Pavement Management & Road Surface Improvement Alternatives
BETA Group, Inc.

BETA Works with more than 140 communities throughout New England on developing and maintaining Pavement Management Programs.

- Relied on by organizations to teach pavement management theory and project process
  - APWA
  - T2 Connecticut
  - Bay State Roads (MA)
  - Highway Associations
- Attend national conferences on pavement preservation and maintenance.

We complete projects like this every day!
What is Pavement Management?
Pavement Management

- The practice of planning for pavement maintenance and rehabilitation with the goal of maximizing the value and life of a pavement network

*Perform the right repair at the right time!*
Pavement Management
Pavement Management

1. Capture Information
2. Justify Your Actions
3. Market Your Needs
Pavement Management

1. Capture Information
2. Justify Your Actions
3. Market Your Needs
## Compile Roadway Inventory File

### Roadway Profile

<table>
<thead>
<tr>
<th>Type</th>
<th>Miles</th>
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Existing Conditions Assessments

Windshield Survey

Automated
Existing Conditions Assessments

**New Technology**

Uses Machine-Learning Technology to extract information every 10’

- Non-biased
- Cost effective
- High Resolution photographs

Photograph from Inspections
Categorize Roadways

- Roadways are rated based on exiting conditions on a scale (0-100, 1-5, etc.)
- Roadways are categorized into maintenance categories based on a rating
Additional Roadway Information

- Width
- Length
- Striping
- Sidewalks
- Curbing

Clearinghouse for roadway information!
### Current Roadway Status

<table>
<thead>
<tr>
<th>Repair Method</th>
<th>Length (Miles)</th>
<th>Square Yards</th>
<th>Percent Repair</th>
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<tr>
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<td><strong>269.14</strong></td>
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**AVERAGE RSR by Segment:** 68.2

---

#### Repair Method Length (Miles) Square Yards Percent Repair

- Rehabilitation: 62.14 miles, 938,719 square yards, 23%
- Preventative Maintenance: 139.26 miles, 2,181,640 square yards, 52%
- Routine Maintenance: 35.53 miles, 567,725 square yards, 13%
- No Maintenance Required: 32.21 miles, 543,323 square yards, 12%
- Total: 269.14 miles, 4,231,408 square yards

---

**Benchmark for Performance Measuring**
Develop Planning Level Cost Estimates

- Quickly develop planning level construction costs based on inventory information
- Segment-level reporting for partial rehabilitation

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<tr>
<th>Name</th>
<th>From</th>
<th>To</th>
<th>Width</th>
<th>Length (Foot)</th>
<th>Square Yards</th>
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BETA Group, Inc.
1/11/2018
This Report is Intended for General Planning and Informational Purposes Only
Page 4 of 4C
Pavement Management

1. Accumulate and Capture Information
2. Justify Your Actions
3. Market Your Needs
Pavement Management

✔ Understand the “Big Picture”
  • Network Condition - First
    • Establish backlog
    • Analysis and Forecasting
  • Project details - Second
    • Capital Planning
    • Selling budgetary needs
Pavement Management

Allows users to become PROACTIVE rather than REACTIVE
Pavement Management

Pavement Deterioration Curve

Routine Maintenance
Preventative
Rehabilitation
Reconstruction

Less Expensive
Less Intrusive

More Expensive
More Intrusive
Pavement Management

PROACTIVE vs. REACTIVE

Repairs performed twice over 40 years...
$60 - $80 per SY over 40 years
Pavement Management

PROACTIVE vs. REACTIVE

Maintenance and repairs 7 times over 40 years...
$26 to $45 over the SAME 40 years
Review – Analyze – Prioritize

• Create custom reports
  • Detailed Segment Report
  • Roadways in order of PCI

• Cost Benefit Value
  • Data driven analysis to assist with prioritizing repairs

• Initial Street Lists
  • Coordinate with Utilities
  • Assess for Trees
  • Evaluate Sidewalks
Pavement Management

1. Accumulate and Capture Information
2. Justify Your Actions
3. Market Your Needs
What Options do I have?

- City/Town Funding
- Grants

Depending on Situation.....

- Bonds/Borrowing
- Additional Town/City Funding
Roadway Forecast Model Percentage Breakdown:
- Routine Maintenance – 10%
- Preventative Maintenance – 25%
- Minor Rehabilitation – 40%
- Major Rehabilitation – 25%

*Town Accepted Paved Roadways Only

Planning Level Cost Estimates
RSR Forecasting – 5 Years (Standard Model)

Projected RSR By Year

Current RSR 61.97

Amount Spent Per Year (Present Day Dollars)

- FY2019 Ch. 90 Allotment
  - $409K*
  - $550K
  - $700K
  - $850K
  - $1M
# 2019 Paving Program

## Repair - by Percent of Funding

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<tr>
<th>Repair Type</th>
<th>Miles</th>
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<tbody>
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<td>Cape Seal</td>
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Road Surface Improvement Alternatives

City of Manchester

- Roads: 403 Miles
- Population: 110,000
- Average PCI: 53
Road Surface Improvement Alternatives

Objectives of a Pavement Management Strategy:

Using roadway classifications and analysis to select the right candidates and the appropriate treatments

- Maximize the life span
- Minimize the cost
Road Surface Improvement Alternatives

So Many Choices... Where do you Start?

