Mn/DOT County Road Safety Plans

TZD Stakeholder Breakfast

January 20, 2010

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Michael Barry
Loren Hill

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Agenda

- Background, Goals & Objectives
- Project Overview
  - Schedule, Participating Counties, Approach
- Safety Emphasis Areas
- Safety Strategies
- Identifying At-Risk Locations
- Examples of Projects
- Next Steps/Comments
- Questions
Background

- Federal Highway Initiative
  - Changed national safety performance measure
    - Fatalities (severe crashes) as opposed to All crashes
    - Safety goals for every State
  - Data driven process
  - More effective safety investments
    - Better link between crash causation and implementation of safety strategies
- Four Safety E’s
- All roads
Background

Safety Goal
A 5% Reduction in the Number of Traffic Fatalities

Critical Emphasis Areas

- All Others
- Driver Safety Awareness
- Ran-Off the Road
- Head-On & Across Median
- Aggressive Drivers
- Young Drivers
- Signalized Intersections
- Unsignalized Intersections
- Alcohol Related
- Unbelted

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated</th>
<th>2010 Goal</th>
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<tbody>
<tr>
<td>2002</td>
<td>657</td>
<td></td>
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<tr>
<td>2005</td>
<td>559</td>
<td></td>
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<tr>
<td>2006</td>
<td>494</td>
<td></td>
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<tr>
<td>2007</td>
<td>498</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>455</td>
<td></td>
</tr>
<tr>
<td>2009 (Estimated)</td>
<td>420</td>
<td></td>
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<tr>
<td>2010 Goal</td>
<td>400</td>
<td></td>
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</tbody>
</table>
### Roadway Segment Crash and Fatality Rates by Jurisdictional Class

<table>
<thead>
<tr>
<th>Roadway Jurisdiction Classification</th>
<th>Miles</th>
<th>Crashes</th>
<th>Fatalities</th>
<th>Crash Rate*</th>
<th>Fatality Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate</td>
<td>914</td>
<td>9,689</td>
<td>43</td>
<td>0.8</td>
<td>0.3</td>
</tr>
<tr>
<td>Trunk Highway</td>
<td>10,956</td>
<td>22,583</td>
<td>196</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>CSAH /County Roads</td>
<td>44,997</td>
<td>22,768</td>
<td>185</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>City Streets</td>
<td>19,105</td>
<td>21,423</td>
<td>41</td>
<td>2.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Other (Township, etc.)</td>
<td>59,387</td>
<td>2,282</td>
<td>29</td>
<td>1.9</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>State Total</strong></td>
<td>135,359</td>
<td>78,745</td>
<td>494</td>
<td>1.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

* per million vehicle miles (MVM)  
** per 100 million vehicle miles (100 MVM)  


### Highlights
- As a class, interstates had lower crash and fatality rates than conventional roadways. This is likely due to three factors:
  - Interstates only serve a mobility function  
  - Interstates tend to have a consistently high standard of design  
  - Interstates have very strict control of access  
- Of the conventional roadways, Trunk Highways had the lowest crash rate and the second lowest fatality rate.  
- City streets had the highest crash rate and a low fatality rate.
- County and township roads had moderately high crash rates and the highest fatality rates.  
- This distribution of crashes generally supports the idea that greater numbers of crashes occur in urban areas and greater numbers of fatal crashes occur in rural areas.  
- Crash rates and fatality rates by roadway jurisdiction (and for the state as a whole) are interesting, however, there is a great deal of evidence to suggest that crash rates are more a function of roadway design than who owns the road.
Background

- Sponsored by…
  - Funding provided by the Minnesota Department of Transportation
  - Almost $3.5 million made available to prepare County Safety Plans for 87 counties over three years
Goal and Objectives

- Development of County Safety Plans
  - Create county crash goal
  - Establish safety emphasis areas
  - High priority safety strategies
  - At-risk locations
  - Safety investment options

- Identify high priority safety projects, both proactive and reactive.

- Position counties to compete for safety funds
  - Highway Safety Improvement Program
  - High Risk Rural Roads Program
  - Minnesota Central Safety Funds

- Foster safety culture among county stakeholders
Schedule of Delivery

- Phase I - October 15, 2009 to mid July 2010
- Phase II - July 2010 to April 2011
- Phase III - April 2011 to January 2012
- Phase IV - January 2012 to September 2012
Participating Counties

**ATP 3**
- Benton – Robert Kozel
- Cass – David Enblom
- Crow Wing – Tim Bray
- Isanti – Richard Heilman
- Kanabec – Gregory Nikodym
- Mille Lacs – Bruce Cochran
- Morrison – Steve Backowski
- Sherburne – Rhonda Lewis
- Stearns – Mitch Anderson
- Todd – Loren Fellbaum
- Wadena – Joel Ulring
- Wright – Wayne Fingalson

**ATP 6**
- Dodge – Guy Kohlinofer
- Fillmore – John Grindeland
- Freeborn – Sue Miller
- Goodhue – Gregory Isakson
- Houston – Brian Pogodzinski
- Mower – Mike Hanson
- Rice – Dennis Luebbe
- Wabasha – Dietrich Flesch
- Winona – David Kramer
Project Approach – Phase I

- Crash Analysis
- Select Safety Emphasis Areas
- Develop Comprehensive List of Safety Strategies
- Safety Workshop
- Identify Short List of Critical Strategies
- Identify Safety Projects
- Review Mtg w/ Counties
- May 2010
- Identify Safety Projects
- May 2010
- Safety Plan
- July 2010
- Project Programming
- Project Development
- Implementation
- Evaluation
- Refinement & Update SHSP
## Minnesota’s Safety Emphasis Areas

