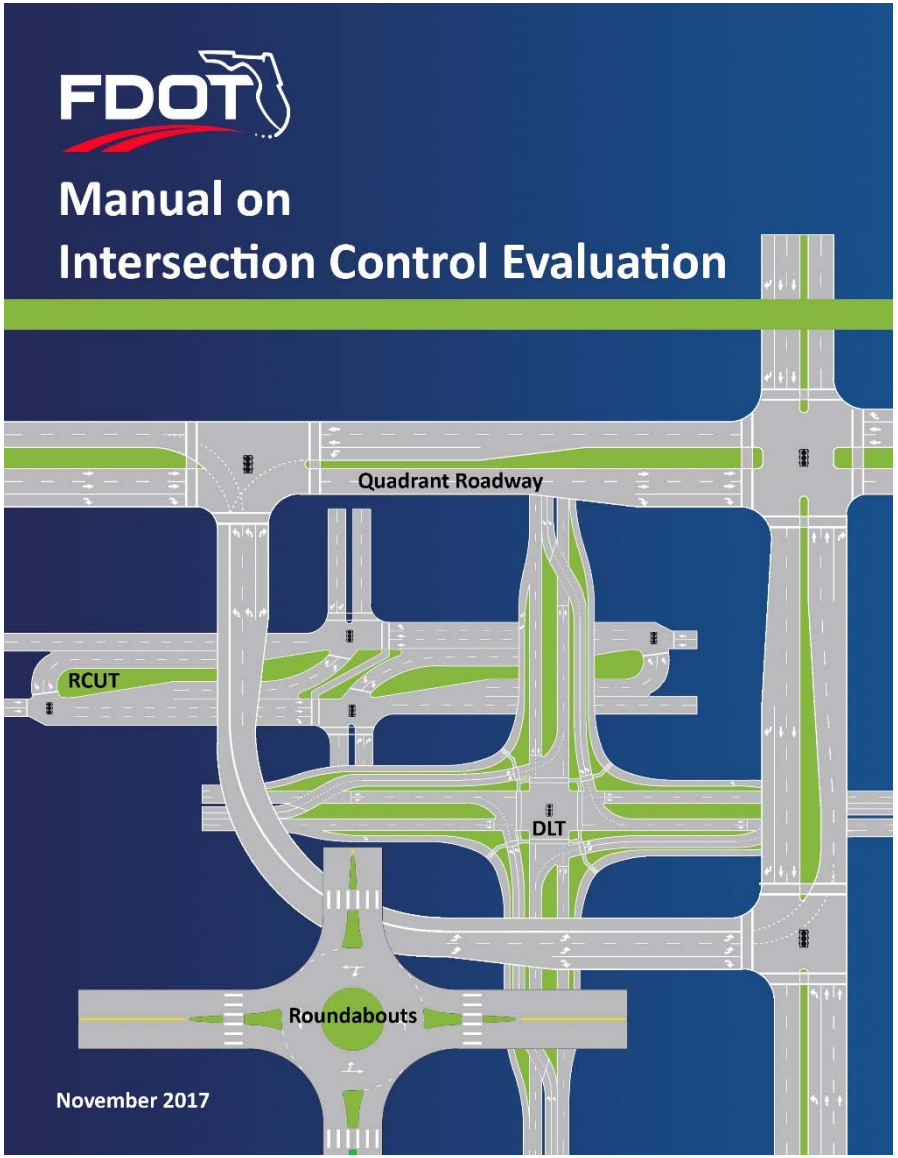
2019 INTERSECTION CONTROL EVALUATION

ANALYSTS TRAINING

FDOT

FDOT'S MANUAL ON INTERSECTION CONTROL EVALUATION

- Adopted November 2017
- Why ICE?
- When ICE is Required?
- Applicability and Process
- Tools and Resources
- Forms



TRAINING OUTCOME GOALS

1. Learn ICE Tools & Resources
   - Hands-on application of tools
   - Understand ICE Process

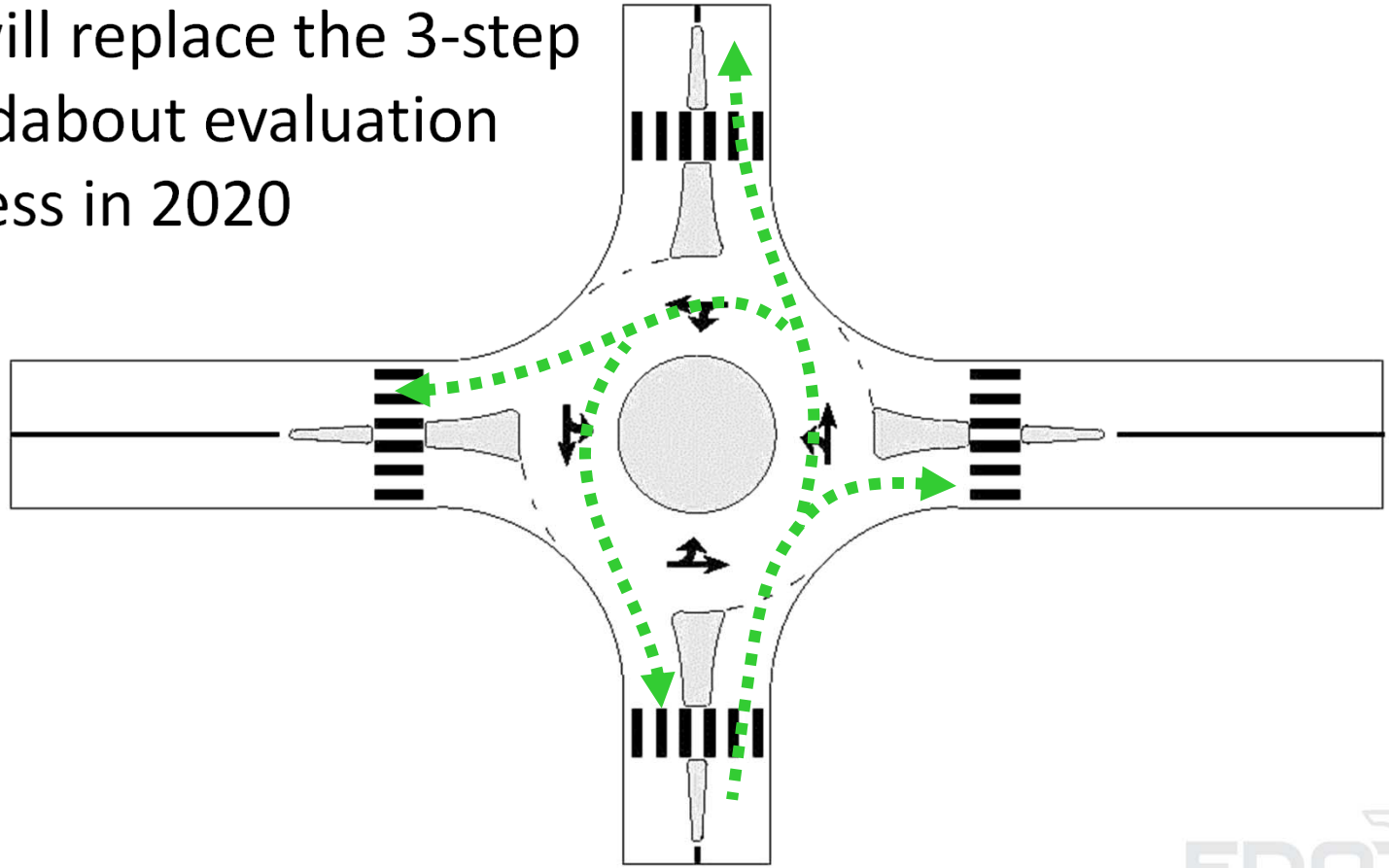
2. Learn ICE Decision Process
   - Walk through the process to choose a Control Strategy to advance for implementation

ICE PURPOSE

- Consistently consider multiple context-sensitive control strategies when planning a new or modified intersection through…
  - Informed decision-making considering
    - purpose and need, context classification, safe travel facilities for all road users, with the overall best value
  - Select a context-sensitive control strategy considering
    - the goals and needs of the community and all road users
  - Measure the control strategy's value using
    - performance-based criteria
- Promotes thoughtful consideration of alternative intersection types through quantitative analysis

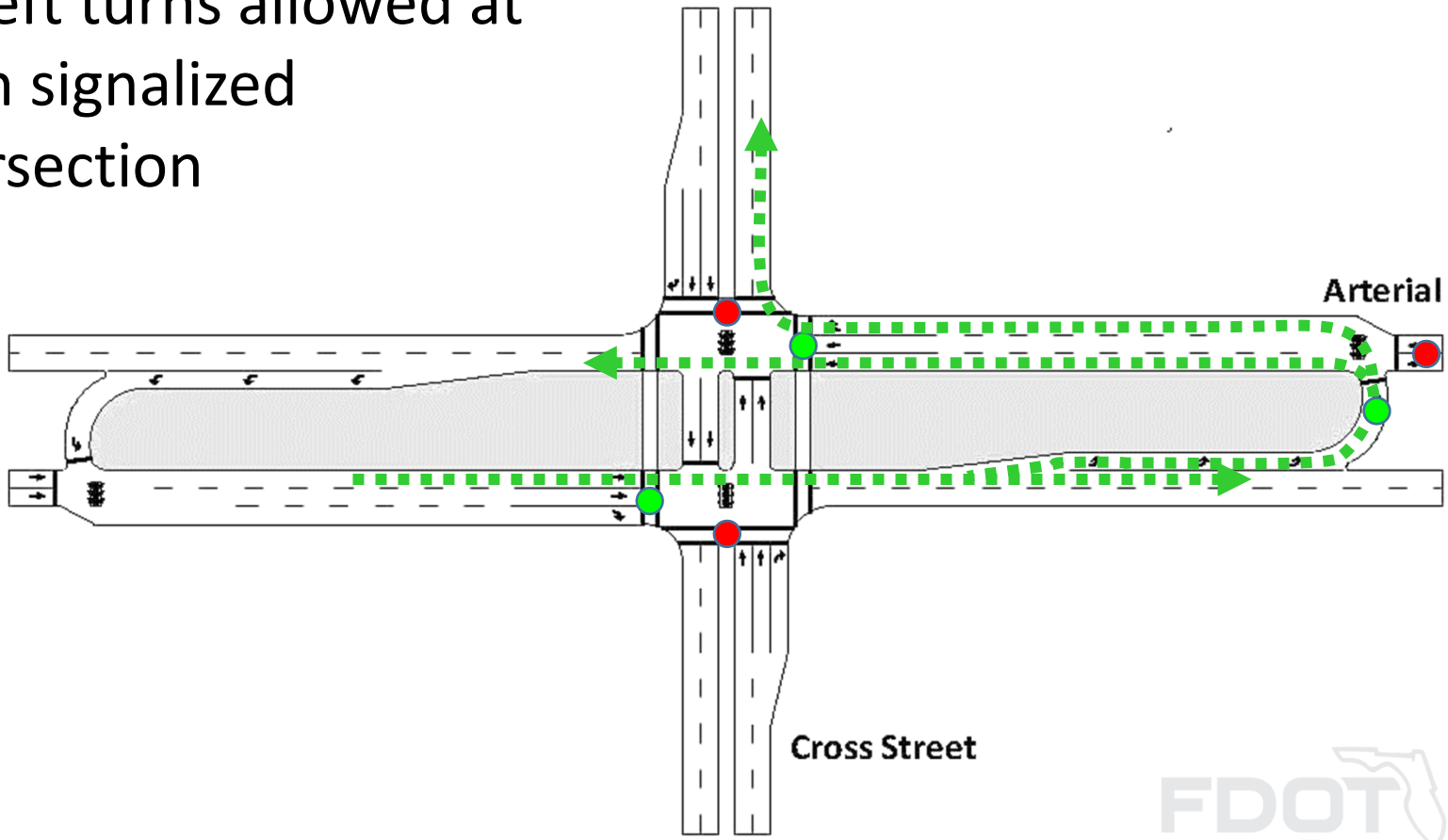
Roundabout

ICE will replace the 3-step roundabout evaluation process in 2020



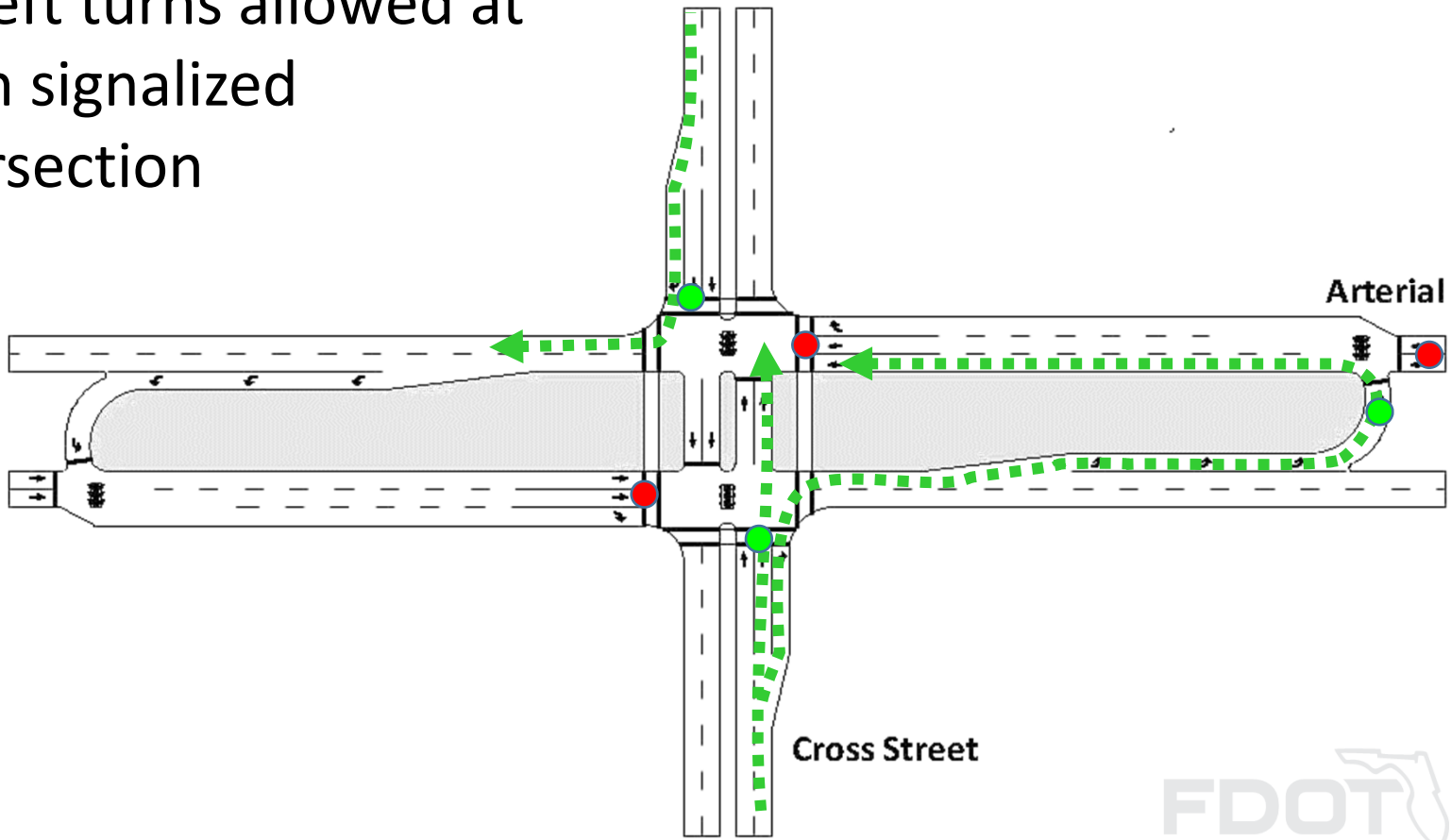
Median U-Turn (MUT)

No left turns allowed at main signalized intersection



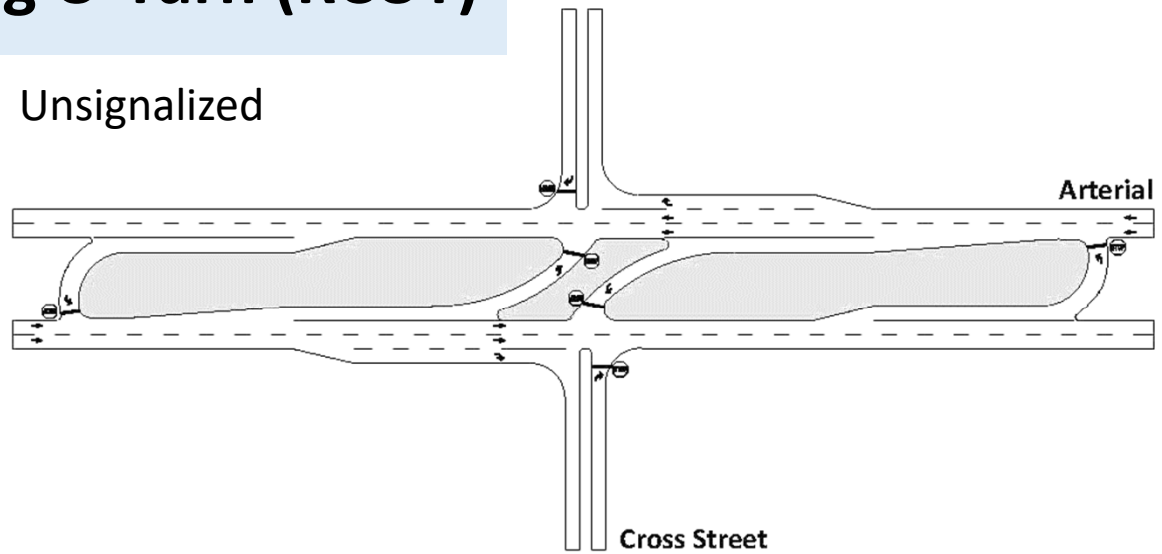
Median U-Turn (MUT)

No left turns allowed at main signalized intersection

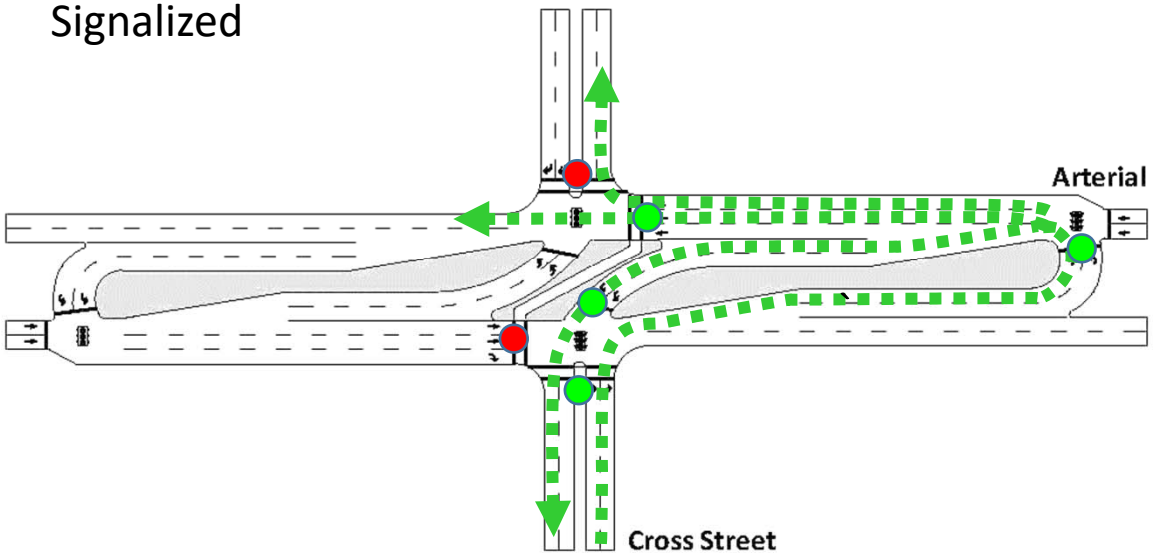


Restricted Crossing U-Turn (RCUT)

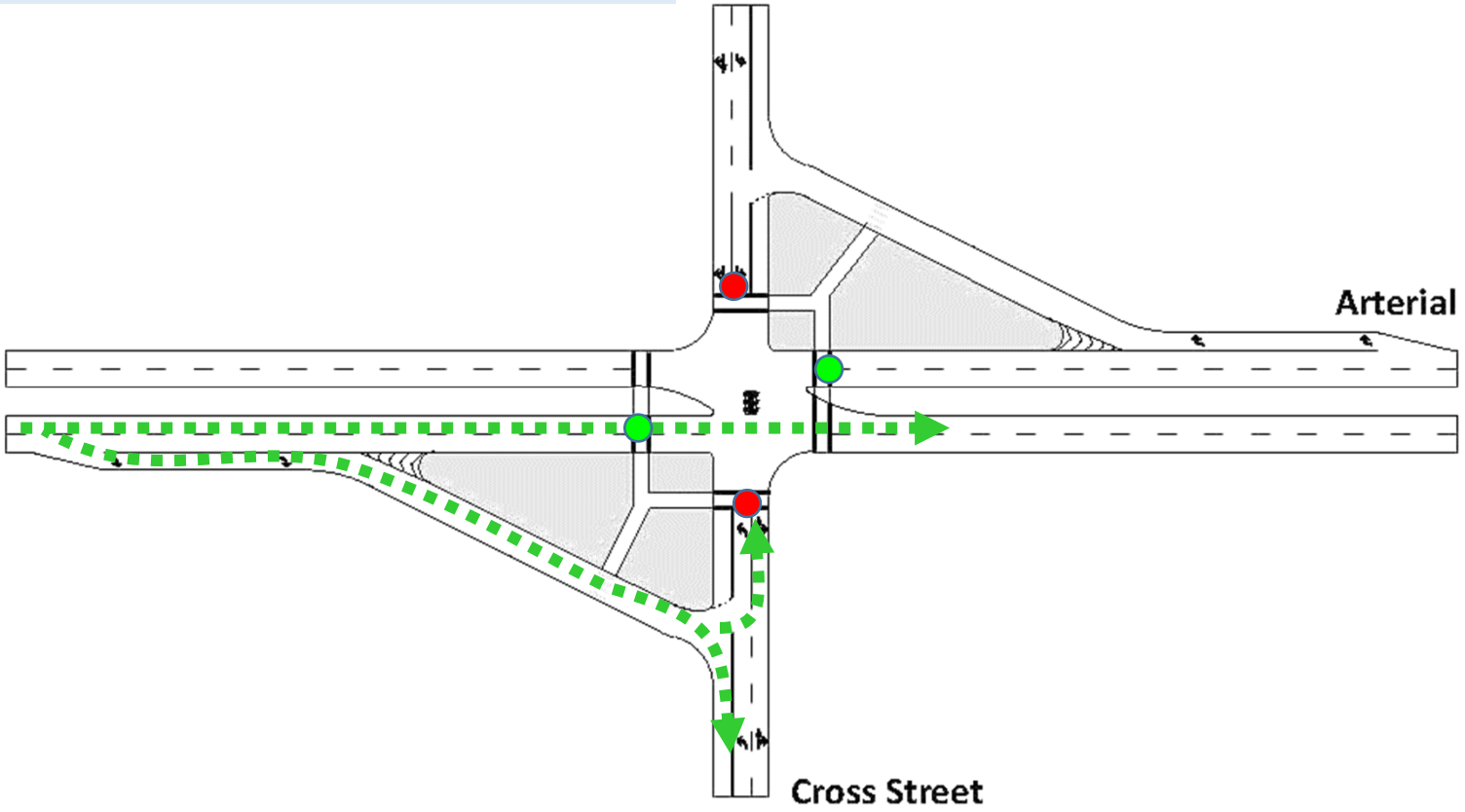
Unsignalized



Signalized

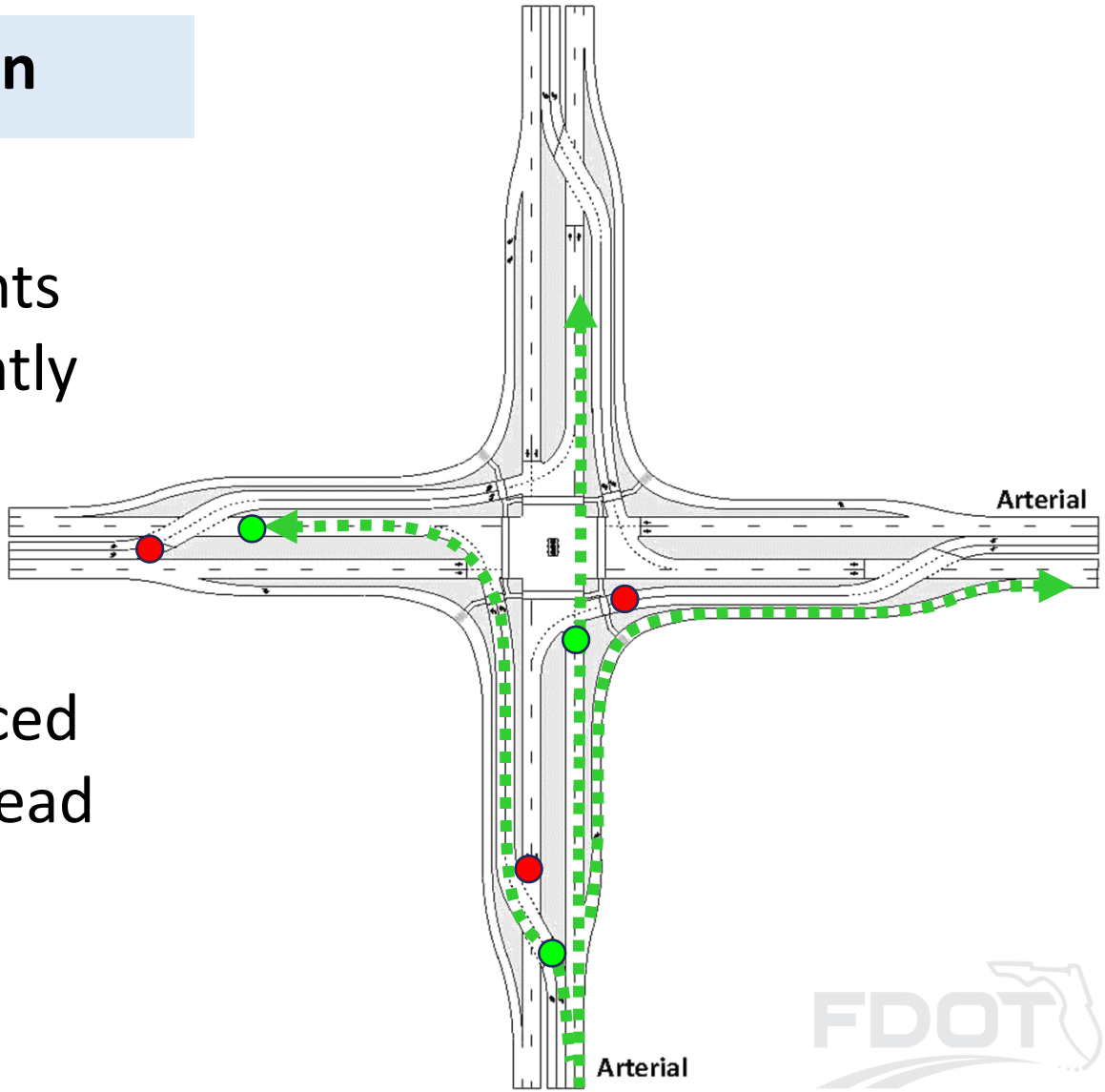


Jughandle

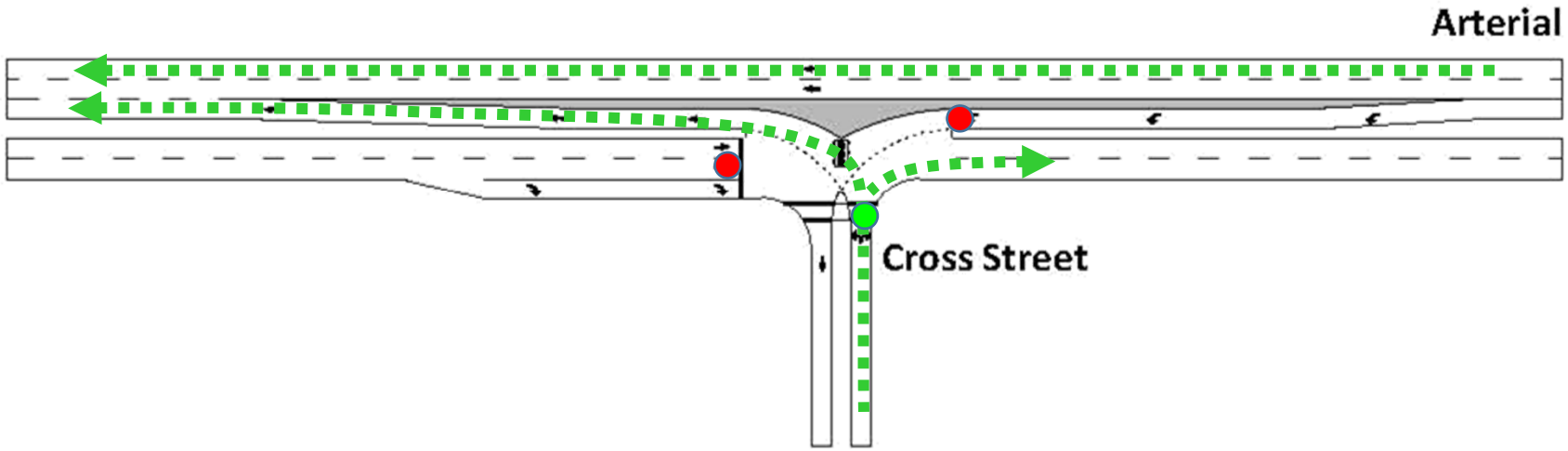


Displaced Left Turn

- Left turns and through movements operate concurrently
- Also called continuous flow intersection
- Could have displaced lefts on 2 legs instead of all 4

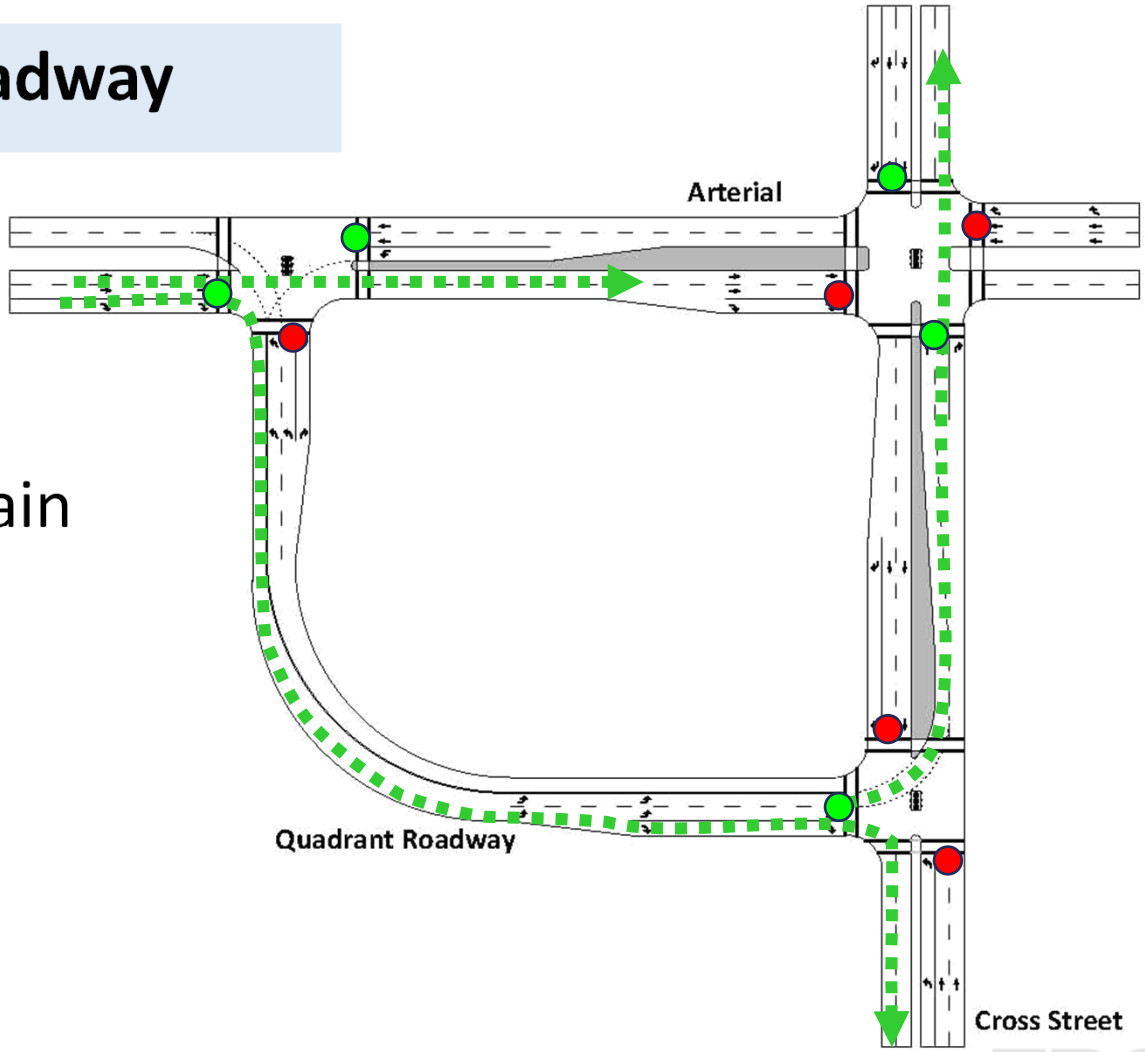


Continuous Green T



Quadrant Roadway

No left turns allowed at main signalized intersection



Quadrant Roadway

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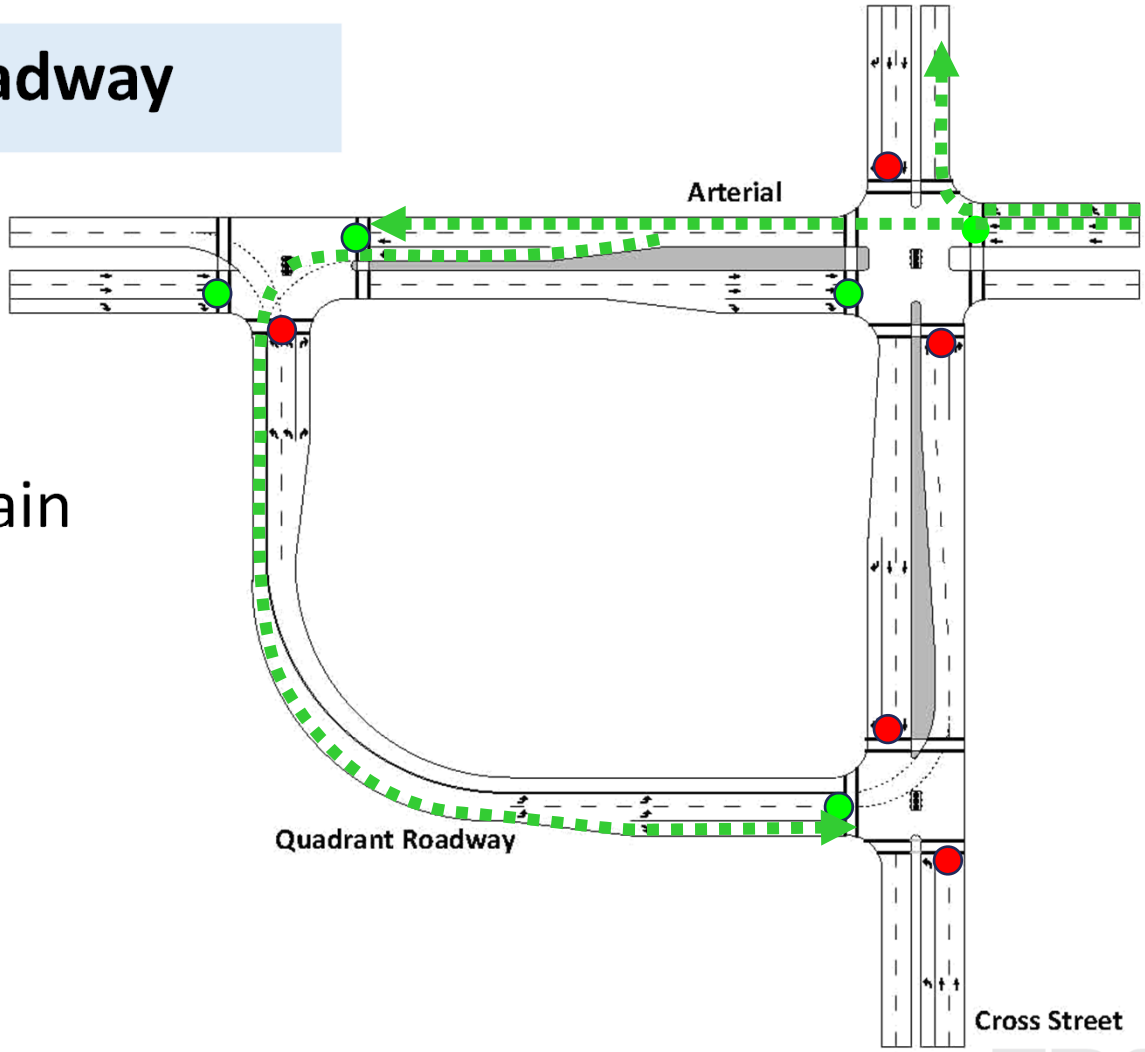

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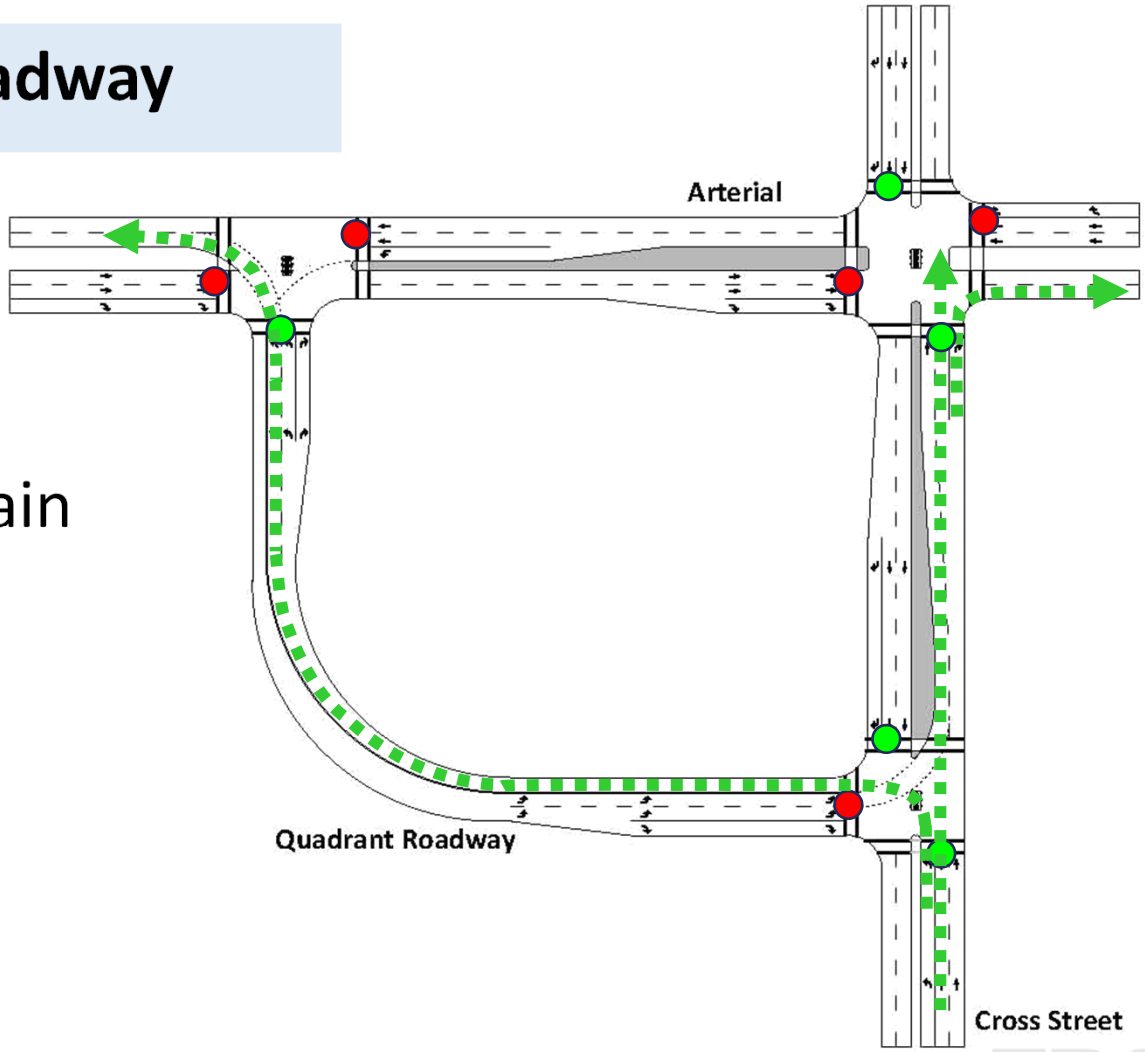
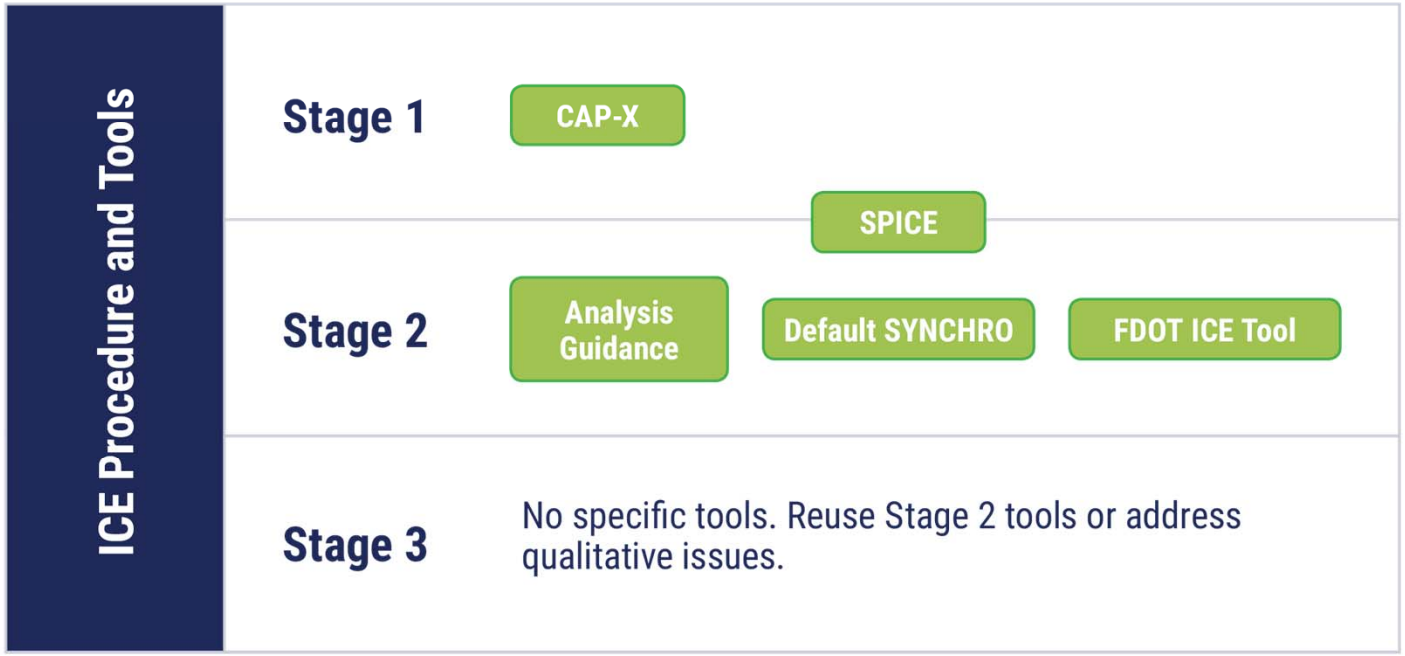


