2017

Asset Management Plan
Public Works, Social Housing,
Parks and Recreation Infrastructure
City of Brantford, Ontario

PREFACE

The 2017 Asset Management Plan provides an overview of the rapidly evolving and improving infrastructure asset management program at the City of Brantford. This plan aims to summarize some of the core policies, procedures and principles developed and adopted by the City for the management of its infrastructure, presented at a high level of detail in order to cater for the broad and strategic scope of the document, and to meet the format outlined in the Ministry of Infrastructure's *Building Together: Guide for Municipal Asset Management Plans* (2012) and the compliance requirements of the Federal Gas Tax Fund administered by the Association of Municipalities Ontario (AMO).

It is the hope that this document provides a snapshot in time, of the practices today which can be benchmarked against and improved upon tomorrow. Writing this document has delivered value in highlighting some 'gaps' and opportunities for improvement, for which action plans can be developed with the goal of further enriching Brantford's holistic and progressive approach to asset management. As we grow and progress as a City, iterations of the asset management plan can be used as a tool to document and communicate our achievements and opportunities for improvement as we strive to be recognized as a leader in Asset Management, sustainably providing enhanced value to the public, minimizing risks and maximizing the return on infrastructure investments.

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ABBREVIATIONS

ATAMS	Activity Tracking and Asset Management System
BCI	Bridge Condition Index
C~Scope	Combining Sea and Coastal Planning in Europe
CADD	Computer Aided Drafting and Design
CAO	Chief Administrative Officer
CAPS	Capital Asset Prioritization System
CCTV	Closed Circuit Television
CMMS	Computerized Maintenance Management System
CSA	Canadian Standards Association
ESL	Estimated Service Life
FCM	Federation of Canadian Municipalities
FIR	Financial Information Return
GIS	Geographic Information System
InfraGuide	National Guide to Sustainable Municipal Infrastructure
IT	Information Technology
LADR	Linear Asset Data Repository
LID	Low Impact Development
MMO	Marine Management Organization
MPMP	Municipal Performance Measurement Program
NWWBI	National Water and Wastewater Benchmarking Initiative
O&M	Operations and Maintenance
OSIM	Ontario Structural Inspection Manual
PACP	Pipeline Assessment and Certification Program
PAN	Priority Action Number
PCI	Pavement Condition Index
PM	Preventative Maintenance
RSL	Remaining Service Life
SAWS	Sewer Assessment Web Service
SCADA	Supervisory Control and Data Acquisition
SQL	Structured Query Language
TCA	Tangible Capital Asset
TES	Traffic Engineering Software

EXECUTIVE SUMMARY

Brantford is a vibrant community with a population of approximately 98,000 people. The Corporation of the City of Brantford (the City), is responsible for the delivery of many of the services that are central to the prosperity and quality of life of people who live and work in the City. These core municipal service areas include: local government (governance and corporate management), fire services, police services, roadways, transit, wastewater, stormwater, drinking water, solid waste management, parks and recreation, library services, and land use planning. This asset management plan includes the following infrastructure areas that support the City's core services:

- Road Network (including streetlights, signs, intersections and traffic signals);
- Sidewalks;
- Bridges and other Structures (including culverts, retaining walls, and stairways);
- Drinking Water Network;
- Wastewater Network;
- Stormwater Network;
- Solid Waste and Landfill (including power generation facility);
- Public Works and Administrative Facilities;
- Corporate Fleet;
- Transit;
- Social Housing;
- Cultural and Tourism Assets (including Public Art and Monuments);
- Brownfield Infrastructure;
- Transportation;
- Airports; and
- Parks and Recreation (including parks, trails, recreation buildings, golf courses and cemeteries)

The City's Asset Management Plan provides a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. While the scope of this document is for the full lifecycle of the City's infrastructure, it is a living document and is expected to be updated every five (5) years.

It should be noted that in 2016 the City and the County of Brant entered into negotiations regarding a boundary adjustment which, when completed in January 2017, resulted in an increase in the overall area of the City and an increase in the number of assets for some categories, as assets within the adjustment area became the property of the City. As the inventories of assets being assumed by the City have not yet been reconciled, they have not been included in this edition of the Asset Management Plan. Future editions of the AMP will include these assets.

Arguably, asset management has been practiced in some shape or form in the City of Brantford since the first settlement in 1784. Over time, the buildings and infrastructure in the City have been constructed, operated, maintained and replaced, as the small village grew to the thriving city it is today. Following a period of minimal new construction during the Second World War in the 1940's, there was an infrastructure construction boom to meet the demands of a rapidly increasing population which saw its peak in the 1970's. As this infrastructure nears the end of its useful life, there will be a greater need to replace that infrastructure, subsequently driving up investment requirements. Now, more than ever,

proactive asset management is needed to ensure that those investments are made in a fiscally responsible manner, while optimizing the lifecycle of the infrastructure.

In 2011, City Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division. By moving the asset management planning function from various groups into a centralized division, it enables each group to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission. The 2017 Asset Management Plan has expanded its scope of assets to include Parks and Recreation and Airport assets.

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. For the 2017 Asset Management Plan, the City has updated the report card. The primary objective of the report card is to develop a repeatable and objective process for assessing the theoretical condition (based on age) and, where performance data exists, establish the current structural and performance condition of the City's infrastructure assets, utilizing data analytics procedures which provide a means to assess impacts on re-investment and funding levels over the short and long term.

Table E1 illustrates the results of the scorecard and the percentage of the system assets considered to have less than 25% remaining service life (RSL) or have exceeded their service life entirely.

Table E1.   Summary of Remaining Service Life and Replacement Value

Program Area	2017 Replacement Value (Millions)	2017 Rating Category (% Remaining Service Life)	% of Assets in Poor or Very Poor Rating Categories	2017 Replacement Value (Millions) of Assets in Poor or Very Poor Rating Categories
Airport	$ 25.45	Fair (35%)	66%	$ 16.74
Bridges, Retaining Walls and Culverts - Public Works	$ 161.19	Good (59%)	9%	$ 13.90
Brownfield Infrastructure	$ 1.38	Very Good (98%)	0%	$ 0.01
Cemeteries	$ 5.15	Poor (12%)	77%	$ 3.97
Corporate Fleet	$ 20.75	Poor (11%)	77%	$ 15.89
Golf Courses	$ 9.45	Fair (27%)	64%	$ 6.01
Parks	$ 167.68	Fair (49%)	21%	$ 34.49
Public Works and Admin. Facilities	$ 64.79	Fair (45%)	11%	$ 7.43
Recreation	$ 122.72	Very Good (78%)	6%	$ 6.88
Road Network	$ 750.93	Good (71%)	7%	$ 55.63
Sanderson Centre	$ 26.72	Fair (35%)	7%	$ 1.92
Sidewalks	$ 105.78	Very Good (78%)	1%	$ 1.27
Social Housing	$ 197.19	Good (54%)	4%	$ 7.17
Solid Waste and Landfill	$ 61.99	Fair (45%)	40%	$ 24.99
Stormwater Collection	$ 340.74	Fair (51%)	11%	$ 35.78
Stormwater Facilities	$ 14.93	Good (67%)	0%	$ -
Tourism	$ 11.63	Fair (44%)	46%	$ 5.34
Transit	$ 39.77	Fair (30%)	39%	$ 15.66
Transportation	$ 27.91	Good (66%)	1%	$ 0.39
Wastewater Collection	$ 236.70	Fair (48%)	12%	$ 27.64
Wastewater Facilities	$ 159.23	Fair (40%)	12%	$ 18.40
Water Distribution	$ 245.76	Fair (51%)	13%	$ 31.37
Water Facilities	$ 197.69	Good (70%)	14%	$ 28.39
Total	**$ 2,995.52**	**Good (58%)**	**12%**	**$ 359.27**

One of the objectives of asset management planning is to ensure that the performance and service provided by the infrastructure meets the needs and expectations of the users. A level of service, or service level, is a criteria set by the organization and community for the quality and performance of the services provided by the municipality. Levels of service typically relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

The City of Brantford has embarked on a number of initiatives to monitor the levels of service provided by the City's infrastructure. These initiatives include meeting regulatory requirements, participating in national benchmarking initiatives, abiding to standard operating procedures, contributing to best practice reviews and monitoring performance through condition assessments.

The asset management strategy is a set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. In order to facilitate the development of the asset management strategy, a number of activities or initiatives take place within the City. **Figure E1** shows the components of the asset management strategy and asset lifecycle activities. At the core of the asset management strategy is the City's data and information which pushes and pulls key data from each of the activities.

Figure E1.   Components of the Asset Management Strategy
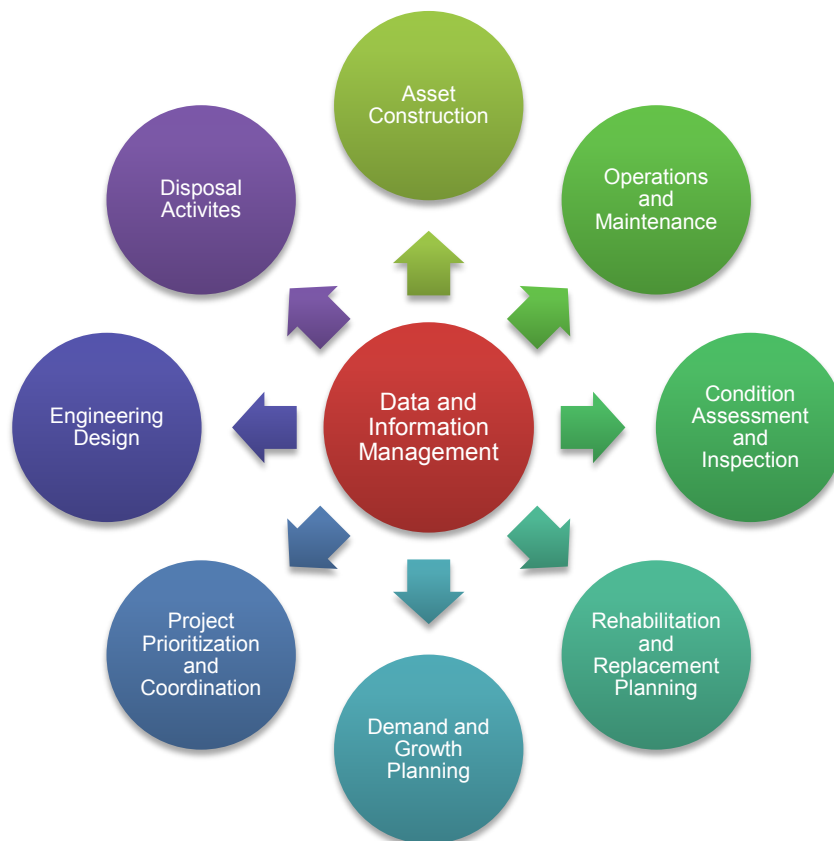
Brantford is a growing city that has been designated as an urban growth center in the Provincial Growth Plan, and is destined for continued growth in all economic sectors. To this end, it is estimated that by 2041 the population of the City of Brantford will grow by 66% to 163,000 (Places to Grow, May 2017). Such growth has impacts on the required capacity and servicing provided by the City's core infrastructure networks. As a step towards better understanding future demand and how we can better plan to meet the future needs of the City, Brantford has implemented several core initiatives such as the Water, Wastewater and Stormwater Master Servicing Plan, the Transportation Master Plan and the 10-year Housing Stability Plan. The Parks and Recreation Master Plan is currently under review.

In order to streamline the capital project selection and allow for objective prioritization across program areas, in 2014 the City developed and implemented automated and integrated business processes for the development of the linear infrastructure capital program.

An integral component of the annual budget cycle is the formation of multi-stakeholder working groups for key asset classes. These stakeholder groups combine tacit and technical knowledge of the infrastructure networks, their performance, problem areas and history that are integral inputs into developing a defensible and accurate capital investment program.

Brantford also uses short and long term analyses with the goal of developing sustainable infrastructure capital plans and financing strategies. Theses analyses include 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts.

Long term infrastructure investment forecasts provide insight into prospective investment requirements which may fall outside of the 10 year planning horizon typically utilized for capital budgeting processes. Large amounts of infrastructure construction during a short time span, as seen in the 1970's, will require equally as heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, then levels of service could potentially decline and operations and maintenance costs could increase. The 100 year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends.

Funding and re-investment requirements were developed for each program areas based on the analysis to establish an average annual cost for re-investment. The analysis shows that there are currently deferred capital investment needs of $227.5 million in the program areas covered in this asset management plan. The 'deferred capital investment needs' refers to an outstanding capital need, which arose in the past, but has not been addressed (i.e. assets that fall within the very poor rating category because their remaining service life is below zero). This could be related to infrastructure deterioration, capacity shortfalls or design service standard upgrades.

The City uses a corporation-wide 10 year capital budget. The 10 year budget planning horizon provides perspective and awareness of future projects outside of the traditional short term plans.

Asset management at the City of Brantford is continually improving, striving towards efficiently managing assets to meet the service needs of the present without compromising the demands of the future. This is being accomplished by implementing approaches to better understand the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life, and how to budget appropriately so assets can be replaced when needed. This all supports the movement towards being recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.

1. Introduction

Brantford is a vibrant community with a population of approximately 98,000 people. The Corporation of the City of Brantford (the City), is responsible for the delivery of many of the services that are central to the prosperity and quality of life of people who live and work in the City, and such services rely on well-planned, well-built and well-maintained infrastructure (Ministry of Infrastructure, 2012). These core municipal service areas include: local government (governance and corporate management), fire services, police services, roadways, transit, wastewater, stormwater, drinking water, solid waste management (garbage), parks and recreation, library services, and land use planning (Ministry of Municipal Affairs and Housing, 2007, pp. 8-13).

This asset management plan includes the following infrastructure that supports the City's core services:

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- Wastewater Network;
- Stormwater Network;
- Solid Waste and Landfill (including power generation facility);
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- Corporate Fleet;
- Transit;
- Social Housing;
- Cultural and Tourism Assets;
- Brownfield Infrastructure;
- Transportation;
- Airports; and
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> **Asset Management**
>
> *"The continuous improvement of systematic and coordinated activities and practices through which the City can optimally and sustainably manage its infrastructure systems, associated performance, risks and expenditures over their lifecycles for the purpose of achieving the organizational strategic plan."*

This City's Asset Management Plan provides a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. While the scope of this document is for the full lifecycle of the City's infrastructure, it is a living document and is expected to be updated every five (5) years.

1.1. Brantford's Asset Management Philosophy

When we turn on a tap we rely on a steady flow of clean water, when we flush the toilet or take the garbage out, we expect the waste to be disposed of, and when we travel from "A to B" on our daily routines we expect safe, clean, non-congested roads and sidewalks. In fact, many of the activities that are critical to the quality of life and prosperity of our communities are dependent on municipal infrastructure. The term "municipal infrastructure" refers to civil assets under the control and responsibility

of municipalities. These assets include, but are not limited to: buried utilities (drinking water and sewer systems), treatment plants, transportation networks (roads, bridges, and transit systems), solid waste management facilities and services, City-owned Facilities, social housing, and parks and recreation.

It is the City's obligation to ensure that municipal infrastructure is managed in a responsible way that serves the needs of the community. The process of managing municipal infrastructure is known as *Asset Management*.

Based on the internationally recognized PAS55 by the Institute of Asset Management (BSI, 2008a), asset management can be defined as *'the continuous improvement of systematic and coordinated activities and practices through which the City can optimally and sustainably manage its infrastructure systems, associated performance, risks and expenditures over their lifecycles for the purpose of achieving the organizational strategic plan'.*

Another definition of note is from the International Infrastructure Management Manual (INGENIUM, 2006) which defines asset management as *'the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner'.*

The City of Brantford's asset management plan is founded on a strategic asset management philosophy, which translates a vision into goals using a Mission, Core Values, and Guiding Principles. These goals and principles provide the objectives that unify, motivate and support the organization toward a common definition of success. **Figure 1** shows how the strategic vision, goals, values and principles relate to the detailed goals and objectives set out in the asset management plan.

Figure 1.   Asset Management Philosophy Pyramid

1.1.1. Asset Management Mission

An asset management mission was developed in 2007 by the City. This mission describes how asset management programs will move towards the City's vision, defining the purpose and primary objectives related to the City's needs and values. The City's asset management mission statement is as follows:

Brantford will efficiently manage its assets to meet the service needs of the present without compromising the sustainability of its infrastructure for the demands of the future by knowing the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life and budgeting appropriately so assets can be replaced once they have expired or are not able to consistently provide planned levels of service.

1.1.2. Asset Management Core Values

Core values are the operating philosophies that will guide the City's asset management strategy and the implementation of its asset management processes and programs. Core values support the vision and mission, and guide an organization's internal conduct as well as its relationship with the external world. The core values established previously for the City of Brantford are:

- Asset Management is an organizational commitment;

- Services and assets must be sustainable;

- Operate in a transparent and accountable manner;

- Continuous improvement of processes, data and technology; and

- Minimize risk to levels of service and public health and safety.

1.1.3. Asset Management Guiding Principles

Guiding principles serve as a series of parameters around which practices and decisions are formed. The City's asset management guiding principles include:

- Asset management will support the City's strategic planning documents such as the Strategic Plan, Transportation Master Plan, Master Servicing Plan, the Official Plan, Parks and Recreation Master Plan and the Housing Stability Plan;

- Asset needs will be prioritized across the organization in an open and consistent fashion to reflect the community's values and priorities;

- Assets will be operated and maintained to meet the declared levels of service;

- Assets will be optimized throughout the entire lifecycle to meet levels of service in the most cost-effective way;

- Risk will always be considered in asset management decision-making processes;

- A technology environment will be developed and maintained to ensure compatibility of systems and applications, and the efficient exchange and use (including analysis), of information; and

- Business processes and resources will be structured to provide the most efficient management of assets.

1.2. Shaping the Future: Evolution of Asset Management in Brantford

Arguably, Asset management has been practiced in some shape or form in the City of Brantford since the first settlement in 1784. Over time, the buildings and infrastructure of the City have been constructed, operated, maintained and replaced, as the small village grew to the thriving city it is today. The prosperity of the 19th and early 20th centuries, due to Brantford's large manufacturing industry, is reflected in the historical architecture found in older city districts where Victorian mansions line streets, and magnificent churches, theatres and commercial buildings echo details of the past. Brantford's infrastructure networks have equal character and heritage.

Figure 2 shows the current distribution of infrastructure construction dates for roads, drinking water, wastewater, and stormwater. The smallest group of assets is those which were built prior to 1950. The length of assets in this group is gradually decreasing as assets reach the end of their service lives and are replaced. From the 1950's to the 1970's there was an increased level of infrastructure construction which were followed by two decades of lower levels of construction. As the infrastructure constructed in the 1970's nears the end of its useful life, there will be a greater need to replace that infrastructure, subsequently driving up investment requirements. Now, more than ever, proactive asset management is needed to ensure that those investments are made in a fiscally responsible manner, while optimizing the lifecycle of the infrastructure.

Figure 2.   City of Brantford Historical Linear Infrastructure Construction and Population
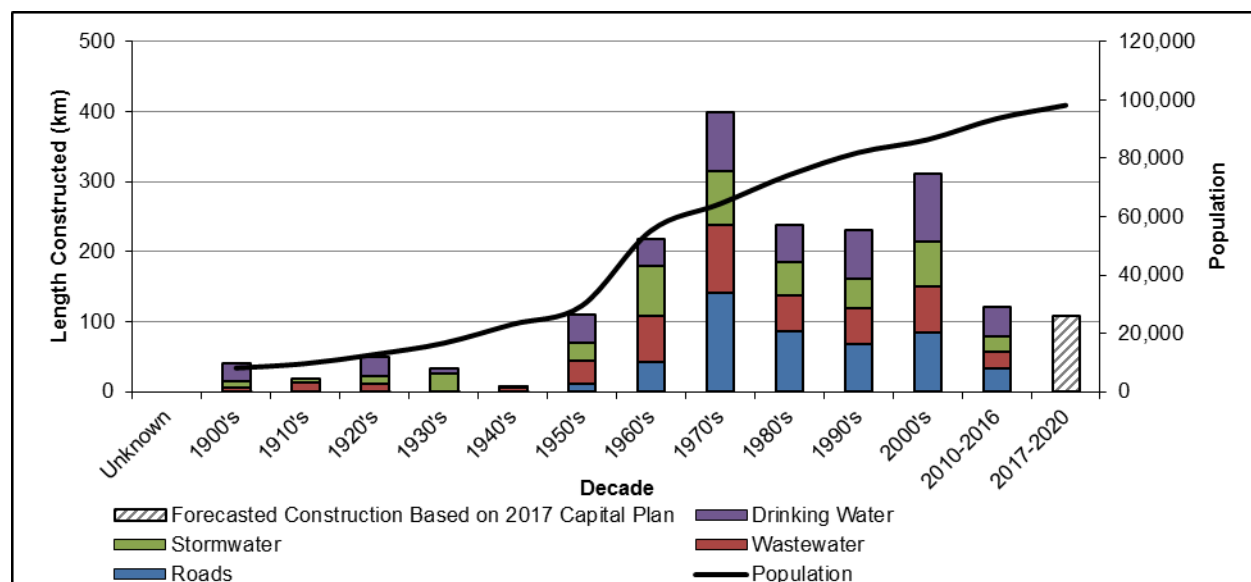
Source: City of Brantford GIS (2016); (Statistics Canada, 2012); City of Brantford Growth Projections (2016)

In 2006, Brantford undertook a community-based consultation process which included input from residents, businesses, community organizations and staff, and resulted in the collection of visions, goals and actions valued by the community. City Council and staff reviewed the strategic goals for 2014-2018 to establish priorities and action plans that would continue to work towards the community's long term desired outcomes. Brantford's renewed strategic plan brings focus and unites the community as we work together to build a vibrant 21st century city. It creates a connection between our community, municipal government and corporate business processes and practices, and responds to the community while remaining flexible, so we can anticipate and adapt to local, regional and global changes and pressures. It provides the framework for future activities, actions, and decisions. The updated version of the strategic plan was completed in 2016, building on the four strategic goals first developed in 2006. Four main pillars were established in *'Shaping Our Future - Brantford's Community Strategic Plan (2014-2018)'*[1]. The pillars established were:

- **Economic Vitality and Innovation:** *Brantford will build a strong, diversified economic base that provides opportunities for both citizens and potential investors while supporting and enhancing innovation and education;*

- **High Quality of Life & Caring for All Citizens:** *Brantford will be recognized as a safe and healthy community for all citizens, while providing a high quality of living through recreation, sport, arts and culture;*

- **Managed Growth & Environmental Leadership:** *Brantford will be known for managing growth wisely, ensuring optimization of its infrastructure while protecting and enhancing our heritage and natural assets;* and

- **Excellence in Governance & Municipal Management:** *Brantford will engage its citizens through open and transparent communications, and be recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.*

In 2011, Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division as shown in **Figure 3**. By moving the asset management planning function from various groups into a centralized division, it enabled each department to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission.

A component of the 2006 City's Corporate Strategic Plan was to develop initiatives to address the issues surrounding asset management and challenging issues concerning the City's residents. In 2016 one such initiative commenced with the goal of expanding the asset management plan to include assets owned by the Programming & Recreation Commission. This expansion was deemed necessary in order to meet the requirements set by the Association of Municipalities Ontario as administrators of the Federal Gas Tax Agreement. The agreement requires the inclusion of the 16 infrastructure categories eligible for Gas Tax funds in the Asset Management Plan of municipalities (Federal Gas Tax Agreement, Schedule B).

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[1] For the City of Brantford's Community Strategic Plan see:
https://mybrantford.ca/ShapingOurFuture201418/StrategicActionPlan201418.aspx#/ [Last Accessed Oct 11, 2016]

Figure 3. City of Brantford Public Works Commission Organizational Structure, March 2017

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                    │ Mayor and Council│
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                       ┌──────────┐
                       │   CAO    │
                       └──────────┘
                              │
                    ┌──────────────────┐
                    │   Public Works   │
                    │    Commission    │
                    └──────────────────┘
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Fleet and Transit Services	Operational Services	Facilities and Asset Management	Engineering Services	Environmental Services
Transit	Utility Special Projects	Facilities	Design & Construction	Solid Waste Operations
Fleet	Sidewalks	Capital Planning & GIS Services	Technical Services / Development Review	Compliance
	Road Maintenance		Surveys	Distribution and Collection Systems
	Bridges and Culverts		Transportation and Parking Services	Water and Wastewater Operations
	Traffic Services			

In the Public Works Commission organizational structure, the Facilities and Asset Management department takes on the following roles and responsibilities:

- Preparation and submission of the Facilities and Asset Management Department's inputs to annual work plans and budgets (capital and operating) of the Public Works Commission;

- Planning for long-term financial investment to ensure consistent asset performance; providing corporate policies and standards related to space, furnishings and facilities; ensuring asset compliance with fire safety, building code, health & safety and environmental codes;

- Development and implementation of an asset management strategy related to facilities, water, wastewater, storm, roads, bridges, solid waste, vehicle, parks, and recreation assets to address full life-cycle costing and analysis to plan for long-term rehabilitation and replacement needs;

- Ensuring that the design and construction of City facilities is carried out in a timely manner in accordance with sound engineering practices, consistent with budgetary guidelines and standards;

- Ensuring that City infrastructure required to support new growth, or to service existing functions, is identified, budgeted for and programmed to be delivered in a timely and cost-effective manner, and in accordance with all appropriate legislative requirements;

- Completion of engineering studies to determine performance and condition of assets in order to establish cost-effective rehabilitation and replacement strategies to minimize lifecycle costs;

- Monitoring of operational performance against policies, procedures and standards with initiation of corrective action as required; preparation and submission of periodic performance reports;

- Monitoring of current levels of service, life cycle trends and deterioration models in order to plan and develop an integrated 10 year detailed budget and 20-100 year projected long range capital re-investment strategy in order to protect the city's infrastructure investments; and

- Management of the City's Capital Budget, prioritization of capital and operating programs, development of presentations, and rationalization of project needs based on a sound asset management approach.

The Facilities and Asset Management department, in collaboration with other departments within the City has established several initiatives to support the components of the asset management plan, as shown in **Figure 4**.

Figure 4.   The Role of Facilities and Asset Management
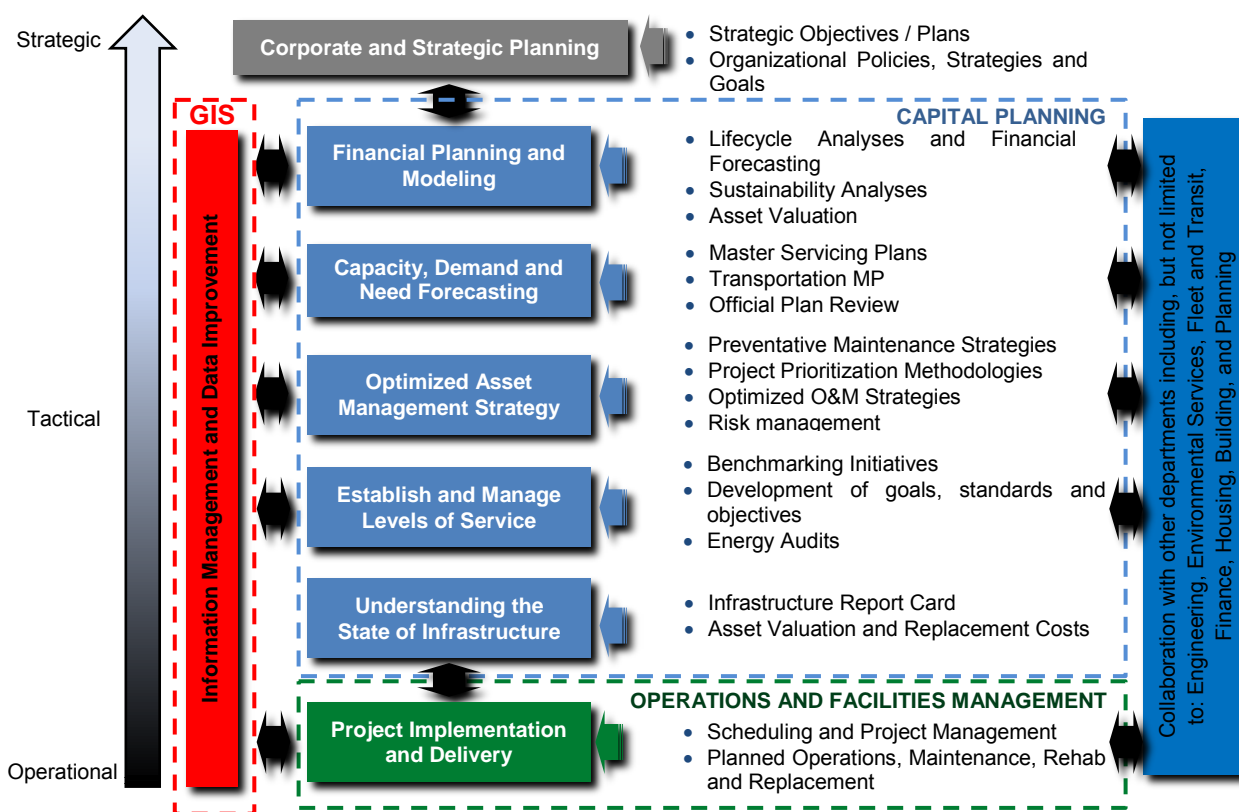
Having a centralized facilities and asset management division facilitates the ability for capital planning priorities to be balanced across the organization and across asset classes. Through the annual capital budgeting process, the Capital Planning division works closely with the relevant stakeholder groups to ensure that the capital plan is feasible from multiple perspectives.

2. State of Local Infrastructure Report Card

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. An update was issued in 2013 which included the new program areas of sidewalks and social housing. For the 2017 Asset Management Plan, the City has updated the report card, now reporting on the following program areas:

1. Road Network;
2. Sidewalks;
3. Bridges, Retaining Walls, Culverts, Stairways and Lookouts;
4. Transportation *(new for 2017)*;
5. Water Distribution;
6. Water Facilities;
7. Wastewater Collection;
8. Wastewater Facilities;
9. Stormwater Collection;
10. Stormwater Facilities;
11. Solid Waste & Landfill;
12. Brownfield Infrastructure *(new for 2017)*;
13. Public Works and Administrative Facilities;
14. Airport *(new for 2017)*;
15. Corporate Fleet;
16. Transit;
17. Social Housing.
18. Parks *(new for 2017)*;
19. Recreation *(new for 2017)*;
20. Cemeteries *(new for 2017)*;
21. Golf Courses *(new for 2017)*;
22. Tourism *(new for 2017)*; and
23. Sanderson Centre – Culture *(new for 2017)*.

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Infrastructure Report Card

"The approach… is firmly grounded in the asset management principles contained within the National Guide to Sustainable Municipal Infrastructure (InfraGuide) and the recent Federation of Canadian Municipalities (FCM) Canadian Infrastructure Report Card (2016)."

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Transportation and Airport were partially included in previous editions of the plan under Road Network and Public Works and Administrative Facilities respectively.

The primary objective of the report card is to develop a repeatable and objective process for assessing the theoretical condition (based on age) and, where performance data exists, establish the current structural and performance condition of the City's infrastructure assets, utilizing data analytics procedures which provide a means to assess impacts on re-investment and funding levels over the short and long term. Information such as this is essential in understanding the current state of infrastructure, trends and major issues or opportunities for enhanced re-investment scenarios. While the City currently has significant data regarding the structural condition of a large majority of its asset classes, a number of data gaps still exist specifically around hydraulic and physical performance of our infrastructure. Additional information about these areas for improvement is included in **Section 2.5** of this document.

The report card:

- Translates the consolidated condition of the infrastructure within each of the program areas into a five (5) level rating system ranging from *Very Poor* to *Very Good*, which is then aggregated to present the overall state of the City's Public Works, and Parks and Recreation infrastructure

- Includes the Public Works, Social Housing, and Parks and Recreation program areas listed above, but allows for the inclusion of other City assets such as Long Term Care in the future.

- Uses available data for the analysis to produce a realistic account of the state of the infrastructure.

- Incorporates financial re-investment / budget information to project the future-state condition of assets based on historic and planned financial re-investment.

- Is developed in a format and using a methodology that is repeatable and consistent with best-practices to allow comparative analysis, trending and scenario development.

While the initial emphasis focuses on the age and physical structural condition of the assets, capacity analysis and master planning activities will be crucial in helping to define the functional capacity of the infrastructure moving forward. The report card is a living document that will incorporate additional and improved information as it becomes available.

The approach employed in the development of Brantford's Infrastructure Report Card is firmly grounded in the asset management principles contained within the National Guide to Sustainable Municipal Infrastructure (InfraGuide) and the recent Federation of Canadian Municipalities (FCM) Canadian Infrastructure Report Card (2016).

A key component in the development of this report card was the compilation and review of the City's asset inventory information. This information included data such as pipe materials, installation dates, estimated service life, condition data (such as main breaks and condition reports), and asset replacement values. Where available, condition, maintenance activities and inspection data was used to define the physical condition. Where no condition or inspection data existed, asset condition was estimated based on service life and engineering opinion, and was considered as a gap in the analysis to be filled for future Report Card development.

2.1. Asset Inventory Summary

An asset inventory for the City's Public Works Infrastructure was developed by utilizing the City's detailed asset data for each of the 23 program areas. Each program area was then divided into asset classes as shown in Table 1. Though not shown in the table, each asset class was divided into asset sub classes which were further broken down to the individual asset level for the analysis (for example, a section of road on a particular street, or individual transit vehicles).

It should be noted that in 2016 the City and the County of Brant entered into negotiations regarding a boundary adjustment which, when completed in January 2017, resulted in an increase in the overall area of the City and an increase in the number of assets for some categories, as assets within the adjustment area became the property of the City. As the inventories of assets being assumed by the City have not yet been reconciled, they have not been included in this edition of the Asset Management Plan. Future editions of the AMP will include these assets.

Table 1.   Asset Inventory Classification

Program Area	Asset Class
Airport	Buildings - Airport
	Instruments - Airport
	Lights – Airport
	Pavements - Airport
	Site Works - Airport
Bridges, Retaining Walls and Culverts - Public Works	Bridges - Public Works
	Culverts < 3m - Public Works
	Culverts OSIM Inspected - Public Works
	Retaining Walls - Public Works
	Stairways - Public Works
Brownfield Infrastructure	Site Works - Planning (Brownfields)
Cemeteries	Amenities & Furniture - Cemeteries
	Shelters & Buildings - Cemeteries
Corporate Fleet	Fleet - General
	Vehicles & Equipment - Airport
	Vehicles & Equipment - Bylaw Enforcement
	Vehicles & Equipment - Environmental Services (Wastewater)
	Vehicles & Equipment - Environmental Services (Water Collection)
	Vehicles & Equipment - Environmental Services (Water Compliance)
	Vehicles & Equipment - Environmental Services (Water Operations)
	Vehicles & Equipment - Environmental Services (Water Treatment)
	Vehicles & Equipment - Facilities & Asset Management
	Vehicles & Equipment - Operational Services (Landfill)
	Vehicles & Equipment - Operational Services (Operations)
	Vehicles & Equipment - Operational Services (Road Maintenance)
	Vehicles & Equipment - Operational Services (Storm Management)
	Vehicles & Equipment - Operational Services (Street/Sidewalk Cleaning)
	Vehicles & Equipment - Operational Services (Survey/Inspection)
	Vehicles & Equipment - Operational Services (Traffic)
	Vehicles & Equipment - Operational Services (Utilities)
	Vehicles & Equipment - Operational Services (Winter Control)
	Vehicles & Equipment - Parks (Aquatics)
	Vehicles & Equipment - Parks (Arenas)
	Vehicles & Equipment - Parks (Cemeteries)
	Vehicles & Equipment - Parks (Forestry)
	Vehicles & Equipment - Parks (Golf)
	Vehicles & Equipment - Parks (Horticulture)

Program Area	Asset Class
	Vehicles & Equipment - Parks (Maintenance)
	Vehicles & Equipment - Parks (Turf)
	Vehicles & Equipment - Transportation Services
Golf Courses	Amenities & Furniture - Golf Courses
	Machinery & Equipment - Golf Courses
	Shelters & Buildings - Golf Courses
Parks	Active Recreation Facilities – Parks
	Amenities & Furniture – Parks
	Arboriculture – Parks
	Bridges – Parks
	Culverts OSIM Inspected – Parks
	Horticulture – Parks
	Lookouts – Parks
	Machinery & Equipment – Parks
	Park Trail Network
	Shelters & Buildings – Parks
	Stairways – Parks
Public Works and Admin. Facilities	Amenities & Furniture - Public Works & Admin
	Buildings - Public Works & Admin
	Site Works – Facilities
Recreation	Active Recreation Facilities - Recreation
	Amenities & Furniture – Recreation
	Shelters & Buildings – Recreation
Road Network	Other – Roads
	Roads
	Roadside Structures
	Street Furniture
	Street Lighting
	Traffic and Roadside
Sanderson Centre	Amenities & Furniture – Theatre
	Buildings – Theatre
Sidewalks	Sidewalks
Social Housing	Amenities & Furniture - Social Housing
	Buildings - Social Housing
	Site Works - Social Housing
Solid Waste and Landfill	Buildings - Landfill
	Computer Software - Landfill
	Control Systems - Landfill
	Landfill Cells

Program Area	Asset Class
	Site Works - Landfill
	Tools/Shop/Garage Equip. - Landfill
Stormwater Collection	Laterals - Stormwater
	Local Sewers - Storm
	Maintenance Holes - Storm
	Stormwater - Inlets
	Trunk Sewers - Storm
Stormwater Facilities	Buildings - Stormwater
	Site Works - Stormwater
Tourism	Amenities & Furniture – Tourism (includes Public Art and Monuments)
	Buildings – Tourism
Transit	Buildings – Transit
	Site Works – Transit
	Transit – General
	Vehicles & Equipment – Transit
Transportation	Amenities & Furniture - Transportation Services
	Buildings – Transportation
	Site Works – Transportation
Wastewater Collection	Laterals – Wastewater
	Local Sewers – Wastewater
	Maintenance Holes – Wastewater
	Trunk Sewers – Wastewater
Wastewater Facilities	Buildings – Wastewater
	Site Works – Wastewater
Water Distribution	Chambers
	Hydrants
	Laterals - Water
	Watermains
Water Facilities	Buildings - Water
	Site Works - Water

Linear inventory data regarding the extent of the networks (water, wastewater, stormwater, roads, sidewalks, bridges and trails) were extracted from the City's GIS. Facility data describing the quantities, value, condition and locations was extracted from various City databases and applications such as the Facilities Database and JD Edwards. Other data types were sourced from a combination of the City's GIS and the Tangible Capital Asset (TCA) registry in JD Edwards. The City's suite of software and databases ensures that the most effective software tools are used to analyze and manage data.

Through intensive data collection efforts both in the office and the field, the City of Brantford's asset registry within the GIS is considered to be a reliable and comprehensive resource for asset information. Changes to assets and repairs conducted by crews as well as other activities, are providing continuous information for the GIS team to update and reconcile the asset registry.

For a breakdown of the asset types by quantity / extent and replacement value, please see **Appendix 1**.

2.2. Asset Replacement Values

The unit replacement costs for linear assets were estimated using current standard budgeting values that are based on data such as historical tender pricing and current market replacement value. A combination of the City's Tangible Capital Asset (TCA) registry, *Hanson's Yardsticks for Costing 2016* as well as insurance assessed property values were used for vertical assets such as facilities and social housing. For non-building assets, values were estimated using historical tender pricing, and current market value replacement values. Parks assets were estimated using a combination of values supplied by the Parks Department, historical tender pricing, and current market replacement values.

Figure 5 illustrates the replacement cost breakdown of the City's $3 billion asset inventory. Some of these values vary from the 2013 edition of the AMP. Variations are due to a variety of factors for each program area and may include:

- Changes to the manner of calculating unit costs to more accurately reflect values obtained for construction projects rather than theoretical sources.

- More accurate cost allocation to inventory data e.g. pipe diameter

- Inclusion of additional asset classes.

- Addition of assets newly obtained by the City, removal of assets no longer owned by the City.

- Ongoing accuracy improvements in the collection of inventory attribute data and asset conditions.

- Removal of provincial and federal taxes from the replacement values for all program areas due to the potential for variance in the additional percentage over the long term.

- Variations in the theoretical and actual Non-residential Building Construction Price Index (NRBCPI) rate for recent years which are used to inflate historic prices to present day.

Figure 5.   Public Works Commission, Social Housing and Parks and Recreation Asset Replacement Value ($ Millions)
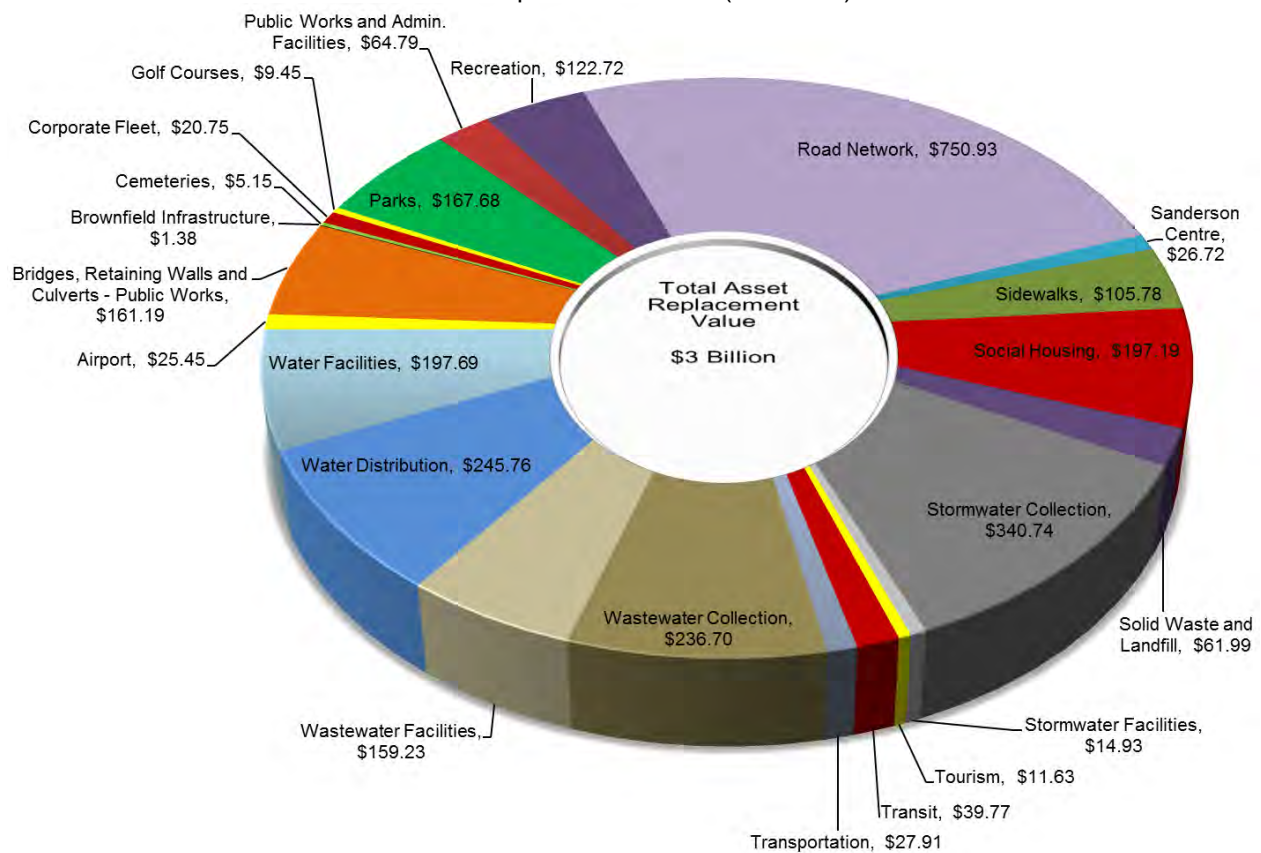
2.3. Asset Estimated Service Life

An asset's estimated service life (ESL) is the period of time that it is expected to be of use and fully functional to the City. Unless tangible condition and hydraulic performance data exists, once an asset reaches the end of its service life, it will be deemed to have deteriorated to a point that necessitates replacement. The ESL for each component was established by using a combination of the City's TCA ESL figures and industry standards. Individual ESL's were used in conjunction with original construction dates to determine the theoretical remaining service life (RSL) of each asset. The percent (%) estimation of RSL was used further as a factor to assist in determining condition ratings.

