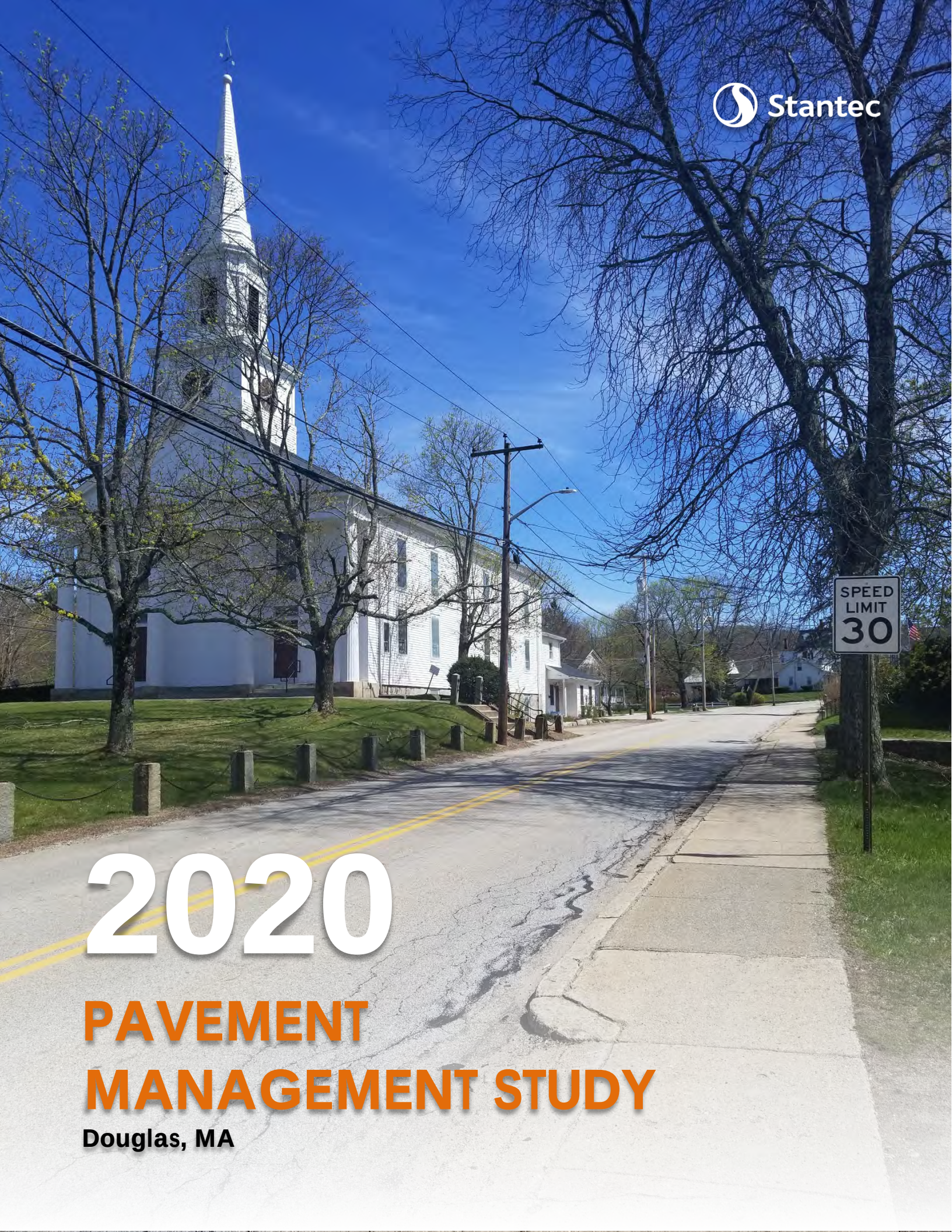

2020

PAVEMENT MANAGEMENT STUDY

Douglas, MA

2020 PAVEMENT MANAGEMENT STUDY

Douglas, MA

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1 INTRODUCTION

1 INTRODUCTION

BACKGROUND

The Town of Douglas is located in Worcester County, Massachusetts just between Routes 395 and 146, and on the Rhode Island State Line. An 83.0 mile public accepted roadway network serves a population of approximately 9,000 citizens.

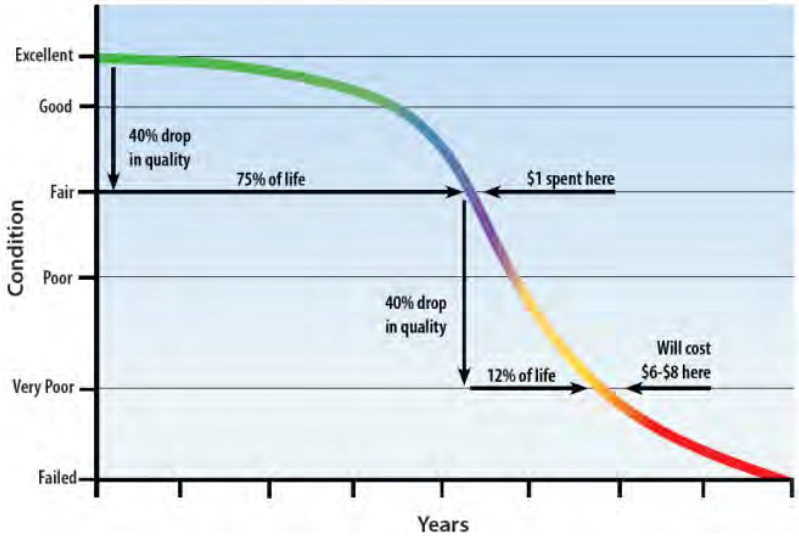
The Town of Douglas, in December 2019, retained the firm of Stantec, to develop and implement a Pavement Management System (PMS) for its roadway system. From the first meeting with Town Administrator, Matt Wojcik, Town Engineer, Bill Cundiff, and Highway Department staff, it was clear that the Town of Douglas is committed to improving their roadway infrastructure to the greatest extent possible. This comprehensive study was undertaken to continue the Town's commitment to long-term capital improvement planning and further to develop a new, on-going preservation maintenance plan with its pavement management system. The pavement management system contains an extensive roadway database describing actual pavement conditions and roadway characteristics in Douglas to better understand future roadway conditions and needs at various funding levels.

This report is designed to be a network level planning tool and intended to provide a foundation for managing the Town's roadway resources by combining technology, local knowledge, and professional engineering input. Before describing the roadway management study, scope, and findings, an introduction to pavement management concepts and theory is offered.

PAVEMENT MANAGEMENT CONCEPTS

The development of a pavement management system is a logical approach public works officials use to allocate cost effective road budgets. The theory of pavement management is based on accurately predicting accelerated roadway deterioration. Figure 1 dramatically illustrates the key concept of making timely maintenance repairs, thereby averting the need for far more expensive structural repairs/reconstruction. The goal is to save money in both the short and long run by developing a road repair program that minimizes expenditures.

Figure 1
Pavement Deterioration Curve



The curve shows the rate at which pavement condition deteriorates over time (Figure 1). A roadway worsens slowly at the beginning of its projected life span (the portion of the graph where the curve is nearly horizontal). The level of deterioration per year increases drastically (the portion where the curve becomes nearly vertical) as the pavement reaches near middle age. When the pavement is near the end of its projected life span, the pavement worsens at a slower rate once again (the curve returns to near horizontal). The point where the pavement approaches middle age, before the curve drops off sharply, is considered the *critical zone* in the pavement's life. Before this point, it is relatively inexpensive to keep a roadway in good service; however, after this point it becomes much more expensive to keep the roadway in good service condition. It is important to note that Figure 1 displays a generic pavement deterioration curve- the actual curve depends on the rating scale used to collect the data.

The pavement management system formalizes the process using computer software. The procedure is to collect, organize, and maintain a complete roadway database that describes a particular road network system. This data is then analyzed to identify existing deterioration levels, prioritize cost-effective repairs, and create an optimal long-term spending plan. As a result, pavement management provides the Town with a tool to make the best use of every available dollar.

STUDY APPROACH

In the Spring of 2020, Stantec field engineers used field tablets to conduct a town-wide roadway inventory and assessment, which included a detailed evaluation of key distress indicators on the roadway surfaces, to build a comprehensive database. The process entailed breaking out pavement management segments, closely observing and recording individual pavement distresses, and determining roadway sufficiency, such as sidewalk and drainage conditions.

Roadways were partitioned into "pavement management segments" whenever there was a change in pavement condition, surface type, width, or other distinguishing characteristics. The pavement management sections were then given a descriptive name that would best allow someone in the Highway Department to identify the field location. Appendix A contains all the pavement management segments identified and sorted in alphabetical order.

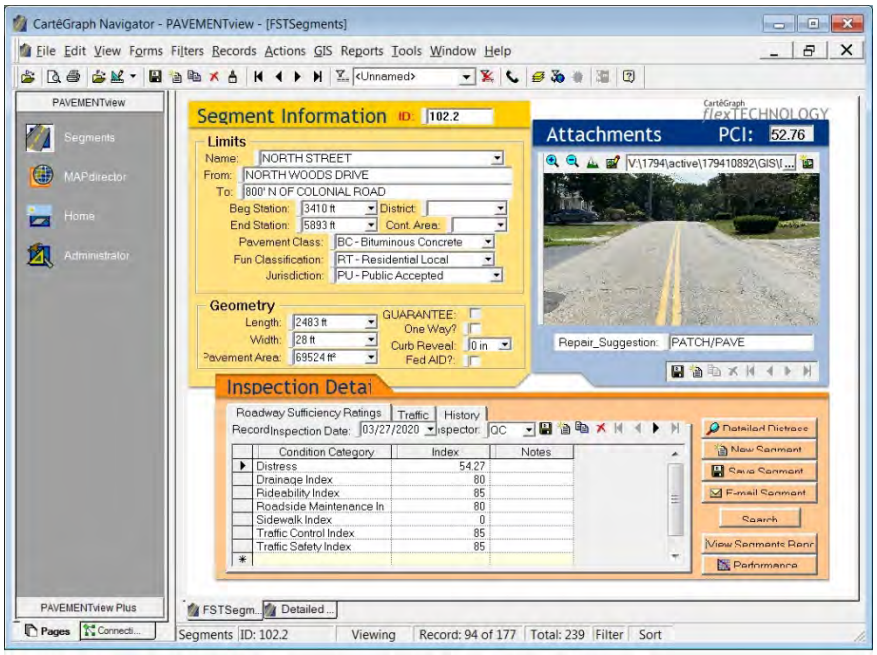
Following the completion of the pavement segmentation, system configuration meetings with the Highway Department were held to gather information for subsequent computer analysis at various funding levels.

2 METHODOLGY

2 METHODOLOGY

Pavement Management Software

Today's computer management technology allows consolidation of multiple data for easy and efficient building, editing, sorting, and reporting. Stantec used Cartêgraph Systems, Inc.- PAVEMENTview®Plus software for storing and analyzing Douglas's roadway data. The database was tailored to reflect Douglas's decision-making criteria for selecting roadway repair types for available and proposed budgets. Douglas's Highway Department and Stantec jointly developed system configuration parameters used in the analysis projections.



For analyzing Douglas's roadway system, the Pavement Condition Index (PCI) served as the primary condition index to compare the roadway serviceability and performance. PCI is an American Society for Testing & Materials (ASTM) method used to quantify pavement condition that has been verified and adopted by American Public Works Association (APWA). For PCI calculation, the severity and extent of major pavement distresses were imported from the data collection effort into Cartegraph and calculated based on ASTM distress standards within the Cartegraph software. The distresses included: potholes or non-utility patching, alligator cracking, distortion, rutting, block cracking, transverse or longitudinal cracking, bleeding or polished aggregate, surface wear or raveling, and shoving, slippage or corrugations. Three (3) pavement surface types were used for analyzing Douglas's pavements:

- "Hot Mix Asphalt" or "bituminous concrete" roadway is typically engineered with a pavement structure designed to withstand predicted traffic load and volume. The roadway usually has a gravel base, an intermediate course, and a top surface wearing course.
- "Gravel" roads having dirt or gravel unbound road surfaces.
- "Chip Seal" treatments, which consist of a mixture of asphalt emulsion, small aggregate and chemical additives, are applied to hot mix asphalt roads with minor cracking or raveling as a preventive maintenance measure.

The Pavement Condition Index (PCI) Defined

Recording of actual field distresses calculate the PCI. A PCI was generated for each inventoried and surfaced public roadway in Douglas using distress data. PCI is measured on a one hundred to zero scale, with one hundred representing a pavement in excellent condition and zero describing a pavement in extremely poor condition. Each type of observed pavement distress is assigned a deduct value based on the distress type, severity, and extent.

More severe distress types, such as potholes, have higher "deduct points" than a lesser distress, such as longitudinal cracking. A weighted sum of the deduct points is then subtracted from the perfect "one hundred" road in order to generate a PCI for each roadway. In general, base related (the pavement foundation) distresses are weighted more heavily than surface related distresses.

The Five Treatment Repair Bands

Stantec's pavement management software decision matrix uses five broad category ranges to group the calculated PCI numbers into five major repair bands. An individual road segment will fall into a particular band based on user defined criteria such as pavement type, functional classification, and curb reveal. Then each segment is assigned a repair alternative candidate with the prescribed treatment band. Table 1 presents the category ranges represented by the PCI bands.

Table 1
(PCI) Treatment Band Ranges[1]

DO NOTHING PCI Band #1 (100 - 88 PCI)	Excellent Condition - in need of no immediate maintenance.
ROUTINE MAINTENANCE PCI Band #2 (87 - 68 PCI)	Good Condition - may be in need of crack sealing and minor localized repair.
PREVENTIVE MAINTENANCE PCI Band #3 (67 - 47 PCI)	Fair Condition - pavement surface in need of patching and thin overlay or surface sealing.
STRUCTURAL IMPROVEMENT PCI Band #4 (46 - 25 PCI)	Poor Condition - pavement structure in need of additional thickness to resist traffic loading.
BASE REHABILITATION PCI Band #5 (25 - 0 PCI)	Failure Condition - in need of full depth reconstruction/reclamation.

1. When roads are in near perfect condition, the **Do Nothing** category (Band #1) prescribes no maintenance.

2. **Routine Maintenance** (Band #2) is regularly used on roads in reasonably good condition to prevent deterioration from the normal effects of traffic and pavement age. This treatment

[1] The PCI ranges given in this table are general averages. The actual treatment band threshold numbers depend on pavement surface type and functional classification.

category would include either crack sealing and/or local repair of pothole, raveling, poorly constructed utility patch, etc.

3. **Preventive Maintenance** (Band #3) or 'Preservation Maintenance' is a slightly greater response to more pronounced signs of age and wear than that of Band #2. Not only would crack sealing, full-depth utility patching, and minor leveling be included, but also surface treatments such as hot-in-place recycling, micro-surfacing, and thin-lift overlay treatments may apply on selected facilities and pavement types. A road in need of Preventive Maintenance is in the critical zone of the pavement deterioration curve (Figure 1). It is in this range of a pavement's life cycle that the most cost-effective repairs can be made. Further deterioration warrants a significantly more costly response.

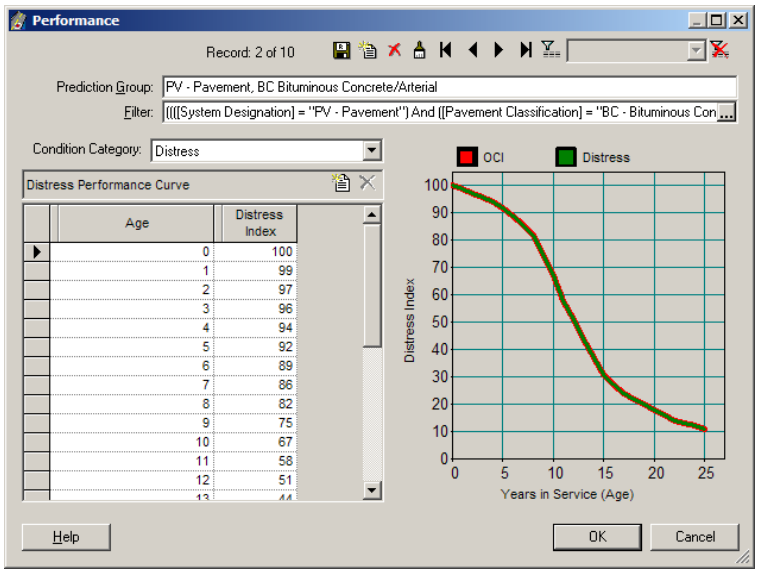
4. When the pavement deteriorates beyond the need for surface maintenance applications, but the road base appears to be sound, **Structural Improvement** (Band #4) repairs are in order. They could include structural overlays, shim and overlay, cold planing and overlay, and hot in-place recycling.

5. The **Base Rehabilitation** category (Band #5) represents roads that exhibit weakened pavement foundation base layers. Complete reconstruction and full depth reclamation fall into this category. Quite often, project level pavement evaluation through field sampling and laboratory testing is used to evaluate the existing materials for possible recycling or reuse.

