

BRIDGES

ASSET MANAGEMENT PLAN

2023

CITY OF FORT COLLINS

An aerial photograph of a highway interchange is the background. Overlaid on this are several circular icons: a bridge, a car, a person walking, a car with a fuel pump, a truck, and a traffic light. A network of white lines connects these icons and other points across the image, suggesting a data or infrastructure network. The background is divided into large geometric shapes in shades of green, blue, and black.

PLANNING, DEVELOPMENT, AND
TRANSPORTATION

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This Asset Management Plan may be used as a supporting document to inform an overarching Transportation Infrastructure Strategic Asset Management Plan.

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Contents

1.0	EXECUTIVE SUMMARY	5
1.1	The Purpose of the Plan.....	5
1.2	Asset Description	5
1.3	Levels of Service.....	5
1.4	Future Demand	5
1.5	Lifecycle Management Plan	6
1.6	Financial Summary.....	6
1.7	Asset Management Planning Practices.....	7
1.8	Monitoring and Improvement Program	7
2.0	Introduction	9
2.1	Background	9
2.2	Goals and Objectives of Asset Ownership	11
3.0	LEVELS OF SERVICE	13
3.1	Customer Research and Expectations	13
3.2	Strategic and Corporate Goals	13
3.3	Legislative Requirements.....	14
3.4	Customer Values.....	14
3.5	Customer Levels of Service	14
3.6	Technical Levels of Service.....	15
4.0	FUTURE DEMAND	18
4.1	Demand Drivers	18
4.2	Demand Forecasts	18
4.3	Demand Impact and Demand Management Plan	18
4.4	Asset Programs to meet Demand	19
4.5	Climate Change Adaptation	19
5.0	LIFECYCLE MANAGEMENT PLAN	21
5.1	Background Data	21
5.2	Operations and Maintenance Plan	23
5.3	Renewal Plan	25
5.4	Summary of future renewal costs.....	26
5.5	Acquisition Plan	27

5.6	Disposal Plan.....	29
5.7	Summary of asset forecast costs	30
6.0	RISK MANAGEMENT PLANNING	31
6.1	Critical Assets	31
6.2	Risk Assessment.....	31
6.3	Infrastructure Resilience Approach	33
6.4	Service and Risk Trade-Offs	34
7.0	FINANCIAL SUMMARY	35
7.1	Financial Sustainability and Projections	35
7.2	Funding Strategy	36
7.3	Valuation Forecasts	36
7.4	Key Assumptions Made in Financial Forecasts	37
7.5	Forecast Reliability and Confidence.....	37
8.0	PLAN IMPROVEMENT AND MONITORING	39
8.1	Status of Asset Management Practices	39
8.2	Improvement Plan	39
8.3	Monitoring and Review Procedures	40
8.4	Performance Measures	40
9.0	REFERENCES	41
10.0	APPENDICES	42
Appendix A	Acquisition Forecast.....	42
Appendix B	Operation Forecast	43
Appendix C	Maintenance Forecast	44
Appendix D	Renewal Forecast Summary	45
Appendix E	Disposal Summary.....	49
Appendix F	Budget Summary by Lifecycle Activity	50

1.0 EXECUTIVE SUMMARY

1.1 The Purpose of the Plan

This Asset Management Plan (AM Plan) details information about infrastructure assets with actions required to provide an agreed level of service in the most cost-effective manner while outlining associated risks. The plan defines the services to be provided, how the services are provided, and what funds are required to provide over the 20 year planning period. The AM Plan will link to a Long-Term Financial Plan which typically considers a 10-year planning period.

1.2 Asset Description

This plan covers the bridge infrastructure assets that provide a safe passage across natural and manmade barriers such as waterways, roadways, railways, and other obstacles.

The bridge network is comprised of the following five categories:

- 92 - Major Bridges (longer than 20 feet)
- 135 - Minor Bridges (between 4 and 20 feet)
- 80 - Less than 4 feet Bridges (small drainage structures)

The above infrastructure assets have replacement value estimated at \$498 million.

1.3 Levels of Service

The allocation in the planned budget is insufficient to continue providing existing services at current levels for the planning period.

The main service consequences of the Planned Budget are:

- Possible structural failure or required to close a bridge based on condition state.
- Condition state of the bridge network will gradually decline with the planned budget over the planning period.
- There will be insufficient funding to perform the necessary renewals along with operations, maintenance, and upgrades or acquisitions of bridges with the necessary functionality for all modes of travel.

1.4 Future Demand

The factors influencing future demand and the impacts they have on service delivery are created by:

- Population growth in the northeast part of the city.
- Inflated construction costs.
- Annexation impacts to bridge network.
- Climate change impacts to flood elevation levels.

These demands will be approached using a combination of managing existing assets, upgrading existing assets and providing new assets to meet demand. Demand management practices may also include a combination of non-asset solutions, insuring against risks and managing failures.

- Will demonstrate within the proposed budget the additional operations and maintenance costs.
- Adjust budget offers for increased funding.
- May need to impose a transportation use tax to help supplement the budget deficiencies.
- Highway Use funds may be necessary to supplement the budget deficiencies.

1.5 Lifecycle Management Plan

1.5.1 What does it Cost?

The forecast lifecycle costs necessary to provide the services covered by this AM Plan includes acquisition, operation, maintenance, renewal, and disposal of assets. Although the AM Plan may be prepared for a range of time periods, it typically informs a Long-Term Financial Planning period of 10 years. Therefore, a summary output from the AM Plan is the forecast of 10-year total outlays, which for the bridge network is estimated as \$130,984,192 or \$13,098,419 on average per year.

1.6 Financial Summary

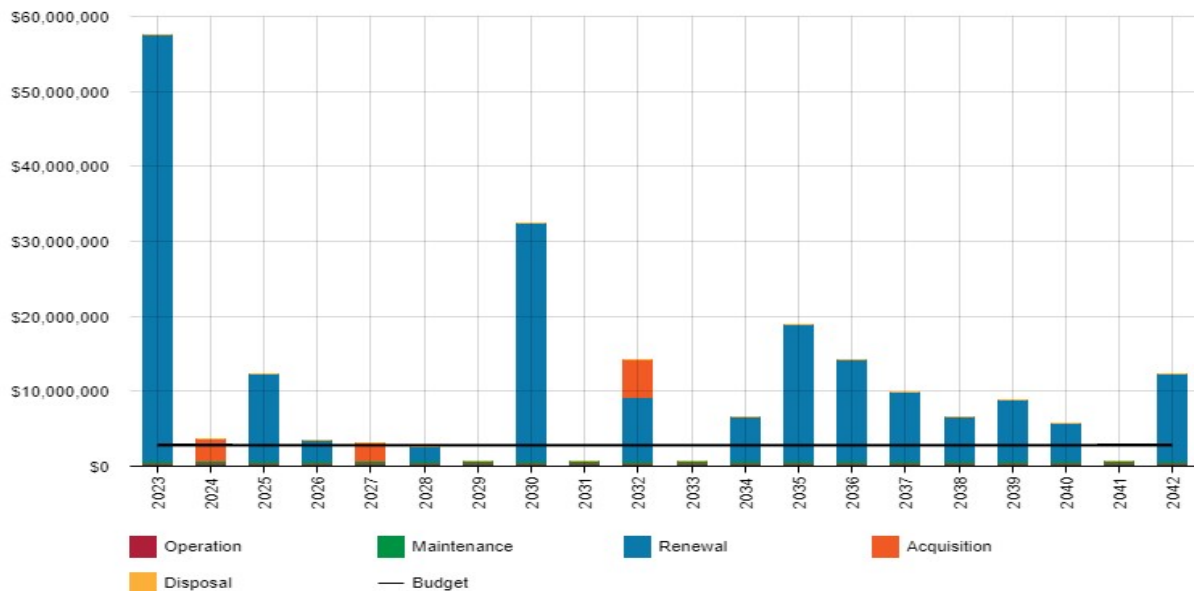
1.6.1 What we will do

Estimated available funding for the 10 year period is \$28,000,000 or \$2,800,000 on average per year as per the Long-Term Financial plan or Planned Budget. This is 21.38% of the cost to sustain the current level of service at the lowest lifecycle cost.

The infrastructure reality is that only what is funded in the long-term financial plan can be provided. The Informed decision making depends on the AM Plan emphasizing the consequences of Planned Budgets on the service levels provided and risks.

The anticipated Planned Budget for the bridge infrastructure assets leaves a shortfall of \$-10,298,419 on average per year of the forecast lifecycle costs required to provide services in the AM Plan compared with the Planned Budget currently included in the Long-Term Financial Plan. This is shown in the figure below.

Forecast Lifecycle Costs and Planned Budgets



The lifecycle summary values are in current dollars based on associated cost from related projects.

We plan to provide bridge network services for the following:

- Operation, maintenance, renewal and acquisition of Major, Minor, Pedestrian, Less than 4 feet, and Unprogrammed bridges to meet service levels set by the City of Fort Collins in annual budgets.

- It is planned to acquire 12 bridges from Larimer County from the Mulberry Annexation, renew 12 Minor bridges, and perform maintenance activities on 50-75 Major/Minor bridges and 10 Pedestrian bridges within the 10 year planning period.

1.6.2 What we cannot do

We currently do **not** allocate enough budget to sustain these services at the proposed standard or to provide all new services being sought. Works and services that cannot be provided under present funding levels are:

- Design and replace all structurally deficient bridges within the current approved budget for the bridge network.

1.6.3 Managing the Risks

Our present budget levels are insufficient to continue to manage risks in the medium term.

The main risk consequences are:

- Bridge structural failure or collapse.
- Bridge closures leading to alternative routes thus inducing additional stress on the road network, added traffic congestion, and increased environmental concerns.
- Possible decrease in the timing of community services.
- Increase in response time for emergency services.

We will endeavor to manage these risks within available funding by:

- Focusing on renewal of critical structures along main traffic routes.
- Increased inspection frequency of critical structures.

1.7 Asset Management Planning Practices

Key assumptions made in this AM Plan are:

- Various bridge design life and expected useful life from those designs. Will be reviewing and updating useful life in future iterations of the plan as indicated in Section 8.0 Plan Improvement.
- Future demand and the impact of demand drivers that may affect future service delivery.
- Bridge network inventory financial costs.

Assets requiring renewal are identified from either the asset register or an alternative method.

- The timing of capital renewals based on the asset register is applied by adding the useful life to the year of acquisition or year of last renewal,
- Alternatively, an estimate of renewal lifecycle costs is projected from external condition modelling systems and may be supplemented with, or based on, expert knowledge.

The Asset Register was used to forecast the renewal lifecycle costs for this AM Plan and is based on a highly reliable level of confidence information.

1.8 Monitoring and Improvement Program

The next steps resulting from this AM Plan to improve asset management practices are:

- Review and update most recent inspection information to ensure current condition data.
- Review and update current replacement costs used in the asset register.

- Review and approve of developed levels of service with Capital Projects Manager, City Engineer, and PDT Directors.
- Perform bi-annual review of risk management after approval of budgeting process.
- Review specific measures align with organizational objectives within the AM Plan.
- Review acquisitions forecast for annual AM Plan update.

2.0 Introduction

2.1 Background

This AM Plan communicates the requirements for the sustainable delivery of services through management of assets, compliance with regulatory requirements, and required funding to provide the appropriate levels of service over the planning period.

The AM Plan is to be read with the Transportation Infrastructure Strategic Asset Management Plan. This should include the Asset Management Policy and Asset Management Strategy, where developed, along with other key planning documents:

- City of Fort Collins Strategic Plan, 2022
- Utilities Strategic Asset Management Plan, 2021
- Parks Infrastructure Replacement Program, 2022
- FCMoves Active Modes Plan, 2022
- Climate Future Plan, 2021

The City of Fort Collins over the past few years has put more focus into asset management understanding the community has high expectations of levels of service. However, with financial needs struggling to maintain existing assets the city's Finance Department has incorporated specific categories of asset management into the financial budgeting process. In addition, multiple departments have begun or recently completed asset management plans; however, the city needs to focus those efforts to change the way we strategize, understand the associated risks, and manage our infrastructure assets to continue to provide the best value to the community at this time.

