



## THE CORPORATION OF THE TOWNSHIP OF CHISHOLM

### Municipal Network Asset Management Assessment Project Final Report

In September of 2021 the township was approved for a grant from the Federation of Canadian Municipalities (FCM) for the Municipal Network Asset Management Assessment Project.

The Township of Chisholm collaborated with the Municipalities of Powassan and East Ferris to put together a proposal for the funding. The benefits of doing a collaborative project were the economy of scale for the majority of the proposed work. The three municipalities worked together in preparing RFP documents for services such as Road Assessments and Road Needs Study. This allowed us to be more appealing for service providers, reduce mobilization costs and receive more competitive quotes.

As part of being a collaboration with other municipalities, the cost share split was 90% FCM funding and 10% municipal contribution.

The primary scope of the project for the Township of Chisholm included:

- 1) Collecting data on the condition of all 120.2 km of roads – including both hard surfaced and gravel
- 2) Implement custom pavement management software and visualization in a secure web-based application
- 3) Complete Road Need Study

The outcomes include:

- 1) StreetScan travelled all of the hard surfaced roads and assigned a condition index
- 2) StreetLogix software incorporated the data from StreetScan
- 3) Roads Needs Study completed by WSP Canada Inc.
- 4) Gravel Road conditions are being added to the StreetLogix software from the Road Needs Study
- 5) StreetLogix will allow us to better prioritize our roads and help where we should be putting our resources

The project was delayed due to COVID and staffing shortages with some of the consultants and third-party contractors.

If anyone has any questions pertaining to this report, please direct them to the Municipal Office at 705-724-3526 or email [info@chisholm.ca](mailto:info@chisholm.ca)

***Please find attached, as appendix A, the '2022 Road Needs Study' from WSP Canada Inc.***

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The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them."

# APPENDIX A



**REPORT**

**2022 Road Needs Study**

*RFPQ22-01*

Submitted to:

**The Township of Chisholm**

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Submitted by:

**WSP Canada Inc.**

Project No. 2252020 (3000)

June 12, 2023



## Distribution List

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## EXECUTIVE SUMMARY

This report presents the results of a Road Needs Study (Study) carried out for Township of Chisholm (Township) in June 2022. The purpose of the Study is to update the Township's roads asset database to provide the basis for optimal management of its road network. Visual condition surveys were carried out on the Township's gravel roadways in accordance with current Ministry of Transportation Ontario (MTO) practices. Pavement Condition Indices (PCIs) were assigned to each gravel roadway segment evaluated in June 2022, and PCIs of paved roadway segments were provided by the Township which was assessed in 2021. Analysis of the Township's road assets was carried out in this Study and including gravel, surface-treated, and hot-mix asphalt road surfaces. Three 10-year capital plans were developed using Decision Optimization Technology (DOT™) software. The resulting capital plans include forecasted timelines for recommended preventative maintenance and rehabilitation strategies for each road section.

A total of 92 km of gravel roads were assessed in June 2022. The breakdown of road surface types with average condition ratings is provided in Table 1. The overall average Pavement Condition Index (PCI) of the Township of Chisholm's road network is estimated at 64 out of a possible 100, indicating a rating described as "Good".

**Table 1: Summary of Road Network by Surface Type**

Surface Type	Length (km)	Percentage	PCI	PCI Description
Hot Mix Asphalt	2.4	2.0	36	Poor
Surface Treated	22.6	19.3	82	Excellent
Gravel	92.1	78.7	60	Good

The three capital plan scenarios have different optimized outcomes for the overall road network condition over the analysis period. The first scenario, with a fixed annual budget of \$150K for paved roads and \$150K for gravel roads, shows decrease in performance (PCI 53) at year 10 of the analysis. The second scenario with a targeted condition of Excellent in three years requires a capital budget of \$3.9 Million in three years (2023-2025) totalling \$8.1 Millions by 2032. The third optimized scenario targeted Excellent condition by end of 10-year period requires an annual budget ranging between \$375K and \$1.5 Million.

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## 1.0 BACKGROUND AND METHODOLOGY

The Township of Chisholm (Township) retained Golder Associates Ltd., a member of WSP, (WSP GOLDER), to carry out a Road Needs Study (Study) in June 2022. The purpose of this Study report is to assess the condition of Township's roads asset and to provide the Township with the timing and estimates for major and minor rehabilitation strategies for 1 to 10 year horizons (2023-2032). Visual pavement condition surveys were carried out on all the Township's gravel roadways in accordance with current Ministry of Transportation Ontario (MTO) practices.

A Pavement Condition Index (PCI) was assigned to each gravel roadway segment based on a riding condition rating (RCR) and type, severity, and extent of distresses referred to as Distress Manifestation Index (DMI). The PCIs for Hot-Mix-Asphalt and Surface Treated roads were previously estimated in 2021 by StreetScan and provided to WSP GOLDER to be included in the analysis of this Study. The PCIs, along with other road network information such as road type (i.e., asphalt, surface treated, gravel, etc.), road lengths and widths, annual average daily traffic (AADT), road environment classifications (i.e., urban, rural, semi-urban), Minimum Maintenance Standard (MMS) Class, etc. are entered into the Decision Optimization Technology (DOT) Roads software to develop optimized rehabilitation treatments. Three optimization scenarios with resulting short-term (1-5 years) and long-term (6-10 years) capital plans were developed to include forecasted timelines for appropriate preventative maintenance and rehabilitation treatments for the road network.

This report should be read in conjunction with "*Important Information and Limitations of This Report*" included in **Appendix A**. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

### 1.1 Background Review

The Township provided WSP GOLDER the following roads database to support the completion of this Study:

- Road Network Inventory in Shapefile;

WSP GOLDER communicated with the Township project team upon reviewing the database to revise the road inventory attributes, including unassumed road segments, widths, shared roads, road class, and AADT (where applicable).

### 1.2 Condition Assessment Methodology

The pavement condition assessment, which identified the extent and severity of each specific distress type, was carried out based on MTO methods for the appropriate surface type, as listed in the following references:

- Inventory Manual for Municipal Transportation Networks (Inventory Manual for Municipal Roads, 1991);
- For surface-treated pavements – Chong, G.J., Phang, W.A., and Wrong, G.A. 1989. Manual for Condition Rating of Surface-Treated Pavements, Distress Manifestations, SP-021, Downsview, Ontario: Research and Development Branch, Ministry of Transportation of Ontario;
- For municipal asphalt pavements – Chong, G.J., Phang, W.A., and Wrong, G.A. 1989. Flexible Pavement Condition Rating, Guidelines for Municipalities, SP-022, Downsview, Ontario: Research and Development Branch, Ministry of Transportation of Ontario; and



- For gravel surface roads – Chong, G.J., Phang, W.A., and Wrong, G.A., 1989. Manual for Condition Rating of Gravel Surface Roads, SP-025, Downsview, Ontario: Research and Development Branch, Ministry of Transportation of Ontario.

## 2.0 FIELD PAVEMENT CONDITION SURVEY

In June 2022, WSP GOLDER completed visual condition assessment to all gravel roadway segments provided by the Township. Field crew collected the data using digital MTO forms built in computer-tablet. A copy of the assessment form is illustrated in Figure 1.

**GRAVEL SURFACE PCI CALCULATION FORM (MTO SP-025)**

Road No. (Street) **QUELETTE ROAD** From **BIG MOOSE ROAD** To **QUAE-QUAE ROAD**

Section ID **147,117** Survey Date **01-Mar-23** Traffic Direction **B**

Project No. **22520202** Length (m) **2065** Municipality **East Ferris** Shoulder Width (m) **0**

Riding Condition Index (RCI) **6.0** Road width (m) **5.5** Surface Type (m) **Gravel** Evaluated by **MSM/ARS**

Riding Condition Rating (At Posted Speed)

Severity of Distress	Density of Distress %	Distress Manifestation Index (DMI)	Pavement Condition Index (PCI)
Slight	+25	3.0	12.0
Moderate	25-45	0.5	
Severe	+50	3.0	12.0
Intermittent		1.0	
Frequent		3.0	15.0
Extensive		2.0	
		1.0	3.0
		0.5	
		2.0	1.5
		1.0	
<b>SCORE</b>			<b>47.5</b>

**Section PCI**

**51**

**PCI = 51**

Calculated by: **MSM/ARS** Reviewed by: **Mo**

Figure 1: MTO Condition Assessment Form (Gravel Surface)

### 2.1 Surface Distress

The density and severity of the distresses were identified and recorded for each gravel roadway segment. The types of typical surface distresses on asphalt/surface treated, and gravel roadways are recorded as Distress Manifestation Index (DMI) according to the MTO manuals.

### 2.2 Riding Condition Rating (RCR)

RCR value was assigned to all road segments while driving at the posted speed limit. RCR is rated on a scale from 1 to 10, 1 being very poor and 10 being excellent; a breakdown is shown in Table 2, in accordance with MTO guidelines. RCR values for all gravel road segments assessed in this Study are illustrated in **Appendix B – 2022 Road Inventory**.

**Table 2: Riding Condition Rating Scale**

RCR	Description of Pavement Section
0-2	Very Poor – Uncomfortable ride with constant bumps and depressions. Cannot maintain posted speed and must steer clear constantly to avoid bumps and depressions
2-5	Poor – Uncomfortable ride with frequent bumps and depressions
5-7	Fair – Still comfortable ride with intermittent bumps and depressions
7-9	Good – Smooth ride with just a few bumps and depressions
9-10	Excellent – Very smooth ride

### 2.3 Pavement Condition Index (PCI)

A Pavement Condition Index (PCI) was calculated based on Riding Condition Rating (RCR) and the Distress Manifestation Index (DMI). The PCI is rated on a scale from 0 to 100, 0 being very poor and 100 being very good. Table 3 shows a breakdown of PCI values and associated typical pavement descriptions, in accordance with MTO guidelines.

**Table 3: PCI Descriptions**

PCI	Description of Condition Rating
80 to 100	Excellent
60 to <80	Good
40 to <60	Fair
20 to <40	Poor
0 to <20	Very Poor

### 3.0 PAVMENT CONDITION

The overall average condition of the Township’s road network, including gravel, surface-treated, and hot-mix-asphalt road surface, were estimated at PCI of 61 described as “Good”. The average PCI are weighted on linear kilometer of road network. The Township’s Road Inventory with Pavement Condition Indices is provided in **Appendix B**. A schematic road network map showing PCI condition ratings of all road segments assessed in this Study is included in **Appendix C**.

A breakdown of the conditions and corresponding lengths are presented in Tables 4. The overall average condition rating based on surface type and functional class is presented in Table 5 and on Figures 1 and 2.

**Table 4: Summary of PCI Based on Road Network Length**

Condition	Length (km)	Percentage
Poor	6.1	5.2
Fair	27.6	23.6
Good	68.7	58.7
Excellent	14.7	12.6
<b>Total</b>	<b>107.8</b>	<b>100</b>

**Table 5: Average PCI by Surface Type**

Surface Type	Average PCI	PCI Description
Hot Mix Asphalt	36	Good
Surface Treated	82	Excellent
Gravel	60	Fair

## 4.0 DATA ANALYSIS AND CAPITAL PLAN

The Decision Optimization Technology (DOT) Roads software was used to facilitate preventative maintenance and rehabilitation budgeting by predicting the deterioration of pavement segments based on a wide range of pavement deterioration curves. Additionally, extensive decision trees, performance models, cost models, life cycle gain, and condition improvement matrices covering a wide spectrum of road classifications were used. The modeling capability of the DOT Roads program is based on traffic, surface type, roadside environment class, functional class, and Minimum Maintenance Standard (MMS) class.

Utilizing a capital planning tool such as DOT Roads with optimization capability can maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon. It can provide the Municipality with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. It also maximizes the value achieved for the money invested.

**It should be noted that the DOT software operates at the *network* level, rather than the *project* level. As such, the lists of projects programmed for each year in the capital plans are intended for budgeting purposes only and do not eliminate the need for further detailed project-level investigations and subsequent closer budgeting of the projects at the detailed design stage.**

Three optimization scenarios were analysed based on project's annual budgets specified by the Township, as follows:

- 1) Impact of Current Annual Budget.
- 2) Targeted Excellent Condition in Short-term (by 2025).
- 3) Targeted Excellent Condition in Long-term (by 2032).

Unit costs for preventative maintenance and rehabilitation treatments were recommended by WSP Golder and revised by the Township's project team (listed in Table 6), which were used in DOT Roads software for the optimization analysis. This typical unit cost includes labour, material, and equipment for each treatment specified below.

**Table 6: Proposed Treatment Options with Unit Costs**

Treatment Code	Description	Cost
<b>Hot Mix Asphalt Roads</b>		<b>\$/m<sup>2</sup></b>
HMA-Crack Seal	Crack Sealing	1.25*
HMA-Ovly	One Lift Overlay	25.50
HMA-2Ovly	Two Lift Overlay	52.00
HMA-EnhSurf	HMA - Enhanced Thin Surfacing (Micro-surfacing)	5.50
HMA-Recon FDR & 60HMA	HMA - Full Depth Reconstruction (150 Gran A, 60 HMA)	42.96
HMA-Recon FDR & 100HMA	HMA - Full Depth Reconstruction (150 Gran A, 100 HMA)	64.36
<b>Surface Treated Roads</b>		<b>\$/m<sup>2</sup></b>
ST-Slurry	Slurry Seal	4.25
ST-SST	ST-Single Surface Treatment (Chip Seal)	4.50
ST-EnhSurf	ST - Enhanced Thin Surfacing (Micro-surfacing)	5.50
ST-DST	ST - Double Surface Treatment (Chip Seal)	9.00
ST-DST SAMI	ST - Double Surface Treatment (Chip Seal) & SAMI	11.50
ST-FDR & DST	Full Depth Reclamation + 100 Gran A + Double Surface Treatment	18.86
ST-FDR & DST & SAMI	Full Depth Reclamation + 100 Gran A + Double Surface Treatment + SAMI	21.36
<b>Gravel Roads</b>		<b>\$/km</b>
Re-Gravelling (25 mm)	Re-Gavelling (25 mm or 1 in)	9,547.50
Rehabilitation	Rehabilitation	57,285.00

\*\$1.25 per meter.

Additional details on the road network overview are provided in **Appendix D**.

## 4.1 Analysis Results

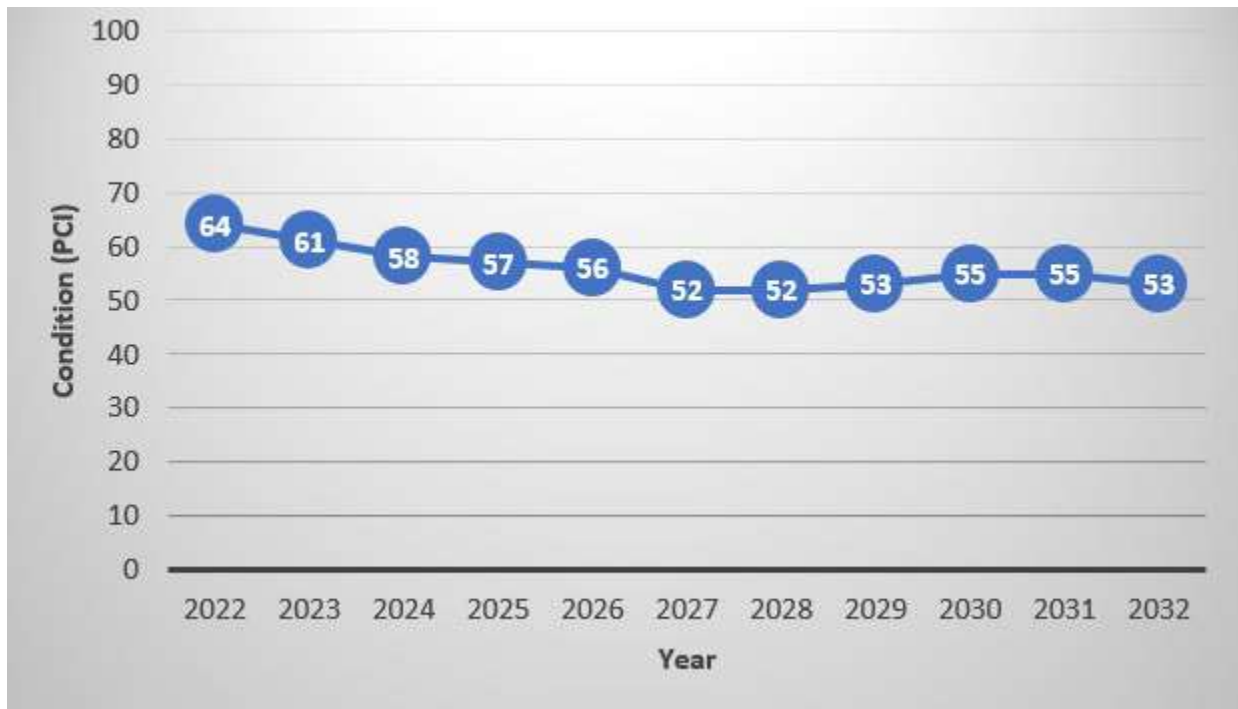
The recommended treatment options to be carried out over the analysis period consist primarily of full depth reclamation and double surface treatment for paved roads and re-gravelling for gravel roads.

The following sections present the predicted performance of the Township's Road network in terms of PCI over the analysis period of 10 years. The first scenario, with a fixed annual budget of \$150K for paved roads and

\$150K for gravel roads, shows decrease in performance (PCI 53) at year 10 of the analysis. The second scenario with a targeted condition of Excellent in three years requires a capital budget of \$3.9 Million in three years (2023-2025) totalling \$8.1 Millions by 2032. The third optimized scenario targeted Excellent condition by end of 10-year period requires an annual budget ranging between \$375K and \$1.5 Million.

**4.1.1 Scenario 1 – Impact of Current Budget**

The yearly predicted performance results for an annual budget of \$150K for Paved roads and \$150K for Gravel roads with 3% annual inflation are shown in Figure 2 and Table 7. Due to insufficient funding, a decrease in overall network performance resulted from this scenario delivering a PCI of 53 by year 10 of the analysis. Additional details regarding Scenario 1, as well as the associated capital plans, are provided in **Appendix E**.



**Figure 2: Scenario 1 - Network Performance (PCI) Over 10-Year Analysis Period**

**Table 7: Scenario 1 - Network Performance (PCI) and Capital Budget**

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Performance (PCI)	64	61	58	57	56	52	52	53	55	55	53
Capital Budget (\$K)	-	295.1	291.6	285.3	329.7	296.8	329.0	322.5	312.9	312.8	382.4

### 4.1.2 Scenario 2 – Targeted Excellent Condition by 2025

In order to improve all the Township’s road network to Excellent Condition in the short term (in the year 2025), a total expenditure of \$3.8 Million in three years is required. The results of this scenario are shown in Figure 3 and Table 8. Additional details regarding Scenario 2, as well as the associated capital plans, are given in **Appendix F**.

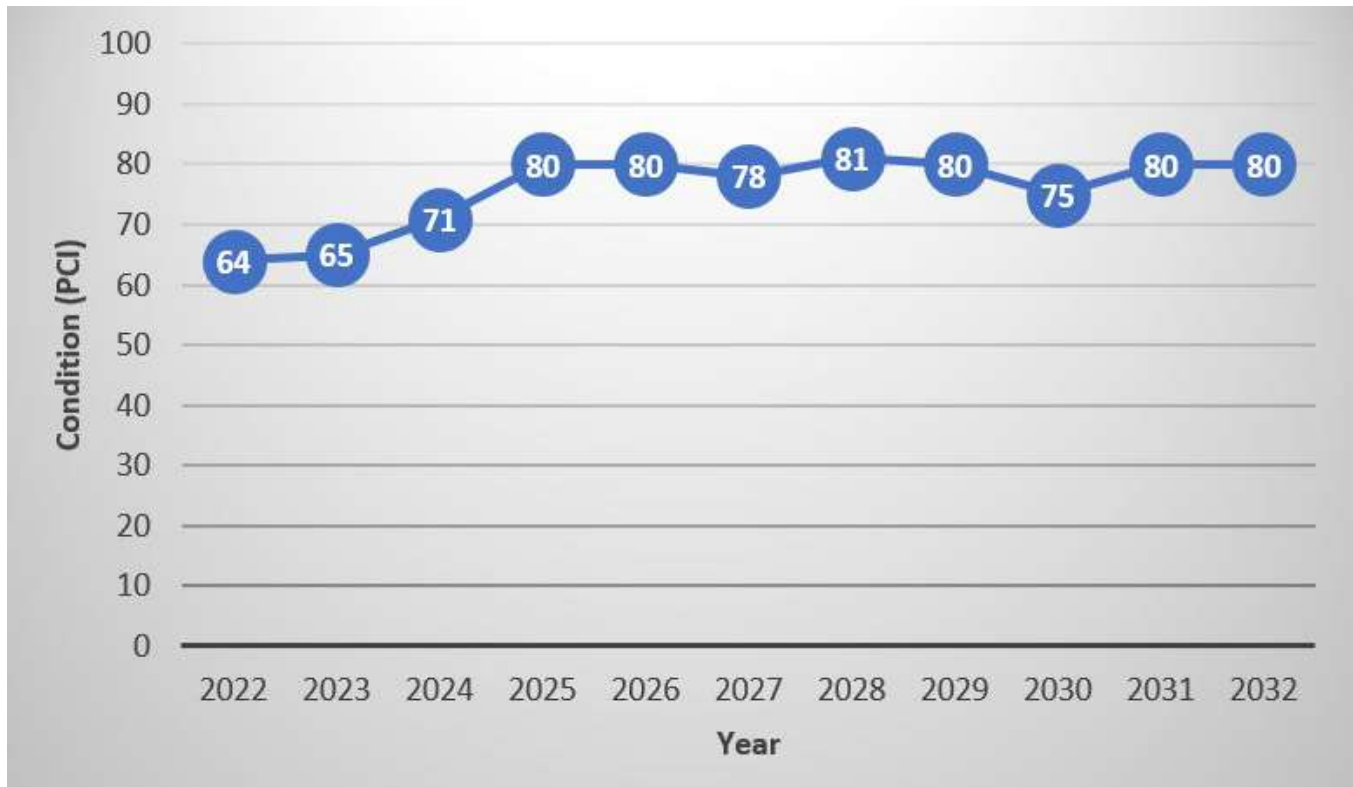


Figure 3: Scenario 2 - Network Performance (PCI) Over 10-Year Analysis Period

Table 8: Scenario 2 - Network Performance (PCI) and Capital Budget

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Performance (PCI)	64	65	71	80	80	78	81	80	75	80	80
Capital Budget (\$K)	-	1279.2	926.2	1603.4	897.9	657.5	359.8	503.7	448.0	885.3	584.7

### 4.1.3 Scenario 3 – Targeted Excellent Condition by 2032

In order to improve the Township roads to Excellent Condition by the end of the 10-year period, an annual expenditure ranging from \$371K to \$1.5M (a total of \$7.6 Million in 10 years) is required. The results of this scenario are shown in Figure 4 and Table 9. Additional details regarding Scenario 3, as well as the associated capital plans, are given in **Appendix G**.

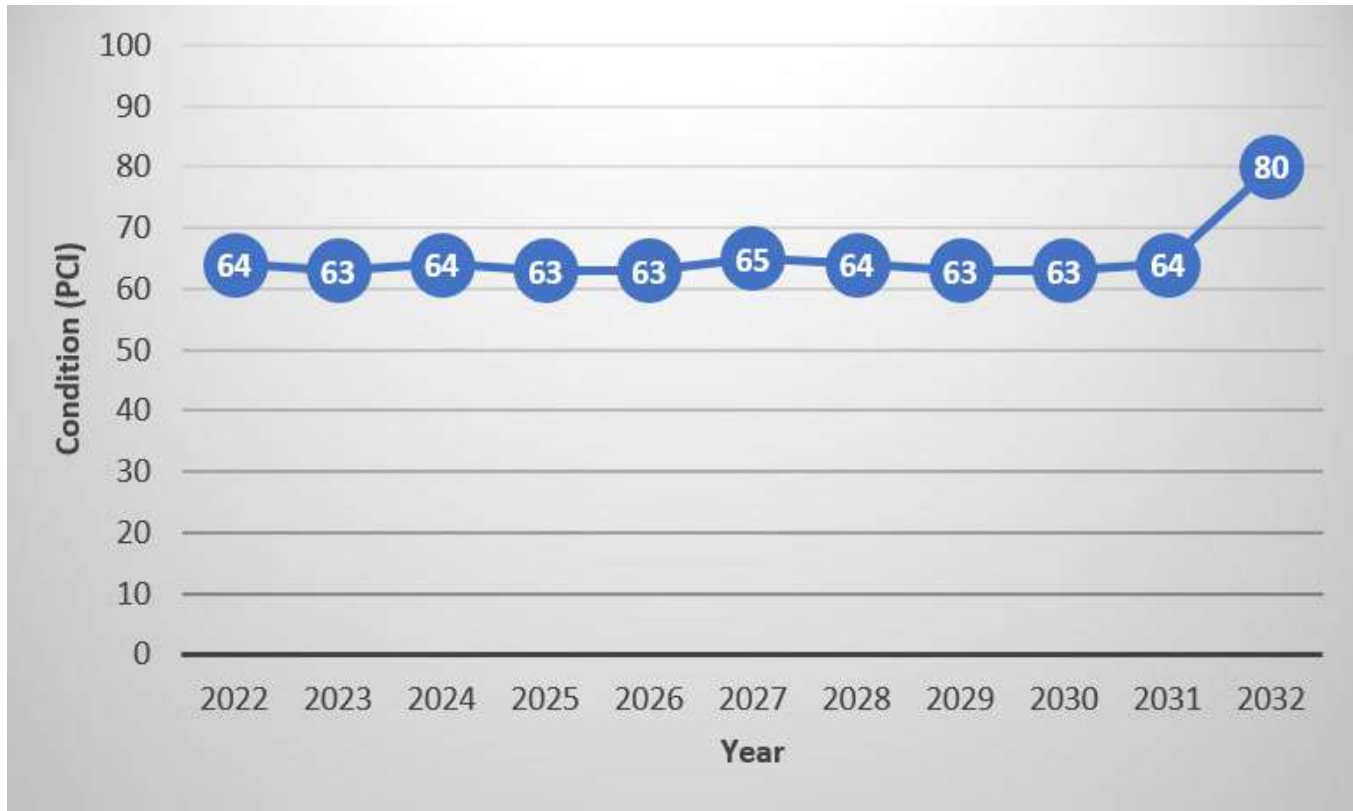


Figure 4: Scenario 3 - Network Performance (PCI) Over 10-Year Analysis Period

Table 9: Scenario 3 - Network Performance (PCI) and Capital Budget

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Performance (PCI)	64	63	64	63	63	65	64	63	63	64	80
Capital Budget (\$K)	-	484.4	664.2	541.0	887.6	1537.9	371.0	642.1	579.4	925.3	1028.6

## 4.2 DOT SOFTWARE UTILIZATION

The optimization analysis utilizing the DOT software was provided as part of this Road Needs Study. Ongoing use of the DOT software is available to the Township at additional cost and can be facilitated through Infrastructure Solutions Inc. (ISI) directly.

### 4.3 Maintenance and rehabilitation treatments

The recommended road improvement strategies are included in the capital plans in Appendices E, F, and G for the three scenarios. The treatment recommendations in the capital plans are listed by road section ID, with start and end location, length of section, suggested treatment (in short form) and budgeted cost. A brief description and the short forms and corresponding full names of the treatments are provided in **Appendix H**.

Typically, there are three categories of treatment types that are applied to roads at different PCI values, as summarized below.

**Preventative Maintenance** – Various maintenance treatments (such as crack sealing, slurry seal, enhanced thin surfacings, etc.) are applied to the pavement surface typically when the pavements are in fairly good to excellent condition (for example, PCI values between 65 and 90), to extend the serviceable life and delay the need for more costly rehabilitation or reconstruction.

**Minor and Major Rehabilitation** – More extensive reactive maintenance or rehabilitation is applied to pavements that have deteriorated to a point where overlays or localized full depth repairs are required (for example, PCI values between 40 and 65), to delay the need for more extensive and costly reconstruction.

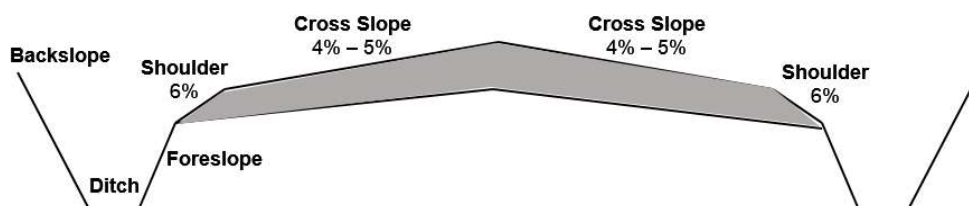
**Reconstruction** – Once the PCI reaches a threshold value (for example, PCI of 40), the pavement structure may require full reconstruction to support traffic over the next 15 or 20 years. Once the pavement is in poor condition, rehabilitation strategies such as resurfacing are no longer cost effective or appropriate.

## 5.0 KEY CONSIDERATIONS FOR GRAVEL ROAD MAINTENANCE

This section discusses general guidelines and recommendations for utilizing best maintenance practices and management concepts for gravel roads.

### 5.1 Building a Proper Cross Section

Building a proper cross section is the primary objective of gravel road maintenance operations. A properly shaped cross section with adequate crown and shoulder cross slope (crossfalls) drain water away from the pavement structure and extends its service life. A typical crossfall for the traveled lanes is between 4% and 5%. The crossfall deteriorates over time and reaches a point at which it no longer sheds water and deteriorates more quickly. Without adequate crossfall, water accumulates on the road surface and softens the crust and penetrates into the subgrade. A typical gravel road cross fall is shown in Figure 5.



**Figure 5: A typical gravel road cross section**

Inadequate crowns can quickly result in surface distresses such as potholes, rutting, or deformation, especially under heavy traffic loading. Many studies show that the poor performance of gravel roads can be attributed mostly to a lack of crossfall and inadequate surface drainage, even in semi-arid regions. Excessive crowns (i.e.,



crossfalls over 6%) are not recommended due to safety issues. Excessive crowns can cause loss of control while driving and encourage road users to drive in the middle of the road regardless of the surface width.

A gravel road cross section should also be adjusted at curves to provide adequate superelevation. By raising the outer edge of a curve on the road above the inner edge, a superelevation reduces the effect of centrifugal force on vehicles and provides better control while turning. Lack of superelevation or improper transition from a crown to a superelevation can become a safety hazard and increases the risk of accident. During maintenance operations, the grader operator should build a gradual transition from a crowned surface to a straight superelevated surface.

Typical lane widths for a gravel road are 3.5 m but can vary from 3.0 m to 3.7 m. Shoulders are graded at around 6% to provide adequate drainage by directing water further from the road surface down the foreslope and into the ditch. Frequently, gravel roads might not have defined shoulders. Road shoulders should be kept at the same level as the edge of the road surface. Sudden drop-offs can lead to safety hazards, while high shoulders prevent water from draining off the road surface into the ditch. High shoulders can result in a secondary ditch along the side of the road that erodes gravel material and subgrade soil resulting in various defects. High shoulders are usually the result of poor maintenance practices.

Ditches are also important to drain water away from the roadway subgrade. Ditches must extend to below the top of the subgrade and require periodic cleaning to remove debris, vegetation, or excess gravel material migrating from the road surface. Similar to ditches, culverts should be maintained periodically to ensure there is no obstruction to prevent the natural flow of water under the road and to ensure that the culverts are not perforated, crushed, or distorted. Care should be taken during maintenance and installation of culverts to ensure proper inlet/outlet elevations and alignment with the flow line of the ditch are achieved to avoid any washout or erosion around the outlets.

## 5.2 Materials for Use

While many agencies use granular road base materials for surfacing on gravel roads, it is not necessarily the ideal material for use in terms of serviceability and maintenance. Road base granular materials are designed to have high structural capacity as well as good drainage characteristics. While structural capacity is also good for a gravel road, the free draining nature of the surfacing is not necessarily an advantage.

Construction granulars can be pit run, produced from a quarry source (in which case they will be 100% crushed), or a partially crushed pit source material (partly crushed). The crushed content of an aggregate improves its structural capacity since the roughly crushed faces provide better granular interlock compared to rounded particles. Crushed products are preferred for gravel roads. Irrespective of the percentage of crushed particles, the particles themselves must be hard and durable. A good test for this is the MicroDeval test. Road surfacing gravels should have maximum MicroDeval losses on the coarse fraction of less than 25%.

Most granular road base materials allow 15 to 20% of coarse material larger than 19 mm. In general, gravel road surfacing should be 100% finer than 19 mm since it provides a smoother ride quality and is less prone to segregation. It also needs an adequate percentage of sand sizes to fill the voids. Typical granular bases will have 45 to 70% passing the 4.75 mm sieve. The sand sizes should be at the higher end of this range for gravel road surfacing.

There is a lot of practical experience that indicates that surfacing gravels with a higher percentage of fines (material finer than 0.075 mm) perform better. For road base granular materials, the fines are usually restricted to

8 to 10% maximum, so as to not impede drainage. However, many agencies prefer fines content up to 15% for surfacing gravels. They will also allow the materials to have Plasticity Indices of 4 to 12%, while for most road base granular materials, the fines are required to be non-plastic. In a road surfacing application, the higher fines content binds the material and allows a crust to form on the surface, reducing material loss.

Some agencies also allow the addition of Recycled Asphalt Products (RAP) in road surfacing granulars. With the increasing use of cold milling for road maintenance, large volumes of RAP are readily available. In general, the addition of RAP should not be greater than 30%, since, above that, the material may no longer be “unbound” and so maintenance regrading activities become more problematic.

### 5.3 Proper Grading Operation

Several studies have been published on proper grading techniques. This section does not provide a detailed review of proper grading techniques; however, some of the main issues and considerations are discussed. Operating speed should be slow enough to avoid bouncing and the creation of cut depressions on the road surface. A speed range of 5 to 10 km per hour is typically recommended; however, factors such as the quality of material, moisture, or subgrade strength can affect the proper operating speed. Operators should maintain a proper blade angle, typically between 35 to 45 degrees, during the grading maintenance to recover material and avoid spilling from the toes of the blade. It is also important to use a proper blade pitch to achieve proper mix and avoid material loss. Excessive backward pitch can result in poor mixing action and also high shoulders. Excessive forward pitch, on the other hand, may result in poor mix and lack of enough penetration to remove surface defects and may not create a smooth ride quality. A proper blade pitch and angle result in a good mixing action with enough penetration to fix surface defects with minimum material loss during the grading operation.

### 5.4 Dust Control

Gravel roads give off dust under traffic action. The amount of dust generation can be affected by factors such as gravel material properties, the percentage of fines, annual precipitation, and the level of daily traffic. Excessive dust from gravel roads can cause health issues, poor air quality to nearby residents, environmental damage, and also increase the risk of accidents. The most common dust suppressants are calcium chloride and magnesium chloride. These are typically applied in liquid form from a tanker with a spray bar. Calcium chloride draws moisture from the air resulting in a damped road surface that reduces the amount of dust generation. Proper dust control can also reduce gravel loss and required grading maintenance cycles. For effective dust control operations, gravel roads should have optimum moisture to allow for complete absorption of the dust suppressant.

### 5.5 Gravel Road Treatments

A practical condition rating scheme for gravel roads was developed by MTO based on evaluating conditions under a set of distress modes in conjunction with an evaluation of the ride quality. This produces an estimate of PCI. A distress manifestation index is calculated from the evaluation of the road condition under eight distress modes, as listed in Table 10. A range of maintenance treatments can then be assigned based on the PCI and major distress types as shown in Table 11.

A such systematic approach for condition assessment of gravel roads provides consistent and representative condition ratings and identifies the predominant surface defects while performing a network-level analysis. It also allows the identification of any underlying conditions that decrease the effectiveness of routine maintenance.

