

# AMP2019

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The 2019 Asset Management Plan for the  
**Township of Papineau-Cameron**

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# Executive Summary

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Infrastructure is inextricably linked to the economic, social and environmental advancement of a community. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada. As analyzed in this asset management plan (AMP), the Township of Papineau-Cameron's infrastructure portfolio comprises the following asset classes: road network, bridges & culverts, buildings, machinery & equipment and vehicles. The asset classes analyzed in this asset management plan for the township had a total 2018 valuation of \$8.9 million, of which roads comprised 38%.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. This AMP, the township's second following the completion of its first edition in 2013, details the state of infrastructure of the township's service areas and provides asset management and financial strategies designed to facilitate its pursuit of developing an advanced asset management program and mitigate long-term funding gaps.

In addition to observed field conditions, historical capital expenditures can assist the township in identifying impending infrastructure needs, and guide its medium- and long-term capital programs. The township has invested sporadically into its infrastructure over the decades until the early 1990s. Investments gradually increase during the 1990s and then peaked in the early 2000s. During this time, \$1.6 million was invested with \$900,000 put into bridges and culverts. Since 2015, \$1 million has been invested with a focus on bridges and culverts and vehicles.

Based on 2018 replacement cost, and primarily condition data, 80% of assets, with a valuation of \$6.8 million, are in good to very good condition; 6% are in poor to very poor condition. The township has provided condition information for 97% of assets based on 2018 replacement cost. Nearly 40% of the assets analyzed in this AMP have at least 10 years of useful life remaining. An additional 11% will reach the end of their useful life within the next five years.

In order for an AMP to be effective, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the township to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

The average annual investment requirement for the above categories is \$619,000. Annual revenue currently allocated to these assets for capital purposes is \$312,000 leaving an annual deficit of \$307,000. To put it another way, these infrastructure categories are currently funded at 50% of their long-term requirements. In 2019, Papineau-Cameron has annual tax revenues of \$1,573,000. Our strategy includes full funding being achieved over 15 years by:

- when realized, reallocating the debt cost reductions of \$62,000 to the infrastructure deficit.
- allocating the current gas tax and OCIF revenue as outlined in Table 23.

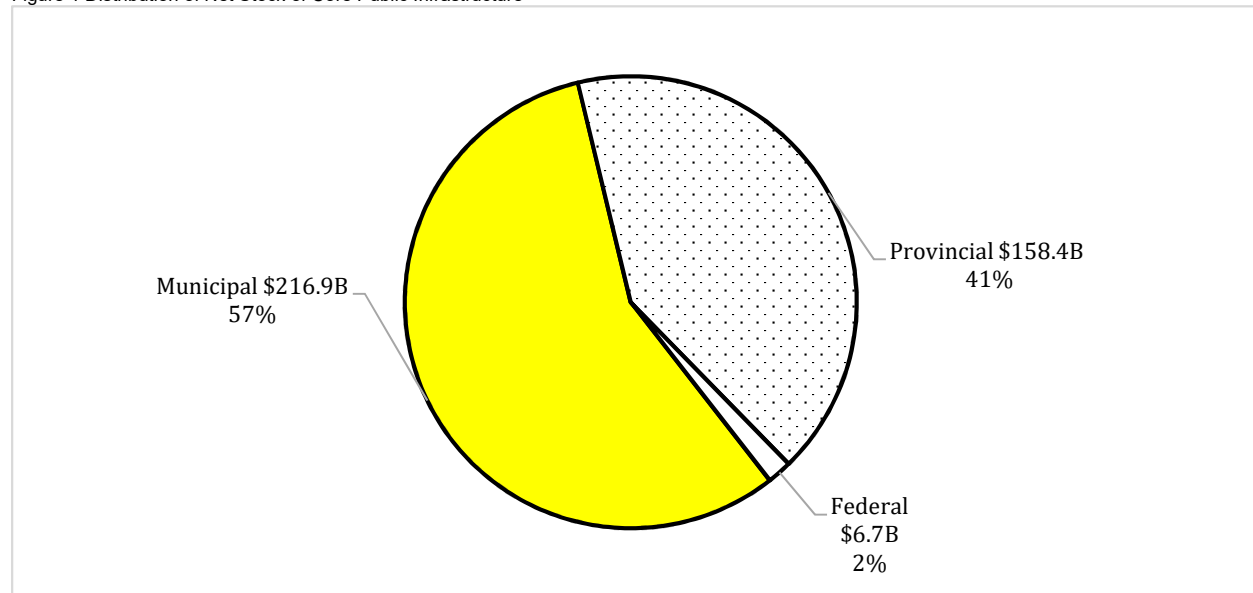
Although our financial strategies allow the municipalities to meet its long-term funding requirements and reach fiscal sustainability, injection of additional revenues will be required to mitigate existing infrastructure backlogs.

A critical aspect of this asset management plan is the level of confidence the township has in the data used to develop the state of the infrastructure and form the appropriate financial strategies. The township has indicated a high degree of confidence in the accuracy, validity and completeness of the asset data for all categories analyzed in this asset management plan.

# I. Introduction & Context

Across Canada, municipal share of public infrastructure increased from 22% in 1955 to nearly 60% in 2013. The federal government's share of critical infrastructure stock, including roads, water and wastewater, declined by nearly 80% in value since 1963.<sup>1</sup>

Figure 1 Distribution of Net Stock of Core Public Infrastructure



Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government. The asset portfolios managed by Ontario's municipalities are also highly diverse. The Township of Papineau-Cameron's capital assets portfolio, as analyzed in this asset management plan (AMP) is valued at \$8.9 million using 2018 replacement costs. The township relies on these assets to provide residents, businesses, employees and visitors with safe access to important services, such as transportation, recreation, culture, economic development and much more. As such, it is critical that the township manage these assets optimally in order to produce the highest total value for taxpayers. This asset management plan, (AMP) will assist the township in the pursuit of judicious asset management for its capital assets.

<sup>1</sup> Larry Miller, Updating Infrastructure In Canada: An Examination of Needs And Investments Report of the Standing Committee on Transport, Infrastructure and Communities, June 2015

## II. Asset Management

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Asset management can be best defined as an integrated business approach within an organization with the aim to minimize the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering established levels of service for present and future customers. It includes the planning, design, construction, operation and maintenance of infrastructure used to provide services. By implementing asset management processes, infrastructure needs can be prioritized over time, while ensuring timely investments to minimize repair and rehabilitation costs and maintain municipal assets.

Table 1 Objectives of Asset Management

Inventory	Capture all asset types, inventories and historical data.
Current Valuation	Calculate current condition ratings and replacement values.
Lifecycle Analysis	Identify Maintenance and Renewal Strategies & Lifecycle Costs.
Service Level Targets	Define measurable Levels of Service Targets.
Risk & Prioritization	Integrates all asset classes through risk and prioritization strategies.
Sustainable Financing	Identify sustainable Financing Strategies for all asset classes.
Continuous Processes	Provide continuous processes to ensure asset information is kept current and accurate.
Decision Making & Transparency	Integrate asset management information into all corporate purchases, acquisitions and assumptions.
Monitoring & Reporting	At defined intervals, assess the assets and report on progress and performance.

# 1. Overarching Principles

The Institute of Asset Management (IAM) recommends the adoption of seven key principles for a sustainable asset management program. According to IAM, asset management must be:<sup>2</sup>

Table 2 Principles of Asset Management

Holistic	Asset management must be cross-disciplinary, total value focused.
Systematic	Rigorously applied in a structured management system.
Systemic	Looking at assets in their systems context, again for net, total value.
Risk-based	Incorporating risk appropriately into all decision-making.
Optimal	Seeking the best compromise between conflicting objectives, such as costs versus performance versus risks etc.
Sustainable	Plans must deliver optimal asset lifecycles, ongoing systems performance, environmental and other long term consequences.
Integrated	At the heart of good asset management lies the need to be joined-up. The total jigsaw puzzle needs to work as a whole - and this is not just the sum of the parts.

<sup>2</sup> "Key Principles", The Institute of Asset Management, [www.iam.org](http://www.iam.org)

# III. AMP Objectives and Content

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This AMP is one component of Papineau-Cameron's overarching corporate strategy. It was developed to support the township's vision for its asset management practice and programs. It provides key asset attribute data, including current composition of the township's infrastructure portfolio, inventory, replacement costs, useful life etc., summarizes the physical health of the capital assets, enumerates the township's current capital spending framework, and outlines financial strategies to achieve fiscal sustainability in the long-term while reducing and eventually eliminating funding gaps.

As with the first edition of the township's asset management plan in 2014, this AMP is developed in accordance with provincial standards and guidelines, and new requirements under the Federal Gas Tax Fund (GTF) stipulating the inclusion of all eligible asset classes. The following asset classes are analysed in this document: road network; bridges & culverts; facilities; machinery & equipment; and vehicles.



## IV. Data and Methodology

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The township's dataset for the asset classes analyzed in this AMP are maintained in PSD's CityWide® Asset Manager module. This dataset includes key asset attributes and PSAB 3150 data, such as historical costs, in-service dates, field inspection data (as available), asset health, and replacement costs.

### 1. Condition Data

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Municipalities implement a straight-line amortization schedule approach to depreciate their capital assets. In general, this approach may not be reflective of an asset's actual condition and the true nature of its deterioration, which tends to accelerate toward the end of the asset's lifecycle. However, it is a useful approximation in the absence of standardized decay models and actual field condition data and can provide a benchmark for future requirements. We analyze each asset individually prior to aggregation and reporting; therefore, many imprecisions that may be highlighted at the individual asset level are attenuated at the class level.

As available, actual field condition data was used to make recommendations more meaningful and representative of the township's state of infrastructure. The value of condition data cannot be overstated as they provide a more accurate representation of the state of infrastructure. The type of condition data used for each class is indicated in Chapter V, Section 2.

## 2. Financial Data

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In this AMP, the average annual requirement is the amount, based on current replacement costs, that municipalities should set aside annually for each infrastructure class so that assets can be replaced upon reaching the end of their lifecycle.

To determine current funding capacity, all existing sources of funding are identified and combined to enumerate the total available funding; funding for the previous three years is analyzed as data is available. These figures are then assessed against the average annual requirements, and are used to calculate the annual funding shortfall (surplus) and for forming the financial strategies.

In addition to the annual shortfall, the majority of municipalities face significant infrastructure backlogs. The infrastructure backlog is the accrued financial investment needed in the short-term to bring the assets to a state of good repair. This amount is identified for each asset class.

Only predictable sources of funding are used, e.g., tax and rate revenues, user fees, and other streams of income the township can rely on with a high degree of certainty. Government grants and other ad-hoc injections of capital are not included in this asset management plan given their unpredictability. As senior governments make greater, more predictable and permanent commitments to funding municipal infrastructure programs, e.g., the Federal Gas Tax Fund, future iterations of this asset management plan will account for such funding sources.



### 3. Infrastructure Report Card

The asset management plan is a complex document, but one with direct implications on the public, a group with varying degrees of technical knowledge. To make communications more meaningful and the AMP more accessible, we've developed an Infrastructure Report Card that summarizes our findings in common language that municipalities can use for internal and external distribution. The report card is developed using two key, equally weighted factors: Financial Capacity and Asset Health.

Table 3 Infrastructure Report Card Description

Financial Capacity		A township's financial capacity grade is determined by the level of funding available (0-100%) for each asset class for the purpose of meeting the average annual investment requirements.
Asset Health		Using either field inspection data as available or age-based data, the asset health component of the report card uses condition (0-100%) to estimate how capable assets are in performing their required functions. We use replacement cost to determine the weight of each condition group within the asset class.
Letter Grade	Rating	Description
A	Very Good	The asset is functioning and performing well; only normal preventative maintenance is required. The township is fully prepared for its long-term replacement needs based on its existing infrastructure portfolio.
B	Good	The township is well prepared to fund its long-term replacement needs but requires additional funding strategies in the short-term to begin to increase its reserves.
C	Fair	The asset's performance or function has started to degrade and repair/rehabilitation is required to minimize lifecycle cost. The township is underpreparing to fund its long-term infrastructure needs. The replacement of assets in the short- and medium-term will likely be deferred to future years.
D	Poor	The asset's performance and function is below the desired level and immediate repair/rehabilitation is required. The township is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	The township is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The township may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.

## 4. Limitations and Assumptions

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Several limitations continue to persist as municipalities advance their asset management practices.

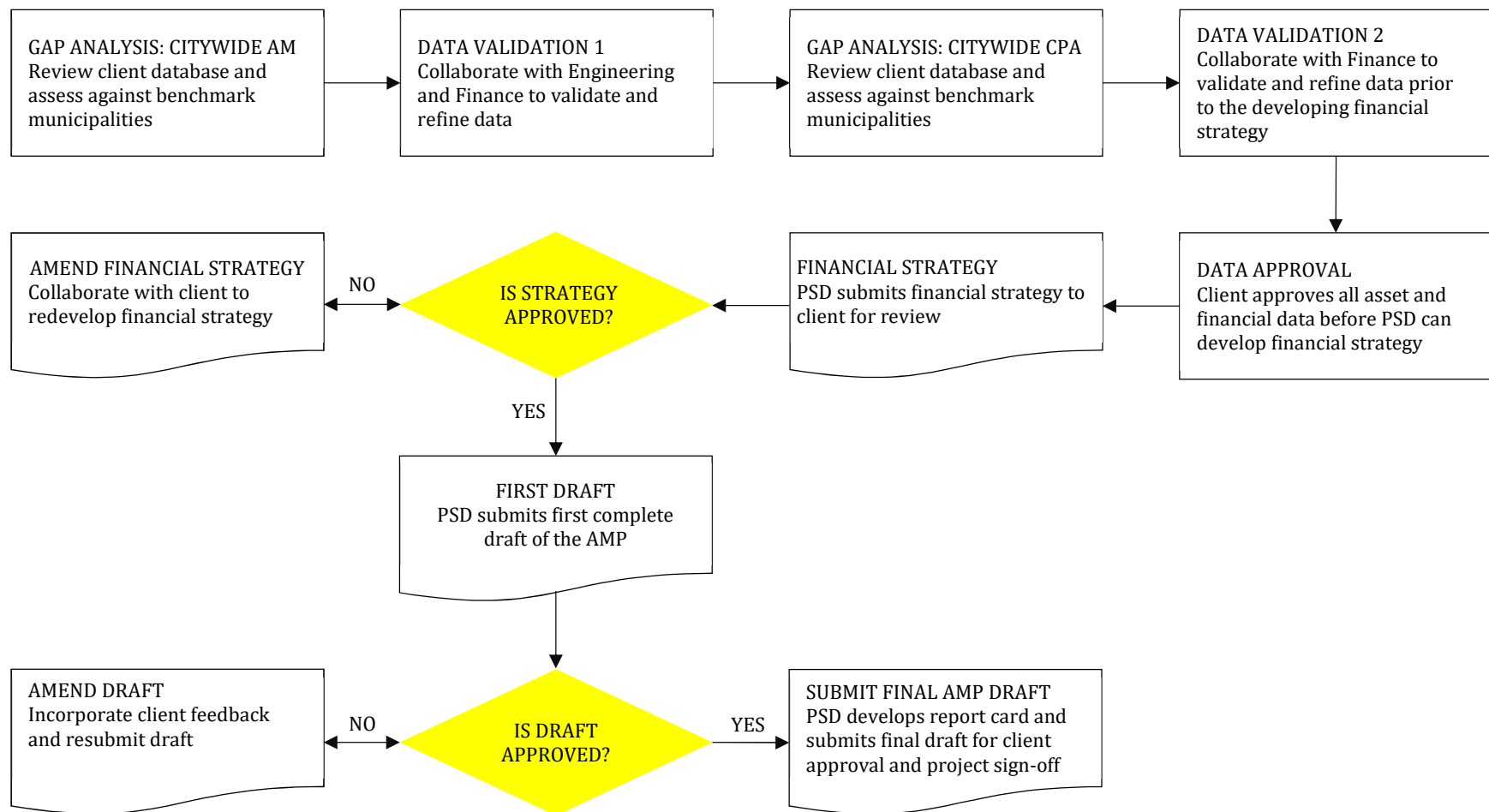
- As available, we use field condition assessment data to illustrate the state of infrastructure and develop the requisite financial strategies. However, in the absence of observed data, we rely on the age of assets to estimate their physical condition.
- A second limitation is the use of inflation measures, for example using CPI/NRBCPI to inflate historical costs in the absence of actual replacement costs. While a reasonable approximation, the use of such multipliers may not be reflective of market prices and may over- or understate the value of a township's infrastructure portfolio and the resulting capital requirements.
- Our calculations and recommendations will reflect the best available data at the time this AMP was developed.
- The focus of this plan is restricted to capital expenditures and does not capture O&M expenditures on infrastructure.



## 5. Process

High data quality is the foundation of intelligent decision-making. Generally, there are two primary causes of poor decisions: inaccurate or incomplete data, and the misinterpretation of data used. The figure below illustrates an abbreviated version of our work order/work flow process between PSD and municipal staff. It is designed to ensure maximum confidence in the raw data used to develop the AMP, the interpretation of the AMP by all stakeholders, and ultimately, the application of the strategies outlined in this AMP.

Figure 2 Developing the AMP – Work Flow and Process



## 6. Data Confidence Rating

Staff confidence in the data used to develop the AMP can determine the extent to which recommendations are applied. Low confidence suggests uncertainty about the data and can undermine the validity of the analysis. High data confidence endorses the findings and strategies, and the AMP can become an important, reliable reference guide for interdepartmental communication as well as a manual for long-term corporate decision-making. Having a numerical rating for confidence also allows the township to track its progress over time and eliminate data gaps.

Data confidence in this AMP is determined using five key factors and is based on the City of Brantford's approach. Municipal staff provide their level of confidence (score) in each factor for major asset classes along a spectrum, ranging from 0, suggesting low confidence in the data, to 100 indicative of high certainty regarding inputs. The five factors used to calculate the township's data confidence ratings are:

F1	F2	F3	F4	F5
The data is up to date.	The data is complete and uniform.	The data comes from an authoritative source	The data is error free.	The data is verified by an authoritative source.

The township's self-assessed score in each factor is then used to calculate data confidence in each asset class using Equation 1 below.

$$\text{Asset Class Data Confidence Rating} = \sum (\text{Score in each factor}) \times \left(\frac{1}{5}\right)$$

## V. Summary Statistics

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In this section, we aggregate technical and financial data across all asset classes analyzed in this AMP, and summarize the state of the infrastructure using key indicators, including asset condition, useful life consumption, and important financial measurements.



# 1. Asset Valuation

The asset classes analyzed in this asset management plan for the township had a total 2018 valuation of \$8.9 million, of which roads comprised 38%, followed by bridges & culverts at 26%. The ownership per household (Figure 4) totaled \$16,000 based on 544 households for all asset categories.

Figure 3 Asset Valuation by Class

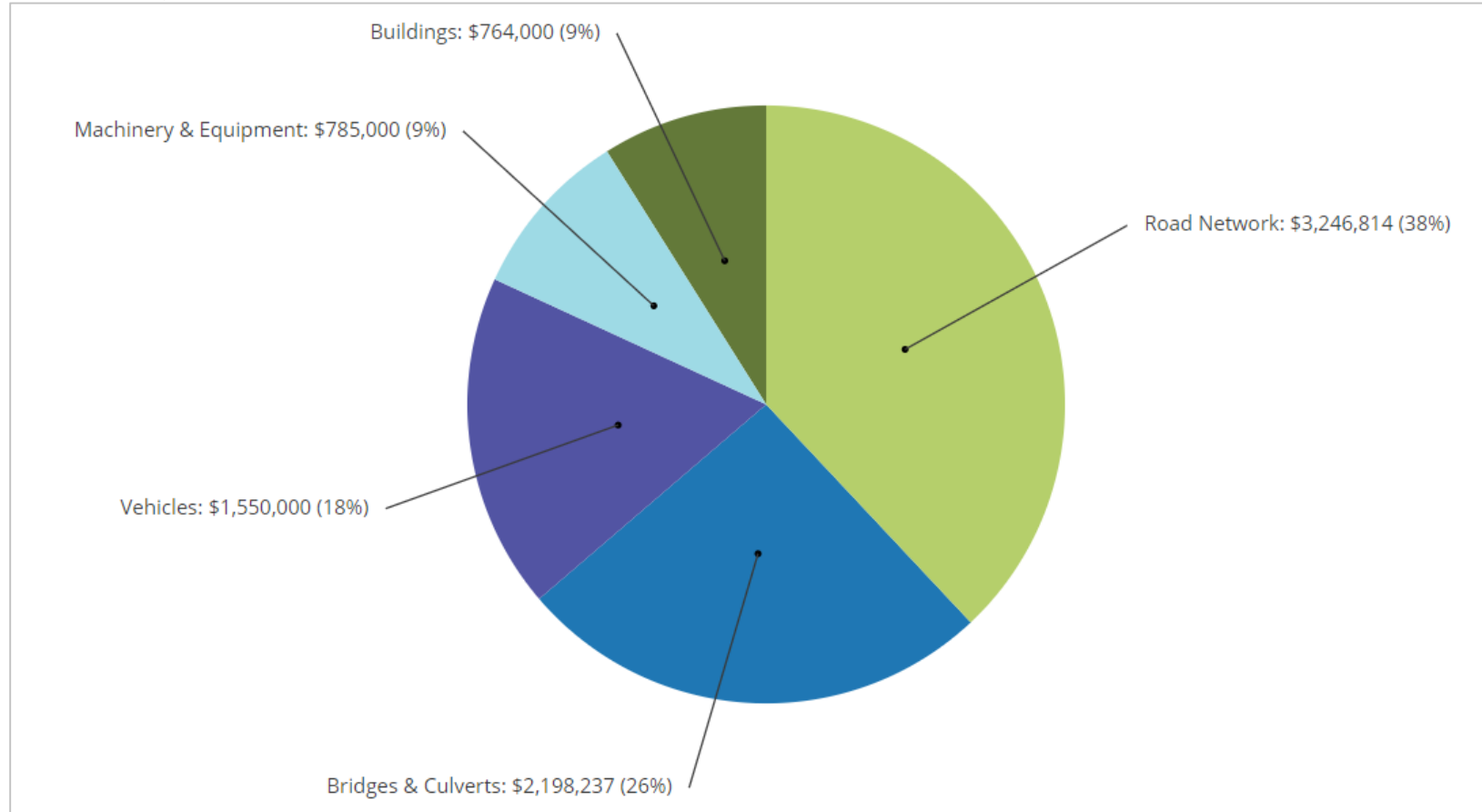
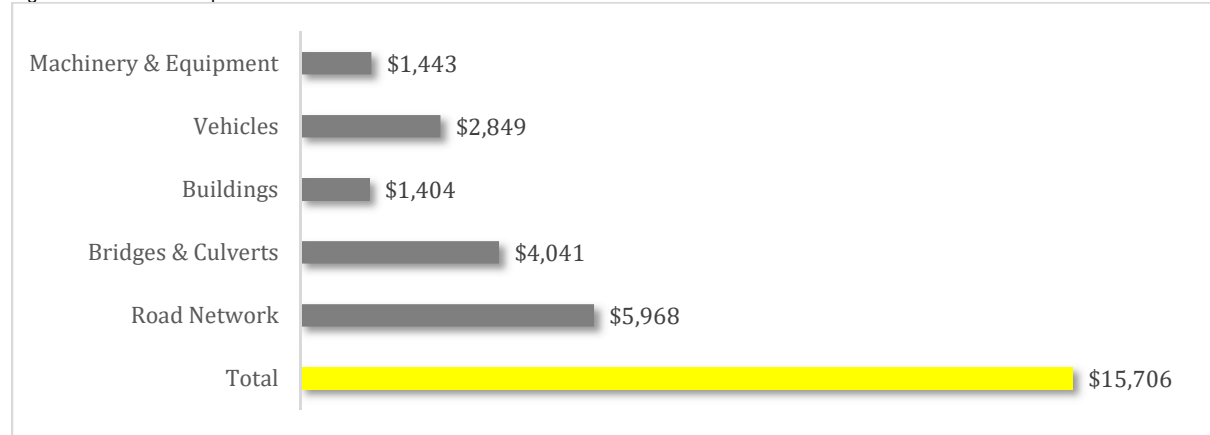




Figure 4 2018 Ownership Per Household



## 2. Source of Condition Data by Asset Class

Observed data will provide the most precise indication of an asset's physical health. In the absence of such information, the age of capital assets can be used as a meaningful approximation of the asset's condition. Table 4 indicates the source of condition data used for the various asset classes in this AMP. The township has condition data for 97% of all assets based on 2018 replacement cost.

