



Alternative Intersections & GDOT's ICE Policy

Chris Raymond, P.E.
Daniel Trevorrow, P.E.
GDOT Office of Traffic Operations



Overview

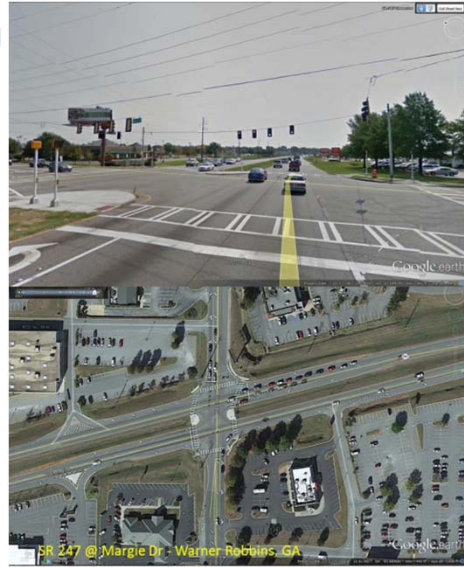
- ❖ **Alternative Intersections**
 - Types
 - Benefits & Applicability
 - Examples
- ❖ **GDOT's ICE Policy**
 - Policy & Process
 - Tools



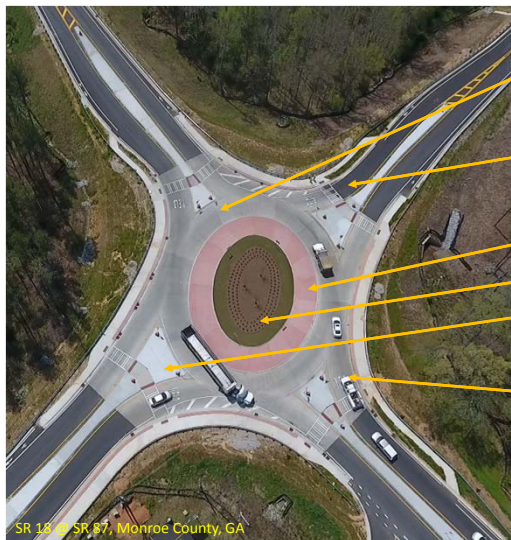


Intersection Control Types

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



Roundabouts



Circulatory roadway

- Slow Speed
- Entry Deflection

Central island

- Truck Apron
- Landscaping

Splitter islands

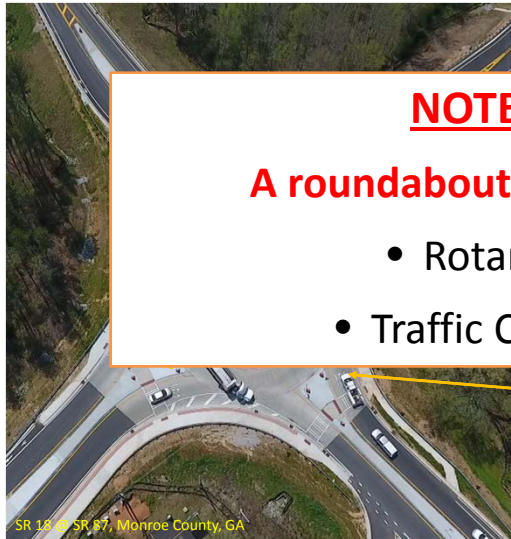
- Pedestrian refuge

Yield on approaches

Mini, Single-Lane or Multi-Lane



Roundabouts



Circulatory roadway

NOTE

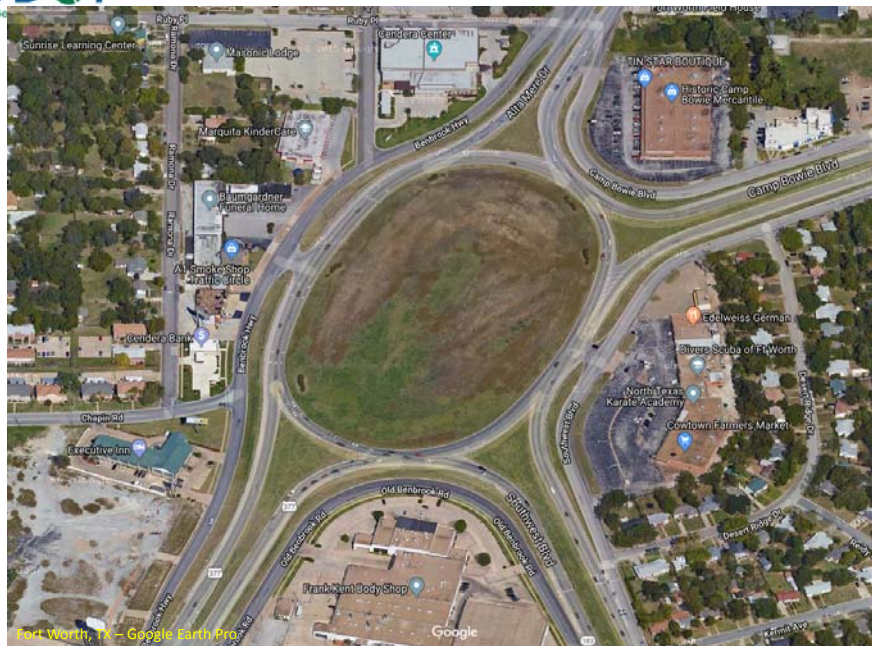
A roundabout is NOT A

- Rotary
- Traffic Circle

Yield on approaches

Mini, Single-Lane or Multi-Lane

SR 14 @ SR 87, Monroe County, GA



Fort Worth, TX - Google Earth Pro







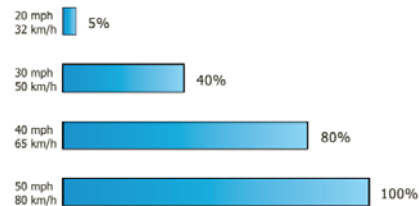
Benefits

- Can improve safety
 - Vehicle
 - Pedestrian/Bicyclists
- Can improve operations
 - Higher capacity, less delay
- Can reduce footprint

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

NCHRP 672, Exhibit 5-15

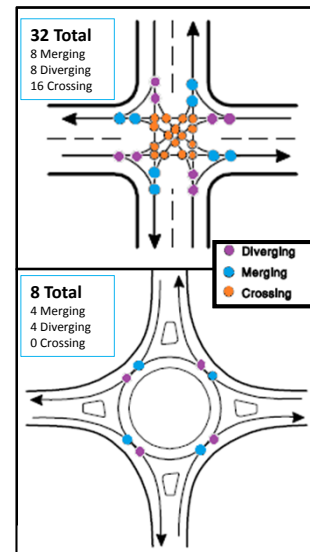
Chance of pedestrian death if hit by a motor vehicle



NCHRP 572, Table 28

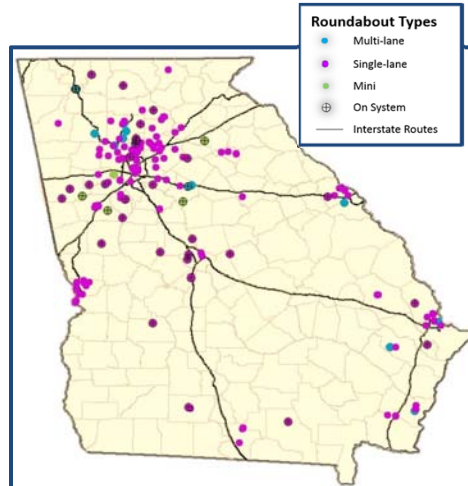
Benefits

- Can improve safety
 - Vehicle
 - Pedestrian/Bicyclists
- Can improve operations
 - Higher capacity, less delay
- Can reduce footprint

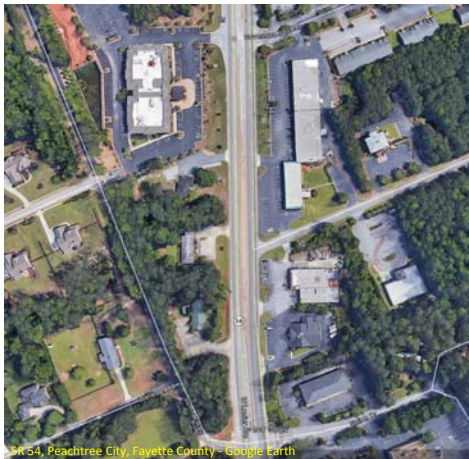


Status in GA

- **50+ On state routes/
built with GDOT \$\$**
 - 35+ single lane/compact
 - 5+ multi-lane/hybrid
 - 10+ mini
- 20+ under construction
- 65+ in design
- **165+ On local roads**
- 250+ Other circular intersections



