GREER GALLOWAY
CONSULTING ENGINEERS

Municipality of Trent Lakes

2023 ROAD NEEDS STUDY

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Municipality of Trent Lakes

Prepared by:

The Greer Galloway Group Inc.
Consulting Engineers
640 Cataraqui Woods Drive
Kingston, Ontario
K7P 2Y5

Tel: (613) 536-5420
Fax: (613) 548-3793

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1. Background

The Greer Galloway Group Inc. was retained by Municipality of Trent Lakes to complete a Roads Inventory and Condition Assessment of the municipal road system. This study was completed to provide the Municipality with a current evaluation of municipal road assets and allow municipal staff to develop short and long-term capital and maintenance programs based on physical and financial needs of the Municipality for a 10-year horizon.

The municipal road system consists of approximately 288 kilometers of roads, built, and maintained for the purposes of moving traffic, people, goods, and services throughout Municipality of Trent Lakes. Of these roads; 185 km are surface-treated, and 103 km are gravel.

A map of the Municipality area roads has been included in **Appendix A.**

2. Purpose

The primary objectives of this study are to:

- Provide an overview of the entire municipal road network and the individual sections that make up the system in a form that will allow the Municipality to objectively consider the needs of each section as identified in the assessment.
- Provide an assessment of the condition of the municipal road system through an established rating system and an evaluation of defined parameters for each of the sections of the road system.
- Provide recommended rehabilitation and reconstruction strategies for all road sections based on available information, minimum maintenance standards, municipal guidelines and standards, and current industry standards and methodologies.
- Provide the Municipality with options related to the management of the road system and allow municipal staff to develop short (now), mid (1-5 years), and long (6-10 years) term capital and maintenance programs based on the needs of the road network and in the best interest of the traveling public; and,
- Provide cost estimates for the required rehabilitation or reconstruction of municipal assets based on appropriate benchmark costs.

3. Methodology

The municipal road network is broken down into sections to be evaluated for condition and needs separately. Each different road constitutes at least one section but can be split into multiple sections where different portions of the same road exhibit distinct enough conditions from one another that the evaluation scheme meant to quantitatively summarize them would not be able to compensate. Changes to conditions that could warrant a road being split into multiple sections could include change in surface type, major changes in physical condition, different speed limits, different cross section dimensions, Different AADTs, etc. A road is also nominally split into multiple sections when its length would otherwise exceed 9.99 km, regardless of changes to conditions between sections.

Field data collected onsite and used for the condition and needs evaluations includes:

- Level of service (Number of Lanes, Directions of travel)
- Apparent level of Maintenance to remove imminent hazards from the road (e.g. potholes, snow storage capacity, etc.).
- Rideability of the road (level of riding discomfort)
- Frequency and Severity of surface distresses
- Surface Material
- Posted speed limit and reasonable operating speed to conditions of road.
- Right of way.
- Surface and shoulder width; and,
- Apparent effectiveness of drainage features, and mode of drainage.

Road sections are evaluated based on surface conditions only. The condition of underground infrastructure is not considered in the assessment. Using the collected field data, each section is assigned point scores in the following categories taken from the MTO Inventory Manual for Municipal Roads (1991).

- Structural Adequacy: An assessment of the load supporting ability and resistance to deformation or rupture of the road surface. A high structural adequacy score is given when there are few signs of distress observed in the road surface.
- Surface Condition: An assessment of driving ease, comfort, and safety. A high surface condition score is given when the driving surface is free of inadequacies that could cause a road user to feel instability in their vehicle, such as uneven crowns, wash boarding, wheel track rutting, etc.
- Surface Width Rating: An assessment of road width in relation to road class and type of road (urban, semi-urban, rural). A high surface width score indicates that the road is of sufficient width for its type and class.
- Shoulder Condition: An assessment of width of the shoulders. A high shoulder condition score indicates a shoulder that is of sufficient width for the class of road.
- Drainage Rating: An assessment of the adequacy of the drainage of the road considering the height of the grade line, the cross slope of the crown and shoulders, apparent capacity of ditches, the slope of gutters and the frequency of outlets or catch basins, and the capacity of the cross culverts. A high drainage score indicates that the road is well drained.
- Maintenance Demand: An assessment of the perceived routine maintenance effort required for the road section. Maintenance effort would include difficulty of snow clearing, need to perform seasonal asphalt patching, shoulder washout repair, etc. A high maintenance demand score indicates that the road requires a below average amount of maintenance to be kept in a drivable state.

