

2019

CORPORATE ASSET MANAGEMENT PLAN

Water Distribution, Storm and Waste Water

INTRODUCTION

This report outlines the state of the City of Saskatoon's **Water Distribution, Storm and Waste Water Collection** systems by providing information on asset inventory, replacement value, condition, and preservation programs.

Funding for Water and Waste Water preservation programs is provided through the Infrastructure Water and Sanitary Sewer Reserve. This reserve is funded through a levy collected on water utility bills.

WATER

Information on the water distribution system is derived from the City's GIS, asset management database, past contract values, inspections, and operation and maintenance records. Condition and past contract information used for this report is updated to 2019.

Due to the amount of time it takes for inventory records to be updated through drafting and GIS processes, inventory records for this report are updated to December 31, 2017 to ensure that the data being used is accurate.

CURRENT INVENTORY

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

Table 1: What do we own? What is it worth?

Asset	Inventory	Replacement Value*
Water Mains – Distribution	1,057 km	\$1,872 M
Water Mains – Primary	119 km	\$282 M
Valves – Distribution	14,503	\$172 M
Valves – Primary	328	\$18 M
Valve Chambers	189	\$23 M
Hydrants	8,165	\$146 M
Service Connections	71,462	\$666 M

**Replacement values have been updated to take into account contract costs up to and including 2018 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.



Primary water main and valve chamber



Water main replacement

CONDITION

The Administration evaluates the condition of the City's assets in order to develop annual programs to maintain the assets at a minimum life cycle cost. 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 2: Expenditure Levels

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 Assets 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 the physical condition desired, the Administration has identified the following expenditure service levels for certain assets within the Water and Wastewater Systems. These assets will be explored further throughout this report. Other assets within the Water and Wastewater Systems require further evaluation to determine a desired expenditure service level.

Table 3: Physical Condition Evaluation

Asset	Physical Condition Actual	Physical Condition Desired	Approved Expenditure Level	Required Annual Funding	Existing Annual Funding	Annual Funding Gap
Water Mains – Distribution	81% Very Good 13% Good 5% Fair 1% Poor 1% Critical	Good	Level B	\$6.2 M	\$6.2M	\$0.0 M
Water Mains – Primary	To be determined	Good	To be determined	To be determined	\$2.25M	Unknown
Valves – Distribution	Assumed Fair	Good	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Valves – Primary	Assumed Fair	Good	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Hydrants	Assumed Fair	Good	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Service Connections	93% Very Good 7% Very Poor	Good	Level B	\$3.7M	\$3.7M	\$0.0 M

Table 4: Capacity Condition Evaluation

Asset	Capacity Condition Actual	Capacity Condition Desired	Approved Expenditure Level	Required Annual Funding	Existing Annual Funding	Annual Funding Gap
Water Mains – Distribution	91% Very Good 8% Poor	Very Good	Level B	\$5.8M	\$5.8M	\$0.0 M
Water Mains – Primary	Excellent	Excellent	Level C	To be determined	To be determined	Unknown

At current funding levels, the number of water mains in “Poor or Worse” condition is steadily declining (Funding Service Level B). It is estimated that the Level of Service goal (Physical Condition Desired) will be met by 2026.

Primary water mains receive approximately \$2.25 million annually for condition assessment and preservation programs.

PROGRAMS

Based on the condition and criticality of assets, locations are selected for either replacement or assessment programs.

Distribution Mains

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

Preservation Program

The physical condition of water mains is used as selection criteria for this program. 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 20 km of water mains with six or more breaks and replaces 4 km per year on average at a cost of \$6.2 million.

Because of the gap between the Level of Service goal and the funds available, water mains with over six breaks are prioritized for replacement. Recent break history, pipe class, and property damage claims due to the water main breaking are taken into account when prioritizing.

Capacity Program

The capacity condition of water mains is determined using flow modelling software. Locations are prioritized based on flow deficiencies for current zoning and land uses. These priority rankings are then used to assign a condition rating.

In 2017, a water main replacement program was initiated focusing on capacity improvement and the replacement of lead service connections. Funding for capacity water main replacement is approximately \$5.8 million and 3.5 km are replaced annually. The program is currently focused on areas with high density of lead service lines in order to align with the Lead Service Replacement Program.