### Top 10 Emphasis Areas (Based on 2004-2008 Minnesota Data) Related Fatal Crashes or Fatalities

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>✓ Increasing Seat Belt Usage and Improving Airbag Effectiveness</td>
<td>1,351 fatalities</td>
<td>53%</td>
<td>1</td>
<td>1,271 fatalities</td>
<td>52%</td>
<td>1</td>
<td>999 fatalities</td>
<td>50%</td>
<td>1</td>
<td>150 fatalities</td>
<td>46%</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Improving the Design and Operation of Highway Intersections</td>
<td>1,013 fatal crashes</td>
<td>36%</td>
<td>3</td>
<td>1,004 fatal crashes</td>
<td>33%</td>
<td>3</td>
<td>929 fatal crashes</td>
<td>36%</td>
<td>2</td>
<td>166 fatal crashes</td>
<td>36%</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Reducing Impaired Driving</td>
<td>1,020 fatal crashes</td>
<td>36%</td>
<td>2</td>
<td>1,068 fatal crashes</td>
<td>36%</td>
<td>2</td>
<td>878 fatal crashes</td>
<td>34%</td>
<td>3</td>
<td>163 fatal crashes</td>
<td>36%</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Keeping Vehicles on the Roadway (combined with Minimizing the Consequences of Leaving the Road)</td>
<td>959 fatal crashes</td>
<td>34%</td>
<td>4</td>
<td>965 fatal crashes</td>
<td>32%</td>
<td>4</td>
<td>805 fatal crashes</td>
<td>31%</td>
<td>4</td>
<td>148 fatal crashes</td>
<td>33%</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Curbing Aggressive Driving</td>
<td>675 fatal crashes</td>
<td>24%</td>
<td>7</td>
<td>850 fatal crashes</td>
<td>28%</td>
<td>5</td>
<td>704 fatal crashes</td>
<td>27%</td>
<td>5</td>
<td>125 fatal crashes</td>
<td>27%</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Instituting Graduated Licensing for Young Drivers</td>
<td>705 fatal crashes</td>
<td>25%</td>
<td>5</td>
<td>718 fatal crashes</td>
<td>24%</td>
<td>6</td>
<td>569 fatal crashes</td>
<td>27%</td>
<td>6</td>
<td>81 fatal crashes</td>
<td>18%</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Reducing Head-On and Across-Median Crashes</td>
<td>505 fatal crashes</td>
<td>18%</td>
<td>9</td>
<td>611 fatal crashes</td>
<td>20%</td>
<td>7</td>
<td>556 fatal crashes</td>
<td>27%</td>
<td>7</td>
<td>101 fatal crashes</td>
<td>22%</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Sustaining Proficiency in Older Drivers</td>
<td>594 fatal crashes</td>
<td>21%</td>
<td>8</td>
<td>533 fatal crashes</td>
<td>18%</td>
<td>9</td>
<td>488 fatal crashes</td>
<td>19%</td>
<td>8</td>
<td>95 fatal crashes</td>
<td>21%</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Keeping Drivers Alert</td>
<td>681 fatal crashes</td>
<td>24%</td>
<td>6</td>
<td>568 fatal crashes</td>
<td>19%</td>
<td>8</td>
<td>431 fatal crashes</td>
<td>17%</td>
<td>9</td>
<td>74 fatal crashes</td>
<td>16%</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓ Making Truck Travel Safer</td>
<td>379 fatal crashes</td>
<td>14%</td>
<td>10</td>
<td>447 fatal crashes</td>
<td>15%</td>
<td>10</td>
<td>414 fatal crashes</td>
<td>16%</td>
<td>10</td>
<td>80 fatal crashes</td>
<td>18%</td>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

✓ Increasing Driver Safety Awareness
✓ Improving Information and Decision Support Systems

Source: Minnesota Crash Records; not including fatalities due to the I-35W Bridge collapse.

1998-2002: 2,797 fatal crashes; 3,126 fatalities; 2,572 vehicle occupant fatalities
2001-2005: 2,701 fatal crashes; 3,008 fatalities; 2,429 vehicle occupant fatalities
2004-2008: 2,701 fatal crashes; 3,008 fatalities; 2,429 vehicle occupant fatalities
Safety Emphasis Areas—
Greater Minnesota vs. Metro

<table>
<thead>
<tr>
<th></th>
<th>Driver Behavior Based Emphasis Areas</th>
<th>Infrastructure Based Emphasis Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Fatalities</td>
<td>Unbelted</td>
</tr>
<tr>
<td>Statewide</td>
<td>3,008</td>
<td>1,271 (52%)</td>
</tr>
<tr>
<td>Greater Minnesota Districts (2001-2005 Fatalities)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Trunk Highway</td>
<td>1,089 (53%)</td>
<td>476 (49%)</td>
</tr>
<tr>
<td>Local Roads</td>
<td>974 (47%)</td>
<td>492 (63%)</td>
</tr>
<tr>
<td>Greater Minnesota Districts Total</td>
<td>2,063 (55%)</td>
<td>968 (36%)</td>
</tr>
<tr>
<td>Metro District (2001-2005 Fatalities)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Trunk Highway</td>
<td>465 (49%)</td>
<td>162 (45%)</td>
</tr>
<tr>
<td>Local Roads</td>
<td>480 (51%)</td>
<td>141 (45%)</td>
</tr>
<tr>
<td>Metro District Total</td>
<td>945 (45%)</td>
<td>303 (34%)</td>
</tr>
</tbody>
</table>

