City of Port Coquitlam | Asset Management Plan

2024

Transportation

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26,500	Number of assets on record in the Transportation asset database
$533.1 million	2023 replacement cost of these assets
2000s	Decade with the highest capital expenditures on the construction or acquisition of Transportation assets ($191M)
2030s	Decade with the first major forecasted asset replacement spike ($177M)
30%	Percentage of assets in poor or worse condition, or with less than 40% service life remaining.
$160.2 million	Current age- and condition-based infrastructure backlog
$31.1 million	Current replacement cost of assets with a very high risk rating
$8.2 million	Annual City spending on capital, maintenance, and operations related to Transportation
2.9%	System-generated recommended capital reinvestment rate for Transportation System infrastructure ($15.6M per year)
1.1%	Port Coquitlam's actual capital reinvestment rate ($5.8M per year)

Executive Summary

This asset management plan (AMP) for the City of Port Coquitlam provides a detailed cross-sectional analysis of the City's Transportation assets. It is a continuation of the City's efforts to build a formal and well-structured asset management program that began with the completion of an asset management strategy in 2019. The strategy identified the development of an AMP for each of the City's eight asset portfolios: Water, Sanitary, Drainage, Transportation, Parks, Facilities, Fleet & Equipment, and Information Services.

Asset management plans help agencies develop a detailed understanding of their community infrastructure and major capital assets that support daily operations. This data-rich knowledge can support better decision-making and help maintain high but affordable service levels.

Valuation and Condition

Port Coquitlam's Transportation portfolio has nearly 27,000 assets on record including 241 kilometers of roadways, 144 kilometers of sidewalks, 33 bridges, and various other assets such as streetlights, traffic signals, and retaining walls. The total current replacement cost of all Transportation assets is estimated at $533.1 million as of 2023, with roads making up nearly 50% of the valuation.

Keeping assets in good condition allows the City to deliver services to residents safely and effectively. Condition data helps to prevent premature and costly rehabilitation or replacements, and ensures that lifecycle activities occur at the right time to maximize asset value and useful life while minimizing costs.

Typically, condition ratings can be established in two ways. The age-based approach simply uses an asset's age as a proxy for its condition: older assets have less service life remaining than newer ones, and are assumed to be in poorer shape. In contrast, in-field condition assessments rely on detailed inspections by qualified staff who assess each asset against robust, technical criteria.

Based on a combination of field inspection data and age, 30% of assets, with a current replacement cost of $160.2 million, are in poor to very poor condition or have less than 40% service life remaining. These assets should be considered for upgrade or replacement in the immediate or short term to avoid costly failures that may disrupt service and pose a risk to public health and safety. It is also more economical to keep assets in at least fair or better condition, with smaller and more frequent maintenance. Assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

Lifecycle Management and Long-term Replacement Needs

As with most communities across Canada, Port Coquitlam is facing an aging infrastructure stock. Data suggests that between 1960 and 2019, an average of $87 million per decade was spent on Transportation assets. The largest expenditures were made between 2000 and 2009,

totaling nearly $202 million, dominated by the construction of the Coast Meridian Overpass ($103 million). New infrastructure is often funded or constructed by development, or partially funded by external partners. However, the ongoing maintenance and replacement costs are borne by the municipality as the asset owner. The initial cost for new assets is only a fraction of the entire lifecycle cost to operate, maintain and replace them. Consequently, the challenge for municipalities is the considerable lifecycle costs of many assets that now fall on taxpayers alone to fund.

As assets age, their performance diminishes, often more rapidly as they approach the final quarter of their design life. These assets require ongoing investments in operations, maintenance, and rehabilitation so that service level can be maintained and delivered consistently. The City's average annual budget for Transportation totals $8.2 million. Of that, $7.1 million per year is spent on the inspection, maintenance, and replacement of Transportation assets. An additional $1.2 million is allocated to operational expenditures that maintain acceptable levels of service and efficient operations, but have no direct impact on asset life.

Eventually, aging assets must be replaced. The City is expected to experience substantial asset replacement needs over the coming decades, peaking at $172.7 million in the current decade, between 2023 and 2032. Deferring replacements can lead to infrastructure backlogs, which can cause a drop in the quality of service provided to residents. The City's current age-based backlog is $14.8 million, comprising assets that have exceeded their useful life but still remain in service. However, this figure increases to over $160 million when assets that are in poor or worse condition or have less than 40% service life remaining, are included in the backlog estimate.

Although not all assets forecasted for replacement will need to be replaced, having a multi-decade view of infrastructure needs is essential for financial planning. A long-term view allows staff to prepare ahead of time for major capital works, avoid unplanned expenditures, and minimize extreme fluctuations in tax and/or utility rates.

Applying a Risk-based Approach

Keeping up with replacement needs poses a substantial challenge for most local governments and public agencies across Canada. A risk-based approach to infrastructure spending can help prioritize capital projects, refine backlog and future needs, and channel funds to where they are needed most. Rather than taking the worst-first approach, a risk-based approach ranks assets based on their condition/performance as well as their criticality—providing a more complete rationale for project selection.

This AMP applies a quantitative approach to risk for all assets. Data that can best explain the probability of asset failures and help approximate the various consequences of these failure events has been modeled to develop asset risk matrices. As risk is a product of the probability of an asset's failure and the overall consequence of the failure event, a high risk-rating does not necessarily suggest that an asset is unable to safely perform its intended function. Even new assets can carry a high risk rating, given their strategic, financial, economic, and socio-political importance to the community.

This analysis indicates that 193 assets, with a current replacement cost of $31.1 million have a very high risk rating due to their potentially high probability of failure, and moderate to severe consequences of failure. An additional 2,273 assets, with a current replacement cost of $169.2 million, were classified with a high risk rating.

Delivering Affordable Levels of service

Together with risk assessments, levels of service offer another lever that the City can use to deliver high-quality but affordable infrastructure programs. Levels of service describe how well agencies deliver services and whether service quality meets the expectations of the community. They can be measured using key performance indicators (KPIs).

For Transportation, a total of 68 KPIs were selected. This included 26 KPIs to measure customer levels of service, and 42 to track the City's technical levels of service. Technical levels of service can be thought of as the activities and steps (inputs) that an organization takes to deliver customer levels of service (outputs) KPI data can be used to inform decisions to maintain, increase or decrease levels of service. Investments in capital and/or maintenance related activities may be adjusted to reduce the frequency of requests and improve customer levels of service. However, adjusting levels of service must be considered in light of cost, performance and risk.

Residents expect only the highest levels of service. However, as funds are limited, customer satisfaction must be balanced with the cost to deliver services and the risk posed to organization. Higher service levels come at a higher price, and can only be provided by diverting funds from one program to another (tradeoff), or by increasing tax- or utility levies. Conversely, lower service levels may reduce funding needs, but can pose greater risk to the organization and the public.

Financial Strategy: Implementing the Asset Management Plan

The financial strategy provides a consolidated analysis for the City's eight service areas. They are grouped based on how assets within each service area are funded. Tax-funded service areas rely on property tax revenues, and include Drainage, Transportation, Parks, Facilities, Fleet & Equipment, and Information Services. Water and Sanitary services are funded directly through their respective utility levies.

Although senior government grants are used to supplement the City's infrastructure spending needs, these are not included in the financial strategy. The aim of the financial strategy is to allow the City to build a sustainable infrastructure program using its own permanent and predictable sources of funding, namely, property taxes and utility levies. It will position Port Coquitlam to gradually eliminate annual funding deficits and achieve full, annual capital funding requirements for both tax- and levy-funded service areas.

Tax-Funded Service Areas

For tax-funded services, the annual average capital requirements total $33.8 million. The City currently contributes $7.9 million annually to its Long-Term General Infrastructure Reserve (LTGIR), creating a combined annual funding deficit of $25.9 million for these six service areas.

To close this gap for tax-funded assets, the City's property taxes would need to increase by 35%, based on 2023 revenues of $74.9 million. As this is not feasible, it is recommended that the City adopt a 15-year phase-in period, requiring a 1.00% annual increase to property taxes each year over this time period. This additional revenue would be fully allocated to the LTGIR. We note that the City already increases annual contributions to the LTGIR by 1% per year based on prior year's levy. As such, the recommended 1.00% increase would be over and above this existing annual increase, for a combined annual increase of 2.00% over the next 15 years.

Drainage Utility

Currently, drainage infrastructure is funded through property taxes. However, there is strong rationale for implementing a dedicated drainage utility levy, and municipalities across Canada have begun to implement this fee structure. Contributing factors include climate change impacts that are driving the need for new or upgraded drainage infrastructure and flood protection, and the higher relative lifecycle costs of drainage assets compared to water and sanitary infrastructure. These expenditures also reduce funds available for other tax-funded assets. If a drainage utility is established, a Long-Term Drainage Infrastructure Reserve (LTDIR) would be created, with annual contributions to this reserve funded through the levy rather than property taxes.

Levy-Funded Service Areas

Similar analysis was conducted for levy-funded services. For water and sanitary, average annual capital requirements total $4.5 million and $4.2 million, respectively. The City currently allocates $1.1 million to the Long-Term Water Infrastructure Reserve (LTWIR), generating an annual funding deficit of $3.4 million. Current allocations to the Long-Term Sewer Infrastructure Reserve (LTSIR) total $850 thousand, also resulting in an annual funding deficit of $3.4 million.

In 2023, Port Coquitlam's water and sanitary revenues totaled $13.1 million and $9.6 million, respectively. To eliminate the funding deficit for each service area, additional contributions are needed to the LTWIR and LTSIR. For water, this would require a one-time levy increase of 26%, specifically for the purpose of phasing in full funding for water. Similarly, achieving full funding for sanitary services would require a one-time levy increase of 35%.

Consistent with tax-funded service areas, it is recommended that the City adopt a 15-year phase-in period to gradually achieve full funding for water and sanitary services. Under this model, water rates would see an annual increase of 0.55% for each year over the phase-in period; sanitary rates would require an increase of 1.03% annually. As with tax-funded services, these increases are in addition to the existing 1% annual increase for each service area.

For both tax- and levy-funded services, these models seek to eliminate annual funding deficits and achieve full funding. Alternative models are also illustrated, with target funding levels set at 75% and 50% of annual capital requirements. While achieving these lower targets may reduce the impact on property tax rates and utility levies, they may perpetuate infrastructure challenges and reduce service levels. Additional financial, economic, social, reputational, and public health and safety risks may also increase as a result of inadequate funding.

As such, it is recommended that the City endeavour to achieve full funding for both tax- and levy-funded service areas. The recommendations presented do not account for inflation; staff should periodically consider the impacts of inflation on both annual capital expenditures, and additional contributions required to the LTGIR, the LTWIR, and the LTSIR to maintain fiscal strength. Further, addressing the infrastructure backlog requires the strategic use of reserves and the City's development cost charges. In addition, asset criticality and risk analysis should be used to prioritize projects.

As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. This periodic funding should not be incorporated into an AMP unless there are firm commitments in place. However, it can be used to help close the infrastructure gap more quickly, or lower the long-term impact on tax and utility levies. It should be noted that the above recommendations do not include the use of reserves or debt. Depending on the urgency of projects and the impact on levels of services, reserves and debt may be used as supplementary, viable options.

Approach and Methodology

This asset management plan (AMP) was developed as part of the City of Port Coquitlam's current engagement with PSD Citywide. Individual AMPs were developed for each of the City's eight service areas, requiring substantial effort and collaboration over three years.

Developing the Asset Management Plan

The contents in this document were developed in five steps, summarized below.

Build a comprehensive asset inventory

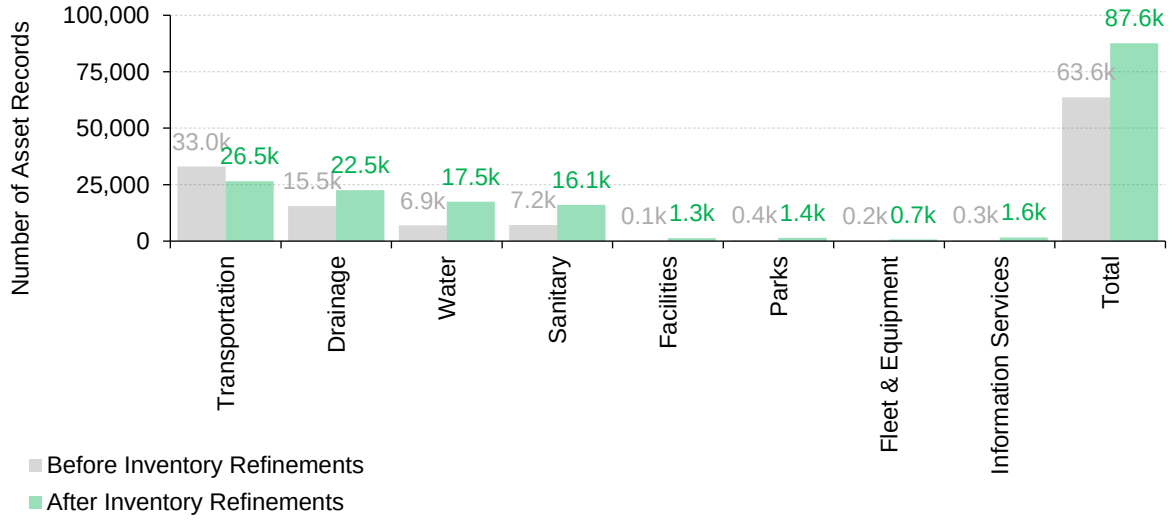
City staff manage multiple large-scale and complex infrastructure datasets, found across different departments and in multiple formats. These datasets contain primary and secondary asset data. Primary data includes asset valuations, such as historical and current replacement costs; in-service dates; useful life estimates; quantities; and condition data. It is virtually impossible to produce any asset management-related reporting without this prerequisite information.

Secondary data provides more contextual information about an asset, such as its location, failure history, size, type, material, etc. These fields are used to establish an asset's criticality and develop risk models.

Both datasets were analyzed, refined, and verified through rigorous staff reviews. Identified gaps were closed through desktop research and/or physical in-field data collection by City staff. All new and existing datasets were ultimately consolidated to build a single source of truth (SST). A sharp focus was placed on data accuracy and currency, in particular, asset replacement costs and useful life estimates. These are key inputs for long-term financial planning and are necessary for determining the magnitude and timing of investments.

This finalized data was then uploaded into Citywide, the City's primary asset management software application. The inventory refinements resulted in a 38% increase in the number of total assets on record for all service areas, from 63,603 asset records to 87,647. For Transportation, however, data refinement led to a 20% decrease, from 33,026 asset records to 26,484.

Figure 1: Number of Asset Records Before and After Inventory Refinements



Conduct asset-level risk assessments and build risk models

Preliminary risk models were developed for each asset class to establish asset risk ratings based on their probability and consequence of failure. Staff reviewed all risk models and provided feedback on the parameters used, including the suitability of parameters and how they were ranked and weighted. Once finalized, these models were built in Citywide and applied to all relevant assets to generate risk matrices.

Compile lifecycle activity data

To better understand the total cost of ownership of all assets, annual operating, maintenance, and capital spends were analyzed. Staff provided feedback on various lifecycle interventions applied to major asset types; the triggers for each treatment and its impact; and typical budget envelopes associated with each activity. Data in any available service level sheets was also reviewed and aggregated.

In addition to identifying lifecycle interventions that may help extend the life of the asset (e.g., asphalt repairs and crack sealing of roads), activities meant to ensure delivery and continuity of acceptable service levels were also included. For example, snow and ice control, street sweeping, and signal timing adjustments have no direct impact on asset lifespan, but they are part of providing Transportation services to residents.

Compile levels of service data

Four core values were established across each of the City's eight asset portfolios to ensure that the delivery of services are reliable, safe, affordable, and practical. To track the performance of Transportation, technical and customer-oriented key performance indicators (KPIs) were selected and populated with data ranging from 2018 to 2021. For Transportation, 28 KPIs were selected for customer levels of service, and 42 for technical levels of service.

Develop financial strategy

The preceding content and information are used to develop a consolidated financial strategy. The strategy outlines the City's current funding position for each service area and a path to reach sustainability by closing any identified funding gaps. Development of the strategy involves a comprehensive review of all pertinent financial documents, including audited statements, and collaboration with Finance staff.

Information from asset management plans can be used to determine appropriate levels of funding for capital and operational budgets. Reinvestment rates can be used to determine annual capital expenditure targets, or allocations to reserves, to ensure that asset replacement needs are met as they arise. Key performance indicators can be helpful in determining how much to allocate to operational budgets in order to maximize the life of assets while maintaining acceptable levels of service and efficient operations.

Limitations and Constraints

This AMP required substantial effort by staff. It was developed based on best-available data, and was subject to the following broad limitations, constrains, and assumptions:

1. The analysis in this AMP is highly sensitive to several critical data fields, including an asset's estimated useful life, replacement cost, quantity, and in-service date. Inaccuracies or imprecisions in any of these fields can have substantial and cascading impacts on all reporting and analytics.
2. User-defined and unit cost estimates, based typically on staff judgment, recent projects, or established through completion of technical studies, offer the most precise approximations of current replacement costs. When this isn't possible, historical costs incurred at the time of asset acquisition or construction can be inflated to present day. This approach, while sometimes necessary, and deployed in this AMP for some asset groups, can produce highly inaccurate estimates.
3. In the absence of condition assessment data, age was used to estimate asset condition ratings. This approach can result in an over- or understatement of asset needs. As a result, financial requirements generated through this approach can differ from those produced by staff.
4. The risk models are designed to support objective project prioritization and selection. However, in addition to the inherent limitations that all models face, they also require availability of important asset attribute data to ensure that asset risk ratings are valid, and assets are properly stratified within the risk matrix. Missing attribute data can misclassify assets.
5. The AMP is cross-sectional, offering a synopsis of the City's infrastructure up to a given time period. Some information may become outdated quickly. This can result from new condition assessments, or acquisition or disposal of assets that was not reflected at the time the AMP was developed.

It is quite common for municipalities to experience these limitations as they develop their first asset management plan. Although many data gaps were closed during this project, some may still persist. Closing these data gaps and overcoming limitations is an iterative process, requiring dedicated staff time and other resources. Staff will continue to refine the City's asset inventory to further enhance data quality and integrity for future iterations of this AMP and all asset management reporting.

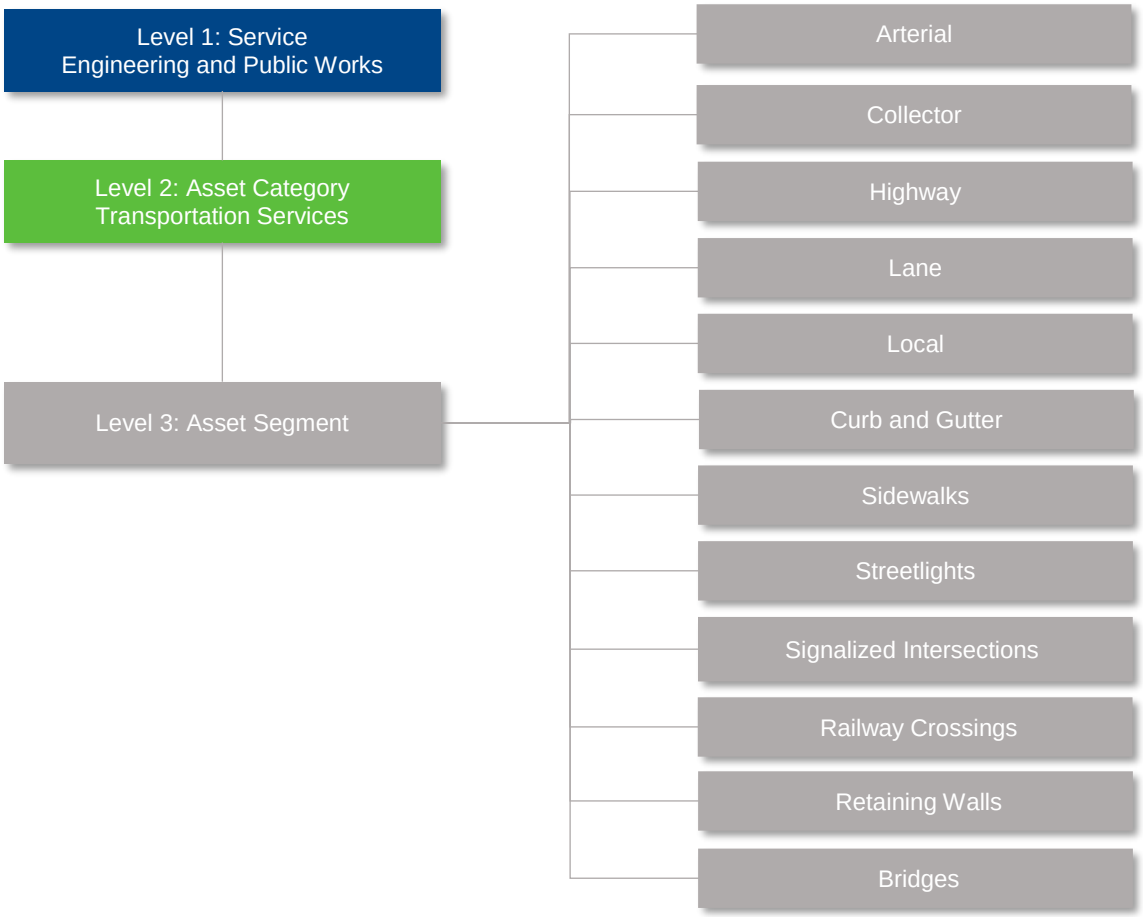
State of the Infrastructure

The state of the infrastructure (SOTI) provides a detailed overview of the City of Port Coquitlam's Transportation assets. It identifies how assets were classified as part of a larger network and system of assets; the current quantity and replacement value of all assets; and, a detailed age and condition profile.

