MUNICIPALITY OF OLIVER PAIPOONGE

FORMAL REPORT - CONDITION RATINGS AND STRATEGY FOR ASSET MANAGEMENT (ROADS)

Submitted to:
Chris Bowles
Kevin Green
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Submitted by:
Laine Mckay

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1 INTRODUCTION

The Municipality of Oliver Paipoonge is responsible for submitting the Current Levels of Service of Core Assets in July 2021. The most prominent category of these assets are the road networks. This report provides a detailed summary of the road assessments, treatment costs and treatment strategies completed by Laine Mckay (Civil Engineering Intern) in the summer of 2020. The information within this report is strictly limited to assessing the Pavement Condition Rating for both the Asphalt Concrete and Surface Treated roadways within the Municipality. The gravel roadways within the Municipality are graded regularly and adequate aggregate quantities are maintained throughout the year. For this reason, the gravel roadways are not being assessed. Condition assessments of other assets located on the Municipalities road networks such as streetlights, signs and culverts are excluded from this report.

The assessments made throughout this study were done so based on the subjective procedures outlined in the following Ministry of Transportation Manuals:

- SP-024 Manual for Condition Rating of Flexible Pavements (Ministry of Transportation, 2016)
- SP-025 Manual for Condition Rating of Gravel Roads (Ministry of Transportation, 1989)
- SP-021 Manual for Condition Rating of Surface-Treated Pavements (Ministry of Transportation, 1989)
- SP-022 Flexible Pavement Condition Rating: Guidelines for Municipalities (Ministry of Transportation, 1989)

The road sections assessed in the Municipality of Oliver Paipoonge are all Flexible Pavements. The types of flexible pavements within the Municipality are Asphalt Concrete Pavement (HCB), Surface-Treated Pavement (LCB) and Gravel. A breakdown of the quantity of roadway per surface type is shown in the table below:

Road Surface Type	%	Length (km)
Surface Treated (LCB)	67.2	173
Asphalt Concrete (HCB)	19.6	50.5
Gravel	13.2	34.0
Total	100.0	258

Table 1. Overall Roadway Length Comparison

Each section of roadway in the Municipality will be assessed to obtain an updated Pavement Condition Rating (PCR). The Pavement Condition Rating is a value between 0-100 that represents the physical condition of the roadway. The PCR can be obtained manually using

subjective analysis or by using advanced technologies. All pavement condition ratings within this report are obtained manually using subjective analysis.

The PCR is based on two parameters: Ride Condition rating (RCR) and Distress Manifestations (DM). The Ride Condition Rating is a subjective rating and is assigned a value between 0-10 (Very Poor to Excellent) based on the quality of the ride. The guidelines for assessing the ride condition rating subjectively are shown in the table below:

RCR	Uniform Description of Ride Condition at Posted Speed (RCR)	Guidelines
8-10	Excellent	Very smooth ride.
6-8	Good	Smooth ride with just a few bumps or depressions.
4-6	Fair	Still comfortable ride with intermittent bumps or depressions.
2-4	Poor	Uncomfortable ride with frequent bumps or depressions.
0-2	Very Poor	Uncomfortable ride with constant bumps or depressions resulting in rattle and shake of rating vehicle. Cannot maintain posted speed and must steer constantly to avoid bumps or depressions.

Table #1. Guidelines for Assessing Ride Condition Rating

Pavement distress manifestations are defects in the pavement judged on severity and density of occurrence. Pavement surface distresses are caused by the combined effects of traffic loading and volume, environmental impacts and overall pavement aging. Distress Manifestations are grouped under three main headings. These headings are Surface Defects, Surface Deformation and Cracking. The most notable types of distress manifestations in Asphalt Concrete and Surface Treated roadways can be found below:

Type	Distress	Description	Possible Causes
Surface Deformation	Rippling/Shoving	A localized longitudinal or transverse displacement of the pavement creating hups or waves.	• Braking or accelerating vehicles on a steep upgrade/downgrade or on a curve or intersection. • Poor Construction Practices
	Wheel Track Rutting	Longitudinal surface	• Poorly compacted

		depressions in the wheel track after repeated loading.	structural layers ● Unstable granular base due to excessive saturation ● Overstressed pavement structure due to excessive wheel load
	Distortion	Dishing, bumps and dips in the pavement surface other than described by rippling/shoving/rutting.	● Differential frost heaving in poorly drained areas ● Culvert failures
Surface Defects	Coarse Aggregate Loss/Ravelling/Segregation	Wearing of the pavement surface by dislodging of pavement materials (coarse or fine aggregates)	● Lack of bond between aggregate and binder from poor construction ● Snow plowing
	Potholes	Bowl shaped holes within the pavement surface. Localized disintegration or broken pavement within an area of fatigue cracking	● Poor drainage and freeze-thaw cycles ● Wheel loading in an area of fatigue cracking
	Flushing	Excessive asphalt concrete on the pavement surface. Generally found in the wheel paths.	● High asphalt cement to void ratio ● Paving over excessively primed surfaces
Cracking	Longitudinal	Cracks that are approximately parallel to the centerline of the roadway. Typically situated in the wheel path or along the pavement joints.	● Wheel path longitudinal cracking can be caused by an overloaded vehicle during the weakest pavement period (early spring) ● Joint cracking is typically caused by lack of asphalt binder near the joint
	Transverse	Cracks that are approximately perpendicular	● Freeze-thaw cycles cause

		to the centerline.	expansion and contraction of surface course ● Reflection from a transverse crack within lower pavement layer
	Pavement Edge	Straight or crescent shaped cracks in a wave formation located at the pavement lane edge.	● Insufficient bearing support or excessive traffic loading at pavement edge ● Frost action
	Map	Interconnected cracks forming a series of large polygons that resemble a map.	● Swelling and shrinkage of the pavement ● Frost action
	Fatigue/Alligator	Series of interconnected cracks resembling alligator skin or chicken wire. Typically developed in the wheel path	● Insufficient bearing support ● Poor drainage

Table #2. Notable Distress Manifestations

The last time the PCR's were obtained was in 2015 and 2019. The 2019 ratings were once again completed by Civil Engineering Intern Laine Mckay. An overall breakdown of these 2019 PCR's by surface type is shown in the table below:

Road Surface Type	Average PCR
Surface Treated (LCB)	71.6
Flexible Pavement (HCB)	76
Gravel	69

Table #3. 2019 Pavement Condition Ratings by Surface Type

In 2019, the majority of the roadways within the Municipality had a PCR within the range of 65-75 which constitutes a "fairly good" to "good" rating. The main purpose of completing these road assessments is so that the Municipality of Oliver Paipoonge can have an updated Pavement Condition Rating for each roadway so that accurate assessments on the service life can be made. After assessing the service life, replacement costs and financial plans will be established for budgeting purposes and proposals. After completing these assessments the

recorded data will be inputted into the current asset management software “Citywide Solutions V4”.

2 METHODOLOGY

2.1 Condition Assessments

Information for each asset in the Municipality of Oliver Paipoonge can be found within “CityWide Solutions”. Each roadway is broken up into smaller subsections that span from intersection to intersection and are listed as their own asset ID number as shown below:

Figure #1. Roadway Subsection

Each roadway section within the Municipality will be evaluated according to the Procedure for Pavement Evaluation (Appendix A). Field assessment forms used to assess Asphalt Concrete and Surface Treated Surfaces (Appendix A) are utilized to evaluate the RCR and DM. From the RCR and DM the PCR is obtained. All pavement condition ratings are carried out in late spring and early summer to assure that there is little to no frost in the ground. Specific notes and pictures are also recorded to highlight more serious and urgent distresses. All evaluations are reviewed by Municipality of Oliver Paipoonge Director of Operations before entering the data into the asset management software.

