

Orlando, FL

November 7-8, 2024



2024 TRANSPORTATION SYMPOSIUM



Intersection Control Evaluation (ICE) Implementation in Florida

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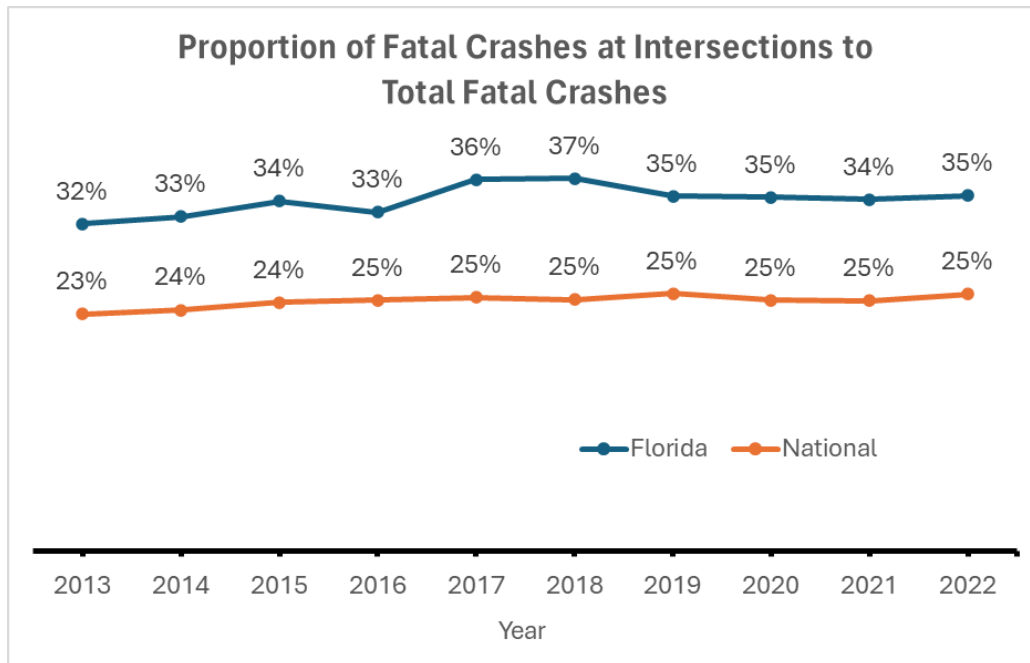
Susan Joel – FDOT In-House Consultant D1 Traffic Operations

Outline

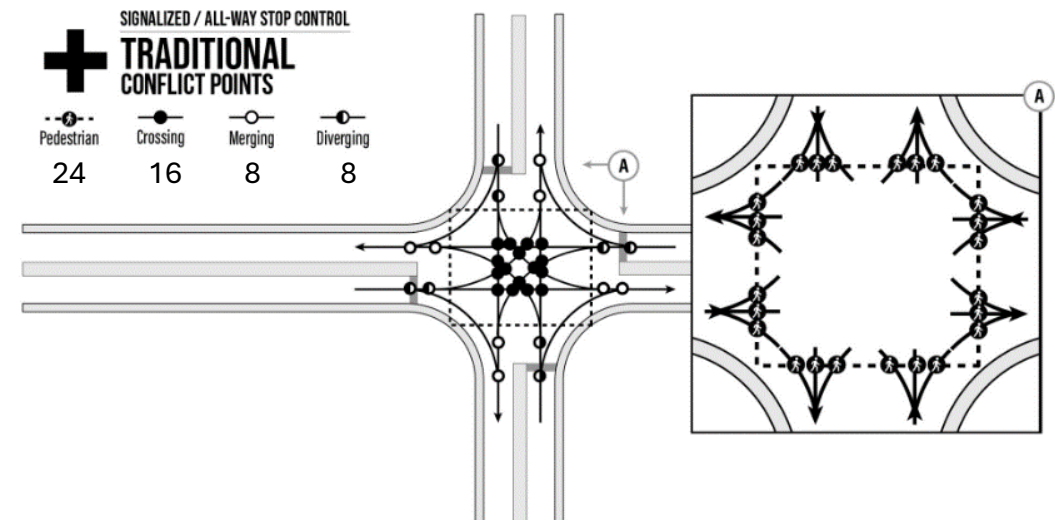
- Why ICE?
- Understand Applicability and Process
- Review Tools and Resources
- Learn about Implementation in Districts

Background

- Intersections take up a small portion of our road network, but are associated with high percentage of traffic fatalities and severe injuries