Asset Hierarchy and Data Classification

Asset hierarchy illustrates the relationship between individual assets and their components, and a wider, more expansive network and system. How assets are grouped in a hierarchy structure can impact how data is reported and interpreted. Assets were structured to support meaningful, efficient reporting and analysis. Key details are summarized at the asset segment level.

Figure 2: Asset Hierarchy and Data Classification



Inventory and Valuation

The City of Port Coquitlam's Transportation portfolio contains nearly 27,000 unique asset records, comprising 241 centerline kilometres (CL-KM) of roadway, 144 kilometres of sidewalks, 33 bridges, and various roadway appurtenance such as streetlights, street signs, signals, and railway crossings. The total current replacement cost of these assets was estimated at nearly $533.1 million as of 2023.

Costing Methods

As part of compliance with PSAB 3150, municipalities across Canada were required to establish historical costs for all capital assets. However, asset management analysis and reporting require accurate current replacement costs. Several approaches can be taken to estimate the cost of replacing a like-for-like asset that offers identical or similar service levels. These are illustrated in Table 1.

Table 1: Methods for Establishing Replacement Costs

Costing Method	Description	Accuracy
CPI	Historical or acquisition costs are inflated to current day using available inflation indices. Given its tendency to provide inaccurate estimates for older assets, this approach is used when other methods cannot be applied with reasonable confidence.	Low
Cost Per Unit	Using procurement data from recent projects, including invoices, quotes, and/or tenders, the unit cost of an asset is applied to all asset types (segments) to establish total current replacement costs. This method is typically applied to linear assets.	High
User-defined	Similar to the cost per unit approach, this method also requires procurement data and staff judgement to estimate an asset's current acquisition cost. This method is typically applied to non-linear or point assets.	High

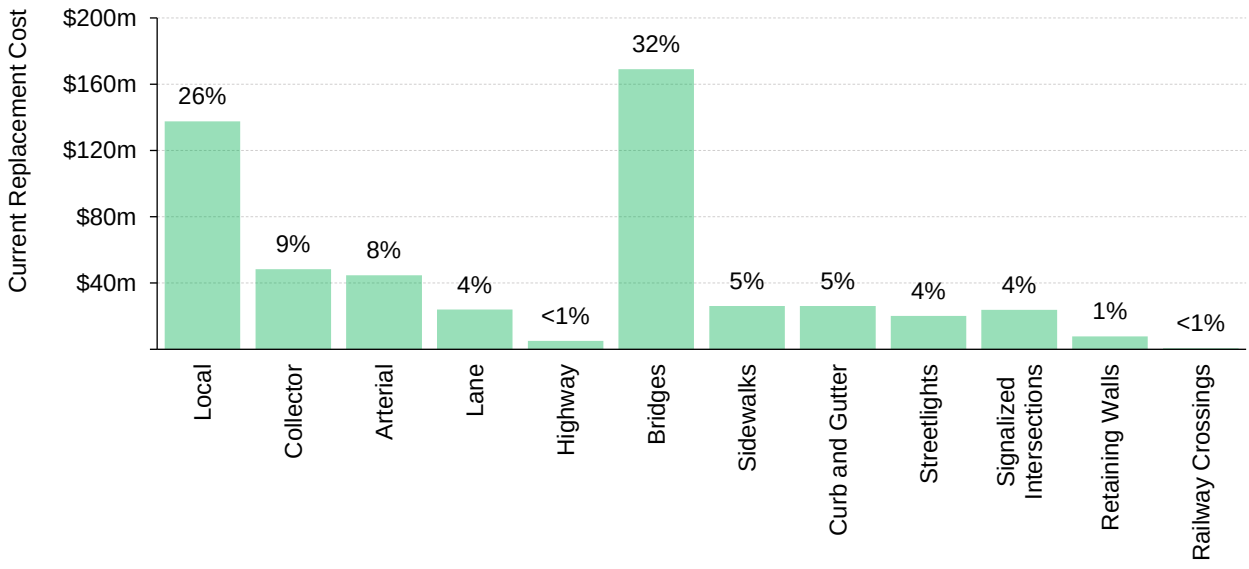
Table 2 summarizes the quantity and current replacement cost of the City's Transportation assets as managed in its primary asset management register, Citywide. With a total current replacement cost of $245.4 million, roads comprise nearly 50% of the overall portfolio, followed by bridges at 32%.

The replacement costs outlined below were initially established by staff in 2021. They were then increased in 2023 by 10% to reflect prevailing market conditions and account for inflation over the last two years.

Table 2: Detailed Asset Inventory

Segment	Quantity	Replacement Cost	Primary Costing Method
Roads	241,301 CL-M	$137,583,207	Cost per unit
Local	124,027 CL-M	$48,327,982	Cost per unit
Collector	36,779 CL-M	$44,593,384	Cost per unit
Arterial	33,494 CL-M	$23,921,305	Cost per unit
Lane (Paved only)	42,928 CL-M	$5,036,426	Cost per unit
Highway	4,073 CL-M	$169,119,500	Cost per unit
Bridges	33	$26,072,590	User defined
Sidewalks	144,164m	$26,078,575	Cost per unit
Curb and Gutter	384,258m	$20,119,000	Cost per unit
Streetlights	3,658	$23,808,917	Cost per unit
Signalized Intersections	55	$7,843,871	User defined
Retaining Walls	6,194m	$577,500	Cost per unit
Railway Crossings	75m	$137,583,207	Cost per unit
Total		**$533,082,257**	

Figure 3: Portfolio Valuation



Asset Condition

Reliable long-term planning for asset replacements hinges on accurate current condition ratings. Condition data helps to prevent premature and costly rehabilitation or replacements, and ensures that lifecycle activities occur at the right time to maximize asset value and useful life while minimizing costs.

Source of Condition Data

Typically, condition ratings can be established in two ways. The age-based approach uses an asset's age as a proxy for its condition: older assets have less service life remaining than newer ones, and are assumed to be in poorer shape. In contrast, in-field condition assessments rely on detailed inspections by qualified staff who assess each asset against robust, technical criteria. Both age and in-field condition ratings provide useful data to refine long-term projections.

This asset management plan relies on assessed condition for 79% of Transportation assets, based on and weighted by replacement cost. For the remaining assets, aged is used as an approximation of condition. The table below identifies the source of condition data used throughout this AMP.

Table 3: Source of Condition Data

Asset Category	Asset Segment	% of Assets with Assessed Condition	Source
Transportation	Highway	99%	2019 Pavement Condition Study
	Arterial	100%	2019 Pavement Condition Study
	Collector	99%	2019 Pavement Condition Study
	Local	97%	2019 Pavement Condition Study
	Lane	99%	2019 Pavement Condition Study
	Sidewalks	0%	Age-based estimates
	Curb and Gutter	0%	Age-based estimates
	Streetlights	0%	Age-based estimates
	Signalized Intersections	0%	Age-based estimates
	Railway Crossings	0%	Age-based estimates
	Bridges	98%	2020 Bridge Inspection Report
	Retaining Walls	0%	Age-based estimates
Total		**79%**	

Condition Assessment Guidelines

Condition Assessment Guidelines were developed for Transportation assets to support the collection of condition data. It is recommended that the guidelines be used to complete some assessments each year, and the collected data be uploaded to Citywide, the City's asset management software.

Condition Rating System

A condition rating scale provides a standardized and descriptive framework that can be used to assign a condition score to all assets, typically on a range of 0-100. This AMP uses a combination of a general condition rating scale, aligned with the federal Canadian Core Public Infrastructure Survey, and asset-specific condition rating scales when available, including the City's pavement condition assessments and bridge inspection reports.

The pavement survey assigns an overall pavement quality index (PQI) rating to each road segment, ranging from 0 to 100. PQI is determined by a combination of road surface distresses and ride comfort. The condition rating system used for bridges uses a 5-point rating system based on the type and nature of bridge defects found.

Table 4: General Condition Rating Scale – All Assets

Condition Rating	Description	Criteria	Service Life Remaining (%)
Very Good (80-100)	Fit for the future	Asset is new or recently rehabilitated	80-100
Good (60-80)	Adequate for now	Asset is performing well; minor defects; only regular maintenance required	60-80
Fair (40-60)	Requires attention	Asset is operational, but signs of deterioration evident; some elements exhibit significant deficiencies; renewal upgrade, or replacement required in the medium term	40-60
Poor (20-40)	Increasing potential of service disruption	Asset approaching end of service life; condition below standard; significant deterioration; renewal, upgrade, or replacement in the short term	20-40
Very Poor (0-20)	Unfit for sustained service	Service life is fully consumed; asset remains in service beyond service life; widespread and advanced deterioration; may be unusable and requires immediate replacement	0-20

Table 5: General Condition Rating Scale – Road Network

Overall Performance Rating	Pavement Quality Index (PQI)
Very Good	80-100
Good	60-80
Fair	40-60
Poor	20-40
Very Poor	0-20

Table 6: General Condition Rating Scale – Bridges

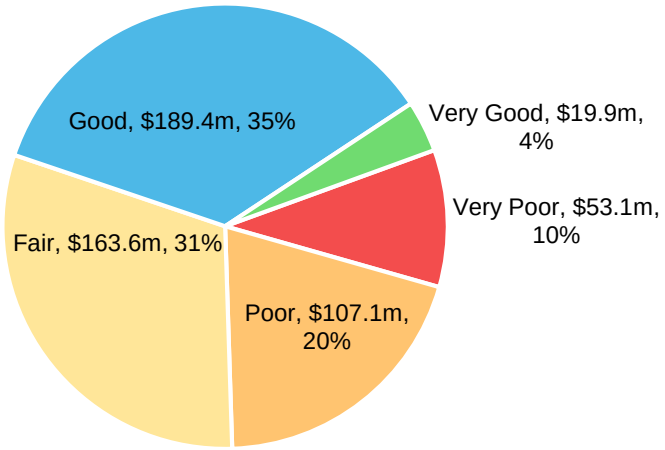
Condition Rating	Description
Very Good	No defects, as new condition
Good (1)	Normal wear and deterioration; not requiring maintenance/repair
Fair (2)	Functioning as intended; minor maintenance/repair required
Poor (3)	Not functioning as intended; more extensive repair required
Very Poor (4)	Not functioning as intended; major repair or replacement required

Projected Asset Conditions

Figure 4 summarizes the replacement cost-weighted condition of all Transportation assets. Based on a combination of field inspection data and age, 70% of assets are in fair or better condition; the remaining 30% of assets, with a current replacement cost of $160.2 million, are estimated to be in poor to very poor condition, or have less than 40% service life remining. Additional detail is provided in subsequent figures at the asset type or segment level.

Assets in poor or worse condition may be candidates for replacement in the immediate or short term and should be monitored closely to avoid costly failures that may disrupt service and pose a risk to public health and safety. Similarly, assets in fair condition may require rehabilitation or replacement in the medium term and should be monitored for further degradation in condition.

Figure 4: Asset Condition: All Transportation Assets



It is often more economical to keep assets in at least fair or better condition. Smaller and more frequent investments in asset maintenance can extend its serviceable life, minimize lengthy and unexpected service disruptions, and help avoid more expensive repairs and renewals in the future. This approach also helps deliver more consistent and predictable service levels.

Road Network

As illustrated in Figure 5 , based on condition assessments, 43% of the City's roads, with a current replacement cost of nearly $111.9 million, are in poor or worse condition. These roads have a pavement quality index of less than 40 out of 100. Roads in this condition exhibit substantial surface distresses, such as cracking and deformations—ultimately delivering a low quality of service to end users.

Of these, 9% were assessed as very poor, making them prime candidates for reconstruction. The condition of these road segments are beyond repair, deliver a very low ride quality, and may impede the efficient and safe flow of traffic.

Figure 5: Asset Condition: Road Network Overall

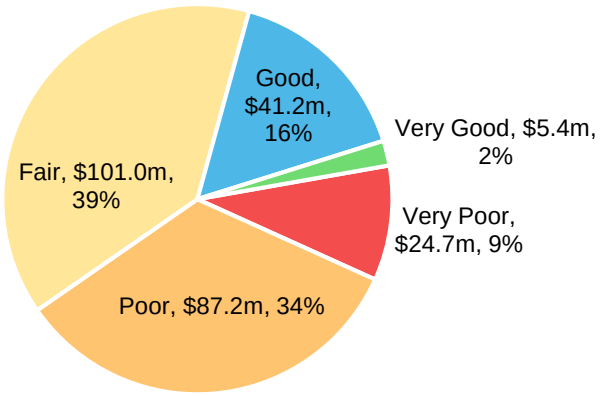
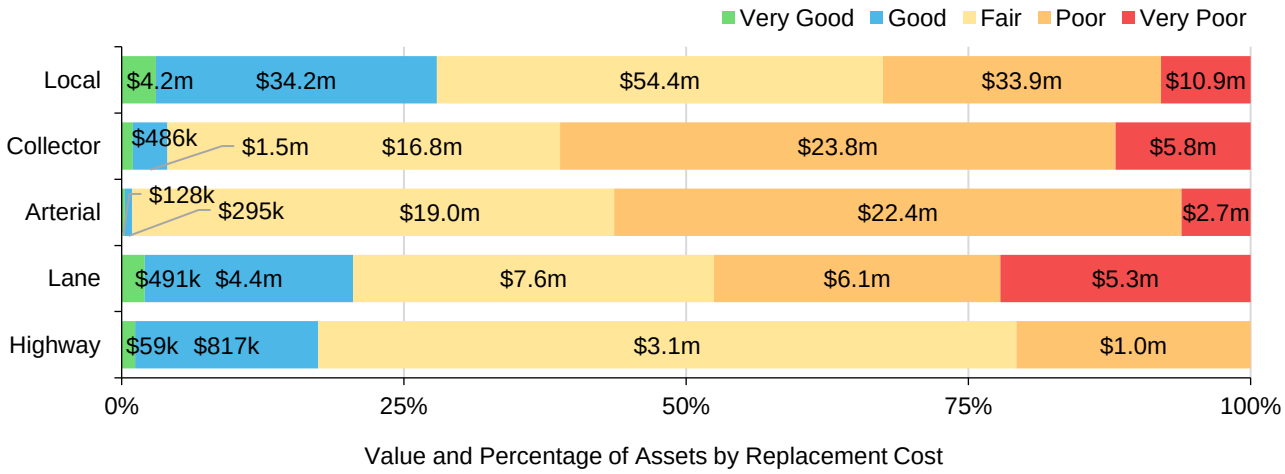


Figure 6 provides condition details for the City's road network by different road classes. This analysis shows that 61% of collector roads, with a current replacement cost of nearly $30 million, were assessed as poor to very poor in condition. The findings were similar for arterial roadways, with 56% found in poor or very poor condition. Although 67% of local roads were assessed as fair or better, the remaining 33%, with a current replacement value of $44.8 million were found to be in poor or worse condition.

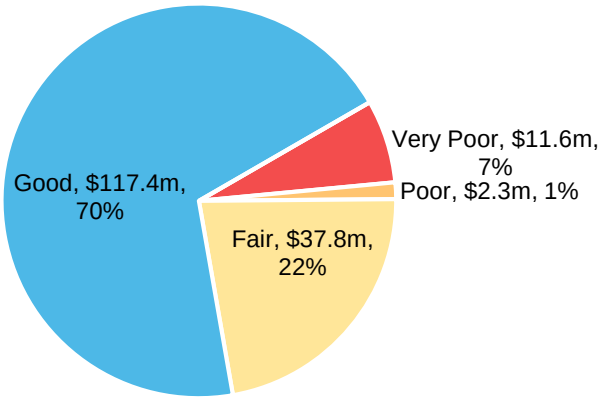
Figure 6: Asset Condition: Road Network by Functional Classification



Bridges and Other Assets

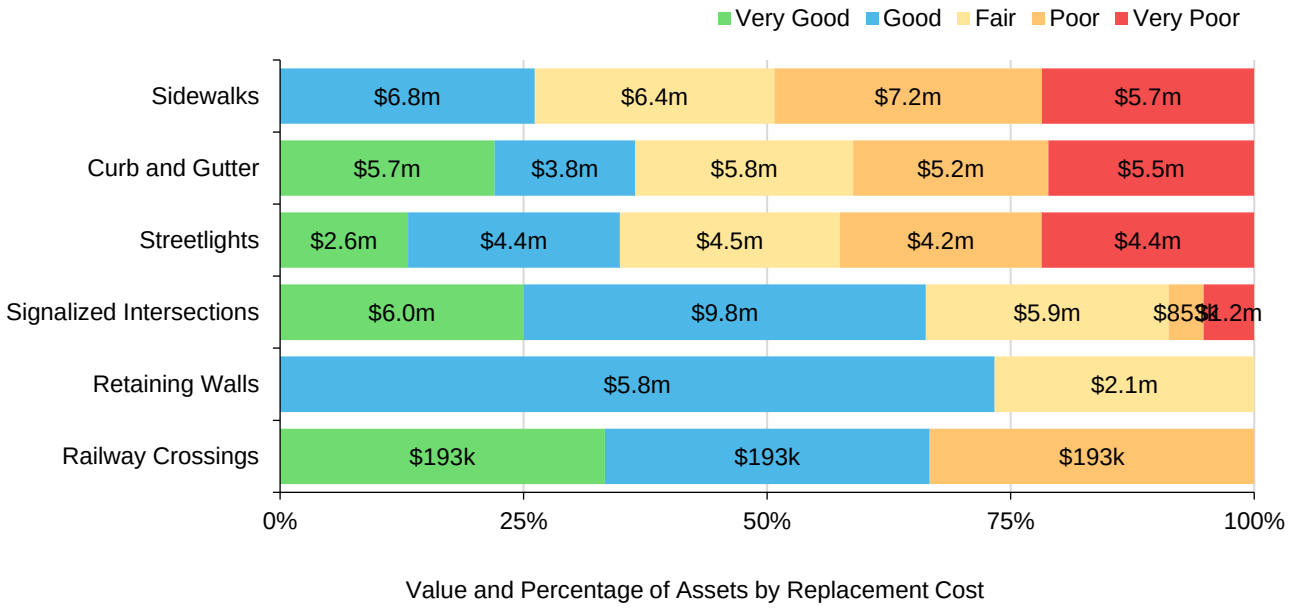
Figure 7 and Figure 8 summarize the condition of the City's bridges and other Transportation assets. Data shows that 92% of bridges are in fair or better condition, with 70% assigned a rating of 'Good'. The remaining 8%, with a current replacement cost of $13.9 million, were given an assessed condition rating of poor or very poor. A poor condition rating for bridges does not necessarily mean that the structures are unsafe. The City's detailed bridge inspection report identifies the condition of each bridge and the level of urgency required in addressing identified defects.

