

STREET MAINTENANCE AND
RECONSTRUCTION ANALYSIS
LEXINGTON, MASSACHUSETTS

DRAFT REPORT
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Submitted to:
Board of Selectmen

Prepared by:
Bill Hadley
John Livsey
Michelle Stevens
Carl Valente
Rob Addelson

Purpose of this Report

The Board of Selectmen, at its annual Goal Setting Session in June – July of 2011, established the following Board goal for FY 2012 – 2013:

- Goal Area: Infrastructure Maintenance
 - Evaluate appropriate level of annual expenditure for facility and infrastructure maintenance; identify funding sources; develop and implement funding model for long term building and road maintenance.
 - Explore increased spending for maintenance of infrastructure to extend its existing life versus major renovation/reconstruction.

Although the goal addresses both facilities and road maintenance, this report is focused on road maintenance. Staff prepared this report to assist the Board of Selectmen in re-evaluating road maintenance funding options.

Introduction

In 2010, the Town of Lexington retained the firm of Fay, Spofford and Thorndike (FST) to better understand future roadway maintenance needs by completing a comprehensive study and developing a roadway database describing actual pavement conditions and road characteristics. Staff worked with FST to develop various funding scenarios and their resulting impact on the condition of the roadway network. It is important to note these scenarios are only intended to serve as a planning tool to provide a foundation for managing the Town's roadway system.

Pavement Condition Index:

The Pavement Condition Index (PCI) is the primary method used by FST to measure the condition of a roadway. PCI is measured on a one hundred to zero scale, with one hundred representing pavement in excellent condition and zero describing a pavement in extremely poor condition. The Town's overall PCI as of 2010 was 68, indicating the Town's roadways are generally in "good" condition. Pavement in "good" condition usually requires only regular maintenance, such as crack sealing, patching and paving. Lexington's goal should be an overall PCI rating in the 80 – 85 range.

Backlog:

Backlog is a secondary measure to use in evaluating the health of a roadway. It provides a point of reference in the development of a road maintenance program and is an estimate representing the cost of repairing all remaining roads in that year, bringing the average PCI to a near perfect 100. The cost to address the estimated Backlog of work shown in Table 2 reflects an amount to achieve an overall PCI of 100. Because the Town's PCI goal should be in the range of 80 – 85, this Backlog estimate should be used to understand the relative differences in the remaining work at the end of the various scenarios. As of fall 2010, Lexington's Backlog of pavement repair work totaled \$18,275,700. The 2011 Backlog is being finalized and should be available in April.

Backlog and PCI:

Backlog and PCI do not have a linear relationship. The PCI represents the overall condition of the roadway network, whereas Backlog describes the overall cost to bring it to perfect condition if it were to be done at once. Although most of the ending PCIs are relatively similar in each scenario, the estimated Backlogs vary because the types of maintenance have some differences. For example, Scenario F has less reconstruction work (which is higher in cost) than Scenario A, resulting in a smaller Backlog amount even though the ending PCIs are equivalent.

What is Excluded from this Analysis:

Major roadway improvement projects, such as the Robinson Road project, are beyond the scope of the road maintenance program because they involve significant enhancements (e.g. widening, drainage, sidewalks) to the roadway. Roadway improvements of this magnitude should remain as individual capital projects so as to not jeopardize the road maintenance program.

