Road Needs Study Report - 2019

Township of Hamilton

D.M. Wills Project No.19-4705

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Prepared for:
Township of Hamilton

Executive Summary

The Township of Hamilton (Township) retained the services of D.M. Wills Associates Limited (Wills) to undertake a review of the Township's existing road network, and assess its physical condition as well as confirm various road attributes. Data collected during the field review was used to develop a prioritized listing of the road network needs, the results of which are documented in this report.

Additionally, Wills inventoried and mapped the Township's guiderail assets. A memo summarizing activities undertaken for the guide rail inventory is included as an appendix of this report.

The Township's road infrastructure system spans a total of 299 km primarily within a rural setting, with small areas of urban and semi-urban development. The road network includes surfaces ranging from gravel to hot mix pavement (asphalt). The Township has approximately 31 km of gravel roads, 145 km of surface treated roads (low class bituminous (LCB) and intermediate class bituminous (ICB)), and 123 km of hot mix asphalt paved roads (high class bituminous (HCB)).

Two (2) primary indicators of the relative health of a road are the structural adequacy and surface condition ratings. The current average structural adequacy rating for the Township's road network is 14.8/20. The current average surface condition rating for the Township's road network is 7.7/10.

6.7% (20 km) of the road network has a Structural "NOW" need, 17.7% (53 km) has a Structural "1-5" year need, and 17.0% (51 km) of the road network has a Structural "6-10" year need.

It should be noted that a structural "NOW" need does not explicitly mean that work must be undertaken on the road immediately (although this may be so in some cases). A structural "NOW" need means that a significant portion of the road is showing distress and requires significant intervention i.e. reconstruction or major rehabilitation to renew its service life. A structural "1-5" year need is expected to become a "NOW" need in the next five years, and a "6-10" year need is expected to become a "NOW" need in the next 10 years should no intervention treatments take place.

Resurfacing

In addition to addressing currently deficient roads (i.e. capital reconstruction), a dedicated preservation management approach is required, **and perhaps even more important**, to "keep the good roads good"; the fundamental principle being that it costs much less to maintain a good road than it does to let it fail and then reconstruct it, from a life cycle cost perspective. Ultimately, the goal of preservation management is to extend the useful life of a road and road network, maximizing the Township's investment over the road life-cycle.

Roads with a structural adequacy of 12/20 or greater are included as candidates for potential resurfacing. Preliminary recommendations and prioritization for road resurfacing are based on condition rating and traffic demands on each road section, as per the Inventory Manual. A road with higher traffic volumes and fair structural adequacy is given priority over a road with moderate traffic and good structural adequacy score, in an attempt to intervene and extend the life of the road before it deteriorates to a level that can no longer be resurfaced (i.e. more expensive reconstruction is required). Specific resurfacing treatment recommendations must be assessed through further field investigation and detail design effort, prior to selecting and implementing the resurfacing strategy.

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a resurfacing program and related budget is recommended as follows:

Hot Mix Paved Roads:

- 122.5 km of paved roads (HCB).
- Degradation rate 0.25 / year (rating drops from 10 to 5, over a 20-year period).
- Annual resurfacing 6.1 km / year.
- **Annual budget $1,774,600**: (6.1 km / year x $143,000 / lane km **RMP1** x 2 lanes).

Surface Treated Roads:

- 145.5 km of surface treated roads (LCB & ICB).
- Degradation rate 0.625 / year (rating drops from 10 to 5, over a 7-year period).
- Annual resurfacing 20.8 km / year.
- **Annual budget $436,800** (20.8 km / year x $21,000 / km **ST1**).

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. Typically, gravel roads should be resurfaced on a 3-5 year cycle.

Gravel Roads:

- 31.4 km of earth / gravel roads.
- 75 mm gravel every 3 years.
- Annual gravelling of 10.5 km.
- Granular A ($20,000 / km).
- **Annual budget $210,000** (10.5 km / year x $20,000 **G**) **.

*** Cost based on supply and application of gravel by external forces.*

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $2,391,400 per year.

Preservation Management

Preservation techniques seal the surface as to prevent water infiltration into the granular base. Route and Seal is used on HCB pavements to seal individual cracks. Slurry Seal / Microsurfacing is used on LCB and HCB pavements to seal large areas, although wide / active cracks will reflect through the treatment. An annual preservation management budget has been estimated as follows:

Cracksealing

- 122.5 km of paved roads (HCB).
- Assume that cracksealing will be applied, on average, once per resurfacing cycle.
- Annual cracksealing of 6.1 km / year
- **Annual budget $24,400** (6.1 km x $4,000 / km **Cracksealing**).

Slurry Seal / Microsurfacing

- 122.5 km of paved roads (HCB).
- 145.5 km of surface treated roads (LCB & ICB).
- Assume that slurry seal / microsurfacing will be applied, on average, once per resurfacing cycle.
- 26.9 km of road to preserve per year (6.1 km HCB and 20.8 km of LCB).
- **Annual budget $570,470** (26.9 km x $20,000 / km **Slurry Sealing / Microsurfacing**).

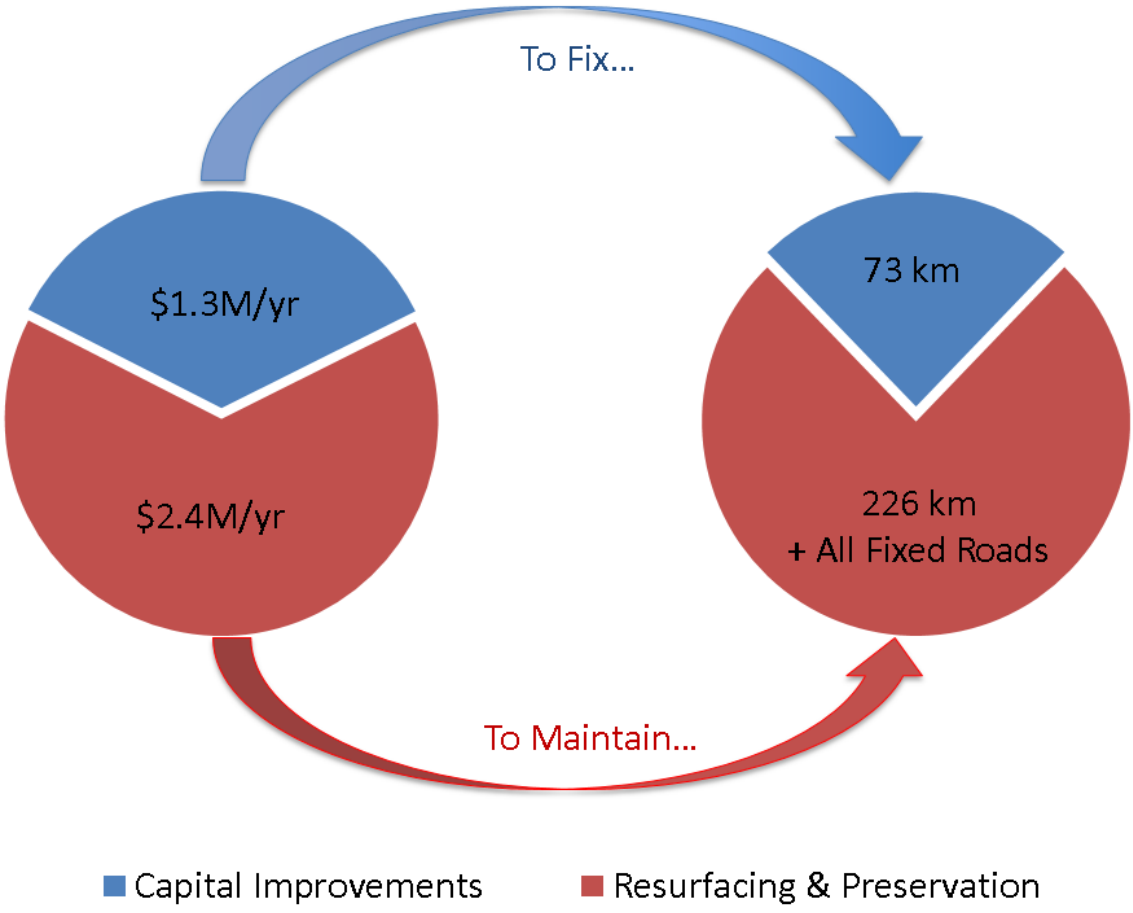
Further to the recommendations above with respect to resurfacing, it is also recommended that regular maintenance in the form of roadside ditch cleanout and clearing be undertaken as a critical component to preservation management in order to extend the useful service life of the existing roads.

Capital Improvements

Preliminary recommendations and prioritization for planned capital improvements i.e. reconstruction, have been developed based on the condition rating and traffic demands on each road section, as per the Inventory Manual. Those roads identified as having a "NOW" or 1 - 5 year need have been included in the capital improvement plan for reconstruction.

A total length of 73.3 km of roads were identified as having structural needs in the "NOW," or 1 – 5 year periods. The estimated cost to improve these roads is approximately $ 12.5 M.

A fully funded 10 year plan following the recommendations in this report includes $2.4M/year for resurfacing needs and $12.5M ($1.3M/year) for the capital needs over ten years. Funding recommendations can be visualized in the graphic below.



Given that 75% of Hamilton's Road network has a structural adequacy of 12 or higher, Wills recommends that priority should be given to resurfacing and preservation over capital needs should funding fall short of ideal levels.

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1.0 Purpose, Background and Study Method

1.1 Purpose

The purpose of the 2019 Road Needs Study Report is to update the current road inventory and road condition assessments within the Township of Hamilton (Township). Using this information, a prioritized listing of the road network needs is developed. The information derived from the study and documented in this report will provide assistance to the Township for developing and executing a planned road maintenance and improvement program.

The Township retained the services of D.M. Wills Associates Limited (Wills) to undertake a review of the existing road network, and assess its physical condition as well as confirm various attributes. Data collected as a result of the field review is used to develop a prioritized listing of the road network needs, the results of which are documented in this report.

1.2 Background

The Township of Hamilton is located in the County of Northumberland, between Rice Lake and Cobourg. The Township is largely rural with some scattered urban / semi-urban developments.

This Road Needs Study was completed to inventory and document the Township's existing road assets. This current study (2019) utilizes sectioning as per the last report. The GIS mapping from the County has been updated to harmonize with sectioning used in this report.

1.3 Study Objectives

Based on discussion with Township staff, the following study objectives were identified:

- Provide a current inventory and value of the Township's roads, assess road conditions and needs, and develop a priority listing for construction needs and improvements.
- Provide a prioritized list of capital projects for the Township to invest in.

To ensure compliance with the latest Ministry of Transportation (MTO) guidelines, the inventories were completed in accordance with the most current edition of the Inventory Manual for Municipal Roads.

1.4 Study Methodology

The procedure utilized to complete the study was in accordance with the Ministry of Transportation's Inventory Manual for Municipal Roads (February 1991).

Additionally, field reviews for the purpose of Pavement Condition Index (PCI) were undertaken in accordance with:

- MTO Manual for Condition Rating of Flexible Pavements, SP-024.
- MTO Manual for Condition Rating of Surface-Treated Roads, SP-021.

There are two (2) key observations when using PCI methods: The Ride Condition Rating (RCR), and the Distress Manifestation Index (DMI). RCR is a subjective measurement of how smooth a travelled surface is, rated from 0 to 10, with 10 representing excellent, new surfaces, and 0 representing an extremely rough, impassible road. DMI aggregates various forms of visible pavement distress into a rating from 0 to 10, with 10 representing a new surface and 0 representing a destroyed surface.

RCR and DMI are rated strictly independently. A rough road may have relatively few visible distresses while a fairly smooth road may display many distresses. In general, rough roads display associated visible distresses.

The combined approach facilitates comparing all the Township's roads, as the Inventory Manual prescribes the same rating system regardless of surface type, while also providing detailed descriptions of the types of distress encountered on surfaces as per the PCI ratings. This approach is compliant with O. Reg. 588/17. Wills undertook the field study in July of 2019.

During the field study, a visual assessment of the following road characteristics was documented to assess the current adequacy of the road:

- Platform Width (overall width of road).
- Surface Width (width of pavement surface).
- Shoulder Width.
- Surface Type (gravel, low class bituminous, or high class bituminous).
- Drainage Type (open ditches vs. storm sewers etc.).
- Surface Condition (assigned based on Ride Condition Rating for this Study).
- Maintenance Demand.
- Roadside Environment.
- Capacity.
- Alignment.

1.4.1 Critical Deficiencies

Critical deficiencies represent road characteristics that result in increased maintenance costs or lead to an inadequate level of service. Road sections may be assessed as critically deficient if any one (1) of the following characteristics fall below the minimum tolerable standards defined in the MTO Inventory Manual:

- Surface type - Insufficient surface type for traffic volumes.
- Surface width - Insufficient width of the road surface excluding the shoulders.
- Capacity - Inability of the road to accommodate traffic volumes at peak periods.
- Structural Adequacy - Inability of the road base to support vehicular traffic.
- Drainage - Increased frequency of flooding or excessive maintenance effort required to prevent flooding.

Critically deficient roads have generally reached the end of their service life and /or require major work to improve e.g. widening or new surface type. As such, reconstruction is generally required.

Surface Type

The following parameters were used to assess the adequacy of the road surface type. Road sections with traffic volumes (AADT) in excess of the Minimum Tolerable values for Earth and Gravel in **Table 1**, were noted as critically deficient triggering a "NOW" surface type need as per the Inventory Manual Method.

Table 1 – Surface Type by Annual Average Daily Traffic (AADT)

Surface Type	AADT		
	Inventory Manual		MTO Pavement Design and Rehabilitation Manual[1]
	Minimum Tolerable	Design Standard	
Earth (E)	<50	-	-
Gravel (G)	<400	0-199	0 - 200
Low Class Bituminous (LCB) / Surface Treatment	-	200-399	200 – 1000 (1000 – 1500 if over Cold Mix)
High Class Bituminous (HCB) / Hot Mix	-	400+	>1500

Table 1 provides further guidance with respect to surface type from both the Inventory Manual as well as the MTO Pavement Design and Rehabilitation Manual.

[1] Ministry of Transportation. Pavement Design and Rehabilitation Manual, Second Edition, 2013, Table 3.3.3 Structural Design Guidelines for Flexible Pavement – Secondary Highways

As detailed in **Table 1**, Gravel surfaces are generally considered acceptable for AADT of less than 200 vehicles but may be tolerable up to 400 AADT. Transition to Surface Treatment should be considered above 200 AADT. Gravel road maintenance costs (resurfacing, grading, dust suppression, etc.) versus surface treatment costs are key considerations.

Low Class Bituminous (LCB) i.e. Surface Treatment may be acceptable for traffic volumes between 200 and 1500 AADT. A transition to a Hot Mix or High Class Bituminous surface from Surface Treatment must be considered on a case by case basis. The following factors require consideration:

- Surface Treatment Maintenance Costs.
- Commercial Vehicle Loading.
- Roadside Environment (Urban, Semi-urban, vs. Rural).
- On-street Parking.
- Adjacent Drainage Infrastructure i.e. curb and gutter, catch basins etc.
- Asphalt Availability/Cost.
- Surface/Platform Width.
- Traffic Volume Growth.
- Sub-base Quality.
- Roadbed Frost Susceptibility.
- Future Resurfacing/Rehabilitation Costs.

Vehicle loading is one of the key considerations for pavement design and ultimately the decision between Hot Mix and Surface Treatment. Roads with high levels of commercial traffic require a more substantial pavement structure. The values noted in **Table 1**, for the "MTO Method" are generally reflective of a highway with 10% commercial vehicles. Roads with AADT in excess of 400 vehicles with a good sub-base and commercial vehicles up to 10% may still perform very well with a Surface Treatment. Existing/past performance of a Surface Treatment can be an excellent indicator when considering the upgrade to Hot Mix.

Surface Width

Surface widths that fall below minimum tolerable standards, as detailed in the MTO Inventory Manual are noted as critically deficient triggering a "NOW" need. The Minimum Tolerable Surface Widths for Rural roads are included in **Table 2**:

Table 2 – Rural Road Surface Width by Annual Average Daily Traffic (AADT)

	AADT							
	1-49	**40-199**	**200-399**	**400-999**	**1000-1999**	**2000-2999**	**3000-3999**	**4000+**
Road Width (m)	5.0	5.5	5.5	6.0	6.0	6.0	6.5	6.5

Capacity

An in-depth traffic capacity analysis was not completed as part of the scope of this Road Needs Study. Decisions with respect to expansion of roads should be made within the context of a Transportation Master Plan or Official Plan for the Township.

However, from a general perspective, a two-lane road can typically provide adequate service up to an AADT of approximately 12,000 vehicles. The functionality of a road from a capacity standpoint is of course dependent upon other factors in combination with volume. Adjacent land uses, number of access points i.e. entrances and side roads etc. also have a significant impact on how the road functions.

A rural road with limited entrances and side roads will have a much greater capacity to flow traffic versus an urban street with many entrances and side road intersections. The AADT of 12,000 can be used as a 'rule of thumb' to trigger further analysis on the road capacity and operation. For the purposes of this study, a detailed capacity analysis was not undertaken as part of the scope of work. All roads were assigned to be adequate from a capacity perspective noting that no road section had an AADT greater than 6000 vehicles.

Structural Adequacy

In cases where road base or structure is showing distress over more than 20% of the length of the road section, a score between 1 and 7 (out of 20) is assessed and the road section is assigned a "NOW" need and considered Critically Deficient per the Inventory Manual. The structural adequacy rating is often the best indicator of the overall road section's health.

It should be noted that a structural "NOW" need does not explicitly mean that work must be undertaken on the road immediately (although this may be so in some cases). A structural "NOW" need means that a significant portion of the road is showing distress of the road bed and requires significant intervention i.e. reconstruction or major rehabilitation to renew it service life. A structural "1-5" year need is expected to become a "NOW" need in the next five years, and a "6-10" year need is expected to become a "NOW" need in the next 10 years.

Drainage

A road section is assessed as a "NOW" need for drainage generally when a road becomes impassible due to water one or more times a year. This information is not readily accessible from inspection. Characteristics such as ditching, water ponding on or around the road, and evidence of past washouts were used to assess road drainage. As such, a road was given a "NOW" need for drainage if there were evident drainage problems that would likely lead to an impassable road during a heavy rain or a rapid snow melt.

2.0 The Road System

2.1 Inventory and Classification

All roads in the Township road system were inventoried according to the methods outlined in the Inventory Manual for Municipal Roads.

The inventory procedure requires that each road in the system be studied as a separate unit. Initially, the road system was divided into sections so that each conformed, as close as possible, to the following requirements:

- Uniform traffic volume.
- Uniform terrain.
- Uniform physical conditions.
- Uniform adjacent land.

Depending on location with respect to the built up areas, roads were classified in a manner generally descriptive of the type of construction as follows:

- Urban - Roads with curb and gutter and storm sewer drainage.
- Semi-Urban - Roads in built up areas (development exceeds 50% of the frontage) without curb and gutter or curb and gutter on one (1) side only.
- Rural - Roads with development on less than 50% of the frontage.

Rural roads were further evaluated based on estimated traffic volumes; such as 0 to 50 vehicles per day, 51 to 200, and 201 to 400 etc. For the purpose of this study, traffic volumes were adopted or estimated from traffic counts completed by the Township.

Table 3 summarizes the total road length in kilometres by surface type and road environment as of November, 2019.

Table 3 – Road System Inventory

Township of Hamilton		
Road System in Kilometres		
(As of November 2019)		
A.	**Surface Type**	**Totals***
	Gravel (loose Top Gravel)	31
	Surface Treatment (LCB & ICB)	145
	Hot Mix Asphalt (HCB)	123
	Total A	**299 km**
B.	**Roadside Environment**	
(i)	**Rural**	
	Gravel (loose Top Gravel)	31
	Surface Treatment (LCB & ICB)	144
	Hot Mix Asphalt (HCB)	80
	Total Rural	**255 km**
(ii)	**Semi-Urban**	
	Gravel (loose Top Gravel)	<1
	Surface Treatment (LCB)	1
	Hot Mix Asphalt (HCB)	36
	Total Semi-Urban	**37 km**
(iii)	**Urban**	
	Gravel (loose Top Gravel)	0
	Surface Treatment (LCB)	0
	Hot Mix Asphalt (HCB)	7
	Total Urban	**7 km**
	Total B	**299 km**
**Estimated to the nearest centreline kilometre.*		

3.0 Road Needs

The primary purpose of the study is to develop a list of all roads within the Township ranked according to priority with respect to road needs.

The method of evaluating road needs in terms of type, cost and timing of improvements is identified in the Inventory Manual for Municipal Roads.

It is important to note that budgetary restrictions will often influence the level of upgrades to the road system and therefore it is imperative to maximize the improvements based on availability of funds and needs priority.

3.1 Critical Deficiencies

The inventory of the road system revealed that certain road sections are now deficient or will become deficient during the study period.