Figure 7: Asset Condition: Bridges



As no in-field condition data was available for other Transportation assets, asset age was used to approximate their condition using a general condition rating scale. Based on asset construction or acquisition years, the majority of these assets are estimated to be in fair or better condition. However, 33% with a current replacement cost exceeding $34 million may be in poor or worse condition, or have less than 40% service life remaining.

Figure 8: Asset Condition: Other Transportation Assets



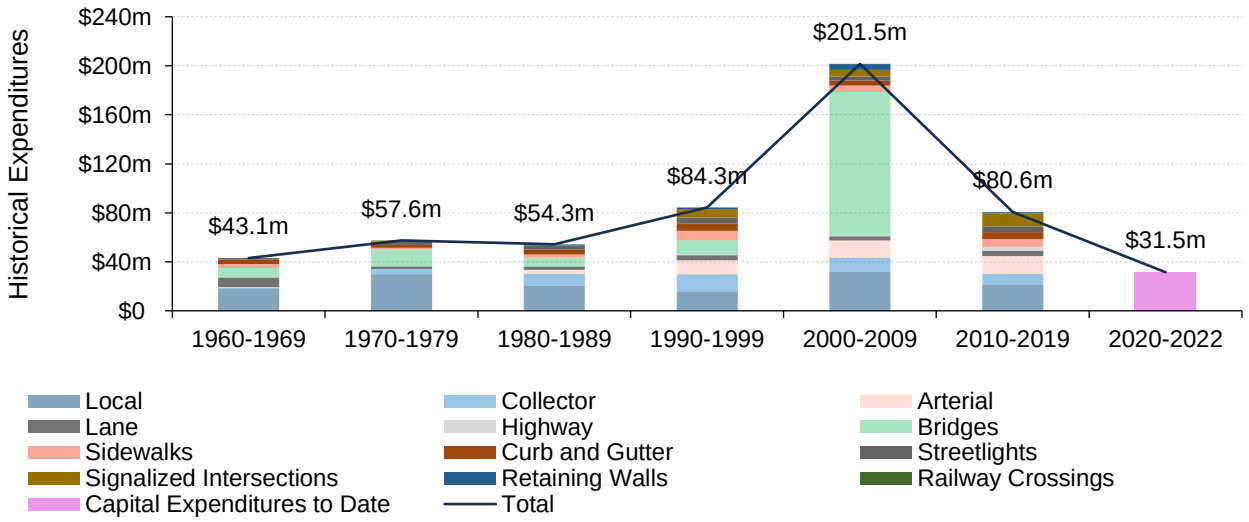
Age Profile

An asset's age profile provides valuable insights and can help identify assets that may be candidates for further evaluation through condition assessment programs; inform the selection of lifecycle strategies; and improve planning for potential replacement spikes. Although imperfect on its own, asset age can help triage asset needs when used in conjunction with other data points, including condition, asset criticality, planned upgrades, project bundling, and prior failure history.

Historical Asset Expenditures

Figure 9 illustrates historical expenditures on the construction or acquisition of Transportation assets since 1960. The data reflects the City's current or active inventory only; assets that have been disposed of or decommissioned over time are not included. Although community infrastructure needs and expectations can evolve significantly over decades, understanding past investment patterns can be informative in planning for future needs.

Figure 9: Historical Expenditures on Asset Acquisition



The decade from 2000-2009 represented a period of substantial expenditures on Transportation assets—the highest in the last 60 years. More than $201 million was invested in bridges, roads, and other Transportation assets. The Coast Meridian Overpass project accounted for $103 million of these investments. On average between 1960 and 2019, transportation expenditures were approximately $87 million each decade. In the current decade, the City has made capital investments in roads, signals, streetlights, sidewalks, and safety improvements, totaling $31.5 million between 2020 and 2022.

Historical spending, when combined with an asset's established design life, can be used to forecast upcoming replacement needs across long-term, often multi-decade time horizons.

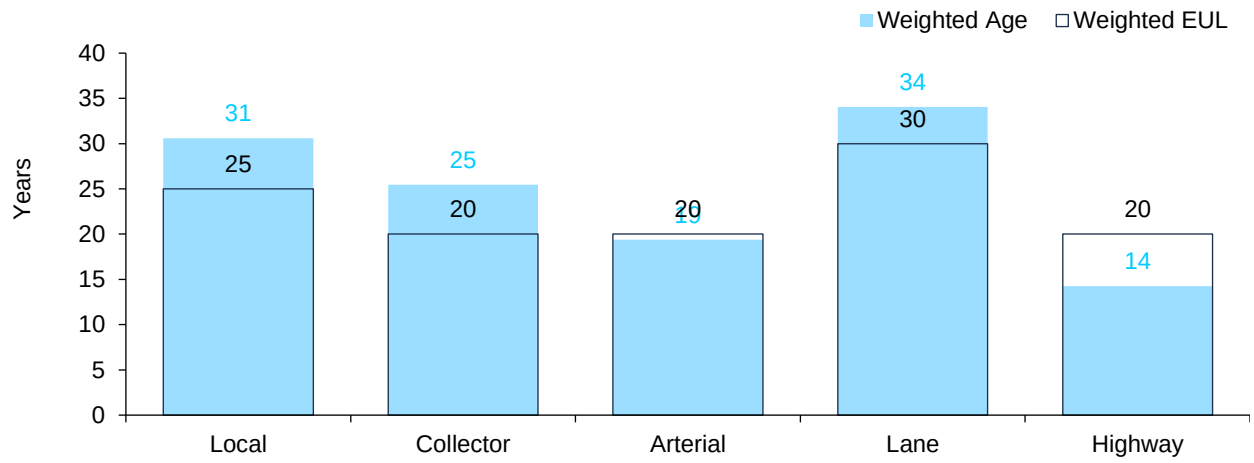
Serviceable Life vs. Current Asset Age

An asset's estimated useful life (EUL) is the serviceable lifespan of an asset during which it can be expected to deliver its intended function safely and effectively. As assets age, their performance diminishes, often more rapidly as they approach the final quarter of their design life.

Determining accurate EULs for all assets is essential for building reliable long-term forecasts and informing condition assessment programs. EULs for all assets were established and verified by staff to ensure they are aligned with broader industry standards, but also reflect typical asset performance and expectations in Port Coquitlam.

Figure 10 plots the average established useful life of each of the City's various road classes against the current age of road segments included in each class. Both values were weighted by the replacement cost of individual assets.

Figure 10: Average Asset Age vs. Estimated Useful Life: Road Network

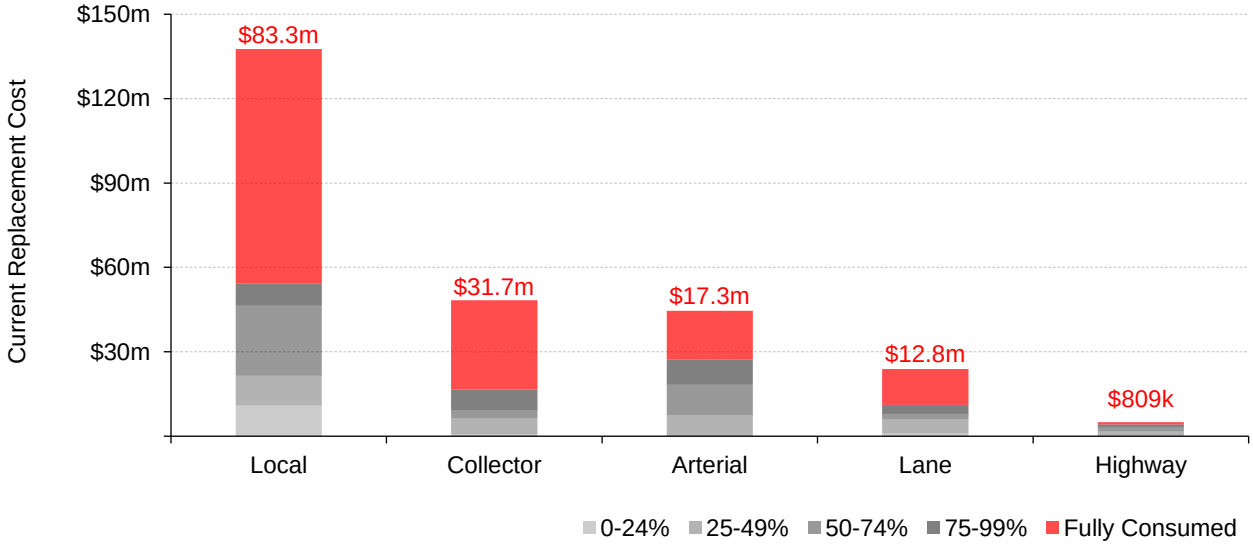


Age analysis shows that, on average, the City's local, collector, and lane roadways continue to remain in service well beyond their established lifespans. Arterial and highway surfaces have also consumed virtually all of their estimated useful life.

The City's Transportation portfolio also includes gravel laneways. Gravel surfaces can last indefinitely if maintained regularly, and do not require periodic, end-of-life reconstruction and replacement like paved roadways.

Figure 11 shows a detailed distribution of the City's paved road network based on the portion of useful life consumed to date. The analysis shows that 61% of local roads with a current replacement cost of $83.3 million, and 66% of collector roadways ($31.7 million) continue to remain in service beyond their established useful life. Arterial and paved lane roadways also contain significant portions that remain in service beyond their lifespans.

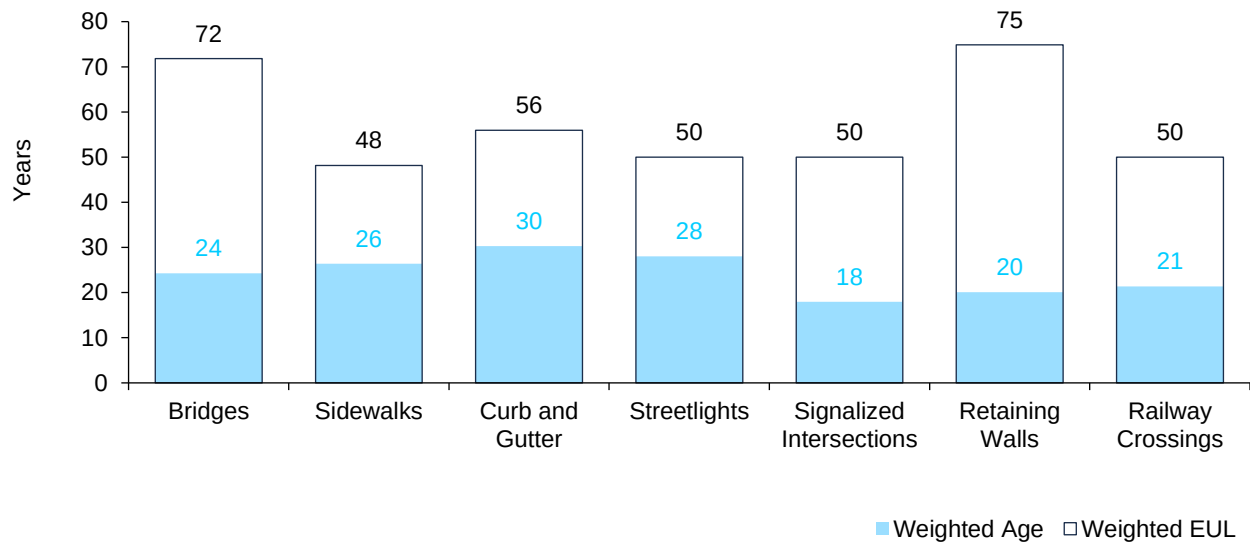
Figure 11: Percentage of Estimated Useful Life Consumed: Road Network



Determining accurate EULs for all assets is essential for building reliable long-term forecasts and informing condition assessment programs. EULs for all assets were established and verified by staff to ensure they are aligned with broader industry standards, but also reflect typical asset performance and expectations in Port Coquitlam.

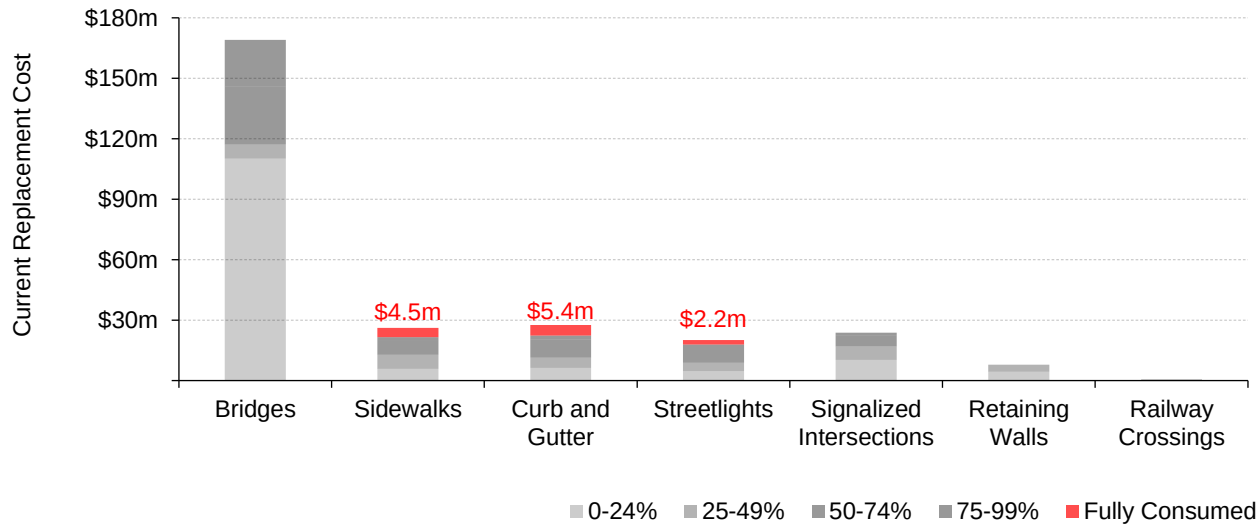
Figure 12 provides a similar analysis for the City's bridges and other Transportation assets. The data reveals that, on average, sidewalks, curb and gutters, and streetlights are in the latter stages of their lifecycle, having consumed more than 50 % of their established lifespans. As illustrated further in Figure 13, this asset group also contains assets that remain in service beyond their established lifespans, worth $12.1 million in current replacement costs.

Figure 12: Average Asset Age vs. Estimated Useful Life: Bridges and Other Transportation Assets



Although Figure 12 suggests that bridges are, on average, in the earlier stages of their lifespans and no bridges were identified as still in operation beyond their lifespan in Figure 13 (as of 2023).The eastbound Lougheed Bridge at Coquitlam River, with a replacement cost of $11.6 million, was placed in to service in 1949 and is due to reach the end of its life in 2024.

Figure 13: Percentage of Estimated Useful Life Consumed: Bridges and Other Transportation Assets



Lifecycle Management

The initial construction or acquisition of assets, particularly major infrastructure, represents only a fraction of the total cost of ownership that agencies can expect to incur. Assets require maintenance, repair, and replacement to ensure they can continue to deliver their intended functions. These reinvestments back into infrastructure are necessary through the life of the asset.

Lifecycle activities and costs are those that have a direct and tangible impact on an asset's lifespan such as maintenance, repairs, and replacements. Additional operational costs are also needed to maintain customer-oriented service levels and efficient operations.

Current Lifecycle Framework

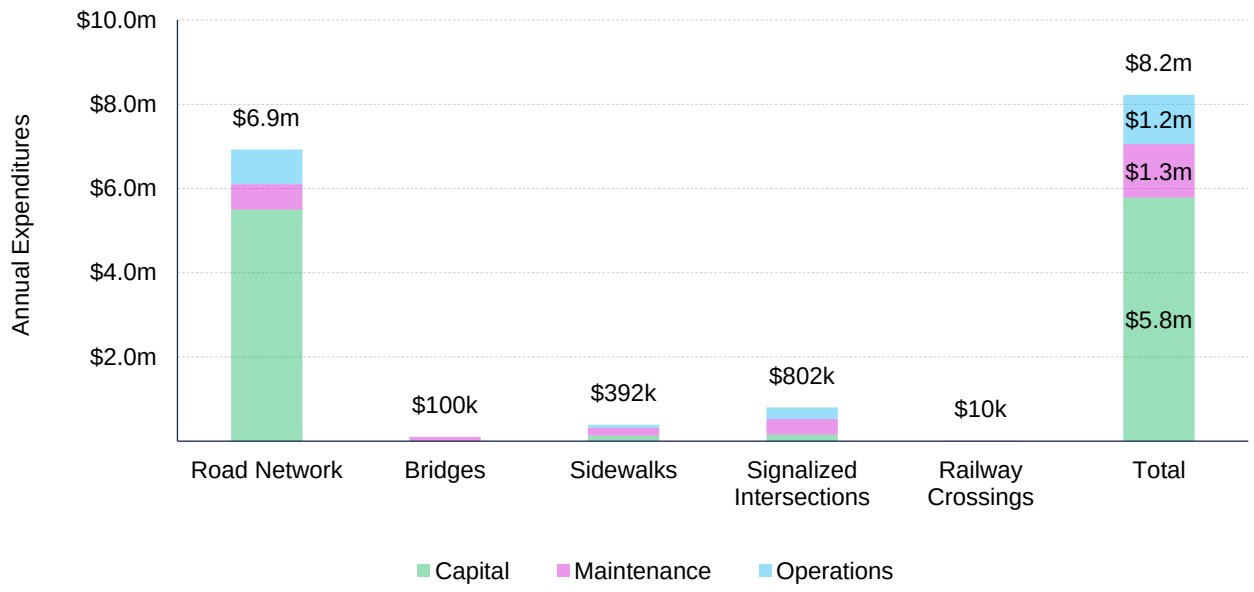
The City of Port Coquitlam's approach to asset lifecycle management is comprehensive. Maintenance, repair, and replacement activities are guided by technical external condition assessment surveys, asset age, and staff judgment through routine inspections and monitoring. Priority levels and other contextual information is used to select the right lifecycle activity at the right time. This section summarizes the City's lifecycle framework for each asset segment, modeled on Table 7.

Table 7: Components of a Lifecycle Framework

Component	Description		
Activity	The treatment, event, or intervention implemented,		
Activity Type	**Capital** Major repairs, renewals, rehabilitations, upgrades, and replacements	**Maintenance** Activities that have a direct and tangible impact on asset lifespan such as inspections, maintenance and minor repairs.	**Operations** Activities and costs needed to maintain acceptable service levels and efficient operations. No impact on asset lifespan.
Activity Trigger	This can include an asset's age and/or a minimum condition threshold. Other triggers may include priority levels, service request, and previously established frequency.		
Impact on Serviceable Life	Impact on an asset's serviceable lifespan resulting from the activity completed		
Annual Budget	Typical funding envelope available (actual spending may vary from year to year).		
Reinvestment Rate	Annual capital budget envelope of each activity as a portion of the total Transportation asset portfolio replacement cost of **$533,082,257**.		

Figure 14 summarizes total annual expenditures by asset segment and expenditure type. On average, the City allocates $8.2 million annually on Transportation assets. Major capital expenditures on bridges vary year-to-year and depend on the types of defects and repair needs identified by bridge inspections. Road paving represents the largest program within Transportation services, accounting for more than 70% of all expenditures.

Figure 14: Summary of Capital, Maintenance, and Operations Expenditures



Of the $8.2 million annual Transportation budget, $7.1 million is spent on the inspection, maintenance, and replacement, of assets. An additional $1.2 million is allocated annually towards operational expenses that maintain acceptable levels of service and efficient operations, but have no direct impact on asset life (e.g., snow removal, signal timing readjustments, street sweeping).

The following table outlines the City's lifecycle framework for Transportation assets.