Right-in Right-out (RIRO) with Downstream U-Turns



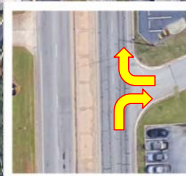
- No left turns or through movements from side street
- Make right turn then U-turn instead
- No left turns into side street, also use U-turn

Benefits

- Improved safety
- Reduces queueing on side street



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 into side street, also use U-turn

Benefits

- Improved safety
- Reduces queueing on side street



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



SR 20 @ Simpson Mill Rd, Henry County, GA



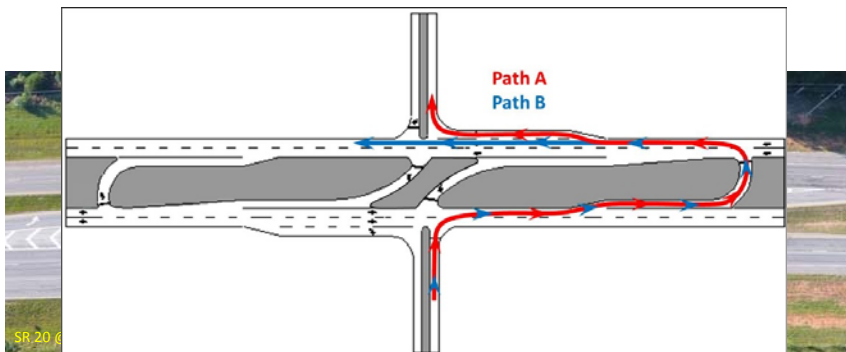
Reduced Conflict U-Turn (RCUT)

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



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



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



Benefits

32 Total
8 Merging
8 Diverging
16 Crossing

● Crossing
● Merging
○ Diverging

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

● Crossing
● Merging
○ Diverging

18 Total
8 Merging
8 Diverging
2 Crossing

FHWA RCUT Informational Guide, Exhibit 4-3. Vehicular conflict points



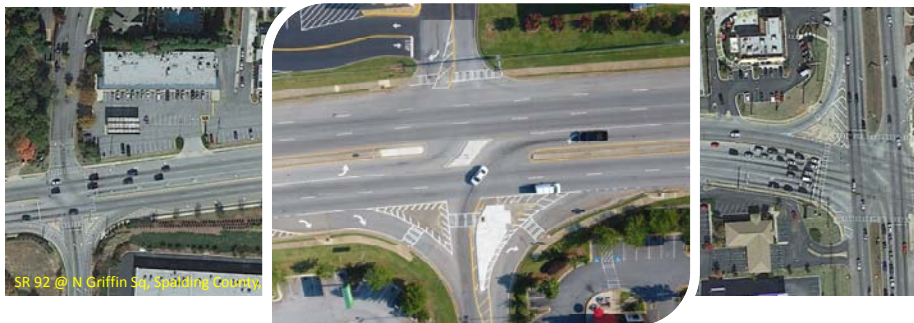
Benefits

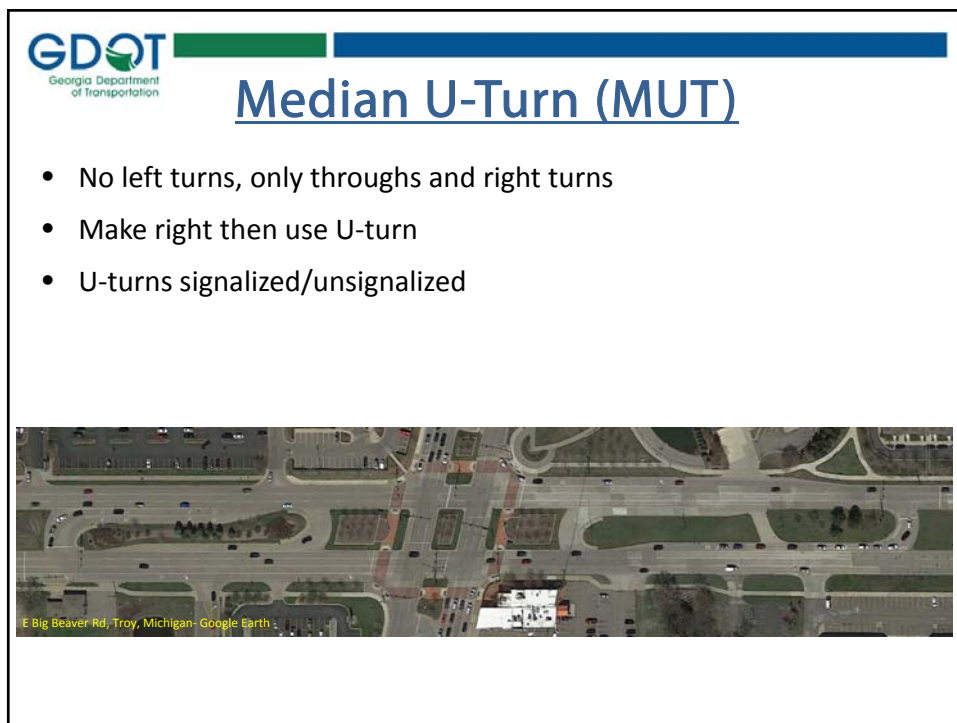
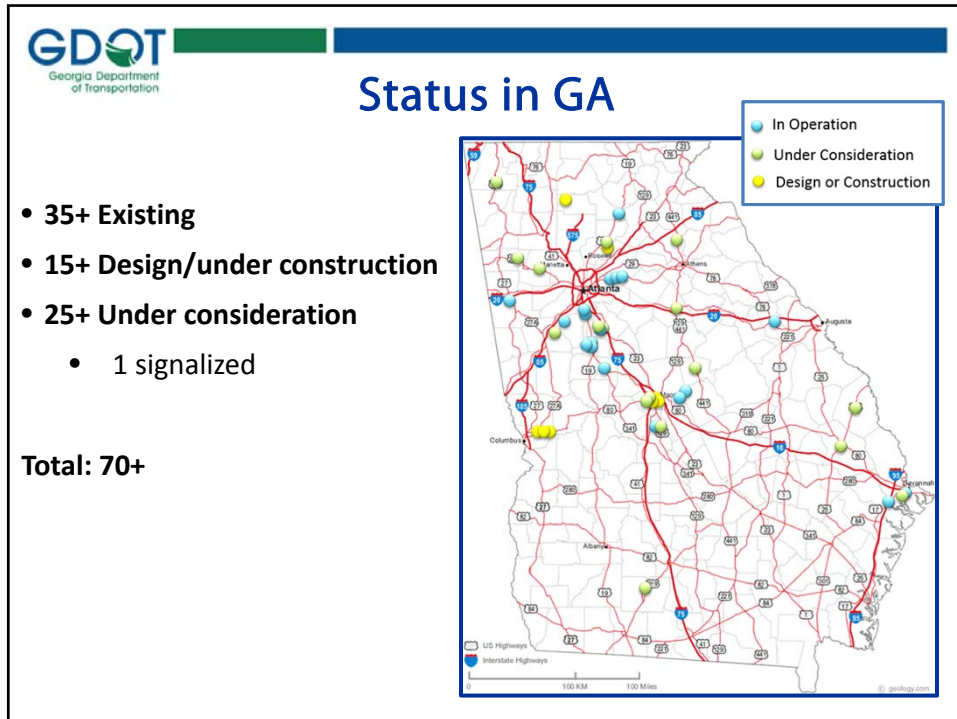
- Improved safety over TWSC
- Reduces queueing on side street
- Often easy retrofit - cheaper