As noted previously, critical deficiencies include road characteristics which result in increased maintenance costs and which inevitably lead to an inadequate level of service. A road section is critically deficient if any one of the following characteristics fall below the minimum tolerable standards defined in the Inventory Manual.

- Surface type - Incorrect surface type to suit traffic volumes on the roadway.
- Surface width - Insufficient width of the road surface excluding the shoulders.
- Capacity - Inability of the road to accommodate traffic volumes at peak periods.
- Structural Adequacy - Inability of the road base to support vehicular traffic.
- Drainage - Increased frequency of flooding or excessive maintenance effort required to prevent flooding.

Of the 299 km of roads inventoried, a total of 47 km were found to be critically deficient in one (1) or more areas. Of the 47 km, approximately 17 km represents roads with AADT of less than 50 vehicles. Regardless of condition, roads with AADT of fifty (50) or less are typically assigned as "Adequate" (as per the Ministry protocol) for the purpose of the system adequacy calculation.

The overall system adequacy for the Township's road network, which is based upon the total road kilometres less the identified critically deficient ("NOW" needs) roads, is as follows:

$$\textbf{2019 System Adequacy} = \frac{\textbf{299 - (47 - 17)}}{\textbf{299}} \textbf{ x 100\% = 90\%}$$

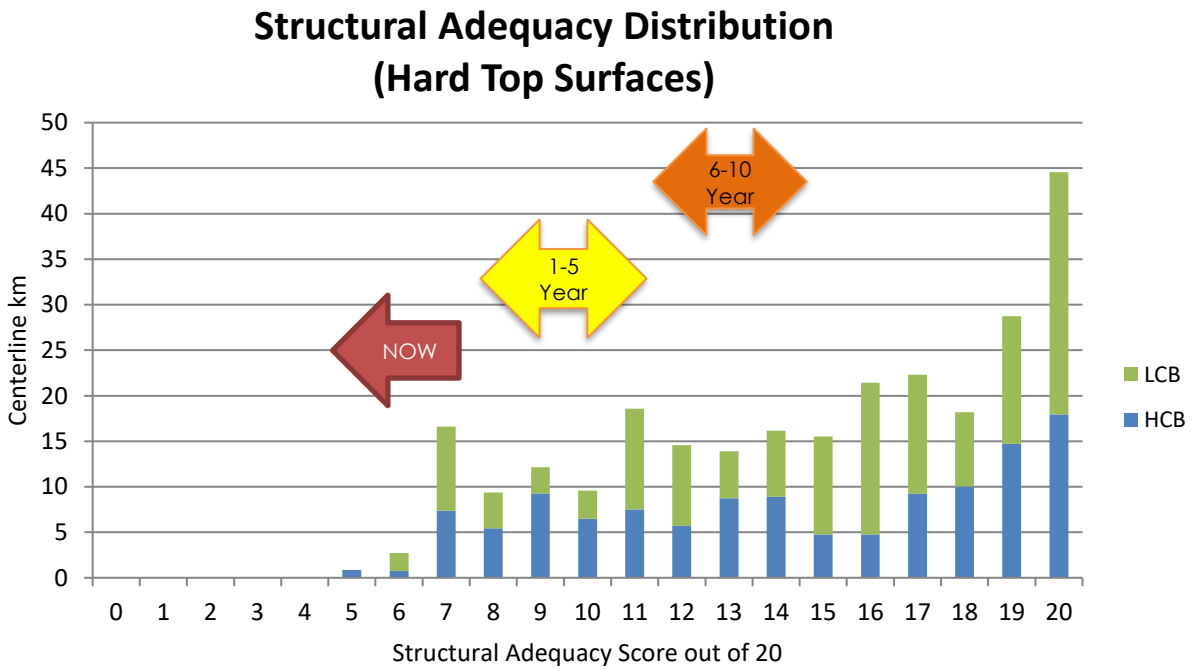
The average surface condition rating of all roads is 7.7/10 while the average structural adequacy rating is 14.8/20. This suggests that the typical road has a fair to good riding quality, but just at the point where significant rehabilitation or reconstruction is required.

As required by O. Reg. 588/17, the average unpaved road was in good condition and the average PCI for hard top surfaces in the Township is 69.9.

A review of the structural adequacy distribution of the Township's hard top roads reveals that over half, 151 km, that are in very good condition (structural adequacy of 15 and over), and with regular resurfacing and preservative maintenance, should not require reconstruction in the next 10 years. Another cohort of roads, approximately 45 km, are in average condition (Structural Adequacy from 12 to 14). Some of these roads may continue to perform well, but without timely resurfacing and preventative maintenance, many of them are expected to become NOW or 1 – 5 year needs. The remaining 72 km of hard top road network is well distributed over the very poor to poor range (structural adequacy from 5 to 11). Most of these roads will require reconstruction over the next 5 years to fully repair them.

It is therefore recommended that, while the Township endeavors to repair these poor roads as part of its 10-year capital plan, every reasonable effort is made, through preservation management, to prevent the current cohort of fair to very good roads (151 km) from becoming capital reconstruction needs themselves.

Figure 1 – Structural Adequacy Distribution



3.2 Priority Ratings of Roads

A mathematical empirical formula was used to calculate the priority rating for each road section. The priority rating is a weighted calculation which takes into account the existing traffic volume and overall condition rating of the road.

This priority analysis is an impartial procedure to place the deficiencies in order of relative need. **A higher Priority Rating number indicates a relatively greater need for improvement.**

The formula takes into account the current traffic volume (AADT), whether it is from actual road counts or estimated road counts and the Condition Rating (CR) of the road at the time of this Road Needs Study Report. The formula is as follows:

$$\textbf{Priority Rating} = 0.2 \times (100 - CR) \times (AADT + 40)^{0.25}$$

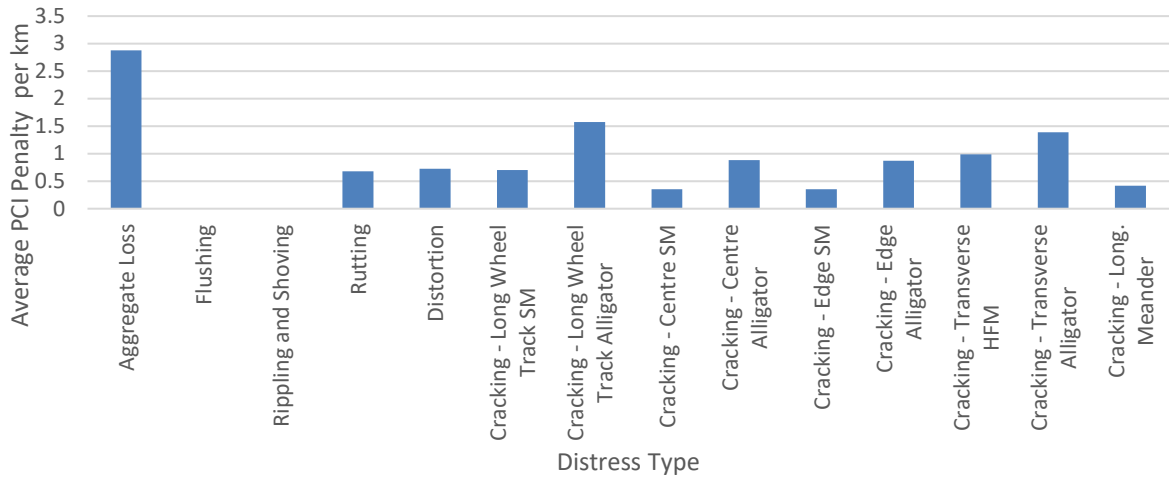
In utilizing the above equation Wills identified a priority listing for review with Township staff. It is important to emphasize that the priority rating calculation considers only CR and traffic volumes.

When developing the recommended capital expenditure plan consideration may be given to the remaining useful service life of a road / roadbed with a view to coordinating major reconstruction efforts at / near the end of the road's life. Furthermore, while a priority rating will give a general idea of which roads should be improved before others, it does not prescribe an exact order for road improvements nor does it determine the timing of preservation and rehabilitation work. For example, it may be wise to defer the full reconstruction of a high priority road ("let the bad roads fail") in favour of resurfacing work on a medium priority road ("keep the good roads good").

3.3 Dominant Distress Types

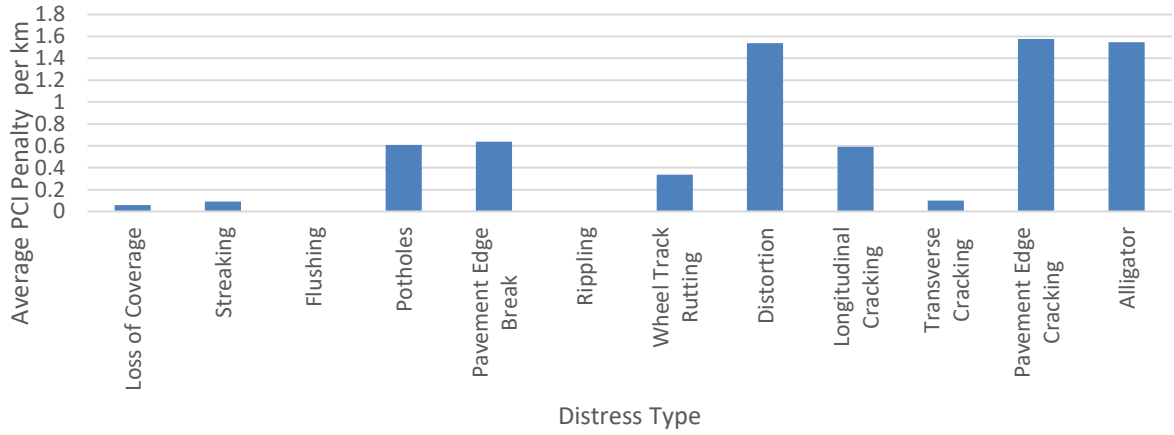
As detailed in **Figure 2**, aggregate loss had the highest effect on PCI rating on the Township's HCB network. Transverse and wheel track cracking were also substantial. Flushing, and rippling and shoving were not observed during inspections.

Figure 2 – HCB Distress Type Prevalence



As detailed in **Figure 3** the principal distress types in the Township's LCB and ICB roads were distortion, pavement edge cracking and alligatoring. Potholes, longitudinal cracking and pavement edge break were moderately significant.

Figure 3 – Surface Treated Distress Type Prevalence



Distress descriptions can be found in **Appendix B**.

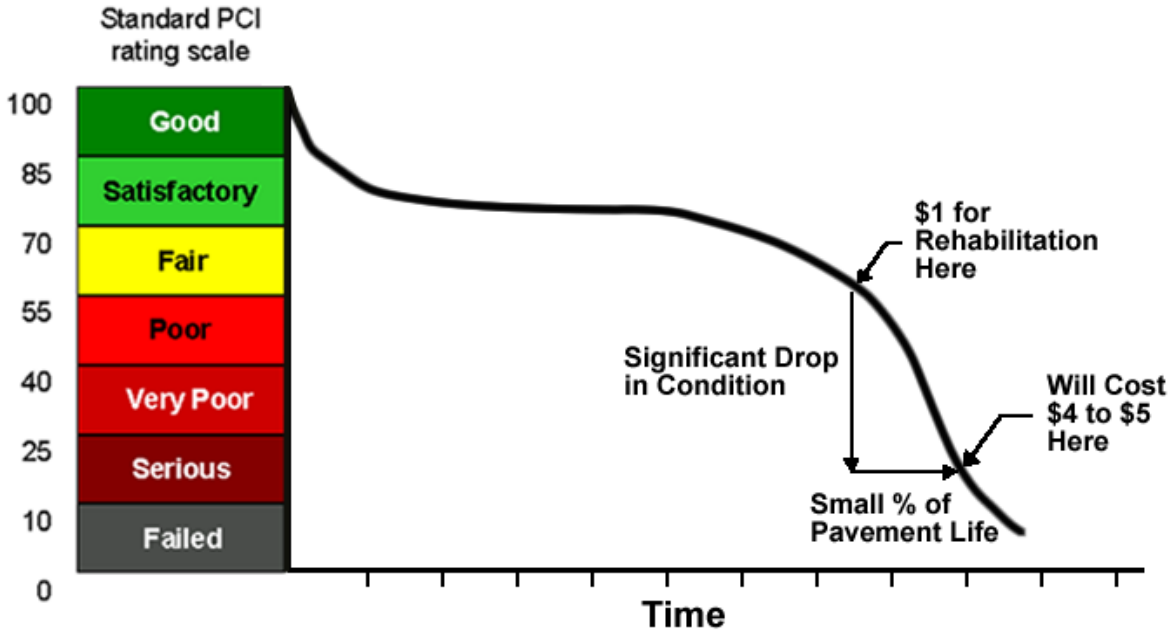
4.0 Roads Best Management Practices

The key to managing a pavement / road network is the timing of maintenance and rehabilitation activities. This idea evolves from the fact that a pavement's structural integrity does not fall constantly with time. A pavement generally provides a constant, acceptable condition for the first part of its service life and then begins to deteriorate very rapidly. In many cases, maintenance and rehabilitation measures are not taken until structural failure or noticeable changes in ride quality become apparent. This is the "fix it once it is already broken" approach.

The unfortunate consequence of this decision is that maintenance and rehabilitation becomes exponentially more expensive over the life of the pavement and is often overlooked until the pavement condition reaches a severe state of distress. There is opportunity for substantial cost savings when intervention is made *before* the pavement becomes severely compromised; i.e. "fix it before it breaks". **Figure 3** illustrates the underlying principle in support of a preservation management approach to pavement infrastructure. The principle also has application to each of the classes of roads maintained by the Township. Significant cost savings will result from proactive intervention rather than simply waiting as long as possible before performing maintenance.

Examples of approach to roads management with their associated cost implications over the lifecycle of a road are set out below in **Figure 4** and are provided as an illustration of the benefit of a "preservation management approach".

Figure 4 – Typical Service Life of an Asphalt Pavement



4.1 Example Life Cycle Cost Analysis

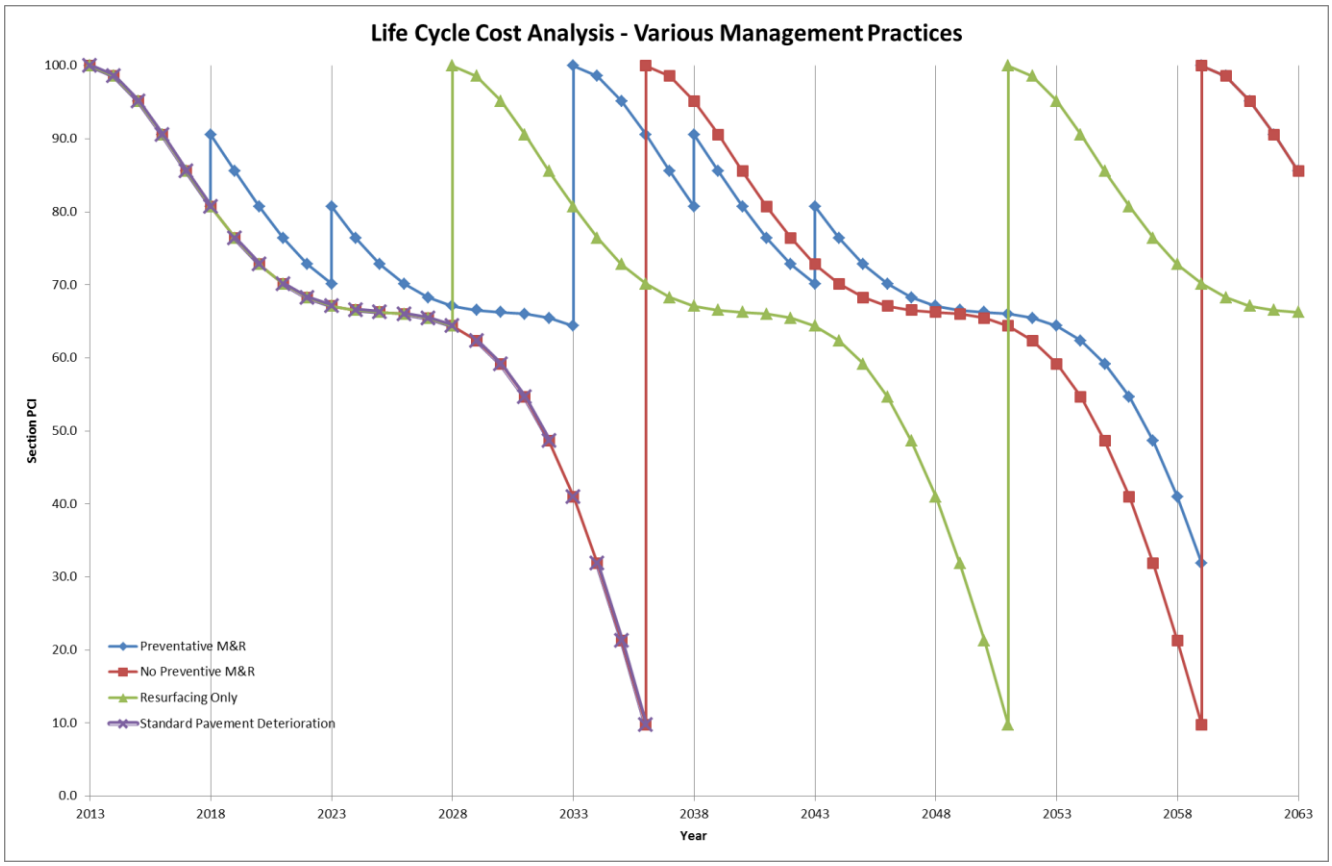
The following life cycle costs analysis compares three (3) different municipalities Municipality 1, Municipality 2 and Municipality 3; each with three (3) distinct approaches to pavement management. For this analysis we will assume each of the three (3) municipalities has 7000 m^2 of pavement, i.e. 1 km of asphalt paved road that is 7 m wide. In each scenario, the road is assumed to have been constructed in 2013 and will operate under normal traffic loading.

The Life Cycle Cost Analysis (LCCA) assumes no user costs. The LCCA uses a discount rate of 2.5% / year.

The LCCA shows the three (3) different municipalities and tracks their pavement management decisions and related condition over the specified time period. Municipality 1 represents decisions made based on strategic preventive maintenance and rehabilitation (M&R), Municipality 2 represents decisions based on no preventive M&R and Municipality 3 represents decisions based on resurfacing only.

Figure 5 below illustrates a time- pavement condition plot for each municipality.

Figure 5 – Time-Condition Plot for 3 Municipalities



The costs associated with the corresponding maintenance and rehabilitation decisions are outlined in the following three (3) charts:

Preventive M&R									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
		-- Annual Ditching/Clearing --							
2018	**5**	**Localized Preventive - Rout and Seal**	81-90	Satisfactory-Good	1000	m	$1.50	$1,500.00	**$1,325.78**
2023	**10**	**Global Preventive - Slurry Seal**	70-81	Satisfactory-Good	7000	m^2	$6.50	$45,500.00	**$35,544.53**
2033	**20**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$124,792.78**
2038	**25**	**Localized Preventive - Rout and Seal**	81-88	Satisfactory-Good	4500	m	$1.50	$6,750.00	**$3,640.89**
2043	**30**	**Global Preventive - Slurry Seal**	68-78	Satisfactory-Good	7000	m^2	$6.50	$45,500.00	**$21,691.79**
2048	**35**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$4,424.40**
2053	**40**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$7,821.04**
2058	**45**	**Full Reconstruction**	32-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$107,290.28**
2063	**5**	**Localized Preventive - Rout and Seal**	81-90	Satisfactory-Good	1000	m	$1.50	$1,500.00	**$436.41**
		Final PCI in 2063:	**90**	**Good**				**Net:**	**$306,967.90**
								Residual Value:	**$85,346.08**
								Total Cost:	**$221,621.82**

The policy of Municipality 1 is to strategically intervene with preventative maintenance measures over the course of the pavement's service life. Two (2) significant maintenance measures are performed on the pavement at various times and ultimately extend the service life of the pavement, prorating the total cost of the pavement over a longer period of time. Eventually, a full reconstruction is required and this cycle repeats. The total life cycle costs are substantially less when compared to Municipality 2 and 3, at a total of $221,622 over 50 years.

No Preventive M&R									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
2023	**10**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$8,202.58**
2028	**15**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$14,499.78**
2030	**17**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	20%	m^2	$30.00	$42,000.00	**$27,602.19**
2036	**23**	**Full Reconstruction**	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$184,707.88**
2043	**7**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	5%	m^2	$30.00	$10,500.00	**$5,005.80**
2048	**12**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	10%	m^2	$30.00	$21,000.00	**$8,848.79**
2053	**17**	**Safety/Stopgap Maintenance - AC Patching/Leveling**	N/A	N/A	20%	m^2	$30.00	$42,000.00	**$15,642.09**
2059	**23**	**Full Reconstruction**	10-100	Poor-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$104,673.45**
		Final PCI in 2063:	**86**	**Good**				**Net:**	**$369,182.56**
								Residiual Value:	**$81,552.92**
								Total Cost:	**$287,629.64**

The policy of Municipality 2 is to simply construct the pavement and wait until serious deficiencies begin to appear before acting. This approach unfortunately remains common still today. Over the last period of the pavement's life, maintenance is required to ensure safety and operation until the pavement becomes completely destroyed. Once the pavement has failed, a complete reconstruction is carried out restoring the pavement to new condition. This cycle repeats again until a second reconstruction is required. The total costs are substantial and total $287,630 over 50 years.

