905			
v/s Ratio Prot					c0.03			c0.31				
v/s Ratio Perm		0.01				0.02			0.14			
v/c Ratio		0.03			0.08	0.06		0.55	0.24			
Uniform Delay, d1		11.4			11.6	11.5		6.9	5.5			
Progression Factor		0.27			1.00	1.00		0.38	0.16			
Incremental Delay, d2		0.1			0.1	0.0		0.3	0.1			
Delay (s)		3.2			11.6	11.6		2.9	1.0			
Level of Service		A			B	B		A	A			
Approach Delay (s)		3.2			11.6			2.6			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	78	0	0	1146	0	0
Future Volume (vph)	78	0	0	1146	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0			3.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	87	0	0	1273	0	0
RTOR Reduction (vph)	18	0	0	0	0	0
Lane Group Flow (vph)	69	0	0	1273	0	0
Turn Type	Prot			NA		
Protected Phases	3 5			1 7		
Permitted Phases						
Actuated Green, G (s)	9.5			31.3		
Effective Green, g (s)	10.5			32.3		
Actuated g/C Ratio	0.22			0.66		
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	349			2403		
v/s Ratio Prot	c0.04			c0.35		
v/s Ratio Perm						
v/c Ratio	0.20			0.53		
Uniform Delay, d1	15.7			4.3		
Progression Factor	0.36			1.00		
Incremental Delay, d2	0.2			0.2		
Delay (s)	5.9			4.5		
Level of Service	A			A		
Approach Delay (s)	5.9			4.5	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	15.5
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	8	0	0	0	0	1241
Future Volume (vph)	8	0	0	0	0	1241
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0					3.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	9	0	0	0	0	1379
RTOR Reduction (vph)	7	0	0	0	0	0
Lane Group Flow (vph)	2	0	0	0	0	1379
Turn Type	Prot					NA
Protected Phases	3 5					1 7
Permitted Phases						
Actuated Green, G (s)	9.5					31.3
Effective Green, g (s)	10.5					32.3
Actuated g/C Ratio	0.22					0.66
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	349					2403
v/s Ratio Prot	c0.00					c0.38
v/s Ratio Perm						
v/c Ratio	0.01					0.57
Uniform Delay, d1	15.0					4.5
Progression Factor	0.52					1.00
Incremental Delay, d2	0.0					0.3
Delay (s)	7.9					4.8
Level of Service	A					A
Approach Delay (s)	7.9		0.0			4.8
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	15.5
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	14	29	41	2	0	0	0	0	0	1237	12
Future Volume (vph)	0	14	29	41	2	0	0	0	0	0	1237	12
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0						3.0	
Lane Util. Factor		1.00			1.00						0.95	
Frt		0.91			1.00						1.00	
Flt Protected		1.00			0.95						1.00	
Satd. Flow (prot)		1740			1824						3627	
Flt Permitted		1.00			0.79						1.00	
Satd. Flow (perm)		1740			1511						3627	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	16	32	46	2	0	0	0	0	0	1374	13
RTOR Reduction (vph)	0	12	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	36	0	0	48	0	0	0	0	0	1386	0
Turn Type		NA		Perm	NA						NA	
Protected Phases		8			4						2	
Permitted Phases				4								
Actuated Green, G (s)		9.1			14.6						26.2	
Effective Green, g (s)		15.6			15.6						27.2	
Actuated g/C Ratio		0.32			0.32						0.56	
Clearance Time (s)		9.5			4.0						4.0	
Vehicle Extension (s)		3.0			8.0						3.2	
Lane Grp Cap (vph)		556			483						2021	
v/s Ratio Prot		0.02									c0.38	
v/s Ratio Perm					c0.03							
v/c Ratio		0.07			0.10						0.69	
Uniform Delay, d1		11.5			11.7						7.7	
Progression Factor		1.00			0.11						0.27	
Incremental Delay, d2		0.0			0.4						0.9	
Delay (s)		11.6			1.7						3.0	
Level of Service		B			A						A	
Approach Delay (s)		11.6			1.7			0.0			3.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	43	0	0	0	0	1241
Future Volume (vph)	43	0	0	0	0	1241
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	5.0					5.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	48	0	0	0	0	1379
RTOR Reduction (vph)	17	0	0	0	0	0
Lane Group Flow (vph)	31	0	0	0	0	1379
Turn Type	Prot					NA
Protected Phases	4					2
Permitted Phases						
Actuated Green, G (s)	5.1					74.9
Effective Green, g (s)	5.1					74.9
Actuated g/C Ratio	0.06					0.83
Clearance Time (s)	5.0					5.0
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	92					3022
v/s Ratio Prot	c0.02					c0.38
v/s Ratio Perm						
v/c Ratio	0.34					0.46
Uniform Delay, d1	40.8					2.0
Progression Factor	1.00					1.00
Incremental Delay, d2	2.2					0.5
Delay (s)	43.0					2.5
Level of Service	D					A
Approach Delay (s)	43.0		0.0			2.5
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay	3.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR
Lane Configurations											
Traffic Volume (vph)	0	0	43	0	0	0	0	1200	6	8	0
Future Volume (vph)	0	0	43	0	0	0	0	1200	6	8	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0					5.0		5.0	
Lane Util. Factor			1.00					0.95		1.00	
Frt			0.86					1.00		1.00	
Flt Protected			1.00					1.00		0.95	
Satd. Flow (prot)			1654					3630		1816	
Flt Permitted			1.00					1.00		0.95	
Satd. Flow (perm)			1654					3630		1816	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	48	0	0	0	0	1333	7	9	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	48	0	0	0	0	1340	0	9	0
Turn Type			Perm					NA		Prot	
Protected Phases								2		4	
Permitted Phases			8								
Actuated Green, G (s)			7.7					72.3		7.7	
Effective Green, g (s)			7.7					72.3		7.7	
Actuated g/C Ratio			0.09					0.80		0.09	
Clearance Time (s)			5.0					5.0		5.0	
Vehicle Extension (s)			3.0					3.0		3.0	
Lane Grp Cap (vph)			141					2916		155	
v/s Ratio Prot								c0.37		0.00	
v/s Ratio Perm			c0.03								
v/c Ratio			0.34					0.46		0.06	
Uniform Delay, d1			38.8					2.8		37.8	
Progression Factor			1.00					0.67		1.00	
Incremental Delay, d2			1.4					0.5		0.2	
Delay (s)			40.2					2.3		38.0	
Level of Service			D					A		D	
Approach Delay (s)	40.2				0.0			2.3		38.0	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	3.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	WBR2	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SER
Lane Configurations											
Traffic Volume (vph)	0	0	107	0	1006	146	0	0	0	78	0
Future Volume (vph)	0	0	107	0	1006	146	0	0	0	78	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)			5.0		5.0	5.0				5.0	
Lane Util. Factor			0.88		0.95	1.00				1.00	
Frt			0.85		1.00	0.85				1.00	
Flt Protected			1.00		1.00	1.00				0.95	
Satd. Flow (prot)			2860		3632	1625				1816	
Flt Permitted			1.00		1.00	1.00				0.95	
Satd. Flow (perm)			2860		3632	1625				1816	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	119	0	1118	162	0	0	0	87	0
RTOR Reduction (vph)	0	0	0	0	0	11	0	0	0	0	0
Lane Group Flow (vph)	0	0	119	0	1118	151	0	0	0	87	0
Turn Type			Perm		NA	Perm				Prot	
Protected Phases					6					8	
Permitted Phases			4			6					
Actuated Green, G (s)			12.3		97.7	97.7				12.3	
Effective Green, g (s)			12.3		97.7	97.7				12.3	
Actuated g/C Ratio			0.10		0.81	0.81				0.10	
Clearance Time (s)			5.0		5.0	5.0				5.0	
Vehicle Extension (s)			3.0		3.0	3.0				3.0	
Lane Grp Cap (vph)			293		2957	1323				186	
v/s Ratio Prot					c0.31					c0.05	
v/s Ratio Perm			0.04			0.09					
v/c Ratio			0.41		0.38	0.11				0.47	
Uniform Delay, d1			50.4		3.0	2.3				50.8	
Progression Factor			1.00		0.87	0.85				1.00	
Incremental Delay, d2			0.9		0.4	0.2				1.9	
Delay (s)			51.4		3.0	2.1				52.6	
Level of Service			D		A	A				D	
Approach Delay (s)	51.4				2.9			0.0		52.6	
Approach LOS	D				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	14	0	0	1146	0	0
Future Volume (vph)	14	0	0	1146	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	4.0			4.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	16	0	0	1273	0	0
RTOR Reduction (vph)	16	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	1273	0	0
Turn Type	Prot			NA		
Protected Phases	8			6		
Permitted Phases						
Actuated Green, G (s)	2.2			109.8		
Effective Green, g (s)	2.2			109.8		
Actuated g/C Ratio	0.02			0.91		
Clearance Time (s)	4.0			4.0		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	29			3323		
v/s Ratio Prot	c0.00			c0.35		
v/s Ratio Perm						
v/c Ratio	0.01			0.38		
Uniform Delay, d1	57.8			0.7		
Progression Factor	1.00			1.00		
Incremental Delay, d2	0.1			0.3		
Delay (s)	58.0			1.0		
Level of Service	E			A		
Approach Delay (s)	58.0			1.0	0.0	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	1.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Design Year (2050)
Operational Analysis - PM Peak Hour

Intersection	
Int Delay, s/veh	74.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	2	12	86	2	140	25	1207	130	135	1064	11
Future Vol, veh/h	7	2	12	86	2	140	25	1207	130	135	1064	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	315	100	-	280	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	1	0	2	0	3	0	3	2	0
Mvmt Flow	7	2	13	90	2	146	26	1257	135	141	1108	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2078	2840	560	2146	2710	629	1119	0	0	1392	0	0
Stage 1	1396	1396	-	1309	1309	-	-	-	-	-	-	-
Stage 2	682	1444	-	837	1401	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.52	6.5	6.94	4.1	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.52	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.52	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.51	4	3.32	2.2	-	-	2.23	-	-
Pot Cap-1 Maneuver	32	18	477	~ 28	21	425	632	-	-	482	-	-
Stage 1	151	210	-	170	231	-	-	-	-	-	-	-
Stage 2	411	199	-	330	209	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	14	12	477	~ 18	14	425	632	-	-	482	-	-
Mov Cap-2 Maneuver	14	12	-	~ 18	14	-	-	-	-	-	-	-
Stage 1	145	148	-	163	222	-	-	-	-	-	-	-
Stage 2	256	191	-	224	148	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	271.6	$ 886.6	0.2	1.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	632	-	-	30	18	425	482	-	-
HCM Lane V/C Ratio	0.041	-	-	0.729	5.093	0.343	0.292	-	-
HCM Control Delay (s)	10.9	-	-	271.6	$ 2268.8	17.8	15.5	-	-
HCM Lane LOS	B	-	-	F	F	C	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	12.1	1.5	1.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	12	86	2	140	25	1207	130	135	1064	11
Future Volume (veh/h)	7	2	12	86	2	140	25	1207	130	135	1064	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1900	1885	1900	1870	1900	1856	1900	1856	1870	1900
Adj Flow Rate, veh/h	7	2	12	90	2	146	26	1257	135	141	1108	11
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	0	2	0	3	0	3	2	0
Cap, veh/h	12	3	21	199	4	178	45	2139	977	169	2442	24
Arrive On Green	0.02	0.02	0.02	0.11	0.11	0.11	0.02	0.61	0.61	0.10	0.68	0.68
Sat Flow, veh/h	566	162	970	1772	39	1585	1810	3526	1610	1767	3605	36
Grp Volume(v), veh/h	21	0	0	92	0	146	26	1257	135	141	546	573
Grp Sat Flow(s),veh/h/ln	1697	0	0	1811	0	1585	1810	1763	1610	1767	1777	1864
Q Serve(g_s), s	1.3	0.0	0.0	5.2	0.0	9.9	1.6	24.0	4.0	8.6	15.7	15.7
Cycle Q Clear(g_c), s	1.3	0.0	0.0	5.2	0.0	9.9	1.6	24.0	4.0	8.6	15.7	15.7
Prop In Lane	0.33		0.57	0.98		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	37	0	0	204	0	178	45	2139	977	169	1204	1263
V/C Ratio(X)	0.57	0.00	0.00	0.45	0.00	0.82	0.58	0.59	0.14	0.83	0.45	0.45
Avail Cap(c_a), veh/h	278	0	0	296	0	259	95	2139	977	185	1204	1263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.3	0.0	0.0	45.6	0.0	47.7	53.1	13.2	9.3	48.9	8.3	8.3
Incr Delay (d2), s/veh	13.4	0.0	0.0	1.6	0.0	12.5	11.1	1.2	0.3	25.3	1.2	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	2.4	0.0	4.5	0.8	9.3	1.4	5.0	5.9	6.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.8	0.0	0.0	47.2	0.0	60.2	64.2	14.4	9.6	74.2	9.5	9.4
LnGrp LOS	E	A	A	D	A	E	E	B	A	E	A	A
Approach Vol, veh/h		21			238			1418			1260	
Approach Delay, s/veh		66.8			55.2			14.9			16.7	
Approach LOS		E			E			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.0	71.2		6.9	7.2	79.0		16.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	11.5	44.5		18.0	5.8	50.2		18.0				
Max Q Clear Time (g_c+I1), s	10.6	26.0		3.3	3.6	17.7		11.9				
Green Ext Time (p_c), s	0.0	9.6		0.0	0.0	9.1		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			19.3
HCM 6th LOS			B

Notes

User approved pedestrian interval to be less than phase max green.

MOVEMENT SUMMARY

Fiske Boulevard & Roy Wall Boulevard Roundabout Alternative

2050 PM Peak Hour

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Fiske Boulevard														
3	L2	25	0.0	26	0.0	0.590	10.1	LOS B	4.3	110.9	0.51	0.33	0.51	32.7
8	T1	1207	3.0	1257	3.0	0.590	10.2	LOS B	4.4	111.5	0.51	0.33	0.51	32.6
18	R2	130	0.0	135	0.0	0.590	10.1	LOS B	4.4	111.5	0.51	0.33	0.51	31.6
Approach		1362	2.7	1419	2.7	0.590	10.2	LOS B	4.4	111.5	0.51	0.33	0.51	32.5
East: Roy Wall Boulevard														
1	L2	86	1.0	90	1.0	0.526	19.0	LOS C	2.5	63.8	0.81	0.95	1.31	28.2
6	T1	2	0.0	2	0.0	0.526	19.0	LOS C	2.5	63.8	0.81	0.95	1.31	28.2
16	R2	140	2.0	146	2.0	0.526	19.1	LOS C	2.5	63.8	0.81	0.95	1.31	27.5
Approach		228	1.6	238	1.6	0.526	19.1	LOS C	2.5	63.8	0.81	0.95	1.31	27.8
North: Fiske Boulevard														
7	L2	135	3.0	141	3.0	0.505	8.3	LOS A	3.4	85.9	0.39	0.23	0.39	33.0
4	T1	1064	2.0	1108	2.0	0.505	8.3	LOS A	3.4	86.1	0.39	0.23	0.39	33.3
14	R2	11	0.0	11	0.0	0.505	8.2	LOS A	3.4	86.1	0.39	0.23	0.39	32.5
Approach		1210	2.1	1260	2.1	0.505	8.3	LOS A	3.4	86.1	0.39	0.23	0.39	33.2
West: Martin Road														
5	L2	7	0.0	7	0.0	0.049	8.8	LOS A	0.2	3.9	0.70	0.70	0.70	32.6
2	T1	2	0.0	2	0.0	0.049	8.8	LOS A	0.2	3.9	0.70	0.70	0.70	32.4
12	R2	12	0.0	13	0.0	0.049	8.8	LOS A	0.2	3.9	0.70	0.70	0.70	31.6
Approach		21	0.0	22	0.0	0.049	8.8	LOS A	0.2	3.9	0.70	0.70	0.70	32.0
All Vehicles		2821	2.3	2939	2.3	0.590	10.1	LOS B	4.4	111.5	0.48	0.34	0.52	32.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	2	0	0	88	140	0	1232	265	0	0	0
Future Volume (vph)	7	2	0	0	88	140	0	1232	265	0	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		0.96			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1840			1912	1625		3632	1625			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1912			1912	1625		3632	1625			
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	7	2	0	0	92	146	0	1283	276	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	34	0	0	32	0	0	0
Lane Group Flow (vph)	0	9	0	0	92	112	0	1283	244	0	0	0
Turn Type	Prot	NA			NA	Perm		NA	Perm			
Protected Phases	7!	4			8!			6				
Permitted Phases						8			6			
Actuated Green, G (s)		23.6			18.1	18.1		25.7	25.7			
Effective Green, g (s)		24.6			24.6	24.6		26.7	26.7			
Actuated g/C Ratio		0.43			0.43	0.43		0.47	0.47			
Clearance Time (s)		4.0			9.5	9.5		4.0	4.0			
Vehicle Extension (s)		8.0			3.0	3.0		3.2	3.2			
Lane Grp Cap (vph)		820			820	697		1692	757			
v/s Ratio Prot		0.00			0.05			c0.35				
v/s Ratio Perm		0.00				c0.07			0.15			
v/c Ratio		0.01			0.11	0.16		0.76	0.32			
Uniform Delay, d1		9.4			9.8	10.0		12.6	9.6			
Progression Factor		0.48			1.00	1.00		0.70	0.47			
Incremental Delay, d2		0.0			0.1	0.1		1.7	0.2			
Delay (s)		4.5			9.9	10.1		10.6	4.7			
Level of Service		A			A	B		B	A			
Approach Delay (s)		4.5			10.0			9.5			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
! Phase conflict between lane groups.			
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	135	0	0	1362	0	0
Future Volume (vph)	135	0	0	1362	0	0
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0			3.0		
Lane Util. Factor	1.00			0.95		
Frt	1.00			1.00		
Flt Protected	0.85			1.00		
Satd. Flow (prot)	1625			3632		
Flt Permitted	0.85			1.00		
Satd. Flow (perm)	1625			3632		
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	141	0	0	1419	0	0
RTOR Reduction (vph)	12	0	0	0	0	0
Lane Group Flow (vph)	129	0	0	1419	0	0
Turn Type	Prot			NA		
Protected Phases	3 5			1 7		
Permitted Phases						
Actuated Green, G (s)	12.1			37.2		
Effective Green, g (s)	13.1			38.2		
Actuated g/C Ratio	0.23			0.67		
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	371			2421		
v/s Ratio Prot	c0.08			c0.39		
v/s Ratio Perm						
v/c Ratio	0.35			0.59		
Uniform Delay, d1	18.5			5.2		
Progression Factor	0.33			1.00		
Incremental Delay, d2	0.4			0.4		
Delay (s)	6.4			5.6		
Level of Service	A			A		
Approach Delay (s)	6.4			5.6	0.0	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	15.5
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	25	0	0	0	0	1210
Future Volume (vph)	25	0	0	0	0	1210
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950
Total Lost time (s)	3.0					3.0
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.85					1.00
Satd. Flow (prot)	1625					3632
Flt Permitted	0.85					1.00
Satd. Flow (perm)	1625					3632
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	26	0	0	0	0	1260
RTOR Reduction (vph)	19	0	0	0	0	0
Lane Group Flow (vph)	7	0	0	0	0	1260
Turn Type	Prot					NA
Protected Phases	3 5					1 7
Permitted Phases						
Actuated Green, G (s)	12.1					37.2
Effective Green, g (s)	13.1					38.2
Actuated g/C Ratio	0.23					0.67
Clearance Time (s)						
Vehicle Extension (s)						
Lane Grp Cap (vph)	371					2421
v/s Ratio Prot	c0.00					c0.35
v/s Ratio Perm						
v/c Ratio	0.02					0.52
Uniform Delay, d1	17.1					4.9
Progression Factor	0.27					1.00
Incremental Delay, d2	0.0					0.2
Delay (s)	4.6					5.1
Level of Service	A					A
Approach Delay (s)	4.6		0.0			5.1
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	15.5
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	9	12	86	2	0	0	0	0	0	1199	36
Future Volume (vph)	0	9	12	86	2	0	0	0	0	0	1199	36
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		3.0			3.0						3.0	
Lane Util. Factor		1.00			1.00						0.95	
Frt		0.92			1.00						1.00	
Flt Protected		1.00			0.95						1.00	
Satd. Flow (prot)		1759			1823						3616	
Flt Permitted		1.00			0.79						1.00	
Satd. Flow (perm)		1759			1515						3616	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	9	12	90	2	0	0	0	0	0	1249	38
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	0	15	0	0	92	0	0	0	0	0	1284	0
Turn Type		NA		Prot	NA						NA	
Protected Phases		8!		3!	4						2	
Permitted Phases												
Actuated Green, G (s)		18.1			23.6						25.7	
Effective Green, g (s)		24.6			24.6						26.7	
Actuated g/C Ratio		0.43			0.43						0.47	
Clearance Time (s)		9.5			4.0						4.0	
Vehicle Extension (s)		3.0			8.0						3.2	
Lane Grp Cap (vph)		755			683						1684	
v/s Ratio Prot		0.01			c0.01						c0.36	
v/s Ratio Perm					c0.04							
v/c Ratio		0.02			0.13						0.76	
Uniform Delay, d1		9.4			9.9						12.7	
Progression Factor		1.00			0.61						0.60	
Incremental Delay, d2		0.0			0.4						1.9	
Delay (s)		9.4			6.4						9.5	
Level of Service		A			A						A	
Approach Delay (s)		9.4			6.4			0.0			9.5	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Appendix G
Drainage Analysis Supporting Details

CONSOR Engineers, LLC					
PROJECT TITLE:	Fiske Boulevard & Roy Wall Boulevard Intersection				
PROJECT NUMBER:					**DATE**
BASIN DESIGNATION:	All 5 Basins		**MADE BY:**	DAB	3/2/2023
BASIN ANALYSIS (PRE/POST):	PRE		**CHECKED BY:**	YSJ	3/3/2023

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Existing Impervious	Urban Land	-	98	4.97	487.10
Pervious	29: Malabar sand, high	A/D	80	4.85	388.12
	47: Pineda sand	C/D	80		
	19: Riviera sand	C/D	80		
			TOTALS	**9.82**	**875.21**

COMPOSITE CN	**89.11**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S --------------------------------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R --------------------------------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) --------------------------------> V(R) = (R / 12)*BASIN AREA (acre-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Basin Criteria	25 Year/24 Hour	8.20	1.22	6.90	5.6
SJRWMD Basin Criteria	100 Year/24 Hour	9.60	1.22	8.27	**6.8**

CONSOR Engineers, LLC				
PROJECT TITLE:	Fiske Boulevard & Roy Wall Boulevard Intersection			
PROJECT NUMBER:				**DATE**
BASIN DESIGNATION:	All 5 Basins	**MADE BY:**	DAB	3/2/2023
BASIN ANALYSIS (PRE/POST):	POST	**CHECKED BY:**	YSJ	3/3/2023

BASIN RUNOFF CURVE NUMBER WORKSHEET

LAND-USE DESCRIPTION	SOIL NAME	SOIL GROUP	CN	AREA (ac)	PRODUCT
Proposed Impervious	Urban Land	-	98	5.23	512.76
Existing Impervious	Urban Land	-	98	0.00	0.00
Pervious	29: Malabar sand, high	A/D	80	4.67	373.30
	47: Pineda sand	C/D	80		
	19: Riviera sand	C/D	80		0.0
			TOTALS	**9.90**	**886.06**

COMPOSITE CN	**89.51**

ESTIMATE OF RUNOFF VOLUME

PROCEDURE TO DETERMINE RUNOFF VOLUME IS BASED ON THE SCS EQUATION AND IS AS FOLLOWS:

1) DETERMINE SOIL STORAGE - S --------------------------------> S = (1000 / CN) - 10 (inches)

2) DETERMINE RUNOFF - R --------------------------------> R = (P - 0.2*S)^2 / (P + 0.8*S) (inches)

P = rainfall in inches

3) DETERMINE RUNOFF VOLUME - V(R) --------------------------------> V(R) = (R / 12)*BASIN AREA (acre-feet)

CALCULATION TABLE

Agency	Design Storm Frequency	P (in)	S (in)	R (in)	V(R) (ac-ft)
SJRWMD Basin Criteria	25 Year/24 Hour	8.20	1.17	6.94	**5.7**
SJRWMD Basin Criteria	100 Year/24 Hour	9.60	1.17	8.32	**6.9**

CONSOR Engineers, LLC				
PROJECT TITLE:	Fiske Boulevard & Roy Wall Boulevard Intersection			
PROJECT NUMBER:				**DATE**
BASIN DESIGNATION	All 5 Basins	**MADE BY:**	DAB	3/2/2023
POND:	1	**CHECKED BY:**	YSJ	3/3/2023

Water Quality

New Impervious Area = 0.26 ac

A. 2.50 " Over New Impervious Area = 0.05 Ac-Ft

Treatment Volume 0.05 Ac-Ft

100 Yr Volume to be Retained **0.08** **Ac-Ft**

Controlling Volume **0.08** Ac-Ft

Stage Storage Calculations

ELEV. (ft)		**AREA (ac)**	**AVG AREA (ac)**	**Delta D (ft)**	**Delta storage (ac-ft)**	**Sum Storage (ac-ft)**
19.00	Out. Berm	0.34				0.35
			0.31	0.25	0.08	
18.75		0.28				0.27
			0.26	0.25	0.06	
18.50	In. Berm	0.23				0.21
			0.22	0.25	0.06	
18.25		0.22				0.15
			0.22	0.25	0.05	
18.00	**100 Yr Volume to be Retained**	0.21				**0.10**
			0.20	0.50	0.10	
17.50	Bottom	0.18				
16.04	NWL					

Freeboard = **0.50** ft

Appendix H
Benefit-Cost Analysis

Florida Department of Transportation
Item Average Unit Cost
From 2021/09/01 to 2022/08/31
Statewide

