FHWA's Vision

"Create the best transportation system in the world for the American people through proactive leadership, innovation and excellence in service."
FHWA's Goals

Mobility

Productivity

Human and Natural Environment

National Security

Safety
Highway Safety Elements

- Driver
- Vehicle
- Roadway
National Crash Trends

- Fatality Rate (per 100 Million Vehicle Miles)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>10.9</td>
</tr>
<tr>
<td>1950</td>
<td>7.2</td>
</tr>
<tr>
<td>1960</td>
<td>5.1</td>
</tr>
<tr>
<td>1970</td>
<td>4.7</td>
</tr>
<tr>
<td>1980</td>
<td>3.3</td>
</tr>
<tr>
<td>1990</td>
<td>2.1</td>
</tr>
<tr>
<td>1995</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Safety Opportunities

Educate
Promote Safety Belt and Air Bag Use
Reduce Impaired Driving
Manage Speed
Develop Safer Vehicles
Roadside Obstacles

Nearly 30% of all traffic fatalities are caused by collisions with fixed objects.

- Trees/Shrubs
- Guardrail
- Embankments
- Utility Poles
Why Drivers Leave the Roadway

★ Forced Off By Other Drivers
★ Inattention
★ Excessive Speed
★ Fatigue
★ To Avoid An Obstacle
★ Driving Impaired
★ Vehicle Failure
★ Weather Conditions
“Forgiving Roadside” Concept

- Recognizes that good drivers can make mistakes and stray from the roadway.
- Provides a recovery opportunity for drivers.
Clear Zone

The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles.
**Design Options**

- Remove Obstacles
- Relocate Obstacles
- Redesign Obstacles (Breakaway Devices)
- Shield Obstacles
Cost Effective Analysis Uses

- Evaluate Need For Barriers
- Evaluate Best Treatment
- Prioritize
- Establish Policy
Agency Cost

- Installation
- Accident Repair
- Routine Maintenance
- Salvage
User Costs (Annual Accident Cost)

- Collision
- Severity
- Accident Type Costs
Need a Common Comparison for Different Investments over Time
Discounting

☆ Time Value of Money
☆ Low - Current Investments
☆ High - Future Investments
Accident Costs

- Property Damage Only Accident Level 1 = $625
- Property Damage Only Accident Level 2 = $3,125
- Slight Injury Accident = $3,750
- Moderate Injury Accident = $12,500
- Severe Injury Accident = $200,000
- Fatal Accident = $1,000,000
Fatal Accidents

★ FHWA - $1,500,000
★ ROADSIDE - $1,000,000
★ Agency Policy - ?
Severity Index

★ 0-10 Scale
★ Proportion of Accident Types
Total Accident Cost = (Cost of Severity Index)(Probability of Severity Index)
<table>
<thead>
<tr>
<th></th>
<th>60 Km/h</th>
<th>80 Km/h</th>
<th>100 Km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree (150 mm)</td>
<td>2.6</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>1:2 Foreslope (2 meter height)</td>
<td>3.2</td>
<td>3.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Longitudinal Barrier</td>
<td>2.0</td>
<td>2.3</td>
<td>2.7</td>
</tr>
<tr>
<td>CAT</td>
<td>2.2</td>
<td>2.6</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Collision Frequency

- Encroachments
- Traffic Volume
- Geometrics
- Angle
- Hazard
Cost Effective Analysis System

Results with ROADSIDE

* Present Worth and Annual Cost for both Total and Agency Costs
Cost Effective Analysis Example

Highway
- Two-way, Two-lane Undivided
- Lane Width = 3.3 meters
- No Shoulder

Traffic
- Design Year (20 years) Traffic = 1,806 VPD
- Traffic Growth = 3.0%
- Design Speed = 100 km/h
Cost Effective Analysis Example

Continued

Feature

- 3.0 meter x 3.0 meter Concrete Box Culvert
- 0.3 meter Protruding Headwall
- 1:2 Taper Wingwalls
Continued - Design Options

<table>
<thead>
<tr>
<th>Cost Effective Analysis Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do Nothing</td>
</tr>
<tr>
<td>Extend Concrete Box Culvert to Clear Zone (9 meters)</td>
</tr>
<tr>
<td>Extend Concrete Box Culvert; Lane Width and Shoulder (3.6 meter and 1.2 meter respectively)</td>
</tr>
<tr>
<td>Eliminate Headwall, Rebuild Wingwalls (1:4), and Install Pipe Grates</td>
</tr>
</tbody>
</table>

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## Cost Effective Analysis Comparisons

<table>
<thead>
<tr>
<th>Option</th>
<th>Annual Accident Cost</th>
<th>Annual Highway Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>$980</td>
<td>$0</td>
</tr>
<tr>
<td>(Do Nothing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 2</td>
<td>$184</td>
<td>$736</td>
</tr>
<tr>
<td>(Extend to Clear Zone)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 3</td>
<td>$765</td>
<td>$589</td>
</tr>
<tr>
<td>(3.6 m lane and 1.2 m shoulder)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 4</td>
<td>$89</td>
<td>$441</td>
</tr>
<tr>
<td>(1:4 Foreslope)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Benefit/Cost Analysis Comparisons

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2 (Extend to Clear Zone)</td>
<td>1.1</td>
</tr>
<tr>
<td>Option 3 (3.6 meter lane and 1.2 meter shoulder)</td>
<td>0.4</td>
</tr>
<tr>
<td>Option 4 (1:4 Foreslope)</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Cost Effective Analysis

Tool

NOT THE ANSWER
Cost Effective Analysis Benefits

★ Compare Alternatives
★ Prioritize for “Best Treatment”
★ Establish Policy
★ AND...
IT CAN SAVE YOU MONEY