



County of Lambton

Core Infrastructure Asset Management Plan



2023



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Glossary

Asset – The County provides a wide range of services to the public and these services rely on physical assets such as roads, bridges, and buildings. Each of these assets helps to provide a service that the public values and has come to expect as part of their everyday lives.

Asset Management Plan (AMP) – A strategic document that states how a group of assets are to be managed over a period of time. The plan describes the characteristics and condition of infrastructure assets, the levels of service expected from them, planned actions to ensure the assets are providing the proposed level of service, and financial strategies to implement the planned actions.

Bridge Condition Index (BCI) – A condition rating system based on the Ontario Structure Inspection Manual published by the Ministry of Transportation (MTO). The BCI rating is on a scale from 0 to 100, with 0 representing the worst possible condition and 100 representing the best possible condition.

Current Replacement Value – The current cost, at the time of publishing the report, that would be incurred to replace an asset with a new equivalent asset.

Core Infrastructure – As defined by O. Reg. 588/17, any municipal infrastructure asset that is associated with water, wastewater, stormwater management, roads and bridges / culverts.

Estimated Useful Life (EUL) – The period in which an asset is expected to be in service.

Lane Kilometres – Lane kilometres take into consideration the number of lanes on the road, which factors in the size of the road and better reflects the maintenance, rehabilitation, and replacement costs. Travelling 1 kilometre on a 2-lane road is equivalent to 2 lane kilometres. Travelling 1 kilometre on a 4-lane road is equivalent to 4 lane kilometres.

Level of Service – The parameters which reflect social, political, environmental, and economic outcomes that the organization delivers. Parameters can include but are not necessarily limited to, safety, customer satisfaction, condition, capacity, reliability, responsiveness, environmental acceptability, cost, and availability.

Lifecycle Activities – Activities undertaken with respect to an asset over its service life, including maintaining, rehabilitating, and replacing.

Lifecycle Costs – The total cost of ownership over the life of an asset.

Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure (O. Reg. 588/17) – Provincial regulation made under the Infrastructure for Jobs and Prosperity Act, 2015, that sets out requirements for municipal asset management planning to help municipalities better understand their infrastructure needs and inform infrastructure planning and investment decisions.

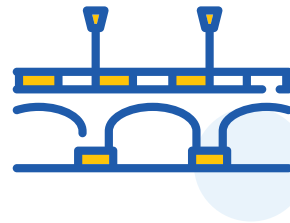
Pavement Condition Index (PCI) – A condition rating system based on the Ministry of Transportation Guide SP-022 Flexible Pavement Condition Rating, Guidelines for Municipalities. The guide provides a consistent standard for rating the roadway by establishing an overall rideability value and the pavement's structural condition on a scale from 0 to 100, with 0 representing the worst possible condition and 100 representing the best possible condition.

Sustainable Funding Target – The funding level required for an asset class to provide and maintain levels of service without resorting to unplanned increases in rates or cuts to service.

Core Asset Summary



1,376 lane km
of **arterial roads**



186
Structures

Core Asset Summary

Current replacement value



\$912.4
MILLION

2023 capital allocation



\$13.1
MILLION
per year

2023 sustainable funding target
(\$1.2 million increase from 2023 capital allocation)



\$14.3
MILLION
per year

Road network at a glance:



1,376 lane km
of **arterial roads**
including:



181 lane km
of **urban asphalt**



1,152 lane km
of **rural asphalt**



43 lane km
of **rural gravel**

Supporting assets, including:



2
roundabouts



51 signalized
intersections



5,600
signs



29 flashing
beacons



80
streetlights



28,000 m of
safety barriers

Average Condition



GOOD RATING = 84/100



\$727.1
MILLION

current replacement value



\$10.5
MILLION
per year

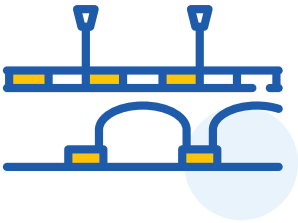
2023 capital allocation



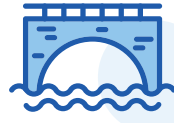
\$11.4
MILLION
per year

2023 sustainable funding target
(\$0.9 million increase from 2023 capital allocation)

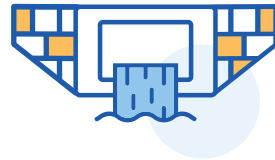
Structures at a glance:



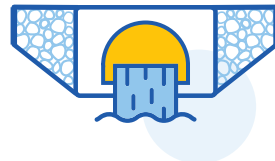
186
Structures
including:



71 Bridges



95 Concrete
culverts

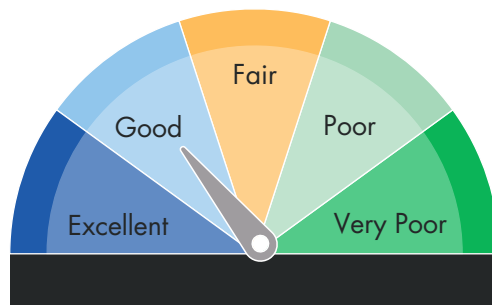


20 Steel
culverts



49 YEARS
STRUCTURES
average age

Average Condition



GOOD RATING = 79/100



\$185.3
MILLION

current replacement value



\$2.6
MILLION
per year

2023 capital allocation



\$2.9
MILLION
per year

2023 sustainable funding target
(\$0.3 million increase from 2023 capital allocation)

Executive Summary

Asset management is a long-term approach for managing and investing in assets owned by the County. The County provides a wide range of services to the public and these services rely on physical assets such as roads, bridges, and buildings. Each of these assets helps to provide a service that the public values and has come to expect as part of their everyday lives.

The asset management plan outlines the process of actively managing all the County owned assets in a way that ensures they will continue to contribute to the quality of life of the community now and in the future. The asset management plan provides information the County uses to make strategic decisions. The main goal of asset management is to provide safe and sustainable services delivered to the community in a predictable and cost-effective manner.

The County’s Asset Management Plan will be updated in three phases:

- Phase One (2023) – Core Infrastructure Asset Management Plan.
- Phase Two (2024) – Corporate Asset Management Plan including all assets with current levels of service.
- Phase Three (2025) – Corporate Asset Management Plan updated with proposed levels of service, lifecycle management strategy and financial strategy.

This update completes Phase One which addresses the County’s core assets.

This report is a living document that presents the County of Lambton’s Core Infrastructure Asset Management Plan, in accordance with Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure. The County is responsible for the following core assets:

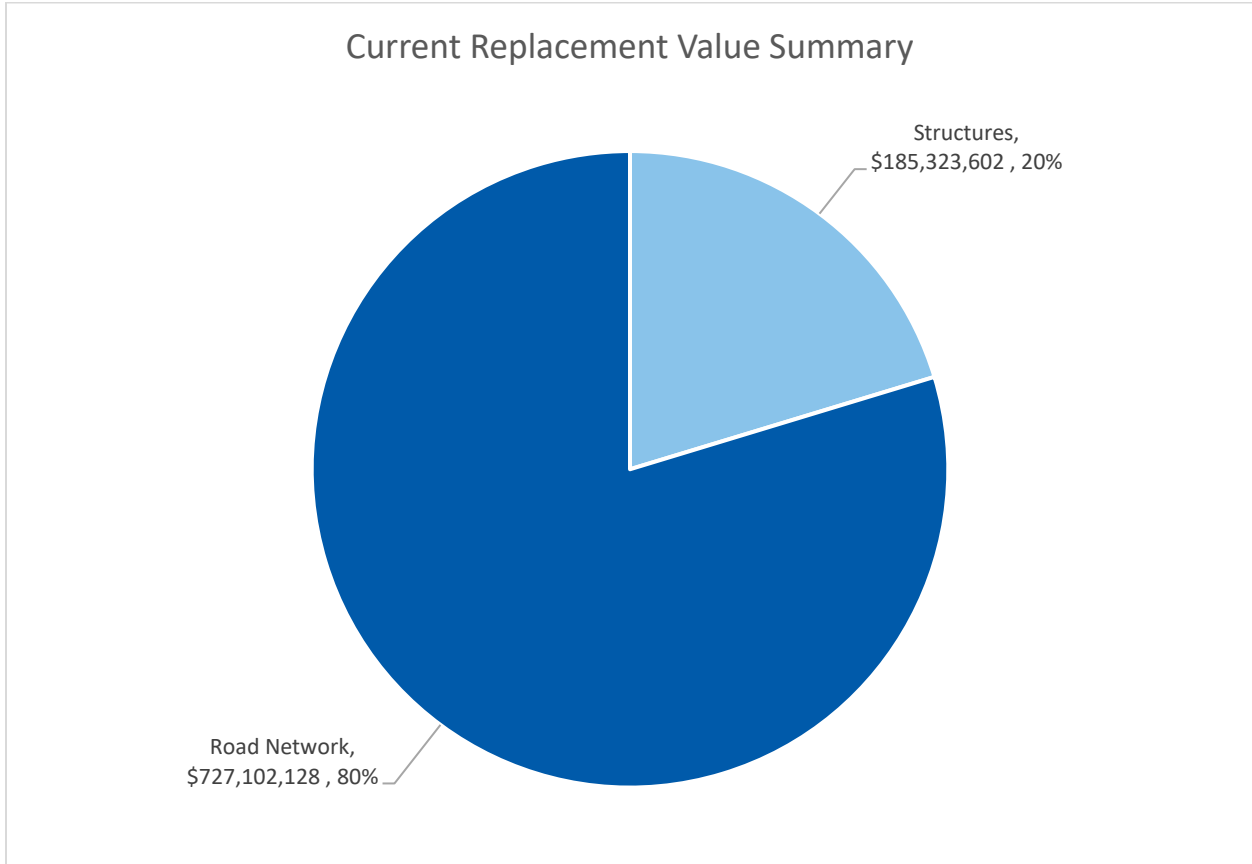
- Road Network: 1,376 lane kilometres of arterial roads throughout the County including supporting assets such as roundabouts, signalized intersections, signage, flashing beacons, streetlights, and safety barriers.
- Structures: 186 bridges and culverts spanning 3.0 metres or greater.

The current replacement value of all core assets owned by the County is estimated at \$912.4 million. A breakdown of the total replacement value by asset class is provided in Table 1 and Figure 1.

Table 1: Core Asset Valuation

Asset Class	Current Replacement Value
Road Network	\$727.1 million
Structures	\$185.3 million
Total	\$912.4 million

Figure 1: Current Replacement Value by Asset Class

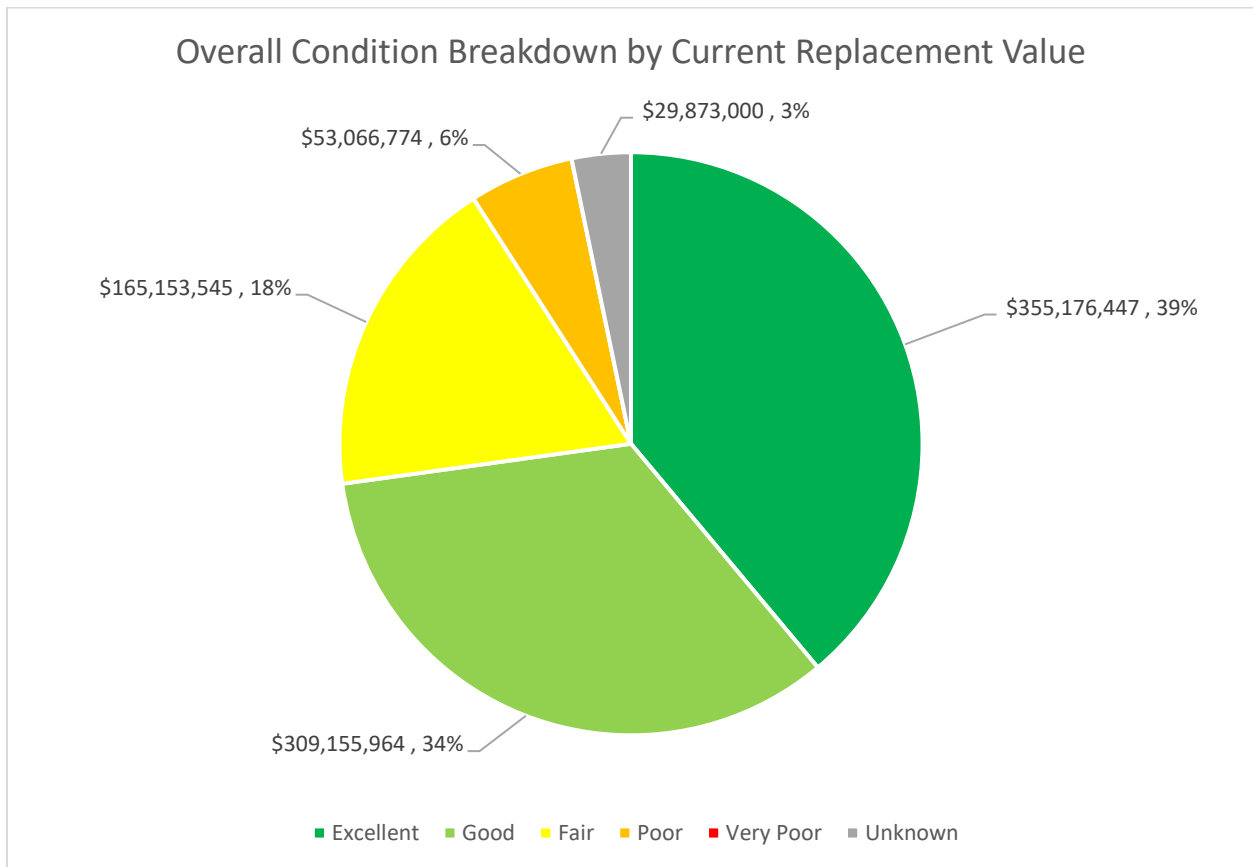


As assets age, understanding the physical condition of the asset is important to help plan for future maintenance, rehabilitation, and replacement. Inspections are routinely performed based on technical standards for each asset class. For consistency amongst all asset classes, a 5-point rating scale is used where conditions range from excellent to very poor. The overall condition of County owned assets relative to the current replacement value is shown in Table 2 and Figure 2.

Table 2: Overall Condition by Current Replacement Value

Condition Rating	Current Replacement Value	Percentage of Current Replacement Value
Excellent	\$355.2 million	39%
Good	\$309.2 million	34%
Fair	\$165.2 million	18%
Poor	\$53.1 million	6%
Very Poor	\$0	0%
Unknown	\$29.9 million	3%

Figure 2: Overall Condition by Current Replacement Value



The County owns and maintains assets to provide services to the public. The level of service is how an asset performs in delivering these services. The County has set minimum proposed levels of service for each asset class. The proposed level of service sets the minimum level of service that the County aims to provide. Minimum proposed level of service targets are provided in Table 3.

Table 3: Core Assets Proposed Level of Service

Proposed Level of Service	Target	Performance
Road Network		
Maintain an average condition of 'Good' or better (PCI greater than 75)	Good (PCI>75)	Good (PCI=83.9)
Maintain 100% of roads above 'Very Poor' condition	100%	100%
Structures		
Maintain an average condition of 'Good' or better (BCI greater than 70)	Good (BCI>70)	Good (BCI=79.2)
Maintain 100% of bridges and major culverts above 'Very Poor' condition	100%	100%

The County is currently meeting the proposed level of service targets set for all core assets.

For each asset class the use of timely maintenance, rehabilitation, and reconstruction techniques can increase an assets lifespan and lower the overall operating costs. Each asset class has its own unique lifecycle strategy. To execute the lifecycle strategy a certain level of funding is needed. This level of funding is the County’s sustainable funding target.

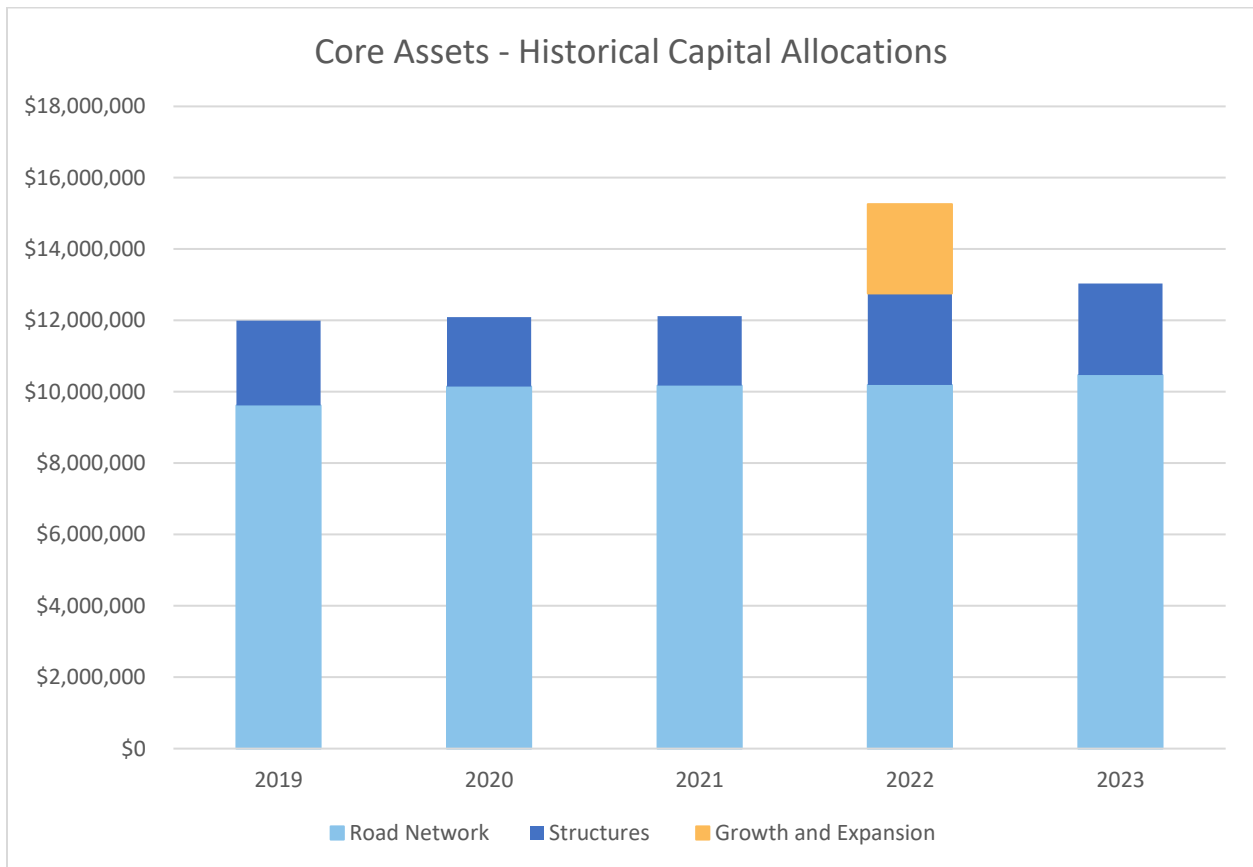
The County’s total capital allocations for the core assets averaged \$12.9 million per year from 2019 to 2023. In 2023, the County budgeted \$13.1 million towards core assets. The capital allocations over the last 5 years for the County’s core assets are provided in Table 4 and Figure 3.

