Pavement Management Summary

Date: February 14, 2020
Date of Inspections: Fall 2019

Repair Category

- No Maintenance Required (94-100)
- Routine Maintenance (80-94)
- Preventative Maintenance (65-80)
- Minor Rehabilitation (45-65)
- Major Rehabilitation (0-45)

Non-Inspected Roadways

- Gravel Roadway (Town Accepted)
- State
- Other (Private, Town Unaccepted, etc)

Dunstable

Tyngsborough

Groton

40

Chelmsford

225

27

110

Littleton

Carlisle

Acton
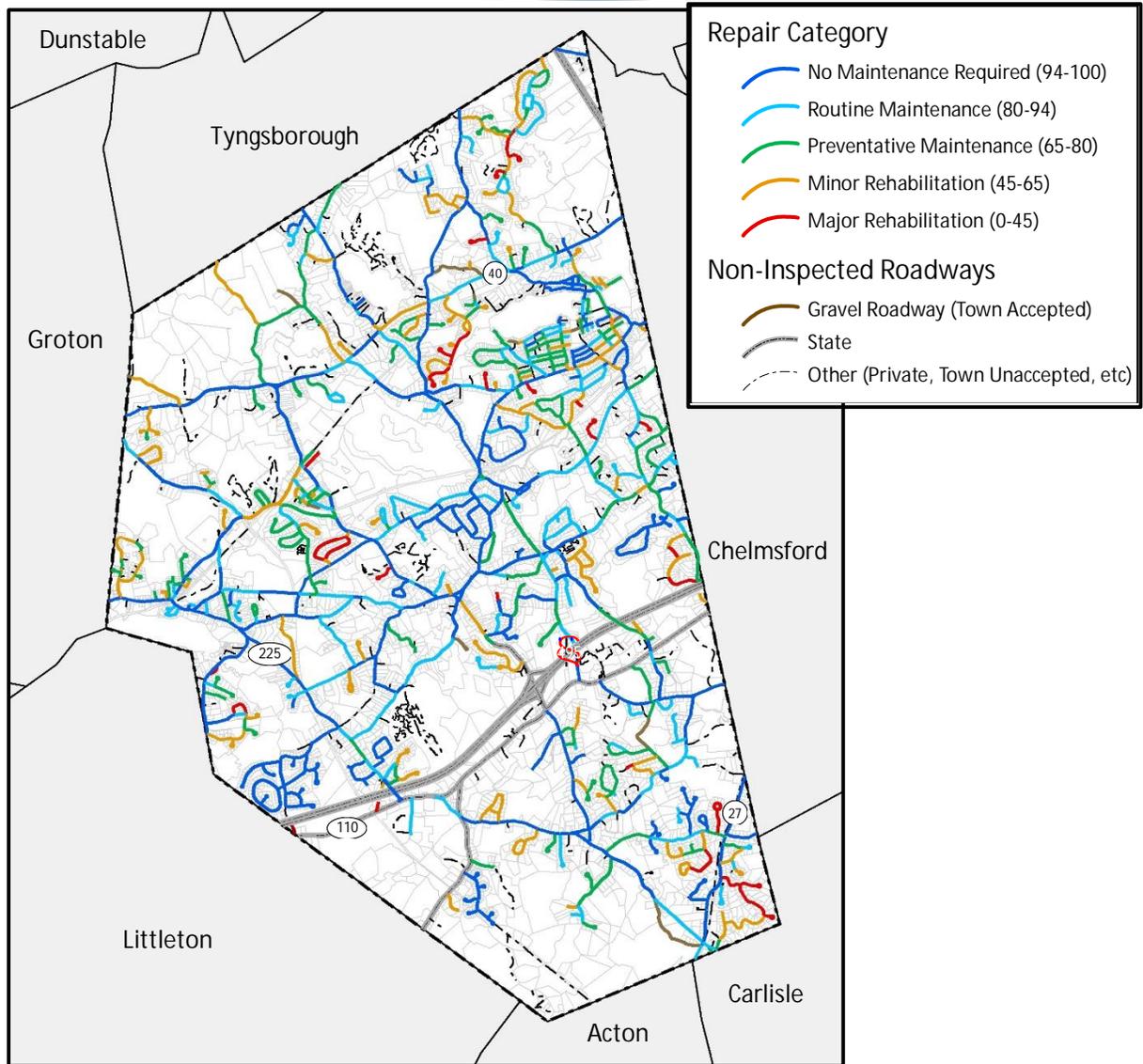
Town of Westford, Massachusetts

TOWN OF WESTFORD. INCORPORATED SEPT. 23. 1729

BETA

IMPROVING COMMUNITIES TOGETHER

Introduction

Background

The Town of Westford retained BETA Group, Inc. (BETA) to continue providing services to its Pavement Management Program (PMP) for its Town maintained roadways. Field inspections were initially conducted back in 2016 with the inception of the program. This comprehensive study was undertaken with the goal of establishing an extensive database of roadway surface conditions in order to produce a prioritized list of improvements. The PMP is a planning tool intended to provide the foundation to manage the Town's roadway resources by combining professional engineering metrics with local institutional knowledge. These efforts will result in the creation of a dynamic Capital Improvement Plan for the Town's roadway network.