Market Area: 08
Contract Type: CC
Displaying: VALID ITEMS WITH HITS
From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0104 7	1	$6,500.00	$39,000.00	6.000	EA	N	SEDIMENT BASIN / CONTAINMENT SYSTEM
0104 9	2	$2,857.14	$20,000.00	7.000	EA	N	SEDIMENT BASIN / CONTAINMENT SYSTEM- CLEANOUT
0104 10 3	51	$2.21	$1,003,780.44	454,574.000	LF	N	SEDIMENT BARRIER
0104 11	19	$15.21	$451,006.02	29,644.000	LF	N	FLOATING TURBIDITY BARRIER
0104 12	6	$9.77	$38,478.50	3,938.000	LF	N	STAKED TURBIDITY BARRIER- NYLON REINFORCED PVC
0104 15	25	$2,405.84	$211,713.65	88.000	EA	N	SOIL TRACKING PREVENTION DEVICE
0104 18	58	$144.04	$337,055.46	2,340.000	EA	N	INLET PROTECTION SYSTEM
0104 19	4	$7.45	$50,835.38	6,820.000	SY	N	CHEMICAL TREATMENT- POWDERED, FOR EROSION CONTROL
0107 1	54	$30.14	$853,163.14	28,302.940	AC	N	LITTER REMOVAL
0107 2	52	$58.09	$1,377,806.14	23,719.930	AC	N	MOWING
0108 1	6	$13,010.39	$117,093.48	9.000	EA	N	MONITOR EXISTING STRUCTURES- INSPECTION AND SETTLEMENT MONITORING
0108 2	6	$29,247.78	$263,230.00	9.000	EA	N	MONITOR EXISTING STRUCTURES- VIBRATION MONITORING
0108 3	3	$10,843.39	$54,216.94	5.000	EA	N	MONITOR EXISTING STRUCTURES- GROUNDWATER MONITORING
0110 1 1	60	$45,646.25	$17,117,801.10	375.010	AC	N	CLEARING & GRUBBING
0110 2 2	3	$18,151.88	$58,086.00	3.200	AC	N	SELECTIVE CLEARING AND GRUBBING, AREAS WITH TREES TO REMAIN
0110 3	4	$30.17	$477,500.00	15,829.000	SF	N	REMOVAL OF EXISTING STRUCTURES/BRIDGES
0110 4 10	55	$34.45	$3,638,093.04	105,608.000	SY	N	REMOVAL OF EXISTING CONCRETE
0110 7 1	11	$184.78	$29,195.71	158.000	EA	N	MAILBOX, F&I SINGLE
0110 21	1	$10.02	$42,084.00	4,200.000	LF	N	TREE PROTECTION BARRIER

Florida Department of Transportation
Item Average Unit Cost
From 2021/09/01 to 2022/08/31
Statewide

Market Area: 08
Contract Type: CC
Displaying: VALID ITEMS WITH HITS
From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0110 22	3	$1,670.23	$51,777.19	31.000	EA	N	TREE ROOT AND BRANCH PRUNING
0110 23	3	$1,080.36	$60,500.00	56.000	EA	N	TREE REMOVAL
0110 73	1	$400.00	$1,396,000.00	3,490.000	LF	N	REMOVE EXISTING BULKHEAD
0110 82	1	$4,500.00	$87,300.00	19.400	MB	N	REMOVE & DISPOSE OF STRUCTURAL TIMBER
0120 1	44	$9.71	$6,124,729.73	630,445.300	CY	N	REGULAR EXCAVATION
0120 2 2	6	$85.14	$236,799.94	2,781.200	CY	N	BORROW EXCAVATION, TRUCK MEASURE
0120 4	4	$21.06	$880,387.00	41,799.700	CY	N	SUBSOIL EXCAVATION
0120 5	1	$20.00	$58,256.00	2,912.800	CY	N	CHANNEL EXCAVATION
0120 6	46	$24.14	$24,734,072.59	1,024,478.100	CY	N	EMBANKMENT
0120 71	10	$9,719.70	$106,916.75	11.000	LS	N	REGULAR EXCAVATION (3-R PROJECTS ONLY)
0121 70	1	$200.00	$9,660.00	48.300	CY	N	FLOWABLE FILL
0145 2	2	$16.13	$19,403.40	1,203.000	SY	N	GEOSYNTHETIC REINFORCED FOUNDATION OVER SOFT SOIL
0160 4	34	$11.41	$6,935,754.91	607,892.000	SY	N	TYPE B STABILIZATION
0285701	12	$40.47	$7,471,251.54	184,630.000	SY	N	OPTIONAL BASE, BASE GROUP 01
0285702	7	$17.18	$320,403.50	18,650.000	SY	N	OPTIONAL BASE, BASE GROUP 02
0285703	5	$40.19	$477,544.68	11,883.000	SY	N	OPTIONAL BASE, BASE GROUP 03
0285704	8	$20.97	$286,935.94	13,682.000	SY	N	OPTIONAL BASE, BASE GROUP 04
0285705	3	$21.36	$374,175.74	17,519.000	SY	N	OPTIONAL BASE, BASE GROUP 05
0285706	7	$23.53	$560,578.55	23,819.000	SY	N	OPTIONAL BASE, BASE GROUP 06
0285707	1	$25.00	$277,675.00	11,107.000	SY	N	OPTIONAL BASE, BASE GROUP 07

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0285708	3	$40.59	$444,521.26	10,952.000	SY	N	OPTIONAL BASE, BASE GROUP 08
0285709	17	$44.33	$1,778,934.06	40,125.000	SY	N	OPTIONAL BASE, BASE GROUP 09
0285710	5	$37.63	$341,899.58	9,085.000	SY	N	OPTIONAL BASE, BASE GROUP 10
0285711	6	$28.29	$1,751,117.54	61,906.000	SY	N	OPTIONAL BASE, BASE GROUP 11
0285712	4	$25.81	$1,303,497.81	50,513.000	SY	N	OPTIONAL BASE, BASE GROUP 12
0285713	3	$75.58	$413,812.84	5,475.000	SY	N	OPTIONAL BASE, BASE GROUP 13
0285714	2	$138.31	$568,328.78	4,109.000	SY	N	OPTIONAL BASE, BASE GROUP 14
0285715	11	$74.63	$1,154,111.32	15,464.000	SY	N	OPTIONAL BASE, BASE GROUP 15
0286 1	9	$29.54	$252,397.91	8,543.000	SY	N	TURNOUT CONSTRUCTION/DRIVEWAY BASE- OPTIONAL MATERIALS
0286 2	2	$252.61	$15,358.54	60.800	TN	N	TURNOUT CONSTRUCTION-ASPHALT/DRIVEWAY BASE- ASPHALT MATERIAL
0327 70 1	5	$2.40	$294,410.47	122,454.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 1" AVG DEPTH
0327 70 2	3	$4.41	$898,055.48	203,435.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 3 1/2" AVG DEPTH
0327 70 3	4	$7.64	$115,232.27	15,078.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 4 1/2" AVG DEPTH
0327 70 4	15	$3.13	$2,117,302.76	675,456.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 3" AVG DEPTH
0327 70 5	8	$4.45	$447,292.31	100,621.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 2" AVG DEPTH
0327 70 6	37	$3.44	$2,221,843.78	645,792.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 1 1/2" AVG DEPTH
0327 70 7	5	$4.65	$339,310.77	72,921.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 4" AVG DEPTH
0327 70 8	6	$2.81	$283,573.04	100,789.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 2 1/2" AVG DEPTH
0327 70 9	2	$12.72	$39,477.50	3,103.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 5 1/4" AVG DEPTH

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0327 70 11	15	$2.08	$3,450,087.21	1,656,488.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 2 1/4" AVG DEPTH
0327 70 12	3	$1.52	$173,927.75	114,141.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 1 1/4" AVG DEPTH
0327 70 13	3	$2.45	$57,655.56	23,518.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 1 3/4" AVG DEPTH
0327 70 15	6	$2.03	$825,300.57	407,250.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 2 3/4" AVG DEPTH
0327 70 16	2	$15.15	$36,682.70	2,421.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 1/2" AVG DEPTH
0327 70 17	6	$1.81	$1,043,514.55	577,541.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 3 1/4" AVG DEPTH
0327 70 18	1	$57.00	$11,970.00	210.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 5 1/2" AVG DEPTH
0327 70 19	9	$2.57	$113,608.33	44,199.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 3/4" AVG DEPTH
0327 70 20	8	$3.21	$587,753.90	183,109.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 3 3/4" AVG DEPTH
0327 70 22	3	$3.31	$332,849.69	100,471.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 4 1/4" AVG DEPTH
0327 70 23	1	$18.50	$16,150.50	873.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 6" AVG DEPTH
0327 70 26	2	$4.25	$80,081.67	18,839.000	SY	N	MILLING EXISTING ASPHALT PAVEMENT, 4 3/4" AVG DEPTH
0334 1 12	11	$119.98	$5,172,554.38	43,113.400	TN	N	SUPERPAVE ASPHALTIC CONC, TRAFFIC B
0334 1 13	33	$117.40	$32,464,202.59	276,533.900	TN	N	SUPERPAVE ASPHALTIC CONC, TRAFFIC C
0334 1 15	6	$168.20	$1,695,661.55	10,081.300	TN	N	SUPERPAVE ASPHALTIC CONC, TRAFFIC E
0334 1 52	3	$127.73	$1,333,210.19	10,437.400	TN	N	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC B, PG76-22
0334 1 53	10	$120.63	$7,009,092.96	58,103.400	TN	N	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC C, PG76-22
0334 1 55	6	$136.45	$7,233,848.21	53,016.100	TN	N	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC E, PG76-22
0334 1 57	1	$159.20	$213,885.20	1,343.500	TN	N	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC C, HIGH POLYMER
0334 1 59	1	$148.04	$1,438,475.07	9,716.800	TN	N	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC E, HIGH POLYMER

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0337 7 25	22	$178.14	$25,583,745.09	143,612.800	TN	N	ASPHALT CONCRETE FRICTION COURSE, INC BIT, FC-5, PG 76-22
0337 7 80	1	$201.00	$56,501.10	281.100	TN	N	ASPHALT CONCRETE FRICTION COURSE,TRAFFIC B, FC-9.5, PG 76-22
0337 7 81	7	$166.54	$4,549,331.85	27,316.800	TN	N	ASPHALT CONCRETE FRICTION COURSE,TRAFFIC B, FC-12.5, PG 76-22
0337 7 82	4	$285.87	$159,141.50	556.700	TN	N	ASPHALT CONCRETE FRICTION COURSE,TRAFFIC C, FC-9.5, PG 76-22
0337 7 83	34	$180.23	$11,263,808.00	62,496.900	TN	N	ASPHALT CONCRETE FRICTION COURSE,TRAFFIC C, FC-12.5, PG 76-22
0337 7 88	1	$503.98	$286,361.44	568.200	TN	N	ASPHALT CONCRETE FRICTION COURSE,TRAFFIC E, FC-12.5, PG 76-22
0339 1	20	$263.71	$1,053,511.23	3,995.000	TN	N	MISCELLANEOUS ASPHALT PAVEMENT
0350 3 1	1	$300.00	$6,000.00	20.000	SY	N	PLAIN CEMENT CONCRETE PAVEMENT, 6"
0350 3 5	2	$71.23	$5,603,707.00	78,667.000	SY	N	PLAIN CEMENT CONCRETE PAVEMENT, 8"
0350 3 8	1	$75.00	$6,111,150.00	81,482.000	SY	N	PLAIN CEMENT CONCRETE PAVEMENT, 9.5"
0350 3 11	1	$100.00	$1,623,400.00	16,234.000	SY	N	PLAIN CEMENT CONCRETE PAVEMENT, 11"
0350 5	4	$3.29	$1,134,858.35	345,434.000	LF	N	CLEANING & SEALING JOINTS- CONCRETE PAVEMENT
0350 6	1	$16.40	$5,100.40	311.000	LF	N	CLEANING & SEALING RANDOM CRACKS- CONCRETE PAVEMENT
0350 30 13	2	$212.33	$134,616.64	634.000	SY	N	CONCRETE PAVEMENT FOR ROUNDABOUT APRON, 12" DEPTH
0352 70	5	$4.73	$798,763.90	168,984.000	SY	N	GRINDING CONCRETE PAVEMENT
0353 70	2	$1,042.79	$1,161,985.00	1,114.300	CY	N	CONCRETE PAVEMENT SLAB REPLACEMENT
0370 1	1	$23.10	$11,827.20	512.000	LF	N	BRIDGE APPROACH EXPANSION JOINT FOR CONCRETE PAVEMENT
0400 0 11	8	$855.91	$2,327,050.62	2,718.800	CY	N	CONCRETE CLASS NS, GRAVITY WALL INDEX 400-011
0400 2 1	2	$1,460.45	$257,039.00	176.000	CY	N	CONCRETE CLASS II, CULVERTS
0400 2 4	2	$899.17	$3,827,323.50	4,256.500	CY	N	CONC CLASS II, BRIDGE SUPERSTRUCTURE

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0400147	2	$1,570.28	$64,067.50	40.800	CF	N	COMPOSITE NEOPRENE PADS
0400148	1	$2,550.00	$24,735.00	9.700	CF	N	PLAIN NEOPRENE BEARING PADS
0401 70 2	1	$534.00	$20,292.00	38.000	CF	N	RESTORE SPALLED AREAS, LATEX MODIFIED MORTAR- STYRENE BUTADIENE
0401 70 3	2	$743.34	$108,230.00	145.600	CF	N	RESTORE SPALLED AREAS, LATEX MODIFIED MORTAR- ACRYLIC
0401 70 4	2	$538.56	$149,180.00	277.000	CF	N	RESTORE SPALLED AREAS, PORTLAND CEMENT GROUT
0411 1	3	$246.67	$3,700.00	15.000	GA	N	EPOXY MATERIAL FOR CRACK INJECTION- STRUCTURES REHAB
0411 2	3	$56.84	$18,076.00	318.000	LF	N	CRACKS INJECT & SEAL- STRUCTURES REHAB
0415 1 1	3	$1.40	$55,473.70	39,696.000	LB	N	REINFORCING STEEL- ROADWAY
0415 1 3	5	$1.93	$116,470.91	60,455.000	LB	N	REINFORCING STEEL- RETAINING WALL
0415 1 4	2	$1.92	$3,566,842.20	1,857,192.000	LB	N	REINFORCING STEEL - BRIDGE SUPERSTRUCTURE
0415 1 5	4	$1.62	$2,323,264.30	1,435,992.000	LB	N	REINFORCING STEEL- BRIDGE SUBSTRUCTURE
0415 1 8	1	$2.00	$2,848.00	1,424.000	LB	N	REINFORCING STEEL- BULKHEAD
0415 1 9	4	$1.76	$634,493.30	359,980.000	LB	N	REINFORCING STEEL- APPROACH SLABS
0415 10 5	1	$2.00	$332,986.00	166,493.000	LF	N	FIBER REINFORCED POLYMER BARS, #5 BAR
0425 1201	6	$9,989.88	$359,635.63	36.000	EA	N	INLETS, CURB, TYPE 9, <10'
0425 1203	1	$22,754.11	$22,754.11	1.000	EA	N	INLETS, CURB, TYPE 9, J BOT, <10'
0425 1205	2	$4,221.80	$8,443.60	2.000	EA	N	INLETS, CURB, TYPE 9, PARTIAL
0425 1311	7	$9,831.80	$403,103.85	41.000	EA	N	INLETS, CURB, TYPE P-1, <10'
0425 1315	1	$6,025.00	$6,025.00	1.000	EA	N	INLETS, CURB TYPE P-1, PARTIAL

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0425 1321	5	$11,573.06	$115,730.56	10.000	EA	N	INLETS, CURB, TYPE P-2, <10'
0425 1331	2	$12,684.55	$139,530.00	11.000	EA	N	INLETS, CURB, TYPE P-3, <10'
0425 1335	1	$8,620.36	$8,620.36	1.000	EA	N	INLETS, CURB, TYPE P-3, PARTIAL
0425 1339	1	$11,649.04	$11,649.04	1.000	EA	N	INLETS, CURB, TYPE P-3, MODIFY
0425 1341	6	$11,955.01	$131,505.15	11.000	EA	N	INLETS, CURB, TYPE P-4, <10'
0425 1345	2	$8,003.45	$16,006.89	2.000	EA	N	INLETS, CURB, TYPE P-4, PARTIAL
0425 1349	1	$11,327.70	$33,983.10	3.000	EA	N	INLETS, CURB, TYPE P-4, MODIFY
0425 1351	18	$9,362.54	$1,067,329.27	114.000	EA	N	INLETS, CURB, TYPE P-5, <10'
0425 1355	4	$6,882.30	$48,176.12	7.000	EA	N	INLETS, CURB, TYPE P-5, PARTIAL
0425 1361	9	$8,983.64	$206,623.82	23.000	EA	N	INLETS, CURB, TYPE P-6, <10'
0425 1365	1	$5,500.00	$5,500.00	1.000	EA	N	INLETS, CURB, TYPE P-6, PARTIAL
0425 1369	1	$14,481.27	$14,481.27	1.000	EA	N	INLETS, CURB, TYPE P-6, MODIFY
0425 1411	4	$15,900.60	$222,608.35	14.000	EA	N	INLETS, CURB TYPE J-1, <10'
0425 1412	1	$17,351.40	$52,054.20	3.000	EA	N	INLETS, CURB, TYPE J-1, >10'
0425 1421	3	$15,931.79	$111,522.55	7.000	EA	N	INLETS, CURB, TYPE J-2, <10'
0425 1431	3	$15,008.16	$90,048.96	6.000	EA	N	INLETS, CURB, TYPE J-3, <10'
0425 1441	2	$19,376.03	$96,880.16	5.000	EA	N	INLETS, CURB, TYPE J-4, <10'
0425 1449	1	$3,806.76	$15,227.04	4.000	EA	N	INLETS, CURB, TYPE J-4, MODIFY
0425 1451	7	$15,974.46	$766,774.20	48.000	EA	N	INLETS, CURB, TYPE J-5, <10'
0425 1461	3	$15,333.33	$92,000.00	6.000	EA	N	INLETS, CURB, TYPE J-6, <10'

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0425 1462	1	$17,000.00	$17,000.00	1.000	EA	N	INLETS, CURB, TYPE J-6, >10'
0425 1465	1	$5,910.00	$5,910.00	1.000	EA	N	INLETS, CURB, TYPE J-6, PARTIAL
0425 1471	3	$11,342.35	$158,792.95	14.000	EA	N	INLETS, CURB, TYPE 7, <10'
0425 1473	1	$14,400.00	$14,400.00	1.000	EA	N	INLETS, CURB, TYPE 7, J BOT , <10'
0425 1501	2	$5,189.72	$10,379.43	2.000	EA	N	INLETS, DT BOT, TYPE A, <10'
0425 1505	1	$3,693.50	$25,854.50	7.000	EA	N	INLETS, DT BOT, TYPE A, PARTIAL
0425 1521	12	$5,638.78	$169,163.26	30.000	EA	N	INLETS, DT BOT, TYPE C,<10'
0425 1523	1	$8,000.00	$8,000.00	1.000	EA	N	INLETS, DT BOT, TYPE C,JBOT, <10'
0425 1525	2	$4,753.33	$14,260.00	3.000	EA	N	INLETS, DITCH BOTTOM, TYPE C, PARTIAL
0425 1529	2	$7,653.40	$15,306.80	2.000	EA	N	INLETS, DT BOT, TYPE C, MODIFY
0425 1531	3	$8,053.85	$104,700.00	13.000	EA	N	INLETS, DITCH BOTTOM, TYPE C MODIFIED- BACK OF SIDEWALK, <10'
0425 1533	1	$22,000.00	$242,000.00	11.000	EA	N	INLETS, DITCH BOTTOM TYPE C MODIFIED- BACK OF SIDEWALK, J BOT, <10'
0425 1534	1	$18,000.00	$36,000.00	2.000	EA	N	INLETS, DITCH BOTTOM, TYPE C MODIFIED- BACK OF SIDEWALK, J BOT, >10'
0425 1535	2	$6,447.99	$12,895.97	2.000	EA	N	INLETS, DITCH BOTTOM TYPE C MODIFIED- BACK OF SIDEWALK, PARTIAL
0425 1541	10	$8,715.88	$313,771.70	36.000	EA	N	INLETS, DT BOT, TYPE D, <10'
0425 1543	2	$16,711.58	$33,423.15	2.000	EA	N	INLETS, DITCH BOTTOM, TYPE D, J BOT, <10'
0425 1545	4	$5,531.43	$33,188.60	6.000	EA	N	INLETS, DITCH BOTTOM, TYPE D, PARTIAL

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0425 1549	4	$8,717.22	$43,586.12	5.000	EA	N	INLETS, DT BOT, TYPE D, MODIFY
0425 1551	7	$7,276.41	$764,022.89	105.000	EA	N	INLETS, DT BOT, TYPE E, <10'
0425 1552	1	$8,000.00	$16,000.00	2.000	EA	N	INLETS, DT BOT, TYPE E, >10'
0425 1553	2	$12,068.60	$181,028.96	15.000	EA	N	INLETS, DT BOT, TYPE E, J BOT, <10'
0425 1554	1	$14,500.00	$217,500.00	15.000	EA	N	INLETS, DT BOT, TYPE E, J BOT, >10'
0425 1555	1	$3,017.12	$3,017.12	1.000	EA	N	INLETS, DT BOT, TYPE E, PARTIAL
0425 1559	3	$8,273.10	$215,100.54	26.000	EA	N	INLETS, DT BOT, TYPE E, MODIFY
0425 1561	5	$8,480.08	$50,880.46	6.000	EA	N	INLETS, DT BOT, TYPE F, <10'
0425 1581	2	$11,000.00	$22,000.00	2.000	EA	N	INLETS, DT BOT, TYPE H, <10'
0425 1589	2	$8,875.00	$35,500.00	4.000	EA	N	INLETS, DT BOT, TYPE H, MODIFY
0425 1701	6	$6,793.82	$550,299.38	81.000	EA	N	INLETS, GUTTER, TYPE S, <10'
0425 1702	1	$8,000.00	$24,000.00	3.000	EA	N	INLETS, GUTTER, TYPE S, >10'
0425 1703	1	$9,500.00	$152,000.00	16.000	EA	N	INLETS, GUTTER, TYPE S, J BOTTOM <10'
0425 1704	1	$14,000.00	$84,000.00	6.000	EA	N	INLETS, GUTTER, TYPE S, J BOTTOM, >10'
0425 1705	2	$4,145.83	$149,249.70	36.000	EA	N	INLETS, GUTTER, TYPE S, PARTIAL
0425 1711	2	$6,045.12	$18,135.37	3.000	EA	N	INLETS, GUTTER, TYPE V, <10'
0425 1713	2	$24,344.22	$48,688.43	2.000	EA	N	INLETS, GUTTER, TYPE V, J BOT, <10'
0425 1781	1	$7,000.00	$7,000.00	1.000	EA	N	INLETS, MEDIAN BARRIER, TYPE 1, <=10'
0425 1910	7	$7,397.02	$59,176.13	8.000	EA	N	INLETS, CLOSED FLUME
0425 1921	2	$12,363.44	$1,149,800.00	93.000	EA	N	INLETS, ADJACENT BARRIER, <=10'

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0425 1922	1	$15,500.00	$62,000.00	4.000	EA	N	INLETS, ADJACENT BARRIER, >10'
0425 1923	3	$11,256.76	$416,500.00	37.000	EA	N	INLETS, ADJACENT BARRIER, J BOTTOM, < 10'
0425 1924	2	$24,777.78	$446,000.00	18.000	EA	N	INLETS, ADJACENT BARRIER, J BOTTOM, >10'
0425 2 41	12	$7,607.23	$258,645.79	34.000	EA	N	MANHOLES, P-7, <10'
0425 2 42	1	$6,300.00	$6,300.00	1.000	EA	N	MANHOLES, P-7, >10'
0425 2 43	4	$6,360.08	$31,800.42	5.000	EA	N	MANHOLES, P-7, PARTIAL
0425 2 61	12	$9,487.24	$483,849.26	51.000	EA	N	MANHOLES, P-8, <10'
0425 2 63	10	$9,182.29	$321,380.11	35.000	EA	N	MANHOLES, P-8, PARTIAL
0425 2 71	11	$11,260.64	$439,164.79	39.000	EA	N	MANHOLES, J-7, <10'
0425 2 72	2	$20,451.73	$940,779.76	46.000	EA	N	MANHOLES, J-7, >10'
0425 2 73	3	$6,832.30	$40,993.82	6.000	EA	N	MANHOLES, J-7, PARTIAL
0425 2 75	1	$16,000.00	$16,000.00	1.000	EA	N	MANHOLES, J-7, >10' CONTROL STRUCTURE
0425 2 91	7	$17,136.69	$668,331.10	39.000	EA	N	MANHOLES, J-8, <10'
0425 2 92	4	$26,875.00	$537,500.00	20.000	EA	N	MANHOLES, J-8, >10'
0425 2 93	5	$6,268.34	$87,756.73	14.000	EA	N	MANHOLES, J-8, PARTIAL
0425 3 43	3	$7,669.74	$23,009.21	3.000	EA	N	JUNCTION BOX, DRAINAGE, P-7, PARTIAL
0425 3 61	2	$9,779.00	$97,790.00	10.000	EA	N	JUNCTION BOXES, J-7, <10'
0425 3 63	1	$9,256.83	$18,513.66	2.000	EA	N	JUNCTION BOXES, DRAINAGE, J-7, PARTIAL
0425 4	2	$4,577.08	$13,731.24	3.000	EA	N	INLETS, ADJUST
0425 5	18	$1,563.04	$178,186.71	114.000	EA	N	MANHOLE, ADJUST

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0425 5 1	8	$1,691.02	$150,500.37	89.000	EA	N	MANHOLE, ADJUST, UTILITIES
0425 6	8	$804.45	$104,578.99	130.000	EA	N	VALVE BOXES, ADJUST
0425 10	1	$350.00	$350.00	1.000	EA	N	YARD DRAIN
0425 11	2	$7,200.43	$14,400.85	2.000	EA	N	MODIFY EXISTING DRAINAGE STRUCTURE
0425 14 1	1	$150.00	$14,250.00	95.000	SF	N	GRATE FOR EXISTING DRAINAGE STRUCTURE, FURNISH AND INSTALL
0425 82	6	$1,626.37	$27,648.23	17.000	EA	N	REPLACE GRATE
0430 95 1	1	$36.80	$6,182.40	168.000	LF	N	OUTFALL BARNACLE REMOVAL, 0 - 24"
0430 95 2	1	$51.75	$158,406.75	3,061.000	LF	N	OUTFALL BARNACLE REMOVAL, 25 - 36"
0430 95 3	1	$74.75	$107,864.25	1,443.000	LF	N	OUTFALL BARNACLE REMOVAL, 37-48"
0430 95 4	1	$115.00	$63,135.00	549.000	LF	N	OUTFALL BARNACLE REMOVAL, 49-60"
0430174115	2	$274.30	$2,194.42	8.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 15"SD
0430174118	6	$131.38	$479,411.01	3,649.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 18"SD
0430174124	7	$173.89	$302,919.31	1,742.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 24"SD
0430174130	4	$194.62	$184,112.38	946.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 30"SD
0430174136	4	$217.69	$200,278.81	920.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 36"SD
0430174142	1	$265.00	$7,420.00	28.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, ROUND, 42"SD
0430174218	3	$132.91	$44,525.85	335.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, OTHER SHAPE - ELLIP/ARCH, 18"SD
0430174224	3	$291.39	$86,250.75	296.000	LF	N	PIPE CULVERT, OPTIONAL MATERIAL, OTHER SHAPE - ELLIP/ARCH, 24"SD