Table 4: Core Assets Historical Capital Allocations

Asset Class	2019	2020	2021	2022	2023
Road Network	\$9,620,000	\$10,145,000	\$10,175,000	\$10,275,000	\$10,470,000
Structures	\$2,374,000	\$1,945,000	\$1,945,000	\$2,565,000	\$2,570,000
Growth and Expansion	\$0	\$0	\$0	\$2,500,000 ¹	\$0
Total Capital Allocations	\$11,994,000	\$12,090,000	\$12,120,000	\$15,340,000	\$13,040,000

¹ Growth and Expansion capital allocations in 2022 are for the roundabout construction at County Road 22 (Egremont Road) and County Road 79 (Nauvoo Road).

Figure 3: Core Assets Historical Capital Allocations



The County has completed a five-year financial plan based on the current needs of the core assets. The five-year long term financial plan is shown in Figure 4. The 2023 sustainable funding target is estimated at \$14.3 million. This represents a \$1.2 million increase from the 2023 capital allocation. The sustainable funding is summarized in Table 5. The capital plan is adjusted with an inflation factor of 2.0%. Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures. The projected five year increases due to inflationary pressures are shown in Table 6.

Figure 4: Core Assets Five-Year Long Term Financial Plan

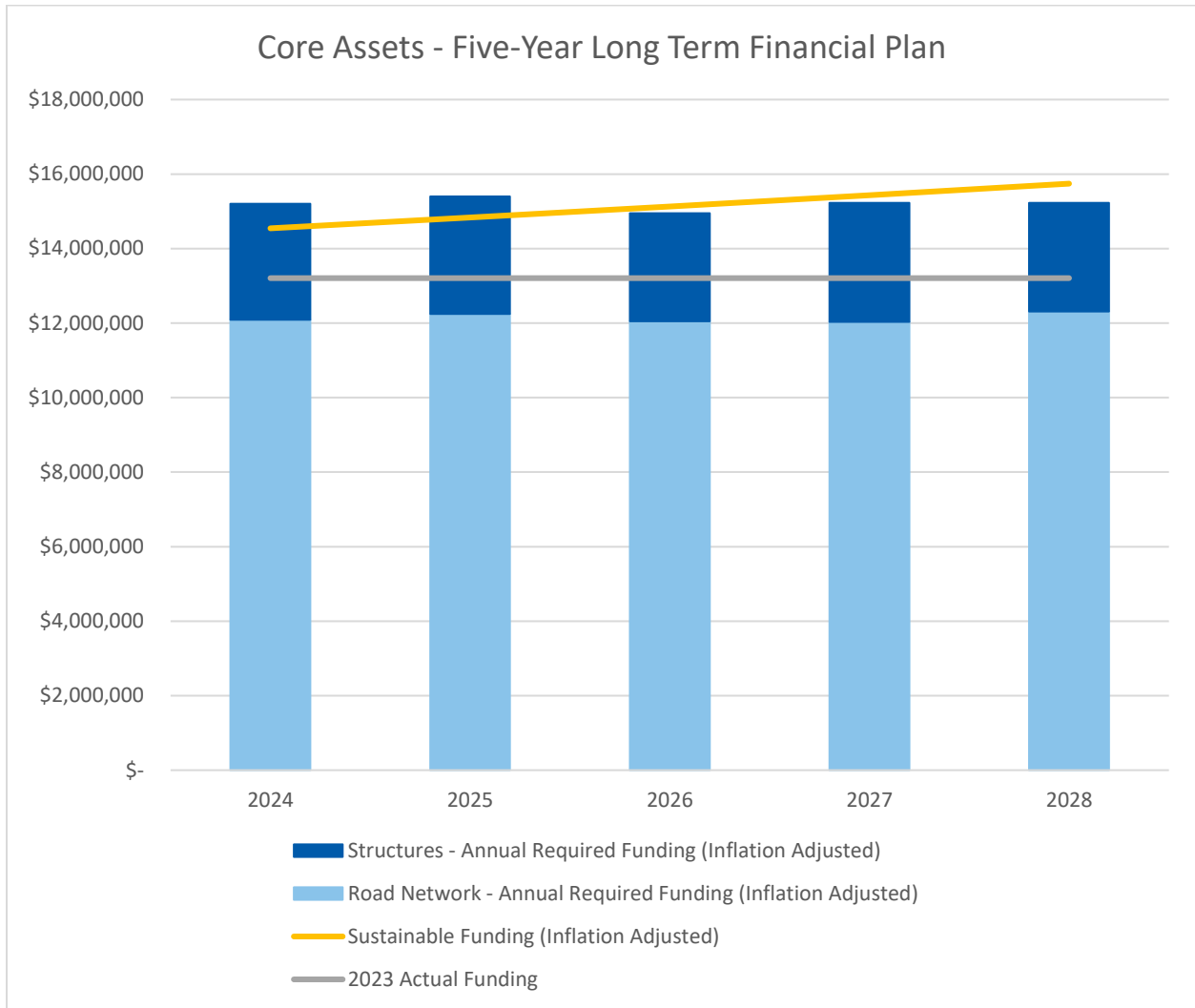


Table 5: Core Assets Sustainable Funding Summary

Asset Category	2023 Sustainable Funding	2023 Capital Allocation	Current Funding Gap
Road Network	\$11.4 million	\$10.5 million	\$0.9 million
Structures	\$2.9 million	\$2.6 million	\$0.3 million
Total	\$14.3 million	\$13.1 million	\$1.2 million

Table 6: Core Assets Sustainable Funding Projected Inflationary Increases

	2023	2024	2025	2026	2027	2028
Inflation Factor (2.0%)	1.000	1.020	1.040	1.061	1.082	1.104
Road Network	\$11,378,068	\$11,605,630	\$11,837,742	\$12,074,497	\$12,315,987	\$12,562,307
Structures	\$2,880,746	\$2,938,361	\$2,997,128	\$3,057,071	\$3,118,212	\$3,180,576
Total Sustainable Funding Target	\$14,258,814	\$14,543,991	\$14,834,870	\$15,131,568	\$15,434,199	\$15,742,883

When established and adhered to, the Asset Management Plan guides decision-makers in making sound and consistent investment decisions. The Asset Management Plan does not bind the County to specific expenditures but instead sets a framework for consistent decision making and planning. The conclusions shown in Table 7 should be considered when making investment decisions regarding the core assets.

Table 7: Core Assets Conclusions

Road Network Conclusions
<ul style="list-style-type: none"> • The County owns 1,376 lane kilometres of arterial roads with a current replacement value of \$727.1 million. • 68% of the network is in good to excellent condition which indicates a well maintained and rehabilitated road network. • The lifecycle strategy is to maximize the length of time between road reconstruction by completing timely maintenance and rehabilitation. • The County is currently meeting the proposed level of service targets set for the road network. • The County has had recent slope stability issues which are difficult to predict and expensive to repair. Additional slope stability issues are a risk to the sustainable funding target. • The 2023 sustainable funding target is \$11.4 million, which is a \$0.9 million increase from 2023 capital allocations. • Growth and expansion projects are not included in the sustainable funding target and would require additional capital allocations. • Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures.
Structures Conclusions
<ul style="list-style-type: none"> • The County owns 186 structures with a current replacement value of \$185.3 million. • 91% of the network is in good to excellent condition which indicates a well maintained and rehabilitated network. • The structure network is aging and a significant increase in major rehabilitations and replacements is projected over the next 25 years. • The lifecycle strategy is to maximize a structures life while prioritizing high risk projects for major rehabilitation and replacement. • The County is currently meeting the proposed level of service for structures. • The 2023 sustainable funding target is \$2.9 million, which is a \$0.3 million increase from 2023 capital allocations. • Growth and expansion projects are not anticipated in the next 10 years. • Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures.

1. Introduction

1.1. County of Lambton Overview

The County of Lambton, referred to as the County, is an upper-tier municipality in Southwestern Ontario. It is bordered to the north by Lake Huron, to the west by the St. Clair River which is part of the Canada-United States border, to the south by the municipality of Chatham-Kent and to the east by Middlesex County and Huron County. The County covers a total land area of 3,002 square kilometres. The County is made up of eleven local municipalities. Also, located within the County census division are three independent First Nations reserves.

The County is a community that is both urban and rural in nature and is home to over 128,000 residents. It was founded in the mid-19th century. The County is home to the first commercial oil well in Canada, founded in 1858, and subsequently became the country's petrochemical refining centre. Today, the County has evolved from its roots in agriculture, tourism, and petrochemicals to a position of leadership in the fields of research, innovation, and the new bio-economy.

With nearly 1,200 employees, the County is responsible for programs and services that care for its residents and allow the community to flourish. The County provides and funds the following services as directed by the Strategic Plan:

- Cultural Services
- Finance, Facilities and Court Services
- Infrastructure and Development Services
- Long-Term Care
- Public Health Services
- Social Services

The purpose of the Asset Management Plan is to drive future infrastructure investment in accordance with its Strategic Plan's Mission Statement:

The mission of the County of Lambton is the promotion of economic growth, environmental stewardship, and an enhanced quality of life through the provision of responsive and efficient services. Such promotion is accomplished by working with municipal and community partners.

1.2. Asset Management Regulation

In 2017, the Province of Ontario enacted Ontario Regulation 588/17: Asset Management Planning for Municipal Infrastructure, under the Infrastructure and Prosperity Act, to support improvements in municipal asset management.

The Regulation provides the authority for the province to regulate municipal asset management planning. It reflects the province's commitment to guide investments in public infrastructure that was first initiated in 2011 when the Province released Building Together Guide for Municipal Asset Management Plans as its long-term infrastructure plan and strategic framework.

The intent of the Regulation is to facilitate asset management best practices throughout the municipal sector, provide a degree of consistency to asset management plans, and leverage asset management planning to optimize infrastructure investment decisions. The requirements of the regulation are phased in, as follows:

- July 1, 2019: Every municipality shall prepare its first strategic asset management policy.
- July 1, 2022: Every municipality shall prepare an asset management plan in respect to its core municipal infrastructure assets.
- July 1, 2024: Every municipality shall prepare an asset management plan in respect of all of its other municipal infrastructure assets.
- July 1, 2025: Every asset management plan must include proposed levels of service, lifecycle management strategy and financial strategy for the following 10 years.

Additionally, the regulation requires the continued evaluation and improvement of the asset management plan, as follows:

- Every municipal council shall conduct an annual review of its asset management progress on or before July 1 in each year, starting the year after the municipality's asset management plan is completed.
- Every municipality shall review and, if necessary, update its strategic asset management policy at least every five years.
- Every municipality shall review and update its asset management plan at least every five years.

Finally, the regulation requires that the asset management plan be publicly available, as follows:

- Every municipality shall post its current strategic asset management policy and asset management plan on a website that is available to the public and shall provide a copy of the policy and plan to any person who requests it.

1.3. Background

Asset management at the County of Lambton has been an evolving process. Significant milestones that have been achieved to date are summarized below:

- 2014 – The first Asset Management Plan was approved by County council which included roads, structures, and social housing.
- 2019 – Asset Management Plan updated to include buildings, fleet, machinery, and medical equipment.
- 2021 – Strategic Asset Management Policy approved by County council.

In 2021, the County initiated a review of the current Asset Management Plan and processes and established a plan to move forward to ensure compliance with new and updated provincial regulations, specifically, O. Reg. 588/17. Following the review, a Corporate Asset Management Team was created to meet legislative requirements and to have a professionally prepared and monitored Asset Management Plan. The County is taking a phased approach to update the Asset Management Plan to meet current regulations. The Plan will be updated according to the following three phases:

- Phase One (2023) – Core Infrastructure Asset Management Plan
- Phase Two (2024) – Corporate Asset Management Plan with current levels of service
- Phase Three (2025) – Corporate Asset Management Plan updated with proposed levels of service, lifecycle management strategy and financial strategy

1.4. Asset Management Plan

Phase One of the asset management plan focuses on the core assets owned by the County. The County is responsible for the following core assets:

- Road Network: 1,376 lane kilometres of arterial roads throughout the County including supporting assets such as roundabouts, signalized intersections, signage, flashing beacons, streetlights, and safety barriers.
- Structures: 186 bridges and culverts spanning 3.0 metres or greater.

Each core asset class is summarized in a section of the report with the following information:

- State of Infrastructure: An overview of the current state of infrastructure within the category including inventory, value, age, estimated useful life and condition.
- Level of Service: Information on the current levels of service as determined by the regulation along with proposed levels of service.
- Risk Assessment: A framework for assessing risk of individual assets and prioritizing investments to minimize risk.

- Lifecycle Strategy: A summary of the proposed maintenance, rehabilitation and reconstruction techniques.
- Financial Strategy: A long-term financial plan to execute the proposed lifecycle strategy including sustainable funding targets.
- Growth and Expansion: Discussion on increases in demand caused by population and employment growth.
- Conclusions: Summary of key findings to be considered by decision-makers to make informed and consistent municipal infrastructure decisions.

The goal of the Asset Management Plan is to provide an accurate assessment of each asset class. This information should be used by decision-makers in making sound and consistent investment decisions. The Asset Management Plan does not bind the County to specific expenditures but instead sets a framework for consistent decision making and planning.

1.5. Next Steps

This report completes Phase One of the County’s Asset Management Plan that addresses the County’s core assets. Future updates to the Asset Management Plan will include:

- Phase Two will build upon this report to include a state of the infrastructure summary for all assets owned by the County. These assets include facilities, fleet and equipment within several different County divisions. Phase Two will also include a summary of the current level of service provided by each asset class. Phase Two is to be completed in 2024.
- Phase Three will establish the proposed levels of service for each asset class. Performance of each asset class will be based on measures developed by the County, such as those that would measure energy usage and operating efficiency. A lifecycle and financial strategy will be developed for all asset classes to meet the proposed levels of service. Phase Three is to be completed in 2025.

Future updates will be presented for approval through a resolution at County Council.



Roads





Roads Gallery

2.1. State of Infrastructure

The County of Lambton strives to provide a safe, efficient, and reliable arterial road network that supports the movement of traffic throughout the County. A well-maintained road network plays a key part in providing responsive and efficient services to the community. The County owns and maintains 647 centreline kilometres of roads, or a total of 1,376 lane kilometres.

Centreline kilometres are a measurement of the actual length of roads within the County or the distance travelled between locations. While, lane kilometres take into consideration the number of lanes on the road, which factors in the size of the road and better reflects the maintenance, rehabilitation, and replacement costs. The asset management plan will provide all measurements in lane kilometres.

For the purposes of the asset management plan the road network is divided into the following three asset types:

- 181 lane km’s of urban arterial asphalt roads
- 1,152 lane km’s of rural arterial asphalt roads
- 43 lane km’s of rural arterial gravel roads

The road network also includes many supporting assets that are required for the safe movement of vehicles. These assets include roundabouts, signalized intersections, signage, flashing beacons, street lights and safety barriers. A summary of the road network infrastructure in the County of Lambton is provided in Table 2-1 and Table 2-2.

Table 2-1: Road Network Asset Summary

Road Network				
Asset Type	Length (lane-km)	Pavement Area (m ²)	Average Age ¹ (years)	Average Condition (PCI)
Urban Arterial – Asphalt	181	623,371	15.1	83.5
Rural Arterial – Asphalt	1,152	4,840,059	12.3	83.8
Rural Arterial – Gravel	43	157,989	N/A	98.0
Total	1,376	5,228,501	13.5	83.9

¹ Age of a road segment is considered from the date of the last major rehabilitation. Age information for gravel roads is not reliable as they are maintained annually.

Table 2-2: Road Network Supporting Assets Summary

Supporting Assets			
Asset Type	Quantity	Unit	Average Age (years)
Roundabouts	2	Each	7.5
Signalized Intersections	115	Legs ¹	N/A
Signage	5,600	Each	N/A
Flashing Beacons	29	Each	N/A
Streetlights	80	Each	N/A
Safety Barriers	28,000	Length (m)	N/A

¹ Intersections have shared ownership if the joining road is owned by a local municipality. A leg is considered as one direction of travel (i.e., a standard four-way intersection has 4 total legs).