2.4. Asset Condition Rating

The City undertakes numerous investigative techniques in order to determine and track the physical condition of its infrastructure. For instance, the interior of sanitary and storm pipes are routinely inspected using closed circuit television (CCTV) inspection. These inspections are guided by standard principals of defect coding and condition rating that allow for a physical condition "score" for the infrastructure to be developed. For infrastructure without a standardized approach to condition assessment scoring,

information such as visual inspections, building condition audits, bridge audits (OSIM Inspections[2]), annual pavement inspections, watermain break records and other maintenance related observations were used in establishing the condition of the asset.

Using the ESL and physical condition data (where available), a weighted score was calculated for each asset. Assets were then placed into one of five rating categories ranging from *Very Good* to *Very Poor* as shown in **Table 2** below. Individual infrastructure asset scores were then aggregated up to the program area, and then a weighted overall system rating was obtained.

As previously mentioned, a combination of the ESL and known asset condition, where available, was used to estimate the percentage of RSL for the assets. The percentage RSL for each asset was then weighted (based on replacement value), and used to provide the weighted average RSL for the program area. For example, the weighted average percentage RSL of the sidewalk network is 78%, meaning that on average, the sidewalk network assets are 22% into their estimated service life of 40 years, and have 78% of their service life remaining (i.e. the weighted average age of the road network is 9 years old). This would place the sidewalk network assets into the category of "Good" as defined in **Table 2**.

Understanding the percentage RSL for each of the assets helps to facilitate planning for replacement and major rehabilitation activities by providing insight into the quantity of assets that have exceeded typical ESLs, and therefore require attention due to increasing probability of failure and subsequently deteriorating levels of service. It is important to note that some low-risk assets may also be feasible to run-to-failure, and though they may have exceeded their ESL, they may be fully functional, have good condition, and provide high levels of service for many years.

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[2] OSIM – the Ontario Structural Inspection Manual sets the standards for detailed bridge inspections and provides a uniform approach for professional engineers and other inspectors to follow. OSIM Inspections must be conducted in accordance with **Ontario Regulation 104/97**, *Standards for Bridges*

Table 2.   Rating Categories based on Service Life and Condition

Rating Category	% of Remaining Service Life (RSL)	Definition
Very Good	76 - 100%	*Fit for the Future* - The infrastructure in the system or network is generally in very good condition, typically new or recently rehabilitated. A few elements show general signs of deterioration that require attention
Good	51% -75%	*Adequate for Now* - Some infrastructure elements show general signs of deterioration that require attention. A few elements exhibit significant deficiencies
Fair	26% - 50%	*Requires Attention* – The infrastructure in the system or network shows general signs of deterioration and require attention with some elements exhibiting significant deficiencies
Poor	0% - 25%	*At Risk* - The infrastructure in the system or network is in poor condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration.
Very Poor	< 0%	*Unfit for Sustained Service* - The infrastructure in the system or network is in unacceptable condition with widespread signs of advanced deterioration. Many components in the system exhibit signs of imminent failure, which is affecting service or has effectively exceeded its theoretical service life.

Table 3 illustrates the percentage of the system assets considered to have less than 25% RSL or have exceeded their RSL entirely. For example 77% of Cemetery assets fall within the *Poor* and *Very Poor* rating categories.

As can be seen from **Table 3**, the weighted average for all Public Works, Social Housing and Parks and Recreation infrastructure falls within the *Good* category with an average estimated RSL of 58%.

However, as has been noted, the City must continue to complete condition and performance assessments in order to properly assess the condition of the assets. For example, City streetlights and poles have not had formal condition audits completed within the past 20 years. Consequently, in 2017 the Public Works Commission will be embarking on a streetlight and pole condition audit project.

Also important to note is that approximately 12% of the City's Public Works, Social Housing and Parks and Recreation asset portfolio falls within the poor or very poor rating categories. This 12% equates to a total replacement value of $360 million. This is in-line with similar infrastructure categories across Canada, as described in the FCM Canadian Infrastructure Report Card (2016). The FCM report identified that by replacement value, 13% of the municipal infrastructure across Canada is considered to be in *Poor* to *Very Poor* condition. Through the development of the City's report card, it would appear that Brantford's results are relatively consistent with municipal infrastructure conditions across the Country.

Table 3.   Summary of Remaining Service Life and Replacement Value

Program Area	2017 Replacement Value (Millions)	2017 Rating Category (% Remaining Service Life)	% of Assets in Poor or Very Poor Rating Categories	2017 Replacement Value (Millions) of Assets in Poor or Very Poor Rating Categories
Airport	$ 25.45	Fair (35%)	66%	$ 16.74
Bridges, Retaining Walls and Culverts - Public Works	$ 161.19	Good (59%)	9%	$ 13.90
Brownfield Infrastructure	$ 1.38	Very Good (98%)	0%	$ 0.01
Cemeteries	$ 5.15	Poor (12%)	77%	$ 3.97
Corporate Fleet	$ 20.75	Poor (11%)	77%	$ 15.89
Golf Courses	$ 9.45	Fair (27%)	64%	$ 6.01
Parks	$ 167.68	Fair (49%)	21%	$ 34.49
Public Works and Admin. Facilities	$ 64.79	Fair (45%)	11%	$ 7.43
Recreation	$ 122.72	Very Good (78%)	6%	$ 6.88
Road Network	$ 750.93	Good (71%)	7%	$ 55.63
Sanderson Centre	$ 26.72	Fair (35%)	7%	$ 1.92
Sidewalks	$ 105.78	Very Good (78%)	1%	$ 1.27
Social Housing	$ 197.19	Good (54%)	4%	$ 7.17
Solid Waste and Landfill	$ 61.99	Fair (45%)	40%	$ 24.99
Stormwater Collection	$ 340.74	Fair (51%)	11%	$ 35.78
Stormwater Facilities	$ 14.93	Good (67%)	0%	$ -
Tourism	$ 11.63	Fair (44%)	46%	$ 5.34
Transit	$ 39.77	Fair (30%)	39%	$ 15.66
Transportation	$ 27.91	Good (66%)	1%	$ 0.39
Wastewater Collection	$ 236.70	Fair (48%)	12%	$ 27.64
Wastewater Facilities	$ 159.23	Fair (40%)	12%	$ 18.40
Water Distribution	$ 245.76	Fair (51%)	13%	$ 31.37
Water Facilities	$ 197.69	Good (70%)	14%	$ 28.39
Total	**$ 2,995.52**	**Good (58%)**	**12%**	**$ 359.27**

Figure 6 shows the replacement value of infrastructure within each of the rating categories. Overall, of the City's $3 billion in assets, 64% (or $1.92 billion) fall within the *Very Good* to *Good* categories; 24% ($0.72 billion) being in the *Fair* category, 4% ($0.13 billion) in the *Poor* category, and 8% ($0.23 billion) have exceeded their theoretical service lives and as such are in the *Very Poor* category.

Figure 6. Asset Rating Category Summary by Replacement Value ($ Millions)
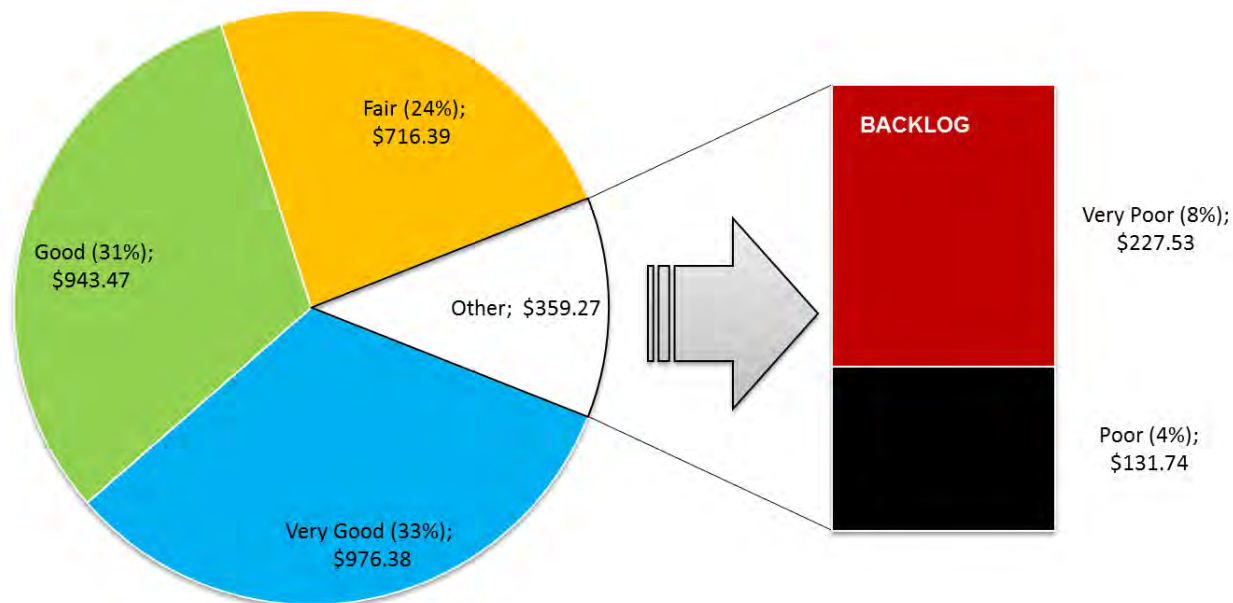
The subsequent figure (**Figure 7**) shows the breakdown of assets by rating category across each of the program areas. From this it is apparent that Corporate Fleet, Cemeteries, Golf Courses, and Tourism have the greatest relative replacement value of assets that have exceeded their ESL, with 64%, 59%, 36%, and 33% respectively. In addition, Sanderson Centre, Transit, Wastewater Facilities, Public Works and Administrative Facilities, and Wastewater Collection have the largest value of assets that fall within the *Fair* and *Poor* rating categories, with 92%, 60%, 56%, 53% and 52%, respectively. This illustrates that in the near future there may be significant amounts of assets moving from *Fair* to *Poor* and from *Poor* to *Very Poor* as the infrastructure continues to age.

Figure 7. Breakdown of Asset Rating Category by Program Area
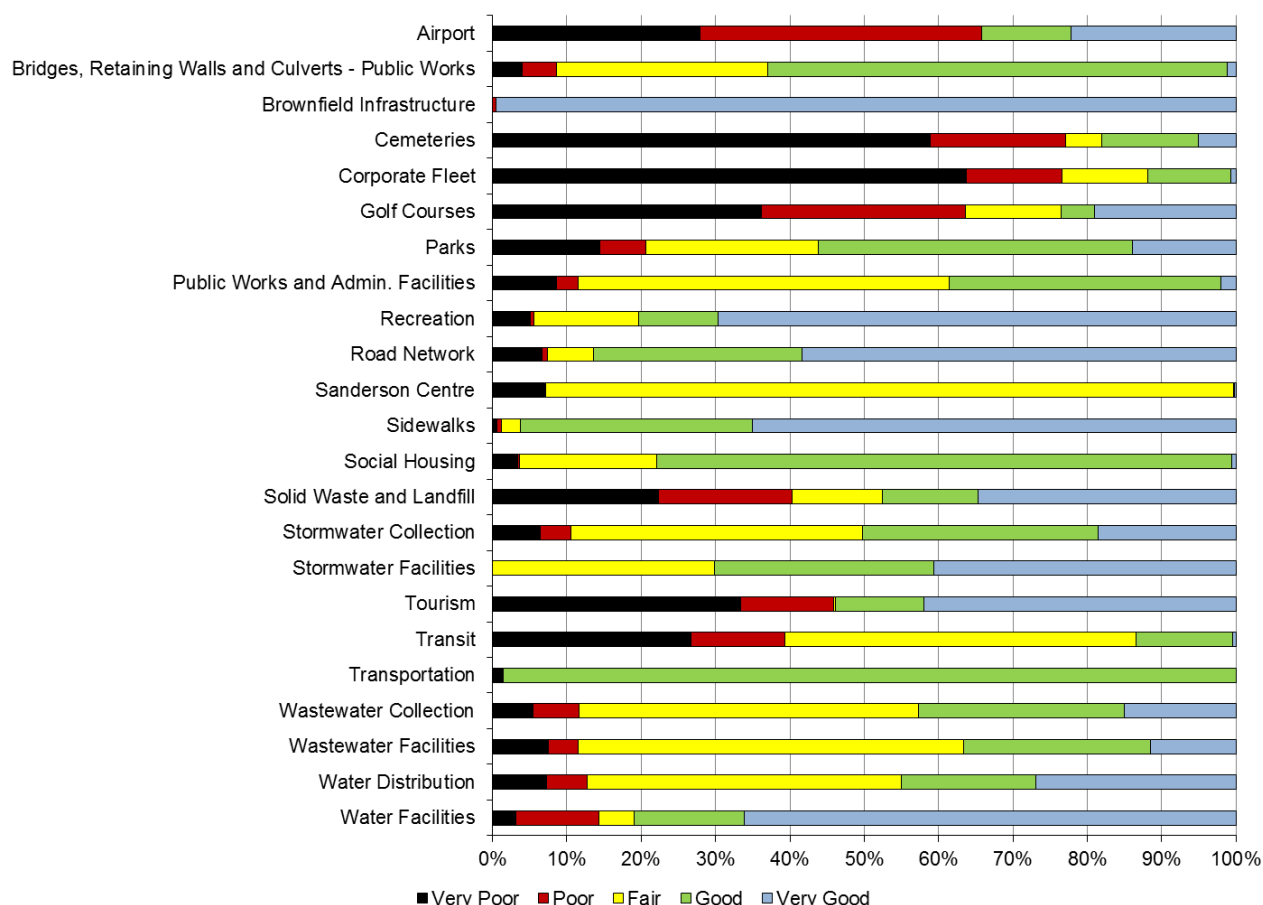
2.5. 2014 to 2017 Comparison

In order to determine whether initiatives are having an impact, the overall remaining service life of the different asset classes have been compared in Table 4 for 2014 and 2017 in order to illustrate the relative trends or changes identified through the lifecycle analysis. The data suggests that several asset classes, as a whole, are continuing to age and deteriorate at a rate faster than the assets are being renewed. This is illustrated by the downward-facing arrows at several of the asset classes including Bridges, Retaining Walls and Culverts, Roads, Solid Waste and Landfill

As the City continues to invest in technical studies and condition assessment activities the resulting data will allow for better prediction and planning of effective asset renewal and financial re-investment.

Recurring infrastructure report cards issued in between asset management plans will assist in the identification of trends and issues that will impact the City in dealing with infrastructure and services on a sustainable basis. It will also provide the opportunity to engage stakeholders across the City, and will form a starting point for development of more detailed and tactical operation plans aimed at identifying expenditures needed to provide service in a cost-effective and sustainable manner.

Table 4.   2014 to 2017 RSL Comparison

Program Area	2014 Est. RSL%	2017 Est. RSL%	Description	% Change
Airport	N/A	35%	Requires Attention	Not Calculated
Bridges, Retaining Walls and Culverts - Public Works	64%	59%	Adequate for Now	⬇ -5%
Brownfield Infrastructure	N/A	98%	Fit for the Future	Not Calculated
Cemeteries	N/A	12%	At Risk	Not Calculated
Corporate Fleet	15%	11%	At Risk	⬇ -4%
Golf Courses	N/A	27%	Requires Attention	Not Calculated
Parks	N/A	49%	Requires Attention	Not Calculated
Public Works and Admin. Facilities	39%	45%	Requires Attention	⬆ 6%
Recreation	N/A	78%	Fit for the Future	Not Calculated
Road Network	79%	71%	Adequate for Now	⬇ -8%
Sanderson Centre	N/A	35%	Requires Attention	Not Calculated
Sidewalks	29%	78%	Fit for the Future	⬆ 49%
Social Housing	N/A	54%	Adequate for Now	Not Calculated
Solid Waste and Landfill	63%	45%	Requires Attention	⬇ -18%
Stormwater Collection	54%	51%	Requires Attention	⬇ -3%
Stormwater Facilities	61%	67%	Adequate for Now	⬆ 6%
Tourism	N/A	44%	Requires Attention	Not Calculated
Transit	55%	30%	Requires Attention	⬇ -25%
Transportation	N/A	66%	Adequate for Now	Not Calculated
Wastewater Collection	67%	48%	Requires Attention	⬇ -19%
Wastewater Facilities	49%	40%	Requires Attention	⬇ -9%
Water Distribution	49%	51%	Requires Attention	⬆ 2%
Water Facilities	73%	70%	Adequate for Now	⬇ -3%
Overall	64%	58%	Adequate for Now	⬇ -6%

2.6. Data Confidence and Data Gaps

As with any data-intensive quantitative analysis, the results are only as good as the data that it is based on. The City recognizes that in the datasets used for the development of the infrastructure report card there are some gaps that may impact the validity of the results. To overcome the data gaps, an approach has been employed to measure and quantify the confidence in the data, and then to develop an action plan to improve the confidence in the data for future iterations. This approach also gives the reader a measure of how accurate the results of the analysis may be, and also aids the City in understanding deficiencies in the data and identifying areas for improvement.

In 2010, an assessment methodology was developed based on approaches used by C~Scope (Combining Sea and Coastal Planning in Europe) for reviewing geographical datasets, and an approach used by the Marine Management Organization (MMO) for reviewing evidence. The approach allows each piece of data to be assessed based on a number of factors in terms of high, moderate or low confidence based on the parameters shown in Table 5.

Table 5.   Data Confidence Assessment Matrix

Factor	High Confidence (100%)	Moderate Confidence (50%)	Low Confidence (0%)
When was the data collected or last updated	Data is suitably up to date.	There may be minor changes to the data since it was collected.	There may be major changes to the data since it was collected.
Is the data complete for its intended use, suitably uniform?	The data is fully complete and present for the dataset.	The data is partially complete and present for the majority of the area e.g. data from surveys / sampling or collated from multiple but not comprehensive sources.	The data is known to be incomplete.
Is the data from an authoritative source?	Created from official and/or peer-reviewed sources.	Created from unofficial "published" sources – reports, internet etc.	Created by unofficial unpublished sources – fieldwork, personal accounts etc.
Any indication of errors?	No indication of errors.	Some errors evident – missing / incorrect / additional areas etc.	Significant number of errors – obviously missing or incorrect data.
Is the data verified by a relevant stakeholder (the staff member directly responsible for the assets)?	The data has been fully verified.	The data has been partially verified.	The data has not been verified.

Developed from: (C-SCOPE, 2012)

Each data set is evaluated based on the answer for each factor, providing a percentage confidence rating score between 0% (all factors have low confidence) and 100% (all factors have high confidence). The rating is calculated using **Equation [1]**.

$$Confidence\ Rating = \sum Factor\ Confidence\ Rating \times \frac{1}{5} \qquad [1]$$

For example, a data set which has had minor changes since it was collected, is partially complete, created by unofficial unpublished sources, has no indication of errors, and has been partially verified would be scored as follows:

$$\left(50\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) + \left(100\% \times \frac{1}{5}\right) + \left(50\% \times \frac{1}{5}\right) = 60\%\ (Moderate\ Confidence)$$

The data confidence ratings for the datasets used in this analysis compared to the data used in the 2013 analysis are shown in **Table 6.**

Table 6.   Data Confidence Ratings for the Asset Report Card

Program Area	2013 Inventory and Condition	Valuation	2017 Inventory and Condition	Valuation	Data Confidence Trend	Comments
Airport	Not included in 2013 Report Card.		50%	80%	N/A	- A CCTV or zoom camera inspection of wastewater and stormwater pipes at the Airport and along the airport access road owned by the City is planned for 2017/2018. Currently only limited data is available from various site plans dating back to 1939 when the airport was first constructed. - An investigative survey will be completed in 2017 to confirm that the assumed alignments shown in the GIS inventory are approximately correct for the linear infrastructure. - Detailed inventory information about some assets may not be obtainable until the asset is replaced. - This program area includes airport buildings which were previously included under Public Works and Administration Facilities. - Condition assessments of airport buildings are planned for 2017. - Aviation Ave, the access road to the landside of the airport will be included in the 2017 Road Condition Assessment.
Bridges, Retaining Walls and Culverts - Public Works	30%	30%	80%	90%	⬆	- OSIM inspections were completed in 2011, 2013 and 2015. - Condition data and replacement cost estimates for all bridges and culverts over 3m in span were estimated by the 2015 OSIM consultant. - Some new structures constructed in 2016 are not included in this edition of the AMP. - Retaining walls in this edition of the plan focus on large walls which were inspected as part of the 2015 OSIMs. Some walls are still being identified.
Brownfield Infrastructure	Not included in 2013 Report Card.		60%	90%	N/A	- Reflects buried and above ground infrastructure but in as a form of containment or noise control. It does not include infrastructure from previous site uses which has been abandoned. - While recent infrastructure has been included it is not known what historic infrastructure, if any, may be present on some older city sites. - Capital Planning will work with Policy Planning to ensure new infrastructure on City brownfield sites continues to be added to the GIS inventory.
Cemeteries	Not included in 2013 Report Card.		50%	80%	N/A	- As part of the 2017 AMP process GIS inventories for cemetery assets were standardized, data gaps are known to exist to varying degrees for different asset groups. - In 2017, various cemetery buildings will have Building Condition Assessments completed. Where Building Condition Assessments have previously been completed, they have been used, where they have not been completed, age has been used as a proxy. - Replacement costs are based on a combination of insurance assessment values, historic built costs and industry standard unit costs.
Corporate Fleet	60%	70%	90%	90%	⬆	- Fleet inventory data is complete and suitably up to date. No condition data is available; however age was used as a proxy. - Costs are based on historical acquisition and upgrade costs. - The inventory has been verified in 2016.
Golf Courses	Not included in 2013 Report Card.		70%	80%	N/A	- As part of the 2017 AMP process GIS inventories for golf assets were standardized, data gaps are known to exist to varying degrees for different asset groups. - Where Building Condition Assessments have previously been completed, they have been used for condition, where they have not been completed, age has been used as a proxy. - Replacement costs are based on a combination of insurance assessment values, historic built costs and industry standard unit costs.
Parks	Not included in 2013 Report Card.		60%	70%	N/A	- As part of the 2017 AMP process GIS inventories for parks assets were standardized, data gaps are known to exist to varying degrees for different asset groups. - In 2017, parks plans to complete a tree inventory which will replace the outdated inventory used for the completion of this AMP. - In 2017, various park buildings will have Building Condition Assessments completed. Where Building Condition Assessments have previously been completed, they have been used, where they have not been completed, age has been used as a proxy. - In 2017 parks will begin using ArcGIS collector to update their inventories which will improve the data accuracy for future editions of the AMP.

Program Area	2013 Inventory and Condition	2013 Valuation	2017 Inventory and Condition	2017 Valuation	Data Confidence Trend	Comments
Public Works and Admin. Facilities	80%	80%	90%	90%	⬆	- A Building Condition Assessment project was begun in 2013. This has led to some Public Works and Admin. Facility having condition assessments assigned by consultants based on site reviews. The Assessments are ongoing, with more buildings scheduled for 2017. The remaining structures had condition ratings assigned based on age. - Replacement costs are based on a combination of insurance estimated property values, inflated construction / acquisition costs or industry standard unit costs for certain types of buildings.
Recreation	Not included in 2013 Report Card.		60%	80%	N/A	- As part of the 2017 AMP process GIS inventories for recreation assets were standardized, data gaps are known to exist to varying degrees for different asset groups. - In 2017, various recreation buildings will have Building Condition Assessments completed. Where Building Condition Assessments have previously been completed, they have been used, where they have not been completed, age has been used as a proxy. - Replacement costs are based on a combination of insurance assessment values, historic built costs and industry standard unit costs.
Road Network	70%	80%	90%	90%	⬆	- Inventory data is comprehensive - In 2014, a Roadway Driveability Condition Assessment Study was completed. Scores were decreased using industry standard deterioration curves for 2015 and 2016. In 2017 a second field assessment will be completed which will allow calibration of the deterioration curves. - In 2016, the cost estimating templates used for engineering and capital planning were combined into one, increasing the accuracy of valuation.
Sanderson Centre	Not included in 2013 Report Card.		80%	70%	N/A	- Data based on the Tangible Capital Asset registry of assets and the GIS building inventory. - A condition assessment of the building was completed in 2015.
Sidewalks	30%	70%	90%	80%	⬆	- In 2014, a Sidewalk Condition Assessment Study was completed. - Replacement costs are based on replacement values estimated by the consultant for the 2014 inspections.
Social Housing	90%	80%	90%	90%	⮕	- Inventory data is complete and condition data is from the 2013 Social Housing Building Condition Assessment Project. - Replacement costs are based on the Insurance Estimate of Property Values completed by Social Housing and Public Works. A substantial re-assessment was performed in 2016 as it was identified that the insured replacement values for some properties had not been indexed for many years. In addition in 2016 site visits were performed by the insurance company to further refine the replacement value estimates.
Solid Waste and Landfill	30%	40%	90%	90%	⬆	- A Master Plan was completed in 2014. Costs and inventory were verified against the master plan values. - Some inventory assets and values came from the Tangible Capital Asset registry.
Stormwater Collection	40%	80%	50%	90%	⬆	- While inventory data is very comprehensive, only 23% of condition data was available. - A Trunk Line Condition Assessment project was begun in 2014 and continues in 2017 to improve the condition data coverage. - In 2016, the cost estimating templates used for engineering and capital planning were combined into one, increasing the accuracy of valuation.
Stormwater Facilities	60%	60%	60%	70%	⮕	- Facility inventory data is based on the City's published and verified Tangible Capital Asset Inventory and GIS inventory. - There is currently no condition data for the facilities and age was used as a proxy. - The inventory has been verified since the 2013 iteration and there have been significant changes and improvements in the data.
Tourism	Not included in 2013 Report Card.		70%	70%	N/A	- Data based on the Tangible Capital Asset registry of assets and the GIS building inventory. - The bulk of the value for this area is the Tourism building which was constructed in 2002. No condition assessment has been completed on this structure and none is scheduled at this time. - Structure replacement value is based on insurance valuation.

Program Area	2013 Inventory and Condition	Valuation	2017 Inventory and Condition	Valuation	Data Confidence Trend	Comments
Transit	60%	60%	80%	90%	⬆	- Transit inventory data is complete and suitably up to date. No condition data is available; age was used as a proxy. - Bus shelters were formerly owned by a contractor; in 2016 they became the property of the City. In 2017 an inventory and condition assessment will be completed for this asset group. Bus shelters are not included in this edition of the AMP. - Since 2012, the Transit data has been expanded to include property, such as the Transit Garage and Transit Terminal. - Costs are based on historical acquisition and upgrade costs except buildings may also be based on Insurance valuations or industry standard unit costs. - The vehicle inventory has been verified in 2016.
Transportation	Not included in 2013 Report Card.		70%	90%	N/A	- Transportation inventory data is complete and suitably up to date. No condition data is available, age was used as a proxy. - This program area includes the parkade which was formally recorded under Public Works and Administrative Facilities. - Costs are based on unit costs, historical acquisition and upgrade costs and insurance valuations.
Wastewater Collection	70%	80%	70%	90%	➡	- While inventory data is very comprehensive, only 85% of condition data was available. - A Trunk Line Condition Assessment project was begun in 2014 and continues in 2017 to improve the condition data coverage. - In 2016, the cost estimating templates used for engineering and capital planning were combined into one, increasing the accuracy of valuation.
Wastewater Facilities	60%	60%	70%	60%	⬆	- Facility inventory data is based on the City's published and verified Tangible Capital Asset Inventory and GIS inventory. - The pumping stations and some of the treatment plant buildings have had condition inspections completed. For other structures there is currently no condition data for the facilities and age was used as a proxy. - The inventory has been verified since the 2013 iteration and there have been significant changes and improvements in the data.
Water Distribution	60%	80%	60%	90%	➡	- While inventory data is very comprehensive, there is no condition data. Age and Watermain breaks were used as a proxy. - In 2016, the cost estimating templates used for engineering and capital planning were combined into one, increasing the accuracy of valuation. - 2016 Construction projects had not yet been updated for discrete assets in the network such as hydrants and chambers at the time of AMP finalization.
Water Facilities	60%	60%	70%	80%	⬆	- Facility inventory data is based on the City's published and verified Tangible Capital Asset Inventory and GIS inventory. - There is currently no condition data for most of the water facilities and age was used as a proxy. Where condition data was available it has been used. - The inventory has been verified since the 2013 iteration and there have been significant changes and improvements in the data.

3. Desired Levels of Service

One of the objectives of asset management planning is to ensure that the performance and service provided by the infrastructure meets the needs and expectations of the users. A level of service (LOS), or service level, is a criteria set by the organization and community for the quality and performance of the services provided by the municipality. Levels of service typically relate to quality, quantity, reliability, resiliency, responsiveness, environmental acceptability and cost.

Through the application of asset management principles, the City aims to understand the relationship between the levels of service and the cost of providing the service. This relationship can then be evaluated in consultation with the community to determine the optimum level of service they are willing to pay for (INGENIUM, 2006, p. 3.6).

Levels of service have not formally been set for the different infrastructure asset groups present in the City. Levels of service are typically developed as one of three types as shown in Table 7.

Table 7.   Level of Service Types

Level of Service Types	Description - Example	Measurement Tool
Strategic	*Relates to corporate goals* - provide safe drinking water	Benchmarking against other Municipalities
Technical	*Relates to regulatory requirements, physical performance of assets* – Number of watermain breaks	Key Performance Indicators
Customer	*Relates to customer satisfaction with asset performance* – Average response time until watermain break is fixed	Customer Satisfaction Surveys

The majority of the City's current unofficial levels of service are Technical LOS. While some LOS are present for the strategic and customer types, in the past they have not had formal recording and reporting requirements. As part of the City's future implementation of an Activity Tracking and Asset Management System (ATAMs) software the City will increase its ability to track and report Technical and Customer LOS. The City plans to develop official LOS targets in each of the three categories. The City of Brantford is involved in a number of initiatives to monitor the LOS provided by the City's infrastructure with respect to those LOS which fall within the technical category.

Corporately, the City of Brantford participates in the Municipal Performance Measurement Program (MPMP) which records the City's success level in meeting strategic LOS defined by the Province. In addition the City participates in the Federation of Canadian Municipalities infrastructure report card which aggregates the condition of assets across multiple municipalities. City initiatives pertaining specifically to asset management LOS are summarized below.

3.1. Water, Wastewater and Stormwater

3.1.1. Benchmarking Overview

Since 2002, the City has been an active participant in the National Water and Wastewater Benchmarking Initiative (NWWBI).[3] This project was developed in response to a need for Canadian municipal water and wastewater utilities to measure, track and report on their utility performance (NWWBI, 2013). In the 2012 iteration, the NWWBI included approximately 43 Canadian municipalities, regional districts, and water utility companies. The benchmarking framework was founded for the purpose of answering four important questions that are commonly posed to managers of water, wastewater and stormwater (NWWBI, 2012):

1. How well are we doing?
2. How do we compare with similar organizations?
3. Are we getting value for money? and
4. How can we get better at what we do?

For over a decade the City of Brantford has been measuring the levels of service for water, wastewater and stormwater infrastructure through the NWWBI framework. The NWWBI's Utility Management Model defines a framework to achieve seven (7) high level performance goals developed through consultation with participants across Canada. The performance goals are as follows:

1. Provide reliable and sustainable infrastructure;
2. Ensure adequate capacity;
3. Meet service requirements with economic efficiency;
4. Protect public health and safety;
5. Provide a safe and productive workplace;
6. Have satisfied and informed customers; and
7. Protect the environment.

The standardized "Utility Management Model", as shown in **Figure 8**, was developed to provide a framework for the selection and definition of performance measures for these goals. It depicts the relationship between these goals and the many performance measures that are used to track a utility's success in achieving them and the annual process of collecting, analyzing and reporting on data that is critical to the measurement of performance.

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[3] For a full description of the NWWBI performance indicators visit http://www.nationalbenchmarking.ca/.

Figure 8. National Water and Wastewater Benchmarking Initiative Utility Management Model
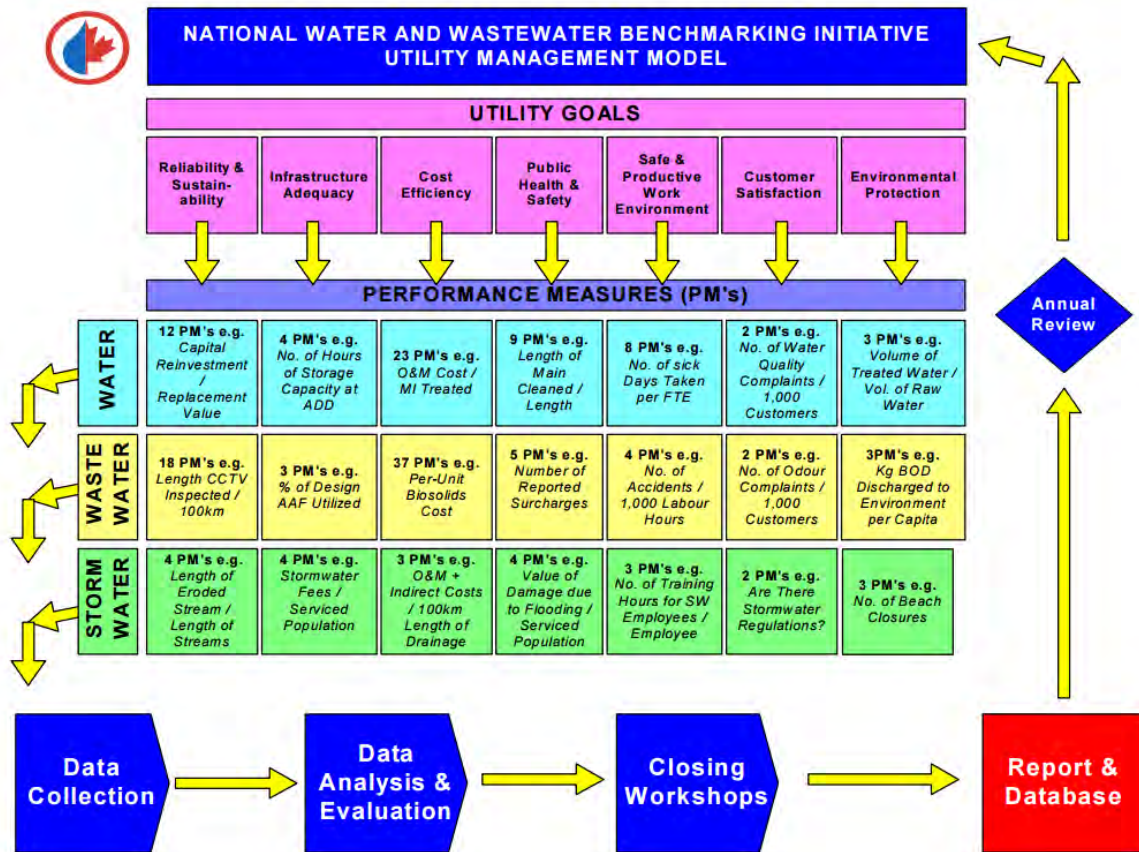
Source: AECOM, 2015

3.1.2. Year to Year Performance Tracking

The tracking of performance measures from year to year allows staff to gain insight into trends, inter-relationships and the downstream impacts of initiatives. For example, a combination of factors can cause watermain breaks such as the construction quality, pipe age, pipe material, soil conditions, ground and water temperature, and pressure changes in the system. **Figure 9** shows an example of the number of water main breaks per 100km length broken down by material, compared to the average pipe age in the distribution system. The figure shows that since 2001 the average pipe age of pipes was decreasing until 2013, and then increased from 2013 to 2014. Due to the number of breaks in the last two years and the comparatively low number of breaks in 2012, the number of watermain breaks per 100km length has changed to an increasing trend, whereas in the previous AMP it had been on a decreasing trend. The 2014 spike in watermain breaks is suspected to be a result of the colder than average winter which resulted in a deeper frostline than typically would be expected for the City. The data also shows that a large proportion of the watermain breaks from year to year are by pipes with metallic materials, indicating that metallic material watermains currently present a higher probability of failure than non-metallic watermains, which may be due to a prevalence of metallic watermains being installed 50 to 100 years

ago. An example of a technical LOS which could be developed based on this data would be: *decrease the number of watermain breaks each year going forward.*

Figure 9. Water Distribution Number of Watermain Breaks / 100km Length and Average Age of Pipes
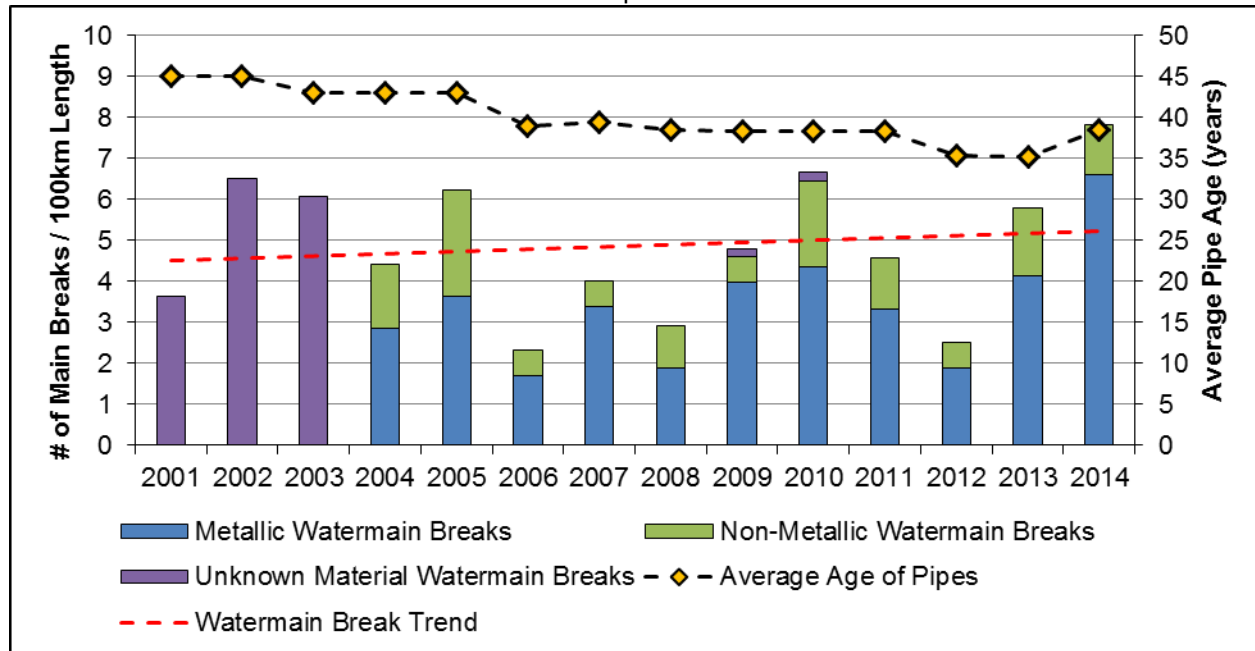
The City also uses the data to conduct comparisons to other similar organizations. **Figure 10** shows the number of watermain breaks in Brantford and other similar organizations (with networks below 575km and above 350 km) in comparison to the average pipe age. The graph shows that while Brantford has some of the oldest pipes in the comparison group, the number of watermain breaks is just under the overall average number of main breaks. An example of a strategic LOS which could be supported by this data is: *maintain a safe drinking water system with fewer service interruptions than the Canadian average for systems of a similar size.*

Figure 10. Water Distribution # of Main Breaks / 100 km Length and Average Pipe Age (Systems <575 km)
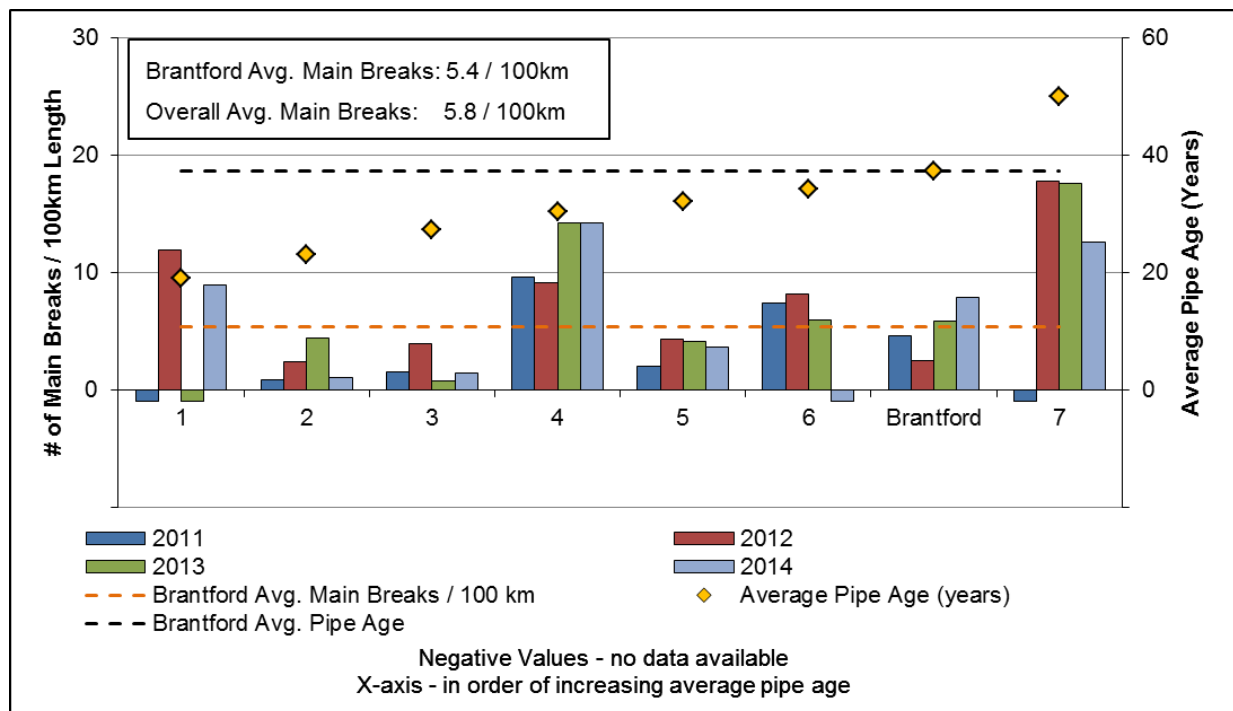
3.2. Visualizing Levels of Service

To aid in gaining an understanding of the levels of service being provided by an asset, the City undertakes inspections on a regular basis, which helps categorize the current condition and performance of the infrastructure. **Figure 11** to **Figure 15** show how a road segment's Pavement Condition Index (PCI) translates into the visual condition or levels of service provided by the road.