Source: Minnesota Strategic Highway Safety Plan

Represents at least 3% greater than statewide average

Highlights

- Almost 70% of the fatalities in Minnesota are in the 79 counties outside of the 8 county Minneapolis – St. Paul Metropolitan Area.
- Fatal crashes are split almost evenly between the state and local roadway systems – which results in higher fatality rates on the local system.
- In Urban areas, the primary factors associated with fatal crashes are intersections and speeding.
- In Rural areas, the primary factors associated with fatal crashes are not using safety belts, alcohol, and road departure crashes.
Statewide Emphasis Areas

Fatalities by Emphasis Area for Part 1: Driver

- Involving Young Driver
- Involving Driver with an Invalid License
- Involving Older Driver
- Involving Aggressive or Speeding Driver
- Drug and Alcohol-related crashes
- Involving Inattentive or Distracted Driver
- Unbelted Vehicle Occupant

Annual Fatalities in Emphasis Area

- 2003: 239
- 2004: 224
- 2005: 193
- 2006: 193
- 2007: 193
- 2008: 178
- 2009: 163

- 2003: 178
- 2004: 152
- 2005: 161
- 2006: 166
- 2007: 178
- 2008: 150
- 2009: 150

- 2003: 111
- 2004: 151
- 2005: 151
- 2006: 123
- 2007: 115
- 2008: 125
- 2009: 81

- 2003: 108
- 2004: 122
- 2005: 102
- 2006: 75
- 2007: 72
- 2008: 81
- 2009: 74

- 2003: 28
- 2004: 53
- 2005: 36
- 2006: 36
- 2007: 49
- 2008: 49
- 2009: 49
Statewide Emphasis Areas

Fatalities by Emphasis Area for Part 4: Highways

- Vehicle-Train
- Single Vehicle Run-Off-Road
- At Intersection
- Head-on
- Work Zone

Annual Fatalities in Emphasis Area

- 2003: 213, 171, 117
- 2004: 183, 168, 123
- 2005: 179, 162, 106
- 2006: 188, 156, 109
- 2007: 188, 156, 109
- 2008: 166, 148, 101
- 2009: 213, 171, 117
### Critical Emphasis Areas

#### Winona County Emphasis Areas

<table>
<thead>
<tr>
<th>Emphasis Area</th>
<th>Statewide Percentage</th>
<th>ATP 6 Interstate, US &amp; TH</th>
<th>ATP 6 CSAH &amp; CR</th>
<th>Group 7 City, Twnshp &amp; Other</th>
<th>Winona County Interstate, US &amp; TH</th>
<th>Winona County CSAH &amp; CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fatal and Serious Injury Crashes</td>
<td>10,172</td>
<td>475</td>
<td>433</td>
<td>272</td>
<td>86</td>
<td>65</td>
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<tr>
<td>Young drivers (under 21)</td>
<td>26%</td>
<td>24% (116)</td>
<td>28% (121)</td>
<td>34% (92)</td>
<td>27% (23)</td>
<td>26% (17)</td>
</tr>
<tr>
<td>Unlicensed drivers</td>
<td>7%</td>
<td>5% (25)</td>
<td>6% (25)</td>
<td>7% (18)</td>
<td>6% (5)</td>
<td>9% (6)</td>
</tr>
<tr>
<td>Older drivers (over 64)</td>
<td>13%</td>
<td>20% (96)</td>
<td>13% (56)</td>
<td>13% (34)</td>
<td>8% (7)</td>
<td>18% (12)</td>
</tr>
<tr>
<td>Aggressive driving and speeding-related</td>
<td>22%</td>
<td>23% (108)</td>
<td>25% (107)</td>
<td>20% (54)</td>
<td>26% (24)</td>
<td>22% (14)</td>
</tr>
<tr>
<td>Drug and alcohol-related</td>
<td>25%</td>
<td>15% (73)</td>
<td>29% (125)</td>
<td>21% (57)</td>
<td>31% (27)</td>
<td>20% (13)</td>
</tr>
<tr>
<td>Inattentive, distracted, asleep drivers</td>
<td>21%</td>
<td>27% (130)</td>
<td>15% (63)</td>
<td>14% (38)</td>
<td>9% (8)</td>
<td>26% (17)</td>
</tr>
<tr>
<td>Safety awareness</td>
<td>-</td>
<td>--</td>
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</tr>
<tr>
<td>Unbelted vehicle occupants</td>
<td>27%</td>
<td>28% (133)</td>
<td>31% (135)</td>
<td>25% (69)</td>
<td>30% (26)</td>
<td>29% (19)</td>
</tr>
<tr>
<td>Special Users</td>
<td></td>
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<tr>
<td>Pedestrians crashes</td>
<td>8%</td>
<td>4% (17)</td>
<td>3% (12)</td>
<td>10% (27)</td>
<td>5% (4)</td>
<td>3% (2)</td>
</tr>
<tr>
<td>Bicycle crashes</td>
<td>4%</td>
<td>1% (6)</td>
<td>1% (6)</td>
<td>7% (18)</td>
<td>3% (3)</td>
<td>2% (1)</td>
</tr>
<tr>
<td>Motorcycles crashes</td>
<td>14%</td>
<td>16% (74)</td>
<td>18% (76)</td>
<td>8% (22)</td>
<td>21% (18)</td>
<td>12% (8)</td>
</tr>
<tr>
<td>Heavy vehicle crashes</td>
<td>9%</td>
<td>14% (68)</td>
<td>5% (23)</td>
<td>7% (20)</td>
<td>1% (1)</td>
<td>23% (15)</td>
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<tr>
<td>Safety enhancements</td>
<td>-</td>
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<tr>
<td>Train-vehicle collisions</td>
<td>0%</td>
<td>0% (1)</td>
<td>0% (2)</td>
<td>1% (3)</td>
<td>0% (0)</td>
<td>0% (0)</td>
</tr>
<tr>
<td>Road departure crashes</td>
<td>27%</td>
<td>31% (149)</td>
<td>48% (207)</td>
<td>23% (63)</td>
<td>55% (47)</td>
<td>32% (21)</td>
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<tr>
<td>Consequences of leaving road</td>
<td>-</td>
<td>--</td>
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</tr>
<tr>
<td>Intersection crashes</td>
<td>43%</td>
<td>37% (177)</td>
<td>26% (112)</td>
<td>50% (136)</td>
<td>17% (15)</td>
<td>29% (19)</td>
</tr>
<tr>
<td>Head-On and Sideswipe (opposite) crashes</td>
<td>15%</td>
<td>17% (83)</td>
<td>19% (83)</td>
<td>12% (32)</td>
<td>26% (22)</td>
<td>22% (14)</td>
</tr>
<tr>
<td>Work zone crashes</td>
<td>1%</td>
<td>2% (8)</td>
<td>1% (4)</td>
<td>0% (0)</td>
<td>1% (1)</td>
<td>0% (0)</td>
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<tr>
<td>EMS Enhancing Emergency Capabilities</td>
<td>-</td>
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<tr>
<td>Management</td>
<td>-</td>
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<td>Information and decision support systems</td>
<td>-</td>
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<tr>
<td>More effective processes</td>
<td>-</td>
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DPS Crash Data Records, 2004 to 2008

