Town of Whitby

Service Area Asset Management Plan

Road Right-of-Way

DECEMBER 2017

ASSET HEALTH GRADE

B

FINANCIAL CAPACITY GRADE

D

KEY PERFORMANCE INDICATOR

↓

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Executive Summary

Infrastructure is directly linked to the economic, social and environmental advancement of a community. Municipalities own and manage nearly 60% of the public infrastructure stock in Canada.

The Town of Whitby's infrastructure portfolio comprises seven distinct Service Areas: Road Right-of-Way (ROW), Facilities, Fire, Municipal Information Systems (MIS) Equipment, Parks, Library Resource and Fleet. Together, these assets have a total valuation of approximately $2 billion, with ROW comprising $1.47 billion of this portfolio.

Strategic asset management is critical in extracting the highest total value from public assets at the lowest lifecycle cost. In this regard, the Town of Whitby has developed a Service Area Asset Management Plan (SAAMP) for each of its seven asset categories. This SAAMP details the state of infrastructure of the Town's ROW Service Area and provides asset management and financial strategies designed to facilitate the Town's pursuit of developing an advanced asset management program and mitigate long-term funding gaps.

The Town has provided observed condition data for ROW assets. Based on replacement cost, 84%, of Whitby's ROW assets, with a valuation of more than $1.23 billion, are in good to very good condition. 5.1% of the Town of Whitby's assets are in poor to very poor condition. As such, an Overall Asset Health Grade of 'A' has been assigned to the municipality for its ROW assets.

The Asset Health Grade is a snapshot in time (December 31, 2016) – and does not look at future asset assumptions or future funding needs to continue to adequately maintain our assets. It is also important to note that the Asset Health Grade is an average of all the Service Area's assets, and some individual assets have a condition higher or lower than what the average grade indicates.

While current asset health is an imperative indicator of the Town's asset management maturity, equally important is the municipality's ability to fund the long-term replacement needs of each of its asset classes. The average annual investment requirement for Whitby's ROW assets total $23,841,300. Total annual revenue currently allocated to these assets for capital purposes is $14,909,700, leaving an annual deficit of $6,094,260. To put it another way, Whitby's ROW assets are currently funded at 60% of their long-term requirements. As a result, the municipality received a 'C' for its financial sustainability grade.

At this level of funding, the municipality is underprepared for its medium-term and long-term infrastructure needs. As a result, replacement for assets in the medium-term will likely be deferred to future years. Funding at or above 70% of its annual infrastructure needs will position the municipality to meet is short-term and medium-term requirements.

Whitby currently has in place a robust condition assessment program and detailed condition rating scales for its ROW classes. This is a vital component of a sustainable

asset management program, and we recommend its continuation with a portion of capital funding dedicated to the initiative. Establishment of a risk prioritization framework will further augment the Town's ability to prioritize future projects related to ROW, and more optimally allocate available funding. The Town should review on an annual basis its levels of service (LOS) and condition-related key performance indicators (KPIs). The LOS and KPIs should reflect the short- and long-term demand that will be placed on the infrastructure. This is the Town's second SAAMP for its ROW assets. The Town should continue to update this report on an annual basis.

This SAAMP is a living document and will continually be updated and built upon. To ensure that future versions are meaningful documents that support the Town's ability to continue to build a strong asset management program, the following items are recommended:

1. The municipality continue its robust ROW condition assessment program and that a portion of capital funding is dedicated to this. Research should be conducted to investigate available preventative maintenance techniques with pilot projects to test their effectiveness.
2. The Town should update this SAAMP on an annual basis.
3. The Town should undertake the development of a long-term financial strategy.
4. The Town should undertake the growth projections via the Development Charges Study.
5. The Town should investigate and develop other rehabilitation strategies.

1. Introduction

Ontario's municipalities own more of the province's infrastructure assets than both the provincial and federal government combined. Across Canada, the municipal share of public infrastructure increased from 22% in 1955 to nearly 60% in 2013.

Figure 1-1 Distribution of Net Stock of Core Public Infrastructure
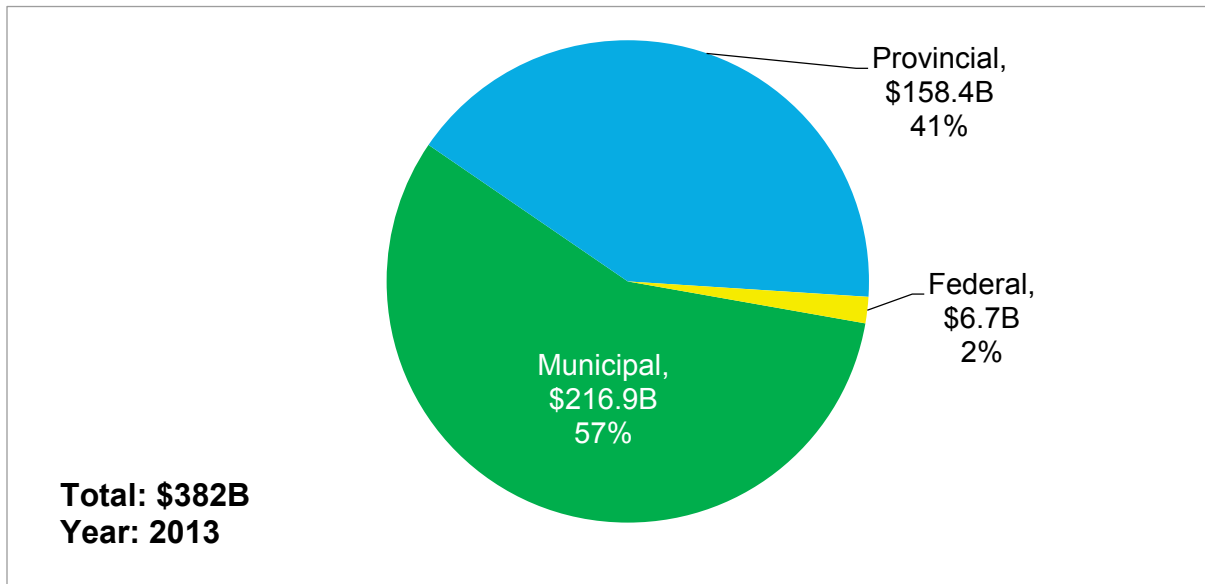
The asset portfolios managed by Ontario's municipalities are also highly diverse. The Town of Whitby owns approximately $2 billion of these public assets in seven distinct Service Areas:

1. Road Right-of-Way (ROW)
2. Fleet
3. Fire
4. Municipal Information Systems (MIS) Equipment
5. Parks
6. Library Resources
7. Fleet

Figure 1-2 illustrates the breakdown of the Town's asset portfolio by Service Area.

Figure 1-2 Asset Portfolio by Service Area – Based on 2015 Replacement Value

Fire $4.1 M

MIS Equipment $2.9 M

Library Resources $10.7 M

Fleet $34.7 M

Parks $70.1 M

Facilities $366.2 M

Roads $1,471.5 M

Roads Base $744.7 M

Storm Water Management $194.8 M

Roads Surfaces - HCB-4 $144.1 M

Sidewalks & Multi-Use Paths $99.2 M

Bridges & Culverts $93.2 M

Roads Surfaces - HCB-3 $80.5 M

Street Trees $47.6 M

Street Lights $23.7 M

Roadside Appurtenances $18.8 M

Roads Surfaces - HCB-1/2 $14.1 M

Roads Surfaces - LCB $5.5 M

Parking $5.3 M

Total $1,959.9 M

Whitby 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 Town manage these assets by making the right decisions, at the right time, for the right reasons, and for the right costs.

This Service Area Asset Management Plan (SAAMP), one of seven components of an overarching Municipal Asset Management Plan (MAMP), will assist the municipality in this pursuit of judicious asset management for its ROW assets.

1.1 What is Asset Management?

Asset Management (AM) can be best defined as an integrated business approach within an organization that minimizes the lifecycle costs of owning, operating, and maintaining assets, at an acceptable level of risk, while continuously delivering expected levels of service for present and future customers.

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

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

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

1.2 Goals of the Municipality

The 2014-18 Goals of Whitby Council lists specific objectives that contribute to the vision of an inclusive, thriving and sustainable community. Asset Management is related to four of the goals:

   To continue the Whitby tradition of responsible financial management and respect
      for taxpayers; and to understand the importance of affordability to a healthy,
      balanced community.
   To ensure Whitby is clearly seen by all stakeholders to be business- and investment-
      friendly and supportive; and to strive to continuously improve the effectiveness
      and efficiency of service delivery.
   To remain the community of choice for families and become the community of
      choice for seniors and job creators; and to focus new growth around the
      principles of strong, walkable and complete neighbourhoods that offer mobility
      choices.

Achievement of these objectives depends on a wide range of assets that support the Town's services, including transportation, parking, solid waste collections, fire protection, parks, recreation and culture. Delivery of these services depends on the availability of suitable and reliable infrastructure assets. Maintaining, renewing, expanding and disposing of these assets can be costly, so it is essential to understand what level of service is required by the community, and how different asset maintenance and capital improvement strategies will impact the service delivered.

Through increased understanding of how infrastructure assets and management of those assets affects its services, the Town will be able to more efficiently deliver services and achieve its vision of being a 'Community of Choice'.

1.3   Asset Management Vision

The Town of Whitby's Asset Management vision is: *Providing the framework for responsibly managing all Town owned infrastructure.*

1.3.1 Asset Management Objectives

The Town works as a collaborative team to comprehensively and consistently undertake the following objectives for all Town owned assets. These asset management objectives help to inform the implementation of the Town's asset management vision:

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 categories through risk and prioritization strategies.

Sustainable Financing: Identify sustainable Financing Strategies for all asset categories.

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.

1.4   Purpose of the SAAMP

This SAAMP is one component of the Town of Whitby's overarching Municipal Asset Management Plan (MAMP) and was developed to support the Town's strategic vision for its asset management practice and programs. It provides key asset attribute data, including current composition, inventory, useful life etc., summarizes the physical health of the capital assets in its ROW Service Area, assess the Town's current capital spending framework, and enumerates financial strategies to achieve infrastructure sustainability in the long-term and mitigate any funding gaps.

1.5 Contents of the SAAMP

This Service Area Asset Management Plan focuses on ROW, one of the seven Service Areas managed by the Town. For discussion, and analysis purposes, the ROW Service Area has been broken down into the following Primary Asset Categories:

1. Roads
2. Bridges & Culverts
3. Sidewalks & Multi-Use Paths
4. Parking
5. Roadside Appurtenances
6. Stormwater Management
7. Street Lights
8. Street Trees

Table 1-1 illustrates the core components included in this document.

Table 1-1 Contents of the SAAMP

#	Section Title	Description
1	Introduction	Explains how the goals of the municipality are dependent on infrastructure, and clarifies the relationship of the MAMP to municipal planning and financial documents.
2	State of Existing Infrastructure	Summarizes the asset hierarchy, inventory, valuation, age distribution and condition. Also discusses how and when information regarding the characteristics, value, and condition of assets will be updated.
3	Levels of Service	Defines levels of service through performance indicators and targets, and outlines current performance. Describes external trends or issues that may affect expected levels of service.
4	Asset Maintenance and Renewal Strategies	The asset maintenance and renewal strategies are the set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, and at the lowest life cycle cost.
5	Financial Plan	This section integrates asset management planning with financial planning and budgeting.
6	Recommendations	Provides a summary of the state of the infrastructure, current level of service, and recommended asset management and funding strategies. Also summarizes recommendations for monitoring achievement of the AM objectives and for continuous improvement of the MAMP in future updates.
	Appendix A	Provides a summary of analytical assumptions used in the AM Plan, including benchmark costs, asset service lives, capital growth, etc.

1.6   Growth and Demand

Growth is a critical infrastructure demand driver for most infrastructure services. As such, the municipality must not only account for the lifecycle cost for its existing asset portfolio, but those of any anticipated and forecasted capital projects associated specifically with growth. Whitby has experienced rapid population growth since 1980, and its infrastructure investments reflect this trend. The chart below shows how the population has evolved over time and the estimated growth increase for the next 15 years. While Whitby's population growth rate has decreased since the mid-2000s, the forecasts used by the municipality anticipate a second wave of rapid population increase, with an expected population of 193,000 by 2031, an increase of approximately 50% from its 2013 population of 130,145.

Figure 1-3 Whitby's Population and Infrastructure Trend
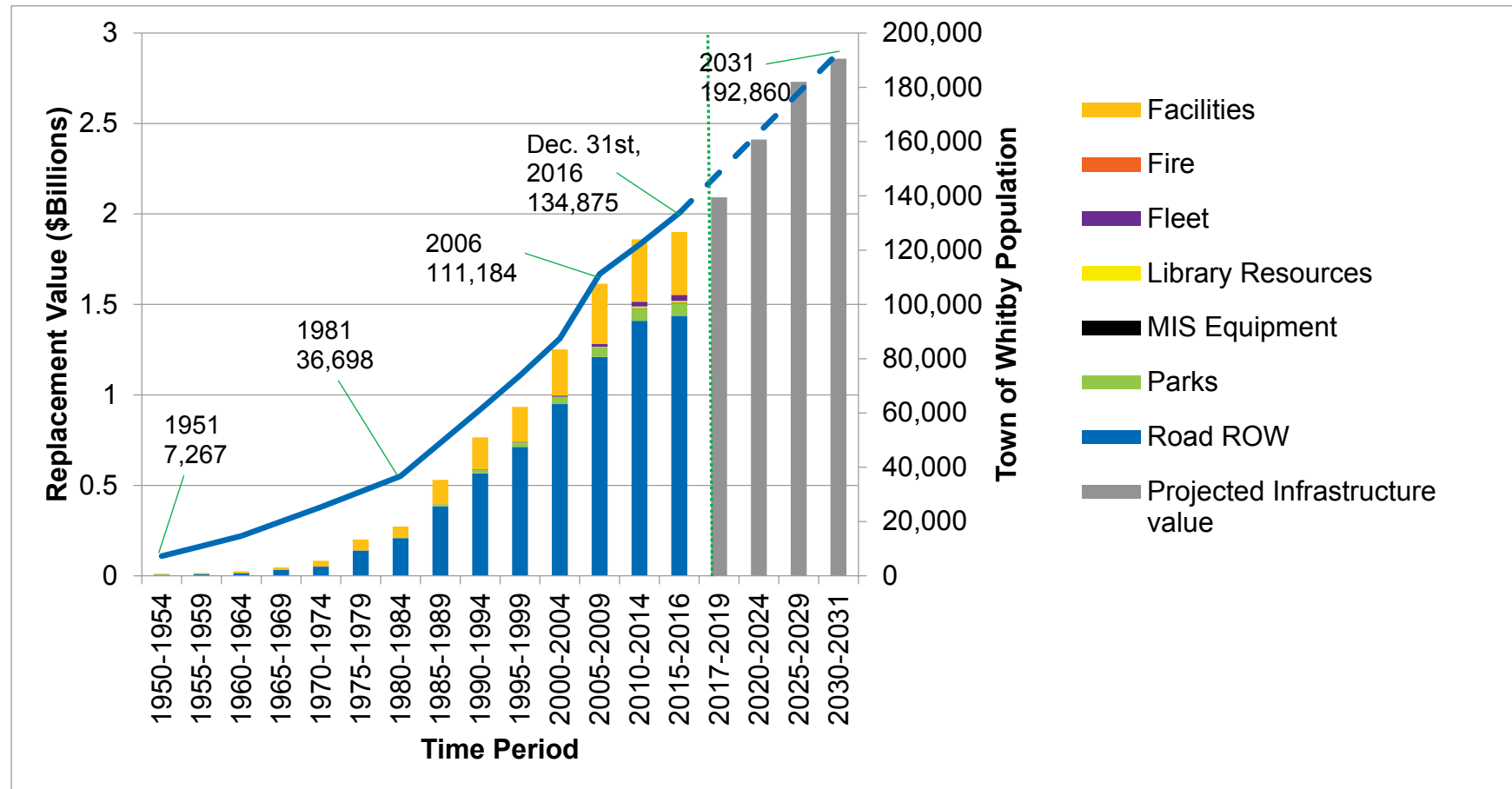
2. State of Local Infrastructure

In this section, we summarize key elements of the Town's ROW services portfolio. This includes a detailed outline of the Town's asset inventory and the condition of assets. When observed data was not available, we relied on the age of the assets to approximate their conditions.

2.1   Asset Hierarchy

The asset hierarchy illustrates the relationship of individual assets and their components to a wider, more expansive network and system, with the 'Town of Whitby' as Level 1 in the hierarchy. Each level provides greater detail.

Figure 2-1 Asset Hierarchy and Breakdown

Level 2 Service	Level 3 Asset Class	Level 4 Asset Type
Road Right-of Way	Roads	HCB 1,2,3 & 4
		LCB
		Gravel
	Bridges & Culverts	Road Bridges
		Ped. Bridges
		Culverts 3m +
		Culverts 0 to 3m
	Sidewalks & Multi-Use Paths	Sidewalks
		Multi-Use Paths
	Parking	Meters
		Kiosks
		Public Lots
	Roadside Appurtenances	Traffic Control Signs
		Information Signs
		Fences
		Guiderails
		Retaining Walls
	Stormwater Management	Stormwater Ponds
		Storm Sewers
		Major Channels
	Street Lights	
	Street Trees	

2.2 Asset Inventory

Whitby's ROW state of the infrastructure analysis includes the following asset clsses:

Roads
Bridges & Culverts
Sidewalks & Multi-Use Paths
Parking
Roadside Appurtenances
Stormwater Management
Street Lights
Street Trees

Table 2-1 details the Town's inventory for its ROW Service Area at the component level.

Table 2-1 Asset Inventory by Component - Roads

Asset Class	Asset Type	2010 Quantity	2015 Quantity	2016 Quantity
Roads	HCB 1	50 lane km	51 lane km	51 lane km
	HCB 2	37 lane km	29 lane km	29 lane km
	HCB 3	264 lane km	303 lane km	305 lane km
	HCB 4	593 lane km	573 lane km	576 lane km
	LCB	126 lane km	128 lane km	129 lane km
	Road Base	1,082 lane km	1,096 lane km	1,099 lane km
Bridges & Culverts	Road Bridges	23	23	22
	Culverts (3m+)	21	21	24
	Culverts (0 to 3m)	Unknown	2,179	2,179
	Pedestrian Bridges	20	20	20
Sidewalks & Multi-Use Paths	Sidewalks	497,100 m	499,765 m	509,980 m
	Multi-Use Paths	4,769 m	8,628 m	8,628 m
Parking	Public Lots - Surface	8 Lots	8 Lots	8 Lots
	Public Lots - Base	8 Lots	8 Lots	8 Lots
	Meters	281	281	281
	Kiosks	Unknown	10	10
Roadside Appurtenances	Traffic Control Signs	29	31	31
	Information Signs	Unknown	10,674	10,674
	Fences	26,301 m	30,032 m	30,032 m
	Guiderails	11,693 m	12,172 m	12,172 m
	Retaining Walls	2,663 m^2	2,732 m^2	2,732 m^2

Asset Class	Asset Type	2010 Quantity	2015 Quantity	2016 Quantity
Stormwater Management	Stormwater Ponds	39 Ponds	41 Ponds	41 Ponds
	Storm Sewers	369,591 m	375,298 m	375,298 m
	Major Channels	2,357 m	2,357 m	2,357 m
Street Lights	Poles	7,475	7,776	7,776
	Luminaires	11.379	11,915	11,915
Street Trees	Street Trees	Unknown	35,526	35,640

2.3   Replacement Cost Valuation

Replacement values determined using unit costs for individual asset components will yield more reliable estimates of current market prices. However, in the absence of this detail, the historical costs were inflated to 2016. In some cases, the Town provided user-defined replacement costs. The estimated replacement value totalled $1.48 billion for Whitby's ROW portfolio. The total cost per household is approximately $31,481 using 45,772 households. In this section, we detail the replacement value of all ROW infrastructure by asset class.

Figure 2-2 Estimate 2016 Asset Valuation by Asset Class

Sidewalks & Multi-Use Paths $99.2 M 6.7%

Bridges & Culverts $97.5 M 6.6%

Street Trees $50.6 M 3.4%

Street Lights $23.7 M 1.6%

Roadside Appurtenances $18.8 M 1.3%

Parking $5.3 M 0.4%

Storm Water Management $194.8 M 13.2%

Roads Surfaces $244.3 M 17%

Roads Base $744.7 M 50.4%

Total $1,478.8 M
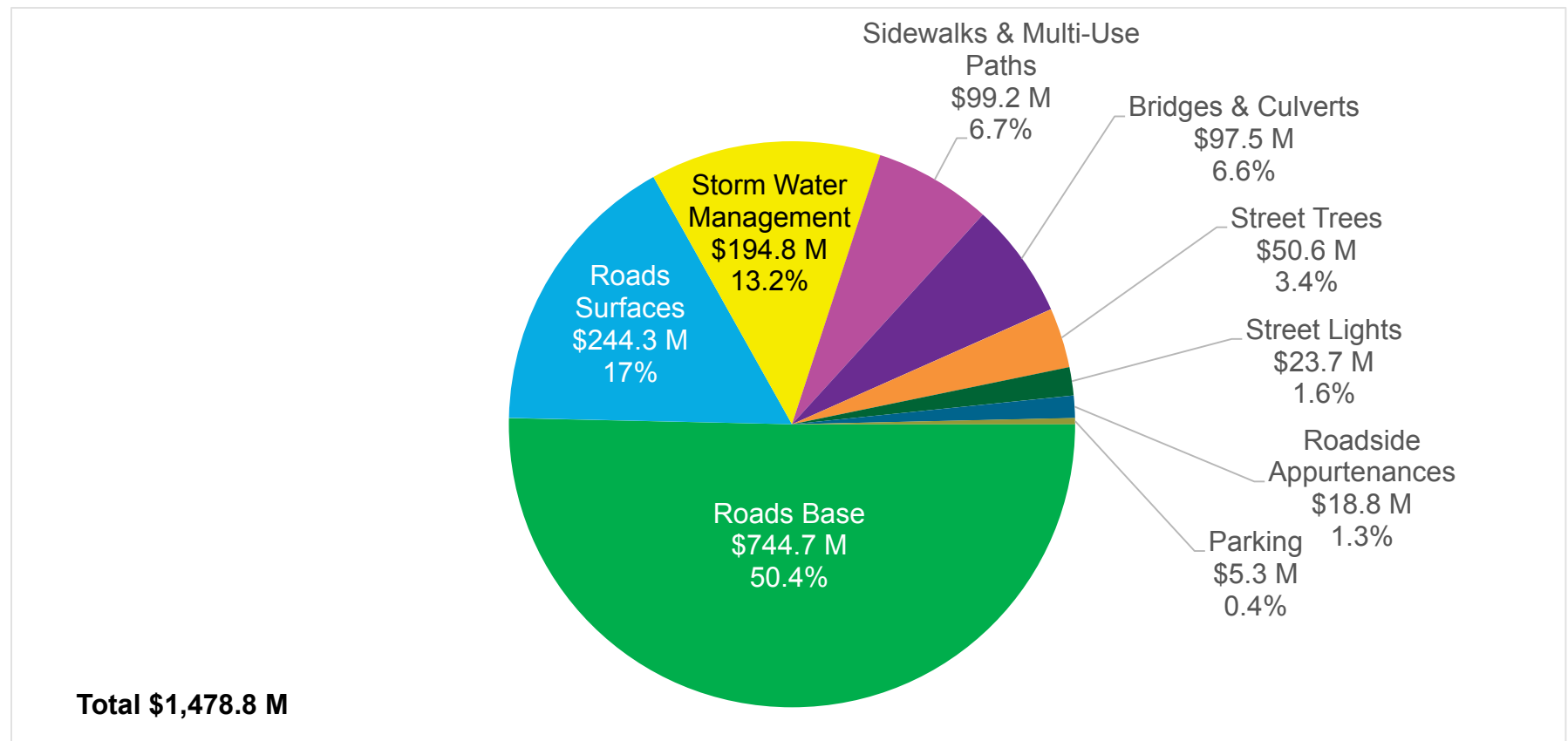
Figure 2-3 Replacement Value Per Household
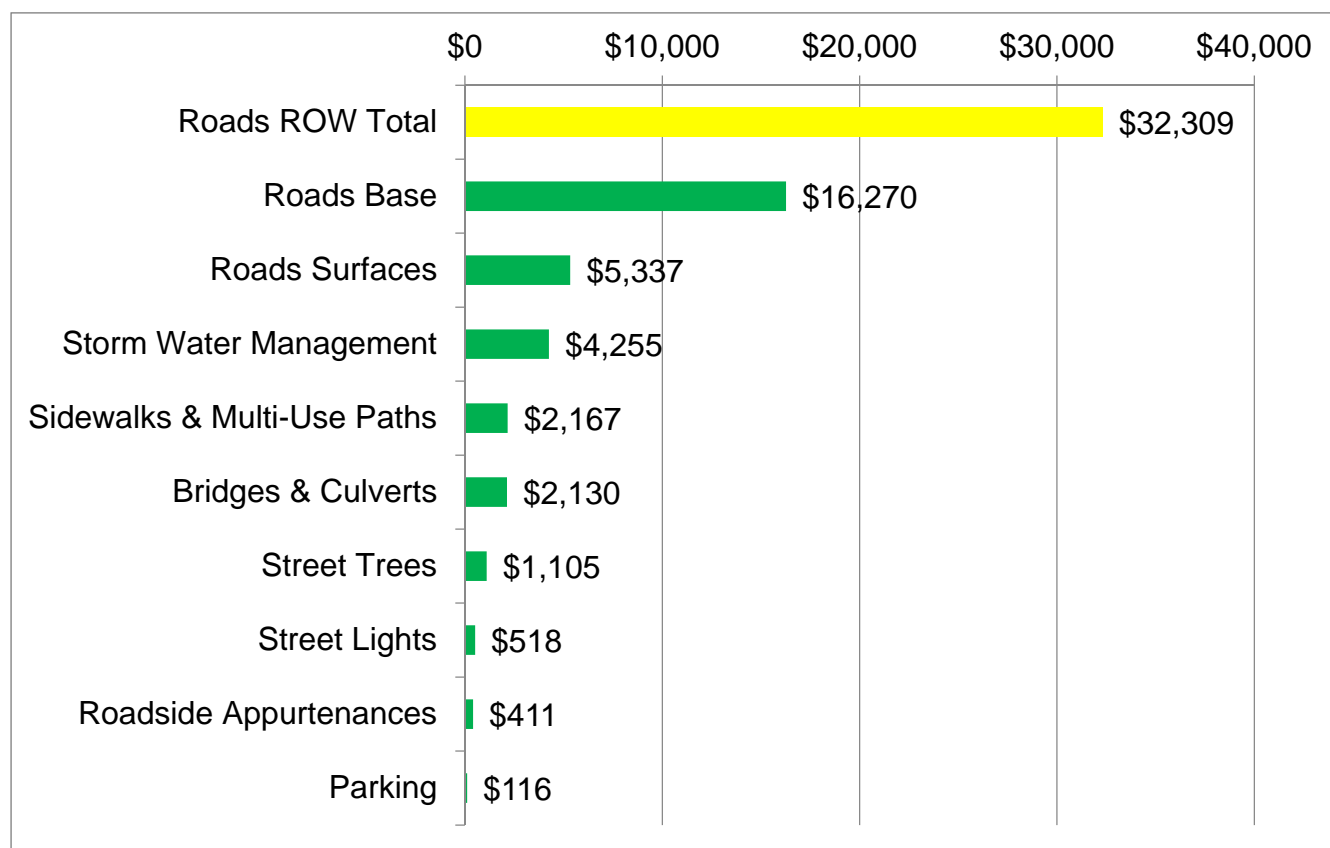
Table 2-2 Estimated 2016 Asset Valuation by Component - Roads

Asset Class	Asset Type	Quantity (Lane km)	2016 Replacement Cost
Roads	Roads Surfaces - HCB-4	576.105	$144,120,536
	Roads Surfaces - HCB-3	305.126	$80,491,006
	Roads Surfaces - HCB-2	28.778	$5,861,299
	Roads Surfaces - HCB-1	50.908	$8,276,579
	Roads Surfaces - LCB	132.614	$5,529,172
	Roads Base	1024.768	$744,726,204
	Total		$989,004,797

Table 2-3 Estimated 2016 Asset Valuation by Component – Bridges & Culverts

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Bridges & Culverts	Road Bridges - Deck	22	$27,056,465
	Culverts 3m+	22	$21,548,011
	Road Bridges - Superstructure	22	$20,292,348
	Road Bridges - Substructure	21	$20,292,348
	Culverts 0 to 3 m	2179	$5,539,964
	Pedestrian Bridges	20	$2,765,220
		Total	$97,494,357

Table 2-4 Estimated 2016 Asset Valuation by Component – Sidewalks

Asset Class	Asset Type	Quantity (m)	2016 Replacement Cost
Sidewalks & Multi-Use Paths	Sidewalks	509,980.47	$97,828,795
	Multi-Use Paths	8,628.70	$1,341,336
		Total	$99,170,131

Table 2-5 Estimated 2016 Asset Valuation by Component – Parking

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Parking	Public Lots - Surface	8 Lots	$1,458,045
	Public Lots - Base	8 Lots	$3,402,105
	Meters	281	$331,234
	Kiosks	10	$112,200
		Total	$5,303,584

Table 2-6 Estimated 2016 Asset Valuation by Component – Roadside Appurtenances

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Roadside Appurtenances	Traffic Control Signals	111	$7,374,600
	Information Signs	10,674	$1,512,499
	Fences	30,032 m	$6,431,307
	Guiderails	12,172 m	$885,906
	Retaining Walls	2,732 m2	$2,613,495
	Total		$18,817,807

Table 2-7 Estimated 2016 Asset Valuation by Component – Stormwater Management

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Stormwater Management	Stormwater Ponds	41 Ponds	$25,261,428
	Storm Sewers	375,298m	$165,077,155
	Major Channels	2,357m	$4,423,886
	Total		$194,762,469

Table 2-8 Estimated 2016 Asset Valuation by Component – Street Lights

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Street Lights	Poles	7,776	$17,432,660
	Luminaries	11,915	$6,283,504
	Total		$23,716,164

Table 2-9 Estimated 2016 Asset Valuation by Component – Street Trees

Asset Class	Asset Type	Quantity	2016 Replacement Cost
Street Trees	Street Trees	35,640	$50,576,798
	Total		$50,576,798

2.4   Asset Condition and Remaining Useful Life

Understanding the current condition of the assets and their remaining useful life can provide the Town with a more complete picture of its infrastructure portfolio and upcoming short, medium and long-term needs. The Town provided assessed condition data for road surfaces, bridges & culverts, and segments of its stormwater management. The Town has developed condition scales for its ROW assets. These are provided in the Appendix.