Table 4 Source of Condition Data by Asset Class

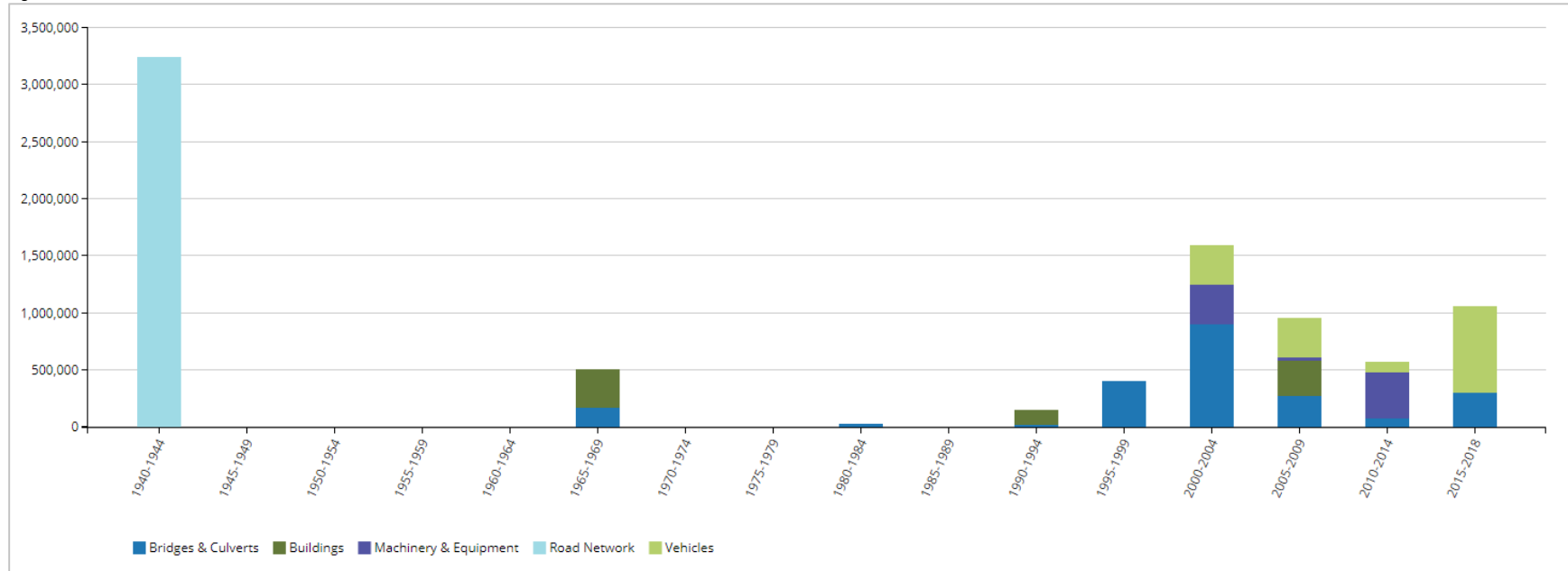
Asset class	Component	Source of Condition Data
Roads Network	All assets	100% Assessed - 2017
Bridges & Culverts	All assets	100% Assessed - 2017
Buildings	All assets	100% Assessed - 2017
Machinery & Equipment	All assets	100% Assessed - 2017
Vehicles	Tandem Plow/ Sander Truck	67% Assessed – 2017
	Remaining segments	100% Assessed - 2017



### 3. Historical Investment in Infrastructure – All Asset Classes

In conjunction with condition data, two other measurements can augment staff understanding of the state of infrastructure and impending and long-term infrastructure needs: installation year profile, and useful life remaining. Using 2018 replacement costs, Figure 5 illustrates the historical investments made in the asset classes analyzed in this AMP since 1940. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics; they can also fluctuate with provincial and federal stimulus programs. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

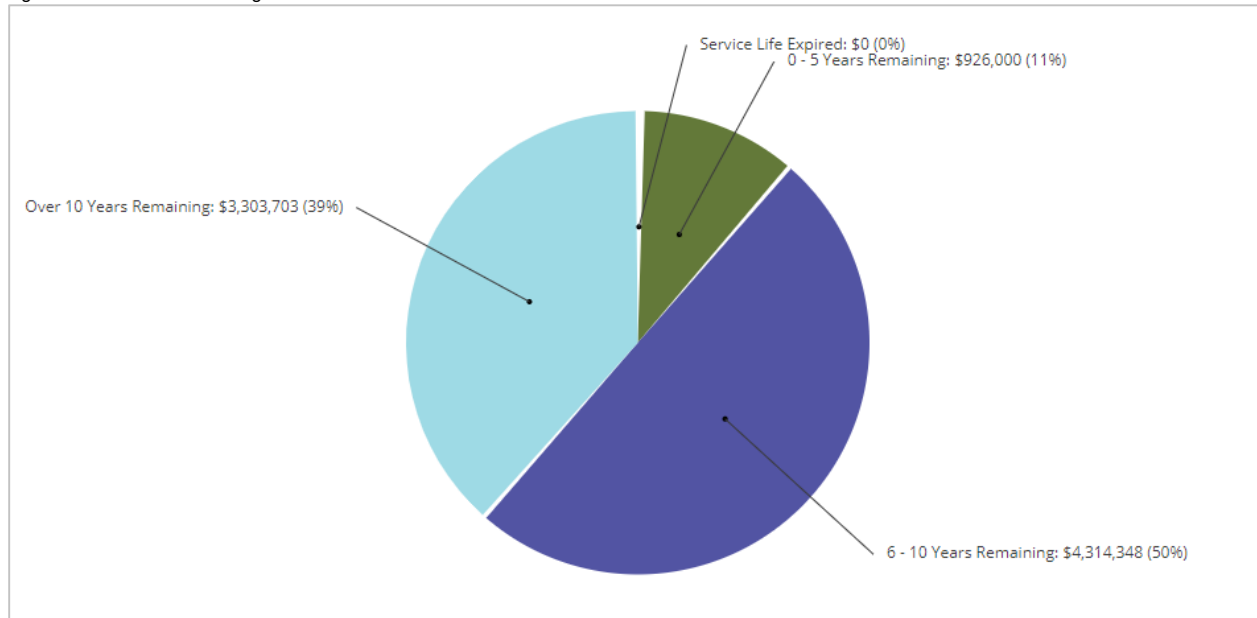


The township has invested sporadically into its infrastructure over the decades until the early 1990s. Investments gradually increase during the 1990s and then peaked in the early 2000s. During this time, \$1.6 million was invested with \$900,000 put into bridges and culverts. Since 2015, \$1 million has been invested with a focus on bridges and culverts and vehicles.

## 4. Useful Life Consumption – All Asset Classes

While age is not a precise indicator of an asset's health, in the absence of observed condition assessment data, it can serve as a high-level, meaningful approximation and help guide replacement needs and facilitate strategic budgeting. Figure 6 shows the distribution of assets based on the percentage of useful life already consumed.

Figure 6 Useful Life Remaining as of 2018 – All Asset Classes

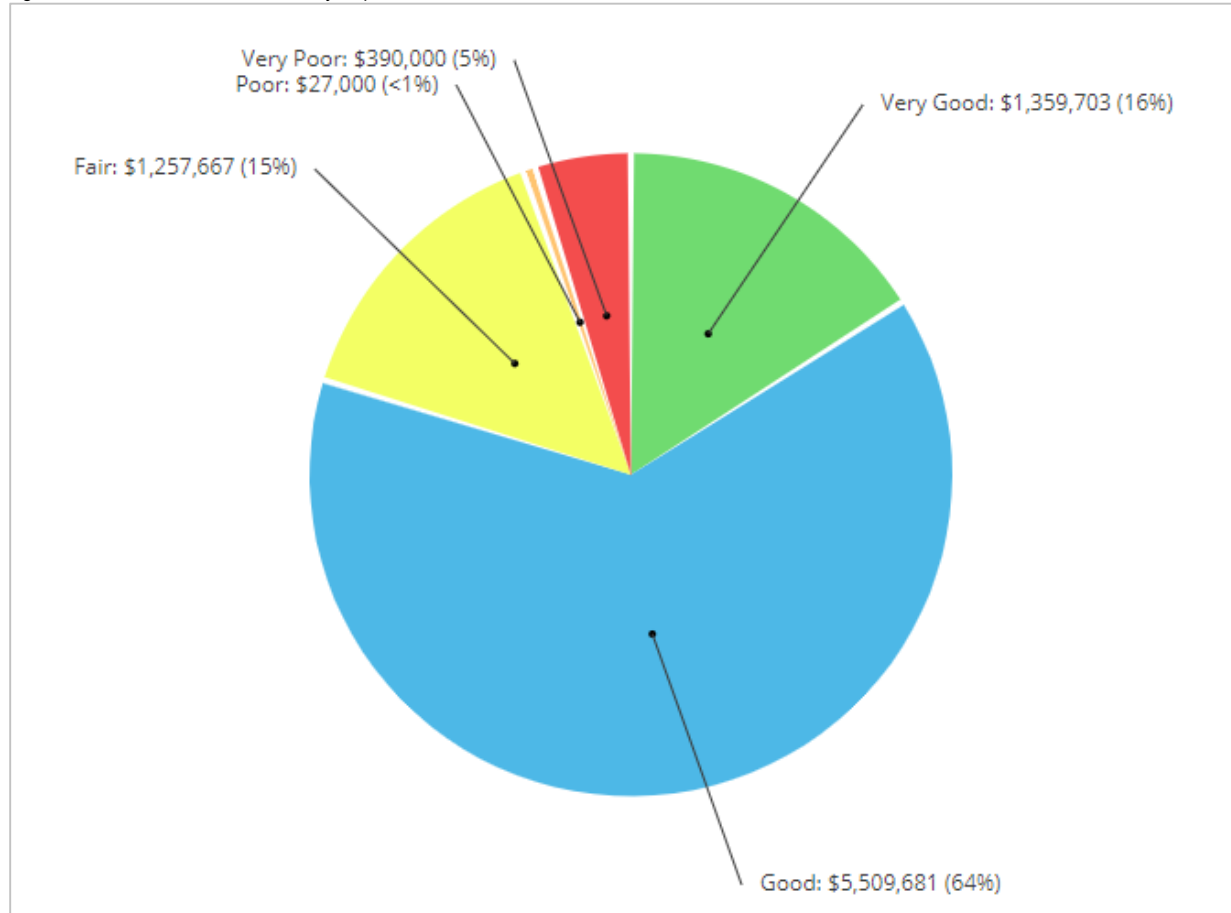


Nearly 40% of the assets analyzed in this AMP have at least 10 years of useful life remaining. An additional 11% will reach the end of their useful life within the next five years.

## 5. Overall Condition – All Asset Classes

Based on 2018 replacement cost, and primarily condition data, 80% of assets, with a valuation of \$6.8 million, are in good to very good condition; 6% are in poor to very poor condition.

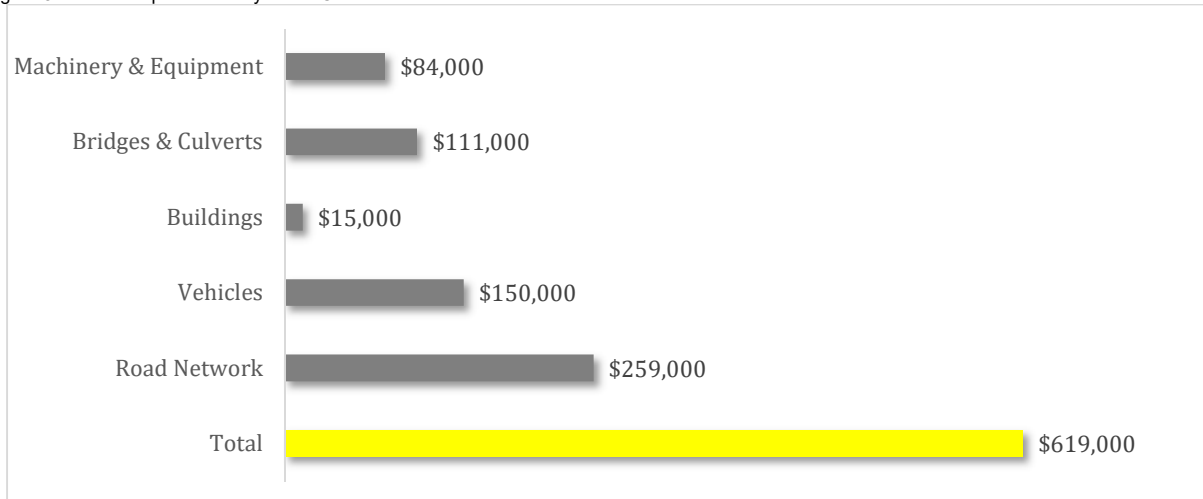
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes



## 6. Financial Profile

This section details key high-level financial indicators for the township's asset classes.

Figure 8 Annual Requirements by Asset Class



The annual requirements represent the amount the township should allocate annually to each of its asset classes to meet replacement needs as they arise, prevent infrastructure backlogs and achieve long-term sustainability. In total, the township must allocate \$619,000 annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

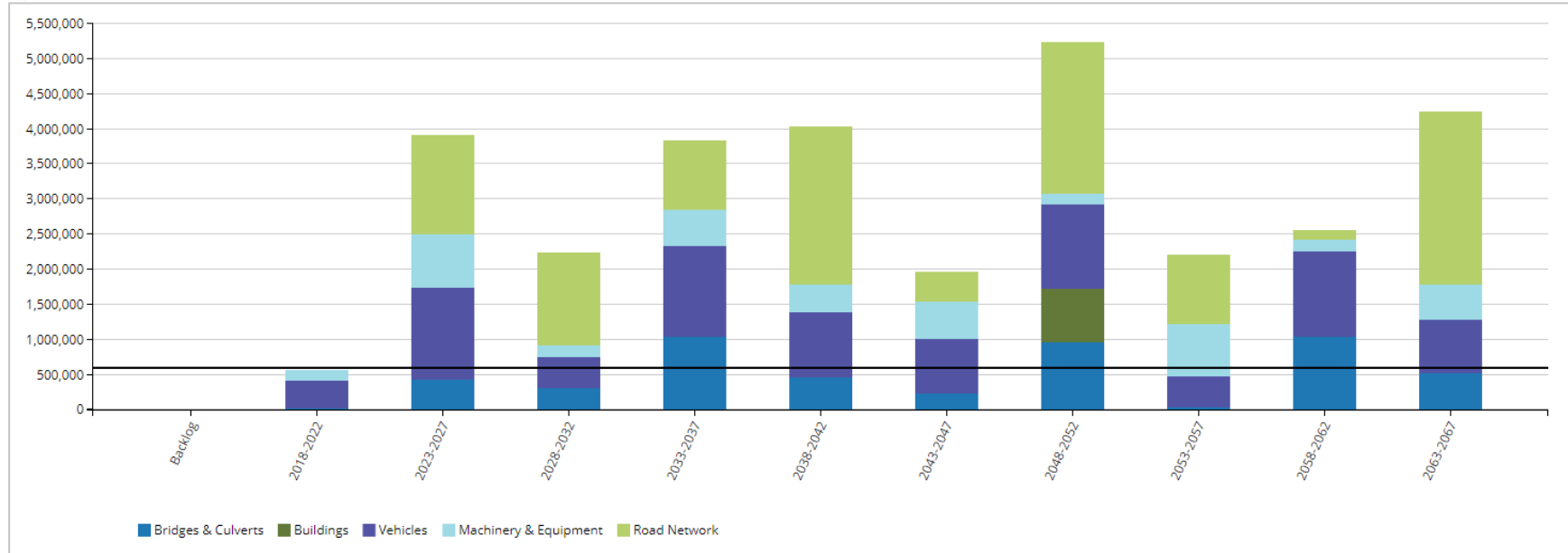
Bridges & Culverts	\$0
Machinery & Equipment	\$0
Road Network	\$0
Vehicles	\$0
Buildings	\$0
Total	\$0

The township has no infrastructure backlog. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond their established useful life.

## 7. Replacement Profile – All Asset Classes

In this section, we illustrate the aggregate short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's asset classes. The backlog is the total investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 10 Replacement Profile – All Asset Classes



Based primarily on condition data, the township has no backlog. Aggregate replacement needs will total \$567,000 over the next five years. An additional \$3.9 million will be required between 2031 and 2027. The township's aggregate annual requirements (indicated by the black line) total \$619,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet the replacement needs for its various asset classes as they arise without the need for deferring projects and accruing annual infrastructure deficits. Currently, the township is funding 50% of the annual requirements for tax-funded assets. See the 'Financial Strategy' chapter for achieving a more optimal and sustainable funding level.

## 8. Data Confidence

The township has a high degree of confidence in the data used to develop this AMP, receiving a weighted confidence rating of 98%. This is indicative of significant effort in collecting and refining its data set.

Table 5 Data Confidence Ratings

Asset Class	The data is up-to-date.	The data is complete and uniform.	The data comes from an authoritative source.	The data is error free.	The data is verified by an authoritative source.	Average Confidence Rating	Weighted Confidence Rating
Road Network	100%	100%	100%	90%	100%	98%	37%
Bridges & Culverts	100%	100%	100%	90%	100%	98%	25%
Buildings & Facilities	100%	90%	100%	90%	100%	96%	9%
Machinery & Equipment	100%	100%	100%	90%	100%	98%	9%
Fleet	100%	100%	100%	90%	100%	98%	18%
Overall Weighted Average Data Confidence Rating							98%

## VI. State of Local Infrastructure

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The state of local infrastructure includes the full inventory, condition ratings, useful life consumption data and the backlog and upcoming infrastructure needs for each asset class. As available, assessed condition data was used to inform the discussion and recommendations; in the absence of such information, age-based data was used as the next best alternative.



# 1. Road Network

## 1.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 6 illustrates key asset attributes for the township's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the township's roads assets are valued at \$3.2 million based on 2018 replacement costs. The useful life indicated for each asset type below was assigned by the township.

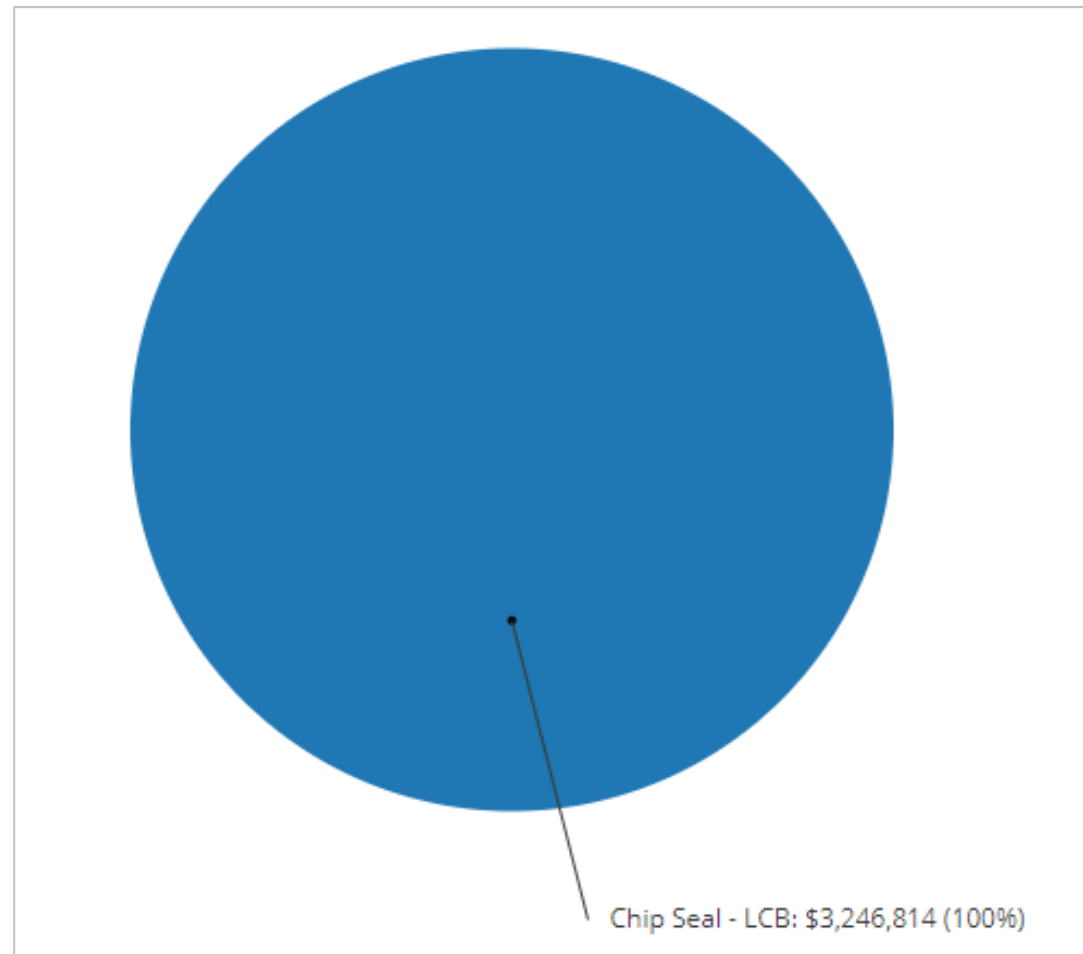
Table 6 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life (Years)	Replacement Cost Method	2018 Overall Replacement Cost
Road Network	Chip Seal – LCB	17km	10-20	User Defined	\$3,246,814
	Gravel	72km	12-50	Not Planned for Replacement	\$0
Total					\$3,246,814

For the purposes of this AMP, we have excluded the category of gravel roads since gravel roads are a perpetual maintenance asset and end of life replacement calculations do not normally apply. However, Papineau-Camérons gravel roads make up over 80% of their road network and they are expecting to spend up to \$60,000 on maintenance per year.



