WSDOT’s Implementation Plan for the 2002 Guide

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NCHRP 1-40 Review

- Changes may occur with the 2002 Guide due to the NCHRP 1-40
  - Implementation plan may change depending on the outcome of NCHRP 1-40
  - Some aspects of implementation plan can begin prior to the completion of NCHRP 1-40
What is needed?

- Sensitivity analysis
- Axle load spectra
- Materials quantification
- Seasonal climate impacts
- Field evaluation
- Calibration to local conditions
- Laboratory protocols
- Link to the pavement management system
Sensitivity Analysis

- Determine what design inputs have largest impact on structural design
- Review work conducted by University of Arkansas (Kevin Hall)
- Resolve the most critical inputs first
Washington State Pavement Management System

- Data contained in WSPMS includes
  - Traffic
    - ADT
    - Truck counts (single, double and train)
    - Directional split
  - Subgrade modulus (FWD testing results)
  - Construction history
  - Pavement condition data (e.g. cracking, rut, ride)
### Analysis Unit Average

<table>
<thead>
<tr>
<th>Length (miles)</th>
<th>1.30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rut (mm)</td>
<td>4</td>
</tr>
<tr>
<td>Std Dev (mm)</td>
<td>1</td>
</tr>
<tr>
<td>PSC</td>
<td>98</td>
</tr>
<tr>
<td>IRI (cm/km)</td>
<td>60</td>
</tr>
</tbody>
</table>

#### Defect Type

<table>
<thead>
<tr>
<th>Alligator Cracking</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patching</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reversing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Longitudinal Cracking</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transverse Cracking</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flushing</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Directional Traffic

- **Traffic Year**: 2002
- **Directional Split**: 54.6%
- **Single Units**: 14.35
- **Double Units**: 30.72
- **Peak Hour**: 10.83%
- **Total Trucks**: 5,183
- **Trucks Percentage**: 13.83%

### Performance

<table>
<thead>
<tr>
<th>Region</th>
<th>County</th>
<th>Part Class</th>
<th>ARM Begin</th>
<th>ARM End</th>
<th>Length (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympic</td>
<td>Thurston</td>
<td>Rural Interstate</td>
<td>99.29</td>
<td>100.59</td>
<td>1.30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access Control</th>
<th>Lev. of Dev.</th>
<th>Terrain</th>
<th>Highway Type</th>
<th>No. of Lanes</th>
<th>Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full</td>
<td>Design Standard</td>
<td>Level</td>
<td>Divided</td>
<td>3</td>
<td>36.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane Miles</th>
<th>Lt Shoulder (ft)</th>
<th>Rt Shoulder (ft)</th>
<th>Fed. Aid Type</th>
<th>Fed. Aid No</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.90</td>
<td>0.0</td>
<td>10.0</td>
<td>Interstate</td>
<td>0005</td>
<td>N</td>
</tr>
</tbody>
</table>

### Year | Contract | Construction | Thickness (ft) | Surface Type | Exception |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>014362</td>
<td>RESURFACE EXISTING RDWY</td>
<td>0.15</td>
<td>ACP CLASS A AR4000W</td>
<td>NONE</td>
</tr>
<tr>
<td>1996</td>
<td>014362</td>
<td>PLANING</td>
<td>0.08</td>
<td>GRINDING ACP OR BST</td>
<td>NONE</td>
</tr>
<tr>
<td>1984</td>
<td>012571</td>
<td>RESURFACE EXISTING RDWY</td>
<td>0.08</td>
<td>ACP CLASS B AR4000W</td>
<td>NONE</td>
</tr>
<tr>
<td>1985</td>
<td>000000</td>
<td>RESURFACE EXISTING RDWY</td>
<td>0.25</td>
<td>ACP CLASS B AR4000W</td>
<td>NONE</td>
</tr>
<tr>
<td>1985</td>
<td>000000</td>
<td>RESURFACE EXISTING RDWY</td>
<td>0.25</td>
<td>ACP CLASS B AR4000W</td>
<td>NONE</td>
</tr>
<tr>
<td>1985</td>
<td>000000</td>
<td>RECONSTR EXISTING ALIGN</td>
<td>0.42</td>
<td>CTB</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>000000</td>
<td>RECONSTR EXISTING ALIGN</td>
<td>0.42</td>
<td>Untreated Base</td>
<td></td>
</tr>
</tbody>
</table>

### Related Programmed Project

- **SR 5 Mainline Increasing 99.15 to 101.23**

### Ad. Date/FIN/Title

- **Not Scheduled**

### Special Project

- **Maint. Area**: 1
- **Maint. Section**: 01
Axle Load Spectra

- WSDOT/UW Study
  - What traffic data is currently being collected?
  - How is the data being stored?
  - Any data concerns?
  - Are more WIM or AVC sites needed?
  - How can it be incorporated into the 2002 Guide?
Axle Load Spectra

- WSDOT/UW Study Recommendations
  - Major calibration issues with WIM sites
    - Only 20% of sites provided usable data
  - Load spectra
    - Will likely be a “moving target” for some time
    - One axle load spectra for all roadways recommended (needs to be confirmed after calibration of other sites has been completed)
    - Additional sites not recommended at this time
Axle Load Spectra

- Review results NCHRP 1-39
- How to link current data files to NCHRP 1-39 and then into 2002 Guide
  - Automatic load into 2002 Guide from the Washington State Pavement Management System
  - Minimal user input required
Materials Quantification

- Re-evaluate 1980’s study that developed WSDOT ME design procedure
  - Does it correlate to 2002 Guide equations and results?
- Validate “Witczak” equation for HMA dynamic modulus
- Quantify aggregate sources and PG binders for dynamic modulus
Materials Quantification

- Incorporate existing database of subgrade modulus from FWD/backcalculation analysis
- Potential to include HMA and base backcalculated moduli
Seasonal Climate Impacts

- Calibrate 2002 Guide to current layer moduli seasonal effects
- Incorporate additional climate sites
  - Guide currently has only 29 sites
  - 98 sites available in Washington State
Field Evaluation

● Are additional field studies necessary?
  ● GPR or DCP
  ● Existing HMA, PCCP, base, and subgrade evaluation

● WSDOT currently uses
  ● FWD testing
  ● Coring
  ● Backcalculation procedures
Calibration to Local Conditions

- Using pavement management system
  - Evaluate 2002 Guide distress prediction
    - Rutting, ride, cracking, faulting, etc.
  - Verify current distress limits
  - Determine appropriate reliability limits
Calibration to Local Conditions

- Using existing ME procedure
  - Evaluate results of 2002 Guide to WSDOT ME procedure
Laboratory Protocol

- What additional tests are required?
  - Dynamic modulus
  - Coefficient of thermal expansion
  - Etc.

- Sensitivity analysis will be critical
Envision a toggle button within WSPMS

- All data concerning existing project would be written to file for 2002 Guide

- Minimize user effort to obtain/re-enter required input data

- Develop default values for inputs based on location, functional class, climate, etc.
Questions?