Road Safety Audits

* Assessments, Reviews, etc.
Agenda

• Basic Concepts of RSAs
• Common Issues and Challenges
• RSA Procedures
• Case Studies
• Keys to Success
• MPO Perspective
BASIC CONCEPTS
The Goal

*Begin with the end in mind*

Reduce the number and severity of motor vehicle crashes.
Today’s Objective

Introduce and discuss RSAs as a useful tool to reduce traffic injuries and fatalities
IN Crash Statistics

![Bar chart showing crash statistics from 2009 to 2014, with fatalities and fatal crashes indicated. The 2014 data is unofficial.](chart.png)
IN Crash Statistics

Figure 3.7. Indiana traffic collisions by road class, 2009-2013

Source: Indiana State Police Automated Reporting and Information Exchange System (ARIES), as of March 21, 2014
Note: Excludes unknown road class.
IN Crash Statistics

Figure 3.7. Indiana traffic collisions and fatal and incapacitating injury collision rates, by road class, 2009-2013

Source: Indiana State Police Automated Reporting and Information Exchange System (ARIES), as of March 21, 2014
Note: Excludes unknown road class.
The Problem

- Increase in:
  - Drivers
  - Vehicles
  - Miles Traveled
  - Congestion
  - Crashes

- Competition for resources
  - Budget
  - Staffing
The Real Problem

Of every 100 children born this year in the U.S.

One will die violently in a highway crash during his/her lifetime.

70 will be injured in a crash during their lifetimes...

We must reduce deaths and injuries.
Basic Concepts

- What is an RSA?
- Why do we need RSAs?
- When do we conduct RSAs?
Road Safety Audits

A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team.
Road Safety Audits

A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team.
Road Safety Audits

A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team.
A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team.
An RSA also...

- Considers the safety of all road users
- Considers interactions at the borders or limits of the project
- Proactively considers mitigation measures
<table>
<thead>
<tr>
<th>Traditional Road Safety Review</th>
<th>RSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>Proactive</td>
</tr>
<tr>
<td>In-house team</td>
<td>Independent team</td>
</tr>
<tr>
<td>Field review (sometimes)</td>
<td>Field reviews always</td>
</tr>
<tr>
<td>Standards compliance</td>
<td>Comprehensive, with human factors</td>
</tr>
</tbody>
</table>
Why do we need RSAs?

- Roadway Factors (28%)
  - 4%

- Vehicle Factors (8%)
  - 4%
  - 4%

- Human Factors (95%)
  - 24%

TYPICAL REPORTED CRASH CAUSES
Why do we need RSAs?

There are many competing interests at play in road projects:
- Cost
- Right of way
- Environment
- Topographic and geotechnical conditions
- Socio-economic issues
- Capacity / efficiency
- Politics
- Safety
Why do we need RSAs?

- Compromises and constraints are a normal part of transportation budgeting.
- RSAs demonstrate the safety implications of roadway elements.
- RSAs ensure that safety is an explicit consideration, and that safety does not “fall through the cracks.”
When do we conduct RSAs?

- **Pre-construction**
  - Planning / feasibility
  - Preliminary (draft) design
  - Detailed design

- **Construction**
  - Work zones
  - Pre-opening

- **Post-construction**
  - Existing roads
RSAs & Project Staging

More Major Issues Addressed by RSA

Planning / Feasibility

Preliminary Design

Detailed Design

Pre-Opening

Less Opportunity for Design Changes
Road Safety: GORE

- Geometry
- Operations
- Road Users
- Environment
Road Safety: Geometry

- Curve
- Gradient
- Cross Section
- Clearance
- Sight Distance
- Clear Zone
Road Safety: Operations

- Congestion
- Signing
- Signal Operation
- Speeding
- Queuing
- Turning Movements
Road Safety: Road Users/Human Factors

- Motorists
  - Motorcyclists
- Bicyclists
- Pedestrians
- Special Needs

Each Year in the U.S.
- 64,000 pedestrians injured
- 5,000 pedestrians killed
Road Safety: Environment

- Weather
- Lighting Conditions
Road Safety: Environment
Basic Concepts for MPO’s

What is an RSA?
- Toolbox item

Why do MPOs need RSA’s?
- Project justification
- Funding
- Project support
- Seek new solutions and provide recommendations
- Fiduciary responsibility