Winona County Critical Emphasis Areas (based on top 5 ATP numbers)

Note: Numbers are not additive, as one crash may involve a young driver at an intersection.

- Five Critical Emphasis Areas selected
  - Young Drivers (under 21)
  - Drug and alcohol-related
  - Unbelted vehicle occupants
  - Road departure crashes
  - Intersection Crashes

1/20/2009
Safety Strategies Overview NCHRP Report 500

- A series of guides to assist state and local agencies in reducing injuries and fatalities in targeted emphasis areas.
- The guides correspond to the emphasis areas outlined in the AASHTO Strategic Highway Safety Plan.
- Each guide includes a brief introduction, a general description of the problem, the strategies/countermeasures to address the problem, and a model implementation process.
Screening - Initial Strategies


The strategies will be screened using:
- Crash data,
- Effectiveness,
- Cost, and
- Input from Safety Workshop.

The Critical Strategies should have the greatest potential to significantly reduce the number of traffic fatalities in Winona County.
# List of Road Departure Strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Relative Cost to Implement and Operate</th>
<th>Effectiveness</th>
<th>Typical Timeframe for Implementation</th>
<th>Workshop Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.1 A -- Keep vehicles from encroaching on the roadside</td>
<td>15.1 A1 -- Install shoulder rumble strips</td>
<td>Low</td>
<td>Proven</td>
<td>Short</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A2 -- Install edgelines, edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders</td>
<td>Low</td>
<td>Experimental</td>
<td>Short</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A3 -- Install centerline rumble strips</td>
<td>Low</td>
<td>Experimental</td>
<td>Short</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A4 -- Provide enhanced shoulder or delineation and marking for sharp curves</td>
<td>Low</td>
<td>Tried / Proven</td>
<td>Short</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A5 -- Provide improved highway geometry for horizontal curves</td>
<td>Moderate</td>
<td>Proven</td>
<td>Long</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A6 -- Provide enhanced pavement markings</td>
<td>Low</td>
<td>Tried</td>
<td>Short</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 A7 -- Provide skid-resistance pavement surfaces</td>
<td>Moderate</td>
<td>Proven</td>
<td>Medium</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>15.1 A8 -- Apply shoulder treatments</td>
<td>Low</td>
<td>Experimental</td>
<td>Medium</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>*Eliminate shoulder drop-offs *Shoulder wedge *Widen and/or pave shoulders</td>
<td>Low</td>
<td>Proven</td>
<td>Medium</td>
<td>✓</td>
</tr>
<tr>
<td>15.1 B -- Minimize the likelihood of crashing into an object or overturning if the vehicle travels off the shoulder</td>
<td>15.1 B1 -- Design safer slopes and ditches to prevent rollovers</td>
<td>Moderate</td>
<td>Proven</td>
<td>Medium</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 B2 -- Remove/relocate objects in hazardous locations</td>
<td>Moderate to High</td>
<td>Proven</td>
<td>Medium</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>15.1 B3 -- Delineate trees or utility poles with retroreflective tape</td>
<td>Low</td>
<td>Experimental</td>
<td>Short</td>
<td>X</td>
</tr>
<tr>
<td>15.1 C -- Reduce the severity of the crash</td>
<td>15.1 C1 -- Improve design of roadside hardware</td>
<td>Moderate to High</td>
<td>Tried</td>
<td>Medium</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>15.1 C2 -- Improve design and application of barrier and attenuation systems</td>
<td>Moderate to High</td>
<td>Tried</td>
<td>Medium</td>
<td>X</td>
</tr>
</tbody>
</table>