Figure 11. Very Good Condition (PCI between 80 and 100)
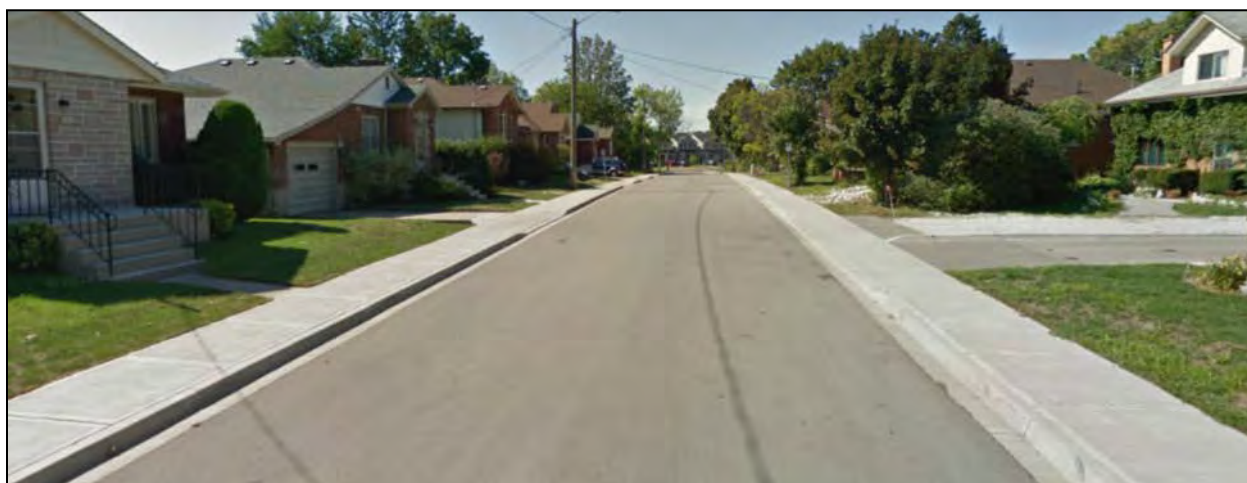
Figure 11 illustrates a road that has just been constructed and is in very condition. In the very good condition category (PCI 80-100), typically the roads show no signs of defects. **Figure 12** shows an example of a road that is in the good condition rating category (PCI 60-79). In this category, minor early signs of defects start appear such as cracks. In the example shown below, cracks have been filled for preventative maintenance purposes.

Figure 12.   Good Condition (PCI between 60 and 79)

An example of a road in fair condition (PCI 40-59) is shown in **Figure 13**. In the fair condition rating category, the road shows moderate signs of deterioration such as alligator cracking, which in some cases may necessitate minor patch repairs.

Figure 13.   Fair Condition (PCI between 40 and 59)
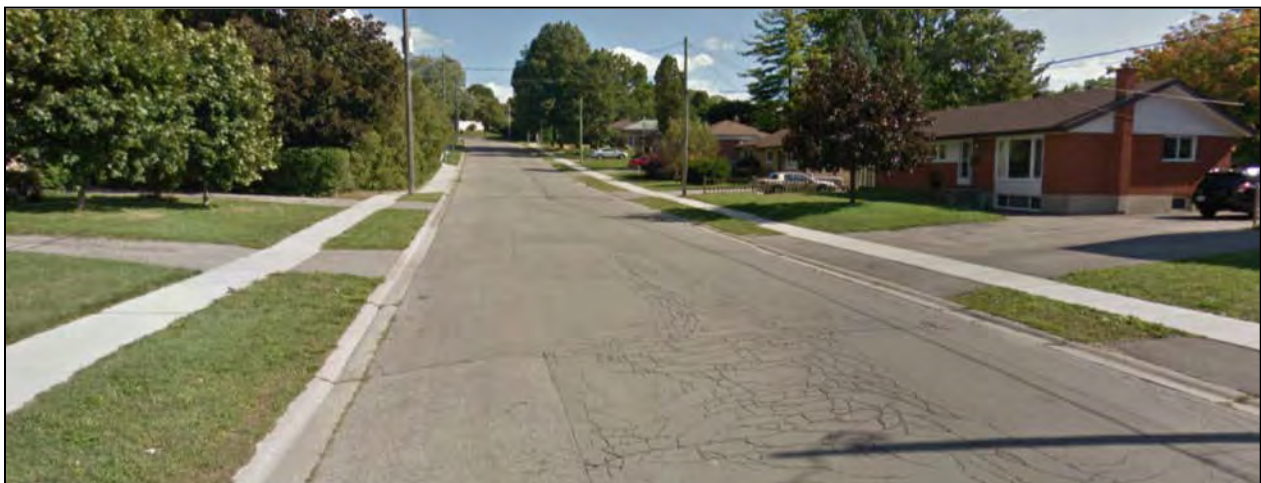
Figure 14 shows an example of a road that would fall into the poor condition rating category (PCI 20-39). At this stage, there has been substantial alligator cracking to the point that several pot holes have formed, resultantly increasing the operations and maintenance requirements of the road. In the 2016 capital planning process, all roads with a PCI below 40 were identified as reconstruction candidates for the 10 year capital forecast. Being identified as a candidate does not mean that a road section will end up in the

10 year capital plan, as priority ranking and budget constraints may result in a road section being deferred beyond the 10 year horizon.

Figure 14.   Poor Condition (PCI between 20 and 39)

The final condition rating category is very poor (PCI 0-19), which is demonstrated in **Figure 15**. Very poor roads show advanced signs of base and surface failure. The road shown in the figure has failed to the point that large amounts of the surface asphalt have crumbled away, exposing the granular base. In the 2016 capital planning process, all roads with a PCI below 40 were identified as reconstruction candidates for the 10 year capital forecast. Being identified as a candidate does not mean that a road section will end up in the 10 year capital plan, as priority ranking and budget constraints may result in a road section being deferred beyond the 10 year horizon.

Figure 15.   Very Poor Condition (PCI between 0 and 19)

To aid in the development of capital budgets, and to gain an understanding of investment requirements across the City, condition ratings are regularly mapped as shown in **Figure 16**, and used for planning purposes.

Figure 16. Example Map of Road Condition Ratings
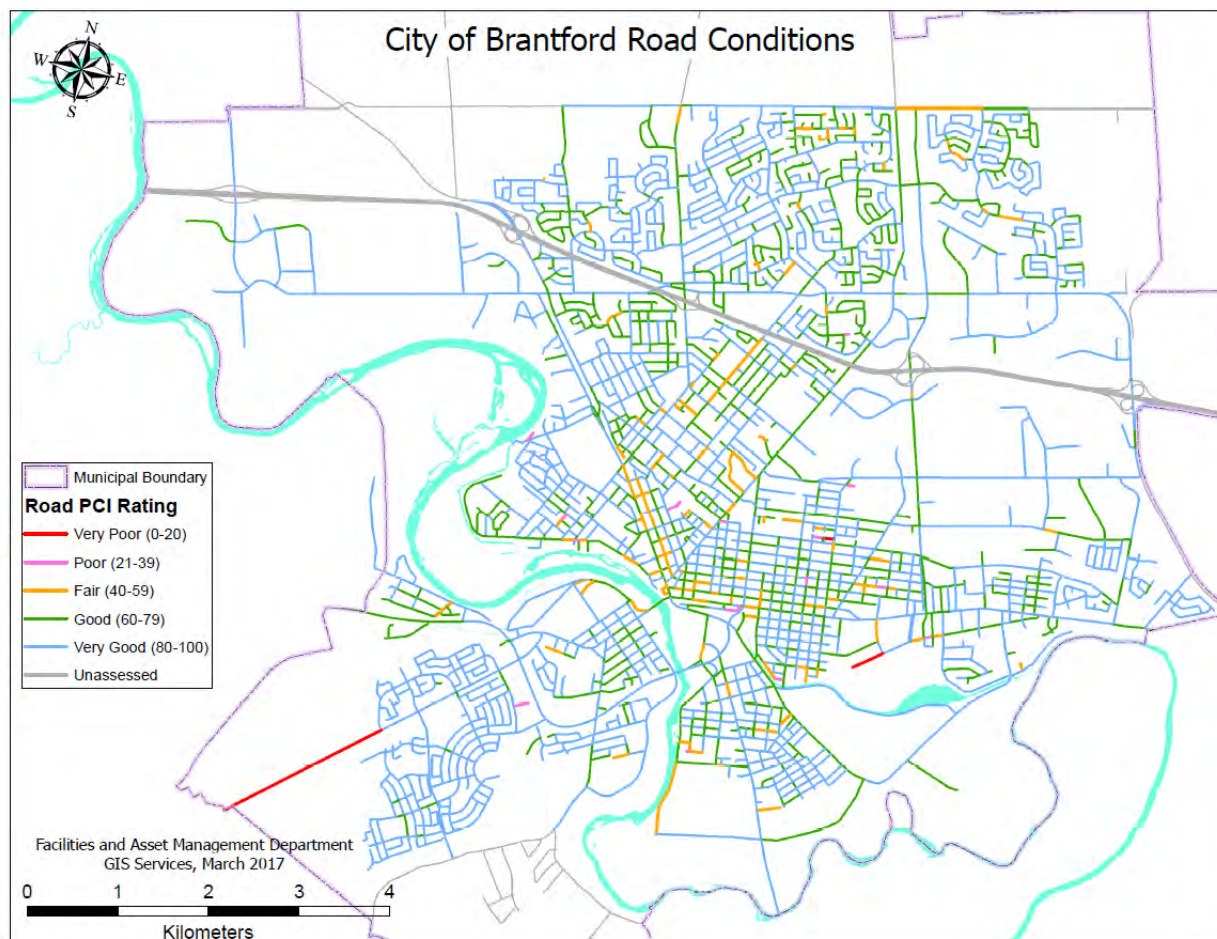
Note:

- *This map is based on the 2014 road inspection program, road condition deteriorates over time, and road construction projects have been completed, therefore this map may not represent the current road condition ratings.*

3.3. Level of Service Initiatives

In addition to tracking the performance measures as part of the NWWBI, the City maintains levels of service to meet or exceed a number of legislated standards (Technical LOS). For instance, roadways are maintained to meet the criteria for inspections, pot holes and cracks set out in Ontario Regulation 239/02 – Minimum Maintenance Standards for Municipal Highways. On an ongoing basis, the City maintains documents and has implemented a number of initiatives that further establish the current and expected levels of service for quality and safety, quantity and capacity, and availability of services that include but are not limited to those shown in **Table 8**.

Table 8.   Current Level of Service Initiatives

Service Criteria	Initiative	LOS Type (Strategic/Technical/ Customer)
Quality and Safety	**Roads and Sidewalks** • Minimum Maintenance Standards • Ontario Good Roads Association Municipal Roads Survey • Annual Condition Assessment • Design Guidelines • Traffic Monitoring	Technical Strategic/Technical Technical Technical Technical
	Bridges, Culverts and Retaining Walls • OSIM inspections • Bridge Maintenance Strategy	Technical Strategic/Technical
	Water, Wastewater and Stormwater • Drinking Water Quality Management Standard (DWQMS) • Standard Operating Procedures • National Water and Wastewater Benchmarking Initiative • Design Guidelines	Technical Technical Strategic/Technical Technical
	Solid Waste and Landfill • Waste Collection Standards • Blue Box Best Practice Annual Review	Technical Strategic
	Public Works and Admin Facilities • Building Condition Assessments (5-Year Return Cycle) • ASHRAE Guidelines • Energy Use and Efficiency Audits	Technical Technical Technical
	Corporate Fleet and Transit • Preventative maintenance strategy • Ministry of Transportation Motor Carrier Safety Standards Schedule 1 and 2	Strategic/Technical Technical
	Social Housing • Building Condition Assessment (5 year cycle) • Annual building and unit inspections • Elevator inspections in accordance with TSSA • Reserve fund audits – capital planning • Annual Ministry of Municipal Affairs and Housing audits and reporting	Technical Technical Technical Technical Strategic/Technical
	Parks and Recreation • Minimum Trail Maintenance Standards • Play Equipment Safety Standards • Building Condition Assessment (5 year cycle) • Minimum Facility Maintenance Standards	Technical Technical Technical Technical
	Airport • Minimum Maintenance Standards in accordance with Transportation Canada	Technical

Service Criteria	Initiative	LOS Type (Strategic/Technical/ Customer)
Demand and Capacity	**Roads, Transit, Bridges and Sidewalks** • Transportation Master Plan • Traffic Controller Study	Strategic Technical
	Water, Wastewater and Stormwater • Water, Wastewater and Stormwater Master Servicing Plan • Treatment Plant Optimization Strategy	Strategic Strategic
	Solid Waste and Landfill • Provincial Waste Collection Standards	Technical
	Public Works and Admin Facilities • Corporate Facility Accommodation Strategy • Operations Yard Master Plan	Strategic Strategic
	Fleet and transit • Fleet and transit lifecycle costing analysis	Strategic/Technical
	Social Housing • 10 Year Housing Stability Plan and 5 Year Implementation Plan	Strategic/Technical
	Parks and Recreation • Master Plan	Strategic/Technical/ Customer
Availability and Accessibility	**Social Housing, Facilities, Parks and Recreation** • Accessibility for Ontarians with Disabilities • Barrier Free Design • Facility Accessibility Design Standards	Technical Technical Strategic/Customer
	Corporate • Customer Service Strategy • Communication Strategy • Online initiatives – myBrantford.ca • Infrastructure Report Card	Strategic/Customer Strategic/Customer Strategic/Customer Strategic/Technical

3.4. Level of Service Improvement Plan

Overtime the City plans to continue adding and refining LOS for each of the three categories of Strategic, Technical and Customer. This will included:

• Completion of a customer expectation inquiry exercise to determine the LOS expected from various asset groups by members of the public and user groups.

• Gap analyses to determine the current levels of service, customer expectations and options to close the gaps.

• Develop official LOS objectives for all three categories, obtain Council endorsement and develop a reporting mechanism and timeline to convey the degree to which LOS are being achieved

• Linking cost and LOS objectives and develop a method to allocate costs based on LOS objectives.

• Customer request tracking system in place.

4. Asset Management Strategy

The asset management strategy is the set of planned actions that will enable the assets to provide the desired levels of service in a sustainable way, while managing risk, at the lowest lifecycle cost. In order to facilitate the development of the asset management strategy, a number of activities or initiatives take place within the City. **Figure 17** shows the components of the asset management strategy and asset lifecycle activities. At the core of the asset management strategy is the City's data and information which pushes and pulls key data from each of the activities. The activities, starting from the original construction of the asset denote the required planning activities carried out by Brantford throughout the asset management planning lifecycle.

In 2015, the provincial government established the *Infrastructure for Jobs and Prosperity Act, 2015* the purpose of this act is to *'establish mechanisms to encourage principled, evidence-based and strategic long-term infrastructure planning that supports job creation and training opportunities, economic growth, protection of the environment and design excellence'* (Housing, 2016). The Act lists 13 principles that planning and investment decisions should take into account. While the legislation does not include immediate requirements for reporting, the City needs to be prepared to demonstrate compliance, if required by the province. The Asset Management Strategy is a key support document to meet the evidence-based and strategic long-term planning requirements of the *Infrastructure for Jobs and Prosperity Act, 2015*.

Figure 17. Components of the Asset Management Strategy
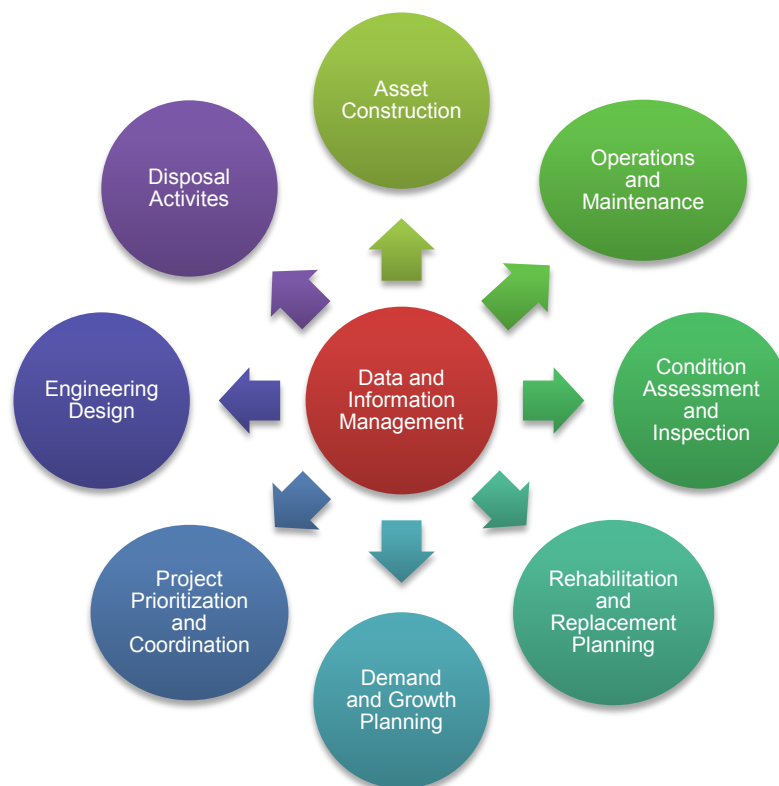
4.1. Data and Information Management

The Information Technology (IT) Services Department provides a suite of computer applications and systems to approximately 800 staff with dedicated user accounts at the City. The IT Services Department maintains the GIS server environment currently using ArcGIS for Internet Mapping along with ArcSDE and Oracle for spatial information storage and organization. The GIS data is managed, reviewed and input by staff in the GIS department. IT Services also maintains the majority of the key data repositories and applications utilized for the purpose of asset management.

Key databases and applications that have current or future implications for the asset management strategies of the City include, but are not limited to:

- *Avantis Computerized Maintenance Management System (CMMS):* Currently utilized for maintenance management and work order purposes to varying extents within the Public Works Department. Avantis currently supports ESRI shapefile format only for GIS integration. An upgrade for Avantis has been identified and budgeted for by IT Services. There are ongoing requirements for bi-directional integration with the GIS desktop and web mapping environments. The CMMS also merits consideration with respect to mobile access for digital work orders and asset maintenance and updating in the field, along with requirements for remote access to GIS information by Avantis field users and operations staff.

- *Linear Asset Data Repository (LADR):* This is the current repository for most linear infrastructure assets cared for by the Environmental Services Department within Public Works. The City plans to phase out this program over the next 1-2 years.

- *GIS System (Esri Canada):* In 2014 the City of Brantford undertook a project to complete a Geospatial Database Model Design and Build for the City's GIS datasets. The scope of work included defining user requirements, designing a conceptual geospatial database model that met user requirements and, the creation of a logical database design and physical data model. As a result of this project the City chose to proceed with the implementation of Esri's Canadian Municipal Data Model (CMDM). The new data model was developed and populated with asset attribution information previously stored in stand-alone databases. Once the data model conversion process was completed the City was able to upgrade to the most recent software versions available from Esri Canada for geospatial mapping and analysis. This enhanced geospatial database, has allowed the City to take advantage of some of the state of the art remote-field data collection and web mapping applications offered in the Esri GIS suite of tools.

- *GIS Web Mapping:* The City provides most internal staff with access to GIS through web based maps. Various map views have been established to allow the end user to select the type of mapping / query they would like. A similar portal and web map have been established for select external users (utility locaters and contractors carrying out City projects). A smaller group of power users leverage GIS data using more robust desktop applications. Both platforms derive their information from a centralized enterprise geodatabase that is administered by GIS services staff. This geodatabase serves as the authoritative source for not only Public Works assets, but also parcel fabric, addressing and several other municipal datasets.

- *Capital Planning Database:* The Capital Planning Database is used for the management of capital project data and multi-year budget forecasting. Future opportunities include integration and

dynamic feed for display of analytics within a web-based GIS viewer. In the future, the application functionalities may be expanded to facilitate tool development within GIS for common functionality, reporting and data analysis.

- *Questica Budgeting Software:* In 2015 the City identified the need for a formalized budgeting tool that could be used for both operating and capital budget preparation and analysis. Through the City's procurement process Questica Budget software was selected. Installation and configuration of the Operating Budget module is scheduled for Q1 – 2017 while the Capital Budget model is scheduled for implementation in Q4 – 2017. It is anticipated that upon successful roll-out of the new software the City will be able to move away from the Capital Planning Database referenced above.

- *Sewer Assessment Web Service (SAWS):* SAWS is currently being replaced by a SQL Server application to manage the City's wastewater and storm sewer CCTV data. The SAWS application became outdated when the National Association of Sewer Service Companies (NASSCO) created a North American CCTV Standard (PACP®) and moved away from the previous WRC standard. In addition, the SAWS Client Server application (Oracle) is not supported by the City's IT department. CCTV data is collected in the field via sewer inspection contracts. All contracted staff, are required to have successfully completed the PACP® / CSA PLUS 4012 Pipeline Assessment and Certification Program (PACP®) Canadian Edition.

- *JD Edwards:* This application, based on an Oracle database, is the City's core financial system which stores all project-related financial information as well as the tangible capital asset register.

- *Traffic Engineering Software (TES):* Utilized in Transportation and Parking Services for the storage of traffic volumes, count data, accident statistics, and collision information. Currently, some of the GIS layers being utilized by TES are edited directly within the TES environment.

- *Supervisory Control and Data Acquisition (SCADA):* SCADA systems are used for Water & Wastewater operations and planning. In early 2016 the City completed its first SCADA Master Plan which addressed the following key objectives:

  - Supports the vision for integrating other business applications with SCADA
  - Provides the City with a plan for immediate deliverables
  - Builds a foundation for growth
  - Provides a roadmap on effectively utilizing additional resources
  - Addresses required infrastructure upgrades & technology enhancements
  - 10 year plan for Capital and Operating Requirements

Staff has incorporated the recommendations from the SCADA Master Plan into both operating and capital forecasts to ensure that we are able to keep the City's SCADA systems: functional, current and compatible with other software platforms for future integration requirements.

- *Building and Facility Database:* Building on an existing database developed for pumping stations, in 2016 the City began work on an Uniformat II compliant Facility Database using Microsoft Access to house facility data. The database will permit the uploading of data from both GIS and site inspection forms. It will also allow the City to generate work packages for single or multiple facilities.

- *Water, Wastewater and Stormwater Hydraulic Models:* In 2014 the City of Brantford completed a City wide Master Servicing Plan to identify preferred water, sanitary and stormwater servicing strategies to support existing servicing needs and projected growth. The hydraulic models generated during this study allow for simulation of growth and demand scenarios, and provide input to the need, timing and cost of servicing and infrastructure.

- *Transportation System Model (TRANSCAD):* Along with the Master Servicing Plan, the Transportation Master Plan will provide balanced strategies for the servicing and operation of important transportation infrastructure within the city for the next 30 years. The GIS transportation model updated during this study allows for simulation of population/employment growth and transportation demand scenarios using travel patterns derived from the most recent Transportation Tomorrow Survey database. The study will look at potential impacts on City wide transportation networks including active transportation (walking/cycling), public transit, goods movement and auto travel, as well as support, inter-city transportation services.

- *YARDI Property Management Software (YARDI):* YARDI is the Housing Department's primary Property Management software. Through this software, Housing staff produce work orders, maintain a comprehensive tenant data base and produce financial records.

- *Treekeeper:* Used by the Programming & Recreation Commission, Treekeeper is a web based GIS and work order system for trees, provided as an external system from Davey Resource Group. It is used by City arborists and City staff to maintain a tree inventory and keep track of work done on trees. The City plans to replace this program within the next 1-5 years.

- *Reliable Reporting:* This is proprietary, web based inventory and inspection software utilized by the Programming & Recreation Commission to record monthly inspections of park playground equipment. The City plans to replace this program within the next 1-5 years.

- *Class for Windows:* This is software system run internally with an Oracle database. It is used by the Programming & Recreation Commission to support the City's recreation and community centers. It is used to support a variety of tasks including: scheduling classes, point of sale systems and memberships management. The software is currently being upgrading to Active Net which is scheduled for implementation in Q4 – 2017.

- *Manifold Corridor Rating Tool:* The Manifold Corridor Rating Tool is used to facilitate the optimization of individual asset intervention and the timing of intervention between the underground utilities and roadway. Developed within a GIS environment to assist with the development of the City's capital program, the corridor tool allows users to assign weights to individual asset groups based on defined criteria for an asset's likelihood and consequence of failure. The geographical location of assets is also incorporated into the final risk/corridor score. In late 2016 the Manifold Corridor Rating Tool was updated to incorporate the City's sidewalk condition assessment scores.

- *Activity Tracking and Asset Management System (ATAMS):* In 2016 the Public Works Commission undertook an initiative to complete municipal maintenance business process mapping and to create functional specifications for an integrated activity tracking and asset management system solution (ATAMs) for the Public Works Commission and more specifically, the following business areas: Roads (including sidewalks & street furniture), Water (linear),

Wastewater (linear), Stormwater (linear & treatment facilities), Administrative Facilities (Corporate Admin. Buildings), and Capital Planning & Asset Management. Pending approval of procurement budgets, the City will seek to select an activity tracking/ work order management system in 2017. The successful implementation and roll-out of this initiative will help to fill in the last piece of the asset management puzzle by providing a vehicle to support data-driven decisions around budgeting, resource planning, levels of service and capital planning. Further benefits to be realized include the efficient exchange and use of information which can be used to optimize resourcing and better align service deliveries.

Brantford constantly reviews and looks for ways to improve its data and information management capabilities, which is likely to necessitate significant changes that will result in increased efficiency in the coming years. Some examples of such initiatives include:

- SMART Cities Initiative; and
- CustomerOne – Corporate Customer Service Strategy.

4.2. Operations and Maintenance

Throughout the life of the assets corrective and preventative maintenance, as well as operational activities are recorded in the Avantis CMMS. Some assets will be transitioning to ATAMS in the coming years. The collected data is utilized as inputs to capital planning when the assets reach a point where the benefits of rehabilitating and replacing the asset, exceed the costs. As well as undertaking regular maintenance studies to identify and implement best management practices for multiple asset classes, the City benchmarks operations and maintenance activities and costs on an ongoing basis.

4.3. Condition Assessment and Inspection

Asset condition and performance information supports lifecycle decision making and is critical to the management of risks and performance in achieving level of service standards. The City actively undertakes condition assessment activities, and utilizes the information in the development of capital plans. A list of the current condition assessment and inspection initiatives is shown in **Table 9**.

Table 9.   Condition Assessment and Inspection Projects by Program Area

Program Area	Project	Interval	Target % of Network
Road Network	• Annual Road Survey	Ongoing	100%
	• Detailed Roadway Surface and Drivability Condition Assessment	Annual	100%
	• Minimum Maintenance Standards Road Survey	Ongoing	100%
Sidewalks	• Sidewalk Condition Assessment	3 Years	100%
	• Minimum Maintenance Standards Sidewalk Survey – Trip Hazards	Annual	100%
Bridges, Retaining Walls and Culverts	• Bridge and Culvert Structural Condition Assessment (OSIM)	Biennial	100%
	• Bridge Detailed Condition Investigation	Ongoing	As required
Water Distribution	• Cast/Ductile Watermain Condition Assessment	Ongoing	100%
	• Watermain Condition Assessment	Annual	As required

Program Area	Project	Interval	Target % of Network
Water Facilities	• Water Booster Station and Reservoir Condition Assessment Study	5 Years	100%
Wastewater Collection	• Wastewater Collection System Trunkline Condition Assessment	Annual	10%
	• In-House Wastewater Collection System CCTV Condition Assessment	Annual	10%
	• Manhole Condition Assessment Program	Biennial	3%
Wastewater Facilities	• Sanitary Pumping Station Facility Condition Assessment	5-10 Years	100%
Stormwater Collection	• In-House Stormwater Collection System CCTV Condition Assessment	Annual	10%
	• Manhole Condition Assessment Program	Biennial	3%
Stormwater Facilities	• Stormwater Retention Ponds and Stormceptor Inventory and Condition Assessment Study	One-off (2013-14)	100%
Solid Waste & Landfill	• Capacity Analysis and Forecasting	Ongoing	Ongoing
Public Works and Administrative Facilities	• Facility/Building Condition Assessment Program	Annual	20%
	• Facility/Building Roofing Condition Study	Annual	10%
Corporate Fleet and Transit	• Ministry of Transportation Motor Carrier Safety Standards Schedule 1 and 2	Time/mile-age/fuel	100%
Social Housing	• Social Housing Building Condition Assessments	5 Years	100%
	• Facility/Building Roofing Condition Study	Annual	10%
Airport	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Inspection of Airside (e.g. lights, debris on runway, pavement defects)	Daily	100%
	• Skid Tests of Runway	Weather Dependent	100%
	• Communication Equipment Testing (e.g. Airside radio, emergency response)	Daily	100%
	• In-house Fence Condition Assessment	Quarterly	100%
Transportation	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
Tourism	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Condition Assessments of Public Art and Monuments	5 Years	100%
Sanderson Centre	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Inspection of Fire Systems and Personnel Lift	Annual	100%
	• Inspection/load testing of chain motors, mechanical lift systems	Annual	100%
	• Inspection of HVAC systems	Bi-Annual	100%
	• Health Unit Inspections	Annual	100%

Program Area	Project	Interval	Target % of Network
Parks	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
Recreation	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Inspection of Fire System, Overhead Doors, Various Alarms and Sensors, Specialty Facilities (e.g. water slides) for all buildings	Annual	100%
	• Inspection of Elevators/Lifts	Quarterly	100%
	• Performance Assessments during System Maintenance of the Mechanical/HVAC systems, specialized air handling systems, electrical backups, filters	Annual	100%
	• Weight Room Equipment Inspection	Monthly	100%
	• Electrical Safety Inspections (ESA)	Annual	100%
	• Equipment (Fork lift, manlift etc.) Inspections	Bi-annual	100%
	• Concessions Health Unit Inspections	Annual	100%
Cemeteries	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Building Health and Safety Inspections	Monthly	100%
	• Oakhill Boardwalk Health and Safety Inspections	Monthly	100%
	• Electrical Safety Inspections (ESA)	Annual	100%
	• Backflow Prevention Devices Inspections	Annual	100%
Golf	• Part of the Public Works and Administrative Facilities Building Condition Assessment Program		
	• Irrigation System Performance Assessment during System Maintenance	Bi-annual	

Note:
- *The "target % of Network" represents the percentage of the network assets that are covered in the specified interval.*

4.4. Rehabilitation and Replacement Planning

In 2013, the City revisited its capital program development process for linear infrastructure to make the most of additional data. Traditionally, an in-house database tool was used to generate an overall condition score for each water, wastewater and stormwater asset based on available data such as remaining service life, number of breaks, and the diameter of the pipe. Road project candidates were selected based on a visual windshield survey of Pavement Condition Index (PCI) as well as engineering judgement, condition assessments and cursory inspection. While this allowed lists of projects to be developed on a program level, a lack of relationships in the data between individual assets or groups of assets gave rise to challenges in analyzing an optimum treatment for a right of way corridor, which at the time required manual reconciliation of the project lists. In order to automate the process and allow for objective prioritization across program areas, the City developed automated and integrated business

processes for the development of the linear infrastructure capital program. This new process was developed and implemented by the Fall of 2014 and is currently being used by Capital Planning.

The new capital planning business process is comprised of three core steps which are founded on data analytics and collaboration of the capital budget stakeholder working groups. The three steps are as shown in **Figure 18**.

Figure 18. Steps in the Linear Asset Capital Project Selection Process

Identify and Select Project Candidates	• Watermains • Wastewater and Stormwater Sewers • Roads • Sidewalks
Corridor Coordination Process - Establish the Project Type	• Spot Repair • Rehabilitation • Stand-alone Replacement • Full Corridor Reconstruction
Prioritize the Program	• Rank the Assets • Group or phase the projects • Evaluate resourcing and funding scenarios • Finalize the workplan and budget

4.4.1. Capital Budget Stakeholder Working Groups

An integral component of the annual budget cycle is the formation of multi-stakeholder working groups for key asset classes. These stakeholder groups combine personal "tacit" and technical knowledge of the infrastructure networks, their performance, problem areas and history that are valuable inputs into developing a defensible and accurate capital investment program. While every effort is made to ensure that processes are automated, data is accurate and the outputs of analyses are credible, the human element of sharing ideas, providing multiple perspectives, and communicating experience is critical to success of the City of Brantford's capital budget development. The stakeholder working groups are comprised of representatives from various City departments that include, but are not limited to those shown in **Figure 19**.

Figure 19.   Typical Members of Stakeholder Working Groups

Program Area	Typical Stakeholders
Road Network	Capital Planning, Road Maintenance, Design & Construction, Traffic Services, Transportation/Parking Services, Transit
Sidewalks	Capital Planning, Sidewalk Maintenance, Transportation/Parking, Transit
Bridges	Capital Planning, Bridge Maintenance, Design and Construction, Transportation/Parking
Water Distribution	Capital Planning, Distribution Operations, Technical Services / Development Review, Design and Construction, Compliance
Wastewater and Stormwater Collection	Capital Planning, Wastewater Operations, Technical Services / Development Review, Design and Construction
Water, Wastewater and Stormwater Facilities	Capital Planning, Water and Wastewater Operations (Treatment Plant)
Solid Waste and Landfill	Capital Planning, Solid Waste Operations
Public Works and Administrative Facilities	Capital Planning, Facilities Management, Facility/Property Managers
Corporate Fleet and Transit	Capital Planning, Fleet and Transit
Social Housing	Property Managers, Facility Management, Service Managers, Finance
Airport	Capital Planning, Facilities Management, Brantford Municipal Airport Board, Facility/Property Managers
Transportation	Capital Planning, Transportation/Parking
Tourism	Capital Planning, Facility Management, Facility/Property Managers, Director Economic Development & Tourism, Manager of Tourism, Manager of Parks Services
Sanderson Centre	Capital Planning, Facility Management, Facility/Property Managers
Parks	Capital Planning, Parks Director, Managers of Parks Operations
Recreation	Capital Planning, Facility/Property Managers
Cemeteries	Capital Planning, Cemetery Supervisor
Golf	Capital Planning, Golf Manager, Greenskeeper

Developing and coordinating the budget for the linear infrastructure is typically a complex process requiring input from many stakeholders across the organization as well as being very data intensive. To rationalize the process, the City has developed a workflow for the development of the budget which is shown in **Figure 20**. By formalizing the workflow and mapping out the steps, inputs and outputs as shown in the figure, the City is able to identify areas for improvement. This workflow was implemented for development of the 2014 budget cycle and is intended to evolve and continuously improve in years to come.

Figure 20. Linear Infrastructure Capital Budget Development Workflow
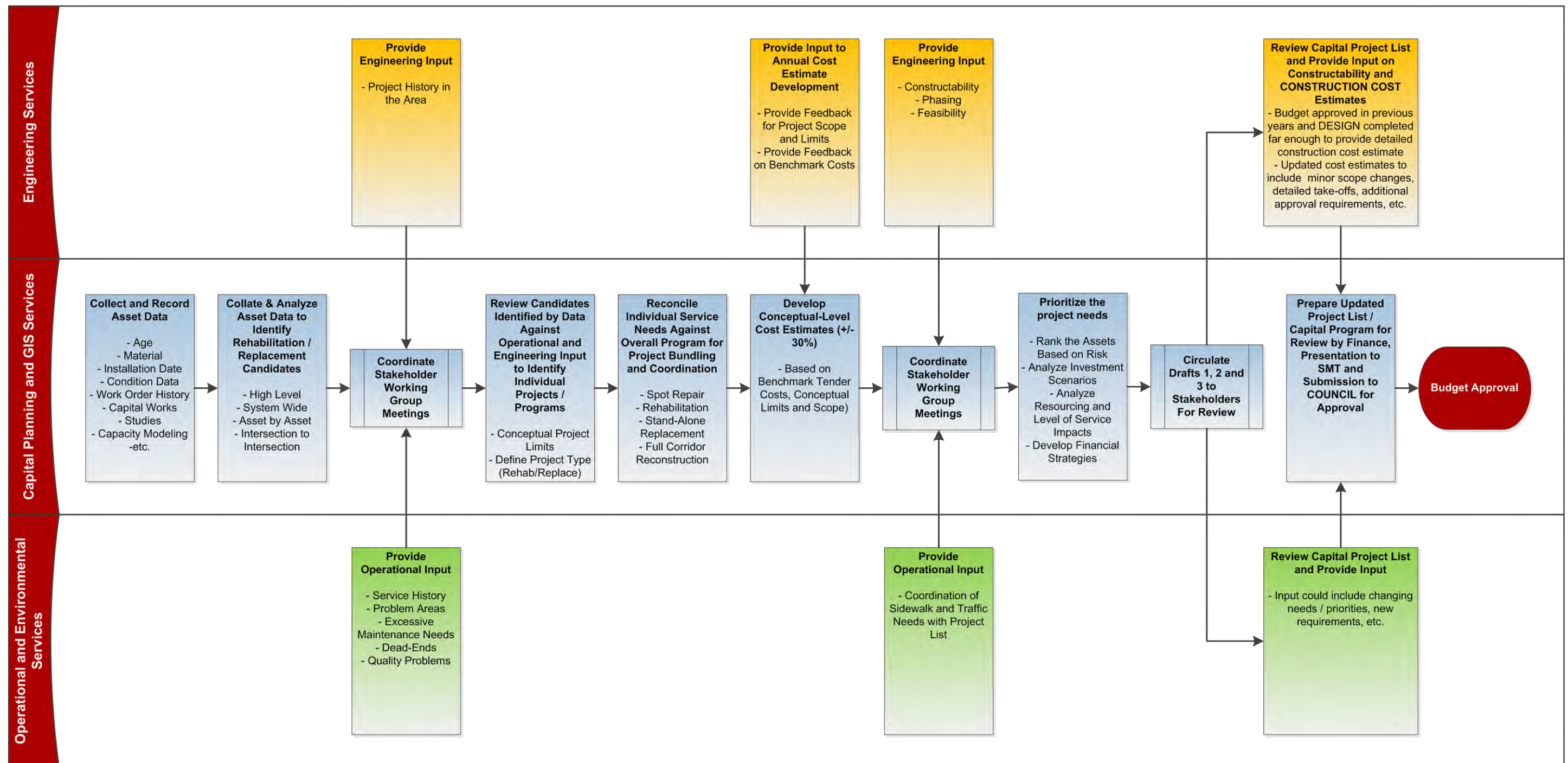
4.4.2. Identifying and Selecting Project Candidates

The workflows used in the selection of water, wastewater, stormwater and road replacement candidates are shown in **Figure 21** to **Figure 23**.

