AMP2016

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The 2016 Asset Management Plan for the

Township of Conmee

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Executive Summary

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 Conmee's infrastructure portfolio comprises six distinct infrastructure categories: road network, bridges & culverts, buildings, land improvements, vehicles, and machinery & equipment. The asset classes analyzed in this asset management plan for the township had a total 2016 valuation of $9.8 million, of which roads comprised 59%, followed by buildings at 16%.

The majority of the townships investments into its assets occurred in the early 1930s when all road network assets were installed. Investments then began again in the late 1970s when investments topped $700,000. Investments have fluctuated over the decades and since 2010, nearly $1.1 million has been invested into various asset categories.

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.

Based on 2016 replacement cost, and a combination of assessed and age-based data, nearly 40% of assets, with a valuation of $3.9 million, are in good to very good condition; an additional 40% are in poor to very poor condition. While the township provided condition data for a majority of its road surfaces, bridges & culverts, and buildings, other assets lacked this information. Over 30% of the assets analyzed in this AMP have over 10 years of useful life remaining. However, 23%, with a valuation of $2.2 million, remain in operation beyond their established useful life while another 32% will reach the end of their useful life within the next five years.

In order for an AMP to be effectively put into action, 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 townships asset categories is $437,000. Annual revenue currently allocated to these assets for capital purposes is $72,000 leaving an annual deficit of $365,000. To put it another way, these infrastructure categories are currently funded at 16% of their long-term requirements. In 2016, the township has annual tax revenues of $732,000. Our strategy includes full funding being achieved over 20 years by:

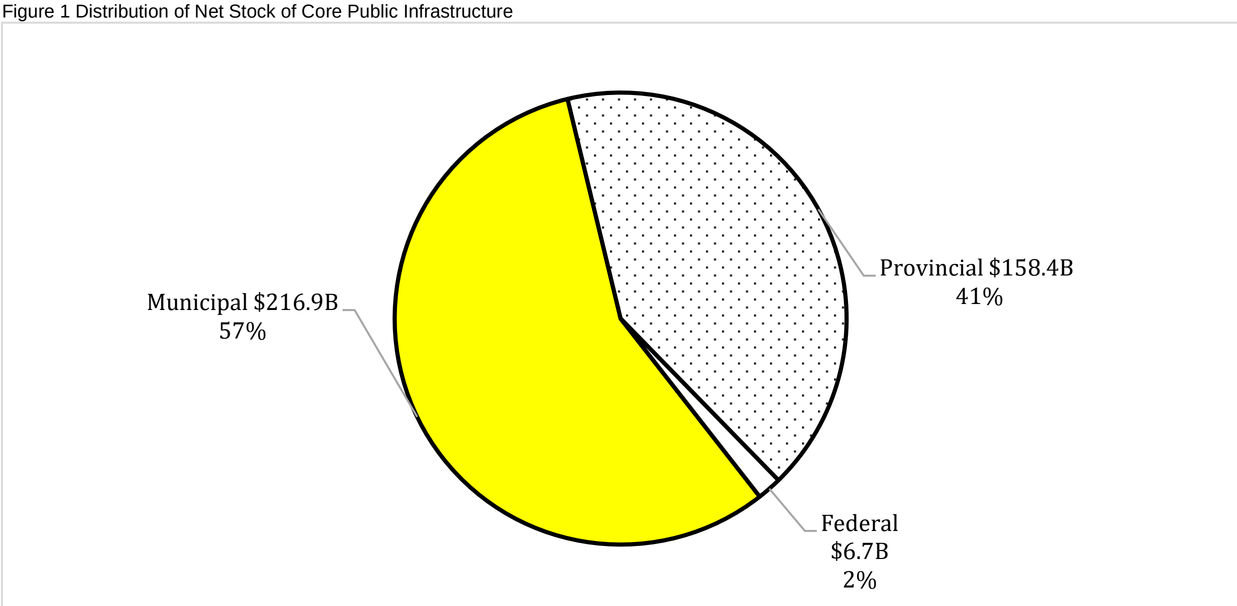
1. increasing tax revenues by 2.9% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
2. allocating the current gas tax and OCIF revenue as well as scheduled increases to the infrastructure deficit as they occur.
3. increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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.

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.[1]

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 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.

[1] 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

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.
Life Cycle Analysis	Identify Maintenance and Renewal Strategies & Life Cycle 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 the IAM, asset management must be:[2]

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 life cycles, 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.

[2] "Key Principles", The Institute of Asset Management, *www.iam.org*

III. AMP Objectives and Content

This AMP is one component of the Township of Conmee'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, useful life etc., summarizes the physical health of the capital assets, assess 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 2013, this AMP is developed in accordance with provincial standards and guidelines, and new requirements under the Federal Gas Tax Fund stipulating the inclusion of all eligible asset classes. Previously, only core infrastructure categories were analyzed. The following asset classes are analysed in this document: road network; bridges & culverts; buildings; land improvements; vehicles; and machinery & equipment.

This AMP includes a detailed discussion of the state of local infrastructure and assets for each class; outlines industry standards levels of service and key performance indicators (KPIs); outlines asset management renewal strategy for major infrastructure; and provides financial strategy to mitigate funding shortfalls.

IV. Data and Methodology

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

1. Condition Data

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; therefore, while deficiencies may be present at the individual level, imprecisions are minimized at the asset-class level as the data is aggregated.

As available, actual field condition data was used to make recommendations more precise. 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

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, aggregated, and an average for the previous three years is calculated, 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 enumerated 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 facilitate communications, we've developed an Infrastructure Report Card that summarizes our findings in accessible language that municipalities can use for internal and external distribution. The report card is developed using two key, equally weighted factors:

Table 3 Infrastructure Report Card Description

Financial Capacity	A township's financial capacity is determined by how well it's meeting the average annual investment requirements (0-100%) for each infrastructure class.
Asset Health	Using either field inspection data as available or age-based data, the asset health provides a grade for each infrastructure class based on the portion of assets in poor to excellent condition (0-100%). 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

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

1. As available, we use field condition assessment data to determine both the state of infrastructure and develop the financial strategies. However, in the absence of observed data, we rely on the age of assets to estimate their physical condition.

2. 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.

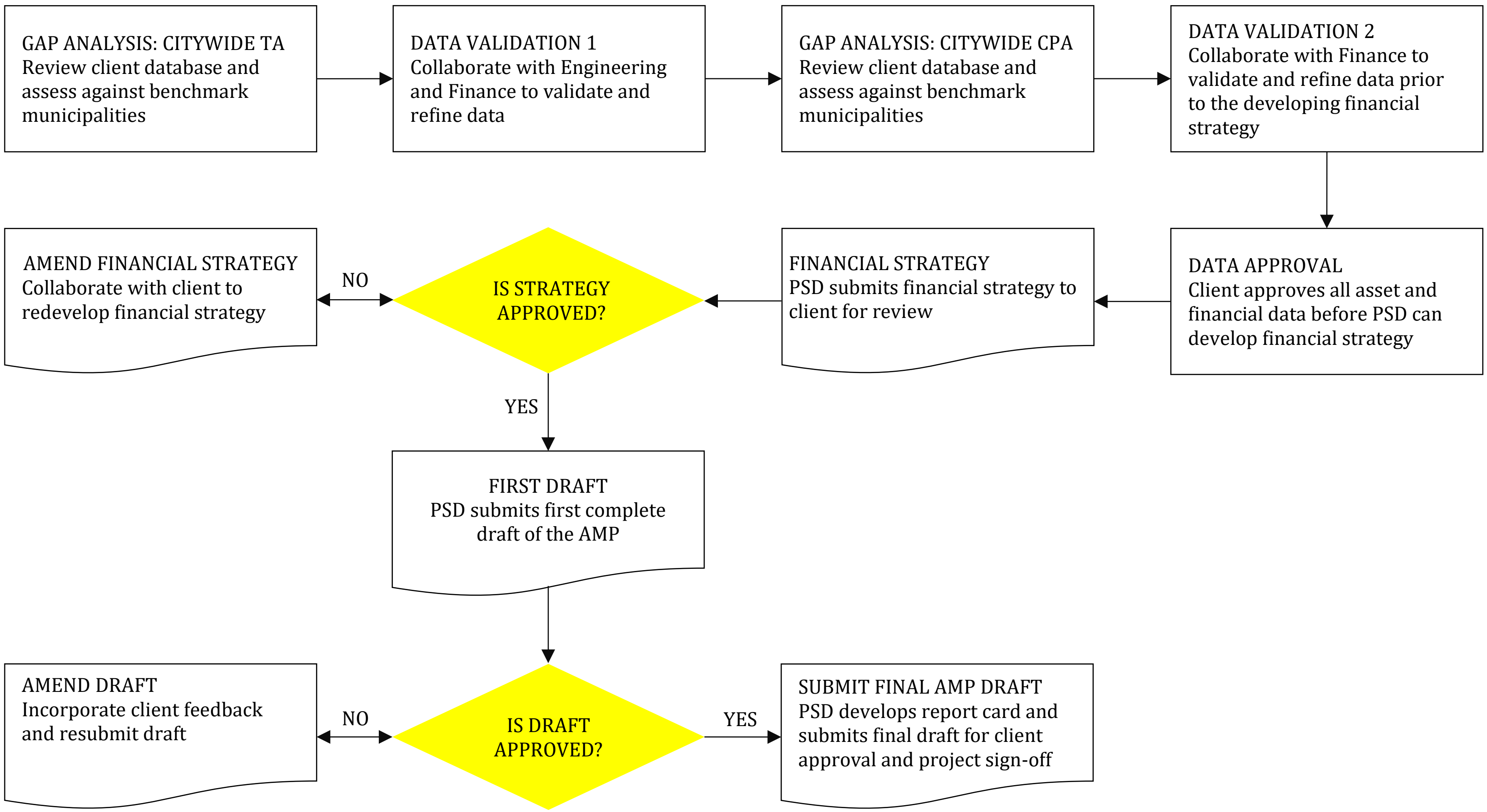
3. Our calculations and recommendations will reflect the best available data at the time this AMP was developed.

4. 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. The township 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.

$$Asset\ Class\ Data\ Confidence\ Rating = \sum Score\ in\ each\ factor \times \frac{1}{5}$$

V. Summary Statistics

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 2016 valuation of $9.8 million, of which roads comprised 59%, followed by buildings at 16%. The ownership per household (Figure 4) totaled $28,582 based on 344 households in the service area for all assets. Note that the assets analyzed within this AMP include the townships active inventory as it was at the end of 2015.

Figure 3 Asset Valuation by Class

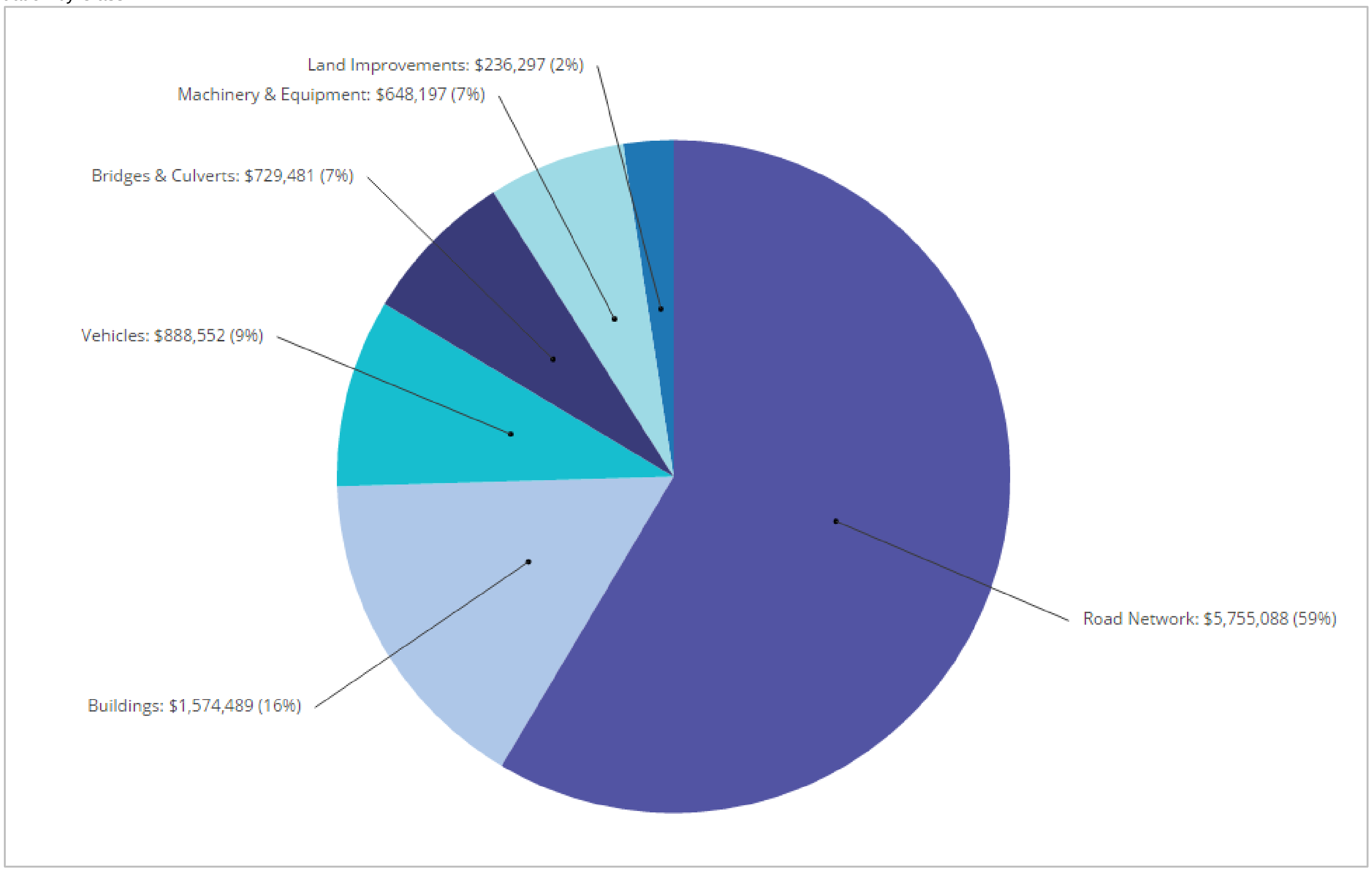
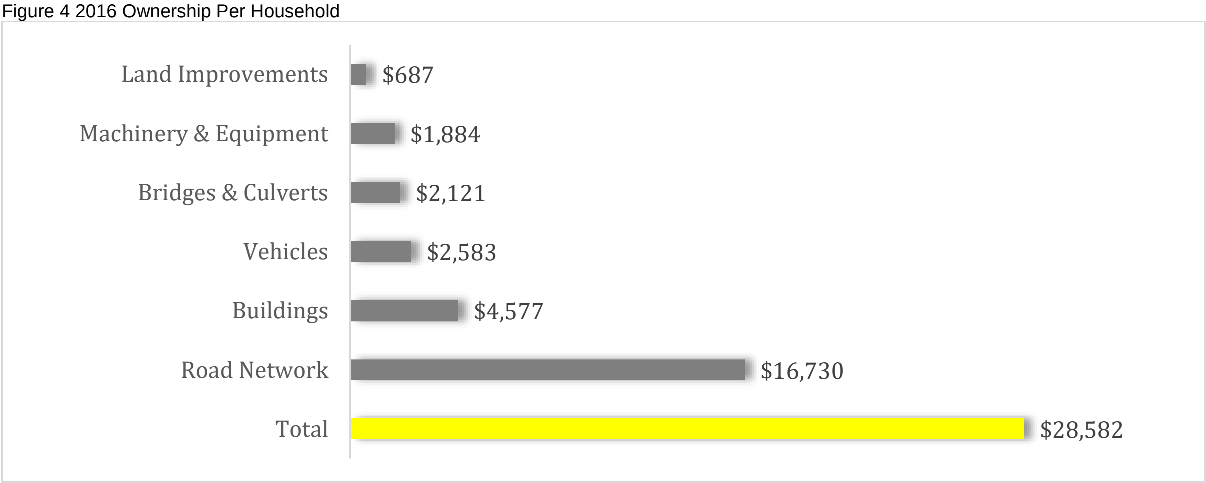


Figure 4 2016 Ownership Per Household



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, 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 each of the six asset classes in this AMP. Based 2016 replacement cost, 64% of the townships assets have condition assessment data.

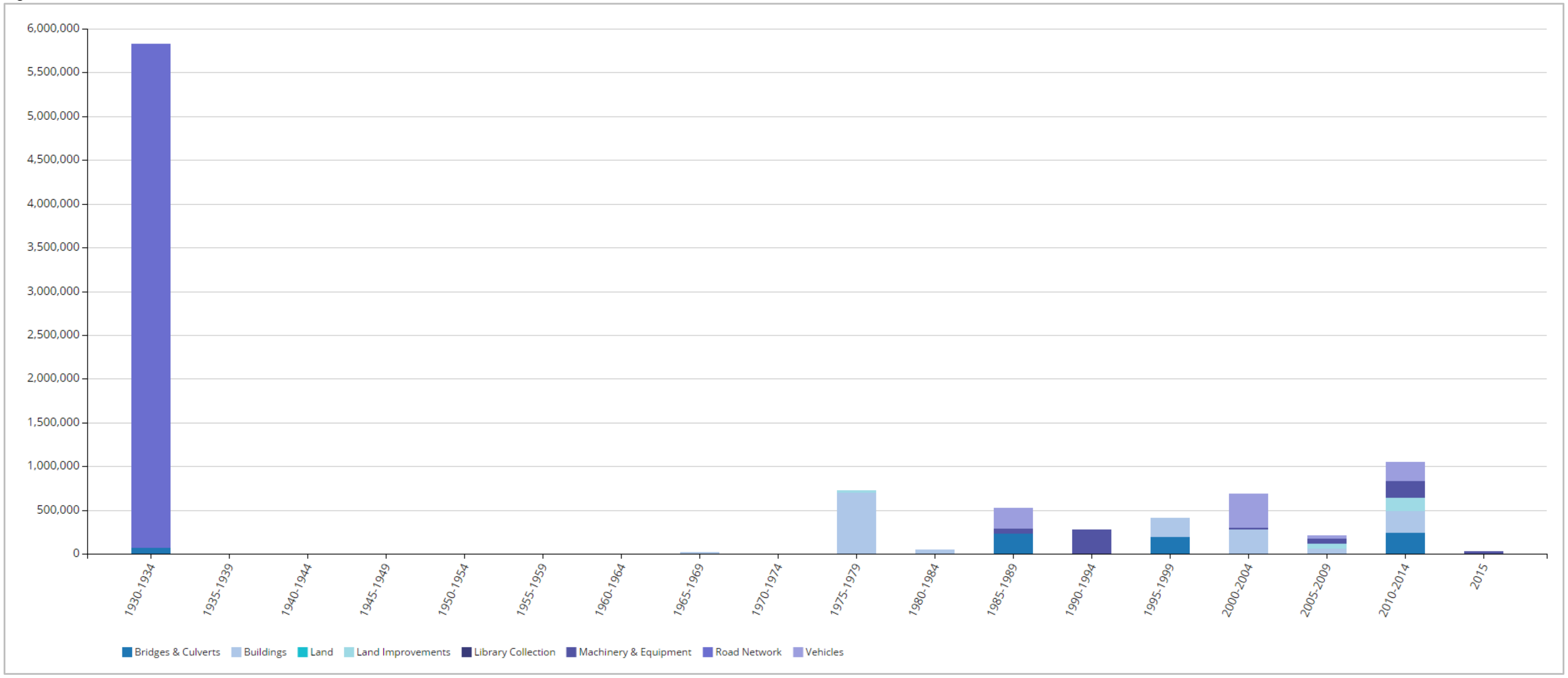
Table 4 Source of Condition Data by Asset Class

Asset class	Component	Percentage of Assets Assessed by 2016 Replacement Cost	Source of Condition Data
Bridges & Culverts	Enders Road Bridge	100%	2013 Assessment
	Pokki Road Bridge	100%	2013 Assessment
	Maxwell Bridge	0%	N/A
	Mokomon Road 4 Bridge	100%	2013 Assessment
	Mokomon Road 5 Bridge	100%	2013 Assessment
	Ilkka Drive Culvert	100%	2013 Assessment
Road Network	Subsurfaces (Includes Culverts)	0%	N/A
	Surfaces	84%	2013 Hatch Mott MacDonald
Buildings	Comm. Centre/Office	25%	2013 Assessment
	Municipal Garage	100%	2013 Assessment
	Fire Hall	67%	2013 Assessment
	Landfill Building	100%	2013 Assessment
	Machine Shed	0%	N/A
	House - 103 Hume Road	0%	N/A
	Rink Shack	0%	N/A
Vehicles	All	0%	N/A
Machinery & Equipment	All	0%	N/A
Land Improvements	All	0%	N/A
	Total	64%	

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 infrastucture needs: installation year profile, and useful life remaining. The installation year profile in Figure 5 illustrates the historical invesments in infrastructure across the asset classes analyzed in this AMP since 1930 using 2016 replacement costs. Often, investment in critical infrastructure parallels population growth or other significant shifts in demographics.

Figure 5 Historical Investment in Infrastructure – All Asset Classes

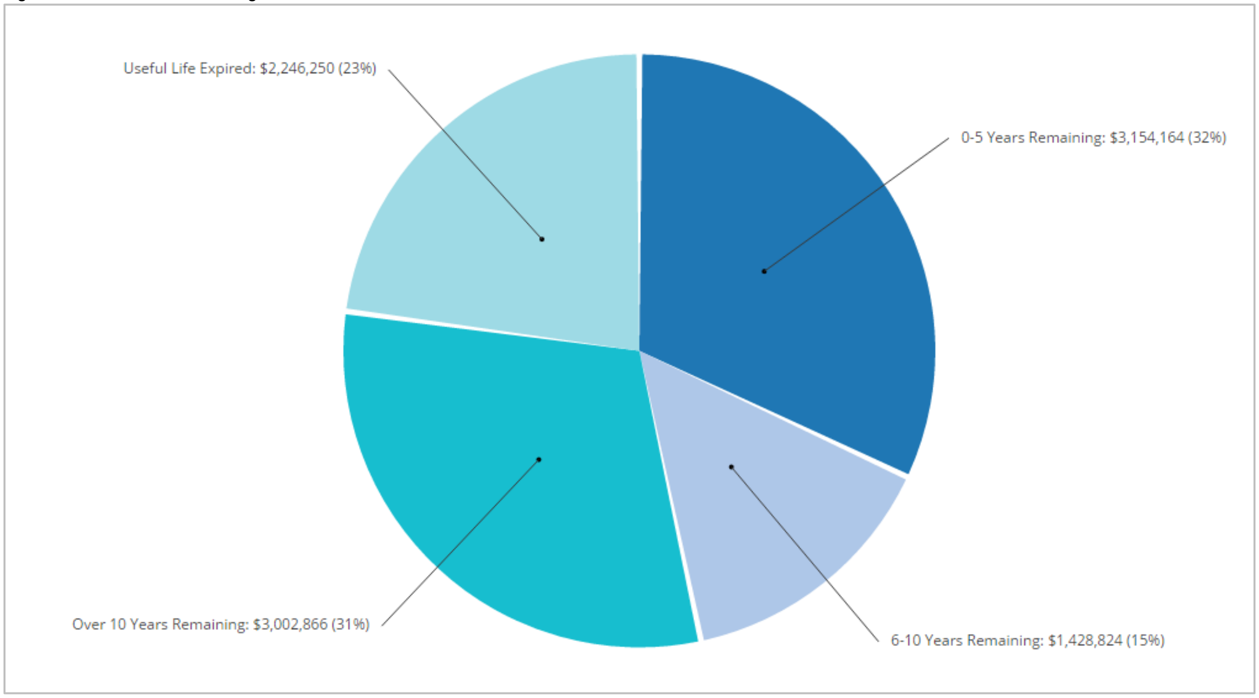


The majority of the townships investments into its assets occurred in the early 1930s when all road network assets were installed. Investments then began again in the late 1970s when investments topped $700,000. Investments have fluctuated over the decades and since 2010, nearly $1.1 million has been invested into various asset categories.