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0430554202	1	$20,000.00	$20,000.00	1.000	EA	N	STRAIGHT CONCRETE ENDWALLS, 54", DOUBLE, 0 DEGREES, ELLIPTICAL
0430554302	1	$27,000.00	$27,000.00	1.000	EA	N	STRAIGHT CONCRETE ENDWALLS, 54", TRIPLE, 0 DEGREES, ELLIPTICAL
0430566100	1	$26,000.00	$26,000.00	1.000	EA	N	STRAIGHT CONCRETE ENDWALLS, 66", SINGLE, 0 DEGREES, ROUND
0430630954	1	$9,000.00	$9,000.00	1.000	EA	N	U-ENDWALL, INDEX 430-012, 54" PIPE
0430630960	1	$42,000.00	$42,000.00	1.000	EA	N	U-ENDWALL, INDEX 264/430-012, 60" PIPE
0430830	7	$603.68	$75,158.76	124.500	CY	N	PIPE FILLING AND PLUGGING- PLACE OUT OF SERVICE
0430880 02	1	$22,620.00	$90,480.00	4.000	EA	N	FLAP GATES, 25-36"
0430880 03	1	$30,100.00	$60,200.00	2.000	EA	N	FLAP GATES, 37-48"
0430880 04	1	$74,000.00	$74,000.00	1.000	EA	N	FLAP GATES, 49-60"
0430886 36	1	$3,800.00	$38,000.00	10.000	EA	N	MANATEE GRATE FOR 36", UNHINGED
0430950	1	$215.00	$31,540.50	146.700	CY	N	DESILTING CONCRETE BOX CULVERT
0430963 1	4	$95.83	$17,248.68	180.000	LF	N	PVC PIPE FOR BACK OF SIDEWALK, 4"
0430963 2	1	$45.69	$365.52	8.000	LF	N	PVC PIPE FOR BACK OF SIDEWALK, NON STANDARD DIAMETER
0430982125	11	$2,901.64	$72,540.89	25.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 18" CD
0430982129	8	$2,901.73	$52,231.12	18.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 24" CD
0430982133	3	$4,487.08	$13,461.25	3.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 30" CD
0430982138	3	$5,657.09	$28,285.45	5.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 36" CD
0430982140	1	$7,700.00	$15,400.00	2.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 42" CD
0430982141	1	$8,500.00	$51,000.00	6.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 48" CD
0430982142	2	$14,000.00	$28,000.00	2.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 54" CD

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0430982143	2	$16,333.33	$49,000.00	3.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 60" CD
0430982144	1	$22,000.00	$88,000.00	4.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 66" CD
0430982625	2	$2,718.04	$5,436.08	2.000	EA	N	MITERED END SECTION, OPTIONAL - ELLIPTICAL / ARCH, 18" CD
0430982629	1	$4,095.06	$4,095.06	1.000	EA	N	MITERED END SECTION, OPTIONAL - ELLIPTICAL / ARCH, 24" CD
0430982633	2	$4,346.83	$13,040.49	3.000	EA	N	MITERED END SECTION, OPTIONAL - ELLIPTICAL / ARCH, 30" CD
0430984123	2	$2,267.92	$4,535.84	2.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 15" SD
0430984125	6	$1,430.04	$75,792.32	53.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 18" SD
0430984129	8	$2,332.54	$111,961.93	48.000	EA	N	MITERED END SECTION, OPTIONAL ROUND, 24" SD
0430984133	4	$3,279.39	$88,543.64	27.000	EA	N	MITERED END SECTION , OPTIONAL ROUND, 30" SD
0430984138	3	$4,157.54	$87,308.32	21.000	EA	N	MITERED END SECTION , OPTIONAL ROUND, 36" SIDE DRAIN
0430984140	1	$4,500.00	$9,000.00	2.000	EA	N	MITERED END SECTION , OPTIONAL ROUND, 42" SD
0430984625	4	$2,070.21	$31,053.17	15.000	EA	N	MITERED END SECT, OPTIONAL - ELLIPTICAL / ARCH, 18" SD
0430984629	4	$2,384.61	$35,769.19	15.000	EA	N	MITERED END SECT, OPTIONAL - ELLIPTICAL / ARCH, 24" SD
0430984633	3	$3,748.59	$48,731.68	13.000	EA	N	MITERED END SECT, OPTIONAL /ELLIP/ARCH, 30" SD
0430984638	1	$3,500.00	$28,000.00	8.000	EA	N	MITERED END SECT, OPTIONAL /ELLIP/ARCH, 36" SD
0430990	1	$2,340.59	$44,471.21	19.000	EA	N	MITERED END SECT, REPLACE GRATE
0430991	1	$2,000.00	$4,000.00	2.000	EA	N	MITERED END SECT, REPLACE SLAB- CONSTRUCTION USE
0431 1115	2	$104.71	$48,898.58	467.000	LF	N	PIPE LINER, CURED IN PLACE, 15"
0431 1118	2	$118.83	$95,303.61	802.000	LF	N	PIPE LINER, CURED IN PLACE, 18"
0431 1124	1	$124.07	$40,322.75	325.000	LF	N	PIPE LINER, CURED IN PLACE, 24"

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0515 4 1	3	$51.32	$317,747.00	6,191.000	LF	N	BULLET RAIL, SINGLE RAIL
0519 78	3	$1,621.95	$137,866.02	85.000	EA	N	BOLLARDS
0520 1 7	30	$35.62	$1,874,642.64	52,632.000	LF	N	CONCRETE CURB & GUTTER, TYPE E
0520 1 10	41	$38.72	$3,244,964.56	83,809.000	LF	N	CONCRETE CURB & GUTTER, TYPE F
0520 1 11	1	$65.00	$390.00	6.000	LF	N	CONCRETE CURB & GUTTER, VARIABLE HEIGHT TYPE F
0520 2 1	3	$31.81	$29,872.02	939.000	LF	N	CONCRETE CURB, TYPE A
0520 2 2	6	$56.43	$120,823.18	2,141.000	LF	N	CONCRETE CURB, TYPE B
0520 2 4	18	$46.96	$333,398.14	7,099.000	LF	N	CONCRETE CURB, TYPE D
0520 2 8	2	$30.89	$21,346.56	691.000	LF	N	CONCRETE CURB, TYPE RA
0520 3	6	$43.55	$112,276.37	2,578.000	LF	N	VALLEY GUTTER- CONCRETE
0520 4	2	$11.59	$52,292.70	4,513.000	LF	N	CURB-CONCRETE PAVEMENT JOINT
0520 5 11	12	$109.71	$394,187.71	3,593.000	LF	N	TRAFFIC SEPARATOR CONCRETE-TYPE I, 4' WIDE
0520 5 12	3	$104.06	$44,328.61	426.000	LF	N	TRAFFIC SEPARATOR CONCRETE-TYPE I, 6' WIDE
0520 5 16	1	$199.91	$2,598.83	13.000	LF	N	TRAFFIC SEPARATOR CONCRETE- TYPE I, 8.5' WIDE
0520 5 21	1	$293.10	$1,172.40	4.000	LF	N	TRAFFIC SEPARATOR - CONCRETE, TYPE II, 4' WIDE
0520 5 41	2	$109.65	$4,057.00	37.000	LF	N	TRAFFIC SEPARATOR CONCRETE- TYPE IV, 4' WIDE
0520 5 42	1	$355.00	$1,065.00	3.000	LF	N	TRAFFIC SEPARATOR CONCRETE- TYPE IV, 6' WIDE
0520 5 52	1	$70.00	$13,230.00	189.000	LF	N	TRAFFIC SEPARATOR CONCRETE- TYPE V, 6' WIDE
0520 6	11	$39.29	$653,261.27	16,625.000	LF	N	SHOULDER GUTTER- CONCRETE
0520 70	14	$109.40	$855,049.28	7,816.000	SY	N	CONCRETE TRAFFIC SEPARATOR, SPECIAL- VARIABLE WIDTH

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0521 1 11	1	$90.00	$469,800.00	5,220.000	LF	N	MEDIAN CONCRETE BARRIER, 38" HEIGHT
0521 1 12	2	$311.24	$3,763,490.00	12,092.000	LF	N	MEDIAN CONCRETE BARRIER, SHORT GRADE-SEPARATED
0521 1 13	1	$400.00	$4,467,600.00	11,169.000	LF	N	MEDIAN CONCRETE BARRIER, TALL GRADE-SEPARATED
0521 1 14	1	$550.00	$195,800.00	356.000	LF	N	MEDIAN CONCRETE BARRIER, VARIABLE SECTION WIDTH FOR SIGN OR PIER SHIELDING
0521 5 4	1	$240.00	$21,600.00	90.000	LF	N	CONCRETE TRAFFIC RAILING- BRIDGE, 32" VERTICAL FACE
0521 5 12	1	$90.00	$36,900.00	410.000	LF	N	CONCRETE TRAFFIC RAILING- BRIDGE, 36" MEDIAN SINGLE SLOPE
0521 5 13	3	$110.53	$803,200.00	7,267.000	LF	N	CONCRETE TRAFFIC RAILING- BRIDGE, 36" SINGLE-SLOPE
0521 8 7	3	$244.96	$3,304,495.00	13,490.000	LF	N	CONCRETE BARRIER, WITH JUNCTION SLAB, 36" SINGLE SLOPE
0521 8 8	1	$559.00	$97,266.00	174.000	LF	N	CONCRETE BARRIER, WITH JUNCTION SLAB, 42" SINGLE SLOPE
0521 9 1	1	$75.00	$748,350.00	9,978.000	LF	N	OPAQUE VISUAL BARRIER, INDEX 521-010 CONCRETE
0521 72 40	3	$295.56	$1,748,825.00	5,917.000	LF	N	SHOULDER CONCRETE BARRIER, 38" OR 44" HEIGHT
0521 72 41	1	$340.00	$496,740.00	1,461.000	LF	N	SHOULDER CONCRETE BARRIER, RETAINING SECTION
0521 72 43	1	$350.00	$89,250.00	255.000	LF	N	SHOULDER CONCRETE BARRIER, CURB AND GUTTER BARRIER
0521 72 60	1	$250.00	$2,423,500.00	9,694.000	LF	N	SHOULDER CONCRETE BARRIER, 38" WALL SHIELDING BARRIER
0521 72 61	1	$400.00	$875,600.00	2,189.000	LF	N	SHOULDER CONCRETE BARRIER, VARIABLE WIDTH FOR WALL OR SIGN SHIELDING
0522 1	41	$63.77	$4,049,060.90	63,498.000	SY	N	CONCRETE SIDEWALK AND DRIVEWAYS, 4" THICK
0522 2	46	$64.80	$5,624,022.18	86,787.000	SY	N	CONCRETE SIDEWALK AND DRIVEWAYS, 6" THICK
0522 3	3	$93.60	$5,428.98	58.000	SY	N	BUS BOARDING PAD- CONCRETE

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0522 4	5	$140.69	$43,331.55	308.000	SY	N	BUS SHELTER PAD- CONCRETE
0523 3	1	$105.00	$8,610.00	82.000	SY	N	PATTERNED PAVEMENT
0524 1 1	6	$94.52	$18,904.72	200.000	SY	N	CONCRETE DITCH PAVT, NON REINFORCED, 3"
0524 1 2	4	$98.63	$55,432.32	562.000	SY	N	CONCRETE DITCH PAVEMENT, NON REINFORCED, 4"
0524 1 4	8	$82.38	$140,540.21	1,706.000	SY	N	CONCRETE DITCH PAVEMENT, NON REINFORCED, 6"
0524 1 19	2	$159.88	$10,871.52	68.000	SY	N	CONCRETE DITCH PAVT, 3", REINFORCED
0524 1 29	6	$81.08	$77,918.87	961.000	SY	N	CONCRETE DITCH PAVEMENT, 4", REINFORCED
0524 2 1	1	$61.00	$89,060.00	1,460.000	SY	N	CONCRETE SLOPE PAVEMENT,NON REINFORCED, 3"
0524 2 2	3	$115.56	$63,788.00	552.000	SY	N	CONCRETE SLOPE PAVEMENT,NON REINFORCED, 4"
0524 2 4	1	$103.00	$6,180.00	60.000	SY	N	CONCRETE SLOPE PAVEMENT,NON REINFORCED, 6"
0524 2 49	1	$140.00	$980.00	7.000	SY	N	CONCRETE SLOPE PAVEMENT, 6", REINFORCED
0525 1	1	$108.30	$974.70	9.000	LF	N	ASPHALTIC CONCRETE CURB- TO REMAIN
0526 1 2	4	$185.50	$72,717.65	392.000	SY	N	PAVERS, ARCHITECTURAL, SIDEWALK
0527 2	46	$32.83	$830,775.60	25,304.000	SF	N	DETECTABLE WARNINGS
0530 3 3	3	$175.24	$16,560.20	94.500	TN	N	RIPRAP- RUBBLE, BANK AND SHORE
0530 3 4	9	$167.45	$69,543.55	415.300	TN	N	RIPRAP, RUBBLE, F&I, DITCH LINING
0530 4 6	1	$330.00	$99,330.00	301.000	SY	N	ARTICULATING CONCRETE BLOCK REVETMENT SYSTEM, THICKNESS 6"
0530 5 11	1	$350.00	$250,250.00	715.000	SY	N	GABION, MATTRESS LESS THAN 1 FOOT THICKNESS
0530 5 13	1	$130.00	$282,659.00	2,174.300	CY	N	GABION, BASKET
0530 74	7	$171.91	$44,317.42	257.800	TN	N	BEDDING STONE

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0550 10220	6	$23.26	$332,845.40	14,309.000	LF	N	FENCING, TYPE B, 5.1-6.0', STANDARD
0550 10228	1	$15.00	$2,145.00	143.000	LF	N	FENCING, TYPE B, 5.1-6.0, RESET EXISTING
0550 10230	1	$31.42	$23,125.12	736.000	LF	N	FENCING, TYPE B, 6.1-7.0', STANDARD
0550 10236	1	$60.00	$4,740.00	79.000	LF	N	FENCING, TYPE B, 6.1-7.0', WITH VINYL COATING AND BARBED WIRE ATTACHMENT
0550 10248	1	$206.50	$2,271.50	11.000	LF	N	FENCING, TYPE B, 7.1-8.0, RESET EXISTING
0550 10929	1	$35.00	$44,030.00	1,258.000	LF	N	FENCING, SPECIAL TYPE, 5.1-6.0', SPECIAL FEATURES
0550 60211	1	$1,127.00	$7,889.00	7.000	EA	N	FENCE GATE, TYPE B, SINGLE, 0- 6.0' OPENING
0550 60212	1	$3,000.00	$3,000.00	1.000	EA	N	FENCE GATE, TYPE B, SINGLE, 6.1 - 12.0' OPENING
0550 60214	1	$2,500.00	$2,500.00	1.000	EA	N	FENCE GATE, TYPE B, SINGLE, 18.1-20.0' OPENING
0550 60223	1	$2,078.00	$6,234.00	3.000	EA	N	FENCE GATE, TYPE B, DOUBLE, 12.1-18.0' OPENING
0550 60400	1	$1,250.00	$5,000.00	4.000	EA	N	FENCE GATE, RESET EXISTING GATE- WITHOUT RESETTING FENCE
0550 60622	1	$5,000.00	$5,000.00	1.000	EA	N	FENCE GATE, TYPE B WITH VINYL COATING, DOUBLE, 6.1-12.0' OPENING
0561 1	1	$2,504.17	$450,000.00	179.700	TN	N	COATING EXISTING STRUCTURAL STEEL
0561 2	1	$3.75	$34,098.75	9,093.000	SF	N	COATING EXISTING STRUCTURAL STEEL
0563 4	1	$13.56	$542.40	40.000	SF	N	ANTI-GRAFFITI COATING, NON-SACRIFICIAL
0570 1 2	56	$4.48	$5,551,238.70	1,238,412.000	SY	N	PERFORMANCE TURF, SOD
0570 1 3	10	$9.67	$1,107,743.97	114,509.000	SY	N	PERFORMANCE TURF, SOD AND SOIL- SHOULDER TREATMENT INDEX 570-010

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0571 1 11	4	$9.22	$17,188.48	1,865.000	SY	N	PLASTIC EROSION MAT, TURF REINFORCED MAT, TYPE 1
0571 1 12	4	$6.43	$17,669.70	2,747.000	SY	N	PLASTIC EROSION MAT, TRM, TYPE 2
0571 1 13	1	$10.00	$41,730.00	4,173.000	SY	N	PLASTIC EROSION MAT, TURF REINFORCED MAT, TYPE 3
0580 1 1	2	$49,691.55	$99,383.10	2.000	LS	N	LANDSCAPE COMPLETE- SMALL PLANTS
0580 1 2	3	$28,869.71	$86,609.14	3.000	LS	N	LANDSCAPE COMPLETE- LARGE PLANTS
0580 7253	1	$20.00	$3,880.00	194.000	EA	N	LANDSCAPE- SMALL SHRUB/ORNAMENTAL GRASS, GREEN ISLAND FICUS-FICUS MICROCARPA 'GREEN ISLAND', 3 GALLON
0581 1 1	1	$1,200.00	$6,000.00	5.000	EA	N	RELOCATE TREES AND PALMS, PALM, <14' OF CLEAR TRUNK
0591 1200	1	$19.98	$11,028.96	552.000	LF	N	IRRIGATION SLEEVE, 2" DIAMETER
0611 1 1	19	$1,840.89	$90,098.76	48.943	MI	N	ITSFM SUBSURFACE DOCUMENTATION- PROJECT LENGTH
0611 2 1	15	$2,107.75	$54,801.38	26.000	EA	N	ITSFM LOCATION DOCUMENTATION- INTERSECTION
0611 2 2	9	$1,551.36	$114,800.40	74.000	EA	N	ITSFM LOCATION DOCUMENTATION- ITS SITE
0611 2 3	2	$2,756.48	$5,512.95	2.000	EA	N	ITSFM LOCATION DOCUMENTATION- COMMUNICATIONS BUILDING
0630 2 11	47	$19.13	$2,809,772.57	146,914.000	LF	N	CONDUIT, FURNISH & INSTALL, OPEN TRENCH
0630 2 12	46	$32.32	$4,606,733.46	142,550.000	LF	N	CONDUIT, FURNISH & INSTALL, DIRECTIONAL BORE
0630 2 14	20	$37.76	$120,694.90	3,196.000	LF	N	CONDUIT, FURNISH & INSTALL, ABOVEGROUND
0630 2 15	5	$59.61	$117,306.00	1,968.000	LF	N	CONDUIT, FURNISH & INSTALL, BRIDGE MOUNT
0630 2 16	4	$21.13	$1,623,526.55	76,850.000	LF	N	CONDUIT, FURNISH & INSTALL, EMBEDDED CONCRETE BARRIERS AND TRAFFIC RAILINGS
0630 3 1	2	$186.54	$42,532.00	228.000	EA	N	REPLACE ROUTE MARKER FOR EXISTING CONDUIT

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0632 7 1	36	$9,048.32	$950,073.62	105.000	PI	N	SIGNAL CABLE- NEW OR RECONSTRUCTED INTERSECTION, FURNISH & INSTALL
0632 7 2	5	$9.45	$32,783.78	3,470.000	LF	N	SIGNAL CABLE- REPAIR/REPLACE/OTHER, FURNISH & INSTALL
0632 7 4	1	$1,350.00	$1,350.00	1.000	PI	N	SIGNAL CABLE, ADJUST
0632 7 6	18	$1,804.55	$88,422.72	49.000	PI	N	SIGNAL CABLE, REMOVE- INTERSECTION
0632 7 7	1	$1.27	$595.63	469.000	LF	N	SIGNAL CABLE, REMOVE- OUTSIDE OF INTERSECTION
0633 1111	2	$4.62	$1,422.10	308.000	LF	N	FIBER OPTIC CABLE, F&I, OVERHEAD,2-12 FIBERS
0633 1121	23	$3.54	$112,271.81	31,688.000	LF	N	FIBER OPTIC CABLE, F&I, UNDERGROUND,2-12 FIBERS
0633 1122	4	$2.58	$98,047.68	37,988.000	LF	N	FIBER OPTIC CABLE, F&I, UNDERGROUND,13-48 FIBERS
0633 1123	7	$3.38	$128,074.38	37,915.000	LF	N	FIBER OPTIC CABLE, F&I, UNDERGROUND,49-96 FIBERS
0633 1124	3	$6.13	$352,527.70	57,496.000	LF	N	FIBER OPTIC CABLE, F&I, UNDERGROUND, 97 - 144 FIBERS
0633 1127	1	$8.56	$73,085.28	8,538.000	LF	N	FIBER OPTIC CABLE, F&I, UNDERGROUND, 241 - 288 FIBERS
0633 1410	2	$3.87	$2,297.10	593.000	LF	N	FIBER OPTIC CABLE, RELOCATE, OVERHEAD
0633 1420	8	$6.33	$74,049.38	11,690.000	LF	N	FIBER OPTIC CABLE, RELOCATE, UNDERGROUND
0633 1610	1	$2.70	$351.00	130.000	LF	N	FIBER OPTIC CABLE, REMOVE, OVERHEAD
0633 1620	9	$1.25	$69,356.82	55,495.000	LF	N	FIBER OPTIC CABLE, REMOVE, UNDERGROUND
0633 2 31	28	$53.98	$203,811.56	3,776.000	EA	N	FIBER OPTIC CONNECTION, INSTALL, SPLICE
0633 2 32	11	$87.04	$23,500.78	270.000	EA	N	FIBER OPTIC CONNECTION, INSTALL, TERMINATION
0633 3 11	19	$1,184.69	$92,405.51	78.000	EA	N	FIBER OPTIC CONNECTION HARDWARE, F&I, SPLICE ENCLOSURE
0633 3 12	20	$197.39	$58,230.36	295.000	EA	N	FIBER OPTIC CONNECTION HARDWARE, F&I, SPLICE TRAY

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0633 8 6	1	$3.09	$61.80	20.000	LF	N	MULTI-CONDUCTOR COMMUNICATION CABLE, REMOVE
0634 4153	6	$7,777.66	$46,665.95	6.000	PI	N	SPAN WIRE ASSEMBLY, F&I, TWO POINT, BOX OR DROP BOX
0634 5 1	2	$44.89	$4,130.00	92.000	LF	N	FIBERGLASS INSULATOR, FURNISH & INSTALL
0635 2 11	49	$1,158.48	$2,848,692.08	2,459.000	EA	N	PULL & SPLICE BOX, F&I, 13" x 24" COVER SIZE
0635 2 12	28	$2,197.87	$940,688.31	428.000	EA	N	PULL & SPLICE BOX, F&I, 24" X 36" COVER SIZE
0635 2 13	18	$4,781.51	$468,588.37	98.000	EA	N	PULL & SPLICE BOX, F&I, 30" X 60" RECTANGULAR OR 36" ROUND COVER SIZE
0635 3 11	2	$649.08	$8,438.00	13.000	EA	N	JUNCTION BOX, FURNISH & INSTALL, AERIAL
0635 3 12	4	$715.20	$43,627.06	61.000	EA	N	JUNCTION BOX, FURNISH & INSTALL, MOUNTED
0635 3 13	3	$843.21	$261,395.00	310.000	EA	N	JUNCTION BOX, FURNISH & INSTALL, EMBEDDED
0639 1111	1	$2,915.40	$2,915.40	1.000	AS	N	ELECTRICAL POWER SERVICE, F&I, OVERHEAD, METER FURNISHED BY POWER COMPANY
0639 1112	7	$8,627.60	$86,276.03	10.000	AS	N	ELECTRICAL POWER SERVICE, F&I, OVERHEAD METER PURCHASED BY CONTRACTOR FROM POWER COMPANY
0639 1113	1	$3,400.00	$3,400.00	1.000	AS	N	ELECTRICAL POWER SERVICE, F&I, OVERHEAD METER NOT REQUIRED
0639 1121	5	$3,473.99	$31,265.95	9.000	AS	N	ELECTRICAL POWER SERVICE, F&I, UNDERGROUND, METER FURNISHED BY POWER COMPANY
0639 1122	23	$3,900.39	$214,521.39	55.000	AS	N	ELECTRICAL POWER SERVICE, F&I, UNDERGROUND, METER PURCHASED BY CONTRACTOR

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0639 1123	1	$3,200.00	$3,200.00	1.000	AS	N	ELECTRICAL POWER SERVICE, F&I, UNDERGROUND, METER NOT REQUIRED
0639 1410	1	$1,086.66	$1,086.66	1.000	AS	N	ELECTRICAL POWER SERVICE, REL OVERHEAD
0639 1420	2	$2,104.33	$4,208.66	2.000	AS	N	ELECTRICAL POWER SERVICE, RELOCATE, UNDERGROUND
0639 1610	2	$442.15	$884.30	2.000	AS	N	ELECTRICAL POWER SERVICE, REMOVE OVERHEAD
0639 1620	5	$868.09	$9,549.00	11.000	AS	N	ELECTRICAL POWER SERVICE, REMOVE UNDERGROUND
0639 2 1	36	$23.81	$1,525,253.49	64,060.000	LF	N	ELECTRICAL SERVICE WIRE, FURNISH & INSTALL
0639 2 4	1	$6.00	$1,260.00	210.000	LF	N	ELECTRICAL SERVICE WIRE, RELOCATE
0639 2 6	4	$1.46	$1,373.40	939.000	LF	N	ELECTRICAL SERVICE WIRE, REMOVE
0639 3 11	17	$1,536.55	$141,362.56	92.000	EA	N	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT
0639 3 60	3	$299.50	$898.50	3.000	EA	N	ELECTRICAL SERVICE DISCONNECT, REMOVE- POLE OR CABINET TO REMAIN
0639 5 31	1	$150,000.00	$150,000.00	1.000	EA	N	EMERGENCY GENERATOR-PERMANENT 51-75 KW
0639 5 50	1	$4,500.00	$4,500.00	1.000	EA	N	EMERGENCY GENERATOR-PERMANENT, REMOVE
0639 6 1	7	$2,314.36	$94,888.56	41.000	EA	N	ELECTRICAL POWER SERVICE- TRANSFORMER FURNISH & INSTALL
0639 8100	1	$11,602.31	$23,204.62	2.000	LS	N	ELECTRICAL POWER SERVICE- CONTRIBUTION IN AID OF CONSTRUCTION (CIAC), DUKE (DO NOT BID)
0641 2 11	4	$1,747.78	$31,460.00	18.000	EA	N	PRESTRESSED CONCRETE POLE, F&I, TYPE P-II PEDESTAL
0641 2 12	30	$1,529.07	$133,028.91	87.000	EA	N	PRESTRESSED CONCRETE POLE, F&I, TYPE P-II SERVICE POLE
0641 2 15	1	$13,460.00	$13,460.00	1.000	EA	N	PRESTRESSED CONCRETE POLE, F&I, TYPE P-V