Table 8: Lifecycle Framework

Activity	Type	Activity Trigger	Impact on Serviceable Life	Budget
Road Paving - Arterials	Capital	Condition	Extended by 25 years	$1,500,000
Road Paving - Collectors	Capital	Condition	Extended by 25 years	$1,500,000
Road Paving - Locals	Capital	Condition	Extended by 25 years	$2,300,000
Road Paving - Lanes	Capital	Condition	Extended by 25 years	$200,000
Sidewalk Rehabilitation	Capital	Inspection	Extended by 50 years	$130,000
Major bridge repairs, upgrades, and replacements	Capital	Condition	Extended by 10-75 years	Not budgeted
Major retaining wall repairs, upgrades and replacements	Capital	Poor	Extended by 10-75 years	Not budgeted
Streetlight Pole Replacement	Capital	Inspection	Extended by 25 years	$32,000
Signal Pole Replacement	Capital	Inspection	Extended by 25 years	$65,000
Streetlight Bulb Replacement	Capital	Every 15 years	Extended by 15 years	$57,500
Sub-Total Capital				**$5,784,500**
Asphalt Repairs	Maintenance	Condition	Extended by 10 years	$275,000
Crack Sealing	Maintenance	Condition	Extended by 10 years	$55,000
Pot Hole Repairs	Maintenance	Condition	Extended by 5 years	$90,000
Curb and Gutter Repairs	Maintenance	Condition	Extended by 5 years	$64,500
Downtown Parking Lots	Maintenance	Condition	Extended by 5 years	$16,700
Grading - Lanes	Maintenance	Scheduled	Extended by 3 years	$100,000
Sidewalk Inspections	Maintenance	Scheduled	Extended by 5 years	$10,000
Sidewalk repairs and maintenance	Maintenance	Scheduled	Extended by 5-10 years	$120,000
Bus Stop Maintenance	Maintenance	Scheduled	Extended by 5 years	$3,000

Activity	Type	Activity Trigger	Impact on Serviceable Life	Budget
Boulevard Maintenance	Maintenance	Scheduled	Extended by 5 years	$50,000
Bridge inspection	Maintenance	Scheduled	Variable	$100,000
Minor bridge repairs and maintenance	Maintenance	Condition	Extended by 5-10 years	Not budgeted
Retaining wall Inspection	Maintenance	Scheduled	Extended by 10-20 years	Not budgeted
Minor retaining wall repairs and Maintenance	Maintenance	Poor	Extended by 5-10 years	Not budgeted
Traffic Signal Repairs	Maintenance	Inspection	Extended by 10 years	$240,000
Traffic Signal Relamping	Maintenance	Inspection	Extended by 7 years	$3,000
Streetlight Panel Repairs and Replacement	Maintenance	Inspection	Extended by 15 years	$45,000
Streetlight Painting and Numbering	Maintenance	Inspection	Extended by 5 years	$18,000
Sign Installation and Repairs	Maintenance	Scheduled	Extended by 10 years	$70,000
Railway Crossing Maintenance	Maintenance	Condition	Extended by 5 years	$10,000
Sub-Total Maintenance				**$1,270,2000**
Street Sweeping	Operations	Scheduled	No impact	$165,000
Snow & Ice Response	Operations	Priority	No impact	$400,000
Dust Control – Lanes	Operations	Scheduled	No impact	$32,300
Vandalism	Operations	By request	No impact	$6,500
Illegal Dumping	Operations	By request	No impact	$80,000
Christmas Decorations	Operations	Scheduled	No impact	$24,180
Road Marking Inspection and Cleaning	Operations	Scheduled	No impact	$113,500
Sidewalk Grinding	Operations	Scheduled	No impact	$9,000
Sidewalk Snow & Ice Response	Operations	Weather and Priority	No impact	$70,000

Activity	Type	Activity Trigger	Impact on Serviceable Life	Budget
Signal Adjustments	Operations	Traffic Condition	No impact	$25,000
Streetlight Outages	Operations	Inspection	No impact	$60,000
Sign Layout and Manufacturing	Operations	By request	No impact	$160,000
Sign Inspection and Cleaning	Operations	Inspection	No impact	$5,100
New Traffic Control Sign Installations	Operations	Inspection	No impact	$21,500
Sub-Total Operations				**$1,172,080**
Total				**$8,226,780**

Reinvestment Rates

Capital reinvestment rates, expressed as a percentage of asset replacement costs, offer valuable information about the financial sustainability of infrastructure assets. Reinvestment rates can be used to determine annual capital expenditure targets, or allocations to reserves, to ensure asset replacement needs are met as they arise.

Maintenance and operational costs are not reflected in reinvestment rates, but are important considerations for operational budgeting in order to maximize the life of assets while maintaining acceptable levels of service and efficient operations.

Table 9 illustrates two types of reinvestment rates: segment and service area. The segment-level reinvestment is calculated by dividing the total capital expenditures of an asset segment by the replacement cost of that particular asset segment. The service area reinvestment rate is calculated by dividing capital expenditures for each asset segment over the total replacement cost of the service area as a whole. The overall, combined service area reinvestment rate can be used for long-term financial planning and strategic decision-making.

Table 9 shows that the City's annual Transportation capital expenditures of $6.1 million yield an overall, service area reinvestment rate of 1.1%.

Table 9: Current Reinvestment Rates

Segment	Annual Capital Budget	Segment Capital Reinvestment Rate	Service Area Capital Reinvestment Rate
Road Network	$5,775,000	2.2%	1.1%
Bridges	$0	0.0%	0.0%
Sidewalks	$130,000	0.5%	0.0%
Streetlights	$89,500	0.4%	0.02%
Signalized Intersections	$154,500	0.6%	0.0%
Retaining Walls	$0	0.0%	0.0%
Railway Crossings	$0	0.0%	0.0%
Total	**$5,784,500**		**1.1%**

Reinvestment Rate Benchmarks

Although there is no scientific or industry consensus on how much an agency should spend or allocate to reserves each year for asset replacements, some benchmarking is available to provide guidance on adequate reinvestment levels, or target reinvestment rates (TRR).

Inconsistencies in methodologies and incomplete details make for imperfect comparisons but can still be very useful. Actual reinvestments also vary considerably across municipalities, and reflect many factors, including current asset conditions, financial capacity, and council priorities.

Canadian Infrastructure Report Card

In 2016, the Canadian Infrastructure Report Card (CIRC) produced an assessment of the health of municipal infrastructure as reported by cities and communities across Canada. The CIRC remains a joint project produced by several organizations, including the Federation of Canadian Municipalities (FCM), the Canadian Society of Civil Engineers (CSCE), the Canadian Network of Asset Managers (CNAM), and the Canadian Public Works Association (CPWA).

The 2016 version of the report card contained recommended reinvestment rates that can serve as benchmarks for municipalities. The report card contains both a range for reinvestment rates that outlines the lower and upper recommended levels, as well as actual municipal averages.

With respect to transportation infrastructure, the CIRC report card contained reinvestment rates only for roads, sidewalks, and bridges. Rates for all transportation assets were unavailable from CIRC, but an average of 1-3% is typically used for major infrastructure groups, such as roads, facilities, water, sanitary, and storm.

System Generated Reinvestment Rates

Using the City's inventory data, Citywide Asset Manager generates the average annual requirements (AAR) associated with each asset. The AAR is calculated by dividing the replacement cost of an asset by its established useful life. This can then be aggregated for all assets to derive category level reinvestment rates.

The AAR serves as a benchmark for annual infrastructure spending, or allocations to reserves, to ensure that asset replacement needs are met as they arise. AAR value is then divided by the total replacement cost of the service area or category to calculate target reinvestment rates. For Transportation assets, the average annual requirements total $15,648,055, for a system-generated target reinvestment rate of 2.9%.

Table 10: System-generated Reinvestment Rates

Segment	AAR	System-generated TRR
Road Network	$11,198,595	4.3%
Bridges	$2,397,502	1.4%
Sidewalks	$560,111	2.1%
Curb and Gutter	$496,397	1.9%
Streetlights	$402,380	2.0%
Signalized Intersections	$476,178	2.0%
Retaining Walls	$105,342	1.3%
Railway Crossings	$11,550	2.0%
Total	**$15,648,055**	**2.9%**

Comparative Analysis

Table 11 compares the City's current reinvestment rates against CIRC's 2016 guidelines and the system-generated reinvestment rates as found in Citywide.

Table 11: Transportation Capital Reinvestment Rate Comparison

Benchmark	Assets Included	Target Capital Reinvestment Range	2016 Municipal Average	Port Coquitlam Capital Reinvestment Rate (Segment)	Port Coquitlam Capital Reinvestment Rate (Service Area)
CIRC	Roads and Sidewalks	2.0% - 3.0%	1.1%	2.1%	1.1%
CIRC	Bridges	1.0% - 1.5%	0.8%	0%	0%
Citywide Asset Manager	Roads and Sidewalks	4.1%	1.1%	2.1%	1.1%
Citywide Asset Manager	Bridges	1.4%	0.8%	0%	0%
Citywide Asset Manager	All Transportation Assets	2.4%	1-3%	<0.5%	1.1%

The analysis shows that, at the segment level, Port Coquitlam's reinvestment rate for roads and sidewalks is comparable to the CIRC range but below system-generated targets: the City is reinvesting 2.1 % of the total replacement cost of all roads and sidewalks back into these assets each year. Investments in bridges can fluctuate substantially year to year. Overall, the City's capital reinvestment rate of 1.1% for transportation, while in line with the 2016 municipal average, remains below both the CIRC and system-generated levels.

Maintaining adequate reinvestment rates –whether through actual spending on infrastructure programs or earmarking funds for future investments—ensures that service levels are maintained, and replacement needs can be met as they arise.

Capital and Operational Budgeting

Information from asset management plans can be used to determine appropriate levels of funding for capital and operating budgets, which serve different purposes.

Table 12: Purpose of Capital and Operating Budgets

Budget	Role in Infrastructure Programs
Capital	The capital budget includes funds to replace existing assets and acquire new, non-growth related assets. Asset replacements are funded by taxpayers and can be determined by reinvestment rates. Growth-related assets and capacity upgrades are partially funded by Development Cost Charges or external parties, or constructed by development. These are determined by growth projects and infrastructure capacity assessments.
Operational	The operational budget includes funds to maintain assets and deliver services. Maintenance costs include activities and expenditures that have a direct impact on assets by prolonging and maximizing their service life or deferring their replacement. These expenditures are informed by asset management plans and key performance indicators. Operational costs include activities and expenditures that maintain acceptable levels of service and efficient operations but have no direct or tangible impact on asset lifespan.

Capital reinvestment rates can be used to determine annual capital expenditure targets, or allocations to reservices, to ensure asset replacements needs are met as they arise.

Key performance indicators can be tracked and used to determine how much to spend on maintenance and operational activities in order to maximize the service life of assets while maintaining acceptable levels of service and efficient operations.

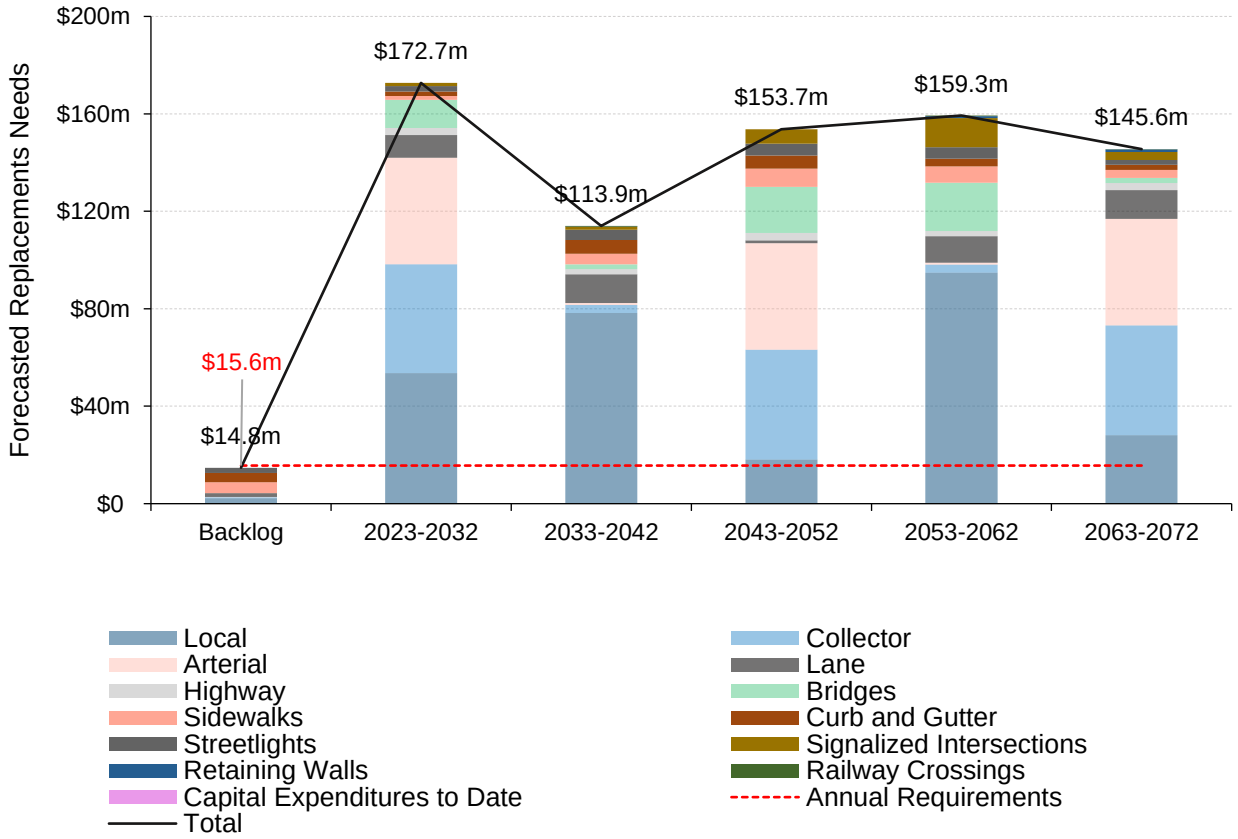
Forecasted Long-term Replacement Needs

In contrast to historical investments in infrastructure, Figure 15 illustrates the cyclical short-, medium- and long-term replacement requirements for Transportation assets over the coming decades. The City's average annual requirements for Transportation asset replacements total $15.6 million (red dotted line). Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The City's current capital expenditures of approximately $5.8 million per year on Transportation asset replacements are less than half of the $15.6 million recommended to ensure that replacement needs are met.

The chart illustrates substantial capital needs through the forecast period. The first replacement spike, totaling $172.7 million is forecasted in the current decade—approximately 20 years after 2000-2009 during which the largest investments were made in transportation infrastructure.

Figure 15: Forecasted Long-term Replacement Needs



The chart also shows a Transportation age-based backlog of $14.8 million, comprising assets that have reached the end of their estimated useful life. However, the figure increases to $160.2

million when assets in poor or worse condition, or with less than 40% service life are included in the backlog estimate. These assets may be candidates for immediate or short-term replacement because they are in poor or very poor condition. Both age and condition should be used to forecast replacement needs and refine capital expenditure estimates.

The magnitude of capital needs typically far exceeds what most agencies can afford to fund. risk-based approach can be used to direct funds where they are needed most first in order to strategically address age- and condition-based backlogs.

Risk Analysis

The level of risk an asset carries determines how closely it is monitored and maintained, including the frequency of various lifecycle activities, and the investments it requires on an ongoing basis.

Some assets are also more important to the community than others, based on their financial and economic significance, their role in delivering essential services, the impact of their failure on public health and safety, and the extent to which they support a high quality of life for community stakeholders.

Although public health and safety is paramount, many factors other than an asset's age or condition must be considered when prioritizing investments in infrastructure and making the most of limited funds.

Keeping up with replacement needs poses a substantial challenge for most local governments and public agencies across Canada. A risk-based approach to infrastructure spending can help prioritize capital projects to channel funds where they are needed most. Rather than taking the worst-first approach, a risk-based approach ranks assets based on their condition/performance as well as their criticality—providing a more complete rationale for project selection.

Calculating Asset Level Risk

Risk is a product of two variables: the probability that an asset will fail, and the resulting consequences of that failure event. It can be a qualitative measurement, (low, medium, high) or quantitative measurement (1-5), that can be used to rank assets and projects, identify appropriate lifecycle strategies, optimize short- and long-term budgets, minimize service disruptions, and maintain public health and safety.

The approach used in this asset management plan relies on a quantitative measurement of risk associated with each asset. The probability and consequence of failure are each scored from 1 to 5, producing a minimum risk index of 1 for the lowest risk assets, and a maximum risk index of 25 for the highest risk assets.

Figure 16: Calculating Risk Ratings

Risk	=	Probability of Failure	x	Consequence of Failure

Probability of Failure

Several factors can help decision-makers estimate the probability or likelihood of an asset's failure. Typically, these can include the asset's condition (pavement distress), age, previous performance history, capacity challenges, and exposure to extreme weather events, such as flooding and ice jams—both a growing concern for municipalities in Canada. Each of these factors and individual attributes must also be weighted based on how well it can predict and explain the likelihood of asset failure.

Consequence of Failure

The consequence of failure describes the overall effect that an asset's failure will have on an organization's asset management goals. Consequences of failure can range from non-eventful to severe. An uneven sidewalk with some surface distress may pose a minor inconvenience to residents. However, a bridge failure poses critical health and safety risks, and may disconnect areas of the City.

The parameters used to describe and measure an asset's consequence of failure will aim to align with the Triple Bottom Line (economic, social, environmental) approach to risk management as well as other considerations including regulatory, health and safety, and strategic.

When various types of consequences that the organization and community may face from an asset's failure are identified and properly weighted based on their relative magnitudes, an asset's criticality can be approximated.

Table 13: Types of Consequences of Asset Failure

Type of Consequence	Description
Direct Financial	Direct financial consequences are typically measured as the replacement costs of the asset(s) affected by the failure event, including interdependent infrastructure.
Economic	Economic impacts of asset failure may include disruption to local economic activity and commerce, business closures, service disruptions, etc. Whereas direct financial impacts can be seen immediately or estimated within hours or days, economic impacts can take weeks, months and years to emerge, and may persist for even longer.
Socio-political	Socio-political impacts are more difficult to quantify and may include inconvenience to the public and key community stakeholders, adverse media coverage, and reputational damage to the community and the City.
Environmental	Environmental consequences can include pollution, erosion, sedimentation, habitat damage, etc.
Public Health and Safety	Adverse health and safety impacts may include injury or death, or impeded access to critical services.
Strategic	These include the effects of an asset's failure on the community's long-term strategic objectives, including economic development, business attraction, etc.

Individual risk models are developed for major Transportation assets, and applied to the City's inventory within Citywide to establish asset risk ratings. These risk indices or ratings are then used to stratify assets within a risk matrix, as illustrated in Figure 17.

Figure 17: Risk Ratings and Lifecycle Strategy

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
13,522 Assets	7,960 Assets	2,271 Assets	2,273 Assets	193 Assets
$77,602,234	$79,119,989	$176,004,717	$169,224,767	$31,130,550
► **Strategy**: Monitoring, e.g., routine inspections ► **Goal**: Detetect any early signs of wear or potential issues		► **Strategy**: Monitoring and proactive management and preventative maintenance ► **Goal**: Prevent escalation of issues and further disrepair	► **Strategy**: Immediate action, e.g., repair or replacement ► **Goal**: Avoid further downtime, and reduce consequences of asset failure	

Since risk ratings rely on many factors beyond an asset's physical condition or age, assets in a state of disrepair can sometimes be classified as low risk, despite their poor condition rating. In such cases, although the probability of failure for these assets may be high, their consequence of failure ratings were determined to be low based on the attributes used and the data available.

Similarly, assets in very good condition can receive a moderate to high risk rating despite a low probability of failure. These assets may be deemed as highly critical to the City based on their costs, economic importance, social significance, and other factors.

Continued calibration of an asset's criticality and regular data updates are needed to ensure these models more accurately reflect an asset's actual risk profile.

Risk Models and Matrices

This following section outlines the proposed risk models for Transportation assets. Factors and weights used in both the probability of failure and consequence of failures are outlined, along with the associated ranges that will be used to classify individual assets. Resulting risk matrices are illustrated for each major asset type, as well as major Transportation Services assets as a whole.

Risk Matrix: All Major Transportation Assets

The following summary-level risk matrix show how roads, sidewalks, retaining walls, and bridges are classified based on their risk ratings.

