FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

SECOND SUBMISSION - JULY 2026

1600 James Naismith Drive, Ottawa
Proposed Residential Development – Phase 2
KWA PROJECT: 24062

Report Prepared for:
1600 James Naismith LP
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Toronto, ON M8Z 1S4

Report Prepared by:
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2453 Auckland Drive
Burlington, Ontario
L7L 7A9

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1.0 INTRODUCTION

KWA Site Development Consulting Inc. (KWA) has been retained by 1600 James Naismith LP to prepare a detailed Functional Servicing and Stormwater Management Report along with a corresponding grading and servicing design in support of the Site Plan Amendment (SPA) for the proposed development. The subject property is located at the northwest corner of Telesat Court at municipal address 1600 James Naismith Drive in the City of Ottawa. The proposed development is Phase 2 of the subject site, located north-west of the existing building. Phase 1 involved the conversion of the former office building into a multi-residential apartment building. Refer to **Figure 1.1** below.

This report will:

- Provide background information regarding the subject property;
- Summarize the existing site conditions;
- Provide information regarding the proposed development conditions;
- Outline the proposed grading for the development; and
- Outline the existing and proposed municipal servicing.

The recommended servicing has been developed in accordance with the applicable design criteria and requirements of the City of Ottawa (the City).

Figure 1-1: Location Plan

1.1 PROJECT BACKGROUND

The total property is approximately 3.8ha in area at municipal address 1600 James Naismith Drive in the City of Ottawa. The site consists of an existing 8 storey mid-rise rental apartment building (recently converted from an office building) and parking areas associated with that previous use. This report will focus on Phase 2 of the proposed development which is located at the north-western side of the property to the west of the existing building, with a site area of approximately 1.26ha. The remaining land is not part of this application.

The subject site is bound by the existing Phase 1 lands to the east, existing and future parkland to the south, existing residential on Aurele Street to the west, and Queensway Regional Highway 174 to the north. The site is currently occupied by an existing parking lot.

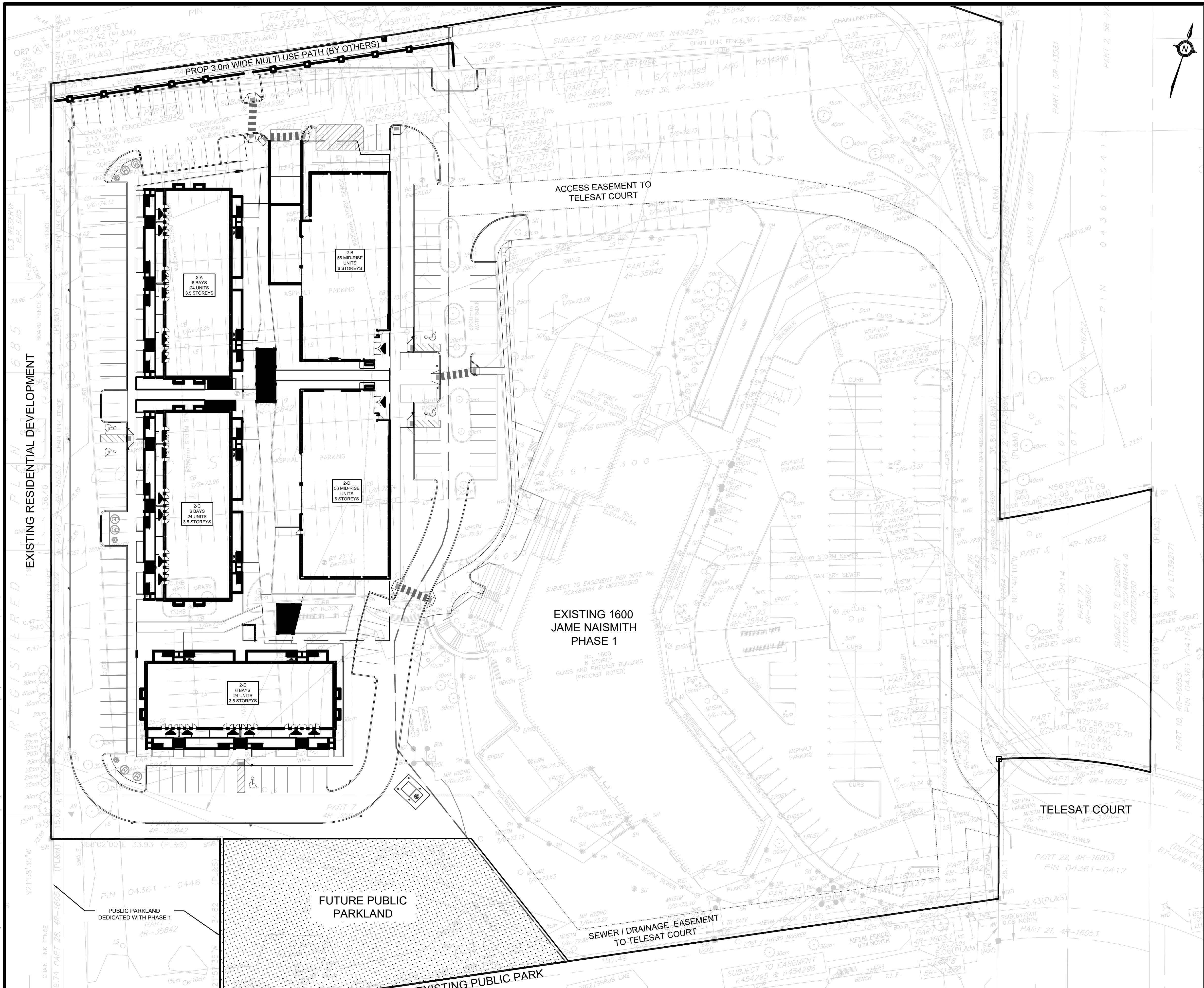
The existing topography of the site has a gentle slope from North to South, towards the existing parkland to the south of the site with elevation differences of approximately 1.0-1.5m across the length of the site.