- Choose the Right Treatment
- Preserve Good Roads
- Chip Away at the Worst

*Keep Good Roads Good!*
Developing Our Roadway Improvement Plan

- Evaluate/Inventory Network Conditions
- Identify Treatments Based on Distress Conditions
- Establish a Budget and Treatment Allocation
Developing Our Roadway Improvement Plan

- Adopt Preservation - Start Crack Sealing Right Now!

- Focus on Main Arteries
  - Highest Traffic Volumes
  - Biggest Benefit to Citizens
Asphalt Deterioration Curve

The Right Treatment, to the Right Road, at the Right Time...

1. Crack Sealing, Fog Seal/Rejuvenator
2. Slurry Seal, Single Chip Seal or Micro Surfacing
3. Double Chip Seal or Micro Surfacing
4. Cape Seal
5. HMA Overlay
6. In-Place Recycling & Overlay
7. Mill & HMA Overlay
8. Full Depth Reconstruction
Preservation Treatments: Maintenance that slows the rate of deterioration due to the elements

- Crack Sealing
- Fog Sealing
- Chip Sealing
- Microsurfacing
- Cape Sealing
- Bonded Wearing Course
Fog Seal – a light application of diluted slow-setting asphalt emulsion with rejuvenator

- Low-cost sealing
- Restore flexibility
- Reduce raveling
Preservation Alternatives

**Chip Seals** – layer of emulsified asphalt covered with crushed stone (single or double)

- rough surface - good skid resistance
- moisture barrier/seals cracks
- reduces aging and oxidation due to water and sun
Preservation Alternatives

**Microsurfacing** - a slurry of crushed aggregate, mineral filler and polymer-modified emulsified asphalt

- Halts oxidation and raveling
- Smooth surface – increased friction
Preservation Alternatives

**Cape Seal** – multi-layer treatment of chip seal covered with microsurface

- Smooth surface similar to HMA
- Seals cracks/moisture barrier
- Increased durability
**Preservation Alternatives**

**Bonded Wearing Course** – a gap graded, ultra thin hot-mix asphalt mixture applied over a thick polymer modified asphalt emulsion membrane

- Seals the underlying road from water infiltration
- Slows down the aging process
- Provides a new wearing surface
Rehabilitation Options

**Traditional Rehabilitation Treatments:** Repairing or removing portions of an existing paved surface to reset the deterioration process.

- Structural HMA Overlay
- Cold Plane & HMA Overlay
- Full-Depth Reclamation
- Reconstruction
Rehabilitation Options

Alternative Rehabilitation Treatments:
Repairing portions of an existing pavement to reset the deterioration process.

- Hot-in-Place Recycling
- Cold-in-Place Recycling
Cold-in-Place Recycling: a method that removes and reuses the existing asphalt surface. It involves grinding off several inches of existing asphalt, pulverizing, adding foamed asphalt and cement, and placing it back down with a paver.

- recycle existing materials
- reduced trucking and materials costs
- minimize reflective cracking
- quick return to traffic
Cold-in-Place Recycling

What is Required?

- Samples and specific mix design
- Engineered solution
- Good drainage
- Stable subgrade
- Wearing course
Life Cycle vs. Capital Expense: start maintaining roads at a lower unit cost, buy more years of life at a discount, and get used to driving on good surfaces all the time.

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<th>Cost ($/SY)</th>
<th>Estimated Service Life</th>
<th>Equivalent Annual Cost</th>
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Cold-in-Place Recycling

East Industrial Park Drive Pilot (2017):

- Constructed in the mid-1980’s
- Traffic: 17,000 ADT (8% trucks)
- PCI Range: 16 to 56 (avg 29)
- Easy Access to I-93 System
- 50 feet wide x 1.2 miles long
- 3 Lane Road Section
- Pavement Depth: 3 to 6 inches
Pavement distresses included:

- Fatigue cracking
- Rutting
- Potholes
- Delamination
- Utility patches

*Traditional mill & overlay was rendered unsuitable and full depth reclamation only made financial sense at a lower PCI in at least another 5 years.*
East Industrial Park Drive Pilot (2017)

Decision Making:

- Road Shape and Base Conditions
- Attractive Unit Cost (per SY)
- Annual Cost/Year of Service Life
- Speed of Construction/Minimized Disruption of Traffic
- Added Strength/Structure (4” CIR and 1.5” HMA overlay)
Good Roads Cost Less, so...

Drive More Miles on Good Roads!

Cost/Benefit - Realize the remaining asset value and add 15 years of service life at half the cost of traditional full depth reclamation.
Questions