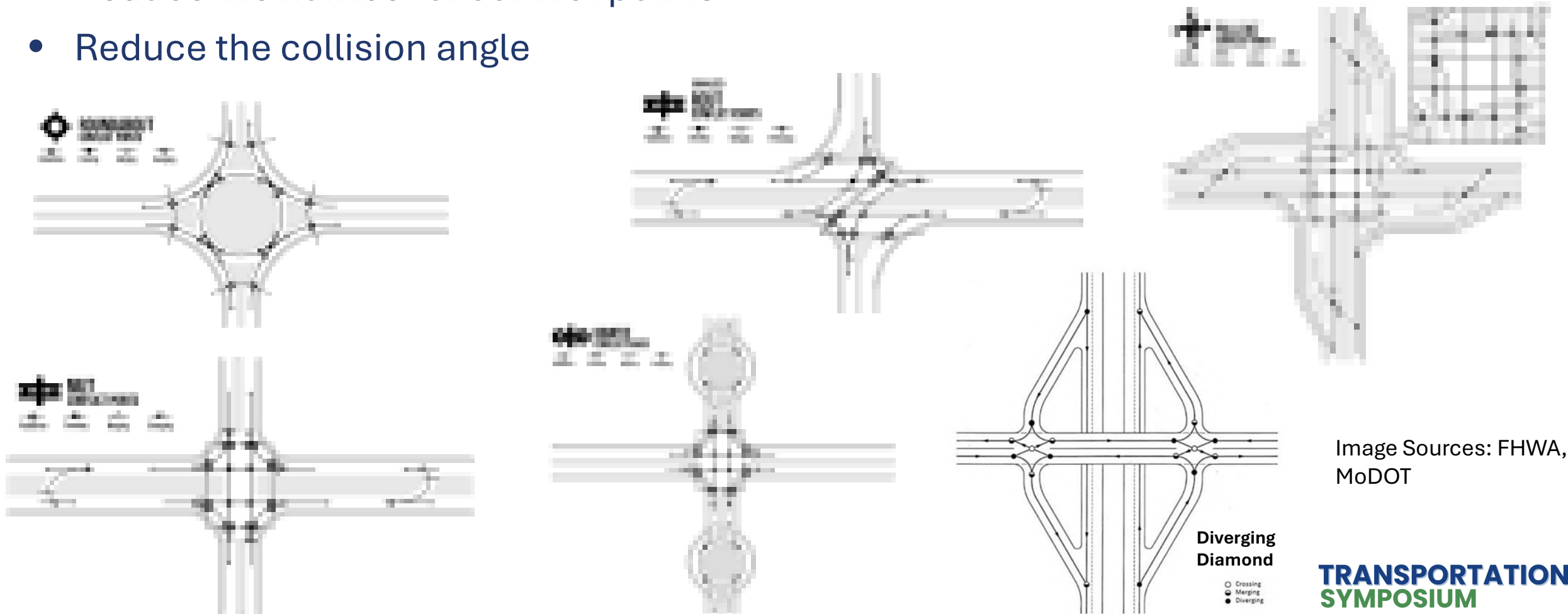


- Intersection choices have historically been stop control or signalization
- Innovative intersection Concept – FHWA Proven Safety Countermeasures

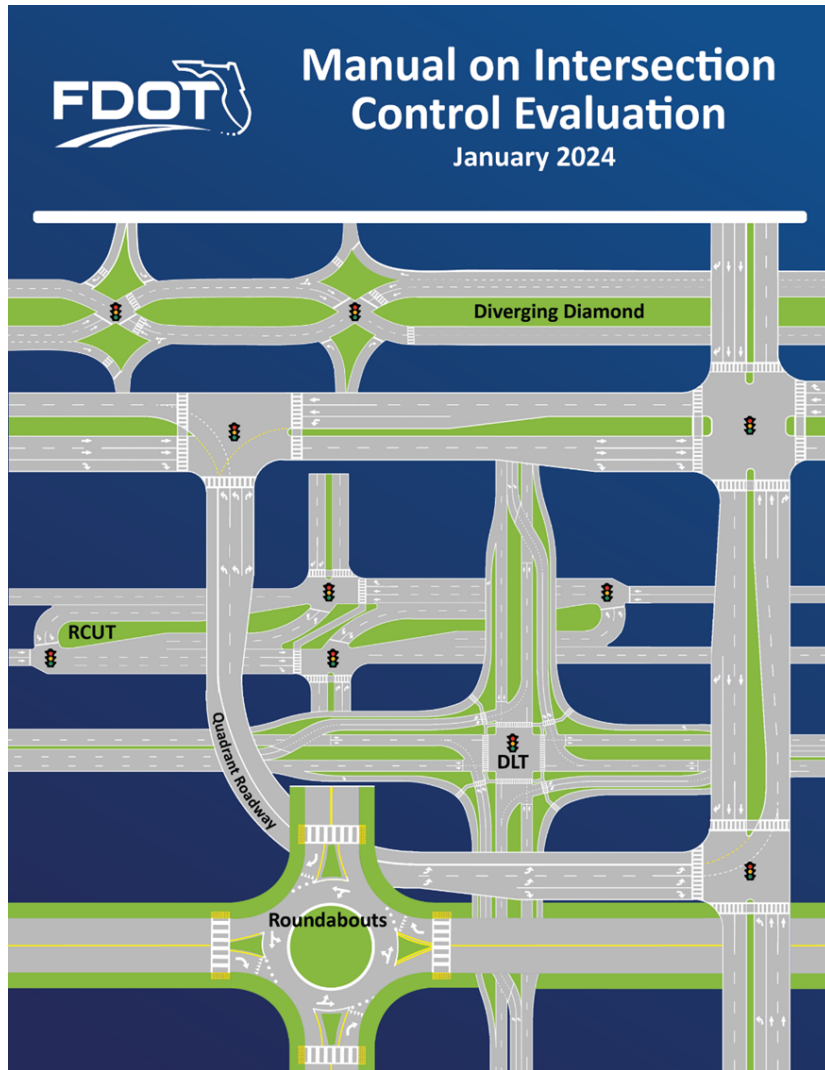


Innovative Intersection Designs

- Reduce the number of conflict points
- Reduce the collision angle



Why ICE in Florida?



- Intersection Control Evaluation (ICE) entails a performance-based analytical approach to
 - screen intersection alternatives among conventional and innovative intersection designs,
 - identify an optimal **context-sensitive** solution for all road users
- The first FDOT ICE policy in 2018
- Several updates made to ICE procedure, with latest in January 2024

Applicability of ICE – When ICE is Required

Signalization of a new or existing intersection

Major reconstruction of an existing signalized intersection

Conversion of a directional/ bi-directional median opening to a full median opening

Driveway/Connection permit applications for category E, F, G

DTOE and DDE consider an ICE a good fit

Applicability of ICE – When ICE is **NOT** Required

Signalization of a midblock pedestrian crosswalk

No substantive proposed changes to the intersection

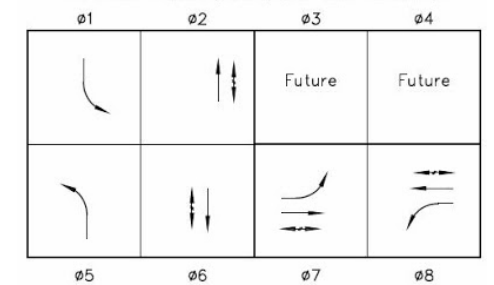
Minor intersection operational improvements

