Appendix E

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

JLR No.: 16953-118
Revision: DRAFT

November 18, 2022

Casselman Water and Wastewater Infrastructure Master Plan Technical Memorandum 1B

Casselman Linear Infrastructure Condition Assessment

J.L.Richards
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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.

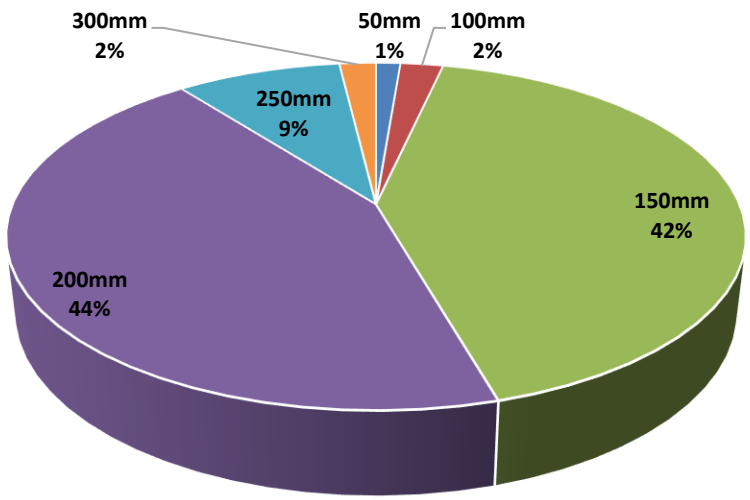

Figure 1: Watermain Diameter

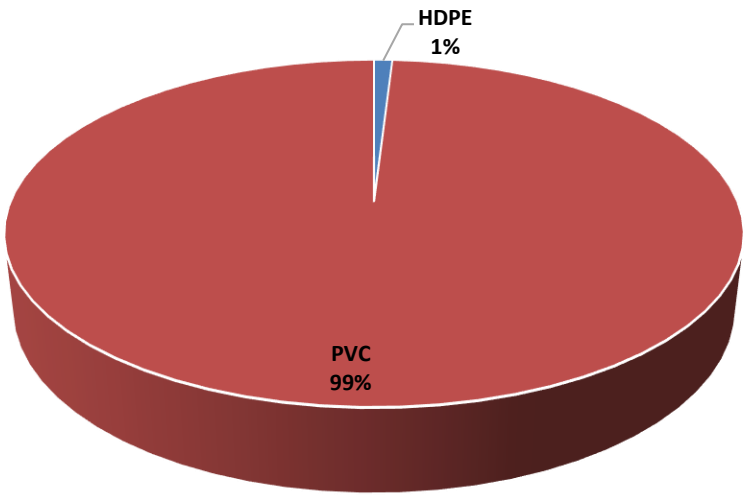

Figure 2: Watermain Material

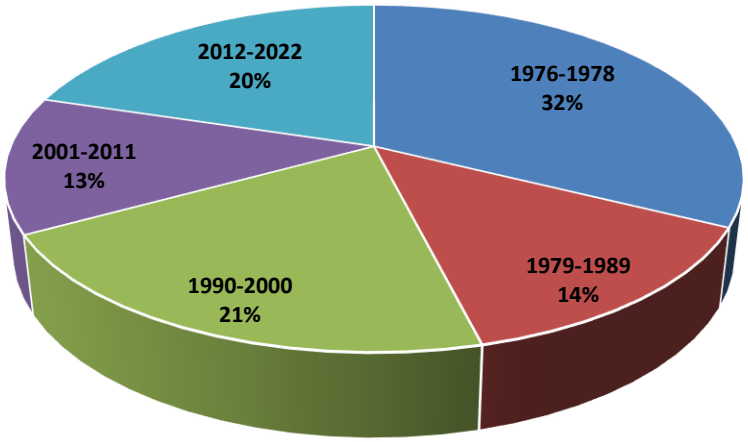

Figure 3: Watermain Installation Date

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.

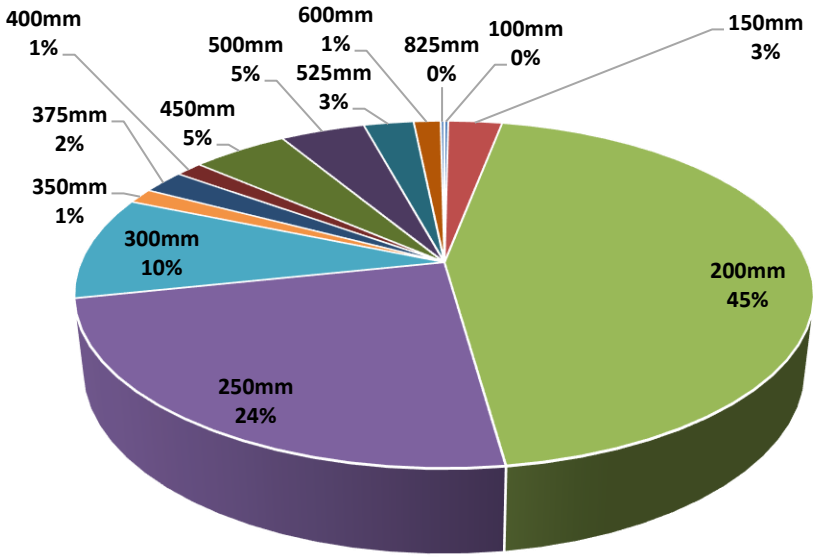

Figure 4: Sanitary Sewer Diameter

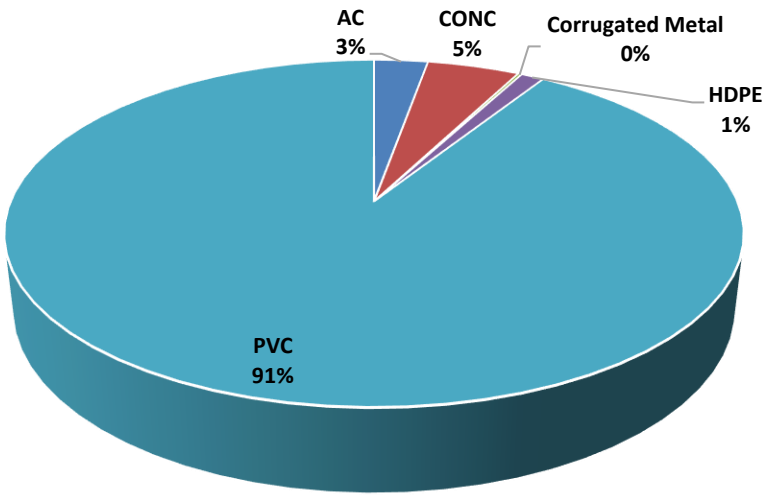

Figure 5: Sanitary Sewer Material

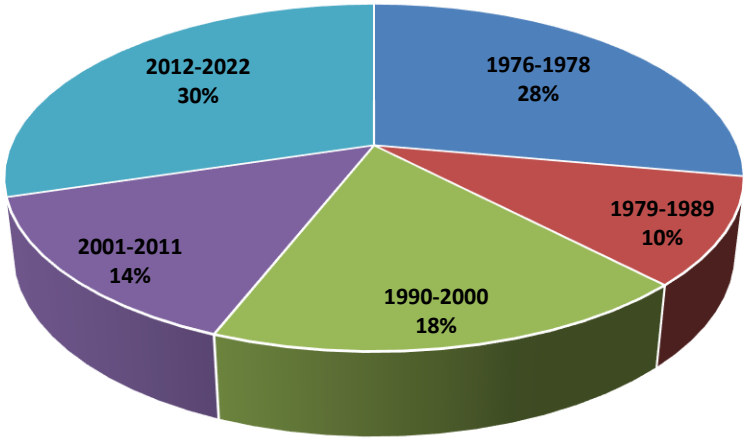

Figure 6: Sanitary Sewer Installation Date

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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Appendix F

TM 2 Growth Projections
(February 2, 2023)

JLR No.: 16953-118
Revision: DRAFT

February 2, 2023

Casselman Water and Wastewater Infrastructure Master Plan Technical Memorandum 2

Casselman Growth Projections

J.L.Richards
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JLR Review

Prepared by:	Reviewed by:
Marc Rivet, RPP, MCIP Associate, Senior Planner	Nikita Jariwala, M.Pl. Planner

The Municipality of Casselman (the Municipality) is a lower-tier municipality in the United Counties of Prescott and Russell (UCPR). UCPR has recently adopted a new Official Plan for the UCPR (pending Ministerial approval). As per the *Planning Act*, this Upper-Tier plan is required to set the growth projections for its lower-tier municipalities.

Provincial Policy Statement 2020 (PPS), Section 1.4.2 reads:

> "Where planning is conducted by an upper-tier municipality: a) the land and unit supply maintained by the lower-tier municipality identified in policy 1.4.1 shall be based on and reflect the allocation of population and units by the upper-tier municipality."

The UCPR Official Plan provides forecasts for the Municipality to the year 2046 (25-year planning horizon), as summarized in the following table:

Table 1: Casselman Population, Household, and Employment Forecasts for 2046

	Growth Study (2021)	Growth Study (2046)	Growth (2021 to 2046)
Population	4,070	5,820	1,750
Household	1,580	2,450	870
Employment	1,930	2,220	290

Source: UCPR OP September 2022 based on Growth Management Strategy, March 2022.
Note: Total population includes Census Net Undercoverage; total employment includes Usual Place of Work, Work at Home and No Fixed Workplace

ON December 15, 2022, Statistics Canada released adjusted 2021 Census of Population numbers. The 2021 Census of Population (which took place in May 2021) slightly revised Casselman's total population to 3,960 with a total number of private dwellings occupied by usual residents of 1,578. Per Census, the average household size in Casselman was 2.51 in 2021.

Per the UCPR Growth Strategy the average household size is expected to decline to 2.37 in 2046.

The Building Department provided the following statistics for the two large subdivisions in the municipality:

Date of Occupancy	**Amount of units**			
	Casselman Development		West of Sarah	Total
	Phase 1	Phase 2	Phase 1	
Prior to May 31, 2021	132	0	0	132
Prior to December 31, 2022	70	34	13	117

It is assumed the occupied units as of May 31, 2021were accounted for in the 2021 Census of Population. Based on municipal data, an additional 117 units were built and occupied to the end of year 2021. Assuming an average household size of 2.51, (117*2.51), we can estimate an additional population of 293 people to **December 2022** resulting in a **population of 4,253 and 1,695 households (maintaining an average household size of 2.51)**.

The Municipality is 100% Urban Settlement Area and designated for growth (see Figure 1). Per the UCPR Official Plan, 15% of all new residential units created during this planning horizon shall be through intensification (this includes additional residential units). This means that approximately 131 units should be within the established built-up areas of the Municipality via infill, redevelopment, additional residential units, etc. Per PPS, intensification is defined as:

> "means the development of a property, site or area at a higher density than currently exists through: a) redevelopment, including the reuse of brownfield sites; b) the development of vacant and/or underutilized lots within previously developed areas; c) infill development; and d) the expansion or conversion of existing buildings."

Intensification is permitted across the Municipality except where infrastructure is inadequate or there are significant physical constraints (including additional residential units).

UCPR Official Plan has also set a goal that a minimum target of 30% of new housing or units created by conversion, to be affordable (per Bill 23 this represents no greater than 80 per cent of the average market rent or average purchase price).

In order to meet the varied housing requirements of the Counties' residents and to provide for orderly residential development, it is the policy of the UCPR Official Plan that, subject to the availability of water and wastewater services, zoning regulations be designed to provide for a mix of 70% low-density residential development, 20% medium density development and 10% high density residential development in the Urban Policy Area (which includes the Municipality). For the purpose of this section, low-density is defined as up to 35 units per net hectare. Medium density development on full municipal services should not exceed 55 units per net hectare for townhouses or row houses, and 75 units per net hectare for apartments. High density being above these density targets.

The Municipality's Planning Department has provided information in regard to committed and proposed development across Casselman, as summarized in the following table and illustrated in Figures 2 and 3. The Municipality has development files at various stages of approval from pre-consultation, draft approval to registered plans of subdivisions which include the following breakdown of residential and employment uses:

Table 2: Committed Developments

Committed Development	Units	Minus already built / occupied (December 2022)
Casselman Developments Limited (Plan of Subdivision file number 030-S-19-002)		
Phase 1 (M-Plan Approved)	210	8 vacant / unoccupied
Phase 2 A (M-Plan Approved)	40	6 vacant / unoccupied
Phase 2B (Draft Plan Approved Only - Committed)	144	144
Phase 3 (Draft Plan Approved Only - Committed)	179	179
Total Remaining (January 2023)		337

West of Sarah (Plan of Subdivision file number 030-S-19-003)		
Phase 1 (M-Plan Approved)	45	32 vacant / unoccupied
Phase 2 (Draft Plan Approved Only - Committed)	36	36
Phase 3 (Draft Plan Approved Only - Committed)	16	16
Phase 4 (Draft Plan Approved Only - Committed)	37	37
Total Remaining (January 2023)		121

Table 3: Uncommitted Developments

Uncommitted Development	**Units**
Plan of Subdivision Applications	
Project Martineau-Hughes	38
Applications for Site Plan Approval (more than 10 units)	
Devcore	97

Not accounting for potential developments or intensification and built – occupied units in registered subdivisions, there are approximately **459 draft approved or registered and vacant / not yet occupied lots/units which are considered as committed (assumed capacity in water/wastewater treatment plant).**

According to the growth forecast, the Municipality's demand for housing is expected to be 870 units by 2046. Assuming 117 were built and occupied since the study date, the expected number of units to meet projected growth is 753 units to the year 2046.

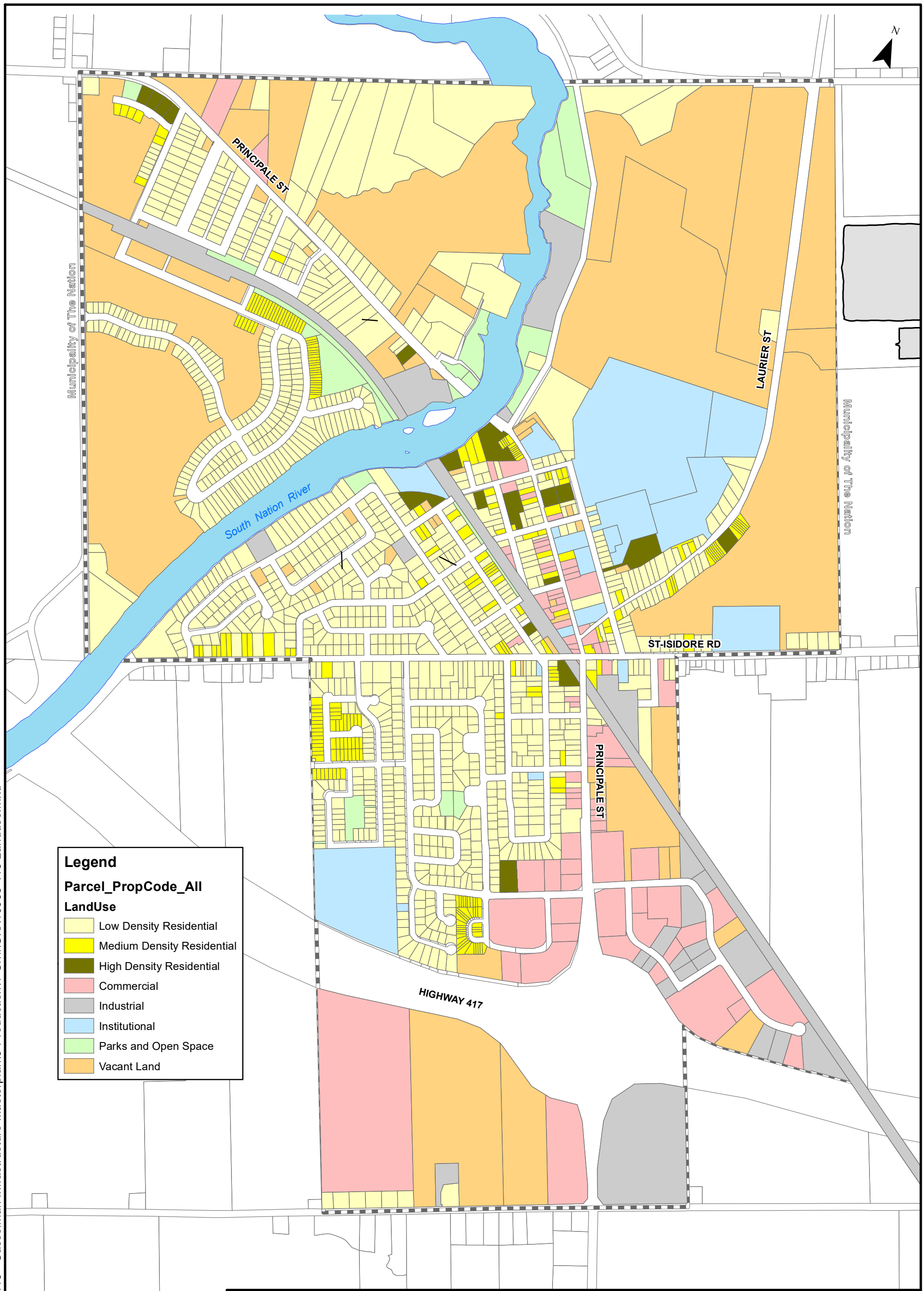
This projection represents approximately 33 new housing starts per year which is significantly lower than recent permit activity which has been closer to the 110 units per year. This trend will need to be monitored on a yearly basis.

With Committed units (draft approved) of 459 lots/units, the Municipality will see a shortfall of approximately 294 lots/units (note registered lots which have yet to be built have not been accounted for in this approximation) to meet this forecasted growth.

Based on the intensification policies it is assumed that approximately 131 units would be developed as intensification within the built-up areas, therefore reducing the shortfall to 163 lots/units.

