Municipality of Clarington

Asset Management Plan **2022**

Clarington

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Executive Summary

The Municipality of Clarington's infrastructure systems support a wide range of municipal services that enable residents, businesses, and other Clarington stakeholders to live, work and play in our Municipality. This Asset Management Plan ("AMP" or the "Plan") document focuses on Clarington's core infrastructure of bridges and culverts, roads, and storm water systems. The Municipality developed the Plan following requirements outlined in Ontario regulation 588/17: Asset Management Planning for Municipal Infrastructure.

The Municipality of Clarington's core infrastructure assets hold a replacement value of $1.1 billion as of December 2020. The cost per household for the infrastructure portfolio is $30,691 based on 35,936 households. This report is based on the audited year 2020, as 2021 was not complete when developing this asset management plan.

Based on replacement cost and a blend of age-based and observed data, 83.4 percent of Clarington's assets are in Fair to Very Good condition. However, 16.6 percent of assets fall into the Poor or Very Poor condition classes and are worth $43 million and $37 million. An overall health grade of 'A' has been assigned to our municipality. The asset health grade is only a snapshot in time (December 2020) and doesn't consider future asset assumptions or future funding needs to continue adequately maintaining our assets.

Clarington's asset management plan is a living document that will continually be updated and expanded. To ensure that future asset management plans are meaningful and support a strong asset management program, the following items are recommended:

- To continually review best practices as they relate to preventative maintenance and rehabilitation strategies to minimize lifecycle costs and maximize asset service life
- To build an asset management system that integrates all asset management data into one data source while maintaining asset ownership responsibilities of each department
- To continue to develop robust condition assessment programs for all asset categories on a pre-determined schedule to ensure data accuracy and availability of funding
- To build a collaborative environment with open lines of communication to ensure that there is a clear line of sight on departmental responsibilities and asset management outcomes.

Per regulation O.Reg 588/17, future asset management plans will be presented to Council as follows:

- **Phase 2** (by July 2024) Asset Management Plan for all municipal assets, including current service levels and costs to maintain these levels
- **Phase 3** (by July 2025) Builds on Phase 2. The plan shifts from current levels of service to focus on proposed levels of service and related lifecycle management, including financial strategy for all municipal assets.
- **Phase 4** (by July, starting in 2026), an annual review of asset management planning progress, must be conducted by Council
- **Phase 5** (starting in the year 2030), a complete asset management plan is conducted and approved by Council every five years.

Introduction

Introduction

What is Asset Management?

Asset management (AM) is the strategy to realize value from assets, reduce risks and provide the expected level of service to the community in a socially, environmentally, and economically sustainable manner. Effective asset management requires an overarching framework to establish and guide its practice so that asset management becomes central to strategic, financial, and operational decision-making at all levels of the organization.

AM includes the planning, design, construction, operation, and maintenance of infrastructure used to provide services. Infrastructure needs can be prioritized over time by utilizing AM processes while also ensuring timely investments to minimize repair and rehabilitation costs and maintain municipal assets.

Key questions municipalities must ask themselves today as they develop their AMPs and programs are the following:

- What is the asset worth?
- What is the asset's condition and expected remaining service life?
- What is the level of service expectation, and what needs to be done?
- When do you need to do preventative maintenance, rehabilitation, or replacement?
- How much will the remedial works cost, and what is the acceptable level of risk(s)?
- What is the overall life cycle needs/costs?
- What are the long-term sustainable financing needs?

Asset Management Plan Purpose

Asset management plans are documents developed by the Municipality that specify the activities, resources and timescales required for individual assets or asset classes to achieve a defined level of service objectives. The Plan enables the Municipality to make informed decisions regarding the construction, operation, maintenance, renewal, replacement, expansion, and disposal of infrastructure assets while minimizing risk and cost to the community while maximizing service delivery. The asset management plan is designed to:

- Guide the consistent application of standards, best practices and tools
- Support effective service delivery through the sustainable management of Clarington's infrastructure
- Align investments with infrastructure priorities to deliver established levels of service in a financially responsible manner
- Provide input into long-term infrastructure plans and budgets

- Support business cases for crucial infrastructure investments and funding opportunities
- Develop sustainable financing plans
- Support discussion of establishing levels of service targets
- Comply with legislative requirements

Corporate Asset Management Plan Overview

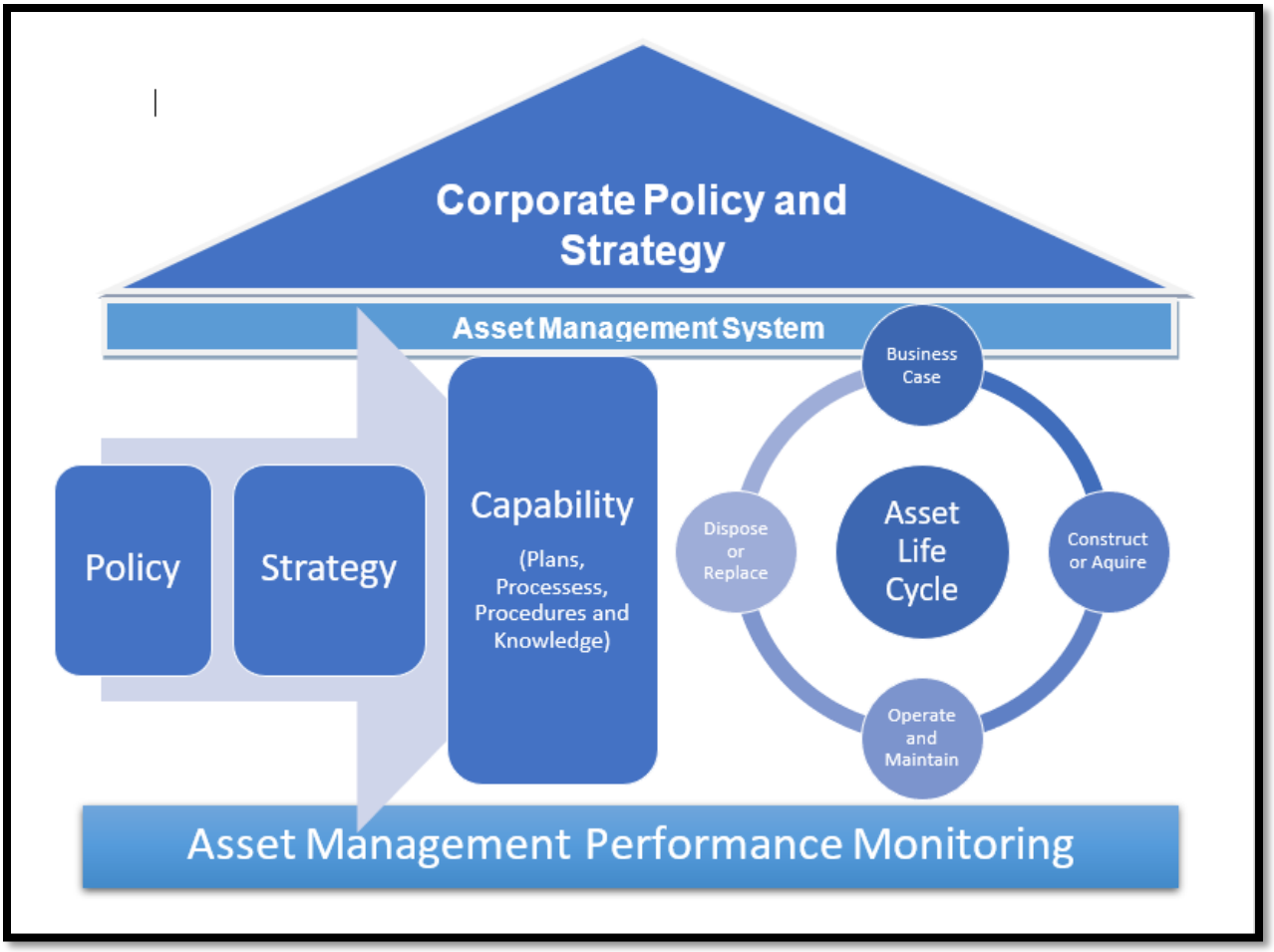
This Plan, which utilizes data verified as of December 2020, is the initial phase of plans outlined in O.Reg 588/17. The requirement dictated that this initial asset management plan should focus on core infrastructure assets. For Clarington, those asset categories are bridges and culverts, roadways, and stormwater management. This Plan will specify the quantity, quality, and replacement value of those core infrastructure assets, our approach to condition ratings, the current level of service those assets provide, and calculated performance measures to use as a comparison tool in future years. The Plan will then discuss lifecycle activities for those core assets. The lifecycle activities have been analyzed to expose any risk factors and depict which events should occur in the following years, including the associated costs.

Asset Management Policy

The Municipality of Clarington adopted the Strategic Asset Management Policy (G15) in 2019. The policy outlines Clarington's commitments and principles that will be considered in asset management planning. It ensures strategic alignment with the Corporation's vision of building a sustainable, creative, and caring community. This vision requires the alignment of many initiatives, and all existing and planned asset decisions must support the recommended levels of service and our long-term vision for the community.

Corporate Asset Management Framework

The corporate asset management framework represents the integrated relationship between elements of an effective asset management system and provides a structure for standardization and consistency of asset management practices and plans throughout the Municipality.



This framework is used to guide the development and implementation of the core infrastructure asset management plans included in this report, and is intended to ensure long-term core asset sustainability, demonstrate a commitment to good stewardship and support improved accountability and transparency to the community.

Statement of Local Infrastructure

Clarington

Statement of Local Infrastructure

Storm Water Management

The Municipality of Clarington protects its citizens and the natural environment by managing and treating its storm water infrastructure. The Municipality is responsible for maintaining and replacing storm system infrastructure located beneath Municipality-owned roadways and property.

- Under the Municipal Act, 2001 Clarington is required to collect and manage storm water and drainage from lands within the Municipality.
- Clarington's storm water systems are designed specifically to collect, manage, and mitigate potential flooding.
- This is done by draining rainwater away from buildings and roads and controlling the rate of discharge into the local rivers and streams.
- Storm sewers are designed to convey flows during frequent rainfall events to the scale of a 100-year storm event.
- In addition to controlling the flow of the water runoff, systems in recently developed areas have additional infrastructure which helps remove sediment and pollutants before it outlets back into the natural environment.
- Clarington staff are continuously working towards improving the accuracy and reliability of the storm water system inventory so it can be better used for long-term asset management planning.

What do we own? What is it worth?

An extensive network of infrastructure is operated and maintained by the Municipality to manage storm water runoff. Valued in 2020 dollars at approximately $188,412,973 the storm water infrastructure consists of two asset types – conveyance and management.

- The stormwater conveyance network is divided between storm sewer conduits, and storm sewer structures.
- Conduits refer to the mainline pipes which the water flows through.
- Structures include assets such as catch basins, outlets/inlets, and maintenance holes.
- The stormwater management category consists of stormwater management facilities or ponds. The Municipalities ponds are divided into two categories being either wet or dry.
- The storm water inventory is updated via letters of assumption for subdivision developments and letters of completion / holdback releases for reconstruction projects.
- Inventory is tracked and maintained through both GIS and asset management software.
- Clarington owns a total of 260 kilometers of storm sewer lines and 38 Storm water Management Facilities, 37 of which have been contributed by developers.

Asset Segment	Quantity	Replacement Cost Method	2020 Replacement Cost
Ponds - Wet	23	70% of historical cost, inflated	$ 5,638,662
Ponds - Dry	15	50% of historical cost, inflated	3,074,310
Conduit (km) (Mainline Pipe)	260	Cost Per Unit	129,019,454
Maintenance Holes	4,072	Cost Per Unit	35,987,562
Catch Basins	6,378	Cost Per Unit	13,062,942
Inlet / Outlet Structures	184	Cost Per Unit	244,721
Oil Grit Separators	13	Cost Per Unit	1,238,510
			$ 188,266,161

Figure 2.1: Includes the quantity, replacement cost method and total estimated replacement cost for all inventoried storm water assets

Estimated replacement costs for conveyance infrastructure is based on average unit costs. The unit costs are reflective of recent network maintenance and reconstruction contract costs. Additional costs to install the infrastructure and external consulting have not been factored in. At the present time it is too difficult to analyze each storm network and predict these costs without a full review of each system. Each system is unique, and costs can vary based on specific locations, depths and required upgrades to pipe sizes for flow capacity. Currently, the Municipality aligns these costs during its capital budget forecasting. As more asset management data becomes available, the Municipality will be better equipped to predict these cost variances.

The replacement value for Clarington's conduit and structures is considered as if this service would be replaced on a complete standalone basis. Clarington's current process is coordinating the replacement of stormwater management infrastructure with the replacement of our road network or the Region of Durham's sanitary water infrastructure. This coordination ensures cost efficiencies during reconstruction projects while maintaining the current level of service at the lowest cost. While the core infrastructure of the stormwater management system and the road network system are presented separately, often the two coincide when considering their replacement needs.

Estimated replacement costs for the storm water Management facilities are based on a percentage of the historical asset cost, 100 percent inflated to 2020 dollars. Historical costs were derived from development costs from assumed subdivisions. It has been determined that only 70 percent of a wet pond and 50 percent of a dry stormwater pond will be considered a replaceable asset. Clarington concluded that there is a percentage of work required during initial construction to establish the infrastructure that will not be needed again when the assets are replaced.

Useful life

Clarington's linear stormwater management conveyance network consists of assets built using various materials. Current industry standards typically use concrete material for conduits and structures, but some older assets still exist in the inventory constructed using asbestos cement and vitrified clay. These older assets have been given an estimated useful life of 40 years. Although few of these assets still exist, the ones that do have been deemed to still be in fair condition. These assets make up 1.2 percent or 3.4 kilometres of the entire inventory and have been scheduled to be replaced when their respective road networks are reconstructed in the near future.

Conduits and structures that have been constructed using concrete cement or Polyvinyl Chloride (PVC) have been given useful lives of 75 years and represent 98.8 percent, the vast majority of Clarington's stormwater inventory.

Clarington's stormwater management ponds are relatively new (the first one built in approximately 1988) and are expected to have long useful lives. The useful life of 75 years is considered appropriate per industry standards before the facilities would require extensive reconstruction works. These assets are much easier to inspect and maintain, unlike the underground network. In 2017, Clarington initiated a stormwater management capital maintenance program to provide cleanout and rehabilitation works to some of the aging assets. Rather than extend the facilities' estimated useful life, the required work has been necessary to ensure the assets meet their expected end-of-life cycles.

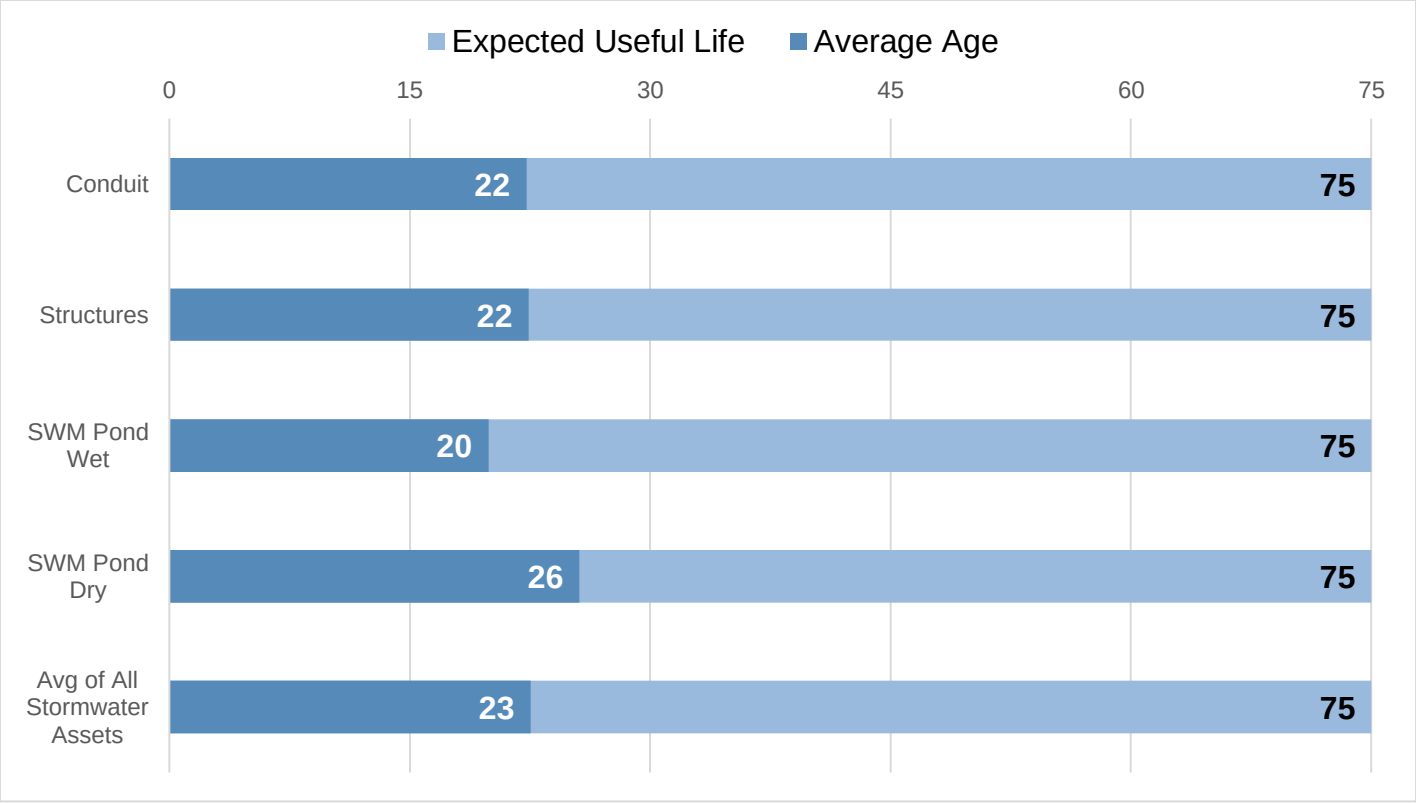


Figure 2.2: Average Age as a Proportion of Average Useful Life of Clarington's Storm Water Management Assets

Asset Segment	Estimated Useful Life (Yrs)	Avg Age (Yrs)	Projected Service Life Remaining (Yrs)	% Of Assets with More Than Half EUL Remaining	% Of Assets with Less Than Half EUL Remaining
Storm Water Ponds – Wet	75	19.9	55.1	100%	0%
Storm Water Ponds - Dry	75	25.6	49.4	100%	0%
Conduit (Concrete)	75	22.3	52.7	90.30%	9.70%
Conduit (Asbestos Cement/Clay)	40	43.5	0	31.30%	68.70%
Structures	75	19.9	55.1	91.30%	8.70%
Totals		**22.6**	**52.4**		

Figure 2.3: Shows the useful life, the average age, projected service life remaining and the percentage of assets which are below halfway through their estimated useful life and over halfway through their estimated useful life for each asset segment.

The age for Clarington's conveyance network, which are contributed by developers, is based on when assets are assumed from the developers and Clarington takes over ownership. Age for assets that fall within Clarington's capital urban development and reconstruction programs are based on the construction year of substantial completion.

The average age of the Municipalities storm water network is 22.6 years. Considering an industry-standard useful life of 75 years Clarington's storm water network, aside from the small percentage of assets made using asbestos cement and vitrified clay, is relatively young. Only a small portion of conveyance assets have exceeded half their useful life, and to date, no stormwater management pond has reached its halfway useful life point.

Due to the reasonable age of the storm network assets, it has been decided to project service life for this asset class based on age rather than condition. It has yet to be determined, but as assets age and inspection data becomes more available, it is possible Clarington may begin assigning an assessed condition rating to the older infrastructure. It can then be determined whether the assessed conditions will increase or decrease the average service life remaining for each specific asset.

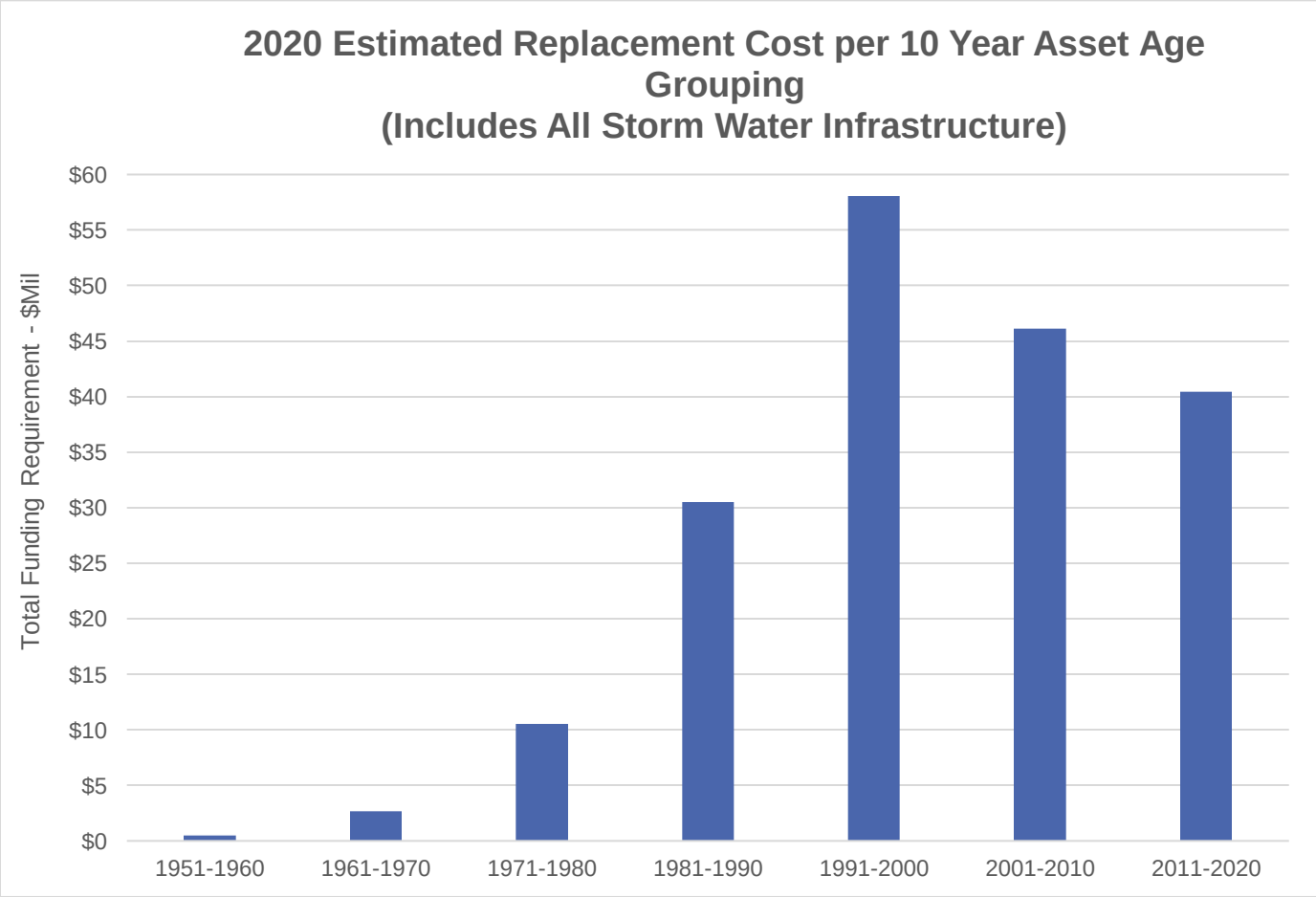


Figure 2.4: Required 2020 replacement costs for the total inventoried stormwater network in 10-year age intervals.

Asset Condition

In this asset management plan, age has been used to determine the condition of the storm network conduit and structures. Internal staff inspection data has been used to assess the condition of the stormwater management facilities. The age-based condition measure is a percentage of the estimated useful life consumed based on each asset's age and the average life expectancy based on industry standards.

Below is the scale which Clarington is currently using for stormwater conveyance assets and aged based condition rating:

Condition Rating	Age (Yrs)	Grade	Category	Description
80-100	1-15	A	Very Good	The assets are functioning as intended with little if any deterioration.
60-80	16-30	B	Good	The assets are functioning as intended. Still, little deterioration is expected. No maintenance is forecasted for conduits, but some structures may require minor maintenance.
40-60	31-45	C	Fair	The assets are functioning as intended. Normal deterioration and distress may be identified. Conduit maintenance is possible in the forecasted future. Structures not already maintained will require maintenance to maintain functionality.
20-40	46-60	D	Poor	Some assets are starting not to function as intended. Deterioration and significant distress likely identified. Further maintenance and repair work are required for both conduits and structures to restore functionality.
0-20	61-75	E	Very Poor	The assets are not functioning as intended. Significant deterioration and major distress identified. Assets require immediate attention and likely replacement in the short-term future.

Figure 2.5: Clarington's scale for age-based stormwater asset condition assessments. Table includes condition rating, asset age category, condition grading, and the description of each specific condition category.

Clarington's current process, as mentioned above, is to coordinate the replacement of the conveyance infrastructure with the replacement of the road network infrastructure and the Region of Durham's sanitary water infrastructure. This ensures various cost efficiencies can be realized while maintaining the desired levels of service. Therefore Clarington's current practice is to inspect the underground infrastructure when the road network reconstruction life cycle schedules occur or when the Region of Durham plans upgrades to their underground assets.

Clarington's urban and non-rural roads where underground infrastructure resides are typically fully reconstructed after 60 years. Assuming the stormwater infrastructure was constructed in and around the original road base and surface were constructed, at 60 years, the storm network will have reached the poor condition category. As stated in the previous table, this is when we can anticipate some assets have started not to function as intended. The infrastructure is inspected in and around this time using closed-circuit television (CCTV). If warranted, major repairs and replacements to the storm network can be scheduled for when the rest of the road network is already under construction.

Referring to figure 2.3, Clarington's stormwater infrastructure that is not made from asbestos cement or vitirfied clay has an average age of 22.3 years for conduit and 19.9 years for structures. Clarington's Public Works Department has determined that, considering the average age of the infrastructure, at this time, it is not recommended to perform a full CCTV inspection of the entire 260km network. The costs to do so can not be justified considering that the infrastructure is, on average, in good to very good condition and is initially inspected upon assumption from the developers. This methodology will continue to be used for the foreseeable future until Public Works feels the network has reached an age that a full inspection can be justified and budget allows for that increase to be created.

Conversely, an annual inspection program has been fully implemented for all 38 stormwater management facilities the Municipality owns. Unlike CCTV inspections, Public Works staff can do inspections of the facilities at little expense other than staff time and wages. The inspection program has helped identify deficiencies and ensures issues are corrected before a failure or reduction to service level occurs. Without inspecting the assets, it can not be guaranteed the ponds are functioning as their designs were intended. Ensuring the functionality of the storm water ponds benefits the Municipality in many ways, such as aiding in safeguarding public health, reducing flooding potential for public and private lands and demonstrating due diligence for sound asset management principles.

Below is the scale in which Clarington is currently using for storm water facility inspection assesed condition ratings:

Condition Rating	Grade	Category	Description
80-100	A	Very Good	The assets are functioning as intended, with little repairs to the facility required.
60-80	B	Good	The assets are functioning as intended. Still, very little repairs are necessary other than minor maintenance. Sediment buildup may be beginning.
40-60	C	Fair	The assets are beginning not to function as intended. Routine repairs and sediment buildup likely. Facility should be monitored for cleanout works.
20-40	D	Poor	Most assets are not functioning as intended. Significant repairs are needed. Sediment removal and erosion work's need to be considered.
0-20	E	Very Poor	The assets are not functioning as intended. Assets require immediate attention and repair to avoid public health and safety concerns.

Figure 2.6: Clarington's scale for inspection-based stormwater facility condition assessments. Table includes condition rating, condition grading, and each specific condition category description.

Overall the Municipalities conveyance assets are in good condition (B Grade).

- Overall Conduit Average: 69.7 percent
- Overal Structure Average: 69.4 percent

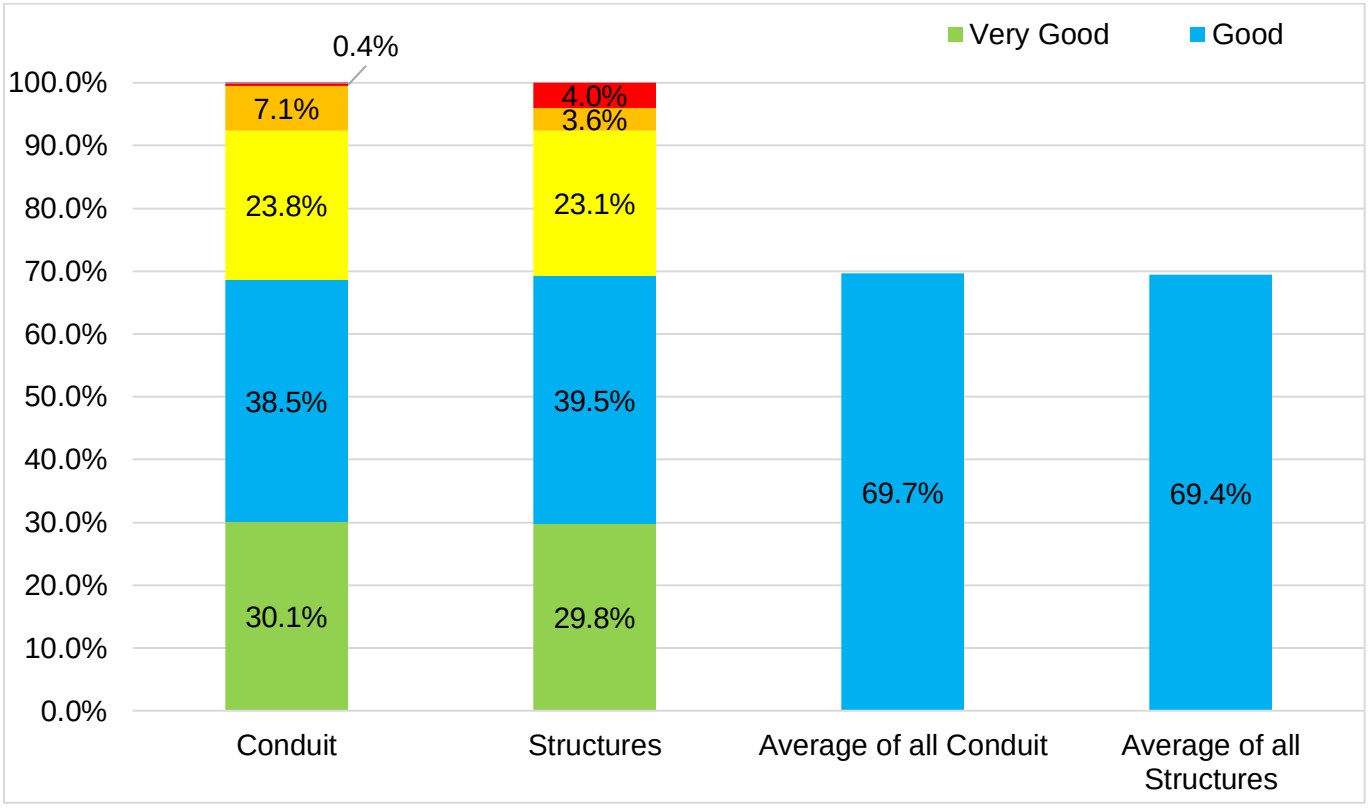


Figure 2.7: Storm water Conduit and Structure aged based assessed condition ratings

- Of the 0.4 percent of conduit assessed in very poor condition, 21 percent of the assets have been included in the capital budget forecasts within the next four years.
- Of the 4 percent of structures assessed in very poor condition, 69 percent of the assets have been included in the capital budget forecasts within the next four years
- The remaining conveyance assets assessed in very poor condition and not forecasted for replacement, 64 percent of those assets have been CCTV inspected and deemed to still be in fair condition, whereas they do not require replacement within the current 5-year capital forecast.

- All remaining non-inspected conduit & structure assets assessed in poor condition will be inspected in the future operating budgets to determine their remaining useful lives related to our required levels of service.

Overall the Municipality's Storm water Management facilities are in very good condition (A Grade).