2.4.1 Asset Condition Distribution

This section provides detail on the physical condition of the Town of Whitby's ROW assets. The Town has provided observed condition data for ROW assets. Based on replacement cost, 84%, of Whitby's ROW assets, with a valuation of more than $850 million, are in good to very good condition. Less than 3% of the Town of Whitby's assets are in poor to very poor condition. The overall condition of ROW assets are shown in Figure 2-4.

Figure 2-4 Condition Distribution by Asset Class – All Roads Assets

Total $1,478,846,106
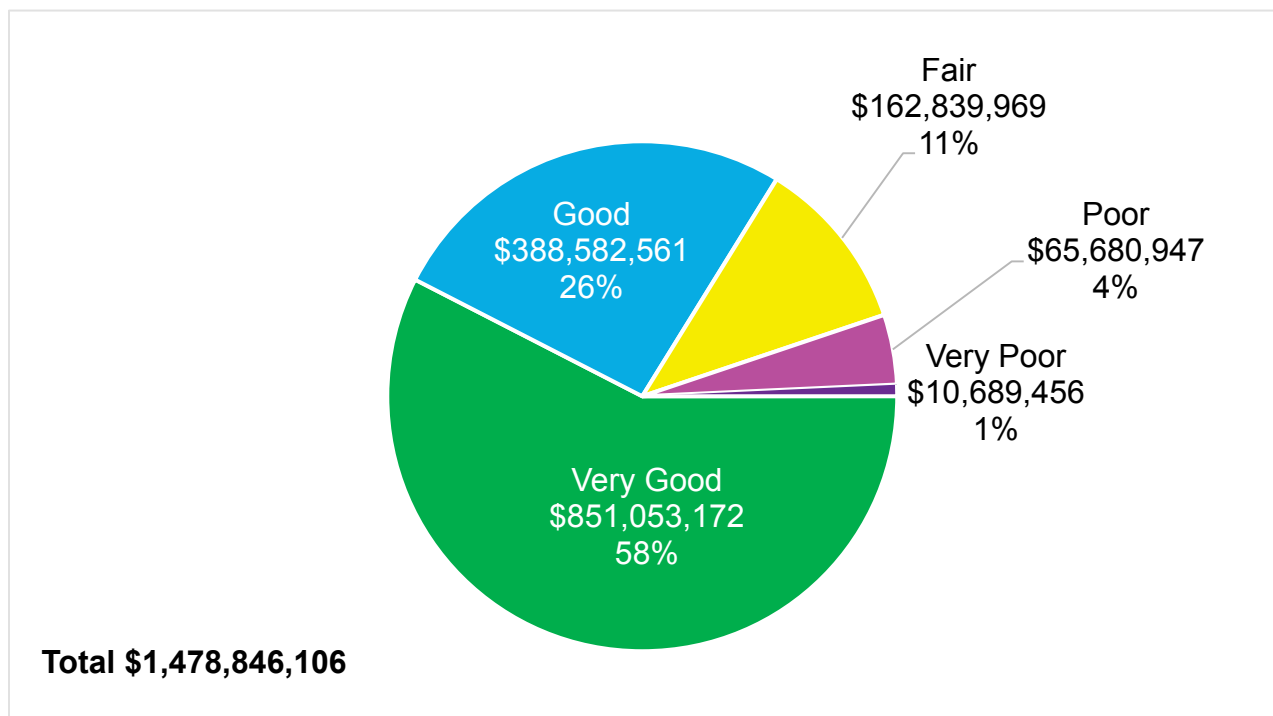
The following graphs illustrate the condition distribution of each of the Town's ROW Level 3 assets.

Figure 2-5 Asset Condition – Road Surfaces

Fair
$51,222,357
21%

Poor
$18,246,432
7%

Very Poor
$3,805,634
2%

Good
$93,961,109
38%

Very Good
$77,043,060
32%

Total $244,278,593
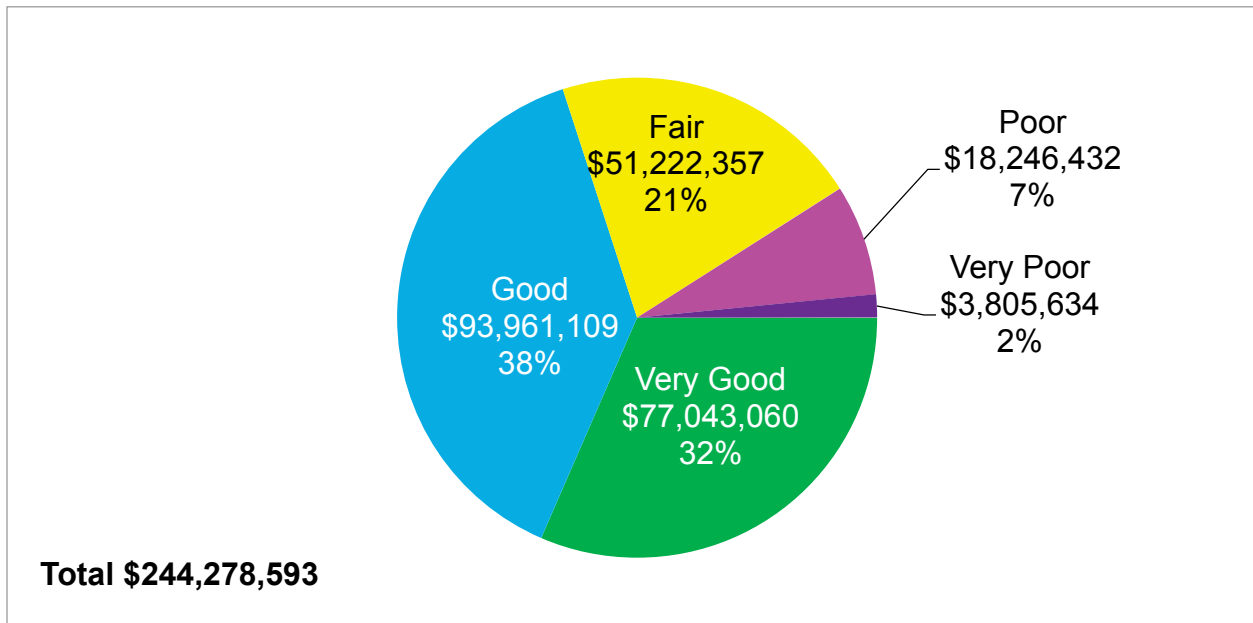
Figure 2-6 Asset Condition – Road Base

Good
$2,849,303
0.4%

Fair
$2,132,922
0.3%

Poor
$1,482,468
0.2%

Very Poor
$1,554,607
0.2%

Very Good
$736,706,903
98.9%

Total $744,726,204
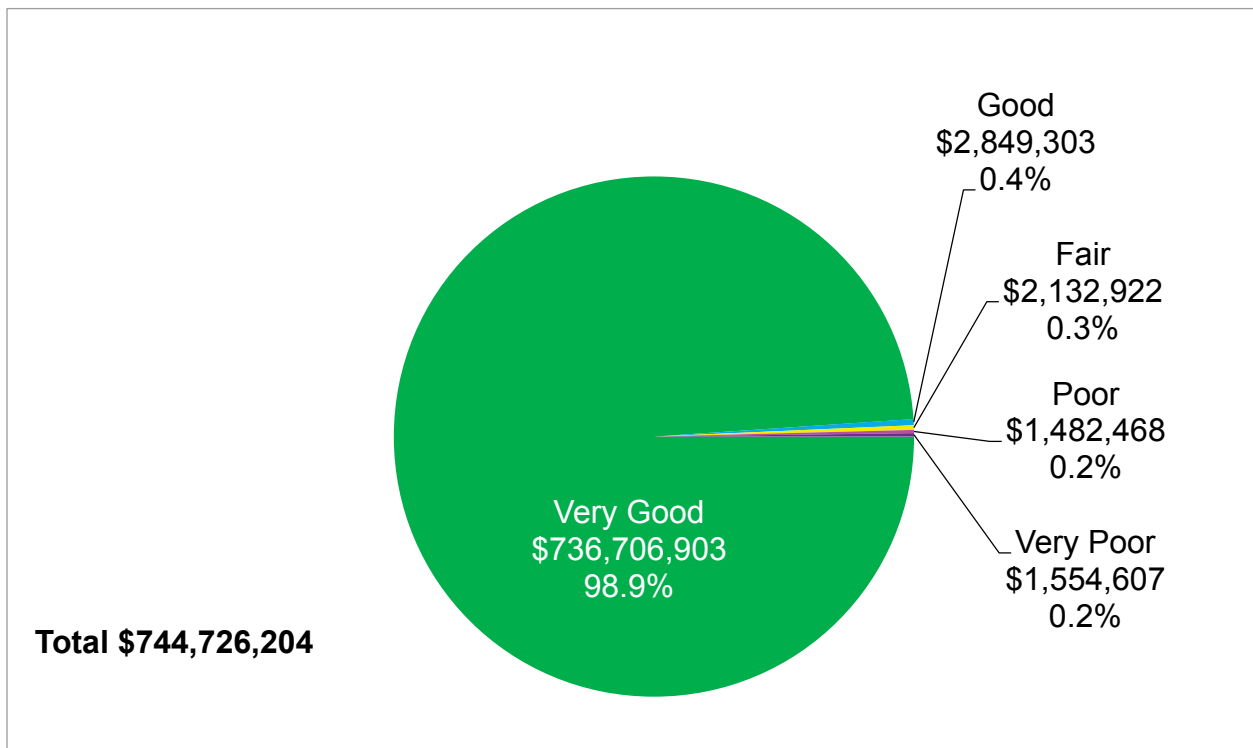
Figure 2-7 Asset Condition – Bridges & Culverts

Fair
$4,462,214
4.6%

Poor
$347,144
0.4%

Very Poor
$64,611
<0.1%

Good
$68,397,355
70.2%

Very Good
$24,223,032
24.8%

Total $97,494,357
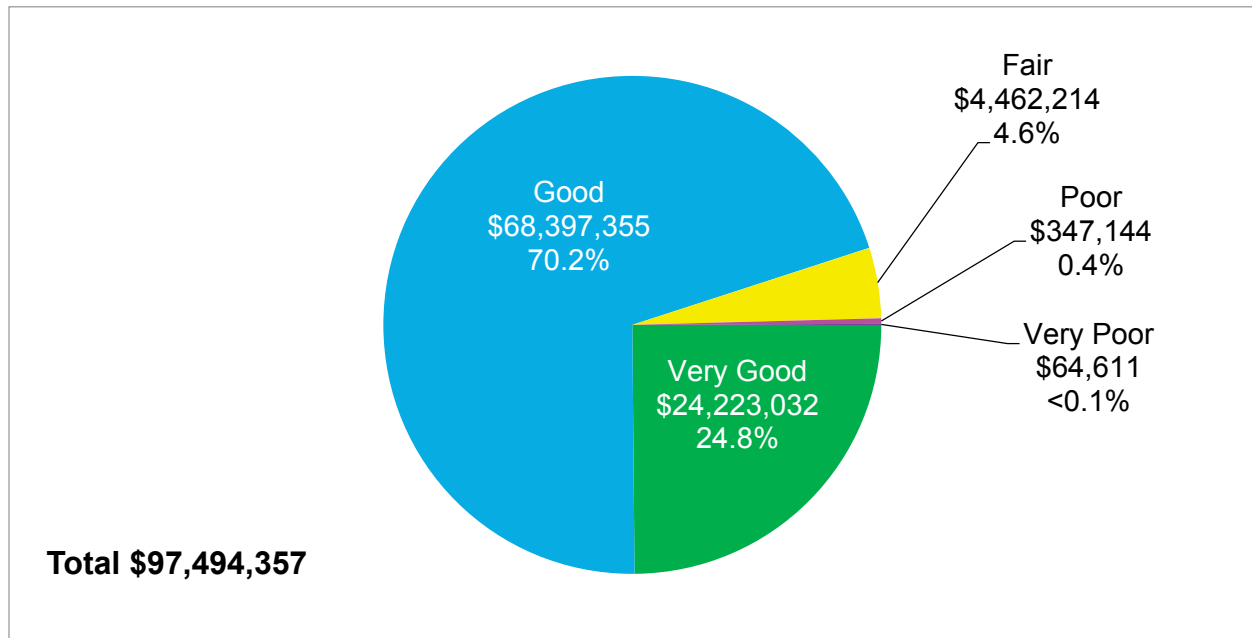
Figure 2-8 Asset Condition – Sidewalks & Multi-Use Paths

Fair
$2,587,500
2.6%

Poor
$129,999
0.1%

Very Poor
$25,977
<0.1%

Good
$91,585,369
92.4%

Very Good
$4,841,285
4.9%

Total $99,170,131
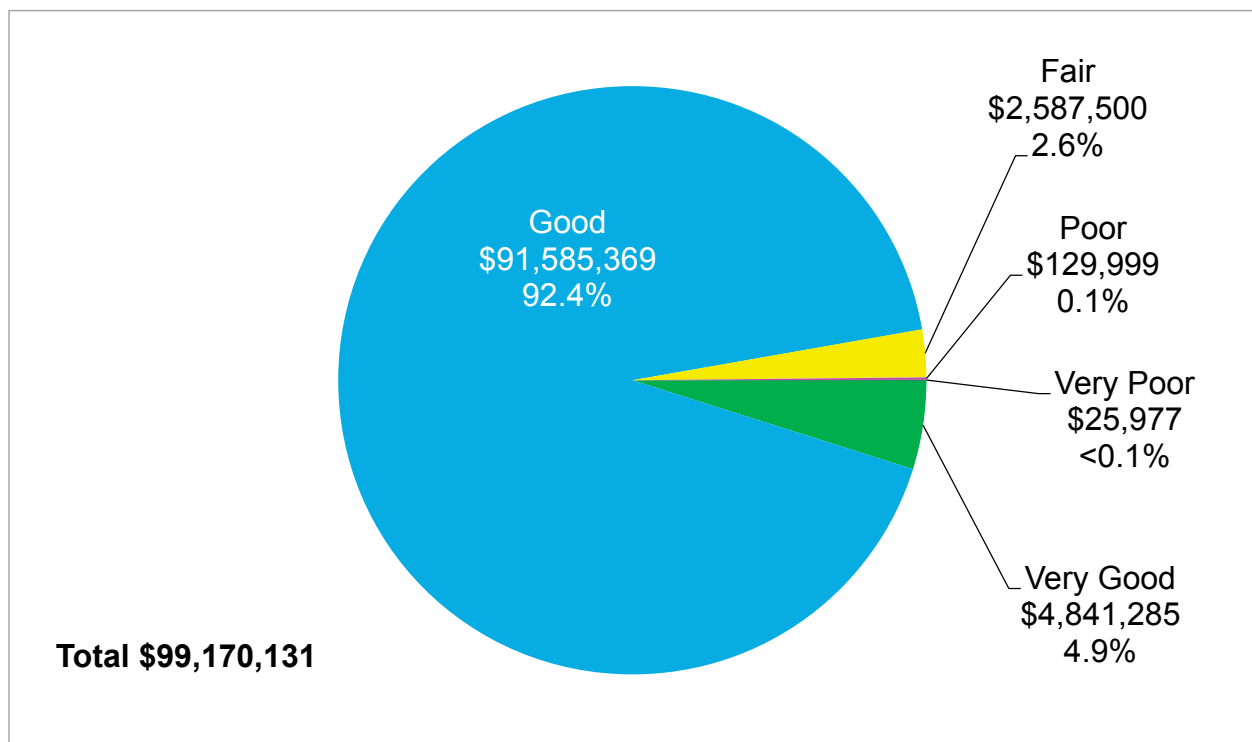
Figure 2-9 Asset Condition – Parking

Fair
$2,850,471
53.7%

Poor
$44,226
0.8%

Very Poor
$12,966
0.2%

Very Good
$763,800
14.5%

Good
$1,632,121
30.8%

Total $5,303,584
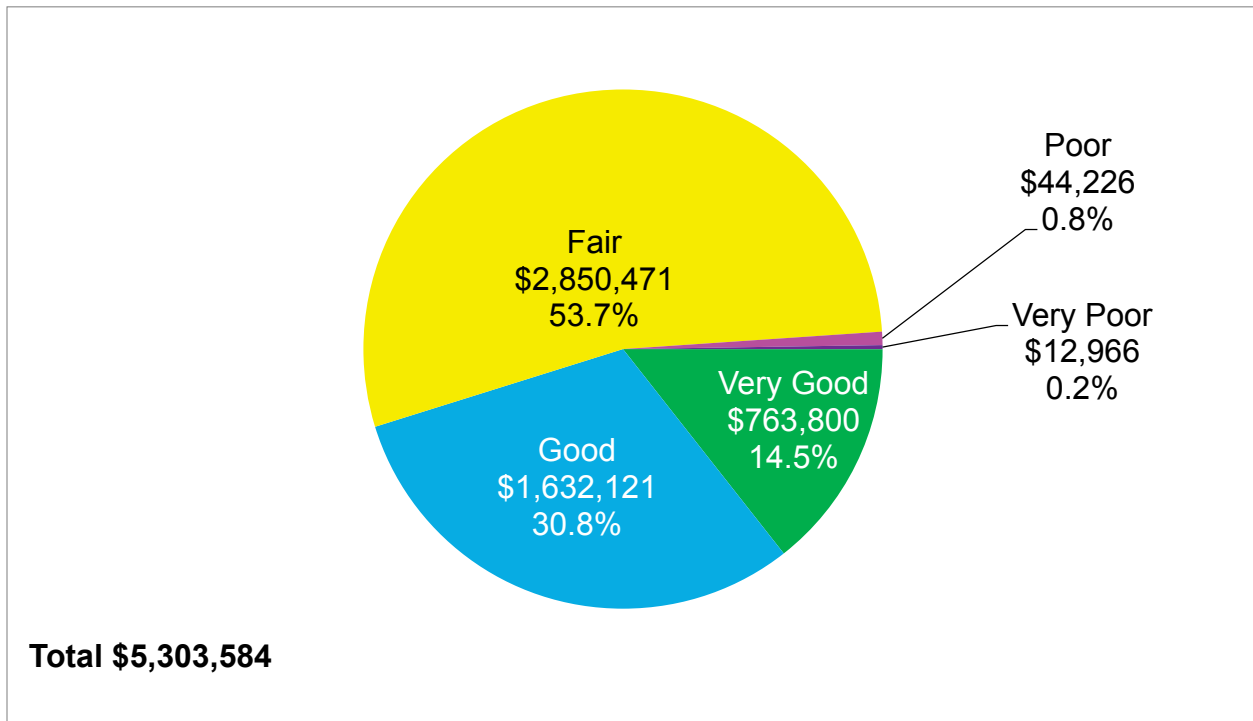
Figure 2-10 Asset Condition – Roadside Appurtenances

Poor
$5,191,220
28%

Fair
$5,812,393
31%

Very Poor
$737,427
4%

Very Good
$472,191
2%

Good
$6,604,575
35%

Total $18,817,807
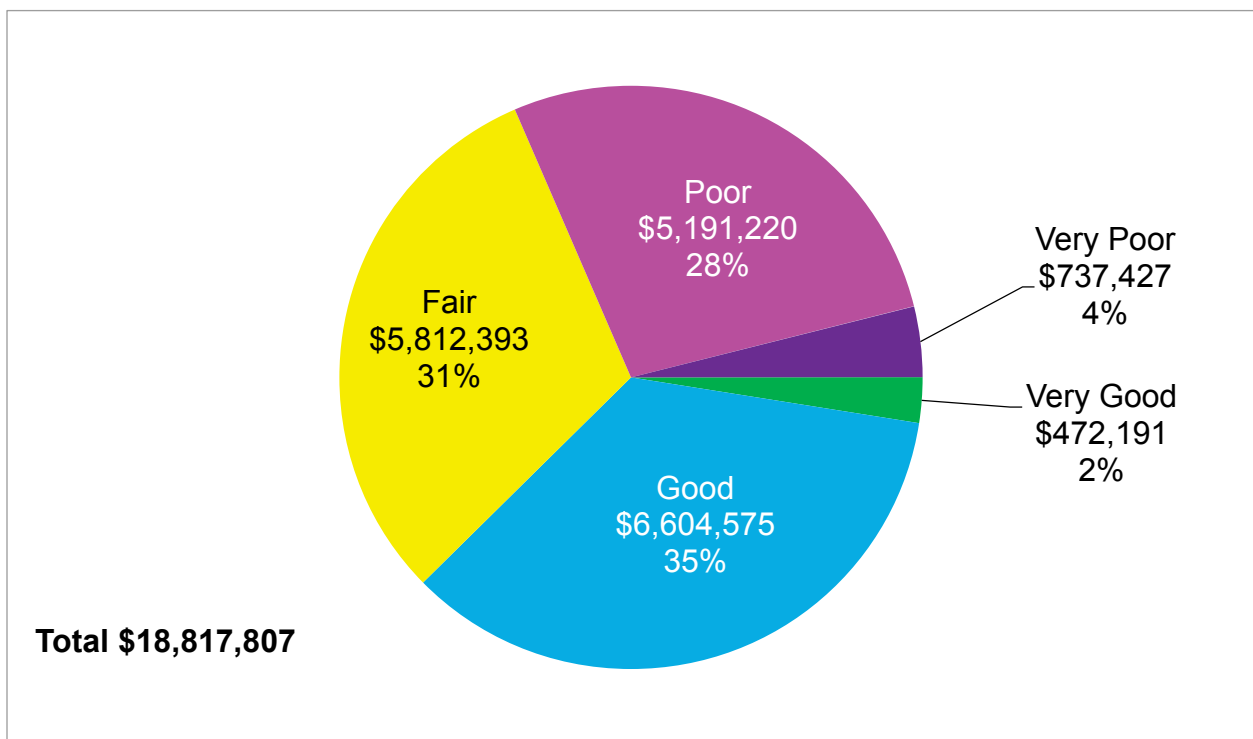
Figure 2-11 Asset Condition – Stormwater Management