The infrastructure assets covered by this AM Plan include the five categories of the bridge network assets – Major, Minor, Pedestrian, Less than 4 feet, and Unprogrammed. For a detailed summary of the assets covered in this AM Plan refer to Table in Section 5.

These assets are used to provide transportation connectivity services.

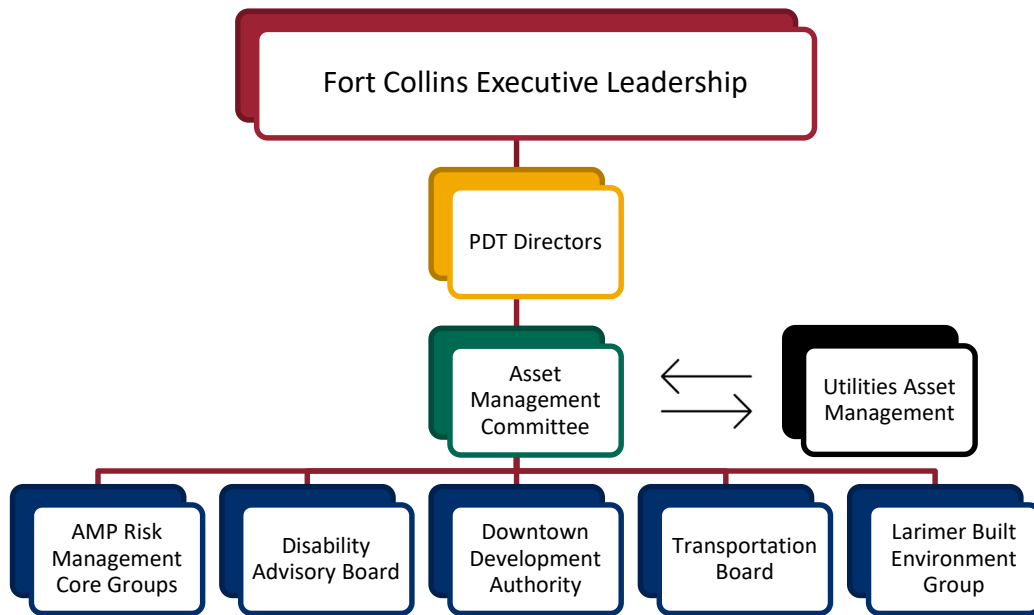
The infrastructure assets included in this plan have a total replacement value of \$498 million.

Key stakeholders in the preparation and implementation of this AM Plan are shown in Table 2.1.

Table 2.1: Key Stakeholders in the AM Plan

Key Stakeholder	Role in Asset Management Plan
City Council	<ul style="list-style-type: none"> • Represent needs of community/shareholders, • Allocate resources and provide high level oversight to deliver strategic objectives and plans, • Ensure sustainable service delivery, • Communicate City strategic objective and measures.
City Leadership	<ul style="list-style-type: none"> • Ensuring council’s policy direction through day-to-day management of city functions, including oversight of City operating departments. • Implementation of annual budget • Ensure effective delivery of services consistent with council direction.
PDT Directors	<ul style="list-style-type: none"> • Communicate needs of community/shareholders, • Approve bi-annual budget offers to meet community needs and planning efforts, • Approve department strategy, policy, plans and procedures, and status of asset management program.
City Engineer	<ul style="list-style-type: none"> • Represent needs of Engineering Department to PDT Directors, • Assist with policy, processes, and budgets. • Assist with establishing levels of service
Capital Projects Manager	<ul style="list-style-type: none"> • Assist with development of objectives, measures, targets/goals, • Review budget to manage lifecycle costs, • Assist with establishing levels of service for asset infrastructure.
External Committees, Boards, or Groups	<ul style="list-style-type: none"> • Communicates with the community to identify and express concerns related to transportation issues, • Help develop or identify solutions related to levels of service, performance measures, or asset infrastructure.

Our organisational structure for service delivery from infrastructure assets is detailed below,



2.2 Goals and Objectives of Asset Ownership

Our goal for managing infrastructure assets is to meet the defined level of service (as amended from time to time) in the most cost effective manner for present and future consumers. The key elements of infrastructure asset management are:

- Providing a defined level of service and monitoring performance,
- Managing the impact of growth through demand management and infrastructure investment,
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet the defined level of service,
- Identifying, assessing, and appropriately controlling risks, and
- Linking to a Long-Term Financial Plan which identifies required, affordable forecast costs and how it will be allocated.

Key elements of the planning framework are:

- Levels of service – specifies the services and levels of service to be provided,
- Risk management – what are the associated risks and consequences,
- Future demand – how this will impact on future service delivery and how this is to be met,
- Lifecycle management – how to manage its existing and future assets to provide defined levels of service,
- Financial summary – what funds are required to provide the defined services,
- Asset management practices – how we manage provision of the services,
- Monitoring – how the plan will be monitored to ensure objectives are met,
- Asset management improvement plan – how we increase asset management maturity.

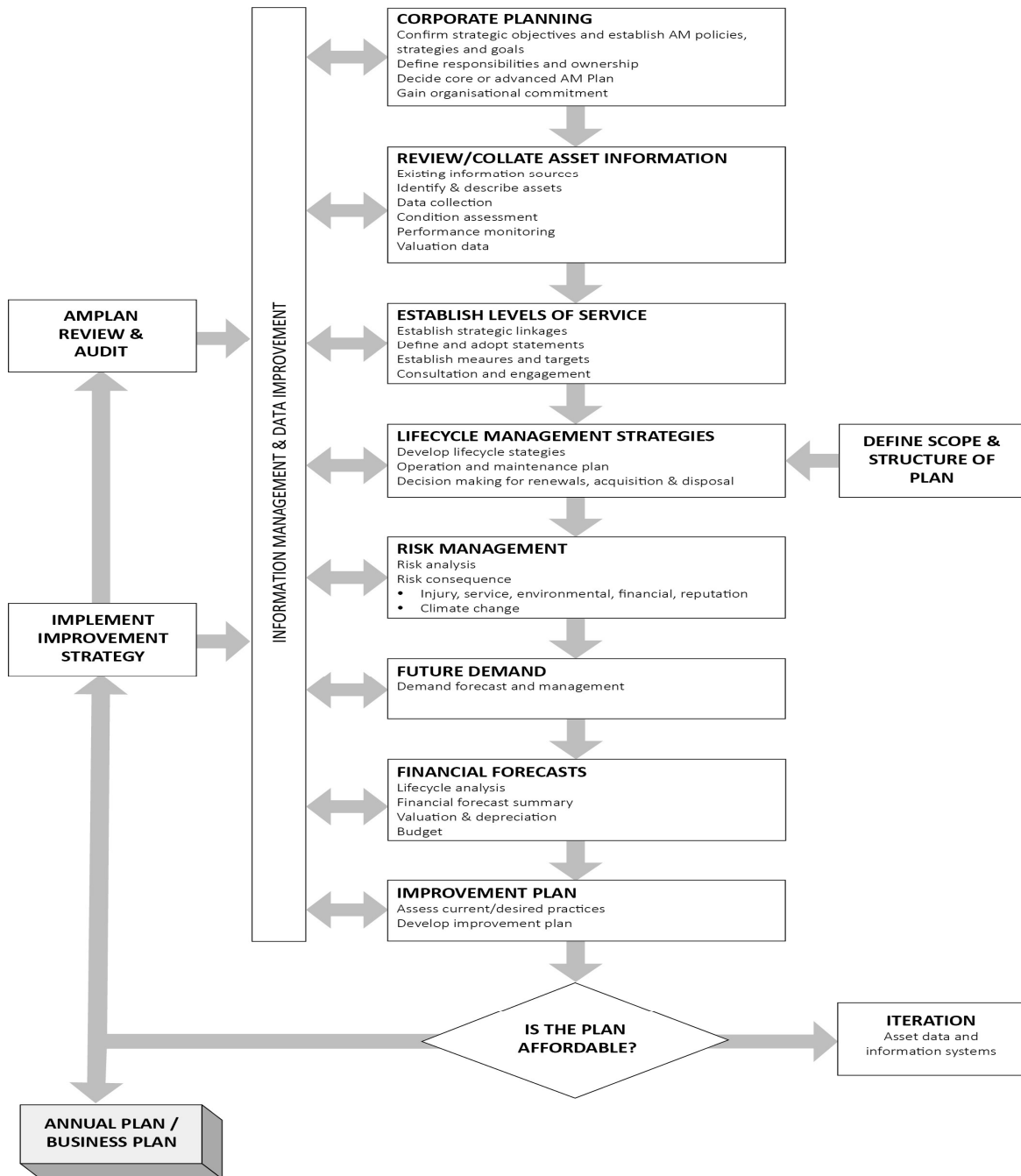
Other references to the benefits, fundamentals principles and objectives of asset management are:

- International Infrastructure Management Manual 2015¹
- ISO 55000²

A road map for preparing an AM Plan is shown as follows.

Road Map for preparing an Asset Management Plan

Source: IPWEA, 2006, IIMM, Fig 1.5.1, p 1.11



¹ Based on IPWEA 2015 IIMM, Sec 2.1.3, p 2 | 13

² ISO 55000 Overview, principles and terminology

3.0 LEVELS OF SERVICE

3.1 Customer Research and Expectations

This AM Plan is prepared to facilitate consultation prior to adoption of levels of service by the City of Fort Collins. Future revisions of the AM Plan will incorporate customer consultation on service levels and costs of providing the service. This will assist council and stakeholders in matching the level of service required, service risks and consequences with the customer’s ability and willingness to pay for the service.

We currently have no research on customer expectations for the bridge network. This will be investigated for future updates of the AM Plan and Table 3.1 will summarize the results from our Customer Satisfaction Survey.

Table 3.1: Customer Satisfaction Survey Levels

Performance Measure	Satisfaction Level				
	Very Satisfied	Fairly Satisfied	Satisfied	Somewhat satisfied	Not satisfied

3.2 Strategic and Corporate Goals

This AM Plan is prepared under the direction of the City of Fort Collins vision, mission, goals and objectives.

Our vision is:

We foster a thriving and engaged community through our operational excellence and culture of innovation.

Our mission is:

Exceptional Service for an Exceptional Community.

Strategic goals have been set by the City of Fort Collins City Plan and Strategic Plan. The relevant goals and objectives and how these are addressed in this AM Plan are summarised in Table 3.2.

Table 3.2: Goals and how these are addressed in this Plan

Goal	Objective	How Goal and Objectives are addressed in the AM Plan
Transportation & Mobility 6.1	Improve safety for all modes and users of the transportation system to ultimately achieve a system with no fatalities or serious injuries.	Reviews functionality and service capacity of bridges and identifies the necessary budget to improve those conditions.
Transportation & Mobility 6.5	Maintain existing and aging transportation infrastructure to keep the system in a state of good repair and continually address missing elements to meet community needs and expectations.	Reviews customer levels of service for lifecycle costing while balancing associated risks within the proposed budget.

3.3 Legislative Requirements

There are many legislative requirements relating to the management of assets. Legislative requirements that impact the delivery of the bridges service are outlined in Table 3.3.

Table 3.3: Legislative Requirements

Legislation	Requirement
Code of Federal Regulations	49 CFR 237 – Bridge Safety Standards
FHWA (Federal Highway Administration)	National Bridge Inspection Standards
MAP-21 (Moving Ahead for Progress in the 21 st Century Act)	Provided requirements for the inventory and inspection of bridges and tunnels on all public roads.

3.4 Customer Values

Service levels are defined in three ways, customer values, customer levels of service and technical levels of service.

Customer Values indicate:

- what aspects of the service is important to the customer,
- whether they see value in what is currently provided and
- the likely trend over time based on the current budget provision

Table 3.4: Customer Values

Service Objective:			
Customer Values	Customer Satisfaction Measure	Current Feedback	Expected Trend Based on Planned Budget
Safe passage from point A to point B	Customer Feedback	No complaints	Anticipated to remain the same
Connectivity	Customer Feedback	No complaints	Anticipated to increase with future expected closures
No weight restrictions	Customer Feedback	Minimal complaints	Anticipated to increase if limits increase

3.5 Customer Levels of Service

The Customer Levels of Service are considered in terms of:

Condition How good is the service ... what is the condition or quality of the service?