When Do We Conduct RSAs?
- Identified hazardous locations
- Project development
COMMON ISSUES & CHALLENGES
Common Issues and Challenges

1. Responsibilities
2. Programming & Scheduling
3. Effects on Project Cost
4. Legal Liability
1. RSA Responsibilities

Highway Agency / Road Owner

- Commit to the RSA process
- Commit resources (time, funding, and staff)
- Select RSA team
- Provide required information
- Attend RSA meetings
- Describe issues, challenges, and constraints
- Prepare response letter
1. RSA Responsibilities

RSA Team

- Attend pre-review meeting and acquire an understanding of the roadway, challenges, and constraints
- Review available information
- Conduct field review
- Identify safety issues
- Identify feasible suggestions for mitigation
- Present preliminary findings at post-review meeting
2. Programming & Scheduling

**Pre-construction RSAs:**

*Will an RSA delay the project?*

- RSAs require a relatively short time.

- Pre-construction RSAs can occur concurrently with the agency’s review of the design drawings.
3. Effect on Project Cost

Will an RSA drive up costs?

The RSA team provides suggestions only. The road agency or designer remains responsible for design decisions.

Mitigate problems:

- Focus on low-cost safety improvements
- Suggestions can be pre-screened with the road agency and designer
- Suggestions must be consistent with the design stage
4. Legal Liability

What if we identify issues/problems in the RSA but the agency doesn’t address them?

Do RSAs expose agencies to more legal liability?

- Agencies should seek legal advice
- Agencies can be taken to court with or without a road safety assessment
- RSAs can be part of a safety management system
On January 14, 2003, the United States Supreme Court upheld the constitutionality of 23 USC 409. In section 409, Congress established an evidentiary privilege for information that States and other entities compile or collect for purposes of complying with certain highway safety programs.

i.e., safety information (like an RSA study) is protected from use in the courtroom.
4. Legal Liability

RSA leaders must carefully complete the RSA to a reasonable standard of care and professionalism.

- Identify RSA scope
- Identify RSA materials
- Identify limitations
- Consult road owner during review
4. Legal Liability

“[RSAs] demonstrate a proactive approach to identifying and mitigating safety concerns.”

“Our attorneys say that once safety issues are identified, and if we have financial limitations on how much and how fast we can correct the issues, then the audit will help us in defense of liability.”
Common Issues & Challenges for MPO’s

- Staff time (cost)
- Team members
RSA PROCEDURES

The 8-step Process
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct start-up meeting
4. Perform field reviews
5. Conduct analysis and prepare report
6. Present findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities:
- RSA Team
- Project Owner
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews under various conditions
5. Conduct audit analysis and prepare report of findings
6. Present findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities
- **RSA Team**
- **Design Team / Project Owner**
Identify the Project

Design stage project

Existing location
Candidates for RSAs

- High-crash sites
- High-profile sites
- Changed traffic patterns
RSA Procedures for MPO’s

1. Project Identification
   - Safety Management System
   - Transportation Improvement Program
   - Locally funded projects
RSA Procedure

1. Identify project or
2. Select RSA team
3. Conduct start-up meeting
4. Perform field reviews under various conditions
5. Conduct audit analysis and prepare report of findings
6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities
- RSA Team
- Design Team / Project Owner
Select RSA Team

- Independent
- Experienced
- Multi-disciplinary
Select RSA Team: Core Skills

Traffic operations

Traffic safety

Geometric design
Select RSA Team: Supplementary Skills

- Law enforcement
- Maintenance personnel
- Emergency responders
- Local knowledge
Select RSA Team

- Exchange staff from another local agency
- Volunteers
- Consultants
- Combination of above
RSA Team Volunteers

- HELPERS maintains a list of trained RSA volunteers
- You can be on that list
2. RSA Team Selection

- Law enforcement
- Consultants
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews under various conditions
5. Conduct audit analysis and prepare report of findings
6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities

- RSA Team
- Design Team / Project Owner
Start-up Meeting

- Identify individual roles/backgrounds
- Review project background information
- Communicate project concerns
- Review RSA process
- Discuss any constraints or limitations
- Discuss schedule
- Provide contact information
Start-up Meeting: Review Project Information

- Crash history
- Traffic volume and speed data
- Maps and/or aerial photographs
- Background reports
- History of improvements
- Design drawings/as-builts
Step 3