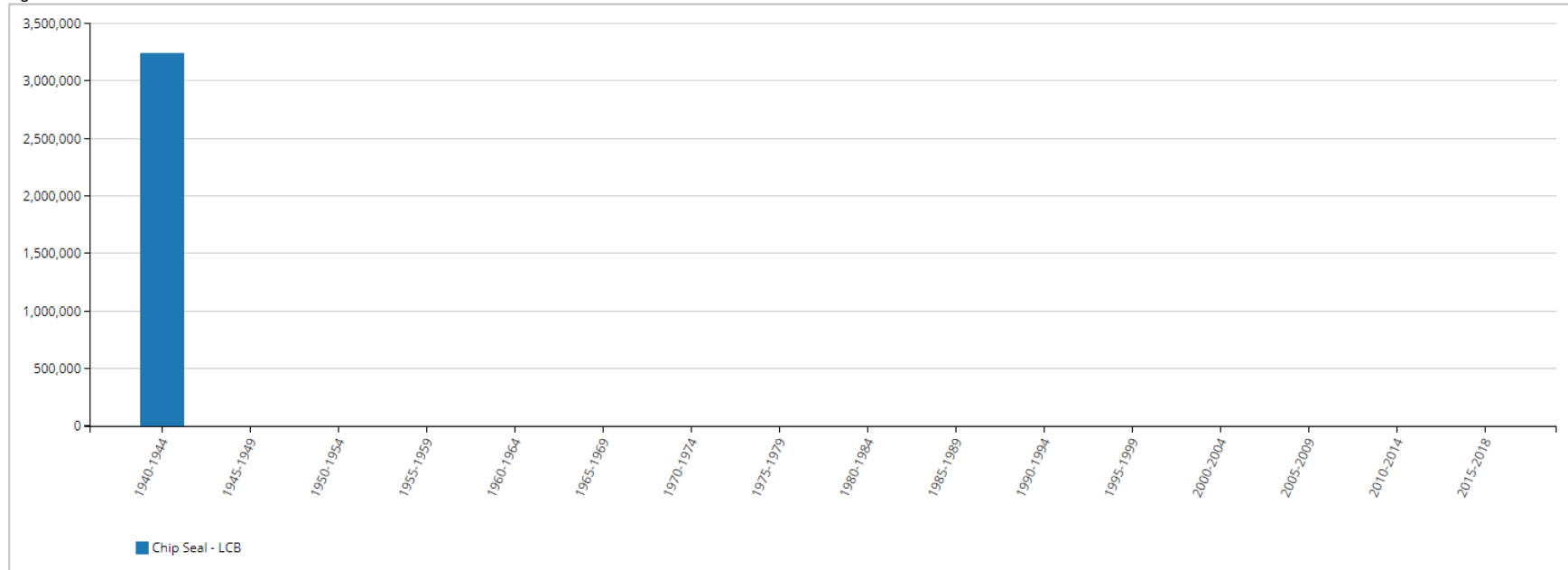
Figure 11 Asset Valuation – Road Network



## 1.2 Historical Investment in Infrastructure

Figure 12 shows the township's historical investments in its road network since 1940. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 1.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 12 Historical Investment – Road Network

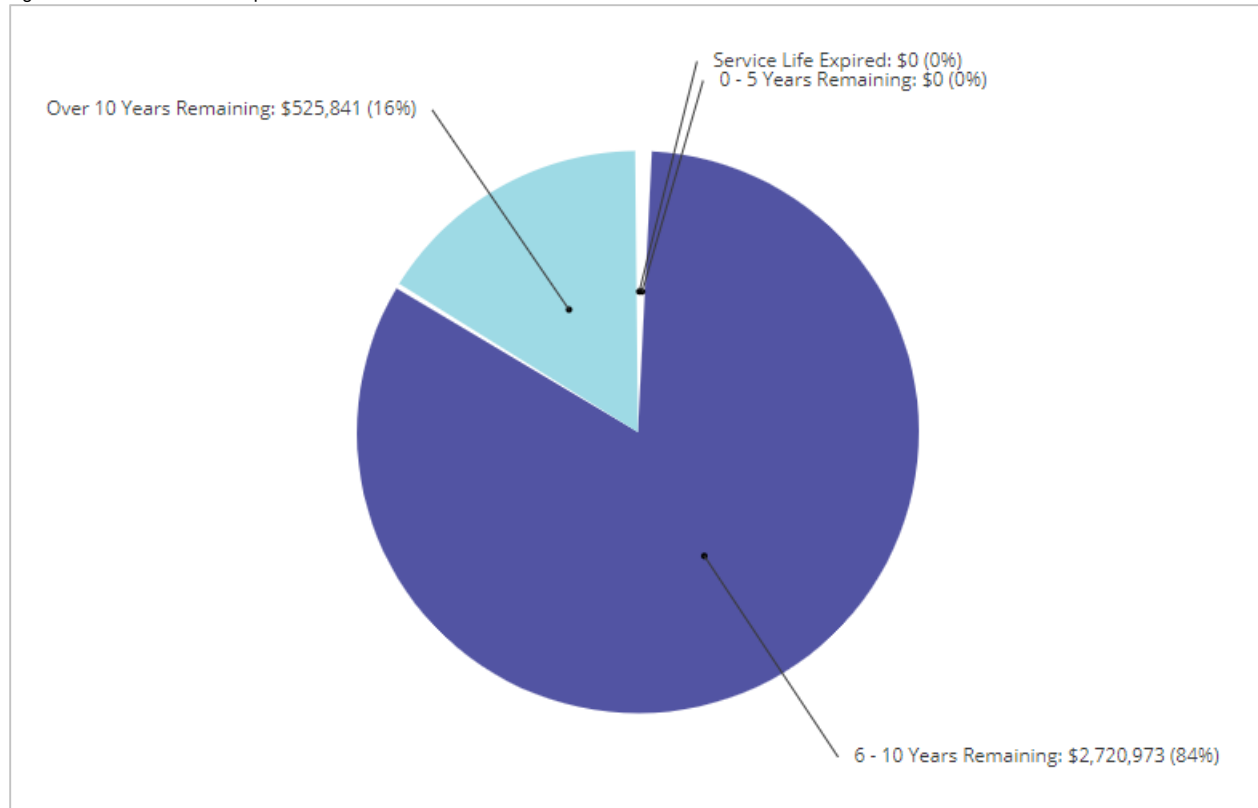


The township was unable to provide an accurate in-service date for all of its road network assets. This is an estimate of when the roads were installed.

### 1.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 13 illustrates the useful life consumption levels as of 2018 for the township's road network.

Figure 13 Useful Life Consumption - Road Network

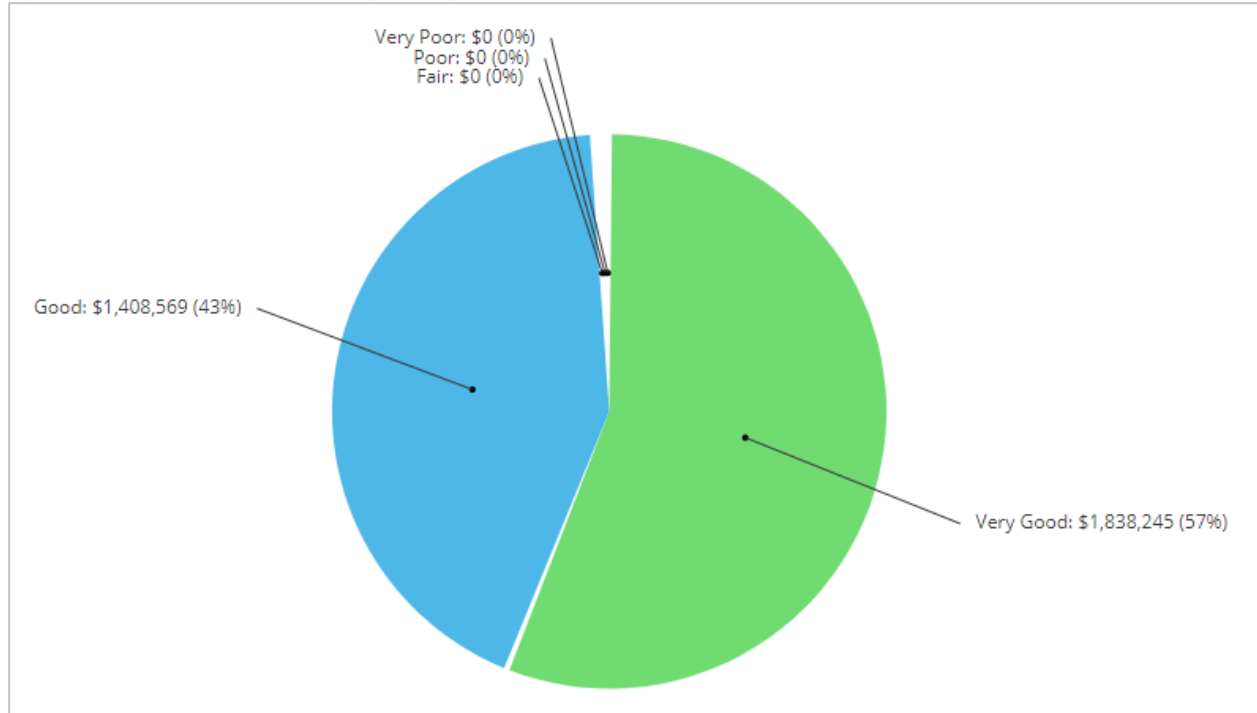


16% of the township's road network has at least 10 years of useful life remaining. The remaining 84%, with a valuation of \$2.7 million, will reach the end of their useful life within the next six to ten years.

## 1.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the township's road network as of 2018. By default, we rely on observed field data as provided by the township. In the absence of such information, age-based data is used as a proxy. The township has provided condition data for all of its road network assets.

Figure 14 Asset Condition – Road Network (Assessed)

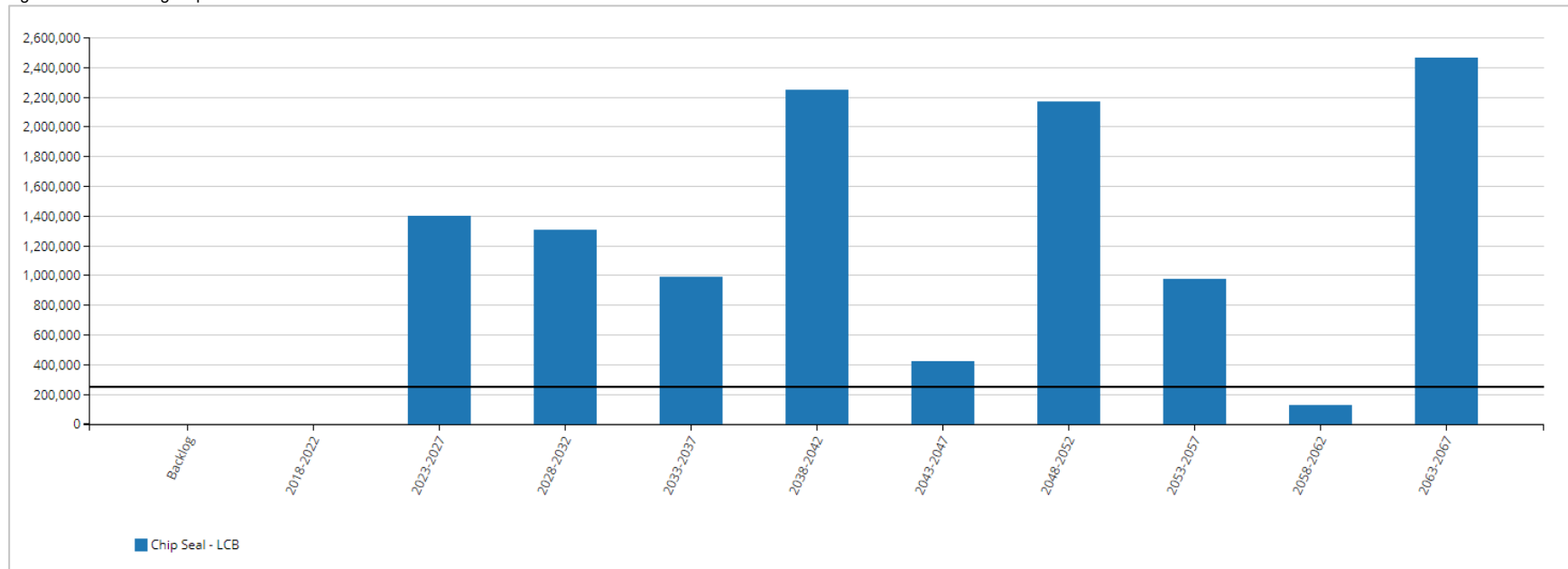


Based on assessed condition data, 100% of assets are in good to very good condition.

## 1.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's road network assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 15 Forecasting Replacement Needs – Road Network



Assessed condition data shows no backlog or five-year replacement needs. \$1.4 million is forecasted in replacement needs between 2023-2027. The township's annual requirements (indicated by the black line) for its road network total \$259,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the township is currently allocating \$196,000, leaving an annual deficit of \$63,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

## 1.6 Recommendations – Road Network

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- Assessed condition data indicates no backlog and 10-year replacement needs of \$1.4 million. The township should continue its condition assessments of road surfaces, and expand the program to incorporate all assets in order to more precisely estimate its actual financial requirements and field needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.
- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of the backlog as well as short, medium, and long term replacement needs. See Section 4, ‘Risk’ in the ‘Asset Management Strategies’ chapter for more information.
- In addition to the above, a tailored lifecycle activity framework should also be developed to promote standard lifecycle management of the road network as outlined further within the “Asset Management Strategy” section of this AMP.
- Road network key performance indicators should be established and tracked annually as part of an overall level of service model. See Section 7 ‘Levels of Service’.
- The township is funding 76% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable funding levels.

## 2. Bridges & Culverts

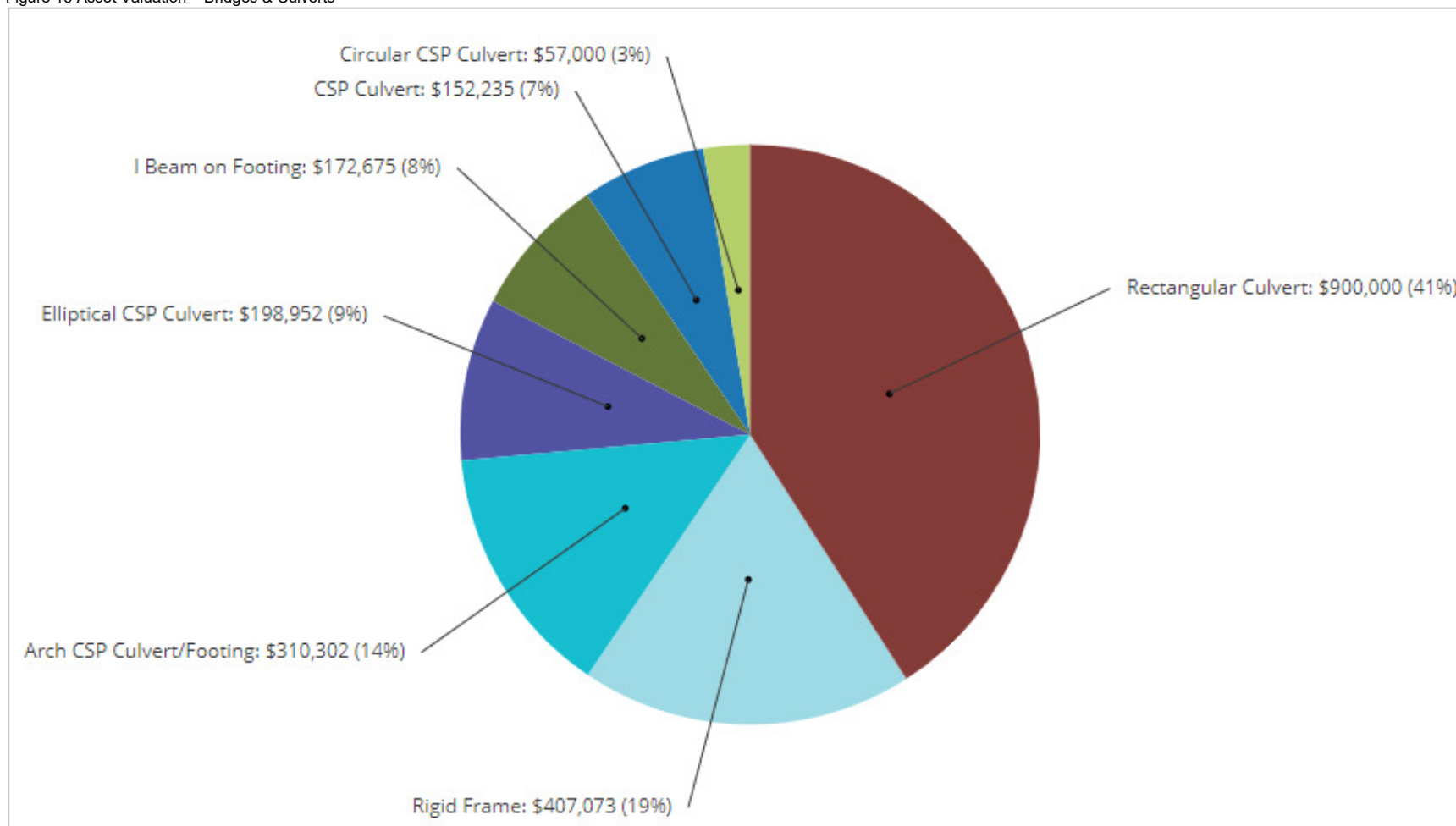
### 2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 7 illustrates key asset attributes for the township's bridges & culverts, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the township's bridges & culverts assets are valued at \$2.1 million based on 2018 replacement costs. The useful life indicated for each asset type below was assigned by the township.

Table 7 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life (Years)	Replacement Cost Method	2018 Overall Replacement Cost
Bridges & Culverts	Arch CSP Culvert/Footing	3	10-23	User Defined	\$310,302
	Circular CSP Culvert	2	10-23	User Defined	\$57,000
	CSP Culvert	4	17-30	User Defined	\$152,235
	Elliptical CSP Culvert	1	30	User Defined	\$198,952
	I beam on Footing	1	38	User Defined	\$172,675
	Rectangular Culvert	1	24	User Defined	\$900,000
	Rigid Frame	1	12	User Defined	\$407,073
Total					\$2,198,237

Figure 16 Asset Valuation – Bridges & Culverts

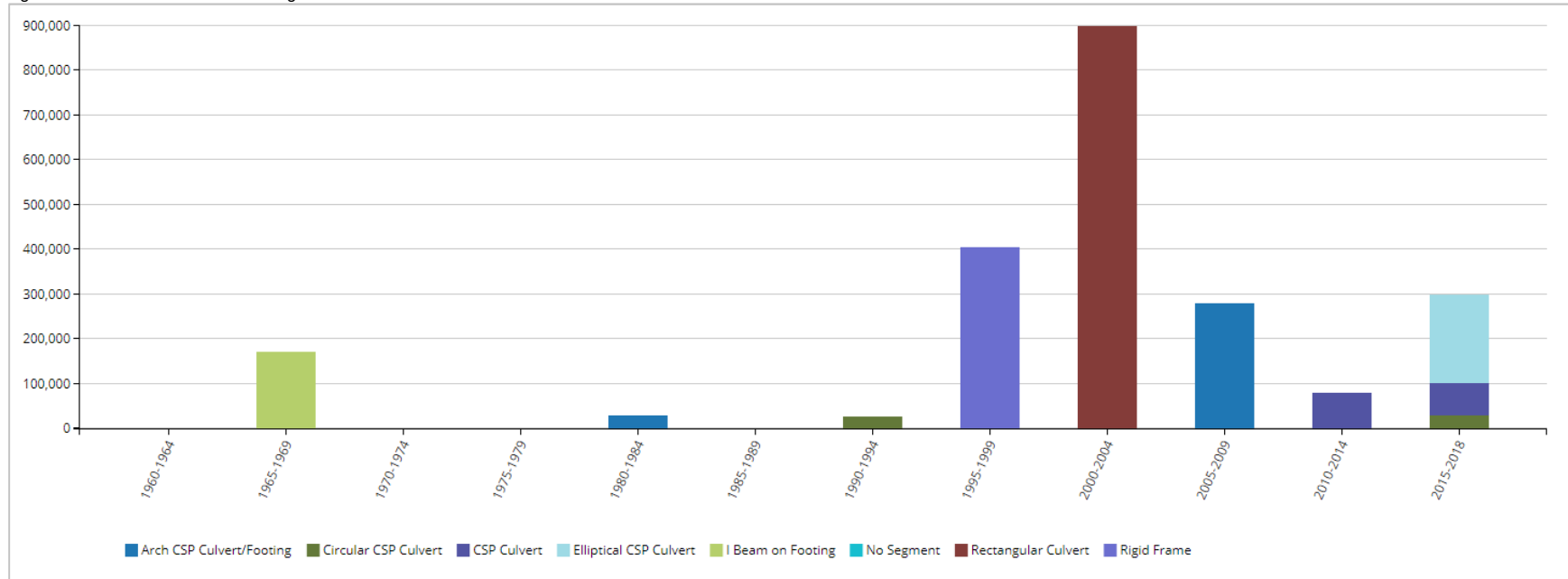




## 2.2 Historical Investment in Infrastructure

Figure 17 shows the township's historical investments in its bridges & culverts since 1960. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 2.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 17 Historical Investment – Bridges & Culverts

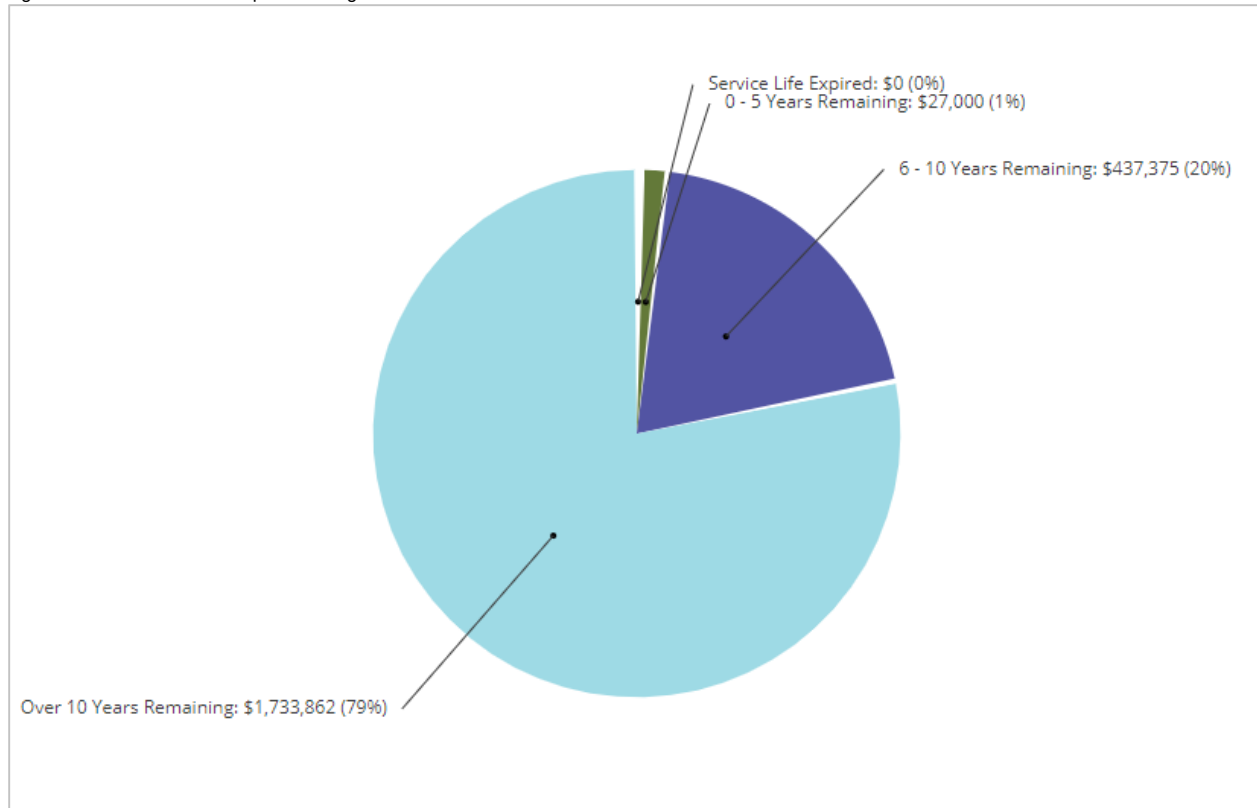


The township has invested sporadically in its bridges and culverts since the 1960s. In the early 2000s, the period of largest investment, \$900,000 was invested into a rectangular culvert.

## 2.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels as of 2018 for the township's bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

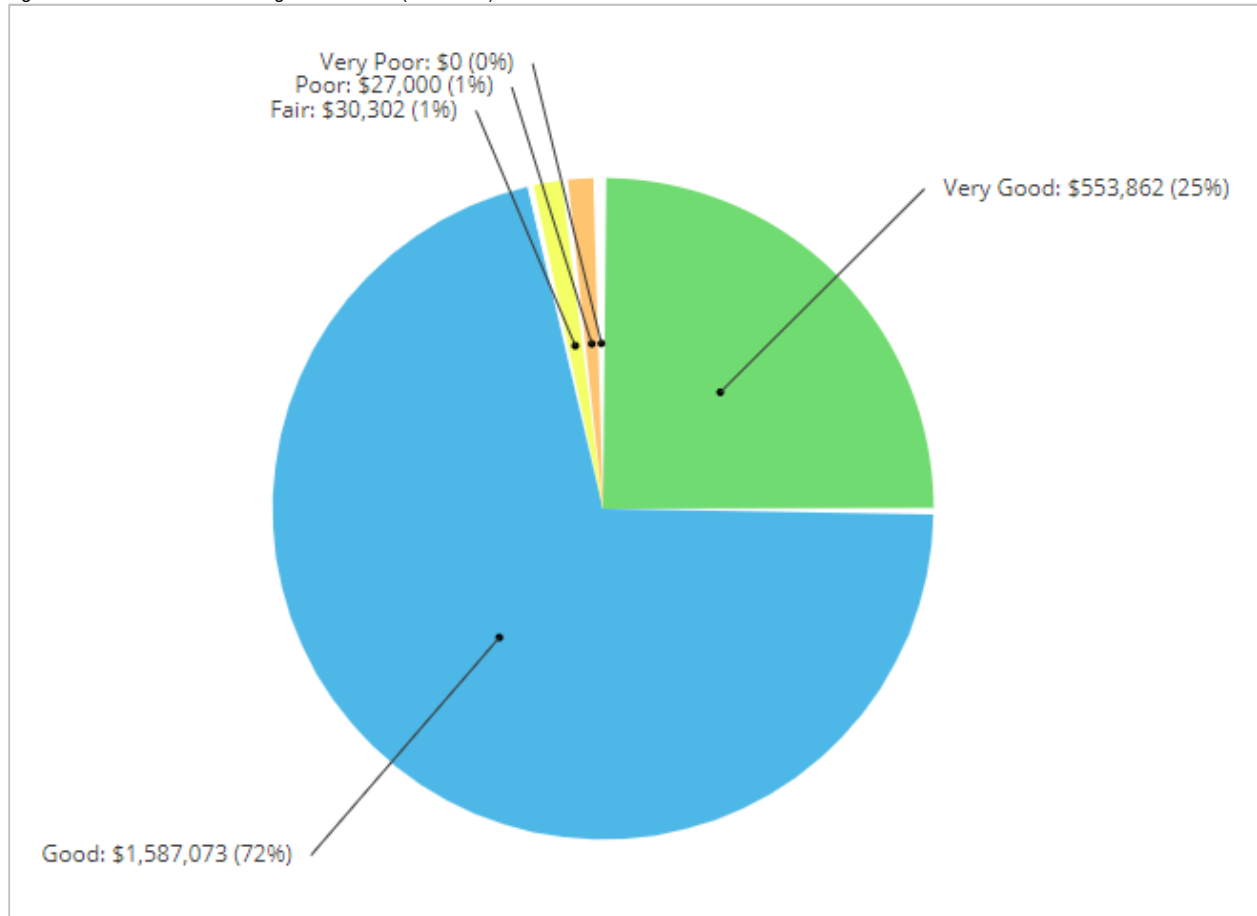


While 79% of the assets have at least 10 years of useful life remaining, 1% will reach the end of their useful life within the next five years.

