The City of SPRUCE GROVE

UTILITY SYSTEMS INFRASTRUCTURE

ANNUAL REPORT

December 2024

City of Spruce Grove

The City of SPRUCE GROVE

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INTRODUCTION

The City of Spruce Grove provides utility services to residents, businesses, and visitors which are delivered through the Water, Sanitary and Stormwater assets owned, operated, and maintained by the City. These assets support the environmental, social, and economic well being of the community and are distributed throughout the various neighbourhoods that make up Spruce Grove.

The City's 2022 -2025 Strategic Plan identifies the importance of the utility systems as a pillar for Environmental Sustainability under the following goal:

- **Goal 8:** The City, residents, and infrastructure are more resilient to the effects of climate change.
  - **Objective b:** Improve resilience of water management and natural infrastructure.
    - **Action 1:** Report on annual inspections, maintenance, and management of the City's sanitary, water, and stormwater systems.

This Annual Report (Report) focuses on maintenance and inspection and demonstrates the resiliency of the utility systems and prudent investment in utility programs by providing an overview of each utility system in the form of:

- Base information about the quantity, age distribution and condition of water mains, sanitary mains, and storm mains.
- An overview of the current City inspection, maintenance, and management programs.
- The current performance of the utility system in the form of a set of monitored performance indicators.

The Report focuses on assets and data associated with Water, Sanitary and Stormwater systems and is a result of collaboration and consultation among many City departments including Public Works, Finance, Business Advisory Services and Engineering. The Report data is obtained from the City's Geographic Information System, Asset Management System, policies, and financial system.

The information in this report is current to December 31, 2023.

SECTION 1: ASSET INFORMATION

The utility networks consist of a set of connected mains (pipes) of varying diameters and other utility assets which transport water, wastewater and storm water to and from points of distribution and collection such as the water reservoirs for potable water, dwellings and businesses for removal of wastewater and collection of rainwater from roadways. These mains form the backbone of supply and distribution of each system.

This first version of the Annual Report focuses on the condition of the mains which are a key contributor and indicator of performance of the networks.

The following utility systems are reflected in this Report:

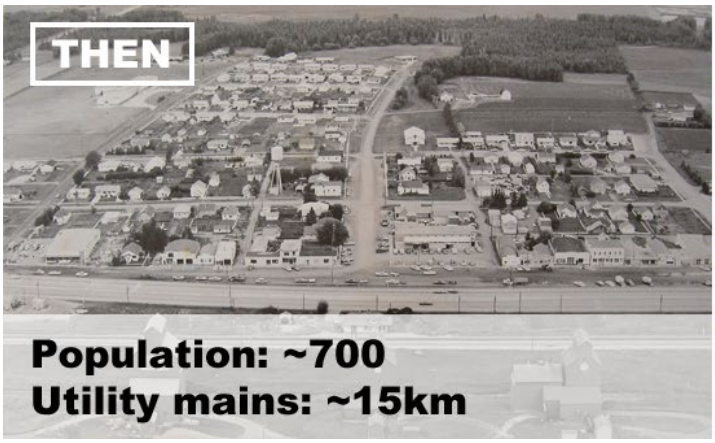
- The water distribution system provides safe and reliable water as a part of the City's utility services. The water distribution system encompasses transmission, storage, and distribution to users. Water system assets include, water reservoirs, service connections, watermains, valves, hydrants, and water meters.

- The sanitary system collects and treats wastewater from customers before safely transporting it for processing. Assets include sanitary mains and manholes.

- The stormwater system collects and manages runoff from rain and snow melt, then releases it to receiving storm water management facilities such as storm ponds. Both built and natural assets play an important role in stormwater service delivery. Assets include culverts, catch basins, manholes, storm mains, and Storm Water Management Facilities (SWMF) which encompasses the storm ponds and related control devices.

Growth of the City and the Utility Systems

The City has more than doubled in population since the year 2000, and the increase in utility mains to service the new residents and businesses shows a corresponding increase in length. The rapid growth from the 1970s to present reflects a 307 km increase in total mains installed and has kept pace with the City's population growth.



The chart below illustrates the growth in the total length of utility mains along with population growth over time.

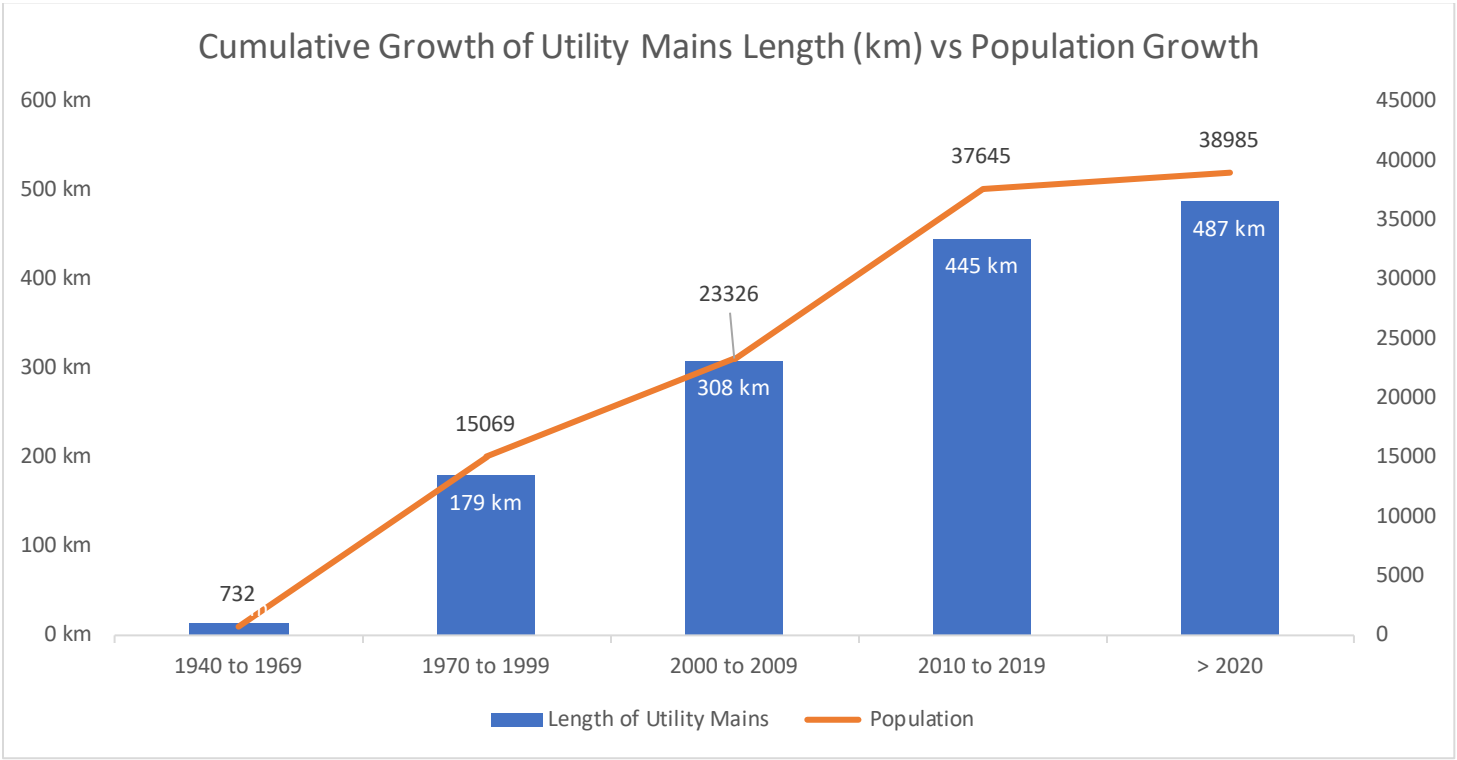


Chart: Age ranges of the utility mains are based on the Statistics Canada Canadian Core Public Infrastructure Survey (CCPI) standard. All population numbers are based on Census data.