Funding History

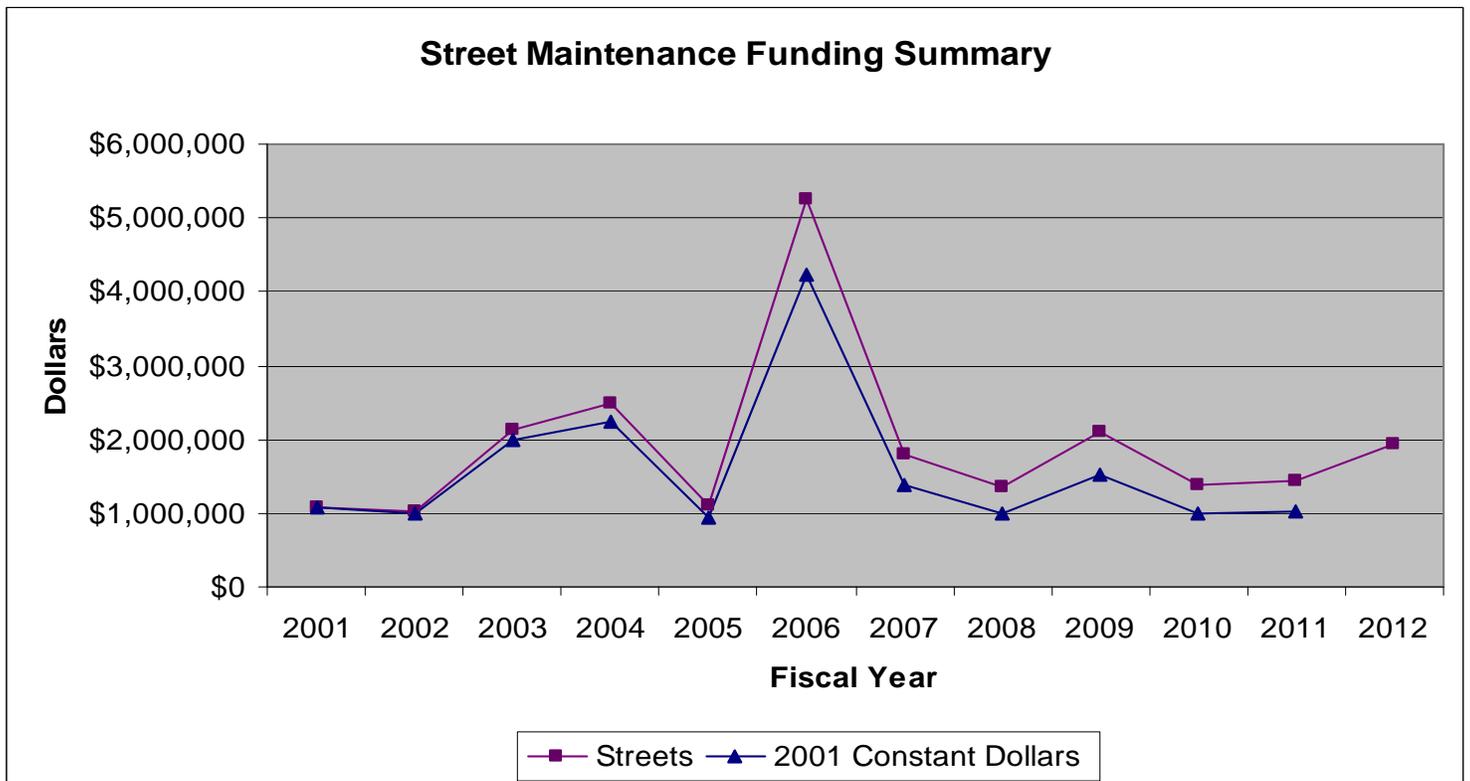
In 1999, the Town's (adjusted) overall PCI was approximately 48, representing a **poor overall condition of the Town's roads**. One strategy the Board of Selectmen undertook to improve the maintenance and condition of the roads was to increase maintenance funding by requesting and receiving voter approval for:

- Proposition 2 ½ Override: May 2000 - \$500,000¹
- Proposition 2 ½ Debt Exclusion: May 2002 - \$7,000,000

Table 1 - Historical Funding Summary for Street Maintenance

Funding Summary													
	2001	2002	2003	2004	2005	2006 ²	2007	2008	2009	2010	2011	2012	AVERAGE
Tax Levy	\$ 601,400	\$ 500,000	\$ 650,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 525,000	\$ 538,100	\$ 551,600	\$ 846,600	\$ 559,392
General Fund Debt	\$ -	\$ 50,000	\$ -	\$ -	\$ 40,000	\$ -	\$ 160,000	\$ 160,000	\$ 860,000	\$ 160,000	\$ 160,000	\$ 160,000	\$ 145,833
Chapter 90	\$ 483,200	\$ 479,700	\$ 478,800	\$ 478,200	\$ 566,500	\$ 823,100	\$ 565,500	\$ 703,200	\$ 707,600	\$ 696,000	\$ 721,200	\$ 930,600	\$ 636,133
2003 Debt Exclusion	\$ -	\$ -	\$ 1,000,000	\$ 1,500,000	\$ -	\$ 3,918,000	\$ 582,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 583,333
Total	\$ 1,084,600	\$ 1,029,700	\$ 2,128,800	\$ 2,478,200	\$ 1,106,500	\$ 5,241,100	\$ 1,807,500	\$ 1,363,200	\$ 2,092,600	\$ 1,394,100	\$ 1,432,800	\$ 1,937,200	\$ 1,924,692