2.2 Roadway Classifications

Roadways are designed to serve a variety of different purposes which means that all of them are not created alike. Similarly, not all roadways require the same treatment options. In order to create a strategy for treating the different roadways in the Municipality, the roadways must be sorted into separate “classes”. Three separate classes of roadways have been created in order to group the similar roadways. A description of each roadway class is listed below:

High Class
High Class roadways are subjected to high traffic volumes, loads and speeds. As a result, an extensive base with an asphalt concrete pavement surface course is utilized. High Class roadways are capable of having a perfect road **PCR of 100**.

Middle Class
The majority of the Municipality contains roadways with lower traffic volumes, loads and speeds compared to the High Class roadways. Middle Class roadways contain a sub-base consisting of untreated “B” gravel, a base consisting of untreated “A” gravel and a double Bituminous Surface Treated surface course. Middle Class roads are capable of having a perfect road **PCR of 90**.

Low Class
Low Class roadways are located in the housing developments within the Municipality. Low Class roadways are subjected to low loads and speeds compared to the other two roadway classes. As a result, Low Class Roadways consist of a base similar to the Middle Class roadways but with thinner layer thicknesses. The surface course on Low Class roadways consists of Asphalt Concrete. Low Class roadways are capable of having a perfect road **PCR of 90.**

2.3 Treatment Summaries

4 general road treatment strategies will be tailored to each roadway class. The PCR will dictate the type of treatment that the roadway is eligible for. The 4 treatment summaries are listed and described below:

1. **Regular Maintenance**
   The Regular maintenance summary includes costs covered by the Municipalities operating budget and is applied to help preserve the condition of the roadway and prevent future deterioration. Regular Maintenance is done on all roads regardless of the PCR rating. Regular maintenance is the only treatment that roadways with a PCR over 70 will receive. A few examples of the treatments that make up the regular maintenance summary are:

   - Crack Sealing
   - Hot Mix Repairs
   - Edge Reconstruction
   - Maintenance Grading/Granular Distribution (Gravel Roads)

2. **Preventative**
   The Preventative summary consists of treatments intended to address functional surface defects. Minor deficiencies and deterioration prevention will be addressed. A detailed breakdown of the treatments corresponding to each road class, along with the cost per kilometer are shown in the results section.

3. **Reconstruction**
   The Reconstruction summary is intended to address both functional and structural distresses. This treatment summary is intended to bring the roadway to a near perfect state. It is designed to promote structural capacity and a high level of serviceability**.** A detailed breakdown of the treatments corresponding to each road class, along with the cost per kilometer are shown in the results section.

4. **New Construction (PCR <40)**
   The New Construction summary is implemented whenever a complete base rebuild is needed on a roadway. This can be both on an existing roadway or a new roadway. This treatment option can be applied to existing roadways with a PCR less than 40 if reconstruction is not feasible. This is a special case where the existing surface is no longer serviceable due to a very poor road base and a full excavation would be more feasible in the long run. A detailed breakdown of the treatments corresponding to each road class, along with the cost per kilometer are shown in the results section.

2.4 Trigger PCR's

As previously stated, the treatment summary that a roadway is eligible for is based on the PCR of the roadway. The approximate PCR's that trigger each treatment summary are shown below:

Roadway Class	Treatment Summary	PCR Trigger Range
High Class	Preventative	≈70
	Reconstruction	≈60
	New Construction	<40
Middle Class	Preventative	60-70
	Reconstruction	40-59
	New Construction	<40
Low Class	Preventative	60-70
	Reconstruction	40-59
	New Construction	<40

Table #4: Trigger PCR's Based on Roadway Class

The Municipality holds its High Class Roadways to a much higher standard in comparison to the middle class and low class roadways. As a result, treatments are triggered at a higher PCR to maintain a high level of serviceability for roadway users.

Approximate PCR Ratings after Treatment Has Been Applied

1. Regular Maintenance: Done on all roadways, intended to prolong serviceability and slow deterioration.

2. Preventative: Returns PCR to 75-90 (depending on construction and roadway class)
3. Expansion/Reconstruction: Provides a new PCR of 80-100 (depending on construction and roadway class)
4. New Construction: Provides a new PCR of 90-100 (depending on roadway class)

The new PCR's after a treatment has been applied are highly variable. It depends on the extent of construction and also the quality of construction.

2.4 Change in PCR (∆PCR)

The change in Pavement Condition Rating per year is a pivotal part of accurately managing roadways. The condition assessments from 2015, 2019 and 2020 will be heavily relied on when calculating an accurate ∆PCR. Looking back at previous roadway construction projects and determining why and when the project took place will also be useful in coming up with a ∆PCR. The type of treatment along with the class of roadway will be largely taken into consideration.

2.5 Cost Estimates

All treatment summaries will have cost estimates associated with them. These cost estimates will be based on current Northwestern Ontario contractor unit prices for the year of 2020. Quantities will be determined based on previous road construction projects in the Municipality and will be prorated on a per kilometer basis.

2.6 Strategy

As previously stated, the purpose of this report is to create an accurate method of planning and budgeting for roadway construction projects based on the assets' condition. All of the variables in the methodology section will be inputted into the Municipalities asset management software. The software will generate reports on a per year basis what the Municipality should be expecting to spend on maintaining their roadways. The Municipality of Oliver Paipoonge Director of Operations has defined the typical treatment strategy policy to be 2 preventative treatments prior to a reconstruction treatment. It is not expected that the Municipality follow the reports exactly when budgeting for roadway projects. It is intended to be a guide to identify problematic roadways, predict a likely treatment option and estimate the cost of the construction.

3 RESULTS

3.1 Pavement Condition Ratings

After assessing all roadways within the Municipality, some notable statistics have been gathered. All condition assessments have been made for each segment of roadway. The following table shows the weighted PCR averages for each roadway class:

Roadway Class	Average PCR
High Class	81
Middle Class	72.3
Low Class	65.1

Table #5. 2020 Pavement Condition Ratings

The overall PCR for each roadway class has minutely changed since 2019. There is a 0.5 % increase in PCR for the Middle Class roadways, a 3.5 % decrease in PCR for the Low Class roadways and no change in PCR for the High Class roadways.

3.2 Treatment Summaries with Costs

Each treatment summary cost is based on the typical quantities for each item. The cost per unit is obtained from current northwestern Ontario contractor prices.