Encouraged for local roadways, not required

Recommended for ramp terminal intersections, not required



PHASE SEQUENCE DIAGRAM

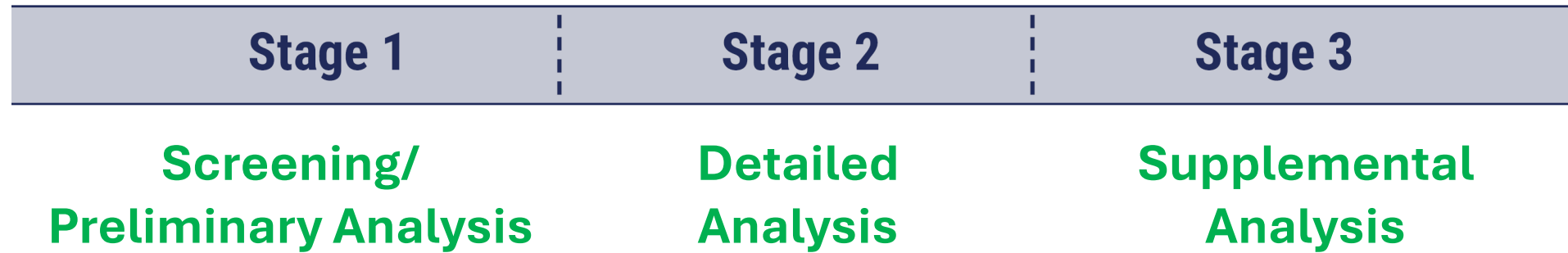




Intersection Control Evaluation Process and Stages

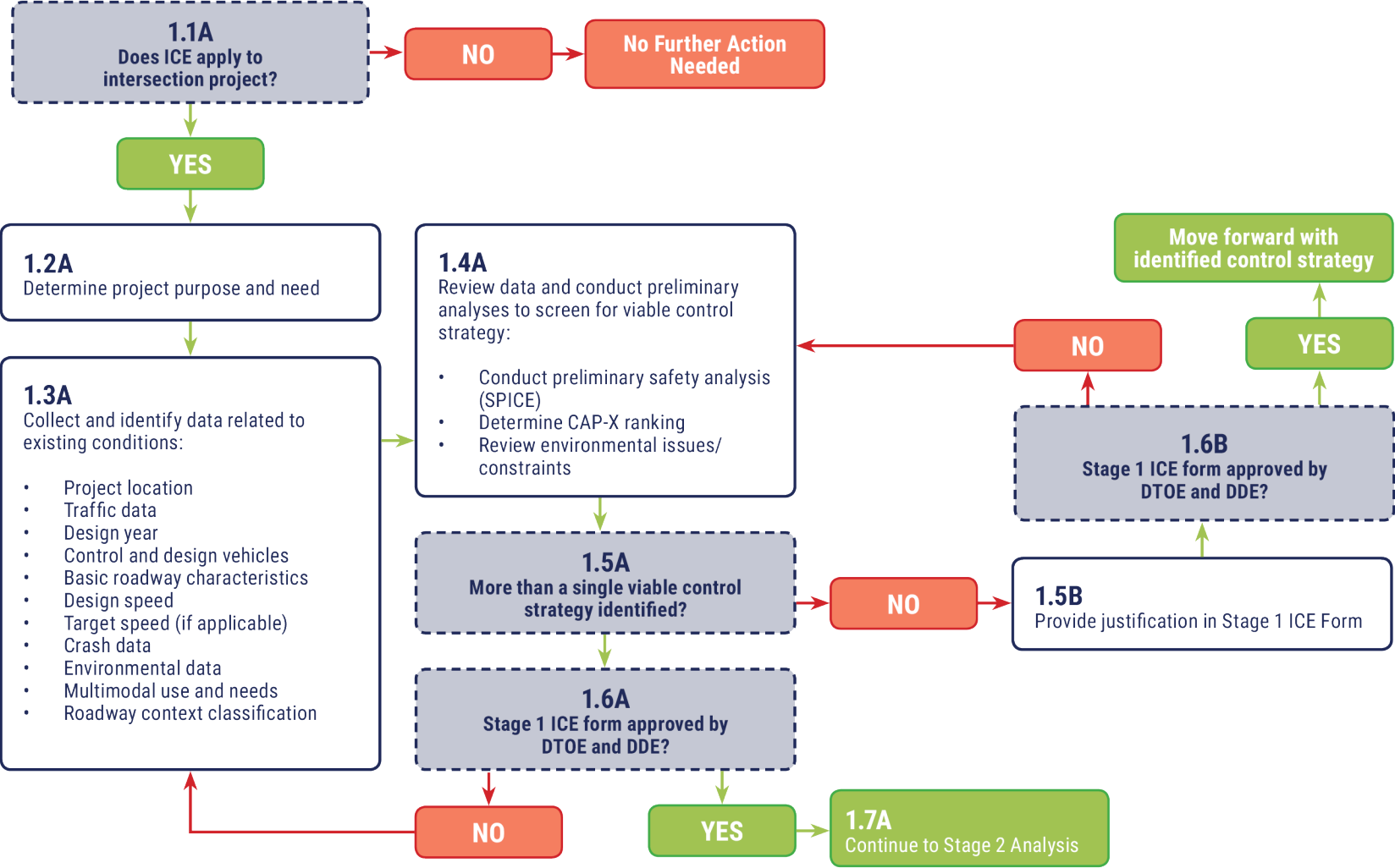


Conducting an ICE - ICE Stages



- Not all stages are required for every project
 - A single control strategy cannot be identified at a given stage
 - Funding source

Stage 1: Screening/Preliminary Analysis



Available Tools

CAP-X

SPICE

CAP- X: Capacity Analysis for Planning of Junctions



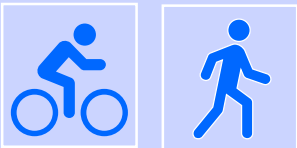
Microsoft Excel-based spreadsheet tool



Evaluate and compare operational performance



Simplified HCM methodology based on Critical Lane Volume



Score-based Multimodal Ped and Bike accommodations analysis



U.S. Department of Transportation
Federal Highway Administration



Capacity Analysis for
Planning of Junctions

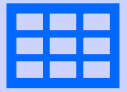
CAP-X

Cap-X Tool Customization
for Florida DOT
January, 2024



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SPICE: Safety Performance for ICE



Microsoft Excel-based spreadsheet tool



Evaluate and compare safety performance

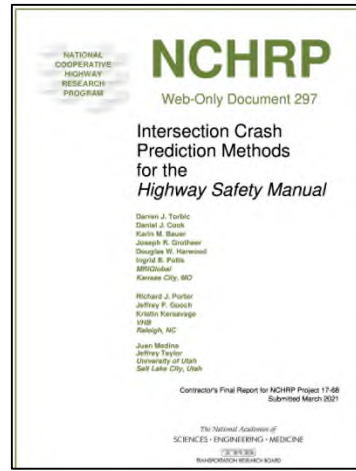
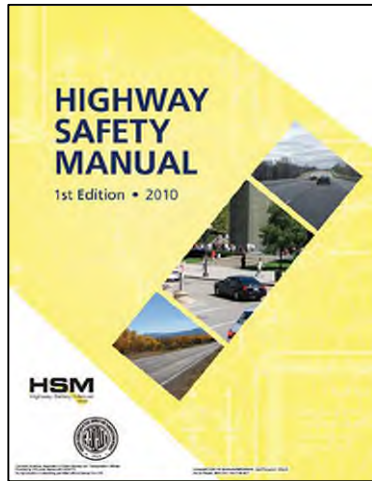
Crash Prediction method