Total $194,762,469

- Fair $61,801,492 31.7%
- Poor $31,241,458 16.0%
- Very Poor $3,533,615 1.8%
- Very Good $3,996,929 2.1%
- Good $94,188,975 48.4%
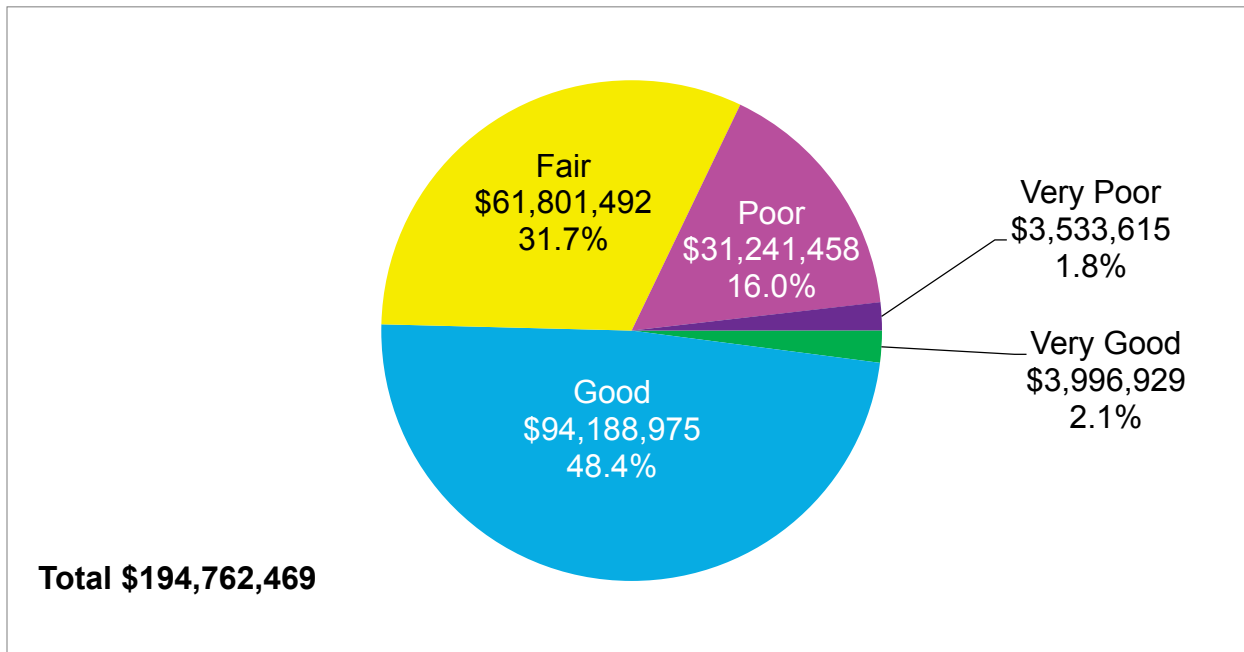
Figure 2-12 Asset Condition – Street Lights

Total $23,716,164

- Fair $2,610,161 11.0%
- Poor $1,053,687 4.5%
- Very Poor $97,562 0.4%
- Good $19,954,753 84.1%
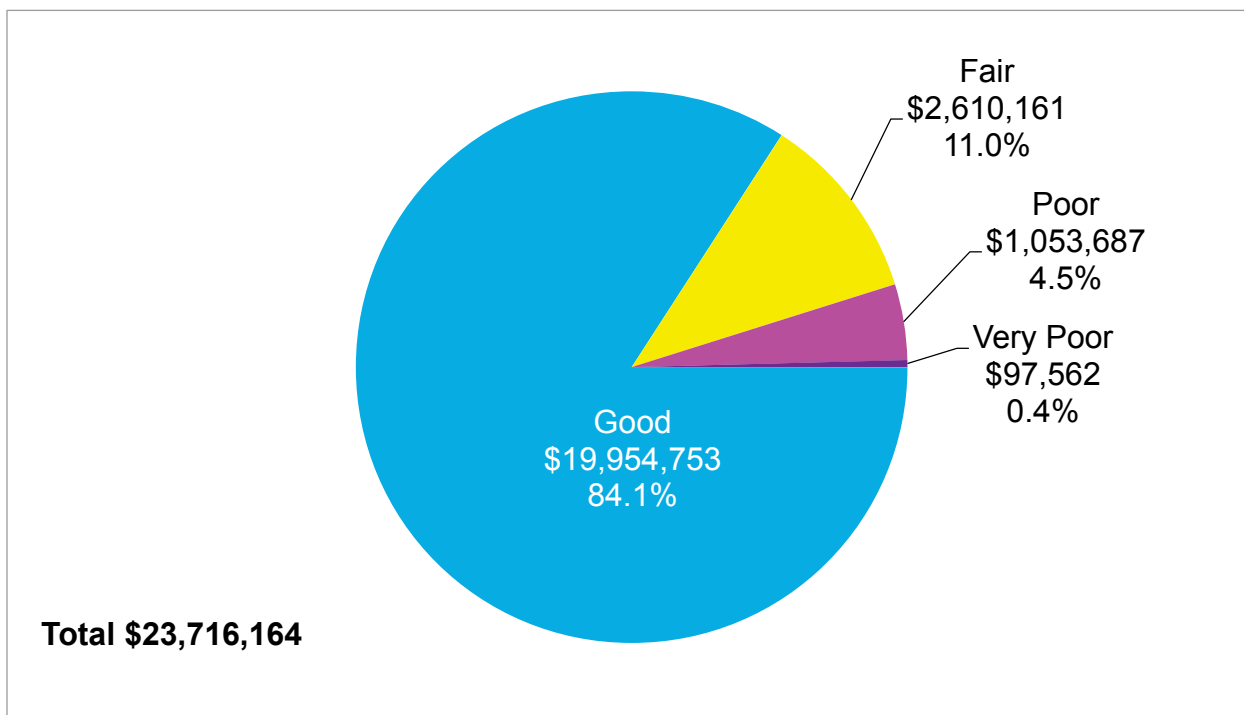
Figure 2-13 Asset Condition – Street Trees

Total $50,576,798

Fair
$29,360,458
58.1%

Poor
$7,944,313
15.7%

Very Poor
$857,055
1.7%

Very Good
$3,005,971
5.9%

Good
$9,409,001
18.6%
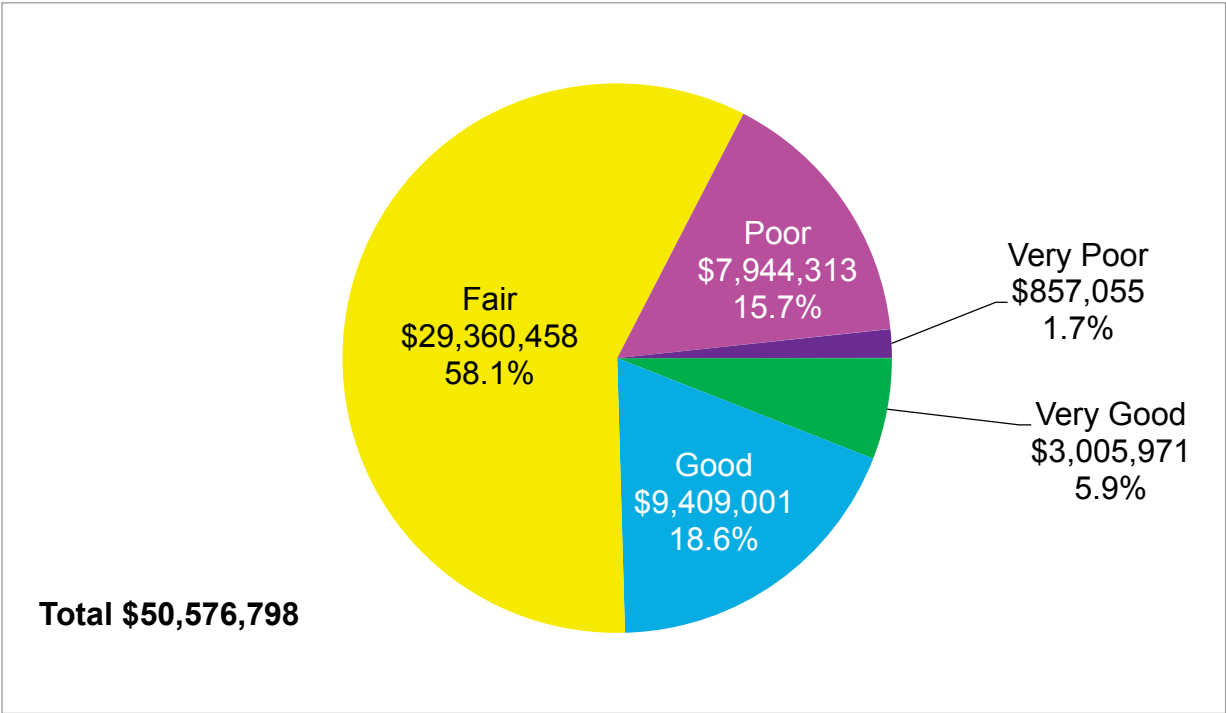
2.4.2 Infrastructure Report Card

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 have 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:

1. **Asset Health**: As shown in Table 2-3, using either field inspection data as available or age-based data, the asset health provide a grades for each infrastructure class based on the portion of assets in poor to Very Good condition (0-100%). We use replacement cost to determine the weight of each condition group within the asset class.
2. **Financial Sustainability**: As shown in Table 5-2, a municipality's financial sustainability is determined by how well it is meeting the average annual investment requirements (0-100%) for each infrastructure class.

Table 2-10 Asset Health Grading Scale

Letter Grade	Numerical Scale	Rating	Description
A	4.50-5.0	Very Good	Asset is new or recently rehabilitated
B	3.50-4.49	Good	Asset is no longer new, but is fulfilling its function. Preventative maintenance is beneficial at this stage.
C	2.50-3.49	Fair	Deterioration is evident but asset continues to fulfil its function. Preventative maintenance is beneficial at this stage.
D	1.50-2.49	Poor	Significant deterioration is evident and service is at risk.
F	1.0-1.49	Very Poor	Asset is beyond expected life and has deteriorated to the point that it may no longer be fit to fulfil its function.

Table 2-11 Infrastructure Report Card - Asset Health

Asset Class (Level 3)	Asset Health Grade
Roads-Surface	B
Roads-Base	A
Bridges & Culverts	B
Sidewalks & Multi-Use Paths	B
Parking	B
Roadside Appurtenances	B
Stormwater Management	B
Street Lights	B
Street Trees	B
Overall Service Area Grade	**B**

The Town has provided observed condition data for ROW assets. Based on replacement cost, 84%, of Whitby's ROW assets, with a valuation of more than $1.24 billion, are in good to Very Good condition. 5.2% of the Town of Whitby's ROW assets are in poor to very poor condition.

The asset health grade for each asset class was derived using weighted average of its replacement cost according to the following equation:

Asset Class Health Grade = ((5 * asset value in Very Good condition) + (4 * asset value in good condition) + (3 * asset value in fair condition) + (2 * asset value in poor condition) + (1 * asset value in very poor condition)) / total asset value.

2.5   Asset Age

The useful life indicated for the asset types below was assigned by the municipality and obtained from the Town's GIS data and personal geodatabases. In conjunction with observed field data, the useful life values and the associated asset life stage can guide the maintenance, rehabilitation or replacement related activities of major assets. The data is presented in the following order to provide a comprehensive summary of Whitby's ROW assets:

Table 2-12 Asset Useful Life in Years

Asset Class	Asset Type	Expected Useful Life
Roads	HCB 1 Surface/HCB 1 Base	15/90
	HCB 2 Surface/HCB 2 Base	15/90
	HCB 3 Surface/HCB 3 Base	35/96
	HCB 4 Surface/HCB 4 Base	35/96
	LCB	20
Bridges & Culverts	Deck and Superstructure	60
	Substructure	120
	Culverts (3m+)	90
	Culverts (0 to 3m)	50
	Pedestrian Bridges	30/35/40/50
Sidewalks & Multi-Use Paths	Sidewalks	45
	Multi-Use Paths	20
Parking	Public Lots - Surface	25
	Public Lots - Base	100
	Meters	20
Roadside Appurtenances	Traffic Control Signs	30
	Information Signs	10/20
	Fences	20/25/30
	Guiderails	25
	Retaining Walls	25/30/35/50/65/80
Stormwater Management	Stormwater Ponds	90
	Storm Sewers	90
	Major Channels	80
Street Lights	Poles	50
	Luminaries	25
Street Trees	Street Trees	50

2.5.1 Installation Profile: Infrastructure Investment in Whitby

In this section, we provide the installation profile and asset life consumption rate using in-service data. Together, these graphs can illustrate infrastructure investment trends and upcoming needs at Whitby. Figure 2-14 illustrates the level of investment in Whitby's ROW infrastructure since 1980.

Figure 2-14 Aggregate Installation Profile
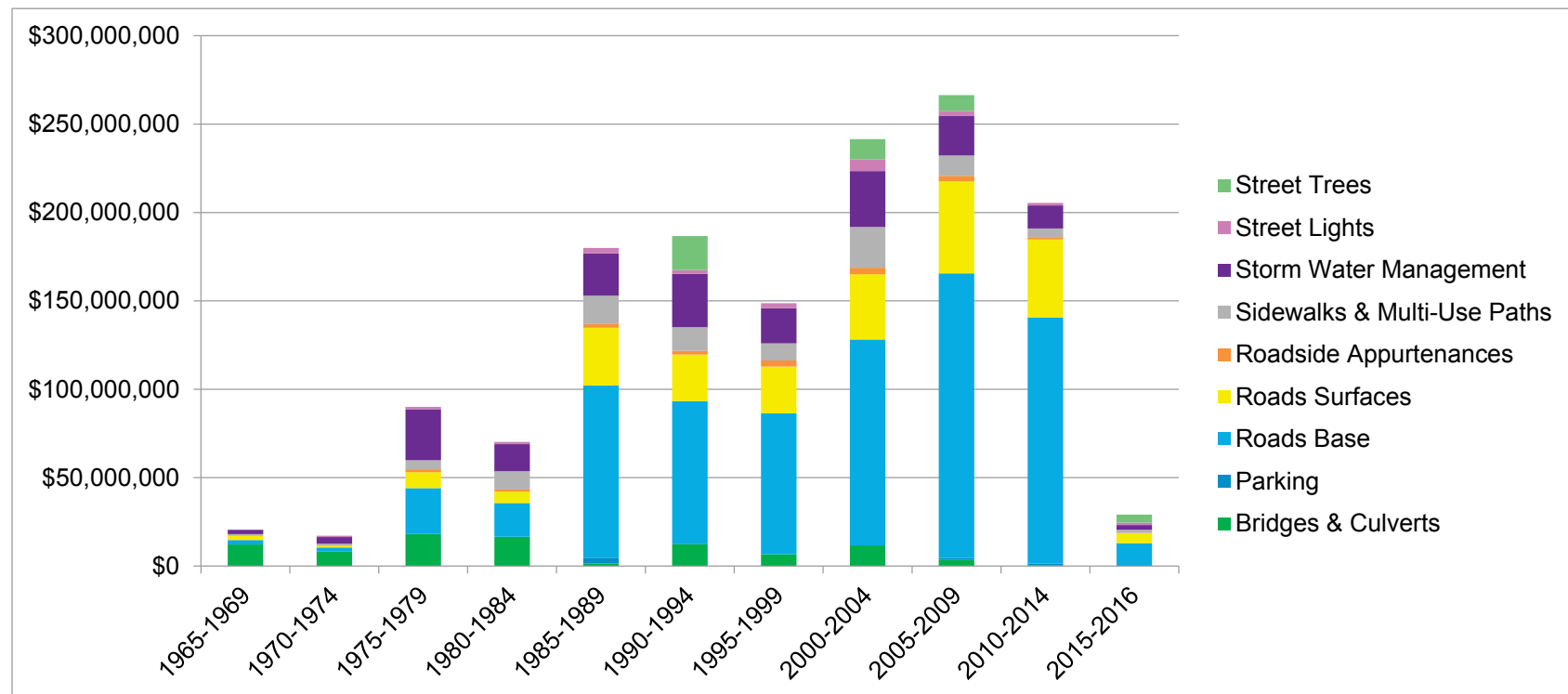
Mirroring its population increase, the Town made significant investments in its ROW assets beginning in the mid- to late 1980s. Road Base has continued to comprise the largest share of expenditures, followed by Road Surface, and Storm. The Town's largest expenditures were made between 2005 and 2009, with investments in ROW totalling $261 million. The following figures illustrate historic investment trends in each asset class. Between 2010 and 2016, the Town of Whitby invested more than $227 million in its ROW assets.

Figure 2-15 Asset Installation Profile - Roads
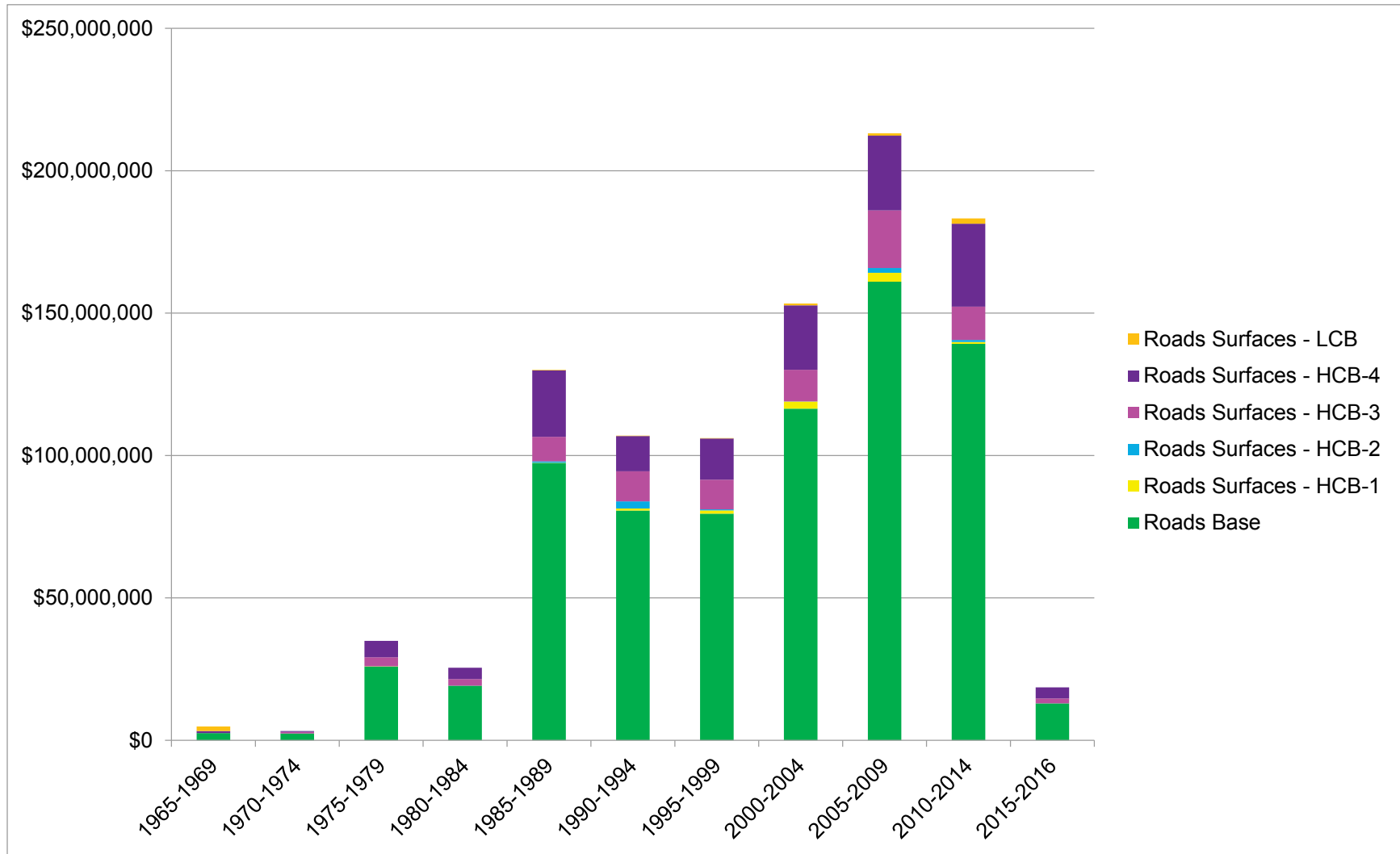
Figure 2-16 Asset Installation Profile – Bridges & Culverts
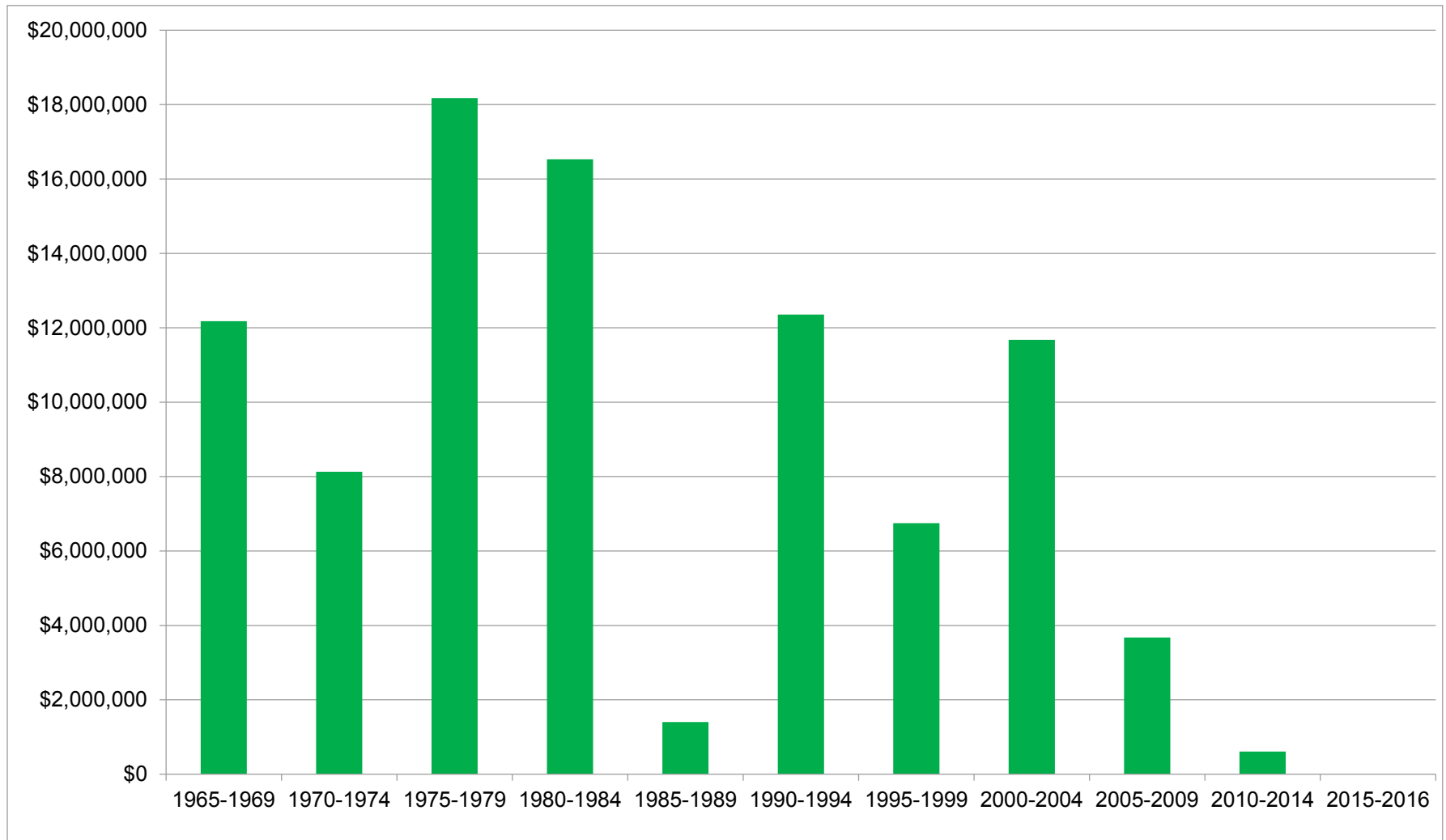
Figure 2-17 Asset Installation Profile – Sidewalks & Multi-Use Paths

