GET AHEAD OF THE CURVE
COMBATTING RUN-OFF-THE-ROAD COLLISIONS

Presented by: Kendra Schenk, PE, PTOE
Presentation Overview

- Project Background
- Field Assessment & Data Review
- Countermeasures
- Safety Benefits
- Next Steps
Project Background
Roadway Departure Crash

A crash in which a vehicle crosses an edge line, a center line, or otherwise leaves the traveled way

Source: NEWS Lincoln County
Roadway Departure Fatality Statistics

2013 - 2015

BURGESS & NIPLE

FHWA Roadway Safety Data Dashboard
Fatalities in the United States

2013 – 2015 Averages
National Average 33,560

FHWA Roadway Safety Data Dashboard
Percent of Roadway Departure Fatalities

2013 – 2015 Averages
National Average – 54%

FHWA Roadway Safety Data Dashboard
Roadway Departure Fatalities - National

- Signs, Utility Poles, Traffic Signals: 7%
- Other Fixed Object: 5%
- Barrier: 5%
- Roadside Topography: 4%
- Trees, Shrubs: 19%
- Overturn: 30%
- Opposing Direction: 23%

Source: FARS 2010 – 2012 (most harmful event)
Roadway Departure Fatalities – West Virginia

- ROR-Right: 54%
- ROR-Left: 43%
- Crossed Median: 30%
- Boulder, Shrub, Tree: 27%
- Embankment: 19%
- Guardrails, Traffic Barriers, Crash Attenuators: 15%
- Curb, Ditch, Culvert: 10%
- Sign, Light, Utility Pole/Support: 10%
- Other Fixed Object: 6%
- Building, Fence, Wall: 5%
- Airborne: 5%
- Bridge: 2%
- Hydrant, Mailbox: 1%
Risk Factors for Fatal Overturn Crashes

- 76% Tractor
- 72% Speed Limit 50
- 43% Curve

Source: FARS 2010 – 2012 (most harmful event)
Risk Factors for Fatal Opposite Direction Crashes

- 83% of head-on crashes involve a vehicle passing another vehicle
- 68% of crashes involve a tractor
- 68% of crashes involve a speed limit sign
- 32% of crashes involve a lane change

Only 4% of head-on crashes involve a vehicle passing another vehicle

Source: FARS 2010 – 2012 (most harmful event)
Risk Factors for Fatal Tree and Shrub Crashes

68%  52%  48%  46%
Reduce Roadway Departure Fatalities in West Virginia

- **2006:** 282 Fatalities
- **2007:** 308 Fatalities
- **2008:** 288 Fatalities
- **2009:** 273 Fatalities
- **2010:** 202 Fatalities
- **2011:** 219 Fatalities
- **2012:** 205 Fatalities
- **2013:** 211 Fatalities
- **2014:** 172 Fatalities
- **2015:** 168 Fatalities

**5-Year Rolling Average:**
- 2007: 258
- 2012: 237
- 2014: 202
- 2015: 195

**Percent of All Fatalities:**
- 65%

**Percent of All Serious Injuries:**
- 56%

**Reduce Roadway Departure Fatalities by 1/2 by 2030**
- **195 in 2015**
- **177 by 2020**
Roadway Departures in West Virginia

- FHWA provided West Virginia Accelerated HSIP Projects
  - Upgrade Existing Cable Guardrail
  - New Cable Guardrail
  - Guardrail Projects
  - High Friction Surface Treatment Projects
  - ITS Projects
  - Lighting Projects
  - Low Cost Roadway Departure Projects
Roadway Departure Assessments

- Contracted 6 Engineering Firms
- Nearly 1,450 miles of priority routes
- Focus on low-cost countermeasures:
  - Shoulder widening
  - High friction surface treatments
  - Minor guardrail improvements
  - Hazard delineation
  - Rumble strips/stripes
  - Signing
  - Pavement markings
  - Raised pavement markings

Source: safety.fhwa.dot.gov/hsip

Source: fhwa.dot.gov
Field Assessment and Data Review
West Virginia Division of Highways District 8

Map showing locations of Canaan Valley, Snowshoe, WV, WV 72 in Tucker County, US 219 in Tucker County.
Field Assessment

- Drive the route in each direction
Field Assessment
Field Assessment

- Distance Measuring Instrument to locate deficiencies along the route

MP 10.59 – SKID MARKS

MP 7.61 – DAMAGED GUARDRAIL

MP 5.26 – ERODED GUARDRAIL

MP 4.93 – DAMAGED SIGN
Field Assessment

- Curve Advisory Speed Re-evaluation
  - Updated Federal Requirements (by December 31, 2019)
  - More reliable methods for determining advisory speeds
  - Adjusted for vehicle, road design, and pavement changes since last evaluation