Inventory

The City operates almost 500 km of mains and more than 36, 000 other assets that support the utility systems in delivering services to customers. The following table reflects the various types of assets across the utility systems.

Utility System	Asset Type	Quantity
Water Distribution	Reservoirs	4 Cells ~ 50,000 m^3 capacity
	Watermains	177 km
	Main Water Valves	1825 units
	Hydrants	1286 units
	Service Connections	13988 units
	Water Meters	14590 units
Sanitary System	Sanitary mains	168 km
	Sanitary Manholes	2053 units
Storm Water	Storm mains	142 km
	Storm Ponds (SWMF)	59 units
	Catch basins	2746 units

Age Groupings

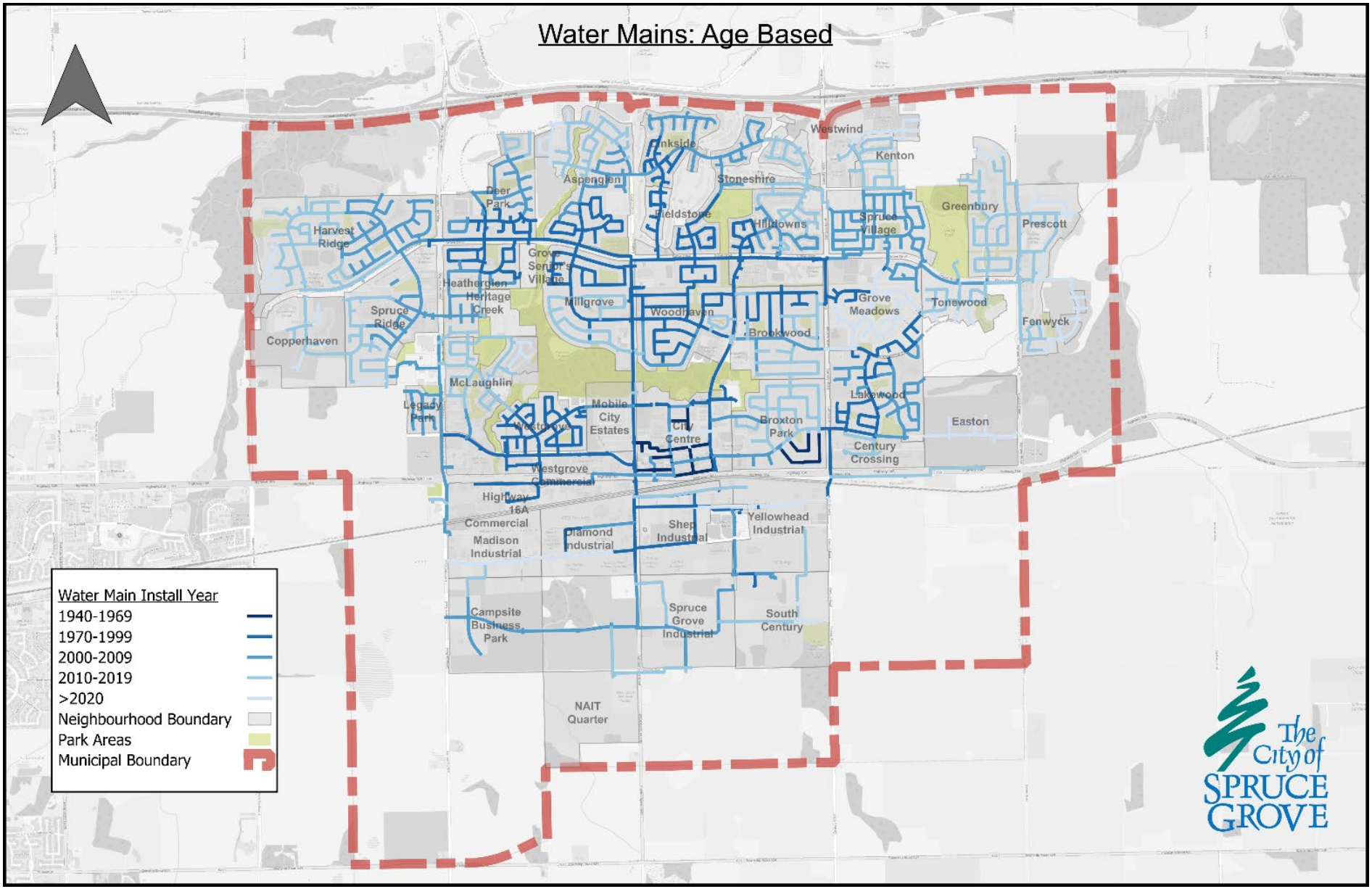
The following table reflects the age of the mains across the utility systems.

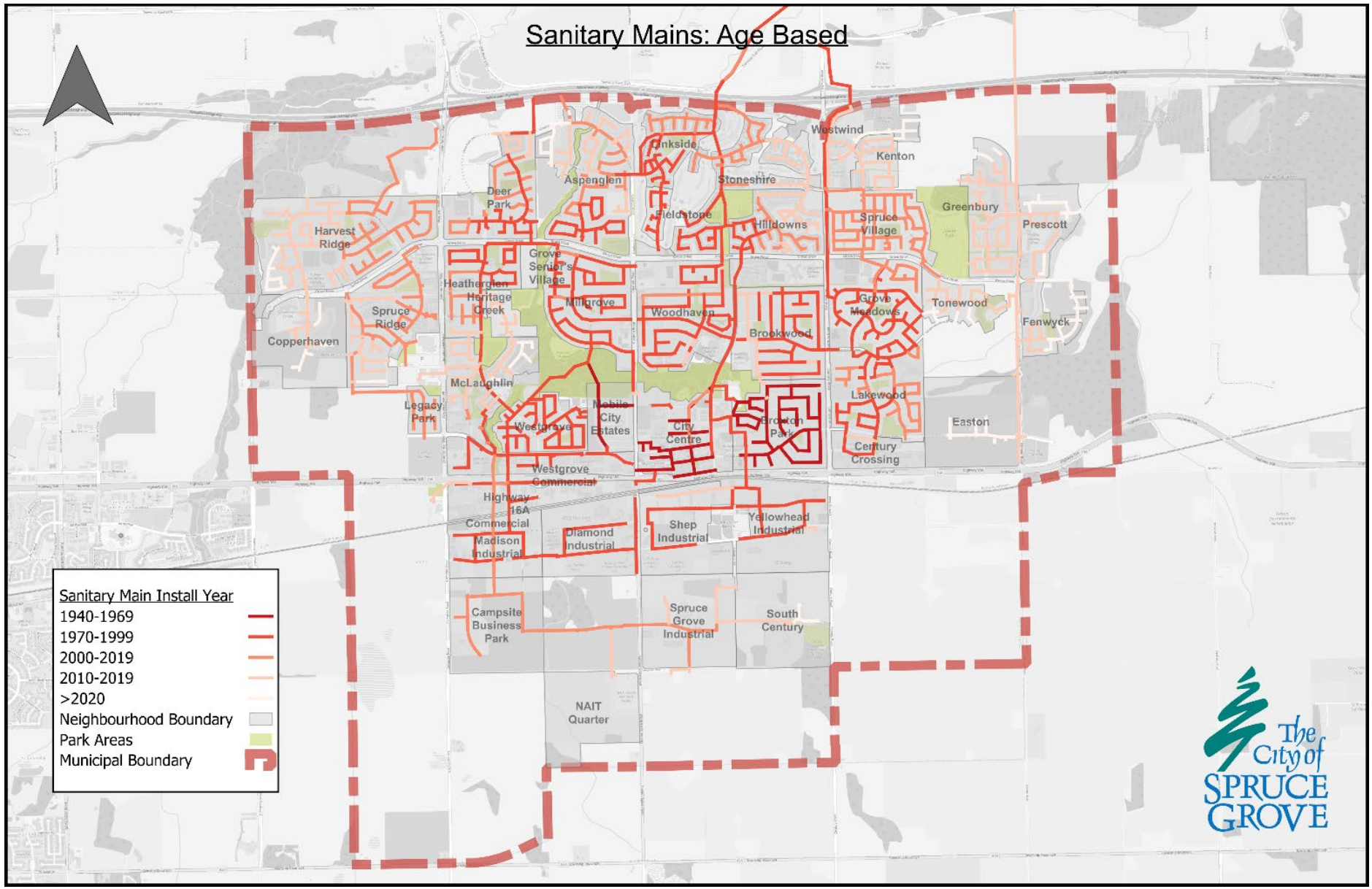
Length of Mains by Year Installed					
Installation Year	1940 to 1969	1970 to 1999	2000 to 2009	2010 to 2019	> 2020
Watermain	3 km	51 km	48 km	54 km	20 km
Sanitary main	10 km	68 km	40 km	41 km	9 km
Storm main	2 km	45 km	40 km	43 km	13 km