Figure 2-18 Asset Installation Profile – Parking
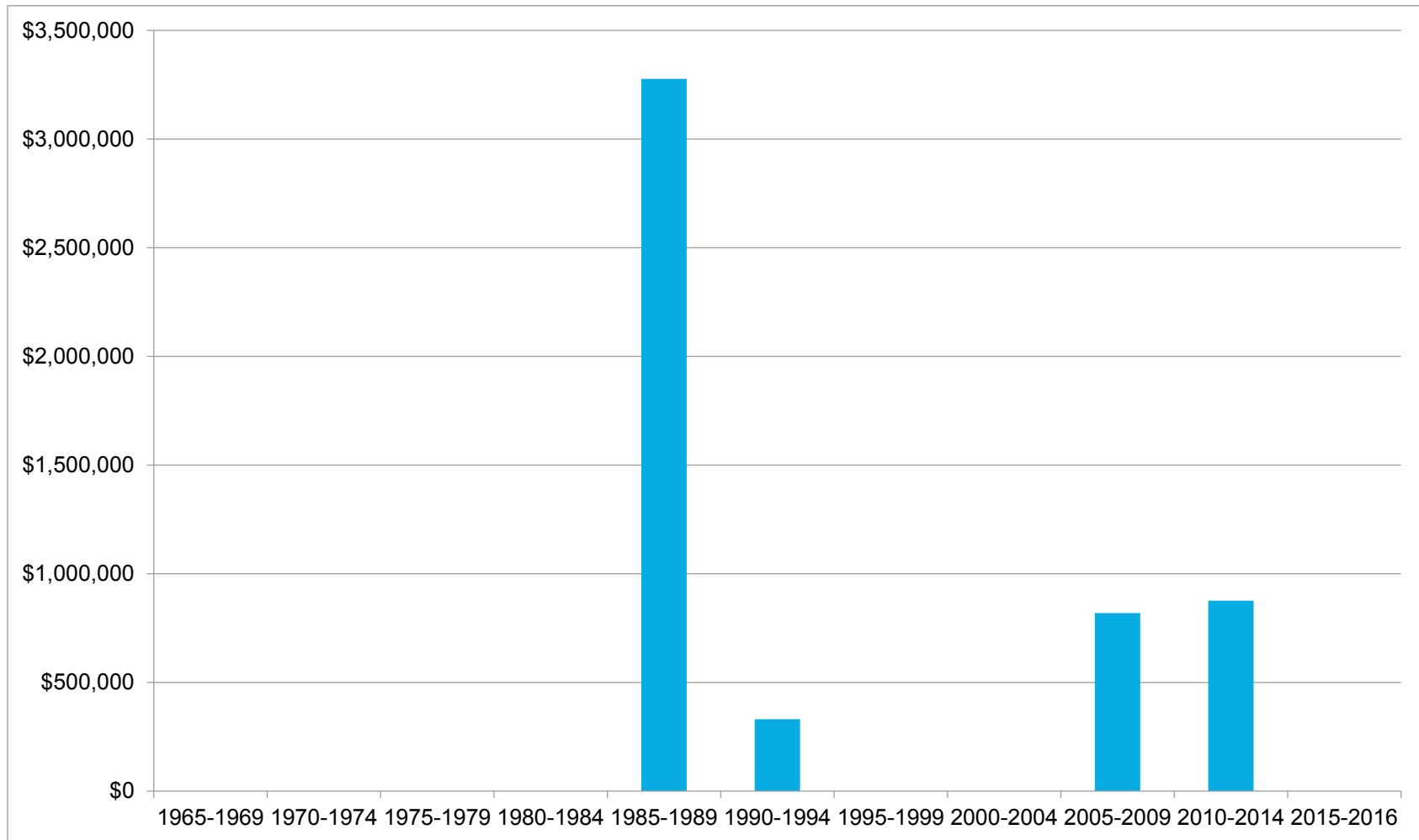
Figure 2-19 Asset Installation Profile – Roadside Appurtenances
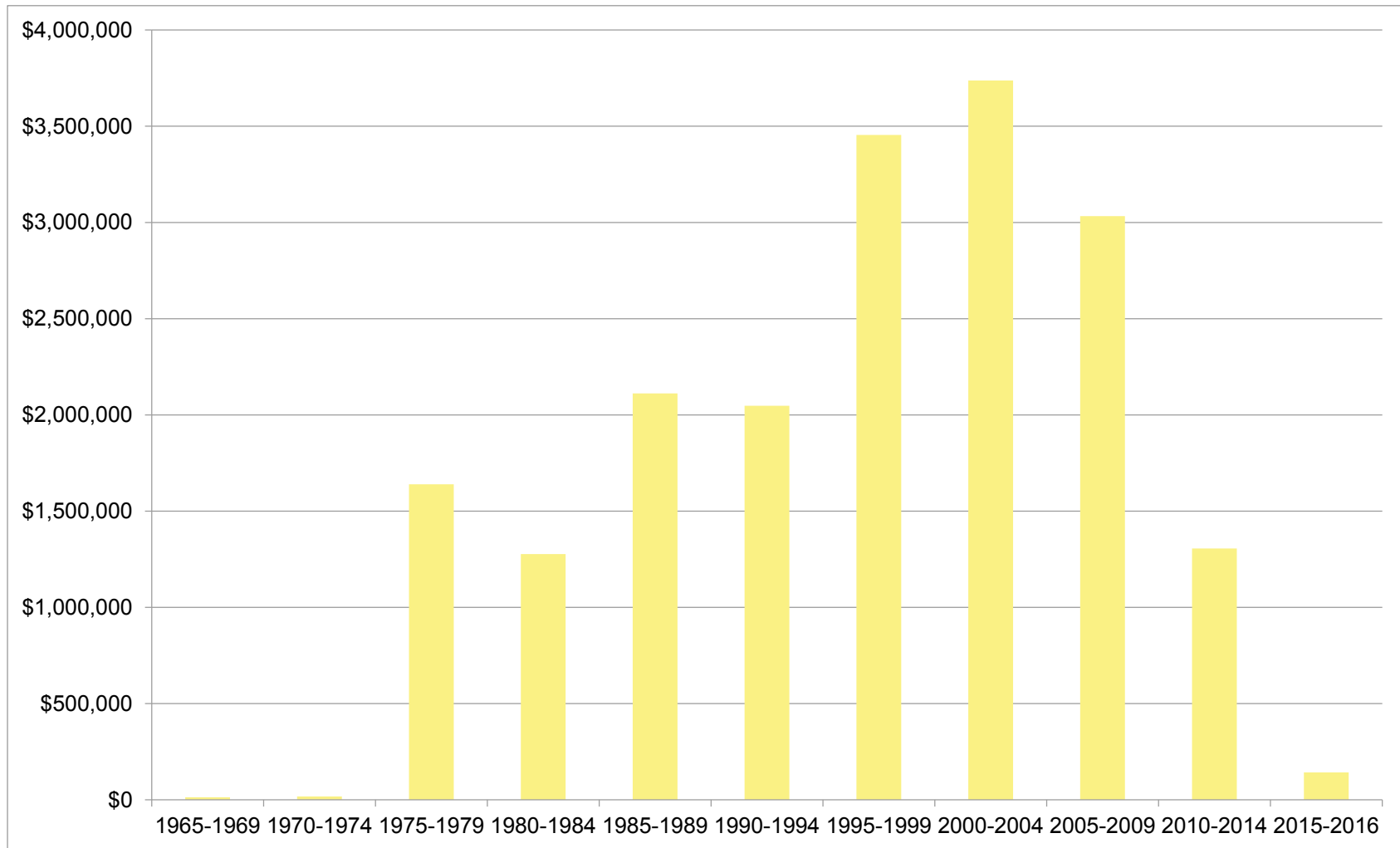
Figure 2-20 Asset Installation Profile – Stormwater Management
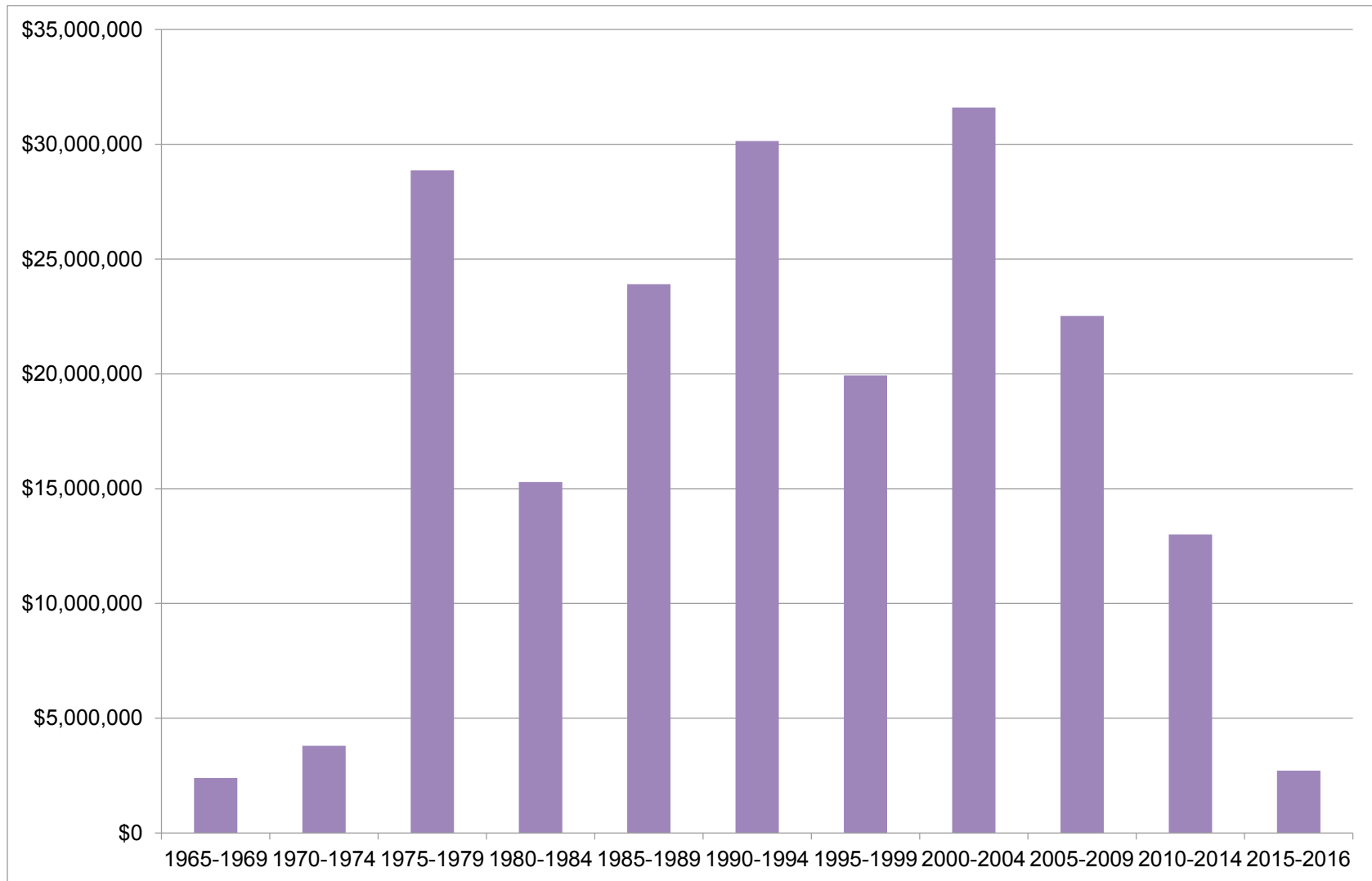
Figure 2-21 Asset Installation Profile – Street Lights
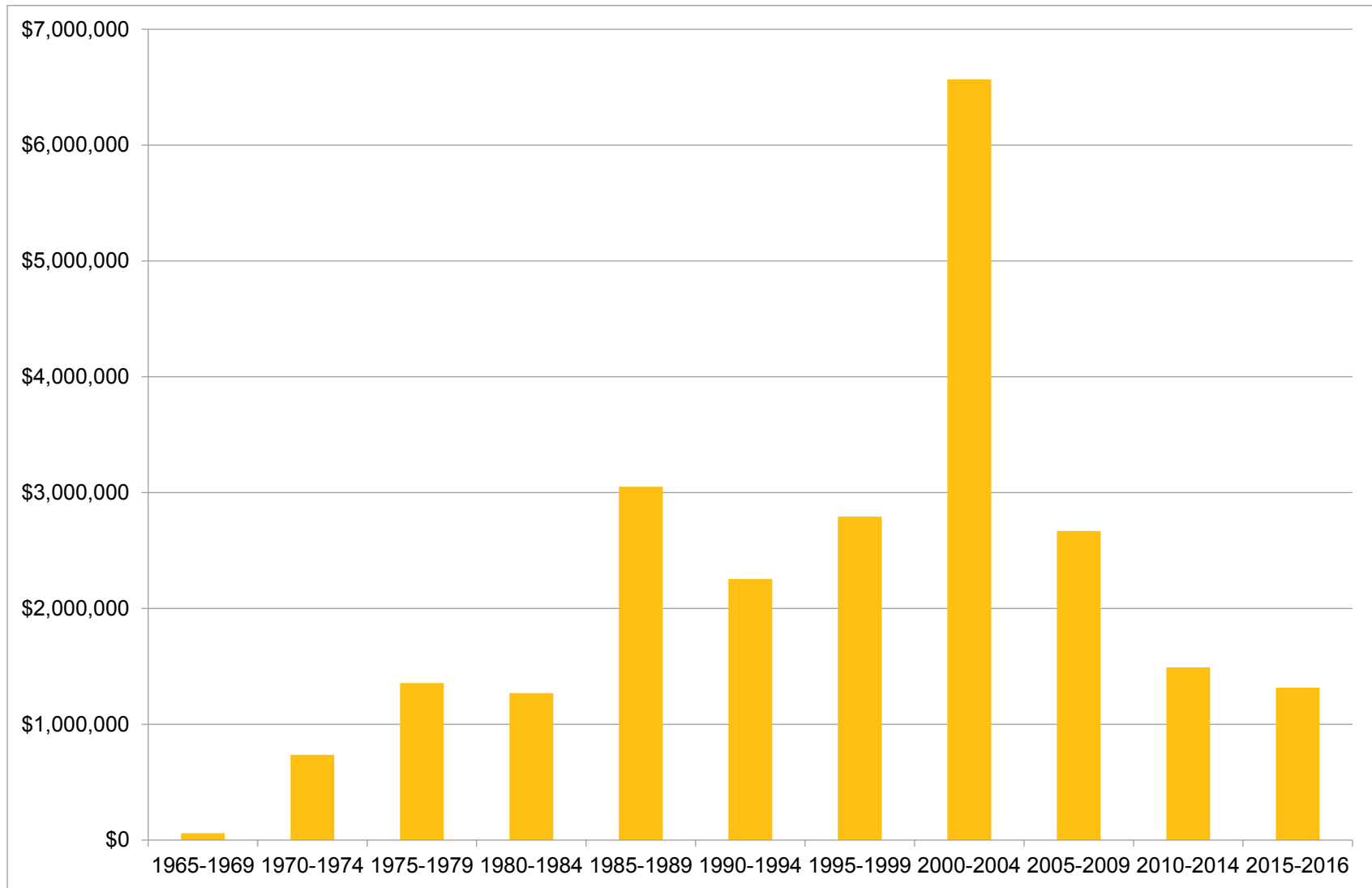
Figure 2-22 Asset Installation Profile – Street Trees
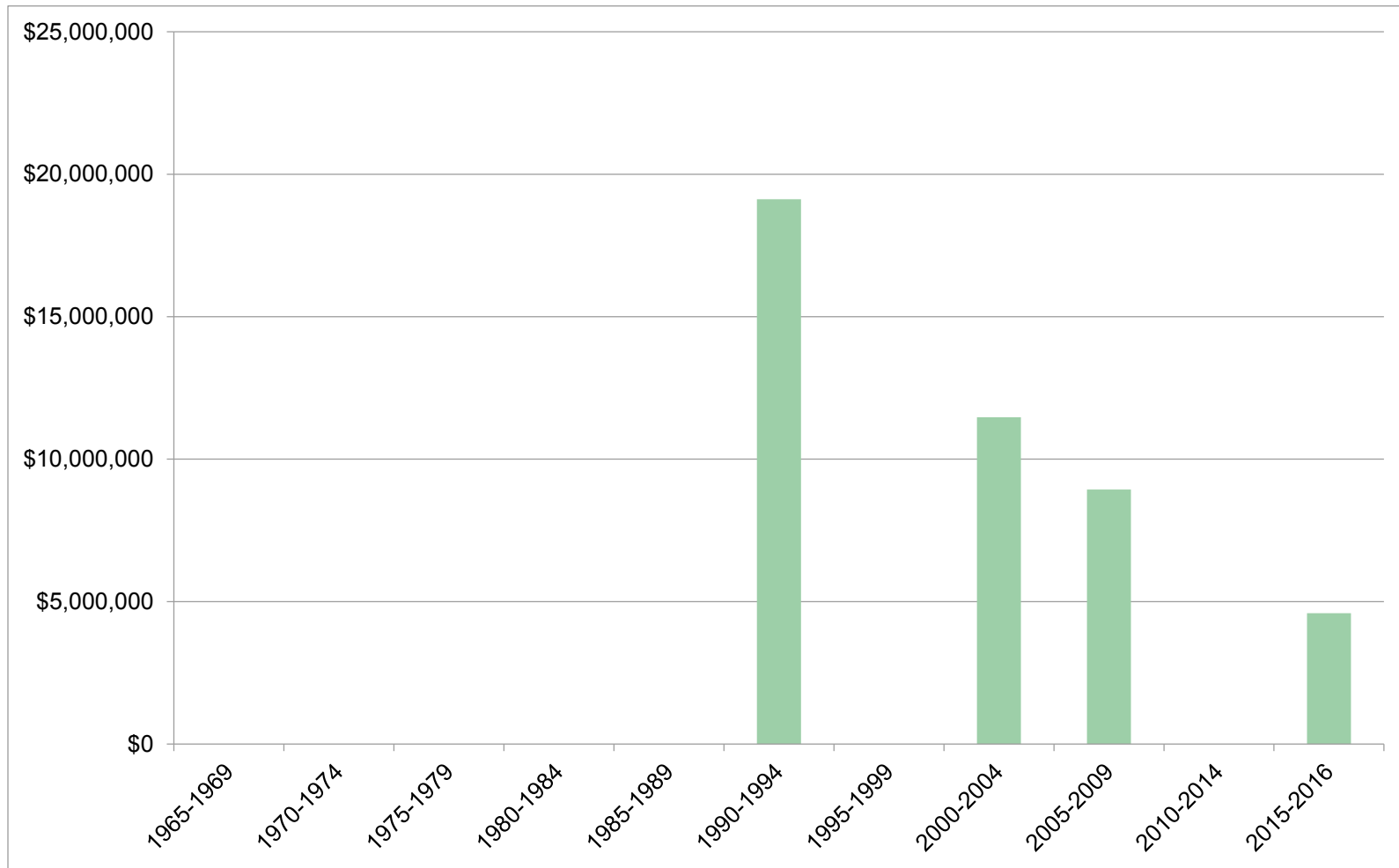
2.6   Useful Life Consumption

In this section, we detail the extent to which each asset class has consumed its useful life based on the above, established useful life standards.

Figure 2-23 Aggregate Useful Life Consumption

5-10 Years Remaing $56,087,328 3.8%

0-5 Years Remaining $21,857,981 1.5%

> 10 Years Remaining $1,354,072,773 91.6%

Useful Life Exceeded $46,828,024 3.1%

Total $1,478,846,106
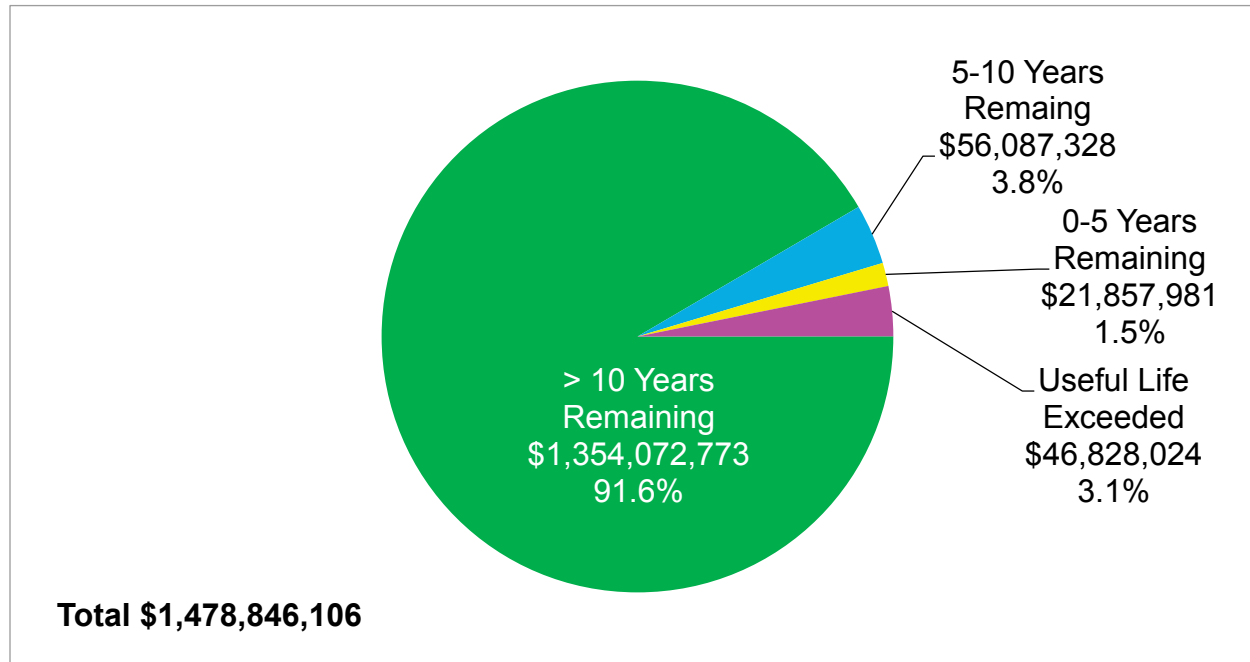
While the overwhelming majority, 91%, of the Town of Whitby's ROW assets have at least 10 years of useful life remaining, 3.2% of assets with a valuation of $47 million remain in operation beyond their estimated useful life. Further, an additional $22 million in assets will see their useful life expire within the next five years.

The following graphs illustrate the useful life consumption distribution by asset class.

Figure 2-24 Useful Life Consumption – Roads

5-10 Years Remaing, $39,768,097, 4.0%

0-5 Years Remaining, $14,403,406, 1.5%

Useful Life Exceeded, $24,620,508, 2.5%

> 10 Years Remaining, $910,212,786, 92.0%

Total $989,004,797
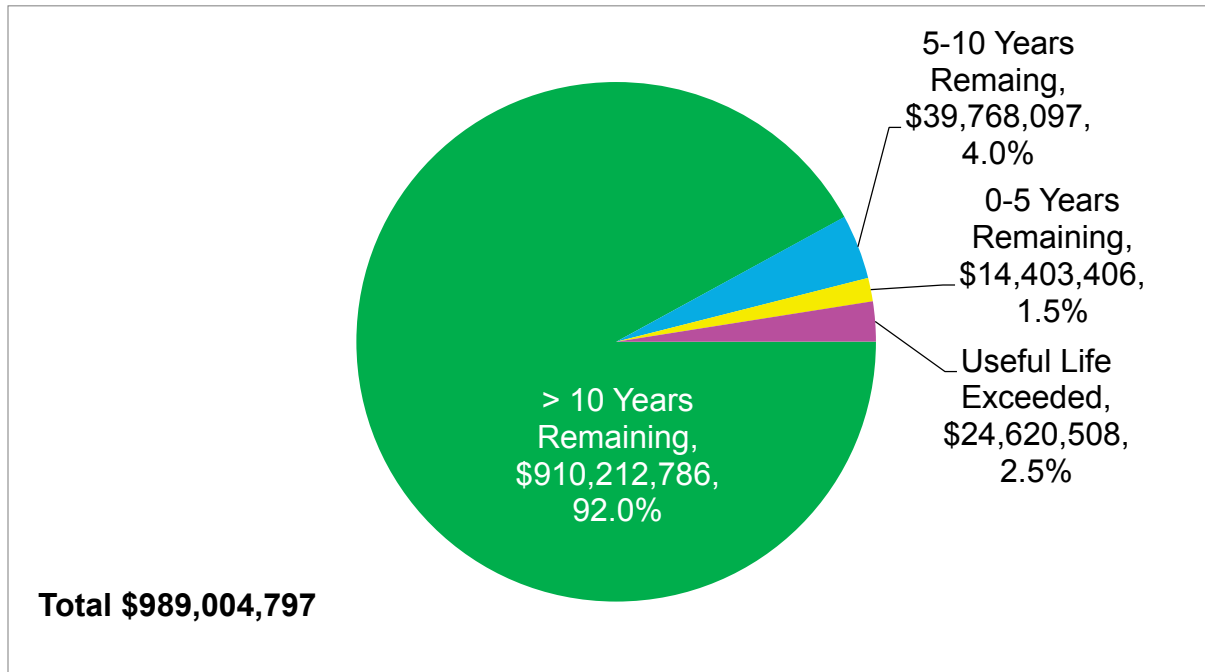
Figure 2-25 Useful Life Consumption – Bridges & Culverts

5-10 Years Remaing $2,715,503 3%

0-5 Years Remaining $686,973 1%

Useful Life Exceeded $7,632,919 8%

> 10 Years Remaining $86,458,963 88%

Total $97,494,357
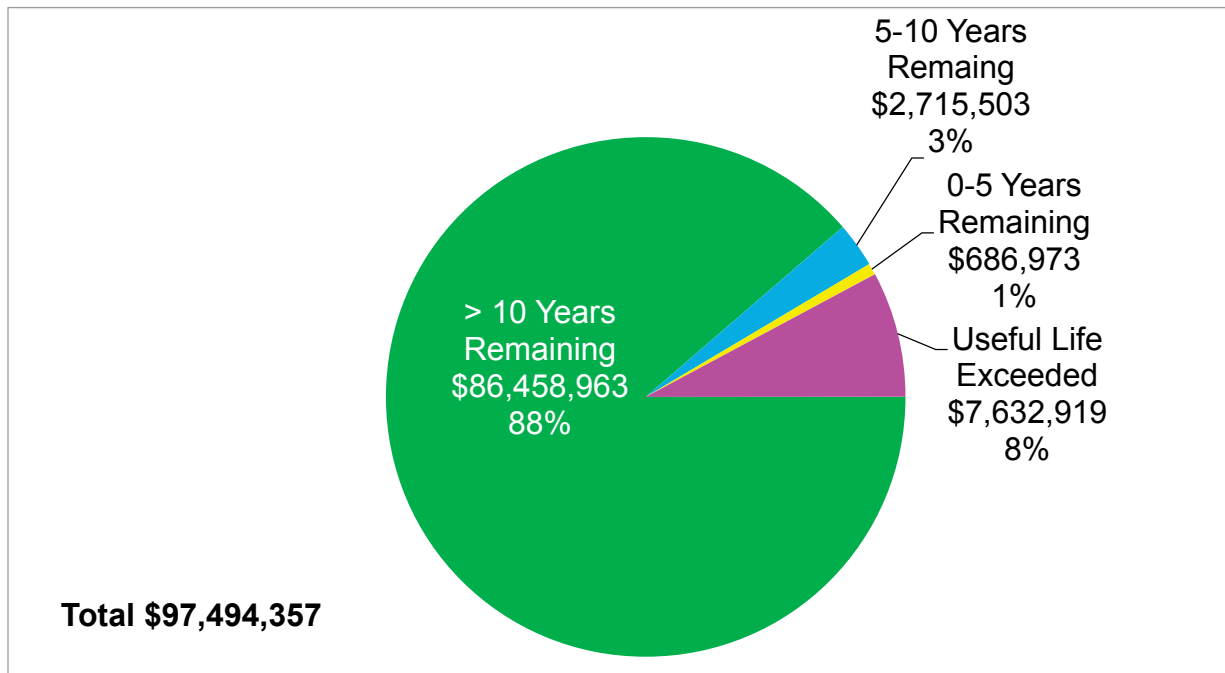
Figure 2-26 Useful Life Consumption – Sidewalks & Multi-Use Paths

5-10 Years
Remaing
$8,876,792
9%

0-5 Years
Remaining
$3,091,463
3%

Useful Life
Exceeded
$2,749,326
3%

> 10 Years
Remaining
$84,452,549
85%

Total $99,170,131
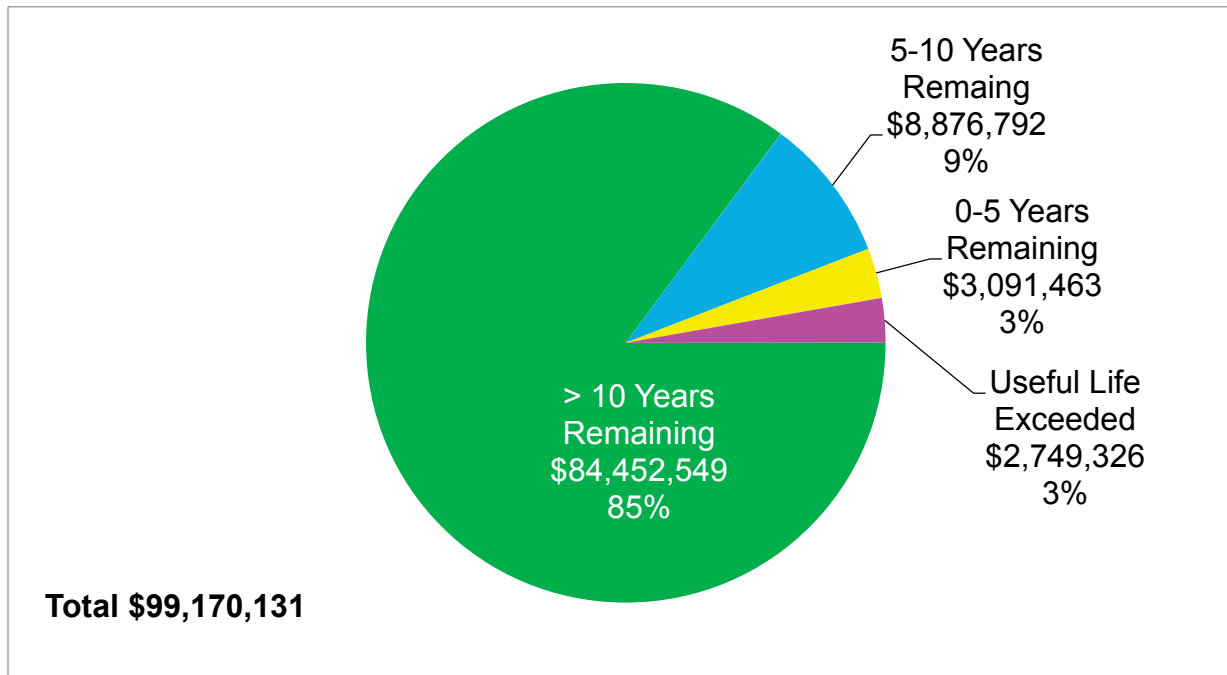
Figure 2-27 Useful Life Consumption – Parking

