

Case Studies and Resources

ICE Examples

Ohio DOT (ODOT) CAP-X Multimodal Help Guide

As part of their ICE process, ODOT provides a guide that details how to use the spreadsheet-based CAP-X (Capacity Analysis for Planning of Junctions) tool for multimodal analysis. CAP-X scores performance for pedestrians and bicyclists based on design elements such as crossing length and directness. It also includes a variety of common intersection designs with their default pedestrian crossing locations, as well as specific considerations for bicycles.

Washington State DOT (WSDOT) Design Manual

The WSDOT ICE design manual includes guidance on accommodating other transportation modes by detailing considerations for speeds, cycle lengths, turning movements, and ways to measure pedestrian demand. Other sections of the manual provide more specific design guidance for intersections that include pedestrian crossings, shared use paths, or bike routes.

Other Resources

NACTO Design Guides

The National Association of City Transportation Officials (NACTO) provides a free series of design guides featuring options and best practices for urban streets, transit streets, and urban bikeways. Each guide includes intersection specific guidance.

North Carolina DOT (NCDOT) Complete Streets Project Evaluation Methodology

This methodology lists a series of steps for selecting a facility type and a matrix of potential facilities based on anticipated bike and pedestrian need, demand, and safety risk. The guide also directs readers to facility specifications in the NCDOT Roadway Design Manual for sidewalks, shared use paths, and bike lanes.

FHWA Separated Bike Lane Planning and Design Guide

The FHWA Separated Bike Lane Planning and Design Guide provides the tools to identify locations to include separated lanes, various intersection designs, midblock lane design considerations, and pavement markings.

Find out more about the SEAS Update
at: www.campo-nc.us

Southeast Area Study Update

This pamphlet is a product of the Southeast Area Study (SEAS) Update and is intended to serve as a technical resource to help planners, engineers, and developers advance the *guiding principles of the study*...



LIVABILITY



TRAFFIC FLOW



SUSTAINABLE GROWTH



TRAVEL SAFETY



ACTIVE TRANSPORTATION



NETWORK CONNECTIVITY



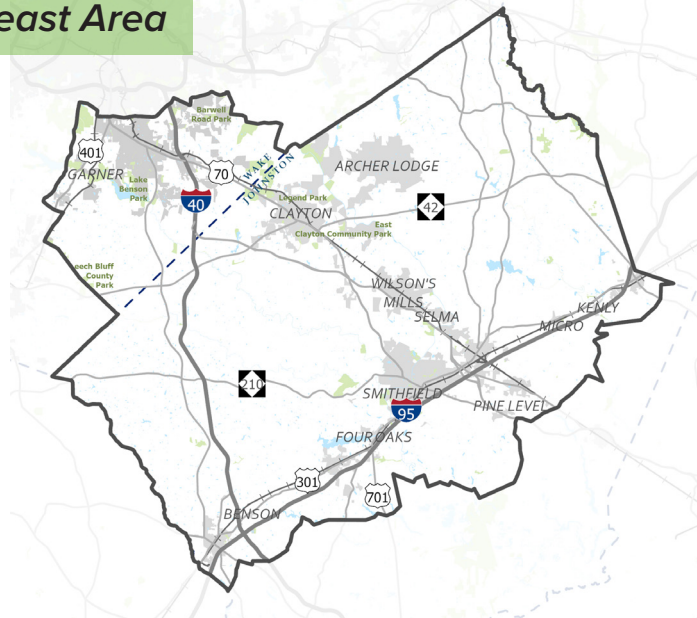
ECONOMIC VITALITY



FREIGHT MOVEMENT

As the Southeast Area grows and changes, **multimodal design will be increasingly important to advancing these principles**. The SEAS Update includes recommendations for multimodal facilities and intersection improvements, and this toolkit provides guidance and resources for choosing alternatives that meet the needs of all users, whether driving, walking, rolling, biking, or taking transit.