Benefits

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







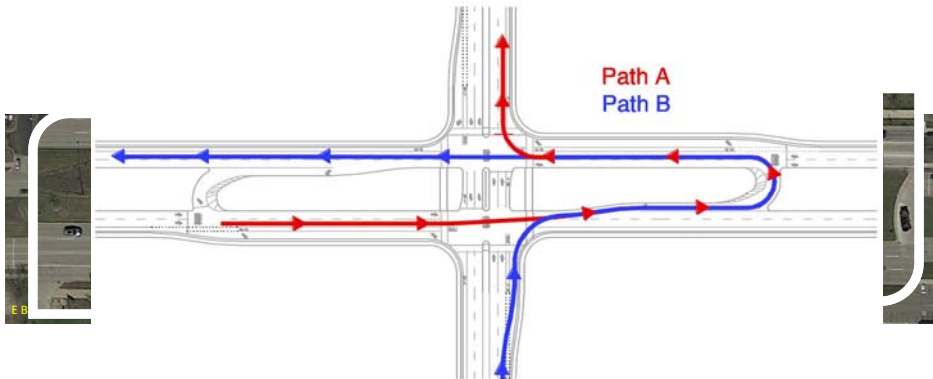
Median U-Turn (MUT)

- No left turns, only throughs and right turns
- Make right then use U-turn
- U-turns signalized/unsignalized



Median U-Turn (MUT)

- No left turns, only throughs and right turns
- Make right then use U-turn
- U-turns signalized/unsignalized



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

Benefits

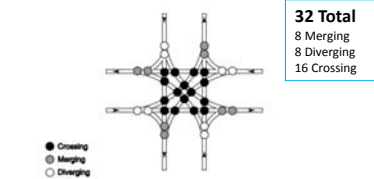


Exhibit 4-2. Vehicle-vehicle conflict points at conventional intersection.

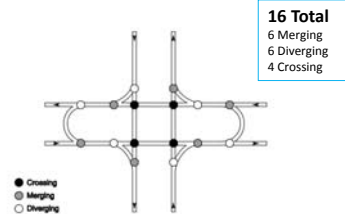
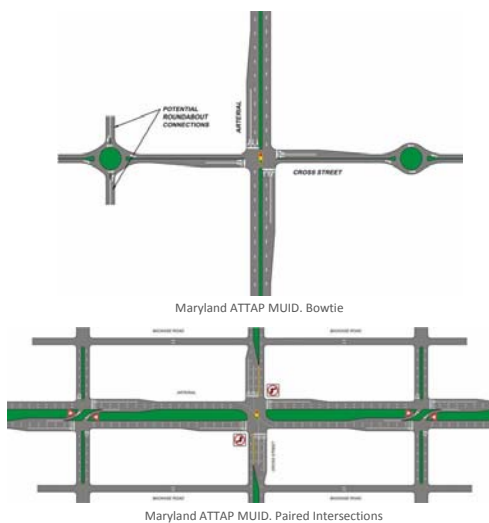


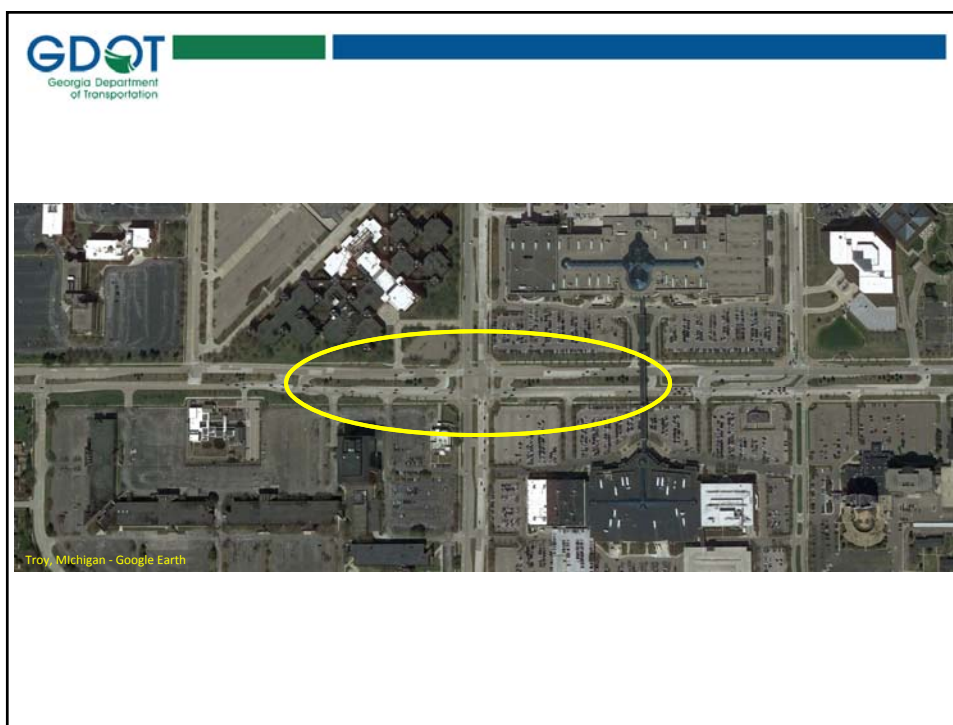
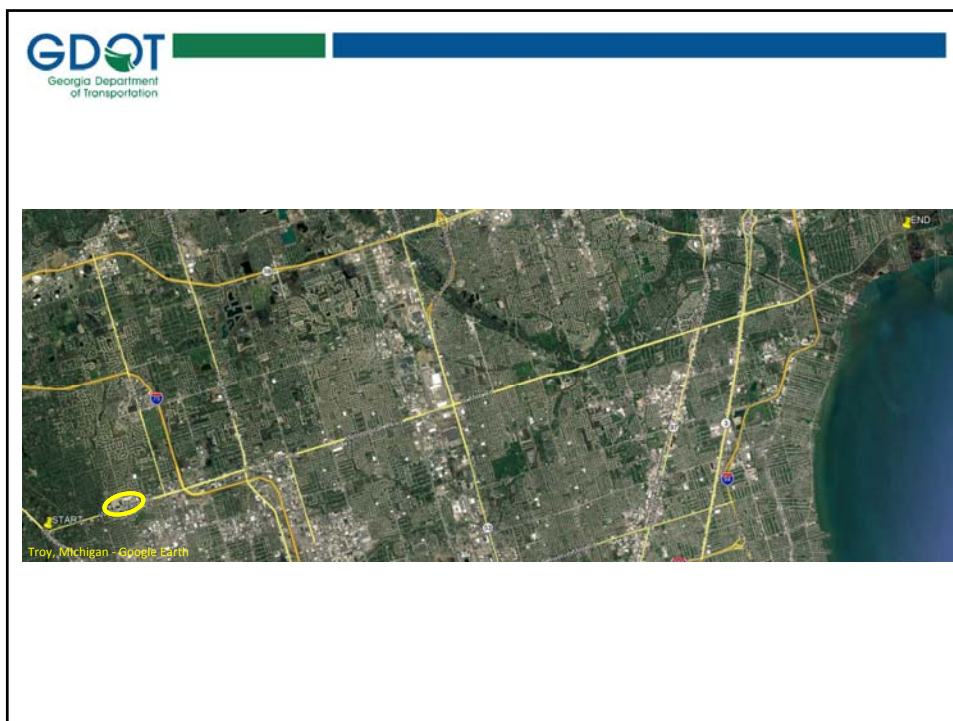
Exhibit 4-3. Vehicle-vehicle conflict points at MUT intersection.
FHWA Median U-Turn Intersection Information Guide