The policy of Municipality 3 is periodic resurfacing. The pavement is constructed and time passes until early signs of serious distress are observed. This occurs after the time when preventive maintenance is neither appropriate nor possible, but before the pavement becomes completely destroyed. Resurfacing is performed and restores the pavement to almost new condition. The pavement then deteriorates for the remainder of its life, requiring significant maintenance in the last years before it becomes completely destroyed. A full reconstruction is then carried out and the cycle continues. The total costs are in between that of Municipality 1 and 2 at $260,038 over 50 years.

Resurfacing Only									
Year	**Age**	**Treatment**	**Δ PCI**	**PCI_q**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**	**Present Worth**
2028	**15**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$141,191.58**
2051	**23**	**Full Reconstruction**	10-100	Serious-Good					
		Remove Asphalt Full Depth			7000	m^2	$15.00	$105,000.00	
		Add and Compact Corrective Aggregate/Correct Crossfall (25mm avg.)			420	t	$35.00	$14,700.00	
		40mm Base Course			686	t	$125.00	$85,750.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$325,937.50	**$127,534.43**
2067	**15**	**Surface Course**	64-100	Poor-Good					
		Mill and Dispose of Surface Course			7000	m^2	$12.00	$84,000.00	
		50mm Surface Course			892.5	t	$135.00	$120,487.50	
								$204,487.50	**$53,898.67**
		Final PCI in 2063:	**66**	**Good**				**Net:**	**$322,624.67**
								Residiual Value:	**$62,587.12**
								Total Cost:	**$260,037.55**

It may be easy to see upfront cost savings by understanding that as long as any costs associated with maintaining the pavement are deferred as long as possible, money will be saved. The reality is that extending a pavements service life prorates the total cost of the pavement over a longer period of time and ultimately becomes more economical in the long run. If preventive maintenance measures are strategically planned and carried out, then the service life of the pavement can be maximized and substantial reconstruction costs can be deferred for longer periods of time. In a time when economy and efficiency are becoming more and more important, this type of proactive management is essential in the management of infrastructure.

4.1.1 Gravel Roads

The Township currently maintains approximately 31 km of gravel road. The proposed preservation management approach for this class of road is outlined in the following **Table 4** and **Table 5.**

Table 4 – Preservation Management Approach- Gravel Surface

Action	Frequency
Regrade surfaces to maintain smooth / safe driving surface and proper crossfall.	As needed, generally 2-3 times per year for higher volume gravel, or more frequently as necessary; 1-2 for lower volume.
Add calcium to tighten surface, retain aggregate and reduce dust.	Each spring on all roads of higher volume and as needed during summer months.
Ditching and brushing of right-of-ways to improve roadbed drainage and safety.	Complete road network every 10 years.

Table 5 – Capital Activities – Gravel Roads

Action	Frequency
Add layer (75 mm) of granular material to road surface.	Every 3 years for gravel roads.
Base and sub-base improvements.	As needed or as dictated by traffic volumes.
Reconstruct / convert to hard top.	As dictated by traffic volumes.

4.1.2 Surface Treated Roads

Surface treated roads have a hard wearing surface that must be preserved in order to be effective. The Township currently maintains 145 km of surface treated roads. Unlike gravel roads, a significant investment has been made in the surface and consequently these roads must be managed properly to obtain the longest possible service life from the surface.

Table 6 – Preservation Management Approach – Surface Treated Roads

Activity	Age (Years)	Ride Condition Rating	Estimated Service Life Extension (Years)
Slurry Seal	3	8	4
Single Surface Treatment	6	7	3
Double Surface Treatment	10	6	5
Pulverize and DST	14	<4	8

In addition to the noted preservation approach in **Table 6** – Preservation Management Approach – Surface Treated Roads, the following best management practices may be employed to preserve the surface, extend the service life and reduce life cycle costs of surface treated roads:

1. Surface treatment shall be applied to the entire road platform, from "grass to grass", including any shoulders. This will eliminate grading on surface treated roads, which has a tendency to damage the edge of the surface treatment and cause premature failure of the surface.
2. Suitable new technologies will be utilized where they can be demonstrated to reduce life cycle costs, such as fibre-reinforced surface treatment. This technology can be used to mitigate reflective cracking (if cracks are narrow and inactive) when a single or double surface treatment is applied over an aging surface. It can eliminate the need for pulverizing the underlying surface in certain situations and can reduce overall costs.
3. Assess drainage and culvert needs prior to any significant renewal or rehabilitation strategy and complete any improvements concurrently. This will eliminate the need to cut / excavate a relatively new surface to replace a culvert.
4. Ditching and clearing (brushing) of the right-of-ways (ROW) to improve roadbed drainage and safety.

4.1.3 Asphalt Roads

Asphalt surfaces are the smoothest and most durable hard top surface used by the Township however; they are also the most expensive. The Township currently maintains 123 km of asphalt surface roads. Asphalt provides a constant, acceptable condition for the initial portion of its service life but then begins to deteriorate rapidly as it ages. Surface defects such as cracking and raveling are the first signs of the deterioration. If left untreated, the pavement will rapidly deteriorate to the point where reconstruction is the only option. A preservation management strategy can mitigate this by applying renewal treatments earlier in the pavements life before the conditions begin to deteriorate too far. **Table 7** below summarizes preservation management activities to be considered for asphalt roads:

Table 7 – Preservation Management Approach – Rural Asphalt Roads

Activity	Age (Years)	Ride Condition Rating	Estimated Service Life Extension (years)
Crack seal	2-6	9	2
Slurry Seal / Microsurface	4-8	8	4-6
Overlay	12-15	6-7	10
Pulverize and Pave	20-25	< 5	20
Reconstruct	30	< 4	30

Note: Slurry seal can be used on lower volume paved roads (less than 1000 vehicles per day). For roads with volumes in excess of 1000 AADT, microsurfacing should be considered.

In addition to the above noted preservation approach, the following best management practices may be employed to extend the service life and reduce life cycle costs of asphalt roads:

1. Review the condition of other infrastructure, particularly underground infrastructure prior to implementing any major renewal or rehabilitation of the pavement. Any repairs or capital upgrades to other infrastructure should be coordinated. This should reduce utility cuts in newer asphalt.
2. Repair potholes in the surface in a timely fashion to prevent saturation and weakening of road base.
3. Undertake regular shouldering program of rural paved roads to promote proper drainage. Poorly maintained shoulders allow surface water to pond and saturate the road base, which weakens the base and leads to cracking at the edge of pavements.
4. Undertake a ditching program to ensure there is adequate drainage for road base on rural roads. This will reduce the likelihood of structural distresses caused by softening of the road base due to poor drainage.
5. Specify the appropriate type of performance graded asphalt cement for the location.
6. Undertake a clearing program to reduce shading of the roadbed and remove roots / vegetation from the road base.

4.2 Application of Preservation Management Approach

The preservation management activities detailed in each of the tables above are not necessarily intended or required to be completed on each and every road. Road deterioration rates and the type of deterioration will dictate when action should be taken and what kind of treatment is most appropriate. The intention of the above is to outline the series of techniques to be considered in an effort to realize and extend the useful service life of the road asset for the lowest overall lifecycle cost while maintaining the highest overall condition. As detailed in the life cycle costs analysis presented above, the preservation management approach to roads is proven to yield the lowest overall life-cycle costs.

Each of the preservation management activities for gravel, surface treatment and asphalt roads identified above (including route and seal, slurry seal, resurfacing etc.), shall be considered as part of the regular Road Needs Study Report every five (5) years. Recommendations on the specific treatments required shall be documented and prioritized in this Report.

4.3 Types of Improvements

All roads were examined to appraise the extent and type of improvement necessary.

"Order of Magnitude" construction costs were developed for each of the below options on a per kilometre basis. An estimated cost for isolated frost heave repairs was also considered.

The below alternative rehabilitation strategies are considered preliminary in nature and are intended to assist in providing an order of magnitude cost estimate to rehabilitate the road. Further field investigations and engineering design is required to confirm and develop the rehabilitation strategies for each road.

4.3.1 Asphalt

High Class Bituminous roads (HCB) or hot mix asphalt roads have rehabilitation alternatives ranging from a simple overlay to complete reconstruction. The following is a listing of standard road rehabilitation techniques that were considered for HCB or hot mix asphalt roads.

RO1 Resurfacing, Single-Lift Overlay.

RO2 Resurfacing, Double-Lift Overlay.

RMP1 Resurfacing, Mill and Pave 1-Lift.

RMP2 Resurfacing, Mill and Pave 2-Lifts.

PP1 Pulverize and Pave 1-Lift.

PP2 Pulverize and Pave 2-Lifts.

Recon 1R Excavate and Reconstruct Road and Pave 1-Lift – Rural.

Recon 1S Excavate and Reconstruct Road and Pave 1-Lift – Semi-Urban.

Recon 2S Excavate and Reconstruct Road and Pave 2-Lifts – Semi-Urban.

Recon 2U Excavate and Reconstruct Urban Road and Pave 2-Lifts – Urban.

SS Slurry Seal (Preventative Maintenance).

MS Microsurfacing (Preventative Maintenance).

RS Route and Seal (Preventative Maintenance).

4.3.2 Surface Treatment

Surface treated roads are generally able to be rehabilitated with either a single or double Low Class Bituminous (LCB) overlay treatment. They may also be upgraded to HCB pavement or downgraded to gravel. In some cases, previous resurfacing of LCB roads has occurred or the LCB surface or road structure has deteriorated to a state where a simple overlay surface treatment is not feasible. In these cases consideration can be given to removal or pulverizing of the existing surface treatment and placement of a new application. In some cases, where it is necessary to improve the overall

roadbed structure, the addition of Granular A to build up the road and the reapplication of a surface treatment is recommended. The following is a listing of standard road rehabilitation techniques that were considered for LCB (surface treated) roads:

ST1 Single Surface Treatment.

ST2 Double Surface Treatment.

ST2R Double Surface Treatment, with Removal of Existing.

ST2A Double Surface Treatment, over New Granular A.

ST2PA Double Surface Treatment, over Pulverized Existing and New Granular A.

ST2PAW Double Surface Treatment, over Pulverized Existing and New Granular A with 1 m Widening.

SS Slurry Seal (Preventative Maintenance).

4.3.3 Gravel

Gravel roads can likewise be upgraded with the reapplication of Gravel (G) or surface treatments (ST2).

4.4 Benchmark Construction Costs

The Unit Price Form found in **Appendix A** is based on average prices for the local area. The unit prices were used to prepare an array of benchmark construction costs.

The design standards in **Table 8** were utilized for development of the benchmark cost estimates for reconstruction. It should be noted that these are suggested standards and therefore should not necessarily be used as standards for detail design of roadway improvements.

Table 8 – Design Standards for Construction Cost Estimates

Functional Classification	Surface Width (m)	Shoulder Width (m)	Granular A Depth (mm)	Granular B Depth (mm)	Hot Mix Depth (mm)*
Rural R200 (50 to 199 vpd)	6.0	1.5	150	450	-
Rural R300 (200 to 399 vpd)	6.0	1.5	150	450	16*
Rural R400 (400 to 999 vpd)	6.5	1.5	150	450	50
Semi - Urban Local Residential	6	1.5	150	450	50
Semi - Urban Local Industrial	6.5	1.5	150	450	50
Urban Local Residential	8.5	-	150	600	100
Urban Local Industrial	9.0	-	150	600	100

Note - Prime and Double Surface Treatment is based on 16 mm of Hot Mix.

5.0 Improvement Plan

In the following tables you will find three (3) columns being used to describe the condition of the road; Surface Condition, Structural Adequacy, and Condition Rating. To better understand the prioritization of the lists, descriptions of these ratings can be found below.

Surface Condition: Surface conditions relate to driving ease, comfort and safety. Inadequacies for paved surface include excessive or uneven crowns, washboarding, raveling and bumpiness because of cracking, sealing, and rough patching. Inadequacies on loose top surfaces do not include situations that can be readily corrected by maintenance blading. They do include unconsolidated surfaces due to poorly graded or clean aggregate and permanent roughness due to insufficient depth of aggregate or weak subgrade. The effects of surface inadequacies in ascending order of seriousness are noise, vibration, sway, excessive steering effort and reduced speed. *Rated on a scale of 1 to 10*.

Structural Adequacy: The Structural Adequacy point rating relates to the capability of the surface and base courses to support a load and to resist deformation or rupture. Soft spots and frost boils are structural adequacy distress signs for loose top roads. For paved surfaces, distress signs may be cracking, rutting, heaving, pot-holing, roughness, alligatoring, dishing, breakup, distortion, frost boils, etc. *Rated on a scale of 1 to 20*.

Condition Rating: A holistic rating that sums point ratings from alignment, surface condition, surface width, level of service, structural adequacy, drainage and maintenance demands. The condition rating is one of the major factors used to calculate the Priority Rating. *Rated on a scale of 1 to 100*.

5.1 Road Needs

The Township of Hamilton's Capital Improvement Plan is included on the next page, **Table 9.** This table notes the recommended capital improvements based on priorities throughout the Township. **All costs are based on 2019 dollars and should be adjusted for inflation based on program year, for budgeting purposes.** The capital improvements are listed in descending priority based on traffic volumes and Condition Rating, as described previously.

