The Effects of a Comprehensive QA/QC Plan on Pavement Management

Virginia Department of Transportation &
Quality Engineering Solutions, Inc.

Southeast Pavement Management Conference

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The Effects of a Comprehensive QA/QC Plan on Pavement Management

Presentation Outline

- VDOT QA/QC Process Historical Review
- 2005 Data Collection and Processing Contract
- Control Site Evaluations
- Independent Verification & Validation
- VDOT Data Analysis
  - Roadway Treatment Cost Implications
- Conclusions
VDOT QA/QC Process Historical Review
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- Semi-automated imaging systems 1995-98
- Large infrastructure data collection contract in 2000 with ICAS
- Consensus-based windshield ratings utilized 1999-2005
- IRI QA/QC addressed 1999 - 2001
- Automated imaging/ distress contract in 2005 & 2006
VDOT QA/QC Process Historical Review

- Lessons learned along the way:
  - Personnel certification training
  - Validation of equipment accuracy & precision
  - Daily QC procedures
  - On-going QC process
  - Independent validation & verification of results
2005 Data Collection and Processing Contract
2005 Data Collection and Processing Contract

- State-of-the-practice technologies in capture and analysis of pavement data
  - Digital imaging of pavement surface
  - Laser measurements of longitudinal & transverse profiles
  - Automated/Semi-automated distress quantification
2005 Data Collection and Processing Contract

- 569 miles of Concrete Pavements
  - Combination of JRCP & CRCP
- 2600 miles of Asphalt Pavements
  - ~1900 miles Interstate
  - ~700 miles ramps & loops
2005 Data Collection and Processing Contract

- Vendor had an established in-house QC/QA
- QES provided IV&V
- Vendor used automated and semi-automated distress identification software
- Calibrated using VDOT selected control sites
- VDOT data used as “ground truth”
Control Site Evaluations
Control Site Evaluations

- Establish precision & bias for:
  - Roughness
  - Rutting
  - Distress

- Use to calibrate the distress rating process
  - Automated
  - Semi/Automated
  - Manual
Control Site Evaluations

- 13 Control Sites
  - Selected by VDOT
  - Various lengths
  - Various roughness & distresses

- VDOT 10 runs
- Vendor 3 to 5 runs
Control Site Evaluations

- Distress Calibrations
  - Based upon distress index values
  - Limit of +/- 10 index points from VDOT value

- Purpose
  - Training
  - Calibrate automated/semi-automated processes
    - One iteration for CRCP
    - Two iterations for JRCP
    - Three iterations for ACP

- Must complete prior to production rating
Independent Verification & Validation
Independent Verification & Validation

- Performed after vendor in-house QC/QA process completed
- 10% of all production ratings reviewed
- 95% of deliverable must pass the IV&V review before acceptance
Independent Verification & Validation

- JRCP deliverable
  - 38% of the 26 sections reviewed failed
  - Feedback to vendor resulted in slight changes to their rating protocols
  - New 5% sample of revised deliverable
  - 100% passed the IV&V check
  - Deliverable accepted
Independent Verification & Validation

- CRCP deliverable
  - 100% of the 29 sections reviewed passed
  - Deliverable accepted
Independent Verification & Validation

- Six ACP deliverables

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- Feedback to vendor resulted in changes to their rating protocols
- Entire deliverable resubmitted
- Deliverable accepted
Independent Verification & Validation

● Initial benefits of IV&V
  - Increases the confidence level VDOT has in the reported data
  - Provided enhanced QC/QA for vendor
    ● Modifications to rating protocols to suit project
    ● Increased QA checks prior to delivery
VDOT Data Analysis

- Condition data used for the determination of
  - Condition state of the pavements
  - Recommended maintenance treatments
  - Zero-based budget
  - Selection of sections for project-level evaluations
  - Planning future work needs
VDOT Data Analysis

- Maintenance treatments are recommended using decision tree approach
- Distresses and distress combinations are considered at various severity levels
- Each maintenance group has an associated unit cost
- Zero-based budget determined
Condition states determined based on critical condition index on a scale of 0-100

Five condition states: Excellent, Good, Fair, Poor, and Very Poor

Deficient pavement sections are those in poor and very poor condition
VDOT Data Analysis

- Example data for I-81 and I-95
Existing Conditions

E = Excellent
G = Good
F = Fair
P = Poor
V = Very poor
Recommended Treatments

DN = Do Nothing
PM = Preventive Maint
CM = Corrective Maint
RM = Restorative Maint
RC = Reconstruct
District Implications

- 25% fewer deficient lane miles on I-81
- 20% fewer deficient lane miles on I-95
Cost Ramifications

- I-81 cost correction of $8.9 million (21%)
- I-95 cost correction of $0.3 million (1%)
Conclusions

- A comprehensive QA/QC includes:
  - Agency participation
  - Vendor certification/validation
  - Control sites
  - Vendor in-house QC/QA
  - Independent verification & validation
Conclusions

- IV&V in Virginia has resulted in:
  - Increased accuracy in reporting existing condition indices (changes by as much as 25%)
  - Increased accuracy in reporting deficient pavements by district (20 to 25% change)
  - Increased accuracy in the prediction of a needs based budget (changes as much as 21%)
Conclusions

- Without IV&V, agencies may be under or over estimating maintenance and rehabilitation needs by 25% or more!
THANK YOU!