Figure 21.   Water Candidate Selection Process Flow Chart

Off page reference to **Figure 26**
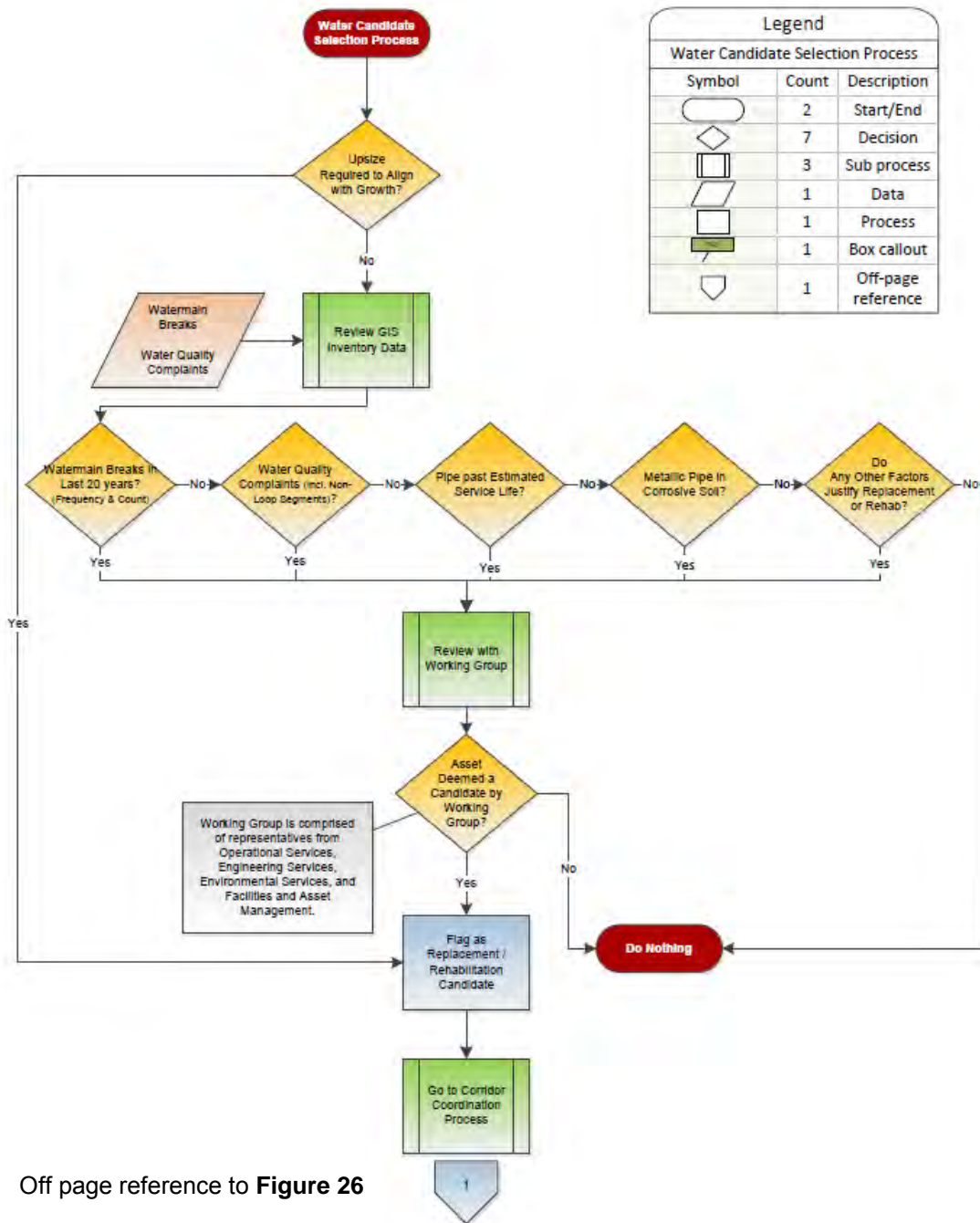
Figure 22.   Wastewater and Stormwater Sewer Candidate Selection Process Flow Chart

Off page reference to **Figure 26**

*Selection of Technologies Workflow Chart available - contact Capital Planning
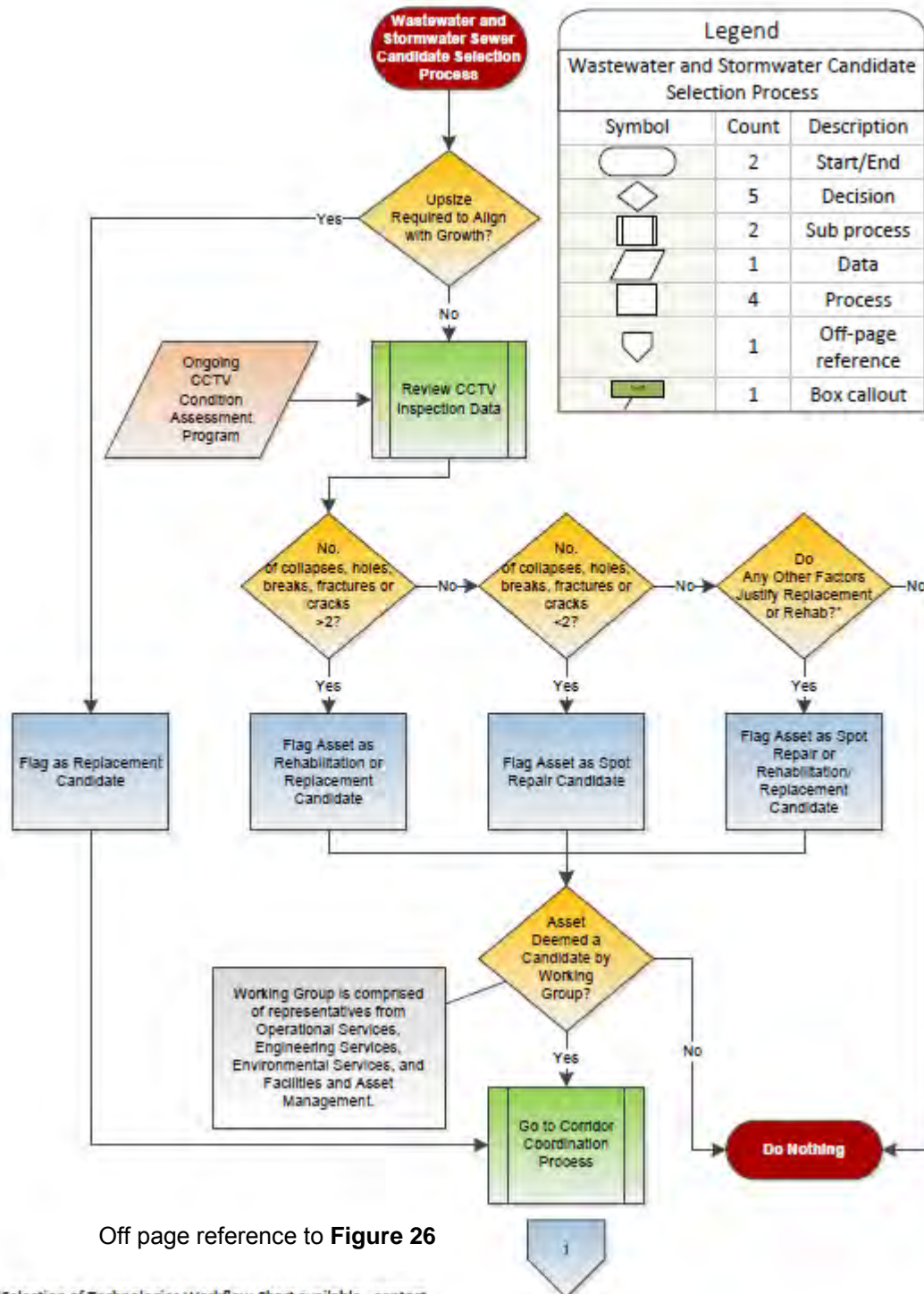
Figure 23. Road Candidate Selection Process Flow Chart
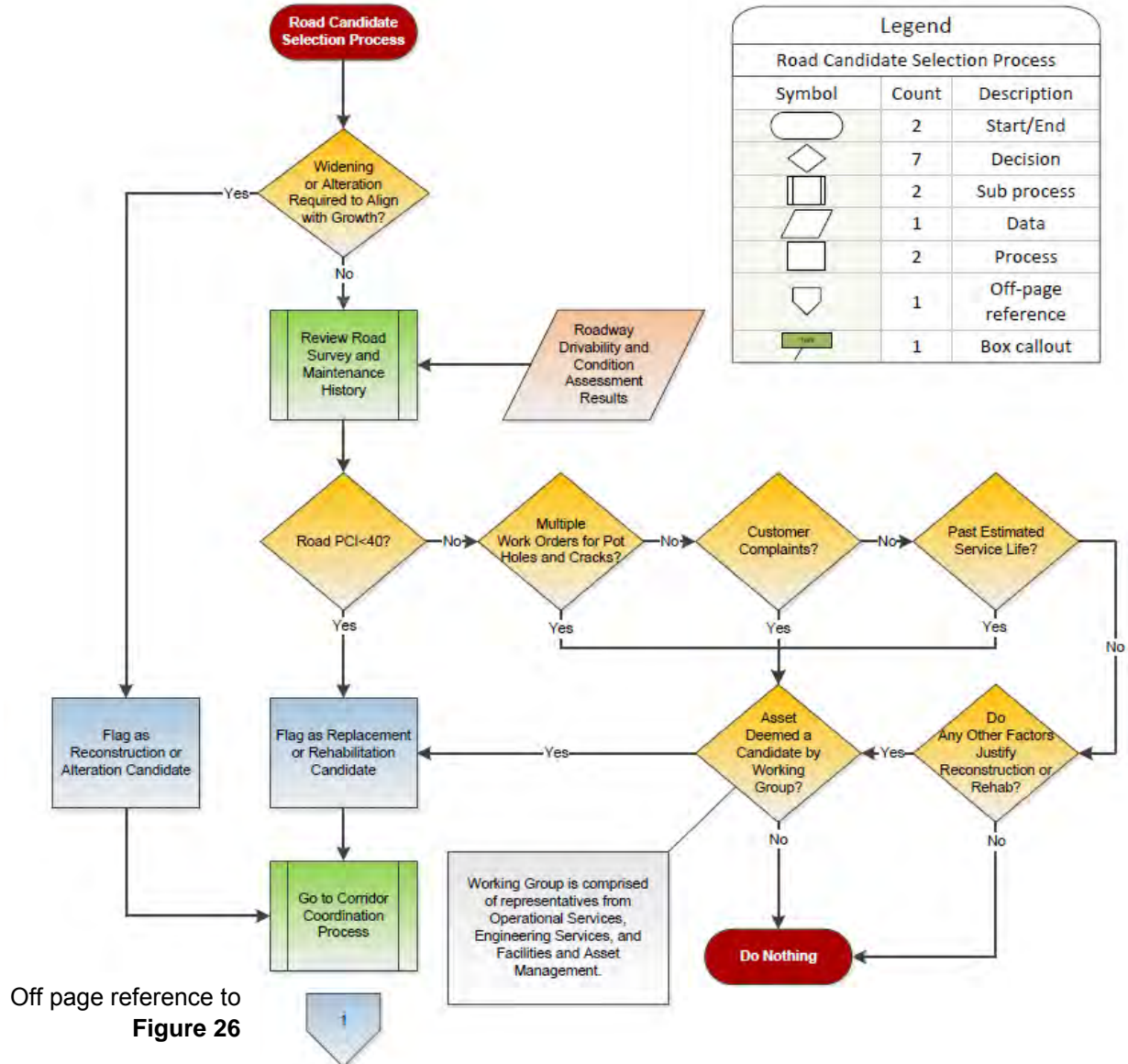
4.4.3. Corridor Coordination

The candidate selection process identifies which individual assets may be required to be replaced or rehabilitated. In any given right of way, there may be multiple assets of varying asset type that have been identified as replacement or rehabilitation candidates. Moreover, there may be assets within that same right of way that have recently been repaired, are in excellent condition, and may last for a number of years. The process of corridor coordination allows the City to identify and evaluate these scenarios, and

develop the appropriate strategy that will extend the life of the corridor as long as possible, while maintaining the required levels of service and minimizing risk exposure.

In order to form the locational relationship between the assets of different asset classes, the City divides all of the City right of ways into 'corridors'. With assets grouped into corridors, each asset can be assessed alongside each other to diagnose the optimum treatment method. **Figure 24** shows an example of how the right of way is divided into the corridors. Typically a corridor will range along a road from one intersection to the next, and also in easements from one end to the next.

Figure 24.   Example of Corridor Breakdown

A hypothetical example of the lifecycle of an infrastructure corridor is shown in **Figure 25**. The figure shows an illustration of the varying lifespan of the asset classes in the corridor. For example, the road may require rehabilitation at approximately 40 years from the time it is constructed. At 60 years, the watermain may require replacement, requiring a trench to be cut in the road surface (which may still be in good condition); instead trenchless relining of the watermain could extend the service life of the pipe for an additional 40 years, and require minimal impact to the road surface. This approach to integrated capital planning allows the corridor reconstruction to be harmonized at the end of each asset's lifecycle, providing greater return on infrastructure investments over the long-term as well as minimizing disruption to the public due to construction activities.

Figure 25.   Hypothetical Corridor Lifecycle
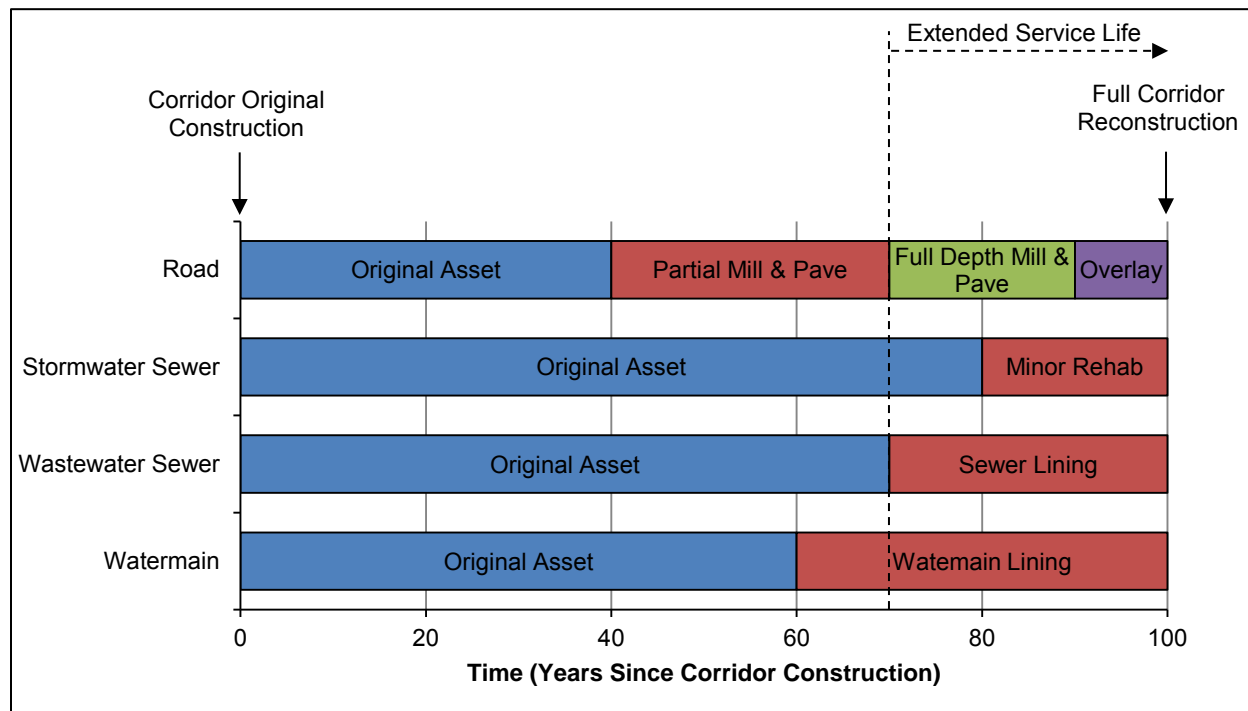
In order to ensure that decisions are being made consistently across the entire infrastructure network, the City has developed a formalized decision making process for selection of the project type. Mapping decision criteria in this way helps ensure a consistent, defensible and transparent approach to decision making. In addition, it allows the visualization of areas for improvement from stakeholder input and peer review. **Figure 26** depicts the decision criteria that are used for selecting the project type of a corridor. Following the corridor coordination process, corridors are grouped together and phased through consultation with each of the stakeholder working groups with the goal of achieving efficiencies in economies of scale.

Figure 26. Corridor Coordination (Project Type) Process Flow Chart
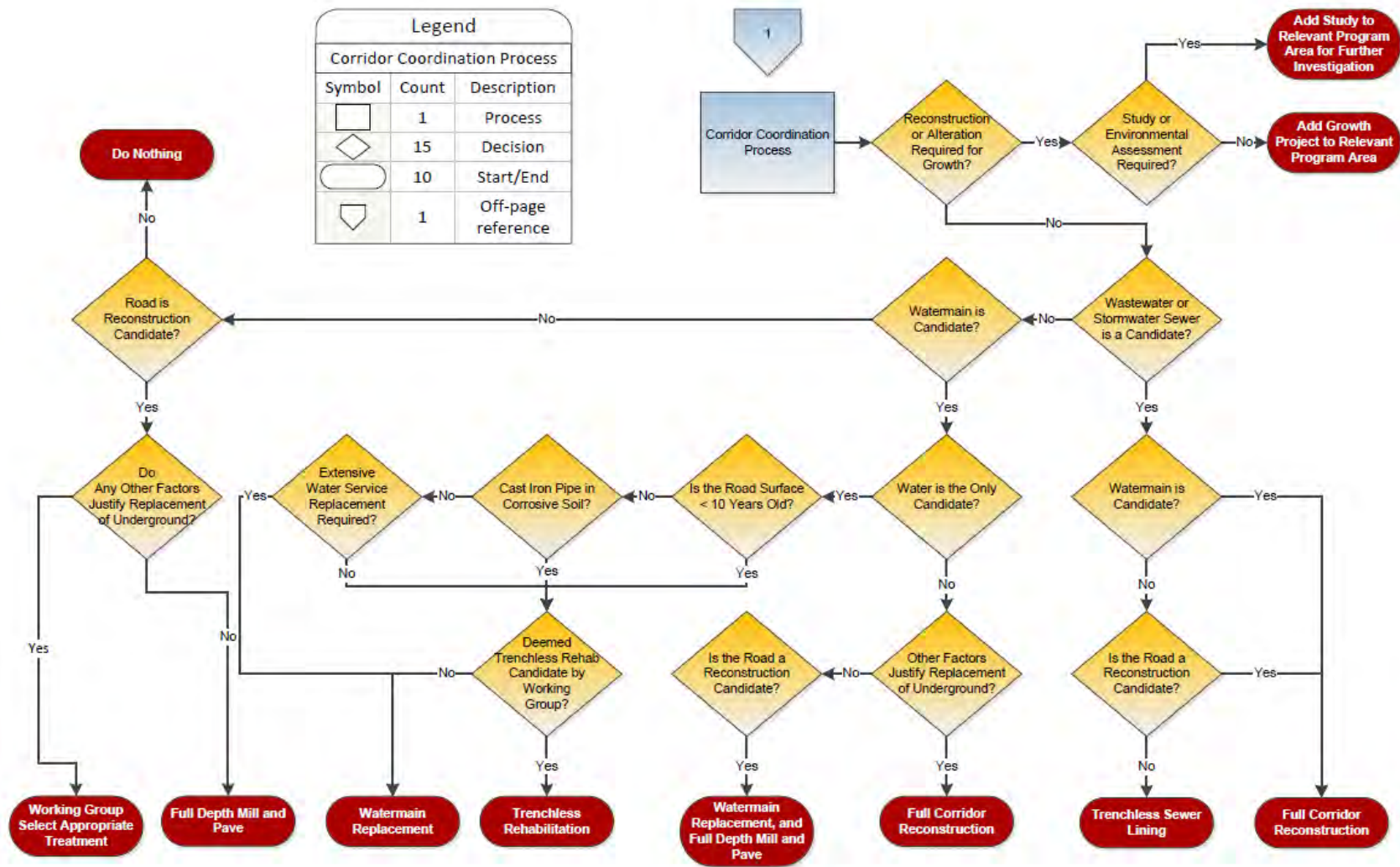
4.5. Demand and Growth Planning

Brantford is a growing city that has been designated as an urban growth center in the Provincial Growth Plan, and is destined for continued growth in all economic sectors. To this end, it is estimated that by 2041 the population of the City of Brantford will grow by 68% to 163,000 (Ministry of Infrastructure, 2013). Such growth has impacts on the required capacity and servicing provided by the City's core infrastructure networks. As a step towards better understanding future demand and how we can better plan to meet the future needs of the City, Brantford has implemented several core initiatives.

4.5.1. Water, Wastewater and Stormwater Master Servicing Plan 2013

The City of Brantford completed a City wide Master Servicing Plan to identify a preferred water, sanitary and stormwater servicing strategy to support existing servicing needs and projected growth. The Plan provided the business case for the need, timing and cost of servicing and infrastructure. The study utilizes the Class Environmental Assessment process to develop a master plan that will form the servicing strategy for the design and operation of the City's water, sanitary and stormwater systems to the year 2036. The Master Servicing Plan will meet the growth projections for the City as defined in the Places to Grow Growth Plan for the Greater Golden Horseshoe, and align with other City planning documents including but not limited to the Downtown Master Plan, the Waterfront Master Plan, the Transportation Master Plan, the Streetscape Design Plan, the Southwest Secondary Plan, the Intensification Strategy and the Official Plan. .The objectives of the Master Servicing Plan are as follows:

- Develop servicing policies and principles which future servicing must adhere to;
- Evaluate servicing options for alternative land use growth scenarios as part of the process of identifying the preferred land use option for growth to 2041;
- Identify the City's water, wastewater, and stormwater infrastructure needs to the year 2041 with consideration for a longer term servicing strategy;
- Develop a recommended implementation program for the preferred alternatives in the Master Servicing Plan for input in the Development Charges By-law process;
- Work with City staff undertaking the City's Official Plan Review and Transportation Master Plan Update to ensure that water, sanitary and stormwater servicing alternatives align responsibly with overall development and growth strategies for the City;
- Determine traditional treatment, pumping and storage requirements generated from existing use and projected growth;
- Leverage existing facilities to avoid new infrastructure where possible;
- Plan for new pipes in intensification areas with older infrastructure that require rehabilitation anyway;
- Optimize operations of the systems at the outer limits – optimize level of service and minimize energy usage where possible;
- Look for opportunity to reduce demands and flows in order to reduce need to expand the system or twin pipes;
- Plan for lot level stormwater controls and low impact development (LID) to minimize trunk stormwater infrastructure; and
- Consider innovative use of technologies and servicing concepts like grey water use to optimize system capacity.

In 2017 the City will be updating the Master Servicing Plan to address an extended planning horizon to 2041, revised growth projections provided by the 2017 Growth Plan for the Greater Golden Horseshoe, as well as the City's expanded boundary.

4.5.2. Transportation Master Plan Update 2014

The Transportation Master Plan 2014 was undertaken to guide the City of Brantford in the development of an all-inclusive transportation network to serve residents, visitors, employees and employers as growth occurs towards 2031. Population and employment data was used to determine where development has occurred and where future growth will take place to ensure the sustainability of municipal services and the implementation of future facilities to service those areas. Co-ordination with surrounding municipal and the provincial government was an important factor in the determination of long range network improvements and inter-regional services. Council's objective to provide Brantford residents with complete streets, improved active transportation initiatives, traffic management and traffic calming measures were also considered in the development of the 2014 Transportation Master Plan's Transportation Network Improvement Plan. Elements of the Transportation Master Plan include:

- Managing future transportation demand (Traffic Impact Studies, Downtown Parking Policies, Traffic Calming)
- Optimization of the existing transportation system (Arterial Road Optimization)
- Managing truck routes and goods movement
- Transit improvements (Inter-municipal and Go Transit Service)
- Plan for walking and cycling (Active Transportation Implementation Plan)
- Plan for road network improvements (Road Network Improvement Plan)
- Plan to support downtown revitalization

In 2017 the City will be updating the Transportation Plan to address an extended planning horizon to 2041, revised growth projections provided by the 2017 Growth Plan for the Greater Golden Horseshoe, as well as the City's expanded boundary. In addition, the City of Brantford in conjunction with the County of Brant will undertake a joint City-County strategic transportation study to look at people and goods movement across an expanded geographic area.

4.5.3. Official Plan Consolidation and Update

The City of Brantford Official Plan is a policy document that sets out the City's general land use direction for long-term growth and development in a coordinated way to meet the community's needs and priorities. It also provides a way to evaluate and settle conflicting land uses while meeting local and provincial interests.

The Official Plan is made up of text and maps. The text includes policies describing the goals and objectives for the various land use designations within the City along with a general list of permitted uses in each of the designations. The maps divide lands in the city into different land use designations which are read with the policies to determine which uses are permitted in certain parts of the city.

An Official Plan is a legal document regulated by the Ontario Planning Act. The Planning Act requires municipalities to review their Official Plan at least every five years to ensure that the policies of the Plan meets the changing economic, social and environmental needs of the municipality and changes that are made at the Provincial level regarding planning and land use matters. Occasionally, it is necessary to

change certain policies and mapping through an "Amendment." The Planning Act outlines how municipalities, review and process changes to the Official Plan. The City must give the public opportunities for input before adopting any changes to the Official Plan.

4.5.4. Brantford-Brant Housing Stability Plan 2014 - 2024

The Brantford – Brant Housing Stability Plan 2014 - 2024 will guide a housing and homelessness vision that incorporates solutions and initiatives to a range of housing options and supports, with a focus on dignity, pride in community and self-sufficiency over the next decade.

The Municipal government's role in planning for housing and homelessness services has been recognized in the Provincial Government's release of its Long Term Affordable Housing Strategy. The strategy states that Municipal Service Managers must establish local vision, engage the community to determine local needs and outcomes, and participate in local planning. As part of the *Housing Services Act 2012, Part II.*, Municipal Service Managers must develop a local 10 Year Housing and Homelessness Plan.

The Plan includes 53 recommendations, 25 were identified by community stakeholders as a priority. The following list of recommendations (not in priority sequence), are included in the Asset Management section:

- Compare planning alternatives in accordance with the Ontario Municipal Class Environmental Assessment process.
- Assess the impact of End of Operating Agreements and support strategic planning that will mitigate negative impact.
- Continue to respond or express interest in provincial funding announcements that allow for the opportunity to increase affordable housing, allocating 5% of units to those with physical disabilities and 5% to victims of violence.
- Explore the feasibility to develop new municipally funded capital programs to increase the supply of affordable housing (e.g. capital grants/loans, convert to rent programs, tax deferrals, development charges).
- Devise alternative business models in an effort to sustain and enhance the existing rent-geared-to-income model.
- Continue to work collaboratively with the Aboriginal Housing Providers to create additional housing units addressing the needs of the aboriginal community.
- Continue to work collaboratively with the Habitat for Humanity to create new affordable housing and ownership opportunities.
- Support increased contributions to the affordable housing reserve fund, thereby supporting the annual target of 180 new affordable units.
- Encourage the County of Brant to establish an affordable housing reserve fund to address the need for additional affordable housing units in the County.
- Support and monitor housing providers in the implementation of the *Accessibility for Ontarians with Disabilities Act* (AODA) on the Built Environment.

- Ensure the ongoing funding of capital reserves for social housing communities based on annually updated building condition assessments and encourage the practice of updating Building Condition Audits every five years incorporating AODA and Energy Reduction Strategies.
- The City of Brantford and County of Brant shall identify and evaluate sites, where deemed appropriate, for the inclusion of affordable housing units and also ensure that new affordable housing developments comply with appropriate urban design principles and guidelines, as required in each municipalities' respective Official Plan.
- Explore the feasibility and further promote opportunities for complete communities and density housing (i.e. developers gain more density and increased height in exchange for providing affordable housing), and use of Community Improvement Plans to offer other incentives for affordable housing.
- Ensure the ongoing sustainability and growth of social housing (rent-geared-to-income).
- Continue to monitor the affordable housing targets (180 new residential units/year), through the annual Residential Monitoring Report, and include reference to specific tenure targets (85% affordable rental and 15% affordable ownership).

New Affordable Units - In response to the Places to Grow Act and the Growth Plan, the City of Brantford had developed a range of new policies under Official Plan Amendment 125. Under section 13.2.1 of the affordable housing section it states, "The City shall set as its target for the development of affordable rental and homeownership housing, the creation of 180 new residential units each year through either the construction of new units or through the conversion of non-residential space. The target shall be interpreted as 85% affordable rental units and 15% affordable ownership units, of the 180 new residential unit targets. The 2015 *Residential Monitoring Report* issued by the City identified 37 units were added to the City's inventory in 2015, this included 9 supplemental rental units and 24 assisted home ownership units.

4.5.5. Parks and Recreation Master Plan Update 2017

The Parks and Recreation Master Plan was developed in 2003 to guide the delivery of recreation services, parks and open spaces, programs and facilities within the City of Brantford. In 2016 the City began the development of a new Parks and Recreation Master Plan to meet the demands of the growing population and guide the future development of Parks and Recreation services. The plan will ultimately guide the next 10 years of programming and services and the next 25 years as it relates to infrastructure.

Included in the update would be the review of:

- Lifecycle costing of facilities
- User fees & subsidies
- Staff complement for the Department
- Cost recovery rates for true cost of operating
- Alternate funding sources
- Future development of Parks and Recreation infrastructure

4.5.6. Other Initiatives that potentially impact Infrastructure Servicing

Along with the strategies described above, the City regularly develops strategies for specific purposes which feed into asset management decision making and demand forecasts. Some examples of these studies (completed and ongoing), are listed below:

- Affordable Housing Strategy
- AODA Assessment of Municipal Facilities
- Brantford Transit Comprehensive Study
- Brownfield Redevelopment Initiative
- Colborne and Dalhousie Street Two-Way Conversion Study
- Development Charges Study
- Downtown Revitalization
- Economic Development Strategy
- Greenwich-Mohawk Brownfield Project
- Intensification Strategy
- North of Shellard Neighbourhood and Recreation Plan
- Railway Safety Audits of 19 Crossings
- SCADA Master Plan
- Streetlight and Transit Stop Survey and Condition Assessment Study
- Social Planning
- Wastewater Treatment Optimization Study

4.6. Project Prioritization

Since most organizations, including the City of Brantford, rarely have sufficient financial resources to complete all required or recommended projects, capital works must be prioritized to ensure that critical projects are completed. In the absence of formal models for prioritizing projects, the City historically relied on ranking mechanisms based on informal methods that are often un-documented and inconsistent. Projects were often added to a project list until the City funding envelopes could no longer afford them, or projects were included on alternative discretionary lists such as an unfunded project list. Projects outside of the funding envelopes were either deferred or cancelled outright. In the absence of a formal, repeatable and documented prioritization process, varying factors played a role in project selection.

One of the key aspects of developing a consistent and defensible approach to capital planning and budgeting at the City of Brantford was the development of formalized decision making and prioritization criteria to be used when evaluating infrastructure assets. In 2006 the City implemented a Capital Asset Prioritization System (CAPS) for linear assets developed by an external consultant. CAPS used an algorithm to calculate a Priority Action Number (PAN) for all linear water, wastewater and stormwater assets based on available data.

● ● ●

Data Analytics

…the process of examining, transforming, modeling and visualizing data with the goal of discovering useful information, suggesting conclusions, making more accurate predictions, and supporting smarter decision making.

● ● ●

In 2012, the City re-visited the process of capital program development which resulted in the introduction of several initiatives:

- Prioritization methodology for non-linear capital projects (e.g. facilities, parks and recreation, etc.);

- Prioritization methodology for linear capital projects (water distribution, wastewater collection, stormwater collection, roads and sidewalks);

- Development of business processes and criteria for capital project candidate selection (as described in **Section 4.4**); and

- Development of a capital planning workflow and multi-departmental working groups to develop and review capital budgets and levels of service (as described in **Section 4.4**).

In 2014, the City began using a Corridor Coordination Tool to prioritize linear capital projects which looks at all projects required within a road corridor when determining the priority ranking. The Corridor Coordination Tool is reviewed and calibrated on a yearly basis.

4.6.1. Non-Linear Project Prioritization

The system that was developed for non-linear capital projects relies on criteria that was established by staff and peer consultation, and was built on data analytics and a number of industry best practices.

At the highest level, an overall classification for each City project can be established:

- *High priority* projects are typically those that are required by regulation or law, are required by contract, improve public or employee health and safety, significantly reduce current operating,

maintenance or contractual expenses, or significantly increase the use of facilities and revenues, or contribute to job retention or benefit all or a majority of the City residents.

- *Medium priority* projects typically include those projects that would prevent additional deterioration of assets, improve delivery of services to the public, contribute to job creation, or might be non-essential, but have a high degree of public support.

- *Low priority* projects typically include those that support delivery of a service for which there might be declining demand, enable the provision of a new service or improve quality of life, but are considered non-essential.

In order to establish an individual project priority and ranking for comparative analysis, supporting information such as structural condition, performance condition, failure rates, project requirements and drivers for each potential project are reviewed.

The following eight (8) categories are used to score projects:

1. Legislated, Mandatory or Required By Law
2. Consequence of Failure
3. Service Levels
4. Operation and Maintenance Impact
5. Improved Efficiency
6. Expansion and Growth
7. Health and Safety
8. Coordinated Project

Project categories are divided into specific criteria that further establish the relative priority of the proposed project. The project ranking categories and sub-criteria are illustrated in Table 10.

Table 10.   Facility Project Ranking Criteria

Category (Sub-Criteria)	Weighting (Score)
1. Required to Meet Legislated Standards	**20%**
1.1. Does the project satisfy Federal, Provincial, County, or City mandates (e.g., by not performing this project Federal/Provincial money is withheld, laws violated if not followed, or addresses concurrency issues)? (Yes/No)	50
1.2. Is the project required for regulatory reasons, or does the project satisfy Federal, Provincial, County, or City recommendations or pending regulations? (Yes/No)	50
2. Consequence of Failure	**15%**
2.1. What is the consequence of failure of the asset? (High/Medium/Low)	100
3. Levels of Service	**10%**
3.1. Does the project maintain level of service standards? (Yes/No)	25
3.2. Does the project affect all customers within a recognized neighborhood or facility? (Yes/No)	25
3.3. Does the project affect all customers within the City by changing the way the City delivers services or does business (many external stakeholders)? (Yes/No)	50
4. Operation and Maintenance Impact	**10%**
4.1. After completion of the project, will maintenance be significantly more expensive and time consuming than at current level (requires additional resources)? (Yes/No)	-100
4.2. Will the project significantly decrease the demand on O&M budgets? (Yes/No)	100
4.3. Is the total capital cost of the project so high that it requires, on a temporary basis, the hiring of additional staff or significantly increases overhead costs beyond current levels? (Yes/No)	-50
5. Improved Efficiency	**10%**
5.1. Will the project significantly increase or improve the efficiency of existing processes? (Yes/No)	30
5.2. Does the project preserve or extend the life of an existing asset? (Yes/No)	50
5.3. Does the project use innovative solutions, approaches, or use technology in creative ways? (Yes/No)	20
6. Expansion and Growth	**10%**
6.1. Does the project increase infrastructure capacity to meet existing deficiencies to service the existing population? (Yes/No)	50
6.2. Does the project increase infrastructure capacity to meet future growth needs? (Yes/No)	25
6.3. Will the project attract new economies (i.e. tourism, facility use, businesses etc.)? (Yes/No)	25
7. Health and Safety	**15%**
7.1. Does the project eliminate a risk or hazard to public health and/or safety that endangers the City's population area? (Yes/No)	50
7.2. Does the project significantly reduce hazards or risks for users of the facility? (Yes/No)	50
8. Coordinated Project	**10%**
8.1. Will not commencing the project, or delaying the project, have major impacts on other projects or programs? (Yes/No)	50
8.2. Is the project required to be coordinated with other projects? (Yes/No)	5
Maximum Score	**100**

As illustrated in

Table 10, the eight (8) categories are further broken down into sub-criteria, which form the ranking. All of the criteria require an answer of 'yes' or 'no' or 'low', 'medium', or 'high'. For each of the categories and the sub-criteria, a relative weighting has been assigned, providing the relative importance between the criteria. The categories with the highest weightings are those projects that are Legislated, Mandated or Required By Law (20%), or have the greatest Consequence of Failure and Health and Safety' risks (15%). All other criteria have a 10% weighting.

Each response is then scored as illustrated in **Table 11**, with a possible overall maximum score of 100%.

<p align="center">Table 11. Prioritization Criteria Scoring</p>

Criteria Answer	Rating Calculation
Yes	100% x Sub-Criteria Score x Category Weighting
No	0
High	100% x Sub-Criteria Weighting x Category Weighting
Medium	67% x Sub-Criteria Weighting x Category Weighting
Low	33% x Sub-Criteria Weighting x Category Weighting

Once individual scores for each question are assigned and the weighting for each is applied, then each project receives an overall score out of 100. By applying the financial guidelines / envelopes against the list of projects, a line can be drawn to identify which projects can be funded within the current budget year and which projects require deferral further out in the capital project forecast.

It is also important to ensure that future projects requiring large financial expenditures be reviewed in the model using the same prioritization approach in order to start establishing capital reserve accounts for these projects. To date, however, this concept has not been applied but is under consideration by the City's Finance department who are currently undertaking a review of capital financing strategies and policy for the City.

4.6.2. Linear Project Prioritization

As mentioned previously, historically the City used CAPS as well as stakeholder input as the basis for establishing the condition and priority of the linear projects. CAPS used an algorithm to generate a Priority Action Number (PAN) for each water, sanitary and stormwater asset. As needs and available data have changed over time, the City has developed automated and integrated business processes for the development of the linear infrastructure capital program including the development of a Corridor Tool. Prioritizing with the new process results in a prioritized corridor as opposed to differing priority lists for the different linear asset types. The process was introduced in 2014 using an algorithm to rank projects and identify both critical assets and assets that present the highest risks. Asset risk is calculated by applying **Equation [2]**. In the year of introduction the weighting of the two scores was divided equally (50/50). Overtime these weightings have been adjusted to better reflect actual rehabilitation requirements by increasing the weight of the Probability of Failure Score.

$$Asset\ Risk = Probability\ of\ Failure\ Score\ \times Consequence\ of\ Failure\ Score \qquad [2]$$

Failure can be defined as the condition at which an asset no longer meets its intended objective. Typically the most critical assets are those with the highest consequence of failure, and not necessarily a high

probability of failure. For example, the failure of a watermain supplying a busy commercial location may cause substantial financial loss and a failure of a watermain servicing a hospital may have serious or life threatening consequences, however, a failure in a low density residential street during work hours may cause minimal disruptions. The most critical assets may be required to be monitored and inspected more frequently in order to pre-emptively identify potential hazards.

The probability and consequence of failure are quantified by breaking them down into several measurable criteria. **Figure 27** shows an example of the criteria and data sources used to quantify the probability and consequence of failure for roads. While the level of detail is beyond the scope of this document, rules are defined for each of the criteria to allocate a score where risks may be higher. For instance, a road with 0% Base Remaining Service Life is likely to have a higher chance of failure than a road that has just been constructed (i.e. with 100% Base Remaining Service Life), in this case the road with 0% Base Remaining Service Life would be allocated a higher probability of failure score.

Figure 27.   Road Risk-Based Prioritization Criteria
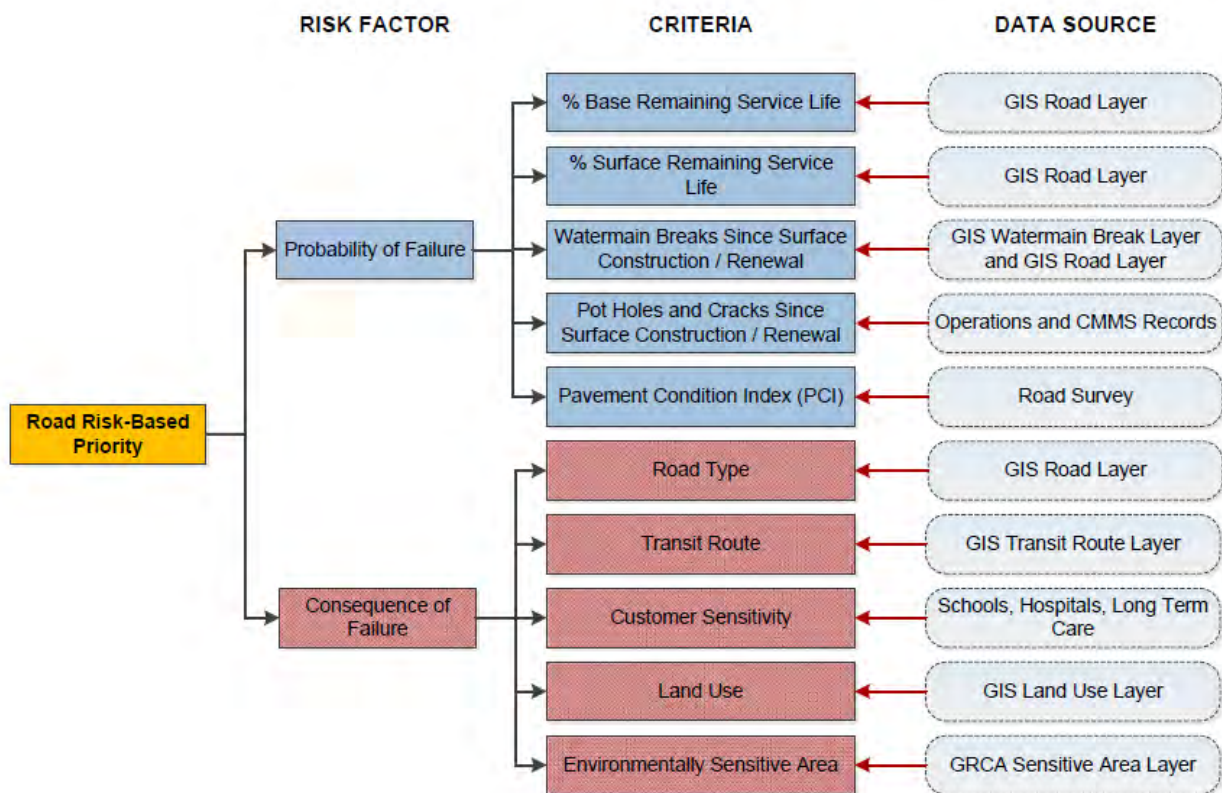
The criteria currently used in the evaluation of watermain risks and priorities are shown in **Figure 28**. The watermain risk priority takes into account maintenance records, as well as aspects that will impact the behaviour of the pipe such as the material, and the soil corrosivity. In the case where there is a metallic pipe in corrosive soil the asset is expected to have a higher risk of failure. While not currently included, there is opportunity to include performance data from the water hydraulic model such as hydraulic capacity and growth-related servicing requirements.

Figure 28.   Watermain Risk-Based Prioritization Criteria and Data Sources
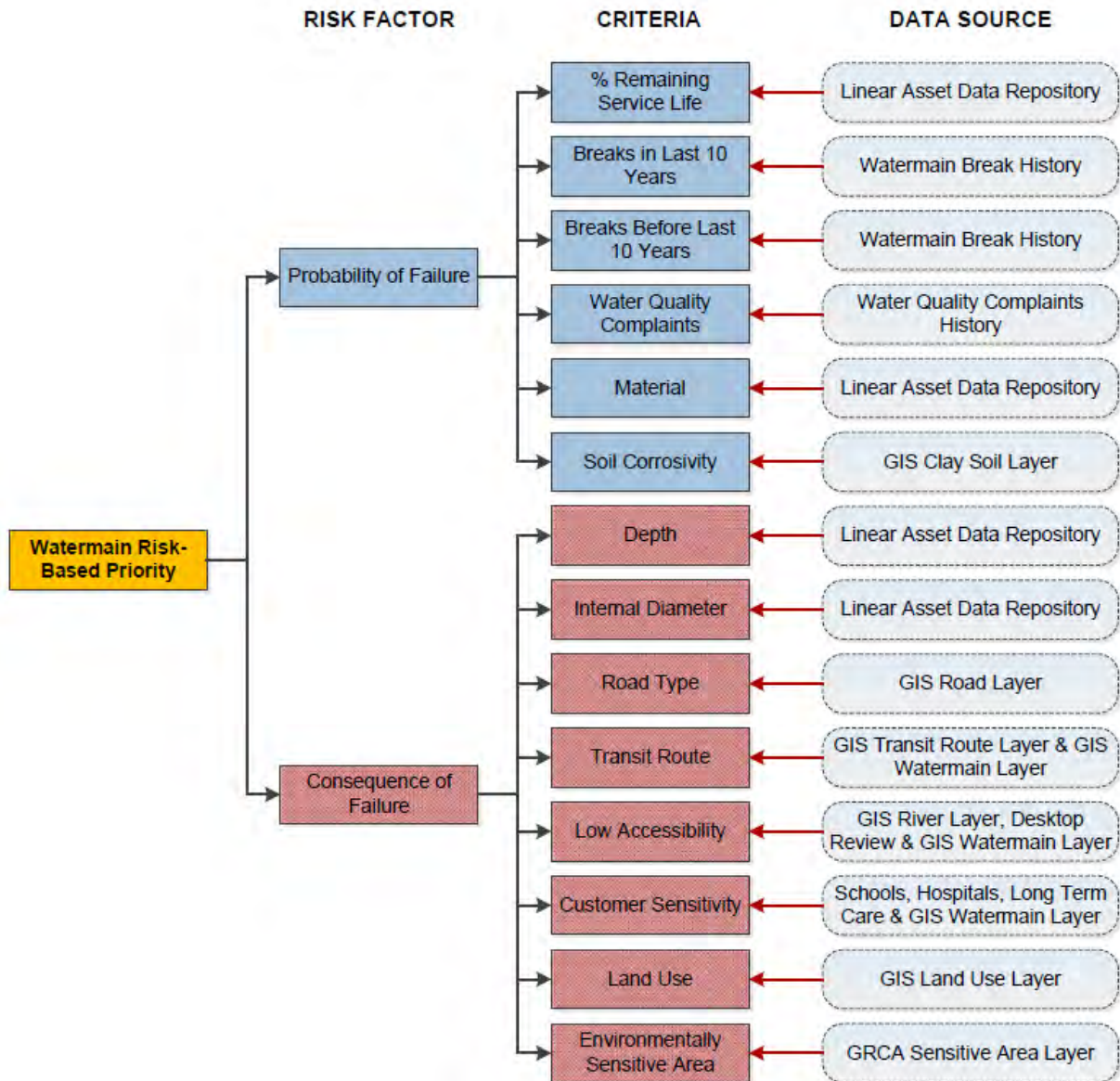
Factors that impact the probability and consequence of failure in wastewater and stormwater sewers are provided in **Figure 29**. Due to the similarities in behaviour, material, data, and condition assessment methods, wastewater and stormwater were deemed to be assessed based on the same criteria.