FDOT ICE IMPLEMENTATION PLAN

- 2018: Training and Acclimation
  - Implementation Focus: District Training
    - Two intersections per district
- 2019: Districts Identify & Conduct ICE Analysis for Additional Locations
  - Implementation Focus: Refine ICE Process
    - Evaluate minimum of three projects in these offices/focus areas
      - PD&E
      - Traffic Operations
      - Access Management/Permitting
  - Conduct round of FDOT ICE Training
- 2020: Full ICE Procedure Implementation by Districts
  - Implementation Focus: Mainstream ICE Process
    - ICE Manual Procedures fully effective January 1, 2020
    - Quality Assistance Reviews (QAR) starting in Year 4

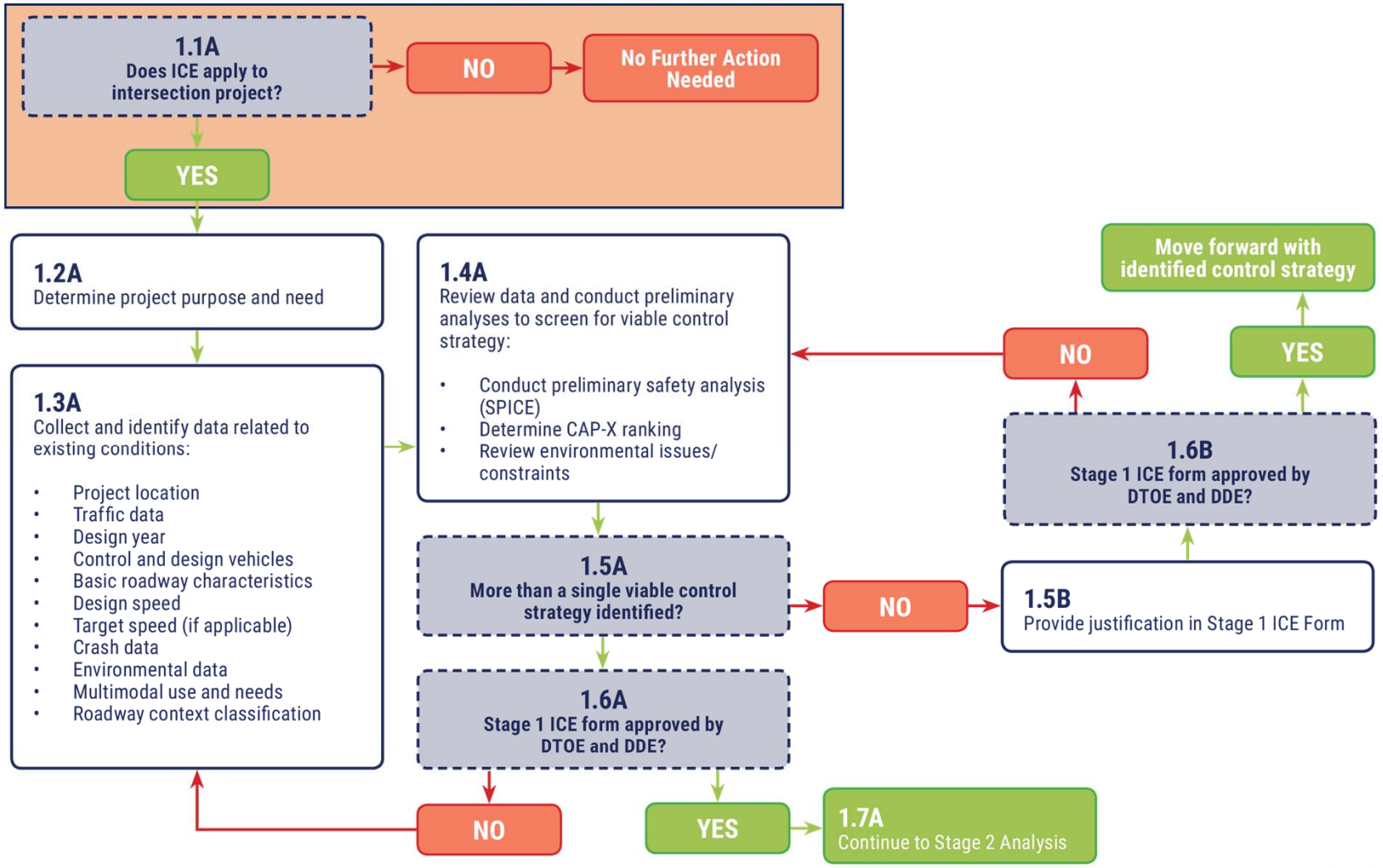
STAGES OF ICE

Stage 1	Stage 2	Stage 3
Screening	Preliminary Control Strategy Assessment	Detailed Control Strategy Assessment



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 1; Page 7

ICE STAGE 1 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10

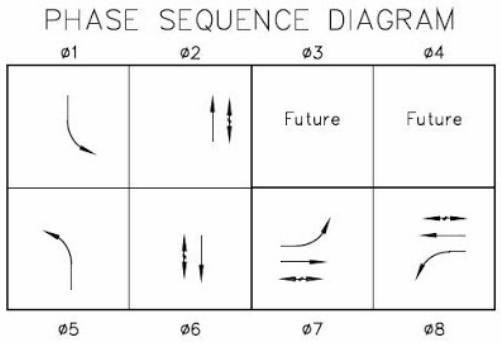
ICE is REQUIRED when

- New signalization is proposed
- Major reconstruction of existing signalized intersection is proposed
  - Adding exclusive left turns, adding intersection legs
- Conversion of a directional or bi-directional median opening to a full median opening is proposed
- Driveway/Connection permit applications for Category E, F, G
- District Design Engineer (DDE) and District Traffic Operations Engineer (DTOE) consider an ICE a good fit for the project

Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Section 2.3; Page 5

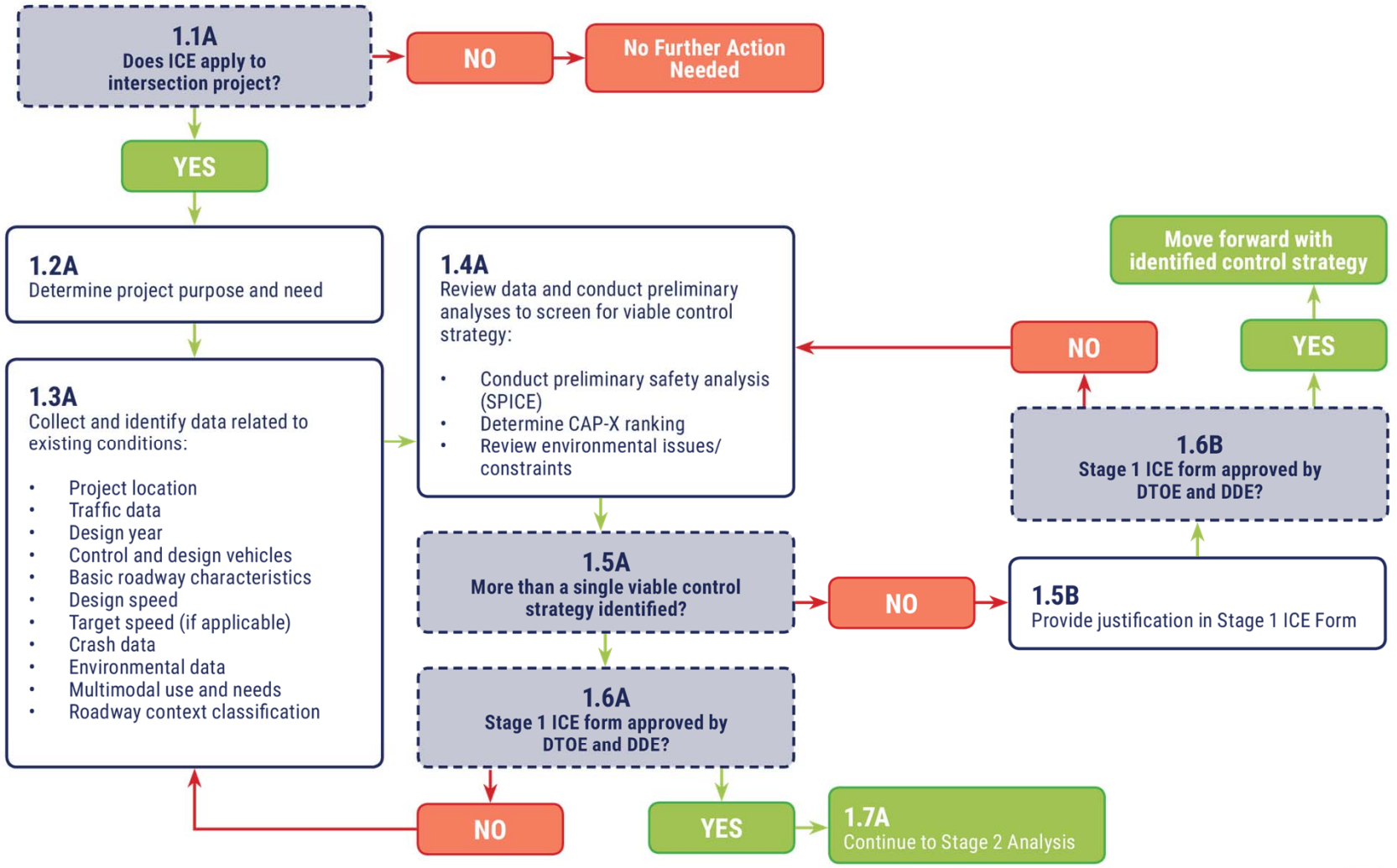
ICE NOT REQUIRED

- Work does not include substantive proposed changes to intersection
  - Mill and resurface pavement; changing full median opening to directional median opening
- Minor intersection operational improvements
  - Adding right turn lane or signal phasing changes or equipment upgrades
- Encouraged for local roadways, not required
- Recommended for ramp terminal intersections (stop control, signalized, or yield), not required



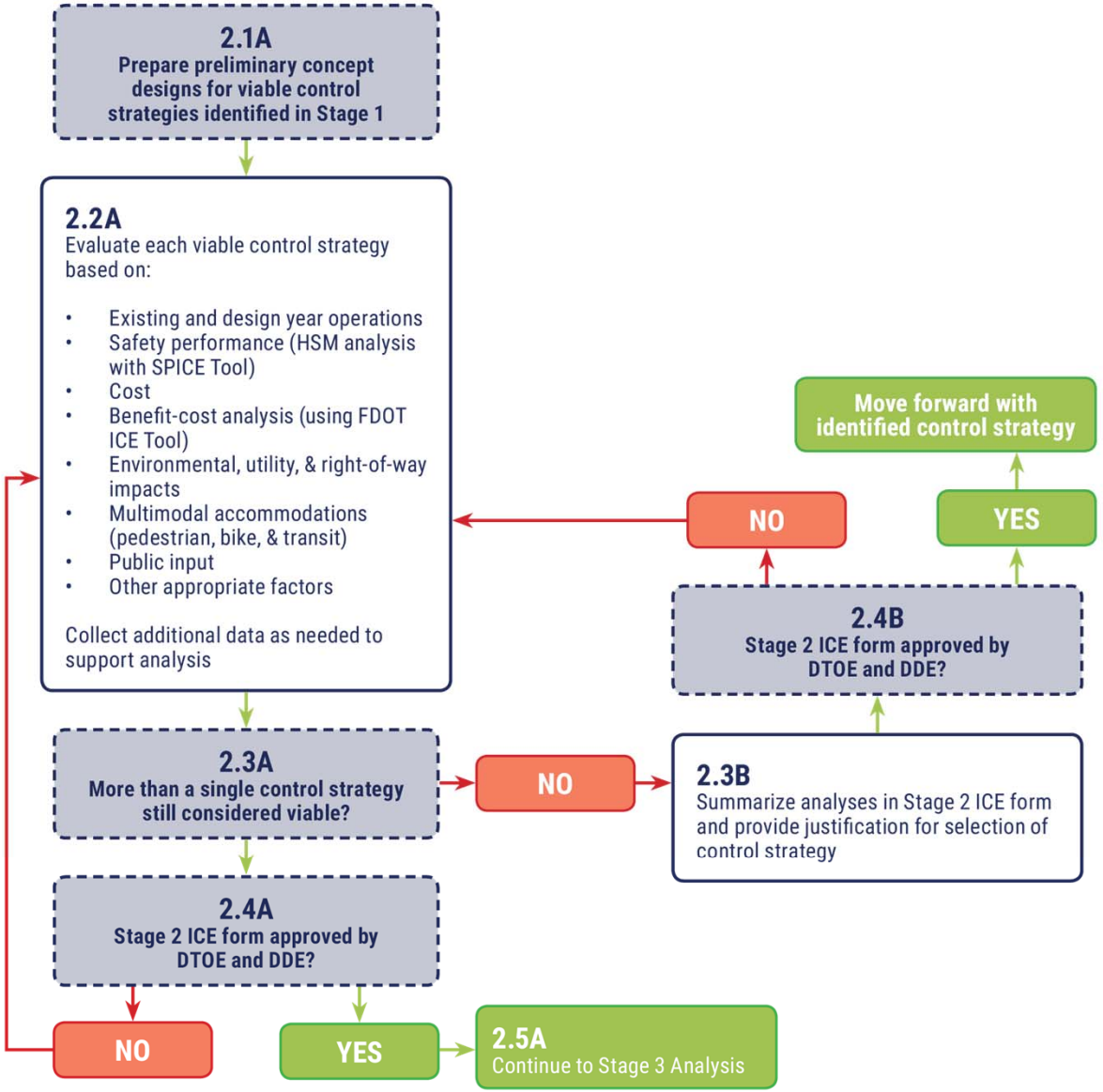
Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Section 2.3; Page 5

ICE STAGE 1 PROCESS



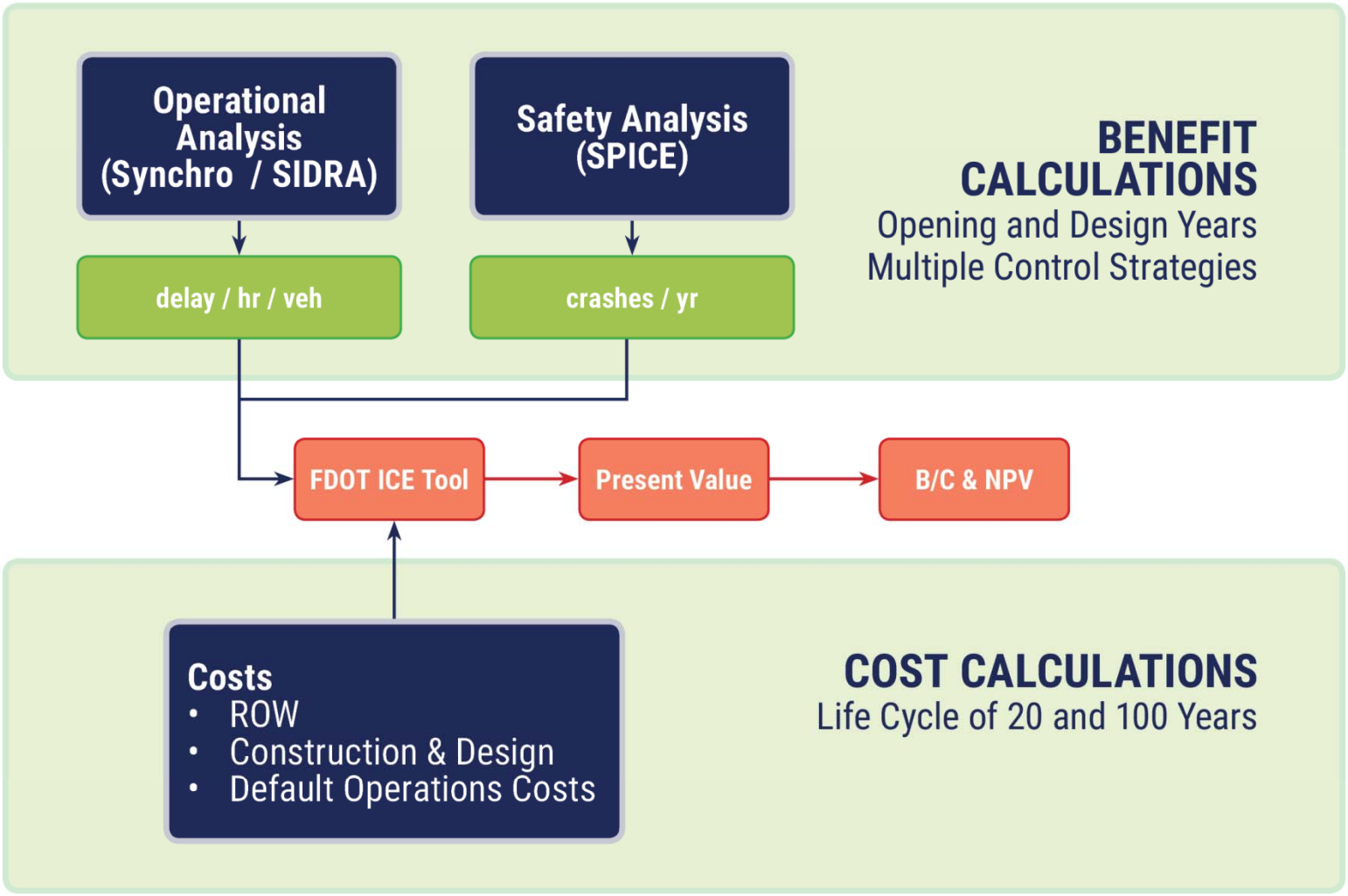
Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10

ICE STAGE 2 PROCESS

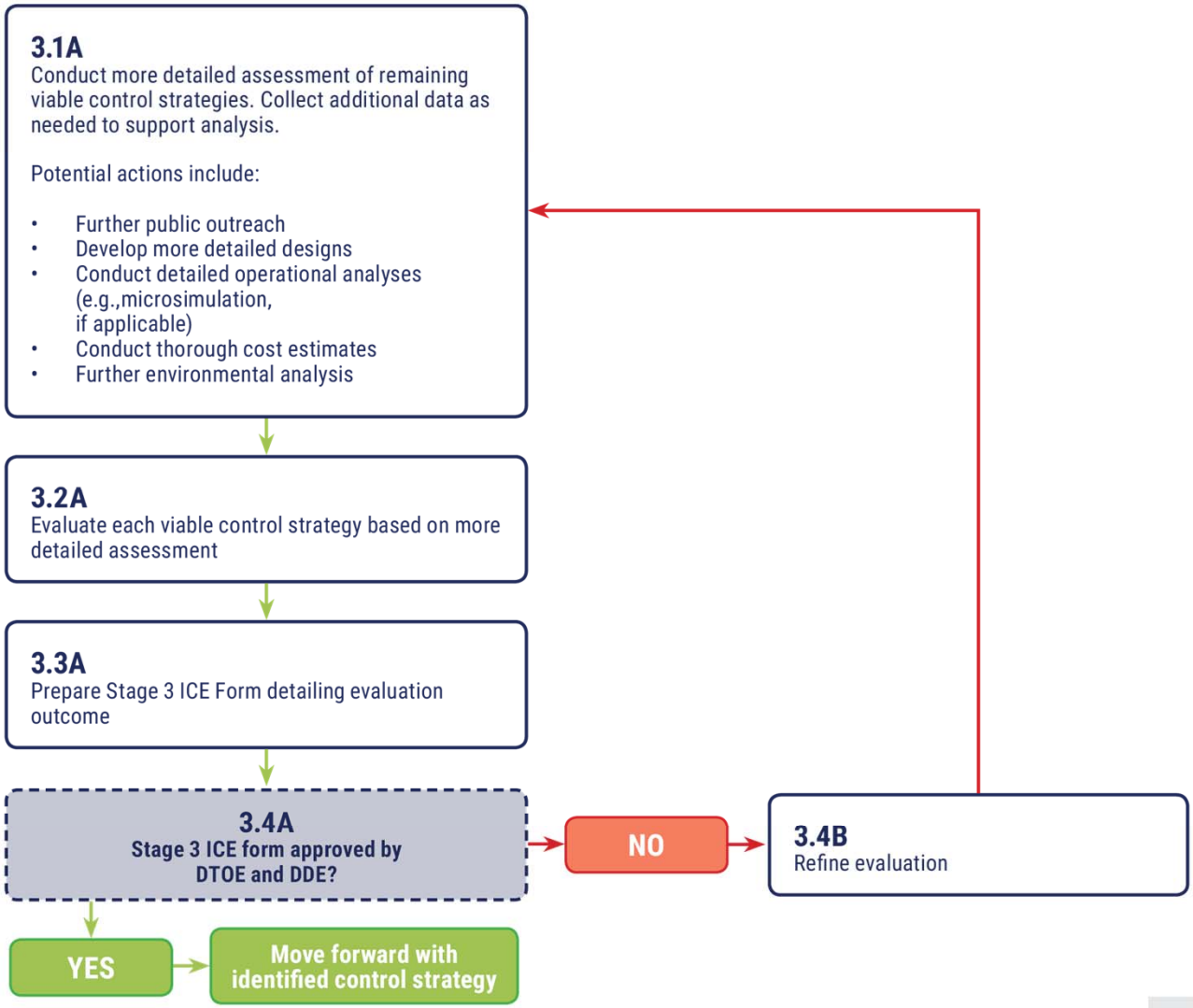


Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

STAGE 2 OVERVIEW



ICE STAGE 3 PROCESS

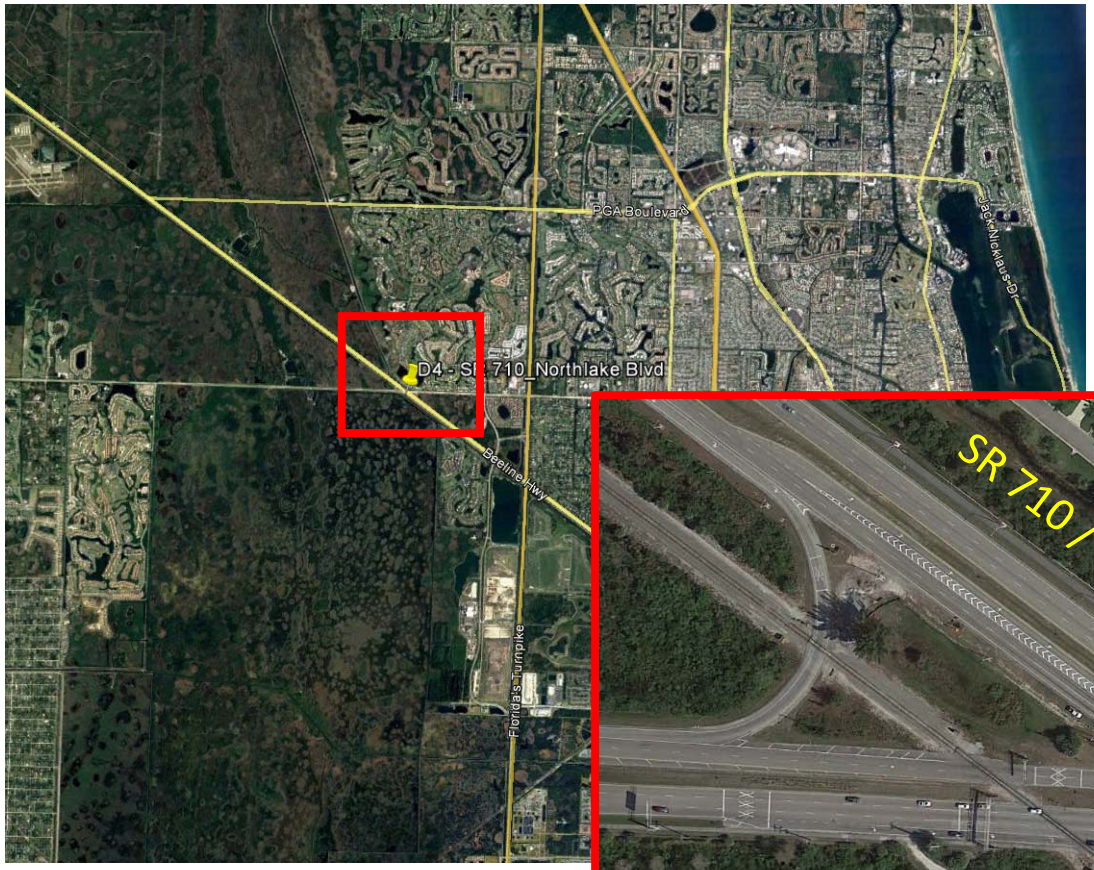


Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 4. Page 18

STUDY INTERSECTION #1

SR 710 AT NORTHLAKE BOULEVARD

SR 710 / NORTHLAKE BLVD – INTERSECTION OVERVIEW



- Existing intersection operational deficiencies
- Proposed intersection reconstruction
- SR 710: 4 to 6 lane widening scheduled south of Northlake Blvd

SR 710 / NORTHLAKE BLVD – INTERSECTION OVERVIEW

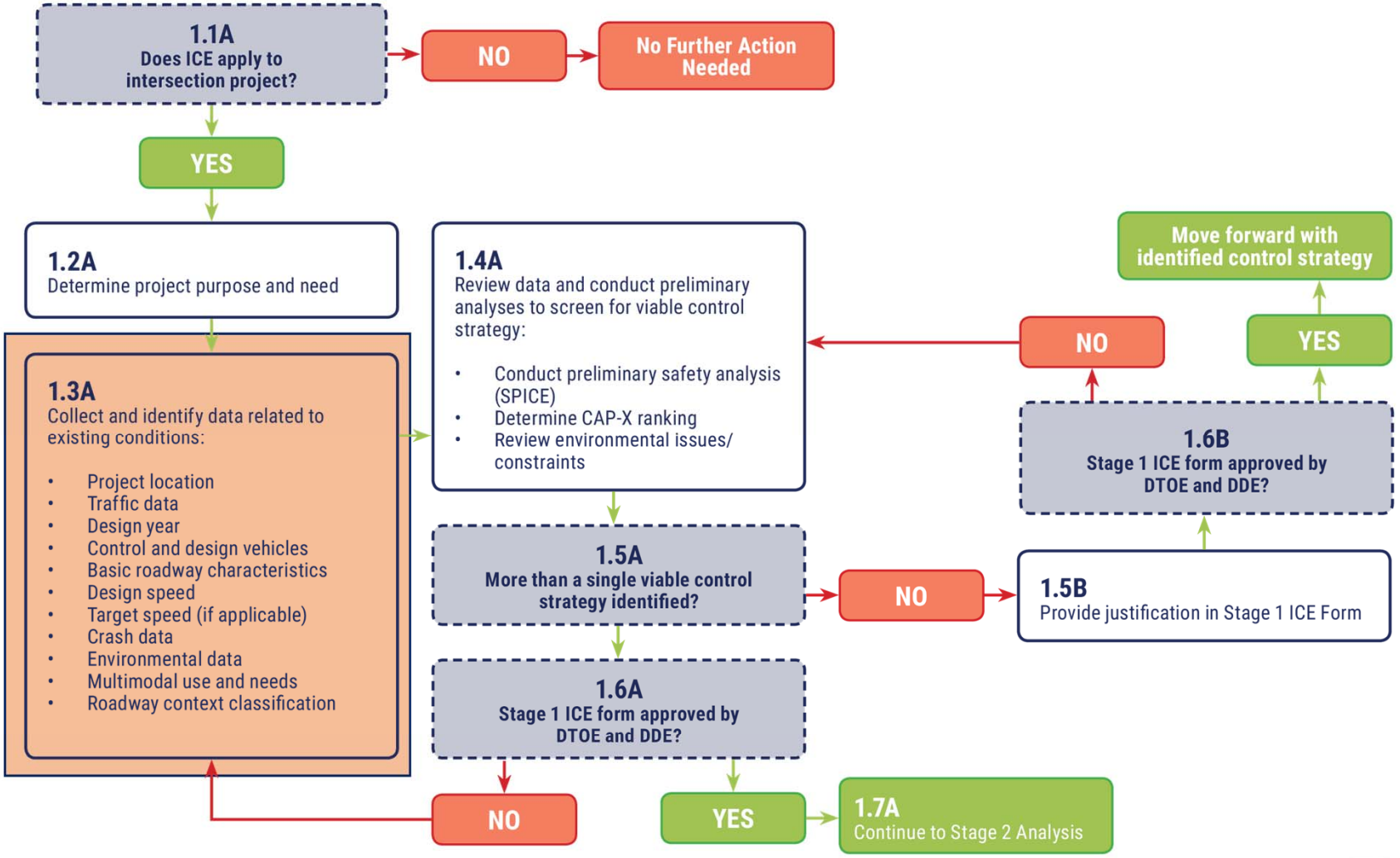
- Existing Year for Analysis – 2019
  - SR 710 AADT – 21,400
  - Northlake AADT – 32,400
- Opening Year 2020
  - SR 710 AADT – 22,400
  - Northlake AADT – 33,400
- Design Year 2040
  - SR 710 AADT – 28,700
  - Northlake AADT – 38,800
- Heavy Vehicle Percentage
  - SR 710 – NB 13.9%, SB 14.8%
  - Northlake – EB 4%, WB 9.8%
- Context Classification
  - SR 710 - C3R Suburban Residential
- Posted Speed
  - SR 710 – 55 MPH
  - Northlake Boulevard – 55 MPH

SR 710 / NORTHLAKE BLVD. – INTERSECTION OVERVIEW

- 2013 – 2017 Crash Data Summary:
  - 229 Total Crashes
  - 2 Fatal Crashes
    - 1 Rear-End and 1 Pedestrian
  - 52 Injury Crashes
  - 175 Property Damage Only
  - Detailed breakdown located in handout

STAGE 1 FORM

ICE STAGE 1 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10

ICE Forms For Reporting, Not Analysis

Project Information

Project Name	FDOT ICE Training - D4	FDOT Project #		Date	06/24/19
Submitted By	Jack Freeman, Kittelson	Agency/Company	FDOT	Email	jfreeman@kittelson.com
FDOT Context Classification	C3R - Suburban Residential	FDOT District	District 4	County	Palm Beach
Project Locality (*City/Town/Village*)	West Palm Beach	Project Type	Congestion Mitigation Project		
Project Purpose (*What is the catalyst for this project and why is it being undertaken?*)	The intersection currently experiences significant delays during peak periods. In the hopes of avoiding a costly grade-separated interchange, at-grade alternatives are being evaluated for their ability to better accommodate the high volumes at this intersection relative to the existing signalized control.				
Project Setting Description (*Describe the area surrounding the intersection*)	The intersection lies in a relatively rural area of West Palm Beach. The NW, SW, and SE quadrants are all occupied by wetlands (undeveloped). The NE quadrant features several residential developments (several hundred homes) accessing Northlake Boulevard at the adjacent signalized intersection (approximately 1.35 miles east)				
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*)	Given the relatively rural nature of the intersection, pedestrian and bicycle volumes at the intersection are low. Three of the four quadrants of the intersection are occupied by wetlands that extend for several square miles. Northlake Boulevard features a mix of shared-use paths and sidewalks along both sides of the roadway; these are primarily utilized for recreational purposes. Pedestrians and bicyclists originating from the homes in the NE quadrant do not have direct access to the intersection as the developments feature perimeter walls. Both motorized and non-motorized traffic from the				

Basic Intersection Information

Major Street Information										
Route #:	710	Route Name(s)	Beeline Highway					Milepost	17.025	
Existing Control Type	Signal		Existing AADT	21,400		Design Year AADT	28,700			
Design Vehicle	Interstate Semitrailer (WB-62)		Control Vehicle	Interstate Semitrailer (WB-62)						
Primary Functional Classification	Rural Principal Arterial					Design Speed (mph)	55			
Secondary Functional Classification (if app.)						Target Speed (mph) [if app.]				

Approach #1	Direction	Northbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along	Neither side of the approach	Left-Turn	2				
	Crosswalk on Approach?	Yes	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	2	Left	308	Left	1,038
	Multi-Use Path?	No	Left-Through-Right		Through	723	Through	397
	Scheduled Bus Service?	No	Through-Right		Right	5	Right	10
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		13.8%	
Approach #2	Direction	Southbound	Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes	
	Sidewalks along:	One side of the approach	Left-Turn	1				
	Crosswalk on Approach?	No	Left-Through		Weekday AM Peak		Weekday PM Peak	
	On-Street Bike Facilities?	No	Through	2	Left	48	Left	93
	Multi-Use Path?	Yes	Left-Through-Right		Through	311	Through	527
	Scheduled Bus Service?	No	Through-Right		Right	85	Right	337
	Bus Stop on Approach?	No	Right-Turn	1	Daily Truck %		14.8%	

Basic Intersection Information

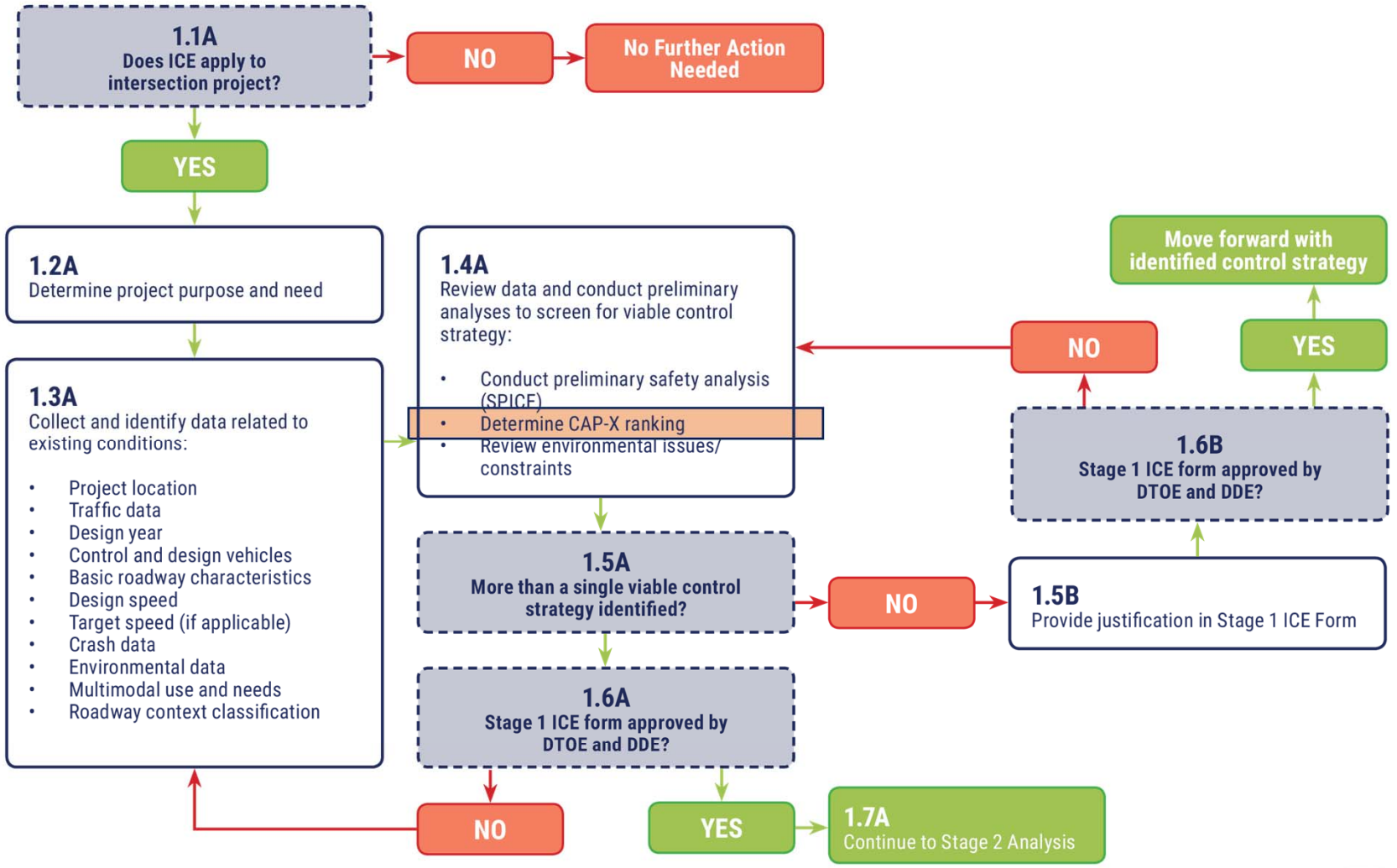
Minor Street Information											
Route #:	CR-809A	Route Name(s)	Northlake Boulevard					Milepost (if app.)			
Existing Control Type	Signal			Existing AADT	32,400			Design Year AADT	38,800		
Design Vehicle	Interstate Semitrailer (WB-62)			Control Vehicle	Interstate Semitrailer (WB-62)						
Primary Functional Classification		Rural Principal Arterial						Design Speed (mph)	55		
Secondary Functional Classification (if app.)								Target Speed (mph) [if app.]			
Approach #1	Direction	Westbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes			
	Sidewalks along:	Both sides of the approach		Left-Turn	1						
	Crosswalk on Approach?	Yes		Left-Through		Weekday AM Peak		Weekday PM Peak			
	On-Street Bike Facilities?	Yes		Through	2	Left	1	Left	6		
	Multi-Use Path?	No		Left-Through-Right		Through	363	Through	1,586		
	Scheduled Bus Service?	No		Through-Right		Right	115	Right	67		
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		9.8%			
Approach #2	Direction	Eastbound		Number of Lanes		Study Period #1 Traffic Volumes		Study Period #2 Traffic Volumes			
	Sidewalks along:	One side of the approach		Left-Turn	0						
	Crosswalk on Approach?	No		Left-Through		Weekday AM Peak		Weekday PM Peak			
	On-Street Bike Facilities?	No		Through	3	Left	173	Left	62		
	Multi-Use Path?	No		Left-Through-Right		Through	1,772	Through	690		
	Scheduled Bus Service?	No		Through-Right		Right	1,196	Right	396		
	Bus Stop on Approach?	No		Right-Turn	1	Daily Truck %		4.0%			

Crash History

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 (2013-2017) was collected for the study intersection. Over the five-year history, 229 total crashes were reported with 2 crashes involving a fatality and 52 involving injuries. One fatal crash was rear-end related while the other involved a pedestrian. 60 percent of the injuries resulted from rear-end crashes, which accounted for approximately 51 percent of the total crashes. 39 percent of crashes occurred on a Monday or Tuesday, and 17 percent occurred between 4 and 6 PM.