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 approxmiation and help guide replacement needs and facilitate strategic budgeting. Figure 6 shows the distibution of assets based on the percentage of useful life already consumed.

Figure 6 Useful Life Remaining as of 2015 – All Asset Classes

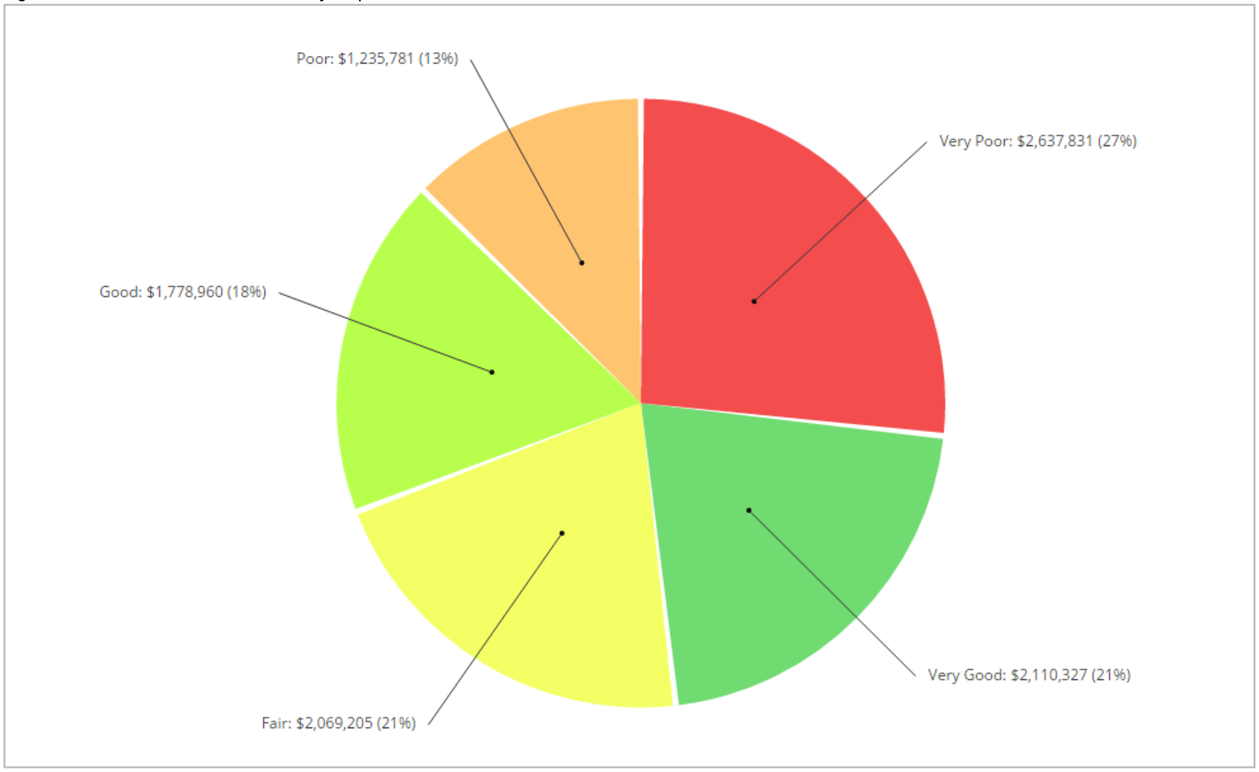


Over 30% of the assets analyzed in this AMP have over 10 years of useful life remaining. However, 23%, with a valuation of $2.2 million, remain in operation beyond their established useful life while another 32% will reach the end of their useful life within the next five years.

5. Overall Condition – All Asset Classes

Based on 2016 replacement cost, and a combination of assessed and age-based data, nearly 40% of assets, with a valuation of $3.9 million, are in good to very good condition; an additional 40% are in poor to very poor condition.

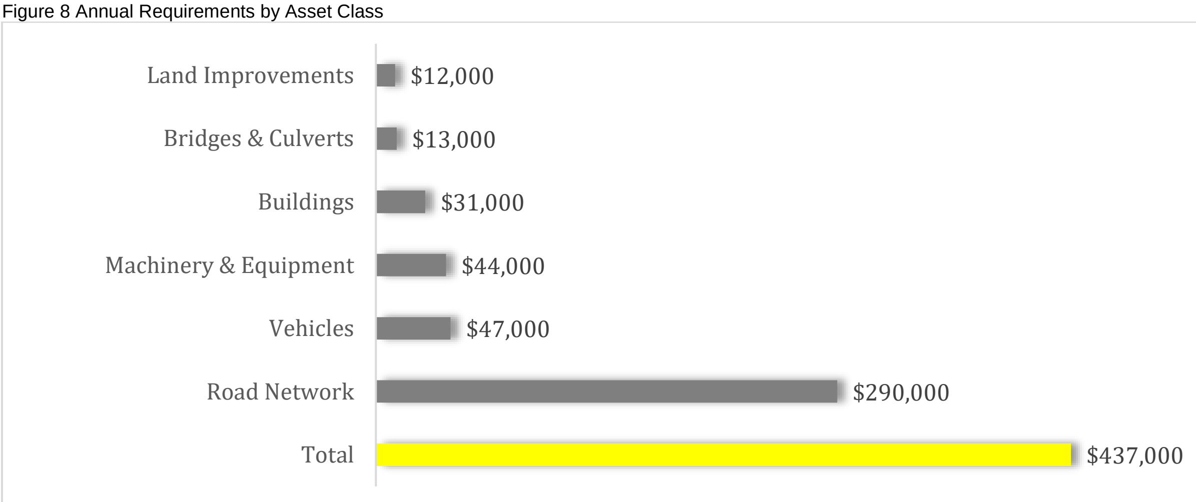
Figure 7 Asset Condition Distribution by Replacement Cost as of 2015 – All Asset Classes



6. Financial Profile

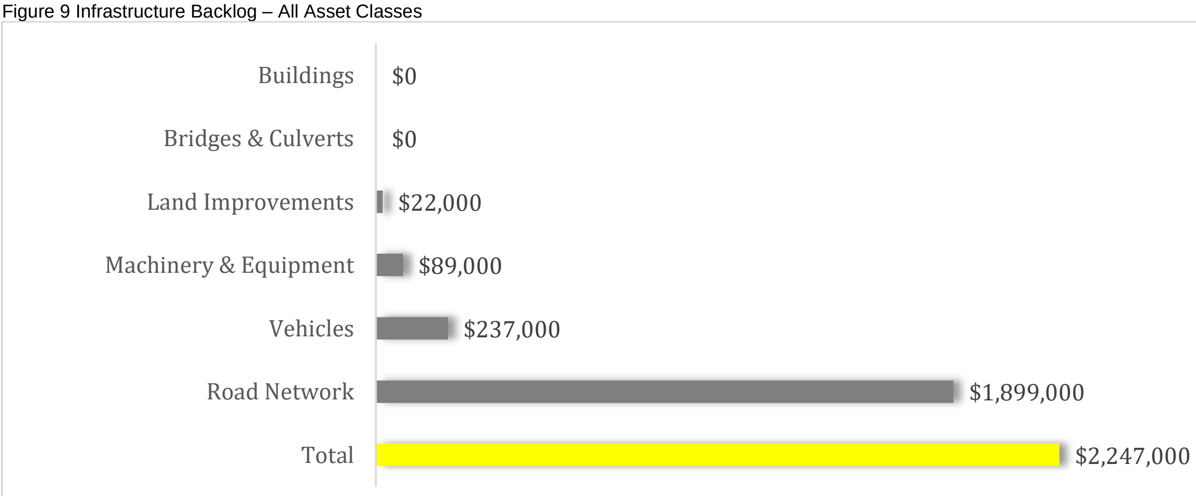
This section details key financial indicators related to the township's asset classes as analyzed in this asset management plan.

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 need as they arise, prevent infrastructure backlogs and achieve long-term sustainability. In total, the township must allocate $437,000 annually for the assets covered in this AMP.

Figure 9 Infrastructure Backlog – All Asset Classes

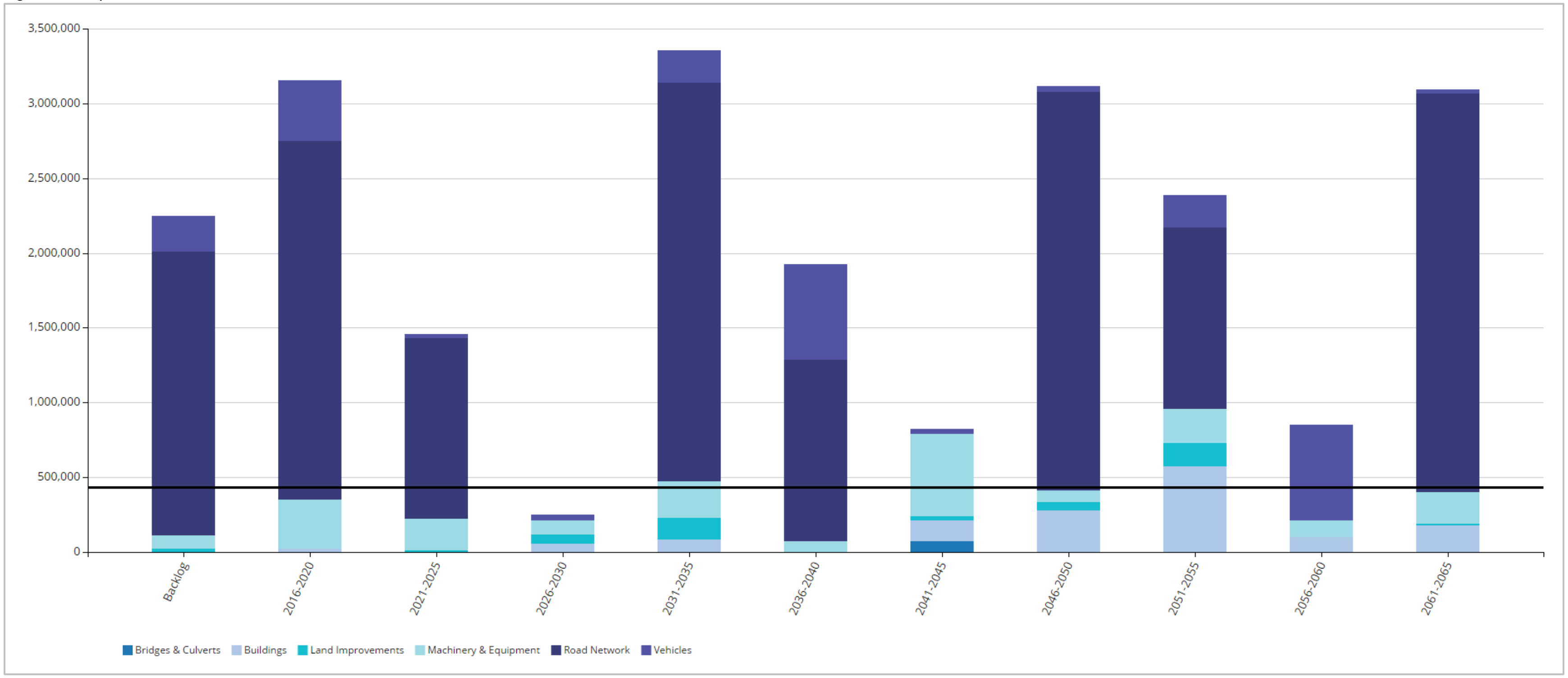


The township has a combined infrastructure backlog of $2.3 million, with the road network comprising 85%. The backlog represents the investment needed today to meet previously deferred replacement needs. In the absence of assessed data, the backlog represents the value of assets still in operation beyond 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 as analyzed in this AMP. 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 10 Replacement Profile – All Asset Classes



Based on a combination of assessed and age data, the township has a combined backlog of $2.3 million, of which the road network comprises $1.9 million. Aggregate replacement needs will total nearly $3.2 million over the next five years. An additional $1.5 million will be required between 2021 and 2025. The township's aggregate annual requirements (indicated by the black line) total $437,000. At this funding level, the township is 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 16% of the annual requirements for all asset categories. See the 'Financial Strategy' chapter for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the township to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

VI. State of Local Infrastructure

In this section, we detail key indicators for each class discussed in this asset management plan. 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

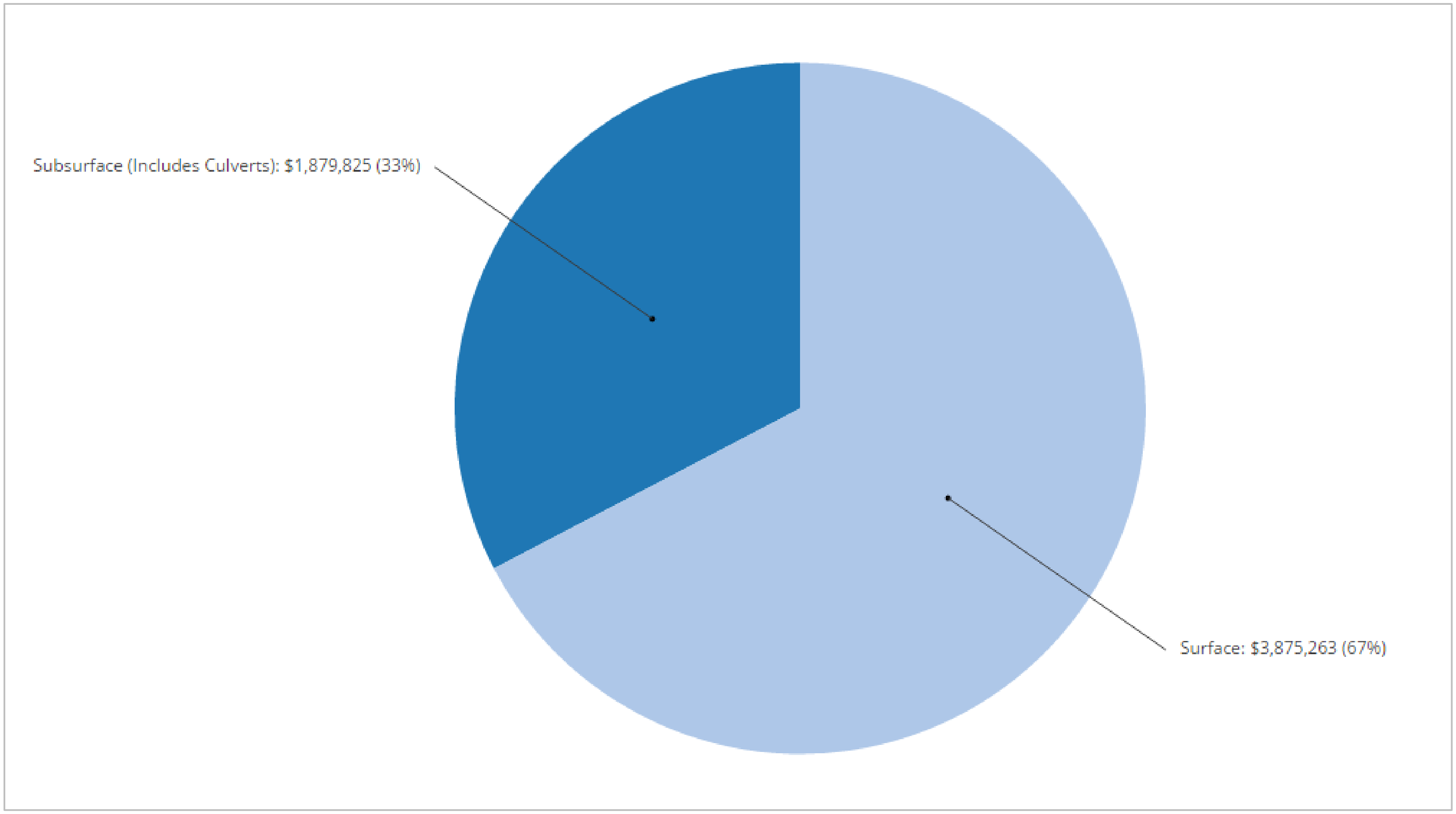
Table 5 illustrates key asset attributes for the township's road network, including quantities of various assets, their useful life, their replacement cost, and the valuation method by which the replacement cost were derived. In total, the township's road network assets are valued at $5.8 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township and obtained from the township's accounting data as maintained in the CityWide® Tangible Asset module.

The township's entire road network is made up of gravel roads. Traditionally, gravel roads are not included within an AMP since gravel roads are perpetually maintained and not replaced. For Conmee, the gravel roads are included because the township is undertaking a program of gravel road rehabilitation that will include graveling, calcium, changing culverts, ditching, excavator work, crowning etc. Therefore, the costs for the gravel roads are included so that the township can see these costs reflected in the financial strategy. The cost per km for road surfaces was determined based on a quote obtained for the rehabilitation of one road within the township.

Table 5 Key Asset Attributes – Road Network

Asset Type	Asset Component	Quantity	Useful Life (Years)	Valuation Method	2016 Overall Replacement Cost
Road Network	Subsurfaces (Includes Culverts)	49	60	NRBCPI Quarterly (Toronto)	$1,879,825
	Surfaces	72.63km	15	$52,631.58/km	$3,875,263
				Total	**$5,755,088**

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 1950. 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 short-, medium- and long-term replacement needs.

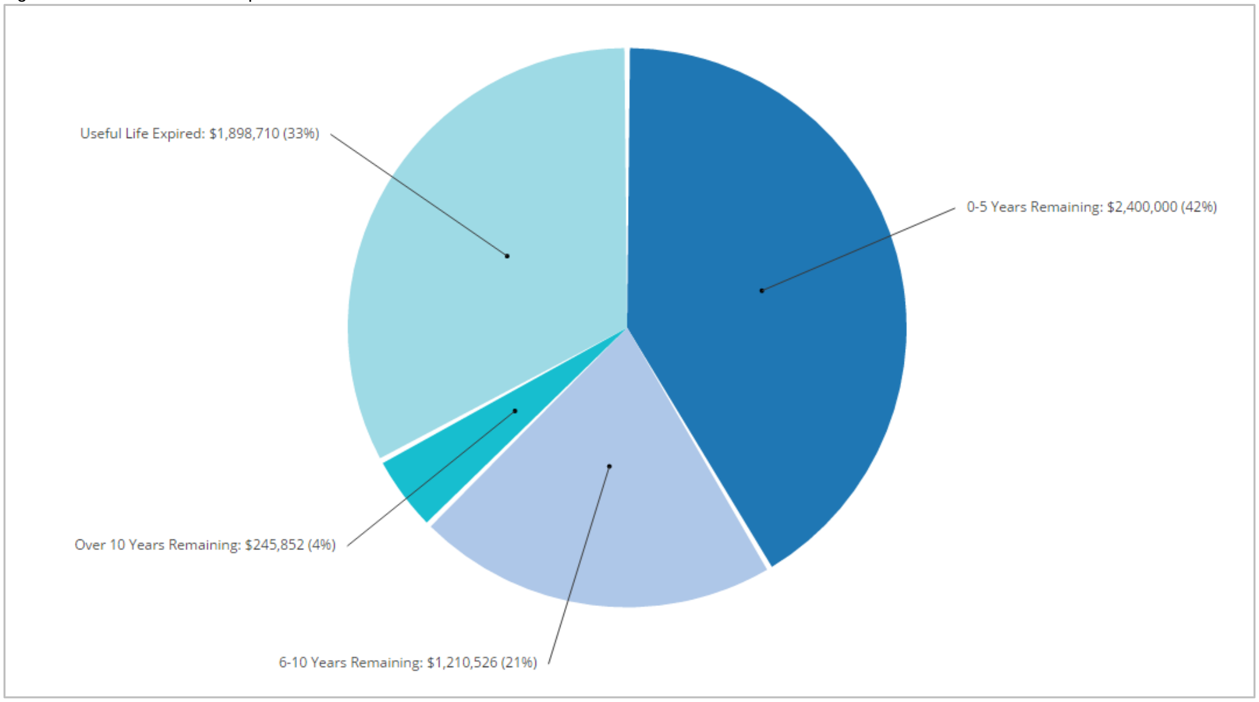
Figure 12 Historical Investment – Road Network

All of the townships road network assets were installed in the early 1930s.

1.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 13 illustrates the useful life consumption levels as of 2015 for the township's road network.

Figure 13 Useful Life Consumption - Road Network

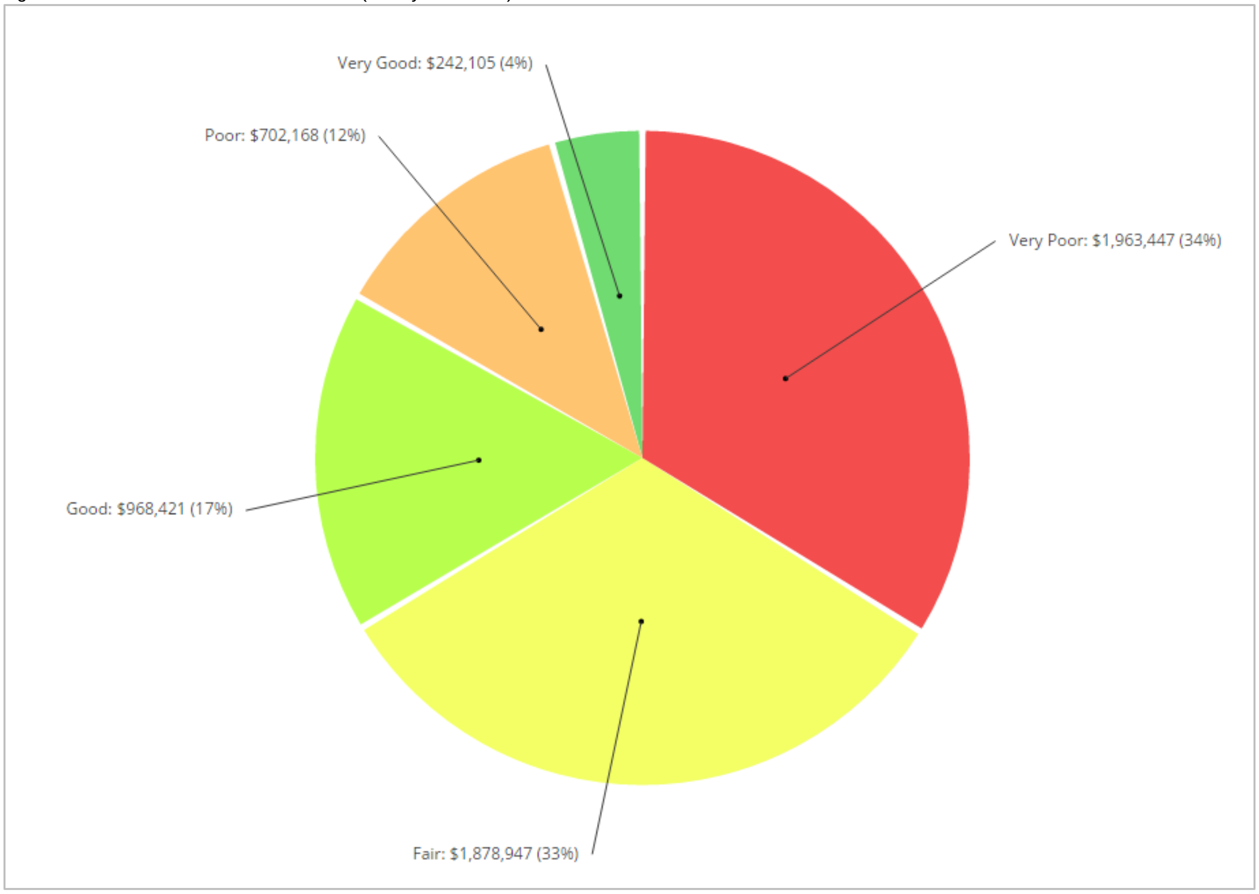


While 4% of the township's road network has at least 10 years of useful life remaining, 33%, with a valuation of $1.9 million, remain in operation beyond their useful life. An additional 42% will reach the end of their useful life in five years.

1.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's road network as of 2015. 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 84% of road network assets obtained through a 2013 Hatch Mott MacDonald report.

