Intersection Control Evaluation (ICE) Policy & Alternative Intersections

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GDOT Office of Traffic Operations

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GDOT Mission Statement

Deliver a transportation system focused on **innovation**, **safety**, sustainability and mobility

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Overview

GDOT's ICE Policy

- Policy & Process

Alternative Intersections

- Types
- Benefits & Applicability
- Examples

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Why ICE?

Desire to create a level playing field for all intersection alternatives

- Typically, non-traditional alternatives were not considered
- Goal:
  - Integrate safety into our decision-making process for ALL projects
  - Consider all intersection control types
- Provide documentation

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Purpose of ICE

- Traceability
- Transparency
- Consistency
- Accountability

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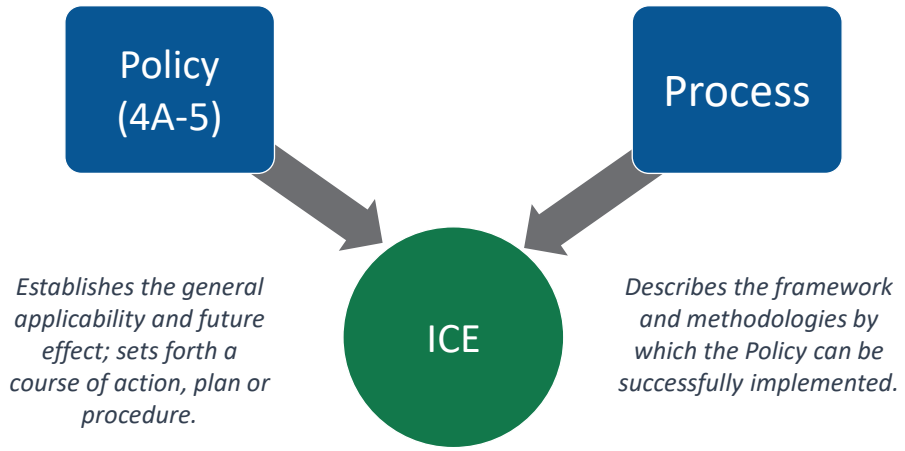
ICE Policy & Process



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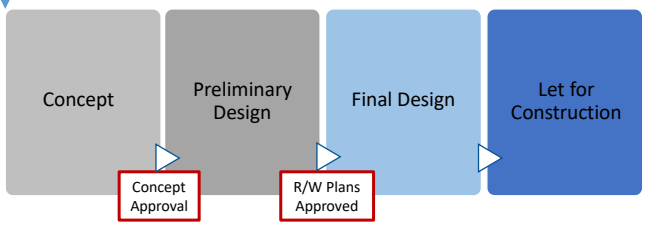
ICE Implementation

ICE is required for all projects that do not have concept approval by July 1, 2017

ICE Submission to ICE@dot.ga.gov inbox is due per PTIP requirements

July 1st



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ICE Policy – Location and Format

My GDOT → ROADS → Manuals & Guides→ Traffic Operations

Title	Revised	Contact
Category: Alternative Intersections		
Category: Driveway and Encroachment		
Category: Intersection Control Evaluation		
Intersection Control Evaluation (ICE): Multi-File Summary		
Intersection Control Evaluation (ICE): Policy		
Intersection Control Evaluation (ICE): Policy Appendices		
Intersection Control Evaluation (ICE): Policy Training Presentation		
Intersection Control Evaluation (ICE): Tool Training Presentation		
Intersection Control Evaluation (ICE): Tool V2.15 Example		
Intersection Control Evaluation (ICE): Tool v2.22		
Intersection Control Evaluation (ICE): Tool Version 2.2 Users Guide		

OR bookmark: http://mydocs.dot.ga.gov/info/gdotpubs/Publications/4A-5.pdf

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Intersection Control Evaluation

The Policy – Requirements & Waiver

Not Required	Required	Waiver
• No changes to intersection footprint or control	• Project is on State route/NHS and/or uses State or Federal money	• ICE ***may*** be waived based on appropriate evidence and a written request

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Intersection Control Evaluation

The Policy – Not Required

A project that will **not do any widening**, where there is no change to **intersection geometry** or **control**. Examples include:

- Resurfacing
- Signal timing and maintenance
- Signal Permit revision w/ no changes to physical footprint of intersection
- Sidewalk/streetscape improvements
- Bridge replacement (with no realignment or relocation of intersection)

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Intersection Control Evaluation

The Policy – Not Required

For driveway permits, where the driveway is **not a new leg** to an already existing intersection, that satisfy either of the following criteria:

- The driveway is along a divided, multilane roadway where the access will be limited to a closed median (no median opening) with only right-in/right-out access

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Intersection Control Evaluation

The Policy – Not Required

For driveway permits, where the driveway is **not a new leg** to an already existing intersection, that satisfy either of the following criteria:

- The driveway is along an undivided roadway and the development will not be required to construct left and/or right turn lanes (as per the Driveway Manual and District Traffic Engineer)

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Intersection Control Evaluation

The Policy – Waiver Eligible

In certain circumstances where an ICE would otherwise be required, the requirement ***may*** be waived based on appropriate evidence presented with a written request.