STAGE 1
ANALYSIS
FDOT

ICE STAGE 1 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10


STAGE 1
CAP-X
FDOT

Existing AM TMC Inputs

Project Name:	*SR 710 at Northlake Blvd - D4 ICE Training*
Project Number:	*XXXXX.XX*
Location	*West Palm Beach, FL*
Date	2017 AM
Number of Intersection Legs	4
Major Street Direction	East-West

Reset Tool to Defaults

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	173	1772	1196	4.00%	0.00%
Westbound	0	1	363	115	9.80%	0.00%
Southbound	0	48	311	85	14.80%	0.00%
Northbound	0	308	723	5	13.80%	0.00%

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

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		**C3R-Suburban Residential**				
Critical Lane Volume Threshold	2-phase signal			**Suggested = 1800**	**1800**	
	3-phase signal			**Suggested = 1750**	**1750**	
	4-phase signal			**Suggested = 1700**	**1700**	

Equivalent Pasenger Car Volume

	Volume (Veh/hr)			
	U-Turn	Left	Thru	Right
Eastbound	0	190	1843	1313
Westbound	0	1	399	126
Southbound	0	55	357	98
Northbound	0	351	823	6

- Must enter Context Class
- Manual overrides for:
  - Adjustment Factor
  - Critical Volume Threshold
  - Truck to PCE

Notes:	
Left-Turn Adjustment Factor	*Conversion of left-turning vehicles to equivalent through vehicles*
Right-turn Adjustment Factor	*Conversion of right-turning vehicles to equivalent through vehicles*
U-turn Adjustment Factor	*Conversion of U-turning vehicles to equivalent through vehicles*
Truck to PCE Factor	*1truck = X Passenger Car Equivalents*
Critical Lane Volume Sum Limit	*Saturation Value for Critical Lane Volume Sum at an intersection*

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

Existing Intersection Configuration	*Traffic Signal*

Number of Lanes for Existing Configuration
(Can be edited in "3- Alt Num Lanes Input" as needed)

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**		2	2	1		1	2	1		0	3	1		1	2	1

Results for Existing Configuration

TYPE OF INTERSECTION	Sheet	Zone 1 (North)		Zone 2 (South)		Zone 3 (East)		Zone 4 (West)		Zone 5 (Center)			
		CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C		
Traffic Signal	**FULL**	--	--	--	--	--	--	--	--	1833	1.20	--	--

Existing Configuration Results

Overall v/c Ratio	1.20	Pedestrian Accommodation	Fair	Bicycle Accommodation	Fair	Transit Accommodation	Good

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

Step 2B: Alternative Selection

Rankings Inclusion		Yes/No	Comment
At-Grade Non-Roundabout Intersections?		Yes	
Traffic Signal		Yes	
Two-Way Stop Control		No	Existing Traffic Signal
All-Way Stop Control		No	Existing Traffic Signal
Continuous Green T		No	4 legged intersection
Quadrant Roadway	S-W	No	No nearby rdwy network
	N-E	No	No nearby rdwy network
	S-E	Yes	
	N-W	No	No nearby rdwy network
Partial Displaced Left Turn		Yes	
Displaced Left Turn		Yes	
Signalized Restricted Crossing U-Turn		Yes	
Unsignalized Restricted Crossing U-Turn		No	Existing Traffic Signal
Median U-Turn		Yes	
Partial Median U-Turn		Yes	
Roundabouts?		No	Existing rdwy is 6-lane
50 ICD Miniroundabout			
75 ICD Miniroundaobut			
1x1			
1x2			
2x1			
2x2			
Grade Separated Interchanges?		No	
Diamond			
Partial Cloverleaf A			
Partial Cloverleaf B			
Displaced Left Turn Interchange			
Diverging Diamond Interchange			
Single Point			

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

- Slides 5-14 display intersection control type graphics
- Clicking on blue hyperlinks in "Sheet" column also display control type graphics

Project Name:	*SR 710 at Northlake Blvd - D4 ICE Training*
Project Number:	*XXXXX.XX*
Location:	*West Palm Beach, FL*
Date:	2017 AM
Analysis Type:	At-Grade Intersections Only

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		2	2	1		1	2	1		0	3	1		1	2	1
Quadrant Roadway	S-E	Use the respective intersection tab(s) to specify the # of lanes inputs.															
Partial Displaced Left Turn	E-W		2	2	1		1	2	1		1	3	1		1	2	1
Displaced Left Turn	FULL		2	2	1		1	2	1		1	3	1		1	2	1
Signalized Restricted Crossing U-Turn	E-W				2				2	2	1	3	1	2	1	2	1
Median U-Turn	E-W			2	2			2	1	2		3	1	1		2	1
Partial Median U-Turn	E-W		2	2	1		1	2	1	1		3	1	1		2	1

For shared lanes, enter "0" in L or R

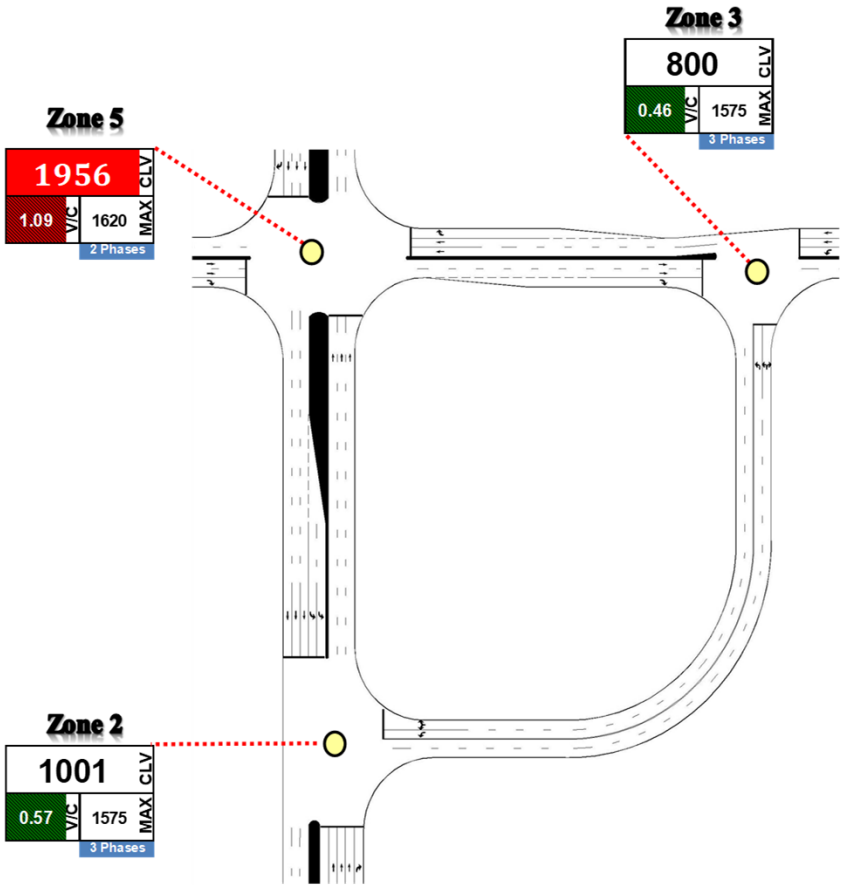
SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

Quadrant Roadway Intersection (S-E)

Design and Results

Project Name:	SR 710 at Northlake Blvd - D4 ICE Training
Project Number:	XXXXX.XX
Location	West Palm Beach, FL
Date	2017 AM

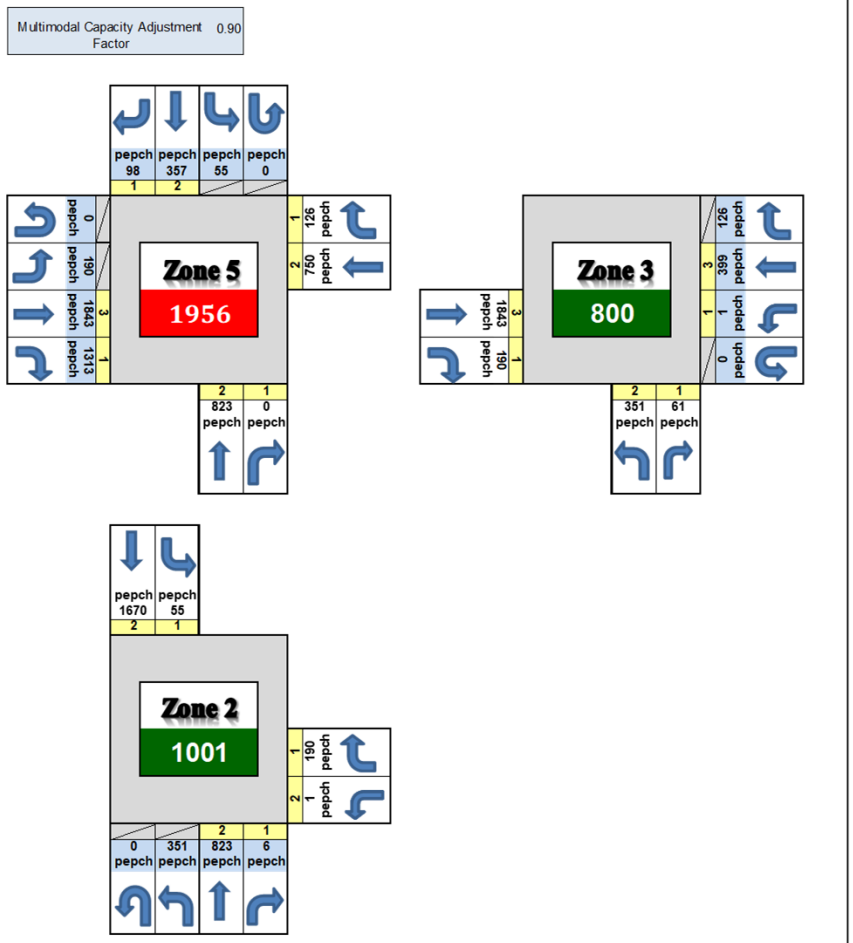
Volume-to-Capacity Ratio			
< 0.750	0.750 - 0.875	0.875 - 1.00	≥ 1.00
VOLUME / CAPACITY RATIO:		1.09	



Note: This diagram does not reflect the actual lane configuration of the Intersection

Quadrant Roadway Intersection (S-E)

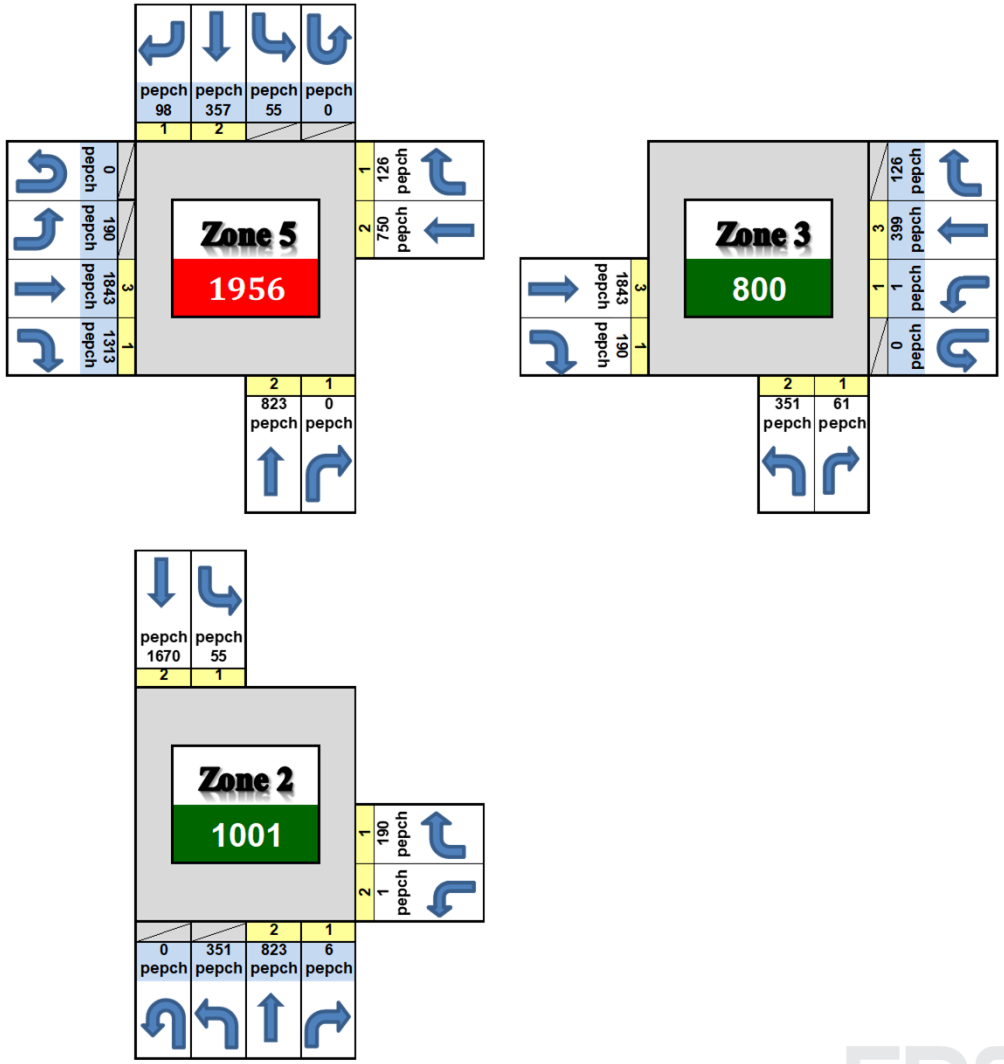
Data Input and Configuration



SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

Quadrant Roadway Lane Inputs

- Need to update lanes at all intersections/zones to accommodate re-routed traffic



- Detailed Results Tab – Reporting highest V/C movement to determine Overall V/C Ratio

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									1833	1.20	1.20	Fair	Fair	Good
Quadrant Roadway	S-E			1001	0.57	800	0.46			1956	1.09	1.09	Fair	Fair	Fair
Partial Displaced Left Turn	E-W					634	0.35	575	0.32	1829	1.05	1.05	Fair	Fair	Good
Displaced Left Turn	FULL	564	0.31	364	0.20	634	0.35	575	0.32	1772	0.98	0.98	Fair	Fair	Good
Signalized Restricted Crossing U-Turn	E-W	2265	1.26	2659	1.48	997	0.55	1373	0.76			1.48	Good	Good	Fair
Median U-Turn	E-W					601	0.33	1185	0.66	1957	1.09	1.09	Good	Good	Fair
Partial Median U-Turn	E-W					501	0.28	1117	0.62	1830	1.05	1.05	Good	Good	Fair

- Summary Results Tab – Intersection selected for evaluation are ranked from lowest to highest V/C

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Displaced Left Turn	0.98	1	4.8	Fair	Fair	Good
Partial Displaced Left Turn E-W	1.05	2	4.8	Fair	Fair	Good
Partial Median U-Turn E-W	1.05	2	6.3	Good	Good	Fair
Quadrant Roadway S-E	1.09	4	4.4	Fair	Fair	Fair
Median U-Turn E-W	1.09	4	6.3	Good	Good	Fair
Traffic Signal	1.20	6	4.8	Fair	Fair	Good
Signalized Restricted Crossing U-Turn E-W	1.48	7	6.3	Good	Good	Fair
--	--	--	4.8	--	--	--
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Change "Major Street" from "E-W" to "N-S"

Project Name:	*SR 710 at Northlake Blvd - D4 ICE Training*
Project Number:	*XXXXX.XX*
Location	*West Palm Beach, FL*
Date	2017 AM
Number of Intersection Legs	4
Major Street Direction	North-South

Reset Tool to Defaults

Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	173	1772	1196	4.00%	0.00%
Westbound	0	1	363	115	9.80%	0.00%
Southbound	0	48	311	85	14.80%	0.00%
Northbound	0	308	723	5	13.80%	0.00%

- May need to update lanes for different re-routed movements
  - RCUT, MUT, PMUT

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		2	2	1		1	2	1		0	3	1		1	2	1
Quadrant Roadway	S-E	Use the respective intersection tab(s) to specify the # of lanes inputs.															
Partial Displaced Left Turn	N-S		2	2	1		1	2	1		0	3	1		1	2	1
Displaced Left Turn	FULL		2	2	1		1	2	1		1	3	1		1	2	1
Signalized Restricted Crossing U-Turn	N-S	2	2	2	1	2	1	2	1				2				2
Median U-Turn	N-S	2		2	1	1		2	1			3	1			2	1
Partial Median U-Turn	N-S	2		2	1	1		2	1		0	3	1		1	2	1

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

- Major road as SR 710 (N-S) PM results

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Displaced Left Turn	0.98	1	4.8	Fair	Fair	Good
Partial Displaced Left Turn N-S	1.01	2	4.8	Fair	Fair	Good
Quadrant Roadway S-E	1.09	3	4.4	Fair	Fair	Fair
Traffic Signal	1.20	4	4.8	Fair	Fair	Good
Partial Median U-Turn N-S	1.22	5	6.3	Good	Good	Fair
Median U-Turn N-S	1.31	6	6.3	Good	Good	Fair
Signalized Restricted Crossing U-Turn N-S	1.42	7	6.3	Good	Good	Fair
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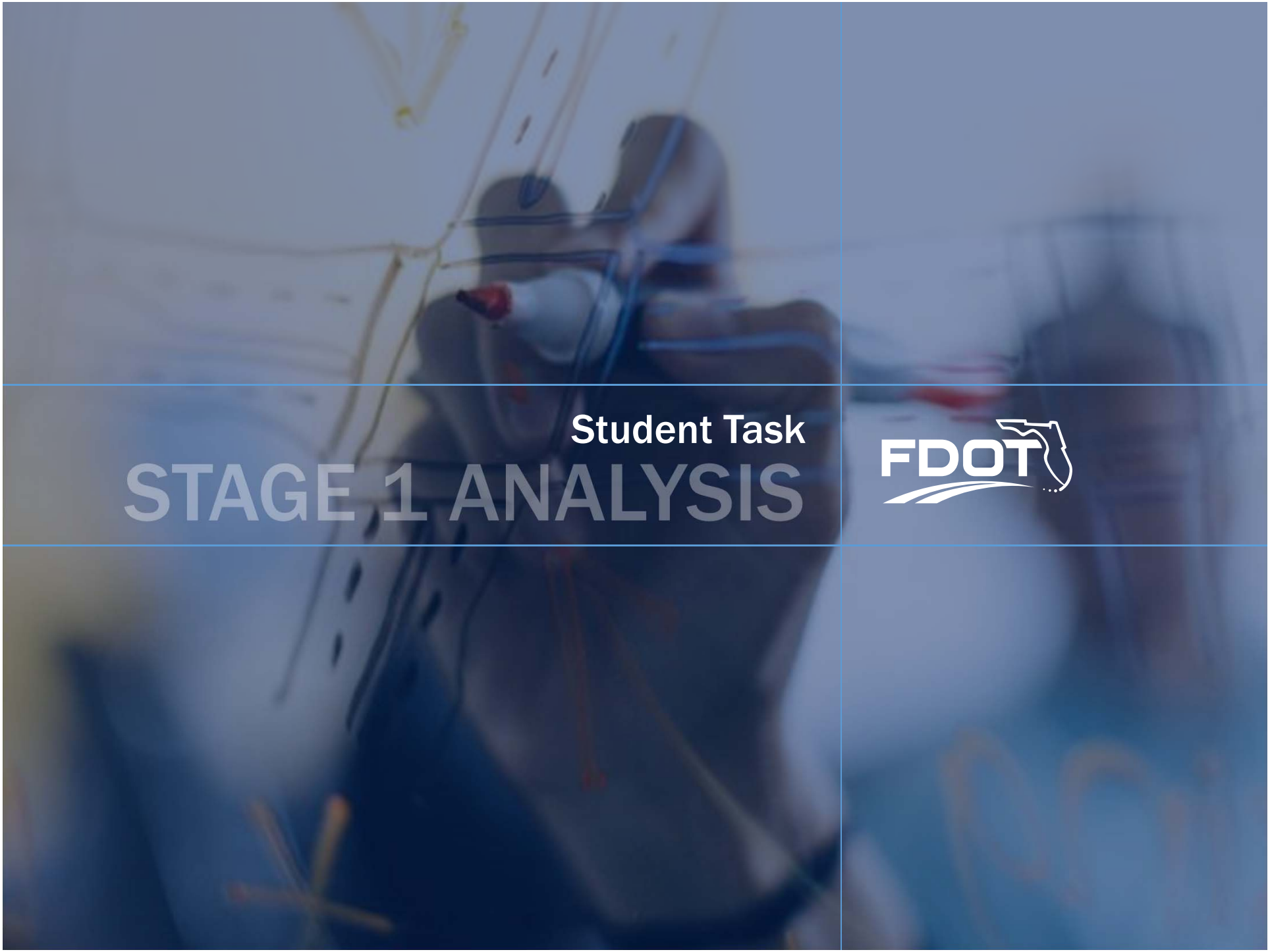

Student Task

STAGE 1 ANALYSIS

- Student Task
  - Fill in # lanes for AM CAP-X Analysis for both E-W and N-S major road directions
  - Complete PM CAP-X Analysis for both E-W and N-S major road directions

- Major road as Northlake (E-W) PM results

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Displaced Left Turn	0.85	1	4.8	Fair	Fair	Good
Median U-Turn E-W	0.94	2	6.3	Good	Good	Fair
Quadrant Roadway S-E	1.06	3	4.4	Fair	Fair	Fair
Partial Displaced Left Turn E-W	1.07	4	4.8	Fair	Fair	Good
Partial Median U-Turn E-W	1.11	5	6.3	Good	Good	Fair
Signalized Restricted Crossing U-Turn E-W	1.22	6	6.3	Good	Good	Fair
Traffic Signal	1.29	7	4.8	Fair	Fair	Good
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SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

- Major road as SR 710 (N-S) PM results

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Displaced Left Turn N-S	0.85	1	4.8	Fair	Fair	Good
Displaced Left Turn	0.85	1	4.8	Fair	Fair	Good
Quadrant Roadway S-E	1.06	3	4.4	Fair	Fair	Fair
Traffic Signal	1.29	4	4.8	Fair	Fair	Good
Median U-Turn N-S	1.51	5	6.3	Good	Good	Fair
Partial Median U-Turn N-S	1.55	6	6.3	Good	Good	Fair
Signalized Restricted Crossing U-Turn N-S	1.79	7	6.3	Good	Good	Fair
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Results Summary

Control Type	E-W Major Road		N-S Major Road	
	AM	PM	AM	PM
DLT	0.98	0.85	0.98	0.85
Partial DLT	1.05	1.07	1.01	0.85
Partial MUT	1.05	1.11	1.22	1.55
Quadrant (S-E)	1.09	1.06	1.09	1.06
MUT	1.09	0.94	1.31	1.51
Traffic Signal	1.20	1.29	1.20	1.29
Signalized RCUT	1.48	1.22	1.42	1.79

SR 710 / NORTHLAKE BLVD – STAGE 1 CAP-X

Capacity Analysis for Planning of Junctions

Summary Report - Page 1 of 2

Project Name:	SR 710 at Northlake Blvd - D4 ICE Training
Project Number:	XXXXX.XX
Location:	West Palm Beach, FL
Date:	2017 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	173	1772	1196	4.00%	0.00%
Westbound	0	1	363	115	9.80%	0.00%
Southbound	0	48	311	85	14.80%	0.00%
Northbound	0	308	723	5	13.80%	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		**C3R-Suburban Residential**	
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

Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Displaced Left Turn	0.98	1	4.8	Fair	Fair	Good
Partial Displaced Left Turn N-S	1.01	2	4.8	Fair	Fair	Good
Quadrant Roadway S-E	1.09	3	4.4	Fair	Fair	Fair
Traffic Signal	1.20	4	4.8	Fair	Fair	Good
Partial Median U-Turn N-S	1.22	5	6.3	Good	Good	Fair
Median U-Turn N-S	1.31	6	6.3	Good	Good	Fair
Signalized Restricted Crossing U-Turn N-S	1.42	7	6.3	Good	Good	Fair
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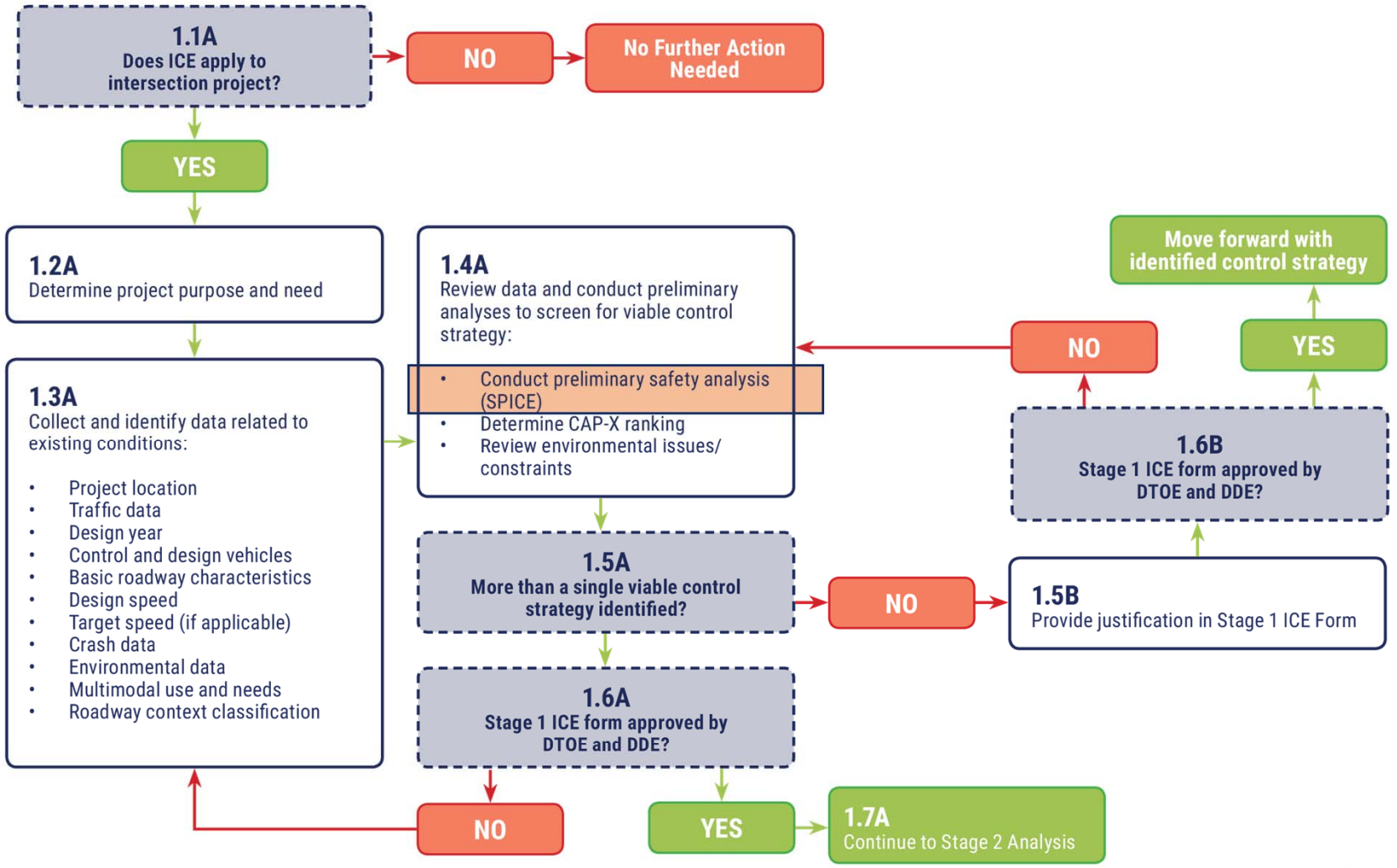
Summary Report needs to be printed and attached to the Stage 1 ICE Form

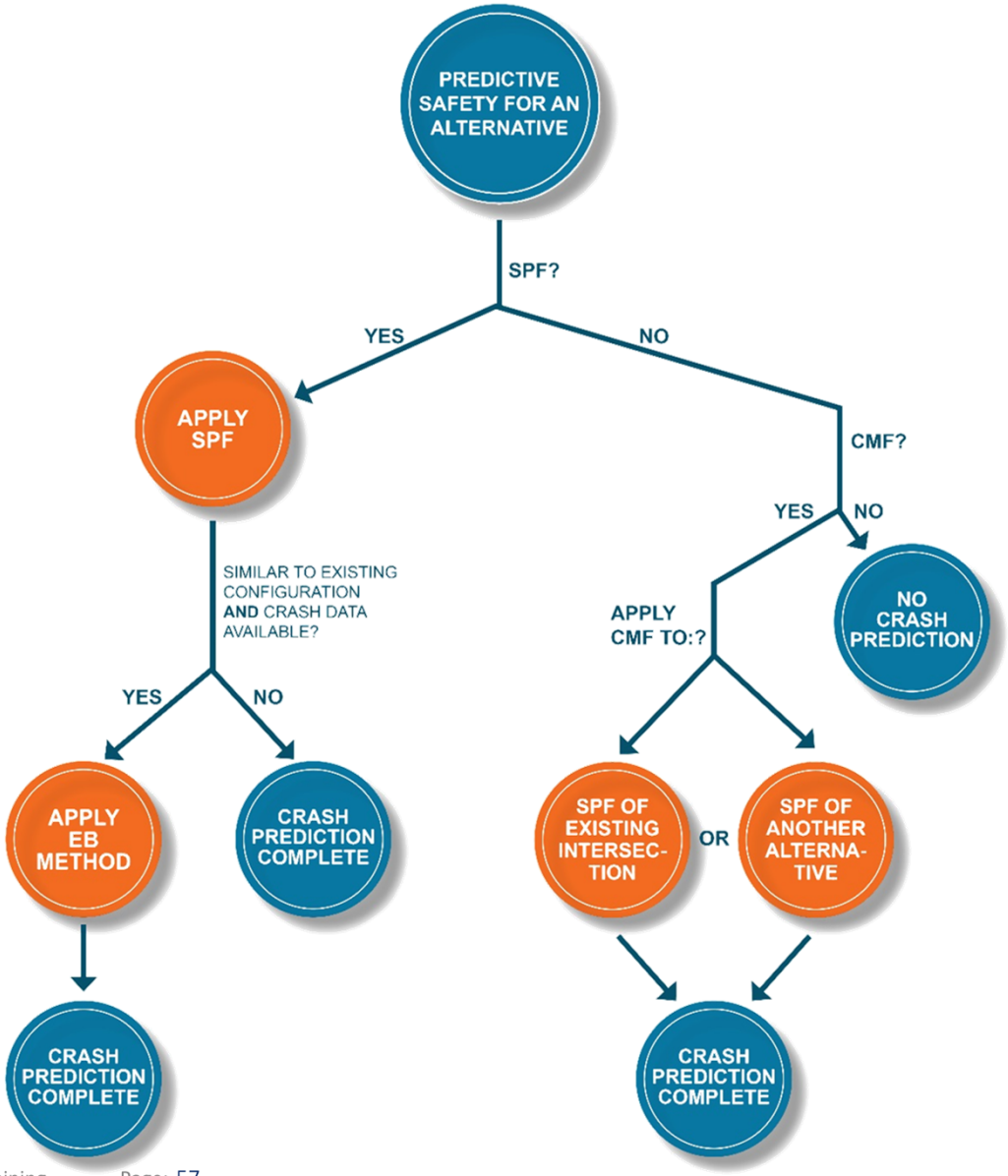

STAGE 1
SPICE
FDOT

ICE STAGE 1 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10

1.4 A – SPICE TOOL OVERVIEW



At-Grade Intersection to include in SPICE Tool

Traffic Signal	On Rural Two Lane Highway	3 leg	-	-	1	SPF under development in 17-68
	On Rural Multilane Highway	3 leg	-	-	3	SPF under development in 17-68
		3 leg	2x2	6 or more	7	SPF from 17-58
		4 leg	2x2	6 or more	8	SPF from 17-58
		3 leg	1x2	-	9	SPF from 17-58
		4 leg	1x2	-	10	SPF from 17-58
		3 leg	1x1	-	11	SPF from 17-58
		4 leg	1x1	-	12	SPF from 17-58
		5 leg	-		13	SPF under development in 17-68
	On High Speed (50+ MPH) Urban and Suburban Arterial	3 leg	-	-	14	SPF under development in 17-68
		4 leg	-	-	15	SPF under development in 17-68
		5 leg	-	-	18	SPF under development in 17-68
		3 leg	2x2	6 or more	23	SPF from 17-58
		4 leg	2x2	6 or more	24	SPF from 17-58
		3 leg	1x2	-	25	SPF from 17-58
		4 leg	1x2	-	26	SPF from 17-58
		3 leg	1x1	-	27	SPF from 17-58
		4 leg	1x1	-	28	SPF from 17-58
	On High Speed (50+ MPH) Urban and Suburban Arterial	3 leg	-	-	29	SPF under development in 17-68
		4 leg	-	-	30	SPF under development in 17-68
All-Way Stop	On Rural Two Lane Highway	4 leg	-	-	31	SPF under development in 17-68
	On Urban and Suburban Arterial	3 leg	-	-	32	SPF under development in 17-68
	On Urban and Suburban Arterial	4 leg	-	-	33	SPF under development in 17-68

Legend

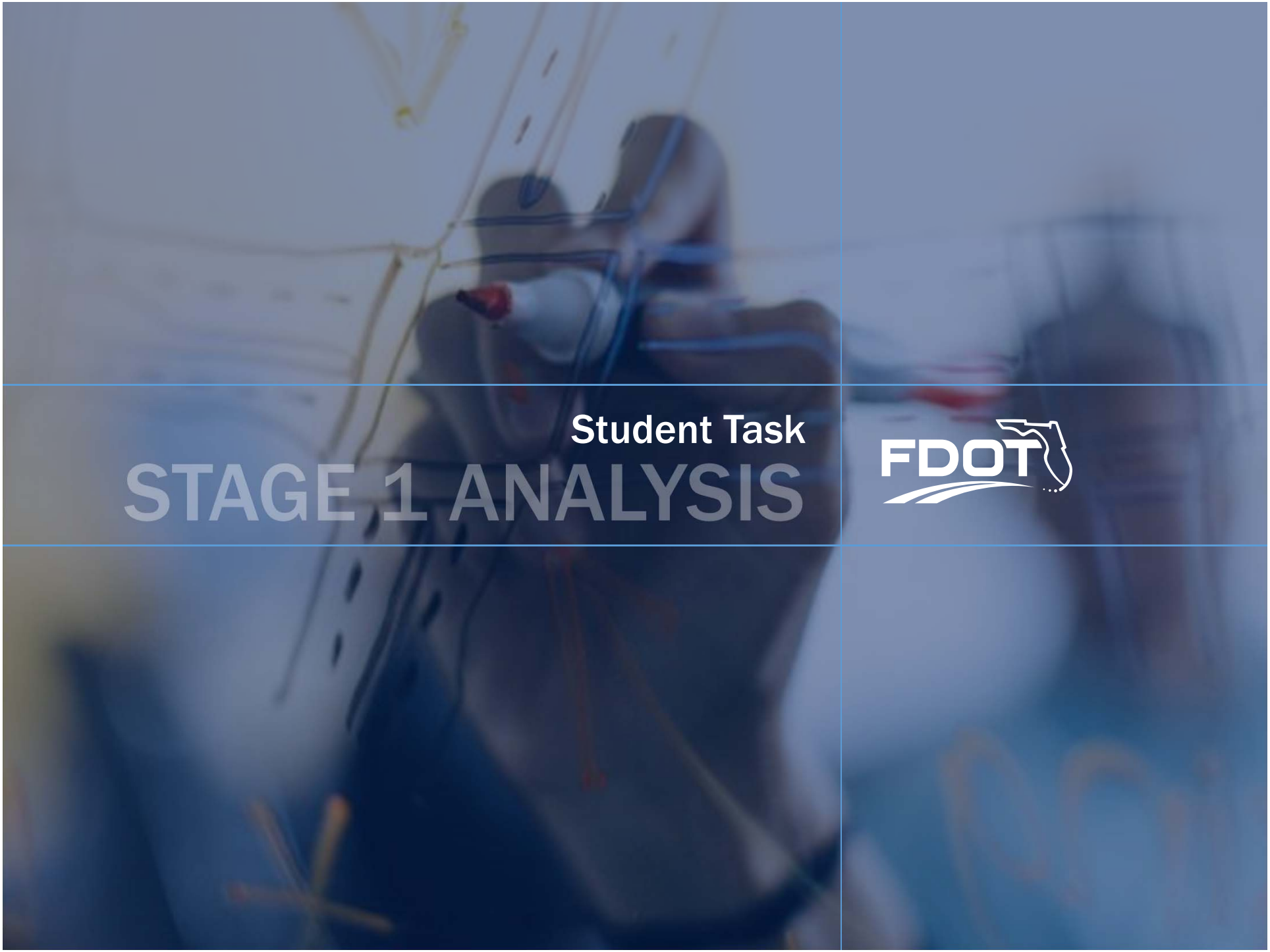
Completed SPF - include in SPICE Tool
SPF Under Development - Include in SPICE Tool
CMF - Include in SPICE Tool
Exclude from SPICE Tool

SR 710 / NORTHLAKE BLVD – STAGE 1 SPICE

Project Information	
Provide general project information for reference purposes only.	
Project Name:	FDOT District 4 ICE Training
Intersection:	SR 710 at Northlake Boulevard
Agency:	FDOT
Project Reference:	XXXXX.XX
City:	West Palm Beach
State:	Florida
Date:	7/1/2019
Analyst:	KAI
Use this button to clear all inputs/outputs and reset the tool to its initial defaults	Reset SPICE Tool

Control Strategy Selection – Base Values

Control Strategy Selection and Inputs		
Specify the Facility Level Inputs and the Control Strategies to be included in the SPICE Analysis.		
Intersection Type	At-Grade Intersections	
Analysis Year	Opening and Design Year	
Opening Year	2020	
Design Year	2040	
Facility Type	On Urban and Suburban Arterial	For more information on how to determine these values, see the "Definitions" worksheet
Number of Legs	4-leg	
1-Way/2-Way	2-way Intersecting 2-way	
# of Major Street Lanes (both directions)	5 or fewer	
Major Street Approach Speed	Less than 55 mph	
Opening Year - Major Road AADT	33,400	
Opening Year - Minor Road AADT	22,400	
Design Year - Major Road AADT	38,800	
Design Year - Minor Road AADT	28,700	



Student Task

STAGE 1 ANALYSIS

- Student Task
  - Select Control Strategies to be analyzed in SPICE Analysis

SR 710 / NORTHLAKE BLVD – STAGE 1 SPICE

- All control strategies initially included
- Traffic Signal (Alt. Config.) – applicable if existing condition is signal

Control Strategy	Include	Base Intersection	
Traffic Signal	Yes	--	
Traffic Signal (Alternative Configuration)	No	--	
Minor Road Stop	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range
All Way Stop	No	--	
1-Lane Roundabout	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range
2-Lane Roundabout	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range
Displaced Left Turn (DLT)	Yes	Traffic Signal	
Median U-Turn (MUT)	Yes	Traffic Signal	
Signalized Restricted Crossing U-Turn (RCUT)	Yes	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range
Unsignalized Restricted Crossing U-Turn (RCUT)	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range
Continuous Green-T Intersection	No	Traffic Signal	
Jughandle	Yes	Traffic Signal	
Other 1	No	Traffic Signal	*Please Select
Other 2	No	Minor Road Stop	*Please Select

SR 710 / NORTHLAKE BLVD – STAGE 1 SPICE

- Traffic Signal and All Way Stop – Left-turn and right-turn sum of all approaches
- Minor Road Stop – Left-turn and right-turn sum for uncontrolled approaches only

At-Grade Intersection Inputs

Provide inputs needed to compute and apply Part C CMFs.

		Control Strategy				
Input		**Traffic Signal**	**Displaced Left Turn (DLT)**	**Median U-Turn (MUT)**	**Signalized RCUT**	**Jughandle**
Opening Year Major Road AADT	Optional AADT Overrides	33400	33400	33400	33400	33400
Opening Year Minor Road AADT		22400	22400	22400	22400	22400
Design Year Major Road AADT		38800	38800	38800	38800	38800
Design Year Minor Road AADT		28700	28700	28700	28700	28700
Number of Approaches with Left-Turn Lanes	Additional Required Control Strategy Inputs	3				
Number of Approaches with Right-Turn Lanes		4				
Number of Uncontrolled Approaches with Left-Turn Lanes						
Number of Uncontrolled Approaches with Right-Turn Lanes						

SR 710 / NORTHLAKE BLVD – STAGE 1 SPICE

- Base condition HSM inputs
- Leave as default for Stage 1

Input		Control Strategy: Traffic Signal	Displaced Left Turn (DLT)	Median U-Turn (MUT)	Signalized RCUT	Jughandle	
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis							
Reset Planning Inputs to Defaults	Part C CMFS Optional For Stage 1 ICE, Required for Stage 2 ICE						
Skew Angle	A yellow cell indicates the value may be used in the SPF computation	N/A	CMF - No Inputs Required	CMF - No Inputs Required	Scroll Down for Signalized RCUT SPF Inputs	CMF - No Inputs Required	All yellow cells will be automatically populated by a macro. If users want to do a planning-level analysis, they can leave the automatic inputs as-is
Lighting Present		Yes					
# of Approaches Permissive LT Signal Phasing		0					
# of Approaches Perm/Prot LT Signal Phasing		0					
# of Approaches Protected LT Signal Phasing		0					
Number of Approaches with Right-Turn-on-Red Prohibited		0					
Red Light Cameras Present		No					
Number of Major Street Through Lanes		0					
Number of Minor Street Lanes		0					
# of Major St Approaches w/ Right-Turn Channelization		0					
Number of Approaches with U-Turn Prohibited		0					
Pedestrian Volume by Activity Level		Low (50)					
User Specified Sum of all daily pedestrian crossing volumes		50					
Max # of Lanes Crossed by Pedestrians		5					
Number of Bus Stops within 1000' of Intersection		0					
Schools within 1000' of intersection		No					
Number of Alcohol Sales Establishments within 1000' of Intersection		0					

SPICE Stage 1 Results – Northlake as Major Road

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

Compute Results

Project Information

Project Name:	FDOT District 4 ICE Training	**Intersection Type**	At-Grade Intersections
Intersection:	SR 710 at Northlake Boulevard	**Opening Year**	2020
Agency:	FDOT	**Design Year**	2040
Project Reference:	XXXXX.XX	**Facility Type**	On Urban and Suburban Arterial
City:	West Palm Beach	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	7/1/2019	**# 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	Rank	AADT Within Prediction Range?	Source of Prediction
Traffic Signal	Total	16.17	20.03	379.81	4	Yes	Calibrated SPF
	Fatal & Injury	5.66	7.08	133.59			
Displaced Left Turn (DLT)	Total	14.23	17.63	334.23	3	N/A	CMF
	Fatal & Injury	4.98	6.23	117.56			
Median U-Turn (MUT)	Total	13.74	17.03	322.84	1	N/A	CMF
	Fatal & Injury	3.96	4.95	93.51			
Signalized RCUT	Total	34.09	44.78	826.68	5	No	Uncalibrated SPF
	Fatal & Injury	8.89	12.06	219.39			
Jughandle	Total	11.96	14.82	281.06	2	N/A	CMF
	Fatal & Injury	4.19	5.24	98.86			

SPICE Stage 1 Results – SR 710 as Major Road

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

Compute Results

Project Information

Project Name:	FDOT District 4 ICE Training	**Intersection Type**	At-Grade Intersections
Intersection:	SR 710 at Northlake Boulevard	**Opening Year**	2020
Agency:	FDOT	**Design Year**	2040
Project Reference:	XXXXX.XX	**Facility Type**	On Urban and Suburban Arterial
City:	West Palm Beach	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	7/1/2019	**# of Major Street Lanes (both directions)**	5 or fewer
Analyst:	KAI	**Major Street Approach Speed**	Less than 55 mph

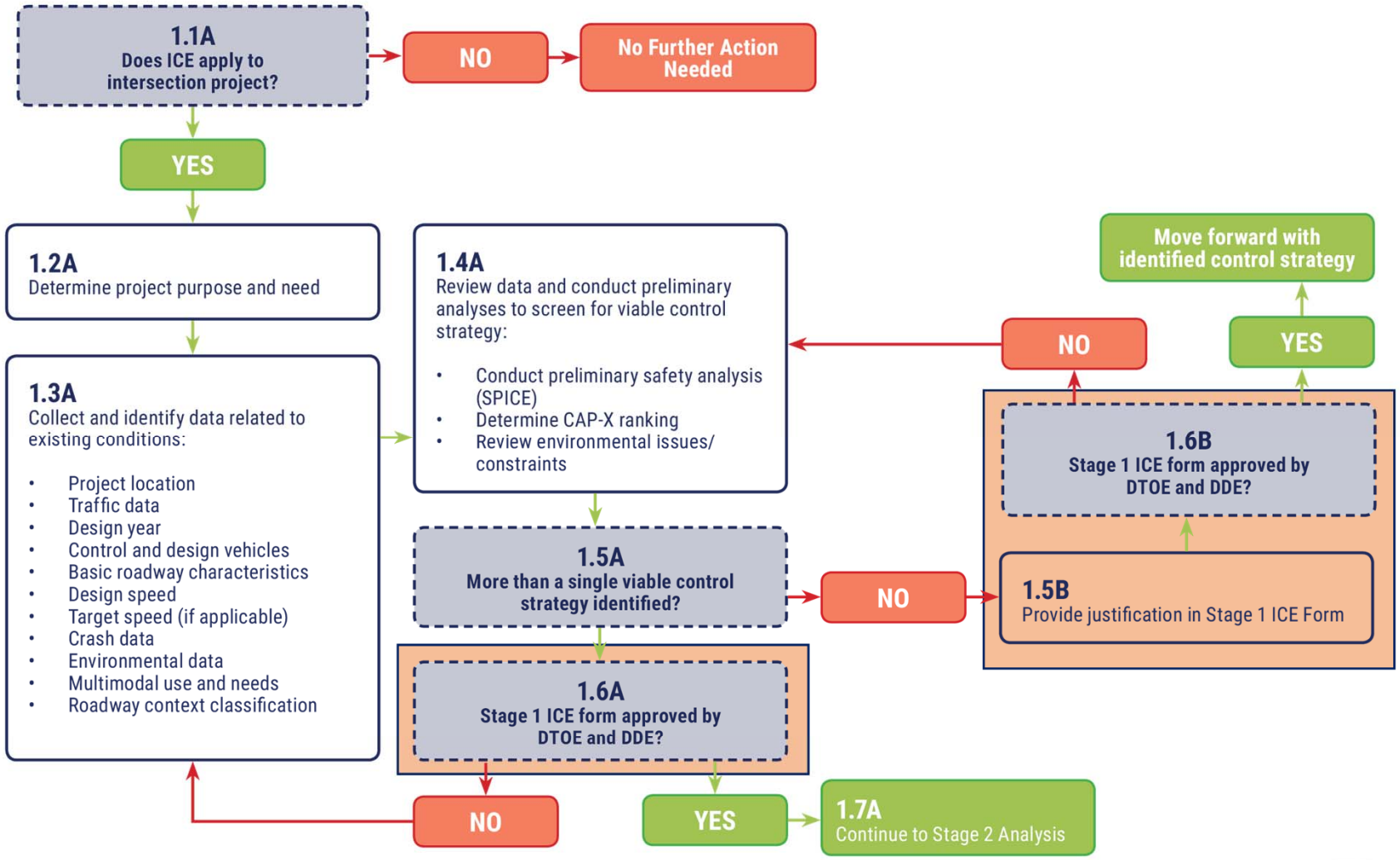
Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	Rank	AADT Within Prediction Range?	Source of Prediction
Traffic Signal	Total	11.72	15.69	287.39	4	No	Calibrated SPF
	Fatal & Injury	3.97	5.40	98.14			
Displaced Left Turn (DLT)	Total	10.31	13.81	252.91	3	N/A	CMF
	Fatal & Injury	3.49	4.75	86.37			
Median U-Turn (MUT)	Total	9.96	13.34	244.28	1	N/A	CMF
	Fatal & Injury	2.78	3.78	68.70			
Signalized RCUT	Total	26.08	36.58	655.97	5	No	Uncalibrated SPF
	Fatal & Injury	7.34	10.44	186.08			
Jughandle	Total	8.67	11.61	212.67	2	N/A	CMF
	Fatal & Injury	2.93	4.00	72.63			

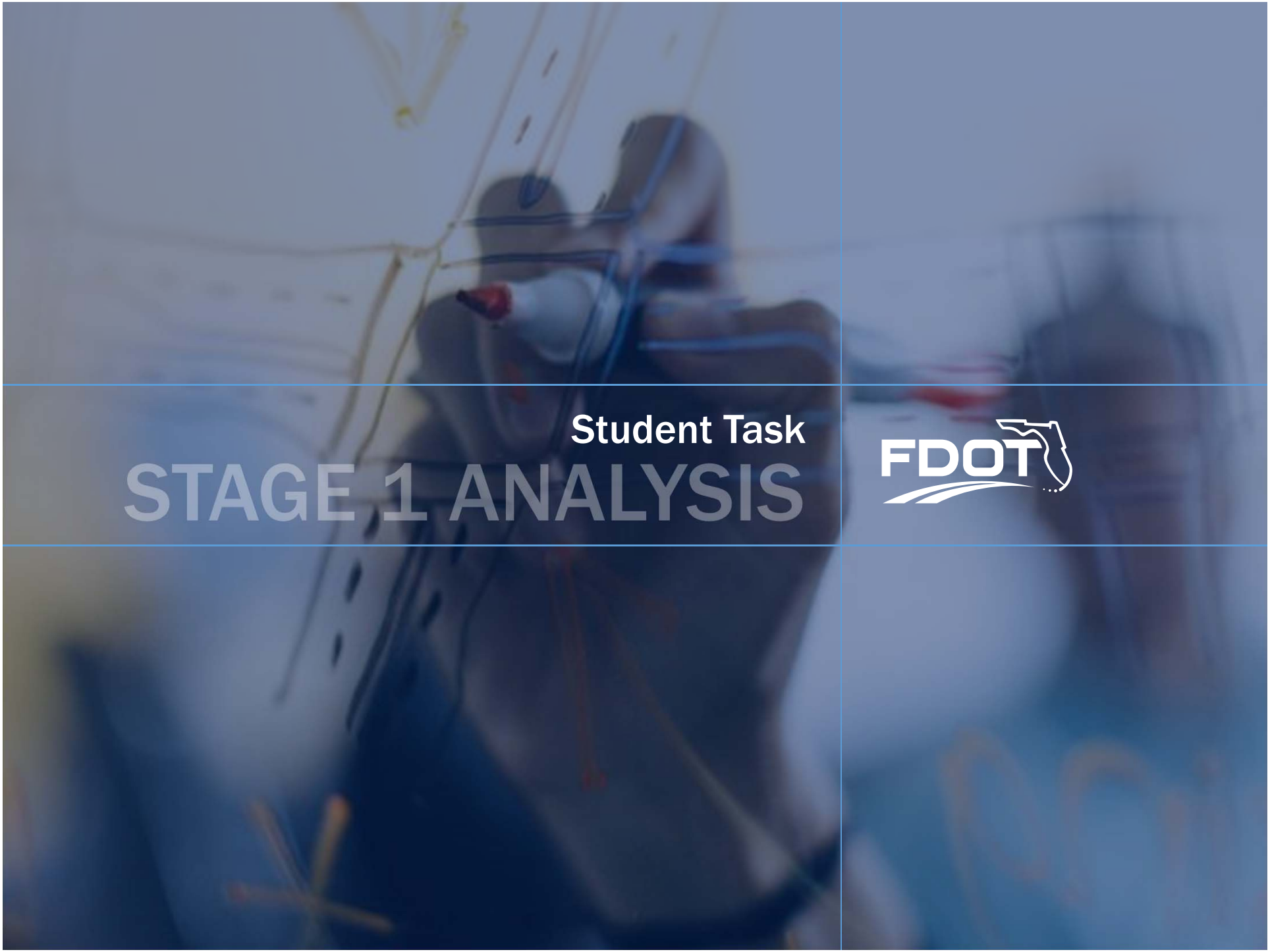
STAGE 1 FORM

FDOT

ICE STAGE 1 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 2; Page 10



Student Task

STAGE 1 ANALYSIS

- Student Task
  - Select Control Strategies in the *ICE Form* to be advanced from *Stage 1:* Screening to *Stage 2:* Preliminary Control Strategy Assessment

SR 710 / NORTHLAKE BLVD. – STAGE 1 RESULTS

Existing control type must move on to Stage 2 as the future no-build condition

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.						
Control Strategy	CAP-X Outputs			SPICE Ranking	Strategy to Be Advanced?	Justification
	V/C Ratio		Multimodal Score			
	Weekday AM Peak	Weekday PM Peak				
Two-Way Stop-Controlled	N/A	N/A	N/A	N/A	No	Existing signalized intersection.
All-Way Stop-Controlled	N/A	N/A	N/A	N/A	No	Existing signalized intersection.
Signalized Control	1.20	1.29	4.8	4	Yes	The existing signal will move forward as the future no-build.
Roundabout	N/A	N/A	N/A	N/A	No	Both the major and minor roadways have 2-3 lane approaches.
Median U-Turn	1.09 (E-W Road) 1.31 (N-S Road)	0.94 (E-W Road) 1.51 (N-S Road)	6.3	1	No	A median U-turn would re-route the 1,000+ vehicle NBL movement, which is not desirable.
RCUT (Signalized)	1.48 (E-W Road) 1.42 (N-S Road)	1.22 (E-W Road) 1.79 (N-S Road)	6.3	5	No	An signalized RCUT is not anticipated to have adequate capacity to handle existing traffic volumes.
RCUT (Unsignalized)	N/A	N/A	N/A	N/A	No	Existing signalized intersection.