**Table 10: Gravel Roads Distress Manifestation (MTO 1989)**

Distress Mode	Distress Type
<b>Surface Defects</b>	Loose Gravel
	Dust
	Potholes
	Break-up
<b>Surface Deformation</b>	Washboarding
	Rutting
	Flat / Reverse Crown
	Distortion

**Table 11: Example of Using PCI data to determine proper maintenance treatment actions**

PCI Range	Treatment
80-100	Routine maintenance
60-79	Routine maintenance. Dust control may be necessary for residential areas.
40-59	Increased routine maintenance necessary. Addition of gravel and dust control additives become necessary.
20-39	Maintenance with addition of gravel necessary. Dust control a must for residential areas. Some portions may need rehabilitation.
0-19	Rehabilitation necessary.

## 6.0 PROJECT LEVEL INVESTIGATION

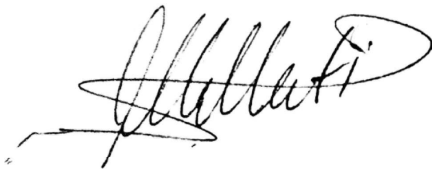
As discussed in Section 4.0, this network level survey is sufficient for capital planning purposes but does not absolve the Township from carrying out project level analysis to refine the rehabilitation recommendations produced herein. Upon approval of the 10-year capital plan, WSP GOLDER is also available to provide project level support for annual rehabilitation, and capital road works programs. Our experienced pavement and geotechnical engineers have provided rehabilitation recommendations to all tiers of government across Canada with the intention of providing an improved level of service while meeting the needs of the capital plan and annual budget. Further, at the detailed project level, new pavement materials and construction technologies or technologies not considered during the capital planning analysis can be considered to further optimize the rehabilitation strategy.

## 7.0 CLOSING

We trust the information provided in this report satisfies your needs. We will be pleased to assist further with respect to developing specific annual maintenance plans based on the results of this study, if required. It is recommended that the pavement condition surveys be updated every three years. Please do not hesitate to contact the undersigned if you have further questions.

## Signature Page

**WSP Canada Inc.**



Mohamed S. Maslati  
*Pavement and Materials Engineer-in-Training*



Ahmed R. Suleiman, MEng., Ph.D.  
*Pavement and Materials Specialist*

MSM/ARS/msm/ljv

[https://golderassociates.sharepoint.com/sites/160328/project files/6 deliverables/3000 chisholm ms report/22520202 \(3000\) rep reva 2023'06'12 chisholm ms - final report.docx](https://golderassociates.sharepoint.com/sites/160328/project%20files/6%20deliverables/3000%20chisholm%20ms%20report/22520202%20(3000)%20rep%20rev%202023%2006%2012%20chisholm%20ms%20-%20final%20report.docx)

**APPENDIX A**

**Important Information and  
Limitations of This Report.**

**Standard of Care:** Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

**Basis and Use of the Report:** This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

**Soil, Rock and Ground Water Conditions:** Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

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Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

**Sample Disposal:** Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

**Follow-Up and Construction Services:** All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

**Changed Conditions and Drainage:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



**APPENDIX B**

**2022 Road Inventory**

**Township of Chisholm  
Road Inventory - 2022 Road Needs Study**

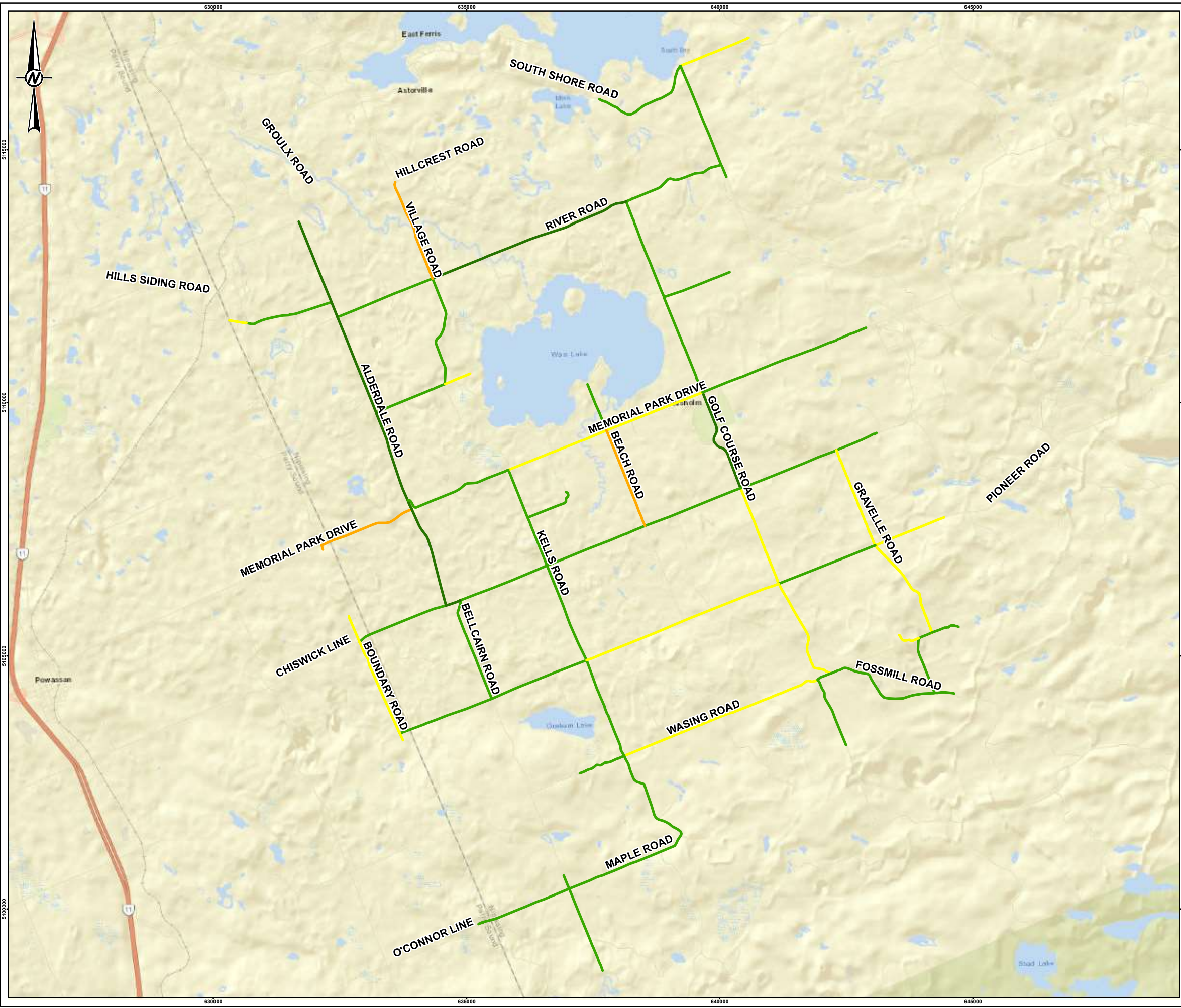
Section ID	Road Name	From	To	Section Length (m)	Surface Type	AADT	AADT Year	Road Class	Functional Class	Roadside Environment	Boundary Road	Platform Width (m)	Surface Width (m)	Shoulder Width (m)	Pavement Condition Index
1944014703	ALDERDALE RD	Grahamvale Road	River Road	2040	LCB	409	2003	5	Collector	R	No	9.7	7.4	1.15	98
1944038730	ALDERDALE RD	Twp Boundary	Hill Siding Road	1720	LCB	320	2003	5	Collector	R	No	9.4	6.8	1.3	98
1944062483	ALDERDALE RD	Hill Siding Road	River Road	310	LCB	320	2003	5	Collector	R	No	9.8	6.8	1.5	98
1944265315	ALDERDALE RD	Grahamvale Road	Memorial Park Drive	1840	LCB	600	2003	4	Minor Arterial	R	No	9.6	7.6	1	92
1944383667	ALDERDALE RD	Memorial Park Drive W	Chiswick Line	2040	LCB	396	2003	5	Collector	R	No	8.7	6.7	1	97
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	HCB	600	2003	4	Minor Arterial	R	No	9.8	7.8	1	88
1944033831	ALGONQUIN RD	Wasing Road	End	1410	Gravel	10	2003	6	Local	R	No	6.8	4.8	1	64
1944010896	BEACH RD	Green Point Road	Memorial Park Drive	980	Gravel	53	2003	5	Local	R	No	7.2	5.2	1	71
1944491434	BEACH RD	Memorial Park Drive	Chiswick Line	2040	Gravel	20	2006	6	Local	R	No	4.5	4	0.25	27
1944135141	BEAR MOUNTAIN RD	Maple Road	End - South	1750	Gravel	10	2003	6	Local	R	No	6.2	4.2	1	72
194446446	BEAR MOUNTAIN RD	Maple Road	End - north	280	Gravel	35	2006	6	Local	R	No	6.2	4.2	1	74
1944215803	BELLCAIRN RD	Chiswick Line	Pioneer Road	2080	Gravel	125	2006	5	Local	R	No	7.2	5.2	1	72
1944473644	BOOTH RD	Golf Course Road	End	1390	Gravel	23	2003	6	Local	R	No	6.2	4.2	1	61
1944004443	BOUNDARY RD	Connession Rd 8	End	110	Gravel	49	2009	6	Local	R	Yes	5.2	4.9	0.25	51
1944025447	BOUNDARY RD	Chiswick Line	End	550	Gravel	49	2009	6	Local	R	Yes	6.2	4.2	1	57
1944113714	BOUNDARY RD	Chiswick Line	Pioneer Road	1980	Gravel	110	2003	5	Local	R	Yes	8	6	1	49
1944462876	BOUNDARY RD	Pioneer Road	Robson Lane/Con 8 Rd.	50	Gravel	49	2006	6	Local	R	Yes	6.8	4.8	1	51
1944392306	CEDAR RD	River Road	End	270	Gravel	23	2003	6	Local	R	No	5	4	0.5	68
1944056279	CHISWICK LINE	Alderdale Road	Bellcairn Road	300	HCB	383	2003	5	Collector	R	No	7.8	5.8	1	98
1944016138	CHISWICK LINE	Boundary Road	Point on Road	20	Gravel	270	2003	5	Collector	R	No	8.2	6.2	1	64
1944016140	CHISWICK LINE	Point On Road	Alderdale Road	1850	Gravel	270	2003	5	Collector	R	No	8.2	6	1.1	64
1944060044	CHISWICK LINE	Kells Road	Beach Road	2090	Gravel	206	2003	5	Collector	R	No	8.4	6	1.2	67
1944072294	CHISWICK LINE	Bell Cairn Road	Kells Road	1850	Gravel	383	2003	5	Collector	R	No	8.6	6	1.3	63
1944138707	CHISWICK LINE	Gravelle Road	End	870	Gravel	56	2003	5	Local	R	No	6.8	4.8	1	62
1944197246	CHISWICK LINE	Beach Road	Golf Course Road	2030	Gravel	206	2003	5	Local	R	No	7.6	5.6	1	60
1944211451	CHISWICK LINE	Golf Course Road	Gravelle Road	2030	Gravel	196	2003	5	Local	R	No	6.8	4.8	1	60
1944143958	CHURCH RD	Kells Road	End	1050	Gravel	49	2006	6	Local	R	No	6.2	4.2	1	64
1944111203	FOSSMILL RD	Golf Course Road	Polarvale Road	2340	Gravel	30	2003	6	Local	R	No	7.4	5.4	1	70
1944352076	FOSSMILL RD	Polarvale Road	End	380	Gravel	30	2006	6	Local	R	No	5.5	4.5	0.5	60
1944004301	GOLF COURSE RD	Memorial Park Drive	Chiswick Line	2130	LCB	480	2003	5	Collector	R	No	8	6	1	93
1944149389	GOLF COURSE RD	Booth Road	Memorial Park Drive	2040	LCB	467	2003	5	Collector	R	No	8.8	6.8	1	78
1944246973	GOLF COURSE RD	River Road	Booth Road	2030	LCB	467	2003	5	Collector	R	No	8.7	6.7	1	75
1944088221	GOLF COURSE RD	Chiswick Line	Pioneer Road	2030	Gravel	166	2003	5	Local	R	No	7.2	5.2	1	52
1944119614	GOLF COURSE RD	Pioneer Road	Wasing Road	2210	Gravel	133	2003	5	Local	R	No	7.4	5.4	1	48
1944322935	GRAHAMVALE RD	Village Road	End	530	Gravel	49	2006	6	Local	R	No	5.4	4.4	0.5	59
1944332342	GRAHAMVALE RD	Alderdale Road	Village Road	1470	Gravel	50	2003	5	Local	R	No	6.4	4.4	1	70
1944426653	GRAVELLE RD	Polarvale Road	Pioneer Road	2120	Gravel	40	2003	6	Local	R	No	7	5	1	51
1944463301	GRAVELLE RD	Chiswick Line	Pioneer Road	2030	Gravel	100	2003	5	Local	R	No	7	5	1	55
1944045562	HS SIDING RD	Private Road	Alderdale Road	1750	Gravel	73	2003	5	Local	R	No	6.6	4.6	1	64
1944157935	HS SIDING RD	Twp Boundary	Private Drive	340	Gravel	73	2003	5	Local	R	No	6.6	4.6	1	55
1944049185	KELLS RD	Chiswick Line	Pioneer Road	2020	Gravel	150	2003	5	Local	R	No	7.6	5.6	1	69
1944299070	KELLS RD	Memorial Park Drive	Church Road	1010	Gravel	77	2003	5	Local	R	No	7.2	5.2	1	63
1944397264	KELLS RD	Church Road	Chiswick Line	1030	Gravel	77	2003	5	Local	R	No	7.4	5.4	1	67
1944188657	MAPLE RD	Pioneer Road	Wasing Road	2030	Gravel	157	2003	5	Local	R	No	7.4	5.4	1	63
1944391379	MAPLE RD	Twp Boundary	Bear Mountain Road	1920	Gravel	4	2003	6	Local	R	No	7	5	1	65
1944482458	MAPLE RD	Bear Mountain Road	Wasing Road	4570	Gravel	73	2003	5	Local	R	No	6.6	4.6	1	64
1944321375	MEMORIAL PARK DR	Trapper Road	Alderdale Road	1940	HCB	663	2003	4	Minor Arterial	R	No	11	7	2	21
1944052096	MEMORIAL PARK DR	Kells Road	Memory Lane	20	Gravel	283	2003	5	Collector	R	No	9	7	1	48
1944088977	MEMORIAL PARK DR	Golf Course Road	End	4090	Gravel	100	2003	5	Local	R	No	6.6	4.6	1	67
1944174128	MEMORIAL PARK DR	Beach Road	Golf Course Road	2040	Gravel	177	2003	5	Local	R	No	7.8	5.8	1	59
1944370777	MEMORIAL PARK DR	Memory Lane	Green Point Road	940	Gravel	283	2003	5	Collector	R	No	7.2	5.2	1	48
1944402585	MEMORIAL PARK DR	Alderdale Road	Kells Road	2230	LCB	346	2003	5	Collector	R	No	9	7	1	64
1944484008	MEMORIAL PARK DR	Green Point Road	Beach Road	1130	Gravel	283	2003	5	Collector	R	No	7.8	5.8	1	59
1944044863	PIONEER RD	Golf Course Road	Gravelle Road	2050	Gravel	57	2003	5	Local	R	No	7	5	1	66
1944217337	PIONEER RD	Bellcairn Road	Maple Road/Kells Road	2020	Gravel	117	2003	5	Local	R	No	8	6	1	67
1944405674	PIONEER RD	Gravelle Road	End	1330	Gravel	49	2006	6	Local	R	No	7	5	1	52
1944435274	PIONEER RD	Maple Road/Kells Road	Golf Course Road	4090	Gravel	120	2003	5	Local	R	No	7.2	5.2	1	51

**Township of Chisholm  
Road Inventory - 2022 Road Needs Study**

Section ID	Road Name	From	To	Section Length (m)	Surface Type	AADT	AADT Year	Road Class	Functional Class	Roadside Environment	Boundary Road	Platform Width (m)	Surface Width (m)	Shoulder Width (m)	Pavement Condition Index
1944478763	PIONEER RD	Boundry Road	Belcairn Road	1940	Gravel	87	2003	5	Local	R	No	7.6	5.6	1	64
1944189288	POPLARVALE RD	Poplarvale Rd	End	460	Gravel	49	2009	6	Local	R	No	4.5	4	0.25	55
1944214293	POPLARVALE RD	Poplarvale Rd	Gravelle Road	290	Gravel	30	2003	6	Local	R	No	7.2	5.2	1	65
1944478009	POPLARVALE RD	Gravelle Road	End	560	Gravel	30	2006	6	Local	R	No	5	4.5	0.25	75
1944490733	POPLARVALE RD	Fossmill Road	Poplarvale Rd	1140	Gravel	30	2003	6	Local	R	No	6.6	4.6	1	63
1944335170	RIVER RD	Mallard Haven Road	Laporte Road	1940	LCB	443	2003	5	Local	R	No	9	7	1	94
1944383581	RIVER RD	Village Road	Mallard Haven Road	1040	LCB	700	2003	4	Minor Arterial	R	No	9	7	1	81
1944385205	RIVER RD	Laporte Road	Golf Course Road	1150	LCB	443	2003	5	Local	R	No	9	7	1	84
1944008231	RIVER RD	Twp Road to Twp Road	South Shore Road	2100	Gravel	170	2003	5	Local	R	No	7.5	5.5	1	62
1944136872	RIVER RD	Golf Course Road	Twp Road	2070	Gravel	230	2003	5	Local	R	No	7.2	5.2	1	61
1944193803	RIVER RD	Alderdale Road	Village Road	2020	Gravel	230	2003	5	Local	R	No	8.7	6	1.35	65
1944013422	S SHORE RD	River Road	Twp Boundary West	2170	Gravel	166	2003	5	Collector	R	Yes	6.6	4.6	1	63
1944195515	S SHORE RD	River Road	East Twp Limit	1460	Gravel	235	2003	5	Collector	R	Yes	7.6	5.6	1	46
1944016621	TRAPPERS RD	Memorial Park Drive	End	90	Gravel	49	2009	6	Local	R	Yes	5.2	4.9	0.25	37
1944342228	VILLAGE RD	Township Boundary	River Road	2060	LCB	706	2003	4	Minor Arterial	R	No	8.5	6.5	1	32
1944253474	VILLAGE RD	River Road	Grahamvale Road	2210	Gravel	109	2003	5	Local	R	No	7	5	1	65
1944059532	WASING RD	Maple Road	End	970	Gravel	49	2006	6	Local	R	No	5.6	4.6	0.5	77
1944144903	WASING RD	Algonquin Road	Golf Course Road	300	Gravel	66	2003	5	Local	R	No	6.8	4.8	1	77
1944355162	WASING RD	Maple Road	Algonquin Road	4130	Gravel	66	2003	5	Local	R	No	7	5	1	46

**APPENDIX C**

**Road Network Map**



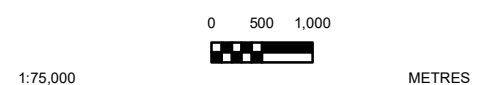
**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



NOTE(S)

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

TITLE  
**PAVEMENT CONDITION RATING - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PATH: S:\Clients\Municipality\_of\_East\_Ferris\Road\_Needs\_Study\03\_PCI\_Rating\03\_PCI\_Rating.mxd PRINTED ON: 2023-03-10 AT: 2:42:18 PM

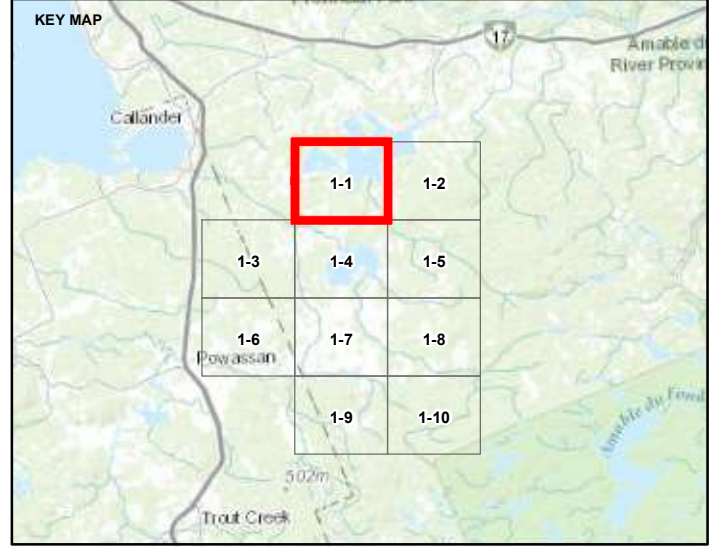
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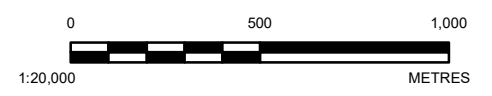
**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



NOTE(S)

**REFERENCE(S)**  
 1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
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 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

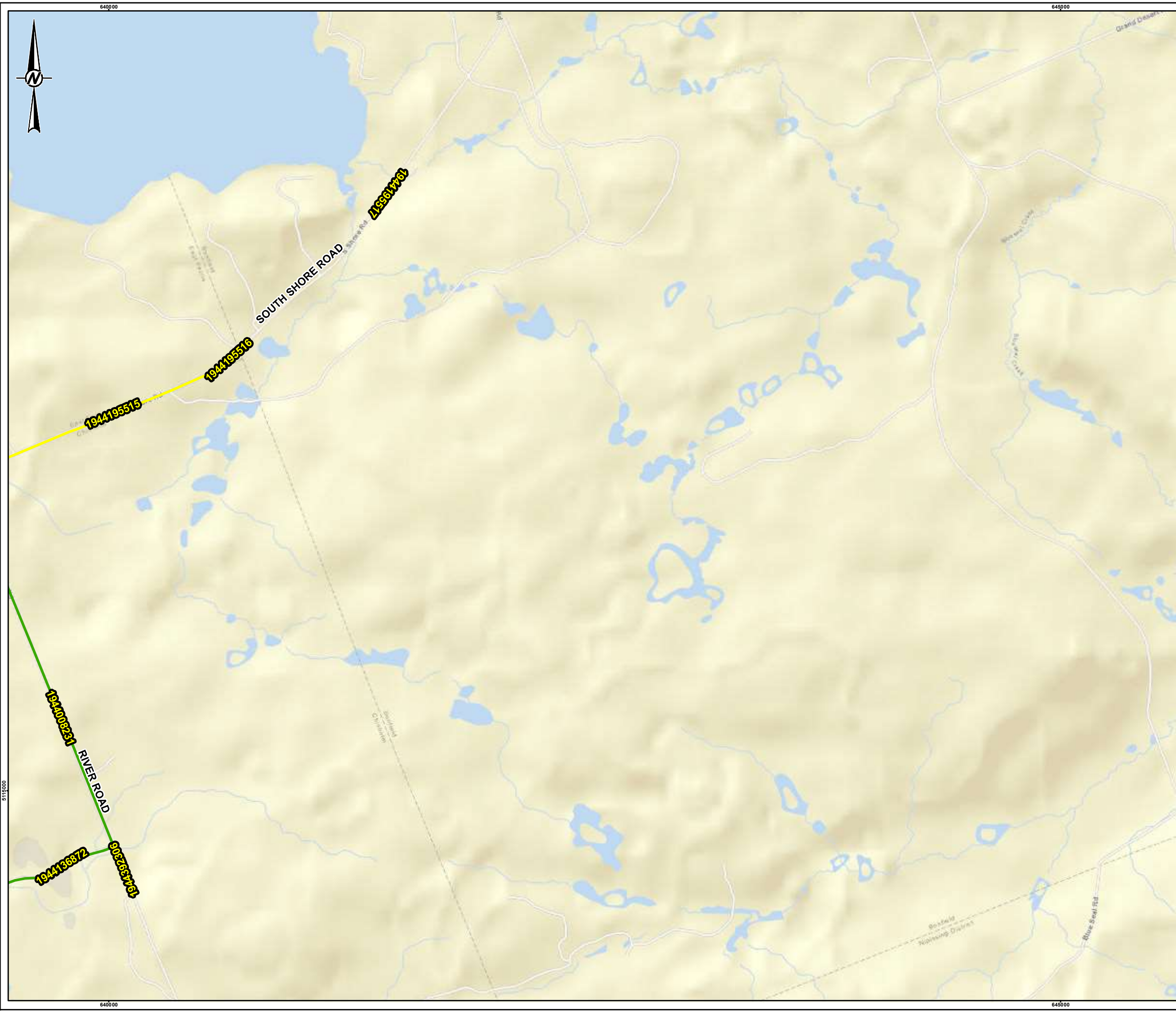
TITLE  
**2022 GRAVEL ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

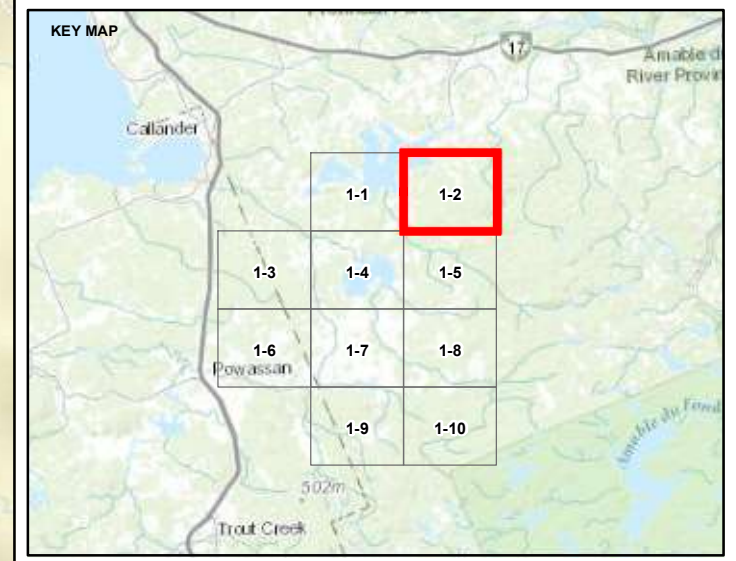
PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	1-1

PATH: S:\Clients\Municipality\_of\_East\_Ferris\Road\_Needs\_Study\99\_PROJ\20230320\20230320\_PCI\_Conditions\_Chisholm\22520202-0003-M-0001.mxd PRINTED ON: 2023-03-10 AT: 2:03:41 PM

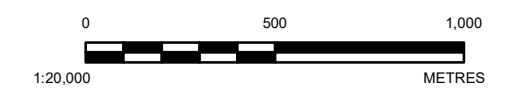
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



- LEGEND**
- Pavement Condition Index (PCI)**
- EXCELLENT
  - GOOD
  - FAIR
  - POOR
  - VERY POOR




**DRAFT**



**NOTE(S)**

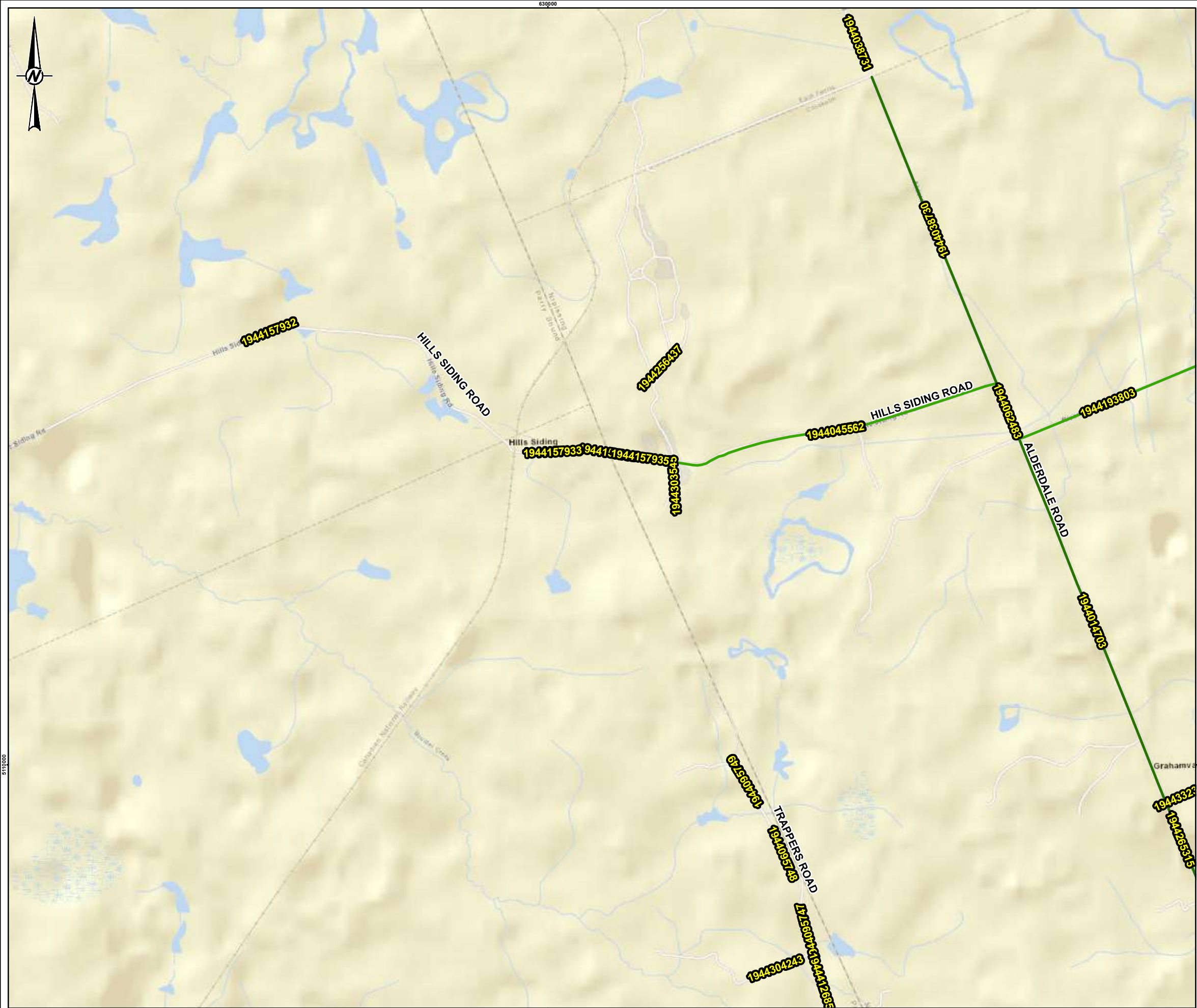
**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT			
THE TOWNSHIP OF CHISHOLM			
PROJECT			
2022 CHISHOLM ROADS NEEDS STUDY			
TITLE			
2022 GRAVEL ROAD CONDITIONS - PCI RATING			
CONSULTANT	YYYY-MM-DD	2023-03-10	
	DESIGNED	MM	
	PREPARED	RRD	
	REVIEWED		
	APPROVED		
PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	1-2

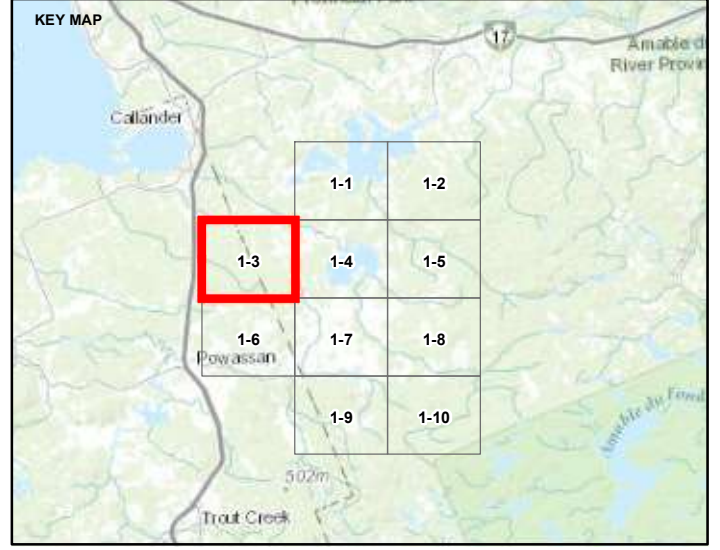
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

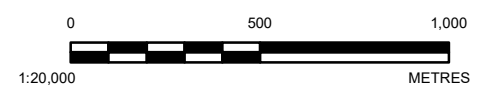


**LEGEND**  
**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



DRAFT



**NOTE(S)**

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

**CLIENT**  
 THE TOWNSHIP OF CHISHOLM

**PROJECT**  
 2022 CHISHOLM ROADS NEEDS STUDY

**TITLE**  
 2022 GRAVEL ROAD CONDITIONS - PCI RATING

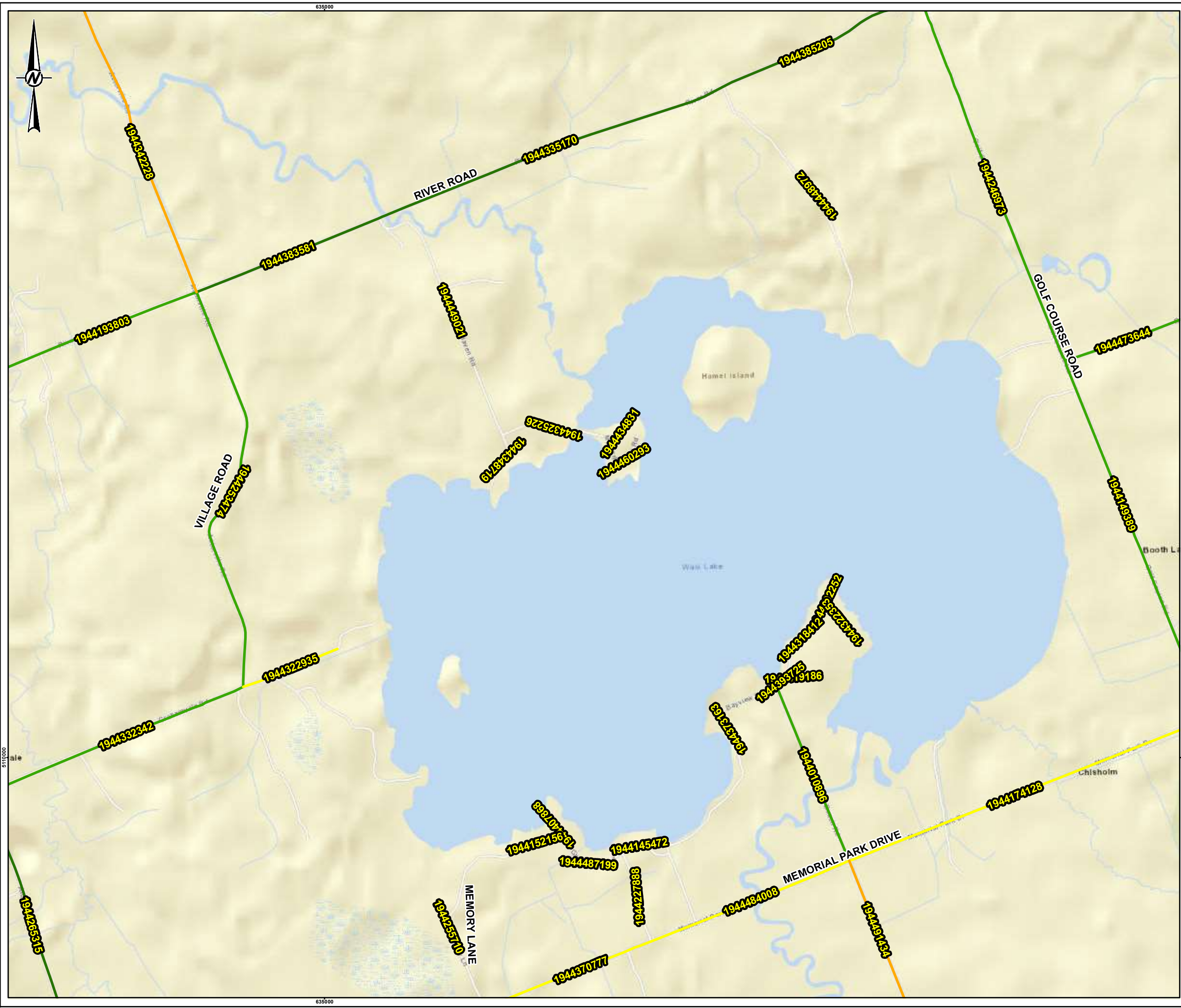
<b>CONSULTANT</b>		YYYY-MM-DD	2023-03-10
	DESIGNED		MM
	PREPARED		RRD
	REVIEWED		
	APPROVED		

