

Introduction

Background

The Town of Maynard retained BETA Group, Inc. (BETA) to provide pavement management services to better maintain the Town's roadway network. Field inspections were previously conducted in 2014 and 2018 with the most current round of inspections being performed in the Fall of 2022. This comprehensive study was undertaken with the goal of establishing an extensive database of roadway surface conditions in order to assist in the development of a prioritized list of improvements. The Pavement Management Program (PMP) is a planning tool intended to provide the foundation to manage the Town's roadway resources in conjunction with local institutional knowledge. Ultimately, these efforts will assist in the development of a dynamic Capital Improvement Plan for the Town's roadway network.

The Town is committed to maintaining the PMP and improving its roadway network. This will 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.

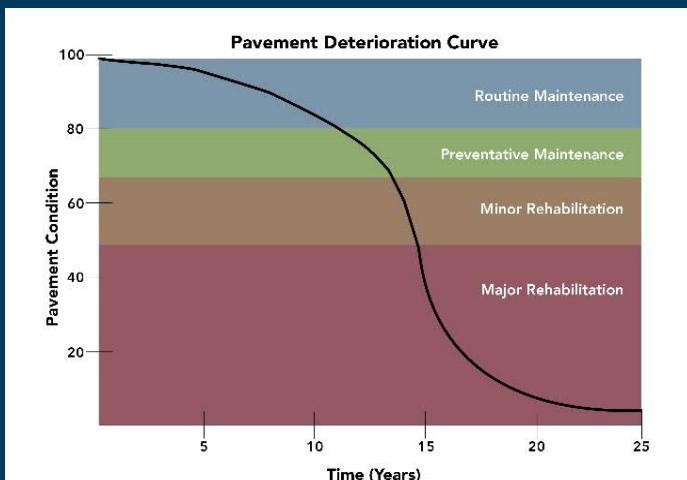
Implementing a PMP involves identification of the road network, evaluation of its surface conditions, and specification of its maintenance practices and associated repair costs. Roadway condition data is compiled to facilitate the calculation of a **Road Surface Rating (RSR)** for each street segment. 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 roadway survey in Maynard, consisting of paved, Town Accepted and Unaccepted roadways, was completed in the Fall of 2023. A total of **44.54 centerline miles** were inspected, serving as the basis for this report. The prior inspections in 2014 and 2018 were conducted manually via field forms. This past round inspections, the Town opted to migrate to an automated approach utilizing a lidar sensor mounted on a vehicle. As the vehicle traveled each roadway, a 3D digital point cloud was developed and all roadway assets within a 50' radius of the lidar sensor were scanned and populated. As part of the data collection, images were captured, georeferenced and timestamped every 20' section of roadway. Upon completion of the field data collection, proprietary algorithms and AI machine learning technology were run to identify pavement surface distresses such as cracks, potholes, seals, patches, and pavement oxidation to generate RSRs at the segment level. BETA then conducted a thorough review to ensure the quality of the data for analysis and reporting.

Pavement Deterioration Curve





Summary of Findings

Based on the update completed in the Fall of 2023, the **overall Road Surface Rating for Maynard's Town Accepted roadway network was 68.77**. This represents a **decrease of 0.25 points (69.02)** from the pavement assessment conducted in 2018. When factoring in the Unaccepted roads inventoried as part of this current project, the **overall RSR scored 67.15**. 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.

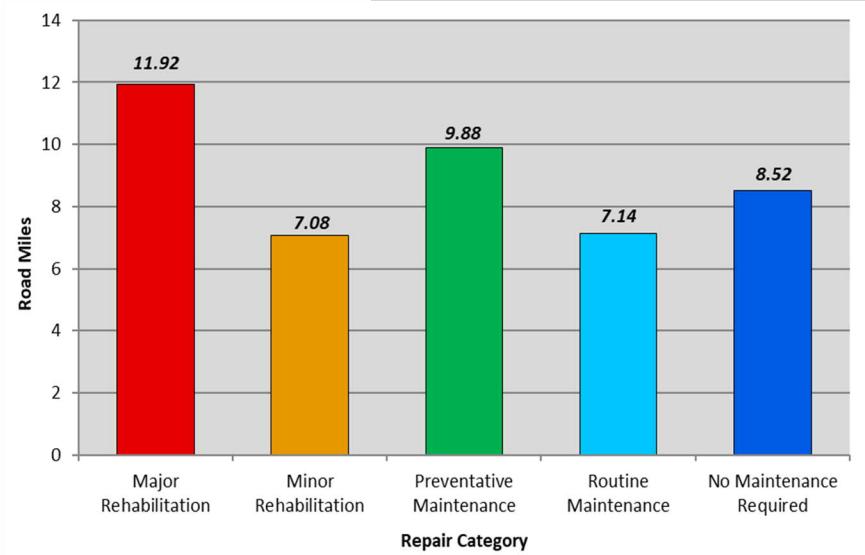
As part of the pavement management process, repair strategies and associated unit costs were defined (as shown below) to develop the Town's Backlog Summary. This analysis summarizes the mileage of roadway that fall within each suggested repair category as well as the estimated cost based to complete the recommended maintenance or repair. **The current backlog summary for the Town's overall roadway network is approximately \$12 Million based on current market trends.** This budgetary dollar figure represents a snapshot of the funding it would take to perform all outstanding maintenance for the Town's road network within the next year. While this is not typically feasible, this analysis acts as another benchmark for the magnitude of work necessary at the time of inspections.

