Document 1 - Large-Diameter Watermain Condition Assessment Program

The City has continued to move forward with the large-diameter watermain condition assessment program. The main benefit of this program is the ability to proactively assess and identify deficiencies that can be addressed in a planned and controlled fashion without negatively impacting customers. There are currently 238 kilometres of large-diameter watermains (≥610 millimetres) in the City. The expected service life is between 80 and 110 years and the average age is approximately 39 years.

The program continues to be governed by a working group composed of technical experts and management representatives from multiple Infrastructure and Water Services department branches, including Linear Asset Management, Water Resources Planning and Engineering, Water Distribution, and Water Production. The working group discusses alternatives and puts forth recommendations for the inspection program. A risk-based prioritization approach, considering competing priorities within the drinking water system, is used to establish the annual program. The program has focused the inspections on the approximately 54.8 kilometres of pipeline that was installed from ~1972 to 1979 that has experienced a higher degree to wire breaks leading to premature failure. It is recognized industry-wide that the 1972-79 C301 pipe, have experienced a modest tendency for premature failure, as compared to concrete pressure pipe material manufactured and installed before and after this period. To date, the City has completed 44.2 kilometres (81 per cent) of unique structural condition assessment and 52.3 kilometres (95 per cent) of unique leak detection on this cohort of pipes. The outstanding structural inspections on this cohort of pipes are all pending completion of capital projects before an inspection is possible and are as follows:

- Orleans Res- CP000124 Hurdman Bridge Pump Station Upgrades
- St. Joseph A- Forest Valley VFD Repairs
- Fallowfield A- SUC Changeover
- Hazeldean A2- CP000822 Hazeldean A2 Local watermain
- Britannia A- Morisset Pump Station

Through this program, 17.9 kilometres of large-diameter watermain was inspected for leaks and 10.7 kilometres for structural deficiencies in 2023. Each type of inspection provides unique condition information upon which rehabilitation and replacement decisions are made. Completion of both types of condition assessment often takes multiple years. A watermain segment is considered to be completely inspected when both leak detection and structural condition have been assessed, as appropriate based on engineering analysis, pipe material and current technology available on the market.

In 2023, 3.3 kilometres of watermain were newly considered fully completed. Figure 1 illustrates the progress to date for the Large Watermain Condition Assessment Program - the left-side shows the total large diameter watermains (including the cohort of pipes installed from ~1972 to 1979) and the right side shows the cohort of the pipes installed from ~1972 to 1979.

Figure 1 - Large Diameter (≥610 millimetres) Condition Assessment Progress Unique Inspections to Date (kilometres)