<b>PROJECT NO.</b> 22520202	<b>CONTROL</b> 0003	<b>REV.</b> A	<b>FIGURE</b> 1-3
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PATH: S:\Clients\Municipalities\4 - East - Forest Road - Needs Study\99\_PROD\22520202\0\_PROD\0003\_PCI\_Conditions\_Chisholm\22520202\0003\M001.mxd PRINTED ON: 2023-03-10 AT: 2:03:49 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

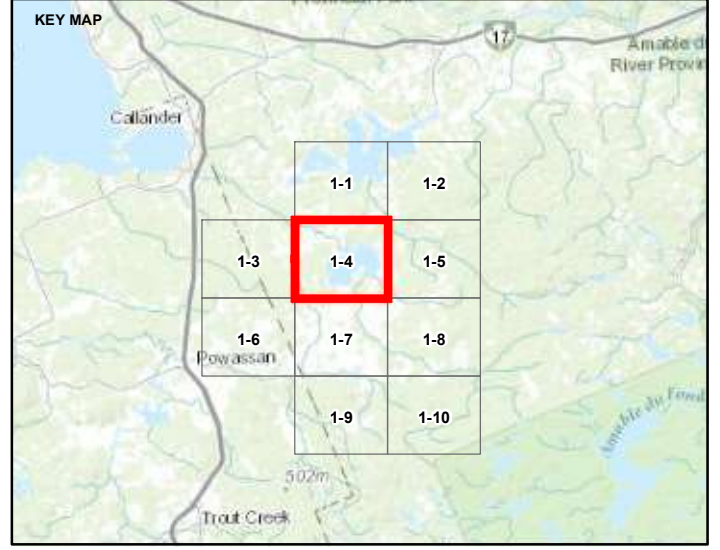




**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT (Green line)
- GOOD (Light Green line)
- FAIR (Yellow line)
- POOR (Orange line)
- VERY POOR (Red line)



**NOTE(S)**

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

**CLIENT**  
 THE TOWNSHIP OF CHISHOLM

**PROJECT**  
 2022 CHISHOLM ROADS NEEDS STUDY

**TITLE**  
**2022 GRAVEL ROAD CONDITIONS - PCI RATING**

CONSULTANT	WSP
DATE	YYYY-MM-DD 2023-03-10
DESIGNED	MM
PREPARED	RRD
REVIEWED	
APPROVED	

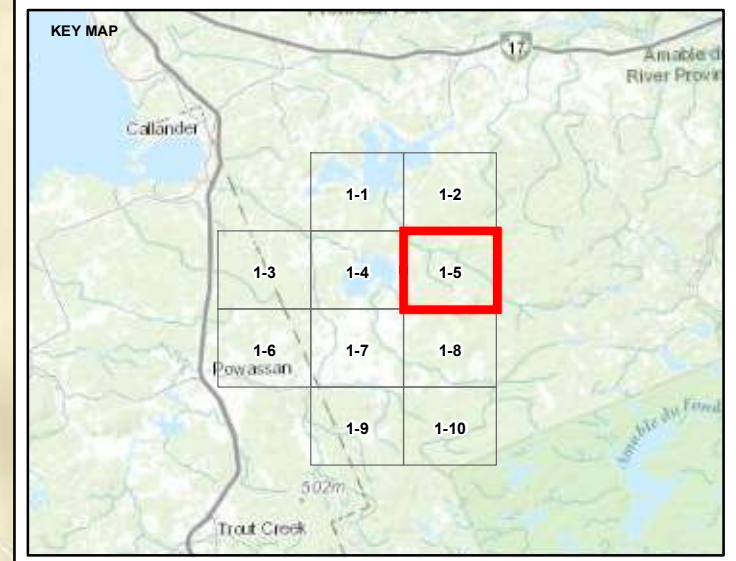
PROJECT NO. 22520202	CONTROL 0003	REV. A	FIGURE 1-4
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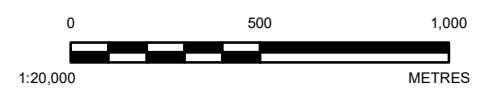
**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



**NOTE(S)**

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

**CLIENT**  
 THE TOWNSHIP OF CHISHOLM

**PROJECT**  
 2022 CHISHOLM ROADS NEEDS STUDY

**TITLE**  
 2022 GRAVEL ROAD CONDITIONS - PCI RATING

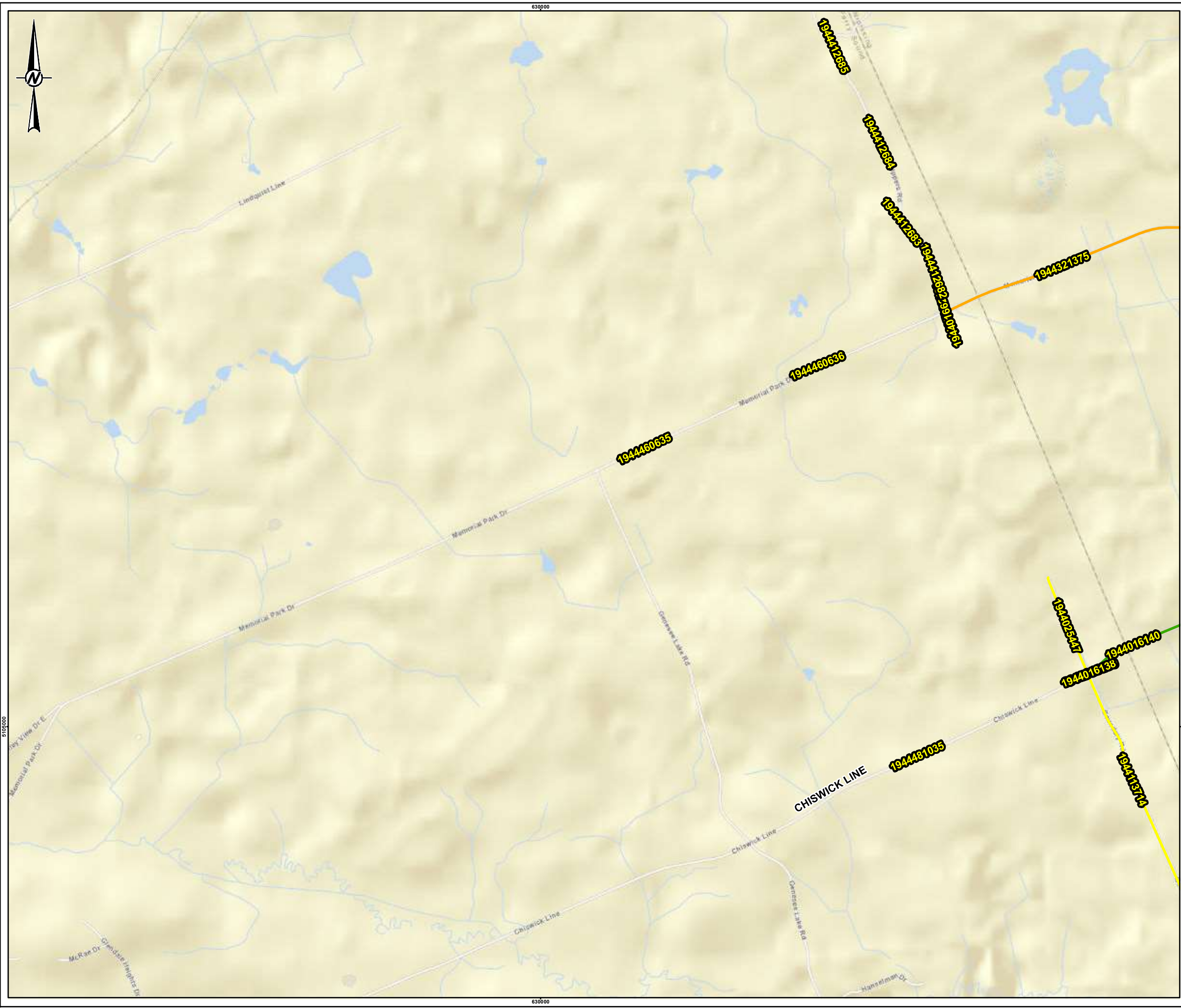
<b>CONSULTANT</b>	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

<b>PROJECT NO.</b>	<b>CONTROL</b>	<b>REV.</b>	<b>FIGURE</b>
22520202	0003	A	1-5

PATH: S:\Clients\Municipality\_of\_Essex\Road\_Needs\_Study\99\_PROD\0003\_PRC\02520202\00\_PRC\0003\_PRC\_Conditions\_Chiswick\12520202\0003\0003.mxd PRINTED ON: 2023-03-10 AT: 2:44:00 PM  
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B  
 25mm

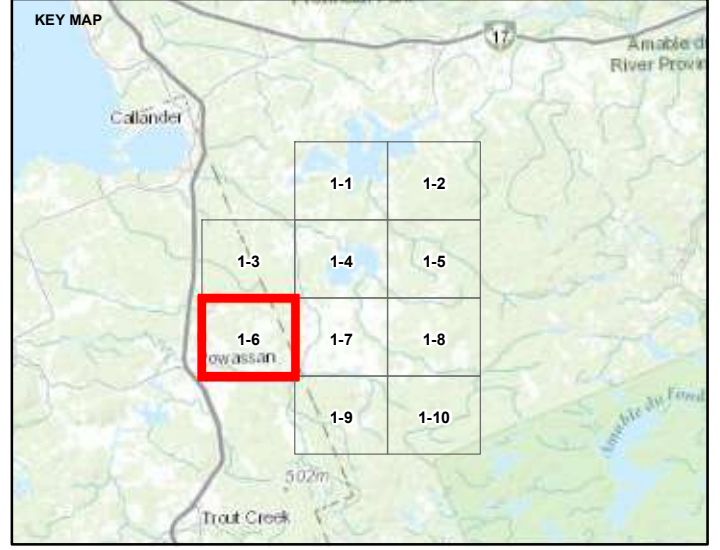
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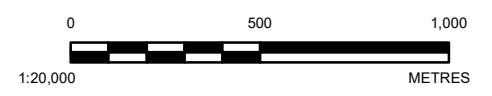
**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



NOTE(S)

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

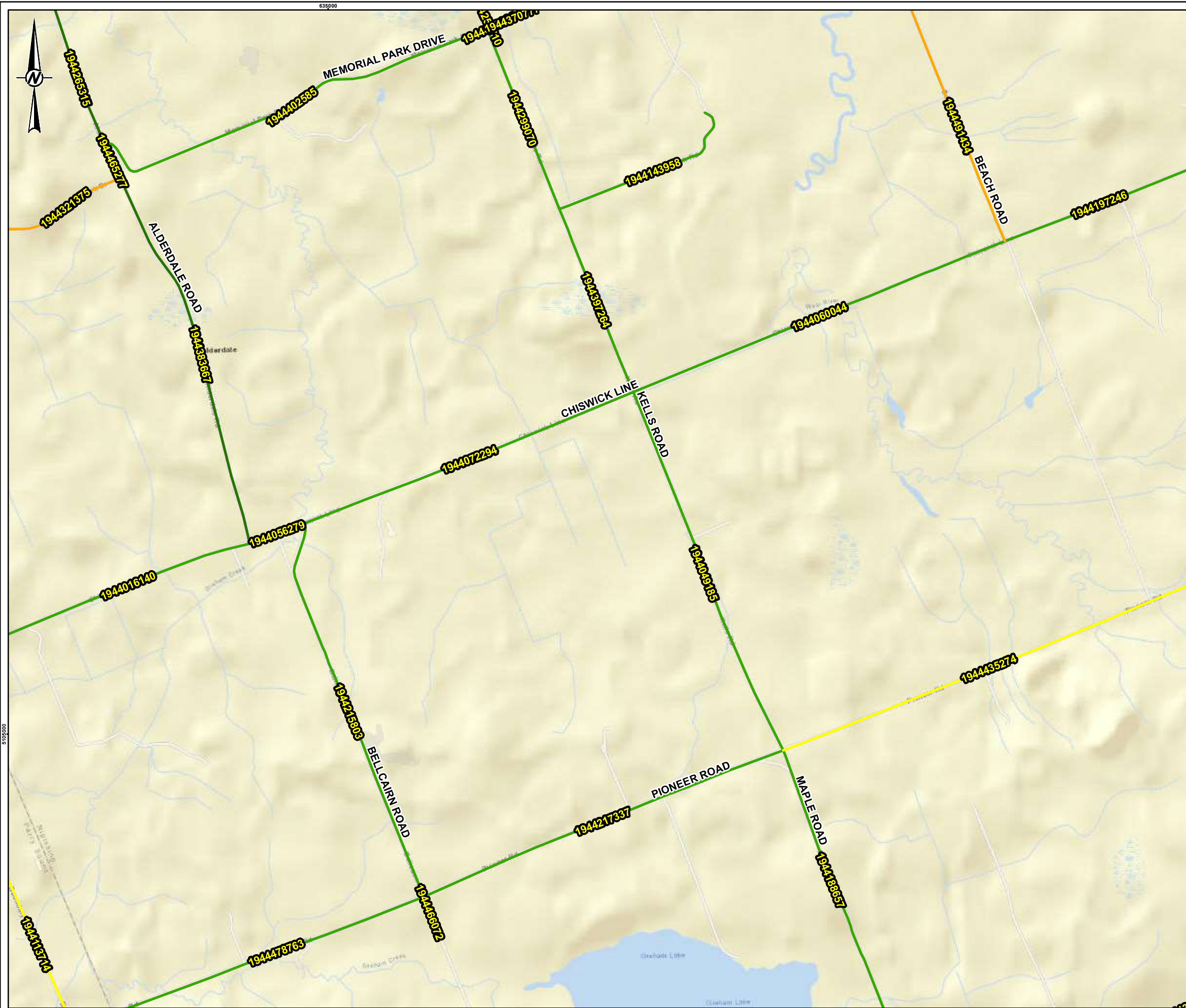
CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

TITLE  
**2022 GRAVEL ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

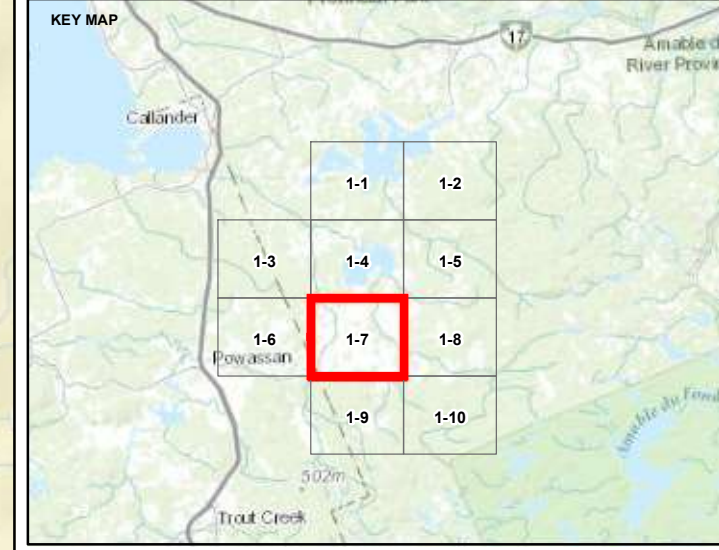
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



**LEGEND**

*Pavement Condition Index (PCI)*

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



NOTE(S)

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
**THE TOWNSHIP OF CHISHOLM**

PROJECT  
**2022 CHISHOLM ROADS NEEDS STUDY**

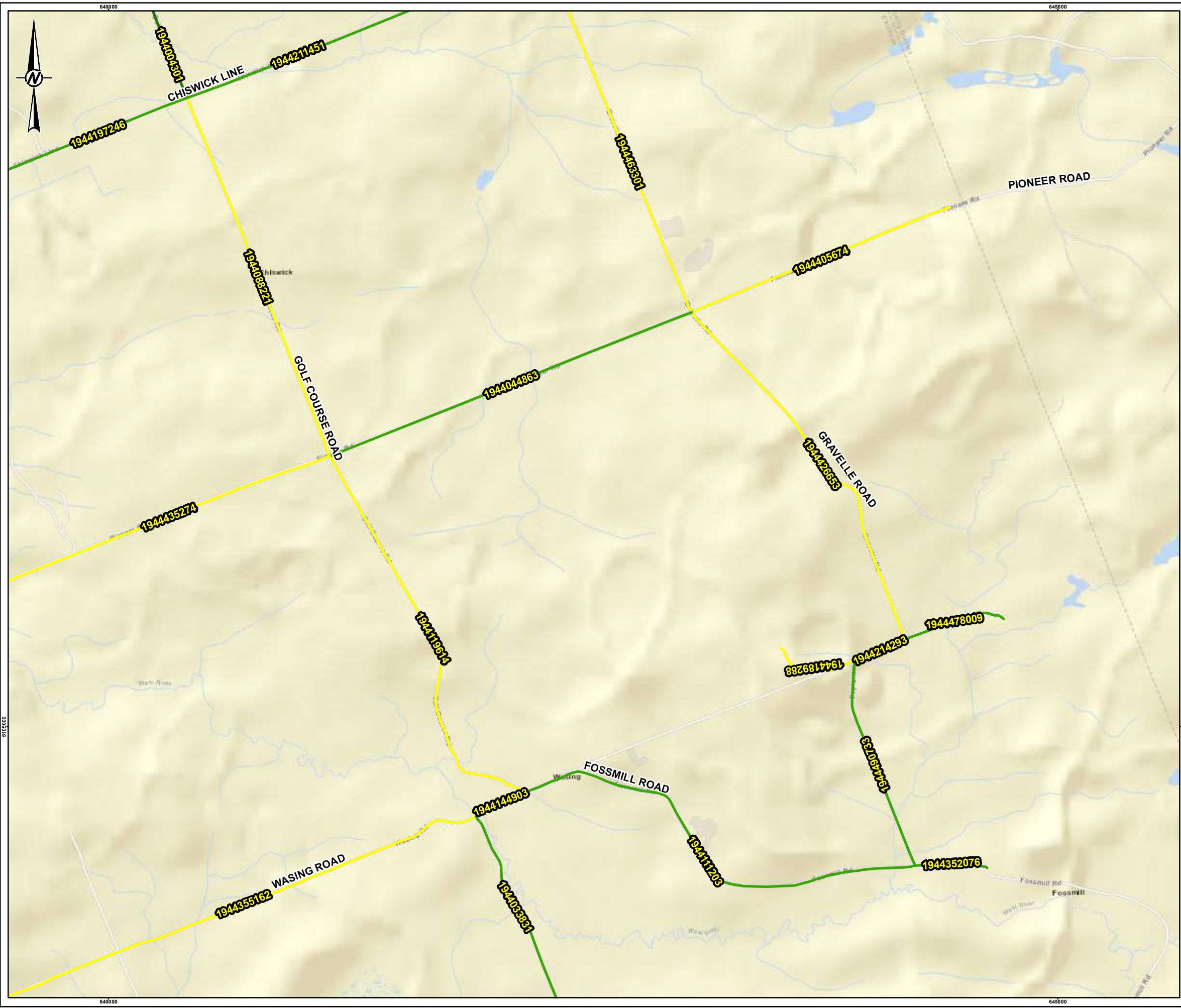
TITLE  
**2022 GRAVEL ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	1-7

PATH: S:\Clients\Municipalities\17\_Est17\_ForestRoad\_Needs\_Study\199\_PROD\20230310\_199\_PROD\0003\_PCL\_Conditions\_Chisholm\13232023\0003\0003-0003-M-0001.mxd PRINTED On: 2023-03-10 AT: 2:44:08 PM  
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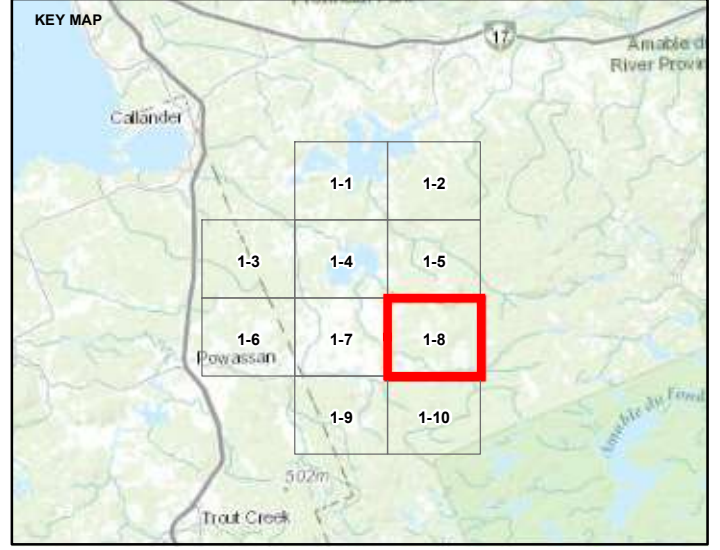
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B  
 25mm



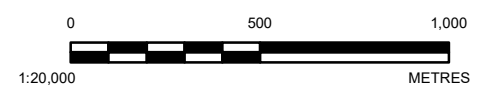
**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**



**NOTE(S)**

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

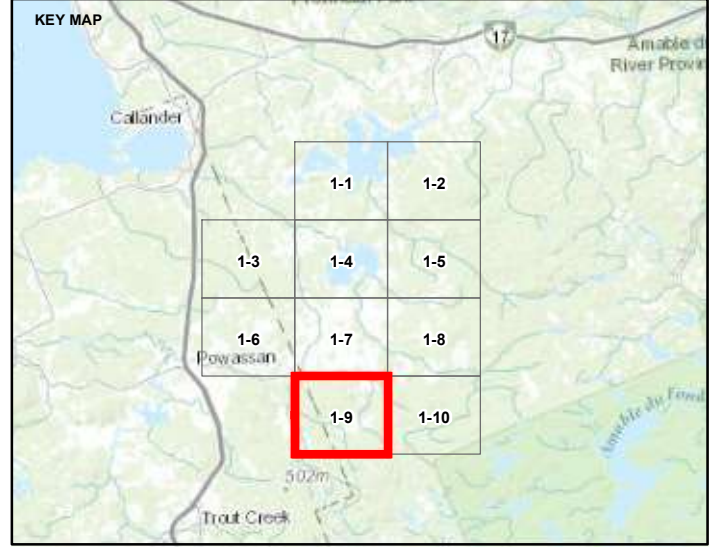
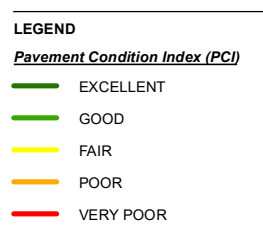
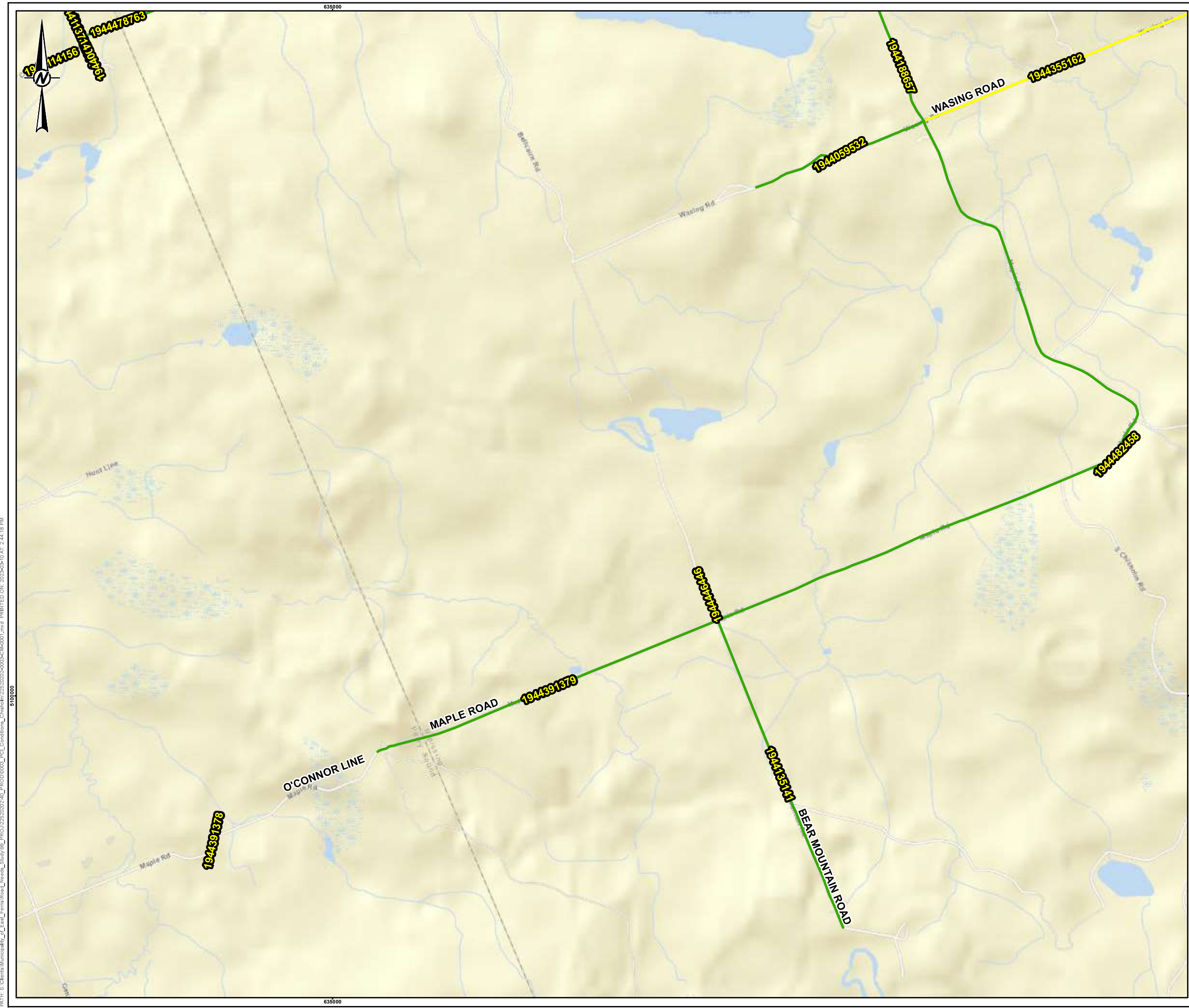
TITLE  
**2022 GRAVEL ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

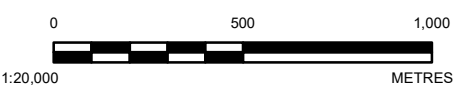
PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	1-8

PATH: S:\Clients\Municipality\_of\_East\_Fernie\Road\_Needs\_Study\99\_PROJ\2023\20230310\_PRC\0003\_PCL\_Conditions\_Chiswick\1232023\2023-03-10\2023-03-10\_24413.PM  
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



**DRAFT**



**NOTE(S)**


**REFERENCE(S)**

- BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
- PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

**CLIENT**  
 THE TOWNSHIP OF CHISHOLM

**PROJECT**  
 2022 CHISHOLM ROADS NEEDS STUDY

**TITLE**  
 2022 GRAVEL ROAD CONDITIONS - PCI RATING

CONSULTANT	DATE	REVISION
	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	1-9

PATH: S:\Clients\Municipality\_of\_East\_Ferns\Road\_Needs\_Study\03\_PROI\2023\2023\03\_PROI\0003\_PCL\_Conditions\_Chisholm\1252023\2023-03-10\AT: 2:44:19 PM  
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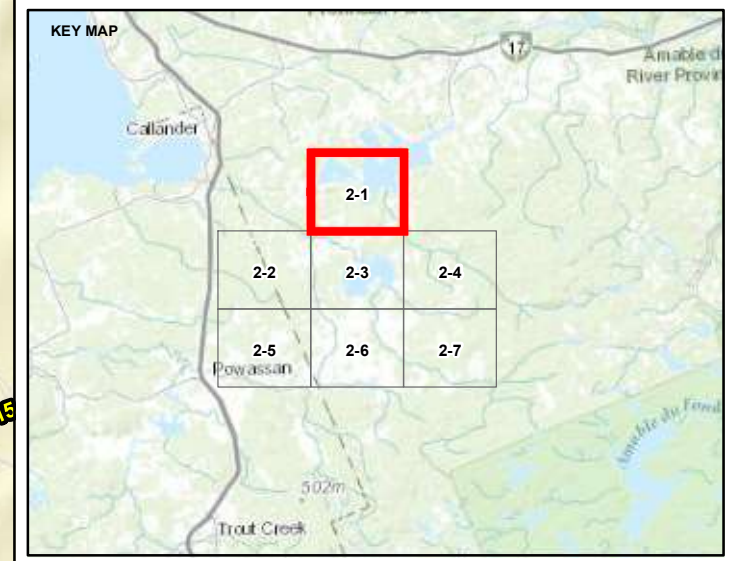




**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



DRAFT

1:20,000 METRES

**NOTE(S)**

---

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
THE TOWNSHIP OF CHISHOLM

---

PROJECT  
2022 CHISHOLM ROADS NEEDS STUDY

---

TITLE  
**PAVED ROAD CONDITIONS - PCI RATING**

---

CONSULTANT		YYYY-MM-DD	2023-03-10
		DESIGNED	MM
		PREPARED	RRD
		REVIEWED	
		APPROVED	

---

PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	2-1

PATH: S:\Clients\Municipality\_of\_East\_Ferris\Road\_Needs\_Study\99\_PROJ\2023\202303\003-CHISHOLM-002.mxd PRINTED ON: 2023-03-10 AT: 2:41:35 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

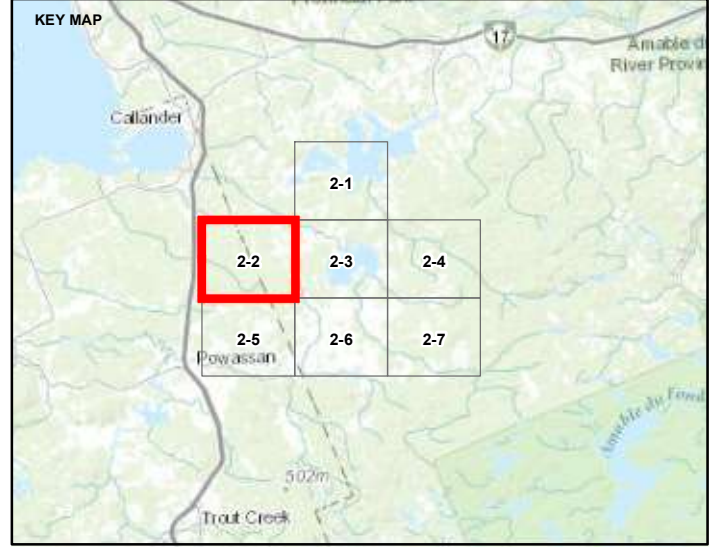




**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



DRAFT

0 250 500  
  
 1:20,000 METRES

**NOTE(S)**

**REFERENCE(S)**  
 1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

**CLIENT**  
 THE TOWNSHIP OF CHISHOLM

**PROJECT**  
 2022 CHISHOLM ROADS NEEDS STUDY

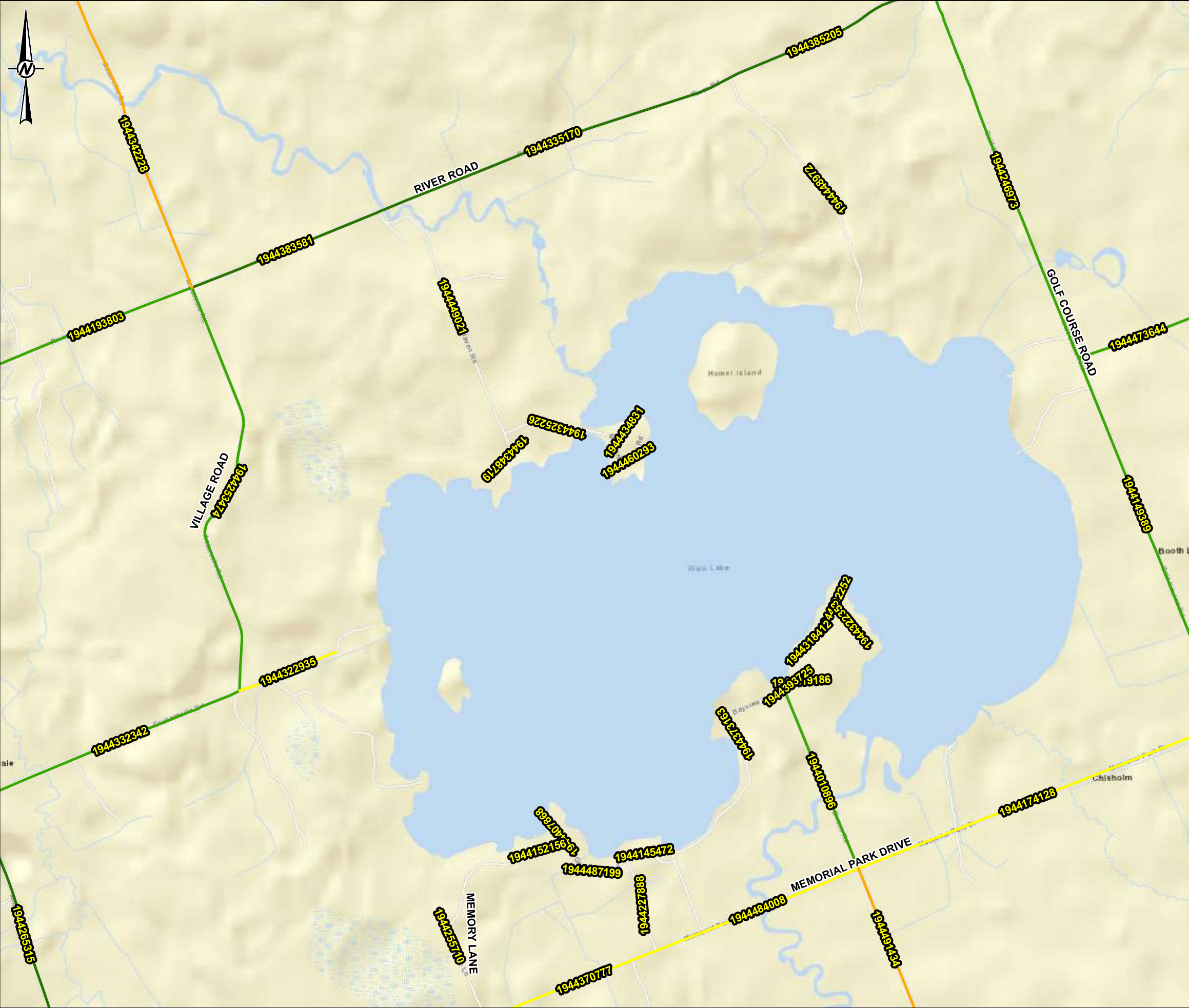
**TITLE**  
**PAVED ROAD CONDITIONS - PCI RATING**

<b>CONSULTANT</b>		YYYY-MM-DD	2023-03-10
	DESIGNED	MM	
	PREPARED	RRD	
	REVIEWED		
	APPROVED		

<b>PROJECT NO.</b> 22520202	<b>CONTROL</b> 0003	<b>REV.</b> A	<b>FIGURE</b> 2-3
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PATH: S:\Clients\Municipality\_of\_Essex\Road\_Needs\_Study\99\_ PROJ\2023\20230310\_Productions\Chisholm\20230310\20230310\_0002.mxd PRINTED ON: 2023-03-10 AT: 2:41:40 PM  
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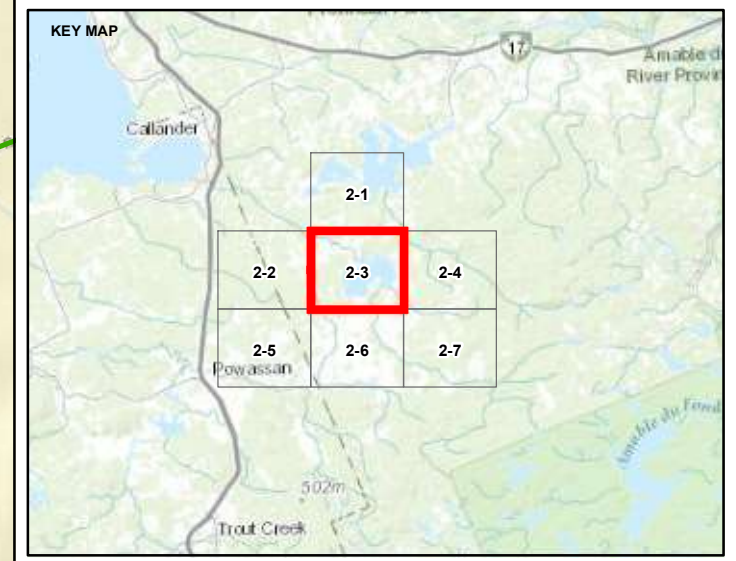
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B