Figure 18: Detailed Risk Matrix – Major Transportation Assets

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	12 Assets $117.5M	10 Assets $23.8M	13 Assets $10.5M	0 Assets $0	1 Asset $11.6M
3	147 Assets $8.3M	191 Assets $16.1M	518 Assets $47.6M	342 Assets $45.9M	70 Assets $1.4M
2	501 Assets $16.2M	683 Assets $22.7M	1,619 Assets $57.7M	1,689 Assets $69.1M	252 Assets $2.7M
1	227 Assets $731.5K	1,147 Assets $2.2M	2,194 Assets $4.7M	343 Assets $2.4M	1,013 Assets $1.5M

Probability of Failure

To provide a more simplified view, the matrix below consolidates assets into broader risk classifications. The figure illustrates that 193 assets, with a current replacement cost of $31.1 million have a very high risk rating due to their potentially high probability of failure, and moderate to severe consequences of failure. An additional 2,273 assets, with a current replacement cost of $169.2 million, were classified with a high risk rating.

Figure 19: Consolidated Risk Matrix - Major Transportation Assets

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
2,575 Assets	3,660 Assets	2,271 Assets	2,273 Assets	193 Assets
$18,269,038	$67,869,193	$176,004,717	$169,224,767	$31,130,550

Road Network

The City's road network datasets contain several essential attributes that have been integrated into these risk models, including condition data such as Pavement Quality Index (PQI), road class, and route designations (e.g., heavy truck route, disaster response route).

In the model below for probability of failure, a road section's PQI was determined to be the best predictor of its potential failure. Hence, it received the largest relative weighting, at 75%. This general approach is used for all probability of failure models.

Figure 20: Probability of Failure – Road Network

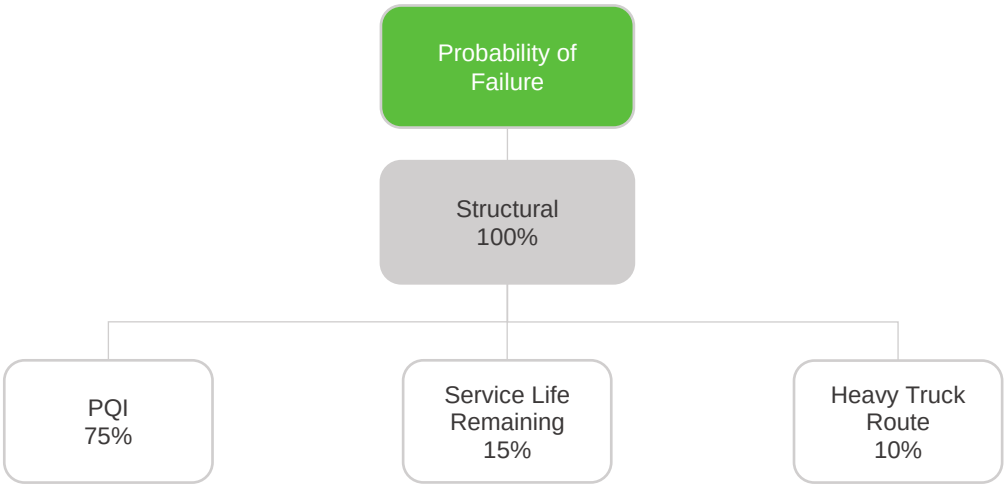


Table 14 outlines the relationship between the probability of failure and the ranges used for each of the above factors. Assets with a condition rating of 75% or less, or with a remaining service life of less than 15%, have the highest likelihood of failure, i.e., 'Almost Certain'.

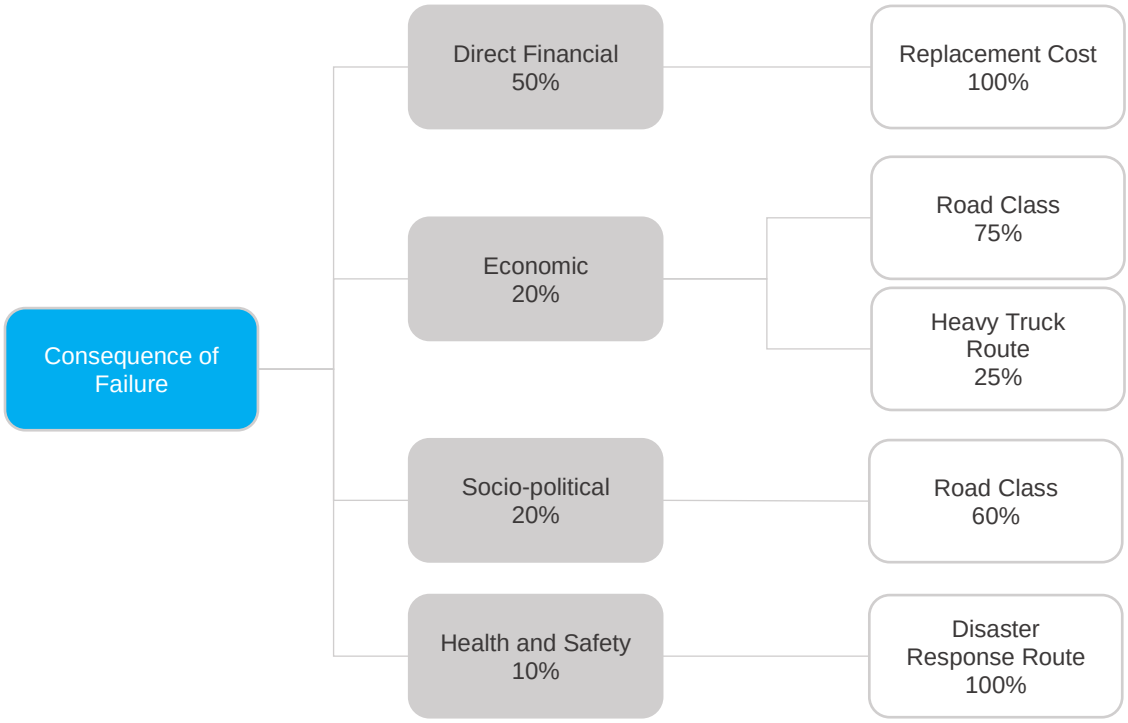
Table 14: Defining Probability of Failure Ranges – Road Network

Factor	Range (0-100%)	Probability of Failure
PQI (%)	100	1—Rare
	70 - 99	2—Unlikely
	50 - 70	3—Possible
	20 - 50	4—Likely or Probable
	0 - 20	5—Almost Certain
Service Life Remaining (%)	Greater than 40	1—Rare
	30 - 40	2—Unlikely
	20 - 30	3—Possible
	10 - 20	4—Likely or Probable
	0 - 10	5—Almost Certain
Heavy Truck Route	No	2—Unlikely
	Yes	3—Possible

The model below outlines the type of potential consequences that may result from failure of the City's roads, the relative weight of each consequence type, and the data (attributes) used to approximate that effect.

For example, high capacity roadways such as highways and arterial roads carry a higher volume and variety of traffic than local roads. Traffic speeds along these roads are also much higher than other road types. As a result, Road Class was determined to be the best proxy for an asset's economic consequence of failure, receiving the highest relative weighting of 75%.

Figure 21: Consequence of Failure – Road Network



This approach was used for all consequence of failure models developed for Transportation assets.

Table 15: Defining Consequence of Failure Ranges – Road Network

Type of Consequence	Measure	
Direct Financial	Replacement Cost	Consequence of Failure
	Less than $10,000	1—Insignificant
	$10,000 - $50,000	2—Minor
	$50,000 - $100,000	3—Moderate
	$100,000 - $500,000	4—Major
	Greater than $500,000	5—Severe
Economic	Road Class	Consequence of Failure
	Lane	1—Insignificant
	Local	2—Minor
	Collector	3—Moderate
	Arterial	4—Major
	Highway	5—Severe
	Heavy Truck Route Designation	Consequence of Failure
	No	2—Minor
	Yes	4—Major
Socio-political	Road Class	Consequence of Failure
	Lane	1—Insignificant
	Local	2—Minor
	Collector	3—Moderate
	Arterial	4—Major
	Highway	5—Severe
Health and Safety	Disaster Response Route Designation	Consequence of Failure
	No	2—Minor
	Yes	5—Severe

Risk Matrix: Road Network

The risk matrix below is based on the previous risk model developed for the City's road network. It is generated using available asset data.

Figure 22: Detailed Risk Matrix - Road Network

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	1 Asset $59.4K	7 Assets $1.2M	10 Assets $2.7M	0 Assets $0	0 Assets $0
3	15 Assets $1.8M	105 Assets $13.5M	425 Assets $37.9M	340 Assets $43.9M	0 Assets $0
2	177 Assets $9.8M	459 Assets $20.4M	1,268 Assets $54.1M	1,678 Assets $68.9M	2 Assets $56.7K
1	44 Assets $306.1K	87 Assets $792.7K	183 Assets $1.8M	277 Assets $2.3M	0 Assets $0

Probability of Failure

The consolidated risk matrix in Figure 23 shows that 1,993 road segments, with a current replacement cost of $142 million have a high risk to very high risk rating. Assets with these risk ratings typically have a minimum probability of failure of 'Possible' and a moderate to severe potential consequence of failure.

Figure 23: Consolidated Risk Matrix – Road Network

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
268 Assets	1,527 Assets	1,290 Assets	1,873 Assets	120 Assets
$8,011,943	$48,389,788	$61,067,147	$125,756,235	$16,237,191

Sidewalks

Figure 24: Probability of Failure – Sidewalks

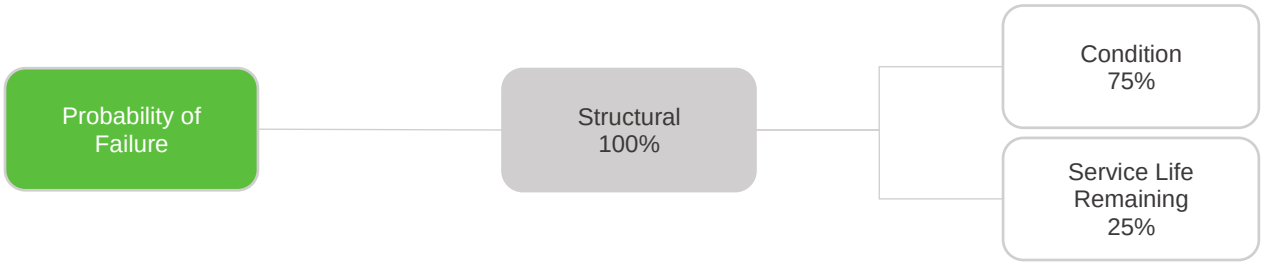


Table 16: Defining Probability of Failure Ranges - Sidewalks

Factor	Range (0-100%)	Probability of Failure
Condition (%)	100	1—Rare
	70 - 99	2—Unlikely
	50 - 70	3—Possible
	20 - 50	4—Likely or Probable
	0 - 20	5—Almost Certain
Service Life Remaining (%)	Greater than 40	1—Rare
	30 - 40	2—Unlikely
	20 - 30	3—Possible
	10 - 20	4—Likely or Probable
	0 - 10	5—Almost Certain

Figure 25: Consequence of Failure – Sidewalks

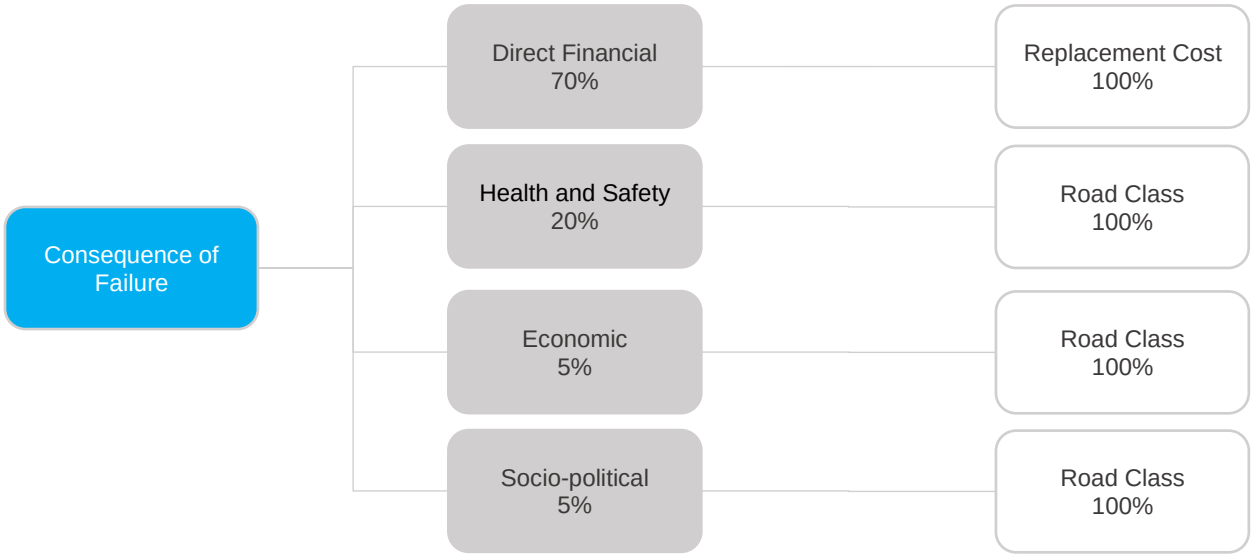


Table 17: Defining Consequence of Failure Ranges - Sidewalks

Type of Consequence	Measure	
Direct Financial	Replacement Cost	Consequence of Failure
	Less than $5,000	1- Insignificant
	$5,000 - $10,000	2—Minor
	$10,000 - $100,000	3—Moderate
	$100,000 - $500,000	4—Major
Health and Safety	Road Class	Consequence of Failure
	Lane/Local	2—Minor
	Collector	3—Moderate
	Arterial/Highway	4 – Major
Economic	Road Class	Consequence of Failure
	Lane/Local/	2—Minor
	Collector	3 - Moderate
	Arterial/Highway	4 – Major
Socio-political	Road Class	Consequence of Failure
	Lane/Local	2 – Minor
	Collector	3 - Moderate
	Arterial/Highway	4 – Major

Risk Matrix: Sidewalks

The risk matrix below is based on the previous risk model developed for the City's sidewalks.

Figure 26: Detailed Risk Matrix – Sidewalks

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	1 Assets $128.3K	0 Assets $0	1 Asset $110.5K	0 Assets $0	0 Assets $0
3	107 Assets $2.7M	84 Assets $2.2M	85 Assets $1.8M	1 Asset $43.6K	70 Assets $1.4M
2	190 Assets $2.8M	224 Assets $2.3M	351 Assets $3.5M	11 Assets $141.5K	250 Assets $2.6M
1	138 Assets $306.6K	1,060 Assets $1.4M	2,011 Assets $3.0M	66 Assets $80.0K	1,013 Assets $1.5M

Probability of Failure

The consolidated risk matrix in Figure 27 shows that 71 sidewalk sections with a current replacement cost of $1.4 million have a very high risk rating. Assets with this risk rating have a minimum probability of failure of 'Possible' and a moderate to severe potential consequence of failure. An additional 387 assets, with a combined replacement cost of $5.2 million, carry a high risk rating.

Figure 27: Consolidated Risk Matrix – Sidewalks

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
2,116 Assets	2,109 Assets	980 Assets	387 Assets	71 Assets
$4,571,769	$9,901,360	$4,937,571	$5,243,532	$1,418,359

Figure 28: Probability of Failure – Retaining Walls

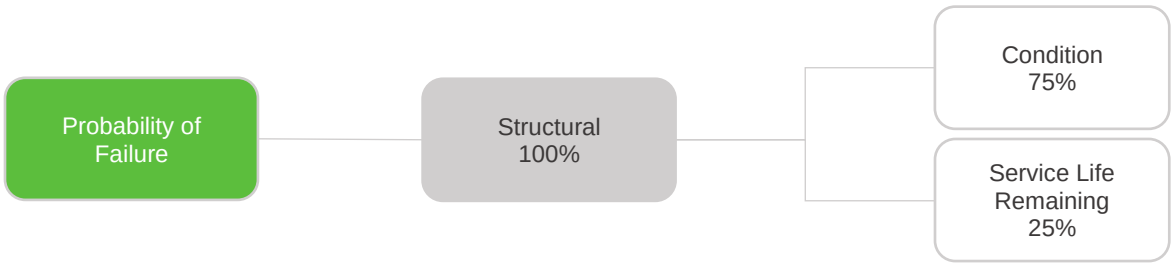


Table 18: Defining Probability of Failure Ranges - Retaining Walls

Factor	Range (0-100%)	Probability of Failure
Condition (%)	100	1—Rare
	70 - 99	2—Unlikely
	50 - 70	3—Possible
	20 - 50	4—Likely or Probable
	0 - 20	5—Almost Certain
Service Life Remaining (%)	Greater than 40	1—Rare
	30 - 40	2—Unlikely
	20 - 30	3—Possible
	10 - 20	4—Likely or Probable
	0 - 10	5—Almost Certain

Figure 29: Consequence of Failure – Retaining Walls

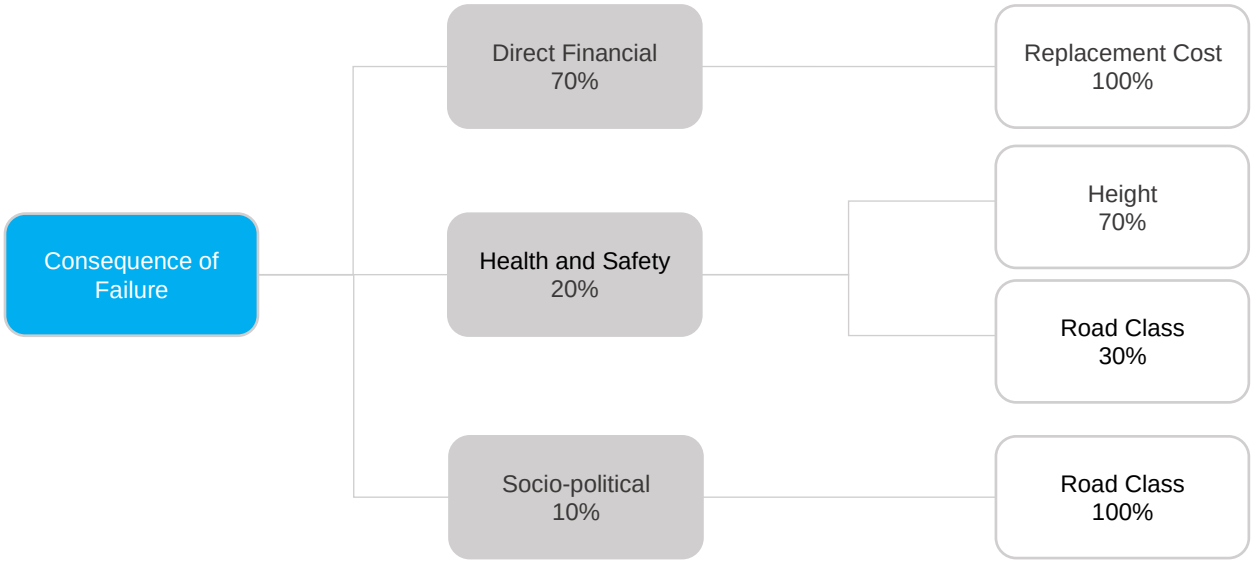


Table 19: Defining Consequence of Failure Ranges - Retaining Walls

Type of Consequence	Measure	
Direct Financial	Replacement Cost	Consequence of Failure
	Less than $5,000	1— Insignificant
	$5,000 - $10,000	2—Minor
	$10,000 – $100,000	3—Moderate
	$100,000 to $500,000	4—Major
	More than $500,000	5 - Severe
Health and Safety	Height	Consequence of Failure
	Less than 2m	2—Minor
	2m - 4m	3—Moderate
	4m - 8m	4—Major
	Greater than 8m	5—Severe
	Road Class	Consequence of Failure
	Lane/Local	2—Minor
	Collector	3—Moderate
	Arterial/Highway	5—Severe
Socio-political	Road Class	Consequence of Failure
	Lane/Local	1—Insignificant
	Collector	3—Moderate
	Arterial/Highway	5—Severe

Risk Matrix: Retaining Walls

The risk matrix below is based on the previous risk model developed for the City's retaining walls.

Figure 30: Detailed Risk Matrix – Retaining Walls

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	5 Assets $1.6M	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
3	17 Assets $2.6M	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
2	131 Assets $3.5M	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	45 Assets $118.7K	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0

Probability of Failure

The consolidated risk matrix in Figure 31 shows that all retaining walls are currently classified with a very low to low risk rating. However, as no inspection data was available, only age was used to approximate the condition of retaining walls. This may distort the asset's probability of failure rating.