Primary Mains

Due to the importance of primary water mains, the City is currently undertaking proactive condition assessment and cathodic protection initiatives.

Condition Assessment

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 11.8 km of primary water main were inspected in 2017 and 2018 at a cost of \$3.5 million. A further 9.2 km of inspection is planned for 2019 and 2020.

To date, no major structural concerns have been discovered in the inspected mains. One medium-sized leak was discovered on the 1200 mm diameter main feeder main from the water treatment plant to the 42nd St Reservoir. An initial repair was done on the main to stop the leak and it was determined that two sections of pipe should be replaced. This replacement is planned for fall of 2019.

Cathodic Protection

This is a method of preserving metallic water mains by using electrical currents to help prevent corrosion of the water mains. Saskatoon has had various cathodic protection systems installed since the 1990s, however repairs of the system 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 for the remainder of primary metallic water mains. The repairs and installation are expected to be complete in 2020.

Service Connections

Connections are replaced either in emergency situations or on planned programs. Planned connections replacements are done in advance of roadway reconstruction and as part of the capacity water main replacement program which kicked off in 2017.

Starting in 2017, funding levels were set so that all remaining lead service lines would be replaced over 10 years. Current funding is approximately \$800,000 per year for emergency lead-line replacements and \$2.9 million for planned lead-line replacements. In 2017 and 2018 approximately 944 and 414 lead lines were replaced respectively, with the 2017 program supplemented by federal and provincial infrastructure spending.

Hydrants and Distribution Valves

There is no dedicated capital preservation or capacity improvement program for these assets. They are routinely operated and inspected by Water & Waste Operations Division and are replaced or repaired by operating programs. Hydrants and distribution valves are replaced during capital water main replacement projects when they are located within the limits of the water main replacement project.

Primary Valves

There is no dedicated capital preservation program for primary valves. These valves are routinely inspected by Water & Waste Operations Division and minor repairs are carried out with operating funding. In cases where full replacement of primary valves are required, capital primary water main preservation funding has been used. As a more defined primary water main funding strategy is developed based on the results of the ongoing inspection program, a primary valve preservation funding source will be developed.

*There are
approximately
3,000
lead lines
remaining in use.
Approximately
350 will be
replaced in 2019.*



Sewer main and manhole construction

WASTEWATER

Information on the City's wastewater collection system, also referred to as the sanitary collection system, is derived from the City's GIS, asset management database, past contract values, inspections, and operation and maintenance records. Condition and past contract information used for this report is updated to 2019. Due to the amount of time it takes for inventory records to be updated through drafting and GIS processes, inventory records for this report are updated to December 31, 2017 to ensure that the data being used is accurate.

CURRENT INVENTORY

The Sanitary Collection network consists of: Collection Mains, Trunk Mains, Force Mains, Manholes, and Service Connections.

Table 5: What Do We Own? What Is It Worth?

Asset	Inventory	Replacement Value*
Sanitary Mains – Collection	924 km	\$1,985 M
Sanitary Mains – Trunks	138 km	\$423 M
Manholes - Collection	10,607	\$125 M
Manholes - Trunks	1,349	\$16 M
Force Mains	51 km	\$105 M
Service Connections	70,293	\$551 M

**Replacement values have been updated to take into account contract costs up to and including 2018 contracts. Values may have decreased or increased from previous reports due to normal variations in costs.*

Sanitary collection inventory managed by the Public Private Partnership are not included above.

CONDITION

Using the same Levels of Service and condition definitions as defined in the Water section of this report, the following table outlines Physical Condition, Expenditure Levels and Funding Gaps for Wastewater Collection infrastructure.