- Overall Storm water Wet Pond Average Condition: 84 percent
- Overall Conduit Average: 86.3 percent

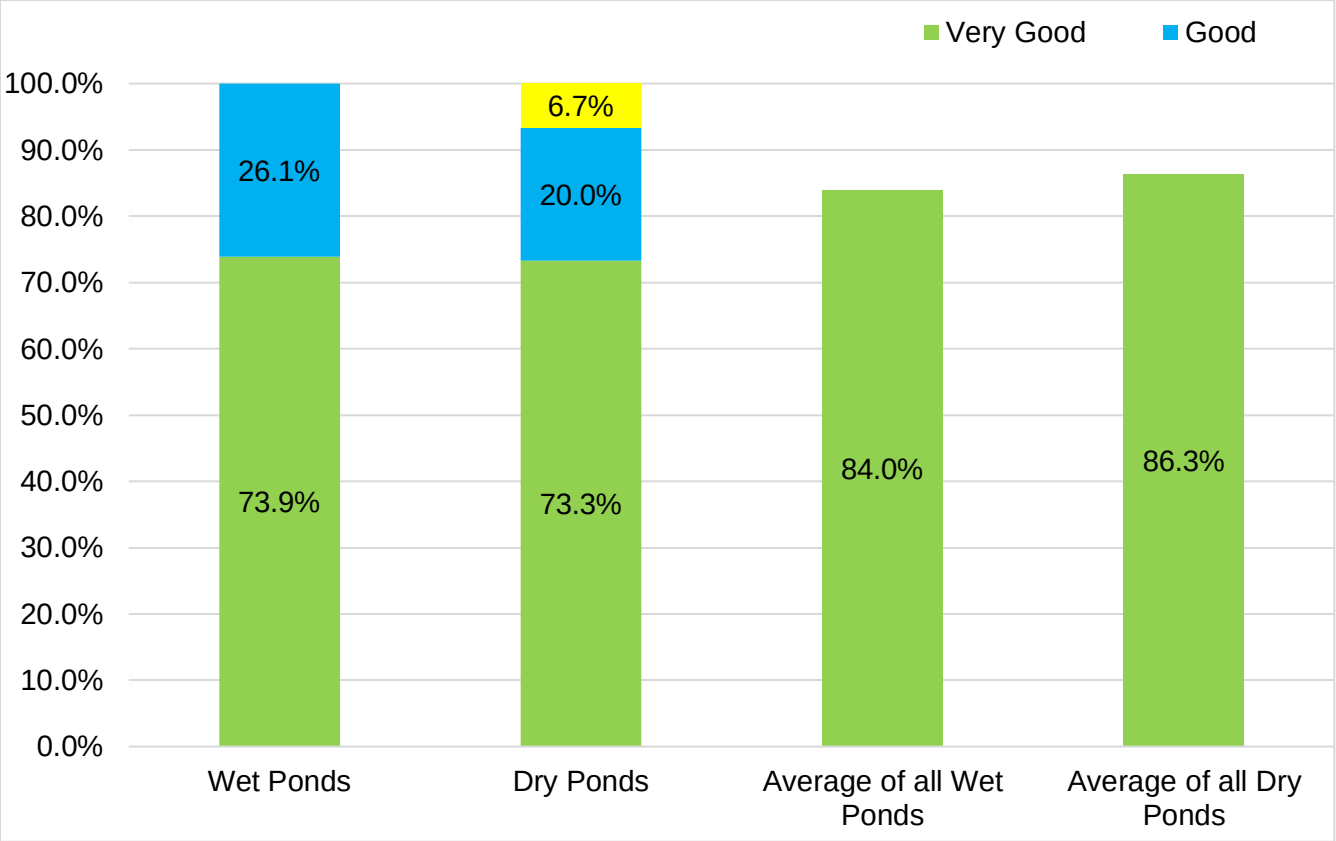


Figure 2.8: Storm water Wet and Dry Pond inspection based assessed condition ratings

- The 6.7 percent of facilities in fair condition equates to one storm water pond. This pond has received is forecasted for cleaning and sediment removal in 2022.
- In 2022, Clarington will be pursuing an update to the storm water Management Master Plan. Once completed, the plan will better outline scheduling priorities for pond cleanout and sediment removal.

Roads

What do we own? What is it worth?

The Municipality of Clarington's road network consists of critical components to provide safe and efficient transportation service throughout our community. The road network includes all municipality-owned and managed roadways which provide support for roadside infrastructure. The Public Works Department is responsible for managing operational and rehabilitation processes for all our road infrastructure while managing the increased costs of a high-growth municipality.

- Under the Municipal Act, 2001, Clarington is required to collect and manage road infrastructure within the Municipality.
- Clarington's road network is assessed on a bi-annual basis by an external agency with the expertise for road assessment.
- Operational maintenance procedures utilized in our municipality include patching, grading, sweeping, ditching, as well as winter maintenance (sanding, salting, and plowing).
- Capital procedures in our municipality include design and construction of new roads, major rehabilitation activities, crack sealing, asphalt resurfacing, and reconstruction.

The Municipality of Clarington provides a sustainable transportation system through our community by operating and maintaining a comprehensive road network. The road network is valued at approximately $714,628,356 in 2020 dollars, consisting of two asset types – surface and base.

- Clarington's road surface network is divided between two categories: paved and unpaved roads.
- Paved roads include the various levels of road surface assets, such as high class bituminous and low class bituminous.
- High class bituminous (HCB) surface is divided by four levels that is determined by the average daily traffic and the asphalt depth.
- Low class bituminous (LCB) roads are lower grade local paved roads, utilized in more rural areas.
- Unpaved roads consist of two categories, earth, and gravel roads.
- The road network inventory is updated via letters of assumption for subdivision or commercial developments and holdback releases for reconstruction projects managed by Clarington.
- Clarington's road inventory is controlled through both GIS and asset management software.
- Clarington owns a total of 811 kilometers of paved roads and 105 kilometers of unpaved roads.

Asset Category	Asset Segment	Quantity (Km)	Historical Cost	2020 Replacement Costs
Unpaved Roads	Earth Roads	40	$0	$0
	Gravel Roads	65	0	3,533,854
Paved Roads-Surface	High Class Bituminous 1 (HCB-1)	1	545,171	410,000
	High Class Bituminous 2 (HCB-2)	4	1,220,712	1,838,975
	High Class Bituminous 3 (HCB-3)	164	33,510,196	53,390,675
	High Class Bituminous 4 (HCB-4)	259	39,534,113	84,393,260
	Low Class Bituminous (LCB)	366	19,933,503	32,555,250
Roads Base	Roads Base	914	224,808,241	538,506,342
Total			**$319,551,936**	**$714,628,356**

Figure 2.9: Includes the quantity, total historical cost and total estimated replacement cost for all inventoried road assets

Road infrastructure utilizes a calculated average unit cost to determine the estimated replacement costs. The unit costs are developed based on current unit pricing provided from Clarington's 2019 State of Infrastructure for Roads, with our Engineering (now

Public Works Department Infrastructure Division) staff providing valuation splits for base and surface amounts. The State of Infrastructure report provides the detailed information required for the assessment of Clarington's entire road network while stating the needed improvements for each of Clarington's road infrastructure. The replacement costs do not incorporate upgrade plans for road infrastructure to increase the pavement quality level. These costs provide the estimated values for rehabilitating the existing pavement level. Currently, the Municipality aligns costs of connecting rehabilitation projects during its capital budget forecasting to achieve the optimal use of annual budgets. As more asset management data becomes available, the Municipality will continue to improve the prediction of cost variances.

Historical costs were derived from two processes: development costs from assumed subdivisions or capital costs allocated to assets during addition to Tangible Capital Assets at project completion. Clarington's unpaved roads do not have a historical cost due to the timing and nature of these assets in the inventory. The earth roads are not constructed roads, therefore, they do not have a historical cost and require minimal to no reconstruction.

Useful life

Clarington's road network consists of assets built using various pavement standards for traffic requirements. Current industry standards typically use higher grades of asphalt. Functional classification systems are developed by a collaboration of a number of agencies that include the Transportation Association of Canada and the Ontario Ministry of Transportation (MTO). These classifications serve a purpose, but the results vary significantly in terms of performance, replacement and treatment costs. Providing additional parameters based on surface type, depth and traffic volume would improve the pavement performance models.

Clarington's road base infrastructure is expected to have long useful lives of 60 years. The road base's reaching the expected useful lives is dependent on the surface condition and the efficiency of lifecycle events. The useful life of road surface fluctuates with different traffic needs and usage. Increased pavement grades and depths are used to handle weight requirements and vehicle volumes. For most Clarington's roads, a

useful life of 30 years is considered appropriate per industry standards before the pavement requires extensive reconstruction. External consultants produce a report that provides an in-depth analysis of Clarington's entire road network every two years. The report details the current lifecycle requirements for all roads in Clarington.

The age of Clarington's Road network is based on municipal capital programs for new and reconstruction that are assumed at the construction year of substantial completion. Clarington takes ownership of contributed road assets in the year of development acceptance.

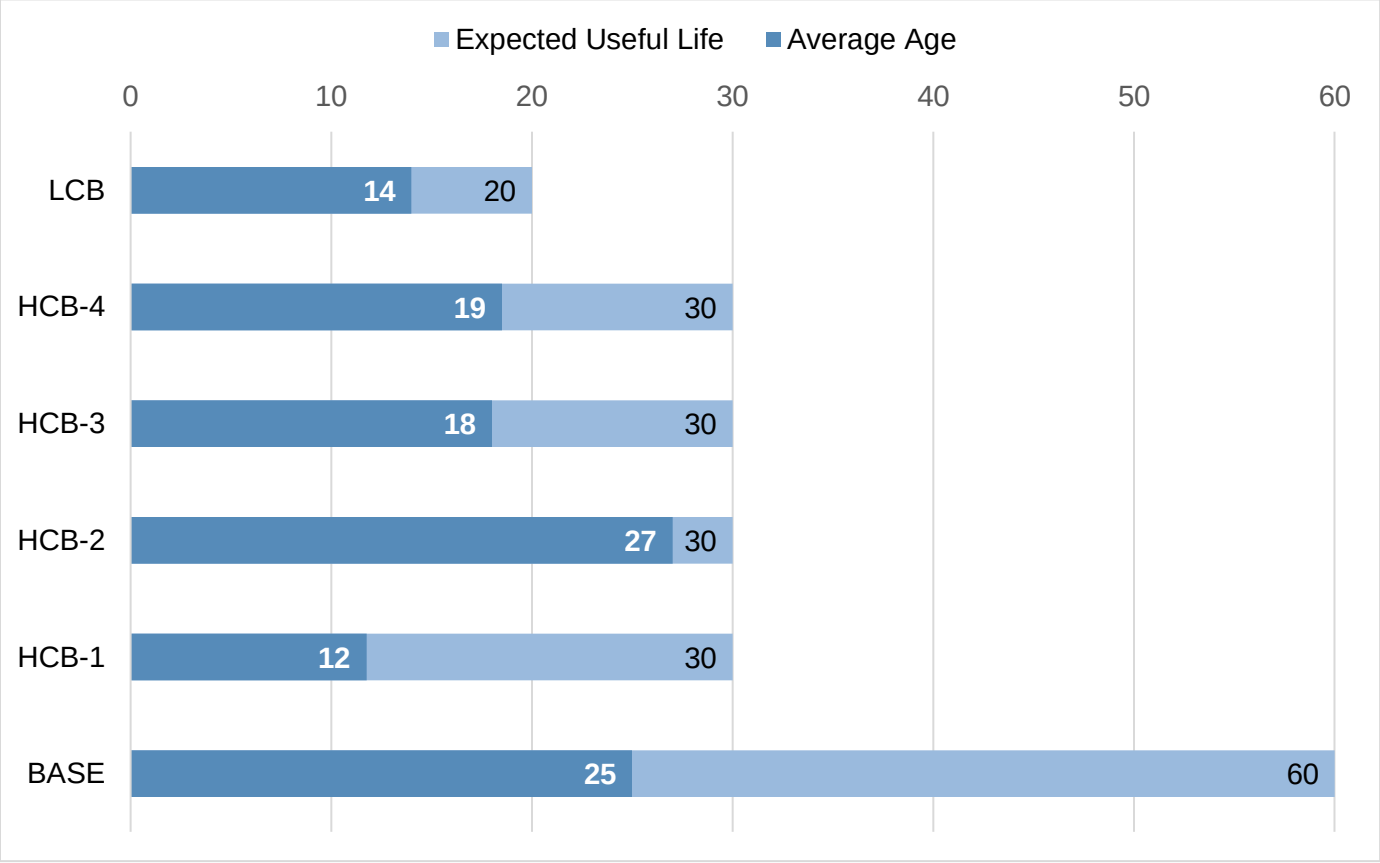


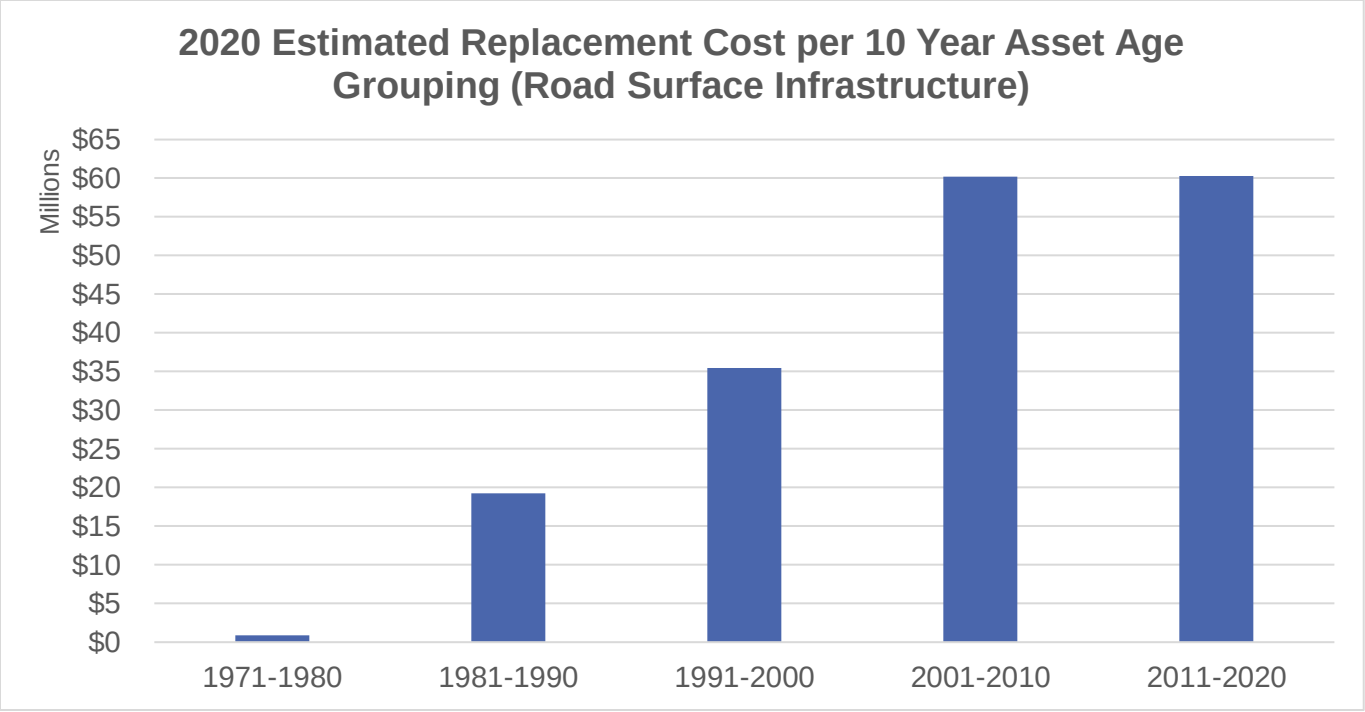
Figure 2.10: Average Age as a Proportion of Average Useful Life of Clarington's Road Network Infrastructure

Asset Category	Estimated Useful Life (Yrs)	Avg Age (Yrs)	Projected Service Life Remaining (Yrs)	% Of Assets with More Than Half EUL Remaining	% Of Assets with Less Than Half EUL Remaining
LCB	20	14.2	5.8	48.4%	51.6%
HCB-4	30	18.6	11.4	37.1%	62.9%
HCB-3	30	17.8	12.2	48.0%	52.0%
HCB-2	30	26.8	3.2	22.7%	77.3%
HCB-1	30	11.8	18.2	100.0%	0.0%
BASE	60	25.1	34.9	63.3%	36.7%

Figure 2.11: Shows the useful life, the average age, projected service life remaining and the percentage of assets which are below half-way through their estimated useful life and over halfway through their estimated useful life for each asset segment.

The expected useful life of the different High-Class Bituminous (HCB) asphalt surface roads is 30 years. The HCB road asphalt surface replacement is estimated to be required twice during the useful life of the road base. Low-Class Bituminous (LCB) surface roadways have a slightly shorter expected useful life of 20 years and are expected to be replaced three times during the life of the road base.

The road surface network, shown in figure 3, currently has the majority of assets with less than 50 percent remaining in their expected useful life. This information determines that most of the road surfaces in Clarington are in the later stages of life expectancy. The average age of Clarington's road base infrastructure is 25.1 years. Considering the standard useful life of 60 years, most road base assets have not exceeded half their useful life. Having 63.3 percent of road base assets with more than half of the remaining useful life left, indicates that the majority of road surfaces are nearing the first reconstruction based on their useful lives.



- *Figure 2.12: Required 2020 replacement costs for the total inventoried road surface network in 10-year age intervals.*

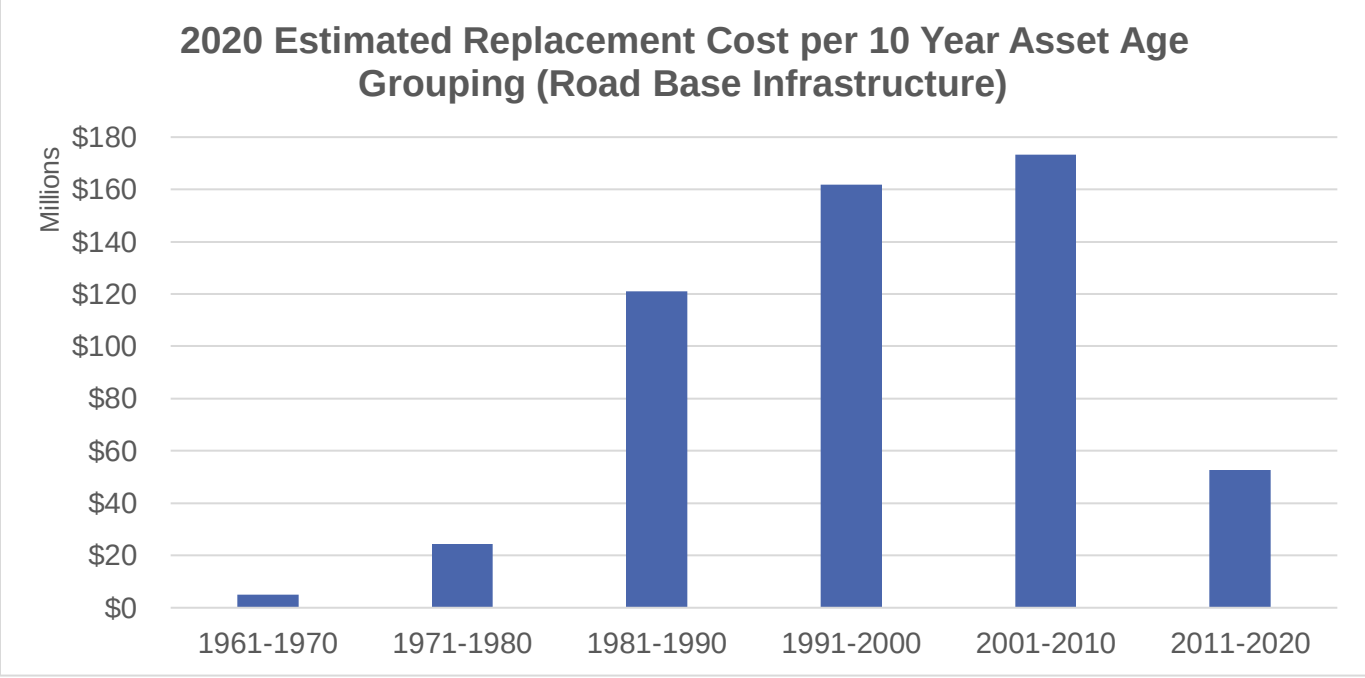


Figure 2.13: Required 2020 replacement costs for the total inventoried road base network in 10-year age intervals.

Asset Condition

Clarington utilizes physical condition assessments for road surface assets in this asset management plan, which is more accurate for roads than an age-based condition approach. Due to road infrastructure condition fluctuations from many factors, the roadways do not always follow a straight-line deterioration that an age-based method provides. These factors have caused staff to determine that physical condition assessments are the optimal condition valuation for Clarington's road surface network. Road base infrastructure does not receive a physical condition assessment because of the direct correlation with the road's surface. The age-based condition measure is a percentage of the estimated useful life consumed based on each asset's age and the average life expectancy based on industry standards. Below is the scale which Clarington is currently using for Road network assets condition rating:

<table>
<tr><th>Condition Rating</th><th>Grade</th><th>Category</th><th>Image example of Road Condition</th></tr>
<tr><td>75-100</td><td>A</td><td>Very Good</td><td rowspan="2">  </td></tr>
<tr><td colspan="3">Roads within this category may show surface distress for up to 10% of the length. The required maintenance effort may be slightly above average but not uneconomical compared to the reconstruction costs.</td></tr>
<tr><td>60-74</td><td>B</td><td>Good</td><td rowspan="2">  </td></tr>
<tr><td colspan="3">Roads within this category show surface distress from 11% to 15% of the length. Similar to the Very Good level, required maintenance may be above average but not necessarily uneconomical compared to the cost of a full reconstruction.</td></tr>
</table>

Condition Rating	Grade	Category	Image example of Road Condition
40-59	C	Fair	
Roads show surface distress from 16% to 20% of the length, and the required maintenance effort is high.			
20-39	D	Poor	
Roads show surface distress of more than 20% of the length, and the required maintenance effort is excessive			
0-19	E	Very Poor	
These roads have exceeded their expected useful life and do not meet the road requirements. Roads within this category is not necessarily the highest priority for asset management or return on investment perspectives			

Figure 2.14: Clarington's scale for road condition assessments. Table includes condition rating, condition grading, and the description of each specific condition category.

Overall the Municipality's Paved Road Surface assets are in GOOD condition (B Grade).

- Overall Paved Road Surface Average Condition: 69.4 percent
- Overal Road Base Average Condition: 58.2 percent

Road Category	Very Good	Good	Fair	Poor	Critical	Total Km's
HCB-1		0.20		0.62		0.82
HCB-2	1.08	0.39	2.02	0.85		4.34
HCB-3	108.38	17.19	21.73	14.46	2.53	164.29
HCB-4	154.30	22.17	45.75	26.41	10.40	259.03
LCB	117.05	41.38	56.00	121.80	25.50	361.73
Totals	**380.81**	**81.33**	**125.50**	**164.14**	**38.43**	**790.21**
% Of Inventory	48%	10%	16%	21%	5%	100%

Figure 2.15: Paved Road Surface condition assessment ratings by road type and road lengths in kilometres

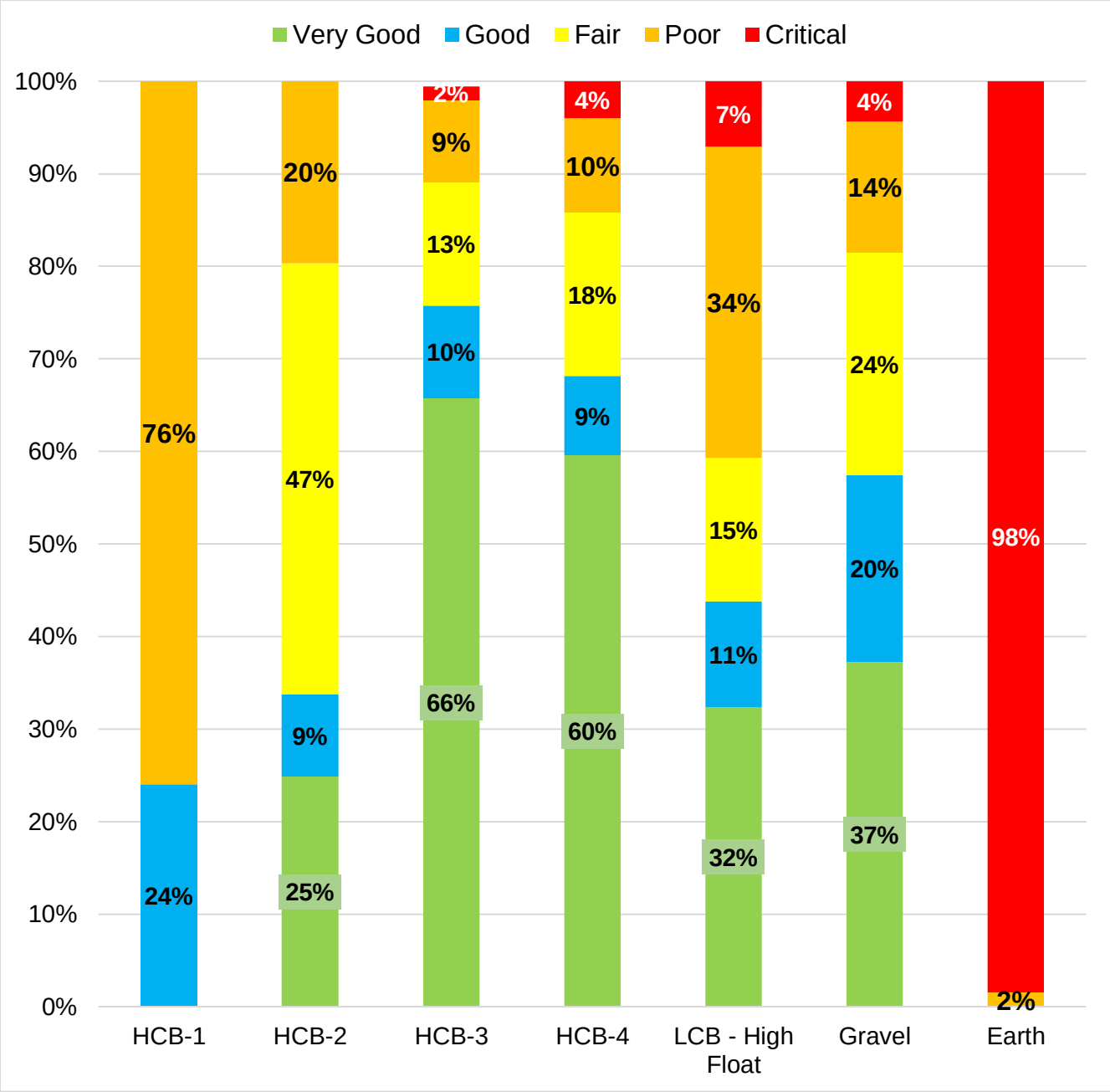


Figure 2.16: Road Surface assessed condition ratings as a percentage

- Of the two percent of HCB-3 Road Surfaces assessed in critical condition, 76 percent of the assets have been included in the capital budget forecasts within the next five years.
- Of the four percent of HCB-4 Road Surfaces assessed in critical condition, 34 percent of the assets have been included in the capital budget forecasts within the next five years.
- Unpaved gravel roads are rehabilitated with Clarington's gravel road program. This program completes the annual maintenance processes required to maintain our current level of service for these roads. This includes grading,

dragging, and ditching of these roads. These roads do not require additional rehabilitation capital costs for proper operations.

- All earth roads require minimal maintenance or reconstruction events and do not require a replacement cost because they are not constructed road infrastructure.
- All remaining road assets assessed in poor condition will be inspected in the following State of Road Infrastructure to determine their remaining useful lives related to our required level of service.

Bridges & Culverts

What do we own? What is it worth?

The Municipality of Clarington operates and maintains bridges and culverts, which enable safe and effective travel. The Public Works Department is responsible for planning and managing this critical infrastructure.

The Municipality of Clarington currently has 123 bridge assets, including 24 pedestrian bridges and 149 culvert assets in its inventory. The 272 structures have a total replacement cost of $200,020,200.

- Under the Municipal Act, 2001, Clarington shall keep its bridges and culverts in a state of repair that is reasonable in the circumstances, including the character and location of the bridge or culvert.
- The Municipality considers the risk of flooding and erosion when prioritizing which structures will be repaired or replaced.
- Bridge condition scores are developed and are used to guide repairs, rehabilitation, and replacement schedules.
- Public Works Infrastructure Division has a ten-year rehabilitation forecast for bridges and culverts as determined by findings in the inspections.
- The Municipality must plan for future expansion and required needs due to community growth and changing transportation modes.

King Street East Bridge (Bowmanville, On)

- A bridge is a structure which provides a roadway or walkway for the passage of vehicles, pedestrians or cyclists across an obstruction, gap or facility and is greater than or equal to 3 metres in span.
- A culvert is a structure that forms an opening through soil for the passage of water, vehicles or pedestrians/ cyclists and has a span of 3 metres or more.
- A pedestrian bridge enables pedestrians to cross wet, fragile, or marshy lands and railways.
- The Bridge and Culvert inventory is divided into the following segments: Bridges - C - Cast in Place, Bridges - P - Precast Concrete, Bridges - S – Steel, Bridges - T - Timber/Wood, Culverts, and Pedestrian Bridges
- Out of the 99 bridge assets only two (2.02 percent) of these require a load restriction. These bridge assets are identified as 094024 at Jackman Rd and 099045 at Holt Rd.

The table below includes the quantity, replacement cost method and total estimated replacement cost for all inventoried bridges and culverts

Asset Segment	Quantity (each)	Replacement Cost Method	2020 Replacement Cost
Bridges - C - Cast in Place	80	Utilized the technical expertise of GHD consultants to value the replacement costs of the assets. *See exclusions below	$65,386,000
Bridges – P- Precast Concrete	13		46,098,236
Bridges - S - Steel	4		4,973,124
Bridges - T - Timber/Wood	2		1,221,405
Culverts	149		77,365,179
Pedestrian Bridges	24		4,976,256
TOTAL	**272**		**$200,020,200**

Figure 2.17: Bridge and culvert age and replacement cost

*The following assets have replacement costs based on CPI tables as they were excluded in the GHD inspections but included in the above table

Asset Segment	Bridge	2020 Replacement Cost
Bridges - C - Cast in Place	094003 West Beach Rd	$318,061
	098057 – Conc B, Clarke	656,889
	098095 – Conc7/8, Clarke	41,851
	099127 – Conc 8, Darlington	324,681
	099517 – Liberty St	115,567
Bridges – P- Precast Concrete	094013 – Bowmanville Creek Bridge	1,768,139
Culverts	098052 – Lakeshore Rd	110,304
	098512 – Conc 1, Clarke	82,005
	098544 – Conc 7/8, Clarke	51,056
	099091 – Conc 5/6 Darlington	238,374
	099501 – Conc BF, Darlington	230,556
	098553 – Stephenson Rd	467,802
Pedestrian Bridges	Lions Memorial	29,313

Figure 2.18: Bridge and culvert exclusions

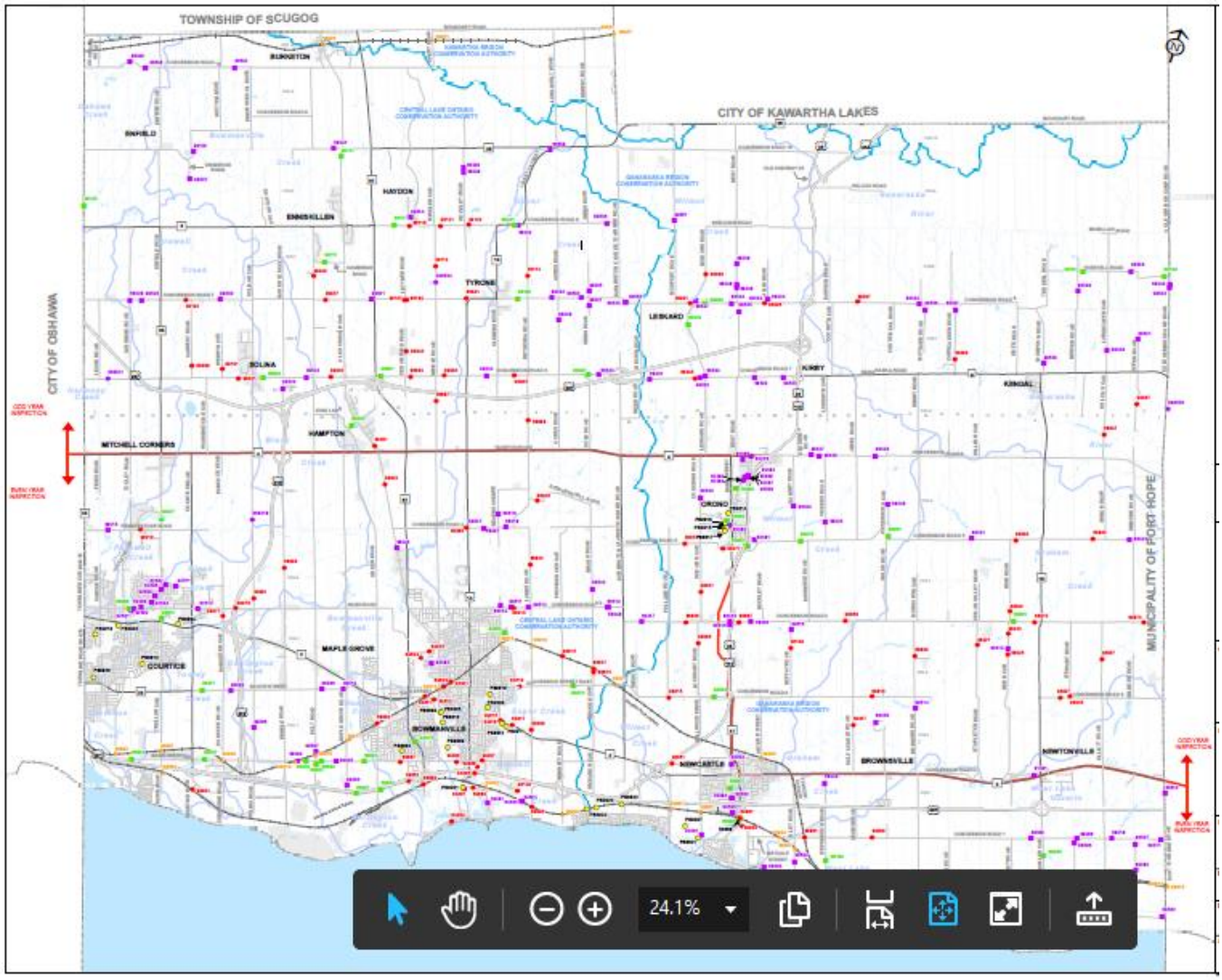


Figure 2.19: Bridge and culvert locations on aerial map of Clarington

The replacement costs used are calculated by GHD as a part of the Municipal Structure Inventory and Inspection 2020. In addition to the base cost of physically constructing the structure itself, a variety of associated costs have also been included in the total replacement cost of each bridge. The associated costs include:

- An allowance to address temporary or permanent utility relocations varied by roadside environment to include $57,000 for utility-related works in an urban environment, $31,000 in a semi-urban environment and $23,000 in a rural area.
- An allowance for the construction of bridge approaches is calculated based on the width of the approaching roadways. A unit rate of $13,000/m of road width is utilized based on the assumption that the average length of approach works will be 25 m on both sides of the structure.
- An engineering allowance to address approvals, design and contract administration costs associated with the structure's construction. The engineering allowance has been calculated as 20 percent of the construction cost including estimated approach and utility works.
- A contingency allowance of 15 percent to address other minor cost factors not accounted for in the base cost.