Function Is it suitable for its intended purpose Is it the right service?

Capacity/Use Is the service over or under used ... do we need more or less of these assets?

In Table 3.5 under each of the service measures types (Condition, Function, Capacity/Use) there is a summary of the performance measure being used, the current performance, and the expected performance based on the current budget allocation.

These are measures of fact related to the service delivery outcome (e.g. number of occasions when service is not available or proportion of replacement value by condition %'s) to provide a balance in comparison to the customer perception that may be more subjective.

Table 3.5: Customer Level of Service Measures

Type of Measure	Level of Service	Performance Measure	Current Performance	Expected Trend Based on Planned Budget
Condition	Bridge Condition	Bridge Inspections	Very Good – 9% Good – 44% Fair – 40% Poor – 3% Very poor – 4%	Condition state will gradually worsen based on the planned budget.
	Confidence levels		High	High
Function	Functionally Obsolete	Compliance with standards	6% of bridges have some function that does not meet standards.	Function of the bridge network is anticipated to remain the same with the planned budget.
	Confidence levels		High	High
Capacity	Average daily traffic over poor and structurally deficient bridges	Current traffic data and future projections	2.8% (40,740 trips) of traffic impact poor condition bridges. There are a sufficient number of bridges to manage traffic.	Traffic impacts are anticipated to improve with the planned budget.
	Confidence levels		Medium	Medium

3.6 Technical Levels of Service

Technical Levels of Service – To deliver the customer values, and impact the achieved Customer Levels of Service, are operational or technical measures of performance. These technical measures relate to the activities and allocation of resources to best achieve the desired customer outcomes and demonstrate effective performance.

Technical service measures are linked to the activities and annual budgets covering:

- **Acquisition** – the activities to provide a higher level of service (e.g. widening a road, sealing an unsealed road, replacing a pipeline with a larger size) or a new service that did not exist previously (e.g. a new library).
- **Operation** – the regular activities to provide services (e.g. opening hours, cleansing, mowing grass, energy, inspections, etc).
- **Maintenance** – the activities necessary to retain an asset as near as practicable to an appropriate service condition. Maintenance activities enable an asset to provide service for its planned life (e.g. road patching, unsealed road grading, building and structure repairs),
- **Renewal** – the activities that return the service capability of an asset up to that which it had originally provided (e.g. road resurfacing and pavement reconstruction, pipeline replacement and building component replacement),

Service and asset managers plan, implement and control technical service levels to influence the service outcomes.³

Table 3.6 shows the activities expected to be provided under the current 10 year Planned Budget allocation, and the Forecast activity requirements being recommended in this AM Plan.

Table 3.6: Technical Levels of Service

Lifecycle Activity	Purpose of Activity	Activity Measure	Current Performance*	Recommended Performance **
TECHNICAL LEVELS OF SERVICE				
Acquisition	Improve bridge functionality for all modes of travel	Frequency of renewals based on condition state	Non-conforming bridges are being updated every 2-4 years.	It is not anticipated for a change in budget based on forecasted acquisitions.
	Acquired bridges through new development	Forecasted based on development approvals	Trending at one donated bridge every 5 years.	Based on future City growth, it is anticipated the budget would remain the same.
		Budget	<i>\$3,000,000</i>	<i>\$3,000,000</i>
Operation	Review the condition of bridge assets	What is the frequency of inspections?	Most bridges are on a 2-year inspection cycle. Some are on 1-year cycle due to structure condition.	Keep all bridges on a 2-year inspection cycle. Increased budget due to acquisition growth.
	Maintain clean deck surface from debris and chemicals that would impact bridge condition.	How often surface cleaning would occur.	Deck cleaning occurs once every 5-years.	Deck cleaning may need to be reduced to once every 10-years.
		Budget	<i>\$400,000</i>	<i>\$410,000</i>
Maintenance	Keep bridges in good to fair condition to extend useful life.	How often maintenance activities are occurring	Perform 10-15 reactive bridges repairs - concrete patching, joint sealant, deck replacement, rail painting and replacement, etc.	Perform 10 additional bridge repairs each year to extend useful life of fair condition bridges.
	Repair foundation scour of bridge substructure	How often performing inspections for scour	Identify any scour maintenance and plan repairs when possible	Immediately repair scour concerns upon notice after inspections
		Budget	<i>\$300,000</i>	<i>\$750,000</i>
Renewal	Replace bridges that are at the	Frequency of renewals varies	Typically, bridges are replaced every 75 years.	It is not anticipated to change the typical renewal period of 75 years. Budget

³ IPWEA, 2015, IIMM, p 2|28.

Lifecycle Activity	Purpose of Activity	Activity Measure	Current Performance*	Recommended Performance **
	end of their useful life.	based on condition state.		increase to renew backlog and forecasted bridges that have exceeded useful life.
		Budget	<i>\$2,100,000</i>	<i>\$2,600,000</i>
Disposal	Prepare for renewed structure.	Frequency of renewals	Demolition and haul off concrete structures every 2 years.	If renewals were to increase, then disposals will need to be adjusted accordingly.
	Upcycle a pedestrian bridge	How often this activity would occur.	Remove and relocate an under capacity pedestrian bridge to another location once every 5-10 years.	It is not anticipated a change in budget would be required for this activity.
		Budget	<i>\$200,000</i>	<i>\$250,000</i>

Note: * Current activities related to Planned Budget.

** Expected performance related to forecast lifecycle costs.

It is important to monitor the service levels regularly as circumstances can and do change. Current performance is based on existing resource provision and work efficiencies. It is acknowledged changing circumstances such as technology and customer priorities will change over time.

4.0 FUTURE DEMAND

4.1 Demand Drivers

Drivers affecting demand include things such as population change, regulations, changes in demographics, seasonal factors, vehicle ownership rates, consumer preferences and expectations, technological changes, economic factors, agricultural practices, environmental awareness, etc.

4.2 Demand Forecasts

The present position and projections for demand drivers that may impact future service delivery and use of assets have been identified and documented.

4.3 Demand Impact and Demand Management Plan

The impact of demand drivers that may affect future service delivery and use of assets are shown in Table 4.3.

Demand for new services will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices can include non-asset solutions, insuring against risks and managing failures.

Opportunities identified to date for demand management are shown in Table 4.3. Further opportunities will be developed in future revisions of this AM Plan.

Table 4.3: Demand Management Plan

Demand driver	Current position	Projection	Impact on services	Demand Management Plan
Population growth in the northeast part of the city.	Traffic impact studies to determine the necessity of new transportation infrastructure.	Alternate routes are being proposed for demand management. These routes contain bridge crossings.	Additional acquisition(s) will require future operations and maintenance funding.	Will demonstrate within the proposed budget the additional operations and maintenance costs.
Inflated Construction Costs	Review annual construction costs	Material costs will continue to go up increasing the overall costs of bridge renewals.	The current budget will not be able to keep up with maintenance and renewals. Thus, service levels will decrease over time.	Adjust budget offers for increased funding. May need to impose a transportation use tax to help supplement the budget deficiencies. Highway Use funds may be necessary to supplement the budget deficiencies.
Annexations	Review proposed annexations and the impacts to the bridge network.	Future annexations will add multiple structures to the bridge program.	Additional acquisition(s) will require renewal funding based on the current	Adjust budget offers for increased funding. May need to impose a transportation use tax to help supplement the budget deficiencies.

			condition state of the bridges.	Highway Use funds may be necessary to supplement the budget deficiencies.
Climate Change Impacts	Reviewing alternative materials for mix designs that have lower impacts to the environment and are more resilient.	It's possible that replacement of certain materials will be necessary to lower the environmental impact.	Additional materials will increase the cost of bridge construction and maintenance.	May need to impose a transportation use tax to help supplement the budget deficiencies. Highway Use funds may be necessary to supplement the budget deficiencies.

4.4 Asset Programs to meet Demand

The new assets required to meet demand may be acquired, donated or constructed. Additional assets are discussed in Section 5.4.

Acquiring new assets will commit the City to ongoing operations, maintenance and renewal costs for the period that the service provided from the assets is required. These future costs are identified and considered in developing forecasts of future operations, maintenance and renewal costs for inclusion in the long-term financial plan (Refer to Section 5).

4.5 Climate Change Adaptation

The impacts of climate change may have a significant impact on the assets we manage and the services they provide. In the context of the Asset Management Planning process climate change can be considered as both a future demand and a risk.

How climate change impacts on assets will vary depending on the location and the type of services provided, as will the way in which we respond and manage those impacts.⁴

As a minimum we consider how to manage our existing assets given potential climate change impacts for our region.

Risk and opportunities identified to date are shown in Table 4.5.1

Table 4.5.1 Managing the Impact of Climate Change on Assets and Services

Climate Change Description	Projected Change	Potential Impact on Assets and Services	Management
Construction Materials	It is anticipated that new materials will be utilized during bridge construction to lower the environmental impact.	The cost of acquiring certain materials will increase the construction costs. In addition, there may be significant lead times.	Ensure costs are accounted for within operations, maintenance, and renewals. Will need to properly plan for longer lead times

⁴ IPWEA Practice Note 12.1 Climate Change Impacts on the Useful Life of Infrastructure

Increased and Prolonged Temperature	Experiencing more days of higher temperatures.	It is possible that higher and longer temperatures can have higher carbon concentrations that can contribute to faster deterioration of bridges.	Will have to review alternative methods and materials of construction.
Flood Events	Increase snow melt and more frequent rain events and intensity of rainfalls.	Flooding can cause scour around piers thus leading to structural damage. Intense flooding could possibly submerge some bridges.	Review flood elevations and ensure renewals or new structures are built above flood elevations.

Additionally, the way in which we construct new assets should recognize that there is opportunity to build in resilience to climate change impacts. Building resilience can have the following benefits:

- Assets will withstand the impacts of climate change;
- Services can be sustained; and
- Assets that can endure may potentially lower the lifecycle cost and reduce their carbon footprint

Table 4.5.2 summarizes some asset climate change resilience opportunities.

Table 4.5.2 Building Asset Resilience to Climate Change

New Asset Description	Climate Change impact These assets?	Build Resilience in New Works
Upgrading CMP Less than 4' Bridges	Yes, can expedite deterioration rates.	Utilizing new materials during renewal to extend the useful life.
Bridge Piers	Yes, flooding can quickly scour piers causing structure failure.	Extend piers deeper during renewals that may not have as much impact during flood event.

The impact of climate change on assets is a new and complex discussion and further opportunities will be developed in future revisions of this AM Plan.

5.0 LIFECYCLE MANAGEMENT PLAN

The lifecycle management plan details how the City of Fort Collins plans to manage and operate the assets at the agreed levels of service (Refer to Section 3) while managing life cycle costs.

5.1 Background Data

5.1.1 Physical parameters

The assets covered by this AM Plan are shown in Table 5.1.1.