Table 9 – Township of Hamilton's Capital Improvement Plan

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
2020 Capital Program – Double Surface Treatment									
110	Augustine Road	From 2 - Highway 2 to North End	1.94	40	*ST2A - Double Surface Treatment*	*$80*	5 / 10	8 / 20	47 / 100
1475	Lew Harris Road	From 9 - Oak Ridges Drive to 520m S. of 18-Rice Lake Scenic Drive	1.83	289	*ST1 - Single Surface Treatment*	*$38*	6 / 10	12 / 20	73 / 100
1480	Lew Harris Road	From 520m S of 18-Rice Lake Scenic Drive to 300m S. of 18-Rice Lake Scenic Drive	0.22	289	*PP1 - Pulverize and Pave 1 Lift*	*$35*	4 / 10	8 / 20	69 / 100
1483	Lew Harris Road	From 300m S. of 18-Rice Lake Scenic Drive to 18 - Rick Lake Scenic Drive	0.3	289	*Preventative Maintenance*	*$0*	10 / 10	19 / 20	89 / 100
970	Bickle Hill Road	From Theatre Road North to Williamson Road	1.78	255	*ST2A - Double Surface Treatment*	*$73*	6 / 10	7 / 20	61 / 100
90	Lovshin Road	From 2 - Highway 2 to North End	1.48	45	*ST2A - Double Surface Treatment*	*$61*	5 / 10	8 / 20	50 / 100
672	Smith Settlement Road	From 15 - Harwood Road to North End	1.2	60	*ST2A - Double Surface Treatment*	*$49*	6 / 10	9 / 20	55 / 100
2020 Capital Program – Hot Mix Paving									
270	Oliver's Lane	From 0.4 km East of Ontario Street to Division Street North	0.62	638	*PP1 - Pulverize and Pave 1 Lift*	*$99*	5 / 10	9 / 20	42 / 100
290	Forest Hills Drive	From Ontario Street to Danforth Road West	1.11	327	*PP1 - Pulverize and Pave 1 Lift*	*$177*	7 / 10	11 / 20	61 / 100
1581	Lakeshore Drive, Harwood	From 18 - Rice Lake Scenic Drive to Queen Street	0.06	128	*PP1 - Pulverize and Pave 1 Lift*	*$10*	6 / 10	11 / 20	54 / 100
1585	Lakeshore Drive, Harwood	From Queen Street to Front Street	0.61	183	*Recon 1S - Full Reconstruction + 1 Lift*	*$301*	5 / 10	5 / 20	47 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
NOW Needs									
345	Division Street North	From Lot 16/17 to Olivers Lane	0.47	727	*ST2A - Double Surface Treatment with Granular A*	*$38*	6 / 10	6 / 20	47.8 / 100
145	Hamilton Road	From Telephone Road to 74 - Dale Road	2.03	1221	*ST2A - Double Surface Treatment with Granular A*	*$162*	5 / 10	7 / 20	58.6 / 100
1585*	Lakeshore Drive, Harwood	From Queen Street to Front Street	0.61	183	*Recon 1S - Full Reconstruction + 1 Lift*	*$301*	5 / 10	5 / 20	47 / 100
405	Hircock Road	From Nagle Road to Pine Tree Court	0.64	60	*ST2A - Double Surface Treatment with Granular A*	*$51*	5 / 10	6 / 20	37 / 100
310	Stoneridge Road	From Forest Hills Drive to Danforth Road West	0.64	344	*Recon 1S - Full Reconstruction + 1 Lift*	*$316*	6 / 10	7 / 20	55 / 100
1715	Oak Street, Bewdley	From Lake Street to North End	0.28	150	*Recon 1S - Full Reconstruction + 1 Lift*	*$138*	5 / 10	7 / 20	47 / 100
1351	Cavan Road	From Sackville Bridge Road to 9 - Oak Ridges Drive	0.82	966	*Recon 1R - Full Reconstruction + 1 Lift*	*$405*	6 / 10	7 / 20	66.4 / 100
1660	Sidey Drive, Bewdley	From Main Street to Boulton Street	0.28	200	*Recon 1S - Full Reconstruction + 1 Lift*	*$138*	5 / 10	6 / 20	52 / 100
1685	Mill Street, Bewdley	From Oak Street to Rice Lake Road North	0.09	50	*Recon 1S - Full Reconstruction + 1 Lift*	*$44*	4 / 10	7 / 20	43 / 100
540	Overlook Heights	From Burwash Road to North End	0.17	90	*Recon 1S - Full Reconstruction + 1 Lift*	*$84*	5 / 10	6 / 20	49 / 100
1710	Oak Street, Bewdley	From Boulton Street to Lake Street	0.11	50	*Recon 1S - Full Reconstruction + 1 Lift*	*$54*	5 / 10	7 / 20	47 / 100
1095	Edgar Benson Road	From Eagleson Road to End of LCB	0.42	50	*ST2A - Double Surface Treatment with Granular A*	*$34*	4 / 10	6 / 20	47 / 100
970*	Bickle Hill Road	From Theatre Road North to Williamson Road	1.78	255	*ST2A - Double Surface Treatment with Granular A*	*$142*	6 / 10	7 / 20	61 / 100
685	Leach Road	From Racetrack Road to North End	1.34	85	*ST2A - Double Surface Treatment with Granular A*	*$107*	5 / 10	7 / 20	52.6 / 100
1165	Rice Lake Drive South	From 28 - County Road 28 to 7 - Donaldson Road W.	1.99	322	*Recon 1R - Full Reconstruction + 1 Lift*	*$983*	5 / 10	7 / 20	65 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
1167	Rice Lake Drive South	From 7 - Donaldson Road W to 9 - Oak Ridges Drive	2.17	355	*Recon 1R - Full Reconstruction + 1 Lift*	*$1,072*	5 / 10	7 / 20	66 / 100
1110	Fisher Road	From Start of LCB to Beaver Meadow Road West	0.35	50	*ST2A - Double Surface Treatment with Granular A*	*$28*	4 / 10	7 / 20	51 / 100
95	Bob Carr Road	From 2 - Highway 2 to South End	0.32	45	*Recon 1R - Full Reconstruction + 1 Lift*	*$158*	6 / 10	6 / 20	51 / 100
670	Racetrack Road	From Crossen Road to 15 - Harwood Road	1.15	366	*Recon 1R - Full Reconstruction + 1 Lift*	*$568*	6 / 10	7 / 20	67 / 100
865	Doyle Road, Camborne	From Alberts Alley to South End	0.16	20	*ST2A - Double Surface Treatment with Granular A*	*$13*	5 / 10	7 / 20	47 / 100
1725	Boulton Street, Bewdley	From Poplar Drive to Sidey Drive	0.13	45	*Recon 1S - Full Reconstruction + 1 Lift*	*$64*	5 / 10	7 / 20	52 / 100
965	Bell Hill Road	From McClelland Road South to East End	0.4	20	*ST2A - Double Surface Treatment with Granular A*	*$32*	4 / 10	7 / 20	48 / 100
1515	Sully Road	From 9 - Oak Ridges Drive to 18 - Rice Lake Scenic Drive	3.17	433	*ST2A - Double Surface Treatment with Granular A*	*$253*	6 / 10	7 / 20	69 / 100
1730	Boulton Street, Bewdley	From Sidney Drive to Rice Lake Drive	0.24	133	*Recon 2U - Full Reconstruction + 2 Lifts*	*$265*	5 / 10	5 / 20	67 / 100
1250	Reyns Road	From 9 - Oak Ridges Drive to South End	0.44	10	*ST2A - Double Surface Treatment with Granular A*	*$35*	4 / 10	6 / 20	63 / 100
1-5 Year Needs									
1200	Beaver Meadow Road East	From Johnstone Road South to 0.2 km East of Johnstone Road South	0.16	10	*ST2A - Double Surface Treatment with Granular A*	*$13*	5 / 10	8 / 20	58 / 100
1480*	Lew Harris Road	From 520m S of 18 - Rice Lake Scenic Drive to 300m S of 18 - Rice Lake Scenic Drive	0.22	289	*PP1 - Pulverize and Pave 1 Lift*	*$35*	4 / 10	8 / 20	69 / 100
1450	Snelgrove Road, Gores Landing	From 18 - Burnham Street North to Kelly Road	0.17	128	*PP1 - Pulverize and Pave 1 Lift*	*$27*	6 / 10	9 / 20	58 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
465	Van Luven Road	From End of HCB to Highway 401	0.99	83	*PP1 - Pulverize and Pave 1 Lift*	*$158*	6 / 10	10 / 20	55 / 100
195	Howard Baker Road	From 74 - Dale Road to 90m Southerly	0.09	45	*ST2A - Double Surface Treatment with Granular A*	*$7*	6 / 10	8 / 20	55 / 100
1352	Manley Road	From Cavan Road to North End	0.09	5	*ST2A - Double Surface Treatment with Granular A*	*$7*	7 / 10	11 / 20	51 / 100
1460	Churchill Road, Gores Landing	From Kelly Road to West End	0.18	60	*PP1 - Pulverize and Pave 1 Lift*	*$29*	7 / 10	9 / 20	54 / 100
1485	Lewis Court	From Lew Harris Road to East End Turnaround	0.18	100	*PP1 - Pulverize and Pave 1 Lift*	*$29*	7 / 10	8 / 20	56 / 100
1705	Pine Street, Bewdley	From Lake Street to Mill Street	0.18	50	*PP1 - Pulverize and Pave 1 Lift*	*$29*	6 / 10	11 / 20	54 / 100
1665	Sidey Drive, Bewdley	From Boulton Street to East End	0.27	110	*PP1 - Pulverize and Pave 1 Lift*	*$43*	4 / 10	8 / 20	48 / 100
1575	Queen Street, Harwood	From Lakeshore Drive to Highland Drive	0.23	128	*PP1 - Pulverize and Pave 1 Lift*	*$37*	6 / 10	11 / 20	54 / 100
1490	McFarland Road	From 18 - Rice Lake Scenic Drive to North End	0.19	75	*PP1 - Pulverize and Pave 1 Lift*	*$30*	7 / 10	10 / 20	70 / 100
1518	Sully Road North	From 18-Rice Lake Scenic Drive to 0.2 km North	0.19	50	*PP1 - Pulverize and Pave 1 Lift*	*$30*	6 / 10	10 / 20	55 / 100
1555	Goose Creek Road	From 18 - Rice Lake Scenic Drive to North End	0.57	20	*ST2A - Double Surface Treatment with Granular A*	*$46*	7 / 10	11 / 20	62 / 100
1745	Valleyview Crescent, Bewdley	From Rice Lake Drive to Rice Lake Drive	0.57	255	*PP1 - Pulverize and Pave 1 Lift*	*$91*	6 / 10	10 / 20	57 / 100
880	Jibb Road	From Harding Road to Bethel Grove Road 5th Line	1.73	250	*ST2A - Double Surface Treatment with Granular A*	*$138*	6 / 10	10 / 20	72 / 100
460	Van Luven Road	From Hutsell Road to End of HCB	0.77	250	*PP1 - Pulverize and Pave 1 Lift*	*$123*	6 / 10	9 / 20	60 / 100
525	Baltibrook Road, Baltimore	From 45 - County Road 45 to North End	0.29	50	*ST2A - Double Surface Treatment with Granular A*	*$23*	5 / 10	9 / 20	32 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
910	Garland Road	From 74 - Dale Road to 290m North of 74 - Dale Road	0.29	55	*ST2A - Double Surface Treatment with Granular A*	*$23*	6 / 10	10 / 20	58 / 100
945	Dines Road	From Ough's Road to Birchaven Drive	0.29	10	*ST2A - Double Surface Treatment with Granular A*	*$23*	6 / 10	10 / 20	57 / 100
830	Jamieson Road	From Kennedy Road to McBridge Road 6th Line	1.28	155	*ST2A - Double Surface Treatment with Granular A*	*$102*	7 / 10	11 / 20	67 / 100
90*	Lovshin Road	From 2 - Highway 2 to North End	1.48	45	*ST2A - Double Surface Treatment with Granular A*	*$118*	5 / 10	8 / 20	50 / 100
1288*	Cavan Road	From Little Road N to Morton Road	1.68	294	*PP1 - Pulverize and Pave 1 Lift*	*$269*	6 / 10	11 / 20	74 / 100
1085*	Cherry Lane	From 15 - Harwood Road to East End	0.89	90	*PP1 - Pulverize and Pave 1 Lift*	*$142*	6 / 10	10 / 20	75 / 100
1550*	Hillview Drive	From 9 - Oak Ridges Drive to Corkery Road	0.9	183	*PP1 - Pulverize and Pave 1 Lift*	*$144*	6 / 10	10 / 20	73 / 100
780*	Majestic Hills Drive	From 18 - Burnham Street North to South End Turnaround	1.39	310	*PP1 - Pulverize and Pave 1 Lift*	*$222*	5 / 10	8 / 20	54 / 100
665*	Racetrack Road	From Ferguson Road to Crossen Road	1.89	355	*PP1 - Pulverize and Pave 1 Lift*	*$302*	6 / 10	9 / 20	60 / 100
1195*	Beaver Meadow Road East	From 15 - Harwood Road to Johnstone Road South	2.49	289	*PP1 - Pulverize and Pave 1 Lift*	*$398*	6 / 10	10 / 20	69 / 100
1581*	Lakeshore Drive, Harwood	From 18 - Rice Lake Scenic Drive to Queen Street	0.06	128	*PP1 - Pulverize and Pave 1 Lift*	*$10*	6 / 10	11 / 20	54 / 100
835*	Taylor Road, Camborne	From Kennedy Road to East End	0.15	20	*ST2A - Double Surface Treatment with Granular A*	*$12*	5 / 10	10 / 20	49 / 100
1225*	Barrett Road	From 9 - Oak Ridges Drive to South End	0.07	10	*PP1 - Pulverize and Pave 1 Lift*	*$11*	6 / 10	10 / 20	59 / 100
1160*	Spring Road	From Vimy-Ridge Road 6th Line to North End	0.23	30	*ST2A - Double Surface Treatment with Granular A*	*$18*	6 / 10	8 / 20	55 / 100
1500*	Traill Road North	From 18 - Rice Lake Scenic Drive to South End	0.23	20	*ST2A - Double Surface Treatment with Granular A*	*$18*	5 / 10	9 / 20	56 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
1600*	Sherwin Street, Harwood	From Shortt Street to Lakeshore Drive	0.1	20	*PP1 - Pulverize and Pave 1 Lift*	*$16*	6 / 10	10 / 20	53 / 100
672*	Smith Settlement Road	From 15 - Harwood Road to North End	1.2	60	*ST2A - Double Surface Treatment with Granular A*	*$96*	6 / 10	9 / 20	55 / 100
895*	Williamson Road	From Bickle Hill Road to Jibb Road	1.3	438	*ST2A - Double Surface Treatment with Granular A*	*$104*	6 / 10	11 / 20	55.6 / 100
1350*	Cavan Road	From Rice Lake Drive North to Sackville Bridge Road	1	971	*PP1 - Pulverize and Pave 1 Lift*	*$160*	7 / 10	10 / 20	75 / 100
1525*	Sutter Creek Drive	From Sully Road to North End	0.7	40	*ST2A - Double Surface Treatment with Granular A*	*$56*	5 / 10	9 / 20	70 / 100
1553*	Hillview Drive	From Corkery Road to Rice Lake Scenic Drive	1.4	383	*PP1 - Pulverize and Pave 1 Lift*	*$224*	6 / 10	11 / 20	75 / 100
1700*	Ridge Road, Bewdley	From Mill Street to Cemetery	0.1	30	*ST2A - Double Surface Treatment with Granular A*	*$8*	5 / 10	8 / 20	49 / 100
370*	Skye Valley Drive	From Division Street to Division Street	2.15	499	*PP1 - Pulverize and Pave 1 Lift*	*$344*	6 / 10	8 / 20	57 / 100
60*	Stanton Road South	From Workman Road to North End	0.15	20	*ST2A - Double Surface Treatment with Granular A*	*$12*	6 / 10	11 / 20	69 / 100
1329*	Harmony Road	From Byers North (10th Line) to South End	0.06	35	*ST2A - Double Surface Treatment with Granular A*	*$5*	6 / 10	11 / 20	53 / 100
675*	Crossen Road	From Racetrack Road to Road Between Lot 8/9, Conc IV	1.91	133	*ST2A - Double Surface Treatment with Granular A*	*$153*	6 / 10	11 / 20	65.2 / 100
290*	Forest Hills Drive	From Ontario Street to Danforth Road West	1.11	327	*PP1 - Pulverize and Pave 1 Lift*	*$177*	7 / 10	11 / 20	61 / 100
785*	Smylie Road	From 18 - Burnham Street North to Baker Road North	1.53	483	*PP1 - Pulverize and Pave 1 Lift*	*$245*	6 / 10	9 / 20	65.4 / 100
1470*	Waldon Road, Gores Landing	From 18 - Rice Lake Scenic Drive to South End	0.51	90	*PP1 - Pulverize and Pave 1 Lift*	*$82*	6 / 10	9 / 20	62.6 / 100
110*	Augustine Road	From 2 - Highway 2 to North End	1.94	40	*ST2A - Double Surface Treatment with Granular A*	*$155*	5 / 10	8 / 20	47 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
1605*	Front Street, Harwood	From 18 - Rice Lake Scenic Drive to Queen Street	0.41	511	*PP1 - Pulverize and Pave 1 Lift*	*$66*	6 / 10	9 / 20	56 / 100
1410*	Oriole Beach Road	From Lander Road to North End	1.03	30	*ST2A - Double Surface Treatment with Granular A*	*$82*	6 / 10	11 / 20	55 / 100
270*	Oliver's Lane	From 0.4 km East of Ontario Street to Division Street North	0.62	638	*PP1 - Pulverize and Pave 1 Lift*	*$99*	5 / 10	9 / 20	42 / 100
455	Van Luven Road	From Nagle Road to Hutsell Road	1.04	1254	*PP1 - Pulverize and Pave 1 Lift*	*$166*	6 / 10	9 / 20	54 / 100
165	Dalewood Court	From Theatre Road to North End Cul-de-Sac	0.21	90	*PP1 - Pulverize and Pave 1 Lift*	*$34*	7 / 10	10 / 20	59 / 100
1680	Mill Street, Bewdley	From Main Street to Oak Street	0.21	50	*PP1 - Pulverize and Pave 1 Lift*	*$34*	6 / 10	9 / 20	55 / 100
1305	Benson Road	From Donaldson Road West 7th Line to 9 - Oak Ridges Drive	2.04	78	*ST2A - Double Surface Treatment with Granular A*	*$163*	6 / 10	11 / 20	63.2 / 100
230	Lorraine Street	From Ontario Street to 74 - Dale Road	0.43	233	*PP1 - Pulverize and Pave 1 Lift*	*$69*	6 / 10	9 / 20	56 / 100
1285	Cavan Road	From Canning Road to Morton Road	1.69	294	*PP1 - Pulverize and Pave 1 Lift*	*$270*	6 / 10	11 / 20	74 / 100
1010	Vic Lightle Road	From Bethel Grove Road 5th Line to Vimy-Ridge Road 6th Line	2.08	122	*ST2A - Double Surface Treatment with Granular A*	*$166*	6 / 10	11 / 20	66.8 / 100
365	Carlton Boulevard	From Danforth Road West to North End	0.11	50	*PP1 - Pulverize and Pave 1 Lift*	*$18*	6 / 10	9 / 20	55 / 100
1510	Burrison Road	From 18 - Rice Lake Scenic Drive to 18 - Rice Lake Scenic Drive	0.22	67	*ST2A - Double Surface Treatment with Granular A*	*$18*	7 / 10	11 / 20	57 / 100
1595	Shortt Street, Harwood	From Highland Drive to East End	0.22	80	*PP1 - Pulverize and Pave 1 Lift*	*$35*	6 / 10	9 / 20	51 / 100
1610	Front Street, Harwood	From Lakeshore Drive to Railway Road	0.22	311	*PP1 - Pulverize and Pave 1 Lift*	*$35*	6 / 10	9 / 20	51 / 100
720	Cochrane Road South	From 74 - Dale Road to North End	0.99	90	*ST2A - Double Surface Treatment with Granular A*	*$79*	6 / 10	9 / 20	46 / 100
1045	Minifie Road 6th Line	From 18 - Burnham Street North to Dejong Road	1.1	494	*Recon 1R - Full Reconstruction + 1 Lift*	*$543*	6 / 10	8 / 20	62.4 / 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Preliminary Improvement Type Recommendation	Cost (x1000)	Surface Condition	Structural Adequacy	Condition Rating
520	Elm Avenue, Baltimore	From Community Centre Road to Maple Crescent	0.34	178	*PP1 - Pulverize and Pave 1 Lift*	*$54*	6 / 10	11 / 20	57 / 100
305	Trotter's Lane East	From Ontario Street to East End Turnaround	0.23	30	*PP1 - Pulverize and Pave 1 Lift*	*$37*	5 / 10	9 / 20	56 / 100
1220	Robson Road	From 15 - Harwood Road to South End	0.93	40	*ST2A - Double Surface Treatment with Granular A*	*$74*	6 / 10	11 / 20	64.8 / 100
1615	Railway Road	From Lakeshore Drive to Front Street	0.12	20	*PP1 - Pulverize and Pave 1 Lift*	*$19*	7 / 10	8 / 20	52 / 100
850	Albert Court, Camborne	From 18 - Burnham Street North to West End	0.22	150	*PP1 - Pulverize and Pave 1 Lift*	*$35*	6 / 10	9 / 20	58 / 100
1560	Young Street	From 18 - Rice Lake Scenic Drive to North End	0.37	345	*PP1 - Pulverize and Pave 1 Lift*	*$59*	6 / 10	9 / 20	55 / 100
300	Trotters Lane West	From Ontario Street to West End	0.13	40	*PP1 - Pulverize and Pave 1 Lift*	*$21*	5 / 10	9 / 20	56 / 100
1720	Chapel Street, Bewdley	From Boulton Street to Lake Street	0.13	50	*PP1 - Pulverize and Pave 1 Lift*	*$21*	6 / 10	10 / 20	51 / 100
545	Atanasoff Road	From Community Centre Road to North End	0.39	20	*ST2A - Double Surface Treatment with Granular A*	*$31*	6 / 10	10 / 20	46 / 100
100	Apple Orchard Road	From 2 - Highway 2 to North End	0.8	30	*PP1 - Pulverize and Pave 1 Lift*	*$128*	6 / 10	11 / 20	56 / 100
585	Meyers Road North	From 45 - County Road 45 to North End	0.27	10	*PP1 - Pulverize and Pave 1 Lift*	*$43*	6 / 10	11 / 20	49 / 100
613	Hickerson Road	From N of Clapperton Road to 1.9km North of 45 - County Road 45	0.6	144	*ST2A - Double Surface Treatment with Granular A*	*$48*	6 / 10	10 / 20	53.4 / 100
1520	Stevenson Road	From Sully Road to East End	0.36	60	*ST2A - Double Surface Treatment with Granular A*	*$29*	6 / 10	8 / 20	55 / 100
950	Birch Haven Drive	From Dines Road to East End	0.05	10	*ST2A - Double Surface Treatment with Granular A*	*$4*	6 / 10	10 / 20	54 / 100

Listed in 2020 Construction Program

Notes:

1. *Rehabilitation strategy to be confirmed by geotechnical investigations at detail design.*

2. *Timing of storm sewer/culvert work should be considered in conjunction with road reconstruction and vice versa, where applicable.*

3. *Costing is zero for roads within the network but maintained by others (i.e. boundary roads).*

5.2 Annual Resurfacing Program

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a resurfacing program / budget is recommended, in addition to the noted capital improvement works, as follows:

Hot Mix Paved Roads:

- 122.5 km of paved roads (HCB).
- Degradation rate 0.25 / year (rating drops from 10 to 5, over a 20-year period).
- Annual resurfacing 6.1 km / year.
- **Annual budget $1,774,600**: (6.1 km / year x $143,000 / lane km **RMP1** x 2 lanes).

Surface Treated Roads:

- 145.5 km of surface treated roads (LCB & ICB).
- Degradation rate 0.625 / year (rating drops from 10 to 5, over a 7-year period).
- Annual resurfacing 20.8 km / year.
- **Annual budget $436,800** (20.8 km / year x $21,000 / km **ST1**).

Gravel roads require regular maintenance. Maintenance includes regular grading and reapplication of new gravel. Typically, gravel roads should be resurfaced on a 3-5 year cycle.

Gravel Roads:

- 31.4 km of earth / gravel roads.
- 75 mm gravel every 3 years.
- Annual gravelling of 10.5 km.
- Granular A ($20,000 / km).
- **Annual budget $210,000** (10.5 km / year x $20,000 **G**) **.

** *Cost based on supply and application of gravel by external forces.*

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $2,391,400 per year.

Relative road preservation / resurfacing priorities for all roads not included in the previous Capital Improvement Plan are listed below in **Table 10,** Township of Hamilton's Resurfacing Priorities. Roads are listed in order of descending preservation priorities.

