



9th International Conference on MANAGING PAVEMENT ASSETS (ICMPA9)

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

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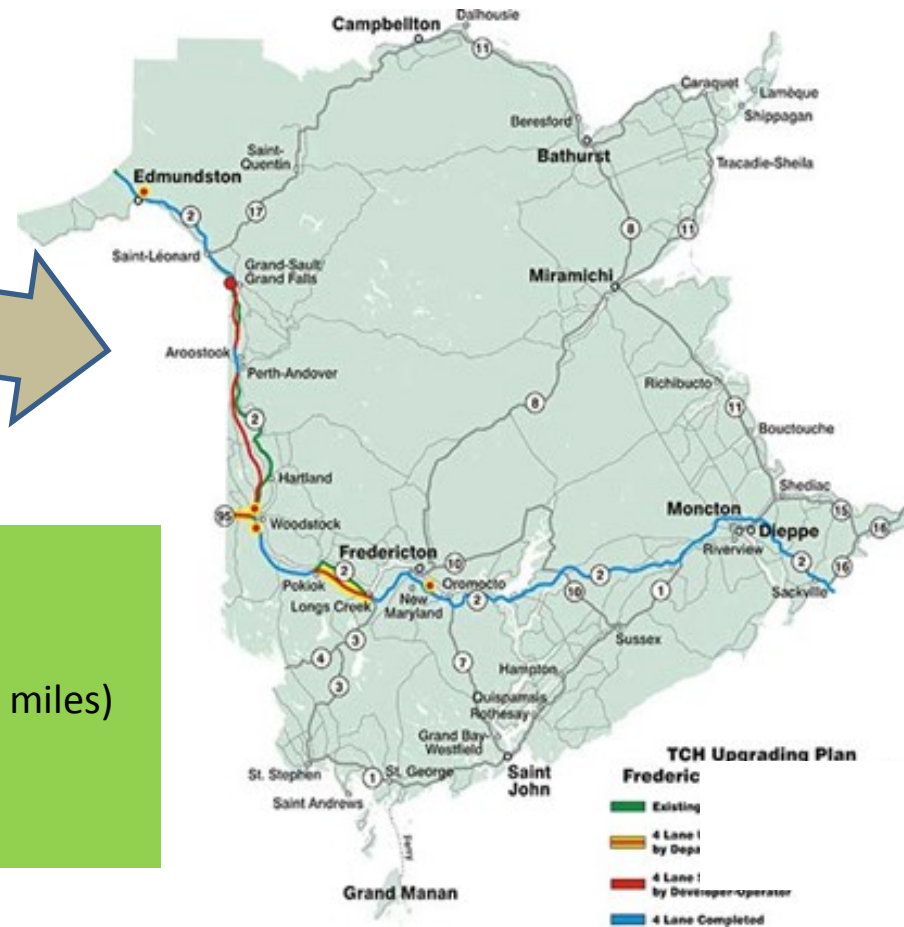
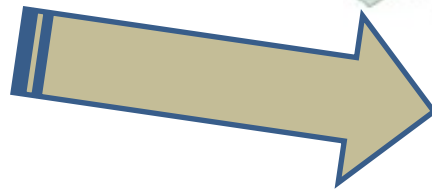
Outline

- **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 < 1000vpd



Low Volume Roads in N.B



Low Volume Roads in N.B.

- Challenges

- Deteriorating condition
- Escalating rehabilitation costs
- Maintaining
- Requiring significant investment
- Economic / fiscal constraints
- Other competing demands

Unsustainable



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

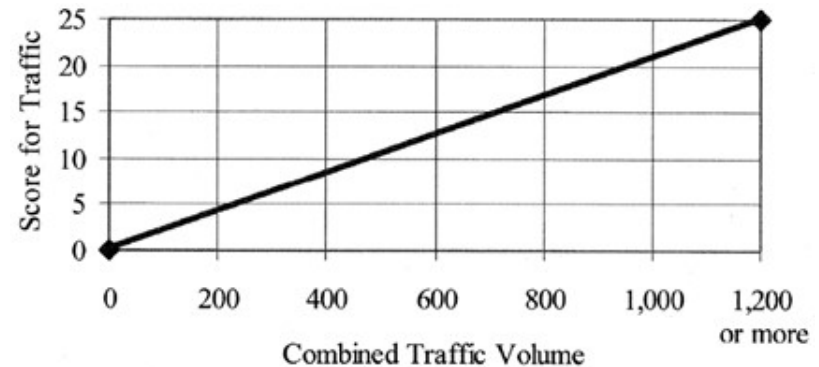
What Others Do....