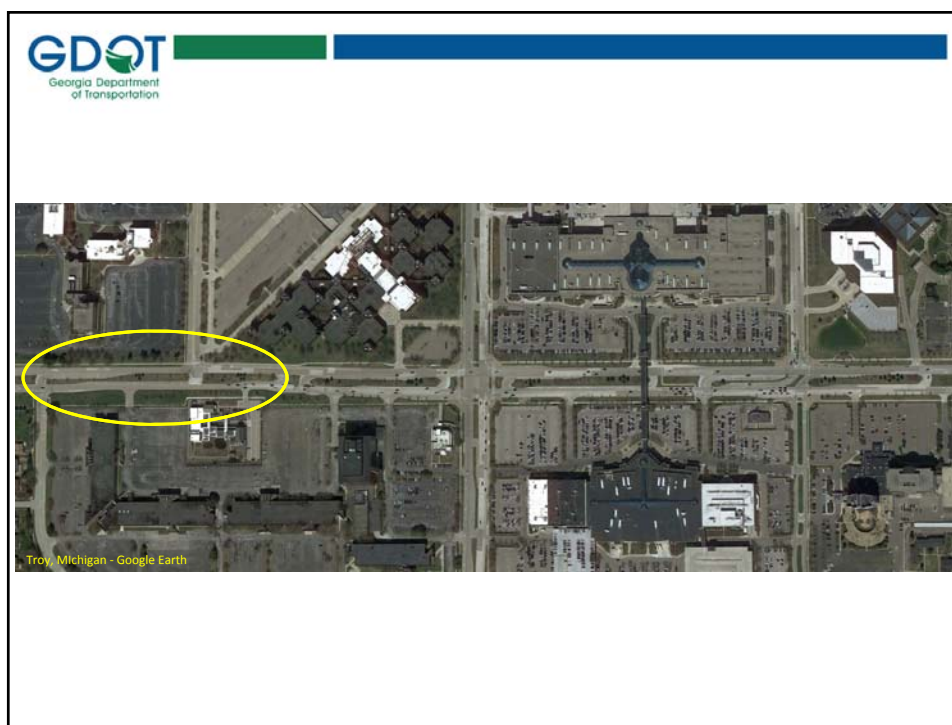
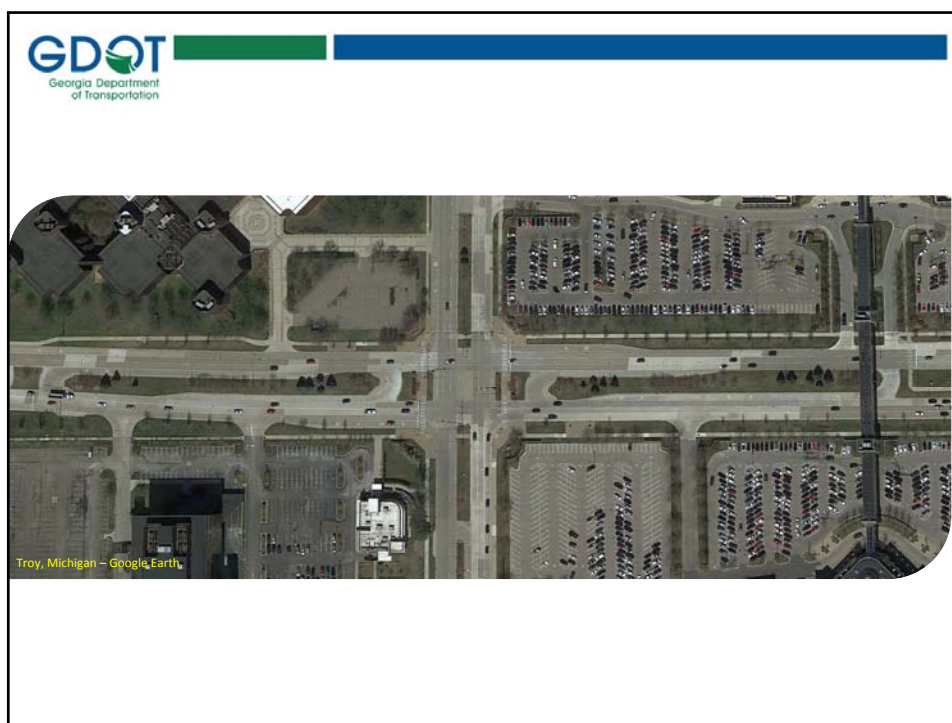
- Improved safety over traffic signal & AWSC
- Reduced signal phases
- Good alternative with existing wide medians
- Easily used in corridor with other alt. intersections
 - Roundabouts
 - RCUTs
 - RIRO

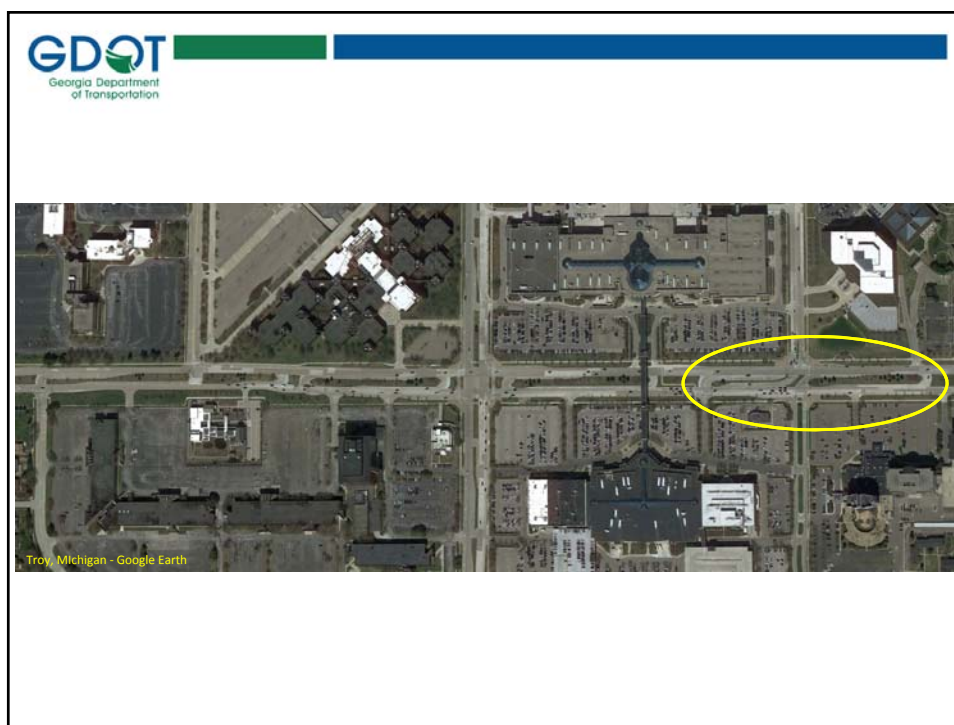
Benefits



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









GDOT
Georgia Department of Transportation

High-T/Continuous Green-T

The diagram illustrates a High-T/Continuous Green-T intersection. It shows an arterial road with a green-paved through lane and a cross street with a stop sign. The diagram is labeled 'ARTERIAL' and 'CROSS STREET'.

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

Benefits & Applicability

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

FHWA AIIR, Fig. 149



Maryland ATTAP MUID Quadrant Roadway

Quadrant Roadway

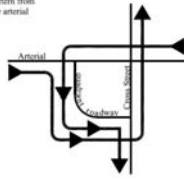
- No direct left turns at main intersection
- All left turns rerouted to connector, quadrant roadway
- Both junctions of connector road typically signalized
- All signals coordinated

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

Quadrant Roadway

A) Left turn
pattern from
the arterial



B) Left turn
pattern from
the cross
street

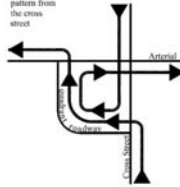


Figure 126. Illustration. Left-turn movements at a QR intersection.

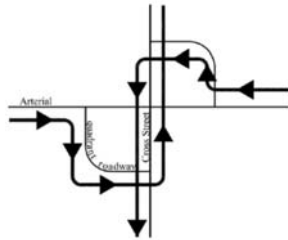


Figure 127. Illustration. Intersection with connector roadways in two quadrants.