BETA and Town Staff will work together to identify goals with regard to roadway network condition. Based on these discussions, it is clear that the Town is committed in maintaining and improving its roadway network. This could only be achieved by preserving and maintaining the existing infrastructure to the greatest extent possible.

Pavement Management Approach

Pavement management is based on the theory of predicting roadway deterioration over time. This theory allows pavement managers to perform timely maintenance to the roadway system, extending the roadway's life in order to avoid more costly and extensive structural repairs. A key aspect of pavement management, as illustrated by the Pavement Deterioration Curve, is the recognition that roadways deteriorate in an accelerated fashion at particular times in the roadway lifecycle. Understanding this concept allows opportune decisions that yield the most cost-effective results.

Implementing a PMP involves identification of the road network, evaluation of its surface conditions, and specification of its maintenance practices and associated repair costs. Roadway condition data is compiled to facilitate the calculation of a Road Surface Rating (RSR) for each street segment. This range includes a possible low value of 0 for a road characterized by a high severity of distress, and a possible maximum value of 100 for a road with no visible defects. Ultimately, the RSR value allows each roadway segment to be placed into a planning level repair category.
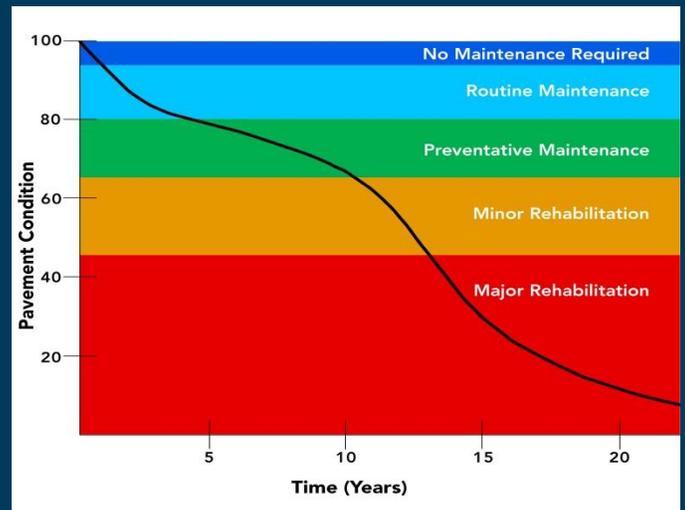
Roadway Survey

The most recent roadway survey in Westford, consisting of paved, Town accepted roadways, was completed in the Fall of 2019. A total of 152.11 accepted miles of roadway were inspected, serving as the basis for this report. The required field inspections were preformed by RoadBotics, a company specializing in roadway condition assessments by utilizing machine-learning technology. This proven methodology allowed for consistent data to be delivered to the Town.

Images were captured every 10 ft and later utilized by RoadBotics as data points to assess roadway conditions. The images were analyzed to identify pavement surface damage through algorithms to identify damages such as cracking, potholes, depressions and patching. BETA then conducted QA/QC and verified material type and roadway widths in order to ensure measurements for estimating and reporting.

*Pavement Deterioration Curve*

Summary of Findings

Upon completion of the survey, the overall RSR for Westford's accepted public roadway network was 83.08. The overall RSR represents a benchmark for performance measuring of the Town's pavement management program moving forward. If the overall RSR were to drop in the years to come, this would be a sign that the program needs to be adjusted or funding for the program may need to be increased.

Repair strategies and associated unit costs were defined (as shown below) to develop the Backlog Summary. This summarizes both the mileage of roadway within each suggested repair method as well as the estimated cost based on unit prices for each repair method. The current backlog summary for the Town's public roadway network is approximately $15.5 Million. This budgetary dollar figure represents the funding necessary if the Town were to perform all required maintenance for the Town's road network within the next year.