These point ratings are summed to generate a condition rating for the road section. The condition rating and the Road AADT are put through the following formula to generate a priority rating:

$$Priority\ Rating = 0.2(100 - C.R.)x\ (AADT + 40)^{1/4}$$

The priority rating calculation provides a rudimentary means of weighing the condition of a road section against the amount of use that road section experiences, as reflection of road importance. This can be used to order the roads into rehabilitation sequence, most typically into categories of "0 years" (Now), "1-5 years", or "6-10 years". The priority ratings determined for the road sections in this network can be found in **Appendix B.** It is noted that some roads may seem higher priority based on an AADT of 200 being used for roads with no known daily counts.

The priority ratings provide only a basic measure of the relative importance and benefit of improving one section before another. However, it must be remembered that there are many other factors to be considered such as utility requirements, adjacent property constraints, land use development, transit, school bus routes, etc.

Another framework for considering the state of roads is based on their perceived "Needs" in the following categories:

- Surface Type Needs
- Surface Width Needs
- Capacity Needs
- Drainage Needs
- Structural Adequacy Needs

The Need of a road section in each of these categories is determined as prescribed by the manual, and in most cases is determined using combinations of the individual points ratings. Needs are expressed as one of the following time frames:

"0 Years" Needs

These sections of road warrant immediate improvements due to a significant deficiency or particularly poor condition. Roads could be rated as "0 Years" needs due to a requirement for: full road base reconstruction, grade raise or re-grading, cross fall corrections, shoulder rehabilitation, drainage improvements, or resurfacing.

"1-5 Years" Needs

These sections of road are anticipated to need either reconstruction or resurfacing within the next 5 years based on the review of their current conditions. These sections are typically in poor condition or rapidly deteriorating condition and warrant improvements in the near future.

"6-10 Years" Needs

These sections of road are anticipated to need either reconstruction or resurfacing within the next 6 to 10 years based on the review of their current conditions.

A road's overall "Need" is the nearest of the timeframes determined out of all of the categories. For example a road with a Drainage Need of "6-10 Year" and a Structural Adequacy Need of "1-5" year would have an overall need of "1-5 years".

It is important to remember that “Needs” as calculated according to the manual are just an indicator of an approximate timeframe of how long a road section is expected to remain serviceable before slipping into some form of an unacceptable state or a period of time over which a hazard can be reasonably tolerated. For example in the “Structural Adequacy Category” the need type can be thought of as the time than can elapse before the road is anticipated to slip into a state of deterioration that will require significant or full reconstruction. The Need is not an indicator of when the road can be left until. For example, a road with a “6-10 Year” structural adequacy could be deferred, but could be a good candidate to receive a less expensive resurfacing method or preservation treatment that will extend its life in a more cost effective way (e.g. asphalt overlay, microsurfacing on asphalt surfaces). This is where the priority rating calculation is relied upon, to suggest important roads from the network that would benefit the most from attention regardless of whether that attention would be high or low cost.

A table summarizing the full extent of information gathered/derived for each road section that influence the decision making and can be found in **Appendix B.**

4. Road Structure and Maintenance

All road sections in the Municipality have a driving surface of either hot mix asphalt, surface treatment, or gravel. Each wearing surface has a different life expectancy, maintenance procedures, methods of rehabilitation and associated costs.

Hot Mix Asphalt (High Class Bituminous – HCB)

Generally, the life expectancy for an asphalt surfaced road is 20 years. However, this will vary depending on the adequacy of the initial design, maintenance program, drainage, traffic volume, and traffic type.

Proper maintenance programs will maximize the life expectancy of an asphalt surface and should include the following components:

- Spot improvements to the asphalt surface.
- Spot improvements and maintenance of the roadside ditches
- Seal coats to extend the service life of existing surface treatment.
- Microsurfacing to correct minor rutting and cross section abnormalities.
- HMA overlays to extend the service life of asphalt with minor cracking or rutting.
- Crack sealing at the appropriate time to slow crack evolution

Surface Treatment (Low Class Bituminous – LCB)

Surface treatment is a cost-effective alternative to hot mix asphalt. A double surface treated road will have a life expectancy of 6 to 10 years if the initial design and application are adequate (surface treatment placed on a poor base, poorly drained area, or other inappropriate condition may have a life expectancy of 5 years or less). Surface treatment is typically reserved for roads with an AADT between 400-1000 vpd subject to adjustment factors consideration importance of the route and frequency of commercial traffic. Surface treated roads tend to provide a coarse riding experience and are typically a nuisance to the traveling public while they cure after initial placement and even after due to the propensity of aggregate to come loose and be kicked up by vehicles, and so it is typically also reserved for rural roads or roads in small hamlets.