FHWA AIIR Chpt 5. Quadrant Roadways

- 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

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





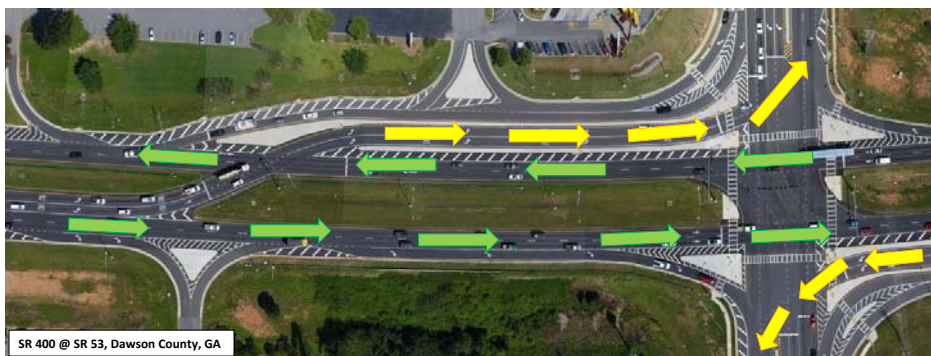
Continuous Flow Intersection (CFI)

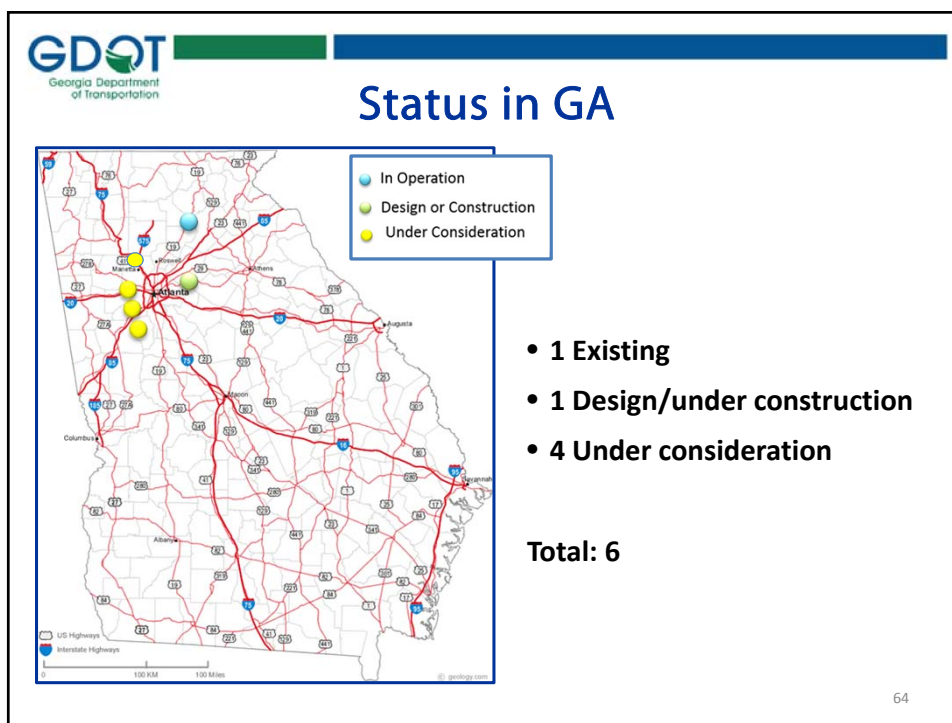
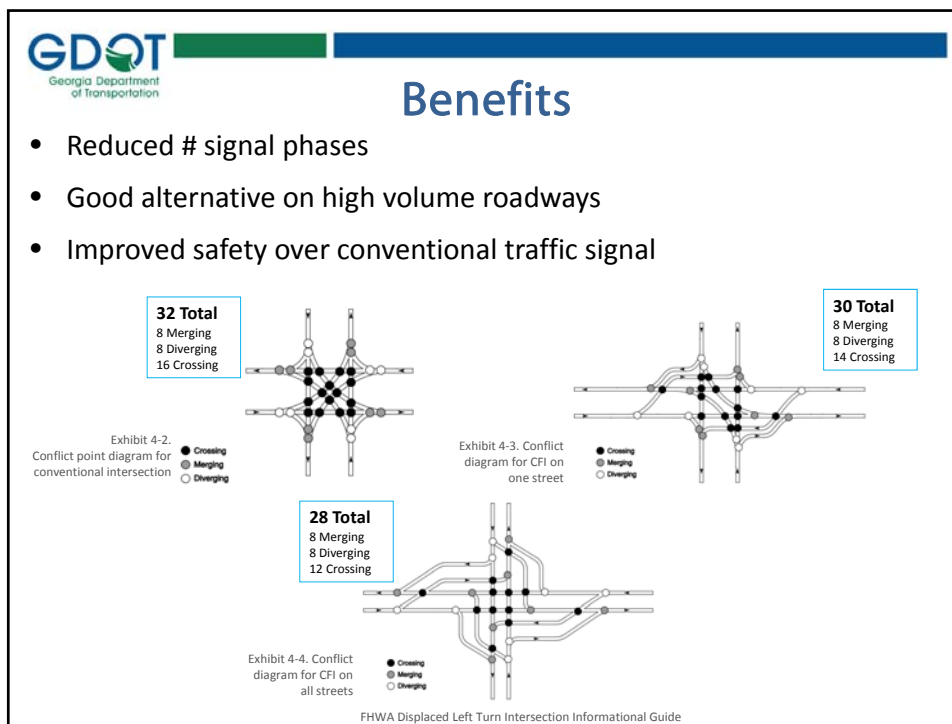
- Left turning traffic crosses opposing lanes in advance of main intersection at a signalized cross-over intersection
 - Displaced Left Turn (DLT)
- Left turns at same time as through movements
- Can have varying # of displaced left turns

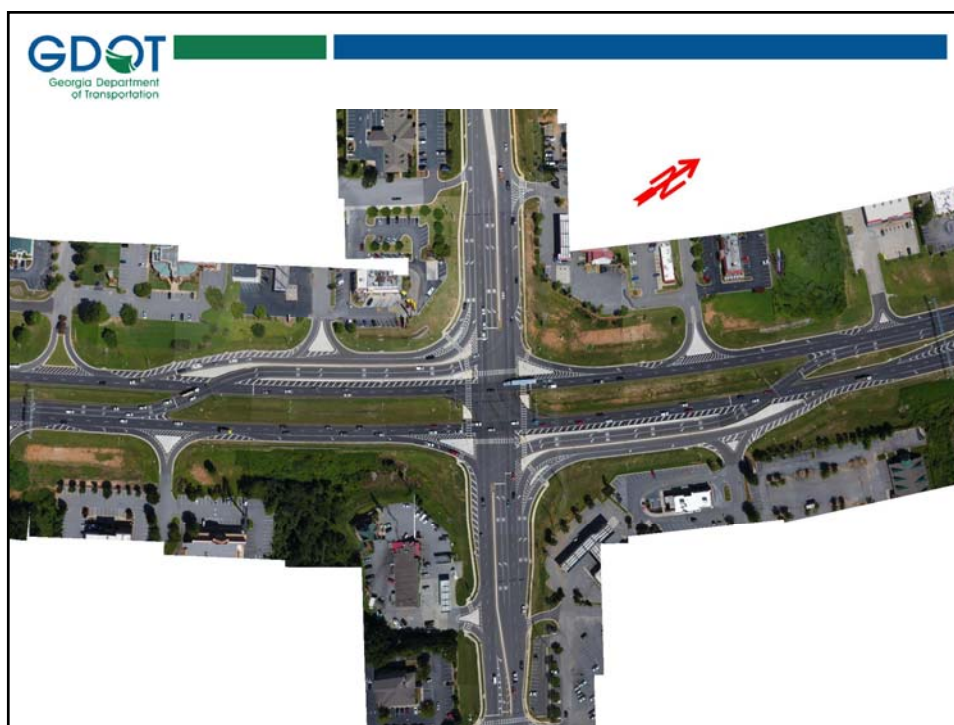


Continuous Flow Intersection (CFI)

- Left turning traffic crosses opposing lanes in advance of main intersection at a signalized cross-over intersection
 - Displaced Left Turn (DLT)
- Left turns at same time as through movements
- Can have varying # of displaced left turns









Diverging Diamond Interchange (DDI)

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



Gwinnet County website

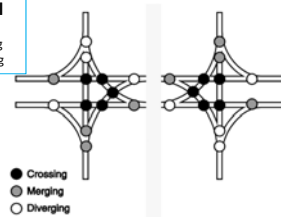


I-85 @ Jimmy Carter Blvd, Gwinnet County, GA

Benefits

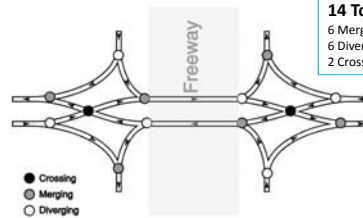
- Especially good where left turning volume high
- Reduce # signal phases
- Improved safety over conventional interchange
- Viable alternative to bridge widening for capacity increase

