Appendix E

TM 1B Linear Infrastructure Condition Assessment (November 18, 2022)

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Casselman Water and Wastewater Infrastructure Master Plan Technical Memorandum 1B

Casselman Linear Infrastructure Condition Assessment

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JLR Review

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1.0 Introduction

The Corporation of the Municipality of Casselman (the Municipality) initiated a Class Environmental Assessment (Class EA) Study to address treatment, capacity, and condition limitations of its water, wastewater, and storm conveyance system through the development of a Water and Wastewater Infrastructure Master Plan to be completed in accordance with the Municipal Engineers Association (MEA) Class EA master planning process. The ultimate objective of the Master Plan is to develop a strategy that can be implemented over an appropriate time period in a prioritized fashion to improve the overall performance and reliability of the water and wastewater system and to ensure it can be relied on to accommodate current and future flows generated within the Municipality. J.L. Richards & Associates Limited (JLR) was retained by the Municipality in 2021 to assist in the completion of the Master Plan.

The Municipality is located along Highway 417 on the South Nation River and borders the Municipality of the Nation. The Municipality is serviced by a water conveyance system, consisting of the water treatment plant (WTP), elevated standpipe, and over 22 km of watermains; and a wastewater conveyance system consisting of a wastewater treatment plant (WWTP), six (6) sewage pumping stations (SPS), and over 30km of sewers.

The purpose of this Technical Memorandum 1B (TM 1B) is to summarize key findings from a desktop condition assessment of the linear water and wastewater conveyance system infrastructure, which will be utilized as one of the technical documents for input into the preparation of the overall Master Plan. This is the second memorandum completed for Phase 1 of the Master Plan process that will form the basis for assessing servicing alternatives for the future. The following memoranda have already been completed:

- TM 1A Casselman Water Treatment Plant and Sewage Pumping Stations Condition Assessment.

2.0 General Methodology

2.1 Memorandum Objectives

The objectives of TM 1B are to:

- Summarize a desktop condition assessment for the water distribution and wastewater collection system;
- Report on significant findings from the desktop analysis; and
- Ultimately utilize this information for the development of the Master Plan.

2.2 Review of Background Information

JLR was previously retained by the Municipality to complete a water/wastewater infrastructure GIS update. As part of the study, a large inventory of historical drawings related to these Casselman systems was provided, reviewed, and input into the GIS.

2.3 Desktop Condition Assessment

A desktop condition assessment of water and wastewater conveyance piping infrastructure was undertaken. A piping inventory, including pipe diameter, material, and age, was reviewed and compared to typical industry standards for the desktop piping condition assessment. Text

3.0 Overview of Existing Conveyance System

3.1 Water Linear Infrastructure

The Municipality of Casselman water network is made up of over 22 km of watermains ranging in diameter from 50 mm to 300 mm. The various watermain materials present in the system include high-density polyethylene (HDPE) and polyvinyl chloride (PVC). The age of the pipe in the system varies from 46 years old to those installed in 2021. Figures 1 through 3 illustrate the above.