Figure 29.   Wastewater and Stormwater Risk-Based Prioritization Criteria and Data Sources
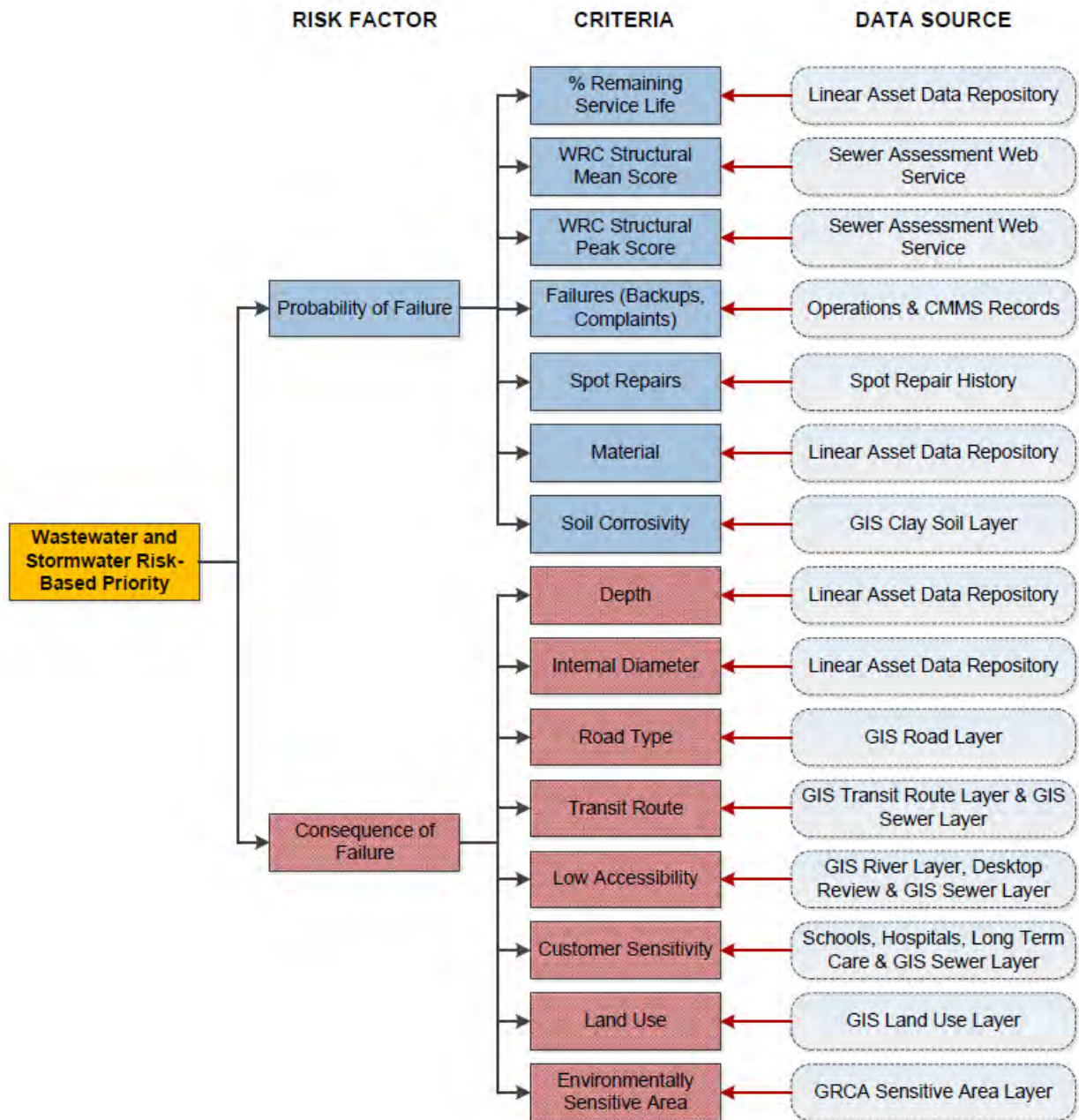
4.7. Engineering Design, Construction and Disposal Activities

Throughout the development of asset lifecycle management strategies and capital investment plans, Engineering Services, Facilities and Asset Management, Operational Services and other site specific personnel and departments collaborate to ensure feasibility and constructability of the program. The typical cycle from the conceptual project list development to project delivery and construction is shown in **Figure 30**.

Figure 30. Capital Budget and Project Delivery Cycle
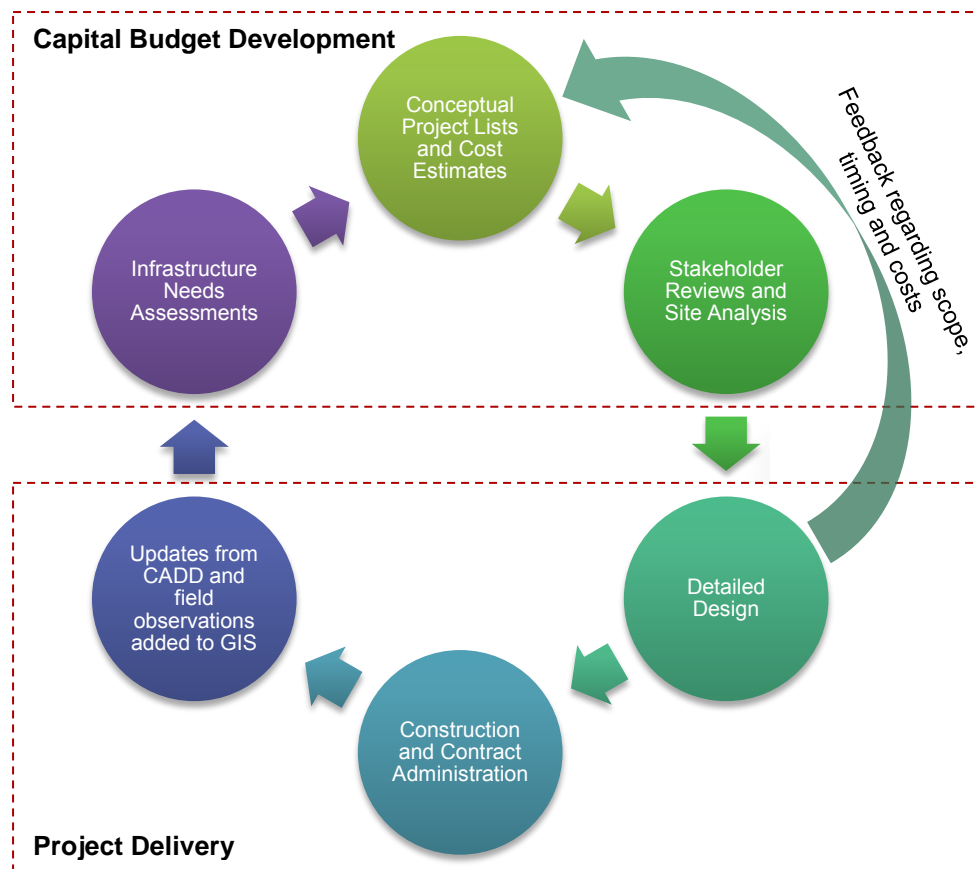
An initial project list is developed through carrying out needs assessments and analyses using the processes as described in previous sections of this document. These project lists are conceptual in nature, typically forecasting needs over 10 years with the scope of projects based on expected worst case scenarios to account for future contingencies. These lists are then reviewed and validated by various stakeholders and representatives from the respective departments. During the detailed design phase, projects are individually analyzed and scoped to the needs of the project. The conceptual cost estimates and timing are then refined in the 10 year budget accordingly to reflect the identified project-specific scope and requirements. Once constructed the detailed CADD designs and field observations are compiled and entered into the City's GIS system to update and maintain asset records.

5. Financing Strategy

Several financing strategies are available for the funding of capital projects which are utilized on a project by project basis. The typical financing strategies utilized by the city are as follows:

- *Pay as you go:* Saving all funds in advance of building or acquiring an asset. This strategy is long range in nature and sometimes requires foregoing needs in the short term until enough capital has been saved to carry out the required project.

- *Reserve Accounts:* Contributing revenues to a reserve account, and drawing funds from the account. This strategy allows a reserve 'threshold' to be set to provide a buffer for unexpected expenditures. It also allows lifecycle contributions to be made on an annual basis which can be drawn upon when needed.

- *Capital Levy:* In June 2014, City Council approved increasing the Operating Budget contribution to the Capital Program to 1.5% of the levy annually. Council voted to suspend the levy for 2017.

- *Debenture Financing:* A loan issued to the organization for building or acquiring an asset, which involves repayment annually with interest. The Province has limits on the total amount of debt which is based on an Annual Payment Limit or 25% of the municipality's source revenue.

- *Third-Party Contributions:* Contributions from parties external to the organization. This typically comes from contributions, subsidies and recoveries from development or grants from senior levels of government. This funding strategy impacts rates (except in the case of grants and subsidies).

- *User Fees:* Rates charged to the users of a service, which is typically based on a full cost recovery model.

In reality the City utilizes a combination of the above funding strategies depending on the specific project situation. Brantford, like many other cities across Canada has historically seen increases in taxes and rates lower than inflation and the true cost of delivering the service. Underground infrastructure, which can be fully functional for over 60 years and is often out of sight and out of mind, has historically received investments below the lifecycle requirements resulting in a steadily increasing backlog of deferred maintenance and capital expenditures.

Since the Walkerton incident in 2002, there has been an influx of new regulations for water and wastewater utilities, including the Safe Drinking Water Act, the Sustainable Water and Sewage Systems Act, and more recently the Water Opportunities and Water Conservation Act. The new requirements are proving to reshape the way municipalities finance and manage their infrastructure, requiring changes in business processes and operational procedures with the intention of achieving full cost recovery of water and wastewater services.

In further steps to achieve this goal, the City of Brantford undertakes a water and wastewater system financial sustainability plan every five (5) years. This plan is then used as a basis for the water and wastewater rate structure.

Brantford uses short and long term analyses with the goal of developing sustainable infrastructure capital plans and financing strategies. These analyses include a 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts.

5.1. 100 Year Sustainability Forecasts

Long term infrastructure investment forecasts provide insight into prospective investment requirements which may fall outside of the 10 year planning horizon typically utilized for capital budgeting processes. Large amounts of infrastructure or building construction during a short time span, as seen in the 1970's, will require equally as heavy investment once those assets reach the end of their service lives. If those investment requirements are not addressed appropriately, levels of service could potentially decline and operations and maintenance costs could increase. The 100 year forecast aims to cover the entire lifecycle of the assets, therefore allowing identification of such trends.

Funding and re-investment requirements were developed for each program area based on the analysis to establish an average annual cost for re-investment. The reinvestment forecast takes into consideration statistical parameters that utilize the condition, estimated service lives, replacement costs and lifecycle probability distributions to provide trends of replacement costs on a given year. The replacement trends can then be used to develop short-term and long-term (25-year and 100-year) replacement requirements and average annual costs. The replacement costs are based on 2015/2016 average tender prices, historic built costs, consultant recommendations, and insurance assessed values.

Figure 31 depicts the annual capital investment requirements across the asset groups covered in this analysis. The figure shows that there are currently deferred capital investment needs of $227.5 million this is an increase of $42.4 million since the 2012 AMP. However, this increase includes the deferred capital investment needs of the assets newly added to the AMP. Focusing on just the assets included in the 2012 AMP, the current deferred capital investment needs are approximately $177.4 million. This represents an increase of $7.7 million since the 2012 AMP. The 'deferred capital investment needs' refers to an outstanding capital need, which arose in the past, but has not been addressed (i.e. assets that fall within the very poor rating category because their remaining service life is below zero). This could be related to infrastructure deterioration, capacity shortfalls or design service standard upgrades. The figure also shows various spikes in the replacement forecasts, which is typically due to large assets with high replacement value, or groups of assets being required to be replaced in a given year. An example of this can been seen in areas of post-war growth where communities were built and developed en masse with significant investments in new infrastructure made over a relatively short time period.

Figure 31. All Program Areas 100 Year Investment Requirement Forecast (2017 Dollars)

25 Year Average Annual Cost: $72 Million

100 Year Average Annual Cost: $77 Million

Exceeded Service Life (Very Poor): $227.5 Million

Legend:
- Roads & Sidewalks
- Bridges, Culverts, Retaining Walls and Stairways
- Water
- Wastewater
- Stormwater
- Public Works & Admin. Facilities
- Social Housing
- Fleet, Transit & Transportation
- Solid Waste & Landfill
- Tourism and Culture
- Brownfield Infrastructure
- Airport
- Parks & Recreation
- Exceeded Service Life (Very Poor)
- 100-Year Average Annual Total Cost
- 25-Year Average Annual Total Cost

The following subsections show the breakdown of the long-term forecast by asset class, along with some discussion of funding sources and the types of projects that the replacements would be a component of.

5.1.1. Road Network

Figure 32 shows the forecasted annual investment requirements for the Road Network (including Roads, Intersections, Streetlights, Traffic Signs, Guard Rails, Sound Barriers and Laneways). The analysis shows deferred capital needs of $49.6 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2017, resulting in an investment spike at the end of the service life of the assets (in 2028, 2041, 2053, 2077, 2089, 2100 and 2113), while in reality the investments would be spread over a number of years depending on criticality. The forecasted 100 year average annual investment requirement is $22.0 million.

Road replacement projects are funded through a combination of Federal Gas Tax, Tax-supported dedicated reserve accounts, and rate-supported reserve accounts where a road that otherwise would not be replaced is impacted as part of a rate project (such as watermain replacement when the road is in good condition). Growth related projects are funded in part or wholly through development charges.

Road reconstruction and rehabilitation is typically a component of the following project types:

- Full Corridor Reconstruction Projects;
- Watermain Replacement Projects (where the sidewalk is impacted by the construction); and
- Road Resurfacing Projects.

Figure 32.   Road Network 100 Year Investment Requirement Forecast (2012 Dollars)
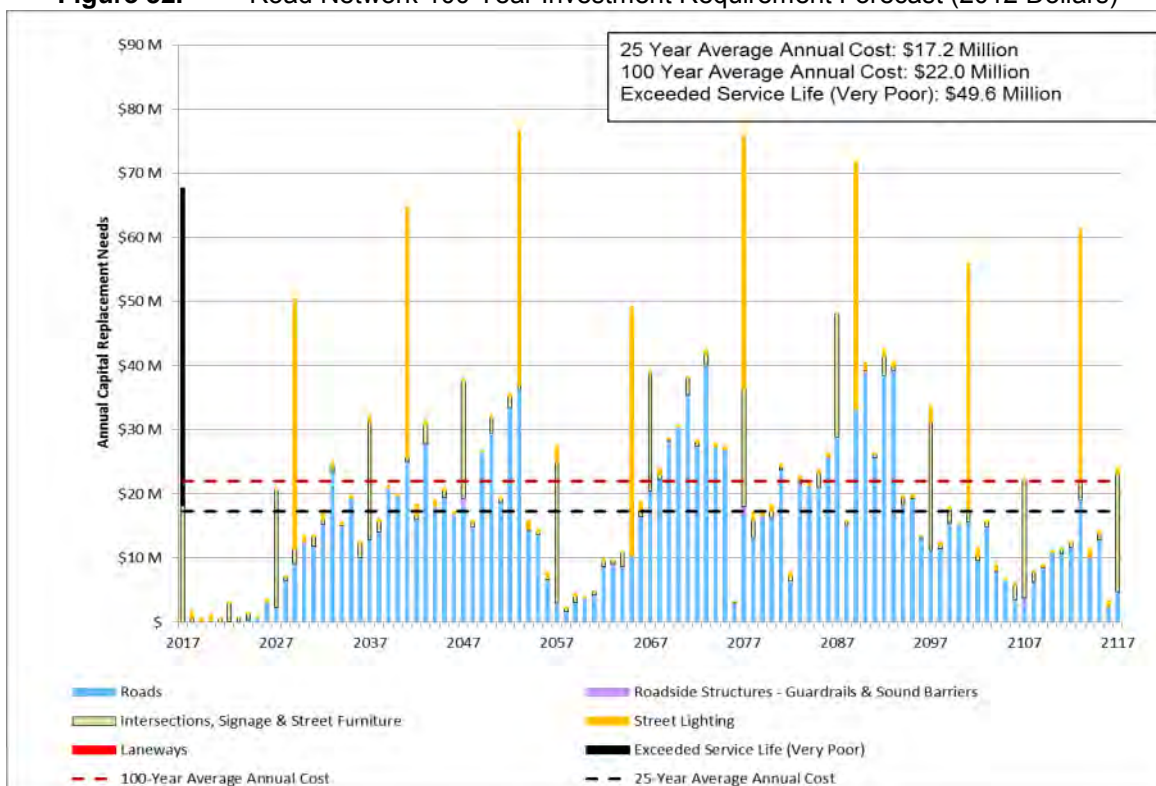
5.1.2. Sidewalks

The forecasted annual investment requirements for the City's sidewalks are shown in **Figure 33**. The analysis shows deferred capital needs of $0.6 million, which represents sidewalks in the City that have a very poor condition rating. In addition there is $38.6 million in sidewalks which have exceeded or reached the end of their service life in 2017. In reality, sidewalks can last many years beyond their estimated service life due to many factors such as location, maintenance, construction quality, weather and usage. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2017, resulting in an investment spike at the end of the service life of the assets (in 2057 and 2097), while the investments would typically be spread over a number of years depending on criticality.

The forecast shows that the average annual 100 year investment requirement, based on estimated service life, is $3.3 million per year. In order to maintain the levels of service for sidewalks, the City prioritizes the sidewalk candidate list on an annual basis to ensure that the most critical and high risk sidewalks are addressed.

Sidewalk replacement projects are funded through a combination of Federal Gas Tax, Tax-supported dedicated reserve accounts, and rate-supported reserve accounts where a sidewalk that otherwise would not be replaced is impacted as part of a rate project (such as watermain replacement when the sidewalk is in good condition). Sidewalk Replacement would typically occur as a component of the following project types:

- Full Corridor Reconstruction;
- Watermain Replacement Projects (where the sidewalk is impacted by the construction);
- Stand Alone Sidewalk Replacement Projects; and
- Road Resurfacing Projects (where there are deficiencies in the curbs and sidewalk).

Figure 33.   Sidewalks 100 Year Investment Requirement Forecast
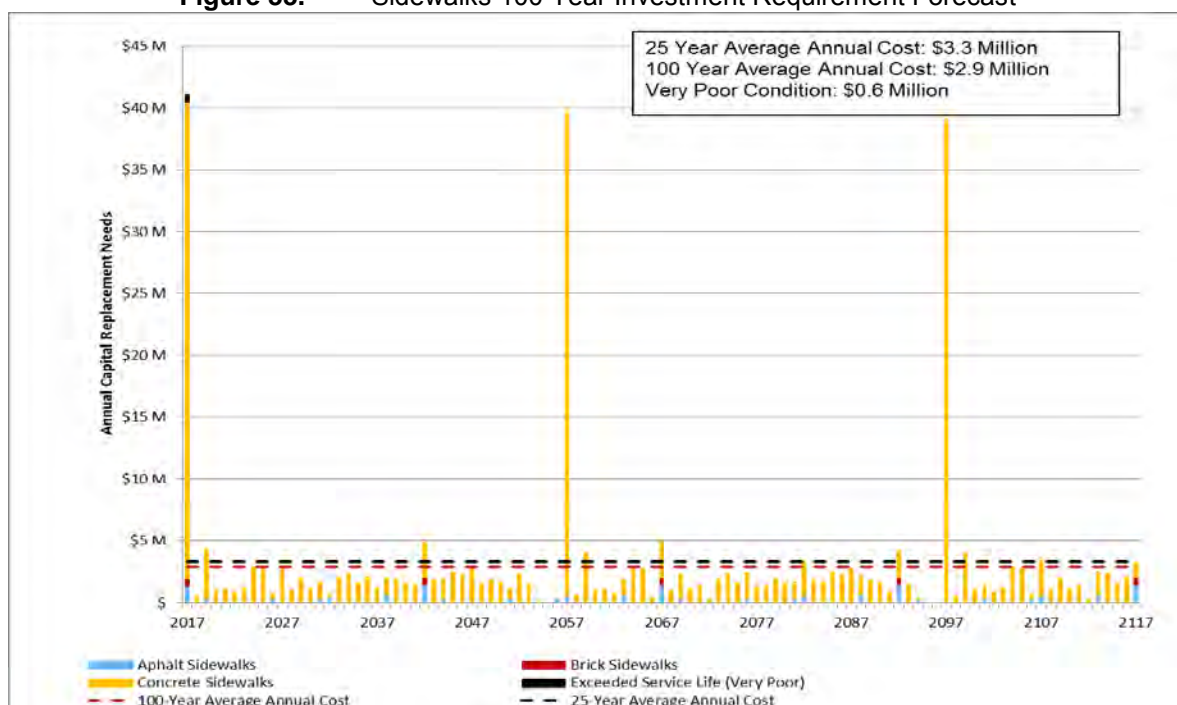
5.1.3. Bridges, Retaining Walls and Culverts – Public Works

Figure 34 shows the forecasted annual investment requirements for bridges, retaining walls and culverts. The analysis shows deferred capital needs of $6.5 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure illustrates several spikes in investment requirements, which is typically due to the bridges with high replacement value that were constructed in the 1970's reaching the end of their service lives, or groups of assets being required to be replaced on a given year. Large assets or asset groups are anticipated to reach the end of their service lives between 2070 and 2075. The forecasted 100 year average annual investment requirement is $2.3 million.

Bridge, retaining wall and culvert capital replacement projects are funded through a combination of Federal Gas Tax, Tax-supported dedicated reserve accounts and debt where required.

These replacements would typically occur as a component of the following project types:

- Bridge, Culvert or Retaining Wall Rehabilitation; and
- Bridge, Culvert or Retaining Wall Reconstruction.

Figure 34. Bridges, Retaining Walls and Culverts 100 Year Investment Requirement Forecast
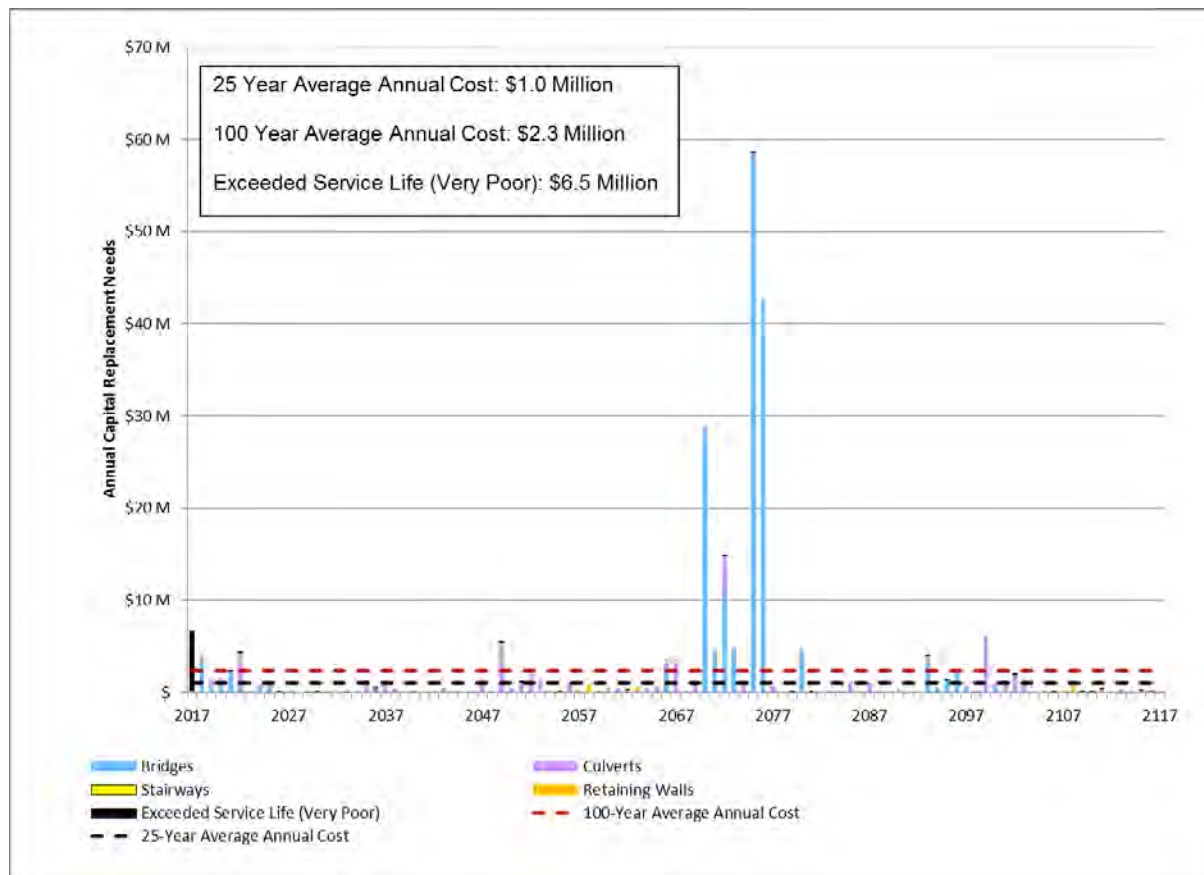
5.1.4. Transportation

The transportation forecasted annual investment requirements are show in Figure 35. The analysis shows deferred capital needs of $0.4 million, which represents overdue capital transportation replacement expenditures or the replacement cost of transportation assets (e.g. parkade, parking lots and lighting) that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirements is $0.7 million.

Transportation replacement and renewal projects are funded through a combination of Federal Gas Tax and Tax-supported dedicated reserve accounts.

Figure 35. Transportation 100 Year Investment Requirement Forecast
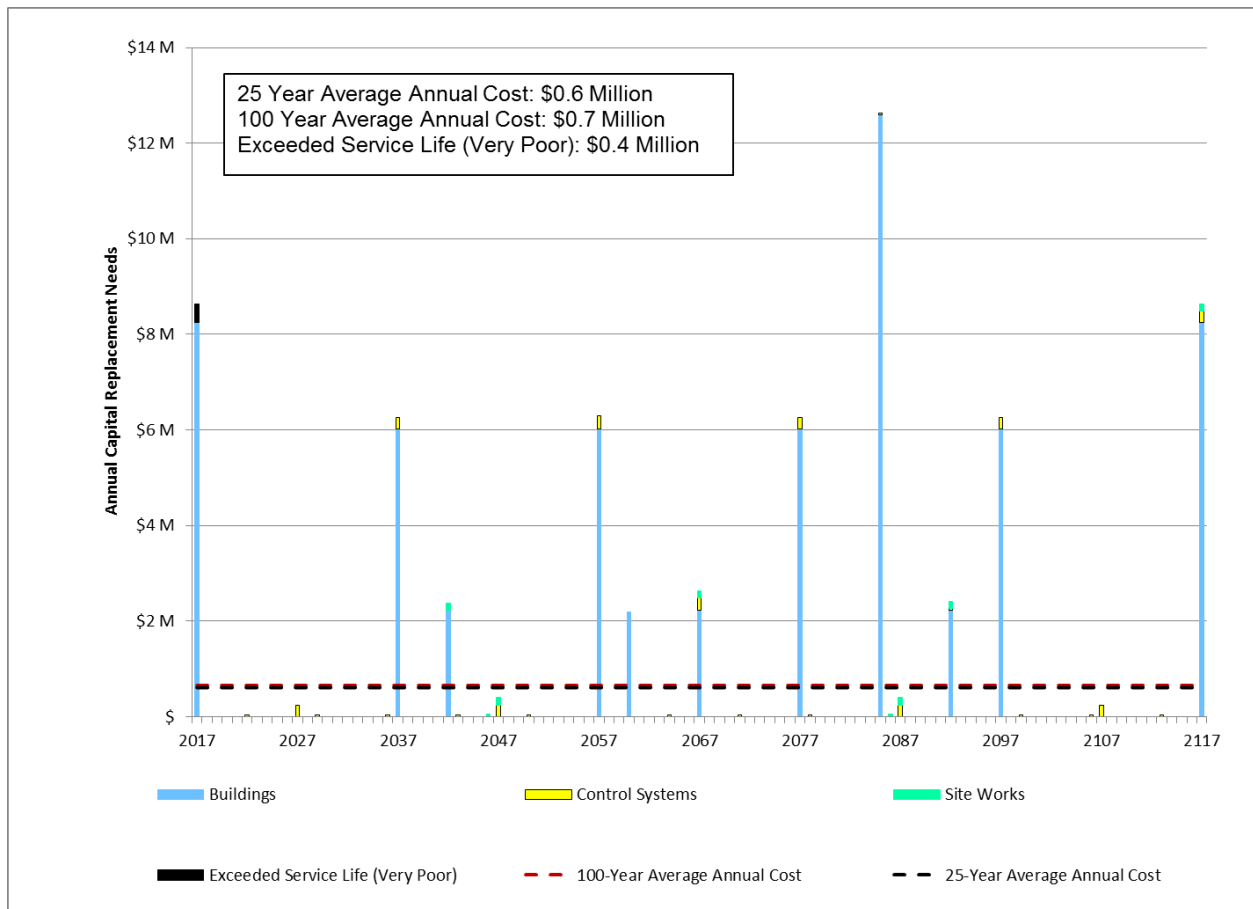
5.1.5. Water Distribution

The water distribution forecasted annual investment requirements are shown in **Figure 36**. The analysis shows deferred capital needs of $18 million, which represents overdue capital watermain replacement expenditures or the replacement cost of watermains that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $3.5 million.

The replacement forecast for the water distribution network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Water replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Growth related projects are funded in part or wholly through development charges.

Water distribution infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Watermain Replacement;
- Watermain Replacement and Road Resurfacing; and
- Full Corridor Reconstruction.

Figure 36.   Water Distribution Network 100 Year Investment Requirement Forecast
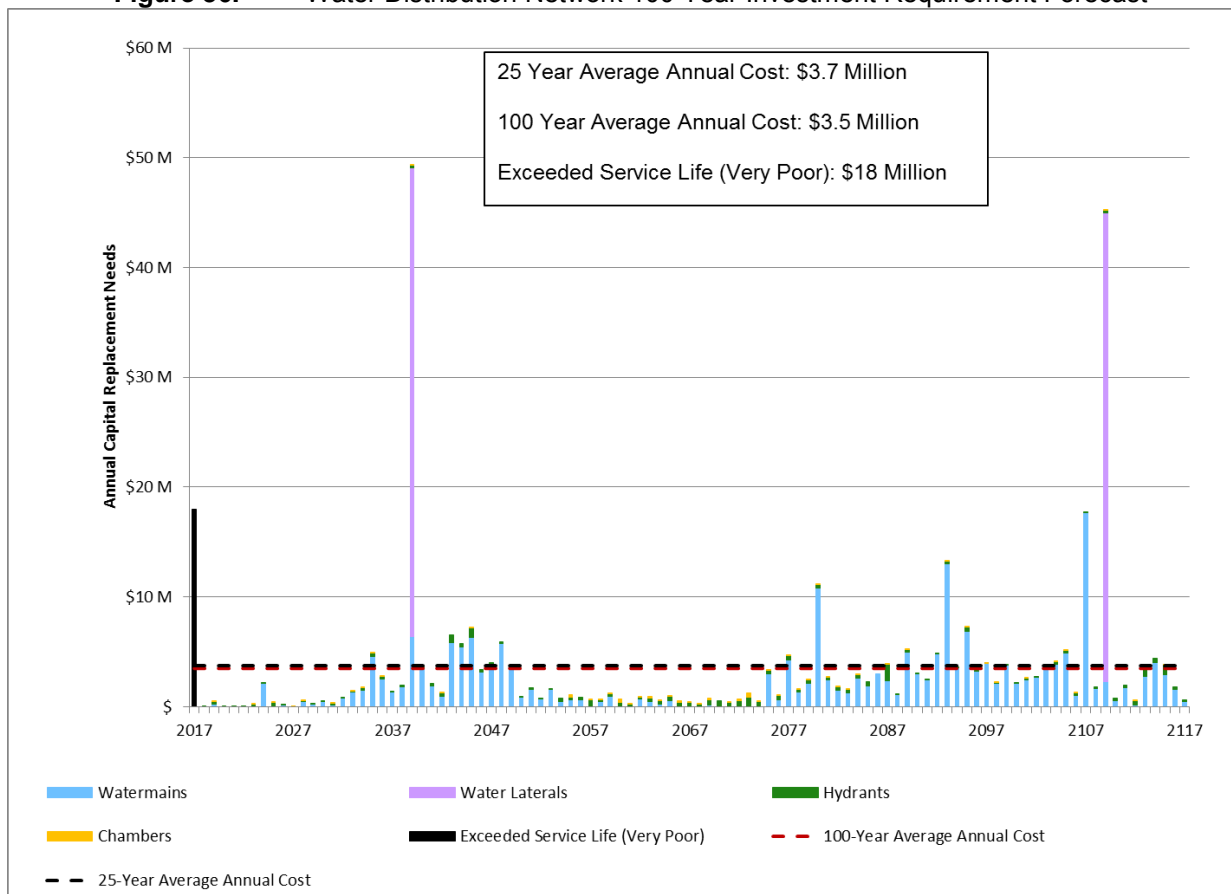
Note:
- *For this analysis watermain replacement costs only include replacement of the watermain, appurtenances and backfill. Costs do not include road restoration.*

5.1.6. Water Facilities

Figure 37 shows the forecasted annual investment requirements for water facilities (including the water treatment plant, pumping stations, elevated tanks and raw water quality monitoring stations). The analysis shows deferred capital needs of $6.2 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. There is a large investment spikes in 2071 which is due to treatment plant process buildings, with high replacement value, being due for replacement. The forecasted 100 year average annual investment requirement is $6.7 million.

Water facility replacement and renewal projects are funded through dedicated rate-supported reserve accounts. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 37.   Water Facility 100 Year Investment Requirement Forecast
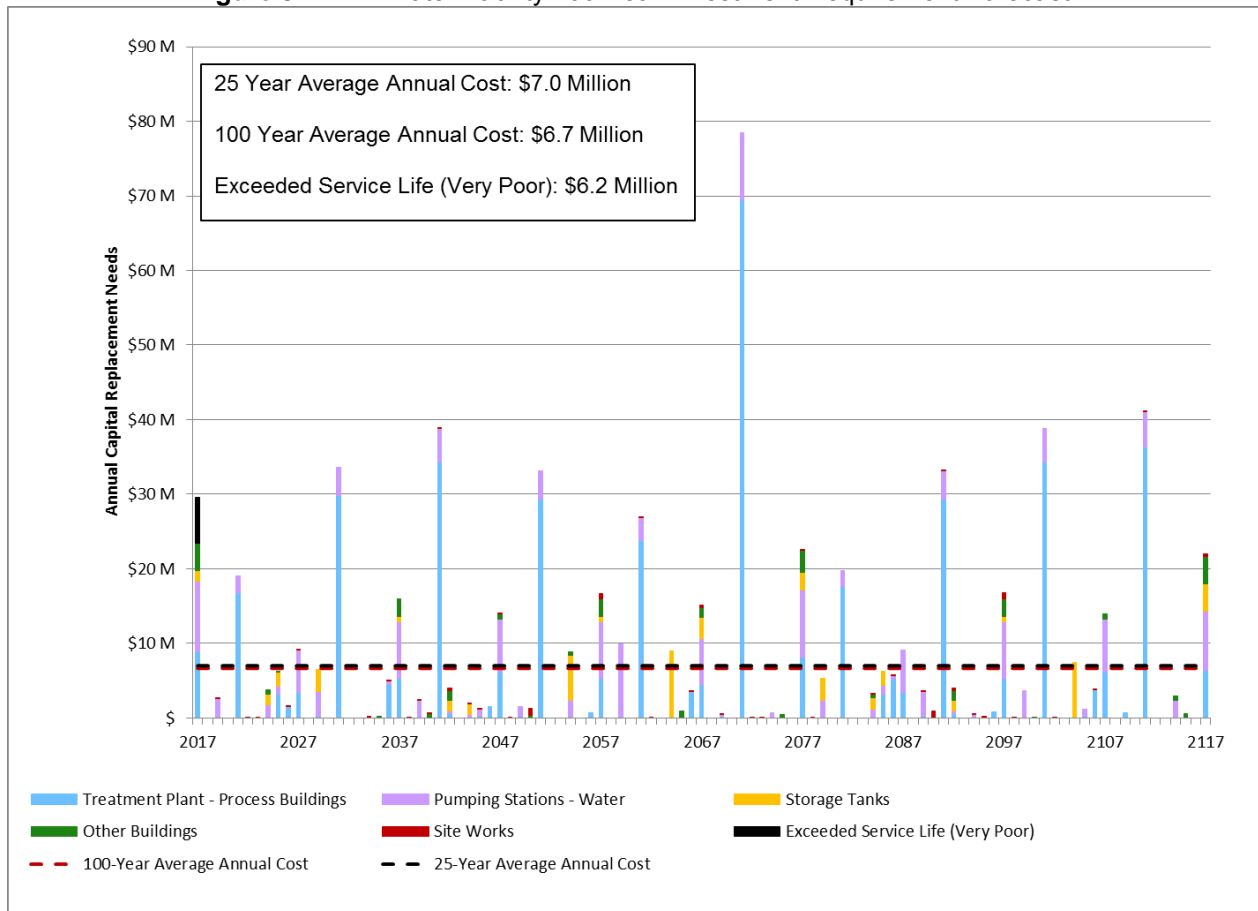
5.1.7. *Wastewater Collection*

The wastewater collection forecasted annual investment requirements are shown in **Figure 38**. The analysis shows deferred capital needs of $12.9 million, which represents overdue capital wastewater replacement expenditures or the replacement cost of wastewater sewers that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $3.1 million.

While the quantity of wastewater laterals is known, they have not yet been brought into the GIS mapping, this results in all laterals having the same installation year assigned. Due to the installation year being the same, this leads to two large spikes when the laterals reach their estimated service life (in 2039 and 2109). In reality the original lateral installation dates would be distributed over multiples years.

The replacement forecast for the wastewater collection network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Wastewater replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Growth related projects are funded in part or wholly through development charges.

Wastewater collection network infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Wastewater Sewer Replacement (in easements);
- Full Corridor Reconstruction; and
- Wastewater Lining.

Figure 38.   Wastewater Collection Network 100 Year Investment Requirement Forecast
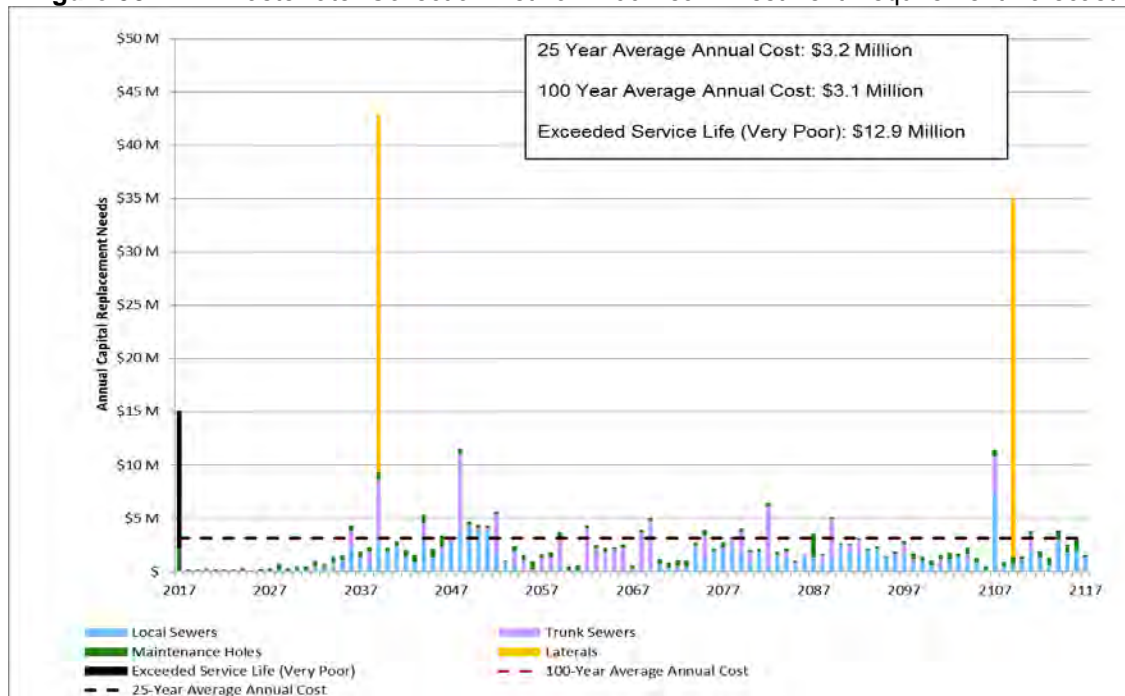
Note:
- *For this analysis wastewater sewer replacement costs only includes replacement of the wastewater sewer, appurtenances and backfill. Costs do not include road restoration.*

5.1.8. Wastewater Facilities

Figure 39 shows the forecasted annual investment requirements for wastewater facilities (including the wastewater treatment plant and pumping stations). The analysis shows deferred capital needs of $12.0 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. For the purpose of the analysis, the deferred capital replacements are to be addressed in 2017. There are sporadic investment spikes throughout the 100 year forecast, which are due to treatment plant process buildings, with high replacement value, coming due on those years. The forecasted 100 year average annual investment requirement is $4.9 million.

Wastewater facility replacement and renewal projects are funded through dedicated rate-supported reserve accounts. Wastewater facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 39.   Wastewater Facility 100 Year Investment Requirement Forecast
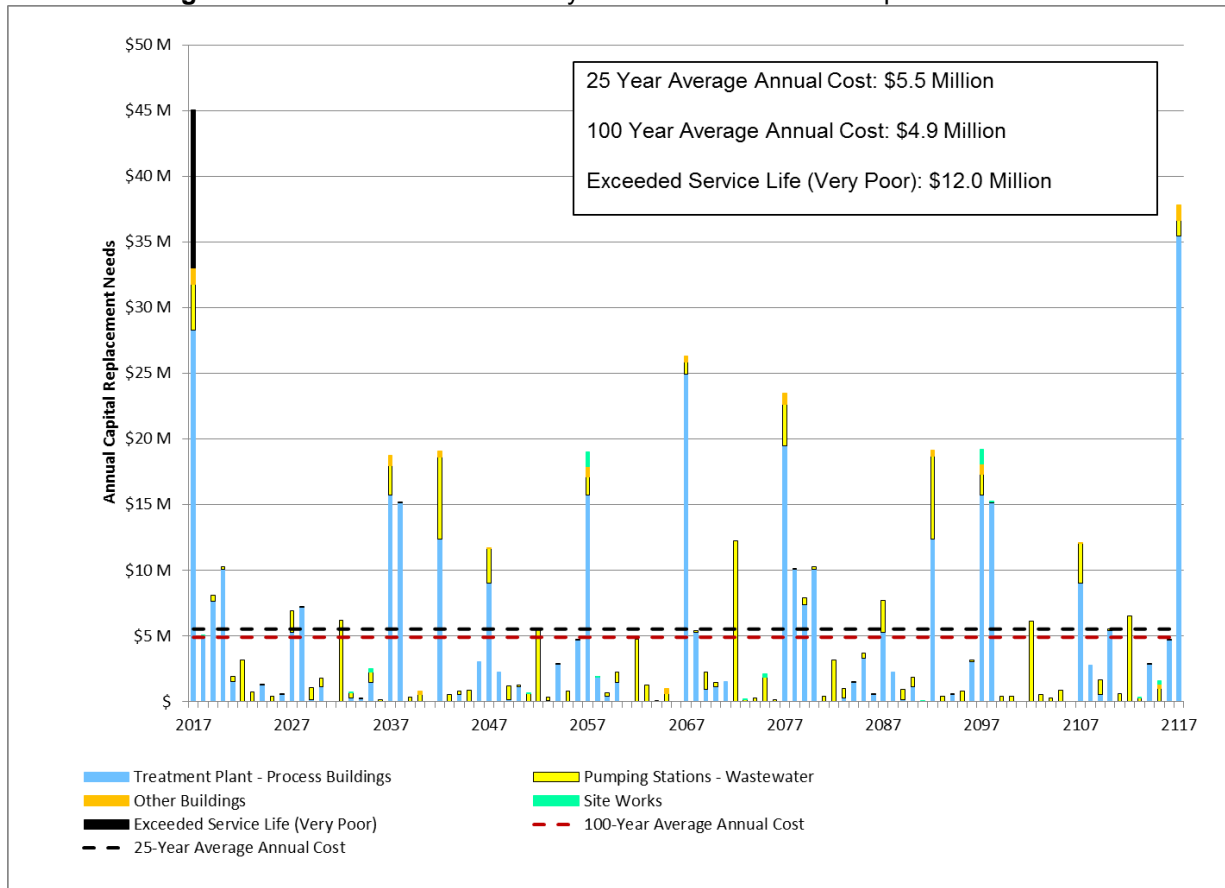
5.1.9. Stormwater Collection

The stormwater collection forecasted annual investment requirements are shown in **Figure 40**. The analysis shows deferred capital needs of $26.7 million, which represents overdue capital stormwater replacement expenditures or the replacement cost of stormwater sewers that have exceeded their theoretical service lives. The forecasted 100 year average annual investment requirement is $2.9 million.

The replacement forecast for the stormwater collection network does not include the cost of road restoration which typically amounts to 40% to 60% of the total project cost. Stormwater projects are funded through tax and currently have no dedicated funding source.