Source: NCHRP 500 Series

Short (<1 year)  
Medium (1-2 years)  
Long (>2 years)  

1/20/2009
Safety Workshop

- Date/Time: March 10th, 8:30AM to 3PM
- Location: Rushford Village Hall
- Agenda
  - 8:30 – Coffee and Registration
  - 9AM - Introductions
  - Background Information/Desired Outcomes
  - Breakout Sessions – Prioritize Strategies
  - 12PM – 1PM - Lunch
  - Report Back/Final Presentation
  - 2:45 – 3PM - Wrap-up
## Priority List of Signalized Intersection Safety Strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Voting Results</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.2 A4 -- Employ signal coordination along a corridor or route</td>
<td></td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>17.2 E2 -- Supplement conventional enforcement of red-light running with confirmation lights</td>
<td>17</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

## Priority List of Unsignalized Intersection Safety Strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Voting Results</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.1 B -- Reduce the frequency and severity of intersection conflicts through geometric design improvements</td>
<td>17.1 B12 -- Restrict or eliminate turning maneuvers by providing channelization or closing median openings</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>17.1 E -- Improve driver awareness of intersections as viewed from the intersection approach</td>
<td>17.1 E5 -- Install larger regulatory and warning signs at intersections and improve visibility of intersections by providing enhanced signing and delineation</td>
<td>13</td>
<td>3</td>
</tr>
</tbody>
</table>

## Priority List of Road Departure Safety Strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Voting Results</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.1 A1 -- Install shoulder rumble strips</td>
<td></td>
<td>15.1 A2 -- Install edgelines &quot;profile marking&quot;, edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders</td>
<td>19</td>
</tr>
<tr>
<td>15.1 A3 -- Install centerline rumble strips</td>
<td>15.1 A4 -- Provide enhanced shoulder or delineation and marking for sharp curves</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>15.1 A6 -- Provide enhanced pavement markings</td>
<td></td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>15.1 A8 -- Apply shoulder treatments *Eliminate shoulder drop-offs *Shoulder wedge &quot;Widen and/or pave shoulders&quot;</td>
<td></td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

## Priority List of Seat Belt Usage Safety Strategies

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Voting Results</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1 A4 -- Support Legislation to change seat belt usage from a secondary to a primary offense.</td>
<td></td>
<td>8.1 A5 -- Insure that restraints, especially child and infant restraints, are properly used</td>
<td>12</td>
</tr>
<tr>
<td>8.1 B -- Support legislation to improve child passenger safety laws</td>
<td></td>
<td>8.1 A6 -- Maximize use of occupant restraints by all vehicle occupants</td>
<td>6</td>
</tr>
</tbody>
</table>

## Priority List of Impaired/Aggressive/Young Drivers and Bicyclist Safety

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Strategies</th>
<th>Voting Results</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase bicycle helmet usage</td>
<td></td>
<td>Support diversion programs to impaired driving offenses</td>
<td>4</td>
</tr>
<tr>
<td>Support legislation to require ignition interlocks as a condition for license reinstatement</td>
<td></td>
<td>Conduct educational and public information campaigns against aggressive driving</td>
<td>0</td>
</tr>
<tr>
<td>Develop parent-teen driver's education presentations and handbook aimed at educating individuals on the risk of teen driving</td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Continue seat belt challenges among high schools to encourage teens to buckle up</td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

---

- **Strategies Receiving Highest Votes**
  - Install shoulder rumble strips
  - Conducting educational campaigns and develop parent-teen driver’s education aimed at teen driving
  - Improving driver awareness of intersections

1/20/2009
Example – Typical Intersection Strategies

Included Strategies:

- Change Intersection Type
- Street Lighting
- Dynamic Warning Signs
- Enhanced Signing and Delineation
- Improve Sight Distance
Example – Typical Run-Off Road Strategies

Lane Departure Crashes

Key Objectives:
Keep Vehicles in Their Lane

Key Strategies:
• Improved curve delineation
• Improved lane markings

Key Objectives:
Improve Shoulders

Key Strategies:
• Safety edge
• Paved shoulders
• Shoulder rumble strips

Rumble Strip
Without Safety Edge
With Safety Edge
ATP 6 County Crash Data Overview

Source: MnCMAT Crash Data, 2003-2007
Severe is fatal and serious injury crashes (K+A).

5 Year Crashes ATP 6
35,890
1,258

State System
16,571 – 46%
481 – 38%

CSAH/CR
7,509 – 21%
493 – 39%

Rural
4,400 – 59%
395 – 80%

City, Townshp, Other
11,810 – 33%
284 – 23%

Urban
3,109 – 41%
98 – 20%

Example
All – %
Severe – %

Run Off Road – 235 (24%), 24 (46%)
Rear End – 307 (31%), 5 (10%)
Head On – 57 (6%), 9 (17%)
Right Angle – 98 (10%), 4 (8%)

Not Inters-Related
999 – 32%
52 – 53%

Unknown/Other
495 – 16%
9 – 9%

Inters-Related
1,615 – 52%
37 – 38%

Not Animal
3,760 – 85%
383 – 97%

Animal
640 – 15%
12 – 3%

Inters-Related
1,035 – 28%
97 – 25%

Unknown/Other
302 – 8%
52 – 53%

Run Off Road
183 (38%), 16 (34%)
Right Angle – 48 (10%), 7 (15%)
Rear End – 66 (14%), 2 (4%)
Left Turn – 37 (8%), 8 (17%)