SR 710 / NORTHLAKE BLVD. – STAGE 1 RESULTS

Existing control type must move on to Stage 2 as the future no-build condition

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.						
Control Strategy	CAP-X Outputs			SPICE Ranking	Strategy to Be Advanced?	Justification
	V/C Ratio		Multimodal Score			
	Weekday AM Peak	Weekday PM Peak				
Jughandle				2	No	An existing jughandle is present in the SE corner but does not provide much operational benefit.
Displaced Left-Turn	0.98 (Both E-W & N-S Road)	0.85 (Both E-W & N-S Road)	4.8	3	No	Multiple left turn movements are less than 75 vehicles in either peak hour so this treatment wouldn't be as effective for the cost.
Continuous Green Tee	N/A	N/A	N/A	N/A	No	The intersection currently has 4 approaches.
Quadrant Roadway	1.09 (SE)	1.06 (SE)	4.4		Yes	Developing a quadrant roadway in the S-E quadrant holds the potential to alleviate the operational issues experienced at the
Partial Median U-Turn	1.05 (E-W Road) 1.22 (N-S Road)	1.11 (E-W Road) 1.55 (N-S Road)	N/A	1	No	The PMUT is anticipated to operate with a worse V/C than either the QR or the PDLT.
Partial DLT	1.05 (E-W Road) 1.01 (N-S Road)	1.07 (E-W Road) 0.85 (N-S Road)	N/A	3	Yes	A PDLT for the N-S roadway would provide operational benefits for the 1,000+ vehicle NBL movement.

Resolution – Must be signed by DTOE and DDE

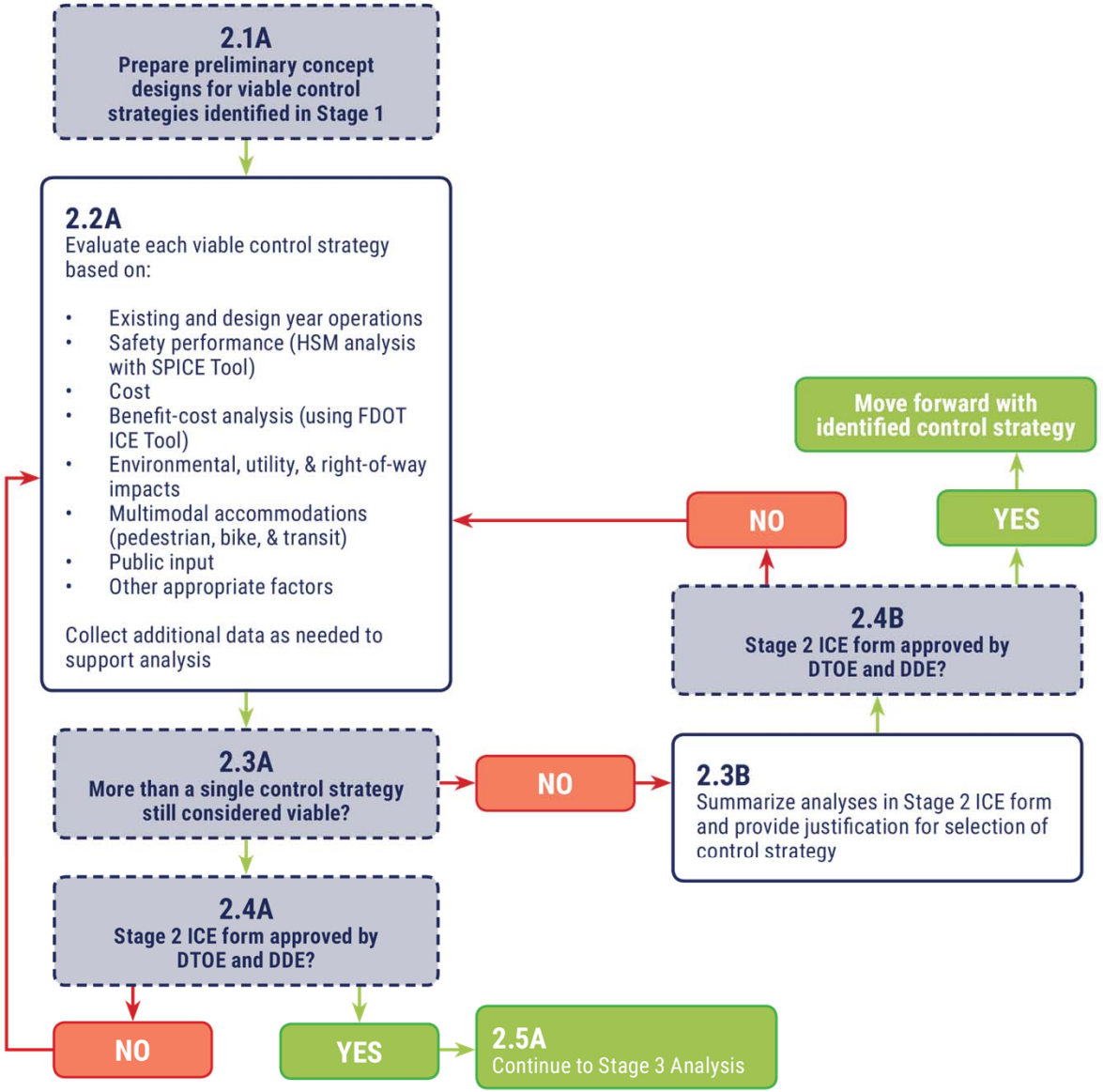
Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination	Multiple Viable Alternatives Identified: Continue to Stage 2				
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	

STAGE 2

ANALYSIS

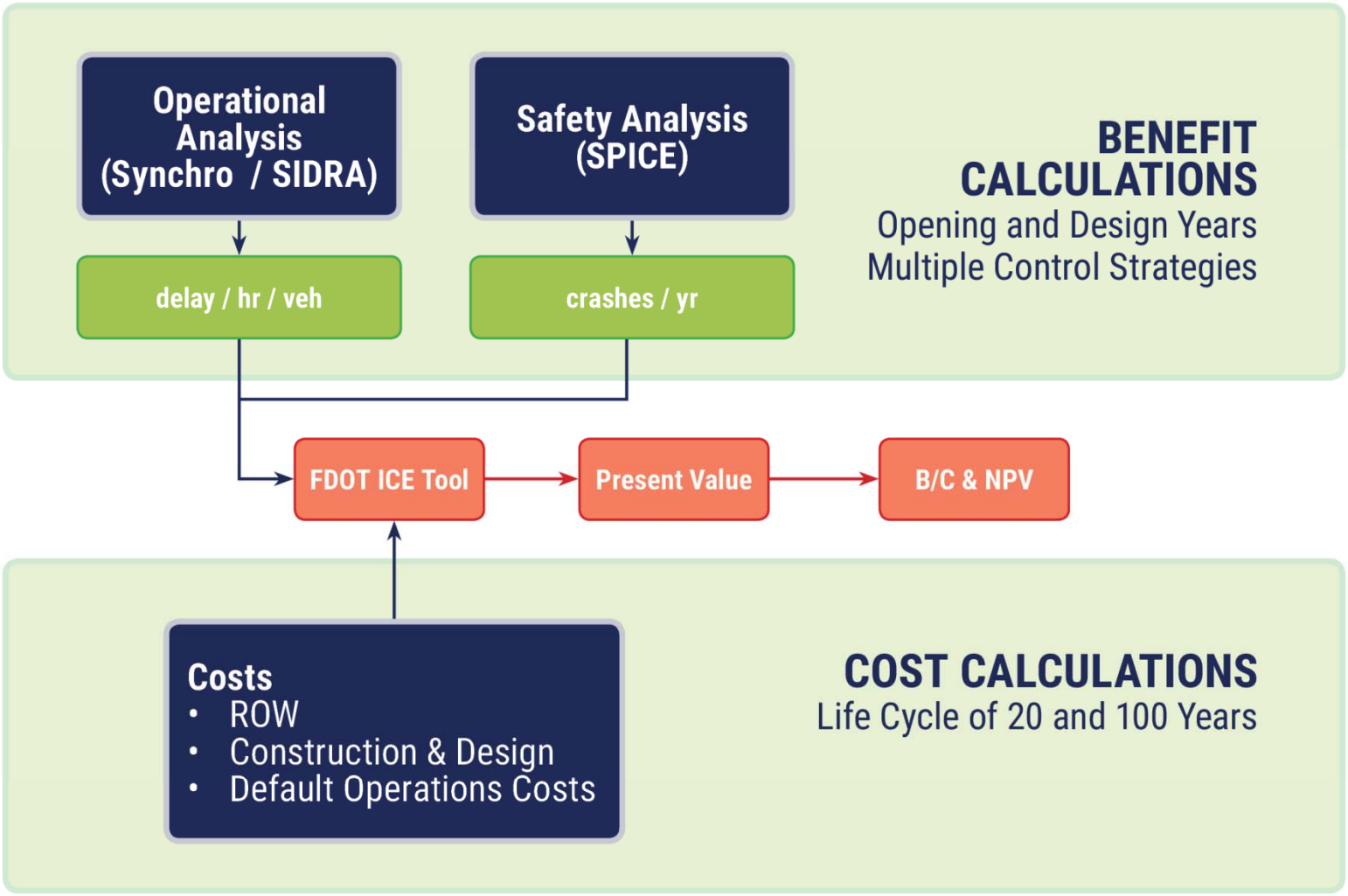
FDOT

ICE STAGE 2 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

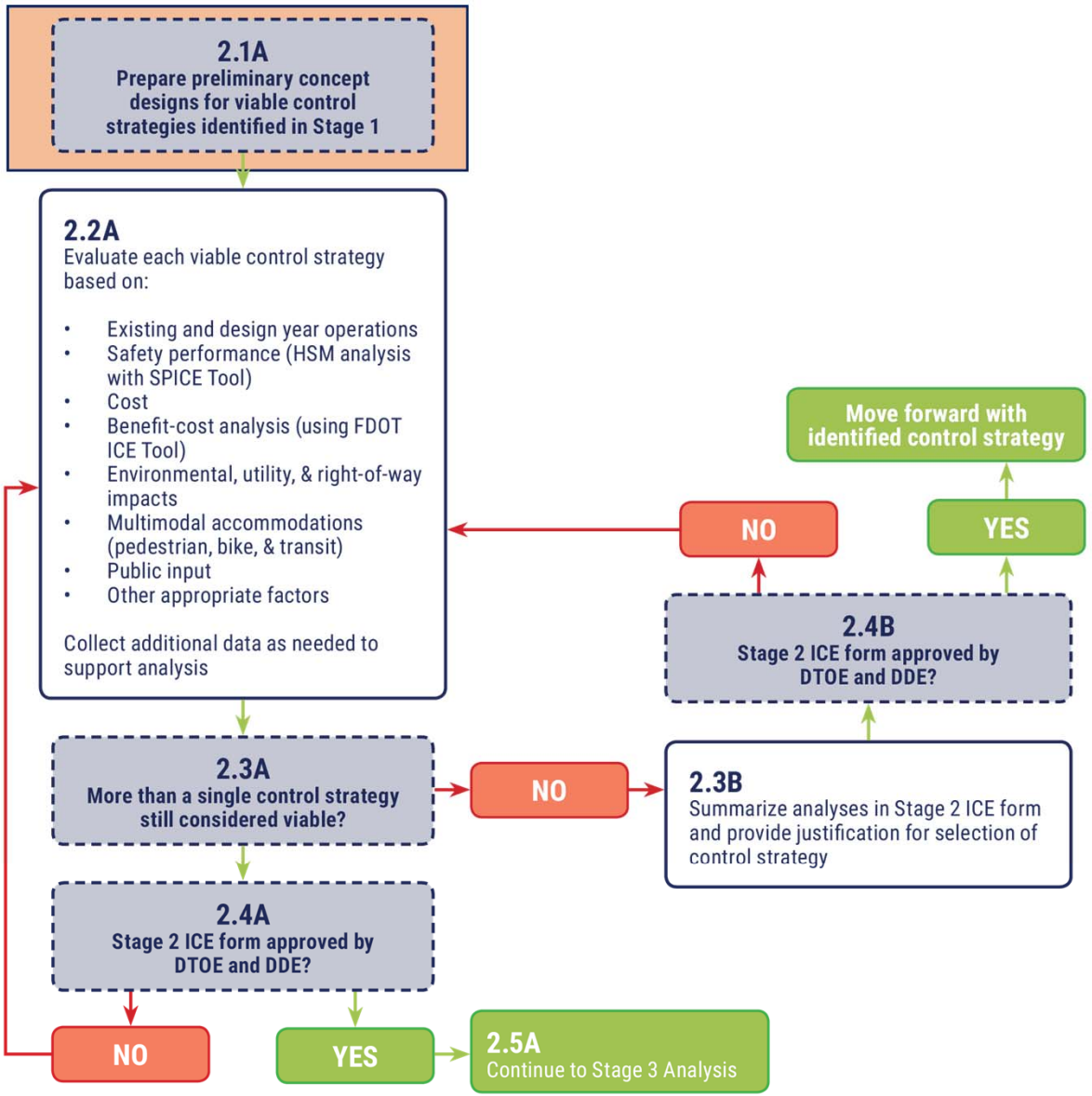
STAGE 2 OVERVIEW



STAGE 2

CONCEPTS

ICE STAGE 2 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT

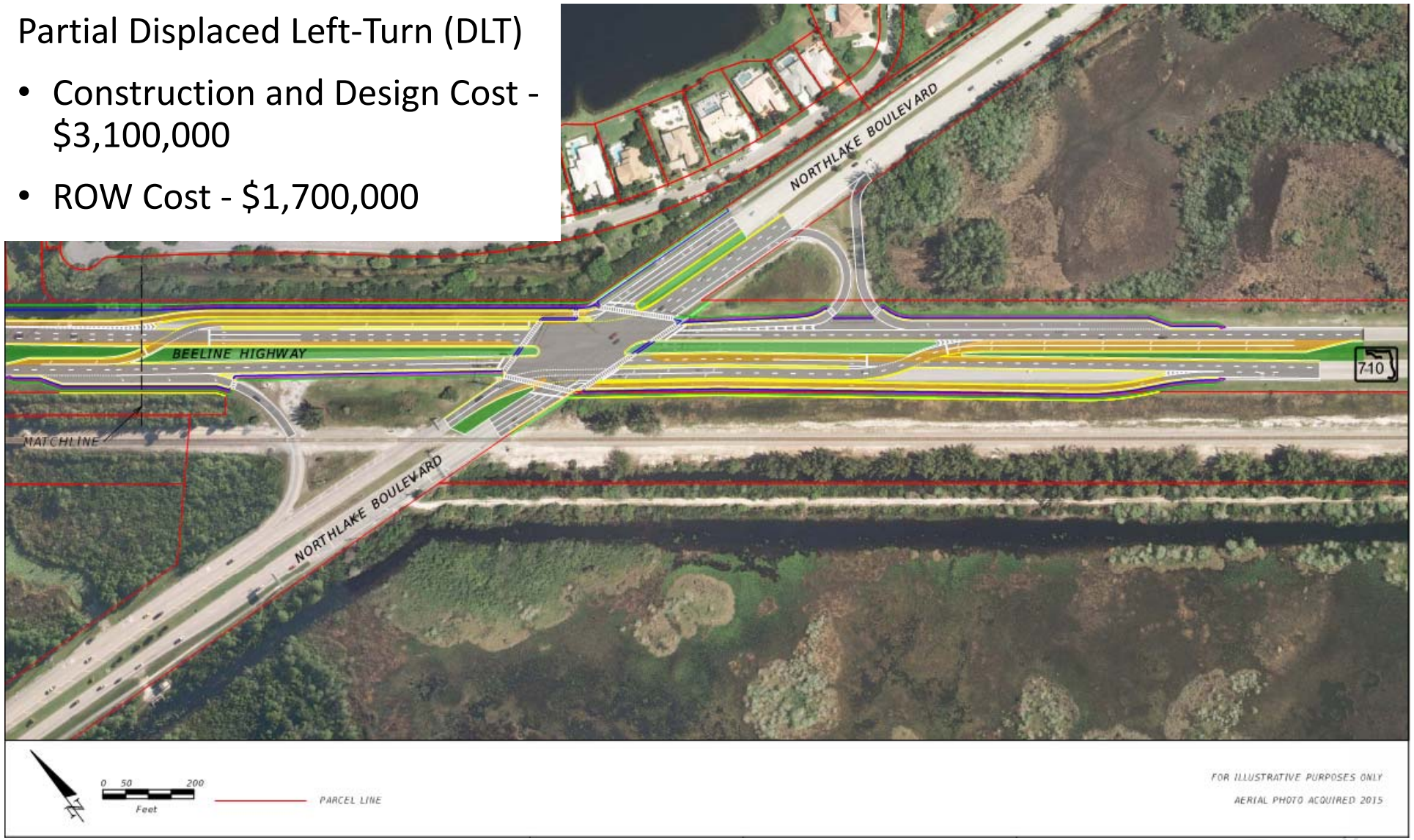
Traffic Signal – Existing

- Construction and Design Cost - $0
- ROW Cost - $0

SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT

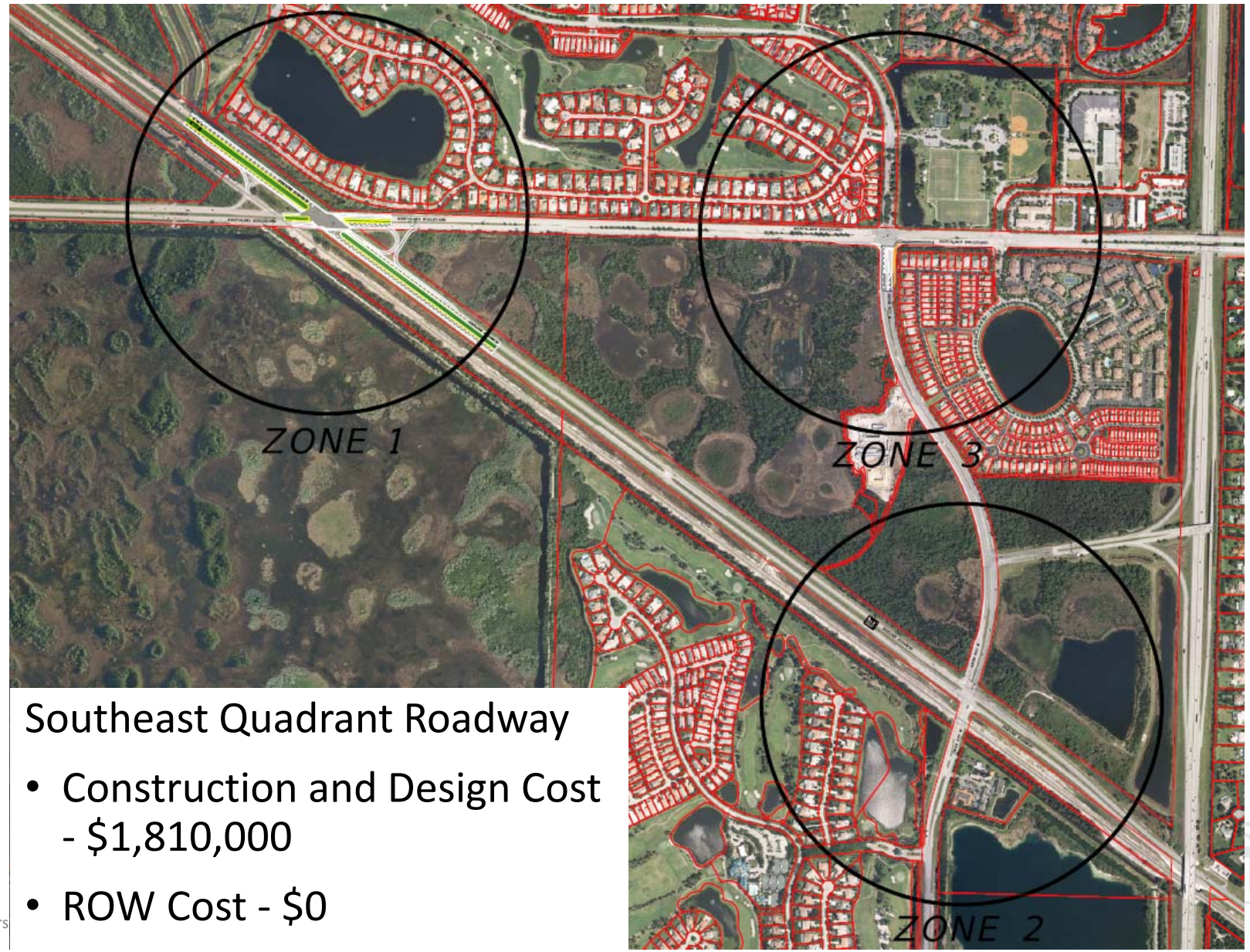
Partial Displaced Left-Turn (DLT)

- Construction and Design Cost - $3,100,000
- ROW Cost - $1,700,000



SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT

SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT



Southeast Quadrant Roadway

- Construction and Design Cost - $1,810,000
- ROW Cost - $0

SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT

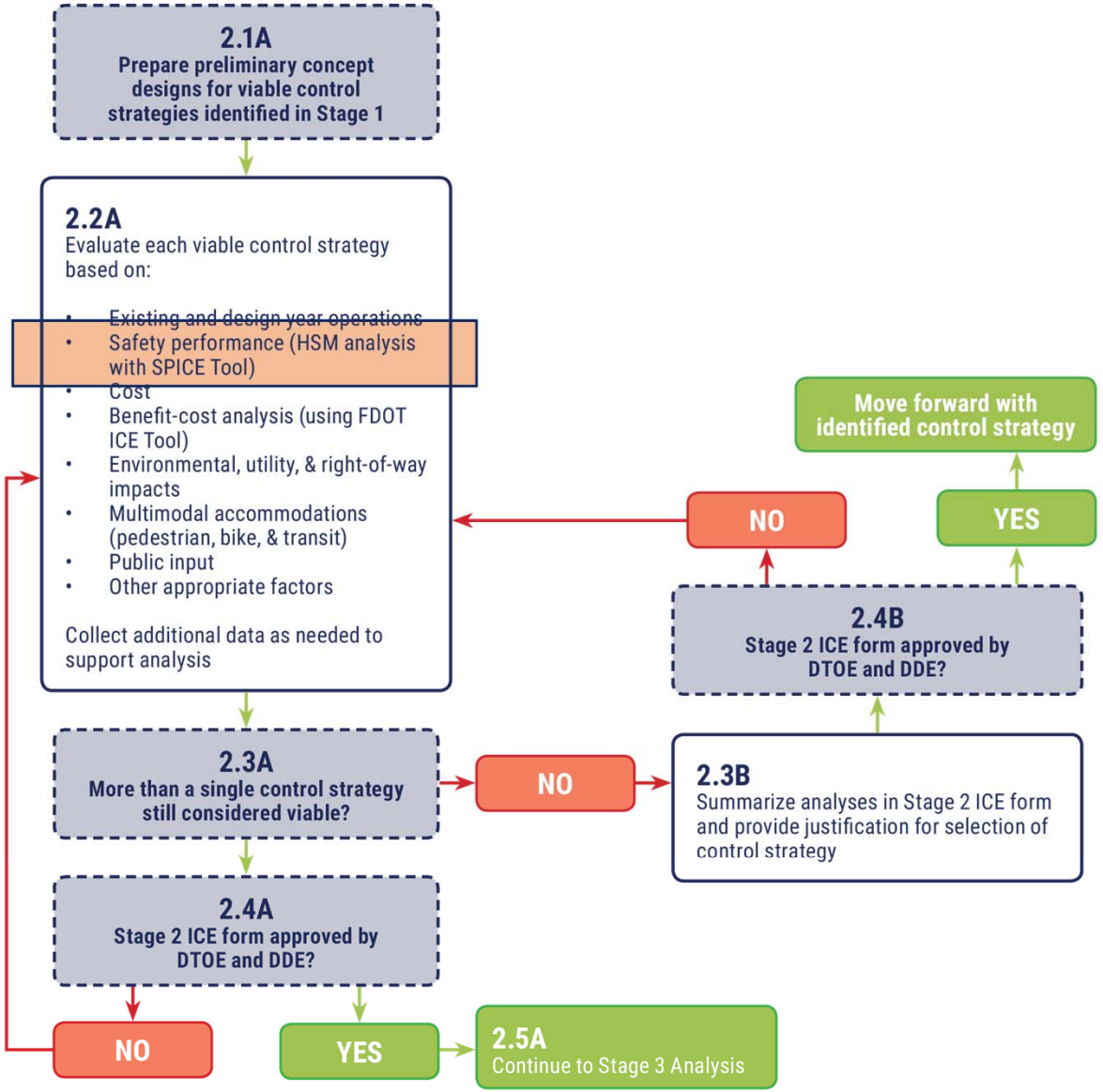
SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT

Quad SE – Zone 2

SR 710 / NORTHLAKE BLVD. – STAGE 2 CONCEPT DEVELOPMENT


STAGE 2
SPICE
FDOT

ICE STAGE 2 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

Remove control types that were not advanced in Stage 1

Control Strategy	Include	Base Intersection		
Traffic Signal	Yes	--		
Traffic Signal (Alternative Configuration)	No	--		
Minor Road Stop	No	--	Opening Year AADT Outside c	Design Year AADT Outside of SPF Development Rang
All Way Stop	No	--		
1-Lane Roundabout	No	--	Opening Year AADT Outside c	Design Year AADT Outside of SPF Development Rang
2-Lane Roundabout	No	--	Opening Year AADT Outside c	Design Year AADT Outside of SPF Development Rang
Displaced Left Turn (DLT)	Yes	Traffic Signal		
Median U-Turn (MUT)	No	Traffic Signal		
Signalized Restricted Crossing U-Turn (RCUT)	No	--	Opening Year AADT Outside c	Design Year AADT Outside of SPF Development Rang
Unsignalized Restricted Crossing U-Turn (RCUT)	No	--	Opening Year AADT Outside c	Design Year AADT Outside of SPF Development Rang
Continuous Green-T Intersection	No	Traffic Signal		
Jughandle	No	Traffic Signal		
Other 1	No	Traffic Signal	*Please Select	
Other 2	No	Minor Road Stop	*Please Select	

Update HSM inputs from the base condition for site specific conditions

		Control Strategy		
Input		Traffic Signal	Displaced Left Turn (DLT)	
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis				
Reset Planning Inputs to Defaults	Part C CMFS Optional For Stage 1 ICE, Required for Stage 2 ICE			
Skew Angle	A yellow cell indicates the value may be used in the SPF computation	N/A	CMF - No Inputs Required	All yellow cells will be automatically populated by a macro. If users want to do a planning-level analysis, they can leave the automatic inputs as-is
Lighting Present		Yes		
# of Approaches Permissive LT Signal Phasing		0		
# of Approaches Perm/Prot LT Signal Phasing		0		
# of Approaches Protected LT Signal Phasing		3		
Number of Approaches with Right-Turn-on-Red Prohibited		0		
Red Light Cameras Present		No		
Number of Major Street Through Lanes		0		
Number of Minor Street Lanes		0		
# of Major St Approaches w/ Right-Turn Channelization		0		
Number of Approaches with U-Turn Prohibited		0		
Pedestrian Volume by Activity Level		Low (50)		
User Specified Sum of all daily pedestrian crossing volumes		50		
Max # of Lanes Crossed by Pedestrians		8		
Number of Bus Stops within 1000' of Intersection		0		
Schools within 1000' of intersection		No		
Number of Alcohol Sales Establishments within 1000' of Intersection		0		

Obtain 5 years of crash data from FDOT CARS and Signal Four Analytics Database

Is historical crash data available?	Yes			
Number of years available:	5	(Up to 10)	First Year Data is available:	2013
Historical Intx Type:	4SG			

Historical Crash Counts		Year										
		2013	2014	2015	2016	2017	--	--	--	--	--	Total
Combined	Total											
	Fatal/Injury											
	PDO											
Single-Vehicle	Total	0	2	4	4	9	--	--	--	--	--	19
	Fatal/Injury	0	0	3	1	4						8
	PDO	0	2	1	3	5						11
Multiple-Vehicle	Total	38	30	34	35	71	--	--	--	--	--	208
	Fatal/Injury	7	9	7	5	16						44
	PDO	31	21	27	30	55						164
Veh-Ped	Fatal/Injury	0	0	0	0	1						1
Veh-Bike	Fatal/Injury	0	0	1	0	0						1
Total	All	38	32	39	39	81	--	--	--	--	--	229

SPICE Stage 2 Results

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

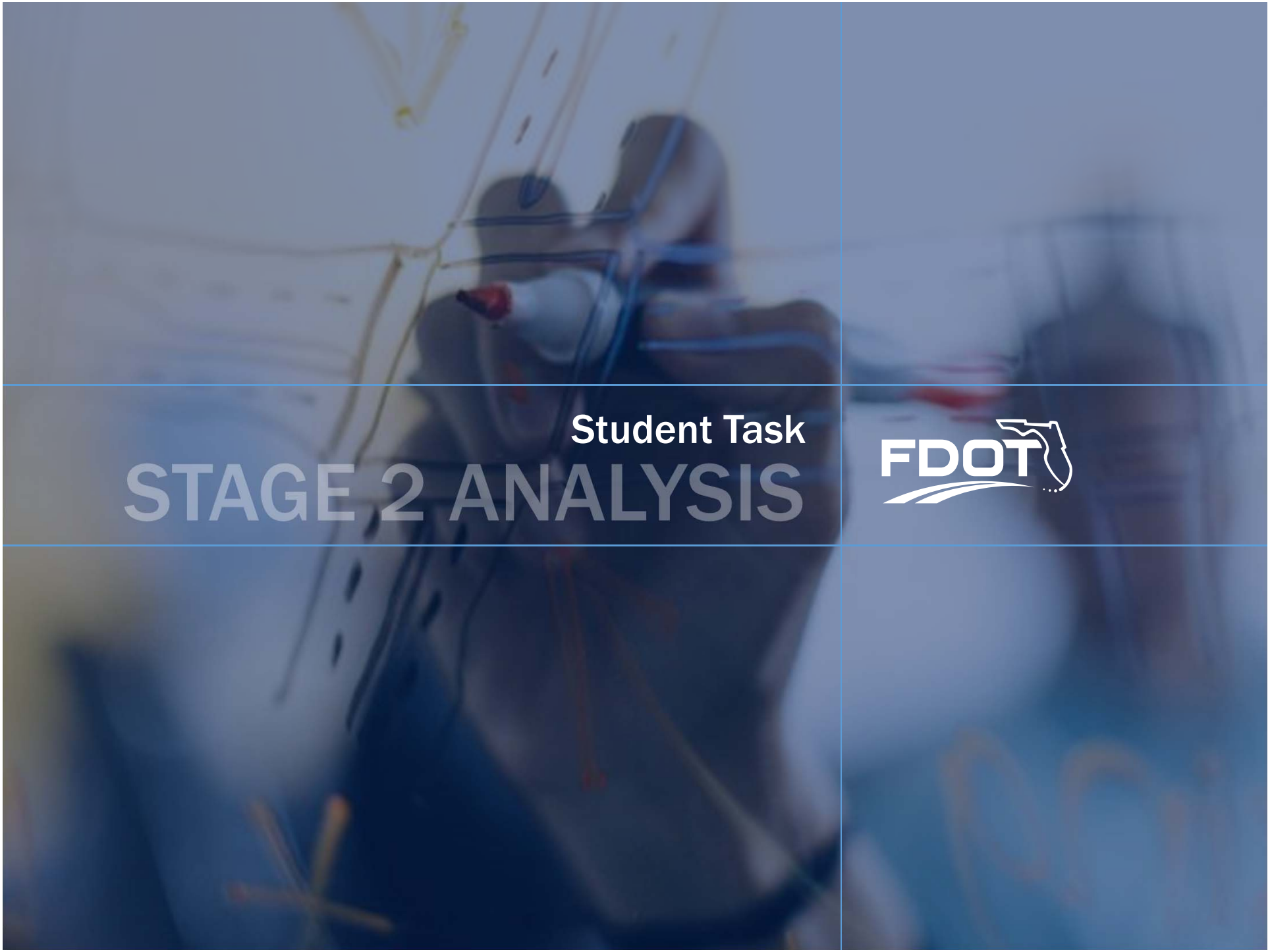
Compute Results

Project Information

Project Name:	FDOT District 4 ICE Training	**Intersection Type**	At-Grade Intersections
Intersection:	SR 710 at Northlake Boulevard	**Opening Year**	2020
Agency:	FDOT	**Design Year**	2040
Project Reference:	XXXXX.XX	**Facility Type**	On Urban and Suburban Arterial
City:	West Palm Beach	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	7/1/2019	**# 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	Rank	AADT Within Prediction Range?	Source of Prediction
Traffic Signal	Total	38.24	47.44	899.03	2	Yes	Calibrated SPF w/ EB
	Fatal & Injury	7.40	9.27	174.85			
Displaced Left Turn (DLT)	Total	33.65	41.74	791.15	1	N/A	CMF
	Fatal & Injury	6.51	8.16	153.87			



Student Task

STAGE 2 ANALYSIS

FDOT

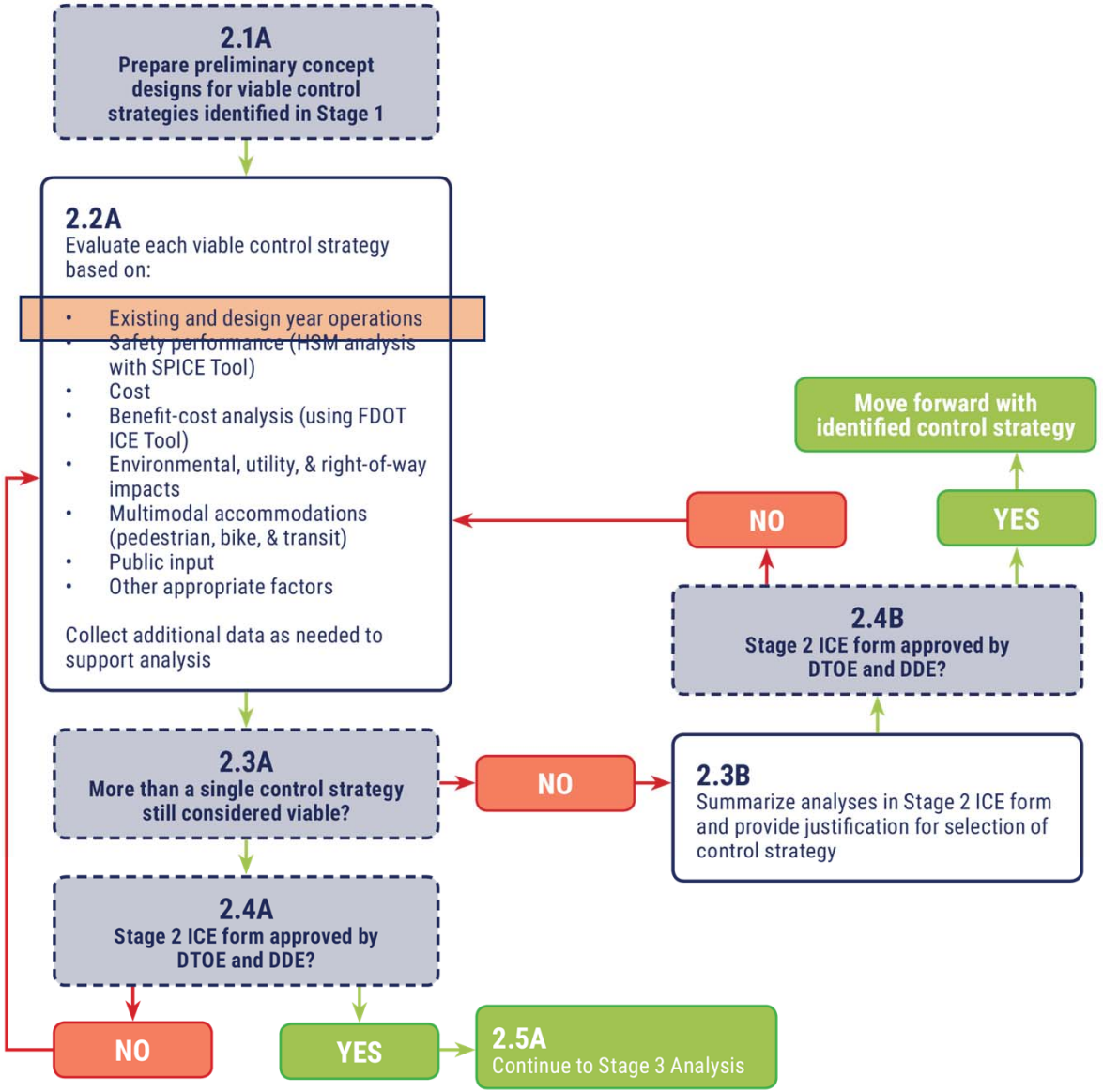
- Student Task
  - Perform “Save As” on Stage 1 SPICE
  - Complete Stage 2 SPICE analysis –
    - Update control types
    - Update HSM base conditions
    - Update crash data