Gravel Surface

Gravel roads, although cheaper to build, have many hidden costs associated with the more frequent maintenance required on them. Proper maintenance of gravel roads includes the following components:

- Addition of appropriate amounts of gravel at the proper times.
- Restoration and reshaping of ditch Drainage.
- Grading to restore shoulders and surface cross section; and,
- Dust control.

5. Service Life and Road Maintenance

Every road is designed to last for a specific number of years based on current and future traffic demands. Pavement design includes granular base, subbase, and subgrade. Good pavement designs also consider the average annual daily traffic and percentage of heavy trucks using the road. Generally, it is accepted that properly constructed roadways, which include adequate base and subbase materials, will have a life span of approximately 40 years with intermittent surface rehabilitation. High class bitumen (HCB) or asphalt will provide a high riding quality for between 12 and 20 years before needing to be resurfaced. A road surface of Low-Class Bitumen (LCB) or surface treatment will provide a high riding quality for 6 to 10 years before needing to be resurfaced.

The performance of LCB and HCB pavement types depends greatly on the traffic loading to which the roads are subjected. Road deterioration, pavement deterioration in particular, begins at a relatively slow pace for a newly constructed road. Over time, as the road is subjected to vehicular loading, distresses begin to manifest in the road surface. Distress in the road surface accelerates the deterioration as surface water penetrates more readily into the road base and subbase.

5.1 Maintenance

Road maintenance begins immediately after a road is constructed and takes one of three forms: preventative, routine, or corrective.

General roadway maintenance considers road components within the right-of-way and includes activities such as shoulder grading, roadside mowing, and erosion control. Completion of these tasks improve the performance of the road surface. Ideally, these activities are completed proactively in order to prevent problems from occurring in the future.

Routine maintenance is generally considered a reactive process that includes inexpensive, localized work that can be completed by municipal forces. This would include such tasks as pothole repairs, drainage improvements, and shallow patching.

Preservation activities include work such as creak sealing, functional milling and resurfacing, and micro surfacing and are generally expected to service the road for five to ten years.

Rehabilitation strategies are required when additional preservation measures are no longer cost effective due to the road surface condition. These activities include resurfacing, cold in-place recycling, and full depth reconstruction.

6. Road System

The make-up of the municipal road system by surface type is shown in the following table:

Table 1: Road Network by Surface Type

	HCB (1)	LCB (2)	Gravel	Total
Length (km)	8.825	176.418	103.36	288.60
Length (%)	3.06	61.13	35.81	100

(1) HCB: High Class Bituminous (Hot Mix Asphalt)
(2) LCB: Low Class Bituminous (Double Surface Treatment)

Roads within the network were subdivided based on whether their roadside environments are rural, semi-urban or urban in character. The Municipality of Trent Lakes road system contains many small hamlets and neighborhoods, and is comprised of all three types:

Table 2: Road Network by Roadside Environment

	Urban	Semi-Urban	Rural	Total
Length (km)	0	47.39	241.213	288.603
Length (%)	0	16.42	83.58	100

Rural Roads are areas with sparse development and no curb and gutter or sewer systems.

Semi-Urban Roads are roads that contain well developed portions for a significant portion of their length.

Urban Roads are well developed along their length and drainage is at least in part achieved with curb and gutter flow systems served by storm/combination sewer systems.

Using the “Municipal Act, 2001 – Ontario Regulation 239/02 – Minimum Maintenance Standards for Municipal Highways”, the roads were further categorized by Class as shown in Table 3 below.

Table 3: Road Network by Class

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Total
Length (km)	0	0	0	4.998	216.389	67.22	288.603
Length (%)	0	0	0	1.73	74.98	23.29	100

The determination of the road class is based on the speed limit and average annual daily traffic (AADT) applicable to the section of road (as shown below in Table 4 from the Minimum Maintenance Standards

for Municipal Highways). AADT measures used to calculate road class are as provided by the Municipality.

Table 4: Classification of Highways

Average Annual Daily Traffic (number of motor vehicles)	Posted or Statutory Speed Limit (kilometres per hour)						
	91 - 100	81 - 90	71 - 80	61 - 70	51 - 60	41 - 50	1 - 40
15,000 or more	1	1	1	2	2	2	2
12,000 - 14,999	1	1	1	2	2	3	3
10,000 - 11,999	1	1	2	2	3	3	3
8,000 - 9,999	1	1	2	3	3	3	3
6,000 - 7,999	1	2	2	3	3	3	3
5,000 - 5,999	1	2	2	3	3	3	3
4,000 - 4,999	1	2	3	3	3	3	4
3,000 - 3,999	1	2	3	3	3	4	4
2,000 - 2,999	1	2	3	3	4	4	4
1,000 - 1,999	1	3	3	3	4	4	5
500 - 999	1	3	4	4	4	4	5
200 - 499	1	3	4	4	5	5	5
50 - 199	1	3	4	5	5	5	5
0 - 49	1	3	6	6	6	6	6

7. Costing

Many road rehabilitation, maintenance, and construction projects can be categorized to describe various types of improvements. These categories lend themselves to preliminary cost estimating in common units, such as kilometers, tonnes, meters, square meters, etc.