Start-up Meeting: Provide Project Information

- Where to get crash data?
  - ARIES
  - MPO/HELPERS
  - Law enforcement
  - FARS (www.fars.nhtsa.dot.gov)
RSA Procedures for MPO’s

3. Start-Up Meeting

- Encourage team members to travel the site prior to the Start-Up Meeting
- Roadway owner involvement (do NOT disclose solution)
- Discuss prior improvement efforts / changes (if applicable)
- Data – simple summary and patterns
- Signal timing (if applicable)
RSA Procedure

**Responsibilities**

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews
5. Conduct audit analysis and prepare report of findings
6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings
Field Reviews: Preparation

- Review available data
- Arrange transportation
- Designate photographer(s) and secretary
Field Reviews: Equipment

- Safety vests
- Camera(s)
- Measuring wheel
- Measuring tape/ruler
- Level
- Clipboard
- Notepad
- Traffic/crash data
- Prompt list
Field Reviews: Prompt List

- Provides structure to the site visit
- Reminds the team what to look for and helps ensure that nothing is overlooked
- FHWA website:
  - http://safety.fhwa.dot.gov/rsa/
- http://www.pedbikeinfo.org/
Field Reviews

Walk the site
Field Reviews

- Observe road user characteristics
- Observe surrounding land uses
- Observe link points to the adjacent transportation network
Field Reviews: Common Issues

- Sight distance obstructions
- Pedestrian and cyclist conflicts
- Roadway geometry
- Pavement condition
- Signs and pavement markings
- Speeding
- Visual Clutter
Field Review

- Talk with nearby residents & passing motorists
- Look for other issues
  - e.g. ponding
- Evidence of other users
  - e.g. goat paths
Field Review

- Look for indicators of crashes
  - Skid marks
  - Tire marks off edge of roadway
  - Damaged trees
  - Damaged guardrail
  - Bent signs
  - Crash debris
  - Roadside crosses or memorials
Field Reviews:
Observe Variable Conditions

- Peak and off-peak traffic periods
- School arrival and dismissal
- Dry and wet weather conditions
- Day and night conditions
RSA Procedures for MPO’s

4. Field Review

- Single vehicle
- Provide safety vests
- Schedule should ensure common crash elements are present (day of week, time, weather, etc. if possible)
- Stop watch
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews
5. Conduct RSA analysis
6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities
- RSA Team
- Design Team / Project Owner
Conduct RSA Analysis

- Identify and prioritize safety concerns
- Develop suggestions for reducing the degree of risk
- Report on findings
# Using Relative Risk to Prioritize Safety Issues

<table>
<thead>
<tr>
<th>RISK CATEGORY</th>
<th>SEVERITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Frequent</td>
<td>C</td>
</tr>
<tr>
<td>Occasional</td>
<td>B</td>
</tr>
<tr>
<td>Infrequent</td>
<td>A</td>
</tr>
<tr>
<td>Rare</td>
<td>A</td>
</tr>
</tbody>
</table>
Analysis: Inventory and Review Information

- Put aside materials that are not relevant
- Determine if any materials are missing or needed
- Organize materials the team may use
Resources & References
Analysis: Traffic Crashes

Examine crash history of existing roads

Where do you get the data?
Analysis: Collision Diagrams
Analysis: Collision Diagrams
Analysis: Review Data

- Operations
  - Congestion, delay, queueing
  - Signal operations
  - Vehicle speeds
  - Driveways
Analysis: Review Data

- Geometry
  - Curve radius
  - Sight distance
  - Clear Zone
Analysis: Review Data

- All users
  - School buses
  - Farm vehicles
  - Buggies
  - Trucks
  - Cyclists
  - Pedestrians
  - Transit
  - Children
  - Special needs
  - Animals
  - Golf carts
Address All Users

Unintended Consequences
Analysis: Review Data

Identify and summarize main issues. Examples:

- **Sight distance**
  - lack of SD around curve
  - lack of SD at intersection

- **Roadway geometry**
  - complex horizontal curves
  - vertical curve
  - improper superelevation

- **Roadway surface**
  - pavement cracking
  - polishing of pavement

- **Signs**
  - no curve warning sign or advisory speed
  - incorrect sign location
  - incorrect sign size
  - signs lack retroreflectivity
Project Suggestions