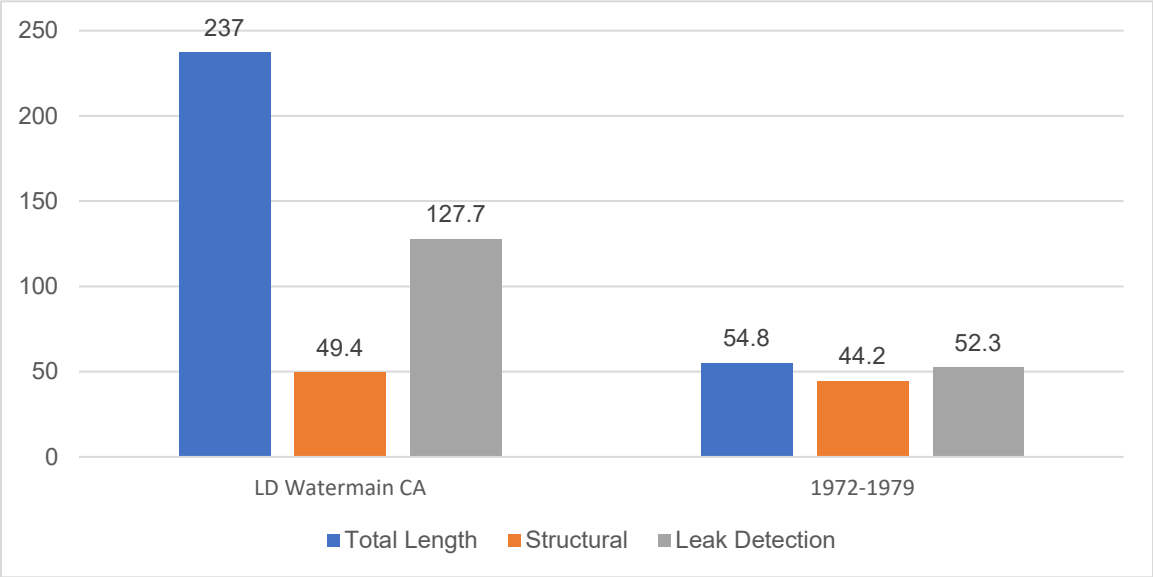

Table 1 - Summary of Current Condition Assessment Results

Description	Total Distance (m)	# of Distressed Pipes				Total # of Pipes inspected	% of Distressed Segments	Last Inspection Date
		Immediate action Required	Short-Term Action n Required	To be Monitored Long-Term	Total			
Eagleson B	1064	1	0	6	7	182	3.8%	2023
Orleans B	3916	0	1	3	4	743	0.5%	2023
Loretta N	368	0	0	1	1	92	1.1%	2023
Ottawa South A	5306	1	0	10	11	972	1.1%	2023
Baseline Ph3	1130	0	0	2	2	215	0.9%	2022
Vanier B	2230	1	0	2	3	328	0.6%	2022
Orleans C & D	3940	0	0	0	0	740	0	2021
Eagleson A and B	1250	0	2	3	5	261	1.9%	2020
Morgan's Grant Ph 2B	383	0	0	1	1	63	1.6%	2019
Morgan's	938	0	0	1	1	149	0.7%	2019

Description	Total Distance (m)	# of Distressed Pipes				Total # of Pipes inspected	% of Distressed Segments	Last Inspection Date
		Immediate action Required	Short-Term Action n Required	To be Monitored Long-Term	Total			
Grant Ph1								
Bridlewood B	1309	0	3	7	10	186	5.4%	2019
Baseline 4	890	0	1	0	1	153	0.7%	2019
Morgan's Grant Ph 2A	394	0	0	0	0	63	0.0%	2018
Bridlewood A Ph1	1451	0	0	2	2	222	0.9%	2017
Britannia B	2615	0	0	45	45	555	8.1%	2017
Woodroffe A North	1009	0	0	3	3	179	1.7%	2017
Morgan's Grant Ph 3	867	0	0	0	0	108	0.0%	2016
Orleans A	1680	0	0	3	3	287	1.0%	2015
Lorry Greenberg	300*	0	0	0	0	41	0.0%	2015
Bridlewood A Ph 2	616	0	0	0	0	89	0.0%	2015
Ogilvie	315	0	0	0	0	65	0.0%	2015
Ottawa South B	1752	0	0	0	0	255	0.0%	2015

Table 1 notes the number of distressed pipes and percentage of distressed segments. It should be noted that Pure Technologies[1] has found that the current average percentage of distressed segments across all of their inspections is around 3.00 per cent (The Water Research Foundation[2] previously published industry distress rate in 2012 was 3.7 per cent). To provide more details regarding the actions taken based on assessment results, the following definitions were used:

- Immediate Action Required: Pipe segment condition is such that it needs to be repaired or replaced before bringing the pipe back into service. Urgent Repair.
- Short-Term Action Required: Pipes should be scheduled for repair or replacement in the next few years. The timeline depends on the severity of the distress and professional opinion of the structural engineer. The pipe can

[1] Pure Technologies is a Xylem brand which performs inspections of pipelines using electromagnetic and acoustic technologies.

[2] The Water Research Foundation (WRF) is non-profit, educational organization that funds, manages, and publishes research on the technology, operation, and management of drinking water, wastewater, reuse, and stormwater systems—all in pursuit of ensuring water quality and improving water services to the public.

be put back in service, but steps should be taken to repair or replace it. Planned Repair

- To Be Monitored Long-Term: There is distress in the pipe section, but it is relatively minor. No repair or replacement intervention planned. The pipe will be reassessed after the next inspection. The timing of the next inspection is to be determined through regular program planning.

Table 2 – Summary Leak Detection Results for 2023

Description	Total Distance (m)	# of Leaks	Management Strategy
Ottawa South A/B	7602	0	-
St. Joseph A	2281	1	1 small leak (>5L/s) found. Water Distribution is working to verify the leak.
Robertson Ph0/1, Baseline Ph 2/3	7982	0	-

Table 2 summarises the leak detection results for 2023. Most inspections happen in Q4 of the inspection year, this is to allow time for the inspections and, if required, any repairs before May of the following year when water demands typically increase. As such, repair and replacement occur in the following year(s). Repairs to be completed include:

- Eagleson B- One pipe was found with a potential cylinder defect and was repaired in December 2023.
- Ottawa South A- One distressed was repaired in 2023. Three distressed pipes will be included in the Bank St integrated project to be opportunistically repaired.
- St. Joseph A- The leak is currently being investigated by Water Distribution

At the beginning of each calendar year the working group meets to review and update the three-year plan for the condition assessment program. The plans are impacted by some multiple constraints such as level of service expectations, resources, hydraulic impacts, other concurrent capital construction projects.