Source: fhwa.dot.gov
Field Assessment

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CARS – Key Benefits

▪ **Safety**
  - Drive any speed with traffic
  - Continuous driving of roadway
  - No turning around

▪ **Accuracy & Uniformity**
  - Data Collection & assessment is fully automated

▪ **Cost Efficiency**
  - Save hours over traditional methods
  - Fewer employee incidents/accidents
  - Better Tort defense
CARS – Cloud Portal

- Tied to the State LRS
- Provides sign placement
- Chevron requirements and spacing
- Cloud storage
CARS in West Virginia District 8

1,096 CURVES

545 (50%) WARRANTED SIGNS
55 (10%) SIGNED CORRECTLY
100 (18%) SIGNS REMOVED

BURGESS & NIPLE
“The Cockpit”

- CARS Ballbank Indicator
- Remote for Camera
- Distance Measuring Instrument
- Video Camera
- CARS Tablet
- Laptop for Notes

BURGESS & NIPLE
Crash Data

- 403 crashes reported between 2011 and 2015

“DRIVER 1 VERBALLY STATED THIS WAS THE FIRST TIME HE HAD BEEN ON THIS ROUTE AND HE WAS TRAVELING TO GORDONSVILLE, VIRGINIA TO A WAL-MART DISTRIBUTION CENTER.”
Countermeasures
Roadway Departure Countermeasures

Source: safety.fhwa.dot.gov/roadway_dept/
Traditional Improvements

- Spot improvements
  - Curve reconstruction
  - Slope reconstruction
  - Pavement or shoulder widening

- Costly

- Usually substantial reduction in crashes at improvement site

- Negligible impact on reducing statewide fatalities
Systematic Improvements

- Reverse of traditional approach
- Effective, low-cost countermeasures
- Install systematically at numerous locations
  - Not limited to highest crash locations
- Results in a statewide reduction of roadway departure crashes
- Bigger “bang” for your buck
Countermeasures – Signing
Countermeasures – Signing

Source: Low-Cost Treatments for Horizontal Curve Safety 2016
Countermeasures – Pavement Markings

Restripe Faded Pavement Markings

4” Edge Line

8” Edge Line

RPM
Countermeasures – Rumble Strips

- Recommended sparingly
  - Weather concerns
  - Snow plow concerns
  - Low volume roadways (3,000 ADT max)
  - Narrow or non-existent shoulders
  - Pavement conditions

Countermeasures – Pavement
Countermeasures - Pavement

- High Friction Surface Treatment
  - Limited to curves with pattern of wet pavement crashes

Source: fhwa.dot.gov
Countermeasures - Guardrail

- Low Guardrail
- Damaged Guardrail
- Eroded Guardrail
- Missing Guardrail Posts
Countermeasures – Guardrail

Source: Low-Cost Treatments for Horizontal Curve Safety 2016
Countermeasures – Shoulder Widening

Source: Low-Cost Treatments for Horizontal Curve Safety 2016
Countermeasures – Fixed Object Delineation
Countermeasures – US 33 in Pendleton County

- 9 crashes 2011 - 2015
- 8 traveling downhill
- 8 tractor trailers
- 1 fatality
- 9 unfamiliar drivers
- Drivers reported brake malfunctions

Runaway Truck Ramp
Modify Superelevation (12% for 30 mph, 25% for 35 mph)
Modify Radius
Barrier Improvements
Wider shoulder/clear zone on the outside of the curve
High Friction Surface Treatment
Countermeasures – WV 32 in Tucker County

2 crashes 2011 - 2015
1 fatality, 1 serious injury

Regrade embankment and install energy-absorbing barrier
Countermeasures – WV 72 in Tucker County
Safety Benefits
Safety Benefits

- CMFs from CMF Clearinghouse or published research
- Societal cost per crash

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Location</th>
<th>Construction Costs</th>
<th>Lifespan</th>
<th>Safety Benefit</th>
<th>Benefit-to-Cost Ratio</th>
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<tbody>
<tr>
<td>Upgrade Curve Signs</td>
<td>MP 0.00 – 33.36</td>
<td>$223,000</td>
<td>10 years</td>
<td>$482,300</td>
<td>$4,823,000</td>
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What’s Next?
Next Steps

- Low-cost countermeasures will be included in contract documents and put out to bid
Summary – By the Numbers

MILES DRIVEN
2,979

MILES DRIVEN FROM DESK CHAIR
1,040

CURVES ANALYZED
1,096

NEW SIGNS RECOMMENDED
8,626

WINDSHIELD CLEANINGS
132

VEHICLES THAT PASSED OUR STUDY CAR
1,200

and 1 bike

ANSWERS THAT STILL NEED GOOGLED
56

RABBITS IMPACTED BY THIS PROJECT
1

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Questions?

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