26 Total
 8 Merging
 8 Diverging
 10 Crossing



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

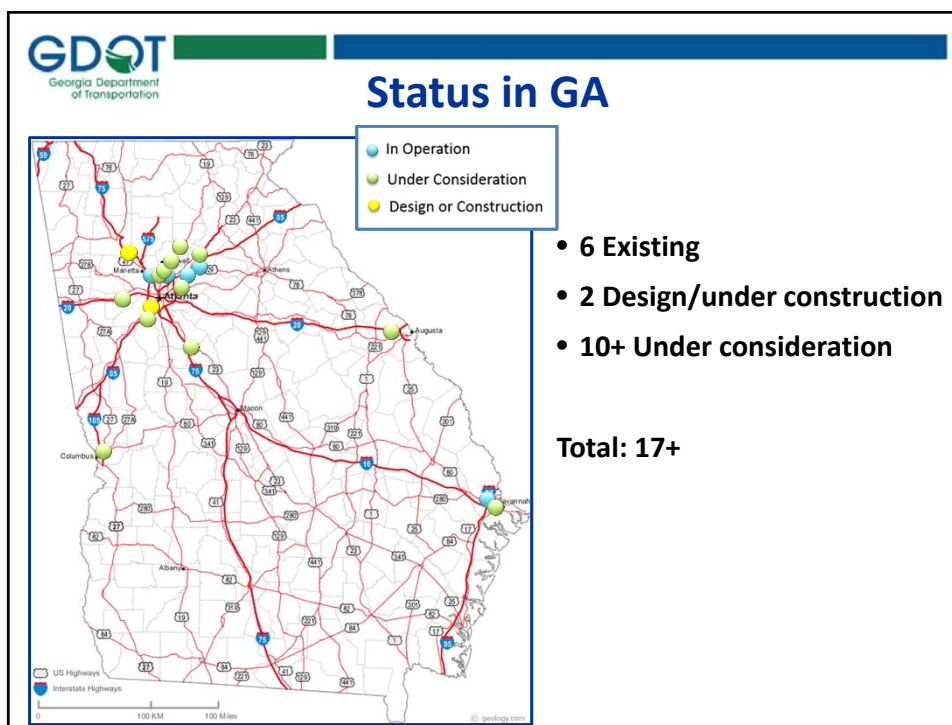
14 Total
 6 Merging
 6 Diverging
 2 Crossing



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



I-85 @ Pleasant Hill Rd, Gwinnett County, GA





Single-Point Urban Interchange (SPUI)

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



SR 400 @ Lenox Rd NE, Fulton County, GA



Benefits

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



Intersection Control Evaluation

ICE



GDOT Mission Statement

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



<http://alphastockimages.com/>



Why ICE??

Integrate safety into our decision making process for intersection control on ALL projects





GDOT
Georgia Department
of Transportation

Purpose of ICE

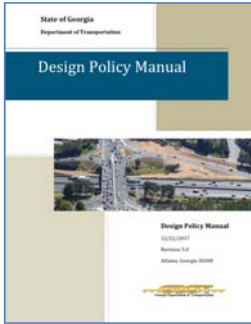
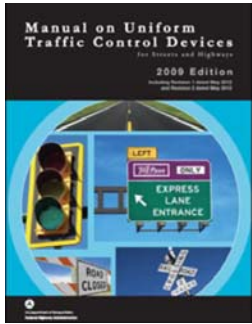
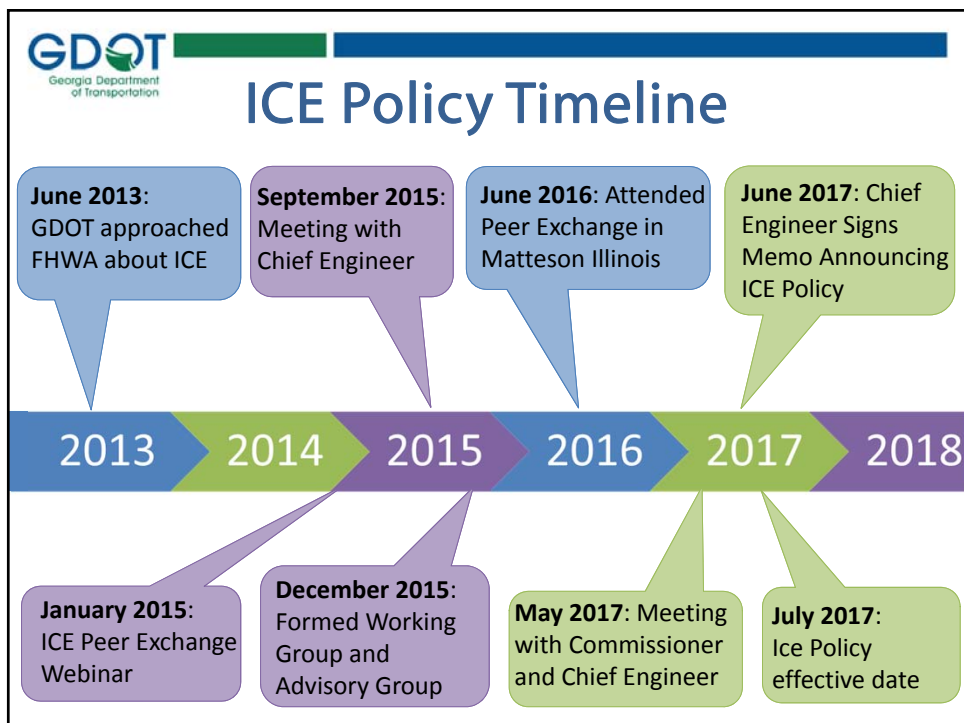
The purpose of ICE is to provide:

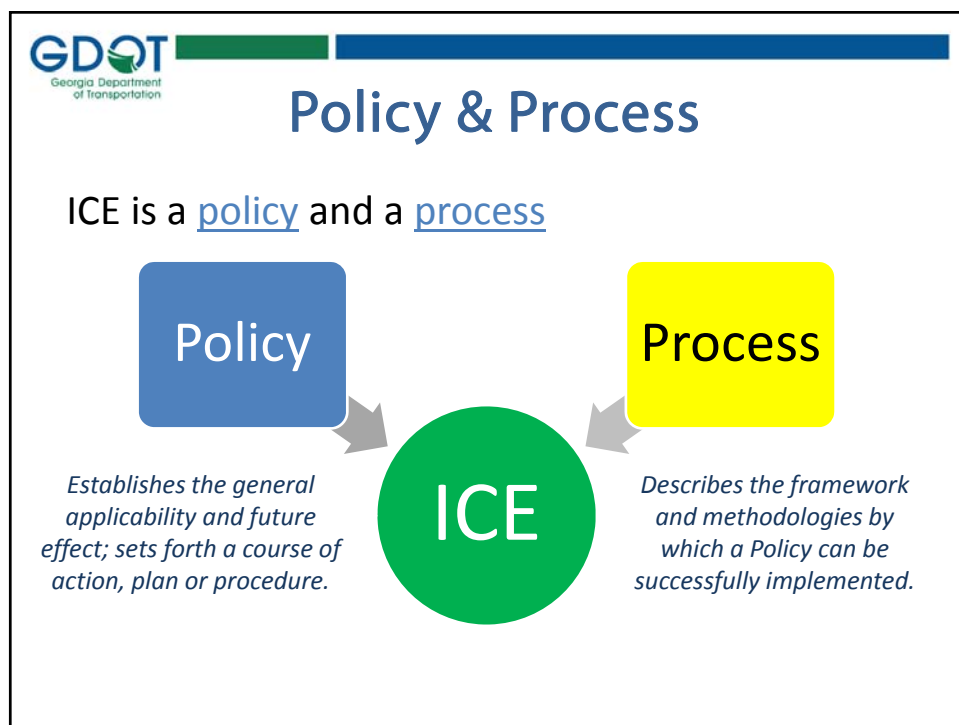
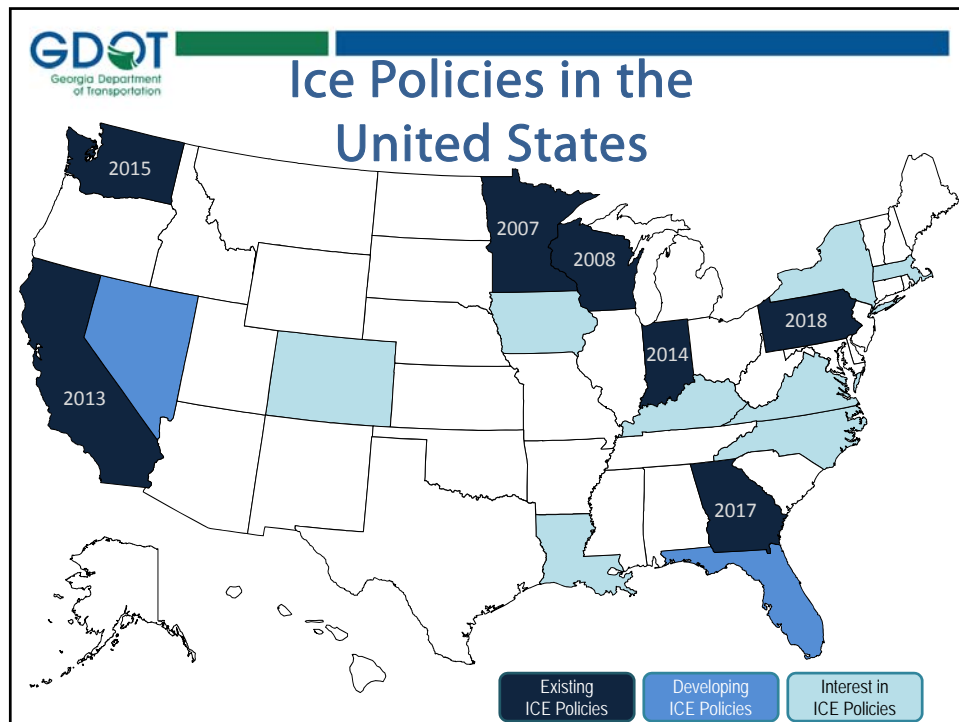
- **Traceability**
- **Transparency**
- **Consistency**
- **Accountability**