STAGE 2

OPERATIONAL ANALYSIS

FDOT

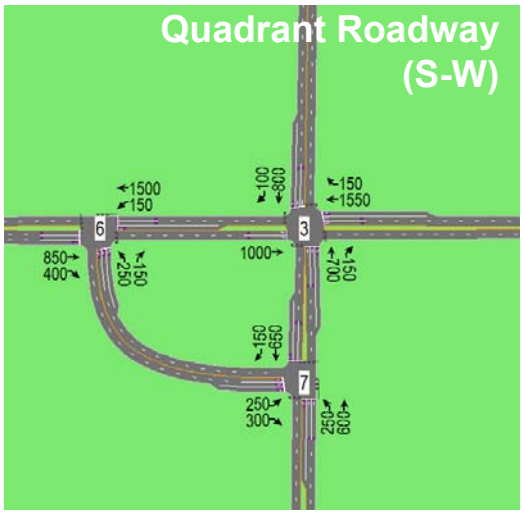
ICE STAGE 2 PROCESS

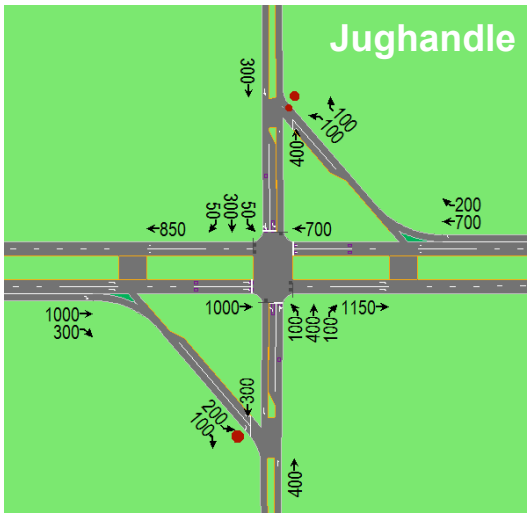


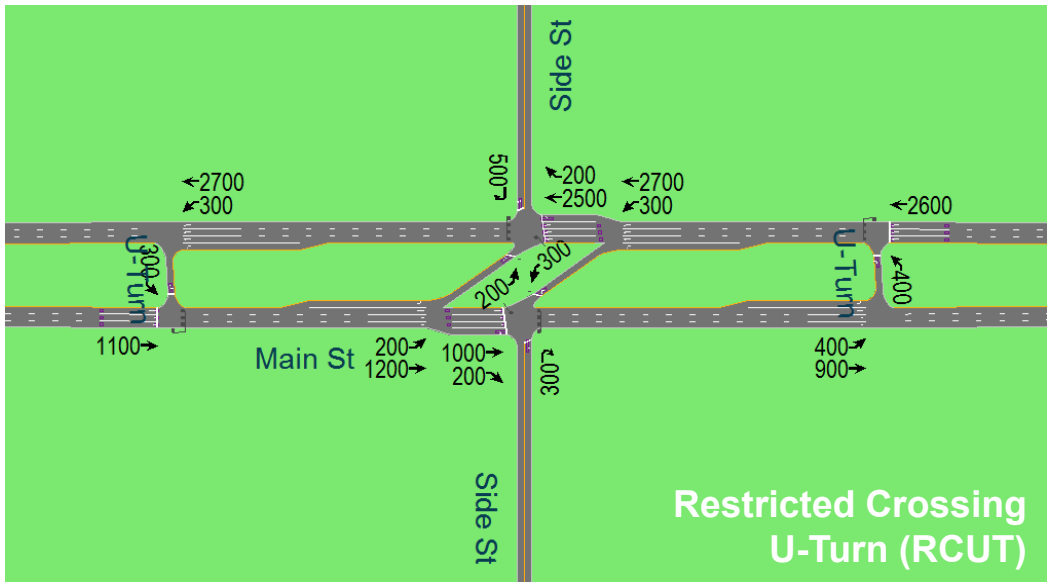
Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

2.2 A – SYNCHRO TEMPLATES OVERVIEW

- Median U-Turn (MUT)
- Restricted Crossing U-Turn (RCUT)
  - Unsignalized
  - Signalized
  - Expanded to corridors
- Jug-handle
- Displaced Left Turn (DLT)
- Continuous Green T
- Quadrant Roadway
- Diverging Diamond Interchange (DDI)







- Platoon Ratio
  - Describes the quality of signal progression for the corresponding movement group
  - Definition – HCM 6th Edition Equation 19-5

Platoon Ratio	Arrival Type	Progression Quality
0.33	1	Very poor
0.67	2	Unfavorable
1.00	3	Random arrivals
1.33	4	Favorable
1.67	5	Highly favorable
2.00	6	Exceptionally favorable

Source: HCM 6th Edition Exhibit 19-13 Relationship Between Arrival Type and Progression Quality

2.2 A – PLATOON RATIO APPLICATION

- Evaluated progression between intersection types
- Assumptions for Theoretical Analysis

	Volumes	Roadway Configuration	Posted speed limit	Saturation flow rate	Cycle length	
					Signalized and DLT	MUT and RCUT
Major road*	500 vehicles peak direction/hr/ln	4 lanes divided w/LT and RT lanes	45 mph	1,950 veh/h/ln	180 sec	90 sec
Minor road	25% of major street volumes		35 mph	1,950 veh/h/ln		

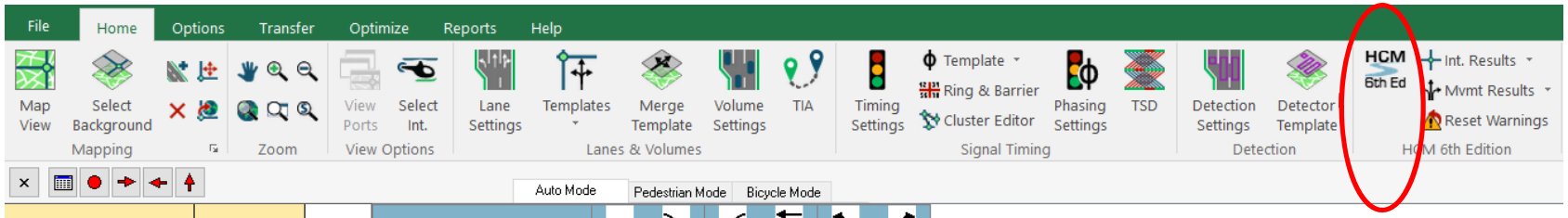
* ¼ mile major intersection spacing

- Signal timings optimized with Synchro
- VISSIM analysis for performance measures to estimate HCM platoon ratio

2.2 A – PLATOON RATIO ESTIMATES FOR CORRIDORS

Analysis Intersection	Upstream Intersection	Platoon Ratio
Standard Signal	Standard Signal	1.38
	Roundabout	1.00
	RCUT	1.25
	MUT	1.21
	DLT	1.15
RCUT	Standard Signal	1.24
	Roundabout	1.00
	RCUT	1.46
	MUT	1.43
	DLT	1.21
MUT	Standard Signal	1.25
	Roundabout	1.00
	RCUT	1.48
	MUT	1.52
	DLT	1.15
DLT	Standard Signal	1.15
	Roundabout	0.99
	RCUT	1.20
	MUT	1.20
	DLT	1.33

2.2 A – PLATOON RATIO APPLICATION



HCM 6th INTERSECTION	
Node #	17
Description	
Control Type	Actd-Coord
Cycle Length (s)	90.0
Lock Timings	☐
HCM Equilibrium Cycle(s)	90.0
HCM Control Delay(s)	11.9
HCM Intersection LOS	B
Analysis Time Period (h)	0.25
Saturation Flow Rate (pc/h/ln)	—
Use Saturation Flow Rate	☐
Sneakers Per Cycle (veh)	2.0
Number of Calc.Iterations	35
Stored Passenger Car Length (ft)	25
Stored Heavy Vehicle Length (ft)	45
Probability Peds. Pushing Button	0.51
Deceleration Rate (ft/s/s)	4.00
Acceleration Rate (ft/s/s)	3.50
Distance Between Stored Cars (ft)	8.00
Queue Length Percentile	50
Left-Turn Equivalency Factor	1.05
Right-Turn Equivalency Factor	1.18
Heavy Veh Equivalency Factor	2.00
Critical Gap for Perm. Left Turn (s)	4.5
Follow-up Time Perm Excl Left(s)	2.5
Follow-up Time Perm Shrd Left(s)	4.5
Stop Threshold Speed (mph)	5.0
Critical Merge Gap (s)	3.7

HCM 6th Settings	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	0	0	0	2000	250	0
Future Volume (vph)	0	0	0	2000	250	0
Turn Type	—	—	—	—	Prot	—
Protected Phases	—	—	—	6	8	—
Permitted Phases	—	—	—			—
Lagging Phase?	—	—	—	☑	—	—
Opposing right-turn lane influen	—	—	—	—	—	—
+ Signal Timing Details						
Recall Mode	—	—	—	C-Max	Max	—
+ Adjusted Flow Rate (veh/h)				2000	250	
Adjusted No of Lanes	—	—	—	2	1	—
Pedestrian volume (p/h)	—	0	—	—	—	0
Bicycle volume (bicycles/h)	—	0	—	—	—	0
Right Turn on Red Volume (vph)	—	0	—	—	—	0
+ Ideal Satd. Flow (vphpl)	1950	1950	1950	1950	1950	1950
Work zone on approach?	☐	—	—	☐	☐	—
Total Approach Width	—	—	—	—	—	—
Lanes open during work zone	—	—	—	—	—	—
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
HCM Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
Initial Queue (veh)	—	—	—	0	0	—
Include Unsignalized Delay?	—	—	—	—	—	—
Unsig. Movement Delay (s/veh)	—	—	—	—	—	—
Right Turn Channelized	—	None	—	None	—	None
HCM 6th Capacity (veh/h)	—	—	—	2533	0	—
HCM Volume/Capacity	—	—	—	0.790	0.000	—
HCM Lane Group Delay(s/veh)	—	—	—	11.9	0.0	—
HCM Lane Group LOS	—	—	—	B	A	—
HCM Approach Delay (s/veh)	—	—	—	11.9	0.0	—
HCM Approach LOS	N/A	—	—	B	A	—

2.2 A – PLATOON RATIO APPLICATION: RCUT W/UPSTREAM RCUT

HCM 6th Settings	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	0	0	0	2000	250	0
Future Volume (vph)	0	0	0	2000	250	0
Turn Type	—	—	—	—	Prot	—
Protected Phases	—	—	—	6	8	—
Permitted Phases	—	—	—			—
Lagging Phase?	—	—	—	☑	—	—
Opposing right-turn lane influen	—	—	—	—	—	—
+ Signal Timing Details						
Recall Mode	—	—	—	C-Max	Max	—
+ Adjusted Flow Rate (veh/h)	—	—	—	2000	250	—
Adjusted No of Lanes	—	—	—	2	1	—
Pedestrian volume (p/h)	—	0	—	—	—	0
Bicycle volume (bicycles/h)	—	0	—	—	—	0
Right Turn on Red Volume (vph)	—	0	—	—	—	0
+ Ideal Satd. Flow (vphpl)	1950	1950	1950	1950	1950	1950
Work zone on approach?	☐	—	—	☐	☐	—
Total Approach Width	—	—	—	—	—	—
Lanes open during work zone	—	—	—	—	—	—
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
HCM Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
Initial Queue (veh)	—	—	—	0	0	—
Include Unsignalized Delay?	—	—	—	—	—	—
Unsig. Movement Delay (s/veh)	—	—	—	—	—	—
Right Turn Channelized	—	None	—	None	—	None
HCM 6th Capacity (veh/h)	—	—	—	2533	0	—
HCM Volume/Capacity	—	—	—	0.790	0.000	—
HCM Lane Group Delay(s/veh)	—	—	—	11.9	0.0	—
HCM Lane Group LOS	—	—	—	B	A	—
HCM Approach Delay (s/veh)	—	—	—	11.9	0.0	—
HCM Approach LOS	N/A	—	—	B	A	—

HCM 6th Settings	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	0	0	0	2000	250	0
Future Volume (vph)	0	0	0	2000	250	0
Turn Type	—	—	—	—	Prot	—
Protected Phases	—	—	—	6	8	—
Permitted Phases	—	—	—			—
Lagging Phase?	—	—	—	☑	—	—
Opposing right-turn lane influen	—	—	—	—	—	—
+ Signal Timing Details						
Recall Mode	—	—	—	C-Max	Max	—
+ Adjusted Flow Rate (veh/h)	—	—	—	2000	250	—
Adjusted No of Lanes	—	—	—	2	1	—
Pedestrian volume (p/h)	—	0	—	—	—	0
Bicycle volume (bicycles/h)	—	0	—	—	—	0
Right Turn on Red Volume (vph)	—	0	—	—	—	0
+ Ideal Satd. Flow (vphpl)	1950	1950	1950	1950	1950	1950
Work zone on approach?	☐	—	—	☐	☐	—
Total Approach Width	—	—	—	—	—	—
Lanes open during work zone	—	—	—	—	—	—
HCM Platoon Ratio	1.00	1.00	1.00	1.46	1.00	1.00
HCM Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
Initial Queue (veh)	—	—	—	0	0	—
Include Unsignalized Delay?	—	—	—	—	—	—
Unsig. Movement Delay (s/veh)	—	—	—	—	—	—
Right Turn Channelized	—	None	—	None	—	None
HCM 6th Capacity (veh/h)	—	—	—	2533	0	—
HCM Volume/Capacity	—	—	—	0.790	0.000	—
HCM Lane Group Delay(s/veh)	—	—	—	2.6	0.0	—
HCM Lane Group LOS	—	—	—	A	A	—
HCM Approach Delay (s/veh)	—	—	—	2.6	0.0	—
HCM Approach LOS	N/A	—	—	A	A	—

Synchro 10 Default Parameter

Note the change in delay/LOS

2.2 A – PLATOON RATIO APPLICATION

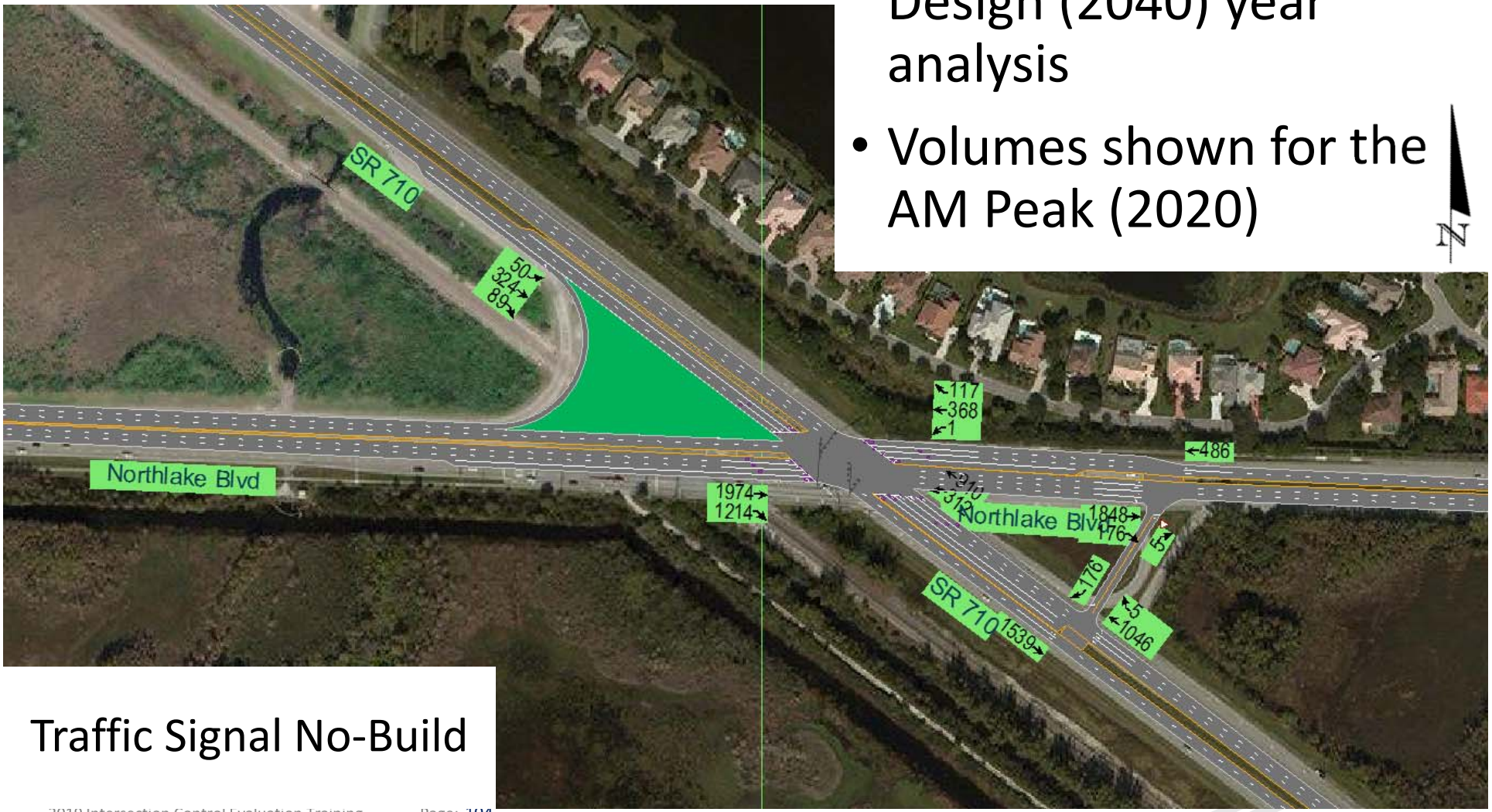
- Isolated intersection with other intersections greater than ½ mile away and no coordination
  - Platoon ratios should NOT be applied

- Intersection within a coordinated signal system i.e. Standard Signal to Standard Signal, RCUT to RCUT (Super Street), RCUT to Standard Signal, etc.
  - Platoon ratios may be applied

- Platoon ratios are applied to major road through movements only

SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2020)



Traffic Signal No-Build

SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

HCM Signalized Intersection Capacity Analysis
1: SR 710 & Northlake Blvd

D4 ICE Training
2020 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1974	1214	1	368	117	312	910	0	50	324	89
Future Volume (vph)	0	1974	1214	1	368	117	312	910	0	50	324	89
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Lane Util. Factor		0.91	1.00	1.00	0.95	1.00	0.97	0.91		1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		5119	1594	1684	3368	1507	3152	4670		1625	3250	1454
Flt Permitted		1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		5119	1594	1684	3368	1507	3152	4670		1625	3250	1454
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1974	1214	1	368	117	312	910	0	50	324	89
RTOR Reduction (vph)	0	0	258	0	0	47	0	0	0	0	0	76
Lane Group Flow (vph)	0	1974	956	1	368	70	312	910	0	50	324	13
Heavy Vehicles (%)	4%	4%	4%	10%	10%	10%	14%	14%	14%	14%	14%	14%
Turn Type		NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		67.2	67.2	1.1	74.3	74.3	14.7	26.8		5.6	17.7	17.7
Effective Green, g (s)		67.2	67.2	1.1	74.3	74.3	14.7	26.8		5.6	17.7	17.7
Actuated g/C Ratio		0.54	0.54	0.01	0.60	0.60	0.12	0.21		0.04	0.14	0.14
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		2758	858	14	2006	897	371	1003		72	461	206
v/s Ratio Prot		0.39		0.00	c0.11		c0.10	c0.19		0.03	0.10	
v/s Ratio Perm			c0.60			0.05						0.01
v/c Ratio		0.72	1.11	0.07	0.18	0.08	0.84	0.91		0.69	0.70	0.06
Uniform Delay, d1		21.6	28.8	61.3	11.4	10.7	53.9	47.7		58.7	51.0	46.3
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.95	0.95		1.00	1.00	1.00
Incremental Delay, d2		0.9	67.2	2.2	0.0	0.0	15.6	13.3		25.2	8.7	0.6
Delay (s)		22.5	95.9	63.5	11.5	10.7	66.8	58.9		83.9	59.7	46.9
Level of Service		C	F	E	B	B	E	E		F	E	D
Approach Delay (s)		50.5			11.4			60.9			59.8	
Approach LOS		D			B			E			E	

Intersection Summary				
HCM 2000 Control Delay	50.1	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.07			
Actuated Cycle Length (s)	124.7	Sum of lost time (s)	24.0	
Intersection Capacity Utilization	101.1%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

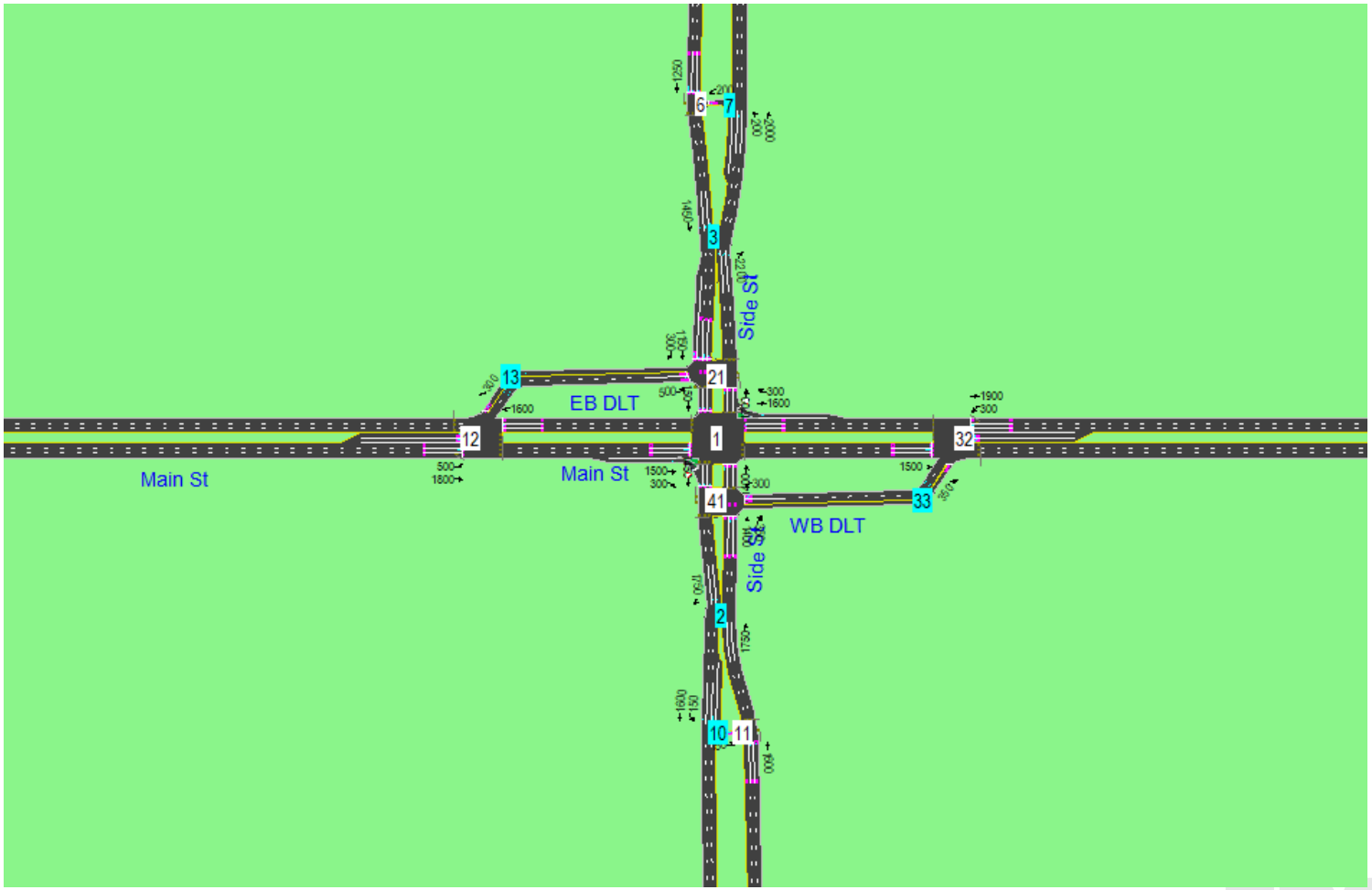
HCM Signalized Intersection Capacity Analysis
1: SR 710 & Northlake Blvd

D4 ICE Training
2020 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	763	402	6	1610	68	1053	466	0	96	549	350
Future Volume (vph)	0	763	402	6	1610	68	1053	466	0	96	549	350
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Lane Util. Factor		0.91	1.00	1.00	0.95	1.00	0.97	0.91		1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		5119	1594	1684	3368	1507	3152	4670		1625	3250	1454
Flt Permitted		1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		5119	1594	1684	3368	1507	3152	4670		1625	3250	1454
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	763	402	6	1610	68	1053	466	0	96	549	350
RTOR Reduction (vph)	0	0	242	0	0	38	0	0	0	0	0	130
Lane Group Flow (vph)	0	763	160	6	1610	30	1053	466	0	96	549	220
Heavy Vehicles (%)	4%	4%	4%	10%	10%	10%	14%	14%	14%	14%	14%	14%
Turn Type		NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		61.8	61.8	1.0	68.8	68.8	45.0	54.4		13.6	23.0	23.0
Effective Green, g (s)		61.8	61.8	1.0	68.8	68.8	45.0	54.4		13.6	23.0	23.0
Actuated g/C Ratio		0.40	0.40	0.01	0.44	0.44	0.29	0.35		0.09	0.15	0.15
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		2043	636	10	1496	669	916	1641		142	482	216
v/s Ratio Prot		0.15		0.00	c0.48		c0.33	0.10		0.06	c0.17	
v/s Ratio Perm			0.10			0.02						0.15
v/c Ratio		0.37	0.25	0.60	1.08	0.05	1.15	0.28		0.68	1.14	1.02
Uniform Delay, d1		32.8	31.1	76.7	43.0	24.4	54.9	36.2		68.5	65.9	65.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.99	1.00		1.00	1.00	1.00
Incremental Delay, d2		0.1	0.2	70.6	46.8	0.0	80.0	0.4		12.0	85.1	65.8
Delay (s)		32.9	31.3	147.3	89.8	24.4	134.2	36.8		80.5	151.0	131.7
Level of Service		C	C	F	F	C	F	D		F	F	F
Approach Delay (s)		32.4			87.3			104.3			137.4	
Approach LOS		C			F			F			F	

Intersection Summary				
HCM 2000 Control Delay	89.5	HCM 2000 Level of Service	F	
HCM 2000 Volume to Capacity ratio	1.16			
Actuated Cycle Length (s)	154.8	Sum of lost time (s)	24.0	
Intersection Capacity Utilization	108.7%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

Displaced Left-Turn Template



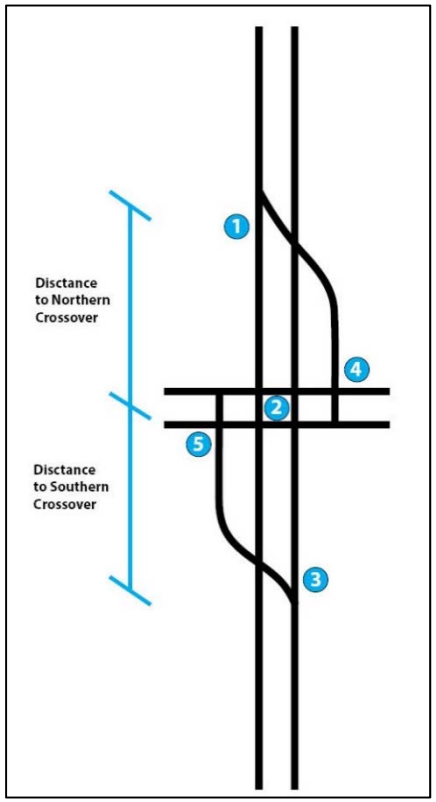
SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2020)

Partial Displaced Left-Turn Alternative

SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

Signalized PDLT Intersection Results (Opening AM Peak)



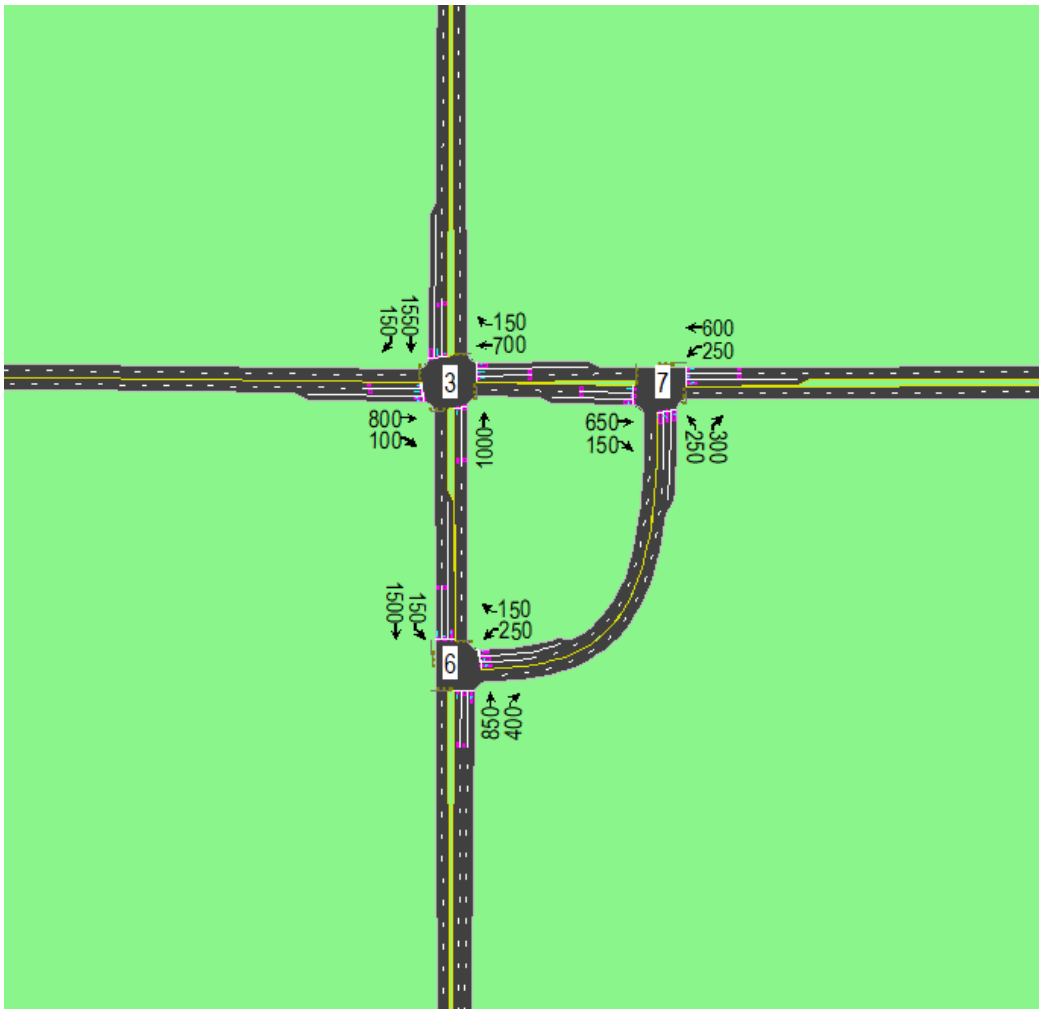
HCM Signalized Intersection Capacity Analysis — D4 ICE Training
1: SR 710 & SBRT Slip Ramp/SB DLT — 2020 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	0	0	0	1027	0	50	324	89
Future Volume (vph)	0	0	0	0	0	0	0	1027	0	50	324	89
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)								4.5		4.5	4.5	4.5
Lane Util. Factor								0.91		1.00	0.95	1.00
Frt								1.00		1.00	1.00	0.85
Flt Protected								1.00		0.95	1.00	1.00
Satd. Flow (prot)								5219		1816	3632	1625
Flt Permitted								1.00		0.00	1.00	1.00
Satd. Flow (perm)								5219		0	3632	1625
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	0	0	0	0	1027	0	50	324	89
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	50
Lane Group Flow (vph)	0	0	0	0	0	0	0	1027	0	50	324	39
Turn Type								NA		pm+pt	NA	Perm
Protected Phases								8		1	6	
Permitted Phases										6		6
Actuated Green, G (s)								16.3		19.7	19.7	19.7
Effective Green, g (s)								16.3		19.7	19.7	19.7
Actuated g/C Ratio								0.36		0.44	0.44	0.44
Clearance Time (s)								4.5		4.5	4.5	4.5
Vehicle Extension (s)								3.0		3.0	3.0	3.0
Lane Grp Cap (vph)								1890		795	1590	711
v/s Ratio Prot								c0.20		0.03	c0.09	
v/s Ratio Perm												0.02
v/c Ratio								0.54		0.06	0.20	0.05
Uniform Delay, d1								11.4		7.3	7.8	7.3
Progression Factor								1.00		1.00	1.00	1.00
Incremental Delay, d2								0.3		0.0	0.3	0.1
Delay (s)								11.7		7.3	8.1	7.4
Level of Service								B		A	A	A
Approach Delay (s)		0.0			0.0			11.7			7.9	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

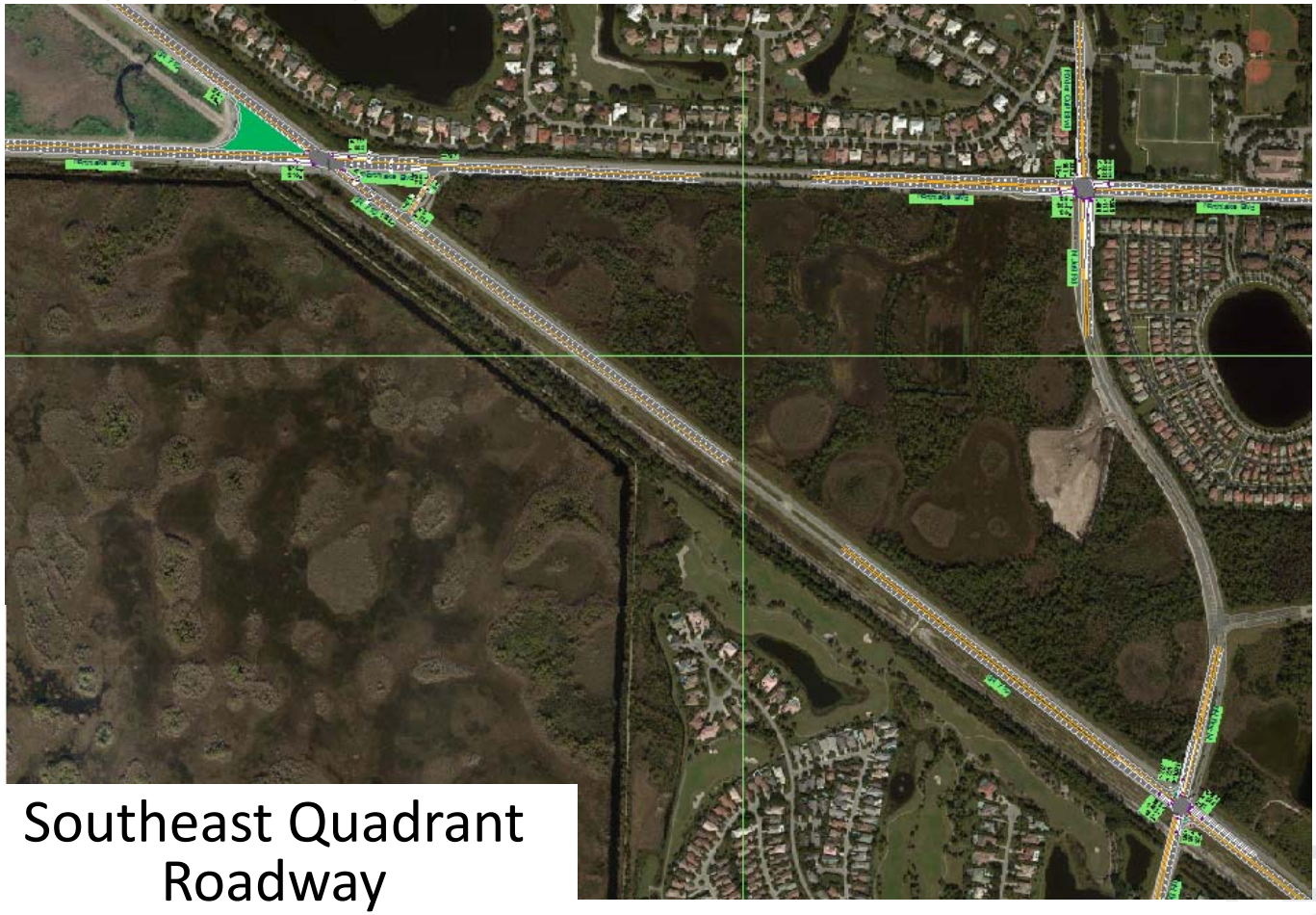
c Critical Lane Group

Quadrant Roadway Template



SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2020)



Southeast Quadrant Roadway

SR 710 / NORTHLAKE BLVD. – STAGE 2 OPERATIONAL ANALYSIS

HCM Signalized Intersection Capacity Analysis
1: SR 710 & Northlake Blvd

D4 ICE Training
2020 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑	↱		↑↑↑			↑↑	↱
Traffic Volume (vph)	0	1974	1214	0	680	117	0	910	0	0	374	89
Future Volume (vph)	0	1974	1214	0	680	117	0	910	0	0	374	89
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Lane Util. Factor		0.91	1.00		0.95	1.00		0.91			0.95	1.00
Frt		1.00	0.85		1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)		5119	1594		3368	1507		4670			3250	1454
Flt Permitted		1.00	1.00		1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)		5119	1594		3368	1507		4670			3250	1454
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1974	1214	0	680	117	0	910	0	0	374	89
RTOR Reduction (vph)	0	0	30	0	0	8	0	0	0	0	0	71
Lane Group Flow (vph)	0	1974	1184	0	680	110	0	910	0	0	374	18
Heavy Vehicles (%)	4%	4%	4%	10%	10%	10%	14%	14%	14%	14%	14%	14%
Turn Type		NA	Perm		NA	Perm		NA			NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases			4			8						6
Actuated Green, G (s)		91.0	91.0		91.0	91.0		27.0			27.0	27.0
Effective Green, g (s)		91.0	91.0		91.0	91.0		27.0			27.0	27.0
Actuated g/C Ratio		0.70	0.70		0.70	0.70		0.21			0.21	0.21
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		3583	1115		2357	1054		969			675	301
v/s Ratio Prot		0.39			0.20			c0.19			0.12	
v/s Ratio Perm			c0.74			0.07						0.01
v/c Ratio		0.55	1.06		0.29	0.10		0.94			0.55	0.06
Uniform Delay, d1		9.5	19.5		7.3	6.3		50.7			46.1	41.3
Progression Factor		1.00	1.00		1.00	1.00		0.96			1.00	1.00
Incremental Delay, d2		0.2	45.0		0.1	0.0		17.5			3.3	0.4
Delay (s)		9.7	64.5		7.4	6.4		66.3			49.4	41.7
Level of Service		A	E		A	A		E			D	D
Approach Delay (s)		30.6			7.2			66.3			47.9	
Approach LOS		C			A			E			D	

Intersection Summary				
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	1.03			
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	93.3%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

HCM Signalized Intersection Capacity Analysis
1: SR 710 & Northlake Blvd

D4 ICE Training
2020 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑	↱		↑↑↑			↑↑	↱
Traffic Volume (vph)	0	763	402	0	2663	68	0	466	0	0	645	350
Future Volume (vph)	0	763	402	0	2663	68	0	466	0	0	645	350
Ideal Flow (vphpl)	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950	1950
Total Lost time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Lane Util. Factor		0.91	1.00		0.95	1.00		0.91			0.95	1.00
Frt		1.00	0.85		1.00	0.85		1.00			1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)		5119	1594		3368	1507		4670			3250	1454
Flt Permitted		1.00	1.00		1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)		5119	1594		3368	1507		4670			3250	1454
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	763	402	0	2663	68	0	466	0	0	645	350
RTOR Reduction (vph)	0	0	7	0	0	14	0	0	0	0	0	18
Lane Group Flow (vph)	0	763	395	0	2663	54	0	466	0	0	645	332
Heavy Vehicles (%)	4%	4%	4%	10%	10%	10%	14%	14%	14%	14%	14%	14%
Turn Type		NA	Perm		NA	Perm		NA			NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases			4			8						6
Actuated Green, G (s)		100.0	100.0		100.0	100.0		28.0			28.0	28.0
Effective Green, g (s)		100.0	100.0		100.0	100.0		28.0			28.0	28.0
Actuated g/C Ratio		0.71	0.71		0.71	0.71		0.20			0.20	0.20
Clearance Time (s)		6.0	6.0		6.0	6.0		6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		3656	1138		2405	1076		934			650	290
v/s Ratio Prot		0.15			c0.79			0.10			0.20	
v/s Ratio Perm			0.25			0.04						c0.23
v/c Ratio		0.21	0.35		1.11	0.05		0.50			0.99	1.14
Uniform Delay, d1		6.7	7.6		20.0	5.9		49.8			55.9	56.0
Progression Factor		1.00	1.00		1.00	1.00		0.98			1.00	1.00
Incremental Delay, d2		0.0	0.3		55.0	0.0		1.0			33.5	97.4
Delay (s)		6.7	7.8		75.0	5.9		50.8			89.4	153.4
Level of Service		A	A		E	A		D			F	F
Approach Delay (s)		7.1			73.3			50.8			111.9	
Approach LOS		A			E			D			F	

Intersection Summary				
HCM 2000 Control Delay	64.1	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.11			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	102.8%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

How do Delay Calculations fit into ICE Process?

- TWSC – Delay is calculated in TWSC Delay tab in the **ICE Tool** using the delay for each movement from Synchro to obtain overall intersection delay

- Signalized – Overall intersection delay from Synchro is input directly into the Delay tab in the **ICE Tool**

- Roundabout – Overall intersection delay from SIDRA is input directly into the Delay tab in the **ICE Tool**

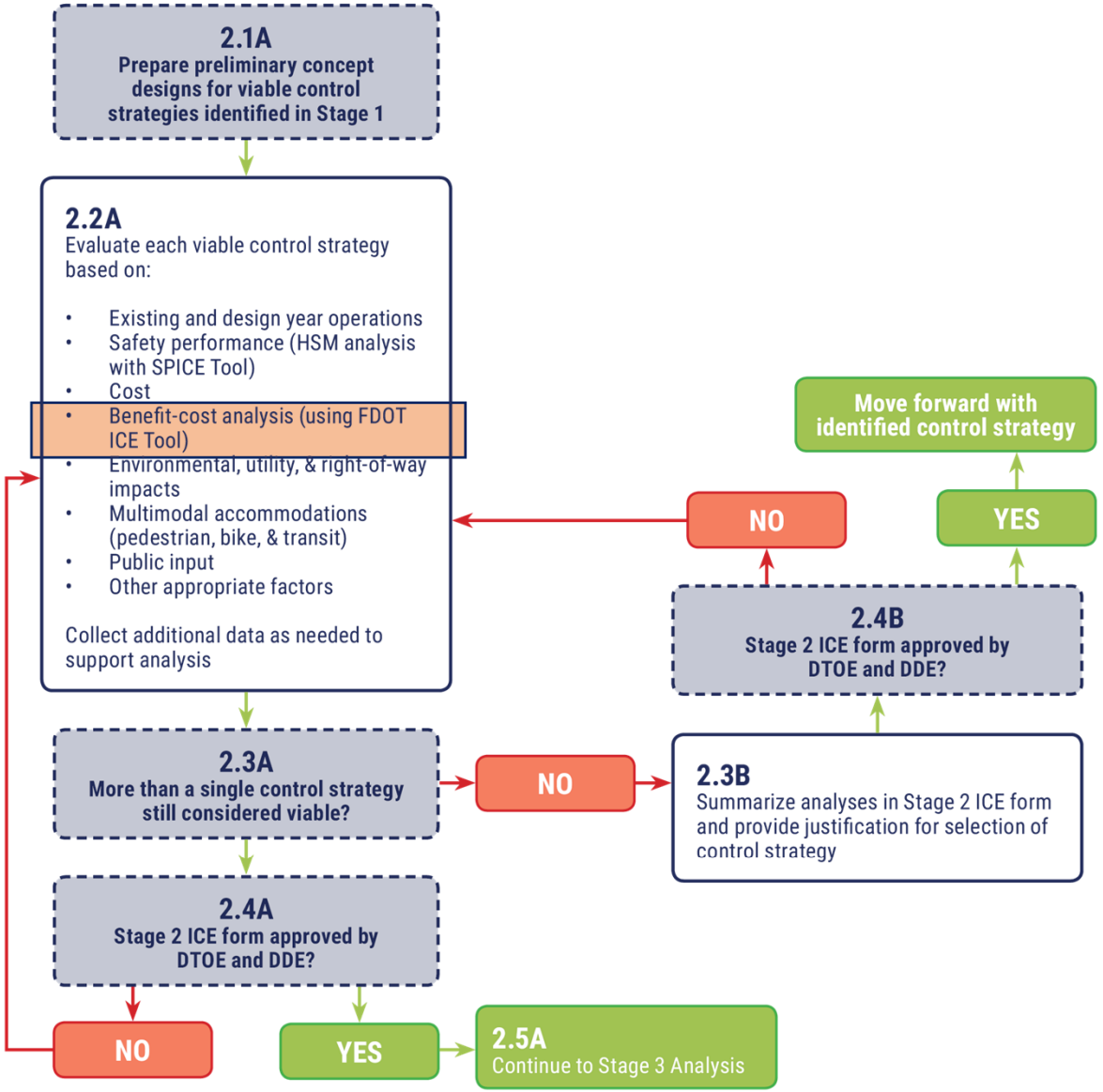
How do Delay Calculations fit into ICE Process?

