Ten Years of Pavement Distress Independent Verification & Validation in Virginia

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Presentation Outline

• History
• Process
• Results
• Conclusions
History

• Same vendor since 2005
  ▪ 2005
    • Interstate routes, ramps & loops
  ▪ 2006 – 2014
    • Interstate routes
    • Primary routes
    • 20% of secondary routes per year

• Generally the same imaging system
  ▪ Improved forward imaging in 2009/2010
History

- Data Quality Management Plan (DQM)
  - Vendor QC during collection and processing
  - Independent Verification & Validation
    - Control sites for roughness, rutting & distress
    - 5% Independent distress rating
    - Year-to-year verification
  - VDOT acceptance
Previous TRB Reports

- Quality Monitoring Plan provides:
  - 30% increase in accuracy of reporting deficient pavements
  - Cost correction of over $18 million for Interstate maintenance recommendations
  - Improves maintenance & rehabilitation needs by as much as 25%
PROCESS
Data Quality Monitoring Plan

- **Pre-data collection quality procedures**
  - Identification of the key data elements to be controlled
  - Determine the criticality of each element and expected variability
  - Establish control data
  - Develop tolerance limits and variability measures
Data Quality Monitoring Plan

• Production level quality checks
  ▪ Equipment and procedural checks
  ▪ Verify data collection measures and associated QC
  ▪ Develop control measures for data processing and associated QC
  ▪ Develop reporting process and associated QC
  ▪ Data reporting and delivery
Data Quality Monitoring Plan

• Independent Verification & Validation
  ▪ Control key data elements
  ▪ Independent distress evaluations
  ▪ High level data range checks
  ▪ Year-to-year consistency checks
IV&V Process

- 5% random sample per deliverable
- Independent distress rating
- Compare LDR & NDR
  - +/- 10 index points for 95% of the samples
RESULTS
Evaluation Process

- Evaluated how the variability between independently rated index values and the vendor delivered data changed over the years
Non-Load Related Distress (NDR)
Average Index Value Difference

![Average Difference (QES-Vendor)](image.png)
Overall Magnitude of the Average Differences

Magnitude of the Average Difference (QES-Vendor)

QES Index - Vendor Index (Absolute Values)

LDR  NDR  LDR Trend  NDR Trend

Root Mean Squared Error Over Time

Root Mean Squared Error

Index Value


LDR  NDR  LDR Trend  NDR Trend
Root Mean Squared Percent Error Over Time

![Root Mean Squared Percent Error Graph]

- **Percent**
- **Year**

- LDR
- NDR
- LDR Trend
- NDR Trend
Coefficient of Variation Over Time
Covariance of Index Values Over Time
Conclusions

• IV&V is critical in improving the quality of collected and reported data
• Early years show a wider variation
• Each evaluation of the variability over time illustrate the effectiveness of IV&V
• Errors are corrected before propagating to other deliverables
• There remains room for improvement
THANK YOU