Table 10 – Township of Hamilton's Resurfacing Plan

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
6-10 Year Needs								
340	Division Street North	From 45 - County Road 45 to Lot 16/17	0.72	1387	*HCB*	7/ 10	12 / 20	60/ 100
80	Normar Road	From 2 - Highway 2 to South End	1.66	1720	*LCB*	6/ 10	12 / 20	70/ 100
105	Theatre Road South	From 2 - Highway 2 to Telephone Road	2.06	1582	*HCB*	7/ 10	13 / 20	71/ 100
1670	Lake Street, Bewdley	From Boundary Road to Main Street	0.44	444	*HCB*	6/ 10	12 / 20	62/ 100
180	Telephone Road	From Theatre Road South to 18 - Burnham Street North	3.3	1237	*HCB*	7/ 10	13 / 20	71/ 100
515	Maple Crescent, Baltimore	From Elm Avenue to Community Centre Road	0.53	311	*HCB*	6/ 10	13 / 20	61/ 100
360	Carlton Boulevard	From 45 - County Road 45 to Danforth Road West	0.42	244	*HCB*	6/ 10	12 / 20	59/ 100
395	Nagle Road	From Highway 401 to Hircock Road	1.98	982	*HCB*	7/ 10	12 / 20	71/ 100
155	Telephone Road	From Hamilton Road to Theatre Road South	2.91	1410	*HCB*	7/ 10	14 / 20	74/ 100
1650	Waverly Street, Bewdley	From Main Street to Boundary Road	0.44	200	*HCB*	6/ 10	14 / 20	62/ 100
1632	Boundary Road, Bewdley	From Lake Street to North End	0.7	190	*HCB*	6/ 10	12 / 20	62/ 100
1300	McAllister Road	From 9 - Oak Ridges Drive to South End	0.51	40	*G/S*	6/ 10	13 / 20	51/ 100
140	Dr Johnson Road	From Hamilton Road to East End	1.08	10	*G/S*	7/ 10	12 / 20	45/ 100
377	Slater Street	From End of CC&CG to East End Turnaround	0.33	110	*HCB*	7/ 10	12 / 20	59/ 100
1760	Dieppe Road, Bewdley	From 28 - County Road 28 to Rice Lake Drive North	0.22	239	*HCB*	7/ 10	14 / 20	65/ 100
740	Francis Street, Precious Corners	From Behan Road to Jean Davey Road	0.37	178	*HCB*	7/ 10	12 / 20	63/ 100
1590	Highland Drive, Harwood	From Queen Street to Lakeshore Drive	0.13	155	*HCB*	8/ 10	13 / 20	62/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
555	McMann Road	From Meyers Road to Boundary Line	0.26	40	*LCB*	6/ 10	12 / 20	53/ 100
745	Theresa Street, Precious Corners	From Behan Road to Jean Davey Road	0.39	189	*HCB*	7/ 10	13 / 20	64/ 100
1465	Lampman Lane, Gores Landing	From Plank Road to West End	0.1	50	*ICB*	6/ 10	12 / 20	55/ 100
50	Cunningham Road	From Danforth Road East to North End Turnaround	0.82	50	*LCB*	6/ 10	12 / 20	55/ 100
1655	Beech Street, Bewdley	From Boundary Road to Main Street	0.44	155	*HCB*	7/ 10	14 / 20	63/ 100
565	Lime Kiln Trail	From 45 - County Road 45 to East End	0.2	40	*ICB*	5/ 10	12 / 20	54/ 100
855	Alberts Alley, Camborne	From 18 - Burnham Street North to 0.4 km West of 18 - Burnham Street	0.29	111	*HCB*	7/ 10	14 / 20	61/ 100
1065	Timlin Road, Cold Springs	From Minifie Road 6th Line to South End	0.14	20	*G/S*	8/ 10	14 / 20	52/ 100
1015	Percy Rose Road	From Bethel Grove Road 5th Line to North End	0.46	30	*LCB*	5/ 10	13 / 20	54/ 100
750	Jean Davey Road, Precious Corners	From Cornish Hollow Road to 60 metres west of Francis Street	0.29	161	*HCB*	7/ 10	14 / 20	65/ 100
1360	Oak Hills Road	From 9 - Oak Ridges Drive to Bamsey Drive	1.97	416	*LCB*	7/ 10	12 / 20	72/ 100
935	Hamilton Road	From 74 - Dale Road to 0.4 km North of 74 - Dale Road	0.4	10	*G/S*	7/ 10	12 / 20	52/ 100
1202	Beaver Meadow Road East	From 0.2 km East of Johnstone Road South to Boundary Road	0.67	10	*G/S*	6/ 10	12 / 20	52/ 100
1405	Lander Road	From King Road to 18 - Burnham Street North	1.26	749	*LCB*	7/ 10	13 / 20	76/ 100
335	Forest Glen Crescent	From Division Street to West End Turnaround	0.34	80	*HCB*	7/ 10	12 / 20	62/ 100
1150	Little Road	From Vimy-Ridge Road 6th Line to Cavan Road	3.2	488	*LCB*	7/ 10	14 / 20	74/ 100
350	Division Street North	From Olivers Lane to Danforth Road West	0.57	483	*LCB*	6/ 10	12 / 20	74/ 100
315	Stone Court	From Stoneridge Road to North End Turnaround	0.11	60	*HCB*	6/ 10	12 / 20	61/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
980	Bethel Grove Road 5th Line	From 28 - County Road 28 to 830m East of 28 - County Road 28	0.83	361	*HCB*	7/ 10	13 / 20	73/ 100
575	Cedar Hill Court	From 45 - County Road 45 to North End Turnaround	0.1	50	*HCB*	6/ 10	12 / 20	61/ 100
1204	Boundary Road	From Beaver Meadow Road East to 0.3 km South of Beaver Meadow Road East	0.29	10	*G/S*	6/ 10	12 / 20	56/ 100
805	Charbrook Crescent	From Smylie Road to South End Turnaround	0.35	80	*HCB*	7/ 10	14 / 20	65/ 100
1475	Lew Harris Road	From 9 - Oak Ridges Drive to 520m S of 18-Rice Lake Scenic Drive	1.83	289	*LCB*	6/ 10	12 / 20	73/ 100
25	McEwen Road	From 2 - Highway 2 to Danforth Road East	2.13	233	*LCB*	8/ 10	13 / 20	72/ 100
1080	Roy Herron Road, Cold Springs	From Minifie Road 6th Line to North End	0.19	30	*ICB*	6/ 10	13 / 20	61/ 100
595	Cedar Creek Trail	From 15 - Harwood Road to East End	0.12	30	*G/S*	6/ 10	14 / 20	61/ 100
150	Don Lang Road	From Telephone Road to North End	1.01	10	*G/S*	7/ 10	13 / 20	58/ 100
295	Grand View Court	From Forest Hills Drive to South End Turnaround	0.19	40	*HCB*	8/ 10	12 / 20	63/ 100
1175	Donaldson Road West 7th Line	From Rick Lake Drive South to Benson Road	0.91	166	*LCB*	5/ 10	12 / 20	71/ 100
890	Harding Road	From Jibb Road to North End	0.36	20	*G/S*	7/ 10	13 / 20	61/ 100
1145	Morton Road	From Vimy-Ridge Road 6th Line to Cavan Road	3.69	183	*LCB*	7/ 10	14 / 20	72/ 100
1320	Seeney Road	From 28 - County Road 28 to South End	0.14	10	*G/S*	7/ 10	12 / 20	60/ 100
860	Alberts Alley, Camborne	From Doyle Road, Camborne to Jibb Road	0.34	35	*LCB*	7/ 10	14 / 20	64/ 100
1290	Cavan Road	From 9 - Oak Ridges Drive to Little Road N	0.93	577	*HCB*	7/ 10	13 / 20	79/ 100
170	Bill Lang Road	From Telephone Road to North End	0.27	10	*G/S*	7/ 10	14 / 20	61/ 100
1395	L. Westington Road	From 9 - Oak Ridges Drive to North End	0.21	10	*G/S*	7/ 10	12 / 20	61/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
1135	Frank Ritchie Road	From McBride Road 6th Line to North End	0.36	20	*G/S*	8/ 10	14 / 20	63/ 100
147	Nelson Road	From 74 - Dale Road to South End	0.37	10	*G/S*	7/ 10	13 / 20	64/ 100
660	Racetrack Road	From 74 - Dale Road to Ferguson Road	1.46	555	*HCB*	8/ 10	14 / 20	81/ 100
1280	Cavan Road	From 18 - Burnham Street North to Canning Road	2.1	283	*HCB*	7/ 10	14 / 20	79/ 100
1235	Tinney Road	From Linton Road to McKinlay Road	1.01	117	*LCB*	7/ 10	13 / 20	75/ 100
570	McDougall Road	From 15 - Harwood Road to East End Turnaround	0.58	100	*HCB*	6/ 10	13 / 20	78/ 100
15	Ron Harnden Road	From Danforth Road East to North End	0.72	45	*LCB*	7/ 10	12 / 20	76/ 100
330	Halle Road	From Castle Hill Drive to East End	0.14	20	*LCB*	6/ 10	12 / 20	74/ 100
645	Pollock Road	From 15 - Harwood Road to South End Turnaround	0.29	30	*LCB*	7/ 10	13 / 20	78/ 100
265	Oliver's Lane	From Ontario Street to 0.4 km East of Ontario Street	0.42	483	*HCB*	7/ 10	14 / 20	88/ 100
Structurally Adequate Roads								
453	Van Luven Road	From 45 - County Road 45 to Nagle Road	0.19	2558	*HCB*	7/ 10	15 / 20	64/ 100
400	Nagle Road	From Hircock Road to Van Luven Road	0.52	1482	*HCB*	9/ 10	18 / 20	72/ 100
1607	Front Street, Harwood	From Queen Street to Lakeshore Drive	0.15	383	*HCB*	7/ 10	15 / 20	63/ 100
1750	Rice Lake Drive North, Bewdley	From S Limits of Bewdley (Start of West C&G) to 70 m North of Mill Street	0.82	1532	*HCB*	10/ 10	18 / 20	74/ 100
823	Kennedy Road	From End of CC&CG to Jamieson Road	0.71	1093	*HCB*	10/ 10	20 / 20	72/ 100
380	Cap Wilson Drive	From 45 - County Road 45 to Deerfield Drive	0.19	433	*HCB*	8/ 10	17 / 20	67/ 100
640	Daignault Road	From 15 - Harwood Road to North End	0.75	50	*G/S*	8/ 10	16 / 20	51/ 100
825	Kennedy Road	From 18 - Burnham Street North to Jamieson Road	2.12	694	*HCB*	8/ 10	15 / 20	71/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
385	Deerfield Drive	From Cap Wilson Drive to Lynden Court	0.6	400	*HCB*	8/ 10	17 / 20	69/ 100
357	Division Street North	From 1.2 km North of Danforth Road West to 74 - Dale Road	1.1	1182	*HCB*	10/ 10	20 / 20	76/ 100
160	Theatre Road South	From Telephone Road to 74 - Dale Road	2.02	1382	*HCB*	8/ 10	16 / 20	77/ 100
1190	Beaver Meadow Road West	From 18 - Burnham Street North to Eagleson Road	2.07	760	*HCB*	7/ 10	17 / 20	74/ 100
240	June Avenue	From Ontario Street to Haymur Street	0.22	782	*HCB*	10/ 10	19 / 20	74/ 100
736	Behan Road, Precious Corners	From Jean Davey Road to Cornish Hollow Road	0.42	228	*HCB*	7/ 10	15 / 20	66/ 100
625	Kraumanis Road	From Hickerson Road to South End	0.36	20	*G/S*	7/ 10	15 / 20	51/ 100
75	Jarvis Road	From Elgin Street to Danforth Road East	0.5	610	*LCB*	9/ 10	18 / 20	73/ 100
430	Meadowland Drive	From Nagle Road to Van Luven Road	0.94	488	*HCB*	9/ 10	18 / 20	72/ 100
185	Danforth Road West	From 74 - Dale Road to 18 - Burnham Street North	2.03	771	*LCB*	8/ 10	16 / 20	75/ 100
755	Cornish Hollow Road	From 74 - Dale Road to 1.2km North of 74 - Dale Road	1.42	860	*HCB*	10/ 10	20 / 20	76/ 100
1325	Byers Road (10th Line)	From 28 - County Road 28 to Arrowhead Road	1.83	333	*LCB*	8/ 10	16 / 20	71/ 100
1455	Plank Road, Gores Landing	From 18 - Rice Lake Scenic Drive to North End	0.35	380	*HCB*	9/ 10	18 / 20	72/ 100
500	Community Centre Road	From Burwash Road to 0.2 km West of Payne Road	1.37	971	*HCB*	9/ 10	17 / 20	78/ 100
445	Oriole Crescent	From Van Luven Road to Van Luven Road	0.64	233	*HCB*	8/ 10	17 / 20	69/ 100
480	Hutsell Road	From Van Luven Road to East End Turnaround	0.67	170	*HCB*	8/ 10	15 / 20	67/ 100
1640	Hunter Street, Bewdley	From Boundary Road to Main Street	0.44	266	*HCB*	8/ 10	18 / 20	70/ 100
1400	Lander Road	From 9 - Oak Ridges Drive to King Road	1.9	588	*LCB*	7/ 10	15 / 20	75/ 100
735	Behan Court, Precious Corners	From 74 - Dale Road to northerly	0.27	455	*HCB*	9/ 10	19 / 20	74/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
245	June Avenue	From Haymur Street to Lenore Avenue	0.36	449	*HCB*	10/ 10	19 / 20	74/ 100
120	Moore Service Road	From Hunco Farm Road to North End	0.6	45	*G/S*	7/ 10	16 / 20	60/ 100
1630	Boundary Road, Bewdley	From 28 - County Road 28 to Lake Street	0.42	500	*HCB*	10/ 10	20 / 20	75/ 100
560	Ellis Road	From Meyers Road South to 0.4 km Easterly	0.41	100	*HCB*	8/ 10	15 / 20	65/ 100
1380	Shore Road	From Cook Road to Taits Beach Road	0.34	355	*LCB*	8/ 10	16 / 20	73/ 100
920	Rowe Road	From Bethel Grove Road 5th Line to South End	0.45	10	*G/S*	8/ 10	16 / 20	55/ 100
250	Lenore Avenue	From Haymur Street (N) to Olivers Lane	0.2	483	*HCB*	10/ 10	19 / 20	75/ 100
260	Lenore Avenue	From Catherine Street to Haymur Street (S)	0.15	483	*HCB*	10/ 10	19 / 20	75/ 100
1345	Rice Lake Drive North	From 9 - Oak Ridges Drive to S Limits of Bewdley (Start of West C&G)	0.95	544	*HCB*	8/ 10	17 / 20	76/ 100
820	Kennedy Road	From 18 - Burnham Street North to Jamieson Road	1.04	1093	*HCB*	10/ 10	20 / 20	80/ 100
870	Jibb Road	From Kennedy Road to Alberts Alley	0.42	527	*HCB*	10/ 10	20 / 20	76/ 100
425	Cardinal Court	From Nagle Road to West End Turnaround	0.31	260	*HCB*	9/ 10	18 / 20	72/ 100
1420	King Road	From William Road to North End	0.51	45	*HCB*	8/ 10	17 / 20	62/ 100
1695	Main Street, Bewdley	From Lake Street to Rice Lake Road North, Bewdley	0.51	388	*HCB*	10/ 10	19 / 20	75/ 100
1435	Glen Lynden Road	From Harris Beatworks Road to West End	0.14	40	*LCB*	7/ 10	15 / 20	62/ 100
505	Community Centre Road	From 0.2 km West of Payne Road to Les Davey Road	1.11	727	*HCB*	9/ 10	18 / 20	79/ 100
1505	Close Point Road	From 18 - Rice Lake Scenic Drive to North End	0.16	65	*LCB*	8/ 10	15 / 20	65/ 100
650	Peter Street	From 74 - Dale Road to North End	0.2	180	*LCB*	9/ 10	18 / 20	71/ 100
410	Hircock Road	From Pine Tree Court to Nagle Road	0.41	211	*HCB*	9/ 10	18 / 20	72/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
580	Staples Road	From 45 - County Road 45 to North End Turnaround	0.2	50	*HCB*	7/ 10	17 / 20	64/ 100
600	Clapperton Road	From 15 - Harwood Road to Hickerson Road	1.04	277	*LCB*	9/ 10	17 / 20	74/ 100
1735	Brisbin Road, Bewdley	From Main Street to West End	0.23	45	*HCB*	8/ 10	15 / 20	64/ 100
1310	Main Street	From 9 - Oak Ridges Drive to Hunter Street	0.81	627	*HCB*	10/ 10	19 / 20	79/ 100
610	Hickerson Road	From 45 - County Road 45 to N of Clapperton Road	1.33	250	*LCB*	8/ 10	16 / 20	74/ 100
10	Carruthers Road	From 2 - Highway 2 to North End	1.31	20	*G/S*	8/ 10	17 / 20	62/ 100
840	Burgess Crescent, Camborne	From Jibb Road to Jibb Road	0.55	333	*HCB*	10/ 10	20 / 20	76/ 100
55	Workman Road	From 2 - Highway 2 to Stanton Road South	0.27	1426	*LCB*	8/ 10	17 / 20	83/ 100
392	Deerfield Drive	From Lynden Court to North End	0.25	90	*HCB*	8/ 10	17 / 20	69/ 100
1335	Hannah Road	From 28 - County Road 28 to 0.5 km East of Evertsen Road	1.26	178	*LCB*	7/ 10	16 / 20	73/ 100
1215	Jasper Martin Road	From 9 - Oak Ridges Drive to South End	0.36	10	*G/S*	7/ 10	16 / 20	61/ 100
45	Hill 60	From Danforth Road East to South End	0.6	10	*G/S*	8/ 10	16 / 20	61/ 100
730	Precious Road	From Cornish Hollow Road to South End	0.07	10	*G/S*	7/ 10	15 / 20	61/ 100
420	Ravine Drive	From Hircock Road to Cardinal Court	0.42	144	*HCB*	9/ 10	18 / 20	72/ 100
1255	Buttar-Blezzard Road	From Cavan Road to North End	0.25	20	*ICB*	8/ 10	15 / 20	63/ 100
605	Roebuck Road	From Clapperton Road to North End	0.33	20	*G/S*	7/ 10	15 / 20	63/ 100
450	Gordon Street	From Van Luven Road to North End	0.35	80	*HCB*	8/ 10	17 / 20	69/ 100
390	Lynden Court	From Deerfield Drive to West End Turnaround	0.14	80	*HCB*	8/ 10	17 / 20	69/ 100
1645	Poplar Drive, Bewdley	From Main Street to East End	0.44	200	*HCB*	10/ 10	20 / 20	74/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
510	Mouncey Road	From 45 - County Road 45 to North End	0.27	40	*HCB*	8/ 10	16 / 20	66/ 100
655	Glendale Drive	From Peter Street to East End Turnaround	0.33	110	*LCB*	9/ 10	18 / 20	71/ 100
1070	McIntosh Street, Cold Springs	From 18 - Burnham Street North to Minifie Road 6th Line	0.34	155	*HCB*	9/ 10	19 / 20	73/ 100
1265	West Road	From Cavan Road to South End	0.9	20	*G/S*	7/ 10	15 / 20	64/ 100
1125	Bowman Road	From McBride Road 6th Line to North End	0.54	20	*G/S*	7/ 10	15 / 20	64/ 100
470	Payne Road	From Van Luven Road to Start of LCB	2.6	100	*G/S*	8/ 10	16 / 20	71/ 100
275	Sunset Drive	From Olivers Lane to Forest Hills Drive	0.52	244	*HCB*	10/ 10	20 / 20	76/ 100
1180	Donaldson Road West 7th Line	From Benson Road to Little Road	1.67	166	*LCB*	7/ 10	15 / 20	74/ 100
705	Ken May Road	From Ferguson Road to North End	0.84	10	*G/S*	8/ 10	15 / 20	63/ 100
1102	Fisher Road South	From Minifie Road 6th Line to North End	0.22	10	*G/S*	7/ 10	15 / 20	63/ 100
955	Joe Bunting Road	From McClelland Road South to West End	0.66	10	*G/S*	7/ 10	15 / 20	63/ 100
175	Birch Road	From Telephone Road to South End	0.48	15	*G/S*	8/ 10	15 / 20	64/ 100
5	Heritage Road	From 2 - Highway 2 to South End	0.08	20	*G/S*	8/ 10	16 / 20	65/ 100
1740	Ainley Road, Bewdley	From Brisbin Road to South End	0.11	20	*G/S*	8/ 10	16 / 20	65/ 100
1295	Gibbs Road	From Donaldson Road West 7th Line to North End	0.46	20	*G/S*	7/ 10	16 / 20	65/ 100
1315	Lakeview Lane	From 28 - County Road 28 to North End	0.57	20	*G/S*	8/ 10	15 / 20	65/ 100
1370	Halstead Beach Road	From 9 - Oak Ridges Drive to North End	1.55	340	*LCB*	8/ 10	17 / 20	78/ 100
1425	William Road	From King Road to East End	0.6	85	*LCB*	8/ 10	16 / 20	71/ 100
1140	Art Lang Road	From Vimy Ridge 6th Line to North End	0.4	20	*G/S*	8/ 10	16 / 20	66/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
752	Jean Davey Road, Precious Corners	From 60 metres west of Francis Street to Behan Road	0.65	161	*HCB*	9/ 10	20 / 20	75/ 100
85	Danforth Road East	From Jarvis Road to Ron Harnden Road	3.4	1448	*HCB*	10/ 10	19 / 20	85/ 100
1115	Turner Road	From Beaver Meadow Road 7th Line to South End	0.33	10	*G/S*	8/ 10	18 / 20	65/ 100
40	Joe Oliver Road	From 2 - Highway 2 to North End	1.36	40	*G/S*	9/ 10	17 / 20	69/ 100
394	Fawn Hill Court	From Deerfield Drive to East End	0.21	30	*HCB*	8/ 10	16 / 20	68/ 100
1120	Jack Gordon Road	From McBride Road 6th Line to North End	0.49	20	*G/S*	8/ 10	18 / 20	67/ 100
725	Cochrane Road North	From Cornish Hollow Road to South End	0.22	20	*G/S*	8/ 10	16 / 20	67/ 100
885	Lacey Road	From Jibb Road to South End	0.45	20	*G/S*	8/ 10	17 / 20	67/ 100
235	Catherine Street	From June Avenue to Olivers Lane	0.34	161	*HCB*	10/ 10	20 / 20	76/ 100
35	Pentecostal Road	From 2 - Highway 2 to South End	0.72	400	*HCB*	9/ 10	17 / 20	80/ 100
1020	Winifred Goheen	From Vimy Ridge Road 6th Line to South End	0.62	30	*G/S*	8/ 10	18 / 20	69/ 100
320	Castle Hill Drive	From Danforth Road West to Halle Road	0.7	455	*HCB*	10/ 10	19 / 20	81/ 100
680	Crossen Road	From Conc IV, Lot 8/9 to 15 - Harwood Road	2.1	50	*G/S*	8/ 10	18 / 20	71/ 100
845	Ford Street, Camborne	From Jibb Road to South End Turnaround	0.22	150	*HCB*	10/ 10	20 / 20	76/ 100
1430	Harris Boatworks Road	From Lander Road to North End	1.26	280	*LCB*	8/ 10	15 / 20	79/ 100
1185	Donaldson Road East 7th Line	From Canning Road to 18 - Burnham Street North	2.05	172	*LCB*	7/ 10	15 / 20	77/ 100
1625	Hilton Harris Road	From 9 - Oak Ridges Drive to North End	0.5	10	*G/S*	8/ 10	15 / 20	67/ 100
1620	Earl Joice Road	From 9 - Oak Ridges Drive to North End	0.24	10	*G/S*	8/ 10	15 / 20	67/ 100
960	Bell Hill Road East	From Garland Road to East End	0.16	10	*G/S*	8/ 10	18 / 20	67/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
255	Haymur Street	From June Avenue to Lenore Avenue	0.2	133	*HCB*	10/ 10	20 / 20	76/ 100
210	Danforth Road West	From Division Street North to 45 - County Road 45	1.02	1437	*HCB*	9/ 10	18 / 20	86/ 100
1635	Allan Road, Bewdley	From Boundary Road to East End	0.08	20	*G/S*	9/ 10	19 / 20	69/ 100
440	Crestview Court	From Meadowland Drive to South End Turnaround	0.13	50	*HCB*	9/ 10	18 / 20	72/ 100
915	Garland Road	From 290m North of 74 - Dale Road to Bell Hill Road	1.67	10	*G/S*	8/ 10	18 / 20	68/ 100
1375	Tower Manor Road	From 9 - Oak Ridges Drive to Shore Road	1.64	355	*LCB*	7/ 10	16 / 20	81/ 100
415	Pine Tree Court	From Hircock Road to West End Turnaround	0.07	40	*HCB*	9/ 10	18 / 20	72/ 100
435	Prairieglen Circle	From Meadowland Drive to West End Turnaround	0.08	40	*HCB*	9/ 10	18 / 20	72/ 100
1035	Vimy-Ridge Road 6th Line	From Kennedy Road to 0.2 km East of Kennedy Road	0.24	20	*LCB*	7/ 10	15 / 20	70/ 100
1765	Kidd Street, Bewdley	From Lake Street to North End	0.08	20	*HCB*	10/ 10	19 / 20	70/ 100
225	Ontario Street	From Danforth Road West to 74 - Dale Road	1.53	2286	*HCB*	9/ 10	19 / 20	88/ 100
995	Mulder Road	From Jibb Road to Kennedy Road	1.37	128	*LCB*	8/ 10	17 / 20	77/ 100
1495	Traill Road South	From 9 - Oak Ridges Drive to North End	1.81	80	*LCB*	10/ 10	20 / 20	75/ 100
630	Alnwick Hill Road	From 0.9 km North of 15 - Harwood Road to Pollard Road	0.78	100	*LCB*	10/ 10	19 / 20	76/ 100
1330	Evertsen Road	From Byers Road to Hannah Road	1.05	100	*LCB*	8/ 10	17 / 20	76/ 100
280	Sunrise Court	From Sunrise Drive to East End Turnaround	0.24	100	*HCB*	10/ 10	20 / 20	76/ 100
1570	Ardagh Crescent, Harwood	From Old Schoolhouse Road to South End Cul-de-Sac	0.26	100	*HCB*	10/ 10	20 / 20	76/ 100
795	Baker Road South	From Cornish Hollow Road to North End	0.18	10	*G/S*	9/ 10	18 / 20	69/ 100
1210	Johnstone Road North	From 9 - Oak Ridges Drive to South End	0.7	10	*G/S*	8/ 10	18 / 20	69/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
1155	Glen Gavel Road	From Vimy-Ridge Road 6th Line to North End	0.64	10	*G/S*	8/ 10	16 / 20	69/ 100
673	Noble Road	From Racetrack Road to West End	0.12	30	*G/S*	10/ 10	20 / 20	72/ 100
1030	Vimy-Ridge Road 6th Line	From Little Road to Kennedy Road	1.93	599	*LCB*	9/ 10	18 / 20	84/ 100
152	Garland Road	From 74 - Dale Road to South End	0.41	10	*HCB*	8/ 10	16 / 20	70/ 100
700	Ferguson Road	From Rose Road to Honeywell Hill Road	1.4	122	*LCB*	8/ 10	16 / 20	78/ 100
1755	Rice Lake Drive North, Bewdley	From Valleyview Crescent South, Bewdley to 28 - County Road 28	1.02	1287	*HCB*	9/ 10	18 / 20	87/ 100
70	Stanton Road North	From Elgin Street to South End	0.72	150	*LCB*	9/ 10	18 / 20	79/ 100
1230	Linton Road	From Beaver Meadow Road West to Tinney Road	0.79	117	*LCB*	8/ 10	17 / 20	78/ 100
1365	Bamsey Drive	From Oak Hills Road to West End	1	225	*LCB*	8/ 10	16 / 20	81/ 100
985	Bethel Grove Road 5th Line	From 830m East of 28 - County Road 28 to Irwing Goheen Road	1.87	361	*LCB*	10/ 10	20 / 20	83/ 100
130	Hamilton Road	From Canadian Pacific Railway to Peacock Boulevard	0.49	5033	*HCB*	10/ 10	20 / 20	91/ 100
1000	Whitney Howard Road	From Bethel Grove Road 5th Line to North End	1.26	60	*LCB*	9/ 10	17 / 20	76/ 100
30	Grimshaw Road	From Danforth Road East to North End	0.28	10	*G/S*	8/ 10	19 / 20	72/ 100
207	Danforth Road West	From Castle Hill Drive to Division Street North	0.31	1437	*HCB*	9/ 10	19 / 20	88/ 100
715	Dejong Road	From Honeywell Hill Road to Minifie Road 6th Line	2.15	144	*LCB*	8/ 10	16 / 20	80/ 100
20	Moore Orchard Road	From 2 - Highway 2 to South End	0.31	45	*LCB*	8/ 10	16 / 20	76/ 100
1075	Parker Lane, Cold Springs	From McIntosh Street to South End	0.16	30	*LCB*	9/ 10	20 / 20	75/ 100
1130	Canning Road	From McBride Road 6th Line to Donaldson Road E. 7th Line	2.02	100	*LCB*	7/ 10	15 / 20	79/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
285	Paige Court	From Sunrise Drive to East End	0.22	40	*HCB*	10/ 10	20 / 20	76/ 100
815	Willis Road	From 18 - Burnham Street North to West End	0.8	50	*LCB*	10/ 10	20 / 20	77/ 100
115	Moore Service Road	From 2 - Highway 2 to Hunco Farm Road	0.32	111	*HCB*	8/ 10	15 / 20	80/ 100
1340	Hannah Road	From 0.5 km East of Evertsen Road to Scriven Road	2.07	178	*LCB*	8/ 10	17 / 20	82/ 100
1187	Beaver Meadow Road West	From Eagleson Road to 15 - Harwood Road	0.84	760	*HCB*	9/ 10	19 / 20	87/ 100
1260	Canning Road	From Donaldson Road 7th Line to Cavan Road	1.08	100	*LCB*	8/ 10	16 / 20	80/ 100
65	Ash Road	From Workman Road to South End	0.08	40	*LCB*	9/ 10	17 / 20	77/ 100
930	McClelland Road North	From Bell Hill Road to Bethel Grove Road 5th Line	2.04	222	*LCB*	10/ 10	18 / 20	83/ 100
1565	Old Schoolhouse Road	From 15 - Harwood Road to 30 m South of Ardagh Crescent	0.29	166	*HCB*	10/ 10	20 / 20	82/ 100
1100	Edgar Benson Road	From End of LCB to Fisher Road	0.41	50	*G/S*	9/ 10	18 / 20	78/ 100
125	Hunco Road	From Moore Service Road to North End	0.26	50	*HCB*	7/ 10	15 / 20	78/ 100
1752	Rice Lake Drive North, Bewdley	From 70m North of Mill Street to Valleyview Crescent South, Bewdley	0.35	1398	*HCB*	10/ 10	18 / 20	89/ 100
550	Meyers Road South	From Community Centre Road to 45 - County Road 45	2.29	277	*LCB*	9/ 10	17 / 20	84/ 100
200	Danforth Road West	From 18 - Burnham Street North to Ontario Street	0.89	1376	*HCB*	10/ 10	19 / 20	89/ 100
1535	White Road South	From 9 - Oak Ridges Drive to Corkery Road	0.91	111	*LCB*	7/ 10	16 / 20	81/ 100
475	Payne Road	From Start of LCB to Community Centre Road	1.21	100	*LCB*	9/ 10	19 / 20	81/ 100
220	Ontario Street	From Oliver's Lane to Danforth Road West	1.15	2702	*HCB*	10/ 10	20 / 20	91/ 100
1385	Taits Beach Road	From Shore Road to East End Turnaround	0.46	130	*LCB*	8/ 10	16 / 20	82/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
1355	Sackville Bridge Road	From 9 - Oak Ridges Drive to Cavan Road	0.2	50	*HCB*	7/ 10	16 / 20	79/ 100
1105	Fisher Road	From Edgar Benson Road to Start of LCB	0.66	50	*G/S*	9/ 10	18 / 20	79/ 100
1240	McKinlay Road	From Tinney Road to 9 - Oak Ridges Drive	0.72	122	*LCB*	8/ 10	15 / 20	82/ 100
800	Baker Road North	From Smylie Road to South End	0.16	20	*ICB*	7/ 10	18 / 20	77/ 100
892	Williamson Road	From 74 - Dale Road to Bickle Hill Road	1.93	527	*LCB*	8/ 10	19 / 20	87/ 100
1170	Donaldson Road West 7th Line	From 28 - County Road 28 to Rice Lake Drive South	0.34	200	*LCB*	8/ 10	16 / 20	84/ 100
990	Bethel Grove Road 5th Line	From Irwing Goheen Road to Jibb Road	1.86	266	*LCB*	9/ 10	19 / 20	85/ 100
1040	McBride Road 6th Line	From Jamieson Road to 18 - Burnham Street North	2.45	144	*LCB*	9/ 10	19 / 20	83/ 100
135	Hamilton Road	From Peacock Boulevard to Telephone Road	1.17	2253	*HCB*	10/ 10	20 / 20	91/ 100
760	Cornish Hollow Road	From 1.2 km North of 74 - Dale Road to Ball Road	2.38	300	*LCB*	10/ 10	20 / 20	86/ 100
875	Jibb Road	From Alberts Alley to Harding Road	0.94	216	*HCB*	8/ 10	17 / 20	85/ 100
690	Rose Road	From Ferguson Road to Leach Road	1.3	78	*LCB*	8/ 10	17 / 20	82/ 100
590	Pioneer Road	From 45 - County Road 45 to North End	1.05	130	*LCB*	10/ 10	20 / 20	84/ 100
1245	Clarke McKinlay Road	From McKinlay Road to East End	0.33	10	*LCB*	9/ 10	18 / 20	79/ 100
1440	Kelly Road, Gores Landing	From 18 - Burnham Street North to Snelgrove Road	0.46	294	*HCB*	9/ 10	18 / 20	87/ 100
1545	White Road North	From Corkery Road to 15 - Harwood Road	1.2	139	*HCB*	9/ 10	19 / 20	85/ 100
1390	Cook Road	From Shore Road to North End	0.17	170	*LCB*	9/ 10	19 / 20	86/ 100
355	Division Street North	From Danforth Road West to 1.2 km North of Danforth Road West	1.15	1182	*HCB*	10/ 10	20 / 20	91/ 100
695	Ferguson Road	From Racetrack Road to Rose Road	1.34	233	*LCB*	9/ 10	18 / 20	87/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
615	Hickerson Road	From 1.9 km North of 45 - County Road 45 to Kraumanis Road	1.03	100	*LCB*	10/ 10	20 / 20	85/ 100
485	Northumberland Heights Road	From Highway 401 to 0.6 km Northerly	0.6	20	*LCB*	8/ 10	15 / 20	82/ 100
1050	Minifie Road 6th Line	From Dejong Road to 15 - Harwood Road	1.75	350	*HCB*	10/ 10	20 / 20	89/ 100
1090	Eagleson Road	From Minifie Road 6th Line to Beaver Meadow Road	2.09	67	*LCB*	9/ 10	19 / 20	85/ 100
1055	Turk Road	From 15 - Harwood Road to East End	2.51	322	*LCB*	10/ 10	20 / 20	89/ 100
1415	King Road	From Lander Road to William Road	0.42	144	*LCB*	9/ 10	18 / 20	87/ 100
710	Honeywell Hill Road	From Ferguson Road to Dejong Road	0.32	144	*LCB*	9/ 10	18 / 20	87/ 100
635	Pollard Road	From South to North End	0.06	40	*LCB*	9/ 10	19 / 20	84/ 100
325	Castle Hill Drive	From Halle Road to 74 - Dale Road	1.15	455	*HCB*	10/ 10	19 / 20	90/ 100
1483	Lew Harris Road	From 300m S of 18-Rice Lake Scenic Drive to 18 - Rick Lake Scenic Drive	0.3	289	*HCB*	10/ 10	19 / 20	89/ 100
628	Alnwick Hill Road	From 15 - Harwood Road to 0.9 km North of 15 - Harwood Road	0.89	189	*LCB*	10/ 10	19 / 20	88/ 100
620	Hickerson Road	From Kraumanis Road to 670m Northerly	0.67	30	*LCB*	10/ 10	20 / 20	84/ 100
1025	Vimy-Ridge Road 6th Line	From 28 - County Road 28 to Little Road	2.92	233	*LCB*	10/ 10	20 / 20	89/ 100
810	Wallace Jibb Road	From 18 - Burnham Street North to Dejong Road	1.7	60	*LCB*	9/ 10	19 / 20	87/ 100
495	Comunity Centre Road	From 45 - County Road 45 to Burwash Road	0.86	2136	*HCB*	9/ 10	16 / 20	94/ 100
905	Theatre Road North	From 74 - Dale Road to Bickle Hill Road	1.91	355	*HCB*	10/ 10	20 / 20	91/ 100
775	Ball Road	From Cornish Hollow Road to Ferguson Road	0.86	117	*LCB*	9/ 10	19 / 20	89/ 100
215	Ontario Street	From Cobourg North Limits to Oliver's Lane	0.62	3529	*HCB*	8/ 10	18 / 20	95/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
1530	Corkery Road	From 15 - Harwood Road to 18 - Rice Lake Scenic Drive	2.36	294	*LCB*	10/ 10	20 / 20	91/ 100
1275	Cole Road	From Cavan Road to 9 - Oak Ridges Drive	0.84	94	*LCB*	9/ 10	20 / 20	89/ 100
925	McClelland Road South	From 74 - Dale Road to Bell Hill Road	1.97	255	*LCB*	10/ 10	20 / 20	91/ 100
1675	Lake Street, Bewdley	From Main Street to Rice Lake Drive	0.41	671	*HCB*	8/ 10	16 / 20	93/ 100
900	Stu Black Road	From 74 - Dale Road to North End Turnaround	1.53	210	*LCB*	10/ 10	20 / 20	91/ 100
490	Les Davey Road	From Community Centre Road to South End	0.89	70	*LCB*	10/ 10	20 / 20	89/ 100
535	Burwash Road	From The Gully to Community Centre Road	0.38	605	*HCB*	8/ 10	16 / 20	93/ 100
1205	Johnstone Road South	From Beaver Meadow Road East to North End	0.44	10	*HCB*	9/ 10	18 / 20	87/ 100
1567	Old Schoolhouse Road	From 30 m South of Ardagh Crescent to 18 - Rice Lake Scenic Drive	0.35	166	*HCB*	10/ 10	20 / 20	91/ 100
1005	Irving Goheen Road	From Bethel Grove Road 5th Line to Vimy-Ridge Road 6th Line	2.09	89	*LCB*	10/ 10	20 / 20	90/ 100
790	Smylie Road	From Baker Road North to Cornish Hollow Road	0.94	111	*HCB*	10/ 10	20 / 20	91/ 100
765	Cornish Hollow Road	From Ball Road to Smylie Road	0.46	100	*LCB*	10/ 10	20 / 20	91/ 100
530	The Gully, Baltimore	From 45 - County Road 45 to Burwash Road	0.2	50	*HCB*	9/ 10	19 / 20	91/ 100
770	Cornish Hollow Road	From Smylie Road to North End	0.49	30	*LCB*	10/ 10	20 / 20	91/ 100
375	Slater Street	From 45 - County Road 45 to End of CC&CG	0.1	178	*HCB*	8/ 10	17 / 20	94/ 100
205	Danforth Road West	From Ontario Street to Castle Hill Drive	0.88	1410	*HCB*	9/ 10	19 / 20	97/ 100
1580	Queen Street, Harwood	From Highland Drive to Front Street	0.19	128	*HCB*	9/ 10	17 / 20	95/ 100
1445	Kelly Road, Gores Landing	From Snelgrove Road to Plank Road	0.54	294	*HCB*	9/ 10	18 / 20	96/ 100