Preventative Maintenance Cost/km

High Class Roadway			
Preventative			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
40mm Mill	tonne	762	$20
40mm Hot Mix Asphalt	tonne	762	$150
Line Painting	km	1	$1,000
		Cost/km	**$130,540**

Table #6. High Class Roadway Preventative Cost/km

Middle Class Roadway			
Preventative			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Hot Mix Asphalt Padding	tonne	10	$250.00
Spray Injection Patching	km	1	$500.00
Frost Boil Repair	km	1	$4,000.00

Single Surface Treatment	m2	7000	$2.75
Line Painting	km	1	$1,000.00
		Cost/km	**$27,250.00**

Table #7. Middle Class Roadway Preventative Cost/km

Low Class Roadways			
Preventative			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Hot Mix Asphalt Patching	tonne	5	$250.00
Line Painting	km	1	$1,000.00
Shoulder Excavation	m3	200	$15.00
Shoulder Widening	m3	200	$29.00
		Cost/km	**$11,050.00**

Table #8. Low Class Roadway Preventative Cost/km

Expansion/Reconstruction Cost/km

High Class Roadways			
Expansion/Reconstruction			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Pulverize	m2	7500	$1.5
Granular "M" Gravel (100mm)	m3	1000	$18
100mm Hot Mix Asphalt	tonne	1960	$150
Line Painting	km	1	$1,000
900mm+ CSP	km	1	$12,500.00
Shoulder Excavation (200mm)	m3	400	$15.00
Shoulder Widening	m3	400	$29.00
New Signs	km	1	$500.00
Ditch Cleanout	m	500	$10.00
Granular Sealing	m2	1200	$7.70

		Cost/km	**$388,482**

Table #9. High Class Roadway Reconstruction Cost/km

Middle Class Roadways			
Expansion/Reconstruction			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Scarify/Pulverize	m2	8000	$1.50
Granular "M" Gravel (150mm)	m3	1200	$18.00
Road Excavation	m3	1200	$10.00
Granular "B" Gravel	m3	1200	$17.00
Filter Cloth	m2	2000	$3.50
Double Surface Treatment	m2	7000	$5.75
800/900mm CSP	km	1	$5,500.00
Ditch Construction	m	300	$15.00
Ditch Cleanout	m	700	$5.00
Line Painting	km	1	$1,000.00
		Cost/km	**$127,750.00**

Table #10. Middle Class Roadway Reconstruction Cost/km

Low Class Roadway			
Expansion/Reconstruction			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Pulverize	m2	8000	$1.50
Granular "M" Gravel (50mm)	m3	450	$18.00
Hot Mix Asphalt (40mm)	tonne	735	$150.00
Line Painting	km	1	$1,000.00
		Cost/km	**$131,350.00**

Table #11. Low Class Roadway Reconstruction Cost/km

New Construction Cost/km

High Class Roadways		
New Construction		
Cost is based on averaging similar projects throughout Northwestern Ontario	Cost/km	**$1,150,000**

Table #12. High Class Roadway New Construction Cost/km

Middle Class Roadways			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Granular "B" Gravel (600mm)	m3	6000	$17.00
Granular "M" Gravel (150mm)	m3	1350	$18.00
Ditch Construction	m3	2000	$15.00
800/900mm CSP (Centerline)	km	2	$5,500.00
500mm CSP (Driveway)	km	4	$1,000.00
Filter Cloth	m2	5000	$3.50
Signage	km	1	$500.00
Double Surface Treatment	m2	7000	$5.75
Line Painting	km	1	$1,000.00
		Cost/km	**$230,550.00**

Table #13. Middle Class Roadway New Construction Cost/km

Low Class Roadway			
New Construction			
Treatment	**Unit**	**Quantity/km**	**Cost/unit**
Granular "B" Gravel (600mm)	m3	6000	$17.00
Granular "M" Gravel (150mm)	m3	1350	$18.00
Ditch Construction	m3	2000	$15.00
800/900mm CSP (Centerline)	km	2	$2,000.00

500mm CSP (Driveway)	km	4	$1,000.00
Filter Cloth	m2	5000	$3.50
Signage	km	1	$500.00
Hot Mix Asphalt (50mm)	tonne	735	$150.00
Line Painting	km	1	$1,000.00
		Cost/km	**$293,550.00**

Table #14. Low Class Roadway New Construction Cost/km

Note: All roadway classes are eligible for New Construction when the PCR is below 40. As previously stated, this treatment summary is a special case and is not commonly used in the Municipality. Also, the costs associated with the Low Class Preventative summary are typically covered by the Municipalities operating budget and are not capitalized.

The lengths of existing roadways that are currently within each treatment summary are shown below:

Roadway Class	Treatment Summary	% Eligible (by length)
High Class	Regular Maintenance	69
	Preventative Maintenance	20
	Reconstruction	10
	New Construction	1
Middle Class	Regular Maintenance	54
	Preventative Maintenance	40
	Reconstruction	6
	New Construction	0
Low Class	Regular Maintenance	37
	Preventative Maintenance	35
	Reconstruction	27
	New Construction	1

Table #15. % of Roadways Eligible for each Treatment Summary by Roadway Class

3.3 *Change in PCR (∆PCR)*

∆PCR's were determined by comparing the PCR's from 2015, 2019 and 2020. An emphasis was put on the difference in PCR between the years of 2019 and 2020 as the same rater was used. Furthermore, the ∆PCR was also computed by examining the time of past roadway construction and comparing it to the PCR of 2019 and 2020. The type of treatment along with the Class of road way was also largely taken into consideration. The following values are the deterioration rates based on the 3 different roadway classes.

- High Class Roadways: 2.5 points/year
- Middle Class Roadways: 3 points/year
- Low Class Roadways: 2.5 points/year

The ∆PCR values were all rounded up to the nearest 0.5 to provide a more conservative estimate. These rates will vary based on factors like Annual Average Daily Traffic (AADT), Environmental Issues (Flooding) and original quality of construction.

3.4 Management Strategy

Each roadway classification has its own treatment strategy that corresponds directly to all calculated inputs in Sections 3.1, 3.2 and 3.3. Citywide solutions can represent the management strategy using a strategy graph. An example of this strategy graph and the treatment event details for a High Class Roadway is shown below:

Graph #1. Treatment Strategy Curve for a High Class Roadway

+	Event Date	Name	Description	Event Class	Cost	Funding Source	Event Range / Trigger	Impact	Added EUL
	2031-07-01	Preventative Treatment	40mm Mill, 40mm Hot Mix Asphalt, Line Painting	Preventative Maintenance	$130,148.38 , $130,540.00/km	Capital	70 to 70 Condition	Set to 85 Condition	6 Years
	2037-07-01	Preventative Treatment (Copy)	40mm Mill, 40mm Hot Mix Asphalt, Line Painting	Preventative Maintenance	$130,148.38 , $130,540.00/km	Capital	70 to 70 Condition	Set to 80 Condition	4 Years
	2045-07-01	Expansion/Reconstruction	Pulverize, Granular "M" Gravel (100mm), 100mm Hot Mix Asphalt, Line Painting, 900mm+ CSP, Shoulder Excavation (200mm), Shoulder Widening, New Signs, Ditch Cleanout, Granular Sealing	Rehabilitation	$406,010.30 , $407,232.00/km	Capital	60 to 69 Condition	Set to 100 Condition	16 Years

Figure #2. Lifecycle Events in High Class Roadway Treatment Strategy

The strategy graph represents an assets PCR over its service life. As the PCR drops between the aforementioned trigger points, it triggers a treatment and resets the PCR. The treatment function is also altered when condition assessments are inputted. For this specific asset, a reconstruction was implemented in 2019, setting the PCR at 100. After approximately 12 years with no treatments other than regular maintenance, the asset is expected to have a PCR of 70, triggering a preventative treatment. If this treatment is implemented on schedule it will reset the PCR to the programmed impact. Moving forward, it will be eligible for one more preventative treatment prior to another reconstruction.