0-5 Years
Remaining
$112,200
2%

Useful Life
Expired
$1,314,321
25%

> 10 Years
Remaining
$3,877,063
73%

Total $5,303,584
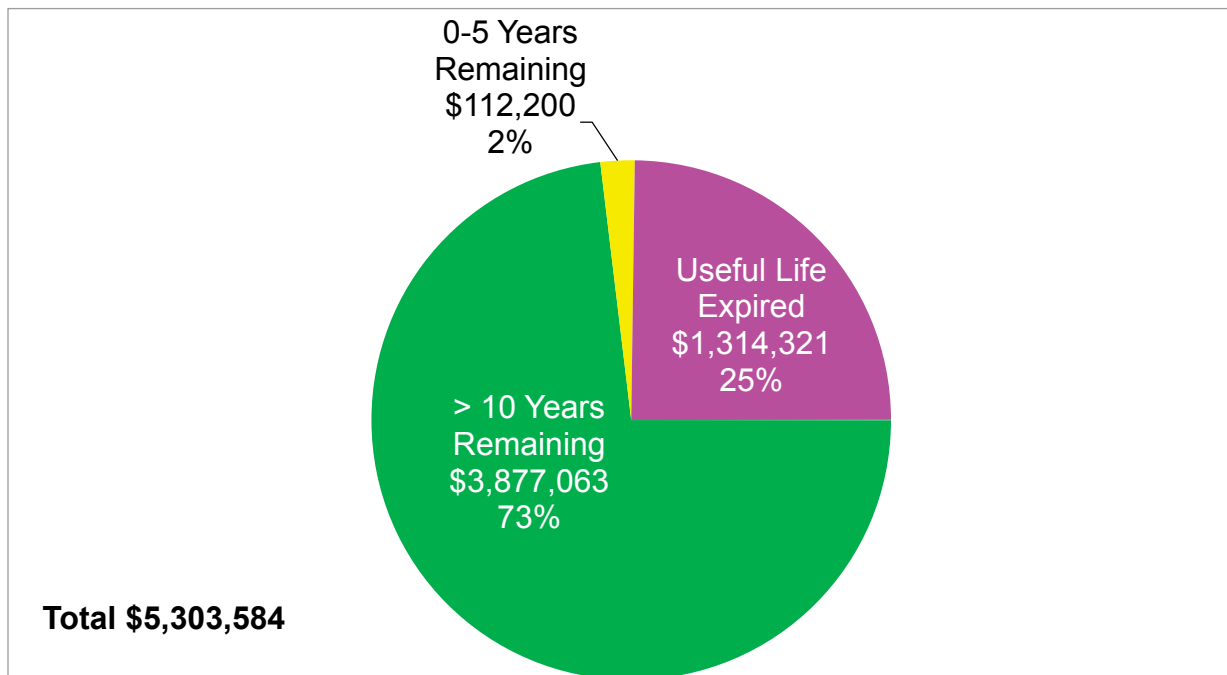
Figure 2-28 Useful Life Consumption – Roadside Appurtenances

0-5 Years
Remaining
$3,056,000
16%

Useful Life
Exceeded
$5,674,122
30%

5-10 Years
Remaing
$2,980,768
16%

> 10 Years
Remaining
$7,106,917
38%

Total $18,817,807
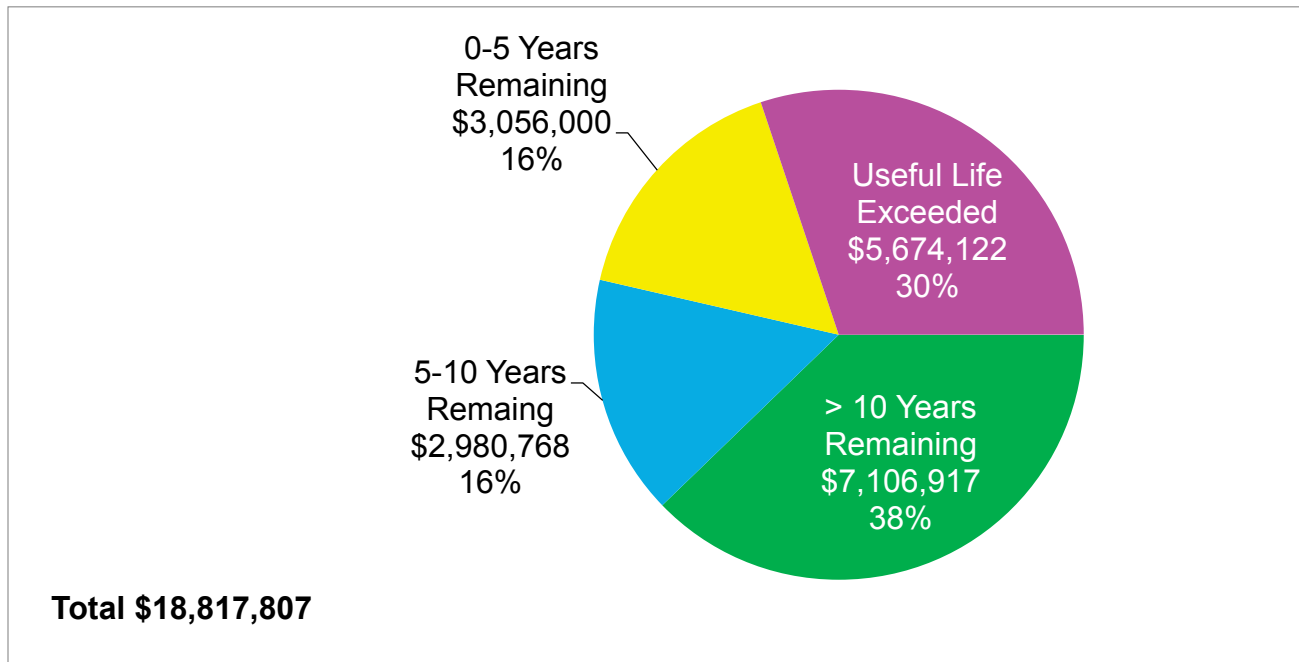
Figure 2-29 Useful Life Consumption – Stormwater Management

> 10 Years
Remaining
$194,762,469
100%

Total $194,762,469
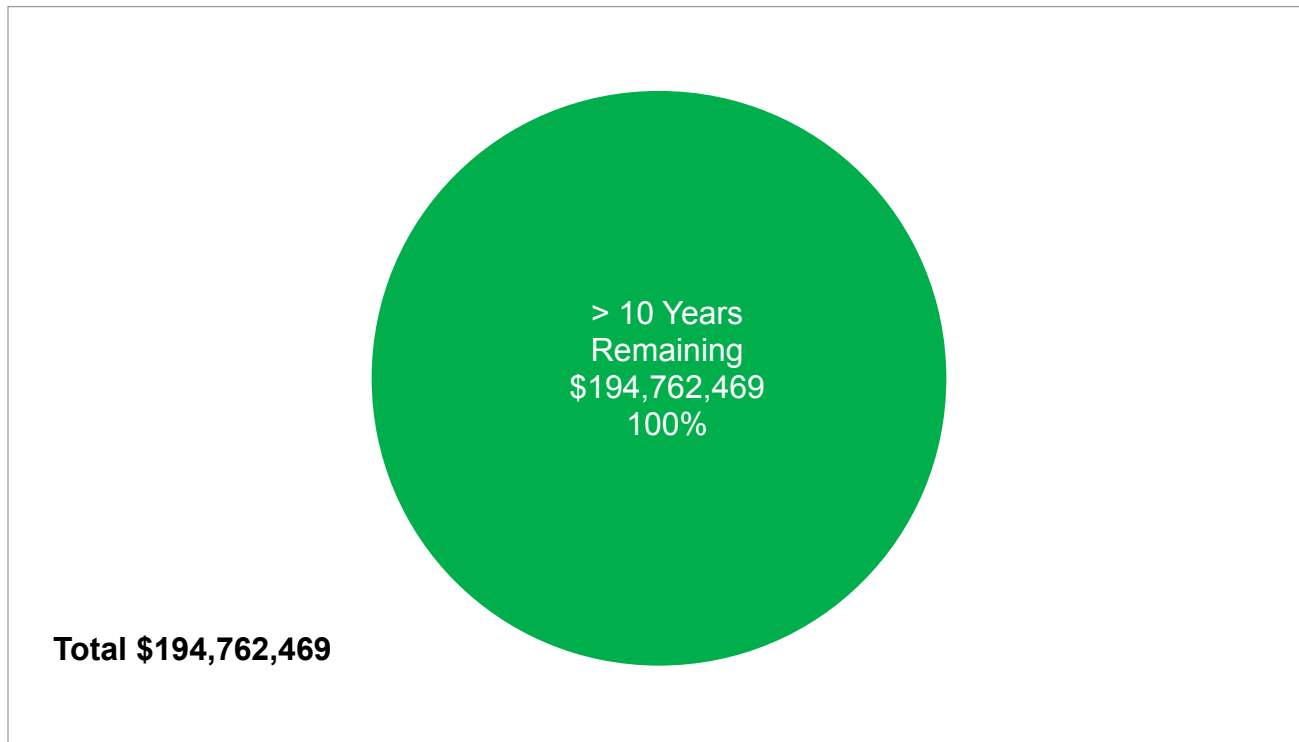
Figure 2-30 Useful Life Consumption – Streetlights

Total: $23,716,164

5-10 Years Remaing $1,746,169 7%

0-5 Years Remaining $507,939 2%

Useful Life Exceeded $1,386,250 6%

> 10 Years Remaining $20,075,806 85%
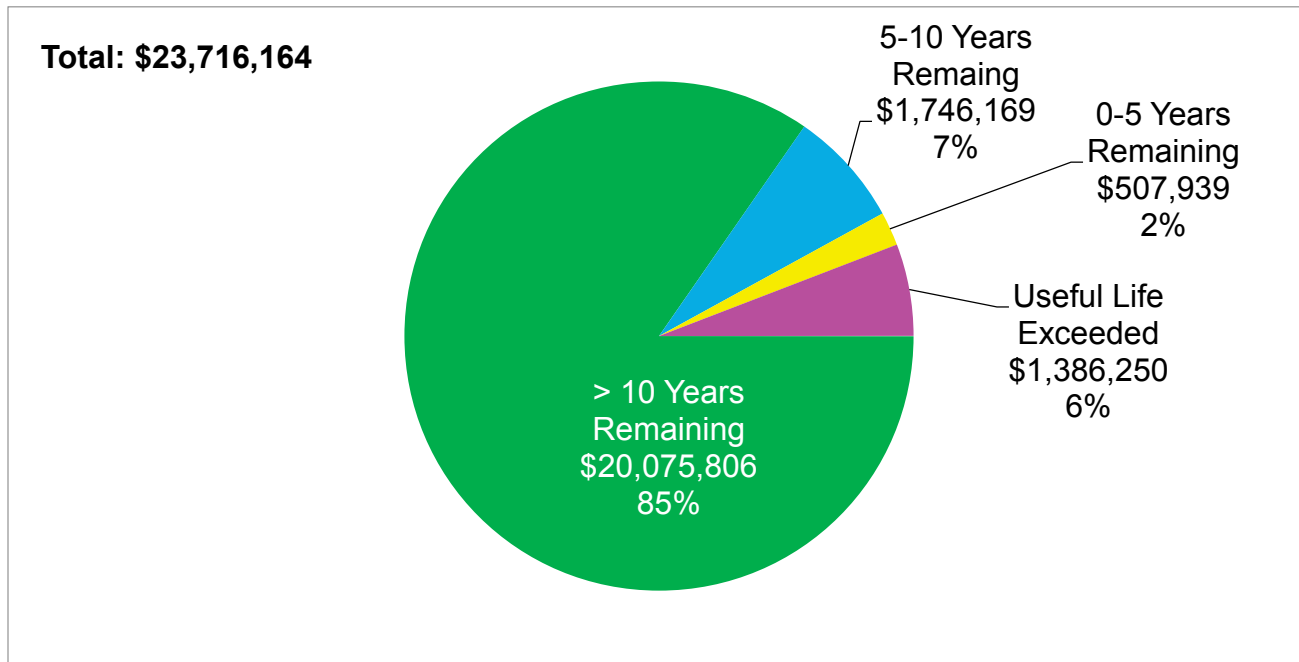
Figure 2-31 Useful Life Consumption – Street Trees

Total: $50,576,798

Useful Life Exceeded $3,450,578 7%

> 10 Years Remaining $47,126,221 93%
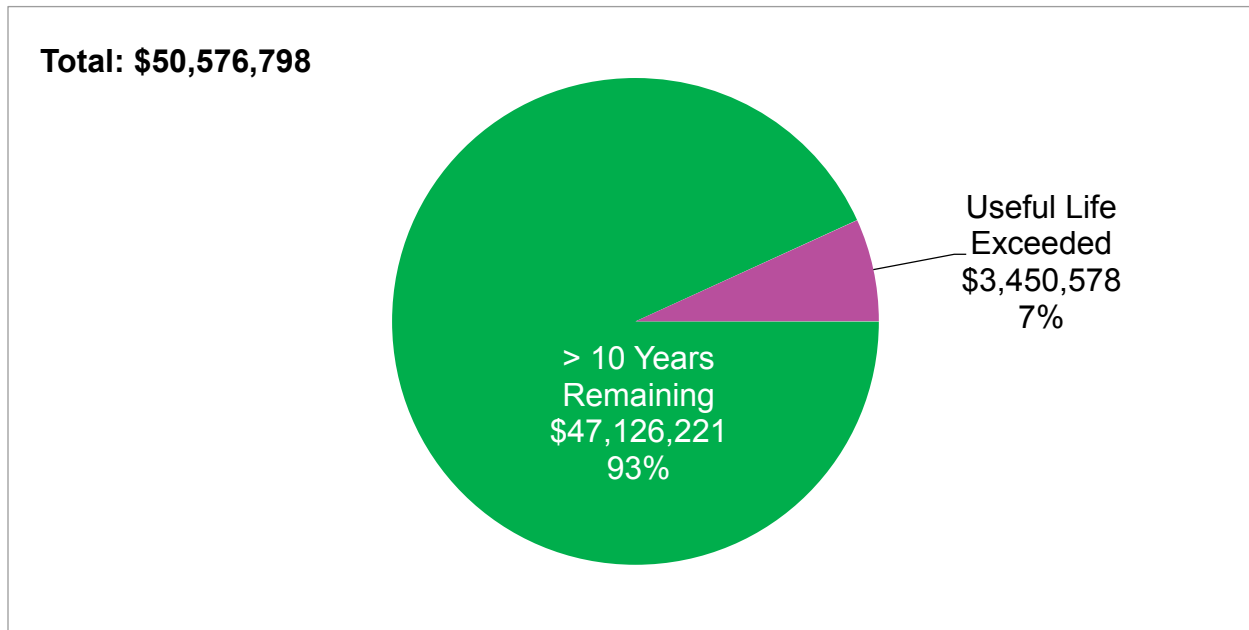
3. Levels of Service

The two primary risks to a municipality's financial sustainability are the total lifecycle costs of infrastructure, and establishing levels of service (LOS) that exceed its financial sustainability. In this regard, municipalities face a choice: overpromise and underdeliver; underpromise and overdeliver; or promise only that which can be delivered sustainably.

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 Town.

3.1 Overview of Performance Management

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 municipality. 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 municipality. The following levels of service categories have been established as guiding principles for the LOS that "each service should strive to provide internally to the organization (Town of Whitby) and externally to customers and regulators.

Available: 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

Reliable: Services are predictable and continuous

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 Town remains steadfast in its pursuit of delivering the highest value for money to various internal and external stakeholders.

3.2   Risk Management & Prioritization

3.2.1 Project Prioritization

Generally, infrastructure needs exceed municipal capacity. As such, municipalities must carefully select projects 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.

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).

As identified by Whitby, the consequences of failure are typically reflective of:

    An asset's importance in an overall system
    The criticality of the function performed
    The exposure of the public and/or staff to injury or loss of life

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 Town'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

Figure 3-1 below illustrates a range of risk factors and describes, in general terms, how the consequences of asset failure can be evaluated relative to each factor. The weightings placed on the various factors should reflect the criticality of each asset and the degree to which the public is directly exposed to risk.

Figure 3-1 Risk Factors and Consequence of Failure

	Level of Service	Other Assets	Economic Efficiency	Life, Safety and Liability
High (5)	The asset will cease to function and service will be unavailable to many users	Other assets will not be functional or will deteriorate more quickly	Opportunities for significant life extending/cost-saving rehabilitation will be missed	The asset's failure could lead directly to loss of life or injury
Medium (3)	The asset will still function but the quality of the service will be reduced for many users	The functionality of other assets will be reduced	Opportunities for moderate life extending rehabilitation will be missed	The asset's failure could lead indirectly to loss of life or injury
Low (1)	The asset will function but the quality of the service will be reduced for a few users	The function or condition of other assets will not be impacted	Replacement at failure is the only efficient option and can be easily accomplished	The potential for minor claims is increased

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 probability of failure is increased as more and more factors collude to cause asset failure.

In order to generate an infrastructure risk matrix, or a heat map, for Whitby's ROW assets, we will use the following consequence of risk scoring and probability of risk as shown below in Tables 3-1 to 3-4. The primary determinant of the probability of failure is the condition of the assets.

Table 3-1 Consequence of Failure – Roads

Asset Class	Criteria	Consequence of Failure	Description
Road Surface & Base	20,001 AADT or above	5	Major roadway; assets failure will compromise critical services and severely impede traffic flow; public safety is impacted; high value assets
	10,001-20,000 AADT	4	Assets are high use, and their failure may result in injury to public and service may likely be compromised; high value assets
	3,001-10,000 AADT	3	Medium traffic volume; local services may be compromised; risk to public safety remains a factor
	1,001-3,000 AADT	2	Low to medium traffic volume; minor, but noticeable impact on traffic flow; public safety remains a factor; lower value assets
	10-1,000 AADT	1	Low value assets; low traffic volume, and low service criticality.
Bridges/ Culverts 3m+	$2,000,000 and above	5	High value asset; high service criticality; public safety a factor
	$500,001 - $2,000,000	4	Medium to high value asset; high service criticality; public safety a factor
	$50,001 - $500,000	3	Medium value asset; medium service criticality; public safety a factor
	$5,001 - $50,000	2	Low to medium value asset; minimal service criticality
	Up to $5,000	1	Low value asset; easily replaced; no service criticality
Pedestrian Bridges	N/A	3	Medium value asset; medium service criticality; public safety a factor
Culverts 0 to 3m	N/A	1	Low value asset; easily replaced; no service criticality
Sidewalks	N/A	3	Medium value asset; medium service criticality; public safety a factor
Multi-Use Paths	N/A	3	Medium value asset; medium service criticality; public safety a factor
Meters	N/A	1	Low value asset; easily replaced; no service criticality
Public Lots – Surface/Base	N/A	2	Low to medium value asset; minimal service criticality
Parking Kiosks	N/A	1	Low value asset; easily replaced; no service criticality

Asset Class	Criteria	Consequence of Failure	Description
Traffic Control Signals	N/A	4	Medium to high value asset; high service criticality; public safety a factor
Retaining Walls	N/A	3	Medium value asset; medium service criticality; public safety a factor
Fences	N/A	1	Low value asset; easily replaced; no service criticality
Guiderails	N/A	4	Medium to high value asset; high service criticality; public safety a factor
Information Signs	N/A	4	Medium to high value asset; high service criticality; public safety a factor
Storm Sewers	>900 mm	5	High value asset; high service criticality; public safety a factor
	750-825 mm	4	Medium to high value asset; high service criticality; public safety a factor
	600-675 mm	3	Medium value asset; medium service criticality; public safety a factor
	450-525 mm	2	Low to medium value asset; minimal service criticality
	0-375 mm	1	Low value asset; easily replaced; no service criticality
Major Channels	N/A	4	Medium to high value asset; high service criticality; public safety a factor
Storm Water Ponds	N/A	4	Medium to high value asset; high service criticality; public safety a factor
Street Lights	N/A	1	Low value asset; easily replaced; no service criticality
Street Trees	N/A	1	Low value asset; easily replaced; no service criticality

Table 3-2 describes the condition rating and corresponding probability of failure for the following asset classes: Roads Surface, Roads Base, Guiderails, Retaining Walls, Public Lots, Pedestrian Bridges, Culverts 0 to 3m.

Table 3-2 Probability of Failure of Roads, Guiderails, Retaining Walls, Public Lots

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

Table 3-3 describes the condition rating and corresponding probability of failure for Road Bridges and Culverts 3 m in diameter or greater.

Table 3-3 Probability of Failure of Road Bridges and Culverts (3 m+)

Condition Rating	Probability of Failure
0-59 Very Poor	5 – Very High
60-69 Fair	4 – High
70-85 Good	3 – Moderate
85-100 Very Good	2 – Low

Table 3-4 describes the condition rating and corresponding probability of failure for Parking Meters/Kiosks, Roadside Appurtenances, Sidewalks/Multi-Use Paths, Stormwater Management, Street Lights, and Street Trees.

Table 3-4 Probability of Failure: Parking Meters, Kiosks, Roadside Appurtenances, Sidewalks & Multi-Use Paths, Stormwater Management, Street Lights, Street Trees

Condition Rating	Probability of Failure
1 - Very Poor	5 – Very High
2 - Poor	4 – High
3 - Fair	3 – Moderate
4 - Good	2 – Low
5 – Very Good	1 – Very Low

The position of the assets on the risk matrix indicates their risk exposure and priority. Figure 3-2 shows how assets are categorized into their respective priority levels based on the probability of failure and the consequence of a failure event.

Figure 3-2 Categorizing Assets Based on Risk

The risk matrix below categories the Town's asset classes in its ROW services area based on their consequence of failure and the probability of failure events.

Figure 3-3 Aggregate Risk Matrix – All Roads Assets

Consequence of Failure	Probability of Failure 1	2	3	4	5
5	758 Assets $68,175,180 4.63%	346 Assets $49,437,130 3.37%	123 Assets $15,396,812 1.05%	25 Assets $2,690,676 0.18%	5 Assets $583,808 0.04%
4	1,473 Assets $37,367,550 2.54%	2,448 Assets $48,867,459 3.32%	4,255 Assets $18,881,873 1.28%	3,049 Assets $2,503,602 0.17%	276 Asset $1,640,063 0.11%
3	1,058 Assets $104,792,696 7.12%	2,724 Assets $111,283,171 7.56%	383 Assets $17,845,272 1.21%	85 Assets $6,119,400 0.42%	17 Assets $1,396,740 0.09%
2	1,868 Assets $196,740,231 13.37%	679 Assets $33,615,765 2.29%	245 Assets $12,607,724 0.86%	106 Assets $8,383,605 0.57%	37 Assets $2,741,345 0.19%
1	36,393 Assets $552,710,156 37.56%	20,076 Assets $97,921,308 6.65%	6,334 Assets $39,735,266 2.70%	891 Assets $22,791,312 1.55%	317 Assets $17,132,045 1.16%

Probability of Failure

Figure 3-4 Risk Matrix – Roads

Consequence of Failure					
5	68 Assets $25,089,518 2.54%	20 Assets $2,258,390 0.23%	19 Assets $2,280,677 0.23%	17 Assets $2,308,523 0.23%	4 Assets $558,963 0.06%
4	35 Assets $18,413,918 1.86%	8 Assets $1,061,554 0.11%	14 Assets $2,339,086 0.24%	6 Assets $1,012,653 0.10%	7 Asset $1,599,462 0.16%
3	331 Assets $86,200,850 8.72%	112 Assets $12,959,214 1.31%	38 Assets $3,998,700 0.40%	35 Assets $3,799,275 0.38%	9 Asset $1,274,117 0.13%
2	857 Assets $174,303,321 17.62%	251 Assets $22,843,907 2.31%	101 Assets $8,113,356 0.82%	87 Assets $7,946,163 0.80%	31 Assets $2,615,550 0.26%
1	2,185 Assets $494,844,903 50.03%	554 Assets $52,553,118 5.31%	227 Assets $23,554,855 2.38%	201 Assets $20,303,830 2.05%	165 Assets $16,770,894 1.70%
	1	2	3	4	5

Probability of Failure

Figure 3-5 Risk Matrix – Bridges & Culverts

Consequence of Failure	Probability of Failure				
5	4 Assets $11,740,865 12.60%	11 Assets $29,215,127 31.36%	0 Assets $0	0 Assets $0	0 Assets $0
4	5 Assets $6,988,610 7.50%	32 Assets $25,240,380 27.09%	1 Assets $603,093 0.65%	0 Assets $0	0 Assets $0
3	3 Assets $1,169,575 1.26%	40 Assets $11,592,823 12.44%	11 Assets $1,079,937 1.16%	0 Assets $0	0 Assets $0
2	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	0 Assets $0	884 Assets $2,349,025 2.52%	1,124 Assets $2,779,184 2.98%	143 Assets $347,144 0.37%	28 Assets $64,611 0.07%
	1	2	3	4	5

Due to the construction of the Metrolinx East Rail Maintenance Facility, the Hopkins St. bridge south of Victoria St was decommissioned in July of 2016 and is not included in this risk assessment.