Safe System for Intersections (SSI) method

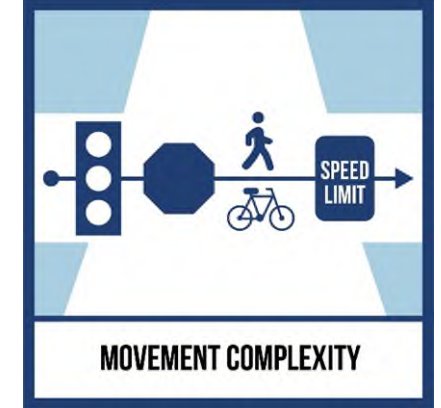
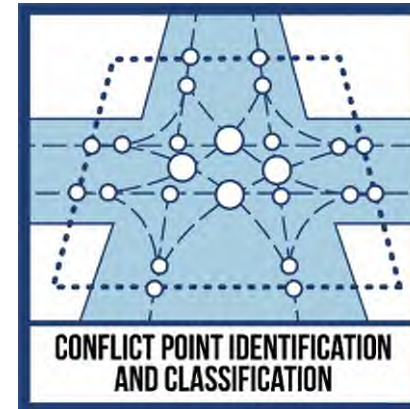
| Safety Performance for Intersection Control Evaluation Tool | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|
| Introduction | | | | | | Overview | | | | | |
| The Safety Performance for Intersection Control Evaluation (SPICE) Tool was developed to provide an easy-to-use tool that automates the predictive safety analysis of intersections. This tool will allow analysts conducting Intersection Control Evaluations (ICE) to be equipped with necessary safety information during the decision-making process, without having to research a myriad of crash modification factors (CMFs) and Safety Performance Functions (SPFs) in multiple sources. The SPICE tool will perform a comparative predictive safety analysis of different intersection control strategies. The results – crash frequency and severity for each alternative – will then enable safety performance of alternatives to be considered quantitatively like traffic operations, construction cost, maintenance cost, or other factors. FDOT SPICE Tool is a Florida specific adaptation of Federal Highway Administration (FHWA) SPICE Tool. | | | | | | The SPICE Tool performs safety analysis of at-grade intersection forms/control types and ramp terminal intersections of diamond interchanges. This user-friendly tool requires only data inputs that are readily available to the analyst. In addition, the SPICE tool has an option to conduct planning level analysis, where the tool assumes default values for data inputs that are challenging to obtain in the early stages of a project and/or have a very minor impact on the results. The SPICE tool assumes that certain attributes of the intersection – AADT, facility type, and number of legs – are the same for all alternatives. If they are not, users will be required to use the tool twice to get results. The tool will not allow simultaneous evaluation of at-grade intersections and ramp terminal intersections. For projects where analysis of both intersections and interchanges is needed, users are required to use the tool twice to get results. | | | | | |
| Worksheets | | | | | | | | | | | |
| Project Information: Provide general project information for reference purposes only. | | | | | | | | | | | |
| Definitions: Reference sheet with additional information related to inputs for the SPICE tool. | | | | | | | | | | | |
| Control Strategy Selection: Choose between At-Grade or Ramp Terminal intersection types to be included in the SPICE analysis. | | | | | | | | | | | |
| At-Grade Inputs: SPF and Part C CMF inputs for At-Grade intersections (Hidden if Ramp Terminals are being analyzed). | | | | | | | | | | | |
| Ramp Terminal Inputs: SPF and Part C CMF inputs for Ramp Terminal intersections (Hidden if At-Grade intersections are being analyzed). | | | | | | | | | | | |
| SSI Inputs: Safe System for Intersection inputs used to calculate SSI score | | | | | | | | | | | |
| Calibration: Inc | | | | | | | | | | | |
| Historical: Cras | | | | | | | | | | | |
| Results: Summ | | | | | | | | | | | |
| Additional Wor | | | | | | | | | | | |
| Maintenance | | | | | | | | | | | |
| Version: SPIC | | | | | | | | | | | |
| Agency: | | | | | | | | | | | |
| Project Reference: | | | | | | | | | | | |
| Maintained By: | | | | | | | | | | | |
| Contact Inform: | | | | | | | | | | | |
| Date: | | | | | | | | | | | |
| Disclaimer | | | | | | | | | | | |
| Analysis: | | | | | | | | | | | |
| Florida Department of Transportation Safety Performance for Intersection Control Evaluation Tool | | | | | | | | | | | |
| Compute Results | | | | | | | | | | | |
| Summary of total prediction results for each alternative | | | | | | | | | | | |
| Project Information | | | | | | | | | | | |
| Intersection Type | | | | | | | | | | | |
| Opening Year | | | | | | | | | | | |
| Design Year | | | | | | | | | | | |
| Facility Type | | | | | | | | | | | |
| Number of Legs | | | | | | | | | | | |
| L-View/R-View | | | | | | | | | | | |
| # of Major Street Lanes (both directions) | | | | | | | | | | | |
| Major Street Approach Speed | | | | | | | | | | | |
| SSI Score | | | | | | | | | | | |
| NO WARRANTY | | | | | | | | | | | |
| The user of this tool is responsible for the results of the analysis. The user of this tool is responsible for the results of the analysis. The user of this tool is responsible for the results of the analysis. | | | | | | | | | | | |
| Crash Prediction Summary | | | | | | | | | | | |
| SSI Score | | | | | | | | | | | |
| Control Strategy | | | | | | | | | | | |
| Crash Type | | | | | | | | | | | |
| Opening Year | | | | | | | | | | | |
| Design Year | | | | | | | | | | | |
| Total Project Life Cycle | | | | | | | | | | | |
| Crash Prediction Rank | | | | | | | | | | | |
| AADT Within SPF Prediction Range? | | | | | | | | | | | |
| Source of Prediction | | | | | | | | | | | |
| Opening Year | | | | | | | | | | | |
| Design Year | | | | | | | | | | | |
| Rank | | | | | | | | | | | |
| Traffic Signal (All) | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Minor Road Stop | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| All Way Stop | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| 3-lane Roundabout | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| 2-lane Roundabout | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Displaced Left Turn (DLT) | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Median U-Turn (MUT) | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Signalized R/O/T | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Unsignalized R/O/T | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Signalized Thru-Cut | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Unsignalized Thru-Cut | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Bowtie | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Jughandle | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Other 1* | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |
| Other 2* | | | | | | | | | | | |
| Total | | | | | | | | | | | |
| Fatal & Injury | | | | | | | | | | | |