It should be noted that the current replacement value (CRV) figure is a benchmark-based estimate that relies on the geometry and design of the existing structure to arrive at estimated replacement costs. The costs are intended primarily for comparing the general value of various structures to one another and should be considered primarily as an order of magnitude values. In planning a complete replacement of a structure, specific consideration should be given to additional costs that may arise from various current design considerations. Examples of such considerations include:

- Need to widen the structure to accommodate increased traffic.
- Need to lengthen the structure to eliminate wall style abutments and replace with stub abutments set further back from watercourses
- Costs associated with the potential need for the staging of construction, traffic control and detours.
- Costs associated with complex removal operations to dispose of the existing structure.

Useful life

The table below outlines the useful life by structure type

Asset	Useful Life
Bridge – Constructed prior to year 2000	50 Years
Bridge – Constructed after year 2000	75 Years
Culvert	75 Years
Pedestrian Bridge	75 Years

Figure 2.20: Bridge and culvert useful life expectancy

The average age of the Municipality's bridges is 43 years old.

The following bridges have an age greater than 80 years old. It is a reasonable assumption that these historical bridges have been regularly rehabilitated since their original construction, and as the condition assessments show, they are in good condition.

Structure ID	Location	Age of Structure (Yrs)
098015	Conc. 2/3, Clark	90
099077	Conc 2, Darlington	80
098023	Conc 3, Clarke	85
099516	Conc 3, Darlington	90
098059	Conc B/I, Clarke	90
099521	Conc 5/6, Darlington	90
098530	Conc 6, Clarke	90
099534	Conc 7, Darlington	92

Figure 2.21: Bridge assets with age greater than 80 years

The average age of Clarington's culverts is 40 years old. The following culverts have an age greater than 80 years old. It is a reasonable assumption that these culverts have been regularly rehabilitated since their original construction, and as the condition assessments show, they are in good condition

Structure ID	Location	Age of Structure (Yrs)
093504	North St	86
098503	Conc B Clarke	91
095502	Leigh St	91

Figure 2.22: Culvert assets with an age greater than 40 years

The average age of the Municipality of Clarington's pedestrian bridges is 16 years old. All the pedestrian bridges are below 40 years old and are in acceptable condition.

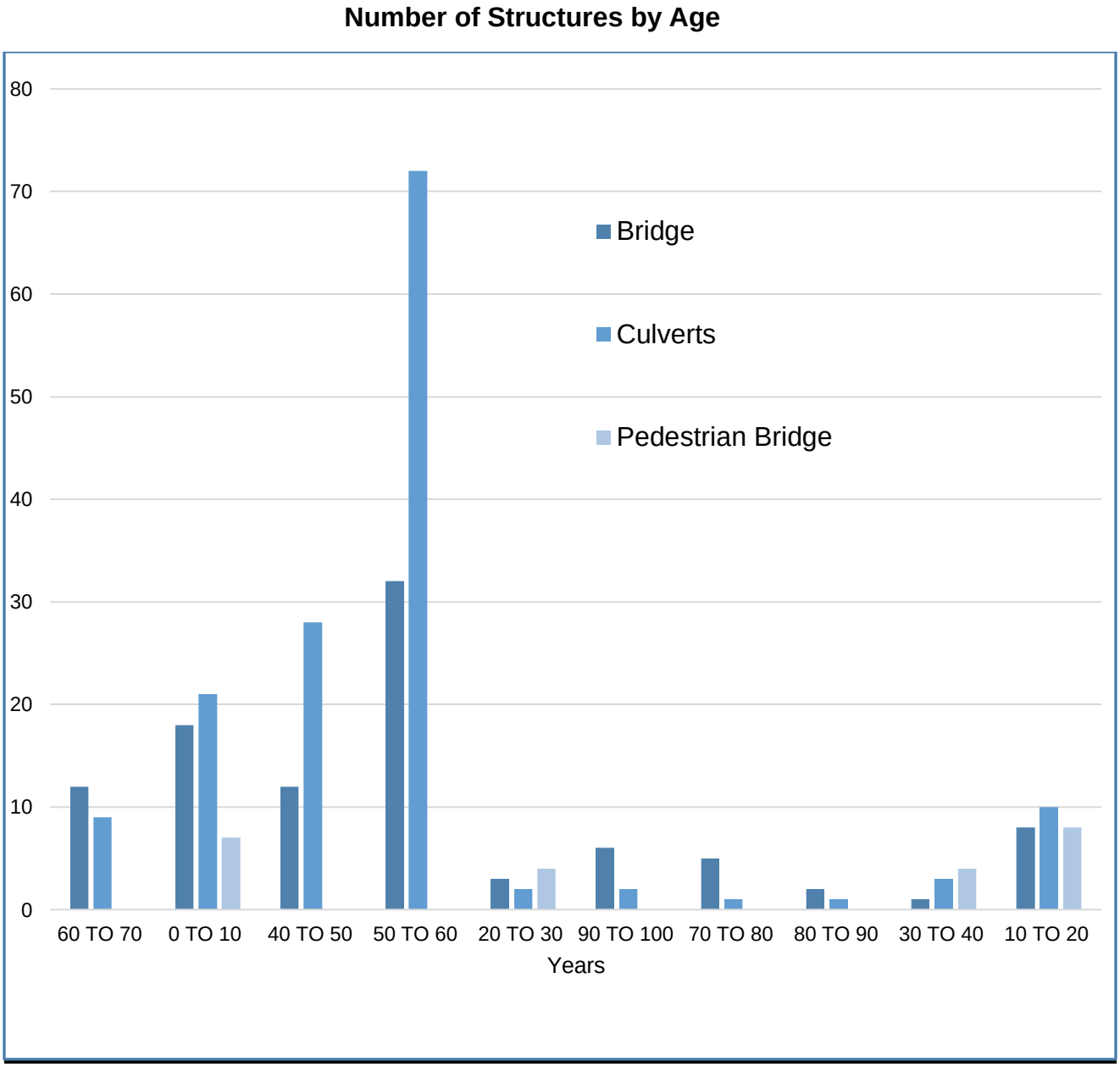


Figure 2.23: Number of bridge and culvert assets by age

Asset Condition

The Bridge Condition Index (BCI) is calculated based on the weighted sum of the condition of various structure components and is a number between zero and 100, with higher numbers corresponding to a better condition.

The structure prioritization number (SPN) is calculated using the condition of the structure (the BCI) and other factors, including traffic, the value of the structure, cost of repairs, load posting limitations, performance deficiencies and detour length. The SPN is also a number between 0 and 100, corresponding with a higher priority for repair/replacement.

BCI and SPN are described in more detail in the Municipal Structure Inventory and Inspection report. Bridge condition scores are developed and are used to guide repairs, rehabilitation, and replacement schedules.

The Municipality continues to maintain a good condition rating for bridges and culverts. Of the 268 Bridges and Culverts recorded in the Municipality's asset listing, 70 percent are in Very Good – Good condition. Only 19 percent are considered in Poor – Very Poor condition based on the BCI values. As per the Ministry of Transportation guidelines, a condition of 70 and above would result in no work needed in the next five years, 60 to 70 would have work in the next five years, and anything below 60 would require work within the following year.

The following table outlines the BCI Ratings from Very Good to Very Poor

Bridge and Culvert Condition Index Rating

Asset Condition Grade System – Bridges and Culverts	
GRADE	**CONDITION RANGE (BCI)**
Very Good	>80
Good	70 to 79.9
Fair	65 to 69.9
Poor	60 to 64.9
Very Poor	0 to 59.9

Figure 2.24: Outlines BCI ratings from very good to very poor

Bridges and Culverts Condition

Asset Category	Very Good	Good	Fair	Poor	Very Poor	Unknown
Bridges	13	58	11	8	8	1
Culverts	25	72	17	7	27	1
Pedestrian Bridges	9	9	1	0	2	2
Totals	**47**	**139**	**29**	**15**	**37**	**4**
% Of Inventory	17%	51%	11%	6%	14%	1%

Figure 2.25: Outlines the number of bridges and culverts per condition category

The following was completed by GHD during the 2020 Municipal Structure Inventory and Inspection, which outlines the results of field inspection investigations

1. A visual re-inspection for deficiencies and recording of any relevant dimensions.

2. An updated photographic inventory of the structure's appearance and deficiencies.

3. The compilation of the field review using Worktech Asset Foundation Software.

4. An individual assessment of the condition and state of repair/non-repair of each structure and the recommendation of improvements and estimated costs to bring the existing structure to an acceptable level of service.

5. Recommendation of the feasible options and cost-effectiveness of maintaining the existing structure versus possible replacement and the costs and timing of the same.

6. Calculation of the Current Replacement Value (CRV), Bridge Condition Index (BCI), and Structure Prioritization Number (SPN) for each structure. Based on the Structure Prioritization Values (SPN), relative rankings of bridge and culvert needs have been provided based on the Structure Prioritization Values (SPN).

7. Identification of specific budget recommendations for detailed condition surveys and bridge rehabilitation/replacement, including associated engineering design and supervision and construction estimates.

The table below shows the percentage of structures with a Structure Priority Number (SPN) under 25 and an SPN between 25-50. Currently, Clarington has no structures with a SPN higher than 50. This information will be tracked over time in hopes of reducing the percentages of structures with a higher SPN value.

Percentage of Bridge and Culverts with a SPN Less Than 50%

Structure Type	SPN Value		
	< 25	>25 and < 50	> 50
Bridge	44%	56%	0%
Culvert	20%	80%	0%
Pedestrian Bridge	62%	38%	0%

Figure 2.26: Summarizes the percentage of assets within various SPN ranges

The detour length factor is included to represent the disruption and inconvenience that may result if a structure were to have to undergo complete replacement of a lengthy major rehabilitation that may limit or preclude traffic from travelling over or under the structure. The detour length is measured as the distance required to travel from one side of the structure by circumventing it on similar or higher functional classification roads. For example, the detour length around a structure located on an arterial road would be measured along other arterial roads, although local or collector roads in the detour route may shorten it.

The calculated average detour rate for bridge and culvert assets, are as follows:

- Bridges is 6.78 kilometres
- Culverts is 6.65 kilometres

Levels of Service

Levels of Service

Storm Water Management

Current Level of Service

Ontario regulation 588/17 requires that levels of service use qualitative and technical descriptions to describe the quality of service delivered by the stormwater management assets in the Municipality. A combination of mapping and metrics have been provided to illustrate the service levels provided by the infrastructure. Figure 3.1 shows the qualitative descriptions and technical metrics required in O.Reg 588/17 for stormwater management assets.

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical levels of service (technical metrics)
Scope	Description, which may include maps, of the user groups or areas of the municipality that are protected from flooding, including the extent of the protection provided by the municipal storm water management system.	1. Percentage of properties in municipality resilient to a 100-year storm. 2. Percentage of the municipal storm water management system resilient to a 5-year storm.

Figure 3.1: O.Reg 588/17 Stormwater Management Levels of Service Requirements

To fulfill the requirement in O.Reg 588/17, two separate studies were undertaken. The first study, required to meet the ***"Percentage of properties in municipality resilient to a 100-year storm"*** requirement, was prepared internally by the Municipality's Planning and Development Services Department.

Using GIS with municipal, conservation authority and provincial data, every property in Clarington was assigned to one of five categories. Each property was assigned its category based on its proximity within flood mapping and flood damage centres. Additionally, property resilience was further refined based on whether the property has buildings within the flood mapping or was owned by a public agency. The detailed methodology can be viewed within the attached report from Ganaraska Region Conservation Authority (GRCA).

Resilience	Properties	Percentage	Area: acres
Resilient	33,634	91.5%	33,176
Mostly Resilient	1,588	4.3%	20,203
Some Resilience	90	0.2%	1,151
Little Resilience	839	2.3%	4,529
Not Resilient	620	1.7%	1,195
Total	**36,771**	**100%**	**60,255**

Figure 3.2: Resilience of all properties in Clarington to a 100-year storm event

As shown in Figure 3.2, the results of this study indicate that 91.5 percent of Clarington's properties are resilient to a 100-year storm event. Furthermore, 95.8 percent of properties in Clarington are resilient and mostly resilient; this equates to approximately 35,222 of Clarington's parcels. Clarington's urban and rural areas are similarly represented in resilience, as 96 percent of urban properties are resilient or mostly resilient, and 94 percent of rural properties are considered resilient or mostly resilient.

In Clarington, 4.2 percent or 1,549 parcels are considered to have some, little or no resilience to a 100-year storm event. Properties considered to have some, little or no resilience are 4 percent of urban properties and 6 percent of the rural properties.

Resilience Category	Variables
Resilient	Property is not within flood mapping.
Mostly Resilient	Property is within flood mapping and not within a flood damage center. Property is municipally, or conservation authority owned, is vacant or has no buildings in the flood mapping.
Some Resilience	Property is within flood mapping and not within a flood damage center. Property has buildings in the flood mapping.
Little Resilience	Property is within flood mapping and a flood damage centre. Property is municipally, or conservation authority owned, is vacant or has no buildings in the flood mapping
Not Resilient	Property is within flood mapping and a flood damage centre. Property has buildings in the flood damage centre.

Figure 3.3: Resilience categories and variables.

The resilience of a Clarington property to a 100-year storm event can be described as its vulnerability to such an event, if subjected to an event, the risks the event poses to a property and its ability to adapt to those risks. Clarington's two conservation authorities completed the work of assigning the vulnerability, likelihood, and impact in their flood risk assessment work. The results of this work are the identification of flood damage centres based on a determined level of flood risk to people and property. Flood damage centres are clusters of highly vulnerable buildings to a flood event.

Properties in these flood damage centres have the lowest resilience to a 100-year storm. Many properties within these areas may not have buildings in the flood damage centre, in which case, they have more resilience.

Properties not within a flood damage centre but within the flood extents of a 100-year storm have more resilience than those in a flood damage center. Those properties without buildings in the flood extent have increased resilience as well. Properties owned by the Municipality, the Region of Durham or a conservation authority are generally interpreted as having increased resilience as adaptive measures are generally taken on these properties.

Properties not within the flood extents of a 100-year flood are considered resilient to a 100-year storm.

Figure 3.4 shows the mapping of the geographic locations within Clarington for the five resilience categories. Each property shows its resilience category to the full boundaries of the property, not just the portion in the flood mapping or flood damage center.

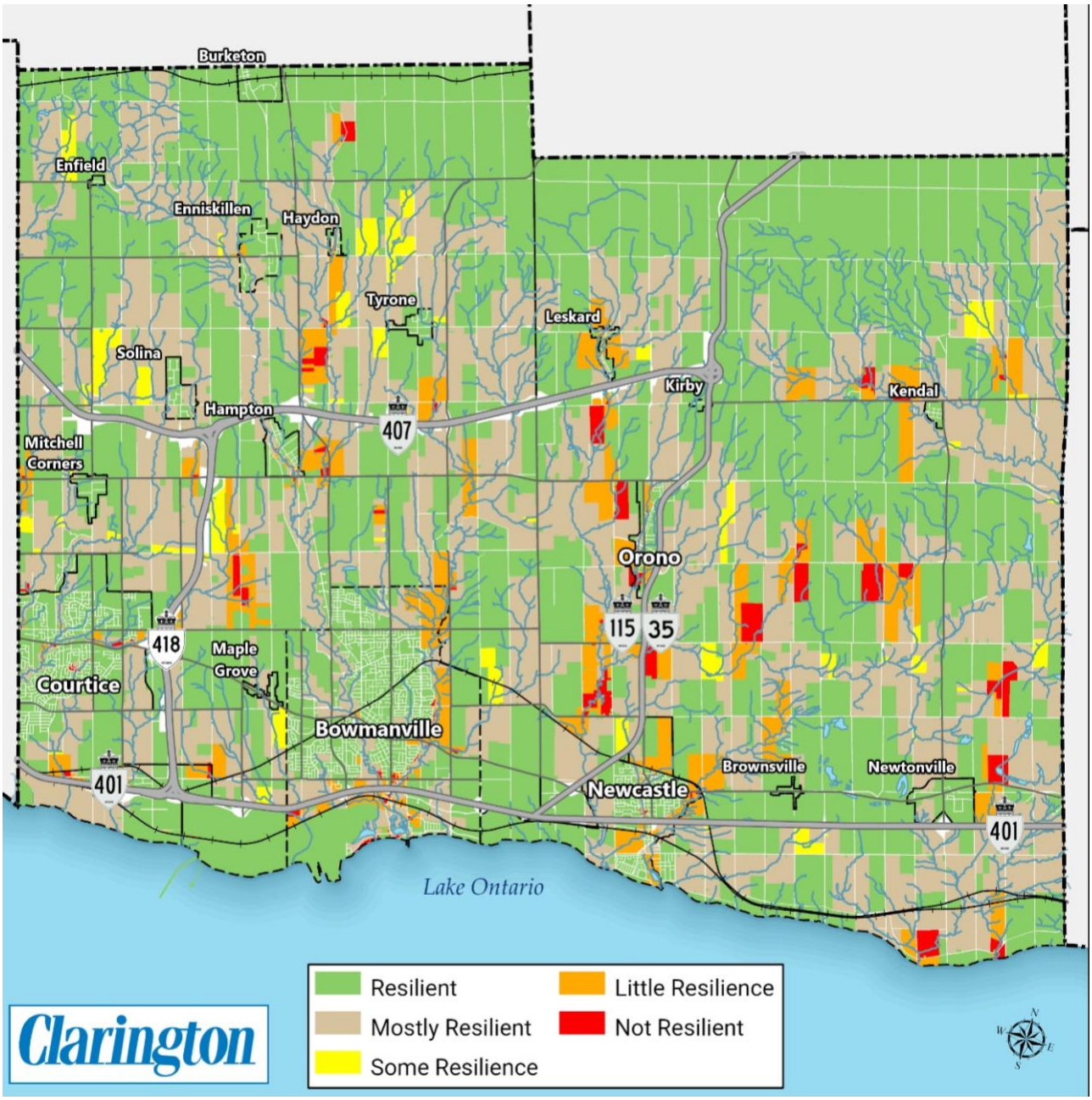


Figure 3.4: Map outlining Municipal Properties resiliency to a 100-year storm event.

The second study, to meet the requirement of ***"Percentage of the municipal storm water management system resilient to a 5-year storm",*** was prepared by the Ganaraska Region Conservation Authority. The conservation authority's jurisdiction resides within Clarington's municipal limits. Ganaraska's authority also encompasses other neighbouring towns and municipalities, some of which Ganaraska had already provided similar studies for in the past.

This partnership involved supplying the conservation authority with sufficient storm sewer data to allow their engineers to assess and model Clarington's networks. This data included shape files for outlets, structures, catch basins, conduits and sub catchment areas, and limits of subdivisions, storm water pond locations, and drainage areas. The methodology, data limitations and the criteria used for analysis can all be reviewed within the 2021 Clarington Storm Sewer Risk Assessment Report.

After reviewing the data, it was determined that the Municipality of Clarington's storm sewer network included approximately 171 individual storm sewer systems. Engineers from both parties agreed that by conservative assumption, only systems pre-dating 1985 would be modelled for the purposes of the study. The likelihood of a system constructed after 1985 not using the 5-year storm standard would be relatively small and not worth the resources to model.

After refining Clarington's storm sewer network for systems pre-dating 1985 it was determined that approximately 33 storm systems required analysis and modelling. It is noted that some systems have undergone partial replacements over the years. If a particular system still included at least one asset pre-dating 1985, the entire system was analyzed and run through the model**.** Figure 3.5 below shows the number of systems modelled for each urban area of Clarington where storm water infrastructure resides.

Community	Number of Storm Systems Modelled
Bowmanville	19
Courtice	3
Hampton	4
Newcastle	1
Orono	6
Total	**33**

Figure 3.5: The distribution of analyzed systems within the communities of the Municipality

The distribution of pre-1985 storm sewer systems within the study area is depicted in red in Figure 3.6 below.

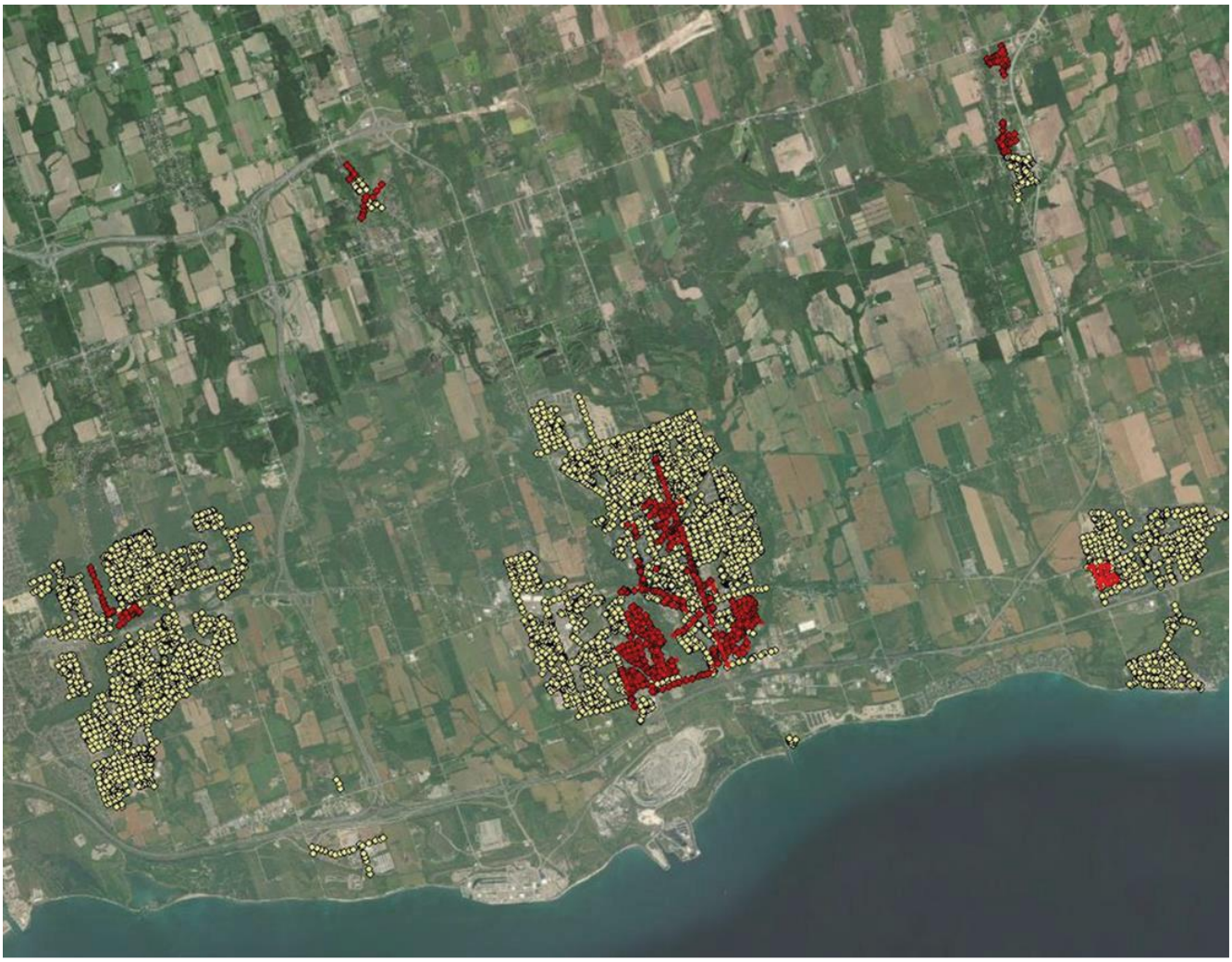


Figure 3.6: The distribution of pre-1985 storm sewer systems within the study area

Storm Sewer System Summary	<80% Capacity	80-100% Capacity	>100% Capacity	Total Conduits
Bowmanville				
Conduit Modelled	642	70	81	793
Conduit Assumed After 1985	1,602	0	0	1,602
Totals	**2,244**	**70**	**81**	**2,395**
Burketon				
Conduit Modelled	0	0	0	0
Conduit Assumed After 1985	1	0	0	1
Totals	**1**	**0**	**0**	**1**
Courtice				
Conduit Modelled	29	2	1	32

Storm Sewer System Summary	<80% Capacity	80-100% Capacity	>100% Capacity	Total Conduits
Conduit Assumed After 1985	1,457	0	0	1,457
Totals	**1,486**	**2**	**1**	**1,489**
Hampton				
Conduit Modelled	14	3	4	21
Conduit Assumed After 1985	15	0	0	15
Totals	**29**	**3**	**4**	**36**
Newcastle				
Conduit Modelled	34	0	1	35
Conduit Assumed After 1985	558	0	0	558
Totals	**592**	**0**	**1**	**593**
Newtonville				
Conduit Modelled	0	0	0	0
Conduit Assumed After 1985	13	0	0	13
Totals	**13**	**0**	**0**	**13**
Orono				
Conduit Modelled	45	1	3	49
Conduit Assumed After 1985	59	0	0	59
Totals	**104**	**1**	**3**	**108**
Tyrone				
Conduit Modelled	0	0	0	0
Conduit Assumed After 1985	6	0	0	6
Totals	**6**	**0**	**0**	**6**

Figure 3.7: Tabular results for all modelled sewer systems by urban area summarized

Network Wide Totals	<80% Capacity	80-100% Capacity	>100% Capacity	Total Conduits
Number of Conduits	4,475	76	90	4,641
Percentages	**96.42%**	**1.64%**	**1.94%**	**100%**

Figure 3.8: The percentage of the Municipal Storm water management system resilient to a 5-year storm.

The study results carried out by the Ganaraska Region Conservation Authority revealed that the Municipality of Clarington's storm sewer network is estimated to be 98.06 percent resilient to a 5-year storm event.

The results indicate that approximately 90 of the conduits analyzed and modelled may have capacity issues under such an event. Several of the conduits within the network modelled for the study are included in roadways already identified for replacement in Clarington's 5-year capital forecast. Of the identified assets, 90 percent are in Bowmanville, contained within older subdivisions and road networks. Once replacement projects in these areas commence, staff and consultants will review designs and conduit sizing to ensure infrastructure meets current standards and capacity thresholds.

It is recommended that Municipal staff use the study and report provided by Ganaraska to evaluate the future risk associated with the identified assets. Prioritization for future infrastructure replacements could potentially be modified if an increased risk has been recognized for conduit capacity limitations.

Current Performance Measures

Municipal Objective	Technical Measure	Technical Performance	Target
Providing Storm Water services in an efficient manner	Annual Operating Cost to Provide Service ($ / Household)	**$17.20**	⟷
Providing Storm Water services with minimal impact	% Of Storm water assets in fair or better condition	**93%**	↑
Providing Storm Water services with minimal impact	5-Year Km Average of storm sewer network CCTV inspected annually (Includes new assumptions/Capital replacements /O&M)	**8.97**	↑
Providing Storm Water services with minimal impact	% Of storm system with insufficient capacity to convey flows of a 5-year weather event	**1.94%**	↓
Providing Storm Water services with minimal impact	% Of Municipal properties resilient to a 100-year weather event	**91.5%**	↑
Providing Storm Water services with minimal impact	% Of Municipal properties not resilient to a 100-year weather event	**1.7%**	↓

Municipal Objective	Technical Measure	Technical Performance	Target
Providing Storm Water services with minimal impact	% Of inspections & routine minor maintenance carried out on Storm Water Management Facilities annually	**100% (**Inspected and maintained once annually)	
Providing Storm Water services with minimal impact	% Of Total Catch basins cleaned annually (3-year Avg)	**18%**	
Providing Storm Water services with minimal impact	% Of streets with catch basins street swept twice annually	**98%**	

Figure 3.9: The calculated performance measures for storm water assets

Roads

Current Level of Service

Ontario Regulation 588/17 requires legislated community levels of service for core assets. Community levels of service use qualitative descriptions to describe the scope or quality of service delivered by an asset category. Examples of legislated community levels of service include a map showing the different levels of road class pavement conditions.

Ontario Regulation 588/17 also requires legislated technical levels of service for core assets. Technical levels of service use metrics to measure the scope of service being delivered by the road infrastructure. Examples of technical levels of service include an average surface condition for paved roads based on the Pavement Condition Index (PCI) value and average condition levels for unpaved roads, such as gravel and earth.

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical levels of service (technical metrics)
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity.	1. Number of lane-kms of each arterial roads, collector roads and local roads as a proportion of square kms of land area in the municipality.

Figure 3.10: O.Reg 588.17 Road Network Levels of Service Requirements

The entire road network is analyzed bi-annually by completing the Statement of Infrastructure for Roads. 4Roads Management Services Inc. completed the most recent Statement of Road Infrastructure in 2019. This report provides accurate quality assessments and breakdowns of all the road infrastructure managed by Clarington. As part of completing the statement of road infrastructure, information was developed and provided to meet O.Reg 588/17 requirements for Clarington's road infrastructure.

The road infrastructure owned by the Municipality of Clarington is separated into three categories, arterial, collector and local roads. Figure 3.11 provides the operating requirements for each road class and the expected average daily traffic within each class.

Road Classification	Function	Average Daily Traffic
Arterial Roads	Delivers high volumes of urban traffic between areas of activity.	Above 15,000
Collector Roads	Connects local streets with arterial streets. Provides traffic service to residential, schools, churches, parks, and low intensity commercial facilities.	Between 1,500 and 15,000

Road Classification	Function	Average Daily Traffic
Local Roads	Provides access to individual properties and connect neighbourhood destinations.	Less than 1,500

Figure 3.11: Road Classification definitions

Figure 3.12 details the number of lane kilometres for each road class. The technical level of service requirement for O.Reg 588/17 requires comparing the data from Figure 3 with the total square kilometres of land within the Municipality of Clarington. The total square kilometres of land within Clarington is 614 km^2.

Corporate Level of Service Objective	Level of Service Measurement	Technical Measurement Performance	% Of Total Square Kilometres of Land
Provide a transportation network with a reasonable level of connectivity	Number of lane kilometres of arterial roads as a proportion of total square kilometres of land in the municipality.	**4.100**	**0.22 %**
	Number of lane kilometres of collector roads as a proportion of total square kilometres of land in the municipality.	**541.391**	**28.92%**
	Number of lane kilometres of local roads as a proportion of total square kilometres of land in the municipality.	**1,326.704**	**70.86%**
	Total lane kilometres of road in Clarington	**1,872.195**	

(Total Square kilometres of land in Clarington is 612)

Figure 3.12: Road Network Levels of Service – Lane Kilometres by Road Type

This analysis indicates that a large majority of our road infrastructure are considered local roads, totalling 70.86 percent compared to the total square kilometres. The local roads also consist of 70.86 percent of the total road infrastructure. The collector roads represent 28.92 percent of the roads within Clarington, and the arterial road infrastructure consists of 0.22 percent of the total lane kilometres of roads. This data shows that a large portion of our road infrastructure is dedicated to local travel within Clarington.

The AMP regulation also requires legislated technical levels of service metrics to measure the quality of service being delivered by the road infrastructure. From a qualitative perspective, the Municipality of Clarington must provide illustrations explaining the different levels of road class pavement conditions. For the technical levels of service, data includes an average surface condition for paved roads based on the Pavement Condition Index value and average condition levels for unpaved roads, such as gravel and earth.

Service Attribute	Community Levels of Service (Qualitative Descriptions)	Technical levels of service (technical metrics)
Quality	Description or images that illustrate the different levels of road class pavement condition.	1. For paved roads in the municipality, the average PCI value. 2. For unpaved roads in the municipality, the average surface condition (e.g., excellent, good, fair or poor).

Figure 3.13: O.Reg 588.17 Road Network Levels of Service Quality Requirement

Pavement Condition Index (PCI) is a value that provides the general quality of a road by a measurement that is completed by a manual survey of the pavement. PCI tracks the deterioration of a road as the infrastructure ages, ensuring that it meets road safety standards and the level of service that the corporation desires to provide. The average PCI rating for Clarington's roads is broken down in Figure 3.14.

Paved Road Type	Length of Road (km)	Average of PCI Rating
HCB1	1.96	68.50
HCB2	4.33	41.20
HCB3	170.86	64.67
HCB4	267.71	63.27
LCB1	365.96	50.56
Total	**810.82**	**58.92**

Figure 3.14: Average PCI for Paved Roads

The average PCI rating for Clarington's paved roads indicates that the road network, as a whole, is within the fair condition level at 58.92. To improve the average PCI level, the Municipality of Clarington must focus on rehabilitation of the largest area of road types, LCB or high float roads. The 365.96 kilometres of road within the LCB category currently has an average PCI of 50.56. The second lowest of Clarington's paved road types would be the 4.33 kilometres of HCB2 roads that are nearing the poor condition category, with an average PCI of 41.20.

In Clarington, unpaved roads are categorized into two types, gravel and earth. The majority of costs for these types of roads are operating costs and are largely focused on the maintenance of gravel roads. Clarington's unpaved roads do not utilize a capital rehabilitation program. Grading, dragging, and gravel patching are performed annually to ensure the gravel roads maintain a positive condition level.