## 2.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the township's bridges & culverts as of 2018. By default, we rely on observed field data adapted from OSIM inspections as provided by the township. In the absence of such information, age-based data is used as a proxy. All assets are based on assessed condition data.

Figure 19 Asset Condition – Bridges & Culverts (Assessed)

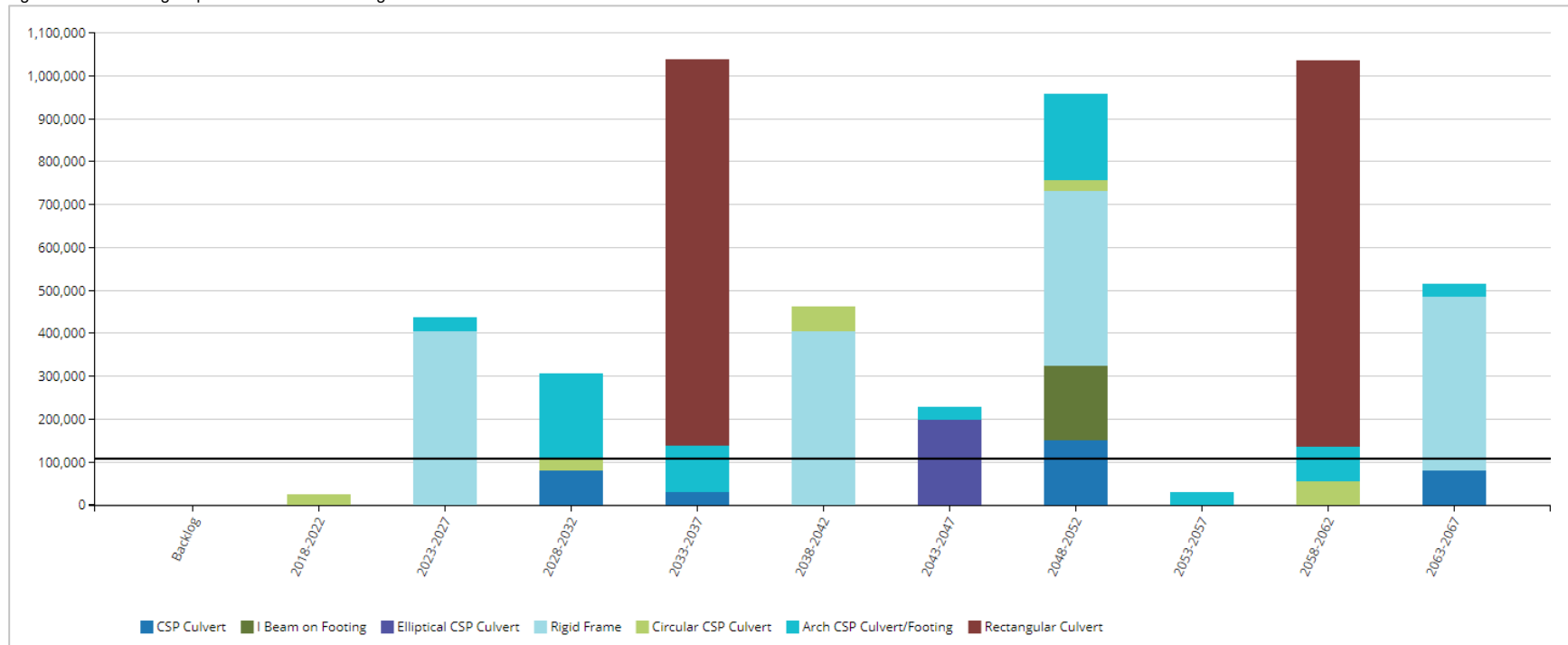


Assessed data indicates that while 97% of the township's bridges & culverts are in good to very good condition, 71%, with a valuation of \$27,000, are in poor condition.

## 2.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's bridges & culverts. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 20 Forecasting Replacement Needs – Bridges & Culverts



In addition to no backlog and minimal 5-year replacement needs of \$27,000; \$437,000 will be required between 2023 and 2027. The township's annual requirements (indicated by the black line) for its bridges & culverts total \$111,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The township is currently allocating \$36,000, leaving an annual deficit of \$75,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

## **2.6 Recommendations – Bridges & Culverts**

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- Assessed condition data indicates no backlog and 10-year replacement needs of \$464,000. The results and recommendations from the OSIM inspections should be incorporated into the AMP analysis and used to generate the short-and long-term capital and maintenance budgets for the bridge and large culvert structures. See Section VIII, 'Asset Management Strategies'.
- Bridge & culvert structure key performance indicators should be established and tracked annually as part of an overall level of service model. See Section VII 'Levels of Service'.
- The township is funding 32% of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to achieve more sustainable and optimal funding levels.

### 3. Buildings & Facilities

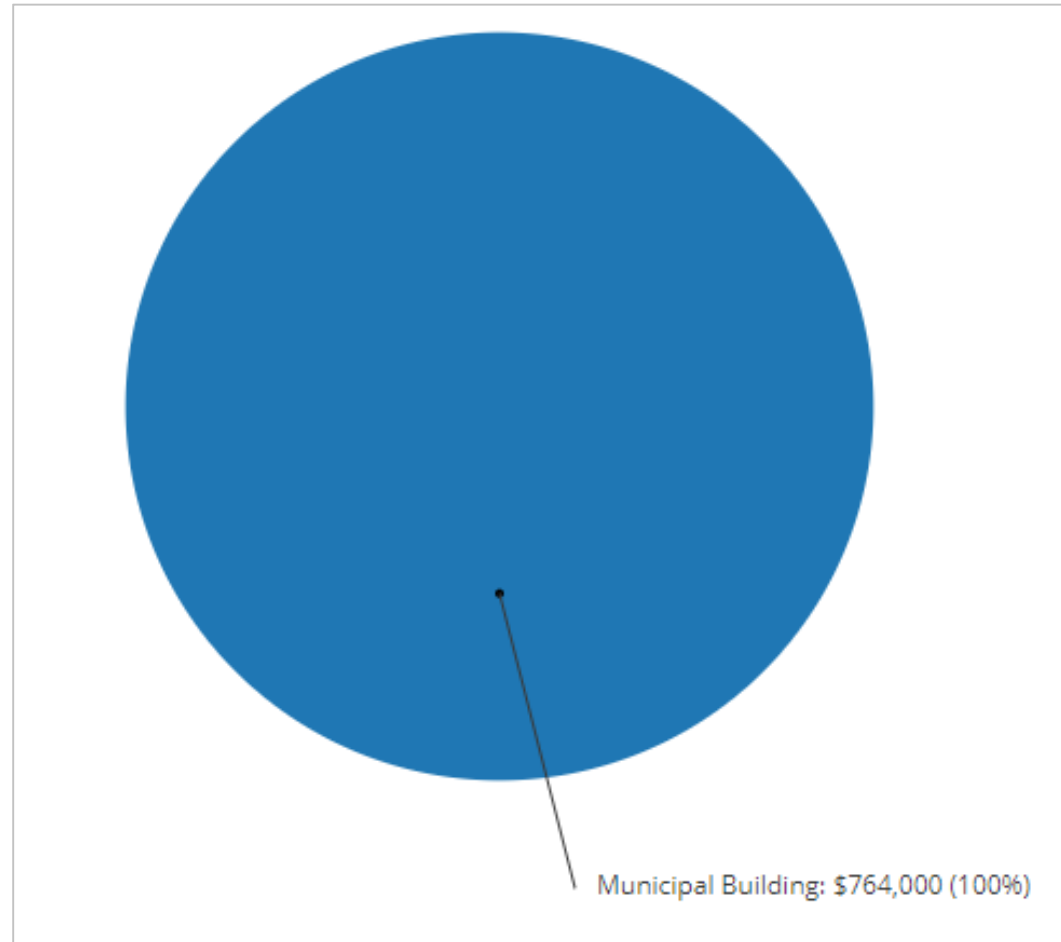
#### 3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 8 illustrates key asset attributes for the township's buildings & facilities, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the township's buildings assets are valued at \$764,000 based on 2018 replacement costs. The useful life indicated for each asset type below was assigned by the township.

Table 8 Key Asset Attributes – Buildings & Facilities

Asset Type	Asset Component	Quantity	Useful Life in Years	Valuation Method	2018 Replacement Cost
Buildings & Facilities	Municipal Buildings	4	50	User Defined	\$764,000
				Total	\$764,000

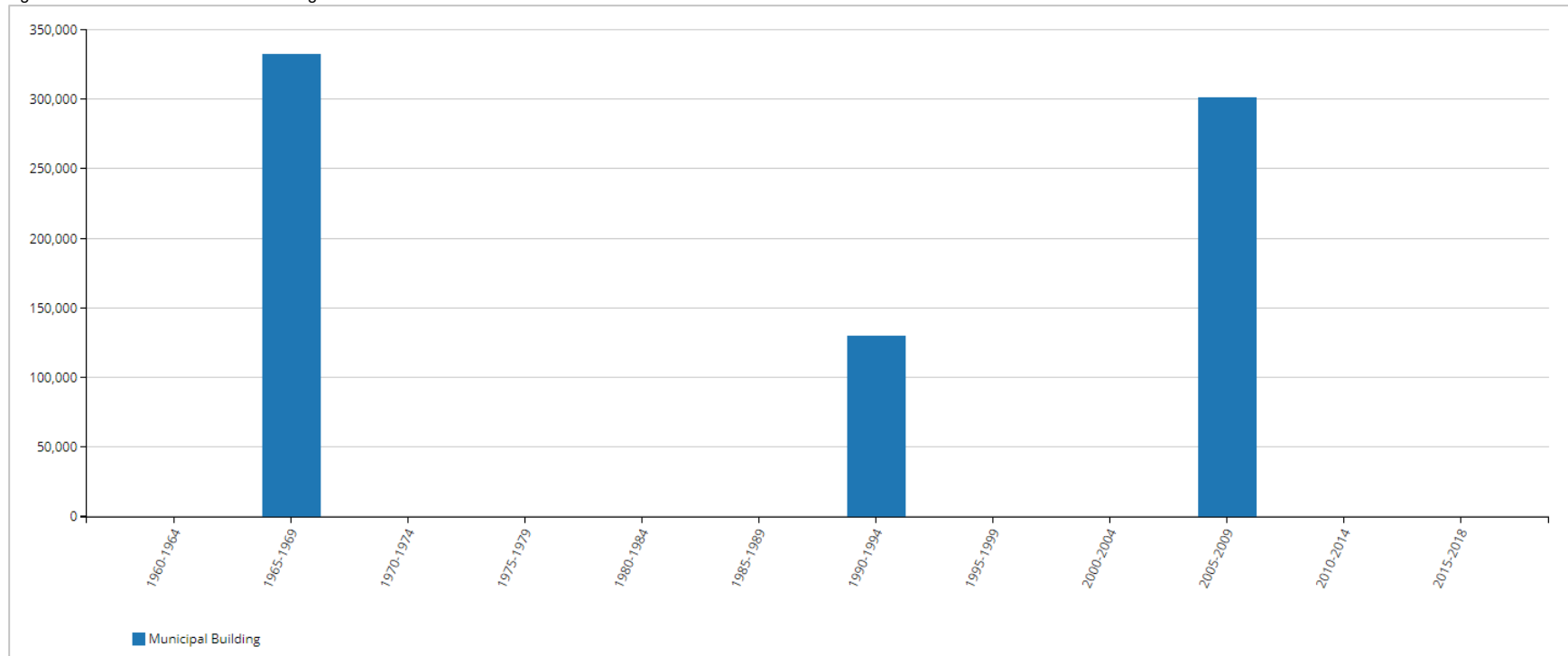
Figure 21 Asset Valuation – Buildings & Facilities



### 3.2 Historical Investment in Infrastructure

Figure 22 shows the township's historical investments in its buildings & facilities since 1960. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 6.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 22 Historical Investment – Buildings & Facilities



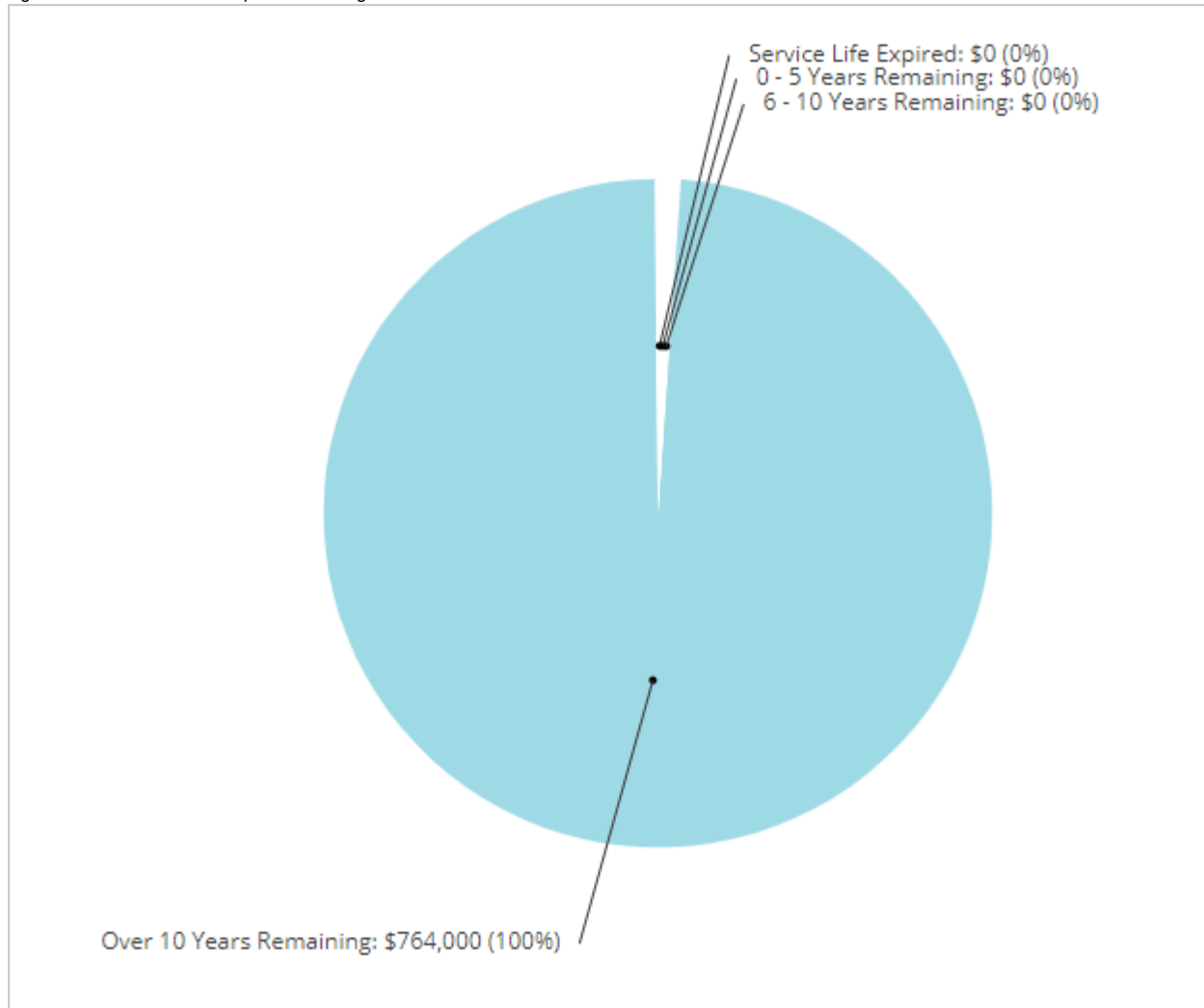
The township's investments into its building assets have been sporadic since the 1960s. Between 1965 and 1969, the period of largest investment, \$333,000 was invested into the building assets.



### 3.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 23 illustrates the useful life consumption levels as of 2018 for the township's buildings assets.

Figure 23 Useful Life Consumption – Buildings & Facilities

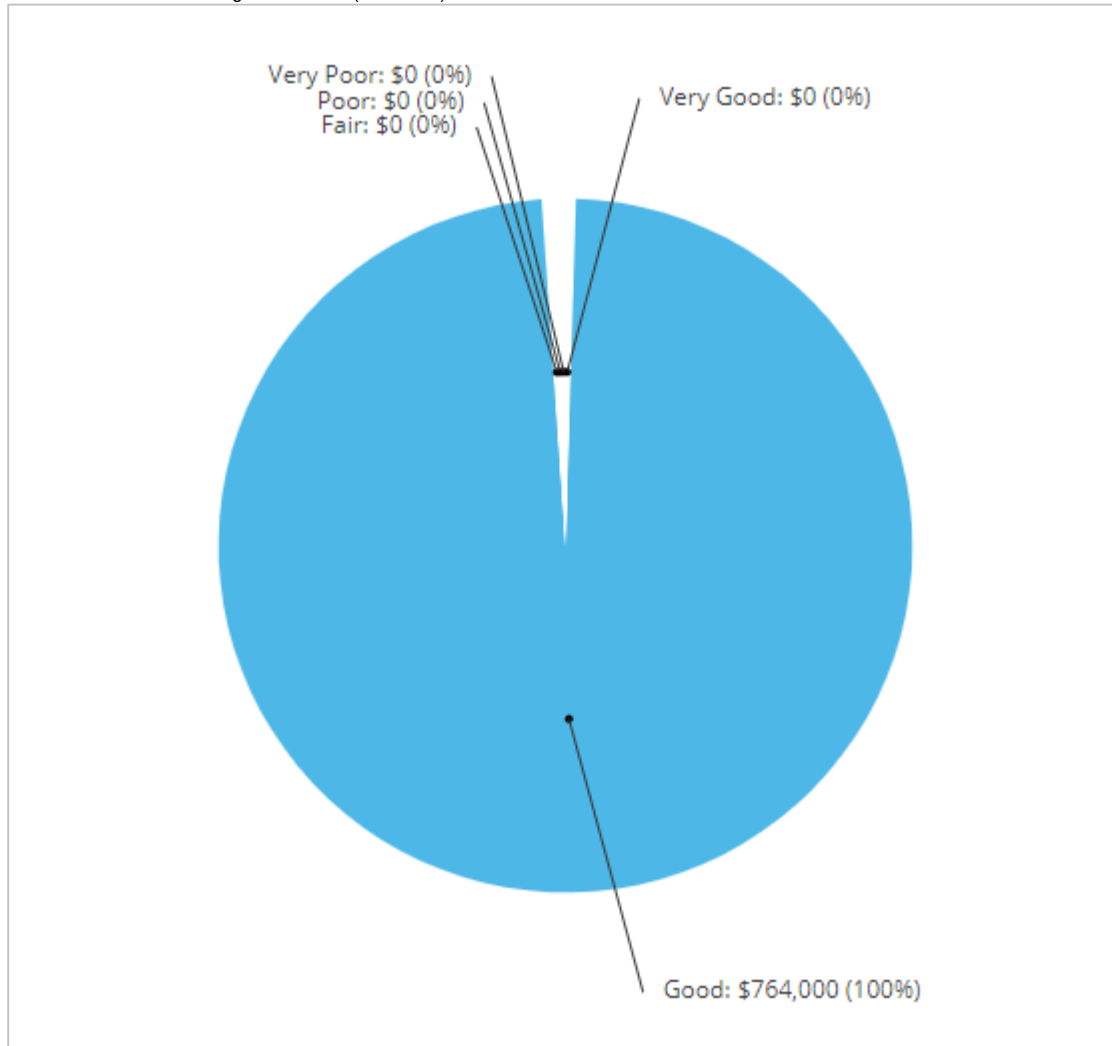


100% of buildings assets have at least 10 years of useful life remaining.

### 3.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the township's buildings assets. By default, we rely on observed field data as provided by the township. In the absence of such information, age-based data is used as a proxy. The township has provided condition data for all of its structures.

Figure 24 Asset Condition – Buildings & Facilities (Assessed)

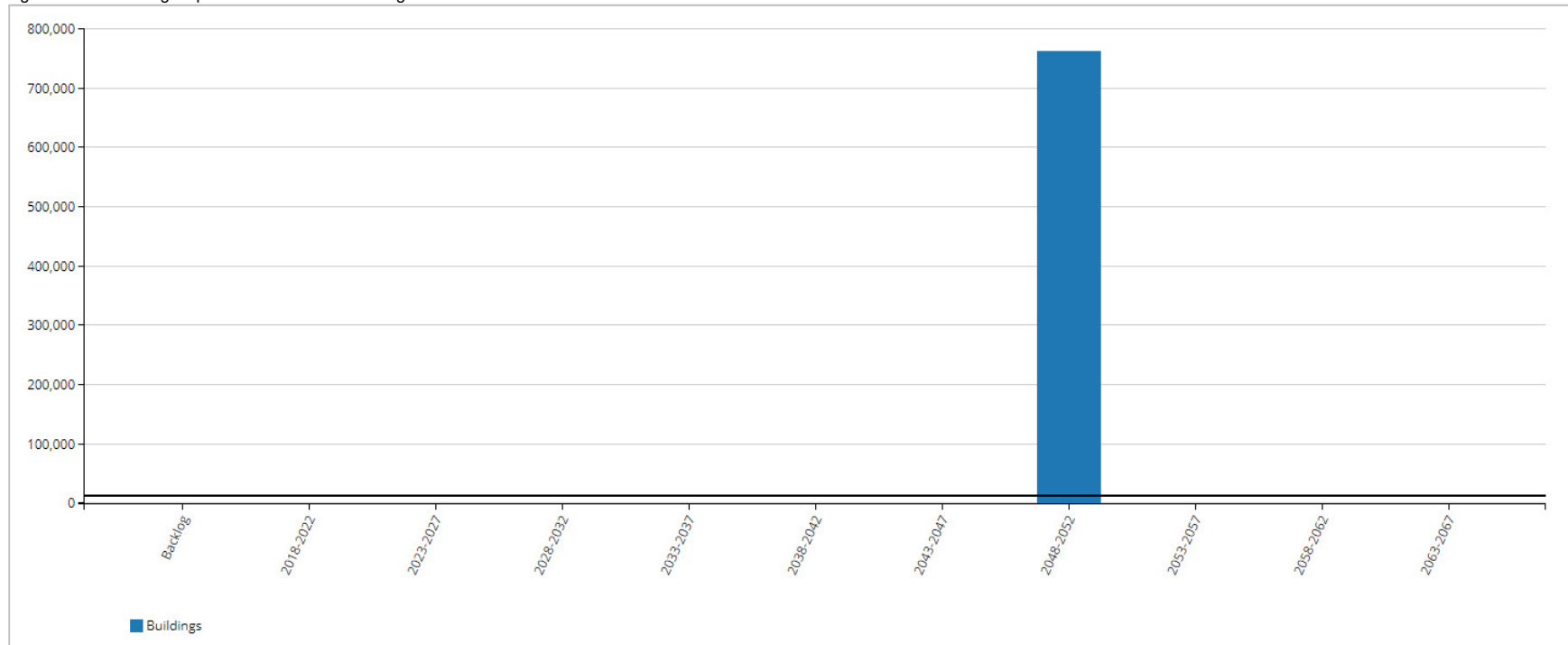


100% of buildings assets are in good condition.