There is no dedicated funding source to address state of good repair needs of the City's stormwater collection network and so work in generally funded through a combination of general tax reserves, debt, and where available, third party grant funding. However, to address stormwater needs attributed to growth the city has development charge reserve account.

Stormwater collection network infrastructure rehabilitation and reconstruction would typically occur as a component of the following project types:

- Stand-alone Stormwater Sewer Replacement (in easements);
- Full Corridor Reconstruction; and
- Stormwater Lining.

Figure 40.   Stormwater Collection Network 100 Year Investment Requirement Forecast
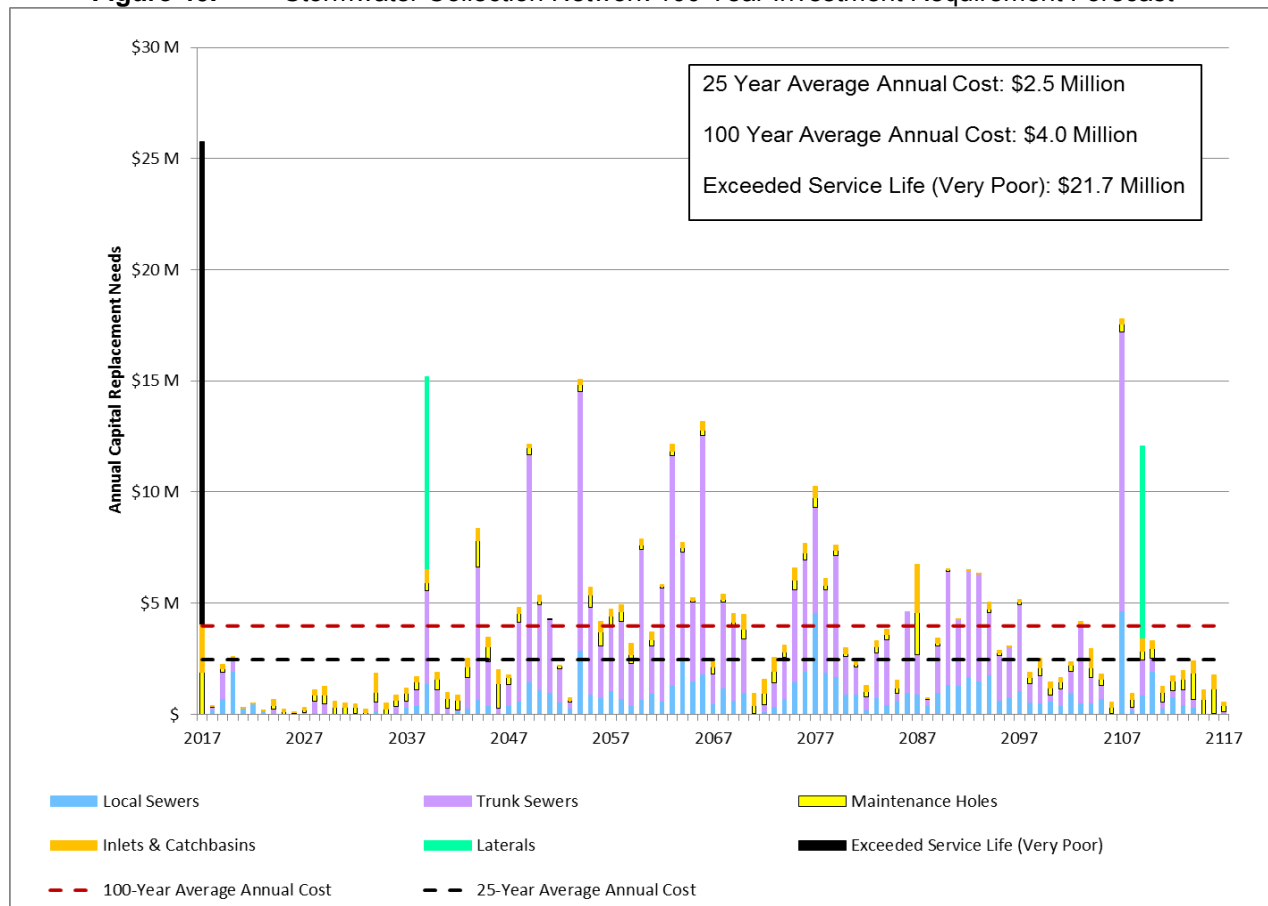
Note:

- *Stormwater Sewer replacement cost only includes replacement of the watermain, appurtenances and backfill. The cost does not include road restoration.*

5.1.10. Stormwater Facilities

Figure 41 shows the forecasted annual investment requirements for stormwater facilities (including stormwater detention ponds, gates and pumping stations). The analysis shows that there are currently no deferred capital needs. There is a large investment spike in 2078 which is due to detention ponds with high replacement cost reaching the end of their service life necessitating replacement. The forecasted 100 year average annual investment requirement is $0.26 million.

There is no dedicated funding source to address state of good repair needs of the City's stormwater facility network and so work in generally funded through a combination of general tax reserves, debt, and where available, third party grant funding. However, to address stormwater needs attributed to growth the city has a development charge reserve account. Stormwater facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 41. Stormwater Facility 100 Year Investment Requirement Forecast
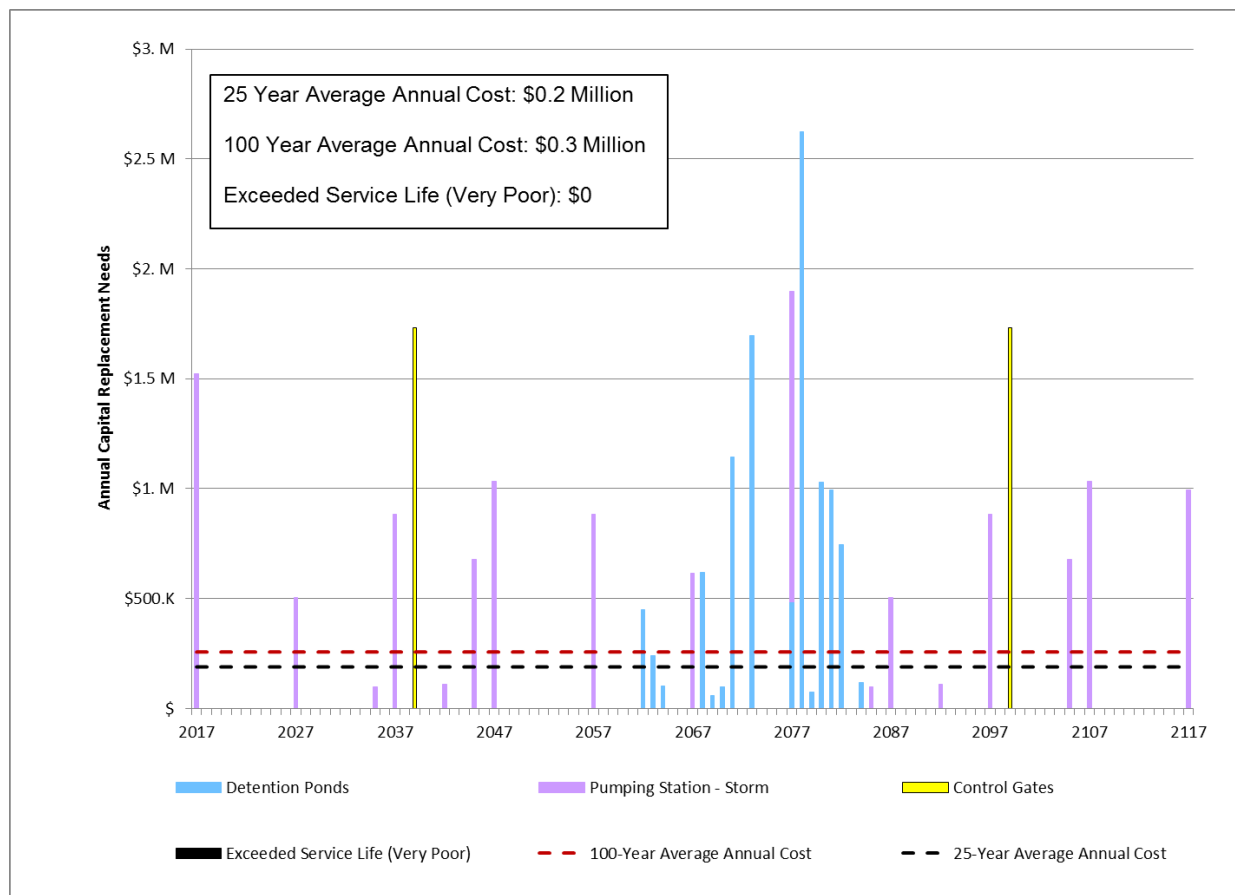
5.1.11. Solid Waste and Landfill

Figure 42 shows the forecasted annual investment requirements for solid waste and landfill. The analysis shows deferred capital needs of $13.8 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to large assets in the Landfills Cells and Equipment category and site buildings with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $2.7 million.

Solid waste and landfill replacement and renewal projects are funded through user rates such as tipping fees and tax-supported dedicated reserve accounts although in recent years the City has not been able to make any financial contributions to the capital reserve. Therefore, the City looks to fund projects through a combination of general tax reserves and debt. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 42.   Solid Waste and Landfill 100 Year Investment Requirement Forecast
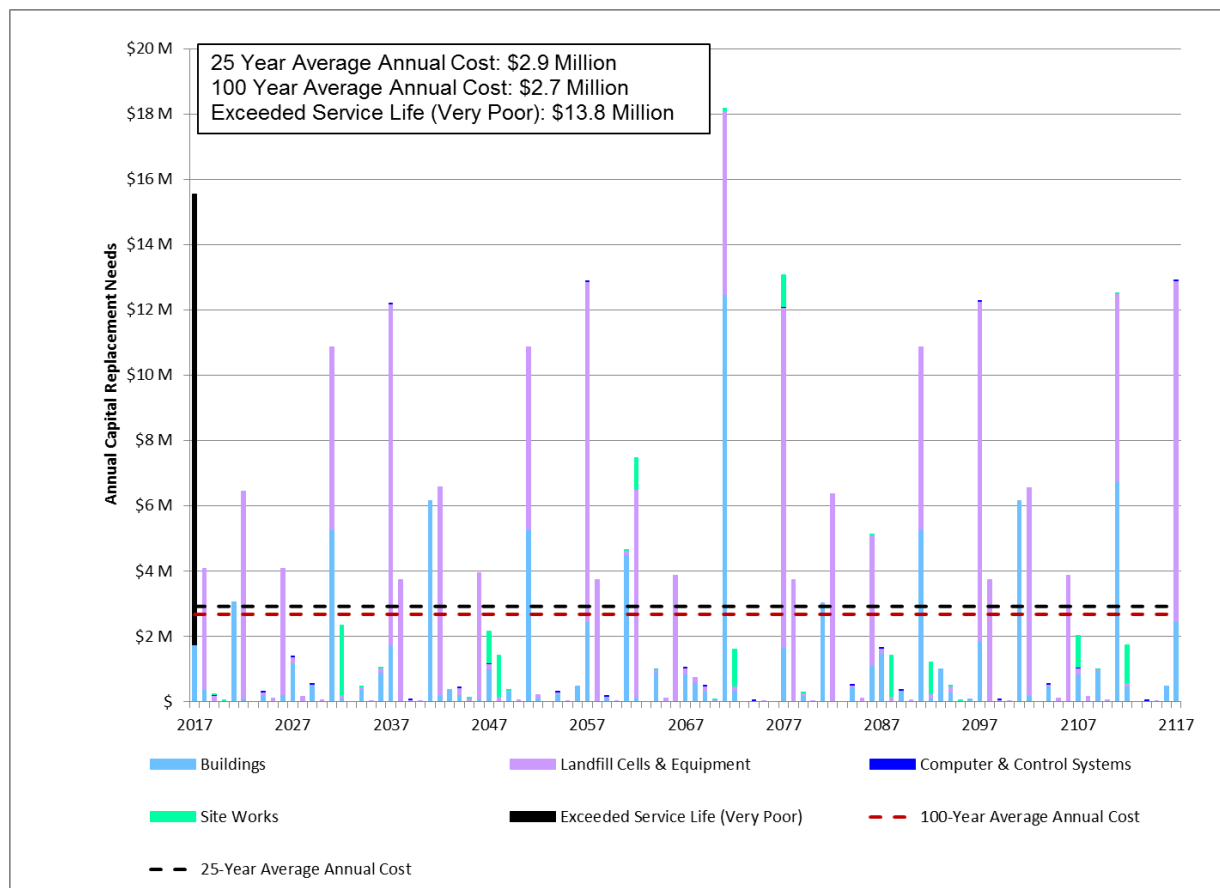
5.1.12. Public Works and Administrative Facilities

Figure 43 shows the forecasted annual investment requirements for public works and administrative facilities. There is limited available data pertaining to historical facility upgrades and renewals. Condition Assessments have been completed for some buildings, resulting in the very poor assets identified. Some additional assets have been identified as having a need in 2017 based on estimated service life but have not identified as in very poor condition. An annual building condition assessment program for public works and administrative facilities was implemented in 2013; the results of which will continue to improve the forecast for this program area

Note: Public Works and Admin Facilities occupied by other departments have been documented under their respective departments for clarity, with budget amounts for their upkeep divided accordingly. This is to allow for the full picture of assets being used by the departments.

The figure shows sporadic investment spikes which are due to due to large assets with high replacement value, and groups of assets reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $2.1 million.

Public Works and Administrative facility replacement and renewal projects are funded through tax-supported dedicated reserve accounts or rate supported reserve accounts, shared with other services such as Parks and Recreation. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 43. Public Works and Administrative Facilities 100 Year Investment Requirement Forecast
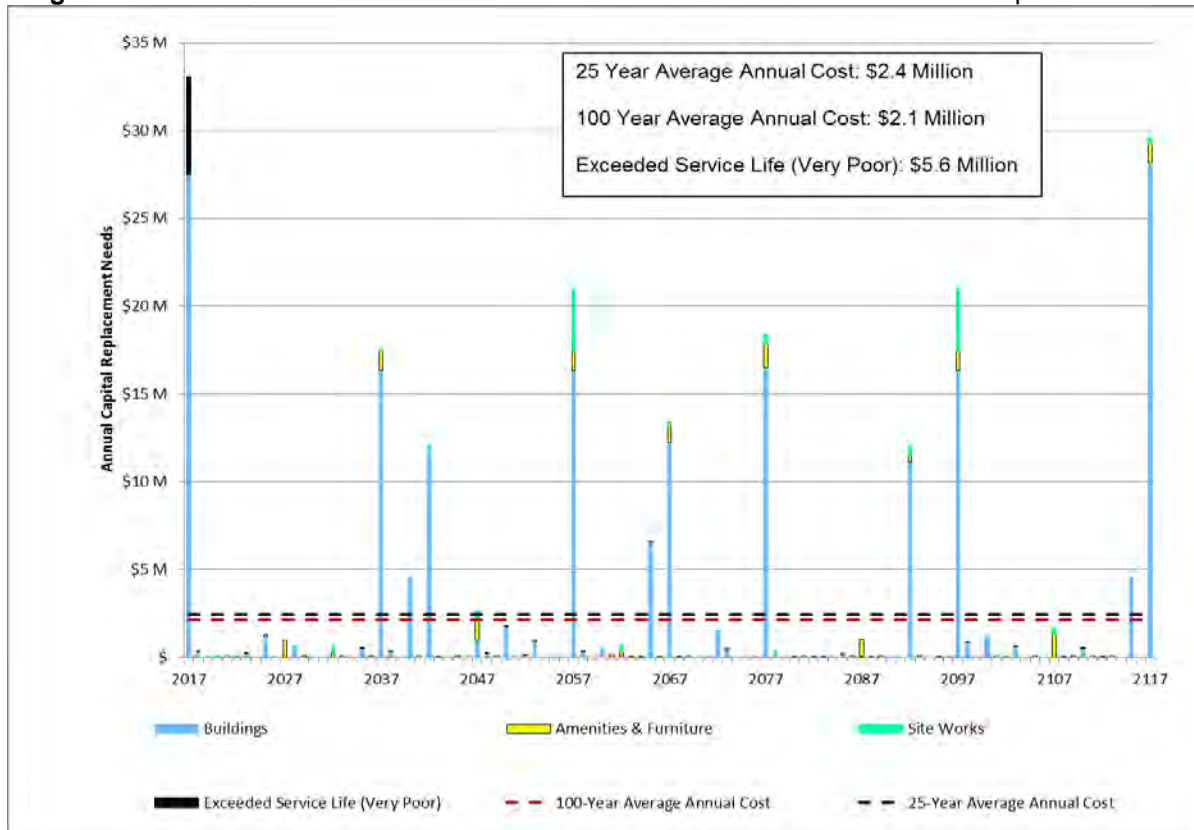
5.1.13. Corporate Fleet

Figure 44 shows the forecasted annual investment requirements for corporate fleet (including vehicles, heavy equipment, trailers, mowers and tractors, tools/shop/equipment, instrumentation and fuel storage). The analysis shows deferred capital needs of $13.2 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure illustrates several spikes in investment requirements, with one large spike in 2087. These are typically due to assets in the fleet inventory with high replacement value reaching the end of their service lives, or groups of assets being required to be replaced on a given year. The forecasted 100 year average annual investment requirement is $2.5 million.

Fleet capital replacement projects are funded through a combination of user-rate chargebacks and Tax-supported dedicated reserve accounts.

Figure 44. Corporate Fleet 100 Year Investment Requirement Forecast
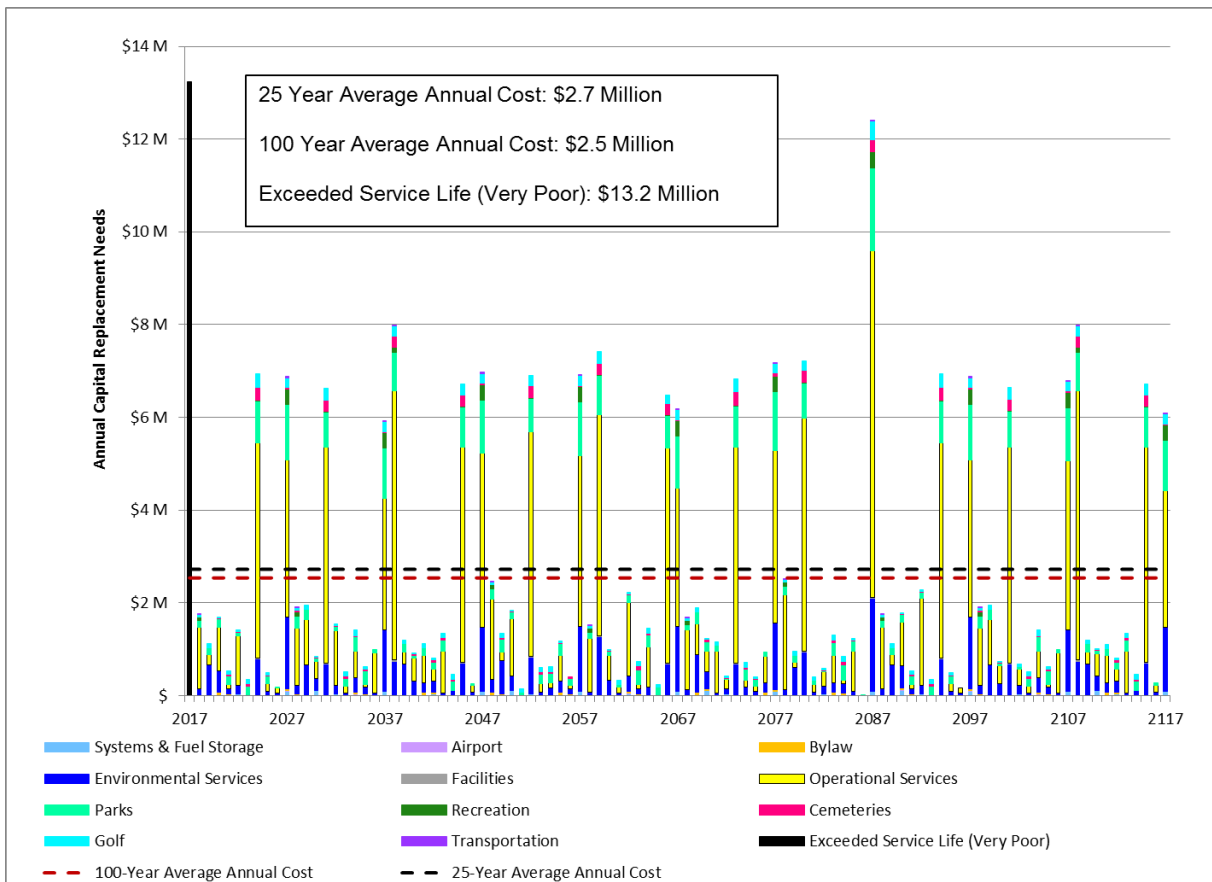
5.1.14. Transit

Figure 45 shows the forecasted annual investment requirements for transit (including transit buses, buildings, parking lots, light duty vehicles, sewer jets/street sweepers, and tools/shop/equipment). The analysis shows deferred capital needs of $10.5 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure shows sporadic spikes which typically coincide with work being required on the transit service centre or transit terminal buildings. The forecasted 100 year average annual investment requirement is $2.6 million.

Transit capital replacement projects are funded through a combination of Federal Fuel Tax, Provincial Fuel Tax, and Tax-supported dedicated reserve accounts. Growth related projects are funded in part or wholly through development charges.

Figure 45.   Transit 100 Year Investment Requirement Forecast
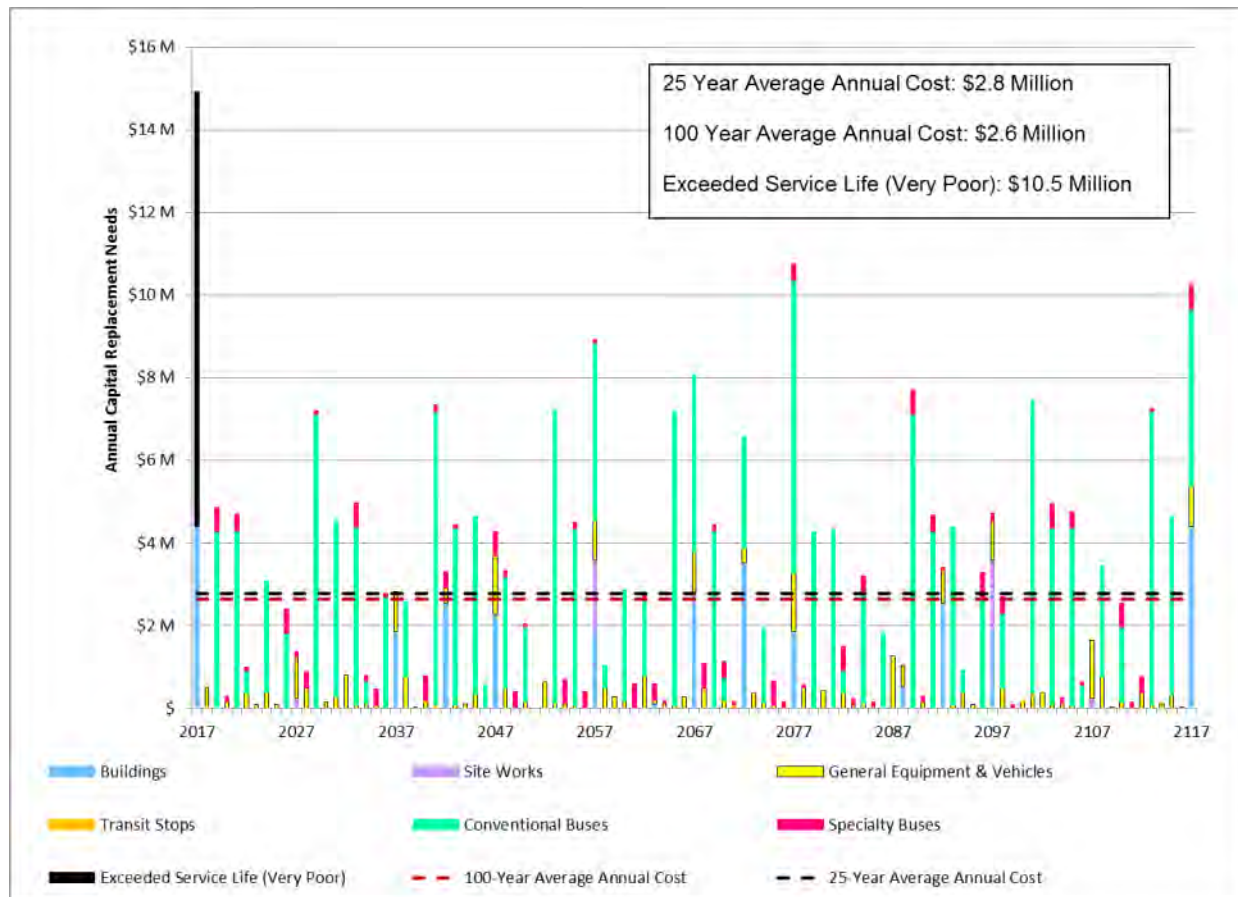
5.1.15. Social Housing Facilities

Figure 46 shows the forecasted annual investment requirements for the City's social housing building portfolio. The analysis shows deferred capital needs of $6.6 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. There is limited available data pertaining to historical facility upgrades and renewals, therefore a building condition assessment program for all social housing buildings was implemented in 2013; the results of which will improve the understanding of the deferred capital needs. A review of the building insurance values was completed in 2016; this resulted in an increase in the total replacement value estimate for this program area.

The analysis shows that there are numerous large investment spikes over the forecast which are due to large assets in the townhouse and apartment buildings with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $5.4 million.

Social housing building replacement and renewal projects are funded through tax-supported dedicated reserve accounts, and provincial and federal grant programs. The facility reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

**Figure 46.** Social Housing Facility 100 Year Investment Requirement Forecast
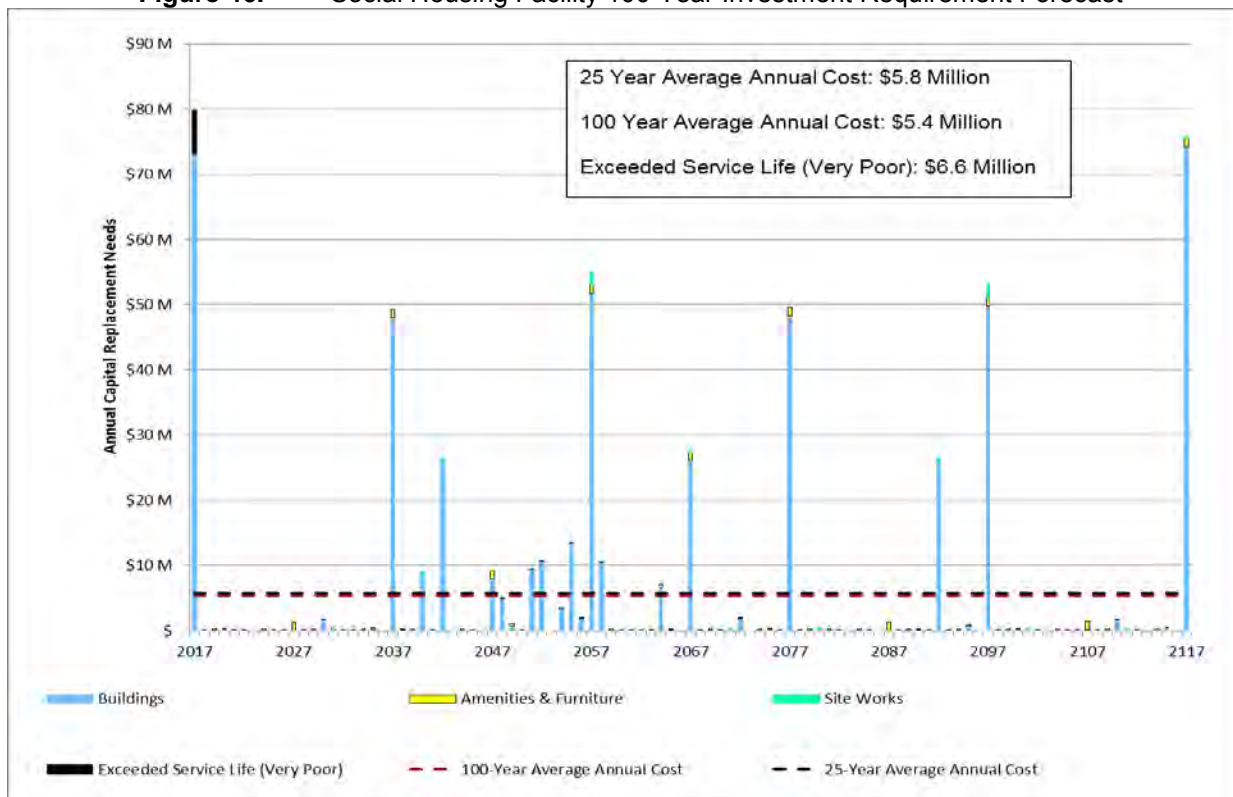
Note:

- *The Condition Assessments from 2013 have not been inputted into the City's Facilities Database, for the 2018 assessments, it is planned that they will be entered in the database which will result in a more even distribution of capital replacement needs in future AMP reports.*

5.1.16. Tourism

Figure 47 shows the forecasted annual investment requirements for the City's tourism building and Public Art and Monuments portfolio. The analysis shows deferred capital needs of $3.9 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives. Public Art and Monuments in most cases have an expected service life of 100 years, in reality most assets will undergo significant restorations but will not be replaced.

Tourism replacement and renewal projects are funded through tax-supported dedicated reserve accounts, and provincial and federal grant programs. Facility and Monument reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 47.   Tourism 100 Year Investment Requirement Forecast
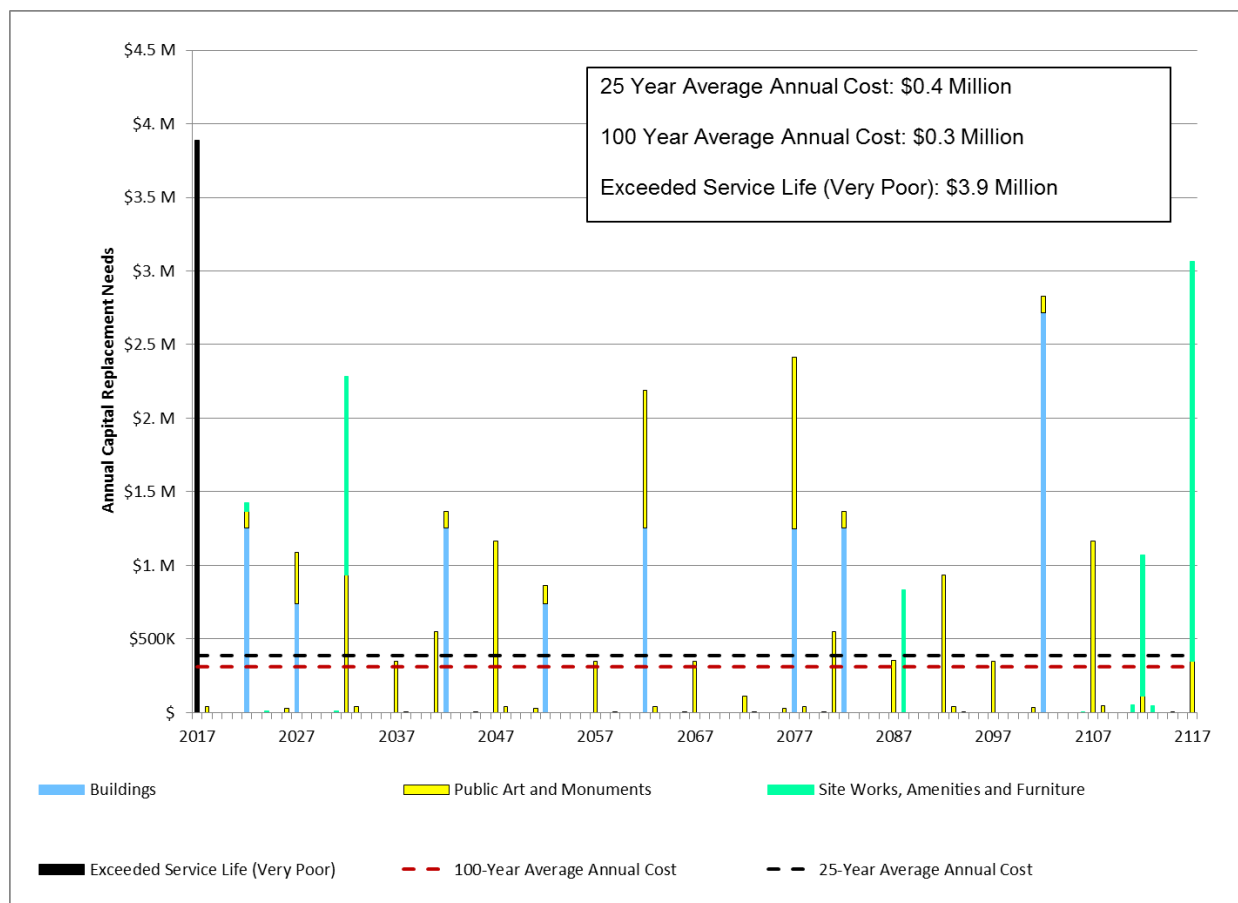
5.1.17. Sanderson Centre (Culture)

Figure 48 shows the forecasted annual investment requirements for the Sanderson Centre (including internal fittings). The analysis shows deferred capital needs of $1.9 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure shows sporadic spikes which typically coincide with work being required on the building. The forecasted 100 year average annual investment requirement is $1.0 million.

Sanderson Centre capital replacement projects are funded through a combination of a Tax-supported dedicated reserve accounts, and provincial and federal grant programs.

Figure 48. Sanderson Centre 100 Year Investment Requirement Forecast
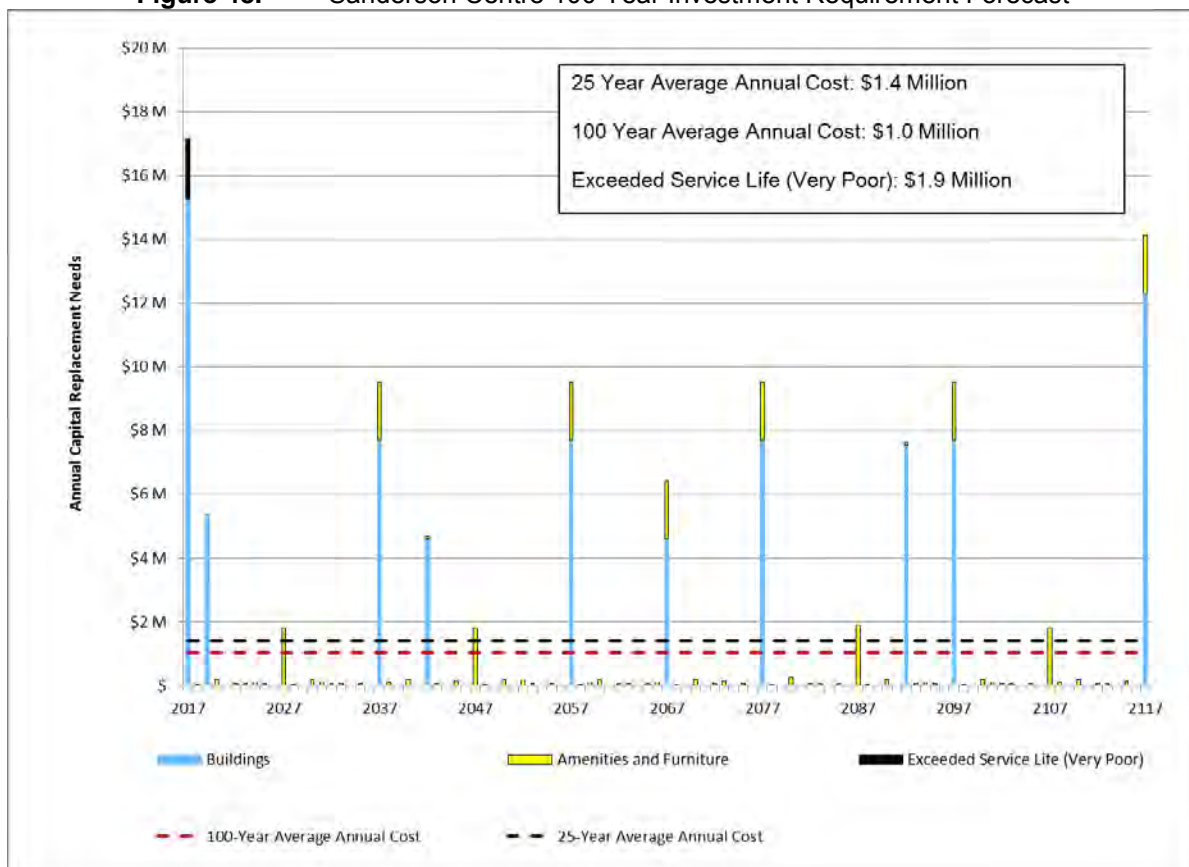
5.1.18. Brownfield Infrastructure

Figure 49 shows the forecasted annual investment requirements for Brownfield Infrastructure. The analysis shows no deferred capital needs, this is due to the infrastructure being installed in 2016 and its having an expected service life of 100 years.

The figure shows sporadic spikes which typically coincide with work being required on the building. The forecasted 100 year average annual investment requirement is $13,800.

Brownfield Infrastructure capital replacement projects are funded from tax supported reserve accounts on an as needed basis.

Figure 49. Brownfield Infrastructure 100 Year Investment Requirement Forecast
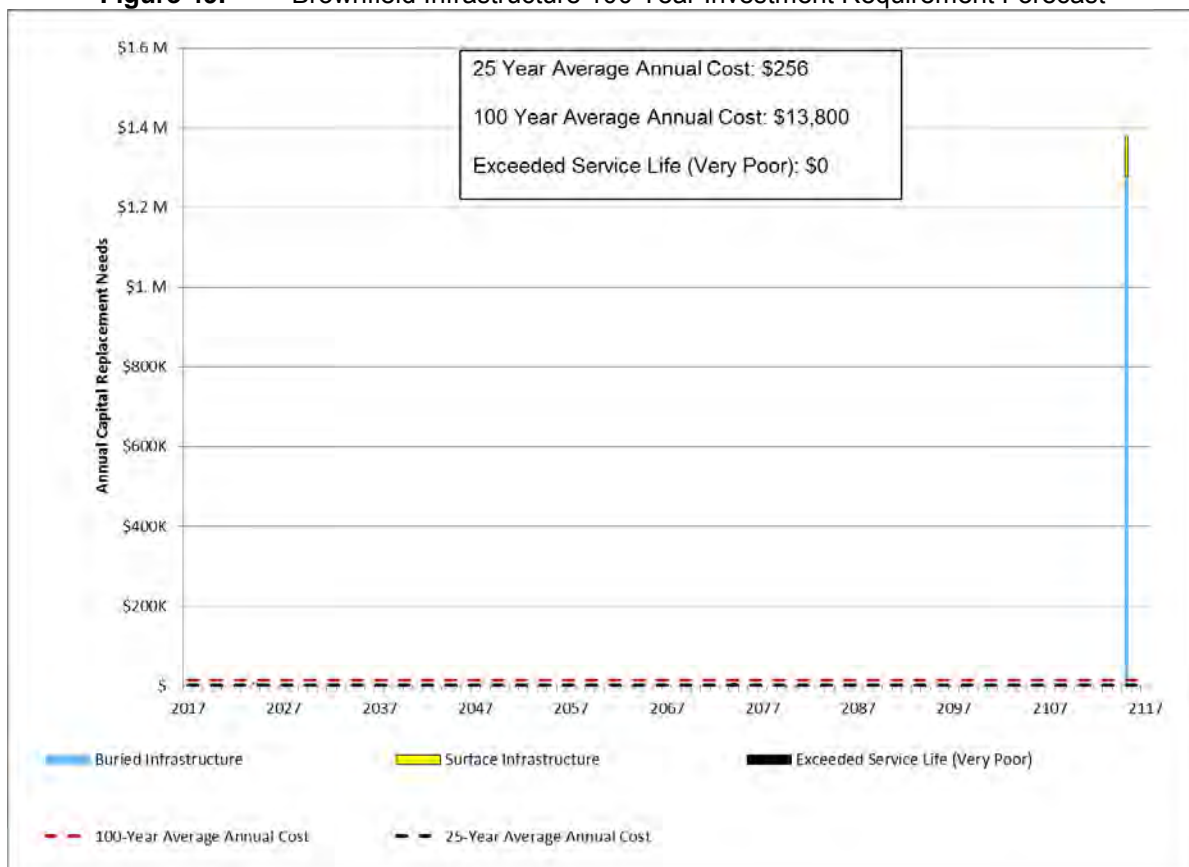
5.1.19. Airport

Figure 50 shows the forecasted annual investment requirements for the City's tourism building and Public Art and Monuments portfolio. The analysis shows deferred capital needs of $7.1 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The figure shows sporadic spikes which typically coincide with work being required on airport pavements and buildings. The forecasted 100 year average annual investment requirement is $0.7 million.

Airport replacement and renewal projects are funded through a combination of user fees, debt, and provincial and federal grant programs. Airport reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs. Airport distribution and collection systems for water, wastewater and stormwater are included with the rest of the City assets under their designated program area.

Figure 50.   Airport 100 Year Investment Requirement Forecast
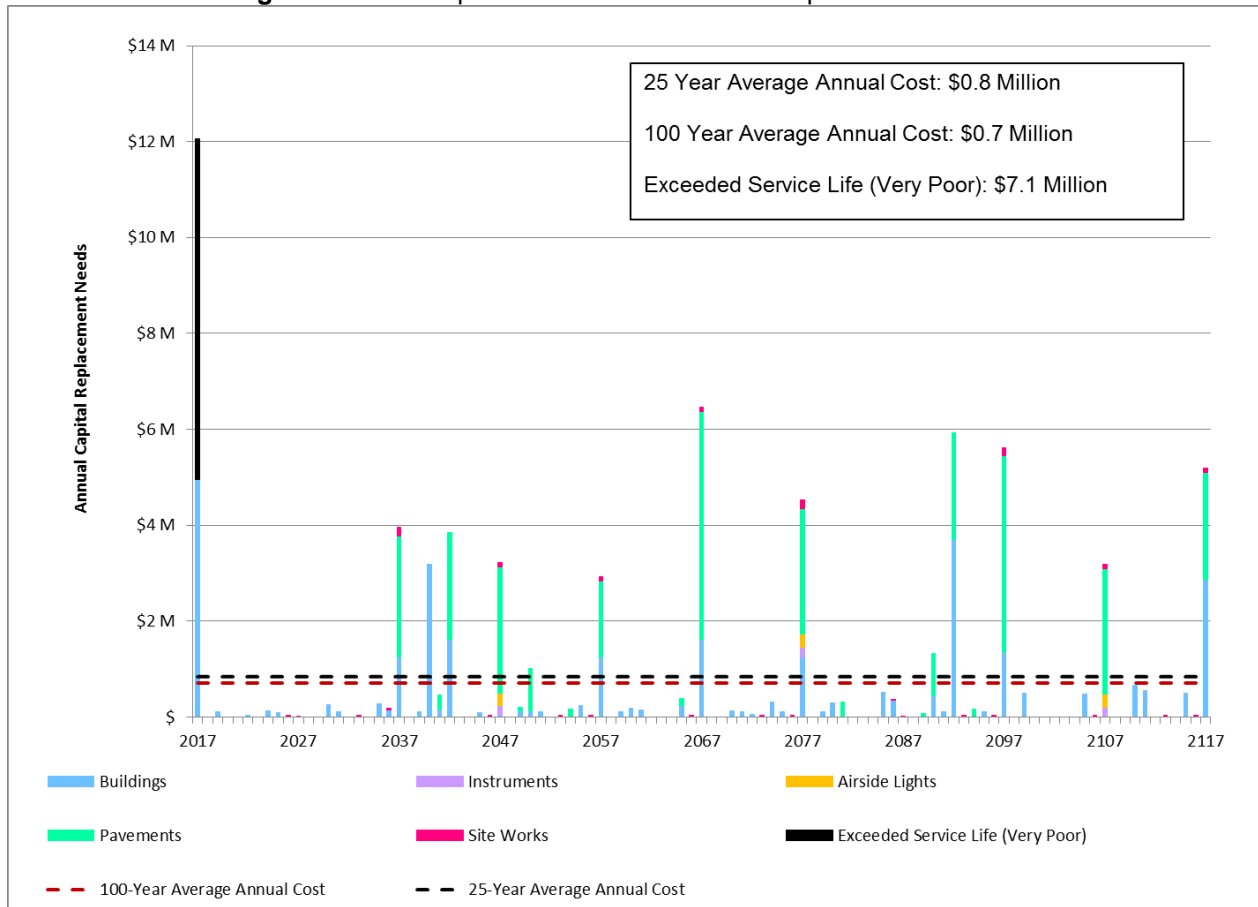
5.1.20. Parks

Figure 51 shows the forecasted annual investment requirements for parks services. The analysis shows deferred capital needs of $24.2 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to large assets or large groups of assets in the bridges, active recreation, arboriculture and amenities and furniture categories with high replacement value(s) reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $5.7 million.