**LEGEND**

**Pavement Condition Index (PCI)**

EXCELLENT	Green
GOOD	Yellow-Green
FAIR	Yellow
POOR	Orange
VERY POOR	Red



NOTE(S)

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

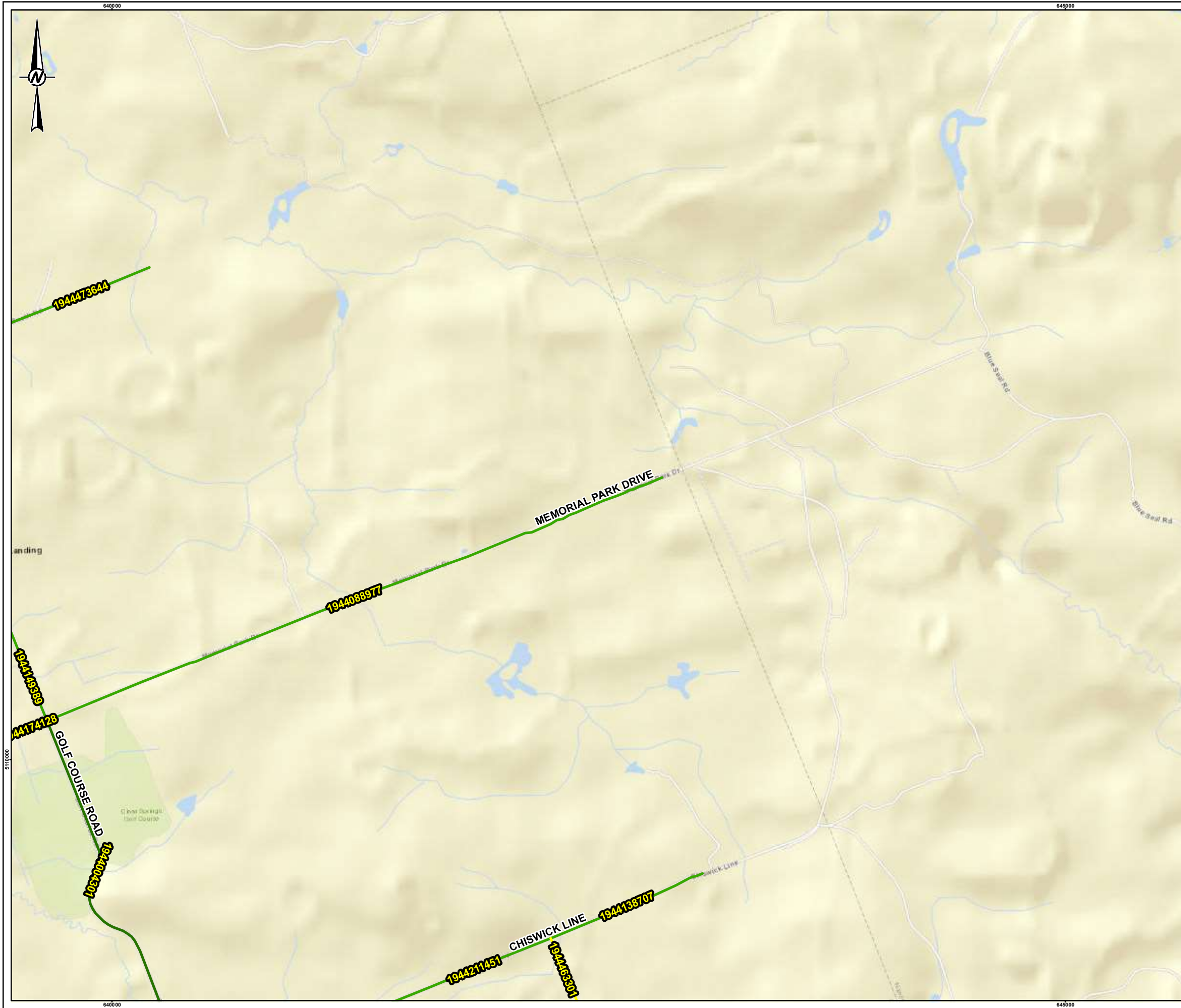
CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

TITLE  
**PAVED ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

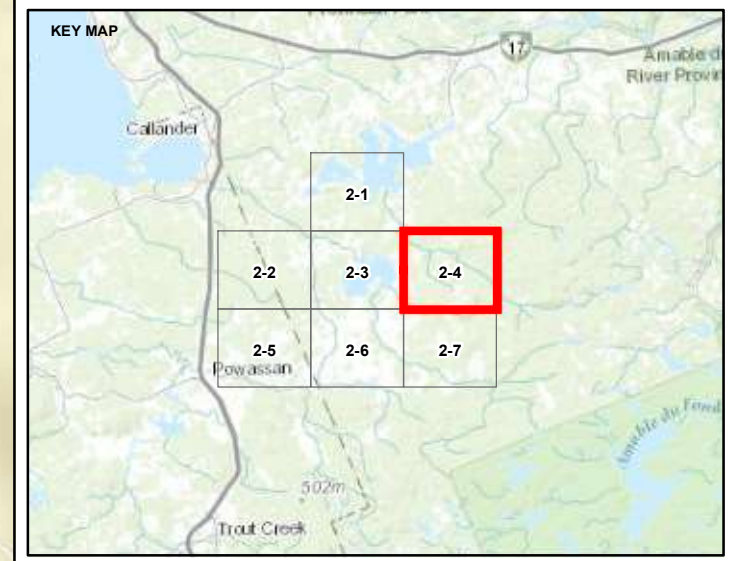
PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	2-4



**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



**DRAFT**

0      250      500

1:20,000      METRES

**NOTE(S)**

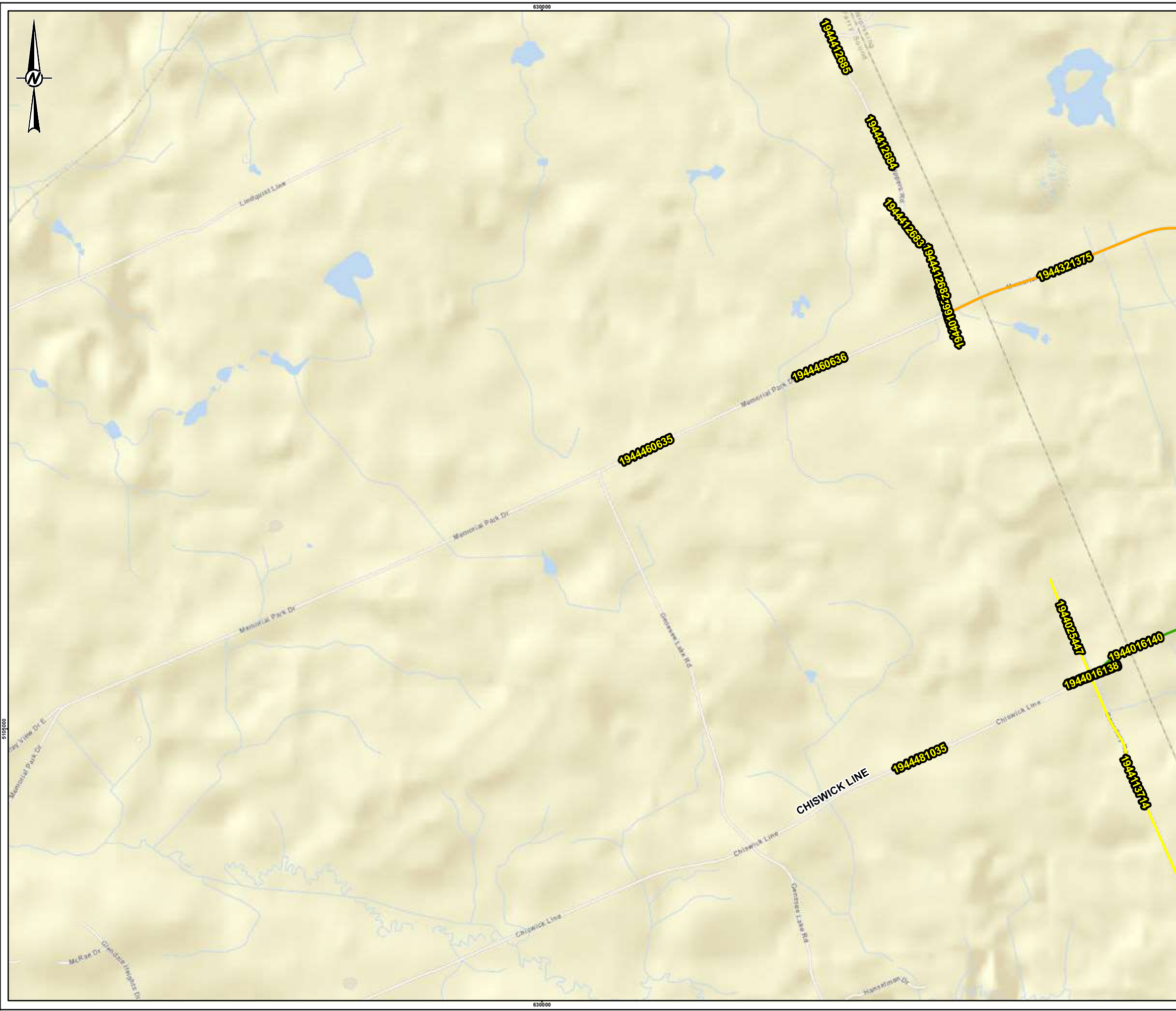
**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

<b>CLIENT</b>			
THE TOWNSHIP OF CHISHOLM			
<b>PROJECT</b>			
2022 CHISHOLM ROADS NEEDS STUDY			
<b>TITLE</b>			
PAVED ROAD CONDITIONS - PCI RATING			
<b>CONSULTANT</b>		YYYY-MM-DD 2023-03-10	
		DESIGNED MM	
		PREPARED RRD	
		REVIEWED	
		APPROVED	
<b>PROJECT NO.</b>	<b>CONTROL</b>	<b>REV.</b>	<b>FIGURE</b>
22520202	0003	A	2-5

PATH: S:\Clients\Municipality\_of\_East\_Ferns\Road\_Needs\_Study\99\_PROJ\20230220\00\_Productions\_PCL\_Conditions\_Chiswick\12320230220-0002-M-002.mxd PRINTED ON: 2023-03-10 AT: 2:41:50 PM

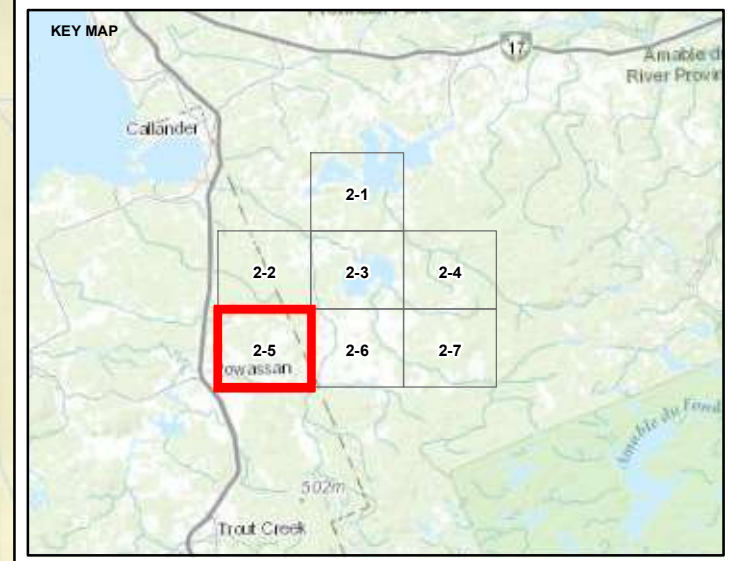
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



DRAFT

0      250      500

1:20,000      METRES

**NOTE(S)**

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
**THE TOWNSHIP OF CHISHOLM**

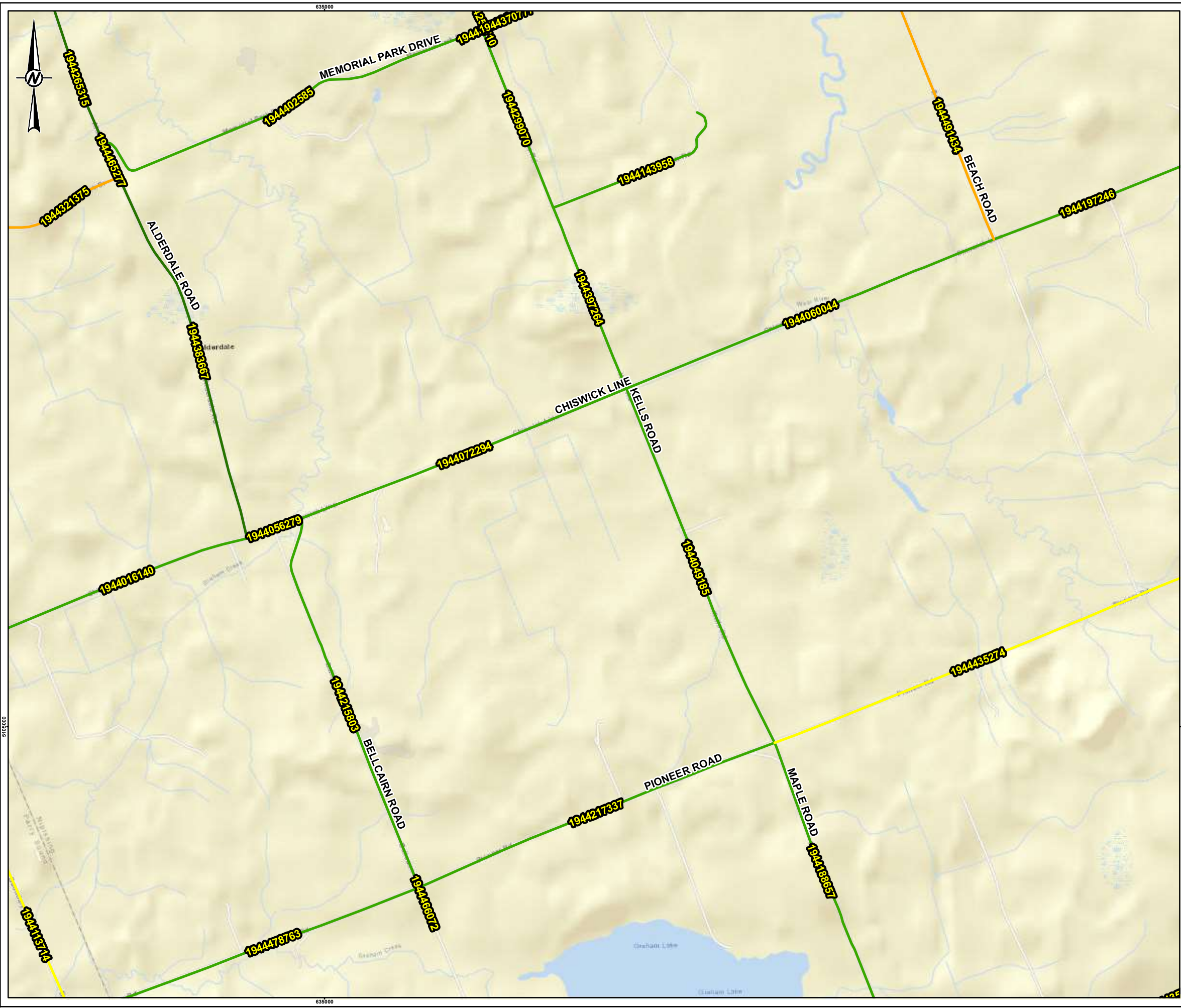
PROJECT  
**2022 CHISHOLM ROADS NEEDS STUDY**

TITLE  
**PAVED ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PATH: S:\Clients\Municipalities\21\_East\_EmswilerRoad\_Needs\_Study\2022\20220310\_Productions\_PCL\_Conditions\_Chisholm\22520202020310\_Productions\_PCL\_Conditions\_Chisholm.mxd PRINTED ON: 2023-03-10 AT: 2:41:54 PM

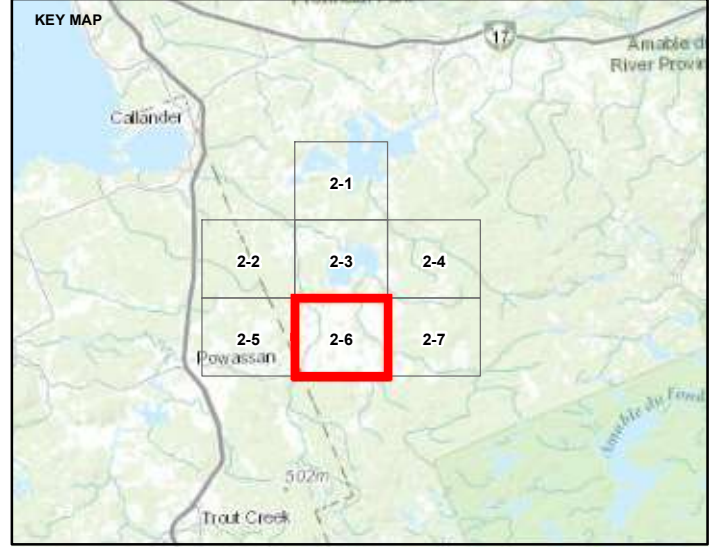
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



**LEGEND**

**Pavement Condition Index (PCI)**

- EXCELLENT
- GOOD
- FAIR
- POOR
- VERY POOR



NOTE(S)

**REFERENCE(S)**

1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

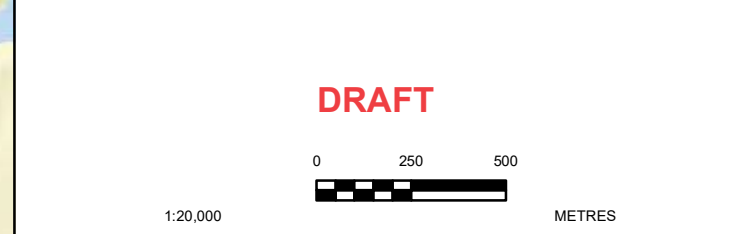
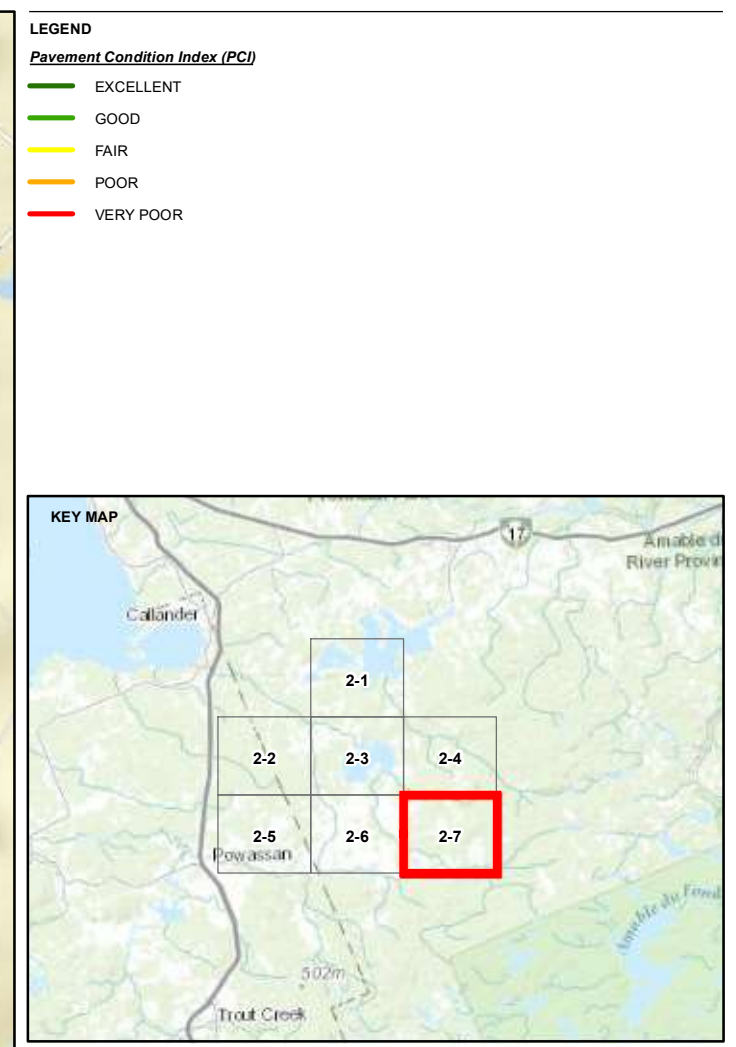
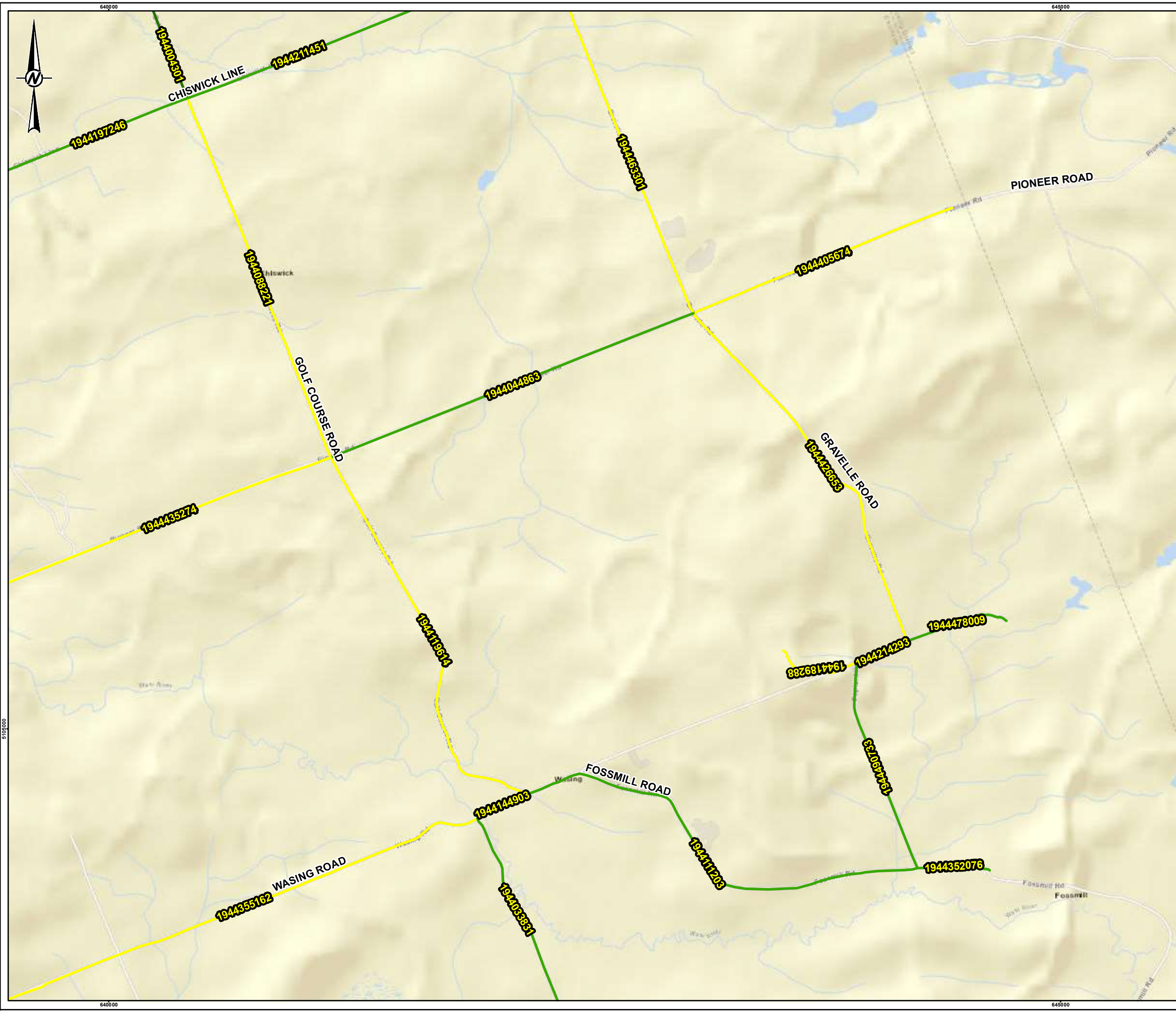
TITLE  
**PAVED ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	2-7

PATH: S:\Clients\Municipalities\East\_EmeraRoad\_Needs\_Study\Proj\22520202\00\_PavedRoads\_PCI\_Conditions\_Chisholm\12520202-0003-M-0002.mxd PRINTED ON: 2023-03-10 AT: 2:41:58 PM  
 635000

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



NOTE(S)

REFERENCE(S)  
 1. BASE IMAGERY: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY  
 2. PROJECTION: TRANSVERSE MERCATOR; DATUM: NAD83; COORDINATE SYSTEM: UTM ZONE 17.

CLIENT  
 THE TOWNSHIP OF CHISHOLM

PROJECT  
 2022 CHISHOLM ROADS NEEDS STUDY

TITLE  
**PAVED ROAD CONDITIONS - PCI RATING**

CONSULTANT	YYYY-MM-DD	2023-03-10
	DESIGNED	MM
	PREPARED	RRD
	REVIEWED	
	APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
22520202	0003	A	2-8

PATH: S:\Clients\Municipality\_of\_Essex\Road\_Needs\_Study\99\_PROJ\2023\20230310\_Productions\_PCL\_Conditions\_Chiswick\_22520202\_0003\_0003\_2023-03-10.DAT: 2:45:04 PM  
 5105000

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B  
 25mm

**APPENDIX D**

# Road Network Overview



# Infrastructure Solutions

March 10, 2023

## Township of Chisholm



**Report Type:** NetworkOverview

**Report Generated by:** Amanda Zhang

### Network Overview

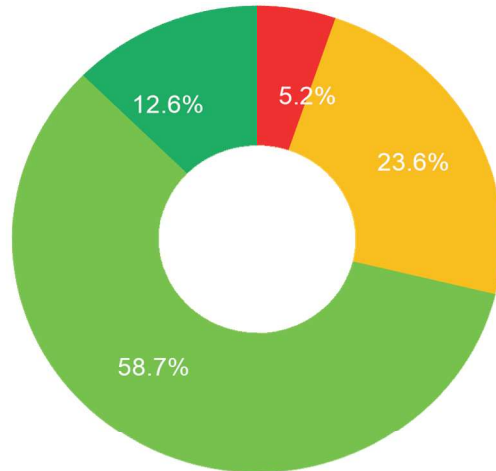
The Township of Chisholm has a total of 117 Km of Roads. The network overall condition based on the latest condition assessment data is estimated at 64, representing an overall "Good" condition. The details of network overview information are as follows.

Title	Condition	Condition State
Network Overall Condition	64	Good
Hot-Mix-Asphalt Condition	36	Poor
Surface Treated Condition	82	Excellent
Gravel Condition	60	Good



## Network Condition Status

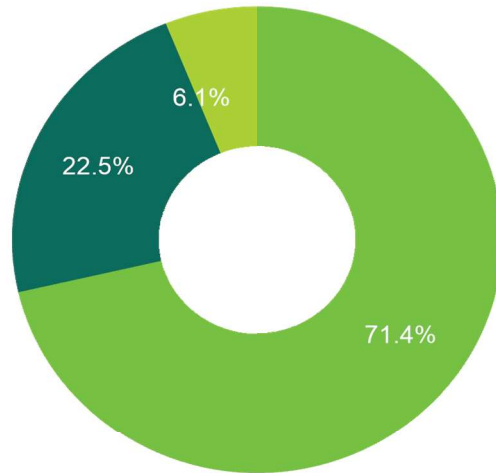
■ Poor ■ Fair ■ Good ■ Excellent



Condition	Length (Km)	Percentage
Poor	6.1	5.2%
Fair	27.6	23.6%
Good	68.7	58.7%
Excellent	14.7	12.6%

## Functional Class Breakdown

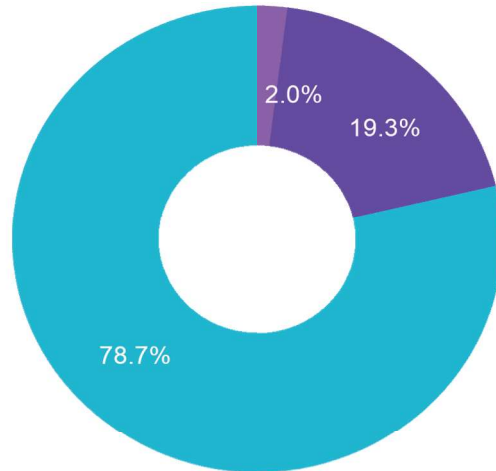
Local Collector Minor Arterial



Functional Class	Length (Km)	Percentage
Local	83.6	71.4%
Collector	26.4	22.5%
Minor Arterial	7.1	6.1%

## Surface Type Breakdown

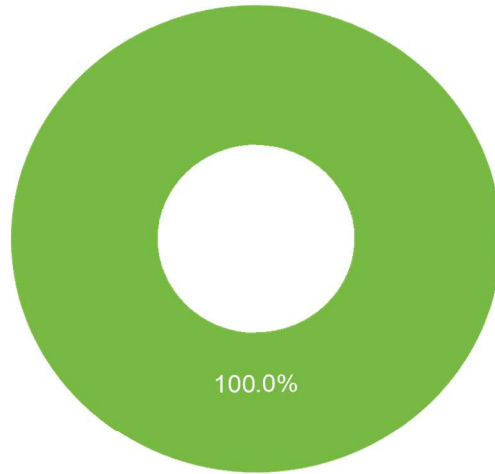
Hot Mix Asphalt   Surface Treated   Gravel



Surface Type	Length (Km)	Percentage
Hot Mix Asphalt	2.4	2.0%
Surface Treated	22.6	19.3%
Gravel	92.1	78.7%

## Roadside Environment Breakdown

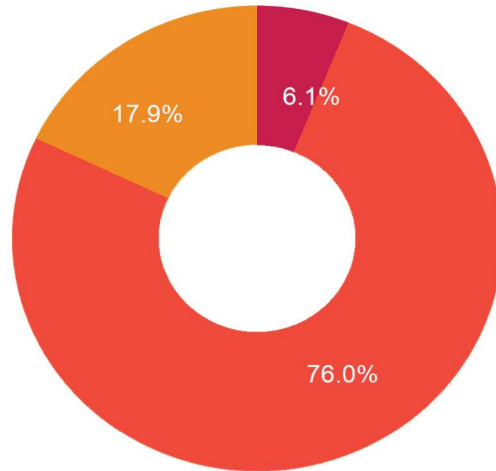
■ Rural



Roadside Environment	Length (Km)	Percentage
Rural	117.1	100.0%

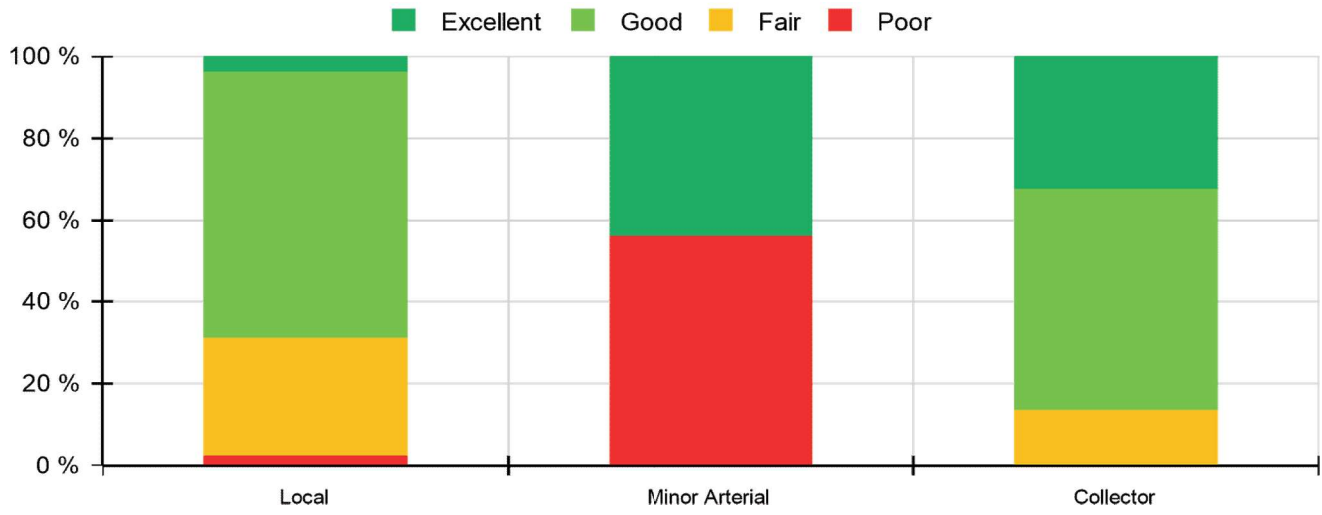
## MMS Breakdown

■ 4 ■ 5 ■ 6



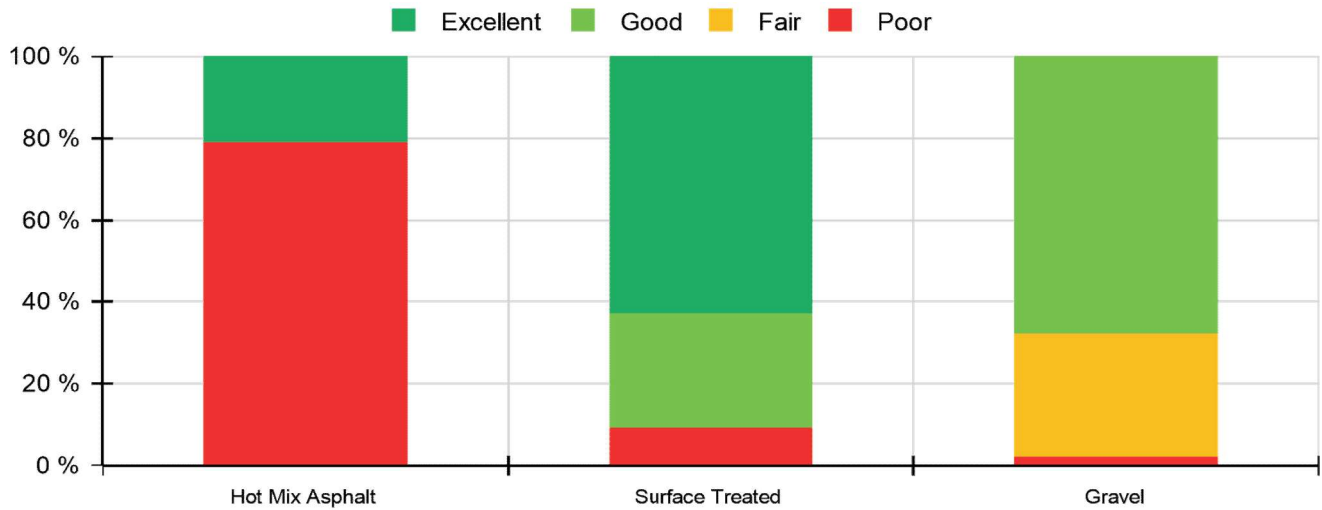
MMS	Length (Km)	Percentage
4	7.1	6.1%
5	89.0	76.0%
6	21.0	17.9%

