Road Needs Study Report - 2017

Township of Douro-Dummer

D.M. Wills Project No.17-4647

D.M. Wills Associates Limited
PARTNERS IN ENGINEERING
Peterborough

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Prepared for
Township of Douro-Dummer

Executive Summary

The Township of Douro-Dummer (Township) retained the services of D.M. Wills Associates (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.

The Township's complete road infrastructure system spans a total of 260 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 paved (asphalt). The Township has approximately 6 km of earth roads, 143 km of gravel roads, 105 km of surface treated roads (Low class bituminous (LCB)), and 6 km of hot mix asphalt paved roads (high class bituminous (HCB)).

5% of the road network has a structural "NOW" need, 4% has a structural "1-5" year need, and 8% 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 the road's surface has reached the end of its useful service life and will require reconstruction or major rehabilitation to fully repair. Logically, 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. Note that many "6-10" year needs may be corrected by timely resurfacing, extending their service lives.

Capital Improvements

Prioritization and recommendations for planned capital improvements have been developed based on the condition rating and traffic demands on each road. Those roads identified as having a "NOW", 1 – 5 year, or 6 – 10 year structural need have been included in the capital improvement plan for rehabilitation.

A total length of approximately 40.2 km of roads were identified as having structural needs in the "NOW," 1 – 5 year, or 6 – 10 year periods. The estimated cost to improve these roads is approximately $ 2.4 M. An additional length of approximately 7.8 km of road is identified as having inadequate surface widths or surface type. Generally, provided no operational or safety concerns are identified, roads with surface width and/or type deficiencies are typically addressed / considered at the next full reconstruction cycle.

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, 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. A road resurfacing program is therefore recommended in addition to capital improvements.

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

Hot Mix Paved Roads:

- 6.3 km of paved roads (HCB).
- Degradation rate 0.25 / year (surface rating drops from 10 to 5, over a 20-year period).
- Annual resurfacing 0.3 km / year.
- **Annual budget $67,800**: (0.3 km / year x $126,000 / ln **RMP1** x 2 lanes).

Surface Treated Roads:

- 105.1km of surface treated roads (LCB).
- Degradation rate 0.625 / year (surface rating drops from 10 to 5, over a 7-year period).
- Annual resurfacing 15.0 km / year.
- **Annual budget $360,000** (15.0 km / year x $24,000 / 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:

- 143.0 km of earth / gravel roads.
- 75mm gravel every 3-5 years.
- Annual gravelling of 28.6 km.
- Granular A ($19,000 / km).
- **Annual budget $543,400** (28.6 km / year x $19,000 **G**) **.

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

Generally speaking, gravel roads will be less expensive to preserve than surface treated roads, which are, in turn, less expensive to preserve than hot mix roads. Additionally, converting a gravel surface to surface treatment incurs a high initial capital cost. Surface Type conversions should not be undertaken without significant funding increases.

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $971,200 per year.

Further, it is recommended that regular maintenance in the form of roadside ditch cleanout and clearing be undertaken in order to extend the useful service life of the existing roads.

Road System Inventory

Township of Douro-Dummer **Road System in Kilometers** **(As of November 2017)**		
A.	**Surface Type**	**Totals***
	Earth	6
	Gravel (loose Top Gravel)	143
	Surface Treatment (LCB)	105
	Hot Mix Asphalt (HCB)	6
	Total A	**260 km**
B.	**Roadside Environment**	
(i)	**Rural**	
	Earth	6
	Gravel (loose Top Gravel)	143
	Surface Treatment (LCB)	96
	Hot Mix Asphalt (HCB)	5
	Total Rural	**250 km**
(ii)	**Semi-Urban**	
	Gravel (loose Top Gravel)	0
	Surface Treatment (LCB)	9
	Hot Mix Asphalt (HCB)	1
	Total Semi-Urban	**10 km**
(iii)	**Urban**	
	Gravel (loose Top Gravel)	0
	Surface Treatment (LCB)	0
	Hot Mix Asphalt (HCB)	0
	Total Urban	**0km**
	Total B	**260 km**
**Estimated to the nearest kilometre.*		

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1.0 Purpose, Background and Study Method

1.1 Purpose

The purpose of the 2017 Road Needs Study Report is to update the current road inventory and road condition assessments within the Township of Douro-Dummer (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 (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 and sidewalk network needs, the results of which are documented in this report.

1.2 Background

The Township of Douro-Dummer is located in central-eastern Ontario within Peterborough County. The Township is largely rural with some scattered semi-urban developments. The communities of Warsaw, Donwood and Douro serve as the Township's main population centres.

In 2009, a Road Needs Study Report was completed to inventory and document the Township's existing road assets. This current study (2017) utilizes and builds from the road asset information documented in the 2009 Road Needs Study.

1.3 Study Objectives

Based on the Request for Proposal and 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.

1.4 Study Methodology

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

During the field study the following road characteristics were reviewed and 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).
- Structural Adequacy.
- Maintenance Demand.
- Roadside Environment.
- Capacity.
- Alignment.

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.

Surface Type

Wills assessed the adequacy of the road surface type based on the parameters listed in **Table 1**. Roads with traffic volumes (AADT) in excess of the values recommended below for various surface types were noted as critically deficient triggering a "Now" need.

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

Surface Type	Standard AADT Level	Tolerable AADT
Earth (E)	-	<50
Gravel (G)	0-199	<400
Low Class Bituminous (LCB)	200-399	<800
High Class Bituminous (HCB)	400+	-

Note that these ranges are guidelines and not necessarily meant to be rigidly applied. If a LCB road has a higher than recommended AADT (Annual Average Daily Traffic), but is performing at a desirable level, it may not need to be upgraded to HCB. Similarly, if a section of gravel road requires excessive maintenance (for example, on steep grades); LCB may be justified at lower traffic levels. Additionally, urban roads may require consideration for HCB surfaces to support drainage infrastructure i.e. curb & gutter, despite having low AADT.

Surface Width

Surface widths that fall below minimum tolerable standards, as detailed in the MTO Inventory Manual were noted as critically deficient triggering a "Now" need.

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, and 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 the highest traffic volume amongst all road segments of approximately 1100 AADT.

Structural Adequacy

In cases where road base or structure is showing distress over more than 20% of the length of the road section, a "Now" need is assessed.

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 municipal road system were inventoried according to the methods outlined in the MTO 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 provided by the Township.

Table 2 summarizes the total road length in kilometres by surface type and road environment as of November 2017.

The existing road system consists of 261 km of roadway, 7 km of earth roads, 146 km of gravel roads, 102 km of surface treated roads (LCB) and 6 km of HCB (asphalt paved) roads; with all calculations being approximate and rounded to the nearest kilometre.

