

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



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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



VDOT QA/QC Process Historical Review

- 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

Index Value	Original % Pass	Final % Pass
NDR	70.0	95.0
LDR	82.8	97.8

- 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



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

VDOT Data Analysis

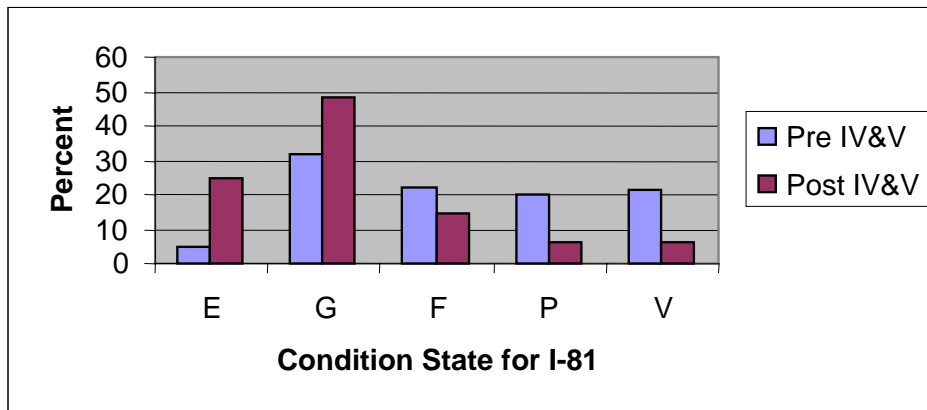
- Condition states determined based on critical condition index on a scale of 0-100
- Five condition states: Excellent, Good, Fair, Poor, and Very Poor
- Deficient pavement sections are those in poor and very poor condition