### 3.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's buildings assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 25 Forecasting Replacement Needs – Buildings & Facilities



Assessed condition data indicates no backlog and no ten-year replacement needs. The township's annual requirements (indicated by the black line) for its buildings total \$15,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. The township is currently allocating approximately \$5,000, leaving an annual deficit of \$10,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

### **3.6 Recommendations – Buildings & Facilities**

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- The township should continue its condition inspection program for its buildings & facilities to precisely estimate future financial needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.
- The data collected through condition assessment programs should be integrated into a risk management framework which will guide prioritization of short, medium, and long term replacement needs. See Section 4, ‘Risk’ in the ‘Asset Management Strategies’ chapter for more information.
- In addition to the above, a tailored lifecycle activity framework should be developed to promote standard lifecycle management of buildings & facilities as outlined further within the “Asset Management Strategy” section of this AMP.
- Using the above information, the township should assess its short-, medium- and long-term capital, and operations and maintenance needs.
- An appropriate percentage of the replacement costs should then be allocated for the township’s O&M requirements.
- Facility key performance indicators should be established and tracked annually as part of an overall level of service model. See Chapter VII, ‘Levels of Service’.
- The township is funding 33% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

## 4. Machinery & Equipment

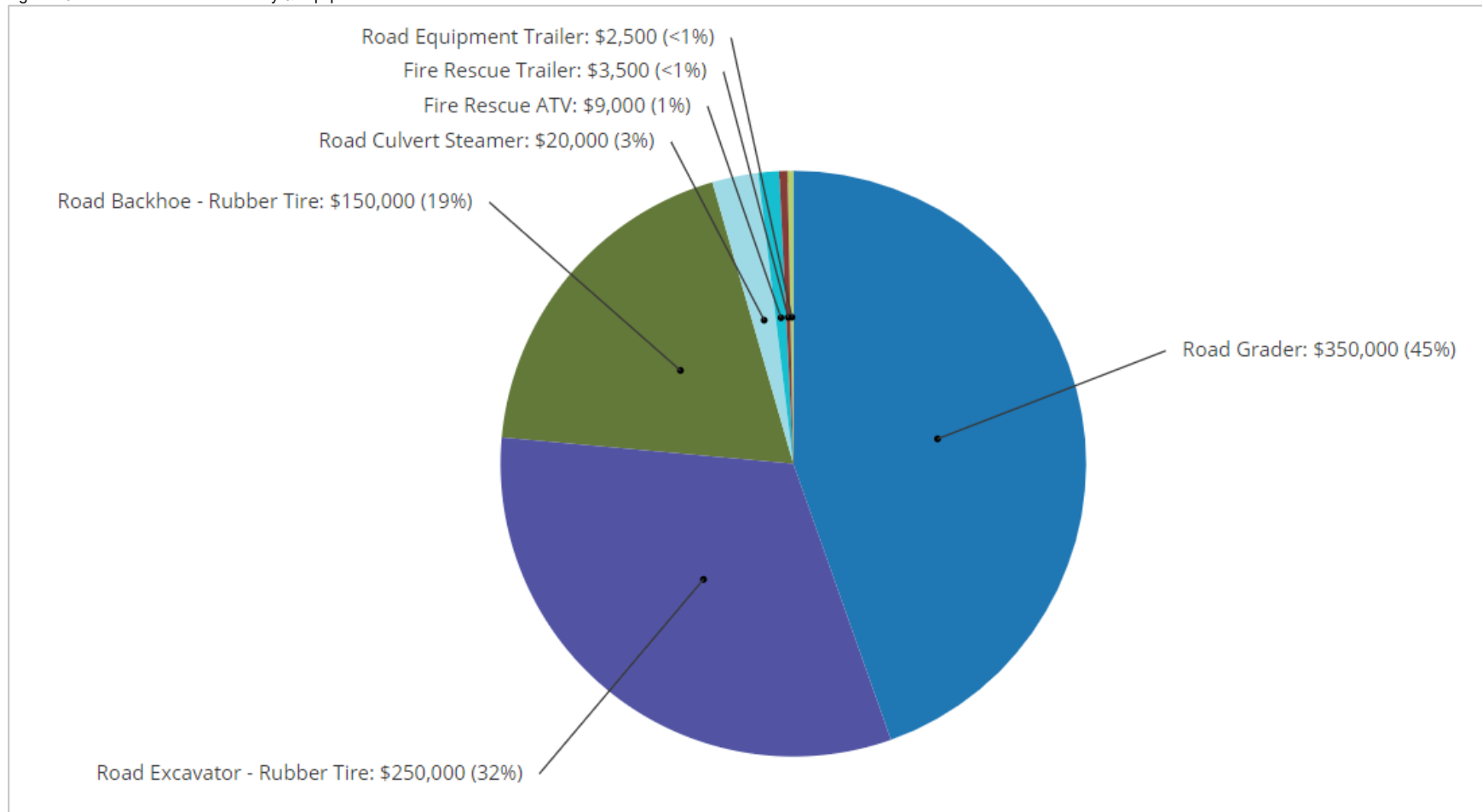
### 4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 illustrates key asset attributes for the township's machinery & equipment, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the township's machinery & equipment assets are valued at \$785,000 based on 2018 replacement costs. The useful life indicated for each asset type below was assigned by the township.

Table 9 Asset Inventory – Machinery & Equipment

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2018 Replacement Cost
Machinery & Equipment	Fire Rescue ATV	1	10	User Defined	\$9,000
	Fire Rescue Trailer	1	15	User Defined	\$3,500
	Road Backhoe – Rubber Tire	1	5	User Defined	\$150,000
	Road Culvert Steamer	1	15	User Defined	\$20,000
	Road Equipment Trailer	1	15	User Defined	\$2,500
	Road Excavator – Rubber Tire	1	15	User Defined	\$250,000
	Road Grader	1	10	User Defined	\$350,000
Total					\$785,000

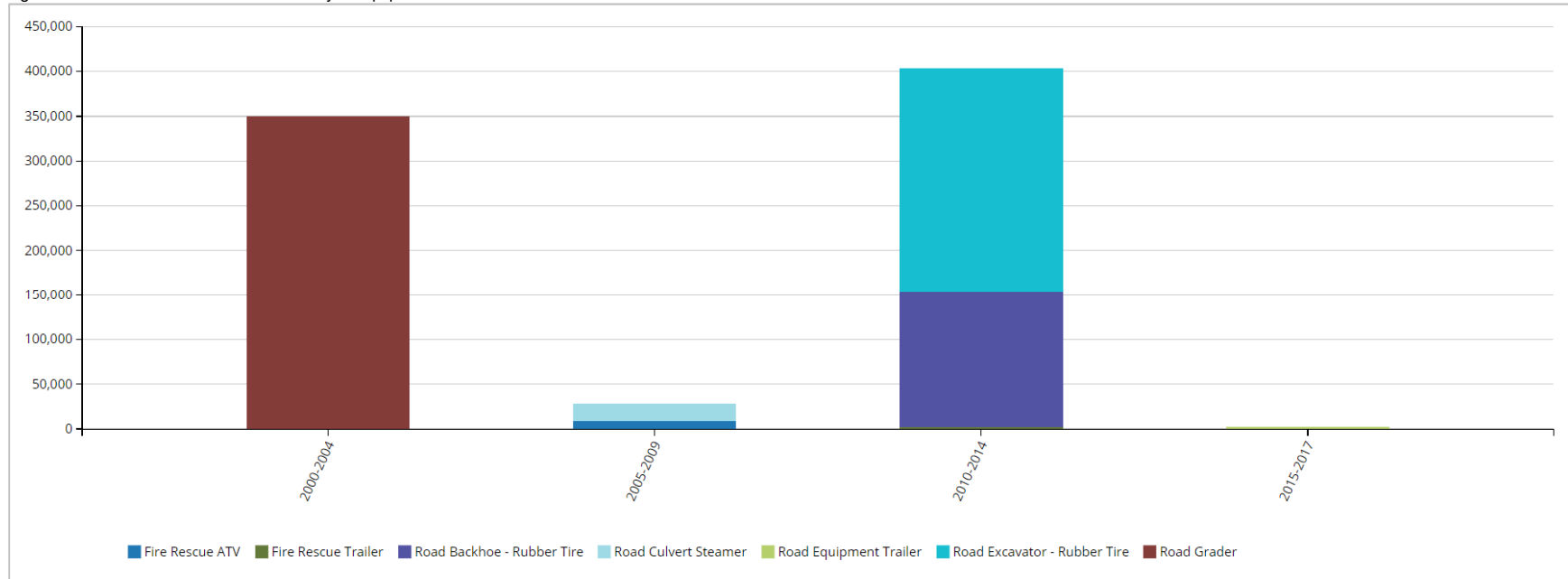
Figure 26 Asset Valuation – Machinery & Equipment



## 4.2 Historical Investment in Machinery & Equipment

Figure 27 shows the township's historical investments in its machinery & equipment since 2000. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 7.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 27 Historical Investment – Machinery & Equipment

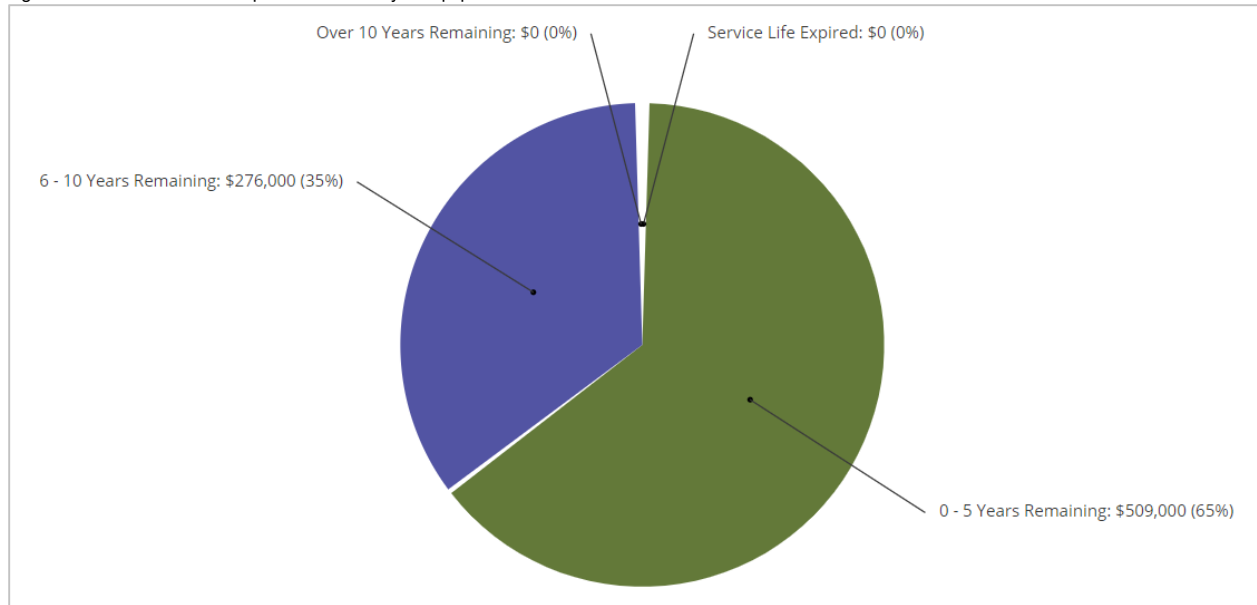


The township rapidly expanded its machinery & equipment portfolio beginning in the early 2000s. Between 2010 and 2014, the period of largest investment, \$404,000 was invested in the machinery and equipment category.

### 4.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 28 illustrates the useful life consumption levels as of 2018 for the township's machinery & equipment assets.

Figure 28 Useful Life Consumption – Machinery & Equipment



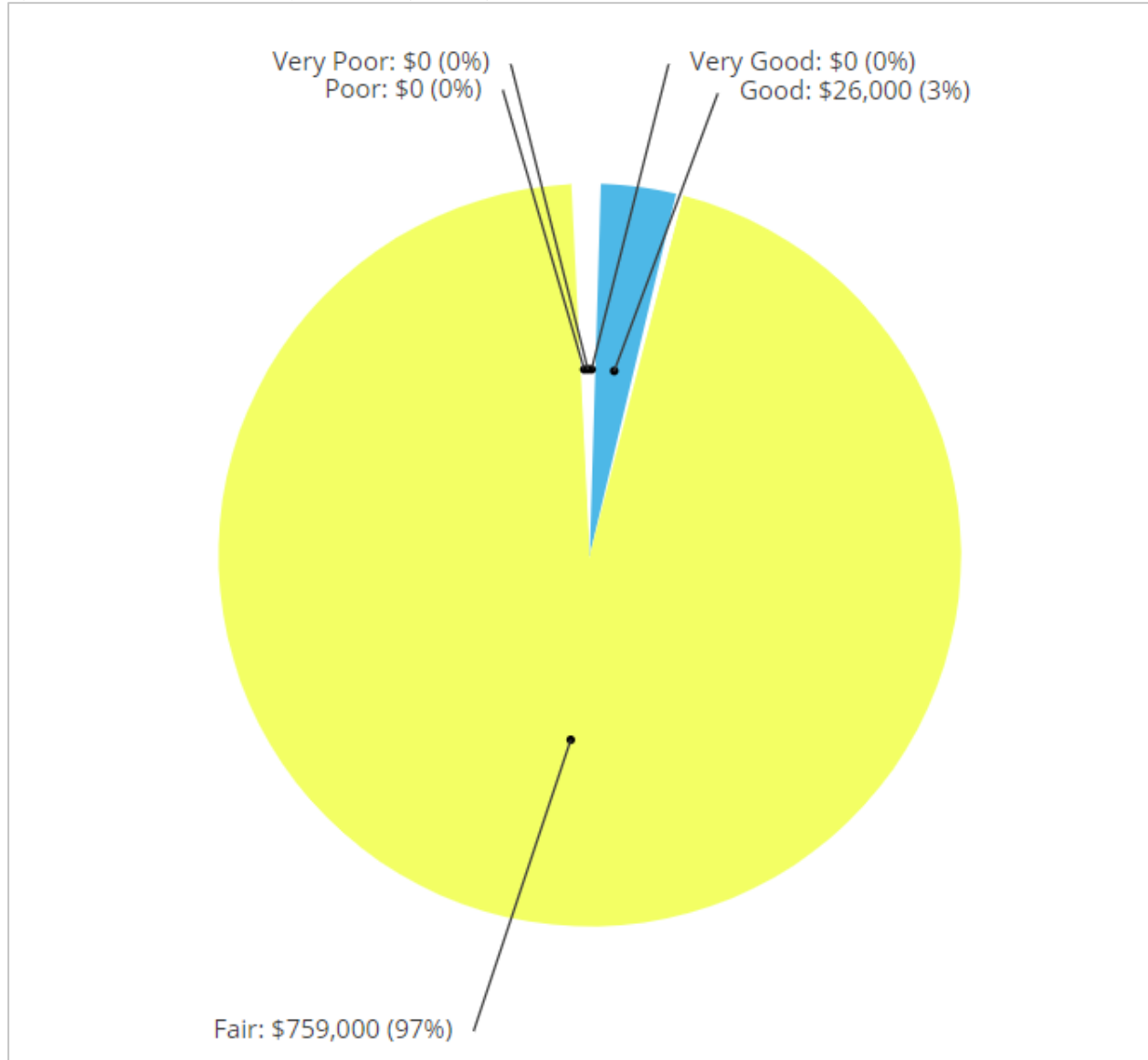
While 35% of assets have 6 to 10 years of useful life remaining, 65%, with a valuation of \$509,000, will reach the end of their useful life within the next five years.



## 4.4 Current Asset Condition

Using replacement cost, in this section we summarize the condition of the township's machinery & equipment assets as of 2018. By default, we rely on observed field data as provided by the township. In the absence of such information, age-based data is used as a proxy. The township has provided condition data for all of its machinery & equipment assets.

Figure 29 Asset Condition – Machinery & Equipment (Assessed)

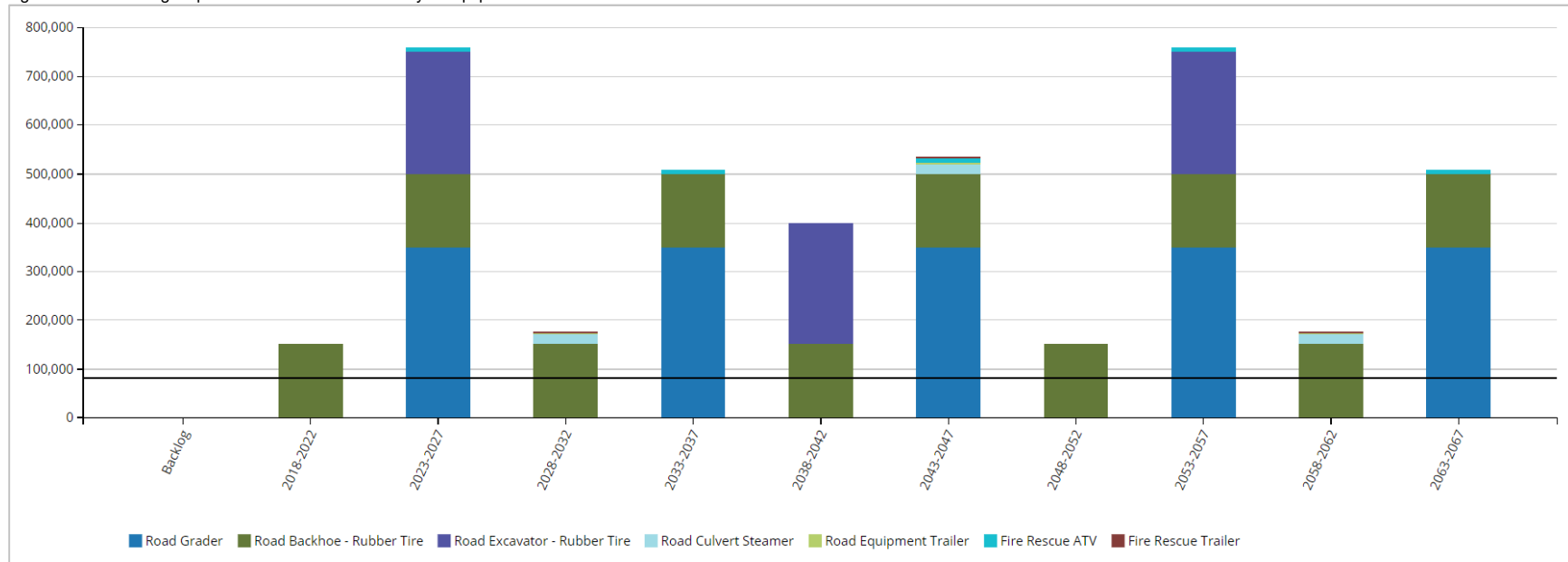


Based on assessed data, 3% of assets, with a valuation of \$26,000, are in good condition. The remaining assets are in fair condition.

## 4.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's machinery & equipment assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 30 Forecasting Replacement Needs – Machinery & Equipment



Assessed condition data indicates no backlog, the township's replacement needs total \$150,000 in the next five years. An additional \$759,000 will be required between 2023-2027. The township's annual requirements (indicated by the black line) for its machinery & equipment total \$84,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the township is currently allocating \$27,000, leaving an annual deficit of \$57,000. See the 'Financial Strategy' section for maintaining a sustainable funding level.

## **4.6 Recommendations – Machinery & Equipment**

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- The township should continue its component based condition inspection program for all machinery & equipment assets to better define financial requirements for its machinery and equipment. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.
- Using the above information, the township should assess its short-, medium- and long-term capital, and operations and maintenance needs.
- An appropriate percentage of the replacement costs should then be allocated for the township’s O&M requirements.
- The township is funding 32% of its long-term requirements on an annual basis. See the ‘Financial Strategy’ section on how to maintain sustainable and optimal funding levels.

## 5. Vehicles

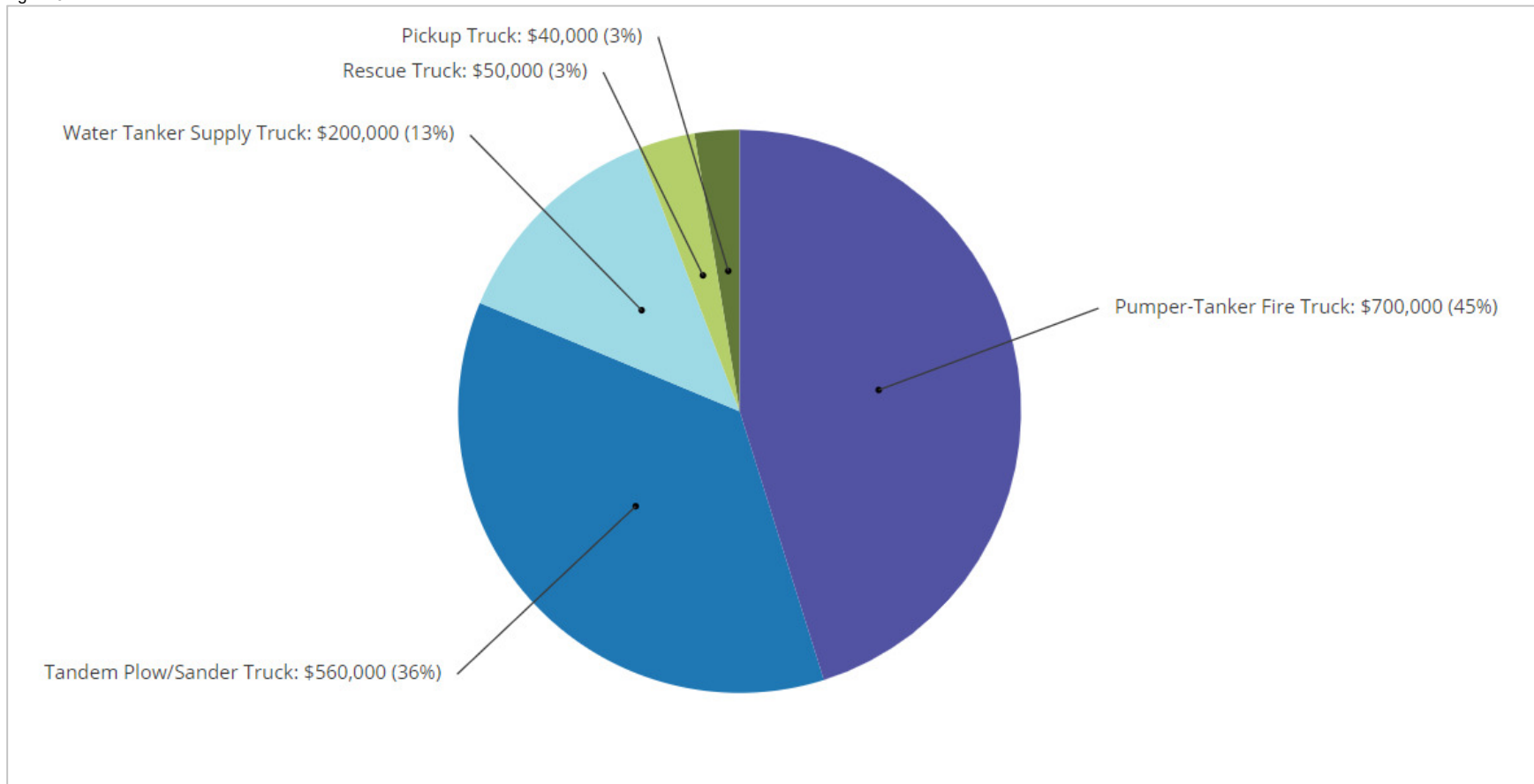
### 5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 illustrates key asset attributes for the township's vehicles portfolio, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement costs were derived. In total, the township's vehicles assets are valued at \$1.5 million based on 2018 replacement costs. The useful life indicated for each asset type below was assigned by the township.