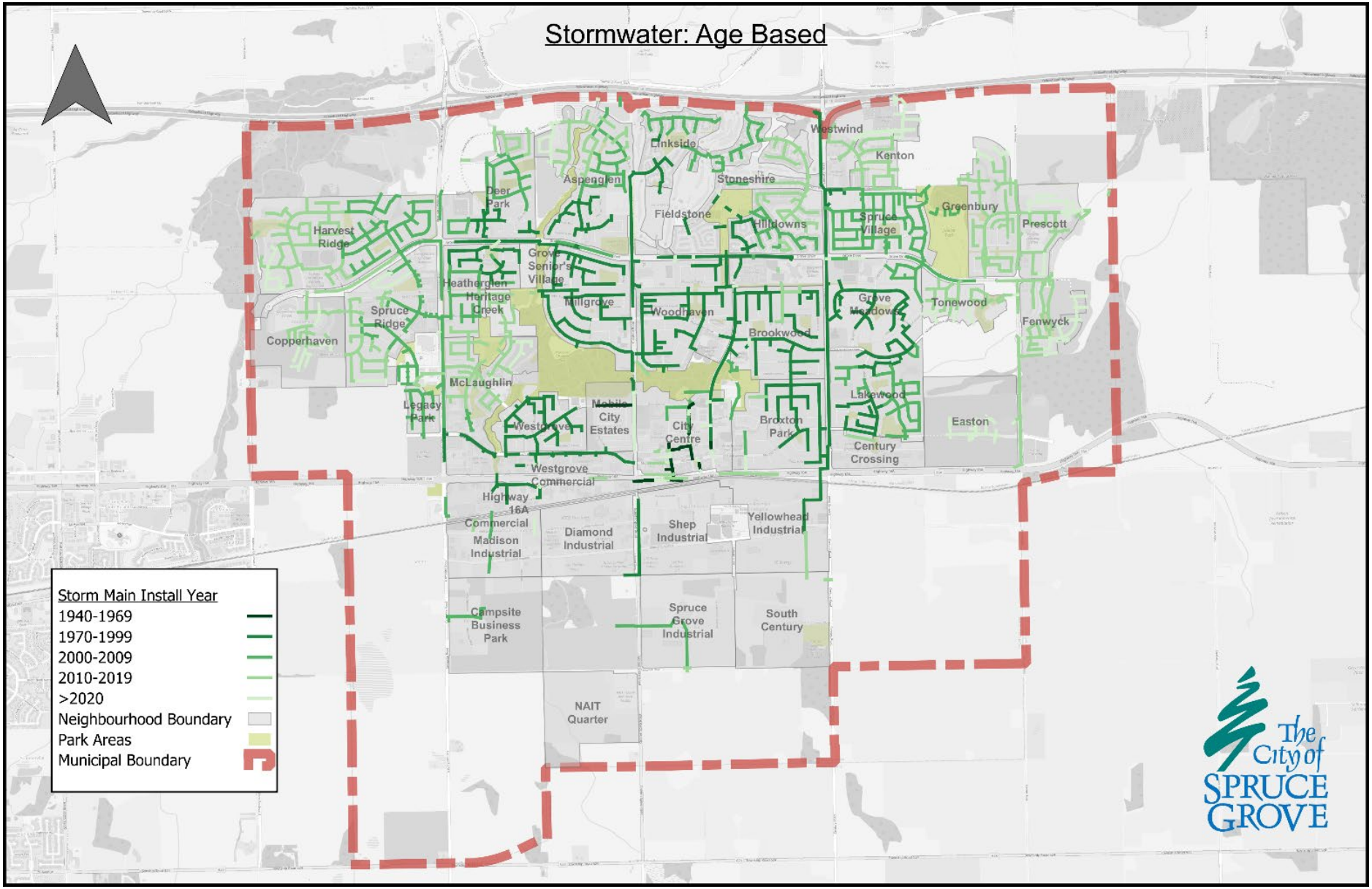
The following table reflects the proportion of mains by age across the utility systems.

Percent of Total Length of Main by Year Installed					
Installation Year	1940 to 1969	1970 to 1999	2000 to 2009	2010 to 2019	> 2020
Watermain	2%	29%	27%	30%	11%
Sanitary main	6%	40%	24%	24%	6%
Storm main	1%	32%	28%	30%	9%

The following maps represent the age distribution of utility mains across the city.




Sanitary Mains: Age Based
Sanitary Main Install Year
1940-1969
1970-1999
2000-2019
2010-2019
>2020
Neighbourhood Boundary
Park Areas
Municipal Boundary
Westwind
Kenton
Inkside
Aspenglen
Stoneshire
Deer Park
Fieldstone
Hilldowns
Spruce Village
Greenbury
Prescott
Harvest Ridge
Grove Senior's Village
Heatherglen
Heritage Creek
Millgrove
Woodhaven
Grove Meadows
Tonewood
Fenwyck
Spruce Ridge
Copperhaven
Brookwood
McLaughlin
Lakewood
Legacy Park
Mobile City Estates
Westgrove
City Centre
Brookwood Park
Easton
Century Crossing
Westgrove Commercial
Highway 16A Commercial
Madison Industrial
Diamond Industrial
Shep Industrial
Yellowhead Industrial
Campsite Business Park
Spruce Grove Industrial
South Century
NAIT Quarter
The City of SPRUCE GROVE