Methodology for Safety Performance Measure

Crash Prediction Method



SSI Method



Source: VHB

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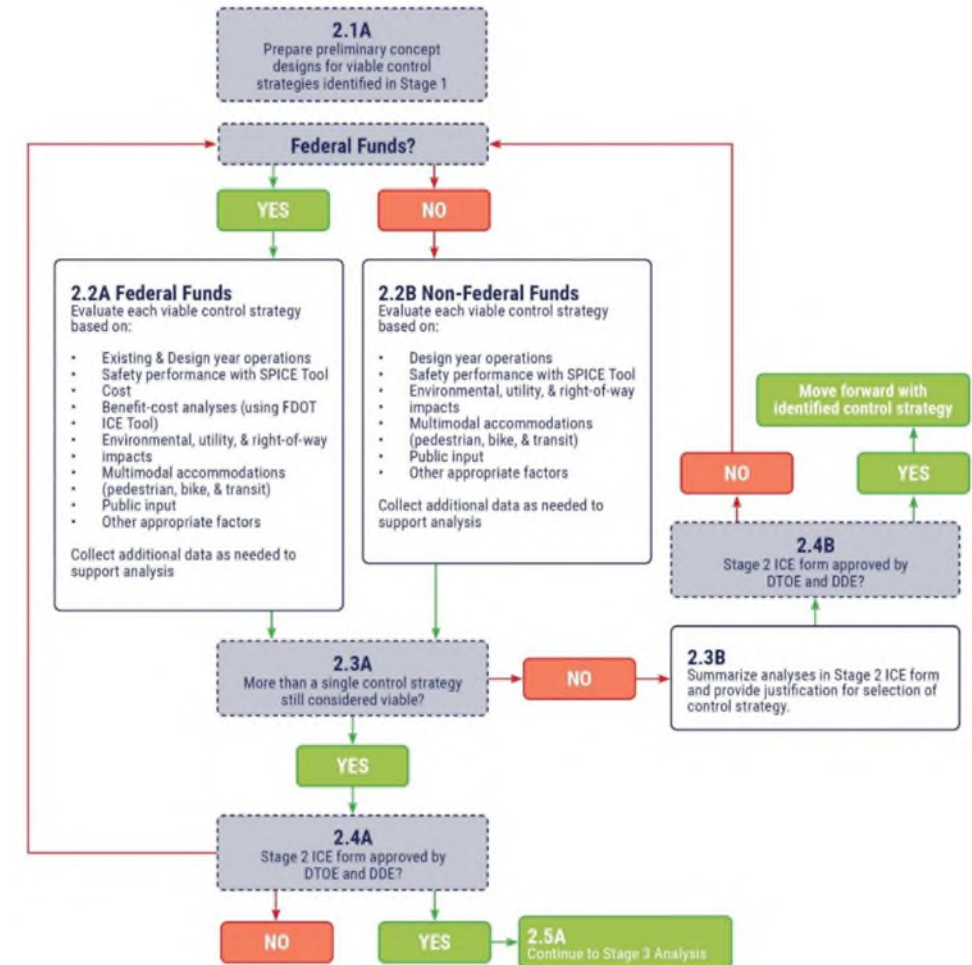
Stage 2: Detailed Analysis

- Prepare preliminary conceptual design
- Determine funding source
- In-depth operational and safety analysis