VDOT Data Analysis

- Example data for I-81 and I-95



Existing Conditions



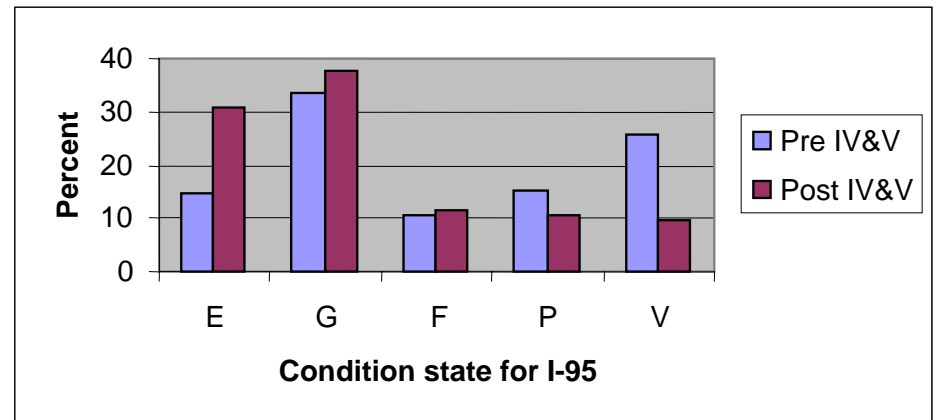
E = Excellent

G = Good

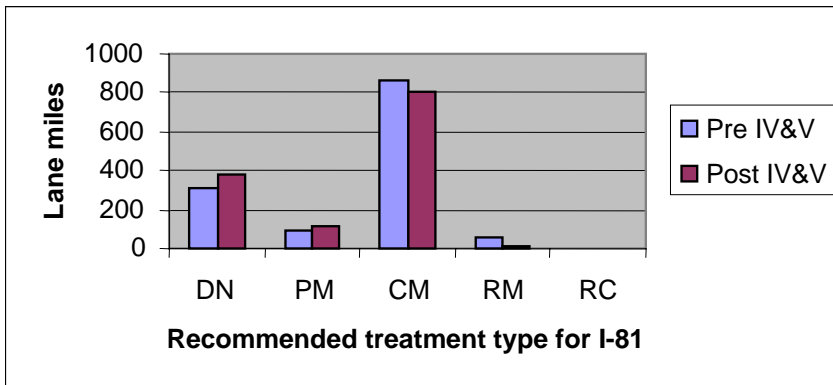
F = Fair

P = Poor

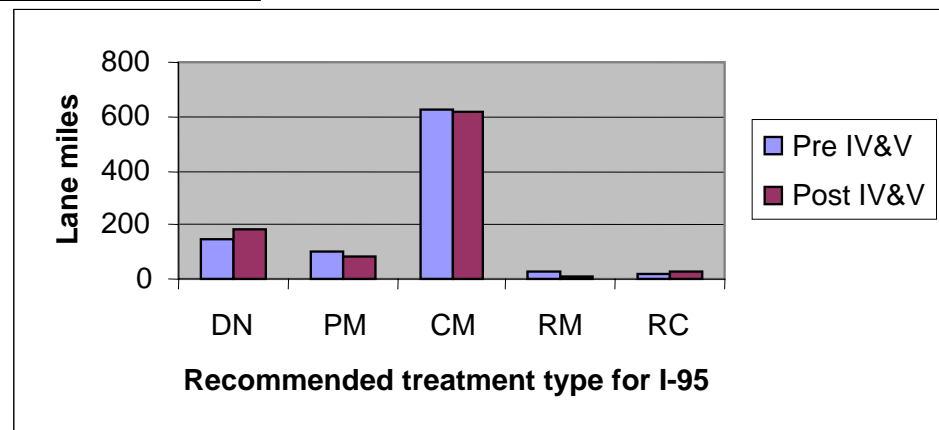
V = Very poor



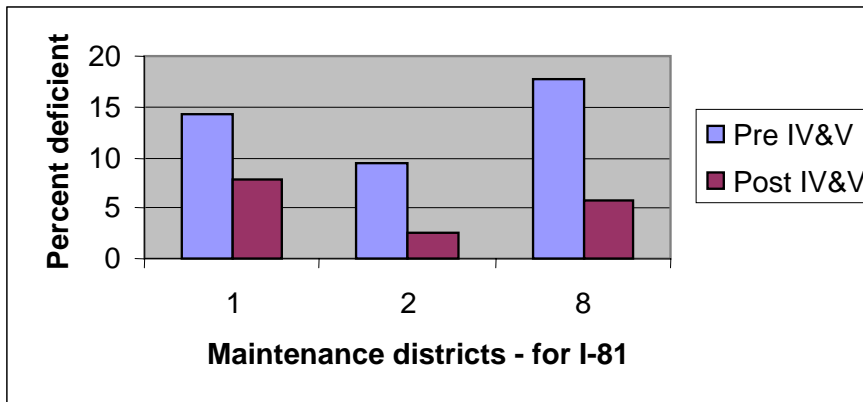
Recommended Treatments



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

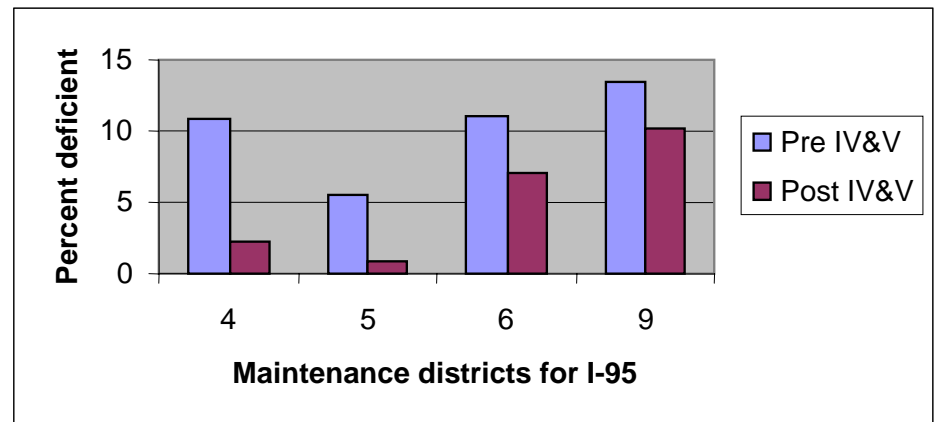


District Implications

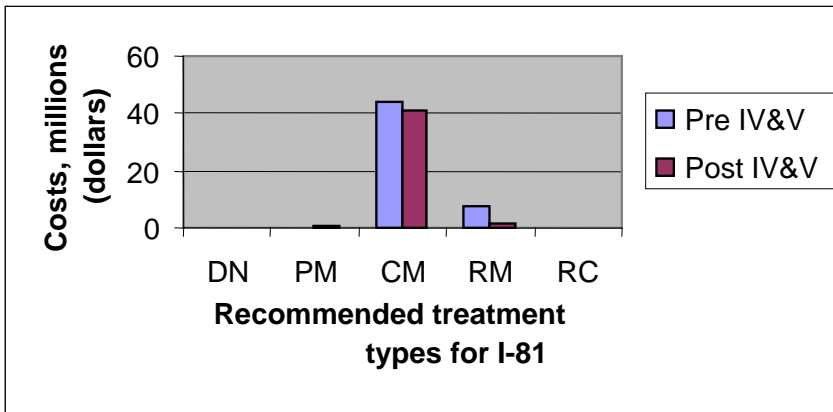


- 25% fewer deficient lane miles on I-81

- 20% fewer deficient lane miles on I-95

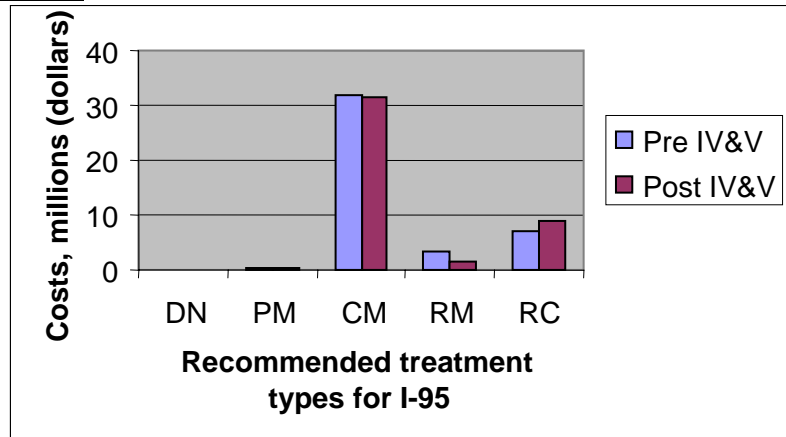


Cost Ramifications



- 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!