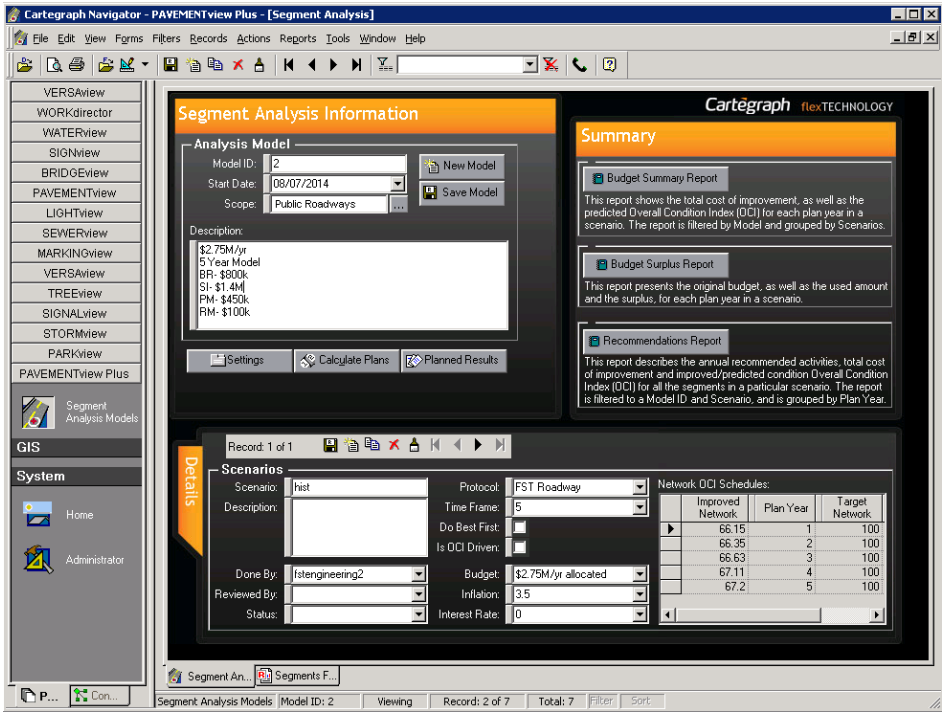
Priority Ranking and Future Projection

After all pavement segment repairs are assigned, the software prioritizes needed system repairs based on the highest projected Network Priority Ranking (NPR). The NPR value uses variables representing functional classification, pavement type, PCI, and traffic volume. Although road repairs could be prioritized on a "worst first" basis, Stantec and Douglas Highway Department chose to maximize its available road funds by generating an NPR that favors cost-effective repairs that improve and/or maintain salvageable pavement segments. This would delay repair actions on those segments that require reconstruction or major rehabilitation; i.e., their condition cannot deteriorate much further. After the relatively good roads are "preserved", future repairs are then directed toward the poorer, heavily traveled roads.

In order to properly plan future repairs, the software utilizes several different deterioration curves.



These pavement performance curves depict four (4) major categories relative to functional classification (arterial roads in one curve, collectors in one curve, local through roads in one curve and local dead-end roads in another curve) and two (2) fundamental pavement systems (a curve for Hot Mix Asphalt pavements and a curve for gravel surfaces). When a road segment is evaluated as to whether it should be included in future repair programs, it's deterioration is predicted by the applicable curve shown for the model duration, which accounts for the differential effects of traffic volume and pavement type.



Each plan year, the software prepares a future roadway condition projection, exhausts the assigned budget, and then produces an annual list of road segments to include in the repair program. The system also takes inflation into account for the time value of money. In these cases, a 2.9% inflation rate was used. Having explained the methodology built into the pavement management software, the next section describes the existing conditions on public roads in Douglas.

Stantec

3 EXISTING CONDITIONS

3 EXISTING CONDITIONS

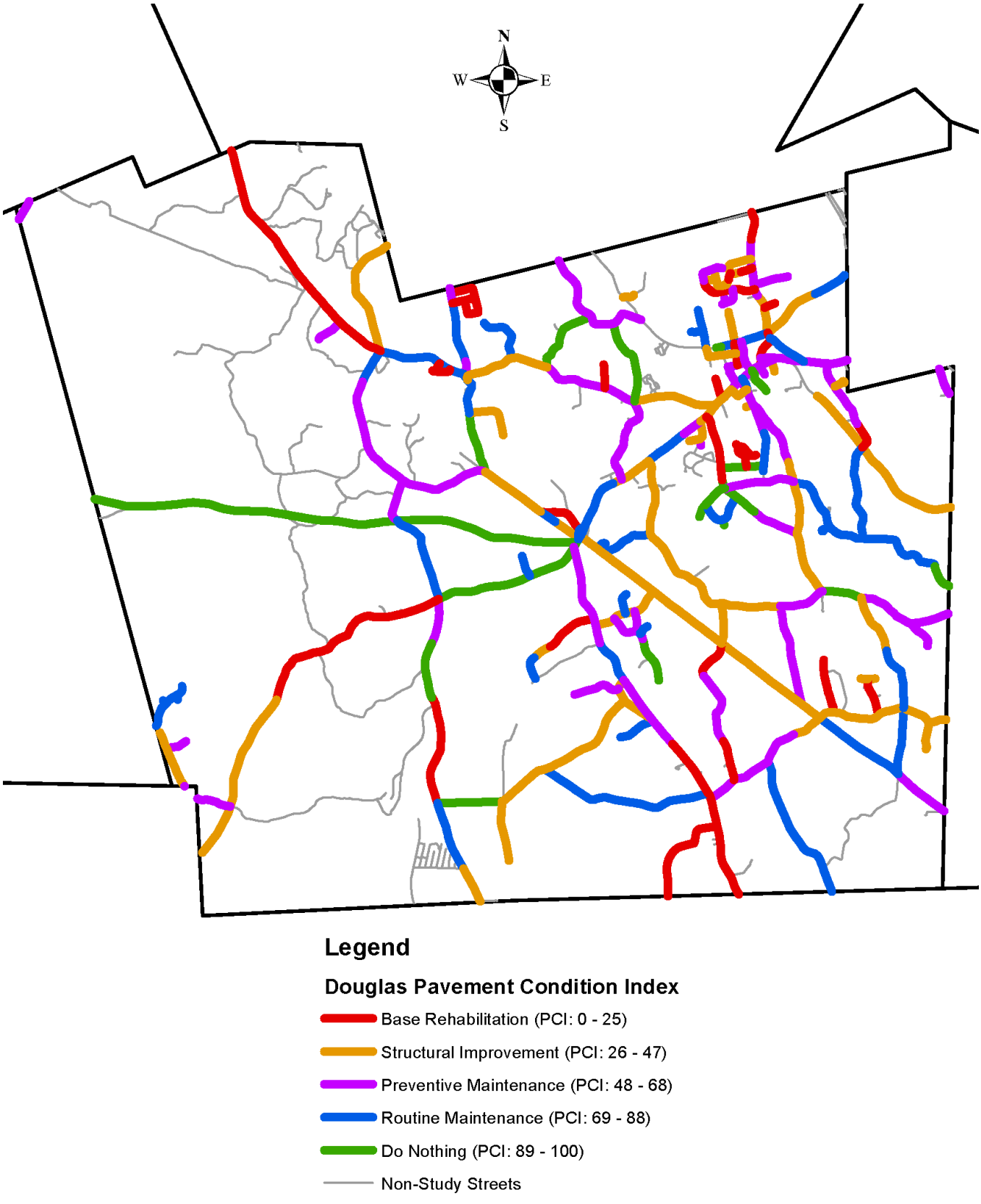
Roadway Mileage and Current PCI

Douglas has 112 public streets that make up 83.0 miles. This public roadway system is predominantly hot mix asphalt (bituminous concrete) roadway surfaces. Stantec identified 177 pavement management segments and determined that the Town's average road network PCI in the Summer of 2020 was 54, placing Douglas's typical road conditions in the bottom of the Preventive Maintenance treatment band (PCI range from 67 to 47). This PCI average value generally represents a roadway in "fair" condition.

An average road condition in this range by definition means that sensible resources will be needed to sustain network wide road conditions as a significant portion of the network is in Preventive Maintenance. It is likely that while any proposed pavement management spending plan will strive to maximize the benefit of each dollar spent, without a pre-emptive strike the system will undoubtedly continue to lose roads from the routine and preventive maintenance category into the structural improvement and base rehabilitation treatment bands. This very costly loss will present a challenge to Douglas officials if the Town wants to retain its roads in good condition.

The following map (Figure 2) shows current pavement conditions in the Town followed by photographs illustrating examples of Douglas roadways that fall into each of the five treatment repair bands, and a roadway representative of the average Town roadway condition. The photographs also show the location and the PCI value for each treatment band.

Figure 2
Town Wide Pavement Conditions



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PCI = 98 **DO NOTHING**

Webster Street from Southwest Main Street to Webster Townline

PCI = 85 **ROUTINE MAINTENANCE**

Yew Street from Southeast Main Street to Glen Street

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PCI = 60 **PREVENTIVE MAINTENANCE**

Locust Street from Yew Street to Southeast Main Street

PCI = 38 **STRUCTURAL IMPROVEMENT**

Linden Street from Southeast Main Street to Uxbridge Townline

Stantec

PCI = 11 **BASE REHABILITATION**

Fairbanks Court from Linden Street to Dead End

TOWN AVERAGE PCI = 54

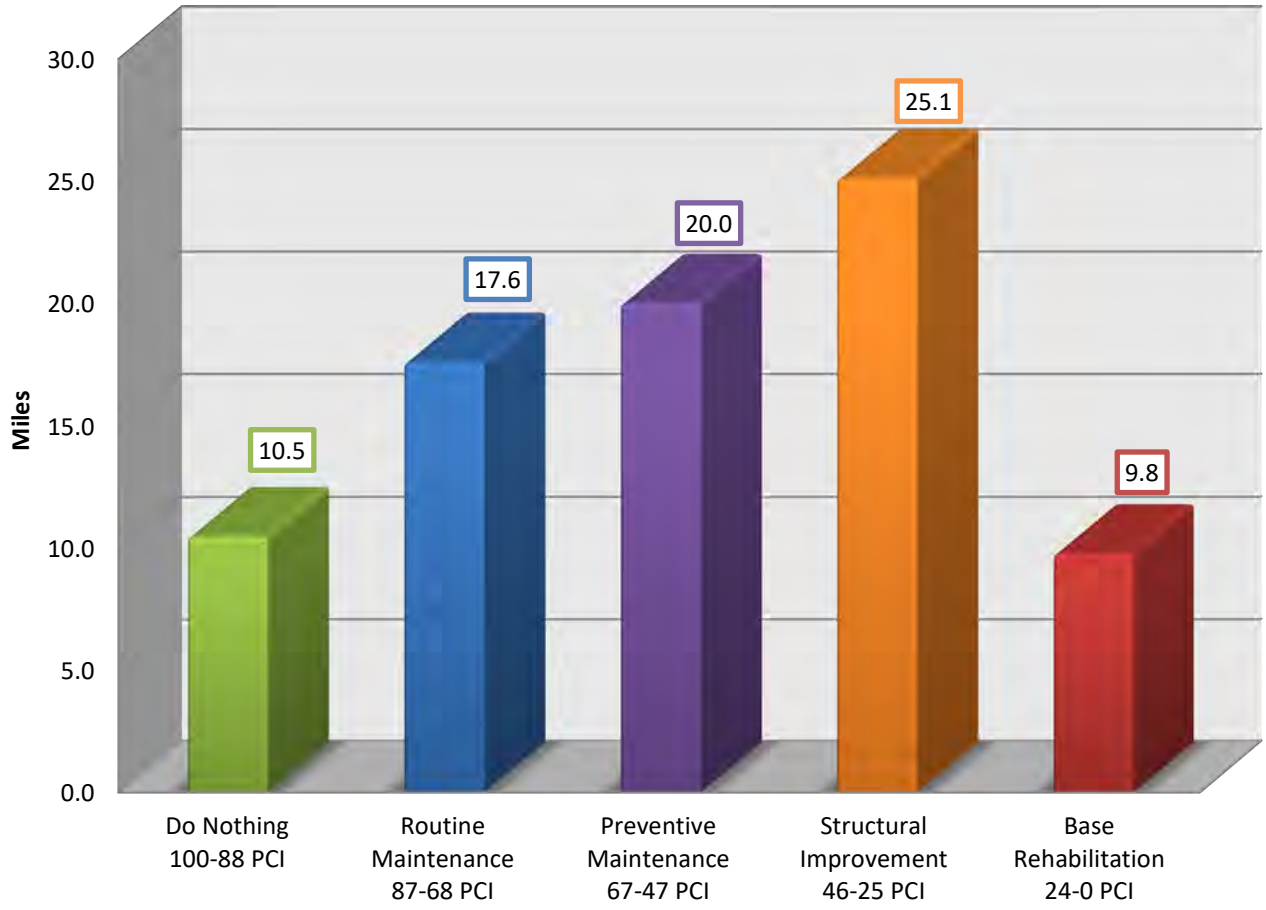
Cook Street from Gilboa Street to Main Street

Stantec

Distribution of Pavement Conditions

A categorization of the surveyed pavement segments depicted in Figure 3 shows that 13% (10.5 miles) of the roadways fall into the "Do Nothing" band; 21% (17.6 miles) of the roads are in the "Routine Maintenance" band; 24% (20.0 miles) of the roads are in the "Preventive Maintenance" band; 30% (25.1 miles) of the roads are in need of "Structural Improvement"; and 12% (9.8 miles) of the pavement segments are in need of "Base Rehabilitation". The distribution of treatment band miles in Douglas is fairly good as only 12% of the network requires 'Base Rehabilitation.' It is recommended for the Town to adopt a pavement management strategy for future years to maintain a healthy distribution of network miles.

Figure 3
PCI Distribution in Miles by Treatment Band



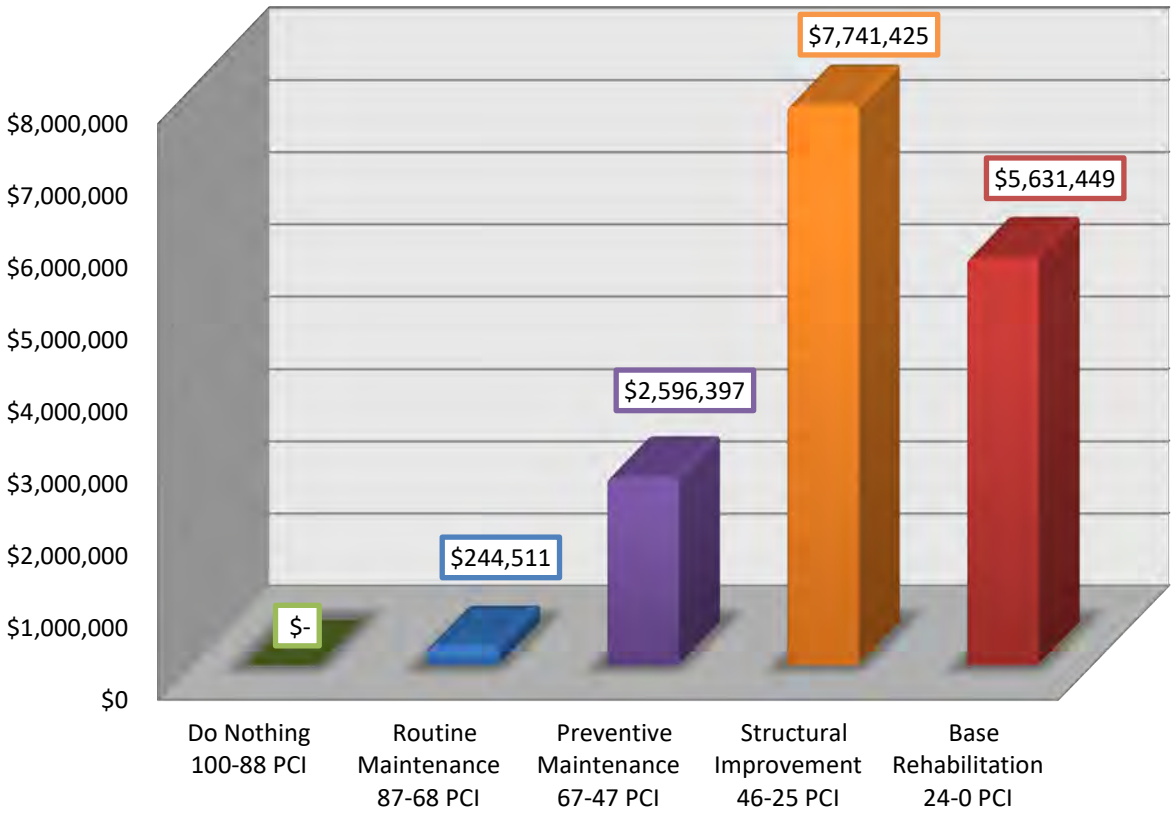
For planning purposes, Base Rehabilitation type repairs range between $30-$45 per square yard depending on functional classification and drainage conditions, Structural overlay improvement costs are between $18-$25 per square yard pending on the thickness of pavement being resurfaced, Preventive maintenance costs about $6-12 per square yard, and routine maintenance is in the $1-2 per square yard range.

Current Roadway Backlog

Backlog is defined as the cost of repairing all the roads within one year and bringing the average PCI to a near perfect 100. Backlog is a "snapshot" or relative measure of outstanding repair work. The backlog not only represents how far behind the Douglas roadway network is in terms of its present physical condition, but its cost value serves as a benchmark to measure the impact of various funding scenarios. A backlog offers a basis for comparison to future and/or past year's backlog(s). Backlog dollars represent the pavement structure only; it does not include related repair cost for sidewalk, pedestrian ramp improvements, utilities, drainage, signals, unless specified within the activity.

As of August 2020, Douglas's backlog of pavement repair work totaled $16,213,72. This cost estimate consists of $5,631,449 in base rehabilitation; $7,741,425 in structural improvement work; $2,596,397 in preventive maintenance, and $244,511 in routine maintenance. The figure below summarizes costs by treatment band. Note that nearly **82%** of the backlog is dedicated to expensive capital repair bands.