2.1.1. Asset Inventory and Valuation

The County’s road network is comprised of a total of 34 numbered County roads. Each County road is divided into clearly identified segments that are distinguished by major intersections, in total there are 621 road segments. A map showing the location of all County Roads is provided in Appendix A.

Each segment is labelled with an asset type that identifies what setting the roadway is in. The County has two distinct roadway settings, including:

- Urban which has curb and gutter at the edge of the pavement and underground infrastructure that is owned by the local municipality.
- Rural which has granular or paved shoulders and roadside ditches.

Most of the roads within the County network are paved with a small quantity of gravel roads identified as Rural Arterial Gravel. Each road segment is assigned with various attribute information, such as:

- Condition
- Age
- Road dimensions
- Traffic conditions
- Current replacement costs
- Maintenance and rehabilitation history

The County also follows Ontario Regulation 239/02: Minimum Maintenance Standards for Municipal Highways which defines classes of highways based on the posted speed limit and average daily traffic. Roads with higher speed limits and average daily traffic require more frequent inspections and quicker response times to identified deficiencies

such as potholes, debris, snow and ice accumulation, etc. County roads are divided into the classes summarized in Table 2-3. A map showing the class of all County roads is provided in Appendix A.

Table 2-3: Minimum Maintenance Standards Classification

Road Class	Patrolling Frequency	Length (lane-km)
Class 1	3 times every 7 days	0.7
Class 2	2 times every 7 days	306.3
Class 3	Once every 7 days	857.7
Class 4	Once every 14 days	171.1
Class 5	Once every 30 days	40.6

The current replacement values of assets in the road network are based on recent trends in reconstruction costs and totals an estimated \$727.1 million, including:

- \$99.5 million in Urban Arterial Asphalt Roads
- \$576.2 million in Rural Arterial Asphalt Roads
- \$21.6 million in Rural Arterial Gravel Roads
- \$29.9 million in Supporting Assets

A summary of current replacement values is provided in Table 2-4 and 2-5.

Table 2-4: Road Network Valuation

Road Network		
Asset Type	Length (lane-km)	Current Replacement Value ¹
Urban Arterial Asphalt	181	\$99,502,568
Rural Arterial Asphalt	1,152	\$576,155,992
Rural Arterial Gravel ²	43	\$21,570,568
Subtotal	1,376	\$697,229,128

¹ The following unit rates were used to calculate Current Replacement Value: Urban Arterial Asphalt = \$550,000 / lane km, Rural Arterial Asphalt = \$500,000 / lane km and Rural Arterial Gravel = \$500,000 / lane km.

² Rural Arterial Gravel roads will be replaced with asphalt roads whenever feasible, as such Rural Asphalt Arterial unit rates have been used for Rural Arterial Gravel roads.

Table 2-5: Supporting Assets Valuation

Additional Road Assets			
Asset Type	Quantity	Units	Current Replacement Value¹
Roundabouts	2	Each	\$4,000,000
Signalized Intersections	115	Legs	\$6,900,000
Signage	5,600	Each	\$980,000
Flashing Beacons	29	Each	\$85,000
Streetlights	80	Each	\$520,000
Safety Barriers	28,000	Length (m)	\$17,388,000
Subtotal	N/A	N/A	\$29,873,000

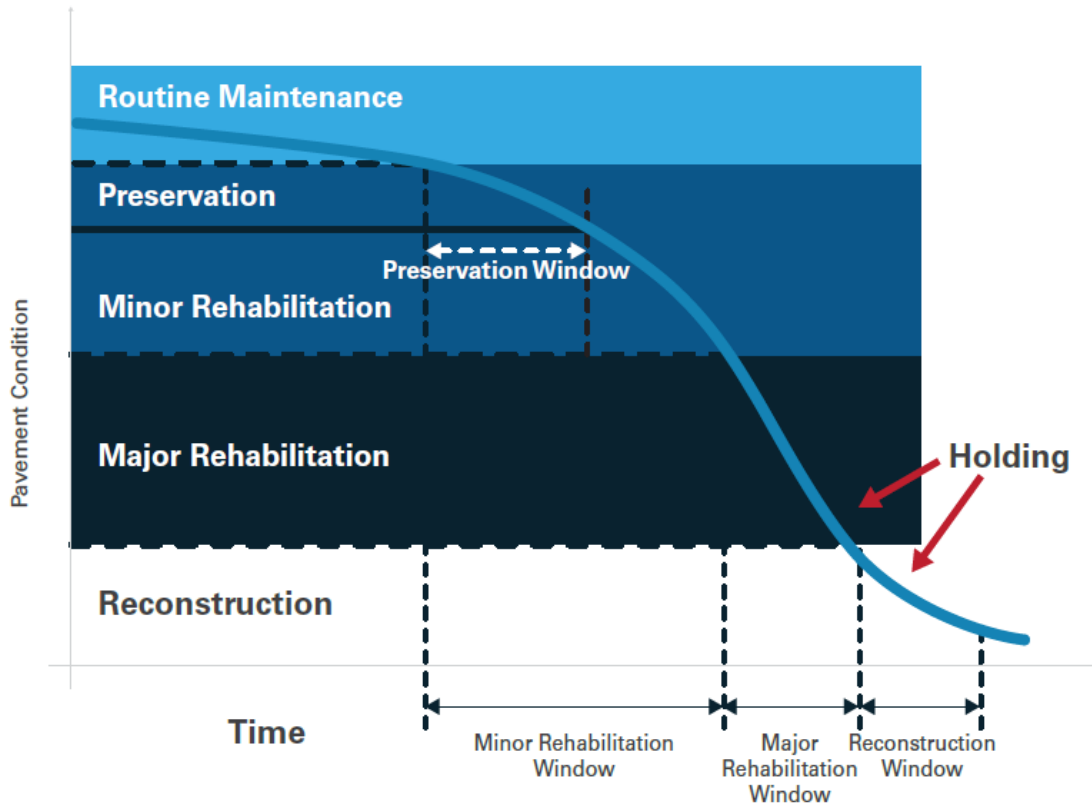
¹ The following unit rates were used to calculate Current Replacement Value: Roundabouts = \$2,000,000 each, Signalized intersections = \$60,000 / leg, Signage = \$175 / sign, beacons = \$2,500 / beacons and \$5,000 / overhead beacon, Streetlights = \$6,500 / streetlight, and Safety barriers = \$400 / m for cable barriers and \$800 / m for steel beam barriers.

2.1.2. Age and Estimate Useful Life

The exact age of roads is difficult to determine due to historical data gaps. Some roadways have existed in the County for well over one hundred years and continue to be maintained, rehabilitated, and reconstructed to provide service to the community. Additionally, the ownership of roads has varied over time with roads either being uploaded by local municipalities or downloaded from the province. Road rehabilitation and reconstruction dates are collected as projects are completed to establish reliable age information.

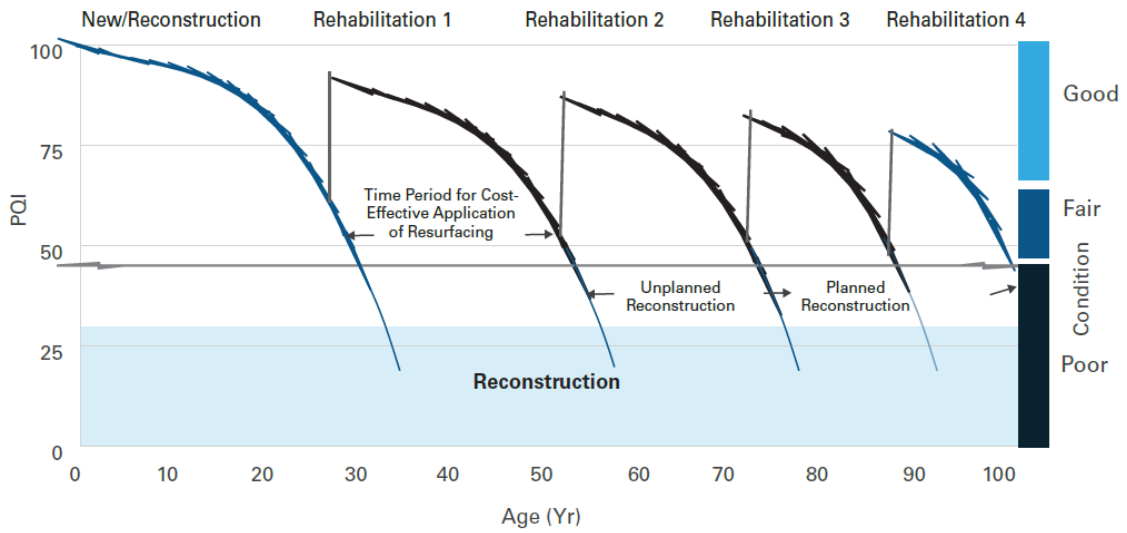
Once a road is built the pavement will start to deteriorate and the rate of deterioration will increase over time. A typical pavement performance curve is included in Figure 2-1 (Taken from City of Toronto, Core Infrastructure Asset Management Plan, 2021).

Figure 2-1: Typical Roadway Performance Curve Without Interventions



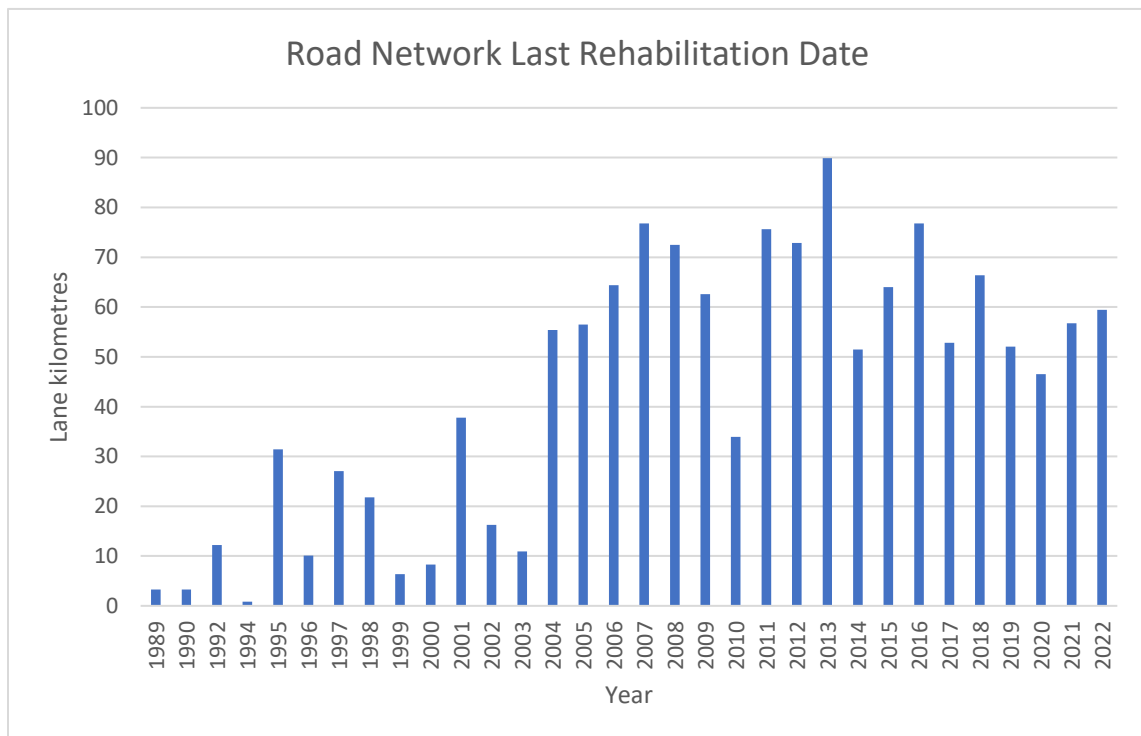
As a road deteriorates there are windows to apply maintenance and rehabilitation to extend the life of the roadway. If a road is left to deteriorate without any intervention it will reach a very poor condition in approximately 20 to 25 years. Once the road deteriorates to this point a full reconstruction is required. However, a properly maintained and rehabilitated road can provide approximately 75 to 100 years of service life or more before full replacement is required. During this time roads will generally undergo three to four cycles of major rehabilitation occurring about every 25 to 35 years. A typical service life of a well-maintained road is included in Figure 2-2 (Taken from City of Toronto, Core Infrastructure Asset Management Plan, 2021).

Figure 2-2: Typical Roadway Service Life with Interventions



The County has accurate data on the date roads have undergone their last rehabilitation. A histogram with the last rehabilitation date by lane kilometres is shown in Figure 2-3.

Figure 2-3: Road Network Last Rehabilitation Date



2.1.3. Condition

The County uses a pavement condition index (PCI) as the primary performance indicator when determining lifecycle strategies. Road condition is analyzed by County staff for each road segment and the frequency of inspections is at a minimum of once every 5 years. Road segments observed as being in distress may be analyzed at a higher frequency to ensure accurate and up to date conditions are recorded. The County’s inspection frequency for roads is summarized in Table 2-6.

Table 2-6: Road Network Inspection Frequency

Asset Type	Inspection Frequency
Road Network	MTO Flexible Pavement Condition Rating every five (5) years

The network is reviewed in compliance with Ministry of Transportation Guide SP-022 Flexible Pavement Condition Rating, Guidelines for Municipalities. This is a standard guide used by highway authorities throughout Ontario. The guide provides a consistent standard for rating the roadway by establishing an overall rideability value and the pavement's structural condition. The condition is determined by reviewing the severity and density of thirteen various distress manifestations observed within the road surface. The resulting data is translated into a five-point condition scale shown in Table 2-7.

Table 2-7: Road Network Condition Descriptions

PCI	Condition Scale	Service Level	Associated Work
90 or greater	Excellent	Recently reconstructed or rehabilitated. There are no visual cracks or structural issues. The ride is smooth.	No action is required.
75 to 90	Good	The road is showing a few signs of surface deterioration, random cracks or rutting. The ride is relatively smooth	Maintenance
60 to 75	Fair	The road is showing signs of surface deterioration, random cracks, rutting and some patching of surface defects. The ride is becoming rough.	Maintenance or Rehabilitation
40 to 60	Poor	The road is showing signs of deterioration, cracks, rutting, and patching of surface defects that occurs over 50 percent of the surface. Some structural issues are starting to show. The ride is uncomfortable.	Rehabilitation or Reconstruction
Below 40	Very Poor	The road is showing significant structural issues with large visible cracks, rutting, and patching of surface defects that occurs over 75 percent of the surface. The road is difficult to drive at the posted speed limit	Reconstruction or reconstruction

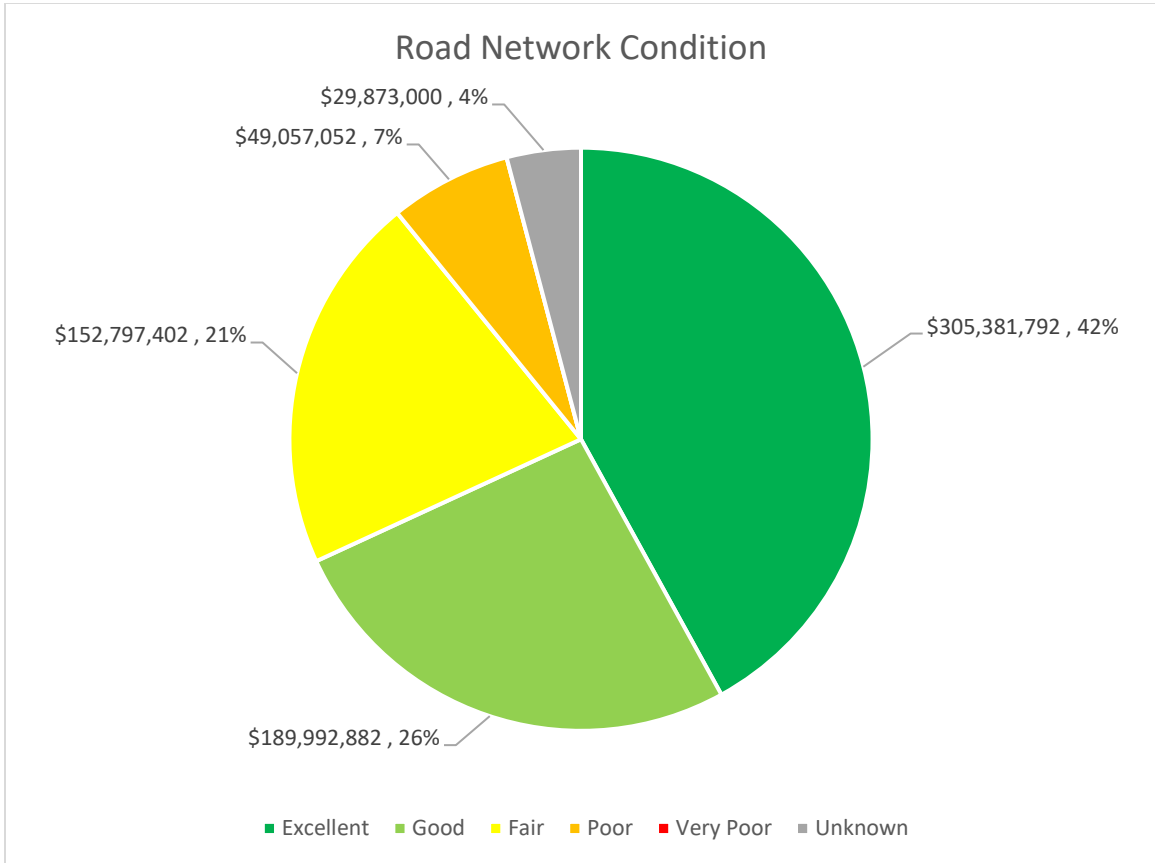
The County also undertakes an annual road coring program to determine the condition of granular material located underneath the asphalt. This is completed by an external geotechnical consultant. The program consists of coring through the road platform to confirm asphalt, granular and existing soil thicknesses to a depth of 1.0 metre. The road cores provide accurate data on how the roads have been built and any deficiencies that need to be addressed that could not be determined by visual inspection.