Figure 14 Asset Condition – Road Network (Mainly Assessed)

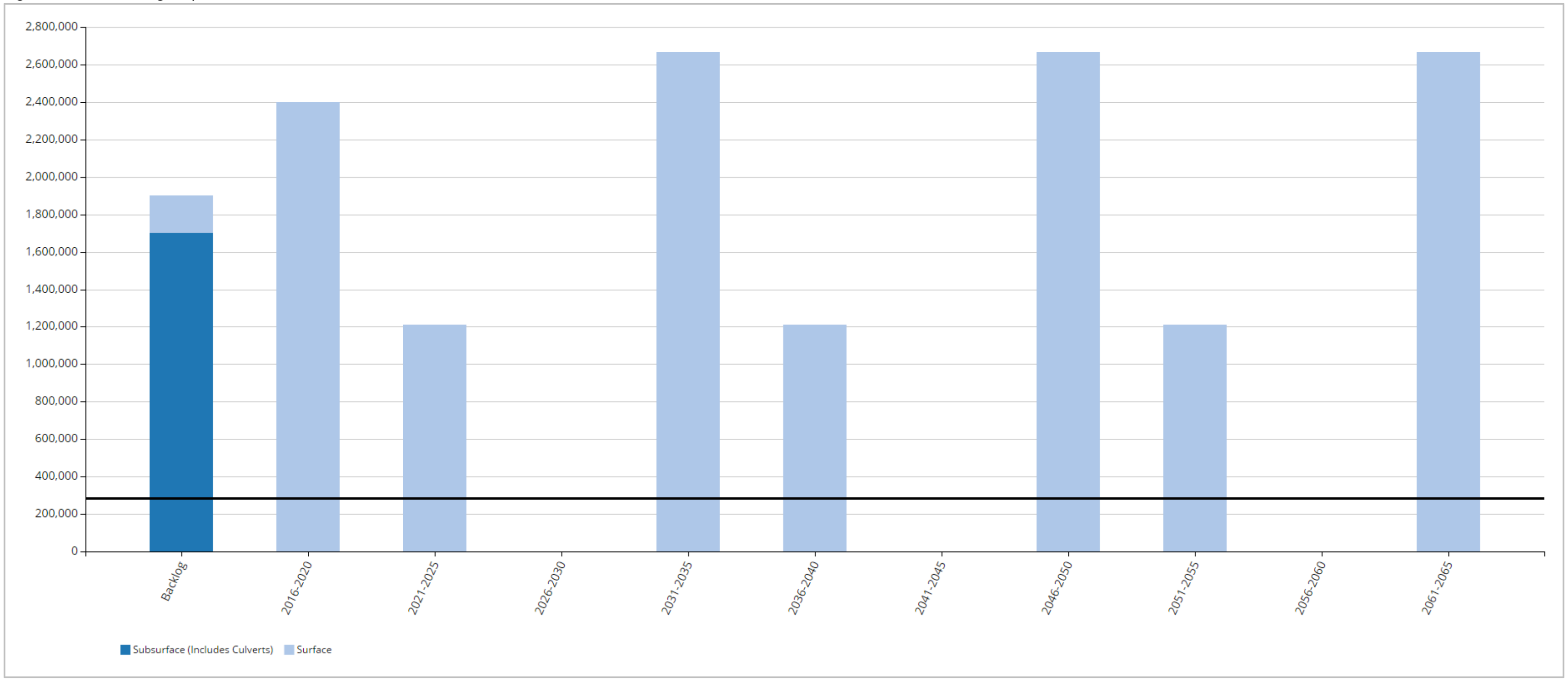


Based on primarily assessed condition data, over 20% of assets, with a valuation of $1.2 million are in good to very good condition; 46% are in poor to very poor condition.

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



In addition to a $1.9 million backlog, replacement needs are forecasted to be $2.4 million in the next five years with an additional $1.2 million in the period between 2021-2025. The township's annual requirements (indicated by the black line) for its road network total $290,000. At this funding level, the township is 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 $47,000 leaving an annual deficit of $243,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the township to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs

1.6 Gravel Roads: Maintenance Requirements

Paved roads are usually designed and constructed with careful consideration given to the correct shape of the cross section. Once paving is complete the roadway will keep its general shape for the duration of its useful life. Gravel roads are quite different. Many have poor base construction, will be prone to wheel track rutting in wet weather, and traffic will continually displace gravel from the surface to the shoulder area, even the ditch, during wet and dry weather. Maintaining the shape of the road surface and shoulder is essential to ensure proper performance and to provide a sufficient level of service for the public.

Therefore, the management of gravel roads is not through major rehabilitation and replacement, but rather through good perpetual maintenance and some minor rehabilitation which depend on a few basic principles: proper techniques and cycles for grading; the use and upkeep of good surface gravel; and, dust abatement and stabilization.

Maintaining a Good Cross Section
In order to maintain a gravel road properly, a good cross section is required consisting of a crowned driving surface, a shoulder with correct slope, and a ditch. The crown of the road is essential for good drainage. A road with no crown, or insufficient crown, will cause water to collect on the surface during a rainfall, will soften the crust, and ultimately lead to rutting which will become severe if the subgrade also softens. Even if the subgrade remains firm, traffic will cause depressions in the road where water collects and the road will develop potholes. It is a generally accepted industry standard that 1.25cm per 12cm (one foot), approximately 4%, on the cross slope is ideal for road crown.

The road shoulder serves some key functions. It supports the edge of the travelled portion of the roadway, provides a safe area for drivers to regain control of vehicles if they are forced to leave the road, and finally, carries water further away from the road surface. The shoulder should ideally meet the edge of the roadway at the same elevation and then slope away gradually towards the ditch.

The ditch is the most important and common drainage structure for gravel roads. Every effort should be made to maintain a minimal ditch. The ditch should be kept free of obstructions such as eroded soil, vegetation or debris.

Grading Operations
Routine grading is the activity that ensures gravel roadways maintain a good cross section or proper profile. The three key components to good grading are: operating speed, blade angle, and blade pitch.

Excessive operating speed can cause many problems such as inconsistent profile, and blade movement or bouncing that can cut depressions and leave ridges in the road surface. It is generally accepted that grader speed should not exceed 8km per hour. The angle of the blade is also critical for good maintenance and industry standards suggest the optimal angle is between 30 and 45 degrees. Finally, the correct pitch or tilt of the blade is very important. If the blade is pitched back too far, the material will tend to build up in front of the blade and will not fall forward, which mixes the materials, and will move along and discharge at the end of the blade.

Good Surface Gravel

Once the correct shape is established on a roadway and drainage matters are taken care of, attention must be given to the placement of good gravel. Good surface gravel requires a percentage of stone which gives strength to support loads, particularly in wet weather. It also requires a percentage of sand size particles to fill the voids between the stones which provide stability. And finally, a percentage of plastic fines are needed to bind the material together which allows a gravel road to form a crust and shed water. Typical municipal maintenance routines will include activities to ensure a good gravel surface through both spot repairs (often annually) and also re-graveling of roadways (approximately every five years).

Dust Abatement and stabilization

A typical maintenance activity for gravel roads also includes dust abatement and stabilization. All gravel roads will give off dust at some point, although the amount of dust can vary greatly from region to region. The most common treatment to reduce dust is the application of Calcium Chloride, in flake or liquid form, or Magnesium Chloride, generally just in liquid form. Of course, there are other products on the market as well. Calcium and Magnesium Chloride can be very effective if used properly. They are hygroscopic products which draw moisture from the air and keep the road surface constantly damp. In addition to alleviating dust issues, the continual dampness also serves to maintain the loss of fine materials within the gravel surface, which in turn helps maintain road binding and stabilization. A good dust abatement program can actually help waterproof and bind the road, in doing so can reduce gravel loss, and therefore, reduce the frequency of grading.

The Cost of Maintaining Gravel Roads

We conducted an industry review to determine the standard cost for maintaining gravel roads. However, it became apparent that no industry standard exists for either the cost of maintenance or for the frequency at which the maintenance activities should be completed. Presented below, as a guideline only, are two studies on the maintenance costs for gravel roads: The Minnesota Study[3] (2005) and the South Dakota Study[4] (2004).

Minnesota Study (2005)

The first study is from the Minnesota Department of Transportation (MnDOT) Local Road Research Board (LRRB), where the researchers looked at historical and estimated cost data from multiple counties in Minnesota.

The study team found that the typical maintenance schedule consisted of routine grading and re-graveling with two inches of new gravel every five years. They found that a typical road needed to be graded 21 times a year or three times a month from April – October, and the upper bound for re-graveling was five years for any road over 100 ADT; lower volume roads could possibly go longer. The calculated costs including materials, labour, and hauling totaled $1,400 per year or $67 per visit for the grading activity and $13,800 for the re-gravel activity every five years. The re-gravel included an estimate gravel cost of $7.00 per cubic yard and a 2.5” thick lift of gravel (to be compacted down to 2”). Therefore, they developed an average estimated annual maintenance cost for gravel roads at $4,160 per mile. This converts to $2,600 per km of roadway and if adjusted for inflation into 2012 dollars, using the Non-Residential Building Construction Price Index (NRBCPI), it would be $3,500.

[3] *Jahren, Charles T. et. al. “Economics of Upgrading an Aggregate Road,” Minnesota Department of Transportation, St. Paul, MN, January 2005.*

[4] *Zimmerman, K.A. and A.S. Wolters. “Local Road Surfacing Criteria,” South Dakota Department of Transportation, Pierre, SD, June 2004.*

South Dakota study (2004)
This second study was conducted by South Dakota's Department of Transportation (SDDOT). The default maintenance program for gravel roads from SDDOT's report includes grading 50 times per year, re-graveling once every six years, and spot graveling once per year. The unit cost for grading was very similar to Minnesota at $65 per mile, re-gravel at $7,036 per mile and spot graveling or pothole repair at $2,420 per mile, totaling to an average annual maintenance cost of $6,843 per mile. Due to the frequency of the grading activity and the addition of the spot gravel maintenance, the SDDOT number is higher than Minnesota reported even though the re-gravel activity is reported at about half of the price in Minnesota.

This converts to $4,277 per km of roadway and if adjusted for inflation into 2012 dollars, using the NRBCPI, it would be $5,758.

Ontario Municipal Benchmarking Initiative (OMBI)
One of the many metrics tracked through the Ontario Municipal Benchmarking Initiative is the "Operating costs for Unpaved (Loose top) Roads per lane Km." As referenced from the OMBI data dictionary, this includes maintenance activities such as dust suppression, loose top grading, loose top gravelling, spot base repair and wash out repair.

Of the six Ontario municipalities that included 2012 costs for this category, there is a wide variation in the reporting. The highest cost per lane km was $14,900 while the lowest cost was $397. The average cost was $6,300 per lane km. Assuming two lanes per gravel road to match the studies above, the Ontario OMBI average becomes $12,600 per km of roadway. Table 6 summarizes the maintenance costs per KM of road (adjusted for inflation using NRBCPI).

Table 6 Summary of Gravel Roads Maintenance Costs

Source	2012 Maintenance Cost Per KM
Minnesota Study	$3,500
South Dakota Study	$5,758
OMBI Average (six municipalities)	$12,600

As discussed above, there are currently no industry standards in regards to the cost of gravel road maintenance and the frequency at which the maintenance activities should be completed. Also, there is no established benchmark cost for the maintenance of a km of gravel road and the numbers presented above will vary significantly due to the level of service or maintenance that's provided (i.e., frequency of grading cycles and re-gravel cycles).

As mentioned at the start of this section, Conmee's road network is nearly 100% gravel roads. The costs for rehabilitation have been estimated based on a quote received by the municipality. However based on the analysis provided above, the township should further refine this cost through a detailed study to establish different cost options associated with different levels of service and that this be included with future updates to this AMP.

1.7 Recommendations – Road Network

- The township should continue its condition assessments of road surfaces and expand the program to incorporate additional asset components 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 life cycle activity framework should also be developed to promote standard life cycle 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 only 16% 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

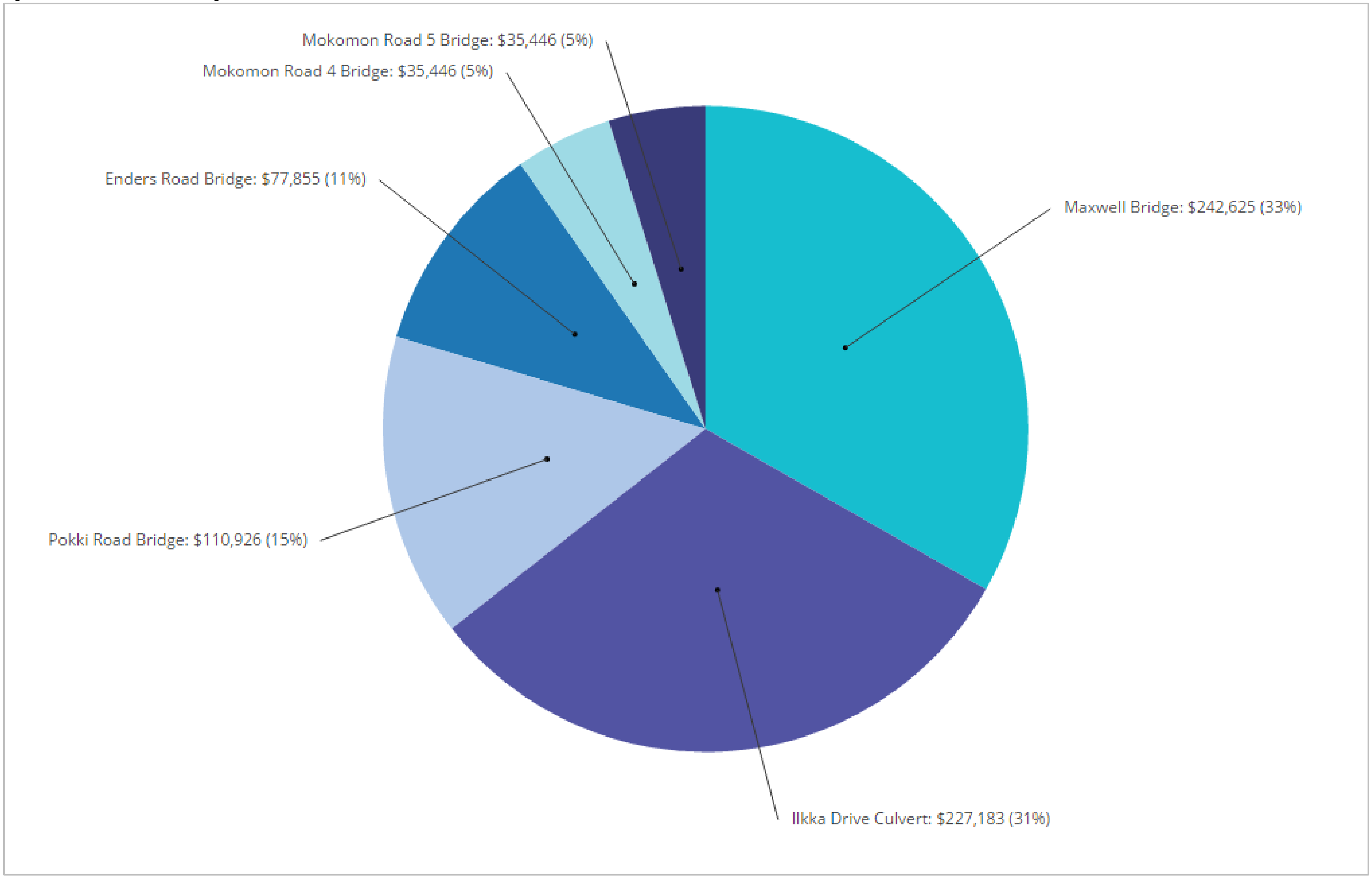
2.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

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 $729,481 based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township.

Table 7 Key Asset Attributes – Bridges & Culverts

Asset Type	Asset Component	Quantity	Useful Life (Years)	Valuation Method	2016 Overall Replacement Cost
Bridges & Culverts	Enders Road Bridge	1	80	NRBCPI Quarterly (Toronto)	$77,855
	Pokki Road Bridge	1	80	NRBCPI Quarterly (Toronto)	$110,926
	Maxwell Bridge	1	80	NRBCPI Quarterly (Toronto)	$242,625
	Mokomon Road 4 Bridge	1	80	NRBCPI Quarterly (Toronto)	$35,446
	Mokomon Road 5 Bridge	1	80	NRBCPI Quarterly (Toronto)	$35,446
	Ilkka Drive Culvert	1	35	NRBCPI Quarterly (Toronto)	$227,183
				Total	**$729,481**

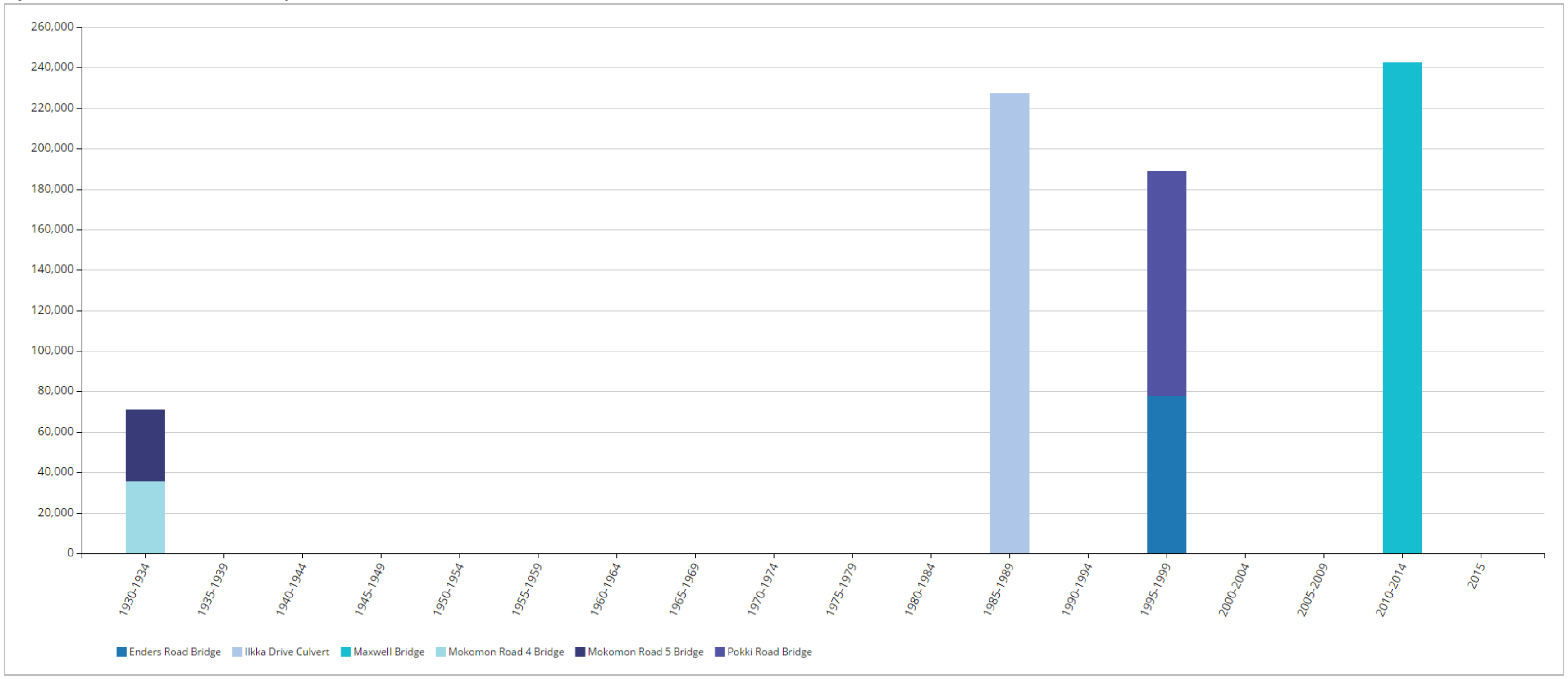
Figure 16 Asset Valuation – Bridges & Culverts



2.2 Historical Investment in Infrastructure

Figure 17 shows the township's historical investments in its bridges & culverts since 1930 based on 2016 replacement costs. 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 short-, medium- and long-term replacement needs.

Figure 17 Historical Investment – Bridges & Culverts

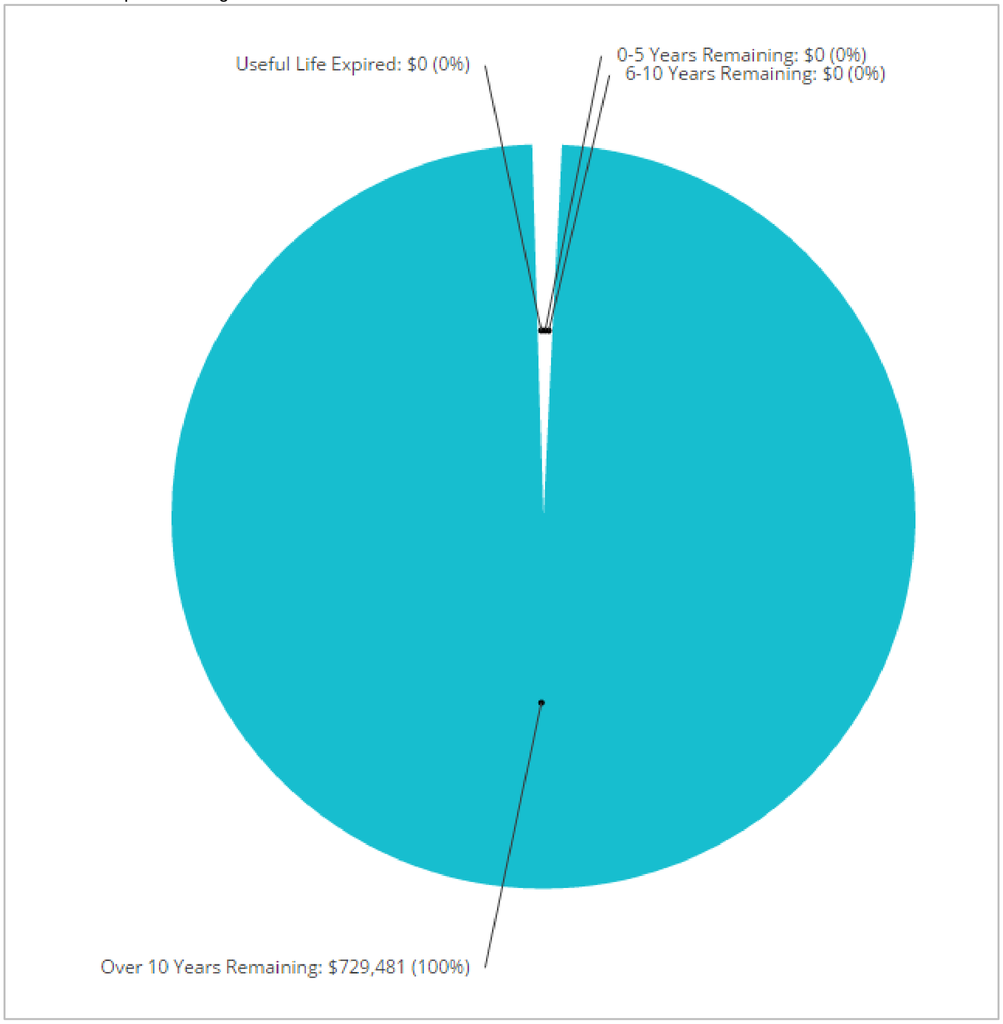


The townships bridges and culverts have been installed at various points in time since the early 1930s. Most recently, the Maxwell bridge was installed in the early 2010s with a valuation of over $240,000.

2.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 18 illustrates the useful life consumption levels as of 2015 for the township's bridges & culverts.