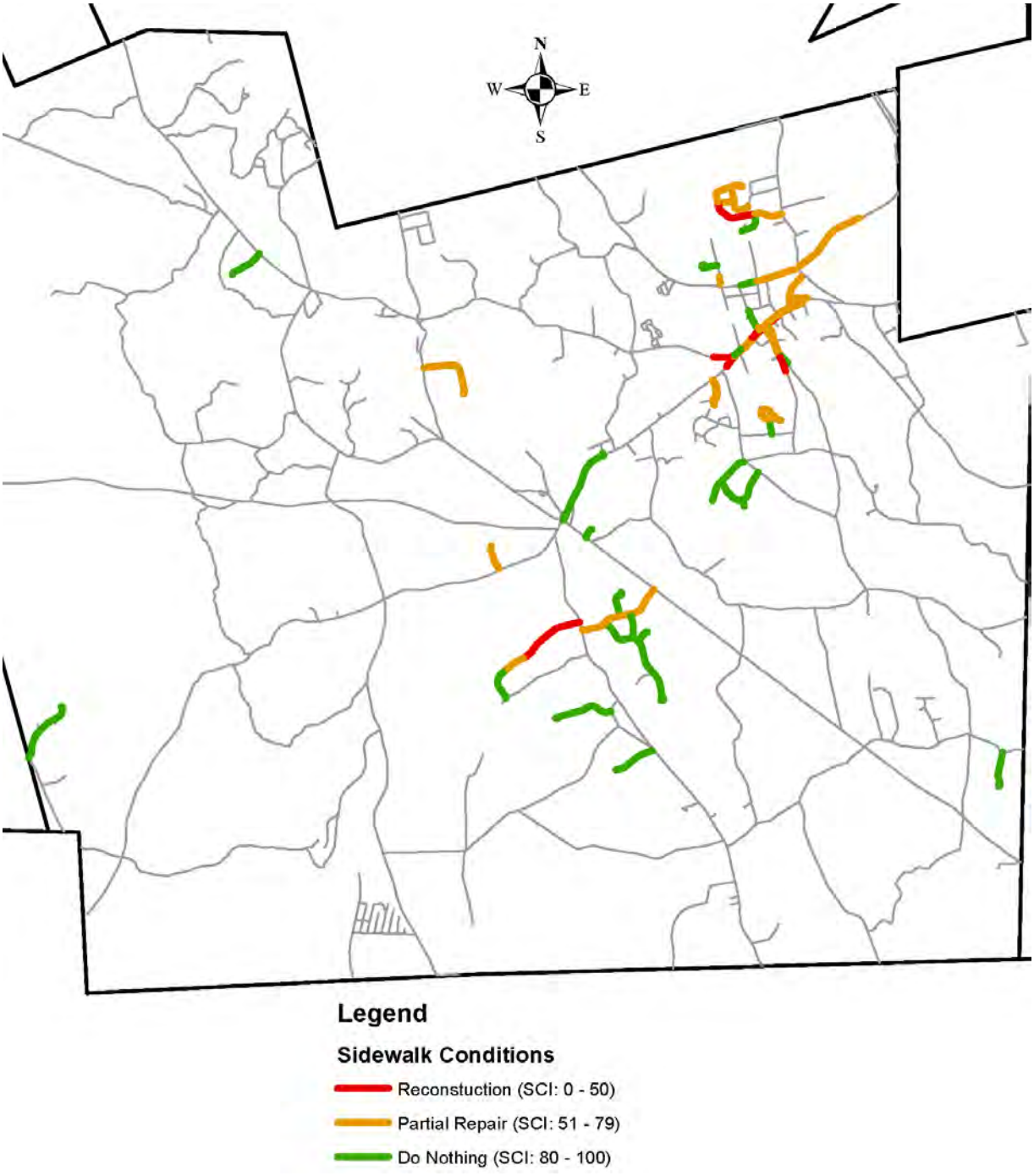
Figure 4
Dollar Backlog of Outstanding Repairs



Current Sidewalk Conditions and Backlog

In addition to the pavement backlog, Stantec inventoried approximately 15.2 miles of public sidewalks during our field assessment. The average area-based Sidewalk Network Index (SCI) as of August is **73.9**. Using repair costs based on varying sidewalk materials and conditions, Stantec determined Douglas's backlog for sidewalk maintenance and repair as of August 2020 to be **$882,527**. Below is a map (Figure 5) representing town-wide conditions.

Figure 5
Town Wide Sidewalk Conditions



4 MODEL/ PLANNING PROCESS

4 MODEL/PLANNING PROCESS

BUDGET ANALYSIS

The analysis software of the pavement management system is used to make financial determinations and projections. Consideration is given to the required budget, by repair type, based on the supplied information from meetings with Highway Department staff and Stantec for overall desired roadway network conditions.

A **regressive** spending program occurs when insufficient funds are invested in road repairs, resulting in an ever-increasing repair backlog. An **equilibrium** program spends enough money each year to keep the average PCI generally stable. A **progressive** program provides sufficient improvement funds to result in a reduction of the backlog over time. Various scenarios were analyzed for Douglas to measure the effects of alternative funding levels and to determine the funding needed to avoid regressive spending. The following scenarios are compared to today's current backlog (**$16,213,782)** along with the average PCI of 54 for the road network.

The planning process determines the most beneficial improvement plan based on the dollars available for each repair type and other factors. Pavement management pulls together these components in its Network Priority Ranking (NPR) value in order to develop a cost-effective program. As previously stated, the NPR was configured to maximize roadway funds. In all of the following model projections (except the Historical Budget Worst-First), the software was used to allocate funding amounts by best NPR value based on the pavement management theory. Pavement management theory recognizes that roads deteriorate in an accelerated fashion after the first 75% of their service life and, consequently, prioritizes timely road expenditures to avert far more costly and widespread repairs.

Scenario Findings

What follows is an overview of the budget/planning model results. Six budget/planning scenarios were modeled:

- Zero Budget Scenario
- Historical Budget (Worst First)
- Historical Budget (Pavement Management Strategy)
- Equilibrium (Maintain PCI) Funding Scenario
- Improve PCI Funding Scenario
- Front-Load Funding Scenario

After establishing Douglas's current backlog of work, Stantec projected the network average pavement condition index and backlog with a zero annual roadway appropriation for ten years; the expected budget appropriation rate for ten years with a priority on repairing the worst streets first; and the same historical budget allotment with a priority on pavement management theory; then, a ten year scenario showing funding levels needed to maintain the current PCI; and finally, the impact of a progressive ten year funding scenario.

All scenarios accounted for the "optimum" NPR with the exception of the Historical Budget (Worst First) where NPR focuses on repairing the worst segments first. The dollar amounts appropriated incorporate a 2.90% annual inflation rate. **Therefore, where the annual roads program appropriation appears to remain the same, it in fact represents a net budget decrease due to the impact of current inflation.**

In the scenario specific summary tables (Tables 3 -7) that follow, each plan begins with the same current network average PCI, and then shows the new network average PCI at the end of each plan period. The tables also use the same amount of outstanding repair work (current backlog) at the start of each plan period, so the first plan year backlog will appear the same for each of the scenarios. The successive years document the impact of the funding plan in comparison of road network average conditions and backlog.

Zero Budget Scenario

In recent history, funding for Douglas road repairs has come primarily from State Aid sources. Given the unreliability of consistent State funding, a worst-case scenario was developed to show how severely the Town would be impacted over a ten-year period by not funding any road repairs.

Table 2
Zero Budget

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$0	51.1	$18,327,980
FY 2023	$0	46.4	$22,183,742
FY 2024	$0	41.8	$24,930,346
FY 2025	$0	37.8	$28,516,094
FY 2026	$0	34.1	$31,446,497
FY 2027	$0	31.0	$35,032,082
FY 2028	$0	28.1	$37,585,145
FY 2029	$0	25.4	$40,930,736
FY 2030	$0	22.8	$46,354,970
FY 2031	$0	20.5	$51,021,904

In a ten-year period, the scenario shows that with no road maintenance funding, the network average PCI dropped from a PCI of 54 (the middle of the 'Preventive Maintenance' band) down to a PCI of 20.5 (the top of the 'Base Rehabilitation' band). Further, the numbers show the repair backlog is nearly *3.2 times* the original backlog at $16,213,782**.** The system-wide deterioration was dramatic because the concentration of roads in the 'Preventive Maintenance' band quickly slipped into the 'Structural Improvement' type repairs, and roads in the 'Structural Improvement' band fell into the most expensive repair band, the 'Base Rehabilitation' treatment range. This is regressive spending at its worst and this level of deterioration would not be expected to occur.

Historical Budget (Worst First)

Stantec met with Douglas's Highway Department staff to review historic funding levels and decided to use $360k/year (representative of recent annual Chapter 90 allocations) as the Historical Budget for future scenarios.

The Historical Budget (Worst First) scenario prioritized the worst street segments first, since these represent most citizen roadway complaints and repair requests.

Table 3
Historical Budget (Worst-First)

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$360,000	52.0	$17,968,135
FY 2023	$360,000	48.3	$21,453,162
FY 2024	$360,000	44.5	$23,819,230
FY 2025	$360,000	41.2	$26,716,316
FY 2026	$360,000	38.6	$29,073,366
FY 2027	$360,000	36.2	$32,099,958
FY 2028	$360,000	34.0	$34,002,532
FY 2029	$360,000	32.1	$36,620,694
FY 2030	$360,000	30.0	$41,371,891
FY 2031	$360,000	28.3	$45,412,898

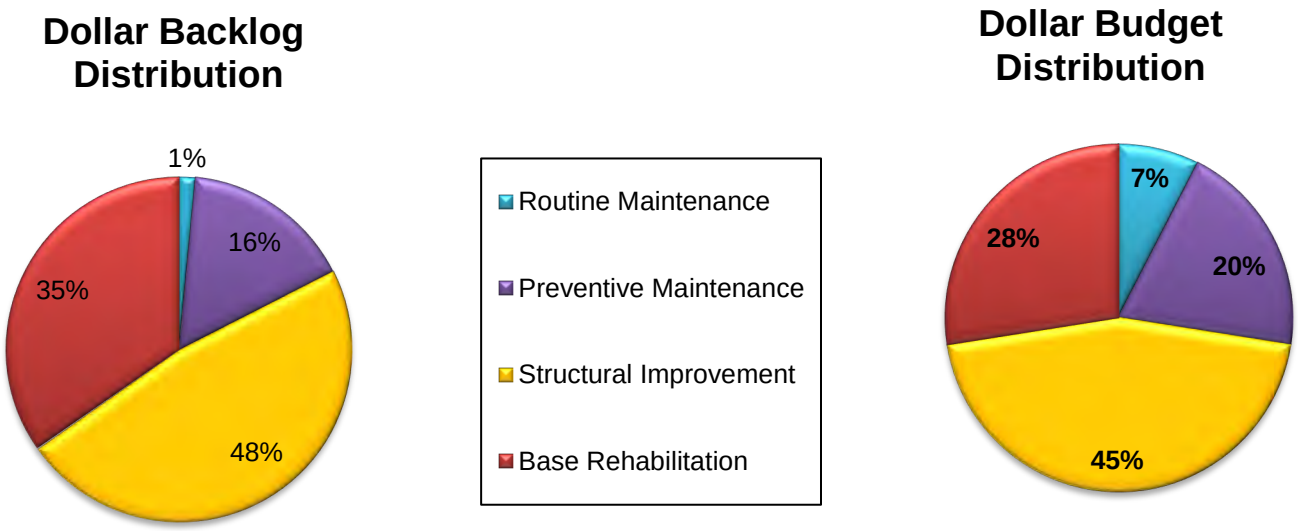
The network average PCI dropped from a PCI of 54 (the middle of the 'Preventive Maintenance' band) down to a PCI of 28.3 (the bottom of the 'Structural Improvement' band). If this funding level remains unchanged, by the year 2031, the present backlog of $16,213,782 will have grown to $45,412,898 in the tenth year of the projection. Although better than the Zero Budget scenario, this still reflects a serious regressive spending program.

Historical Budget (Pavement management strategy)

This Historical Budget scenario uses the same funding level as the previous scenario, except it utilizes Pavement Management Strategies to optimize the budget. The following strategies are used to optimize budget:

1) Create budget allocations based on the percentage of current miles and backlog costs dedicated for each treatment band. This strategy helps the Town understand how the miles are distributed and allocate funds to ensure negative trends do not occur over time. For this budget scenario the allocations presented in Figure 6 were used:

Figure 6
Backlog Distribution vs. Budget Allocation



As can be seen, a higher percentage was emphasized in Routine Maintenance and Preventive Maintenance, while a lower percentage relative to the total backlog was spent on Base Rehabilitation. The Pavement Management strategy helps ensure that not only the "fair" segments (Preventive Maintenance) are treated, but also segments continue to get resurfaced (Structural Improvement) before they get into the Base Rehabilitation treatment band.

2) In order to get the most of the allocations, a worst-first approach is used within each treatment band. This strategy is employed to utilize the budget to select segments which are on the verge of falling into more expensive treatment bands. By treating these segments now, the Town saves money based on the potential unit cost jump each segment would require when dropping to a lower treatment band.

3) Create a Network Priority Ranking (NPR) system which will prioritize "good" roads but also take into account factors such as 'Functional Classification' and 'Traffic' to ensure segments which are traveled more get attended to first.

By addressing this pavement management philosophy, and deferring the "poorer" roads, the network average PCI still regresses significantly, but is 12.8 points higher than the Worst-First approach. More importantly, by simply changing repair strategy, at the end of this ten-year scenario, the Town will have saved almost *$8.0 million dollars* (note: the backlog difference in FY 2031) by adhering to the pavement management concept.

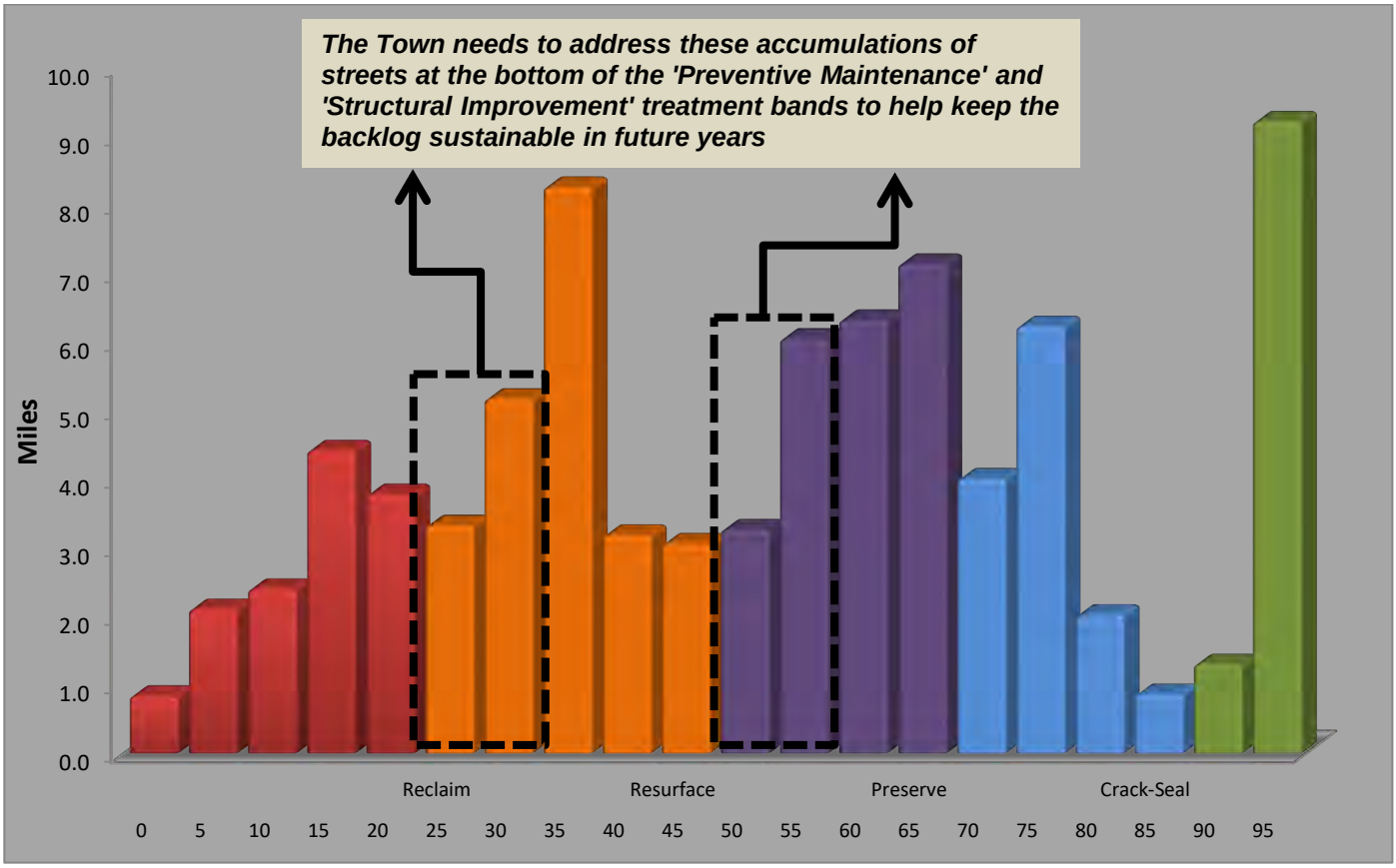
Table 4
Historical Budget (Pavement Management Strategy)

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$360,000	53.3	$17,968,912
FY 2023	$360,000	50.6	$21,822,368
FY 2024	$360,000	47.9	$22,822,368
FY 2025	$360,000	45.5	$24,873,181
FY 2026	$360,000	44.0	$26,848,285
FY 2027	$360,000	43.2	$29,455,611
FY 2028	$360,000	42.1	$30,669,602
FY 2029	$360,000	41.7	$32,464,392
FY 2030	$360,000	41.3	$35,038,186
FY 2031	$360,000	41.1	$37,567,167

While this budget represents regressive spending, the scenario illustrates the importance of not directing roadway funds towards the worst streets, but rather "preservation" maintenance repair types such as crack sealing and surface treatments. It is important to note that even with the best use of the current budget, the average PCI still drops 13.2 points. This trend shows that maintaining current funding levels is not enough to prevent segments from dropping to more expensive treatment bands resulting in an exponentially growing backlog.