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

Existing Surface Type	Surface Treatments					
	Traffic AADT	Priority Points	Gravel Only	Black Gravel	Double Chip	Asphalt Paving
Gravel Surface	<300	<70	✓	✓		
Gravel Surface	300-500	70-100			✓	
Gravel Surface	>500	>100				✓
RAC Surface	<500	70-100			✓	
RAC Surface	>500	>100				✓
Chip Seal Surface	<500	70-100			✓	
Chip Seal Surface	>500	>100				✓
Sand Seal Surface	<500	70-100			✓	
Sand Seal Surface	<500	70-100			✓	
Asphalt Pavement	<500	70-100			✓	
Asphalt Pavement	>500	>100				✱

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



Main Selection Factor	Relative Factor Weight	Selection factor Value	Selection Factor Score
Traffic volumes	25	430	10
Impact on local residents	10	10%	2
Impact on local business	10	3	3
Impact on long-distance travel	10	20%	4
Agency costs	45	\$200,000	40
All Factors	100		59

What Others Do....

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

The screenshot shows a web-based application window titled "SDDOT Local Roads Surfacing Criteria Decision Tool". The main heading is "General Cost Analysis Setup". Below the heading is a brief instruction: "Use the controls on this page to define the scope of your analysis, choose the alternative surface types you wish to include, define general analysis setup inputs, and specify whether or not to include user costs." There are "Back" and "Next" buttons in the top right corner.

The form is divided into several sections:

- Analysis Type:** A dropdown menu is set to "Upgrade/Downgrade".
- Selection of Alternative Surface Types:** A section with the instruction "Check the boxes below next to the different surface types you wish to compare in this analysis." It contains four checked checkboxes: "Hot-Mix Asphalt (HMA)", "Blotter", "Gravel", and "Stabilized Gravel".
- Analysis Setup Inputs:** A section with four input fields: "Project length:" (5 mile(s)), "Road width:" (24 feet), "Average daily traffic (ADT):" (350 vehicles per day), and "Urban or rural setting:" (Rural).
- Inclusion of User Costs:** A section with the instruction "User costs such as vehicle operating costs (VOC) and crash costs can have a significant impact on the results of a cost analysis. If you wish to include user costs in your analysis, check the box provided below. Leaving this box unchecked will result in costs being calculated solely on 'Agency' costs (i.e., those maintenance and construction costs incurred by the Agency)." It contains one checked checkbox: "Include user costs (vehicle operating costs and crash costs)".

A small red question mark icon is located in the bottom right corner of the form area.

What Others Do....