GDOT
Georgia Department of Transportation

Intersection Control Policy Before ICE

- **GDOT Design Policy Manual**
 - Ch. 7 Design Policy Manual: At Grade Intersections
 - Ch. 8 Design Policy Manual: Roundabouts
- **MUTCD**





Intersection Control Evaluation

THE POLICY



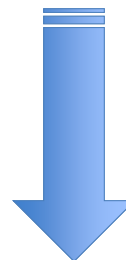
Location and format

<http://www.dot.ga.gov/>



Home -> Business & Government -> Design Manuals -> Manuals & Guides

Intersection Control Evaluation
ICE Policy Training Presentation
ICE Tool: v2.14 Users Guide
Intersection Control Evaluation (ICE) Policy
Intersection Control Evaluation (ICE) Policy: Appendix A - Stage 1
Intersection Control Evaluation (ICE) Multi-File Summary v2.14
Intersection Control Evaluation (ICE) Policy: Appendix B - Stage 2
Intersection Control Evaluation (ICE) Policy: Appendix C
Intersection Control Evaluation (ICE) Policy: Appendix D
Intersection Control Evaluation (ICE) Policy: Tool v2.14
Intersection Control Evaluation (ICE) Policy: Tool v2.14 Example
Memo



Scroll to
bottom of
the page

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 <u>may</u> be waived based on appropriate evidence and a written request

Not Required
<p>A project that will <u>not do any widening</u>, where there is no change to <u>intersection geometry</u> or <u>control</u>. Examples include:</p> <ul style="list-style-type: none">– 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)



Not Required: Driveway Permits

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

1. 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
2. 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)



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, such as extending existing turn lane(s)
- The intersection consists of a **public roadway** intersecting a divided, multilane roadway where the access will be limited to a closed median with only right-in/right-out access that will operate acceptably;
- 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



Approvals

Level 1: Chief Engineer (or Designee)

- Projects going through Plan Development Process
- New or revised signal permits
- New median openings



Level 2: District Engineer with notification to Chief Engineer

Projects that are not level 1 where:

- Leg is added to intersection
- Intersection control will be changed

Level 3: District Engineer

- QR, Driveway Permits, Maintenance Work that does not qualify as level 2



Implementation

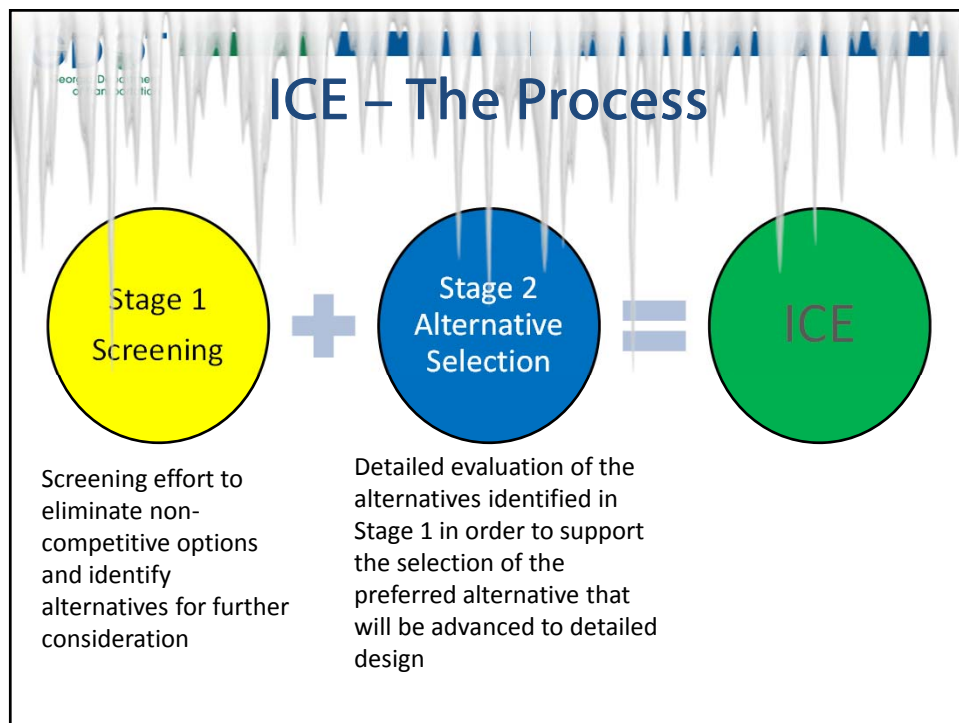
- ICE is required for all projects that do not have concept approval by July 1, 2017
- If ICE would delay the concept report submittal for any projects that have schedules set by July 1, 2017, ICE may be completed during the preliminary design phase
- Submittals during preliminary design must occur no later than 1/3 of the way through the time allotted for preliminary design





Intersection Control Evaluation

THE PROCESS





Stage 1 - Screening

Unsignalized

- Minor Stop
- All-Way Stop
- Mini Roundabout
- Single Lane Roundabout
- Multilane Roundabout
- RCUT
- RIRO w/Downstream U-Turn
- High-T (unsignalized)
- Offset-T Intersections
- Diamond Interchange (Stop)
- Diamond Interchange (RAB)
- Turn Lane Improvements
- Other



Stage 1 - Screening

Signalized

- Signal
- Median U-Turn
- RCUT
- Displaced Left Turn (CFI)
- Continuous Green-T
- Jughandle
- Diamond Interchange (signal)
- Quadrant Roadway
- Diverging Diamond
- Single Point Interchange
- Turn Lane Improvements
- Other



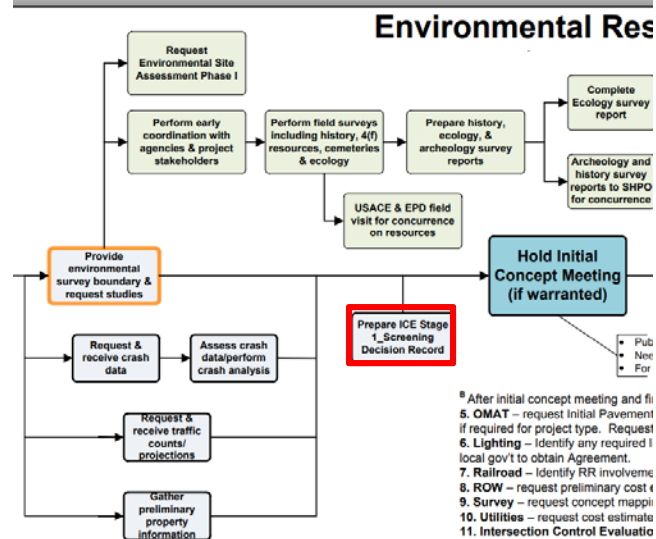


Stage 1 - Screening

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, constraints and location context**?
6. Does alternative **appear feasible** with respect to **other project factors**?
7. **Overall feasible alternative?**