Table 2 - Road System Inventory

Township of Douro-Dummer **Road System in Kilometers** **(As of November 2017)**		
A.	**Surface Type**	**Totals***
	Earth	6
	Gravel (loose Top Gravel)	143
	Surface Treatment (LCB)	105
	Hot Mix Asphalt (HCB)	6
	Total A	**260 km**
B.	**Roadside Environment**	
(i)	**Rural**	
	Earth	6
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(ii)	**Semi-Urban**	
	Gravel (loose Top Gravel)	0
	Surface Treatment (LCB)	9
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	Total Semi-Urban	**10 km**
(iii)	**Urban**	
	Gravel (loose Top Gravel)	0
	Surface Treatment (LCB)	0
	Hot Mix Asphalt (HCB)	0
	Total Urban	**0km**
	Total B	**260 km**
**Estimated to the nearest 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 260 km of roads inventoried, a total of 20.3 km had a critical deficiency. Of the 20.3 km, approximately 6.4 km represents roads with AADT of less than 50 vehicles. Regardless of condition, roads with AADT of fifty or less are typically assigned as "Adequate" (as per the Ministry protocol) for the purpose of the system adequacy calculation.

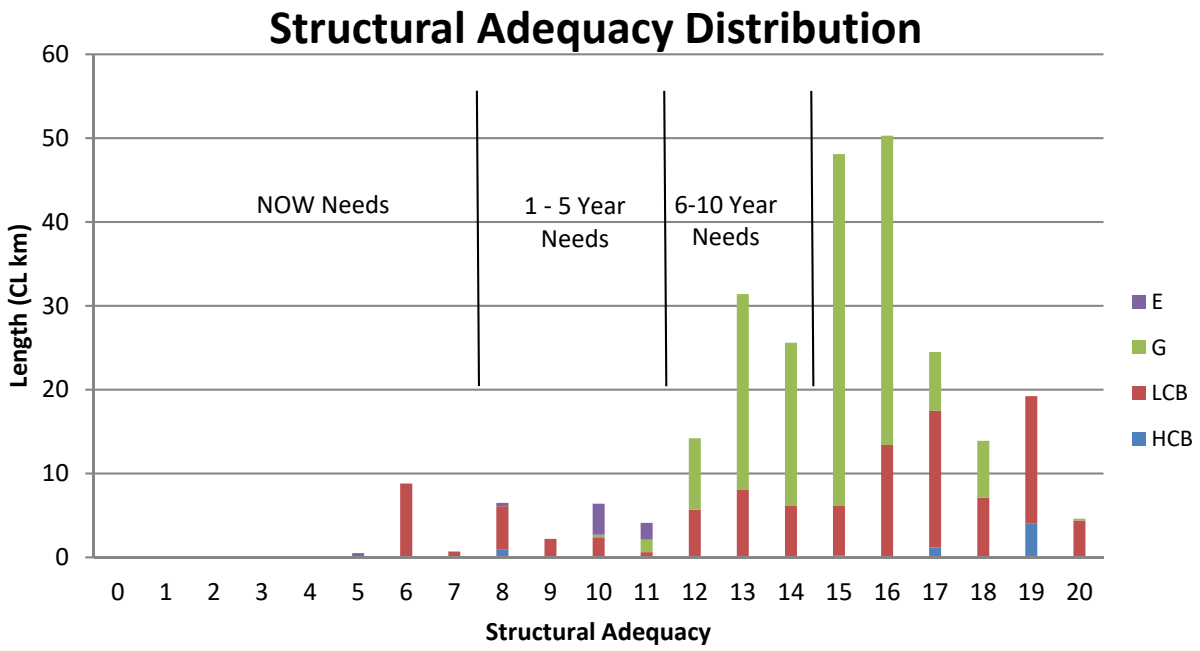
The overall system adequacy for the Township's road network, which is based upon the total road kilometres less the identified critically deficient ("NOW" needs) roads, is as follows:

$$\textbf{2017 System Adequacy} = \frac{\textbf{260 - (20.3 - 6.4)}}{\textbf{260}} \textbf{ x 100\% = 95\%}$$

The average surface condition rating of all roads is 7.7 / 10 while the average structural adequacy rating is 14.7 / 20. This suggests that the typical road has a good riding quality, and in fair to good condition.

Looking at the structural adequacy distribution of the township's roads reinforces this picture. A group of roads, over 60%, are in good condition (structural adequacy of 15 and over), and with regular resurfacing and preservative maintenance, should not require reconstruction in the next ten (10) years. Another 30% are in fair condition (structural adequacy from 12 to 14). The remaining 10% of the road network is well distributed over the poor to very poor range (structural adequacy from 5 to 11). Most of these roads will require reconstruction over the next five (5) years to fully repair them.

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



3.2 Condition Rating

Although the condition rating is appropriate to use in the context of a road needs study, Wills has noted that using the Condition Rating as a general signifier of a road's condition can lead to odd comparisons. Since 45% of the rating may be scored for a road's width, alignment, or level of service, it is easy for a straight, wide road to have a better CR than good road that is narrow and windy.

For this reason, an Asset Condition Rating, or ACR, should be used outside the context of this report (i.e. in the Township's Asset Management Plan). The ACR considers only attributes that define the physical condition of the road. Explicitly, these attributes are Surface Condition, Structural Adequacy, Drainage, and Maintenance Demand.

The scoring systems for Condition Rating (CR) and Asset Condition Rating (ACR) is determined as per **Table 3**.

Table 3 – Scoring Systems

Attribute	Condition Rating (Standard Inventory Manual Approach)	Asset Condition Rating
Surface Condition	10	10
Structural Adequacy	20	20
Drainage	15	15
Maintenance Demand	10	10
Shoulder Width	10 (Rural Only)	
Surface Width	15 (Rural / Semi-Urban) 25 (Urban)	
Level of Service	20 (Urban / Semi-Urban Only)	
Horizontal Alignment	10 (Rural)	
Vertical Alignment	10 (Rural Only)	
Total	**100**	**55**

3.3 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, as per the Inventory Manual Methodology.

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:

Priority Rating = 0.2 x (100 - CR) x (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").