Within Citywide Solutions, the Capital Replacement Profile Report generates costs required to treat each roadway that is eligible for treatment based on its PCR. An example of this report over a period of 5 years, for the High Class Roadway profile is shown below:

CityWide Home > AM > Asset Management Reports > Capital Replacement Profile Report (Yearly) > Data (Classification) 2 Database updated Municipality of Oliver Paipoonge Engineering

Filter No Filters Profile High Class Roadways Segment All Segments Year 2020 to 2025 Range 1 Year Blocks

Run Report

Showing 25 records

			Event Cost	2020	2021	2022	2023	2024	2025
	High Class Roadways								
	Roads - HCB	-	$4,638,581.40	$244,339.20	$1,081,097.60	$469,752.10	$2,702,800.92	$140,591.58	-
	7 - ROSSLYN RD	-	$244,339.20	$244,339.20	-	-	-	-	-
	17 - VIBERT RD	-	$234,972.00	-	$234,972.00	-	-	-	-
	27 - TWIN CITY CROSSROAD	-	$169,702.00	-	$169,702.00	-	-	-	-
	28 - ARTHUR ST W	-	$78,324.00	-	-	-	$78,324.00	-	-
	51 - OLIVER RD	-	$140,591.58	-	-	-	-	$140,591.58	-
	52 - OLIVER RD	-	$70,361.06	-	-	-	$70,361.06	-	-
	53 - OLIVER RD	-	$211,866.42	-	$211,866.42	-	-	-	-
	54 - OLIVER RD	-	$205,208.88	-	-	$205,208.88	-	-	-
	55 - OLIVER RD	-	$19,450.46	-	$19,450.46	-	-	-	-
	70 - RIVER RD	-	$2,248,735.10	-	-	-	$2,248,735.10	-	-
	118 - ROSSLYN RD	-	$110,767.10	-	-	$110,767.10	-	-	-
	124 - RUBIN DR	-	$93,988.80	-	-	$93,988.80	-	-	-
	125 - OLIVER RD	-	$59,787.32	-	-	$59,787.32	-	-	-

Figure #3: Capital Replacement Profile Report

4 DISCUSSION

4.1 Pavement Distresses

After assessing all Asphalt Concrete and Bituminous Surface Treated roadways within the Municipality, a few prominent pavement distresses were observed. Firstly, an extensive amount of transverse cracking was observed due to the harsh Northwestern Ontario climate. The intense freeze-thaw cycles cause an expansion and contraction of the surface course, resulting in cracking perpendicular to the centerline. Transverse cracking in this climate is inevitable and is typically a low severity functional distress. However, if the cracks go untreated for long periods of time they will widen, exposing the underlying layers to the elements. An example of a transverse crack that has been untreated is shown in the figure below:

Figure #4: Transverse Crack left Untreated within Municipality

This can result in a structural distress and have a significant impact on the roadways service life. Crack sealing is an effective method to manage this inevitable distress and is included in the Regular Maintenance treatment summary.

Secondly, the Municipalities roadways are subjected to significant frost heaving in a number of areas. A frost heave is the rising of the ground surface due to frost action. Unwanted moisture in the subbase will freeze in winter months, causing an increase in volume. This increase in volume results in vertical movement of the ground surface. This movement causes swelling and distortion of the surface course. In many instances frost heaving causes a large blowout in the roadway as shown below:

Figure #5: Frost Heave within Municipality

This open pocket in the pavement structure is also another source for unwanted moisture to enter the underlying roadway layers. In many cases within the Municipality, these frost heaves require motorists to slow down as they approach the area to avoid damage to their vehicle. The most notable causes of frost heaves in the Municipality, is the abundance of frost susceptible soils above the frost penetration depth and improper drainage. Coarse grained soils (gravels) with large void ratios can typically accommodate the volume increase without resulting in heaving. However, fine grained soils such as silts, sands and clays have very small void ratios and are very susceptible to heaving. Therefore, frost heaves can be eliminated by removing frost susceptible soils within the frost penetration depth or eliminating sources of water. Full depth excavation of frost susceptible soils within the frost penetration depth is required to eliminate heaving in problematic areas. In addition, ditches should be constructed to a depth deeper than the pavement structure with the appropriate grading (longitudinal and transverse) to allow water to flow away from the roadway. Excessive vegetation growth can also impede water flow. It is recommended that a thorough geotechnical investigation should be completed to identify the exact level of the frost penetration within the Municipality. Frost heave repair, which includes full depth excavation of frost susceptible soils, is included in both the Preventative Maintenance treatment summary along with the Reconstruction treatment summary. Furthermore, ditch construction and ditch cleanout are included in the Reconstruction treatment summary.

4.2 Management Strategy

As previously stated, the treatment strategy that Citywide Solutions produces is to be used as a helpful **guide** for asset management. It is not expected that the Municipality follow the reports exactly when budgeting for roadway projects. It is intended to be a guide to identify problematic roadways, predict a likely treatment option and estimate an accurate cost of the construction. The Municipality cannot afford to treat all roadways in a given year that the software will recommend. The chosen roadways that will be Capital budget projects will be selected by the Municipality Director of Operations. These decisions will be based on a number of factors including AADT, the urgency of a treatment and the consequence of failure. Further research should be conducted in determining policy for prioritizing roadway capital projects. Furthermore, it is important to acknowledge that Citywide Solutions is a software that is dependent on the information that is inputted. It will only be as accurate as the information that the users are putting into it. For this reason, variables such as treatment costs, ∆PCR, PCR, additions/disposals and asset profiles must be updated or improved regularly to ensure accurate results.

5 CONCLUSION

The objective of this report was to obtain updated Pavement Condition Ratings, to create a road treatment strategy and an accurate roadway management guide. The average PCR for the High Class, Middle Class and Low Class roadways are 81, 72.3 and 65.1 respectively, which corresponds to a “fairly good” to “good” classification. As shown in Table #15, a very small portion of the High Class and Middle Class roadways are eligible for the expansion/reconstruction treatment summary. The roadways within the Hamlets are in need of reconstruction which accounts for the higher percentage for the Low Class roadways. In comparison, the majority of High Class, Middle Class and Low Class Roadways are eligible for the Preventative treatment summary. As a result, it is suggested that the majority of the road projects in the near future consist of Preventative treatments. Lastly, a strong emphasis should be put on updating and improving the information within Citywide Solutions.

Appendix A: Evaluation Forms for Describing Density and Severity of Distresses and Obtaining Pavement Condition Rating

PCR	A Guide for the Estimation of Pavement Condition Rating for Flexible Pavements
90 - 100	Pavement is in excellent condition with few cracks. The Ride Condition Rating is excellent with few areas of very slight to slight distortion.
75 - 90	The pavement is in good condition with frequent very slight or slight cracking. The Ride Condition Rating is good with a few slightly rough and uneven sections.
65 - 75	The pavement is in fairly good condition with slight cracking, slight or very slight distortion and a few areas of slight alligatoring. The Ride Condition Rating is fairly good with intermittent rough and uneven sections.
50 - 65	The pavement is in fair condition with intermittent moderate and frequent slight cracking, and with intermittent slight or moderate alligatoring and distortion. The Ride Condition Rating is fair and the surface is slightly rough and uneven.
40 - 50	The pavement is in poor to fair condition with frequent moderate cracking and distortion, and intermittent moderate alligatoring. The Ride Condition Rating is poor to fair and the surface is moderately rough and uneven.
30 - 40	The pavement is in poor to fair condition with frequent moderate alligatoring and extensive moderate cracking and distortion. The Ride Condition Rating is poor to fair and the surface is moderately rough and uneven.
20 - 30	The pavement is in poor condition with moderate alligatoring and extensive severe cracking and distortion. The Ride Condition Rating is poor and the surface is very rough and uneven.
0 - 20	The pavement is in poor to very poor condition with extensive severe cracking, alligatoring and distortion. The Ride Condition Rating is very poor and the surface is very rough and uneven.