67.15

CURRENT OVERALL TOWN NETWORK
ROADWAY SURFACE RATING (RSR)
(December 2023 Update)

RSR Breakdown by Mileage

Repair Method	RSR Range	Unit Price (sy)*
Major Rehabilitation	0-50	\$48.00
Minor Rehabilitation	50-65	\$18.00
Preventative Maintenance	65-80	\$9.50
Routine Maintenance	80-92	\$1.00
No Maintenance Required	92-100	\$0.00



**Please Note: Unit pricing accounts for curb to curb improvements only; Does not include any drainage, sidewalk, ADA, gravel subbase or utility improvements.*

Backlog Summary				
Repair Method	Length (Miles)	Square Yards	Percent Repair	Estimated Cost
Major Rehabilitation	11.92	177,742	26.8%	\$8,531,592
Minor Rehabilitation	7.08	108,458	15.9%	\$1,952,237
Preventative Maintenance	9.88	154,423	22.2%	\$1,467,021
Routine Maintenance	7.14	110,545	16.0%	\$110,545
No Maintenance Required	8.52	133,376	19.1%	\$0
Total	44.54	684,544	100%	\$12,061,395
AVERAGE RSR by Segment:	67.15			



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 \$600 Thousand annually to maintain the current rating. However, if the Town were to secure roughly \$950 Thousand annually, the Network RSR is projected to approach 70 in 5 years. Conversely, spending only the Ch. 90 allotment of \$265 Thousand annually on road improvements would likely cause the Network RSR to degrade to 65 RSR. The current model accounts for 3% annual inflation

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.

Program Maintenance

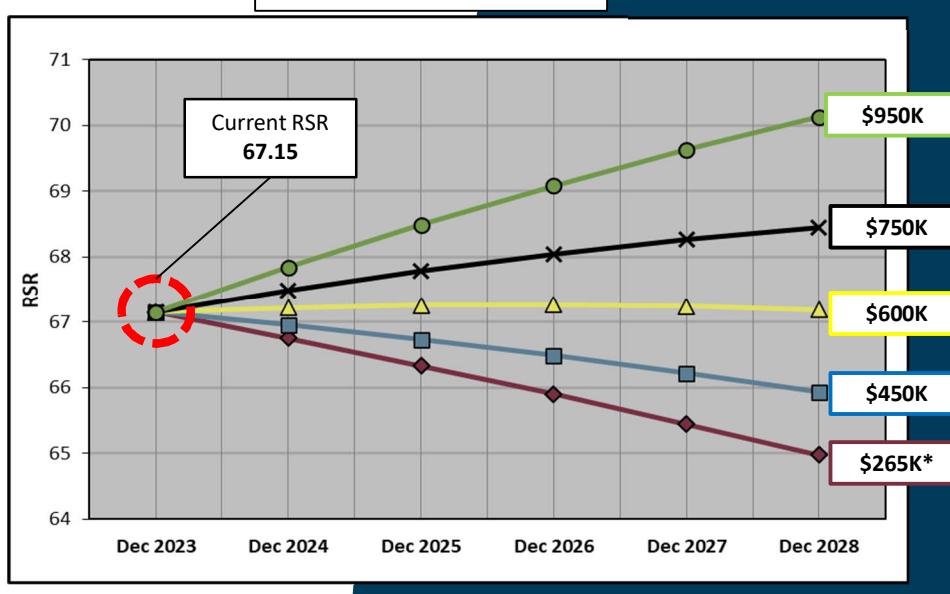
To best manage and update the Town's PMP database, the following practices are suggested:

- When utilizing pavement data to aid in capital planning, other assets such as sidewalks, utilities, etc. should be considered on a case to case basis
- 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.
- Review developments in pavement technology that might offer a more cost-effective alternative to pavement maintenance or rehabilitation over the pavement's life cycle.
- Re-inspect the roadway network every 3-4 years to keep the system and imagery current

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

Projected RSR By Year

Forecast Model



*Denotes FY24 Ch. 90 Allotment

Representative Photographs