Table 10 Asset Inventory – Vehicles

Asset Type	Components	Quantity	Useful Life in Years	Valuation Method	2018 Replacement Cost
Vehicles	Pickup Truck	1	4	User Defined	\$40,000
	Pumper-Tanker Fire Truck	2	5-11	User Defined	\$700,000
	Rescue Truck	1	8	User Defined	\$50,000
	Tandem Plow/Sander Truck	2	8-18	User Defined	\$560,000
	Water Tanker Supply Truck	1	12	User Defined	\$200,000
Total					\$1,550,000

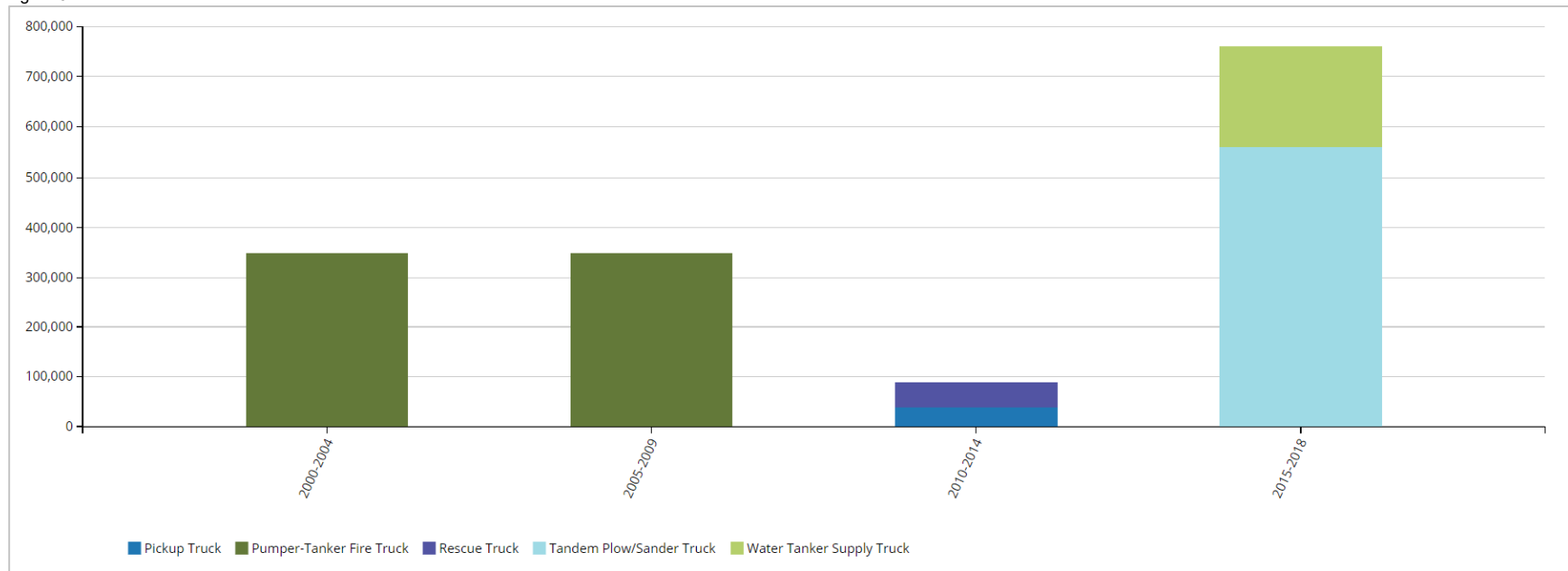
Figure 31 Asset Valuation – Vehicles



## 5.2 Historical Investment in Infrastructure

Figure 32 shows the township's historical investments in its vehicle's portfolio since 2000. While observed condition data will provide superior accuracy in estimating replacement needs and should be incorporated into strategic plans, in the absence of such information, understanding past expenditure patterns and current useful life consumption levels (Section 9.3) can inform the forecasting and planning of infrastructure needs and in the development of a capital program. Note that this graph only includes the active asset inventory as of December 31, 2018.

Figure 32 Historical Investment – Vehicles

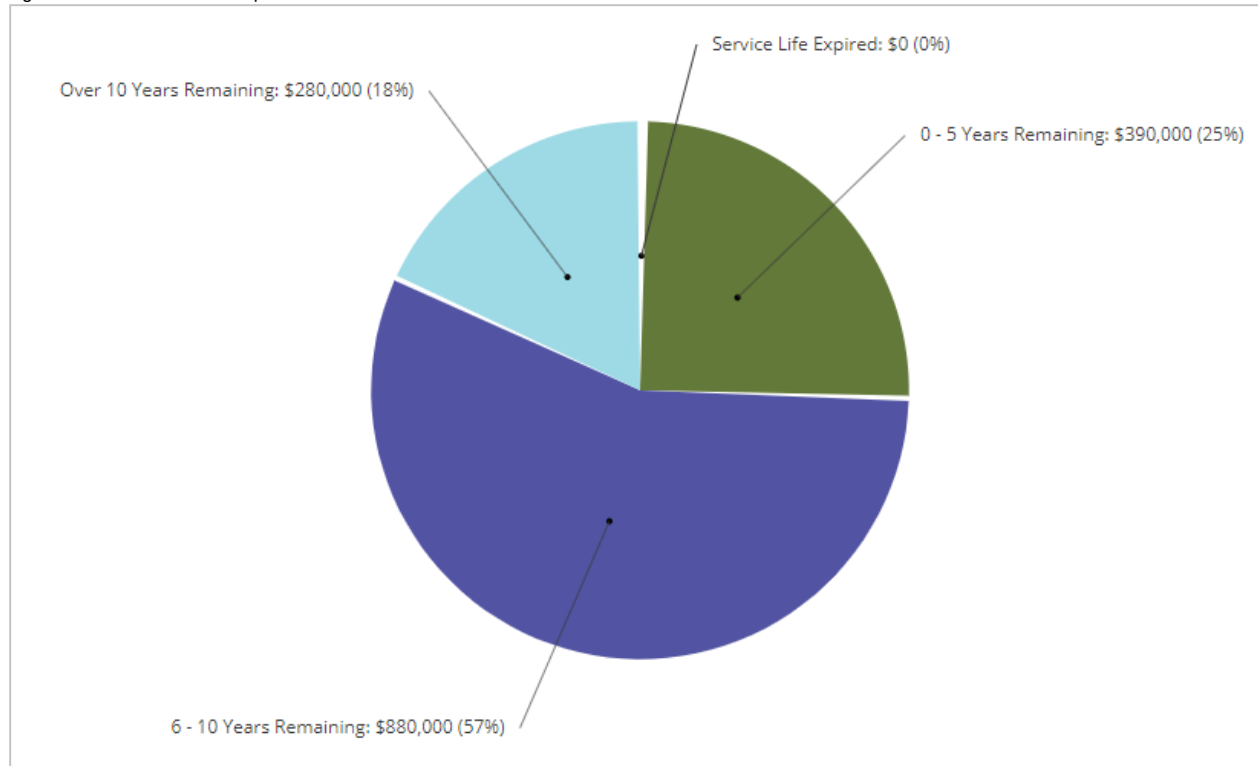


Investments in vehicles quickly increased starting in the 2000s. In 2015-2018, the period of largest investment, \$760,000 was invested with \$560,000 put into tandem plow/sander trucks.

### 5.3 Useful Life Consumption

In conjunction with historical spending patterns and observed condition data, understanding the consumption rate of assets based on industry established useful life standards provides a more complete profile of the state of a community's infrastructure. Figure 33 illustrates the useful life consumption levels as of 2018 for the township's vehicles.

Figure 33 Useful Life Consumption – Vehicles

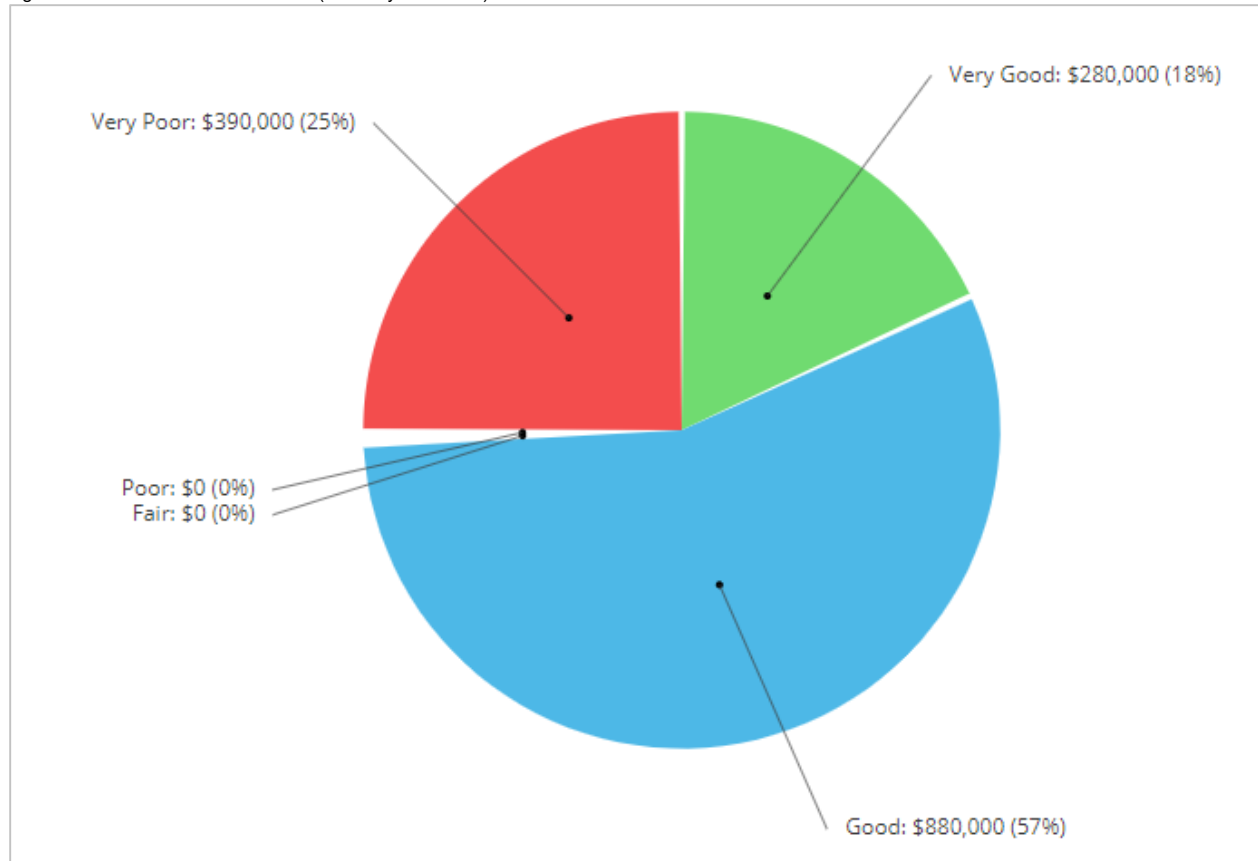


18% of assets have at least 10 years of useful life remaining; 25%, with a valuation of \$390,000 will reach the end of their useful life within the next five years.

## 5.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's vehicle assets as of 2018. By default, we rely on observed field data as provided by the township. In the absence of such information, age-based data is used as a proxy. The township has provided condition data for most of its vehicles while the remaining assets rely on age-based data.

Figure 34 Asset Condition – Vehicles (Primarily Assessed)



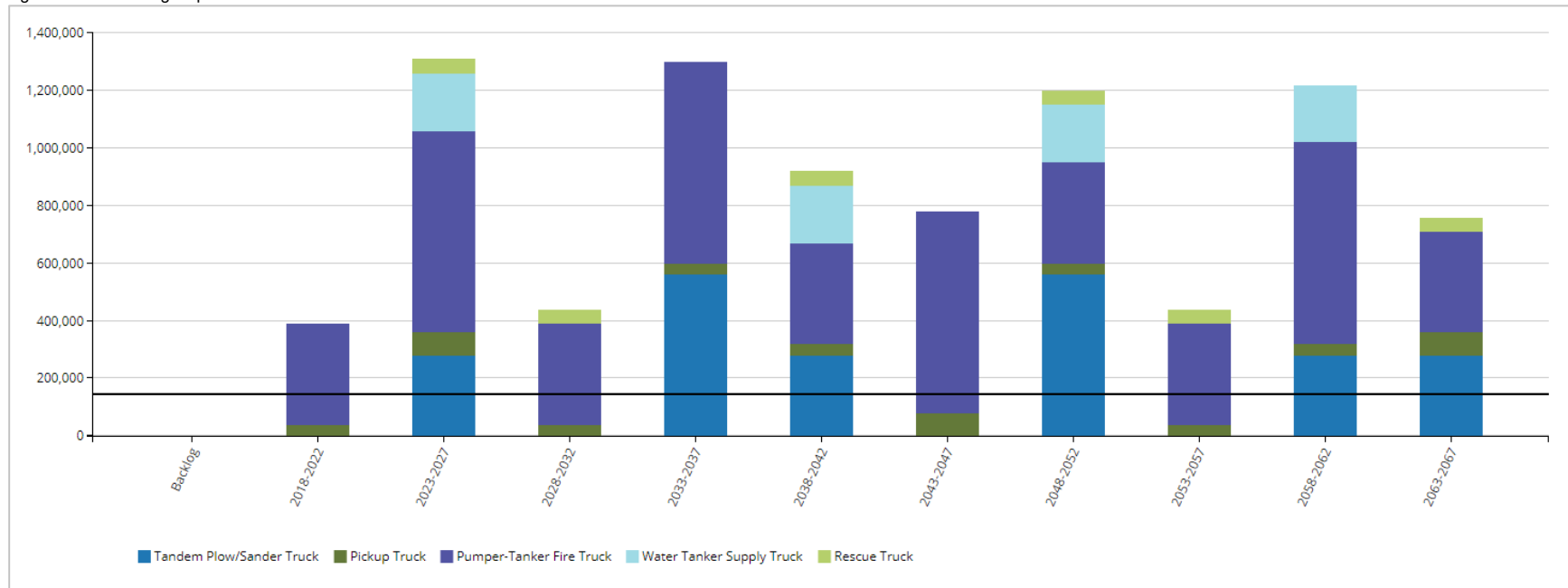
Primarily assessed data shows that 25% of the township's vehicle assets are in very poor condition; 75%, with a valuation of \$1.16 million are in good to very good condition.



## 5.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's vehicles assets. The backlog is the aggregate investment in infrastructure that was deferred over previous years or decades. In the absence of observed data, the backlog represents the value of assets that remain in operation beyond their useful life.

Figure 35 Forecasting Replacement Needs – Vehicles



Primarily assessed data indicates no backlog, replacement needs will total over \$390,000 over the next five years; an additional \$1.3 million will be required between 2023-2027. The township's annual requirements (indicated by the black line) for its vehicles total \$150,000. At this funding level, the township would be allocating sufficient funds on an annual basis to meet replacement needs as they arise without the need for deferring projects and accruing annual infrastructure deficits. However, the township is currently allocating \$48,000, leaving an annual deficit of \$102,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

## 5.6 Recommendations – Vehicles

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- A preventative maintenance and lifecycle assessment program should be established for all vehicle assets to gain a better understanding of current condition and performance as well as the short- and medium-term replacement needs. See Section 2, ‘Condition Assessment Programs’ in the ‘Asset Management Strategies’ chapter.
- Using the above information, the township should assess its short-, medium- and long-term capital and operations and maintenance needs.
- An appropriate percentage of the replacement costs should then be allocated for the township’s O&M requirements.
- The township is funding 32% of its long-term replacement needs on an annual basis. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

## VII. Levels of Service

The two primary risks to a township's financial sustainability are the total lifecycle costs of infrastructure, and establishing levels of service (LOS) that exceed its financial capacity. In this regard, municipalities face a choice: overpromise and underdeliver; under promise and overdeliver; or promise only that which can be delivered efficiently without placing inequitable burden on taxpayers. In general, there is often a trade-off between political expedience and judicious, long-term fiscal stewardship.

Developing realistic LOS using meaningful key performance indicators (KPIs) can be instrumental in managing citizen expectations, identifying areas requiring higher investments, driving organizational performance and securing the highest value for money from public assets. However, municipalities face diminishing returns with greater granularity in their LOS and KPI framework. That is, the objective should be to track only those KPIs that are relevant and insightful and reflect the priorities of the township.

### 1. Guiding Principles for Developing LOS

Beyond meeting regulatory requirements, levels of service established should support the intended purpose of the asset and its anticipated impact on the community and the township. LOS generally have an overarching corporate description, a customer oriented description, and a technical measurement. Many types of LOS, e.g., availability, reliability, safety, responsiveness and cost effectiveness, are applicable across all service areas in a township. The following LOS categories are established as guiding principles for the LOS that each service area in the township should strive to provide internally to the township and to residents/customers. These are derived from the Town of Whitby's *Guide to Developing Service Area Asset Management Plans*.

Table 11 LOS Categories

LOS Category	Description
Reliable	Services are predictable and continuous; services of sufficient capacity are convenient and accessible to the entire community.
Cost Effective	Services are provided at the lowest possible cost for both current and future customers, for a required level of service, and are affordable.
Responsive	Opportunities for community involvement in decision making are provided; and customers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy and integrity.
Safe	Services are delivered such that they minimize health, safety and security risks.
Suitable	Services are suitable for the intended function (fit for purpose).
Sustainable	Services preserve and protect the natural and heritage environment.

## 2. Key Performance Indicators and Targets

In this section, we identify industry standard KPIs for major infrastructure classes that the township can incorporate into its performance measurement and for tracking its progress over future iterations of its AMPs. The township should develop appropriate and achievable targets that reflect evolving demand on infrastructure, its fiscal capacity and the overall corporate objectives.

Table 12 Key Performance Indicators – Road Network and Bridges & Culverts

Level	KPI (Reported Annually)
Strategic	<ul style="list-style-type: none"> <li>– Percentage of total reinvestment compared to asset replacement value</li> <li>– Completion of strategic plan objectives (related to roads, and bridges &amp; culverts)</li> </ul>
Financial Indicators	<ul style="list-style-type: none"> <li>– Annual revenues compared to annual expenditures</li> <li>– Annual replacement value depreciation compared to annual expenditures</li> <li>– Cost per capita for roads, and bridges &amp; culverts</li> <li>– Maintenance cost per square metre</li> <li>– Revenue required to maintain annual network growth</li> <li>– Total cost of borrowing vs. total cost of service</li> </ul>
Tactical	<ul style="list-style-type: none"> <li>– Overall Bridge Condition Index (BCI) as a percentage of desired BCI</li> <li>– Percentage of road network rehabilitated/reconstructed</li> <li>– Percentage of paved road lane kilometres rated as poor to very poor</li> <li>– Percentage of bridges and large culverts rated as poor to very poor</li> <li>– Percentage of asset class value spent on O&amp;M</li> </ul>
Operational Indicators	<ul style="list-style-type: none"> <li>– Percentage of roads inspected within the last five years</li> <li>– Percentage of bridges and large culverts inspected within the last two years</li> <li>– Operating costs for paved lane per kilometres</li> <li>– Operating costs for bridge and large culverts per square metre</li> <li>– Percentage of customer requests with a 24-hour response rate</li> </ul>

Table 13 Key Performance Indicators – Buildings &amp; Facilities

Level	KPI (Reported Annually)
Strategic	<ul style="list-style-type: none"> <li>– Percentage of total reinvestment compared to asset replacement value</li> <li>– Completion of strategic plan objectives (related to buildings &amp; facilities)</li> </ul>
Financial Indicators	<ul style="list-style-type: none"> <li>– Annual revenues compared to annual expenditures</li> <li>– Annual replacement value depreciation compared to annual expenditures</li> <li>– Revenue required to meet growth related demand</li> <li>– Repair and maintenance costs per square metre</li> <li>– Energy, utility and water cost per square metre</li> </ul>
Tactical	<ul style="list-style-type: none"> <li>– Percentage of component value replaced</li> <li>– Percent of facilities rated poor or critical</li> <li>– Percentage of facilities replacement value spent on O&amp;M</li> <li>– Facility utilization rate               <ul style="list-style-type: none"> <li>– <math>Utilization Rate = \frac{Occupied Space}{Facility Usable Area}</math></li> </ul> </li> </ul>
Operational Indicators	<ul style="list-style-type: none"> <li>– Percentage of facilities inspected within the last five years</li> <li>– Number/type of service requests</li> <li>– Percentage of customer requests addressed within 24 hours</li> </ul>

Table 14 Key Performance Indicators – Vehicles

Level	KPI (Reported Annually)
Strategic	<ul style="list-style-type: none"> <li>– Percentage of total reinvestment compared to asset replacement value</li> <li>– Completion of strategic plan objectives (related to vehicles)</li> </ul>
Financial Indicators	<ul style="list-style-type: none"> <li>– Annual revenues compared to annual expenditures</li> <li>– Annual replacement value depreciation compared to annual expenditures</li> <li>– Cost per capita for vehicles</li> <li>– Revenue required to maintain annual fleet portfolio growth</li> <li>– Total cost of borrowing vs. total cost of service</li> </ul>
Tactical	<ul style="list-style-type: none"> <li>– Percentage of all vehicles replaced</li> <li>– Average age of vehicles</li> <li>– Percent of vehicles rated poor or critical</li> <li>– Percentage of vehicles replacement value spent on O&amp;M</li> </ul>
Operational Indicators	<ul style="list-style-type: none"> <li>– Average downtime per vehicles category</li> <li>– Average utilization per vehicles category and/or each vehicle</li> <li>– Ratio of preventative maintenance repairs vs. reactive repairs</li> <li>– Percent of vehicles that received preventative maintenance</li> <li>– Number/type of service requests</li> <li>– Percentage of customer requests addressed within 24 hours</li> </ul>

Table 15 Key Performance Indicators – Machinery & Equipment

Level	KPI (Reported Annually)
Strategic	<ul style="list-style-type: none"> <li>– Percentage of total reinvestment compared to asset replacement value</li> <li>– Completion of strategic plan objectives (related to machinery &amp; equipment)</li> </ul>
Financial Indicators	<ul style="list-style-type: none"> <li>– Annual revenues compared to annual expenditures</li> <li>– Annual replacement value depreciation compared to annual expenditures</li> <li>– Cost per capita for machinery &amp; equipment</li> <li>– Revenue required to maintain annual portfolio growth</li> <li>– Total cost of borrowing vs. total cost of service</li> </ul>
Tactical	<ul style="list-style-type: none"> <li>– Percentage of all machinery &amp; equipment replaced</li> <li>– Average age of machinery &amp; equipment assets</li> <li>– Percent of machinery &amp; equipment rated poor or critical</li> <li>– Percentage of vehicles replacement value spent on O&amp;M</li> </ul>
Operational Indicators	<ul style="list-style-type: none"> <li>– Average downtime per machinery &amp; equipment asset</li> <li>– Ratio of preventative maintenance repairs vs. reactive repairs</li> <li>– Percent of machinery &amp; equipment that received preventative maintenance</li> <li>– Number/type of service requests</li> </ul>

### 3. Future Performance

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In addition to a township's financial capacity and legislative requirements, many factors, internal and external, can influence the establishment of LOS and their associated KPI. These can include the township's overarching mission as an organization, the current state of its infrastructure and the wider social, political and macroeconomic context. The following factors should inform the development of most levels of service targets and their associated KPIs:

#### **Strategic Objectives and Corporate Goals**

The township's long-term direction is outlined in its corporate and strategic plans. This direction will dictate the types of services it aims to deliver to its residents and the quality of those services. These high-level goals are vital in identifying strategic (long-term) infrastructure priorities and as a result, the investments needed to produce desired levels of service.

#### **State of the Infrastructure**

The current state of capital assets will determine the quality of services the township can deliver to its residents. As such, levels of service should reflect the existing capacity of assets to deliver those services, and may vary (increase) with planned maintenance, rehabilitation or replacement activities and timelines.

#### **Community Expectations**

The general public will often have qualitative and quantitative insights regarding the levels of service a particular asset or a network of assets should deliver, e.g., what a road in 'good' condition should look like or the travel time between destinations. The public should be consulted in establishing LOS; however, the discussions should be centered on clearly outlining the lifecycle costs associated with delivering any improvements in LOS.

#### **Economic Trends**

Macroeconomic trends will have a direct impact on the LOS for most infrastructure services. Fuel costs, fluctuations in interest rates and the purchasing power of the Canadian dollar can impede or accelerate any planned growth in infrastructure services.

#### **Demographic Changes**

The composition of residents in a township can also serve as an infrastructure demand driver, and as a result, can change how a township allocates its resources (e.g., an aging population may require diversion of resources from parks and sports facilities to additional wellbeing centers). Population growth is also a significant demand driver for existing assets (lowering LOS), and may require the township to construct new infrastructure to parallel community expectations.

#### **Environmental Change**

Forecasting for infrastructure needs based on climate change remains an imprecise science. However, broader environmental and weather patterns have a direct impact on the reliability of critical infrastructure services.

## **4. Monitoring, Updating and Actions**

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The township should collect data on its current performance against the KPIs listed and establish targets that reflect the current fiscal capacity of the township, its corporate and strategic goals, and as feasible, changes in demographics that may place additional demand on its various asset classes. For some asset classes, e.g., minor equipment, furniture, etc., cursory levels of service and their respective KPIs will suffice. For major infrastructure classes, detailed technical and customer-oriented KPIs can be critical. Once this data is collected and targets are established, the progress of the township should be tracked annually.



## VIII. Asset Management Strategies

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The asset management strategy section will outline an implementation process that can be used to identify and prioritize renewal, rehabilitation and maintenance activities. This will assist in the development of a 10-year capital plan, including growth projections, to ensure the best overall health and performance of the township's infrastructure. This section includes an overview of condition assessment, the lifecycle interventions required, and prioritization techniques, including risk, to determine which capital projects should move forward into the budget first.



# **1. Non-Infrastructure Solutions & Requirements**

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The township should explore, as requested through the provincial requirements, which non-infrastructure solutions should be incorporated into the budgets for its infrastructure services. Non-infrastructure solutions are such items as studies, policies, condition assessments, consultation exercises, etc., that could potentially extend the life of assets or lower total asset program costs in the future without a direct investment into the infrastructure.

Typical solutions for a township include linking the asset management plan to the strategic plan, growth and demand management studies, infrastructure master plans, better integrated infrastructure and land use planning, public consultation on levels of service and condition assessment programs. As part of future asset management plans, a review of these requirements should take place, and a portion of the capital budget should be dedicated for these items in each programs budget.