The Municipality's Planning Department has also been in discussion with developers (not yet approved status) for an additional 135 units. This would still represent a shortfall of approximately 28 lots/units to meet expected growth to a 2046 planning horizon. It is recommended that a density study is conducted for the remaining vacant lands to assess land needs/density to meet expected growth.

In terms of employment uses, 290 jobs are anticipated by the year 2046. Based on available supply of employment lands this target will be achievable. Further analysis may be required to confirm the amount of employment lands and determine if certain parcels may be converted to residential lands.



PROJECT:

MUNICIPALITY OF CASSELMAN
WATER AND WASTEWATER MASTER PLAN
CASSELMAN, ONTARIO

DRAWING:

LAND USE INVENTORY

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DESIGN:	MK	JLR NO:	16953-118
DRAWN:	TB	DRAWING NO.:	FIGURE 1
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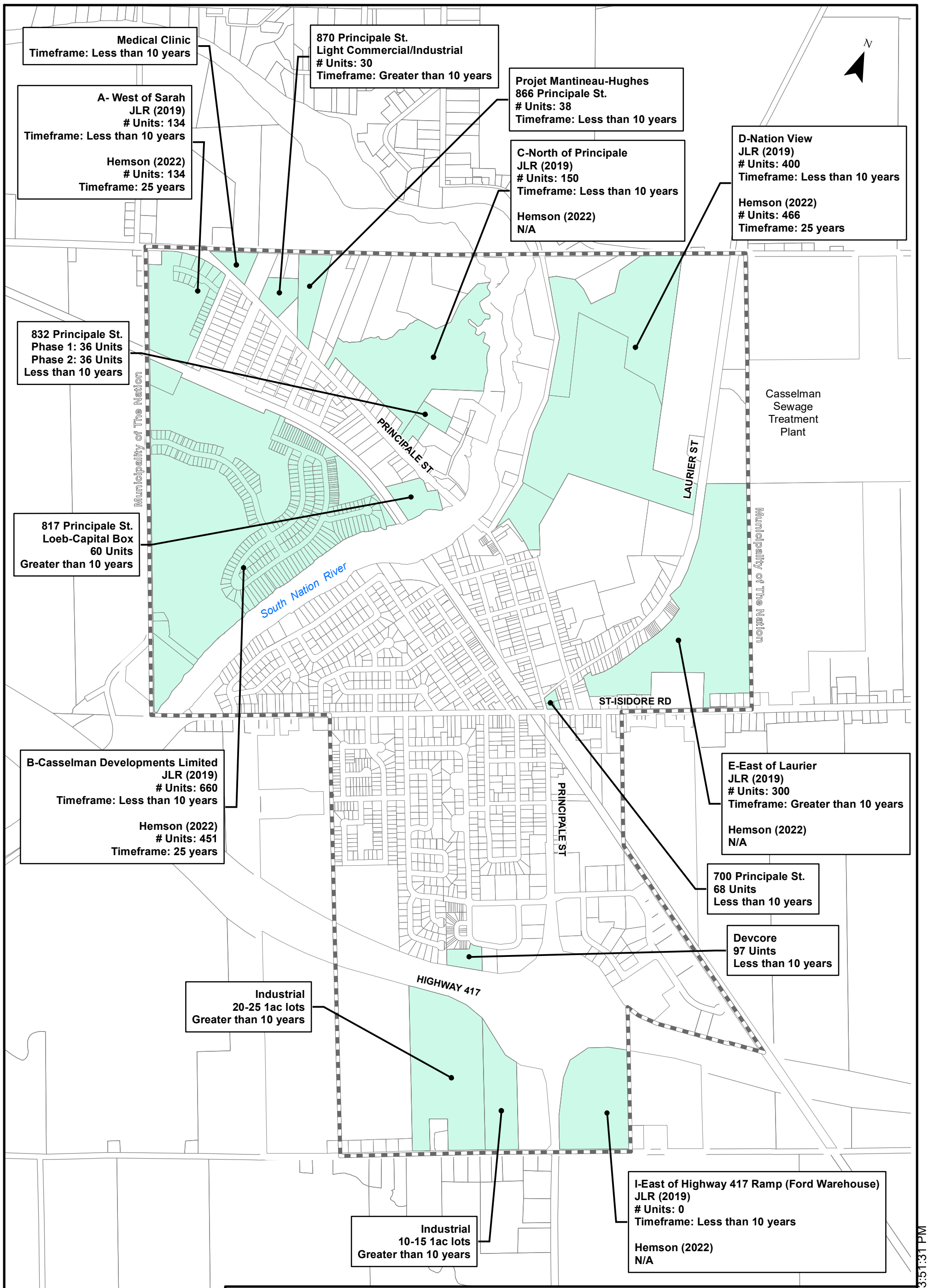

PROJECT:

MUNICIPALITY OF CASSELMAN
WATER AND WASTEWATER MASTER PLAN
CASSELMAN, ONTARIO

DRAWING:

DEVELOPMENT FORECAST

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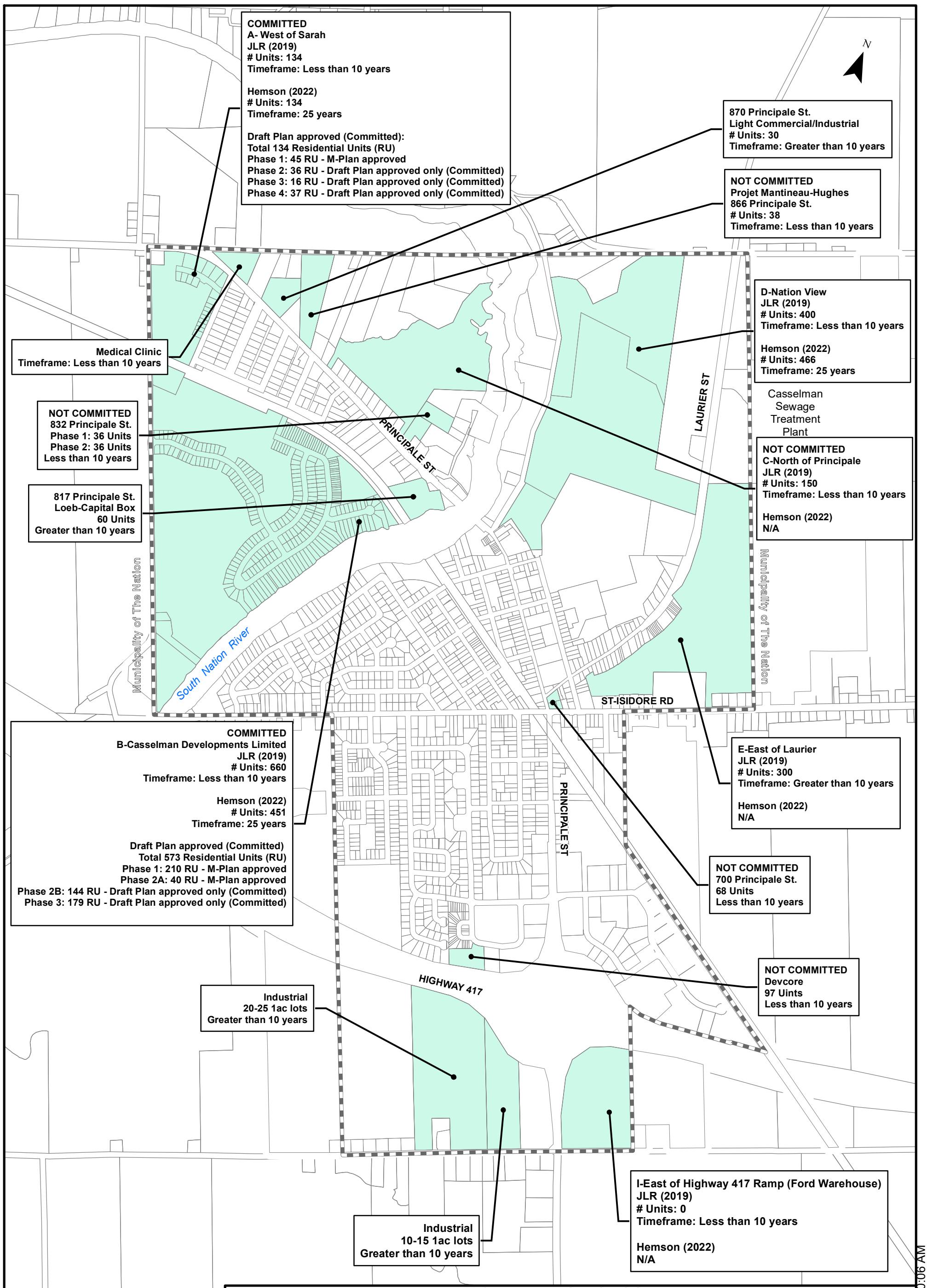

PROJECT:

MUNICIPALITY OF CASSELMAN
WATER AND WASTEWATER MASTER PLAN
CASSELMAN, ONTARIO

DRAWING:

COMMITTED UNITS

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Appendix G

Municipality of Casselman
Sewage Treatment System
Uncommitted Hydraulic
Reserve Capacity – 2022
(September 21, 2023)

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September 21, 2023
Our File: 16953-120

VIA E-MAIL ppbeauchamp@casselman.ca

Pierre-Paul Beauchamp
Director of Public Works
The Corporation of the Municipality of Casselman
751 St. Jean Street
PO Box 710
Casselman, ON K0A 1M0

Dear Mr. Beauchamp:

Re: Municipality of Casselman Sewage Treatment System
Uncommitted Hydraulic Reserve Capacity - as of December 2022 (REV 4)

This letter report summarizes the methodology and calculations used to determine the Uncommitted Hydraulic Reserve Capacity for the Municipality of Casselman Sewage Treatment System, as of December 2022.

BACKGROUND

J.L. Richards & Associates Limited (JLR) was retained by the Municipality of Casselman (the Municipality) to update calculations for uncommitted hydraulic reserve capacity of their existing lagoon-based sewage treatment system, in order to determine treatment capacity constraints on future development.

The Casselman Sewage Treatment System (Casselman STS) consists of two (2) facultative lagoon cells (Cells 'A' and 'B'), an aerated lagoon cell (Cell 'C'), an aeration system, a phosphorous removal system, a wetwell and pumping system to supply two Moving Bed Biofilm Reactor (MBBR) process tanks, a Disc Filter, and a flow measurement system. The system also includes a main sewage pumping station and a forcemain. The Casselman STS has an average rated flow capacity of 2,110 m^3/day. This facility operated under the Ministry of the Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) No. 2712-6RVNRB from August 24, 2006, until October 2, 2018. On October 3rd, 2018, the ECA was amended, and as a result, this facility was operating under ECA No. 8225-B3HSD4. The ECA was further amended in 2019 to improve the performance of the lagoon sewage treatment system and ECA No. 8160-BAHPRF dated April 29, 2019, was issued. ECA No. 8160-BAHPRF came into effect prior to the fall discharge in 2020, upon completion of the modifications to the sewage treatment system identified within this approval.

The following establishes the theoretical uncommitted hydraulic reserve capacity based on the most recent ECA, draft approved development information reported, and existing usage.

CANADA'S BEST MANAGED COMPANIES

September 21, 2023
Our File: 16953-120

Pierre-Paul Beauchamp, The Corporation of the Municipality of Casselman

METHODOLOGY

The methodology used to determine the Uncommitted Hydraulic Reserve Capacity is based on the MECP document titled "Procedure D-5-1: Calculating and Reporting Uncommitted Reserve Capacity at Sewage and Water Treatment Plants" (March 1995). The uncommitted reserve capacity is calculated by subtracting the total average daily flow (raw sewage flows), and the potential daily sewage flow predicted for draft approved developments (committed hydraulic reserve capacity) from the Casselman STS rated capacity. Additionally, a 5% intensification of existing dwellings was included as part of the committed reserve flow calculation based on feedback provided by the Municipality.

TOTAL AVERAGE DAILY FLOW

The average annual daily flows for the Casselman STS for the past five years (2018-2022) were obtained from the Municipality. A 3- and 5-year average were calculated using the average annual daily flows of the past five years. Table 1 below summarizes the calculated total average daily flow. MECP Procedure D-5-1 allows for the use of either a 3-year average or a 5-year average of the average daily flow. The 3-year average was used for this review since the total average daily flow was slightly more conservative with this approach.

Table 1: Total Average Daily Flow (2018-2022)

Year	Average Annual Daily Flow (m^3/day)
2018	1,331
2019	1,354
2020	1,468
2021	1,310
2022	1,442
3-Year Average (2020-2022)	**1,407**
5-Year Average (2018-2022)	**1,381**

HYDRAULIC RESERVE CAPACITY

According to ECA No. 8160-BAHPRF the Casselman STS has a rated raw sewage influent capacity of 2,110 m^3/day. The hydraulic reserve capacity may be obtained by subtracting the total average daily flow from the rated capacity. Based on the above, the hydraulic reserve capacity of the Casselman STS as of 2022 is 2,110 m^3/d –1,407 m^3/d = 703 m^3/day.

COMMITTED HYDRAULIC RESERVE CAPACITY

Committed development information used within this report is based on information provided by the Municipality. The amount of flow attributed to approved and draft approved developments and inclusion of existing dwellings intensification units is summarized in Table 2 below.

September 21, 2023
Our File: 16953-120

Pierre-Paul Beauchamp, The Corporation of the Municipality of Casselman

Table 2: Committed Reserve Capacity

Development	**Units**	**Equivalent Population [1]**
New Construction – Vacant [2]	N/A	N/A
Casselman Developments Limited		
Phase 1 (M-Plan Approved)	6	14
Phase 2 A (M-Plan Approved)	6	14
Phase 2B (Draft Plan Approved Only - Committed)	144	342
Phase 2C (Draft Plan Approved Only - Committed)	37	88
Phase 3 (Draft Plan Approved Only - Committed)	230	546
West of Sarah		
Phase 1 (M-Plan Approved)	26	62
Phase 2 (Draft Plan Approved Only - Committed)	36	86
Phase 3 (Draft Plan Approved Only - Committed)	16	38
Phase 4 (Draft Plan Approved Only - Committed)	37	88
821 Principale St. (Building permit issued - Committed)	9	21
825 Principale St. (Building permit issued - Committed)	9	21
17 Aquatria St. (Senior Housing) (Draft Plan approved only – Committed) [3]	50	100
720-722 St. Joseph St. (Building permit issued - Committed)	6	14
Intensification of Existing Units		
Existing Dwellings (1,337 units per 2021 Census) [4]	67	159
Total		**1,593**
Average Committed Reserve Flow (m^3/day) [5]		**558**

[1] Assumes 2.375 people per unit (DC Bylaw Schedule 5, Municipality of Casselman, Mid-2023 to Mid-2046)
[2] The Municipality confirmed that no vacant units are to be considered in this review
[3] Assumes 2.00 people per unit for Senior Housing
[4] Assume 5% intensification for existing dwelling units
[5] Based on an average day per capita usage of 0.35 m^3/d/cap

As shown in Table 2, using the total equivalent population and an average day per person usage of 0.35 m^3/d/cap (MECP Design Guidelines for Sewer Works 2008), the "committed" hydraulic reserve capacity is calculated as 1,593 persons x 0.35 m^3/d/person = 558 m^3/d.

UNCOMMITTED HYDRAULIC RESERVE CAPACITY

Based on MECP Procedure D-5-1, the "uncommitted" hydraulic reserve capacity is calculated by subtracting the hydraulic reserve capacity from the "committed" hydraulic reserve capacity. The "uncommitted" hydraulic reserve capacity is 703 m^3/day - 558 m^3/d = 145 m^3/d.

As such, based on MECP Procedure D-5-1 and reported approved/draft approved development information, the Municipality has allocated approximately 93% of the entire hydraulic reserve capacity of the Casselman STS. The remaining residual capacity would be available to support an additional 175 residential units above the developments noted in Table 2.

PROJECTED TIMING FOR CASSELMAN STS EXPANSION

Based on the wastewater demands presented in this report and growth development timelines confirmed by the Municipality, a graph representing the projected average daily wastewater demands of the Casselman STS and anticipated timing to reach 80%, 90%, and 100% of the rated capacity was prepared.

This graph indicates that based on the Municipality's anticipated growth numbers (as further refined during the master planning study), 80% of the STS rated capacity will be reached by the end of 2023, 90% STS rated capacity will be reached sometime in 2025, and the rated capacity of the STS will be reached sometime in 2026.

SUMMARY

Based on the current wastewater generated within the Municipality and the number of draft approved developments, the calculations presented in this report indicate that there is sufficient hydraulic reserve capacity available at the Casselman STS to service all draft approved developments, including 5% intensification of existing lots.

However, as stated in the MECP ECA No. 8160-BAHPRF, once 80% of the rated capacity limit is reached a summary of efforts made to achieve the design objectives in the Approval, including an assessment of the issues and recommendations for pro-active actions to prevent flow exceedances and operational issues, should be completed by the Municipality.

The Municipality has proactively taken steps to review their overall infrastructure needs as they are currently working with J.L. Richards & Associates on a master planning study to assess various options to improve the performance and reliability of the water and wastewater treatment and sewage collection systems to ensure they can be relied upon to accommodate current and future flows generated within the Municipality.

Since the Municipality is currently experiencing high development pressures, it is recommended that an uncommitted reserve capacity calculation is undertaken on an annual basis to review any changes to the assumptions and impact on the projected timelines and to determine the need to initiate the planning process (i.e., Class Environmental Assessment) for a Casselman STS expansion.