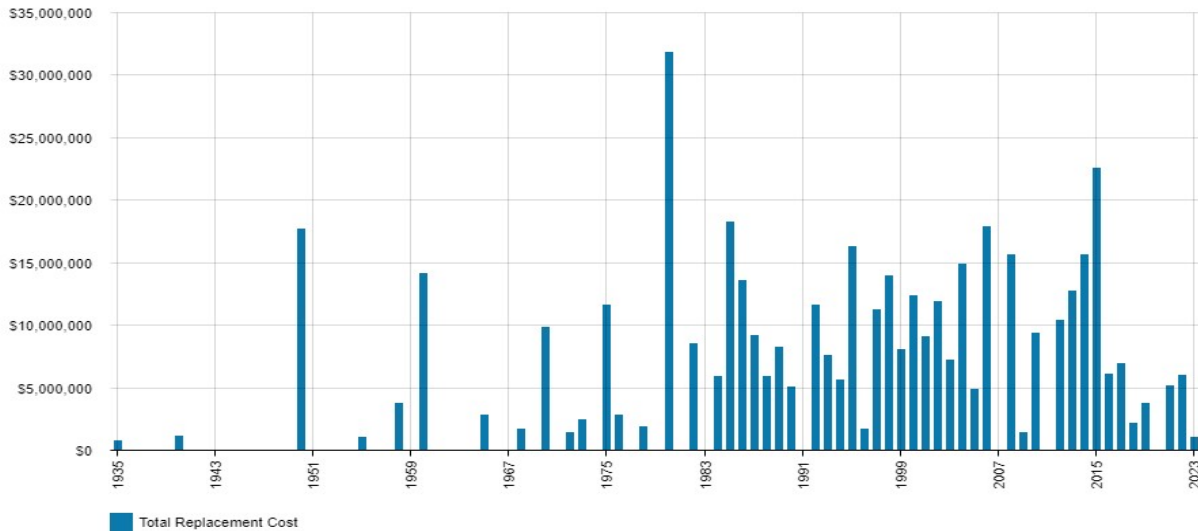
These assets include bridges that are owned, inspected and maintained by Engineering, Parks, and Natural Areas departments within the City.

The age profile of the assets included in this AM Plan are shown in Figure 5.1.1.

Table 5.1.1: Assets covered by this Plan

Asset Category	Dimension (Sq. Ft.)	Total Count	Replacement Value
Major	320,325	92	\$240.0 Million
Minor	136,920	135	\$198.5 Million
Pedestrian	26,516	141	\$47.4 Million
Less than 4 feet	To be determined	80	\$12.5 Million
Unprogrammed	6,508	3	\$1.9 Million
TOTAL			\$498 Million

Figure 5.1.1: Asset Age Profile



All figure values are shown in current day dollars.

Add discussion about the age asset profile. Outline how past peaks of investment that may require peaks in renewals in the future. Comment on the overall age versus useful lives of the assets.

5.1.2 Asset capacity and performance

Assets are generally provided to meet design standards where these are available. However, there is insufficient resources to address all known deficiencies. Locations where deficiencies in service performance are known are detailed in Table 5.1.2.

Table 5.1.2: Known Service Performance Deficiencies

Location	Service Deficiency
Structurally Deficient Bridges	Structure deterioration rates are becoming critical and may impact road network.

The above service deficiencies were identified from bridge inspection reports.

5.1.3 Asset condition

Condition is currently monitored by performing inspections on a two-year frequency for Major and Minor bridges. Due to the number of Minor bridges half are inspected on an annual basis. Pedestrian bridges are inspected on a five-year frequency with 1/5th inspected annually. Staff is working with our bridge consultant to determine the inspection frequency for Less than 4' bridges.

Condition is measured using a 1 – 5 grading system⁵ as detailed in Table 5.1.3. It is important that a consistent approach is used in reporting asset performance enabling effective decision support. A finer grading system may be used at a more specific level, however, for reporting in the AM plan results are translated to a 1 – 5 grading scale for ease of communication.

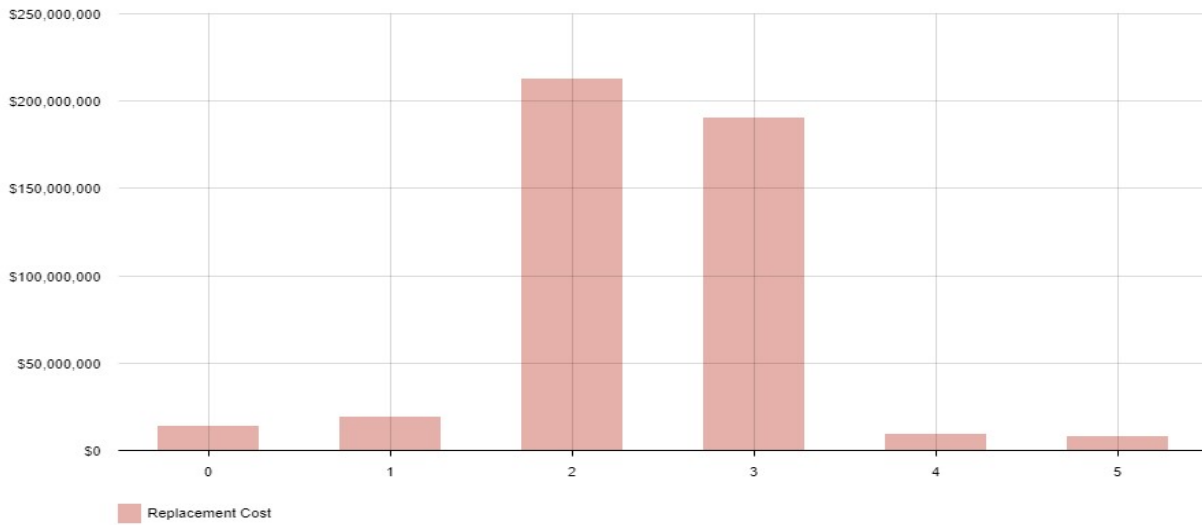
Table 5.1.3: Condition Grading System

Condition Grading	Description of Condition
1	Very Good: free of defects, only planned and/or routine maintenance required
2	Good: minor defects, increasing maintenance required plus planned maintenance
3	Fair: defects requiring regular and/or significant maintenance to reinstate service
4	Poor: significant defects, higher order cost intervention likely
5	Very Poor: physically unsound and/or beyond rehabilitation, immediate action required

The condition profile of our assets is shown in Figure 5.1.3.

⁵ IPWEA, 2015, IIMM, Sec 2.5.4, p 2 | 80.

Figure 5.1.3: Asset Condition Profile



The majority of the bridge assets are in good to fair condition. As demonstrated in the Asset Condition Profile above managing the fair condition assets with an operations and maintenance plan will be necessary to extend the useful life of those assets. Falling into poor and very poor condition grades typically requires renewal only options for repair and is considerably more costly.

All figure values are shown in current day dollars.

5.2 Operations and Maintenance Plan

Operations include regular activities to provide services. Examples of typical operational activities include cleaning, street sweeping, asset inspection, and utility costs.

Maintenance includes all actions necessary for retaining an asset as near as practicable to an appropriate service condition including regular ongoing day-to-day work necessary to keep assets operating. Examples of typical maintenance activities include pipe repairs, asphalt patching, and equipment repairs.

The trend in maintenance budgets are shown in Table 5.2.1.

Table 5.2.1: Maintenance Budget Trends

Year	Maintenance Budget \$
2022 (Asset Inspection)	\$400,000
2023 (Asset Inspection & Maintenance)	\$700,000
2024 (Asset Inspection & Maintenance)	\$700,000

Maintenance budget levels are considered to be adequate to meet projected service levels, which may be less than or equal to current service levels. Where maintenance budget allocations are such that they will result in a lesser level of service, the service consequences and service risks have been identified and are highlighted in this AM Plan and service risks considered in the Infrastructure Risk Management Plan.

Assessment and priority of reactive maintenance is undertaken by staff using experience and judgement.

Asset hierarchy

An asset hierarchy provides a framework for structuring data in an information system to assist in collection of data, reporting information and making decisions. The hierarchy includes the asset class and component used for asset planning and financial reporting and service level hierarchy used for service planning and delivery.

The service hierarchy is shown in Table 5.2.2.

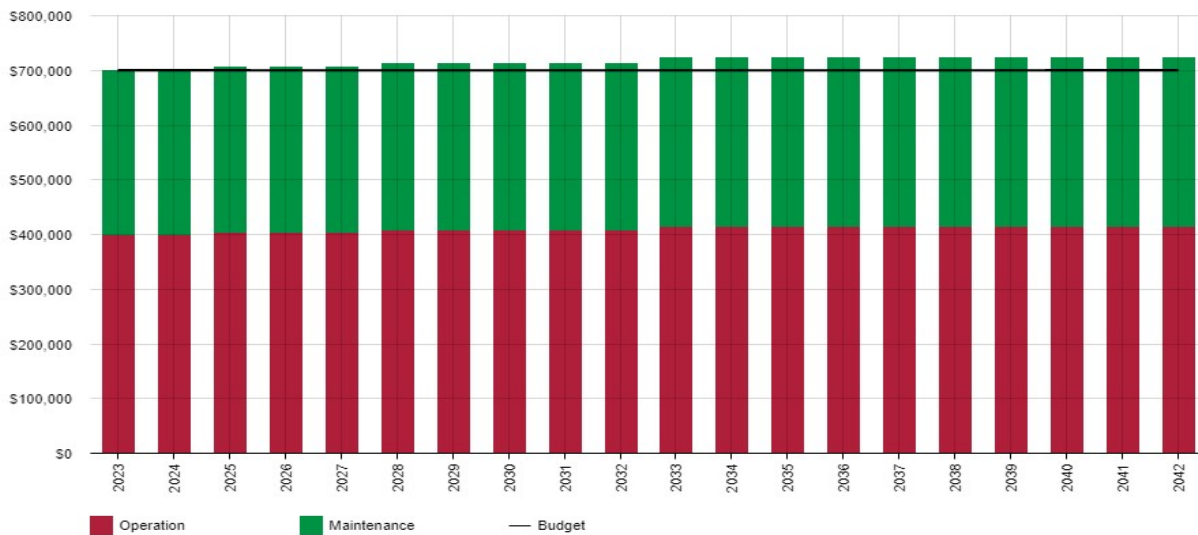
Table 5.2.2: Asset Service Hierarchy

Service Hierarchy	Service Level Objective
Bridge Decking	To provide a surface to carry a load efficiently and effectively over an obstruction.
Superstructure (Beams, Girders, Parapet Walls, and Handrails)	To support the roadway or decking.
Substructure (Abutments, Piers, Wing Walls – mentioned below)	To support the superstructure and transfer loads safely to subgrade.
Wing Walls	To retain soil for the substructure, roadway, and approach embankment.
Culvert	Another form of a bridge consisting of a tunnel-like structure to allow the safe passage of vehicular or pedestrian traffic.

Summary of forecast operations and maintenance costs

Forecast operations and maintenance costs are expected to vary in relation to the total value of the asset stock. If additional assets are acquired, the future operations and maintenance costs are forecast to increase. If assets are disposed of the forecast operation and maintenance costs are expected to decrease. Figure 5.2 shows the forecast operations and maintenance costs relative to the proposed operations and maintenance Planned Budget.

Figure 5.2: Operations and Maintenance Summary



All figure values are shown in current day dollars.

It is anticipated the forecast operations and maintenance costs will increase over time due to acquisition growth from construction of new assets as well as donated assets from development.

Deferred maintenance (i.e. works that are identified for maintenance activities but unable to be completed due to available resources) should be included in the infrastructure risk management plan.

5.3 Renewal Plan

Renewal is major capital work which does not significantly alter the original service provided by the asset, but restores, rehabilitates, replaces, or renews an existing asset to its original service potential. Work over and above restoring an asset to original service potential is considered to be an acquisition resulting in additional future operations and maintenance costs.

Assets requiring renewal are identified from one of two approaches in the Lifecycle Model.

- The first method uses Asset Register data to project the renewal costs (current replacement cost) and renewal timing (acquisition year plus updated useful life to determine the renewal year), or
- The second method uses an alternative approach to estimate the timing and cost of forecast renewal work (i.e., condition modelling system, staff judgement, average network renewals, or other).

The typical useful lives of assets used to develop projected asset renewal forecasts are shown in Table 5.3. Asset useful lives were last reviewed in September, 2022.⁶

Table 5.3: Useful Lives of Assets

Asset (Sub)Category	Useful life
Major and Minor Bridges	Varies between 50 and 75 years depending on design timeframe. All newly constructed bridges are 75 years
Pedestrian Bridges	50 Years

The estimates for renewals in this AM Plan were based on the asset register.