The condition of the road network is shown relative to the current replacement value of each asset, which includes:

- \$305.4 million or 42% in excellent condition
- \$190.0 million or 26% in good condition
- \$152.8 million or 21% in fair condition
- \$49.1 million or 7% in poor condition
- \$29.9 million or 4% in unknown condition

A pie chart with the condition of the road network and the associated current replacement value is shown in Figure 2-4. A map showing the location of roads and their condition is included in Appendix A.

Figure 2-4: Road Network Condition by Current Replacement Value



2.2. Level of Service

2.2.1. Current Level of Service

The current level of service provided by the County’s road network is summarized as community levels of service in Table 2-8 and technical levels of service in Table 2-9.

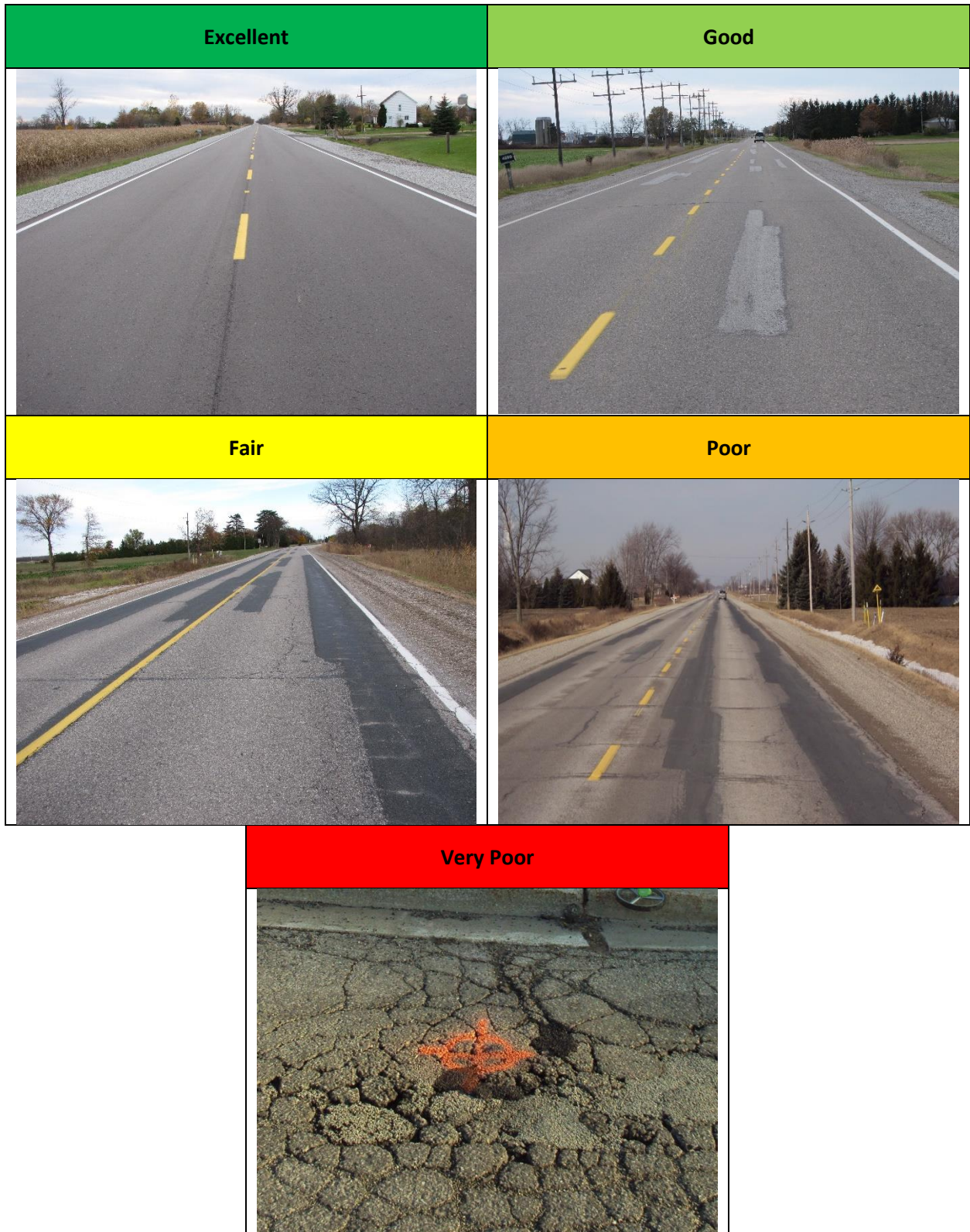
Table 2-8: Community Level of Service

Qualitative Description	Current Level of Service
Description, which may include maps, of the road network in the municipality and its level of connectivity.	The County’s road network is classified as arterial roads and as such the type of traffic supported by the structures includes motor vehicles, heavy transport vehicles, emergency response vehicles, school buses, cyclists and pedestrians. The County also supports the Lambton County Regional Trail System which is an on-road, shared access route for motorists, cyclists and pedestrians. A map showing the County road network is included in Appendix A.
Description or images that illustrate the different levels of road class pavement condition.	Images of the condition of roads are shown in Figure 2-5.

Table 2-9: Technical Level of Service

Technical Metrics	Current Level of Service
Number of lane-kilometres of arterial roads as a proportion of square kilometres of land area of the municipality.	(1,376 lane km / 3,002 km ² land area) = 0.46 lane km / km ² land area
The average pavement condition index of the road network.	Good (PCI = 83.9)

Figure 2-5: Local Examples of Road Network Condition



2.2.2. Proposed Level of Service

The proposed level of service for roads focuses on the physical condition of the overall road network and sets the minimum level of service that the County aims to provide. Pavement condition is the main factor used to determine lifecycle events and is also the most noticeable by the residents and visitors of the County. Proposed levels of service are summarized in Table 2-10.

Table 2-10: Road Network Proposed Level of Service

Proposed Level of Service	Target	Performance
Maintain an average condition of 'Good' or better (PCI greater than 75)	Good (PCI>75)	Good (PCI=83.9)
Maintain 100% of roads above 'Very Poor' condition	100%	100%

Roads identified for replacement are allowed to decline to 'poor' condition. Poor condition roadways are considered acceptable in the short-term, except for any roads that have concerns with safety or performance.

The County is currently meeting the proposed level of service targets set for the road network.

2.3. Risk Assessment

The County currently assesses risk for individual projects when determining a long-term capital plan. This evaluation is based on:

- Physical condition
- Urgency of identified needs
- Service impact

In recent years, slope stability issues have increased the risk of failure in several areas where the roadway has been constructed on a large amount of fill material. These slope stability issues are difficult to predict and expensive to repair. Future versions of the asset management plan will look to identify areas that are at risk of slope stability issues.

A network wide risk assessment is currently being developed by the County and will be included in future versions of the asset management plan.

2.4. Lifecycle Strategy

The key to long-term cost-effective pavement performance is the use of timely maintenance, rehabilitation, and reconstruction techniques. The benefits of applying these techniques appropriately are realized in lower lifecycle costs, longer service life, reuse of existing materials, increased service levels and less disruptions to the travelling public. The

lifecycle strategies that the County uses in the overall sustainable management of its road network are summarized in Table 2-11.

Table 2-11: Summary of Structures Lifecycle Strategy

Category	Lifecycle Strategy
Non-Infrastructure	<p>The County implements seasonal half-load restrictions to select roadways identified as being susceptible to damage due to traffic loading during freeze/thaw events. Overlap between County assets and those of local municipalities are reviewed and coordinated with key stakeholders. Financial and logistical savings can be recognized by using a coordinated asset management approach.</p>
Maintenance	<p>Maintenance is applied to maintain the current level of service and prevent further deterioration. The County groups maintenance into two categories:</p> <ul style="list-style-type: none"> • Routine maintenance including catch basin cleaning, ditch cleaning, roadside cleaning, pothole repair, pavement marking, snow removal, ice prevention, etc. This maintenance is done on a routine basis to address immediate issues. • Preservation including crack sealing and spray patching. This maintenance is designed to be proactive and is used to preserve the current condition and to slow deterioration.
Rehabilitation	<p>Rehabilitation is completed to increase the condition of the road and extend its estimated useful life. The County groups rehabilitation into two categories:</p> <ul style="list-style-type: none"> • Minor Rehabilitation (Surface Renewal) including micro surfacing, bonded wearing course, asphalt overlay and topcoat mill and pave. • Major Rehabilitation (Resurfacing) including full depth mill and pave, cold-in-place recycling (CIR), cold in place recycling with expanded asphalt mix (CIREAM) and full depth reclamation (pulverizing).
Replacement	<p>Total reconstruction of a section of roadway is determined when it is no longer financially practical or technically viable to continue maintenance and rehabilitation strategies. Other reasons for replacement may include:</p> <ul style="list-style-type: none"> • Issues with underlying soil • Slope stability issues in areas with fill.

	<ul style="list-style-type: none"> Improvements to the geometric design such as road re-alignment, turn lanes, road widening, etc. <p>Prior to reconstructing, maintenance and rehabilitation is minimized and the road condition is left to decline in advance of replacement.</p>
Disposal	Based on road network reviews, segments of road may be downloaded to local municipalities, closed, or abandoned, subject to approval by Council.
Expansion	Based on road network reviews, segments of road may be uploaded from either local municipalities, subject to approval by Council or downloaded from the Province of Ontario. Other expansions may be necessary to provide operational or geometric design improvements to the network. Such expansions to the network coincide with areas of growth within the County and is subject to approval by Council.

The lifecycle strategy used for road segments is affected by many factors including road classification, pavement structure, traffic volume, traffic distribution, construction materials, quality of construction, and maintenance and rehabilitation history. Condition and performance can also be impacted by underground utility work and private development activities. Generally, a properly maintained and rehabilitated road will provide approximately 75 to 100 years of service or more before full replacement is required. Roads will generally undergo three to four cycles of major rehabilitation occurring about every 25 to 35 years of their service life. The lifecycle strategy for a major rehabilitation cycle used for the road network is summarized in Table 2-12.

Table 2-12: Road Network Lifecycle Strategy

Event Name	Event Trigger	Impact to BCI	Event Cost Urban	Event Cost Rural
Maintenance	Age = 5 to 10 years PCI < 80	PCI = 85	\$2,500 / lane km	\$2,500 / lane km
Minor Rehabilitation	Age = 12 to 18 years PCI < 70	PCI = 90	\$85,000 / lane km Urban Arterial	\$50,000 / lane km Rural Arterial
Maintenance	Age 20 to 25 PCI < 80	PCI = 85	\$2,500 / lane km	\$2,500 / lane km
Major Rehabilitation or Reconstruction	Age 25 to 35 years PCI < 60	PCI = 98 or 100	Major Rehab: \$200,000 / lane km	Major Rehab: \$175,000 / lane km
			Reconstruction: \$550,000 / lane km	Reconstruction: \$500,000 / lane km

2.5. Financial Strategy

2.5.1. Historical Allocations

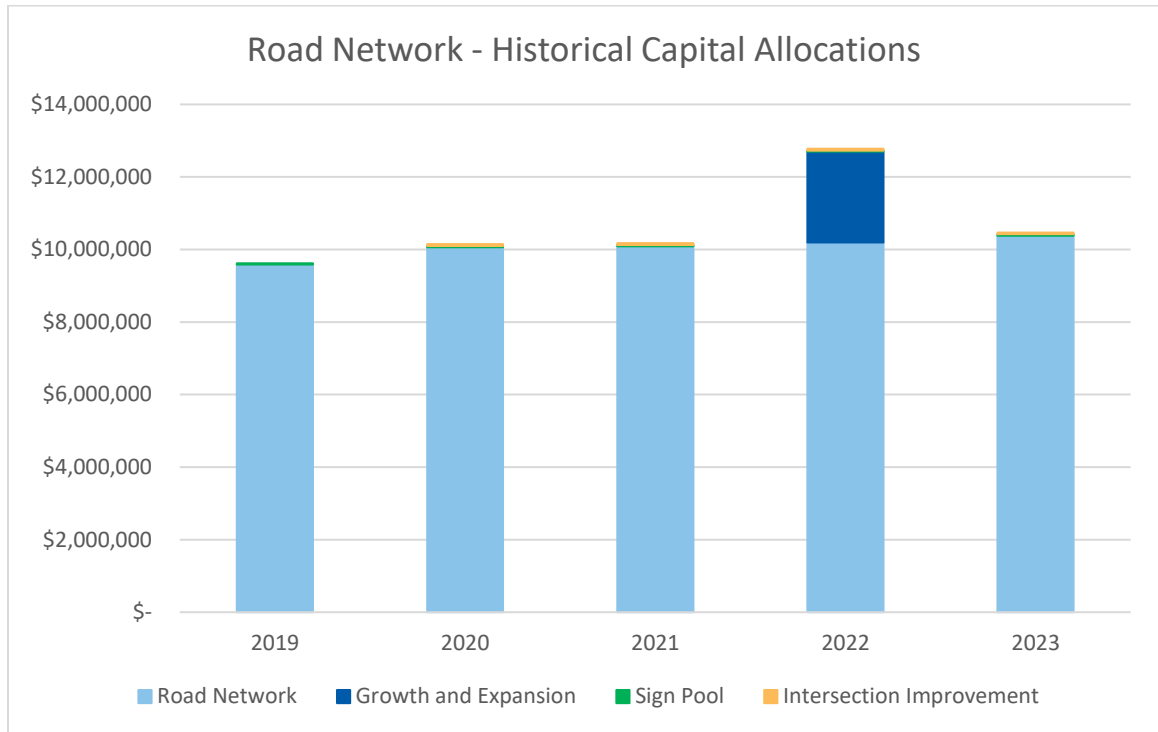
The County’s total capital allocations for the road network averaged \$10.6 million per year from 2019 to 2023. In 2023, the County budgeted \$10.5 million towards the road network. This includes \$90,000 in capital allocations to supporting assets for sign replacements and intersection improvements. The capital allocations over the last 5 years for the County’s structures network are provided in Table 2-13 and Figure 2-6.

Table 2-13: Road Network Historical Capital Allocations

Asset Type	2019	2020	2021	2022	2023
Road Network	\$9,585,000	\$10,060,000	\$10,085,000	\$10,195,000	\$10,380,000
Growth and Expansion	\$0	\$0	\$0	\$2,500,000 ¹	\$0
Sign Pool	\$35,000	\$35,000	\$40,000	\$30,000	\$40,000
Intersection Improvement	\$0	\$50,000	\$50,000	\$50,000	\$50,000
Total Capital Allocations	\$9,620,000	\$10,145,000	\$10,175,000	\$12,775,000	\$10,470,000

¹ Growth and Expansion capital allocations in 2022 are for the roundabout construction at County Road 22 (Egremont Road) and County Road 79 (Nauvoo Road).

Figure 2-6: Road Network Historical Capital Allocations



2.5.2. Long-Term Financial Plan

The sustainable funding target for the road network is determined by averaging the combined costs of lifecycle events and asset replacements over the next major rehabilitation cycle. This includes maintenance, minor rehabilitations, major rehabilitations, and reconstruction. It is assumed that 90% of the network will require a major rehabilitation and 10% will require a reconstruction at the end of this cycle. The annual funding requirement does not incorporate a backlog as the road network currently meets the proposed level of service.

The total cost to maintain all roads over the next major rehabilitation cycle is \$375.5 million. When appropriate lifecycle events are completed on the road network, the estimate useful life for a major rehabilitation cycle is approximately 33 years. Dividing the total network cost by the estimated useful life results in an annual sustainable funding target. Additionally, the \$90,000 that is currently allocated to supporting assets is assumed to be sufficient to maintain these assets. The sustainable funding target is \$11.4 million. This represents a \$0.9 million increase from the 2023 capital allocation. The sustainable funding is summarized in Table 2-14.

Table 2-14: Sustainable Funding Summary of Major Rehabilitation Cycle

Total Network Lifecycle Events Costs	Estimated Useful Life	2023 Sustainable Funding ¹	2023 Capital Allocations ¹	Current Funding Gap	Percent Increase
\$375,476,250	33	\$11,378,068	\$10,470,000	\$908,068	8.7%

¹Includes \$90,000 allocated to supporting assets.

Additionally, the County completes a five-year long term financial plan based on the current needs of the road network. This plan is updated every year. The plan lists approved projects for the current construction season, along with a list of future planned projects. The five-year long term financial plan is shown in Figure 2-7 below and a copy of the plan is available for review on the County of Lambton website within the Roads webpage. The financial plan is adjusted with an inflation factor of 2.0%. Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures. The projected five year increases due to inflationary pressures are shown in Table 2-15.