For this study, benchmark costing was developed as shown in the following table. The costing was generated from recent project pricing experienced by Trent Lakes . and the past experience of Greer Galloway with other clients. Costs are per kilometer of road based on the assumptions listed below.

Table 5: Benchmark Costing Items

Item	Surface Type	New Cost
Complete Urban Reconstruction	Asphalt	$1,758,000/km
Complete Rural Reconstruction	Asphalt (50 mm final pavement thickness)	$620,000/km
	Asphalt (100 mm final pavement thickness)	$888,000/km
	Double Surface Treatment	$578,000/km
	Gravel	$480,000/km
Resurfacing	Asphalt Overlay (Additional Lift)	$120,000/km

	Asphalt Rehabilitation (Shave and Pave) or (Pulverize and Resurface)	$225,000/km
	Surface Treatment	$65,000/km
	Gravel	$26,000/km
Preservation Techniques	Microsurfacing/HL-2 Overlay	$40,000/km
	Single Surface Treatment	$38,500/km
	Crack Sealing	$5,500/km
Ditching	-	$50,000/km
Shoulder Rehabilitation	-	$20,000/km

- Costs for “Complete Urban Reconstruction” include full base replacement, new 7-meter-wide road base, 50 mm HL3 asphalt surface, curb and gutter, sidewalk, and topsoil / sod.
- Costs for “Complete Rural Reconstruction” include full base replacement and new surface for a 7-meter-wide road, shouldering, ditching, and seed/sod.
- Costs for “Resurfacing” include placement of new surface material (50 mm HL3 asphalt surface, double surface treatment, or 75 mm Granular A), assuming a 7-meter-wide road.
- Costs for “Preservation Techniques” include the costs of simply applying the selected preservation technique only.
- Costs for “Ditching” include ditch excavation for half of the length of the road section. Ditching is only expected to be required for half of the length of the road section due to entrances, existing ditches, high points, etc.
- Costs for “Shoulder Rehabilitation” include removal and disposal of excess shoulder material and vegetation for the full length of the road section.
- Other related costs, such as property acquisition, utilities, engineering, etc., are not included in the Benchmark Costs. Where the Municipality feels these factors may impact construction, a 10% markup should be applied to items to cover these professional fees and contingencies.

8. Review of Field Data and Municipality Rehabilitation Plan

There were a few prominent features of the Municipality’s infrastructure that were evident during the collection of field data. The first of these was a commitment to roadway drainage and adequate ditching, except only in the lowest use gravel roads. This is typical of municipalities that have roads that are primarily adjacent to agricultural land, and aids in prolonging the life of roadways.

Almost all road sections with geometric deficiencies such as substandard horizontal curves tend to still be quite gradual (unless rounding the corner of farm fields). In almost all cases of substandard horizontal curves, adequate hazard signage is in place to communicate it in advance. Advanced warning of coming stop signs where sightlines to intersections are obscured are always in place as well.

Road platform and surface widths were nearly always above minimum standards, and the only roads with widening needs per the manual service only a couple of residences, effectively negating the likelihood of vehicles being hampered by the substandard width.

Many of the paved roads in the network mature in age and/or in a more advanced state of deterioration display moderate-severe wheel path rutting in conjunction with alligator cracking and potholing. Because of the modest AADT experienced by most roads in the network, It is believed that this is a symptom of deteriorated or insufficient subbase. If the pavement is only resurfaced and no steps are taken to address this base material, the replacement surface is expected to deteriorate faster than typical service life.

The highest AADT in the road network is 829 vpd, with many roads falling between 100-500 vpd. Given these low AADT numbers, The extent of the rural road network that is paved with high quality bituminous (hot mix) is quite high. Typically, HCB is not recommended from a cost/benefit standpoint until AADT's exceed 1000 vpd (limit subject to adjustment based on %Commercial Use). Many of the gravel roads within the network were reported to GGG by information provided by the Municipality to have AADT in the vicinity of 50 vpd.