Chart 1 - Historical Funding Summary for Street Maintenance



1. This amount has been maintained in the Operating Budget each year, and increased to \$525,000 in FY2009, then increasing by an additional 2.5% annually. The funds associated with the 2001 Override did not replace tax levy funds. Prior to 2001, the Town was only funding street maintenance with Chapter 90 state funding.

2. 2006 includes \$3.9M issued in debt.

Proposed Funding Scenarios

FST developed six scenarios to measure the impact of continued investment in road repair at different levels and differing allocation of funds among competing priorities. Table 2 provides a summary of each scenario. Table 3 provides a more detailed presentation of the annual funding plan for each scenario. Please note this is a ten-year model that accounts for inflation, however, significant volatility in the fuel market can result in asphalt escalations rates beyond that of standard inflation. For example, the cost of in-place asphalt more than doubled from the 1998 VHB report to the 2010 FST report.

Table 2 - Scenario Summary

Scenario	Funding	Description	Estimated 10 Year Cost	Estimated 2021 PCI	Estimated 2021 Backlog ¹
A	Historical	Combination of maintaining best and worst streets, with \$250K for crack sealing, patching and paving, and \$400K for reconstruction. Years 9 and 10 increase crack sealing and patching to \$450K and reconstruction to \$800K.	\$22.5M	81	\$24.4M
B	Historical	Similar to Scenario A, this is a combination of maintaining best and worst streets, but with \$200K for crack sealing, patching and paving, and \$750K for reconstruction.	\$22.5M	77	\$35.4M
C	Historical	Streets in the worst condition are repaired first.	\$22.5M	50	\$70.6M
D	Historical	Streets in the best condition are repaired first.	\$22.5M	78	\$33.4M
E	Progressive	Keeps maintenance Backlog at today's levels, while also placing emphasis on reconstruction.	\$31.2M	85	\$16.4M
F	Aggressive	Counters pavement deterioration aggressively in the early stages through preventative maintenance, while including funding for reconstruction work.	\$25M	81	\$18.6M

Table 3 – Detailed Funding Scenarios

Consultant Funding Scenarios ²												
Scenario ³	FY	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
A	Historical Budget (combination best and worst)	\$1,937,200	\$2,116,200	\$2,154,700	\$2,194,500	\$2,235,600	\$2,278,000	\$2,321,800	\$2,367,000	\$2,413,700	\$2,461,900	\$22,480,600
	Estimated Ending PCI	72				74					81	
	Estimated Remaining Backlog	\$16,095,030				\$20,099,456					\$24,440,563	
B	Historical Budget (combination best and worst)	\$1,937,200	\$2,116,200	\$2,154,700	\$2,194,500	\$2,235,600	\$2,278,000	\$2,321,800	\$2,367,000	\$2,413,700	\$2,461,900	\$22,480,600
	Estimated Ending PCI	72				73					77	
	Estimated Remaining Backlog	\$16,092,985				\$22,074,756					\$35,360,167	
C	Historical Budget (worst-first)	\$1,937,200	\$2,116,200	\$2,154,700	\$2,194,500	\$2,235,600	\$2,278,000	\$2,321,800	\$2,367,000	\$2,413,700	\$2,461,900	\$22,480,600
	Estimated Ending PCI	69				59					50	
	Estimated Remaining Backlog	\$16,088,587				\$29,045,765					\$70,562,709	
D	Historical Budget (best-first)	\$1,937,200	\$2,116,200	\$2,154,700	\$2,194,500	\$2,235,600	\$2,278,000	\$2,321,800	\$2,367,000	\$2,413,700	\$2,461,900	\$22,480,600
	Estimated Ending PCI	73				72					78	
	Estimated Remaining Backlog	\$16,088,597				\$20,417,354					\$33,369,607	
E	Progressive Funding Scenario	\$1,937,200	\$ 2,250,000	\$ 2,500,000	\$ 2,500,000	\$ 3,000,000	\$ 3,500,000	\$ 3,500,000	\$ 4,000,000	\$ 4,000,000	\$ 4,000,000	\$31,187,200
	Estimated Ending PCI	72				74					85	
	Estimated Remaining Backlog	\$16,090,037				\$19,158,299					\$16,370,146	
F	Aggressive Funding Scenario	\$ 3,250,000	\$ 3,250,000	\$ 3,250,000	\$ 3,250,000	\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	\$ 2,000,000	\$25,000,000
	Estimated Ending PCI	73				80					81	
	Estimated Remaining Backlog	\$14,784,190				\$12,452,491					\$18,621,188	