September 21, 2023
Our File: 16953-120

Pierre-Paul Beauchamp, The Corporation of the Municipality of Casselman

Yours very truly,

J.L. RICHARDS & ASSOCIATES LIMITED

Meaghan Keon

Jordan Morrissette

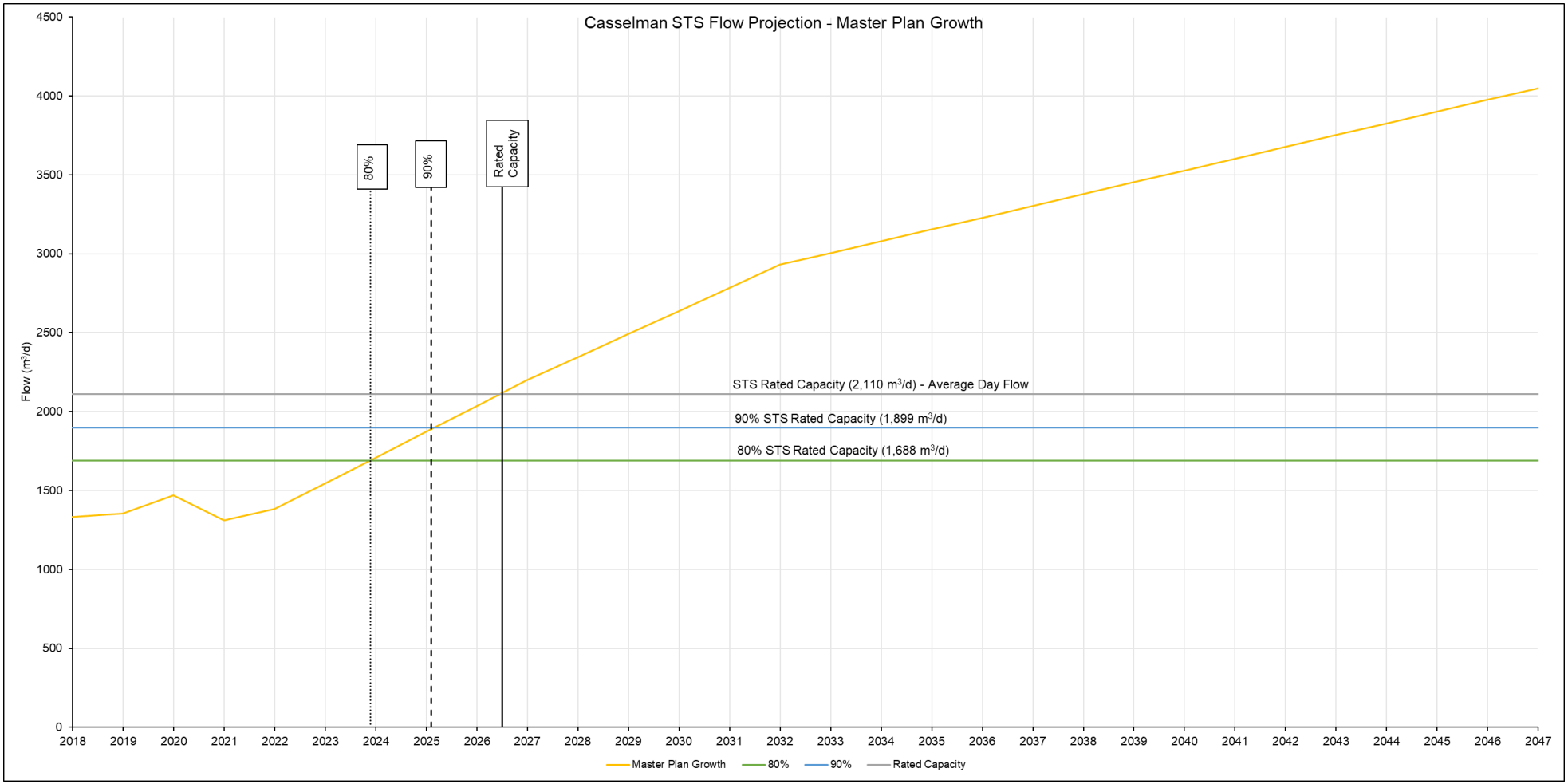
Meaghan Keon, MASc., EIT
Environmental Engineering Intern

Jordan Morrissette, M.Eng., P.Eng.
Associate
Senior Environmental Engineer

MK/JM

Appendix A

Casselman STS Flow Projection – Master Plan Growth


Casselman STS Flow Projection - Master Plan Growth
Flow (m³/d)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
80%
90%
Rated Capacity
STS Rated Capacity (2,110 m³/d) - Average Day Flow
90% STS Rated Capacity (1,899 m³/d)
80% STS Rated Capacity (1,688 m³/d)
Master Plan Growth
80%
90%
Rated Capacity

Appendix H

Water Model

DETAILED WATER DEMANDS - CASSELMAN PHASE 1

Water Usage Data	TOTAL NO. OF RESIDENTIAL UNITS (1)(3)	TOTAL RESIDENTIAL POP. (1)(3)	TOTAL AVG. DAY DEMAND (L/s) (2)	TOTAL MAX. DAY DEMAND (L/s) (2)	TOTAL PEAK HOUR DEMAND (L/s) (2)
	1695	4,048	12	23	34

Water Usage Data				
	TOTAL RES. FLOWS (L/s)	8.19	18.68	26.56
	TOTAL ICI FLOWS (L/s)	3.32	4.12	6.12
	TOTAL SCHOOL FLOWS (L/s)	0.49	0.20	1.31

Notes:
1) Existing units and populations for residential areas within the municipality are based on Watson's Report (2023)
2) Total ADD, MDD and PHD are based on 5 year average metered data from 2018 to 2022
3) Average Unit Density is assumed as 2.39 persons per unit (Watson's Report, 2023)

Legend:		
	(No Colour)	Residential Areas
	(Green)	ICI Flows per 2010 Water Model
	(Yellow)	New Areas Part of 2022 Model
	(Orange)	School

DETAILED WATER USAGE BREAKDOWN IN MODEL

NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-1	11.29	26.97	0.05	0.12	0.18
J-2	21.46	51.24	0.10	0.23	0.34
J-2			0.07	0.09	0.11
J-3	6.78	16.18	0.03	0.07	0.11
J-3			0.18	0.22	0.27
J-4	7.90	18.88	0.04	0.08	0.12
J-4			0.01	0.02	0.02
J-5	19.20	45.85	0.09	0.20	0.30
J-5			0.12	0.14	0.17
J-7	14.68	35.06	0.07	0.15	0.23
J-7			0.13	0.17	0.20

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-8	11.29	26.97	0.05	0.12	0.18
J-9			0.01	0.01	0.01
J-10	6.78	16.18	0.03	0.07	0.11
J-10			0.07	0.09	0.10
J-11	5.65	13.48	0.03	0.06	0.09
J-11			0.09	0.11	0.13
J-12	6.78	16.18	0.03	0.07	0.11
J-12			0.12	0.15	0.18
J-13	18.07	43.15	0.09	0.19	0.28
J-13			0.01	0.01	0.01
J-14	11.29	26.97	0.05	0.12	0.18
J-14			0.03	0.04	0.05
J-15	5.65	13.48	0.03	0.06	0.09
J-16	14.68	35.06	0.07	0.15	0.23
J-17	5.65	13.48	0.03	0.06	0.09
J-18	7.90	18.88	0.04	0.08	0.12
J-18			0.01	0.01	0.02
J-19	5.65	13.48	0.03	0.06	0.09
J-20	11.29	26.97	0.05	0.12	0.18
J-21	9.03	21.57	0.04	0.10	0.14
J-23	7.90	18.88	0.04	0.08	0.12
J-24	11.29	26.97	0.05	0.12	0.18
J-25			0.00	0.00	0.00
J-26	19.20	45.85	0.09	0.20	0.30
J-27	4.52	10.79	0.02	0.05	0.07
J-28			0.03	0.03	0.04
J-29	7.90	18.88	0.04	0.08	0.12
J-29			0.00	0.01	0.01
J-30	10.16	24.27	0.05	0.11	0.16
J-31	16.94	40.45	0.08	0.18	0.27
J-32	24.84	59.33	0.12	0.24	0.39

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-33	22.58	53.94	0.11	0.01	0.35
J-34			0.01	0.07	0.01
J-35	6.78	16.18	0.03	0.49	0.11
J-36			0.39	0.00	0.58
J-37			0.00	0.18	0.00
J-38	16.94	40.45	0.08	0.07	0.27
J-39	6.78	16.18	0.03	0.07	0.11
J-40			0.06	0.07	0.09
J-41			0.05	0.24	0.08
J-42	22.58	53.94	0.11	0.25	0.35
J-43	23.71	56.63	0.11	0.00	0.37
J-45			0.00	0.14	0.00
J-46	13.55	32.36	0.07	0.24	0.21
J-47	22.58	53.94	0.11	0.03	0.35
J-47			0.03	0.20	0.04
J-48			0.13	0.08	0.36
J-48			0.06	0.14	0.09
J-49	13.55	32.36	0.07	0.13	0.21
J-50	12.42	29.67	0.06	0.26	0.19
J-51	24.84	59.33	0.12	0.19	0.39
J-52	18.07	43.15	0.09	0.24	0.28
J-53	22.58	53.94	0.11	0.13	0.35
J-54	12.42	29.67	0.06	0.17	0.19
J-55	15.81	37.76	0.08	0.06	0.25
J-56	5.65	13.48	0.03	0.07	0.09
J-59	6.78	16.18	0.03	0.13	0.11
J-60	12.42	29.67	0.06	0.17	0.19
J-61	15.81	37.76	0.08	0.38	0.25
J-62	36.14	86.30	0.17	0.12	0.57
J-63	11.29	26.97	0.05	0.12	0.18
J-64	11.29	26.97	0.05	0.17	0.18

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-65	15.81	37.76	0.08	0.20	0.25
J-66	19.20	45.85	0.09	0.19	0.30
J-67	18.07	43.15	0.09	0.12	0.28
J-68	11.29	26.97	0.05	0.23	0.18
J-69	21.46	51.24	0.10	0.15	0.34
J-70	14.68	35.06	0.07	0.12	0.23
J-71	11.29	26.97	0.05	0.08	0.18
J-72	7.90	18.88	0.04	0.12	0.12
J-73	11.29	26.97	0.05	0.08	0.18
J-74	7.90	18.88	0.04	0.06	0.12
J-75	5.65	13.48	0.03	0.06	0.09
J-76	5.65	13.48	0.03	0.12	0.09
J-77	11.29	26.97	0.05	0.19	0.18
J-78	18.07	43.15	0.09	0.10	0.28
J-79	9.03	21.57	0.04	0.07	0.14
J-80	6.78	16.18	0.03	0.05	0.11
J-81	4.52	10.79	0.02	0.07	0.07
J-82	6.78	16.18	0.03	0.18	0.11
J-83	16.94	40.45	0.08	0.15	0.27
J-84	14.68	35.06	0.07	0.15	0.23
J-85	14.68	35.06	0.07	0.06	0.23
J-87	5.65	13.48	0.03	0.12	0.09
J-88	11.29	26.97	0.05	0.20	0.18
J-90			0.13	0.10	0.36
J-91			0.08	0.16	0.12
J-92			0.13	0.41	0.19
J-93			0.28	0.09	0.75
J-93			0.07	0.08	0.11
J-94			0.06	0.61	0.09
J-95			0.41	0.05	1.11
J-97	4.52	10.79	0.02	0.05	0.07

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-98	4.52	10.79	0.02	0.10	0.07
J-99	9.03	21.57	0.04	0.10	0.14
J-100	9.03	21.57	0.04	0.15	0.14
J-101	14.68	35.06	0.07	0.17	0.23
J-102	15.81	37.76	0.08	0.11	0.25
J-103	10.16	24.27	0.05	0.12	0.16
J-104	11.29	26.97	0.05	0.12	0.18
J-105	11.29	26.97	0.05	0.30	0.18
J-106	28.23	67.42	0.14	0.11	0.44
J-109	10.16	24.27	0.05	0.17	0.16
J-110	15.81	37.76	0.08	0.11	0.25
J-110			0.08	0.08	0.13
J-113	7.90	18.88	0.04	0.43	0.12
J-114			0.35	0.13	0.52
J-115	12.42	29.67	0.06	0.07	0.19
J-116	6.78	16.18	0.03	0.01	0.11
J-116			0.01	0.05	0.02
J-120	4.52	10.79	0.02	0.13	0.07
J-121	12.42	29.67	0.06	0.07	0.19
J-122	6.78	16.18	0.03	0.17	0.11
J-123	15.81	37.76	0.08	0.13	0.25
J-125	12.42	29.67	0.06	0.02	0.19
J-126	2.26	5.39	0.01	0.12	0.04
J-127	11.29	26.97	0.05	0.13	0.18
J-128	12.42	29.67	0.06	0.12	0.19
J-129	11.29	26.97	0.05	0.14	0.18
J-132			0.11	0.14	0.17
J-135	13.55	32.36	0.07	0.07	0.21
J-136	6.78	16.18	0.03	0.07	0.11
J-137	6.78	16.18	0.03	0.08	0.11
J-138	7.90	18.88	0.04	0.14	0.12

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	NO. OF UNITS (SINGLES)	POP'N	AVG. DAY DEMAND (L/s)	MAX. DAY DEMAND (L/s)	PEAK HOUR DEMAND (L/s)
J-139	13.55	32.36	0.07	0.08	0.21
J-140	7.90	18.88	0.04	0.17	0.12
J-141	15.81	37.76	0.08	0.17	0.25
J-142	15.81	37.76	0.08	0.12	0.25
J-143	11.29	26.97	0.05	0.08	0.18
J-145	7.90	18.88	0.04	0.05	0.12
J-147	4.52	10.79	0.02	0.18	0.07
J-148	16.94	40.45	0.08	0.30	0.27
J-154	28.23	67.42	0.14	0.33	0.44
J-155	31.62	75.51	0.15	0.12	0.50
J-181	11.29	26.97	0.05	0.06	0.18
J-183	5.65	13.48	0.03	0.14	0.09
J-184	13.55	32.36	0.07	0.73	0.21
J-185			0.49	0.20	1.31
J-211	19.20	45.85	0.09	0.27	0.30
J-212	25.97	62.03	0.13	0.26	0.41
J-213	24.84	59.33	0.12	0.15	0.39
J-214	14.68	35.06	0.07	0.14	0.23
J-215	13.55	32.36	0.07	0.08	0.21
J-216	7.90	18.88	0.04	0.10	0.12
J-217	9.03	21.57	0.04	0.26	0.14
J-218	24.84	59.33	0.12	0.21	0.39
J-219	20.33	48.54	0.10	0.13	0.32
J-220	12.42	29.67	0.06	0.37	0.19
J-238	35.01	83.60	0.17	0.12	0.55
J-240	11.29	26.97	0.05	0.08	0.18
J-248	7.90	18.88	0.04	0.08	0.12
J-253	7.90	18.88	0.04	0.19	0.12
J-275	18.07	43.15	0.09	0.07	0.28
J-278	6.78	16.18	0.03	0.05	0.11
J-295	4.52	10.79	0.02	0.24	0.07

DETAILED WATER USAGE BREAKDOWN IN MODEL					
NODE ID	**NO. OF UNITS (SINGLES)**	**POP'N**	**AVG. DAY DEMAND (L/s)**	**MAX. DAY DEMAND (L/s)**	**PEAK HOUR DEMAND (L/s)**
J-296	22.58	53.94	0.11	0.05	0.35
TOTALS	**1695**	**4048**	**12**	**23**	**34**

Casselman Water Model

PMP-1 (Pump curve)

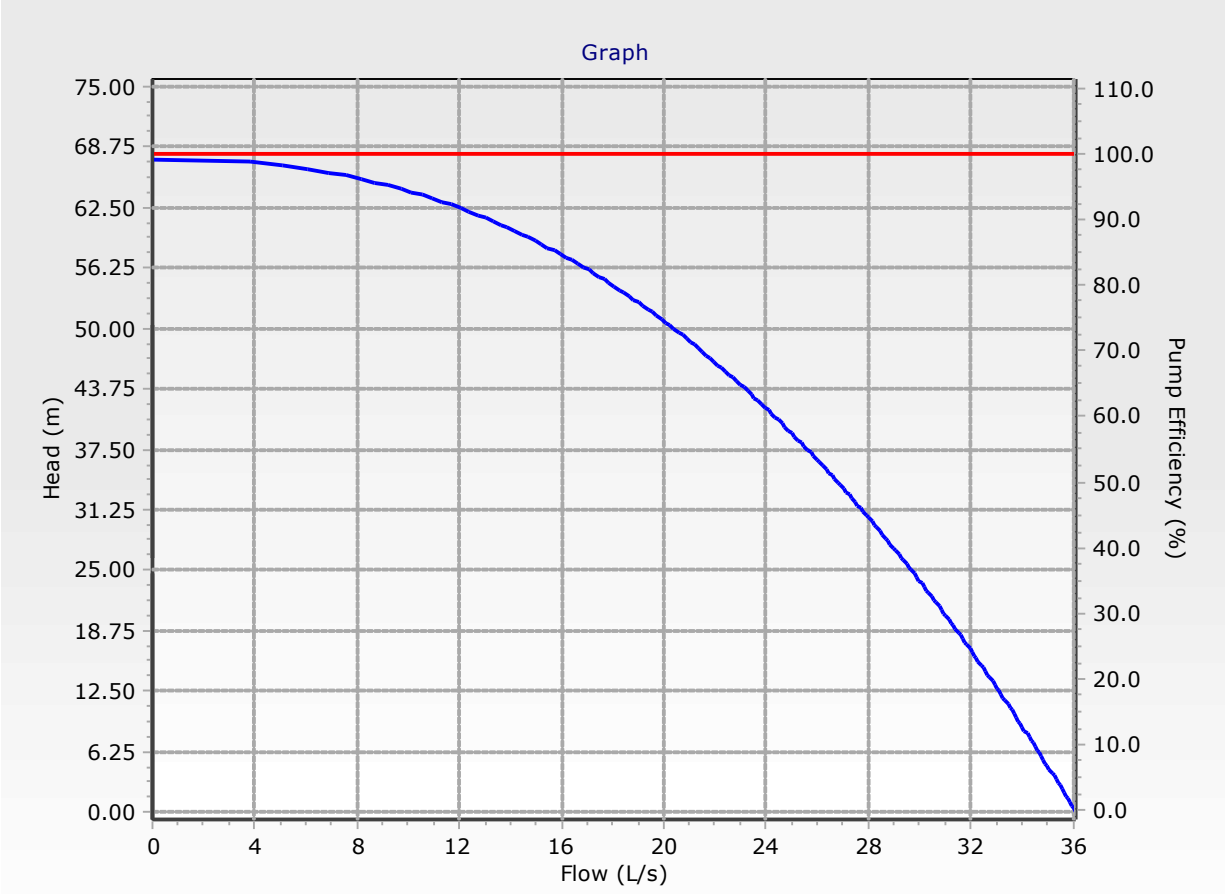
Element Details			
ID	181	Notes	
Label	PMP-1 (Existing)		