1.2 PROPOSED DEVELOPMENT

The proposed development of the site includes the construction of three (3) blocks of 3.5 storey stacked townhomes and two (2) blocks of 6 storey mid-rise buildings with a total of 184 units. The buildings will have a perimeter circular wrap-around driveway, with at grade parking, underground parking, and a primary connection to the existing east development and a vehicular connection to Telesat Court through the existing Phase 1 development area. Refer to Figure 1.2 for the proposed development plan.

1.3 SITE ACCESS

The site's main vehicular access will be through the existing Phase 1 development from James Naismith Drive and Telesat Court.



LEGEND

NOT FOR CONSTRUCTION

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2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

1600 JAMES NAISMITH
PHASE 2

PROPOSED
DEVELOPMENT PLAN

PROJECT # 24062	DRAWING # 1.2
SCALE:	1:750
DATE:	JAN 2026
DRAWN BY:	TF
DESIGNED BY:	TF
CHECKED BY:	TF

2.0 STORMWATER MANAGEMENT

2.1 EXISTING DRAINAGE CONDITIONS

The existing topography of the site has a gentle slope from north to south, with existing catchbasins scattered throughout the existing parking lot which capture site drainage, collect it and discharge it to the municipal storm sewer. The minor system drainage drains to a 300mm storm sewer along the north-east corner of the Phase 2 site, which connects to a 450mm running through the Phase 1 lands, which ultimately discharges at the south-east corner of the property into a 600mm municipal storm sewer located in Telesat Court. The site's major emergency flow route discharges to the south end of the existing parking lot, which then flows overland to the parkland to the south into a collection conveyance swale continuing to drain south to the downstream municipal storm sewer.

There is a 600mm storm sewer along the south property line that will collect the drainage from Phase 2 and route it to Telesat Court via an easement on the Phase 1 lands. This storm sewer is connected to the 600mm storm sewer in Telesat Court, so ultimately the storm drainage from the site will have an equivalent flow condition for the municipal storm sewer system.

The existing sewer infrastructure is shown on the **Servicing Plan (S1)** and existing drainage is shown on the **Existing Drainage Plan F2-1.**

2.2 STORMWATER MANAGEMENT DESIGN CRITERIA

The proposed stormwater management design is based on the MOE 2008 Stormwater Management Planning & Design (SWMPD), The City of Ottawa Sewer Guidelines (October 2012), The City of Ottawa Stormwater Management Design Guidelines (2012), and the pre-consultation comments received by the City of Ottawa on March 3, 2025:

- **Quantity Control:** Post-development 100-year storm event flows to be controlled to the pre-development 5-year peak flow, with a maximum runoff coefficient of 0.50. An overflow must be provided of 100yr + 20% of site flows.
- **Quality Control:** Stormwater quality control measures will be provided to achieve, as a minimum, the Enhanced level of protection (i.e. 80% TSS removal) as described in the MOE SWMPD manual.
- **Construction Erosion and Sediment Control:** All applicants must include an Erosion and Sediment Control plan demonstrating that fish habitat and water quality are not affected by sediment from the property during or following site construction.
- **Stormwater Outlet:** Stormwater drainage systems shall discharge to municipal storm sewer system where feasible. In cases where this is not possible, stormwater drainage systems may discharge to natural watercourses.

2.3 PROPOSED STORMWATER OUTLET

There is a 600mm storm sewer along the south property line that will collect the drainage from Phase 2 and route it to Telesat Court via an easement on the Phase 1 lands. This sewer was designed to convey drainage from the subject site through the Phase 1 lands along the southern property line, flowing west to east, and ultimately discharging to the existing 600 mm storm sewer on Telesat Court. Accordingly, the proposed Phase 2 development will connect to this existing 600 mm storm sewer at the southeast corner of the Phase 2 site.