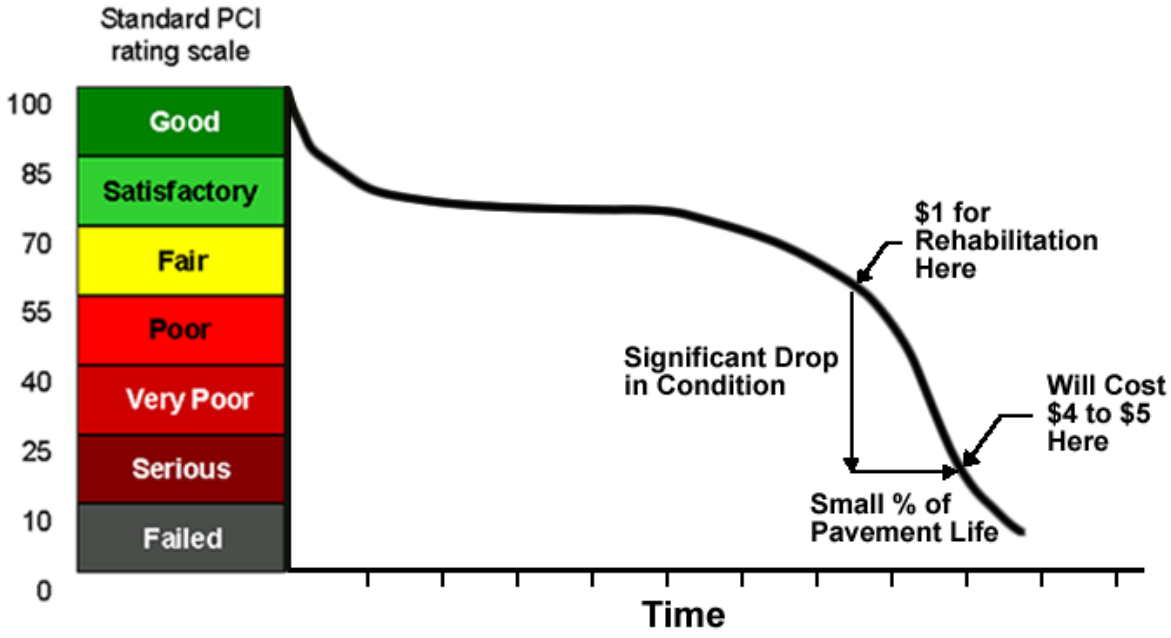
4.0 Roads Best Management Practices

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 1** 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 1** and are provided as an illustration of the benefit of a "preservation management approach".

Figure 1- Typical Service Life of an Asphalt Pavement



4.1 Example Life Cycle Cost Analysis

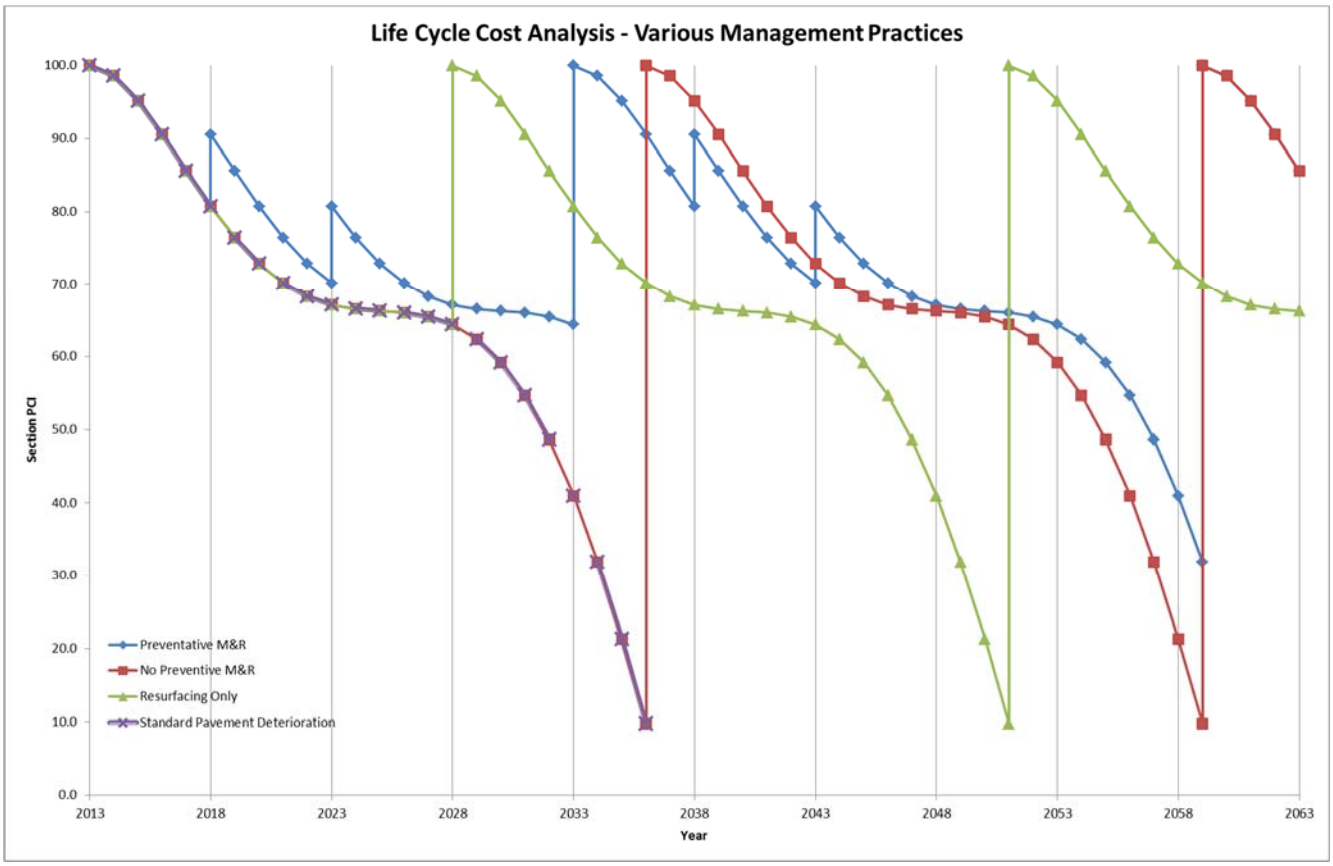
The following life cycle costs analysis compares three (3) different municipalities Municipality 1, Municipality 2 and Municipality 3; each with three (3) distinct approaches to pavement management. For this analysis we will assume each of the three (3) municipalities has 7000 m^2 of pavement, i.e. 1 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 2 below illustrates a time- pavement condition plot for each municipality.

Figure 2 - 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.

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**

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.

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.

4.2 Preservation Management Approach

4.2.1 Gravel Roads

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[1].

Table 5 - Capital Activities – Gravel Roads

Action	Frequency
Add layer (75 mm) of granular material to road surface.	Every 3-5 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.

4.2.2 Surface Treated Roads

Surface treated roads have a hard wearing surface that must be preserved in order to be effective. 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[2]	3	8	4
Slurry Seal[2]	6	7	3
Double Surface Treatment	10	6	5
Pulverize and DST	14	<4	8

[1] A ten-year cycle is considered ideal. The Township is currently closer to a fifteen-year cycle as some roads require higher than normal effort to bring up to standard. After these roads are repaired in full, it is expected that the Township will be able to employ a ten-year cycle.
[2] The Township has been able to get better prices on surface treatment than slurry seal by bundling Township work with County of Peterborough Surface Treatment tenders. Should this economy of scale change in the future, the Township should consider including slurry seal in their program.

In addition to the above noted preservation approach in **Table 6**, 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 fiber-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.

4.2.3 Asphalt Roads

Asphalt surfaces are the smoothest and most durable hard top surface used by the Township however; they are also the most expensive. 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[3]	2-6	9	2
Slurry Seal / Microsurface[3]	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.

[3] Due to the limited number of HCB roads, these techniques are not employed by the Township. They are referenced here for information.