- Proposed improvements do not substantially alter the character of the intersection, and are considered minor in nature
  - i.e. extending existing turn lane(s)

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Intersection Control Evaluation

The Policy – Waiver Eligible

- The intersection consists of a public roadway intersecting a divided, multilane roadway where the access will be limited to a closed median with only RIRO access that will operate acceptably

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Intersection Control Evaluation

The Policy – Waiver Eligible

- The intersection is along an undivided, two-lane roadway that will not be widened and:
  - Low risk in terms of exposure (less than 1,000 vehicles entering per day).
  - Latest 5 years of crash history is not indicative of a crash problem
  - No undesirable geometric features
  - Proposed changes will not adversely affect safety

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Intersection Control Evaluation

Approvals

- **Level 1**: Chief Engineer (or Designee)
- Level 2: District Engineer & State Traffic Engineer (with notification to Chief Engineer)
- **Level 3**: District Engineer (or Designee)

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Intersection Control Evaluation

The Process

Screening effort to eliminate non-competitive options and identify alternatives for further consideration

Detailed evaluation of the alternatives identified in Stage 1 in order to support the selection of the preferred alternative that will be advanced to detailed design

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ICE Stage 1 Screening

1. Does alternative address the project need in a balanced manner and in scale with the project?
2. Does alternative improve safety performance in terms of reducing severe crashes?
3. Does alternative incorporate safety, convenience and accessibility for pedestrians and/or bicyclists
4. Does alternative improve (or preserve) traffic operations (congestion, delay, reliability, etc.)?
5. Does alternative appear feasible given the site characteristics, constrains and location context?
6. Does alternative appear feasible with respect to other project factors?
7. **Overall feasible alternative?**

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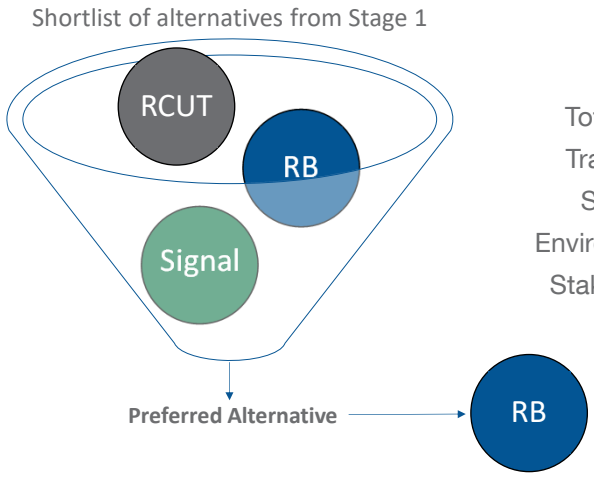
ICE Stage 2 Alternative Selection



Total Project Cost
Traffic Operations
Safety Analysis
Environmental Impacts
Stakeholder Posture

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ICE Tool

- Excel-based
- Streamline the process for evaluating alternatives
- Provide standardized decision records for Stage 1 and Stage 2
- Assists the analyst in choosing the best alternative for the intersection

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Purpose of ICE Tool

- Provide simplified and consistent way of using data to quantify & evaluate intersection control benefits:
  - **Traffic Volume**
  - **Safety**
  - **Cost**
  - **Environmental Impact**
  - **Stakeholder Support**
- Provide traceability, transparency, consistency & accountability when evaluating & selecting control types
- Reduce time to analyze, compare multiple alternatives
- Select alternative that reflects the overall best value in terms of specific performance-based criteria

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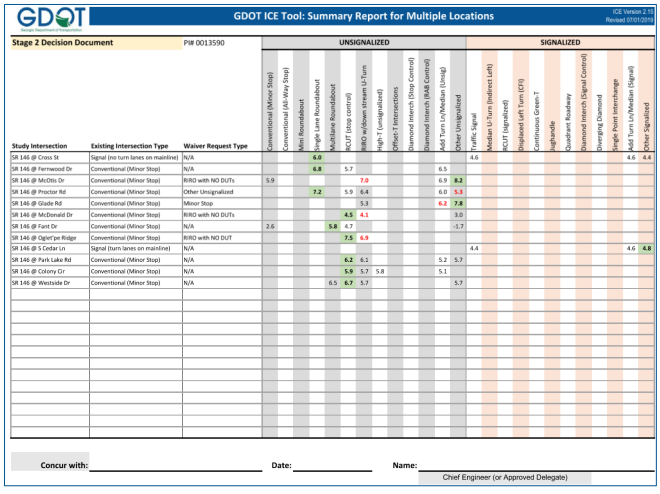
ICE Tool – Multi-File Summary Sheet

- Automatically populates information
- Provide convenient summary
- Concurrence Memo for Stage 1



GDOT ICE Tool: Summary Report for Multiple Locations

Stage 2 Decision Document — P# 0013590

Study Intersection	Existing Intersection Type	Waiver Request Type	Conventional (Minor Stop)	Conventional (All-Way Stop)	Mini Roundabout	Single Lane Roundabout	Multilane Roundabout	RCUT (stop control)	RIRO w/Downstream U-Turn	High-T (unsignalized)	Offset-T Intersections	Diamond Interch (Stop Control)	Diamond Interch (RAB Control)	Add Turn Ln/Median (Unsig)	Other Unsignalized	Traffic Signal	Median U-Turn (Indirect Left)	RCUT (signalized)	Displaced Left Turn (DLT)	Continuous Green-T	Jughandle	Quadrant Roadway	Diamond Interch (Signal Control)	Diverging Diamond	Single Point Interchange	Add Turn Ln/Median (Signal)	Other Signalized
SR 146 @ Cross St	Signal (no turn lanes on mainline)	N/A				6.8										4.6										4.6	4.4
SR 146 @ Fernwood Dr	Conventional (Minor Stop)	N/A				6.8		5.7						6.5													
SR 146 @ McDlis Dr	Conventional (Minor Stop)	RIRO with NO DUTs	5.9						7.0					6.9	8.2												
SR 146 @ Proctor Rd	Conventional (Minor Stop)	Other Unsignalized				7.2		5.9	6.4					6.0	5.3												
SR 146 @ Glade Rd	Conventional (Minor Stop)	Minor Stop							5.3					6.2	7.8												
SR 146 @ McDonald Dr	Conventional (Minor Stop)	RIRO with NO DUTs						4.5	4.1						3.0												
SR 146 @ Fant Dr	Conventional (Minor Stop)	N/A	2.6				5.8	4.7							-1.7												
SR 146 @ Ogle'pe Ridge	Conventional (Minor Stop)	RIRO with NO DUT						7.5	6.9																		
SR 146 @ S Cedar Ln	Signal (turn lanes on mainline)	N/A														4.4										4.6	4.8
SR 146 @ Park Lake Rd	Conventional (Minor Stop)	N/A						6.2	6.1					5.2	5.7												
SR 146 @ Colony Cir	Conventional (Minor Stop)	N/A						5.9	5.7	5.8				5.1													
SR 146 @ Westside Dr	Conventional (Minor Stop)	N/A					6.5	6.7	5.7						5.7												