Figure 2-7: Road Network Five-Year Long Term Financial Plan

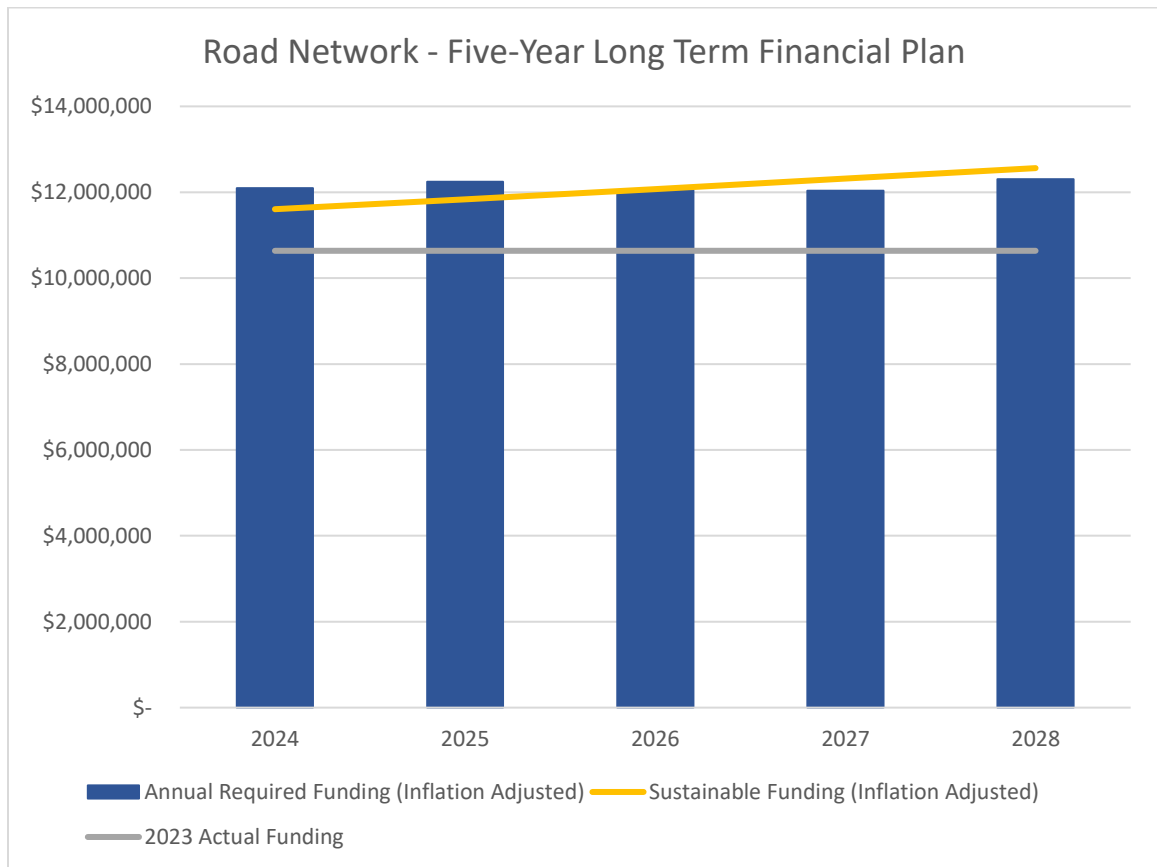


Table 2-15: Sustainable Funding Projected Inflationary Increases

	2023	2024	2025	2026	2027	2028
Inflation Factor (2.0%)	1.000	1.020	1.040	1.061	1.082	1.104
Sustainable Funding Target	\$11,378,068	\$11,605,630	\$11,837,742	\$12,074,497	\$12,315,987	\$12,562,307

2.6. Growth and Expansion

Population and employment growth within the County will result in an increased demand on the road network. The County has seen an increase in growth and development recently and the County Official Plan is currently being updated to provide new population, demographic and employment projections for all local municipalities.

During the approval process for development applications a traffic impact study is completed to assess any required upgrades to County roads in the area. The County requires that any upgrades identified in the traffic impact study are paid for by the developer as part of the development process.

Significant increases in traffic volumes or shifts in traffic patterns can result in a need for road widenings or intersection improvements. It is not projected that any road widening projects will be required in the next ten years. However, there are currently intersection improvements, such as traffic lights or roundabouts, that are being considered to provide an increased level of service. While the need for these intersection improvements may be influenced by growth within the County they are not captured in development projects and are funded directly from capital allocations.

Any growth and expansion projects are not considered in the annual sustainable funding target and would require additional capital allocations.

2.7. Conclusion

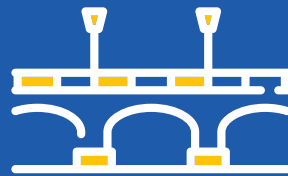
The County’s road network plays a key role in providing responsive and efficient services to the community. The following conclusions should be considered by decision-makers to make sound and consistent municipal infrastructure decisions:

- The County owns 1,376 lane kilometres of arterial roads with a current replacement value of \$727.1 million.
- 68% of the network is in good to excellent condition which indicates a well maintained and rehabilitated road network.

- The lifecycle strategy is to maximize the length of time between road reconstruction by completing timely maintenance and rehabilitation.
- The County is currently meeting the proposed level of service targets set for the road network.
- The County has had recent slope stability issues which are difficult to predict and expensive to repair. Additional slope stability issues are a risk to the sustainable funding target.
- The 2023 sustainable funding target is \$11.4 million, which is a \$0.9 million increase from 2023 capital allocations.
- Growth and expansion projects are not included in the sustainable funding target and would require additional capital allocations.
- Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures.



Structures





Structures Gallery

3.1. State of Infrastructure

Structures assist in the safe and efficient movement of vehicular traffic and form part of the County’s road network. The County of Lambton owns and maintains 186 structures totaling over 40,000 square metres of deck area. For the purposes of the asset management plan the structures are divided into the following three asset types:

- 71 bridges
- 95 concrete culverts spanning 3.0 metres or greater
- 20 steel culverts spanning 3.0 metres or greater

In accordance with the Canadian Highway Bridge Design Code (CHBDC), a bridge is defined as “a structure that provides a roadway or walkway for the passage of vehicles, pedestrians, or cyclists across an obstruction, gap, or facility and is greater than 3.0 metre in span”.

The CHBDC defines culverts as “a structure that forms an opening through soil”. Culverts that are included in the Ontario Structures Inventory Manual (OSIM) have a span greater than or equal to 3.0 metres and more than 600 millimetres of cover and are referred to as major culverts. Culverts of less than 3.0 metres in span are not assessed based on OSIM methodology and are referred to as minor culverts. Minor culverts are not identified in this report but are maintained as part of the associated road asset.

A summary of the bridge and major culvert infrastructure in the County of Lambton is provided in Table 3-1. Data is based on structure inspections completed in 2022.

Table 3-1: Structures Asset Summary

Asset Type	Number of Structures	Total Deck Area (m2)	Average Age	Average Condition (BCI)
Bridges	71	24,621	51	Good (80.8)
Concrete Culverts (>3.0m)	95	12,612	48	Good (78.6)
Steel Culverts (>3.0m)	20	3,372	45	Good (76.1)
Total	186	40,605	49	Good (79.2)

3.1.1. Asset Inventory and Valuation

The County owns and maintains a total of 186 structures consisting of 71 bridges, 95 concrete culverts and 20 steel culverts. A total of 17 structures or 9.1% are jointly owned with bordering Counties or Railways and the costs associated with inspection, maintenance, rehabilitation and reconstruction are shared. A map showing the location of all structures is provided in Appendix B.

Structures are identified with a unique identification number issued by County staff. This numbering system follows the format XX-Y-ZZZ where:

- XX is the County Road number or boundary location (EB = east boundary, SB = south boundary and IB = interior boundary)
- Y is the type of structure (3 = bridge and 5 = culvert)
- ZZZ is the location of the bridge measured as a distance (chainage) from the starting point of the road.

The current replacement values of bridges and major culverts is based on recent trends in reconstruction costs for equivalent structures and totals an estimated \$185.3 million, including:

- \$129.5 million in bridges
- \$44.1 million in concrete culverts (>3.0m)
- \$11.7 million in steel culverts (>3.0m)

A summary of current replacement values is provided in Table 3-2. The values shown below only reflect the County’s portion for any shared assets.

Table 3-2: Structures Valuation

Asset Type	Number of Structures	Current Replacement Value ¹
Bridges	71	\$129,527,074
Concrete Culverts (>3.0m)	95	\$44,079,385
Steel Culverts (>3.0m) ²	20	\$11,717,143
Total	186	\$185,323,602

¹ The following unit rates were used to calculate Current Replacement Value: Bridges = \$6,000 / m² deck area, Concrete Culverts = \$3,500 / m² deck area and Steel Culverts = \$3,500 / m² deck area.

² Steel Culverts are replaced with Concrete Culverts whenever feasible. Concrete Culvert unit rates have been used for Steel Culverts

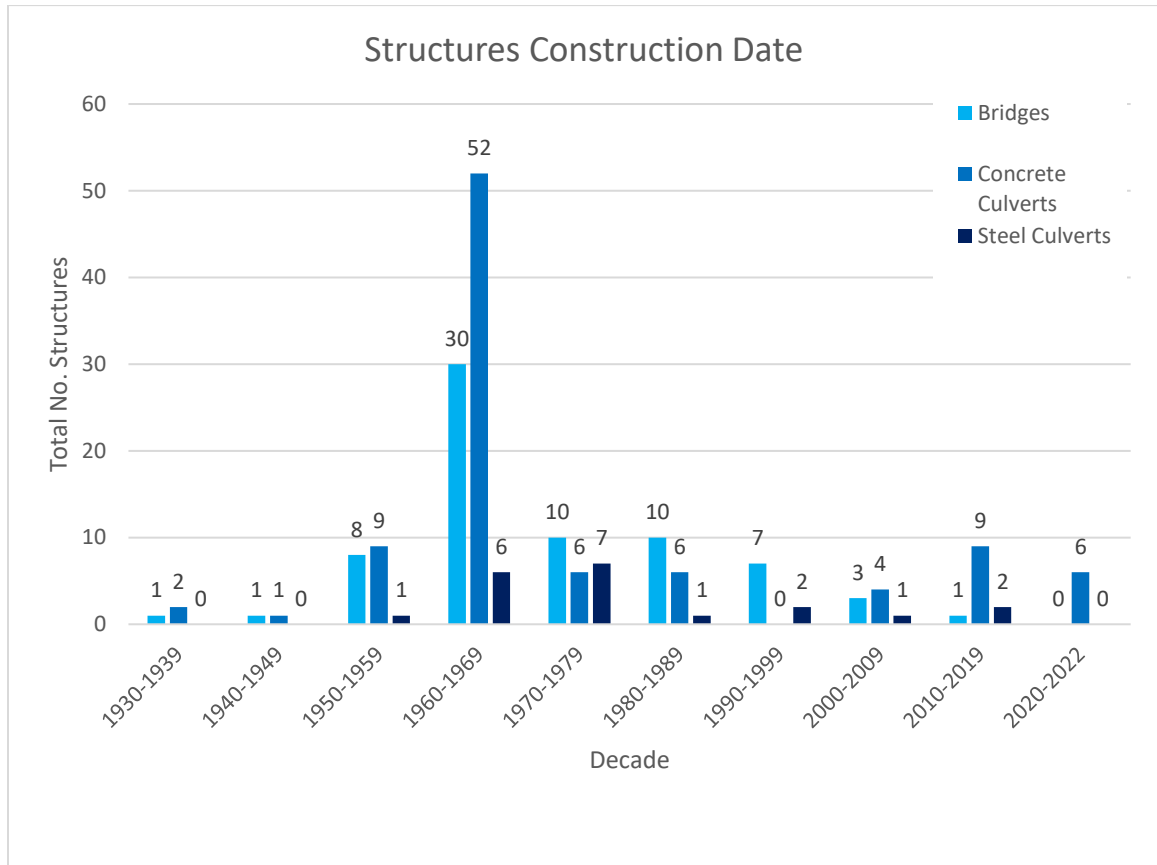
3.1.2. Age and Estimate Useful Life

The County records the date each structure was built, this age information is summarized below:

- Average age of bridges is 51 years, 63.4% are older than 50 years.
- Average age of concrete culverts is 48 years, 68.4% are older than 50 years.
- Average age of steel culverts is 45 years, 50.0% are older than 50 years.

Overall, there are 120 structures greater than 50 years old which is 64.5% of the network. Therefore, the structure network is trending to an older age profile. A histogram with the structure construction dates is shown in Figure 3-1.

Figure 3-1: Structures Construction Date

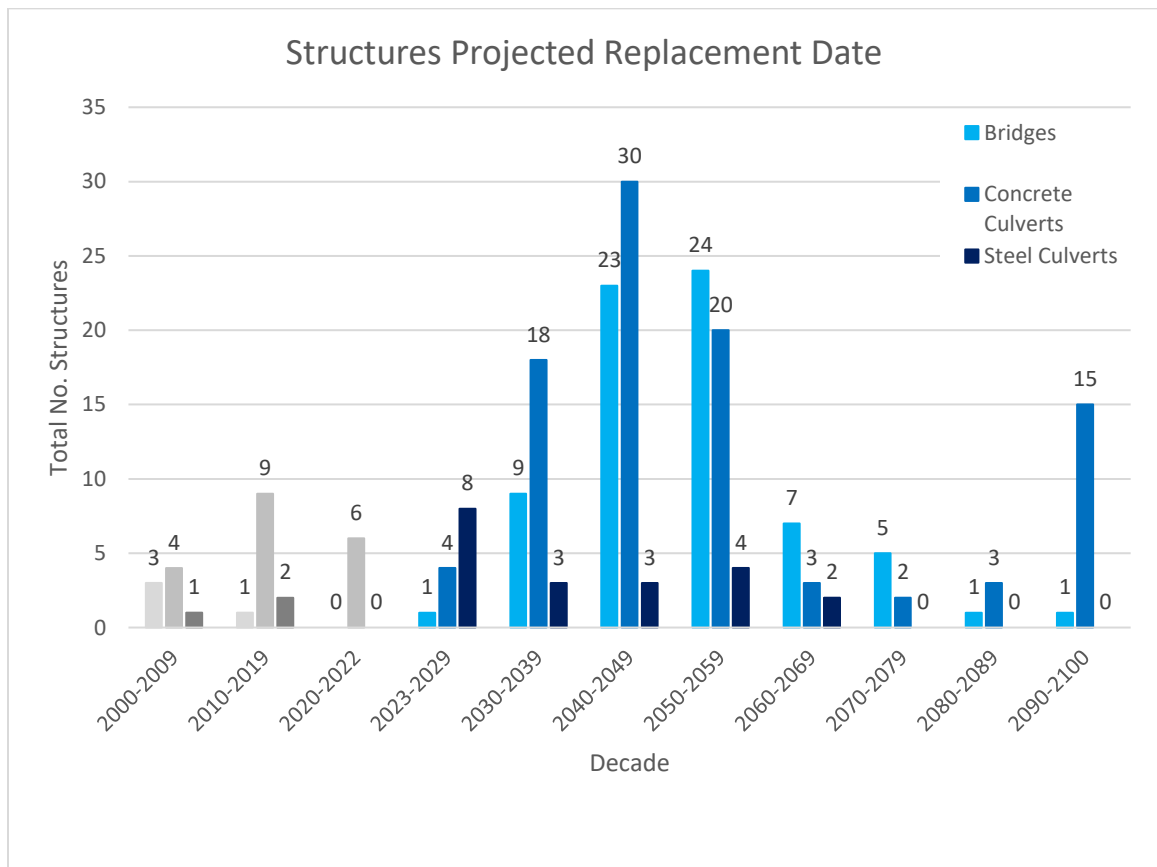


Many of the structures in the County’s network were constructed during the 1960’s. During this period there was major infrastructure investments that occurred throughout Canada, and this was fundamental to the construction of the bridge and highway system that we utilize today. Therefore, many structures in the County network are projected to reach the end of their useful lives in the next 25 years.

The Canadian Highway Bridge Design Code estimates that the useful life for bridges and concrete culverts is 75 years, while steel culverts have a shorter estimated useful life of 50 years. However, the actual useful life of a structure may vary due to a variety of factors such as design, construction methods, previous rehabilitation and maintenance schedules, traffic volumes, traffic loading, etc.

The County reviews each structure on a case-by-case basis as it ages and approaches the end of its estimated useful life. Based on the structures current condition, age, and maintenance history a replacement date is determined and the estimated useful life is adjusted accordingly. A total of 99 structures, totaling 53.2% of the network, may reach the end of their estimated useful life prior to 2050. A histogram with the structures projected replacement date is shown in Figure 3-2.

Figure 3-2: Structures Projected Replacement Date



3.1.3. Condition

Bridges and major culverts are legislated through Ontario Regulation 104/97: Standards for Bridges as amended by Ontario Regulation 472/10 made under the Public Transportation and Highway Improvement Act. In accordance with the regulation “The structural integrity, safety and condition of every bridge shall be determined through the performance of at least one inspection in every second calendar year under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual (OSIM)”. The County’s inspection frequency for structures is summarized in Table 3-3.

Table 3-3: Structures Inspection Frequency

Asset Type	Inspection Frequency
Bridges and major culverts as per O.Reg. 472/10	OSIM inspection every two (2) years, 100% biennially
Minor culverts	Normal maintenance inspections by operations staff and prior to completing road rehabilitation or reconstruction in the area

The County’s most recent OSIM inspection was completed in 2022 by an external consultant. These inspections are used to develop a condition rating, known as the Bridge Condition Index (BCI), which is based on the Ministry of Transportation (MTO) rating system. The BCI rating is on a scale from 0 to 100, with 0 representing the worst possible condition and 100 representing the best possible condition. While there are several factors associated with prioritizing needs, the BCI is used to reflect the general condition of bridges and culverts.

The BCI provided by the OSIM inspection is translated into a five-point condition scale shown in Table 3-4.