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0649 1 14	1	$45,500.00	$182,000.00	4.000	EA	N	STEEL STRAIN POLE, F&I, TYPE PS- VII
0649 1 15	1	$45,000.00	$180,000.00	4.000	EA	N	STEEL STRAIN POLE, F&I, TYPE PS- VIII
0649 1 16	2	$60,000.67	$480,005.36	8.000	EA	N	STEEL STRAIN POLE, F&I, TYPE PS- IX
0649 1 17	1	$70,629.46	$282,517.84	4.000	EA	N	STEEL STRAIN POLE, F&I, TYPE PS- X
0649 1 63	2	$6,012.76	$36,076.54	6.000	EA	N	STEEL STRAIN POLE, REMOVE, SHALLOW FOUNDATION REMOVAL, BOLT ON ATTACHMENT
0649 1 65	1	$7,700.00	$23,100.00	3.000	EA	N	STEEL STRAIN POLE, REMOVE, DEEP FOUNDATION REMOVAL, BOLT ON ATTACHMENT
0649 2155	2	$50,750.00	$406,000.00	8.000	EA	N	STEEL CCTV POLE, FURNISH & INSTALL WITH LOWERING DEVICE, 55'
0649 2170	1	$95,000.00	$380,000.00	4.000	EA	N	STEEL CCTV POLE, FURNISH & INSTALL WITH LOWERING DEVICE, 70'
0649 2603	1	$4,500.00	$9,000.00	2.000	EA	N	STEEL CCTV POLE, REMOVE POLE- SHALLOW FOUNDATION REMOVAL, BOLT ON ATTACHMENT
0649 2605	1	$10,000.00	$10,000.00	1.000	EA	N	STEEL CCTV POLE, REMOVE POLE- COMPLETE/DEEP FOUNDATION REMOVAL, BOLT ON ATTACHMENT
0649 21 1	1	$33,187.38	$66,374.76	2.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 30'
0649 21 2	1	$65,740.00	$131,480.00	2.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 30'-30'
0649 21 3	10	$60,512.50	$907,687.50	15.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 40'
0649 21 5	3	$72,158.36	$288,633.43	4.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 40'-40'

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0649 21 6	7	$64,607.14	$581,464.26	9.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 50'
0649 21 7	2	$96,760.50	$193,521.00	2.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 50'-30'
0649 21 8	2	$75,836.24	$151,672.47	2.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 50'-40'
0649 21 10	5	$76,677.36	$613,418.88	8.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 60'
0649 21 15	7	$100,055.50	$1,200,665.96	12.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 70'
0649 21 21	4	$70,421.07	$422,526.40	6.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, SINGLE ARM 78'
0649 21 24	1	$80,191.10	$80,191.10	1.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 78'-50'
0649 21 26	2	$156,653.60	$313,307.20	2.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 78'-70'
0649 21 27	3	$115,576.01	$346,728.03	3.000	EA	N	STEEL MAST ARM ASSEMBLY, FURNISH AND INSTALL, DOUBLE ARM 78'-78'
0649 26 3	3	$4,632.58	$18,530.30	4.000	EA	N	STEEL MAST ARM ASSEMBLY, REMOVE, SHALLOW FOUNDATION- BOLT ON ATTACHMENT
0649 26 5	4	$8,668.00	$52,008.00	6.000	EA	N	STEEL MAST ARM ASSEMBLY, REMOVE, DEEP FOUNDATION- BOLT ON ATTACHMENT
0649 26 7	1	$3,712.00	$3,712.00	1.000	EA	N	STEEL MAST ARM ASSEMBLY, REMOVE, REMOVE ARM AND ATTACHMENTS; POLE REMAINS

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0650 1 14	27	$1,688.00	$973,976.33	577.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 3 SECTION, 1 WAY
0650 1 15	1	$1,947.00	$3,894.00	2.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 3 SECTION, 2-4 WAYS
0650 1 16	10	$1,447.46	$85,400.20	59.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 4 SECTION, 1 WAY
0650 1 19	11	$1,802.45	$70,295.36	39.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL ALUMINUM, 5 SECTION CLUSTER, 1 WAY
0650 1 24	1	$1,065.00	$14,910.00	14.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE W/ALUM TOP, 3 SECTION, 1 WAY
0650 1 26	1	$1,380.00	$4,140.00	3.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE W/ALUM TOP, 4 SECTION, 1 WAY
0650 1 34	4	$1,050.42	$34,663.90	33.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE, 3 SECTION, 1 WAY
0650 1 35	1	$1,842.99	$1,842.99	1.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE, 3 SECTION, 2-4 WAYS
0650 1 36	2	$1,323.96	$5,295.82	4.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE, 4 SECTION, 1 WAY
0650 1 39	1	$1,535.83	$4,607.49	3.000	AS	N	VEHICULAR TRAFFIC SIGNAL, FURNISH & INSTALL POLYCARBONATE, 5 SECTION CLUSTER, 1 WAY

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0650 1 60	11	$151.28	$41,147.99	272.000	AS	N	VEHICULAR TRAFFIC SIGNAL, REMOVE- POLES TO REMAIN
0650 1 70	6	$853.84	$23,907.47	28.000	AS	N	VEHICULAR TRAFFIC SIGNAL, RELOCATE- INCLUDES REMOVAL AND REINSTALLATION
0650 2102	3	$323.33	$3,556.68	11.000	EA	N	VEHICULAR SIGNAL AUXILIARIES, REPAIR/REPLACE/RETROFIT- FURNISH & INSTALL, BACKPLATE- BLACK WITH REFLECT BORDER
0650 2109	12	$492.76	$91,653.81	186.000	EA	N	VEHICULAR SIGNAL AUXILIARIES, REPAIR/REPLACE/RETROFIT- FURNISH & INSTALL, BACKPLATE- FLEXIBLE REQUIRED
0653 1 11	33	$733.93	$352,286.95	480.000	AS	N	PEDESTRIAN SIGNAL, FURNISH & INSTALL LED COUNTDOWN, 1 WAY
0653 1 12	13	$1,487.35	$55,032.04	37.000	AS	N	PEDESTRIAN SIGNAL, FURNISH & INSTALL LED COUNTDOWN, 2 WAYS
0653 1 40	1	$500.00	$500.00	1.000	AS	N	PEDESTRIAN SIGNAL, RELOCATE
0653 1 60	15	$91.02	$9,921.65	109.000	AS	N	PEDESTRIAN SIGNAL, REMOVE PED SIGNAL- POLE/PEDESTAL TO REMAIN
0654 1 10	2	$58,646.64	$1,172,932.80	20.000	AS	N	MIDBLOCK CROSSWALK: IN ROADWAY LIGHT ASSEMBLY, FURNISH & INSTALL- AC POWERED, COMPLETE CROSSING
0654 2 11	1	$8,500.00	$51,000.00	6.000	AS	N	MIDBLOCK CROSSWALK: RECTANGULAR RAPID FLASHING BEACON, FURNISH & INSTALL- AC, COMPLETE SIGN ASSEMBLY- SINGLE DIRECTION
0654 2 17	1	$22,755.80	$182,046.40	8.000	AS	N	MIDBLOCK CROSSWALK: RECTANGULAR RAPID FLASHING BEACON, FURNISH/INSTALL- AC, SIGN ASSY- SINGLE DIR ACCESSIBLE DETECTOR
0654 2 18	1	$26,249.63	$209,997.04	8.000	AS	N	MIDBLOCK CROSSWALK: REC RAPID FLASHING BEACON, FURNISH/INSTALL- AC, SIGN ASSEMBLY- BACK-BACK ACCESSIBLE DETECTOR

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0654 2 27	1	$6,080.96	$24,323.84	4.000	AS	N	MIDBLOCK CROSSWALK: REC RAPID FLASHING BEACON, FURNISH/INSTALL- SOLAR, SIGN ASSEMBLY- SINGLE DIR ACCESSIBLE DETECTOR
0654 2 28	1	$10,655.00	$42,620.00	4.000	AS	N	MIDBLOCK CROSSWALK: REC RAPID FLASHING BEACON, FURNISH/INSTALL- SOLAR, SIGN ASSEMBLY- BACK-BACK ACCESSIBLE DETECTOR
0654 2 60	2	$1,166.67	$7,000.00	6.000	AS	N	MIDBLOCK CROSSWALK: RECTANGULAR RAPID FLASHING BEACON, REMOVE COMPLETE SIGN ASSEMBLY
0654 3 10	4	$1,366.65	$40,999.56	30.000	AS	N	MIDBLOCK CROSSWALK: PEDESTRIAN HYBRID BEACON ASSEMBLY, FURNISH & INSTALL COMPLETE ASSEMBLY
0660 1109	9	$285.80	$36,296.72	127.000	EA	N	LOOP DETECTOR INDUCTIVE, F&I, TYPE 9
0660 1110	5	$355.06	$6,035.95	17.000	EA	N	LOOP DETECTOR INDUCTIVE, F&I, TYPE 10
0660 1111	2	$281.17	$1,968.16	7.000	EA	N	LOOP DETECTOR INDUCTIVE, F&I, TYPE 11, 4 CH, SS, RM
0660 1112	1	$287.00	$574.00	2.000	EA	N	LOOP DETECTOR INDUCTIVE, F&I, TYPE 12, 4 CH, SS, RM, TD
0660 1600	4	$76.88	$5,535.08	72.000	EA	N	LOOP DETECTOR INDUCTIVE, REMOVE- CABINET TO REMAIN
0660 2101	2	$1,013.94	$54,752.76	54.000	AS	N	LOOP ASSEMBLY- F&I, TYPE A
0660 2102	19	$937.71	$323,509.79	345.000	AS	N	LOOP ASSEMBLY, F&I, TYPE B
0660 2106	14	$1,092.09	$157,260.96	144.000	AS	N	LOOP ASSEMBLY, F&I, TYPE F
0660 3 11	12	$2,125.17	$182,764.74	86.000	EA	N	VEHICLE DETECTION SYSTEM- MICROWAVE, FURNISH & INSTALL CABINET EQUIPMENT

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0660 6600	2	$457.50	$915.00	2.000	EA	N	VEHICLE DETECTION SYSTEM- AVI, REMOVE COMPLETE SYSTEM
0660 7 22	1	$85,700.00	$171,400.00	2.000	EA	N	VEHICLE DETECTION SYSTEM- WRONG WAY FOR EXIT RAMP, 3 OR MORE LANES, AC POWERED
0660 9 11	1	$21,422.00	$64,266.00	3.000	EA	N	TRAFFIC DATA DETECTION SYSTEM- VIDEO, FURNISH AND INSTALL, CABINET EQUIPMENT
0660 9 12	1	$14,378.00	$86,268.00	6.000	EA	N	TRAFFIC DATA DETECTION SYSTEM- VIDEO, FURNISH AND INSTALL, ABOVE GROUND EQUIPMENT
0663 1111	9	$7,061.91	$91,804.89	13.000	EA	N	SIGNAL PRIORITY AND PREEMPTION SYSTEM, F&I, OPTICAL, CABINET ELECTRONICS
0663 1112	9	$2,449.36	$107,772.04	44.000	EA	N	SIGNAL PRIORITY AND PREEMPTION SYSTEM, F&I, OPTICAL, DETECTOR
0663 1121	3	$6,044.05	$18,132.16	3.000	EA	N	SIGNAL PRIORITY AND PREEMPTION SYSTEM, FURNISH AND INSTALL, GPS, REPLACE CABINET ELECTRONICS
0663 1122	3	$5,679.39	$17,038.16	3.000	EA	N	SIGNAL PRIORITY AND PREEMPTION SYSTEM, FURNISH AND INSTALL, GPS, DETECTOR
0663 1400	3	$1,184.00	$4,736.00	4.000	EA	N	SIGNAL PRIORITY & PREEMPTION SYSTEM, RELOCATE
0663 1600	2	$428.27	$856.53	2.000	EA	N	SIGNAL PRIORITY & PREEMPTION SYSTEM, REMOVE
0665 1 11	27	$287.85	$138,169.73	480.000	EA	N	PEDESTRIAN DETECTOR, FURNISH & INSTALL, STANDARD
0665 1 12	10	$1,476.02	$144,650.40	98.000	EA	N	PEDESTRIAN DETECTOR, FURNISH & INSTALL, ACCESSIBLE
0665 1 40	1	$232.56	$930.24	4.000	EA	N	PEDESTRIAN DETECTOR, RELOCATE
0665 1 50	1	$2,356.45	$2,356.45	1.000	EA	N	PEDESTRIAN DETECTOR, ADJUST/MODIFY ON EXISTING POLE

Florida Department of Transportation
Item Average Unit Cost
From 2021/09/01 to 2022/08/31
Statewide

Market Area: 08
Contract Type: CC
Displaying: VALID ITEMS WITH HITS
From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0665 1 60	14	$55.45	$7,375.51	133.000	EA	N	PEDESTRIAN DETECTOR, REMOVE- POLE/PEDESTAL TO REMAIN
0670 5110	15	$35,450.63	$815,364.42	23.000	AS	N	TRAFFIC CONTROLLER ASSEMBLY, F&I, NEMA
0670 5111	8	$36,629.55	$402,925.03	11.000	AS	N	TRAFFIC CONTROLLER ASSEMBLY, F&I, NEMA, 1 PREEMPTION
0670 5112	5	$35,210.98	$176,054.88	5.000	AS	N	TRAFFIC CONTROLLER ASSEMBLY, F&I, NEMA, 2 PREEMPTION
0670 5500	1	$3,710.00	$3,710.00	1.000	AS	N	TRAFFIC CONTROLLER ASSEMBLY, RELOCATE CONTROLLER WITH CABINET
0670 5600	16	$814.11	$18,724.52	23.000	AS	N	TRAFFIC CONTROLLER ASSEMBLY, REMOVE CONTROLLER WITH CABINET
0671 2 11	1	$5,130.00	$5,130.00	1.000	EA	N	TRAFFIC CONTROLLER WITHOUT CABINET, F&I IN EXISTING CABINET, NEMA
0671 2 40	4	$3,203.40	$64,068.00	20.000	EA	N	TRAFFIC CONTROLLER, MODIFY
0671 2 50	1	$854.93	$1,709.86	2.000	EA	N	TRAFFIC CONTROLLER, RELOCATE- WITHOUT CABINET
0671 2 60	1	$127.00	$127.00	1.000	EA	N	TRAFFIC CONTROLLER, REMOVE- CABINET TO REMAIN
0676 1116	1	$23,116.90	$46,233.80	2.000	EA	N	TRAFFIC SIGNAL CONTROLLER CABINET, FURNISH & INSTALL WITHOUT CONTROLLER, NEMA SIZE6, 44" W X 52" H X 24" D
0676 1500	1	$1,020.00	$1,020.00	1.000	EA	N	TRAFFIC SIGNAL CONTROLLER CABINET, ADJUST/MODIFY
0676 1600	1	$3,750.00	$3,750.00	1.000	EA	N	TRAFFIC SIGNAL CONTROLLER CABINET, REMOVE
0676 2112	1	$10,000.00	$30,000.00	3.000	EA	N	ITS CABINET, FURNISH & INSTALL, POLE MOUNT, 336S, 24" W X 46" H X 22" D
0676 2122	5	$8,366.59	$108,765.70	13.000	EA	N	ITS CABINET, FURNISH & INSTALL, POLE MOUNT WITH SUNSHIELD, 336S, 24" W X 46" H X 22" D

Florida Department of Transportation
Item Average Unit Cost
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Statewide

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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0700 1 11	53	$456.62	$1,237,453.14	2,710.000	AS	N	SINGLE POST SIGN, F&I GROUND MOUNT, UP TO 12 SF
0700 1 12	37	$1,626.99	$1,184,448.52	728.000	AS	N	SINGLE POST SIGN, F&I GROUND MOUNT, 12-20 SF
0700 1 13	23	$2,001.63	$184,149.63	92.000	AS	N	SINGLE POST SIGN, F&I GROUND MOUNT, 21-30 SF
0700 1 14	3	$3,824.66	$30,597.30	8.000	AS	N	SINGLE POST SIGN, F&I GROUND MOUNT, 31+ SF
0700 1 21	1	$2,135.00	$10,675.00	5.000	AS	N	SINGLE POST SIGN, F&I BARRIER MOUNT INDEX 11871/700-013 UP TO 12 SF
0700 1 22	2	$4,233.85	$55,040.00	13.000	AS	N	SINGLE POST SIGN, F&I BARRIER MOUNT INDEX 11871/700-013, 12-20 SF
0700 1 31	2	$3,142.55	$34,568.00	11.000	AS	N	SINGLE POST SIGN, F&I BRIDGE MOUNT INDEX 11870/700-012, UP TO 12 SF
0700 1 32	2	$3,303.33	$9,910.00	3.000	AS	N	SINGLE POST SIGN, F&I BRIDGE MOUNT INDEX 11870/700-012, 12-20 SF
0700 1 50	40	$399.36	$103,435.38	259.000	AS	N	SINGLE POST SIGN, RELOCATE
0700 1 60	51	$59.52	$108,735.21	1,827.000	AS	N	SINGLE POST SIGN, REMOVE
0700 1 74	3	$3,597.41	$43,168.96	12.000	AS	N	SINGLE POST SIGN, F&I CUSTOM, 31+ SF
0700 2 11	1	$2,000.00	$2,000.00	1.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, UP TO 12 SF
0700 2 12	3	$4,684.89	$42,164.00	9.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, 12-20 SF
0700 2 13	9	$5,554.21	$66,650.46	12.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, 21-30 SF
0700 2 14	15	$6,702.65	$368,645.74	55.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, 31-50 SF
0700 2 15	16	$8,618.04	$594,644.87	69.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, 51-100 SF
0700 2 16	6	$12,377.02	$507,458.00	41.000	AS	N	MULTI- POST SIGN, F&I GROUND MOUNT, 101-200 SF

Florida Department of Transportation
Item Average Unit Cost
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Statewide

Market Area: 08
Contract Type: CC
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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0700 4114	4	$149,696.80	$4,490,904.00	30.000	EA	N	OVERHEAD STATIC SIGN STRUCTURE, FURNISH & INSTALL, CANTILEVER, 41-50 FT
0700 4125	2	$236,000.00	$472,000.00	2.000	EA	N	OVERHEAD STATIC SIGN STRUCTURE, FURNISH & INSTALL, SPAN, 51-100 FT
0700 4140	1	$13,400.00	$26,800.00	2.000	EA	N	OVERHEAD STATIC SIGN STRUCTURE, FURNISH & INSTALL, OVERPASS BRIDGE MOUNT
0700 4514	1	$80,000.00	$160,000.00	2.000	EA	N	OVERHEAD STATIC SIGN STRUCTURE, RELOCATE, CANTILEVER, 41-50 FT
0700 4640	2	$3,665.00	$14,660.00	4.000	EA	N	OVERHEAD STATIC SIGN STRUCTURE, REMOVE BRIDGE MOUNT
0700 5 21	5	$3,397.00	$27,176.00	8.000	EA	N	INTERNALLY ILLUMINATED SIGN, FURNISH & INSTALL OVERHEAD MOUNT, UP TO 12 SF
0700 5 22	26	$4,445.94	$782,485.15	176.000	EA	N	INTERNALLY ILLUMINATED SIGN, FURNISH & INSTALL, OVERHEAD MOUNT, 12-18 SF
0700 5 60	7	$444.67	$37,797.02	85.000	EA	N	INTERNALLY ILLUMINATED SIGN, REMOVE
0700 6 11	4	$5,921.19	$301,980.77	51.000	AS	N	HIGHLIGHTED SIGN, F&I GROUND MOUNT- AC POWERED, UP TO 12 SF
0700 6 12	1	$4,978.40	$39,827.20	8.000	AS	N	HIGHLIGHTED SIGN, F&I GROUND MOUNT- AC POWERED, 12-20 SF
0700 6 21	1	$6,697.05	$40,182.30	6.000	AS	N	HIGHLIGHTED SIGN, F&I GROUND MOUNT- SOLAR POWERED, UP TO 12 SF
0700 6108	1	$7,475.00	$59,800.00	8.000	AS	N	HIGHLIGHTED SIGN, F&I BARRIER MOUNT- WRONG WAY, AC POWERED , PROJECT 441113-1-52-01

Florida Department of Transportation
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From 2021/09/01 to 2022/08/31
Statewide

Market Area: 08
Contract Type: CC
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From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0711 11103	7	$13,109.07	$63,710.10	4.860	GM	N	THERMOPLASTIC, STANDARD, WHITE, SOLID, 12" FOR INTERCHANGE MARKINGS
0711 11123	43	$3.62	$376,792.08	104,148.000	LF	N	THERMOPLASTIC, STANDARD, WHITE, SOLID, 12" FOR CROSSWALK AND ROUNDABOUT
0711 11124	32	$5.04	$185,031.58	36,680.000	LF	N	THERMOPLASTIC, STANDARD, WHITE, SOLID, 18" FOR DIAGONALS AND CHEVRONS
0711 11125	51	$6.41	$167,516.27	26,140.000	LF	N	THERMOPLASTIC, STANDARD, WHITE, SOLID, 24" FOR STOP LINE AND CROSSWALK
0711 11130	2	$148.17	$2,518.83	17.000	EA	N	THERMOPLASTIC, STANDARD, WHITE, VERTICAL DEFLECTION MARKING
0711 11140	1	$137.33	$2,197.28	16.000	EA	N	THERMOPLASTIC, STANDARD, WHITE, VERTICAL DEFLECTION ADVANCE WARNING MARKING
0711 11141	41	$2,892.40	$83,914.25	29.012	GM	N	THERMOPLASTIC, STANDARD, WHITE, 2-4 DOTTED GUIDELINE/ 6-10 GAP EXTENSION, 6"
0711 11144	2	$5,551.07	$416.33	.075	GM	N	THERMOPLASTIC, STANDARD, WHITE, 2-2 DOTTED EXTENSION LINE, 12" FOR ROUNDABOUT
0711 11160	32	$149.92	$89,051.06	594.000	EA	N	THERMOPLASTIC, STANDARD, WHITE, MESSAGE OR SYMBOL
0711 11170	49	$73.34	$258,305.07	3,522.000	EA	N	THERMOPLASTIC, STANDARD, WHITE, ARROW
0711 11180	6	$4.62	$4,953.63	1,072.000	LF	N	THERMOPLASTIC, STANDARD, WHITE, YIELD LINE
0711 11224	37	$5.80	$121,670.36	20,972.000	LF	N	THERMOPLASTIC, STANDARD, YELLOW, SOLID, 18" FOR DIAGONAL OR CHEVRON

Florida Department of Transportation
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Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0711 14341	2	$3,910.38	$829.00	.212	GM	N	THERMOPLASTIC, PREFORMED, BLACK, 2-4 DOTTED GUIDELINE ON CONCRETE SURFACES
0711 14526	2	$19.22	$10,050.60	523.000	LF	N	THERMOPLASTIC, PREFORMED, 24" WHITE WITH 4" BLACK CONTRAST FOR CROSSWALK ON CONCRETE PAVEMENT, 32"
0711 14560	3	$993.90	$40,750.00	41.000	EA	N	THERMOPLASTIC, PREFORMED, WHITE WITH BLACK CONTRAST ON CONCRETE PAVEMENT, MESSAGE OR SYMBOL
0711 14570	5	$818.45	$136,681.92	167.000	EA	N	THERMOPLASTIC, PREFORMED, WHITE WITH BLACK CONTRAST, ARROW ON CONCRETE SURFACE
0711 14660	6	$1,575.47	$103,980.78	66.000	EA	N	THERMOPLASTIC, PREFORMED, MULTI COLOR ROUTE SHIELD
0711 15101	26	$5,252.02	$874,917.73	166.587	GM	N	THERMOPLASTIC, STANDARD-OPEN GRADED ASPHALT SURFACES WHITE, SOLID, 6"
0711 15102	13	$6,634.15	$80,770.77	12.175	GM	N	THERMOPLASTIC, STANDARD-OPEN GRADED ASPHALT SURFACES, WHITE, SOLID, 8"
0711 15131	25	$1,733.62	$355,989.71	205.345	GM	N	THERMOPLASTIC, STANDARD-OPEN GRADED ASPHALT SURFACES, WHITE, SKIP, 6",10-30 SKIP OR 3-9 LANE DROP
0711 15133	8	$3,718.93	$15,005.88	4.035	GM	N	THERMOPLASTIC, STANDARD-OPEN GRADED ASPHALT SURFACES, WHITE, SKIP, 12"- APPROACH TO TOLL PLAZA OR 3-9 LANE DROP
0711 15201	26	$5,363.62	$755,299.88	140.819	GM	N	THERMOPLASTIC, STANDARD-OPEN GRADED ASPHALT SURFACES, YELLOW, SOLID, 6"

Florida Department of Transportation
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Statewide

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From: 0102 1 To: 9999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0110 2 2	20	$39,720.33	$691,133.69	17.400	AC	N	SELECTIVE CLEARING AND GRUBBING, AREAS WITH TREES TO REMAIN
0110 3	29	$44.11	$9,897,597.81	224,385.000	SF	N	REMOVAL OF EXISTING STRUCTURES/BRIDGES
0110 4 10	243	$30.78	$12,918,835.80	419,711.000	SY	N	REMOVAL OF EXISTING CONCRETE
0110 5	1	$4,920.00	$24,600.00	5.000	EA	N	PLUGGING WATER WELLS, ARTESIAN
0110 6	1	$15,000.00	$15,000.00	1.000	EA	N	PLUGGING WATER WELLS, NON-ARTESIAN
0110 7 1	65	$235.91	$215,856.81	915.000	EA	N	MAILBOX, F&I SINGLE
0110 12 1	1	$7,500.00	$195,000.00	26.000	SY	N	HYDRODEMOLITION, REMOVAL OF DECK SURFACE
0110 21	40	$8.14	$910,236.68	111,798.000	LF	N	TREE PROTECTION BARRIER
0110 22	36	$787.78	$772,807.67	981.000	EA	N	TREE ROOT AND BRANCH PRUNING
0110 23	19	$579.48	$316,397.16	546.000	EA	N	TREE REMOVAL
0110 71 1	2	$317.08	$207,055.00	653.000	LF	N	BRIDGE FENDER SYSTEM, REMOVAL & DISPOSAL
0110 73	3	$393.68	$1,489,285.00	3,783.000	LF	N	REMOVE EXISTING BULKHEAD
0110 82	3	$3,270.48	$138,668.50	42.400	MB	N	REMOVE & DISPOSE OF STRUCTURAL TIMBER
0110 84	1	$400,000.00	$400,000.00	1.000	LS	N	TRANSPORT EXISTING MATERIAL FOR REEF ESTABLISHMENT
0120 1	183	$9.66	$33,986,736.67	3,519,308.800	CY	N	REGULAR EXCAVATION
0120 2 2	74	$24.61	$2,387,015.05	97,005.700	CY	N	BORROW EXCAVATION, TRUCK MEASURE
0120 2100	1	$75.00	$14,550.00	194.000	CY	N	BORROW EXCAVATION, TRUCK MEASURE, PROJECT 442906-1-52-01
0120 3	1	$65.00	$107,575.00	1,655.000	CY	N	LATERAL DITCH EXCAVATION
0120 4	43	$24.52	$6,907,562.69	281,689.900	CY	N	SUBSOIL EXCAVATION
0120 5	6	$32.03	$310,335.10	9,689.600	CY	N	CHANNEL EXCAVATION
0120 6	155	$15.86	$68,246,252.38	4,303,239.700	CY	N	EMBANKMENT