Figure 31: Consolidated Risk Matrix – Retaining Walls

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
188 Assets	10 Assets	0 Assets	0 Assets	0 Assets
$5,580,826	$2,263,045	$0	$0	$0

Bridges

Figure 32: Probability of Failure – Bridges

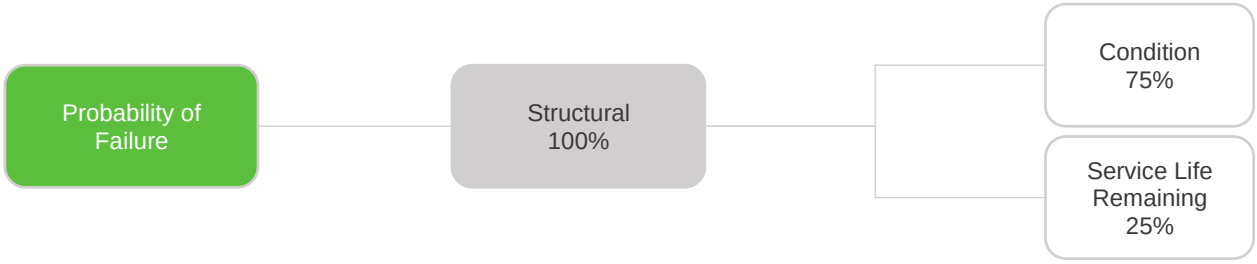


Table 20: Defining Probability of Failure Ranges - Bridges

Factor	Range (0-100%)	Probability of Failure
Condition (%)	100	1—Rare
	70 - 99	2—Unlikely
	50 - 70	3—Possible
	20 - 50	4—Likely or Probable
	0 - 20	5—Almost Certain
Service Life Remaining (%)	Greater than 40	1—Rare
	30 - 40	2—Unlikely
	20 - 30	3—Possible
	10 - 20	4—Likely or Probable
	0 - 10	5—Almost Certain

Figure 33: Consequence of Failure – Bridges

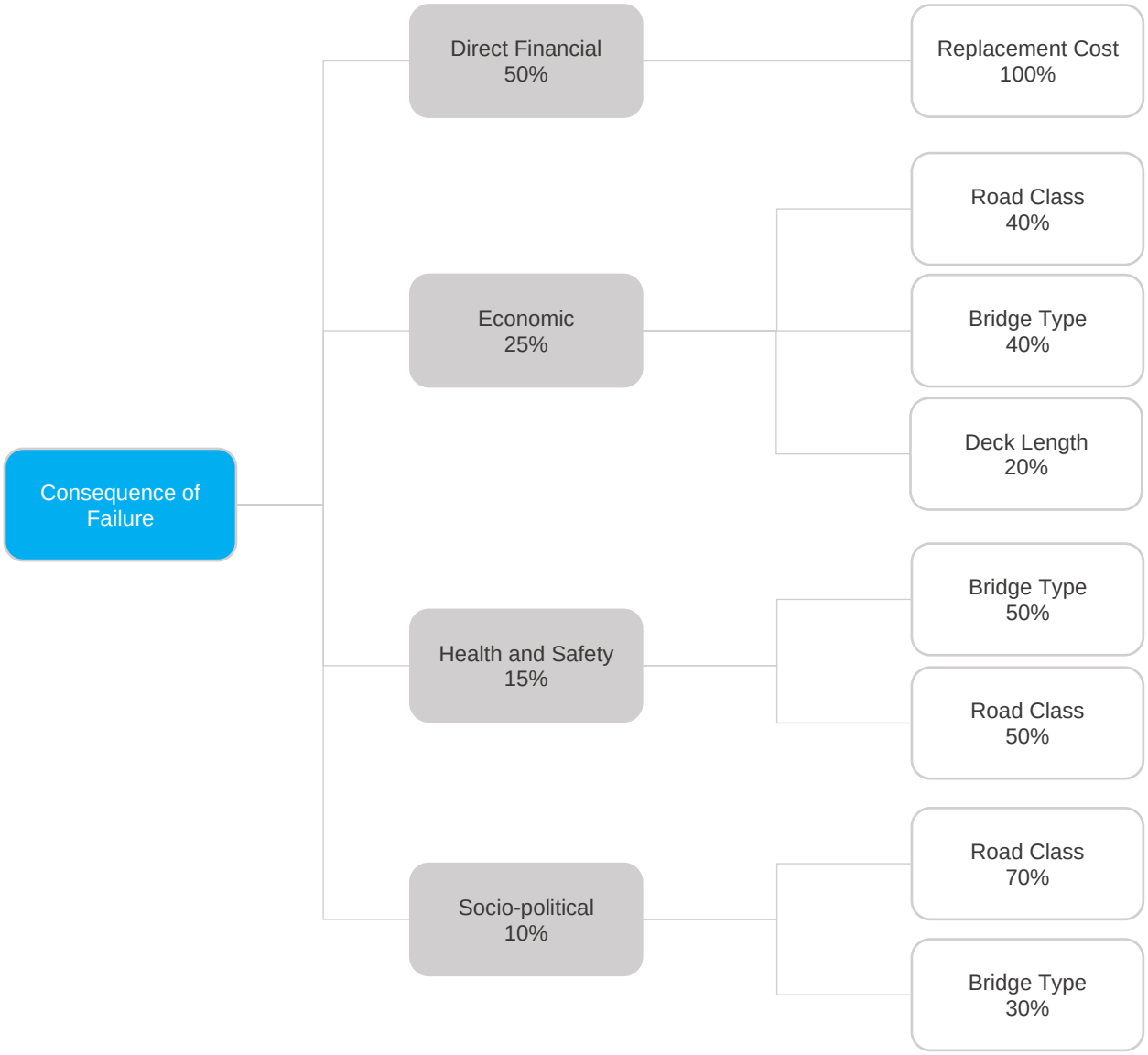


Table 21: Defining Consequence of Failure Ranges - Bridges

Type of Consequence	Measurement	
Direct Financial	Replacement Cost	Consequence of Failure
	Less than $5,000	1 - Insignificant
	$5,000 - $10,000	2—Minor
	$10,000 - 100,000	3—Moderate
	$100,000 - 500,000	4—Major
	More than $500,000	5—Severe
Economic	Deck Length	Consequence of Failure
	5m or Less	2—Minor
	5m - 30m	3—Moderate
	30m - 100m	4—Major
	More than 100m	5—Severe
	Bridge Type	Consequence of Failure
	Pedestrian	2 – Minor
	Vehicle	4—Major
	Road Class	Consequence of Failure
	Lane/Local	2—Minor
	Collector	3—Moderate
	Arterial	4—Major
	Highway	5—Severe
Health and Safety	Bridge Type	Consequence of Failure
	Pedestrian	3—Moderate
	Vehicle	5—Severe
	Road Class	Consequence of Failure
	Lane/Local	2—Minor
	Collector	3—Moderate
	Arterial	4—Major
	Highway	5—Severe
Socio-political	Bridge Type	Consequence of Failure
	Pedestrian	3 – Moderate
	Vehicle	4—Major
	Road Class	Consequence of Failure
	Lane/Local	2—Minor
	Collector	3—Moderate
	Arterial	4—Major
	Highway	5—Severe

Risk Matrix: Bridges

The risk matrix below is based on the previous risk model developed for the City's bridges.

Figure 34: Detailed Risk Matrix – Bridges

Consequence of Failure	1	2	3	4	5
5	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
4	5 Assets $115.7M	3 Assets $22.7M	2 Assets $7.7M	0 Assets $0	1 Asset $11.6M
3	8 Assets $1.3M	2 Assets $330.0K	8 Assets $7.9M	1 Asset $1.9M	0 Assets $0
2	3 Assets $104.5K	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0
1	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0	0 Assets $0

Probability of Failure

The consolidated risk matrix in Figure 35 shows that two City bridges (Eastbound Lougheed Highway vehicle bridge and the McAllister Avenue pedestrian bridge), with a replacement value of $13.5 million carry a very high risk rating, due to their high probability of failure and major potential consequences of a failure event. An additional 13 assets, with a combined replacement cost of $38.2 million were classified with a high risk rating. This includes the Westbound Lougheed Highway section.

Figure 35: Consolidated Risk Matrix – Bridges

Very Low (1 - 4)	Low (5 - 7)	Moderate (8 - 9)	High (10 - 14)	Very High (15 - 25)
3 Assets	14 Assets	1 Asset	13 Assets	2 Assets
$104,500	$7,315,000	$110,000,000	$38,225,000	$13,475,000

Levels of Service

Levels of service (LOS) measure the quality and quantity of service provided, and offer direction for infrastructure investments. They are necessary for performance tracking and reporting. Many agencies attempt to deliver levels of service that cannot be sustainably funded by the existing tax base. This can lead to an eventual drop in quality of service, or increases to tax and utility rates to fund higher service levels.

LOS should be affordable and aligned with the community's long-term vision for itself and the service attributes it most values for different infrastructure programs.

Defining Levels of Service

Levels of service measure the quality, function, and capacity of an asset class or service area. LOS is an internationally recognized concept, employed across a variety of sectors, including public infrastructure. The International Standards Organization's ISO 55000 defines levels of service as the "parameters, or combination of parameters, which reflect the social, political, environmental, and economic outcomes that the organization delivers."

Levels of Service Framework

A typical levels of service framework includes several common components, as outlined in the table below.

Table 22: Components of a Levels of Service Framework

Component	Description and Purpose
Core Value	Typical core values that can be used for infrastructure programs include safety, reliability, efficiency, sustainability, and affordability.
Levels of Service Statement	The LOS statement expands on each core value and converts it into an objective for each service area.
Customer Levels of Service	CLOS are measurements or qualitative descriptions that help **describe the performance of the asset group or service area from an end-user perspective**. CLOS measure experiences, e.g., customer satisfaction with quality of recreational facilities; average travel times between major residential and commercial centres; watermain breaks; and, health and safety incidents.
Technical Levels of Service	TLOS are typically more operational in nature and are designed to measure the various **activities and steps that the organization takes to deliver the customer-oriented levels of service**. They can include data on maintenance activities and different condition assessment programs. TLOS are often seen as inputs whereas CLOS are viewed as outputs. Some KPIs can be both customer and technical oriented.
Key Performance Indicators	For both CLOS and TLOS, suitable key performance indicators (KPIs) must be selected to support reporting and tracking of each.

Core Values and Service Statements

Table 23 outlines the four core values and service developed for service delivery across the City's eight asset portfolios. Service statements expand on the values to convert them into broader goals.

Table 23: Core Values and Service Statements

Core Value	Service Statement
Reliable	Service delivery is reliable and provided with minimal service disruption to meet agreed upon levels of service.
Safe	All safety standards and regulatory requirements are met to protect public health, safety, and the environment.
Affordable	Services are affordable, fair, and equitable, accounting for the full cost of service delivery at agree upon levels of service.
Practical	Resources are prioritized towards the delivery of basic infrastructure and services first.

Selecting Suitable KPIs

Given the complexity of infrastructure services, countless customer and technical levels of service KPIs can be used to monitor performance, and ultimately, adjust the cost, performance, and risk associated with different assets. For the purpose of asset management planning, KPIs selected should be higher-level in nature and summarize the performance of the asset group as a whole rather than enumerate daily, operational indicators.

The KPIs should also be aligned with corporate goals and initiatives. This maintains a 'line of sight' between staff activities, end-user experiences, and council direction as typically illustrated in strategic planning documents, i.e., measuring what matters most to Port Coquitlam residents. In addition, rather than generating new metrics, the selected KPIs should first maximize data already available. Often, available data can be readily converted into meaningful KPIs.

For Transportation, a total of 68 KPIs were selected. This included 26 KPIs to measure customer levels of service, and 42 to track the City's technical levels of service. A practical way to distinguish between the two is to think of technical levels of service as the activities and steps the organization takes to deliver customer levels of service. Given their significance, historical data for the last four years was retrieved to illustrate performance trends for customer levels of service.

Table 24: Customer Levels of Service

KPI	2018	2019	2020	2021	Trend
Capital					
# of service requests related to road rehabilitation	0	15	41	43	↗
% of transportation assets in poor or worse condition	*	*	*	30	*
% of roads in poor or worse condition	*	*	*	43	*
% of bridges in poor or worse condition	*	*	*	8	*
% of sidewalks in poor or worse condition	*	*	*	49	*
% of traffic signals or lights in poor or worse condition	*	*	*	9	*
Maintenance					
# of service requests related to bridges	8	12	17	22	↗
# of service requests related to barricades/no-posts/guard rail	30	42	50	57	↗
# of service requests for lane maintenance	87	124	135	152	↗
# of service requests for potholes	223	291	303	312	↗
# of service requests for sinkholes	15	26	26	17	→
# of service requests for road repairs (crack sealing, patching)	101	140	125	83	↘
# of service requests related to sidewalk maintenance, curb, and driveway letdowns	148	233	278	261	→
Operations					
# of service requests related to illegal dumping	522	680	779	968	↗
# of calls related to vandalism	5	11	9	6	→
# of service requests for dust control	34	23	41	58	↗
# of service requests for shoulder grading	7	15	17	16	→
# of service requests related to snow removal on roads	44	71	119	125	↗
# of service requests related to pavement markings	3	29	44	32	→
# of service requests related to streetlight maintenance (City)	1	141	332	354	↗
# of service requests related to streetlight maintenance (BC Hydro)	0	47	97	118	↗
# of service requests related to street signage	2	154	258	195	→
# of service requests for traffic signal maintenance	0	66	99	65	→
# of service requests for driveway let downs	0	11	27	32	↗
# of service requests for street sweeping	148	158	131	163	→

Table 25: Technical Levels of Service

KPI	2021	Budget
Capital		
Annual capital investment in sidewalk rehabilitation	$130,000	$130,000
Annual capital investment in local road paving	$3,000,000	$2,300,000
Annual capital investment in lane paving	$200,000	$200,000
Annual capital investment in collector road paving	$445,000	$1,500,000
Annual capital investment in arterial road paving	$1,925,000	$1,500,000
Annual capital investment in streetlight pole replacement	12	$32,000
Annual capital investment in streetlight bulb replacement (of 3377)	241	$57,500
Annual capital investment in traffic signal pole replacements (0f 251)	0	$65,000
Average annual reinvestment rate in road bridge replacement	$0	$0
Average annual reinvestment rate in pedestrian bridge replacement	$0	$0
Annual capital investment	$5,700, 000	$5,784,500
Maintenance		
Bus stop inspection, maintenance and repairs (of 5 City shelters) - scheduled and reactive	5 inspections, 1 repair	$3,000
Parking lot inspection, maintenance and repairs (of 4 lots)	4 inspections and repairs	$16,700
Annual capital investment in asphalt repairs		$275,000
Grading and repair of gravel lanes (42km), parking lots (5), shoulders (planned & reactive)	84km	$100,000
Bridge inspection, maintenance and repair	31	$100,000
Streetlight panel inspection and replacement	6	$45,000
Annual maintenance costs for rail crossings (3)	3	$10,000
Traffic signal inspection and repair (of 251)	251	$240,000
Traffic signal relamping (of 251)		$3,000
Signs inspection and repair (of 7,700, based on 10-year cycle)	1,634	$70,000
Meters of crack sealing completed (per 195km of paved roads)	35km	$55,000

KPI	2021	Budget
# of potholes filled (per 225km of roads and lanes)	807	$90,000
Sidewalk maintenance and repair (of 66,000 m^2)	155	$120,000
Curb and gutter repairs (of 203km)	n/a	$64,500
Sidewalk inspections - scheduled (per 66,000 m^2)	100%	$10,000
City owned boulevard and median maintenance – scheduled and reactive	100%	$50,000
Streetlight poles painted annually (0f 225)	43	$18,000
Average annual maintenance expenditures		$1,270,000
Operations		
Dust control - gravel lanes (42km) and gravel parking lots (5)	48 km	$32,300
# of illegal dumping responses	589	$80,000
Vandalism (as reported)	100%	$6,500
Road and bridge sweeping - scheduled and reactive	423 lane-km	$165,000
Christmas Decorations	100%	$24,180
Streetlight Outages	N/A	$60,000
Traffic signals inspection and adjustment (of 54)	55	$25,000
Road marking inspection and repainting	34	$113,500
Sign inspection and cleaning	676	$5,100
Traffic control signs manufactured	3,697	$160,000
New traffic control sign installations	313	$21,500
Sidewalk grinding (trip hazards)	N/A	$9,000
Sidewalks and trails cleared of snow and ice hazards - scheduled per Priority 1, 2 & 3	100%	$70,000
Roads cleared of snow and ice hazards (of 202km) - scheduled per Priority 1, 2 & 3	100%	$400,000
Average annual operating expenditures		$1,172,080

Levels of Service Analysis

Table 26 provides the 4-year percentage change in service requests for KPIs that best align with asset condition and performance. These may be helpful indicators in determining if sufficient funding and resources are being allocated to the maintenance and replacement of assets.

Table 26: Trends in Select Customer Levels of Service KPIs

KPI	Percentage change between 2018-2021
# of service requests for lane maintenance	+75%
# of service requests for potholes	+40%
# of service requests for road repairs (crack sealing, patching)	-18%
# of service requests for shoulder grading	+129%
# of service requests for sinkholes	+13%
# of service requests related to barricades/no-posts/guard rail	+90%
# of service requests related to bridges	+175%
# of service requests related to road rehabilitation	+187%
# of service requests related to sidewalk maintenance, curb and driveway letdowns	+76%

Table 27 shows the change in service requests for KPIs that best align with service delivery, but have no direct relationship with asset lifespans. These may be helpful indicators in determining if sufficient funding and resources are being allocated towards service delivery.

Table 27: Trends in Customer Levels of Service KPIs – Service Delivery

KPI	Percentage change between 2018-2021
# of service requests for street sweeping	+10%
# of calls related to vandalism	+20%
# of service requests related to illegal dumping	+85%

KPI data can be used to support decisions to maintain, increase, or decrease levels of service to reduce the frequency of requests and incidents. Trends should be considered in further detail with knowledgeable staff to understand potential influences and context before making decisions.

For example, service level performance may be affected in a given year by weather, material pricing, supply chain issues, staff absences or contractor availability. These factors should be taken into account to determine if the effects are temporary, or longer term and potentially warranting adjustment. Adjusting levels of service must also be considered in light of cost, performance, and risk, as further explained below.

Balancing Cost, Performance and Risk

Levels of service are fundamentally about balancing three key parameters: cost, performance, and risk. Any adjustment to one of these parameters will have a direct impact on the other two. High performance and low risk may require a substantial budget. In contrast, if constituents can tolerate lower performance from community assets, they incur a lower cost but assume a higher risk.

Table 28 briefly outlines how these parameters change when maintenance or capital related service levels are maintained, increased, or decreased. Those service levels have a direct impact on assets by maximizing their service life or deferring their replacement.

Table 28: Balancing Cost, Performance, and Risk

Levels of Service Goal	Impact on Cost	Impact on Asset Performance	Impact on Risk
Maintain	Minimum impact on cost; possible escalation due to market conditions	No expected change beyond typical deterioration	No expected change in asset risk rating
Increase	• Costs increase due to more frequent maintenance, rehabilitation, and/or replacement cycles • Tax rates and utility rates may increase • Increasing asset capacity or enhancing functionality may further escalate costs	• Assets are maintained at a higher condition, delivering higher expected performance • User experience and quality of life may improve	• With a more robust lifecycle program, asset failure may be reduced, resulting in a lower risk rating • User safety and environmental protection may improve
Decrease	• Costs may decrease as lifecycle programs are reduced and services are eliminated	• Assts may deteriorate faster and fail earlier than expected due to deferral of maintenance needs • User experience and quality of life may worsen	• Deferred maintenance may lead to higher failure rates, resulting in higher exposure • User safety and environmental protection may decrease

A sustainable levels of service approach requires municipalities to periodically recalibrate these parameters. Ultimately, trade-offs must be made between different programs based on demand, and between service quality and cost to constituents.

Financial Strategy

Each year, the City of Port Coquitlam makes important investments in its infrastructure to ensure assets deliver their intended function safely and efficiently. These efforts contribute to making Port Coquitlam a highly desirable place to live. The 2023 ranking of The 100 Most Livable Cities in Canada by the *Globe and Mail* placed the City at 17th.