## Condition Status by Functional Class



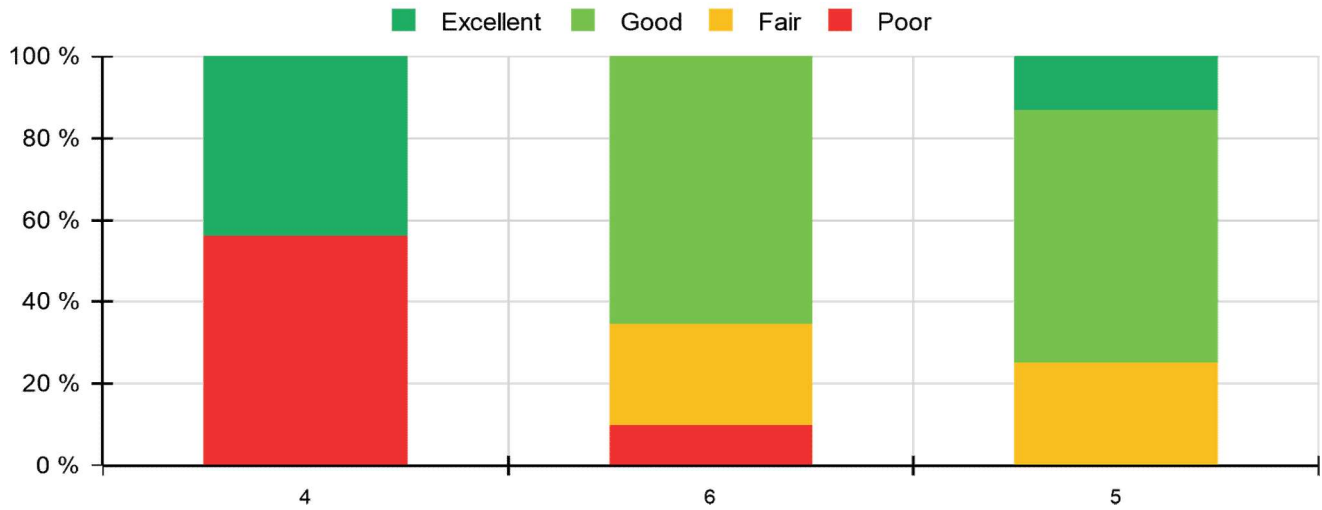
Functional Class	Excellent	Good	Fair	Poor
Local	3.1	54.4	24.0	2.1
Minor Arterial	3.1	0.0	0.0	4.0
Collector	8.5	14.3	3.6	0.0

## Condition Status by Surface Type



Surface Type	Excellent	Good	Fair	Poor
Hot Mix Asphalt	0.5	0.0	0.0	1.9
Surface Treated	14.2	6.3	0.0	2.1
Gravel	0.0	62.4	27.6	2.1

## Condition Status by MMS



MMS	Excellent	Good	Fair	Poor
4	3.1	0.0	0.0	4.0
6	0.0	13.8	5.2	2.1
5	11.6	55.0	22.4	0.0



**APPENDIX E**

**Scenario 1 - Impact of Current Budget**

## Optimization Result

### Scenario Summary

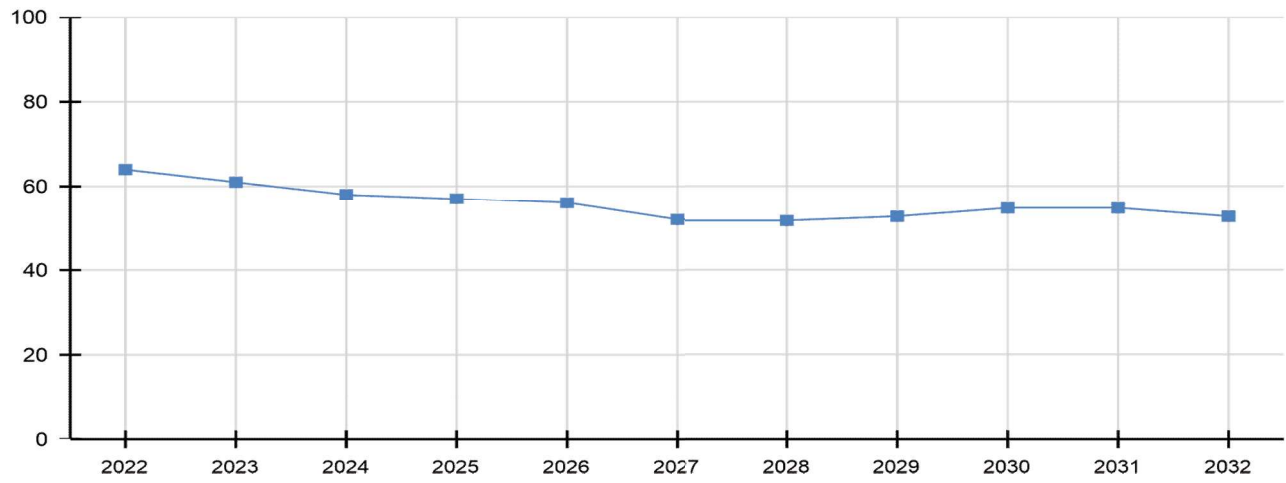
#### Scenario

Name:	SC1.1 Impact of Current Budget
Description:	150K Gravel ; 145K Paved Capital, 5K Paved Routine Maintenance; Roll leftover forward
Year:	2023

#### Optimization Settings

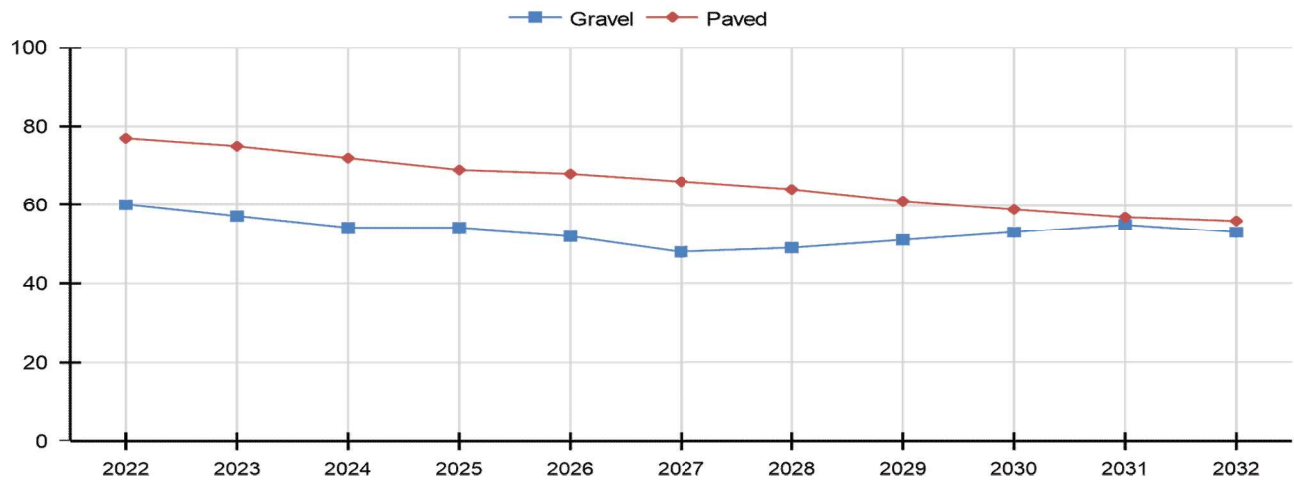
Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Asset Replacement Value	No
Estimate Current Condition	False
Operational Efficiency	Yes

## Network Condition



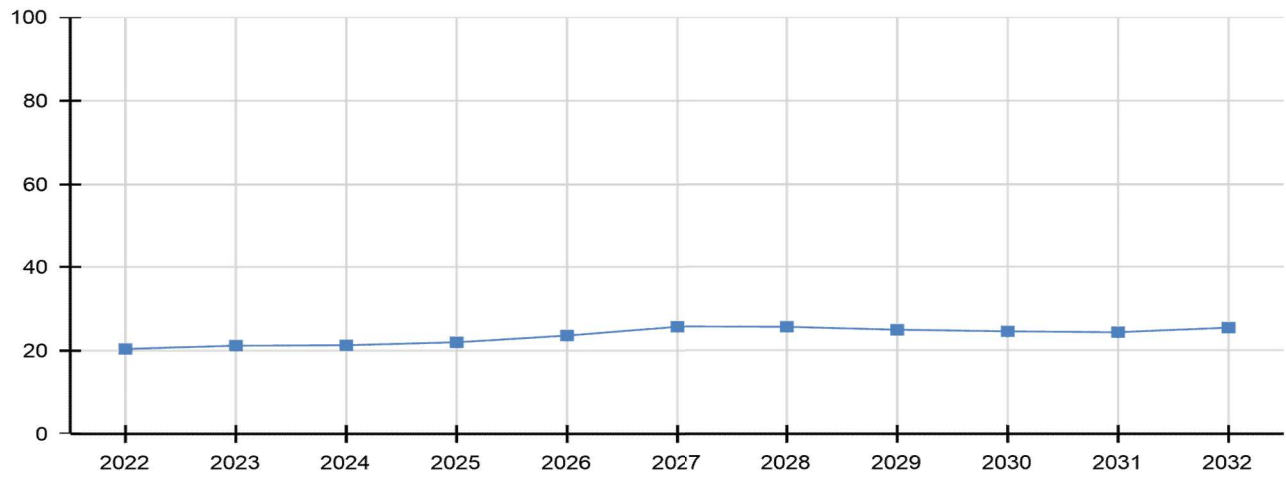
Year	Condition
2022	64
2023	61
2024	58
2025	57
2026	56
2027	52
2028	52
2029	53
2030	55
2031	55
2032	53

## Network Condition by Performance Class



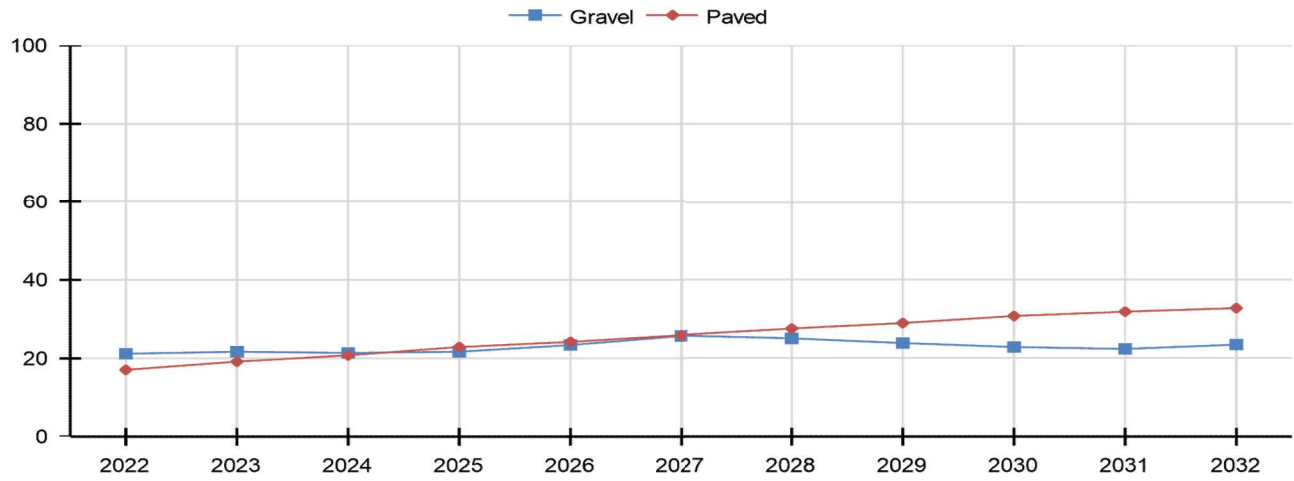
Year	Paved	Gravel
2022	77	60
2023	75	57
2024	72	54
2025	69	54
2026	68	52
2027	66	48
2028	64	49
2029	61	51
2030	59	53
2031	57	55
2032	56	53

## Network Risk Index



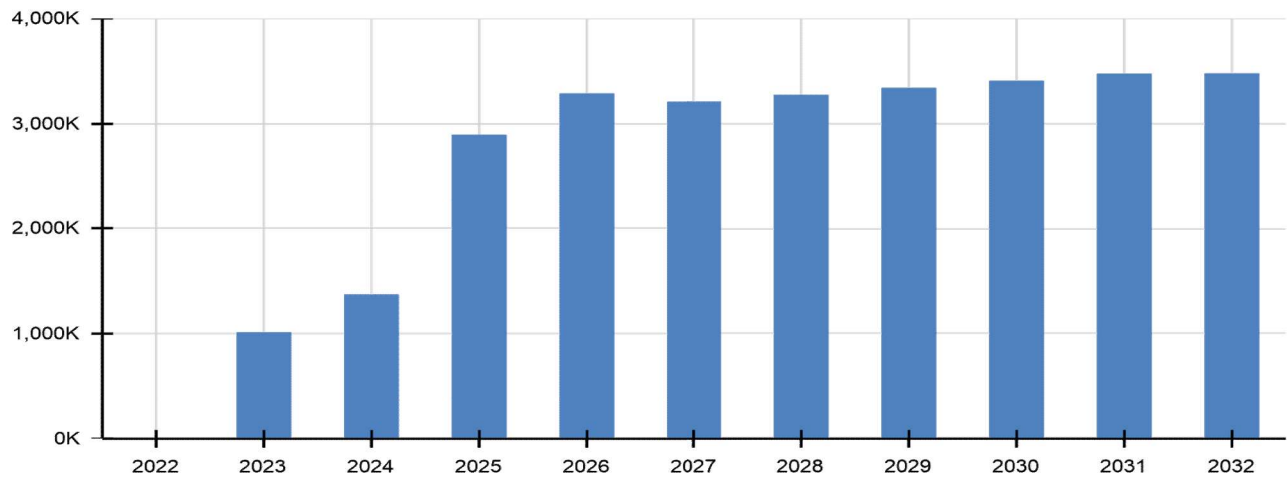
Year	Value
2022	20
2023	21
2024	21
2025	22
2026	24
2027	26
2028	26
2029	25
2030	24
2031	24
2032	25

## Network Risk Index by Performance Class



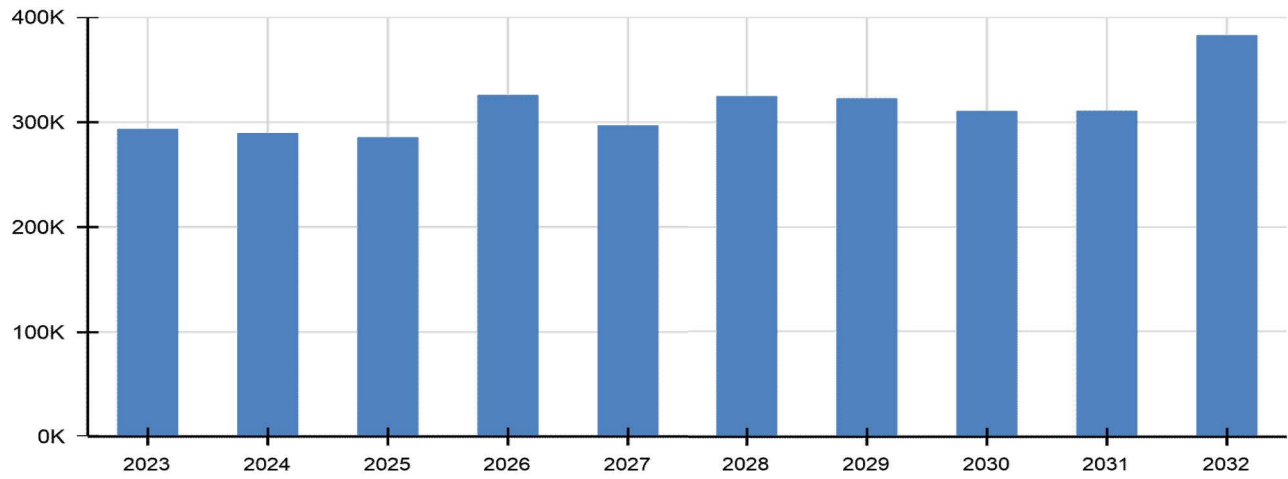
Year	Paved	Gravel
2022	17	21
2023	19	22
2024	21	21
2025	23	22
2026	24	23
2027	26	26
2028	28	25
2029	29	24
2030	31	23
2031	32	22
2032	33	23

## Deficit Projection



Year	Value
2022	\$0
2023	\$1,010,688
2024	\$1,368,829
2025	\$2,894,712
2026	\$3,285,755
2027	\$3,208,532
2028	\$3,272,702
2029	\$3,338,156
2030	\$3,404,919
2031	\$3,473,018
2032	\$3,475,441

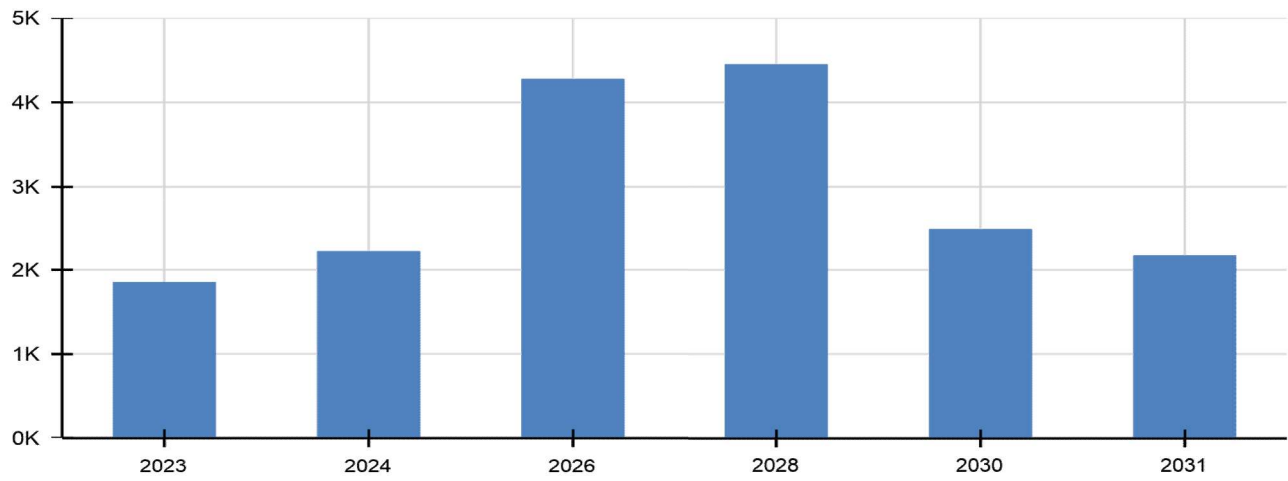
## Capital Expenditure



Year	Value
2023	\$293,272
2024	\$289,384
2025	\$285,324
2026	\$325,433
2027	\$296,750
2028	\$324,549
2029	\$322,512
2030	\$310,384
2031	\$310,649
2032	\$382,363

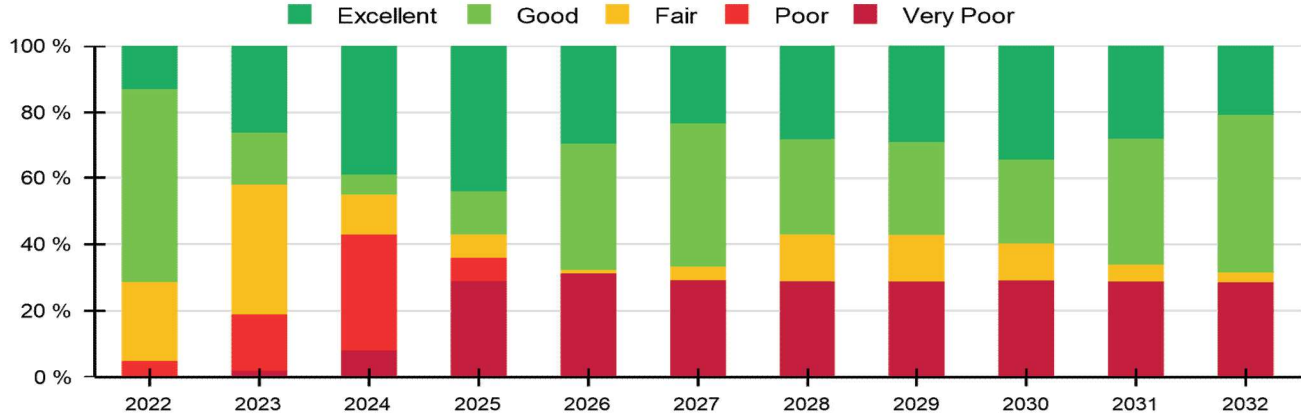


## Maintenance Expenditure



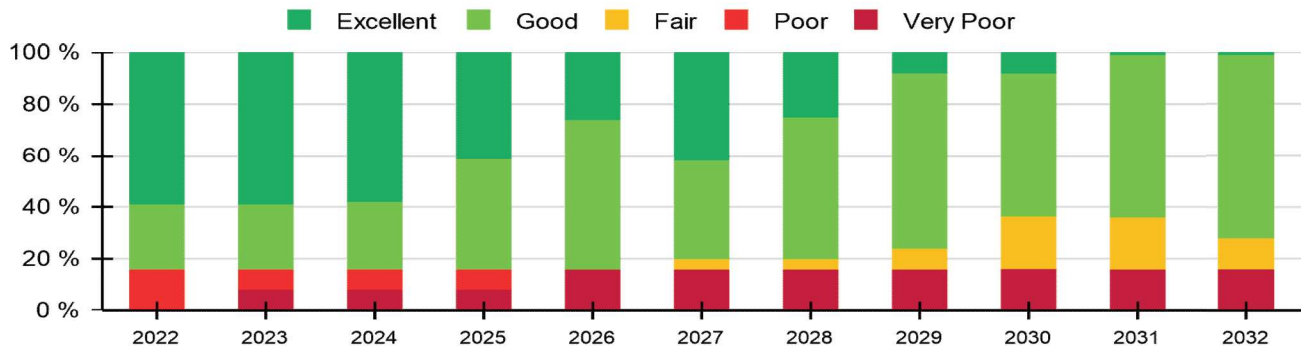
Year	Value
2023	\$1,852
2024	\$2,218
2026	\$4,274
2028	\$4,447
2030	\$2,498
2031	\$2,170

## Network Condition Distribution



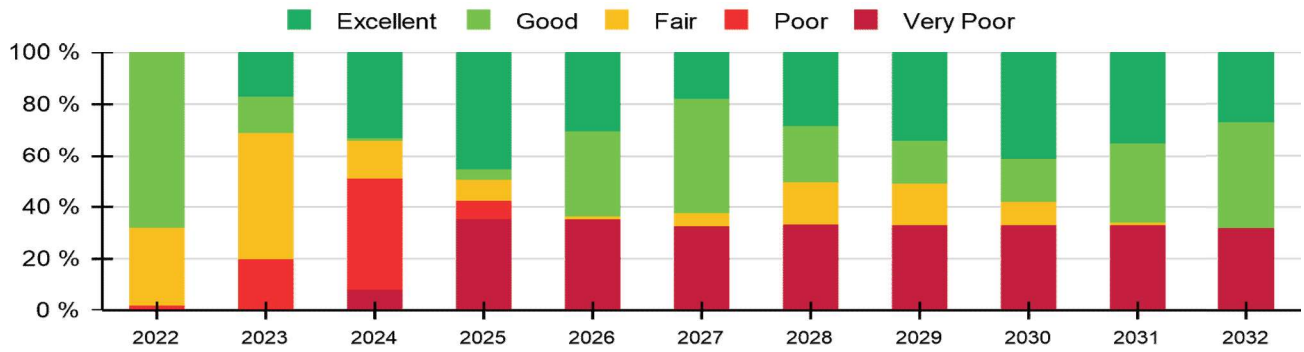
Year	Excellent	Good	Fair	Poor	Very Poor
2022	13%	59%	24%	5%	0%
2023	26%	16%	39%	17%	2%
2024	39%	6%	12%	35%	8%
2025	44%	13%	7%	7%	29%
2026	29%	38%	1%	0%	31%
2027	23%	43%	4%	0%	29%
2028	28%	29%	14%	0%	29%
2029	29%	28%	14%	0%	29%
2030	34%	25%	11%	0%	29%
2031	28%	38%	5%	0%	29%
2032	21%	48%	3%	0%	29%

## Paved Condition Distribution



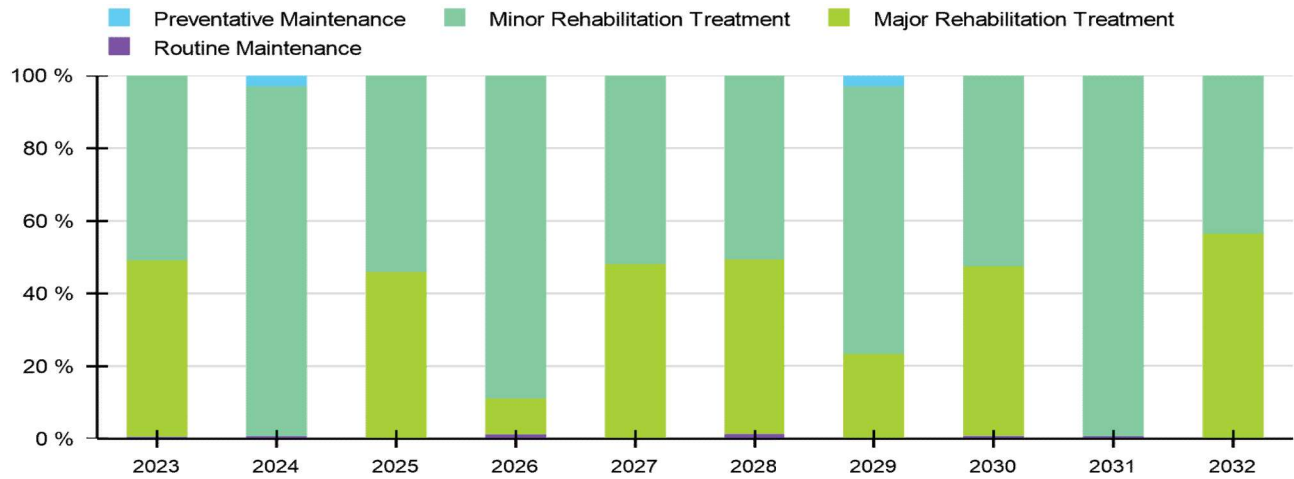
Year	Excellent	Good	Fair	Poor	Very Poor
2022	59%	25%	0%	16%	0%
2023	59%	25%	0%	8%	8%
2024	58%	26%	0%	8%	8%
2025	41%	43%	0%	8%	8%
2026	26%	58%	0%	0%	16%
2027	42%	38%	4%	0%	16%
2028	25%	55%	4%	0%	16%
2029	8%	68%	8%	0%	16%
2030	8%	55%	20%	0%	16%
2031	1%	63%	20%	0%	16%
2032	1%	71%	12%	0%	16%

## Gravel Condition Distribution



Year	Excellent	Good	Fair	Poor	Very Poor
2022	0%	68%	30%	2%	0%
2023	17%	14%	49%	20%	0%
2024	33%	1%	15%	43%	8%
2025	45%	4%	8%	7%	35%
2026	30%	33%	1%	0%	35%
2027	18%	45%	5%	0%	33%
2028	28%	22%	16%	0%	33%
2029	34%	17%	16%	0%	33%
2030	41%	17%	9%	0%	33%
2031	35%	31%	1%	0%	33%
2032	27%	41%	0%	0%	32%

## Capital Expenditure by Treatment Type



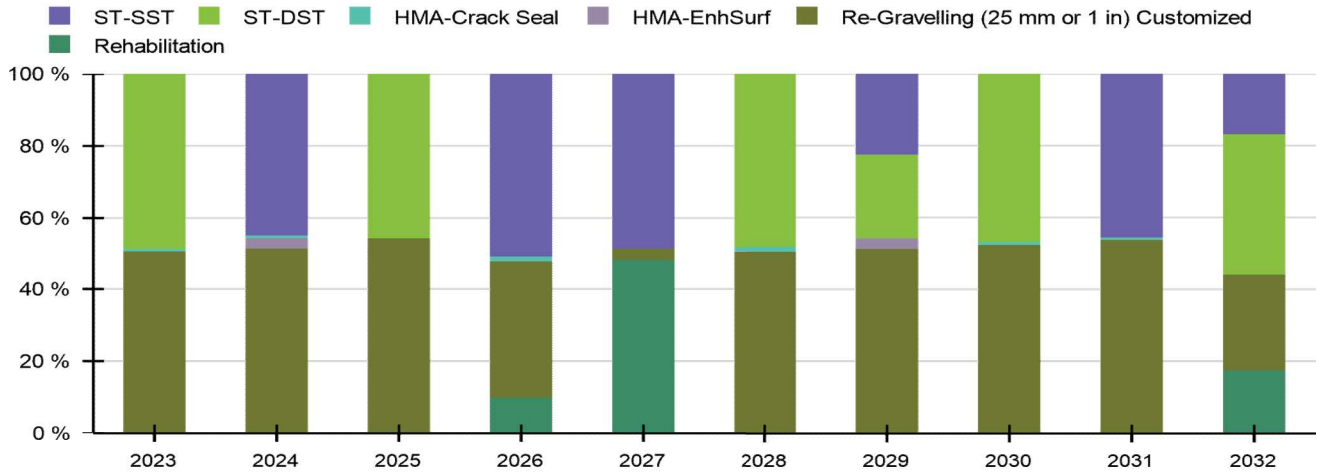
Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Routine Maintenance	Total
2023	\$0	\$149,972	\$143,300	\$1,852	\$295,124
2024	\$8,480	\$280,904	\$0	\$2,218	\$291,602
2025	\$0	\$154,207	\$131,117	\$0	\$285,324
2026	\$0	\$292,569	\$32,864	\$4,274	\$329,707
2027	\$0	\$153,811	\$142,939	\$0	\$296,750
2028	\$0	\$166,334	\$158,215	\$4,447	\$328,996
2029	\$9,363	\$237,887	\$75,262	\$0	\$322,512
2030	\$0	\$164,105	\$146,279	\$2,498	\$312,882
2031	\$0	\$310,649	\$0	\$2,170	\$312,819
2032	\$0	\$166,110	\$216,253	\$0	\$382,363
<b>Total</b>	<b>\$17,843</b>	<b>\$2,076,548</b>	<b>\$1,046,229</b>	<b>\$17,459</b>	<b>\$3,158,079</b>

## Project Size by Treatment Type (Km)



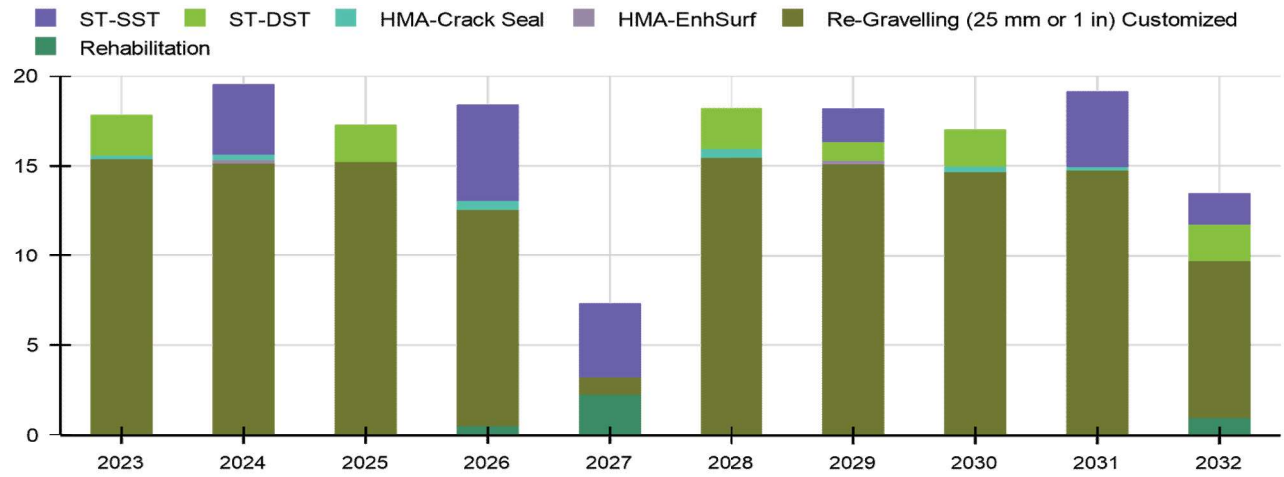
Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Routine Maintenance	Total
2023	0.00	15.40	2.23	0.19	17.82
2024	0.19	19.03	0.00	0.30	19.52
2025	0.00	15.22	2.05	0.00	17.27
2026	0.00	17.37	0.53	0.49	18.39
2027	0.00	5.04	2.26	0.00	7.30
2028	0.00	15.47	2.23	0.49	18.19
2029	0.19	16.94	1.04	0.00	18.17
2030	0.00	14.67	2.04	0.30	17.01
2031	0.00	18.93	0.00	0.19	19.12
2032	0.00	10.48	2.99	0.00	13.47
<b>Total</b>	<b>0.38</b>	<b>148.55</b>	<b>15.37</b>	<b>1.96</b>	<b>166.26</b>

## Capital Expenditure by Treatment Method



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-SST	\$0	\$130,416	\$0	\$168,038	\$143,586	\$0	\$72,284	\$0	\$142,235	\$64,158	\$720,717
ST-DST	\$143,300	\$0	\$129,901	\$0	\$0	\$158,215	\$75,262	\$146,279	\$0	\$149,216	\$802,173
HMA-Crack Seal	\$1,852	\$2,218	\$0	\$4,274	\$0	\$4,447	\$0	\$2,498	\$2,170	\$0	\$17,459
HMA-EnhSurf	\$0	\$8,480	\$0	\$0	\$0	\$0	\$9,363	\$0	\$0	\$0	\$17,843
Re-Gravelling (25 mm or 1 in) Customized	\$149,972	\$150,488	\$154,207	\$124,531	\$10,225	\$166,334	\$165,603	\$164,105	\$168,414	\$101,952	\$1,355,831
Rehabilitation	\$0	\$0	\$1,216	\$32,864	\$142,939	\$0	\$0	\$0	\$0	\$67,037	\$244,056
<b>Total</b>	<b>\$295,124</b>	<b>\$291,602</b>	<b>\$285,324</b>	<b>\$329,707</b>	<b>\$296,750</b>	<b>\$328,996</b>	<b>\$322,512</b>	<b>\$312,882</b>	<b>\$312,819</b>	<b>\$382,363</b>	<b>\$3,158,079</b>

## Project Size by Treatment Method (Km)



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-SST	0.00	3.88	0.00	5.32	4.07	0.00	1.84	0.00	4.17	1.72	21.00
ST-DST	2.23	0.00	2.03	0.00	0.00	2.23	1.04	2.04	0.00	2.03	11.60
HMA-Crack Seal	0.19	0.30	0.00	0.49	0.00	0.49	0.00	0.30	0.19	0.00	1.96
HMA-EnhSurf	0.00	0.19	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.38
Re-Gravelling (25 mm or 1 in) Customized	15.40	15.15	15.22	12.05	0.97	15.47	15.10	14.67	14.76	8.76	127.55
Rehabilitation	0.00	0.00	0.02	0.53	2.26	0.00	0.00	0.00	0.00	0.96	3.77
<b>Total</b>	<b>17.82</b>	<b>19.52</b>	<b>17.27</b>	<b>18.39</b>	<b>7.30</b>	<b>18.19</b>	<b>18.17</b>	<b>17.01</b>	<b>19.12</b>	<b>13.47</b>	<b>166.26</b>