5.3.1 Renewal ranking criteria

Asset renewal is typically undertaken to either:

- Ensure the reliability of the existing infrastructure to deliver the service it was constructed to facilitate (e.g., replacing a bridge that has a 5-ton load limit), or
- To ensure the infrastructure is of sufficient quality to meet the service requirements (e.g., condition of a playground).⁷

It is possible to prioritise renewals by identifying assets or asset groups that:

- Have a high consequence of failure,
- Have high use and subsequent impact on users would be significant,
- Have higher than expected operational or maintenance costs, and

⁶ Enter Reference to Report documenting Review of Useful Life of Assets

⁷ IPWEA, 2015, IIMM, Sec 3.4.4, p 3|91.

- Have potential to reduce life cycle costs by replacement with a modern equivalent asset that would provide the equivalent service.⁸

The ranking criteria used to determine priority of identified renewal proposals is detailed in Table 5.3.1.

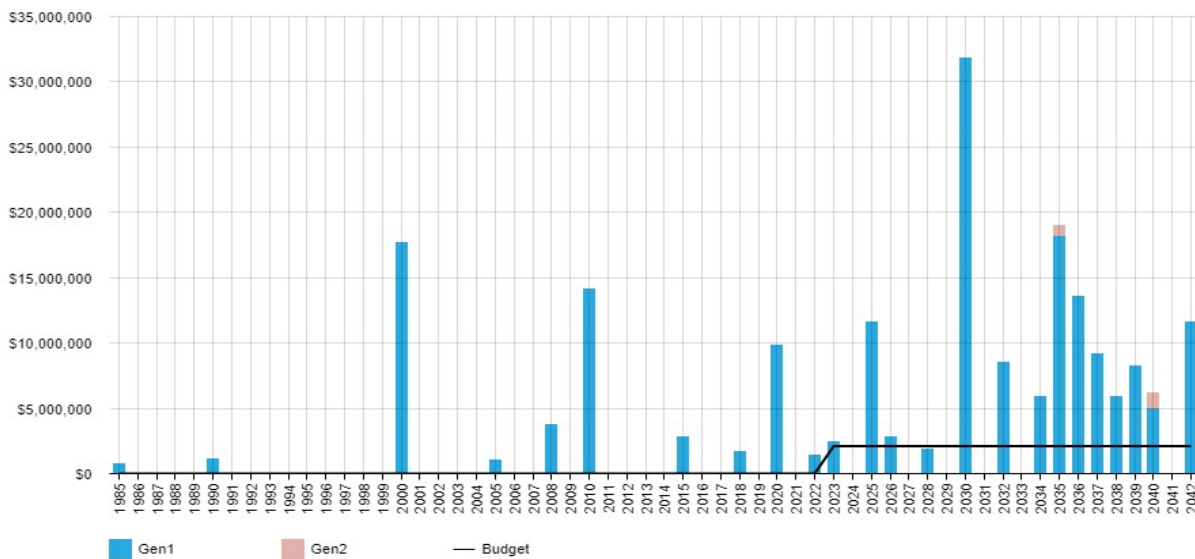
Table 5.3.1: Renewal Priority Ranking Criteria

Criteria	Weighting
Structure Condition	33%
Consequence of Risk	33%
Equity	33%
Total	100%

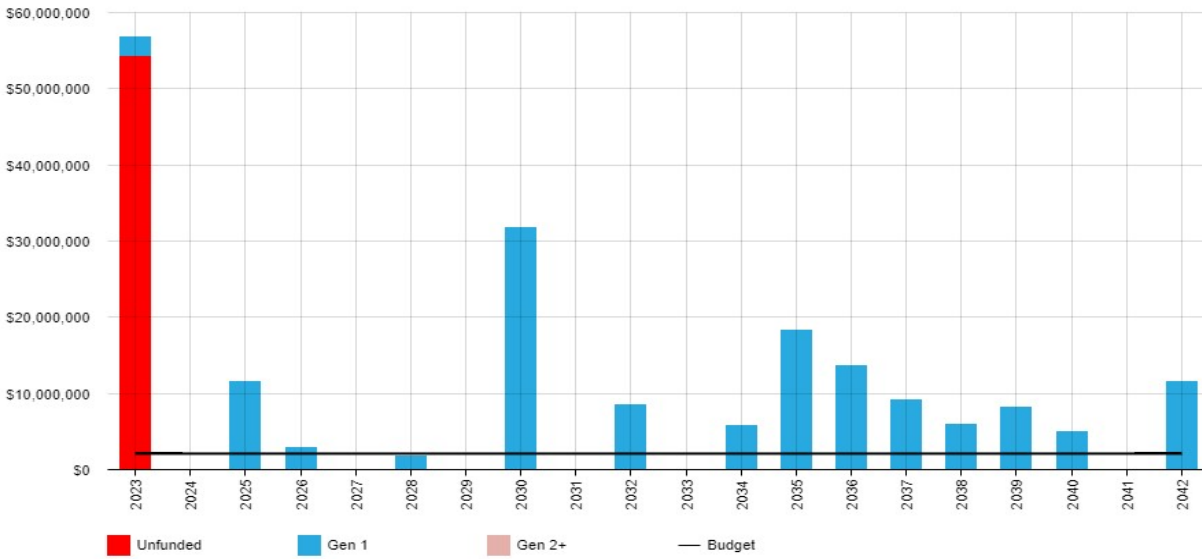
5.4 Summary of future renewal costs

Forecast renewal costs are projected to increase over time if the asset stock increases. The forecast costs associated with renewals are shown relative to the proposed renewal budget in Figure 5.4.1. A detailed summary of the forecast renewal costs is shown in Appendix D.

Figure 5.4.1: Forecast Renewal Costs



⁸ Based on IPWEA, 2015, IIMM, Sec 3.4.5, p 3|97.



All figure values are shown in current day dollars.

The forecasted renewals are indicating a significant future cost to the city in addition to past backlogged renewals that have exceeded their useful life. However, as part of the operations and maintenance plan, bridges will continue to be evaluated on an annual or bi-annual basis to determine condition state for future renewals and to determine appropriate budget allocations.

Deferred renewal (assets identified for renewal and not scheduled in capital works programs) should be included in the risk analysis process in the risk management plan.

5.5 Acquisition Plan

Acquisition reflects new assets that did not previously exist or works which will upgrade or improve an existing asset beyond its existing capacity. They may result from growth, demand, social or environmental needs. Assets may also be donated to the City.

5.5.1 Selection criteria

Proposed acquisition of new assets, and upgrade of existing assets, are identified from various sources such as community requests, proposals identified by strategic plans or partnerships with others. Potential upgrade and new works should be reviewed to verify that they are essential to the Entities needs. Proposed upgrade and new work analysis should also include the development of a preliminary renewal estimate to ensure that the services are sustainable over the longer term. Verified proposals can then be ranked by priority and available funds and scheduled in future works programs. The priority ranking criteria is detailed in Table 5.5.1.

Table 5.5.1: Acquired Assets Priority Ranking Criteria

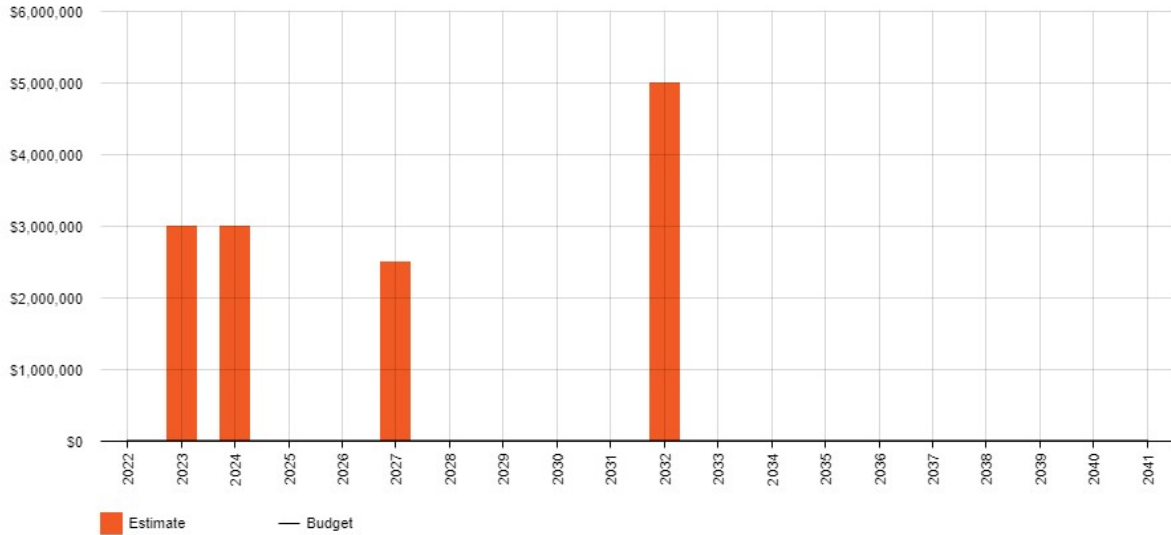
Criteria	Weighting
Functional Status / Service Benefit	55%
Financial Benefit / Grant Opportunities	25%
Equity	10%

Structural Condition	10%
Total	100%

Summary of future asset acquisition costs

Forecast acquisition asset costs are summarized / summarized in Figure 5.5.1 and shown relative to the proposed acquisition budget. The forecast acquisition capital works program is shown in Appendix A.

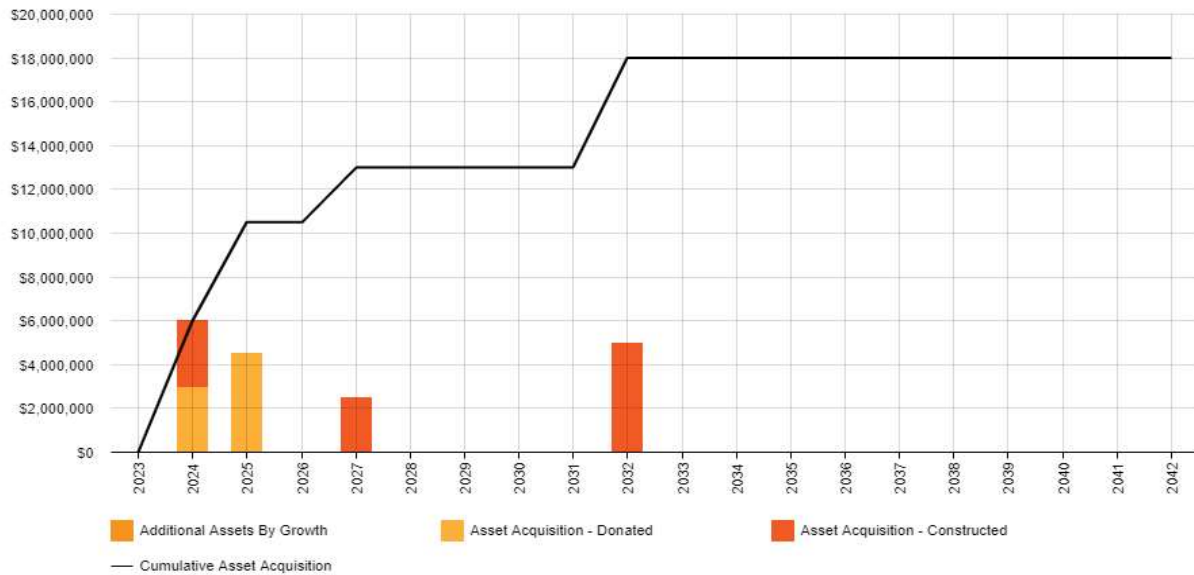
Figure 5.5.1: Acquisition (Constructed) Summary



All figure values are shown in current day dollars.

When an Entity commits to new assets, they must be prepared to fund future operations, maintenance and renewal costs. They must also account for future depreciation when reviewing long term sustainability. When reviewing the long-term impacts of asset acquisition, it is useful to consider the cumulative value of the acquired assets being taken on by the Entity. The cumulative value of all acquisition work, including assets that are constructed and contributed shown in Figure 5.5.2.

Figure 5.5.2: Acquisition Summary



All figure values are shown in current dollars.