1 - Backlog is an estimate representing the cost of repairing all the roads within one year and bringing the average PCI to a near perfect 100

2 - Does not include funding for intersection improvements or new sidewalks

3 - Assumes a 3.25% increase in the historical tax levy and debt funding, with Chapter 90 funding flat at 2012 level

Discussion and Findings

A typical roadway user will begin to notice a difference in overall roadway conditions for each PCI change (increase or decrease) of 4 or 5 PCI points. As previously stated, the Town's PCI has increased significantly since 1999, from 48 to 68. This shows a significant improvement in roadway condition during that 10 – 12 year span. A clear result of the Town's increase in funding is the number of roadways that need reconstruction, which has decreased from approximately 37 miles to 10 miles within this time span. Ideally, the Town will continue to increase the overall roadway PCI, with a goal of reaching and maintaining the 80 – 85 range.

When evaluating different funding scenarios to reach this goal, it is critical to balance the following factors: the capacity of the staff to successfully manage the construction contracts, the limits of a general contractor to complete the work within a construction season, and the tolerance of the public for traffic disruptions during the construction activity. Also, it is important to note that Backlog is a secondary measure to use in evaluating the overall condition of the roadway. Completely eliminating the Backlog is an ideal that is neither practical nor necessary.

Scenarios A & B (Continue Historical Funding Level): The pavement management strategy for road repairs in Scenarios A and B, a combination of maintaining the best and worst streets, relate closely to the Town's current pavement management strategy.

- Scenario A has a lower funding amount applied to reconstruction and will take longer to reconstruct roads in poor condition. Due to the smaller funding amount for reconstruction, the model demonstrates a larger focus on the less travelled local streets as these are smaller segments that fit within the funding limits.
- Scenario B has a larger allocation of funds for reconstruction. The model assigns some priority to larger volume roadways. This, coupled with the fund allocation that can support a larger roadway segment, results in the model placing a greater emphasis on arterials and collector roads.

Although Scenario A shows a slightly higher actual PCI, Scenario B may result in a higher perceived PCI because it will result in greater improvement to heavier travelled roadways.

Scenario C (Continue Historical Funding Level): In this scenario, streets in the worst condition are repaired first, while deferring preventative maintenance for the streets in “good” condition. This results in a decrease in the Town's overall PCI to 50. This is not a recommended practice as it does not provide the preventive maintenance necessary to extend the life of a roadway.

Scenario D (Continue Historical Funding Level): In this scenario, streets in the best condition are repaired first, while deferring “poorer” roads. This scenario focuses on the preservation of streets in “good” condition with repairs such as crack sealing and surface treatments. However, roads that are in the worst condition will continue to deteriorate. The result is an increase in the Town's overall PCI to 78.

Scenario E (Implement Progressive Funding Level): This scenario keeps the maintenance backlog at today's levels, while also placing emphasis on reconstruction. As seen in Table 3, this scenario backloads the funding into the last five years of the ten-year plan. Scenario E is estimated to increase the PCI to 85.

Scenario F (Implement Aggressive Funding Level): This scenario counters pavement deterioration aggressively in the early stages through preventative maintenance and includes funding for reconstruction work. As seen in Table 3, this scenario frontloads the funding in the first five years of the ten-year plan, allocating more funds for reconstruction. Scenario F is estimated to increase the PCI to 81.