Sect. No.	Road Name	From - To	Length (km)	AADT	Surface Type	Surface Cond.	Struct. Adeq.	Cond. Rating
1270	West Road	From Cavan Road to 9 - Oak Ridges Drive	0.77	50	*LCB*	10/ 10	20 / 20	97/ 100
257	Haymur Street	From Lenore Avenue to Olivers Lane	0.12	50	*HCB*	10/ 10	19 / 20	98/ 100
1690	Main Street, Bewdley	From Hunter Street to Lake Street	0.21	527	*HCB*	10/ 10	19 / 20	99/ 100
1689	Mill Street, Bewdley	From Rice Lake Drive North, Bewdley to East End (Rice Lake Boat Launch)	0.05	50	*HCB*	10/ 10	19 / 20	99/ 100

Notes:

1. *Priorities in descending order. The higher the priority rating the greater the need.*
2. *Rehabilitation strategy to be confirmed by geotechnical investigations at detail design.*
3. *Costing is zero for roads within the network but maintained by others (i.e. boundary roads).*

5.3 Preservation Management

Preservation techniques seal the surface as to prevent water infiltration into the granular base. Route and Seal is used on HCB pavements to seal individual cracks. Slurry Seal / Microsurfacing is used on LCB and HCB pavements to seal large areas, although wide / active cracks will reflect through the treatment. An annual preservation management budget has been estimated as follows:

Cracksealing

- 122.5 km of paved roads (HCB).
- Assume that cracksealing will be applied, on average, once per resurfacing cycle.
- Annual cracksealing of 6.1 km / year.
- **Annual budget $24,400** (6.1 km x $4,000 / km **Cracksealing**).

Slurry Seal / Microsurfacing

- 122.5 km of paved roads (HCB).
- 145.5 km of surface treated roads (LCB & ICB).
- Assume that slurry seal / microsurfacing will be applied, on average, once per resurfacing cycle.
- 26.9 km of road to preserve per year (6.1 km HCB and 20.8 km of LCB).
- **Annual budget $570,470**(32.5 km x $20,000 / km **Slurry Sealing / Microsurfacing**).

5.4 Road Maintenance

Preventative road and roadside maintenance is critical to prolonging the useful service life of a road and maximizing the capital investment. A continuous road and roadside maintenance program is recommended to reduce the road degradation rates. Ditch cleanout and clearing of vegetation from the right-of-way should be carried out on a regular basis. This can either be accomplished through dedicated internal Township forces or sub-contracting to private contractors. Consideration may be given to a dedicated capital program of ditch cleanout and clearing, to ensure resources are

5.5 Replacement Cost

In conjunction with this Road Needs Study Report, a replacement cost for the road asset was calculated based strictly on roadbed materials i.e. sub-base, base and surface. Road design standards noted in **Table 8** were used to estimate the existing depth of road bed materials for the purpose of the replacement cost calculation.

The total replacement cost for the Township's road infrastructure is approximately $83.7 M.

Note this cost represents the theoretical road bed materials costs only and does not include items such as removal of the existing road bed, installation of signs, pavement markings, lighting, drainage infrastructure, property etc.

6.0 Summary

D.M. Wills Associates (Wills) undertook a review of the Township of Hamilton's (Township) existing road network to assess its physical condition and confirm various road attributes. Data collected as a result of the field review was used to develop a prioritized listing of the road network needs based primarily on condition and traffic volumes.

Wills undertook the field study in October and November of 2019. A visual assessment of each road within the Township was undertaken to assess the current condition of the road**.**

Two primary indicators of the relative health of a road are the structural adequacy and surface condition ratings. The current average structural adequacy rating for the Township's road network is 14.8/20. The current average surface condition rating for the Township's road network is 7.7/10.

6.7% (20 km) of the road network has a Structural "NOW" need, 17.7% (53 km) has a Structural "1-5" year need, and 17.0% (51 km) of the road network has a Structural "6-10" year need.

Preservation Management

In addition to addressing currently deficient roads (i.e. capital reconstruction), a dedicated preservation management approach is required, **and perhaps even more importantly**, to "keep the good roads good"; the fundamental principle being that it costs much less to maintain a good road than it does to let it fail and then reconstruct it, from a life cycle cost perspective. Ultimately, the goal of preservation management is to extend the useful life of a road and road network, maximizing the municipality's investment over the road life-cycle.