Stormwater: Age Based
Storm Main Install Year
1940-1969
1970-1999
2000-2009
2010-2019
>2020
Neighbourhood Boundary
Park Areas
Municipal Boundary
Westwind
Linkside
Kenton
Aspenglen
Stoneshire
Deer Park
Fieldstone
Hilldowns
Spruce Village
Greenbury
Prescott
Harvest Ridge
Grove Senior's Village
Heatherglen
Heritage Creek
Millgrove
Woodhaven
Grove Meadows
Tonewood
Fenwyck
Spruce Ridge
Copperhaven
Brookwood
McLaughlin
Legacy Park
Mobile City Estates
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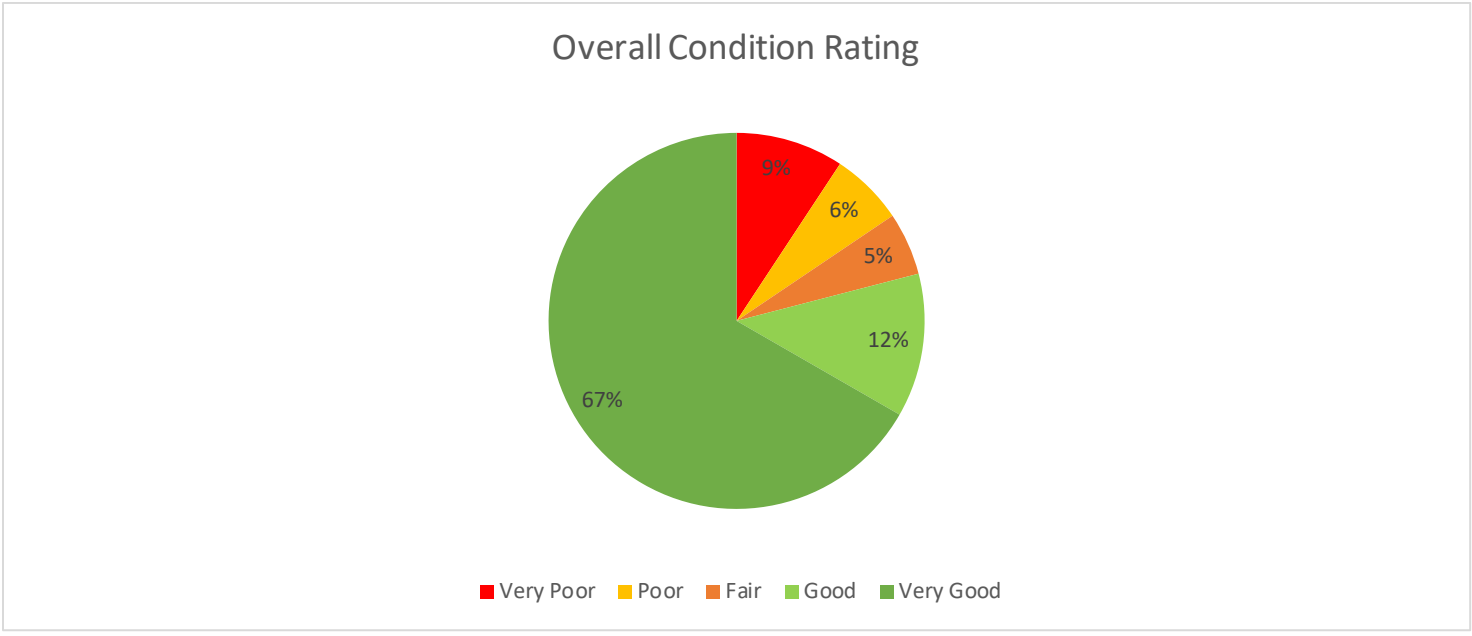
More than 50% of the City's utility mains, are less than 25 years old. Common practice is to replace other connected assets along the main that support the utility function such as valves, manholes, and catch basins at the same time, thereby rejuvenating the system. A further benefit of the new assets is that technological changes introduced mains made from Polyvinyl Chloride (PVC) that are expected to last close to 100 years which makes assets of 25 years or less relatively young and less prone to failure. The relative youth of the utility assets is reflected in the Condition Rating section of the Report.

Condition Rating

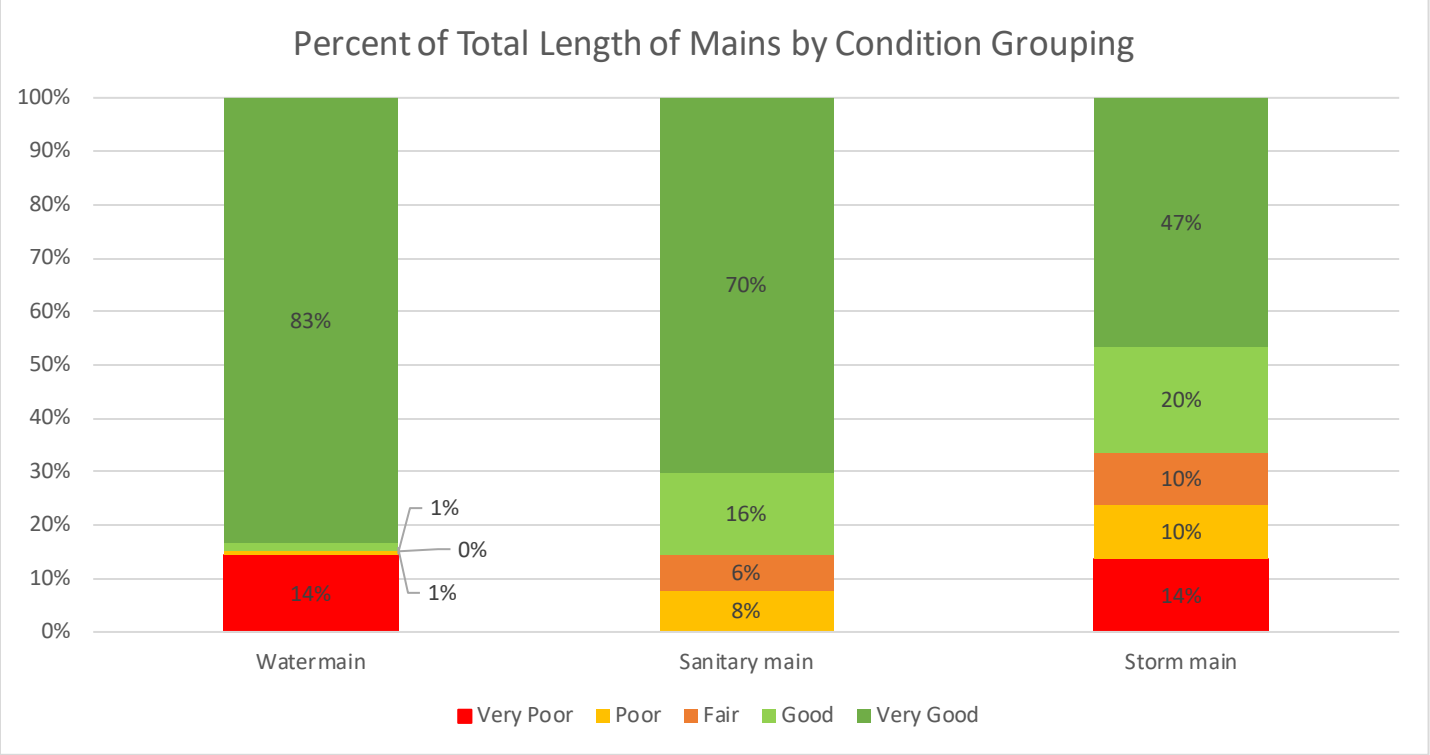
Condition rating information informs the overall health of the system along with lifecycle rejuvenation and replacement requirements. The rating scale used in the Report is utilized by Statistics Canada in the Canadian Core Public Infrastructure Survey (CCPI)[1] which collects and benchmarks asset information nationwide. Adopting this standard further supports ease of comparison and benchmarking of the City's assets with other municipalities. Further information on the condition rating scale can be found in Appendix A – Condition Ratings.

Overall, 79% of the utility mains network is in good to very good condition and 11% is in poor to fair condition.