Concept Development Process





ICE Documentation

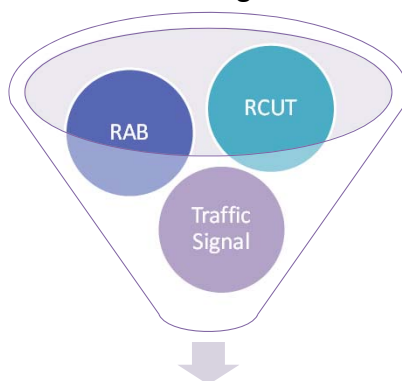
Stage 1

- Completed Stage 1: Screening Decision Record
- Single intersection projects may proceed seamlessly to Stage 2
- For corridor projects a Concurrence Memo should be generated and signed (use Multi-File Summary tool)
- Required for Concept Report



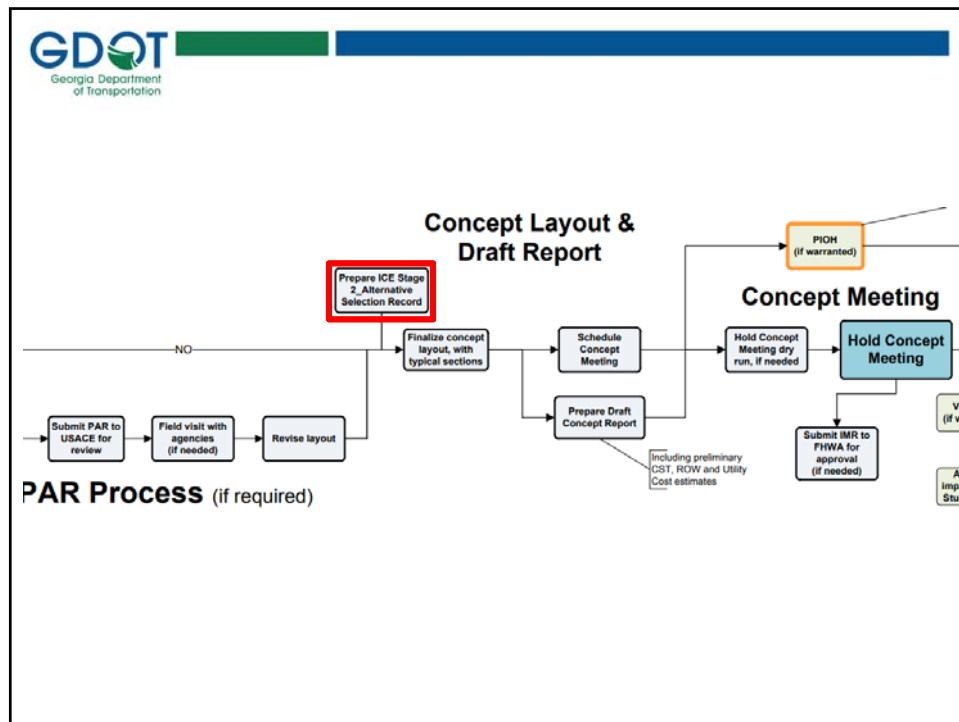
Stage 2 - Alternative Selection

Shortlist of Alternatives
from Stage 1



- Total Project Cost
- Traffic Operations
- Safety Analysis
- Environmental Impacts
- Stakeholder Posture

Preferred Alternative



ICE Documentation

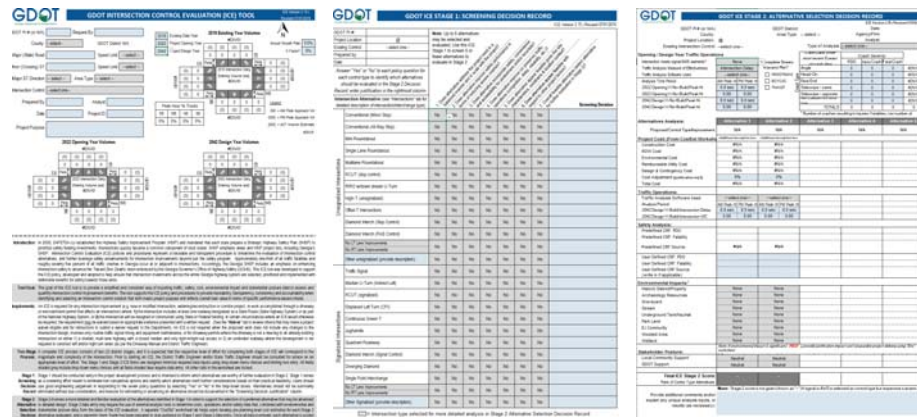
Stage 1

- Completed Stage 1: Screening Decision Record
- Single intersection projects may proceed seamlessly to Stage 2
- For corridor projects a Concurrence Memo should be generated and signed (use Multi-File Summary tool)
- Required for Concept Report

Stage 2

- Completed Stage 2: Alternative Selection Decision Record with supporting documentation
- Included in Project Concept Report or as a stand-alone document
- Completed waiver form if the ICE recommended alternative is not selected as the preferred alternative
- Required in Concept for stand alone intersection projects.

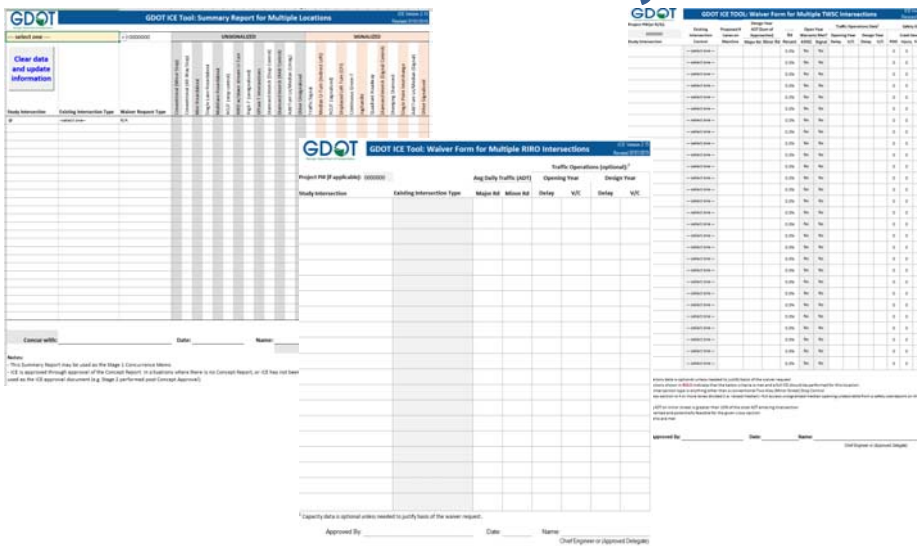
ICE Tool



The screenshot displays the ICE Tool interface, which is used for evaluating intersection control. It is divided into three main sections:

- Section 1: Project Information and Diagrams**
 - Includes fields for Project Name, Location, and Date.
 - Contains diagrams for the intersection layout, including a plan view and a side view.
- Section 2: Intersection Data Entry**
 - Contains a table for entering intersection data, including intersection type, approach, and control type.
 - Includes a table for entering intersection data, including intersection type, approach, and control type.
- Section 3: Results Summary**
 - Contains a table for summarizing the results of the evaluation, including intersection type, approach, and control type.
 - Includes a table for summarizing the results of the evaluation, including intersection type, approach, and control type.

Multi-File Summary Tool



The screenshot displays the Multi-File Summary Tool interface, which is used for summarizing the results of the ICE Tool for multiple locations. It includes the following sections:

- Section 1: Project Information**
 - Includes fields for Project Name, Location, and Date.
- Section 2: Summary Report**
 - Contains a table for summarizing the results of the evaluation, including intersection type, approach, and control type.
- Section 3: Notes**
 - Contains a text area for entering notes related to the evaluation.
- Section 4: Approval**
 - Includes fields for the user's name, date, and signature.



Chris Raymond, P.E. State Traffic Operations Manager	Daniel Trevorrow, P.E. Alternative Intersections Supervisor (RAID Team Supervisor)
GDOT Office of Traffic Operations	GDOT Office of Traffic Operations
Office #: 404-635-2809 Email: cdraymond@dot.ga.gov	Office #: 404-635-2967 Email: dtrevorrow@dot.ga.gov