

2021

CORPORATE ASSET MANAGEMENT PLAN

Water Distribution

INTRODUCTION

This report outlines the state of Saskatoon's water distribution system by providing information on asset inventory, replacement value and condition.

The source of information is from the City's GIS, asset management database, past contract values and operation and maintenance records. Records up to December 31, 2019, have been used for this report.

CURRENT INVENTORY

The City's Water Distribution Network consists of Distribution Mains, Primary Mains, Valves, Hydrants and Service Connections.

Table 1 – Inventory and Valuation

Asset	Type	Inventory	Replacement Value*
Water mains	Distribution	1,072 km	\$2,253 M
	Primary	120 km	\$271 M
Valves	Distribution	10,598 ea	\$194 M
	Primary	14,802 ea	\$25 M
Chambers		202 ea	\$18 M
Hydrants		7,418 ea	\$141 M
Service Connections		71,701 ea	\$552 M
Total			\$3,454 M

**Replacement Values have been updated to take into account contract costs up to and including 2020 contracts. Values may have decreased or increased from previous reports due to normal variations in costs.*

Water distribution inventory managed by the Public Private Partnership are not included above.

*The City's water
distribution
infrastructure
has a replacement
value of over
\$3.4 billion.*





ASSET PERFORMANCE

This section outlines how the condition and performance of assets is determined.

Distribution Mains

Physical condition of distribution mains is assessed by counting the number of breaks that have occurred on a main. Water & Waste Operations provides break data information, recorded when a repair is performed on a main.

Physical condition grades are assigned on a five-point scale from “A” to “F”. The grading system developed is shown in the table below.

Table 2 – Physical Condition Grades

Grade	Physical Condition	Number of Breaks
“A”	Very Good	0
“B”	Good	1 or 2
“C”	Fair	3 to 5
“D”	Poor	6 to 8
“F”	Very Poor	9 or more

The table below shows the physical condition of distribution mains by length.

Table 3 – Physical Condition of Distribution Mains by Length

Condition	Length	Percentage by Length
A	877 km	82.3%
B	131 km	12.3%
C	42 km	3.9%
D	13 km	1.2%
F	3 km	0.3%

Capacity condition of water mains is determined using the City’s water model, which estimates a level of “friction” inside each water main in the network to determine the capability of that main to deliver required flows. This friction affects the flow condition and correlates with the pressure and flow measurement made in the field.

Ninety-two percent (92%) of water mains meet flow requirements and are considered in Good capacity condition and 8% do not meet requirements and are considered in Poor capacity condition.

Primary Mains

Due to the importance of primary water mains, the City is currently undertaking proactive condition assessments to assess performance.

A risk rating has been assigned to all primary water mains and this ranking system is being used to select annual condition assessment projects. A total of 21 km of primary water mains were inspected between 2017 and 2020 at a cost of \$4.8 million.

Based on these condition assessments, necessary repairs have been performed on the critical 42nd Street Reservoir feeder main. Non-urgent structural concerns have been identified on the Acadia Reservoir feeder main and remediation plans will be developed in 2021.

Service Lines

The overall condition of service connections is considered Good. Approximately 93% of service connections are made of copper or plastic and have low failure rates. There are approximately 2,700 connections that are made of lead, which tend to have higher failure rates of approximately 100 failures per year. Lead connections can also potentially leach lead into drinking water. Health Canada sets limits for acceptable levels of lead in drinking water and random tests in Saskatoon have found locations where these limits are being exceeded. The City is dealing with lead connections through customer education and a lead connection replacement program.

LIFE CYCLE PROGRAMS

The water distribution system is managed through asset preservation and operation and maintenance programs. The established levels of service for these programs are to provide potable water for consumption, provide water to Saskatoon Fire Department for fire suppression purposes, provide sufficient flow for residential and commercial use, protect the environment, and provide fiscal responsibility.





ASSET PRESERVATION

This section outlines programs that ensure the performance, maintain the condition, or replace failed assets.

Distribution Mains

Water mains are replaced and rehabilitated through two programs: the Preservation Program and the Capacity Program. Pipes are either replaced by open trench excavation or lined using Cured-in-Place Pipe (CIPP).

The preservation program addresses the physical condition of water mains. A water main is considered to be in “Poor” physical condition if it has had six or more breaks in the past 25 years. The City has set a Level of Service goal to replace water mains once they reach “Poor” condition. The City currently has 16 km of water mains with six or more breaks and replaces 4 km per year on average of \$7.1 million.

In 2017, a water main replacement program was initiated, focused on capacity improvement and the replacement of lead service connections. Funding for capacity water main replacement is approximately \$7.6 million and 3.5 km are replaced annually. The program is currently focused on areas with high density or lead service lines in order to align with the Lead Service Replacement Program.

Primary Water Mains

Primary water mains are inspected and assessed as described in the asset performance section above. Based on these assessments, various rehabilitation and replacement projects may be undertaken.

Primary water mains are also preserved using a method called cathodic protection. Electrical currents are used to prevent corrosion of the water mains. Saskatoon has had various cathodic protection systems installed since the 1990’s; however, repairs of the systems are needed as well as completion of the system to cover all metallic primary water mains. A project is ongoing to evaluate the existing cathodic protection system and design and install cathodic protection to the remainder of primary metallic water mains. The repairs and installation are expected to be completed in 2021.