- Outcome
 - Existing frameworks + / -
 - None were ideal
 - Data intensive





DECISION MAKING INPUTS

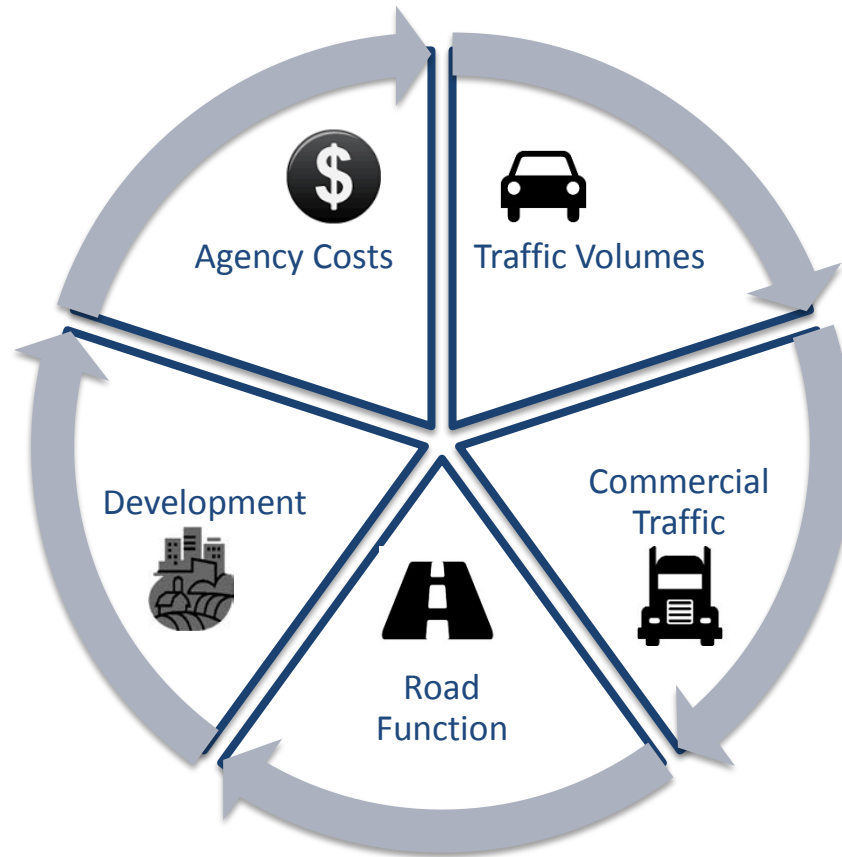
Decision Making Inputs

- **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

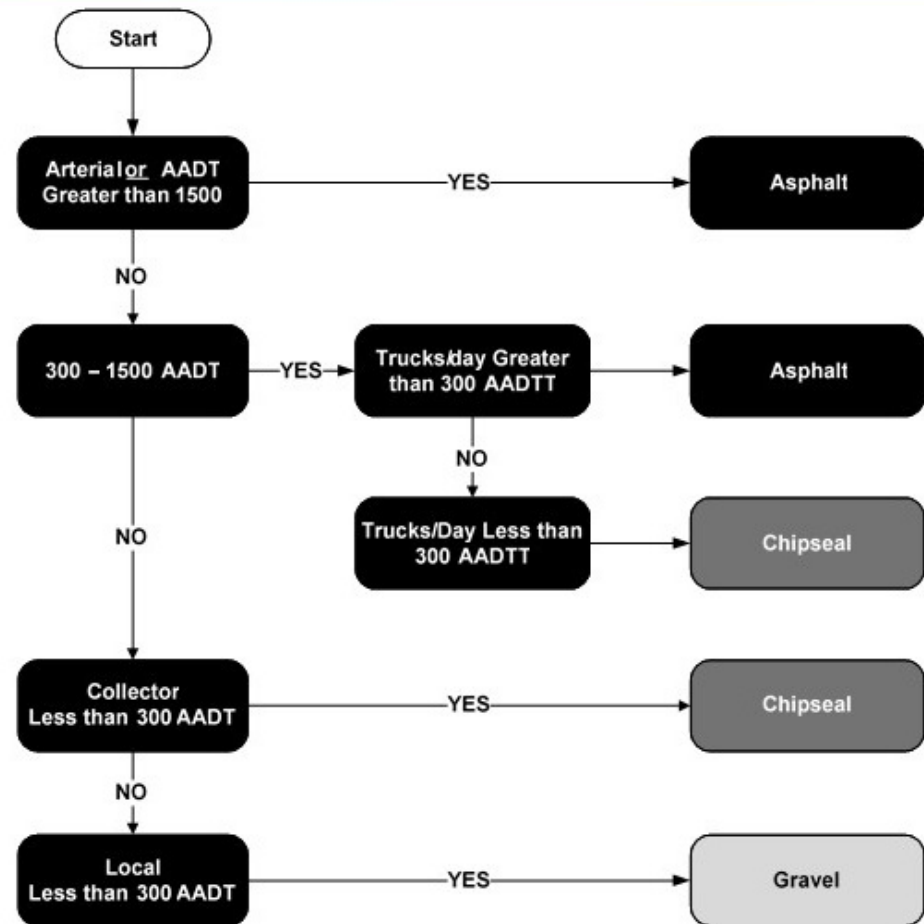
Surface Selection Framework

- 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



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 $> 1\text{km}$ 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

Road Class	Existing Asphalt km	Candidate for Conversion to Chip Seal	
		km	%
Arterial Highways	2,900	0	-
Collector Highways	2,400	430	18%
Local Numbered Highways	885	275	31%
Local Named Roads	420	175	41%
Total	6,605	880	13%

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...