Table 3-4: Structures Condition Descriptions

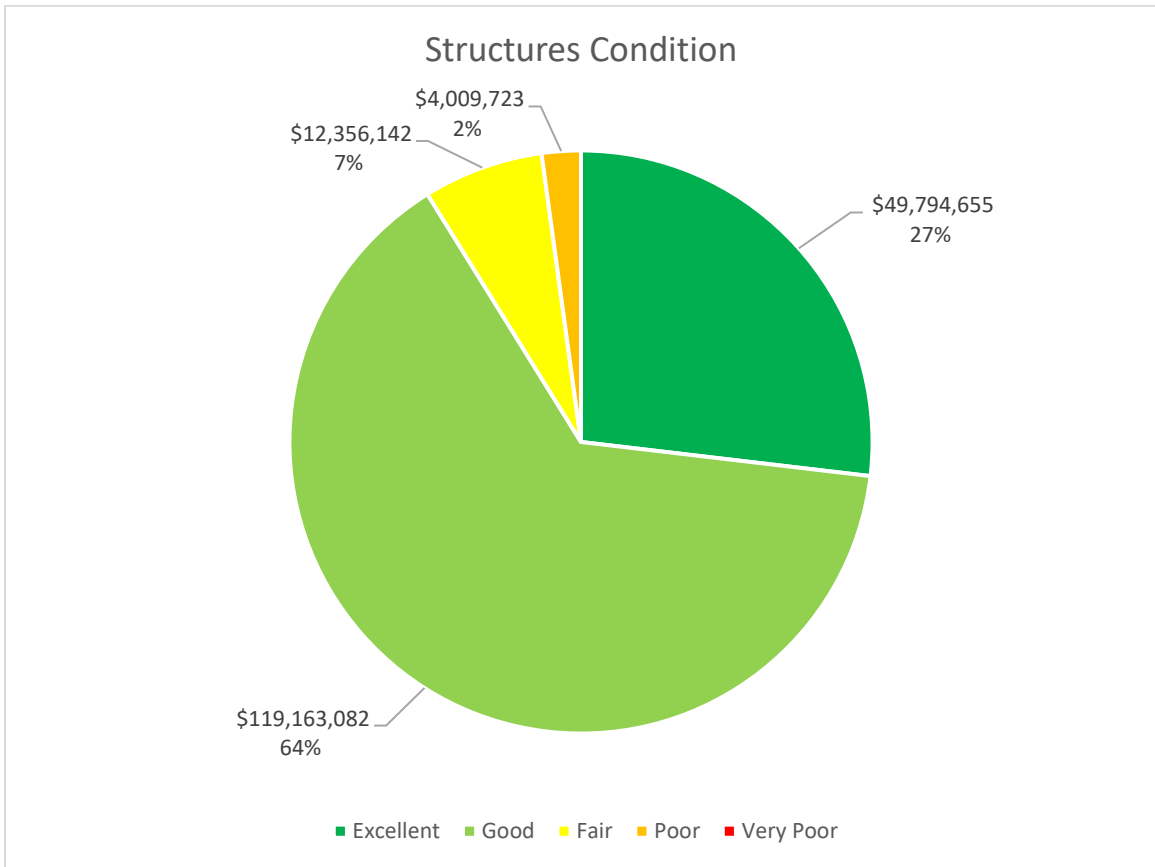
BCI	Condition Scale	Service Level	Associated Work
85 or greater	Excellent	Recently reconstructed or rehabilitated. The structure is new or like new condition.	No action is required.
70 to 85	Good	The structure or components of the structure are showing signs of minor defects. The structure is performing as intended.	Maintenance. Rehabilitation is not usually required within five years.
60 to 70	Fair	The structure or components of the structure are showing signs of moderate defects. Performance of the structure may be slightly impacted.	Minor or Major rehabilitation is usually required within the next five years. This is the ideal time to schedule major bridge or culvert repairs from an economic perspective.
30 to 60	Poor	The structure or components of the structure are showing signs of severe defects. The structure is not performing as intended however a poor rating does not necessarily mean the bridge or structure is unsafe or unsuitable for use. Load restrictions may be required.	Major rehabilitation or reconstruction is usually required within approximately one year.
Below 30	Very Poor	The structure or components of the structure are showing signs of very severe defects. Load restrictions or temporary closure may be required.	Reconstruction is usually required immediately and is likely the most economical solution.

The condition of the structure network is shown relative to the current replacement value of each asset, which includes:

- \$49.8 million or 27% in excellent condition
- \$119.2 million or 64% in good condition
- \$12.4 million or 7% in fair condition
- \$4.0 million or 2% in poor condition

A pie chart with the condition of structures and the associated current replacement value is shown in Figure 3-3. A map showing the location of structures and their condition is included in Appendix B.

Figure 3-3: Structure Network Condition Breakdown by Current Replacement Value



3.2. Level of Service

3.2.1. Current Level of Service

The current level of service provided by the County’s structure network is summarized as community levels of service in Table 3-5 and technical levels of service in Table 3-6.

Table 3-5: Community Level of Service

Qualitative Description	Current Level of Service
Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists).	The County’s road network is classified as arterial roads, which support the following type of traffic: motor vehicles, heavy transport vehicles, emergency response vehicles, school buses, cyclists, and pedestrians. The County also supports the Lambton County Regional Trail System which is an on-road, shared access route for motorists, cyclists and pedestrians. A map showing the location of County structures is included in Appendix B.
1. Description or images of the condition of bridges and how this would affect use of the bridges. 2. Description or images of the condition of culverts and how this would affect use of the culverts.	Images of the condition of bridges are shown in Figure 3-4. Images of the condition of culverts are shown in Figure 3-5. A map showing the location of structures and their condition is included in Appendix B.

Table 3-6: Technical Level of Service

Technical Metrics	Current Level of Service
Percentage of bridges in the municipality with loading or dimensional restrictions.	0.0%
For bridges in the municipality, the average bridge condition index value.	Good (BCI = 80.8)
For concrete culverts in the municipality, the average bridge condition index value.	Good (BCI = 78.6)
For steel culverts in the municipality, the average bridge condition index value.	Good (BCI = 76.1)

Figure 3-4: Local Examples of Bridge Condition



Figure 3-5: Local Examples of Culvert Condition

<p>Excellent - Structure No. 79-5-474, BCI = 100, Construction Date = 2022</p>	<p>Good - Structure No. 09-5-010, BCI = 75, Construction Date = 1977</p>
	
<p>Fair - Structure No. 22-5-307, BCI = 64, Construction Date = 1960</p>	<p>Poor – Structure No. 02-5-385, BCI = 44, Construction Date = 1962</p>
	
<p>Very Poor – Structure No. 08-5-102, BCI = 28, Construction Date = 1974 (Photo taken in 2022 prior to reconstruction)</p>	
	

3.2.2. Proposed Level of Service

Proposed level of service for structures focuses on the physical condition of the overall network as this provides the best indication of how a structure will perform in the short to medium term. The proposed level of service sets the minimum level of service that the County aims to provide. Proposed levels of service are summarized in Table 3-7.

Table 3-7: Structures Proposed Level of Service

Proposed Level of Service	Target	Performance
Maintain an average condition of 'Good' or better (BCI greater than 70)	Good (BCI>70)	Good (BCI=79.2)
Maintain 100% of bridges and major culverts above 'Very Poor' condition	100%	100%

Bridges identified for replacement are allowed to decline to 'poor' condition. Bridges rated as poor are considered as acceptable in the short-term except for any structures that have concerns with safety or performance.

The County is currently meeting the proposed level of service targets set for structures.

3.3. Risk Assessment

The County currently assesses risk for individual projects when determining a long-term capital plan. This evaluation is based on:

- Physical condition
- Urgency of identified needs
- Service impact

A network wide risk assessment is currently being developed by the County and will be included in future versions of the asset management plan.

3.4. Lifecycle Strategy

The main goal of the lifecycle strategy is to maximize the life of the structure while maintaining a proposed level of service at the lowest possible cost. During the bi-annual OSIM review a list of recommended improvements is produced for each structure. These lifecycle events are classified as maintenance, minor rehabilitation, major rehabilitation, and replacement. The lifecycle strategies that the County uses in the overall sustainable management of its structures is summarized in Table 3-8.

Table 3-8: Summary of Structures Lifecycle Strategy

Category	Lifecycle Strategy
Non-Infrastructure	Structure lifecycle events are coordinated with the road network whenever possible. Financial and logistical savings can be recognized by using a coordinated asset management approach.
Maintenance	Maintenance is performed through spring bridge washing, crack sealing, minor concrete repairs, slope repairs, tree trimming, etc. Structures are continually reviewed for possible inclusion into these operations as well as other selective repairs, to maintain current level of service and to maximize useful life.
Minor Rehabilitation	Minor rehabilitations include the replacement of bridge bearings, resurfacing, replacement of waterproofing, concrete patching, replacement of joint seals, barrier repairs, etc.
Major Rehabilitation	Major rehabilitations involve more extensive work such as concrete overlays on decks, deck replacements, replacement of barriers, replacement of joint assemblies, resurfacing of substructure components, recoating structural steel, etc.
Replacement	Total reconstruction of a bridge or culvert is determined when it is no longer financially or technically viable to duplicate maintenance or rehabilitation strategies. The remaining useful life of the bridge or culvert is balanced with the associated risk prior to the ultimate replacement of the structure.
Disposal	Bridges and major culverts may be downloaded to the local municipalities or removed, subject to approval by Council.
Expansion	Bridges and major culverts may be uploaded from local municipalities or downloaded from the Province of Ontario. Existing structures may be widened to accommodate additional lanes of traffic, sidewalks, or to provide clear zone to remove the need for protective barriers. Structures that cross a water course may need to be expanded to accommodate increased hydraulic demands. All expansions are subject to approval by Council.

The lifecycle strategy that is used is different for bridges, concrete culverts, and steel culverts. Bridges are more complex with a variety of different components that are exposed to the elements, this results in more maintenance and rehabilitation work. Concrete and steel culverts are made up of very few components that are buried in soil which provides protection from the elements, resulting in less maintenance and rehabilitation work.

Maintenance is an important part of a structure’s lifecycle strategy to sustain current levels of service and extend a structures useful life. Bridges, concrete culverts, and steel culverts are included in annual maintenance activities. These costs are reflected in the County’s

Public Works operating budget. Currently, the maintenance budget is sufficient for the County’s structure network.

Lifecycle strategies provide a general guideline for what maintenance and rehabilitation will be required throughout the life of a structure. However, recommendations from inspections may vary from the general timeline due to a variety of factors. Where possible, lifecycle events are planned in conjunction with the activities of the road network to minimize disruption and realize cost efficiencies. The lifecycle strategy for each asset type is summarized below.

3.4.1. Bridge Lifecycle Strategy

The bridge lifecycle strategy consists of minor rehabilitations, major rehabilitations, and full asset replacement. First, a minor rehabilitation is triggered at an age between 20 to 40 years and a BCI between 70 to 80 at an estimated cost of 15% of the current replacement value. Second, a major rehabilitation is triggered at an age between 40 to 60 years and a BCI of between 60 to 70 at an estimated cost of 35% of the current replacement value. Third, an additional major rehabilitation or replacement of the bridge is triggered at an age between 60 to 80 years and when the BCI drops below 60. At this stage an assessment is required to determine the preferred option between rehabilitation or replacement. Finally, if the structure is still in service replacement of the bridge will typically occur between 80 to 100 years or later and when the BCI drops below 60. The bridge lifecycle strategy is summarized in Table 3-9.

Table 3-9: Bridge Lifecycle Strategy

Event Name	Event Trigger	Impact to BCI	Event Cost
Minor Rehabilitation	Age = 20 to 40 years BCI = 70 to 80	BCI = 90	15% of replacement value
Major Rehabilitation	Age = 40 to 60 years BCI = 60 to 70	BCI = 85	35% of replacement value
Major Rehabilitation or Replacement	Age = 60 to 80 years BCI = >60	BCI = 85 or 100	55% of replacement value or 100% replacement value
Replacement	Age = 80 to 100 years BCI = <60	BCI = 100	100% replacement value

3.4.2. Concrete Culvert Lifecycle Strategy

The concrete culvert lifecycle strategy consists of a possible major rehabilitation and full asset replacement. The potential for a major rehabilitation is evaluated between 50 to 75 years and a BCI of 60 to 70 at an estimated cost of 35% of the current replacement

value. If a major rehabilitation is completed it will extend the life of the structure. The replacement of the culvert is triggered at an age between 75 to 100 years and when the BCI drops below 60. The concrete culvert lifecycle strategy is summarized in Table 3-10.

Table 3-10: Concrete Culvert Lifecycle Strategy

Event Name	Event Trigger	Impact to BCI	Event Cost
Major Rehabilitation	Age = 50 to 75 years BCI = 60 to 70	BCI = 85	35% of replacement value
Replacement	Age = 75 to 100 years BCI = <60	BCI = 100	100% replacement value

3.4.3. Steel Culvert Lifecycle Strategy

The steel culvert lifecycle strategy consists of a possible major rehabilitation and full asset replacement. The potential for a major rehabilitation is evaluated between 40 to 50 years and a BCI of 60 to 70 at an estimated cost of 35% of the current replacement value. The replacement of the culvert is triggered at an age between 50 to 75 years and when the BCI drops below 60. The County aims to replace steel culverts with concrete culverts whenever it is feasible due to the longer life span of concrete culverts. The steel culvert lifecycle strategy is summarized in Table 3-11.

Table 3-11: Steel Culvert Lifecycle Strategy

Event Name	Event Trigger	Impact to BCI	Event Cost
Major Rehabilitation	Age = 40 to 50 years BCI = 60 to 70	BCI = 85	35% of replacement value
Replacement	Age = 50 to 75 years BCI = <60	BCI = 100	100% replacement cost

3.5. Financial Strategy

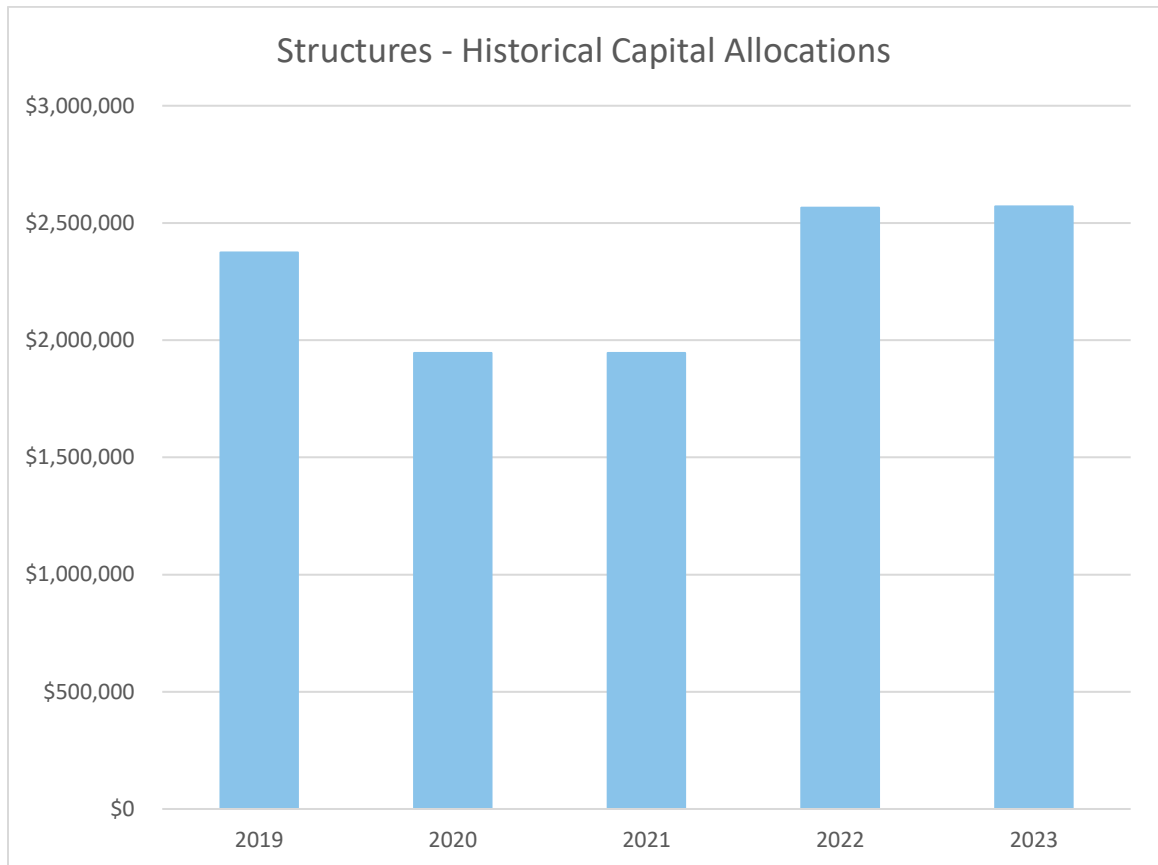
3.5.1. Historical Capital Allocations

The County’s total rehabilitation and replacement allocations for structures averaged \$2.3 million per year from 2019 to 2023. In 2023, the County budgeted \$2.6 million. The capital allocations over the last 5 years for the County’s structures network are provided in Table 3-12 and Figure 3-6.

Table 3-12: Structures Historical Capital Allocations

2019	2020	2021	2022	2023
\$2,374,000	\$1,945,000	\$1,945,000	\$2,565,000	\$2,570,000

Figure 3-6: Structures Historical Capital Allocations



3.5.2. Long Term Financial Plan

The sustainable funding target of the structure network is determined by reviewing rehabilitation and replacement requirements for individual structures. The goal is to maintain the current level of service by completing rehabilitations and replacements of the County’s structures in line with the proposed lifecycle strategy. The proposed projects are selected based on age, condition, and recommendations from inspections.

The County completes a five-year financial plan based on the current needs of the structure network. This plan is updated every year. The plan lists approved projects for the current construction season, along with a list of future planned projects. The five-

year long term financial plan is shown in Figure 3-6 below and a copy of the plan is available for review on the County of Lambton website within the Roads webpage. The 2023 sustainable funding target is estimated at \$2.9 million. This represents a \$0.3 million increase from the 2023 capital allocation. The sustainable funding is summarized in Table 3-13. The capital plan is adjusted with an inflation factor of 2.0%. Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures. The projected five year increases due to inflationary pressures are shown in Table 3-14.