Pump Curve

Flow (L/s)	Head (m)
0	67.67
15	57.91
19	53.65
27	34.75

Pump Efficiency Type			
Pump Efficiency Type	Constant Efficiency	Motor Efficiency	100.0 %
Constant Efficiency	100.0 %	Is Variable Speed Drive?	False

Transient (Physical)			
Inertia (Pump and Motor)	0.000 kg·m²	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True



Casselman Water Model

PMP-2 (Pump curve)

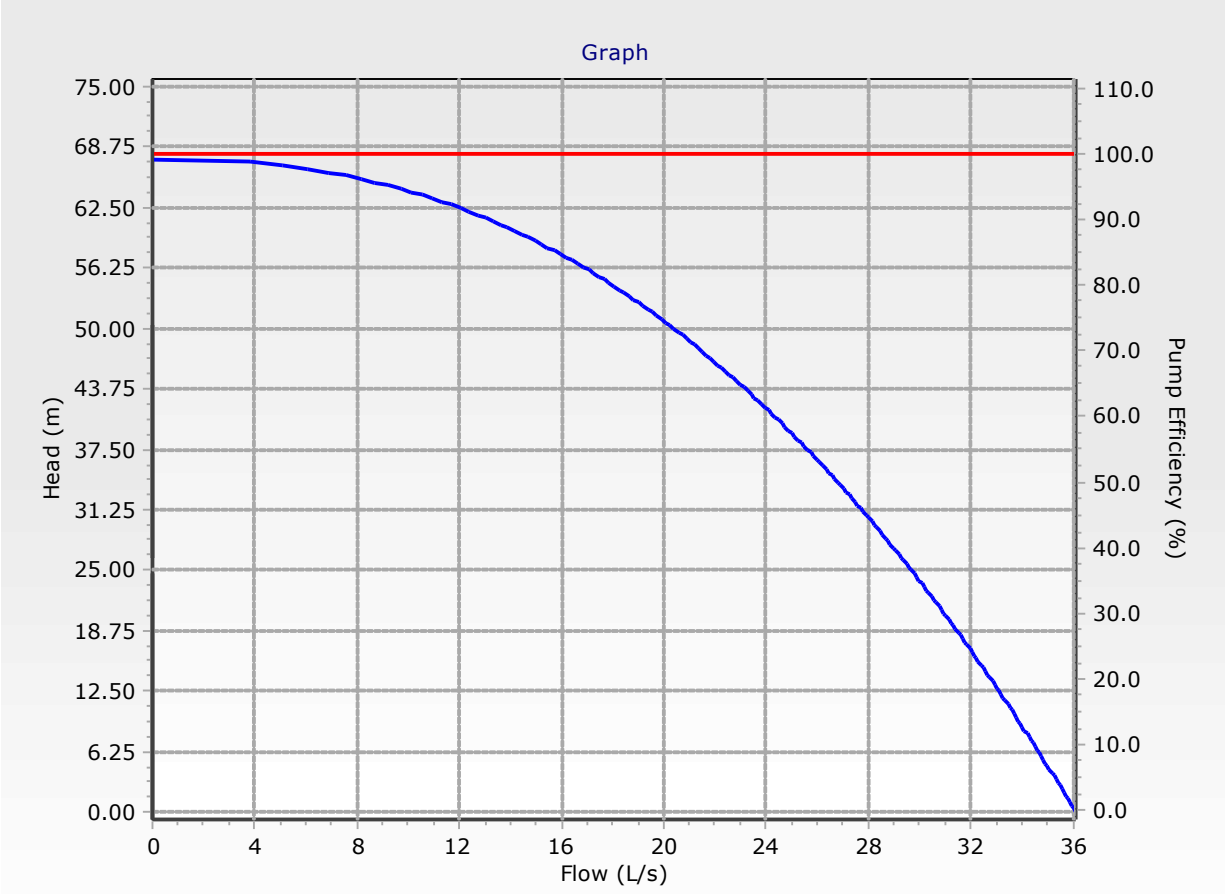
Element Details			
ID	180	Notes	
Label	PMP-2 (Existing)		

Pump Curve

Flow (L/s)	Head (m)
0	67.67
15	57.91
19	53.65
27	34.75

Pump Efficiency Type			
Pump Efficiency Type	Constant Efficiency	Motor Efficiency	100.0 %
Constant Efficiency	100.0 %	Is Variable Speed Drive?	False

Transient (Physical)			
Inertia (Pump and Motor)	0.000 kg·m²	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True



1000-343 Preston Street, Ottawa, ON K1S 1N4
Direct: 343-804-9370

J.L. Richards
& Associates Limited
ENGINEERS · ARCHITECTS · PLANNERS

CANADA BEST MANAGED COMPANIES Platinum member

From: Dawn Crump <DCrump@ocwa.com>
Sent: April 26, 2023 1:02 PM
To: Tatyana Roumie <troumie@jlrichards.ca>
Subject: Fwd: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Response from operations can be found below.

Dawn

Sent from my iPhone

Begin forwarded message:

> **From:** Caroline Lamarche <CLamarche@ocwa.com>
> **Date:** April 26, 2023 at 12:48:19 PM EDT
> **To:** Dawn Crump <DCrump@ocwa.com>
> **Subject: FW: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2**
>
> Hi Dawn,
>
> The max psi in town, with the tower full (98%) and the plant running is 52 psi. Other then that, we don't know what 90% equals to in meters. I would assume that the tank height from the tank inspection report is more accurate given that the drawings could have been preliminary...
>
> Hope that helps,
> Caroline
>
> **Caroline Lamarche**
> Process & Compliance Technician
> Nation Valley Cluster
> Cell: (613) 551-3386
> ONTARIO CLEAN WATER AGENCY
> AGENCE ONTARIENNE DES EAUX

From: Erin Markham
Sent: April-26-23 9:20 AM
To: Caroline Lamarche <CLamarche@ocwa.com>; Sebastien Cadieux <SCadieux@ocwa.com>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Ok so he says 36.5 m when it is at 52 psi which is full…1m = 9.8 kpa or 1 psi= 2.31 ft

Hope that helps ☺

Erin Markham
Process & Compliance Technician
Prescott-Russell Cluster
Office: 613-675-1920
Cell: 647-237-1845
ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

From: Caroline Lamarche <CLamarche@ocwa.com>
Sent: April-25-23 3:20 PM
To: Erin Markham <EMarkham@ocwa.com>; Sebastien Cadieux <SCadieux@ocwa.com>
Subject: FW: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Hi,

Do you know what the % of the Casselman Tower equals in meters? Aka the elevation that corresponds with 90%.

Thanks!
Caroline

Caroline Lamarche
Process & Compliance Technician
Nation Valley Cluster
Cell: (613) 551-3386
ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

From: Dawn Crump <DCrump@ocwa.com>
Sent: April 25, 2023 2:43 PM
To: John Cameron <JCameron@ocwa.com>; Jonathan Hartle <JHartle@ocwa.com>; Caroline Lamarche <CLamarche@ocwa.com>

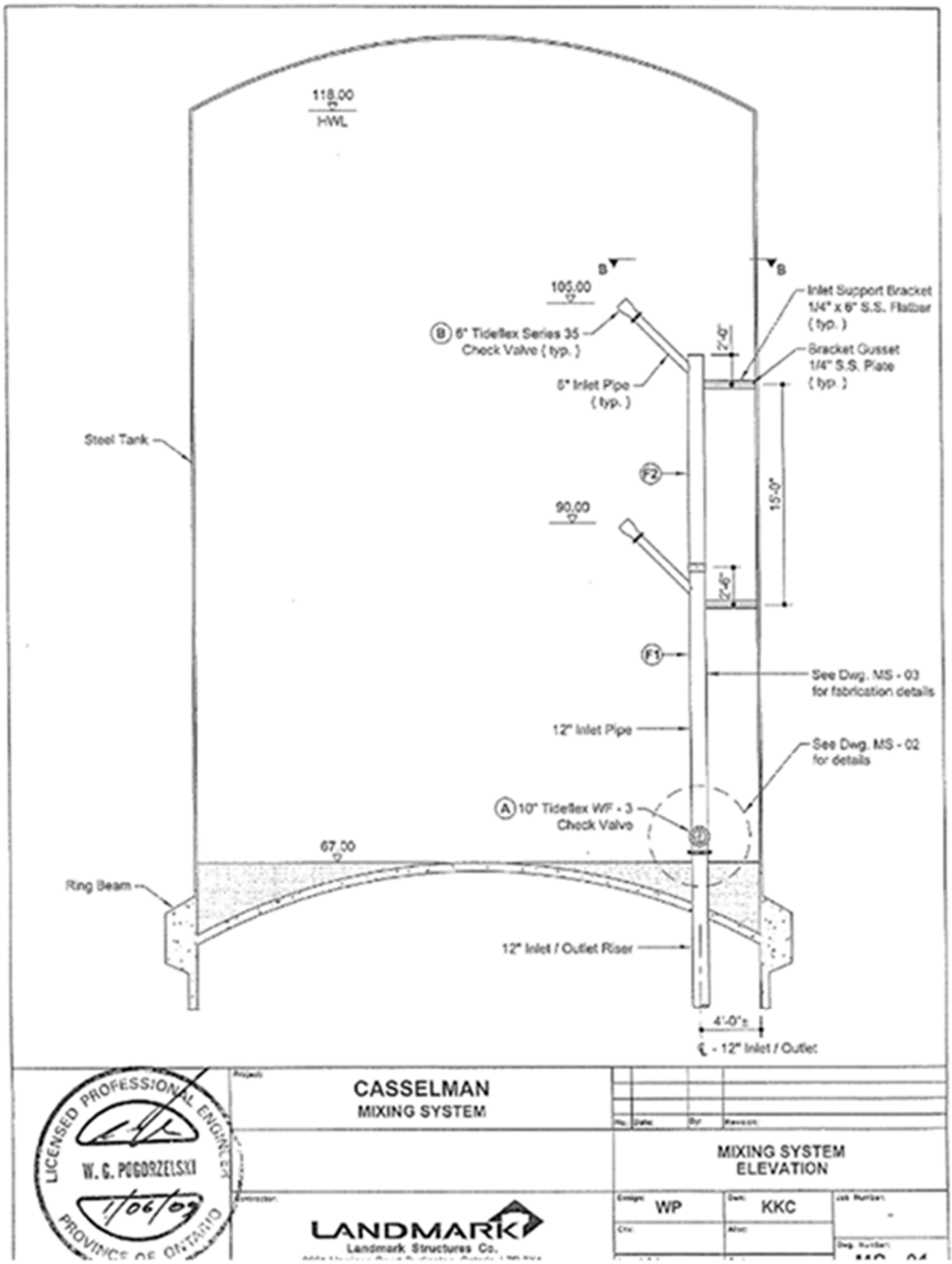
Jingmiao Shi <sshi@jlrichards.ca>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Hi Dawn,

Thanks for your response. There are discrepancies between the Inspection Report you provided and the drawing below. The High Water Level (HWL) in this Report is 111.35 m but the drawing shows 118 m. In the report, the ground elevation is 66.14 m and the tank height is 41.50 m, which results in a tank height of 107.64 m. Therefore, the HWL in the drawing below is higher than the tank height from the report.

You mentioned that the operating levels for the tower on the Scada are for a 90% start and 98% stop. We are trying to determine the elevation that corresponds to the 90%.

Please let me know if you can provide this elevation.



Thanks,
Tatyana

From: Dawn Crump <DCrump@ocwa.com>
Sent: April 19, 2023 8:48 AM

To: Tatyana Roumie <troumie@jlrichards.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Hi Tatyana,

We are not able to confirm the exact location of the overflow based on the information that we have at this time, but I've attached the most recent tower inspection report here, in case it contains any additional information that may be useful to you.

Dawn

Dawn Crump
Senior Operations Manager
Nation Valley Cluster
Ontario Clean Water Agency
Cell: (613) 223-2207

From: Tatyana Roumie <troumie@jlrichards.ca>
Sent: April-17-23 3:25 PM
To: Dawn Crump <DCrump@ocwa.com>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Dawn,

I just wanted to follow up with you, we would like to confirm that the standpipe base elevation is 67 m and the standpipe overflow elevation is 118 m (this would be 100% full).

Therefore, the start level would be at 90% of this volume between 67 and 118 m?

Any chance we could receive a response early this week? 😊

Thanks,
Tatyana

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Great, thanks!

One last question, do we have an overflow? If so, what is the HGL?

Thanks,
Tatyana

Tatyana Roumie, EIT, M.Eng.
Civil Engineering Intern

J.L. Richards & Associates Limited
1000-343 Preston Street, Ottawa, ON K1S 1N4
Direct: 343-804-9370

From: Dawn Crump <DCrump@ocwa.com>
Sent: April 5, 2023 11:24 AM
To: Tatyana Roumie <troumie@jlrichards.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

Yes, it should be referencing to the top water level.

Dawn

Dawn Crump
Senior Operations Manager
Nation Valley Cluster
Ontario Clean Water Agency
Cell: (613) 223-2207

From: Tatyana Roumie <troumie@jlrichards.ca>
Sent: April-04-23 2:24 PM
To: Dawn Crump <DCrump@ocwa.com>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>

Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Dawn,

Thank you for the quick response. Are you referring to 90% and 98% of 118 m?

Thanks,
Tatyana

Tatyana Roumie, EIT, M.Eng.
Civil Engineering Intern

J.L. Richards & Associates Limited
1000-343 Preston Street, Ottawa, ON K1S 1N4
Direct: 343-804-9370

J.L. Richards & Associates Limited
ENGINEERS · ARCHITECTS · PLANNERS

CANADA BEST MANAGED COMPANIES Platinum member

From: Dawn Crump <DCrump@ocwa.com>
Sent: April 4, 2023 11:57 AM
To: Tatyana Roumie <troumie@jlrichards.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>
Subject: RE: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

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Hi Tatyana,

The normal operating levels for the tower on the Scada are for a 90% start and 98% stop.

Dawn

Dawn Crump
Senior Operations Manager
Nation Valley Cluster
Ontario Clean Water Agency
Cell: (613) 223-2207

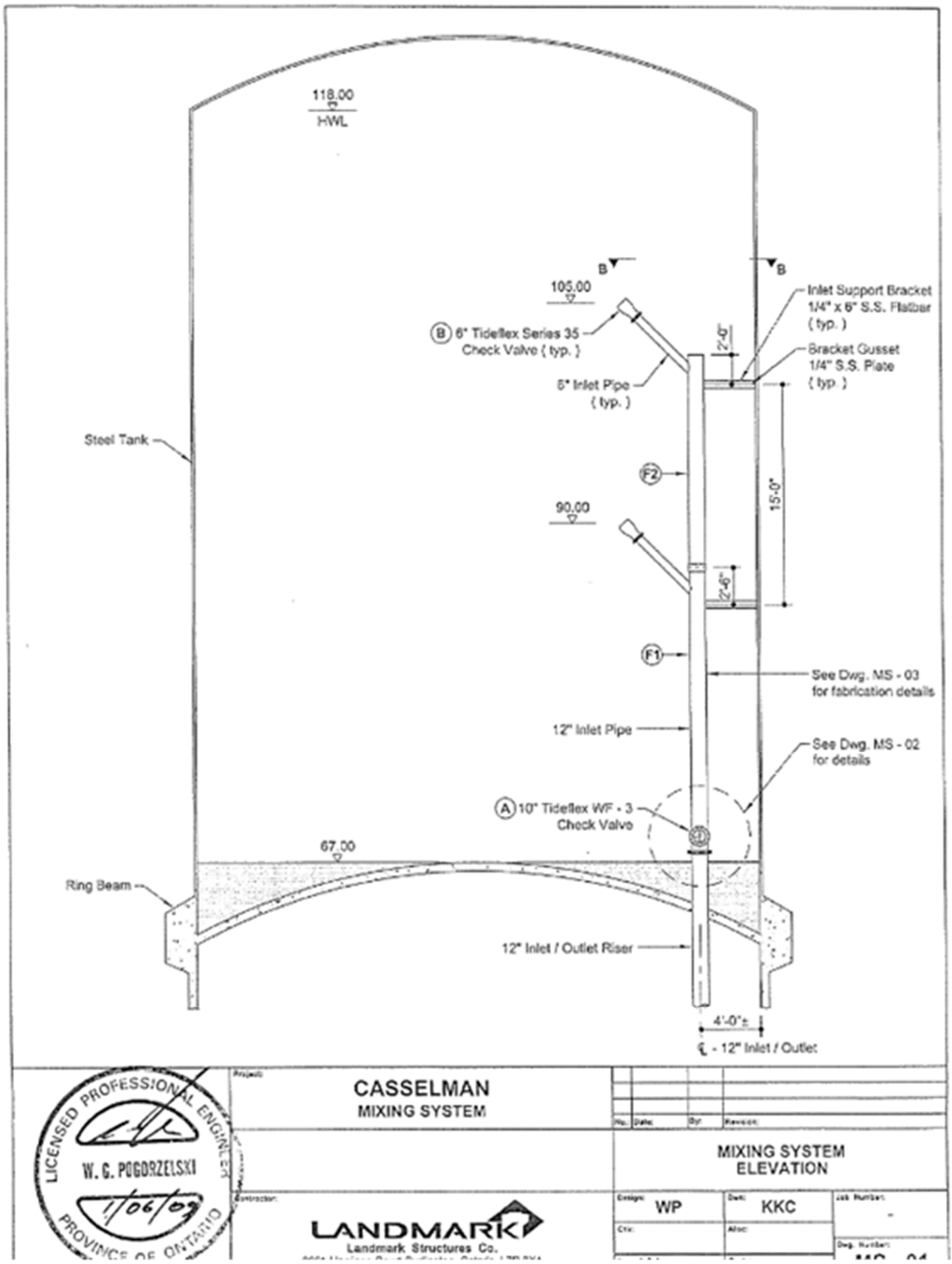
From: Tatyana Roumie <troumie@jlrichards.ca>
Sent: April-04-23 9:27 AM
To: Dawn Crump <DCrump@ocwa.com>
Cc: Annie Williams <awilliams@jlrichards.ca>; Susan Jingmiao Shi <sshi@jlrichards.ca>
Subject: 16953-118 Casselman Infrastructure Master Plan - Water Modelling for Phase 2

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello Dawn,

I am hoping you could provide the current operating start and stop levels for the standpipes.

