Office of Safety Research and Development

UTILIZING GIS TO IMPROVE SAFETY ON THE NATION'S HIGHWAYS

Craig Thor, Ph.D.

Geographic Information Systems (GIS) in Transportation Safety

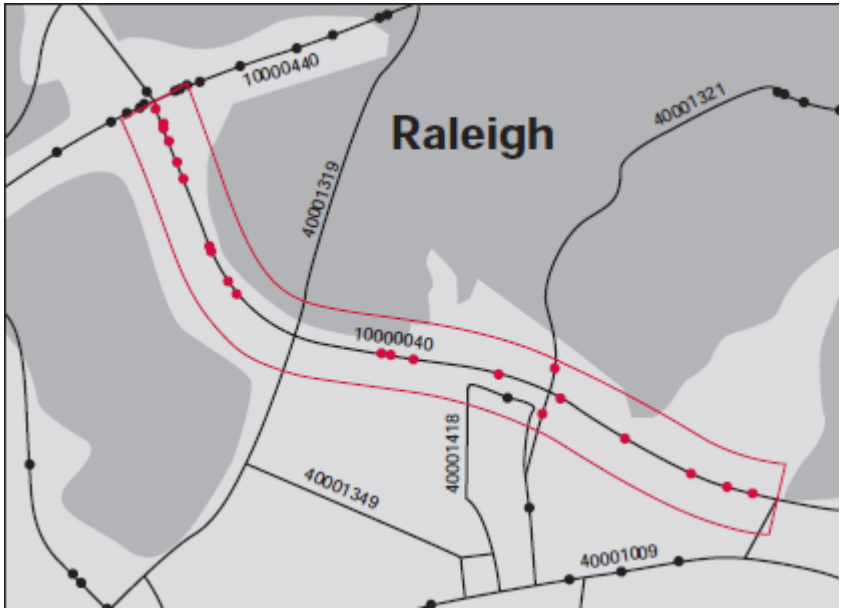
December 4-5, 2012

GIS at FHWA

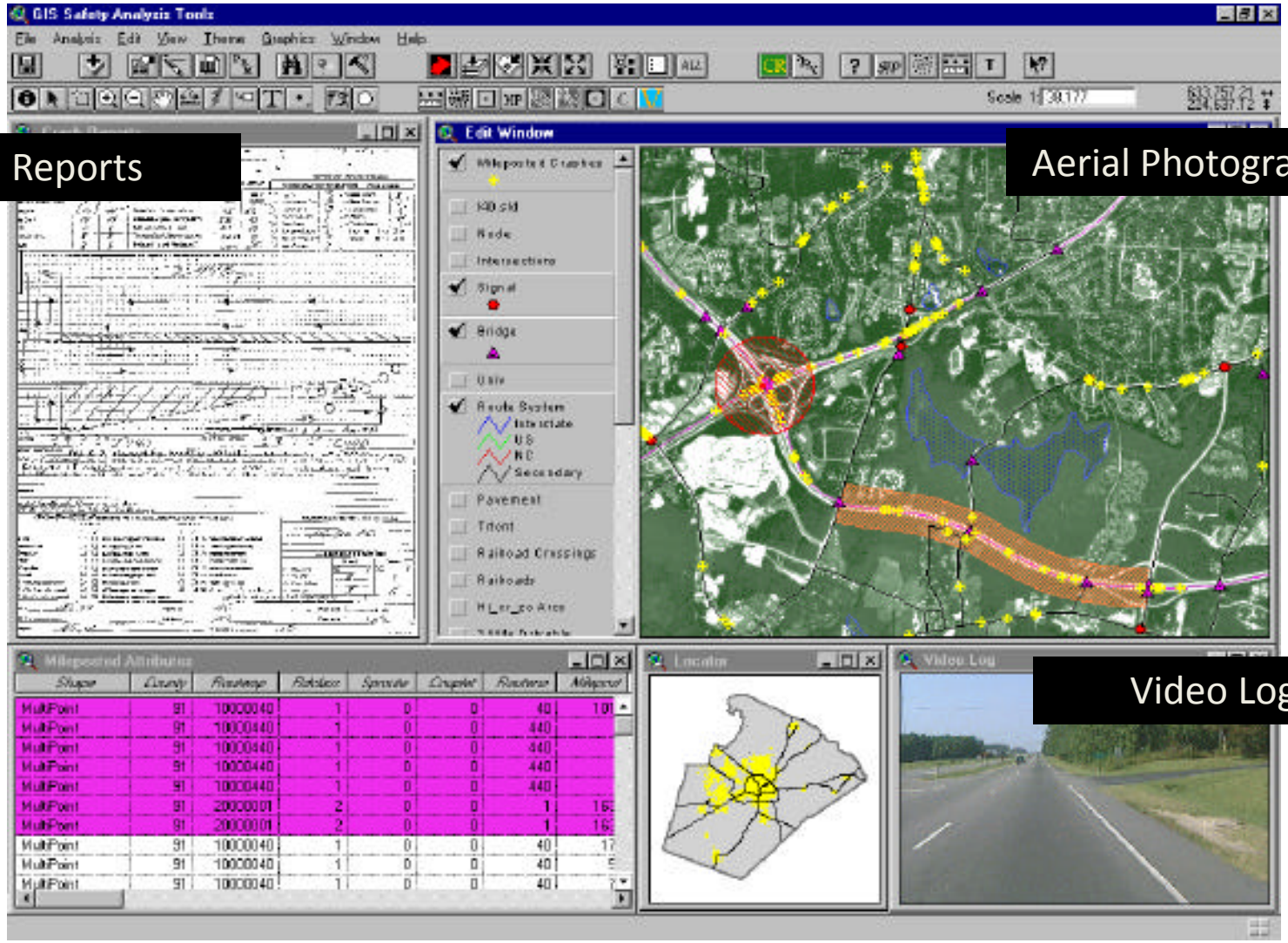
- Asset Management
- Planning
- Bridge Inventory
- Highway Performance Monitoring
- Operations
- **SAFETY**