- **Short Term Solutions**
  - Maintenance (e.g. clear vegetation, repair guardrail)
  - Signs
  - Pavement Markings
  - Remove/shield roadside hazards
  - Enforcement
  - Driver education

- **Long Term Solutions**
  - Redesign curve
  - Modify alignment
  - Roundabout
RSA Procedures for MPO’s

5. Conduct Analysis

- Include the “Good”
- Low Cost (Short Term) & High Cost (Long Term)
  - Ensure short term recommendations are included within long term improvements, if applicable
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews under various conditions
5. Conduct audit analysis and prepare report of findings
6. Present preliminary RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings

Responsibilities:
- RSA Team
- Design Team / Project Owner
Step 6

RSA Findings Presentation

- Discuss safety concerns
- Clarify findings and suggestions
- Assist project owner in making an informed decision
RSA Findings Presentation

- Be positive
- Discuss safety successes
RSA Findings Presentation

- Factor in feedback
- Review and revise findings as appropriate
- Initiate formal report
  - Designate tasks
# RSA Findings: Formal Report

## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA Background</td>
<td>2</td>
</tr>
<tr>
<td>RSA Observations</td>
<td>3</td>
</tr>
<tr>
<td>RSA Recommendations</td>
<td>7</td>
</tr>
<tr>
<td>Appendix</td>
<td>9</td>
</tr>
<tr>
<td>Vicinity Map</td>
<td>10</td>
</tr>
<tr>
<td>Crash Summary</td>
<td>11</td>
</tr>
<tr>
<td>Volume and Speed Data</td>
<td>12</td>
</tr>
<tr>
<td>INDOT Friction Test Report</td>
<td>13</td>
</tr>
<tr>
<td>Additional Pictures</td>
<td>14</td>
</tr>
</tbody>
</table>

## Table of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1: Pavement Condition</td>
<td>3</td>
</tr>
<tr>
<td>Figure 2: Curve Identification</td>
<td>3</td>
</tr>
<tr>
<td>Figure 3: Three westbound signs covered by vegetation</td>
<td>4</td>
</tr>
<tr>
<td>Figure 4: Looking west through curve</td>
<td>5</td>
</tr>
<tr>
<td>Figure 5: Damaged Guardrail</td>
<td>5</td>
</tr>
<tr>
<td>Figure 6: At Dunn Street looking east on Old SR 37</td>
<td>6</td>
</tr>
</tbody>
</table>
RSA Findings: Formal Report

Safety concerns

Vacant corner lots and faded pavement markings render the intersection inconspicuous. Drivers fail to anticipate the intersection and enter during the red phase, causing angle collisions.

Vehicles are unable to clear the intersection in time due to the lack of an all-red interval, resulting in angle collisions.

CORRIDOR-WIDE ISSUES:
1. Visibility of signal heads is limited by the use of 8-inch signal lenses, diagonal span wires, and the absence of low-level signal heads.
2. Faded pavement markings provide limited guidance to drivers.

Suggestions

The presence of left-turn vehicles in the shared lane reduces visibility of opposing through vehicles, resulting in left-turn head-on and secondary rear-end and sideswipe collisions.

Restripe all pavement markings, including crosswalks.

Provide eastbound and westbound left-turn lanes and phases.

Provide signal ahead sign (W3-3) at eastbound and westbound approaches.

Provide lane markings at North-South Road.

Correct westbound secondary signal head alignment.

Remove turn restriction signs.

CORRIDOR-WIDE COUNTERMEASURES:
1. Install 12-inch lenses on primary signal heads.
2. Mount primary signal heads with reflective yellow backboards in a box span configuration.
3. Provide far-left low-level signal heads on all approaches.
RSA Report

Be brief!
RSA Procedures for MPO’s

6. Present Findings to Project Owner
   - Invite elected officials
   - Offer future support
   - Discuss owner’s proposed solution
1. Identify project
2. Select RSA team
3. Conduct a start-up meeting
4. Perform field reviews under various conditions
5. Conduct audit analysis and prepare report of findings
6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings to Design Team / Project Owner
Suggestion 1: Use of W2-1 (Cross Road) as advance intersection warning signs on both US 60 approaches.