Figure 3-6 Risk Matrix – Sidewalks & Multi-Use Paths

Risk Matrix grid — Consequence of Failure (vertical axis, 1–5) vs Probability of Failure (horizontal axis, 1–5):

Consequence of Failure	Probability 1	Probability 2	Probability 3	Probability 4	Probability 5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
3	174 Assets $5,251,779 5.30%	2,299 Assets $80,061,377 80.73%	252 Assets $10,541,534 10.63%	31 Assets $1,356,354 1.37%	2 Assets $48,524 0.05%
2	3 Assets $350,746 0.35%	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	43 Assets $1,239,062 1.25%	13% Assets $320,268 0.32%	1 Asset $488 <0.01%	0 Assets $0	0 Assets $0

Probability of Failure

Figure 3-7 Risk Matrix – Parking

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
3	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
2	2 Assets $763,800 14.40%	6 Assets $2,071,057 39.05%	8 Assets $2,025,293 38.19%	0 Assets $0	0 Assets $0
1	95 Assets $111,983 2.11%	156 Assets $274,259 5.17%	29 Assets $44,226 0.83%	11 Assets $12,966 0.24%	0 Assets $0

Probability of Failure

Figure 3-8 Risk Matrix – Roadside Appurtenances

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	1,140 Assets $910,181 7.71%	2,242 Assets $542,737 4.60%	4,176 Assets $816,066 6.92%	3,032 Assets $443,457 3.76%	269 Assets $40,601 0.34%
3	0 Assets $0	24 Assets $1,174,632 9.96%	16 Assets $626,127 5.31%	10 Assets $782,034 6.63%	3 Assets $30,702 0.26%
2	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	246 Assets $3,815,327 32.34%	275 Assets $1,674,074 14.19%	50 Assets $688,515 5.84%	14 Assets $218,069 1.85%	6 Assets $35,322 0.30%

Probability of Failure

59

Figure 3-9 Risk Matrix – Stormwater Management

Consequence of Failure	1	2	3	4	5
5	686 Assets $31,334,797 16.09%	315 Assets $18,063,614 9.27%	104 Assets $13,116,135 6.73%	8 Assets $382,153 0.20%	1 Assets $24,845 0.01%
4	293 Assets $11,054,841 5.68%	166 Assets $18,022,788 9.25%	64 Assets $12,123,628 6.22%	11 Assets $1,047,491 0.54%	0 Assets $0
3	569 Assets $12,170,492 6.25%	249 Assets $5,495,126 2.82%	66 Assets $1,598,975 0.82%	9 Assets $181,737 0.09%	3 Assets $43,397 0.02%
2	1,056 Assets $21,322,364 10.95%	422 Assets $8,736,800 4.49%	136 Assets $2,469,075 1.27%	19 Assets $437,442 0.22%	6 Assets $125,796 0.06%
1	1,317 Assets $20,328,511 10.44%	683 Assets $11,268,178 5.82%	261 Assets $4,113,532 2.11%	75 Assets $1,177,796 0.60%	8 Assets $112,957 0.06%

Probability of Failure

Figure 3-10 Risk Matrix – Street Lights

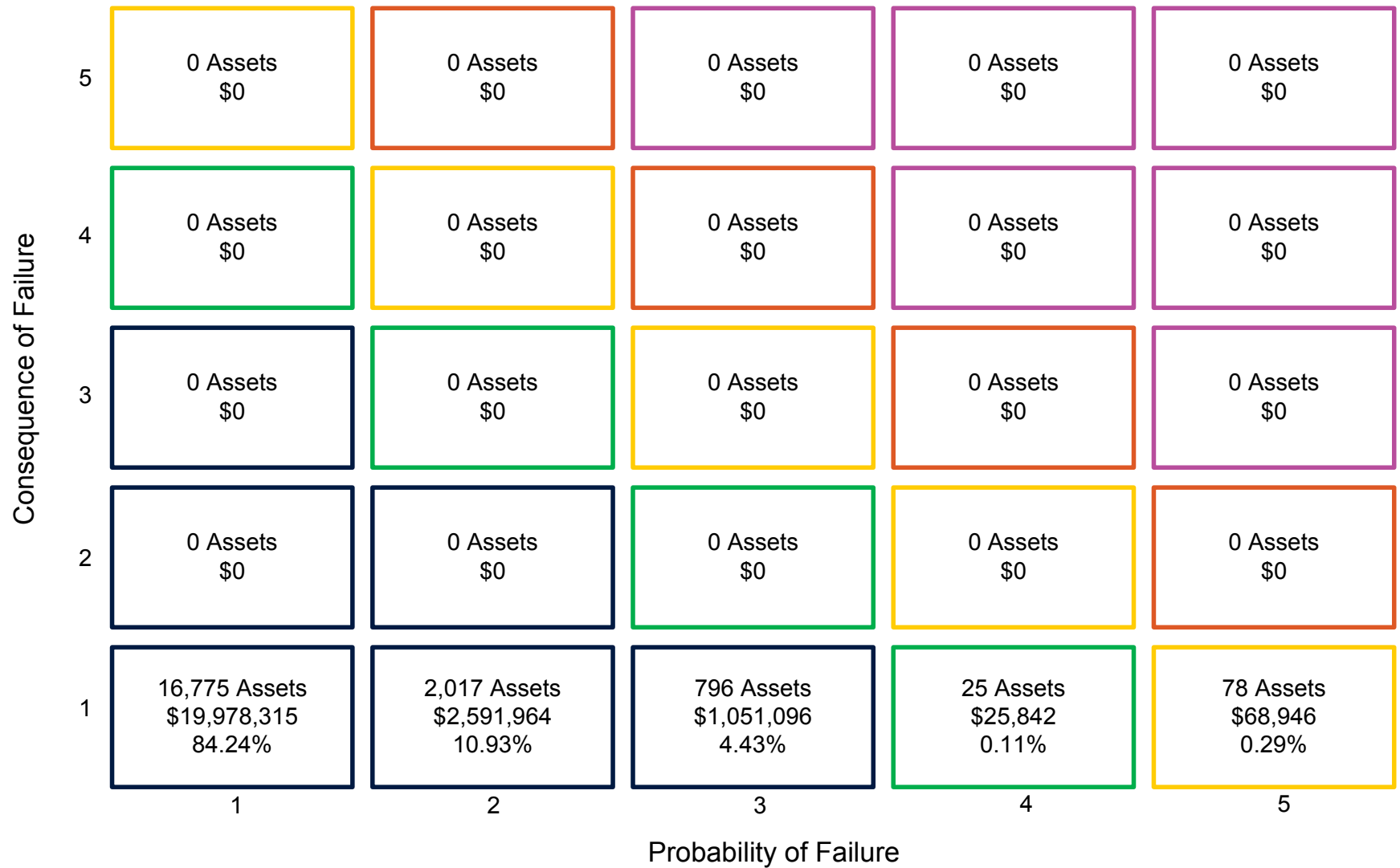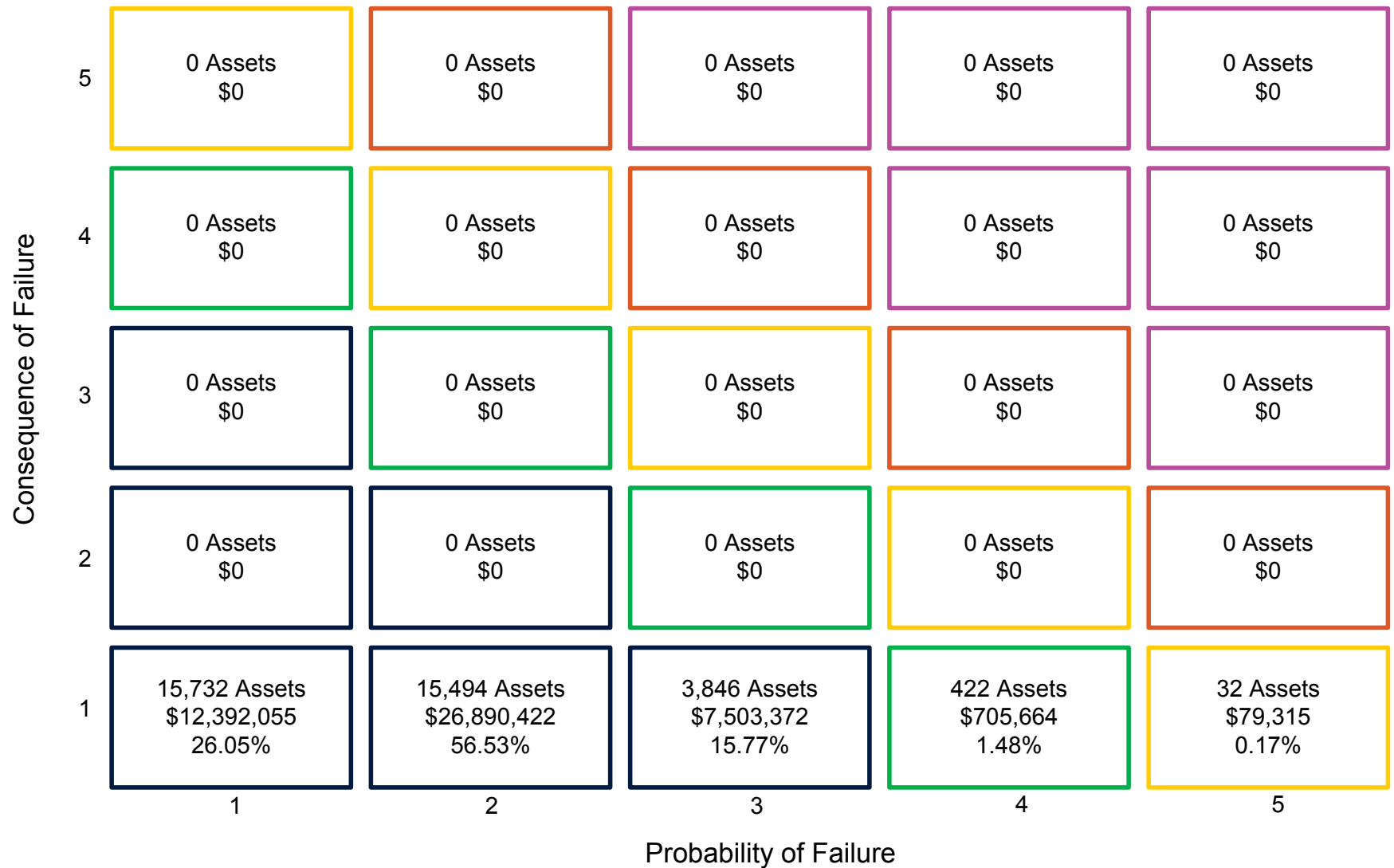| Consequence of Failure					
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
3	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
2	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	16,775 Assets $19,978,315 84.24%	2,017 Assets $2,591,964 10.93%	796 Assets $1,051,096 4.43%	25 Assets $25,842 0.11%	78 Assets $68,946 0.29%
	1	2	3	4	5

Probability of Failure

Figure 3-11 Risk Matrix – Street Trees

Consequence of Failure	Probability of Failure				
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
3	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
2	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	15,732 Assets $12,392,055 26.05%	15,494 Assets $26,890,422 56.53%	3,846 Assets $7,503,372 15.77%	422 Assets $705,664 1.48%	32 Assets $79,315 0.17%
	1	2	3	4	5

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3.3   Key Performance Indicators and Targets

We recommend condition-related KPIs and service oriented KPIs for the Town's ROW assets. Condition related KPIs gauge the functionality of assets, e.g., observed condition rating and investments in maintenance. Service oriented KPIs illustrate whether assets meet community expectations. In subsequent iterations of this SAAMP, the 'Future Level' of KPIs for each asset class can be entered, illustrating a trend.

Table 3-5 Key Performance Indicators (KPIs)

Asset Class	KPI Target – Condition Related	Current Level	KPI Status	Previous Level	KPI Trend
Roads	• More than 75% of HCB1 and HCB2 are in Good or better condition (PCR 50-100) Less than 5% are in Poor or worse condition (PCR <40). • More than 75% of HCB3 and HCB4 are in Fair or better condition (PCR 40-100). Less than 10% of HCB3 and HCB4 are in Very Poor condition.	• 61.6% of HCB1/HCB2 and 75% HCB3/HCB4 in Good or Very Good condition • 6% of HCB1/HCB2 and 5.5%HCB3/HCB4 in Poor to Very Poor condition	☒ ☑	☑ ☑	↓ =
Bridges & Culverts	• More than 85% of bridge and culvert assets in Good or Very Good condition (BCI 70 – 100) and less than 1% in Poor or Very Poor condition	• 95% in Good to Very Good condition	☑	☑	=
Sidewalks & Multi-Use Paths	• At least 50% of sidewalks in Good or Very Good condition rating 4 or 5. Less than 1% in Very Poor condition	• 97% in Good to Very Good condition	☑	☑	=
Parking	• Meters – More than 80% in Fair or better condition • Kiosks – More than 95% in Fair or better condition • Parking Lots – Less than 5% should be in Poor or Very Poor condition	• 86% of meters Fair or better condition • 90% of kiosks in Fair or better condition • 0% in Poor or Very Poor Condition	☑ ☑ ☑	☑ ☑ ☑	=

Asset Class	KPI Target – Condition Related	Current Level	KPI Status	Previous Level	KPI Trend
Roadside Appurtenances	• Signs – Less than 1% in Poor or Very Poor condition • Guiderails – Less than 1% in Poor or Very Poor condition • Fences – Less than 5% in Poor or Very Poor condition • Retaining Walls – Less than 5% in Poor or Very Poor condition	• The majority of signs are in Poor or Very Poor condition • Less than 1% of guiderails in Poor or Very Poor condition • Less than 4% of fences in Very Good condition • Less than 2% of retaining walls in Poor or Very Poor condition	☒ ☑ ☑ ☑	☑ ☑ ☑ ☑	↓
Street Lights	• Less than 1% of street lights luminaries and poles along arterial roads are in Poor or Very Poor condition • Less than 5% of streetlights luminaries and poles along local and collector are in Poor or Very Poor condition	• Less than 1% of all streetlight luminaries and poles along arterial roads are in Poor or Very Poor condition • Less than 1% of all streetlight luminaires and poles along local roads are in Poor or Very Poor condition	☑ ☑	☑ ☑	=
Street Trees	• Less than 1% are in Poor or Very Poor condition	• 14% in Poor to Very Poor condition	☒	☒	=
Stormwater Management	• Storm Lines – Less than 5% are in Poor to Very Poor condition • Storm Ponds – Less than 5% are in Poor to Very Poor condition	• Less than 2% of storm lines in Poor to Very Condition • Less than 4% of storm ponds in Poor to Very Poor condition	☑ ☑	☑ ☑	=

3.4   Future Performance

In addition to the Financial Sustainability, and legislative requirements, e.g., 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.

The municipality's overarching strategic goals as a community will determine the types of services it will provide to its residents, the associated demand on infrastructure, and the level of service it can feasibly deliver. These LOS are directly influenced by – and should reflect – not only the municipality's financial capacity to maintain the assets, but also the current state of the infrastructure.

Public expectations and opinions can also play an important part in prioritizing investments in infrastructure and service delivery standards. 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. Citizenship expectations and insights will also reflect the demographic composition of the community. Further, a growing community can place added demand on critical infrastructure, and may reduce levels of service standards.

Lastly, the wider global context can have direct consequence on a municipality's capacity to provide established levels of service. Fluctuations in macroeconomic variables such as interest rates and fuel costs, and environmental considerations such as climate change, should be considered prior to making infrastructure investments and changing the municipality's asset portfolio.

3.5   Monitoring, Updating and Actions

Roads and related infrastructure are considered essential assets that provide core services to the citizens of Whitby. The Town of Whitby has established condition-related, technical and service-oriented LOS targets for its ROW Service Area. The municipality should collect data on its current performance against the KPIs listed in section 3.2.

We recommend the Town continue to assess its ROW program against technical and service-oriented KPIs that gauge not only the maintenance and condition of the ROW, but also how well they are meeting resident expectations. These established targets should reflect the current fiscal capacity of the municipality, its corporate and strategic goals, and changes in demographics that may place additional demand on its ROW assets.

We also recommended that ROW condition data be collected on at established intervals as defined in the table below.

Table 3-6 Lifecycle Activities – Inspection Frequency

Asset Class	Inspection Interval
Roads	Every 2 Years
Bridges	Every 2 Years
Pedestrian Bridges	Every 2 Years
Culverts 3m+	Every 2 Years
Retaining Walls	Every 2 Years
Sidewalks	Every Year
Trees	Every 7 Years
Storm Lines	Every 10 Years
Street Lights	Every 5 Years
Channels and Enclosures	Every 5 Years

As a function of traffic counts, the Town should also make a point of recording the number of heavy trucks and other large vehicles on Town roads, as these vehicles have exponentially higher impacts on road condition than standard passenger vehicles.

3.6   Non-Infrastructure Solutions and Requirements

The municipality should explore, as requested through the provincial requirements, which non-infrastructure solutions should be incorporated into the budgets for its ROW 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 municipality 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 municipality should continue to implement holistic condition assessment programs for its ROW assets. This will advance the understanding of infrastructure needs, improve budget prioritization methodologies, and provide a clearer path of what is required to achieve sustainable infrastructure programs.

4. Asset Maintenance & Renewal Strategies

The asset management and renewal 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 municipality'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. The following tables illustrate the lifecycle activities associated with roads surface components within the ROW infrastructure.

Gravel roads are scarified, graded and shaped every three years. Material is also added, and ditches are maintained. In the intermediate years, potholes are filled and roads are regraded two to three times a year.

Table 4-1 Lifecycle Activities - HCB1 & HCB2

Service Area	Asset Class	Lifecycle Event	Cost/lane-km	Year
Road Right of Way	Roads – HCB 1 & HCB 2	Crack Sealing	$1,737	5
		Crack Sealing	$1,737	10
		R1 Resurfacing	$166,464	15
		Crack Sealing	$1,737	20
		Crack Sealing	$1,737	25
		R1 Resurfacing	$166,464	30
		Crack Sealing	$1,737	35
		Crack Sealing	$1,737	40
		R2 Resurfacing	$182,070	45
		Crack Sealing	$1,737	50
		Crack Sealing	$1,737	55
		R1 Resurfacing	$166,464	60
		Crack Sealing	$1,737	65
		Crack Sealing	$1,737	70
		R1 Resurfacing	$166,464	75
		Crack Sealing	$1,737	80
		Crack Sealing	$1,737	85
		Reconstruction	$676,250	90

Table 4-2 Lifecycle Activities – HCB3 & HCB4

Service Area	Asset Class	Lifecycle Event	Cost/lane-km (HCB3)	Cost/lane-km (HCB4)	Year
Road Right of Way	Roads – HCB 3 & HCB 4	Crack Sealing	$1,737	$1,737	5
		Crack Sealing	$1,737	$1,737	10
		R2 Resurfacing	$275,705	$239,292	35
		Crack Sealing	$1,737	$1,737	40
		Crack Sealing	$1,737	$1,737	45
		R2 Resurfacing	$275,705	$239,292	65
		Crack Sealing	$1,737	$1,737	70
		Crack Sealing	$1,737	$1,737	75
		Reconstruction	$1,136,637	$975,375	96

Table 4-3 Lifecycle Activities – LCB

Service Area	Asset Class	Lifecycle Event	Cost/m2	Year
Road Right of Way	Roads – LCB	Slurry Seal	$2.20	6-7
		Single Surface Treatment & Slurry Seal	$7.95	12-14
		Reconstruction	$13.95	20

Table 4-4 Lifecycle Activities – Road Bridges

Service Area	Asset Class	Lifecycle Event	Cost	Year
Road Right of Way	Bridges & Culverts	Replace Deck & Superstructure	$5,100m^2	60
		Replace Deck, Superstructure & Substructure	$7,285m^2	120

Table 4-5 Lifecycle Activities – Culverts

Service Area	Asset Class	Lifecycle Event	Cost	Year
Road Right of Way	Bridges & Culverts	Reconstruct (Culverts 0 to 3m)	$280/m	50
		Reconstruct (Culverts 3m +)	$4,790m^2	90

Table 4-6 Lifecycle Activities – Sidewalks

Year	Activity	Cost
0	Construct	$125/m^2
45	Reconstruct	$125/m^2

Table 4-7 Lifecycle Activities – Multi-Use Paths

Year	Activity	Cost
0	Construct	$50/m^2
20	Reconstruct	$50/m^2

Table 4-8 Lifecycle Activities – Parking Meters

Year	Activity	Cost
0	Purchase	$1,155
20	Replace	$1,155

Table 4-9 Lifecycle Activities – Parking Kiosks

Year	Activity	Cost
0	Purchase	$11,000
10	Replace	$11,000

Table 4-10 Lifecycle Activities – Public Parking Public Lots

Activity	Cost	Year	Notes
Construct	$116/m^2	0	
Crack Sealing	$2.00/m	6	Assuming 0.5m/m^2
Crack Sealing	$2.00/m	12	Assuming 0.5m/m^2
Resurface	$50/m^2	25	
Crack Sealing	$2.00/m	31	Assuming 0.5m/m^2
Crack Sealing	$2.00/m	37	Assuming 0.5m/m^2
Resurface	$50/m^2	50	
Crack Sealing	$2.00/m	56	Assuming 0.5m/m^2
Crack Sealing	$2.00/m	62	Assuming 0.5m/m^2
Reconstruct	$116/m^2	80	

Table 4-11 Lifecycle Activities – Roadside Appurtenances (Traffic Control Signals)

Year	Activity	Cost
0	Purchase	$250,000
30	Replace	$250,000

Table 4-12 Lifecycle Activities – Roadside Appurtenances (Fences)

Year	Activity	Cost
0	Construct	$210/m
25	Reconstruct	$210/m

Table 4-13 Lifecycle Activities – Roadside Appurtenances (Guiderails)

Year	Activity	Cost
0	Construct	$71.35/m
25	Reconstruct	$71.35/m

Table 4-14 Lifecycle Activities – Roadside Appurtenances (Information Signs)

Year	Activity	Cost
0	Purchase	$118.64
20	Replace	$118.64

Table 4-15 Lifecycle Activities – Stormwater Management (Ponds)

Year	Activity	Ponds	Storm Lines	Major Channels
0	Construct	$60.81/m^3	$430/m	$1,840/m
90	Reconstruct	$60.81/m^3	$430/m	$1,840/m

Table 4-16 Lifecycle Activities – Street Lights

Year	Activity	Poles	Luminaires
0	Purchase	$2,198	$517
25	Replace	$0	$517
50	Replace	$2,198	$0

Table 4-17 Lifecycle Activities – Street Trees

Year	Activity	Cost
0	Purchase	$462
50	Replace	$462

4.1 Condition Assessment Programs

4.1.1 Pavement Network Inspection

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

Surface distress data involves the collection of multiple industry standard surface distresses, which are captured either electronically, using sensing detection equipment mounted on the van, or visually, by the van's inspection crew.

Roughness data capture involves the measurement of the roughness of the road, measured by lasers that are mounted on the inspection van's bumper, calibrated to an international roughness index.

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

It is recommended that the municipality continue to implement a pavement condition assessment program and that a portion of capital funding is dedicated to this.

4.1.2 Bridges & Culverts Inspection

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). At present, in the municipality, there are 66 structures that meet this criterion, including 20 pedestrian bridges.

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 municipality'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 municipality's bridges and culverts.

4.1.3 Storm Sewer Network Inspections

The most popular and practical type of sanitary and storm sewer assessment is the use of Closed Circuit Television Video (CCTV). The process involves a small robotic crawler vehicle with a CCTV camera attached that is lowered down a maintenance hole into the sewer main to be inspected. The vehicle and camera then travels the length of the pipe providing a live video feed to a truck on the road above where a technician / inspector records defects and information regarding the pipe. A wide range of construction or deterioration problems can be captured including open/displaced joints, presence of roots, infiltration & inflow, cracking, fracturing, exfiltration, collapse, deformation of pipe and more. Therefore, sewer CCTV inspection is an Very Good tool for locating and evaluating structural defects and general condition of underground pipes.

Even though CCTV is an Very Good option for inspection of sewers it is a fairly costly process and does take significant time to inspect a large volume of pipes.

Another option in the industry today is the use of Zoom Camera equipment. This is very similar to traditional CCTV, however, a crawler vehicle is not used but in it's a place a camera is lowered down a maintenance hole attached to a pole like piece of equipment. The camera is then rotated towards each connecting pipe and the operator above progressively zooms in to record all defects and information about each pipe. The downside to this technique is the further down the pipe the image is zoomed, the less clarity is available to accurately record defects and measurement. The upside is the process is far quicker and significantly less expensive and an assessment of the manhole can be provided as well. Also, it is important to note that 80% of pipe deficiencies generally occur within 20 metres of each manhole.

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

4.2 Lifecycle Framework

4.2.1 Paved Roads

The following diagrams, extracted from CityWide®, depict the typical deterioration of HCB/LCB roads, and the points of intervention at key stages throughout the lifecycle of the asset. Detailed lifecycle intervention activities are outlined in Tables 4-1, 4-2, and 4-3. These curves depict the associated costs of lifecycle activities as assigned by the Town. With future updates of this SAAMP, the Town may wish to review the condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality's work program. Also note: adjusting these thresholds actually adjusts the level of service provided and ultimately changes the amount of money required.

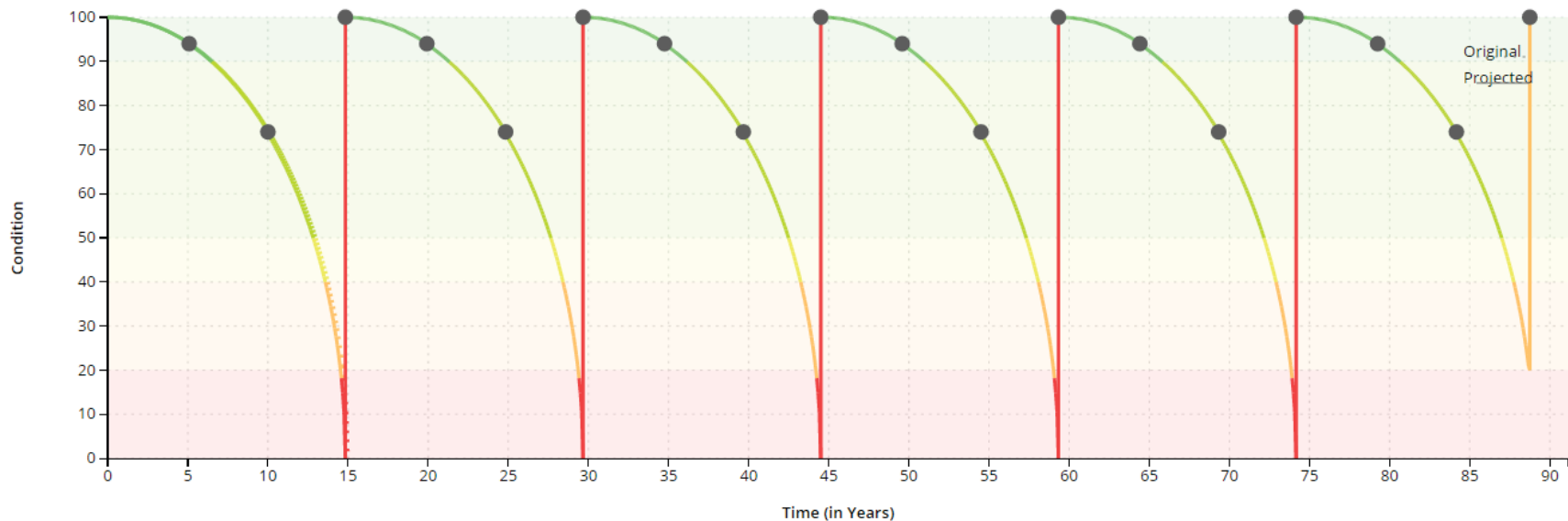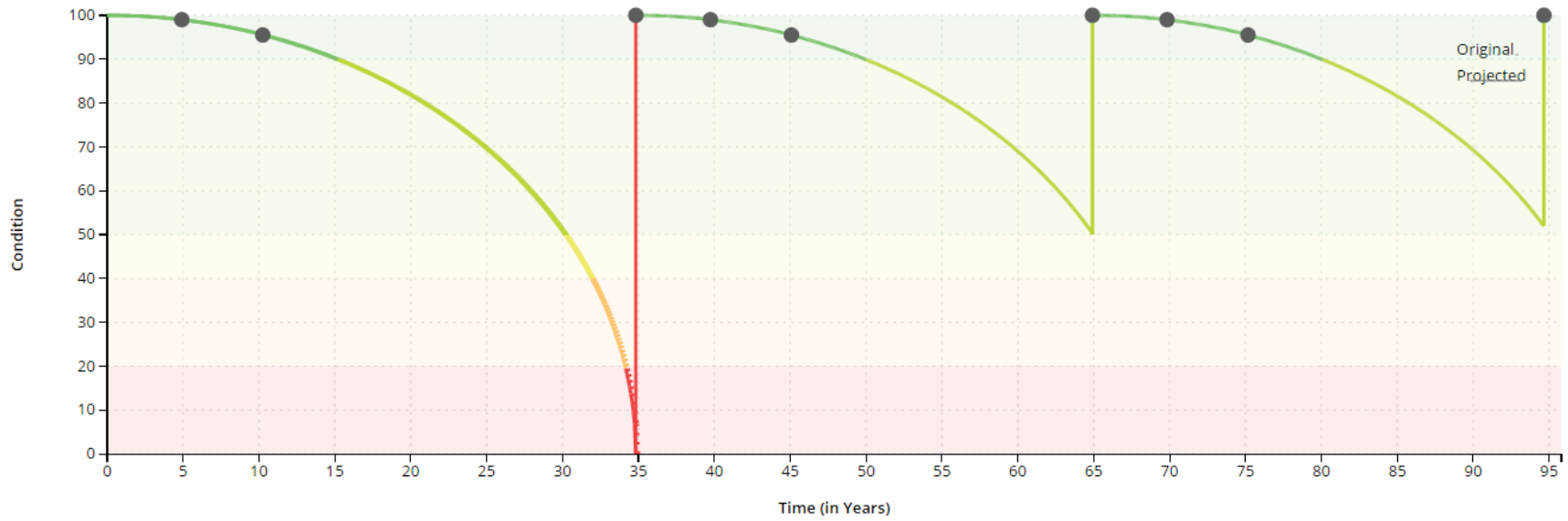Figure 4-1 Lifecycle Strategy/Deterioration Curve: HCB1 & 2

Figure 4-2 Lifecycle Strategy/Deterioration Curve: HCB3 &4

4.2.2 Storm Sewers

The following analysis has been conducted at a fairly high level, using industry standard activities and costs for sanitary and storm sewer rehabilitation and replacement. With future updates of this asset management strategy, the municipality may wish to run the same analysis with a detailed review of municipality activities used for sewer mains and the associated local costs for those work activities. The following diagram depicts a general deterioration profile of a sewer main with a 100-year life.

