Right Repair, Right Time, Right Cost at the Right Place

Fredericton Lean and Asset Management Conference
April, 2016
GNB Assets
- Highways and Structures
- Buildings
- Other

Asset Management
- Concepts
- Data and Modeling
- Deployment

Continuous Improvements
- Reducing errors and Improving Efficiencies
- Connected and standardized systems
- Cross Asset Optimization and Scheduling
Brief overview of

GNB ASSETS
Pollett River Bridge (1893)
Pollett River Bridge (Continued)
The Department of Transportation and Infrastructure

• Mission:
  – Contribute to NB’s Economy and Quality of life
  – Provide and support sustainable infrastructure
  – Provide safe and efficient movement of people and goods

• Key Objectives:
  – Invest in infrastructural Renewal
  – Enhance Strategic Partnerships
  – Plan, Build, Maintain, Divest
  – Competence, Impartiality, Integrity, Respect, Service
Infrastructure Snapshot

- Highways: 22,633 km
- Bridges and Large Culverts: 5,296
- Small Culverts: >= 235,000
- Signs: >= 77,000
- Buildings:
Highways

~390 km

~380 km
Structures

~380 km

~390 km
Signs

~390 km

~380 km
Highway Condition

Good/Excellent

Fair

Poor
Bridge and Culvert (Excellent Condition)

Culvert Inlet

Culvert

Deck

Super + Sub structures
Bridge and Culvert (Fair Condition)
Bridge and Culvert (Poor Condition)
Which will you fix first?
Roofs
ASSET MANAGEMENT
TIME

New House

Minor Repair: $500

Full New Roof and Ceiling: $30,000

Total Spending: $500

Do Nothing: $0

Roof Water Damage

Insulation Damage

Water Leaking on Occupants

Five Broken Shingles

Do Nothing Stage

Roof in Good Condition

Using AM

No AM

New House
What is Asset Management?

• It is **not a black box** but rather a framework for decision making

• **Systematic process based on:**
  – Economics
  – Engineering
  – Business principles

• **Improves decision making:**
  – Evidence based decision making
  – Transparent
  – Resource allocation
  – Performance and metrics based
Rehab Cost vs. Condition

- **Time**
- **Asset Condition**: Very Good, Good, Fair, Poor, Very Poor

Cost increases as asset condition worsens over time.
Strategic Planning supported by AM

- 10 Year Plan
- 3 Year Forward Works Program
- Annual Programs
MCA: Multi Criteria Analysis
# AMDF: New Asset and Asset Divestiture

<table>
<thead>
<tr>
<th>QBL</th>
<th>Provincial Objectives</th>
<th>Criteria</th>
<th>Indicator Weight*</th>
<th>Indicators</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Job Creation</td>
<td>7</td>
<td>Jobs created after construction</td>
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<td></td>
<td>5</td>
<td>Regional unemployment rates</td>
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<tr>
<td>Economic (Wt = 50)</td>
<td>More Jobs (Wt = 26)</td>
<td>Foster Private Sector Business Growth</td>
<td>8</td>
<td>Impact on transportation costs to input and output markets (i.e. labour, supplier, and customer markets).</td>
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<td></td>
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<td>Supports Economic Development Plans</td>
<td>6</td>
<td>Level of support for initiatives in provincial economic development plans</td>
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<td>Effective Service Delivery</td>
<td>8</td>
<td>Infrastructure provides the required capacity to meet present and future needs at acceptable levels of service</td>
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<tr>
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<td>8</td>
<td>Impact on network operating, maintenance, and rehabilitation costs</td>
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<tr>
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<td>Maximizes Leveraging Opportunities</td>
<td>8</td>
<td>Potential for sharing infrastructure costs with a public or private sector partner</td>
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<tr>
<td>Environment (Wt = 15)</td>
<td>Fiscal Responsibility (Wt = 24)</td>
<td>Mitigate risks of climate change</td>
<td>7</td>
<td>Resilience to severe climate events</td>
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<tr>
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<td>Environmental Impacts</td>
<td>4</td>
<td>Impact on GHG emissions</td>
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<td></td>
<td></td>
<td></td>
<td>4</td>
<td>Other environmental impacts</td>
</tr>
<tr>
<td>Social (Wt = 25)</td>
<td>Best Place to Raise a Family (Wt = 50)</td>
<td>Health and Safety Impacts</td>
<td>10</td>
<td>Impact on risk of a casualty collision (i.e. injury or fatal collision)</td>
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<tr>
<td></td>
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<td>Access to services that meet primary needs</td>
<td>6</td>
<td>Impact on access to emergency services</td>
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<td></td>
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<td>Supported by community plans</td>
<td>3</td>
<td>Level of local community support</td>
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<tr>
<td>Cultural (Wt = 10)</td>
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<td>First Nations</td>
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<td>Impact on First Nations lands, culture, or community</td>
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<td></td>
<td>Preserves or Enhances Heritage Resources</td>
<td>5</td>
<td>Impact on heritage resources</td>
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</table>

* Preliminary weights developed by DTI Project Teams.  Weights should be reviewed periodically.
Rehab of Existing Assets

- The traditional “fix the worst first” approach does not maximize the value of assets.