83.08
CURRENT TOWN NETWORK
ROADWAY SURFACE RATING (RSR)
(February 2020)

RSR Breakdown by Mileage

Repair Method	RSR Range	Unit Price (sy)
Reconstruction	0-20	$85.00
Reclamation	20-50	$40.00
Rehabilitation	50-70	$17.00
Preventative Maintenance	70-80	$12.00
Routine Maintenance	80-94	$0.50
Defer Maintenance	94-100	$0.00
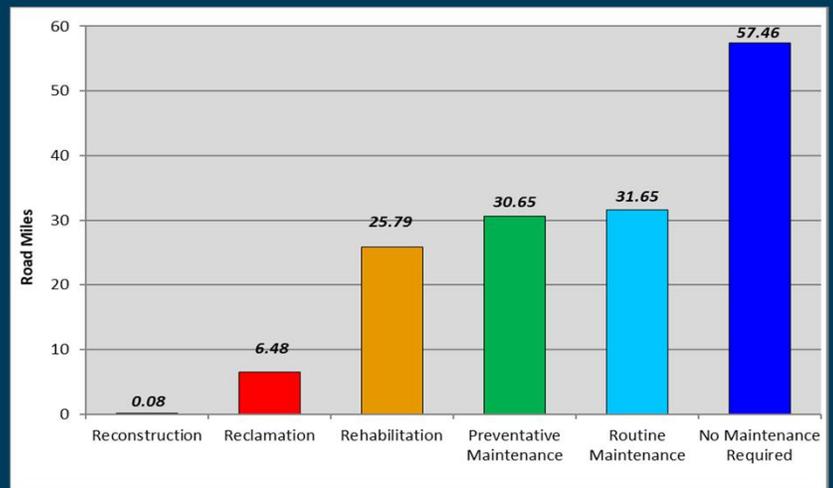
Backlog Summary

| Repair Method	Length (Miles)	Square Yards	Percent Repair	Estimated Cost
Reconstruction	0.08	579	0.05%	$49,182
Reclamation	6.48	94,665	4.26%	$3,786,611
Rehabilitation	25.79	373,600	16.95%	$6,351,206
Preventative Maintenance	30.65	426,706	20.15%	$5,120,469
Routine Maintenance	31.65	454,896	20.81%	$227,448
No Maintenance Required	57.46	880,469	37.78%	$0
Total	152.11	2,230,915	100%	$15,534,916
AVERAGE RSR by Segment:	83.08			

Capital Planning & Concluding Remarks

A series of Cost Benefit Value (CBV) analyses were generated to serve as a tool to prioritize potential roadway projects for inclusion in a multi-year Capital Improvement Plan (CIP). The development of a CIP will assist the Town in improving its network rating over time.

A 5-year forecast model was run to demonstrate how the network-level RSR for paved roadways would fluctuate over time under different funding scenarios. The model suggests that the Town secure approximately $1.9M annually to maintain the current rating. However if the Town secures at least $3M annually, the Network RSR is projected to approach 86 in 5 years.

The PMP provides decision makers with a picture of existing roadway conditions, a cost estimate to protect those paved roadways in good condition, and a recommended strategy to meet the Town's goals and objectives.

Forecast Model

Projected RSR By Year

Current RSR 83.08

$3M
$2.5M
$1.9M
$1.5M
$891K*
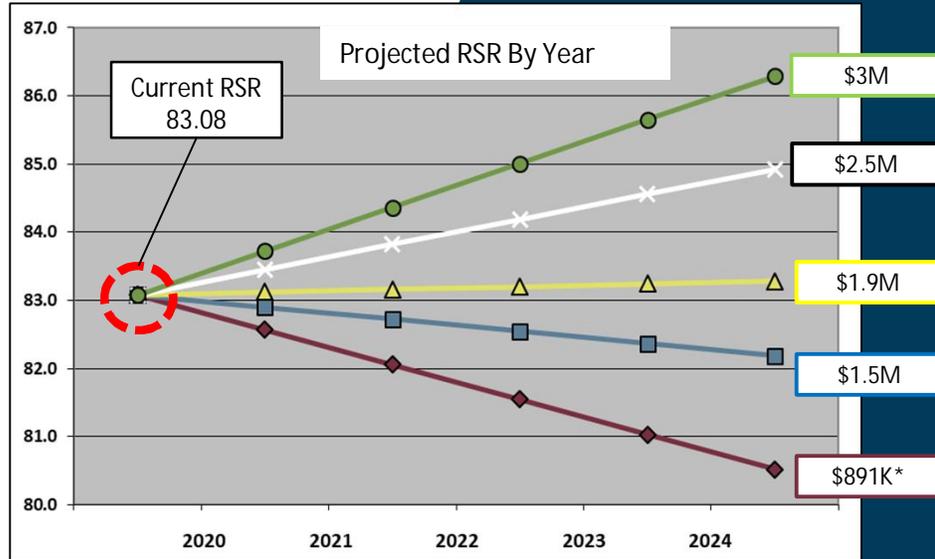
*Denotes FY20 Ch. 90 Allotment

Program Maintenance

To best manage and update the Town's PMP database, the following practices are suggested:

- Post all annual roadway improvements into the database. Both the pavement condition rating and repair history information should be entered.
- Add any new roadway network descriptions to the database as soon as the Town accepts the roadways.
- Update repair method unit costs annually to provide accurate work plan forecasts.
- Assign one or more individuals to oversee system upkeep and to request annual pavement condition updates.
- Review developments in pavement technology that might offer a more cost effective alternative to pavement maintenance or rehabilitation over the pavement's life cycle.

The Pavement Management Program will serve as a valuable instrument to the Town and facilitate a progressive approach to managing roadway infrastructure.

Brookside Rd-02
RSR = 99

Lakeside Ter-03
RSR = 42