Concur with: _____ Date: _____ Name: _____

Chief Engineer (or Approved Delegate)

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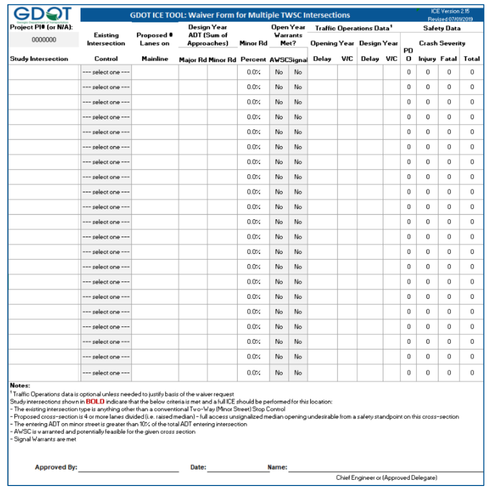
ICE Tool – Multi-File Summary Sheet

TWSC Waiver Tab

- Single waiver form for multiple TWSC intersections
- Lines turn red if data suggests full ICE needed
- Typically used for TWLTL roadways



GDOT ICE TOOL: Waiver Form for Multiple TWSC Intersections

ICE Version 2.15
Revised 07/01/2019

Project PI# (or N/A): 0000000

Study Intersection	Existing Intersection Control	Proposed # Lanes on Mainline	Design Year ADT (Sum of Approaches) Major Rd	Minor Rd	Minor Rd Percent	Open Year Warrants Met? AWSC	Signal	Traffic Operations Data[1] Opening Year Delay	V/C	Design Year Delay	V/C	Safety Data Crash Severity PDO	Injury	Fatal	Total
	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0
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	--- select one ---				0.0%	No	No					0	0	0	0
	--- select one ---				0.0%	No	No					0	0	0	0

Notes:
[1] Traffic Operations data is optional unless needed to justify basis of the waiver request
Study intersections shown in **BOLD** indicate that the below criteria is met and a full ICE should be performed for this location:
- The existing intersection type is anything other than a conventional Two-Way (Minor Street) Stop Control
- Proposed cross-section is 4 or more lanes divided (i.e. raised median) - full access unsignalized median opening undesirable from a safety standpoint on this cross-section
- The entering ADT on minor street is greater than 10% of the total ADT entering intersection
- AWSC is warranted and potentially feasible for the given cross section
- Signal Warrants are met

Approved By: ______________ **Date:** ______________ **Name:** ______________
Chief Engineer or (Approved Delegate)

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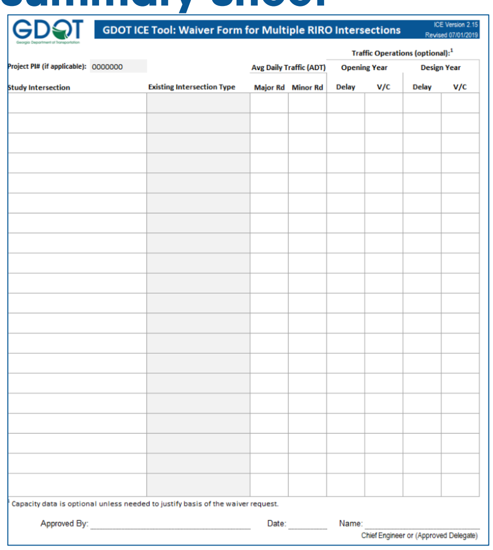
Georgia Department of Transportation

ICE Tool – Multi-File Summary Sheet

RIRO Waiver Tab

- Single waiver form for multiple RIRO intersections
- Typically used for median divided roadways
- Driveways on corridor projects with a median in front of it



GDOT ICE Tool: Waiver Form for Multiple RIRO Intersections

ICE Version 2.15
Revised 07/01/2019

Project PI# (if applicable): 0000000

Study Intersection	Existing Intersection Type	Avg Daily Traffic (ADT) Major Rd	Minor Rd	Traffic Operations (optional):[1] Opening Year Delay	V/C	Design Year Delay	V/C

[1] Capacity data is optional unless needed to justify basis of the waiver request.

Approved By: ______________ Date: ______________ Name: ______________
Chief Engineer or (Approved Delegate)

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Intersection Control Types

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GDOT Georgia Department of Transportation

Intersection Control Types

- Minor Stop / Two-Way Stop Control
- All-Way Stop Control
- Right In Right Out (RIRO)
- Signalized Intersection
- Roundabout
- Reduced Conflict U-Turn (RCUT)
- Median U-Turn (MUT)
- High T / Continuous Green T
- Quadrant Roadway
- Displaced Left Turn (DLT, CFI)
- Jug Handle
- Innovative Interchanges (SPUI, DDI, roundabouts)

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Intersection Control Types

Minor Stop / Two-Way Stop Control

- Vehicles on minor street stop and give right-of-way to major street.

All-Way Stop Control

- All vehicles must stop and take turns entering the intersection.