Road Type	Condition Levels					Total
	Very Good	Good	Fair	Poor	Critical	
Earth				0.60	38.90	39.50
Gravel	24.16	13.12	15.62	9.17	2.85	64.92
Total Kilometres	24.16	13.12	15.62	9.77	41.75	104.42

Figure 3.15: Average Condition Ratings for Unpaved Roads in Kilometres

The Municipality of Clarington currently manages 104.42 kilometres of gravel and earth roads. The gravel road infrastructure is favourable, with 81.48 percent of the inventory being in the very good to fair condition levels. In contrast, only 4.39 percent of the gravel road infrastructure are in the critical condition level and requires rehabilitation. The earth roads infrastructure condition level is within the critical area due to limited seasonal usage. These assets receive minimal to no maintenance and are utilized by a low number of our community.

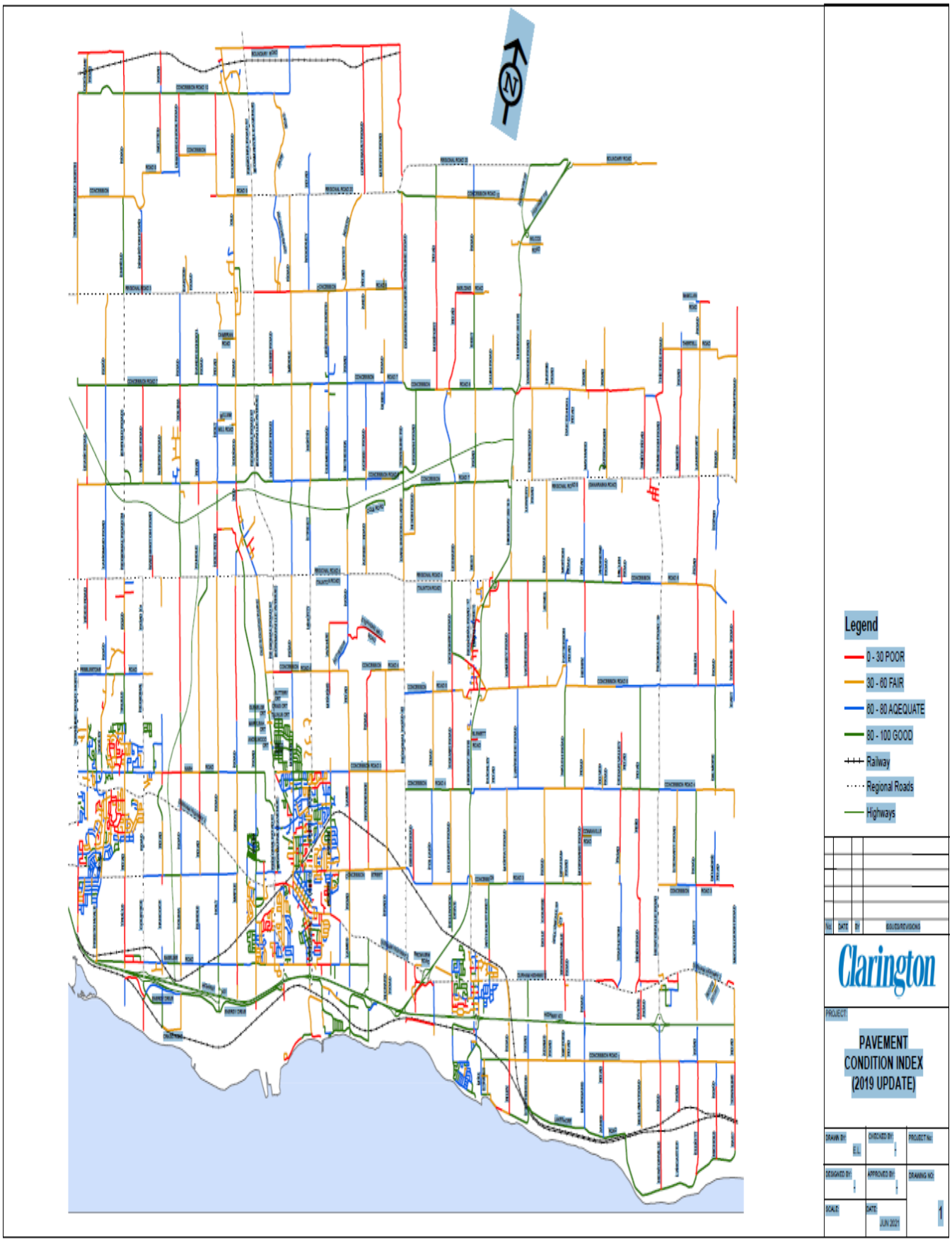


Figure 3.16: Map displaying Clarington's Road Network connectivity by PCI Value

Current Performance measures

The average condition value of each road type will be used as a benchmark moving forward. This will be used to determine if road infrastructure condition ratings are improving or declining on average with each asset management plan update. The overall average condition rating of Clarington's paved road network is 69.42. The physical condition assessment is provided within the bi-annual road statement of infrastructure.

Road Type	Road Type	Length of Road (Metres)	Average of Condition Rating
Paved	HCB1	820	50.00
	HCB2	4,330	53.25
	HCB3	164,280	75.33
	HCB4	259,020	74.49
	LCB1	365,960	53.23
Unpaved	Gravel	64,480	56.23
Grand Total		**858,890**	

Figure 3.17: Average Condition by Road Type

Unpaved Roads Maintenance	2020	2019	2018	2017	2016	5 Year Average
Total Operating Costs	$366,268	$326,073	$311,036	$377,739	$395,469	
Total Lane Km's of Unpaved Roads*	207	208	210	213	212	
Annual Cost Per KM	**$1,769**	**$1,568**	**$1,481**	**$1,773**	**$1,865**	**$1,691**

Figure 3.18: 5 Year Annual Average Operating costs for Unpaved Roads
*Lane kilometres of Unpaved Roads from FIR Annual Schedules
*Unpaved roads consist of gravel and earth roads.

Paved Roads Maintenance	2020	2019	2018	2017	2016	5 Year Average
Total Annual Operating Costs	$2,105,248	$1,777,803	$1,821,056	$2,061,950	$1,657,458	
Total Lane Km's of Paved Roads*	1,658	1,645	1,615	1,607	1,595	
Annual Operating	**$1,270**	**$1,081**	**$1,128**	**$1,283**	**$1,039**	**$1,160**

Cost Per Lane KM

Figure 3: 19 Year Annual Average Operating costs for Paved Roads
*Lane kilometres of paved Roads from FIR Annual Schedules
*Paved Roads Include LCB (low-class bituminous) and HCB (high-class bituminous) surfaced roads

	2020	2019	2018	2017	2016	5 Year Average
Road Metre's Rehabilitated Annually	42,760	27,930	20,470	11,360	63,720	20,780

Figure 3.20: Paved Roads Rehabilitated 5 Year Average

This metric provides the length of road Clarington has rehabilitated each of the last five years and the calculated average length of paved roads. This metric will allow us to determine if we are rehabilitating a greater number of roads each year to maintain our current service level. Since 2017, we have seen an increase each year with the length of road rehabilitated. This will connect directly with our average condition rating values in Figure 3.17.

Bridges & Culverts

Current Level of Service

As per O.Reg 588/17, this Asset Management Plan is built using the current level of service that the Municipality of Clarington is offering.

The following tables identify the current level of service for Bridges & Culverts. These metrics include the community and technical level of service metrics that are required as part of O. Reg. 588/17. Additional information and metrics that are significant in achieving desired levels of service have also been included.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by Bridges & Culverts.

Service Attribute	Qualitative Description	Current Level of Service (2020)
Scope	Description of the traffic that is supported by municipal bridges (e.g., heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists)	Bridges and structural culverts support the movement of motor vehicles, heavy transport vehicles, emergency vehicles, pedestrians, and cyclists throughout the City's Road network bridges and structural culverts are a key component of the municipal transportation network. Currently, there are two bridges with a load limit by-law.

Service Attribute	Qualitative Description	Current Level of Service (2020)
Quality	Description or images of the condition of bridges and how this would affect the use of the bridges	See the following images and descriptions of conditions below
Quality	Description or images of the condition of culverts and how this would affect use of the culverts	See the following images and descriptions of conditions below

Figure 3.21: qualitative descriptions for levels of service

Condition	Bridge	Culvert
Very Good >80 BCI The structure is functioning as intended. Very little to no deterioration. New or recent rehabilitation. Very low risk of failure. Low capital maintenance needs.		
Good 70 to 79.9 BCI		

Condition	Bridge	Culvert
The structures are functioning as intended. No major maintenance is anticipated within the next five years. Some signs of deterioration. Low risk of failure. Some unplanned maintenance is required		
Fair 65 to 69.9 BCI The structures are functioning as intended. Additional signs of deterioration and minor distress observed. Maintenance will be required within the next five years to maintain functionality Level of Service may be affected. Some failures occur. Rehabilitation is possible		
Condition	**Bridge**	**Culvert**
Poor 60 to 64.9 BCI		

Condition	Bridge	Culvert
The structures are starting not to function as intended. Significant distress observed. Maintenance and some repairs are required within the next few years to restore functionality Failures will increasingly occur. Reduced ability to provide the service. Maintenance costs will likely increase. Rehabilitation may become impossible		
Critical < 60 The structures are not functioning as intended. Significant deterioration and major distress observed. Requires immediate attention. Assets have exceeded their service life and require careful monitoring and maintenance		

Figure 3.22: *Clarington's scale for bridge and culvert condition assessments. Table includes condition rating, condition grading, and the description of each specific condition category.*

Technical levels of service relate to the quality, quantity or capacity, reliability, environmental implications, availability, safety, and maintainability of the asset. They translate customer expectations and legislative requirements into technical objectives, performance measures, and targets.

The primary service level is to maintain an adequate condition and load limits using the SPN as an indicator. Provincial legislation requires all bridges and culverts over 3.0 m span to be inspected under a professional engineer's direction every two years.

Clarington's practice is to inspect all structures 1.2 m span and larger, which includes 271 structures. Each year, half of the structures are examined, and a Municipal Structure Inventory and Inspection report is produced by our consultant. The Inspections are completed following the MTO Municipal Bridge Appraisal Manual, February 1992, the MTO Municipal Culvert Appraisal Manual, August 1993, and the Ontario Structure Inspection Manual 2000, Rev April 2008. This report describes the condition of each structure, maintenance needs, significant rehabilitation needs, and replacement needs and summarizes the overall condition and funding requirements.

Clarington has developed a ten-year plan based on the data collected during the inspections, updated as part of the annual inspection reporting. We base the plan on two main performance measures, the bridge condition index (BCI), and the structure priority number (SPN).

The ten-year plan is developed through an iterative process. The list of structures is sorted by highest SPN. We then review the list to remove any structures under another agency's jurisdiction, such as the railways or the province. We also remove structures that will be addressed through another process, such as reconstruction for development or the Highway 407 extension. The remaining structures are selected to fit within the projected budget in the forecast. We include structures that need to be replaced as well as repair work to extend the life of the structures. Each structure inspection sheet is briefly reviewed to determine if the structure should be moved up in the program to make repairs that will extend the life of the structure or moved down the list because the repair costs are so high it would be more cost effective to wait until the structure needs to be replaced. We also review our road improvement program to coordinate structure repairs with road repairs

Condition measures are used to determine the current health and state of the Municipal Bridges and Culverts and help drive decisions relating to asset management, maintenance, rehabilitation, and replacement to improve conditions when required. Below is a table that outlines the current level of service for the specified attribute.

Many legislative and regulatory requirements directly influence levels of service. Due to the critical nature of the bridge and culvert structures, the Municipality's adherence to various legislative requirements is essential to ensure the structures are safe. The following standards and regulations must be adhered to:

Ontario Regulation 104/97

Provincial legislation requires all bridges and culverts over 3.0 m span to be inspected under a professional engineer's direction every two years. The inspections are completed in accordance with the MTO Municipal Bridge Appraisal Manual, February 1992, and the MTO Municipal Culvert Appraisal Manual, August 1993, and the Ontario Structure Inspection Manual 2000, Rev April 2008.

Ontario Regulation 239/02

Provides rules and Minimum Maintenance Standards relating to bridge deck spalls and surface discontinuity.

CSA S6-19

This Code is based on limit states design principles and defines design loadings, load combinations and load factors, criteria for earthquake resistant design, and detailed design criteria for the various materials.

Accessibility for Ontarians with Disabilities Act

(AODA) is an Ontario law mandating that organizations must follow standards to become more accessible to people with disabilities.

Highway Traffic Act, Section 123

Provides regulations limiting weight on bridges.

O Reg 103/97

Contains standards to determine allowable gross vehicle weight for bridges

Current Performance measures

Service Attribute	Qualitative Description	2019	2020	Trend
Scope	Percentage of bridges in the municipality with loading or dimensional restrictions*	2.02 %	2.02%	
Quality	For bridges in the municipality, the average bridge condition index value.	71.13	72.53	
Quality	For culverts in the municipality, the average bridge condition index value.	70.59	70.87	
Quality	For pedestrian bridges in the municipality, the average bridge condition index value.	80.03	77.56	
Quality	For bridges in the municipality, the average SPN	27.35	27.32	
Quality	For culverts in the municipality, the average SPN	30.4	30.32	
Quality	For pedestrian bridges in the municipality, the average SPN	24.27	25.65	

Figure 3.23: *The calculated performance measures for bridge and culvert assets.*

Lifecycle Management Strategy

Clarington

Lifecycle Management Strategy

Storm Water Management

Lifecycle Activities

Storm sewer infrastructure in Clarington undergoes regular asset management activities that enable the assets to provide the current levels of service sustainably, while managing risk at the lowest lifecycle cost.

The condition and performance of all storm sewer assets deteriorate over time. Due to the long useful life of these assets, the deterioration period is gradual and dependent on many various factors and characteristics. These factors may include an asset's location, utilization, maintenance history and environment.

Clarington has ensured programs are in place so that storm sewer infrastructure is monitored to track the deterioration over time and identify when proactive and reactive maintenance is required as well as repair and replacement requirements.

Storm Water Conduit Maintenance Activities:

Inspections

Storm sewer conduit should continue to include an annual maintenance program employing CCTV inspections and pipe flushing. This maintenance activity is typically performed around year 40 and closer to the end of the asset's life. The approach of inspecting the pipe around year 40 is to identify any issues that may be starting to occur halfway through the asset's lifecycle. Typically, the inspections align with the road network reconstruction programs. Coordinating these two projects ultimately leads to lower total project costs since pipe rehabilitation or replacement can occur when the road is being replaced.

It is recommended conduit be inspected and flushed up to three times throughout its lifecycle. This ensures any sewer repair or replacement needs are identified. The first inspection is typically performed before assuming the asset to confirm it has been installed as designed. This initial inspection would not require flushing maintenance and

is not included in the lifecycle costing schedule since it occurs before asset ownership by the Municipality.

Clarington has been performing CCTV inspections on its conduit since 2010. The Public Works Department has kept maintenance records for all the locations inspected and uses the video from these inspections to help prioritize reconstruction projects in the five-year capital budget program.

Although inspections have been occurring for over a decade, Clarington has built up a backlog of inspections based on the pipe's age alone. This backlog is due to budget constraints and a significant amount of infrastructure built throughout the 1950s and 1960s. The backlog of events has been included in the 2021 forecasted operating requirement and will continue to roll forward until inspections are caught up to current lifecycle requirements.

Replacement:

This asset management plan focuses on replacing storm water conduits at the end of their useful life through the capital replacement program. There is a backlog of replacements shown in the 2021 capital forecast due to the age of the infrastructure constructed in 1950-1960s. Although the assets were given an estimated useful life of 40 years, it has become evident that much of the infrastructure has held up to current levels of service beyond that estimated time frame through the CCTV inspection program.

Most of the backlogged end-of-life assets are scheduled to be replaced through various road reconstruction contracts within the next five-year capital cycle. Once these assets have been replaced there are minimal capital replacement needs over the next 15 to 20 years. With future needs being so minimal, an affordable budget approach to gradually work towards decreasing the backlog has been implemented. This approach works considering service levels have not been lost. If the levels of service Clarington provides begin to deteriorate, the replacement of these assets will need to be prioritized at an increased pace.

Storm Water Structure Maintenance Activities:

Clarington currently performs lifecycle activities on two types of storm water structures. These structures are curb and gutter catch basins and maintenance holes. Inlets, outlets, outfalls, oil grit separators, and catch basins located off the roadways such as in parks or rear yards do not have current lifecycle activities.

The Public Works Department will continue to monitor these structures and work towards implementing required maintenance activities if a time comes when these assets begin to no longer provide the expected level of service.

Inspections

Like stormwater conduit, the maintenance holes and catch basins are CCTV inspected. Given that the estimated useful life of these structures is identical to the conduit, the inspection schedule is also aligned. When the conduit on a particular roadway is

scheduled to be inspected, the maintenance holes and catch basins included in that system will likely be inspected as well.

Resetting

Maintenance holes and catch basins receive adjustments and resetting throughout the asset lifecycles as structures age, water flow, traffic, and frost help to deteriorate the concrete. These factors can vary widely by location, making the prediction of a maintenance schedule for this activity challenging. Although not always the case, often these structures need to be adjusted when the road surface is shaved and repaved; therefore, it was decided to align this activity with the road network pavement work requirements.

Due to the size of the inventory of these assets Clarington does not have the resources to inspect every one of these structures annually. The process currently is to rely on public complaints and road patrol crews to identify locations where there are issues. Those locations are then inspected by Public Works staff, and if warranted, they are added to an annual tender for repair.

A backlog for this maintenance activity exists from prior years. This is partially due to an incomplete database of pre-existing maintenance. The last three years of resetting work was reviewed, and those locations were removed from the backlog or 10-year forecast. Other assets likely exist within the forecast or backlog that may have been reset in the last 10 to 20 years. Due to the unpredictability of when the activity may occur, if at all

and lack of prior maintenance activity data, the forecast for this specific event is likely marginally inflated.

Street Sweeping

Clarington currently performs street sweeping activities a minimum of twice per year. Activities focus on urban areas where some streets may be swept more frequently if necessary. This activity usually takes place in the spring and fall months. During the spring, sweeping removes sand and salt from the roadways before it enters the basins and, eventually the storm system. In the fall, it helps to remove the accumulation of leaf debris from the curb and gutters.

In the past Clarington was able to perform street sweeping activities with little cost. Clarington owns and operates its street sweeper truck and does not have to contract this service. Aside from employee wages and fuel, there are minimal operating costs associated with this maintenance activity.

New provincial legislation will be implemented in 2022 for the safe removal and disposal of street sweeping sediment. This change in legislation will require Clarington to contract out the disposal of sweepings. It has been estimated this service will cost approximately $650,000 annually. Once the service has been contracted and performed Clarington will be able better to define the actual activity cost for this event. Forecasts and projections will be refined in future asset management plans once actual costs are established.

Basin Cleaning & Disposal

Curb and gutter catch basins are cleaned every three years on a rotating schedule. This service is contracted out and entails removing and disposing of debris and buildup in the basins. This service is vital to ensuring the debris that makes its way into the catch basins does not have a chance to build up. Buildup can result in flooding and can make its way into the stormwater management ponds. It can have environmental impacts and lead to sediment accumulation resulting in pre-mature pond cleanouts.

Replacement

This asset management plan replaces stormwater structures through the capital replacement program at the end of their useful life. Historically structures have been built using concrete and have stood up to estimated life expectancies as anticipated. No replacement backlog exists for our storm structures, leading to a limited capital replacement requirement over the next ten years.

Although the capital requirement does not identify the need for significant replacement within the ten-year plan, some assets will likely be replaced before the end of useful life occurs to coincide with the conduit and road network replacement schedules. This will provide a cost-benefit and avoid unaligned reconstruction work in the future.

Storm Water Wet / Dry Pond Maintenance Activities:

In 2011, the Municipality of Clarington retained AECOM to assess the functionality and identify maintenance needs for stormwater ponds. AECOM developed a long-term maintenance needs plan for all the storm water facilities owned and operated by the Municipality at that time.

Based on the results of the study and field assessment, the Municipality has been able to successfully implement several initiatives to maintain and remediate our stormwater facilities to ensure each one continues to function as it was intended.

Inspection

Since receiving the finalized report from AECOM in 2013, the Municipality has implemented a comprehensive annual inspection program on each storm water facility assumed by the Municipality. This annual program, which is performed by Public Works staff, ensures deficiencies are identified, issues are corrected, and routine maintenance requirements are completed.

- Various attributes that make up the storm water management facilities are inspected annually.

  Some of these include:

- Forebays
- Forebay Berms
- Inlet/Outlets
- Slope Conditions
- Erosion Control Features
- Vegetation Growth
- Sediment Accumulation

Inspection reports are completed by staff and assessed condition ratings are assigned to each asset and uploaded into the asset management software. The condition reports are used by staff to coordinate the required minor and major maintenance activities at each facility.

Minor Maintenance

This maintenance work is identified through the inspection reports and is scheduled at each facility at least once annually. Minor maintenance may include activities such as grass cutting and litter and debris removal from the facilities' inlets and outlets. These activities are performed by Clarington Public Works staff with no contracted lifecycle event cost associated.

Major Maintenance

Additional maintenance works recommended to be completed every five years include aquatic terrestrial vegetation maintenance, erosion restoration and structural repairs. In most cases, these activities are also performed by Clarington Public Works staff. This Asset Management Plan identifies no contracted cost associated with this lifecycle event. However, on rare occasions, a vendor may be contracted to perform work outside the skillset of Municipal staff.

Sediment Quantity Monitoring Survey

Sediment monitoring surveys should be completed every five years, especially in the years following the assumption of the facility from the developer. Once catchment areas have been established and lifecycle activities on the catch basins in those catchment areas have been implemented, the monitoring should be used to establish sediment load rates. These load rates can be used to predict future cleanout and sediment removal works. The Municipality should establish standard sediment quantity monitoring

and reporting procedures to ensure consistent results each year. Currently, Clarington contracts out this activity to a consulting firm.

Clarington has only been performing sediment monitoring on facilities where visual inspections have identified sediment accumulation. These surveys are then used to prioritize pond cleanout work. It is recommended that Clarington enhance the frequency of sediment monitoring to provide the Municipality with a comprehensive understanding of current pond functionality to ensure an adequate level of service continues to be met.

This Plan incorporates a scheduled life event for sediment quality monitoring every five years for wet and dry ponds. Due to past practice, there remains a backlog of surveys not performed within the past five years. This backlog is identified in the 2021 budget year and will continue to roll forward until the associated facilities have completed quantity monitoring surveys.

Sediment Cleanout & Removal

As per the report provided by AECOM, sediment cleanout and removal for both wet and dry stormwater ponds is recommended every 10 to 20 years. Schedules for each pond can vary based on facility storage volumes and the size of the catchment areas. This asset management plan estimates a lifecycle cleanout activity every 15 years for wet ponds and every 20 years for dry ponds.

It is challenging to estimate the approximate cost of cleaning out each pond. Cost can vary significantly based on the amount of sediment present, the size of the facility, access to the facility, and the method used to clean the facility. AECOM's report estimated an approximate cost of $250,000 per pond. That amount has been inflated to current pricing and used as an estimate for all Clarington's wet ponds. It was determined dry ponds would likely cost 25 percent less to clean. The reduced pricing structure was used for all of Clarington's dry pond facilities.

The maintenance costs for pond cleanouts are currently budgeted through Clarington's capital works program rather than the annual operating budget due to fluctuating costs and length of time to complete. This helps Clarington save for projects that may require more than one budget year to finance and allows for unexpended funds from one cleanout to be available for the next pond cleanout. The Plan shows these activities as operating requirements, even though Clarington budgets the activity as a capital requirement.

The wet and dry pond inventory includes a backlog of ponds that require cleanouts. The significant operating requirement shows this for 2021. Once Clarington can reduce the current backlog, stormwater pond cleanouts will become financially manageable over the next ten years. Clarington is working towards completing a stormwater master maintenance plan which will help prioritize pond cleanout schedules and get the stormwater pond lifecycle event activities back on a consistent schedule.

Replacement

This asset management plan replaces stormwater ponds at the end of the asset's useful life through the capital replacement program. Storm water ponds are relatively new and are expected to have long useful lives. Clarington does not have a storm water pond scheduled for replacement until approximately 2063.

A sizable portion of the storm water management facilities' construction costs originates from excavating the original basin. It is estimated that replacement costs will be 30 percent less than those of the initial expenditure.

All storm water assets detailed lifecycle events, event costs, event impact and approximate asset age of scheduled event can be reviewed in ***Appendix 4.***

Full Lifecycle Costs

The following graphs forecast long-term operating and capital requirements for Clarington's stormwater assets. Lifecycle events in year one includes all backlogged events, and each year after that includes scheduled events at 2 percent inflation of the 2020 lifecycle event cost.

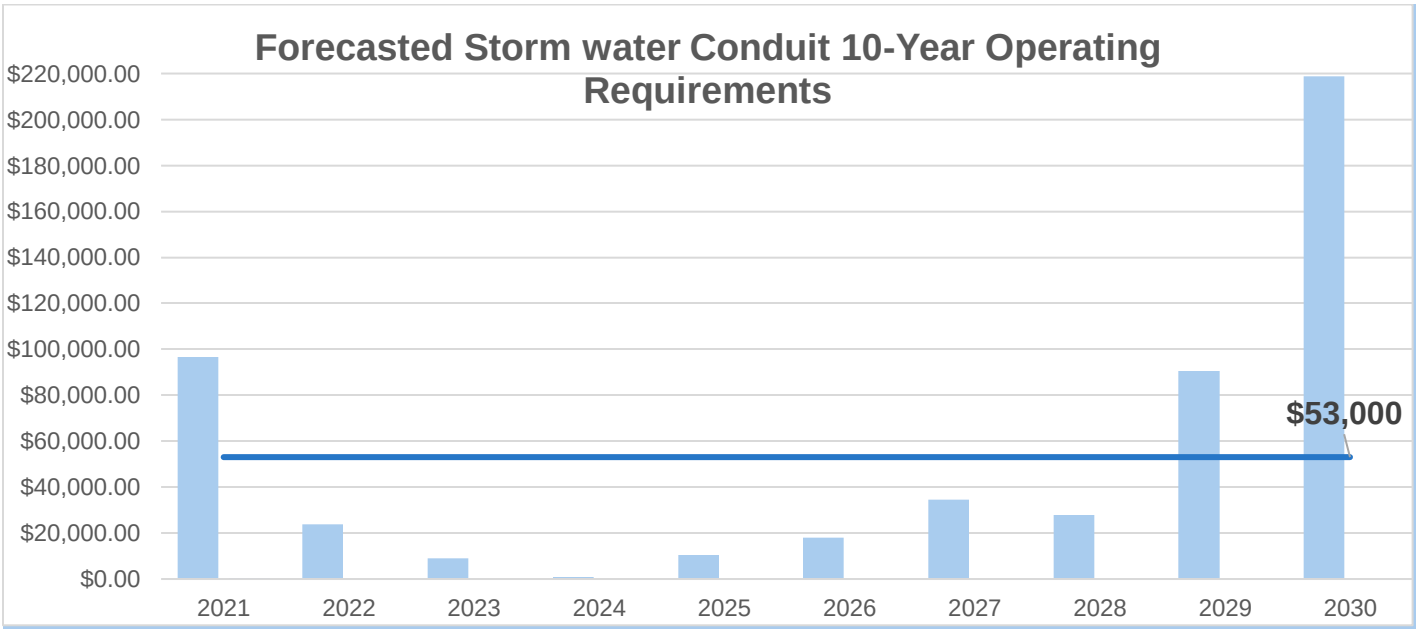


Figure 4.1: Forecasted 10-year operating requirements for conduit

- Excluding the backlog, operating requirements between 2021-2028 average $16,000.
- In the 1990s a large amount of assets were constructed and assumed. This is evident in 2029-2030, where operating requirements escalate significantly.
- To decrease the backlogged inspections and adequately account for the expanded requirements in nine to ten years, an annual operating requirement of approximately $53,000 is suggested to maintain the current level of service Clarington is providing.

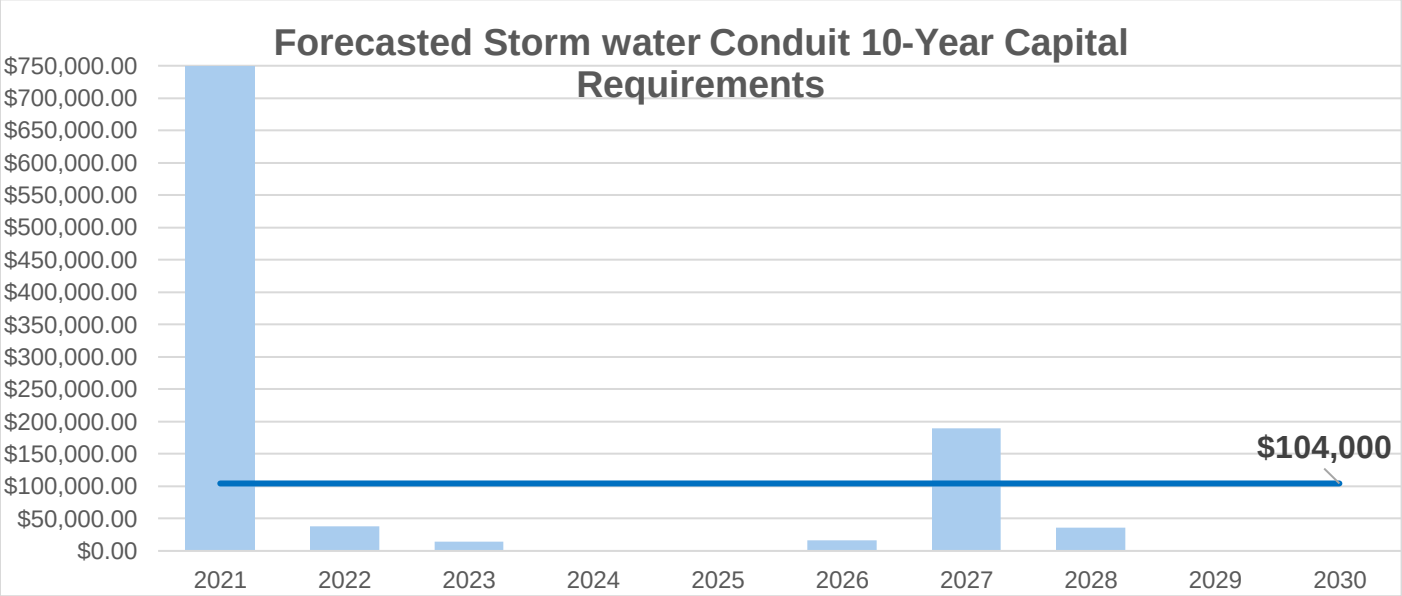


Figure 4.2: Forecasted 10-year capital requirements for conduit

- Concrete storm sewer assets are still relatively new, with an average inventory age of 22 years. The young age means very few concrete conduits will reach the end of life within ten years.
- Over the next five to ten years, the capital program will focus on replacing the end-of-life non-concrete infrastructure and urbanizing roadways that don't have the pre-existing infrastructure to service Clarington's expanding population.
- To decrease the backlog and replace all additional end-of-life assets over the next ten years, an annual capital requirement of approximately $104,000 is suggested to maintain Clarington's current level of service.
- Capital replacement requirements identified in this graph are solely the costs required to replace the existing asset. They do not include any consulting and design costs, or costs associated with digging up the roadway infrastructure. These costs are incorporated with the road network replacement requirements.

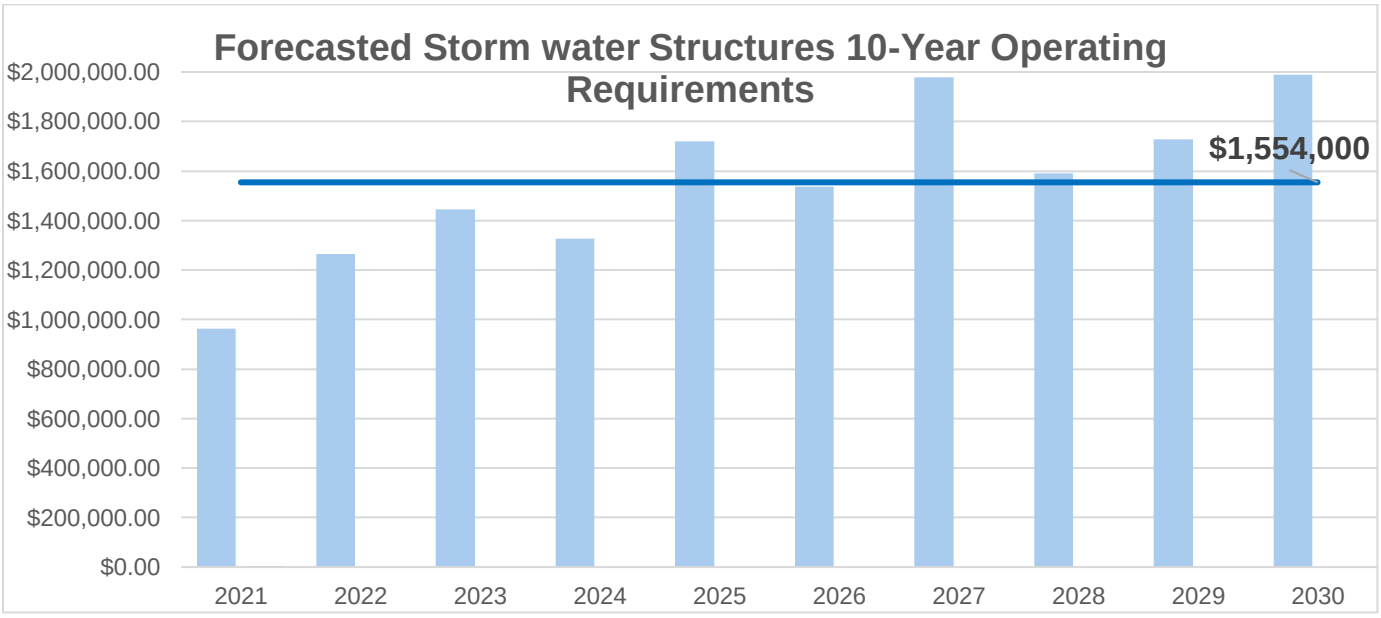


Figure 4.3: Forecasted 10-year operating requirements for structures

- New regulations for street sweeping sediment disposal come into effect in 2022, creating an estimated $650,000 annual budget increase.
- It is possible further budget increases can be expected in the ten-year plan if it is decided structures currently not being maintained with regular maintenance activities begin scheduled lifecycle events.
- To decrease backlogged maintenance and to properly account for new regulations, an annual operating requirement of approximately $1,554,000 is suggested to maintain the current level of service Clarington is providing.