Road resurfacing is an effective way of extending the overall life of the pavement structure and therefore a road resurfacing program is highly recommended. Roads with a structural adequacy of 12/20 or greater are included as candidates for potential resurfacing. Preliminary recommendations and prioritization for road resurfacing are based on condition rating and traffic demands on each road section, as per the Inventory Manual. A road with higher traffic volumes and fair structural adequacy is given priority over a road with moderate traffic and good structural adequacy score, in an attempt to intervene and extend the life of the road before it deteriorates to a level that can no longer be resurfaced (i.e. more expensive reconstruction is required). Specific resurfacing treatment recommendations must be assessed through further field

investigation and detail design effort, prior to selecting and implementing the resurfacing strategy.

Based on typical degradation rates for gravel roads, surface treatment, and hot mix, a total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $2,391,400 per year.

Further to the recommendations above with respect to resurfacing, it is also recommended that regular maintenance in the form of roadside ditch cleanout and clearing be undertaken as a critical component to preservation management in order to extend the useful service life of the existing roads.

Capital Improvements

Preliminary recommendations and prioritization for planned capital improvements i.e. reconstruction, have been developed based on the condition rating and traffic demands on each road section, as per the Inventory Manual. Those roads identified as having a "NOW" or 1 - 5 year need have been included in the capital improvement plan for reconstruction.

A total length of 73 km of roads were identified as having structural needs in the "NOW," or 1 – 5 year periods. The estimated cost to improve these roads is approximately $ 12.5 M.

The time of inspection plays a significant role in assessing a road's condition. Certain deficiencies, particularly for gravel roads, are only obvious during the "spring break-up" period. By midsummer, any evidence to suggest these deficiencies may have disappeared due to regular grading and grooming activities and general drying of the roadbed. The field work for this study was carried out in October and November 2019, by which time of "spring break-up" was not evident.

We trust the above and attached information will be of benefit to the Township and appreciate the opportunity to assist the Township in developing its road improvement plan.

Respectfully submitted,

Eric St. Pierre

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Eric St. Pierre, P.Eng
Transportation Engineer

ESP/ms

Statement of Limitations

This report has been prepared by D.M. Wills Associates on behalf of the Township of Hamilton. The conclusions and recommendations in this report are based on available background documentation and discussions with applicable Township staff at the time of preparation.

The report is intended to document the 2019 Roads Needs Study Report findings and assist the Township in developing budgetary plans for investment into their road network.

Any use which a third party makes of this report, other than as a Road Needs Study Report is the responsibility of such third parties. D.M. Wills Associates Limited accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or action taken based on using this report for purposes other than as a summary of the 2019 Road Needs Study Report findings.

Appendix A

Unit Price Form

ROAD IMPROVEMENT COSTS
Township of Hamilton

Unit Costs	Units	Unit Cost
Granular A	t	$ 17.00
Granular B	t	$ 14.00
Hot Mix	t	$ 150.00
Earth Excavation	m3	$ 15.00
Asphalt Removal	m2	$ 4.00
Asphalt Removal - Partial Depth	m2	$ 2.50
Removal of Concrete Curb & Gutter	m	$ 20.00
Concrete Curb & Gutter	m	$ 110.00
In-Place Full Depth Reclamation	m2	$ 2.00
Surface Treatment - Single	m2	$ 3.00
Surface Treatment - Double	m2	$ 5.80
Granular A Conversion	2.2	t/m3
Granular B Conversion	2	t/m3
Hot Mix Conversion	2.45	t/m3

Gravel (75mm)

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Granular A	7.0	75	2.2	t		1155	$17.00	$ 20	
							G	**20**	**(per Kilometre)**

Frost Heave Treatment

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/50m Digout (x 1000)*	
Earth Excavation	8.0	800		m3		320	$15.00	$ 5	
Granular A	7.0	150	2.2	t		115.5	$17.00	$ 2	
Granular B	8.0	650	2	t		520	$14.00	$ 7	
							FT	**14**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Single [ST1]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Single (Overlay)	7.0			m2		7000	$3.00	$ 21	
							ST1	**21**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Double [ST2]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*		*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Double (Overlay)	7.0			m2		7000	$5.80	$ 41	
							ST2	**41**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Double with Removal of Existing [ST2R]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Double	7.0			m2		7000	$5.80	$ 41	
Removal Asphalt Pavement	7.0	16		m2		7000	$4.00	$ 28	
							ST2R	**69**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Double with Granular Base [ST2A]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Double	7.0			m2		7000	$5.80	$ 41	
Granular A	7.0	150	2.2	t		2310	$17.00	$ 39	
							ST2A	**80**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Double with Pulverization and Granular Base [ST2PA]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Double	7.0			m2		7000	$5.80	$ 41	
Granular A	7.0	150	2.2	t		2310	$17.00	$ 39	
Pulverizing	7.0			m2		7000.0	$2.00	$ 14	
Minor Items @ 25%								$ 4	
							ST2PA	**97**	**(per Kilometre)**

Surface Treatment - Rural/Semi Urban - Widening and Double with Pulverization and Granular Base [ST2PAW]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Surface Treatment - Double	7.0			m2		7000	$5.80	$ 41	
Granular A	7.0	150	2.2	t		2310	$17.00	$ 39	
Pulverizing	7.0			m2		7000.0	$2.00	$ 14	
Earth Excavation	2	450		m3		900	$15.00	$ 14	
Granular B	1	450	2	t		900	$14.00	$ 13	
Minor Items @ 25%								$ 10	
							ST2PAW	**130**	**(per Kilometre)**

Resurfacing - Rural/Semi Urban Single Lift Overlay [RO1]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction ** *	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	3	50	2.45	t	74	441	$150.00	$ 66	
Granular A	1.5	50	2.2	t		165	$17.00	$ 3	
Minor Items @ 15%								$ 10	
							RO1	**79**	**(per Lane Kilometre)**

Resurfacing - Rural/Semi Urban - Double Lift Overlay [RO2]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction ** *	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	3	90	2.45	t	66	728	$150.00	$ 109	
Granular A	1.5	90	2.2	t		297	$17.00	$ 5	
Minor Items @ 15%								$ 17	
							RO2	**131**	**(per Lane Kilometre)**

Resurfacing - Urban - Single Lift Mill and Pave [RMP1]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	4.25	50	2.45	t		521	$150.00	$ 78	
Remove Curb and Gutter				m		200	$20.00	$ 4.00	
Curb and Gutter - 20%				m		200	$110.00	$ 22.00	
Milling	4.25			m2		4250	$2.50	$ 10.63	
Minor Items @ 25%								$ 29	
							RMP1	**143**	**(per Lane Kilometre)**

Resurfacing - Urban - Double Lift Mill and Pave [RMP2]

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	4.25	90	2.45	t		937	$150.00	$ 141	
Remove Curb and Gutter				m		200	$20.00	$ 4.00	
Curb and Gutter - 20%				m		200	$110.00	$ 22.00	
Milling	4.25			m2		4250	$2.50	$ 10.63	
Minor Items @ 25%								$ 44	
							RMP2	**221**	**(per Lane Kilometre)**

Pulverize and Pave One Lift [PP1] Rural/Semi-Urban

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	3	50	2.45	t		367.5	$150.00	$ 55	
Granular A	1.5	50	2.2	t		165	$17.00	$ 3	
Pulverize	3			m2		3000	$2.00	$ 6.00	
Minor Items @ 25%								$ 16	
							PP1	**80**	**(per Lane Kilometre)**

Pulverize and Pave Two Lifts [PP2] Rural/Semi-Urban

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Hot Mix	3	90	2.45	t		661.5	$150.00	$ 99	
Granular A	1.5	90	2.2	t		297	$17.00	$ 5	
Pulverize	3			m2		3000	$2.00	$ 6	
Minor Items @ 25%								$ 28	
							PP2	**138**	**(per Lane Kilometre)**

Semi-Urban: Resurfacing and Widening - Residential (Single Lift Widening)

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction* **	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Earth Excavation	2	600		m3		1200	$15.00	$ 18	
Granular A	5	150	2.2	t		1650	$17.00	$ 28	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Hot Mix	8	50	2.45	t	196	1176	$150.00	$ 176	
Milling	4			m2		4000	$2.50	$ 10	
Minor Items @ 25%								$ 74	
							RW1	**369**	**(widening one side)**

Commercial and Industrial (Double Lift Widening)

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Earth Excavation	2	600		m3		1200	$15.00	$ 18	
Granular A	5	150	2.2	t		1650	$17.00	$ 28	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Hot Mix	8	90	2.45	t	353	2117	$150.00	$ 318	
Milling	4			m2		4000	$2.50	$ 10	
Minor Items @ 25%								$ 109	
							RW2	**546**	**(widening one side)**

Gravel Road Widening

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Earth Excavation	2	600		m3		1200	$15.00	$ 18	
Granular A	1	150	2.2	t		330	$17.00	$ 6	
Granular B	1	450	2	t		900	$14.00	$ 13	
Minor Items @ 25%								$ 9	
							GW	**45**	**(widening one side)**

Rural: Full Excavation and Reconstruction - Gravel (6 m surface width)

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Earth Excavation	5	600		m3		3000	$15.00	$ 45	
Granular A	3	150	2.2	t		990	$17.00	$ 17	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Minor Items @ 25%								$ 31	
							Recon G	**156**	**(per Lane Kilometre)**

Rural: Full Excavation and Reconstruction - 1 Lift

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Asphalt Removal - Full Depth	3			m2		3000	$4.00	$ 12	
Earth Excavation	5	600		m3		3000	$15.00	$ 45	
Granular A	4	150	2.2	t		1320	$17.00	$ 22	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Hot Mix	3	50	2.45	t		368	$150.00	$ 55	
Minor Items @ 25%								$ 49	
							Recon 1R	**247**	**(per Lane Kilometre)**

Semi-Urban: Full Excavation and Reconstruction - 1 Lift

Item	*Width - m*	*Depth - mm*	*Conversion Factor*	*Unit*	*Crossfall Correction*	*Quantity*	*Unit Cost*	*Cost/km (x 1000)*	
Asphalt Removal - Full Depth	3			m2		3000	$4.00	$ 12	
Earth Excavation	5	600		m3		3000	$15.00	$ 45	
Granular A	4	150	2.2	t		1320	$17.00	$ 22	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Hot Mix	3	50	2.45	t		368	$150.00	$ 55	
Minor Items @ 25%								$ 49	
							Recon 1S	**247**	**(per Lane Kilometre)**

Semi-Urban: Full Excavation and Reconstruction - 2 Lift

Item	Width - m	Depth - mm	Conversion Factor	Unit	Crossfall Correction	Quantity	Unit Cost	Cost/km (x 1000)	
Asphalt Removal - Full Depth	3			m2		3000	$4.00	$ 12	
Earth Excavation	5	600		m3		3000	$15.00	$ 45	
Granular A	4	150	2.2	t		1320	$17.00	$ 22	
Granular B	5	450	2	t		4500	$14.00	$ 63	
Hot Mix	3	90	2.45	t		662	$150.00	$ 99	
Minor Items @ 25%								$ 60	
							Recon 2S	**302**	**(per Lane Kilometre)**

Urban: Full Excavation and Reconstruction - 2 Lift

Item	Width - m	Depth - mm	Conversion Factor	Unit	Crossfall Correction	Quantity	Unit Cost	Cost/km (x 1000)	
Asphalt Removal - Full Depth	4.25			m2		4250	$4.00	$ 17	
Earth Excavation	5.5	750		m3		4125	$15.00	$ 62	
Granular A	4.5	150	2.2	t		1485	$17.00	$ 25	
Granular B	5.5	600	2	t		6600	$14.00	$ 92	
Hot Mix	4.25	90	2.45	t		937	$150.00	$ 141	
Remove Curb and Gutter				m		1000	$20.00	$ 20.00	
Curb and Gutter				m		1000	$110.00	$ 110.00	
Minor Items @ 25%								$ 84	
							Recon 2U	**551**	**(per Lane Kilometre)**

Rout and Seal

Item				Unit		Quantity	Unit Cost	Cost/km (x 1000)	
Rout and Seal				m		1000	$4.00	$ 4	
							RS	**4**	**(per Lane Kilometre)**

Slurry Seal

Item	Width - m			Unit		Quantity	Unit Cost	Cost/km (x 1000)	
Slurry Seal	7			m2		7000	$2.90	$ 20	
							SS	**20**	**(per Lane Kilometre)**

Microsurfacing

Item	Width - m			Unit		Quantity	Unit Cost	Cost/km (x 1000)	
Microsurfacing	7			m2		7000	$2.90	$ 20	
							MS	**20**	**(per Lane Kilometre)**

Semi-Urban: Upgrade to Urban - 2 Lift

Item	Width - m	Depth - mm	Conversion Factor	Unit	Crossfall Correction	Quantity	Unit Cost	Cost/km (x 1000)	
Asphalt Removal - Full Depth	4.25			m2		4250	$4.00	$ 17	
Earth Excavation	5.5	600		m3		3300	$15.00	$ 50	
Granular A	4.5	150	2.2	t		1485	$17.00	$ 25	
Granular B	5.5	450	2	t		4950	$14.00	$ 69	
Hot Mix	4.25	90	2.45	t		937	$150.00	$ 141	
Curb and Gutter				m		1000	$110.00	$ 110.00	
Minor Items @ 25%								$ 75	
							Recon 2U	**487**	**(per Lane Kilometre)**

Rural: Full Excavation and Reconstruction with 700mm grade raise - Gravel (6 m surface width)

Item	Width - m	Depth - mm	Conversion Factor	Unit	Crossfall Correction	Quantity	Unit Cost	Cost/km (x 1000)	
Earth Excavation	5	450		m3		2250	$15.00	$ 34	
Granular A	4	150	2.2	t		1320	$17.00	$ 22	
Granular B	6	1000	2	t		12000	$14.00	$ 168	
Minor Items @ 25%								$ 56	
							Recon G	**280**	**(per Lane Kilometre)**

Appendix B

PCI Distress Definitions

1.0 Flexible Pavements – Distress Descriptions

Loss of Coarse Aggregates: Pavement surface is breaking up into small pock-marks as coarse aggregate particles are lost from the surface.

Ravelling: progressive loss of pavement materials (coarse or fine aggregates, or both) from surface downward results in a pock-marked appearance.

Segregation: A construction-related deficiency resulting in areas of the pavement surface having comparatively coarser or finer texture than that of the surrounding surface; a non-uniform distribution of aggregate sizes through the mat.

Flushing: The presence of free asphalt cement on the pavement surface. Most likely to occur in the wheel tracks during hot weather**.**

Rippling: Regular transverse undulations in the surface of the pavement, consisting of closely spaced, alternate valleys and crests (Washboard Effect).

Shoving: Singular and multiple waves or humps located transversely or longitudinally on the pavement surface.

Wheel Track Rutting: Longitudinal depressions taking the form of a single or double rut in the wheel tracks after repeated load application. Wheel track rutting results from densification and permanent deformation under the load, combined with displacement of pavement materials. Deep ruts are often accompanied by longitudinal cracking in the wheel tracks.

Distortion: Any deviation (other than described for rippling, shoving, and rutting) of the pavement surface from its original shape. Generally, distortions result from settlement, slope failure, volume changes due to moisture changes or frost heaving, and from residual effects of frost heaving accumulating after each winter.

Distortion may take the form of dishing, bumps, dips (do not include the bumps associated with cupped or tented cracks), all of which give rise to pitch, roll, and jarring drop in a moving vehicle**.**

Longitudinal Wheel-Track Cracking: Cracks that follow a course approximately parallel to the centre line of the pavement and are situated at or near the centre of the wheel tracks.

Centreline Cracking: Crack(s) that run(s) along or near the road centre line.

Pavement Edge Cracking: Crack parallel to extending out from the pavement lane edge, and is either a fairly continuous "straight" crack or consists of crescent-shaped cracks in a wave forma-tion. On some thin asphalt surfaces, pavement edge cracking

progressively encroaches onto the outer wheel tracks through the middle of the lane, and may even progress to the centre line.

Transverse Cracking: Crack follows a course approximately at right angles to the pavement centre line. Full transverse cracks tend to be regularly spaced along the length of the road, while half transverse and partial transverse occur at shorter, intermediate distances.

Longitudinal Meander and Mid-lane Cracking: Crack, usually quite long, that wanders from edge to edge of the pavement, or crack that is usually straight and parallel to the centre line, at or near the middle of the lane. These types of cracks are usually single cracks, but occasionally secondary cracks do develop parallel to them.

Random / Map Cracking: Interconnected cracks forming a series of large polygons that resemble a map. The cracking appears to combine transverse and longitudinal cracks.

Alligator Crack: Cracks that form a network of polygon blocks resembling the skin of an alligator.

2.0 Surface-Treated Pavements – Distress Descriptions

Loss of Cover Aggregate: The whipping off of cover aggregate under traffic from a surface-treated pavement, leaving only the asphalt.

Streaking: Alternating lean and heavy lines of asphalt running parallel to the centerline of the road. Sometimes streaking also occurs at right angles to the centerline.

Flushing: Free Asphalt migrating upward to the pavement surface. Most likely to occur in the wheels tracks, especially during hot weather.

Potholes: Round of irregular shaped holes in pavement; can be unrelated to other surface defects or a direct result of other defects such as alligator cracking, frost boil, etc.

Pavement Edge Breaks: Edge breaking occurs with or without cracks.

Rippling: Regular transverse undulations in the pavement surface consisting of closely spaced alternate valleys and crests (washboard effect); unevenness of pavement surface caused by traffic action moving surface mat forward, backward or sideways; often accompanied by "flushing".

Wheel Track Rutting: Longitudinal depression left in the wheel tracks after repeated load application resulting from compaction and permanent deformation under load, and pavement materials shoving sideways. Deep ruts are often accompanied by longitudinal cracking in the wheel tracks.

Distortion: Any deviation of pavement surface from its original shape (other than described for rippling or rutting). Generally, these distortion result from settlement, slope

failure, and volume changes due to moisture and frost heaving accumulating after each winter. The resulting deformation may take the form of dishing, bumps, dips, tenting or stepping at cracks, all of which give rise to pitch, roll and jarring drop in a moving vehicle.

Longitudinal Cracking: Cracks follow a course approximately parallel to the direction of travel and are situated at or near the centre of the wheel tracks, centerline, mid-lane, etc.

Transverse Cracking: Crack follows a course approximately at right angles to the pavement centerline. Full width transverse cracks tend to be regularly spaced along the length of the road while half width transverse and part transverse cracks occur at shorter intermediate distances.

Pavement Edge Cracking: Crack is parallel to and within 300 mm of the pavement edge and is either a straight continuous crack or consists of crescent shaped cracks in a wave formation. Pavement edge cracking will progressively encroach into the outer wheel tracks through the middle of the pavement lane and may even progress right across the centerline.

Alligator Cracking: Cracks forming from a network of multi-sided (polygon) blacks resemble the skin of an alligator.

Appendix C

Guiderail Report Memo

WILLS

PARTNERS IN ENGINEERING

Memo

To:	Township of Hamilton
From:	Eric St. Pierre, P.Eng.
Date:	January 13, 2020
Subject:	2019 Guiderail Report Memo

1.0 Purpose, Background and Study Method

The Township of Hamilton (Township) retained the services of D.M. Wills Associates Limited (Wills) to map and inventory the Township's existing Guiderail Systems. This memo summarizes activities undertaken for the inventory.

The purpose of this guide rail assessment is to map the ownship's existing safety device network and determine which systems require repair or replacement.

Wills collected the following information for all guiderails to indicate where major repair or replacement is warranted:

- Type.
- Number of missing hardware.
- Mounting height.
- Offset and Recovery Zone.
- Embankment slope.
- Number of poor posts.
- Length of distressed cables / beams.

2.0 Mapping

Guiderail locations were mapped using a handheld GPS to mark their ends. All data collected for the Guiderail Inventory is included in the GIS Mapping. For convenience, a table detailing each guiderail system is provided at the end of this memo.

Delineation posts (i.e. 3-CGR posts without the cable) were mapped and included in the inspection, but not rated as guiderail.

D.M. Wills Associates Limited
150 Jameson Drive, Peterborough, Ontario, Canada K9J 0B9
P. 705.742.2297 **F**. 705.748.9944 **E**. wills@dmwills.com

3.0 Summary of Findings

The Township maintains 124 guiderail systems with a total length of 8.7 km. Both three-cable guiderail (3-CGR) and steel beam guiderail (SBGR) are present.

3.1 Condition

Generally, guiderails within the Township were in good condition, with minor maintenance issues noted. Five (5) systems with a total length of 150 m are in poor condition and are recommended for replacement.

3.2 Mounting Height

A guiderail's mounting height is integral to its performance during a collision. Too high, and errant vehicles may slip under it. Too low, and an errant vehicle may vault over it.

The mounting height of 3-CGR, as measured from the shoulder to the top cable, is considered acceptable when between 660 and 710 mm.

Typical SBGR mounting height, as measured from the shoulder to the middle of the rail, is considered acceptable when between 53 0mm to 580 mm. In the last few years, a new "Type-M" standard has been developed for SBGR installations in Ontario. The main difference between Type-M SBGR and pre-Type-M SBGR is placing rail splices between posts as opposed to on them, and a higher mounting height. Type-M SBGR mounting is considered acceptable when between 600 to 650 mm.