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.

4.3 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.

5.0 Road Needs Study Summary Table

5.1 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.

5.1.1 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.

Upgrade 2U Excavate and Upgrade to Urban Cross-Section 2 Lifts – Urban.

SS Slurry Seal (Preventative Maintenance).

MS Microsurfacing (Preventative Maintenance).

RS Route and Seal (Preventative Maintenance).

5.1.2 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)

5.1.3 Gravel

Gravel roads can likewise be upgraded with the reapplication of Gravel (G) or surface treatments (ST1).

5.2 Benchmark Construction Costs

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

For the Township of Douro-Dummer, the following design standards, **Table 8,** were utilized for development of the benchmark cost estimate 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	450	100
Urban Local Industrial	9.0	-	150	450	100

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

6.0 Improvement Plan

6.1 Road Needs

The Capital Improvement Plan is included in **Appendix B**, noting recommendations in terms of priorities throughout the Township. AADT is based on counts / estimates provided by the Township. All costs are based on 2017 dollars and should be adjusted for inflation based on program year, for budgeting purposes. The capital improvements are listed based on need (Structural "NOW", 1-5 years, 6-10 years, needs as well as surface upgrades and widening needs) and in descending priority based on traffic volumes and Condition Rating, as described previously.

It should be noted that recommendations made are for benchmark costing only. They only consider the rating and traffic level of the road. Selection of actual pavement treatment should be made in detail design. In cases where the benchmark recommendation includes a surface type conversion, the Township should refer to the Township's Policy T-27, Criteria for Surface Treatment for definitive guidance.

Furthermore, work on the Township's boundary roads (Strickland Street, Division Road, Dummer Asphodel Road) needs to be coordinated with the neighboring municipality, as informed by their respective Boundary Road Agreements.

6.2 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 construction works, as follows:

Hot Mix Paved Roads:

- 6.3 km of paved roads (HCB).
- Degradation rate 0.25 / year (surface rating drops from 10 to 5, over a 20-year period).
- Annual resurfacing 0.3 km / year.
- **Annual budget $67,800**: (0.3 km / year x $126,000 / ln **RMP1** x 2 lanes).

Surface Treated Roads:

- 105.1km of surface treated roads (LCB).
- Degradation rate 0.625 / year (surface rating drops from 10 to 5, over a 7-year period).
- Annual resurfacing 15.0 km / year.
- **Annual budget $360,000** (15.0 km / year x $24,000 / 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:

- 143.0 km of earth / gravel roads.
- 75mm gravel every 3-5 years.
- Annual gravelling of 28.6 km.
- Granular A ($19,000 / km).
- **Annual budget $543,400** (28.6 km / year x $19,000 **G**) **.

*** Cost based on use of Township's gravel pit*

Generally, the life-cycle cost of a gravel road is much lower than an LCB road, which in turn is much lower than an HCB road due to higher capital investment in the initial surface.

The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $971,200 per year.

Candidates for preservation / resurfacing include all roads with a 6-10 year structural need or are rated as structurally adequate. Although some of these roads will invariably

become capital needs, most can have their service lives extended at significantly less cost than reconstruction (i.e. keeping the good roads good).

Roads that are candidates for preservation / resurfacing are listed in **Appendix C,** Township of Douro-Dummer's Resurfacing List. Roads are listed in alphabetically for ease of reference.

6.3 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:

Route and Seal

- 6.3 km of paved roads (HCB).
- Assume that route and seal will be applied, on average, once per resurfacing cycle.
- 0.3 km of road to route and seal each year
- **Annual budget $1,200** (0.3 km x $4,000 / km In **Route and Seal**).

Given the Township's short total length of HCB roads, it is not be practical to fund an annual Route and Seal program. Alternatively, the Township may wish to program route and seal activities automatically 4 years after any new lift of HCB is paved.

Slurry Seal / Microsurfacing

- 6.3 km of paved roads (HCB).
- 102.3 km of surface treated roads (LCB).
- Assume that slurry seal / microsurfacing will be applied, on average, once per resurfacing cycle.
- 14.9 km of road to preserve per year (0.3 km HCB and 14.6 km of LCB).
- **Annual budget $194,900** (14.9 km x $13,000 / km **Slurry Sealing**).

Since the Township bundles surface treatment work with County of Peterborough tenders (gaining an economy of scale), the cost of slurry seal has not been historically competitive with surface treatment in the Township. Should this economic advantage change in the future, the Township should consider implementing a slurry seal program.

6.4 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 dedicated to these important activities.

7.0 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 $30.3 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.

8.0 Sidewalk Assessment

As part of the 2017 Road Needs Study an inventory/assessment of all township sidewalk was undertaken. The completed sidewalk inventory/assessment included documenting of the following:

- Material type.
- Width.
- Location (Side of Road).
- Length.
- AODA compliance.
- Condition.

The Sidewalk Summary Table, **Table 9**, lists the condition, width and AODA compliance issues for all sidewalks in the Township.

Table 9 - Sidewalk Summary Table

Road Section	Road Name	From	Length (m)	Side	Width	Condition	Notes on AODA Compliance
044	English Line (South)	County Road 4 - School Crosswalk	50	Even	1.5	G	Lacking TWSI at School crosswalk
045	Water Street	Mill Street to House 884	96	Even	1.2	P	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 4 (Water Street)	West Street – English Line	587	Odd	1.5	G	Lacking TWSI at Curb Ramps
	County Road 4 (Water Street)	Mill Street - West Street	270	Even	1.5	G	Lacking TWSI at Curb Ramps
	County Road 4 (Water Street)	Mill Street - West Street	270	Odd	1.5	G	Lacking TWSI at Curb Ramps
	County Road 4 (Mill Street)	Church Street - Water Street	80	Even	1.1	P	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 4 (Mill Street)	Church Street - Water Street	80	Odd	1.1	P	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 4	Ford Street - Mill Street	80	Even	1.1	P	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 38	Ford Street – Water Street	210	Even	1.5 – 1.3	F	Lacking TWSI at Curb Ramps
136	Douro 4th Line Road	County Road 8 to North End of Church	145	Even	1.2	P	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 8	Douro Limits - Douro 4th Line	80	Even	1.1	F	Sidewalk is too narrow and lacks TWSI on curb ramps.
	County Road 8	Douro Limits - Douro 4th Line	110	Odd	1.1	F	Sidewalk is too narrow and lacks TWSI on curb ramps.

All of the Township's sidewalks are concrete. Five sections are in poor condition, with the remaining section in good or fair condition. In terms of AODA compliance, all sections other than the newly installed ones on English Line, and on Water Street from Mill Street to English Line lack the 1.5 m width specified in the AODA. As these sidewalk sections are also in poor condition, a full reconstruction or asset removal is recommended.

Tactile Walking Surface Indicators (TWSI) were not present within the Township. These have recently become mandatory as per O. Reg. 191/11 on January 1, 2016.