9. Projected Capital Improvement Plan and Recommendations

Condition ratings, priority ratings and recommended improvement plans for hard topped and loose topped roads are presented in the following subsections. They are discussed separately, because the condition ratings and priority ratings are generated using different criteria making the condition/priority ratings for each category of surface different and making it impossible to rank order them together. Furthermore, it is most often the case that hard topped vs gravel roads are managed under different budgets by municipalities.

9.1 Capital Improvement Plan – Hard Topped Roads

Through the collection of field data and subsequent analysis, Greer Galloway has produced a guide for rehabilitation of the Municipality's Road infrastructure in years 1-5, and years 6-10 categories for hard surface (surface treatment and hot mix-asphalt) roads within the network. It is our opinion that none of the roads within the network are in sufficiently poor condition to warrant urgent repair (they will hold up for at least another year) and so no roads were placed in a 0-year category.

For the purposes of catering to a small municipality with a smaller budget for road repair, the condition ratings of the roads assessed have been deprioritized with respect to vertical and horizontal alignment, and level of service by assigning all roads maximum scores in these point categories. Addressing these deficiencies can require significant spot reconstruction costs including in some cases additional land acquisition, but the need to perform them can also be mitigated with the addition of appropriate hazard signage, which the Municipality has up in some instances. This adjustment to the condition ratings in turn eliminates the effect such deficiencies would have on the priority ratings.

For the purpose of this plan, Greer Galloway has used annual budgets of $600,000/year for hardtop road rehabilitations. This does not consider potential cost of living adjustments (COLA), which are typically approximately 2% per year. Below are the proposed expenditure plans for 2023-2032:

Table 6: 1-5 Year (2023-2027) Hard Top Road Improvement Plan

Asset ID (Section)	Road Name	From	To	Length (km)	Structural Adequacy Rating (out of 20)	Current AADT	Priority Rating	Recommended Treatment	Cost
	GALWAY RD	Cty Rd #121	Queens Line	3.05	17	459	31.19	Single Surface Treatment Overlay	$117,425.00
	GALWAY RD	Queens Line	Allens Alley	2.04	17	200	30.25	Single Surface Treatment Overlay	$78,347.50
	KENNEDY DR	End	FR 91	1.70	17	342	28.29	Double Surface Treatment	$982,600.00
	BARCROFT RD	Teds Lane	Sgarbush Cres	1.20	17	428	27.91	Double Surface Treatment	$692,444.00
	MISSISSAGUA DAM RD	Dam Rd	FR 133	0.70	16	200	27.76	Double Surface Treatment	$404,600.00
	KAWARTHA HIDEAWAY LOOP	Kawarha Hideaway Rd	End at Boat Launch	0.58	17	200	25.98	Double Surface Treatment	$332,350.00
	MCKEE AVE	HWY 507	250m	0.25	15	200	25.45	Double Surface Treatment	$144,500.00
	DARVELL LANE	Woodland Trail	End	0.28	18	428	25.19	Single Surface Treatment	$10,895.50
	BARCROFT RD	South curve	Flynns Rd	1.34	17	200	25.12	Single Surface Treatment	$51,590.00
	DARVELL RD	Kawarha Hideaway Rd	Kawartha Hideaway Rd	0.22	18	200	24.40	Single Surface Treatment	$8,585.50
	HENRY ST	George St	End	0.25	17	428	24.40	Asphalt Rehabilitation	$56,700.00
	BARCROFT RD	Sgarbush Cres	South curve	0.74	18	200	24.19	Single Surface Treatment	$28,490.00
	BROWN'S LANE	Ojibway Dr. S	End	0.20	16	200	24.08	Single Surface Treatment	$7,661.50
	FULTON LANE	Cty Rd #37	End	0.11	18	200	23.62	Microsurfacing	$4,400.00
								Total:	**2,920,589.00**