Figure 18 Useful Life Consumption – Bridges & Culverts

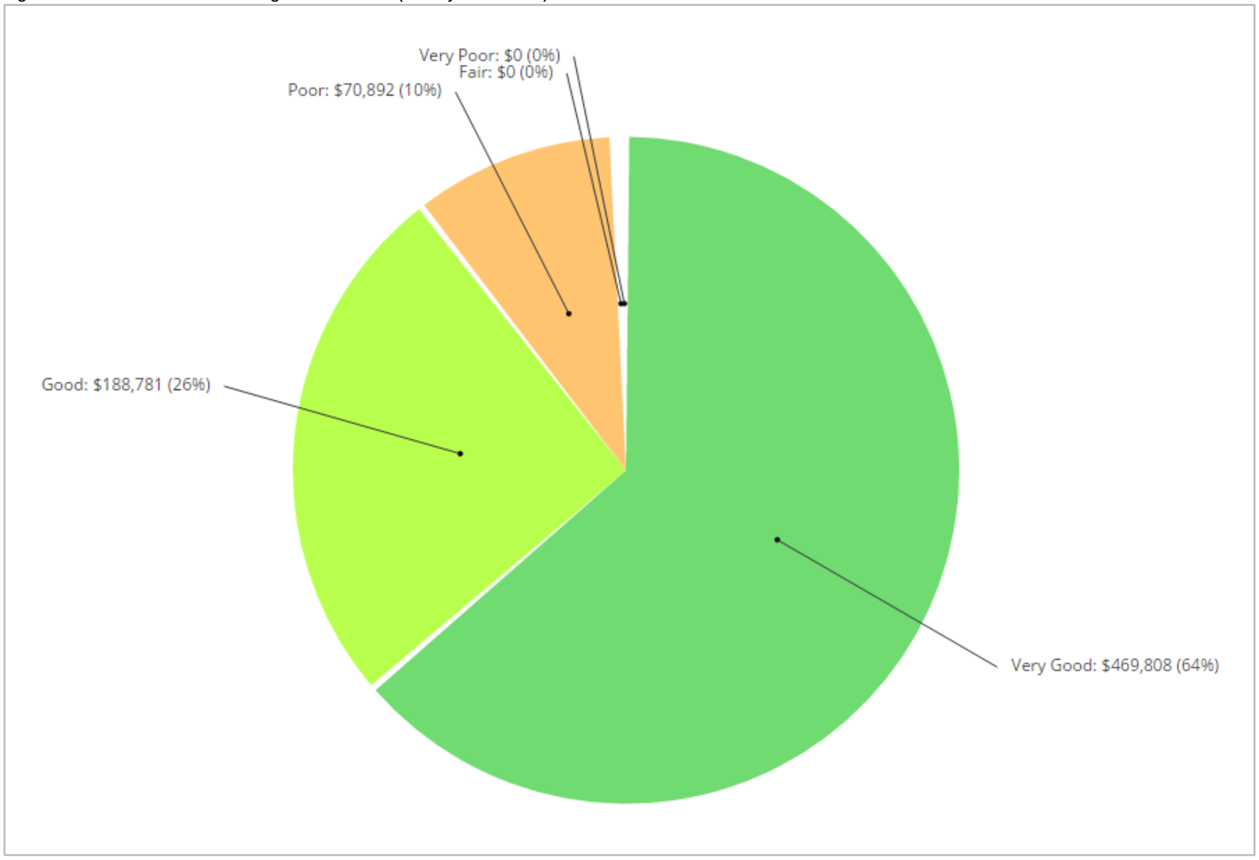


All of the townships bridges and culverts have over 10 years of useful life remaining.

2.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's bridges & culverts as of 2015. 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. The township has provided condition assessment data for 67% of bridge & culvert assets from a 2013 inspection.

Figure 19 Asset Condition – Bridges & Culverts (Mainly Assessed)

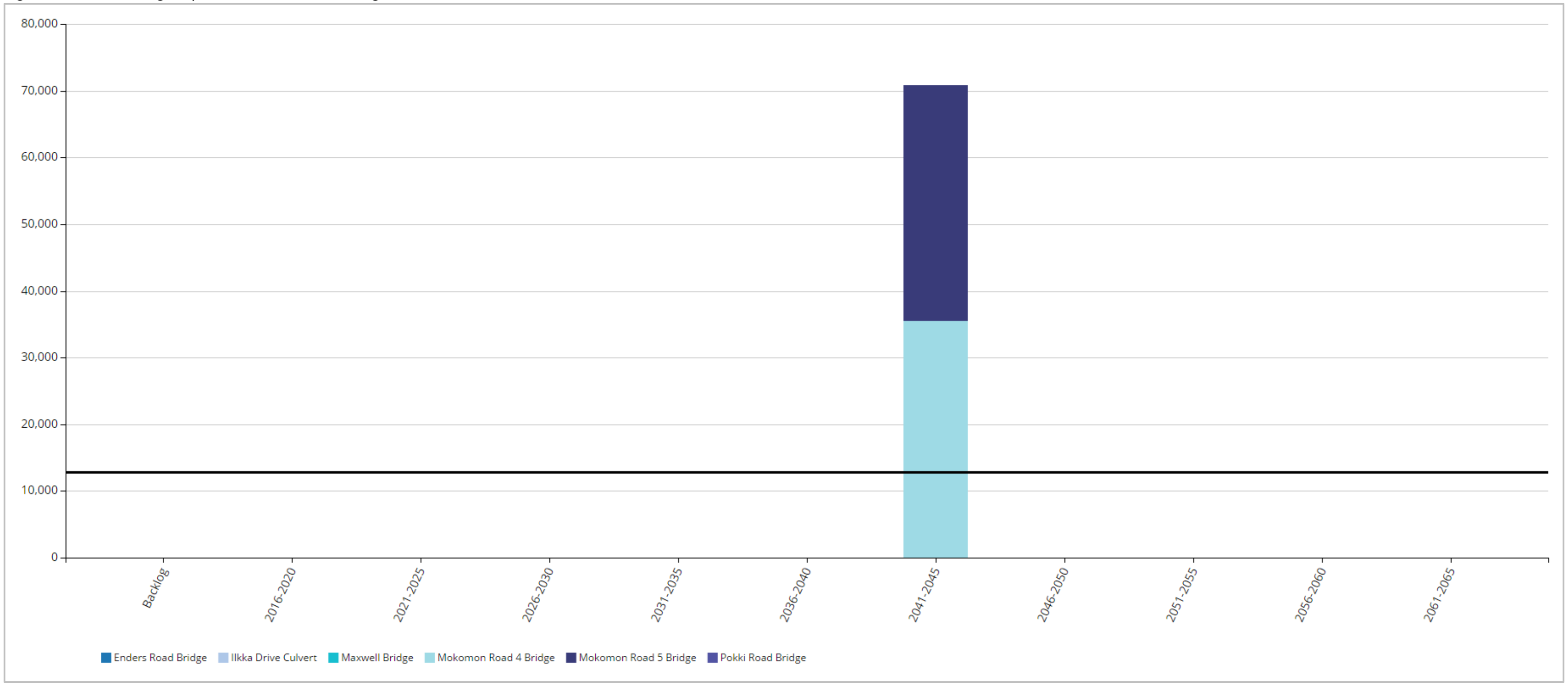


Primarily condition assessment data indicates that 90% of the township's bridges & culverts are in good to very good condition while the remaining 10%, with a valuation of $71,000, are in poor condition.

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



Due to the long estimated useful lives of the assets as well as the current condition, there is no backlog or short to medium term replacement needs for bridges & culverts. The township's annual requirements (indicated by the black line) for its bridges & culverts total \$13,000. At this funding level, the township is 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 \$9,000, leaving an annual deficit of \$4,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

2.6 Recommendations – Bridges & Culverts

- The results and recommendations from the condition inspections should be 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 69% 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

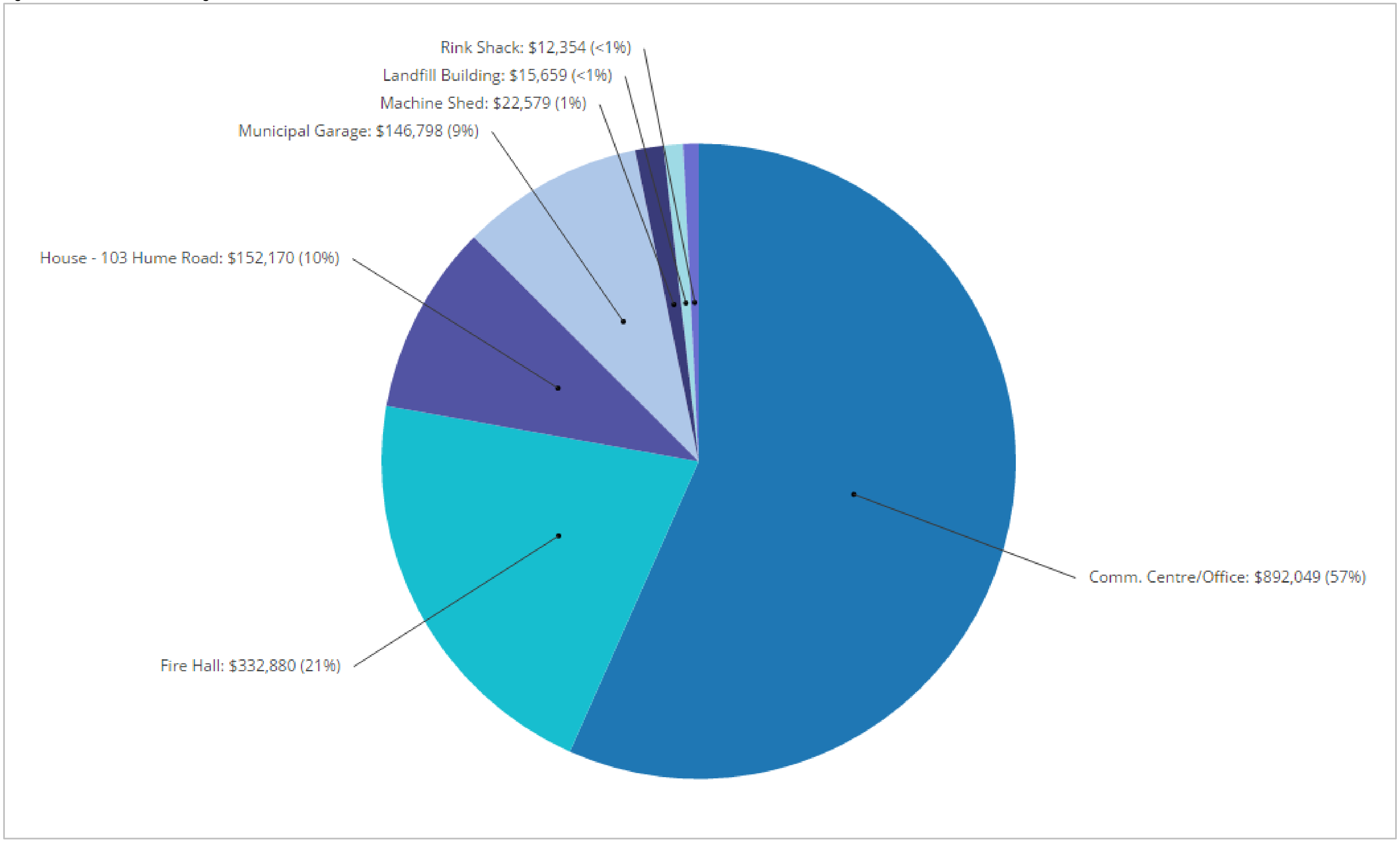
3.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 8 illustrates key asset attributes for the township's buildings assets, 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 $1.6 million based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township.

Table 8 Key Asset Attributes – Buildings

Asset Type	Asset Component	Quantity	Useful Life	Valuation Method	2016 Overall Replacement Cost
Buildings	Comm. Centre/Office	1	50	NRBCPI Quarterly (Toronto)	$892,049
	Municipal Garage	1	50, 70	NRBCPI Quarterly (Toronto)	$146,798
	Fire Hall	2	25, 50, 70	NRBCPI Quarterly (Toronto)	$332,880
	Landfill Building	1	25	NRBCPI Quarterly (Toronto)	$15,659
	Machine Shed	1	50	NRBCPI Quarterly (Toronto)	$22,579
	House - 103 Hume Road	1	50	NRBCPI Quarterly (Toronto)	$152,170
	Rink Shack	1	20	NRBCPI Quarterly (Toronto)	$12,354
				Total	**$1,574,489**

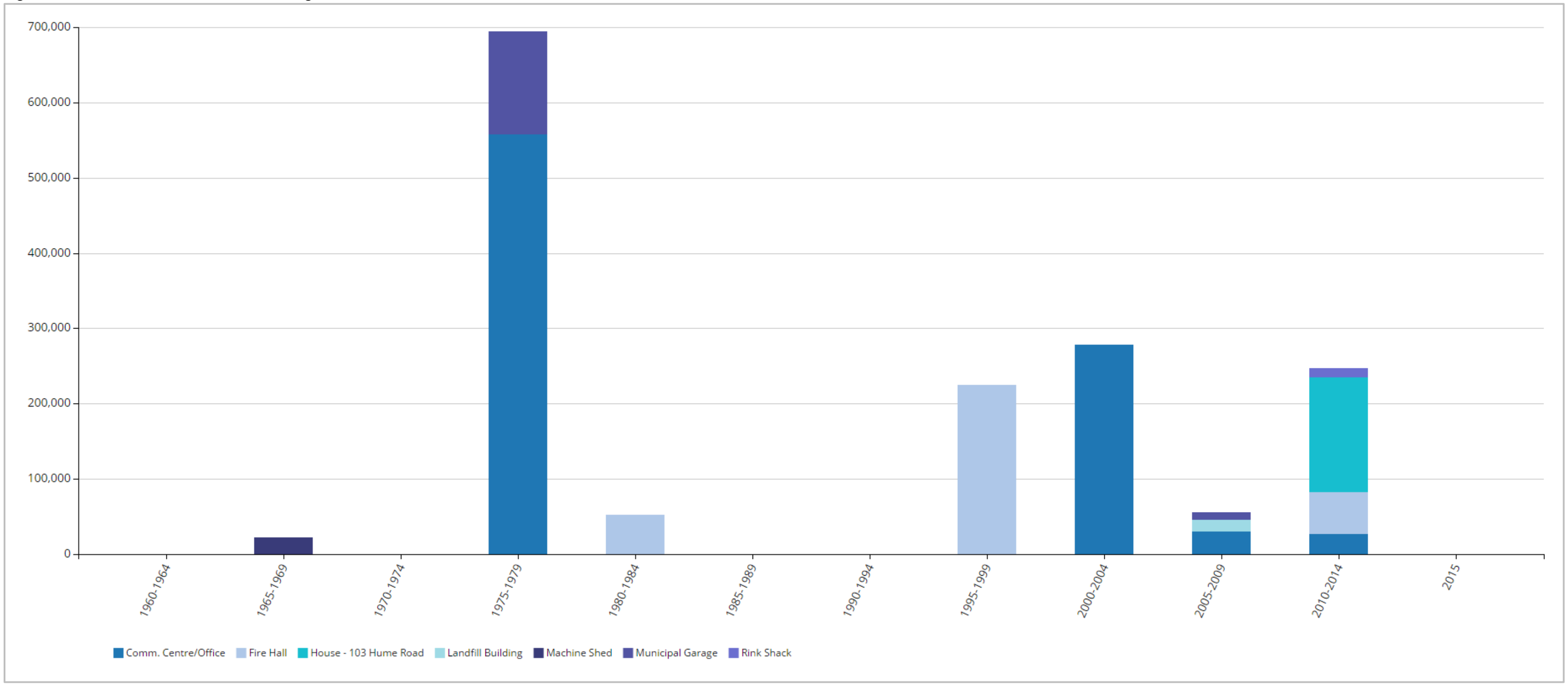
Figure 21 Useful Life – Buildings



3.2 Historical Investment in Infrastructure

Figure 22 shows the township's historical investments in its buildings since 1960 based on 2016 replacement cost. 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 3.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 22 Historical Investment – Buildings

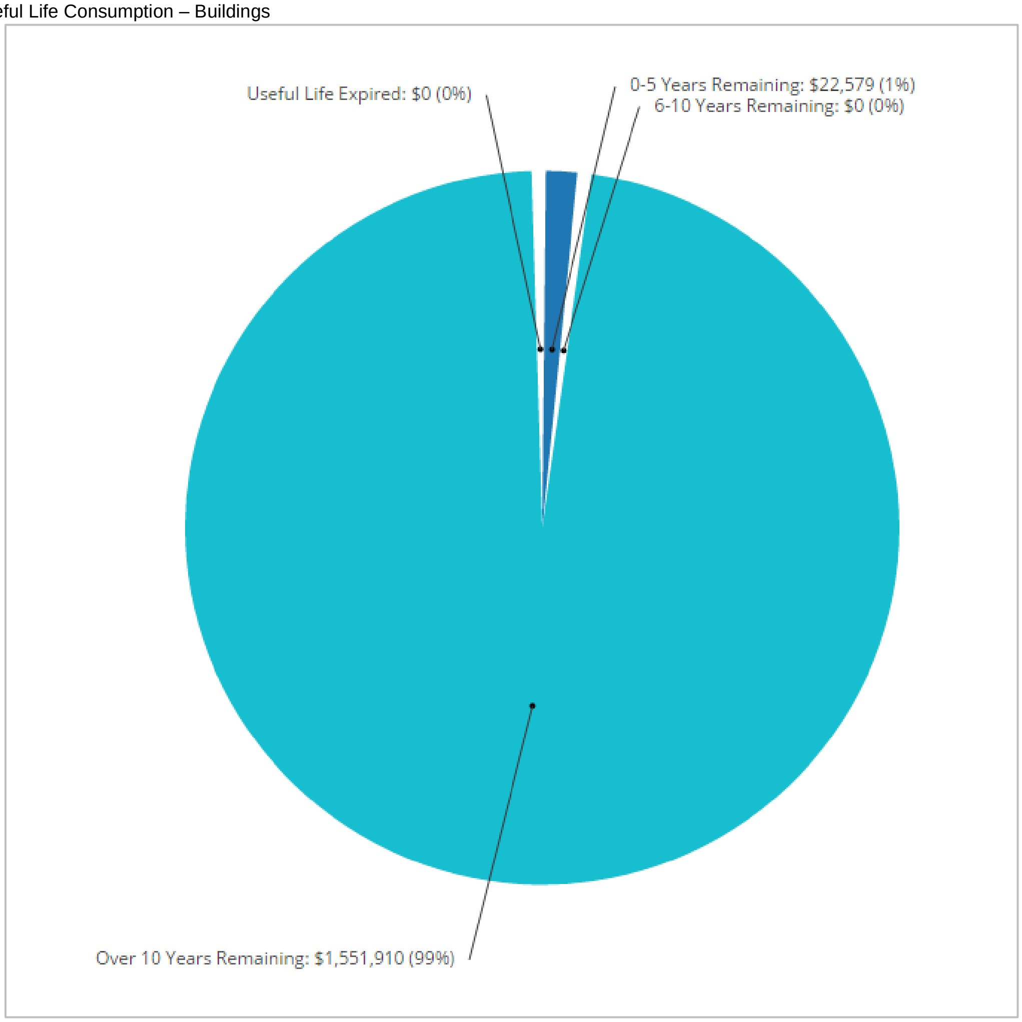


The township's investments in its facilities portfolio have fluctuated over the decades. Investments hit a high of nearly $700,000 in the late 1970s with investments into the Communications Centre/Office. Since 2010, the township has spent nearly $250,000 on buildings assets.

3.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 23 illustrates the useful life consumption levels as of 2015 for the township's buildings assets.

Figure 23 Useful Life Consumption – Buildings

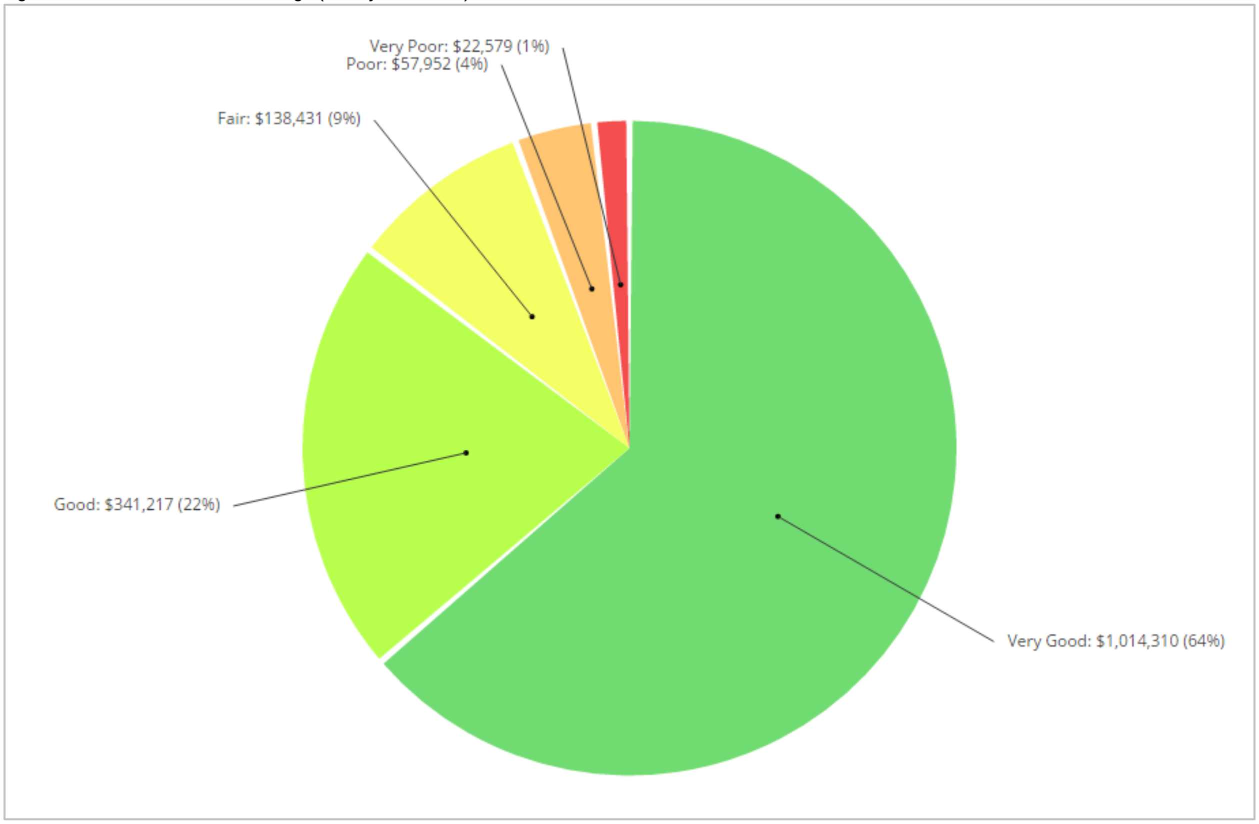


Nearly all buildings assets have over 10 years of useful life remaining.

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 67% of buildings assets from an assessment completed in 2013.