Figure 7 shows the histogram of current network conditions broken down by intervals of 5 PCI points to further demonstrate the need to increase funding on the road network.

Figure 7
PCI Histogram of Network Conditions



As seen in Figure 7, Douglas currently has a broad distribution of miles throughout the treatment bands. A large portion of the Town's road network requires 'Preventive Maintenance' with a substantial amount of mileage dedicated to 'Structural Improvement' and 'Base Rehabilitation'. The Town has some serious work ahead.

In order for the Town to maintain this distribution, it is vital to sufficiently fund the mileage at the bottom of both the 'Structural Improvement' and 'Preventive Maintenance' treatment band to prevent roadways from deteriorating into more expensive treatment bands and thus inflating the backlog, as shown in the dashed boxes in Figure 7.

Equilibrium Funding Scenario

Recognizing that an increase in local dollars will be needed to maintain Town-wide road conditions, a scenario that would generally keep the PCI and backlog at today's levels over a ten-year time period was evaluated.

This alternative would perform cost-effective repair work identified by existing conditions to maintain the current network conditions. The work would be done over a ten-year period costing $12,600,000, which would require $1,260,000 per year.

Table 5
Maintain PCI Funding Scenario

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$1,260,000	54.9	$17,062,166
FY 2023	$1,260,000	54.1	$18,894,129
FY 2024	$1,260,000	53.6	$19,428,159
FY 2025	$1,260,000	52.9	$20,449,290
FY 2026	$1,260,000	52.7	$20,797,675
FY 2027	$1,260,000	54.3	$21,849,527
FY 2028	$1,260,000	54.8	$21,977,109
FY 2029	$1,260,000	54.6	$22,441,200
FY 2030	$1,260,000	55.1	$23,988,843
FY 2031	$1,260,000	56.2	$25,495,874

This funding scenario would allow the Town to spend sufficiently on streets in need of capital repair, while also maintaining a preventive and routine maintenance program. The PCI increases slightly throughout the projection, finishing at 56.2 (in the middle of the 'Preventive Maintenance' band), with the backlog of repair work only increasing slightly over the next ten years. This scenario represents how much the Town should strive to spend at a minimum.

By spending $9.0 million dollars more than the current budget over ten years, this scenario allows for a more aggressive resurfacing program, which leads to fewer segments in the 'Base Rehabilitation' treatment band and a backlog that is $12 million less after 10 years compared to the historical budget with pavement management strategy.

Improve PCI Funding Scenario

Recognizing that Town Average pavement conditions are fair, a scenario to improve the PCI was investigated. This alternative would perform cost-effective repair work identified by existing conditions to maintain the current network conditions. The work would be done over a ten-year period costing $17,100,000, which would require $1,710,000 per year.

Table 6
Improve PCI Funding Scenario

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$1,710,000	55.5	$16,542,927
FY 2023	$1,710,000	55.8	$17,650,723
FY 2024	$1,710,000	56.6	$17,442,467
FY 2025	$1,710,000	57.0	$17,853,042
FY 2026	$1,710,000	58.4	$17,479,078
FY 2027	$1,710,000	59.5	$17,879,986
FY 2028	$1,710,000	62.1	$17,409,069
FY 2029	$1,710,000	63.6	$17,315,984
FY 2030	$1,710,000	65.7	$17,646,599
FY 2031	$1,710,000	68.4	$17,756,047

As shown in Table 6, this funding alternative would allow the Town to spend additional funds on streets in need of capital repair, while also maintaining a preservation program. Town average PCI increases throughout the projection, finishing at 68.4 (in the bottom of the 'Routine Maintenance' band), with the backlog of repair work remaining relatively level over the next ten years.

Progressive Front-load Funding Scenario

Lastly, a scenario to improve system-wide conditions was investigated. This scenario looks at spending the $22,400,000 over the next ten years and front-loading funds the first 5 years recognizing timing is crucial for Douglas to save money in the long run.

As can be seen from Table 7 below, the conditions of the network improve dramatically to 93.7, which is the middle of the 'Do Nothing' treatment band, while the backlog is erased down to $0 dollars after the eighth year of the projection.

Table 7
Progressive Funding Scenario

YEAR	FUNDING	PCI LEVEL	BACKLOG
Present		54.3	$16,213,782
FY 2022	$4,500,000	63.7	$13,820,048
FY 2023	$4,500,000	73.2	$11,161,559
FY 2024	$4,500,000	82.8	$7,282,825
FY 2025	$4,500,000	89.5	$3,302,286
FY 2026	$3,400,000	94.6	$61,500
FY 2027	$200,000	95.3	$29,060
FY 2028	$200,000	95.3	$67,855
FY 2029	$200,000	95.4	$46,352
FY 2030	$200,000	94.9	$0
FY 2031	$200,000	93.7	$0

By spending $5.3 million dollars more than the 'Improve PCI Funding' model over ten years, this scenario allows Douglas to realize a gain of 39.4 points in the average PCI to 93.7 and return to below current Chapter 90 level appropriations after the fifth year. This is a remarkable program.

Summary of Roadway Funding Scenarios

Figure 8
Average PCI of Roadway Funding Scenarios:

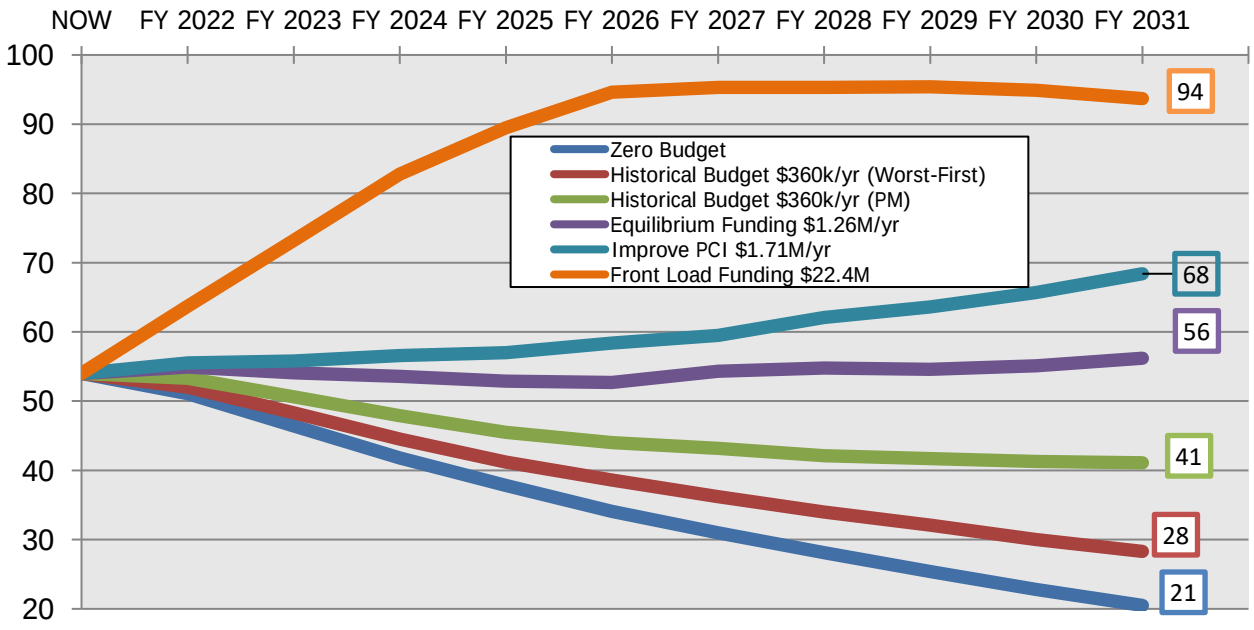
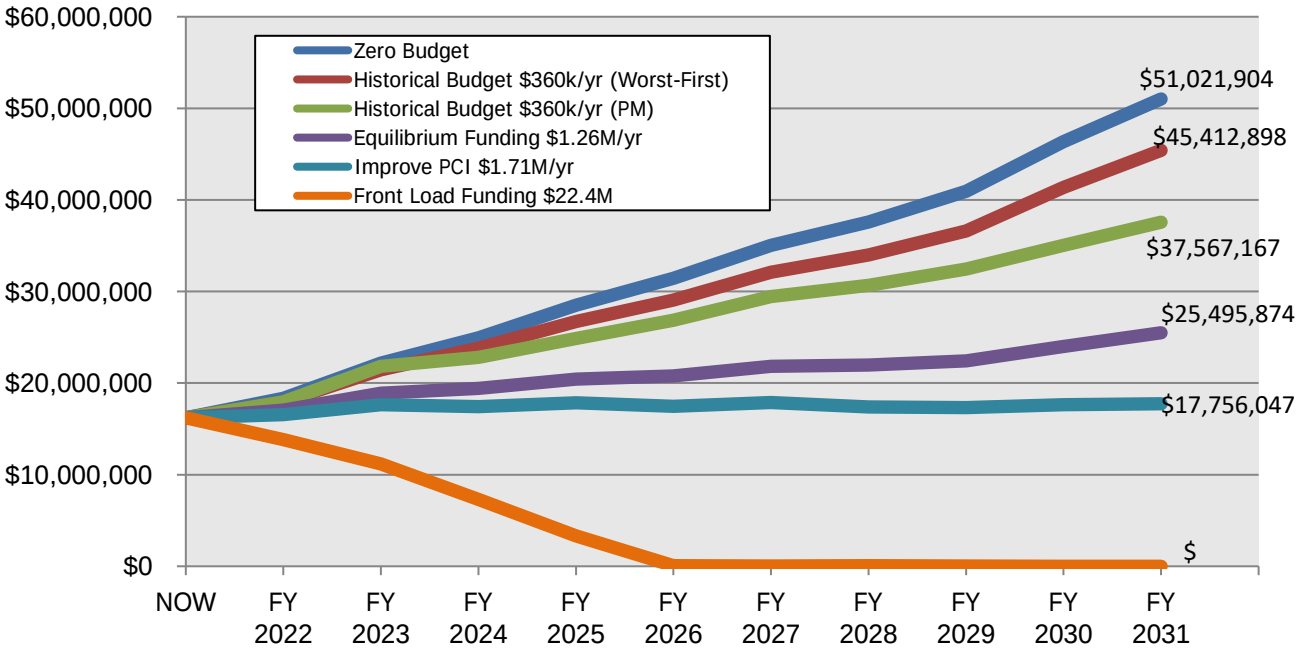


Figure 9
Future Backlog of Roadway Funding Scenarios:



Stantec

5 CONCLUSION

5 CONCLUSION

Recommended Plan of Action

The overall roadway network in the Town of Douglas is currently in fair condition. The findings in this report illustrate current funding levels are low and will not prevent expected roadway deterioration unless additional funding beyond Chapter 90 apportionment is budgeted. Future roadway funding levels need to be increased, as Douglas's annual budget needs to include an aggressive maintenance program for it's currently fair condition streets while also addressing extensive structural improvement needs. Additionally, it is recommended that roads be reviewed each year to confirm that deterioration is occurring at the expected computer model rates. Based on these reviews and inspections, an update to the pavement management software will provide the Town with a better understanding of its actual roadway degradation and confirmation of appropriate funding needs to prevent it.

If pre-emptive action is not taken, the large mileage of streets currently in need of routine and preventive maintenance will rapidly digress to poorer conditions that would subject the Town to far more expensive roadway work in the future. Today's roadway network currently sits at a "critical point" where the window of opportunity to perform cost-effective and major capital roadway repairs is presented.

The unit cost price for repairing segments increases drastically as the treatment bands worsen. For example, it is almost twice as expensive to repair segments in the 'Structural Improvement' band compared to those in the 'Preventive Maintenance' band. An optimum pavement management strategy was considered in which segments are treated at the most ideal time within each treatment band. This strategy recognizes which segments are on the verge of multiplying in repair expense and treats them to maximize taxpayer dollars. In executing this strategy, Stantec recognized that Douglas's current budget is not sufficient to treat enough of these segments and too many are seeping into the more expensive treatments. It is because of this that Stantec recommends that the Town should strive to secure between $12,600,000 and $17,100,000 for the next ten years to address its roadway backlog and gain control of its deteriorating roadways. Also, the Town should continue keeping abreast of the latest developments in pavement restoration technology that might offer a more cost-effective alternative to pavement maintenance or rehabilitation over the pavement's life cycle.

It's easy to forget that pavements are a community's single largest asset. The Town has a major investment in its 83-mile public roadway network. Simply considering the pavement surface alone, without water, sewer, drainage, curbing, or sidewalks assets, it would cost Douglas over $60,000,000 in today's dollars to completely replace the existing pavement infrastructure. Pavements are not perpetual, they're one of the Town's fastest deteriorating assets due to environmental effects, increased traffic loading, and utility cuts.

Additional roadway funding will protect Douglas's pavement assets, resulting in better overall roadway conditions and satisfaction that taxpayer dollars have been well spent.

Pavement Management System Maintenance

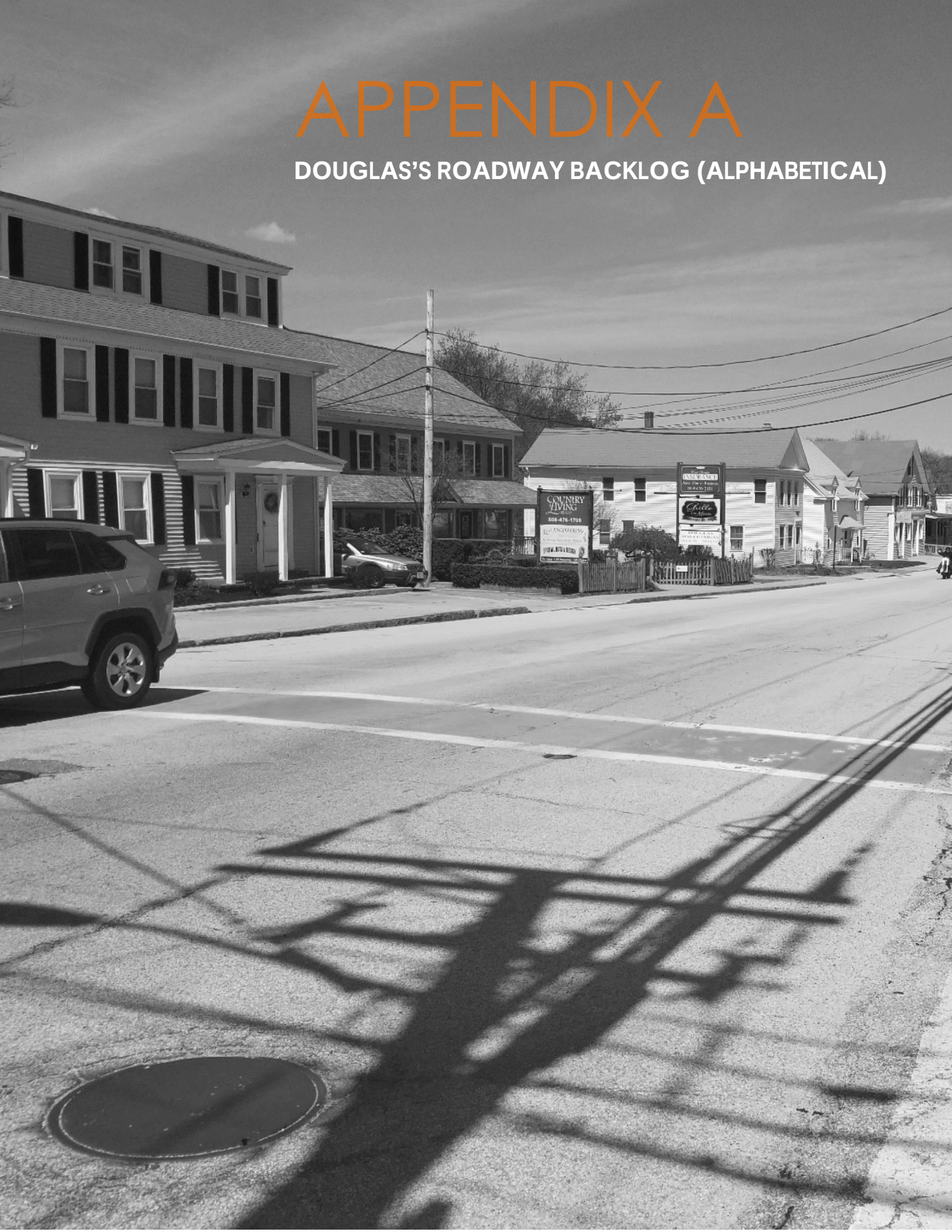
Pavement management is a systematic process that needs the long-term commitment of Town decision-makers and support of practitioners to maintain the pavement management system. Standard management and upkeep of the database include the following practices:

- Form a Pavement Management Committee. Members should include representatives from different Town departments, committees, and from both management and operational levels.
- Ensure total mileage of public streets under Douglas's jurisdiction (83.0 miles) are included in MassDOT's current Chapter 90 apportionment mileage (76.3 miles).
- Post all annual pavement management segment improvements into the database. Repair history information should be entered.
- Re-inspect Arterial and Collector roadways annually; local roads every two (2) years; dead end and cul-de-sacs every three (3) years. As an alternative, re-inspect 100% of Town every three (3) years.
- Add any new roadways to the database as soon as the Town accepts them. Pavement and roadside data can be added as it becomes available.
- Implement a sound departmental quality control/assurance program with particular focus on major pay items such as hot mix asphalt.
- Explore low cost base rehabilitation treatments such as asphalt stabilized base, leveling and

Stantec can support this proposed action plan using our transportation expertise and talents. In summary, the pavement management system should serve as a valuable tool to the Town of Douglas and to Douglas decision-makers in their pro-active approach to managing the Town's roadways.