Table 7: 6-10 Year (2028-2032) Hard Top Road Improvement Plan

Asset ID (Section#)	Road Name	From	To	Length (km)	Structural Adequacy Point Rating	Current AADT	Adjusted Priority Rating (No H or V Alignment, No Surface Width, No Shoulder Width)	Recommended Treatment	Total Cost
	GEORGE ST	Cty Rd #37	Henry St	0.19	18	168	11.00	Microsurfacing	$7,400.00
	RIVERSIDE DR	FR 127	FR 128	0.90	17	200	8.00	Single Surface Treatment	$34,650.00
	BESSIE AVE N	HWY 36	911# 1740	0.50	16	200	15.00	Single Surface Treatment	$19,250.00
	CRYSTAL LAKE RD	Allens Alley	FR #597	2.16	16	200	11.00	Single Surface Treatment	$83,160.00
	CRYSTAL LAKE RD	Bridge	Allens Alley	2.61	16	200	15.00	Single Surface Treatment	$100,292.50
	CRYSTAL LAKE RD	Cty Rd #121	Bridge	2.72	16	200	15.00	Single Surface Treatment	$104,720.00
	PENCIL LAKE RD	Cty Rd #507	End	1.44	17	200	15.00	Single Surface Treatment	$55,594.00
	BEAVER LAKE RD	FR 240	FR 256	2.40	17	200	15.00	Single Surface Treatment	$92,400.00
	ADAM CUMMINGS RD	400m	FR #51	1.94	16	200	8.00	Single Surface Treatment	$74,536.00
	PENINSLA CRT	PenninSla Dr	End	0.19	17	200	15.00	Single Surface Treatment	$7,161.00
	SAUNDERS RD	Philrick Dr	End at FR 86	0.51	19	200	12.00	Single Surface Treatment	$19,750.50
	SNRISE CRT	Cty Rd #23	End	0.84	17	200	12.00	Single Surface Treatment	$32,147.50
	DAM RD	Mississauga Dam Rd	End at 911# 40	0.43	15	200	15.00	Double Surface Treatment	$245,650.00
	CEDAR TERR	Sgarbush Blvd	End	0.28	17	200	15.00	Single Surface Treatment	$10,895.50
	EDWINA DR	911# 226	Northern Ave	1.30	16	200	15.00	Double Surface Treatment	$751,400.00
	BEAVER LAKE RD	FR 209	McGinnis Lake Rd	1.00	17	200	18.65	Single Surface Treatment	$38,500.00
	ADAM CUMMINGS RD	FR #51	End	1.40	17	200	18.11	Single Surface Treatment	$53,900.00
	ADAM CUMMINGS RD	Lakehurst Circle Rd	400m	0.40	17	200	18.11	Single Surface Treatment	$15,400.00

	BEECH TERR	Sgarbush Blvd	End	0.21	18	370	18.11	Double Surface Treatment	$120,224.00
	BUCKHORN TRAIL	Cty Rd #36	End	0.14	15	200	18.11	Single Surface Treatment	$5,390.00
	LAPLANTE'S RD	Cty Rd #37	End FR #30	1.15	17	200	17.32	Single Surface Treatment	$44,198.00
	BESSIE AVE S	HWY 36	End	0.58	18	168	17.32	Double Surface Treatment	$334,662.00
	CEDAR CRT	Cedar Dr	End	0.53	18	59	17.32	Single Surface Treatment	$20,443.50
	PENINSLA DR	Northern Ave	End	0.92	18	200	17.32	Single Surface Treatment	$35,420.00
	TED'S LANE	Barcroft Rd	FR #67	0.84	18	200	17.32	Single Surface Treatment	$32,340.00
	MISSISSAGUA DAM RD	HWY 507	Dam Rd	2.2	16	200	16.53	Single Surface Treatment	$84,700.00
	CAROLINA CRT	Sgarbush Blvd	End	0.288	18	200	16.53	Single Surface Treatment	$11,088.00
	SOUTH GREENS LAKE RD	Cty Rd #507	End	0.113	17	200	16.53	Single Surface Treatment	$4,350.50
								Total:	**$2,439,623.00**

The roads within each of these 4 tables are listed in order of descending priority (top is most important), however, as can be seen the priority ratings of the roads within the same tables can be quite close together. For this reason, treatments have not been scheduled year-by-year, and the precise sequence of each road can be reorganized slightly within the 5-year windows to suit the capacities of the municipality.

It should be noted that the above 1-5- and 6-10-year road management plan is intended to be used as a guide, and that situations can arise that will require modification or deviation from the stated recommendations. Recommended treatments for roads within he 1-5 year category are based on the current conditions observed in the field. Recommended treatments for the 6-10 year category are based on the current conditions, except with the structural adequacy rating “aged” by 7-years according to normal Deterioration Curves for the surface material in question. These assumptions will not perfectly account for how roads may degrade between now and the time they are listed for capital improvements.

Many of the treatments recommended concern complete reconstruction of the roads, including addressing road subbase. This is because many of the hard topped (HCB in particular) roads within the network are displaying moderate-sever distortion along with alligator/severe cracking and potholing. It may be possible to more cost effectively extend the service life of these sections by performing targeted patching, or performing a less costly rehabilitation method on the whole section with a larger than assumed proportion of spot treatments that address the road right down to the subbase.