Other/Unknown
358 – 22%
6 – 16%

Right Angle
285 (50%), 11 (73%)
Rear End – 74 (13%), 2 (13%)
Left Turn – 61 (11%), 0 (0%)

Signalized
482 – 47%
47 – 49%

Head On, SS Opp
151 – 6%
28 – 11%

Thru-Stop
446 – 43%
47 – 49%

On Curve
59 – 39%
13 – 46%

On Curve
895 – 55%
112 – 62%

Right Angle
178 (40%), 28 (60%)
Run Off Road – 55 (12%), 5 (11%)
Head On – 17 (4%), 4 (9%)

Other/Unknown
358 – 22%
6 – 16%

Run Off Road
183 (38%), 16 (34%)
Right Angle – 48 (10%), 7 (15%)
Rear End – 66 (14%), 2 (4%)
Left Turn – 37 (8%), 8 (17%)

Right Angle
285 (50%), 11 (73%)
Rear End – 74 (13%), 2 (13%)
Left Turn – 61 (11%), 0 (0%)

All Way Stop
10 – 1%
1 – 1%

Thru-Stop
446 – 43%
47 – 49%

Head On, SS Opp
151 – 6%
28 – 11%

On Curve
59 – 39%
13 – 46%

On Curve
895 – 55%
112 – 62%

Right Angle
178 (40%), 28 (60%)
Run Off Road – 55 (12%), 5 (11%)
Head On – 17 (4%), 4 (9%)

Other/Unknown
358 – 22%
6 – 16%

Run Off Road
183 (38%), 16 (34%)
Right Angle – 48 (10%), 7 (15%)
Rear End – 66 (14%), 2 (4%)
Left Turn – 37 (8%), 8 (17%)

Right Angle
285 (50%), 11 (73%)
Rear End – 74 (13%), 2 (13%)
Left Turn – 61 (11%), 0 (0%)
Houston County Crash Data Overview

Source: MnCMAT Crash Data, 2003-2007
Severe is fatal and serious injury crashes (K+A).

5 Year Crashes Houston County
1,516
63

State System
762 – 50%
33 – 52%

CSAH/CR
426 – 28%
22 – 35%

City, Twnshp, Other
328 – 22%
8 – 13%

Urban
107 – 25%
1 – 5%

Rural
319 – 75%
21 – 95%

Not Inters-Related
48 – 45%
1 – 100%

Unknown/Other
16 – 15%
0 – 0%

Inters-Related
43 – 40%
0 – 0%

Animal
87 – 27%
1 – 5%

Not Animal
232 – 73%
20 – 95%

Run Off Road – 13 (27%), 1 (100%)
Rear End – 13 (27%), 0 (0%)
SS Same – 8 (17%), 0 (0%)
Other – 6 (13%), 0 (0%)

Signalized
3 – 7%
0 – 0%

All Way Stop
2 – 5%
0 – 0%

Thru-Stop
23 – 53%
0 – 0%

Other/Unknown
15 – 35%
0 – 0%

Run Off Road – 5 (38%), 0 (0%)
SS Same – 3 (23%), 1 (100%)
Rear End – 3 (23%), 0 (0%)

Head On, SS Opp
12 – 6%
0 – 0%

Run off Road
152 – 81%
16 – 94%

Right Angle – 8 (35%), 0 (0%)
Left Turn – 5 (22%), 0 (0%)
Rear End – 3 (13%), 0 (0%)

Rear End – 4 (27%), 0 (0%)
Run Off Road – 4 (27%), 0 (0%)
SS Same – 3 (20%), 0 (0%)

Thru-Stop
4 – 0%
0 – 0%

Run Off Road – 16 – 60%
1 – 50%

On Curve
9 – 75%
0 – 0%

Unknown/Other
17 – 7%
5 – 100%

Not Inters-Related
188 – 81%
17 – 85%

Animal
87 – 27%
1 – 5%

Not Animal
232 – 73%
20 – 95%

Run Off Road – 16 (10%), 0 (0%)
Rear End – 2 (13%), 0 (0%)
SS Same – 8 (53%), 0 (0%)
Rear End – 3 (20%), 0 (0%)

Other/Unknown
13 – 76%
1 – 100%

Thru-Stop
4 – 0%
0 – 0%

Run Off Road – 16 – 60%
1 – 50%

On Curve
9 – 75%
0 – 0%

Unknown/Other
17 – 7%
5 – 100%

Not Inters-Related
188 – 81%
17 – 85%

Animal
87 – 27%
1 – 5%

Not Animal
232 – 73%
20 – 95%

Run Off Road – 16 (10%), 0 (0%)
Rear End – 2 (13%), 0 (0%)
SS Same – 8 (53%), 0 (0%)
Rear End – 3 (20%), 0 (0%)

Other/Unknown
13 – 76%
1 – 100%

Thru-Stop
4 – 0%
0 – 0%

Run Off Road – 16 – 60%
1 – 50%

On Curve
9 – 75%
0 – 0%

Unknown/Other
17 – 7%
5 – 100%

Not Inters-Related
188 – 81%
17 – 85%

Animal
87 – 27%
1 – 5%

Not Animal
232 – 73%
20 – 95%

Run Off Road – 16 (10%), 0 (0%)
Rear End – 2 (13%), 0 (0%)
SS Same – 8 (53%), 0 (0%)
Rear End – 3 (20%), 0 (0%)

Other/Unknown
13 – 76%
1 – 100%

Thru-Stop
4 – 0%
0 – 0%

Run Off Road – 16 – 60%
1 – 50%

On Curve
9 – 75%
0 – 0%

Unknown/Other
17 – 7%
5 – 100%

Not Inters-Related
188 – 81%
17 – 85%

Animal
87 – 27%
1 – 5%

Not Animal
232 – 73%
20 – 95%

Run Off Road – 16 (10%), 0 (0%)
Rear End – 2 (13%), 0 (0%)
SS Same – 8 (53%), 0 (0%)
Rear End – 3 (20%), 0 (0%)
Stearns County - Crash Data Overview

Source: MnCMAT Crash Data, 2003-2007
Severe is fatal and serious injury crashes (K+A).