**APPENDIX F**

**Scenario 2 - Targeted Excellent  
Condition by Year 2025**

## Optimization Result

## Scenario Summary

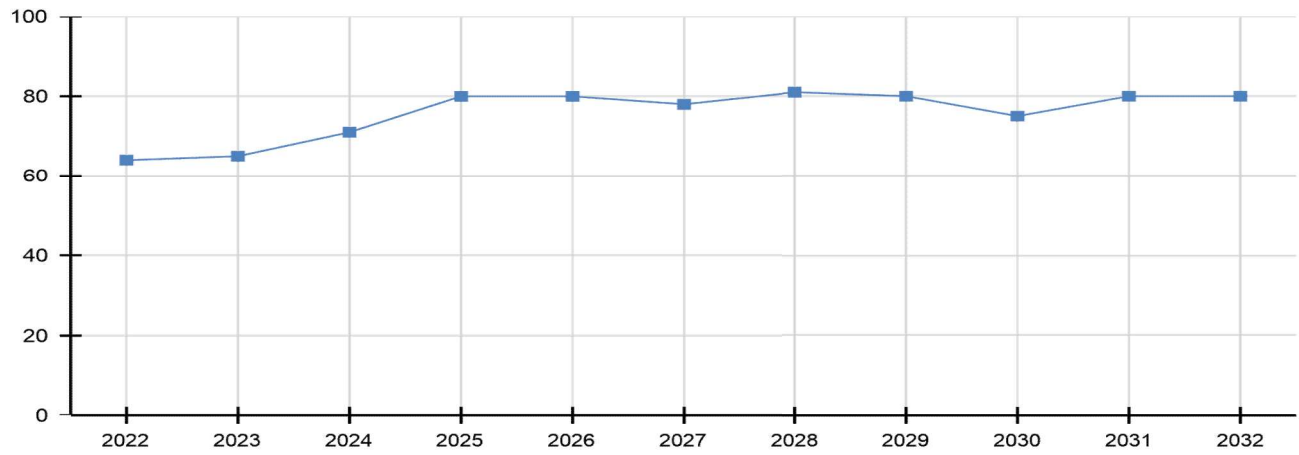
### Scenario

<b>Name:</b>	SC2.1 Target Very Good at 2025
<b>Description:</b>	Budget required to improve overall condition to excellent in 3 years and then maintain the condition in the last 7 years.
<b>Year:</b>	2023

### Optimization Settings

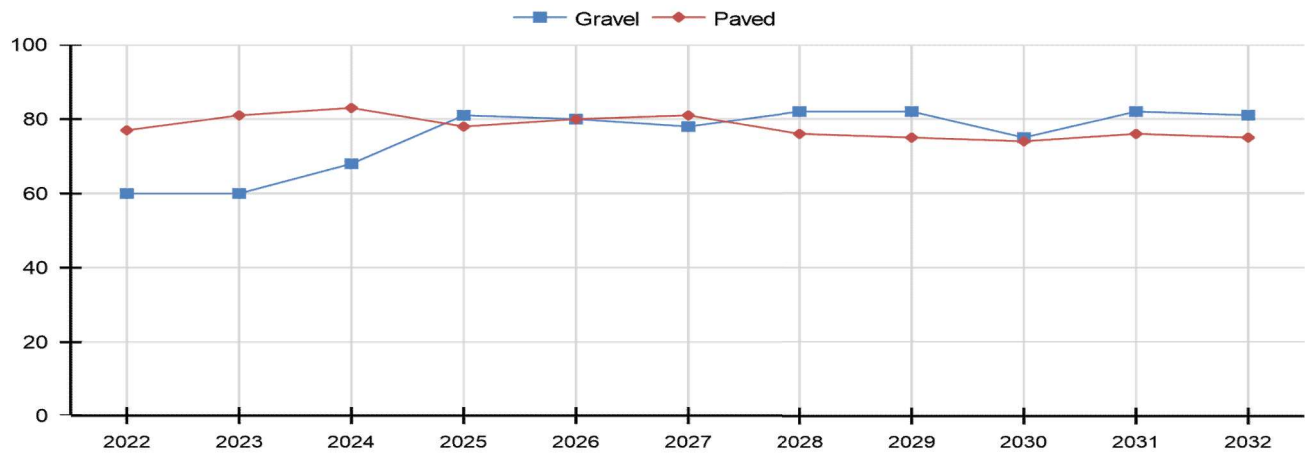
<b>Optimization Mode</b>	Target Optimization
<b>Planning Horizon (Years)</b>	10
<b>Include Priorities</b>	Yes
<b>Asset Replacement Value</b>	No
<b>Estimate Current Condition</b>	False
<b>Operational Efficiency</b>	Yes

## Network Condition



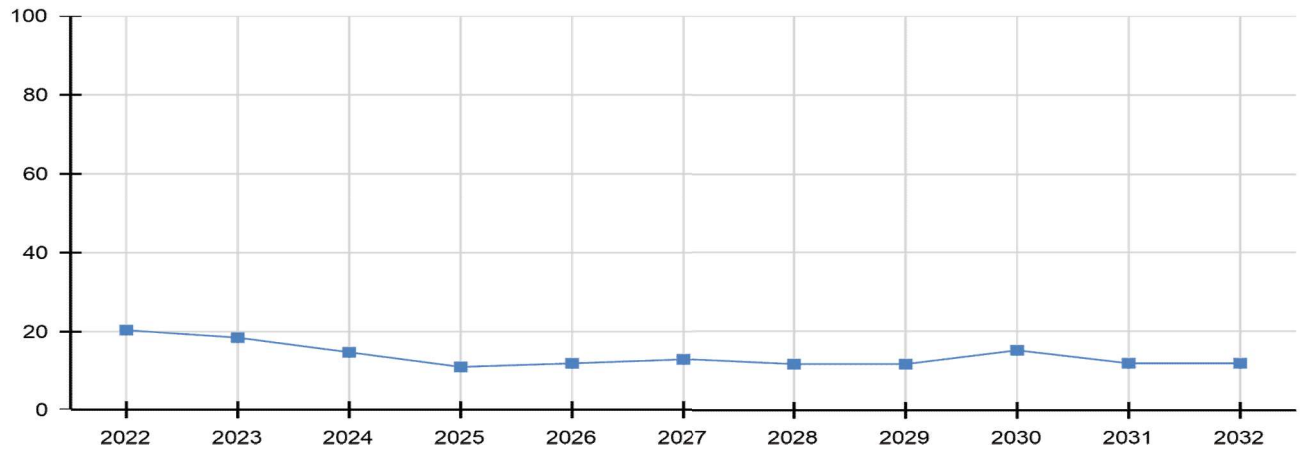
Year	Condition
2022	64
2023	65
2024	71
2025	80
2026	80
2027	78
2028	81
2029	80
2030	75
2031	80
2032	80

## Network Condition by Performance Class



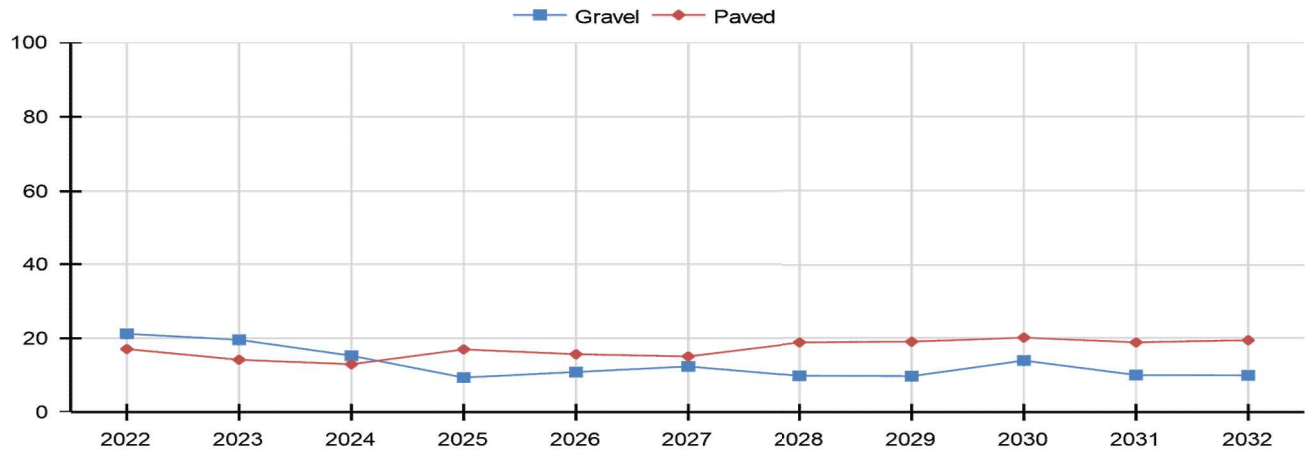
Year	Paved	Gravel
2022	77	60
2023	81	60
2024	83	68
2025	78	81
2026	80	80
2027	81	78
2028	76	82
2029	75	82
2030	74	75
2031	76	82
2032	75	81

## Network Risk Index



Year	Value
2022	20
2023	18
2024	15
2025	11
2026	12
2027	13
2028	12
2029	12
2030	15
2031	12
2032	12

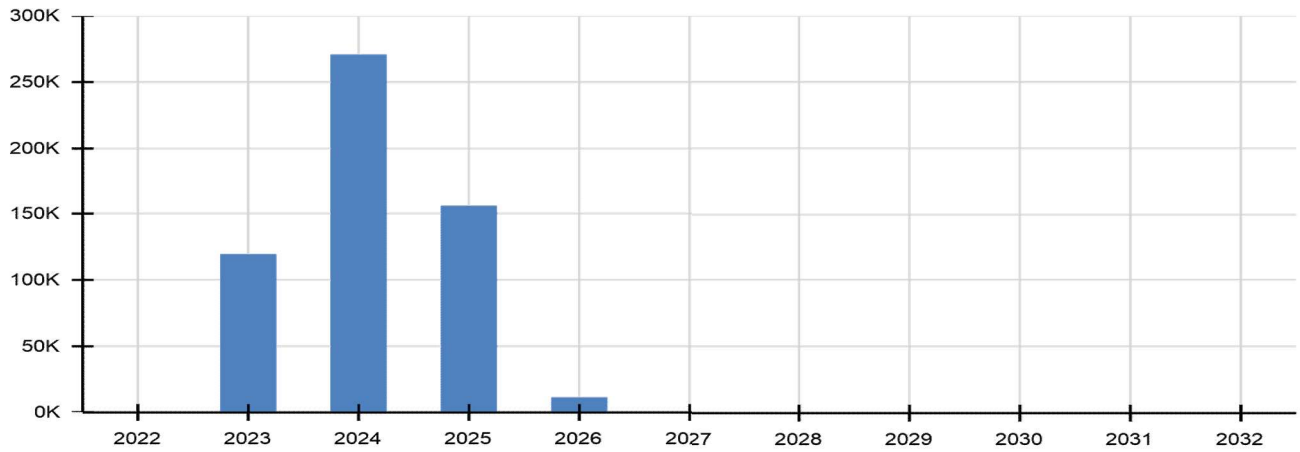
## Network Risk Index by Performance Class



Year	Paved	Gravel
2022	17	21
2023	14	20
2024	13	15
2025	17	9
2026	16	11
2027	15	12
2028	19	10
2029	19	10
2030	20	14
2031	19	10
2032	19	10

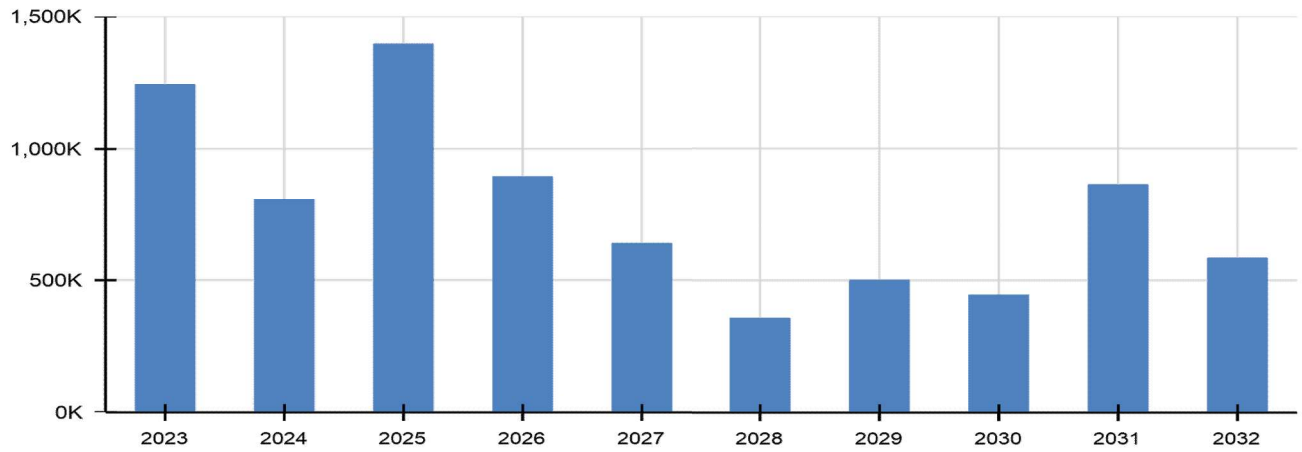


## Deficit Projection



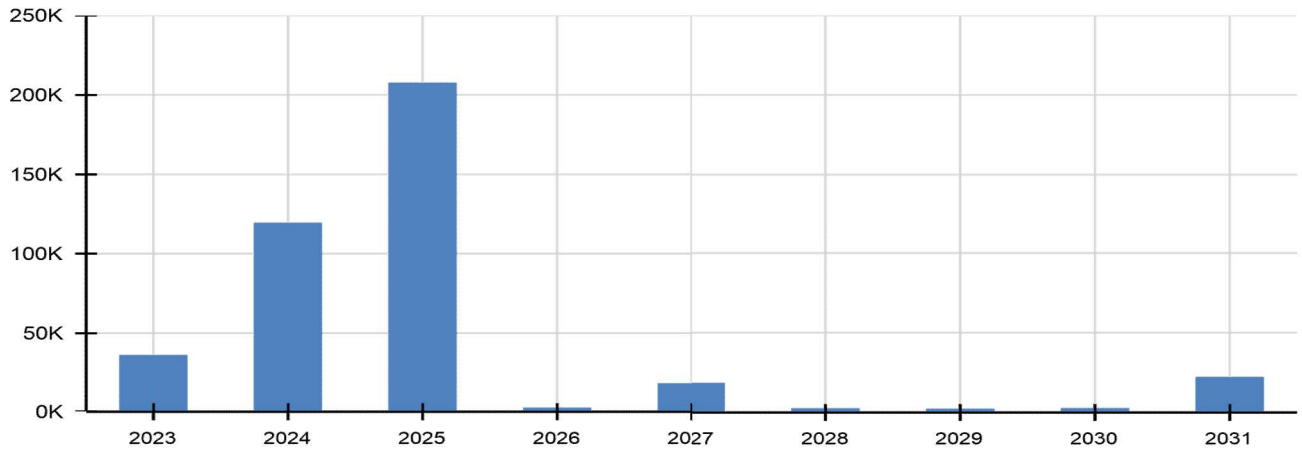
Year	Value
2022	\$0
2023	\$119,199
2024	\$270,581
2025	\$155,626
2026	\$11,161
2027	\$0
2028	\$0
2029	\$0
2030	\$0
2031	\$0
2032	\$0

## Capital Expenditure



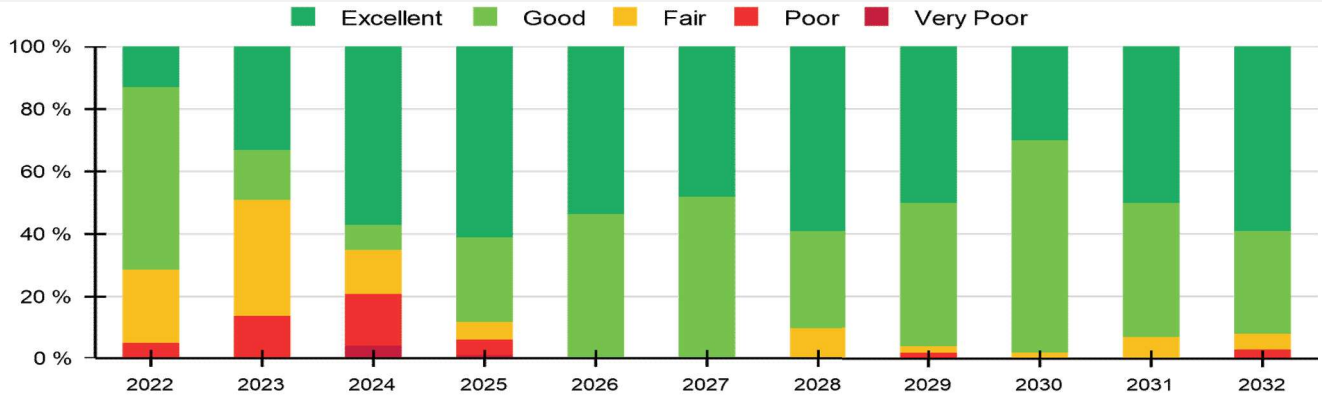
Year	Value
2023	\$1,243,094
2024	\$806,951
2025	\$1,395,971
2026	\$895,623
2027	\$639,125
2028	\$357,398
2029	\$501,610
2030	\$445,479
2031	\$863,214
2032	\$584,722

## Maintenance Expenditure



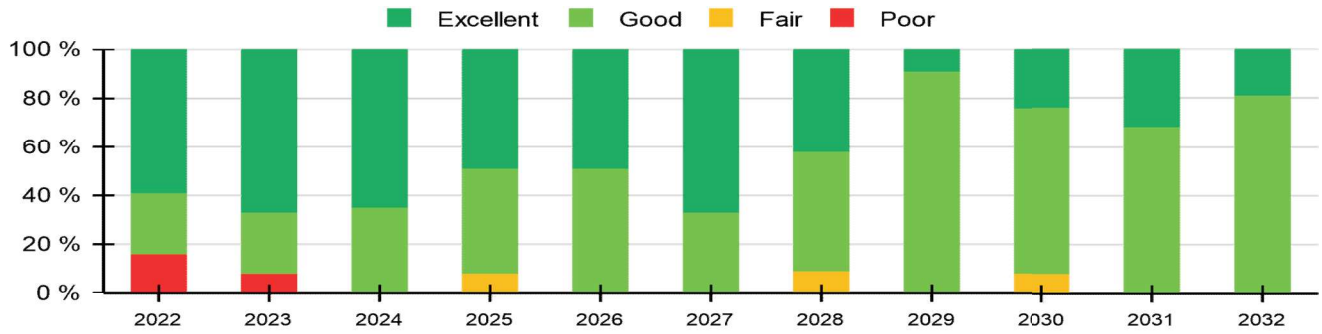
Year	Value
2023	\$36,065
2024	\$119,208
2025	\$207,422
2026	\$2,308
2027	\$18,374
2028	\$2,401
2029	\$2,128
2030	\$2,498
2031	\$22,059

## Network Condition Distribution



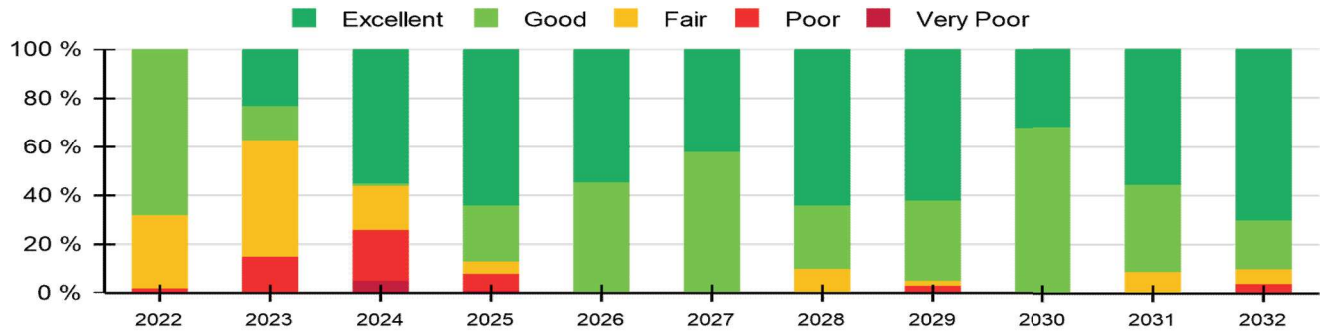
Year	Excellent	Good	Fair	Poor	Very Poor
2022	13%	59%	24%	5%	0%
2023	33%	16%	37%	14%	0%
2024	57%	8%	14%	17%	4%
2025	61%	27%	6%	5%	1%
2026	53%	46%	0%	0%	0%
2027	48%	52%	0%	0%	0%
2028	59%	31%	10%	0%	0%
2029	50%	46%	2%	2%	0%
2030	30%	68%	2%	0%	0%
2031	50%	43%	7%	0%	0%
2032	59%	33%	5%	3%	0%

## Paved Condition Distribution



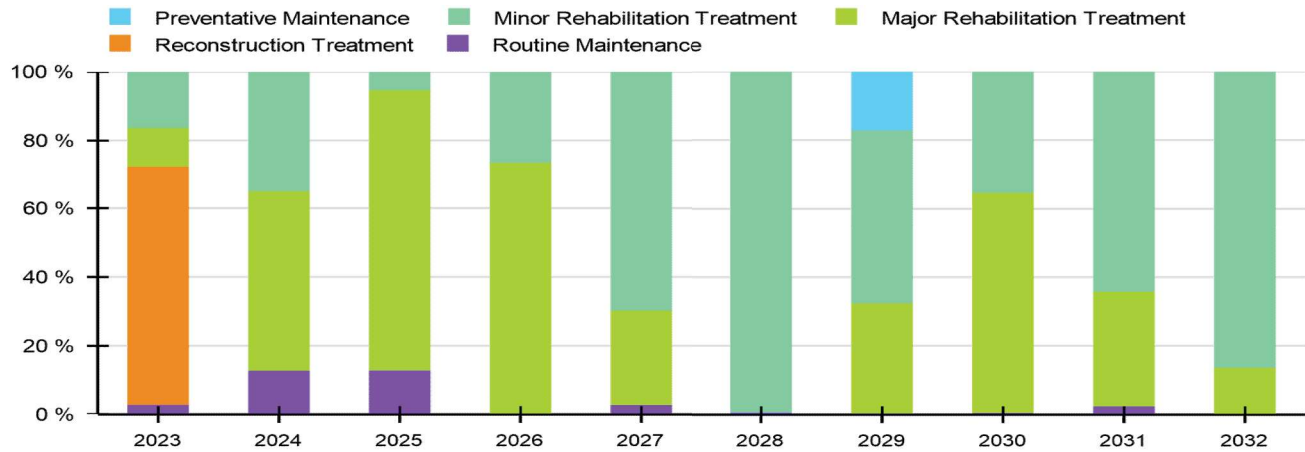
Year	Excellent	Good	Fair	Poor
2022	59%	25%	0%	16%
2023	67%	25%	0%	8%
2024	65%	35%	0%	0%
2025	49%	43%	8%	0%
2026	49%	51%	0%	0%
2027	67%	33%	0%	0%
2028	42%	49%	9%	0%
2029	9%	91%	0%	0%
2030	24%	68%	8%	0%
2031	32%	68%	0%	0%
2032	19%	81%	0%	0%

## Gravel Condition Distribution



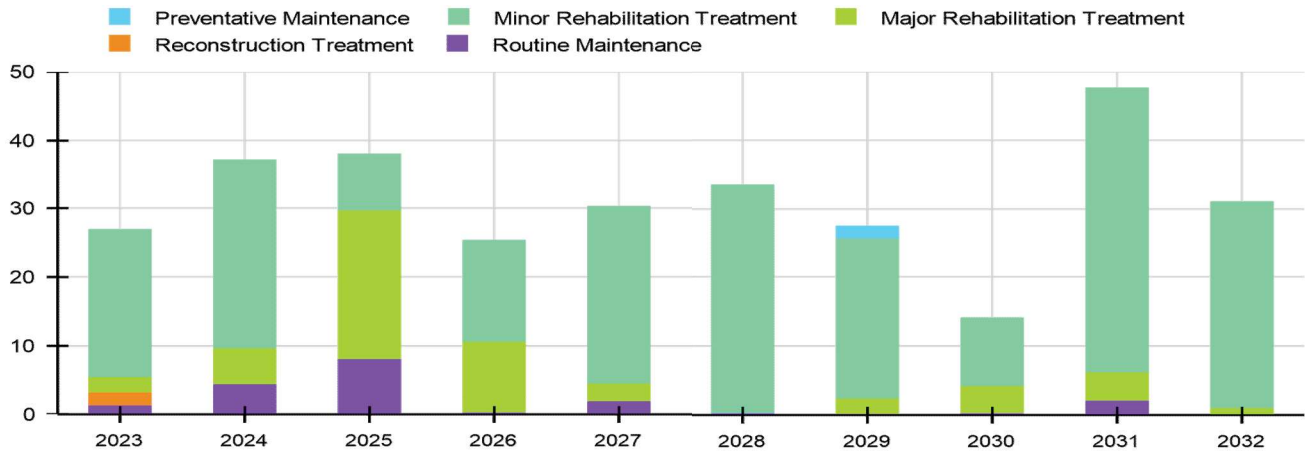
Year	Excellent	Good	Fair	Poor	Very Poor
2022	0%	68%	30%	2%	0%
2023	23%	14%	48%	15%	0%
2024	55%	1%	18%	21%	5%
2025	64%	23%	5%	7%	1%
2026	54%	45%	0%	0%	0%
2027	42%	58%	0%	0%	0%
2028	64%	26%	10%	0%	0%
2029	62%	33%	2%	3%	0%
2030	32%	68%	0%	0%	0%
2031	56%	36%	9%	0%	0%
2032	70%	20%	6%	4%	0%

## Capital Expenditure by Treatment Type



Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Reconstruction Treatment	Routine Maintenance	Total
2023	\$0	\$208,305	\$143,300	\$891,489	\$36,065	\$1,279,159
2024	\$0	\$320,456	\$486,495	\$0	\$119,208	\$926,159
2025	\$0	\$84,703	\$1,311,268	\$0	\$207,422	\$1,603,393
2026	\$0	\$237,339	\$658,284	\$0	\$2,308	\$897,931
2027	\$0	\$458,334	\$180,791	\$0	\$18,374	\$657,499
2028	\$0	\$357,398	\$0	\$0	\$2,401	\$359,799
2029	\$85,795	\$254,436	\$161,379	\$0	\$2,128	\$503,738
2030	\$0	\$157,741	\$287,738	\$0	\$2,498	\$447,977
2031	\$0	\$567,719	\$295,495	\$0	\$22,059	\$885,273
2032	\$0	\$504,853	\$79,869	\$0	\$0	\$584,722
<b>Total</b>	<b>\$85,795</b>	<b>\$3,151,284</b>	<b>\$3,604,619</b>	<b>\$891,489</b>	<b>\$412,463</b>	<b>\$8,145,650</b>

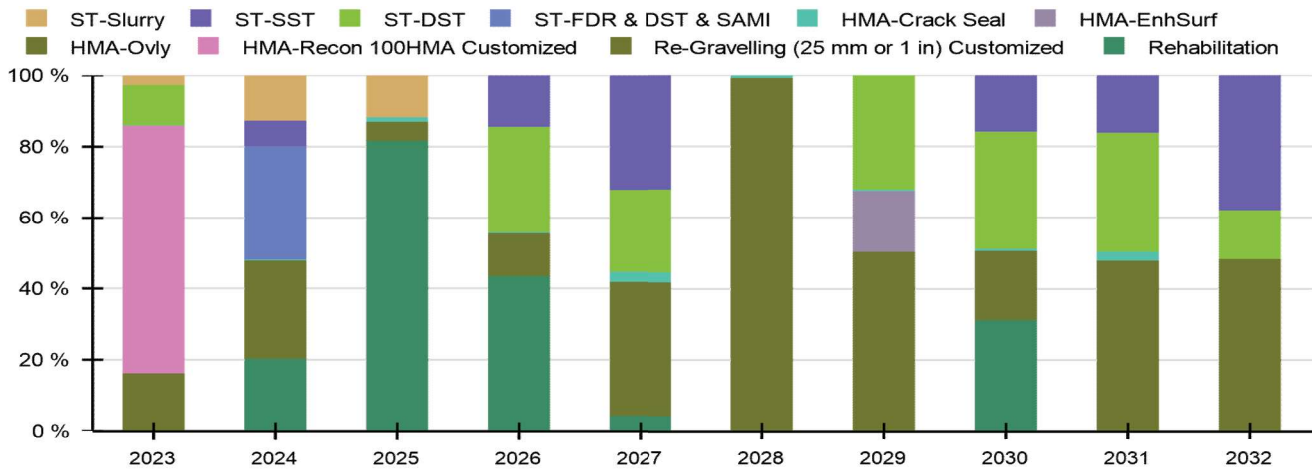
## Project Size by Treatment Type (Km)



Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Reconstruction Treatment	Routine Maintenance	Total
2023	0.00	21.39	2.23	1.94	1.34	26.90
2024	0.00	27.51	5.23	0.00	4.47	37.21
2025	0.00	8.36	21.57	0.00	8.14	38.07
2026	0.00	14.67	10.37	0.00	0.30	25.34
2027	0.00	25.70	2.64	0.00	1.94	30.28
2028	0.00	33.24	0.00	0.00	0.30	33.54
2029	1.94	23.20	2.23	0.00	0.19	27.56
2030	0.00	9.85	3.93	0.00	0.30	14.08
2031	0.00	41.46	4.07	0.00	2.13	47.66
2032	0.00	30.05	1.04	0.00	0.00	31.09
<b>Total</b>	<b>1.94</b>	<b>235.43</b>	<b>53.31</b>	<b>1.94</b>	<b>19.11</b>	<b>311.73</b>

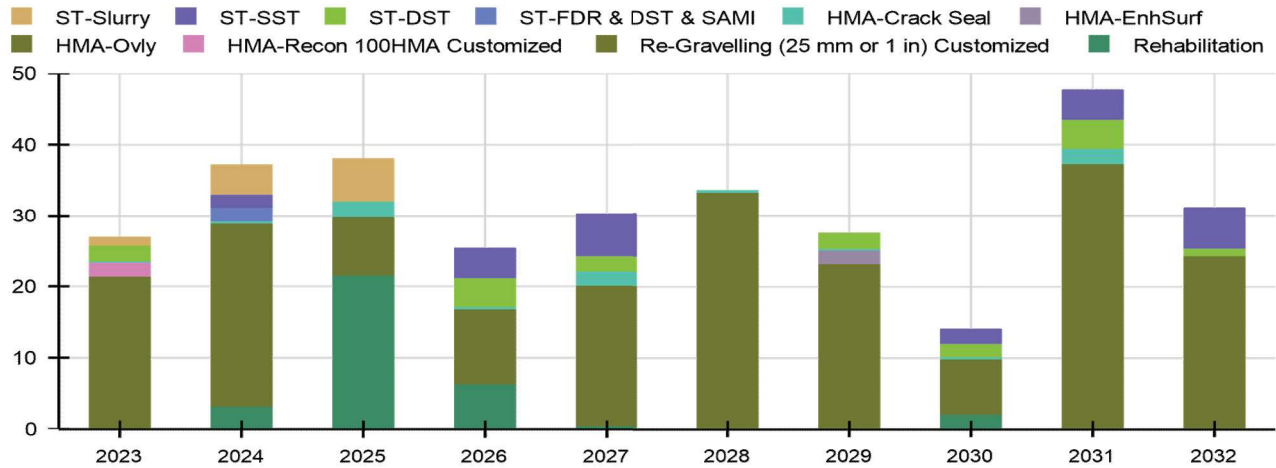


## Capital Expenditure by Treatment Method



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-Slurry	\$34,212	\$116,945	\$187,834	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$338,991
ST-SST	\$0	\$65,470	\$0	\$128,827	\$211,056	\$0	\$0	\$70,598	\$142,235	\$221,460	\$839,646
ST-DST	\$143,300	\$0	\$0	\$267,639	\$152,330	\$0	\$161,379	\$147,460	\$295,495	\$79,869	\$1,247,472
ST-FDR & DST & SAMI	\$0	\$297,565	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$297,565
HMA-Crack Seal	\$1,852	\$2,263	\$19,588	\$2,308	\$18,374	\$2,401	\$2,128	\$2,498	\$22,059	\$0	\$73,471
HMA-EnhSurf	\$0	\$0	\$0	\$0	\$0	\$0	\$85,795	\$0	\$0	\$0	\$85,795
HMA-Ovly	\$0	\$0	\$0	\$0	\$41,724	\$0	\$0	\$0	\$0	\$0	\$41,724
HMA-Recon 100HMA Customized	\$891,489	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$891,489
Re-Gravelling (25 mm or 1 in) Customized	\$208,305	\$254,986	\$84,703	\$108,512	\$205,554	\$357,398	\$254,436	\$87,142	\$425,484	\$283,394	\$2,269,914
Rehabilitation	\$0	\$188,930	\$1,311,268	\$390,645	\$28,461	\$0	\$0	\$140,278	\$0	\$0	\$2,059,582
<b>Total</b>	<b>\$1,279,158</b>	<b>\$926,159</b>	<b>\$1,603,393</b>	<b>\$897,931</b>	<b>\$657,499</b>	<b>\$359,799</b>	<b>\$503,738</b>	<b>\$447,976</b>	<b>\$885,273</b>	<b>\$584,723</b>	<b>\$8,145,649</b>

## Project Size by Treatment Method (Km)



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-Slurry	1.15	4.17	6.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.33
ST-SST	0.00	1.84	0.00	4.17	6.01	0.00	0.00	2.06	4.17	5.70	23.95
ST-DST	2.23	0.00	0.00	4.07	2.19	0.00	2.23	1.84	4.07	1.04	17.67
ST-FDR & DST & SAMI	0.00	2.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.06
HMA-Crack Seal	0.19	0.30	2.13	0.30	1.94	0.30	0.19	0.30	2.13	0.00	7.78
HMA-EnhSurf	0.00	0.00	0.00	0.00	0.00	0.00	1.94	0.00	0.00	0.00	1.94
HMA-Ovly	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.19
HMA-Recon 100HMA Customized	1.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.94
Re-Gravelling (25 mm or 1 in) Customized	21.39	25.67	8.36	10.50	19.50	33.24	23.20	7.79	37.29	24.35	211.29
Rehabilitation	0.00	3.17	21.57	6.30	0.45	0.00	0.00	2.09	0.00	0.00	33.58
<b>Total</b>	<b>26.90</b>	<b>37.21</b>	<b>38.07</b>	<b>25.34</b>	<b>30.28</b>	<b>33.54</b>	<b>27.56</b>	<b>14.08</b>	<b>47.66</b>	<b>31.09</b>	<b>311.73</b>









Scenario 2 - Targeted Excellent Condition by 2025

Asset ID	Name	Start Position	End Position	Length (m)	Surface Type	PCI_After	PCI_Before	Criticality	Risk	Treatment Type	Treatment	Year	Cost
1944013422	S SHORE RD	River Road	Twp Boundary West	2170	Gravel	100.0	50.0	55.2	31	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 25,255.22
1944195515	S SHORE RD	River Road	East Twp Limit	1460	Gravel	100.0	50.0	55.2	31	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 16,991.99