The amount of HCB roads within the rural portion of the network is small in comparison and should remain that way to reduce the added cost of replacement when due with a small municipal road budget.

Greer Galloway recommends that the Municipality make every effort to rehabilitate the roadways as shown, and that the Municipality consider these to be the maximum delays to rehabilitation. Potential consequences of delaying/reducing the road maintenance program include:

- Deterioration of road conditions.
- Compromising of road safety.
- Deterioration of the existing level of service to a point at which it will become inadequate.
- Detachment of local communities.
- Diminished tourism and positive public perception.
- Reduced efficiency of movement of goods and services.
- Damage to vehicles due to road conditions.
- Decreased emergency response times.

9.2 Capital Improvement Plan – Loose Topped Roads

Field data was also collected for loose top roads, and analysis was performed to generate condition point ratings and priority ratings. Identifying the state of deterioration and source of distresses on a gravel road can be difficult to precisely perform. The observable frequency and magnitude of distresses in the road surface are often a function of

- Amount of elapsed time between date of observation and date of last routine maintenance, since maintenance will often render the road surface in a pristine-looking condition, hiding distresses.
- Timing of date of observation relative to onset of spring and the progression of associated freeze-thaw cycles that can advance deficiencies such as general distortion, potholing, and frost heaving/boiling.
- Timing of date of observation relative normal inclement weather events, which can have an accelerated effect on some distress manifestation.

The field review of gravel roads within the road network for this study was performed in late April 2023. At this time, freezing and thawing of the road material had ceased, and distress manifestation had run its course for the season. At time of review snow had entirely melted off the road surfaces. The Municipality had also started to perform any annual maintenance activity (e.g. grading/dragging) on the road surfaces.

The primary distress demonstrated by most roads were some degree of slight-moderate potholing. These were most often attributed to the next most often seen distress of poorly defined cross section surface with a crown affecting drainage of surface water from the road. The manual dictates that distresses that can be addressed with routine maintenance are to be disregarded in generating most point ratings, and to rate structural adequacy the manual requires focus on soft spots and frost boils primarily. These two deficiencies were nearly always absent from the road surfaces, and so despite there being at times extensive potholing, the gravel roads for the most part were assigned high structural adequacy ratings. As with the hardtop roads, point scores in geometrics were deprioritized due to ample signing in most cases. Point scores were also deprioritized with regards to surface widths where the AADT on roads was 50 vpd or below. These point scores therefore did not affect rank order and priority ratings. Some roads without AADT information that were assumed at 100 VPD will show higher ranking than they should however given that the priority rating is calculated using AADT data.

Deterioration of gravel roads to the point that they would require full depth reconstruction can be mitigated ideally through the periodic replenishment the surface with new gravel (properly graded and compacted) along with proper maintenance techniques including routine (multiple times a year) dragging/grading of surfaces and ditches, material recovery, vegetation removal from shoulders, and dust control. Maintenance was presumed to be covered separately from the capital improvement budget. A capital improvement budget for gravel roads was only assumed to provide for gravel resurfacing, or if warranted by severe distresses gravel road reconstruction.

Since the precise deterioration rate of gravel roads is difficult to predict, A list of the highest priority gravel roads as determined using the methods of the manual are listed below in order of descending priority, to offer a suggestion of the sequence in which these roads should receive resurfacing or reconstruction. The logic behind this sequence is that these roads are displaying the most advanced deterioration since they last experienced maintenance and are therefore presumably most in need of having their surface replenished. A capital improvement budget for gravel roads was not provided and so a yearly budget of $200,000 was assumed and gravel roads were listed until approximately 3-years of budget was consumed. This does not consider potential cost of living adjustments (COLA), which are typically approximately 2% per year.

Table 8: 1-3 Year (2023-2025) Gravel Road Improvement Plan

Asset ID (Section#)	Road Name	From	To	Length (km)	Structural Adequacy Point Rating	Current AADT	Adjusted Priority Rating (No H or V Alignment, No Surface Width, No Shoulder Width)	Recommended Treatment	Total Cost
1	CAINES LANE	Crystal Lake Rd	End	1.14	12	75	29.47	Gravel Resurfacing	$59,280.00
2	WEST CLEAR BAY POINT	Pine Point Trail	End	0.4	14	75	29.47	Gravel Resurfacing	$20,800.00
3	CHARLIE ALLEN RD	Tates Rd	End	1.7	14	75	28.82	Gravel Resurfacing	$44,200.00
4	WHITE BOUNDARY RD	White Lake Rd	Cty Rd #503	6.63	13	7	27.23	Gravel Resurfacing	$172,380.00
5	BOUNDARY LANE	South Salmon Lake Rd	FR #349	1.2	14	100	24.08	Gravel Resurfacing	$31,200.00
6	HUNT'S LINE RD	Six Foot Bay Rd	End	0.91	16	100	24.08	Gravel Resurfacing	$23,660.00
7	KEN'S RD	400m	End	0.8	16	75	23.58	Gravel Resurfacing	$20,800.00
8	MCKEE AVE	250m	End	0.25	15	75	23.58	Gravel Resurfacing	$6,500.00
9	PARKSIDE DR	HWY 49	End	1.43	15	75	23.58	Gravel Resurfacing	$37,180.00
10	TIE'S MOUNTAIN RD	911# 48	911# 311	2	17	100	23.39	Gravel Resurfacing	$52,000.00