Figure 3-6: Structures Five-Year Long Term Financial Plan

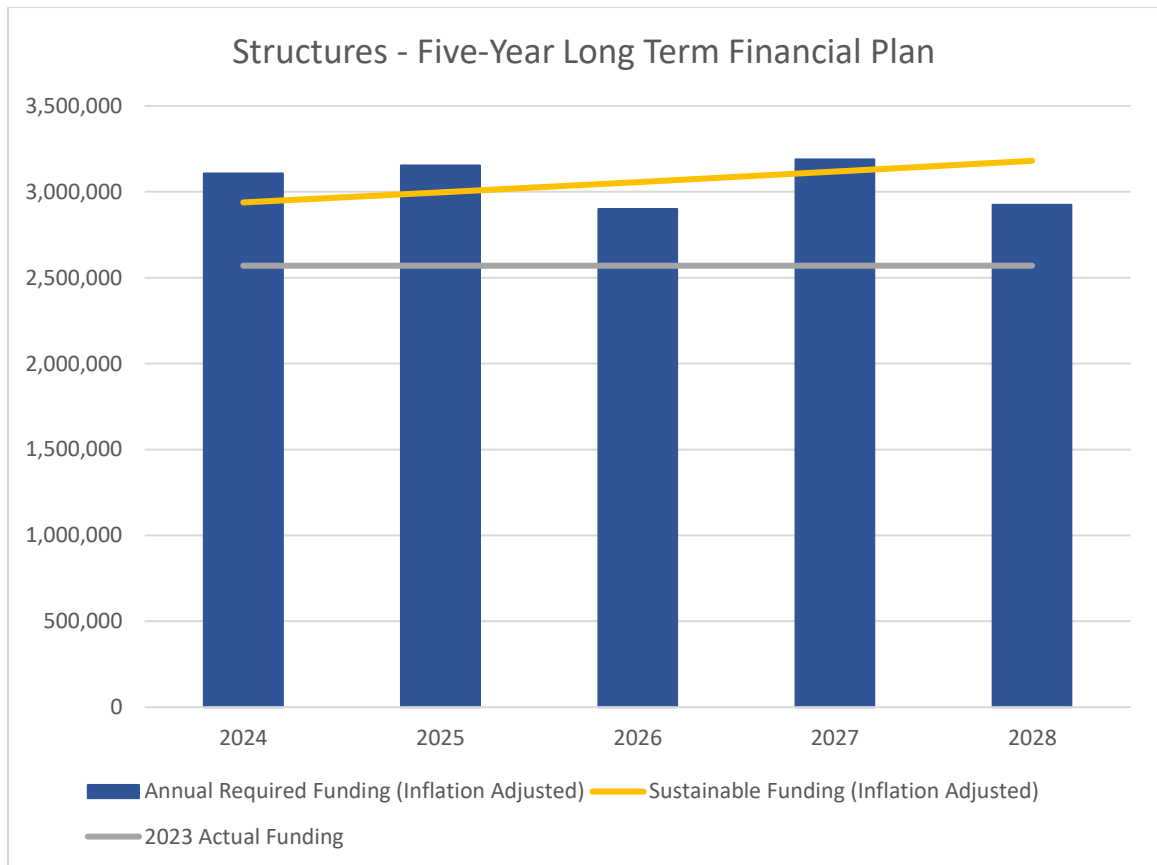


Table 3-13: Structures Sustainable Funding Summary

2023 Sustainable Funding	2023 Capital Allocations	Current Funding Gap	Percent Increase
\$2,880,746	\$2,570,000	\$310,746	12.1%

Table 3-14: Sustainable Funding Projected Inflationary Increases

	2023	2024	2025	2026	2027	2028
Inflation Factor (2.0%)	1.000	1.020	1.040	1.061	1.082	1.104
Sustainable Funding Target	\$2,880,746	\$2,938,361	\$2,997,128	\$3,057,071	\$3,118,212	\$3,180,576

3.6. Growth and Expansion

Significant increases in traffic volumes or shifts in traffic patterns can result in a need for structure widenings. It is not projected that any structure widening projects will be required in the next ten years.

Any growth and expansion projects are not considered in the annual sustainable funding target and would require additional capital allocations.

3.7. Conclusion

Structures are an important part of the safe and efficient movement of vehicles across the County’s road network. The following conclusions should be considered by decision-makers to make sound and consistent municipal infrastructure decisions:

- The County owns 186 structures with a current replacement value of \$185.3 million.
- 91% of the network is in good to excellent condition which indicates a well maintained and rehabilitated network.
- The structure network is aging and a significant increase in major rehabilitations and replacements is projected over the next 25 years.
- The lifecycle strategy is to maximize a structures life while prioritizing high risk projects for major rehabilitation and replacement.
- The County is currently meeting the proposed level of service for structures.
- The 2023 sustainable funding target is \$2.9 million, which is a \$0.3 million increase from 2023 capital allocations.
- Growth and expansion projects are not anticipated in the next 10 years.
- Future sustainable funding targets will need to be increased annually to keep up with inflationary pressures.

Appendix A – Road Network Maps



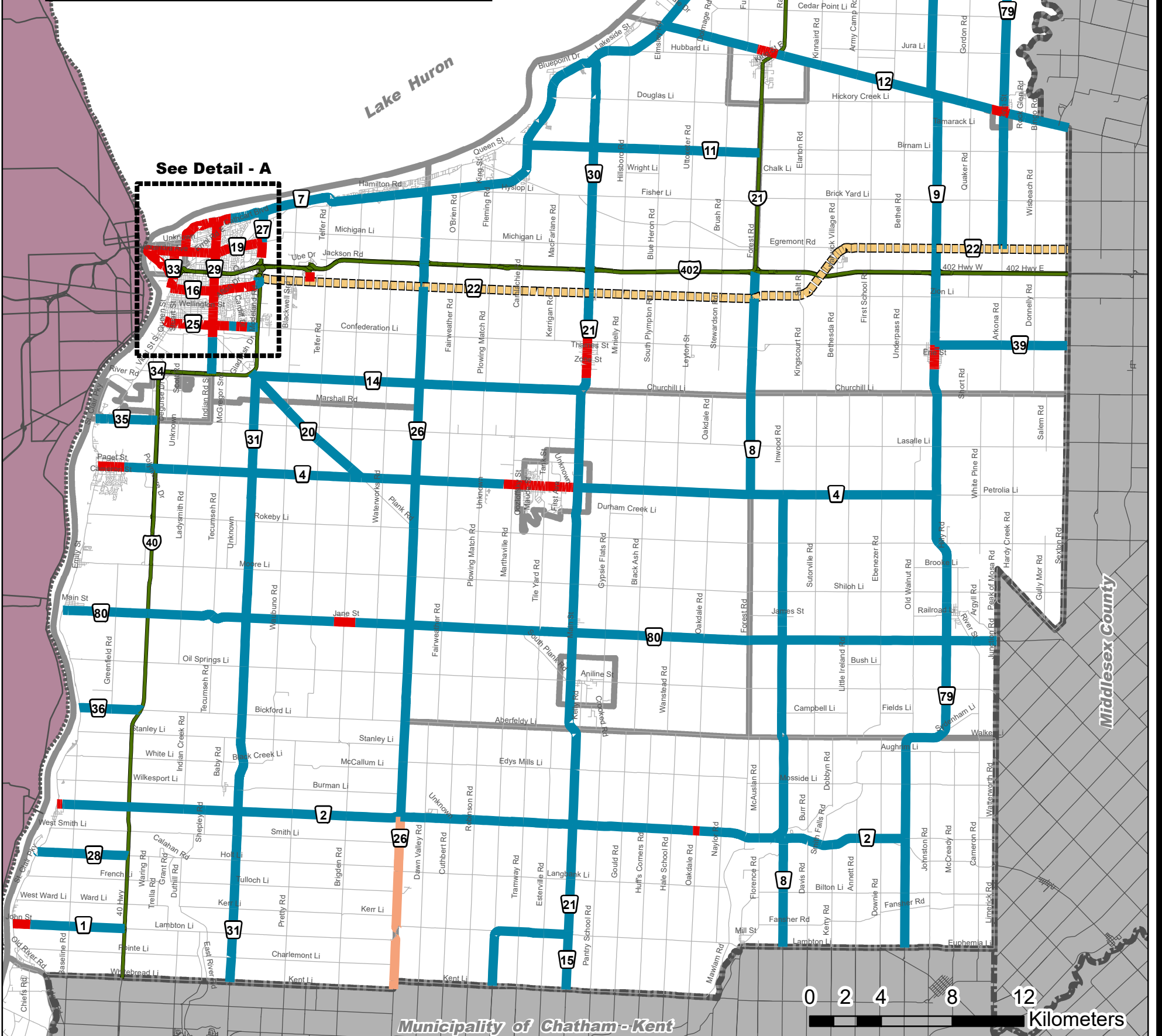
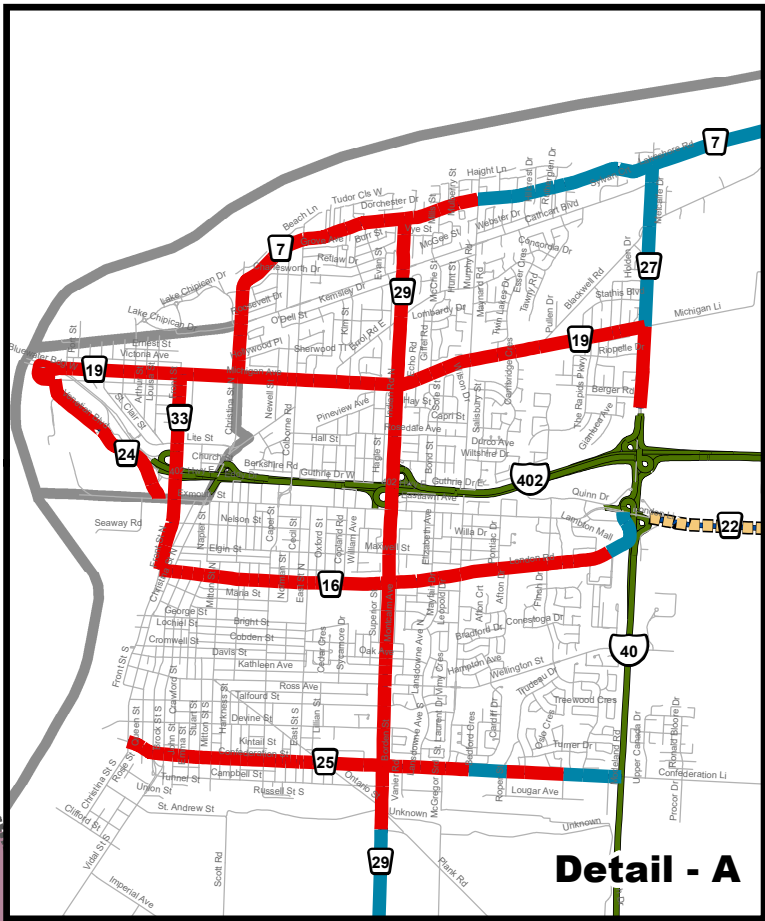
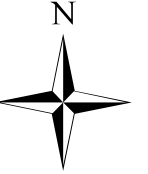
The Corporation of the County of Lambton Asset Management Plan Road Network

Legend

Lambton County Road Network

Roadway Type

- Asphalt - Urban Arterial
- Asphalt - Rural Arterial
- Asphalt - EDR (Emergency Detour Route)
- Gravel
- Provincial Roadways
- Local Roadways
- USA Major Roads
- Administrative Boundaries
- Neighbouring Municipalities
- USA





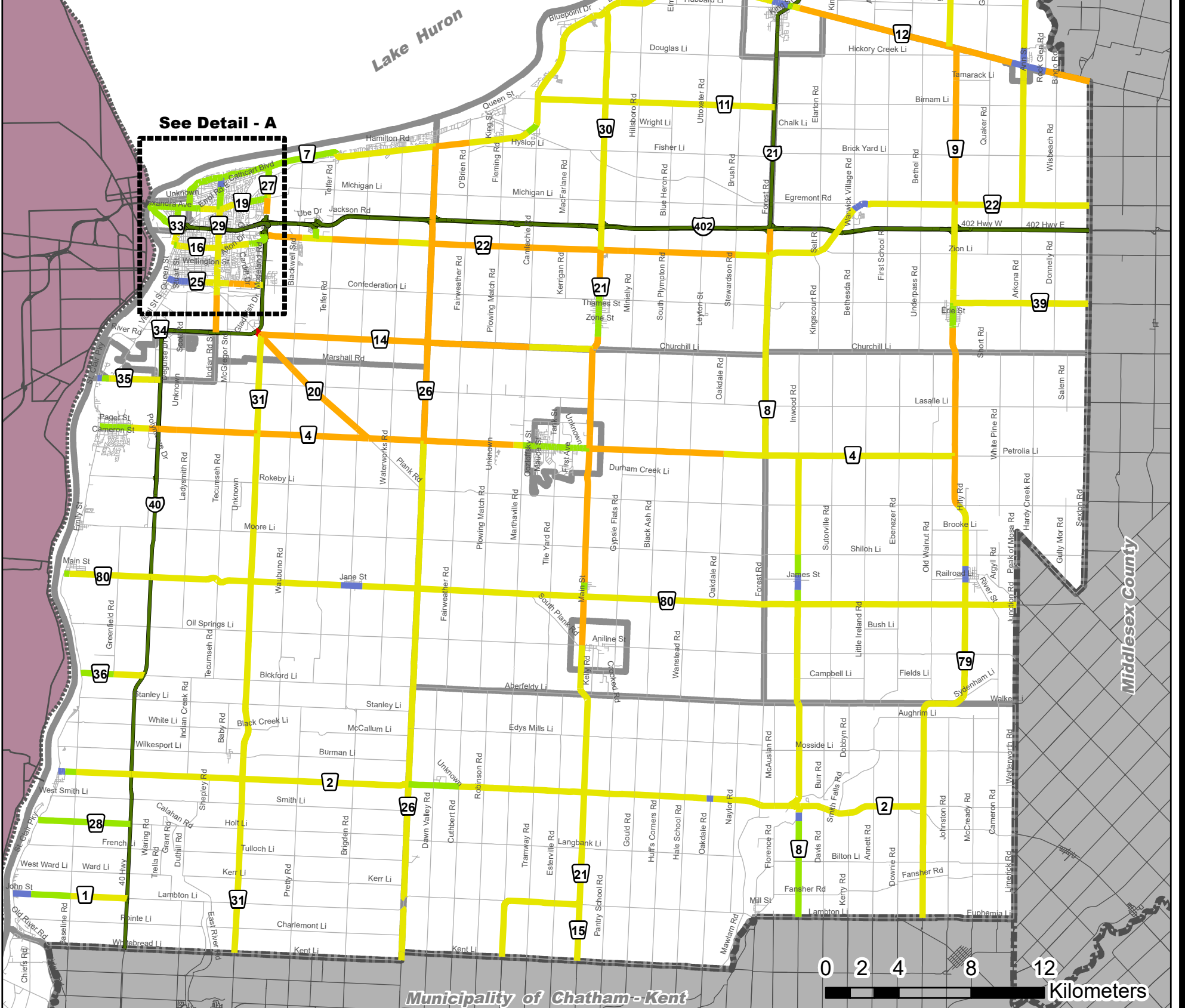
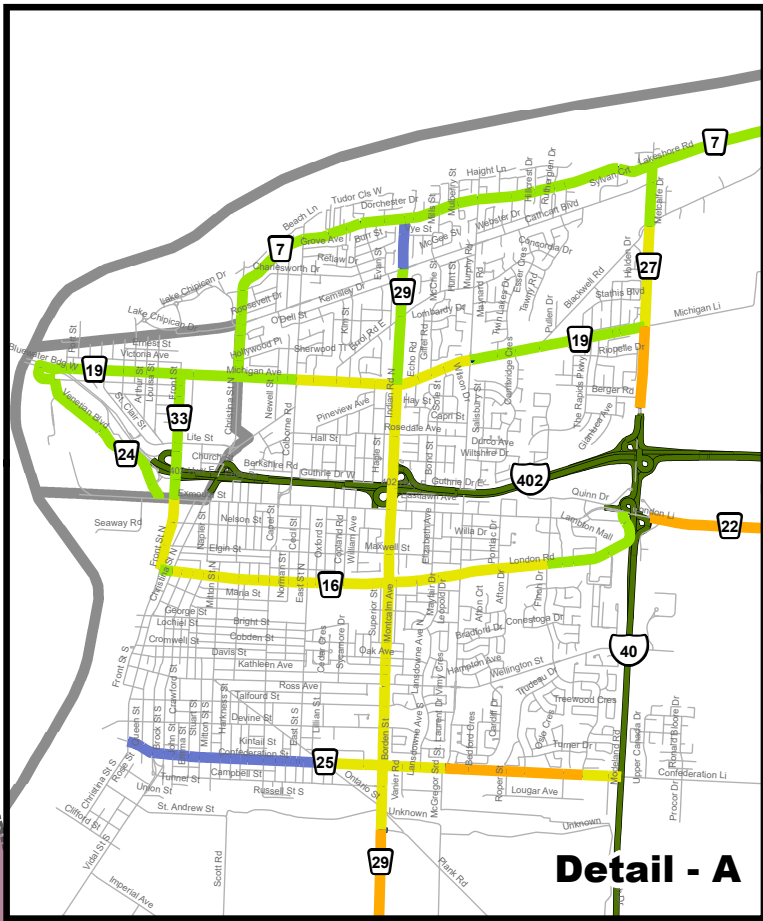
The Corporation of the County of Lambton Asset Management Plan Minimum Maintenance Standards Classes

Legend

Minimum Maintenance Standards (366/18)