APPENDIX A

DOUGLAS'S ROADWAY BACKLOG (ALPHABETICAL)



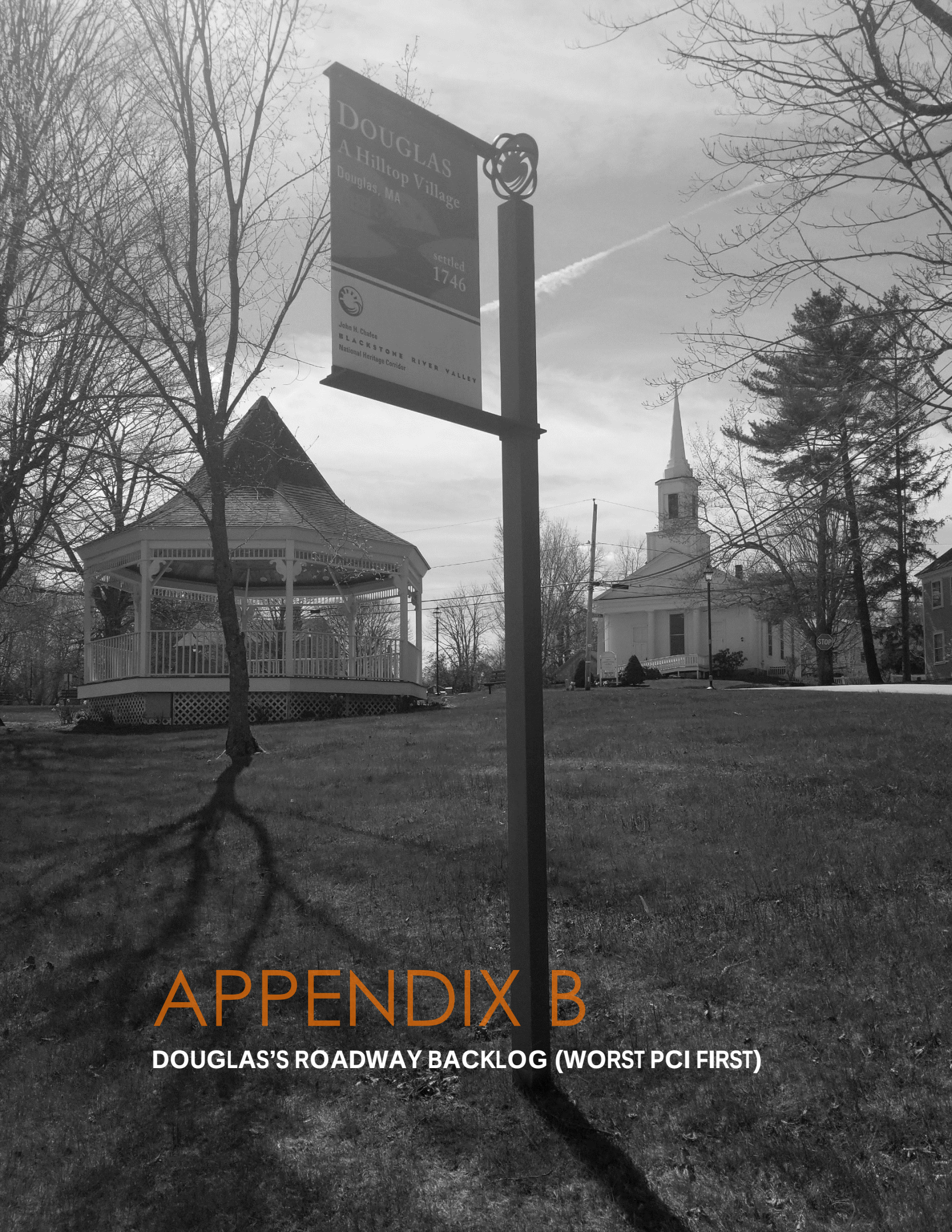
ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
1	A STREET	GILBOA STREET	CEMETERY STREET	1555	38.6	BC - 2" Overlay Local	$ 75,718
3	ARCH STREET	SOUTH STREET	SOUTH STREET	2432	38.4	BC - 2" Overlay Local	$ 96,891
5	B STREET	MANCHAUG STREET	COOK STREET	778	52.6	BC - 1-1/2" Mill & Overlay	$ 22,637
7	BELVOIR AVENUE	FOREST STREET	BIRCH STREET	1001	5.08	BC - Reclaim Local	$ 85,018
10	BIRCH STREET	NORTHWEST MAIN STREET	570' N OF NORTHWEST MAIN STREET	570	65.5	BC - Shim, Crack Seal & Patch	$ 10,288
10.1	BIRCH STREET	570' N OF NORTHWEST MAIN STREET	BELEVOIR STREET	2631	79	BC - Crack Seal or Patch	$ 3,333
10.2	BIRCH STREET	BELVOIR AVENUE	SUTTON TOWN LINE	672	60.6	BC - Shim, Crack Seal & Patch	$ 12,130
12	BOWEN COURT	NORTHEAST MAIN STREET	DEAD END	435	47	BC - 1-1/2" Mill & Overlay	$ 12,657
13	BRANDYWINE CIRCLE	DARLING WAY	CUL DE SAC	212	66.9	BC - Crack Seal and Patch	$ 684
14	BRIARWOOD CIRCLE	DOWNS ROAD	CUL DE SAC	934	76	BC - Crack Seal or Patch	$ 1,557
16	BROOKSIDE DRIVE	BROOKSIDE DRIVE	CUL DE SAC	2306	15.2	BC - Reclaim Local	$ 235,027
20	C STREET	NORTH STREET	NORTHEAST MAIN STREET	740	63.8	BC - Shim, Crack Seal & Patch	$ 16,872
22	CASWELL COURT	MANCHAUG STREET	DEAD END	1738	77.7	BC - Crack Seal or Patch	$ 3,128
24	CEDAR STREET	WALLIS STREET	WEBSTER STREET	1940	57.2	BC - 1-1/2" Mill & Overlay	$ 59,135
24.1	CEDAR STREET	WEBSTER STREET	SOUTHWEST MAIN STREET	4092	76.8	BC - Crack Seal and Patch	$ 12,103
25	CEMETERY STREET	B STREET	GILBOA STREET	946	0	BC - Reclaim Local	$ 88,381
26	CHARLES STREET	NORTH STREET	NORTHEAST MAIN STREET	1800	79.4	BC - Crack Seal or Patch	$ 3,000
27	CHESTNUT STREET	WALNUT STREET	SOUTH STREET	7713	68.7	BC - Crack Seal and Patch	$ 18,665
29	CHURCH STREET	COMMON STREET	NORTHWEST MAIN STREET	2073	22.4	BC - 2" Overlay Local	$ 91,765
30	CHURCHILL ROAD	SOUTHWEST MAIN STREET	DEAD END	947	71.3	BC - Crack Seal and Patch	$ 3,056
31	CLIFF STREET	WEBSTER TOWN LINE	OXFORD TOWN LINE	900	48.1	BC - 1-1/2" Mill & Overlay	$ 26,187
32	COBBLESTONE LANE	FRANKLIN STREET	OLDE CARRIAGE LANE	1161	92.5	Do Nothing	$ -
32.1	COBBLESTONE LANE	OLDE CARRIAGE LANE	CUL DE SAC	568	100	Do Nothing	$ -
33	COLONIAL ROAD	NORTH STREET (N)	500' W OF NORTH STREET (S)	1832	31.6	BC - 2" Mill & Overlay Local	$ 121,352
33.1	COLONIAL ROAD	500' W OF NORTH STREET (S)	NORTH STREET (S)	500	10.1	BC - Reclaim Local	$ 50,960
34	COMMON STREET	MAIN STREET	MAIN STREET	673	71	BC - Crack Seal and Patch	$ 1,900
35	CONSERVATION DRIVE	WEST STREET	DEAD END	2457	70.9	BC - Crack Seal and Patch	$ 7,267
36	COOK STREET	GILBOA STREET	MAIN STREET	1399	53.8	BC - 1-1/2" Mill & Overlay	$ 38,768
37	COTTAGE COLONY	NORTHWEST MAIN STREET	END OF PAVEMENT	1217	16.8	BC - Reclaim Local	$ 72,355
38	COTTAGE STREET	MAIN STREET	DEPOT STREET	877	30.6	BC - 2" Overlay Local	$ 34,940
39	CRESCENT LANE	MANZI WAY	500' S OF MANZI WAY	497	61.1	BC - Shim, Crack Seal & Patch	$ 11,804
39.1	CRESCENT LANE	500' S OF MANZI WAY	CUL DE SAC	1988	90.7	Do Nothing	$ -
40	CROSS STREET	MUMFORD STREET	WEST STREET	3287	95.4	Do Nothing	$ -
41	CUMMINGS COURT	NORTHEAST MAIN STREET	DEAD END	916	11.4	BC - Reclaim Local	$ 97,249
42	DARLING WAY	POND STREET	DEAD END	940	64.4	BC - Shim, Crack Seal & Patch	$ 21,432
43.1	DAVIS STREET	2050' S OF NE MAIN STREET	1100' S OF MONROE STREET	4142	34.7	BC - 3" Overlay Art/Col	$ 393,656
43.2	DAVIS STREET	1100' S OF MONROE STREET	UXBRIDGE TOWN LINE	3873	26.5	BC - 3" Overlay Art/Col	$ 368,090
44	DEPOT STREET	NORTHEAST MAIN STREET	560' S OF MARTIN ROAD	1692	62.7	BC - Shim, Crack Seal & Patch	$ 36,970
44.1	DEPOT STREET	560' S OF MARTIN ROAD	1400' S OF MARTIN ROAD	840	48.9	BC - 1-1/2" Mill & Overlay	$ 26,769

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
44.2	DEPOT STREET	1400' S OF MARTIN ROAD	DCR PATH	1670	81.4	BC - Crack Seal or Patch	$ 2,561
46	DOUGLAS HILL WAY	NORTHWEST MAIN STREET	DEAD END	2252	44.7	BC - 1-1/2" Mill & Overlay	$ 81,127
47	DOWNS ROAD	SOUTHEAST MAIN STREET	SOUTH STREET	3087	29.4	BC - 2" Overlay Local	$ 163,981
49	ELM STREET	YEW STREET	SOUTHEAST MAIN STREET	1778	43.9	BC - 2" Overlay Local	$ 59,030
50	ESSEX STREET	CRESCENT LANE	DEAD END	455	69.9	BC - Crack Seal and Patch	$ 1,468
51	FAIRBANKS COURT	LINDEN STREET	DEAD END	2341	10.9	BC - Reclaim Local	$ 238,595
52	FAIRFAX WAY	BIRCH STREET	FOREST STREET	966	5.31	BC - Reclaim Local	$ 98,455
53	FAIRWAY VIEW DRIVE	LINDEN STREET	CUL DE SAC	1215	45.2	BC - 1-1/2" Mill & Overlay	$ 42,086
54	FOREST STREET	FAIRFAX WAY	IRENE STREET	1095	8.91	BC - Reconstruction Local	$ 317,200
55	FRANKLIN STREET	MARTIN ROAD	540' E OF OLDE CARRIAGE LANE	2106	58.2	BC - Shim, Crack Seal & Patch	$ 42,015
55.1	FRANKLIN STREET	540' E OF OLDE CARRIAGE LANE	340' N OF COBBLESTONE LANE	2035	97.8	Do Nothing	$ -
55.2	FRANKLIN STREET	340' N OF COBBLESTONE LANE	NORTHEAST MAIN STREET	2885	23.7	BC - 2" Overlay Local	$ 134,095
56	GILBOA COURT	NORTH STREET	DEAD END	1513	62.7	BC - Shim, Crack Seal & Patch	$ 25,872
57	GILBOA STREET	MANCHAUG STREET	NORTH STREET	2339	68.8	BC - Shim, Crack Seal & Patch	$ 53,329
57.1	GILBOA STREET	NORTH STREET	1500' W OF OLD LACKEY DAM ROAD	2730	36	BC - 3" Overlay Art/Col	$ 297,897
57.2	GILBOA STREET	1500' W OF OLD LACKEY DAM ROAD	UXBRIDGE TOWN LINE	1523	79.1	BC - Crack Seal or Patch	$ 3,148
58	GILBOA STREET EXT	MANCHAUG STREET	GILBOA STREET	204	99.6	Do Nothing	$ -
60	GLEASON COURT WEST	NORTHEAST MAIN STREET	DEAD END	1107	100	Do Nothing	$ -
61	GLEN STREET	YEW STREET	NORTHEAST MAIN STREET	3277	35.9	BC - 2" Overlay Local	$ 123,303
62	GROVE STREET	MUMFORD STREET	WEST STREET	3775	91.1	Do Nothing	$ -
63	HEMLOCK STREET	SOUTH STREET	RHODE ISLAND STATE LINE	4478	22.7	BC - 2" Overlay Local	$ 208,138
64	HIGH STREET	SOUTHWEST MAIN STREET	CONNECTICUT STATE LINE	1573	54.1	BC - 1-1/2" Mill & Overlay	$ 45,769
64.1	HIGH STREET	CONNECTICUT STATE LINE	CONNECTICUT STATE LINE	2728	31.7	BC - 3" Overlay Art/Col	$ 201,654
65	HILLTOP DRIVE	TOWN LINE	CUL DE SAC	2204	79.5	BC - Crack Seal or Patch	$ 3,673
67	IRENE STREET	LUCY STREET	FOREST STREET	430	9.75	BC - Reconstruction Local	$ 124,563
72	JEPHERSON DRIVE	SOUTH STREET	CUL DE SAC	1616	70.3	BC - Crack Seal and Patch	$ 5,214
73	JOHNSON COURT	WEST STREET	DEAD END	1015	15.9	BC - Reclaim Local	$ 73,276
74	KELLY CIRCLE	SOUTHEAST MAIN STREET	DEAD END	463	79.8	BC - Crack Seal or Patch	$ 648
83	LINDEN STREET	SOUTHEAST MAIN STREET	UXBRIDGE TOWN LINE	5960	37.5	BC - 2" Overlay Local	$ 250,638
84	LOCUST STREET	YEW STREET	SOUTHEAST MAIN STREET	4388	58.1	BC - Shim, Crack Seal & Patch	$ 87,541
85	LUCY STREET	BELVOIR AVENUE	IRENE STREET	631	13.9	BC - Reclaim Local	$ 64,312
86	MADDEN WAY	SUNSET DRIVE	DEAD END	276	57.7	BC - Shim, Crack Seal & Patch	$ 6,031
87	MAIN STREET	SOUTHWEST MAIN STREET	600' W OF RIEDELL ROAD	2961	75.1	BC - Crack Seal and Patch	$ 11,147
87.1	MAIN STREET	600' W OF RIEDELL ROAD	GLEN STREET	1847	46.6	BC - 3" Overlay Art/Col	$ 182,040
87.2	MAIN STREET	GLEN STREET	760' S OF SUNSET DRIVE	1952	77.9	BC - Crack Seal and Patch	$ 7,348
87.3	MAIN STREET	760' S OF SUNSET DRIVE	100' N OF SUNSET AVENUE	907	55.6	BC - 1-1/2" Mill & Overlay	$ 35,188
87.4	MAIN STREET	100' N OF SUNSET AVENUE	COTTAGE STREET	1919	40.4	BC - 3" Overlay Art/Col	$ 243,176
87.5	MAIN STREET	COTTAGE STREET	NORTHEAST MAIN STREET	1636	67.3	BC - Shim, Crack Seal & Patch	$ 55,951
90	MANZI WAY	DOWNS ROAD	DOWNS ROAD	2091	50.7	BC - 1-1/2" Mill & Overlay	$ 66,636