It is recommended, under this category of solutions, that the township should develop and implement holistic condition assessment programs for all asset classes. This will advance the understanding of infrastructure needs, improve budget prioritization methodologies and provide a clearer path of what is required to achieve sustainable infrastructure programs.

## **2. Condition Assessment Programs**

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The foundation of an intelligent asset management practice is based on having comprehensive and reliable information on the current condition of the infrastructure. Municipalities need to have a clear understanding regarding the performance and condition of their assets, as all management decisions regarding future expenditures and field activities should be based on this knowledge. An incomplete understanding of an asset may lead to its untimely failure or premature replacement.

Some benefits of holistic condition assessment programs within the overall asset management process are listed below:

- understanding of overall network condition leads to better management practices
- allows for the establishment of rehabilitation programs
- prevents future failures and provides liability protection
- potential reduction in operation/maintenance costs
- accurate current asset valuation
- allows for the establishment of risk assessment programs
- establishes proactive repair schedules and preventive maintenance programs
- avoids unnecessary expenditures
- extends asset service life therefore improving level of service
- improves financial transparency and accountability
- enables accurate asset reporting which, in turn, enables better decision making

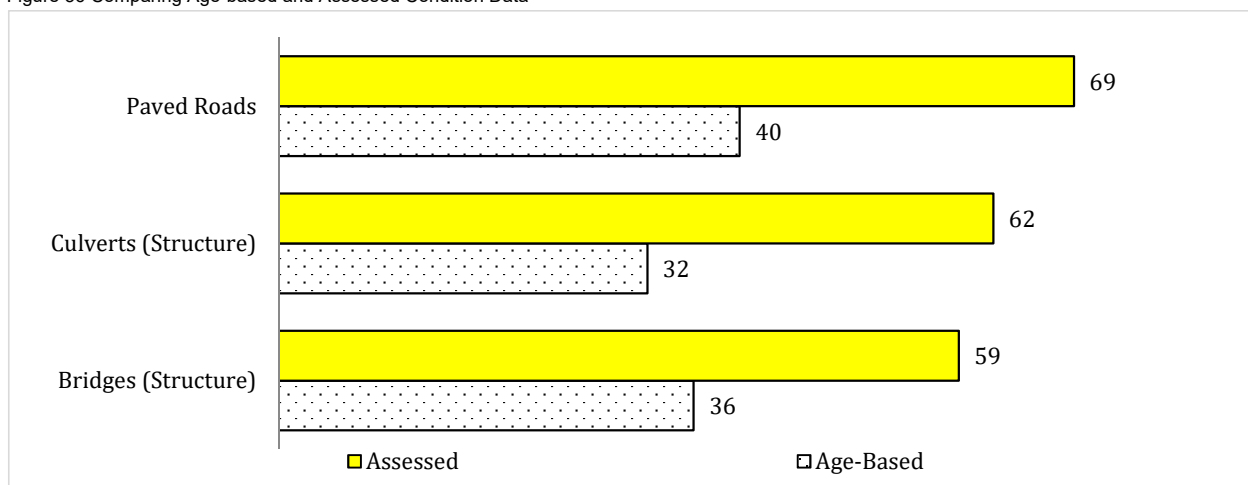
Condition assessment can involve different forms of analysis such as subjective opinion, mathematical models, or variations thereof, and can be completed through a very detailed or very cursory approach. When establishing the condition assessment for an entire asset class, a cursory approach (metrics such as good, fair, poor, very poor) is used. This is an economical strategy that will still provide up to date information, and will allow for detailed assessment or follow-up inspections on those assets captured as poor or critical condition later.

## The Impact of Condition Assessments

In 2015, PSD published a study in partnership with the Association of Municipalities of Ontario (AMO). The report, *The State of Ontario's Roads and Bridges: An Analysis of 93 Municipalities*, enumerated the infrastructure deficits, annual investment gaps, and the physical state of roads, bridges and culverts with a 2013 replacement value of \$28 billion.

A critical finding of the report was the dramatic difference in the condition profile of the assets when comparing age-based estimates and actual field inspection observations. For each asset group, field data based condition ratings were significantly higher than age-based condition ratings, with paved roads, culverts, and bridges showing an increase in score (0-100) of +29, +30, and +23 points respectively. In other words, age-based measurements maybe underestimating the condition of assets by as much as 30%.

Figure 36 Comparing Age-based and Assessed Condition Data



## **2.1 Pavement Network**

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Typical industry pavement inspections are performed by consulting firms using specialized assessment vehicles equipped with various electronic sensors and data capture equipment. The vehicles will drive the entire road network and typically collect two different types of inspection data: surface distress data and roughness data.

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically using sensing detection equipment mounted on the van, or visually by the van's inspection crew. Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

Another option for a cursory level of condition assessment is for municipal road crews to perform simple windshield surveys as part of their regular patrol. Many municipalities have created data collection inspection forms to assist this process and to standardize what presence of defects would constitute a good, fair, poor, or critical score. Lacking any other data for the complete road network, this can still be seen as a good method and will assist greatly with the overall management of the road network.

It is recommended that the township continue its pavement condition assessment program and that a portion of capital funding is dedicated to this. We also recommend expansion of this program to incorporate additional components.

## **2.2 Bridges & Culverts**

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Ontario municipalities are mandated by the Ministry of Transportation to inspect all structures that have a span of 3 metres or more, according to the OSIM (Ontario Structure Inspection Manual).

Structure inspections must be performed by, or under the guidance of, a structural engineer, must be performed on a biennial basis (once every two years), and include such information as structure type, number of spans, span lengths, other key attribute data, detailed photo images, and structure element by element inspection, rating and recommendations for repair, rehabilitation, and replacement.

The best approach to develop a 10-year needs list for the township's structure portfolio relies on the structural engineer who performs the inspections to also produce a maintenance requirements report, and rehabilitation & replacement requirements report as part of the overall assignment. In addition to defining the overall needs requirements, the structural engineer should identify those structures that will require more detailed investigations and non-destructive testing techniques. Examples of these investigations are:

- Detailed deck condition survey
- Non-destructive delamination survey of asphalt covered decks
- Substructure condition survey
- Detailed coating condition survey
- Underwater investigation
- Fatigue investigation
- Structure evaluation

Through the OSIM recommendations and additional detailed investigations, a 10-year needs list can be developed for the township's bridges.

## 2.3 Buildings & Facilities

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The most popular and practical type of buildings & facilities assessment involves qualified groups of trained industry professionals (engineers or architects) performing an analysis of the condition of a group of facilities and their components, that may vary in terms of age, design, construction methods and materials. This analysis can be done by walk-through inspection (the most accurate approach), mathematical modeling or a combination of both. The following asset classifications are typically inspected:

- **Site Components** – property around the facility and outdoor components such as utilities, signs, stairways, walkways, parking lots, fencing, courtyards and landscaping
- **Structural Components** – physical components such as the foundations, walls, doors, windows, roofs
- **Electrical Components** – all components that use or conduct electricity such as wiring, lighting, electric heaters, and fire alarm systems
- **Mechanical Components** – components that convey and utilize all non-electrical utilities within a facility such as gas pipes, furnaces, boilers, plumbing, ventilation, and fire extinguishing systems
- **Vertical Movement** – components used for moving people between floors of buildings such as elevators, escalators and stair lifts

Once collected, this information can be uploaded into the CityWide®, the township's asset management and asset registry software database in order for short- and long-term repair, rehabilitation and replacement reports to be generated to assist with programming the short- and long-term maintenance and capital budgets.

It is recommended that the township continue its inspection of structures and expand its condition assessment program for other segments. It is also recommended that a portion of capital funding is dedicated to this.

## 2.4 Vehicles and Machinery & Equipment

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The typical approach to optimizing the maintenance expenditures of vehicles and machinery & equipment, is through routine vehicle and component inspections, routine servicing, and a routine preventative maintenance program. Most makes and models of vehicles and machinery assets are supplied with maintenance manuals that define the appropriate schedules and routines for typical maintenance and servicing, and also more detailed restoration or rehabilitation protocols.

The primary goal of sound maintenance is to avoid or mitigate the consequence of failure of equipment or parts. An established preventative maintenance program serves to ensure this, as it will consist of scheduled inspections and follow up repairs of vehicles and machinery & equipment in order to decrease breakdowns and excessive downtimes.

A good preventative maintenance program will include partial or complete overhauls of equipment at specific periods, including oil changes, lubrications, fluid changes and so on. In addition, workers can record equipment or part deterioration so they can schedule to replace or repair worn parts before they fail.

The ideal preventative maintenance program would move progressively further away from reactive repairs and instead towards the prevention of all equipment failure before it occurs.

It is recommended that a preventative maintenance routine is defined and established for all vehicles and machinery & equipment assets, and that a software application is utilized for the overall management of the program.

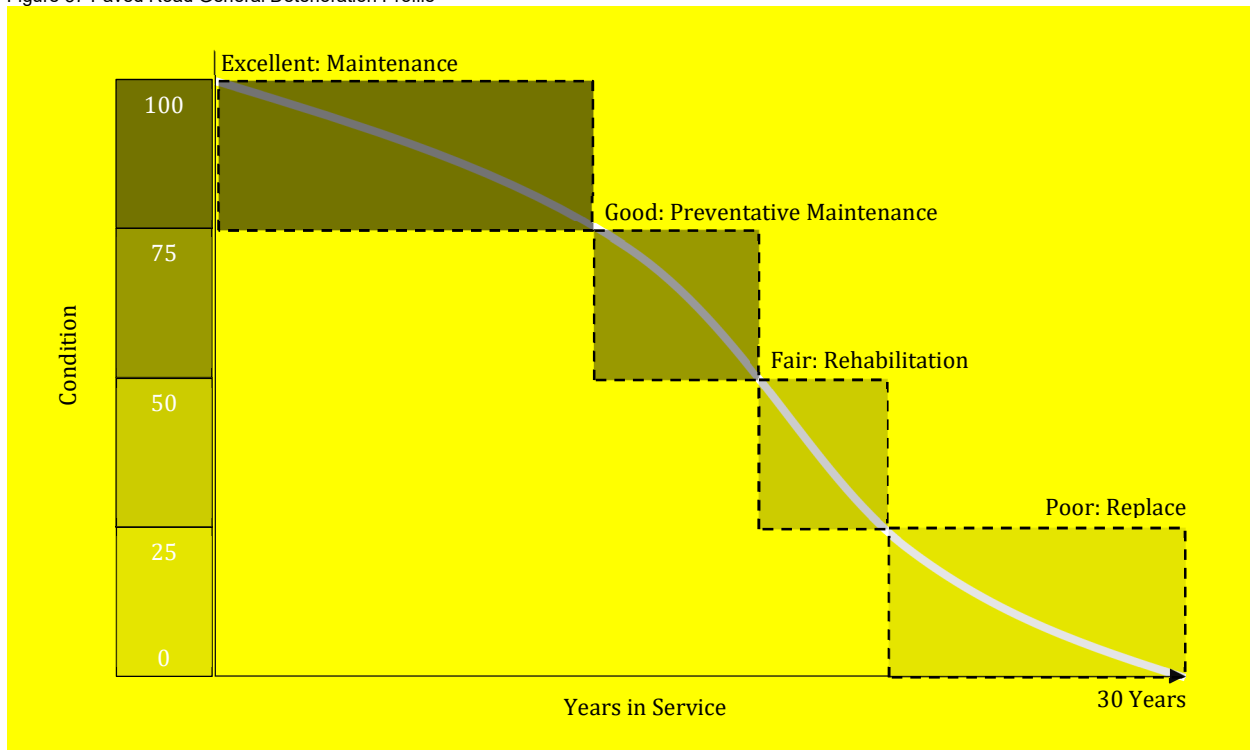
### 3. Lifecycle Analysis Framework

An industry review was conducted to determine which lifecycle activities can be applied at the appropriate time in an asset's life, to provide the greatest additional life at the lowest cost. In the asset management industry, this is simply put as doing the right thing to the right asset at the right time. If these techniques are applied across entire asset networks or portfolios (e.g., the entire road network), the township can gain the best overall asset condition while expending the lowest total cost for those programs.

#### 3.1 Paved Roads

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for paved roads. With future updates of this asset management strategy, the township may wish to run the same analysis with a detailed review of township activities used for roads and the associated local costs for those work activities. All of this information can be entered into the CityWide® software suite in order to perform updated financial analysis as more detailed information becomes available. The following diagram depicts a general deterioration profile of a road with a 30-year life.

Figure 37 Paved Road General Deterioration Profile



As shown above, during the road's lifecycle, there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; preventative maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied to also coincide approximately with the condition state of the asset as shown below:

Table 16 Asset Condition and Related Work Activity for Paved Roads

Condition	Condition Range	Work Activity
Very Good (Maintenance only phase)	81-100	– Maintenance only
Good (Preventative maintenance phase)	61-80	– Crack sealing – Emulsions
Fair (Rehabilitation phase)	41-60	– Resurface - mill & pave – Resurface - asphalt overlay – Single & double surface treatment (for rural roads)
Poor (Reconstruction phase)	21-40	– Reconstruct - pulverize and pave – Reconstruct - full surface and base reconstruction
Very Poor (Reconstruction phase)	0-20	– Critical includes assets beyond their useful lives which make up the backlog. They require the same interventions as the 'poor' category above.

With future updates of this asset management strategy, the township may wish to review the above condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the township's work program. Also note: when adjusting these thresholds, it actually adjusts the level of service provided and ultimately changes the amount of money required. These thresholds and condition ranges can be updated and a revised financial analysis can be calculated. These adjustments will be an important component of future asset management plans, as the province requires each township to present various management options within the financing plan.

It is recommended that the township establish a lifecycle activity framework for the various classes of paved road within their transportation network.

## 3.2 Bridges & Culverts

The best approach to develop a 10-year needs list for the township's bridge structure portfolio relies on the structural engineer who performs the inspections to develop a maintenance requirements report, a rehabilitation and replacement requirements report and identify additional detailed inspections as required.

## 3.3 Buildings & Facilities

The best approach to develop a 10-year needs list for the township's facilities portfolio would be to have the engineers, operational staff or architects who perform the facility inspections to also develop a complete portfolio maintenance requirements report and rehabilitation and replacement requirements report, and also identify additional detailed inspections and follow up studies as



required. This may be performed as a separate assignment once all individual facility audits/inspections are complete.

The above reports could be considered the beginning of a 10-year maintenance and capital plan; however, within the facilities industry, there are other key factors that should be considered to determine over all priorities and future expenditures. Some examples would be functional and legislative requirements, energy conservation programs and upgrades, customer complaints and health and safety concerns, and customer expectations balanced with willingness-to-pay initiatives.

It is recommended that the township establish a prioritization framework for the facilities asset class that incorporates the key components outlined above.

### **3.4 Vehicles and Machinery & Equipment**

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The best approach to develop a 10-year needs list for the township's vehicles and machinery & equipment portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized lifecycle vehicle replacement schedule. The preventative maintenance program would serve to determine budget requirements for operating and minor capital expenditures for renewal of parts, and major refurbishments and rehabilitations. An optimized replacement program will ensure a vehicle or equipment asset is replaced at the correct point in time in order to minimize overall cost of ownership, minimize costly repairs and downtime, while maximizing potential re-sale value. There is significant benchmarking information available within the vehicles industry in regard to vehicle lifecycles which can be used to assist in this process. Once appropriate replacement schedules are established, the short- and long-term budgets can be funded accordingly.

There are, of course, functional aspects of vehicles management that should also be examined in further detail as part of the long-term management plan, such as vehicles utilization and incorporating green vehicles, etc. It is recommended that the township establish a prioritization framework for the vehicles asset class that incorporates the key components outlined above.

## 4. Growth and Demand

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Growth is a critical infrastructure demand driver for most infrastructure services. As such, the township 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. Based on the 2016 census, the population for Papineau-Cameron has increased 4% since 2011 to reach 1,016. Population changes will require the township to determine the impact to expected levels of service and if any changes to the existing asset inventory may be required.

## 5. Project Prioritization and Risk Management

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Generally, infrastructure needs exceed municipal capacity. As such, municipalities rely heavily on provincial and federal programs and grants to finance important capital projects. Fund scarcity means projects and investments must be carefully selected based on the state of infrastructure, economic development goals, and the needs of an evolving and growing community. These factors, along with social and environmental considerations will form the basis of a robust risk management framework.

### 5.1 Defining Risk Management

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From an asset management perspective, risk is a function of the consequences of failure (e.g., the negative economic, financial, and social consequences of an asset in the event of a failure); and, the probability of failure (e.g., how likely is the asset to fail in the short- or long-term). The consequences of failure are typically reflective of:

- **An asset's importance in an overall system:**  
For example, the failure of an individual computer workstation for which there are readily available substitutes is much less consequential and detrimental than the failure of a network server or telephone exchange system.
- **The criticality of the function performed:**  
For example, a mechanical failure on a road construction equipment may delay the progress of a project, but a mechanical failure on a fire pumper truck may lead to immediate life safety concerns for fire fighters, and the public, as well as significant property damage.
- **The exposure of the public and/or staff to injury or loss of life:**  
For example, a single sidewalk asset may demand little consideration and carry minimum importance to the township's overall pedestrian network and performs a modest function. However, members of the public interact directly with the asset daily and are exposed to potential injury due to any trip hazards or other structural deficiencies that may exist.

The probability of failure is generally a function of an asset's physical condition, which is heavily influenced by the asset's age and the amount of investment that has been made in the maintenance and renewal of the asset throughout its life.

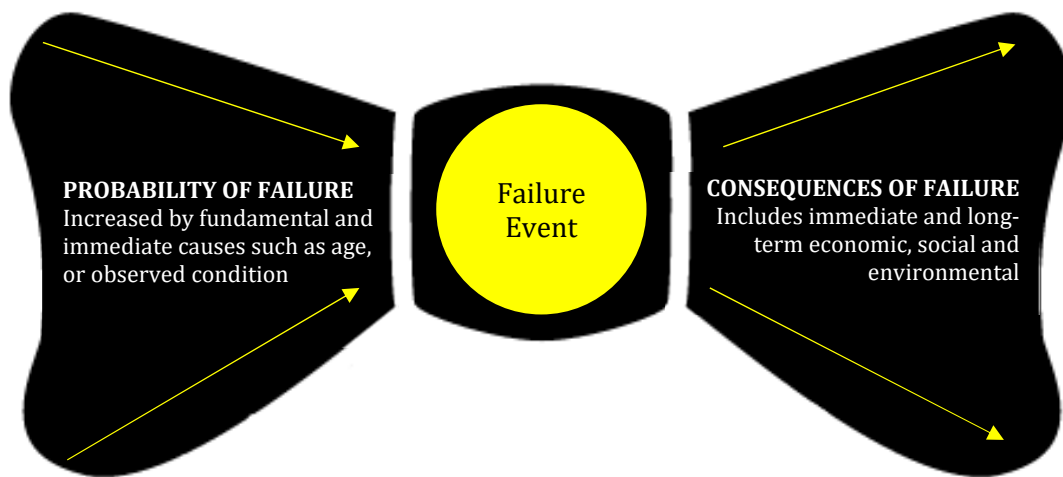
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the township's ability to deliver targeted levels of service

- The impact that actions (or inaction) on one asset will have on other related assets
- The opportunities for economic efficiency (realized or lost) relative to the actions taken

## 5.2 Risk Matrices

Using the logic above, a risk matrix will illustrate each asset's overall risk, determined by multiplying the probability of failure (PoF) scores with the consequence of failure (CoF) score, as illustrated in the table that follow. This can be completed as a holistic exercise against any data set by determining which factors (or attributes) are available and will contribute to the PoF or CoF of an asset. Figure 38 (known as a bowtie model in the risk industry) illustrates this concept. The probability of failure is increased as more and more factors collude to cause asset failure.

Figure 38 Bow Tie Risk Model



## Probability of Failure

In this AMP, the probability of a failure event is predicted by the condition of the asset.

Table 17 Probability of Failure – All Assets

Asset Classes	Condition Rating	Probability of Failure
ALL	0-20 Very Poor	5 – Very High
	21-40 Poor	4 – High
	41-60 Fair	3 – Moderate
	61-80 Good	2 – Low
	81-100 Excellent	1 – Very Low

## Consequence of Failure

The consequence of failure for the asset classes analyzed in this AMP will be determined either by the replacement costs of assets, or other attributes as relevant. These attributes include material types, classifications, or size. Asset classes for which replacement cost is used include bridges & culverts, buildings & facilities, vehicles, and machinery & equipment. This approach is premised on the assumption that the higher the replacement cost, the larger (and likely more important) the asset, requiring a higher risk scoring.

Assets for which other attributes are used include roads. Attributes are selected based on their impact on service delivery. For linear infrastructure, pipe diameter is used to estimate a suitable consequence of failure score as it reflects the potential upstream service area affected. Scoring for roads, the risk is based on classification as it reflects the traffic volumes and number of people affected.

Table 18 Consequence of Failure – Roads

Road Classification	Consequence of failure
Gravel	Score of 1
LCB	Score of 3

Table 19 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to \$30k	Score of 1
\$31 to \$50k	Score of 2
\$51 to \$100k	Score of 3
\$101 to \$300k	Score of 4
\$301k and above	Score of 5

Table 20 Consequence of Failure – Machinery &amp; Equipment

Replacement Value	Consequence of failure
Up to \$5k	Score of 1
\$6k to \$15k	Score of 2
\$16k to \$100k	Score of 3
\$101k to \$150k	Score of 4
Over \$150k	Score of 5

Table 21 Consequence of Failure – Buildings &amp; Facilities

Replacement Value	Consequence of failure
Up to \$100k	Score of 1
\$101k to \$150k	Score of 2
\$151k to \$165k	Score of 3
\$166k to \$200k	Score of 4
Over \$200k	Score of 5

Table 22 Consequence of Failure – Vehicles

Replacement Value	Consequence of failure
Up to \$40k	Score of 1
\$41k to \$150k	Score of 2
\$151k to \$200k	Score of 3
\$201k to \$300k	Score of 4
Over \$300k	Score of 5

The risk matrices that follow show the distribution of assets within each asset class according to the probability and likelihood of failure scores as discussed above.