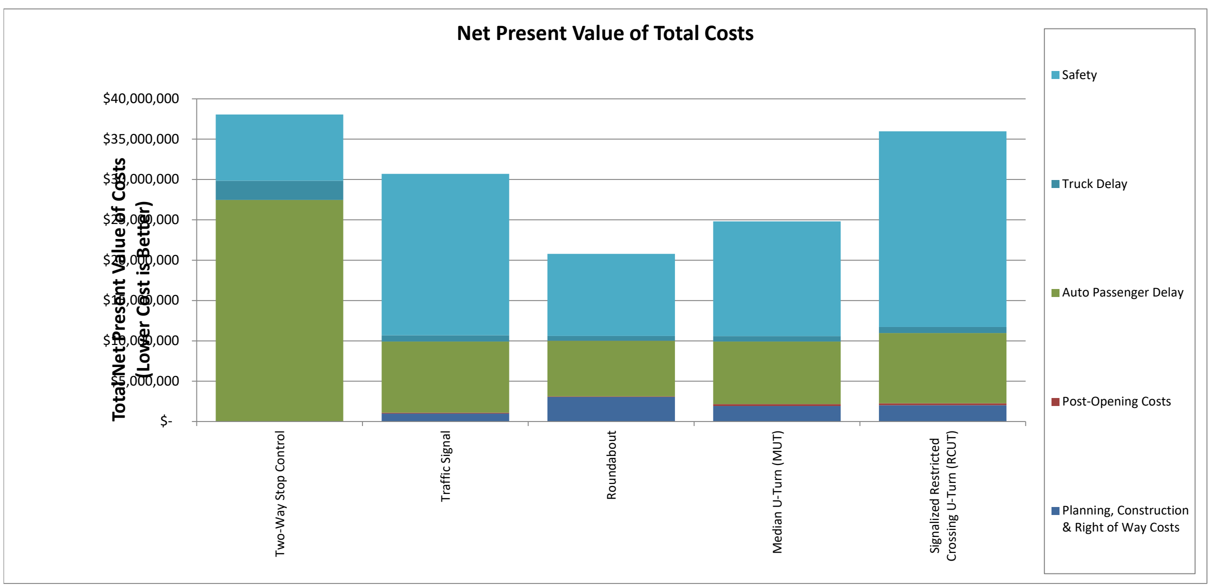
Agency:	Space Coast Transportation Planning Organization
Project Name:	Fiske Blvd. and Roy Wall Blvd. Intersection Analysis
Project Reference:	Work Order 22-14K
Intersection:	Fiske Blvd. and Roy Wall Blvd/Martin Road
City:	Rockledge
State:	Florida
Performing Department or Organization:	Transportation Department
Date:	10/5/2022
Analyst:	KAI
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs						
	Two-Way Stop Control	**Traffic Signal**	**Roundabout**	**Median U-Turn (MUT)**	**Signalized Restricted Crossing U-Turn (RCUT)**		
Planning, Construction & Right of Way Costs	$ -	$ 1,002,500	$ 3,052,300	$ 1,923,400	$ 2,025,900		
Post-Opening Costs	$ 14,590	$ 98,229	$ 72,952	$ 238,276	$ 238,276		
Auto Passenger Delay	$ 27,446,851	$ 8,820,661	$ 6,884,960	$ 7,765,621	$ 8,703,596		
Truck Delay	$ 2,386,842	$ 767,028	$ 598,690	$ 675,281	$ 756,835		
Safety	$ 8,198,825	$ 20,007,789	$ 10,182,096	$ 14,203,421	$ 24,244,521		
Total cost	**$38,047,108**	**$30,696,206**	**$20,790,998**	**$24,805,999**	**$35,969,128**		

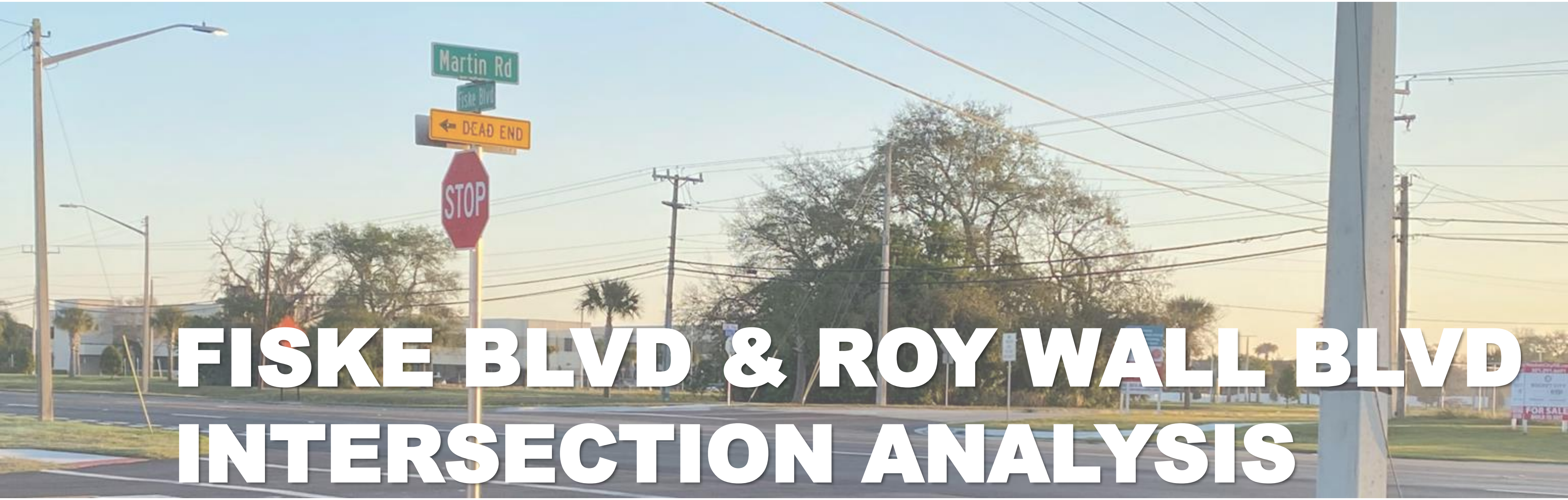
Select Base Case for Benefit-Cost Comparison: (Choose from list)	Two-Way Stop Control

Benefit Categories	Net Present Value of Benefits Relative to Base Case						
	Two-Way Stop Control	**Traffic Signal**	**Roundabout**	**Median U-Turn (MUT)**	**Signalized Restricted Crossing U-Turn (RCUT)**		
Auto Passenger Delay		$ 18,626,190	$ 20,561,891	$ 19,681,229	$ 18,743,255		
Truck Delay		$ 1,619,815	$ 1,788,152	$ 1,711,562	$ 1,630,008		
Safety		$ (11,808,964)	$ (1,983,271)	$ (6,004,596)	$ (16,045,696)		
Net Present Value of Benefits		**$ 8,437,040**	**$ 20,366,772**	**$ 15,388,195**	**$ 4,327,566**		
Net Present Value of Costs		**$ 1,086,138**	**$ 3,110,661**	**$ 2,147,086**	**$ 2,249,586**		
Net Present Value of Improvement		**$ 7,350,902**	**$ 17,256,111**	**$ 13,241,109**	**$ 2,077,980**		
Benefit-Cost (B/C) Ratio		**7.77**	**6.55**	**7.17**	**1.92**		
Delay B/C		**18.64**	**7.18**	**9.96**	**9.06**		
Safety B/C		**preferred. Benefits are less than base case and cost is greater than base**	**preferred. Benefits are less than base case and cost is greater than base**	**preferred. Benefits are less than base case and cost is greater than base**	**preferred. Benefits are less than base case and cost is greater than base**		



Appendix I
Rockledge City Council Presentation

DATE 06/21/2023



FISKE BLVD & ROY WALL BLVD INTERSECTION ANALYSIS

PRESENTATION TO ROCKLEDGE CITY COUNCIL

SPACE COAST TPO

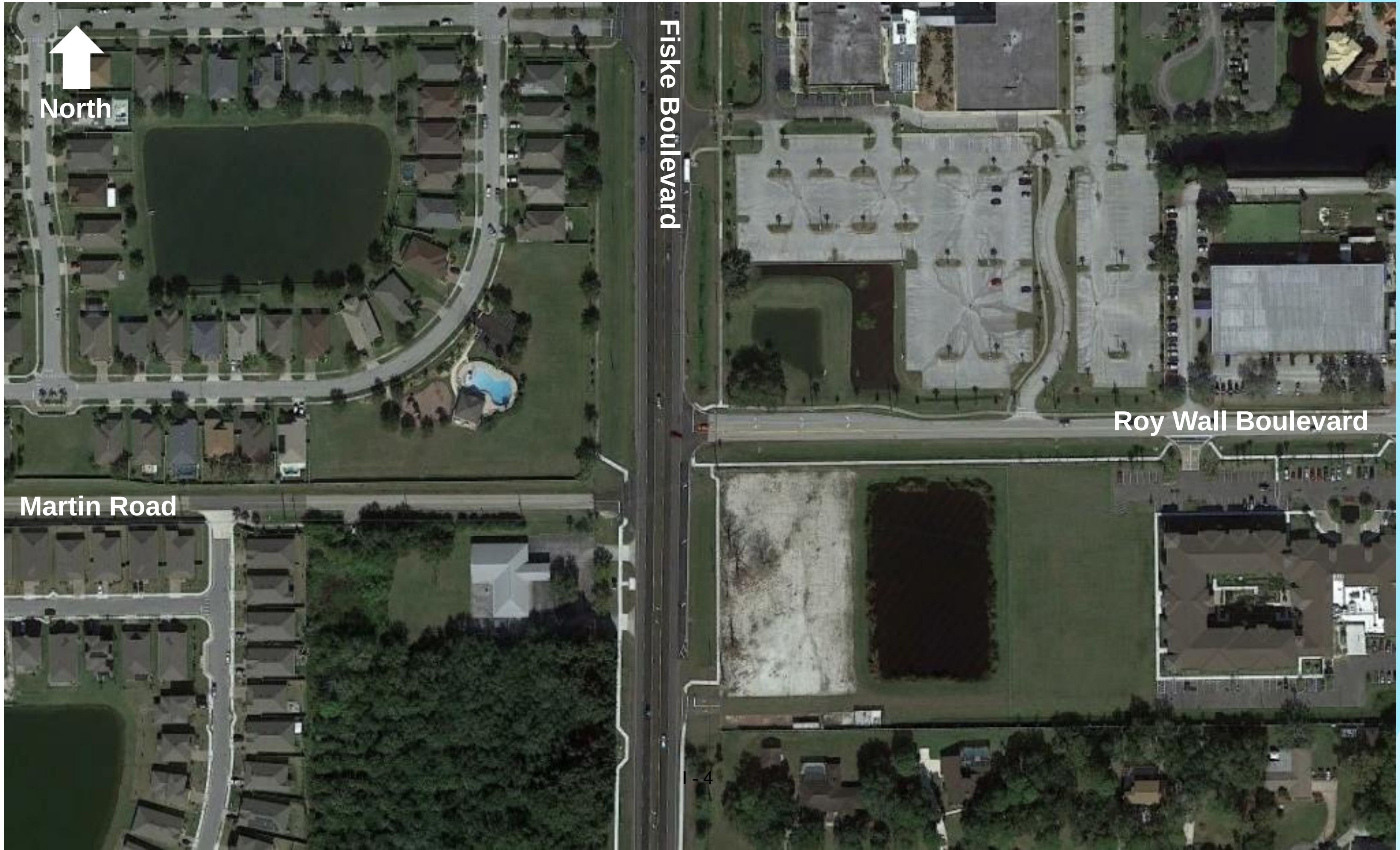
KITTELSON & ASSOCIATES

consor

Meeting Agenda

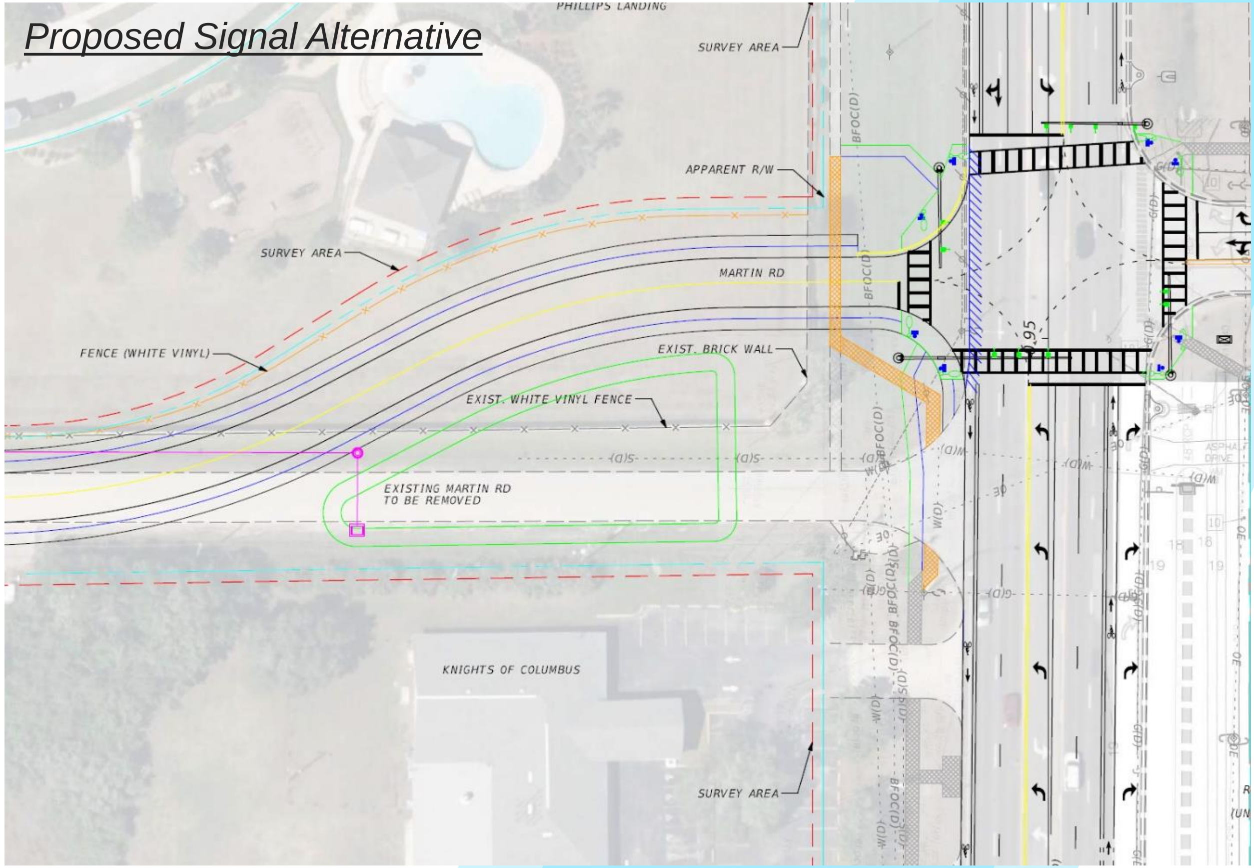
- Project Background
- Intersection Control Evaluation (ICE) Process Overview
- Intersection Alternatives
- Drainage Analysis
- Recommendation
- Next Steps

Project Location

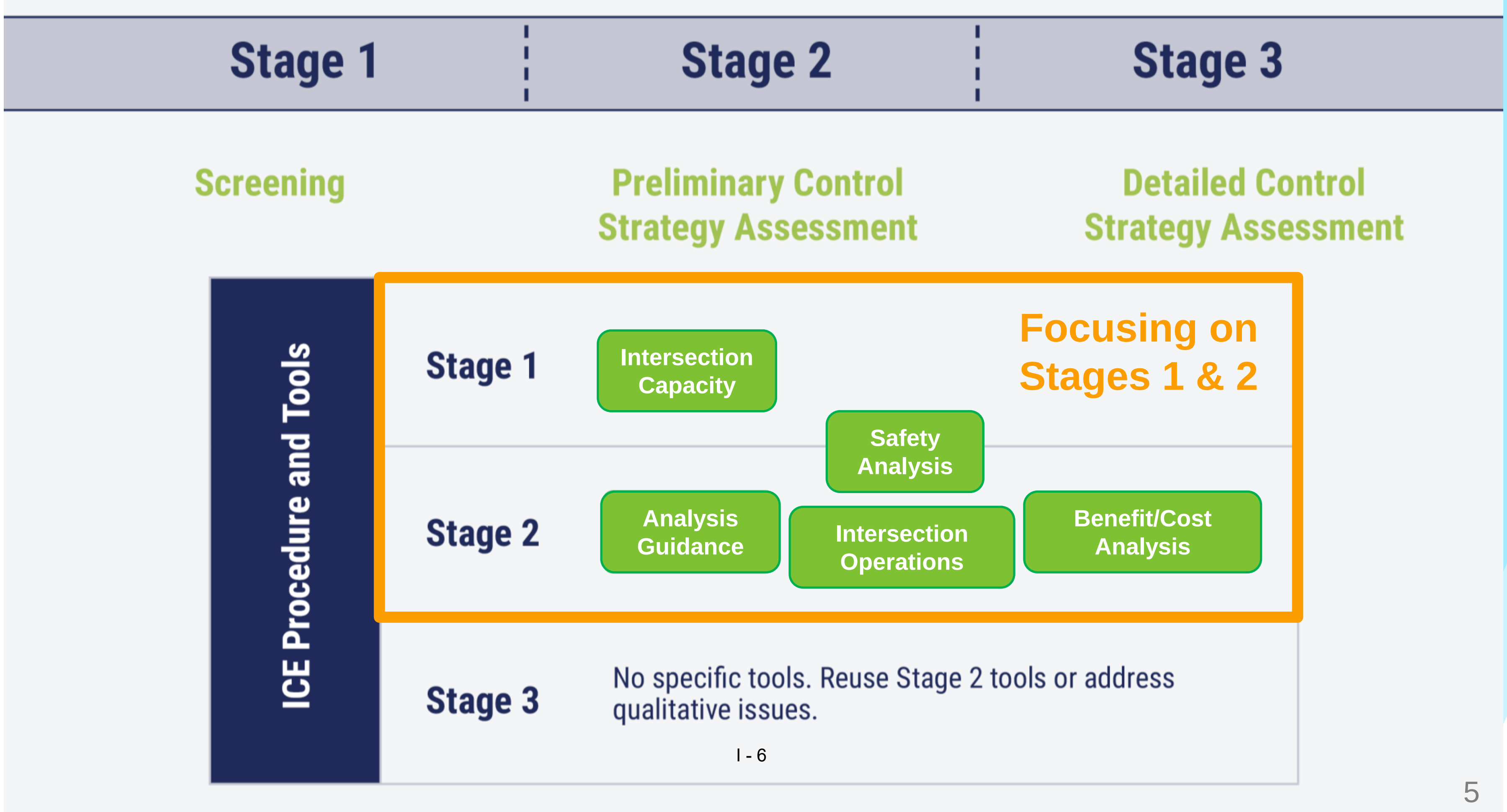


Project Background

- Improvements proposed from SR 519/Fiske Blvd Corridor Planning Study
- Martin Road Realignment
  - Tie into Fiske and Roy Wall intersection
  - Change in drainage patterns
- Analyses needed prior to design
  - Intersection Control Evaluation (ICE)
  - Drainage Analysis



Intersection Control Evaluation (ICE) Process



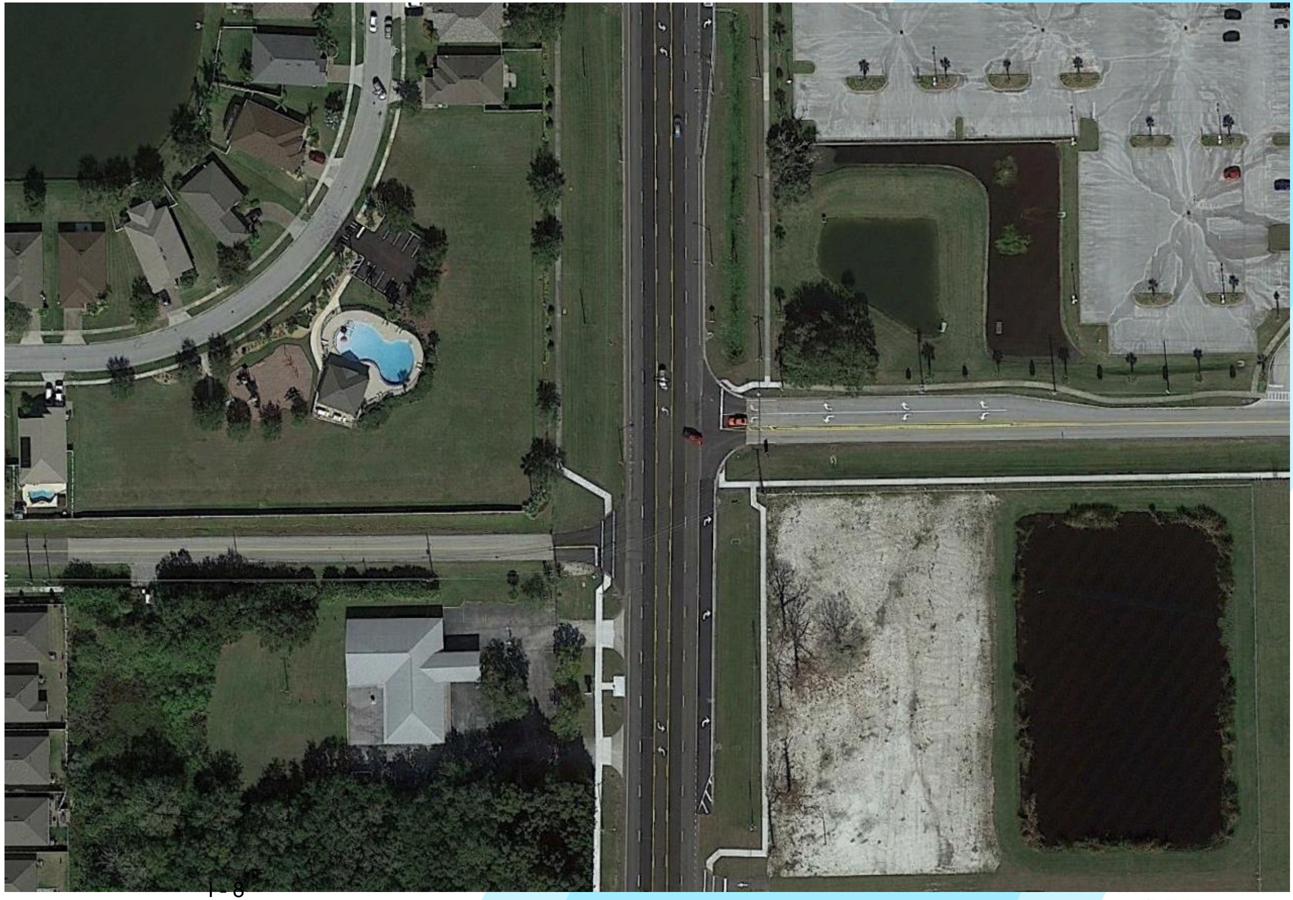
Stage 1 ICE Summary

Control Strategy	Strategy Advanced to Stage 2?
Two-Way Stop Controlled	Yes (Future No-Build)
Traffic Signal	Yes
2x1 Roundabout	Yes
2x2 Roundabout	No
Partial Median U-Turn (MUT)	Yes
Median U-Turn	No
Signalized Restricted Crossing U-Turn (RCUT)	Yes

Two-Way Stop Controlled (No-Build)

- No pedestrian crossings across Fiske Boulevard

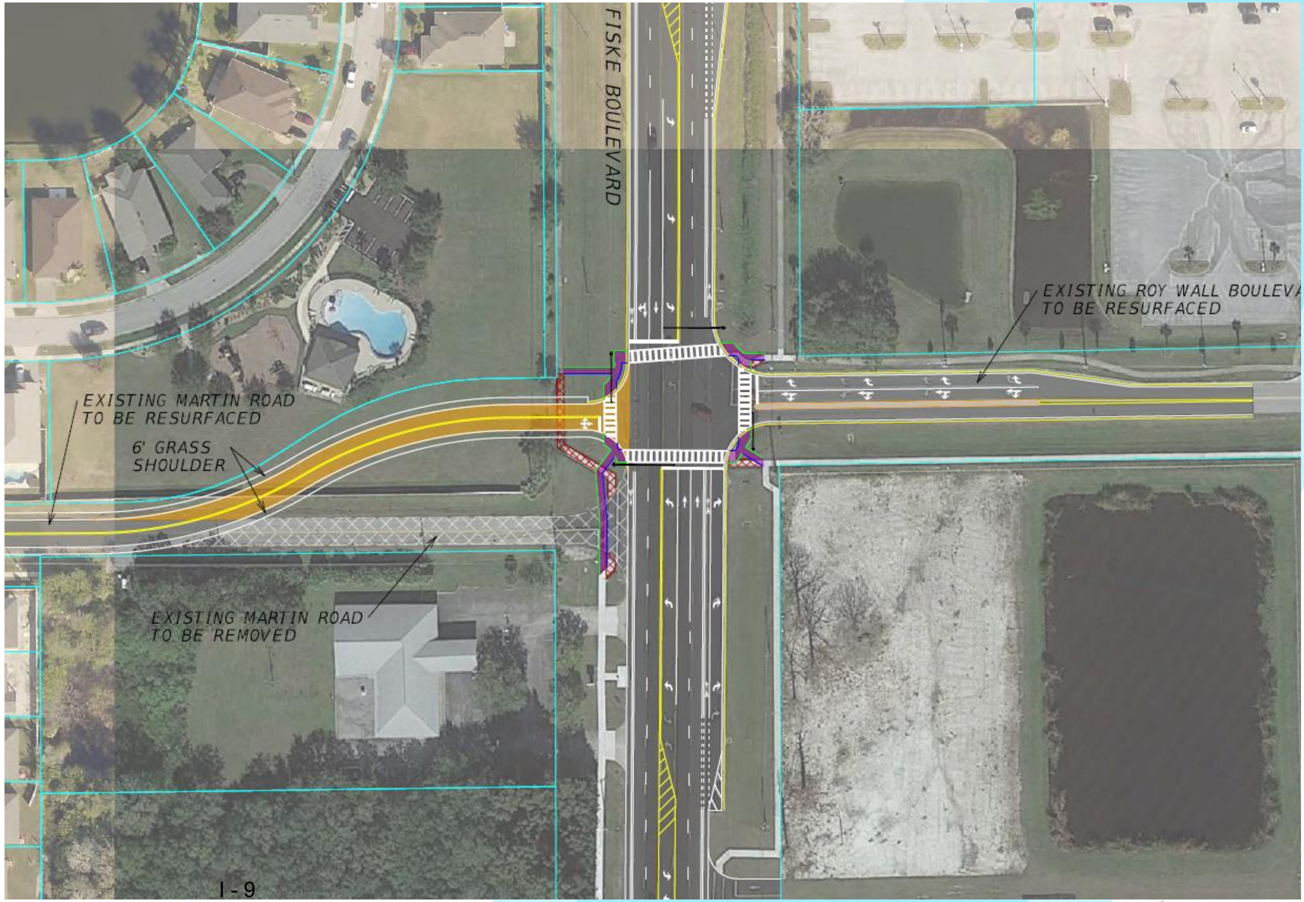
- Existing drainage concerns along Martin Road



I - 8

Traffic Signal

- Adds enhanced pedestrian crossings at intersection
- New pavement needed for Martin Road realignment
- Traffic separators along Fiske Boulevard approaches can be added