- Asset Management (rehabilitation) models generate the best series of treatments for the life-cycle of the assets.

- The rehabilitation schedules from the model may be further adjusted based on additional information from DTI district offices, elected officials, and industry stakeholders.
OPTIMIZE

ALL THE THINGS!
Models in Action

- Infrastructure
  - Highways (Asphalt and Chipseal): 5
  - Bridges & Culverts: 3.5
  - Brush Cutting: 4
- Roofs: 4

1: Knowledge and Experience
2: Inventory Enabled
3: Modeled
4: Optimized
5: Continuously Improved
6: Legislated
Infrastructure Model

Minimize expenditure over 75 year planning horizon

Such that:

- All preventative and inspection based work to be complete

- Threshold for assets based on condition are met:
  - Poor and very poor
  - Excellent and very good
Importance of Minor Treatments

AM - Right Repair, Right Place, Right Time

- Preservation (e.g. cracksealing)
- Minor Rehab (e.g. mill & surface)
- Major Rehab (e.g. mill, base & surface)
- Reconstruction (e.g. grading, base & surface)

Surface Age

PSDI
Asset Management on Asphalt

% Asset Age and Life Cycle

- **Very Good**
- **Good**
- **Fair**
- **Poor**
- **Very Poor**

- 75% of asset age
- 25% of asset age

40% Condition drop

- **Ideal Situation (adds 10+ years to road life)**
- **Minor Work**: $100K required
- **Major Work**: $200-300K required
- **Reconstruction**: $500-600K required
Benefits of Asset Management

% Poor Roofs - AM vs. Worst First - Similar funding level

- Asset Management
- Worst First
Which will you fix first?

a

d

b

e

c

f

g

h

i
PROCESS, & CONTINUOUS IMPROVEMENTS
Data
- Systems Integration with GIS
- Standardization
- Backend Validation

CIP
- Add new features
- Improve data collection methods

Innovation
- Cross Asset Optimization
- Cross Asset Scheduling
## Common Data Structure

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Asset class</strong></td>
<td>Dissolved Salt as % of tot. anions</td>
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<tr>
<td><strong>Asset ID</strong></td>
<td>Water hardness</td>
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<tr>
<td><strong>Bridge Major component / Highway Maintenance</strong></td>
<td>Culvert Pipe size i.e. large enough for a liner/invert?</td>
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<tr>
<td><strong>County where asset is located</strong></td>
<td>Culvert and Bridge Priority code from inspection data</td>
</tr>
<tr>
<td><strong>District where asset is located</strong></td>
<td>Culvert and Bridge Overall Assessment</td>
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<tr>
<td><strong>Asset Material Type</strong></td>
<td>Any form of load rating on the asset?</td>
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<tr>
<td><strong>Culvert and Bridge Components / Highway Functional Class</strong></td>
<td>Traffic Counts nearest the asset</td>
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<tr>
<td><strong>Asset Component Condition Index</strong></td>
<td>Collision Factors nearest to the asset</td>
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<tr>
<td><strong>Fill over the Culvert / Highway current state</strong></td>
<td>Is asset on a Strategic corridor?</td>
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<tr>
<td><strong>Salt Concentration</strong></td>
<td>Is asset Scheduled in Future</td>
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</table>
**PDT (1/2)**

### Table 1: 2014 Data

<table>
<thead>
<tr>
<th>Year</th>
<th>District</th>
<th>Route</th>
<th>Route Name</th>
<th>Route Description</th>
<th>CS Start</th>
<th>CS End</th>
<th>Start</th>
<th>End</th>
<th>Cost</th>
<th>Functional Class</th>
<th>Category</th>
<th>Age</th>
<th>ED</th>
<th>Volume</th>
<th>Collision Index</th>
<th>Match</th>
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<td>Rehab</td>
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</table>

### Table 2: 2015 Data

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<th>Year</th>
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<th>Route</th>
<th>Route Name</th>
<th>Route Description</th>
<th>CS Start</th>
<th>CS End</th>
<th>Start</th>
<th>End</th>
<th>Cost</th>
<th>Functional Class</th>
<th>Category</th>
<th>Age</th>
<th>ED</th>
<th>Volume</th>
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**New Nouveau Brunswick**
PDT (2/2)
Continuous Improvements (1/5)