Given the magnitude of infrastructure needs, it is common for municipalities, including Port Coquitlam, to experience annual shortages in funding. This creates annual funding deficits, requiring projects to be deferred to later years. This, in turn, creates long-term infrastructure backlogs.

Achieving full-funding for infrastructure programs is a substantial challenge for municipalities across Canada. Closing annual funding gaps and avoiding long-term backlogs can take many years.

This financial strategy provides a consolidated analysis of the City's eight service areas, and is designed to support the implementation of asset management plans and gradually eliminate gaps identified in the City's annual reinvestment rates.

The financial strategy also provides support for the development of 10-20 year capital plans for each asset group with the City's asset management program.

Approach and Methodology

The assets included in the City of Port Coquitlam's eight service areas have a combined 2023 replacement cost of $1.9 billion, as illustrated in Table 29 below. The table also summarizes the average annual requirements (AAR) for each service area, and the equivalent system-generated target, capital reinvestment rate (TRIR). The City's overall AARs total $42.5 million, generating an equivalent reinvestment rate of 2.2%. To put this differently, the City should invest, on average, 2.2% of the overall current replacement costs of its infrastructure portfolio back into these assets to remain current with replacement needs.

Table 29: Service Area Replacement Costs and Target Reinvestment Rates

Service Area	Replacement Cost	Average Annual Requirements (AAR)	System-generated Target Capital Reinvestment Rate (TRIR)
Transportation	$533,082,256	$15,648,055	2.9%
Drainage	$446,128,207	$7,406,986	1.7%
Water	$303,278,014	$4,541,037	1.5%
Sanitary	$266,373,836	$4,214,139	1.6%
Facilities	$262,262,312	$4,561,458	1.7%
Parks	$41,088,943	$1,682,841	4.1%
Fleet & Equipment	$33,488,624	$3,156,517	9.4%
Information Services	$9,580,473	$1,298,008	13.5%
Total	**$1,895,282,667**	**$42,509,042**	**2.2%**

The overall and individual, service area reinvestment rates serve as critical benchmarks, ensuring that asset replacements needs are met as they arise, and projects are not deferred. However, this 'full funding' is difficult to achieve for most municipalities across Canada, leading to annual infrastructure deficits, which can in turn accumulate to create long-term infrastructure backlogs.

The purpose of the financial strategy is to position Port Coquitlam to meet its target reinvestment rates as outlined above. This is done by examining the City's current funding levels for each service area, quantifying funding gaps, and identifying a roadmap to close these gaps. To ensure fiscal prudence, only those funding sources considered sustainable are integrated with the strategy. The concept of sustainable funding is discussed in more detail.

Current Financial Planning Framework

Port Coquitlam is a growing city. The community saw a growth rate of 4.9% between 2016 and 2021, and has a current population of more than 61,000 residents. Different funding and financing mechanisms are used to ensure that the City's infrastructure portfolio can continue to meet the needs of a growing and evolving population. The focus of the asset management plans and the financial strategy is the City's current asset portfolio.

Capital Budget

The City's capital budget is a forward-looking document that is used to plan for long-term investments, including infrastructure, that provide benefits to Port Coquitlam over time and support service delivery. The capital budget is traditionally funded from tax levies, user fees, senior government transfers and grants, development cost charges (DCCs), debt, and reserves. These funds are used to cover the expenses of maintenance, replacement, and expansion of the asset base which is tied to the level of services provided by the City.

The distinction must be made between the replacement of exiting assets and investments in new assets, including upgrades and expansions. Asset management plans and this financial strategy pertain to the replacement of existing assets. New assets are purchased, built, developed, or contributed to or by the City to specifically accommodate the growth of population or the expansion of services or service levels.

Debt

Debt can be used as a strategic funding source for major public works. The benefits of leveraging debt judiciously for infrastructure planning include:

- the ability to stabilize tax and user rates when dealing with variable and uncontrollable factors,
- equitable distribution of the cost and benefits of infrastructure over its useful life,
- a secure source of funding,
- the ability to proceed with projects sooner than waiting to save enough in cash or grants to pay for the project all at once and,
- flexibility in cash flow management.

Following an initial reduction in interest rates amid the Covid-19 pandemic, interest rates have risen steadily since. As a result, the cost of servicing the debt through interest payment has

increased substantially, making its use for infrastructure projects less compelling. The following graph shows the historical changes to Municipal Finance Authority of BC (MFA) lending rates[1].

Figure 36: Historical MFA Lending Rates[2]

Port Coquitlam currently has $17.6 million (2023 opening balance) of net debt outstanding for the Coast Meridian Overpass. This debt has an annual principal and interest payments of $1.0 million, which are expected to continue until 2039. The City also has outstanding debt for the Port Coquitlam Community Centre which currently has $48.8 million outstanding and carries an annual principal and interest payment of $2.3 million, which expires in 2049.

The funding options outlined in this plan allow Port Coquitlam to fully fund the long-term infrastructure replacement requirements without further use of debt.

[1] https://mfa.bc.ca/clients/long-term-borrowing: "New Issues are often funded by issuing a 10 year bond, locking in a fixed interest rate for ten years. As clients may borrow for up to thirty years, loans longer than ten years a typically refinanced every five years, following the initial ten years."
[2] The illustration does not consider actuarial adjustments.

Senior Government Support

Given the magnitude of investments needed in infrastructure, municipalities often rely on senior government programs to supplement their funding for capital projects and capacity building initiatives. These programs are subject to change with evolving federal and policy landscape, and therefore, create some vulnerability for municipalities that may rely heavily on these funding streams.

Of particular importance is the Canada Community-Building Fund (CCBF), formerly the federal Gas Tax Fund. In the past, municipalities have considered the CCBF a sustainable funding source used for infrastructure projects. Administered through a 10-year tripartite agreement (2014-2024) with the Government of British Columbia and the Union of British Columbia Municipalities (UBCM), the CCBF provides all municipalities with a permanent, predictable, and indexed source of infrastructure funding.

Port Coquitlam received $241k from the CCBF in 2022. Although historically stable, the City should actively monitor and evaluate the potential repercussions of a newly elected government on the CCBF and other senior government funding streams, considering the potential impact on funding priorities, allocations, and eligibility criteria.

While the structure of the transfers may evolve, both the province and federal governments continue to provide reliable sources of funding for asset management and infrastructure programs. When possible, transfers should be leveraged by the City to address the backlog of existing assets that have exceeded their service life.

Sustainability

Although senior government transfers—both recurring such as the CCBF, and one-time, project-specific grants and transfers—can be used to augment the City's fiscal capacity, this funding strategy relies only on the City's own-source revenues. These are limited to property taxes and utility levies. While a stable funding stream, the City typically earmarks the CCBF to fund new assets; as such, it was not integrated with the financial strategy. However, the City should consider allocating these funds to the replacement of existing assets, at least until the backlog has been addressed.

Reserves

Reserves play a critical, often primary, role in long-term financial planning for infrastructure investments. The benefits of having reserves available for infrastructure planning include:

- the ability to stabilize tax and user rates when dealing with variable and sometimes uncontrollable factors;
- financing one-time or short-term investments;
- accumulating the funding for significant future infrastructure investments;
- managing the use of debt; and,
- normalizing infrastructure funding requirement.

Long-Term Infrastructure Reserves

The City of Port Coquitlam's dedicated, long-term infrastructure reserves include the Long-Term General Infrastructure Reserve (LTGIR), the Long-Term Sewer Infrastructure Reserve (LTSIR), and the Long-Term Water Infrastructure Reserve (LTWIR). These reserves are funded through property taxes and utility levies. The current balance of these reserves totals $24.1 million.

Table 30: Long-Term Infrastructure Reserve Balances

Reserve	Balance
Long-Term General Infrastructure Reserve (LTGIR)	$15,688,227
Long-Term Water Infrastructure Reserve (LTWIR)	$4,816,463
Long-Term Sewer Infrastructure Reserve (LTSIR)	$3,619,233
Total	**$24,123,923**

Since 2010, the City has consistently made annual contributions, calculated as the prior year's amount plus an additional 1% of the prior year's taxation or utility levy. The intent of these reserves is to ensure the City can fund future asset replacement requirements in the short and long terms. This is accomplished through annual transfers to the Capital Reserves to complete work identified in the Annual Capital Programs.

Capital Reserves

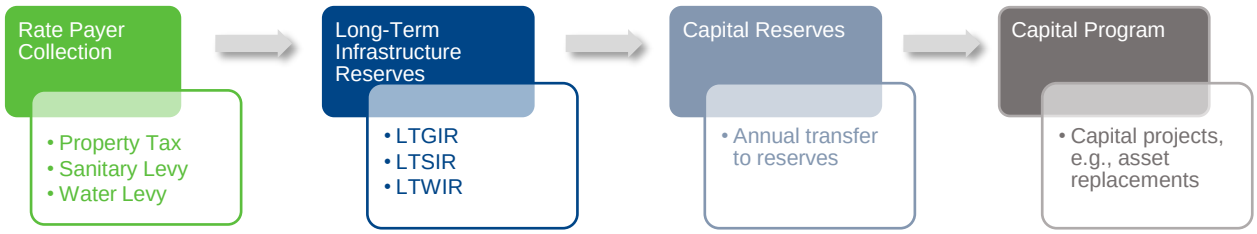
In addition to the long-term infrastructure reserves, Port Coquitlam also has other capital reserves used to implement the capital program. These reserves are funded by property taxation, utility levies, and the sale of land or assets. While these are predominately intended to support either new assets or the expansion of existing assets, the City can still draw from these reserves to address the backlog in the short term and support the reduction of any deficits over time. The forecasted balance of these reserves as of December 31, 2023, is $25.3 million.

Table 31: Capital Reserve Balances

Reserve	Balance
General Capital	$2,712,053
Sewer Infrastructure	$1,017,166
Water Infrastructure	$14,888,201
Land Sale	$3,326,828
Equipment Replacement	$2,079,097
Cart Replacement	$1,254,886
Total	**$25,278,231**

The figure below illustrates the flow of funding at the City, from collection of property taxes and utility levies, to implementation of the capital program.

Figure 37: Funding Flow



Since the annual capital program is funded through reserves, the aim of the financial strategy is to synchronize long-term infrastructure reserve contributions with the average annual requirements identified for the eight service areas, as illustrated in Table 29. As such, the recommendations focus on the incremental increases to the annual long-term infrastructure reserves contributions.

Development Cost Charges (DCC) Program

Port Coquitlam's DCC bylaws are regulated by the province through the *Local Government Act*. The City uses DCCs collected to finance a portion of upcoming infrastructure costs associated with the growth of new developments. The program is designed to ensure that the benefiters (new development) contribute to the installation costs.

The City's DCC Program encompasses infrastructure earmarked for both replacement and expansion. Recognizing that existing rate payers may receive benefit from the construction or expansion of infrastructure, the capital costs are partially reduced from DCC collections and supplemented by alternative funding sources. Because of this, the DCC contributions are limited to fund specified infrastructure projects used to establish the DCC fees in the in the Bylaws.

As such, whenever possible, the DCC contributions should be leveraged by the City to provide funding for assets slated for replacement and expansion when addressing the current asset backlog. This maximizes the value of the investment by achieving two goals with one asset replacement: replacement for condition/age and upgrading for additional capacity.

Achieving Reinvestment Rate Targets

This section identifies annual infrastructure and annual funding deficits for each of the City's eight service areas. The system-generated average annual requirements are contrasted against two figures. The first is the City's actual annual reinvestments into its assets, calculated by aggregating capital expenditures on various lifecycle programs for each service area. The second is its annual contributions to long-term infrastructure reserves (LTIRs).

We make a distinction between actual reinvestments on infrastructure each year which may be funded and financed through various streams, and annual contributions to the LTIRs funded only through sustainable sources, i.e., property taxation or utility levies . The recommendations in the financial strategy hinge on the latter, i.e., adjusting annual contributions to the LTIRs to achieve target reinvestment rates.

Separate analysis is presented for tax-funded and rate-funded service areas. Tax funded service areas are funded by property taxes and collected as general revenue. Rate funded service areas are those funded by the collection of utility fees. Tax-funded service areas include: Drainage, Transportation, Parks, Facilities, Fleet & Equipment, and Information Services. Utility Levy -funded service areas include: Water and Sanitary Services.

Tax-Funded Service Areas

As illustrated in Table 32, the City's average annual requirements for its six tax-funded service areas total $33.8 million. Annual capital expenditures total approximately $15 million for these assets, creating an infrastructure deficit of $18.8 million.

Table 32: Comparing Average Annual Requirements Against Current Capital Reinvestments

Service Area	Average Annual Requirements	Current Capital Reinvestments	Annual Infrastructure Deficit
Drainage	$7,406,986	$2,500,000	$4,906,986
Transportation	$15,648,055	$5,784,500	$9,863,555
Parks	$1,682,841	$2,150,000	$(467,159)
Facilities	$4,561,458	$583,112	$3,978,346
Fleet and Equipment	$3,156,517	$2,922,167	$234,350
Information Services	$1,298,008	$1,019,334	$278,674
Total	**$33,753,865**	**$14,959,113**	**$18,794,752**

The current capital reinvestments listed above are funded through both own-source revenues, e.g., property taxation, and other streams. Table 33, however, quantifies the City's contributions to the LTGIR. The City's ability to make consistent contributions to the LTGIR will determine how sustainable infrastructure programs are. These contributions will build up the LTGIR and are necessary for gradually eliminating the annual infrastructure deficit, as well as managing persistent backlogs.

LTGIR contributions are funded from the City's property taxation revenue—the primary, predictable, and sustainable (See the Sustainability section) source of funding for infrastructure needs.

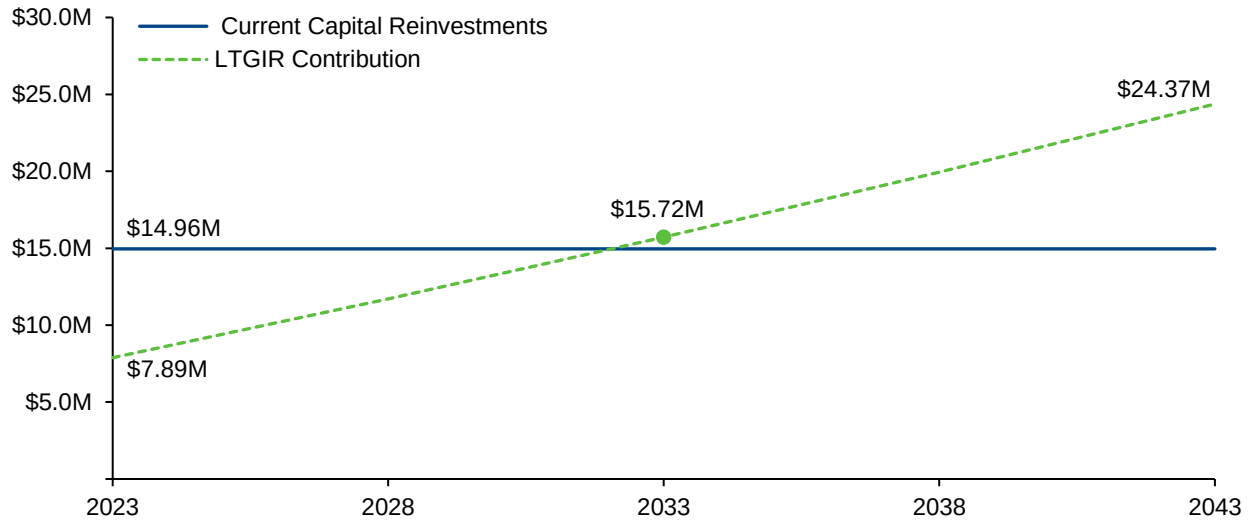
This analysis shows that based on its current annual contributions of $7.9 million to the LTGIR, an annual funding deficit of $25.9 million is generated each year. These annual contributions outpace the City's actual capital spending each year, illustrated in Table 32 above as $15 million.

Table 33: Comparing Average Annual Requirements Against Annual Contributions to the LTGIR

Service Areas	Total Average Annual Requirements	Annual Contributions to LTGIR	Annual Capital Funding Deficit	Funding Level
Tax-Funded	$33,753,865	$7,885,600	$25,868,265	23%

The City increases annual contributions to the LTGIR each year by an additional 1% of the prior year's tax levy. At this rate, contributions will total more than $24 million by 2043. However, under the current funding framework for existing assets, despite this judicial strategy, annual capital spending on tax-funded service areas will continue to outpace these annual contributions until 2033.

Figure 38: Annual Contributions to the LTGIR vs. Annual Capital Spending



This illustration does not account for inflationary increase to annual capital expenditures or other market pressures, which would increase the gap between annual contributions and current reinvestments, and extend the timeline of fully funding capital spends through annual contributions. Although infrastructure spending can be supplemented by other streams, a more sustainable funding framework would see the City increase its fiscal capacity through own-source revenues, i.e., property taxation.

Annual Deficits

The City currently faces two types of deficits. The infrastructure deficit is the gap between average annual requirements and current capital expenditures. This gap currently stands at $18.8 million, as illustrated in Table 32.

The second, the annual capital funding deficit, is the gap between average annual requirements and contributions to the LTGIR, calculated as $25.9 million as illustrated in Table 33. Before the annual infrastructure deficit can be addressed, the funding deficit must first be closed by increasing contributions to the LTGIR. As such, it is the target of the financial strategy.

Funding Models

The funding models presented below outline funding goals, and how the annual deficit decreases with reductions in these targets. These deficit figures are used to calculate resulting rate increases to allow the City to close the annual contribution deficit for LTGIR.

At the full-funding level, the City would need to meet the full $33.8 million annual requirements, and close a $25.9 million current funding gap. Understanding that the financial impact on rate payers may be difficult, options to reduce the annual funding to a level of 75% and 50% of the AAR are included.

Table 34: Funding Levels and Resulting Funding Deficits

Model	Funding Goal	Current Contributions to the LTGIR	Resulting Funding Deficit
Fully Funded	$33.8M	$7.9M	$25.9M
75%	$25.3M	$7.9M	$17.4M
50%	$16.9M	$7.9M	$9.0M

Each model has risks and benefits, as outlined below. The right model balances the burden placed between generations of residents while realizing the highest value from infrastructure assets.

Table 35: Risks and Benefits of Funding Models

Model	Potential Risks	Potential Benefits
Fully Funded	– Higher financial impact on taxpayers – Limited financial flexibility for other programs and services	– Avoid further accumulation of backlog – Potential long-term costs savings – High economic and social benefits, including ability to attract more investments and businesses – Less vulnerability to evolving provincial and federal policy and funding programs
75%	– Further accumulation of existing infrastructure backlog – Lower, overall levels of service – Potential safety implications – Higher indirect economic, social, and reputational risks resulting from infrastructure disrepair – Higher vulnerability to evolving provincial and federal policy and funding programs	– Lower impact on taxpayers – More budget flexibility for other programs and service
50%	– Further, more rapid accumulation of existing backlogs – Potentially high safety implications – Low service levels – Lower quality of life and potential loss of local economic activity – Higher reputational damage – High dependence on other sources of funding – High vulnerability to unexpected asset failures	– Lowest impact on taxpayers

Eliminating the Annual Deficit

In 2023, Port Coquitlam's property taxation revenues totaled $74,880,000. To eliminate the funding deficit, additional contributions are needed to the LTGIR. The following table outlines the tax increases required to support these additional contributions, depending on the funding model selected. In addition to these models, three phase-in periods are presented, allowing the City to achieve the desired funding goal between five and 20 years.

The City already increases annual contributions to the LTGIR by an additional 1% per year based on prior year's levy. As such, the rate increases presented for the three phase-in periods are over and above this preestablished mechanism.

Table 36: Tax Rate Increase Required to Achieve Funding Levels

Model	Overall Tax Rate Increase Required	5 Years	10 Years	15 Years	20 Years
Fully Funded	35%	↑5.11%	↑2.01%	↑1.00%	↑0.49%
75%	23%	↑3.27%	↑1.11%	↑0.40%	↑0.05%
50%	12%	↑1.29%	↑0.14%	↓0.24%	↓0.43%

As illustrated in Table 36, achieving full funding would require a one-time tax increase of 35%, or 5.11% per year over a five-year phase-in period, over and above the existing 1% annual increase. In contrast, a 50% funding model would see the City reduce tax rates over a 15-year phase in period. This option is not recommended.