9.0 Storm Sewer Assessment

As part of the 2017 Road Needs Study, the township's existing storm sewer system was also reviewed.

The Township currently has two (2) storm sewer systems in their inventory, both located within the village of Warsaw. The first system is located along West Street and contains two (2) catchbasins. This system includes a north inlet pipe and an outlet connecting to the County system at County Road No. 4. The second system contains eight (8) catchbasins and is located between Church Street and County Road 4. From the visual inspection undertaken by Wills, both systems appear to be in good condition.

It should be noted that the Township has what may be considered a third storm sewer system on Crowe's Landing Road. This storm sewer is irregular in its composition: catch basins are merely grates attached to vertical CSP's, with horizontal pipes outletting downstream. When this system is replaced, it should be upgraded to current standards.

10.0 Summary

D.M. Wills Associates (Wills) undertook a review of the Township of Douro-Dummer'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 November of 2017. A visual assessment of each road within the Township was undertaken to assess surface and structural distress. A Condition Rating (CR) was calculated based on the identified deficiencies.

An overall road system adequacy has been calculated, consistent with the MTO Inventory Manual for Municipal Road (February 1991), based on a number of road characteristics including:

- Capacity
- Geometrics
- Surface Condition
- Shoulder and Road Widths
- Structural Adequacy
- Drainage
- Maintenance Demand

The average surface condition rating of all roads is 7.7 / 10 while the average structural adequacy rating is 14.7 / 20. This suggests that the typical road has a good riding quality, and in fair to good condition.

Capital Improvements

Prioritization and recommendations for planned capital improvements have been developed based on the condition rating and traffic demands on each road. Those roads identified as having a "NOW", 1 – 5 year, or 6 – 10 year structural needs have been included in the capital improvement plan for rehabilitation.

A total length of approximately 44.6 km of roads were identified as having structural needs in the "NOW," 1 – 5 year, or 6 – 10 year periods. The estimated cost to improve these roads is approximately $ 2.4 M. An additional length of approximately 7.8 km of road is identified as having inadequate surface widths or surface type. Generally, provided no operational or safety concerns are identified, roads with surface width and/or type deficiencies are typically addressed / considered at the next full reconstruction cycle.

Resurfacing

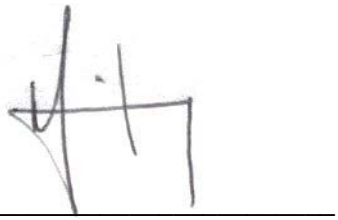
The total resurfacing program, (hot mix, surface treatment and gravel) is estimated at $971,200 per year.

Implementation / continuation of a road and roadside preventative maintenance program are strongly recommended. A concerted effort and funding for regular road maintenance can reduce the annual resurfacing / reconstruction requirements by prolonging the useful service life of a road.

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 November 2017, by which time Any deficiencies specifically evident during the "spring break-up" were not visible.

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,



Michael Lang, P. Eng.
Manager, Transportation Engineering

ML/ESP/ms

Statement of Limitations

This report has been prepared by D.M. Wills Associates on behalf of the Township of Douro-Dummer. 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 2017 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 2017 Road Needs Study Report findings.

Appendix A

Unit Price Form

Appendix B

Capital 10-Year Plan

Capital 10-Year Plan

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. *A structural "NOW" need does not explicitly mean that work must be undertaken on the road immediately. A structural "NOW" need means that the road's surface has reached the end of its useful service life and will require reconstruction or major rehabilitation to fully repair.*

Sect. No.	Road Name	From - To	Length (km)	AADT	Benchmark Costing Recommendation	Cost (x1000)	Surface Type Need	Surface Width Need
NOW Needs (Structural Adequacy is rated below 8/20)								
079	Daleview Drive	County Road 4-Division Road	0.70	385	*ST2PAW - Widening by 1 m, Double Surface Treatment, with Pulverization of Existing and Granular A*	*$104*	ADEQ	NOW
057	7th Line Road North Dummer	Centre Dummer-North Limit	1.20	49	*Recon G - Full Reconstruction 6m Gravel Road*	*$110*	ADEQ	ADEQ
012	White Lake Road West	County Road 6-South Limit	2.70	147	*ST2A - Double Surface Treatment with Granular A*	*$171*	ADEQ	ADEQ
153	Cooney Island Road	4th Line Road-East Limit	2.50	49	*Recon G - Full Reconstruction 6m Gravel Road*	*$229*	ADEQ	ADEQ
054	Douglas	Rock Road-4th Line Road	2.00	200	*ST2A - Double Surface Treatment with Granular A*	*$127*	ADEQ	ADEQ
039	Clifford Road	3rd Line Road South Dummer (west)-South Street	2.00	100	*ST2A - Double Surface Treatment with Granular A*	*$127*	ADEQ	ADEQ
167	Canal Road	County Road 4-North Limit	0.70	162	*ST2A - Double Surface Treatment with Granular A*	*$44*	ADEQ	ADEQ
008	Gilchrist Bay Road	County Road 6 (East)-County Road 6 (West)	1.30	49	*ST2A - Double Surface Treatment with Granular A*	*$82*	ADEQ	ADEQ
046	Mill Street	West Limit-Peterborough Street	0.10	49	*ST2A - Double Surface Treatment with Granular A*	*$6*	ADEQ	ADEQ
1-5 Year Needs (Structural Adequacy is rated at 8/20 to 11/20)								
098	Strickland Street	Highway 28 (formerly Highway 134)-Westerly 500 m (Lakefield limits)	0.40	816	*ST2A - Double Surface Treatment with Granular A*	*$25*	NOW	ADEQ
094	McNab Avenue	County Road-South Limit	0.10	49	*ST2A - Double Surface Treatment with Granular A*	*$6*	ADEQ	ADEQ
205	Little Lane	County Road 6-Gilcrest Bay	0.10	49	*ST2A - Double Surface Treatment with Granular A*	*$6*	ADEQ	ADEQ