Expenditure on new assets and services in the capital works program will be accommodated in the long-term financial plan, but only to the extent that there is available funding.

The forecasted acquisitions to be constructed by the City exceed the current budget level as shown in Figure 5.7.1. As demonstrated in the graph above, it is anticipated the City will acquire an additional \$10 million in assets over the next three years. These assets, in the short-term, have programmed funding for operations. Additional maintenance dollars will need to be programmed for the long-term. The Vine Bridge Replacement will need to seek out additional funding opportunities to replace this asset.

5.6 Disposal Plan

Disposal includes any activity associated with the disposal of a decommissioned asset including sale, demolition or relocation. Assets identified for possible decommissioning and disposal are shown in Table 5.6. A summary of the disposal costs and estimated reductions in annual operations and maintenance of disposing of the assets are also outlined in Table 5.6. Any costs or revenue gained from asset disposals is included in the long-term financial plan.

Table 5.6: Assets Identified for Disposal

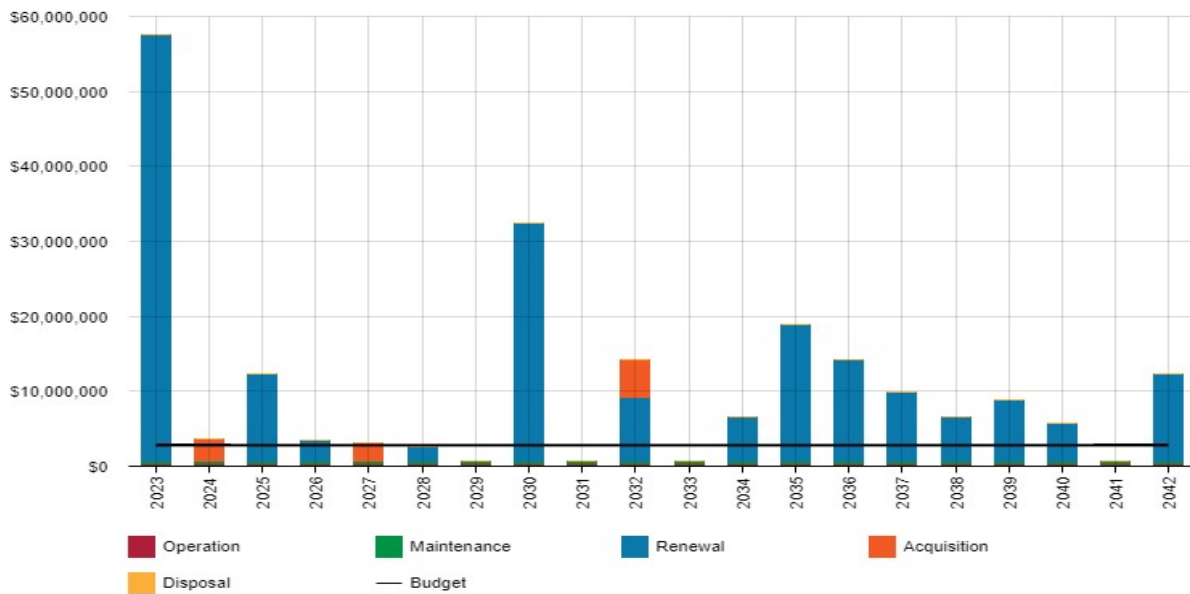
Asset	Reason for Disposal	Timing	Disposal Costs	Operations & Maintenance Annual Savings
Pedestrian Bridge Renewal	Renewed Structure	2-5 years	\$200,000	n/a

5.7 Summary of asset forecast costs

The financial projections from this asset plan are shown in Figure 5.7.1. These projections include forecast costs for acquisition, operation, maintenance, renewal, and disposal. These forecast costs are shown relative to the proposed budget.

The bars in the graphs represent the forecast costs needed to minimize the life cycle costs associated with the service provision. The proposed budget line indicates the estimate of available funding. The gap between the forecast work and the proposed budget is the basis of the discussion on achieving balance between costs, levels of service and risk to achieve the best value outcome.

Figure 5.7.1: Lifecycle Summary



All figure values are shown in current day dollars.

A number of bridges have greatly exceeded their useful life which is demonstrating an initial backlog with insufficient funding to manage the renewals. Risk management planning will be necessary, and it is anticipated at some point there may be disruption of community services.

6.0 RISK MANAGEMENT PLANNING

The purpose of infrastructure risk management is to document the findings and recommendations resulting from the periodic identification, assessment and treatment of risks associated with providing services from infrastructure, using the fundamentals of International Standard ISO 31000:2018 Risk management – Principles and guidelines.

Risk Management is defined in ISO 31000:2018 as: ‘coordinated activities to direct and control with regard to risk’⁹.

An assessment of risks¹⁰ associated with service delivery will identify risks that will result in loss or reduction in service, personal injury, environmental impacts, a ‘financial shock’, reputational impacts, or other consequences. The risk assessment process identifies credible risks, the likelihood of the risk event occurring, and the consequences should the event occur. The risk assessment should also include the development of a risk rating, evaluation of the risks and development of a risk treatment plan for those risks that are deemed to be non-acceptable.

6.1 Critical Assets

Critical assets are defined as those which have a high consequence of failure causing significant loss or reduction of service. Critical assets have been identified and along with their typical failure mode, and the impact on service delivery, are summarized in Table 6.1. Failure modes may include physical failure, collapse or essential service interruption.

Table 6.1 Critical Assets

Critical Asset(s)	Failure Mode	Impact
Structurally Deficient Bridges (Major/Minor)	Without renewal of the 16 SD bridges failure or collapse is imminent.	Impact will disrupt community services, emergency services, school routes, and higher levels of traffic congestion on main roadways. Failure will also impact staff service due to required alternative routes.
Structurally Deficient Bridges (Major/Minor)	Weight Restricted	Alter the transportation of goods, emergency services, school bus routes, and staff service due to weight restrictions.
Structurally Deficient Bridges (Major/Minor)	Additional Services Required	Additional funding is necessary due to increased inspection frequency reducing available funding for operations, maintenance, and renewals.

By identifying critical assets and failure modes an organization can ensure that investigative activities, condition inspection programs, maintenance and capital expenditure plans are targeted at critical assets.

6.2 Risk Assessment

The risk management process used is shown in Figure 6.2 below.

It is an analysis and problem-solving technique designed to provide a logical process for the selection of treatment plans and management actions to protect the community against unacceptable risks.

The process is based on the fundamentals of International Standard ISO 31000:2018.

⁹ ISO 31000:2009, p 2

¹⁰ REPLACE with Reference to the Corporate or Infrastructure Risk Management Plan as the footnote

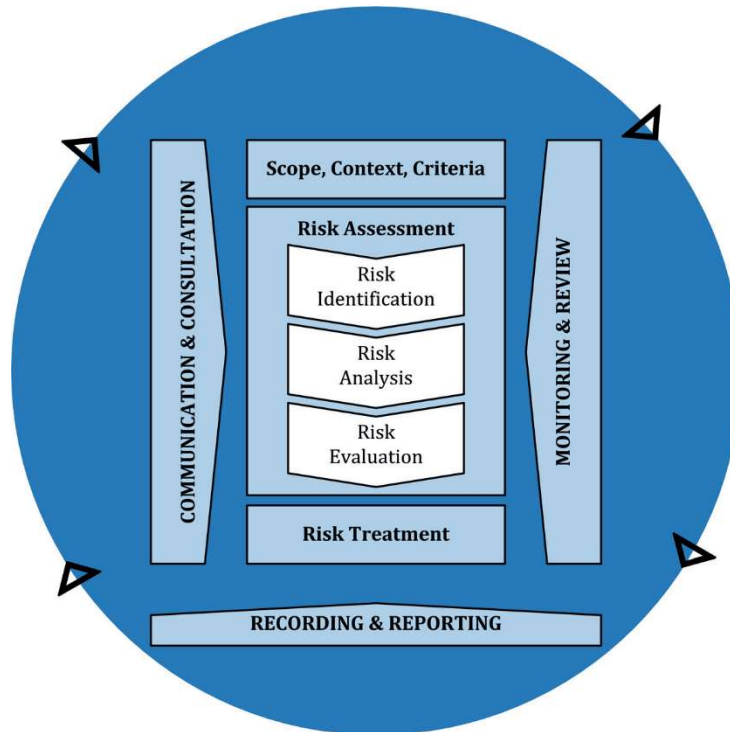


Fig 6.2 Risk Management Process – Abridged
 Source: ISO 31000:2018, Figure 1, p9

The risk assessment process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur, development of a risk rating, evaluation of the risk and development of a risk treatment plan for non-acceptable risks.

An assessment of risks¹¹ associated with service delivery will identify risks that will result in loss or reduction in service, personal injury, environmental impacts, a ‘financial shock’, reputational impacts, or other consequences.

Critical risks are those assessed with ‘Very High’ (requiring immediate corrective action) and ‘High’ (requiring corrective action) risk ratings identified in the Infrastructure Risk Management Plan. The residual risk and treatment costs of implementing the selected treatment plan is shown in Table 6.2. It is essential that these critical risks and costs are reported to Planning Development & Transportation Directors.

¹¹ REPLACE with Reference to the Corporate or Infrastructure Risk Management Plan as the footnote

Table 6.2: Risks and Treatment Plans

Service or Asset at Risk	What can Happen	Risk Rating (VH, H)	Risk Treatment Plan	Residual Risk *	Treatment Costs
Bridge Network	Mulberry Corridor Annexed Assets from Larimer County	VH	Cost Share, Budget Offers, Grant Opportunities, Road Network Funds, Highway Use Funds	M	Est. \$12M
Bridge Network	Loss of Staff and their historic knowledge of the bridge program	H	Succession Planning – cross train project managers to manage bridge projects	L	\$80,000
Bridge Network	Maintenance underfunding to maintain bridges in fair to good condition extending useful life	H	Budget Offers, Grant Opportunities, Highway Use Funds	M	\$750,000 300,000 – approved budget offer for 2023/2024
Bridge Network	Flooding – Loss of Structures or bridge closures	H	Continue Inspection Frequency, Perform Required Maintenance, Reconstruct at Higher Flood Stage	M	\$1.5M - \$10M
Bridge Network	Critical Asset Replacements	H	Budget Offers, Grant Opportunities, Road Network Funds to renew structurally deficient bridges	L	\$7M

Note * The residual risk is the risk remaining after the selected risk treatment plan is implemented.

6.3 Infrastructure Resilience Approach

The resilience of our critical infrastructure is vital to the ongoing provision of services to customers. To adapt to changing conditions we need to understand our capacity to ‘withstand a given level of stress or demand’, and to respond to possible disruptions to ensure continuity of service.

Resilience recovery planning, financial capacity, climate change risk assessment and crisis leadership.

Our current measure of resilience is shown in Table 6.3 which includes the type of threats and hazards and the current measures that the organization takes to ensure service delivery resilience.

Table 6.3: Resilience Assessment

Threat / Hazard	Assessment Method	Current Resilience Approach
Bridge Closures	Condition Assessment	High - Continue to perform bridge inspections and prioritize any critical maintenance activities. Prioritize bridge renewals based upon risk assessment.
Maintain bridges in state of good or fair condition	Condition Assessment	High – Develop 10-year maintenance program for on-call bridge maintenance contractor to be reviewed annually after inspection period.
Scour Critical Bridges	Condition Assessment	High - Scour critical bridges should be prioritized first for maintenance to ensure footing stability

6.4 Service and Risk Trade-Offs

The decisions made in adopting this AM Plan are based on the objective to achieve the optimum benefits from the available resources.

6.4.1 What we cannot do

There are some operations and maintenance activities and capital projects that are unable to be undertaken within the next 10 years. These include:

- Design and replace all structurally deficient bridges within the current bridge network.

6.4.2 Service trade-off

If there is forecast work (operations, maintenance, renewal, acquisition or disposal) that cannot be undertaken due to available resources, then this will result in service consequences for users. These service consequences include:

- Possible road closures or increased levels of weight restrictions that would limit heavy vehicle passage.
- Community services interruption and increased emergency response time due to rerouting.