As with funding models, phase-in periods also carry similar risk and benefits. Shorter time frames would reduce the pace of accumulating backlogs and help address infrastructure needs more quickly. However, they may place heavy burden on rate-payers. More protracted funding periods reduce rate-payer obligation, but may cause more rapid and further asset disrepair.

We recommend that the City adopt the full-funding model over a 15-year phase-in period, with aim of meeting 100% of the $33.8 million annual requirements. This would require further increasing the LTGIR contribution by an additional 1.00% per year over the phase-in period, over and above the existing annual increase of 1%.

Drainage Utility Levy

The City should also consider the establishment of a drainage utility levy, coupled with the creation of a dedicated Long-Term Drainage Infrastructure Reserve Fund (LTDIR).

Several municipalities have established a drainage utility levy as the design and costs of drainage systems have changed significantly over the years. Contributing factors include:

i. climate change impacts (sea level rise, increased rainfall, higher intensity storms) driving the need for new or upgraded drainage infrastructure and flood protection;

ii. mitigation of environmental impacts and protection of watercourses driving the need for green infrastructure and enhancement projects;

iii. drainage infrastructure costing significantly more than water or sanitary infrastructure to construct and maintain;

iv. drainage assets currently being funded by General Revenue, which reduces the amount available for all of the other tax-funded assets.

If a Drainage Utility is established, a Long Term Drainage Infrastructure Reserve (LTDIR) would also be established with annual contributions funded through Drainage utility levies rather than property taxes.

Levy-Funded Service Areas

The analysis presented in this section includes Port Coquitlam's water and sanitary services, and is similar to the tax-funded service areas. The average annual requirements for the two levy -funded service areas total $8.8 million, against annual capital expenditures of $3.5 million. This creates an annual infrastructure deficit of $5.2 million.

Table 37: Comparing Average Annual Requirements Against Current Capital Reinvestments

Service Area	Average Annual Requirements	Current Capital Reinvestments	Annual Infrastructure Deficit
Water	$4,541,037	$2,034,200	$2,506,837
Sanitary	$4,214,139	$1,500,000	$2,714,139
Total	**$8,755,177**	**$3,534,200**	**$5,220,977**

As with tax-funded assets, the City contributes to long-term infrastructure reserves for both water and sanitary services, managed in the Long-Term Water Infrastructure Reserve (LTWIR) and the Long-Term Sanitary Infrastructure Reserve (LTSIR).

Based on the City's current contributions levels to the LTWIR and LTSIR, water services are currently meeting 25% of their average annual requirements, with sanitary at 20%. These funding levels create an annual capital funding deficit of $3.4 million each for water and sanitary services.

Table 38: Comparing Average Annual Requirements Against Annual Contributions to the LTWIR and LTSIR

Service Areas	Total Average Annual Requirements	Annual Contributions to LTWIR/LTSIR	Annual Capital Funding Deficit	Funding Level
Water	$4,541,037	$1,138,300	$3,402,737	25%
Sanitary	$4,214,139	$850,000	$3,364,139	20%
Total	**$8,755,177**	**$1,988,300**	**$6,766,877**	**23%**

As with the LTGIR, the City's contributions to both the LTWIR and LTSIR are increased each year by 1% of the prior year utility levy for each service area. At this growth rate, annual contributions to the LTWIR and LTSIR will become sufficient to fund current capital expenditures for each service area between 2029 and 2030. However, as current capital expenditures are below average annual requirements, the annual infrastructure gap will still persist beyond the 20-year horizon illustrated.

Figure 39: Annual Contributions to the LTWIR vs. Annual Capital Spending

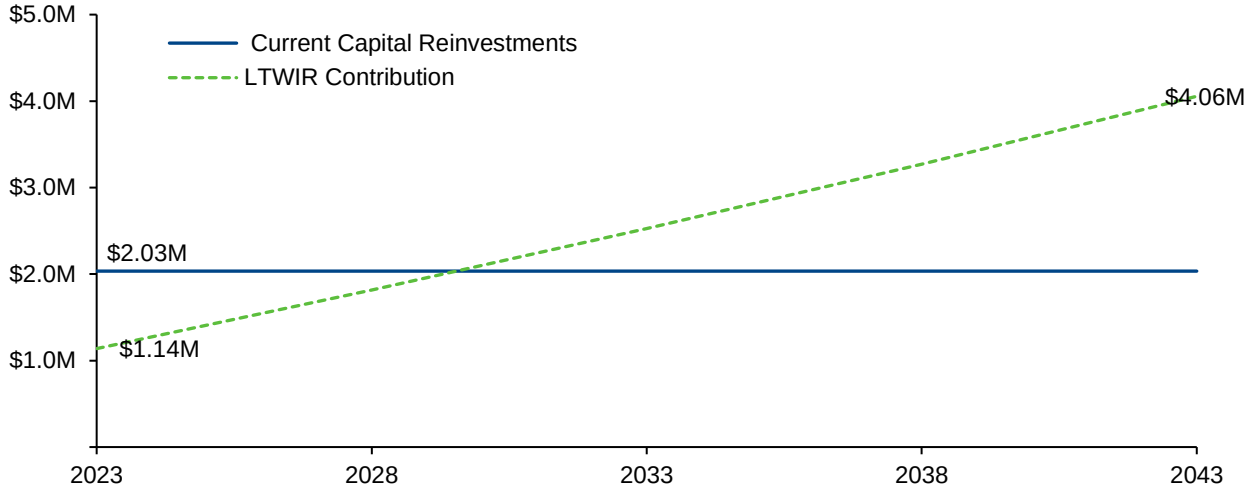
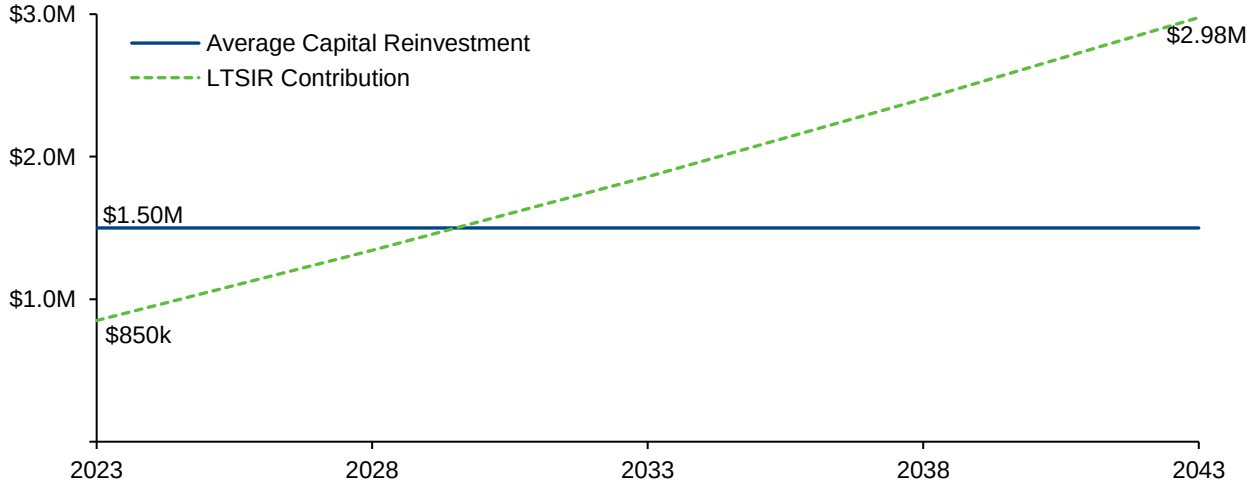


Figure 40: Annual Contributions to the LTSIR vs. Annual Capital Spending



These illustrations do not account for inflationary increase to annual capital expenditures or other market pressures, which would increase the gap between annual contributions and current reinvestments, and extend the timeline of fully funding capital spends through annual contributions. Similar to tax-funded assets, infrastructure spending can be supplemented by other streams; however, a more sustainable funding framework would see the City increase its fiscal capacity through own-source revenues, i.e., water and sanitary utility revenues.

Annual Deficits

Similar to tax-funded asset categories, the City faces two types of deficits. The first, illustrated in Table 37, is the gap between average annual requirements and actual current capital reinvestments.

The second, referred to as the annual capital funding deficit, is the gap between the same average annual requirements and annual contributions to the Long-Term Water Infrastructure Reserve and the Long-Term Sanitary Infrastructure Reserve. This gap, totaling $6.8 million, is illustrated in Table 38 for both water and sanitary services, and is the target of the financial strategy.

Funding Models

The funding models presented below outline funding goals, and how the annual deficit decreases with reductions in these targets. These deficit figures are used to calculate resulting levy increases to allow the City to close the annual contribution deficit for LTWIR and LTSIR.

At the full-funding level, the City would need to meet the full $8.8 million annual requirements for water and sanitary, and close the combined funding deficit of $6.8 million. Understanding that the financial impact on levy payers may be difficult, options to reduce the annual funding targets to a level of 75% and 50% of the AAR are included for both water and sanitary.

Table 39: Funding Levels and Resulting Funding Deficits: Water Services

Model	Funding Goal	Contributions to the LTWIR	Resulting Funding Deficit
Fully Funded	$4,541,037	$1,138,300	$3,402,737
75%	$3,405,777	$1,138,300	$2,267,478
50%	$2,270,518	$1,138,300	$1,132,219

Table 40: Funding Levels and Resulting Funding Deficits: Sanitary Services

Model	Funding Goal	Contributions to the LTSIR	Resulting Funding Deficit
Fully Funded	$4,214,139	$850,000	$3,364,139
75%	$3,160,604	$850,000	$2,310,605
50%	$2,107,069	$850,000	$1,257,070

In selecting the appropriate funding target, careful consideration of the risk and benefits of each need to be evaluated. See Table 35: Risks and Benefits of Funding .

Eliminating Annual Deficits

In 2023, Port Coquitlam's water and sanitary revenues totaled $13,120,000 and $9,560,000, respectively. To eliminate the funding deficit for each service area, additional contributions are needed to the LTWIR and LTSIR.

The following tables outlines the water and sanitary levy increases required to support these additional contributions, depending on the funding model selected. Similar to tax-funded assets, three phase-in periods are presented, allowing the City to achieve its desired funding levels between five and 20 years.

The City already increases annual contributions to each utility reserve by an additional 1% per year based on prior year's levy. As such, the rate increases presented for the three phase-in periods are over and above this preestablished goal.

Table 41: Utility Rate Increase Required to Achieve Funding Levels: Water

Model	Overall Water Levy Increase Required	5 Years	10 Years	15 Years	20 Years
Fully Funded	26%	↑3.72%	↑1.33%	↑0.55%	↑0.16%
75%	17%	↑2.24%	↑0.61%	↑0.07%	↓0.20%
50%	9%	↑0.67%	↓0.17%	↓0.45%	↓0.59%

Table 42: Utility Rate Increase Required to Achieve Funding Levels: Sanitary

Model	Overall Sanitary Levy Increase Required	5 Years	10 Years	15 Years	20 Years
Fully Funded	35%	↑5.22%	↑2.06%	↑1.03%	↑0.52%
75%	24%	↑3.42%	↑1.19%	↑0.45%	↑0.09%
50%	13%	↑1.50%	↑0.24%	↓0.17%	↓0.38%

As illustrated in Table 41, achieving full funding for water would require a one-time levy increase of 26%, or 3.72% per year over a five-year phase-in period, over and above the existing 1% annual increase. Similarly, achieving full funding for sanitary would require a one-time levy increase of 35%, or 5.22% per year over a five-year phase-in period, over and above the existing 1% annual increase.

In contrast, a 50% funding model would see the City reduce water levies over a 20-year phase-in period, and sanitary levies over the 15-year phase-in period. This option is not recommended.

Consistent with the approach for tax-funded service areas, it is recommended that the City adopt the full-funding model for both water and sanitary, with the aim of achieving 100% of the $8.8 million combined annual requirements over a 15-year phase-in period.

For water services, this would require further increasing contributions to the LTWIR by an additional 0.55% annually, over and above the existing annual increase of 1%. Similarly, for sanitary services, the LTSIR would see annual contributions increase by an additional 1.03%, over and above the existing 1% annual increase.

Infrastructure Backlogs

The models presented above would allow the City of Port Coquitlam to gradually increase its annual contribution to long-term infrastructure reserves for both tax- and levy -funded service areas. This strategy would address annual infrastructure deficits.

In addition to these deficits, most communities in Canada also have persistent infrastructure backlogs, accumulated over many decades. As projects are deferred, assets requiring replacements continue to remain in service beyond their design life and despite their poor condition ratings. Table 43 summarizes the infrastructure backlog for each service area.

Table 43: Age- and Condition-based Infrastructure Backlogs

Service Area	Infrastructure Backlog
Drainage	$162.1M
Transportation	$160.2M
Parks	$25.6M
Facilities	$29.8M
Fleet & Equipment	$24.2M
Information Services	$6.4M
Water	$109.7M
Sanitary	$99.5M
Total	**$617.4M**

Using Reserves

Addressing existing backlogs requires strategic use of funding sources and a risk-based prioritization of projects, to channel funding where they are needed most. Theoretically, the City can use existing long-term infrastructure reserves to partially tackle a portion of this backlog. However, Table 44 shows that even if long-term infrastructure reserves were fully depleted, less than 4% of the total infrastructure backlog would be eliminated. Of note, backlogs should be refined through regular in-field condition assessments and prioritized through risk and asset criticality assessments.

Table 44: Long-Term Infrastructure Reserves vs. Backlogs

Reserve	Forecasted Closing Balance, December 31, 2023	Infrastructure Backlog	Reserves to Backlog Ratio
General (Tax Funded)	$15.7M	$408.3M	3.8%
Water (Rate Funded)	$4.8M	$109.7M	4.4%
Sanitary (Rate Funded)	$3.6M	$99.5M	3.6%
Total	**$24.1M**	**$617.4M**	**3.9%**

To put this in perspective, a typical homeowner with a property value assessed at $969,000 would have $37,800 on hand for major home repairs. Although there is no scientific consensus on optimal reserve levels, whether a 3.9% ratio is sufficient will depend on individual (council) risk appetite, current asset conditions, and forecasted future needs.

Leveraging Development Cost Charges (DCC)

Port Coquitlam is also a growing city, and there is an opportunity to strategically leverage the City's DCC program to address existing asset backlogs. The City's current DCC program totals nearly $219 million, distributed over 20 years. Given their benefits to existing residents, the City would be required to contribute $117.8 million, or 53% of the total project cost estimates. This figure includes a 1% municipal assist factor for growth-related projects.

Table 45: Development Cost Charges (DCC) Program

Service Area	Total DCC Project Value	Port Coquitlam Contribution	DCC Recoverable
Drainage	$74,494,000	$47,196,403	$27,297,598
Transportation	$100,400,000	$43,283,930	$57,116,070
Water	$16,467,760	$9,478,459	$6,989,301
Sanitary	$27,547,840	$17,811,128	$9,736,712
Total	**$218,909,601**	**$117,769,920**	**$101,139,680**

Analysis shows that there is a significant overlap between projects slated to be completed as part of the DCC program (capacity upgrades to support growth) and assets that are currently in a backlog state (beyond their service life and due for replacement due to age/condition). As illustrated below, 56% of projects, by current cost estimates, will result in the replacement of assets currently considered in a backlog state. These replacements are designed to meet higher demand and usage, and will result in capacity upgrades and or higher functionality—resulting in higher overall service levels.

Table 46: Overlap Between DCC Program and Assets in Backlog State

Service Area	Total DCC Project Value	Projects Addressing Backlog ($)	Projects Addressing Backlog (%)	Port Coquitlam Contribution	DCC Recoverable
Drainage	$74,494,000	$39,636,026	53%	$23,748,706	$15,887,320
Transportation	$100,400,000	$60,900,000	61%	$30,107,040	$30,792,960
Water	$16,467,760	$11,407,760	69%	$7,522,109	$3,885,651
Sanitary	$27,547,840	$10,957,151	40%	$6,723,966	$4,233,185
Total	**$218,909,601**	**$122,900,937**	**56%**	**$68,101,820**	**$54,799,117**

Recommendations

Given the risks and benefits associated with different funding levels and phase-in period, the following approach is recommended to address annual infrastructure deficits.

Tax Funded Service Areas

- The City should endeavour to achieve full-funding for its tax-funded service areas, requiring $33.8 million on an annual basis to meet the replacement needs of its existing asset portfolio.

- To achieve this, a 15-year phase-in period is recommended to allow for an equitable distribution of financial burden between current and future residents.

- This would require further incrementally increasing the LTGIR contribution by an additional 1.00% of the budgeted prior year's taxation levy each year over the 15-year phase-in period, solely for the purpose of phasing in full funding for the tax funded assets. This is in addition to the existing annual increase of 1%.

This would increase individual property taxes by a further $21.30, based on a home assessed at $969,000. This increase would be over and above the higher taxes resulting from the 1% annual increase already implemented, and estimated at $21.35.

- The recommendations presented do not account for inflation. Staff should consider the impacts of inflation on both annual capital expenditures, and additional contributions required to the LTGIR to maintain fiscal strength.

- Should the City establish a drainage utility levy, the creation of a dedicated Long-Term Drainage Infrastructure Reserve Fund (LTDIR) should also be established. Annual contributions towards the LTDIR should then be funded through the newly established utility levy equivalent to the amount funded through property taxes. This would reduce the average annual requirements for tax-funded assets by 22%.

Levy-Funded Service Areas

- The City should endeavour to achieve full-funding for its water and sanitary service areas, requiring $8.8 million on an annual basis to meet the replacement needs of its existing asset portfolio.

- To achieve this, a 15-year phase-in period is recommended for both water and sanitary, consistent with tax-funded phase-in period, allowing for an equitable distribution of financial burden between current and future residents.

- For water services, this would require further incrementally increasing contribution to the LTWIR by an additional 0.55% of the budgeted prior year's utility levy each year over the 15-year phase-in period, solely for the purpose of phasing in full funding for water. This is in addition to the existing annual increase of 1%.

  This would increase individual water levies by a further $2.73. This increase would be over and above the higher water levies resulting from the 1% annual increase already implemented, and estimated at $4.98

- For sanitary services, the 15-year, full-funding model would require further incrementally increasing contribution to the LTSIR by an additional 1.03% of the budgeted prior year's utility levy each year over the 15-year phase-in period, solely for the purpose of phasing in full funding for water. This is in addition to the existing annual increase of 1%.

  This would increase individual sanitary levies by a further $3.71. This increase would be over and above the higher sanitary levies resulting from the 1% annual increase already implemented, and estimated at $3.60.

- The recommendations presented do not account for inflation. Staff should consider the impacts of inflation on both annual capital expenditures, and additional contributions required to the LTWIR and LTSIR to maintain fiscal strength.

- Addressing the infrastructure backlog requires the strategic use of reserves and the City's DCC program. In addition, asset criticality and risk analysis should be used to prioritize projects.

As in the past, periodic senior government infrastructure funding will most likely be available during the phase-in period. This periodic funding should not be incorporated into an AMP unless there are firm commitments in place. However, it can be used to help close the infrastructure gap more quickly, or lower the long-term impact on tax and utility levies. It should be noted that the above recommendations do not include the use of reserves or debt. Depending on the urgency of projects and the impact on levels of services, reserves and debt can be viable, supplemental options.

Next Steps

Asset management does not stop with the completion of asset management plans. An asset management program is an ongoing effort to responsibly manage City assets from procurement, through their full lifecycle, to replacement. The work completed with the asset management plans sets a strong foundation for the City to move forward in this regard, and is intended to be refined and built on with future work.

Future work includes items outlined in the City's asset management strategy, such as:

- Developing 10-20 year capital plans for each asset portfolio using the high risk assets identified in each plan to prioritize projects
- Reconciling assets updated in the Citywide asset register with the PSAB asset register used for financial reporting
- Training staff on the Citywide asset management software and keeping the database up to date
- Working with staff in each asset group to update asset inventories, complete condition assessments, update replacement value estimates, refine risk assessments, and periodically review lifecycle activities and service levels
- Considering natural assets and climate change in the City's asset management program