Distress Type			Severity of Distress				
			1 Very Slight	2 Slight	3 Moderate	4 Severe	5 Very Severe
Surface Defects	1	Ravelling and Coarse Agg. Loss, Segregation and Potholes	Barely noticeable loss.	Noticeable loss.	Pockmarks well-spaced, shallow disintegration, open- textured look.	Pockmarks closely-spaced, disintegration with small potholes.	Disintegration with large potholes.
	2	Flushing	Very faint colouring (veining).	Colouring visible (interconnected veining).	Distinctive appearance with free asphalt.	Free asphalt on surface; has wet look.	Wet look with tire noise like driving on wet pavement surface.
Surface Deformations	3	Rippling and Shoving	Barely noticeable. Washboard effect.	Noticeable. Washboard effect.	Bumpy. Washboard effect.	Very bumpy. Pronounced washboard effect.	Large humps may cause poor control of car.
	4	Wheel Track Rutting	3-6 mm Usually no longitudinal cracks.	7-12 mm May include single longitudinal cracks.	13-19 mm May include starting multiple longitudinal cracks. Dual rutting may begin to be visible.	20-25 mm May include multiple longitudinal cracks. May include dual rutting.	> 25 mm May include multiple longitudinal cracks. Usually with dual rutting.
	5	Distortion	Barely noticeable swaying motion.	Fairly noticeable bump or drop. Good control of car.	Noticeable bump or drop. Good/fair control of car.	Significant bounce. Fair control of car.	Excessive and harsh bounce. Poor control of car.
Cracking – Single and Multiple	6	Longitudinal Wheel Track	Width <3 mm. Single hairline cracks. ***Transverse cracks may be partial or full width.***	3-12 mm width. Single cracks. *Transverse cracks may be partial or full width.*	13-19 mm width for single cracks or multiple cracks starting. ***Transverse cracks may also have slight cupping or lipping. (Barely noticeable bump.)***	20-25 mm width for single cracks or multiple cracks; spalling begins to develop. ***Transverse cracks may also have moderate cupping or lipping. (Noticeable bump.)***	> 25 mm wide for single cracks or multiple cracks with spalling developed. May begin to alligator. ***Transverse cracks may also have severe cupping or lipping. (Bump or thump.)***
	8	Centre Line					
	12	Transverse (half, full & multiple)					
	14	Meander & Midlane					
	15	Random / Map					
	10	Pavement Edge	Width <3 mm. Single crack or single wave formation.	3-12 mm width. Single crack or two parallel cracks up to 0.3 m from edge.	Multiple cracks extend up to 0.6 m from edge.	Multiple cracks extend up to 1.5 m from edge.	Multiple cracks extend over 1.5 m from edge. Alligator pattern forming.
Cracking – Alligator	7	Longitudinal Wheel Track	Alligator pattern forming. May include depression up to 6 mm.	Alligator pattern established with block corners fracturing. May include depression 7-12 mm.	Alligator pattern established with spalling of blocks. May include depression 13-19 mm.	Blocks begin to lift. Small potholes from missing blocks. May include depression 20-25 mm.	Polygon blocks lifting. Potholes from missing blocks. May include depression >25 mm.
	9	Centre Line					
	11	Pavement Edge					
	13	Transverse					

Note: Crack width should be determined during the period from May to October.
Do not report routed and sealed cracks; these will be reported as Maintenance Treatment.

Pavement Distresses

Guide for Describing Extent of Pavement Distresses

Class	All Distresses Except Transverse Cracking*	Transverse Cracking Only
1 Few	<10%	Cracks (full and/or half cracks) are more than about 40 m apart.
2 Intermittent	10-20%	No set pattern. Cracks (full and/or half) are about 30 to 40 m apart.
3 Frequent	20-50%	A set pattern. Cracks (full and/or half) are about 20 to 30 m apart.
4 Extensive	50-80%	Rather regular pattern. Cracks (full and/or half are about 10 to 20 m apart).
5 Throughout	80-100%	Regular pattern. Cracks (full and/or half) are less than about 10 m apart.

** Based on percent of surface area within the PMS section affected by distress*

Shoulder Distresses

Guide for Describing Severity of Shoulder Distresses

Type of Distress	Severity of Distress	
	1 Moderate	2 Severe
Cracking	Multiple slight to moderate cracks developed.	Multiple moderate to severe cracks developed.
Pavement Edge - Shoulder (Curb) Separation	Single cracks. Width: 13-19 mm.	Single crack width over 20 mm or multiple cracks.
Distortion	Noticeable edge curling, depression or heaving. No major cracks.	Obvious edge curling, depression or heaving. Multiple cracks.
Breakup	Disintegration with small potholes up to 150 mm.	Disintegration with potholes >150 mm.
Edge Break	Edge cracks with some loss of material.	Edge breaking with extensive loss of material.

Appendix B: Surface Distress Examples within Municipality

Figure 4. Severe Pothole/Frost Boil (C-Line Rd. Section: Barrie Dr.-Candy Mtn Dr.)

Hanna Rd (Boundary Dr to Hwy 61)
Severe frost Heave

Figure 7. Rippling (Intola Rd Section: Yurick Dr-Hwy 102)

Figure 8. Wheel Track Rutting (Mud lake Rd. Section: Pole Line Rd-Oliver Rd)

Figure 10. Severe Longitudinal Crack through CenterLine (Pole Line Rd Section:Mining Rd-Pineview Rd)

Boundary Dr (Hwy 61-Wilderness Rd)
Severe Longitudinal Cracking

Figure 12 Moderate Wheel Track Rutting with Centerlane Alligator Cracking
(Mud Lake Rd. Section: Everett Rd-Hwy 102)