FYI - In the previous Master Plan Phase 1 Report, we assumed that high level is 105 m and low level is 90 m. Please see the screenshot of the drawing below. These two levels match the Tideflex valves elevations.



Thanks,
Tatyana

Tatyana Roumie, EIT, M.Eng.

Casselman Water Model

Junction Elevations

ID	Label	Elevation (m)
766	J-210	63.00
800	J-226	64.82
801	J-227	65.26
803	J-228	66.00
805	J-229	66.00
807	J-230	64.00
809	J-231	63.15
811	J-232	62.00
813	J-233	66.00
821	J-236	65.57
823	J-237	67.00
870	J-249	67.00
876	J-252	68.00
1065	J-305	67.00
1070	J-306	66.00
1072	J-307	69.00
1074	J-308	67.00
1076	J-309	69.00
1079	J-311	68.00
1080	J-312	66.59
1084	J-313	66.00
1086	J-314	67.00
1089	J-315	64.00
1092	J-316	65.00
1094	J-317	66.00
1112	J-325	65.00
1115	J-326	68.00
1117	J-327	66.24
1178	J-330	66.00
1183	J-331	62.30
345	J-118	63.55
785	J-219	68.00
783	J-218	68.00
781	J-217	68.00
779	J-216	68.00
993	J-278	68.00
777	J-215	68.00
985	J-275	68.00
769	J-211	68.00
1032	J-296	68.00
1031	J-295	68.00
322	J-93	66.80
271	J-41	66.97
348	J-121	66.75
350	J-123	66.70
404	J-178	67.00
401	J-175	67.00

Casselman Water Model
Junction Elevations

ID	Label	Elevation (m)
402	J-176	67.00
403	J-177	67.00
405	J-179	67.00
878	J-253	66.62
319	J-90	66.44
347	J-120	66.50
349	J-122	66.50
343	J-116	66.45
845	J-240	66.62
321	J-92	66.30
352	J-125	66.30
342	J-115	66.29
335	J-106	66.40
336	J-107	66.40
237	J-7	66.45
374	J-147	66.00
317	J-88	66.00
277	J-48	66.00
337	J-108	66.25
787	J-220	66.01
340	J-113	66.14
292	J-63	66.00
270	J-40	66.23
354	J-127	66.00
353	J-126	66.00
272	J-42	66.14
245	J-15	65.90
267	J-37	66.45
1158	J-329	65.83
356	J-129	65.90
332	J-103	65.84
251	J-21	65.84
307	J-78	65.78
1108	J-324	65.75
996	J-279	66.00
998	J-280	66.00
1000	J-281	66.00
1002	J-282	66.00
1004	J-283	66.00
1017	J-288	66.00
1019	J-289	66.00
1025	J-292	66.00
1027	J-293	66.00
1029	J-294	66.00
359	J-132	66.00
263	J-33	65.75
255	J-25	65.78

Casselman Water Model

Junction Elevations

ID	Label	Elevation (m)
358	J-131	65.92
867	J-248	65.77
357	J-130	65.90
327	J-98	65.60
234	J-4	65.99
260	J-30	65.84
266	J-36	66.14
355	J-128	65.60
264	J-34	65.75
318	J-89	65.50
268	J-38	65.78
244	J-14	65.53
306	J-77	65.47
236	J-6	65.96
265	J-35	66.05
254	J-24	65.53
408	J-182	65.40
242	J-12	65.69
304	J-75	65.38
256	J-26	65.47
293	J-64	65.38
361	J-134	65.35
243	J-13	65.38
259	J-29	65.62
320	J-91	65.30
312	J-83	65.29
325	J-96	65.30
257	J-27	65.38
273	J-43	65.38
241	J-11	65.53
238	J-8	65.53
276	J-47	65.23
411	J-185	65.20
316	J-87	65.20
274	J-45	65.29
294	J-65	65.23
235	J-5	65.53
326	J-97	65.20
288	J-59	65.23
249	J-19	65.23
253	J-23	65.23
308	J-79	65.08
309	J-80	65.05
344	J-117	65.23
360	J-133	65.32
760	J-208	65.00
753	J-205	65.00

Casselman Water Model

Junction Elevations

ID	Label	Elevation (m)
376	J-149	65.00
328	J-99	65.00
285	J-56	65.01
269	J-39	65.20
948	J-260	65.00
949	J-261	65.00
950	J-262	65.00
951	J-263	65.00
952	J-264	65.00
969	J-268	65.00
303	J-74	64.92
382	J-155	64.88
331	J-102	64.90
290	J-61	64.92
375	J-148	64.85
252	J-22	64.92
305	J-76	64.83
407	J-181	64.81
291	J-62	64.86
323	J-94	64.80
247	J-17	64.92
409	J-183	64.80
410	J-184	64.79
370	J-143	64.78
311	J-82	64.77
284	J-55	64.83
289	J-60	64.83
333	J-104	64.80
334	J-105	64.80
367	J-140	64.75
301	J-72	64.77
287	J-58	64.80
362	J-135	64.74
330	J-101	64.70
240	J-10	64.92
295	J-66	64.70
248	J-18	64.77
302	J-73	64.62
369	J-142	64.61
373	J-146	64.60
329	J-100	64.60
246	J-16	64.62
286	J-57	64.59
324	J-95	64.50
381	J-154	64.50
744	J-201	64.50
746	J-202	64.50

Casselman Water Model

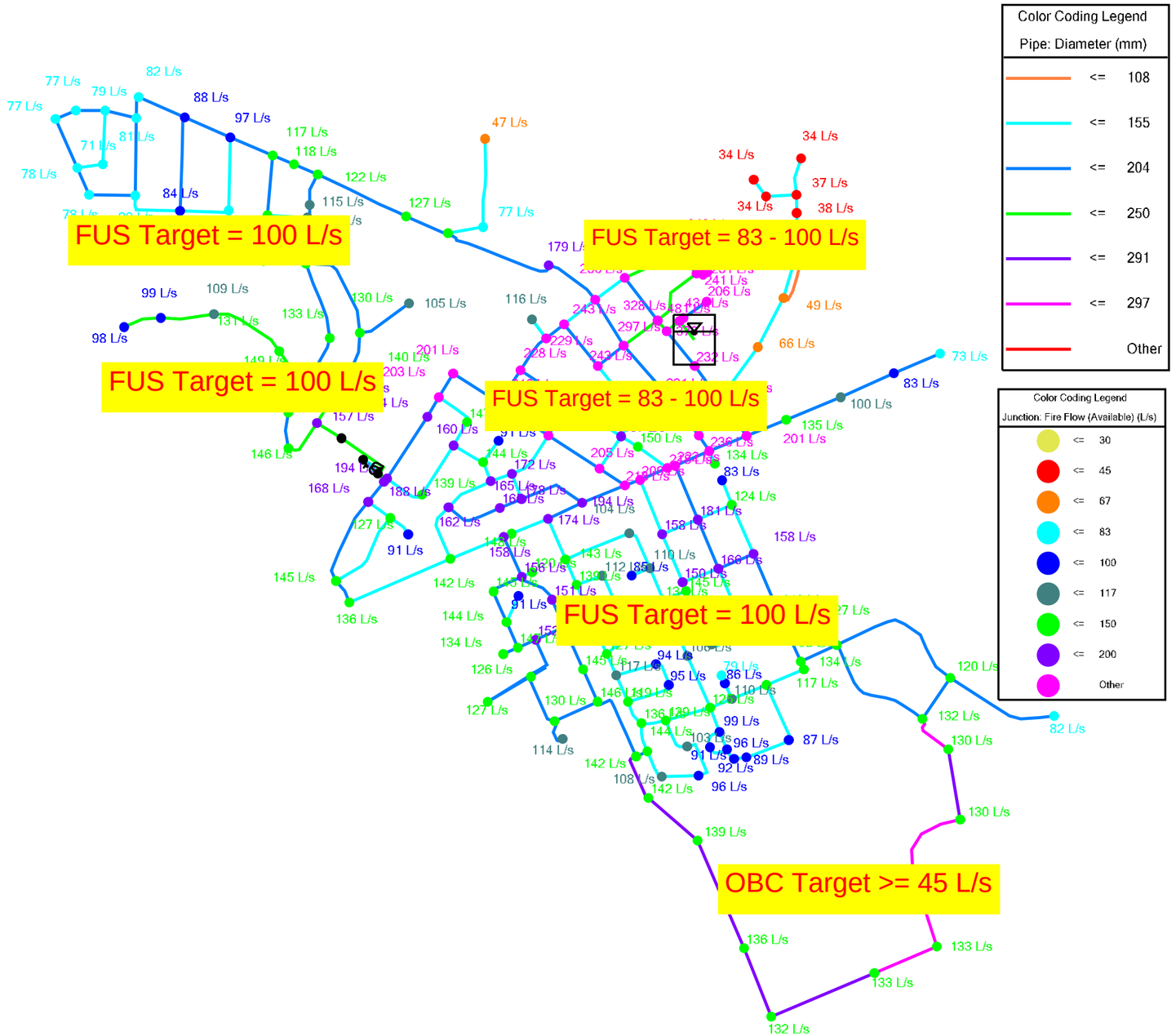
Junction Elevations

ID	Label	Elevation (m)
314	J-85	64.47
250	J-20	64.47
239	J-9	64.62
406	J-180	64.30
315	J-86	64.30
371	J-144	64.29
310	J-81	64.28
363	J-136	64.26
313	J-84	64.25
365	J-138	64.15
339	J-110	64.10
366	J-139	64.10
368	J-141	64.09
773	J-213	64.11
364	J-137	64.05
233	J-3	64.47
775	J-214	64.09
748	J-203	64.00
763	J-209	64.00
372	J-145	64.00
232	J-2	64.25
771	J-212	63.97
346	J-119	63.55
261	J-31	63.40
296	J-67	63.30
283	J-54	63.20
758	J-207	63.00
828	J-238	63.04
258	J-28	63.25
298	J-69	62.80
280	J-51	62.80
282	J-53	62.80
262	J-32	62.94
281	J-52	62.75
279	J-50	62.60
300	J-71	62.40
341	J-114	62.48
338	J-109	62.40
297	J-68	62.20
278	J-49	62.10
275	J-46	61.97
299	J-70	61.80
231	J-1	61.94
831	J-239	58.00

Casselman Water Model

Maximum Day Demand + Fire Flow - Existing

2 Pumps on, Standpipe HGL= 100.52 m



Appendix I

Wastewater Model

Printed: 2023-09-22 at 5:26 PM

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119
Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

Design Constants/Coefficients

Manning's "n" =	0.013	
Infilt. Allowance =	0.28	L/s/ha
Residential Flow =	350	L/cap/d
Commercial/Institutional Flow Rate =	28000	L/gross ha/d
Industrial Flow Rate =	35000	L/gross ha/d

Unless otherwise indicated, Manning's 'n' is assumed to be 0.013

Population Data (Existing)

Total Number of Units:	1695	
Census Existing Population:	4048	
Population Calibration Factor:	0.791	
Computed Population:	4048	
Harmon Equation Correction Factor:	1.0	
Weighted Coefficients		
Singles & Semi-Detached:	2.62	
Multiple Dwellings:	2.04	
Apartments:	1.42	
ICI peaking factor:	1.50	
PPU:	2.39	

Population Data (New Subdivision)

Single Family:	3.4	persons/unit
Townhouse:	2.7	persons/unit
Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

| STREET | MANHOLE NUMBER FROM | MANHOLE NUMBER TO | FROM MH - TO MH | EXISTING RESIDENTIAL AREA: Census Data: Singles & Semis (units) | Multiple Dwellings (units) | Apart (units) | Vacant | Popul. (peop.) | Metered Residential | Cumm. Popul. (peop.) | Cumm. Metered Residential (L/s) | Peaking Factor | Avg. Flow (l/s) | FUTURE RESIDENTIAL: Popul. (peop.) | Cumm. Popul. (peop.) | Peaking Factor | Avg. Flow | Peak Res. Flow (l/s) | SANITARY CONTRIBUTION: EXISTING ICI: Areas (ha): Commerc. | Industrial | Flows (l/s): Commerc. | Industrial | Peaking Factor | ICI Flow (l/s) | FUTURE ICI: Areas (ha): Commerc. | Industrial | Flows (l/s): Commerc. | Industrial | Peaking Factor | ICI Flow (l/s) | Cumm. Peak ICI Flow (l/s) | EXISTING EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | FUTURE EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | Pump Flow (l/s) | Total Peak Des. Flow (l/s) | Pump Correction Factor | Total Peak Des. Flow with pump (l/s) | Q_d/Q_{full} % | Residual Capacity (l/s) | SEWER DATA: DIA. (mm) | Actual Dia. (mm) | DESIGN SLOPE (%) | ACTUAL SLOPE (%) | CAPAC. (l/s) | VEL. (m/s) | LENGTH (m) | Upstream Obvert (m) | Upstream Invert (m) | Downstream Obvert (m) | Downstream (m) | Comments |
|---|---|---

Printed: 2023-09-22 at 5:26 PM

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119
Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

Design Constants/Coefficients

Manning's "n" =	0.013	
Infilt. Allowance =	0.28	L/s/ha
Residential Flow =	350	L/cap/d
Commercial/Insstitutional Flow Rate =	28000	L/gross ha/d
Industrial Flow Rate =	35000	L/gross ha/d

Unless otherwise indicated, Manning's 'n' is assumed to be 0.013

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Census Existing Population:	4048
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Computed Population:	4048
Harmon Equation Correction Factor:	1.0

Weighted Coefficients

Singles & Semi-Detached:	2.62
Multiple Dwellings:	2.04
Apartments:	1.42
ICI peaking factor:	1.50
PPU:	2.39

Population Data (New Subdivision)

Single Family:	3.4	persons/unit
Townhouse:	2.7	persons/unit
Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