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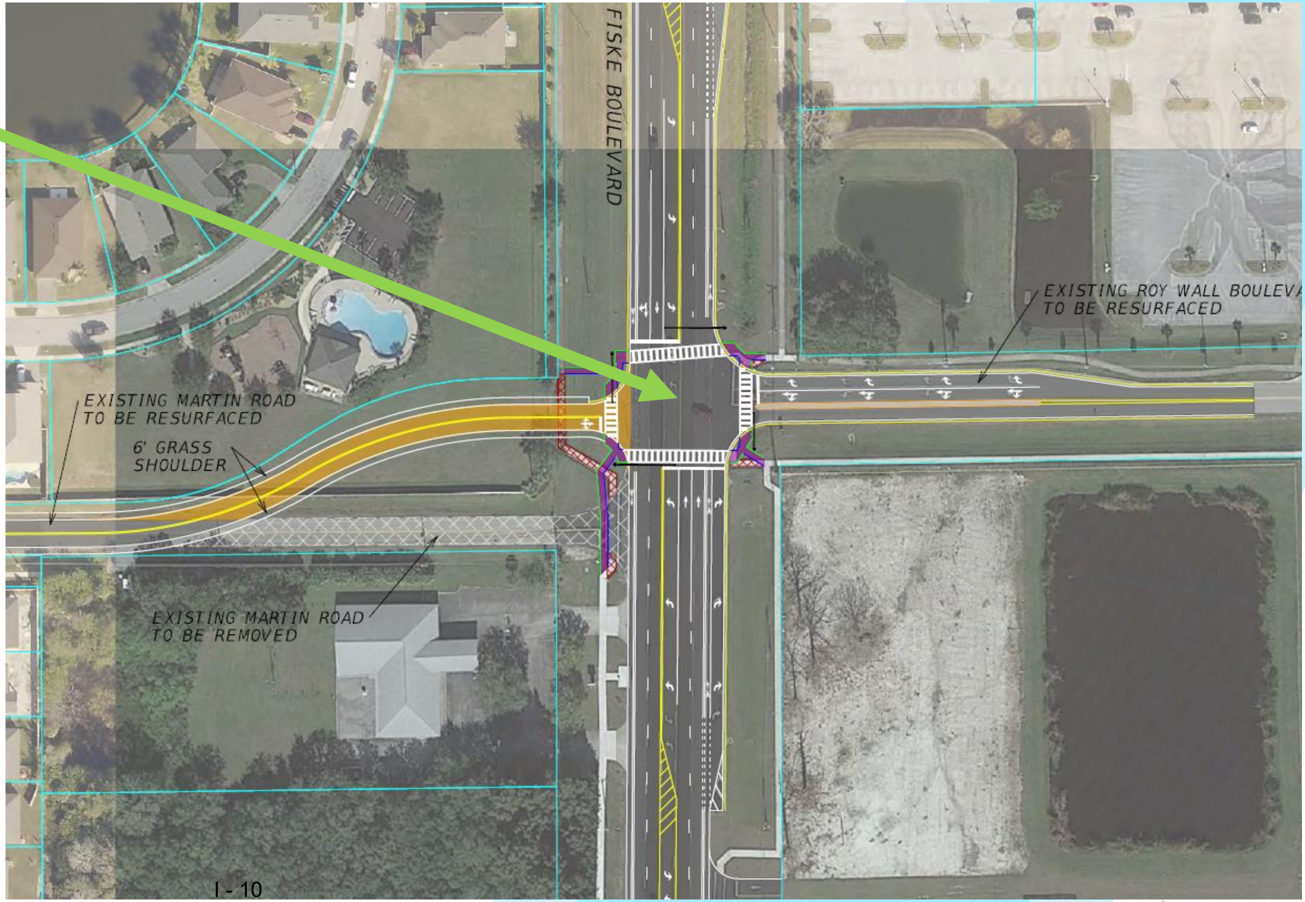

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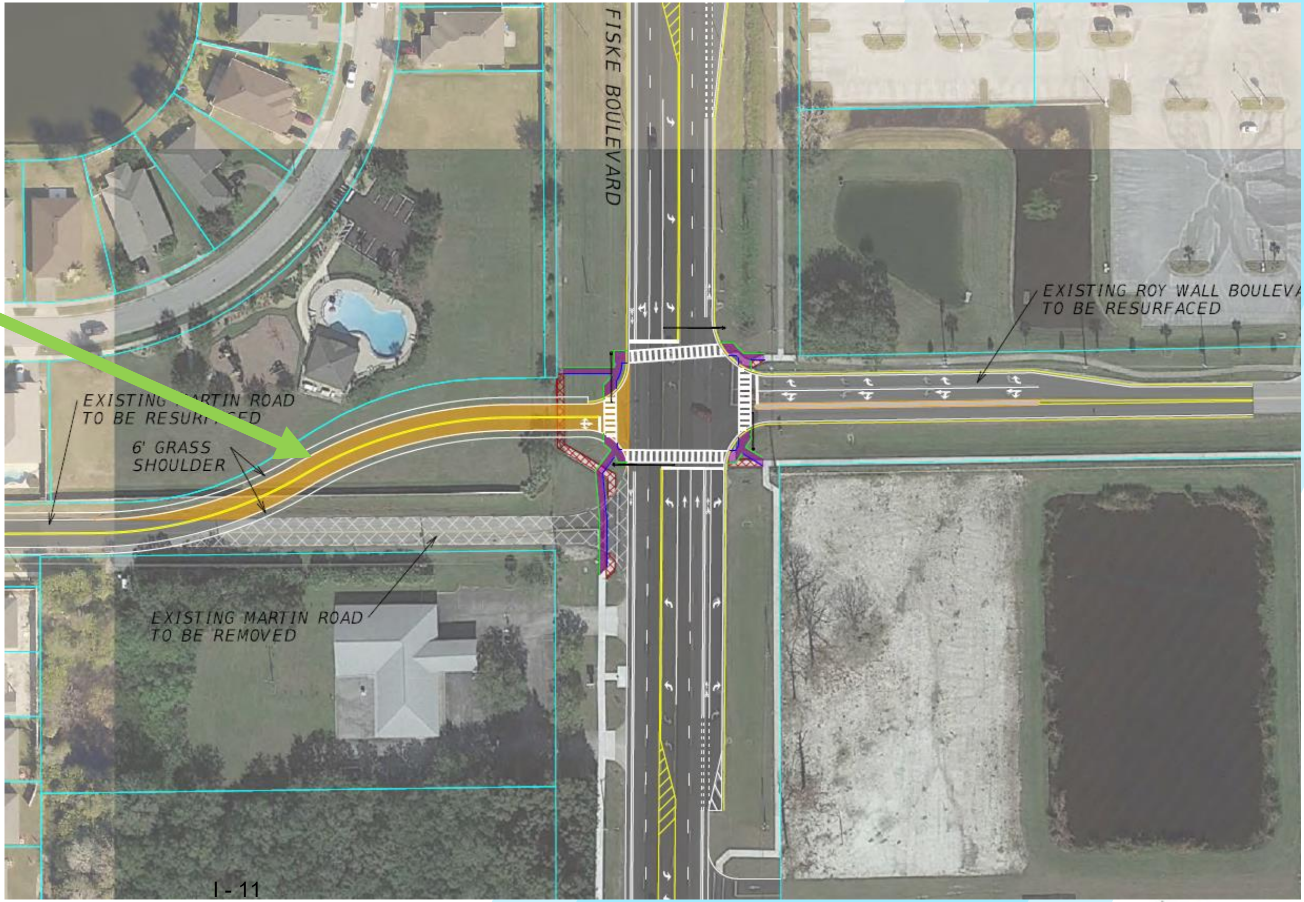
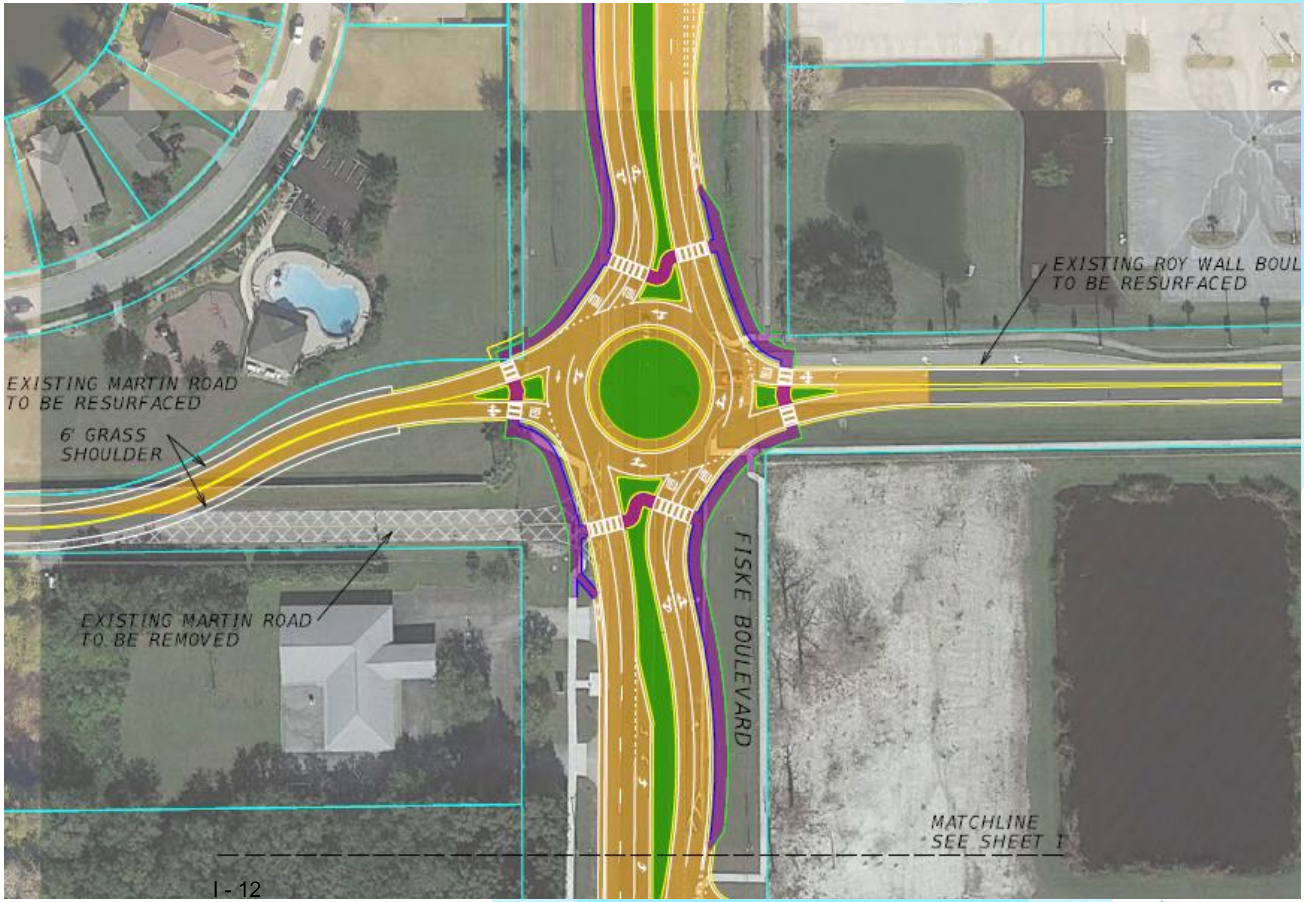


Roundabout

- Adds enhanced pedestrian crossings at intersection
- Opportunity for landscaping at splitter islands and central island
- Minor right-of-way taking in NW corner
- Assumed full rebuild of Fiske Boulevard within limits



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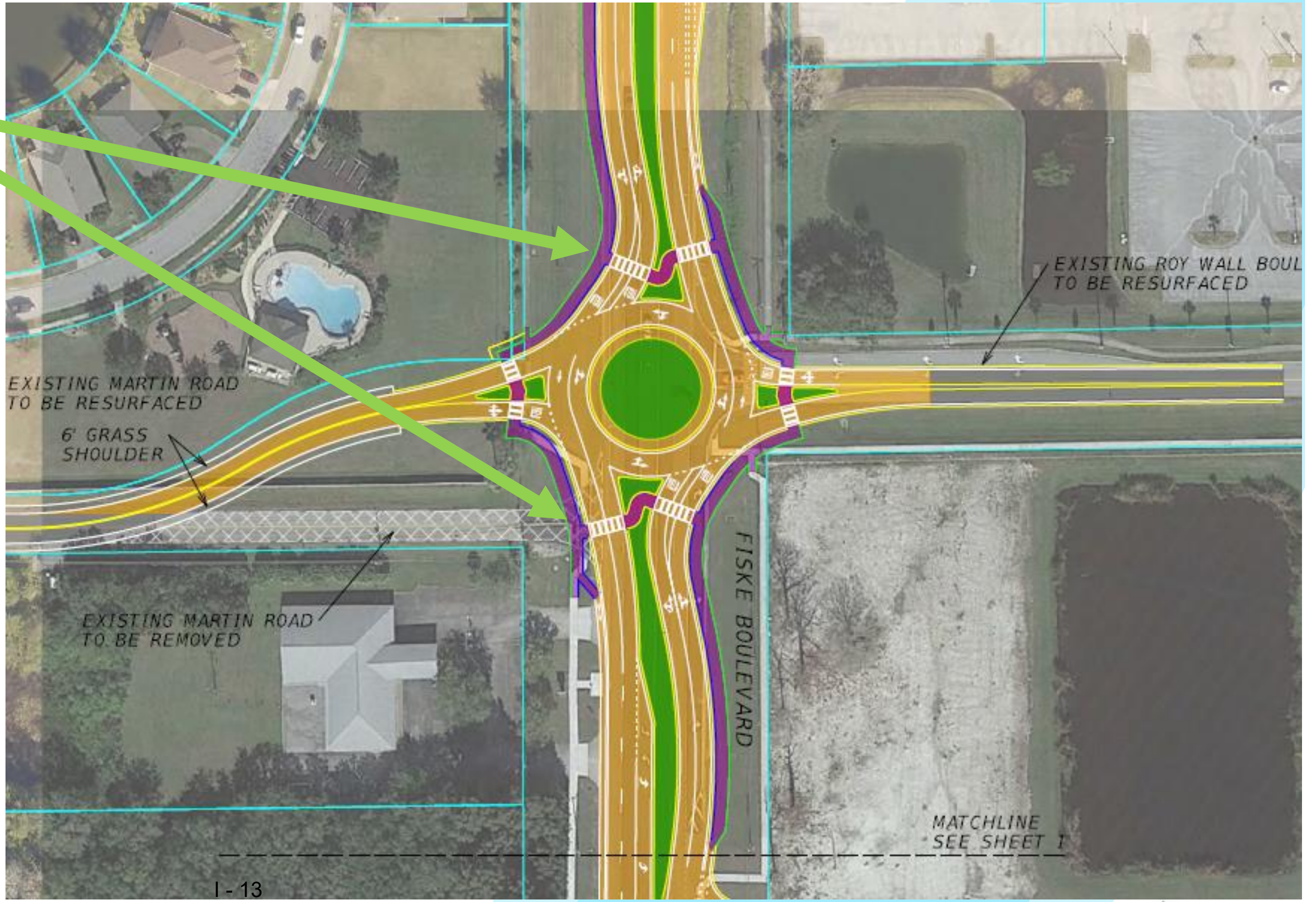

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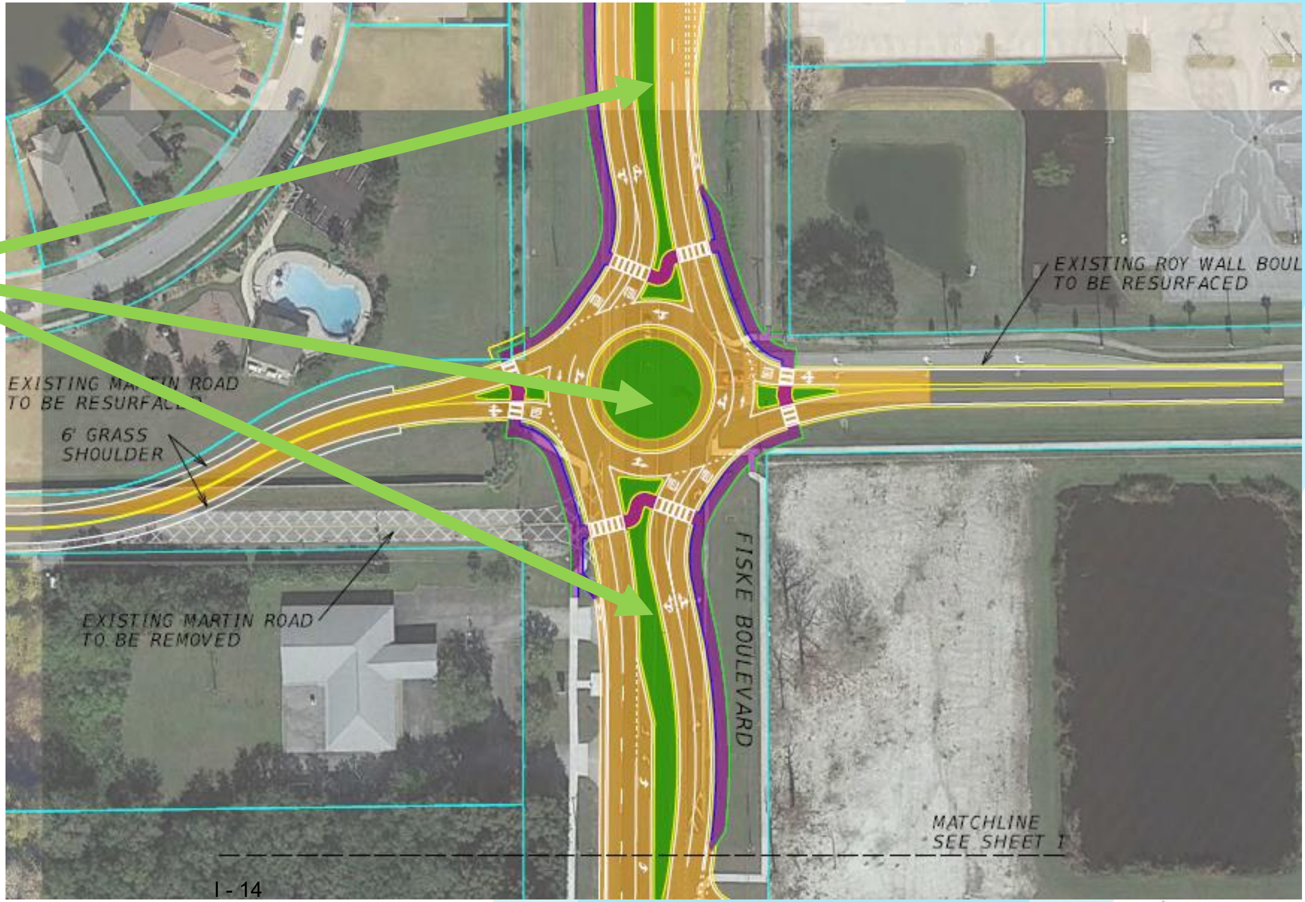

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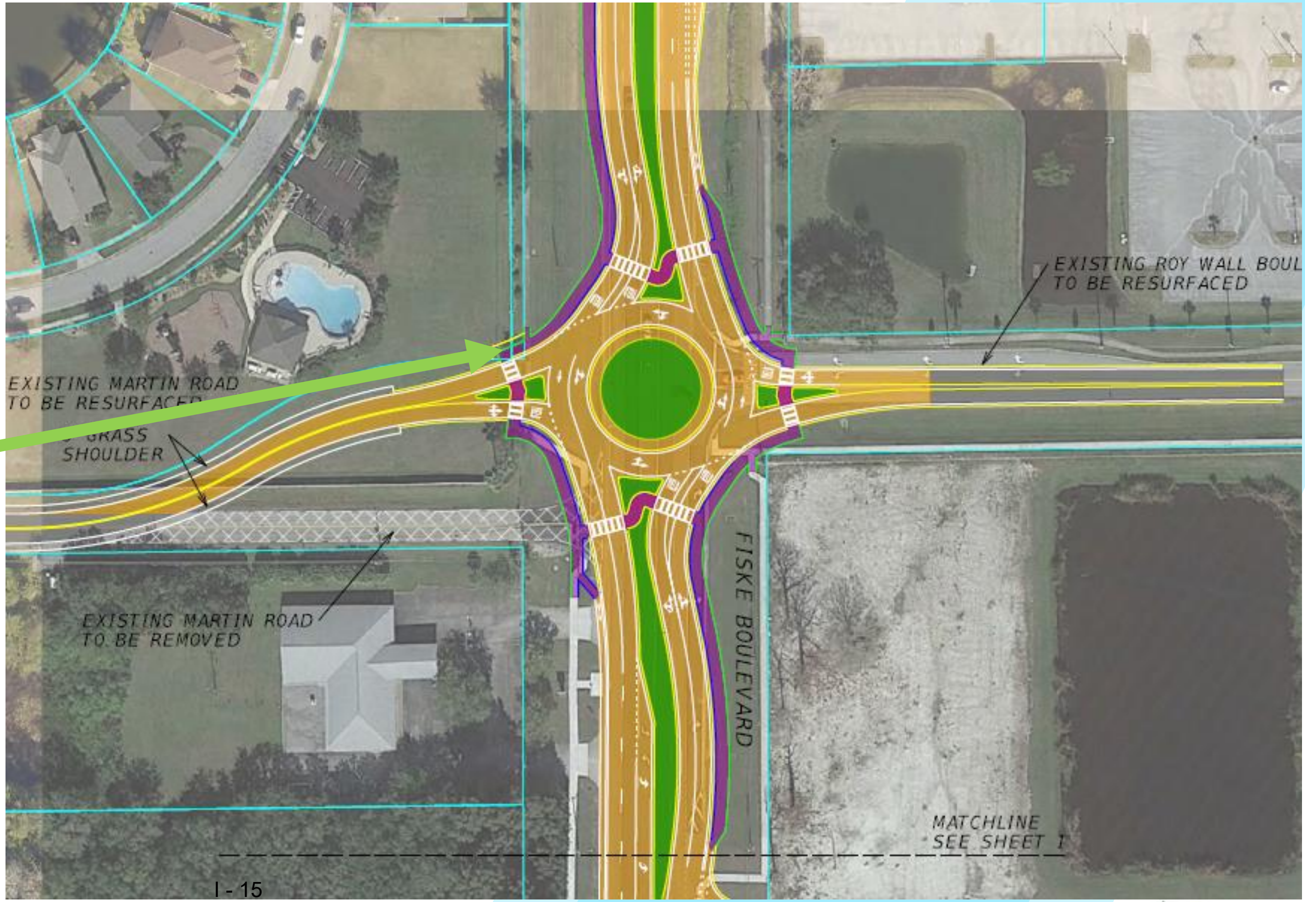
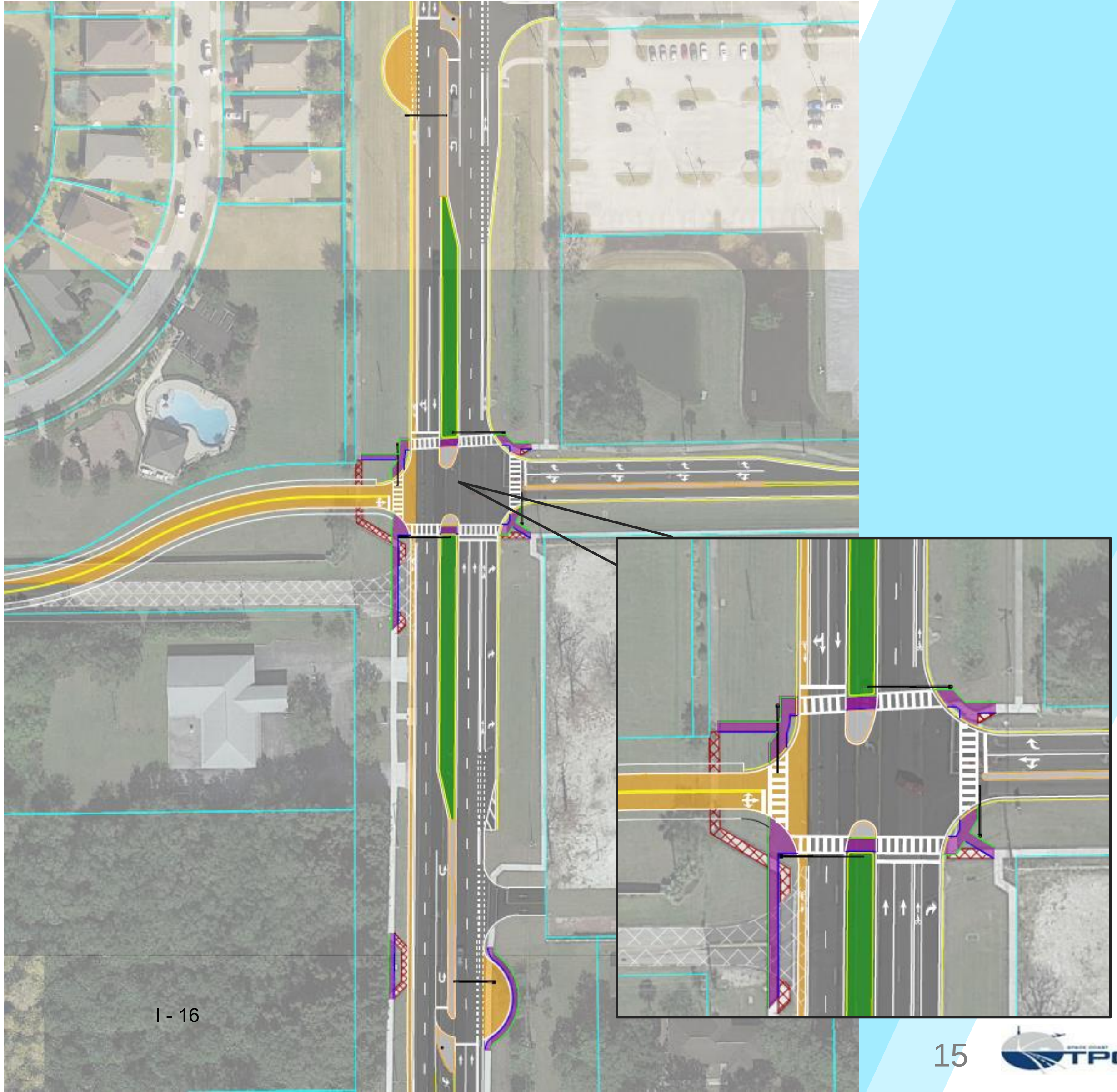
- Minor right-of-way taking in NW corner
- Assumed full rebuild of Fiske Boulevard within limits



Partial MUT

- Restricts northbound and southbound left turns
- New median added between U-turn locations
- Bulb-outs added at U-turns to accommodate school bus
- Adds enhanced pedestrian crossings at intersection