11	TIE'S MOUNTAIN RD	911# 311	End	2.9	17	100	23.39	Gravel Resurfacing	$75,400.00
12	WHITE VALLEY RD	Bass Lake Rd	911# 158	1.8	17	101	22.74	Gravel Resurfacing	$46,800.00
13	BASS LAKE RD	Bridge #1 on map	7 minute Trail	2.2	16	100	22.70	Gravel Resurfacing	$57,200.00
								Total:	**647,400.00**

It should be noted that the above 3-year road management plan is intended to be used as a guide only. The range of priority ratings for these roads is quite low, and structural adequacy ratings (deemed the most important point rating for characterizing these roads) are mostly high. There should be considered to be ample opportunity for the Municipality to reorder this list to address roads with similar AADT in the order they see fit. Gravel roads in particular often warrant deviation from the stated recommendations as distresses can manifest so quickly.

10. Conclusions and Recommendations

10.1 Conclusions

Based on the observations of the field review, discussions with senior municipal staff, and general knowledge of the region, the following conclusions are put forward.

- The Municipality of Trent Lakes has approximately 289 kilometers of road.
- 3.06% of the road system has a hot mix asphalt surface, 61.13% has a surface treated surface, and 35.81% has a gravel surface.
- 0% of the road system has been constructed to an Urban cross-section, 16.42% has been constructed to a semi-urban cross-section, and 85.58% has been constructed to a rural cross section.
- 1.73% of the road system consists of Class 4 roads, 74.98% are Class 5 roads, 23.29% are Class 6 roads
- The Municipality's road network does contain substandard geometrics, and where substandard geometrics' exist they are generally appropriately signed to communicate the hazard.
- The Municipality's roads appear to be mostly appropriately constructed with regards to drainage features, with well-shaped ditches and intersecting drainage channels often featuring along the roads. The precise effectiveness of drainage measured in place is difficult to ascertain from these road surveys and must rely on more thorough studies or the observed experience of the municipality.
- There are many LCB roads with high relative traffic demand that are in a state of light deterioration within the network.
- The Gravel Roads Within the network are generally in a condition that can be restored to full serviceability with routine maintenance, but a list of the highest priority roads to receive gravel resurfacing to replenish lost material has been provided.

10.2 Recommendations

The following recommendations are put forward and take into account: the safety of the users of the system and the corresponding liability risk to the municipality, the cost of and revenue available for capital improvement, and the cost effectiveness of recommended expenditures.

- Prioritize, plan, and implement rehabilitation and improvement projects based on the capital improvement plan provided in Section 9.1 of this report.
- When resurfacing an existing roadway, it is recommended that the Municipality ensure adequate drainage and base conditions are present prior to surface rehabilitation. The Municipality should be advised that performing upgrades without ensuring adequate drainage and subsurface conditions are present can lead to premature failure of the roadway and increased maintenance costs.
- In areas where full depth reconstruction has not been specified, it is recommended that the Municipality review the roadway to determine if spot repairs with base replacement are necessary. Factors in determining this should include the presence of alligator cracking, frost damage and distortion.
- Upgrade road surfaces from gravel to surface treatment on proven adequacy of the road base to support the upgraded surface and AADT. Commit to base improvement as necessary to ensure its adequacy. Currently, Greer Galloway notes that the LCB network is the most cost effective to maintain.
- The Municipality's regular traffic counting program should continue.
- The condition of the road system should be reviewed on a regular basis to measure the effectiveness of strategies and the sufficiency of funding levels.
- Municipality staff should complete regular shoulder maintenance of roads where shoulders are higher than the road surface. It is recommended that each spring, the shoulders be cut and graded away from the road to reinstate proper drainage.

Respectfully submitted,
The Greer Galloway Group Inc.

Kevin Hawley, P. Eng

Taylor Lauzon, Civil Eng. Technologist