STREET	MANHOLE NUMBER FROM	MANHOLE NUMBER TO	FROM MH - TO MH	EXISTING RESIDENTIAL AREA: Census Data: Singles & Semis (units)	Multiple Dwellings (units)	Apart (units)	Vacant	Popul. (peop.)	Metered Residential	Cumm. Popul. (peop.)	Cumm. Metered Residential (L/s)	Peaking Factor	Avg. Flow (l/s)	FUTURE RESIDENTIAL: Popul. (peop.)	Cumm. Popul. (peop.)	Peaking Factor	Avg. Flow (l/s)	Peak Res. Flow (l/s)	EXISTING ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	FUTURE ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	Cumm. Peak ICI Flow (l/s)	EXISTING EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	FUTURE EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	Pump Flow (l/s)	Total Peak Des. Flow (l/s)	Pump Correction Facto (l/s)	Total Peak Des. Flow with pump (l/s)	Q_p/Q_{dwf} %	Residual Capacity (l/s)	SEWER DATA: DIA. (mmm)	Actual Dia. (mmm)	DESIGN SLOPE (%)	ACTUAL SLOPE (%)	CAPAC. (l/s)	VEL. (m/s)	LENGTH (m)	Upstream Obvert (m)	Upstream Invert (m)	Downstream Obvert (m)	Downstream (m)	Comments
ROGER	855	850	855-850		77.33				157.81		157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.03	0.288	0.288		0.000	0.000		2.845		2.845	12.92	19.174	200	203.20	0.401	0.414	22.019	0.679	31.39	63.22	63.020	63.09	62.890	
	850	845	850-845								157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.288		0.000	0.000		2.845		2.845	13.07	18.925	200	203.20	0.400	0.405	21.770	0.671	12.35	63.05	62.850	63.00	62.800	
	845	840	845-840								157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.288		0.000	0.000		2.845		2.845	13.59	18.085	200	203.20	0.383	0.374	20.930	0.645	37.41	62.95	62.750	62.81	62.610	
	840	835	840-835								157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.288		0.000	0.000		2.845		2.845	12.82	19.354	200	203.20	0.389	0.421	22.199	0.685	11.88	62.76	62.560	62.71	62.510	
	835	830	835-830								157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.288		0.000	0.000		2.845		2.845	11.39	22.126	200	203.20	0.411	0.533	24.971	0.770	39.43	62.66	62.460	62.45	62.250	
RICHER	239	241	239-241								0.0		4.00	0.00		0.0	4.00	0.00	0.00	1.14	0.00	0.37	0.00	1.50	0.554					1.500	0.000	0.554	1.14	0.319	0.319		0.000	0.000		0.873		0.873	2.78	30.594	200	203.20	1.000	0.846	31.467	0.970	20.10	63.30	63.100	63.13	62.930	
RICHER	241	870	241-870								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.554	0.00	0.000	0.319		0.000	0.000		0.873		0.873	2.49	34.269	200	203.20	1.000	1.055	35.142	1.084	9.48	63.13	62.930	63.03	62.830	
RICHER	870	865	870-865								0.0		4.00	0.00		0.0	4.00	0.00	0.00	2.06	0.00	0.67	0.00	1.50	1.002					1.500	0.000	1.556	2.06	0.577	0.896		0.000	0.000		2.452		2.452	5.99	38.460	250	254.00	0.436	0.435	40.912	0.807	80.48	63.11	62.860	62.76	62.510	
	865	860	865-860								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.556	0.00	0.000	0.896		0.000	0.000		2.452		2.452	6.88	33.200	250	254.00	0.343	0.330	35.653	0.704	33.31	62.76	62.510	62.65	62.400	
	860	830	860-830								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.556	0.00	0.000	0.896		0.000	0.000		2.452		2.452	7.34	30.975	250	254.00	0.291	0.290	33.428	0.660	47.88	62.65	62.400	62.52	62.261	MH 830 added later. Do not have as-built info in N/S direction.
RICHER	830	815	830-815								157.8		4.00	0.64		0.0	4.00	0.00	2.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.556	0.00	0.000	1.184		0.000	0.000		5.297		5.297	15.94	27.930	250	254.00	0.293	0.287	33.227	0.656	74.25	62.51	62.261	62.30	62.048	
LAFLECHE	267	246	267-246								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.72	0.00	0.23	0.00	1.50	0.348					1.500	0.000	0.348	0.72	0.200	0.200		0.000	0.000		0.549		0.549	1.18	46.111	200	203.20	1.000	1.860	46.659	1.439	33.34	63.04	62.840	62.42	62.220	
LAFLECHE	246	825	246-825								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.348	0.00	0.000	0.200		0.000	0.000		0.549		0.549	0.95	57.468	200	203.20	1.000	-2.875	58.016	1.789	13.91	62.42	62.220	62.82	62.620	
LAFLECHE	825	820	825-820								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.348	0.00	0.000	0.200		0.000	0.000		0.549		0.549	1.57	34.431	250	254.00	0.320	0.318	34.979	0.690	69.20	62.46	62.210	62.24	61.990	
	820	819	820-819								0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.348	0.00	0.000	0.200		0.000	0.000		0.549		0.549	0.76	71.244	250	254.00	0.350	1.339	71.793	1.417	7.47	62.22	61.970	62.12	61.870	
	247	248	247-248			12.05		17.15			17.2		4.00	0.07		0.0	4.00	0.00	0.28	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.25	0.070	0.070		0.000	0.000		0.348		0.348	1.28	26.795	200	203.20	0.570	0.629	27.143	0.837	15.89	62.69	62.490	62.59	62.390	
	249	248	249-248			12.05		17.15			17.2		4.00	0.07		0.0	4.00	0.00	0.28	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.25	0.070	0.070		0.000	0.000		0.348		0.348	1.34	25.583	200	203.20	0.590	0.574	25.931	0.800	17.41	62.69	62.490	62.59	62.390	
	248	819	248-819								34.3		4.00	0.14		0.0	4.00	0.00	0.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.140		0.000	0.000		0.696		0.696	2.35	28.872	200	203.20	0.750	0.747	29.568	0.912	60.26	62.55	62.350	62.10	61.900	
	819	815	819-815								34.3		4.00	0.14		0.0	4.00	0.00	0.56	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.348	0.00	0.000	0.341		0.000	0.000		1.245		1.245	4.27	27.909	250	254.00	0.350	0.221	29.154	0.575	63.40	62.12	61.870	61.98	61.730	
ST. MARIE	900	890	900-890	9.01				23.57			23.6		4.00	0.10		0.0	4.00	0.00	0.38	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.96	0.268	0.268		0.000	0.000		0.650		0.650	3.07	20.506	200	203.20	0.407	0.382	21.156	0.652	96.78	63.04	62.840	62.67	62.470	
ST. MARIE	895	890	895-890	1.13				2.95			2.9		4.00	0.01		0.0	4.00	0.00	0.05	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.15	0.042	0.042		0.000	0.000		0.090		0.090	0.29	31.379	200	203.20	0.900	0.846	31.469	0.970	10.64	63.49	63.290	63.40	63.200	
EASEMENT	890	885	890-885								26.5		4.00	0.11		0.0	4.00	0.00	0.43	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.310		0.000	0.000		0.740		0.740	3.53	20.216	200	203.20	0.382	0.375	20.956	0.646	55.99	62.67	62.470	62.46	62.260	As-built says N 62.25 and W62.26' at MH 885. It was assumed that these values are reversed.
	885	875	885-875								26.5		4.00	0.11		0.0	4.00	0.00	0.43	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.310		0.000	0.000		0.740		0.740	4.03	17.640	200	203.20	0.290	0.289	18.380	0.567	69.31	62.45	62.250	62.25	62.050	As-built says N 62.25 and W62.26' at MH 885. It was assumed that these values are reversed.
FAUCHER	880	875	880-875	13.51				35.36			35.4		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.13	0.318	0.318		0.000	0.000		0.891		0.891	2.54	34.209	200	203.20	1.000	1.052	35.100	1.082	47.52	62.80	62.600	62.30	62.100	
FAUCHER	875	815	875-815								61.9		4.00	0.25		0.0	4.00	0.00	1.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.628		0.000	0.000		1.630		1.630	8.91	16.668	200	203.20	0.288	0.286	18.299	0.564	94.40	62.25	62.050	61.98	61.780	
ISABELLE	815	810	815-810	4.50				11.79			265.8		4.00	1.08		0.0	4.00	0.00	4.31	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.43	0.122	2.274		0.000	0.000		8.485		8.485	25.50	24.788	250	254.00	0.296	0.288	33.273	0.657	100.82	61.99	61.740	61.70	61.450	
ISABELLE	810B	810A	810B-810A		29.33			59.86			59.9		4.00	0.24		0.0	4.00	0.00	0.97	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.26	0.072	0.072		0.000	0.000		1.042		1.042	4.42	22.536	200	203.20	0.474	0.475	23.578	0.727	67.39	62.17	61.970	61.85	61.650	
	810A	810	810A-810								59.9		4.00	0.24		0.0	4.00	0.00	0.97	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.072		0.000	0.000		1.042		1.042	3.97	25.197	200	203.20	0.611	0.588	26.239	0.809	20.41	61.80	61.600	61.68	61.480	
ISABELLE	810	795	810-795	4.50				11.79			337.4		4.00	1.37		0.0	4.00	0.00	5.47	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.41	0.115	2.462		0.000	0.000		9.833		9.833	21.78	35.324	250	254.00	0.525	0.530	45.157	0.891	31.71	61.63	61.378	61.46	61.210	Length may not be as-built / Large slope discrepancy
BOILEAU	805	800	805-800	11.26				29.47			29.5		4.00	0.12		0.0	4.00	0.00	0.48	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.10	0.307	0.307		0.000	0.000		0.785		0.785	3.12	24.403	200	203.20	0.543	0.542	25.188	0.777	27.50	62.00	61.795	61.85	61.646	
	800	795	800-795								29.5		4.00	0.12		0.0	4.00	0.00	0.48	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.307		0.000	0.000		0.785		0.785	3.49	21.720	200	203.20	0.432	0.433	22.505	0.694	84.61	61.84	61.643	61.48	61.277	
ISABELLE	795	765	795-765								366.9		4.00	1.49		0.0	4.00	0.00	5.94	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	2.769		0.000	0.000		10.618		10.618	26.78	29.036	250	254.00	0.409	0.409	39.654	0.783	70.25	61.46	61.210	61.18	60.923	Length may not be as-built - OMM
SAUVE	790	785	790-785	13.51				35.36			35.4		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.67	0.469	0.469		0.000	0.000		1.042		1.042	2.73	37.161	250	254.00	0.365	0.379	38.203	0.754	33.76	62.51	62.261	62.39	62.133	
	785	780	785-780								35.4		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.469		0.000	0.000		1.042		1.042	3.40	29.635	250	254.00	0.247	0.245	30.677	0.605	57.26	62.38	62.133	62.25	61.993	
	780	775	780-775								35.4		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.469		0.000	0.000		1.042		1.042	2.27	44.868	250	254.00	0.522	0.548	45.910	0.906	22.83	62.20	61.954	62.08	61.829	
	775	770	775-770	10.13				26.52			61.9		4.00	0.25		0.0	4.00	0.00	1.00	0.00	0.00	0.00	1.01	0.283	0.752					1.500	0.000	0.000	1.01	0.283	0.752		0.000	0.000		1.755		1.755	5.48	30.252	250	254.00	0.266	0.266	32.006	0.632	85.66	61.86	61.609	61.64	61.381	
	770	765	770-765								61.9		4.00	0.25		0.0	4.00	0.00	1.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.752		0.000	0.000		1.755		1.755	5.00	33.327	250	254.00	0.322	0.320	35.081	0.692	46.91	61.32	61.073	61.18	60.923	
ISABELLE	765	760	765-760	5.63				14.73			443.5		4.00	1.80		0.0	4.00	0.00	7.19	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.55	0.155	3.676		0.000	0.000		12.767		12.767	37.25	21.511	250	254.00	0.298	0.305	34.278	0.676	32.10	61.17	60.920	61.08	60.822	Length may not be as-built - OMM
	760	735	760-735								443.5		4.00	1.80		0.0	4.00	0.00	7.19	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	3.676		0.000	0.000		12.767		12.767	37.77	21.031	250	254.00	0.299	0.297	33.797	0.667	42.12	61.05	60.802	60.93	60.677	Length may not be as-built - OMM
GAGNE	755	750	755-750	7.88				20.63			20.6		4.00	0.08		0.0	4.00	0.00	0.33	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.56	0.156	0.156		0.000	0.000		0.490		0.490	2.16	22.157	200	203.20	0.436	0.438	22.647	0.698	25.79	62.68	62.484	62.57	62.371	
	750	745	750-745								20.6		4.00	0.08		0.0	4.00	0.00	0.33	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.156		0.000	0.000		0.490		0.490	2.35	20.394	200	203.20	0.365	0.373	20.884	0.644	53.15	62.55	62.347	62.35	62.149	
	745	740	745-740	10.13		0.86		27.74			48.4		4.00	0.20		0.0	4.00	0.00	0.78	0.00	0.00	0.00	1.01	0.282	0.438					1.500	0.000	0.000	1.01	0.282	0.438		0.000	0.000		1.222		1.222	7.31	15.491	200	203.20	0.243	0.239	16.713	0.515	39.40	62.33	62.133	62.24	62.039	
	740	735	740-735								48.4		4.00	0.20		0.0	4.00	0.00	0.78	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.438		0.000	0.000		1.222		1.222	5.74	20.057	200	203.20	0.385	0.387	21.279	0.656	99.29	62.22	62.015	61.83	61.631	
ISABELLE	735	730	735-730	5.63				14.73			506.6		3.97	2.05		0.0	3.97	0.00	8.15	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.54	0.153	4.267		0.000	0.000		14.321		14.321	37.56	23.805	250	254.00	0.324	0.378	38.126	0.752	20.92	60.90	60.652	60.83	60.573	Length may not be as-built - OMM
	730	PS2	730-PS2								506.6		3.97	2.05		0.0	3.97	0.00	8.15	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	4.267		0.000	0.000		14.321		14.321	32.62	29.585	250	254.00	0.000	0.501	43.906	0.866	11.58	60.82	60.573	60.77	60.515	Updated in QGIS and manually inputed to included PS2
	PS2	725	PS2-725								506.6		3.97	2.05		0.0	3.97	0.00	8.15	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	4.267		0.000	0.000	20.500	14.321	6.179	20.500	0.00		250	254.00	0.000	-17.638	0.000	5.142	14.48	60.77	60.515	63.32	63.069	**Forcemain**
	725	715	725-715								506.6		3.97	2.05		0.0	3.97	0.00	8.15	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	4.267		0.000	0.000		14.321	6.179	20.500	70.46	8.593	250	254.00	0.219	0.220	29.093	0.574	45.47	63.32	63.069	63.22	62.969	
GAGNE	720	715	720-715	11.26				29.47			29.5		4.00	0.12		0.0	4.00	0.00	0.48	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.97	0.271	0.271		0.000	0.000		0.748		0.748	3.76	19.170	200	203.20	0.335	0.339	19.919	0.614	99.74	63.53	63.328	63.19	62.990	
ISABELLE	715	710	715-710	3.38				8.84			544.9		3.95	2.21		0.0	3.95	0.00	8.73	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.36	0.101	4.638		0.000	0.000		15.272	6.179	21.451	54.64	17.810	250	254.00	0.395	0.400	39.261	0.775	42.70	63.17	62.917	63.00	62.746	
	710	700	710-700								544.9		3.95	2.21		0.0	3.95	0.00	8.73	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	4.638		0.000	0.000		15.272	6.179	21.451	56.95	16.213	250	254.00	0.373	0.369	37.864	0.743	33.91	63.00	62.746	62.88	62.621	
ALICE	705	700	705-700	5.63				14.73			14.7		4.00	0.06		0.0	4.00	0.00	0.24	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.52	0.147	0.147		0.000	0.000		0.385		0.385	1.80	21.016	200	203.20	0.387	0.391	21.402	0.660	53.93	63.10	62.902	62.89	62.691	
ISABELLE	700	695	700-695	14.63				38.31			597.9		3.93	2.42		0.0	3.93	0.00	9.53	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	1.42	0.396	5.181		0.000	0.000		16.612	6.179	22.791	43.63	29.444	250	254.00	0.290	-0.709	52.235	1.031	99.87	62.87	62.621	63.58	63.329	
	695	675	695-675								597.9		3.93	2.42		0.0	3.93	0.00	9.53	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.904	0.00	0.000	5.181		0.000	0.000		16.612	6.179	22.791	66.71	11.376	250	254.00	0.306	0.303	34.167	0.674	95.28	62.56	62.310	62.28	62.021	
ALICE	690	685	690-685	18.01				47.15			47.1		4.00	0.19		0.0	4.00	0.00	0.76	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.77	0.496	0.496		0.000	0.000		1.260		1.260	5.85	20.279	200	203.20	0.393	0.396	21.539	0.664	88.33	63.27	63.072	62.93	62.722	
	685	680	685-680								47.1		4.00	0.19		0.0	4.00	0.00	0.76	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.496		0.000	0.000		1.260		1.260	6.03	19.650	200	203.20	0.371	0.373	20.910	0.645	88.10	62.90	62.703	62.58	62.374	
	680	675	680-675	4.50				11.79			58.9		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000					1.500

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119

Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

Design Constants/Coefficients

Manning's "n" =	0.013	
Infilt. Allowance =	0.28	L/s/ha
Residential Flow =	350	L/cap/d
Commercial/Institutional Flow Rate =	28000	L/gross ha/d
Industrial Flow Rate =	35000	L/gross ha/d

Unless otherwise indicated, Manning's 'n' is assumed to be 0.013

Population Data (Existing)

Total Number of Units:	1695
Census Existing Population:	4048
Population Calibration Factor:	0.791
Computed Population:	4048
Harmon Equation Correction Factor:	1.0

Weighted Coefficients

Singles & Semi-Detached:	2.62
Multiple Dwellings:	2.04
Apartments:	1.42
ICI peaking factor:	1.50
PPU:	2.39

Population Data (New Subdivision)

Single Family:	3.4	persons/unit
Townhouse:	2.7	persons/unit
Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

| STREET | MANHOLE NUMBER FROM | MANHOLE NUMBER TO | FROM MH - TO MH | EXISTING RESIDENTIAL AREA – Census Data: Singles & Semis (units) | Multiple Dwellings (units) | Apart (units) | Vacant | Popul. (peop.) | Metered Residential | Cumm. Popul. (peop.) | Cumm. Metered Residential (L/s) | Peaking Factor | Avg. Flow (l/s) | FUTURE RESIDENTIAL: Popul. (peop.) | Cumm. Popul. (peop.) | Peaking Factor | Avg. Flow | Peak Res. Flow (l/s) | SANITARY CONTRIBUTION – EXISTING ICI: Areas (ha): Commerc. | Industrial | Flows (l/s): Commerc. | Industrial | Peaking Factor | ICI Flow (l/s) | FUTURE ICI: Areas (ha): Commerc. | Industrial | Flows (l/s): Commerc. | Industrial | Peaking Factor | ICI Flow (l/s) | Cumm. Peak ICI Flow (l/s) | EXISTING EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | FUTURE EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | Pump Flow (l/s) | Total Peak Des. Flow (l/s) | Pump Correction Factor (l/s) | Total Peak Des. Flow with pump (l/s) | Q_p/Q_{full} % | Residual Capacity (l/s) | SEWER DATA: DIA. (mm) | Actual Dia. (mm) | DESIGN SLOPE (%) | ACTUAL SLOPE (%) | CAPAC. (l/s) | VEL. (m/s) | LENGTH (m) | Upstream Obvert (m) | Upstream Invert (m) | Downstream Obvert (m) | Downstream (m) | Comments |
|---|---|---

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VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119
Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

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Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

