USE OF VDOT’S PAVEMENT MANAGEMENT SYSTEM TO PROACTIVELY PLAN AND MONITOR PAVEMENT MAINTENANCE AND REHABILITATION ACTIVITIES TO MEET THE AGENCY’S PERFORMANCE TARGET

Matthew Ayotte, Akyiaa Morrison, Raja Shekharan Ph.D, P.E., Tanveer Chowdhury P.E., Eddie Coggins

Virginia DOT
Outline

• Introduction
• Background
• Methodology
  ▪ Performance Targets/Paving Targets
  ▪ Project Tracking
  ▪ 2013 Performance Monitoring Process
• Results
• Conclusions
• Sample Reports
Introduction

- Maintenance of a pavement network requires well planned maintenance and rehabilitation (M&R) activities
- Pavement management systems recommend M&R activities, but detailed project-level analysis is needed to supplement these recommendations
- A performance monitoring process is needed to track the selections made in the field against the recommendations
• VDOT consists of nine maintenance districts and a central office.
• The central office is responsible for storing the pavement condition data and provides analysis and reports.
• Each maintenance district is responsible for developing and planning the M&R activities within that district as long as recording paving.
• VDOT maintains approximately 127,000 lane miles on the Interstate, Primary and Secondary Networks.
• 100% of Interstate and Primary, 20% of Secondary pavement condition data is collected each year.
VDOT tracks the Critical Condition Index (CCI) on its pavements.
The CCI is based on the lower of two calculated ratings—LDR and NDR (asphalt):
- LDR- Load-related Distress Rating
- NDR- Non-load-related Distress Rating
LDR and NDR both follow the PCI procedure developed by the Army Corps of Engineers; rated on a scale of 0 (worst condition) to 100 (best condition).
A “sufficient” pavement has a CCI ≥ 60.
Background

• VDOT has a pavement program strategy identified for interstate, primary, and secondary systems
  - Interstate pavements are to maintain a sufficiency ≥82% with no management section rated with CCI ≤30
  - Primary pavements are to maintain a sufficiency ≥82%
  - Secondary pavements are to maintain a sufficiency ≥65%
METHODOLOGY
Methodology

1. Develop initial performance and baseline targets
2. Compare initial list of planned paving projects & targets that could be achieved
3. Prepare additional projects/revise the current projects
4. Are desired targets met?
   - NO: Go back to step 2
   - YES: Go to step 5
5. Final list of projects
6. Execution to meet targets
### Examples of Maintenance Activities

<table>
<thead>
<tr>
<th>Preventive Maintenance (PM)</th>
<th>Corrective Maintenance (CM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Minor Patching</td>
<td>• Moderate Patching</td>
</tr>
<tr>
<td>• &lt;5% pavement area</td>
<td>• &lt;10% pavement area</td>
</tr>
<tr>
<td>• Depth &lt;=2”</td>
<td>• Depth up to 6”</td>
</tr>
<tr>
<td>• Surface Treatment</td>
<td>• Partial depth patching and thin (&lt;=2”) overlay</td>
</tr>
<tr>
<td>− Chip seal, slurry seal, latex, THMACO</td>
<td>• &lt;=2” milling and &lt;=2”overlay</td>
</tr>
<tr>
<td>− Thin overlays up to 1”</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Restorative Maintenance (RM)</th>
<th>Reconstruction (RC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Heavy Patching</td>
<td>• Mill, break and seat and thick overlay</td>
</tr>
<tr>
<td>• &lt;20% of pavement area</td>
<td>• Reconstruction</td>
</tr>
<tr>
<td>• Depth up to 9”</td>
<td>• Full Depth Reclamation</td>
</tr>
<tr>
<td>• Full depth patching and up to 4” overlay</td>
<td></td>
</tr>
<tr>
<td>• Milling and up to 4” overlay</td>
<td></td>
</tr>
</tbody>
</table>
Methodology

1. Develop initial performance and baseline targets

2. Compare initial list of planned paving projects & targets that could be achieved

3. Prepare additional projects/revise the current projects

4. Are desired targets met?
   - NO
   - YES: Final list of projects

5. Execution to meet targets
2013 Performance Monitoring

• May 2013:
  ▪ Initial baseline targets were published. This allowed the districts to start planning for the next year’s paving.