Sect. No.	Road Name	From - To	Length (km)	AADT	Benchmark Costing Recommendation	Cost (x1000)	Surface Type Need	Surface Width Need
063	Cooper Road	4th Line Road-Caves Road	1.80	162	*ST2A - Double Surface Treatment with Granular A*	*$114*	ADEQ	ADEQ
095	Division Road	County Road 4-Burnham Line 10	0.80	498	*ST2A - Double Surface Treatment with Granular A*	*$51*	ADEQ	ADEQ
058	4th Line Road South Dummer	Clifford Road-Centre Dummer Road	1.20	109	*ST2A - Double Surface Treatment with Granular A*	*$76*	ADEQ	ADEQ
045	Water Street	Ford Street-Mill Street	0.20	49	*ST2A - Double Surface Treatment with Granular A*	*$13*	ADEQ	ADEQ
161	Douro 8th Line Road	County Road 4-250 m South	0.20	200	*ST2A - Double Surface Treatment with Granular A*	*$13*	ADEQ	ADEQ
093	Edgewood Avenue	County Road 4-South Limit	0.10	49	*ST2A - Double Surface Treatment with Granular A*	*$6*	ADEQ	ADEQ
179	Galloway Drive	McCracken Landing-West Limit	0.10	49	*ST2A - Double Surface Treatment with Granular A*	*$6*	ADEQ	ADEQ
156	Douro 5th Line Road	County Road 4-South Limit	0.09	49	*G - Gravel (75mm)*	*$0.2*	ADEQ	ADEQ
048	Church Street	Mill Street-West Street	0.20	49	*ST2A - Double Surface Treatment with Granular A*	*$13*	ADEQ	ADEQ
166	Lonsberry Lane	County Road 4-East Limit	0.60	49	*ST2A - Double Surface Treatment with Granular A*	*$38*	ADEQ	ADEQ
064	3rd Line Road North Dummer	Caves Road-County Road 6	2.10	298	*ST2A - Double Surface Treatment with Granular A*	*$133*	ADEQ	ADEQ
049	West Street	County Road 4-West Limit	0.20	49	*ST2A - Double Surface Treatment with Granular A*	*$13*	ADEQ	ADEQ
052	Payne Line Road	County Road 4-Westerly	0.50	168	*ST2A - Double Surface Treatment with Granular A*	*$32*	ADEQ	ADEQ
023	11th Line South Dummer	Dummer-Asphodel Road-North Limit	0.90	200	*PP1A - Pulverize and Pave 1 Lift, with Grade Raise*	*$186*	ADEQ	ADEQ
6-10 Year Needs (Structural Adequacey is rated from 12/20 to 14/20)								
162	Bradfield Road	County Road 4-300 m South	0.30	76	*ST2 - Double Surface Treatment*	*$11*	ADEQ	ADEQ
013	Division Road	Highway 28 (formerly Highway 134)-Indian River Line	5.30	785	*ST2 - Double Surface Treatment*	*$200*	ADEQ	ADEQ
014	Division Road	Indian River Line-Carlow Line	2.70	578	*ST2 - Double Surface Treatment*	*$102*	ADEQ	ADEQ
132	Douro 2nd Line Road	County Road 4-County Road 8	2.00	142	*ST2 - Double Surface Treatment*	*$76*	ADEQ	ADEQ
144	Ayotte Crescent	8th Line Road-East Limit	0.20	49	*ST2 - Double Surface Treatment*	*$8*	ADEQ	ADEQ

Sect. No.	Road Name	From - To	Length (km)	AADT	Benchmark Costing Recommendation	Cost (x1000)	Surface Type Need	Surface Width Need
044	English Line (South)	County Road 4-South Limit	0.20	108	*ST2 - Double Surface Treatment*	*$8*	ADEQ	ADEQ
069	4th Line Road North Dummer	Sawmill Road-North Limit	3.10	350	*ST2 - Double Surface Treatment*	*$117*	ADEQ	ADEQ
065	Caves Road	Cooper Road-County Road 4	1.60	134	*ST2 - Double Surface Treatment*	*$60*	ADEQ	ADEQ
206	Ironwoods Drive	County Road 4-South Limit	0.40	49	*ST2 - Double Surface Treatment*	*$15*	ADEQ	ADEQ
053	Rock Road	South Street-Douglas	1.70	353	*ST2 - Double Surface Treatment*	*$64*	ADEQ	ADEQ