Florence St. (Hwy 11-17 to Ditmars Dr)
Extensive Alligator Cracking and Potholes

Hanna Rd (Candy Mtn Dr to Hwy 130)
Extensive Alligator Cracking

Appendix C: 2020 Pavement Condition Ratings By Class

High Class Roadways

Asset ID	Name	Location	Material	Length (km)	2019 PCR	2020 PCR
7	ROSSLYN RD	From: MACGREGOR ST To: ROSSDALE RD	High Class Bituminous	0.6	64	61
17	VIBERT RD	From: CEDAR LANE To: 130 HWY	High Class Bituminous	1.8	75	72
26	OLIVER RD	From: SPENCE RD To: SINCLAIR RD	High Class Bituminous	1.552	100	98
27	TWIN CITY CROSSROAD	From: 130 HWY To: 11-17 HWY	High Class Bituminous	1.3	76	74
28	ARTHUR ST W	From: 25TH SIDE RD To: HANIAK RD	High Class Bituminous	0.6	82	79
29	ROSSLYN RD	From: KINGSWOOD RD To: 130 HWY	High Class Bituminous	0.523	60	55
51	OLIVER RD	From: TOWNLINE RD To: CENTRE AVE	High Class Bituminous	1.077	79	80
52	OLIVER RD	From: CENTRE AVE To: NICHOLETTS RD	High Class Bituminous	0.539	77	77
53	OLIVER RD	From: NICHOLETTS RD To: BOULTER RD	High Class Bituminous	1.623	75	73
54	OLIVER RD	From: BOULTER RD To: CALVERT RD	High Class Bituminous	1.572	75	75
55	OLIVER RD	From: RUBIN DR To: POINT DE MEURON RD	High Class Bituminous	0.149	75	74
56	OLIVER RD	From: POINT DE MEURON RD To: BAXENDALE DR	High Class Bituminous	0.331	97.5	95
57	OLIVER RD	From: MUD LAKE RD To: VELEY LANE	High Class Bituminous	1.676	100	96
58	OLIVER RD	From: VELEY LANE To: MINING RD	High Class Bituminous	0.997	100	96
59	OLIVER RD	From: MINING RD To: MAKI RD	High Class Bituminous	0.603	100	97
60	OLIVER RD	From: MAKI RD To: SPENCE RD	High Class Bituminous	1.631	100	98
70	RIVER RD	From: BARRIE DR To: 588 HWY	High Class Bituminous	5.522	72	68
118	ROSSLYN RD	From: 130 HWY To: PINEWOOD DR S	High Class Bituminous	0.272	65	65
124	RUBIN DR	From: CALVERT RD To: OLIVER RD	High Class Bituminous	0.72	80	76
125	OLIVER RD	From: CALVERT RD To: RUBIN DR	High Class Bituminous	0.458	75	75
132	OLIVER RD	From: BERINI DR To: HILL ST	High Class Bituminous	0.789	100	97
134	OLIVER RD	From: SINCLAIR RD To: BERINI DR	High Class Bituminous	0.998	100	97
142	COOPER RD	From: HWY 130 To: DEAD END	High Class Bituminous	0.58	69	69
149	ARTHUR ST W	From: HANIAK RD To: 130 HWY	High Class Bituminous	1	75	73
152	ROSSLYN RD	From: 25TH SIDE RD To: QUEENS RD	High Class Bituminous	1.039	60	57
158	OLIVER RD	From: MCLEAN AVE To: MACGILLVARY AVE	High Class Bituminous	0.128	97.5	95
165	OLIVER RD	From: BAXENDALE DR To: MCLEAN AVE	High Class Bituminous	0.268	97.5	95
169	ROSSLYN RD	From: QUEENS RD To: KINGSWOOD RD	High Class Bituminous	0.475	59	57
173	ROSSLYN RD	From: PINEWOOD DR S To: PENNOCK DR	High Class Bituminous	0.238	66	63
174	ROSSLYN RD	From: PENNOCK DR To: MACGREGOR ST	High Class Bituminous	0.32	66	63
201	OLIVER RD	From: MACGILLVARY AVE To: MUD LAKE RD	High Class Bituminous	0.465	100	98
221	OLIVER RD	From: HILL ST To: 11-17 HWY	High Class Bituminous	0.134	100	98
239	TWIN CITY CROSSROAD	From: 11-17 HWY To: POLE LINE RD	High Class Bituminous	0.699	74	73
2423	DEHOOP RD	Rubin Industrial Park	High Class Bituminous	0.23	78	77
2425	WIDEMAN RD		High Class Bituminous	0.3	78	77

Middle Class Roadways

Asset ID	Name	Location	Material	Length (km)	2019 PCR	2020 PCR
1	CANDY MOUNTAIN DR	From: WEST RIVERDALE RD To: DEAD END	Low Class Bituminous	0.529	76	76
3	CALVERT RD	From: OLIVER RD To: JOHN ST. RD	Low Class Bituminous	3.2	63	77
4	MAKI RD	From: OLIVER RD To: MCNALLEY DR	Low Class Bituminous	1.724	68	77
5	NICHOLETTS RD	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.6	80	79
6	MUD LAKE RD	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.796	58	80
8	MCCLUSKEY DR	From: 61 HWY To: 130 HWY	Low Class Bituminous	0.928	77	73
9	C-LINE RD	From: BARRIE DR To: CANDY MOUNTAIN DR	Low Class Bituminous	2.029	65	59
10	POLE LINE RD	From: PINEVIEW RD To: 11-17 HWY	Low Class Bituminous	1.672	70	68
14	WING RD	From: 11-17 HWY To: POLE LINE RD	Low Class Bituminous	2.431	58	54
16	POINT DE MEURON RD	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.529	70	65
18	GARDNER RD	From: 130 HWY To: MACGREGOR ST	Low Class Bituminous	0.69	45	42
20	CENTRE ST	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.6	63	62
22	YURICK DR	From: TOWNLINE RD To: INTOLA RD	Low Class Bituminous	1.617	72	65
24	CANDY MOUNTAIN DR	From: HANNA RD To: 130 HWY	Low Class Bituminous	2.049	75	74
30	CANDY MOUNTAIN DR	From: GILLESPIE RD To: HANNA RD	Low Class Bituminous	2.015	59	87
31	JOHN ST. RD	From: MAKI RD To: DEAD END	Low Class Bituminous	0.9	90	85
33	HARSTONE DR	From: E-LINE RD To: LUCKENS RD	Low Class Bituminous	1.32	75	73
34	HARSTONE DR	From: FRASER RD To: 588 HWY	Low Class Bituminous	7.469	87	85
36	POLE LINE RD	From: TOWNLINE RD To: CENTRE ST	Low Class Bituminous	1.089	72	70
37	POLE LINE RD	From: CENTRE ST To: VIBERT RD	Low Class Bituminous	0.126	73	71
38	POLE LINE RD	From: VIBERT RD To: NICHOLETTS RD	Low Class Bituminous	0.412	69	68
39	POLE LINE RD	From: NICHOLETTS RD To: BOULTER RD	Low Class Bituminous	1.578	64	62
41	POLE LINE RD	From: POINT DE MEURON RD To: WING RD	Low Class Bituminous	0.534	67	63
42	POLE LINE RD	From: WING RD To: MUD LAKE RD	Low Class Bituminous	1.119	63	60
43	POLE LINE RD	From: MUD LAKE RD To: MCFARLINE RD	Low Class Bituminous	0.904	66	62
44	POLE LINE RD	From: MCFARLINE RD To: MINING RD	Low Class Bituminous	1.9	69	69
45	POLE LINE RD	From: MINING RD To: PINEVIEW RD	Low Class Bituminous	2.041	55	54
46	JOHN ST. RD	From: TOWNLINE RD To: NICHOLETTS RD	Low Class Bituminous	1.618	67	64
47	JOHN ST. RD	From: NICHOLETTS RD To: BOULTER RD	Low Class Bituminous	1.606	66	65
48	JOHN ST. RD	From: BOULTER RD To: CALVERT RD	Low Class Bituminous	1.609	66	67
49	JOHN ST. RD	From: CALVERT RD To: MUD LAKE RD	Low Class Bituminous	1.6	64	62
50	JOHN ST. RD	From: MUD LAKE RD To: MAKI RD	Low Class Bituminous	3.202	90	85
62	CANDY MOUNTAIN DR	From: 130 HWY To: MONTEITH RD	Low Class Bituminous	2.024	85	82
63	BARRIE DR	From: ASPEN RD To: C-LINE RD	Low Class Bituminous	2.044	59	90
64	BARRIE DR	From: MONTEITH RD To: RIVER RD	Low Class Bituminous	0.829	73	72
65	BOUNDARY DR	From: 61 HWY To: Spruce Dr.	Low Class Bituminous	0.469	65	65
66	BOUNDARY DR	From: WILDERNESS RD To: 61 HWY	Low Class Bituminous	0.527	65	65
67	WRIGLEY DR	From: MUD LAKE RD To: MAKI RD	Low Class Bituminous	3.17	90	89
68	MINING RD	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.6	62	60

