Overview

1. Background
2. Previous research
   1. FHWA
   2. SHRP2
   4. VDOT
   5. Pooled Fund Study, 2018-2021
3. Summary
Traffic Speed Deflectometer

• What is it?
  – A specialized truck with a 20-22kip rear axle load
  – Can measure traditional surface-observable condition
  – Doppler lasers measure deflection slope

• What can we do with it?
  – Assess the structural capacity of pavements at traffic speed (~50mph)
  – ...and measure rutting, ride quality, cracking, pavement and roadway images, cross slope
Benefits to Agencies

• Allow realistic production for network-level testing
  – Significant portions of a network can be covered daily
  – Include structural properties in PMS decision-making

• All this with...
  – Increased operator and public safety
  – Continuous (nearly) rather than discrete measurements
Background

• Pavement decision making
  – Based on surface observed distresses
  – Structural capacity data on a pavement network is rare

• Structural testing
  – Current state of the practice is FWD
    • Lane closures
    • Discrete data
Background

- FHWA study, 2011 & SHRP2 study, 2013
  - Identified several traffic speed deflection devices

- Benefits included
  - Continuous collection
  - Collection at near highway speeds

- Future work should study accuracy and analysis methods
Background

  – Focused on the devices identified previously

• Further studied TSDD data
  – Compared vehicle-measured pavement deflection with embedded sensors
  – Compared qualitative ranking of structural condition with FWD
  – Identified analysis parameters
TPF-5(282)

- Demonstrate network-level TSD testing
  - Two testing cycles
  - Two days per cycle
  - 9 agencies

- Agencies selected test routes

<table>
<thead>
<tr>
<th>State</th>
<th>Miles</th>
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<tbody>
<tr>
<td>California</td>
<td>980</td>
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<tr>
<td>Georgia</td>
<td>646</td>
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<td>Idaho</td>
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<td>South Carolina</td>
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<tr>
<td>Virginia</td>
<td>622</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,928</strong></td>
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</table>
TPF-5(282) Data Example

Structural Condition I-81 South

- 2007 FWD
- 2010 FWD
- 2012 FWD
- 2013 FWD
- 2015 FWD
- 2015 TSD

Milepost

FWD D0 (mil)

TSD D0 (mil)
TPF-5(282) Data Example

\[ y = 1.2698x - 0.7589 \]

\[ R^2 = 0.9737 \]
TPF-5(282) Implementation Example
Idaho DOT Implementation Example

- Developing process for corridor management
- Combining network structural performance and ME performance predictions to estimate future maintenance schedules
  - Planned versus reactive maintenance
TPF-5(282) Findings

- Short- and long-term repeatability is good
  - More work needed for temperature correction

- TSD and FWD followed similar trends
  - But not a one-to-one replacement as expected

- Little relationship between TSD results and PMS surface condition
  - Shows need for structural testing
2017 Testing in Virginia

- 4,000+ miles of testing on interstate and primary routes
- Study impact to PMS results by including TSD-based structural response
- Deflection indices, rutting, ride quality, cracking, pavement and roadway images, cross slope
VDOT 2017, Remaining Work

• Identify strong vs weak sections and compare to PMS previous decision making and rehab history

• Determine ranges of calculated indices that identify good vs poor structural condition
  – Structural sufficiency vs design
  – Similar budget output from PMS
  – Combination?
cracking
rutting and IRI
thickness
deflection
Pooled Fund Study, 2018-2021

- TPF 5(385), Pavement Structural Evaluation with Traffic Speed Deflection Devices

- State partners
  - FHWA, Arkansas, Idaho, Illinois, Indiana, Kansas, Louisiana, Minnesota, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Vermont
Pooled Fund Study Objectives/Scope

- Provide means to conduct demonstration testing
  - ARRB Group TSD & Dynatest Raptor

- Develop specifications for data collection and guidelines for PMS application

- Demonstrate
  - How to use data to support project level decision-making
  - Costs (and any savings) through case studies

- Conduct workshops and prepare training
Pooled Fund Study Commitment Levels

• Option 1
  – Participation in the study for one agency rep (no testing) = $15,000 / year

• Option 2a
  – Option 1 plus one day of testing on agency designated routes (~100-200 miles) = $45,000 / year

• Option 2b
  – Option 2a plus additional days of testing = $32,000 / day / year
Pooled Fund Study Status

• Project stated October 1, 2018

• Working with agencies for fall 2018 and spring 2019 testing

• Virginia
  – Likely one district per year and cover untested high priority routes within each
Thank you!

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