Table 6: Physical Condition Evaluation

Asset	Physical Condition Actual	Physical Condition Desired	Approved Expenditure Level	Required Annual Funding	Existing Annual Funding	Annual Funding Gap
Sanitary Mains – Collection	Projected Condition Based on Known Condition of 43% of Collection System 75% Very Good 0% Good 7% Fair 9% Poor 9% Very Poor	Fair	Level B	\$3.4 M	\$3.4 M	\$0.0 M
Sanitary Mains – Trunks	Known Condition of 38% of Trunk System 26% Very Good 1% Good 7% Fair 1% Poor 4% Very Poor	Good	To be determined	To be determined	\$1.4 M	Unknown
Manholes – Collection	Fair	Fair	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Manholes – Trunks	Fair	Good	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Force Mains	Assumed Good	Good	To be determined	To be determined	No dedicated Capital Preservation Program	Unknown
Service Connections	92% Very Good 8% Poor	Good	Level B	\$1.26 M	\$1.26 M	\$0.0 M

*The 2019 budget includes funding of **\$3.4 million** allocated to improving the condition of sanitary mains collection. At current funding levels the backlog of “Poor” and “Very Poor” mains will be addressed by the year 2022.*

PROGRAMS

Based on the condition and criticality of assets, locations are selected for replacement or assessment programs.

Sanitary Mains

Sewer mains are inspected regularly and are rehabilitated proactively before they reach a condition where service is interrupted or costly repairs are required. Currently, approximately 43% of the collection system has a physical condition rating; however, funding levels for the preservation program are determined by projecting the condition rating of the entire system using the known condition data.

Sewer Mains are rehabilitated using Cured-in-Place Pipe (CIPP) lining. This method is more cost effective than traditional open excavation replacement methods. The CIPP method requires no excavation. A liner is inserted through existing manholes and a new pipe is created within the existing deteriorated pipe.

There are currently 43 km of sanitary mains collection with a known physical condition of “Poor” or “Very Poor”.

Based on this planned expenditure service level, there is no funding gap present.

Sanitary Trunk Mains

These currently receive approximately \$1.4 million annually for preservation programs. Large diameter sanitary mains require specialized equipment and expertise to evaluate and rehabilitation projects can be very costly. Trunk mains have been prioritized for inspection and approximately 20 km will be inspected in 2019.

Currently, approximately 38% of the trunk system has a physical condition rating. Due to the varying degree of costs that could be incurred in rehabilitating a trunk sewer, a projected condition rating similar to that used for collection mains is not used for trunk mains. Future funding for trunk rehabilitation projects will be determined based on inspection program results.

Manholes

Manholes are replaced by Water & Waste Operations or a private contractor based on the type of repair. Water & Waste Operations will fix minor repairs as necessary.

Service Connections

Connections are replaced as they fail or at the request of the homeowner. The current service level and budget of \$1.26 million per year will allow for the replacement of approximately 20 homeowner-requested connections and 90 emergency replacements.

STORM WATER

Information on the City's storm water collection system is derived from the City's GIS, asset management database, past contract values, inspections, and operation and maintenance records. Condition and past contract information used for this report is updated to 2019 and inventory information is updated to December 31, 2018 records.

CURRENT INVENTORY – STORM WATER UTILITY

The minor system consists of piping, manholes, catch basins, and outfall structures that convey runoff from more frequent, lower intensity storm events (up to a "one-in-two-year" storm).

The major system consists of overland street drainage, eight dry ponds, 26 wet ponds (including three natural ponds and two constructed wetlands), ditches, swales, and any other land that is required to convey runoff from less frequent, higher intensity storms that produce runoff in excess of what the minor system typically handles.

Table 7: What Do We Own? What Is It Worth?

Asset	Inventory	Replacement Value*
Storm Mains – Collection	674 km	\$1,389 M
Storm Mains – Trunks	71 km	\$305 M
Manholes - Collectors	8,929 ea	\$96 M
Manholes - Trunks	493 ea	\$5 M
Force Mains	4 km	\$8 M
Service Connections	2,934 ea	\$23 M
Catch Basins - Collectors	13,122 ea	\$56 M
Catch Basins - Trunks	493 ea	\$2 M
Leads - Collectors	151 km	\$75 M
Leads - Trunks	7 km	\$4 M
Dry Ponds	8 ea	\$6 M
Wet Ponds	26 ea	\$35 M
Culverts	12 km	\$9 M
Outfalls	114 ea	\$5 M
Sub-Drainage	44 km	\$1.24 M
Oil & Grit Separators	1 ea	\$0.05 M
Total		\$2.019 B

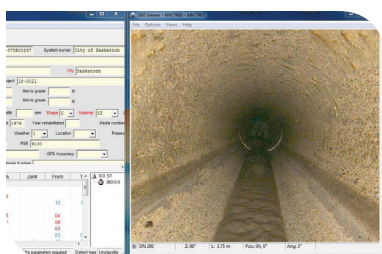
*Replacement values were updated to take into account contract costs up to and including 2018 contracts. Values may have changed from previous reports due to normal variations in costs and updated data.