Although the physical condition of the guiderail was generally good, over half of the guiderail network was mounted at the wrong height.

- 2,210 m of 3-CGR were mounted too high.
- 950 m of 3-CGR were mounted too low.
- 650 m of SBGR were mounted too high, even when compared to the higher Type-M standard.
- 820 m of SBGR were mounted too low, even when compared to the lower pre-Type-M standard.

4.0 Recommendations

All systems in poor condition should be replaced. The protected hazards should be reviewed and lengths of need recalculated for the new installation. Alternative treatments such as slope flattening may be considered in lieu of a new guiderail.

All guiderails should be corrected to their proper height. Given the high percentage of systems with improper mounting heights, the Township should also increase its inspection frequency and consider guiderail adjustment whenever road work is done.

Guiderail Inventory Summary Table

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
1	28	Hannah Road	Odd	SBGR	5 / 15	553	0.7	1.0	Good	Eccentric Loader	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
2	14	Hannah Road	Even	SBGR	5 / 25	617	1.2	1.3	Good	Eccentric Loader	Fish Tail		Mounting Height Conforms to Type-M SBGR
3	34	Byers Road	Odd	SBGR	12 / 21	587	0.7	1.3	Good	Eccentric Loader	Eccentric Loader		Mounting Height in between Type-M and Pre-Type-M SBGR
4	63	Byers Road	Even	SBGR	12 / 37	630	1.0	0.7	Good	Eccentric Loader	Eccentric Loader		Mounting Height Conforms to Type-M SBGR
5	59	Byers Road	Odd	3CGR	17 / 17	840	0.9	1.0	Good			1 Post Broken	Mounting Height is deficient
6	99	Byers Road	Even	3CGR	28 / 28	813	1.0	1.2	Good				Mounting Height is deficient
7	130	Rice Lake Drive North	Odd	SBGR	0 / 70	510	0.7	1.2	Good	Extruder	Extruder		Mounting Height is deficient
8	54	Main Street	Even	SBGR	0 / 45	637	1.0	1.5	Good	Fish Tail	Fish Tail	1 Post Turned Around	Mounting Height Conforms to Type-M SBGR
9	69	Rice Lake Drive North	Odd	SBGR	0 / 40	537	2.0	1.7	Good	Extruder	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
10	72	Rice Lake Drive North	Odd	SBGR	0 / 38	537	2.0	1.7	Good	Fish Tail	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
11	9	Poplar Drive	Odd	SBGR	6 / 6	693	1.0	1.5	Good	Fish Tail	Fish Tail		Mounting Height is deficient
12	19	Poplar Drive	Even	SBGR	0 / 10	567	1.0	1.5	Good	Fish Tail	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
13	48	Rice Lake Drive North	Even	SBGR	0 / 25	550	2.0	1.0	Good	Extruder	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
14	46	Rice Lake Drive North	Odd	SBGR	0 / 25	513	2.0	1.0	Good	Extruder	Extruder		Mounting Height is deficient
15	58	Bamsey Drive	Odd	SBGR	0 / 31	650	1.3	0.6	Good	Fish Tail	Fish Tail		Mounting Height Conforms to Type-M SBGR
16	53	Cavan Road	Even	SBGR	6 / 22	587	0.8	1.5	Good	Eccentric Loader	Fish Tail		Mounting Height in between Type-M and Pre-Type-M SBGR

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
17	45	Cavan Road	Odd	SBGR	6 / 26	623	1.5	1.7	Good	Eccentric Loader	Fish Tail		Mounting Height Conforms to Type-M SBGR
18	81	Manor Road	Odd	3CGR	23 / 23	853	1.3	1.0	Good				Mounting Height is deficient
19	69	Manor Road	Even	3CGR	20 / 20	720	1.5	1.3	Good				Mounting Height is deficient
20	116	Tower Manor Road	Odd	3CGR	32 / 32	753	1.5	1.2	Good			Two posts (missing Hardware)	Mounting Height is deficient
21	96	Tower Manor Road	Even	3CGR	27 / 27	743	1.4	1.0	Good				Mounting Height is deficient
22	21	West Road	Odd	SBGR	10 / 10	523	1.0	0.9	Good	Turndown	Turndown		Mounting Height is deficient
23	22	West Road	Even	SBGR	11 / 11	570	1.0	1.0	Good	Turndown	Turndown		Mounting Height Conforms to Pre-Type-M SBGR
24	63	Donaldson Road West	Odd	SBGR	12 / 35	587	0.9	0.8	Good	Eccentric Loader	Eccentric Loader		Mounting Height in between Type-M and Pre-Type-M SBGR
25	42	Donaldson Road West	Even	SBGR	12 / 25	500	1.0	1.0	Good	Eccentric Loader	Eccentric Loader	5 Posts not connected SBGR	Mounting Height is deficient
26	38	Donaldson Road West	Odd	SBGR	6 / 22	557	1.0	1.0	Good	Eccentric Loader	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
27	56	Lander Road	Odd	SBGR	6 / 26	710	1.4	1.8	Good	Extruder	Extruder		Mounting Height is deficient
28	58	Lander Road	Even	SBGR	6 / 28	740	1.2	0.7	Good	Extruder	Extruder		Mounting Height is deficient
29	334	Harris Boatworks Road	Even	3CGR	93 / 93	713	1.0	1.6	Good				Mounting Height is deficient
30	50	Sully Road	Even	3CGR	14 / 14	693	1.9	0.8	Good				Mounting Height Conforms to 3-CGR
31	190	Hillview Drive South	Even	3CGR	52 / 52	667	0.7	1.0	Good			3 Posts in bad condition (twisted)	Mounting Height Conforms to 3-CGR
32	64	Corkery Road	Odd	SBGR	0 / 34	740	0.5	0.9	Good	Extruder	Extruder		Mounting Height is deficient
33	88	Corkery Road	Even	SBGR	0 / 48	680	0.3	0.7	Good	Extruder	Extruder		Mounting Height is deficient
34	129	Corkery Road	Odd	3CGR	35 / 35	650	0.7	0.8	Good				Mounting Height is deficient
35	61	Corkery Road	Even	3CGR	17 / 17	600	0.9	1.5	Good				Mounting Height is deficient
36	42	Vimy Ridge Road	Odd	3CGR	12 / 12	690	0.9	1.7	Good				Mounting Height Conforms to 3-CGR
37	34	Vimy Ridge Road	Even	3CGR	10 / 10	717	1.3	1.6	Good			3 Posts in bad condition (twisted)	Mounting Height is deficient

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
38	253	Vimy Ridge Road	Odd	3CGR	72 / 72	647	1.0	1.2	Good				Mounting Height is deficient
39	220	Vimy Ridge Road	Even	3CGR	72 / 72	707	1.0	1.0	Good				Mounting Height Conforms to 3-CGR
40	44	Vic Lightle Road	Even	SBGR	0 / 23	690	1.2	2.0	Good	Extruder	Fish Tail		Mounting Height is deficient
41	38	Vic Lightle Road	Odd	SBGR	6 / 22	620	1.2	1.7	Good	Eccentric Loader	Fish Tail		Mounting Height Conforms to Type-M SBGR
42	42	Vimy Ridge Road	Even	3CGR	12 / 12	687	1.2	1.0	Good				Mounting Height Conforms to 3-CGR
43	78	Vimy Ridge Road	Odd	3CGR	21 / 21	717	1.0	1.5	Good				Mounting Height is deficient
44	62	Vimy Ridge Road	Even	3CGR	18 / 18	800	1.0	1.0	Good				Mounting Height is deficient
45	68	Kennedy Road	Even	3CGR	19 / 19	810	1.2	0.9	Good				Mounting Height is deficient
46	43	Kennedy Road	Odd	3CGR	12 / 12	713	1.2	1.0	Good				Mounting Height is deficient
47	43	Kennedy Road	Even	SBGR	1 / 23	583	0.9	1.5	Good	Extruder	Fish Tail		Mounting Height in between Type-M and Pre-Type-M SBGR
48	42	Kennedy Road	Odd	SBGR	1 / 23	580	0.6	1.5	Good	Extruder	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
49	42	McBride Road	Odd	3CGR	14 / 14	730	0.9	1.2	Good				Mounting Height is deficient
50	105	McBride Road	Odd	3CGR	30 / 30	727	1.2	0.8	Good				Mounting Height is deficient
51	76	McBride Road	Even	3CGR	24 / 24	753	0.9	1.0	Poor			1 Post (Missing Hardware) + Cable in Bad condition (Adjust or Replace)	Mounting Height is deficient
52	68	McBride Road	Odd	3CGR	21 / 21	757	0.9	1.0	Good			2 Posts (Missing Hardware) + Adjust Cable Guiderail (Bad Condition)	Mounting Height is deficient
53	74	McBride Road	Odd	3CGR	22 / 22	840	0.9	1.2	Good				Mounting Height is deficient
54	58	McBride Road	Even	3CGR	17 / 17	797	1.2	0.7	Good				Mounting Height is deficient
55	158	Minifie Road	Even	3CGR	45 / 45	627	0.8	0.9	Good				Mounting Height is deficient
56	145	Minifie Road	Odd	3CGR	41 / 41	627	0.8	1.0	Good				Mounting Height is deficient
57	73	Whitney Howard Road	Odd	3CGR	20 / 20	683	1.4	0.7	Good			1 Post (twisted)	Mounting Height Conforms to 3-CGR
58	92	Whitney Howard Road	Even	3CGR	25 / 25	707	1.2	1.5	Good				Mounting Height Conforms to 3-CGR
59	64	Smylie Road	Odd	SBGR	0 / 35	673	1.1	0.7	Good	Fish Tail	Fish Tail		Mounting Height is deficient

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
60	46	Smylie Road	Even	SBGR	0 / 25	633	0.7	1.0	Good	Fish Tail	Fish Tail		Mounting Height Conforms to Type-M SBGR
61	39	Smylie Road	Odd	SBGR	0 / 21	597	1.2	0.7	Good	Fish Tail	Fish Tail		Mounting Height in between Type-M and Pre-Type-M SBGR
62	47	Smylie Road	Even	SBGR	0 / 25	593	0.9	1.2	Good	Fish Tail	Fish Tail		Mounting Height in between Type-M and Pre-Type-M SBGR
63	96	Ball Road	Odd	3CGR	27 / 27	777	0.7	0.5	Good				Mounting Height is deficient
64	18	Ball Road	Even	3CGR	5 / 5	743	1.5	0.4	Good				Mounting Height is deficient
65	38	Ferguson Road	Even	3CGR	10 / 10	853	1.3	1.2	Good				Mounting Height is deficient
66	17	Ferguson Road	Odd	3CGR	5 / 5	850	1.5	1.3	Good				Mounting Height is deficient
67	54	Cornish Hollow Road	Odd	SBGR	12 / 31	660	0.4	0.7	Good	Eccentric Loader	Eccentric Loader		Mounting Height is deficient
68	43	Cornish Hollow Road	Even	SBGR	12 / 27	660	0.6	1.8	Good	Eccentric Loader	Eccentric Loader		Mounting Height is deficient
69	84	Cornish Hollow Road	Odd	3CGR	24 / 24	637	0.9	0.8	Good				Mounting Height is deficient
70	70	Cornish Hollow Road	Even	3CGR	19 / 19	617	0.9	1.0	Good			Adjust Cable Guiderail	Mounting Height is deficient
71	46	Bickle Hill Road	Odd	3CGR	14 / 14	780	1.5	1.2	Good				Mounting Height is deficient
72	149	Bickle Hill Road	Odd	3CGR	42 / 42	663	1.5	0.8	Good				Mounting Height Conforms to 3-CGR
73	59	Bickle Hill Road	Odd	3CGR	17 / 17	687	2.2	2.0	Good				Mounting Height Conforms to 3-CGR
74	50	Crossen Road	Odd	SBGR	6 / 28	493	1.5	0.8	Good	Eccentric Loader	Turndown	1 Block (Wood) Twisted	Mounting Height is deficient
75	88	Crossen Road	Even	SBGR	6 / 46	520	1.0	0.8	Good	Eccentric Loader	Turndown		Mounting Height is deficient
76	76	Clapperton Road	Even	SBGR	0 / 41	600	1.0	1.2	Good	Extruder	Fish Tail		Mounting Height Conforms to Type-M SBGR
77	62	Clapperton Road	Odd	SBGR	0 / 31	610	0.8	1.7	Good	Extruder	Fish Tail		Mounting Height Conforms to Type-M SBGR
78	123	Hickerson Road	Odd	3CGR	33 / 33	763	1.2	1.7	Good				Mounting Height is deficient
79	116	Hickerson Road	Even	3CGR	33 / 33	747	1.2	2.5	Good				Mounting Height is deficient
80	34	Hickerson Road	Even	3CGR	9 / 9	697	1.3	1.2	Good			1 Post in bad condition, Hardware missing and adjust cable guiderail	Mounting Height Conforms to 3-CGR

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
81	73	Meyers Road North	Odd	SBGR	0 / 30	513	0.7	1.8	Good	Turndown	Turndown	3 Blocks (Twisted)	Mounting Height is deficient
82	71	Meyers Road North	Even	SBGR	0 / 32	533	1.2	1.4	Good	Turndown	Turndown	1 Block (Twisted)	Mounting Height Conforms to Pre-Type-M SBGR
83	116	Hickerson Road	Odd	3CGR	33 / 33	737	1.2	1.6	Good			1 Post (Missing Hardware) and Adjust 3CGR	Mounting Height is deficient
84	82	Hickerson Road	Odd	3CGR	23 / 23	793	1.2	0.9	Good				Mounting Height is deficient
85	63	Danforth Road West	Odd	SBGR	8 / 34	573	0.8	1.0	Good	Extruder	Turndown	3 Blocks (Twisted)	Mounting Height Conforms to Pre-Type-M SBGR
86	61	Danforth Road West	Even	SBGR	8 / 33	580	0.8	1.2	Good	Extruder	Turndown	1 Block (Twisted)	Mounting Height Conforms to Pre-Type-M SBGR
87	59	Danforth Road West	Odd	SBGR	8 / 34	653	1.3	1.5	Good	Extruder	Turndown		Mounting Height is deficient
88	64	Danforth Road West	Even	SBGR	25 / 50	500	1.0	1.6	Good	Extruder	Turndown	SBGR Bent in two sections	Mounting Height is deficient
89	66	Ontario Street	Odd	SBGR	0 / 33	623	0.5	1.1	Good	Extruder	Extruder		Mounting Height Conforms to Type-M SBGR
90	90	Ontario Street	Even	SBGR	0 / 45	597	0.5	1.2	Good	Extruder	Extruder		Mounting Height in between Type-M and Pre-Type-M SBGR
91	162	Telephone Road	Even	SBGR	12 / 91	517	0.5	1.8	Good	Eccentric Loader	Eccentric Loader	10 Blocks (Twisted) and 1 Section bent of SBGR	Mounting Height is deficient
92	96	Telephone Road	Odd	SBGR	58 / 58	627	0.5	1.8	Good	Structure Connection	Eccentric Loader	2 Blocks (Twisted)	Mounting Height Conforms to Type-M SBGR
93	56	Telephone Road	Even	SBGR	12 / 60	673	1.5	2.0	Good	Eccentric Loader	Structure Connection	ECCL bent	Mounting Height is deficient
94	38	Telephone Road	Even	SBGR	0 / 0	673	1.5	2.0	Good	Structure Connection	Eccentric Loader		Mounting Height is deficient
95	55	Telephone Road	Odd	SBGR	6 / 31	607	1.2	2.0	Good	Eccentric Loader	Structure Connection		Mounting Height Conforms to Type-M SBGR
96	39	Telephone Road	Odd	SBGR	6 / 31	607	1.2	2.0	Good	Structure Connection	Eccentric Loader		Mounting Height Conforms to Type-M SBGR
97	30	Telephone Road	Odd	SBGR	0 / 17	613	0.9	2.0	Good	Extruder	Structure Connection		Mounting Height Conforms to Type-M SBGR
98	24	Telephone Road	Odd	SBGR	0 / 17	613	0.9	2.0	Good	Structure Connection	Extruder		Mounting Height Conforms to Type-M SBGR

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
99	24	Telephone Road	Even	SBGR	0 / 17	617	1.3	2.5	Good	Extruder	Structure Connection		Mounting Height Conforms to Type-M SBGR
100	29	Telephone Road	Even	SBGR	0 / 17	617	1.3	2.5	Good	Structure Connection	Extruder		Mounting Height Conforms to Type-M SBGR
101	8	Ontario Street	Odd	Delineator Posts Only	3 / 3								
102	46	Ontario Street	Even	3CGR	12 / 12	650	1.0	1.5	Poor			3 CGR and 12 Pots in bad condition	Mounting Height is deficient
103	36	Danforth Road West	Odd	SBGR	0 / 22	573	1.2	2.0	Good	Extruder	Structure Connection		Mounting Height Conforms to Pre-Type-M SBGR
104	35	Danforth Road West	Odd	SBGR	0 / 22	573	1.2	2.0	Good	Structure Connection	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
105	31	Danforth Road West	Even	SBGR	0 / 22	607	1.1	1.0	Good	Extruder	Structure Connection		Mounting Height Conforms to Type-M SBGR
106	37	Danforth Road West	Even	SBGR	0 / 22	607	1.1	1.0	Good	Structure Connection	Extruder		Mounting Height Conforms to Type-M SBGR
107	31	Division Street North	Odd	SBGR	16 / 16	567	1.3	2.0	Good	Turndown	Fish Tail	1 Block (Twisted)	Mounting Height Conforms to Pre-Type-M SBGR
108	7	Division Street North	Even	SBGR	3 / 3	587	1.4	1.9	Poor	Fish Tail	Fish Tail	Posts in bad condition, SBGR to be replaced (both)	Mounting Height in between Type-M and Pre-Type-M SBGR
109	9	Division Street North	Even	SBGR	3 / 3	587	1.4	1.9	Poor	Fish Tail	Fish Tail	Posts in bad condition, SBGR to be replaced (both)	Mounting Height in between Type-M and Pre-Type-M SBGR
110	15	Division Street North	Odd	SBGR	2 / 2	780	1.0	0.0	Poor	Fish Tail	Fish Tail	Posts in bad condition, SBGR to be replaced	Mounting Height is deficient
111	167	Nagle Road	Even	SBGR	0 / 89	543	1.0	1.4	Good	Extruder	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
112	168	Nagle Road	Odd	SBGR	0 / 88	570	1.2	1.7	Good	Extruder	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
113	104	Danforth Road East	Even	SBGR	0 / 57	560	0.5	1.5	Good	Entrance - W(Beam)	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
114	116	Danforth Road East	Odd	SBGR	0 / 61	560	0.3	1.5	Good	Extruder	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
115	154	Danforth Road East	Even	SBGR	0 / 81	583	0.7	1.1	Good	Extruder	Entrance - W(Beam)	2 Posts in bad condition and 1 Section of SBGR bent	Mounting Height in between Type-M and Pre-Type-M SBGR

Asset ID	Length (m)	Road Name	Side (Odd / Even)	Type	#Poor Posts / Total Posts	Mounting Height (mm)	O/S (m)	Rec. Zone(m)	Phys. Cond.	End Treatment		Notes	Mounting Height
										Approach	Leaving		
116	74	Danforth Road East	Odd	SBGR	0 / 39	520	0.6	0.7	Good	Extruder	Extruder		Mounting Height is deficient
117	36	Danforth Road East	Even	SBGR	0 / 19	537	0.5	0.7	Good	Extruder	Extruder		Mounting Height Conforms to Pre-Type-M SBGR
118	67	McEwen Road	Even	SBGR	0 / 37	637	1.2	0.5	Good	Fish Tail	Fish Tail		Mounting Height Conforms to Type-M SBGR
119	71	McEwen Road	Odd	SBGR	0 / 41	570	1.3	0.8	Good	Fish Tail	Fish Tail		Mounting Height Conforms to Pre-Type-M SBGR
120	34	Nagle Road	Even	SBGR	0 / 22	487	1.7	1.8	Good	Turndown	Structure Connection	1 Block (Twisted)	Mounting Height is deficient
121	32	Nagle Road	Odd	SBGR	0 / 23	520	1.7	1.8	Good	Structure Connection	Turndown		Mounting Height is deficient
122	120	Jibb Road	Odd	3CGR	0 / 30								
123	134	Jibb Road	Even	3CGR	0 / 38								
124	25	Beech Street	Even	3CGR	0 / 6							3-CGR is not appropriate behind curb and gutter locations. Review hazard and need for guiderail.	
125	15	Danforth Road West	Odd	Delineation Posts Only	0 / 4								
126	16	Danforth Road West	Even	Delineation Posts Only	0 / 5								
127	20	Lenore Avenue	Odd	SBGR	0 / 10								
128	30	Hickerson Road	Even	Delineation Posts Only	17								