Southeast Area



Sources

FHWA; Separated Bike Lane Planning and Design Guide; https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf

NACTO; Transit Street Design Guide; <https://nacto.org/publication/transit-street-design-guide/>

NACTO; Urban Street Design Guide; <https://nacto.org/publication/urban-street-design-guide/>

NACTO; Urban Bikeway Design Guide; <https://nacto.org/publication/urban-bikeway-design-guide/>

NACTO; Don't Give Up at the Intersection; <https://nacto.org/publication/urban-street-design-guide/>

NCDOT; Complete Streets Project Evaluation Methodology; <https://connect.ncdot.gov/projects/BikePed/Documents/Complete%20Streets%20Evaluation%20Methodology.pdf>

ODOT; CAP-X Multimodal Help; https://www.transportation.ohio.gov/wps/wcm/connect/gov/c03b7448-e2ee-4ba4-b2c0-5a7664221630/CAP-X+Multimodal+Help+File.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z1B_K9I40IS01H7F40QBNJU3SO1F56-c03b7448-e2ee-4ba4-b2c0-5a7664221630-orr52qR

WSDOT; Design Manual; see chapters 1300, 1510, 1515, and 1520; <https://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/design.pdf>

SEAS

S O U T H E A S T A R E A S T U D Y

UPDATE

Archer Lodge | Benson | Clayton | Four Oaks | Garner | Kenly |
Micro | Pine Level | Selma | Smithfield | Wilson's Mills |
Parts of Raleigh, Johnston County, and Wake County

MULTIMODAL INTERSECTION CONTROL EVALUATION (ICE) TOOLKIT

Photo: NCDOT

What is ICE?


Intersection Control Evaluation (ICE) is a performance-based process and framework used to consider alternatives and identify optimal solutions for intersection improvements. The central goals of ICE are to improve **transparency**, **flexibility**, and **adaptability** during the intersection improvement process.

An ICE is a two-step process of **screening** potential intersection design alternatives and **selecting** the ultimate preferred alternative.

What About Other Modes?

The term “multimodal” includes a variety of road users in addition to the driver, including **people walking and rolling**, **biking**, and **taking transit**. As the Southeast Area grows and builds out plans for sidewalks, greenways, transit service, new roadways, and mixed-use centers, it will become increasingly important for **access**, **mobility**, and **safety** to include accommodations for multimodal users in roadway design.

Intersection Control Evaluations typically focus on safety and delay reduction benefits; however, some ICEs focus more heavily on delay first and vehicle safety second, and have very limited focus on how alternative designs impact the safety and convenience of multimodal users. **The needs of multimodal users must be considered from the beginning to ensure that intersections are safe and efficient for everyone.**

 Including multimodal accommodations in roadway and intersection projects at the outset of a project can also help avoid added costs from retrofitting infrastructure at a later date.

How do I Include Multiple Travel Modes when Doing an ICE?

Prioritize safety first and traffic flow second.

To design for safe and efficient movement of all modes when screening alternatives, in order of importance, **prioritize...**

Safety, first of the people outside of vehicles who are most at risk of injury, followed by the safe movement of vehicles through the intersection.

Efficient movement of all modes that must travel through the space.









Think “Location, location, location”

Not all locations need to be inclusive of all modes, but intersections should safely incorporate all modes expected based on existing routes, destinations, and future plans. When screening alternatives, ask yourself, *is the intersection...*

-  On the pedestrian network?
-  On a bike route or shared use path?
-  Where it would be difficult and expensive to add multimodal provisions later?
-  On a transit route or near a transit stop?
-  Near destinations people would walk or bike to?
-  Where land use supports or is planned to support walking and biking?

Key multimodal principles for safety and efficiency

There are various proven solutions that keep people walking, biking, and taking transit safe. *Consider intersection solutions that...*

-  Deter high speeds
-  Ensure visibility
-  Prevent wide and fast turns
-  Minimize turn conflicts
-  Time signals for flow of all modes
-  Include space for and access to transit stops

Why is it Important to Design Intersections for Multiple Modes?




Infrastructure makes a difference.

Between 2007 and 2021, roughly **98%** of pedestrian fatalities and serious injuries in the Southeast Area were in places **without sidewalks** and **100%** of bicyclist fatalities and serious injuries were in places **without bike facilities**.

Intersection design is critical.

Intersections are major conflict points between people walking and biking and fast-moving multi-ton vehicles. Intersections designed only for traffic flow limit where people can comfortably walk and bike and jeopardize the safety of people who have to cross the street.

Multimodal design should...serve all kinds of users...

-  People walking or rolling
-  People biking
-  Transit riders
-  Drivers



...provide access and mobility to more people...

-  People with no vehicle access
-  People with disabilities that prevent driving
-  Children too young to drive
-  Seniors no longer able to drive safely

...and provide alternatives to worsening congestion.

-  People are given options for getting around besides driving on congested roads
-  People who choose alternative modes free up space on the road for others

Designing for all modes early can even help minimize project costs and cost increases by:

-  Avoiding paying to redo work and retrofit infrastructure completed in earlier phases/projects
-  Avoiding cost inflation from delayed construction