SPICE

Synchro/SIDRA

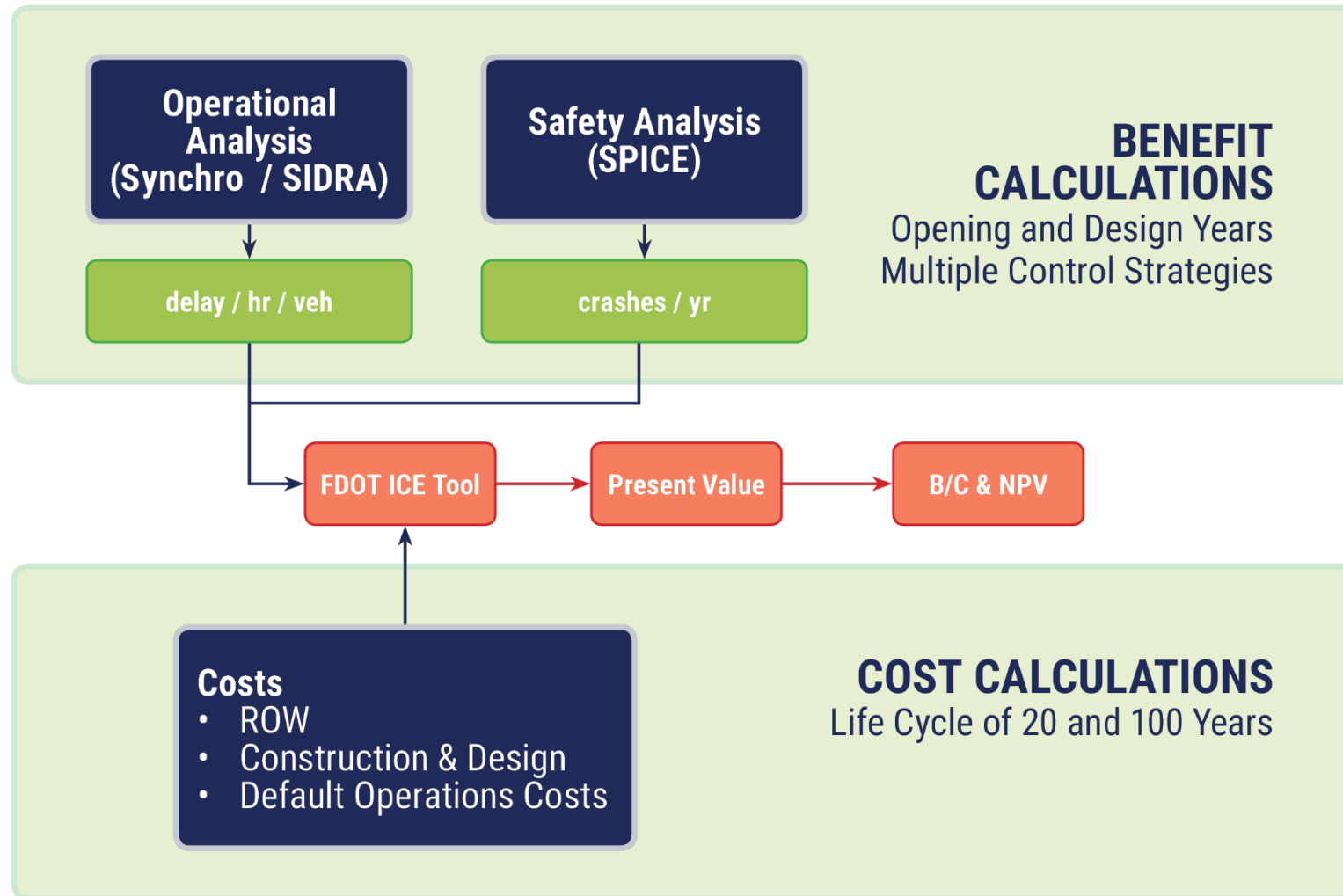
Economic Analysis Tool



SPICE Tool for Stage 2 Analysis

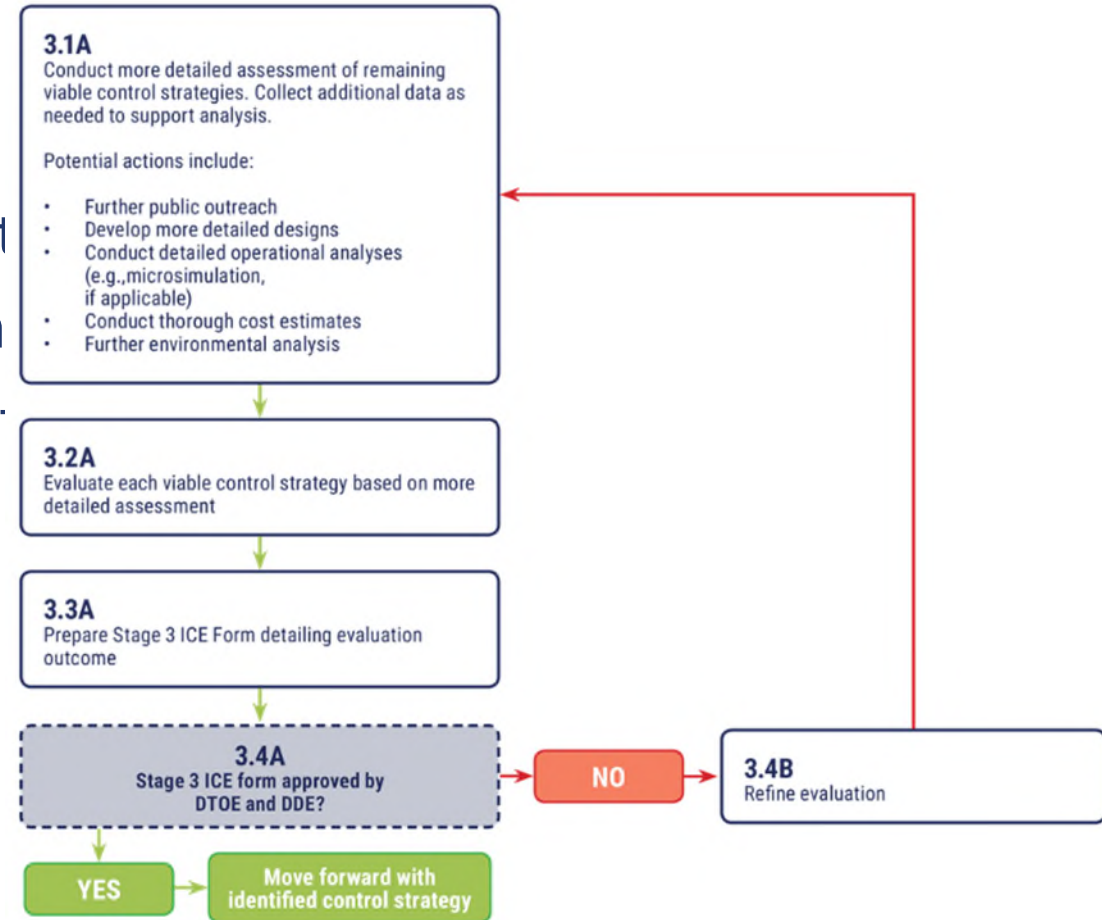
- Use actual values for the CMF variables based on conceptual design
- Enter historical crash data if not already done in Stage 1
- SSI method intended only for Stage 1 analysis, NOT for Stage 2 analysis
 - Variation between conceptual design and SSI assumptions may not reflect in SSI score
- No separate Stage 2 analysis for Thru-cut and bowtie intersections

FDOT Economic Analysis Tool for ICE



Stage 3: Supplemental Analysis

- No additional tools
- Conduct more in-depth analysis and/or
 - Detailed cost estimation and ROW need det
 - Additional assessment of environmental im
 - Additional engagement with public, local of



Summary of ICE Stages

Is there one viable control strategy or more than one?

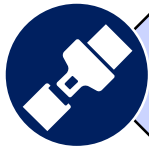
If only one control strategy, Stages 2 and 3 are not necessary

Intent - Don't make ICE a burden if the choice is straightforward

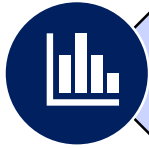
Who Completes the ICE Form?



Benefits of ICE



Integration of Safety into decision making



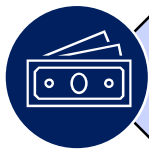
Data- driven process



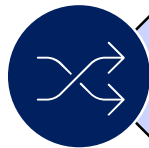
Consistent documentation



Increased awareness of innovative intersections



Cost-Effective solutions



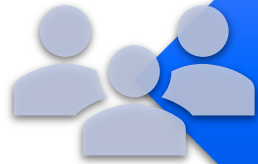
Flexible and scalable procedures



Intersection Control Evaluation District V Implementation



District Five Process



Pre-submittal or scoping meeting



ICE Submittal as part of permit package or during design process



Monthly ICE meeting

District Five Challenges



Awareness of need for ICE



Public acceptance of
alternative intersections



Higher cost alternatives with
comparable performance

Case Study – SR 535 Corridor





Intersection Control Evaluation District I Implementation



District One



Process



Challenges



Lessons Learned

District One Process

- Checklist
 - Tech Memo (S&S) – Two pages plus back-up documentation
 - Links to ICE Forms, MUTS, FTO
- D1 Planning provides input on growth rates
- Assist Teams meetings
- Reviewers
 - Consultant – detailed review
 - Traffic Services Program Engineer – high-level review
 - DTOE and DDE signoff - DocuSign