**APPENDIX G**

**Scenario 3 - Targeted Excellent  
Condition by Year 2032**

## Optimization Result

## Scenario Summary

### Scenario

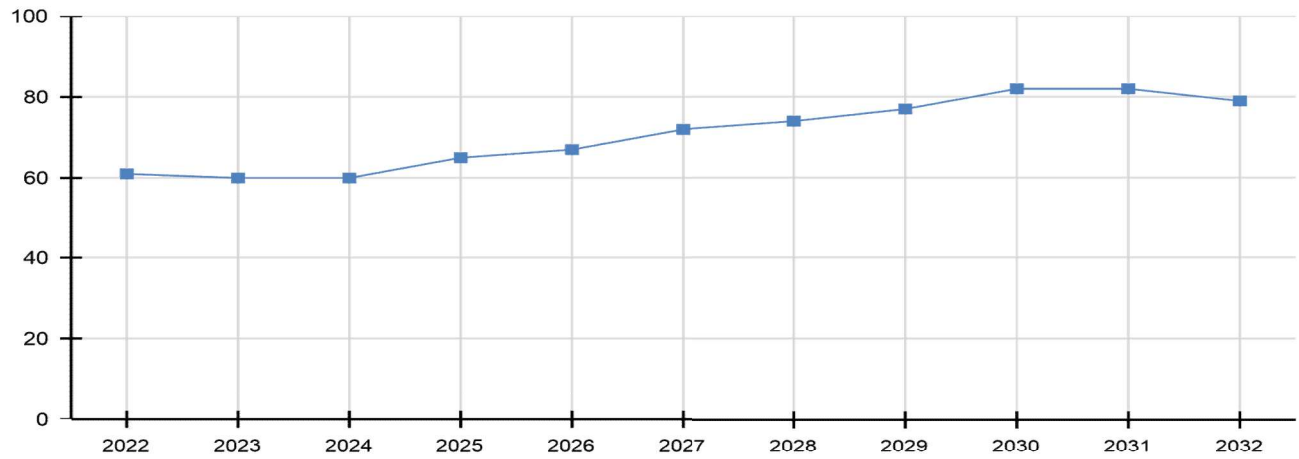
<b>Name:</b>	SC3.9: Target Excellent_Balanced budget
<b>Description:</b>	improve overall condition to excellent by end of year 10
<b>Year:</b>	2023

### Optimization Settings

<b>Optimization Mode</b>	Standard
<b>Planning Horizon (Years)</b>	10
<b>Include Priorities</b>	Yes
<b>Asset Replacement Value</b>	No
<b>Estimate Current Condition</b>	False
<b>Operational Efficiency</b>	No

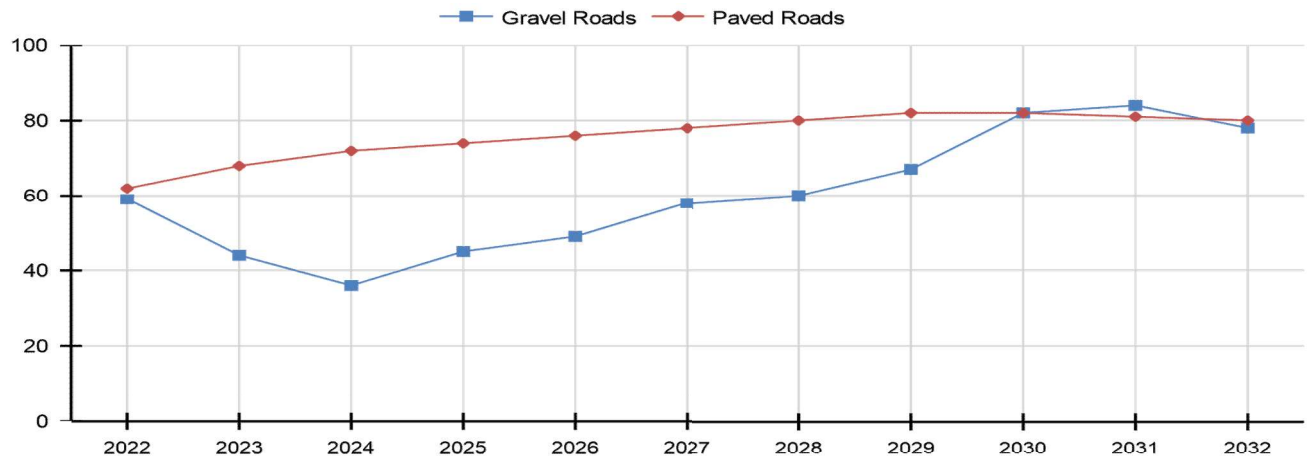


## Network Condition



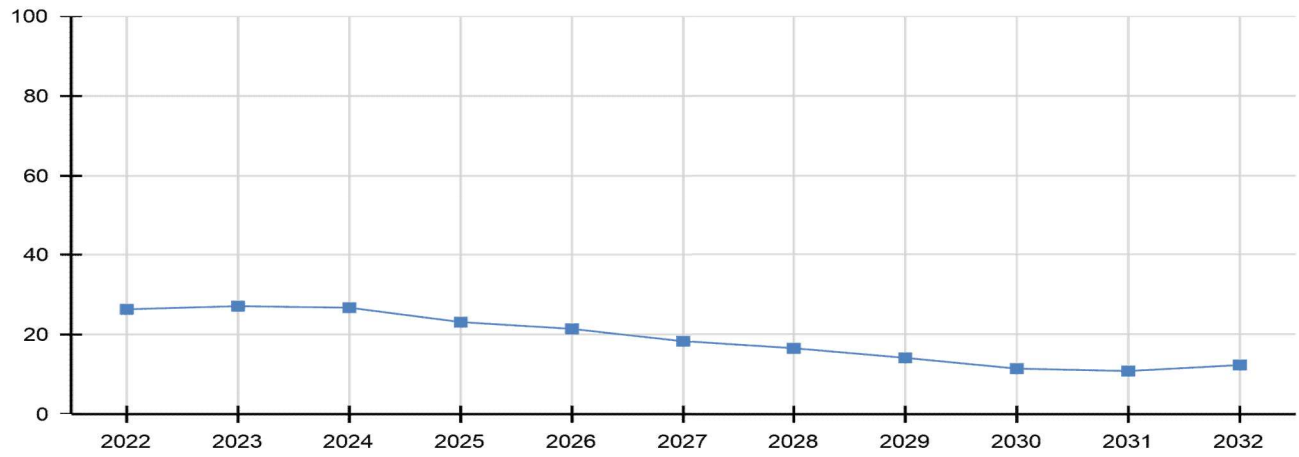
Year	Condition
2022	61
2023	60
2024	60
2025	65
2026	67
2027	72
2028	74
2029	77
2030	82
2031	82
2032	79

## Network Condition by Performance Class



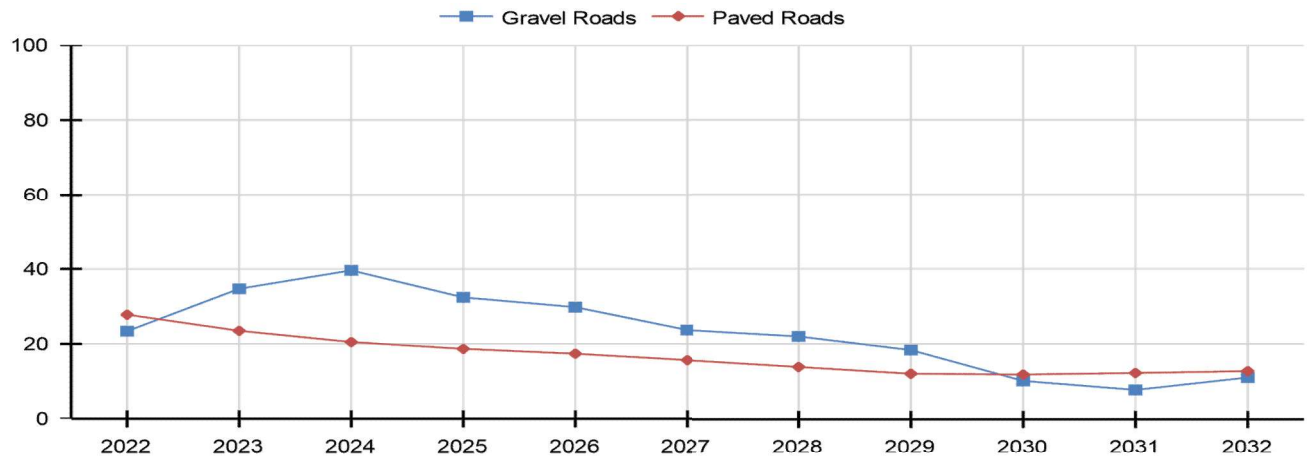
Year	Paved Roads	Gravel Roads
2022	62	59
2023	68	44
2024	72	36
2025	74	45
2026	76	49
2027	78	58
2028	80	60
2029	82	67
2030	82	82
2031	81	84
2032	80	78

## Network Risk Index



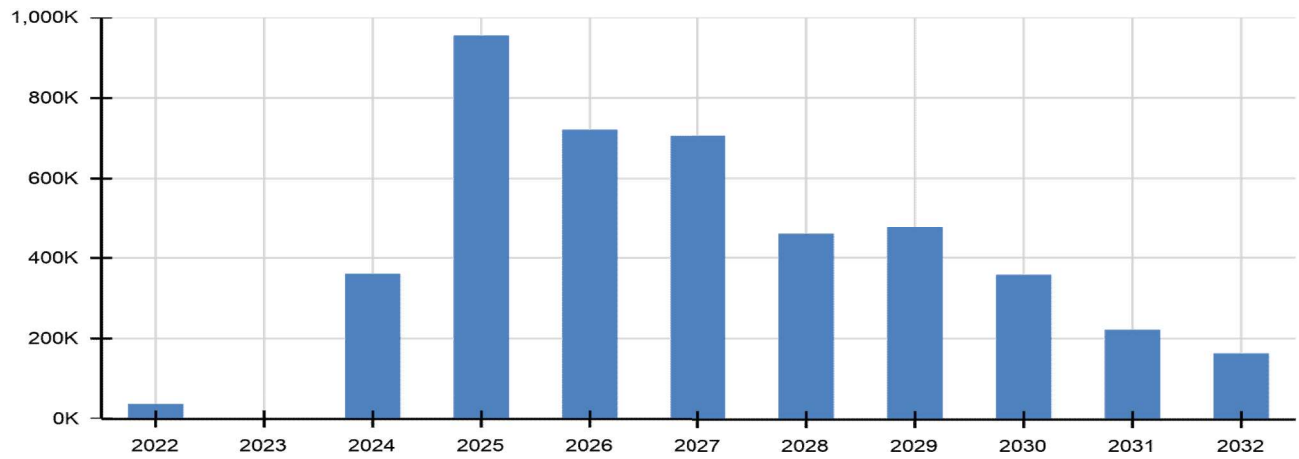
Year	Value
2022	26
2023	27
2024	27
2025	23
2026	21
2027	18
2028	16
2029	14
2030	11
2031	11
2032	12

## Network Risk Index by Performance Class



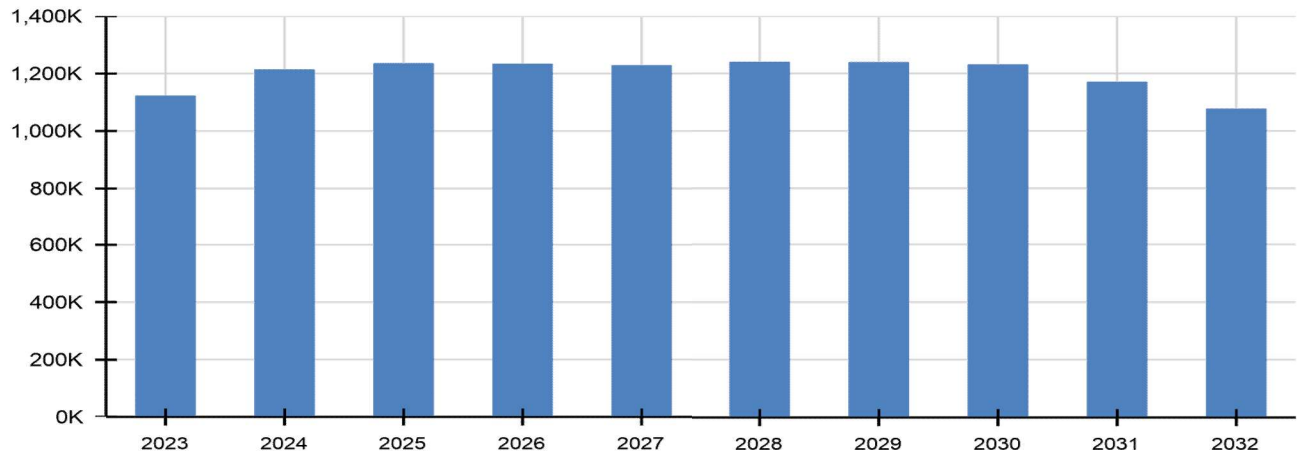
Year	Paved Roads	Gravel Roads
2022	28	23
2023	24	35
2024	21	40
2025	19	32
2026	17	30
2027	16	24
2028	14	22
2029	12	18
2030	12	10
2031	12	8
2032	13	11

## Deficit Projection



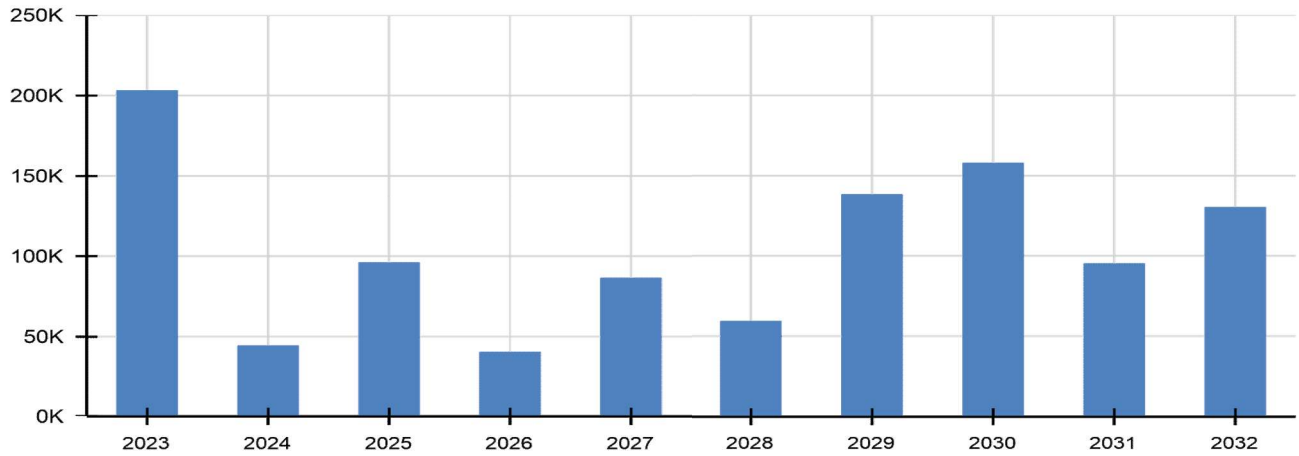
Year	Value
2022	\$36,511
2023	\$0
2024	\$359,922
2025	\$954,100
2026	\$720,488
2027	\$705,078
2028	\$458,813
2029	\$475,399
2030	\$356,933
2031	\$221,321
2032	\$162,609

## Capital Expenditure



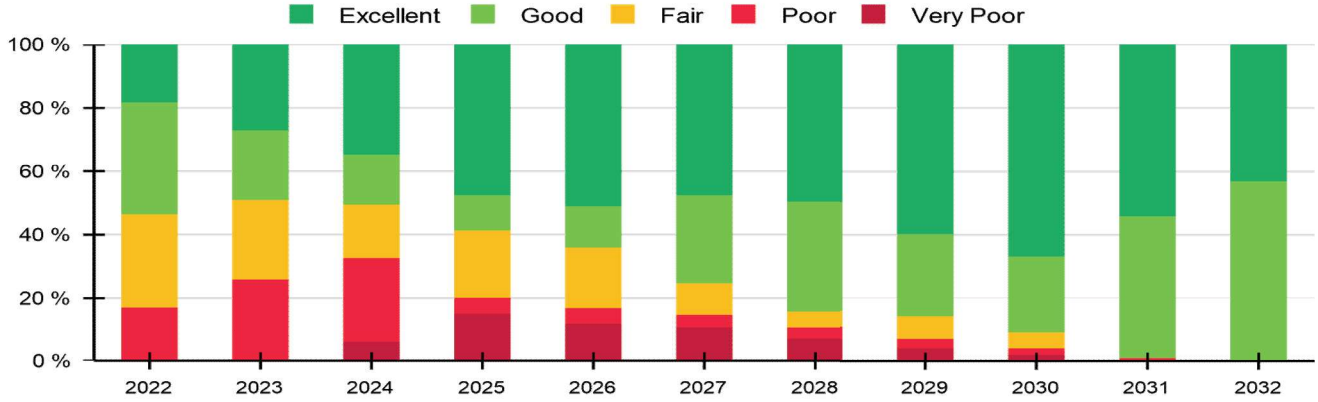
Year	Value
2023	\$1,122,384
2024	\$1,213,574
2025	\$1,234,232
2026	\$1,232,971
2027	\$1,227,849
2028	\$1,239,140
2029	\$1,238,404
2030	\$1,230,054
2031	\$1,169,526
2032	\$1,076,249

## Maintenance Expenditure



Year	Value
2023	\$203,154
2024	\$44,346
2025	\$95,964
2026	\$40,416
2027	\$86,342
2028	\$59,417
2029	\$138,423
2030	\$157,876
2031	\$95,206
2032	\$130,434

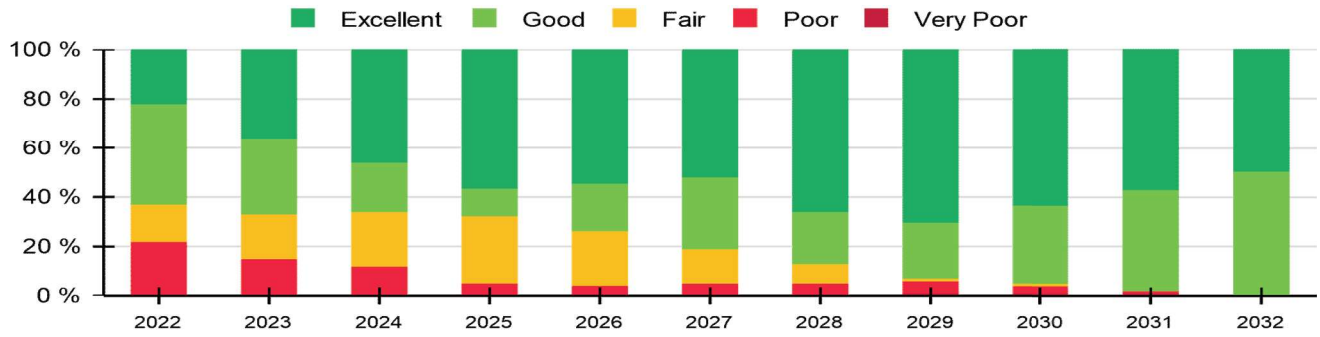
## Network Condition Distribution



Year	Excellent	Good	Fair	Poor	Very Poor
2022	18%	35%	29%	17%	0%
2023	27%	22%	25%	26%	0%
2024	35%	16%	17%	27%	6%
2025	47%	11%	21%	5%	15%
2026	51%	13%	19%	5%	12%
2027	48%	28%	10%	4%	11%
2028	50%	35%	5%	4%	7%
2029	59%	26%	7%	3%	4%
2030	66%	24%	5%	2%	2%
2031	54%	45%	0%	1%	0%
2032	43%	57%	0%	0%	0%

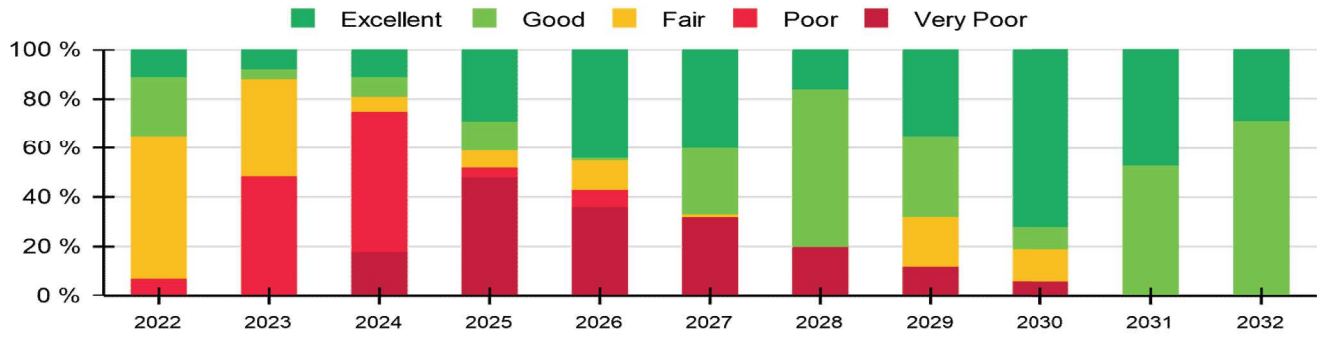


## Paved Roads Condition Distribution



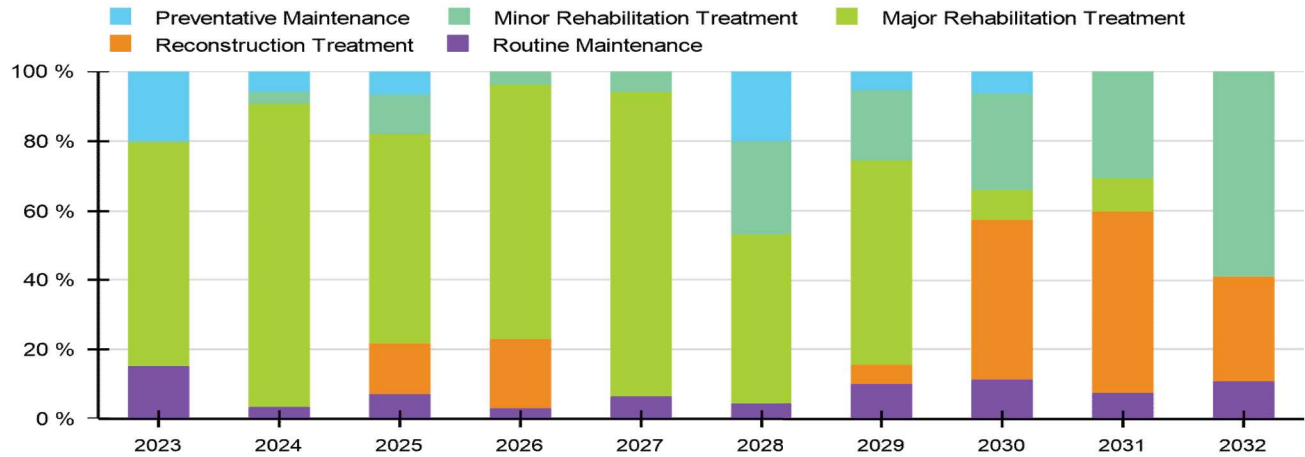
Year	Excellent	Good	Fair	Poor	Very Poor
2022	22%	41%	15%	22%	0%
2023	36%	31%	18%	15%	0%
2024	46%	20%	22%	12%	0%
2025	56%	11%	27%	5%	0%
2026	54%	19%	22%	4%	0%
2027	52%	29%	14%	5%	0%
2028	66%	21%	8%	5%	0%
2029	71%	23%	1%	5%	1%
2030	64%	32%	1%	3%	1%
2031	57%	41%	0%	1%	1%
2032	49%	50%	0%	0%	0%

## Gravel Roads Condition Distribution



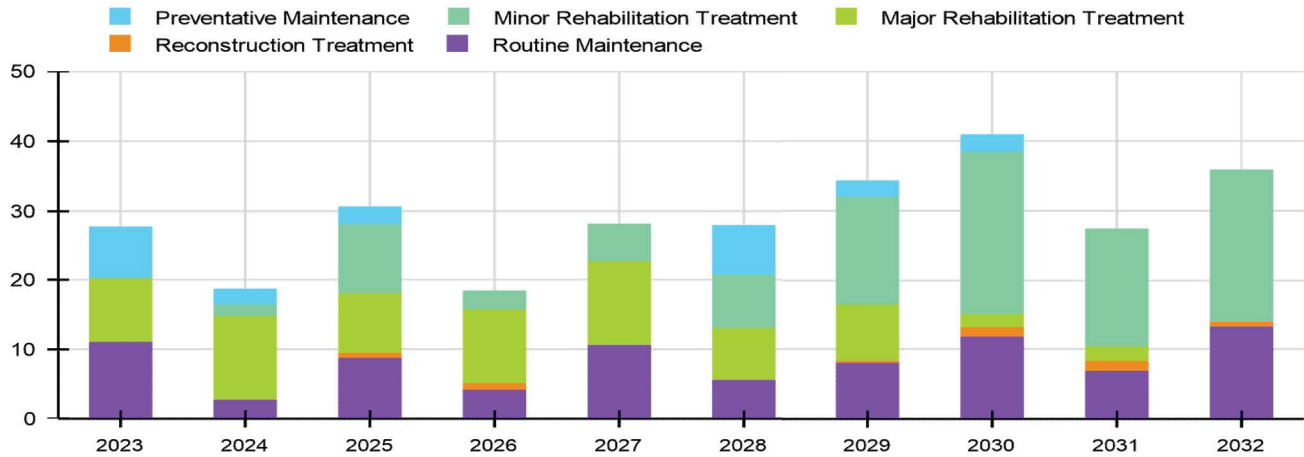
Year	Excellent	Good	Fair	Poor	Very Poor
2022	11%	24%	58%	7%	0%
2023	8%	4%	40%	49%	0%
2024	11%	8%	6%	57%	18%
2025	29%	12%	7%	4%	48%
2026	44%	1%	12%	7%	36%
2027	40%	27%	1%	0%	32%
2028	16%	64%	0%	0%	20%
2029	35%	33%	20%	0%	12%
2030	72%	9%	13%	0%	6%
2031	47%	53%	0%	0%	0%
2032	29%	71%	0%	0%	0%

## Capital Expenditure by Treatment Type



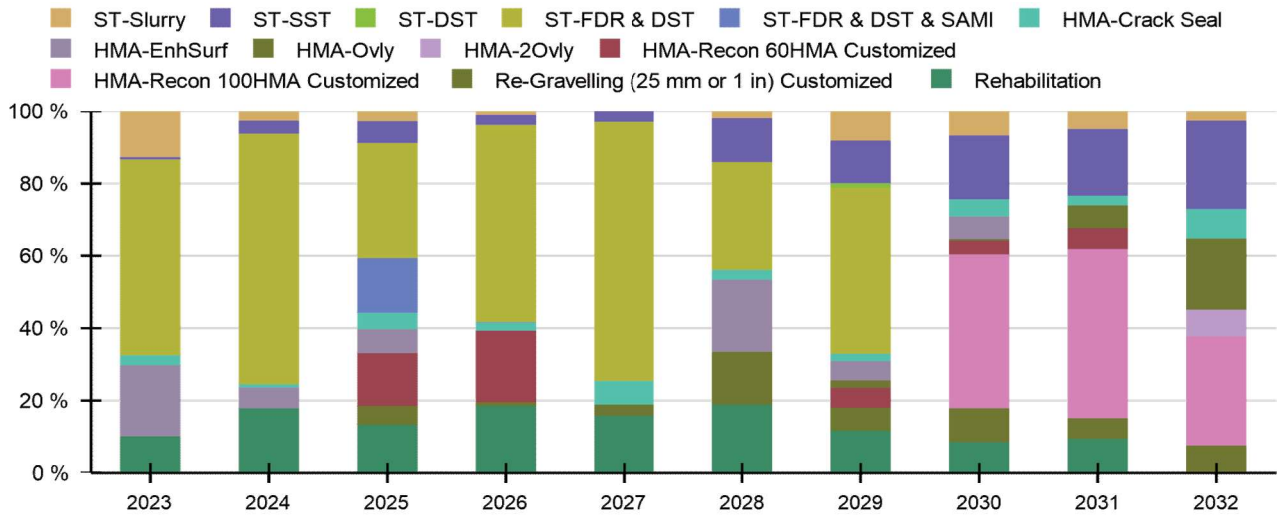
Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Reconstruction Treatment	Routine Maintenance	Total
2023	\$260,554	\$8,760	\$853,070	\$0	\$203,154	\$1,325,538
2024	\$72,174	\$44,369	\$1,097,031	\$0	\$44,346	\$1,257,920
2025	\$87,606	\$149,460	\$802,812	\$194,354	\$95,964	\$1,330,196
2026	\$0	\$47,786	\$932,694	\$252,491	\$40,416	\$1,273,387
2027	\$0	\$77,542	\$1,150,307	\$0	\$86,342	\$1,314,191
2028	\$259,101	\$345,872	\$634,167	\$0	\$59,417	\$1,298,557
2029	\$73,627	\$277,696	\$811,351	\$75,730	\$138,423	\$1,376,827
2030	\$87,606	\$383,080	\$118,466	\$640,902	\$157,876	\$1,387,930
2031	\$0	\$386,585	\$120,335	\$662,606	\$95,206	\$1,264,732
2032	\$0	\$708,820	\$0	\$367,429	\$130,434	\$1,206,683
<b>Total</b>	<b>\$840,668</b>	<b>\$2,429,970</b>	<b>\$6,520,233</b>	<b>\$2,193,512</b>	<b>\$1,051,578</b>	<b>\$13,035,961</b>

## Project Size by Treatment Type (Km)



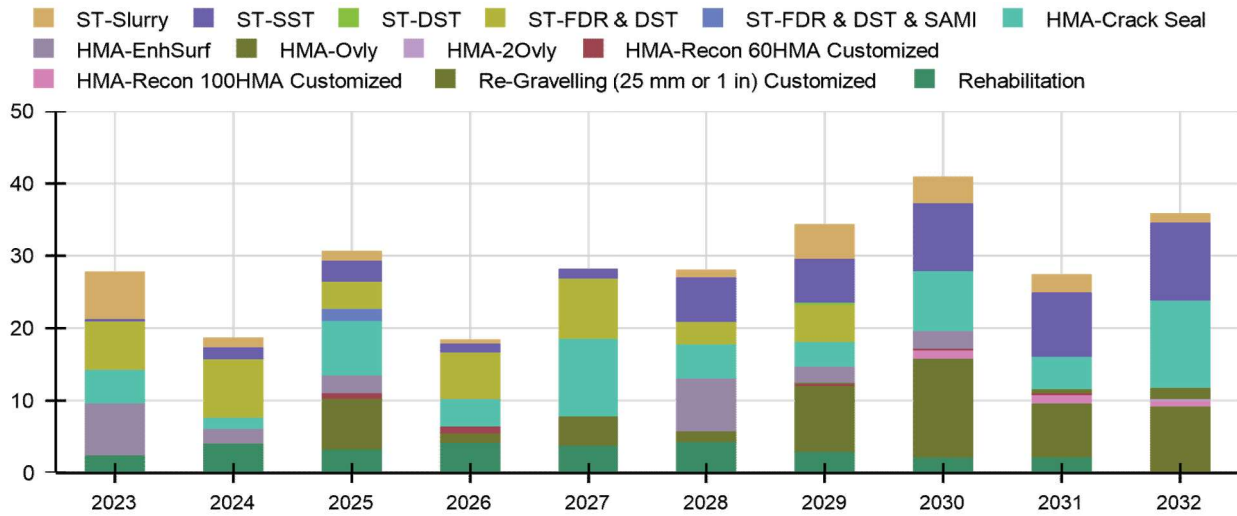
Year	Preventative Maintenance	Minor Rehabilitation Treatment	Major Rehabilitation Treatment	Reconstruction Treatment	Routine Maintenance	Total
2023	7.30	0.32	9.04	0.00	11.10	27.76
2024	2.19	1.67	12.01	0.00	2.80	18.67
2025	2.43	10.09	8.55	0.75	8.81	30.63
2026	0.00	2.63	10.59	0.98	4.22	18.42
2027	0.00	5.52	11.96	0.00	10.69	28.17
2028	7.26	7.68	7.41	0.00	5.66	28.00
2029	2.23	15.46	8.24	0.29	8.08	34.30
2030	2.43	23.23	2.07	1.35	11.83	40.90
2031	0.00	16.96	2.10	1.43	6.90	27.39
2032	0.00	21.88	0.00	0.71	13.27	35.87
<b>Total</b>	<b>23.84</b>	<b>105.43</b>	<b>71.96</b>	<b>5.51</b>	<b>83.37</b>	<b>290.12</b>

## Capital Expenditure by Treatment Method



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-Slurry	\$166,840	\$32,721	\$35,187	\$12,388	\$0	\$24,042	\$111,297	\$91,642	\$61,517	\$31,010	\$566,644
ST-SST	\$8,760	\$44,369	\$80,823	\$34,646	\$37,257	\$157,372	\$161,540	\$245,008	\$232,651	\$294,158	\$1,296,584
ST-DST	\$0	\$0	\$0	\$0	\$0	\$0	\$17,519	\$0	\$0	\$0	\$17,519
ST-FDR & DST	\$718,202	\$871,362	\$423,910	\$694,806	\$941,317	\$387,902	\$632,532	\$0	\$0	\$0	\$4,670,031
ST-FDR & DST & SAMI	\$0	\$0	\$200,449	\$1,554	\$0	\$0	\$0	\$0	\$0	\$0	\$202,003
HMA-Crack Seal	\$36,314	\$11,625	\$60,777	\$28,028	\$86,342	\$35,375	\$27,126	\$66,233	\$33,689	\$99,424	\$484,933
HMA-EnhSurf	\$260,554	\$72,174	\$87,606	\$0	\$0	\$259,101	\$73,627	\$87,606	\$0	\$0	\$840,668
HMA-Ovly	\$0	\$0	\$0	\$0	\$0	\$185,572	\$28,144	\$6,730	\$82,008	\$237,150	\$539,604
HMA-2Ovly	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$89,335	\$89,335
HMA-Recon 60HMA Customized	\$0	\$0	\$194,354	\$252,491	\$0	\$0	\$75,730	\$51,988	\$72,173	\$0	\$646,736
HMA-Recon 100HMA Customized	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$588,915	\$590,433	\$367,429	\$1,546,777
Re-Gravelling (25 mm or 1 in) Customized	\$0	\$0	\$68,637	\$13,140	\$40,285	\$2,929	\$88,012	\$131,342	\$71,925	\$88,178	\$504,448
Rehabilitation	\$134,868	\$225,669	\$178,453	\$236,334	\$208,990	\$246,265	\$161,300	\$118,466	\$120,335	\$0	\$1,630,680
<b>Total</b>	<b>\$1,325,538</b>	<b>\$1,257,920</b>	<b>\$1,330,196</b>	<b>\$1,273,387</b>	<b>\$1,314,191</b>	<b>\$1,298,558</b>	<b>\$1,376,827</b>	<b>\$1,387,930</b>	<b>\$1,264,731</b>	<b>\$1,206,684</b>	<b>\$13,035,962</b>

## Project Size by Treatment Method (Km)



Treatment	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
ST-Slurry	6.48	1.25	1.30	0.49	0.00	0.94	4.69	3.59	2.41	1.22	22.37
ST-SST	0.32	1.67	2.90	1.25	1.30	6.16	6.07	9.43	8.89	10.81	48.80
ST-DST	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.32
ST-FDR & DST	6.69	8.07	3.73	6.45	8.31	3.11	5.10	0.00	0.00	0.00	41.45
ST-FDR & DST & SAMI	0.00	0.00	1.71	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.72
HMA-Crack Seal	4.62	1.55	7.51	3.74	10.69	4.72	3.39	8.24	4.49	12.06	61.00
HMA-EnhSurf	7.30	2.19	2.43	0.00	0.00	7.26	2.23	2.43	0.00	0.00	23.84
HMA-Ovly	0.00	0.00	0.00	0.00	0.00	1.21	0.17	0.04	0.54	1.55	3.51
HMA-2Ovly	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.29
HMA-Recon 60HMA Customized	0.00	0.00	0.75	0.98	0.00	0.00	0.29	0.20	0.28	0.00	2.51
HMA-Recon 100HMA Customized	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	1.15	0.71	3.01
Re-Gravelling (25 mm or 1 in) Customized	0.00	0.00	7.19	1.38	4.22	0.31	9.22	13.76	7.53	9.24	52.84
Rehabilitation	2.35	3.94	3.12	4.13	3.65	4.30	2.82	2.07	2.10	0.00	28.47
<b>Total</b>	<b>27.76</b>	<b>18.67</b>	<b>30.63</b>	<b>18.42</b>	<b>28.17</b>	<b>28.00</b>	<b>34.30</b>	<b>40.91</b>	<b>27.39</b>	<b>35.87</b>	<b>290.12</b>