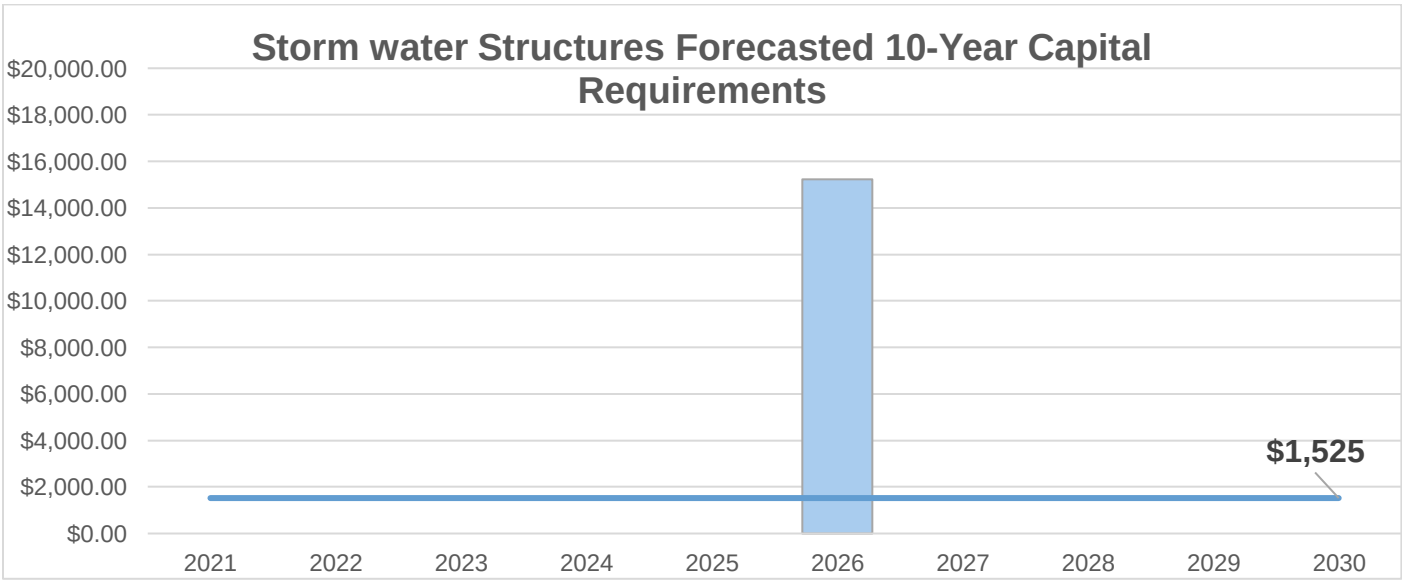


Figure 4.4: Forecasted 10-year capital requirements for structures

- Concrete storm sewer assets are still relatively new, with an average inventory age of 22 years. This relatively young age means very few structures will reach the end of life within ten years.
- Over the next five to ten years, the capital program will include replacing ageing infrastructure on roadways being reconstructed and urbanizing roadways that don't have the pre-existing infrastructure to service Clarington's expanding population.
- To replace all the end-of-life assets over the next ten years, an annual capital requirement of approximately $1,525 is suggested to maintain the current level of service Clarington is providing.
- Capital replacement requirements identified in this graph are solely the costs required to replace the existing asset. They do not include any consulting and design costs, or costs associated with digging up the roadway infrastructure. These costs are incorporated with the road network replacement requirements.

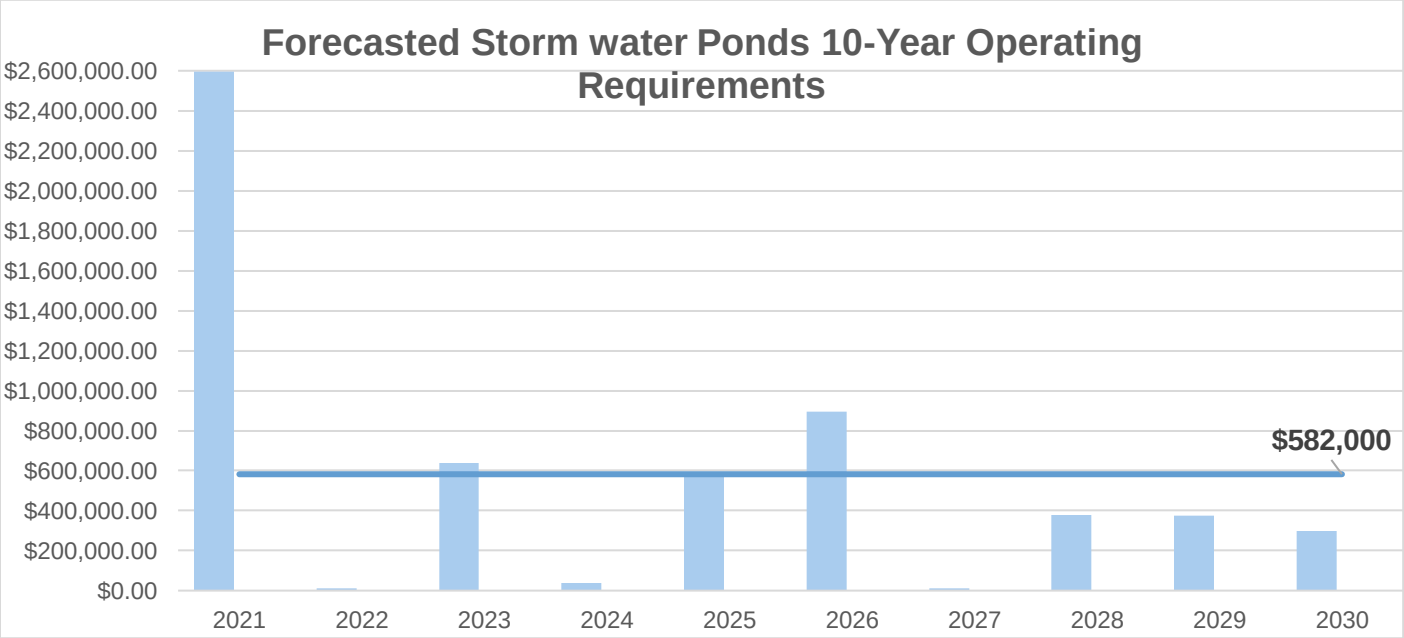


Figure 4.5: Forecasted 10-year capital operating for storm water ponds

- Excluding the backlog, operating requirements between 2021 to 2030 average $325,000 annually.
- In the early 1990s a large number of assets were constructed and assumed. This construction has led to several ponds requiring cleanouts all at once. To mitigate budget impacts, Clarington has prioritized ponds by condition and risk to work towards decreasing the backlog of cleanout events.

- To decrease the backlogged cleanouts and sediment surveys, an annual operating requirement of approximately $582,000 is suggested to provide the level of service expected from storm water management facilities.
- No capital end-of-life replacements for storm water management facilities are anticipated within the 10-year forecast.

Risks Associated with Lifecycle Options

All the lifecycle costing options reviewed and analyzed for conduits, structures and storm ponds will continue to be required for Clarington to maintain current levels of service. It is recommended that budget shortfalls be reviewed so backlogs can be addressed to avoid further deterioration of some aging infrastructure.

Stormwater infrastructure is deemed to have significant useful lives. Many of these assets are not visible to the public eye, which not only makes issues more difficult to identify it can leave certain lifecycle activities overlooked.

It is essential that Clarington follows through with its planned maintenance master plan and continues to improve inspection monitoring capabilities, scheduling of events and following through with all anticipated and required maintenance. The Municipality must ensure it maximizes the maintenance budgets allotted by Council annually.

Although there are few short-term capital replacement needs for storm sewer infrastructure, eventually, several assets will require replacement in and around the same time. Clarington should work towards future planning of these needs to mitigate infrastructure gaps and substantial increases to the capital budget over a short period.

The deterioration of stormwater infrastructure can lead to various risks if not maintained to its original functions. These risks can include the following:

- Potential liability issues
- Emergency repairs
- Non-compliance with Ministry of the Environment Certificates of approval or compliance approvals
- Reduced aids in public health
- Increased risk of flooding
- Environmental contaminations

Roads

Lifecycle Activities

Clarington's asset management plan provides detailed lifecycles for all road infrastructure managed and owned by the Corporation. Lifecycle events are

categorized into four treatment levels, prevention, restoration, rehabilitation, and replacement. Each treatment level includes events for road infrastructure to operate efficiently as possible. The lifecycle breakdown for each road type is provided in Appendix A.

Preventative Treatments

Preventative lifecycle events are processes used to decrease the amount of deterioration within a road. The preferred timing to complete these events is determined by timing and road condition assessments. There are three types of events that Clarington currently utilizes as preventative activities for roadways.

Crack sealing is the placement of a sealant material into cracks of an existing pavement surface to prevent excess water and moisture from penetrating the asphalt. This sealing is a preventative measure to keep the road from deteriorating further. Crack sealing can be done as a stand-alone treatment or in conjunction with other treatments. Crack sealing is performed on all high-class bituminous roads once the physical condition value reaches 88 percent. Once completed, this treatment maintains the current condition rating for two years.

Micro-surfacing and slurry seal is a thin layer (3/8”) applied to an existing paved surface. Two layers can also be applied. This treatment adds a tough wearing coat to the existing pavement. This treatment intends to seal and protect the existing pavement and provide a new wearing course. This treatment does not add strength to the pavement structure. Crack sealing is applied to the pavement before this event. For micro-surfacing, some of the cast-iron structures in the street will be adjusted to final grade before application if deemed necessary. Minor pothole patching and other pavement repairs are done before the application of this treatment. Micro-surfacing is performed on high-class bituminous roads once the physical condition value reaches 77 percent. Once completed, this treatment maintains the current condition rating for three years.

Restorative Treatments

The focus of these events is to provide corrective processes that improve the current quality of the road to a predetermined rating.

Mill and overlay treatment removes the deteriorating wearing surface and leaves the substructure intact. The existing pavement has 0.5 to 2 inches of the surface ground off. All of the cast iron structures (manholes, catch basins water and gas gates) will be reset to meet the new pavement elevation. A bonding agent is sprayed on the pavement, and approximately 1.5 to 2 inches of new pavement is installed. All of the cast-iron structures are adjusted to the final grade before application. Minor pothole patching and other pavement repairs are done before this treatment. This treatment adds strength to the road surface. This process is performed on high-class bituminous

roads once the physical condition value reaches 64 percent. Once the mill and overlay are completed the condition rating increases by 27 condition points.

Rehabilitative Treatment

Rehabilitative treatments are processes that improve the road to like-new conditions. These treatments are planned principally by road condition, although other factors such as roadside environment, traffic requirements, and age can be additional decision factors. Major rehabilitation procedures are planned for all high-bituminous class roads when the condition rating reaches 46. This treatment replaces the entire wearing surface and returns the surface's physical condition to 100.

Reconstruction / Replacement

This treatment is intended for a roadway that has outlived its useful life. Reconstruction/replacement is considered to be the most aggressive resurfacing treatment. The entire pavement structure is completely pulverized to a depth of 14” to 20”. Most of the pulverized material is reused as a sub-base for asphalt paving. Additional material may be required to be blended in the sub-base to meet specifications. After the sub-base is installed, a minimum of 4” of asphalt is installed in multiple layers.

Lifecycle Events Per Road Type

Due to the wide range of road types that are found in our community, different lifecycle maps are providing the events for each road type.

Road Class HCB-1 AADT > 20,000 (assume 10% commercial), assumes 210mm asphalt				
Lifecycle Event	**Cost per lane km**	**"Physical Condition" Rating**	**Effect**	**Approx. Lifecycle Year**
Crack Sealing	$ 2,419	88	Holds condition for 2 years	4
Micro Surfacing	34,297	77	Holds condition for 3 years	9
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	15
Crack Sealing	2,419	88	Holds condition for 2 years	16
Micro Surfacing	34,297	77	Holds condition for 3 years	21
Rural Overlay 2 Lifts / Major Urban Rehab	892,235	46	Increase Physical Condition to 100	33
Crack Sealing	2,419	88	Holds condition for 2 years	37
Micro Surfacing	34,297	77	Holds condition for 3 years	42
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	48
Crack Sealing	2,419	88	Holds condition for 2 years	49
Micro Surfacing	34,297	77	Holds condition for 3 years	54
Rural Overlay 2 Lifts / Major Urban Rehab	892,235	46	Increase Physical Condition to 100	66
Crack Sealing	2,419	88	Holds condition for 2 years	67
Micro Surfacing	34,297	77	Holds condition for 3 years	72
Full Reconstruction	2,507,462	33	Increase PCI to 100	89

Figure 4.6: Lifecycle events for road class HCB-1

Road Class HCB-2 AADT > 10,000 < 20,000 (assume 10% commercial), assumes 170mm asphalt				
Lifecycle Event	**Cost per lane km**	**"Physical Condition " Rating**	**Effect**	**Approx. Lifecycle Year**
Crack Sealing	$ 2,419	88	Holds condition for 2 years	5
Micro Surfacing	34,297	77	Holds condition for 3 years	10
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	17
Crack Sealing	2,419	88	Holds condition for 2 years	18
Micro Surfacing	34,297	77	Holds condition for 3 years	23
Rural Overlay 2 Lifts / Major Urban Rehab	892,235	46	Increase Physical Condition to 100	37
Crack Sealing	2,419	88	Holds condition for 2 years	42
Micro Surfacing	34,297	77	Holds condition for 3 years	47
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	54
Crack Sealing	2,419	88	Holds condition for 2 years	55
Micro Surfacing	34,297	77	Holds condition for 3 years	60
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	67
Crack Sealing	2,419	88	Holds condition for 2 years	68
Micro Surfacing	34,297	77	Holds condition for 3 years	73
Full Reconstruction	2,507,462	33	Increase PCI to 100	89

Figure 4.7: Lifecycle events for road class HCB-2

Road Class HCB-3

AADT > 1,000 < 10,000 (assume 10% commercial), assumes 130mm asphalt

Lifecycle Event	Cost/lane-km	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Crack Sealing	$ 2,419	88	Holds condition for 2 years	7
Micro Surfacing	34,297	77	Holds condition for 3 years	13
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	21
Crack Sealing	2,419	88	Holds condition for 2 years	22
Micro Surfacing	34,297	77	Holds condition for 3 years	28
Rural Overlay 2 Lifts / Major Urban Rehab	892,235	46	Increase Physical Condition to 100	43
Crack Sealing	2,419	88	Holds condition for 2 years	50
Micro Surfacing	34,297	77	Holds condition for 3 years	56
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	64
Crack Sealing	2,419	88	Holds condition for 2 years	65
Micro Surfacing	34,297	77	Holds condition for 3 years	71
Full Reconstruction	2,507,462	33	Increase PCI to 100	94

Figure 4.8: Lifecycle events for road class HCB-3

Road Class HCB-4

AADT < 1,000 (assume 5% commercial), assumes 90mm asphalt

Lifecycle Event	Cost/lane-km	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Crack Sealing	$ 2,419	88	Holds condition for 2 years	11
Single Coat Slurry Seal	24,872	77	Holds condition for 3 years	18
Rural Overlay / Grind Urban Overlay	529,934	64	Increase Physical Condition by 27	26
Crack Sealing	2,419	88	Holds condition for 2 years	28
Single Coat Slurry Seal	24,872	77	Holds condition for 3 years	35
Rural Overlay 2 Lifts / Major Urban Rehab	892,235	46	Increase Physical Condition to 100	50
Crack Sealing	2,419	88	Holds condition for 2 years	61
Single Coat Slurry Seal	24,872	77	Holds condition for 3 years	68
Full Reconstruction	2,507,462	31	Increase PCI to 100	89

Figure 4.9: Lifecycle events for road class HCB-4

Road Class LCB AADT = All				
Lifecycle Event	**Cost/lane-km**	**"Physical Condition" Rating**	**Effect**	**Approx. Lifecycle Year**
Slurry Seal Surface Treatment	$11,025	97	Extend the Useful life by 5 years	1
Double Surface Treatment Resurfacing	42,000	20	Increase Physical Condition to 100	15
Slurry Seal Surface Treatment	11,025	97	Extend the Useful life by 5 years	16
Double Surface Treatment Resurfacing	42,000	20	Increase Physical Condition to 100	30
Slurry Seal Surface Treatment	11,025	97	Extend the Useful life by 5 years	31
Double Surface Treatment Resurfacing	42,000	20	Increase Physical Condition to 100	45

Figure 4.10: Lifecycle events for road class LCB

Full Lifecycle Costs

The average annual operating investment required to meet the forecasted costs over the next ten years is $1.21 million. The costs in this chart are solely based on road pavement preservation requirements and do not include costs that are not directly associated with the lifecycle events of Clarington's paved road infrastructure. Costs included in these events include crack sealing and slurry seal.

Roads Network 10 Year Financial Requirement

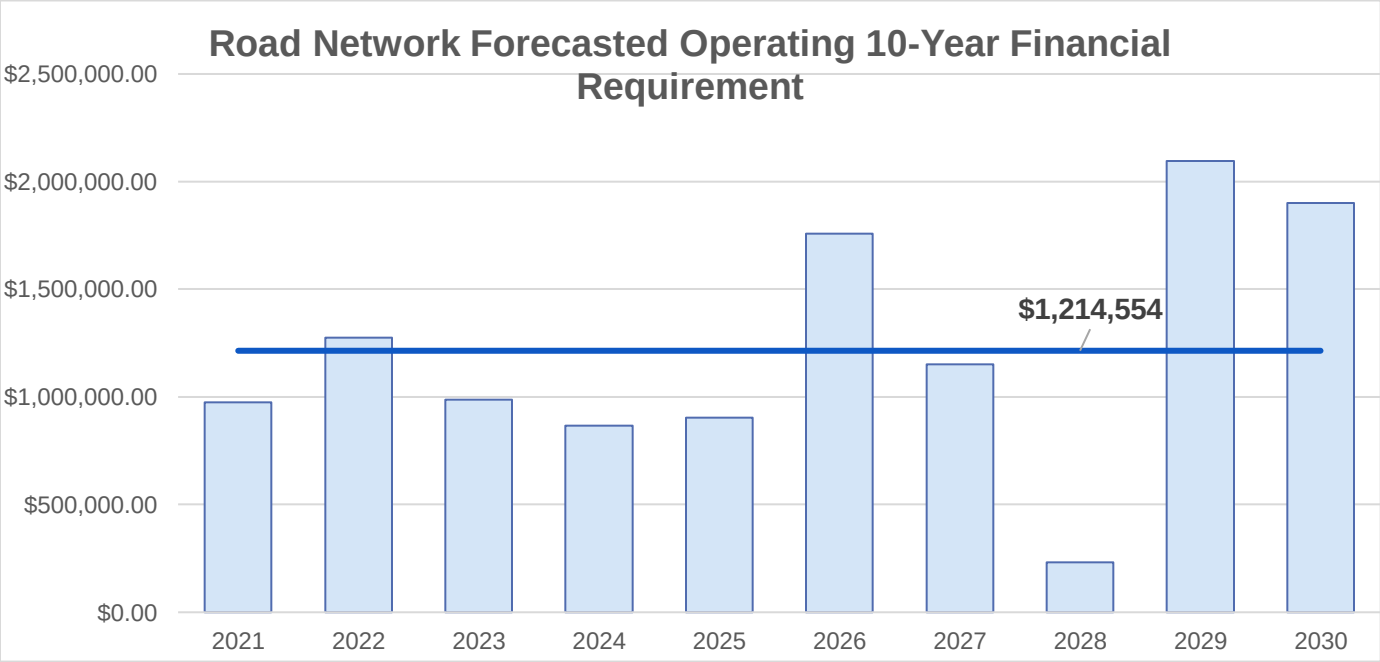


Figure 4.11: Road Network 10 Year Operating Financial Requirements

The ten-year estimated capital investment required for road infrastructure. The average annual capital investment required to meet the forecasted costs is $21.24 million. Our CityWide asset management software has provided the capital requirement estimates following the condition assessments provided from the 2019 Roads Statement of Infrastructure. Costs in the capital forecast estimate include restorative, rehabilitative and replacement road segment projections.

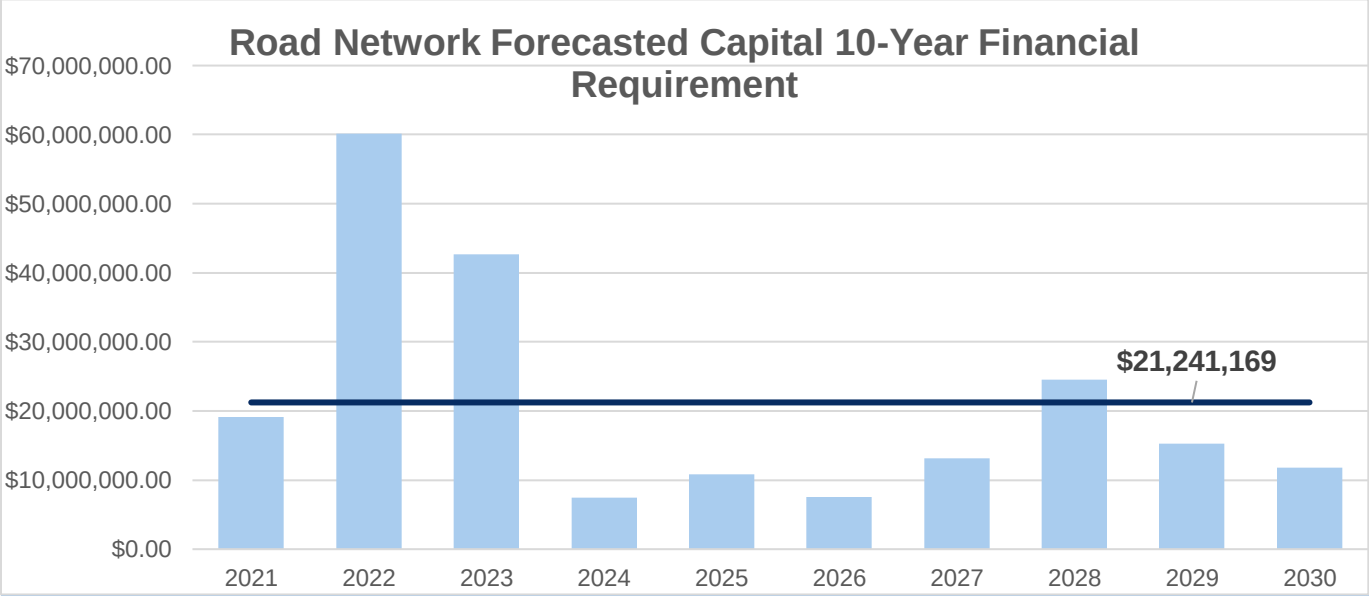


Figure 4.12: Road Network 10 Year Operating Financial Requirements

Risks Associated with Lifecycle Options

Clarington completes road assessments every two years as part of a statement of infrastructure evaluation to ensure that road conditions and performance are adequate. This process ensures that roads requiring improvements at earlier intervals can be adjusted. To mitigate risk of failure within Clarington's road network, it is essential to ensure scheduled treatments are completed at their required intervals. If treatments are delayed or removed, this will substantially increase the pavement deterioration, increasing the required work and costs of projects. In addition to the increased cost, the inherent risk of road failure will see a drastic elevation. In cases when preventative treatments are removed, the life expectancy of a road will decrease rapidly. This will cause the requirement of substantial rehabilitation or reconstruction projects and will bring increased investment in road infrastructure earlier than planned.

The deterioration of road infrastructure can lead to various risks if not maintained to its original functions. These risks can include the following:

- Increase in liability issues
- Emergency repairs
- Non-compliance with Ministry of Transportation Standards
- Reduced aids in public health
- Decreased safety for road users

Clarington will strive towards future planning of these needs to mitigate infrastructure gaps and substantial increases to the capital budget at one time. The Municipality of Clarington is also committed to best practices in asset management and sustainability for road infrastructure.

The projected investment requirements contain the lifecycle events that are essential for the current level of service to be maintained. These lifecycle events are detrimental to the quality of the road network. They are instituted at specific lifecycle points to ensure the lowest costs are achieved while meeting the current service quality. In cases when planned treatments are removed, there will be long-range implications with regard to future budget requirements. Roadways will require substantially increased preservation activities at elevated lifecycle timeframes, causing more significant strain on future budgets. Completing lifecycle events at the estimated timeframe will minimize pavement preservation costs and continue to maintain the current service level provided for our road network.

Bridges & Culverts

Lifecycle Activities

Bridges and culverts undergo regular asset management activities to ensure the assets perform at desired service levels while managing risk at the lowest lifecycle cost. Lifecycle activities include maintenance and other interventions undertaken to sustain asset integrity and service levels and occur over the life of an asset. Over time, these costs can outweigh the initial cost of the asset. The lifecycle management strategy helps plan these maintenance costs over a forecast period.

Age alone is not an accurate indicator of an asset's position in its lifecycle. Bridge and culvert maintenance requirements, rehabilitation and replacements are generally based on observed condition and age along with the inspection recommendations. Condition assessments play a key role in lifecycle analysis. Assets will deteriorate faster or slower than expected depending on whether the asset is maintained. The condition assessment information provides a more accurate indication of lifecycle needs. From an asset management perspective, maintenance solutions include regularly scheduled costs to inspect or maintain assets.

Lifecycle costing for bridges and culverts is comprised of the following costs over an asset's useful life:

- Acquisition or Construction
- Maintenance and Inspections
- Rehabilitation
- Replacement or Removal

Inspections

Every year GHD submits an Inventory and Inspection report relating to half of the bridge and culverts within the Municipality of Clarington. Structures are reviewed in accordance with the Municipal Bridge Appraisal Manual and Municipal Culvert Appraisal Manual. The GHD annual inspection reports update a ten-year forecast for recommended maintenance, rehabilitation, and replacement of our structures. The annual recommendations are based on several factors such as budget, traffic, condition, detour length, surrounding projects etc. The GHD Municipal Structure Inventory and Inspection Report includes lifecycle costing, the total value required to maintain the current level of service and a recommended annual budget.

Minor Rehabilitation & Repairs

Bridges and culverts can be maintained by performing minor rehabilitation when required. Examples of minor rehabilitation works typically include the replacement of bridge bearings, resurfacing, replacement of waterproofing, concrete sealing, patching, replacement of expansion joints, curb repairs, sidewalk repairs, replacement of handrails and restoration of embankments.

Major Rehabilitation & Repairs

Bridges and culverts can be maintained by performing major rehabilitation when required. Major rehabilitations typically involve more extensive work such as concrete overlays on decks or deck replacements, replacement of bridge barriers, resurfacing of substructure components, recoating structural steel, installation of beams, and construction of new walls.

Replacement or Removal

There are circumstances when the most cost-effective option is to replace or remove the asset. This happens when the asset no longer benefits from the repair or rehab performed, and the frequency of failures and associated risks increase to an unacceptable level. On occasion, bridges or culverts may be removed and disposed of. Disposal costs should be considered in the lifecycle costs for these circumstances.

The table below outlines the # of bridge and culvert assets that require repair, rehabilitation, removal, or replacement.

Rehabilitation Required	Number of Assets
Bridge Major Rehabilitation	9
Bridge Minor Repair	61
Bridge Removal	1
Bridge Replacement	4
Culvert Minor Repair	58
Culvert Replacement	34

Figure 4.13: Number of assets requiring rehabilitation

Bridges and culverts must be inspected, and that preventative maintenance should be performed to ensure assets are performing at desired service levels and to identify existing problems before failure occurs.

The table below shows the value of required repair, rehabilitation, replacement, or removal amount by type.

Improvement Desc	Bridge	Culvert	Pedestrian Bridge	Grand Total
Bridge Major Rehab	$2,813,000	$0	$0	$2,813,000
Bridge Minor Repair	3,695,000	0	190,000	3,885,000
Bridge Removal	155,000	0	0	155,000
Bridge Replacement	2,881,000	0	0	2,881,000
Culvert Major Rehab	0	0	0	0
Culvert Minor Repair	0	3,253,000	0	3,253,000
Culvert Replacement	0	12,762,000	0	12,762,000
Total	$9,544,000	$16,015,000	$190,000	$25,749,000

Figure 4.14: Estimated cost of maintenance

Bridges and Culverts can be restored to the desired condition and an acceptable service level. As a result, their useful life can be extended through planned rehabilitation actions. This is often more cost-effective than letting an asset reach its end of life. It is essential to consider whether it is more economical to repair or replace the asset, given the expected frequency of future repairs.

Preventative maintenance is significant in planning to optimize the use of available resources and increase the asset's lifespan and reliability. Maintenance is scheduled on an as-needed basis due to the biannual inspections. Suspected performance deficiencies include pedestrian/vehicular hazards, rough-riding surface, undermining of foundation, continuing movements, load-carrying capacity and unstable embankments.

Full Lifecycle Costs

The estimated financial requirements are based on the GHD inspection recommendations and include the cost to complete all associated rehabilitation, repair, replacement, and removal costs. The graphs identify an annual average that should be allocated to each asset type over the next ten-years to fulfill current lifecycle requirements and maintain the level of service currently being provided.

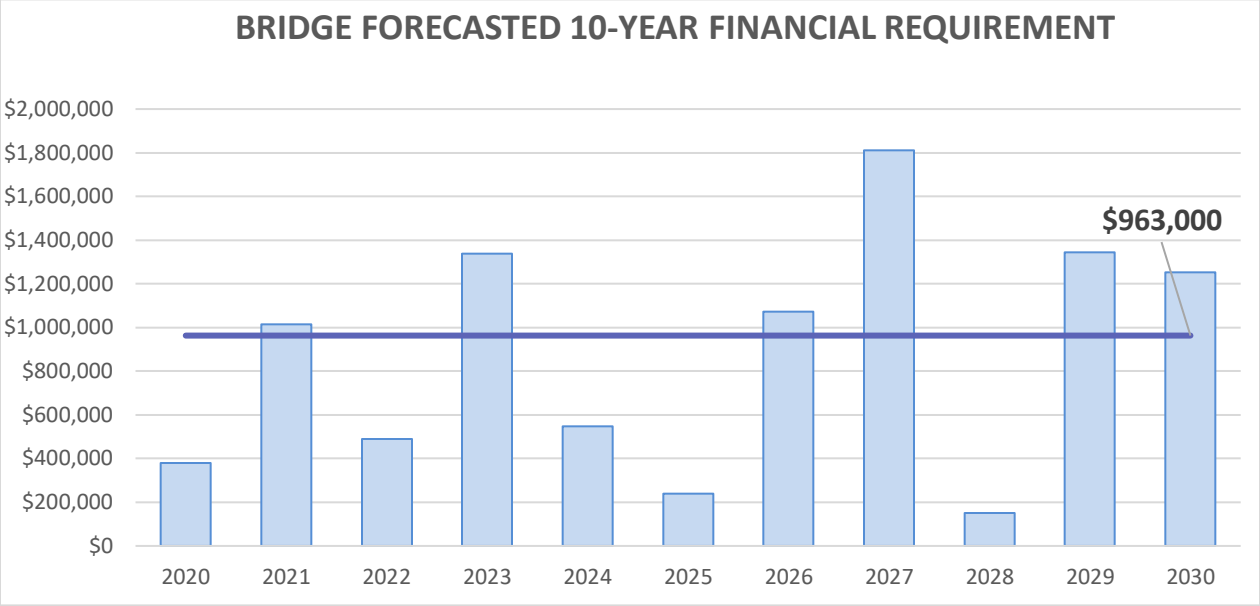


Figure 4.15: 10-year forecast for bridge requirements

For Bridge assets, the average amount to be allocated per year to fund the forecasted lifecycle costs for the next ten years totals $963,000.

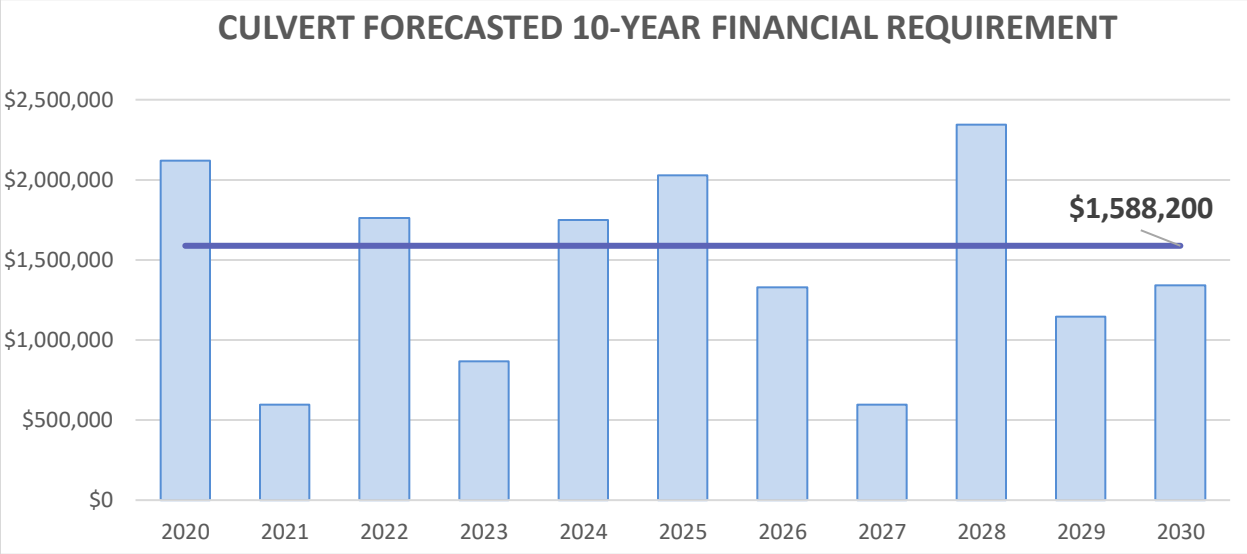


Figure 4.16: 10-year forecast for culvert requirements

For Culvert assets, the average amount to be allocated per year to fund the forecasted lifecycle costs for the next ten years totals $1,588,200.

