New York State Accident Location Information System Analyzing the Past to Provide a Safer Future

Kevin Hunt
NYS Department of Transportation
Jackie Magnant
ESRI
Location Matters

- Accident characteristics meticulously collected at crash sites.
- An **accurate and precise accident location** is a critical characteristic to obtain reliable results from DOT’s accident analysis studies.
ALIS
Project Objectives

• **Establish New High Accuracy Statewide Basemap**
  - Reduce Duplication of Mapping Initiatives
  - Share Common Road Network
    - State & Federal Agencies
    - Local Agencies
    - Citizens
  - Centralize Data Maintenance & Standards

• **Custom Accident Location Applications**
  - Vastly Improve Efficiency and Accident Location Coding and Editing
  - Provide Basic Query and Reporting Tools
  - Meet Consumer Information Requests
  - Sophisticated Accident Analysis (Phase V)
  - Web-Based Executive System for Decision-Makers
Project Stakeholders

A Multi-Agency Initiative:

- **NYS Department of Motor Vehicles (NYSDMV)**
  - Project lead; project and contract management
  - Initial data and location coding from accident reports

- **NYS Department of Transportation (NYSDOT)**
  - Accident data analysis, query and reporting
  - Mitigation studies, federally mandated reporting

- **NYS Office of Cyber Security and Critical Infrastructure Coordination (NYSOCSCIC)**
  - Primary responsibility for construction and maintenance of the Statewide GIS Framework datasets

- **NYS Office for Technology (NYSOFT)**
Project Stakeholders

• Other NYS Stakeholders
  ▪ County Governments
  ▪ Municipalities
  ▪ Metropolitan Planning Organizations (MPO)

• Contractors
  ▪ ESRI (Prime Contractor)
    ▪ Tele Atlas – GIS data development and maintenance
    ▪ fountains spatial, inc – application testing and training
State Highway System: Reference Markers

- One NYSDOT’s primary Linear Referencing Systems
- Field posted
- Uniquely identify a 1/10th mile section of highway
- Used as a location reference in ALIS
Legacy Accident Location References

- **Local Roads:** CLASS street network
  - Constructed in the early 1980s
  - Attributed with street names and route numbers
  - Link/node topology
  - Stored intersection and segment midpoint locations
  - Not actively maintained after early 1990s
NYS Data Product
(a.k.a. “Statewide GIS Framework Data”)

- A new high accuracy statewide basemap
- Constructed by TeleAtlas in cooperation with NYS and ESRI
- The NYS Data Product is a custom built product
  - Based on TeleAtlas’s Dynamap product but not the same.
- Built from “best available” local and state sources
  - Features generated directly from NYS’ Digital Orthoimagery Program
  - Supplemented with TeleAtlas sources
- Local (county) participation optional
  - Many more are participating in maintenance now
  - 27 of 62 counties provided source data for the construction
NYS Data Product
(a.k.a. “Statewide GIS Framework Data”)

- Up-to-date street centerlines
- Street names, route numbers & aliases
- Address ranges & address point layer
- NYSDOT Linear Referencing Systems
- Thruway Authority Linear Referencing Systems
- Railroads
- Bridges
- Civil & public land boundaries
- Census geography
- Zip Code boundaries
- Landmark features
Civil Boundaries
1. Outreach and cooperation with state and local members of NYS GIS Data Sharing Cooperative

2. Two web-based applications (ArcGIS Server 9.1) built through the ALIS project designed to collect and commit updates to NYS Data Product

   • Street Name Editor (SNE): Allows NYSDOT and NYSOCSCIC users to edit/add street names and route numbers on the street layer

   • Map Maintenance Notification & Tracking (MMNT): Allows authorized users to submit updates and changes to the NYS Data Product. The status each change is tracked in the system and the submitter is kept aware of the status
### Accident Location Information System | Map Maintenance Notification and Tracking

**Request #: 21**
**Requestor:** mmnt_cscc_all (CSCIC)
**Status:** Pending Supervisor Approval
**Supervisor:** n/a
**Current Grp:**
**Reviewer:**
**Closed:**
**Editor:**

**County:** Allegany
**Municipality:** Allen

**Type:** Add Alternate Name
**Accident #:** none

Current markup shapes to request:

- **Drawings:** 1
- **Features:** 0

### Attributes:

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>EXISTING VALUE</th>
<th>REQUESTED VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional Prefix</td>
<td>N/A</td>
<td>No Directional</td>
</tr>
<tr>
<td>Street Name</td>
<td>N/A</td>
<td>New</td>
</tr>
<tr>
<td>Street Type</td>
<td>N/A</td>
<td>Street</td>
</tr>
<tr>
<td>Post Directional</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Suffix</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated days to review:** 1
**Estimated days to accept:** 2
**Estimated days to complete:** 1
New York State Police agencies are transitioning to an in-car system that electronically collects accident records.