• General CIPs:
  – Update CIPs for next several years
  – Third party model validation
  – Send List of updates to IM&T on PDT including mapping straight from PDT
  – Risk Analysis on highways, culverts, and bridges
  – Infrastructure Model (iAM V16) implementation
  – Remsoft Training / User-group Presentation
  – Courtney Internal Remsoft Training
Continuous Improvements (2/5)

- **Highways (1/2):**
  - Highway Safety
  - Write Highway Model Logic Executive summary
  - Include/relate rutting, IRI and VIR as part of the Model
  - Incorporate ramps and right turning lane in model
  - Auditor General Report Implementation
  - Highway LpSchedule
  - Provincially Designated Roads within a Municipality
  - R&D Gravel, Cracksealing, Microsurfacing, ditching, drainage, by km
  - Verify Yield and high curves (in house)
  - 900 segments Unknown ages (finalize)
  - Incorporate Traffic Volumes in Highway Models (finalize)
Continuous Improvements (3/5)

- **Highways (2/2):**
  - Jurisdictional Revue of Quebec System
  - National Highway System based on 2013 data
  - MCMS Lookup table to PDT (RCSKEY) + Updates to PDT
  - Match and Aggregator in PDT
  - Purchase of Network Analyst
  - Excel template to be sent to the districts for surface treatment priorities
  - Finalize V16 Run
  - Annexations
  - Roles and Responsibility Chart
  - Incorporate IRI and VIR into V16
  - GIS data project with IM&T
Continuous Improvements (4/5)

• **Culvert/Bridge CIPs:**
  - Update culvert Lookup date
  - Write Bridges/Culvert Model Logic Executive summary
  - Include traffic counts and collision rates on bridges / Culverts
  - AMP for bridges and culverts
  - BRI implementation in ArcGIS
  - Inflation / Discount rates
  - Roles and Responsibility Chart
  - Bridge Rehab and Reconstruction MIP
Continuous Improvements (5/5)

- **Building/Roof CIPs:**
  - Write Bridges/Culvert Model Logic Executive summary
  - Develop a Roof Asset Management Program and Schedule
  - Send Model for third party validation
  - Compare Model to regional plan
  - Roof V15 Updates
  - Roles and Responsibility Chart
Innovation

• **Cross Asset Optimization:**
  – If you have $1M to fix an asset, which one would you fix?

• **Cross Asset Scheduling:**
  – Do Brush cutting and culvert work before highway work
## Enablers, Barriers, and Challenges

<table>
<thead>
<tr>
<th>Enablers</th>
<th>Challenges</th>
<th>Barriers</th>
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<tbody>
<tr>
<td>Gov. commitment (Minister &amp; AG)</td>
<td>Lack of condition data on some assets</td>
<td>Lack of Legislative framework</td>
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<tr>
<td>Frameworks:</td>
<td>Internal and external communication, and education</td>
<td>Cost and commitment to collect new data (New Types of Assets)</td>
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<tr>
<td>• AM Decision Framework (MCA + BCA)</td>
<td>Political intervention</td>
<td></td>
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<tr>
<td>• AM Models</td>
<td>Auditor General requirements</td>
<td></td>
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<tr>
<td>• Road Surface Strategy</td>
<td>Fiscal reality</td>
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<tr>
<td>Continuous collection of data (Assets part of frameworks)</td>
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<tr>
<td>Inventory management</td>
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<tr>
<td>Asset Management models</td>
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</tbody>
</table>

- **Enablers**
  - Gov. commitment (Minister & AG)
  - Frameworks:
    - AM Decision Framework (MCA + BCA)
    - AM Models
    - Road Surface Strategy
  - Continuous collection of data (Assets part of frameworks)
  - Inventory management
  - Asset Management models

- **Challenges**
  - Lack of condition data on some assets
  - Internal and external communication, and education
  - Political intervention
  - Auditor General requirements
  - Fiscal reality

- **Barriers**
  - Lack of Legislative framework
  - Cost and commitment to collect new data (New Types of Assets)
Summary

- AM is:
  - A comprehensive and strategic approach;
  - Transparent and accountable;
  - Performance based;
  - Involves economics, business, engineering, needs assessment/public involvement, and risk assessments;
  - Trade-off analysis
  - Fiscally responsible
Next Steps

• Implementation:
  – GIS for all models
  – Cross Asset Optimization and Scheduling

• Which other assets can/should we bring in?
Asset Management is a commitment to sustainability, transparency, accountability and customer service.

Thank you