GIS in the FHWA Safety Program

- Analysis Tools
  - GIS Safety Analysis Tools
  - PBCAT – Pedestrian and Bicycle Crash Analysis Tools



GIS Safety Analysis Tools



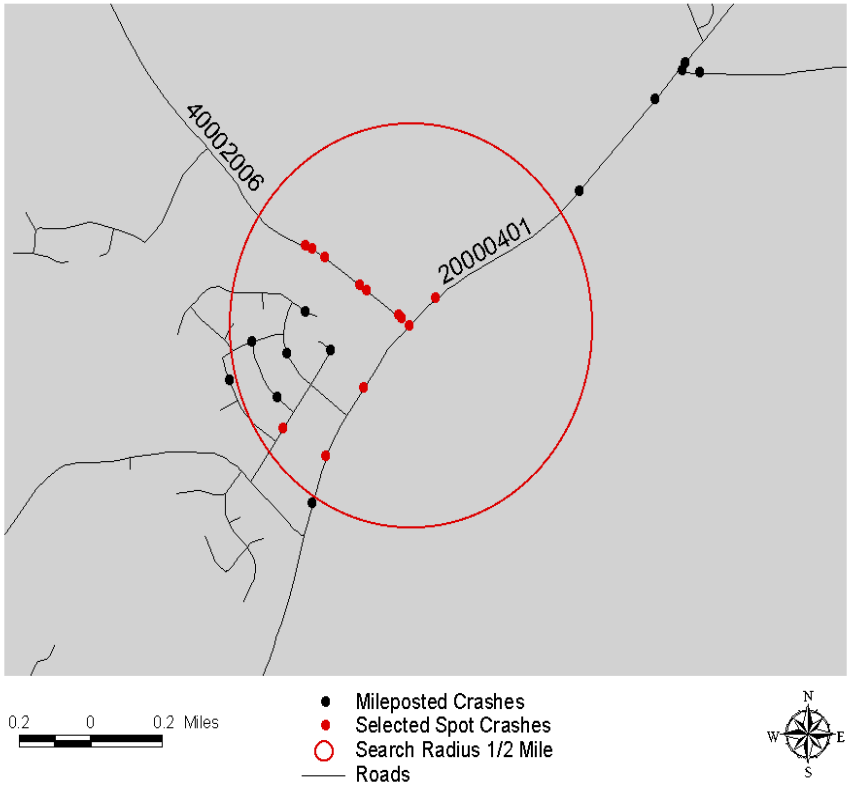
Crash Reports

Aerial Photography

Video Logs

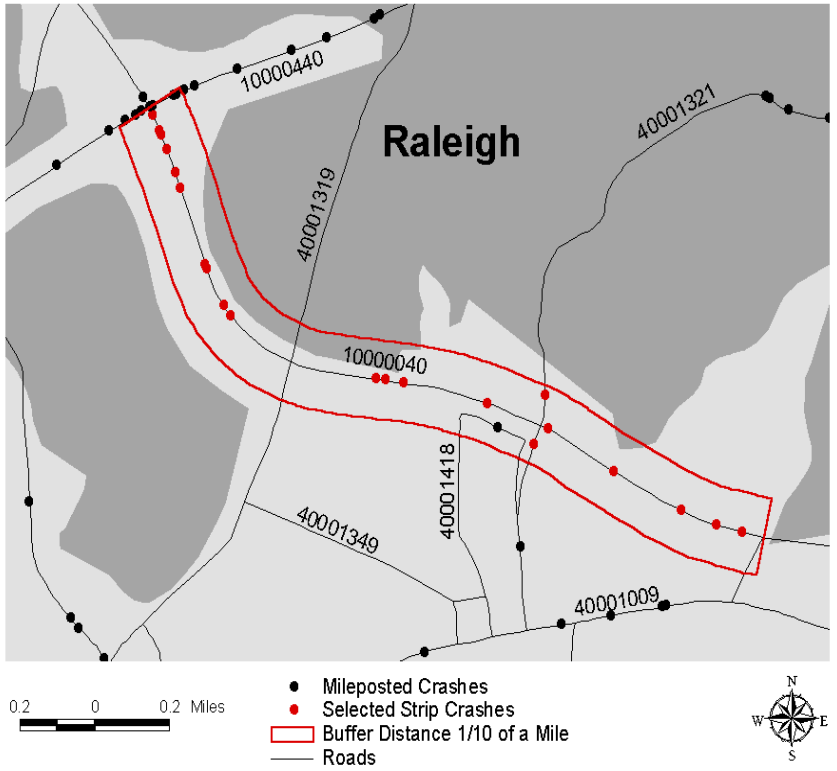
Intersection Analysis

- Evaluation of crashes at a specific location (intersection)