Figure 4-3 Deterioration Curve and Windows of Intervention for Storm Sewers
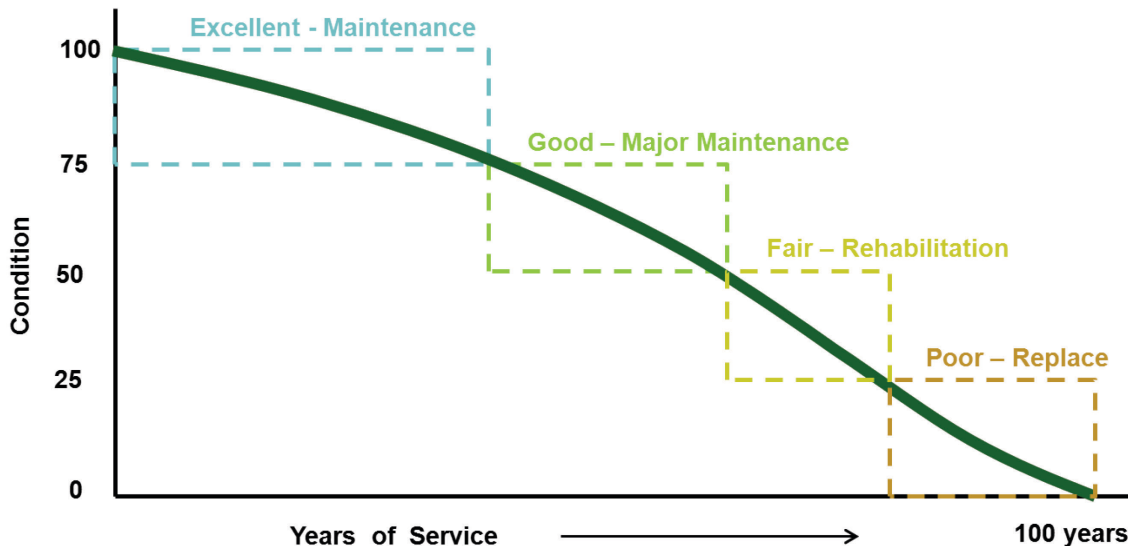
As shown above, during the sewer main's life cycle there are various windows available for work activity that will maintain or extend the life of the asset. These windows are: maintenance; major maintenance; rehabilitation; and replacement or reconstruction.

The windows or thresholds for when certain work activities should be applied also coincide approximately with the condition state of the asset.

With future updates of this SAAMP, the municipality may wish to review the condition ranges and thresholds for when certain types of work activity occur, and adjust to better suit the municipality'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 with the CityWide software suite and an updated financial analysis can be calculated. These adjustments will be an important component of future SAAMPs, as the province requires each municipality to present various management options within the financing plan.

It is recommended that the municipality establish a life cycle activity framework for the various material classes of main within its stormwater management network.

4.2.3 Bridges & Culverts (greater than 3m span)

The best approach to develop a 10-year needs list for the municipality'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. This approach is described in more detail within the "Bridges & Culverts (greater than 3m) Inspections" section above.

4.3　Monitoring, Updating and Action

To continue to develop its asset management program, we recommend the following:

The Town of Whitby should continue to assess the condition of its ROW assets and dedicate a portion of its capital funding to this assessment.

Risk should be reviewed annually to ensure assets are being maintained effectively.

5. Financial Strategy

5.1   General Overview of Financial Plan Requirements

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 is underway (expected Q1 2017) and will be accompanied by an updated Development Charge Background Study and the Long Term Financial Strategy (2017). This will allow The Town of Whitby to identify the financial resources required for sustainable asset management based on existing asset inventories, desired levels of service, and projected growth requirements.

Figure 5-1 depicts the various cost elements and resulting funding levels that should be incorporated into AMPs that are based on best practices.

Figure 5-1 Cost Elements

These elements are required to fully fund replacement costs.

GROWTH REQUIREMENTS
Funding at this level is fully sustainable and covers future investment needs.

SERVICE ENHANCEMENTS

INFLATION REQUIREMENTS
Funding at this level provides for replacement costs at existing service levels.

RENEWAL REQUIREMENTS
Funding at this level provides for proven renewal opportunities which delay the need and cost of full replacement.

AMORTIZATION OF HISTORICAL COST OF INVESTMENT
Funding at this level meets accounting rules implemented in 2009 but does not adequately plan for the future .

PRINCIPAL & INTEREST PAYMENTS
Funding at this level covers cash costs only and is significantly under-funded in terms of lifecycle costs.

OPERATING AND MAINTENANCE COSTS

This report develops such a financial plan by presenting several scenarios for consideration and culminating with final recommendations. 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)
requirements of anticipated growth (none identified for this plan)

If the financial plan component of the 2016 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 municipality'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.

This SAAMP includes recommendations that avoid long-term funding deficits.

5.2   Current Financial Profile

Table 5-1 below outlines the Town of Whitby's capital requirements over the next 100 years. Table 5-2 compares the Town's current funding allocation with its sustainable life cycle requirements.

Table 5-1 Short-term, Medium-term, and Long-term Needs

| Service Area	Asset Type	5 Year Requirement (Short-term)	10 Year Requirement (Medium-term)	25 Year Requirement (Medium-term)	50 Year Requirement (Long-term)	100 Year Requirement (Long-term)
Road Right of Way	Roads	$59,307,116	$142,091,161	$263,749,562	$497,204,280	$1,605,666,882
	Bridges & Culverts	$64,611	$64,611	$37,669,026	$87,525,020	$135,574,963
	Sidewalks & Multi-Use Paths	$25,977	$25,977	$3,036,469	$100,537,444	$202,253,158
	Parking	$5,700,000	$12,975,616	$31,974,224	$72,732,794	$286,458,085
	Roadside Appurtenances	$534,270	$2,170,825	$18,070,263	$34,161,071	$74,433,958
	Stormwater Management	$5,700,000	$12,975,616	$31,974,224	$72,732,794	$286,458,085
	Street Lights	$27,692	$76,754	$6,342,791	$29,999,667	$59,999,335
	Street Trees	$58,565	$79,315	$784,979	$47,570,828	$98,147,626
	Total	**$65,718,232**	**$157,609,427**	**$363,640,994**	**$874,320,393**	**$2,474,546,464**

Table 5-2 Infrastructure Requirements & Current Funding Available

Service Area	Asset Type	5 Year Average Annual Requirement (Short-term)	10 Year Average Annual Requirement (Medium-term)	25 Year Average Annual Requirement (Medium-Term)	50 Year Average Annual Requirement (Long-term)	100 Year Average Annual Requirement (Long-term)	Sustainable Average Annual Lifecycle Requirement
Road Right of Way	Roads	$11,861,423	$14,209,116	$10,549,982	$9,944,086	$16,056,669	$15,660,659
	Bridges & Culverts	$12,922	$6,461	$1,506,761	$1,750,500	$1,355,750	$1,317,492
	Sidewalks & Multi-Use Paths	$5,195	$2,598	$121,459	$2,010,749	$2,022,532	$2,241,040
	Parking	$1,140,000	$1,297,562	$1,278,969	$1,454,656	$2,864,581	$120,125
	Roadside Appurtenances	$106,854	$217,083	$722,811	$683,221	$744,340	$780,420
	Stormwater Management	$1,140,000	$1,297,562	$1,278,969	$1,454,656	$2,864,581	$2,170,172
	Street Lights	$5,538	$7,675	$253,712	$599,993	$599,993	$599,993
	Street Trees	$11,713	$7,932	$31,399	$951,417	$981,476	$951,417
	Total Average Annual Requirement	**$13,143,646**	**$15,760,943**	**$14,545,640**	**$17,486,408**	**$24,745,465**	**$23,841,317**
	Total Funding Available	**$9,985,424**	**$9,985,424**	**$9,985,424**	**$9,985,424**	**$9,985,424**	**$9,985,424**
	Surplus/(Deficit)	**-$3,158,222**	**-$5,775,519**	**-$4,560,216**	**-$7,500,984**	**-$14,760,041**	**-$13,855,893**

5.3 Forecasting Replacement Needs

In the following sections, we illustrate the short-, medium- and long-term infrastructure spending requirements (replacement only) for each asset class. The backlog represents the immediate replacement needs that were deferred over previous years or decades.

Figure 5-2 Forecasting Aggregate Replacement Needs
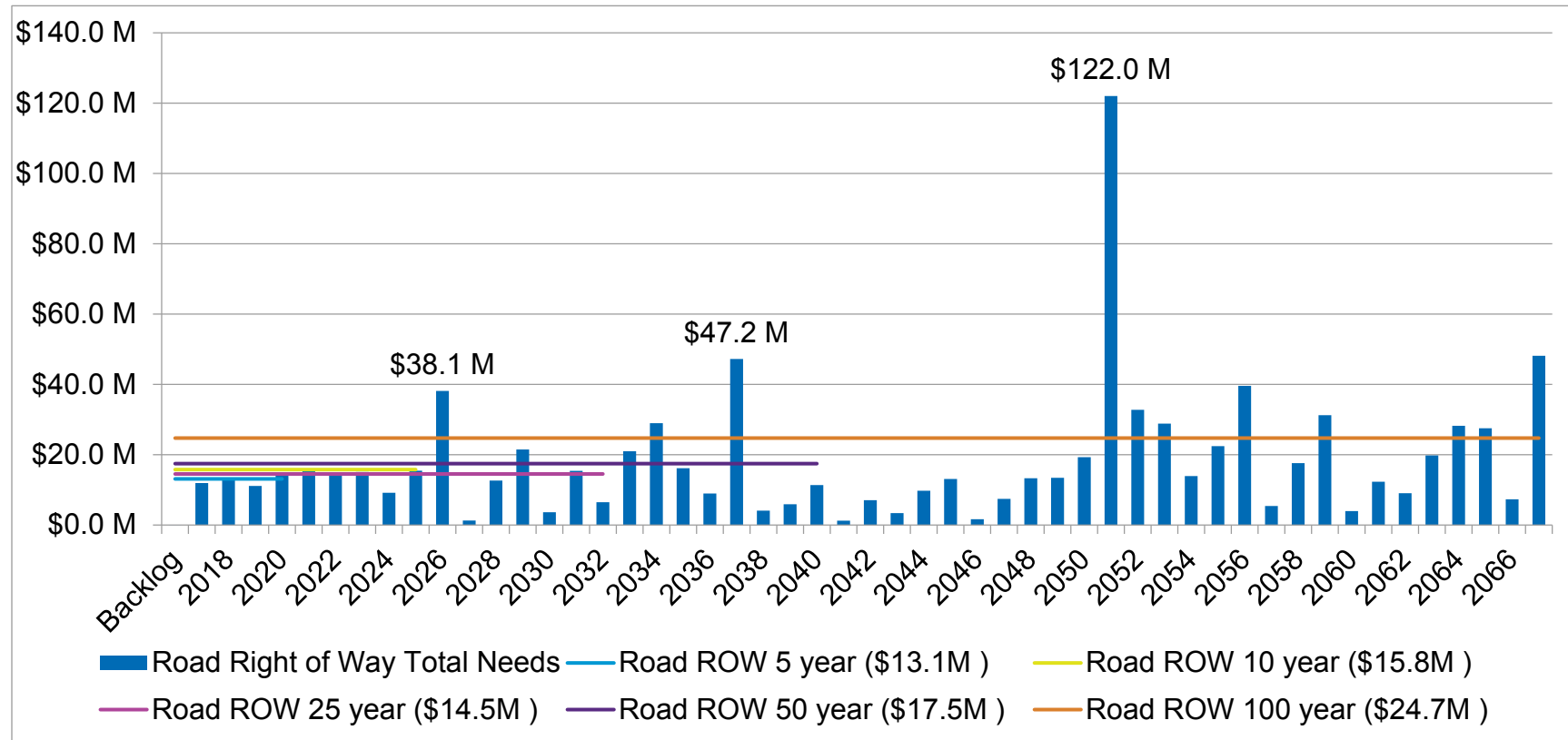
In addition to an infrastructure backlog totalling $35,846, the Town of Whitby's replacement related requirements will total $65.7 million over the next five years. An additional $91.9 million will be required between 2022 and 2026. The following graphs illustrate the forecasted replacement needs for each asset class.

Figure 5-3 Forecasting Replacement Needs – Roads
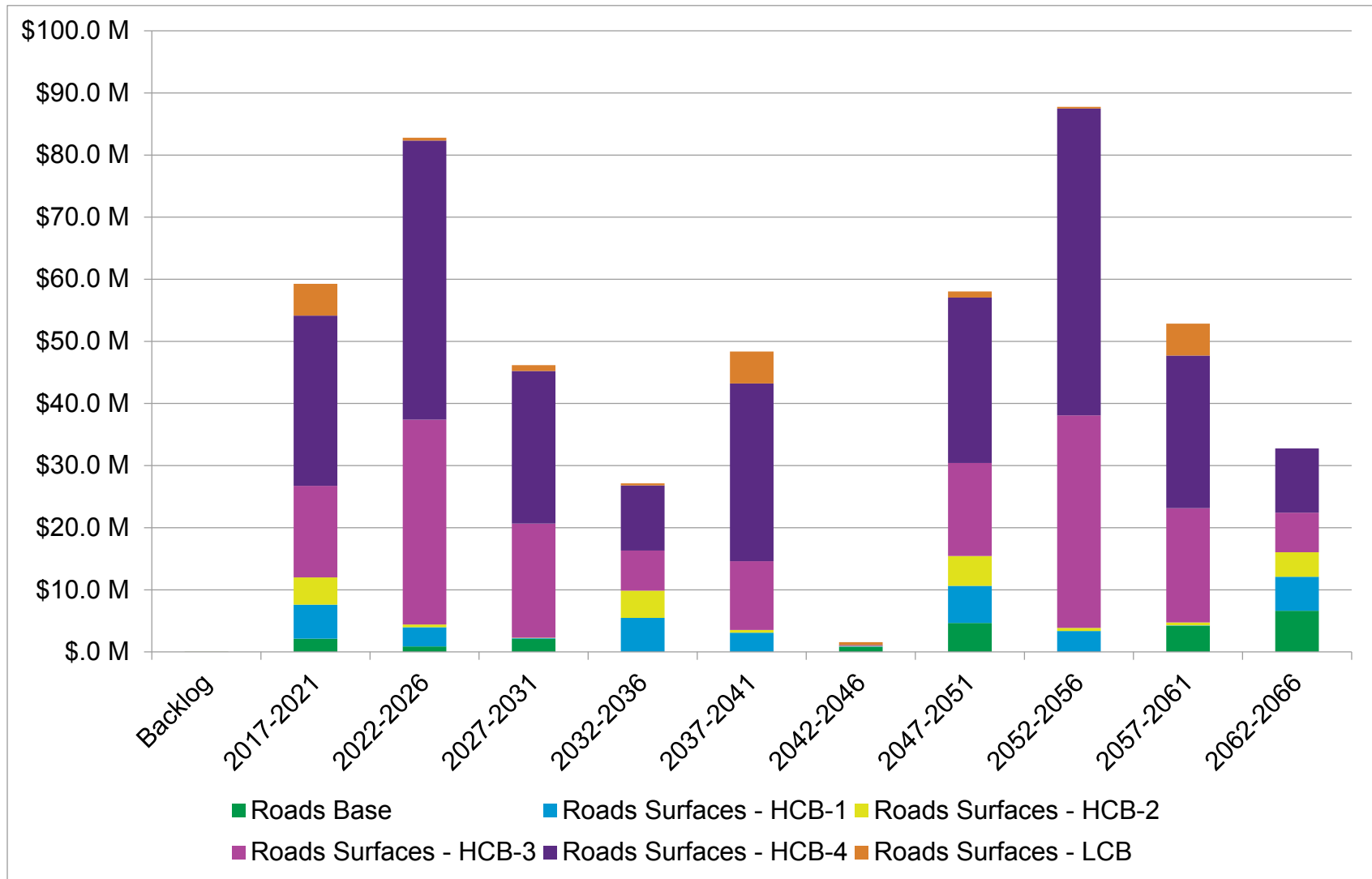
Figure 5-4 Forecasting Replacement Needs – Bridges & Culverts
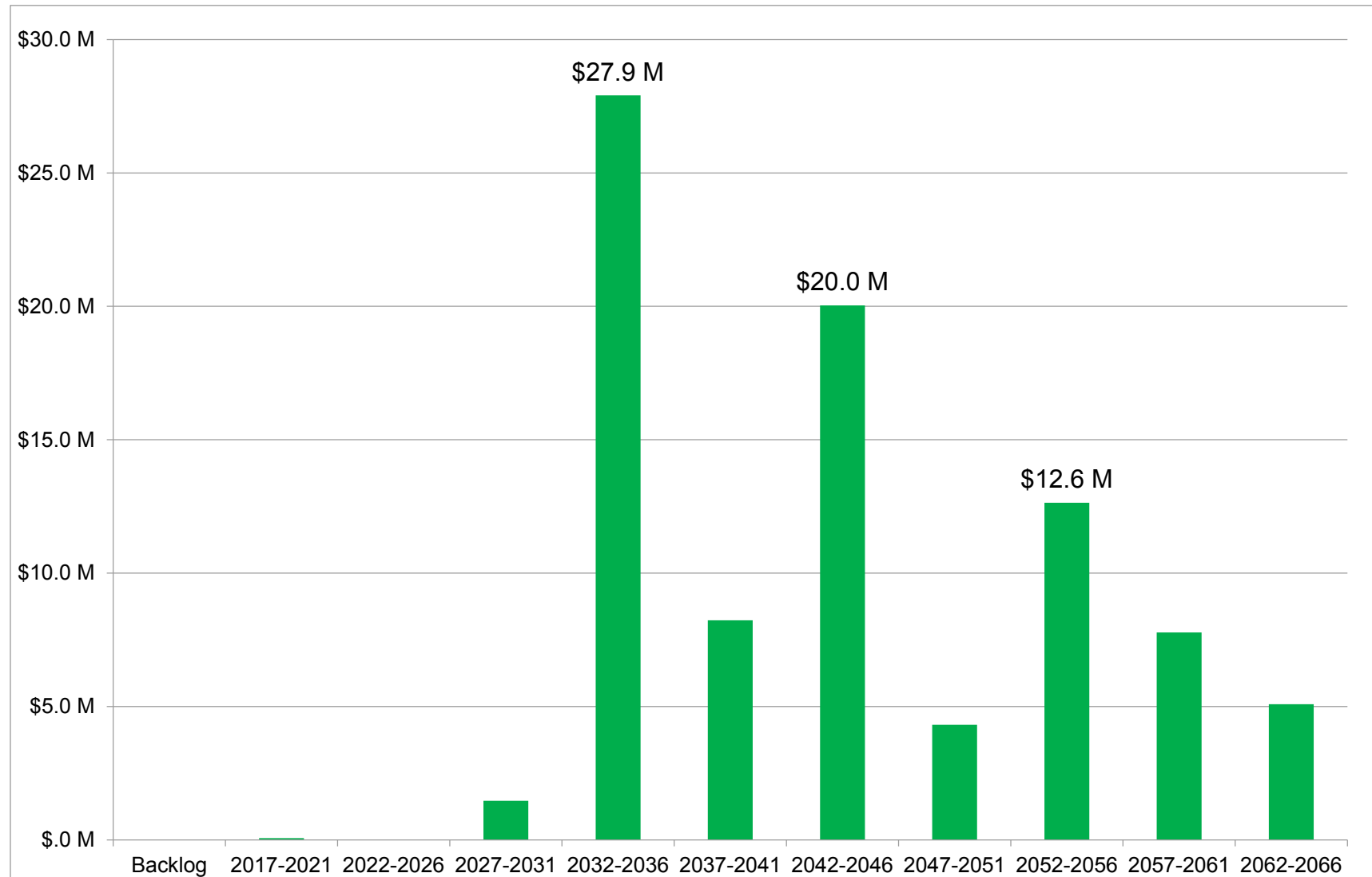
Figure 5-5 Forecasting Replacement Needs – Sidewalks & Multi-Use Paths
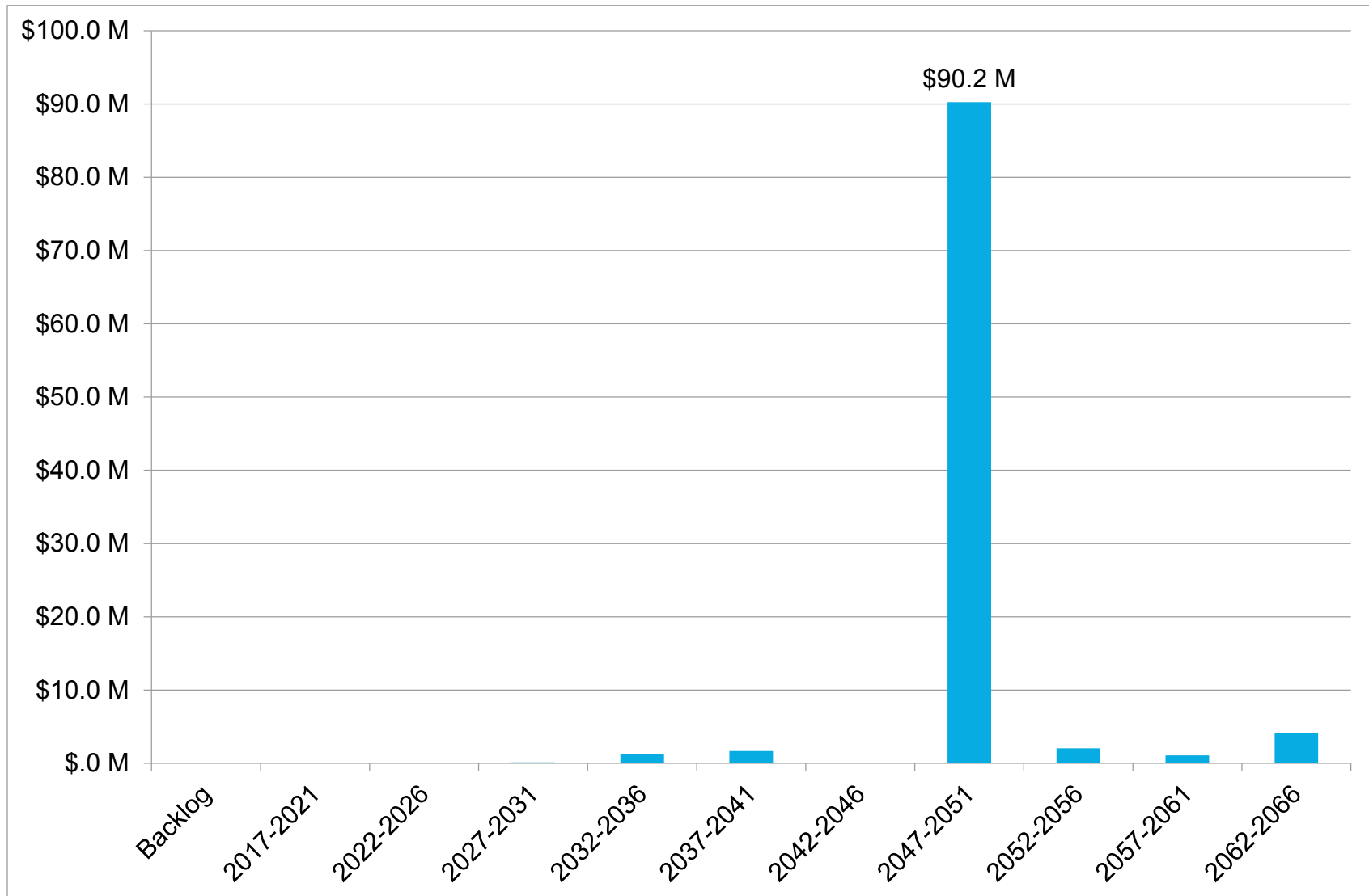
Figure 5-6 Forecasting Replacement Needs – Parking
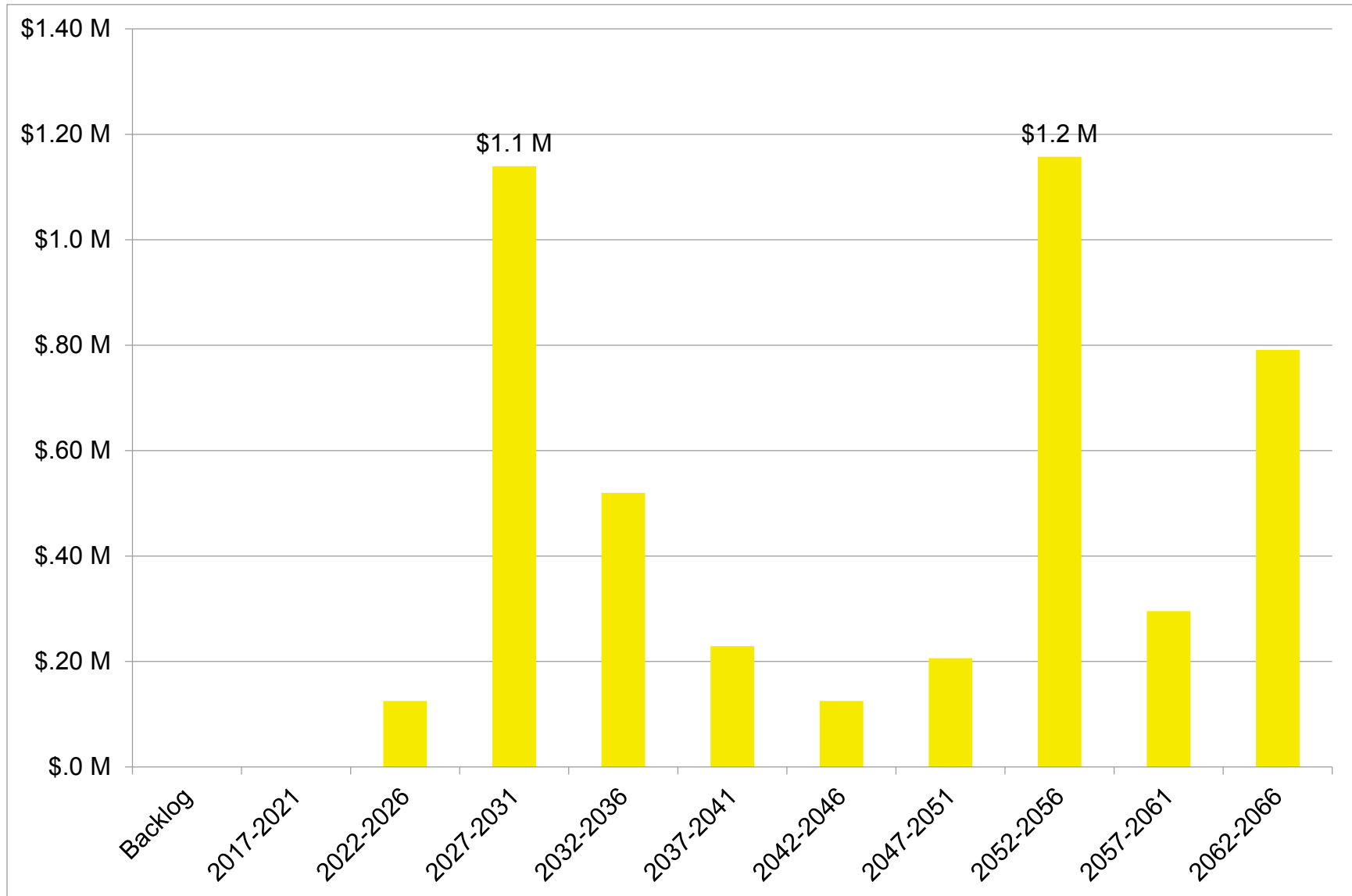
Figure 5-7 Forecasting Replacement Needs – Roadside Appurtenances
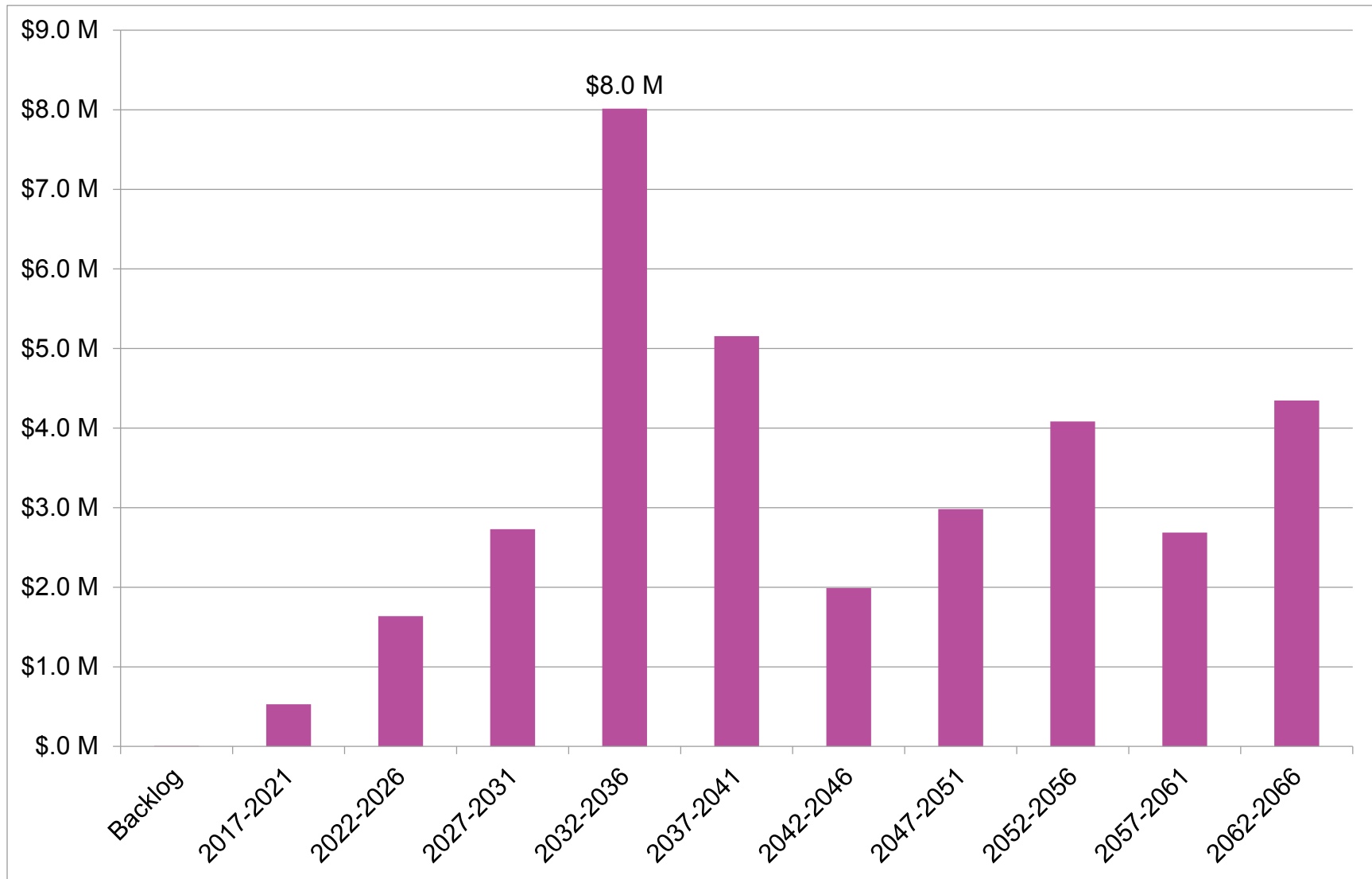
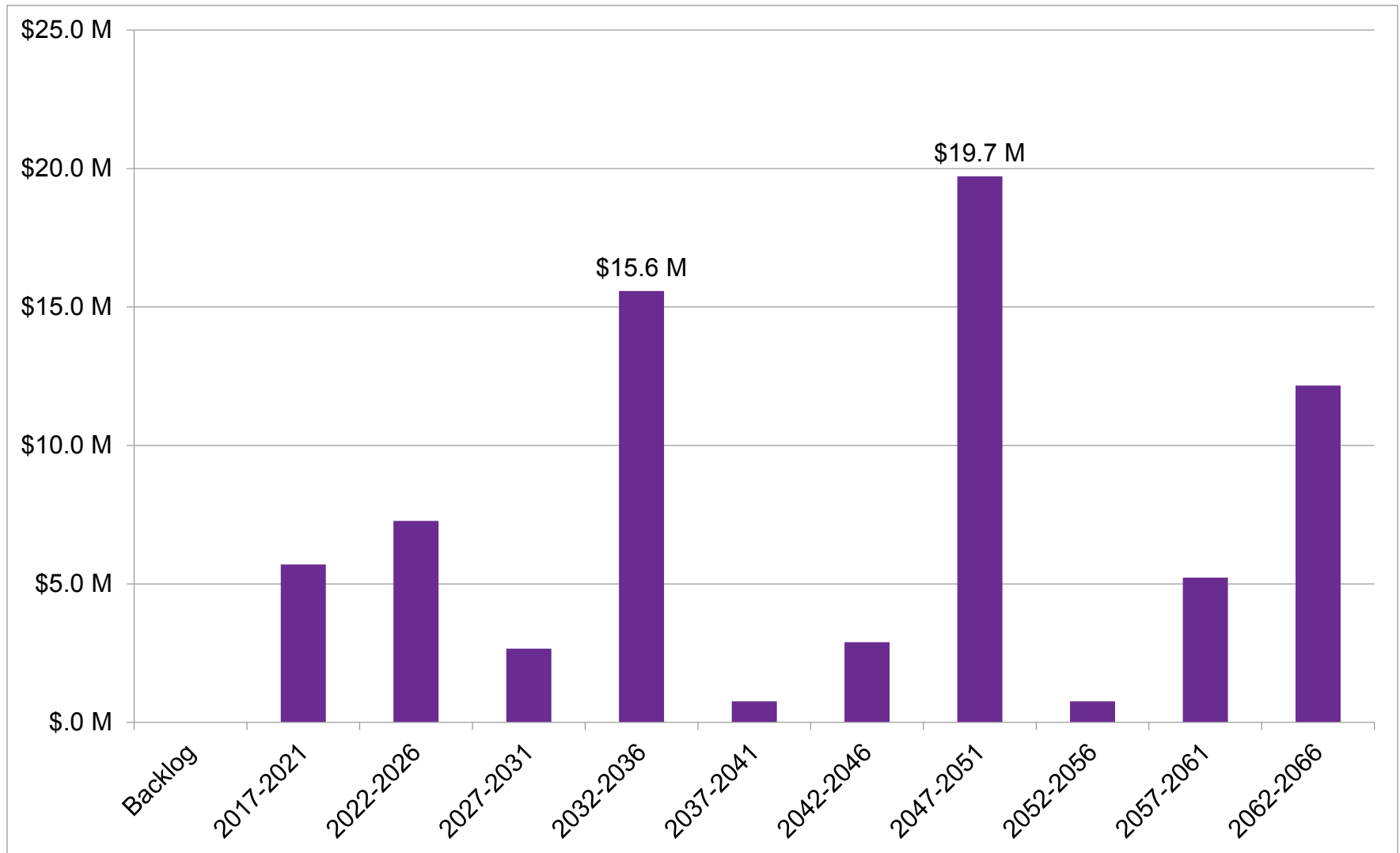Figure 5-8 Forecasting Replacement Needs – Stormwater Management