Parks replacement and renewal projects are funded through tax-supported dedicated reserve accounts. Asset reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 51. Parks 100 Year Investment Requirement Forecast
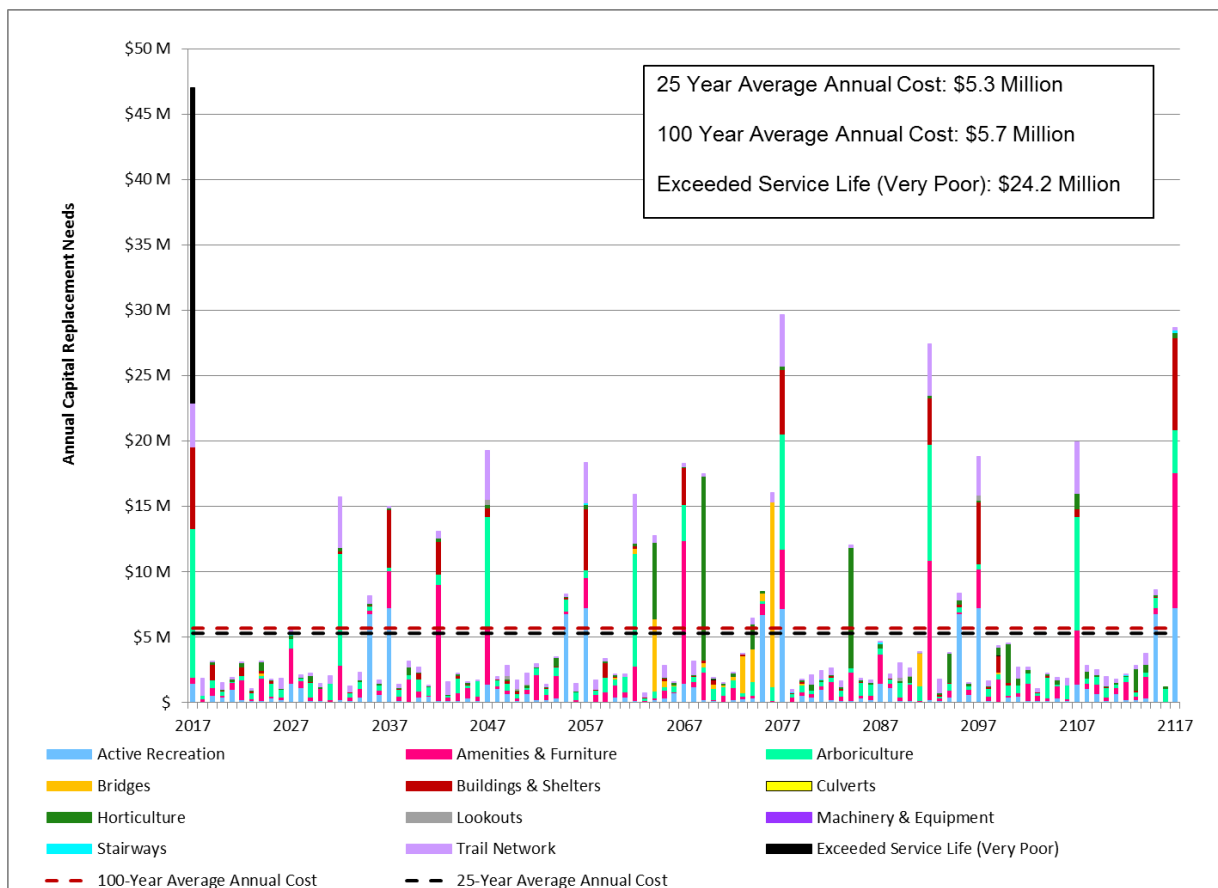
Note:

- *Data for arboriculture is based on an outdated assessment which will be replaced in 2017/2018 with a new inventory. This may result in a reduction of the exceeded service life value.*

5.1.21. Recreation

Figure 52 shows the forecasted annual investment requirements for recreation services. The analysis shows deferred capital needs of $6.2 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to buildings with high replacement value(s) reaching the end of their service lives, and requiring replacement. The forecasted 100 year average annual investment requirement is $3.3 million.

Recreation replacement and renewal projects are funded through user rates and tax-supported dedicated reserve accounts. Asset reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 52.   Recreation 100 Year Investment Requirement Forecast
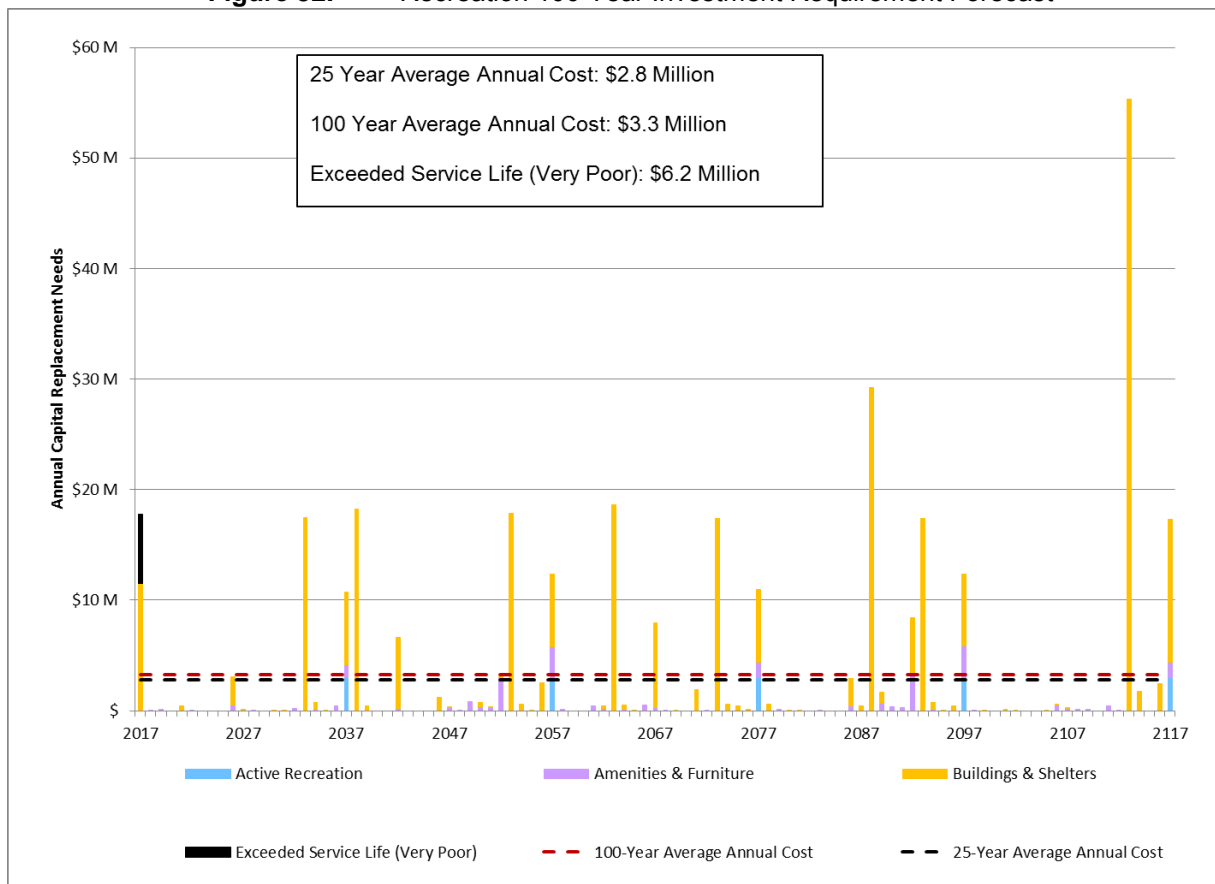
5.1.22. Cemeteries

Figure 53 shows the forecasted annual investment requirements for cemetery services. The analysis shows deferred capital needs of $3.0 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to buildings and pavements with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $0.14 million.

Cemetery replacement and renewal projects are funded through user rates and tax-supported reserve accounts. Asset reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

Figure 53.   Cemeteries 100 Year Investment Requirement Forecast
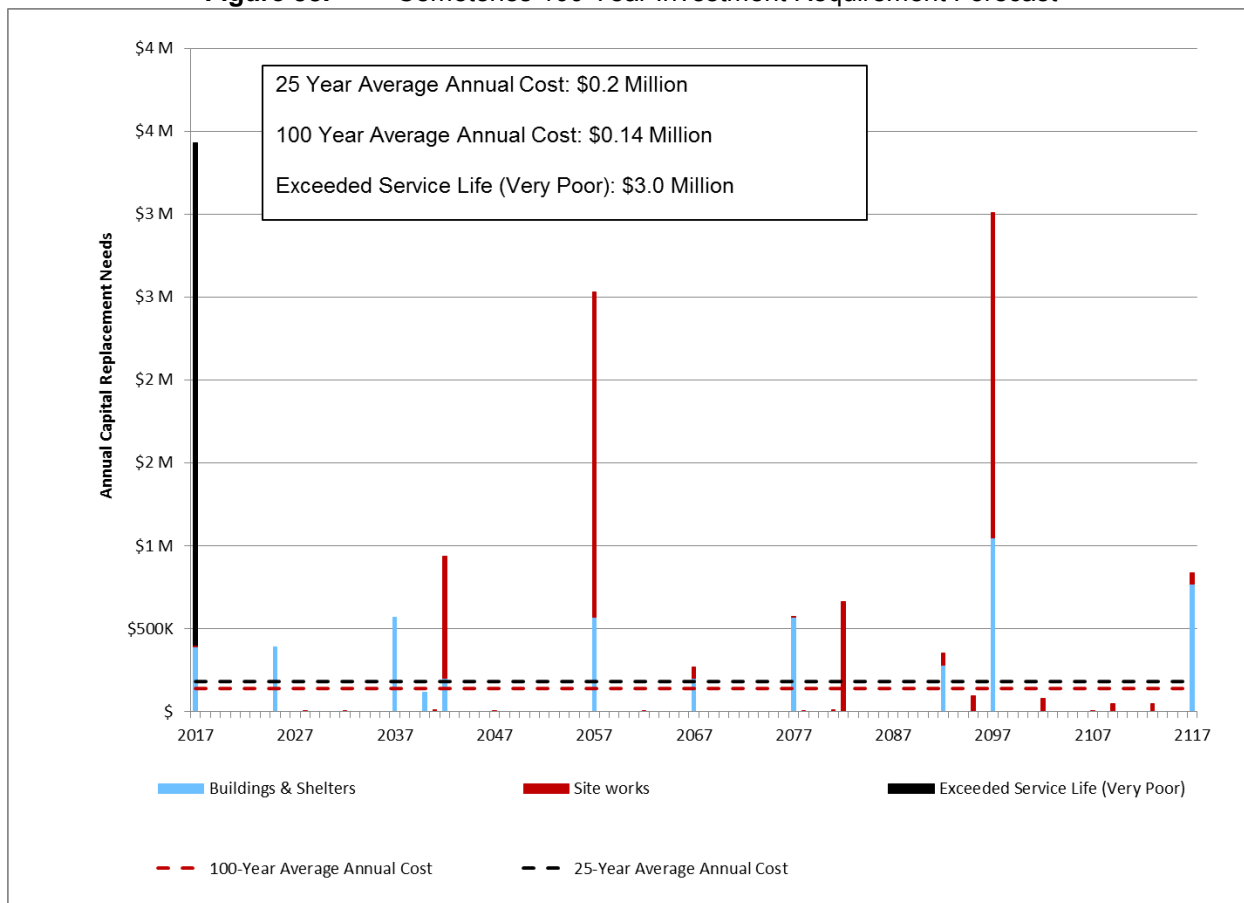
5.1.23. Golf

Figure 54 shows the forecasted annual investment requirements for golf services. The analysis shows deferred capital needs of $3.4 million, which represents overdue capital expenditures or the replacement cost of assets that have exceeded their theoretical service lives.

The analysis shows that there are sporadic spikes throughout the 100 year forecast which are due to buildings and course improvements with high replacement value reaching the end of their service lives, requiring replacement. The forecasted 100 year average annual investment requirement is $0.26 million.

Golf replacement and renewal projects are funded through user rates and where applicable, debt. Asset reconstruction and rehabilitation is typically a component of a variety of project types depending on the project needs.

**Figure 54.** Golf 100 Year Investment Requirement Forecast
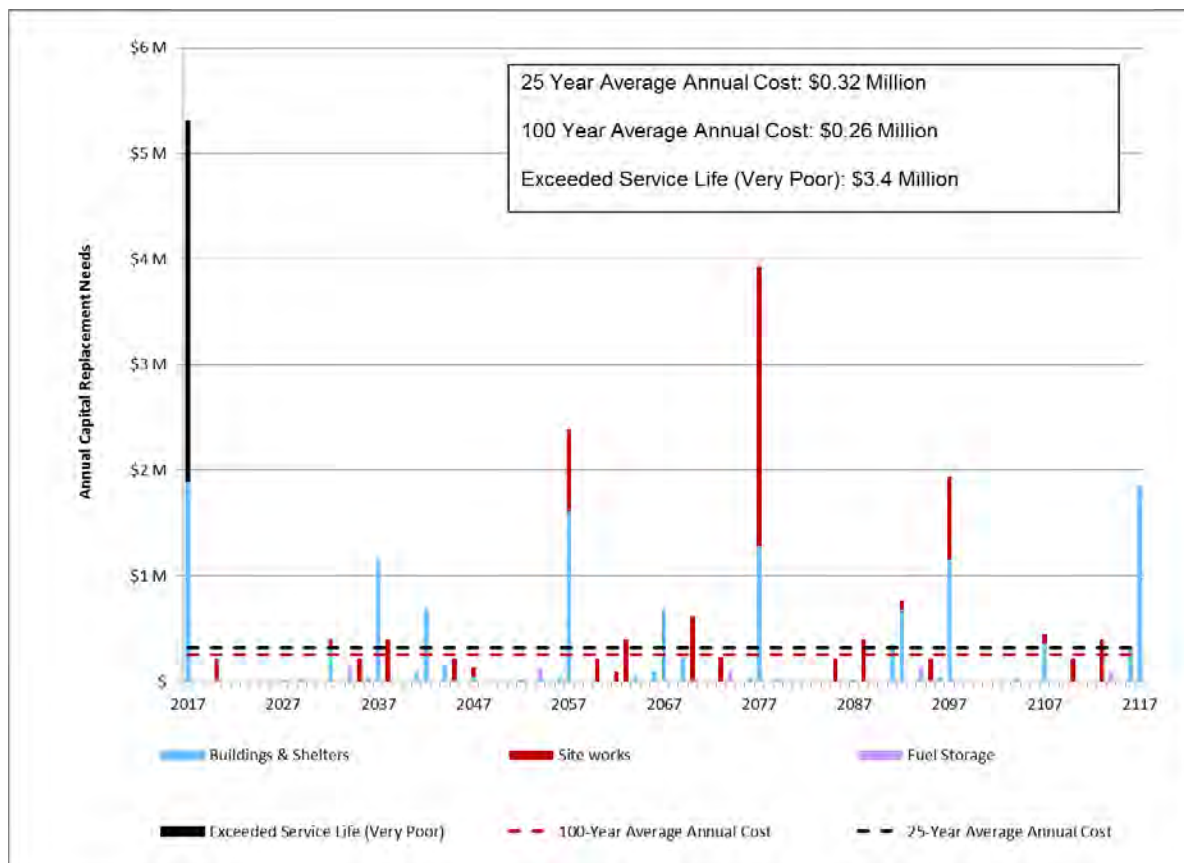
5.1.24. 100 Year Sustainability Forecast Summary

By comparing the 100 year forecasted average annual costs with the current approved funding, the funding gap, or surplus can be estimated. The 2017 approved funding, and the 100 year average annual costs for each program area are shown in Table 12.. It should be noted that the 2017 Approved Funding column represents only the funding that was approved for specific capital projects in each program area, and does not include transfers to reserve accounts or surpluses. The 2017 Approved Funding column does not include growth projects. Growth projects are where the capital assets being constructed are new or substantially different from the existing and do not replace a previously existing asset which has reached the end of its service life. Examples of growth projects include: water distribution lines to subdivisions and community centres in new areas of the City.

To reduce the uncertainties created by the assumptions used to complete this analysis, further study activities are required such as establishing levels of service standards, continued assessment of the physical condition of the infrastructure, determination of capacity backlog and hydraulic / performance constraints, as well as determining the impact of growth and future capacity requirements through master servicing and planning studies.

It is clear that there are challenges to achieving the estimated reinvestment levels identified in the analysis. Staff will continue to use the results of the aforementioned studies in order to conduct analyses to ensure that scarce financial resources are directed to assets with the highest priority for rehabilitation or replacement, ensuring the most efficient use of available funding. This work will also position the City of Brantford to maximize funding opportunities that may become available in the future.

Table 12   Program Area Investment Levels and Anticipated Costs

Program Area	Estimated Remaining Service Life (Condition Category)	Exceeded Service Life - Very Poor ($ Millions)	2017 Lifecycle Replacement Value (Millions)	100 Year Average Annual Cost ($ Millions)	2017-2026 Approved Average Yearly Funding ($ Millions)
Airport	Fair (35%)	$ 7.09	$ 71.70	$ 0.71	$ 0.52
Bridges, Retaining Walls and Culverts - Public Works	Good (59%)	$ 6.48	$ 231.08	$ 2.29	$ 1.52
Brownfield Infrastructure	Very Good (98%)	$ -	$ 1.39	$ 0.01	$ -
Cemeteries	Poor (12%)	$ 3.03	$ 13.93	$ 0.14	$ 0.11
Corporate Fleet	Poor (11%)	$ 13.23	$ 254.32	$ 2.52	$ 2.16
Golf Courses	Fair (27%)	$ 3.42	$ 25.87	$ 0.26	$ 0.02
Parks	Fair (49%)	$ 24.18	$ 573.80	$ 5.68	$ 1.33
Public Works and Admin. Facilities	Fair (45%)	$ 5.59	$ 216.42	$ 2.14	$ 5.60
Recreation	Very Good (78%)	$ 6.23	$ 331.09	$ 3.28	$ 1.23
Road Network	Good (71%)	$ 49.60	$ 2,219.43	$ 21.97	$ 9.91
Sanderson Centre	Fair (35%)	$ 1.89	$ 105.43	$ 1.04	$ 0.17
Sidewalks	Very Good (78%)	$ 0.60	$ 293.87	$ 2.91	$ 0.55
Social Housing	Good (54%)	$ 6.59	$ 545.23	$ 5.40	$ 0.72
Solid Waste and Landfill	Fair (45%)	$ 13.82	$ 270.24	$ 2.68	$ 1.42
Stormwater Collection	Fair (51%)	$ 21.69	$ 401.99	$ 3.98	$ 3.53
Stormwater Facilities	Good (67%)	$ -	$ 25.99	$ 0.26	$ 0.34
Tourism	Fair (44%)	$ 3.89	$ 31.48	$ 0.31	$ 0.04
Transit	Fair (30%)	$ 10.63	$ 266.89	$ 2.64	$ 1.83
Transportation	Good (66%)	$ 0.39	$ 66.35	$ 0.66	$ 0.41
Wastewater Collection	Fair (48%)	$ 12.93	$ 310.42	$ 3.07	$ 3.19
Wastewater Facilities	Fair (40%)	$ 12.02	$ 493.94	$ 4.89	$ 4.68
Water Distribution	Fair (51%)	$ 17.99	$ 352.74	$ 3.49	$ 8.28
Water Facilities	Good (70%)	$ 6.24	$ 673.61	$ 6.67	$ 0.35
Total	**Good (58%)**	**$ 227.53**	**$ 7,777.21**	**$ 77.00**	**$ 47.91**

5.2. 10 Year Capital Budget

In 2013, the City transitioned from a five (5) year capital budget with accompanying unfunded list to a corporation-wide 10 year capital budget. The 10 year budget provides a broader planning horizon, which provides perspective and awareness of future projects outside of traditional short-term plans. In 2013, improvements were also made to format and presentation of the budget documents with the aim of increasing transparency and accountability. Some adjustments include but are not limited to:

- Grouping projects into 'program areas' to be coordinated with similar projects;
- Breaking down project lists into individual streets and boundaries (such as road resurfacing projects, and full corridor construction);
- Summarizing all program areas and projects into a 10 year forecast document as shown in **Table 13**;
- Linking all project funding with reserve funds to review impacts of project implementation scenarios;
- Adding key project data, drivers and attachments to the project detail sheets; and
- Removal of the 'unfunded' list to ensure all projects are reconsidered and re-prioritized on an annual basis.

To facilitate the collection and management of capital project data and ensure a consistent automated process for developing the capital budget documents, the City has invested in budgeting software called Questica which was implemented in early 2017.

An example of the 10 year capital forecast is shown in **Table 13**. The 10 year forecast is a living document and while the first year is what is recommended for approval during the budget cycle, years 2 through 10 are forecasted and may be subject to change as new information becomes available and needs change.

Table 13.   Example of 10 Year Capital Forecast

Page Ref	City of Brantford 2017-2026 Approved Capital Forecast	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
	Total Capital Program	70,441,383	68,517,965	63,041,824	63,221,824	83,896,324	62,672,824	50,200,824	69,235,824	92,419,32	9,233,271
	Public Works	70,193,683	67,782,965	62,976,824	63,031,824	79,906,324	60,677,824	48,945,824	69,220,824	92,389,324	99,193,271
	Bridges	125,000	955,000	1,325,000	100,000	11,566,000	7,000,000	-	-	-	-
261	Bridge Immediate Repair Needs (Various Bridges) (531)	125,000	125,000								
262	Ava Bridge (CNR) Bridge Rehabilitation Program and Intersection Improvements (83)		20,000	700,000		3,500,000					
263	Lorne Bridge Rehabilitation (In conjunction with Project #1190) (830)		750,000			6, 0,000					
264	Veterans Memorial Parkway Bridge over the Grand River Repair/Rehabilitation (792)		60,000	625,000							
265	Eagle Avenue Culvert over Mohawk Waterway Replacement (829)				100,000	566,000					
266	Garden Ave Bridge Rehabilitation Activities (80)					500,000					
267	Erie Ave (Cockshutt) Bridge Rehabilitation Over Grand River (196)					500,000	7,000,000				

Budget year under consideration for approval by Council

5.3. Reserve Fund Forecasts

An analysis technique used typically after all investment needs have been identified by City staff is the reserve fund forecast. This process takes the required capital expenditures, along with the anticipated reserve fund receipts to forecast the balance of the reserve fund in future years. The capital budgeting database application as well as other stand-alone forecast models developed by staff, allow the City to analyze various funding scenarios to identify a financially sustainable budget. Often the capital needs outweigh the anticipated receipts, and therefore the reserve fund forecasts aid in the prioritization of the most critical projects and the evaluation of the risks and service level impacts of maintaining the current investment levels.

An example of a reserve fund forecast is shown in **Figure 55**. This type of analysis shows the impacts that changes in the levels of attainment will have on the reserve fund over the forecasted timespan. Attainment levels are the percentage of the proposed program that is delivered in the year, for example, if 5km of roads have been identified as requiring resurfacing in a year, 100% attainment of that program would be 5km of resurfacing, 50% attainment would be 2.5km of resurfacing, and 10% would be 0.5km of resurfacing. In the example below, the maximum attainment level of the program that can be achieved without resulting in a reserve deficit is 74% of the proposed program.

Figure 55. Sensitivity Analysis for the Impact of Program Scenarios on Reserve Balance
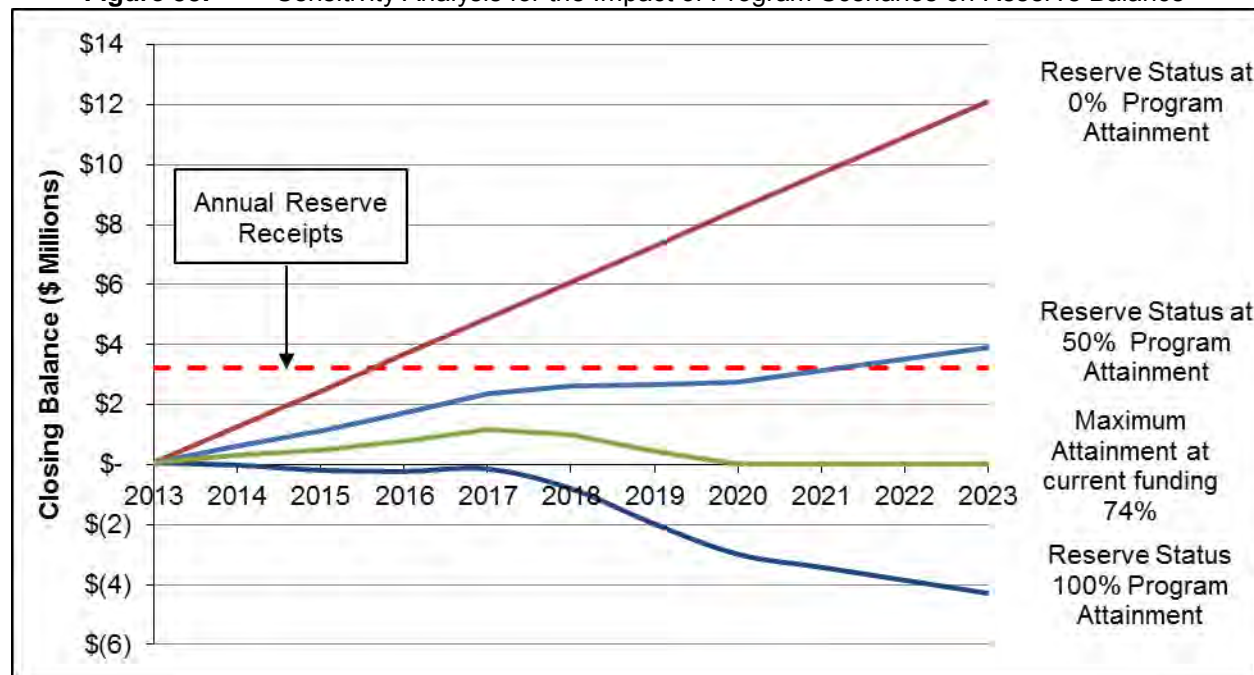
By translating the attainment levels into tangible targets and benchmarks, the City can evaluate, determine and communicate the relationship between the levels of service provided and the true cost of providing that service (i.e. the price/quality relationship). In times where the costs of projects are increasing at a faster rate than the funding levels and resources are increasingly being required to stretch further, this type of analysis can help quantify the impacts of maintaining funding levels, and identify opportunities for re-allocation or changes to levels of service.

Another type of reserve fund forecast is the comparison between annual expenditures and reserve fund closing balance as seen in **Figure 56**. This type of analysis allows the City to evaluate the impact of specific projects, or groups of projects on the future reserve account balance.

Figure 56. Impact Assessment of Funding Levels and Reserve Balance
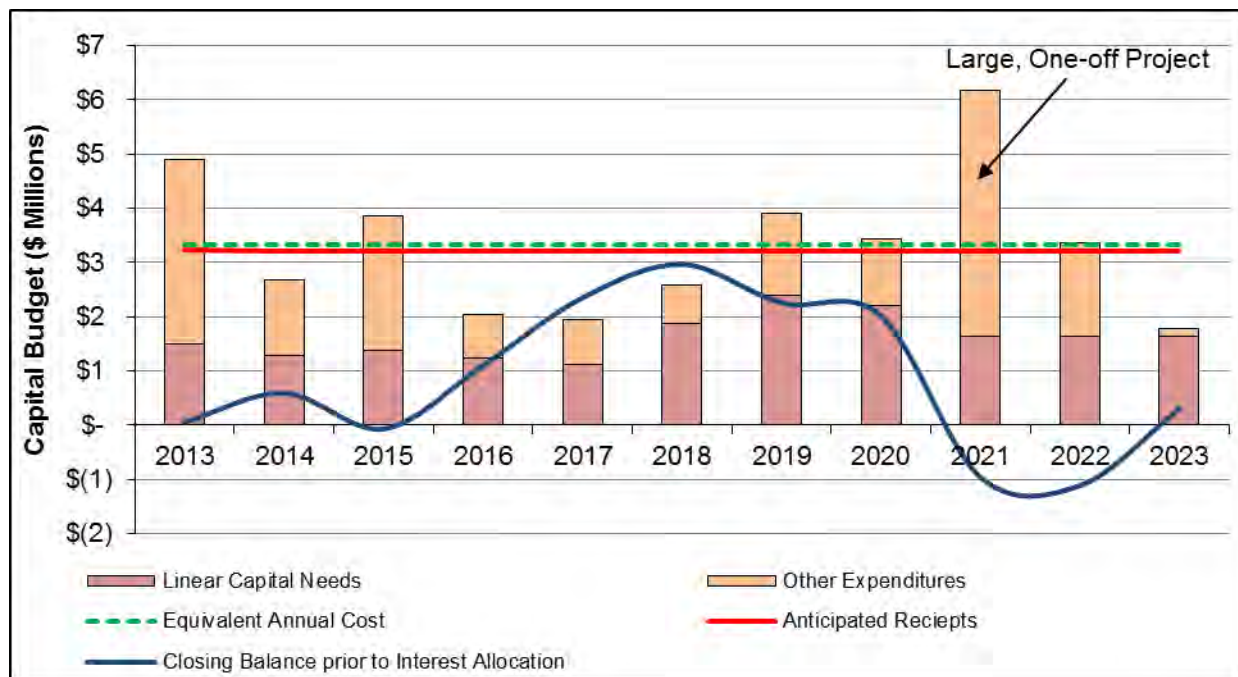
As part of the financial strategy, the City also analyzes capital programs in terms of resourcing and staffing, as well as network replacement targets. For instance, the network attainment targets can be compared with the identified immediate needs to identify how long it would take under the target attainment levels for the immediate needs to be fully addressed. An immediate need is typically a project candidate that has failed or has an observably deteriorated condition that necessitates replacement.

Once the immediate needs are fully addressed, then future proactive projects or increases in levels of service can be planned. Proactive projects are projects that are preventative in nature, and typically consist of replacement, rehabilitation or maintenance of an asset that presents a high risk of failure, but has not yet failed. An example of a proactive replacement project would be the replacement of a cast iron water main in corrosive soil that has 20% remaining service life, but currently has no recorded failures. Increases in levels of service could be asset interventions that raise the quality or performance of an existing asset.

Figure 57 shows an example of one such analysis which takes into account the planned length of the network designed and constructed each year. The identified needs under this scenario will be fully addressed in 2019, therefore allowing for proactive capital projects or increases in levels of service to be planned for the years of 2020 to 2023. While there will always be immediate needs, it is an objective of the City to minimize them where possible through proactive and preventative capital projects.

Figure 57. Evaluating identified needs and opportunities
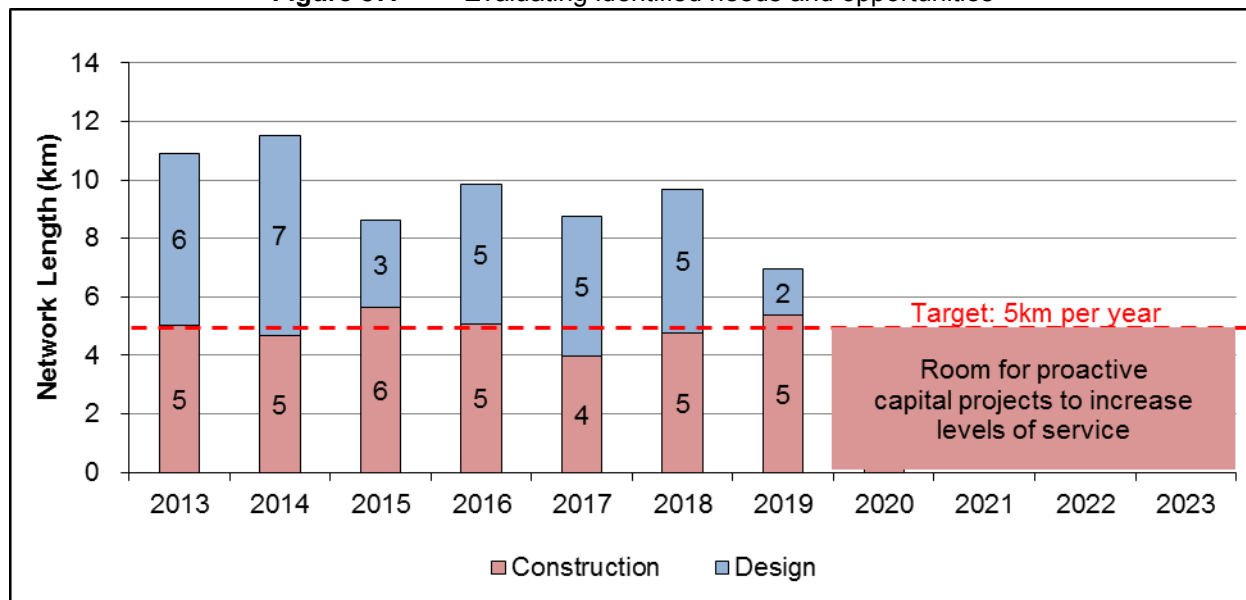
5.4. Benchmarking to the Average Canadian Municipality

The *Canadian Infrastructure Report Card*, generated jointly by the Canadian Construction Association, the Canadian Public Works Association, the Canadian Society for Civil Engineering and the Federation of Canadian Municipalities provides an assessment of the health of municipal infrastructure as reported by cities and communities across Canada. To aide in communication of the amounts being discussed, the Canada report card provides an estimate of infrastructure value per household. The City had 31,448 tax paying residential household in 2016. This number is pre-boundary expansion and does not include rental units in multi-residential units. In order to benchmark Brantford's performance with the rest of Canada, a cost per household has been calculated for all program areas included in the Canada report card, as shown in Table 14. This includes a comparison of the assets in Very Poor and Poor condition in the available program areas as well as a comparison of the reinvestment rate. Some program areas are not included the report card therefore a comparison cannot be made and they have not been included in the table.

The City is generally meeting or exceeding the reinvestment rates of the average Canadian municipality, with the exception of Parks & Recreation which is below the Canada wide rate. While this is accurate, as shown in Table 12, approved funding amounts (reinvestment) are generally below the 100 year average annual cost. It should be noted that the reinvestment rate does not include expansion and growth related capital projects. Therefore while it is a positive sign that the City is generally meeting or exceeding the reinvestment levels of the average Canadian municipality, it is still lower than the calculated required amount to replace assets as they reach the end of their service lives.

Table 14   Replacement Value per Household ($/hhld)

Program Area	Canada Wide ($/hhld)	Brantford ($/hhld)	Assets in Very Poor & Poor Condition Canada Wide ($/hhld)	Assets in Very Poor & Poor Condition Brantford ($/hhld)	Actual Reinvestment Rate Canada Wide	Actual Reinvestment Rate Brantford
Bridges and Other Road Structures	$ 3,553	$ 5,126	$ 145	$ 442	0.8%	0.9%
Parks & Recreation	$ 3,583	$ 9,234	$ 655	$ 1,316	1.3%	0.9%
Public Works & Admin. Facilities	$ 4,913	$ 2,060	$ 873	$ 236	1.7%	8.6%
Road Network & Sidewalks	$23,105	$27,242	$ 3,491	$ 1,809	1.1%	1.2%
Stormwater Network & Facilities	$ 9,357	$11,310	$ 727	$ 1,138	0.8%	1.1%
Transit	$ 5,600	$ 1,265	$ 655	$ 498	Unavailable	4.6%
Wastewater Network & Facilities	$16,380	$12,590	$ 1,891	$ 1,464	1.1%	2.0%
Water Network & Facilities	$14,507	$14,101	$ 1,818	$ 1,900	1.0%	1.9%
Total/ Average	**$80,998**	**$82,928**	**$10,255**	**$8,803**	**1.1%**	**2.7%**

5.5. Compliance Requirements

In 2015, the Association of Municipalities Ontario, who administers the Federal Gas Tax Agreement on behalf of the Federal Government, issued a compliance requirement for City AMPs. The requirement is that the total replacement cost of Tangible Capital Assets (TCAs) included in the asset management plan is to be expressed as a percentage of the total replacement costs of all TCAs report in Schedule 51 of the Financial Information Return (FIR) made annually by the City.

Table 15 shows the replacement values of TCAs included in the AMP and Schedule 51 of the FIR as well as the percentage of FIR assets present in the AMP. At this time five (5) FIR asset categories are not included in the AMP. These assets are generally excluded as they belong to departments outside public works and are therefore outside the current mandate of the Facilities and Asset Management Department. FIR values have been adjusted from their acquisition year to 2017 dollars using NRBCPI values (Non-Residential Building Construction Price Index). It should also be noted that replacement values for the AMP include inflationary factors for construction and non-construction soft costs which are

generally not included in the FIR values, this leads to some categories showing as over 100% inclusion of FIR assets. It is expected as subsequent versions of this table are completed, that a trend analysis of the inclusion percentage will also be included. The trend in inclusion percentage is expected to illustrate whether additional assets are being included in subsequent plans.

Table 15   FIR-AMP Comparison

FIR Category	FIR Account	FIR Amounts Adjusted to 2017	AMP Amounts for 2017	Percentage of FIR Included in AMP
Assets Not Included in FIR	0000 Assets Not Included in FIR		$ 74,449,480.00	No Assets in FIR
Environmental Services	0811 Wastewater Collection	$ 318,064,000.00	$ 237,983,900.00	75%
	0812 Wastewater Treatment	$ 178,225,000.00	$ 159,228,900.00	89%
	0821 Urban Storm Sewer	$ 400,426,000.00	$ 356,083,900.00	89%
	0831 Water Treatment	$ 165,200,000.00	$ 197,686,100.00	120%
	0832 Water Distribution	$ 269,582,000.00	$ 248,171,000.00	92%
	0850 Solid Waste Disposal	$ 34,728,000.00	$ 62,019,600.00	179%
General Government	0299 General Government	$ 42,945,000.00	$ 46,627,500.00	109%
	0260 Program Support			No Assets in FIR
Health Services	1040 Cemeteries	$ 3,027,000.00	$ 5,318,480.00	176%
Planning and Development	1820 Tourism/Market	$ 7,410,000.00	$ 7,294,200.00	98%
Protection Services	0410 Fire	$ 22,128,000.00	Not Currently Included in AMP	
	0420 Police	$ 29,313,000.00	Not Currently Included in AMP	
	0422 Prisoner Transport	$ 156,000.00	Not Currently Included in AMP	
	0440 Protective Inspection	$ 111,000.00	$ 110,600.00	100%
Recreation and Cultural Services	1610 Parks	$ 43,274,000.00	$ 95,909,040.00	222%
	1631 Rec Facilities - Golf/Marina/Ski Hill	$ 6,262,000.00	$ 10,383,600.00	166%
	1634 Rec Facilities - All Other	$ 131,322,000.00	$ 124,766,200.00	95%
	1645 Museums (Bell Homestead)	$ 2,080,000.00	$ 2,095,600.00	101%
	1650 Cultural Services (Sanderson/Glenhyrs	$ 20,303,000.00	$ 36,923,700.00	182%
Social and Family Services	1210 General Assistance - Ont Works	$ 1,113,000.00	Not Currently Included in AMP	
	1230 Child Care (Beryl Angus)	$ 1,081,000.00	Not Currently Included in AMP	
Social Housing	1410 Public Housing (LHC)	$ 133,293,000.00	$ 151,187,200.00	113%
	1420 Non-Profit/Co-Operative Housing	$ 6,628,000.00	$ 43,970,300.00	663%
	1497 Other (Afford. Hous. 40 Queen)	$ 3,141,000.00	$ 2,030,700.00	65%
Transportation Services	0611 Roads - Paved	$ 330,125,000.00	$ 688,862,400.00	209%
	0613 Roads - Bridges/Culverts	$ 68,959,000.00	$ 158,809,300.00	230%
	0614 Roadside - Sidewalks/Signs/Signals	$ 70,300,000.00	$ 138,476,500.00	197%
	0621 Winter Control - excl. Sidewalks/Parki	$ 1,397,000.00	$ 1,396,500.00	100%
	0622 Winter Control - Sidewalks/Parking Lo	$ 625,000.00	$ 624,500.00	100%
	0631 Transit - Conventional	$ 31,462,000.00	$ 39,559,300.00	126%
	0632 Transit - Disabled	$ 1,531,000.00	$ 1,228,500.00	80%
	0640 Parking	$ 25,893,000.00	$ 27,939,700.00	108%
	0650 Street Lighting	$ 22,120,000.00	$ 51,388,400.00	232%
	0660 Air Transportation	$ 16,175,000.00	$ 24,991,300.00	155%
		$ 2,388,399,000.00	$2,995,516,400.00	125%

6. Conclusions

This document presents a historic perspective of Brantford's Asset Management implementation, ongoing activities, and areas of continuous improvement. Through community-based consultation which included input from residents, businesses, community organizations and staff, the City has developed a collection of strategic visions, goals and action valued by the community. Out of these visions, goals, and actions many initiatives have been implemented, and in 2006 one such initiative commenced with the development of a strategic infrastructure management plan for the road right of way system, as a step towards ensuring optimal infrastructure planning and maintenance.

In 2011, Council approved an organizational restructuring which resulted in the creation of a dedicated Facilities and Asset Management Department. The existing Facilities Management and Geographic Information System (GIS) divisions were moved into the new department along with the creation of a new Capital Planning division. By moving the asset management planning function from various groups into a centralized division, it enabled other departments to focus on their respective area, while allowing a consistent approach to asset management across the Public Works Commission.

In 2012, the City of Brantford released its first report card on public works infrastructure which offered an objective assessment of the state of infrastructure management, asset replacement values, asset condition, financial contributions and funding requirements for the City's Public Works infrastructure. For the 2017 Asset Management Plan, the City has updated the report card. The report card found that overall the City's infrastructure is in good condition, with approximately 12% of assets in poor and very poor rating categories. To overcome data gaps, an approach has been employed to measure and quantify the confidence in the data, and then to develop an action plan to improve the confidence in the data for future iterations. This approach identified that in 10 out of 14 program areas in this asset management plan, the data has improved since 2013 and 9 new program areas have been added.