6.4.3 Risk trade-off

The operations and maintenance activities and capital projects that cannot be undertaken may sustain or create risk consequences. These risk consequences include:

- Structural failure or collapse.
- Increased traffic congestion due to rerouting.
- Structure collapse could lead to negative reputation or loss of trust.

These actions and expenditures are considered and included in the forecast costs, and where developed, the Risk Management Plan.

7.0 FINANCIAL SUMMARY

This section contains the financial requirements resulting from the information presented in the previous sections of this AM Plan. The financial projections will be improved as the discussion on desired levels of service and asset performance matures.

7.1 Financial Sustainability and Projections

7.1.1 Sustainability of service delivery

There are two key indicators of sustainable service delivery that are considered in the AM Plan for this service area. The two indicators are the:

- asset renewal funding ratio (proposed renewal budget for the next 10 years / forecast renewal costs for next 10 years), and
- medium term forecast costs/proposed budget (over 10 years of the planning period).

Asset Renewal Funding Ratio

Asset Renewal Funding Ratio¹² 18.52%

The Asset Renewal Funding Ratio is an important indicator and illustrates that over the next 10 years we expect to have 18.52% of the funds required for the optimal renewal of assets.

The forecast renewal work along with the proposed renewal budget, and the cumulative shortfall, is illustrated in Appendix D.

Medium term – 10 year financial planning period

This AM Plan identifies the forecast operations, maintenance and renewal costs required to provide an agreed level of service to the community over a 10 year period. This provides input into 10 year financial and funding plans aimed at providing the required services in a sustainable manner.

This forecast work can be compared to the proposed budget over the first 10 years of the planning period to identify any funding shortfall.

The forecast operations, maintenance and renewal costs over the 10 year planning period is \$12,060,629 on average per year.

The proposed (budget) operations, maintenance and renewal funding is \$2,800,000 on average per year giving a 10 year funding shortfall of \$-9,260,629 per year. This indicates that 23% of the forecast costs needed to provide the services documented in this AM Plan are accommodated in the proposed budget. Note, these calculations exclude acquired assets.

Providing sustainable services from infrastructure requires the management of service levels, risks, forecast outlays and financing to achieve a financial indicator of approximately 1.0 for the first years of the AM Plan and ideally over the 10 year life of the Long-Term Financial Plan.

7.1.2 Forecast Costs (outlays) for the long-term financial plan

Table 7.1.3 shows the forecast costs (outlays) required for consideration in the 10 year long-term financial plan.

Providing services in a financially sustainable manner requires a balance between the forecast outlays required to deliver the agreed service levels with the planned budget allocations in the long-term financial plan.

¹² AIFMM, 2015, Version 1.0, Financial Sustainability Indicator 3, Sec 2.6, p 9.

A gap between the forecast outlays and the amounts allocated in the financial plan indicates further work is required on reviewing service levels in the AM Plan (including possibly revising the long-term financial plan).

We will manage the ‘gap’ by developing this AM Plan to provide guidance on future service levels and resources required to provide these services in consultation with the community.

Forecast costs are shown in 2023 dollar values.

Table 7.1.2: Forecast Costs (Outlays) for the Long-Term Financial Plan

Year	Acquisition	Operation	Maintenance	Renewal	Disposal
2023	0	400000	300000	56821808	0
2024	3000000	400000	300000	0	0
2025	0	408400	304800	11562414	0
2026	0	414700	308400	2837000	0
2027	2500000	414700	308400	0	0
2028	0	418200	310400	1836985	0
2029	0	418200	310400	0	0
2030	0	418200	310400	31803100	0
2031	0	418200	310400	0	0
2032	5000000	418200	310400	8542585	0
2033	0	425200	314400	0	0
2034	0	425200	314400	5855500	0
2035	0	425200	314400	18240830	0
2036	0	425200	314400	13581847	0
2037	0	425200	314400	9156075	0
2038	0	425200	314400	5900100	0
2039	0	425200	314400	8205018	0
2040	0	425200	314400	5027925	0
2041	0	425200	314400	0	0
2042	0	425200	314400	11592602	0
Total	10,500,000	8,380,800	6,217,600	190,963,789	0

7.2 Funding Strategy

The proposed funding for assets is outlined in the Entity’s budget and Long-Term financial plan.

The financial strategy of the entity determines how funding will be provided, whereas the AM Plan communicates how and when this will be spent, along with the service and risk consequences of various service alternatives.

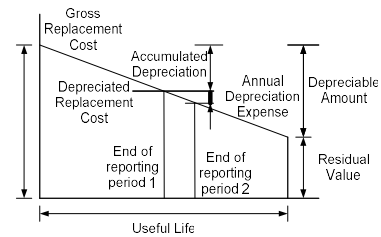
7.3 Valuation Forecasts

7.3.1 Asset valuations

The best available estimate of the value of assets included in this AM Plan are shown below. The assets are valued at fair value at cost to replace service capacity:

Replacement Cost (Current/Gross) \$452,222,680

Depreciable Amount	\$452,222,680
Depreciated Replacement Cost ¹³	\$220,932,176
Depreciation	\$7,731,958



7.3.2 Valuation forecast

Asset values are forecast to increase as additional assets are added and removed from service.

Additional assets will generally add to the operations and maintenance needs in the longer term. Additional assets will also require additional costs due to future renewals. Any additional assets will also add to future depreciation forecasts.

7.4 Key Assumptions Made in Financial Forecasts

In compiling this AM Plan, it was necessary to make some assumptions. This section details the key assumptions made in the development of this AM plan and should provide readers with an understanding of the level of confidence in the data behind the financial forecasts.

Key assumptions made in this AM Plan are:

- Various bridge design life and expected useful life from those designs. Will be reviewing and updating useful life in future iterations of the plan as indicated in Section 8.0 Plan Improvement.
- Future demand and the impact of demand drivers that may affect future service delivery.

7.5 Forecast Reliability and Confidence

The forecast costs, proposed budgets, and valuation projections in this AM Plan are based on the best available data. For effective asset and financial management, it is critical that the information is current and accurate. Data confidence is classified on an A - E level scale¹⁴ in accordance with Table 7.5.1.

Table 7.5.1: Data Confidence Grading System

Confidence Grade	Description
A. Very High	Data based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete and estimated to be accurate $\pm 2\%$
B. High	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example some of the data is old, some documentation is missing and/or reliance is placed on unconfirmed reports or some extrapolation. Dataset is complete and estimated to be accurate $\pm 10\%$
C. Medium	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data are available. Dataset is substantially complete but up to 50% is extrapolated data and accuracy estimated $\pm 25\%$

¹³ Also reported as Written Down Value, Carrying or Net Book Value.

¹⁴ IPWEA, 2015, IIMM, Table 2.4.6, p 2|71.

Confidence Grade	Description
D. Low	Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete, and most data is estimated or extrapolated. Accuracy \pm 40%
E. Very Low	None or very little data held.

The estimated confidence level for and reliability of data used in this AM Plan is shown in Table 7.5.2.

Table 7.5.2: Data Confidence Assessment for Data used in AM Plan

Data	Confidence Assessment	Comment
Demand drivers	Medium	Based on information provided by outside agencies and organizations.
Growth projections	Very High/High	Based on current development trends and data provided by Development Review Engineers.
Acquisition forecast	High	Based on development growth and capacity needs of the transportation network.
Operation forecast	Very High	Based on existing dataset and consultant inspections.
Maintenance forecast	High	Based on existing dataset and consultant inspections. Dataset is primarily complete.
Renewal forecast		
- Asset values	High	Values based on recent project costs.
- Asset useful lives	High	Based on projections by others. Additional review necessary.
- Condition modelling	Very High	Based on current inspections.
Disposal forecast	High	Based on future projects within next five years.

The estimated confidence level for and reliability of data used in this AM Plan is considered to be a *B. High* confidence level.

8.0 PLAN IMPROVEMENT AND MONITORING

8.1 Status of Asset Management Practices¹⁵

8.1.1 Accounting and financial data sources

This AM Plan utilizes accounting and financial data. The source of the financial data is based on bridge consultant projected costs of various types of bridge structures (i.e., Slab, Girder System, Tee Beam, Box Beam, Culvert).

8.1.2 Asset management data sources

This AM Plan also utilizes asset management data. The source of the data is the Bridge Inspection Data Master File.

8.2 Improvement Plan

It is important that an entity recognize areas of their AM Plan and planning process that require future improvements to ensure effective asset management and informed decision making. The improvement plan generated from this AM Plan is shown in Table 8.2.

Table 8.2: Improvement Plan

Task	Task	Responsibility	Resources Required	Timeline
1	Review acquisitions forecast for annual AM Plan update.	Asset Manager	Capital Projects Team	Q4-2023
2	Review specific measures align with organizational objectives within the AM Plan.	Asset Manager	Capital Projects Team and City Engineer	Q4-2023
3	Review Levels of Service with PDT Leadership	Asset Manager	City Engineer and PDT Directors	Q4-2023
4	Review and update Demand Drivers.	Engineering Team	Engineering Team	Q4-2023
5	Review and validation of the useful lives for bridge structures.	Capital Projects Team	Capital Projects Team	Q1-2024
6	Determine if there are specific disposals related to bridge renewals.	Asset Manager	Capital Projects and Parks Team	Q1-2024
7				
8				
9				
10				

¹⁵ ISO 55000 Refers to this as the Asset Management System

8.3 Monitoring and Review Procedures

This AM Plan will be reviewed during the annual budget planning process and revised to show any material changes in service levels, risks, forecast costs and proposed budgets as a result of budget decisions.

The AM Plan will be reviewed and updated annually to ensure it represents the current service level, asset values, forecast operations, maintenance, renewals, acquisition and asset disposal costs and planned budgets. These forecast costs and proposed budget are incorporated into the Long-Term Financial Plan or will be incorporated into the Long-Term Financial Plan once completed.

The AM Plan has a maximum life of 4 years and is due for complete revision and updating within 1 year of each City election.

8.4 Performance Measures

The effectiveness of this AM Plan can be measured in the following ways:

- The degree to which the required forecast costs identified in this AM Plan are incorporated into the long-term financial plan,
- The degree to which the 1-5 year detailed works programs, budgets, business plans and corporate structures consider the 'global' works program trends provided by the AM Plan,
- The degree to which the existing and projected service levels and service consequences, risks and residual risks are incorporated into the Strategic Planning documents and associated plans,
- The Asset Renewal Funding Ratio achieving the Organisational target (this target is often 90 – 100%).

9.0 REFERENCES

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10.0 APPENDICES

Appendix A Acquisition Forecast

The City's bridge program and future development is forecasted to construct multiple bridges in the near future as demonstrated in Table A1. These include:

- Laporte Bridges (2023) – enhancements are being made to widen and improve for alternative modes of travel.
- Vine Bridge (2024) – Application for grant funding for renewal that will be upgraded/improved to accommodate alternative modes of travel.
- Montava Development (2024/2025) – anticipated two new bridges will be built with this development and accepted by the City.
- Turnberry Extension (2027) – forecasted for a new roadway to be constructed within the next 5-10 years. This new route will have to carry a water feature.
- Timberline Realignment (2032) – Application for grant funding for roadway realignment improvements. This new route will have to carry a railroad and roadway system.

Acquisitions will be reviewed on an annual basis and adjusted accordingly.

Table A1 - Acquisition Forecast Summary

Year	Constructed	Donated	Growth
2023	3000000	0	285773
2024	3000000	3000000	286002
2025	0	4500000	288631
2026	0	0	292462
2027	2500000	0	292696
2028	0	0	292930
2029	0	0	293164
2030	0	0	293399
2031	0	0	293633
2032	5000000	0	293868
2033	0	0	294103
2034	0	0	294339
2035	0	0	294574
2036	0	0	294810
2037	0	0	295046
2038	0	0	295282
2039	0	0	295518
2040	0	0	295754
2041	0	0	295991
2042	0	0	296228

Appendix B Operation Forecast

The bridge program will require the following operational costs associated with inspections of all city bridges. Additional operation costs are forecasted for new acquisitions. It is anticipated that these operational costs will increase over time.