Figure 24 Asset Condition – Buildings (Mainly Assessed)

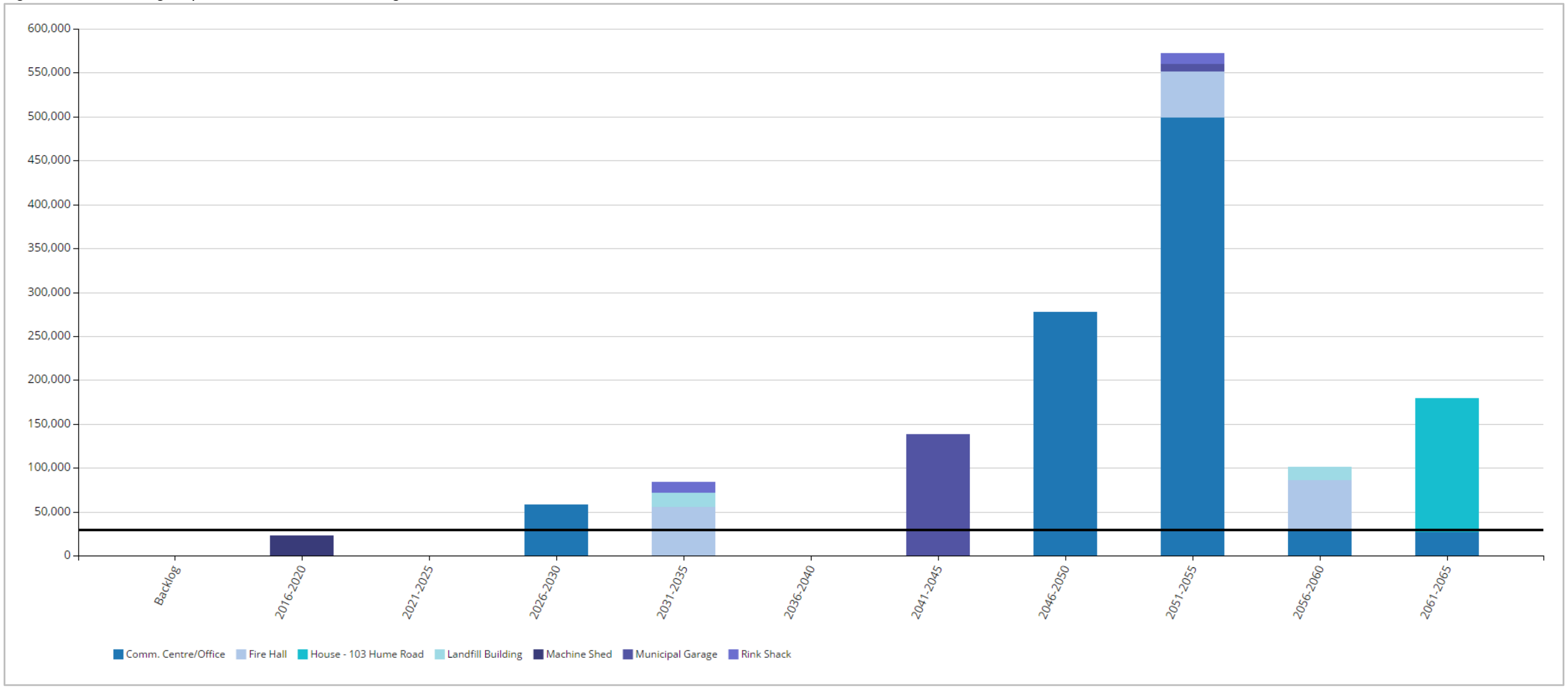


Using primarily condition assessment data, 86% of assets are in good to very good condition. 5%, with a valuation of $81,000, are in poor to very poor condition.

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



Despite no backlog, replacement needs total $22,000 in the net five years. No additional replacement needs occur until 2026. The township's annual requirements (indicated by the black line) for its buildings total $31,000. At this funding level, the township is 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 $16,000, leaving an annual deficit of $15,000. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level.

3.6 Recommendations – Buildings

- The township should continue its condition inspection program and expand it to include all buildings assets in order to get a better understanding of future financial 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.

- 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 13% of its long-term requirements. See the ‘Financial Strategy’ section on how to achieve more sustainable and optimal funding levels.

4. Machinery & Equipment

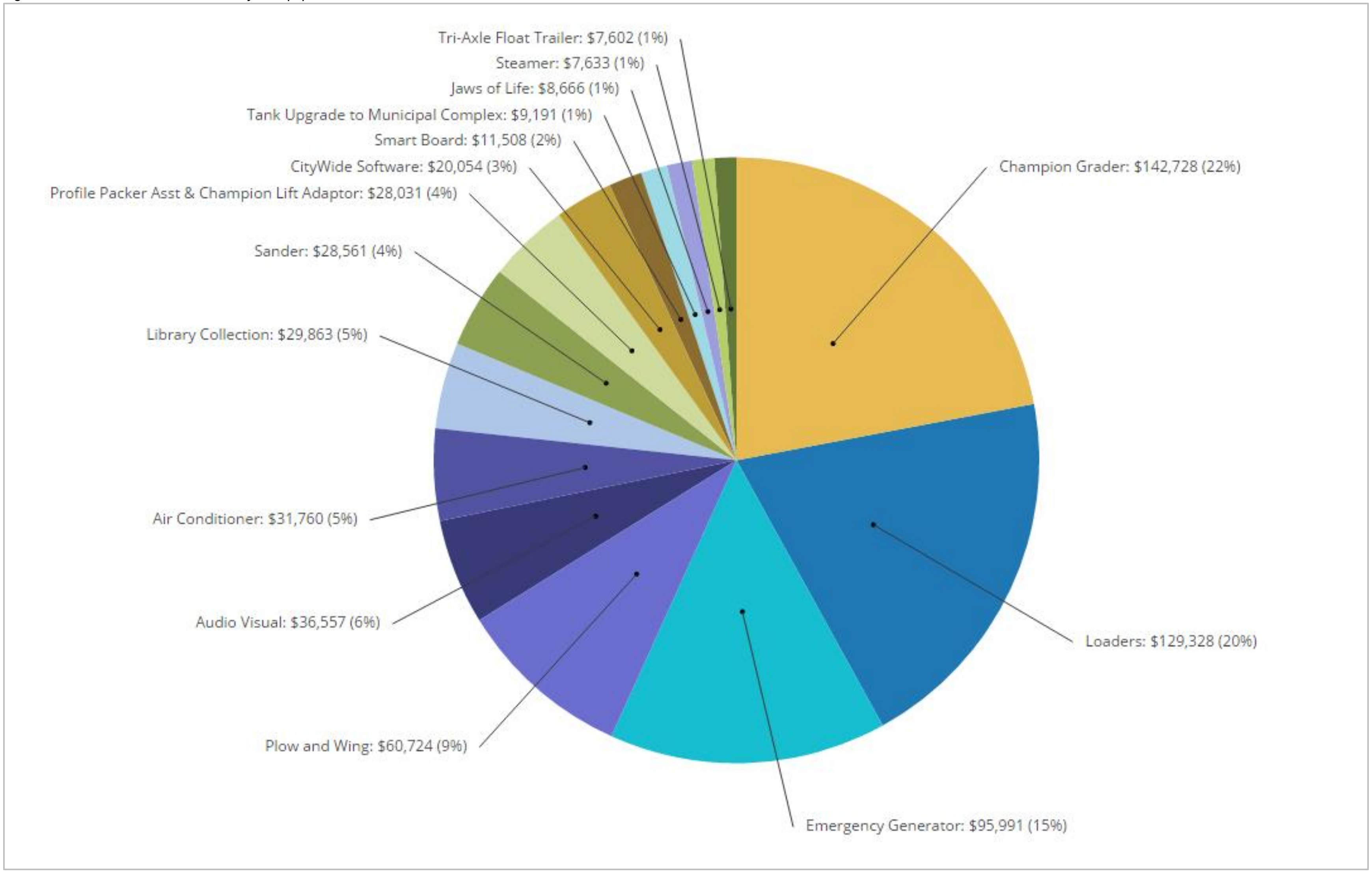
4.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 9 illustrates key asset attributes for the township's machinery & equipment assets, 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 $648,197 based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township and obtained from the township's accounting data as maintained in the CityWide® Tangible Asset module.

Table 9 Key Asset Attributes – Machinery & Equipment

Asset Type	Asset Component	Quantity	Useful Life (Years)	Valuation Method	2016 Overall Replacement Cost
Machinery & Equipment	Loaders	2	25	CPI Monthly (ON)	$129,328
	Jaws of Life	1	10	CPI Monthly (ON)	$8,666
	Emergency Generator	1	10	CPI Monthly (ON)	$95,991
	Tank Upgrade to Municipal Complex	1	10	CPI Monthly (ON)	$9,191
	Audio Visual	1	10	CPI Monthly (ON)	$36,557
	Air Conditioner	1	10	CPI Monthly (ON)	$31,760
	Plow and Wing	1	25	CPI Monthly (ON)	$60,724
	Champion Grader	1	25	CPI Monthly (ON)	$142,728
	Tri-Axle Float Trailer	1	10	CPI Monthly (ON)	$7,602
	Sander	1	25	CPI Monthly (ON)	$28,561
	Steamer	1	25	CPI Monthly (ON)	$7,633
	Profile Packer Assy & Champion lift adaptor	1	25	CPI Monthly (ON)	$28,031
	Smart Board	1	5	CPI Monthly (ON)	$11,508
	CityWide Software	1	5	CPI Monthly (ON)	$20,054
	Library Collection	1	10	CPI Monthly (ON)	$29,863
				Total	**$648,197**

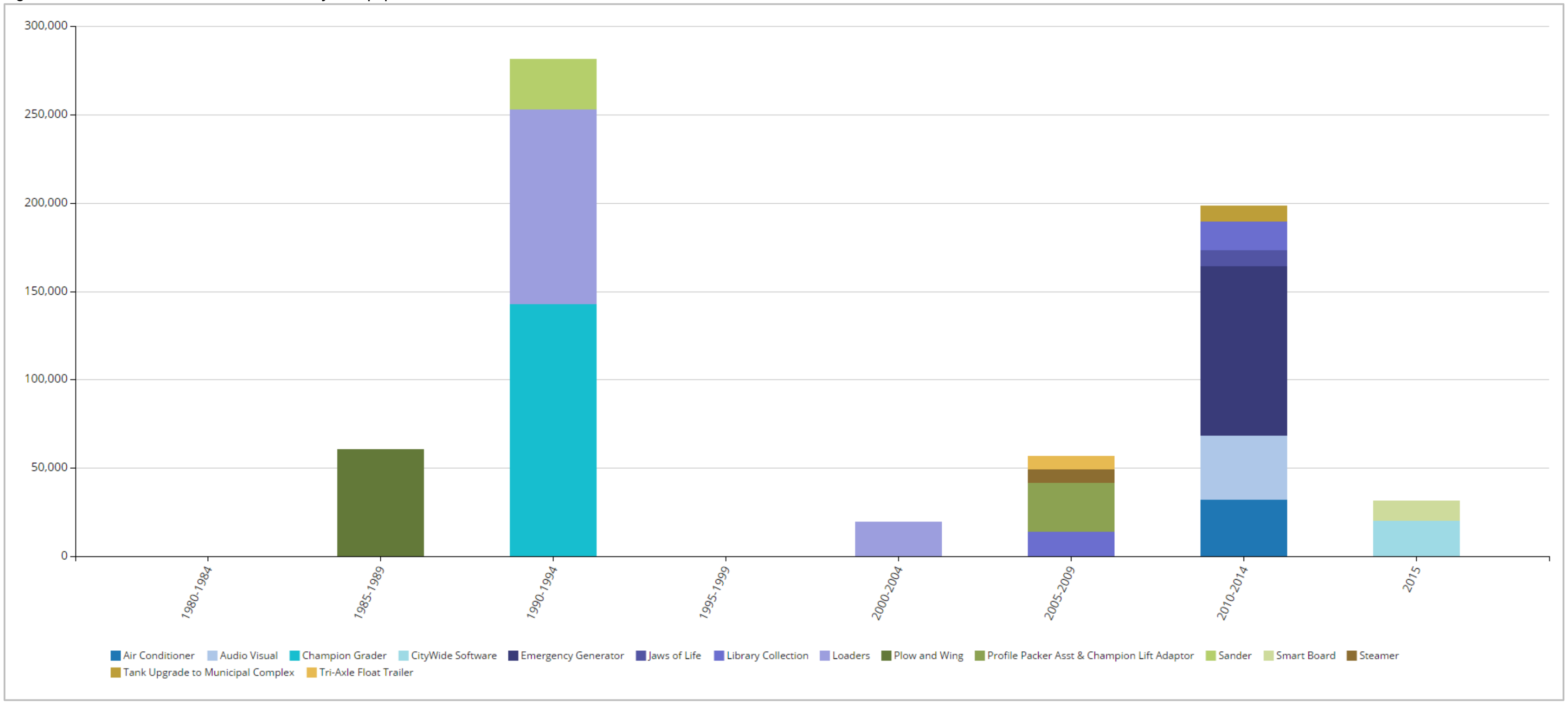
Figure 26 Asset Valuation – Machinery & Equipment



4.2 Historical Investment in Infrastructure

Figure 27 shows the township's historical investments in its machinery & equipment since 1980 based on 2016 replacement cost. 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 4.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 27 Historical Investment – Machinery & Equipment

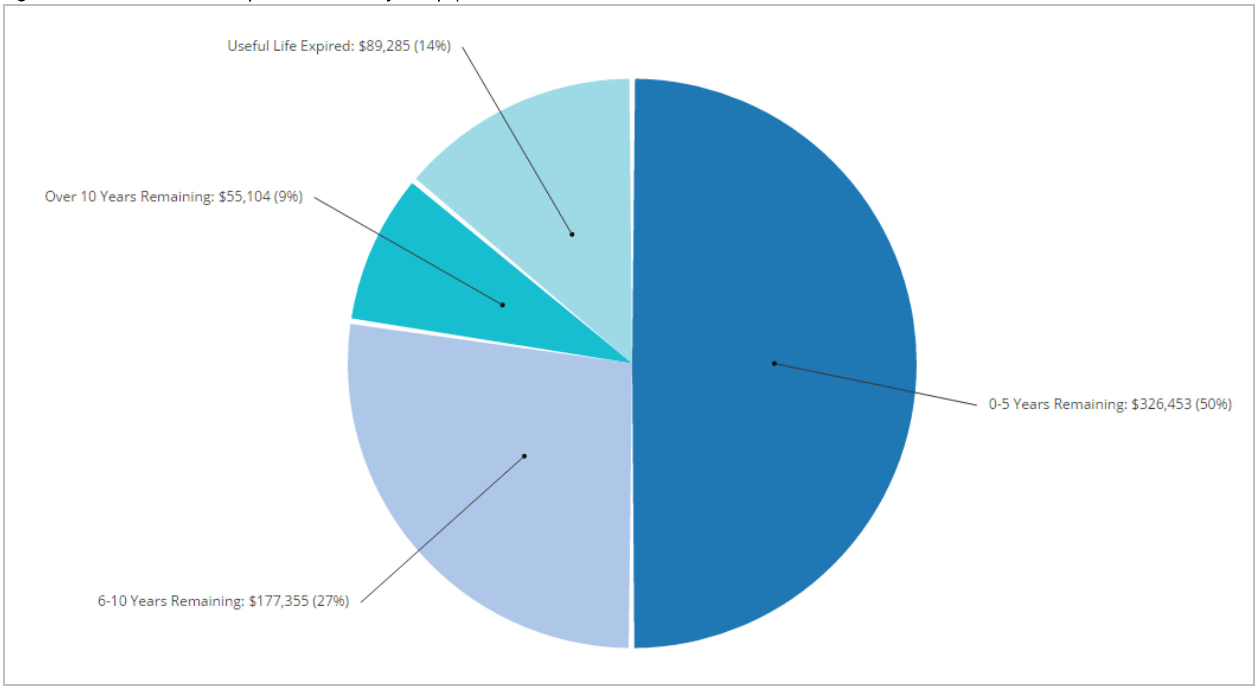


The township began investing into its machinery & equipment starting in the late 1980s. Investments peaked in the early 1990s topping $280,000 with a focus on the Champion Grader. Since 2010, $230,000 has been invested.

4.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 28 illustrates the useful life consumption levels as of 2015 for the township's machinery & equipment assets.

Figure 28 Useful Life Consumption – Machinery & Equipment

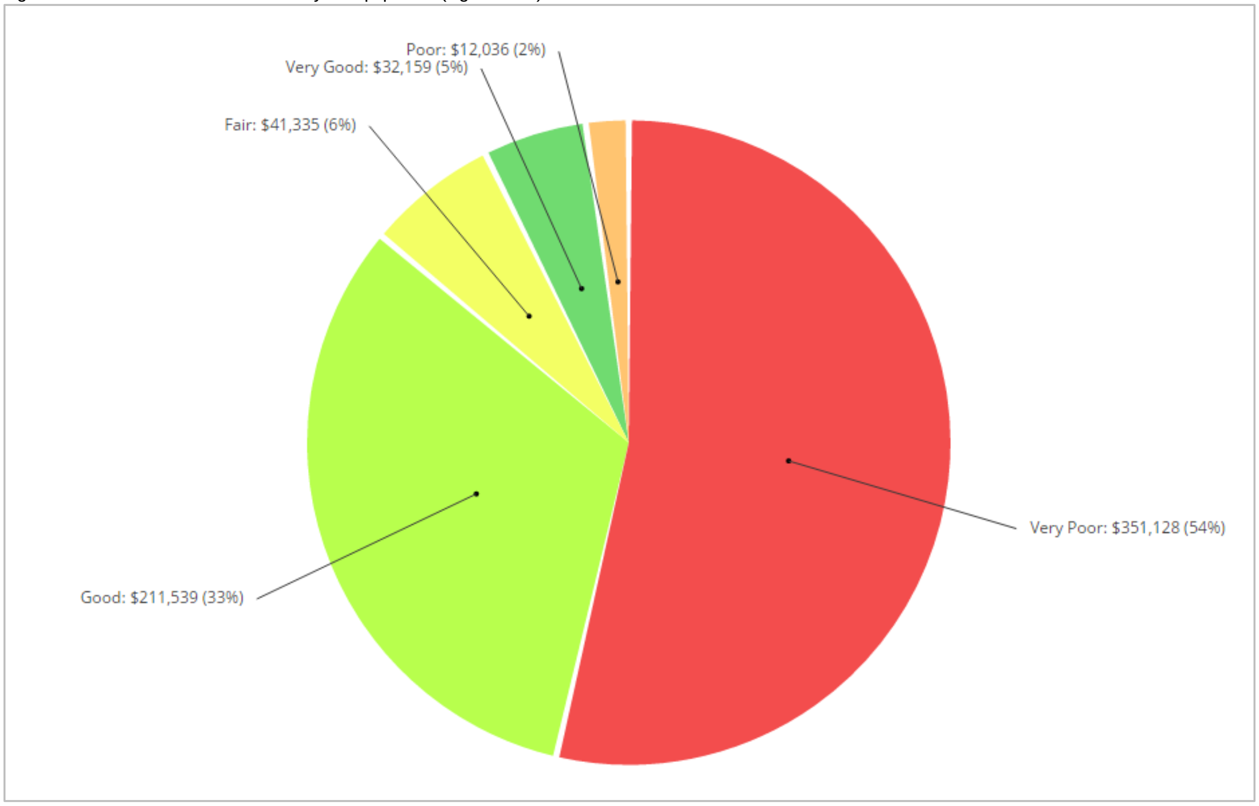


Nearly 10% of assets have at least 10 years of useful life remaining. 14% of assets, with a valuation of nearly $90,000, remain in operation beyond their useful life, while an additional 50%, at a valuation of over $325,000 will reach the end of their useful life within the next five years.

4.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's machinery & equipment assets as of 2015. 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 not provided condition data for any of its machinery & equipment assets.

Figure 29 Asset Condition – Machinery & Equipment (Age-based)

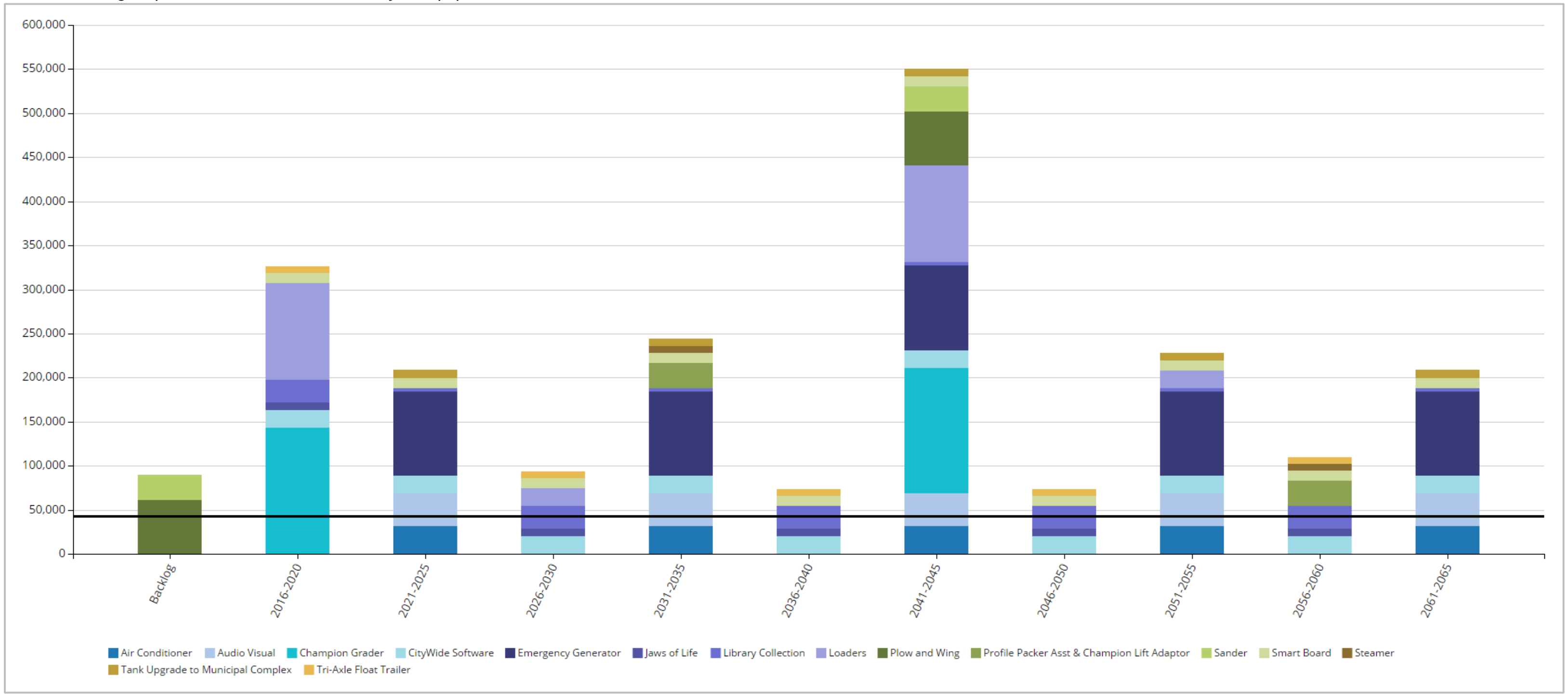


Based on age data, 38% of assets, with a valuation of nearly $245,000, are in good to very good condition, while 56% of assets are in poor to very poor condition.

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



In addition to an age-based backlog of $89,000, the township's replacement needs total over $325,000 in the next five years. An additional $210,000 will be required between 2021-2025. The township's annual requirements (indicated by the black line) for its machinery & equipment total $44,000. At this funding level, the township is 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 not allocating any funding towards this asset category. See the 'Financial Strategy' section for maintaining a sustainable funding level. Further, while fulfilling the annual requirements will position the township to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

4.6 Recommendations – Machinery & Equipment

- Age based data indicates a backlog of $89,000 as well as replacement needs of approximately $530,000 over the next 10 years. The township should implement a component based condition inspection program 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 not funding any portion of its long-term requirements on an annual basis. See the 'Financial Strategy' section on how to maintain sustainable and optimal funding levels.