• Aug 2013:
  ▪ Targets were re-run with new condition data.
  ▪ Influx in funding for RC projects on the interstate.
  ▪ Drastic increase in RC lane miles for the August target.
  ▪ Districts planned work in August 2013 based on the initial targets published in May, plus extra work based on the reconstruction funding that was made available.
• Nov 2013:
  - Further funding was available and the targets were rerun.
  - Districts responded to the changes in targets and funding by adjusting their planned lane miles accordingly.

• Jan/Feb 2014:
  - Both the targets and the work planned by the districts remained stable.
  - Districts finalized their planned paving for the 2014 construction season.
Timeline

- May 13: Baseline Targets
- August 13: Planned Paving Update
- August 13: Updated Targets
- October 13: Final Targets
- November 13: Planned Paving Update
- November 13: Final Targets
- January 14: Planned Paving Update
- March 14: Planned Paving Update
- April 14: Planned Paving Update
- May 14: Planned Paving Update

- May 13: Additional RC Funding & New condition data uploaded
- August 13: Supplemental Funding
RESULTS
Results - Interstate

PM Lane Miles

<table>
<thead>
<tr>
<th>Month</th>
<th>Target</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-13</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Aug-13</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Nov-13</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Jan-14</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Mar-14</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

CM Lane Miles

<table>
<thead>
<tr>
<th>Month</th>
<th>Target</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-13</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Aug-13</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Nov-13</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Jan-14</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Mar-14</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

RM Lane Miles

<table>
<thead>
<tr>
<th>Month</th>
<th>Target</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-13</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Aug-13</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Nov-13</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Jan-14</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Mar-14</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

RC Lane Miles

<table>
<thead>
<tr>
<th>Month</th>
<th>Target</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-13</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Aug-13</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Nov-13</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Jan-14</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Mar-14</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>
Results - Interstate

Percent Sufficient

- Target
- Planned

May-13  Aug-13  Nov-13  Jan-14  Mar-14

83.5%  84.0%  84.5%  85.0%  85.5%  86.0%  86.5%  87.0%  87.5%  88.0%
Results - Primary

![Graph showing percentage of sufficient pavement assets from May 2013 to March 2014. The graph displays two lines: one for the target and another for the planned performance. The target line starts at around 79.5% in May 2013, increases to reach 83.5% in August 2013, and maintains a steady state for the rest of the period. The planned line starts at 80.0% in May 2013 and shows a slight increase to 81.5% in November 2013, followed by a decrease to 81.0% in January 2014 and ends at 80.5% in March 2014.]
Results

- The formal performance monitoring process introduced a level of accountability regarding expectations based on funding levels.
- Districts had to incorporate a “mix of fixes” to meet the targets set through the performance monitoring process.
- M&R plans progressively improved toward meeting the defined network goals.
Conclusions

• Performance monitoring reports provide guidance for the selection of treatments for the future paving season.
• The reporting intervals vary from as long as a quarter year in the initial stages, to once a month at the later stages of treatment plan development.
• Results presented here show that the M&R plans allow for course correction to progressively improve toward meeting the defined network goals.
• Establishment of a performance monitoring process has helped to ensure that the network level objectives are met with respect to the maintenance of the roadway network.
Given initial pavement conditions, expected deterioration and planned paving, Hampton Roads District is predicted to achieve its 2013 performance target of 83.0% of Interstate network in Sufficient Condition and is not predicted to achieve its 2013 performance target of 79.0% of Primary network in Sufficient Condition.
Given planned 2012 Interstate paving, Hampton Roads District:
- Is not predicted to achieve its 20 lane mile paving target for Preventative Maintenance on the Interstate system.
- Is predicted to achieve its 40 lane mile paving target for Corrective Maintenance on the Interstate system.
- Is not predicted to achieve its 10 lane mile paving target for Restorative Maintenance on the Interstate system.
- Is predicted to achieve its 7 lane mile paving target for Reconstruction / Major Rehabilitation on the Interstate system.
Questions?