STREET	MANHOLE NUMBER FROM	MANHOLE NUMBER TO	FROM MH - TO MH	EXISTING RESIDENTIAL AREA: Census Data: Singles & Semis (units)	Multiple Dwellings (units)	Apart (units)	Vacant	Popul. (peop.)	Metered Residential	Cumm. Popul. (peop.)	Cumm. Metered Residential (L/s)	Peaking Factor	Avg. Flow (l/s)	FUTURE RESIDENTIAL: Cumm. Popul. (peop.)	Popul. (peop.)	Peaking Factor	Avg. Flow	SANITARY CONTRIBUTION: Peak Res. Flow (l/s)	EXISTING ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	FUTURE ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	Cumm. Peak ICI Flow (l/s)	EXISTING EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	FUTURE EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	Pump Flow (l/s)	Total Peak Des. Flow (l/s)	Pump Correction Factor	Total Peak Des. Flow with pump (l/s)	Q_p/Q_{full} %	Residual Capacity (l/s)	SEWER DATA: DIA. (mm)	Actual Dia. (mm)	DESIGN SLOPE (%)	ACTUAL SLOPE (%)	CAPAC. (l/s)	VEL. (m/s)	LENGTH (m)	Upstream Obvert (m)	Upstream Invert (m)	Downstream Obvert (m)	Downstream (m)	Comments
	300	**290**	300-290	4.50		6.02		20.36		2706.0		3.48	10.96		0.0	3.48	0.00	38.15	0.79	0.00	0.26	0.00	1.50	0.383					1.500	0.000	27.608	0.79	0.221	38.937		0.000	0.000		104.694	50.371	155.065	84.87	27.649	500	508.00	0.160	0.215	182.714	0.901	49.27	59.70	59.204	59.61	59.098	DWGs did not have as-built lengths or slopes. Lengths were scaled from DWGs. Inverts & lengths were taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
ST. THERESE	295	290	295-290	7.88		6.02		29.20		29.2		4.00	0.12		0.0	4.00	0.00	0.47	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.14	0.318	0.318		0.000	0.000		0.791		0.791	14.49	4.669	200	203.20	-0.029	-0.025	5.460	0.168	78.54	59.83	59.630	59.85	59.650	Length and U/S invert are not as-built. Downstream Invert was taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
MONTCALM	**290**	**255**	290-255							2735.2		3.48	11.08		0.0	3.48	0.00	38.52	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	27.608	0.00	0.000	39.255		0.000	0.000		105.381	50.371	155.752	103.77	**-5.659**	500	508.00	0.160	0.145	150.093	0.741	98.50	59.60	59.098	59.46	58.955	Length and U/S invert are not as-built. D/S invert taken from profile, DWG of St. Therese.
CARTIER	285	280	285-280	2.25				5.89		5.9		4.00	0.02		0.0	4.00	0.00	0.10	0.60	0.00	0.19	0.00	1.50	0.292					1.500	0.000	0.292	0.60	0.168	0.168		0.000	0.000		0.556		0.556	2.52	21.540	200	203.20	0.413	0.417	22.096	0.681	49.16	62.91	62.710	62.71	62.505	
ST. JEAN	280	275	280-275	6.75				17.68		23.6		4.00	0.10		0.0	4.00	0.00	0.38	1.03	0.00	0.33	0.00	1.50	0.499					1.500	0.000	0.791	1.03	0.287	0.456		0.000	0.000		1.629		1.629	7.52	20.021	200	203.20	0.400	0.400	21.650	0.668	67.94	62.66	62.460	62.39	62.188	
	275	265	275-265							23.6		4.00	0.10		0.0	4.00	0.00	0.38	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.791	0.00	0.000	0.456		0.000	0.000		1.629		1.629	7.61	19.768	200	203.20	0.400	0.391	21.397	0.660	101.26	62.37	62.173	61.98	61.777	
DOLLARD	270	265	270-265	4.50	2.67	3.44		22.13		22.1		4.00	0.09		0.0	4.00	0.00	0.36	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.55	0.155	0.155		0.000	0.000		0.514		0.514	2.46	20.380	200	203.20	0.375	0.373	20.894	0.644	84.21	63.04	62.841	62.73	62.527	
ST. JEAN	265	260	265-260	7.88	2.67	26.68		64.05		109.8		4.00	0.44		0.0	4.00	0.00	1.78	1.36	0.00	0.44	0.00	1.50	0.659					1.500	0.000	1.450	1.36	0.380	0.991		0.000	0.000		4.219		4.219	19.37	17.565	200	203.20	0.400	0.405	21.785	0.672	75.98	61.98	61.777	61.67	61.469	
	260	255	260-255							109.8		4.00	0.44		0.0	4.00	0.00	1.78	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.450	0.00	0.000	0.991		0.000	0.000		4.219		4.219	7.01	56.012	200	203.20	1.760	3.099	60.232	1.857	79.68	61.67	61.469	59.20	59.000	Downstream Invert was taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
MONTCALM	255	90	255-90							2845.0		3.46	11.52		0.0	3.46	0.00	39.90	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	29.059	0.00	0.000	40.246		0.000	0.000		109.202	50.371	159.574	104.23	**-6.481**	500	508.00	0.160	0.151	153.093	0.755	105.93	59.43	58.930	59.28	58.770	DWGs did not have as-built lengths or slopes. Lengths were scaled from DWGs. Inverts & lengths were taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
ST. ISIDORE (EAST)	250	245	250-245	5.63		0.86		15.96		16.0		4.00	0.06		0.0	4.00	0.00	0.26	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	2.53	0.708	0.708		0.000	0.000		0.967		0.967	4.45	20.777	200	203.20	0.400	0.404	21.744	0.671	66.36	64.67	64.471	64.41	64.203	
	245	240	245-240							16.0		4.00	0.06		0.0	4.00	0.00	0.26	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.708		0.000	0.000		0.967		0.967	4.43	20.833	200	203.20	0.400	0.405	21.800	0.672	105.93	64.40	64.203	63.98	63.773	
	240	235	240-235							16.0		4.00	0.06		0.0	4.00	0.00	0.26	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.708		0.000	0.000		0.967		0.967	4.44	20.787	200	203.20	0.400	0.404	21.754	0.671	107.12	63.97	63.773	63.54	63.340	
	235	230A	235-230A							16.0		4.00	0.06		0.0	4.00	0.00	0.26	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.708		0.000	0.000		0.967		0.967	6.44	14.037	200	203.20	0.181	0.192	15.003	0.463	25.49	63.54	63.340	63.49	63.291	D/S invert might be incorrect. Length is not as-built and was scaled from DWG.
	230A	230	230A-230	7.88				20.63		36.6		4.00	0.15		0.0	4.00	0.00	0.59	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	1.84	0.515	1.223		0.000	0.000		1.816		1.816	7.74	21.649	200	203.20	0.480	0.470	23.465	0.724	80.38	63.49	63.292	63.12	62.914	U/S invert might be incorrect. Length is not as-built and was scaled from DWG.
	230	225	230-225							36.6		4.00	0.15		0.0	4.00	0.00	0.59	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	1.223		0.000	0.000		1.816		1.816	8.29	20.093	200	203.20	0.400	0.410	21.909	0.676	107.81	63.11	62.914	62.68	62.472	
	225	215	225-215	10.13				26.52		63.1		4.00	0.26		0.0	4.00	0.00	1.02	2.47	0.00	0.80	0.00	1.50	1.202					1.500	0.000	1.202	2.47	0.692	1.915		0.000	0.000		4.139		4.139	19.05	17.584	200	203.20	0.400	0.403	21.723	0.670	114.13	62.67	62.472	62.22	62.012	
BREBOEUF	220	215	220-215	9.01				23.57		23.6		4.00	0.10		0.0	4.00	0.00	0.38	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.86	0.241	0.241		0.000	0.000		0.623		0.623	2.98	20.294	200	203.20	0.375	0.374	20.917	0.645	88.04	62.56	62.359	62.23	62.030	
ST. ISIDORE (EAST)	215	205	215-205	3.38	8.00	2.58		28.84		115.5		4.00	0.47		0.0	4.00	0.00	1.87	0.74	0.00	0.24	0.00	1.50	0.359					1.500	0.000	1.560	0.74	0.207	2.363		0.000	0.000		5.795		5.795	27.97	14.925	200	203.20	0.400	0.367	20.720	0.639	109.90	62.21	62.012	61.81	61.609	
PRINCIPALE	210	205	210-205	1.13		3.44		7.85		7.8		4.00	0.03		0.0	4.00	0.00	0.13	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.32	0.090	0.090		0.000	0.000		0.217		0.217	0.96	22.302	200	203.20	0.422	0.433	22.519	0.694	51.95	62.19	61.987	61.97	61.762	
PRINCIPALE	205	165	205-165		2.67	7.75		16.47		139.8		4.00	0.57		0.0	4.00	0.00	2.27	2.38	0.00	0.77	0.00	1.50	1.155					1.500	0.000	2.715	2.38	0.665	3.118		0.000	0.000		8.099		8.099	37.63	13.426	200	203.20	0.401	0.396	21.525	0.664	51.55	61.75	61.548	61.55	61.344	
	201	33	201-33	4.50	18.67	6.02		58.45		58.5		4.00	0.24		0.0	4.00	0.00	0.95	2.44	0.00	0.79	0.00	1.50	1.187					1.500	0.000	1.187	2.44	0.684	0.684		0.000	0.000		2.818		2.818	13.92	17.425	200	203.20	0.000	0.350	20.243	0.624	108.10	63.91	63.714	63.54	63.336	
	33	200	33-200							58.5		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.187	0.00	0.000	0.684		0.000	0.000		2.818		2.818	13.92	17.425	200	203.20	0.000	0.350	20.243	0.624	≥ 13	63.54	63.336	63.51	63.304	
LAURIER	200	195	200-195	11.26	2.67			34.91		93.4		4.00	0.38		0.0	4.00	0.00	1.51	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.187	0.57	0.160	0.844		0.000	0.000		3.543		3.543	15.40	19.466	200	203.20	0.447	0.452	23.009	0.710	46.44	63.50	63.304	63.30	63.094	
	195	190	195-190	12.38		3.44		37.31		130.7		4.00	0.53		0.0	4.00	0.00	2.12	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.187	1.12	0.313	1.156		0.000	0.000		4.461		4.461	20.64	17.152	200	203.20	0.400	0.399	21.613	0.666	102.51	63.29	63.094	62.89	62.685	
	190	185	190-185	27.02	2.67			76.16		206.8		4.00	0.84		0.0	4.00	0.00	3.35	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.187	2.03	0.568	1.725		0.000	0.000		6.263		6.263	30.32	14.393	200	203.20	0.363	0.364	20.656	0.637	101.25	62.85	62.646	62.48	62.277	
	185	175	185-175							206.8		4.00	0.84		0.0	4.00	0.00	3.35	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.187	0.00	0.000	1.725		0.000	0.000		6.263		6.263	30.11	14.541	200	203.20	0.370	0.370	20.803	0.642	100.63	62.42	62.219	62.05	61.847	
BREBOEUF	180	175	180-175	3.38				8.84		8.8		4.00	0.04		0.0	4.00	0.00	0.14	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.42	0.118	0.118		0.000	0.000		0.262		0.262	0.95	27.208	200	203.20	0.623	0.644	27.469	0.847	94.65	63.69	63.493	63.09	62.883	
LAURIER	175	170	175-170	1.13		1.72		5.40		221.1		4.00	0.90		0.0	4.00	0.00	3.58	0.44	0.00	0.14	0.00	1.50	0.214					1.500	0.000	1.401	0.44	0.123	1.966		0.000	0.000		6.950		6.950	32.38	14.511	200	203.20	0.393	0.393	21.461	0.662	54.15	62.01	61.807	61.80	61.594	
	170	165	170-165							221.1		4.00	0.90		0.0	4.00	0.00	3.58	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.401	0.00	0.000	1.966		0.000	0.000		6.950		6.950	32.39	14.506	200	203.20	0.408	0.393	21.455	0.662	59.01	61.79	61.594	61.57	61.362	
PRINCIPALE	165	160	165-160							360.9		4.00	1.46		0.0	4.00	0.00	5.85	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	4.116	0.00	0.000	5.084		0.000	0.000		15.049		15.049	45.61	17.944	250	254.00	0.285	0.283	32.993	0.651	85.21	61.53	61.280	61.29	61.039	
	160	155	160-155							360.9		4.00	1.46		0.0	4.00	0.00	5.85	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	4.116	0.00	0.000	5.084		0.000	0.000		15.049		15.049	45.84	17.762	250	254.00	0.278	0.280	32.831	0.648	82.49	61.29	61.039	61.06	60.808	
	271	155	271-155							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	36.703	250	254.00	0.000	0.350	36.703	0.724	6.05	61.08	60.829	61.06	60.808	
	155	150	155-150							360.9		4.00	1.46		0.0	4.00	0.00	5.85	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	4.116	0.00	0.000	5.084		0.000	0.000		15.049		15.049	46.41	17.373	250	254.00	0.274	0.273	32.422	0.640	82.75	61.06	60.808	60.84	60.582	
	150	115	150-115							360.9		4.00	1.46		0.0	4.00	0.00	5.85	1.43	0.00	0.46	0.00	1.50	0.684					1.500	0.000	4.811	1.43	0.400	5.484		0.000	0.000		16.143		16.143	49.29	16.611	250	254.00	0.281	0.279	32.754	0.646	83.23	60.83	60.582	60.60	60.350	
BREBOEUF	145	140	145-140	10.13		6.02		35.10		35.1		4.00	0.14		0.0	4.00	0.00	0.57	2.19	0.00	0.71	0.00	1.50	1.063					1.500	0.000	1.063	2.19	0.612	0.612		0.000	0.000		2.244		2.244	10.64	18.837	200	203.20	0.384	0.380	21.081	0.650	71.39	64.33	64.127	64.06	63.856	
	140	125	140-125							35.1		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.063	0.00	0.000	0.612		0.000	0.000		2.244		2.244	10.61	18.898	200	203.20	0.376	0.382	21.141	0.652	55.27	64.06	63.856	63.85	63.645	
ARENA	135	130	135-130							0.0		4.00	0.00		0.0	4.00	0.00	0.00	1.27	0.00	0.41	0.00	1.50	0.619					1.500	0.000	0.619	1.27	0.357	0.357		0.000	0.000		0.976		0.976	3.92	23.946	200	203.20	0.395	0.530	24.922	0.768	49.39	63.17	62.972	62.91	62.710	
	130	125	130-125							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.619	0.00	0.000	0.357		0.000	0.000		0.976		0.976	4.54	20.515	200	203.20	0.391	0.395	21.491	0.663	75.54	62.90	62.703	62.61	62.405	
BREBOEUF	125	120	125-120							35.1		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.682	0.00	0.000	0.969		0.000	0.000		3.220		3.220	15.39	17.699	200	203.20	0.386	0.374	20.918	0.645	42.27	62.57	62.368	62.41	62.210	
	49	48	49-48							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.243	200	203.20	0.440	0.350	20.243	0.624	101.40	63.04	62.844	62.69	62.489	
	48	46	48-46							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.243	200	203.20	0.350	0.350	20.243	0.624	41.45	62.69	62.489	62.55	62.344	
	46	52	46-52	4.50				11.79		11.8		4.00	0.05		0.0	4.00	0.00	0.19	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.22	0.061	0.061		0.000	0.000		0.252		0.252	1.24	19.991	200	203.20	0.350	0.350	20.243	0.624	35.96	62.54	62.344	62.42	62.219	
	52	120	52-120							11.8		4.00	0.05		0.0	4.00	0.00	0.19	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.061		0.000	0.000		0.252		0.252	1.24	19.991	200	203.20	0.350	0.350	20.243	0.624	13.00	62.42	62.219	62.38	62.173	
DOLLARD	120	115	120-115	4.50				11.79		58.7		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	1.682	0.51	0.144	1.173		0.000	0.000		3.806		3.806	17.53	17.902	200	203.20	0.399	0.403	21.708	0.669	100.62	62.37	62.173	61.97	61.768	
PRINCIPALE	115	110	115-110	9.01	2.67	39.59		85.38		505.0		3.97	2.05		0.0	3.97	0.00	8.12	1.43	1.26	0.46	0.51	1.50	1.458					1.500	0.000	7.951	2.68	0.752	7.409		0.000	0.000		23.485		23.485	43.78	30.155	300	304.80	0.283	0.283	53.640	0.735	77.82	60.61	60.305	60.39	60.085	
	110	90	110-90							505.0		3.97	2.05		0.0	3.97	0.00	8.12	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	7.951	0.00	0.000	7.409		0.000	0.000		23.485		23.485	41.37	33.288	300	304.80	0.280	0.317	56.773	0.778	74.20	60.39	60.085	60.15	59.850	Downstream Invert was taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
BREBOEUF	105	100	105-100	1.13		17.21		27.45		27.5		4.00	0.11		0.0	4.00	0.00	0.44	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.57	0.161	0.161		0.000	0.000		0.605		0.605	2.90	20.265	200	203.20	0.400	0.372	20.870	0.644	71.50	62.72	62.521	62.46	62.255	
BREBOEUF	47	54	47-54							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.243	200	203.20	0.000	0.350	20.243	0.624	55.66	62.79	62.586	62.59	62.391	
BREBOEUF	54	100	54-100							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.243	200	203.20	0.000	0.350	20.243	0.624	42.40	62.59	62.391	62.45	62.243	
	100	95	100-95							27.5		4.00	0.11		0.0	4.00	0.00	0.44	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.00	0.000	0.161		0.000	0.000		0.605		0.605	2.90	20.299	200	203.20	0.400	0.373	20.905	0.645	62.69	62.44	62.243	62.21	62.009	
MONTCALM	95	90	95-90	11.26	2.67			34.91		62.4		4.00	0.25		0.0	4.00	0.00	1.01	0.00	0.00	0.00	0.00	1.50	0.000					1.500	0.000	0.000	0.70	0.196	0.357		0.000	0.000		1.367		1.367	1.24	108.719	250	254.00	3.150	3.149	110.086	2.173	102.55	62.26	62.009	59.03	58.780	No upstream invert on as-built for this run. Run includes flow from new St. Euphemie . Downstream Invert was taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
PRINCIPALE	90	85	90-85	2.25				5.89		3418.2		3.39	13.85		0.0	3.39	0.00	46.99	1.84	0.00	0.60	0.00	1.50	0.893					1.500	0.000	37.902	1.84	0.514	48.526		0.000	0.000		133.419	50.371	183.791	83.36	36.683	500	508.00	0.316	0.313	220.474	1.088	38.31	59.29	58.790	59.18	58.670	DWGs did not have as-built lengths or slopes. Lengths were scaled from DWGs. Inverts & lengths were taken from JLR DWG 68-1130-05, Sewer Rehab.(PLAN & PROFILES)
	85	83	85-83							3418.2		3.39	13.85		0.0	3.39	0.00	46.99	0.00	0.00	0.00	0.00	1

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J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119
Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

Design Constants/Coefficients

Manning's "n" =	0.013	
Infilt. Allowance =	0.28	L/s/ha
Residential Flow =	350	L/cap/d
Commercial/Institutional Flow Rate =	28000	L/gross ha/d
Industrial Flow Rate =	35000	L/gross ha/d

Unless otherwise indicated, Manning's 'n' is assumed to be 0.013

Population Data (Existing)