Appendix C

Resurfacing List

Township of Douro-Dummer Resurfacing List

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.*

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
172	10th Line of Dummer	Webster Road - Dummer-Asphodel Road	2.80	112	*G*	ADEQ	ADEQ
028	11th Line Road Mid Dummer	Mill Line Road - North Limit	0.90	49	*G*	ADEQ	ADEQ
073	11th Line Road North Dummer	County Road 6 - South Limit	1.20	250	*HCB*	ADEQ	ADEQ
204	12th Line Road South Dummer (road allowance)	Forced Road Section - Private Lane	0.20	49	*G*	ADEQ	ADEQ
203	12th Line Road south Dummer (forced road section)	Highway No. 7 - 12th Line Road South Dummer (road allowance)	2.20	200	*G*	ADEQ	ADEQ
024	12th Line South Dummer	Forced Road Section - North Limit	6.30	100	*G*	ADEQ	ADEQ
202	1st Line Road Douro	County Road 6 - South Limit	0.90	49	*G*	ADEQ	ADEQ
175	3rd Line Road North Dummer	County Road 6 - North Limit	0.20	49	*G*	ADEQ	ADEQ
035	3rd Line Road South Dummer	County Road 8 - South Limit	1.30	34	*G*	ADEQ	NOW
036	3rd Line Road South Dummer	County Road 8 - Clifford Road	3.00	53	*G*	ADEQ	ADEQ
034	3rd Line Road South Dummer	Division Road - North Limit	0.40	49	*G*	ADEQ	ADEQ
069	4th Line Road North Dummer	Sawmill Road - North Limit	3.10	350	*LCB*	ADEQ	ADEQ
033	4th Line Road South Dummer	County Road 8 - Division Road	3.10	99	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
037	4th Line Road South Dummer	Clifford Road - County Road 8	3.20	120	*LCB*	ADEQ	ADEQ
059	4th Line Road South Dummer	Centre Dummer Road - Cooper Road	2.00	89	*G*	ADEQ	ADEQ
060	4th Line Road South Dummer	Cooper Road - North Limit	2.50	89	*G*	ADEQ	ADEQ
177	5th Line North Dummer	County Road 6 - North Limit	0.10	49	*G*	ADEQ	ADEQ
006	5th Line North Dummer	County Road 6 - South Limits to include entrance to farm owned by Township	1.40	49	*G*	ADEQ	ADEQ
032	5th Line Road South Dummer	Webster Road - North Limit	2.00	67	*G*	ADEQ	NOW
007	6th Line North Dummer	County Road 6 - End of Hawkins Lane	1.40	49	*G*	ADEQ	ADEQ
031	6th Line Road South Dummer	Webster Road - North Limit	1.90	49	*G*	ADEQ	ADEQ
178	6th Line South Dummer	County Road 6 - South Limit	0.20	49	*G*	ADEQ	ADEQ
200	6th Line South Dummer	Webster Road - County Rd 8	3.10	100	*G*	ADEQ	ADEQ
030	7th Line Road Mid-Dummer	Webster Road - North Limit	0.20	49	*G*	ADEQ	ADEQ
201	8th Line Dummer	Webster Road - County Rd. 8	2.90	100	*G*	ADEQ	ADEQ
077	8th Line Road North Dummer	County Road 6 - South Limit	0.60	108	*G*	ADEQ	ADEQ
019	8th Line South Dummer	Webster Road - North Limit	3.60	148	*G*	ADEQ	ADEQ
144	Ayotte Crescent	8th Line Road - East Limit	0.20	49	*LCB*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
040	Banks Avenue	County Road 8 - East Limit	0.20	49	*LCB*	ADEQ	ADEQ
070	Batten Lane	4th Line - East Limit	0.20	49	*G*	ADEQ	ADEQ
002	Birchview Road	McCrackens Landing - Camp Line Road	5.20	306	*LCB*	ADEQ	ADEQ
112	Birchview Road	Highway 28 - Camp Line Road	6.40	691	*LCB*	ADEQ	ADEQ
123	Block Road	Highway 28 (formerly Highway 134) - East Limit	0.10	49	*LCB*	ADEQ	ADEQ
162	Bradfield Road	County Road 4 - 300 m South	0.30	76	*LCB*	ADEQ	ADEQ
163	Bradfield Road	Douro 7th Line Road - West 1.2 km	1.20	49	*G*	ADEQ	ADEQ
003	Camp Line Road	Birchview Drive - Henderson Road	2.70	177	*LCB*	ADEQ	ADEQ
004	Camp Line Road	Henderson Road - County Road 6	1.80	177	*LCB*	ADEQ	ADEQ
148	Carlow Line Road	Division Road - County Road 8	3.40	110	*G*	ADEQ	NOW
065	Caves Road	Cooper Road - County Road 4	1.60	134	*LCB*	ADEQ	ADEQ
128	Cedar Cross Road	Douro 3rd Line - Payne Line Road	4.20	140	*G*	ADEQ	ADEQ
134	Center Road	Douro 3rd Line - Douro 5th Line	2.90	49	*G*	ADEQ	ADEQ
139	Center Road	Douro 5th Line Road - Highway 28 (formerly Highway 134)	1.30	151	*G*	ADEQ	ADEQ
140	Center Road	Highway 28 (formerly Highway 134) - County Road 32	2.70	92	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
038	Clifford Road	4th Line South Dummer - 3rd Line Road	1.30	100	*G*	ADEQ	ADEQ
082	Clinton Avenue	Plati Avenue - Gifford Drive	0.40	181	*LCB*	ADEQ	ADEQ
062	Cooper Road	4th Line Road East - East Limit	1.40	49	*G*	ADEQ	ADEQ
086	Coral Drive	Television Road - East Limit	0.30	135	*LCB*	ADEQ	ADEQ
076	Crowes Landing Road	County Road 6 - North Limit	0.90	282	*LCB*	ADEQ	ADEQ
210	Crowe's Landing Road	9th Line Dummer - Stony Lake	0.20	100	*LCB*	ADEQ	ADEQ
013	Division Road	Highway 28 (formerly Highway 134) - Indian River Line	5.30	785	*LCB*	ADEQ	ADEQ
014	Division Road	Indian River Line - Carlow Line	2.70	578	*LCB*	ADEQ	ADEQ
096	Division Road	Burnham Line 10 - Douro 7th Line	4.20	476	*LCB*	ADEQ	ADEQ
097	Division Road	Douro 7th Line - Highway 28 (formerly Highway 134)	1.30	448	*LCB*	ADEQ	ADEQ
089	Donwood Drive	County Road 4 - Hillview Avenue	0.50	423	*LCB*	ADEQ	ADEQ
149	Douro 1st Line	Division Road - County Road 8	3.70	62	*G*	ADEQ	ADEQ
129	Douro 1st Line Road	Cedar Cross Road - North Limit	0.30	49	*G*	ADEQ	ADEQ
115	Douro 1st Line Road	County Road 6 - North Limit	1.30	49	*G*	ADEQ	ADEQ
131	Douro 1st Line Road	County Road 4 - South Limit	0.70	49	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
130	Douro 1st Line Road	Cedar Cross Road - County Road 4	3.10	75	*G*	ADEQ	ADEQ
133	Douro 2nd Line Road	Cedar Cross Road - County Road 4	3.60	99	*G*	ADEQ	ADEQ
116	Douro 2nd Line Road	County Road 6 - South Limit	0.50	49	*G*	ADEQ	ADEQ
132	Douro 2nd Line Road	County Road 4 - County Road 8	2.00	142	*LCB*	ADEQ	ADEQ
150	Douro 2nd Line Road	Division Road - County Road 8	3.60	136	*LCB*	ADEQ	ADEQ
171	Douro 3rd Line Road	County Road 4 - South Limit	0.40	49	*G*	ADEQ	ADEQ
127	Douro 3rd Line Road	Lynch's Rock Road - County Road 4	5.30	78	*G*	ADEQ	ADEQ
165	Douro 3rd Line Road	Division Road - County Road 8	3.30	188	*G*	ADEQ	ADEQ
113	Douro 3rd Line Road	Birchview Road - South Limit	0.90	49	*G*	ADEQ	ADEQ
110	Douro 3rd Line Road	South Beach - Rishor Avenue	0.40	68	*LCB*	ADEQ	ADEQ
117	Douro 4th Line	County Road 6 - South Limit	4.00	49	*G*	ADEQ	ADEQ
135	Douro 4th Line Road	County Road 4 - North Limit	3.90	113	*G*	ADEQ	ADEQ
151	Douro 4th Line Road	Division Road - Cooney Island Road	1.80	121	*G*	ADEQ	ADEQ
119	Douro 4th Line Road	Highway 28 Intersection - Birchview Road	0.10	49	*G*	ADEQ	ADEQ
118	Douro 4th Line Road	County Road 6 - Highway 28	1.60	358	*LCB*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
136	Douro 4th Line Road	County Road 4 - County Road 8	1.50	305	*LCB*	ADEQ	ADEQ
169	Douro 4th Line Road	Highway 28 - North Limit	0.50	49	*G*	ADEQ	ADEQ
152	Douro 4th Line Road	Cooney Island Road - County Road 8	1.30	190	*LCB*	ADEQ	ADEQ
120	Douro 5th Line	County Rd #6 - Lynch Rock Road	1.50	131	*G*	ADEQ	ADEQ
137	Douro 5th Line Road	Center Road - North Limit	1.30	15	*G*	ADEQ	ADEQ
121	Douro 5th Line Road	Lynch Rock Road - Strickland Road	0.30	155	*LCB*	ADEQ	ADEQ
138	Douro 5th Line Road	Center Road - County Road 4	1.80	103	*G*	ADEQ	ADEQ
155	Douro 5th Line Road	Division Road - North Limit (County Road 8)	2.40	67	*G*	ADEQ	ADEQ
157	Douro 7th Line Road	County Road 4 - South Limit (Bradfield Road)	1.20	133	*LCB*	ADEQ	ADEQ
145	Douro 7th Line Road	County Road 4 - North Limit	1.70	36	*G*	ADEQ	ADEQ
158	Douro 7th Line Road	Division Road - North Limit (Bradfield)	1.90	49	*G*	ADEQ	ADEQ
160	Douro 8th Line Road	Division Road - North Limit	1.90	100	*G*	ADEQ	ADEQ
143	Douro 8th Line Road	County Road 32 - County Road 4	3.90	200	*G*	ADEQ	ADEQ
147	Douro 9th Line	County Road 32 - County Road 4	4.20	200	*G*	ADEQ	ADEQ
164	Douro 9th Line	County Road 4 - Division Road	1.20	100	*LCB*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
208	Dummer Asphodel Road	11th Line Dummer - East End	0.30	49	*G*	ADEQ	ADEQ
015	Dummer Asphodel Road	Carlow Line - County Road 38	1.40	488	*LCB*	ADEQ	ADEQ
017	Dummer Asphodel Road	Bridge - County Road 8	1.10	480	*LCB*	ADEQ	ADEQ
016	Dummer Asphodel Road	County Road 38 - 400 m East of 4th Line (at bridge)	3.30	480	*LCB*	ADEQ	ADEQ
021	Dummer Asphodel Road	County Road 40 - 11th Line South Dummer	2.80	100	*HCB*	ADEQ	ADEQ
055	Dummer Centre Road	4th Line Road - County Road 40	7.90	49	*G*	ADEQ	ADEQ
010	Dummer Lake Road East	County Road 6 - South Limit (to start of Private road)	1.30	137	*G*	ADEQ	ADEQ
044	English Line (South)	County Road 4 - South Limit	0.20	108	*LCB*	ADEQ	ADEQ
174	English Line North	County Road 6 - North Limit	0.90	49	*G*	ADEQ	ADEQ
043	Ford Street	East of South Street - Peterborough Street	0.20	950	*HCB*	ADEQ	ADEQ
083	Gifford Drive	Television Road - Kingsdale	0.50	205	*LCB*	ADEQ	ADEQ
005	Golf Course Road	McCrackens Landing - Barnes Road	2.20	100	*LCB*	ADEQ	ADEQ
114	Henderson Road	Camp Line - West Limit	0.70	49	*G*	ADEQ	ADEQ
141	Hickey Road	7th Line Road - County Road 32	0.50	33	*G*	ADEQ	ADEQ
173	Hickson Road	County Road 40 - West Limit	0.40	49	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
087	Highland Avenue	County Road 4 - North Limit	0.20	49	*LCB*	ADEQ	ADEQ
105	Hilliard Way	Highway 28 - West Limit	0.20	49	*LCB*	ADEQ	ADEQ
090	Hillview Avenue	Donwood Drive - Orchard Crescent	0.20	49	*LCB*	ADEQ	ADEQ
009	Howard Drive	County Road 6 - South Limit	0.10	49	*G*	ADEQ	ADEQ
212	Indacom Drive	County Road 4 - South Limit	0.20	49	*G*	ADEQ	ADEQ
206	Ironwoods Drive	County Road 4 - South Limit	0.40	49	*LCB*	ADEQ	ADEQ
011	Ivandale Road	Dummer Lake Road East - West Limit	0.40	49	*G*	ADEQ	ADEQ
168	Kerr Road	County Road 8 - South Limit	0.10	49	*G*	ADEQ	ADEQ
084	Kingsdale Drive	County Road 4 - North Limit	0.60	280	*LCB*	ADEQ	ADEQ
176	Landfill Road	County Road 6 - to Transfer Station	0.40	49	*G*	ADEQ	ADEQ
126	Lynch's Rock Road	Douro 5th Line - Douro 3rd Line	2.80	177	*G*	ADEQ	ADEQ
092	Maryvale Road	County Road 4 - North Limit	0.40	116	*LCB*	ADEQ	ADEQ
001	McCrackens Landing	County Road 6 - North Limit (Stoney Lake)	1.70	501	*LCB*	ADEQ	ADEQ
072	McNaughton Drive	County Road 6 - McNaughton Lane	0.40	49	*G*	ADEQ	ADEQ
071	McNaughton Lane	McNaughton Drive - North Limit	0.20	49	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
027	Mill Line Road	Bridge - East Limit	1.70	120	*G*	ADEQ	ADEQ
026	Mill Line Road	County Road 40 - Bridge (East End)	1.30	120	*G*	ADEQ	ADEQ
102	Moodie Drive	Stenner Road - East Limit	0.80	90	*LCB*	ADEQ	ADEQ
146	Nassau Road	9th Line - County Road 4	2.90	400	*LCB*	ADEQ	ADEQ
050	Oke Road	County Road 4 - Payne Line Road	1.40	60	*G*	ADEQ	ADEQ
159	Old Douro Road	Highway 28 (formerly Highway 134) - County Road 8	0.50	49	*G*	ADEQ	ADEQ
170	Old Highway 28	South Beach Road - North Limit	0.30	49	*LCB*	ADEQ	ADEQ
091	Orchard Crescent	Donwood Drive - Hillview Avenue	0.40	49	*LCB*	ADEQ	ADEQ
051	Payne Line Road	Oke Road - County Road 4	2.00	168	*G*	ADEQ	ADEQ
081	Plati Avenue	Kingsdale - Television Road	0.50	270	*LCB*	ADEQ	ADEQ
066	Rock Road	Cooper Road - Douglas	2.00	160	*LCB*	ADEQ	ADEQ
067	Rock Road	Rock Road - Douglas Road	0.50	160	*LCB*	ADEQ	ADEQ
053	Rock Road	South Street - Douglas	1.70	353	*LCB*	ADEQ	ADEQ
085	Roxton Road	Kingsdale Drive - East Limit	0.10	49	*LCB*	ADEQ	ADEQ
056	Rusaw Lane	County Road 40 - West Limit	1.40	49	*G*	ADEQ	ADEQ