In 2017, the City of Brantford expanded its asset management plan to include assets managed by the Parks and Recreation Commission. The inclusion of these assets will allow for more informed decision making for both the Parks and Recreation Commission and the Public Works Commission as it allows a more complete picture of capital requirements for multiple City commissions and not just Public Works or Parks and Recreation in isolation. This will allow better prioritization of critical projects throughout the City.

The City of Brantford has embarked on a number of initiatives to monitor the levels of service provided by the City's infrastructure. These initiatives include meeting regulatory requirements, national benchmarking initiatives, standard operating procedures, best practice reviews and condition assessments.

Short and long term analyses are used at the City with the goal of developing sustainable infrastructure capital plans and financing strategies. Theses analyses include a 100 year sustainability forecasts, a 10 year capital budget, and reserve fund forecasts. In 2013, the City transitioned to the implementation of a corporation-wide 10 year capital budget. A 10 year budget planning horizon provides perspective and awareness of future projects outside of the traditional short term plans. In addition to transitioning to a 10 year budget, several improvements have been made to format and presentation of the budget documents with the aim of increasing transparency and accountability.

Asset management at the City of Brantford is continually improving, striving towards efficiently managing assets to meet the service needs of the present without compromising the sustainability of its

infrastructure for the demands of the future. This is being accomplished by implementing approaches to better understand the assets for which the City is responsible, the condition of these assets, how to maintain the assets to maximize useful life, and how to budget appropriately so assets can be replaced when needed. This all supports the movement towards being recognized as a well-managed city that provides efficient and effective government services while remaining fiscally responsible.

7. Next Steps

As well as providing a historical perspective of asset management practices, procedures and principles at the City, the Asset Management Plan has delivered value in highlighting some 'gaps' and opportunities for improvement, for which action plans can be developed with the goal of further enriching Brantford's holistic and progressive approach to asset management. **Table 16** to **Table 19** include preliminary action plans that support each of the sections of the asset management plan and Brantford's overall asset management program. It should be noted that the action plans are tentative, still require input from staff and council in places, and are subject to change depending on factors such as priority and timing.

Table 16.   Preliminary Action Items Pertaining to the State of the Local Infrastructure

Activity / Action Item	Proposed Timing	Responsible Department
• Consider inclusion of all remaining City assets / program areas in subsequent iterations of the report card (e.g. Long Term Care, Protection Services).	N/A	
• Routinely report back to Senior Management and Council on the state of local infrastructure.	Bi-Annually	Public Works
• Maintain annual facility condition investigation / audit program (via capital budget process). Include Parks, Recreation, Golf, Cemeteries and Airport buildings in program.	Annually	Public Works
• Maintain Roadway drivability and condition assessment study to enhance condition data for the City's road network.	3 years	Public Works
• Undertake roadway surface/ furniture inventory (intersections, street lighting, bus stops) to augment asset inventory records.	2017	Public Works
• Maintain annual Traffic Sign reflectivity analysis for all City signs.	Annually	Public Works
• Coordinate findings of OSIM inspections with known maintenance backlog to develop a comprehensive capital re-investment program for the City's bridges.	Bi-Annually	Public Works/ Parks and Rec.
• Undertake specialized condition assessment activities for the City's sanitary and storm trunk system (large diameter collection trunks).	Ongoing	Public Works
• Continue with condition assessment and bathymetric surveys of the City's stormwater management ponds to ascertain current condition and identify capital re-investment requirements to ensure design integrity and functionality.	Ongoing	Public Works

Activity / Action Item	Proposed Timing	Responsible Department
• Maintain CCTV inspection program of the City's sanitary and stormwater linear network. Work to prioritize inspection needs, determine return frequencies, etc.	Ongoing	Public Works
• Identify departmental responsibility for undertaking on-going building condition audits for Social Housing providers (initial study completed in 2013).	2018-2019	Social Housing
• Ongoing annual unit inspections of social and affordable housing units; periodic building envelope inspections and review of building elements	2017-2020	Social Housing
• Continue with condition assessment program for the City's sidewalk network	3 years	Public Works
• Undertake street and park tree inventory and condition assessment to replace existing asset inventory records.	2017	Parks and Rec.
• Continue with monthly trail and play equipment condition assessments to prioritize maintenance and capital repair needs.	Ongoing	Parks and Rec.
• Complete Parks sign inventory using City staff and update GIS inventory.	2017	Parks and Rec.
• Maintain GIS inventories of City assets. Coordinate updates between City commissions.	Ongoing	Public Works/ Parks and Rec.
• Continue with condition assessment program for the City's Public Art and Monuments	5 years	Tourism

Table 17.   Preliminary Action Items Pertaining to the Desired Levels of Service

Activity / Action Item	Proposed Timing	Responsible Department
• Conduct annual review of NWWBI data metrics for level of service standings, utility goal attainment and comparators; identify potential areas for improvement	Annual	Public Works
• Monitor best practices and industry standards pertaining to levels of service - consider implementation at the City where appropriate	Ongoing	Public Works/ Parks and Rec./ Social Housing
• Unit maintenance and restoration standards policy has been reviewed and updated to reflect appropriate property standards, staff continue to fully implement policy	2017-2018	Social Housing
• Implement social and affordable housing units preventative maintenance plan and asset management software solutions to enhance building condition reviews completed by staff in 2017-2018	2018-2020	Social Housing
• Update the Parks and Recreation Master Plan	2017	Parks and Rec.

Table 18.   Preliminary Action Items Pertaining to the Asset Management Strategy

Activity / Action Item	Proposed Timing	Responsible Department
• Augment or optimize existing data systems for operability and harmonization across the organization.	Ongoing	Public Works/ Parks and Rec./ Social Housing
• Complete the implementation of an activity tracking or computerized work management software system for Public Works	Ongoing	Public Works
• Continue to develop and formalize asset prioritization and criticality frameworks.	Ongoing	Public Works
• Work with Finance department to implement new budgeting software including data migration from existing capital planning database	Ongoing	Public Works/ Finance
• Work towards integration of isolated systems, data sources, etc. to optimize capital planning analysis, data consistency, reliability, and sharing.	Ongoing	Public Works
• Continue to maintain water, sanitary and stormwater hydraulic models – develop future methodologies/ business processes around model maintenance, use, and data sharing.	Ongoing	Public Works
• Continue with Condition Assessment and Inspection projects identified in Table 6 of Asset Management Strategy.	Ongoing	Public Works/ Parks and Rec. / Social Housing
• Harmonize growth related needs with capital replacement/rehabilitation needs utilizing outputs from the Official Plan, Master Servicing & Transportation Master Plan and associated hydraulic models.	2017-2018	Public Works
• Staff to review and update twenty year capital asset plan for all city-owned social and affordable housing units	2017-2018	Social Housing
• Review and follow best practices with respect to social and affordable asset management practices, including software solutions	2017-2020	Social Housing

Table 19.   Preliminary Action Items Pertaining to the Financing Strategy

Activity / Action Item	Proposed Timing	Responsible Department
• Work with internal stakeholder departments to review capital needs in the context of developing a sustainable infrastructure re-investment plan and associated financing strategies.	Ongoing	Public Works/ Finance/ Parks and Rec./ Social Housing
• Continue to explore and capitalize on harmonizing infrastructure needs were possible (e.g. corridor or right-of-way management) to optimize capital re-investment spending.	Ongoing	Public Works
• Manage and develop sustainable capital plans and reserves to maintain social and affordable housing assets	2017-2020	Social Housing/ Finance

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Appendix 1 Asset Inventory

Appendix 1.1. Road Network

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals			**$ 750,932,100.00**
Other - Roads			
	12,468	**m**	**$3,582,000.00**
Laneways	12,468	m	$3,582,000.00
Roads			
	1,051,116	**Lane m**	**$666,662,000.00**
Local Road	614,998	Lane m	$303,799,000.00
Major Arterial Road	89,211	Lane m	$77,537,000.00
Major Collector Road	92,636	Lane m	$68,744,000.00
Minor Arterial Road	139,248	Lane m	$118,244,000.00
Minor Collector Road	115,023	Lane m	$98,338,000.00
Roadside Structures			
	155	**Ea.**	**$3,337,100.00**
Guiderails	146	Ea.	$2,361,000.00
Sound Barriers	9	Ea.	$976,100.00
Street Furniture			
	34,823	**Ea.**	**$5,723,500.00**
Mountings - Traffic Signs	11,602	Ea.	$241,800.00
Signs - Information	4,278	Ea.	$645,900.00
Signs - Overhead	34	Ea.	$1,982,500.00
Signs - Parking	9,520	Ea.	$1,353,100.00
Signs - Recreational	54	Ea.	$7,900.00
Signs - Regulatory	6,268	Ea.	$946,900.00
Signs - Transit	415	Ea.	$60,300.00
Signs - Unknown	39	Ea.	$6,000.00
Signs - Warning	2,558	Ea.	$424,100.00
Waste Receptacles	55	Ea.	$55,000.00
Street Lighting			
	14,252	**Ea.**	**$51,388,400.00**
Fixtures and Wiring	10,045	Ea.	$44,240,600.00
Poles - Street Lights	4,207	Ea.	$7,147,800.00
Traffic and Roadside			
	138	**Ea.**	**$20,239,100.00**
Signalized Intersection - with fire pre-emption	109	Ea.	$16,419,800.00
Signalized Intersection - without fire pre-emption	29	Ea.	$3,819,300.00

Appendix 1.2. Sidewalks

AssetClass	Quantity	Length (m)	Replacement Cost ($)
Totals	**580,324**		**$ 105,780,000.00**
Sidewalks			
	580,324	**m**	**$105,780,000.00**
Asphalt Sidewalk	11,240	m	$3,556,000.00
Brick Sidewalk	2,922	m	$632,000.00
Concrete Sidewalk	566,162	m	$101,592,000.00

Appendix 1.3. Bridges, Retaining Walls and Culverts

Asset Class		Quantity 1	Unit 1	Quantity 2	Unit 2	Replacement Cost ($)
Totals		**206**	**each**	**6165**	**m**	**$ 160,910,700.00**
Bridges - Public Works		**27**	**each**	**1192**	**m**	**$129,486,600.00**
	Pedestrian Structures	6	each	183	m	$5,753,300.00
	Railway Structures	9	each	139	m	$6,226,900.00
	Vehicle Structures	12	each	871	m	$117,506,400.00
Culverts < 3m - Public Works		**129**	**each**	**3008**	**m**	**$22,888,400.00**
	Vehicle Structures	129	each	3008	m	$22,888,400.00
Culverts OSIM Inspected - Public Works		**25**	**each**	**1007**	**m**	**$6,347,900.00**
	Pedestrian Structures	1	each	45	m	$299,000.00
	Vehicle Structures	24	each	962	m	$6,048,900.00
Retaining Walls - Public Works		**11**	**each**	**817**	**m**	**$1,507,300.00**
	Retaining Wall - Concrete	3	each	239	m	$604,500.00
	Retaining Wall - Landscape Stone	8	each	578	m	$902,800.00
Stairways - Public Works		**14**	**each**	**141**	**m**	**$680,500.00**
	Pedestrian Structures	14	each	141	m	$680,500.00

Appendix 1.4. Drinking Water
1.4.1 Water Distribution

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**527,678**		**$ 245,760,000.00**
Chambers			
	224	**Ea.**	**$3,121,000.00**
Chambers	224	Ea.	$3,121,000.00
Hydrants			
	2,656	**Ea.**	**$19,146,000.00**
Water Hydrants	2,656	Ea.	$19,146,000.00
Laterals - Water			
	34,770	**Ea.**	**$42,650,000.00**
Commercial/Institutional	2,111	Ea.	$3,501,000.00
Industrial	415	Ea.	$1,721,000.00
Landscaping	118	Ea.	$137,000.00
Residential	32,120	Ea.	$37,283,000.00
Unspecified	6	Ea.	$8,000.00
Watermains			
	490,028	**m**	**$180,843,000.00**
0 - 150mm	209,587	m	$51,625,000.00
200 - 450 mm	255,958	m	$100,312,000.00
475mm or greater	24,480	m	$28,906,000.00

1.4.2 Water Facilities

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**184**		**$ 197,686,100.00**
Buildings - Water	**32**	**Ea.**	**$190,502,300.00**
Detached/Semi-Detached Buildings	1	Ea.	$177,700.00
Laboratory	5	Ea.	$108,588,300.00
Office Building	4	Ea.	$7,011,700.00
Pumping Stations	6	Ea.	$42,088,300.00
Specialty Structures	3	Ea.	$4,576,500.00
Storage Sheds	6	Ea.	$1,531,300.00
Storage Tanks	6	Ea.	$26,204,400.00
Treatment Plant	1	Ea.	$324,100.00
Site Works - Water	**152**	**Ea.**	**$7,183,800.00**
Canal	2	Ea.	$4,928,000.00
Facility Access	1	Ea.	$755,300.00
Outdoor Light Poles - Parking Lots	27	Ea.	$48,000.00
Outdoor Light Poles - Purpose Unknown	56	Ea.	$112,100.00
Outdoor Lighting - Parking Lots	64	Ea.	$305,600.00
Parking Lots	2	Ea.	$1,034,800.00

Appendix 1.5. Wastewater

1.5.1 Wastewater Collection

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**463,183**		**$ 236,696,000.00**
Laterals - Wastewater				
		26,983	**Ea.**	**$33,557,000.00**
	Commercial/Institutional	138	Ea.	$172,000.00
	Industrial	91	Ea.	$113,000.00
	Landscaping	1	Ea.	$1,000.00
	Residential	26,747	Ea.	$33,264,000.00
	Unspecified	6	Ea.	$7,000.00
Local Sewers - Wastewater		**370,455**	**m**	**$101,701,000.00**
	150 - 250 mm	319,356	m	$83,599,000.00
	300 - 400 mm	51,099	m	$18,102,000.00
Maintenance Holes - Wastewater		**5,972**	**Ea.**	**$23,375,000.00**
	Cover - 70 cm Diameter	3,655	Ea.	$14,306,000.00
	Cover - Rectangular	255	Ea.	$997,000.00
	Cover - Unknown	2,062	Ea.	$8,072,000.00
Trunk Sewers - Wastewater		**59,773**	**m**	**$78,063,000.00**
	450 - 900 mm	40,681	m	$36,677,000.00
	975 mm or greater	19,093	m	$41,386,000.00

1.5.2 Wastewater Facilities

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**42**		**$ 159,228,900.00**
Buildings - Wastewater		**35**	**Ea.**	**$157,392,000.00**
	Laboratory	3	Ea.	$16,770,100.00
	Office Building	1	Ea.	$2,368,900.00
	Pumping Stations	9	Ea.	$32,994,700.00
	Specialty Structures	1	Ea.	$403,800.00
	Storage Sheds	1	Ea.	$59,200.00
	Storage Tanks	15	Ea.	$77,864,900.00
	Treatment Plant	4	Ea.	$18,348,900.00
	Warehouses	1	Ea.	$8,581,500.00
Site Works - Wastewater		**7**	**Ea.**	**$1,836,900.00**
	Facility Access	2	Ea.	$1,333,000.00
	Lagoons	1	Ea.	$388,000.00
	Parking Lots	4	Ea.	$115,900.00

Appendix 1.6. Stormwater
1.6.1 Stormwater Collection

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**418,984**		**$ 340,735,000.00**
Laterals - Stormwater		**6,945**	**Ea.**	**$8,637,000.00**
	Commercial/Institutional	36	Ea.	$45,000.00
	Industrial	24	Ea.	$30,000.00
	Residential	6,883	Ea.	$8,560,000.00
	Unspecified	2	Ea.	$2,000.00
Local Sewers - Storm		**202,493**	**m**	**$71,681,000.00**
	150 - 250 mm	12,666	m	$4,490,000.00
	300 - 400 mm	189,827	m	$67,191,000.00
Maintenance Holes - Storm		**5,556**	**Ea.**	**$21,742,000.00**
	Cover - 70 cm Diameter	798	Ea.	$3,123,000.00
	Cover - Rectangular	63	Ea.	$247,000.00
	Cover - Unknown	4,695	Ea.	$18,372,000.00
Stormwater - Inlets		**11,873**	**Ea.**	**$22,237,000.00**
	Catchbasin	11,365	Ea.	$20,485,000.00
	Ditch Inlet/Outlet	53	Ea.	$98,000.00
	Inlet Leads	122	Ea.	$345,000.00
	Open Lid Manhole	333	Ea.	$1,309,000.00
Trunk Sewers - Storm		**192,117**	**m**	**$216,438,000.00**
	450 - 900 mm	150,096	m	$125,337,000.00
	965 mm or greater	42,019	m	$91,101,000.00

1.6.2 Stormwater Facilities

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**24**		**$ 14,929,100.00**
Buildings - Stormwater		**1**	**Ea.**	**$2,723,100.00**
	Pumping Stations	1	Ea.	$2,723,100.00
Site Works - Stormwater		**23**	**Ea.**	**$12,206,000.00**
	Control Gates	2	Ea.	$1,730,000.00
	Detention Ponds	21	Ea.	$10,476,000.00

Appendix 1.7. Solid Waste and Landfill

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**65**		**$61,987,500.00**
Buildings - Landfill		**19**	**Ea.**	**$25,337,400.00**
	Chamber	6	Ea.	$435,000.00
	Detached/Semi-Detached Buildings	1	Ea.	$154,000.00
	Generation Plant	1	Ea.	$16,200,200.00
	Industrial (Vehicle Maintenance)	1	Ea.	$787,500.00
	Picnic Shelters	1	Ea.	$127,900.00
	Pumping Stations	3	Ea.	$4,460,900.00
	Specialty Structures	3	Ea.	$2,203,100.00
	Storage Sheds	2	Ea.	$234,500.00
	Warehouses	1	Ea.	$734,300.00
Computer Software - Landfill		**1**	**Ea.**	**$9,000.00**
	Computer Software	1	Ea.	$9,000.00
Control Systems - Landfill		**2**	**Ea.**	**$25,000.00**
	Control Gates	1	Ea.	$9,000.00
	Control Systems	1	Ea.	$16,000.00
Landfill Cells		**28**	**Ea.**	**$33,055,000.00**
	Bins	4	Ea.	$196,000.00
	Carts	3	Ea.	$116,000.00
	Fencing/Retaining Wall	2	Ea.	$255,000.00
	Land	2	Ea.	$2,390,000.00
	Landfills/Wells/Transfers/Misc.	16	Ea.	$29,976,000.00
	Water Systems	1	Ea.	$122,000.00
Site Works - Landfill		**14**	**Ea.**	**$3,523,100.00**
	Detention Ponds	1	Ea.	$75,000.00
	Facility Access	3	Ea.	$2,124,200.00
	Outdoor Lighting - Parking Lots	7	Ea.	$34,400.00
	Parking Lots	2	Ea.	$1,275,500.00
	Signs - Lit	1	Ea.	$14,000.00
Tools/Shop/Garage Equip. - Landfill		**1**	**Ea.**	**$38,000.00**
	Compactor	1	Ea.	$38,000.00

Appendix 1.8. Corporate Facilities

	Asset Class	Quantity	Unit	Replacement Cost ($)
Totals		**125**	**$**	**64,791,700.00**
Amenities & Furniture - Public Works & Admin		**22**	**Ea.**	**$1,580,600.00**
	Communication Systems	1	Ea.	$26,000.00
	Computer Hardware	2	Ea.	$75,000.00
	Furniture & Equipment	16	Ea.	$1,327,000.00
	Monuments/Plaques	1	Ea.	$47,600.00
	Signs	2	Ea.	$105,000.00
Buildings - Public Works & Admin		**24**	**Ea.**	**$58,854,700.00**
	Commercial Retail Unit	1	Ea.	$1,363,200.00
	Detached/Semi-Detached Buildings	1	Ea.	$35,500.00
	Industrial (Vehicle Maintenance)	3	Ea.	$8,116,300.00
	Museum	3	Ea.	$2,560,800.00
	Office Building	4	Ea.	$43,990,600.00
	Specialty Structures	1	Ea.	$87,300.00
	Storage Sheds	3	Ea.	$40,700.00
	Warehouses	8	Ea.	$2,660,300.00
Site Works - Facilities		**79**	**Ea.**	**$4,356,400.00**
	Facility Access	2	Ea.	$429,800.00
	Outdoor Light Poles - Parking Lots	21	Ea.	$40,400.00
	Outdoor Light Poles - Purpose Unknown	13	Ea.	$24,400.00
	Outdoor Lighting - Parking Lots	35	Ea.	$164,300.00
	Parking Lots	8	Ea.	$3,697,500.00

Appendix 1.9. Brownfield Infrastructure

	Asset Class	Quantity	Unit	Replacement Cost ($)
Totals		**8**		**$1,384,500.00**
Site Works - Planning (Brownfields)		**8**	**Ea.**	**$1,384,500.00**
	Buried Infrastructure	4	Ea.	$1,279,800.00
	Outdoor Light Poles - Purpose Unknown	3	Ea.	$6,400.00
	Surface Infrastructure	1	Ea.	$98,300.00

Appendix 1.10. Transportation

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**54**		**$ 27,906,000.00**
Amenities & Furniture - Transportation Services		**7**	**Ea.**	**$281,400.00**
	Control Systems	7	Ea.	$281,400.00
Buildings - Transportation		**1**	**Ea.**	**$27,279,200.00**
	Multi-Level Parking Garage	1	Ea.	$27,279,200.00
Site Works - Transportation		**46**	**Ea.**	**$345,400.00**
	Outdoor Light Poles - Parking Lots	22	Ea.	$39,100.00
	Outdoor Lighting - Parking Lots	22	Ea.	$106,400.00
	Parking Lots	2	Ea.	$199,900.00

Appendix 1.11. Corporate Fleet

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**325**		**$ 20,750,500.00**
Fleet - General		**5**	**Ea.**	**$185,000.00**
	Communication Systems	1	Ea.	$8,000.00
	Computer Software	1	Ea.	$28,000.00
	Control Systems	1	Ea.	$48,000.00
	Fuel Storage	2	Ea.	$101,000.00
Vehicles & Equipment - Airport		**5**	**Ea.**	**$41,500.00**
	Light Duty Vehicles	2	Ea.	$32,400.00
	Mowers/Tractors	3	Ea.	$9,100.00
Vehicles & Equipment - Bylaw Enforcement		**4**	**Ea.**	**$87,200.00**
	Light Duty Vehicles	4	Ea.	$87,200.00
Vehicles & Equipment - Environmental Services (Wastewater)		**20**	**Ea.**	**$1,287,900.00**
	Backhoes/Loaders	2	Ea.	$288,500.00
	Equipment	2	Ea.	$51,500.00
	Heavy Duty Vehicles	4	Ea.	$348,000.00
	Light Duty Vehicles	7	Ea.	$305,900.00
	Sanders/Plows/Dump Trucks/Graders	3	Ea.	$168,000.00
	Trailers	2	Ea.	$126,000.00

Asset Class		Quantity	Unit	Replacement Cost ($)
Vehicles & Equipment - Environmental Services (Water Collection)		**9**	**Ea.**	**$1,972,200.00**
	Heavy Duty Vehicles	2	Ea.	$226,600.00
	Light Duty Vehicles	2	Ea.	$84,900.00
	Sanders/Plows/Dump Trucks/Graders	2	Ea.	$494,400.00
	Sewer Jets/Street Sweepers	3	Ea.	$1,166,300.00
Vehicles & Equipment - Environmental Services (Water Compliance)		**4**	**Ea.**	**$123,800.00**
	Light Duty Vehicles	4	Ea.	$123,800.00
Vehicles & Equipment - Environmental Services (Water Operations)		**1**	**Ea.**	**$25,700.00**
	Equipment	1	Ea.	$25,700.00
Vehicles & Equipment - Environmental Services (Water Treatment)		**11**	**Ea.**	**$289,300.00**
	Equipment	1	Ea.	$31,900.00
	Heavy Duty Vehicles	1	Ea.	$45,400.00
	Light Duty Vehicles	9	Ea.	$212,000.00
Vehicles & Equipment - Facilities & Asset Management		**1**	**Ea.**	**$23,400.00**
	Light Duty Vehicles	1	Ea.	$23,400.00
Vehicles & Equipment - Operational Services (Landfill)		**3**	**Ea.**	**$107,100.00**
	Heavy Duty Vehicles	1	Ea.	$33,100.00
	Light Duty Vehicles	2	Ea.	$74,000.00
Vehicles & Equipment - Operational Services (Operations)		**32**	**Ea.**	**$1,432,700.00**
	Equipment	1	Ea.	$22,000.00
	Heavy Duty Vehicles	2	Ea.	$130,200.00
	Light Duty Vehicles	24	Ea.	$795,000.00
	Mowers/Tractors	1	Ea.	$30,700.00
	Sanders/Plows/Dump Trucks/Graders	4	Ea.	$454,800.00
Vehicles & Equipment - Operational Services (Road Maintenance)		**19**	**Ea.**	**$2,672,500.00**
	Asphalt Equipment	1	Ea.	$24,100.00
	Rollers	3	Ea.	$43,900.00
	Sanders/Plows/Dump Trucks/Graders	12	Ea.	$2,584,300.00
	Trailers	3	Ea.	$20,200.00
Vehicles & Equipment - Operational Services (Storm Management)		**3**	**Ea.**	**$447,700.00**
	Backhoes/Loaders	1	Ea.	$198,000.00
	Heavy Duty Vehicles	1	Ea.	$146,800.00
	Sanders/Plows/Dump Trucks/Graders	1	Ea.	$102,900.00

Asset Class		Quantity	Unit	Replacement Cost ($)
Vehicles & Equipment - Operational Services (Street/Sidewalk Cleaning)		**10**	**Ea.**	**$1,319,900.00**
	Light Duty Vehicles	2	Ea.	$64,000.00
	Sanders/Plows/Dump Trucks/Graders	2	Ea.	$345,600.00
	Sewer Jets/Street Sweepers	5	Ea.	$872,000.00
	Trailers	1	Ea.	$38,300.00
Vehicles & Equipment - Operational Services (Survey/Inspection)		**22**	**Ea.**	**$1,138,500.00**
	Fuel Equipment	2	Ea.	$121,000.00
	Hoists	8	Ea.	$605,000.00
	Light Duty Vehicles	8	Ea.	$306,500.00
	Other Equipment	4	Ea.	$106,000.00
Vehicles & Equipment - Operational Services (Traffic)		**7**	**Ea.**	**$419,700.00**
	Heavy Duty Vehicles	3	Ea.	$316,700.00
	Light Duty Vehicles	4	Ea.	$103,000.00
Vehicles & Equipment - Operational Services (Utilities)		**6**	**Ea.**	**$743,900.00**
	Light Duty Vehicles	3	Ea.	$117,700.00
	Sanders/Plows/Dump Trucks/Graders	3	Ea.	$626,200.00
Vehicles & Equipment - Operational Services (Winter Control)		**21**	**Ea.**	**$3,659,000.00**
	Attachments	3	Ea.	$75,600.00
	Backhoes/Loaders	4	Ea.	$976,500.00
	Equipment	1	Ea.	$157,200.00
	Heavy Duty Vehicles	1	Ea.	$36,600.00
	Mowers/Tractors	4	Ea.	$599,500.00
	Sanders/Plows/Dump Trucks/Graders	8	Ea.	$1,813,600.00
Vehicles & Equipment - Parks (Aquatics)		**1**	**Ea.**	**$19,200.00**
	Light Duty Vehicles	1	Ea.	$19,200.00
Vehicles & Equipment - Parks (Arenas)		**7**	**Ea.**	**$436,100.00**
	Heavy Duty Vehicles	1	Ea.	$23,200.00
	Light Duty Vehicles	1	Ea.	$17,600.00
	Maintenance Vehicles	5	Ea.	$395,300.00
Vehicles & Equipment - Parks (Cemeteries)		**13**	**Ea.**	**$436,900.00**
	Attachments	2	Ea.	$15,400.00
	Backhoes/Loaders	2	Ea.	$228,000.00
	Heavy Duty Vehicles	1	Ea.	$39,700.00
	Light Duty Vehicles	3	Ea.	$61,200.00
	Mowers/Tractors	5	Ea.	$92,600.00

Asset Class		Quantity	Unit	Replacement Cost ($)
Vehicles & Equipment - Parks (Forestry)		**2**	**Ea.**	**$28,400.00**
	Light Duty Vehicles	2	Ea.	$28,400.00
Vehicles & Equipment - Parks (Golf)		**37**	**Ea.**	**$937,200.00**
	Attachments	1	Ea.	$8,300.00
	Backhoes/Loaders	2	Ea.	$50,800.00
	Light Duty Vehicles	7	Ea.	$162,600.00
	Mowers/Tractors	17	Ea.	$505,200.00
	Specialty Vehicles - Golf	8	Ea.	$196,700.00
	Trailers	2	Ea.	$13,600.00
Vehicles & Equipment - Parks (Horticulture)		**12**	**Ea.**	**$363,900.00**
	Equipment	1	Ea.	$19,200.00
	Heavy Duty Vehicles	3	Ea.	$108,200.00
	Light Duty Vehicles	7	Ea.	$206,200.00
	Mowers/Tractors	1	Ea.	$30,300.00
Vehicles & Equipment - Parks (Maintenance)		**27**	**Ea.**	**$1,030,700.00**
	Attachments	2	Ea.	$15,600.00
	Backhoes/Loaders	2	Ea.	$174,900.00
	Heavy Duty Vehicles	3	Ea.	$200,600.00
	Light Duty Vehicles	14	Ea.	$367,300.00
	Mowers/Tractors	4	Ea.	$134,100.00
	Sanders/Plows/Dump Trucks/Graders	1	Ea.	$86,300.00
	Trailers	1	Ea.	$51,900.00
Vehicles & Equipment - Parks (Turf)		**40**	**Ea.**	**$1,487,400.00**
	Attachments	1	Ea.	$10,800.00
	Heavy Duty Vehicles	3	Ea.	$108,200.00
	Light Duty Vehicles	11	Ea.	$227,600.00
	Mowers/Tractors	22	Ea.	$997,800.00
	Sewer Jets/Street Sweepers	2	Ea.	$134,100.00
	Trailers	1	Ea.	$8,900.00
Vehicles & Equipment - Transportation Services		**3**	**Ea.**	**$33,700.00**
	Attachments	1	Ea.	$10,800.00
	Equipment	2	Ea.	$22,900.00

Appendix 1.12. Transit

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**87**		**$ 39,643,900.00**
Buildings - Transit		**2**	**Ea.**	**$12,812,800.00**
	Industrial (Vehicle Maintenance)	1	Ea.	$11,558,400.00
	Transit Terminal	1	Ea.	$1,254,400.00
Site Works - Transit		**2**	**Ea.**	**$1,971,500.00**
	Parking Lots	2	Ea.	$1,971,500.00
Transit - General		**26**	**Ea.**	**$2,892,400.00**
	Communication Systems	7	Ea.	$816,000.00
	Computer Hardware	2	Ea.	$185,000.00
	Computer Software	2	Ea.	$139,000.00
	Control Systems	6	Ea.	$1,069,000.00
	Equipment	1	Ea.	$9,200.00
	Fuel Storage	1	Ea.	$428,000.00
	Light Duty Vehicles	2	Ea.	$94,100.00
	Maintenance Vehicles	2	Ea.	$18,900.00
	Sewer Jets/Street Sweepers	1	Ea.	$13,200.00
	Transit Stops	2	Ea.	$120,000.00
Vehicles & Equipment - Transit		**57**	**Ea.**	**$21,967,200.00**
	Conventional Buses	35	Ea.	$20,713,600.00
	Light Duty Vehicles	1	Ea.	$25,100.00
	Specialty Buses	21	Ea.	$1,228,500.00

Appendix 1.13. Social Housing

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**250**		**$ 197,188,200.00**
Amenities & Furniture – Social Housing	**30**	**Ea.**	**$2,348,000.00**
Computer Software	1	Ea.	$151,000.00
Control Systems	5	Ea.	$168,000.00
Fencing/Retaining Wall	3	Ea.	$277,000.00
Furniture & Equipment	12	Ea.	$1,496,000.00
Playground Structures	6	Ea.	$178,000.00
Water Systems	3	Ea.	$78,000.00
Buildings – Social Housing	**122**	**Ea.**	**$192,061,800.00**
Apartments	11	Ea.	$110,796,300.00
Detached/Semi-Detached Buildings	72	Ea.	$24,418,800.00
Storage Sheds	9	Ea.	$197,100.00
Townhouses	30	Ea.	$56,649,600.00
Site Works – Social Housing	**98**	**Ea.**	**$2,778,400.00**
Outdoor Light Poles - Parking Lots	13	Ea.	$23,100.00
Outdoor Light Poles - Purpose Unknown	31	Ea.	$55,300.00
Outdoor Lighting - Parking Lots	43	Ea.	$211,200.00
Parking Lots	11	Ea.	$2,488,800.00

Appendix 1.14. Airport

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**372**		**$ 25,453,300.00**
Buildings - Airport	**10**	**Ea.**	**$14,123,800.00**
Commercial and Residential Hangars	9	Ea.	$13,976,000.00
Industrial (Vehicle Maintenance)	1	Ea.	$147,800.00
Instruments - Airport	**13**	**Ea.**	**$216,100.00**
Navigation Aide	10	Ea.	$181,600.00
Power Supply	3	Ea.	$34,500.00
Lights - Airport	**218**	**Ea.**	**$275,800.00**
Lights - RILS	2	Ea.	$2,500.00
Lights - Runway Edge	114	Ea.	$144,200.00
Lights - Taxiway Edge	36	Ea.	$45,500.00
Lights - Taxiway/Apron Junction	30	Ea.	$38,000.00
Lights - Threshold	36	Ea.	$45,600.00
Pavements - Airport	**35**	**Ea.**	**$10,516,400.00**
Apron	3	Ea.	$2,225,900.00
Facility Access	4	Ea.	$223,900.00
Foot Path	7	Ea.	$7,800.00
Local Road	4	Ea.	$462,000.00
Parking Lots	10	Ea.	$2,449,500.00
Runway	3	Ea.	$3,329,300.00
Taxiway	4	Ea.	$1,818,000.00
Site Works - Airport	**96**	**Ea.**	**$321,200.00**
Fencing/Retaining Wall	34	Ea.	$191,000.00
Power Supply	22	Ea.	$91,200.00
Signs - Runway	25	Ea.	$30,000.00
Signs - Taxiway	15	Ea.	$9,000.00

Appendix 1.15. Tourism

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**41**		**$ 11,634,600.00**
Amenities & Furniture - Tourism	**40**	**Ea.**	**$7,818,100.00**
Computer Hardware	1	Ea.	$6,000.00
Computer Software	1	Ea.	$115,000.00
Furniture & Equipment	4	Ea.	$232,000.00
Interior Exhibits	1	Ea.	$448,000.00
Monuments/Plaques	18	Ea.	$6,030,300.00
Outdoor Light Poles - Purpose Unknown	4	Ea.	$7,100.00
Outdoor Lighting - Parking Lots	4	Ea.	$19,700.00
Parking Lots	1	Ea.	$548,000.00
Playground Structures	1	Ea.	$36,000.00
Signs	5	Ea.	$376,000.00
Buildings - Tourism	**1**	**Ea.**	**$3,816,500.00**
Office Building	1	Ea.	$3,816,500.00

Appendix 1.16. Sanderson Centre (Culture)

Asset Class	Quantity	Unit	Replacement Cost ($)
Totals	**28**		**$ 26,723,600.00**
Amenities & Furniture - Theatre	**27**	**Ea.**	**$2,269,000.00**
Communication Systems	1	Ea.	$26,000.00
Computer Hardware	3	Ea.	$82,000.00
Control Systems	13	Ea.	$999,000.00
Furniture & Equipment	10	Ea.	$1,162,000.00
Buildings - Theatre	**1**	**Ea.**	**$24,454,600.00**
Performance Arts Centre	1	Ea.	$24,454,600.00

Appendix 1.17. Parks

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**66748**		**$ 167,677,220.00**
Active Recreation Facilities - Parks		**324**	**Ea.**	**$20,635,800.00**
	Ball Diamonds	40	Ea.	$3,104,700.00
	Lawn Bowling/Bocce Ball	3	Ea.	$55,200.00
	Playground Structures	190	Ea.	$4,395,800.00
	Running Tracks	3	Ea.	$2,132,100.00
	Skate Parks	2	Ea.	$639,600.00
	Soccer Pitches/ Football Field/ Rugby Field	43	Ea.	$7,165,200.00
	Splash Pads/Spray Pads/Pools	3	Ea.	$1,440,300.00
	Tennis/Basketball & Multi-Purpose Pads	39	Ea.	$1,695,700.00
	Volley Ball Court	1	Ea.	$7,200.00
Amenities & Furniture - Parks		**2621**	**Ea.**	**$21,720,580.00**
	Bollards	181	Ea.	$214,400.00
	Fencing/Retaining Wall	229	Ea.	$3,022,820.00
	Hardscaping	1	Ea.	$24,000.00
	Kiosks	57	Ea.	$540,100.00
	Misc. Amenities	4	Ea.	$25,000.00
	Monuments/Plaques	8	Ea.	$46,130.00
	Outdoor Light Poles - Parking Lots	46	Ea.	$82,000.00
	Outdoor Light Poles - Sportsfield	329	Ea.	$591,100.00
	Outdoor Light Poles - Trails & Walkways	24	Ea.	$42,600.00
	Outdoor Lighting - Parking Lots	42	Ea.	$206,400.00
	Outdoor Lighting - Sportsfield	335	Ea.	$8,171,400.00
	Outdoor Lighting - Trails & Walkways	24	Ea.	$103,800.00
	Seating (includes bleachers)	560	Ea.	$6,060,400.00
	Signs	517	Ea.	$719,130.00
	Waste Receptacles	137	Ea.	$175,300.00
	Water Systems	127	Ea.	$1,696,000.00
Arboriculture - Parks		**63083**	**Ea.**	**$25,390,780.00**
	Park Trees	5483	Ea.	$2,206,800.00
	Property Trees	22492	Ea.	$9,053,020.00
	Street Trees	35108	Ea.	$14,130,960.00
Bridges - Parks		**25**	**Ea.**	**$23,727,400.00**
	Pedestrian Structures	24	Ea.	$23,538,300.00
	Railway Structures	1	Ea.	$189,100.00

Asset Class		Quantity	Unit	Replacement Cost ($)
Culverts OSIM Inspected - Parks		**5**	**Ea.**	**$86,400.00**
	Pedestrian Structures	5	Ea.	$86,400.00
Horticulture - Parks		**318**	**Ea.**	**$42,159,900.00**
	Community Gardens	10	Ea.	$216,500.00
	Natural Areas	46	Ea.	$39,998,600.00
	Planting Beds (Perennial)	262	Ea.	$1,944,800.00
Lookouts - Parks		**5**	**Ea.**	**$896,800.00**
	Pedestrian Structures	5	Ea.	$896,800.00
Machinery & Equipment - Parks		**12**	**Ea.**	**$194,000.00**
	Communication Systems	4	Ea.	$125,000.00
	Control Systems	6	Ea.	$21,000.00
	Mowers/Tractors	2	Ea.	$48,000.00
Park Trail Network		**273**	**Ea.**	**$15,189,860.00**
	Facility Access	5	Ea.	$1,027,900.00
	Foot Path	25	Ea.	$495,970.00
	Park Path	85	Ea.	$1,415,000.00
	Parking Lots	33	Ea.	$4,482,500.00
	Shared Use Trails	109	Ea.	$7,453,760.00
	Sidewalk not in ROW	15	Ea.	$309,630.00
	Trail Access	1	Ea.	$5,100.00
Shelters & Buildings - Parks		**75**	**Ea.**	**$17,292,600.00**
	Community Hall	3	Ea.	$1,768,000.00
	Detached/Semi-Detached Buildings	1	Ea.	$219,100.00
	Greenhouse	5	Ea.	$1,479,100.00
	Industrial (Vehicle Maintenance)	1	Ea.	$66,100.00
	Museum	7	Ea.	$4,951,800.00
	Office Building	1	Ea.	$2,080,900.00
	Pavilion	1	Ea.	$1,299,900.00
	Picnic Shelters	22	Ea.	$1,075,500.00
	Public Washrooms	6	Ea.	$767,400.00
	Small Parks Structure	6	Ea.	$286,700.00
	Specialty Structures	8	Ea.	$2,321,100.00
	Storage Sheds	12	Ea.	$475,100.00
	Warehouses	2	Ea.	$501,900.00
Stairways - Parks		**7**	**Ea.**	**$383,100.00**
	Pedestrian Structures	7	Ea.	$383,100.00

Appendix 1.18. Recreation

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**241**		**$ 122,401,900.00**
Active Recreation Facilities - Recreation		**2**	**Ea.**	**$2,971,300.00**
	Splash Pads/Spray Pads/Pools	1	Ea.	$2,961,100.00
	Volley Ball Court	1	Ea.	$10,200.00
Amenities & Furniture - Recreation		**216**	**Ea.**	**$9,837,900.00**
	Fencing/Retaining Wall	1	Ea.	$28,000.00
	Outdoor Light Poles - Parking Lots	94	Ea.	$167,000.00
	Outdoor Light Poles - Sportsfield	3	Ea.	$5,700.00
	Outdoor Lighting - Parking Lots	99	Ea.	$485,500.00
	Outdoor Lighting - Sportsfield	2	Ea.	$52,200.00
	Parking Lots	11	Ea.	$8,919,500.00
	Signs	3	Ea.	$142,000.00
	Water Systems	3	Ea.	$38,000.00
Shelters & Buildings - Recreation		**23**	**Ea.**	**$109,592,700.00**
	Arena	1	Ea.	$5,886,100.00
	Community Centre	4	Ea.	$8,425,100.00
	Picnic Shelters	9	Ea.	$278,400.00
	Recreational Centre	3	Ea.	$90,034,900.00
	Specialty Structures	3	Ea.	$4,876,500.00
	Storage Sheds	3	Ea.	$91,700.00

Appendix 1.19. Cemeteries

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**32**		**$ 5,147,080.00**
Amenities & Furniture - Cemeteries		**27**	**Ea.**	**$2,983,480.00**
	Bollards	1	Ea.	$1,180.00
	Facility Access	3	Ea.	$2,628,100.00
	Fencing/Retaining Wall	9	Ea.	$70,060.00
	Monuments/Plaques	5	Ea.	$262,900.00
	Outdoor Light Poles - Trails & Walkways	3	Ea.	$6,400.00
	Park Path	2	Ea.	$13,420.00
	Signs	4	Ea.	$1,420.00
Shelters & Buildings - Cemeteries		**5**	**Ea.**	**$2,163,600.00**
	Detached/Semi-Detached Buildings	4	Ea.	$1,237,000.00
	Specialty Structures	1	Ea.	$926,600.00

Appendix 1.20. Golf Courses

Asset Class		Quantity	Unit	Replacement Cost ($)
Totals		**78**		**$ 9,446,400.00**
Amenities & Furniture - Golf Courses		**63**	**Ea.**	**$4,851,800.00**
	Facility Access	2	Ea.	$199,400.00
	Golf Tee/Green/Driving Range	29	Ea.	$3,186,000.00
	Irrigation Ponds	2	Ea.	$211,000.00
	Parking Lots	3	Ea.	$660,400.00
	Water Systems	27	Ea.	$595,000.00
Machinery & Equipment - Golf Courses		**3**	**Ea.**	**$95,000.00**
	Fuel Storage	3	Ea.	$95,000.00
Shelters & Buildings - Golf Courses		**12**	**Ea.**	**$4,499,600.00**
	Club House/Pro Shop	3	Ea.	$4,028,400.00
	Picnic Shelters	3	Ea.	$58,500.00
	Specialty Structures	1	Ea.	$177,700.00
	Storage Sheds	4	Ea.	$133,600.00
	Warehouses	1	Ea.	$101,400.00