The Great Impact of Geotechnical Features on System Performance

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Corridors are the primary assets of a transportation agency. A transportation system will have multiple corridors.

Geotechnical features such as embankments, slopes and retaining walls have a large influence on the performance of corridors.

Performance (corridor or system) is the attribute agencies will be measuring and managing – and care most about.
What is a corridor?
Corridors in Wyoming

The State Significant Corridor System

URS, WYDOT, 2010
What is a geotechnical feature?

• A geotechnical asset: slopes, walls, and embankments are examples

  ▪ Performance is largely attributed to soil or rock performance
  ▪ Does not include pits or quarries, or knowledge, such as a subsurface information database
    • These are assets that are not part of corridors
      – “Geotechnical Assets”
What is “performance”?

- Many definitions concurrently
- Our ultimate objective(s)
- Something that can be measured
- Something that can be managed
## USDOT Performance Report

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010 Target</th>
<th>2010 Actual</th>
<th>Met / Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of travel on the National Highway System (NHS) meeting pavement performance standards for &quot;good&quot; rated ride.</td>
<td>52</td>
<td>52</td>
<td>54</td>
<td>57</td>
<td>56</td>
<td>57</td>
<td>58</td>
<td>58*</td>
<td>Met</td>
</tr>
<tr>
<td>Percentage of deck area on National Highway System (NHS) bridges rated as deficient, adjusted for average daily traffic.</td>
<td>32.0</td>
<td>29.9</td>
<td>29.2</td>
<td>29.7</td>
<td>29.5</td>
<td>29.2</td>
<td>28.9</td>
<td>28.7</td>
<td>Met</td>
</tr>
</tbody>
</table>
Condition Reporting

Report to Congress
- System Conditions
- Operational Performance
- Safety
- Revenue and Expenditures
- Investment Analysis

Difficult to associate performance with federal investments
What is “system performance”?

FHWA’s **System Performance** Goal:

The Nation’s highway **system** provides safe, reliable, effective and sustainable mobility for all users.

FHWA is now going farther...
Performance Management in the Future

Performance Management of the Federal Highway Program is a systematic approach to making investment and strategic decisions using information about the condition and performance of the system and developing an approach to achieve a desired set of national goals.
Performance Management Success
Utah Example

• Strategic Direction identifies ‘final four’ of goals that guide performance management and planning
  ▪ Take Care of What We Have
  ▪ Make the System Work Better
  ▪ Improve Safety
  ▪ Increase Capacity
Performance Based Planning at Mn/DOT

• Policy Plan
  ▪ **Vision: A Safe, Efficient and Sustainable Transportation System**
  ▪ Emerged from discussions with stakeholders
  ▪ Identified challenges and opportunities
  ▪ Defined policies to guide decisions

<table>
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<tr>
<th>Safety</th>
<th>Twin Cities Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure Preservation</td>
<td>Greater Minnesota Metropolitan and Regional Mobility</td>
</tr>
<tr>
<td>Maintenance &amp; Security</td>
<td>Community Development and Transportation</td>
</tr>
<tr>
<td>National and Global Connections</td>
<td>Energy and the Environment</td>
</tr>
<tr>
<td>Statewide Connections</td>
<td>Accountability and Transparency</td>
</tr>
</tbody>
</table>
Performance Management Elements

Reporting Examples

- Business Plan 2004 & 2005
  Ohio Department of Transportation

- Measures, Markers and Mileposts
  Washington State Department of Transportation

- 2007 Annual Attainment Report
  Maryland DOT

- Good to Great
  Strategic Plan and Annual Report
  New Mexico DOT

- Measures, Markers and Mileposts
  Virginia Department of Transportation

- Tracker
  Missouri Department of Transportation
Performance Management in the Future

Keywords for Performance are:

- System
- Mobility, Capacity
- Efficiency, Reliability
- Safety
For a system to perform well, its corridors must perform well and deliver mobility, capacity, efficiency, reliability and safety.

One broken link can change all of that.
Geotechnical Message

- Consider 200 slopes, 10 walls and 50 embankment culverts identified as ‘in need’ by separate inventory and assessment methods
  - Measure: reduce number
  - Target: 10% reduction

- Consider 10 corridors of primary significance
  - Measure: safety, efficiency, mobility
  - Target 10% improvement
Geotechnical Message

• It is important to be developing tools and practices for data collection and decision making
Geotechnical Message

• It is also important to be looking beyond – to how that contributes to improved performance of a system through performance of a corridor

  ▪ Bridges
  ▪ Pavement
  ▪ Walls
  ▪ Signs
  ▪ Slopes
  ▪ Embankments
  ▪ Tunnels
  ▪ Etc.
Recent U.S. examples

- Embankment on I-75 in TN
  - March 8, 2011
  - Both SB lanes still closed
  - Built in 1970s
  - 150 ft high embankment
  - CMP culvert
    - Deterioration
    - Separation
    - Saturation
    - Weakening
    - Failure
Recent U.S. examples

• Rockslide on I-40 in NC
  ▪ October 2009
  ▪ 6 month closure
  ▪ 25,000 ADT
  ▪ $10 m repair*
  ▪ $65 m travel time costs*
  ▪ $57 m operating costs*
  ▪ $44 m congestion costs*
  ▪ $10 m other costs*

*HDR, 2010

US-64 in TN, November 2009, $22 m
Recent U.S. examples

• Rockfall on I-70 in CO
  - March 2010
  - Repeat from Nov. 2004
  - 4 days full closure
  - 200 mile detour
  - 2 months partial closure
  - $1.6 m repair

Culvert failure on same corridor
  • June 2003
  • Similar closures
  • $4.2 m repair
Final Thoughts

- Focus on features can lead to stovepipes
- Focus on corridors requires integration
- Geotechnical features are not ‘solid as rock’ – there are ownership responsibilities
- System performance is limited by the weakest link, which may be geotechnical