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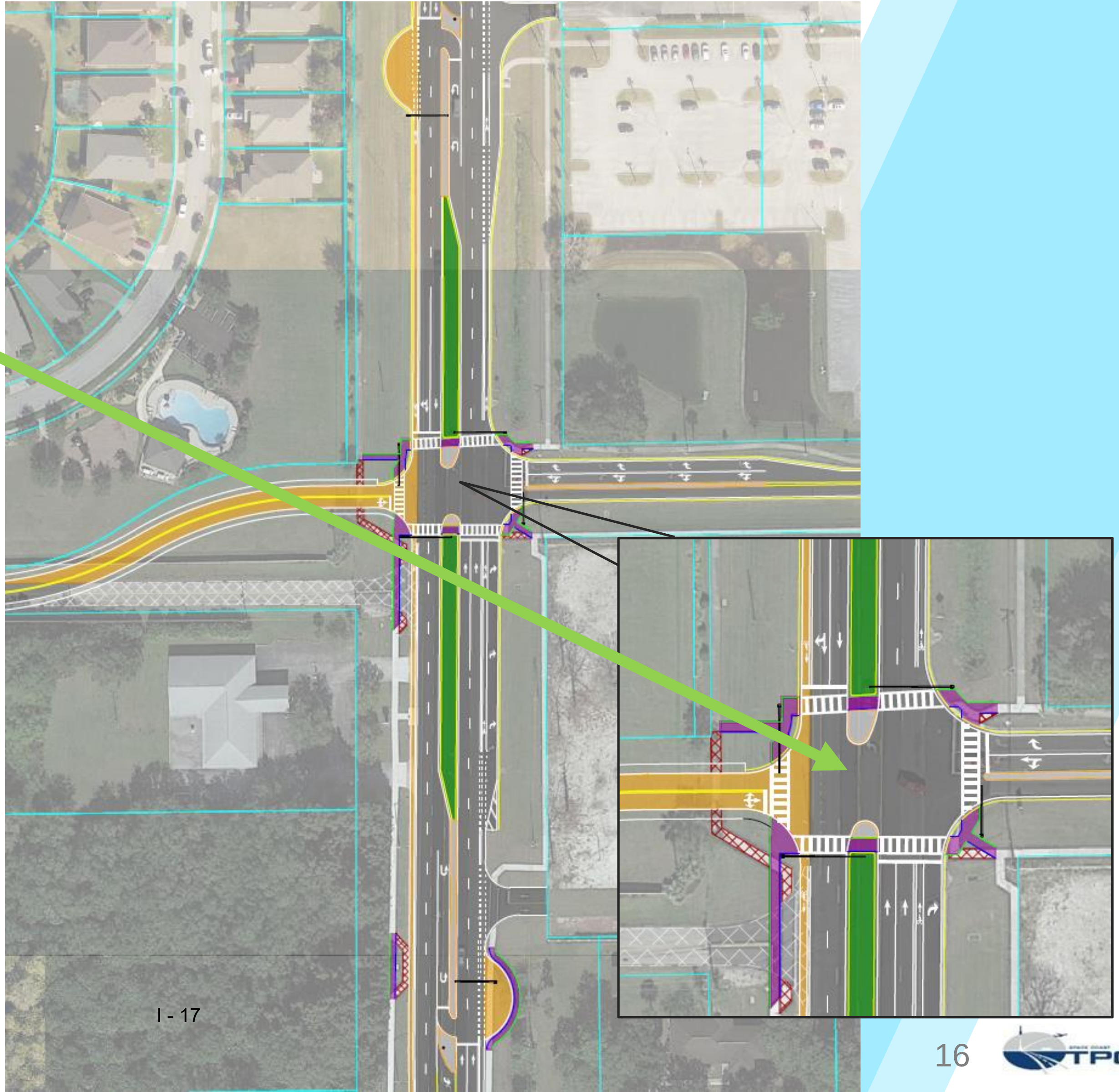

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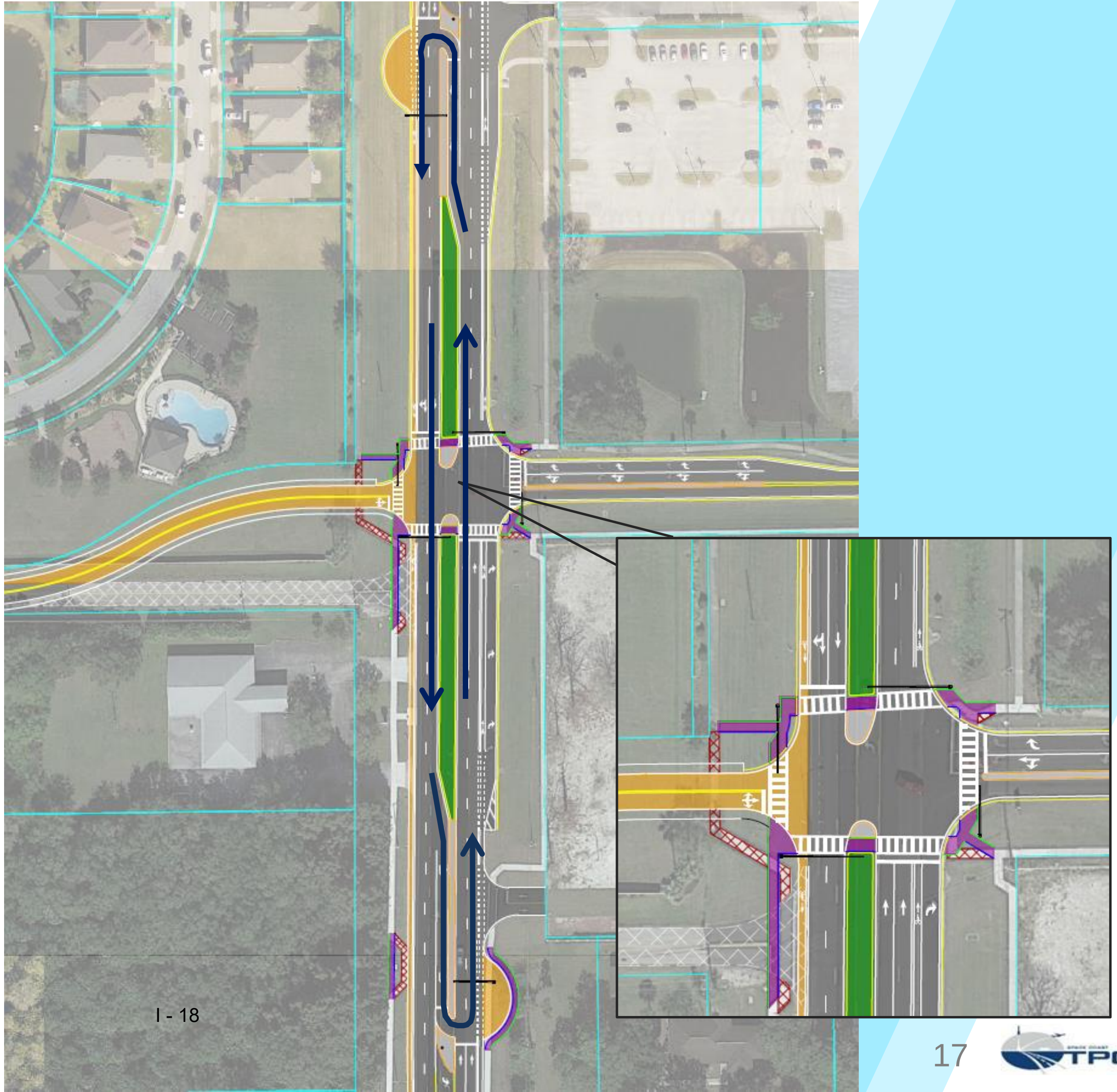

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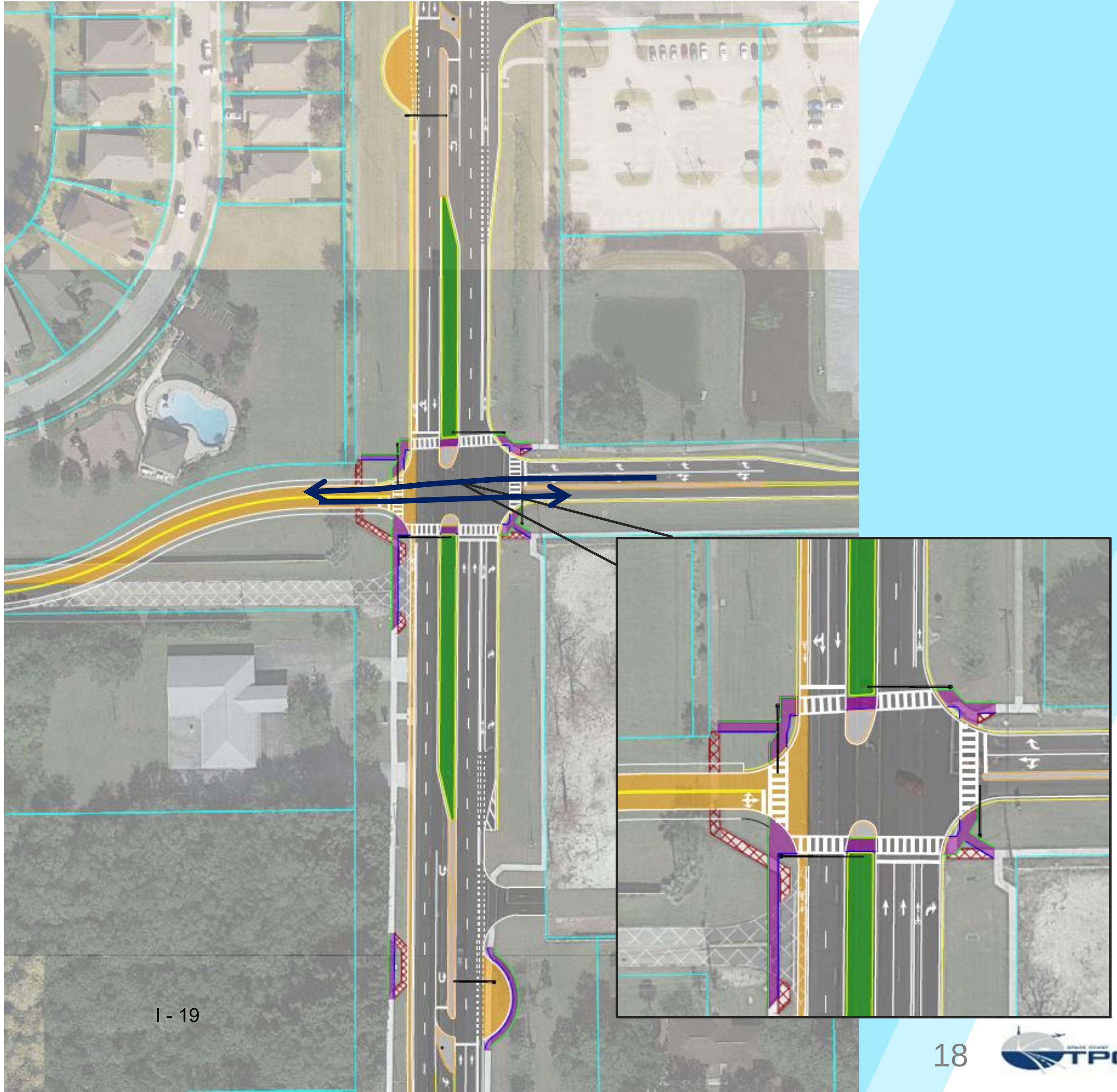

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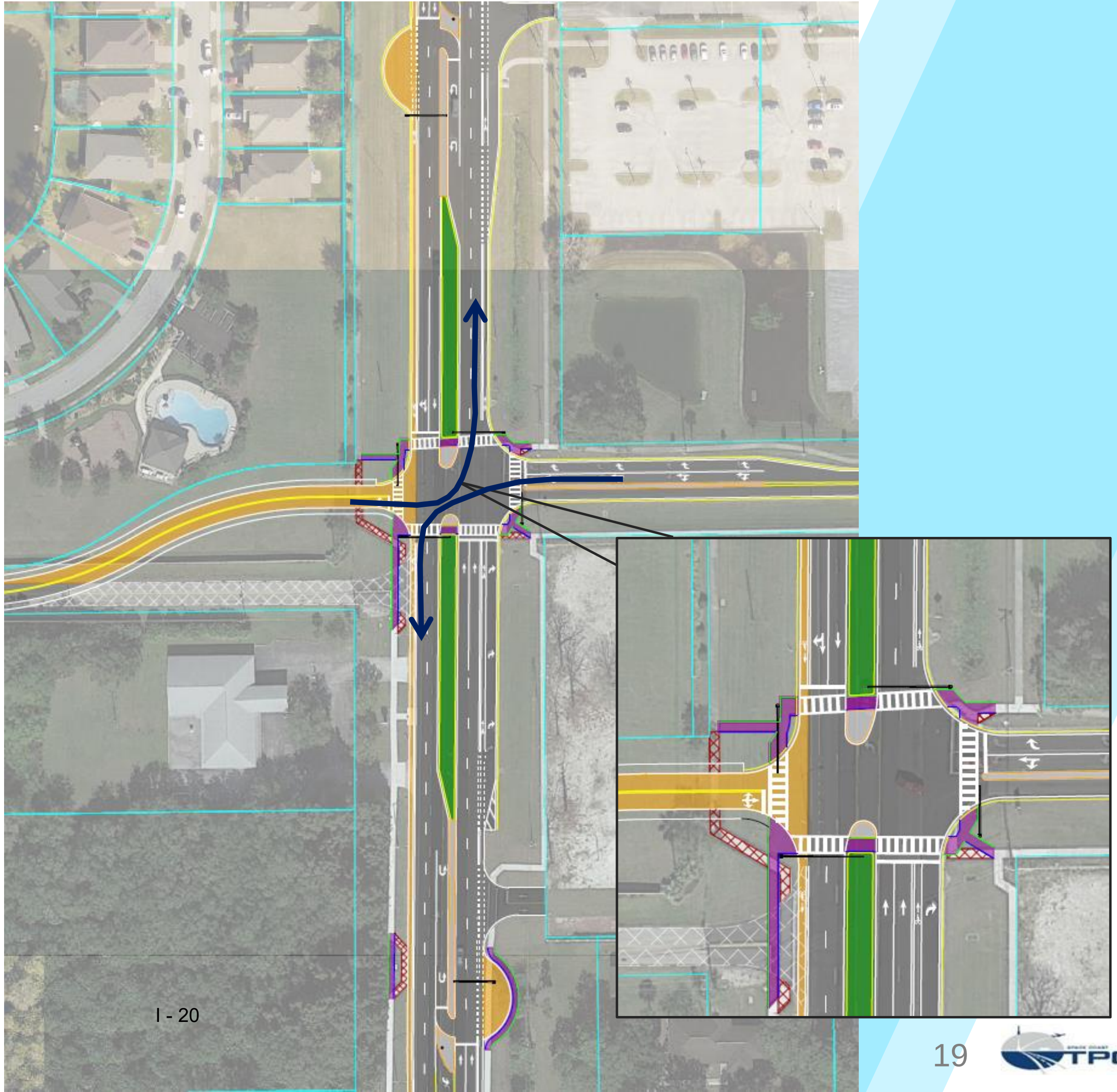

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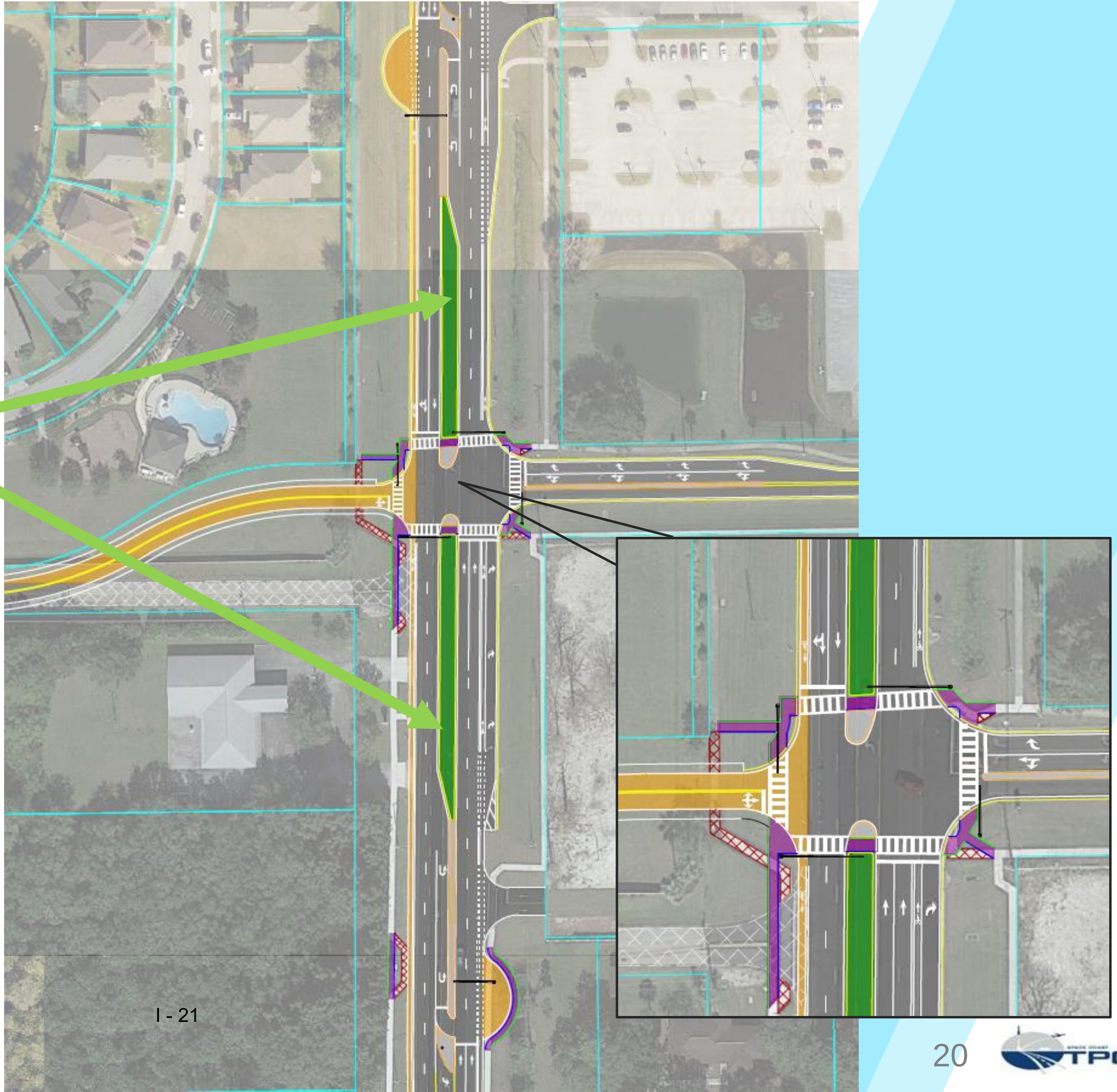

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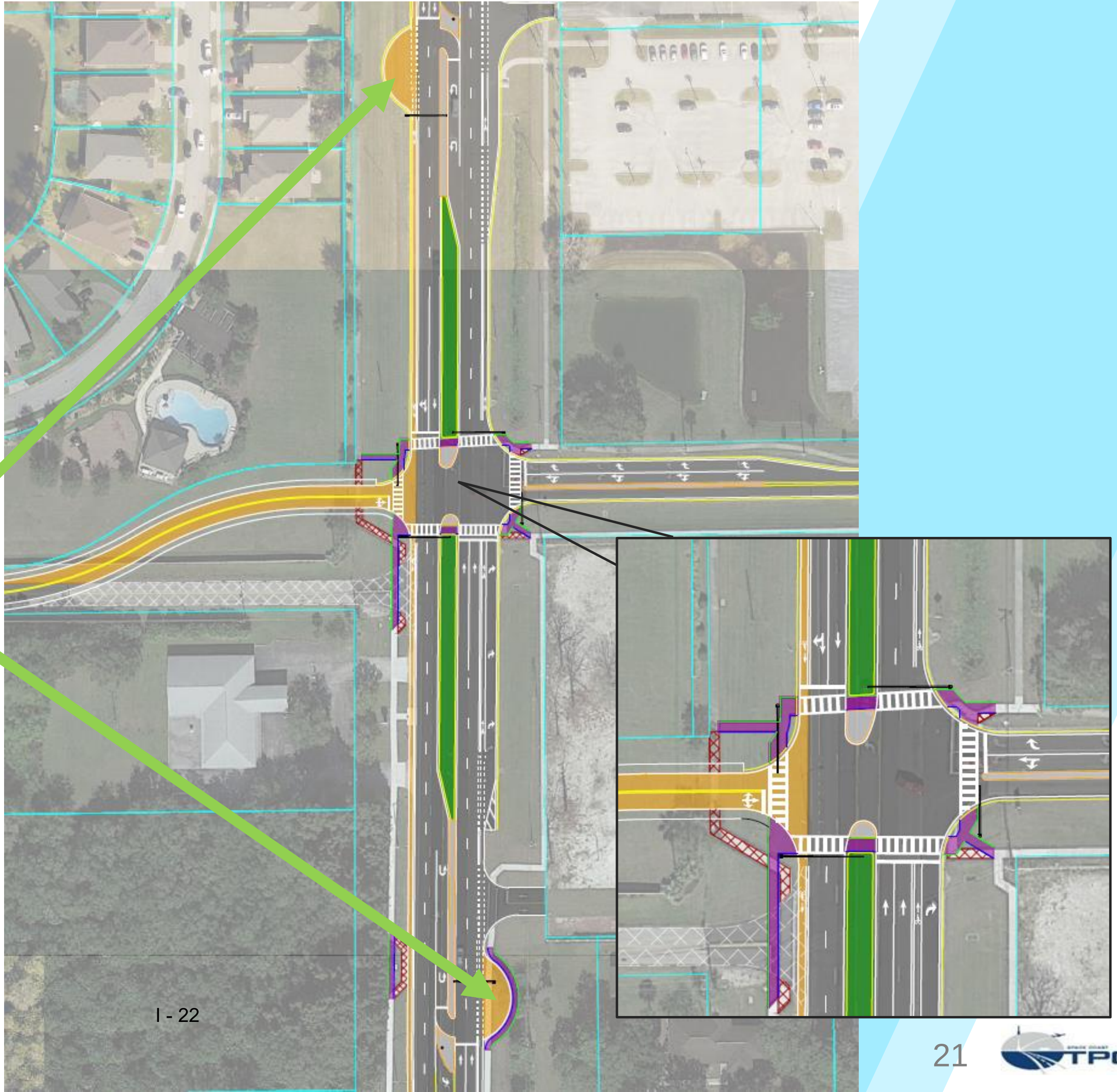

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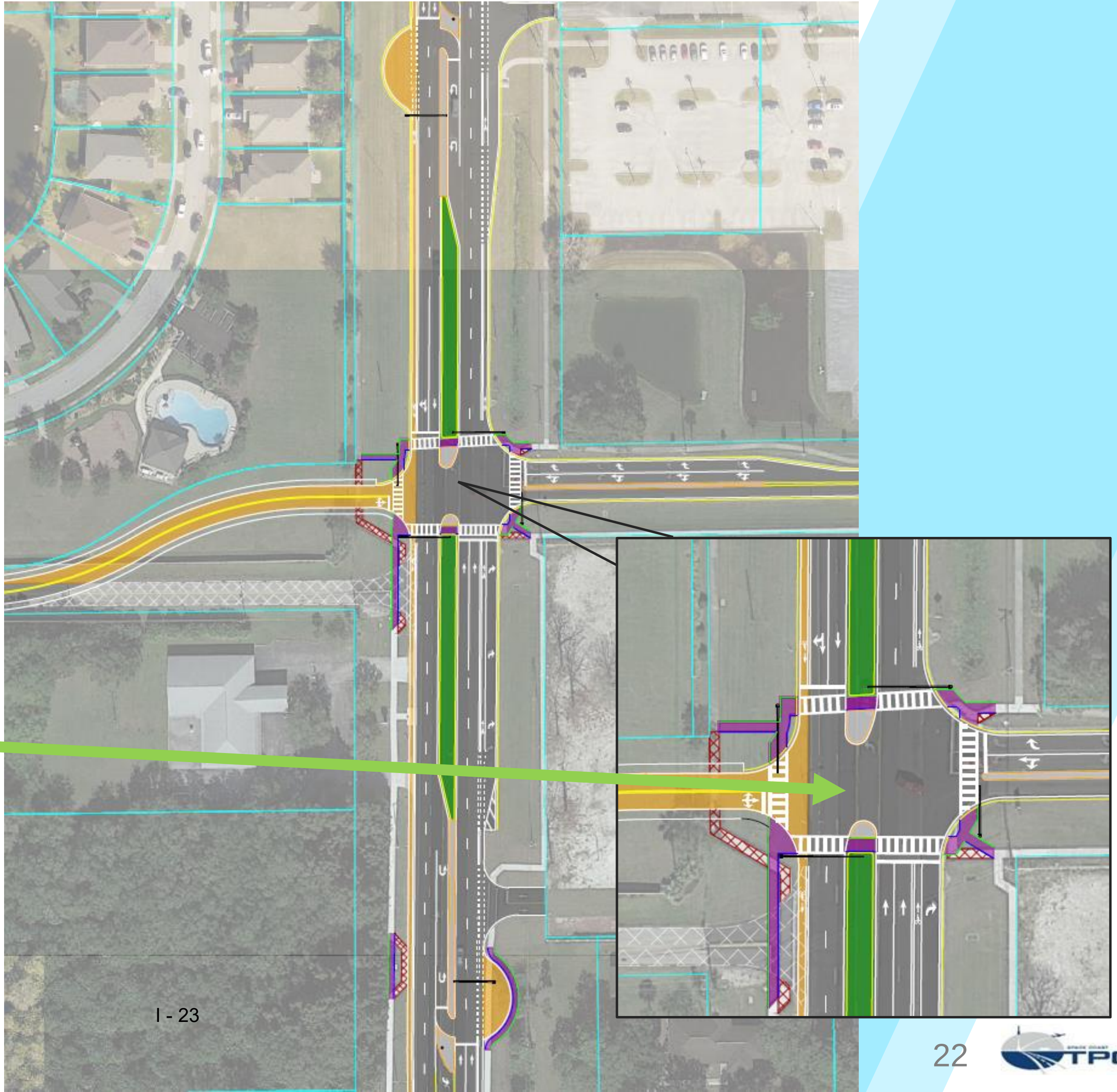