Asset ID	Name	Start Position	End Position	Length (m)	Surface Type	PCI_After	PCI_Before	Criticality	Risk	Treatment Type	Treatment	Year	Cost
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	Hot Mix Asphalt	83.8	83.8	84.3	17.1	Routine Maintenance	HMA-Crack Seal	2023	\$ 1,889.55
1944491434	BEACH RD	Memorial Park Drive	Chiswick Line	2040	Gravel	100.0	20.0	40	30	Major Rehabilitation Treatment	Rehabilitation	2023	\$ 119,198.63
1944004443	BOUNDARY RD	Concession Rd 8	End	110	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 1,071.23
1944462876	BOUNDARY RD	Pioneer Road	Robson Lane/Con 8 Rd.	50	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 486.92
1944088221	GOLF COURSE RD	Chiswick Line	Pioneer Road	2030	Gravel	100.0	33.3	44.3	29.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 19,769.05
1944119614	GOLF COURSE RD	Pioneer Road	Wasing Road	2210	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 21,521.97
1944426653	GRAVELLE RD	Polarvale Road	Pioneer Road	2120	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 20,645.51
1944052096	MEMORIAL PARK DR	Kells Road	Memory Lane	20	Gravel	100.0	25.0	55.2	39.6	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 194.77
1944370777	MEMORIAL PARK DR	Memory Lane	Green Point Road	940	Gravel	100.0	25.0	55.2	39.6	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 9,154.14
1944402585	MEMORIAL PARK DR	Alderdale Road	Kells Road	2230	Surface Treated	83.9	57.0	60.4	31.3	Major Rehabilitation Treatment	ST-DST	2023	\$ 143,299.80
1944484008	MEMORIAL PARK DR	Green Point Road	Beach Road	1130	Gravel	100.0	25.0	55.2	39.6	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 11,004.45
1944405674	PIONEER RD	Gravelle Road	End	1330	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 12,952.14
1944435274	PIONEER RD	Maple Road/Kells Road	Golf Course Road	4090	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 39,830.26
1944383581	RIVER RD	Village Road	Mallard Haven Road	1040	Surface Treated	90.6	75.0	71.3	22.2	Minor Rehabilitation Treatment	ST-SST	2023	\$ 33,415.20
1944385205	RIVER RD	Laporte Road	Golf Course Road	1150	Surface Treated	77.1	77.1	49.6	14.2	Routine Maintenance	ST-Slurry	2023	\$ 34,896.75
1944195515	S SHORE RD	River Road	East Twp Limit	1460	Gravel	100.0	33.3	55.2	36.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 14,218.14
1944016621	TRAPPERS RD	Memorial Park Drive	End	90	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2023	\$ 876.46
1944265315	ALDERDALE RD	Grahamvale Road	Memorial Park Drive	1840	Surface Treated	95.3	80.0	71.3	17.8	Minor Rehabilitation Treatment	ST-SST	2024	\$ 65,470.29
1944383667	ALDERDALE RD	Memorial Park Drive W	Chiswick Line	2040	Surface Treated	83.2	83.2	60.4	12.6	Routine Maintenance	ST-Slurry	2024	\$ 59,250.78
1944033831	ALGONQUIN RD	Wasing Road	End	1410	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 14,005.84
1944473644	BOOTH RD	Golf Course Road	End	1390	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 13,807.17
1944025447	BOUNDARY RD	Chiswick Line	End	550	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 5,463.27
1944113714	BOUNDARY RD	Chiswick Line	Pioneer Road	1980	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 19,667.77
1944056279	CHISWICK LINE	Alderdale Road	Bellcairn Road	300	Hot Mix Asphalt	91.3	91.3	73.5	8	Routine Maintenance	HMA-Crack Seal	2024	\$ 2,218.50
1944016140	CHISWICK LINE	Point On Road	Alderdale Road	1850	Gravel	100.0	25.0	55.2	39.6	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 18,376.46
1944072294	CHISWICK LINE	Bell Cairn Road	Kells Road	1850	Gravel	100.0	25.0	55.2	39.6	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 18,376.46
1944143958	CHURCH RD	Kells Road	End	1050	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 10,429.88
1944004301	GOLF COURSE RD	Memorial Park Drive	Chiswick Line	2130	Surface Treated	83.2	83.2	60.4	12.6	Routine Maintenance	ST-Slurry	2024	\$ 55,401.30
1944322935	GRAHAMVALE RD	Village Road	End	530	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 5,264.61
1944391379	MAPLE RD	Twp Boundary	Bear Mountain Road	1920	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 19,071.78
1944189288	POPLARVALE RD	Poplarvale Rd	End	460	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 4,569.28
1944214293	POPLARVALE RD	Poplarvale Rd	Gravelle Road	290	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 2,880.63
1944490733	POPLARVALE RD	Fossmill Road	Poplarvale Rd	1140	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 11,323.87
1944342228	VILLAGE RD	Township Boundary	River Road	2060	Surface Treated	100.0	24.4	71.3	51.5	Major Rehabilitation Treatment	ST-FDR & DST & SAMI	2024	\$ 297,565.22
1944355162	WASING RD	Maple Road	Algonquin Road	4130	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2024	\$ 41,024.19
1944014703	ALDERDALE RD	Grahamvale Road	River Road	2040	Surface Treated	83.2	83.2	60.4	12.6	Routine Maintenance	ST-Slurry	2025	\$ 66,749.98
1944038730	ALDERDALE RD	Twp Boundary	Hill Siding Road	1720	Surface Treated	83.2	83.2	60.4	12.6	Routine Maintenance	ST-Slurry	2025	\$ 51,716.20
1944062483	ALDERDALE RD	Hill Siding Road	River Road	310	Surface Treated	83.2	83.2	60.4	12.6	Routine Maintenance	ST-Slurry	2025	\$ 9,320.94
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	Hot Mix Asphalt	76.5	76.5	84.3	24.7	Routine Maintenance	HMA-Crack Seal	2025	\$ 1,927.34
1944135141	BEAR MOUNTAIN RD	Maple Road	End - South	1750	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 17,730.80
1944446446	BEAR MOUNTAIN RD	Maple Road	End - north	280	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 2,836.93
1944392306	CEDAR RD	River Road	End	270	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 2,735.61
1944111203	FOSSMILL RD	Golf Course Road	Polarvale Road	2340	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 23,708.61
1944352076	FOSSMILL RD	Polarvale Road	End	380	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 3,850.12
1944246973	GOLF COURSE RD	River Road	Booth Road	2030	Surface Treated	83.9	57.0	60.4	31.3	Major Rehabilitation Treatment	ST-DST	2025	\$ 129,901.41
1944332342	GRAHAMVALE RD	Alderdale Road	Village Road	1470	Gravel	100.0	40.0	44.3	27.7	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 14,893.87
1944045562	HS SIDING RD	Private Road	Alderdale Road	1750	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 17,730.80
1944397264	KELLS RD	Church Road	Chiswick Line	1030	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 10,435.84
1944044863	PIONEER RD	Golf Course Road	Gravelle Road	2050	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 20,770.36
1944217337	PIONEER RD	Bellcairn Road	Maple Road/Kells Road	2020	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 20,466.40
1944478763	PIONEER RD	Boundry Road	Bellcairn Road	1940	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 19,655.85
1944478009	POPLARVALE RD	Gravelle Road	End	560	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 5,673.85
1944335170	RIVER RD	Mallard Haven Road	Laporte Road	1940	Surface Treated	81.8	81.8	49.6	11.2	Routine Maintenance	ST-Slurry	2025	\$ 60,046.69
1944385205	RIVER RD	Laporte Road	Golf Course Road	1150	Surface Treated	83.7	67.7	49.6	20	Minor Rehabilitation Treatment	ST-SST	2025	\$ 38,442.26
1944253474	VILLAGE RD	River Road	Grahamvale Road	2210	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2025	\$ 22,391.46
1944383667	ALDERDALE RD	Memorial Park Drive W	Chiswick Line	2040	Surface Treated	88.1	72.4	60.4	20.8	Minor Rehabilitation Treatment	ST-SST	2026	\$ 66,576.07
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	Hot Mix Asphalt	97.2	73.6	84.3	27.8	Preventative Maintenance	HMA-EnhSurf	2026	\$ 8,822.90
1944010896	BEACH RD	Green Point Road	Memorial Park Drive	980	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2026	\$ 10,127.83
1944215803	BELLCAIRN RD	Chiswick Line	Pioneer Road	2080	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2026	\$ 21,495.80
1944056279	CHISWICK LINE	Alderdale Road	Bellcairn Road	300	Hot Mix Asphalt	84.8	84.8	73.5	13.9	Routine Maintenance	HMA-Crack Seal	2026	\$ 2,308.13
1944138707	CHISWICK LINE	Gravelle Road	End	870	Gravel	100.0	12.5	44.3	37.4	Major Rehabilitation Treatment	Rehabilitation	2026	\$ 53,946.20



## Scenario 3 - Targeted Excellent Condition by 2032

Asset ID	Name	Start Position	End Position	Length (m)	Surface Type	PCI_After	PCI_Before	Criticality	Risk	Treatment Type	Treatment	Year	Cost
1944004301	GOLF COURSE RD	Memorial Park Drive	Chiswick Line	2130	Surface Treated	88.1	72.4	60.4	20.8	Minor Rehabilitation Treatment	ST-SST	2026	\$ 62,250.67
1944149389	GOLF COURSE RD	Booth Road	Memorial Park Drive	2040	Surface Treated	83.9	57.0	60.4	31.3	Major Rehabilitation Treatment	ST-DST	2026	\$ 135,139.49
1944463301	GRAVELLE RD	Chiswick Line	Pioneer Road	2030	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2026	\$ 125,874.47
1944157935	HS SIDING RD	Twp Boundary	Private Drive	340	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2026	\$ 21,082.42
1944049185	KELLS RD	Chiswick Line	Pioneer Road	2020	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2026	\$ 20,875.73
1944299070	KELLS RD	Memorial Park Drive	Church Road	1010	Gravel	100.0	12.5	44.3	37.4	Major Rehabilitation Treatment	Rehabilitation	2026	\$ 62,627.20
1944482458	MAPLE RD	Bear Mountain Road	Wasing Road	4570	Gravel	100.0	12.5	44.3	37.4	Major Rehabilitation Treatment	Rehabilitation	2026	\$ 283,372.57
1944059532	WASING RD	Maple Road	End	970	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2026	\$ 10,024.49
1944144903	WASING RD	Algonquin Road	Golf Course Road	300	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2026	\$ 3,100.36
1944014703	ALDERDALE RD	Grahamvale Road	River Road	2040	Surface Treated	88.1	72.4	60.4	20.8	Minor Rehabilitation Treatment	ST-SST	2027	\$ 75,002.42
1944038730	ALDERDALE RD	Twp Boundary	Hill Siding Road	1720	Surface Treated	88.1	72.4	60.4	20.8	Minor Rehabilitation Treatment	ST-SST	2027	\$ 58,109.98
1944062483	ALDERDALE RD	Hill Siding Road	River Road	310	Surface Treated	88.1	72.4	60.4	20.8	Minor Rehabilitation Treatment	ST-SST	2027	\$ 10,473.31
1944088221	GOLF COURSE RD	Chiswick Line	Pioneer Road	2030	Gravel	100.0	33.3	44.3	29.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2027	\$ 21,398.66
1944119614	GOLF COURSE RD	Pioneer Road	Wasing Road	2210	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2027	\$ 23,296.08
1944321375	MEMORIAL PARK DR	Trapper Road	Alderdale Road	1940	Hot Mix Asphalt	100.0	7.1	84.3	76.8	Reconstruction Treatment	HMA-Recon 100HMA Customized	2027	\$ 964,976.34
1944088977	MEMORIAL PARK DR	Golf Course Road	End	4090	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2027	\$ 258,681.33
1944435274	PIONEER RD	Maple Road/Kells Road	Golf Course Road	4090	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2027	\$ 43,113.55
1944335170	RIVER RD	Mallard Haven Road	Laporte Road	1940	Surface Treated	88.1	72.4	49.6	17.1	Minor Rehabilitation Treatment	ST-SST	2027	\$ 67,470.38
1944195515	S SHORE RD	River Road	East Twp Limit	1460	Gravel	100.0	33.3	55.2	36.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2027	\$ 15,390.17
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	Hot Mix Asphalt	88.4	88.4	84.3	12.2	Routine Maintenance	HMA-Crack Seal	2028	\$ 2,086.22
1944491434	BEACH RD	Memorial Park Drive	Chiswick Line	2040	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 21,934.15
1944004443	BOUNDARY RD	Connession Rd 8	End	110	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 1,182.72
1944462876	BOUNDARY RD	Pioneer Road	Robson Lane/Con 8 Rd.	50	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 537.60
1944056279	CHISWICK LINE	Alderdale Road	Bellcairn Road	300	Hot Mix Asphalt	80.0	80.0	73.5	18.4	Routine Maintenance	HMA-Crack Seal	2028	\$ 2,449.40
1944211451	CHISWICK LINE	Golf Course Road	Gravelle Road	2030	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2028	\$ 130,959.79
1944426653	GRAVELLE RD	Polarvale Road	Pioneer Road	2120	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 22,794.32
1944405674	PIONEER RD	Gravelle Road	End	1330	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 14,300.21
1944193803	RIVER RD	Alderdale Road	Village Road	2020	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2028	\$ 130,314.67
1944355162	WASING RD	Maple Road	Algonquin Road	4130	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2028	\$ 44,405.91
1944265315	ALDERDALE RD	Grahamvale Road	Memorial Park Drive	1840	Surface Treated	86.0	70.1	71.3	26.6	Minor Rehabilitation Treatment	ST-SST	2029	\$ 72,284.49
1944033831	ALGONQUIN RD	Wasing Road	End	1410	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 15,463.58
1944473644	BOOTH RD	Golf Course Road	End	1390	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 15,244.24
1944025447	BOUNDARY RD	Chiswick Line	End	550	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 6,031.89
1944113714	BOUNDARY RD	Chiswick Line	Pioneer Road	1980	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 21,714.81
1944060044	CHISWICK LINE	Kells Road	Beach Road	2090	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2029	\$ 137,527.14
1944143958	CHURCH RD	Kells Road	End	1050	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 11,515.43
1944322935	GRAHAMVALE RD	Village Road	End	530	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 5,812.55
1944045562	HS SIDING RD	Private Road	Alderdale Road	1750	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 19,192.38
1944391379	MAPLE RD	Twp Boundary	Bear Mountain Road	1920	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 21,056.79
1944321375	MEMORIAL PARK DR	Trapper Road	Alderdale Road	1940	Hot Mix Asphalt	88.4	88.4	84.3	12.2	Routine Maintenance	HMA-Crack Seal	2029	\$ 19,116.61
1944402585	MEMORIAL PARK DR	Alderdale Road	Kells Road	2230	Surface Treated	79.8	52.2	60.4	33.1	Major Rehabilitation Treatment	ST-DST SAMI	2029	\$ 206,206.31
1944189288	POPLARVALE RD	Poplarvale Rd	End	460	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 5,044.86
1944214293	POPLARVALE RD	Poplarvale Rd	Gravelle Road	290	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 3,180.45
1944490733	POPLARVALE RD	Fossmill Road	Poplarvale Rd	1140	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 12,502.47
1944016621	TRAPPERS RD	Memorial Park Drive	End	90	Gravel	100.0	40.0	40	25	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2029	\$ 987.04
1944342228	VILLAGE RD	Township Boundary	River Road	2060	Surface Treated	90.6	75.0	71.3	22.2	Minor Rehabilitation Treatment	ST-SST	2029	\$ 69,214.05
1944465277	ALDERDALE RD	Memorial Park Drive E	Memorial Park Drive W	190	Hot Mix Asphalt	79.8	79.8	84.3	21.2	Routine Maintenance	HMA-Crack Seal	2030	\$ 2,127.94
1944392306	CEDAR RD	River Road	End	270	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 3,020.33
1944056279	CHISWICK LINE	Alderdale Road	Bellcairn Road	300	Hot Mix Asphalt	76.3	76.3	73.5	21.7	Routine Maintenance	HMA-Crack Seal	2030	\$ 2,498.39
1944197246	CHISWICK LINE	Beach Road	Golf Course Road	2030	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2030	\$ 136,250.57
1944352076	FOSSMILL RD	Polarvale Road	End	380	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 4,250.84
1944246973	GOLF COURSE RD	River Road	Booth Road	2030	Surface Treated	83.9	57.0	60.4	31.3	Major Rehabilitation Treatment	ST-DST	2030	\$ 143,421.65
1944088221	GOLF COURSE RD	Chiswick Line	Pioneer Road	2030	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 22,708.43
1944397264	KELLS RD	Church Road	Chiswick Line	1030	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 11,522.01
1944044863	PIONEER RD	Golf Course Road	Gravelle Road	2050	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 22,932.16
1944217337	PIONEER RD	Bellcairn Road	Maple Road/Kells Road	2020	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 22,596.56
1944478763	PIONEER RD	Boundry Road	Bellcairn Road	1940	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 21,701.65
1944383581	RIVER RD	Village Road	Mallard Haven Road	1040	Surface Treated	82.8	55.8	71.3	37.5	Major Rehabilitation Treatment	ST-DST	2030	\$ 76,767.12
1944385205	RIVER RD	Laporte Road	Golf Course Road	1150	Surface Treated	85.1	58.4	49.6	25.2	Major Rehabilitation Treatment	ST-DST	2030	\$ 84,886.72
1944253474	VILLAGE RD	River Road	Grahamvale Road	2210	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2030	\$ 24,721.98
1944383667	ALDERDALE RD	Memorial Park Drive W	Chiswick Line	2040	Surface Treated	78.3	62.0	60.4	28.7	Minor Rehabilitation Treatment	ST-SST	2031	\$ 73,505.36



Asset ID	Name	Start Position	End Position	Length (m)	Surface Type	PCI_After	PCI_Before	Criticality	Risk	Treatment Type	Treatment	Year	Cost
1944010896	BEACH RD	Green Point Road	Memorial Park Drive	980	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2031	\$ 11,181.94
1944016138	CHISWICK LINE	Boundary Road	Point on Road	20	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2031	\$ 1,369.22
1944004301	GOLF COURSE RD	Memorial Park Drive	Chiswick Line	2130	Surface Treated	78.3	62.0	60.4	28.7	Minor Rehabilitation Treatment	ST-SST	2031	\$ 68,729.77
1944149389	GOLF COURSE RD	Booth Road	Memorial Park Drive	2040	Surface Treated	83.9	57.0	60.4	31.3	Major Rehabilitation Treatment	ST-DST	2031	\$ 149,204.92
1944321375	MEMORIAL PARK DR	Trapper Road	Alderdale Road	1940	Hot Mix Asphalt	79.8	79.8	84.3	21.2	Routine Maintenance	HMA-Crack Seal	2031	\$ 19,888.92
1944174128	MEMORIAL PARK DR	Beach Road	Golf Course Road	2040	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2031	\$ 139,660.19
1944008231	RIVER RD	Twp Road to Twp Road	South Shore Road	2100	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2031	\$ 143,767.84
1944136872	RIVER RD	Golf Course Road	Twp Road	2070	Gravel	100.0	0.0	44.3	44.3	Major Rehabilitation Treatment	Rehabilitation	2031	\$ 141,714.02
1944013422	S SHORE RD	River Road	Twp Boundary West	2170	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2031	\$ 148,560.10
1944195515	S SHORE RD	River Road	East Twp Limit	1460	Gravel	100.0	33.3	55.2	36.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2031	\$ 16,658.81
1944059532	WASING RD	Maple Road	End	970	Gravel	100.0	50.0	40	22.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2031	\$ 11,067.84
1944014703	ALDERDALE RD	Grahamvale Road	River Road	2040	Surface Treated	88.1	62.0	60.4	28.7	Major Rehabilitation Treatment	ST-DST SAMI	2032	\$ 211,622.31
1944038730	ALDERDALE RD	Twp Boundary	Hill Siding Road	1720	Surface Treated	78.3	62.0	60.4	28.7	Minor Rehabilitation Treatment	ST-SST	2032	\$ 64,158.11
1944135141	BEAR MOUNTAIN RD	Maple Road	End - South	1750	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 20,367.11
1944215803	BELLCAIRN RD	Chiswick Line	Pioneer Road	2080	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 24,207.77
1944016140	CHISWICK LINE	Point On Road	Alderdale Road	1850	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2032	\$ 129,185.68
1944060044	CHISWICK LINE	Kells Road	Beach Road	2090	Gravel	100.0	50.0	55.2	31	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 24,324.15
1944138707	CHISWICK LINE	Gravelle Road	End	870	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 10,125.36
1944211451	CHISWICK LINE	Golf Course Road	Gravelle Road	2030	Gravel	100.0	33.3	44.3	29.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 23,625.85
1944111203	FOSSMILL RD	Golf Course Road	Polarvale Road	2340	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 27,233.74
1944119614	GOLF COURSE RD	Pioneer Road	Wasing Road	2210	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 25,720.75
1944332342	GRAHAMVALE RD	Alderdale Road	Village Road	1470	Gravel	100.0	30.0	44.3	30.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 17,108.37
1944463301	GRAVELLE RD	Chiswick Line	Pioneer Road	2030	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 23,625.85
1944157935	HS SIDING RD	Twp Boundary	Private Drive	340	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 3,957.04
1944049185	KELLS RD	Chiswick Line	Pioneer Road	2020	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 23,509.47
1944299070	KELLS RD	Memorial Park Drive	Church Road	1010	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 11,754.73
1944482458	MAPLE RD	Bear Mountain Road	Wasing Road	4570	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 53,187.26
1944321375	MEMORIAL PARK DR	Trapper Road	Alderdale Road	1940	Hot Mix Asphalt	97.9	76.5	84.3	24.7	Preventative Maintenance	HMA-EnhSurf	2032	\$ 91,046.69
1944052096	MEMORIAL PARK DR	Kells Road	Memory Lane	20	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2032	\$ 1,396.60
1944088977	MEMORIAL PARK DR	Golf Course Road	End	4090	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 47,600.85
1944370777	MEMORIAL PARK DR	Memory Lane	Green Point Road	940	Gravel	100.0	0.0	55.2	55.2	Major Rehabilitation Treatment	Rehabilitation	2032	\$ 65,640.29
1944435274	PIONEER RD	Maple Road/Kells Road	Golf Course Road	4090	Gravel	100.0	37.5	44.3	28.4	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 47,600.85
1944478009	POPLARVALE RD	Gravelle Road	End	560	Gravel	100.0	30.0	40	27.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 6,517.48
1944193803	RIVER RD	Alderdale Road	Village Road	2020	Gravel	100.0	33.3	44.3	29.5	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 23,509.47
1944144903	WASING RD	Algonquin Road	Golf Course Road	300	Gravel	100.0	25.0	44.3	31.8	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 3,491.50
1944355162	WASING RD	Maple Road	Algonquin Road	4130	Gravel	100.0	50.0	44.3	24.9	Minor Rehabilitation Treatment	Re-Gravelling (25 mm or 1 in) Customized	2032	\$ 48,066.38

**APPENDIX H**

**List of Treatments**

Treatment Code	Treatment Description	Revised Client Treatment Cost (\$/m <sup>2</sup> )
<b>Surface Treated Roads</b>		
ST-Slurry	ST - Slurry Seal	4.25
ST-SST	ST - Single Surface Treatment (Chip Seal)	4.50
ST-DST	ST - Double Surface Treatment (Chip Seal)	9.00
ST-DST SAMI	ST - Double Surface Treatment (Chip Seal) & SAMI	11.50
ST-EnhSurf	ST - Enhanced Thin Surfacing (Microsurfacing)	5.50
ST-FDR & DST	ST - Full Depth Reclamation (FDR) + 100 Gran A + Double Surface Treatment	18.86
ST-FDR & DST & SAMI	ST - Full Depth Reclamation (FDR) + 100 Gran A + Double Surface Treatment + SAMI	21.36
<b>Hot Mix Asphalt Roads</b>		
HMA-Crack Seal	HMA - Crack Sealing - Actual price is \$4/m, average \$10K per km	1.25
HMA-EnhSurf	HMA - Enhanced Thin Surfacing (Microsurfacing)	5.50
HMA-Ovly	HMA - One Lift Overlay	25.50
HMA-2Ovly	HMA - Two Lift Overlay	52.00
HMA-Recon FDR & 60HMA	HMA - Full Depth Reclamation - FDR - (150 Gran A, 60 HMA)	42.96
HMA-Recon FDR & 100HMA	HMA - Full Depth Reclamation - FDR - (150 Gran A, 100 HMA)	64.36
<b>Gravel Roads</b>		
Re-Gravelling (25 mm or 1 in)	Re-Gravelling (25 mm or 1 in)	9,547.5 \$/Km
Rehabilitation	Rehabilitation	57,285.0 \$/Km

## **HMA (Paved Roads)**

### **HMA-Crack Seal**

#### **Crack Sealing**

Crack Sealing is the process of placing specialized materials into cracks in unique configurations to keep water and other matter out of the crack and the underlying pavement layers.



*Crack Sealing*

### **HMA-Slurry**

#### **Slurry Seal**

Slurry Seal is mixture of slow setting emulsified asphalt, well graded fine aggregate, mineral filler and water. This treatment is used to fill cracks and seal areas of old pavement, to restore a uniform surface texture, to seal the surface to prevent moisture and air intrusion into the pavement, and to improve skid resistance.



*Slurry Seal*

### **HMA-ST**

#### **Single Surface Treatment (Chip Seal)**

Single Surface Treatment (Chip Seal) is a common type of pavement surfacing construction which involves an application of asphalt binder material (bitumen emulsion) and mineral aggregate (gravel). The emulsion is applied by a pressure distributor, followed immediately by an application of mineral aggregate, and finished by rolling.





*Surface Treatment (Chip Seal)*

### **HMA-DST**

#### **Double Surface Treatment (Chip Seal)**

The process for Single Surface Treatment (Chip Seal) is repeated for the second application of emulsion and mineral aggregate (gravel). The first application of aggregate is coarser than the aggregate used in the second application and usually determines the pavement thickness.

### **HMA-DST SAMI**

#### **Double Surface Treatment (Chip Seal) + SAMI**

In addition to the Double Surface Treatment, the Stress Absorbing Membrane Interlayer (SAMI) is a geo textile mat that is laid between the surface treatments to strengthen the structure of the road.



*SAMI*

### **HMA-EnhSurf**

#### **Enhanced Thin Surfacing (Microsurfacing, Thin HMA Overlay)**

Microsurfacing is an application of a mixture of polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface. Unlike slurry seal, Microsurfacing can be used on high volume roadways to correct wheel path rutting and provide a skid resistant pavement surface.

Thin HMA Overlay is a Hot Mix Asphalt (HMA) overlay of 40 millimeters or less, and is sometimes used when Microsurfacing is not available.



*Micro-surfacing*

### **HMA-Enh2Surf**

#### **Enhanced Double Thin Surfacing (Double Microsurfacing, Cape Seal)**

Double Microsurfacing is an application where the process of Microsurfacing is repeated for a second application.

Cape Seal is an application of a Chip Seal followed by the application of Slurry Seal or Microsurfacing at a later

date.

### **HMA-Ovly**

#### **Mill and One Lift Overlay**

50mm HMA Overlay with or without milling

### **HMA-2Ovly**

#### **Mill and Two Lift Overlay**

2 lift of 50mm HMA Overlay with or without milling

### **HMA-FDR & 2Ovly**

#### **Full Depth Reclamation (FDR) + Two Lift Overlay**

Full Depth Reclamation (FDR) is a process where the full pavement section and a pre-determined portion of the underlying materials are uniformly crushed or pulverized. In this treatment this recycled material is then stabilized by mixing it with a recycling agent and other chemical additives. The recycling agent is commonly asphalt-based emulsion or cold-foamed asphalt, or an emulsified engineered recycling agent. The mixture is then spread and compacted to produce a base layer. Two lifts (typically 50mm each) of Hot Mix Asphalt are applied as a surface material, where the second lift is usually a finer grade of Hot Mix.

### **HMA-FDR & EAS & DST**

#### **FDR with Emulsion/Expanded Asphalt Stabilization + Double Surface Treatment**

Full Depth Reclamation (FDR) plus a recycle agent and other additives plus a second application of emulsion and mineral aggregate (gravel)

### **HMA-FDR & EAS & Ovly**

#### **FDR with Emulsion/Expanded Asphalt Stabilization + One Lift Overlay**

Full Depth Reclamation (FDR) is a process where the full pavement section and a pre-determined portion of the underlying materials are uniformly crushed or pulverized. In this treatment this recycled material is then stabilized by mixing it with a recycling agent and other chemical additives. The recycling agent is commonly asphalt-based emulsion or cold-foamed asphalt, or an emulsified engineered recycling agent. The mixture is then spread and compacted to produce a base layer. A single lift (typically 50mm) of Hot Mix Asphalt is applied as a surface material.

### **HMA-FDR & EAS & 2Ovly**

#### **FDR with Emulsion/Expanded Asphalt Stabilization + Two Lift Overlay**

Full Depth Reclamation (FDR) is a process where the full pavement section and a pre-determined portion of the underlying materials are uniformly crushed or pulverized. In this treatment this recycled material is then stabilized by mixing it with a recycling agent and other chemical additives. The recycling agent is commonly asphalt-based emulsion or cold-foamed asphalt, or an emulsified engineered recycling agent. The mixture is then spread and compacted to produce a base layer. Two lifts (typically 50mm each) of Hot Mix Asphalt are applied as a surface material, where the second lift is usually a finer grade of Hot Mix.



*Expanded Asphalt Stabilization*

**HMA-FDARR & 2Ovly****Full depth asphalt removal and replacement (Two Lifts HMA)**

This treatment is the complete milling and removal of all asphalt material without recycling, and replacing it with two lifts (typically 50mm each) of Hot Mix Asphalt, where the second lift is usually a finer grade of Hot Mix.

**HMA-FDARR & 3Ovly****Full depth asphalt removal and replacement (Three Lifts HMA)**

This treatment is the complete milling and removal of all asphalt material without recycling, and replacing it with three lifts (typically 50mm each) of Hot Mix Asphalt, where the final lift is usually a finer grade of Hot Mix.

**HMA-Recon 90HMA****Full Depth Reconstruction (350 Gran B, 150 Gran A, 90 HMA)**

Full Depth Reconstruction is the excavation and removal of all road materials down to the sub-base or soil, and then reconstructing it with new materials including 350mm of Granular B, 150mm of Granular A and 90mm of Hot Mix Asphalt, typically made up of 2 lifts where the second lift is a finer grade of Hot Mix. This expensive treatment is used as a last resort where a pavement has completely failed and none of the other treatments are determined to provide an adequate solution.

**HMA-Recon 140HMA****Full Depth Reconstruction (350 Gran B, 150 Gran A, 140 HMA)**

Full Depth Reconstruction is the excavation and removal of all road materials down to the sub-base or soil, and then reconstructing it with new materials including 350mm of Granular B, 150mm of Granular A and 140mm of Hot Mix Asphalt, typically made up of 2 or 3 lifts where the final lift is a finer grade of Hot Mix. This expensive treatment is used as a last resort where a pavement has completely failed and none of the other treatments are determined to provide an adequate solution.

## **ST (Surface Treated Roads)**

### **ST-Slurry**

#### **Slurry Seal**

Slurry Seal is mixture of slow setting emulsified asphalt, well graded fine aggregate, mineral filler and water. This treatment is used to fill cracks and seal areas of old pavement, to restore a uniform surface texture, to seal the surface to prevent moisture and air intrusion into the pavement, and to improve skid resistance.

### **ST-SST**

#### **Single Surface Treatment (Chip Seal)**

Single Surface Treatment (Chip Seal) is a common type of pavement surfacing construction which involves an application of asphalt binder material (bitumen emulsion) and mineral aggregate (gravel). The emulsion is applied by a pressure distributor, followed immediately by an application of mineral aggregate, and finished by rolling.

### **ST-DST**

#### **Double Surface Treatment (Chip Seal)**

The process for Single Surface Treatment (Chip Seal) is repeated for the second application of emulsion and mineral aggregate (gravel). The first application of aggregate is coarser than the aggregate used in the second application and usually determines the pavement thickness.

### **ST-DST SAMI**

#### **Double Surface Treatment (Chip Seal) & SAMI**

In addition to the Double Surface Treatment, the Stress Absorbing Membrane Interlayer (SAMI) is a geo textile mat that is laid between the surface treatments to strengthen the structure of the road.

### **ST-EnhSurf**

#### **Enhanced Thin Surfacing (Microsurfacing, Thin HMA Overlay)**

Microsurfacing is an application of a mixture of polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface. Unlike slurry seal, Microsurfacing can be used on high volume roadways to correct wheel path rutting and provide a skid resistant pavement surface.

### **ST-Enh2Surf**

#### **Enhanced Double Thin Surfacing (Double Microsurfacing, Cape Seal)**

Double Microsurfacing is an application where the process of Microsurfacing is repeated for a second application.

Cape Seal is an application of a Chip Seal followed by the application of Slurry Seal or Microsurfacing at a later date.

### **ST-Ovly**

#### **Mill and One Lift Overlay**

50mm HMA Overlay with or without milling

### **ST-FDR & DST**

#### **Full Depth Reclamation (FDR) + Double Surface Treatment**

Full Depth Reclamation (FDR) plus a recycle agent and other additives plus a second application of emulsion and mineral aggregate (gravel)

### **ST-FDR & DST & SAMI**



### **Full Depth Reclamation (FDR) + Double Surface Treatment + SAMI**

Full Depth Reclamation (FDR) plus a recycle agent and other additives plus a second application of emulsion and mineral aggregate (gravel), and SAMI

### **ST-FDR & Ovly**

#### **Full Depth Reclamation (FDR) + One lift Overlay**

Full Depth Reclamation (FDR) is a process where the full pavement section and a pre-determined portion of the underlying materials are uniformly crushed or pulverized. In this treatment this recycled material is then stabilized by mixing it with a recycling agent and other chemical additives. The recycling agent is commonly asphalt-based emulsion or cold-foamed asphalt, or an emulsified engineered recycling agent. The mixture is then spread and compacted to produce a base layer. A single lift (typically 50mm) of Hot Mix Asphalt is applied as a surface material.

### **ST-FDR & 2Ovly**

#### **Full Depth Reclamation (FDR) + Two Lift Overlay**

Full Depth Reclamation (FDR) is a process where the full pavement section and a pre-determined portion of the underlying materials are uniformly crushed or pulverized. In this treatment this recycled material is then stabilized by mixing it with a recycling agent and other chemical additives. The recycling agent is commonly asphalt-based emulsion or cold-foamed asphalt, or an emulsified engineered recycling agent. The mixture is then spread and compacted to produce a base layer. Two lifts (typically 50mm each) of Hot Mix Asphalt are applied as a surface material, where the second lift is usually a finer grade of Hot Mix.

### **ST-FDR & EAS & DST**

#### **FDR with Emulsion/Expanded Asphalt Stabilization + Double Surface Treatment**

Full Depth Reclamation (FDR) plus a recycle agent and other additives plus a second application of emulsion and mineral aggregate (gravel)

### **ST-Recon & Ovly**

#### **Full Depth Reconstruction (350 Gran B, 150 Gran A, 90 HMA)**

Full Depth Reconstruction is the excavation and removal of all road materials down to the sub-base or soil, and then reconstructing it with new materials including 350mm of Granular B, 150mm of Granular A and 90mm of Hot Mix Asphalt, typically made up of 2 lifts where the second lift is a finer grade of Hot Mix. This expensive treatment is used as a last resort where a pavement has completely failed and none of the other treatments are determined to provide an adequate solution.

### **ST-Recon & 2 Ovly**

#### **Full Depth Reconstruction (350 Gran B, 150 Gran A, 140 HMA)**

Full Depth Reconstruction is the excavation and removal of all road materials down to the sub-base or soil, and then reconstructing it with new materials including 350mm of Granular B, 150mm of Granular A and 140mm of Hot Mix Asphalt, typically made up of 2 or 3 lifts where the final lift is a finer grade of Hot Mix. This expensive treatment is used as a last resort where a pavement has completely failed and none of the other treatments are determined to provide an adequate solution.

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