Both (4-leg) intersection types have: 32 baseline conflict points & limited operational and safety benefits as traffic volumes become significant

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Intersection Control Types

Right-In Right-Out (RIRO) with Downstream U-Turns

- No left turns or through movements from side street
- Make right turn then U-turn instead
- No left turns from mainline

Benefits

- Improved safety
- Reduces queueing on side street

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Intersection Control Types

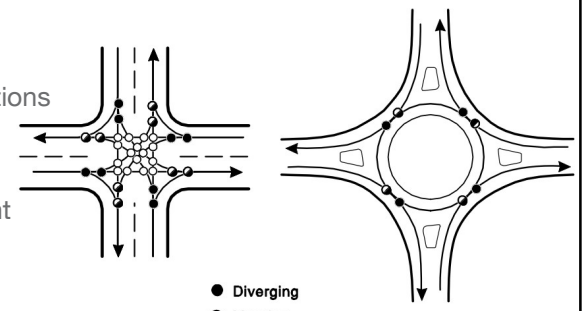
Roundabout

Benefits

- Can improve safety
  - Vehicles
  - Pedestrians
  - Bicyclists
- Can improve operations
  - Higher capacity
  - Lower delay
- Can reduce footprint

32 Total
8 Merging
8 Diverging
16 Crossing

8 Total
4 Merging
4 Diverging
0 Crossing



● Diverging
◕ Merging
○ Crossing

NCHRP 572, Exhibit 5-2

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Intersection Control Types

Roundabout

Mini

SR 138 @ N Moseley Dr, Henry County, GA

Single-lane

SR 154 @ Cedar Grove Rd, Fulton County, GA

Multilane

SR 372 @ Providence Rd, Fulton County, GA

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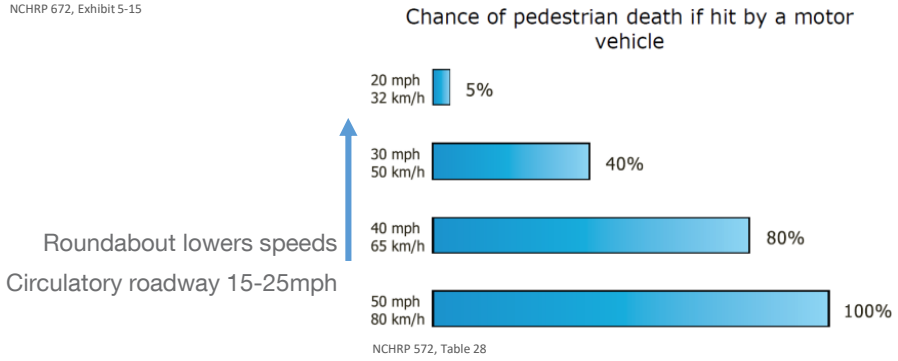
Safety Benefits of a Roundabout

Traffic Control Prior to RBT	% Reduction in Injury Crashes
Signalized	78
All-Way Stop	46
Two-Way Stop	82

NCHRP 672, Exhibit 5-15



NCHRP 572, Table 28

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Roundabouts in Georgia

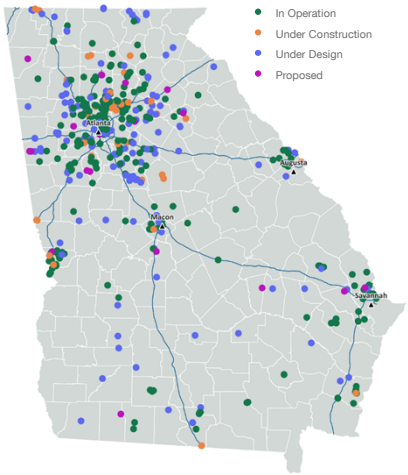
~400 In Operation Statewide

90 In Operation on State Routes

25 Under Construction on State Routes

160 Under Design on State Routes

31 Proposed on State Routes



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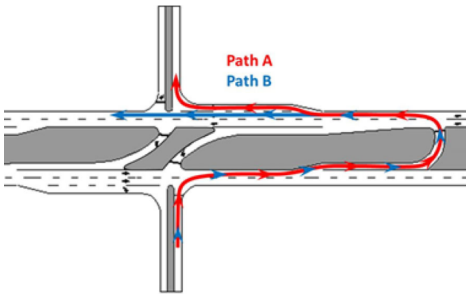
Intersection Control Types

Reduced Conflict U-Turn (RCUT)

- Prevents left turns and through movements from side street
- Make right turn and use U-turn instead
- Allows left turns into side street



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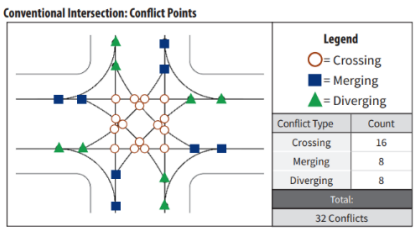
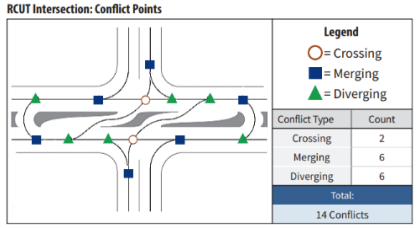
Intersection Control Types

RCUT Benefits

- Improved safety over TWSC
- Reduces queueing on side street
- Often easy retrofit - cheaper





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GDOT Georgia Department of Transportation