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
91	MAPLE STREET	FRANKLIN STREET	MARTIN ROAD	3065	63.5	BC - Shim, Crack Seal & Patch	$ 46,588
91.1	MAPLE STREET	MARTIN ROAD	1100' W OF UXBRDIGE TOWN LINE	8083	78.8	BC - Crack Seal or Patch	$ 8,622
91.2	MAPLE STREET	1100' W OF UXBRDIGE TOWN LINE	UXBRIDGE TOWN LINE	1110	97.6	Do Nothing	$ -
92	MARILYN DRIVE	LINDEN STREET	SANDRA CIRCLE	1667	15.1	BC - Reclaim Local	$ 169,901
93	MARTIN ROAD	DEPOT STREET	890' N OF MAPLE STREET	3036	55.5	BC - 1-1/2" Mill & Overlay	$ 92,544
93.1	MARTIN ROAD	890' N OF MAPLE STREET	YEW STREET	6144	36.2	BC - 2" Overlay Local	$ 299,172
94	MECHANIC STREET	B STREET	NORTHEAST MAIN STREET	848	51.2	BC - 1-1/2" Mill & Overlay	$ 31,724
95	MEETINGHOUSE LANE	OLDE CARRIAGE LANE	DEAD END	246	97.4	Do Nothing	$ -
96	MONROE STREET	NORTHEAST MAIN STREET	YOUNG STREET	3019	60.7	BC - Shim, Crack Seal & Patch	$ 57,361
96.1	MONROE STREET	YOUNG STREET	DAVIS STREET	1225	23.5	GR - Gravel & Drain Improvement	$ 17,803
96.2	MONROE STREET	DAVIS STREET	MAPLE STREET	4245	71.2	BC - Crack Seal and Patch	$ 11,414
98	MOUNT DANIELS WAY	HIGH STREET	DEAD END	924	52.9	BC - 1-1/2" Mill & Overlay	$ 32,006
99	MUMFORD STREET	MANCHAUG STREET	SUTTON TOWN LINE	5661	64.8	BC - Shim, Crack Seal & Patch	$ 112,937
101	NEWPORT DRIVE	CASWELL COURT	CUL DE SAC	700	68.4	BC - Crack Seal and Patch	$ 1,882
102	NORTH STREET	NORTHEAST MAIN STREET	GILBOA STREET	1668	23.2	BC - 2" Mill & Overlay Local	$ 128,903
102.1	NORTH STREET	GILBOA STREET	NORTH WOODS DRIVE	1742	25.4	BC - 2" Overlay Local	$ 107,958
102.2	NORTH STREET	NORTH WOODS DRIVE	800' N OF COLONIAL ROAD	2483	51	BC - 1-1/2" Mill & Overlay	$ 96,329
102.3	NORTH STREET	800' N OF COLONIAL ROAD	SUTTON TOWN LINE	1237	16.7	BC - Reconstruction Local	$ 418,056
104	NORTHEAST MAIN STREET	WEBSTER STREET	UXBRIDGE TOWN LINE	3937	53.2	BC - 1-1/2" Mill & Overlay	$ 152,738
105	NORTHWEST MAIN STREET	COMMONS STREET	660' S OF CHURCH STREET	1201	46.1	BC - 2" Overlay Local	$ 45,190
105.1	NORTHWEST MAIN STREET	660' S OF CHURCH STREET	CHURCH STREET	771	86.2	BC - Crack Seal or Patch	$ 874
105.2	NORTHWEST MAIN STREET	CHURCH STREET	WALLIS STREET	2969	45.7	BC - 2" Overlay Local	$ 111,714
105.3	NORTHWEST MAIN STREET	WALLIS STREET	DOUGLAS HILL WAY	2680	97	Do Nothing	$ -
105.4	NORTHWEST MAIN STREET	DOUGLAS HILL WAY	OAK STREET	5680	71.1	BC - Crack Seal and Patch	$ 12,982
105.5	NORTHWEST MAIN STREET	OAK STREET	RIDGE TRAIL	4299	9.17	BC - Reclaim Local	$ 310,359
105.6	NORTHWEST MAIN STREET	RIDGE TRAIL	TOWN LINE	6948	19.3	BC - Reclaim Local	$ 501,599
106	OAK STREET	NORTHWEST MAIN STREET	150' S OF PARKER ROAD	3897	41.3	BC - 2" Overlay Local	$ 155,256
106.1	OAK STREET	150' S OF PARKER ROAD	SUTTON TOWN LINE	1640	35.3	BC - 2" Overlay Local	$ 65,338
108	OLD FARM ROAD	SOUTH STREET	2400' W OF SOUTH STREET	2358	11.7	BC - Reclaim Local	$ 260,355
108.1	OLD FARM ROAD	2400' W OF SOUTH STREET	1200' N OF WOODLAND ROAD	853	29.7	BC - 2" Mill & Overlay Local	$ 61,211
108.2	OLD FARM ROAD	1200' N OF WOODLAND ROAD	WOODLAND ROAD	1033	86.6	BC - Crack Seal or Patch	$ 1,791
110	OLDE CARRIAGE LANE	COBBLESTONE LANE	FRANKLIN STREET	2274	85	BC - Crack Seal or Patch	$ 3,638
111	ORANGE STREET	PINE STREET	RHODE ISLAND STATE LINE	6546	80.2	GR - Grade	$ 43,727
112	ORCHARD PLACE	DEPOT STREET	DEAD END	306	37.9	BC - 2" Overlay Local	$ 14,223
116	PERRY STREET	YEW STREET	2600' S OF YEW STREET	2630	34.6	BC - 2" Overlay Local	$ 116,421
116.1	PERRY STREET	2600' S OF YEW STREET	LINDEN STREET	2734	79.5	BC - Crack Seal or Patch	$ 3,645
116.2	PERRY STREET	LINDEN STREET	SOUTHEAST MAIN STREET	8283	68.6	BC - Crack Seal and Patch	$ 22,272
118	PILGRIM COURT	COLONIAL ROAD	DEAD END	292	8.93	BC - Reclaim Local	$ 29,761
119	PINE STREET	SOUTH STREET	1400' S OF SOUTHEAST MAIN STREET	4763	66.8	BC - Shim, Crack Seal & Patch	$ 90,497

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
119.1	PINE STREET	1400' S OF SOUTHEAST MAIN STREET	SOUTHEAST MAIN STREET	1390	31	BC - 2" Overlay Local	$ 61,531
121	PINNACLE WAY	HILLTOP DRIVE	CUL DE SAC	191	78.8	BC - Crack Seal or Patch	$ 293
122	PLEASANT STREET	NORTHEAST MAIN STREET	DEPOT STREET	534	87.1	BC - Crack Seal or Patch	$ 748
123	POND STREET	NORTH STREET	SPRING STREET	2544	24.2	BC - 2" Mill & Overlay Local	$ 168,515
123.1	POND STREET	SPRING STREET	CUL DE SAC	1231	47.6	BC - 1-1/2" Mill & Overlay	$ 40,935
124	POTTER ROAD	MANCHAUG STREET	BRIDGE	500	35.6	BC - 2" Overlay Local	$ 13,280
125	PRENTICE COURT	NORTH STREET	DEAD END	491	23.5	BC - 2" Overlay Local	$ 14,128
128	RAILROAD AVENUE	FRANKLIN STREET	DEPOT STREET	1873	99.9	Do Nothing	$ -
131	REDDING LANDING	MONROE STREET	CUL DE SAC	608	40.4	BC - 2" Overlay Local	$ 32,297
135	RIEDELL STREET	WEST STREET	MAIN STREET	3916	58.1	BC - Shim, Crack Seal & Patch	$ 96,725
138	ROYAL CREST DRIVE	ARCH STREET	DEAD END	2068	67.7	BC - Crack Seal and Patch	$ 6,951
139	SANDRA CIRCLE	MARILYN DRIVE	DEAD END	304	29.9	BC - 2" Overlay Local	$ 16,149
143	SMITH HILL WAY	NORTHWEST MAIN STREET	DEAD END	1198	64.8	BC - Shim, Crack Seal & Patch	$ 29,591
144	SOUTH STREET	SOUTHWEST MAIN STREET	WOODLAND ROAD	4409	55.4	BC - 1-1/2" Mill & Overlay	$ 140,505
144.1	SOUTH STREET	WOODLAND ROAD	ARCH STREET (N)	1975	74.3	BC - Crack Seal and Patch	$ 6,107
144.2	SOUTH STREET	ARCH STREET (N)	ARCH STREET (S)	2070	52.4	BC - 1-1/2" Mill & Overlay	$ 65,966
144.3	SOUTH STREET	ARCH STREET (S)	1400' S OF ARCH STREET (S)	1449	65.2	BC - Shim, Crack Seal & Patch	$ 31,661
144.4	SOUTH STREET	1400' S OF ARCH STREET (S)	HEMLOCK STREET	4135	18.6	BC - Reclaim Col	$ 573,906
144.5	SOUTH STREET	HEMLOCK STREET	RHODE ISLAND STATE LINE	4632	24.8	BC - 3" Overlay Art/Col	$ 375,007
145	SOUTHEAST MAIN STREET	SOUTHWEST MAIN STREET	VINE STREET	7746	25.8	BC - 3" Overlay Art/Col	$ 654,382
145.1	SOUTHEAST MAIN STREET	VINE STREET	PINE STREET	5383	34.2	BC - 3" Overlay Art/Col	$ 454,756
145.2	SOUTHEAST MAIN STREET	PINE STREET	PERRY STREET	4214	69.5	BC - Crack Seal and Patch	$ 13,597
145.3	SOUTHEAST MAIN STREET	PERRY STREET	TOWN LINE	2581	60.1	BC - Shim, Crack Seal & Patch	$ 58,847
146	SOUTHWEST MAIN STREET	WEBSTER STREET	CEDAR STREET	7092	95.6	Do Nothing	$ -
146.1	SOUTHWEST MAIN STREET	CEDAR STREET	STREETER TRAIL	5959	10.1	BC - Reclaim Local	$ 582,036
146.2	SOUTHWEST MAIN STREET	STREETER TRAIL	3000' S OF STREETER TRAIL	3076	9.24	BC - Reclaim Local	$ 300,443
146.3	SOUTHWEST MAIN STREET	3000' S OF STREETER TRAIL	CONNECTICUT STATE LINE	7494	38.1	BC - 2" Overlay Local	$ 381,494
147	SPRING STREET	POND STREET	TOWLE COURT	541	43.7	BC - 2" Mill & Overlay Local	$ 35,836
148	STONEWALL COURT	MAPLE STREET	CUL DE SAC	505	74.2	BC - Crack Seal or Patch	$ 741
151	SUMMIT CIRCLE	HILLTOP DRIVE	DEAD END	182	82.8	BC - Crack Seal or Patch	$ 291
152	SUNSET DRIVE	NORTHEAST MAIN STREET	CUL DE SAC	1255	32.7	BC - 2" Mill & Overlay Local	$ 79,667
153	TOWLE COURT	POND STREET	DEAD END	1298	43.2	BC - 2" Mill & Overlay Local	$ 85,979
154	TUCKER CIRCLE	MARILYN DRIVE	DEAD END	332	42.9	BC - 2" Overlay Local	$ 17,636
155	UXBRIDGE STREET	UXBRIDGE TOWN LINE	UXBRIDGE TOWN LINE	1176	53.8	BC - 1-1/2" Mill & Overlay	$ 39,106
156	VINE STREET	SOUTHEAST MAIN STREET	1700' S OF SOUTHEAST MAIN STREET	1757	4.24	BC - Reclaim Local	$ 134,305
156.1	VINE STREET	1700' S OF SOUTHEAST MAIN STREET	1700' N OF PINE STREET	3269	67.1	BC - Shim, Crack Seal & Patch	$ 55,900
156.2	VINE STREET	1700' N OF PINE STREET	PINE STREET	1773	1.74	BC - Reclaim Local	$ 135,528
157	WALLIS STREET	NORTHWEST MAIN STREET	RESERVOIR	1572	79.9	BC - Crack Seal or Patch	$ 2,201
157.1	WALLIS STREET	RESERVOIR	NORTHWEST MAIN STREET	8968	59.3	BC - Shim, Crack Seal & Patch	$ 178,912

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
159	WALLUM LAKE ROAD	SOUTHWEST MAIN STREET	1980' S OF SOUTHWEST MAIN STREET	1983	60	BC - Shim, Crack Seal & Patch	$ 48,980
159.1	WALLUM LAKE ROAD	1980' S OF SOUTHWEST MAIN STREET	260' N OF WALLUM LAKE PARK ROAD	2439	97.4	Do Nothing	$ -
159.2	WALLUM LAKE ROAD	260' N OF WALLUM LAKE PARK ROAD	WALNUT STREET	4826	16.4	BC - Reclaim Col	$ 669,811
159.3	WALLUM LAKE ROAD	WALNUT STREET	BIRCH HILL ROAD	3093	70.7	BC - Crack Seal and Patch	$ 9,564
159.4	WALLUM LAKE ROAD	BIRCH HILL ROAD	RHODE ISLAND STATE LINE	1606	42	BC - 3" Overlay Art/Col	$ 113,062
160	WALNUT STREET	WALLUM LAKE ROAD	WINTER STREET	2903	98.5	Do Nothing	$ -
160.1	WALNUT STREET	WINTER STREET	ARCH STREET	7072	32.5	BC - 2" Overlay Local	$ 313,054
161	WEBSTER STREET	SOUTHWEST MAIN STREET	WEBSTER TOWN LINE	21306	98.1	Do Nothing	$ -
162	WEST STREET	BIRCH STREET	CROSS STREET	3893	39	BC - 2" Overlay Local	$ 189,563
162.1	WEST STREET	CROSS STREET	RIEDELL STREET	4255	64	BC - Shim, Crack Seal & Patch	$ 88,929
162.2	WEST STREET	RIEDELL STREET	MAIN STREET	3670	45.4	BC - 2" Overlay Local	$ 178,705
163	WEST STREET EXT	BIRCH STREET	NORTHWEST MAIN STREET	383	39.1	BC - 2" Overlay Local	$ 18,650
164	WHITE AVENUE	NORTHEAST MAIN STREET	DEAD END	501	45.4	BC - 1-1/2" Mill & Overlay	$ 12,495
165	WHITE COURT	YEW STREET	DEAD END	1291	65	GR - New Gravel	$ 8,653
167	WINTER STREET	WALNUT STREET	PRIVATE PROPERTY	2628	42.1	GR - Gravel & Drain Improvement	$ 30,555
168	WIXTEAD COURT	GILBOA STREET	DEAD END	1397	45.9	BC - 1-1/2" Mill & Overlay	$ 36,777
171	YEW STREET	SOUTHEAST MAIN STREET	GLEN STREET	2336	84.7	BC - Crack Seal or Patch	$ 3,270
171.1	YEW STREET	GLEN STREET	LOCUST STREET	7264	35.3	BC - 2" Overlay Local	$ 337,631
171.2	YEW STREET	LOCUST STREET	MARTIN ROAD	2033	62.5	BC - Shim, Crack Seal & Patch	$ 40,558
171.3	YEW STREET	MARTIN ROAD	PERRY STREET	1749	95.7	Do Nothing	$ -
171.4	YEW STREET	PERRY STREET	UXBRIDGE TOWN LINE	4207	62.1	BC - Shim, Crack Seal & Patch	$ 71,940



APPENDIX B

DOUGLAS'S ROADWAY BACKLOG (WORST PCI FIRST)

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
25	CEMETERY STREET	B STREET	GILBOA STREET	946	0	BC - Reclaim Local	$ 88,381
156.2	VINE STREET	1700' N OF PINE STREET	PINE STREET	1773	1.74	BC - Reclaim Local	$ 135,528
156	VINE STREET	SOUTHEAST MAIN STREET	1700' S OF SOUTHEAST MAIN STREET	1757	4.24	BC - Reclaim Local	$ 134,305
7	BELVOIR AVENUE	FOREST STREET	BIRCH STREET	1001	5.08	BC - Reclaim Local	$ 85,018
52	FAIRFAX WAY	BIRCH STREET	FOREST STREET	966	5.31	BC - Reclaim Local	$ 98,455
54	FOREST STREET	FAIRFAX WAY	IRENE STREET	1095	8.91	BC - Reconstruction Local	$ 317,200
118	PILGRIM COURT	COLONIAL ROAD	DEAD END	292	8.93	BC - Reclaim Local	$ 29,761
105.5	NORTHWEST MAIN STREET	OAK STREET	RIDGE TRAIL	4299	9.17	BC - Reclaim Local	$ 310,359
146.2	SOUTHWEST MAIN STREET	STREETER TRAIL	3000' S OF STREETER TRAIL	3076	9.24	BC - Reclaim Local	$ 300,443
67	IRENE STREET	LUCY STREET	FOREST STREET	430	9.75	BC - Reconstruction Local	$ 124,563
146.1	SOUTHWEST MAIN STREET	CEDAR STREET	STREETER TRAIL	5959	10.1	BC - Reclaim Local	$ 582,036
33.1	COLONIAL ROAD	500' W OF NORTH STREET (S)	NORTH STREET (S)	500	10.1	BC - Reclaim Local	$ 50,960
51	FAIRBANKS COURT	LINDEN STREET	DEAD END	2341	10.9	BC - Reclaim Local	$ 238,595
41	CUMMINGS COURT	NORTHEAST MAIN STREET	DEAD END	916	11.4	BC - Reclaim Local	$ 97,249
108	OLD FARM ROAD	SOUTH STREET	2400' W OF SOUTH STREET	2358	11.7	BC - Reclaim Local	$ 260,355
85	LUCY STREET	BELVOIR AVENUE	IRENE STREET	631	13.9	BC - Reclaim Local	$ 64,312
92	MARILYN DRIVE	LINDEN STREET	SANDRA CIRCLE	1667	15.1	BC - Reclaim Local	$ 169,901
16	BROOKSIDE DRIVE	BROOKSIDE DRIVE	CUL DE SAC	2306	15.2	BC - Reclaim Local	$ 235,027
73	JOHNSON COURT	WEST STREET	DEAD END	1015	15.9	BC - Reclaim Local	$ 73,276
159.2	WALLUM LAKE ROAD	260' N OF WALLUM LAKE PARK ROAD	WALNUT STREET	4826	16.4	BC - Reclaim Col	$ 669,811
102.3	NORTH STREET	800' N OF COLONIAL ROAD	SUTTON TOWN LINE	1237	16.7	BC - Reconstruction Local	$ 418,056
37	COTTAGE COLONY	NORTHWEST MAIN STREET	END OF PAVEMENT	1217	16.8	BC - Reclaim Local	$ 72,355
144.4	SOUTH STREET	1400' S OF ARCH STREET (S)	HEMLOCK STREET	4135	18.6	BC - Reclaim Col	$ 573,906
105.6	NORTHWEST MAIN STREET	RIDGE TRAIL	TOWN LINE	6948	19.3	BC - Reclaim Local	$ 501,599
29	CHURCH STREET	COMMON STREET	NORTHWEST MAIN STREET	2073	22.4	BC - 2" Overlay Local	$ 91,765
63	HEMLOCK STREET	SOUTH STREET	RHODE ISLAND STATE LINE	4478	22.7	BC - 2" Overlay Local	$ 208,138
102	NORTH STREET	NORTHEAST MAIN STREET	GILBOA STREET	1668	23.2	BC - 2" Mill & Overlay Local	$ 128,903
125	PRENTICE COURT	NORTH STREET	DEAD END	491	23.5	BC - 2" Overlay Local	$ 14,128
96.1	MONROE STREET	YOUNG STREET	DAVIS STREET	1225	23.5	GR - Gravel & Drain Improvement	$ 17,803
55.2	FRANKLIN STREET	340' N OF COBBLESTONE LANE	NORTHEAST MAIN STREET	2885	23.7	BC - 2" Overlay Local	$ 134,095
123	POND STREET	NORTH STREET	SPRING STREET	2544	24.2	BC - 2" Mill & Overlay Local	$ 168,515
144.5	SOUTH STREET	HEMLOCK STREET	RHODE ISLAND STATE LINE	4632	24.8	BC - 3" Overlay Art/Col	$ 375,007
102.1	NORTH STREET	GILBOA STREET	NORTH WOODS DRIVE	1742	25.4	BC - 2" Overlay Local	$ 107,958
145	SOUTHEAST MAIN STREET	SOUTHWEST MAIN STREET	VINE STREET	7746	25.8	BC - 3" Overlay Art/Col	$ 654,382
43.2	DAVIS STREET	1100' S OF MONROE STREET	UXBRIDGE TOWN LINE	3873	26.5	BC - 3" Overlay Art/Col	$ 368,090
47	DOWNS ROAD	SOUTHEAST MAIN STREET	SOUTH STREET	3087	29.4	BC - 2" Overlay Local	$ 163,981
108.1	OLD FARM ROAD	2400' W OF SOUTH STREET	1200' N OF WOODLAND ROAD	853	29.7	BC - 2" Mill & Overlay Local	$ 61,211
139	SANDRA CIRCLE	MARILYN DRIVE	DEAD END	304	29.9	BC - 2" Overlay Local	$ 16,149
38	COTTAGE STREET	MAIN STREET	DEPOT STREET	877	30.6	BC - 2" Overlay Local	$ 34,940

