

# Rutting as a Performance Indicator

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- Moving Ahead for Progress in the 21<sup>st</sup> Century
- First "long-term" highway authorization since 2005 (10 extensions to SAFETEA-LU)
- \$105 billion for FYs 2013 and 2014
- Performance-based management of national highway system
- Performance measures established 18 months after enactment
- Prior to enactment, FHWA undertook study, "Improving FHWA's Ability to Assess Highway Infrastructure Health"



- Define a consistent and reliable method to document infrastructure health
  - -Focus on pavements and bridges
  - -Initial focus on IHS, but with possible expansion to NHS
- Develop tools to provide FHWA and State DOTs ready access to key information





- Track #1 Develop an approach for categorizing pavement and bridges as Good / Fair / Poor, that can be used consistently across the country.
- Track #2 Develop an approach for assessing the Overall Health of a multi-state highway corridor.



- Validate IRI as a Tier 1 measure
- Advance potential Tier 2 and Tier 3 measures
- Key questions
  - -Do different data sources tell us the same thing?
  - –Do different metrics help us better understand pavement conditions?

Goal Area	Tier 1	Tier 2	Tier 3
Pavement Preservation	IRI	Functional condition based on Tier 1 plus HPMS distress data	

# **Defining Good / Fair / Poor**



	Condition	Typical Work Required
Good	<ul> <li>Free of significant defects</li> <li>Condition does not adversely affect performance</li> </ul>	<ul> <li>Activities that preserve good conditions (i.e. pavement surface treatments, deck sealing)</li> </ul>
Fair	<ul> <li>Minor deterioration on primary structural bridge elements</li> <li>Isolated surface defects or functional deficiencies on pavements</li> </ul>	<ul> <li>Minor rehabilitation         <ul> <li>Bridge crack sealing, patching of</li> <li>spalls, and corrosion</li> <li>mitigation</li> <li>Pavement overlays and</li> <li>patching</li> </ul> </li> </ul>
Poor	<ul> <li>Advanced deterioration</li> <li>Conditions impact structural capacity</li> </ul>	<ul> <li>Structural repairs, major rehabilitation, reconstruction, or replacement</li> </ul>

# **Pilot Study Corridor**





# National Data - HPMS data in 2010+ format

- State Data
  - -Documentation
  - -Inventory
  - -Pavement Management
- Field data
  - -Collected in eastbound direction only
  - -Rutting, roughness, cracking, faulting
  - -Rolling wheel deflectometer







# **Pilot Study Data**



- IRI is feasible for use as a Tier 1 G/F/P Ride Quality indicator
  - -Reasonable correlation between sources
  - -Make sure data collection/processing consistent
- IRI does not provide complete picture, other measures require additional work
- Additional work performed to investigate bias observed in rutting and identify improvements in HPMS data









#### Minnesota







- Data Collection Recommendations
- Data Processing Recommendations
- Data Quality Control
- Data Storage Recommendations
- Condition Rating

# Equipment







#### **Transverse Spacing**



#### **Longitudinal Sampling Interval**





# **Longitudinal Sampling Interval**







- AASHTO PP70-10: Width should cover at least 13 ft
- Maximum spacing between data points of 0.4 inch
- Maximum spacing between profiles of 10 ft

#### **Profile Filtering – Moving Average**





#### **Reference Line**





# **Gage Width**







- 2-inch moving average filter applied to transverse profile
- Use lane width wireline reference
- Gage width from 1.2 to 1.5 inches



- Initial system validation reviewing each component
- Routine checks of components, AASHTO PP70-10
- Systematic reviews of collected data

#### **Base Length**







- Data Elements
  - Average, minimum, maximum, and standard deviation of rut depth
  - Cross-slope
- Base length of 0.1-mile
- Metadata stored should include the full transverse profile
- Quality control elements identifying level of review



Condition	Distress Range	Percentage of Corridor
Good	Rut < 0.25 inch	96%
Fair	0.25 inch $\leq$ Rut $\leq$ 0.4 inch	3%
Poor	Rut > 0.4 inch	1%

- FHWA Pavement Health Track (PHT) identifies terminal rut of 0.4
- AASHTO ME identifies rut < 0.25 as adequate and rut > 0.4 as inadequate

# **Field Validation**



- 20 segments reviewed within MN
  - -7 Good
  - -7 Fair
  - -6 Poor
- 71% agreement between condition rating
- Based on field validation, threshold values remain as preliminary until further research completed





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