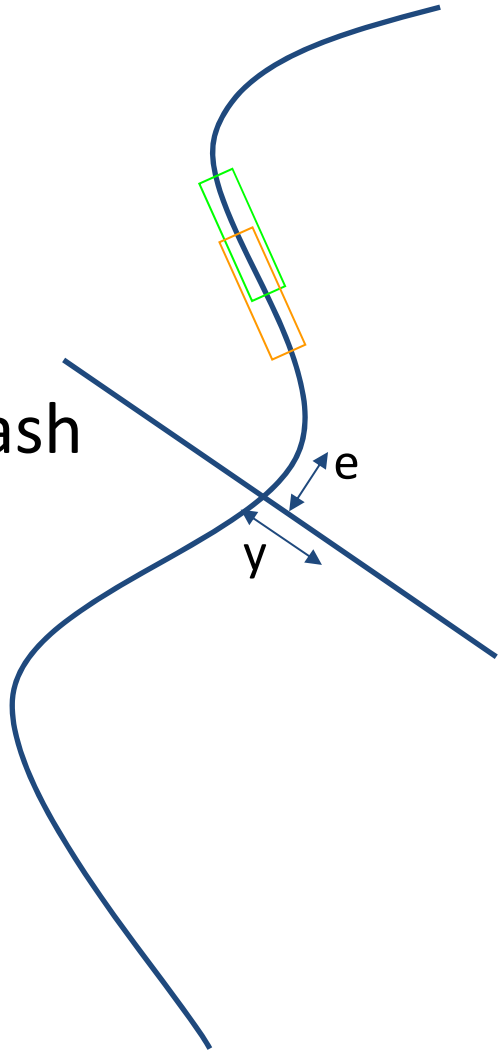
Strip Analysis

- Evaluation of crashes along a designated length of roadway



Sliding Scale Analysis

- Input Parameters
  - Starting length
  - Extension length
  - Maximum extensions without a crash
  - Exclusion distance (e)
  - Y-line distance (y)
  - Crash rate
  - Average crash rate