Highway Classification

- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
- Provincial Roadways
- Local Roadways
- USA Major Roads
- Administrative Boundaries
- Neighbouring Municipalities
- USA





The Corporation of the County of Lambton Asset Management Plan Road Conditions

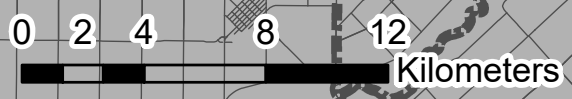
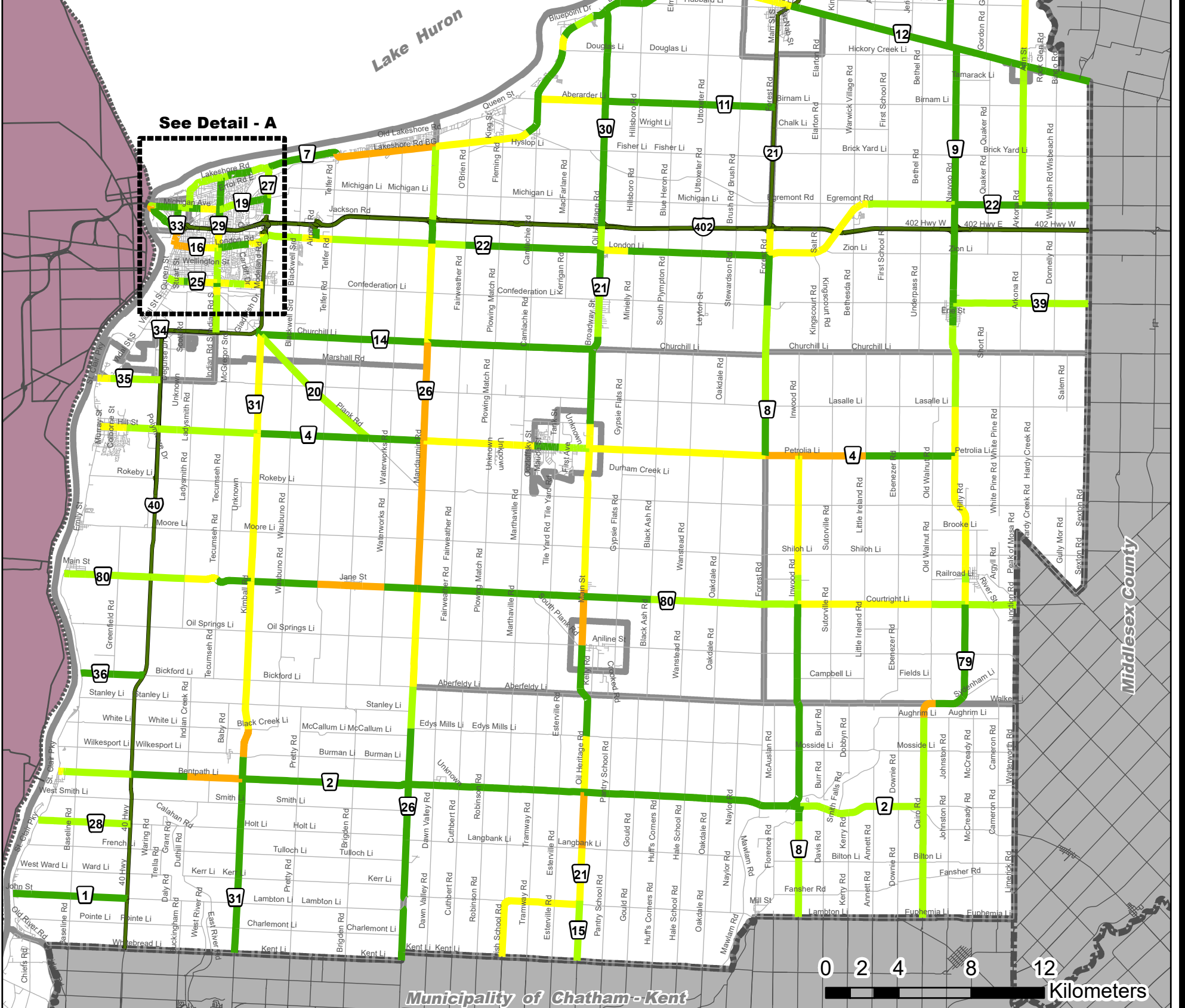
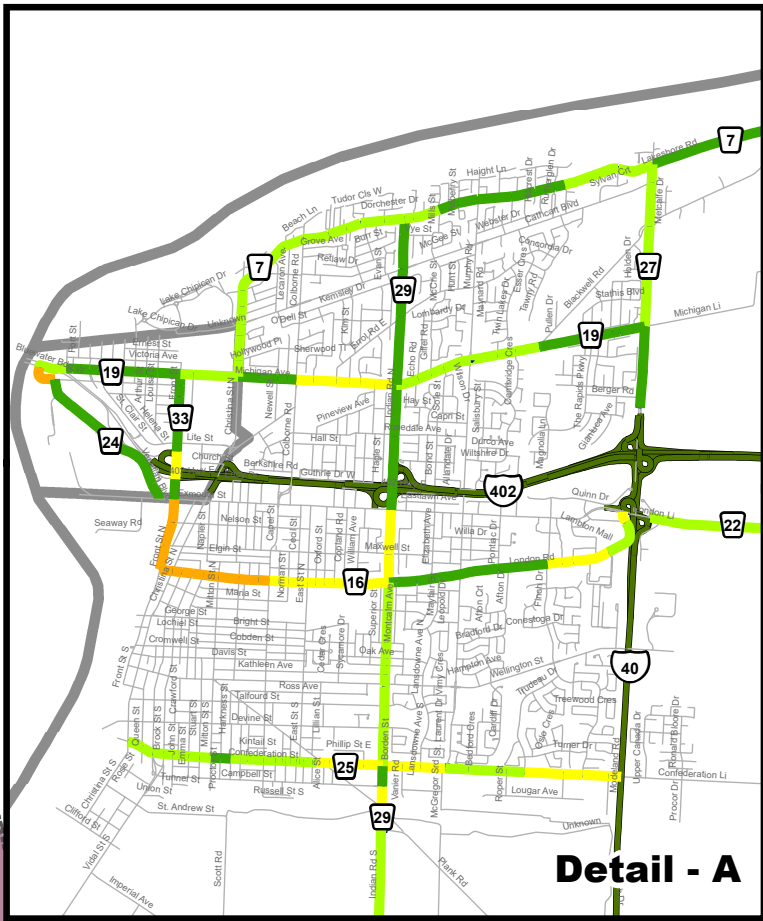
Legend

Lambton County Road Network

PCI

- Excellent (PCI of 90+)
- Good (PCI of 75 - 89)
- Fair (PCI of 60 - 74)
- Poor (PCI of 40 - 59)
- Very Poor (PCI Below 40)

- Provincial Roadways
- Local Roadways
- Administrative Boundaries
- Neighbouring Municipalities
- USA



Appendix B – Structure Maps



The Corporation of the County of Lambton Asset Management Plan Bridges and Culverts

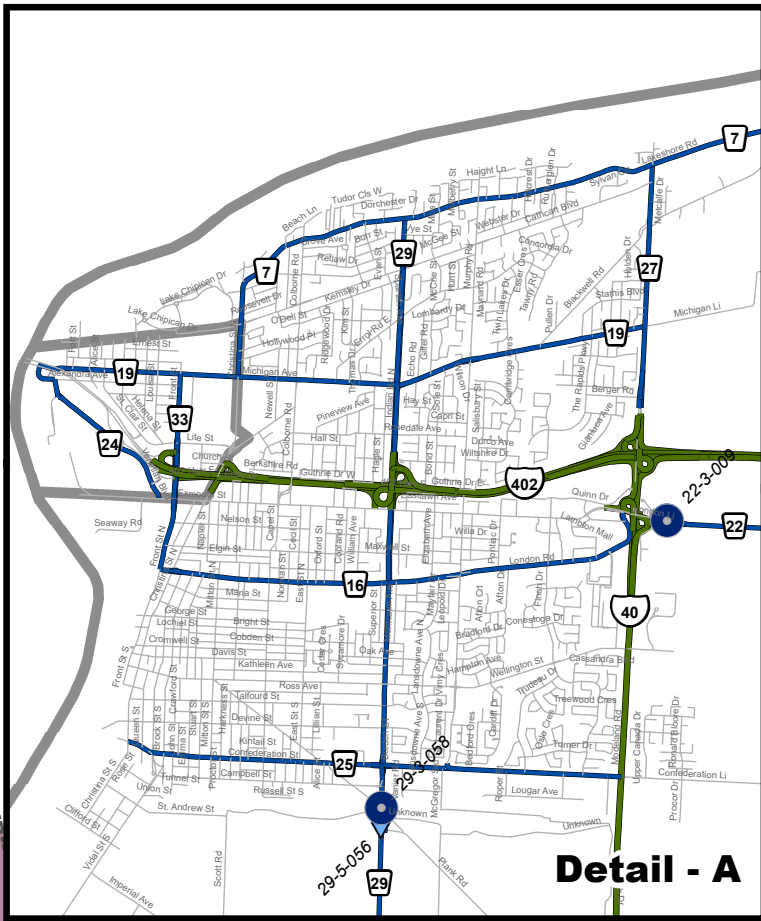
Legend

County Structures (>3m Span)

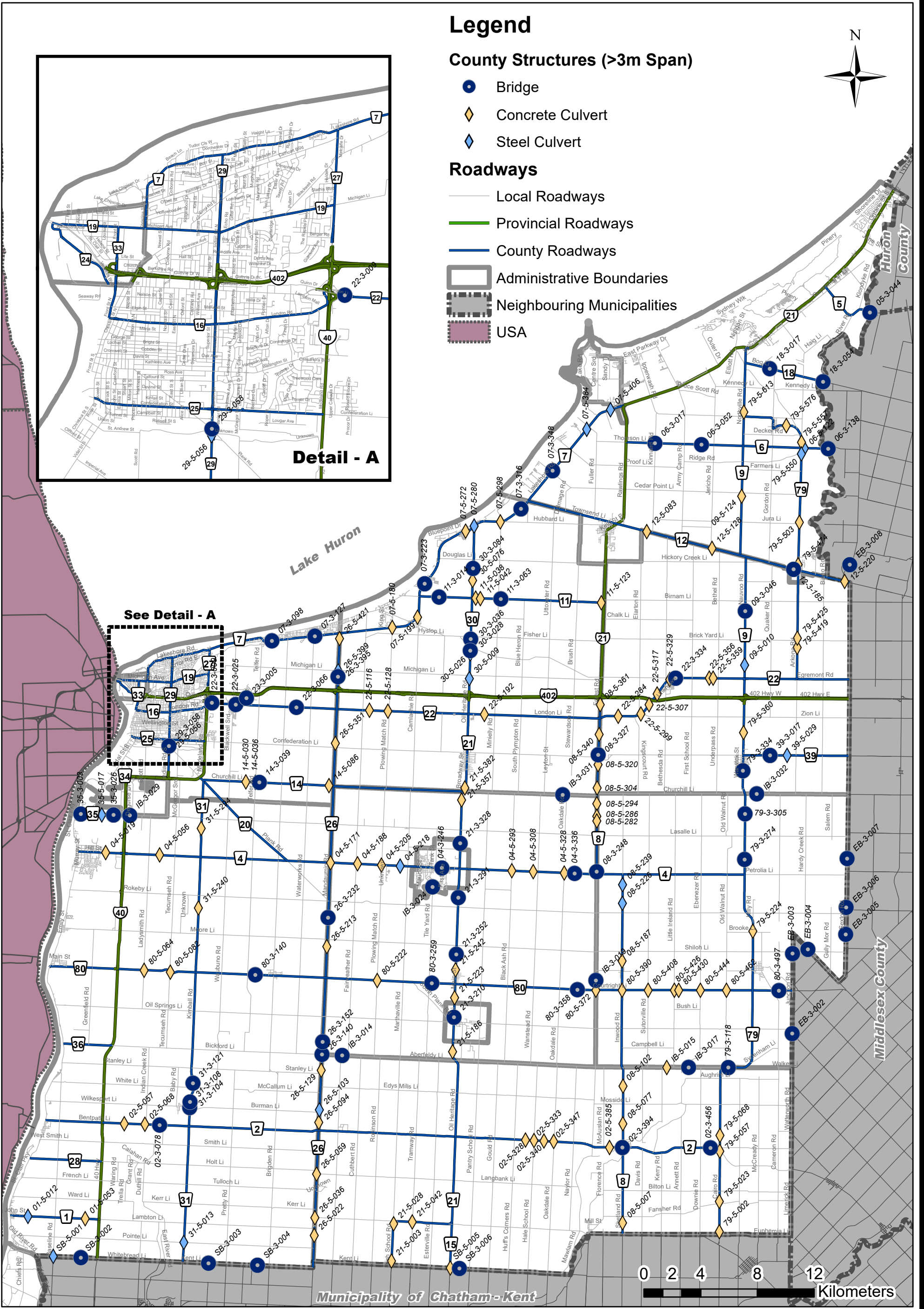
- Bridge
- ◆ Concrete Culvert
- ◆ Steel Culvert

Roadways

- Local Roadways
- Provincial Roadways
- County Roadways
- ▭ Administrative Boundaries
- ▭ Neighbouring Municipalities
- ▭ USA



Detail - A



See Detail - A

Municipality of Chatham-Kent

0 2 4 8 12 Kilometers



The Corporation of the County of Lambton Asset Management Plan Bridge and Culvert Conditions

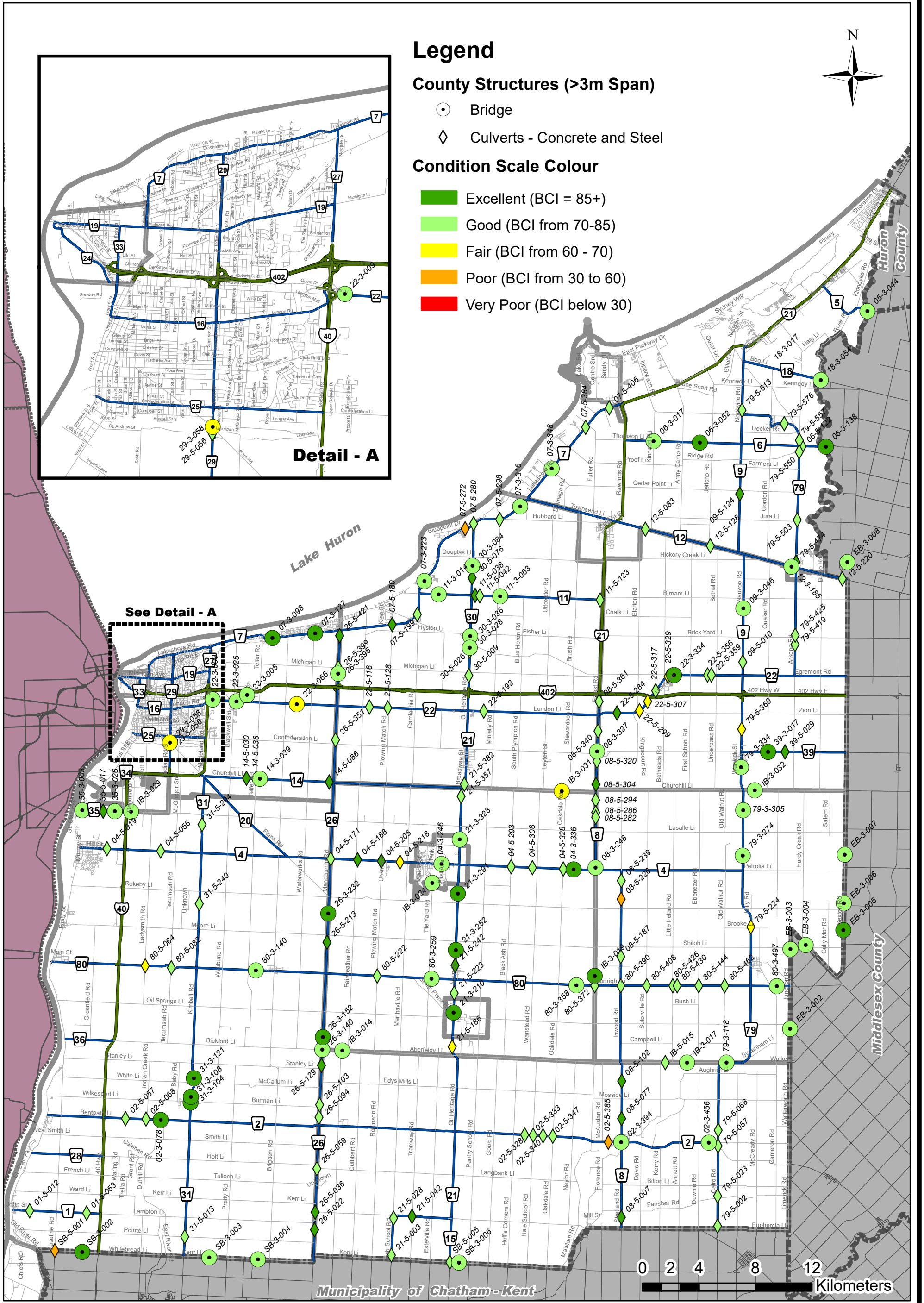
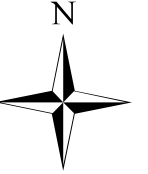
Legend

County Structures (>3m Span)

- Bridge
- ◇ Culverts - Concrete and Steel

Condition Scale Colour

- Excellent (BCI = 85+)
- Good (BCI from 70-85)
- Fair (BCI from 60 - 70)
- Poor (BCI from 30 to 60)
- Very Poor (BCI below 30)





2023 Core Infrastructure Asset Management Plan