Figure 39 Distribution of Assets Based on Risk – All Asset Classes

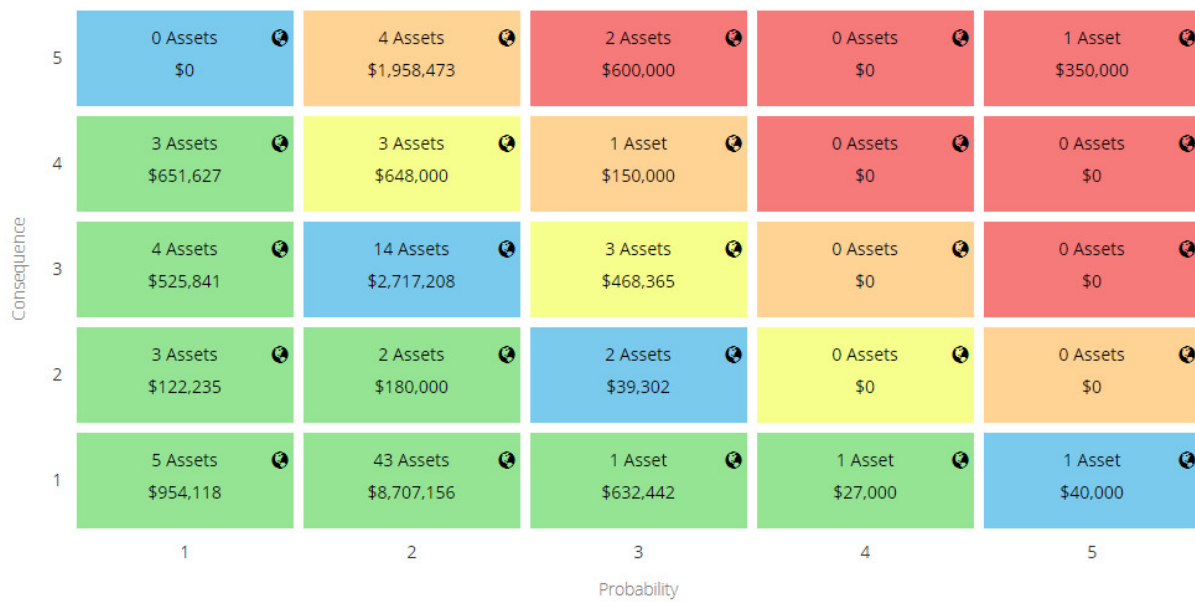


Figure 40 Distribution of Assets Based on Risk – Road Network

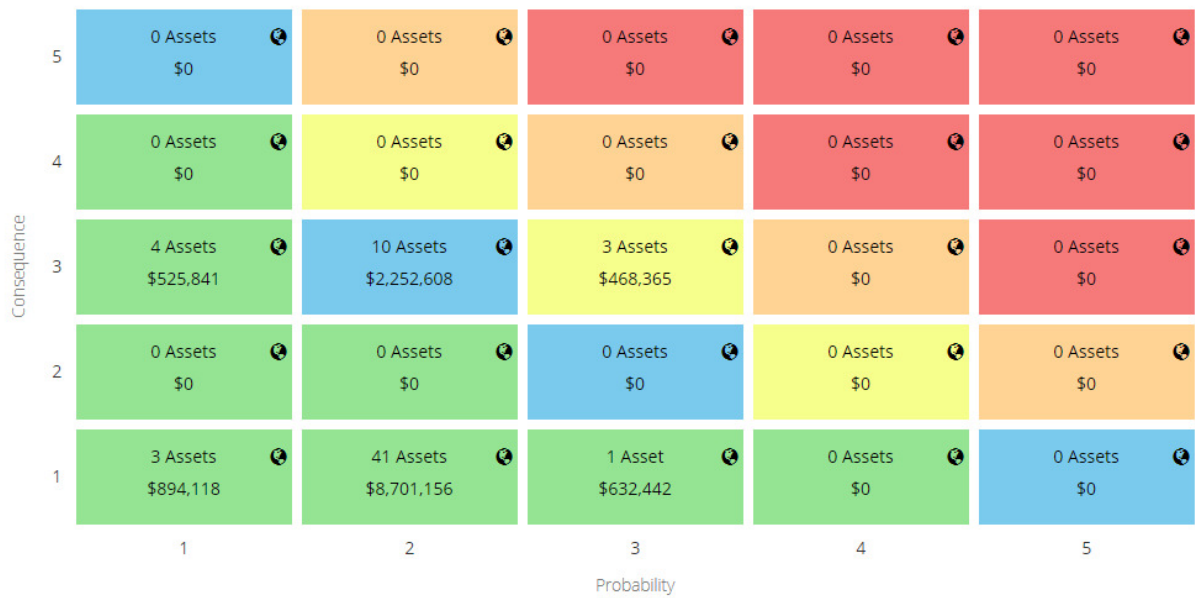


Figure 41 Distribution of Assets Based on Risk – Bridges & Culverts

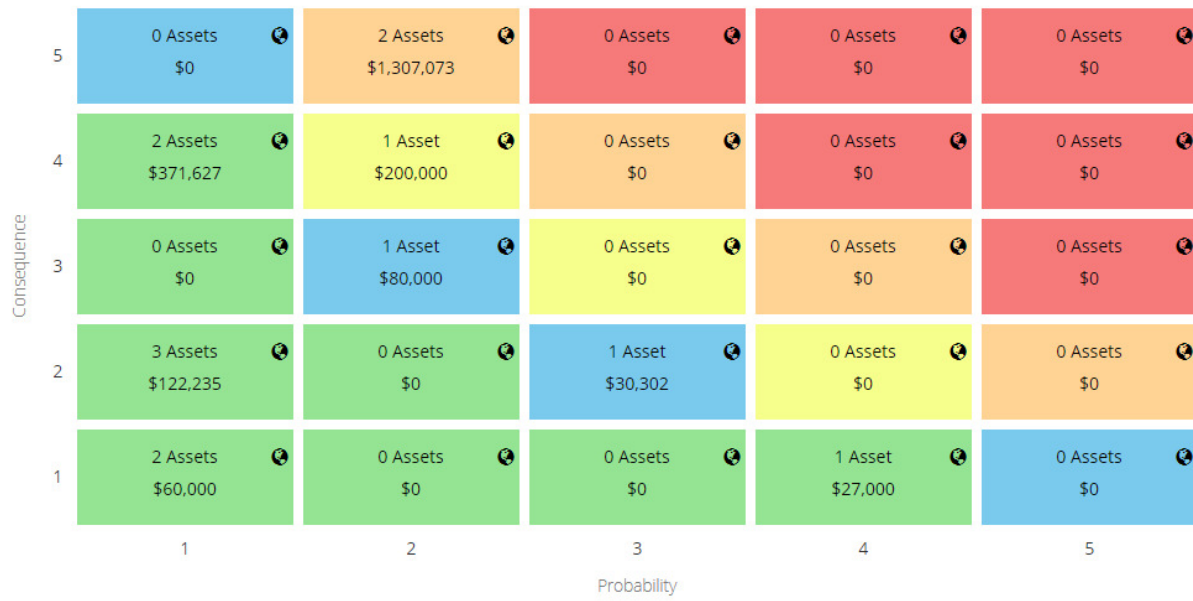


Figure 42 Distribution of Assets Based on Risk – Buildings & Facilities



Figure 43 Distribution of Assets Based on Risk – Machinery & Equipment



Figure 44 Distribution of Assets Based on Risk – Vehicles





# IX. Financial Strategy

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## 1. General Overview

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In order for an AMP to be effective and meaningful, it must be integrated with financial planning and long-term budgeting. The development of a comprehensive financial plan will allow the township to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service and projected growth requirements.



Figure 45 Cost Elements

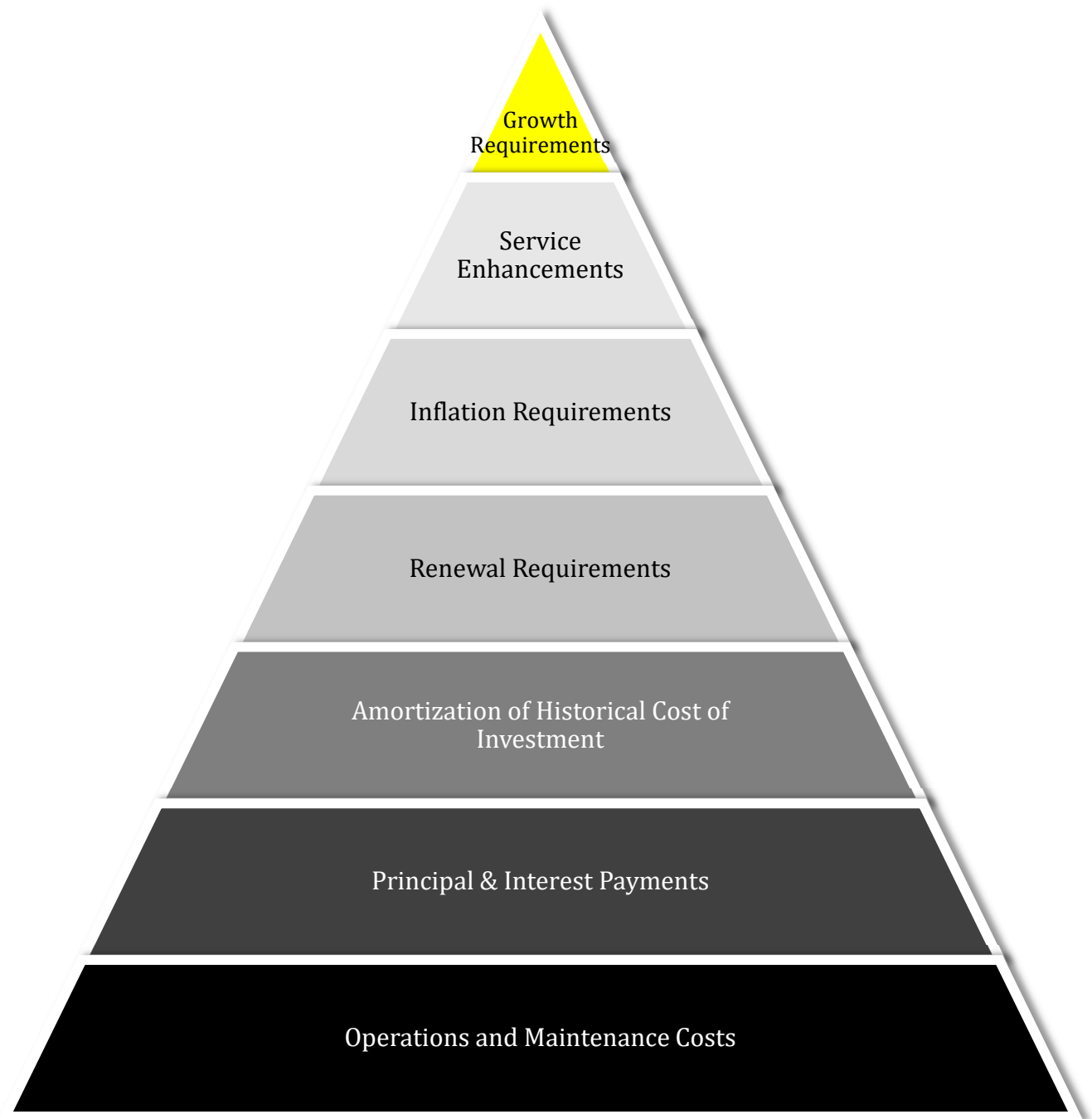


Figure 45 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient in terms of lifecycle costs.

Meeting the annual amortization expense based on the historical cost of investment will ensure municipalities adhere to accounting rules implemented in 2009; however, funding is still deficient for long-term needs. As municipalities graduate to the next level and meet renewal requirements, funding at this level ensures that need and cost of full replacement is deferred. If municipalities meet inflation requirements, they're positioning themselves to meet replacement needs at existing levels of service. In the final level, municipalities that are funding for service enhancement and growth requirements are fiscally sustainable and cover future investment needs.

This report develops a financial plan by presenting several scenarios for consideration and culminating with final recommendations. It includes recommendations that avoid long-term funding deficits. As outlined below, the scenarios presented model different combinations of the following components:

- the financial requirements (as documented in the SOTI section of this report) for existing assets, existing service levels, requirements of contemplated changes in service levels (none identified for this plan), and requirements of anticipated growth (none identified for this plan)
- use of traditional sources of municipal funds including tax levies, user fees, reserves, debt, and development charges
- use of non-traditional sources of municipal funds, e.g., reallocated budgets
- use of senior government funds, such as the federal Gas Tax Fund, Ontario Community Infrastructure Fund (OCIF)

If the financial plan component of an AMP results in a funding shortfall, the province requires the inclusion of a specific plan as to how the impact of the shortfall will be managed. In determining the legitimacy of a funding shortfall, the province may evaluate a township's approach to the following:

- In order to reduce financial requirements, consideration has been given to revising service levels downward.
- All asset management and financial strategies have been considered. For example:
  - If a zero debt policy is in place, is it warranted? If not, the use of debt should be considered.
  - Do user fees reflect the cost of the applicable service? If not, increased user fees should be considered.

## 2. Financial Profile: Tax Funded Assets

### 2.1 Funding Objective

We have developed scenarios that would enable the township to achieve full funding within five to 20 years for the following assets: road network; bridges & culverts; buildings & facilities; machinery & equipment; and vehicles. For each scenario developed, we have included strategies, where applicable, regarding the use of tax revenues, user fees, reserves and debt.

### 2.2 Current Funding Position

Table 23 and Table 24 outline, by asset class, the township's average annual asset investment requirements, current funding positions, and funding increases required to achieve full funding on assets funded by taxes.

Table 23 Infrastructure Requirements and Current Funding Available: Tax Funded Assets

Asset class	Average Annual Investment Required	Total Funding Available in 2018					Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Other	Total Funding Available	
Road Network	259,000	84,000	62,000	50,000	0	196,000	63,000
Bridges & Culverts	111,000	36,000	0	0	0	36,000	75,000
Facilities	15,000	5,000	0	0	0	5,000	10,000
Machinery & Equipment	84,000	27,000	0	0	0	27,000	57,000
Vehicles	150,000	48,000	0	0	0	48,000	102,000
Total	619,000	200,000	62,000	50,000	0	312,000	307,000

## 2.3 Recommendations for Full Funding

The average annual investment requirement for tax funded categories is \$619,000. Annual revenue currently allocated to these assets for capital purposes is \$312,000, leaving an annual deficit of \$307,000. To put it another way, these infrastructure categories are currently funded at 50% of their long-term requirements.

In 2019, the township had annual tax revenues of \$1,573,000. As illustrated in Table 24, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 24 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Road Network	4.0%
Bridges & Culverts	4.8%
Facilities	0.6%
Machinery & Equipment	3.6%
Vehicles	6.5%
Total	19.5%

The following changes in costs and/or revenues over the next number of years should also be considered in the financial strategy:

- As shown in Table 28 Papineau-Cameron's debt payments for these asset categories will be decreasing by \$62,000 over the next 5 years and by \$62,000 over the next 10 years. Although not shown in the table, debt payment decreases will be \$62,000 and \$62,000 over the next 15 and 20 years respectively.

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 25 outlines this concept and presents a number of options.

Table 25 Effect of Changes in OCIF Funding and Reallocating Decreases in Debt Costs

	Without Capturing Changes				With Capturing Changes			
	5 Years	10 Years	15 Years	20 Years	5 Years	10 Years	15 Years	20 Years
Infrastructure Deficit	307,000	307,000	307,000	307,000	307,000	307,000	307,000	307,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	0	0	0	0
Changes in Debt Costs	N/A	N/A	N/A	N/A	-62,000	-62,000	-62,000	-62,000
Resulting Infrastructure Deficit	307,000	307,000	307,000	307,000	245,000	245,000	245,000	245,000
Resulting Tax Increase Required:								
Total Over Time	19.5%	19.5%	19.5%	19.5%	15.6%	15.6%	15.6%	15.6%
Annually	3.9%	2.0%	1.3%	1.0%	3.1%	1.6%	1.0%	0.8%

Considering all of the above information, we recommend the 15-year option that includes capturing the changes. This involves full funding being achieved over 15 years by:

- when realized, reallocating the debt cost reductions of \$62,000 to the infrastructure deficit as outlined above.
- allocating the current gas tax and OCIF revenue as outlined in Table 23.

**Notes:**

- As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. By Provincial AMP rules, this periodic funding cannot be incorporated into an AMP unless there are firm commitments in place. We have included OCIF formula based funding, if applicable, since this funding is a multi-year commitment.
- We realize that raising tax revenues by the amounts recommended above for infrastructure purposes will be very difficult to do. However, considering a longer phase-in window may have even greater consequences in terms of infrastructure failure.

Although this option achieves full funding on an annual basis in 15 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Prioritizing future projects will require the current data to be replaced by condition based data. Although our recommendations include no further use of debt, the results of the condition based analysis may require otherwise.

## 4. Use of Debt

For reference purposes, Table 26 outlines the premium paid on a project if financed by debt. For example, a \$1M project financed at 3.0%<sup>3</sup> over 15 years would result in a 26% premium or \$260,000 of increased costs due to interest payments. For simplicity, the table does not take into account the time value of money or the effect of inflation on delayed projects.

Table 26 Total Interest Paid as a Percentage of Project Costs

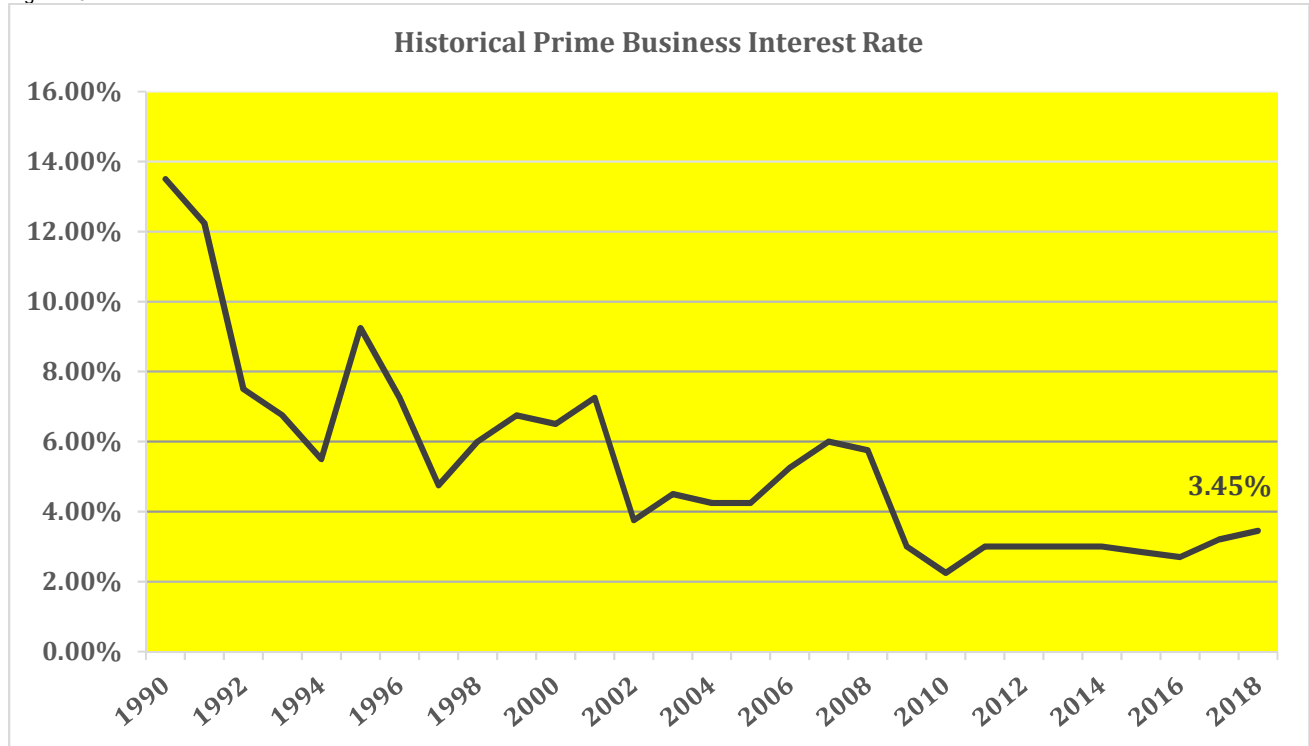
Interest Rate	Number of Years Financed					
	5	10	15	20	25	30
7.0%	22%	42%	65%	89%	115%	142%
6.5%	20%	39%	60%	82%	105%	130%
6.0%	19%	36%	54%	74%	96%	118%
5.5%	17%	33%	49%	67%	86%	106%
5.0%	15%	30%	45%	60%	77%	95%
4.5%	14%	26%	40%	54%	69%	84%
4.0%	12%	23%	35%	47%	60%	73%
3.5%	11%	20%	30%	41%	52%	63%
3.0%	9%	17%	26%	34%	44%	53%
2.5%	8%	14%	21%	28%	36%	43%
2.0%	6%	11%	17%	22%	28%	34%
1.5%	5%	8%	12%	16%	21%	25%
1.0%	3%	6%	8%	11%	14%	16%
0.5%	2%	3%	4%	5%	7%	8%
0.0%	0%	0%	0%	0%	0%	0%

<sup>3</sup> Current municipal Infrastructure Ontario rates for 15 year money is 2.8%.



It should be noted that current interest rates are near all-time lows. Sustainable funding models that include debt need to incorporate the risk of rising interest rates. The following graph shows where historical lending rates have been:

Figure 46 Historical Prime Business Interest Rates



As illustrated in Table 26 , a change in 15 year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

Table 27 and Table 28 outline how Papineau-Cameron has historically used debt for investing in the asset categories as listed. There is currently \$178,000 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of \$62,000, well within its provincially prescribed maximum of \$378,000.

Table 27 Overview of Use of Debt

Asset class	Debt at December 31 <sup>st</sup> , 2018	Use of Debt in Last Five Years				
		2014	2015	2016	2017	2018
Road Network	125,000	0	0	213,000	0	0
Bridges & Culverts	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Vehicles	53,000	0	100,000	0	0	0
Total Tax Funded	178,000	0	100,000	213,000	0	0

Table 28 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2019	2020	2021	2022	2023	2024	2029
Road Network	46,000	46,000	38,000	0	0	0	0
Bridges & Culverts	0	0	0	0	0	0	0
Facilities	0	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0	0
Vehicles	16,000	16,000	16,000	8,000	0	0	0
Total Tax Funded	62,000	62,000	54,000	8,000	0	0	0

The revenue options outlined in this plan allow Papineau-Cameron to fully fund its long-term infrastructure requirements without further use of debt. However, project prioritization based on replacing age-based data with observed data for several tax funded and rate funded classes may require otherwise.

## 5. Use of Reserves

### 5.1 Available Reserves

Reserves play a critical role in long-term financial planning. The benefits of having reserves available for infrastructure planning include: the ability to stabilize tax rates when dealing with variable and sometimes uncontrollable factors; financing one-time or short-term investments; accumulating the funding for significant future infrastructure investments; managing the use of debt; and, normalizing infrastructure funding requirements. By infrastructure class, Table 29 outlines the details of the reserves currently available to Papineau-Cameron.

Table 29 Summary of Reserves Available

Asset class	Balance at December 31 <sup>st</sup> , 2018
Road Network	83,000
Bridges & Culverts	134,000
Facilities	34,000
Machinery & Equipment	116,000
Vehicles	116,000
Total Tax Funded	483,000

There is considerable debate in the municipal sector as to the appropriate level of reserves that a township should have on hand. There is no clear guideline that has gained wide acceptance. Factors that municipalities should take into account when determining their capital reserve requirements include: breadth of services provided, age and condition of infrastructure, use and level of debt, economic conditions and outlook, and internal reserve and debt policies.

The reserves in Table 29 are available for use by applicable asset classes during the phase-in period to full funding. This, coupled with Papineau-Cameron's judicious use of debt in the past, allows the scenarios to assume that, if required, available reserves and debt capacity can be used for high priority and emergency infrastructure investments in the short to medium-term.

### 5.2 Recommendation

As Papineau-Cameron updates its AMP, we recommend that future planning should include determining what its long-term reserve balance requirements are and a plan to achieve such balances.

## X. 2019 Infrastructure Report Card

The following infrastructure report card illustrates the township's performance on the two key factors: Asset Health and Financial Capacity. Appendix 1 provides the full grading scale and conversion chart, as well as detailed descriptions, for each grading level.

Table 30 2016 Infrastructure Report Card

Asset class	Asset Health Grade	Funding Percentage	Financial Capacity Grade	Average Asset Class Grade	Comments
Roads	B	76%	C	C	Based on 2018 replacement cost, and primarily condition data, 80% of assets, with a valuation of \$6.8 million, are in good to very good condition; 6% are in poor to very poor condition.
Bridges & Culverts	B	32%	F	D	
Buildings & Facilities	B	32%	F	D	
Machinery & Equipment	C	33%	F	D	
Vehicles	C	32%	F	D	
Average Asset Health Grade			B		The township is underfunding its assets. Tax-funded categories are funded at 50%.
Average Financial Capacity Grade			F		
Overall Grade for the Township			D		

# XI. Appendix: Grading and Conversion Scales

Table 31 Asset Health Scale

Letter Grade	Rating	Description
A	Excellent	Asset is new or recently rehabilitated
B	Good	Asset is no longer new, but is fulfilling its function. Preventative maintenance is beneficial at this stage.
C	Fair	Deterioration is evident but asset continues to full its function. Preventative maintenance is beneficial at this stage.
D	Poor	Significant deterioration is evident and service is at risk.
F	Very Poor	Asset is beyond expected life and has deteriorated to the point that it may no longer be fit to fulfill its function.

Table 32 Financial Capacity Scale

Letter Grade	Rating	Funding percent	Timing Requirements	Description
A	Excellent	90-100 percent	<input checked="" type="checkbox"/> Short Term <input checked="" type="checkbox"/> Medium Term <input checked="" type="checkbox"/> Long Term	The township is fully prepared for its short-, medium- and long-term replacement needs based on existing infrastructure portfolio.
B	Good	70-89 percent	<input checked="" type="checkbox"/> Short Term <input checked="" type="checkbox"/> Medium Term <input checked="" type="checkbox"/> Long Term	The township is well prepared to fund its short-term and medium-term replacement needs but requires additional funding strategies in the long-term to begin to increase its reserves.
C	Fair	60-69 percent	<input checked="" type="checkbox"/> Short Term <input checked="" type="checkbox"/> Medium Term <input checked="" type="checkbox"/> Long Term	The township is underprepared to fund its medium- to long-term infrastructure needs. The replacement of assets in the medium-term will likely be deferred to future years.
D	Poor	40-59 percent	<input checked="" type="checkbox"/> Short Term <input checked="" type="checkbox"/> Medium Term <input checked="" type="checkbox"/> Long Term	The township is not well prepared to fund its replacement needs in the short-, medium- or long-term. Asset replacements will be deferred and levels of service may be reduced.
F	Very Poor	0-39 percent	<input checked="" type="checkbox"/> Short Term <input checked="" type="checkbox"/> Medium Term <input checked="" type="checkbox"/> Long Term	The township is significantly underfunding its short-term, medium-term, and long-term infrastructure requirements based on existing funds allocation. Asset replacements will be deferred indefinitely. The township may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.