Signalized RCUT

- Restricts eastbound and westbound left turn and thru movements
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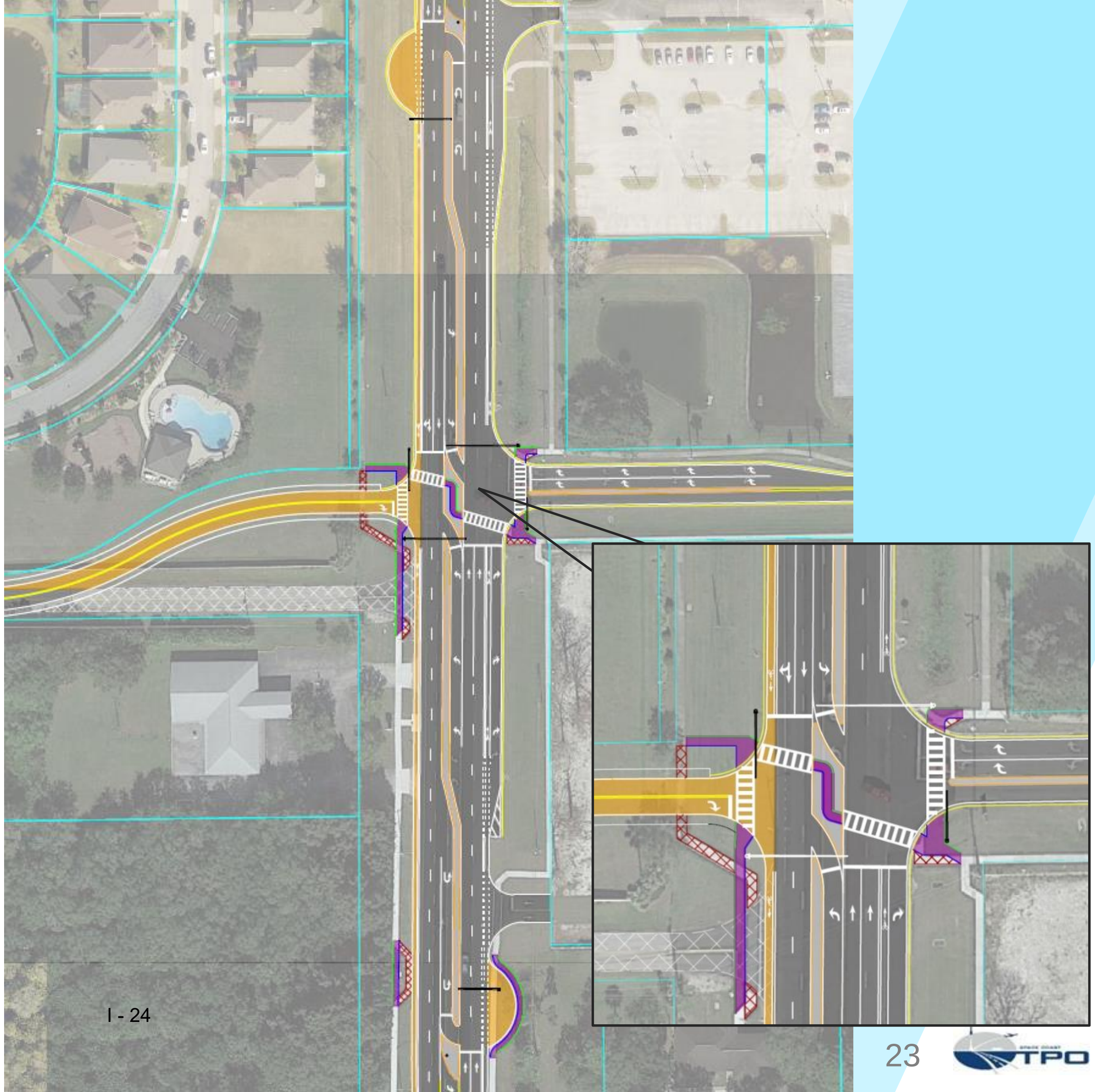

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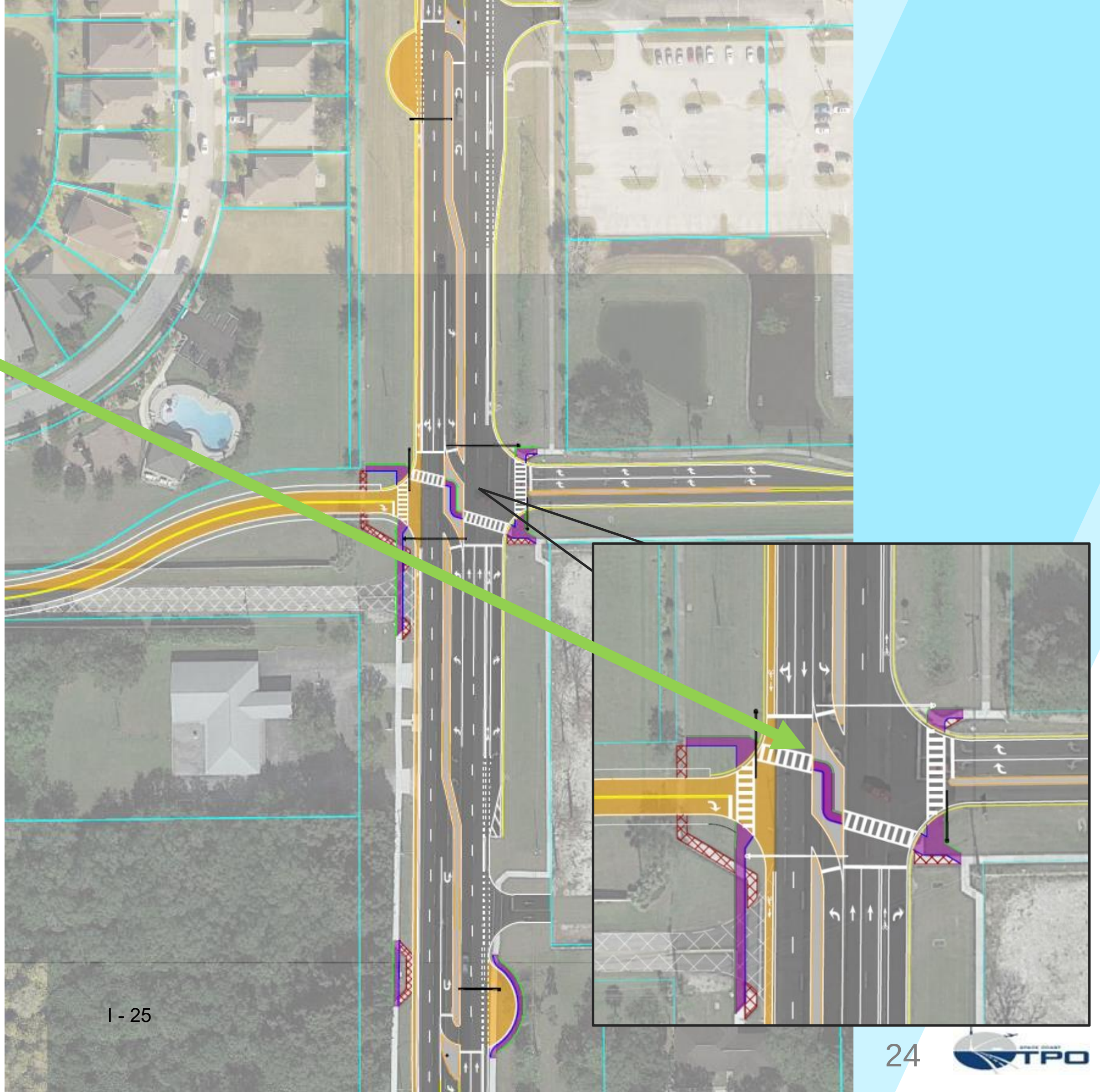

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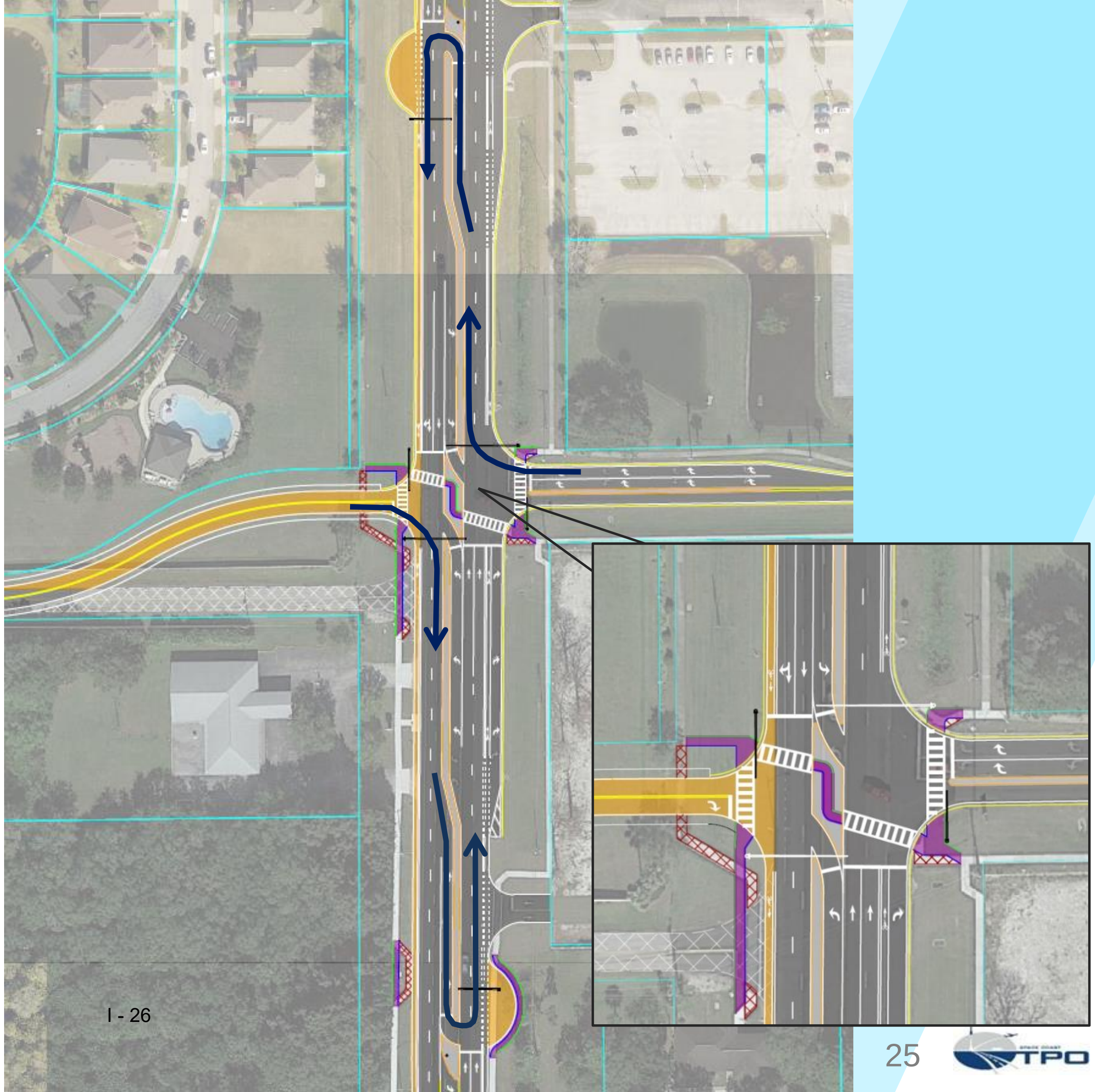

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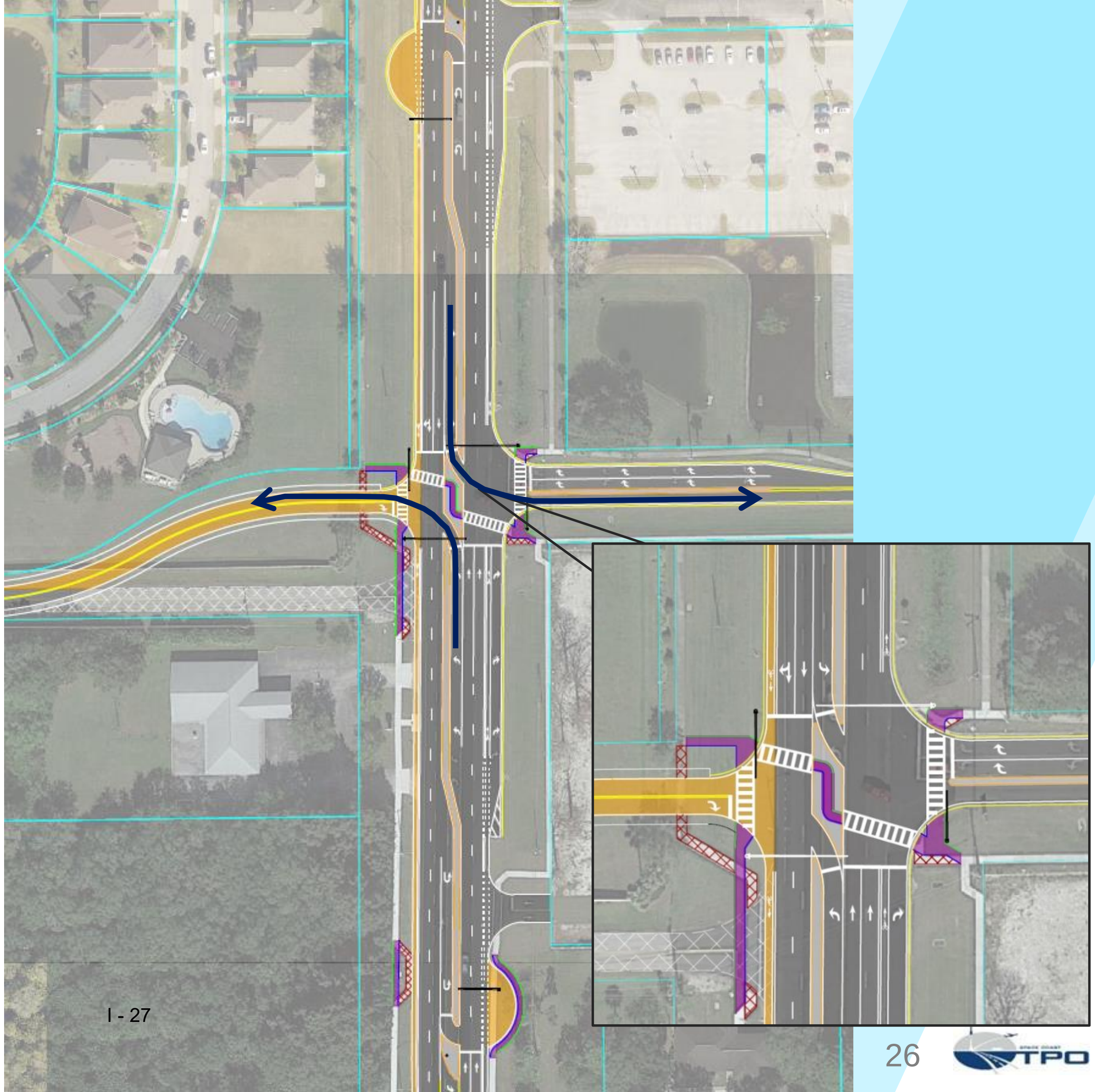

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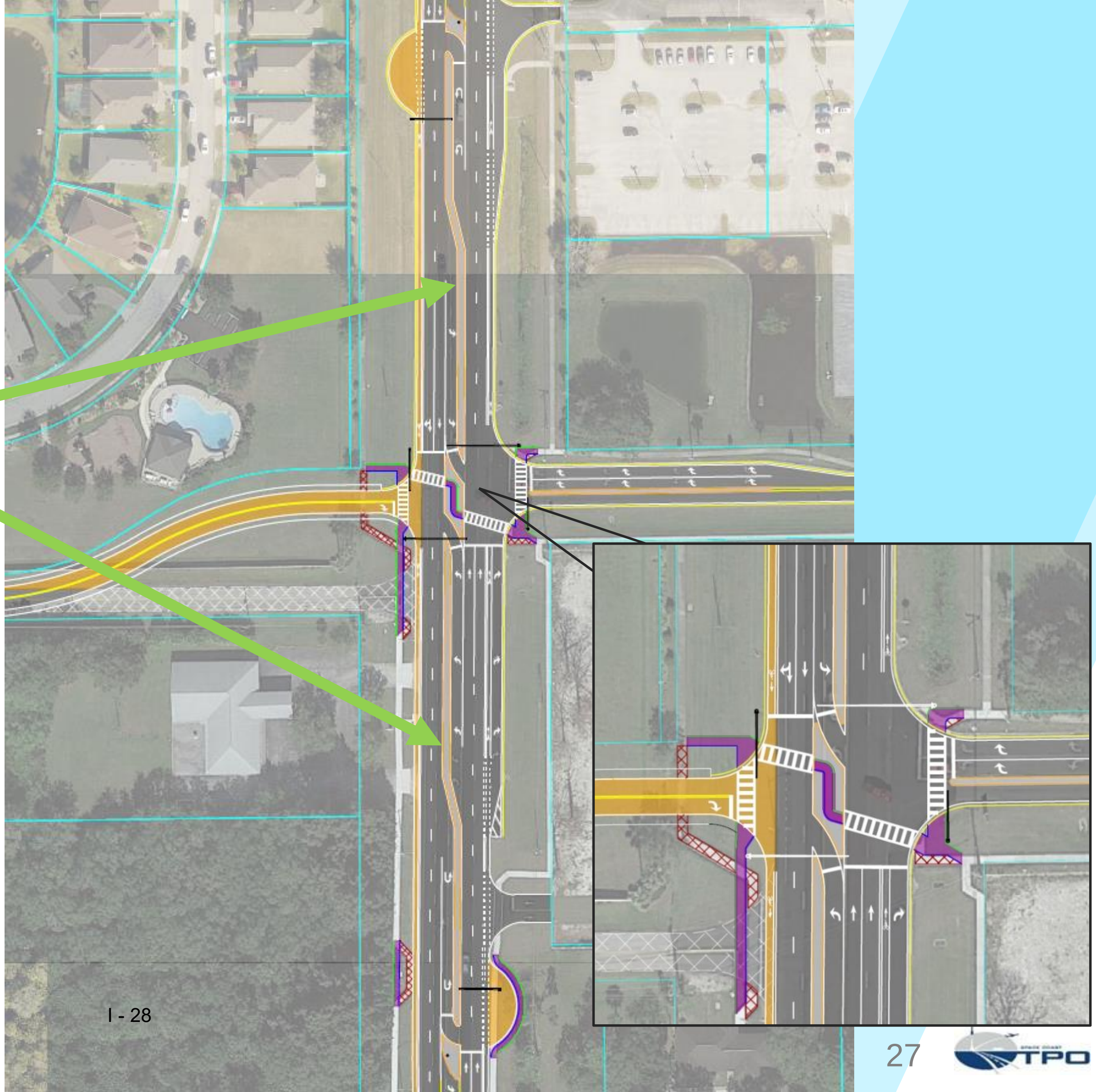

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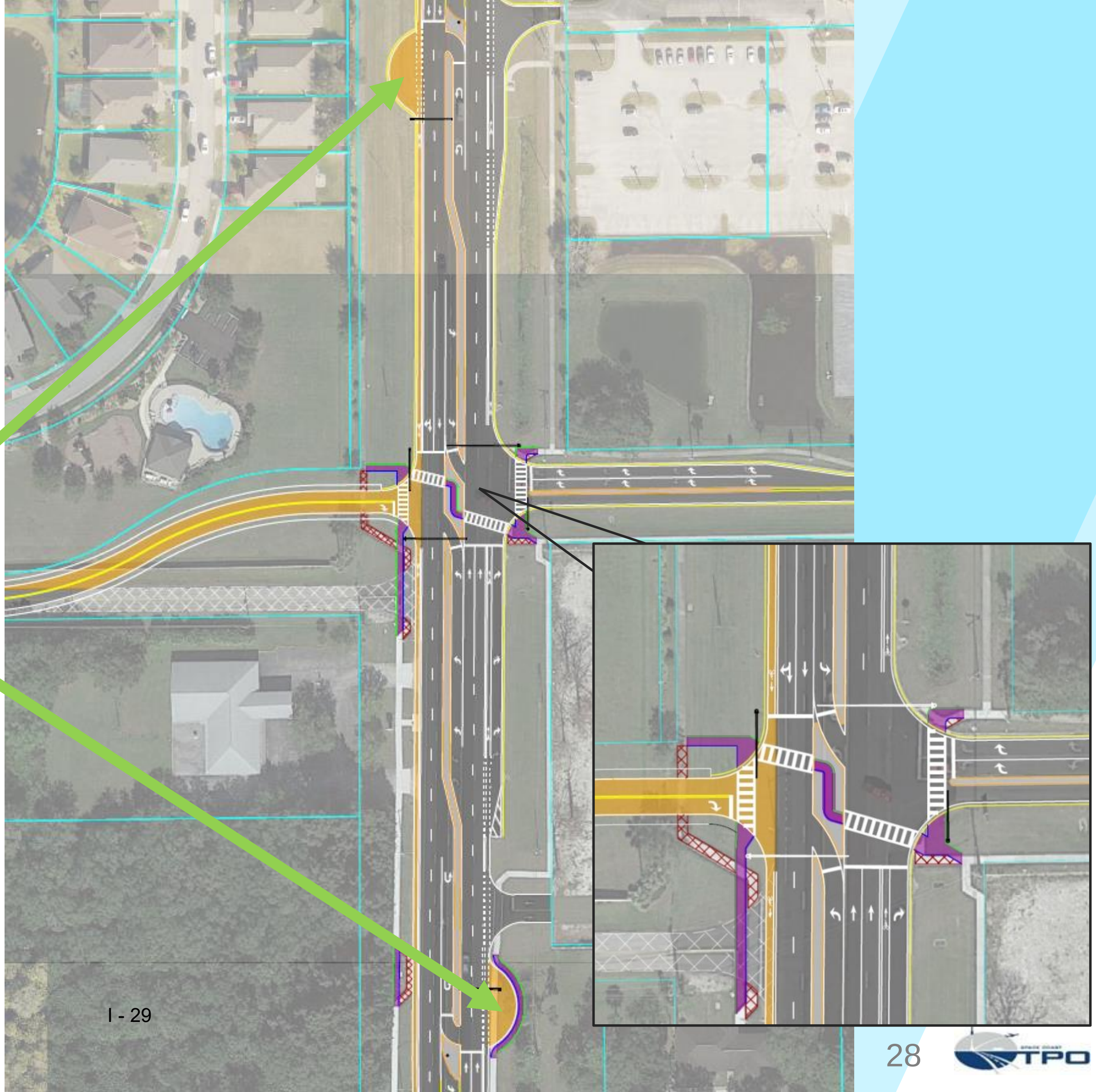

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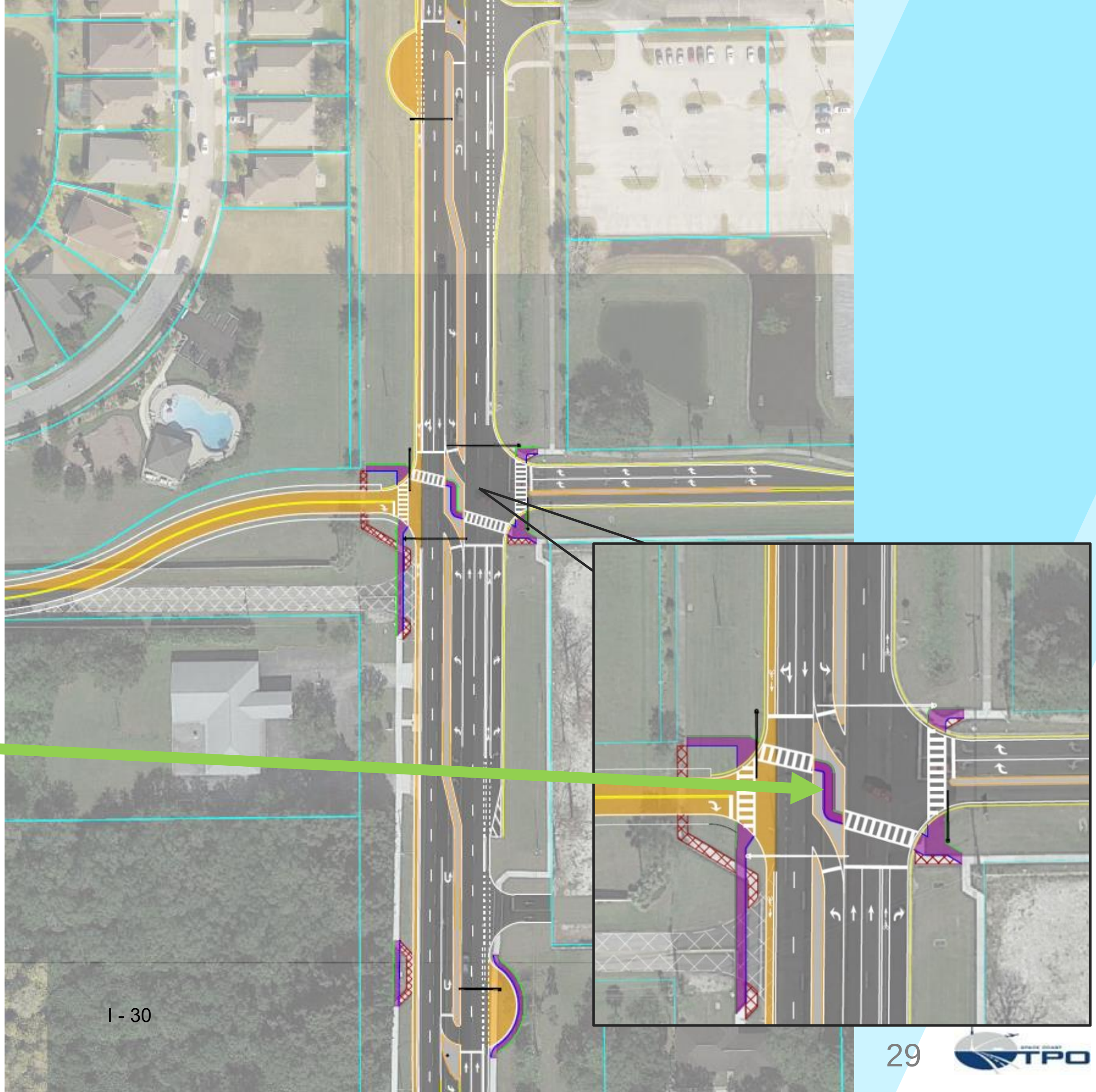

Drainage Analysis

- 25-Year and 100-Year Storm Events evaluated
- Coordinated with FDOT Drainage Engineer, St. Johns River Water Management District, and Brevard County
- Analysis Conclusions
  - No extra water volume discharge anticipated along Martin Road
  - Signal, PMUT, and RCUT would need new pond for treatment
  - Roundabout needs drainage facilities rebuilt along Fiske

Stage 2 ICE Conclusions

- Traffic Operations
  - Stage 2 alternatives anticipated to operate acceptably
- Safety Analysis
  - Roundabout has the lowest number of fatal & injury predicted crashes
  - 20-Year lifecycle fatal & injury crash costs:
    - Roundabout: ~$17 million
    - Signal, PMUT, RCUT: ~$25 million – ~$43 million

Stage 2 ICE Summary

Control Strategy	Total Construction Cost*	Benefit/Cost Ratio
Two-Way Stop Controlled	-	-
Traffic Signal	$1M	7.8
Roundabout	$3M	6.6
Partial MUT	$2M	7.2
Signalized RCUT	$2M	1.9

* Construction costs performed in early Fall 2022 and may not reflect recent changes due to inflation. Costs will be updated during the Design Phase.

Recommendation

- Each Stage 2 alternative anticipated to operate acceptably
- Roundabout has best predicted safety results
- Traffic signal has the highest benefit/cost ratio
- Study shows roundabout as safest alternative; Space Coast TPO will support what City desires for your community

Next Steps

- Summary Tech Memo complete by June 30th
- $1.3 Million in Design Funds has been allocated and is available July 1, 2023

Questions/Contact Information

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