Total Number of Units:	1695	
Census Existing Population:	4048	
Population Calibration Factor:	0.791	
Computed Population:	4048	
Harmon Equation Correction Factor:	1.0	
Weighted Coefficients		
Singles & Semi-Detached:	2.62	
Multiple Dwellings:	2.04	
Apartments:	1.42	
ICI peaking factor:	1.50	
PPU:	2.39	

Population Data (New Subdivision)

Single Family:	3.4	persons/unit
Townhouse:	2.7	persons/unit
Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

STREET	MANHOLE NUMBER FROM	MANHOLE NUMBER TO	FROM MH - TO MH	EXISTING RESIDENTIAL AREA: Census Data: Singles & Semis (units)	Multiple Dwellings (units)	Apart (units)	Vacant	Popul. (peop.)	Metered Residential (L/s)	Cumm. Popul. (peop.)	Cumm. Metered Residential (L/s)	Peaking Factor	Avg. Flow (l/s)	FUTURE RESIDENTIAL: Popul. (peop.)	Cumm. Popul. (peop.)	Peaking Factor	Avg. Flow (l/s)	Peak Res. Flow (l/s)	SANITARY CONTRIBUTION: EXISTING ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	FUTURE ICI: Areas (ha): Commerc.	Industrial	Flows (l/s): Commerc.	Industrial	Peaking Factor	ICI Flow (l/s)	Cumm. Peak ICI Flow (l/s)	EXISTING EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	FUTURE EXTRANEOUS: Area (Ha)	Peak Extr. Flow (l/s)	Cumm. Peak Extr. Flow (l/s)	Pump Flow (l/s)	Total Peak Des. Flow (l/s)	Pump Correction Factor (l/s)	Total Peak Des. Flow with pump (l/s)	Q_d/Q_{full} %	Residual Capacity (l/s)	SEWER DATA: DIA. (mm)	Actual Dia. (mm)	DESIGN SLOPE (%)	ACTUAL SLOPE (%)	CAPAC. (l/s)	VEL. (m/s)	LENGTH (m)	Upstream Obvert (m)	Upstream Invert (m)	Downstream Obvert (m)	Downstream (m)	Comments
	318	PS1	318-PS1							3480.5		3.39	14.10		0.0	3.39	0.00	47.75	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	37.902	0.00	0.000	48.784		0.000	0.000		134.437	50.371	184.809	182.15	-83.349	525	533.40	0.300	0.051	101.460	0.454	11.73	57.10	56.570	57.10	56.564	
	1320	1330	1320-1330	6.75				17.68		17.7		4.00	0.07		0.0	4.00	0.00	0.29	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	1.54	0.433	0.433		0.000	0.000		0.719		0.719	3.65	18.959	200	203.20	0.345	0.331	19.678	0.607	23.58	63.18	62.979	63.10	62.901	
	1675	1680	1675-1680							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	27.138	200	203.20	0.650	0.629	27.138	0.837	63.59	63.93	63.730	63.53	63.330	
	1680	1685	1680-1685							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.755	200	203.20	0.320	0.300	18.755	0.578	13.31	63.53	63.330	63.49	63.290	
	1685	1690	1685-1690							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.023	200	203.20	0.320	0.309	19.023	0.587	113.23	63.49	63.290	63.14	62.940	
	1690	1330	1690-1330							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.299	200	203.20	0.320	0.286	18.299	0.564	13.98	63.14	62.940	63.10	62.900	
	1330	1340	1330-1340							17.7		4.00	0.07		0.0	4.00	0.00	0.29	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.433		0.000	0.000		0.719		0.719	3.52	19.692	200	203.20	0.353	0.356	20.411	0.629	110.16	63.10	62.899	62.71	62.507	
	1340	1350	1340-1350	6.75				17.68		35.4		4.00	0.14		0.0	4.00	0.00	0.57	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	1.35	0.379	0.811		0.000	0.000		1.384		1.384	6.90	18.666	200	203.20	0.347	0.343	20.050	0.618	121.15	62.69	62.488	62.28	62.072	
	1605	1610	1605-1610							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.161	200	203.20	0.320	0.314	19.161	0.591	79.72	63.65	63.450	63.40	63.200	
	1610	1615	1610-1615							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.071	200	203.20	0.320	0.311	19.071	0.588	64.38	63.40	63.200	63.20	63.000	
	1615	1620	1615-1620							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.828	200	203.20	0.320	0.303	18.828	0.581	16.51	63.20	63.000	63.15	62.950	
	1620	1625	1620-1625							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.845	200	203.20	0.320	0.303	18.845	0.581	36.26	63.15	62.950	63.04	62.840	
	1625	1630	1625-1630							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.716	200	203.20	0.320	0.299	18.716	0.577	36.76	63.04	62.840	62.93	62.730	
	1630	1635	1630-1635							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.310	200	203.20	0.320	0.318	19.310	0.595	34.54	62.93	62.730	62.82	62.620	
	1635	1640	1635-1640							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	28.133	200	203.20	0.690	0.676	28.133	0.868	34.02	62.82	62.620	62.59	62.390	
	1655	1660	1655-1660							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	27.011	200	203.20	0.650	0.623	27.011	0.833	35.30	63.34	63.140	63.12	62.920	
	1660	1665	1660-1665							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	18.617	200	203.20	0.320	0.296	18.617	0.574	13.51	63.12	62.920	63.08	62.880	
	1665	1670	1665-1670							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.429	200	203.20	0.320	0.322	19.429	0.599	77.54	63.08	62.880	62.83	62.630	
	1670	1640	1670-1640							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.420	200	203.20	0.320	0.322	19.420	0.599	74.50	62.83	62.630	62.59	62.390	
	1640	1645	1640-1645							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.186	200	203.20	0.320	0.314	19.186	0.592	28.63	62.55	62.350	62.46	62.260	
	1645	1650	1645-1650							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	19.300	200	203.20	0.320	0.318	19.300	0.595	31.43	62.46	62.260	62.36	62.160	
	1650	1350	1650-1350							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.262	200	203.20	0.350	0.351	20.262	0.625	28.52	62.36	62.160	62.26	62.060	
	1350	1360	1350-1360	2.25				5.89		41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.32	0.091	0.902		0.000	0.000		1.570		1.570	7.18	20.289	200	203.20	0.350	0.408	21.859	0.674	17.15	62.25	62.048	62.18	61.978	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1360	1370	1360-1370							41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.902		0.000	0.000		1.570		1.570	8.93	16.015	200	203.20	0.306	0.264	17.585	0.542	37.48	62.16	61.960	62.06	61.861	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1370	1380	1370-1380							41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.902		0.000	0.000		1.570		1.570	7.65	18.948	200	203.20	0.170	0.360	20.518	0.633	8.62	62.04	61.835	62.01	61.804	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1300	1310	1300-1310							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	20.653	200	203.20	0.358	0.364	20.653	0.637	52.70	62.42	62.223	62.23	62.031	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1310	1380	1310-1380							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	21.357	200	203.20	0.306	0.390	21.357	0.659	56.21	62.23	62.031	62.02	61.812	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
PRINCIPALE	1380	1390	1380-1390							41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.902		0.000	0.000		1.570		1.570	8.57	16.755	200	203.20	0.346	0.287	18.326	0.565	83.67	61.99	61.788	61.75	61.548	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1390	1400	1390-1400	2.25				5.89		47.1		4.00	0.19		0.0	4.00	0.00	0.76	1.30	0.00	0.42	0.00	1.50	0.632							1.500	0.000	0.632	1.30	0.364	1.266		0.000	0.000		2.661		2.661	12.55	18.540	200	203.20	0.370	0.384	21.201	0.654	69.55	61.71	61.505	61.44	61.238	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1700	1705	1700-1705	22.51				58.93		58.9		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	3.49	0.978	0.978		0.000	0.000		1.933		1.933	7.14	25.135	200	203.20	0.611	0.626	27.068	0.835	116.97	63.21	63.007	62.48	62.275	
	1705	1710	1705-1710							58.9		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.978		0.000	0.000		1.933		1.933	9.48	18.466	200	203.20	0.347	0.355	20.398	0.629	65.84	62.43	62.234	62.20	62.000	
	1710	1715	1710-1715							58.9		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.978		0.000	0.000		1.933		1.933	9.40	18.624	200	203.20	0.355	0.361	20.556	0.634	66.77	62.17	61.967	61.93	61.726	
	1715	1400	1715-1400							58.9		4.00	0.24		0.0	4.00	0.00	0.95	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.978		0.000	0.000		1.933		1.933	7.06	25.434	200	203.20	0.590	0.640	27.367	0.844	15.48	61.93	61.726	61.83	61.627	
	1400	1410	1400-1410	1.13				2.95		109.0		4.00	0.44		0.0	4.00	0.00	1.77	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.632	2.47	0.691	2.935		0.000	0.000		5.333		5.333	12.98	35.763	300	304.80	0.167	0.166	41.096	0.563	69.30	61.44	61.135	61.32	61.020	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1410	1420	1410-1420	1.13				2.95		112.0		4.00	0.45		0.0	4.00	0.00	1.81	1.17	0.00	0.38	0.00	1.50	0.568							1.500	0.000	1.200	1.17	0.327	3.262		0.000	0.000		6.276		6.276	16.11	32.671	300	304.80	0.144	0.149	38.948	0.534	69.10	61.32	61.020	61.22	60.917	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1720	1725	1720-1725	18.01				47.15		47.1		4.00	0.19		0.0	4.00	0.00	0.76	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	2.78	0.780	0.780		0.000	0.000		1.544		1.544	7.33	19.528	200	203.20	0.365	0.379	21.072	0.650	91.76	63.72	63.521	63.38	63.173	
	1725	1730	1725-1730							47.1		4.00	0.19		0.0	4.00	0.00	0.76	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.780		0.000	0.000		1.544		1.544	7.77	18.331	200	203.20	0.347	0.337	19.875	0.613	113.22	63.32	63.121	62.94	62.739	
	1730	1420	1730-1420							47.1		4.00	0.19		0.0	4.00	0.00	0.76	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.780		0.000	0.000		1.544		1.544	5.79	25.101	200	203.20	0.590	0.606	26.645	0.822	14.51	62.93	62.729	62.84	62.641	
	1420	1430	1420-1430							159.1		4.00	0.64		0.0	4.00	0.00	2.58	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	0.00	0.000	4.042		0.000	0.000		7.820		7.820	18.28	34.954	300	304.80	0.177	0.180	42.774	0.586	63.41	61.22	60.917	61.11	60.803	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1430	1440	1430-1440	4.50				11.79		170.9		4.00	0.69		0.0	4.00	0.00	2.77	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	3.45	0.966	5.008		0.000	0.000		8.977		8.977	20.89	33.989	300	304.80	0.177	0.181	42.965	0.589	62.85	61.22	60.917	61.11	60.803	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1755	1750	1755-1750	5.63				14.73		14.7		4.00	0.06		0.0	4.00	0.00	0.24	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.90	0.253	0.253		0.000	0.000		0.492		0.492	1.72	28.083	200	203.20	0.650	0.697	28.574	0.881	49.47	63.86	63.657	63.52	63.312	
	1750	1745	1750-1745							14.7		4.00	0.06		0.0	4.00	0.00	0.24	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.253		0.000	0.000		0.492		0.492	1.92	25.091	200	203.20	0.517	0.559	25.582	0.789	10.38	63.48	63.275	63.42	63.217	
	1745	1740	1745-1740	10.13				26.52		41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	1.44	0.404	0.657		0.000	0.000		1.326		1.326	10.99	10.742	150	152.40	0.650	0.577	12.068	0.662	85.45	63.32	63.169	62.83	62.676	
	1740	1735	1740-1735							41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.657		0.000	0.000		1.326		1.326	6.50	19.078	200	203.20	0.347	0.356	20.404	0.629	85.49	62.83	62.627	62.53	62.323	
	1735	1440	1735-1440							41.3		4.00	0.17		0.0	4.00	0.00	0.67	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.657		0.000	0.000		1.326		1.326	5.52	22.680	200	203.20	0.493	0.492	24.006	0.740	16.25	62.50	62.300	62.42	62.220	
	1440	1450	1440-1450	2.25				5.89		218.0		4.00	0.88		0.0	4.00	0.00	3.53	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	0.56	0.156	5.821		0.000	0.000		10.554		10.554	22.98	35.370	300	304.80	0.203	0.207	45.923	0.629	56.94	60.93	60.633	60.82	60.515	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
Area C	1450	1460	1450-1460	4.50				11.79		229.8		4.00	0.93		0.0	4.00	0.00	3.72	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	0.94	0.264	6.085		0.000	0.000		11.009		11.009	25.50	32.161	300	304.80	0.177	0.183	43.170	0.592	94.47	60.81	60.507	60.64	60.334	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1755	1760	1755-1760							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	30.836	200	203.20	0.800	0.812	30.836	0.951	54.30	63.80	63.599	63.36	63.158	
	1760	1765	1760-1765							0.0		4.00	0.00		0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.000		0.000	0.000		0.000		0.000	0.00	22.753	200	203.20	0.530	0.442	22.753	0.702	13.57	63.33	63.125	63.27	63.065	
	1765	1770	1765-1770	6.75				17.68		17.7		4.00	0.07		0.0	4.00	0.00	0.29	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	1.01	0.283	0.283		0.000	0.000		0.570		0.570	2.05	27.169	200	203.20	0.643	0.657	27.739	0.855	67.40	63.23	63.030	62.79	62.587	
	1770	1775	1770-1775							17.7		4.00	0.07		0.0	4.00	0.00	0.29	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.00	0.000	0.283		0.000	0.000		0.570		0.570	2.41	23.048	200	203.20	0.466	0.476	23.618	0.728	19.31	62.77	62.567	62.68	62.475	
	1775	1460	1775-1460	3.38				8.84		26.5		4.00	0.11		0.0	4.00	0.00	0.43	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	0.000	0.32	0.091	0.374		0.000	0.000		0.804		0.804	4.10	18.820	200	203.20	0.324	0.329	19.624	0.605	48.95	62.66	62.456	62.50	62.295	
	1460	1470	1460-1470	9.01				23.57		279.9		4.00	1.13		0.0	4.00	0.00	4.54	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	1.60	0.449	6.908		0.000	0.000		12.644		12.644	26.66	34.776	300	304.80	0.217	0.221	47.420	0.650	117.22	60.63	60.330	60.38	60.071	From 16953-81 as-builts, residential peaking factor not adjusted as seen in the rest of the sheet
	1470	1480	1470-1480	9.01				23.57		303.5		4.00	1.23		0.0	4.00	0.00	4.92	0.00	0.00	0.00	0.00	1.50	0.000							1.500	0.000	1.200	2.17	0.608	7.516		0.000	0.000		13.633		13.633	29.50	32.576	300	304.80	0.206	0.210	46.209	0.633	117

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

VILLAGE OF CASSELMAN: SANITARY SEWER AND WATER MASTER PLAN
JLR No. 16953-119

Future Sanitary Sewer System - September 2023 (Existing Conditions)

SANITARY SEWER DESIGN SHEET

Design Constants/Coefficients

Manning's "n" =	0.013	
Infilt. Allowance =	0.28	L/s/ha
Residential Flow =	350	L/cap/d
Commercial/Institutional Flow Rate =	28000	L/gross ha/d
Industrial Flow Rate =	35000	L/gross ha/d

Unless otherwise indicated, Manning's 'n' is assumed to be 0.013

Population Data (Existing)

Total Number of Units:	1695
Census Existing Population:	4048
Population Calibration Factor:	0.791
Computed Population:	4048
Harmon Equation Correction Factor:	1.0

Weighted Coefficients

Singles & Semi-Detached:	2.62	
Multiple Dwellings:	2.04	
Apartments:	1.42	
ICI peaking factor:	1.50	
PPU:	2.39	

Population Data (New Subdivision)

Single Family:	3.4	persons/unit
Townhouse:	2.7	persons/unit
Semi-detached:	2.70	persons/unit
Apartments:	1.80	persons/unit
Duplex:	2.30	persons/unit
Res. Flow:	350	L/cap/d
Infilt. Allowance:	0.28	L/ha/s

Downstream Runs
If population changes, please change value in this cell

Prepared by: M.L.
Checked by: B.P.

SANITARY CONTRIBUTION

| STREET | MANHOLE NUMBER FROM | MANHOLE NUMBER TO | FROM MH - TO MH | EXISTING RESIDENTIAL AREA: Census Data: Singles & Semis (units) | Multiple Dwellings (units) | Apart (units) | Vacant | Popul. (peop.) | Metered Residential | Cumm. Popul. (peop.) | Cumm. Metered Residential (L/s) | Peaking Factor | Avg. Flow (l/s) | FUTURE RESIDENTIAL: Cumm. Popul. (peop.) | Popul. (peop.) | Peaking Factor | Avg. Flow | Peak Res. Flow (l/s) | EXISTING ICI: Areas (ha): Commerc | Industrial | Flows (l/s): Commerc | Industrial | Peaking Factor | ICI Flow (l/s) | FUTURE ICI: Areas (ha): Commerc | Industrial | Flows (l/s): Commerc | Industrial | Peaking Factor | ICI Flow (l/s) | Cumm. Peak ICI Flow (l/s) | EXISTING EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | FUTURE EXTRANEOUS: Area (Ha) | Peak Extr. Flow (l/s) | Cumm. Peak Extr. Flow (l/s) | Pump Flow (l/s) | Total Peak Des. Flow (l/s) | Pump Correction Facto (l/s) | Total Peak Des. Flow with pump (l/s) | Q_d/Q_{full} % | Residual Capacity (l/s) | SEWER DATA: DIA. (mm) | Actual Dia (mm) | DESIGN SLOPE (%) | ACTUAL SLOPE (%) | CAPAC. (l/s) | VEL. (m/s) | LENGTH (m) | Upstream Obvert (m) | Upstream Invert (m) | Downstream Obvert (m) | Downstream (m) | Comments |
|---|---|---