Operation costs will be reviewed on an annual basis and adjusted accordingly.

Table B1 - Operation Forecast Summary

Year	Operation Forecast	Additional Operation Forecast	Total Operation Forecast
2023	400000	4600	400400
2024	400000	8800	405000
2025	400000	6704	413800
2026	400000	409	420504
2027	400000	3910	420914
2028	400000	410	424824
2029	400000	410	425234
2030	400000	411	425644
2031	400000	411	426055
2032	400000	7411	426466
2033	400000	412	433877
2034	400000	412	434289
2035	400000	412	434701
2036	400000	413	435114
2037	400000	413	435526
2038	400000	413	435939
2039	400000	414	436353
2040	400000	414	436766
2041	400000	414	437181
2042	400000	415	437596

Appendix C Maintenance Forecast

The bridge program has secured the following maintenance forecasted costs associated with repairs to City's bridges to help maintain a good or fair rating. The Capital Projects team will be reviewing past and future bridge inspection reports to determine if additional maintenance costs will be required in the future to maintain these ratings. The additional maintenance costs as shown in Table C1 are forecasted based on new acquisitions.

Maintenance costs will be reviewed on an annual basis and adjusted accordingly.

Table C1 - Maintenance Forecast Summary

Year	Maintenance Forecast	Additional Maintenance Forecast	Total Maintenance Forecast
2023	300000	2629	300228
2024	300000	5029	302857
2025	300000	3831	307886
2026	300000	234	311717
2027	300000	2234	311951
2028	300000	234	314185
2029	300000	235	314419
2030	300000	235	314654
2031	300000	235	314888
2032	300000	4235	315123
2033	300000	235	319358
2034	300000	235	319594
2035	300000	236	319829
2036	300000	236	320065
2037	300000	236	320301
2038	300000	236	320537
2039	300000	236	320773
2040	300000	237	321009
2041	300000	237	321246
2042	300000	237	321483

Appendix D Renewal Forecast Summary

The bridge program recommends renewals of existing assets based on useful life and condition of the assets from annual inspections. The renewal forecast as shown in Table D1 also demonstrates a backlog of assets in 2022 that have exceeded their proposed useful life.

Renewal costs will be reviewed on an annual basis and adjusted accordingly.

Table D1 - Renewal Forecast Summary

Year	Renewal Forecast	Renewal Budget
2022	30075792	2100000
2023	1644831	2100000
2024	0	2100000
2025	10064010	2100000
2026	2341029	2100000
2027	0	2100000
2028	479821	2100000
2029	0	2100000
2030	24088650	2100000
2031	0	2100000
2032	4187286	2100000
2033	0	2100000
2034	9808739	2100000
2035	8761531	2100000
2036	16977388	2100000
2037	11494008	2100000
2038	4319750	2100000
2039	5558980	2100000
2040	2295362	2100000
2041	0	2100000

D.2 –Renewal Plan

Following is a detailed output demonstrating those bridges that have exceeded their useful life as well as those being proposed for renewal in the future for the 20-year plan.

Table D2 - Renewal Plan Summary

Asset ID	Remaining Life	Register Renewal Year	Forecast Renewal Year	Renewal Cost	Useful Life
MLD-S-LRL-A	-38	1985	2023	787495	50
CEMT-MTN	-33	1990	2023	1126570	50
CHRY-SYCM-A	-23	2000	2023	707500	50
CRST-COOK	-23	2000	2023	1320310	50
FCPLM-W0.1-CTYP	-23	2000	2023	1718000	50
FCVINE-W.5-SUMV	-23	2000	2023	1820000	50

GRNT-S-MAP	-23	2000	2023	1337800	50
LOOM-MAP	-23	2000	2023	545320	50
LOOM-MAP-A	-23	2000	2023	771355	50
LRL-MYRT-A	-23	2000	2023	900520	50
MAP-LOOM	-23	2000	2023	1321600	50
MAP-W-GRNT-A	-23	2000	2023	1828000	50
MAP-WHTM-A	-23	2000	2023	771355	50
MGNL-OLIV-A	-23	2000	2023	787495	50
OAK-MTN-A	-23	2000	2023	1029685	50
OLIV-OAK-A	-23	2000	2023	916660	50
PROSPT-EFRONTRD	-23	2000	2023	1175005	50
WHTM-S-LAPT-A	-23	2000	2023	771355	50
REM-S-DART	-18	2005	2023	1045840	50
FCTRIL-0.5-LMY	-15	2008	2023	1840100	50
FCLMY-1.2-VINE	-15	2008	2023	1942400	50
FCELIZ-0.1-BRYN	-13	2010	2023	1728800	50
ELIZ-W-SKIN	-13	2010	2023	1718240	50
ELM-W-SHLD	-13	2010	2023	1853125	50
FCBRYN-0.0-WSTV	-13	2010	2023	1857500	50
CEMT-PRKS	-13	2010	2023	900520	50
MOUNTAN-BRYAN-N	-13	2010	2023	1336465	50
MOUNTAN-BRYAN-S	-13	2010	2023	1465630	50
SPR-W-BRTW	-13	2010	2023	1642000	50
SPR-W-LYNN	-13	2010	2023	1642000	50
LMY-S-VINE	-8	2015	2023	1265500	50
LAKE-WLDW	-8	2015	2023	1546360	50
FCMRSN-0.0-RYMT	-5	2018	2023	1701600	50
LAKE-W-CNTR	-3	2020	2023	1433335	50
HRMY-W-CLGE	-3	2020	2023	1359067	50
FCCRST-0.1-BRYN	-3	2020	2023	1434500	50
DRAKE-WYANDOT	-3	2020	2023	1687200	50
PRST-W-CTRE	-3	2020	2023	1078120	50
PRST-W-LAR	-3	2020	2023	1610941	50
VINE-GRIF	-3	2020	2023	1223440	50
FCHTHR-0.1-STUT	-1	2022	2023	1402700	50
FCHRMW-0.7-I25	0	2023	2023	2470400	50
FCLMY-0.1-STUT	2	2025	2025	4124500	50
DNBR-S-BRMG	2	2025	2025	1691665	50
STUT-S-RYEL	2	2025	2025	1349374	50
STOV-SWLW	2	2025	2025	1407505	50
TFTHILL-CLRVW	2	2025	2025	1610935	50

MTV-W-TMB	2	2025	2025	1378435	50
FCSHLD-0.1-HLPD	3	2026	2026	2837000	50
LMY-KNLD	5	2028	2028	1836985	50
HTHRGRD-STUART	7	2030	2030	1223440	50
FOSL-PLSH	7	2030	2030	1324000	50
FCSKY-0.0-SPINK	7	2030	2030	1706000	50
BROOKDR-PARKWDR	7	2030	2030	787495	50
CIPP-DART	7	2030	2030	1094275	50
FCLMY-0.1-RVSDE	7	2030	2030	9294500	50
FCLAPT-PENN	7	2030	2030	1575311	50
MLCK-ROMA	7	2030	2030	1483600	50
MTHW-S-DART	7	2030	2030	1481770	50
MDWLARK-CITATON	7	2030	2030	1407505	50
MDWP-MLCK	7	2030	2030	1870000	50
STUART-HERITAGE	7	2030	2030	1836985	50
STOV-DART	7	2030	2030	1691665	50
STUT-W-HTHR	7	2030	2030	1869265	50
SWALWRD-MDWLARK	7	2030	2030	1417189	50
SHLD-S-HLDL	7	2030	2030	1740100	50
TMB-INTR	9	2032	2032	2304000	50
FCLNDS-0.1-BDWK	9	2032	2032	1814900	50
FCBDWK-0.2-LNDS	9	2032	2032	1699700	50
FCSWLW-0.1-RGNK	9	2032	2032	1694300	50
FNIN-FFIV	9	2032	2032	1029685	50
FCLIND-0.1-WLLW	11	2034	2034	5855500	50
FCMOSS-0.1-BENT	12	2035	2035	1482800	50
FCLMY-0.2-SRGB	12	2035	2035	2449400	50
FCTRT-0.0-JFK	12	2035	2035	2352200	50
HLCR-CLRV	12	2035	2035	1336465	50
HRMY-S-SVRG	12	2035	2035	1523749	50
SHLD-S-RNT	12	2035	2035	1622776	50
TAFT-BRIX-PD	12	2035	2035	1756255	50
OVERTRL-MULBERR	12	2035	2035	1449475	50
PAV-W-CLGE	12	2035	2035	1756255	50
WAKE-SHLD	12	2035	2035	981250	50
TRIL-W-PORT	12	2035	2035	1530205	50
SOMERVL-CHRLSTN	13	2036	2036	948955	50
HTH-MCL	13	2036	2036	1504372	50
FCPRST-0.1-SHPT	13	2036	2036	7771020	50
FCLMY-0.2-TRILB	13	2036	2036	3357500	50
FCPRST-0.2-TMBL	14	2037	2037	5148500	50

FCOAK-0.1-BRYN	14	2037	2037	1559300	50
HLDL-STROG	14	2037	2037	1354000	50
PORT-SW-TRIL-F	14	2037	2037	1094275	50
FSIX-0.1-FFIV	15	2038	2038	1727500	50
FCSUMVW-0.5-VIN	15	2038	2038	2742000	50
FCKTR-0.1-STRS (LR36-0.1-7)	15	2038	2038	1430600	50
FCLAPT-0.0FREYA	16	2039	2039	1796900	50
FCCTRE-0.1-WTGN	16	2039	2039	1818400	50
FCPRST-0.0LYNWA	16	2039	2039	2316800	50
PRST-W-HRT	16	2039	2039	2272918	50
PORT-W-TRIL-F	17	2040	2040	883600	50
STRS-HTH	17	2040	2040	1061980	50
FCRDWG-0.0FLKRA	17	2040	2040	1713600	50
HRMY-W-RGNC	17	2040	2040	1368745	50
FCSHLD-0.2-STUT	19	2042	2042	2603000	50
FCSTUT-0.1WHDBA	19	2042	2042	2852000	50
FCMTCL-0.1-HTH	19	2042	2042	1776209	50
FCHTRD-0.2-STUT	19	2042	2042	2370400	50
FCJFK-0.1-BOCK	19	2042	2042	1990993	50

Appendix E Disposal Summary

There are no planned disposals for the bridge program as demonstrated in Table E1. Disposals will be reviewed as part of the improvement plan for future updates to the AM plan.

Table E1 – Disposal Activity Summary

Year	Disposal Forecast	Disposal Budget
2022	0	0
2023	0	0
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0
2030	0	0
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0
2036	0	0
2037	0	0
2038	0	0
2039	0	0
2040	0	0
2041	0	0

Appendix F Budget Summary by Lifecycle Activity

The following table summarizes the budget estimates from current approved budget offers that have been utilized within the Lifecycle Model for this AM plan.

Table F1 – Budget Summary by Lifecycle Activity

Year	Acquisition	Operation	Maintenance	Renewal	Disposal	Total
2023	0	400000	300000	2100000	0	2800000
2024	0	400000	300000	2100000	0	2800000
2025	0	400000	300000	2100000	0	2800000
2026	0	400000	300000	2100000	0	2800000
2027	0	400000	300000	2100000	0	2800000
2028	0	400000	300000	2100000	0	2800000
2029	0	400000	300000	2100000	0	2800000
2030	0	400000	300000	2100000	0	2800000
2031	0	400000	300000	2100000	0	2800000
2032	0	400000	300000	2100000	0	2800000
2033	0	400000	300000	2100000	0	2800000
2034	0	400000	300000	2100000	0	2800000
2035	0	400000	300000	2100000	0	2800000
2036	0	400000	300000	2100000	0	2800000
2037	0	400000	300000	2100000	0	2800000
2038	0	400000	300000	2100000	0	2800000
2039	0	400000	300000	2100000	0	2800000
2040	0	400000	300000	2100000	0	2800000
2041	0	400000	300000	2100000	0	2800000
2042	0	400000	300000	2100000	0	2800000