Action taken

Traffic Division will revise the plans to add the signs.
Reason for taking no action

Suggestion 2: If ROW is available, add acceleration lane on US 60 in the westbound direction for RT turning from Bowring Rd.

This is not feasible for the following reasons: Any changes to the top of cut/toe of slope would affect the utility relocation which is currently under way. Also, the drive at Sta. 551+20 may conflict with the accelerating vehicles.
Response Letter

Inadequate Response

“We will not realign the intersection at Jefferson Road. We do not feel that it is needed.”
Adequate Response

“While we agree with the need to realign the skewed intersection, the realignment cannot be achieved within the existing right-of-way. Realignment will require the purchase of property at a cost of about $500,000, representing about 15 percent of the total annual transportation budget. The acquisition of the required property may be considered in future budgets.”
RSA Procedures for MPO’s

7. Formal Response

- Roadway owner to MPO
- Letterhead
- Highest ranking official
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct a start-up meeting

8. Incorporate findings into the project

6. Present RSA findings to Project Owner
7. Prepare formal response
8. Incorporate findings into the project

Responsibilities
- RSA Team
- Design Team / Project Owner
Implementation of Improvements

Implementation may depend on policy, manpower and/or funding.
Implementation of Improvements

Pre-construction RSAs

Changes to design drawings

Post-construction RSAs

Incorporate improvements in operating budgets or maintenance programs
RSA Procedures for MPO’s

8. Incorporate Findings into the Project

- HSIP application
- RFP
- Field Check
- Law Enforcement
  - Review Data
- Maintenance Department
CASE STUDIES
Case Study 1

Maplecrest Road: from Stellhorn Road to State Boulevard
Case Study 1

Maplecrest Rd: Stellhorn Rd to State Blvd
Case Study 1

RSA Team

- 1 - Law Enforcement
- 1 - County highway
- 1 - Technical Committee Member (Land-Use Planner)
- 2 - INDOT

NIRCC – MPO

- Collected and Prepared Data
- Assembled RSA Team
- Scheduled and Coordinated RSA
- Attended RSA
  - Assist in process
  - Documentation
  - Answer Questions Regarding data
- Summarized RSA
Case Study 1

Maplecrest Rd: s/o Stellhorn Road to n/o State Boulevard
2007 to 2009 Crash Summary

Summary

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00 - 00:59</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>01:00 - 01:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>02:00 - 02:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>03:00 - 03:59</td>
<td>3</td>
<td>0.03</td>
</tr>
<tr>
<td>04:00 - 04:59</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>05:00 - 05:59</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>06:00 - 06:59</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>07:00 - 07:59</td>
<td>3</td>
<td>0.03</td>
</tr>
<tr>
<td>08:00 - 08:59</td>
<td>4</td>
<td>0.04</td>
</tr>
<tr>
<td>09:00 - 09:59</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>10:00 - 10:59</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>11:00 - 11:59</td>
<td>4</td>
<td>0.04</td>
</tr>
<tr>
<td>12:00 - 12:59</td>
<td>6</td>
<td>0.06</td>
</tr>
<tr>
<td>13:00 - 13:59</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>14:00 - 14:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>15:00 - 15:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>16:00 - 16:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>17:00 - 17:59</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>18:00 - 18:59</td>
<td>3</td>
<td>0.03</td>
</tr>
<tr>
<td>19:00 - 19:59</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>20:00 - 20:59</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>21:00 - 21:59</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>22:00 - 22:59</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>23:00 - 23:59</td>
<td>5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Crashes by Time of Day

Number of Crashes

Month

Crashes by Month

Number of Crashes

Primary Factor

Alcoholic Beverages
Brain Failure or Defective
Disregarding Signal/Reg Sign
Driver Distracted
Failure to Yield
Following too Closely
Headlight Defective or Not On
Improper Lane Usage
ImproperPassing
Improper Turning
Left of Center
Other Engine in Narrative (Driver)
Other Engine in Narrative (Environmental)
Pedestrian Action
Ran off Road Right
Roadway Surface Condition
Speed Too Fast for Weather Condition
Tire Failure or Defective
Unsafe Backing
Unsafe Speed
View Obstructed
Unknown
## Case Study 1