Intersection Control Types

RCUT

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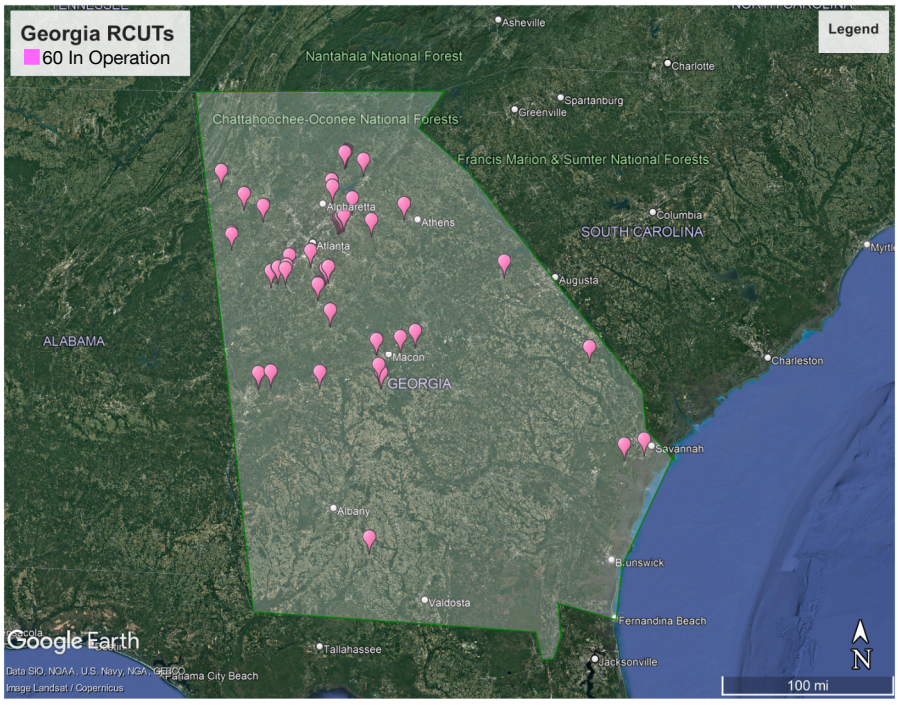

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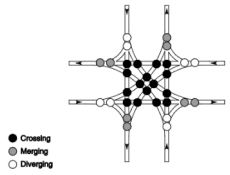
Intersection Control Types

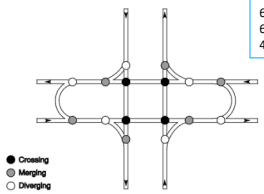
Median U-Turn (MUT)

- No left turns, only throughs and right turns
- Make right then use U-turn
- U-turns signalized/unsignalized
- Can be done on 1-4 legs, traditionally 2 or 4



32 Total
8 Merging
8 Diverging
16 Crossing

Exhibit 4-2. Vehicle-vehicle conflict points at conventional intersection.



16 Total
6 Merging
6 Diverging
4 Crossing

Exhibit 4-3. Vehicle-vehicle conflict points at MUT intersection.
FHWA Median U-Turn Intersection Information Guide

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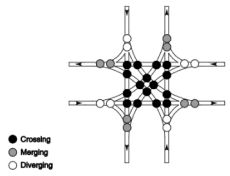
Intersection Control Types

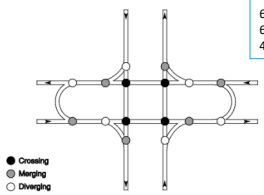
MUT Benefits

- Improved safety over traffic signal & AWSC
- Improves operations - reduced signal phases
- Good alternative with existing wide medians
- Easily used in corridor with other alt. intersections
  - Roundabouts
  - RCUTs
  - RIRO



32 Total
8 Merging
8 Diverging
16 Crossing

Exhibit 4-2. Vehicle-vehicle conflict points at conventional intersection.



16 Total
6 Merging
6 Diverging
4 Crossing

Exhibit 4-3. Vehicle-vehicle conflict points at MUT intersection.
FHWA Median U-Turn Intersection Information Guide

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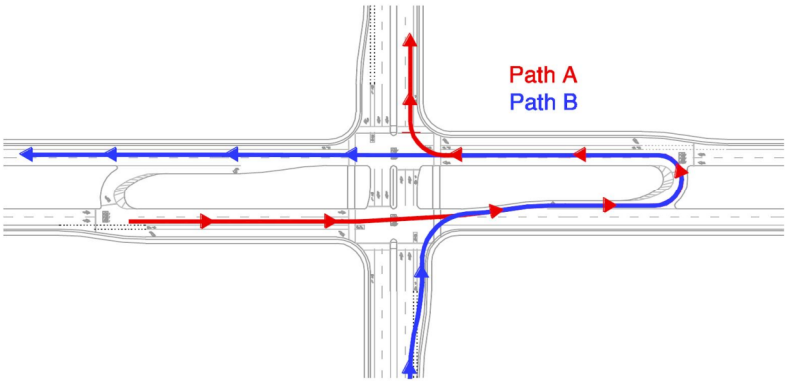
Intersection Control Types

Median U-Turn (MUT)



FHWA: https://safety.fhwa.dot.gov/intersection/innovative/uturn/

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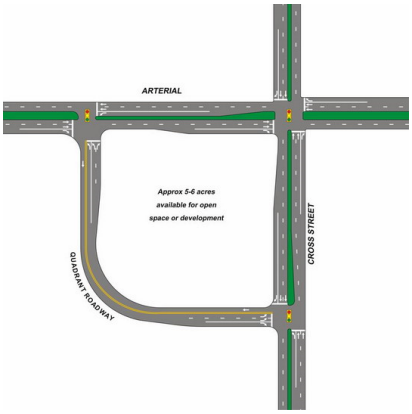
Intersection Control Types

Quadrant Roadway

- No direct left turns at main intersection
- All left turns rerouted to connector, quadrant roadway
- Both junctions of connector road typically signalized
- All signals coordinated



Maryland ATTAP MUID Quadrant Roadway

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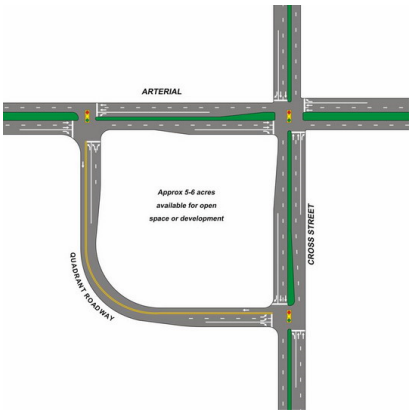
Intersection Control Types