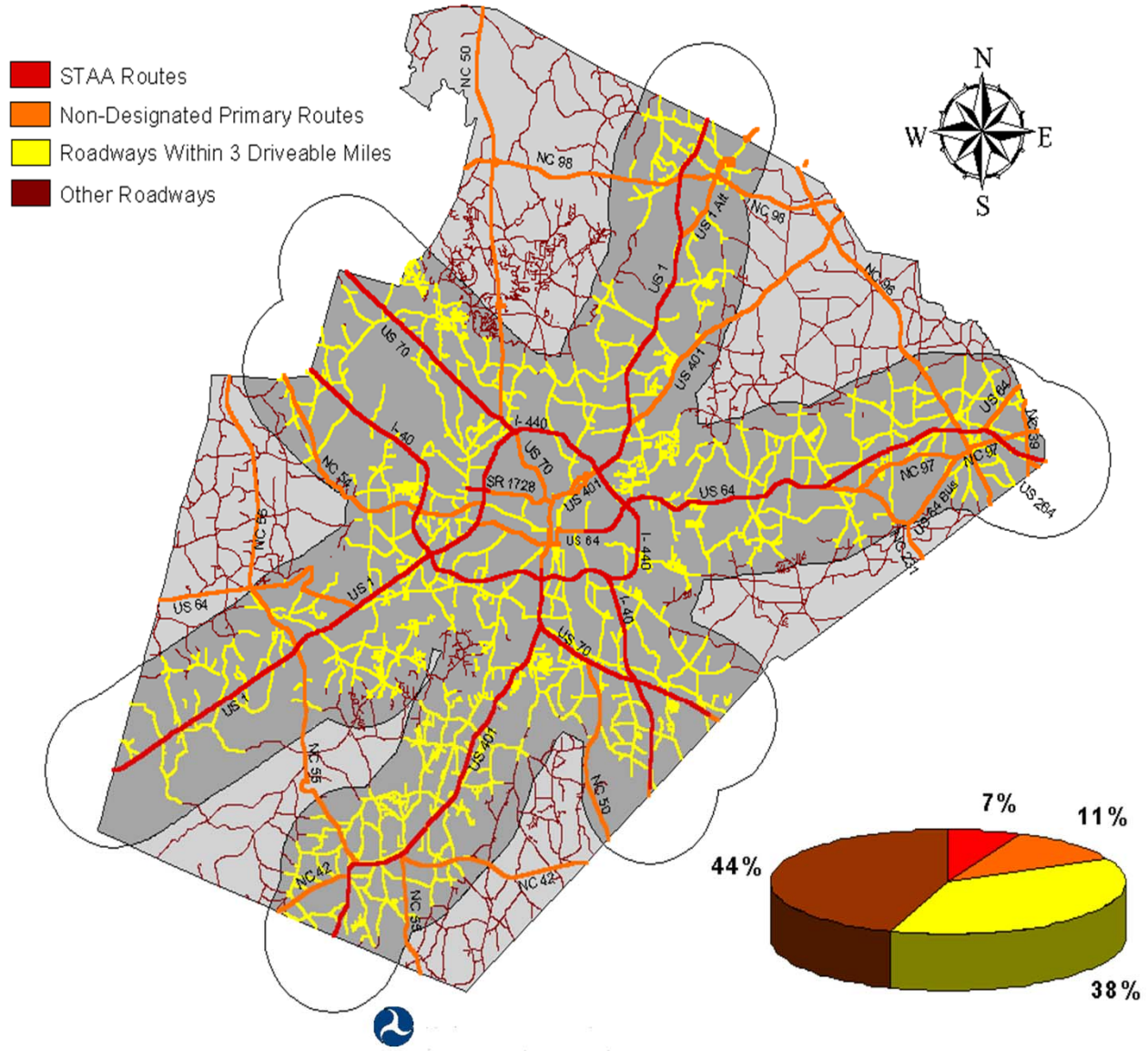
Corridor Analysis

- Evaluation of crashes within a corridor, which may include several connected roadways

EXAMPLE:

Truck crashes within Wake County, NC

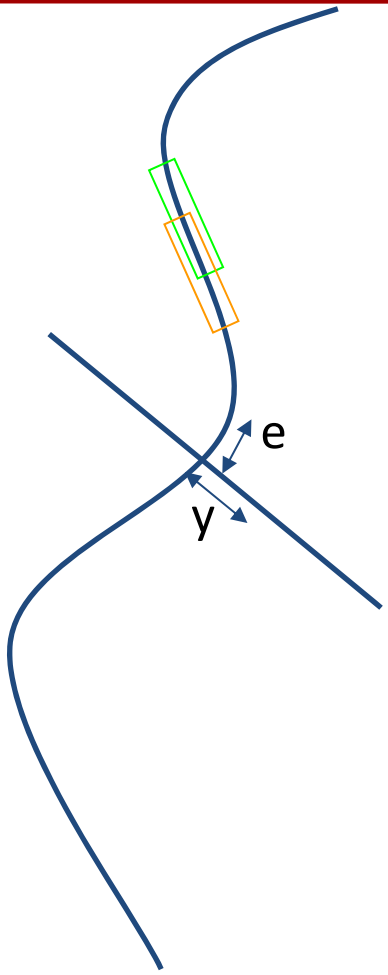
Truck Route Network



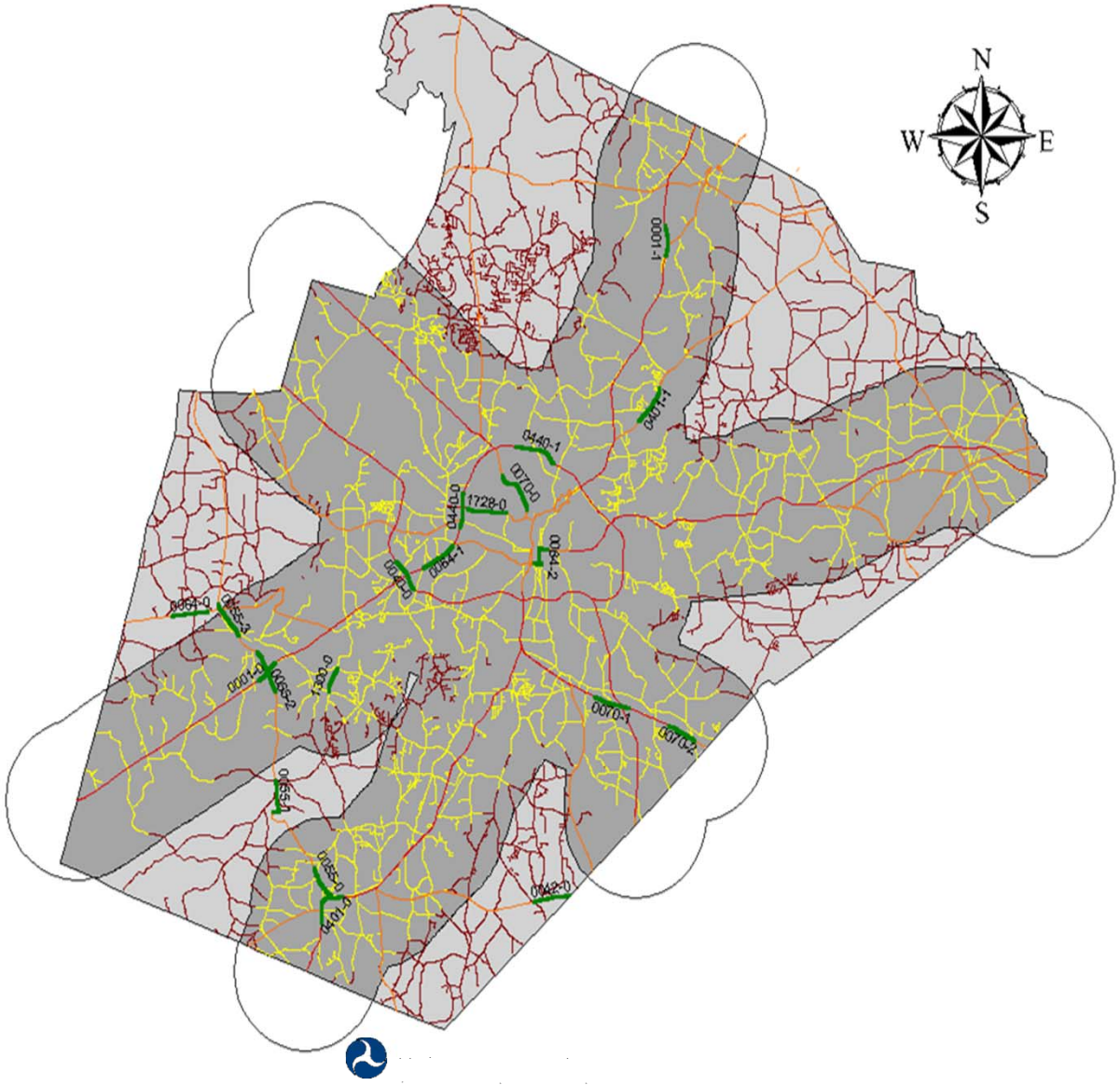
Sliding Scale Analysis

➔ **Input Parameters**

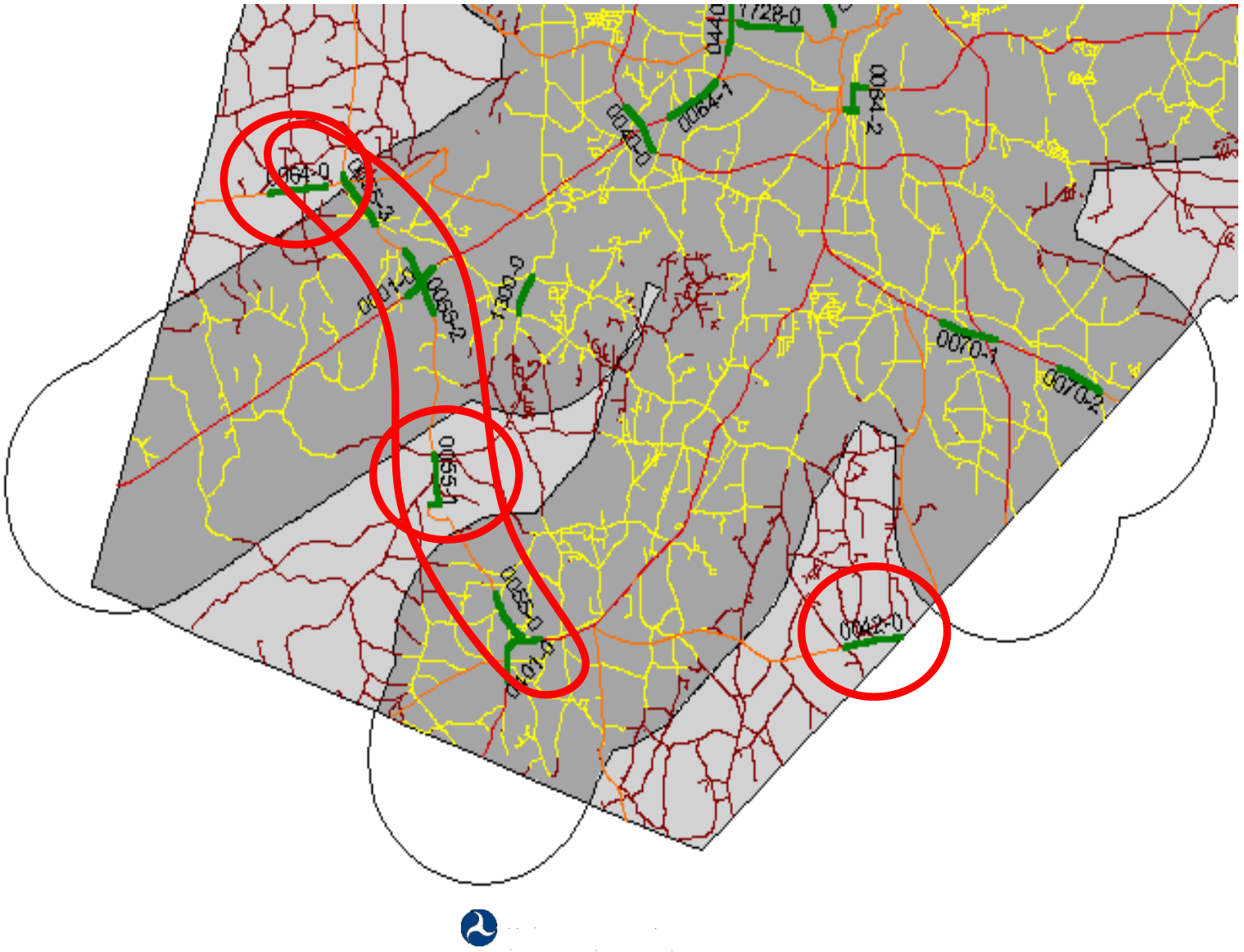
- Starting length: **(1.6 km)**
- Extension length: **(0.16 km)**
- Maximum extensions without a crash: **(5)**
- Exclusion distance (e): **(0)**
- Y-line distance (y): **(0)**
- Average crash rate (crashes / MVM):
  - **Interstate: 0.104**
  - **US Routes: 0.088**
  - **NC Primary: 0.086**
  - **NC Secondary: 0.063**