Storm collection inventory managed by the Public Private Partnership are not included above



Storm water outfall

*The City's storm
water infrastructure
has a replacement
value of over
\$2.0 billion.*



Pipelogix CCTV inspection software

CONDITION

Physical Condition Evaluation

Asset management of the storm water system is at an earlier stage of development in comparison to the water and sanitary systems. Current efforts for storm water system asset management are focused on condition rating and setting service levels. Information on expenditure levels and funding gaps are still in development and are not included in this report.

The physical condition of storm water assets have been assessed and rated based on a sample of CCTV inspections for the storm water mains (up to 2018), and visual inspections of storm water ponds (2016), Montgomery Place culverts (2018), and outfalls (2019).

Table 8: Physical Condition Evaluation

Asset	Description	Rating	Number	Per cent
Storm Water Mains – Collectors	Projected condition based on known condition of 14% of total Collector Mains. Rated A, C, & F as “Very Good”, “Fair”, and “Very Poor” respectively as of December 31, 2018. “Number” is segments of pipe.	A: Very Good	889	76%
		C: Fair	206	18%
		F: Very Poor	76	6%
		Total	1,171	100%
Storm Water Mains – Trunks	Projected condition based on known condition of 7% of total Trunk Mains. Rated A, C, & F as “Very Good”, “Fair”, and “Very Poor” respectively as of December 31, 2018. “Number” is segments of pipe.	A: Very Good	45	90%
		C: Fair	4	8%
		F: Very Poor	1	2%
		Total	50	100%
Outfalls	Condition based on 2019 visual inspections of outfall and ranked A, B, C, D as “Very Good”, “Good”, “Fair”, and “Poor”, respectively. Inspection ratings incorporate outfall pipe and structure condition, handrail and grate condition, and any factors impeding outflow or causing erosion such as overgrowth, sedimentation, or lack of erosion protection.	A: Very Good	20	18%
		B: Good	38	34%
		C: Fair	23	21%
		D: Poor	7	6%
		Unknown	26	21%
		Total	114	100%
Ponds	Comprehensive storm water pond inspections were completed in 2016. Visual assessment was based on the condition of inlet and outlet pipes, structures, and grates, shoreline and rip rap, sediment buildup, invasive species, algae, and any other visual concerns. Ponds were given a condition of “Good”, “Fair”, and “Poor”.	B: Good	21	62%
		C: Fair	13	38%
		D: Poor	0	0%
		Total	34	100%
Montgomery Place Culverts	Montgomery Place culverts were assessed and rated in 2018 from A to D based on physical condition and amount of sedimentation (680 properties with culverts and 590 total culverts as some culverts were shared by two properties.)	A: Good	207	23%
		B: Moderately Good	177	20%
		C: Moderately Poor	169	19%
		D: Poor	127	14%
		No Culverts	222	24%
		Total	902	100%

CAPACITY CONDITION EVALUATION

In 2014, 30 sites with known surface flooding were modelled and prioritized based on risk of flooding, number of properties flooded, and categorization of flooded street. In 2018, the cost of increasing capacity for these areas was estimated based on high level conceptual designs.

In addition to the 30 prioritized areas, several other areas in Saskatoon built to previous standards may also experience flooding during intense rain events because the system is at capacity and the runoff has nowhere else to go. The Montgomery Place neighbourhood is prone to flooding, particularly during spring snow melt, because of its unique culvert and ditch drainage system.

PROGRAMS

In 2018, Water & Waste Operations repaired or replaced 437 manholes, catch basins and catch basin leads, representing almost 2.0% of the total, and a 29% increase over 2017. Repairs and replacements are completed based on annual inspections.