Quadrant Roadway Benefits & Applicability

- Good where there are heavy through volumes
- Reduces delay at severely congested intersections
- Simple two-phase signal at main intersection
- More appropriate as a spot treatment



Maryland ATTAP MUID Quadrant Roadway

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Intersection Control Types

Jug Handle

- Eliminating left turns at the main intersection
- Vehicle right turns after the main intersection and then right turns again

SR 5 @ Tonya Lane, Douglas County

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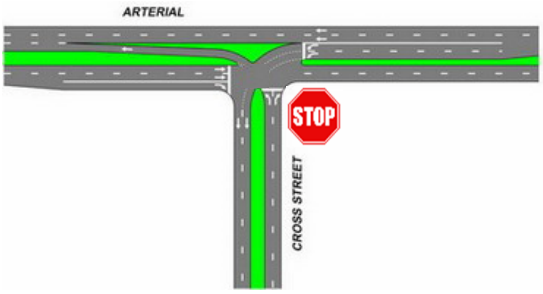
Intersection Control Types

High T

- "Top" through movement separated from other, operates continuously
- Channelized left turn from side street



FHWA AIIR. Fig. 149

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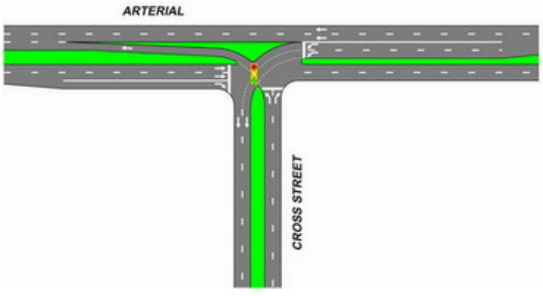
Intersection Control Types

Continuous Green T

Benefits & Applicability

- Good alternative when high through volumes in one particular direction
- Relatively easy conversion with existing wide median



FHWA AIIR. Fig. 149

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Intersection Control Types

Continuous Green T

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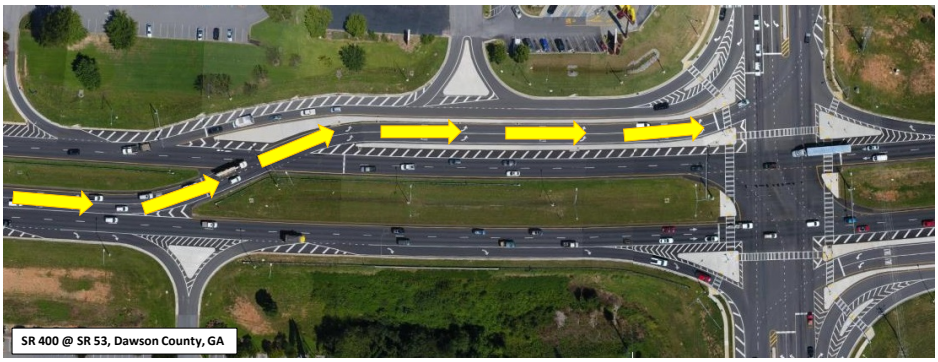
Intersection Control Types

Displaced Left Turn (DLT, CFI)

- Left turning traffic crosses opposing lanes in advance of main intersection at a signalized cross-over intersection



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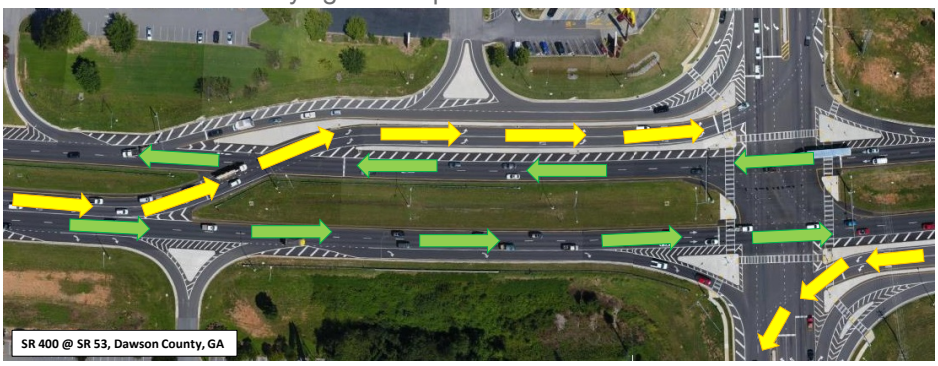
Intersection Control Types

Displaced Left Turn (DLT, CFI)

- Left turns at same time as through movements
- Can have varying # of displaced left turns



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Intersection Control Types

Displaced Left Turn (DLT, CFI) Benefits

- Reduced # signal phases
- Good alternative on high volume roadways
- Improved safety over conventional traffic signal