- RCUT – Delay is calculated in RCUT Delay tab in the **ICE Tool** using the delay for each movement from Synchro to obtain overall intersection delay
- MUT – Delay is calculated in MUT Delay tab in the **ICE Tool** using the delay for each movement from Synchro to obtain overall intersection delay
- Full/PDLT – Delay is calculated in Full/Partial DLT Delay tab in the **ICE Tool** using the delay for each movement from Synchro to obtain overall intersection delay
- Quadrant Roadway – Delay is calculated based on left and right turn movement delays for the new intersections and the travel time within the quadrant roadway network

STAGE 2

FDOT ICE TOOL

ICE STAGE 2 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

Organizational Information

Organization Information	This sheet provides general project information and analysis type selection.
Organization Information	
Agency:	FDOT
Project Name:	District ICE Training
Project Reference:	XXXXX.XX
Intersection:	SR 710 at Northlake Blvd
City:	West Palm Beach
State:	Florida
Performing Department or Organization:	KAI
Date:	3/1/2018
Analyst:	KAI
Analysis Type	At-Grade Intersection

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

At-Grade Intersections List

This sheet is used to manage the at-grade intersections list. After entering all inputs, use the "Setup Worksheets" button at the bottom of the tab before proceeding with the ICE analysis.

	Open Year	Design Year
Operating Cycle	2020	2040
Peak Hour Start	**From**	**To**
AM peak	7:00 AM	8:00 AM
PM peak	5:00 PM	6:00 PM
Weekend peak	10:00 AM	11:00 AM

Enter peak period begin and end times:

Demand forecasts for the opening year *must* be provided below, and travel time/delay forecasts must be given in the Delay worksheet.

Select Analysis Basis: Specific Day/Month

Weekday Count: Wednesday, January 24, 2018 Enter dates as "mm/dd/yyyy"

Weekend Count: Enter dates as "mm/dd/yyyy"

Select facility type: 14 - Urban Principal Arterial -- Other

At intersections of varying facilities select the roadway that will be more representative of the volume, or interpolate between values.

Introduction | OrganizationInformation | Alternatives_MasterList | DemandCounts | DemandProfiles | CostParameters | Delay | RCUT NS | TWSC_Delay | MUT NS | Outputs

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

Specify total volumes or turning counts?	Turning Counts	(Select from drop-down menu)
	Enter the turning movement counts in the DemandCounts worksheet for the peak hours. If data is not available for the weekend peak hour please leave blank.	
	Units	**Year**
		Opening / **Design**
		2020 / **2040**
		Intersection 1
AM peak hour volume	veh/hr	5,188 / 7,115
PM peak hour volume	veh/hr	5,310 / 7,568
Weekend peak hour volume:	veh/hr	
Average annual auto occupancy	Passengers per vehicle	1.0 / 1.0
Average annual % trucks	Average %	8.9% / 9.1%

Show/Hide Detailed Demand Profiles

If “Turning Counts” selected, volumes auto-populate after being entered into “Demand Counts” tab

FDOT ICE TOOL: FLORIDA DEMAND PROFILES

- Demand Profiles – Florida Daily & Monthly values by functional classification

Passenger Vehicle Demand Profile Parameters

Note: All charts illustrating volume profiles are shown to right of Column "R"

Review Daily Profile or Override Values:

Chart shown at right

Day of Week	04 - Rural Principal Arterial -- Other	06 - Rural Minor Arterial	07 - Rural Major Collector	08 - Rural Minor Collector	14 - Urban Principal Arterial -- Other	16 - Urban Minor Arterial	17 - Urban Major Collector
Monday	88.2%	80.6%	90.2%	79.9%	75.6%	75.1%	74.7%
Tuesday	97.9%	98.3%	96.3%	97.8%	101.3%	101.1%	101.7%
Wednesday	97.6%	102.2%	98.7%	106.1%	105.5%	106.8%	107.2%
Thursday	99.1%	103.2%	99.5%	103.8%	106.7%	107.3%	108.3%
Friday	102.6%	105.7%	102.4%	105.9%	107.3%	107.8%	108.0%
Saturday	114.3%	113.4%	112.6%	110.8%	111.2%	111.8%	109.9%
Sunday	100.1%	96.6%	100.2%	95.7%	92.4%	90.2%	90.1%

Review Monthly Profile or Override Values:

Chart shown at right

Month	Functional Class						
	04 - Rural Principal Arterial --	06 - Rural Minor Arterial	07 - Rural Major Collector	08 - Rural Minor Collector	14 - Urban Principal Arterial -- Other	16 - Urban Minor Arterial	17 - Urban Major Collector
January	92.5%	93.2%	95.7%	92.7%	98.3%	94.0%	101.7%
February	101.0%	102.6%	105.7%	102.3%	104.8%	103.1%	113.0%
March	107.1%	105.9%	110.6%	109.9%	107.1%	107.6%	113.5%
April	103.6%	103.8%	106.7%	105.2%	103.9%	100.6%	110.5%
May	103.2%	103.6%	103.1%	101.8%	98.0%	98.7%	102.7%
June	102.5%	101.0%	100.5%	95.4%	97.6%	95.0%	90.7%
July	100.2%	101.0%	97.7%	92.3%	96.2%	96.1%	89.5%
August	94.7%	98.3%	91.0%	94.6%	96.6%	96.9%	93.9%
September	94.5%	98.6%	89.2%	94.3%	96.1%	97.0%	94.7%
October	100.5%	100.6%	102.7%	100.6%	99.6%	102.5%	95.2%
November	101.5%	94.7%	98.9%	104.6%	101.2%	104.8%	96.9%
December	98.7%	96.9%	98.3%	106.4%	100.3%	103.5%	97.8%

FDOT ICE TOOL: FLORIDA DEMAND PROFILES

- Demand Profiles – Florida Weekday hourly values by functional classification
- Weekend values also available

Review Weekday Hourly Demand Profile or Override Values:
Chart shown at right

Category	Hour Starting	Functional Class						
		04 - Rural Principal Arterial --	06 - Rural Minor Arterial	07 - Rural Major Collector	08 - Rural Minor Collector	14 - Urban Principal Arterial --	16 - Urban Minor Arterial	17 - Urban Major Collector
Weekday	12:00 AM	0.7%	0.5%	0.5%	0.4%	0.8%	0.6%	0.5%
	1:00 AM	0.5%	0.3%	0.3%	0.2%	0.5%	0.4%	0.3%
	2:00 AM	0.4%	0.3%	0.3%	0.2%	0.4%	0.3%	0.2%
	3:00 AM	0.6%	0.4%	0.3%	0.2%	0.4%	0.3%	0.2%
	4:00 AM	1.1%	0.9%	0.8%	0.6%	0.7%	0.5%	0.4%
	5:00 AM	2.5%	2.3%	2.0%	1.8%	1.7%	1.5%	1.1%
	6:00 AM	4.8%	4.9%	4.3%	5.9%	4.2%	3.8%	3.6%
	7:00 AM	6.2%	6.9%	6.2%	8.6%	6.4%	6.2%	6.8%
	8:00 AM	5.7%	5.8%	5.7%	7.0%	6.3%	6.2%	6.7%
	9:00 AM	5.5%	5.6%	5.8%	5.0%	5.6%	5.6%	5.7%
	10:00 AM	5.8%	5.8%	6.2%	4.7%	5.6%	5.7%	5.6%
	11:00 AM	6.1%	6.2%	6.5%	4.7%	5.9%	6.1%	6.0%
	12:00 PM	6.2%	6.4%	6.7%	4.8%	6.3%	6.5%	6.4%
	1:00 PM	6.3%	6.4%	6.7%	5.3%	6.3%	6.5%	6.4%
	2:00 PM	6.6%	6.9%	7.0%	5.8%	6.6%	6.8%	6.8%
	3:00 PM	7.2%	7.7%	7.5%	7.0%	7.1%	7.4%	7.4%
	4:00 PM	7.8%	8.0%	7.8%	8.9%	7.5%	7.8%	8.0%
	5:00 PM	7.8%	8.0%	7.9%	10.2%	7.6%	7.9%	8.4%
	6:00 PM	5.8%	5.6%	5.8%	7.3%	6.0%	6.1%	6.3%
	7:00 PM	4.1%	3.9%	4.1%	4.2%	4.4%	4.5%	4.4%
	8:00 PM	3.1%	2.9%	3.0%	3.0%	3.5%	3.5%	3.4%
	9:00 PM	2.4%	2.1%	2.1%	2.0%	2.8%	2.8%	2.6%
	10:00 PM	1.7%	1.4%	1.5%	1.3%	2.1%	1.9%	1.7%
	11:00 PM	1.1%	0.9%	1.0%	0.8%	1.4%	1.2%	1.1%

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

At-Grade Control Strategies

Control #	Include	Short Name	Description
1	No	TWSC	Two-Way Stop Control
2	No	AllStop	All Way Stop
3	Yes	TrafficSignal	Traffic Signal
4	No	TrafficSignalAlt	Traffic Signal (Alt.)
5	No	Roundabout	Roundabout
6	Yes	DLT	Displaced Left Turn (DLT)
7	No	MUT	Median U-Turn (MUT)
8	No	SignalRCUT	Signalized Restricted Crossing U-Turn (RCUT)
9	No	UnsignalRCUT	Unsignalized Restricted Crossing U-Turn (RCUT)
10	No	GreenT	Continuous Green-T Intersection
11	No	Jughandle	Jughandle
12	Yes	Quadrant Itx	Quadrant Roadway Intersection
13	No	Other1	Other 1
14	No	Other2	Other 2

Setup Worksheets

Press the "Setup Worksheets" button to create hidden worksheets that compute performance measures for each selected control strategy.

Introduction | OrganizationInformation | Alternatives_MasterList | DemandCounts | DemandProfiles | CostParameters | Delay | RCUT NS | TWSC_Delay | MUT NS | Outputs

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

Intersection Configuration inputs

Which legs exist?	Westbound / East Leg	Eastbound / West Leg	Southbound / North Leg	Northbound / South Leg
	Yes	Yes	Yes	Yes

Select Major Street Direction: E-W

	Opening Year														
	AM Peak Hour					PM Peak Hour					Weekend Peak Hour				
	U	L	T	R	HV	U	L	T	R	HV	U	L	T	R	HV
Eastbound	0	176	1798	1214	4.00%	0	63	700	402	4.00%	0	0	0	0	2.00%
Westbound	0	1	368	117	9.80%	0	6	1610	68	9.80%	0	0	0	0	2.00%
Southbound	0	50	324	89	14.20%	0	96	549	350	14.20%	0	0	0	0	2.00%
Northbound	0	312	734	5	13.80%	0	1053	403	10	13.80%	0	0	0	0	2.00%

	Design Year														
	AM Peak Hour					PM Peak Hour					Weekend Peak Hour				
	U	L	T	R	HV	U	L	T	R	HV	U	L	T	R	HV
Eastbound	0	204	2088	1956	4.00%	0	73	813	814	4.00%	0	0	0	0	2.00%
Westbound	0	2	587	187	9.80%	0	13	1990	84	9.80%	0	0	0	0	2.00%
Southbound	0	75	668	132	14.20%	0	143	1421	521	14.20%	0	0	0	0	2.00%
Northbound	0	361	849	6	13.80%	0	1218	466	12	13.80%	0	0	0	0	2.00%

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

Type	Category	Unit valuation	Default value	Override value	Use value
Existing (Base) year for discounting	N/A	N/A	N/A	2020	2020
Opening Year	N/A	N/A	N/A	2020	2020
Design Year	N/A	N/A	N/A	2040	2040
Discount rate	N/A	Percent	0.04		0.04
Value of time	Person (weekday)	$ per person hour	$ 17.67		$ 17.67
	Person (weekend)	$ per person hour	$ 17.67		$ 17.67
	Trucks	$ per truck hour	$ 94.04		$ 94.04
Crashes	Fatal & Injury Crashes	$ per crash	$ 282,253		$ 282,253
	Property damage only crashes	$ per crash	$ 7,600		$ 7,600

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL: COST PARAMETERS

At-Grade Intersections	Total Design & Construction	Total Right of Way Costs	Operating & Maintenance	Signal Retiming	Lighting	Signal Maintenance
Traffic Signal	$ -	$ -	Cost Period	$ 5,000 Every 3 years	$ 1,000 1 (yearly)	$ 4,000 1 (yearly)
Displaced Left Turn (DLT)	$ 3,100,000	$ 1,700,000	Cost Period	$ 12,500 Every 3 years	$ 2,000 1 (yearly)	$ 10,000 1 (yearly)
Quadrant Roadway Intersection	$ 1,810,000	$ -	Cost Period	$ 15,000 Every 3 years	$ 3,000 1 (yearly)	$ 12,000 1 (yearly)

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL: SAFETY INPUTS

At-Grade Intersection	Crash Type	Opening Year	Design Year
Traffic Signal	Total	38.24	47.44
	Fatal & Injury	7.40	9.27
Displaced Left Turn (DLT)	Total	33.65	41.75
	Fatal & Injury	6.51	8.16
Quadrant Roadway Intersection	Total		
	Fatal & Injury		

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL: OPERATIONS INPUTS

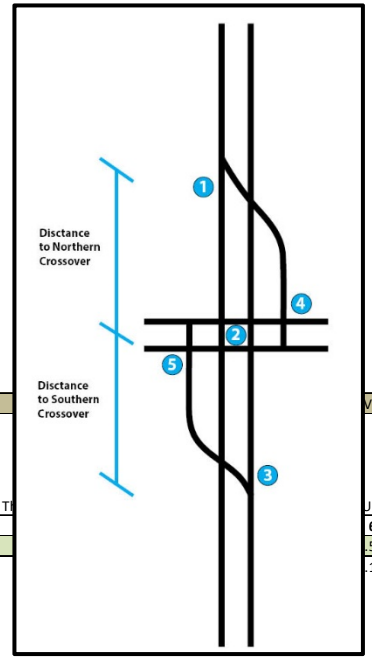
				Opening Year			Design Year		
At-Grade Intersections				Average vehicle delay			Average vehicle delay		
Control Strategy		Delay Type	Units	AM peak	PM peak	Weekend peak	AM peak	PM peak	Weekend peak
Traffic Signal	Single Input	Single Input	sec/veh	50.1	89.5		190.3	234.2	
Displaced Left Turn (DLT)	Single Input	Worksheet (Partial N-S)	sec/veh	14.2	23.1		17.9	45.4	
Quadrant Roadway Intersection	Single Input	Single Input	sec/veh	41.6	70.9		130.4	269.4	

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL: OPERATIONS INPUTS

DLT N-S

Use this sheet to enter the delay information for a partial DLT with the displaced lefts on the North-South street. (Requires turning movement count demand inputs)

User must enter value on this sheet



Note: Intersections 2, 4, and 5 are a single intersection at an actual DTL.
Modeling in SYNCHRO requires 3 separate intersections

Movement nomenclature refers to equivalent movement at conventional intersection.

Opening Year AM Peak — TEV: 5188

Intersection 1	SB Left	NB Thru*	WB Right
Volume	50	734	117
Delay	7.3	11.7	3.3

Intersection 2	SB Left	SB Thru	SB Right	NB Left	NB Thru	NB Right	EB Left&U	EB Thru	WB Left&U	WB Thru
Volume	50	324	89	312	734	5	176	1798	1	368
Delay (Intx 2)		19.1	7.4		22.2	0	26.9	4.7	3.8	3.8
Delay (Intx 4)	17.5								6.4	6.4
Delay (Intx 5)				19.1			9.9	9.9		

Intersection 3	SB Thru**	NB Left	EB Right
Volume	324	312	1214
Delay	4.4	13.9	0

* Delay entered for this movement also applied to EB Left Turn movement
** Delay entered for this movement also applied to WB Left Turn movment

Average delay for DLT: 14.2

Opening Year PM Peak — TEV: 5310

Intersection 1	SB Left	NB Thru*	WB Right
Volume	96	403	68
Delay	4.6	14.7	1.6

Intersection 2	SB Left	SB Thru	SB Right	NB Left	NB Thru	WB Left&U	WB Thru
Volume	96	549	350	1053		6	1610
Delay (Intx 2)		15.6	5.5			.5	14.5
Delay (Intx 4)	13.5					.1	12.1
Delay (Intx 5)				24.2			

Intersection 3	SB Thru**	NB Left	EB Right
Volume	549	1053	402
Delay	9.3	16.4	0

* Delay entered for this movement also applied to EB Left Turn movement
** Delay entered for this movement also applied to WB Left Turn movment

Average delay for DLT: 23.1

Design Year AM Peak — TEV: 7115

Intersection 1	SB Left	NB Thru*	WB Right
Volume	75	849	187
Delay	9.1	11.8	2.9

Intersection 2	SB Left	SB Thru	SB Right	NB Left	NB Thru	NB Right	EB Left&U	EB Thru	WB Left&U	WB Thru
Volume	75	668	132	361	849	6	204	2088	2	587
Delay (Intx 2)		36.7	9.2		35.7	0	38.9	3.2	3.2	3.2
Delay (Intx 4)	25.6								5.6	5.6
Delay (Intx 5)				24.4			8.9	8.9		

Intersection 3	SB Thru**	NB Left	EB Right
Volume	668	361	1956
Delay	15.8	13.8	0

* Delay entered for this movement also applied to EB Left Turn movement
** Delay entered for this movement also applied to WB Left Turn movment

Average delay for DLT: 17.9

Design Year PM Peak — TEV: 7568

Intersection 1	SB Left	NB Thru*	WB Right
Volume	143	466	84
Delay	4.8	15.1	1.1

Intersection 2	SB Left	SB Thru	SB Right	NB Left	NB Thru	NB Right	EB Left&U	EB Thru	WB Left&U	WB Thru
Volume	143	1421	521	1218	466	12	73	813	13	1990
Delay (Intx 2)		51.5	6.3		21.9	0	26.5	4.6	39.9	39.9
Delay (Intx 4)	20.7								21.2	21.2
Delay (Intx 5)				41.4			14.5	14.5		

Intersection 3	SB Thru**	NB Left	EB Right
Volume	1421	1218	814
Delay	19.4	25.5	0

* Delay entered for this movement also applied to EB Left Turn movement
** Delay entered for this movement also applied to WB Left Turn movment

Average delay for DLT: 45.4

Quadrant Roadway Delay Calculation

Northbound Left Delay AM 2020		
Distance along Jog Rd	0.73	Miles
Posted Speed along Jog Rd	45	MPH
Travel Time NB along Jog Rd	58.4	Seconds
NBL Delay at Northlake Blvd/Jog Rd	91.5	Seconds
Distance along Northlake Blvd	0.85	Miles
Posted Speed along Northlake Blvd	55	MPH
Travel Time WB along Northlake Blvd	55.6	Seconds
WBT Delay at Northlake Blvd/SR 710	7.2	Seconds
Distance along SR710	1.21	Miles
Posted Speed along SR710	55	MPH
Travel Time NB along 710	79.2	Seconds
(Signal Alt.) NBL Delay at SR 710/Northlake Blvd	66.8	Seconds
Total Delay	66.7	Seconds

Southbound Left Delay AM 2020		
SBT Delay at SR710/Northlake Blvd	47.9	Seconds
Distance along SR710	1.21	Miles
Posted Speed along SR710	55	MPH
Travel Time SB along SR710	79.2	Seconds
EBL Delay at SR710/Jog Rd	72.1	Seconds
Distance along Jog Rd	0.73	Miles
Posted Speed along Jog Rd	45	MPH
Travel Time NB along Jog Rd	58.4	Seconds
Distance along Northlake Blvd	0.85	Miles
Posted Speed along Northlake Blvd	55	MPH
Travel Time EB along Northlake Blvd	55.6	Seconds
(Signal Alt.) SBL Delay at SR710/Northlake Blvd	83.9	Seconds
Total Delay	118.1	Seconds

Westbound Left Delay AM 2020		
Distance along Jog Rd	0.73	Miles
Posted Sped along Jog Rd	45	MPH
Travel Time SB along Jog Rd	58.4	Seconds
WBL at SR710/Jog Rd	54.3	Seconds
Distance along Northlake Blvd	0.85	Miles
Posted Speed along Northlake Blvd	55	MPH
Travel Time SB along Northlake Blvd	55.6	Seconds
Distance along SR710	1.21	Miles
Posted Speed along SR710	55	MPH
Travel Time WB along SR710	79.2	Seconds
(Signal Alt.) WBL Delay at SR710/Northlake Blvd	63.5	Seconds
Total Delay	-85.6	Seconds

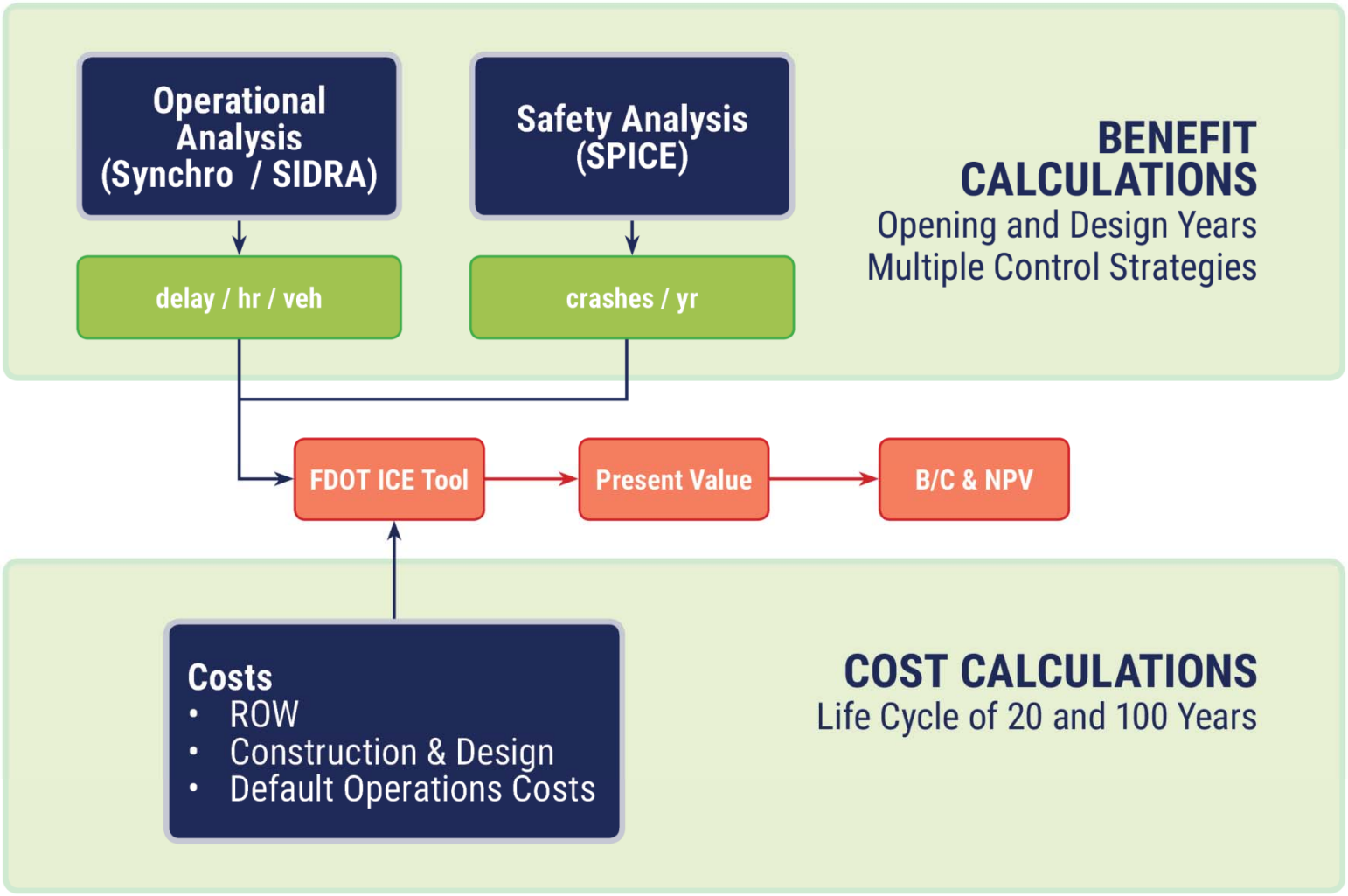
Quadrant Roadway Total Delay Calculation

	AM 2020	PM 2020	AM 2040	PM 2040
Signal Delay	50.1	89.5	190.3	234.2
Signal Volume	5,188	5,310	7,114	7,568
Total Delay	259,919	475,245	1,353,794	1,772,426
QR Main Int Delay	34.7	64.1	131.3	199.3
QR Main Int Volume	5,187	5,304	7,112	7,555
QR LT Delay	99.2	31.5	-14.3	388
QR LT Volume	363	1155	438	1374
QR Total Delay	215,999	376,369	927,542	2,038,824
Ratio	0.83	0.79	0.69	1.15
New Int Delay	41.6	70.9	130.4	269.4

SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL: OPERATIONS INPUTS

				Opening Year			Design Year		
At-Grade Intersections				Average vehicle delay			Average vehicle delay		
Control Strategy		Delay Type	Units	AM peak	PM peak	Weekend peak	AM peak	PM peak	Weekend peak
Traffic Signal	Single Input	Single Input	sec/veh	50.1	89.5		190.3	234.2	
Displaced Left Turn (DLT)	Single Input	Worksheet (Partial N-S)	sec/veh	14.2	23.1		17.9	45.4	
Quadrant Roadway Intersection	Single Input	Single Input	sec/veh	41.6	70.9		130.4	269.4	

SR 710 / NORTHLAKE BLVD. – STAGE 2 OVERVIEW



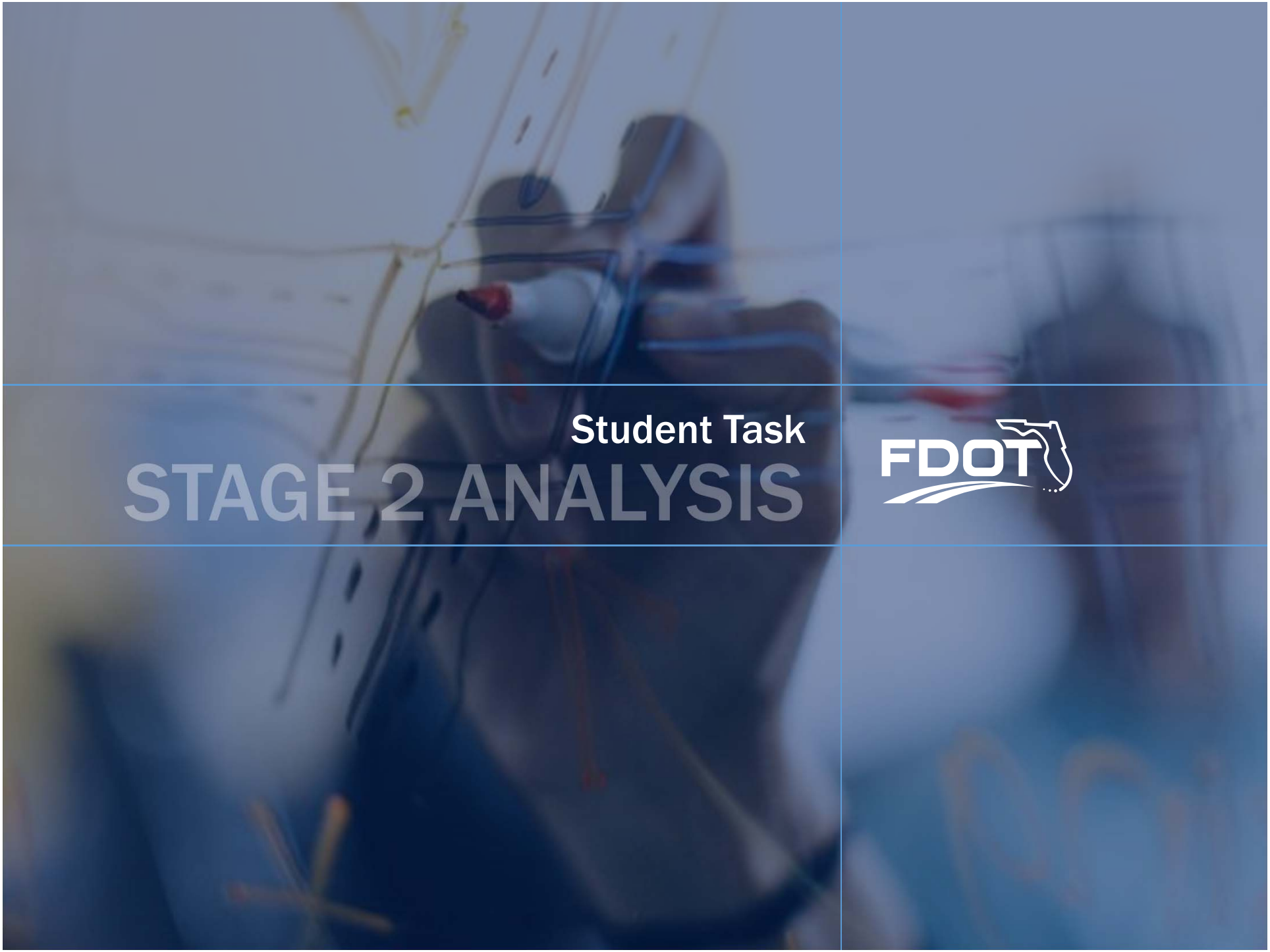
SR 710 / NORTHLAKE BLVD. – STAGE 2 FDOT ICE TOOL

Analysis Summary

Cost Categories	Net Present Value of Costs		
	Traffic Signal	Displaced Left Turn (DLT)	Quadrant Roadway Intersection
Planning, Construction & Right of Way Costs	$ -	$ 3,440,000	$ 1,810,000
Post-Opening Costs	$ 98,229	$ 238,276	$ 294,686
Auto Passenger Delay	$ 177,769,915	$ 35,735,981	$ 152,120,382
Truck Delay	$ 93,849,077	$ 18,848,383	$ 80,323,901
Safety	$ 37,397,121	$ 32,909,466	--
Total cost	**$309,114,341**	**$91,172,107**	**$234,548,969**

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Traffic Signal		

Benefit Categories	Net Present Value of Benefits Relative to Base Case		
	Traffic Signal	Displaced Left Turn (DLT)	Quadrant Roadway Intersection
Auto Passenger Delay		$ 142,033,934	$ 25,649,533
Truck Delay		$ 75,000,693	$ 13,525,176
Safety		$ 4,487,654	
Net Present Value of Benefits		**$ 221,522,282**	**$ 39,174,708**
Net Present Value of Costs		**$ 3,580,048**	**$ 2,006,457**
Net Present Value of Improvement		**$ 217,942,234**	**$ 37,168,251**
Benefit-Cost (B/C) Ratio		**61.88**	**19.52**
Delay B/C		**60.62**	**19.52**
Safety B/C		**1.25**	



Student Task

STAGE 2 ANALYSIS

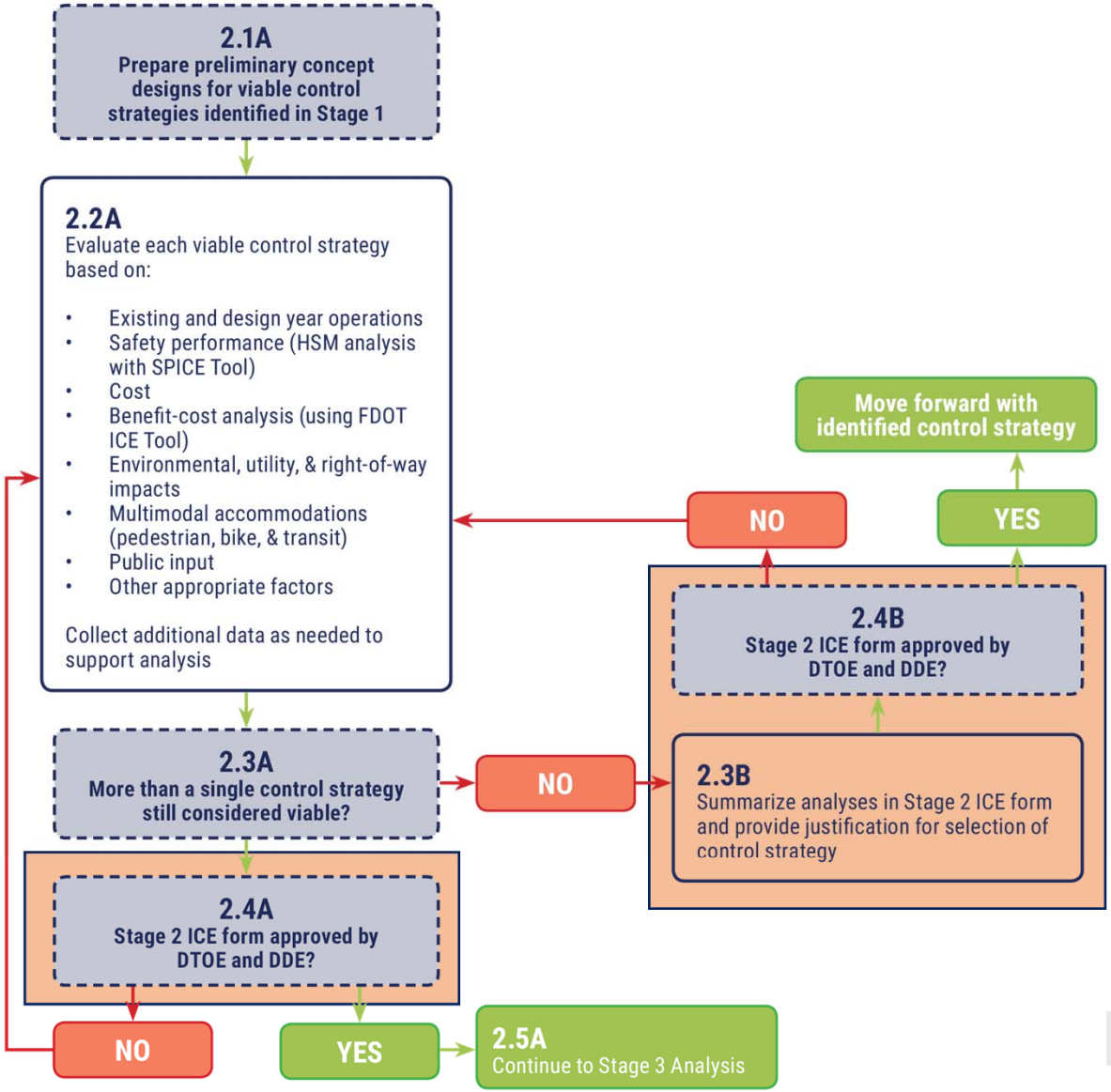
FDOT

- Student Task
  - Complete Stage 2 ICE Tool analysis
    - Update cost estimates for all alternatives
    - Update delay for Traffic Signal and Quadrant Roadway

STAGE 2 FORM

FDOT

ICE STAGE 2 PROCESS



Reference: FDOT Manual of Intersection Control Evaluation; Nov. 1, 2017; Figure 3; Page 14

SR 710 / NORTHLAKE BLVD. – STAGE 2 FORM

Operational Analyses										
Summarize the results of the peak hour analysis performed for each control strategy. Select analysis year based on guidance in the ICE procedures document. Refer to Exhibit 19-8 of the *Highway Capacity Manual, 6th Edition* (HCM6) to determine the appropriate LOS based on intersection delay (*hover over this cell for Exhibit 19-8*).										
Design Vehicle	Interstate Semitrailer (WB-62)			Control Vehicle	Interstate Semitrailer (WB-62)					
Opening Year	2020									
Control Strategy	Peak Hour	Weekday AM Peak		Peak Hour	Weekday PM Peak		Peak Hour	Saturday Midday Peak		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated ?	LOS	Delay (sec.)	All Queues Accommodated?	
Signalized Control	D	50.1	No	F	89.5	No				
Quadrant Roadway	D	41.6	No	E	70.9	No				
Partial DLT	B	14.2	Yes	C	23.1	Yes				
Design Year	2040									
Control Strategy	Peak Hour	Weekday AM Peak		Peak Hour	Weekday PM Peak		Peak Hour	Saturday Midday Peak		
	LOS	Delay (sec.)	All Queues Accommodated?	LOS	Delay (sec.)	All Queues Accommodated	LOS	Delay (sec.)	All Queues Accommodated?	
Signalized Control	F	190.3	No	F	234.2	No				
Quadrant Roadway	F	130.4	No	F	269.4	No				
Partial DLT	B	17.9	Yes	D	45.4	No				
Provide any additional discussion necessary regarding the results of the operational analysis:										

SR 710 / NORTHLAKE BLVD. – STAGE 2 FORM

Safety Performance							
Enter the most recent five (5) years of crash data from the CAR System.					Most recent year of crash data available		2017
Crash Type		2013	2014	2015	2016	2017	Total
Combined	Total	0	0	0	0	0	0
	Fatal/Injury	0	0	0	0	0	0
	PDO	0	0	0	0	0	0
Single-Vehicle	Total	0	2	4	4	9	19
	Fatal/Injury	0	0	3	1	4	8
	PDO	0	2	1	3	5	11
Multi-Vehicle	Total	38	30	34	35	71	208
	Fatal/Injury	7	9	7	5	16	44
	PDO	31	21	27	30	55	164
Vehicle-Pedestrian	Fatal/Injury	0	0	0	0	1	1
Vehicle-Bicycle	Fatal/Injury	0	0	1	0	0	1
Total	All	38	32	39	39	81	229

Apply the FDOT SPICE Tool to model anticipated safety performance of each control strategy. For intersection types not accommodated in the tool, manually apply crash modification factors detailed in the ICE procedures document or qualitatively describe anticipated safety impacts.

Control Strategy	Anticipated Impact on Safety Performance	Opening Year		Design Year	
		Predicted Total Crashes	Predicted Fatal+Injury Crashes	Predicted Total Crashes	Predicted Fatal+Injury Crashes
Signalized Control	The existing signal is antiticpated to have the highest overall crash frequency and highest fatal/injury crashes.	38.24	7.40	47.44	9.27
Quadrant Roadway	No safety analysis was performed for this alternative	N/A	N/A	N/A	N/A
Partial DLT	The DLT is anticipated to have fewer overall and fatal/injury crashes relative to the existing signalized intersection.	33.65	6.51	41.74	8.16

SR 710 / NORTHLAKE BLVD. – STAGE 2 FORM

Costs and Benefit/Cost Ratios						
Remaining cognizant of the current level of detail of each control strategy's conceptual design, provide a cost estimate for each. You may want to include costs for preliminary engineering, required right-of-way acquisitions, construction, and a contingency. Apply the FDOT ICE Tool to determine the delay benefit-cost ratio (B/C), safety B/C, overall B/C, and net-present value for each control strategy.						
			FDOT ICE Tool Outputs			
Control Strategy	ROW Costs ($)	Construction Costs ($)	Delay B/C	Safety B/C	Overall B/C	Net Present Value
Signalized Control	$0	$0	N/A	N/A	N/A	N/A
Quadrant Roadway	$0	$1,810,000	19.52	N/A	19.52	$37,168,251
Partial DLT	$1,700,000	$3,100,000	60.62	1.25	61.88	$217,942,234

Multimodal Accommodations								
Note the existing/anticipated level of pedestrian/bicyclist activity at the study intersection during the peak hours of the typical day. See ICE procedures document for activity level thresholds:								
Peak Hour:	Weekday AM Peak		Weekday PM Peak		Saturday Midday Peak		Activity Level	
	Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street	Ped.	Bicycles
# of ped. crossings (both approaches, if app.):	N/A	N/A	N/A	N/A			Low	Low
# of cyclists (both approaches, if app.):	N/A	N/A	N/A	N/A				

Summarize the ability of each viable control strategy to accommodate the existing/anticipated level of:			
Control Strategy	Pedestrians and Bicyclists	Transit Services	Freight Needs
Signalized Control	No change from existing.	No existing transit stops in site vicinity. No change from existing.	
Quadrant Roadway	Pedestrians/bicyclists will still be accommodated with the same facilities as in the existing condition.	No existing transit stops in site vicinity. No change from existing.	
Partial DLT	Pedestrians/bicyclists will still be accommodated with the same facilities as in the existing condition.	No existing transit stops in site vicinity. No change from existing.	

SR 710 / NORTHLAKE BLVD. – STAGE 2 FORM

Environmental, Utility, and Right-of-Way Impacts	
Summarize any issues related to environmental, utility, or right-of-way (including relocation) impacts specific to each control strategy. Be sure to consider the NEPA requirements for each control type.	
Signalized Control	No impacts anticipated.
Quadrant Roadway	No impacts anticipated.
Partial DLT	Right-of-way impacts are anticipated in the SW quadrant of the intersection to develop the dual NBLT lanes.

Public Input/Feedback (if appropriate)
Summarize any agency or public input regarding the control strategies:
None performed to date.

SR 710 / NORTHLAKE BLVD. – STAGE 2 FORM

ICE Form Stage 2

Control Strategy Evaluation Summary

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	No	The existing traffic signal does not have adequate operations under future year scenarios. The signal is anticipated to have the higher overall and fatal/injury crashes when compared to the PDLT.
Quadrant Roadway	No	The quadrant roadway is expected to perform worse operationally under future year scenarios than the PDLT.
Partial DLT	Yes	The partial displaced left-turn has a B/C ratio above 60 and a NPV over $215 million.

Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination	Identified Control Strategy Approved				
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	

Stage 1 | Stage 2 | Stage 3

SR 710 / NORTHLAKE BLVD – STAGE 2 FORM: ALTERNATIVE SELECTION

- Signalized
  - Pros: No construction cost associated with alternative.
  - Cons: Worse operations than the QR and PDLT

- PDLT
  - Pros: Better operation performance than the Signal and QR. Safety benefits are better when compared to the Signal.
  - Cons: ROW impacts, higher construction cost

- Quadrant
  - Pros: Minimal impact to existing roadway configurations
  - Cons: Out of direction travel for high volume movement (NBL), increase in delay

PDLT is the preferred alternative


DISCUSSION & QUESTIONS
FDOT

STUDY INTERSECTION #2

US 41 AT SR 44 / E HIGHLAND BLVD

FDOT

US 41 / SR 44 – INTERSECTION OVERVIEW

- Currently signalized
- Proposed reconfiguration to include a dual SB left turn lane for increasing demand

US 41 / SR 44 – INTERSECTION OVERVIEW

US 41 / SR 44 – INTERSECTION OVERVIEW

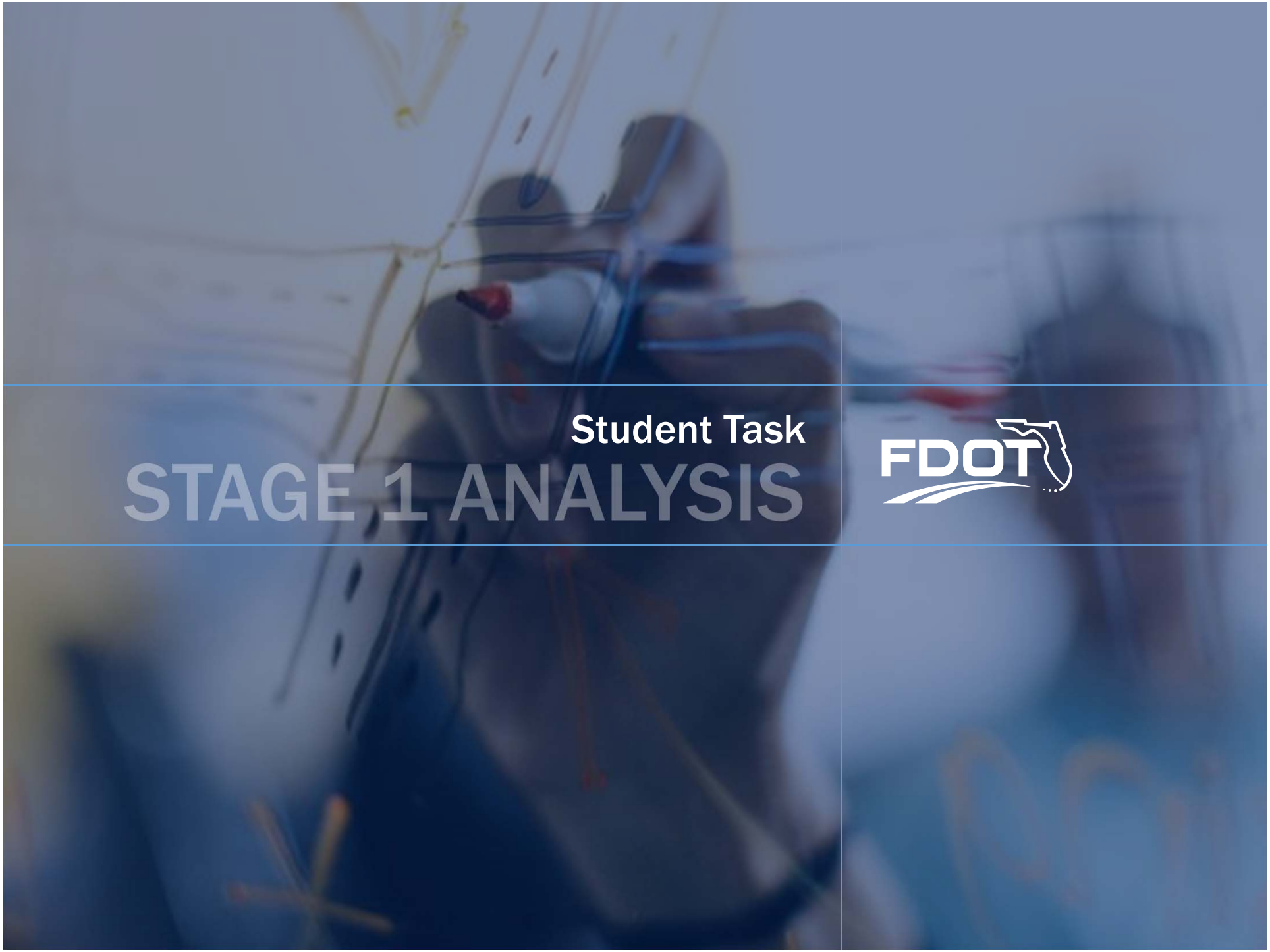
- 2018 Existing Year
  - US 41 AADT – 29,000
  - SR 44 AADT – 15,400
- Opening Year 2020
  - US 41 AADT – 30,300
  - SR 44 AADT – 15,900
- Design Year 2040
  - US 41 AADT – 37,400
  - SR 44 AADT – 18,400
- Heavy Vehicle Percentage
  - US 41 – NB/SB: 10%
  - SR 44 – EB: 6.8%, WB: 4.5%
- Context Classification
  - US 41 – C3C – Suburban Commercial
- Posted Speed
  - US 41 – 45 MPH
  - SR 44 – 45 MPH

US 41 / SR 44 – INTERSECTION OVERVIEW

- 2013 – 2017 Crash Data Summary:
  - 99 Total Crashes
  - 34 Injury Crashes, No Fatalities
  - 65 Property Damage Only
  - Detailed breakdown located in handout

STAGE 1

ANALYSIS



Student Task

STAGE 1 ANALYSIS

- Student Tasks
  - Complete AM and PM CAP-X Analysis
  - Complete Stage 1 SPICE Tool
  - Discuss Stage 1 ICE Form

STAGE 1
CAP-X

FDOT

AM Results – Ranked

Capacity Analysis for Planning of Junctions

Dynamic Results Summary

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Displaced Left Turn N-S	0.37	1	4.8	Fair	Fair	Good
Displaced Left Turn	0.37	1	4.8	Fair	Fair	Good
Signalized Restricted Crossing U-Turn N-S	0.37	1	6.3	Good	Good	Fair
Quadrant Roadway N-W	0.48	4	4.4	Fair	Fair	Fair
Partial Median U-Turn N-S	0.50	5	6.3	Good	Good	Fair
Traffic Signal	0.51	6	4.8	Fair	Fair	Good
Median U-Turn N-S	0.57	7	6.3	Good	Good	Fair
2 X 2	0.57	8	5.6	Fair	Good	Good

PM Results – Ranked

Capacity Analysis for Planning of Junctions

Dynamic Results Summary

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Displaced Left Turn N-S	0.42	1	4.8	Fair	Fair	Good
Displaced Left Turn	0.42	1	4.8	Fair	Fair	Good
Signalized Restricted Crossing U-Turn N-S	0.54	3	6.3	Good	Good	Fair
Traffic Signal	0.58	4	4.8	Fair	Fair	Good
Quadrant Roadway N-W	0.60	5	4.4	Fair	Fair	Fair
Partial Median U-Turn N-S	0.72	6	6.3	Good	Good	Fair
2 X 2	0.72	7	5.6	Fair	Good	Good
Median U-Turn N-S	0.76	8	6.3	Good	Good	Fair


STAGE 1
SPICE
FDOT

Control Strategy Selection – Base Values

Control Strategy Selection and Inputs		
Specify the Facility Level Inputs and the Control Strategies to be included in the SPICE Analysis.		
Intersection Type	At-Grade Intersections	
Analysis Year	Opening and Design Year	
Opening Year	2020	
Design Year	2040	
Facility Type	On Urban and Suburban Arterial	For more information on how to determine these values, see the "Definitions" worksheet
Number of Legs	4-leg	
1-Way/2-Way	2-way Intersecting 2-way	
# of Major Street Lanes (both directions)	5 or fewer	
Major Street Approach Speed	Less than 55 mph	
Opening Year - Major Road AADT	30,300	
Opening Year - Minor Road AADT	15,900	
Design Year - Major Road AADT	37,400	
Design Year - Minor Road AADT	18,400	

Control Strategy Selection – Base Values

Control Strategy	Include	Base Intersection		
Traffic Signal	Yes	--		
Traffic Signal (Alternative Configuration)	Yes	--		
Minor Road Stop	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range	
All Way Stop	No	--		
1-Lane Roundabout	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range	
2-Lane Roundabout	Yes	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range	
Displaced Left Turn (DLT)	Yes	Traffic Signal		
Median U-Turn (MUT)	Yes	Traffic Signal		
Signalized Restricted Crossing U-Turn (RCUT)	Yes	--	Open Major/Minor AADT Ratio O Design Year AADT Outside of SPF Development Range	
Unsignalized Restricted Crossing U-Turn (RCUT)	No	--	Opening Year AADT Outside of SP Design Year AADT Outside of SPF Development Range	
Continuous Green-T Intersection	No	Traffic Signal		
Jughandle	Yes	Traffic Signal		
Other 1	No	Traffic Signal	*Please Select	
Other 2	No	Minor Road Stop	*Please Select	

US 41 / SR 44 – STAGE 1 SPICE

- Traffic Signal and All Way Stop – Left-turn and right-turn sum of all approaches
- Minor Road Stop – Left-turn and right-turn sum for uncontrolled approaches only

		Control Strategy							
Input		**Traffic Signal**	**Traffic Signal (Alt)**	**2-lane Roundabout**	**Displaced Left Turn (DLT)**	**Median U-Turn (MUT)**	**Signalized RCUT**	**Jughandle**	
Opening Year Major Road AADT	Optional AADT Overrides	30300	30300	30300	30300	30300	30300	30300	All strategies will have the same AADT as the Base Conditions unless overridden by user.
Opening Year Minor Road AADT		15900	15900	15900	15900	15900	15900	15900	
Design Year Major Road AADT		37400	37400	37400	37400	37400	37400	37400	
Design Year Minor Road AADT		18400	18400	18400	18400	18400	18400	18400	
Number of Approaches with Left-Turn Lanes	Additional Required Control Strategy Inputs	4	4						Do not include stop controlled approaches for minor stop
Number of Approaches with Right-Turn Lanes		4	4						
Number of Uncontrolled Approaches with Left-Turn Lanes									
Number of Uncontrolled Approaches with Right-Turn Lanes									

- Base condition traffic signal CMF inputs
- Traffic Signal Control Strategies – leave as default for Stage 1

Input		Control Strategy						
		Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Displaced Left Turn (DLT)	Median U-Turn (MUT)	Signalized RCUT	Jughandle	
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis									
Reset Planning Inputs to Defaults	Part C CMFS Optional For Stage 1 ICE, Required for Stage 2 ICE								
Skew Angle	A yellow cell indicates the value may be used in the SPF computation	N/A	N/A	N/A	CMF - No Inputs Required	CMF - No Inputs Required	Scroll Down for Signalized RCUT SPF Inputs	CMF - No Inputs Required	All yellow cells will be automatically populated by a macro. If users want to do a planning-level analysis, they can leave the automatic inputs as-is
Lighting Present		Yes	Yes						
# of Approaches Permissive LT Signal Phasing		0	0						
# of Approaches Perm/Prot LT Signal Phasing		0	0						
# of Approaches Protected LT Signal Phasing		0	0						
Number of Approaches with Right-Turn-on-Red Prohibited		0	0						
Red Light Cameras Present		No	No						
Number of Major Street Through Lanes		0	0						
Number of Minor Street Lanes		0	0						
# of Major St Approaches w/ Right-Turn Channelization		0	0						
Number of Approaches with U-Turn Prohibited		0	0						
Pedestrian Volume by Activity Level		Low (50)	Low (50)						
User Specified Sum of all daily pedestrian crossing volumes		50	50						
Max # of Lanes Crossed by Pedestrians		5	5						
Number of Bus Stops within 1000' of Intersection		0	0						
Schools within 1000' of intersection		No	No						
Number of Alcohol Sales Establishments within 1000' of Intersection		0	0						

- Roundabout Control Strategy – leave as default for Stage 1

Input		Control Strategy						
		Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Displaced Left Turn (DLT)	Median U-Turn (MUT)	Signalized RCUT	Jughandle
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis								
	Roundabout CMF Inputs							
Inscribed Circle Diameter (ft)								
Leg 1 (Major Leg #1)	Leg 1 (Major Leg #1)							
Opening Year Entering AADT				15,150				
Leg has Right-Turn Bypass				No				
# of Access Points within 250' of Yield Line								
Entering Width (ft)				29				
# of Entering Lanes				2				
# of Circulating Lanes				2				
Leg 2 (Major Leg #2)	Leg 2 (Major Leg #2)							
Opening Year Entering AADT				15,150				
Leg has Right-Turn Bypass				No				
# of Access Points within 250' of Yield Line								
Entering Width (ft)				29				
# of Entering Lanes				2				
# of Circulating Lanes				2				
Leg 3 (Minor Leg #1)	Leg 3 (Minor Leg #1)							
Opening Year Entering AADT				7950				
Leg has Right-Turn Bypass				No				
# of Access Points within 250' of Yield Line								
Entering Width (ft)				29				
# of Entering Lanes				2				
# of Circulating Lanes				2				
Leg 4 (Minor Leg #2)	Leg 4 (Minor Leg #2)							
Opening Year Entering AADT				7,950				
Leg has Right-Turn Bypass				No				
# of Access Points within 250' of Yield Line								
Entering Width (ft)				29				
# of Entering Lanes				2				
# of Circulating Lanes				2				

- RCUT Control Strategy – leave as default for Stage 1

Input		Control Strategy						
		Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Displaced Left Turn (DLT)	Median U-Turn (MUT)	Signalized RCUT	Jughandle
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis								
							Restricted Crossing U-	
# U-Turns							2	
# of Major Roadway Lanes							2	
# of Minor Roadway Lanes							2	
Total Offset Distance (ft)							1250	
Number of Driveways							4	
Total Deceleration Lane Length (ft)							750	
Total Acceleration Lane Length (ft)								
Number of Left-Turn Lanes From Major Road							1	
Major Road Speed Limit (mph)							<=50	
Total Median Width (ft)							65	
Maximum Median Width (ft)								

SPICE Stage 1 Results

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

Compute Results

Project Information

Project Name:	FDOT District 7 ICE Training	**Intersection Type**	At-Grade Intersections
Intersection:	US 41 at SR 44	**Opening Year**	2020
Agency:	FDOT	**Design Year**	2040
Project Reference:	XXXXX.XX	**Facility Type**	On Urban and Suburban Arterial
City:	Inverness	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	7/1/2019	**# 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	Rank	AADT Within Prediction Range?	Source of Prediction
Traffic Signal	Total	12.20	15.72	292.81	5	Yes	Calibrated SPF
	Fatal & Injury	4.25	5.57	102.96			
Traffic Signal (Alt)	Total	12.20	15.72	292.81	5	Yes	Calibrated SPF
	Fatal & Injury	4.25	5.57	102.96			
2-lane Roundabout	Total	20.31	25.28	478.42	4	No	Uncalibrated SPF
	Fatal & Injury	3.88	4.94	92.49			
Displaced Left Turn (DLT)	Total	10.73	13.83	257.68	3	N/A	CMF
	Fatal & Injury	3.74	4.90	90.60			
Median U-Turn (MUT)	Total	10.37	13.36	248.89	1	N/A	CMF
	Fatal & Injury	2.98	3.90	72.07			
Signalized RCUT	Total	26.39	35.47	648.10	7	No	Uncalibrated SPF
	Fatal & Injury	6.55	8.93	162.07			
Jughandle	Total	9.03	11.63	216.68	2	N/A	CMF
	Fatal & Injury	3.15	4.12	76.19			

STAGE 1 FORM

FDOT

US 41 / SR 44 – STAGE 1 FORM

Stage 1 Results

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.						
Control Strategy	CAP-X Outputs			SPICE Ranking	Strategy to Be Advanced?	Justification
	V/C Ratio		Multimodal Score			
	Weekday AM Peak	Weekday PM Peak				
Two-Way Stop-Controlled	N/A	N/A	N/A	N/A	No	Existing intersection control is a traffic signal
All-Way Stop-Controlled	N/A	N/A	N/A	N/A	No	Existing intersection control is a traffic signal
Signalized Control	0.51	0.58	4.8	5	Yes	Will move forward as the future no-build scenario.
Roundabout	0.57	0.72	5.6	4	Yes	Slightly worse operations than the signal but could reduce crashes from the existing signal.
Median U-Turn	0.57 (Full) 0.50 (Partial)	0.76 (Full) 0.72 (Partial)	6.3	1	No	Operational performance decreases when compared to the signal. Construction costs on the north leg will reduce feasibility.
RCUT (Signalized)	0.37	0.54	6.3	7	Yes	Operational performance provides a significant improvement for the AM peak and a slight improvement for the PM peak.
RCUT (Unsignalized)	N/A	N/A	N/A	N/A	No	Existing intersection control is a traffic signal
Jughandle				2	No	Existing ROW limitations with existing land uses - including Cooter Pond Park.
Displaced Left-Turn	0.37 (Full) 0.37 (Partial)	0.42 (Full) 0.42 (Partial)	4.8	3	No	Existing ROW limitations with existing land uses - including Cooter Pond Park. Only one left turn movement is high enough to consider DLT.
Continuous Green Tee	N/A	N/A	N/A	N/A	No	Existing intersection configuration is 4-leg.
Quadrant Roadway	0.48	0.60	4.4		Yes	Existing roadway network on the NW corner could be utilized to improve the operational performance at the study intersection.
Signalized Control (Alt)	0.48	0.57	4.8	5	Yes	Proposed lane configuration prior ICE Evaluation: Dual SB Left Turn Lanes.

Stage 1 | Stage 2 | Stage 3

STAGE 2

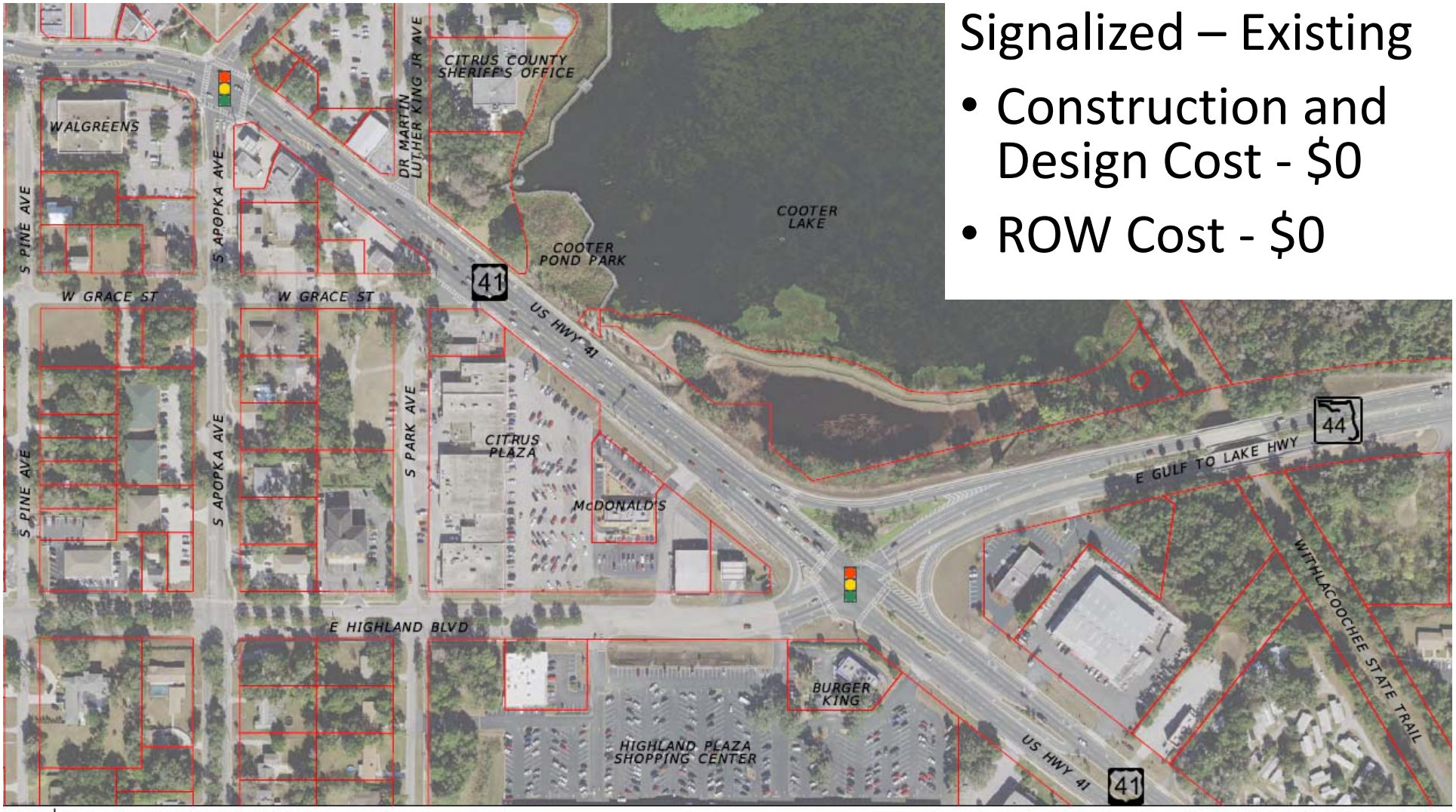
ANALYSIS

FDOT

STAGE 2

CONCEPTS

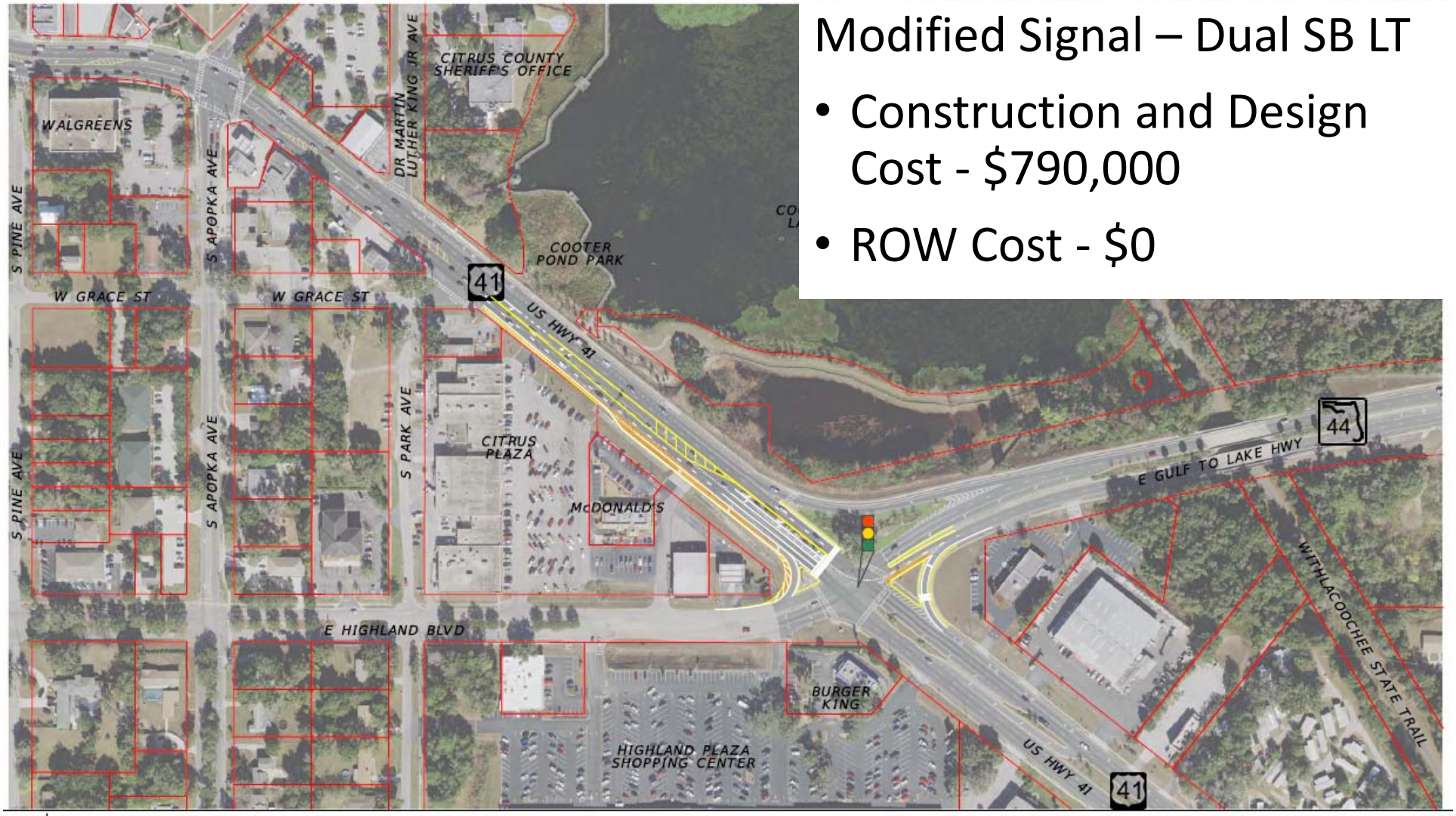
US 41 / SR 44 – STAGE 2 CONCEPT DEVELOPMENT



Signalized – Existing

- Construction and Design Cost - $0
- ROW Cost - $0

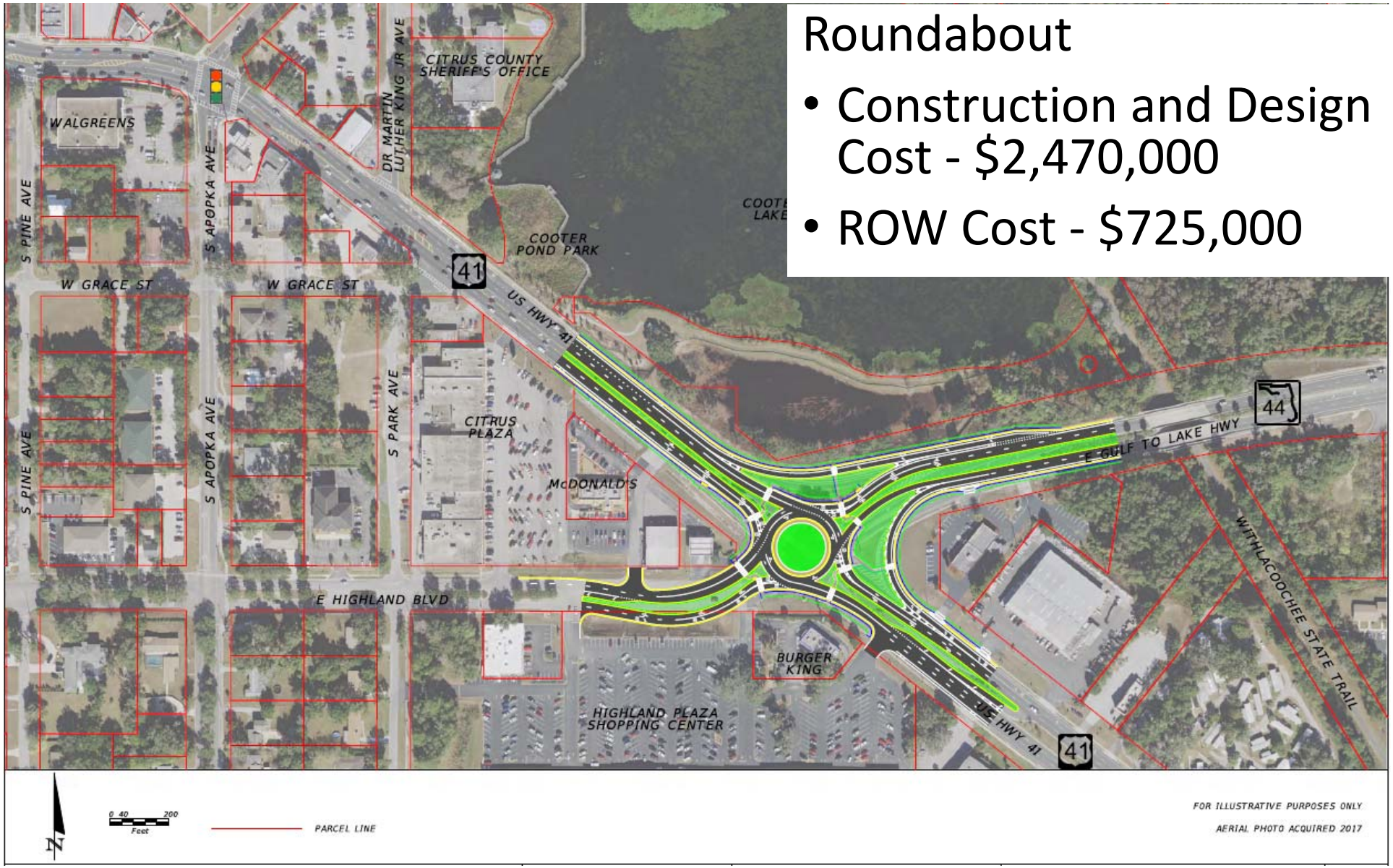
US 41 / SR 44 – STAGE 2 CONCEPT DEVELOPMENT



Modified Signal – Dual SB LT

- Construction and Design Cost - $790,000
- ROW Cost - $0

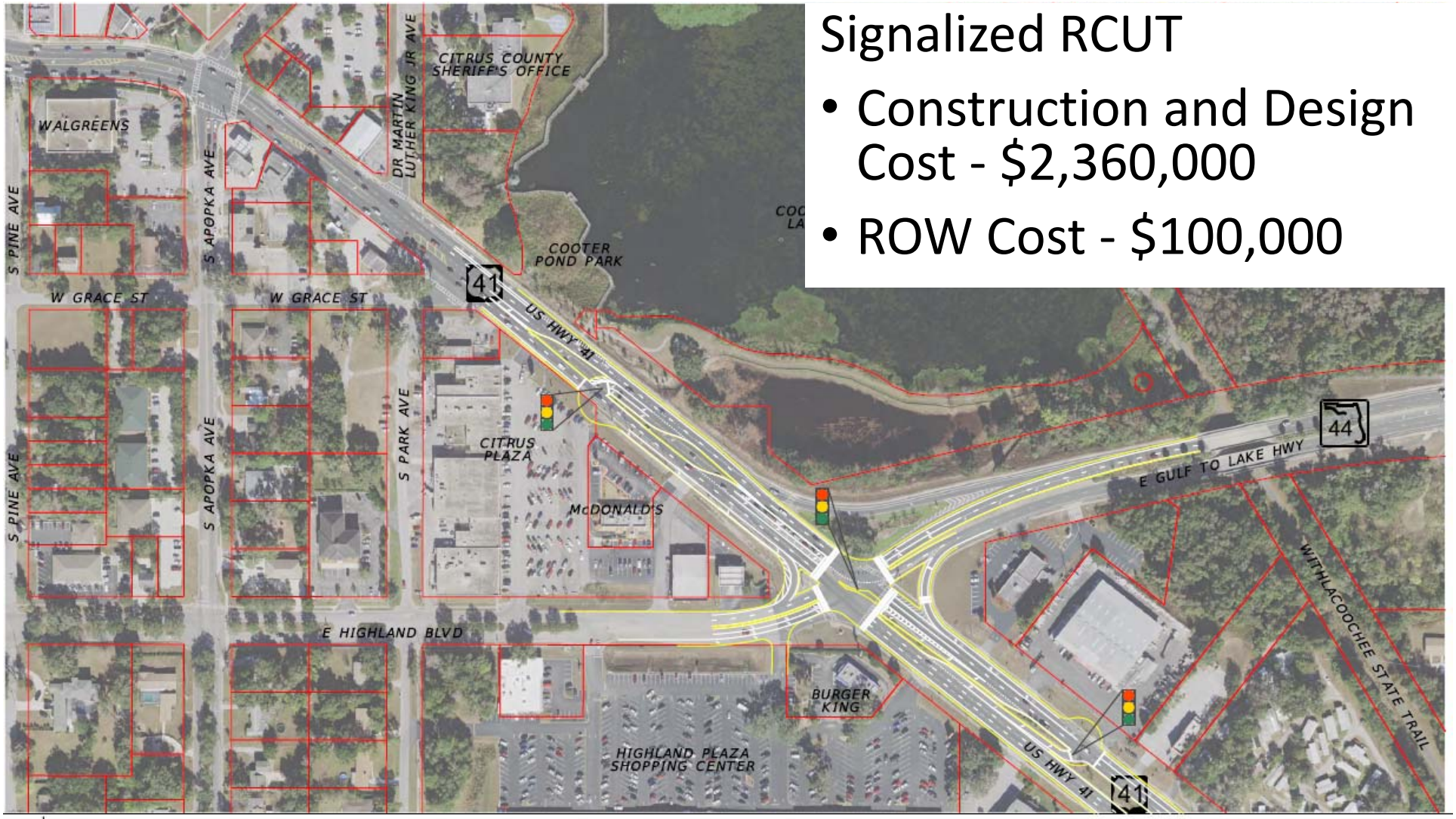
US 41 / SR 44 – STAGE 2 CONCEPT DEVELOPMENT



Roundabout

- Construction and Design Cost - $2,470,000
- ROW Cost - $725,000

US 41 / SR 44 – STAGE 2 CONCEPT DEVELOPMENT



Signalized RCUT

- Construction and Design Cost - $2,360,000
- ROW Cost - $100,000

US 41 / SR 44 – STAGE 2 CONCEPT DEVELOPMENT

Southwest Quadrant Roadway

- Construction and Design Cost - $1,500,000
- ROW Cost - $2,000,000

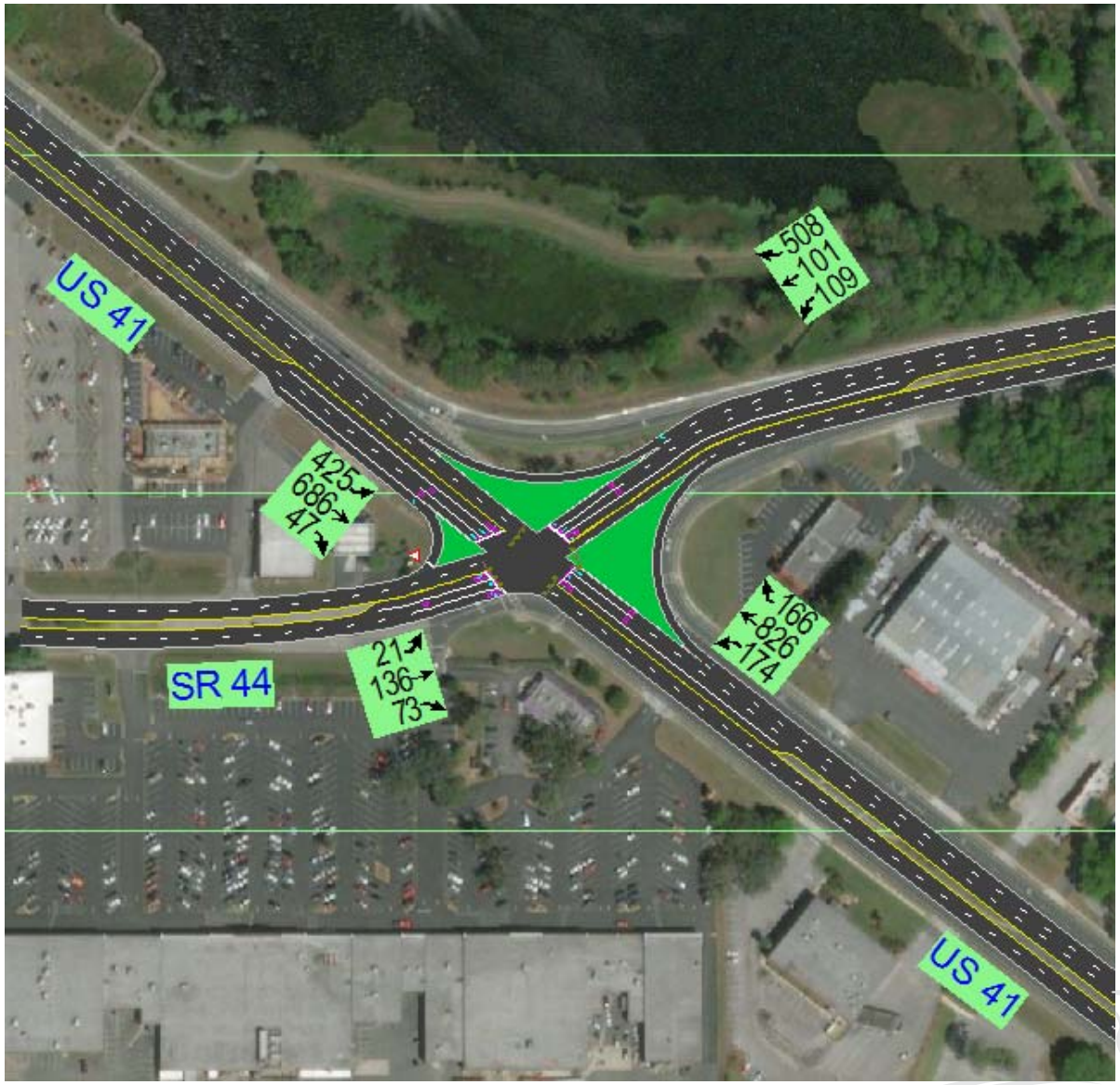
STAGE 2

OPERATIONAL ANALYSIS

FDOT

US 41 / SR 44 – STAGE 2 OPERATIONAL ANALYSIS

- Signalized Intersection (Existing)
- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2040)

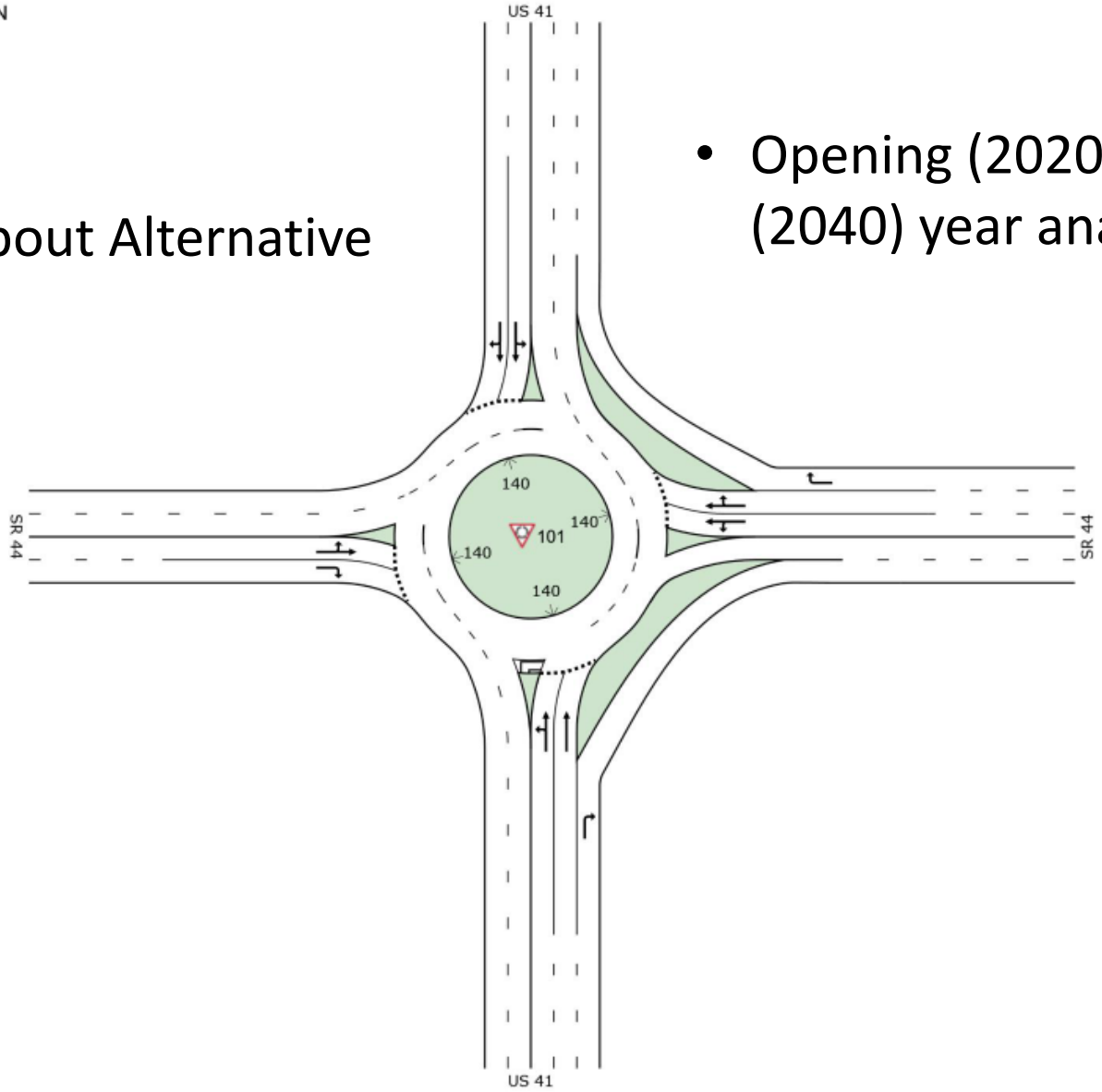


US 41 / SR 44 – STAGE 2 OPERATIONAL ANALYSIS

- Signalized Intersection Modified - SB Dual Left Turn Lane (Proposed)
- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2040)

US 41 / SR 44 – STAGE 2 OPERATIONAL ANALYSIS

Roundabout Alternative



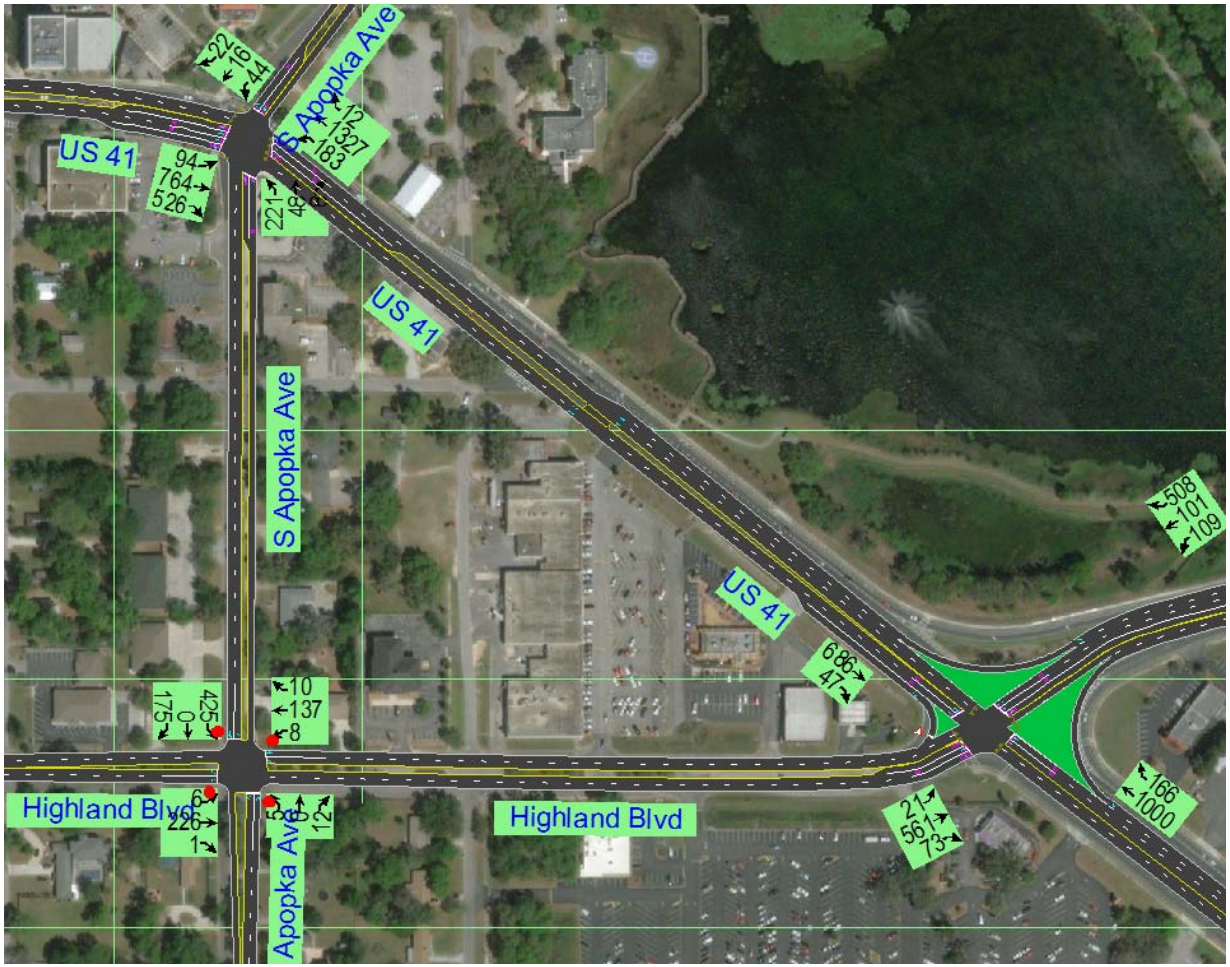
- Opening (2020) and Design (2040) year analysis