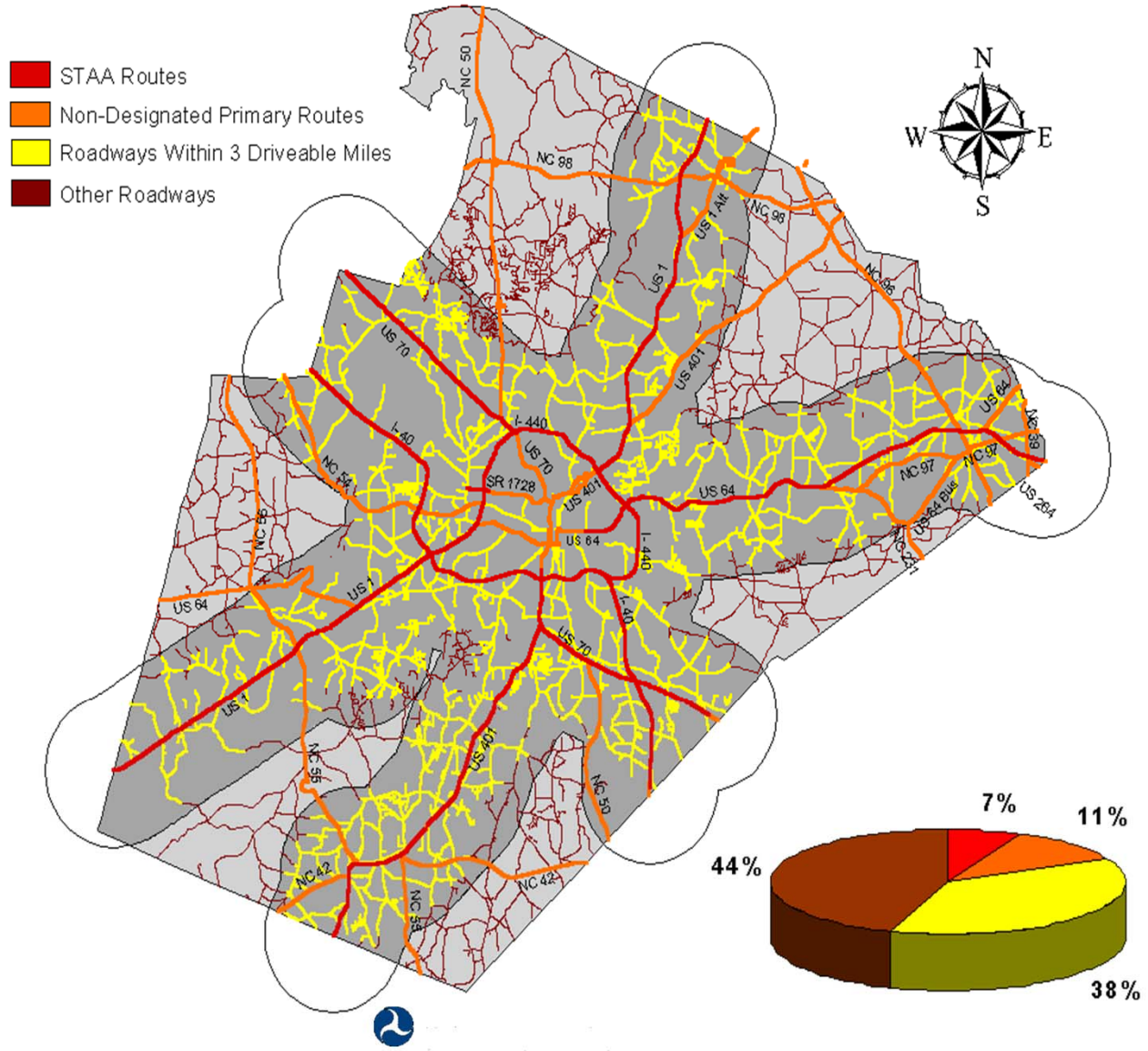
Sliding Scale Analysis Results



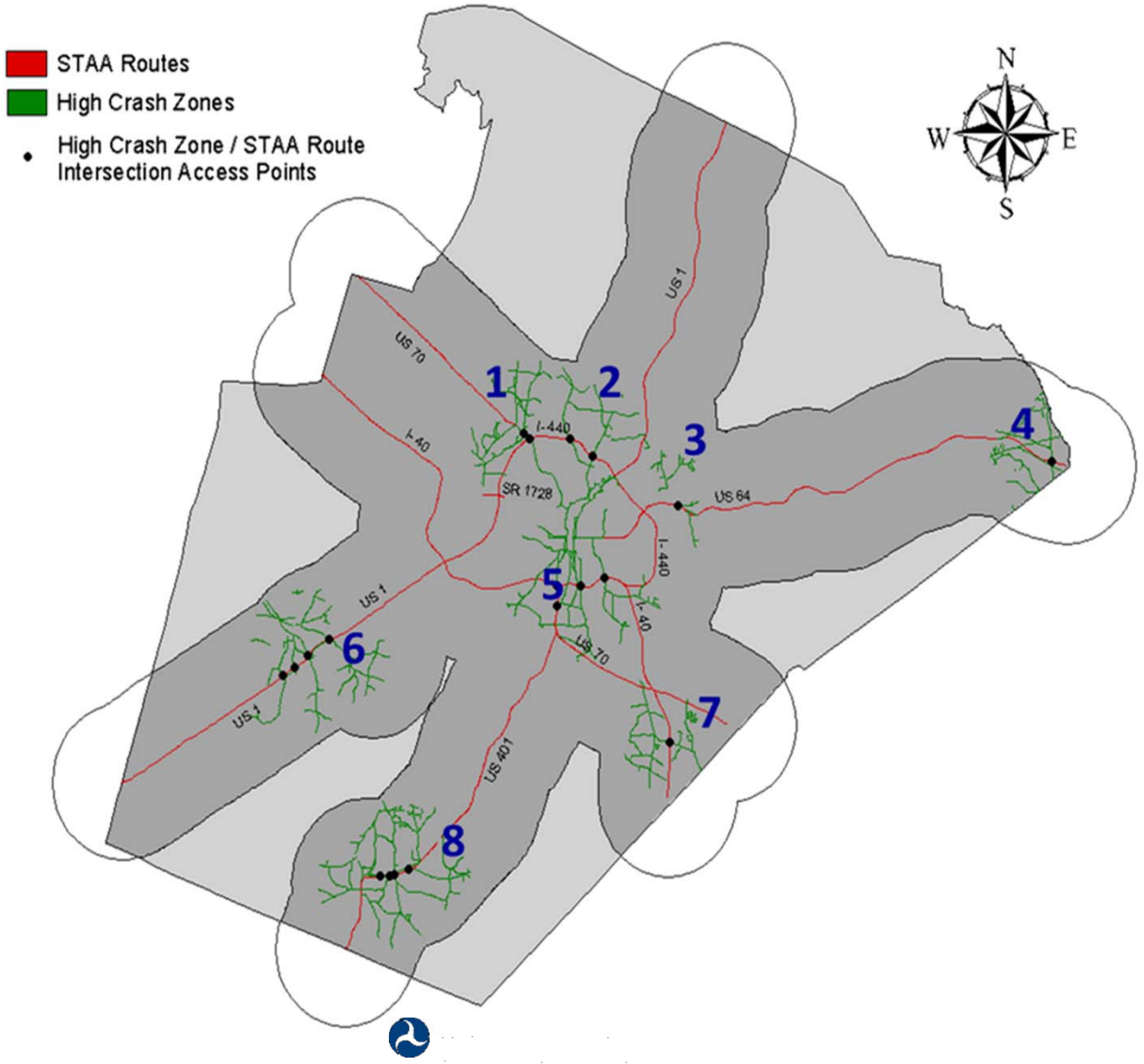
Critical Locations



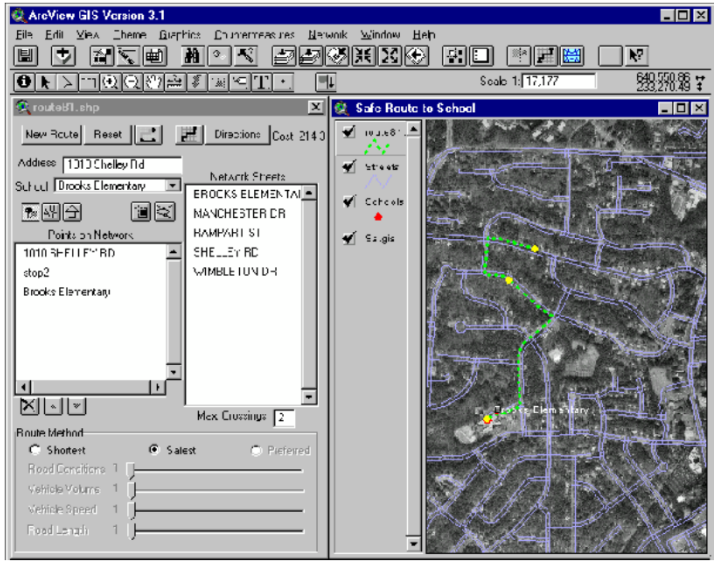
Truck Route Network

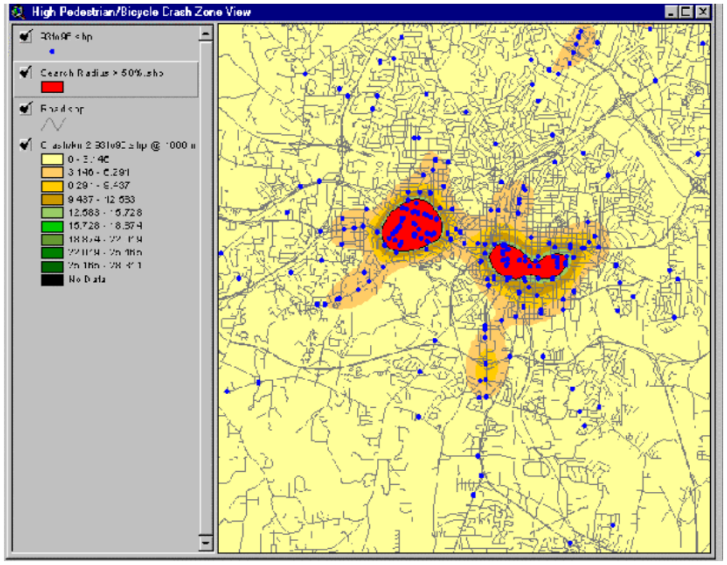


Critical Locations Off Primary Routes



Pedestrian and Bicycle Safety





Roadway Safety Analysis

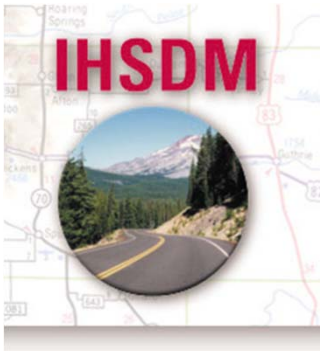
- FHWA supported projects for advanced data analysis
  - **Highway Safety Manual (HSM)**
    - Provides transportation professionals with knowledge, techniques, and methodologies to quantify the safety-related effects of transportation decisions
  - **SafetyAnalyst**
    - Incorporates state-of-the-art safety management approaches into analytical tools to identify safety improvement needs and to develop a systemwide program of site-specific improvement projects.
  - **Interactive Highway Safety Design Model (IHSDM)**
    - A suite of software analysis tools for evaluating safety and operational effects of geometric design decisions on highways
  - **CMF Clearing House**

HSM Highway Safety Manual AASHTO

http://www.highwaysafetymanual.org

SafetyAnalyst

http://www.safetyanalyst.org/



http://www.ihsdm.org/

CMF CRASH MODIFICATION FACTORS CLEARINGHOUSE

http://www.cmfclearinghouse.org/

GIS in the FHWA Safety Program

- Roadway Safety Data Partnership (RSDP)
  - A collaborative effort between FHWA and States to ensure that they are able to develop robust data-driven safety decisions.
  - Capability Assessment
  - Peer Exchanges

ROADWAY SAFETY DATA PARTNERSHIP
COLLECTING • ANALYZING • MANAGING • EXPANDING

- Model Minimum Uniform Crash Criteria (MMUCC)