Lead Service Lines

Lead service lines are replaced either in emergency situations or on planned programs. Planned replacements are done in advance of roadway reconstruction and as part of the capacity water main replacement program. Starting in 2017, funding levels were set so that all remaining lead service lines would be replaced by the end of 2026. Current funding is approximately \$800,000 per year for emergency lead-line replacements and \$2.9 million for planned lead-line replacements. From 2017 to the end of 2020, approximately 2,270 lead service lines were replaced. Approximately 2,200 lead service lines are remaining.

OPERATIONS AND MAINTENANCE

The operation and maintenance (O&M) programs ensure the water system is inspected, operated and maintained within the requirements of the Permit to Operate a Waterworks as issued by the Water Security Agency.

Operations and Inspection

Operations and maintenance programs include the provision of emergency response services to ensure that breaks are turned off in a timely manner protecting both residents and property, support for the turn on/off water service connections when work is taking place on private property, the replacement of water distribution/service valves and fire hydrants as they fail, provision of underground utility location services for the water distribution system, and valve inspection programs.

Repairs

One of the most common causes of a water disruption is a break on a water distribution main, primary water main, water service connection, valve or fire hydrant. Repairs are undertaken with water typically being restored within 24 to 48 hours. Any water disruption in the system will result in a Drinking Water Advisory (DWA) and lab testing before the advisory can be lifted which ensures water is safe for consumption. DWAs are provided to all homes and businesses affected. Alternative water supplies are provided to those affected within eight hours if the issue remains unresolved and typically consist of an emergency water supply trailer.

Hydrant Inspection

Fire hydrants are inspected to ensure they are operating at capacity, highly visible and accessible in the case of an emergency. There are two separate inspection programs for fire hydrants, summer and winter. The annual goal is to ensure that 100% of hydrants are inspected in the winter season and 50% of hydrants are inspected the summer season..

In periods of above average water main breaks, frozen connections, or increased call outs, the fire inspection level of service is reduced to prioritize the supply and operation of the water services.

SERVICE EXPENDITURE LEVELS

The Administration evaluated the condition of the City's assets and developed annual programs in order to maintain assets at minimum life cycle costs. Where feasible, condition assessments are conducted and used to establish condition and develop annual capital improvement plans.

The Level of Service for each type of asset is defined differently, but as the level of service increases for the asset, so does the cost of maintaining the asset.

In order to be able to compare all assets equally, five levels of expenditures are identified below.

"A" represents the highest level of expenditure and "F" represents no expenditure.

Table 4 – Levels of Expenditures

Expenditure Level	Asset Condition	Description
“A”	Getting Better Quickly	Sufficient expenditures to keep asset in top condition and to increase asset condition/ value quickly over time
“B”	Getting Better	Sufficient expenditures to keep asset in top condition and to increase asset condition/value slowly over time
“C”	Maintain Asset in Current Condition	Sufficient expenditures to keep asset in constant condition over time
“D”	Getting Worse	Insufficient expenditures to maintain asset condition. Over time asset condition will deteriorate
“F”	Getting Worse Quickly	No expenditures. Asset Condition/value decreased rapidly

Using the above criteria and physical condition desired, the Administration has identified the following expenditure service levels for asset preservation, capacity, and O&M life cycle programs.

Table 5 – Asset Performance and Funding

Asset Program	Current Performance	Desired Performance	Approved Expenditure Level	Required Annual Funding	Existing Annual Funding	Annual Funding Gap
Distribution Water Main Preservation	82% Very Good	Good	B	\$7.1M	\$7.1M	\$0.0M
	12% Good					
	4% Fair					
	1% Poor					
	0.3% Very Poor					
Distribution Water Main Capacity	92% Very Good	Very Good	B	\$7.6M	\$7.6M	\$0.0M
	8% Poor					
Primary Water Main Preservation	TBD	Good	TBD	TBD	\$1.8M	Unknown
Primary Water Main Capacity	Excellent	Excellent	C	TBD	TBD	Unknown
Service Connection Preservation	93% Very Good	Good	B	\$3.9M	\$3.9M	\$0.0M
	7% Very Poor					
Water Operations and Maintenance	Good	Good	C	\$15.0M	\$15.0M	\$0.0M

The current preservation plans for water distribution mains is based on physical and capacity condition ratings and City Council approved service levels. The future of these programs is to monitor condition states and report on progress and adjust the funding strategy, if necessary, to maintain service level goals. Currently, there is no need for funding adjustment on these programs.

INFRASTRUCTURE RESILIENCE AND CLIMATE CHANGE ADAPTATION STRATEGY

Proper maintenance of existing water infrastructure and the rehabilitation or replacement of failed water infrastructure results in reduced water leakage from the water distribution system. Having a more reliable and less leakage prone distribution system is important in being able to meet water consumption demands and reduces costs and energy demands at the Water Treatment Plant.

THE WAY FORWARD

In 2022, the City will be implementing SAP's Enterprise Asset Management (EAM) system. This system will allow maintenance work to be tracked to individual assets. This level of detail is not currently available in the City's work request and tracking system. The data provided by EAM tracking will be used to better integrate operations and maintenance activities into rehabilitation and replacement planning and provide opportunities for efficiencies in life cycle management of water assets.

The current approved funding for water service connection replacements will be undergoing review to ensure that the City is able to meet its target of replacing all remaining lead service lines by the end of 2026.

Methods of preserving cast iron water mains will continue to be explored. Approximately 200 km of existing cast iron water main have no physical or capacity condition concerns. Analysis is being done to determine if there is a cost-effective way to preserve these mains and delay or avoid expensive replacement costs.



*We strive to maintain and fund
our key infrastructure assets to
minimize total life cycle costs.*