US 41 / SR 44 – STAGE 2 OPERATIONAL ANALYSIS

- Signalized Restricted Crossing U-Turn Alternative
- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2040)

US 41 / SR 44 – STAGE 2 OPERATIONAL ANALYSIS

- Quadrant Roadway Alternative
- Opening (2020) and Design (2040) year analysis
- Volumes shown for the AM Peak (2040)




STAGE 2
SPICE
FDOT

Update HSM inputs base condition for site specific conditions

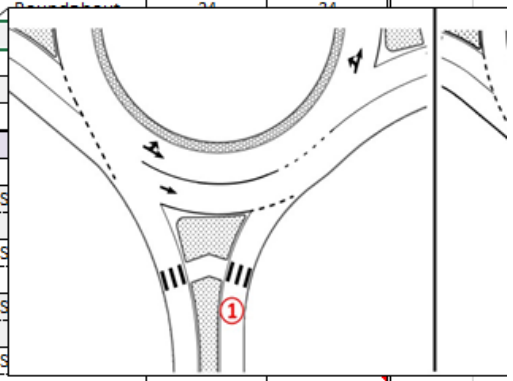
Input		Control Strategy: Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Signalized RCUT	
Keep default values below here for planning-level analysis, override with actual values for full HSM Analysis						
Reset Planning Inputs to Defaults	Part C CMFS Optional For Stage 1 ICE, Required for Stage 2 ICE					
Skew Angle	A yellow cell indicates the value may be used in the SPF computation	N/A	N/A	N/A	Scroll Down for Signalized RCUT SPF Inputs	All yellow cells will be automatically populated by a macro. If users want to do a planning-level analysis, they can leave the automatic inputs as-is
Lighting Present		Yes	Yes			
# of Approaches Permissive LT Signal Phasing		0	0			
# of Approaches Perm/Prot LT Signal Phasing		3	2			
# of Approaches Protected LT Signal Phasing		1	2			
Number of Approaches with Right-Turn-on-Red Prohibited		0	0			
Red Light Cameras Present		No	No			
Number of Major Street Through Lanes		0	0			
Number of Minor Street Lanes		0	0			
# of Major St Approaches w/ Right-Turn Channelization		0	0			
Number of Approaches with U-Turn Prohibited		0	0			
Pedestrian Volume by Activity Level		Low (50)	Low (50)			
User Specified Sum of all daily pedestrian crossing volumes		50	50			
Max # of Lanes Crossed by Pedestrians		6	6			
Number of Bus Stops within 1000' of Intersection		0	0			
Schools within 1000' of intersection		No	No			
Number of Alcohol Sales Establishments within 1000' of Intersection		4	4			

Update Roundabout CMF inputs from the base condition for site specific conditions

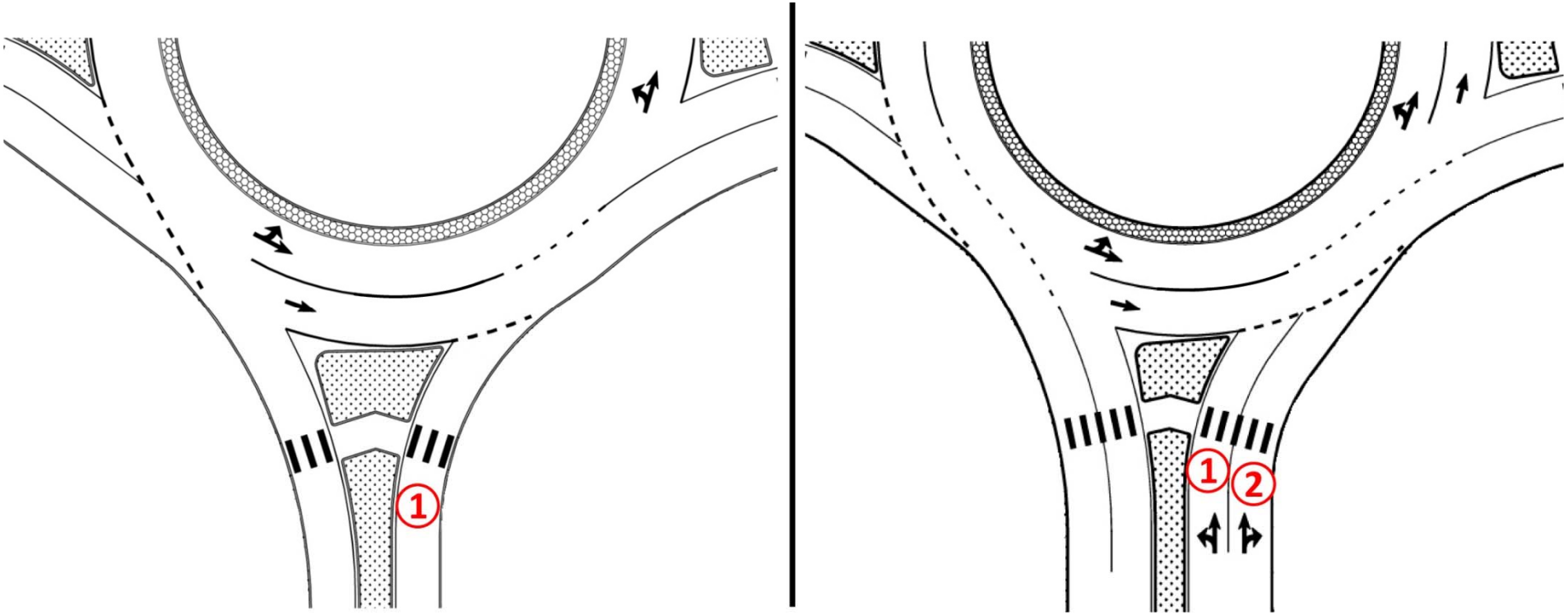
		Control Strategy			
Input		Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Signalized RCUT
	Roundabout CMF Inputs				
Inscribed Circle Diameter (ft)					
Leg 1 (Major Leg #1)	Leg 1 (Major Leg #1)				
Opening Year Entering AADT				15,150	
Leg has Right-Turn Bypass				Yes	
# of Access Points within 250' of Yield Line					
Entering Width (ft)				30	
# of Entering Lanes				2	
# of Circulating Lanes				1	
Leg 2 (Major Leg #2)	Leg 2 (Major Leg #2)				
Opening Year Entering AADT				15,150	
Leg has Right-Turn Bypass				No	
# of Access Points within 250' of Yield Line					
Entering Width (ft)				30	
# of Entering Lanes				2	
# of Circulating Lanes				2	
Leg 3 (Minor Leg #1)	Leg 3 (Minor Leg #1)				
Opening Year Entering AADT				7950	
Leg has Right-Turn Bypass				No	
# of Access Points within 250' of Yield Line					
Entering Width (ft)				30	
# of Entering Lanes				2	
# of Circulating Lanes				2	
Leg 4 (Minor Leg #2)	Leg 4 (Minor Leg #2)				
Opening Year Entering AADT				7,950	
Leg has Right-Turn Bypass				Yes	
# of Access Points within 250' of Yield Line					
Entering Width (ft)				30	
# of Entering Lanes				2	
# of Circulating Lanes				2	

US 41 / SR 44 – STAGE 2 SPICE ROUNDABOUT CMF INPUTS

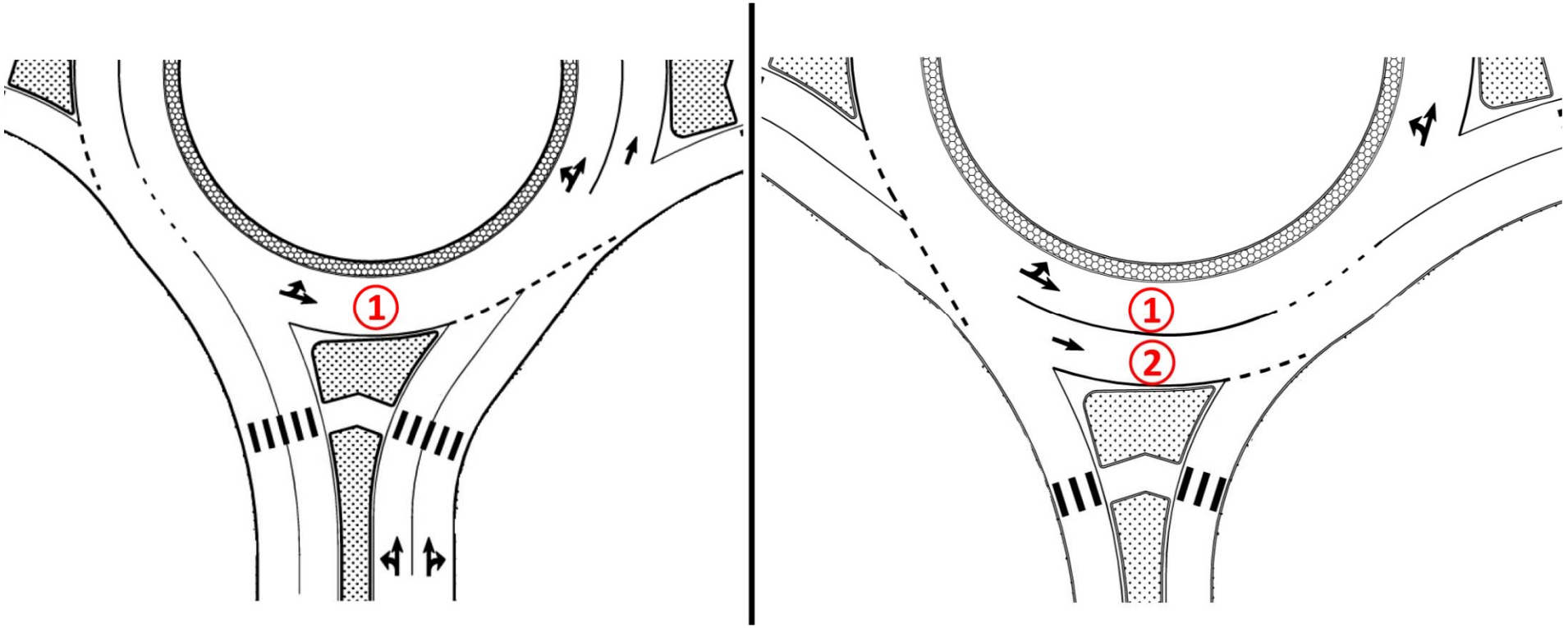
User Input Variable	Units	Definition	Applicable Ranges		
			Range for:	Lower Limit	Upper Limit
Control Strategy Selection					
Number of Major Street Lanes	lanes	Number of lanes on the major street (both directions - does not include turn lanes)	-	-	-
At-Grade Intersection Inputs					
Major/Minor Road AADT	veh/day	Average annual daily traffic (AADT) volume for the major and minor street approaches (see table for ranges).	See table starting in column I (to the right).		
Skew Angle	degrees	Intersecting angle between major street and minor street approaches *(hover cursor for graphical representation)*	-	-	-
Number of Major Street Through Lanes	lanes	Number of through lanes on the major street (both directions - includes shared through lanes)	-	-	-
Number of Minor Street Lanes	lanes	Number of lanes on the minor street (both directions - does not include turn lanes)	-	-	-
Inscribed Circle Diameter	feet		Roundabout	90	160
Opening Year Entering AADT	veh/day		Roundabout	See Table in Column O	
Leg has Right-Turn Bypass	yes/no		Roundabout	-	-
Access Point within 250' of Yield Line	-		Roundabout	0	8
Entering Width	feet				
Number of Entering Lanes	lanes	Number of lanes entering a leg of the roundabout *(hover cursor for graphical representation)*.			
Number of Circulating Lanes	lanes	Number of lanes circulating a leg of the roundabout *(hover cursor for graphical representation)*.			
Ramp Terminal Intersection Inputs					
Crossroad	-	References the major street of the ramp terminal intersection (i.e., the non-ramp terminal legs)			
Crossroad AADT - Inside Leg	veh/day	AADT volume of the crossroad leg located between the two ramp terminals of the interchange			
Crossroad AADT - Outside Leg	veh/day	AADT volume of the crossroad leg located outside of the interchange			
Ramp AADT - Exit	veh/day	AADT volume of the exit ramp			
Ramp AADT - Entrance	veh/day	AADT volume of the entrance ramp			
Exit Ramp Skew Angle	degrees	Skew angle equals 90 minus the intersection angle (in degrees) *(hover cursor for graphical representation)*.	Signalized	0	31,000
Presence of Non-Ramp Public Street Leg	yes/no	Any ramp that has a fourth leg that: (1) is a public street serving two-way traffic and (2) intersects with the crossroad at the terminal. At most ramp terminals, the public street leg will be on the opposite side of the crossroad from the exit ramp.	Stop-Controlled	0	70
			-	-	-
			Stop-Controlled	1	2



US 41 / SR 44 – STAGE 2 SPICE ENTRY LANES



US 41 / SR 44 – STAGE 2 SPICE ROUNDABOUT CIRCULATING LANES

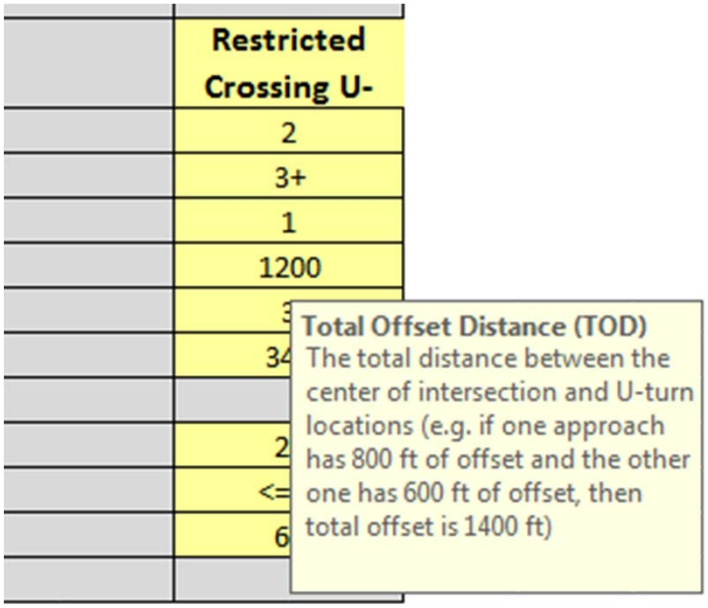


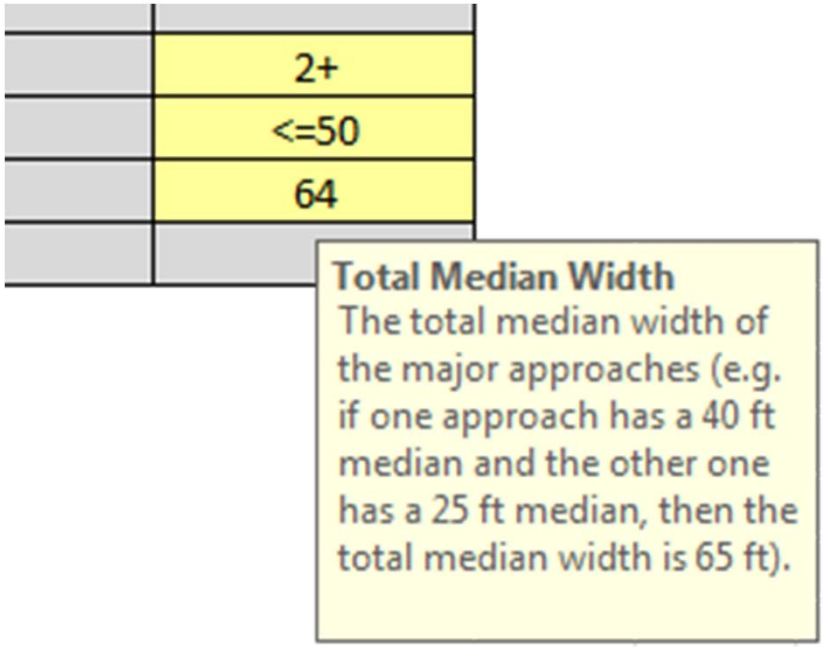
Update RCUT CMF inputs from the base condition for site specific conditions

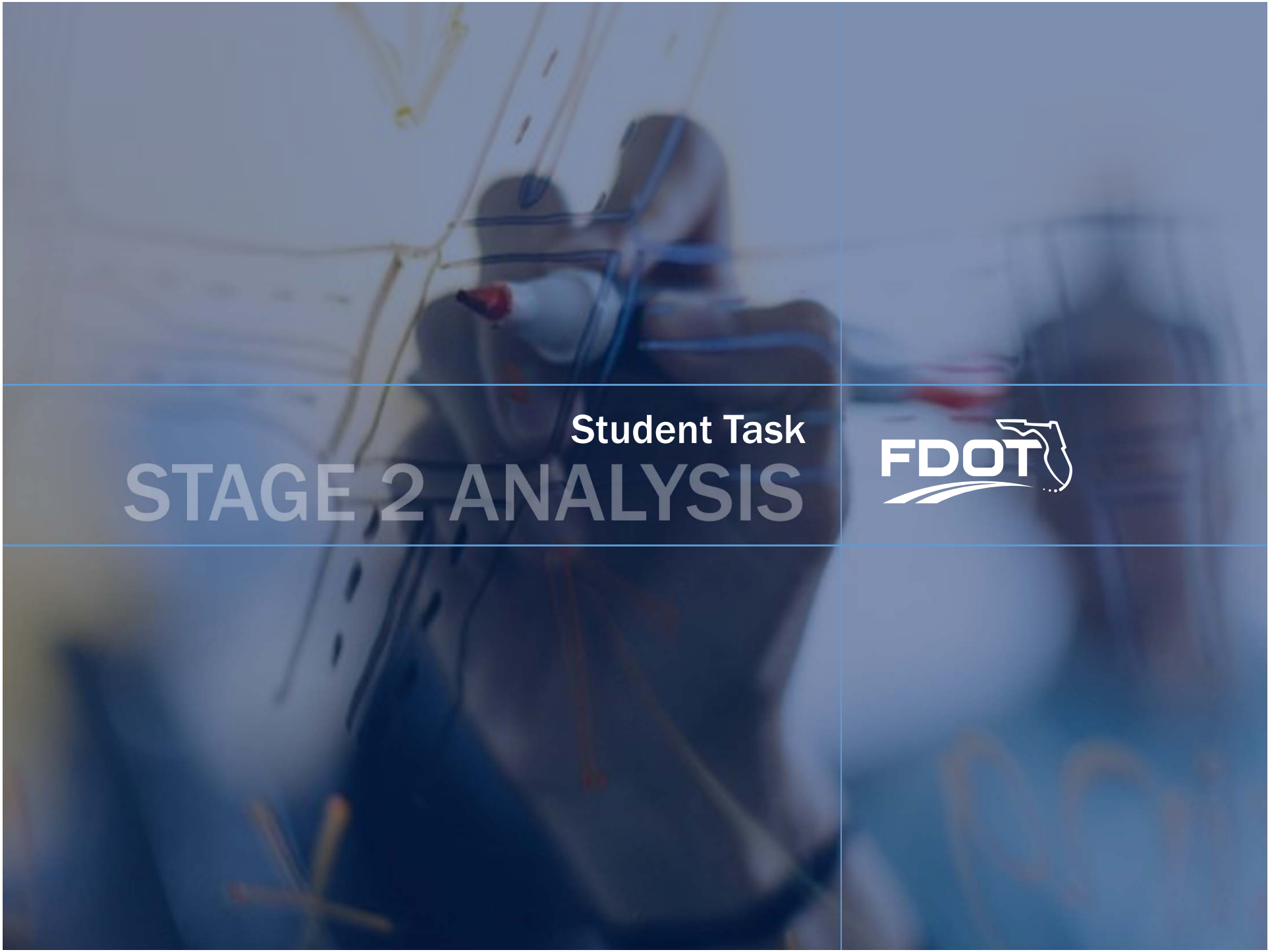
Input		Control Strategy			
		Traffic Signal	Traffic Signal (Alt)	2-lane Roundabout	Signalized RCUT
					Restricted Crossing U-
# U-Turns					2
# of Major Roadway Lanes					2
# of Minor Roadway Lanes					2
Total Offset Distance (ft)					1250
Number of Driveways					8
Total Deceleration Lane Length (ft)					400
Total Acceleration Lane Length (ft)					
Number of Left-Turn Lanes From Major Road					2+
Major Road Speed Limit (mph)					<=50
Total Median Width (ft)					50
Maximum Median Width (ft)					

RCUT CMFs in SPFs DEFINITIONS

- Total Offset Distance CMF – crashes increase with increased offset distance
- Median width CMF – crashes reduce with greater median width







Student Task

STAGE 2 ANALYSIS

FDOT

- Student Tasks
  - Complete Stage 2 SPICE Tool

SPICE Stage 2 Results

Federal Highway Administration (FHWA)
Safety Performance for Intersection Control Evaluation Tool

Compute Results

Results

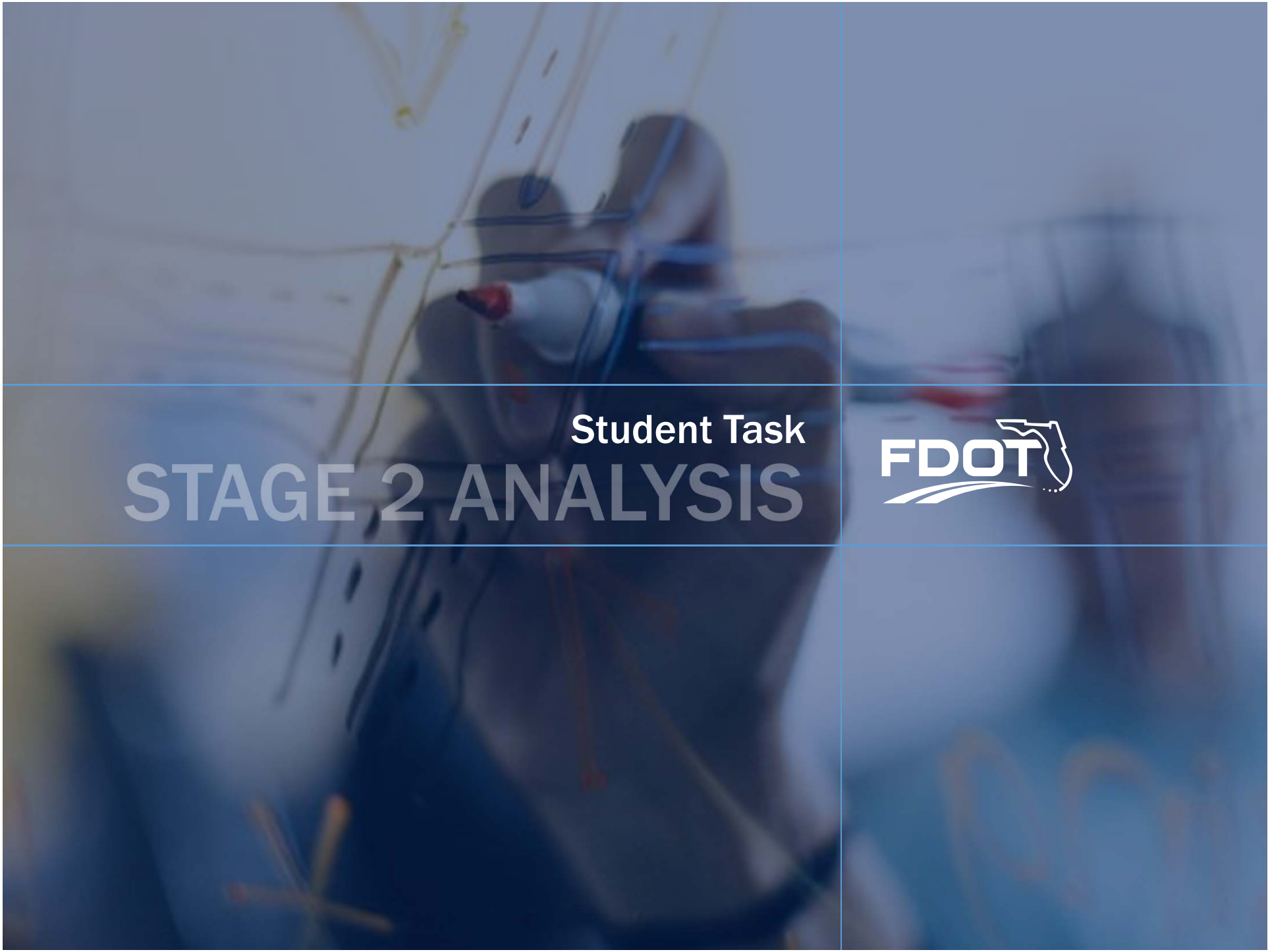
Summary of crash prediction results for each alternative

Project Information

Project Name:	FDOT District 7 ICE Training	**Intersection Type**	At-Grade Intersections
Intersection:	US 41 at SR 44	**Opening Year**	2020
Agency:	FDOT	**Design Year**	2040
Project Reference:	XXXXX.XX	**Facility Type**	On Urban and Suburban Arterial
City:	Inverness	**Number of Legs**	4-leg
State:	Florida	**1-Way/2-Way**	2-way Intersecting 2-way
Date:	7/1/2019	**# 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	Rank	AADT Within Prediction Range?	Source of Prediction
Traffic Signal	Total	18.52	23.92	445.06	3	Yes	Calibrated SPF w/ EB
	Fatal & Injury	5.56	7.29	134.69			
Traffic Signal (Alt)	Total	17.59	22.71	422.67	2	Yes	Calibrated SPF w/ EB
	Fatal & Injury	5.28	6.93	127.97			
2-lane Roundabout	Total	16.49	20.50	388.14	1	No	Uncalibrated SPF
	Fatal & Injury	2.52	3.21	60.14			
Signalized RCUT	Total	30.17	40.55	740.81	4	No	Uncalibrated SPF
	Fatal & Injury	7.46	10.17	184.53			



Student Task

STAGE 2 ANALYSIS

FDOT

- Student Tasks
  - Complete Stage 2 FDOT ICE Tool
    - Update costs under the *Cost Parameters* tab
    - Update delay under the *Delay* tab

STAGE 2

FDOT ICE TOOL

US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – SAFETY INPUTS

At-Grade Intersections	Total Design & Construction	Total Right of Way Costs	Operating & Maintenance	Signal Retiming	Lighting	Signal Maintenance	Roundabout Landscaping
Traffic Signal	$ -	$ -	Cost Period	$ 5,000 Every 3 years	$ 1,000 1 (yearly)	$ 4,000 1 (yearly)	$ - 1 (yearly)
Traffic Signal (Alt.)	$ 790,000	$ -	Cost Period	$ 5,000 Every 3 years	$ 1,000 1 (yearly)	$ 4,000 1 (yearly)	$ - 1 (yearly)
Roundabout	$ 2,470,000	$ 725,000	Cost Period	$ - 1 (yearly)	$ 3,000 1 (yearly)	$ - 1 (yearly)	$ 2,000 1 (yearly)
Signalized Restricted Crossing U-Turn (RCUT)	$ 2,360,000	$ 100,000	Cost Period	$ 12,500 Every 3 years	$ 2,000 1 (yearly)	$ 10,000 1 (yearly)	$ - 1 (yearly)
Quadrant Roadway Intersection	$ 1,500,000	$ 2,000,000	Cost Period	$ 15,000 Every 3 years	$ 3,000 1 (yearly)	$ 12,000 1 (yearly)	$ - 1 (yearly)

US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – SAFETY INPUTS

At-Grade Intersection	Crash Type	Opening Year	Design Year
Traffic Signal	Total	18.52	23.92
	Fatal & Injury	5.56	7.29
Traffic Signal (Alt.)	Total	17.59	22.71
	Fatal & Injury	5.28	6.93
Roundabout	Total	16.49	20.50
	Fatal & Injury	2.52	3.21
Signalized Restricted Crossing U-Turn (RCUT)	Total	30.17	40.55
	Fatal & Injury	7.46	10.17
Quadrant Roadway Intersection	Total	N/A	N/A
	Fatal & Injury	N/A	N/A

US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – OPERATIONS INPUTS

Roundabout Results (Design AM Peak)

Site: 101 [US 41 at SR 44 - 2040 - AM]

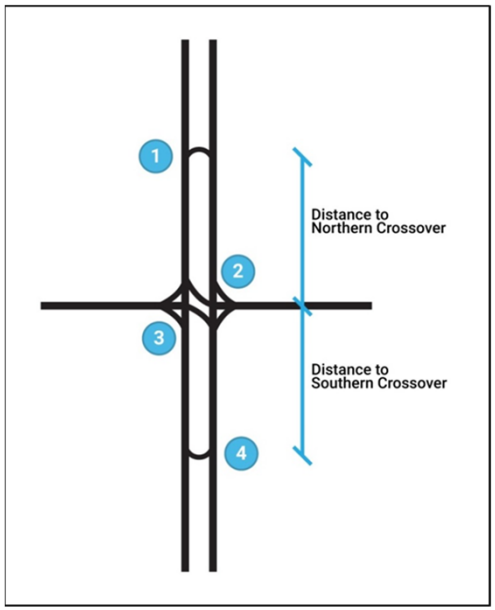
US 41 at SR 44
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 41											
3	L2	189	3.0	0.713	19.1	LOS C	7.5	191.3	0.84	1.13	29.2
8	T1	898	3.0	0.713	19.1	LOS C	7.5	191.3	0.84	1.13	29.4
18	R2	180	3.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	37.8
Approach		1267	3.0	0.713	16.4	LOS C	7.5	191.3	0.72	0.97	30.3
East: SR 44											
1	L2	118	3.0	0.300	12.7	LOS B	1.1	28.6	0.72	0.76	30.5
6	T1	110	3.0	0.300	11.6	LOS B	1.1	28.6	0.70	0.73	32.5
16	R2	552	3.0	0.300	1.3	LOS A	1.1	28.6	0.08	0.09	37.0
Approach		780	3.0	0.300	4.5	LOS A	1.1	28.6	0.27	0.28	35.1
North: US 41											
7	L2	462	3.0	0.684	15.9	LOS C	8.2	209.4	0.77	1.02	29.5
4	T1	746	3.0	0.684	15.1	LOS C	8.4	213.8	0.76	0.99	31.0
14	R2	51	3.0	0.684	14.9	LOS B	8.4	213.8	0.76	0.99	30.4
Approach		1259	3.0	0.684	15.4	LOS C	8.4	213.8	0.76	1.00	30.4
West: SR 44											
5	L2	23	3.0	0.395	15.7	LOS C	1.6	40.5	0.78	0.86	31.1
2	T1	148	3.0	0.395	15.7	LOS C	1.6	40.5	0.78	0.86	30.8
12	R2	79	3.0	0.213	13.3	LOS B	0.7	17.8	0.76	0.76	30.7
Approach		250	3.0	0.395	14.9	LOS B	1.6	40.5	0.77	0.83	30.8
All Vehicles		3557	3.0	0.713	13.3	LOS B	8.4	213.8	0.64	0.82	31.3

US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – OPERATIONS INPUTS

Signalized RCUT Intersection Results (Design AM Peak)



HCM Signalized Intersection Capacity Analysis
5: US 41 & NB Median Cut & SR 44

D7 ICE Training
2040 - RCUT - AM

Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	SBR	NWL	NWR
Lane Configurations											
Traffic Volume (vph)	0	0	230	0	0	0	0	795	148	174	0
Future Volume (vph)	0	0	230	0	0	0	0	795	148	174	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.5					4.5	4.5	4.5	
Lane Util. Factor			0.88					0.91	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)			2787					5085	1583	1770	
Flt Permitted			1.00					1.00	1.00	0.95	
Satd. Flow (perm)			2787					5085	1583	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	250	0	0	0	0	864	161	189	0
RTOR Reduction (vph)	0	0	158	0	0	0	0	0	43	0	0
Lane Group Flow (vph)	0	0	92	0	0	0	0	864	118	189	0
Turn Type			Prot					NA	Perm	Prot	
Protected Phases			8					6		8	
Permitted Phases									6		
Actuated Green, G (s)			15.1					65.9	65.9	15.1	
Effective Green, g (s)			15.1					65.9	65.9	15.1	
Actuated g/C Ratio			0.17					0.73	0.73	0.17	
Clearance Time (s)			4.5					4.5	4.5	4.5	
Vehicle Extension (s)			3.0					3.0	3.0	3.0	
Lane Grp Cap (vph)			467					3723	1159	296	
v/s Ratio Prot			0.03					c0.17		c0.11	
v/s Ratio Perm									0.07		
v/c Ratio			0.20					0.23	0.10	0.64	
Uniform Delay, d1			32.2					3.9	3.5	34.9	
Progression Factor			1.00					0.80	0.45	1.05	
Incremental Delay, d2			0.2					0.1	0.2	4.3	
Delay (s)			32.4					3.2	1.8	40.9	
Level of Service			C					A	A	D	
Approach Delay (s)	32.4				0.0			3.0		40.9	
Approach LOS	C				A			A		D	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

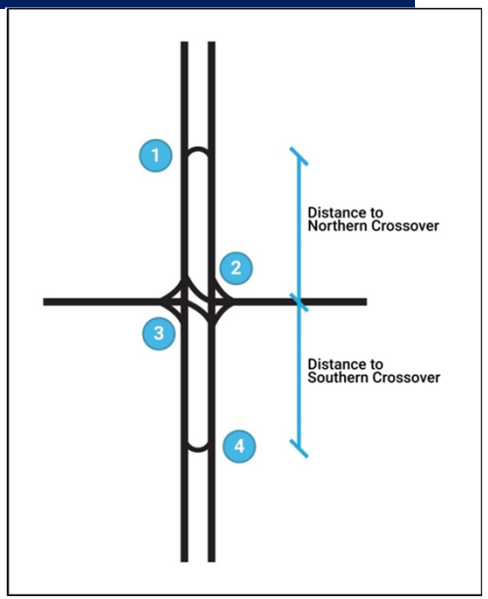
US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – OPERATIONS INPUTS

RCUT N-S

Use this sheet to enter the delay information for a Signalized RCUT with the major street running North-South. (Requires turning movement count demand inputs)

User must enter value on this sheet

	Eastern Crossover	Western Crossover
Distance from main intersection to:	650	550
Free-flow speed on major street:	45	



Design Year AM Peak					Design Year PM Peak				
Intersection 1	SB Thru	NB U-Turn			Intersection 1	SB Thru	NB U-Turn		
Volume	**1158**	**210**			Volume	**1457**	**302**		
Delay	3.3	37.4			Delay	4.8	34.1		
Intersection 2	NB Left	NB Thru	NB Right	WB Right	Intersection 2	NB Left	NB Thru	NB Right	WB Right
Volume	**174**	**847**	**302**	**718**	Volume	**117**	**872**	**293**	**1035**
Delay	40.9	8.8	3.5	28.9	Delay	39.3	16.6	5	20.2
Intersection 3	SB Left	SB Thru	SB Right	EB Right	Intersection 3	SB Left	SB Thru	SB Right	EB Right
Volume	**425**	**795**	**148**	**230**	Volume	**460**	**1076**	**223**	**366**
Delay	26.2	3.2	1.8	32.4	Delay	14.5	3.4	1.4	38
Intersection 4	NB Thru	SB U-Turn			Intersection 4	NB Thru	SB U-Turn		
Volume	**1166**	**157**			Volume	**1089**	**193**		
Delay	4.7	44.6			Delay	5.5	44.4		

Quadrant Roadway Delay Calculation

Northbound Left Delay AM 2020		
NBT Delay at US 41/SR 44	16.6	Seconds
Distance along US 41	0.32	Miles
Posted Speed along US 41	30	MPH
Travel Time NB along US 41	38.4	Seconds
NBL Delay at US 41/Apopka Ave	52.5	Seconds
Distance along Apopka Ave	0.21	Miles
Posted Speed along Apopka Ave	25	MPH
Travel Time SB along Apopka Ave	30.24	Seconds
Distance along Highland Blvd	0.25	Miles
Posted Speed along Highland Blvd	25	MPH
Travel Time NB along Highland Blvd	36.0	Seconds
(Signal Alt.) NBL Delay at US 41/SR 44	15.1	Seconds
Total Delay	86.6	Seconds

Southbound Left Delay AM 2020		
EBR Delay at US 41/Apopka Ave	42.4	Seconds
Distance along Apopka Ave	0.21	Miles
Posted Speed along Apopka Ave	25	MPH
Travel Time SB along Apopka Ave	30.24	Seconds
SBL Delay at Highland Blvd/Apopka Ave	17.8	Seconds
Distance along Highland Blvd	0.25	Miles
Posted Speed along Highland Blvd	25	MPH
Travel Time EB along Highland Blvd	36.0	Seconds
EBT Delay at US 41/SR 44	27.5	Seconds
EBT Delay at US 41/Apopka Ave	29.6	Seconds
Distance along US 41	0.32	Miles
Posted Speed along US 41	30	MPH
Travel Time SB along US 41	38.4	Seconds
(Signal Alt.) SBL Delay at SR710/Northlake Blvd	43.0	Seconds
Total Delay	42.9	Seconds

Quadrant Roadway Total Delay Calculation

	AM 2020	PM 2020	AM 2040	PM 2040
Signal Delay	25.3	29.3	30.8	49.2
Signal Volume	2,609	3,265	3,272	3,947
Total Delay	66,008	95,665	100,778	194,192
QR Main Int Delay	18.6	19.5	25.8	27.2
QR Main Int Volume	2,609	3,265	3,272	3,947
QR LT Delay	129.6	142.9	177.3	224.5
QR LT Volume	485	484	599	577
QR Total Delay	111,383	132,831	190,620	236,895
Ratio	1.69	1.39	1.89	1.22
New Int Delay	42.7	40.7	58.3	60.0

US 41 / SR 44 – STAGE 2 FDOT ICE TOOL – OPERATIONS INPUTS

				Opening Year			Design Year		
At-Grade Intersections				Average vehicle delay			Average vehicle delay		
Control Strategy		Delay Type	Units	AM peak	PM peak	Weekend peak	AM peak	PM peak	Weekend peak
Traffic Signal	Single Input	Single Input	sec/veh	25.3	29.3		30.8	49.2	
Traffic Signal (Alt.)	Single Input	Single Input	sec/veh	21.8	26.6		26.2	46.6	
Roundabout	Single Input	Single Input	sec/veh	8.3	11.8		13.3	21.4	
Signalized Restricted Crossing U-Turn (RCUT)	Select Input Type	Worksheet (N-S)	sec/veh	28.2	26.5		27.1	27.0	
Quadrant Roadway Intersection	Single Input	Single Input	sec/veh	42.7	40.7		58.3	60.0	

Analysis Summary

Cost Categories	Net Present Value of Costs				
	Traffic Signal	Traffic Signal (Alt.)	Roundabout	Signalized Restricted Crossing U-Turn (RCUT)	Quadrant Roadway Intersection
Planning, Construction & Right of Way Costs	$ -	$ 790,000	$ 2,615,000	$ 2,380,000	$ 1,900,000
Post-Opening Costs	$ 98,229	$ 98,229	$ 72,952	$ 238,276	$ 294,686
Auto Passenger Delay	$ 27,475,897	$ 24,060,755	$ 10,420,903	$ 22,786,680	$ 45,708,220
Truck Delay	$ 13,470,641	$ 11,796,047	$ 5,108,726	$ 11,171,554	$ 22,411,030
Safety	$ 27,406,287	$ 26,037,182	$ 13,243,933	$ 38,103,141	--
Total cost	**$68,451,054**	**$62,782,213**	**$31,461,514**	**$74,679,651**	**$70,313,935**

Select Base Case for Benefit-Cost Comparison: (Choose from list)	Traffic Signal

Benefit Categories	Net Present Value of Benefits Relative to Base Case				
	Traffic Signal	Traffic Signal (Alt.)	Roundabout	Signalized Restricted Crossing U-Turn (RCUT)	Quadrant Roadway Intersection
Auto Passenger Delay		$ 3,415,141	$ 17,054,994	$ 4,689,217	$ (18,232,323)
Truck Delay		$ 1,674,595	$ 8,361,915	$ 2,299,088	$ (8,940,388)
Safety		$ 1,369,105	$ 14,162,354	$ (10,696,854)	
Net Present Value of Benefits		**$ 6,458,841**	**$ 39,579,263**	**$ (3,708,549)**	**$ (27,172,711)**
Net Present Value of Costs		**$ 790,000**	**$ 2,589,723**	**$ 2,520,048**	**$ 2,096,457**
Net Present Value of Improvement		**$ 5,668,841**	**$ 36,989,540**	**$ (6,228,597)**	**$ (29,269,169)**
Benefit-Cost (B/C) Ratio		**8.18**	**15.28**	**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**
Delay B/C		**6.44**	**9.81**	**2.77**	**preferred. Benefits are less than base case and cost is greater than base**
Safety B/C		**1.73**	**5.47**	**preferred. Benefits are less than base case and cost is greater than base**	

STAGE 2 FORM

FDOT

- Alternative Selection Justification
  - Signal Control (Existing)
    - Pros: No construction cost associated with alternative
    - Cons: Additional SB Left Turn need identified
  - Modified Signal Control with dual SB left turn
    - Pros: Lowest construction cost and no ROW cost
    - Cons: Little safety benefit
  - Signalized RCUT
    - Pros: Lower construction cost than roundabout
    - Cons: Negative B/C and NPV, worst predicted safety performance
  - Roundabout
    - Pros: Ranks first in delay and first in safety performance
    - Cons: High construction and ROW cost
  - Quadrant Roadway
    - Pros: Lower construction cost than roundabout
    - Cons: High ROW cost at Apopka Ave. intersection with potential Walgreens

Roundabout is the preferred alternative

ICE Form Stage 2

Control Strategy Evaluation Summary

Control Strategy Evaluation		
Provide a brief justification as to why each of the following is either viable or not viable. If a single control strategy is recommended, select it as the only strategy to be advanced.		
Control Strategy	Strategy to be Advanced?	Justification
Signalized Control	No	An additional southbound left turn lane has already been identified as a needed improvement at intersection.
Roundabout	Yes	Alternative provides the highest Benefit-Cost ratio as well as the best Net Present Value. It is expected to have the best operational performance and the lowest injury/fatal predicted crashes.
RCUT (Signalized)	No	Alternative has a negative B/C ratio and NPV. ROW impacts on the north leg to accommodate the U-Turn lanes make the alternative less feasible.
Quadrant Roadway	No	Potential ROW impacts to Walgreens and associated costs with alternative yield a negative B/C ratio and NPV.
Signalized Control (Alt)	No	Alternative provides the second-best B/C and NPV from the alternative comparison.

US 41 / SR 44 – STAGE 2 FORM

Resolution					
To be filled out by FDOT District Traffic Operations Engineer and District Design Engineer					
Project Determination	Identified Control Strategy Approved				
Comments					
DTOE Name		Signature		Date	
DDE Name		Signature		Date	


DISCUSSION & QUESTIONS
FDOT