[1] The Survey information and data can be referenced at: http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=1529565

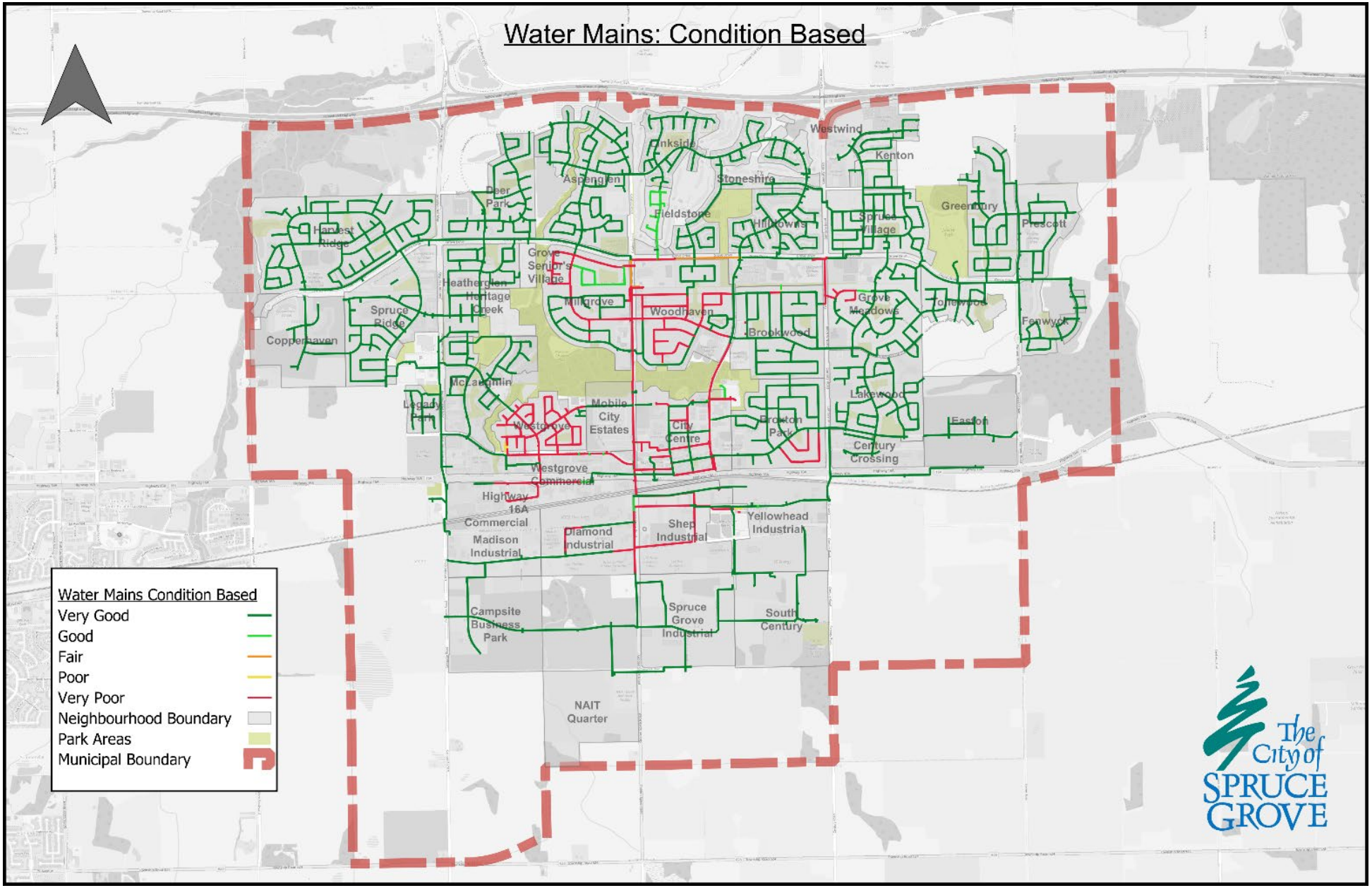
Below is a representation of the condition rating by utility system:



Percent of Total Length of Mains by Condition Grouping					
Condition Group	Very Poor	Poor	Fair	Good	Very Good
Watermain	14%	1%	0%	1%	81%
Sanitary main	0%	8%	6%	16%	70%
Storm main	14%	10%	10%	20%	47%

84% of watermain are in good to very good condition, 86% of the Sanitary mains are in good to very good condition and 67% of the storm mains are in good to very good condition. The relative newness of the infrastructure and use of modern materials and standards supports this condition rating.

The following maps depict the estimated condition ranges of the City's utility mains:


Water Mains: Condition Based
Water Mains Condition Based
Very Good
Good
Fair
Poor
Very Poor
Neighbourhood Boundary
Park Areas
Municipal Boundary
Westwind
Kenton
Oakside
Aspenglen
Stoneshire
Deer Park
Fieldstone
Hilltowns
Spruce Village
Greenbury
Prescott
Harvest Ridge
Grove Seniors Village
Heatherglen
Heritage Creek
Millgrove
Woodhaven
Grove Meadows
Tollewood
Fenwyck
Spruce Ridge
Copperhaven
Brookwood
McLaughlin
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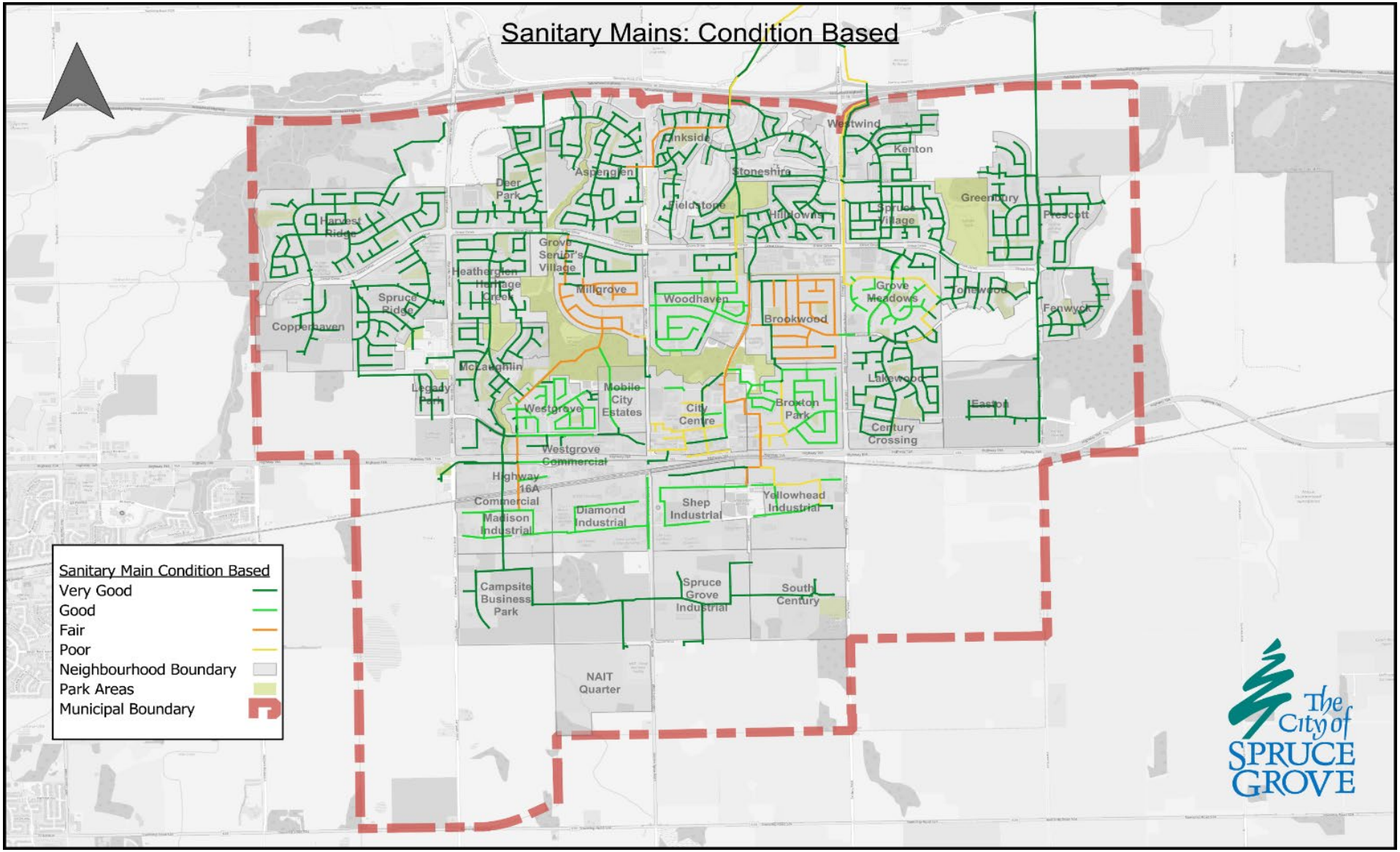
Sanitary Mains: Condition Based
Sanitary Main Condition Based
Very Good
Good
Fair
Poor
Neighbourhood Boundary
Park Areas
Municipal Boundary
Deer Park
Aspengren
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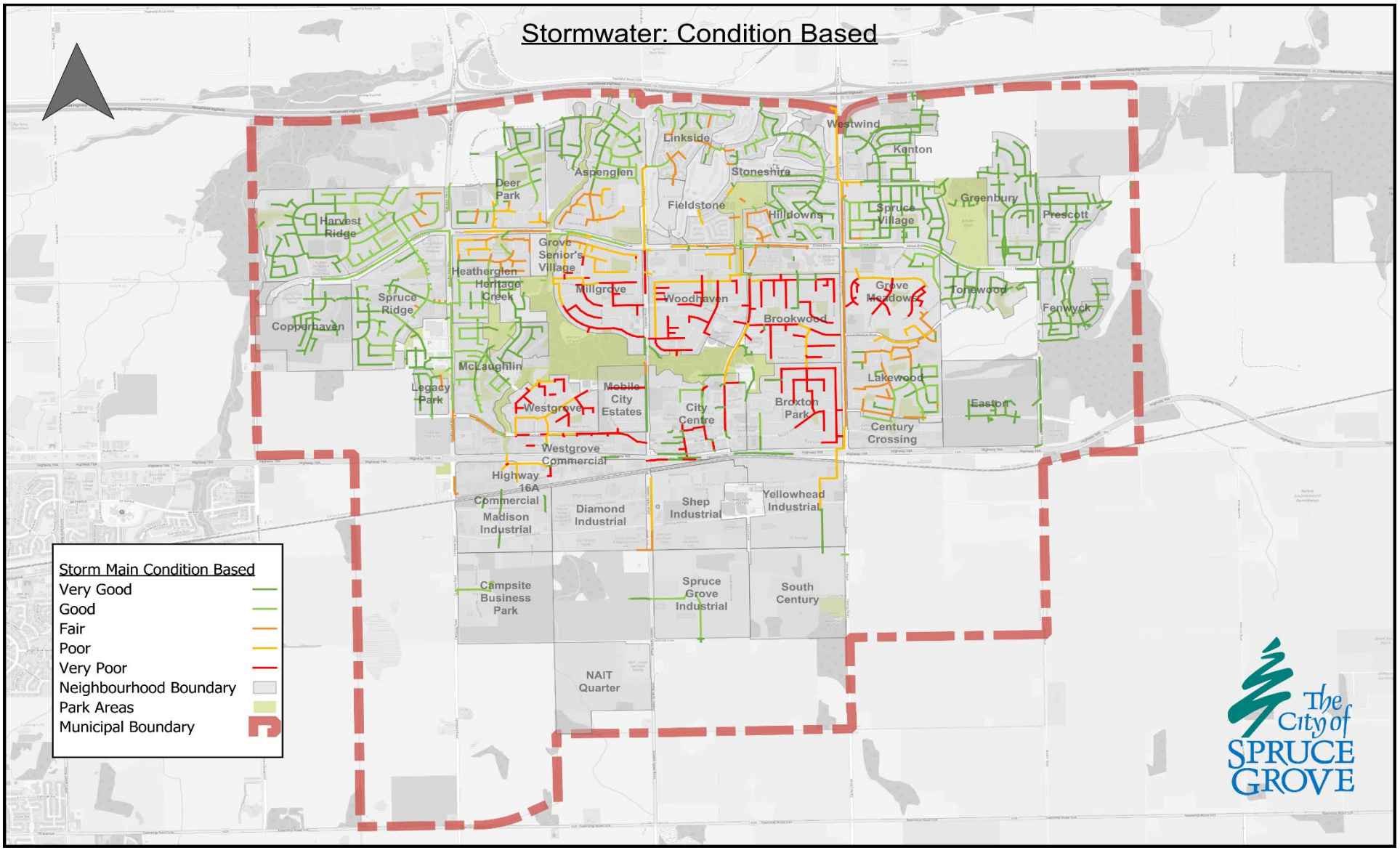
Stormwater: Condition Based
Storm Main Condition Based
Very Good
Good
Fair
Poor
Very Poor
Neighbourhood Boundary
Park Areas
Municipal Boundary
Westwind
Linkside
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SECTION 2: CITY INSPECTION AND MAINTENANCE PROGRAMS

Maintenance and inspections programs are vital in keeping the systems operating smoothly and on track to meet the full expected life and serve the community effectively. Utility maintenance programs are structured activities designed to ensure the reliable operation, safety, and efficiency of utility systems and are governed by the following policies:

- 2,016 – Water Distribution Inspection and Maintenance
- 2,015 – Sanitary Sewer system Inspection and Maintenance Policy
- 2,023 – Storm Water Maintenance Policy

The City's department of Public Works has comprehensive maintenance and inspection programs for the City's utility assets within each utility system. Refer to Appendix B for a complete list of those maintenance and inspection programs.

The desired outcomes of these programs are:

- Maintaining reliability.
- Quality Control/Monitoring.
- Meeting environmental regulation.
- Complying with regulations.
- Maintaining safety.
- Adhering to Best Practices.

These programs encompass a wide range of activities aimed at maintaining and improving the infrastructure that delivers the City's utility services and falls into the following categories:

Preventive Maintenance:

Routine inspections and servicing of assets to prevent failures and extend equipment life. Examples include flushing mains, checking for corrosion, and replacing aging parts.

Corrective Maintenance:

Immediate response to and repair of system issues such as leaks, pipe bursts, pump malfunctions, or treatment system breakdowns. This often involves emergency procedures to minimize both service disruptions and water loss in the water utility system.

Asset Management:

Cataloging and monitoring water infrastructure assets, such as distribution systems and facilities, to plan for upgrades, replacements, and budget allocation.

Condition Assessment:

Evaluating the structural and operational condition of assets using techniques like video inspections to detect potential issues early.

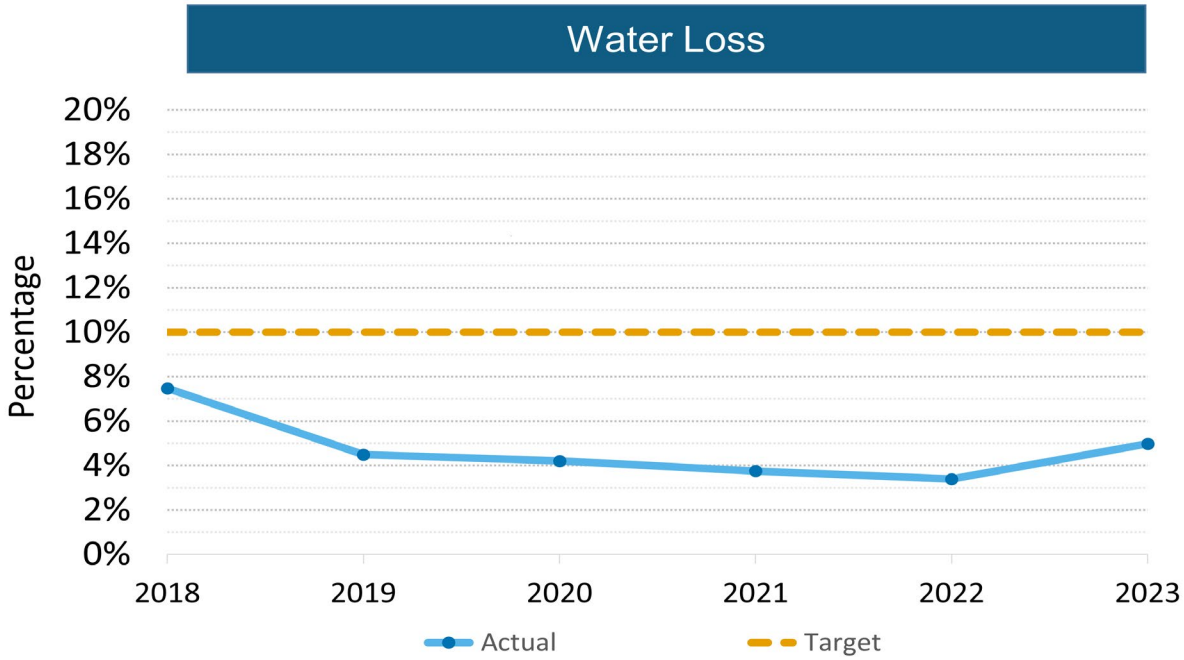
Potable Water Quality Monitoring:

Specific to the water utility system this involves regular testing for contaminants and compliance with regulatory standards to ensure the water supplied is safe for consumption. This includes addressing concerns like lead or microbial contamination.