5. Land Improvements

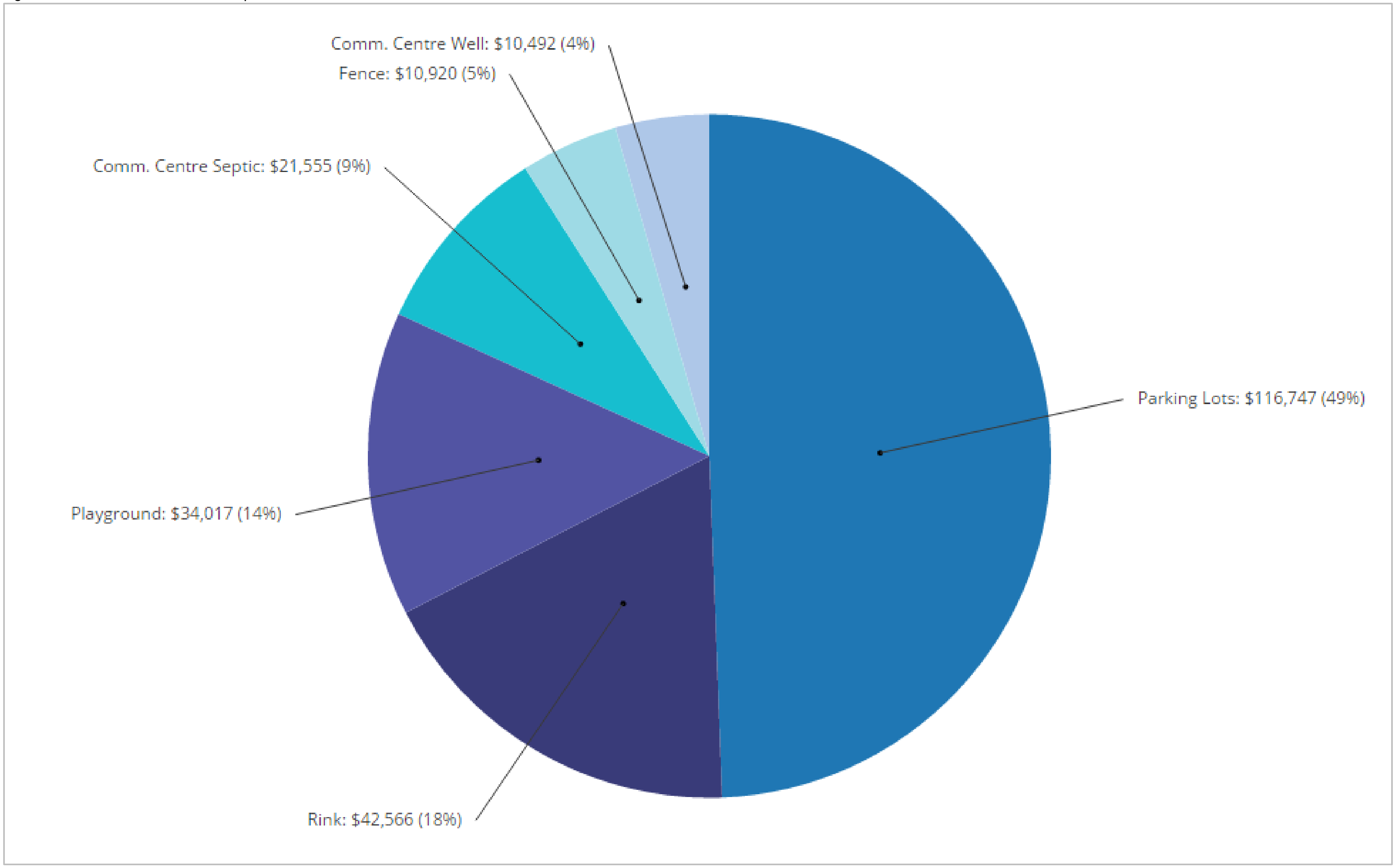
5.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 10 illustrates key asset attributes for the township's land improvement assets, 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 land improvements assets are valued at $236,297 based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township.

Table 10 Key Asset Attributes – Land Improvements

Asset Type	Asset Component	Quantity	Useful Life	Valuation Method	2016 Overall Replacement Cost
Land Improvements	Parking Lots	2	20	CPI Monthly (ON)	$116,747
	Comm. Centre Well	1	75	CPI Monthly (ON)	$10,492
	Comm. Centre Septic	1	25	CPI Monthly (ON)	$21,555
	Fence	1	10	CPI Monthly (ON)	$10,920
	Rink	1	20	CPI Monthly (ON)	$42,566
	Playground	1	20	CPI Monthly (ON)	$34,017
				Total	**$236,297**

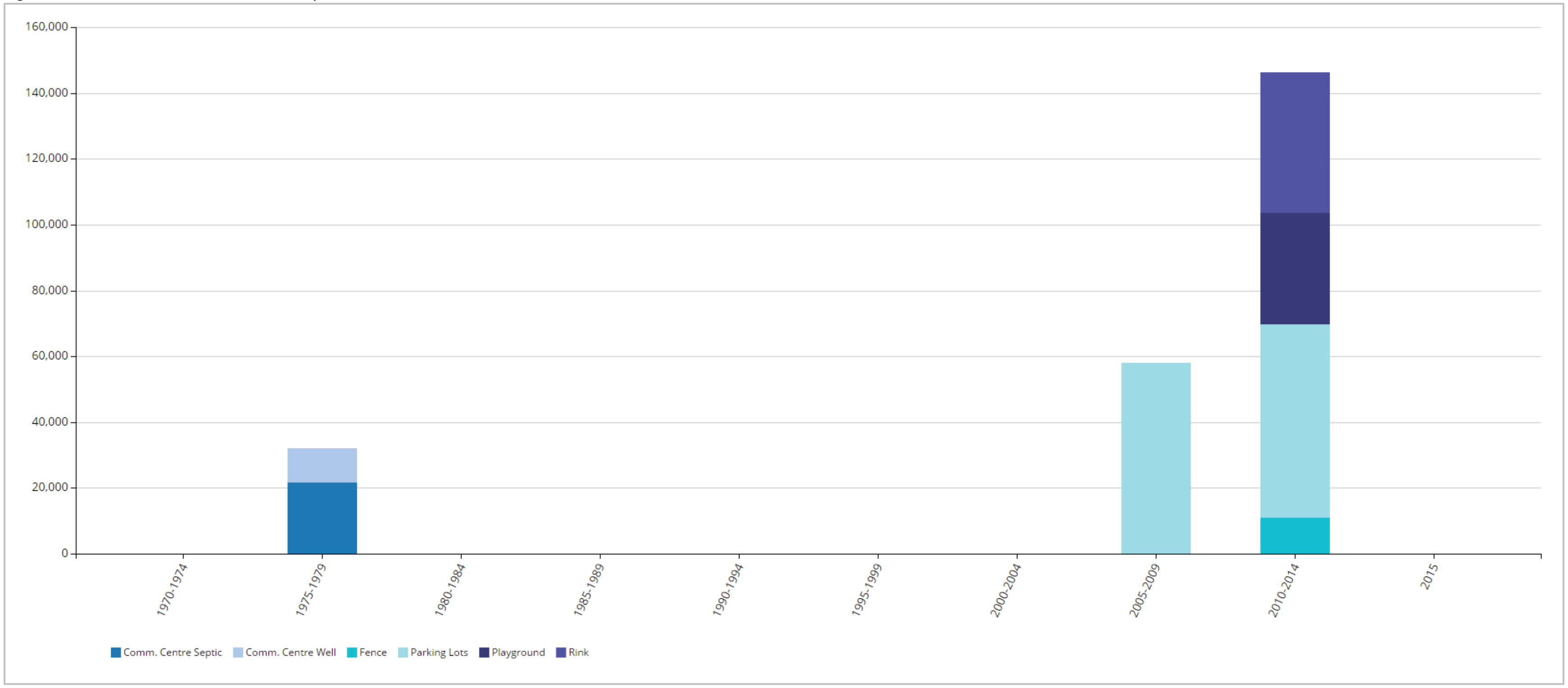
Figure 31 Asset Valuation – Land Improvements



5.2 Historical Investment in Infrastructure

Figure 32 shows the township's historical investments in its land improvements since 1970. 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 5.3) can inform the forecasting and planning of short-, medium- and long-term replacement needs.

Figure 32 Historical Investment – Land Improvements

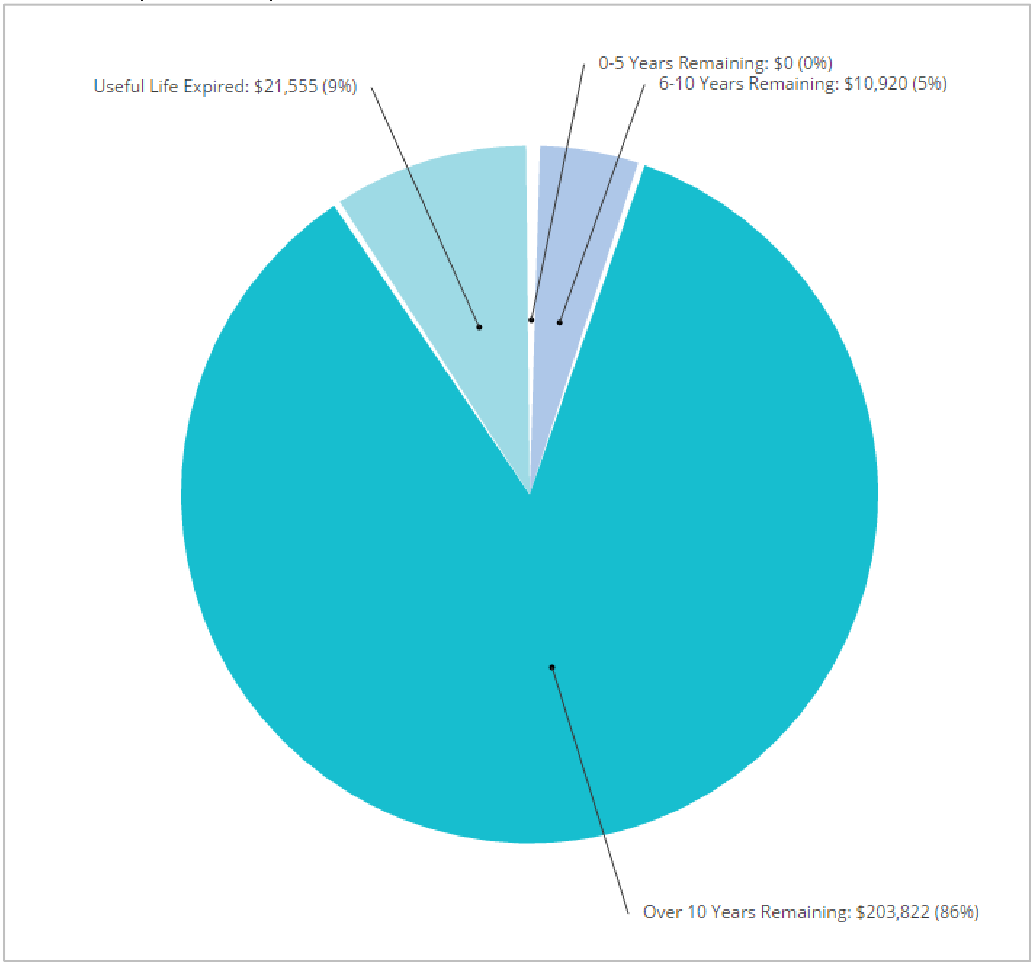


After sporadic investments in the late 1970s and 2000s, the township did the majority of its investment into land improvements in the period between 2010 and 2014. During this time, investments topped $146,000 with $58,000 put into parking lots.

5.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 33 illustrates the useful life consumption levels as of 2015 for the township's land improvement assets.

Figure 33 Useful Life Consumption – Land Improvements

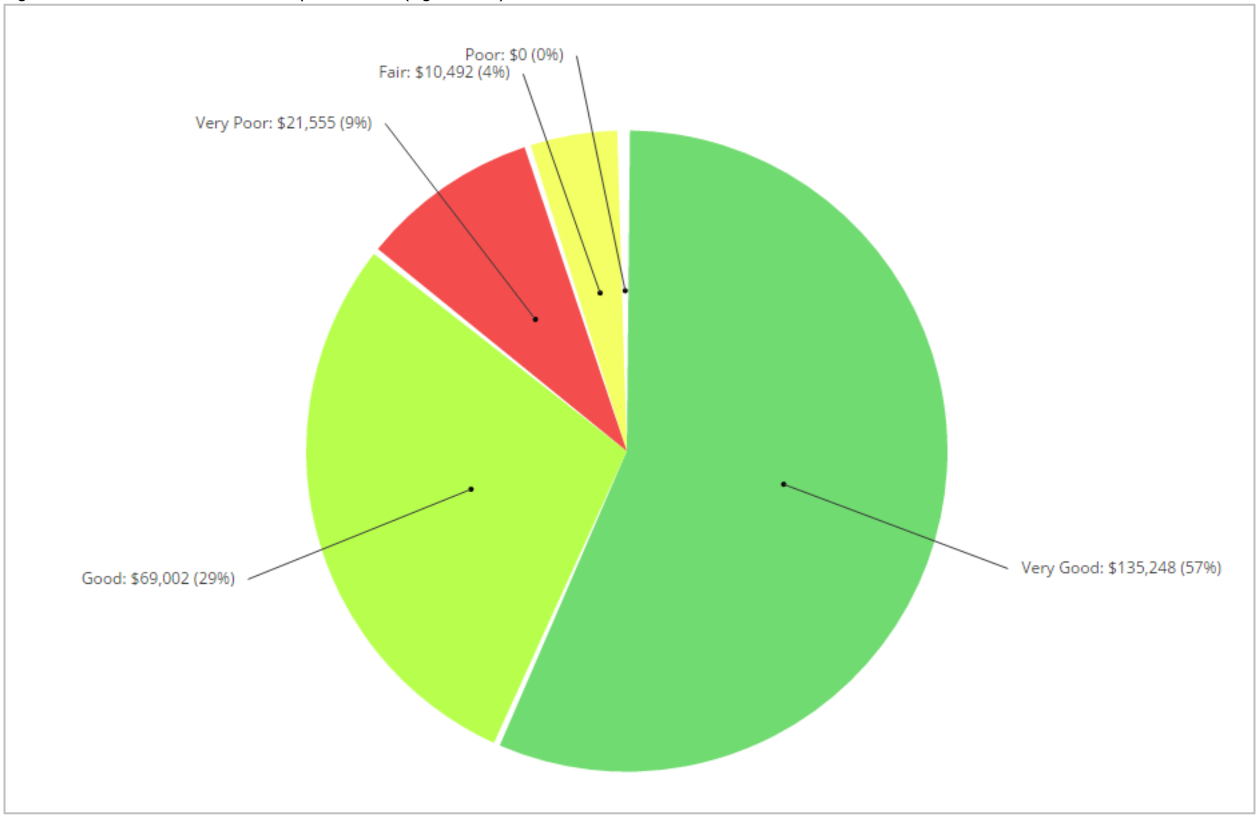


While 86% of assets, at a valuation of over $200,000, have at least 10 years of useful life remaining, 9% remain in operation beyond their useful life.

5.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's land improvement 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 not provided condition data for any of its land improvement assets.

Figure 34 Asset Condition - Land Improvements (Age-based)

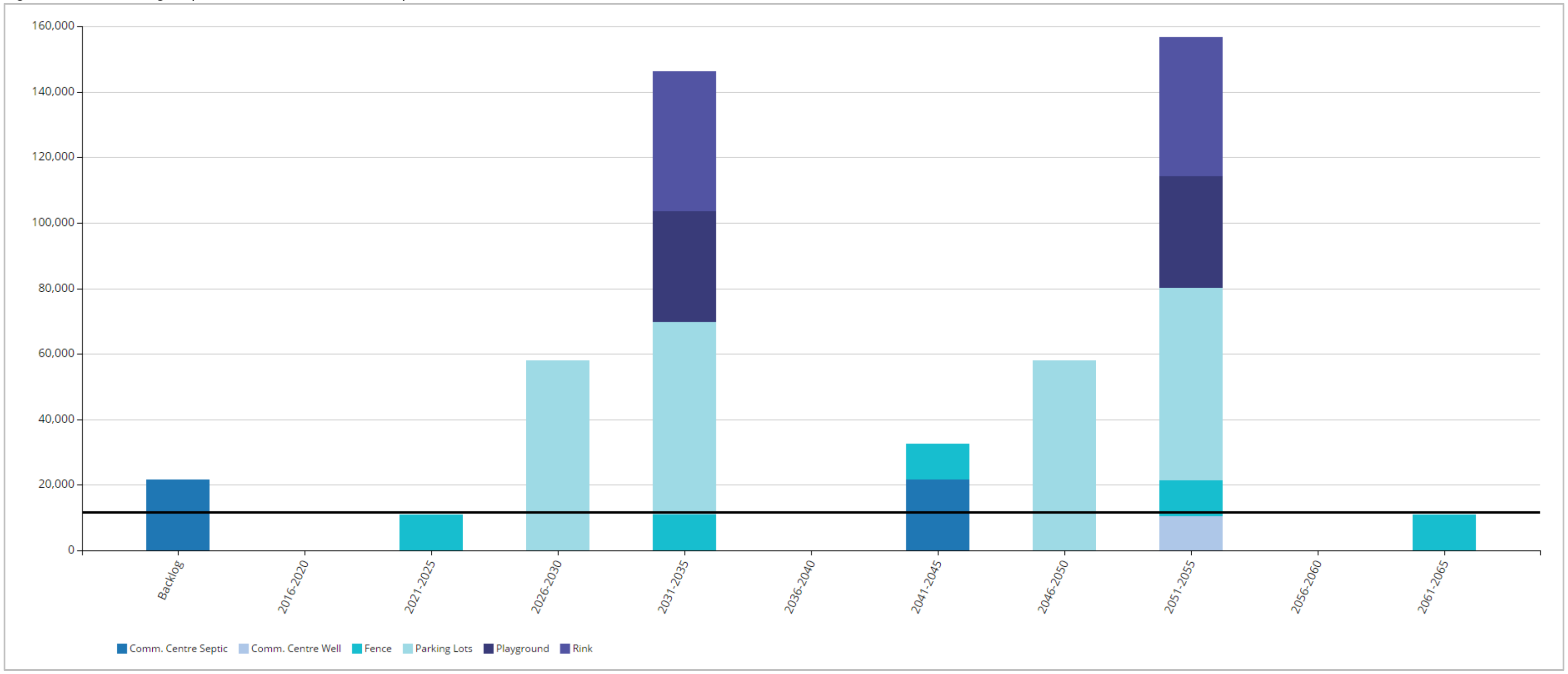


Based on age data, 86% of the township's land improvement assets, with a valuation of over $200,000, are in good to very good condition, while 9% are in very poor condition.

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 land improvements 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 – Land Improvements



Age-based data shows a backlog of $22,000 as well as replacement needs of $11,000 between 2021-2025. The township's annual requirements (indicated by the black line) for its land improvements total $12,000. At this funding level, the township is 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 not allocating any funding towards this asset category. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the township to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

5.6 Recommendations – Land Improvements

- Age based data shows a backlog of $22,000 as well as replacement needs of $11,000 over the next 10 years. The township should implement a condition assessment program for its land improvement assets to better estimate actual condition levels. 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 not funding any portion 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

6. Vehicles

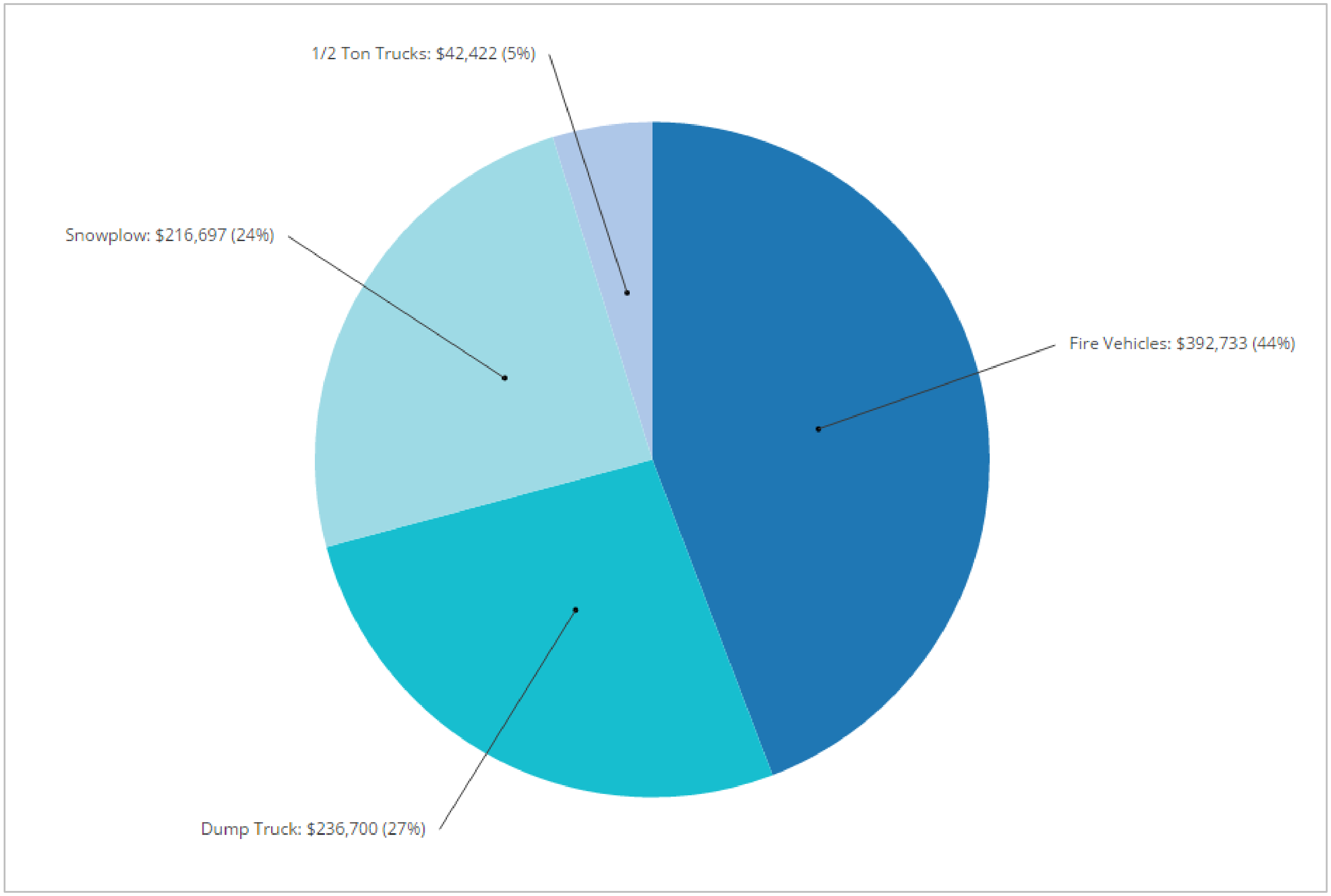
6.1 Asset Portfolio: Quantity, Useful Life and Replacement Cost

Table 11 illustrates key asset attributes for the township's vehicle assets, 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 vehicle assets are valued at $888,552 based on 2016 replacement costs. The useful life indicated for the asset types below was assigned by the township.