MMUCC Model Minimum Uniform Crash Criteria

http://www.mmucc.us/

- Model Inventory of Roadway Elements (MIRE)

MIRE
MODEL INVENTORY OF ROADWAY ELEMENTS

http://www.mireinfo.org/

GIS at State DOTs

- States are moving towards or have created GIS-based data and analysis systems
- Everyday users of the data
  - What are the States doing?
  - What are the priorities?
  - What are the challenges and capability gaps?
  - ***HOW CAN FHWA HELP?***

Assessing GIS Needs for State and Local Safety Programs

- October, 2012 – September, 2013
- Objectives
  - *Assess the GIS practices, needs and challenges, and opportunities in safety programs.*
  - *Help guide future efforts to best support the needs of agencies as they develop and improve their GIS programs for safety.*

Current Challenges

- **Existing Analytical Tools**
  - Available GIS software applications
  - Analytical/statistical techniques
- **Technical obstacles**
  - Warehousing the data
  - Data precision/accuracy
  - Availability of basemaps
  - Different geo-referencing systems
  - Incompatible data definitions/formats
- **Administrative obstacles**
  - Establishing a GIS Champion
  - Funding challenges
  - Identifying GIS as a priority
  - Determining the cost/benefit of GIS implementation
  - Data ownership

What is Needed?

- **Research Topics**
  - Identification of current state of practice
  - Emerging practices/tools, i.e. what will be available in the future?
  - Identification of research gaps that FHWA can help support filling.
  - What program support can FHWA provide?
  - What guidance can be developed to address known administrative challenges?

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