SECTION 3: PERFORMANCE INDICATORS

Water Loss:

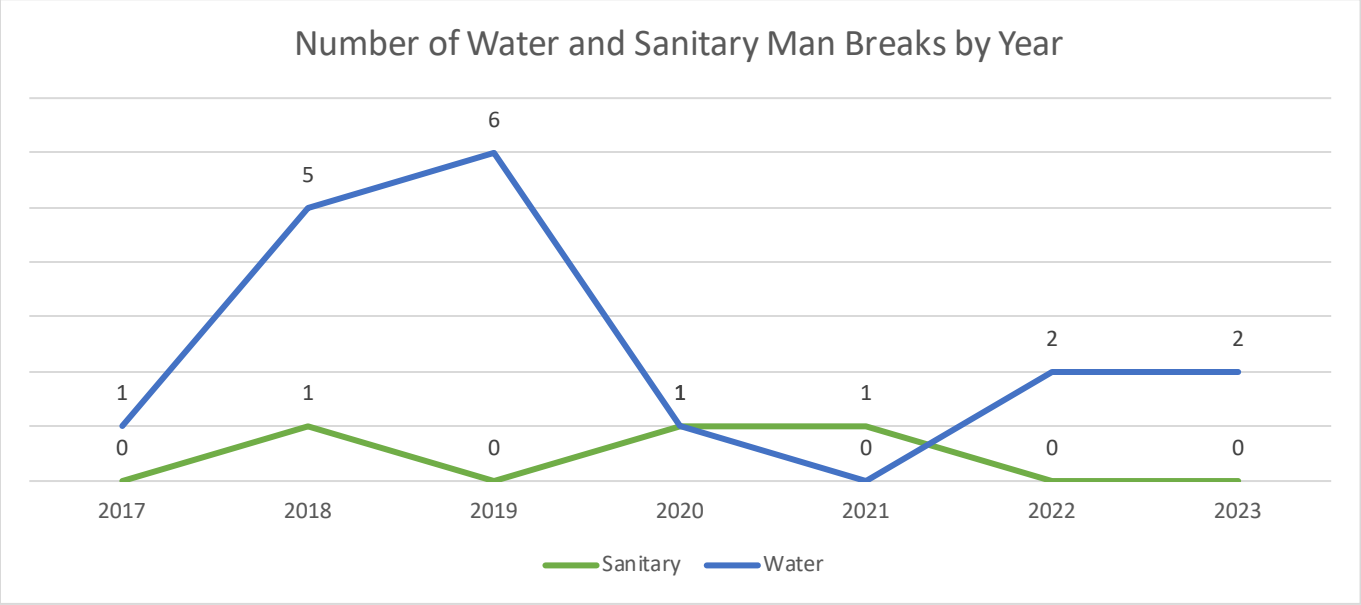
This measure represents the proportion of water lost through apparent losses (unauthorized consumption, customer metering inaccuracies) and real losses (leakage on transmission, distribution mains and service connections, leakage at reservoirs). Water loss is expressed as a percentage of the difference between the water volume the City purchases and the volume of water the City uses and sells to end users.



The proportion of water lost is an important indicator of water distribution efficiency and the state of the City's water infrastructure. According to the Federation of Canadian Municipalities, the amount of unaccounted water can vary from less than 10 percent in new, well-managed systems to more than 50 percent in older systems suffering from poor maintenance. Environment Canada estimates that an average of 13.3 per cent of municipal water is unaccounted.

Main Breaks:

This measure represents the number of significant breaks on utility mains.



Analysis of water and sanitary main failures from 2017 to 2023 indicate that the frequency of such incidents is low. Sanitary mains recorded 3 main failures in this period, indicating the system is reliable and supporting the condition information found in Section 2. Water main failures numbered 17 during the same period, however 4 of the incidents were on the same segment in 2018 and 2019. This information is also used to plan lifecycle replacement of mains.

The City also did not record any water advisories in the past 10 years.

Further to the discussion in Section 1 on the criticality of utility mains to service delivery, in 2024 the City undertook a new inspection of the high-pressure concrete water main that connects the City's two potable water reservoirs. Potable water is distributed to City residents and businesses through these pipes from the City's reservoirs. Because these high-pressure concrete pipes are right at the source of potable water distribution, any failure or leaks would have a potentially significant impact on the City's customers. The results of the inspection indicated that this pipe is in good condition and no leaks were detected, which is supported by the water loss report data as well. Repeat inspections of this pipe is suggested every 7-10 years to ensure the continued performance of the water network.

In 2023, the City undertook the development of an update to the 2015 Stormwater Master Plan (SWMP). The Plan serves to identify infrastructure projects necessary to ensure that the City's Stormwater Management Facilities have the capacity to retain, treat and direct stormwater without damage to surrounding properties and regional watersheds while accommodating major rainfall events and city growth. The outcome of this plan was reflected in the 2025-2027 Corporate Plan as new capital project such as the planned work on McLaughlin pond in 2025. This work is expected to continue annually for each pond based on the SWMP. This is a proactive approach that identifies future needs and plans

to resolve issues in a timely and sustainable manner which allows the Storm Water Management Facilities to minimize risk and maintain good performance.

The City regularly inspects and maintains Storm Water Management Facilities to maintain water quality and prevent blue-green algae blooms which can pose a significant risk to humans, pets, and wildlife. The City has not recorded any blue-green algae blooms in the past 10 years.

Overall, the City's Utility systems are performing well and show evidence that the maintenance and inspection programs are effective at maintaining good service levels.

SECTION 4: FUTURE IMPROVEMENTS

The following is a summary of the future improvements identified specific to this Report:

- Continue to improve asset inventory and condition data for all assets that support utility services by:
  - further building out the asset inventory to include all associated assets that make up the utility networks.
  - continue collecting and evaluating condition data based on inspections for all utility network assets.
  - Improving the timeliness of reporting.
- Reporting on condition ratings for other significant assets in the utility network such as water reservoirs and storm ponds
- Compare the baseline measurements in this Report with future iterations to analyze and understand trends in the performance of the utility system.
- Use the data from the Canadian Core Public Infrastructure Survey for benchmarking with similar municipalities in the region and across Canada.

APPENDIX A: ASSET DATA

Asset Inventory:

- Asset data used in the Report is current as of December 31, 2023
- Quantities and age demographics are collected from the GIS system which is updated through established corporate update processes.