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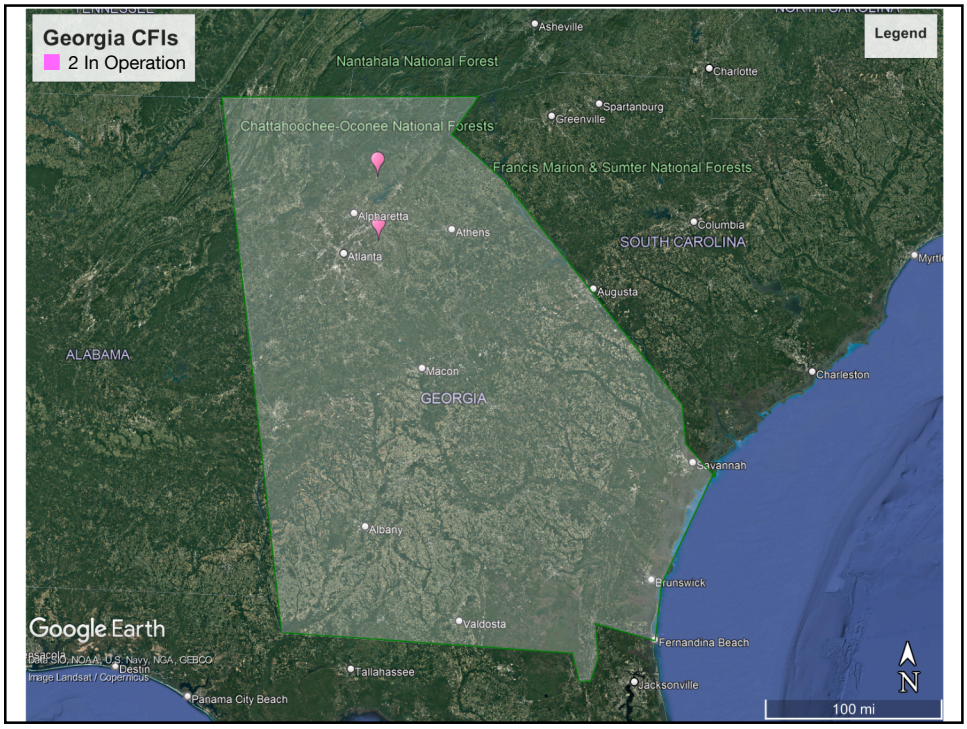
Georgia CFIs
2 In Operation
Legend
Asheville
Nantahala National Forest
Charlotte
Spartanburg
Greenville
Chattahoochee-Oconee National Forests
Francis Marion & Sumter National Forests
Alpharetta
Athens
Columbia
SOUTH CAROLINA
Atlanta
Augusta
ALABAMA
Macon
GEORGIA
Charleston
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Intersection Control Types

Innovative Interchanges (DDI, SPUI, Roundabouts)

- Diverging Diamond Interchange (DDI)
- Single Point Urban Interchange (SPUI)
- Roundabout Interchange

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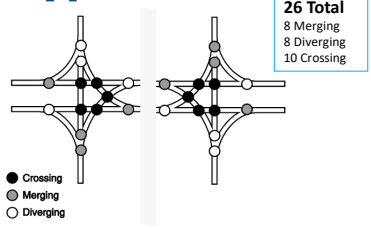
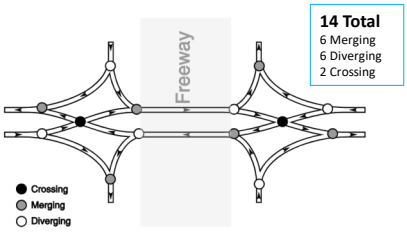
Intersection Control Types

DDI Interchange

- Vehicles shifted to left side of road
- Allows free flow lefts on to freeway
- Allows partial free flow lefts off freeway



FHWA Diverging Diamond Interchange Information Guide
Exhibit 4-2. Conflict point diagram for conventional diamond



FHWA Diverging Diamond Interchange Information Guide
Exhibit 4-1. Conflict point diagram for DDI

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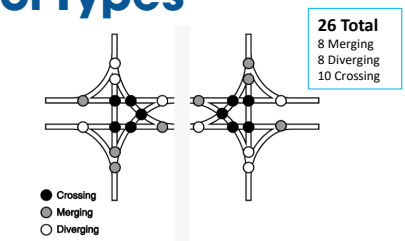
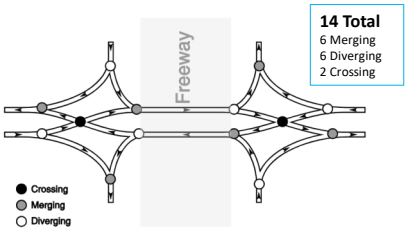
Intersection Control Types

DDI Interchange Benefits

- Especially good where left turning volume high
- Reduce # signal phases
- Improved safety over conventional interchange
- Viable alternative to bridge widening for capacity increase



FHWA Diverging Diamond Interchange Information Guide
Exhibit 4-2. Conflict point diagram for conventional diamond



FHWA Diverging Diamond Interchange Information Guide
Exhibit 4-1. Conflict point diagram for DDI

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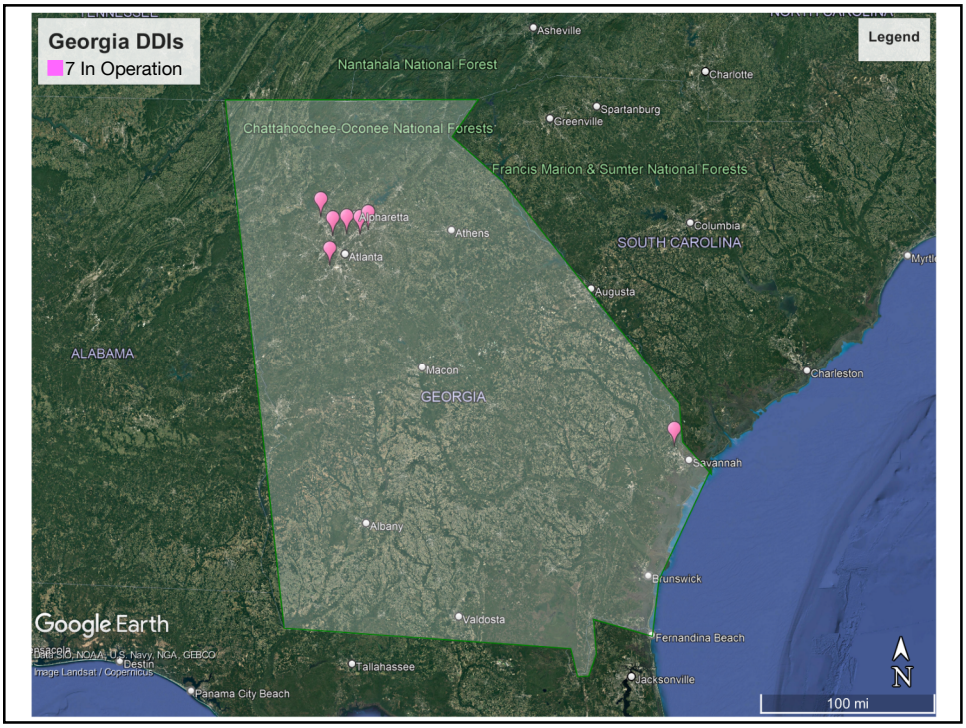