Table 11 Key Asset Attributes – Vehicles

Asset Type	Asset Component	Quantity	Useful Life (Years)	2016 Unit Replacement Cost	2016 Overall Replacement Cost
Vehicles	Fire Vehicles	2	20	CPI Monthly (ON)	$392,733
	1/2 Ton Truck	1	10	CPI Monthly (ON)	$42,422
	Dump Trucks	2	20	CPI Monthly (ON)	$236,700
	Snowplow	1	20	CPI Monthly (ON)	$216,697
				Total	**$888,552**

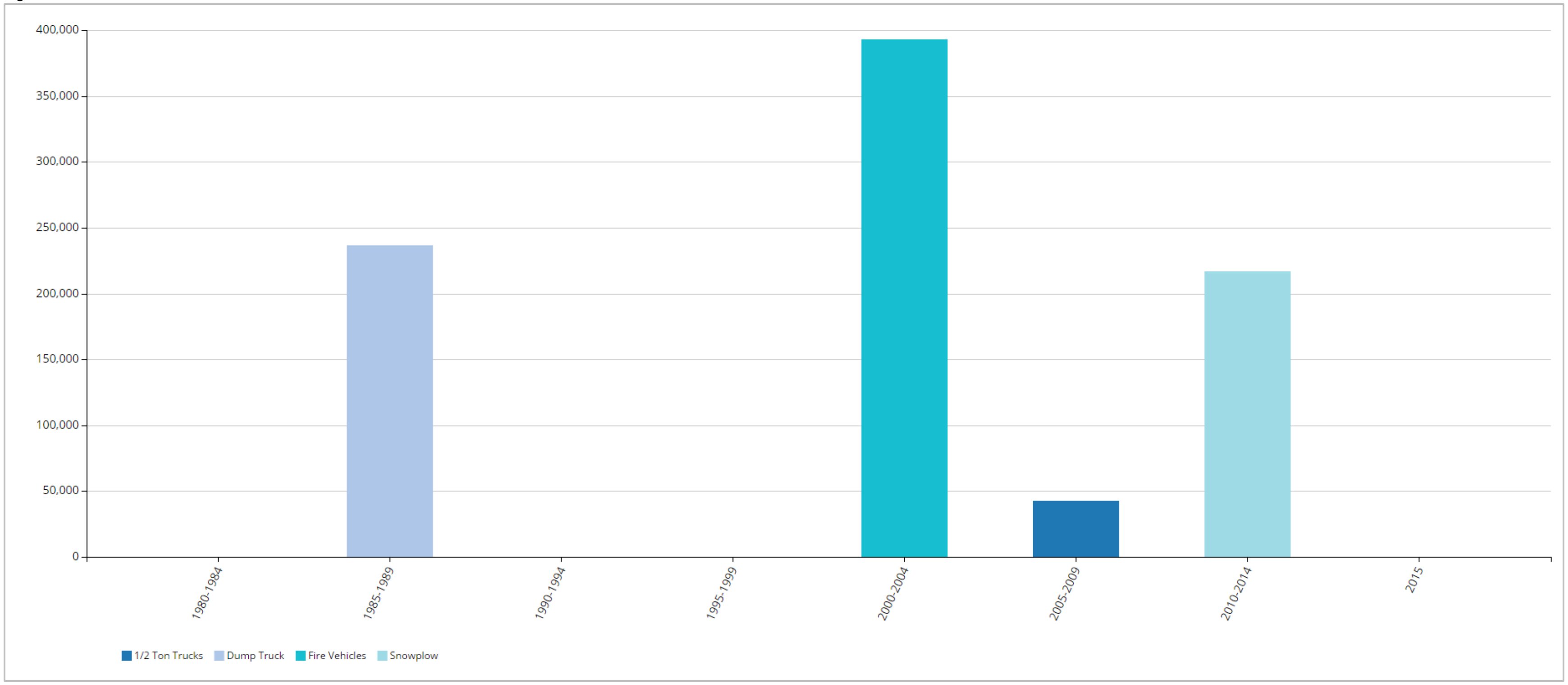
Figure 36 Asset Valuation – Vehicles



6.2 Historical Investment in Infrastructure

Figure 37 shows the township's historical investments in its vehicles since 1980 based on 2016 replacement cost. 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 short-, medium- and long-term replacement needs.

Figure 37 Historical Investment – Vehicles

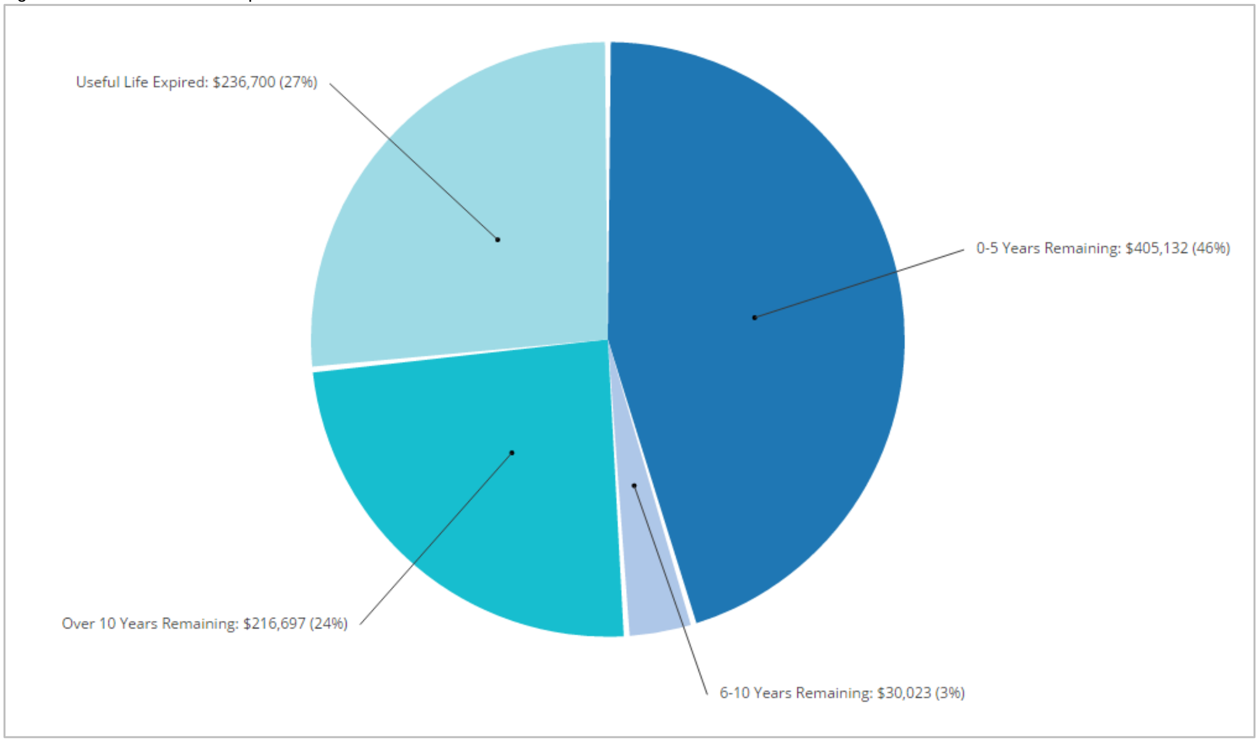


The township has invested sporadically into its vehicle assets since the late 1980s. Investments peaked in the early 2000s when nearly $400,000 was invested into fire vehicles. Since 2010, nearly $220,000 has been invested into snowplow assets.

6.3 Useful Life Consumption

In this section, we detail the extent to which assets have consumed their useful life based on the above, established useful life standards. In conjunction historical spending patterns, observed condition data, understanding the consumption rate of assets based on industry established useful life measures provides a more complete profile of the state of a community's infrastructure. Figure 38 illustrates the useful life consumption levels as of 2015 for the township's vehicles.

Figure 38 Useful Life Consumption – Vehicles

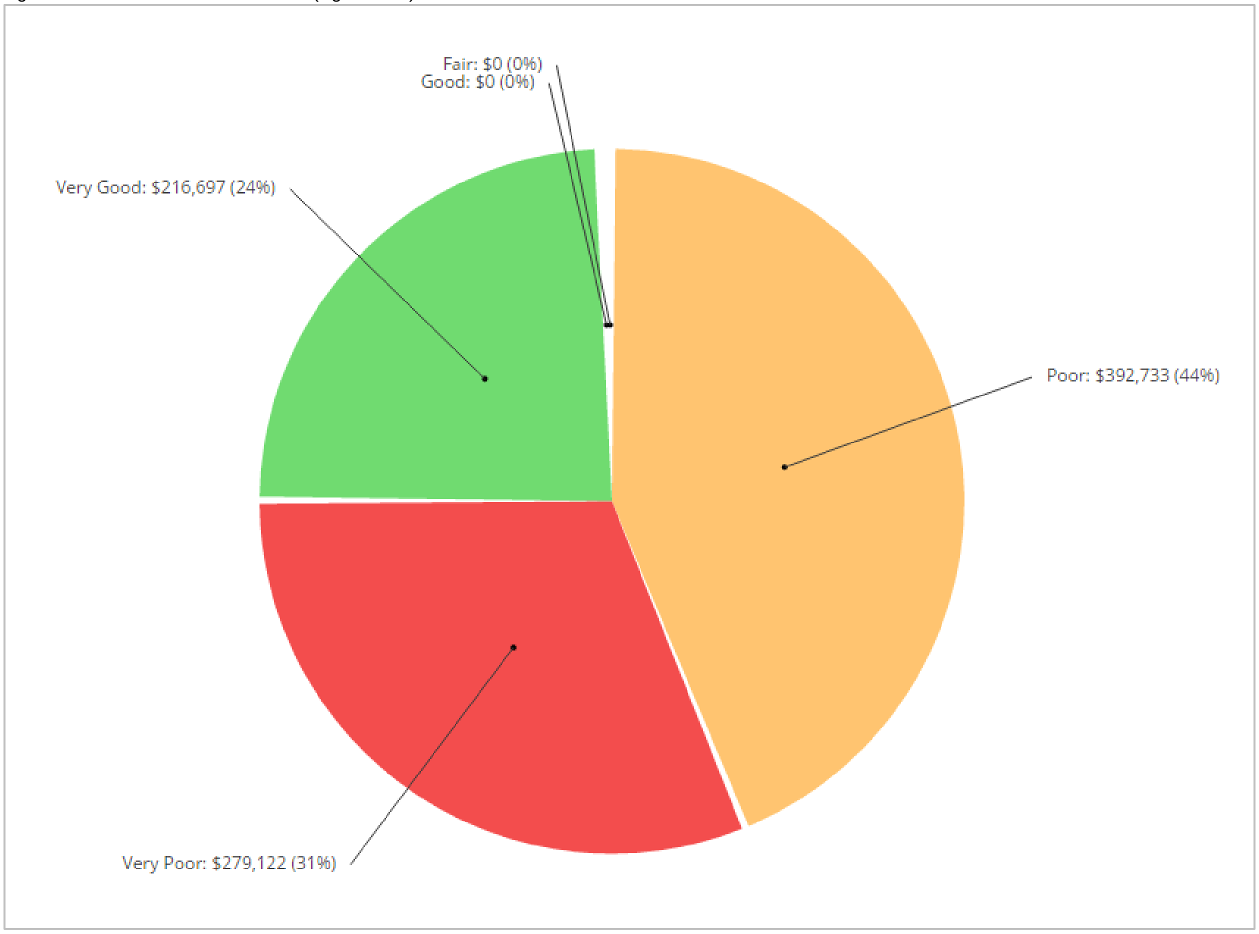


While nearly 25% of assets have at least 10 years of useful life remaining, 27%, at a valuation of $236,700, remain in operation beyond their useful life. An additional 46% will reach the end of their useful life within the next five years.

6.4 Current Asset Condition

Using replacement cost, in this section, we summarize the condition of the township's vehicle assets as of 2015. 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 not provided condition data for any of its vehicle assets.

Figure 39 Asset Condition – Vehicles (Age-based)

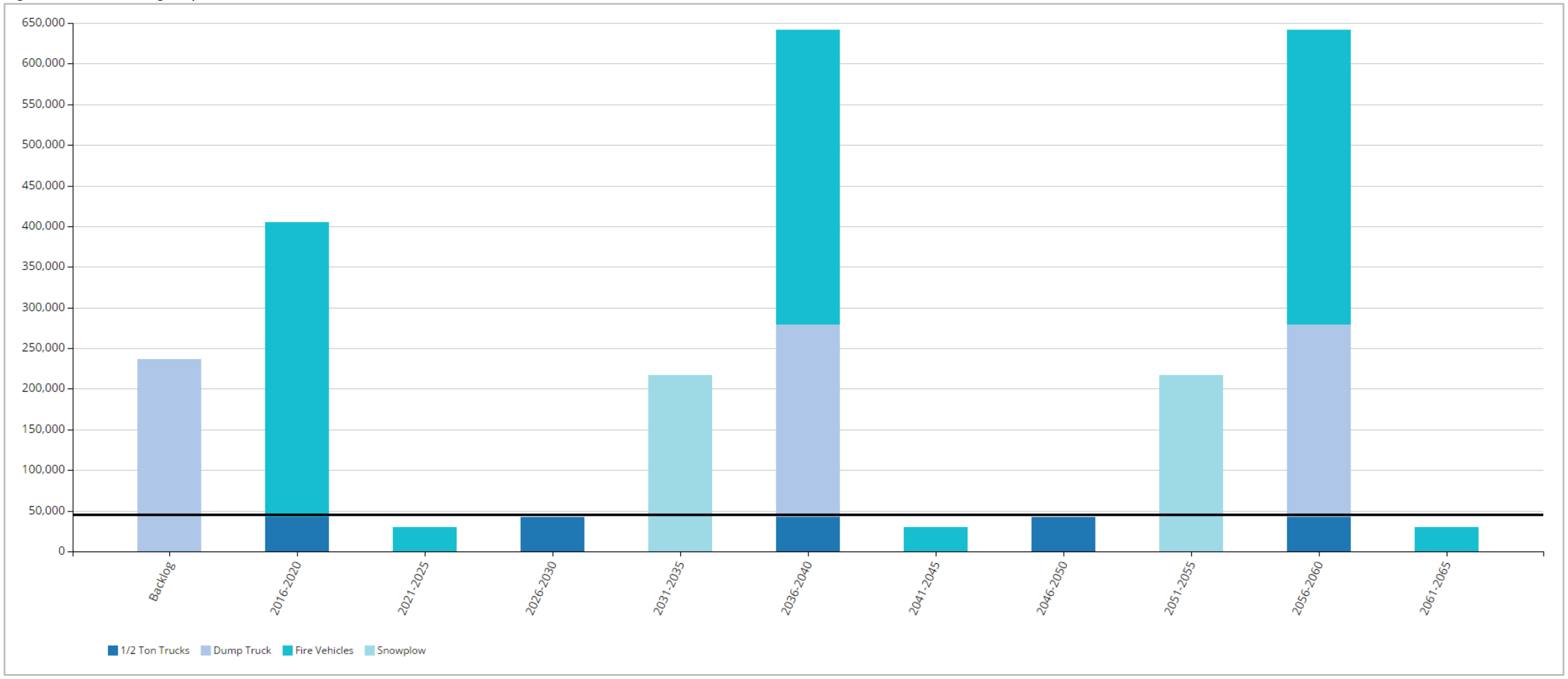


Age-based data shows that 75% of assets, at a valuation of over $670,000 are in poor to very poor condition, while 24% are in very good condition.

6.5 Forecasting Replacement Needs

In this section, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for the township's vehicle 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 40 Forecasting Replacement Needs – Vehicles



In addition to an age-based backlog of $237,000, replacement needs will total $405,000 over the next five years. An additional $30,000 will be required between 2021-2025. The township's annual requirements (indicated by the black line) for its vehicles total $47,000. At this funding level, the township is 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 not allocating any funding towards this asset category. See the 'Financial Strategy' section for achieving a more optimal and sustainable funding level. Further, while fulfilling the annual requirements will position the township to meet its future replacement needs, injection of additional revenues will be needed to mitigate existing infrastructure backlogs.

6.6 Recommendations – Vehicles

- A preventative maintenance and life cycle assessment program should be established for the 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 not funding any portion 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; underpromise 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 Township of Whitby's *Guide to Developing Service Area Asset Management Plans*.

Table 12 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.

While the above categories provide broad strategic direction to council and staff, specific and measurable KPIs related to each LOS category are needed to ensure the township remains steadfast in its pursuit of delivering the highest value for money to various internal and external stakeholders.

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 13 Key Performance Indicators – Road Network and Bridges & Culverts

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related to right-of-way)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Cost per capita for roads, and bridges & culverts • Maintenance cost per square metre • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Overall Bridge Condition Index (BCI) as a percentage of desired BCI • Percentage of road network rehabilitated/reconstructed • Percentage of paved road lane km rated as poor to very poor • Percentage of bridges and large culverts rated as poor to very poor • Percentage of asset class value spent on O&M • Percentage of signage that pass reflectivity test. The remaining should be replaced
Operational Indicators	• Percentage of roads inspected within the last five years • Percentage of bridges and large culverts inspected within the last two years • Operating costs for paved lane per km • Operating costs for bridge and large culverts per square metre • Percentage of customer requests with a 24-hour response rate

Table 14 Key Performance Indicators – Buildings

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives (related buildings and facilities)
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Revenue required to meet growth related demand • Repair and maintenance costs per square metre • Energy, utility and water cost per square metre
Tactical	• Percentage of component value replaced • Overall facility condition index as a percentage of desired condition index • Annual adjustment in condition indexes • Annual percentage of new facilities (square metre) • Percent of facilities rated poor or critical • Percentage of facilities replacement value spent on operations and maintenance Increase facility utilization rate by [x] percent by 2020. • $Utilization\ Rate = \frac{Occupied\ Space}{Facility\ Usable\ Area}$
Operational Indicators	• [x] sq.ft. of facilities per full-time employee (or equivalent), i.e., maintenance staff • Percentage of facilities inspected within the last five years • Number/type of service requests • Percentage of customer requests responded to within 24 hours

Table 15 Key Performance Indicators – Vehicles

Level	KPI (Reported Annually)
Strategic	• Percentage of total reinvestment compared to asset replacement value • Completion of strategic plan objectives
Financial Indicators	• Annual revenues compared to annual expenditures • Annual replacement value depreciation compared to annual expenditures • Revenue required to maintain annual network growth • Total cost of borrowing vs. total cost of service
Tactical	• Percentage of all fleet replaced • Average age of fleet • Percent of fleet rated poor or critical • Percentage of fleet replacement value spent on operations and maintenance
Operational Indicators	• Average downtime per fleet category • Average utilization per fleet category and/or each vehicle • Ratio of preventative maintenance repairs vs. reactive repairs • Percent of fleet that received preventative maintenance • Number/type of service requests • Percentage of customer requests responded to within 24 hours

3. Future Performance

In addition to the financial capacity, and legislative requirements, e.g., *Safe Drinking Water Act*, the Minimum Maintenance Standards for municipal highways, building codes and the *Accessibility for Ontarians with Disability Act*, many factors, internal and external, can influence the establishment of LOS and their associated KPIs, both target and actual, including the township's overarching mission as an organization, the current state of its infrastructure, and the township's financial capacity.

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 service 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 opinions and insights regarding the levels of service a particular asset 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 facilitate any planned growth in infrastructure services.

Demographic Changes
The type of residents that dominate a township can also serve as infrastructure demand drivers, 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

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

The asset management strategy will develop an implementation process that can be applied to the needs identification and prioritization of renewal, rehabilitation, and maintenance activities. This will assist in the production of a 10-year 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 life cycle interventions required; and prioritization techniques, including risk, to determine which priority projects should move forward into the budget first.

1. Non-Infrastructure Solutions & Requirements

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 clearer path of what is required to achieve sustainable infrastructure programs.

2. Condition Assessment Programs

The foundation of good 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 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 about an asset may lead to its premature 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 of an entire asset class, the cursory approach (metrics such as good, fair, poor, very poor) is used. This will be a less expensive approach when applied to thousands of assets, yet 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.

2.1 Pavement Network

Typical industry pavement inspections are performed by consulting firms using specialized assessment fleet equipped with various electronic sensors and data capture equipment. The fleet 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. The CityWide Works software has a road patrol component built in that could capture this type of inspection data during road patrols in the field, enabling later analysis of rehabilitation and replacement needs for budget development.

It is recommended that the township continue to its pavement condition assessment program on a regular basis 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

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 would be to have the structural engineer who performs the inspections to develop a maintenance requirements report, and rehabilitation and replacement requirements report as part of the overall assignment. In addition to refining 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 will be developed for the township's bridges.

2.3 Buildings

The most popular and practical type of buildings and facility 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, mathematical modeling, or a combination of both. But the most accurate way of determining the condition requires a walk-through to collect baseline data. The following asset classifications are typically inspected:

- **Site Components** – property around the facility and includes the 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 type of 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 facilities condition assessment program on a regular basis and expand it to include all buildings assets. Also, a portion of capital funding should be dedicated to this.

2.4 Vehicles

The typical approach to optimizing the maintenance expenditures of a corporate fleet is through routine vehicle inspections, routine vehicle servicing, and an established routine preventative maintenance program. Most, if not all, makes and models of fleet 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 good vehicle 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 fleet and 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 further and 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 vehicle assets and that a software application is utilized for the overall management of the program.

2.6 Parks and open spaces

CSA standards provide guidance on the process and protocols in regards to the inspection of parks and their associated assets, e.g., play spaces and equipment. The park inspection will involve qualified groups of trained industry professionals (operational staff or landscape architects) performing an analysis of the condition of a group of Parks and their components. The most accurate way of determining the condition requires a walk-through to collect baseline data. The following key asset classifications are typically inspected:

- **Physical Site Components –** physical components on the site of the park such as: fences, utilities, stairways, walkways, parking lots, irrigation systems, monuments, fountains.
- **Recreation Components –** physical components such as: playgrounds, bleachers, back stops, splash pads, and benches.
- **Land Site Components** – land components on the site of the park such as: landscaping, sports fields, trails, natural areas, and associated drainage systems.
- **Minor Park Facilities –** small facilities within the park site such as: sun shelters, washrooms, concession stands, change rooms, storage sheds.

It is recommended that the township establish a parks condition assessment program and that a portion of capital funding is dedicated to this.

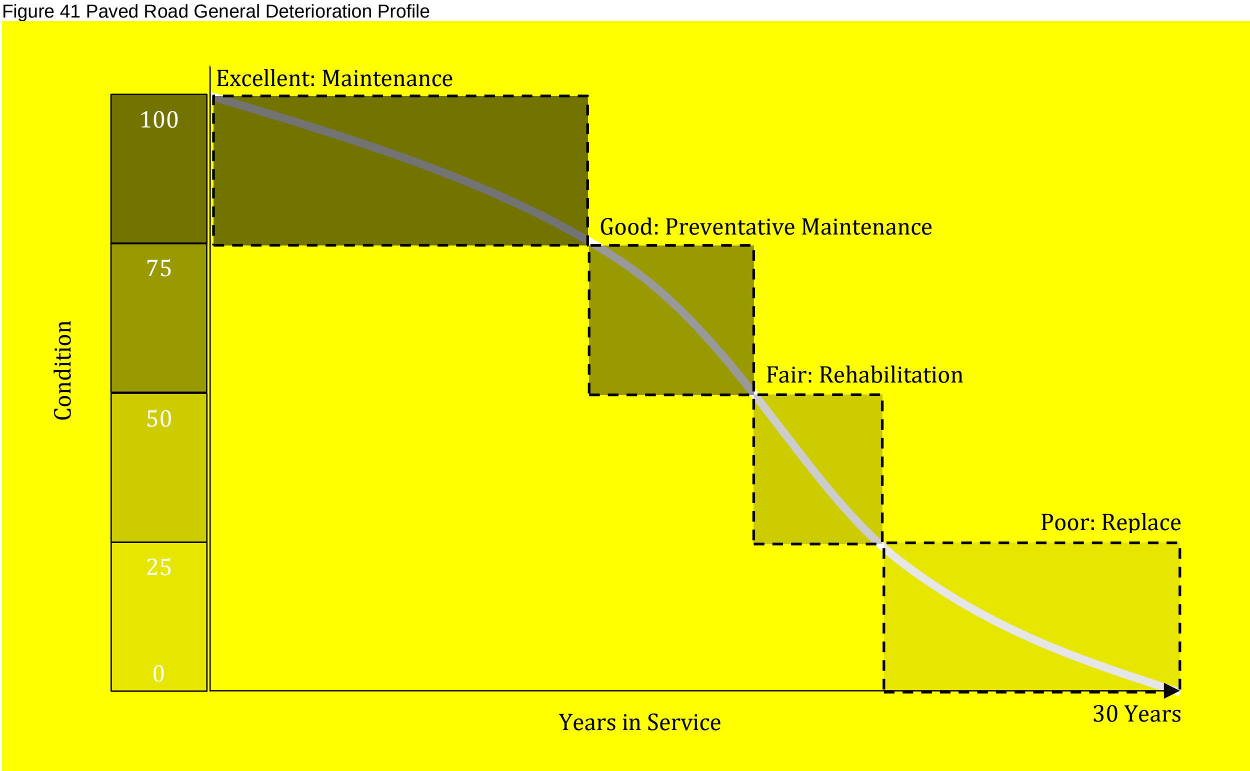
3. Life Cycle Analysis Framework

An industry review was conducted to determine which life cycle 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 could 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 input 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 41 Paved Road General Deterioration Profile



As shown above, during the road's life cycle 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 – Paved Roads

Condition	Condition Range	Work Activity
Excellent (Maintenance only phase)	100-76	• Maintenance only
Good (Preventative maintenance phase)	75 - 51	• Crack sealing • Emulsions
Fair (Rehabilitation phase)	50 -26	• Resurface - mill & pave • Resurface - asphalt overlay • Single & double surface treatment (for rural roads)
Poor (Reconstruction phase)	25 - 1	• Reconstruct - pulverize and pave • Reconstruct - full surface and base reconstruction
Critical (Reconstruction phase)	0	• 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 threshold and condition ranges can be easily 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 life cycle 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 would be to have 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

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/legislative requirements, energy conservation programs and upgrades, customer complaints and health and safety concerns, and also 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

The best approach to develop a 10-year needs list for the township's fleet and vehicle portfolio would first be through a defined preventative maintenance program, and secondly, through an optimized life cycle vehicle replacement schedule. The preventative maintenance program would serve to determine budget requirements for operating and minor capital expenditures for part renewal and major refurbishments and rehabilitations. An optimized vehicle replacement program will ensure a vehicle 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 fleet industry in regards to vehicle life cycles 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 fleet management that should also be examined in further detail as part of the long-term management plan, such as fleet utilization and incorporating green fleet, etc. It is recommended that the township establish a prioritization framework for the fleet asset class that incorporates the key components outlined above.