### Traffic Volume Data

<table>
<thead>
<tr>
<th>Location</th>
<th>Date of Collection</th>
<th>AADT</th>
<th>24 Hour D-Factor</th>
<th>AM Peak Volume</th>
<th>PM Peak Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stellhorn Rd to Birchdale Dr</td>
<td>9/16/2009</td>
<td>18429</td>
<td>0.5127 (SB)</td>
<td>1346 (SB)</td>
<td>1696 (SB)</td>
</tr>
<tr>
<td>Birchdale Dr to Trier Rd</td>
<td>9/16/2009</td>
<td>17458</td>
<td>0.5122 (SB)</td>
<td>1237 (SB)</td>
<td>1606 (NB)</td>
</tr>
<tr>
<td>Trier Rd to Vance Ave</td>
<td>5/12/2010</td>
<td>15777</td>
<td>0.5327 (NB)</td>
<td>1063 (SB)</td>
<td>1360 (NB)</td>
</tr>
<tr>
<td>Vance Ave to Alvarez Dr</td>
<td>7/10/2008</td>
<td>16561</td>
<td>0.5068 (NB)</td>
<td>963 (SB)</td>
<td>1503 (NB)</td>
</tr>
</tbody>
</table>
Case Study 1
## Case Study 1

<table>
<thead>
<tr>
<th>Acceptable Features</th>
<th>Primary Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed limit</td>
<td>Capacity during peak hours</td>
</tr>
<tr>
<td>Lane Widths</td>
<td>Lack of pedestrian</td>
</tr>
<tr>
<td>Drainage</td>
<td>Corridor illumination between intersections</td>
</tr>
<tr>
<td>Overhead illumination (at intersection)</td>
<td>Specific signing issues</td>
</tr>
<tr>
<td>Horizontal and vertical alignment</td>
<td>Inadequate space for transit</td>
</tr>
<tr>
<td>Signalized intersections</td>
<td>Signage obstructing sight distance</td>
</tr>
</tbody>
</table>
Case Study 1

**Short Term Recommendations**
- New pavement markings
- Signage improvements
- Access Control
- Increase length of left turn lane
- Relocate bus stop

**Long Term Recommendations**
- Added Travel Lanes needed in both directions
- Continuous two way left turning lanes needed in designated areas
- Bicycle and pedestrian facilities needed
- Intersections improvements needed at Georgetown N Blvd & Stellhorn Rd
Case Study 1

Outcome of RSA

- Roadway owner agreed to;
  - Add travel lanes
  - Install sidewalk and trail system
  - Install overhead illumination
  - Make intersection improvements
  - Create safe bus stop location(s)
  - Upgrade all signage
KEYS TO SUCCESS &
LESSONS LEARNED
Keys to Success

The RSA Team must acquire a clear understanding of the project background and constraints.
Keys to Success

The RSA Team and Local Road Owner must work cooperatively.
Keys to Success

A “Local Champion” can greatly help facilitate the establishment of RSAs
Keys to Success

The RSA field review should be scheduled to coincide with important site conditions.
RSA reports have been brief
Lessons Learned

- Don’t have tunnel vision
- Be flexible with project limits (if feasible)
- Bring more than one camera
- Double-check the time zone
Keys to Success – MPO Perspective

- Select “good” location for RSA
- Engage with local law enforcement
- Provide all available resources
- Involve elected official throughout the process
- Follow up
  - Promote project
  - Be engaged throughout the project development
WRAP UP
Road Safety Audits (RSAs)

- Formal safety performance examination
- Existing or future road segment or intersection
- Independent, multidisciplinary team
RSA Procedure

1. Identify project
2. Select RSA team
3. Conduct start-up meeting
4. Perform field reviews
5. Conduct analysis and prepare report
6. Present findings to Project Owner
7. Prepare formal response
8. Incorporate findings

RSA Team
Design Team / Project Owner
RSA Resources

- **Free RSA Peer-to-Peer Program**
  - Phone: (866) P2P-FHWA
  - Email: SafetyP2P@fhwa.dot.gov

- **FHWA RSA Website**
  - http://safety.fhwa.dot.gov/rsa
RSA Resources

- NCHRP Syntheses
  - 321: Roadway Safety Tools for Local Agencies
  - 336: Roadway Safety Audits
- RSA Guidelines
QUESTIONS?

Jerry Foust  
jerry.foust@co.allen.in.us  
NIRCC

Laura Slusher  
Islusher@purdue.edu  
Indiana LTAP