69	PEBBLESTONE RD	From: 11-17 HWY To: POLE LINE RD	Low Class Bituminous	2.029	75	70
71	SPENCE RD	From: DEAD END To: OLIVER RD	Low Class Bituminous	0.8	62	58
73	C-LINE RD	From: 588 HWY To: BARRIE DR	Low Class Bituminous	1.394	67	66
75	MAKI RD	From: EVERETT DR To: MILLAR HEIGHTS DR	Low Class Bituminous	1.604	67	58
76	MAKI RD	From: WRIGLEY DR To: EVERETT DR	Low Class Bituminous	1.474	68	70
77	MAKI RD	From: JOHN ST. DR To: WRIGLEY DR	Low Class Bituminous	1.637	64	70
78	MAKI RD	From: NCNALLEY DR To: JOHN ST. RD	Low Class Bituminous	1.614	72	77
81	MCCLUSKEY DR	From: 130 HWY To: MONTEITH RD	Low Class Bituminous	2.029	85	77
82	MUD LAKE RD	From: EVERETT DR To: 102 HWY	Low Class Bituminous	5.629	61	60
83	MUD LAKE RD	From: WRIGLEY DR To: EVERETT DR	Low Class Bituminous	1.584	61	59
84	MUD LAKE RD	From: JOHN ST. RD To: WRIGLEY DR	Low Class Bituminous	1.605	72	70
85	MUD LAKE RD	From: OLIVER RD To: JOHN ST. RD	Low Class Bituminous	3.08	69	69
86	WILDERNESS RD	From: 61 HWY To: BOUNDARY DR	Low Class Bituminous	0.924	85	82
87	BOULTER RD	From: JOHN ST. RD To: DEAD END	Low Class Bituminous	1.363	67	64
88	BOULTER RD	From: OLIVER RD To: JOHN ST. RD	Low Class Bituminous	3.036	80	76
89	BOULTER RD	From: POLE LINE RD To: OLIVER RD	Low Class Bituminous	1.815	65	68
90	FRASER RD	From: 11-17 HWY To: POLE LINE RD	Low Class Bituminous	2.028	76	72
91	FRASER RD	From: BLINDLINE RD To: 11-17 HWY	Low Class Bituminous	1	75	74
92	CALVERT RD	From: SIM LANE To: DEAD END	Low Class Bituminous	0.9	56	53
93	CANDY MOUNTAIN DR	From: WEST RIVERDALE RD To: GILLESPIE RD	Low Class Bituminous	1.382	75	74
94	HANNA RD	From: BOUNDARY DR To: 61 HWY	Low Class Bituminous	2.036	82	80
95	HANNA RD	From: 61 HWY To: CANDY MOUNTAIN DR	Low Class Bituminous	2.43	75	72
96	INTOLA RD	From: 102 HWY To: DEAD END	Low Class Bituminous	1.2	74	72
97	INTOLA RD	From: YURICK DR To: 102 HWY	Low Class Bituminous	2.217	70	66
99	VIBERT RD	From: 11-17 HWY To: POLE LINE RD	Low Class Bituminous	1.9	83	80
100	GILLESPIE RD	From: CANDY MOUNTAIN DR To: 61 HWY	Low Class Bituminous	2.035	82	80
101	NICHOLETTS RD	From: JOHN ST. RD To: DEAD END	Low Class Bituminous	2.6	69	66
102	NICHOLETTS RD	From: OLIVER RD To: JOHN ST. RD	Low Class Bituminous	3.246	73	73
103	HACQUOIL RD	From: 61 HWY To: BOUNDARY DR	Low Class Bituminous	2.04	77	73
105	VELEY LANE	From: OLIVER RD To: NCNALLEY DR	Low Class Bituminous	1.672	72	72
106	HANNA RD	From: CANDY MOUNTAIN DR To: 130 HWY	Low Class Bituminous	2.065	63	90
107	BARRIE DR	From: C-LINE RD To: 588 HWY	Low Class Bituminous	1.4	71	65
116	BARRIE DR	From: RIVER RD To: ASPEN RD	Low Class Bituminous	3.227	58	90
117	BARRIE DR	From: 130 HWY To: MONTEITH RD	Low Class Bituminous	2.031	71	67
123	CALVERT RD	From: JOHN ST. RD To: SIM LANE	Low Class Bituminous	1.582	66	67
126	HARSTONE DR	From: 588 HWY To: E-LINE RD	Low Class Bituminous	3.087	71	72
135	GERMAIN RD	From: 588 HWY To: DEAD END	Low Class Bituminous	0.3	74	70
141	PIPER DR	From: 130 HWY To: DEAD END	Low Class Bituminous	0.748	85	84
144	FRASER RD	From: ROSSLYN RD To: BLINDLINE RD	Low Class Bituminous	1.167	76	75
145	RIDLER DR	From: ROSSLYN RD To: MAPLE ST	Low Class Bituminous	0.104	73	71
146	BLINDLINE RD	From: FRASER ST To: JELLY RD	Low Class Bituminous	1.613	79	77
147	BLINDLINE RD	From: JELLY RD To: DEAD END	Low Class Bituminous	0.951	74	72
148	JELLY RD	From: BLINDLINE RD To: 11-17 HWY	Low Class Bituminous	1.023	80	78
153	MCCLUSKEY DR	From: MONTEITH RD To: WEST BOUNDARY	Low Class Bituminous	2.004	85	81
155	VELEY LANE	From: NCNALLEY DR To: DEAD END	Low Class Bituminous	0.441	70	72
185	RIDLER DR	From: ALDER LANE To: BLINDLINE RD	Low Class Bituminous	0.714	78	75
186	ALDER LANE	From: RIDLER DR To: DEAD END	Low Class Bituminous	0.36	68	68
194	RIDLER DR	From: MAPLE ST To: ALDER LANE	Low Class Bituminous	0.109	68	65
226	BLINDLINE RD	From: RIDLER DR To: FRASER ST	Low Class Bituminous	1.2	75	75
229	BOUNDARY DR	From: HACQUOIL RD To: FALLS RD	Low Class Bituminous	2.655	78	78
230	BOUNDARY DR	From: MONTEITH RD To: West Boundary	Low Class Bituminous	2.5	71	68
231	BOUNDARY DR	From: SPRUCE DR To: MONTEITH RD	Low Class Bituminous	1.039	68	68
232	POLE LINE RD	From: BOULTER RD To: POINT DE MEURON RD	Low Class Bituminous	1.5	67	65
245	WEST RIVERDALE RD	From: WEST RIVERDALE RD To: CANDY MOUNTAI	Low Class Bituminous	0.775	77	76
2371	MORROW RD	MILLAR HEIGHTS DR TO EVERETT DR	Low Class Bituminous	1.554	90	85
2373	MONTEITH RD	CANDY MOUNTAIN DR TO BARRIE DR	Low Class Bituminous	2.009	78	70
2374	EVERETT DR	MUD LAKE RD TO MORROW RD	Low Class Bituminous	1.562	74	72
2378	EVERETT DR	MORROW RD TO MAKI RD	Low Class Bituminous	1.566	73	70
2488	Townline Rd	JOHN STREET RD To: SIMKO DR	Low Class Bituminous	3.2	70	69
2489	Townline Rd	Simko Dr To: Yurick Dr	Low Class Bituminous	1.6	71	71
2490	Townline Rd	YURICK DR To: HWY 102	Low Class Bituminous	1.2	67	65
98	MACGREGOR ST	From: GARDNER RD To: ROSSLYN RD	Low Class Bituminous	0.248	68	68
19	MACGREGOR ST	From: 130 HWY To: GARDNER RD	Low Class Bituminous	0.806	65	59
61	CANDY MOUNTAIN DR	From: MONTEITH DR To: ASPEN RD	Low Class Bituminous	2.42	85	80
35	ROSSLYN RD	From: RIDLER DR To: FRASER RD	Low Class Bituminous	1.267	60	82