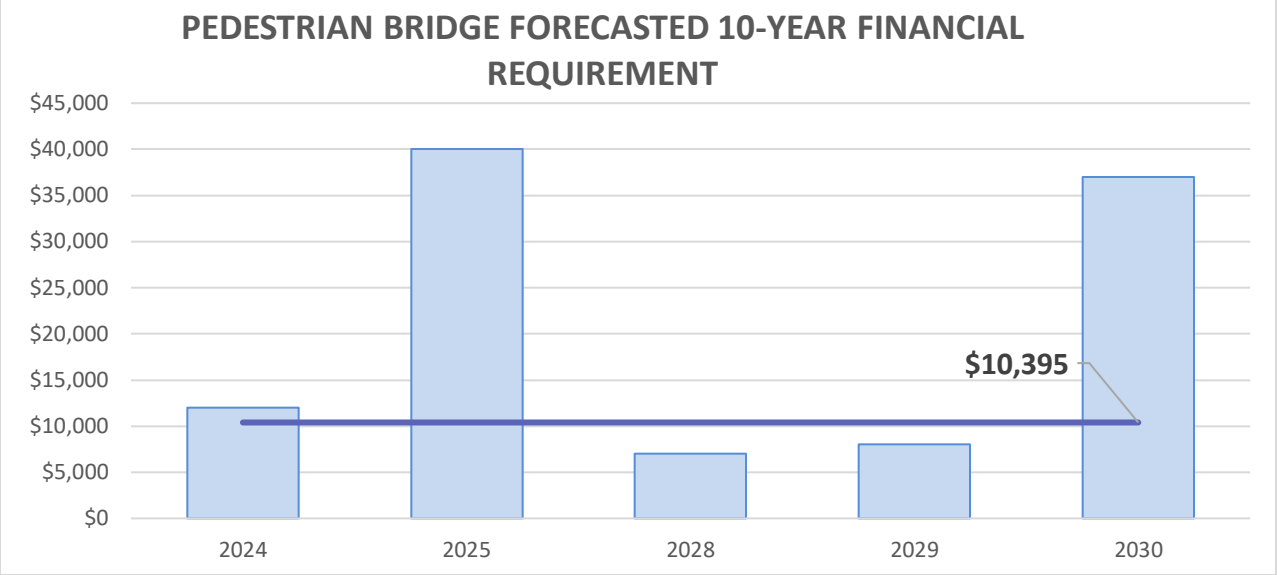


Figure 4.16: 10-year forecast for pedestrian bridge requirements

For Pedestrian bridge assets, the average amount to be allocated per year to fund the forecasted lifecycle costs for the next ten years totals $10,395.

The table below provides the rehab and maintenance costs per square metre for bridges.

ASSET TYPE	TOTAL AREA
Bridges	13,149.81

YEAR	REHAB / MAINT	$ Cost per Square Metre
2021	$ 919,000	$69.89
2022	490,000	37.26
2023	1,338,000	101.75
2024	560,000	42.59
2025	279,000	21.22
2026	1,071,000	81.45
2027	1,810,000	137.64
2028	159,000	12.09
2029	1,353,000	102.89
2030	1,290,000	98.10

Figure 4.17: Rehab and maintenance costs per square metre - Bridges

The table below provides the rehabilitation and maintenance costs per square metre for culverts.

ASSET TYPE	TOTAL AREA
Culverts	8,917.63

YEAR	REHAB / MAINT	COST/M2
2021	$ 583,000	$ 65.38
2022	1,762,000	197.59
2023	851,000	95.43
2024	1,502,000	168.43
2025	1,468,000	164.62
2026	1,017,000	114.04
2027	493,000	55.28
2028	2,296,000	257.47
2029	1,106,000	124.02
2030	936,000	104.96

Figure 4.18: Rehab and maintenance costs per square metre - Culverts

The table below provides the rehab and maintenance costs per square metre for pedestrian bridges.

ASSET TYPE	TOTAL AREA
Pedestrian Bridges	704.08

YEAR	REHAB / MAINT	COST/M2
2021	$0.00	$0.00
2022	$0.00	$0.00
2023	$0.00	$0.00
2024	$12,000	$17.04
2025	$40,000	$56.81
2026	$0.00	$0.00
2027	$0.00	$0.00
2028	$7,000	$9.94
2029	$8,000	$11.36
2030	$37,000	$52.55

Figure 4.19: Rehab and maintenance costs per square metre – Pedestrian Bridges

The table below provides an outline of the lifecycle costs by asset type

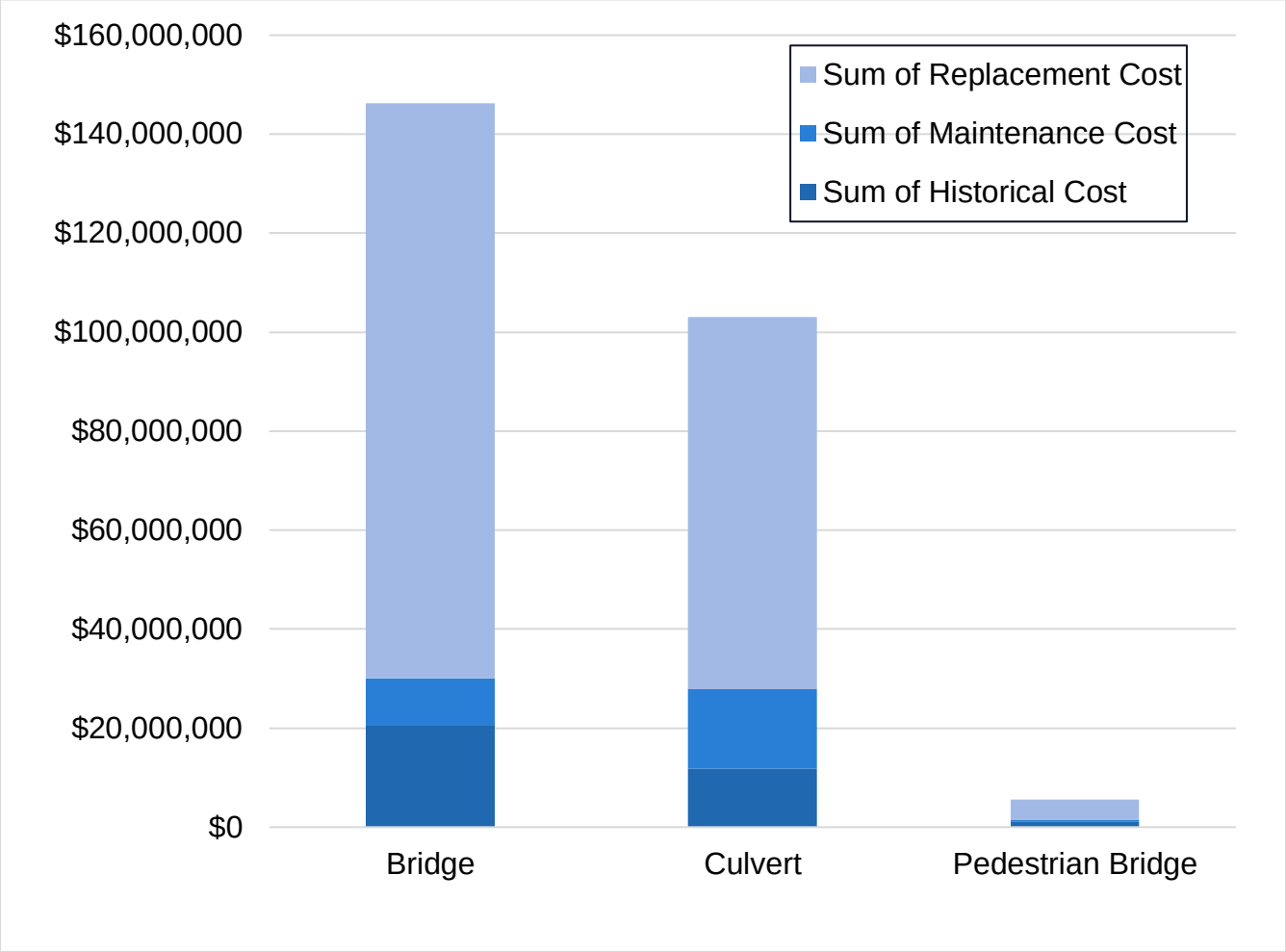


Figure 4.20: Lifecycle costs by asset type

Table 6 below outlines the expected increase in service needs attributable to anticipated development.

Increased Service Needs Attributable to Anticipated Development 2020-2031 Road	Project Types	Structure Works	Timing (year)	Gross Capital Cost Estimate (2020)	Benefit to Existing Development	Total	Potential D.C. Recoverable Cost	
							Residential Share 83%	Non-Residential Share 17%
Bridge Structure Works								
Longworth Ave. Structure at Brookhill	Bridge Structure Works	1,213,228	2022	1,213,228	-	1,213,228	1,006,979	206,249
Baseline Rd.		1,108,501	2023	1,108,501	-	1,108,501	920,056	188,445
Lambs Rd.		1,108,501	2023	1,108,501	-	1,108,501	920,056	188,445
Grady Dr. Structure (and Road Link)	Bridge Structure Works	2,196,527	2024	2,987,454	-	2,987,454	2,479,587	507,867
Lambs Rd. Grade Seperation	Bridge Structure Works	15,006,547	2030	15,006,547	-	15,006,547	12,455,434	2,551,113
Bennett Rd.		1,108,501	2031	1,108,501	-	1,108,501	920,056	188,445
Culvert Works					-	-	-	-
Hancock Rd. Box Culvert (99077)	Culvert Works	987,600	2022	1,012,600	679,000	333,600	276,888	56,712
Lambs Rd. Box Culvert (99069)	Culvert Works	260,049	2023	285,049	-	285,049	236,591	48,458
Baseline Rd. Culvert (99065)	Culvert Works	260,049	2027	285,049	-	285,049	236,591	48,458
Baseline Road Culvert (99063)	Culvert Works	260,049	2028	285,049	-	285,049	236,591	48,458
Baseline Rd. Culvert (99055)	Culvert Works	260,049	2028	285,049	-	285,049	236,591	48,458
Baseline Rd. Culvert (99057)	Culvert Works	260,049	2029	285,049	-	285,049	236,591	48,458

Figure 4.21: Increased service needs attributable to the anticipated development

Risks Associated with Lifecycle Options

Risk consideration may be mitigated by adhering to Provincial Minimum Maintenance Standards and accepted design/specification guidelines, such as the Canadian Highway Bridge Design Code, Ontario Provincial Standard Designs/Specifications and Transportation Association of Canada guidelines. The Municipality is also committed to implementing best practices in asset management and sustainability. A risk management strategy is followed to ensure the assets can provide and function at an optimal service level.

The likelihood of failure relates to the current condition state of each asset, whether they are in excellent, good, fair, poor or critical condition, as this is a good indicator regarding their future risk of failure. The consequence of failure relates to the magnitude, or overall effect that an asset's failure will cause. For instance, a small culvert on a low-traffic road may cause a few customers to have no access for a period, whereby a large bridge on a major urban road could have disastrous effects.

Factors included when examining the risk of bridge failure include:

- Safety
- Overall structure condition and age
- Natural Hazards and factors relating to Climate Change (wind, snow, ice, flooding, earthquakes)

- Traffic growth and future development
- Funding available

The potential impact of various risk factors include:

- Bridges and culverts deteriorate further
- The condition of the overall asset portfolio decreases
- Bridges and culverts deteriorate beyond a condition where rehabilitation is a viable option
- Backlog of work increases
- More costly treatments and replacements are required
- Structures are closed
- Inability to complete all planned projects with allotted budget levels

The Municipality maintains lifecycle strategies that are applied to the assets outlined in this asset management plan that maintains the current level of service while lowering the lifecycle costs. Maintained lifecycle strategies help identify and forecast which lifecycle activities are needed to maintain the current level of service while considering the associated risk and costs. These strategies are applied over the asset's lifecycle at various lifecycle stages such as planning and design, construction, operations, maintenance, repair, rehabilitation, and replacement. Following outlined lifecycle strategies will ensure the quality and effectiveness of our assets, reduce the risk of failure, and will minimize costs

Growth Impact of Asset Management

Clarington

Growth Impact of Asset Management

Clarington's Official Plan (2018)

In 1996, the Municipality of Clarington Official Plan was adopted by Council as approved by Council of the Regional Municipality of Durham. The Official Plan lays the "foundation" for building a good community. As a foundation, it provides a vision of the Municipality, identifies how the vision can be reached, and establishes a monitoring program for checking progress and making necessary adjustments. The last consolidation of the plan was in June 2018.

The vision of the plan can be translated into the following set of guiding principles for Clarington's future growth and development:

- A place where each community can build on its individual character, share a common economic base and a distinct collective image
- A place for people to live, work and play in a safe, vibrant, healthy and prosperous environment
- A place where people, businesses and governments collectively balance growth with the protection, management and enhancement of rural landscapes, cultural heritage, natural resources, and the natural environment
- A place where the built environment emphasizes high quality design and integrates nature in the design process.

The priority intensification areas identified as the primary locations to accommodate growth and the greatest mix of uses, heights and densities include:

- Urban and village centers
- Regional and local corridors
- Courtice and Bowmanville transportation hubs
- Port Darlington and Port of Newcastle waterfront places

The 2018 edition of Clarington's Official Plan included nine secondary plans. These secondary plans include detailed policies and land use designations to guide development or redevelopment. The nine secondary plans included are as follows.

- Bowmanville East Town Centre
- Bowmanville West Town Centre
- Courtice Main Street2
- Newcastle Village Centre
- Port Darlington Neighbourhood
- South-West Courtice
- Clarington Energy Business Park
- Brookhill Neighbourhood
- Clarington Technology Business Park

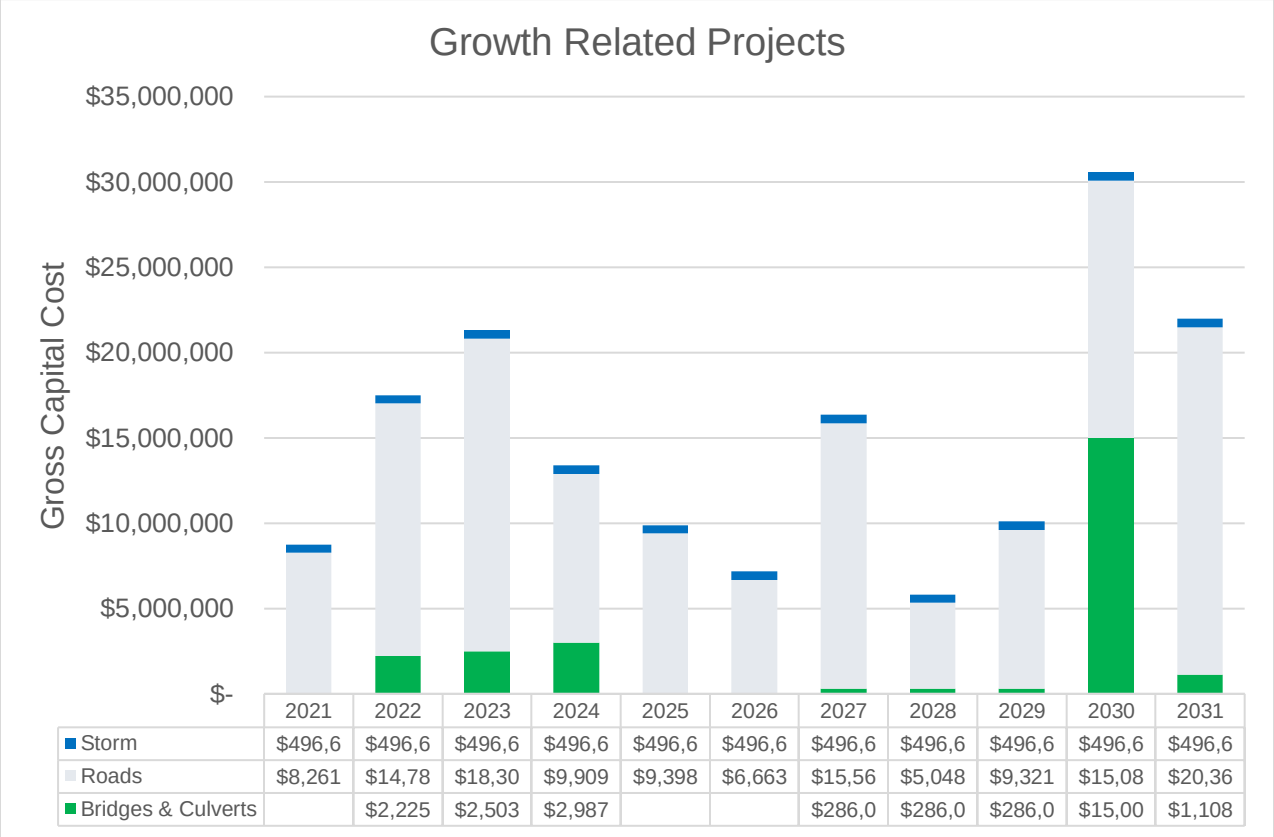
Development Charges Study (2020)

Under the Development Charges Act, municipalities are required to carry out a Development Charge (DC) Study before implementing fees. A DC Study looks at future population growth within a community and the infrastructure necessary to support this growth. When a building permit is obtained, this information is used to calculate development charge fees applied on a per-unit residential growth or per square metre non-residential growth. The Municipality of Clarington engaged the services of Watson and Associates Economists Ltd. to prepare 2020 DC study and update the Municipality's existing DC By-law in January 2021.

Growth is a critical infrastructure demand driver for most infrastructure services. As such, the Municipality must not only account for the lifecycle cost for its existing asset portfolio but those of any anticipated and forecasted capital projects associated specifically with growth. Clarington has experienced rapid population growth, and its infrastructure investments reflect this trend.

Clarington's 2020 Development Charges Background Study can be found at https://www.clarington.net/en/business-and-development/Development-Charges.aspx

The study provides detailed listings of capital investment requirements and projects for the next ten years. A summation of estimated growth capital investment is depicted in the chart below.



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Storm	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6	$496,6
Roads	$8,261	$14,78	$18,30	$9,909	$9,398	$6,663	$15,56	$5,048	$9,321	$15,08	$20,36
Bridges & Culverts		$2,225	$2,503	$2,987			$286,0	$286,0	$286,0	$15,00	$1,108

The gross capital costs included in the ten-year forecast represent both development charge funding along with municipal funds. Much of the growth capital investment will be funded from the collection of development charge revenue.

Appendices

Appendices

Appendix 1: Storm Water 10-year Replacement Forecast

As the following table indicates, there are no end-of-life replacements after the year 2028. This isn't an error but rather a transition period from when Clarington used clay as CSP assets to when the municipality started using concrete. Concrete assets have a much longer useful life.

Asset	Asset Description	Asset Type	Event Date	Event Cost
41428 - B21-075	Alexander Blvd.	Conduit	2021	$ 3,891
45204 - B21-081	Alexander Blvd.	Conduit	2021	4,120
45205 - B21-077	Alexander Blvd.	Conduit	2021	12,382
45206 - B21-079	Alexander Blvd.	Conduit	2021	14,665
41401 - H05-003	Elgin Lane	Conduit	2021	12,682
41402 - H05-005	Elgin Lane	Conduit	2021	24,835
41474 - B17-001	Hobbs Dr. - Easement	Conduit	2021	58,679
41450 - B09-001	King St. W - Easement	Conduit	2021	4,835
41414 - B20-109	Lambert St. N	Conduit	2021	8,698
41415 - B20-111	Lambert St. N	Conduit	2021	2,761
41447 - O04-003	Main St.	Conduit	2021	20,440
41446 - O04-001	Main St. - Easement	Conduit	2021	2,199
41448 - O04-005	Main St. - Easement	Conduit	2021	6,894
41384 - B16-017	Orchard View Blvd	Conduit	2021	22,352
41405 - B16-015	Orchard View Blvd	Conduit	2021	19,935

Asset	Asset Description	Asset Type	Event Date	Event Cost
45207 - B14-095	Parkway Cres.	Conduit	2021	22,110
45208 - B14-097	Parkway Cres.	Conduit	2021	22,783
45209 - B14-105	Parkway Cres.	Conduit	2021	34,900
41389 - H05-009	Perry Ave.	Conduit	2021	25,159
41390 - H05-007	Perry Ave.	Conduit	2021	9,103
41392 - H05-011	Perry Ave.	Conduit	2021	25,773
41437 - B16-001	Simpson Ave.	Conduit	2021	36,521
41439 - B16-007	Simpson Ave.	Conduit	2021	59,151
41441 - B16-019	Simpson Ave.	Conduit	2021	42,178
41395 - B73-001	Simpson Ave.	Conduit	2021	23,380
41440 - B73-003	Simpson Ave.	Conduit	2021	8,809
41406 - B16-013	Southway Dr.	Conduit	2021	13,354
41407 - B14-041	Southway Dr.	Conduit	2021	24,549
41409 - B16-011	Southway Dr.	Conduit	2021	3,534
41410 - B14-039	Southway Dr.	Conduit	2021	14,829
41411 - B16-009	Southway Dr.	Conduit	2021	15,319
41417 - B14-035	Southway Dr.	Conduit	2021	29,952
41418 - B16-005	Southway Dr.	Conduit	2021	3,141
41419 - B14-037	Southway Dr.	Conduit	2021	4,910
41424 - B53-125	Sunset Rd.	Conduit	2021	45,263
41425 - B25-011	Third St.	Conduit	2021	6,585
41426 - B25-009	Third St.	Conduit	2021	12,140

Asset	Asset Description	Asset Type	Event Date	Event Cost
41427 - B25-007	Third St.	Conduit	2021	13,372
41429 - B25-005	Third St.	Conduit	2021	24,483
41431 - B25-003	Third St.	Conduit	2021	8,846
41458 - B04-001	Scugog St. - Easement	Conduit	2022	38,138
41397 - B07-013	King St. W - Easement	Conduit	2023	3,697
41461 - B07-003	Roenigk Dr.	Conduit	2023	1,458
41462 - B07-001	Roenigk Dr. - Easement	Conduit	2023	8,844
41463 - O07-003	Sommerville Dr. - Easement	Conduit	2026	10,678
41465 - O07-001	Sommerville Dr. - Easement	Conduit	2026	5,589
49601 - B21-075	Alexander Blvd.	Maintenance Hole	2026	2,177
49602 - B21-077	Alexander Blvd.	Maintenance Hole	2026	2,177
49603 - B21-079	Alexander Blvd	Maintenance Hole	2026	2,177
49604 - B21-081	Alexander Blvd.	Maintenance Hole	2026	2,177
59655 - CB-4607	Alexander Blvd	Catch Basin	2026	2,177
59656 - CB-4606	Alexander Blvd	Catch Basin	2026	2,177
59657 - CB-4605	Alexander Blvd	Catch Basin	2026	2,177
41391 - B35-015	Baseline Rd.	Conduit	2027	24,187
41436 - B35-011	Baseline Rd.	Conduit	2027	18,624
41438 - B35-013	Baseline Rd.	Conduit	2027	35,158
41444 - B35-009	Baseline Rd.	Conduit	2027	12,185
41445 - B35-007	Baseline Rd.	Conduit	2027	39,307
41454 - B35-005	Baseline Rd.	Conduit	2027	25,783

Asset	Asset Description	Asset Type	Event Date	Event Cost
41472 - B35-001	Baseline Rd.	Conduit	2027	3,628
41381 - C41-001	Nash Rd.	Conduit	2027	4,319
41394 - C42-003	Nash Rd.	Conduit	2027	2,419
41396 - C42-001	Nash Rd.	Conduit	2027	3,663
41442 - C15-001	Nash Rd.	Conduit	2027	3,887
41471 - B35-003	Simpson Ave.	Conduit	2027	16,067
41422 - C08-001	Valley Crest Dr. - Easement	Conduit	2028	13,440
41433 - N02-001	Wilmot St.	Conduit	2028	6,591
41468 - C06-001	Pinedale SWM 17 - Inflow	Conduit	2028	15,419

Appendix 2: Road Assets 10-year Replacement Forecast

Asset	Asset Description	Event Date	Event Cost
3660 - Darlington Park Rd	Darlington Park Rd at Courtice Rd to West End (Darlington Prov Park)	2021	$ 377,000
3663 - Pinedale Cr	Pinedale Cr at Glen Abbey Dr to Pinedale Cr	2021	229,125
3677 - Baseline Rd	Baseline Rd at Trulls Rd to Courtice Rd	2021	268,125
3700 - Beechnut Cr	Beechnut Cr at Sandringham Dr to Sandringham Dr	2021	138,775
3704 - Parklawn Dr	Parklawn Dr at Stuart Rd to Sandringham Dr	2021	109,525
3733 - Thornbury Ct	Thornbury Ct at Robert Adams Dr to West End Cul-de-Sac	2021	20,475
3737 - Saddlebrook Ct	Saddlebrook Ct at Robert Adams Dr to South End Cul-de-Sac	2021	50,375
3770 - Barrington Pl	Barrington Pl at Nash Rd to East End Cul-de-Sac	2021	24,700
3843 - West Townline Rd	West Townline Rd at Southport Dr to South End (23 m S Drwy #1411)	2021	48,750
3851 - West Townline Rd	West Townline Rd at Bloor St to Gord Vinson Ave	2021	80,275
3886 - Courtice Rd	Courtice Rd at 20m N of CNR Underpass - South End	2021	143,184
3888 - Cigas Rd	Cigas Rd at Trulls Rd to Marnie Dr	2021	122,525
3891 - Marnie Dr	Marnie Dr at Baseline Rd to Cigas Rd	2021	43,225
3895 - Progress Dr	Progress Dr at Baseline Rd to Courtice Ct	2021	48,750
3897 - Courtice Ct	Courtice Ct at McNight Rd to West End Cul-de-Sac	2021	156,325
3932 - George St	George St at North St to Manvers Rd	2021	46,800
3935 - Monroe St	Monroe St at Mill Street St N to East End (15 m E Drwy #45)	2021	35,100

Asset	Asset Description	Event Date	Event Cost
3938 - George St	George St at Mill St N to Beaver St N	2021	37,375
3964 - Hart Ct	Hart Ct at Chester Ln to East End Cul-de-Sac	2021	36,400
3969 - Lakeview Rd	Lakeview Rd at Sunset Blvd to Sunset Blvd	2021	119,600
3970 - Sunset Blvd	Sunset Blvd at Lakeview Heights to Robert St W	2021	231,725
3973 - James St W	James St W at Church St to West End (5 m W Drwy #104)	2021	32,825
3980 - Caroline St	Caroline St at Baldwin St to Church St	2021	37,050
3982 - Caroline St	Caroline St at Mill St to Beaver St S	2021	37,050
4001 - Amos St	Amos St at Toronto St to South End (10 m S Drwy #624)	2021	24,050
4016 - Lakeshore Rd	Lakeshore Rd at Boulton St to 400m E of Boulton St	2021	130,000
4088 - Baseline Rd	Baseline Rd at Duke St to Liberty St	2021	51,000
4090 - Baseline Rd	Baseline Rd at Simpson Ave to Mearns Crt	2021	198,250
4097 - Concession St E	Concession St E at Lambs Rd to Providence Rd	2021	269,750
4100 - Simpson Ave	Simpson Ave at Baseline Rd to South End Turnaround	2021	76,050
4120 - Waverley Rd	Waverley Rd at Martin Rd to Spry Ave	2021	33,475
4166 - Victoria St	Victoria St at Ontario St to Liberty St	2021	52,650
4169 - Albert St	Albert St at Duke St to Ontario St	2021	38,350
4170 - Albert St	Albert St at Ontario St to Brown St	2021	39,000
4171 - Albert St	Albert St at Brown St to Liberty St	2021	31,525
4174 - Durham St	Durham St at Duke St to Ontario St	2021	38,350
4192 - Brown St	Brown St at Victoria St to Queen St	2021	98,475
4197 - Queen St	Queen St at Lambert St S to St George St	2021	36,400
4204 - Stevens Rd	Stevens Rd at Martin Rd to Munday Ct	2021	38,675

Asset	Asset Description	Event Date	Event Cost
4208 - Luverme Ct	Luverme Ct at Martin Rd to East End Cul-de-Sac	2021	33,800
4213 - Wellington St	Wellington St at Liberty St to East End Turnaround	2021	24,700
4237 - Concession St	Concession St at Soper Creek Dr to Lambs Rd	2021	157,625
4240 - Odell St	Odell St at High St to West End	2021	24,375
4250 - Rehder Ave	Rehder Ave at Scugog St to 200m W of Scugog St	2021	68,900
4254 - Edsall Ave	Edsall Ave at Scugog St to Rehder Ave	2021	81,575
4256 - Second St	Second St at Scugog St to Prospect St	2021	38,025
4266 - Third St	Third St at High St to Bernard St	2021	135,525
4276 - Sunicrest Blvd	Sunicrest Blvd at Shoreview Dr to Liberty St	2021	78,000
4305 - Queen Av	Queen Av at Queen St to South End	2021	36,725
4334 - High St	High St at Concession St to North End	2021	52,000
4358 - Parkway Av	Parkway Av at Parkway Cr to Parkway Cr	2021	87,750
4361 - Flett St	Flett St at Southway Dr to Parkway Cr	2021	29,250
4364 - Nelson St	Nelson St at Liberty St to East End	2021	33,475
4369 - Lambert St N	Lambert St N at King St to Church St	2021	39,650
4374 - Frank St	Frank St at Prince St to King St	2021	82,225
4438 - King St W	King St W at Reg Rd 57 to Roenigk Dr	2021	310,000
4445 - Waverley Rd	Waverley Rd at Energy Dr to South End	2021	84,500
4449 - King St	King St at Haines St to 148m W of Haines St	2021	62,900
4502 - Clarington Blvd	Clarington Blvd at Stevens Rd to North End Temporary Cul-de-Sac	2021	70,525
4525 - Mill Ln	Mill Ln at West Scugog Ln to West Scugog Ln	2021	137,150
4571 - Somerville Dr	Somerville Dr at Main St to East End	2021	104,000

Asset	Asset Description	Event Date	Event Cost
4579 - Princess St	Princess St at Leigh St to East End	2021	33,475
4587 - Church St	Church St at Somerville Dr to Cobbledick St	2021	85,150
4588 - Church St	Church St at Cobbledick St to Station St	2021	67,600
4593 - Park St	Park St at Church St to East End (Gate to Orono Park)	2021	57,200
4598 - Church St	Church St at Park St to South End	2021	29,250
4608 - Tamblyn Rd	Tamblyn Rd at 454m N of Highway 35 to Conc Rd 6	2021	203,125
4618 - Old Scugog Rd	Old Scugog Rd at Edmonson Av to North Limit of Hampton	2021	165,100
4644 - Millstream Ln	Millstream Ln at Mill Dam to Old Scugog Rd	2021	65,000
4651 - Old Mill St	Old Mill St at Kendal Church St to Newtonville Rd	2021	134,225
4690 - Conc Rd 3	Conc Rd 3 at Highway 35 to Arthur St	2021	318,825
4816 - Mosport Rd	Mosport Rd at Conc Rd 8 to 1600m N of Conc Rd 8	2021	574,600
4839 - Tamblyn Rd	Tamblyn Rd at Taunton Rd to 155m N of Taunton Rd	2021	50,375
4849 - Golf Course Rd	Golf Course Rd at Highway 2 to Bridge	2021	343,200
4850 - Golf Course Rd	Golf Course Rd at Bridge to Conc Rd 3	2021	326,625
4921 - Concession St E	Concession St E at Bragg Rd to Darlington Clarke Townline	2021	267,800
4935 - Gearing's Ln	Gearings Ln at Tooley Rd to North End Cul-de-Sac	2021	60,450
4951 - Firner St	Firner St at Trulls Rd to West End (50 m W Drwy #65)	2021	129,025
4952 - Bradley Blvd	Bradley Blvd at Trulls Rd to East End (50 m E Drwy #63)	2021	136,825
4955 - Conc Rd 6	Conc Rd 6 at West Townline Rd to 0.1km W of Langmaid Rd	2021	357,500
5039 - Conc Rd 8	Conc Rd 8 at Regional Rd 57 to Lettner Rd Road Allowance	2021	253,500
5040 - Conc Rd 8	Conc Rd 8 at Lettner Rd Road Allowance to Middle Rd	2021	268,775
5082 - Tooley Rd	Tooley Rd at McLean Rd to Pebblestone Rd	2021	363,675