TraCS includes a location tool with maps based on the NYS Data Product for pinpointing exact accident locations.

ALIS applications designed to accommodate the electronic accident records submitted from TRACS (XML format).
NYSDOT’s ALIS Accident Applications

Develop a “State of the Art” GIS System to Identify Areas of “High Accident Locations (HALS)” and “Unusual Concentrations of Accident Types” to support Mitigation Strategies for Accidents and Road Hazards Reduction and Ensure Safer Roadways for NYS’ Traveling Public

GOAL
Project Deliverables

- **New York State Data Product**
  - Statewide GIS Data Product
    - Based on GDT Dynamap 2000
    - Enhanced State-wide Geometry & Attribution (Local Government Source Data)
  - Five Web-Based Applications (ASP.NET/ArcGIS Server)
    - Map Maintenance Notification and Tracking (MMNT)
    - Street Name Editor (SNE)

- **One Accident Location Server**
  - Fully integrated into NYS Work Flow
  - Captures Business Logic related to all geocoding
  - 14 Location Coding Methods
  - Scheduler to batch process Accidents after hours
  - Legacy Accident Conflation
  - Batch Processing of 10,000,000 historical Accident records
ALIS Timeline and Changing Architecture

2001 - Client – Server Application
  • MapObjects, ArcSDE, ArcINFO

2004 - ArcGIS Server Beta Released
  • ArcGIS Server 9.0 Development Begins

2006 – QRA Accident Analysis Application
  • Development Project Begins

2007 - ALIS Applications - Final Release
  • ArcGIS Server 9.1

2007 - QRA Final Release Late December
  • ArcGIS Server 9.2
An Accident’s Path through ALIS

Collision Occurs

Police Agency
Records Accident Details

AIS
NYSDMV Records Accident Data in AIS

NYSDMV LCDE - Location Codes
Accident Data in ALIS

CSCIC Provide GIS
Map Updates MMNT & SNE

ArcSDE
NYS Accident Location Information System

ArcGIS Server

INTRANET

SIMS
NYSDOT Safety Info Management Systems Receives Data

NYSDOT QRA
Accident Analysis

NYSDOT LESQR Query / Reports

Accident Prevention Strategies
Location Coding/Data Entry (LCDE)

OBJECTIVES

Used by the DMV accident coders

Increase Accuracy of Accident Locations

• Ability to use all available geographic information from the MV104 accident report form
• Improved accident analysis through more accurate geocoding

Increase Job Efficiency

• Automate Electronic Accident Processing
  • Batch Success Rate @ 50% - Will improve with as data entry methods become more standardized and consistent.
• Minimize or eliminate demands on DMV Accident Coder for Local Geographic Location Knowledge

Reduce Unknown Accident Locations

• Currently up to 15% of all accident cases in the state are not located.
14 Location Coding Methods possible for incoming accidents based on available data in accident report.

<table>
<thead>
<tr>
<th>Field coordinates - High</th>
</tr>
</thead>
<tbody>
<tr>
<td>On street/ Cross street intersection</td>
</tr>
<tr>
<td>On street/ Bridge intersection</td>
</tr>
<tr>
<td>On street/ Railroad intersection</td>
</tr>
<tr>
<td>Address match</td>
</tr>
<tr>
<td>Reference marker</td>
</tr>
<tr>
<td>Milepost</td>
</tr>
<tr>
<td>Field coordinates - Medium</td>
</tr>
<tr>
<td>Field coordinates - Low</td>
</tr>
<tr>
<td>Bridge</td>
</tr>
<tr>
<td>Landmark</td>
</tr>
<tr>
<td>On Street name match</td>
</tr>
<tr>
<td>Municipality</td>
</tr>
<tr>
<td>County</td>
</tr>
</tbody>
</table>
Accident Case: 31521635