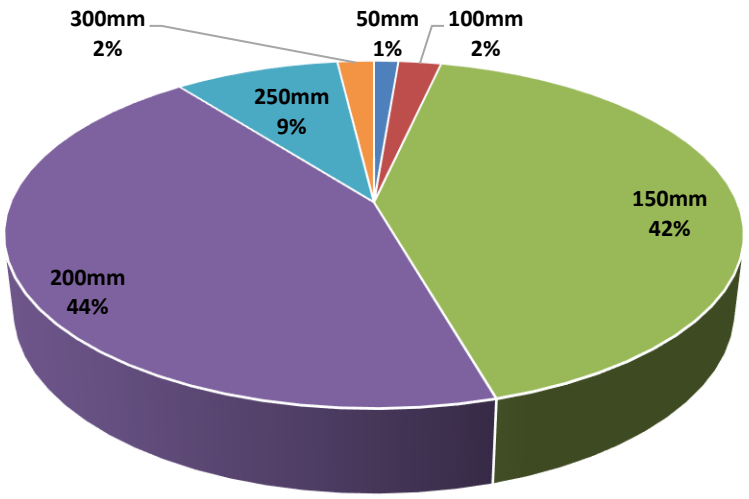

Figure 1: Watermain Diameter

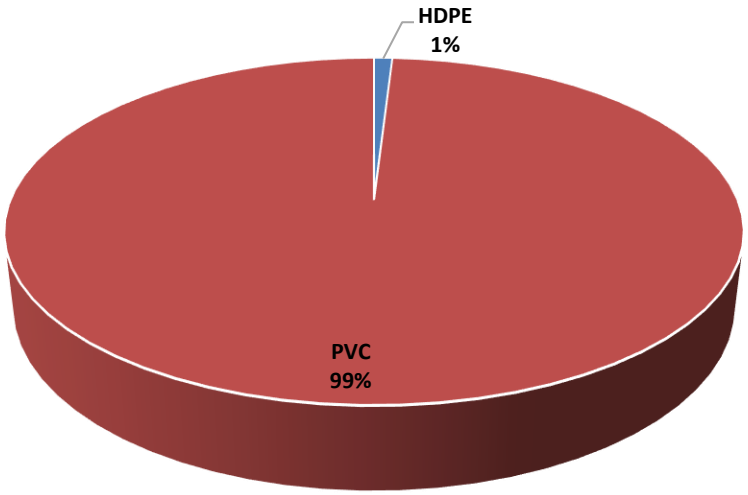

Figure 2: Watermain Material

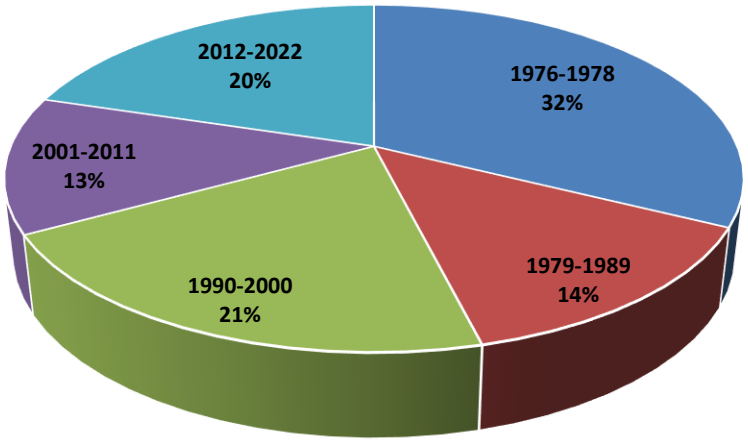

Figure 3: Watermain Installation Date

3.2 Wastewater Linear Infrastructure

The Municipality of Casselman wastewater collection system is made up of over 30 km of sewer ranging in diameter from 100 mm to 825 mm. The various sewer materials present in the system include asbestos cement (AC), concrete (CONC), corrugated metal, high-density polyethylene (HDPE), and polyvinyl chloride (PVC). The age of the pipe in the system varies from 46 years old to those installed in 2021. Figures 4 through 6 illustrate the above.