Low Class Roadways						
Asset ID	Name	Location	Material	Length (km)	2019 PCR	2020 PCR
143	ROSSLYN RD	From: VIBERT RD To: ELM ST	High Class Bituminous	0.234	61	58
150	HANIAK RD	From: 11-17 HWY To: DEAD END	High Class Bituminous	0.62	75	72
151	KINGSWOOD DR	From: ROSSLYN RD To: KINGSWOOD CT	High Class Bituminous	0.1	77	77
159	LAWRENCE ST	From: DEAD END To: MCLEAN AVE	High Class Bituminous	0.3	65	60
160	LAWRENCE ST	From: MCLEAN AVE To: MACGILLVARY AVE	High Class Bituminous	0.111	64	60
161	MACGILLIVRAY AVE	From: LAWRENCE ST To: HUGES ST	High Class Bituminous	0.241	73	71
162	MACGILLIVRAY AVE	From: HUGES ST To: OLIVER RD	High Class Bituminous	0.4	73	70
163	MCLEAN AVE	From: HUGES ST To: LAWRENCE ST	High Class Bituminous	0.241	62	60
164	HUGHES ST	From: MACGILLVARY AVE To: MCLEAN AVE	High Class Bituminous	0.12	60	54
166	MCLEAN AVE	From: OLIVER RD To: BAXENDALE DR	High Class Bituminous	0.141	59	55
167	MCLEAN AVE	From: BAXENDALE DR To: HUGES ST	High Class Bituminous	0.222	59	57
168	BAXENDALE DR	From: OLIVER RD To: MCLEAN AVE	High Class Bituminous	0.227	52	45
170	QUEENS RD	From: ROSSLYN RD To: DEAD END	High Class Bituminous	0.353	70	68
171	KINGSWOOD DR	From: KINGSWOOD CT To: KINGSWOOD DR	High Class Bituminous	0.616	76	74
172	KINGSWOOD CT	From: KINGSWOOD DR To: DEAD END	High Class Bituminous	0.1	76	75
175	PENNOCK DR	From: ROSSLYN RD To: PINEWOOD DR N	High Class Bituminous	1.23	73	72
176	PENNOCK DR	From: PINEWOOD DR N To: 130 HWY	High Class Bituminous	0.286	73	72
177	PINEWOOD DR	From: PENNOCK DR To: ROSSLYN RD	High Class Bituminous	1.025	73	72
178	ROSSLYN RD	From: ROSSDALE ST To: PINE ST	High Class Bituminous	0.202	65	62
179	ROSSLYN RD	From: PINE ST To: ST MARKS ST	High Class Bituminous	0.144	62	60
180	ROSSLYN RD	From: ST MARKS ST To: VIBERT RD	High Class Bituminous	0.2	62	58
181	PINE ST	From: BIRCH LANE To: DEAD END	High Class Bituminous	0.07	68	65
183	CEDAR LANE	From: VIBERT RD To: DEAD END	High Class Bituminous	0.328	75	74
184	ROSSLYN RD	From: ELM ST To: RIDLER DR	High Class Bituminous	0.6	58	54
187	ROSSDALE ST	From: ROSSLYN RD To: MAPLE ST	High Class Bituminous	0.129	69	65
188	ROSSDALE ST	From: MAPLE ST To: ROSEDALE CT	High Class Bituminous	0.481	62	59
189	ST. MARKS ST	From: ROSSLYN RD To: MAPLE ST	High Class Bituminous	0.109	67	60
190	PINE ST	From: ROSSLYN RD To: MAPLE ST	High Class Bituminous	0.106	71	67
191	PINE ST	From: MAPLE ST To: BIRCH LANE	High Class Bituminous	0.289	63	60
192	VIBERT RD	From: MAPLE ST To: CEDAR LANE	High Class Bituminous	0.1	69	61
193	ELM ST	From: ROSSLYN RD To: MAPLE ST	High Class Bituminous	0.098	64	58
195	MAPLE ST	From: ELM ST To: RIDLER DR	High Class Bituminous	0.573	61	57
196	MAPLE ST	From: VIBERT RD To: ELM ST	High Class Bituminous	0.256	67	66
197	MAPLE ST	From: ST. MARKS ST To: VIBERT RD	High Class Bituminous	0.193	67	65
198	MAPLE ST	From: PINE ST To: ST. MARKS ST	High Class Bituminous	0.203	65	64
199	MAPLE ST	From: ROSSDALE RD To: PINE ST	High Class Bituminous	0.202	73	70
200	VIBERT RD	From: ROSSLYN RD To: MAPLE ST	High Class Bituminous	0.1	62	59
202	MARIAN ST	From: DOROTHY ST To: 11-17 HWY	High Class Bituminous	0.179	66	66
203	RUPERT ST	From: DOROTHY ST To: 11-17 HWY	High Class Bituminous	0.188	60	57

204	FLORENCE ST	From: DOROTHY ST To: 11-17 HWY	High Class Bituminous	0.185	60	57
205	DOROTHY ST	From: MARION ST To: RUPERT ST	High Class Bituminous	0.116	67	66
206	DOROTHY ST	From: RUPERT ST To: FLORENCE ST	High Class Bituminous	0.11	65	65
207	DOROTHY ST	From: FLORENCE ST To: CLERGUE ST	High Class Bituminous	0.044	66	65
208	MARIAN ST	From: 11-17 HWY To: DITMARS DR	High Class Bituminous	0.152	65	63
209	RUPERT ST	From: 11-17 HWY To: DITMARS DR	High Class Bituminous	0.188	62	59
210	FLORENCE ST	From: 11-17 HWY To: DITMARS DR	High Class Bituminous	0.214	41	41
211	PORTER ST	From: DITMARS DR To: 11-17 HWY	High Class Bituminous	0.234	65	65
212	CLERGUE ST	From: 11-17 HWY To: TAYOR ST	High Class Bituminous	0.248	67	63
213	DITMARS DR	From: MARION ST To: RUPERT ST	High Class Bituminous	0.124	66	66
214	DITMARS DR	From: RUPERT ST To: FLORENCE ST	High Class Bituminous	0.115	65	63
215	DITMARS DR	From: FLORENCE ST To: PORTER ST	High Class Bituminous	0.114	66	64
216	DITMARS DR	From: PORTER ST To: CLERGUE ST	High Class Bituminous	0.305	61	59
217	CLERGUE ST	From: DITMARS DR To: DELVECCIO ST	High Class Bituminous	0.052	67	66
218	DELVECCIO ST	From: CLERGUE ST To: DEAD END	High Class Bituminous	0.14	60	60
220	MARTYN DR	From: LEITERMAN ST To: MARTYN DR	High Class Bituminous	0.4	64	59
222	CLERGUE ST	From: DELVECCIO ST To: HILL ST	High Class Bituminous	0.014	64	62
223	CLERGUE ST	From: HILL ST To: LEITERMAN ST	High Class Bituminous	0.128	64	62
224	HILL ST	From: OLIVER RD To: CLERGUE ST	High Class Bituminous	1.037	63	58
225	CLERGUE ST	From: DOROTHY ST To: 11-17 HWY	High Class Bituminous	0.242	67	67
227	CLERGUE ST	From: TAYLOR ST To: DITMARS DR	High Class Bituminous	0.112	66	64
228	TAYLOR ST	From: CLERGUE ST To: DEAD END	High Class Bituminous	0.1	63	62
235	KING GEORGE'S PARK DI	From: 130 HWY To: Private Road	High Class Bituminous	0.98	72	71
236	KING GEORGE'S PARK DI	From: Dirt Road To: WHITEWATER PL	High Class Bituminous	0.53	67	67
238	WHITEWATER PL	From: KING GEORGE'S PARK DR To: DEAD END	High Class Bituminous	0.205	73	73
240	KING GEORGE'S PARK DI	From: Private Road To: Dirt Road	High Class Bituminous	1.4	73	72
219	LEITERMAN ST	From: CLERGUE ST To: DEAD END	High Class Bituminous	0.159	80	67
182	BIRCH LANE	From: PINE ST To: DEAD END	Low Class Bituminous	0.3	72	69