At Intersection

Send To Supervisor

Map It Location

1. Location Method Used: Field Coordinates (High)
   - County: Schenectady
   - Muni: Rotterdam
   - On Street: GUILDERLAND AVE

2. Location Method Used: On Street/Cross Street Intersection
   - County: Schenectady
   - Muni: Rotterdam
   - On Street: GUILDERLAND AVE
   - Cross street: DRAPER AVE

Action

Accept
Location Editing/Simply Query Reporting (LESQR) Objectives

• Used by NYSDOT Safety Group
• Refine Location of Accidents Previously Location Coded
  • Verifying accident locations in an study area of interest
  • Updated map data available
• Web-Based Accident Query and Reporting Capabilities
  – Select accident records by location
    • Proximity to a feature (street segments)
    • User defined
  – Report on accident details by location
### Statistical Reports

<table>
<thead>
<tr>
<th>Title</th>
<th>Accident Contributing Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Template</td>
<td>Accident Contributing Factor</td>
</tr>
<tr>
<td>Output Type</td>
<td>Tabular and Map</td>
</tr>
</tbody>
</table>

- **Create**
- **Cancel**

---

### Case Year: 2002

<table>
<thead>
<tr>
<th>Lead/Case</th>
<th>DOT Verified</th>
<th>Case Number</th>
<th>Case Year</th>
<th>Date</th>
<th>On Street</th>
<th>Ped/Bike Action</th>
<th>Ped/Bike Location</th>
<th>Type of Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2100091</td>
<td>2002</td>
<td>1/1/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH SIGN POST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100092</td>
<td>2003</td>
<td>1/2/2003</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH TREE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2101467</td>
<td>2002</td>
<td>3/2/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH MOTOR VEHICLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100123</td>
<td>2002</td>
<td>2/4/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>FIRE EXPLOSION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100010</td>
<td>2002</td>
<td>2/5/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH MOTOR VEHICLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100018</td>
<td>2002</td>
<td>2/5/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH MOTOR VEHICLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100031</td>
<td>2002</td>
<td>3/3/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH ANIMAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2100035</td>
<td>2002</td>
<td>2/9/2002</td>
<td>MADISON AVE</td>
<td>NOT ENTERED</td>
<td>NOT ENTERED</td>
<td>COLLISION WITH FENCE</td>
</tr>
</tbody>
</table>
## Accident Contributing Factor

### Accident Contributing Factor

<table>
<thead>
<tr>
<th>Case Number</th>
<th>Date Year</th>
<th>Vehicle Seq Number</th>
<th>APRINT_REQ_NUM</th>
<th>APRINT_FCTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2100381</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>FELL ASLEEP</td>
</tr>
<tr>
<td>2100838</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>FATIGUED/DROWSY</td>
</tr>
<tr>
<td>2101487</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>FELL ASLEEP</td>
</tr>
<tr>
<td>2100128</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>OTHER (VEHICLE)</td>
</tr>
<tr>
<td>2100810</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>UNKNOWN</td>
</tr>
<tr>
<td>2100128</td>
<td>2002</td>
<td>1</td>
<td>1</td>
<td>UNSAFE LANE CHARGE</td>
</tr>
</tbody>
</table>

### Legend

- **Accident Site**: Shows the location of the accident.
- **Street Network**: Indicates the street network and connections.
- **Other Details**: Includes legend for various symbols used in the map, such as hospitals, schools, etc.

---

This report is confidential. Report generated: March 19, 2007, 03:42 PM.
Query Reporting Analysis (QRA)

Objectives

Accident Analysis Results Supports

- Accident Mitigation Practices
- Road Improvement Projects
- Safety Policies and Procedures
- Funding for Capital Improvement Projects
- Increased Law Enforcement
- Post-Implementation Evaluation System (PIES)
  - Review Recommended Improvement Impact

QRA Stakeholders

- NYS DOT
- Local Governments & Metropolitan Planning Organizations (MPO)
Query Reporting Analysis (QRA)

Application Specifics

- Identify High Accident Locations (HALS)
- Identify Concentrations of Specific Accident Types
- Conduct Detailed Accident Analysis
  - Spot/Intersection/Cluster
  - Strip
  - Sliding Scale
  - Corridor
- Produce Reports illustrating Spatial & Tabular Analysis Results
- Provides Query Capabilities against Accident Data
Questions?