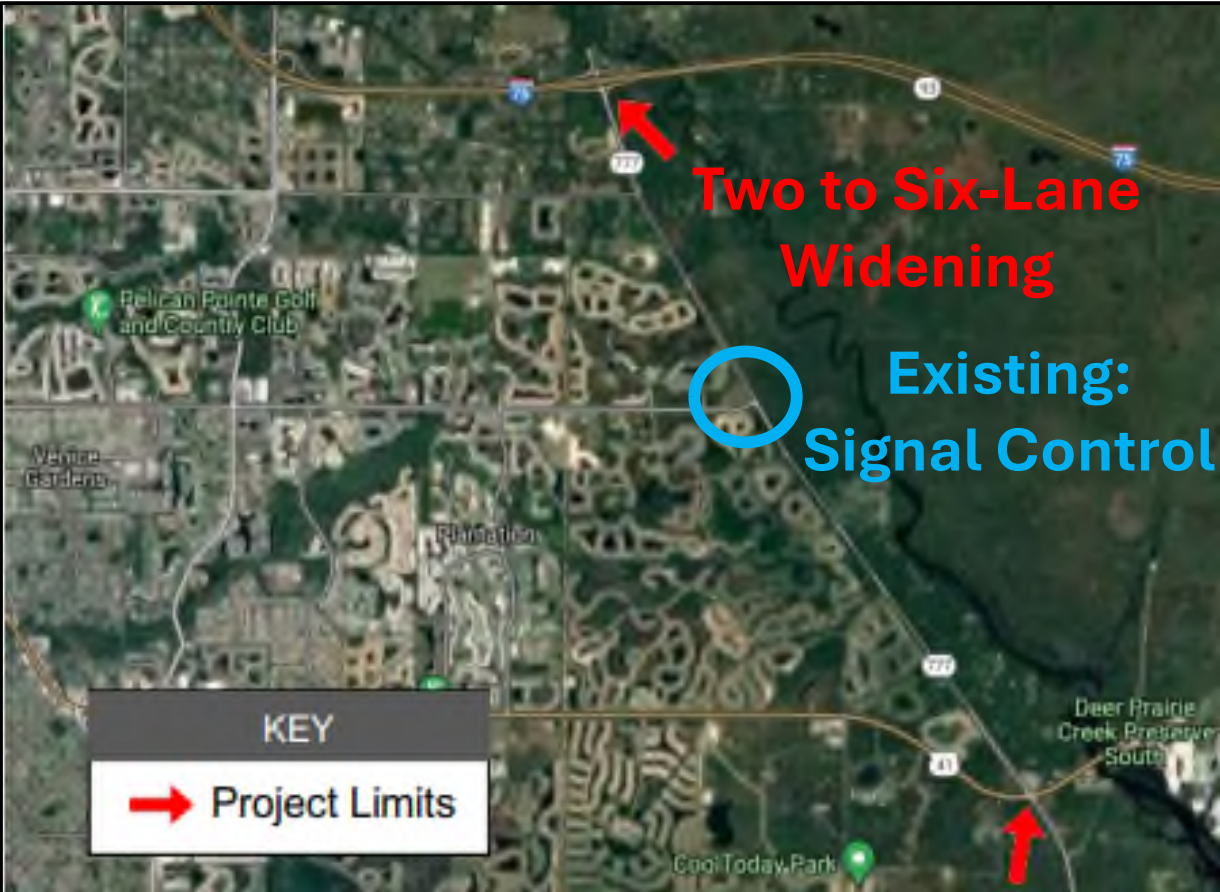
District One Challenges

- Knowledge and Acceptance of ICE
 - More training - internal and external
 - Long-term benefits outweigh upfront costs
 - Local agencies - plan and collaborate early-on with FDOT
- Learning Curve for Conducting ICE
 - Limited Opportunities
 - District Preferences
- Implementation
 - Traffic Operations/Safety – Is there an interim design while funding is procured

