Roadway Data Extraction
Technical Assistance Program
(RDETap)

Traffic Safety Conference
College Station, June 2016
Overview

• Project motivation and objectives
  – MIRE-MIS Program
  – RDE-TAP Project
• Overview of Data Extraction Tool
• Summary of TxDOT proof-of-concept
• Overview of pilot studies
• Live demo of Data Extraction Tool using WSDOT roadway inventory data
• Q&A
Project Motivation

• Highway safety data are vital to making sound decisions on the safe design and operation of roadways

MAP-21 Guidance
  – State safety data systems must support performance measures
  – Collection, integration, improvement, and analysis of safety data
  – Required identification of Fundamental Data Elements, a subset of MIRE elements

• **Bottom line:** access to a reliable inventory of roadway features and crash data will help agencies develop strategies that address deficiencies, using a focused and organized approach
MIRE

- Model Inventory of Roadway Elements

<table>
<thead>
<tr>
<th>Roadway Segment</th>
<th>Intersection</th>
<th>Intersection Leg</th>
<th>Ramp</th>
<th>Interchange</th>
<th>Horizontal Curve</th>
<th>Vertical Grade</th>
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### Fundamental Data Elements

#### Non-Local Paved Roads

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<th>Roadway Segment</th>
<th>Intersection</th>
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<td>• Direction of Inventory</td>
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<td>• Type of Governmental Ownership</td>
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<td>• Functional Class</td>
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<td>• Median Type</td>
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<td>• AADT Year</td>
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<tr>
<td>• Type of Governmental Ownership</td>
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Guidance on State Safety Data Systems, Table 1, dated April 14, 2016

MIRE-MIS

• MIRE Management Information System

• Development of two prototype data extraction tools:
  – Tool 1
    • Runs on ArcGIS platform
    • Scope is intersections and related intersection legs
  – Tool 2
    • Requires proprietary software
    • Incorporates intersection, traffic, geometry, route, speed limit, and turning movements data
OVERVIEW OF DATA EXTRACTION TOOL
Tool Purpose

• Process and integrate roadway inventory data from multiple, diverse sources

• Attach non-spatial attribute data to spatial roadway elements
  – Intersections
  – Intersection legs (intersection approach)
  – Roadway segments
  – Ramps

• Store data in geodatabase

• Export data for safety analysis
<table>
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<tr>
<th>REC</th>
<th>DI</th>
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<th>CITY</th>
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- **Sources:** FHWA, Google Street View, Utah DOT, TxDOT, WSDOT

**MIRE-MIS**

**IHSDM**

Sources: FHWA, Google Street View, Utah DOT, TxDOT, WSDOT
Inputs and Outputs

**Input: GIS Data Layers**
- Roadway network
- Roadway inventory
- Asset nodes
- MPO boundaries
- District boundaries
- County boundaries
- Local roadway data
- ...

**Output: Data for SafetyAnalyst**
- Intersections
- Intersection legs
- Ramps
- Segments
## Inputs and Outputs

<table>
<thead>
<tr>
<th><strong>Spatial Data</strong></th>
<th><strong>Attribute Data</strong></th>
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<tr>
<td>Roadway network</td>
<td><strong>Databases</strong></td>
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<td>Asset nodes</td>
<td>Roadway inventory</td>
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<td>MPO boundaries</td>
<td>Traffic counts</td>
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<td>County boundaries</td>
<td><strong>Manual</strong></td>
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<td>Design files</td>
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<td>Video</td>
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**Spatial Data with Attribution**

- Intersections
- Intersection Legs
Tool Components

- ArcGIS custom toolbar
- 6 ArcGIS ArcToolBox models
- ArcGIS custom data entry interfaces
Toolbar Buttons

- Edit intersection or leg
- (Manually) create intersection
- Delete intersection
- Export intersection and leg data
- Update all intersections and legs
- Update new intersections and legs
MIRE-MIS

TXDOT PROOF-OF-CONCEPT
TxDOT Proof-of-Concept

• Can tools be adapted to data from other states?
• Objectives
  – Use tool to generate intersection legs and attach spatial and non-spatial data to intersections and intersection legs
  – **Use TxDOT layers as-is**
    • adapt models and templates to TxDOT datasets and naming convention
    • adapt attribute names and datatypes
    • remove NH specific code, datasets, and hardcoded values
Data Processing Overview

- Roadway Inventory
  - Roadway Nodes
  - Initial Intersections
  - Tool 1
    - Processed Intersections
    - Processed Intersection Legs
  - Other Data
    - SafetyAnalyst
TxDOT Tool Adaptation

- TxDOT Roadway Inventory
  - Sample Roadway Nodes
    - Manual/QA
  - Sample Initial Intersections
- TxDOT Other Data
- Generic Tool
  - Processed Intersections
  - Processed Intersection Legs
- SafetyAnalyst
Tool Adaptation: Data Inputs

• Use TxDOT input feature classes
  – Roadway Inventory
  – TxDOT Roadways
  – MPO Boundaries
  – County
  – District

• Create new input feature classes
  – Asset Nodes
  – Intersections
TxDOT Preliminary Data Processing
1. Create sample **roadway node** feature class using TxDOT Roadways
   – All crossing and intersecting roadway features regardless of functional classifications

2. Create sample **initial intersection** feature class
   – Physical intersections on all state roads (state-state and state-local)
   – Manual process
TxDOT ArcGIS Models

- Modified existing 6 models
- Added two new models
  - 0. Prep roadway (add unique ID attribute to Roadway Inventory layer)
  - 1.a. Optional (add county name to intersection layer)
Intersection Legs
Intersections
Asset Nodes
TxDOT Roadway Inventory
Texas Roadways
MIRE-MIS

PILOT STUDIES
Pilot Studies

• Pilot implementation at WSDOT
  – Focus on FDEs plus additional state data
  – Focus on intersections, intersection legs, and ramps

• Pilot implementation at MODOT
  – Focus on FDEs
  – Focus on intersections, intersection legs, and ramps
  – Special interest in local data integration
Process

• Adapt tool to create “generic version” for implementation at other states
  – Created MIRE data model
  – Developed extensive documentation

• Conduct implementation meetings

• Modify tools, submit, collect feedback
WSDOT Implementation

• Start: August 2015, End: June 2016

• Main issues
  – Multiple intersection data layers, multiple intersection features per intersection
  – Spatial inaccuracies of intersection features
  – Continuous routes, breaking at intersection needed
  – Determination of major/minor route
WSDOT Implementation

• Tool “upgrades”
  – Compatibility with non-breaking routes at intersections
  – Calculation of intersection offset
  – Calculation of intersection skew angle
  – Compatibility with divided highways (highways represented by two route features instead of one)
WSDOT Implementation
RDETAP Future Steps

• Complete MODOT pilot implementation
• Complete additional pilot implementation at state DOT
• Develop and distribute two guides
  – Programmer guide focused on implementation
  – User guide focused on tool usage and features
• Consider potential tool enhancements
  – Interchange, horizontal curve, vertical grade
## RDE TAP Team Contact Information

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Agency</th>
<th>Phone</th>
<th>Email</th>
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<tbody>
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**Additional Team Members**
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- CTRE: Omar Smadi, Zachary Hans
- Leidos: Brian Chandler
Thank You!