Figure 5-9 Forecasting Replacement Needs – Street Lights
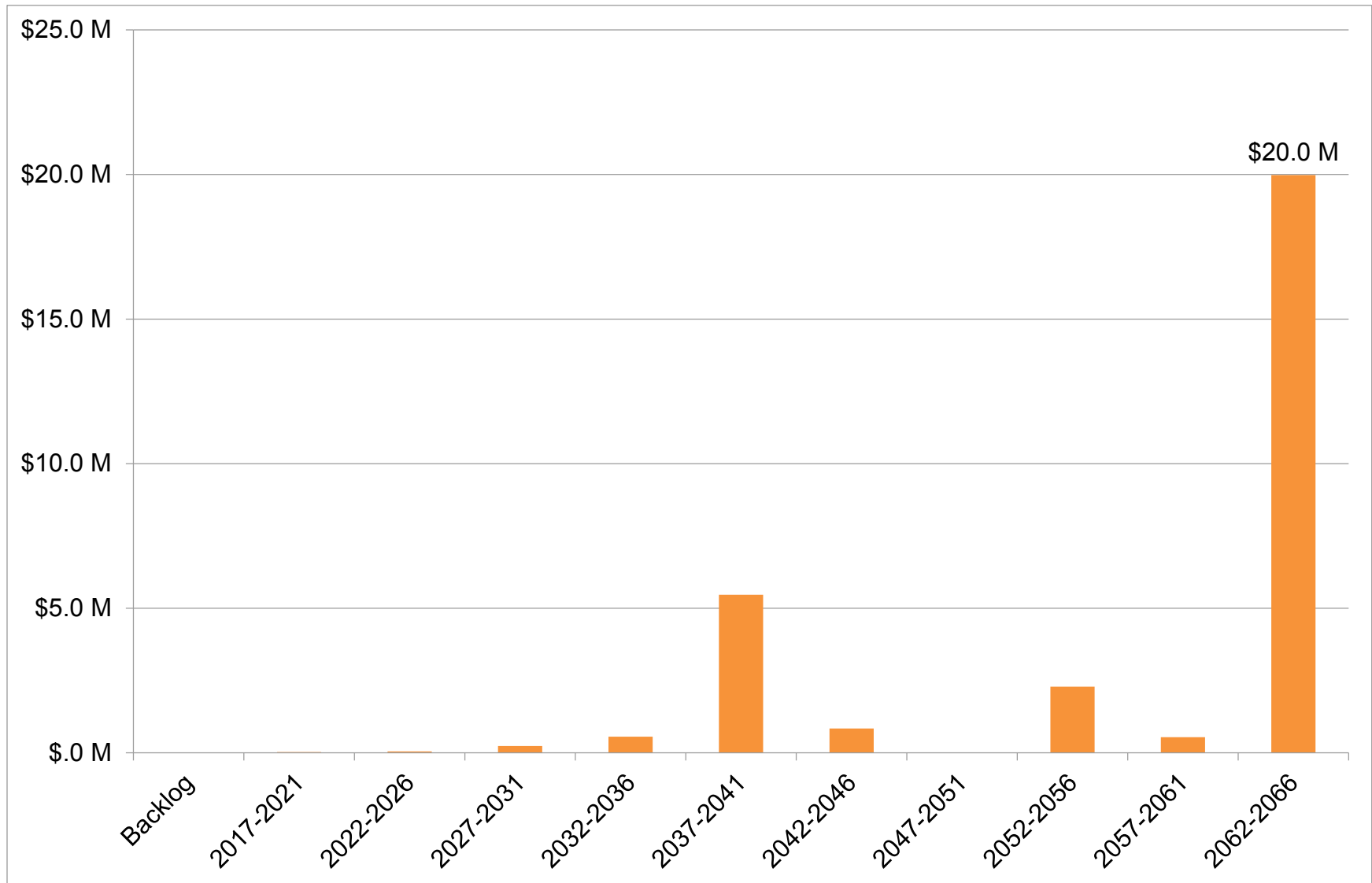
Figure 5-10 Forecasting Replacement Needs – Street Trees
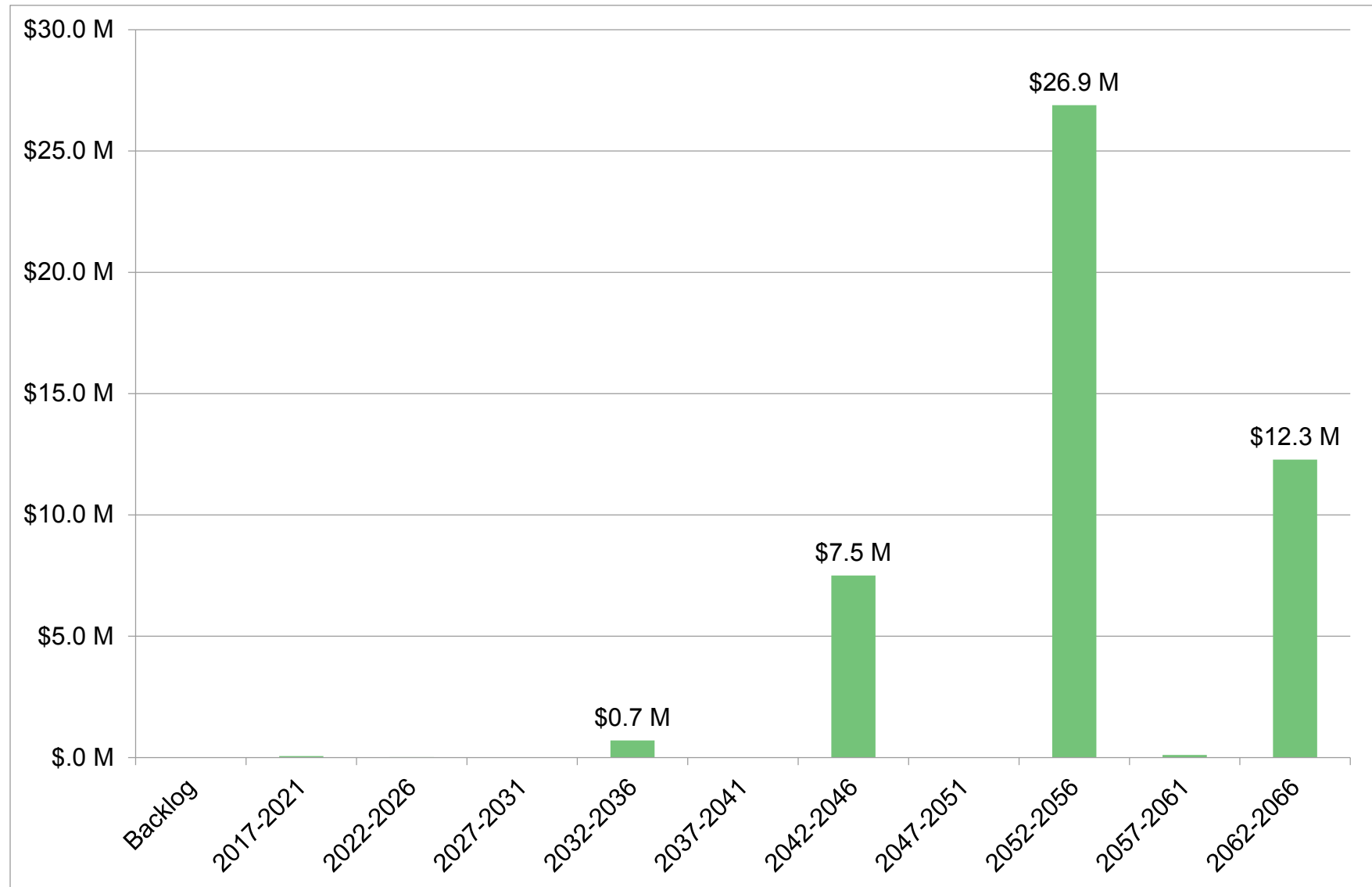
5.4   Financial Sustainability

The average annual investment requirement for Whitby's ROW assets totals $23,841,317. Total annual revenue currently allocated to these assets for capital purposes is $9,985,424, leaving an annual deficit of $13,855,893. To put it another way, ROW are currently funded at 41% of their long-term requirements. In the short-term, Roads assets are funded at 76% of requirements – a funding gap that will increase in the medium-term and result in significant underfunding in the long-term. As a result, the municipality received a 'D' for its financial sustainability grade.

At this level of funding, while the municipality is able to meet its short-term infrastructure needs, it is underpreparing for its medium-term needs and severely deficient in planning for its long-term infrastructure requirements. As a result, replacement for assets in the medium-term will likely be deferred to future years. Funding at or above 70% of its annual infrastructure needs will position the municipality to meet is short-term and medium-term requirements.

Table 5-3 describes various funding levels and their impact on short-term, medium-term, and long-term needs.

Table 5-3 Infrastructure Report Card - Financial Sustainability Grading Scale

How well is the municipality funding its long-term infrastructure requirements?

Short Term ➔ Less than 5 years

Medium Term ➔ 5 to 20 years

Long Term ➔Greater than 20 years

Letter Grade	Rating	Short-Term Needs Met	Medium-Term Needs Met	Long-Term Needs Met	Description
A	Very Good	Yes	Yes	Yes	The municipality is fully prepared for its short-, medium- and long-term replacement needs based on existing infrastructure portfolio.
B	Good	Yes	Yes	No	The municipality 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	Yes	No	No	The municipality 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	Partly	No	No	The municipality 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	No	No	No	The municipality 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 municipality may have to divest some of its assets (e.g., bridge closures, arena closures) and levels of service will be reduced significantly.

6. Recommendations

This is the Town of Whitby's first Service Area Asset Management Plan (SAAMP) for its ROW Services Area. To ensure it is a meaningful document that augments the Town's ability to build a strong asset management program, we recommend the following key actions:

1. The municipality continue its robust ROW condition assessment program and that a portion of capital funding is dedicated to this. Research should be conducted to investigate available preventative maintenance techniques with pilot projects to test their effectiveness.

2. The Town should update this SAAMP on an annual basis.

3. The Town should undertake the development of a long-term financial strategy.

4. The Town should undertake the growth projections via the Development Charges Study.

5. The Town should investigate and develop other rehabilitation strategies.

7. Appendix: Condition Rating Scale

Table 7-1 Roads Rating Scale

Rating		Description	Roads
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Minor localized lateral and joint cracks.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Medium longitudinal, joint and lateral cracks.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Alligator cracking now evident. Potholes, rutting and/or ponding may exist.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Severe cracking, potholes, rutting and/or ponding may exist.

Table 7-2 Sidewalks and Multi-Use Paths

Rating		Description	Sidewalks & MUP
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Discolouration of concrete/asphalt, minor pitting and cracking.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Minor vertical displacements and medium cracking.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Medium vertical displacements and severe cracking.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Ponding, severe vertical displacements, deformation and severe cracking.

Table 7-3 Road Bridges Rating Scale

Rating		Description	Bridges
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Wearing surface - light ravelling, narrow cracks, Soffit - light scaling, Abutments - light scaling and staining
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Wearing Surface ; medium cracking and ravelling, Soffit - medium cracks, Abutments - slight cracking, moderate scaling
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Wearing surface - alligator cracking, Soffit - moderate cracks, Abutments - medium cracking, severe scaling
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Wearing surface - potholes and severe rutting, Soffit - severe map cracking, Abutments - severe map cracking

Table 7-4 Pedestrian Bridges Rating Scale

Rating		Description	Pedestrian Bridges
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Light corrosion of metal elements. Some hairline cracking.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Minor height differences may exist between the height of path & bridge. Minimal Rusting of girders. Footings are starting to spall.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Moderate cracking and insect damage in wood elements. Deck is uneven, footings are deteriorating.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Undermining of abutments, severe cracking of wood and concrete, and severe rusting of metal elements. Some elements may be missing.

Table 7-5 Culverts Rating Scale

Rating		Description	Culverts
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Wearing surface - light ravelling, narrow cracks, Barrels - light corrosion, Embankment - no to minimal erosion
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Wearing Surface ; medium cracking and ravelling, Barrels - moderate corrosion, Embankments - minimal erosion
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Wearing surface - alligator cracking, Barrels -severe corrosion, Embankment - moderate erosion
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Wearing surface - potholes and severe rutting, Barrels - severe corrosion with holes developing, Embankment - severe erosion

Table 7-6 Storm Sewers Rating Scale

Rating		Description	Storm Sewers
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Discolouration of concrete, minor pitting, and <5% sedimentation and/or calcification.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Minor hairline cracking, <15% sedimentation and/or calcification.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Medium cracking, 20-40% sedimentation and/or calcification.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Severe cracking, pieces of pipe may be loose or missing. >40% sedimentation and/or calcification.

Table 7-7 Stormwater Management Ponds Rating Scale

Rating		Description	SWM Ponds
5	Very Good	The asset is typically new or recently rehabilitated.	0 - 9.9% sedimentation. Pond is functioning as designed.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	10 - 19.9% sedimentation. Pond is functioning as designed.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	20 - 39.9% sedimentation. Sediment levels may now be affecting how well the pond is functioning.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	40 - 60% sedimentation. Sediment levels are affecting how well the pond functions.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	>60% sedimentation. Sediment levels are severely reducing the effectiveness of the pond.

Table 7-8 Fences Rating Scale

Rating		Description	Fences
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Minor cracking of fence boards and posts.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Moderate cracking of fence boards and posts. Slight heaving of posts.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Fence boards may be lose, moderate heaving of posts.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Sections of fence are likely to fall, posts are heaved and boards may be missing.

Table 7-9 Retaining Walls Rating Scale

Rating		Description	Retaining Walls
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	No distresses.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Slight lean to wall. Minimal aggregate loss.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Wall has moderate lean, construction materials such as aggregate in gabion baskets starting to wash away.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Wall has severe lean, construction materials such as aggregate in gabion baskets starting to wash away.

Table 7-10 Signs Rating Scale

Rating		Description	Signs
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses, meets or exceeds retroreflectivity.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	No distresses, meets or exceeds retroreflectivity. May have slight bending.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Sign meets retroreflectivity. Starting to show cracking. May have slight bending or vandalism.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Coating is moderately crazed, peeled or faded. Sign does not meet retroreflectivity standards.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Coating is severely crazed, peeled and faded. Rust may be present. Sign may be severely bent. Does not meet retroreflectivity standards.

Table 7-11 Street Trees Rating Scale

Rating		Description	Trees
5	Very Good	The asset is typically new or recently rehabilitated.	No structural defects. Balanced full crown.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Small missing sections of crown. Minor structural defects & diseases. <10% dieback of crown.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Crown has larger missing sections, some branches missing, minor structural defects & disease, 10-30% dieback.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Crown is severely unbalanced, several branches missing, major structural defects & diseases, >30% dieback.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Major structural defects, bark peeling off, broken/missing branches, decay may be present.

Table 7-12 Streetlight Luminaire Rating Scale

Rating		Description	Streetlights Luminaires
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Slightly loose elements allowing the luminaire to slightly sway.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Loose or missing elements.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Luminaire is not working.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Luminaire is not working.

Table 7-13 Poles Rating Scale

Rating		Description	Poles
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Minor pitting.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Minor hairline cracking.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Hairline cracking is becoming concentrated.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Medium to severe cracking.

Table 7-14 Guiderails Rating Scale

Rating		Description	Guiderails
5	Very Good	The asset is typically new or recently rehabilitated.	No distresses.
4	Good	The asset is in good condition. Some elements show general signs of deterioration that require attention. A few elements exhibit minor deficiencies.	Very slight sag in guide wire. Hardware slightly loose.
3	Fair	The asset is in fair condition. It shows further signs of deterioration and requires attention. Some elements exhibit moderate deficiencies.	Slight sag in guide wire. Slight rusting. Evidence of slight washouts.
2	Poor	The asset is in poor condition and approaching low standards. Many elements approaching the end of their service life. A large portion of the elements exhibit significant deterioration.	Moderate sag in guide wire. Wooden posts showing signs of moderate deterioration. Metal elements showing signs of rusting. Moderate washouts undermining some of the posts.
1	Very Poor	The asset is in unacceptable condition with widespread signs of advanced deterioration. All components exhibit signs of imminent failure.	Severe sag in guide wire. Wooden posts missing or severely deteriorated. Metal elements showing severe signs of rusting. Severe washouts undermining some of the posts.