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I-85 @ Jimmy Carter Boulevard

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Intersection Control Types

SPUI Interchange

- One signalized intersection
- Left turns onto freeway can be simultaneous

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Intersection Control Types

SPUI Interchange Benefits

- Simpler sequence phasing for signal
- Increased capacity
- Easier to coordinate with up and downstream signals
- Requires less right of way than conventional diamond interchange, DDI or roundabout interchange

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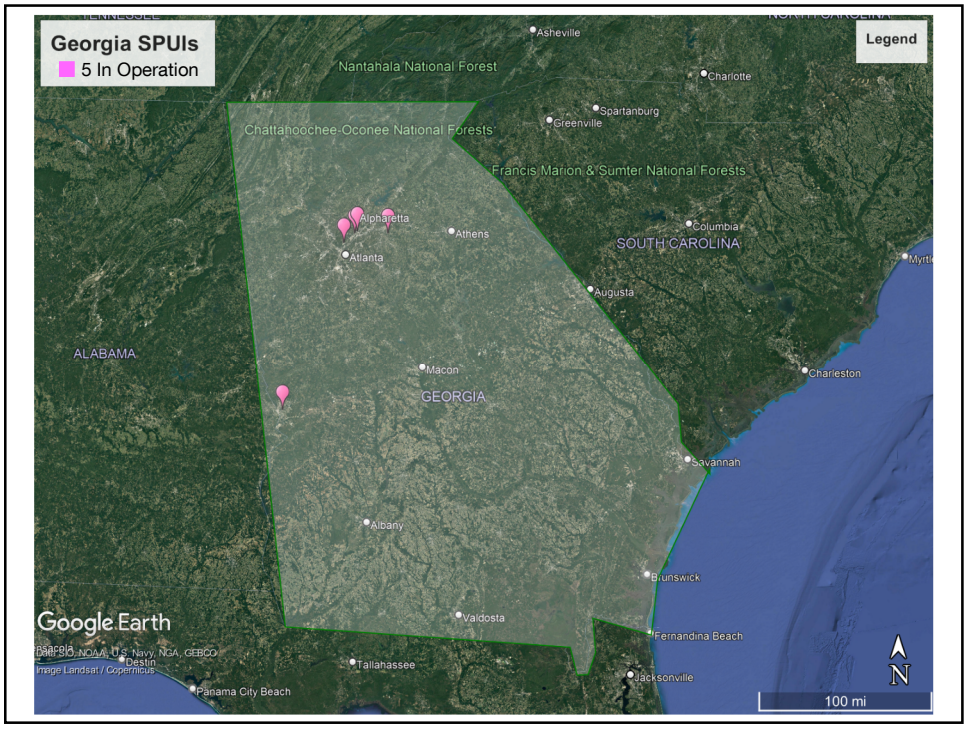

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Intersection Control Types

Roundabout Interchange

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Intersection Control Types

Roundabout Interchange

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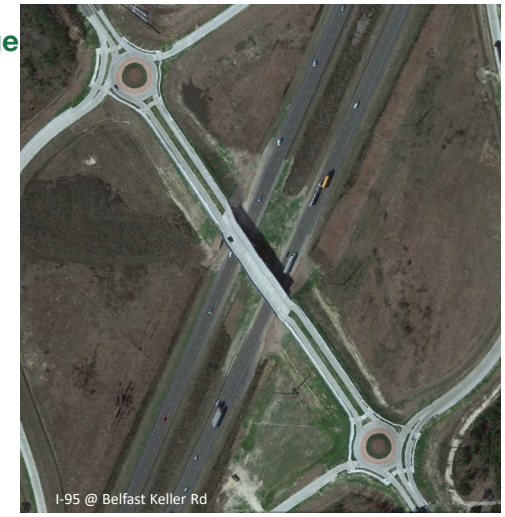
Intersection Control Types

Roundabout Interchange



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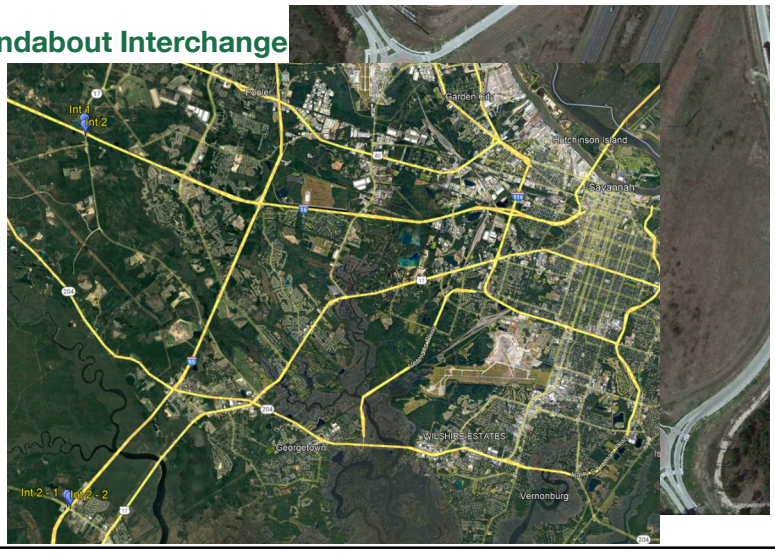
Intersection Control Types

Roundabout Interchange



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Questions?

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