Development of a Sustainable Pavement Management Strategy for Resurfacing Low Volume Roads in New Brunswick

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Acknowledgements

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Outline

• Low Volume Roads in N.B.
• What Others Do
• Decision Making Inputs
• Surface Selection Framework
• Evaluation
• Summary
LOW VOLUME ROADS IN N.B.
Low Volume Roads in N.B.

- Total Paved – 16,500 km (9900 miles)
- 44% asphalt / 56% chipseals
- Arterial / Collector Hwys – 6050 km (3630 miles)
- Local Hwys – 3050 km (1825 miles)
- Local Roads – 6800 km (4080 miles)
Low Volume Roads in N.B.

- Key Stats
  - ½ population lives in rural areas
  - 60% network is Local Class
  - Road network among highest density in the country
  - Almost all Local Roads < 1000 vpd
  - 40% Local Hwys < 1000 vpd
  - 25% Collector Hwys < 1000 vpd
Low Volume Roads in N.B
Low Volume Roads in N.B.

• Challenges
  - Deteriorating condition
  - Escalating rehabilitation costs
  - Maintaining LOS
  - Significant investment
  - Economic / fiscal constraints
  - Other competing demands
Low Volume Roads in N.B.

• **Sustainable Pavement Management Strategy for Road Surfaces**
  - Move Asphalt to Chipseal
  - Clearly defined and transparent criteria
  - Study:
    - What are others doing?
    - Decision inputs need?
    - Develop a framework?
    - Evaluate the framework?
WHAT OTHERS DO...
What Others Do…

• Agency Practices Review
  ▪ Canadian DoT’s and Selected US DoT’s
  ▪ Focus:
    • Policies
    • Factors with defined criteria
    • Decision making framework
  ▪ Web-based & Consultations
What Others Do…

• Key Findings
  ▪ Most did not have comprehensive guidelines
  ▪ Decisions made on project basis
  ▪ Policies focused on only low volume roads
  ▪ Traffic volume predominant screening factor
  ▪ Other factors:
    • Costs
    • Functional purpose, rural / urban setting
    • Impact on local business and long distance travel
What Others Do…

- Nova Scotia
  - Network based
  - Factors / Criteria:
    - Traffic volume
    - Roadside development
  - Scored priority points
  - Treatment selection matrix
  - Spreadsheet tool
What Others Do…

- Northern Ontario
  - Project based
  - Factors / Criteria:
    - Traffic volume
    - Impact on residents
    - Impact on business
    - Impact on long travel
    - DoT costs
  - Weighting methodology
  - Scoring process
What Others Do…

- South Dakota
  - Project based
  - Factors / Criteria:
    - Treatment costs
    - Agency costs
    - User costs
  - Life cycle cost analysis
  - Assess alternative treatments
  - Spreadsheet tool
What Others Do…

• Outcome
  ▪ Existing frameworks + / -
  ▪ None were ideal
  ▪ Data intensive
DECISION MAKING INPUTS
Decision Making Inputs

- NBDTI Guiding Principles
  - Simple & easy to explain
  - Upfront evaluation
  - No significant data collection
  - Objective and quantifiable
  - Definitive, but some flexibility
  - Consider agency costs
  - Consider site specific requirements
Decision Making Inputs

- What others do...
Decision Making Inputs

• Conducted Assessment
  ▪ Benefits for inclusion?
  ▪ What measures exist?
  ▪ Data availability?
  ▪ Data coverage?
  ▪ Overlapping data?
  ▪ New data?
Decision Making Inputs

- Conducted Assessment
  - Benefits for inclusion?
  - What measures exist?
  - Data availability?
  - Data coverage?
  - Overlapping?
Decision Making Inputs

- NBDTI landed on:
  - Agency Costs
  - Road Class
  - Traffic volumes
  - Truck volumes
  - Road Grade
  - Tourism
SURFACE SELECTION FRAMEWORK
Surface Selection Framework

- 2 Stage LOS Screening Process

**Initial Screening**
- Preliminary recommendation
- Asphalt, chip seal, or gravel surface?

**Site Specific**
- Assess site specific characteristics
- Upgrade to higher surface standard?
Surface Selection Framework

- Stage 1 - Initial LOS Screening Factors
  - Functional Class – Arterial, Collector, Local
    - Higher functional purpose generally expected to have a higher standard of surface treatment
  - Daily Traffic – AADT
    - Highest usage should provide the better level of service to minimize road user costs
  - Truck Traffic – AADTT
    - Heavy vehicles require additional strength to prevent accelerated surface damage
Surface Selection Framework

- Agency Costs
  - Several approaches
  - Goal - minimize data inputs
  - Life cycle cost analysis to compare chip seal and asphalt treatments over a 30 year timeframe based on different scenarios
  - ~300 to 400 trucks per day $ chipseal > asphalt
Surface Selection Framework

- **Stage 1**
  Initial LOS Screening

![Flowchart]

- Arterial or AADT Greater than 1500
- 300 – 1500 AADT
- Collector Less than 300 AADT
- Local Less than 300 AADT

- YES
  - Asphalt
  - Asphalt
  - Chipseal
  - Chipseal
  - Gravel

- NO
  - Trucks/May Greater than 300 AADTT
  - Trucks/Day Less than 300 AADTT
Surface Selection Framework

• Stage 2 – Site Specific Upgrading Factors
  ▪ Collector Highways
    • > 7% road grade
    • Existing pavement structure results in lower life-cycle cost (e.g. pulverization)
  ▪ Local Highways and Roads
    • As above
    • Gravel surfaces upgraded to chipseal if road connect two designated highways or provides direct access to a significant tourist destination
EVALUATION
Evaluation

• Scope
  ▪ Estimate the potential reduction in future rehabilitation
  ▪ Applied the initial screening criteria over the existing road network
  ▪ Roads > 1km in length
  ▪ Sensitivity analysis of the traffic and truck volume thresholds also completed
Evaluation

- Identified Candidates
  - Asphalt to Chipseal
  - 880 km (530 miles)
  - 13% of asphalt inventory

<table>
<thead>
<tr>
<th>Road Class</th>
<th>Existing Asphalt km</th>
<th>Candidate for Conversion to Chip Seal</th>
<th>km</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Arterial Highways</td>
<td>2,900</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector Highways</td>
<td>2,400</td>
<td>430</td>
<td>13%</td>
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<tr>
<td>Local Numbered Highways</td>
<td>885</td>
<td>275</td>
<td>31%</td>
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<tr>
<td>Local Named Roads</td>
<td>420</td>
<td>175</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,605</strong></td>
<td><strong>880</strong></td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>
Evaluation

- LCC Analysis
  - 20 year period
  - Treatment costs / timing
  - Reduce $4.6 million annually @ 1000 vpd
  - Increase to 1500 vpd + $1.7 million
SUMMARY
Summary

- Two-staged screening
- Incorporated both network and local conditions
- Relatively simple solution
- Objective and transparent
- Very easy to communicate
- Potential to reduce future rehabilitation costs and spending savings elsewhere
Thank you

• Simple sometimes works…