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
119.1	PINE STREET	1400' S OF SOUTHEAST MAIN STREET	SOUTHEAST MAIN STREET	1390	31	BC - 2" Overlay Local	$ 61,531
33	COLONIAL ROAD	NORTH STREET (N)	500' W OF NORTH STREET (S)	1832	31.6	BC - 2" Mill & Overlay Local	$ 121,352
64.1	HIGH STREET	CONNECTICUT STATE LINE	CONNECTICUT STATE LINE	2728	31.7	BC - 3" Overlay Art/Col	$ 201,654
160.1	WALNUT STREET	WINTER STREET	ARCH STREET	7072	32.5	BC - 2" Overlay Local	$ 313,054
152	SUNSET DRIVE	NORTHEAST MAIN STREET	CUL DE SAC	1255	32.7	BC - 2" Mill & Overlay Local	$ 79,667
145.1	SOUTHEAST MAIN STREET	VINE STREET	PINE STREET	5383	34.2	BC - 3" Overlay Art/Col	$ 454,756
116	PERRY STREET	YEW STREET	2600' S OF YEW STREET	2630	34.6	BC - 2" Overlay Local	$ 116,421
43.1	DAVIS STREET	2050' S OF NE MAIN STREET	1100' S OF MONROE STREET	4142	34.7	BC - 3" Overlay Art/Col	$ 393,656
106.1	OAK STREET	150' S OF PARKER ROAD	SUTTON TOWN LINE	1640	35.3	BC - 2" Overlay Local	$ 65,338
171.1	YEW STREET	GLEN STREET	LOCUST STREET	7264	35.3	BC - 2" Overlay Local	$ 337,631
124	POTTER ROAD	MANCHAUG STREET	BRIDGE	500	35.6	BC - 2" Overlay Local	$ 13,280
61	GLEN STREET	YEW STREET	NORTHEAST MAIN STREET	3277	35.9	BC - 2" Overlay Local	$ 123,303
57.1	GILBOA STREET	NORTH STREET	1500' W OF OLD LACKEY DAM ROAD	2730	36	BC - 3" Overlay Art/Col	$ 297,897
93.1	MARTIN ROAD	890' N OF MAPLE STREET	YEW STREET	6144	36.2	BC - 2" Overlay Local	$ 299,172
83	LINDEN STREET	SOUTHEAST MAIN STREET	UXBRIDGE TOWN LINE	5960	37.5	BC - 2" Overlay Local	$ 250,638
112	ORCHARD PLACE	DEPOT STREET	DEAD END	306	37.9	BC - 2" Overlay Local	$ 14,223
146.3	SOUTHWEST MAIN STREET	3000' S OF STREETER TRAIL	CONNECTICUT STATE LINE	7494	38.1	BC - 2" Overlay Local	$ 381,494
3	ARCH STREET	SOUTH STREET	SOUTH STREET	2432	38.4	BC - 2" Overlay Local	$ 96,891
1	A STREET	GILBOA STREET	CEMETERY STREET	1555	38.6	BC - 2" Overlay Local	$ 75,718
162	WEST STREET	BIRCH STREET	CROSS STREET	3893	39	BC - 2" Overlay Local	$ 189,563
163	WEST STREET EXT	BIRCH STREET	NORTHWEST MAIN STREET	383	39.1	BC - 2" Overlay Local	$ 18,650
131	REDDING LANDING	MONROE STREET	CUL DE SAC	608	40.4	BC - 2" Overlay Local	$ 32,297
87.4	MAIN STREET	100' N OF SUNSET AVENUE	COTTAGE STREET	1919	40.4	BC - 3" Overlay Art/Col	$ 243,176
106	OAK STREET	NORTHWEST MAIN STREET	150' S OF PARKER ROAD	3897	41.3	BC - 2" Overlay Local	$ 155,256
159.4	WALLUM LAKE ROAD	BIRCH HILL ROAD	RHODE ISLAND STATE LINE	1606	42	BC - 3" Overlay Art/Col	$ 113,062
167	WINTER STREET	WALNUT STREET	PRIVATE PROPERTY	2628	42.1	GR - Gravel & Drain Improvement	$ 30,555
154	TUCKER CIRCLE	MARILYN DRIVE	DEAD END	332	42.9	BC - 2" Overlay Local	$ 17,636
153	TOWLE COURT	POND STREET	DEAD END	1298	43.2	BC - 2" Mill & Overlay Local	$ 85,979
147	SPRING STREET	POND STREET	TOWLE COURT	541	43.7	BC - 2" Mill & Overlay Local	$ 35,836
49	ELM STREET	YEW STREET	SOUTHEAST MAIN STREET	1778	43.9	BC - 2" Overlay Local	$ 59,030
46	DOUGLAS HILL WAY	NORTHWEST MAIN STREET	DEAD END	2252	44.7	BC - 1-1/2" Mill & Overlay	$ 81,127
53	FAIRWAY VIEW DRIVE	LINDEN STREET	CUL DE SAC	1215	45.2	BC - 1-1/2" Mill & Overlay	$ 42,086
164	WHITE AVENUE	NORTHEAST MAIN STREET	DEAD END	501	45.4	BC - 1-1/2" Mill & Overlay	$ 12,495
162.2	WEST STREET	RIEDELL STREET	MAIN STREET	3670	45.4	BC - 2" Overlay Local	$ 178,705
105.2	NORTHWEST MAIN STREET	CHURCH STREET	WALLIS STREET	2969	45.7	BC - 2" Overlay Local	$ 111,714
168	WIXTEAD COURT	GILBOA STREET	DEAD END	1397	45.9	BC - 1-1/2" Mill & Overlay	$ 36,777
105	NORTHWEST MAIN STREET	COMMONS STREET	660' S OF CHURCH STREET	1201	46.1	BC - 2" Overlay Local	$ 45,190
87.1	MAIN STREET	600' W OF RIEDELL ROAD	GLEN STREET	1847	46.6	BC - 3" Overlay Art/Col	$ 182,040
12	BOWEN COURT	NORTHEAST MAIN STREET	DEAD END	435	47	BC - 1-1/2" Mill & Overlay	$ 12,657

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
123.1	POND STREET	SPRING STREET	CUL DE SAC	1231	47.6	BC - 1-1/2" Mill & Overlay	$ 40,935
31	CLIFF STREET	WEBSTER TOWN LINE	OXFORD TOWN LINE	900	48.1	BC - 1-1/2" Mill & Overlay	$ 26,187
44.1	DEPOT STREET	560' S OF MARTIN ROAD	1400' S OF MARTIN ROAD	840	48.9	BC - 1-1/2" Mill & Overlay	$ 26,769
90	MANZI WAY	DOWNS ROAD	DOWNS ROAD	2091	50.7	BC - 1-1/2" Mill & Overlay	$ 66,636
102.2	NORTH STREET	NORTH WOODS DRIVE	800' N OF COLONIAL ROAD	2483	51	BC - 1-1/2" Mill & Overlay	$ 96,329
94	MECHANIC STREET	B STREET	NORTHEAST MAIN STREET	848	51.2	BC - 1-1/2" Mill & Overlay	$ 31,724
144.2	SOUTH STREET	ARCH STREET (N)	ARCH STREET (S)	2070	52.4	BC - 1-1/2" Mill & Overlay	$ 65,966
5	B STREET	MANCHAUG STREET	COOK STREET	778	52.6	BC - 1-1/2" Mill & Overlay	$ 22,637
98	MOUNT DANIELS WAY	HIGH STREET	DEAD END	924	52.9	BC - 1-1/2" Mill & Overlay	$ 32,006
104	NORTHEAST MAIN STREET	WEBSTER STREET	UXBRIDGE TOWN LINE	3937	53.2	BC - 1-1/2" Mill & Overlay	$ 152,738
36	COOK STREET	GILBOA STREET	MAIN STREET	1399	53.8	BC - 1-1/2" Mill & Overlay	$ 38,768
155	UXBRIDGE STREET	UXBRIDGE TOWN LINE	UXBRIDGE TOWN LINE	1176	53.8	BC - 1-1/2" Mill & Overlay	$ 39,106
64	HIGH STREET	SOUTHWEST MAIN STREET	CONNECTICUT STATE LINE	1573	54.1	BC - 1-1/2" Mill & Overlay	$ 45,769
144	SOUTH STREET	SOUTHWEST MAIN STREET	WOODLAND ROAD	4409	55.4	BC - 1-1/2" Mill & Overlay	$ 140,505
93	MARTIN ROAD	DEPOT STREET	890' N OF MAPLE STREET	3036	55.5	BC - 1-1/2" Mill & Overlay	$ 92,544
87.3	MAIN STREET	760' S OF SUNSET DRIVE	100' N OF SUNSET AVENUE	907	55.6	BC - 1-1/2" Mill & Overlay	$ 35,188
24	CEDAR STREET	WALLIS STREET	WEBSTER STREET	1940	57.2	BC - 1-1/2" Mill & Overlay	$ 59,135
86	MADDEN WAY	SUNSET DRIVE	DEAD END	276	57.7	BC - Shim, Crack Seal & Patch	$ 6,031
84	LOCUST STREET	YEW STREET	SOUTHEAST MAIN STREET	4388	58.1	BC - Shim, Crack Seal & Patch	$ 87,541
135	RIEDELL STREET	WEST STREET	MAIN STREET	3916	58.1	BC - Shim, Crack Seal & Patch	$ 96,725
55	FRANKLIN STREET	MARTIN ROAD	540' E OF OLDE CARRIAGE LANE	2106	58.2	BC - Shim, Crack Seal & Patch	$ 42,015
157.1	WALLIS STREET	RESERVOIR	NORTHWEST MAIN STREET	8968	59.3	BC - Shim, Crack Seal & Patch	$ 178,912
159	WALLUM LAKE ROAD	SOUTHWEST MAIN STREET	1980' S OF SOUTHWEST MAIN STREET	1983	60	BC - Shim, Crack Seal & Patch	$ 48,980
145.3	SOUTHEAST MAIN STREET	PERRY STREET	TOWN LINE	2581	60.1	BC - Shim, Crack Seal & Patch	$ 58,847
10.2	BIRCH STREET	BELVOIR AVENUE	SUTTON TOWN LINE	672	60.6	BC - Shim, Crack Seal & Patch	$ 12,130
96	MONROE STREET	NORTHEAST MAIN STREET	YOUNG STREET	3019	60.7	BC - Shim, Crack Seal & Patch	$ 57,361
39	CRESCENT LANE	MANZI WAY	500' S OF MANZI WAY	497	61.1	BC - Shim, Crack Seal & Patch	$ 11,804
171.4	YEW STREET	PERRY STREET	UXBRIDGE TOWN LINE	4207	62.1	BC - Shim, Crack Seal & Patch	$ 71,940
171.2	YEW STREET	LOCUST STREET	MARTIN ROAD	2033	62.5	BC - Shim, Crack Seal & Patch	$ 40,558
44	DEPOT STREET	NORTHEAST MAIN STREET	560' S OF MARTIN ROAD	1692	62.7	BC - Shim, Crack Seal & Patch	$ 36,970
56	GILBOA COURT	NORTH STREET	DEAD END	1513	62.7	BC - Shim, Crack Seal & Patch	$ 25,872
91	MAPLE STREET	FRANKLIN STREET	MARTIN ROAD	3065	63.5	BC - Shim, Crack Seal & Patch	$ 46,588
20	C STREET	NORTH STREET	NORTHEAST MAIN STREET	740	63.8	BC - Shim, Crack Seal & Patch	$ 16,872
162.1	WEST STREET	CROSS STREET	RIEDELL STREET	4255	64	BC - Shim, Crack Seal & Patch	$ 88,929
42	DARLING WAY	POND STREET	DEAD END	940	64.4	BC - Shim, Crack Seal & Patch	$ 21,432
143	SMITH HILL WAY	NORTHWEST MAIN STREET	DEAD END	1198	64.8	BC - Shim, Crack Seal & Patch	$ 29,591
99	MUMFORD STREET	MANCHAUG STREET	SUTTON TOWN LINE	5661	64.8	BC - Shim, Crack Seal & Patch	$ 112,937
165	WHITE COURT	YEW STREET	DEAD END	1291	65	GR - New Gravel	$ 8,653
144.3	SOUTH STREET	ARCH STREET (S)	1400' S OF ARCH STREET (S)	1449	65.2	BC - Shim, Crack Seal & Patch	$ 31,661

ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
10	BIRCH STREET	NORTHWEST MAIN STREET	570' N OF NORTHWEST MAIN STREET	570	65.5	BC - Shim, Crack Seal & Patch	$ 10,288
119	PINE STREET	SOUTH STREET	1400' S OF SOUTHEAST MAIN STREET	4763	66.8	BC - Shim, Crack Seal & Patch	$ 90,497
13	BRANDYWINE CIRCLE	DARLING WAY	CUL DE SAC	212	66.9	BC - Crack Seal and Patch	$ 684
156.1	VINE STREET	1700' S OF SOUTHEAST MAIN STREET	1700' N OF PINE STREET	3269	67.1	BC - Shim, Crack Seal & Patch	$ 55,900
87.5	MAIN STREET	COTTAGE STREET	NORTHEAST MAIN STREET	1636	67.3	BC - Shim, Crack Seal & Patch	$ 55,951
138	ROYAL CREST DRIVE	ARCH STREET	DEAD END	2068	67.7	BC - Crack Seal and Patch	$ 6,951
101	NEWPORT DRIVE	CASWELL COURT	CUL DE SAC	700	68.4	BC - Crack Seal and Patch	$ 1,882
116.2	PERRY STREET	LINDEN STREET	SOUTHEAST MAIN STREET	8283	68.6	BC - Crack Seal and Patch	$ 22,272
27	CHESTNUT STREET	WALNUT STREET	SOUTH STREET	7713	68.7	BC - Crack Seal and Patch	$ 18,665
57	GILBOA STREET	MANCHAUG STREET	NORTH STREET	2339	68.8	BC - Shim, Crack Seal & Patch	$ 53,329
145.2	SOUTHEAST MAIN STREET	PINE STREET	PERRY STREET	4214	69.5	BC - Crack Seal and Patch	$ 13,597
50	ESSEX STREET	CRESCENT LANE	DEAD END	455	69.9	BC - Crack Seal and Patch	$ 1,468
72	JEPHERSON DRIVE	SOUTH STREET	CUL DE SAC	1616	70.3	BC - Crack Seal and Patch	$ 5,214
159.3	WALLUM LAKE ROAD	WALNUT STREET	BIRCH HILL ROAD	3093	70.7	BC - Crack Seal and Patch	$ 9,564
35	CONSERVATION DRIVE	WEST STREET	DEAD END	2457	70.9	BC - Crack Seal and Patch	$ 7,267
34	COMMON STREET	MAIN STREET	MAIN STREET	673	71	BC - Crack Seal and Patch	$ 1,900
105.4	NORTHWEST MAIN STREET	DOUGLAS HILL WAY	OAK STREET	5680	71.1	BC - Crack Seal and Patch	$ 12,982
96.2	MONROE STREET	DAVIS STREET	MAPLE STREET	4245	71.2	BC - Crack Seal and Patch	$ 11,414
30	CHURCHILL ROAD	SOUTHWEST MAIN STREET	DEAD END	947	71.3	BC - Crack Seal and Patch	$ 3,056
148	STONEWALL COURT	MAPLE STREET	CUL DE SAC	505	74.2	BC - Crack Seal or Patch	$ 741
144.1	SOUTH STREET	WOODLAND ROAD	ARCH STREET (N)	1975	74.3	BC - Crack Seal and Patch	$ 6,107
87	MAIN STREET	SOUTHWEST MAIN STREET	600' W OF RIEDELL ROAD	2961	75.1	BC - Crack Seal and Patch	$ 11,147
14	BRIARWOOD CIRCLE	DOWNS ROAD	CUL DE SAC	934	76	BC - Crack Seal or Patch	$ 1,557
24.1	CEDAR STREET	WEBSTER STREET	SOUTHWEST MAIN STREET	4092	76.8	BC - Crack Seal and Patch	$ 12,103
22	CASWELL COURT	MANCHAUG STREET	DEAD END	1738	77.7	BC - Crack Seal or Patch	$ 3,128
87.2	MAIN STREET	GLEN STREET	760' S OF SUNSET DRIVE	1952	77.9	BC - Crack Seal and Patch	$ 7,348
91.1	MAPLE STREET	MARTIN ROAD	1100' W OF UXBRDIGE TOWN LINE	8083	78.8	BC - Crack Seal or Patch	$ 8,622
121	PINNACLE WAY	HILLTOP DRIVE	CUL DE SAC	191	78.8	BC - Crack Seal or Patch	$ 293
10.1	BIRCH STREET	570' N OF NORTHWEST MAIN STREET	BELEVOIR STREET	2631	79	BC - Crack Seal or Patch	$ 3,333
57.2	GILBOA STREET	1500' W OF OLD LACKEY DAM ROAD	UXBRIDGE TOWN LINE	1523	79.1	BC - Crack Seal or Patch	$ 3,148
26	CHARLES STREET	NORTH STREET	NORTHEAST MAIN STREET	1800	79.4	BC - Crack Seal or Patch	$ 3,000
116.1	PERRY STREET	2600' S OF YEW STREET	LINDEN STREET	2734	79.5	BC - Crack Seal or Patch	$ 3,645
65	HILLTOP DRIVE	TOWN LINE	CUL DE SAC	2204	79.5	BC - Crack Seal or Patch	$ 3,673
74	KELLY CIRCLE	SOUTHEAST MAIN STREET	DEAD END	463	79.8	BC - Crack Seal or Patch	$ 648
157	WALLIS STREET	NORTHWEST MAIN STREET	RESERVOIR	1572	79.9	BC - Crack Seal or Patch	$ 2,201
111	ORANGE STREET	PINE STREET	RHODE ISLAND STATE LINE	6546	80.2	GR - Grade	$ 43,727
44.2	DEPOT STREET	1400' S OF MARTIN ROAD	DCR PATH	1670	81.4	BC - Crack Seal or Patch	$ 2,561
151	SUMMIT CIRCLE	HILLTOP DRIVE	DEAD END	182	82.8	BC - Crack Seal or Patch	$ 291
171	YEW STREET	SOUTHEAST MAIN STREET	GLEN STREET	2336	84.7	BC - Crack Seal or Patch	$ 3,270