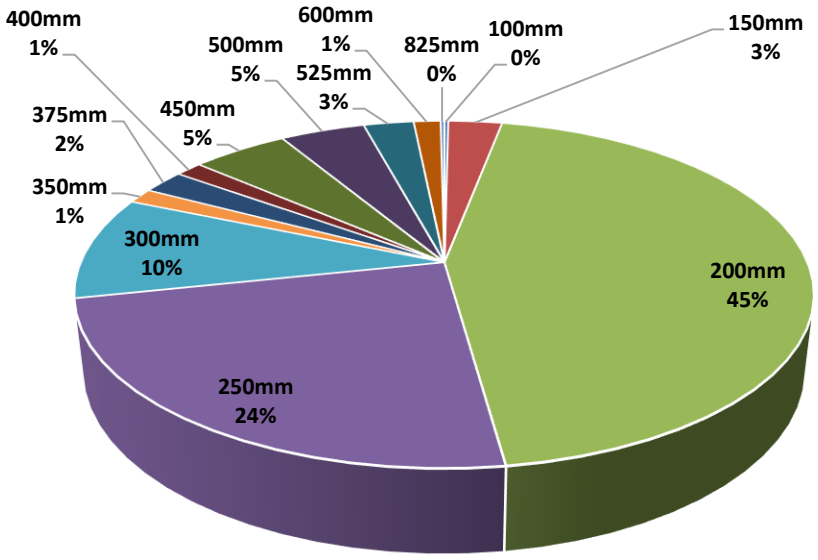

Figure 4: Sanitary Sewer Diameter

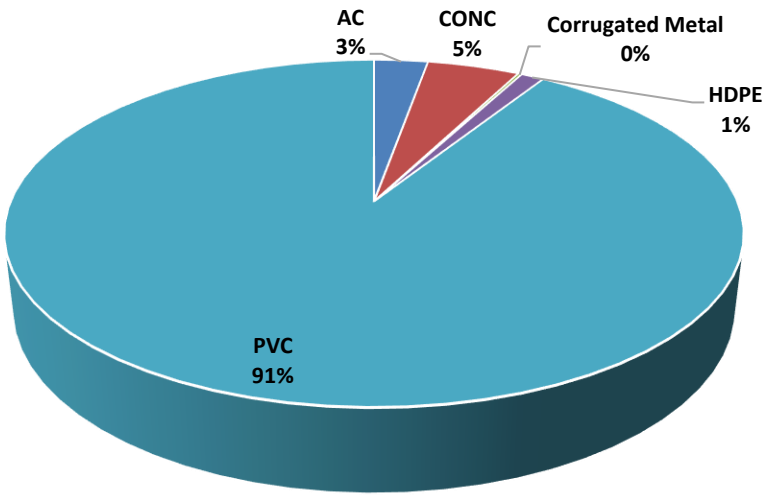

Figure 5: Sanitary Sewer Material

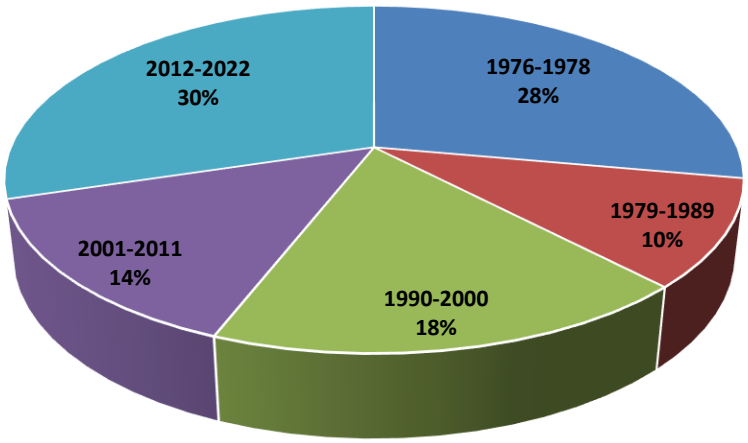

Figure 6: Sanitary Sewer Installation Date

4.0 Desktop Conveyance Condition Assessment

4.1 Linear Infrastructure

In order to better understand the Municipality of Casselman's linear infrastructure condition, JLR completed a desktop condition assessment of the water and wastewater pipes based on type and age of the infrastructure.

The average pipe life span typically depends on a wide variety of factors including type, soil, air characteristic and installation method. Additionally corrosive environments can reduce the life expectancy of pipes such as sanitary sewer with low velocities or long detention times that produce hydrogen sulfide gas. For the purposes of summarizing a desktop condition assessment of the existing pipe network, the proposed service life of various piping is summarized in the table below.

Table 1: Proposed Service Life of Various Piping Materials

Infrastructure	Material	Proposed Service Life
Water	High Density Polyethylene (HDPE)	75 Years
	Polyvinyl Chloride (PVC)	75 Years
Sanitary	Asbestos Cement (AC)	75 Years
	PVC	75 Years
	HDPE	75 Years
	Concrete (CONC)	75 Years
	Corrugated Metal	40 Years

As previously noted, the oldest pipes within the water and sanitary system are 46 years old (installed in 1976). Based on pipe age alone, none will be approaching or exceeding their typical life span in 0-5 years, in 10 years, nor within the 25-year Master Plan timeframe. However, it should be noted that the actual replacement needs would be based on a variety of factors. It is recommended that visual assessment of pipes be completed before replacement is considered.

5.0 Cost Summary of Recommended Capital Upgrades

A summary of estimated Opinion of Probable Costs is provided for the long-term replacement (beyond 25 years) of water and sanitary pipes in the following table. Pricing of various piping by infrastructure type, diameter, and material was based on the City of Ottawa Master Spec Code List published March 3, 2021 and escalated by 30% to account for inflation. As noted above, actual replacement needs would be based on a variety of factors and a visual assessment of pipes should be completed before replacement is considered.

Table 2: Summary of Linear Infrastructure Condition Assessment Recommendations and Estimated Costs Long Term (Beyond Year 2047)

Infrastructure	Length of Pipe (km)	Material	Opinion of Probable Cost (1)
Water	22.69	PVC	$ 22,600,000
	Unknown	HDPE	-
			ROUND TOTAL = $ 22,600,000
Sanitary	27.14	PVC	$ 18,300,000
	1.58	CONC	$ 1,000,000
	0.27	HDPE	$ 240,000
	0.67	AC	$ 500,000 (2)
	Unknown	Corrugated Metal	-
			ROUND TOTAL = $ 20,040,000
			ROUND TOTAL REPLACEMENT COST = $ 42,640,000

Note:

(1) Opinion of Probable Cost is in 2022-dollar value. Class 'D' OPCs developed for this assignment are expected to be within +/- 30%. The OPCs were developed based on past experience on similar projects, professional judgment, and equipment costs provided by suppliers. The "Opinion of Probable Costs" shown has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final "Opinion of Probable Costs" of the project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule and other variable factors. As a result, the final "Opinion of Probable Costs" will vary from the "Opinion of Probable Costs" presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. This "Opinion of Probable Costs" does not include any costs for acquiring the necessary permits or rights-of-way for the above-specified equipment.

(2) Pricing based on Asbestos Cement replaced with PVC piping of equal size.

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