The *2016 State of Storm Water Pond Retention System* report detailed the condition of 26 wet and eight dry storm ponds. In 2019, all ponds will be inspected and the report will be updated. Storm pond asset management in 2018 included remediation of the Agriplace Dry Pond's outlet, inlets and major flow paths. In 2019, options are being evaluated for removing sediment from the Brand Road Pond and 51st Street Pond.

Storm water sewers are cleaned, inspected by CCTV, and rated. As of December 31, 2018, 133 km of storm pipes (18%) of storm pipe were cleaned and inspected and 97 km (13%) were rated. The priority storm water pipes are being rehabilitated using CIPP lining to extend their life at the lowest cost, with 2.7 km of storm water pipes being lined in 2019 at a cost of \$0.8 million.

The *2016 Outfall Evaluation* identified conditions and made recommendations for follow-up maintenance and repair. All high priority actions were completed by Water & Waste Operations. The *2019 Outfall Evaluation* rated no outfalls as urgent. Water & Waste Operations will continue to complete needed outfall maintenance.

In 2018, the *Montgomery Place Culvert Inventory and Assessment* rated 590 culverts, including those on public right-of-ways under driveways. The inventory and assessment will form the basis for a drainage plan for the area which is being developed in 2019.

In 2018, fully subsidized home inspections were offered to residents in areas that are at highest risk of flooding to identify measures that owners can take to mitigate flood damage. The Flood Control Strategy is being implemented between 2019 and 2028 to add infrastructure capacity to 10 flood-risk areas by adding more storm mains and building dry storm water ponds in nearby parks.

*A nine-year
\$54 million
Flood Control Strategy
was approved in 2018
to increase capacity in
10 areas that represent
over half of the total
properties in the 30
areas that are at risk
of flooding.*



Storm sewer inspection

*The 2019 asset
preservation budget
for storm sewers is
\$1.2 million.*



Primary pipe diver

THE WAY FORWARD

The current preservation plans for water distribution mains and sanitary and storm water collection mains are 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. There is currently no need for funding adjustment on these programs.

City Council will be kept abreast of the service level options and costs when further information becomes available, if there is desire to improve the service level or save money by decreasing the service level.

- A condition assessment of 20 km of critical wastewater trunks and 9.2 km of primary water mains will take place in 2019 and 2020. Future preservation programs will be assessed and determined based on these condition assessment reports.
- 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 2027.
- 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.
- The City participates in the National Water and Wastewater Benchmarking Initiative and in the past has used benchmarking data to compare water main break rates in Saskatoon to other Canadian cities. Due to recent changes with the way data is collected, benchmark data was not included in this report. The goal of the data collection changes is to improve how cities are reporting data and it is anticipated that better analysis and comparisons will be available in future reports.
- In 2017, City Council approved the Storm Water Utility Business Plan which emphasized assessing the current condition of storm water assets, and maintaining and preserving the infrastructure to prevent higher future costs. Asset and preservation funding for storm water sewers will increase from \$800,000 in 2018 to more than \$1.6 million in each of 2020 and 2021 to allow more emphasis on lining to achieve lowest life cycle costs.
- While the City's storm water ponds are relatively new, experience in other cities has shown that the cost is high for long-term preservation including removing sediment buildup to maintain performance. The amount allocated to storm pond preservation is increasing from \$350,000 in 2018 to over \$600,000 in each of 2020 and 2021 to allow for more proactive sedimentation removal.
- In 2019, a drainage profile and determination of targeted ditch and culvert elevations for the Montgomery Place neighbourhood will be completed based on the asset inventory and assessment conducted in 2018. Options to address the drainage issues and funding options in Montgomery Place will be evaluated and presented to City Council.

- The Flood Control Strategy, starting with a new dry pond in W.W. Ashley District Park in 2020, is being implemented over the next nine years to increase storm water infrastructure capacity in 10 flood-risk areas, with the goal to protect as many properties as possible from flooding within the available budget. Other cost-effective options will be sought for other areas that are at risk of flooding.

We are committed to maintaining and carefully investing in our Water Distribution, Storm and Waste Water Collection systems.

We will use the financial resources and physical resources under our care to address the needs and expectations of Saskatoon citizens today and for the future.



Primary pipe diver launch



*4th Avenue
curing steam*

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