Sect. No.	Road Name	From	Length (km)	AADT	Existing Surface Type	Surface Type Need	Surface Width Need
068	Sawmill Road	3rd Line Dummer - 4th Line Dummer	2.30	209	*LCB*	ADEQ	ADEQ
025	Simpson Road	12th Line - East Limit	0.90	100	*G*	ADEQ	ADEQ
074	South Bay Road	County Road 6 - North Limit	1.00	100	*LCB*	ADEQ	ADEQ
109	South Beach Road	Highway 28 - East Limit	0.60	127	*LCB*	ADEQ	ADEQ
100	Stenner Road	Highway 28 - North Limit	0.50	150	*LCB*	ADEQ	ADEQ
122	Strickland Road	Highway 28 (formerly Highway 134) - Douro 5th Line	1.20	316	*LCB*	ADEQ	ADEQ
211	Television Road	County Road 4 - North Limit	1.22	1096	*HCB*	ADEQ	ADEQ
108	Thelgar Road	Highway 28 - West Limit	0.30	49	*LCB*	ADEQ	ADEQ
209	Unnamed Road	McCracken's Landing Road - East Limit	0.10	49	*G*	ADEQ	ADEQ
088	Valleyview Avenue	Highland Avenue - County Road 4	0.20	49	*LCB*	ADEQ	ADEQ
020	Webster Road	County Road 40 - 10th Line South Dummer	1.30	60	*G*	ADEQ	ADEQ
029	Webster Road	County Road 40 - County Road 8 (5th Line Road South Dummer)	5.60	390	*LCB*	ADEQ	ADEQ