Example
All – %
Severe – %

State System
4,038 – 36%
111 – 29%

CSAH/CR
3,213 – 29%
152 – 39%

City, Twnshp, Other
3,901 – 35%
123 – 32%

Urban
1,886 – 59%
55 – 36%

Rural
1,327 – 41%
97 – 64%

Not Inters-Related
531 – 28%
19 – 35%

Unknown/Other
276 – 15%
4 – 7%

Inters-Related
1,079 – 57%
32 – 58%

Rear End – 155 (29%), 4 (21%)
Run Off Road – 122 (23%), 8 (42%)
Right Angle – 43 (8%), 1 (5%)
Other – 38 (7%), 4 (21%)
Sideswipe (Opposing) – 18 (3%), 1 (5%)

Not Animal
1,150 – 87%
94 – 97%

Animal
177 – 13%
3 – 3%

Inters-Related
373 – 33%
25 – 27%

Unknown/Other
97 – 8%
5 – 5%

Not Inters-Related
680 – 59%
64 – 68%

Run Off Road – 63 (39%), 7 (64%)
Sideswipe (Same) – 11 (7%), 1 (9%)
Other – 8 (5%), 2 (18%)
Head On – 4 (3%), 1 (9%)

Head On, SS Opp
46 – 7%
6 – 9%

Other/Unknown
160 – 43%
11 – 44%

Signalized
35 – 9%
1 – 4%

Thru-Stop
120 – 32%
12 – 37%

Other/Unknown
261 – 24%
7 – 22%

Run Off Road – 63 (39%), 7 (64%)
Sideswipe (Same) – 11 (7%), 1 (9%)
Other – 8 (5%), 2 (18%)
Head On – 4 (3%), 1 (9%)

Right Angle – 141 (28%), 6 (50%)
Left Turn – 81 (16%), 2 (17%)
Other – 10 (2%), 2 (17%)

Right Angle – 153 (53%), 9 (75%)
Rear End – 42 (15%), 1 (8%)
Left Turn – 24 (8%), 1 (8%)

Thru-Stop
170 – 46%
12 – 48%

On Curve
19 – 41%
3 – 50%

Run Off Road
462 – 68%
43 – 67%

On Curve
196 – 42%
23 – 53%

All Way Stop
8 – 2%
1 – 4%

Signalized
35 – 9%
1 – 4%

Thru-Stop
120 – 32%
12 – 37%

Other/Unknown
261 – 24%
7 – 22%
Rural Roadway Departure

- Are all 325 miles of rural roads equally at risk?

- Find volume categories where road departure crashes are overrepresented when compared to VMT
  - 500 to 2,500 ADT categories
Horizontal Curves

Highlights

- A number of previously published research reports have identified horizontal curves as at-risk elements of rural road systems, however, the degree of risk was not quantified.
- A recent report prepared by the Texas Transportation Institute (FHWA/TX-07/D-5439-1) related actual crash rates on rural roads to the radius of curvature. The results of this research indicates that the crash rate on curves with radii greater than 2,500 feet is approximately equal to the crash rate on tangent sections.
- On curves with radii of 1,000 feet, the crash rate is twice the rate on tangents and curves; curves with radii of 500 feet have crash rates eight times higher than on tangents.
- A number of safety studies that were focused on local, rural systems in Minnesota have found road departure crashes are overrepresented on horizontal curves – 40 to 50% of the road departure crashes in the selected counties occurred on curves, and curves made up less than 10% of the county’s system.
- The same studies also documented that over 60% of the horizontal curves on the county system have radii less than 1,000 feet – from a system perspective, these curves are more at risk.

Source: Texas Transportation Institute (FHWA/TX-07/D-5439-1)
Roadside Safety Strategies (3 of 6)
Curve-Related Roadway Departure

- Approximately 40% of roadway departure crashes are curve related
- 240 curves along rural corridors
- Are all curves equally at-risk?
  - No

- Ranked based on Checkmark system
  - 5 Checks
    - ADT Range – 1,000-2,500
    - Radius Range - 750-1,250 ft
    - Severe Crash on curve
    - Intersection on curve
    - Visual Trap on curve
Curve-Related Roadway Departure

- Crash Rate increases as Radius decreases, with a sharp rise near 1,500’.
- Severe Crashes are overrepresented in mid-range radii, specifically between 750’ and 1,250’
- Curves with a radius between 750’ and 1,250’ received a checkmark
### Curve-Related Roadway Departure

#### Summary of the high priority curves prioritization includes:
- 23 curves received 3, 4 or 5 checkmarks (240 total)
  - 1 received 5 checkmarks
  - 6 received 4 checkmarks
  - 16 received 3 checkmarks
- 10% of all curves
- 18 different corridor segments across the county