Asset	Asset Description	Event Date	Event Cost
5090 - Trulls Rd	Trulls Rd at Pebblestone Rd to 900m N of Pebblestone Rd	2021	293,150
5103 - Solina Rd	Solina Rd at Highway 2 to Nash Rd	2021	260,650
5104 - Solina Rd	Solina Rd at Nash Rd to 600m N of Nash Rd	2021	195,000
5105 - Solina Rd	Solina Rd at 1300m N of Nash Rd to Taunton Rd	2021	938,600
5115 - Rundle Rd	Rundle Rd at Highway 2 to Nash Rd	2021	343,850
5142 - Maryleah Ct	Maryleah Ct at Old Scugog Rd to West End Cul-de-Sac	2021	39,650
5143 - Glenelge Ct	Glenelge Ct at Old Scugog Rd to West End Cul-de-Sac	2021	22,425
5145 - Craig Ct	Craig Ct at Old Scugog Rd to East End Cul-de-Sac	2021	34,125
5146 - Buttery Ct	Buttery Ct at Old Scugog Rd to East End Cul-de-Sac	2021	38,025
5160 - Old Scugog Rd	Old Scugog Rd at Reg Rd 3 to Salter Ct	2021	214,825
5166 - Old Scugog Rd	Old Scugog Rd at Conc Rd 10 to Scugog Boundary Rd	2021	331,500
5203 - Darlington/Clarke T/L	Darlington/Clarke T/L at Highway 2 to South End	2021	205,400
5237 - Salter Ct	Salter Ct at Old Scugog Rd to West End Turnaround	2021	109,850
5708 - Mills St Orono	Mills St Orono at Main St to Pigott Ln	2021	224,250
54531 - Concession St	Concession St at Appleblossom to Mann St	2021	71,500
54565 - Pethick St	Pethick St at Prince William Blvd to 72m S of Hwy #2	2021	55,250
54573 - Rudel Rd	Rudel Rd at Edward St to Hwy#2	2021	94,250
54584 - Waverley Rd	Waverley Rd at Hwy 401 to Energy Dr	2021	46,750
3710 - Nash Rd	Nash Rd at Harry Gay Dr to Hancock Rd	2021	99,775
3714 - Strathallan Dr	Strathallan Dr at Stirling Ave to Trulls Rd	2021	120,575
4095 - Baseline Rd	Baseline Rd at Bowmanville East Limits (Haines St) to Lambs Rd	2021	134,875
4283 - Scugog St	Scugog St at King St W to Church St	2021	59,500

Asset	Asset Description	Event Date	Event Cost
4448 - King St	King St at Mearns Av to 332m E of Mearns Av	2021	141,100
4688 - Conc Rd 3	Conc Rd 3 at Pollard Rd to Lockhart Rd	2021	269,100
4920 - Concession St E	Concession St E at Providence Rd to Bragg Rd	2021	266,825
5091 - Trulls Rd	Trulls Rd at 900m N of Pebblestone Rd to Taunton Rd	2021	372,125
5124 - Holt Rd	Holt Rd at Highway 2 to Nash Rd	2021	483,275
54579 - Simpson Ave	Simpson Ave at Hobb Dr to King St	2021	48,750
3644 - Scugog Boundary Rd	Scugog Boundary Rd at Cochrane Rd to 600m E of Cochrane Rd	2021	53,910
3849 - West Townline Rd	West Townline Rd at Olive Ave to South End (10 m S Drwy #89)	2021	7,650
3931 - Allen's Ln	Allens Ln at North St to West End (Drwy #110)	2021	4,860
4081 - West Beach Rd	West Beach Rd at Cove Rd to East End (gate)	2021	41,850
4242 - Sturrock Rd	Sturrock Rd at Scugog St to West End	2021	11,070
4605 - Pigott Ln	Pigott Ln at Orono Mill Ln to East End	2021	16,470
4649 - Water St	Water St at Newtonville Rd to Hoy St	2021	27,720
4652 - Monck St	Monck St at Kendal Church St to Newtonville Rd	2021	35,640
4654 - Hoy St	Hoy St at Water St to Old Mill Street St	2021	9,360
4655 - Hoy St	Hoy St at Old Mill St to Monck St	2021	10,350
4656 - Dickey St	Dickey St at Water St to Old Mill St	2021	10,980
4657 - Dickey St	Dickey St at Old Mill St to Monck St	2021	10,260
4790 - Conc Rd 8	Conc Rd 8 at 447m E of Maynard Rd N to Carscadden Rd S	2021	84,600
4807 - Curve Inn Rd	Curve Inn Rd at Highway 2 to East End (30 m E Drwy #88)	2021	46,260
4808 - Curve Inn Rd	Curve Inn Rd at Lovekin Rd to Curve Inn Rd	2021	15,480
4862 - Old Sideroad 16/17	Old Sideroad 16/17 at Morgans Rd to Southeast End	2021	13,230

Asset	Asset Description	Event Date	Event Cost
5080 - Leask Rd	Leask Rd at Conc Rd 6 to North End Cul-de-sac	2021	89,460
5179 - Mearns Av	Mearns Av at Conc Rd 4 to South End (10 m S Drwy #3732)	2021	44,910
54941 - Rundle Rd	Rundle Rd at Taunton to Concession Rd 4	2021	42,300
3953 - Rudell Rd	Rudell Rd at Hart Blvd to Edward St	2021	81,250
4074 - Lake Rd	Lake Rd at Port Darlington Rd to East End Cul-de-Sac	2021	269,425
4086 - Baseline Rd	Baseline Rd at Hunt St to Duke St	2021	37,050
4235 - Concession St	Concession St at Mann St to Kershaw St	2021	68,250
4347 - Simpson Av	Simpson Av at 230m N of Baseline Rd to 427m N of Baseline Rd	2021	63,050
4442 - King St W	King St W at George St to Ontario St	2021	56,950
4444 - King St W	King St W at Ontario St to Liberty St	2021	148,325
4501 - Clarington Blvd	Clarington Blvd at Uptown Av to Stevens Rd	2021	44,850
54526 - Conc Rd 3	Conc Rd 3 at 100m E of West Scugog Ln to West Scugog Ln	2021	97,500
54536 - Fenning Dr	Fenning Dr at Southfield Ave to 47m S of Cornish Dr	2021	61,750
4572 - Somerville Dr	Somerville Dr at Station St to West End Turnaround	2022	22,004
4872 - Hillen Rd	Hillen Rd at Conc Rd 6 to North End (Drwy #6168)	2022	32,679
4881 - Newtonville Rd	Newtonville Rd at Lakeshore Rd to Conc Rd 1	2022	256,750
5079 - Fices Rd	Fices Rd at Taunton Rd to South End (45 m S Drwy #4426)	2022	100,378
5132 - Maple Grove Rd	Maple Grove Rd at 433m S of Baseline Rd to Baseline Rd	2022	40,544
5151 - Old Scugog Rd	Old Scugog Rd at North Limit of Hampton to Conc Rd 6	2022	36,237
5201 - Murphy Rd	Murphy Rd at 528m N Reg Rd 20 to 2812m N of Reg Rd 20	2022	1,489,686
3696 - Sandringham Dr	Sandringham Dr at Highway 2 to Windham Cr	2022	185,972
3713 - Strathallan Dr	Strathallan Dr at Sandringham Dr to Stirling Ave	2022	78,446

Asset	Asset Description	Event Date	Event Cost
3747 - Varcoe Rd	Varcoe Rd at Highway 2 to Nash Rd	2022	106,849
3883 - Trulls Rd	Trulls Rd at Nash Rd to George Reynolds Dr	2022	206,597
3904 - Sandringham Dr	Sandringham Dr at Windham Cr to Yorkville Dr	2022	145,396
4102 - Martin Rd	Martin Rd at Squires Gate Dr to Alonna St	2022	73,374
4121 - Waverley Rd	Waverley Rd at Spry Ave to Quinn Dr	2022	138,633
4420 - Aspen Springs Dr	Aspen Springs Dr at Bonnycastle Dr to West Side Dr	2022	179,209
4446 - King St E	King St E at Liberty St to St George St	2022	185,711
4447 - King St E	King St E at Simpsin Av to Mearns Ave	2022	176,868
4766 - Conc Rd 8	Conc Rd 8 at 150m W of Mosport Rd to Leskard Rd	2022	211,331
4964 - Conc Rd 6	Conc Rd 6 at Rundle Rd to Holt Rd	2022	268,475
54514 - Aspen Springs Dr	Aspen Springs Dr at Reg Rd 57 to Bonnycastle Dr	2022	57,482
54517 - Baseline Rd	Baseline Rd at Liberty St to Simpson Ave	2022	74,389
54543 - King St E	King St E at St George St to Simpson Ave	2022	88,434
54575 - Scugog St	Scugog St at Church St to Wellington St	2022	50,720
59296 - Tooley Rd	Tooley Rd at Nash Rd to 75m N of Nash Rd	2022	25,360
59297 - Tooley Rd	Tooley Rd at 430m N of Nash Rd to McLean Rd	2022	201,864
59352 - Liberty St N	130m S of Conc Rd 6 to Conc Rd 6	2022	43,957
4021 - Riley Rd	Riley Rd at Lakeshore Rd to Metcalf St	2022	108,899
4650 - Old Mill St	Old Mill St at Kendal Church St to West End	2022	12,173
4663 - Lakeshore Rd	Lakeshore Rd at Jaynes Rd to 909m E of Jaynes Rd	2022	75,845
4818 - Mosport Rd	Mosport Rd at Conc Rd 9 to 1300m N of Conc. Rd. 9	2022	134,836
4832 - Leskard Rd	Leskard Rd at 160m N of Conc Rd 8 to Skelding Rd	2022	184,463

Asset	Asset Description	Event Date	Event Cost
4854 - Brownsville Rd	Brownsville Rd at Highway 2 to South End Turnaround (200m S Drwy #1545)	2022	62,268
4875 - Ovens Rd	Ovens Rd at Highway 2 to South End Turnaround	2022	58,710
4890 - Shiloh Rd	Shiloh Rd at Conc Rd 5 to Conc Rd 6	2022	202,535
5110 - Solina Rd	Solina Rd at 150m N of Dorest St to Conc Rd 7	2022	92,700
55119 - Leskard Rd	Leskard Rd at Conc Rd 8 to 160m N of Conc Rd 8	2022	14,982
56733 - Stapleton Rd	Stapleton Rd at 200m N of Conc Rd 3 to Conc Rd 4	2022	171,354
3676 - Darlington Blvd	Darlington Blvd at 120m S of Highway 2 to South End (Drwy #60)	2022	206,259
3678 - Robert Adams Dr	Robert Adams Dr at Prestonvale Rd to Mulholland Ct	2022	170,079
3697 - Sandringham Dr	Sandringham Dr at Yorkville Dr to Trulls Rd	2022	192,734
3712 - Glenabbey Dr	Glenabbey Dr at Robert Adams Dr to Prestonvale Rd	2022	114,964
3788 - George Reynolds Dr	George Reynolds Dr at Devondale St to Julia Crt	2022	135,252
3875 - Trulls Rd	Trulls Rd at Bloor St to 700m N of Bloor St	2022	242,101
3881 - Trulls Rd	Trulls Rd at Highway 2 to Nash Rd	2022	121,051
3928 - North St	North St at Highway 2 to Wilmot St	2022	54,101
4234 - Concession St	Concession St at Liberty St to Appleblossom Blvd	2022	71,007
4346 - Simpson Av	Simpson Av at Baseline Rd to 230m N of Baseline Rd	2022	78,784
4394 - Trudeau Dr	Trudeau Dr at Concession St to 430m S of Concession St	2022	30,432
4421 - Bonnycastle Dr	Bonnycastle Dr at West Side Dr to Prestonway Dr	2022	145,396
4425 - Prestonway Dr	Prestonway Dr at Bonnycastle Dr to Martin Rd	2022	51,734
4462 - Freeland Av	Freeland Av at Liberty St to Mearns Av	2022	286,734
4500 - Clarington Blvd	Clarington Blvd at Highway 2 to Uptown Av	2022	48,014
4924 - Nash Rd	Nash Rd at 422m E of Solina Rd to Rundle Rd	2022	134,914

Asset	Asset Description	Event Date	Event Cost
4963 - Conc Rd 6	Conc Rd 6 at 432m E of Solina Rd to Rundle Rd	2022	132,547
5108 - Solina Rd	Solina Rd at Conc Rd 6 to Odlum St	2022	185,972
54519 - Bonnycastle Dr	Bonnycastle Dr at Prestonway Dro to Hartwell Ave	2022	57,482
54520 - Bonnycastle Dr	Bonnycastle Dr at Hartwell Ave to Aspen Springs Dr	2022	81,151
55090 - Yorkville Dr	Yorkville Dr at Granville Dr to Trulls Rd	2022	101,439
3647 - Hill St	Hill St at Reid Rd to Newtonville Rd	2022	82,493
3873 - Trulls Rd	Trulls Rd at Baseline Rd to Bloor St	2022	170,137
4625 - Liberty St	Liberty St at North Division St to East End (20 m E Drwy #37)	2022	10,487
4627 - Millville Av	Millville Av at Old Scugog Rd to East End (Drwy #64)	2022	34,926
4647 - King Ln	King Ln at Millstream Ln to 370m N of Millstream Ln	2022	34,458
4653 - Kendal Church St	Kendal Church St at Old Mill St to Ganaraska Rd	2022	28,746
4658 - Lakeshore Rd	Lakeshore Rd at Riley Rd to Stephenson Rd	2022	111,895
4667 - Lakeshore Rd	Lakeshore Rd at Lancaster Rd to 500m E of Lancaster Rd	2022	41,200
4683 - Lovekin Rd	Lovekin Rd at Ramps to Hwy 35/115 to Cobble-Dick Rd	2022	87,924
4697 - Conc Rd 3	Conc Rd 3 at Elliott Rd to Gilmore Rd	2022	77,531
4824 - Squair Rd	Squair Rd at Conc Rd 4 to Conc Rd 5	2022	11,705
4842 - Gamsby Rd	Gamsby Rd at Conc Rd 5 to Conc Rd 6	2022	214,801
4847 - Vickers Rd	Vickers Rd at Conc Rd 5 to Conc Rd 6	2022	212,835
4863 - Morgans Rd	Morgans Rd at Highway 2 to Conc Rd 3	2022	193,452
4864 - Morgans Rd	Morgans Rd at Conc Rd 3 to Cowanville Rd	2022	95,228
4865 - Morgans Rd	Morgans Rd at Cowanville Rd to Conc Rd 4	2022	96,164
4876 - Reid Rd	Reid Rd at Highway 2 to 1598m N of Highway 2	2022	149,630

Asset	Asset Description	Event Date	Event Cost
4877 - Reid Rd	Reid Rd at 1598m N of Highway 2 to 2872m N of Highway 2	2022	119,292
4880 - White Rd	White Rd at Ganaraska Rd to Conc Rd 8	2022	165,174
4883 - Thompson Rd	Thompson Rd at Ganaraska Rd to The Dell Rd	2022	168,451
4884 - The Dell Rd	The Dell Rd at Thompson Rd to Thertell Rd	2022	116,296
4886 - Mercer Rd	Mercer Rd at Ganaraska Rd to Thertell Rd	2022	256,937
4891 - Shiloh Rd	Shiloh Rd at Conc Rd 6 to Ganaraska Rd	2022	216,861
4897 - East Townline Rd	East Townline Rd at Lakeshore Rd to Conc Rd 1	2022	175,661
4905 - Cold Springs Camp Rd	Cold Springs Camp Rd at Thertell Rd to North End (Drwy #10585)	2022	98,692
5098 - Hancock Rd	Hancock Rd at Highway 2 to Nash Rd	2022	53,279
5100 - Washington Rd	Washington Rd at Taunton Rd to North End (14 m N Drwy #5221)	2022	44,477
5250 - Elliot St	Elliot St at Old Scugog Rd to Cartwright St	2022	11,705
5251 - Mary St	Mary St at Cartwright St to West End (Drwy #33)	2022	6,086
59203 - Brown Rd	Brown Rd at 334m N of Conc Rd 7 to Conc Rd 8	2022	191,954
3679 - Robert Adams Dr	Robert Adams Dr at Hemmingway Dr to Worthington Dr	2023	120,712
3701 - Glenabbey Dr	Glenabbey Dr at Sandringham Dr to South End Temporary Cul-de-Sac (Drwy #218)	2023	142,786
3726 - Granville Dr	Granville Dr at Yorksville Dr to John Walker Cr	2023	28,281
3863 - Prestonvale Rd	Prestonvale Rd at Glenabbey Dr to Claret Rd	2023	225,215
3865 - Prestonvale Rd	Prestonvale Rd at Claret Rd to Phair Av	2023	140,371
3867 - Prestonvale Rd	Prestonvale Rd at Phair Ave to Highway 2	2023	64,946
3876 - Fenning Dr	Fenning Dr at Gord Vinson Ave to Montague Av	2023	47,250
3961 - Edward St	Edward St at Foster Creek Dr to Baldwin St	2023	53,113
3971 - Robert St W	Robert St W at Sunset Blvd to Mill St S	2023	77,946

Asset	Asset Description	Event Date	Event Cost
4297 - Ontario St	Ontario St at Queen St to King St	2023	41,387
4401 - Soper Creek Dr	Soper Creek Dr at Mearns Av to Downham Dr	2023	108,296
4419 - Hartwell Av	Hartwell Av at Martin Rd to Bonnycastle Dr	2023	43,456
4440 - King St W	King St W at Scugog St to Temperance St	2023	112,753
4545 - Rustwood St	Rustwood St at Boswell Dr to West End (43 m West of Hammond Street)	2023	66,564
5213 - Liberty St N	Liberty St N at Conc Rd 6 to Conc Rd 7	2023	671,161
54569 - Robert Adams Dr	Robert Adams Dr at Glen Abbey Dr to Hemingway Dr	2023	75,876
54578 - Simpson Ave	Simpson Ave at Prince St to Hobb Dr	2023	34,489
55321 - Energy Dr	Energy Dr at 120m W of Waverly Rd to Waverly Rd	2023	54,122
4528 - Green Rd	Green Rd at Baseline Rd to Remmington St	2023	141,406
54889 - Robert Adams Dr	Robert Adams Dr at 30m S of Glenabbey Dr to Meadowglade Rd	2023	58,632
54947 - Old Scugog Rd	Old Scugog Rd at Concession Rd 6 to 200 m N of Concession Rd 6	2023	31,040
3787 - George Reynolds Dr	George Reynolds Dr at Nash Rd to Devondale St	2024	106,944
3834 - Sandringham Dr	Sandringham Dr at Avondale Dr to Courtice Rd	2024	90,762
3859 - Prestonvale Rd	Prestonvale Rd at Baseline Rd to 1100m N of Baseline Rd	2024	396,116
3905 - George Reynolds Dr	George Reynolds Dr at Julia Crt to Firwood Av	2024	147,752
3948 - King Ave W	King Ave W at North St to Mill St	2024	75,635
3950 - King Av E	King Av E at Beaver St to Arthur St	2024	66,840
4034 - Resnik Dr	Resnik Dr at Arthur St to Andrew St	2024	129,811
4099 - Baseline Rd	Baseline Rd at 153m E of Spry Av to Hunt St	2024	155,140
4124 - Rhonda Ave	Rhonda Ave at Waverly Rd to Lawrence Gate	2024	235,700
4130 - Conc Rd 3	Conc Rd 3 at West Scugog Ln to 110m W of Middle Rd	2024	151,270

Asset	Asset Description	Event Date	Event Cost
4348 - Simpson Av	Simpson Av at 427m N of Baseline Rd to Southway Dr	2024	66,840
4488 - Simpson Av	Simpson Av at Southway Dr to Prince St	2024	221,628
5159 - Old Scugog Rd	Old Scugog Rd at 500m S of Regional Rd 3 to Regional Rd 3	2024	195,595
5676 - Given Rd	Given Rd at Rudell Rd to West End	2024	98,566
54576 - Scugog St	Scugog St at Wellington St to Odell St	2024	63,322
55115 - Waverley Rd	Waverley Rd at Lawrence Cr to Roenigk Dr	2024	151,270
55331 - Rosswell Dr	Rosswell Dr at Gord Vinson Ave to Bloor St	2024	42,215
5002 - Conc Rd 7	Conc Rd 7 at Baker School Rd to Holt Rd	2024	289,172
3692 - Claret Rd	Claret Rd at Prestonvale Rd to Sandringham Dr	2024	45,733
3892 - Osbourne Rd	Osbourne Rd at Energy Dr to Megawatt Dr	2024	144,234
4078 - West Beach Rd	West Beach Rd at Port Darlington Rd to Cove Rd	2024	487,933
4101 - Martin Rd	Martin Rd at Baseline Rd to Squires Gate Dr	2024	85,133
4151 - Rhonda Blvd	Rhonda Blvd at Lawrence Gate to Old Highway 2	2024	200,872
4236 - Concession St	Concession St at Mearns Ave to Soper Creek Dr	2024	127,348
4509 - Clarington Blvd	Clarington Blvd at Highway 2 to Prince William Blvd	2024	94,280
54585 - West Side Dr	West Side Dr at Aspen Springs Dr to Bonnycastle Dr	2024	73,876
3949 - King Ave W	King Ave W at Mill St to Beaver St	2025	53,962
4187 - Ontario St	Ontario St at Liberty St to Nelson St	2025	68,177
4189 - Ontario St	Ontario St at Nelson St to Albert St	2025	86,118
3927 - Rudell Rd	Rudell Rd at Highway 2 to Given Rd	2025	44,853
5001 - Conc Rd 7	Conc Rd 7 at Solina Rd to Baker School Rd	2025	295,314
55092 - Meadowglade Rd	Meadowglade Rd at Robert Adams Dr to Prestonvale Rd	2025	86,118

Asset	Asset Description	Event Date	Event Cost
55118 - Green Rd	Green Rd at Nash Rd to 875m N of Ross Wright Ave	2025	165,060
5692 - Bons Ave	Bons Ave at Liberty St N to West End	2025	150,707
59304 - Creek Service Rd	Creek Service Rd at Roenigk Dr to East End	2025	15,899
3727 - Granville Dr	Granville Dr at John Walter Cr to John Walter Cr	2025	34,088
3877 - Trulls Rd	Trulls Rd at 700m N of Bloor St to Avondale Dr	2025	83,248
3952 - Rudell Rd	Rudell Rd at Sunset Blvd to Hart Blvd	2025	39,471
3976 - Edward St	Edward St at Baldwin St to Church St	2025	41,983
4007 - Mill St S	Mill St S at Metcalf St to Boulton St	2025	268,402
4087 - Baseline Rd	Baseline Rd at Spry Ave to 153m E of Spry Ave	2025	54,900
4122 - Waverley Rd	Waverley Rd at Quinn Dr to Lawrence Cr	2025	89,707
4146 - Lawrence Gate	Lawrence Gate at Rhonda Blvd to Waverly Rd	2025	35,524
4196 - Queen St	Queen St at Liberty St to Lambert St S	2025	34,806
4198 - Church St	Church St at Scugog St to Temperance St	2025	120,207
4199 - Church St	Church St at Temperance St to Division St	2025	49,877
4201 - Church St	Church St at Liberty St to St. George St	2025	76,789
4495 - Boswell Dr	Boswell Dr at Ivory Crt to Rustwood St	2025	200,943
4529 - Bannister St	Bannister St at West Side Dr to Millburn Dr S	2025	133,842
4686 - Conc Rd 3	Conc Rd 3 at Darlington Clarke Townline to 300m E of Darlington Clarke Townline	2025	154,654
4689 - Conc Rd 3	Conc Rd 3 at Lockhart Rd to Highway 35	2025	342,320
4915 - Bloor St	Bloor St at Courtice Rd to Hancock Rd	2025	298,902
54521 - Boswell Dr	Boswell Dr at Rustwood Cr to Green Rd	2025	104,060
54532 - Concession St	Concession St at Kershaw St to Mearns Ave	2025	64,589

Asset	Asset Description	Event Date	Event Cost
54545 - King St W	King St W at Temperance St to Division St	2025	65,693
54546 - King St W	King St W at Division St to George St	2025	61,000
54570 - Robert Adams Dr	Robert Adams Dr at Worthington Dr to Mulholland Ct	2025	61,000
57475 - Baseline Rd	Baseline Rd at Mearns Rd to Caristrap St	2025	64,589
4521 - Longworth Ave	Longworth Ave at Mearns Ave to West End	2025	148,195
4191 - Ontario St	Ontario St at Albert St to Queen St	2026	135,421
5479 - Port of Newcastle Dr	Port of Newcastle Drive at 35m N of Hodnett Cr to Schooner Ln	2026	164,701
54907 - Bons Ave	Bons Ave at Scugog St to 45m E of Honeyman Dr	2026	150,061
3862 - Prestonvale Rd	Prestonvale Rd at Bloor St to Meadowglade Rd	2026	142,741
3879 - Trulls Rd	Trulls Rd at Avondale Dr to Sandringham Dr	2026	139,081
3903 - Prestonvale Rd	Prestonvale Rd at Meadowglade Rd to Glenabbey Dr	2026	95,161
3941 - Beaver St N	Beaver St N at King Ave to Andrew St	2026	154,087
4083 - Baseline Rd	Baseline Rd at Martin Rd to Spicer Sq	2026	72,469
4123 - Waverley Rd	Waverley Rd at Roenigk Dr to Old Highway 2	2026	65,515
4156 - Roenigk Dr	Roenigk Dr at King St to 100m S of King St	2026	35,868
4285 - Scugog St	Scugog St at Odell St to Meadowview Blvd	2026	255,470
4315 - Temperance St	Temperance St at King St to Church St	2026	40,992
4385 - Orchard Park Dr	Orchard Park Dr at Mearns Av to Peachtree Cr	2026	124,807
4411 - Apple Blossom Blvd	Apple Blossom Blvd at Concession St to Faircombe Cr	2026	127,369
4687 - Conc Rd 3	Conc Rd 3 at 300m E of Darlington Clarke Townline to Pollard Rd	2026	321,350
4911 - Baseline Rd	Baseline Rd at Rundle Rd to Holt Rd	2026	303,050
4912 - Baseline Rd	Baseline Rd at Holt Rd to Maple Grove Rd	2026	303,050

Asset	Asset Description	Event Date	Event Cost
4965 - Conc Rd 6	Conc Rd 6 at Holt Rd to Old Scugog Rd	2026	310,004
5212 - Liberty St N	Liberty St N at Taunton Rd to 1100m N of Taunton Rd	2026	402,603
54516 - Avondale Dr	Avondale Dr at Brownstone Cr to Sandringham Dr	2026	139,081
54552 - Longworth Ave	Longworth Ave at Daley Dr to High St	2026	43,920
54553 - Longworth Ave	Longworth Ave at High St to Argent St	2026	109,801
54582 - Trulls Rd	Trulls Rd at Sandringham Dr to Strathallan Dr	2026	113,461
54583 - Trulls Rd	Trulls Rd at Strathallan Dr to Hwy#2	2026	87,841
4678 - Conc Rd 1	Conc Rd 1 at Newtonville Rd to Lancaster Rd	2026	301,586
5109 - Solina Rd	Solina Rd at Odlum St to 150m N of Dorest St	2026	204,962
54540 - Green Rd	Green Rd at Remmington St to McBride Av	2026	106,141
54541 - Green Rd	Green Rd at McBride Av to Aspen Springs Dr	2026	65,881
54938 - Solina Rd	Solina Rd at Taunton Rd to 750m N of Taunton Rd	2027	279,992
54939 - Solina Rd	Solina Rd at 500m S of Concession Rd 6 to Concession Rd 6	2027	165,382
54560 - Mearns Ave	Mearns Ave at Freeland Av to Conc Rd 3	2027	89,597
3653 - Gord Vinson Ave	Gord Vinson Ave at Townline Rd to Fenning Dr	2028	108,144
3654 - Gord Vinson Ave	Gord Vinson Ave at Fenning Dr to Eastfield Cr	2028	65,496
3689 - Baseline Rd	Baseline Rd at Solina Rd to Rundle Rd	2028	313,390
3839 - Daisyfield Dr	Daisyfield Dr at Trulls Rd to West End Temp Turnaround (20 m W Drwy #117)	2028	157,647
3896 - Avondale Dr	Avondale Dr at Trulls Rd to Farmington Dr	2028	110,429
3998 - Toronto St	Toronto St at Mill St S to Amos St	2028	36,937
4061 - Brookhouse Dr	Brookhouse Dr at Harmer Dr to Edward St	2028	38,079
4084 - Baseline Rd	Baseline Rd at Waverly Rd to Spry Ave	2028	159,932

Asset	Asset Description	Event Date	Event Cost
4092 - Baseline Rd	Baseline Rd at Caristrap St to Haines St	2028	90,247
4093 - Baseline Rd	Baseline Rd at West Side Dr to Martin Rd	2028	139,750
4288 - Scugog St	Scugog St at Meadowview Blvd to Longworth Ave	2028	99,005
4303 - Centre St	Centre St at Carlisle St to Concession St	2028	150,031
4309 - Division St	Division St at King St W to Church St	2028	46,076
4320 - Elgin St	Elgin St at Wellington St to Concession St	2028	86,058
4377 - Mearns Av	Mearns Av at Concession St to Flaxman Av	2028	62,069
4412 - Apple Blossom Blvd	Apple Blossom Blvd at Farncomb Cr to Mann St	2028	99,005
4491 - West Side Dr	West Side Dr at Bonnycastle to Remmington St	2028	99,005
4493 - West Side Dr	West Side Dr at Baseline Rd to Abernethy Cr	2028	160,693
4515 - Longworth Av	Longworth Av at 363m E of Regional Rd 57 to Scugog St	2028	245,492
4614 - Old Scugog Rd	Old Scugog Rd at Taunton Rd to Millville Av	2028	285,211
4910 - Wilmot Creek Rd	Wilmot Creek Rd at Bennett Rd to East End Turnaround	2028	156,885
4914 - Baseline Rd	Baseline Rd at 300m E of Maple Grove to 207m W of Green Rd	2028	125,660
5215 - Conc Rd 7	Conc Rd 7 at Liberty St S to Liberty St N	2028	331,287
54515 - Avondale Dr	Avondale Dr at Farmington Dr to Brownstone Cr	2028	60,926
54567 - Prestonvale Rd	Prestonvale Rd at Southfield Ave to Bloor St	2028	152,316
54586 - West Side Dr	West Side Dr at Remmington St to Abernethy Cr	2028	34,271
55315 - Glenabbey Dr	Glenabbey Dr at Townline Rd S to Bruntsfield St	2028	139,369
59247 - Spry Ave	Spry Ave at Lawrence Cr to Waverley Rd	2028	102,813
59308 - Queen St	Queen St at Queen Ave to Ontario St	2028	90,247
3646 - Rose Cr	Rose Cr at Jones Ave to East End (40 m E Drwy #12)	2028	14,552

Asset	Asset Description	Event Date	Event Cost
3650 - Paynes Cr	Paynes Cr at Highway 2 to Highway 2	2028	73,815
3810 - Glenview Rd	Glenview Rd at Jane Ave to Lynwood Ave	2028	11,178
3899 - Solina Rd	Solina Rd at Osbourne Rd to South Service Rd	2028	94,166
4474 - Lambs Rd	Lambs Rd at Concession St E to CPR Crossing	2028	116,943
4619 - Washington St	Washington St at Old Scugog Rd to North Division St	2028	13,287
4648 - King Ln	King Ln at 370m N of Millstream Ln to 590m N of Millstream Ln	2028	23,515
4675 - Conc Rd 1	Conc Rd 1 at Morgans Rd to Jaynes Rd	2028	87,207
4677 - Conc Rd 1	Conc Rd 1 at Bellamy Rd to Newtonville Rd	2028	89,632
4782 - Conc Rd 8	Conc Rd 8 at Highway 35 to Dawson Rd	2028	69,597
4797 - Skelding Rd	Skelding Rd at Leskard Rd to Best Rd	2028	85,836
4805 - Lovekin Rd	Lovekin Rd at Ramps to Hwy 35/115 to South End (20 m S Drwy #205A)	2028	48,296
4814 - Pollard Rd	Pollard Rd at Conc Rd 4 to Conc Rd 5	2028	220,600
4817 - Mosport Rd	Mosport Rd at 1600m N of Conc Rd 8 to Conc Rd 9	2028	41,336
4852 - Jewel Rd	Jewel Rd at Conc Rd 6 to South End (Drwy #5587)	2028	108,613
4856 - Brownsville Rd	Brownsville Rd at Highway 2 to North End (Drwy #2525)	2028	129,070
4871 - Cedar Valley Rd	Cedar Valley Rd at Conc Rd 4 to 518m N of Conc Rd 4	2028	54,623
4878 - Reid Rd	Reid Rd at 2872m N of Highway 2 to Conc Rd 4	2028	171,777
4902 - East Townline Rd	East Townline Rd at Conc Rd 5 to North End (Drwy #4855)	2028	167,664
4941 - Conc Rd 4	Conc Rd 4 at Regional Rd 57 to Middle Rd	2028	88,367
5044 - Conc Rd 8	Conc Rd 8 at Liberty St N to Aked Rd	2028	98,068
5073 - West Townline Rd	West Townline Rd at Taunton Rd to Coldstream Dr	2028	68,331
5074 - West Townline Rd	West Townline Rd at Coldstream Dr to Conc Rd 6	2028	144,887