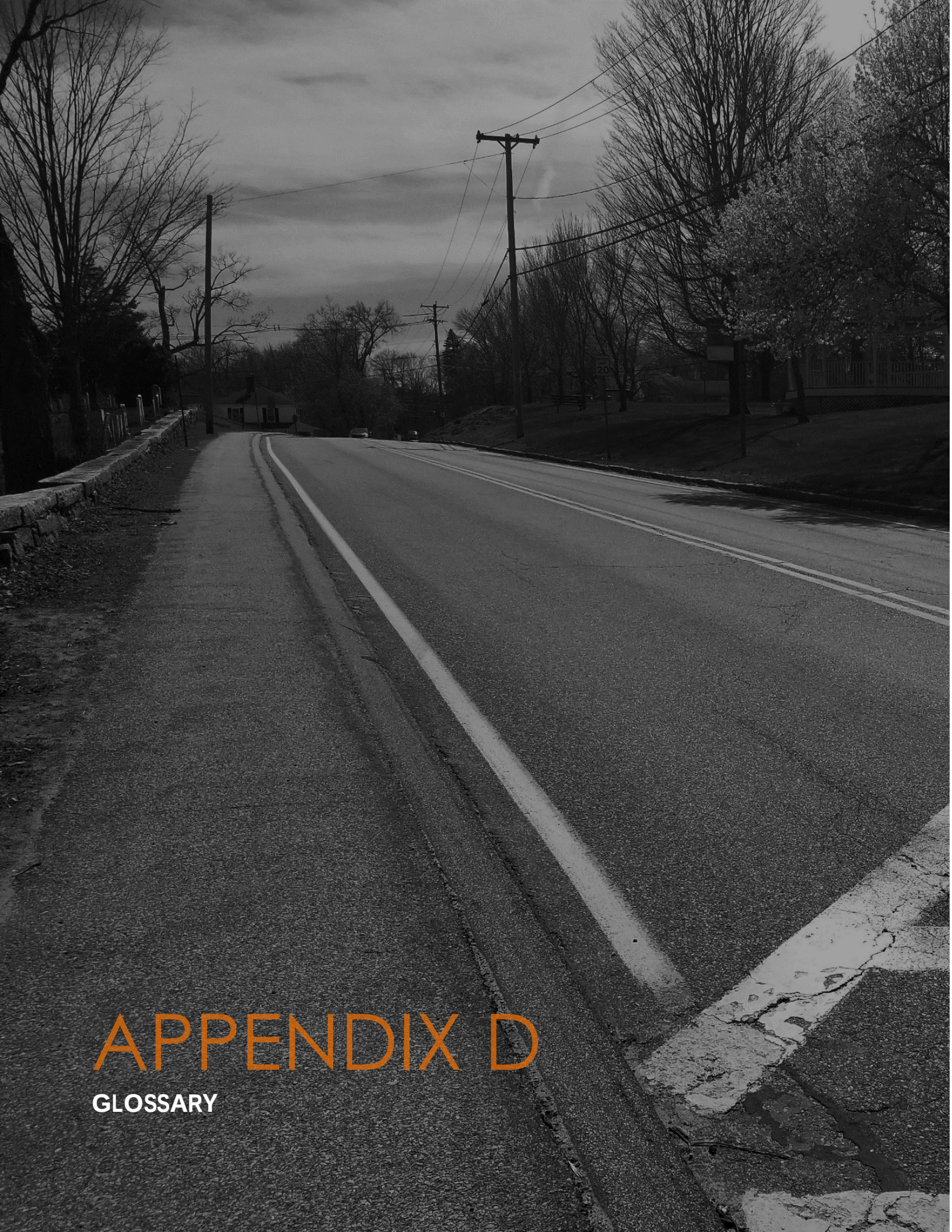
ID	STREETNAME	FROM	TO	LENGTH	PCI	PLAN ACTIVITY	COST
110	OLDE CARRIAGE LANE	COBBLESTONE LANE	FRANKLIN STREET	2274	85	BC - Crack Seal or Patch	$ 3,638
105.1	NORTHWEST MAIN STREET	660' S OF CHURCH STREET	CHURCH STREET	771	86.2	BC - Crack Seal or Patch	$ 874
108.2	OLD FARM ROAD	1200' N OF WOODLAND ROAD	WOODLAND ROAD	1033	86.6	BC - Crack Seal or Patch	$ 1,791
122	PLEASANT STREET	NORTHEAST MAIN STREET	DEPOT STREET	534	87.1	BC - Crack Seal or Patch	$ 748
39.1	CRESCENT LANE	500' S OF MANZI WAY	CUL DE SAC	1988	90.7	Do Nothing	$ -
62	GROVE STREET	MUMFORD STREET	WEST STREET	3775	91.1	Do Nothing	$ -
32	COBBLESTONE LANE	FRANKLIN STREET	OLDE CARRIAGE LANE	1161	92.5	Do Nothing	$ -
40	CROSS STREET	MUMFORD STREET	WEST STREET	3287	95.4	Do Nothing	$ -
146	SOUTHWEST MAIN STREET	WEBSTER STREET	CEDAR STREET	7092	95.6	Do Nothing	$ -
171.3	YEW STREET	MARTIN ROAD	PERRY STREET	1749	95.7	Do Nothing	$ -
105.3	NORTHWEST MAIN STREET	WALLIS STREET	DOUGLAS HILL WAY	2680	97	Do Nothing	$ -
159.1	WALLUM LAKE ROAD	1980' S OF SOUTHWEST MAIN STREET	260' N OF WALLUM LAKE PARK ROAD	2439	97.4	Do Nothing	$ -
95	MEETINGHOUSE LANE	OLDE CARRIAGE LANE	DEAD END	246	97.4	Do Nothing	$ -
91.2	MAPLE STREET	1100' W OF UXBRDIGE TOWN LINE	UXBRIDGE TOWN LINE	1110	97.6	Do Nothing	$ -
55.1	FRANKLIN STREET	540' E OF OLDE CARRIAGE LANE	340' N OF COBBLESTONE LANE	2035	97.8	Do Nothing	$ -
161	WEBSTER STREET	SOUTHWEST MAIN STREET	WEBSTER TOWN LINE	21306	98.1	Do Nothing	$ -
160	WALNUT STREET	WALLUM LAKE ROAD	WINTER STREET	2903	98.5	Do Nothing	$ -
58	GILBOA STREET EXT	MANCHAUG STREET	GILBOA STREET	204	99.6	Do Nothing	$ -
128	RAILROAD AVENUE	FRANKLIN STREET	DEPOT STREET	1873	99.9	Do Nothing	$ -
32.1	COBBLESTONE LANE	OLDE CARRIAGE LANE	CUL DE SAC	568	100	Do Nothing	$ -
60	GLEASON COURT WEST	NORTHEAST MAIN STREET	DEAD END	1107	100	Do Nothing	$ -

APPENDIX C

REPAIR ALTERNATIVES AND UNIT COSTS

2020 Repair Alternative Cost Summary

Activity	Description	Unit Cost/SY
(RM) Crack Seal or Patch	Cleaning and Sealing Cracks with Rubberized Compound OR Shallow Patch	$0.60
(RM) Crack Seal & Patch	Patching, Cleaning, and Sealing Cracks with Rubberized Compound	$1.20
(PM) Shim, Crack Seal & Patch	Patching, Sealing Cracks and Spot HMA 1" Leveling	$8.50
(PM) 1.5" Overlay	1.5" Overlay, adjust structures, police detail & line paint	$12.40
(SI) 2" Overlay Local	2" Overlay, adjust structures, police detail, line paint & 10% contingency	$19.20
(SI) 2" Mill & Overlay Local	2" Mill and overlay, adjust structures, police detail, line paint & 10% contingency	$24.10
(SI) 3" Overlay Art/Col	3" Overlay, adjust structures, police detail, line paint & 10% contingency	$31.00
(SI) 3" Mill & Overlay Art/Col	3" Mill and overlay, adjust structures, police detail, line paint & 10% contingency	$36.40
(BR) Reclaim Local	Reclamation, 4" HMA, remodel & reset structures, police detail, line paint & 15% contingency	$37.90
(BR) Reclaim Arterial/Collector	Reclamation, 6" HMA, remodel & reset structures, police detail, line paint & 15% contingency	$54.00
(BR) Recon Local	Full depth reconstruction, 4" HMA, remodel & reset structures, police detail, line paint & 10% contingency	$107.60
(BR) Recon Arterial/Collector	Full depth reconstruction, 6" HMA, remodel & reset structures, police detail, line paint & 10% contingency	$119.70



APPENDIX D

GLOSSARY

GLOSSARY OF TERMS

ASSET MANAGEMENT SYSTEM (AMS): similar to a Pavement Management System, has all the database attributes describing an infrastructure network such as water, wastewater or drainage system. This additional data to the management system database may include drainage features, utilities, traffic signs, pavement markings, sidewalks, pedestrian ramps and other road related elements within the right of way. Because the roadway network system serves as a common location and identification system for roadside elements, the database can be comprehensively evaluated for infrastructure system wide planning and management.

DEDUCT POINTS: points representing the penalty assessed for each identified distress used in the calculation of the Pavement Condition Index. Each distress has multiple severity and extent levels, with a specific number of points at each level. Deduct points may be modified for all nine pavement distress types. The deduct points are ultimately subtracted from a perfect pavement condition of 100.

DETERIORATION RATE: a rate that predicts of the anticipated change in a roadway's condition over time.

DISTRESS: a physical defect or deficiency on the pavement surface that can be observed and quantified through visual inspection of the pavement surface. Broad categories include surface cracking, base related cracking, patching, and surface wear.

DRAINAGE CONDITION INDEX (DCI): an index derived from controlled measurements and evaluations of pavement surface drainage deficiencies and conditions. It is a serviceability rating established for determining the present stature or performance of the drainage features on a scale from 0 to 100, with 100 being excellent.

FUNCTIONAL CLASSIFICATION: Road functional classification places all streets and roads in the network into one of four general categories - arterial, collector, local, or dead end - according to vehicular volume, roadway geometry, and traffic characteristics.

NETWORK LEVEL: an assessment of conditions and/or program needs across the entire roadway system encompassed by the pavement management study.

NETWORK PRIORITY RANKING (NPR): a value computed by PAVEMENTview®Plus at the time it determines the most beneficial recommended repair for a particular pavement section. The Network Priority Ranking formula is:

NPR = (.40 x PCI) + (.50 x Functional Class. Priority) + (.30 x Pavement Class. Priority) + (.10 ADT)

Where NPR = Network Priority Ranking equals 40% Pavement Condition Index plus 50% Functional Classification Priority Rank plus 30% Pavement Classification Priority Rank and plus 10% Average Daily Traffic.

OVERALL CONDITION INDEX (OCI): an index derived from controlled measurements of pavement condition, rideability, drainage condition, safety, utility condition, traffic control, sidewalk condition, and roadside maintenance. An acceptable scale for roads and streets is 0 to 100, with 100 being excellent.

PAVEMENT CONDITION INDEX (PCI): an index derived from established measurements of pavement surface condition distress or deficiencies. It is a serviceability rating established under controlled conditions having a scale of 0 to 100, with 100 being excellent.

PAVEMENT CLASSIFICATION: Pavement classification identifies the pavement material for streets and roads in the network. There are four categories: BC = Bituminous Concrete, BR = Brick, PC= Portland Concrete, and GR = Gravel.

PAVEMENT MANAGEMENT (PM): is the effective and efficient directing of the various activities involved in providing and sustaining pavements in a condition acceptable to the traveling public at the lowest life-cycle cost.

PAVEMENT MANAGEMENT SYSTEM (PMS): an established, documented procedure treating many or all of the Pavement Management activities in a systematic and coordinated manner. It consists of five essential elements structured to serve decision-making responsibilities at various management levels.

1. Pavement surveys related to condition and serviceability;
2. Database containing all pavement-related information;
3. Analysis scheme;
4. Decision criteria;
5. Implementation procedures.

PAVEMENT PERFORMANCE: the assessment of how well the pavement serves the user over time. The engineer often associates pavement condition with an arbitrary, but quantifiable, value relating to pavement roughness, pavement distress, or pavement strength. Performance is the measured change of condition and/or serviceability over increments of time.

PREVENTATIVE MAINTENANCE: activities performed at planned intervals to protect and seal the pavement. Generally these activities lead to pavement preservation. Seals are designed to provide one or more of the following benefits:

1. Prevent the intrusion of air and moisture;
2. Fill small cracks and voids;
3. Rejuvenate an oxidized binder;
4. Provide a new wearing surface.

PROJECT LEVEL: a detailed assessment or identification of needs relative to a specific roadway, or a section thereof, as opposed to network level applications. It may include on site pavement testing, lab evaluation, life cycle cost analysis, and treatment recommendation for the particular pavement section.

RECONSTRUCTION: the complete removal and replacement of a failed pavement, which might also involve widening, realignment, traffic control devices, safety hardware, and major base and drainage work.

REHABILITATION: any work needed to restore the pavement to a condition that will allow it to perform satisfactorily for several years. Rehabilitation also includes the work necessary to prepare the pavement for an overlay. The major activities involved in the rehabilitation process are:
1. Partial depth patching;
2. Full depth patching;
3. Joint and crack sealing.
4. Grouting and undersealing (filling voids);
5. Grinding and milling (removal of high spots in the pavement.);
6. Overlays.

REPAIR STRATEGIES: PAVEMENTview®Plus represents repair strategies as a decision of user defined "if, then" statements used in the PAVEMENTview®Plus. The recommended repairs are based on five decision factors: Functional Classification, Surface Type, PCI range, curb reveal, and Sidewalk Condition Index (SCI). These criteria input into the decision matrix represent the various conditions for each decision factor.

REPAIR TYPES: the various choices of treatment available for providing a solution to a pavement deficiency or problem. The associated repair type cost is based on a locality's past experience.

RIDEABILITY INDEX (RI): a measure of the smoothness of a pavement, (traveled surface) as perceived by the public traveling in a vehicle at a speed appropriate for the particular surface. It is a serviceability rating having a scale of 0 to 100, with 100 being excellent. A controlled measurement of longitudinal profile pavement surface condition distress or deficiencies can be made using a profilometer and can be correlated to a roughness scale.

ROADSIDE MAINTENANCE INDEX (RMI): an index derived from evaluations of required roadside maintenance activity levels, such as mowing, litter collection, overhanging branches, and sand residue from plowing operations. It is a rating established for determining the present status or relative condition of the roadside maintenance, and is measured on a scale of 0 to 100, with 100 being excellent.

ROUTINE MAINTENANCE: activities performed or steps taken to correct a specific pavement failure or distress area. Routine maintenance usually addresses localized pavement defects and includes activities such as:

1. Full depth patching - more than 2" deep, requiring saw cutting distressed area and removal of pavement and gravel base to a depth of 8", followed by placement of new dense graded gravel base and hot mix asphalt in multiple layers;
2. Skin patching - less than 2" deep, typically no cutting required, placement of hot mix asphalt in 1 layer;
3. Crack sealing – sealing of surface cracks to prevent water intrusion

SIDEWALK CONDITION INDEX (SCI): an index derived from controlled measurements and evaluations of sidewalk and/or walkway and/or pedestrian ramp deficiencies and conditions. It is a serviceability rating established for determining the present status or performance of sidewalks and pedestrian ramps, and is measured on a scale of 0 to 100, with 100 being excellent.

STRUCTURAL IMPROVEMENT: activites performed when the pavement deteriorates beyond the need for preventive maintenance applications and the road base is structurally sound. Activites could include:

1. Thick Overlays;
2. Cold Planning and Overlay;
3. Hot in Place Recycling – Re-heating, scarifying, and adding rejuvenator to existing surface to a depth of 1-1/4" followed by an overlay.

TRAFFIC CONTROL INDEX (TCI): an index derived from factors pertaining to traffic control measures such as traffic signs and signals, lighting, and other warning devices. It is a rating established for determining the performance of the roadway as it relates to traffic control, and is measured on a scale of 0 to 100, with 100 being excellent.

TRAFFIC SAFETY INDEX (TSI): an index derived from measurements and evaluations of stopping sight distance, horizontal and vertical curves, accident data, geometry and other factors which may affect the public safety while traveling on the roadway. It is a rating established for determining the performance of the roadway as it relates to safety, and is measured on a scale of 0 to 100, with 100 being excellent.

UTILITY CONDITION INDEX (UCI): an index derived from controlled measurements and evaluations of utility cuts/patches in the pavement surface area. It is a serviceability rating established for determining the present status or performance of the utility patch on a scale from 0 to 100, with 100 being excellent.