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Segment</th>
<th>Description</th>
<th>Curve</th>
<th>Corridor Visual Trap</th>
<th>K</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>PDO</th>
<th>Severe RoR</th>
<th>Curve Rank</th>
<th>Length</th>
<th>Intersection on Curve</th>
<th>Chevrons</th>
<th>Visual Trap</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 CSAH 3</td>
<td>Mower Co - CSAH 6</td>
<td>1 295</td>
<td>1 0 0 0 0</td>
<td>1 0</td>
<td>800</td>
<td>1,250</td>
<td>Yes</td>
<td>xxx</td>
<td></td>
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<tr>
<td>9 CSAH 4</td>
<td>CSAH 5 - CSAH 22</td>
<td>6 3,075</td>
<td>1 0 1 1 1 0</td>
<td>1,150</td>
<td>1,875</td>
<td>Yes</td>
<td>xxx</td>
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<tr>
<td>11 CSAH 6</td>
<td>CSAH 6 - CSAH 35</td>
<td>2 1,500</td>
<td>None 0 0</td>
<td>1,150</td>
<td>1,050</td>
<td>Yes</td>
<td>xxx</td>
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</tr>
<tr>
<td>18 CSAH 11</td>
<td>CSAH 36 - CSAH 2</td>
<td>2 1,500</td>
<td>None 0 0</td>
<td>900</td>
<td>725</td>
<td>Yes</td>
<td>xxx</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>20 CSAH 2</td>
<td>36th Ave NE - TH 42</td>
<td>4 3,200</td>
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<td>1,050</td>
<td>1,500</td>
<td>Yes</td>
<td>xxx</td>
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<tr>
<td>21 CR 133</td>
<td>55th St NW - CSAH 14</td>
<td>6 1,600</td>
<td>0 0 1 0 0</td>
<td>0 0</td>
<td>800</td>
<td>1,100</td>
<td>Yes</td>
<td>xxx</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 CSAH 3</td>
<td>CSAH 14 - CSAH 13</td>
<td>9 1,200</td>
<td>0 1 0 0 0</td>
<td>0 0</td>
<td>800</td>
<td>500</td>
<td>Yes</td>
<td>xxx</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>24 CSAH 12</td>
<td>US 52 - US 63</td>
<td>2 3,650</td>
<td>0 1 0 2 0</td>
<td>0 1</td>
<td>1,000</td>
<td>725</td>
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<td>xxx</td>
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<tr>
<td>26 CSAH 5</td>
<td>Byron City Limits - Dodge Co (CSA 17)</td>
<td>5 2,150</td>
<td>0 0 1 0 0</td>
<td>0 0</td>
<td>1,100</td>
<td>1,025</td>
<td>Yes</td>
<td>xxx</td>
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<tr>
<td>41 CSAH 34</td>
<td>US 14 - CSAH 3</td>
<td>6 2,150</td>
<td>0 0 0 0 1</td>
<td>0 0</td>
<td>1,150</td>
<td>325</td>
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<tr>
<td>42 CSAH 3</td>
<td>CSAH 6 - CSAH 4</td>
<td>5 1,000</td>
<td>0 1 0 0 2</td>
<td>0 1</td>
<td>850</td>
<td>1,350</td>
<td>Yes</td>
<td>xxx</td>
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<td></td>
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Comprehensive Safety Improvement Process

Analytical Techniques

Implementation Strategies

- Black Spot Analysis
  - Reactive

- System Wide Analysis
  - Proactive

Highlights

- For the past 30 years, most safety programs have been focused on identifying locations with a high frequency or rate of crashes – Black Spots – and then reactively implementing safety improvement strategies.

- The result of making Black Spots the highest priority in the safety program was to focus safety investments primarily on urban and suburban signalized intersections—the locations with the highest number of crashes. However, these Black Spot intersections were found to account for fewer than 10% of fatal crashes.

- A new, more systematic based analysis of Minnesota’s crash data combined with the adoption of a goal to reduce fatal crashes has led to a more comprehensive approach to safety programming—a focus on Black Spots in urban areas where there are intersections with high frequencies of crashes and a systems-based approach for rural areas where the total number of severe crashes is high but the actual number of crashes at any given location is very low.
Examples of Projects

- Edgeline and/or centerline rumblestrips
- Enhanced pavement markings (6” or 4” wet reflective)
- Enhanced delineation for curves
- Median access management
- Confirmation light for enhanced enforcement
- Street lights and enhanced signs and markings
- Dynamic Mainline Intersection Warning
Project Summary

**Infrastructure Based**

- Edge line rumble stripE’s 164 Miles $400,000
- Enhanced (6”) edge lines 84 Miles $25,000
- Enhanced curve delineation 22 Curves $22,000
- Median/channelization 6 Intersections $450,000
- Signs, St. Lights & Dynamic Warning 25 Intersections $451,000
- Enhanced Red Light Enforcement 28 Intersections $100,000
- Total $1,447,000

Note: The value of this list of potential safety projects is greater than what Olmsted County can undertake in a single year based on funding limitations. The actual schedule for implementation will be a function of securing funding from the State’s Highway Safety Improvement Program.

**Driver Behavior Based**

- Continued participation with SE Minnesota TZD and Safe Community Coalitions, including working on the Countywide Fatal Review Committee
- Continued coordination with the County Public Health Department and local law enforcement
Next Steps

- Phase I
  - March – Safety Workshops
  - May - Identify Safety Projects in each county
  - July – Deliver Safety Plans

- Phase II
  - July 2010 thru April 2011

- Phase III
  - April 2011 thru January 2012

- Phase IV
  - January 2012 thru September 2012
Questions?