4. Growth and Demand

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 2011 census, the population of Conmee grew 3.2% from 2006 to reach 764.

In conjunction with raw population growth, the type of shift in demographics can also dictate how the township should allocate its infrastructure investments. As the demographics change and the township assumes responsibility of new infrastructure, the level of strain on various critical and supplementary infrastructure services will shift to reflect the needs of the residents. Some services, e.g., open spaces, are particularly vulnerable to the dual stress of overuse and underfunding.

5. Project Prioritization and Risk Management

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

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 piece 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.

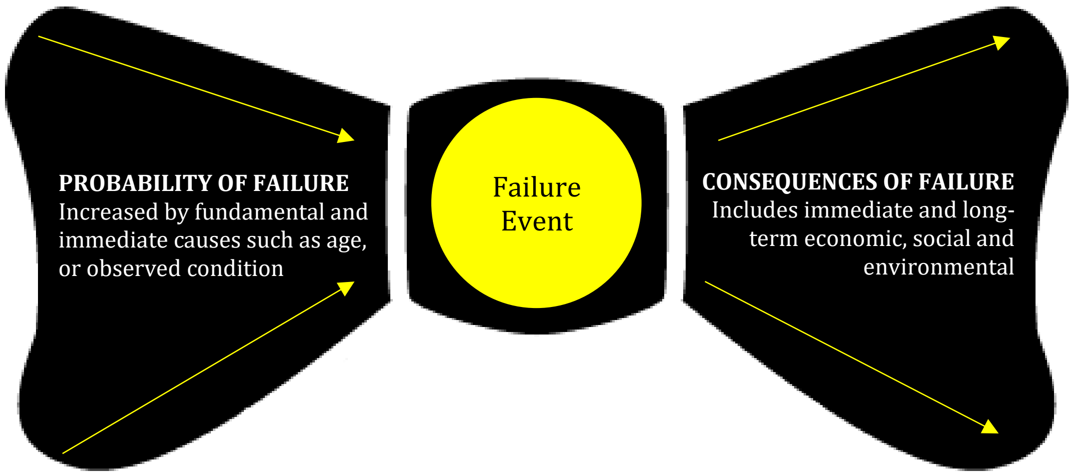
Risk mitigation is traditionally thought of in terms of safety and liability factors. In asset management, the definition of risk should heavily emphasize these factors but should be expanded to consider the risks to the township's ability to deliver targeted levels of service

- 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 below. 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. The following diagram (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 42 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 Probabilitiy 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 their material types, classifications (or other attributes). Asset classes for which replacement cost is used include: bridges & culverts, buildings, land improvements, 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 higher risk scoring.

For roads, asset attributes will be used based on their impact on service delivery. Therefore, scoring for roads is based on classification as this reflects the traffic volumes and number of people affected.

Table 18 Consequence of Failure – Roads

Road Classification	Consequence of failure
Gravel (all)	Score of 3

Table 19 Consequence of Failure – Bridges & Culverts

Replacement Value	Consequence of failure
Up to $50k	Score of 1
$51 to $100k	Score of 2
$101 to $150k	Score of 3
$151 to $200k	Score of 4
$200k and over	Score of 5

Table 20 Consequence of Failure – Buildings

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$11k to $30k	Score of 2
$31k to $100k	Score of 3
$101k to $200k	Score of 4
Over $200k	Score of 5

Table 21 Consequence of Failure – Machinery & Equipment

Replacement Value	Consequence of failure
Up to $5k	Score of 1
$6k to $10k	Score of 2
$11k to $20k	Score of 3
$21k to $60k	Score of 4
Over $60k	Score of 5

Table 22 Consequence of Failure – Land Improvements

Replacement Value	Consequence of failure
Up to $10k	Score of 1
$10k to $20k	Score of 2
$21k to $30k	Score of 3
$31k to $50k	Score of 4
Over $50k	Score of 5

Table 23 Consequence of Failure – Vehicles

Replacement Value	Consequence of failure
Up to $25k	Score of 1
$26k to $60k	Score of 2
$61k to $100k	Score of 3
$101k 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 43 Distribution of Assets Based on Risk – All Asset Classes

Consequence	1	2	3	4	5
5	5 Assets 6 unit(s) $1,244,859	3 Assets 3 unit(s) $431,921	0 Assets - $0	0 Assets - $0	4 Assets 4 unit(s) $676,050
4	4 Assets 5 unit(s) $445,450	4 Assets 3 unit(s) $116,402	1 Assets 1 unit(s) $129,298	0 Assets - $0	2 Assets 2 unit(s) $170,836
3	5 Assets 7 unit(s), km $324,685	14 Assets 22 unit(s), km $1,146,340	22 Assets 37 unit(s), km $1,898,387	9 Assets 13 unit(s), km $772,466	58 Assets 55 unit(s), km $2,079,427
2	3 Assets 2 unit(s) $54,807	4 Assets 5 unit(s) $105,599	1 Assets 1 unit(s) $10,492	2 Assets 2 unit(s) $38,689	4 Assets 4 unit(s) $78,122
1	1 Assets 1 unit(s) $8,367	3 Assets 2 unit(s) $9,759	3 Assets 3 unit(s) $11,114	3 Assets 3 unit(s) $72,310	2 Assets 2 unit(s) $6,724

Probability

Figure 44 Distribution of Assets Based on Risk – Road Network

Consequence	1	2	3	4	5
5	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	3 Assets 4.60 km $242,105.27	11 Assets 18.40 km $968,421.07	21 Assets 35.70 km $1,878,947.39	7 Assets 11.90 unit(s), km $702,167.64	56 Assets 53.03 unit(s), km $1,963,446.85
2	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00

Probability

Figure 45 Distribution of Assets Based on Risk – Bridges & Culverts

Consequence	1	2	3	4	5
5	2 Assets 3.00 unit(s) $469,808.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	1 Assets 2.00 unit(s) $110,926.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
2	0 Assets - $0.00	1 Assets 2.00 unit(s) $77,855.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $70,892.00	0 Assets - $0.00
	1	2	3	4	5

Probability

Figure 46 Distribution of Assets Based on Risk – Buildings

Consequence	1	2	3	4	5
5	2 Assets 2.00 unit(s) $716,386.00	1 Assets 1.00 unit(s) $277,848.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	1 Assets 2.00 unit(s) $152,170.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $129,298.00	0 Assets - $0.00	0 Assets - $0.00
3	2 Assets 2.00 unit(s) $82,580.00	1 Assets 1.00 unit(s) $55,485.00	0 Assets - $0.00	1 Assets - unit(s) $57,952.00	0 Assets - $0.00
2	3 Assets 2.00 unit(s) $54,807.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $22,579.00
1	1 Assets 1.00 unit(s) $8,367.00	1 Assets - unit(s) $7,884.00	1 Assets 1.00 unit(s) $9,133.00	0 Assets - $0.00	0 Assets - $0.00
	1	2	3	4	5

Probability

Figure 47 Distribution of Assets Based on Risk – Land Improvements

Consequence \ Probability	1	2	3	4	5
5	1 Assets 1.00 unit(s) $58,665.00	1 Assets 1.00 unit(s) $58,082.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
4	2 Assets 2.00 unit(s) $76,583.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00
3	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $21,555.00
2	0 Assets - $0.00	1 Assets 1.00 unit(s) $10,920.00	1 Assets 1.00 unit(s) $10,492.00	0 Assets - $0.00	0 Assets - $0.00
1	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00	0 Assets - $0.00

Figure 48 Distribution of Assets Based on Risk – Machinery & Equipment

Consequence \ Probability	1	2	3	4	5
5	0 Assets - $0.00	1 Assets 1.00 unit(s) $95,991.00	0 Assets - $0.00	0 Assets - $0.00	3 Assets 3.00 unit(s) $313,340.00
4	1 Assets - unit(s) $20,054.00	3 Assets 3.00 unit(s) $96,348.00	0 Assets - $0.00	0 Assets - $0.00	1 Assets 1.00 unit(s) $28,561.00
3	1 Assets 1.00 unit(s) $11,508.00	0 Assets - $0.00	2 Assets 2.00 unit(s) $31,786.00	0 Assets - $0.00	0 Assets - $0.00
2	0 Assets - $0.00	2 Assets 2.00 unit(s) $16,824.00	1 Assets 1.00 unit(s) $8,666.00	1 Assets 1.00 unit(s) $7,602.00	1 Assets 1.00 unit(s) $5,519.00
1	1 Assets 1.00 unit(s) $597.00	2 Assets 2.00 unit(s) $2,376.00	1 Assets 1.00 unit(s) $883.00	2 Assets 2.00 unit(s) $4,434.00	1 Assets 1.00 unit(s) $3,708.00

Figure 49 Distribution of Assets Based on Risk – Vehicles

IX. Financial Strategy

1. General Overview

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 50 Cost Elements

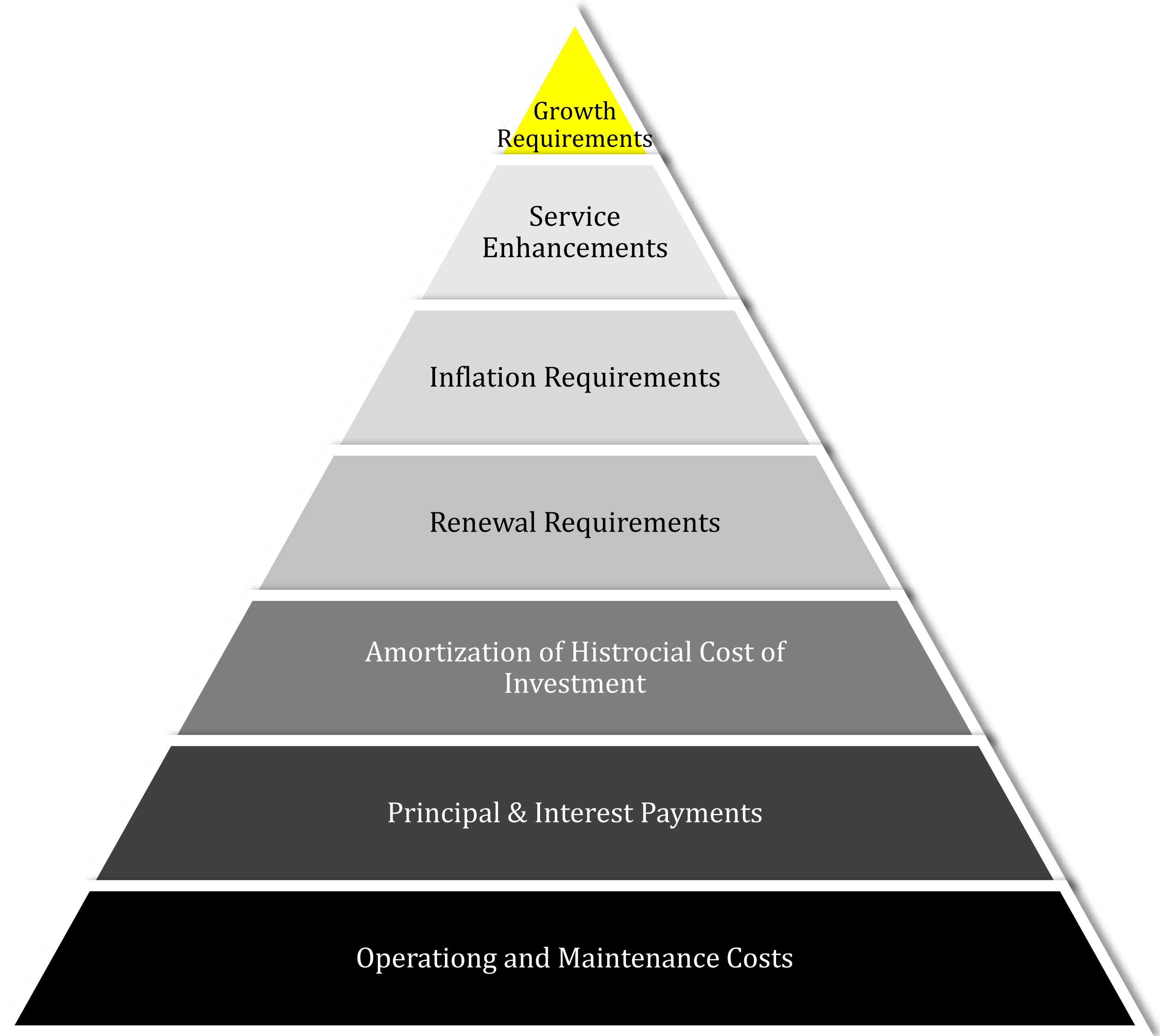


Figure 50 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices. Municipalities meeting their operational and maintenance needs, and debt obligations are funding only their cash cost. Funding at this level is severely deficient 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

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 tax-funded assets: road network; bridges & culverts; buildings; machinery & equipment; vehicles; and land improvement. 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 24 and Table 25 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 24 Infrastructure Requirements and Current Funding Available

Asset class	Average Annual Investment Required	Total Funding Available in 2016					Annual Deficit/Surplus
		Taxes	Gas Tax	OCIF	Taxes to Reserves	Total Funding Available	
Bridges & Culverts	13,000	0	0	9,000	0	9,000	4,000
Buildings	31,000	0	0	16,000	0	16,000	15,000
Land Improvements	12,000	0	0	0	0	0	12,000
Machinery & Equipment	44,000	0	0	0	0	0	44,000
Road Network	290,000	0	47,000	0	0	47,000	243,000
Vehicles	47,000	0	0	0	0	0	47,000
Total	437,000	0	47,000	25,000	0	72,000	365,000

Note, as described in Section VI – 1. Roads Network above, the townships roads are gravel and therefore the average annual investment mentioned refers to the rehabilitation cost for the gravel roads. This cost is included within this financial strategy to ensure the township is considering all major expenses within its financial plan.

2.3 Recommendations for Full Funding

The average annual investment requirement for the above categories is $437,000. Annual revenue currently allocated to these assets for capital purposes is $72,000 leaving an annual deficit of $365,000. To put it another way, these infrastructure categories are currently funded at 16% of their long-term requirements.

In 2016, Conmee has annual tax revenues of $732,000. As illustrated in Table 25, without consideration of any other sources of revenue, full funding would require the following tax change over time:

Table 25 Tax Change Required for Full Funding

Asset class	Tax Change Required for Full Funding
Bridges & Culverts	0.5%
Buildings	2.0%
Land Improvements	1.6%
Machinery & Equipment	6.0%
Road Network	33.2%
Vehicles	6.4%
Total	49.7%

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

- Conmee's formula based OCIF grant is scheduled to grow from $25,000 in 2016 to $50,000 in 2019.
- Normally our recommendations include allocating any decrease in debt costs to the infrastructure deficit. As illustrated in Table 29, Conmee has no debt on these asset categories so this option is not available

Our recommendations include capturing the above changes and allocating them to the infrastructure deficit. Table 26 outlines this concept and presents a number of options.

Table 26 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	365,000	365,000	365,000	365,000	365,000	365,000	365,000	365,000
Change in OCIF Grant	N/A	N/A	N/A	N/A	-25,000	-25,000	-25,000	-25,000
Changes in Debt Costs	N/A	N/A	N/A	N/A	0	0	0	0
Resulting Infrastructure Deficit	365,000	365,000	365,000	365,000	340,000	340,000	340,000	340,000
Resulting Tax Increase Required:								
Total Over Time	**49.7%**	**49.7%**	**49.7%**	**49.7%**	**46.4%**	**46.4%**	**46.4%**	**46.4%**
Annually	10.0%	5.0%	3.3%	2.5%	9.3%	4.6%	3.1%	2.3%

Considering all of the above information, we recommend the 20-year option that includes capturing the changes. This involves full funding being achieved over 20 years by:

- increasing tax revenues by 2.3% each year for the next 20 years solely for the purpose of phasing in full funding to the asset categories covered in this section of the AMP.
- allocating the current gas tax and OCIF revenue as outlined in Table 24.
- allocating the scheduled OCIF grant increases to the infrastructure deficit as they occur.
- increasing existing and future infrastructure budgets by the applicable inflation index on an annual basis in addition to the deficit phase-in.

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 20 years and provides financial sustainability over the period modeled, the recommendations do require prioritizing capital projects to fit the resulting annual funding available. Current data shows a pent-up investment demand of $1,899,000 for paved roads, $0 for bridges & culverts, $89,000 for machinery & equipment, $0 for facilities, $22,000 for land improvements and $237,000 for vehicles. 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 27 outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[5] 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.

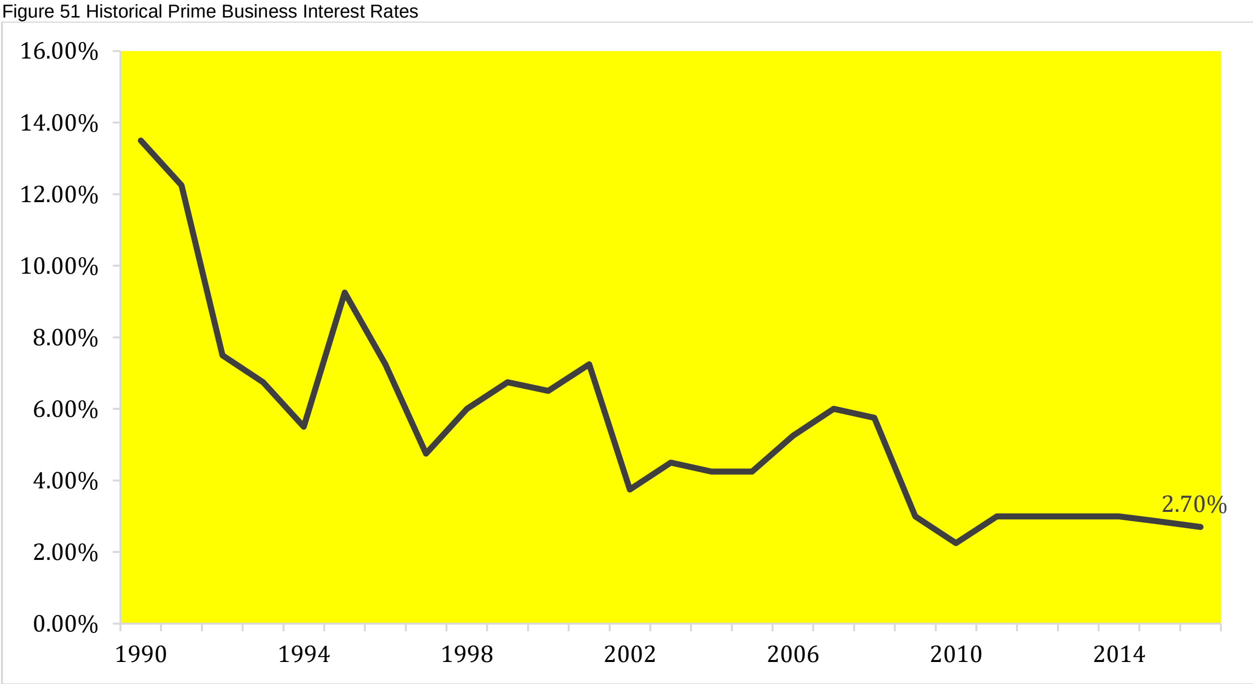
Table 27 Total Interest Paid as a Percentage of Project Costs

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%

[5] Current municipal Infrastructure Ontario rates for 15 year money is 3.2%.

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 51 Historical Prime Business Interest Rates



As illustrated in Table 27, 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 28 and Table 29 outline how Conmee has historically used debt for investing in the asset categories as listed. There is currently $0 of debt outstanding for the assets covered by this AMP with corresponding principal and interest payments of $0. Conmee's provincially prescribed maximum debt payment limit is $185,000.

Table 28 Overview of Use of Debt

Asset class	Debt at December 31st, 2015	Use of Debt in Last Five Years				
		2011	2012	2013	2014	2015
Bridges & Culverts	0	0	0	0	0	0
Buildings	0	0	0	0	0	0
Land Improvements	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0
Road Network	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0
Total	0	0	0	0	0	0

Table 29 Overview of Debt Costs

Asset class	Principal & Interest Payments in Next Ten Years						
	2016	2017	2018	2019	2020	2021	2026
Bridges & Culverts	0	0	0	0	0	0	0
Buildings	0	0	0	0	0	0	0
Land Improvements	0	0	0	0	0	0	0
Machinery & Equipment	0	0	0	0	0	0	0
Road Network	0	0	0	0	0	0	0
Vehicles	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

The revenue options outlined in this plan allow Conmee 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 asset 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 30 outlines the details of the reserves currently available to Conmee. As illustrated, Conmee has no reserves available for these asset categories

Table 30 Summary of Reserves Available

Asset class	Balance at December 31st, 2015
Bridges & Culverts	0
Buildings	0
Land Improvements	0
Machinery & Equipment	0
Road Network	0
Vehicles	0
Total Tax Funded	0

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.

Although there are no reserves available for use by applicable asset classes during the phase-in period to full funding, Conmee's debt capacity means that if required, debt can be used for high priority and emergency infrastructure investments in the short to medium-term.

5.2 Recommendation

As Conmee 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. 2016 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 31 2016 Infrastructure Report Card

<table>
<tr><th>Asset class</th><th>Asset Health Grade</th><th>Funding Percentage</th><th>Financial Capacity Grade</th><th>Average Asset class Grade</th><th>Comments</th></tr>
<tr><td>Road Network</td><td>D</td><td>16%</td><td>F</td><td>F</td><td rowspan="9">Based on 2016 replacement cost, and a combination of assessed and age-based data, nearly 40% of assets, with a valuation of $3.9 million, are in good to very good condition; an additional 40% are in poor to very poor condition.

The township is underfunding its assets. Average asset funding is 16% for all asset categories.</td></tr>
<tr><td>Bridges & Culverts</td><td>B</td><td>69%</td><td>C</td><td>C</td></tr>
<tr><td>Buildings</td><td>B</td><td>52%</td><td>D</td><td>C</td></tr>
<tr><td>Machinery & Equipment</td><td>D</td><td>0%</td><td>F</td><td>F</td></tr>
<tr><td>Land Improvements</td><td>B</td><td>0%</td><td>F</td><td>D</td></tr>
<tr><td>Vehicles</td><td>D</td><td>0%</td><td>F</td><td>F</td></tr>
<tr><td colspan="3">Average Asset Health Grade</td><td colspan="2">D</td></tr>
<tr><td colspan="3">Average Financial Capacity Grade</td><td colspan="2">F</td></tr>
<tr><td colspan="3">Overall Grade for the Township</td><td colspan="2">F</td></tr>
</table>

XI. Appendix: Grading and Conversion Scales

Table 32 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 33 Financial Capacity Scale

Letter Grade	Rating	Funding percent	Timing Requirements	Description
A	Excellent	90-100 percent	☑ Short Term ☑Medium Term ☑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	☑Short Term ☑Medium Term ☒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	☑Short Term ☒Medium Term ☒Long Term	The township is underpreparing 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	☒/☑ Short Term ☒Medium Term ☒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	☒Short Term ☒Medium Term ☒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.