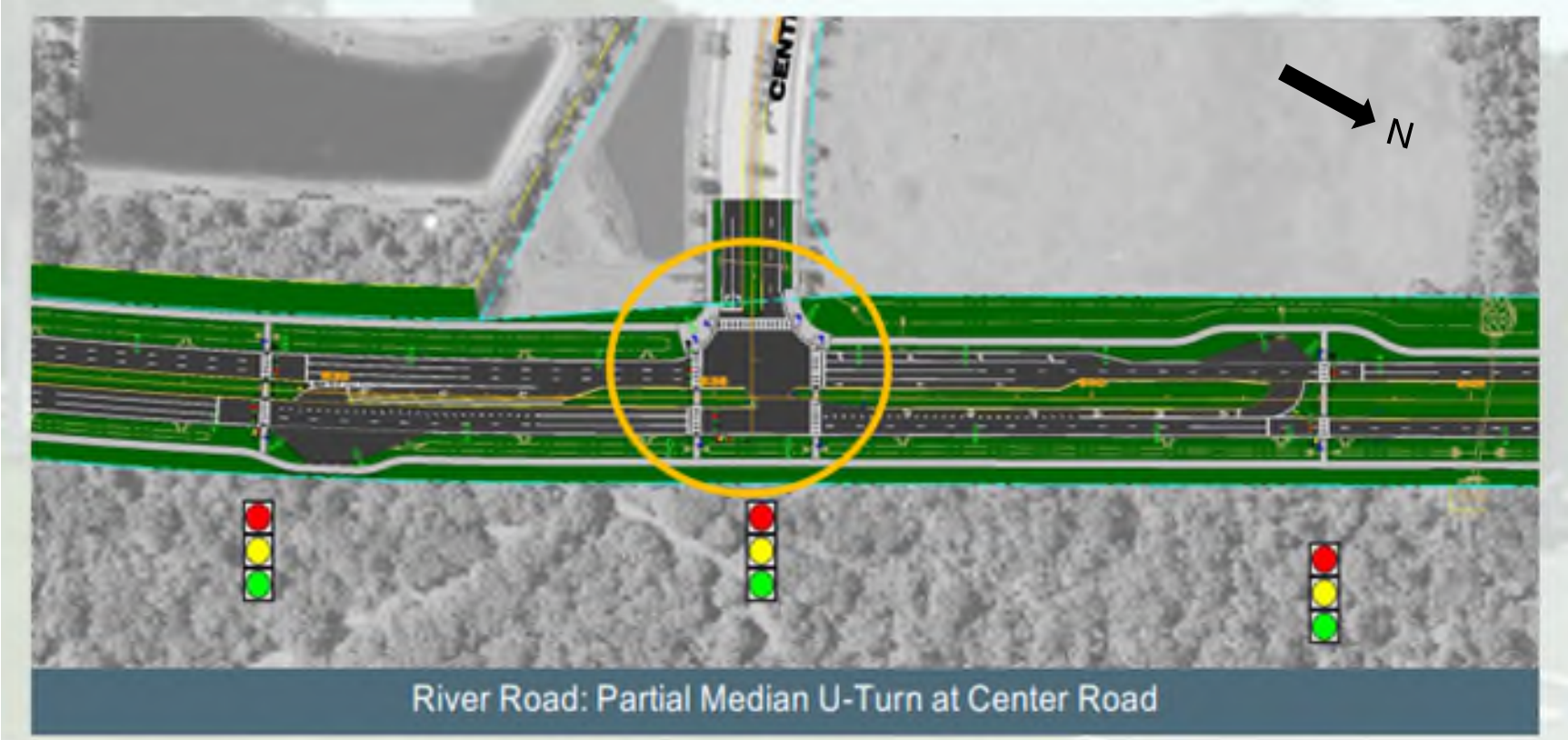
District One Lessons Learned

- Permits
 - Evaluate ICE alternatives early-on
 - ROW donations are part of permitting and ICE process
 - Defaulting to signal does not fulfill goals of ICE
- PD&E
 - Low-volume intersections not meeting criteria are not included in scope
 - Balancing number of alternatives
- Minimize Stage 2 ICE Effort
 - Review roadway network
 - Consider adjacent intersections and impact on alternatives
 - U-turn options
 - Alternatives may be eliminated early in process - validate with concepts/analysis

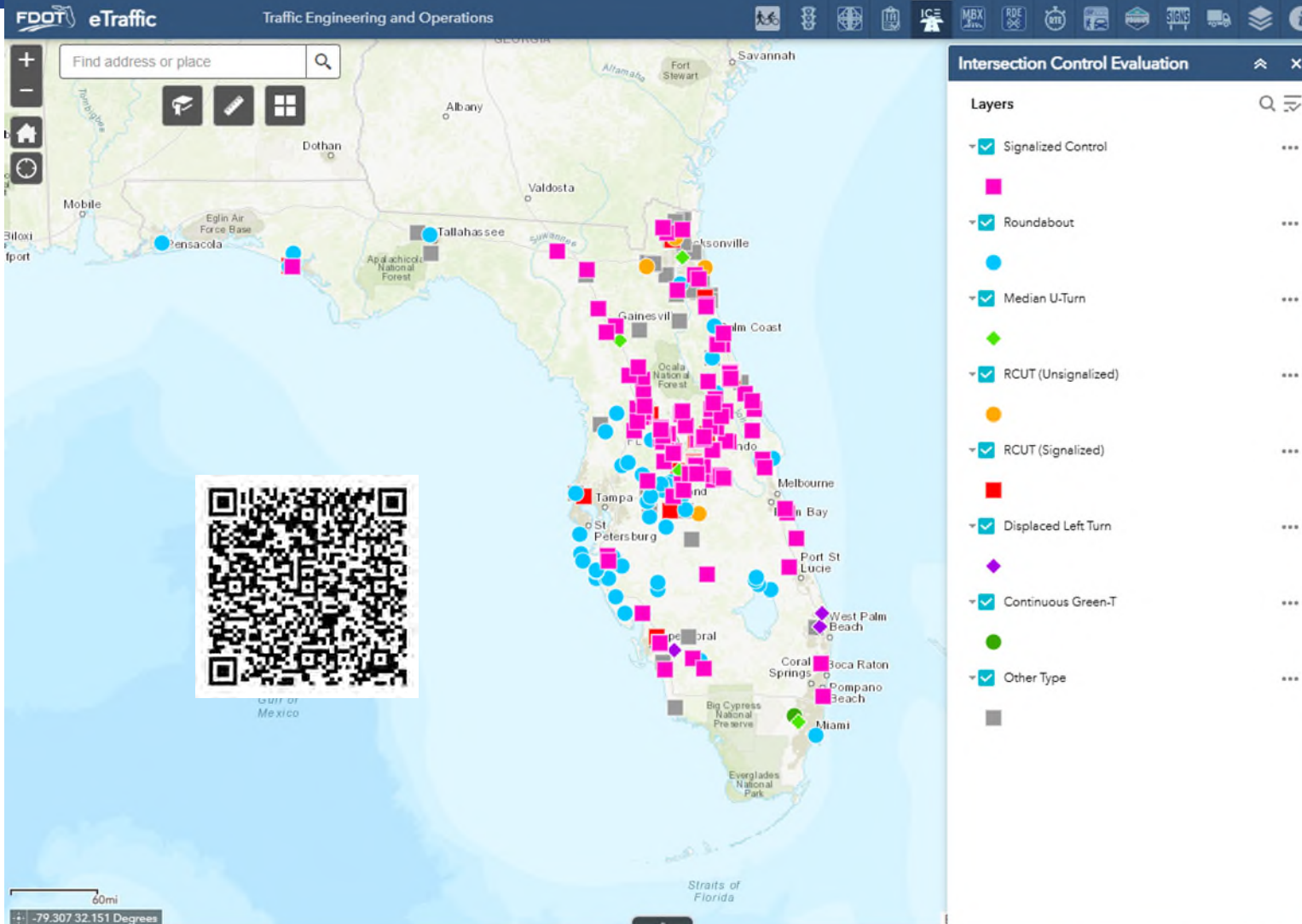
Case Study – SR 777 (River Road) at Center Road, Sarasota County



Case Study – SR 777 (River Road) at Center Road



eTraffic – Inventory of ICE



| Type | Frequency |
|---------------------|-----------|
| Signalized Control | 120 |
| Roundabout | 78 |
| MUT | 5 |
| RCUT – Signalized | 16 |
| RCUT – Unsignalized | 5 |
| DLT | 8 |
| Continuous Green T | 1 |
| Other | 54 |

Safety Message



Contact Us



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