Asset Condition:

- Utility main condition score is estimated based on life expectancy and life degradation curves for each type of pipe, diameter, and material.
- Condition data from each individual asset is summarized into the Canada Core Infrastructure Survey format:

Health Index	Description	Requirements	Statistics Canada Condition Grouping
81–100	Asset is new or is starting to show minor deterioration in a limited number of components.	Normal maintenance	Very Good
61-80	Asset is in good working order but is starting to show deterioration in some components.	Normal maintenance	Good
41-60	Asset is performing reliably but is showing significant deterioration of key components	Increase diagnostic testing; possible remedial work or replacement needed depending on criticality	Fair
21-40	Asset is becoming unreliable, displaying widespread signs of serious deterioration	Start planning process to replace or rehabilitate considering risk and consequences of failure	Poor
0-20	Asset is in poor working order and is displaying extensive serious deterioration	Asset has reached its end-of-life; immediately assess risk; replace or refurbish based on assessment	Very Poor

APPENDIX B: MAINTENANCE AND INSPECTION PROGRAMS

The following table is a catalogue of the programs performed by Public Works on the City utility systems. The outcomes listed are the main drivers for the need of the program. There can be more than one outcome attached to a program and they are listed in order of the program's main effect.

Water Distribution System:

ASSET TYPE	O&M PROGRAMS	FREQUENCY	RELATED POLICY	OUTCOMES
Reservoir/Pump House	Pump house checks	Daily	2,016	Reliability
Reservoir/Pump House	Pump House Maintenance	As required	2,016	Reliability
Reservoir/Pump House	Reservoir Inspections	5 year intervals	2,016	Reliability, Best Practice, Quality Control, Safety
Water Mains	Underground Locates	Daily, on request	2,016	Safety
Water Mains	Water Testing	Bacteriological daily (minimum 44 per month), Chlorine Daily , Complete Chemical analysis Annually, Lead Testing	2,016	Regulation, Safety, Quality Monitoring
Water Mains	Water Quality Flushing	As required	2,016	Quality Monitoring, Safety
Water Mains	Leak Investigation	As required	2,016	Reliability, Environmental, Regulatory
Water Mains	Water Main Repair & Restoration	As required	2,016	Reliability, Environmental, Regulation
Water Mains	Water Valve Exercising	Annually	2,016	Reliability
Water Mains	PRV Chamber Inspection	Spring and fall	2,016	Reliability
Water Mains	UDF Program	Annually 20 % of system	2,016	Quality Monitoring and Safety, Best Practice
Hydrants	Hydrant Purging	Annually (spring)	2,016	Safety, Reliability, Best Practice
Hydrants	Hydrant Winterization	Annually (fall)	2,016	Safety, reliability, Best Practice

ASSET TYPE	O&M PROGRAMS	FREQUENCY	RELATED POLICY	OUTCOMES
Hydrants	Hydrant R&M and Restoration	As required	2,016	Reliability, Safety
Hydrants	Hydrant Snow Removal	As required	2,016	Safety
Meter and CC	CC Operation	As required	2,016	Service
Meter and CC	CC Repair & Restoration	As required	2,016	Reliability
Meter and CC	Leak Investigation	As required	2,016	Environmental, Reliability
Meter and CC	Meter install, repair, removal	As required	2,016	Service
Meter and CC	Tag delivery	As required	2,016	Service

Sanitary Sewer System:

ASSET TYPE	O&M PROGRAMS	FREQUENCY	POLICIES/NOTES	OUTCOMES
Lagoon	Lagoon Operation and Inspection	Monthly inspection, operator is Arrow Utilities	Policy 2,015	Reliability, Environmental, Best Practice
Lagoon	Lagoon Repair and Maintenance	As required	Policy 2,015	Reliability, Environmental
Sewer Laterals	Sewer Lateral Condition Inspection	As required in response to complaints registered by residents	Policy 2,015	Reliability
Sewer Laterals	Sewer Lateral Repair & Restoration	As required in response to complaints registered by residents	Policy 2,015	Reliability, Environmental
Sewer Mains & Manholes	Sewer Main Condition Inspection	20 % per year Ongoing with sewer main flushing	Policy 2,015	Reliability, Best Practice
Sewer Mains & Manholes	Sewer Main Flushing	20% of system per year, identified trouble areas twice per year	Policy 2,015	Reliability, Best Practice, Performance
Sewer Mains & Manholes	Sewer Main Back-Up Inspection	As required in response to complaints	Policy 2,015	Environmental, Safety

ASSET TYPE	O&M PROGRAMS	FREQUENCY	POLICIES/NOTES	OUTCOMES
Sewer Mains & Manholes	Sewer Manhole Inspection	20 % per year Ongoing with sewer main flushing	Policy 2,015	Reliability
Sewer Mains & Manholes	Sewer Manhole Repair & Restoration	As required by priority from 20% inspection usually 1-12 per year	Policy 2,015	Reliability, Safety (Road Issues)
Sewer Mains & Manholes	Sewer Main Repair & Restoration	As required, as well as Engineering program	Policy 2,015	Reliability, Safety (Road Issues)
Lift Station	Inspection and Maintenance	Monthly inspection, Annual maintenance	Policy 2,015	Reliability

Stormwater Management System:

ASSET TYPE	O&M PROGRAMS	FREQUENCY	POLICIES/NOTES	OUTOCMES
Storm Mains	Inspections	5% of system annually	Policy 2,023	Reliability, Safety
Storm Mains	Flushing	5% of system annually	Policy 2,023	Best Practice, Reliability
Storm Manholes	Inspections	33% annually	Policy 2,023	Reliability, Safety
Storm Manholes	Repair & restoration	As required	Policy 2,023	Reliability, Safety, Environmental
Catch Basins	Inspections	3-year intervals	Policy 2,023	Reliability, Safety, Environmental
Catch Basins	Cleaning/flushing	Annually - Collectors/arterials/16A 33% annually - Local residential	Policy 2,023	Environmental, Reliability
Catch Basins	Repair & restoration	As required by priority	Policy 2,023	Reliability
Control Structures	Grit separator inspections	Twice annually	Policy 2,023	Reliability, Environmental, Best Practice

ASSET TYPE	O&M PROGRAMS	FREQUENCY	POLICIES/NOTES	OUTOCMES
Control Structures	Orifice plates inspections	Monthly	Policy 2,023	Reliability, Environmental, Best Practice
Control Structures	Valve exercising	Twice annually	Policy 2,023	Reliability,
Control Structures	Repair/cleaning	As required	Policy 2,023	Reliability, Environmental
Culverts	Inspections	50% Annually	Policy 2,023	Reliability, Safety
Culverts	Repair & restoration	As required by priority	Policy 2,023	Reliability, Safety
Creeks	Inspections	Annually	Policy 2,023	Environmental (Regulation), Safety, Regulation
Creeks	Debris removal/repairs/restoration	As required	Policy 2,023	Environmental (Regulation), Safety, Regulation
Ditches	Inspections	Annually	Policy 2,023	Reliability, Safety
Ditches	Debris removal/repairs/restoration	As required	Policy 2,023	Reliability, Safety, Environmental
Concrete Swales	Inspections	Annually	Policy 2,023	Reliability,
Concrete Swales	Repair & restoration	As required by priority	Policy 2,023	Reliability,
Storm Water Management Facilities	Algae control	As required	Policy 2,023	Environmental
Storm Water Management Facilities	Vegetation control	As required	Policy 2,023	Environmental
Storm Water Management Facilities	Aeration maintenance	As needed	Policy 2,023	Environmental Quality

ASSET TYPE	O&M PROGRAMS	FREQUENCY	POLICIES/NOTES	OUTOCMES
Storm Water Management Facilities	Water quality testing	Twice annually	Policy 2,023	Environmental Regulation, Regulation, Reliability
Storm Water Management Facilities	Pest control/trapping	As required	Policy 2,023	Reliability,
Storm Water Management Facilities	Spill response	As required	Policy 2,023	Environmental Regulation
Storm Water Management Facilities	Cross connection investigation & repair	As required	Policy 2,023	Environmental Regulation, Safety, Regulatory