Asset	Asset Description	Event Date	Event Cost
5078 - West Townline Rd	West Townline Rd at Conc Rd 9 to Conc Rd 10	2028	233,465
5081 - Cochrane's Rd	Cochranes Rd at Conc Rd 10 to North End (15 m N Drwy #10239)	2028	44,183
5173 - Middle Rd	Middle Rd at 500m N of Conc Rd 8 to Reg Rd 20	2028	165,239
5174 - Middle Rd	Middle Rd at Conc Rd 8 to 500m N of Conc Rd 8	2028	52,092
5180 - Mearns Av	Mearns Av at Conc Rd 4 to 1028m N of Conc Rd 4	2028	108,402
5183 - Lambs Rd	Lambs Rd at CPR Crossing to Conc Rd 3	2028	105,766
5197 - Longsault Rd	Longsault Rd at Boundary Rd to North End (Drwy #10126)	2028	250,759
5740 - Charlesville Lane	Charlesville Lane at Nelson Lane to Concession 7	2028	17,926
54954 - Bragg Rd	Bragg Rd at Concession Rd 4 to South	2028	105,449
3812 - Lynwood Av	Lynwood Av at Westmore St to Glenview Rd	2028	26,468
4079 - Watson Cr	Watson Cr at Cedar Crest Beach Rd to 120m N of Cedar Crest Beach Rd	2028	13,814
4466 - Lambs Rd	Lambs Rd at Baseline Rd to Highway 2	2028	70,651
4570 - Somerville Dr	Somerville Dr at Millpond Rd to Main St	2028	30,475
4607 - Tamblyn Rd	Tamblyn Rd at Highway 35 to 454m N of Highway 35	2028	47,874
4623 - Liberty St	Liberty St at Old Scugog Rd to North Division St	2028	12,232
4628 - North Division St	North Division St at Washington St to Milville Av	2028	32,689
4630 - Ormiston Ln	Ormiston Ln at Old Scugog Rd to South Hammerhead	2028	23,937
4633 - Ormiston St	Ormiston St at 290m E of Old Scugog Rd to North End (10 m N Drwy #99)	2028	41,652
4666 - Lakeshore Rd	Lakeshore Rd at Newtonville Rd to Lancaster Rd	2028	87,418
4676 - Conc Rd 1	Conc Rd 1 at Jaynes Rd to Bellamy Rd	2028	175,784
4684 - Browview Rd	Browview Rd at Highway 2 to East End (20 m E Drwy #641)	2028	31,951
4717 - Conc Rd 4	Conc Rd 4 at Elliott Rd to Gilmore Rd	2028	90,054

Asset	Asset Description	Event Date	Event Cost
4718 - Conc Rd 4	Conc Rd 4 at Gillmore Rd to East Townline Rd	2028	87,839
4725 - Conc Rd 5	Conc Rd 5 at 135m E of Ochonski Rd to Somerville Dr	2028	62,215
4794 - Thertell Rd	Thertell Rd at The Dell Rd to Mercer Rd	2028	85,941
4795 - Thertell Rd	Thertell Rd at Mercer Rd to Langstaff Rd	2028	86,363
4800 - Conc Rd 10	Conc Rd 10 at Mosport Rd to 500m E of Mosport Rd	2028	64,430
4802 - Conc Rd 10	Conc Rd 10 at Highway 35 to East End Turnaround (135 m E Drwy #3855)	2028	84,992
4806 - Lovekin Rd	Lovekin Rd at Ramps to Hwy 35/115 to Curve Inn Rd	2028	47,663
4866 - Maynard Rd	Maynard Rd at Conc Rd 8 to North End (Drwy #8318)	2028	69,069
4900 - East Townline Rd	East Townline Rd at 5th Line (Hope) to Conc Rd 4	2028	5,483
4904 - Cold Springs Camp Rd	Cold Springs Camp Rd at Ganaraska Rd to Thertell Rd	2028	285,768
5047 - Conc Rd 9	Conc Rd 9 at West Townline Rd to 1750m E of West Townline Rd	2028	185,591
5054 - Conc Rd 9	Conc Rd 9 at Ormiston Rd to 358m E of Ormiston Rd	2028	37,751
5086 - Langmaid Rd	Langmaid Rd at Conc Rd 7 to 1475m N of Conc Rd 7	2028	156,065
5088 - Langmaid Rd	Langmaid Rd at 1475m N of Conc Rd 7 to Regional Rd 3	2028	51,670
5097 - Hancock Rd	Hancock Rd at Bloor St to Highway 2	2028	171,988
5131 - Holt Rd	Holt Rd at Conc Rd 9 to Conc Rd 9	2028	90,686
5169 - Middle Rd	Middle Rd at Conc Rd 4 to Taunton Rd	2028	217,647
5171 - Middle Rd	Middle Rd at Conc Rd 6 to Conc Rd 7	2028	217,858
5211 - Darlington/Manvers T/L	Darlington/Manvers T/L at Reg Rd 20 to Scugog Boundary Rd	2028	312,868
5234 - Ella Mae Lane	Ella Mae Lane at Old Scugog Rd to Reg Rd 3	2028	28,366
5235 - Leslie Wearn St	Leslie Wearn St at Reg Rd 3 to Old Scugog Rd	2028	24,675
5714 - Concession 5	Concession 5 at 100m E of Hwy35 to Gamsby Rd	2028	149,738

Asset	Asset Description	Event Date	Event Cost
54528 - Conc Rd 9	Conc Rd 9 at 250m W of Enfield Rd to Enfield Rd	2028	31,635
54937 - Solina Rd	Solina Rd at Baseline Rd to Baseline Rd	2028	200,354
4282 - Bons Ave.	Bons Ave. at 210m W of Scugog St to West Scugog Lane	2029	91,664
5700 - Boswell Dr	Boswell Dr at Highway 2 to 340m N of Hwy 2	2029	132,058
53069 - George Reynolds Dr	George Reynolds Dr at Sleeman Sq to Courtice Road	2029	198,087
3683 - Baseline Rd	Baseline Rd at Courtice Rd to Hancock Rd	2029	319,657
3685 - Baseline Rd	Baseline Rd at Hancock Rd to 154m E of Hancock Rd	2029	59,814
3687 - Baseline Rd	Baseline Rd at 154m E of Hancock Rd to Solina Rd	2029	261,397
3861 - Prestonvale Rd	Prestonvale Rd at 1100m N of Baseline Rd to Southfield Ave	2029	116,522
3882 - Farmington Dr	Farmington Dr at Avondale Dr to South End (30 m S of Wilkens Cresc)	2029	121,182
3979 - Edward St	Edward St at Beaver St to Harmer Dr	2029	89,333
3994 - Beaver St S	Beaver St S at James St to Caroline St	2029	93,994
4085 - Baseline Rd	Baseline Rd at Spicer Sq to Waverly Rd	2029	107,678
4140 - Conc Rd 3	Conc Rd 3 at 385m E of Liberty St to Mearns Ave	2029	168,568
4147 - Old Highway 2	Old Highway 2 at Rhonda Blvd to Waverly Rd	2029	75,739
4227 - Scottsdale Dr	Scottsdale Dr at Swindells St to Annisson Ct	2029	79,623
4230 - Concession St	Concession St at Wellington St to Prospect St	2029	50,881
4307 - Division St	Division St at Queen St to King St W	2029	47,774
4321 - Elgin St	Elgin St at Concession St to Bridge	2029	45,443
4367 - Prince St	Prince St at Liberty St to Simpson Av	2029	163,519
4371 - St George St	St George St at King St to Church St	2029	45,443
4376 - Mearns Av	Mearns Av at Orchard Park Dr to Soper Creek Dr	2029	147,594

Asset	Asset Description	Event Date	Event Cost
4378 - Mearns Av	Mearns Av at Flaxman Av to Apple Blossom Blvd	2029	120,406
4413 - Apple Blossom Blvd	Apple Blossom Blvd at Mann St to Mearns Av	2029	157,692
4437 - Green Rd	Green Rd at Hwy 2 to Prince William Dr	2029	132,058
4454 - Scugog St	Scugog St at Longworth Ave to West Scugog Lane	2029	132,058
4455 - Scugog St	Scugog St at Goodwin Ave to Bons Ave	2029	135,942
4504 - Uptown Av	Uptown Av at Clarington Blvd to East End (Garnet Rickard Complex)	2029	43,890
4510 - Longworth Av	Longworth Av at Regional Rd 57 to 265m E of Regional Rd 57	2029	134,597
4513 - Longworth Av	Longworth Av at 263m E of Regional Rd 57 to 363m E of Regional Rd 57	2029	53,331
4517 - Longworth Av	Longworth Av at Scugog St to Daley Dr	2029	108,753
4527 - Bottrell St	Bottrell St at West Side Dr to Millburn Dr	2029	66,806
4537 - Sprucewood Cr	Sprucewood Cr at Mearns Av to Guildwood Dr	2029	106,035
4556 - High St	High St at Hogan Cr to Longworth Av	2029	73,797
4739 - Conc Rd 6	Conc Rd 6 at Highway 35 to Old Kirby Rd	2029	284,313
4776 - Conc Rd 8	Conc Rd 8 at Allin Rd to 400m E of Allin Rd	2029	151,478
4927 - Nash Rd	Nash Rd at Holt Rd to Maple Grove Rd	2029	321,599
4960 - Conc Rd 6	Conc Rd 6 at 867m E of Washington Rd to Solina Rd	2029	147,594
5027 - Conc Rd 7	Conc Rd 7 at Bethesda Rd to Acres Rd	2029	318,492
5483 - Concession St	Concession St at Prospect St to Elgin St	2029	69,913
5666 - Nash Rd	Nash Rd at Townline Rd to Varcoe Rd	2029	163,130
5668 - Centerfield Dr	Centerfield Dr at Hwy #2 to Nash Rd	2029	143,710
5685 - Queen St	Queen St at Temperance St to Queen Ave	2029	163,130
54524 - Brookhouse Dr	Brookhouse Dr at King Ave E to Harmer Dr	2029	108,753

Asset	Asset Description	Event Date	Event Cost
54529 - Concession St	Concession St at Elgin St to Center St	2029	104,869
54530 - Concession St	Concession St at Center St to Liberty St	2029	93,217
54535 - Edward St	Edward St at Harmer Dr to Brookhouse Dr	2029	104,869
54554 - Longworth Ave	Longworth Ave at Argent St to Liberty St	2029	69,913
54557 - Mearns Ave	Mearns Ave at Apple Blossom Blvd to Sprucewood Cr	2029	174,782
54561 - Nash Rd	Nash Rd at Centerfield Dr to Tooley Rd	2029	89,333
54562 - Nash Rd	Nash Rd at Fourth Ave to Courtice Rd	2029	186,434
54563 - Nash Rd	Nash Rd at George Reynolds Dr to Trulls Rd	2029	217,507
54577 - Scugog St	Scugog St at West Scugog Lane to Goodwin Ave	2029	77,681
54903 - Queen St	Queen St at King St to Temperance St	2029	114,191
55089 - Darlington Blvd	Darlington Blvd at Highway 2 to 120m S of Highway 2	2029	46,609
59252 - Nash Rd	Nash Rd at Varcoe Rd to Centerfield Dr	2029	155,362
4090 - Baseline Rd	Baseline Rd at Simpson Ave to Mearns Crt	2029	236,927
4097 - Concession St E	Concession St E at Lambs Rd to Providence Rd	2029	322,376
4120 - Waverley Rd	Waverley Rd at Martin Rd to Spry Ave	2029	40,006
4197 - Queen St	Queen St at Lambert St S to St George St	2029	43,501
4237 - Concession St	Concession St at Soper Creek Dr to Lambs Rd	2029	188,376
4502 - Clarington Blvd	Clarington Blvd at Stevens Rd to North End Temporary Cul-de-Sac	2029	84,284
4618 - Old Scugog Rd	Old Scugog Rd at Edmonson Av to North Limit of Hampton	2029	197,310
4644 - Millstream Ln	Millstream Ln at Mill Dam to Old Scugog Rd	2029	77,681
4690 - Conc Rd 3	Conc Rd 3 at Highway 35 to Arthur St	2029	381,025
4921 - Concession St E	Concession St E at Bragg Rd to Darlington Clarke Townline	2029	320,046

Asset	Asset Description	Event Date	Event Cost
4922 - Nash Rd	Nash Rd at Hancock Rd to Solina Rd	2029	320,046
4955 - Conc Rd 6	Conc Rd 6 at West Townline Rd to 0.1km W of Langmaid Rd	2029	427,246
5039 - Conc Rd 8	Conc Rd 8 at Regional Rd 57 to Lettner Rd Road Allowance	2029	302,956
5090 - Trulls Rd	Trulls Rd at Pebblestone Rd to 900m N of Pebblestone Rd	2029	350,341
5103 - Solina Rd	Solina Rd at Highway 2 to Nash Rd	2029	311,501
5104 - Solina Rd	Solina Rd at Nash Rd to 600m N of Nash Rd	2029	233,043
54531 - Concession St	Concession St at Appleblossom to Mann St	2029	85,449
54573 - Rudel Rd	Rudel Rd at Edward St to Hwy#2	2029	112,637
53068 - Longworth Ave	Longworth Ave at Liberty St TO Brooking St	2029	178,666
5162 - Old Scugog Rd	Old Scugog Rd at Salter Ct to 500m N of Salter Ct	2029	53,779
3710 - Nash Rd	Nash Rd at Harry Gay Dr to Hancock Rd	2029	119,240
4095 - Baseline Rd	Baseline Rd at Bowmanville East Limits (Haines St) to Lambs Rd	2029	161,188
4688 - Conc Rd 3	Conc Rd 3 at Pollard Rd to Lockhart Rd	2029	321,599
4920 - Concession St E	Concession St E at Providence Rd to Bragg Rd	2029	318,881
5091 - Trulls Rd	Trulls Rd at 900m N of Pebblestone Rd to Taunton Rd	2029	444,724
5124 - Holt Rd	Holt Rd at Highway 2 to Nash Rd	2029	577,558
54579 - Simpson Ave	Simpson Ave at Hobb Dr to King St	2029	58,261
3923 - Southfield Ave.	Southfield Ave. at Fenning Dr to Rosswell Dr	2030	144,603
4074 - Lake Rd	Lake Rd at Port Darlington Rd to East End Cul-de-Sac	2030	328,428
4086 - Baseline Rd	Baseline Rd at Hunt St to Duke St	2030	45,164
4235 - Concession St	Concession St at Mann St to Kershaw St	2030	83,196
4347 - Simpson Av	Simpson Av at 230m N of Baseline Rd to 427m N of Baseline Rd	2030	76,858

Asset	Asset Description	Event Date	Event Cost
4501 - Clarington Blvd	Clarington Blvd at Uptown Av to Stevens Rd	2030	54,672
54526 - Conc Rd 3	Conc Rd 3 at 100m E of West Scugog Ln to West Scugog Ln	2030	118,852
54536 - Fenning Dr	Fenning Dr at Southfield Ave to 47m S of Cornish Dr	2030	75,273
3708 - Nash Rd	Nash Rd at Courtice Rd to Harry Gay Dr	2030	202,048

Appendix 3: Bridges and Culverts 10-year Replacement Forecast

Asset ID	Asset Description	Asset Type	Event Date	Event Cost
97	099534-LOT 12/13, CONC VII, DARLINGTON	Bridge	2021	$ 379,000
477	093504-NORTH STREET	Culvert	2021	422,000
485	095501-SOMERVILLE DRIVE, ORONO	Culvert	2021	200,000
515	098509-LOT 7, CONC B/I, CLARKE	Culvert	2021	193,000
516	098510-LOT 4, CONC B/I, CLARKE	Culvert	2021	222,000
524	098518-LOT 29, CONC III/IV, CLARKE	Culvert	2021	150,000
525	098519-LOT 29, CONC III/IV, CLARKE	Culvert	2021	513,000
479	094010-MARTIN ROAD PEDESTRIAN UNDERPASS	Culvert	2021	500,000
480	094501-PORT DARLINGTON ROAD	Culvert	2022	292,000
519	098513-LOT 1, CONC I, CLARKE	Culvert	2022	258,000
578	099125-LOT 35, CONC VIII, DARLINGTON	Culvert	2022	723,000
600	099525-LOT 2, CONC V/VI, DARLINGTON	Culvert	2022	489,000
74	099077-LOT 26/27, CONC II, DARLINGTON	Bridge	2023	883,000
538	098533-LOT 25, CONC VI/VII, CLARKE	Culvert	2023	302,000
540	098535-LOT 28/29, CONC VII, CLARKE	Culvert	2023	436,000
579	099129-LOT 28, CONC VIII, DARLINGTON	Culvert	2024	599,000
610	099536-LOT 1, CONC VII/VIII, DARLINGTON	Culvert	2024	400,000
520	098514-LOT 16/17, CONC II, CLARKE	Culvert	2025	327,000
535	098529-LOT 19, CONC V/VI, CLARKE	Culvert	2025	346,000
593	099514-LOT 8/9, CONC III, DARLINGTON	Culvert	2026	316,000
36	098047-LOT 4/5, CONC VI, CLARKE	Bridge	2027	1,280,000
512	098506-LOT 6/7, CONC B, CLARKE	Culvert	2027	280,000
492	095508-MILL STREET	Culvert	2028	271,000
570	099065-LOT 17, CONC BF/I, DARLINGTON	Culvert	2028	908,000
576	099111-LOT 20, CONC VII, DARLINGTON	Culvert	2028	421,000
594	099515-LOT 34, CONC III/IV, DARLINGTON	Culvert	2028	338,000
597	099520-LOT 22/23, CONC V, DARLINGTON	Culvert	2028	262,000
493	095509-ROBINS ROAD	Culvert	2029	301,000
530	098524-LOT 24/25, CONC V, CLARKE	Culvert	2029	289,000
35	099045-LOT 20/21, CONC VII, DARLINGTON	Bridge	2030	339,000
554	098548-LOT 28/29, CONC VIII, CLARKE	Culvert	2030	297,000
582	099503-LOT 18/19, CONC BF, DARLINGTON	Culvert	2030	182,000

Asset ID	Asset Description	Asset Type	Event Date	Event Cost
588	099509-LOT 20, CONC I/II, DARLINGTON	Culvert	2030	280,000
471	091501-HILL STREET, NEWTONVILLE	Culvert	2031	378,000
500	098055-LOT 8/9, CONC B, CLARKE	Culvert	2031	574,000
558	098552 - Lot 32 Concession 7/8 Clarke	Culvert	2031	393,000
589	099510-LOT 19, CONC I/II, DARLINGTON	Culvert	2031	317,000
612	099538-LOT 10/11, CONC VIII, DARLINGTON	Culvert	2031	282,000
613	099539-LOT 10/11, CONC VIII, DARLINGTON	Culvert	2031	301,000

Appendix 4: Lifecycle Events per Storm Water Asset - Conduit

Storm Sewer - Conduit (Concrete)

Lifecycle Event	Cost/M	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Inspection - CCTV & Pipe Flushing	$ 8.70	40 - 60	No Impact	40
Inspection - CCTV & Pipe Flushing	$ 8.70	0-20	No Impact	70
Asset Replacement	$1,078	0	Increase Condition to 100%	75

*** Conduit replacement costs varies significantly based on diameter and depth of the pipe.*
An average pricing was used based on the various sizes of concrete conduit in Clarington's inventory.

Storm Sewer - Conduit (PVC)

Lifecycle Event	Cost/M	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Inspection - CCTV & Pipe Flushing	$8.70	40 - 60	No Impact	40
Inspection - CCTV & Pipe Flushing	$8.70	0-20	No Impact	70
Asset Replacement	$349	0	Increase Condition to 100%	75

*** Conduit replacement costs varies significantly based on diameter and depth of the pipe.*
An average pricing was used based on the various sizes of CSP conduit in Clarington's inventory.

Storm Sewer - Conduit (VCP)

Lifecycle Event	Cost/M	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Inspection - CCTV & Pipe Flushing	$ 8.70	20-40	No Impact	30
Asset Replacement	$1,078	0	Increase Condition to 100%	75

Appendix 5: Lifecycle Events per Storm Water Asset – Structures

Storm Sewer - Catch Basin Structures (Single Grate)

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Street Sweeping - Spring	$ 54.06	-	Maintains Condition	Annually
Street Sweeping - Fall	$ 54.06	-	Maintains Condition	Annually
Catch Basin Cleaning & Disposal Services	$ 87.97	80 - 100	Maintains Condition	3
Catch Basin Cleaning & Disposal Services	$ 87.97	80 - 100	Maintains Condition	6
Catch Basin Cleaning & Disposal Services	$ 87.97	80 - 100	Maintains Condition	9
Catch Basin Cleaning & Disposal Services	$ 87.97	80 - 100	Maintains Condition	12
Catch Basin Cleaning & Disposal Services	$ 87.97	80 - 100	Maintains Condition	15
Catch Basin Cleaning & Disposal Services	$ 87.97	60 - 80	Maintains Condition	18
Catch Basin Cleaning & Disposal Services	$ 87.97	60 - 80	Maintains Condition	21
Resetting Initial	$ 2,322.00	60 - 80	Maintains Condition	23
Catch Basin Cleaning & Disposal Services	$ 87.97	60 - 80	Maintains Condition	24
Catch Basin Cleaning & Disposal Services	$ 87.97	60 - 80	Maintains Condition	27
Catch Basin Cleaning & Disposal Services	$ 87.97	60 - 80	Maintains Condition	30
Catch Basin Cleaning & Disposal Services	$ 87.97	40 - 60	Maintains Condition	33
Catch Basin Cleaning & Disposal Services	$ 87.97	40 - 60	Maintains Condition	36
Catch Basin Cleaning & Disposal Services	$ 87.97	40 - 60	Maintains Condition	39
Inspection - CCTV	$ 37.00	40 - 60	No Impact	40
Catch Basin Cleaning & Disposal Services	$ 87.97	40 - 60	Maintains Condition	43
Catch Basin Cleaning & Disposal Services	$ 87.97	20 - 40	Maintains Condition	46
Resetting 2	$ 2,322.00	20 - 40	Increases Condition to 60 - 80%	46
Catch Basin Cleaning & Disposal Services	$ 87.97	20 - 40	Maintains Condition	49
Catch Basin Cleaning & Disposal Services	$ 87.97	20 - 40	Maintains Condition	52
Catch Basin Cleaning & Disposal Services	$ 87.97	20 - 40	Maintains Condition	55
Catch Basin Cleaning & Disposal Services	$ 87.97	20 - 40	Maintains Condition	58
Catch Basin Cleaning & Disposal Services	$ 87.97	0-20	Maintains Condition	61
Resetting 3	$ 2,322.00	0-20	Increases Condition to 40 - 60%	63
Catch Basin Cleaning & Disposal Services	$ 87.97	0-20	Maintains Condition	66
Catch Basin Cleaning & Disposal Services	$ 87.97	0-20	Maintains Condition	69
Inspection - CCTV	$ 37.00	0-20	No Impact	70
Catch Basin Cleaning & Disposal Services	$ 87.97	0-20	Maintains Condition	72
Asset Replacement	$1,933	0	Increase Condition to 100%	75

Storm Sewer - Catch Basin Structures (Double Grate)

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Street Sweeping - Spring	$ 54.06	-	Maintains Condition	Annually
Street Sweeping - Fall	$ 54.06	-	Maintains Condition	Annually
Catch Basin Cleaning & Disposal Services	$ 175.94	80 - 100	Maintains Condition	3
Catch Basin Cleaning & Disposal Services	$ 175.94	80 - 100	Maintains Condition	6
Catch Basin Cleaning & Disposal Services	$ 175.94	80 - 100	Maintains Condition	9
Catch Basin Cleaning & Disposal Services	$ 175.94	80 - 100	Maintains Condition	12
Catch Basin Cleaning & Disposal Services	$ 175.94	80 - 100	Maintains Condition	15
Catch Basin Cleaning & Disposal Services	$ 175.94	60 - 80	Maintains Condition	18
Catch Basin Cleaning & Disposal Services	$ 175.94	60 - 80	Maintains Condition	21
Resetting Initial	$ 2,322.00	60 - 80	Maintains Condition	23
Catch Basin Cleaning & Disposal Services	$ 175.94	60 - 80	Maintains Condition	24
Catch Basin Cleaning & Disposal Services	$ 175.94	60 - 80	Maintains Condition	27
Catch Basin Cleaning & Disposal Services	$ 175.94	60 - 80	Maintains Condition	30
Catch Basin Cleaning & Disposal Services	$ 175.94	40 - 60	Maintains Condition	33
Catch Basin Cleaning & Disposal Services	$ 175.94	40 - 60	Maintains Condition	36
Catch Basin Cleaning & Disposal Services	$ 175.94	40 - 60	Maintains Condition	39
Inspection - CCTV	$ 37.00	40 - 60	No Impact	40
Catch Basin Cleaning & Disposal Services	$ 175.94	40 - 60	Maintains Condition	43
Catch Basin Cleaning & Disposal Services	$ 175.94	20 - 40	Maintains Condition	46
Resetting 2	$ 2,322.00	20 - 40	Increases Condition to 60 - 80%	46
Catch Basin Cleaning & Disposal Services	$ 175.94	20 - 40	Maintains Condition	49
Catch Basin Cleaning & Disposal Services	$ 175.94	20 - 40	Maintains Condition	52
Catch Basin Cleaning & Disposal Services	$ 175.94	20 - 40	Maintains Condition	55
Catch Basin Cleaning & Disposal Services	$ 175.94	20 - 40	Maintains Condition	58
Catch Basin Cleaning & Disposal Services	$ 175.94	0-20	Maintains Condition	61
Resetting 3	$ 2,322.00	0-20	Increases Condition to 40 - 60%	63
Catch Basin Cleaning & Disposal Services	$ 175.94	0-20	Maintains Condition	66
Catch Basin Cleaning & Disposal Services	$ 175.94	0-20	Maintains Condition	69
Inspection - CCTV	$ 37.00	0-20	No Impact	70
Catch Basin Cleaning & Disposal Services	$ 175.94	0-20	Maintains Condition	72
Asset Replacement	$3,460.00	0	Increase Condition to 100%	75

Storm Sewer - Catch Basin Structures (Triple Grate)

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Street Sweeping - Spring	$ 54.06	-	Maintains Condition	Annually
Street Sweeping - Fall	$ 54.06	-	Maintains Condition	Annually
Catch Basin Cleaning & Disposal Services	$ 263.91	80 - 100	Maintains Condition	3
Catch Basin Cleaning & Disposal Services	$ 263.91	80 - 100	Maintains Condition	6
Catch Basin Cleaning & Disposal Services	$ 263.91	80 - 100	Maintains Condition	9
Catch Basin Cleaning & Disposal Services	$ 263.91	80 - 100	Maintains Condition	12
Catch Basin Cleaning & Disposal Services	$ 263.91	80 - 100	Maintains Condition	15
Catch Basin Cleaning & Disposal Services	$ 263.91	60 - 80	Maintains Condition	18
Catch Basin Cleaning & Disposal Services	$ 263.91	60 - 80	Maintains Condition	21
Resetting Initial	$ 2,322.00	60 - 80	Maintains Condition	23
Catch Basin Cleaning & Disposal Services	$ 263.91	60 - 80	Maintains Condition	24
Catch Basin Cleaning & Disposal Services	$ 263.91	60 - 80	Maintains Condition	27
Catch Basin Cleaning & Disposal Services	$ 263.91	60 - 80	Maintains Condition	30
Catch Basin Cleaning & Disposal Services	$ 263.91	40 - 60	Maintains Condition	33
Catch Basin Cleaning & Disposal Services	$ 263.91	40 - 60	Maintains Condition	36
Catch Basin Cleaning & Disposal Services	$ 263.91	40 - 60	Maintains Condition	39
Inspection - CCTV	$ 37.00	40 - 60	No Impact	40
Catch Basin Cleaning & Disposal Services	$ 263.91	40 - 60	Maintains Condition	43
Catch Basin Cleaning & Disposal Services	$ 263.91	20 - 40	Maintains Condition	46
Resetting 2	$ 2,322.00	20 - 40	Increases Condition to 60 - 80%	46
Catch Basin Cleaning & Disposal Services	$ 263.91	20 - 40	Maintains Condition	49
Catch Basin Cleaning & Disposal Services	$ 263.91	20 - 40	Maintains Condition	52
Catch Basin Cleaning & Disposal Services	$ 263.91	20 - 40	Maintains Condition	55
Catch Basin Cleaning & Disposal Services	$ 263.91	20 - 40	Maintains Condition	58
Catch Basin Cleaning & Disposal Services	$ 263.91	0-20	Maintains Condition	61
Resetting 3	$ 2,322.00	0-20	Increases Condition to 40 - 60%	63
Catch Basin Cleaning & Disposal Services	$ 263.91	0-20	Maintains Condition	66
Catch Basin Cleaning & Disposal Services	$ 263.91	0-20	Maintains Condition	69
Inspection - CCTV	$ 37.00	0-20	No Impact	70
Catch Basin Cleaning & Disposal Services	$ 263.91	0-20	Maintains Condition	72
Asset Replacement	$4,987.00	0	Increase Condition to 100%	75

Storm Sewer – Maintenance Holes

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Resetting Initial	$ 1,670.00	60 - 80	Maintains Condition	23
Inspection - CCTV	$ 37.00	40 - 60	No Impact	40
Resetting 2	$ 1,670.00	20 - 40	Increases Condition to 60 - 80%	46
Resetting 3	$ 1,670.00	20 - 40	Increases Condition to 40 - 60%	63
Inspection - CCTV	$ 37.00	0-20	No Impact	70
Asset Replacement	$ 8,814	0	Increase Condition to 100%	75

Appendix 6: Lifecycle Events per Storm Water Asset – Ponds

Storm Water Ponds – Wet

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Inspection	$ -	-	No Impact	Annually
Minor Maintenance	$ -	-	Maintains Condition	Annually
Major Maintenance	$ -	60-80	Maintains Condition	5
Sediment Survey	$ 3,833.00	60-80	No Impact	5
Major Maintenance	$ -	60-80	Maintains Condition	10
Sediment Survey	$ 3,833.00	40-60	No Impact	10
Sediment Survey	$ 3,833.00	40-60	No Impact	15
Sediment Cleanout / Structure rehab	$ 286,000.00	20-40	Increases Condition to 80-100%	15
Major Maintenance	$ -	60-80	Maintains Condition	20
Sediment Survey	$ 3,833.00	60-80	No Impact	20
Major Maintenance	$ -	60-80	Maintains Condition	25
Sediment Survey	$ 3,833.00	40-60	No Impact	25
Sediment Survey	$ 3,833.00	40-60	No Impact	30
Sediment Cleanout / Structure rehab	$ 286,000.00	20-40	Increases Condition to 80-100%	30
Major Maintenance	$ -	60-80	Maintains Condition	35
Sediment Survey	$ 3,833.00	60-80	No Impact	35
Major Maintenance	$ -	60-80	Maintains Condition	40
Sediment Survey	$ 3,833.00	40-60	No Impact	40
Sediment Survey	$ 3,833.00	40-60	No Impact	45
Sediment Cleanout / Structure rehab	$ 286,000.00	20-40	Increases Condition to 80-100%	45
Major Maintenance	$ -	60-80	Maintains Condition	50
Sediment Survey	$ 3,833.00	60-80	No Impact	50
Major Maintenance	$ -	60-80	Maintains Condition	55
Sediment Survey	$ 3,833.00	40-60	No Impact	55
Sediment Survey	$ 3,833.00	40-60	No Impact	60
Sediment Cleanout / Structure rehab	$ 286,000.00	20-40	Increases Condition to 80-100%	60
Major Maintenance	$ -	60-80	Maintains Condition	65
Sediment Survey	$ 3,833.00	60-80	No Impact	65
Major Maintenance	$ -	40-60	Maintains Condition	70
Sediment Survey	$ 3,833.00	40-60	No Impact	70
Sediment Survey	$ 3,833.00	20-40	No Impact	70
Full Reconstruction (Average for 23 Facilities at 70% Replacement)	$ 245,160.00	20-40	Increases Condition to 100%	75

Storm Water Ponds –Dry

Lifecycle Event	Cost/Unit	"Physical Condition" Rating	Effect	Approx. Lifecycle Year
Inspection	$ -	-	No Impact	Annually
Minor Maintenance	$ -	-	Maintains Condition	Annually
Major Maintenance	$ -	60-80	Maintains Condition	5
Sediment Survey	$ 3,833.00	60-80	No Impact	5
Major Maintenance	$ -	60-80	Maintains Condition	10
Sediment Survey	$ 3,833.00	60-80	No Impact	10
Major Maintenance	$ -	40-60	Maintains Condition	15
Sediment Survey	$ 3,833.00	40-60	No Impact	15
Sediment Survey	$ 3,833.00	20-40	No Impact	20
Sediment Cleanout / Structure rehab	$ 214,500.00	20-40	Increases Condition to 80-100%	20
Major Maintenance	$ -	60-80	Maintains Condition	25
Sediment Survey	$ 3,833.00	60-80	No Impact	25
Major Maintenance	$ -	60-80	Maintains Condition	30
Sediment Survey	$ 3,833.00	60-80	No Impact	30
Major Maintenance	$ -	40-60	Maintains Condition	35
Sediment Survey	$ 3,833.00	40-60	No Impact	35
Sediment Survey	$ 3,833.00	20-40	No Impact	40
Sediment Cleanout / Structure rehab	$ 214,500.00	20-40	Increases Condition to 80-100%	40
Major Maintenance	$ -	60-80	Maintains Condition	45
Sediment Survey	$ 3,833.00	60-80	No Impact	45
Major Maintenance	$ -	60-80	Maintains Condition	50
Sediment Survey	$ 3,833.00	60-80	No Impact	50
Major Maintenance	$ -	40-60	Maintains Condition	55
Sediment Survey	$ 3,833.00	40-60	No Impact	55
Sediment Survey	$ 3,833.00	20-40	No Impact	60
Sediment Cleanout / Structure rehab	$ 214,500.00	20-40	Increases Condition to 80-100%	60
Major Maintenance	$ -	60-80	Maintains Condition	65
Sediment Survey	$ 3,833.00	60-80	No Impact	65
Major Maintenance	$ -	40-60	Maintains Condition	70
Sediment Survey	$3,833.00	40-60	No Impact	70
Full Reconstruction (Average for 15 Facilities at 70% Replacement)	$ 204,955.00	20-40	Increases Condition to 100%	75