The proposed and existing sewer infrastructure is shown on the **Servicing Plan (S1).**

2.4 PROPOSED STORMWATER MANAGEMENT DESIGN STRATEGY

The proposed stormwater management system will include the capture and conveyance of 1.35ha which includes the entire Phase 2 site (1.26ha) along with a portion of the existing Phase 1 site area (0.09ha) to be received as an external flow allowance. Drainage will be captured by a series of catchbasins spread out across the site. All storm sewers will be sized to convey 100-year flow rate and directed to an underground stormwater storage chamber located in the south-east corner. An orifice will be designed at the outlet of the control maintenance hole at the south-east corner prior to the connection to the existing storm sewer maintenance hole connected to the existing 600mm storm sewer. Proposed underground stormwater chamber is designed to provide the necessary attenuation to maximize the storage volume and ultimately allow the site to release post-development flows from the site to allowable levels. Total suspended solids treatment will be achieved primarily using an oil-grit separator system located downstream of the chamber.

2.5 STORMWATER QUANTITY CONTROL

The City of Ottawa's stormwater management criteria requires that the 100-year post-development peak flow from the site be controlled to the 5-year pre-development peak flow at a runoff coefficient of 0.5. As per guidance from the pre-consultation comments and correspondence with the City, the City mandates that the outflow release rate be set at 50% of the peak allowable rate when estimating the required storage volume using the rational method. This requirement arises from the fact that stored runoff experience fluctuating discharge rates (from a peak flow corresponding to a maximum head down to zero), whereas the rational method assumes a constant peak outflow rate. While this nuance regarding outflow release rates is acknowledged, it is also important to note that the rational method conservatively assumes a constant peak inflow, whereas a runoff hydrograph actually has a more dynamic flow pattern, including rising and falling limbs.

Given these assumptions in the rational method, the City requires: 1) The average release rate equal to 50% of the peak allowable rate to estimate the required storage using the rational method, or 2) If option #1 is not preferred, the City requires a detailed PCSWMM model, which will be subject review by City's Water Resources group.

An analysis using PCSWMM is completed for the existing and proposed conditions using both 3-hr and 6-hr Chicago storm distributions. The 5-year pre-development peak flow for a total site drainage area of 1.35 ha with 50% imperviousness is approximately **173L/s**. Under proposed conditions, on-site runoff for the proposed development will be captured within the private storm sewer network and controlled as follows:

- **Controlled Rooftop (0.3ha)/Parking lot & drive aisle drainage area (0.98ha):** The allowable release rate for this area is 173L/s less the uncontrolled peak flows from the site. Approximately 131m3 of storage has been provided on the roof with the remaining required storage to be provided within an underground chamber located at the southeast corner of the site. The tank has a depth of 1.1 m and resulting in a total storage volume of approximately **280m³**. The outflow will be controlled to **130 L/s** using a **245mm** diameter orifice plate. The controlled flows ultimately discharge to the 600mm site outlet.
- **Uncontrolled basement patio drainage area (0.07 ha):** Runoff from this area is directed to the bypass storm sewer, which is not subject to any controls. The uncontrolled flow in the 100-year storm event is **34 L/s.**

Runoff from private basement walkouts in the Phase 1 development is also conveyed through the Phase 2 lands as an external flow allowance. Pumped drainage from the rear of the Phase 1 building, totaling 16 L/s, is conveyed via a 250 mm storm sewer flowing at 0.25%. This pumped flow rate is confirmed in the Phase 1 Issued for Tender Servicing Plans prepared by LRL Engineering, refer to **Appendix A** for the plan. This external drainage ultimately connects to the 600 mm site outlet through the bypass storm sewer.

Refer to **Appendix A** for the stormwater management calculations, and to the Servicing Plan (**Drawing S1**) for the proposed stormwater management design.

2.6 STORMWATER EMERGENCY OVERLAND FLOW ROUTE

Under existing conditions, the existing emergency overland flow route for the Phase 2 site area spill to the south parking lot, with an existing low elevation of 72.83m, approximately 1.0m lower than the north entrance side of the Phase 2 area. Under proposed conditions, the overland flow route is located at the southeast corner of the Phase 2 lands, where flows will overtop the parking lot curb and be directed towards a conveyance swale that flows south through the parkland and ultimately discharges to the municipal storm sewer system.

The City of Ottawa stormwater management criteria requires that the overland flow route conveyance swale be designed for the 100-year post development flow from the site + 20% as a safety factor. The post development 100-yr flow generated from the subject site is approximately 603 L/s, therefore the design flow with 20% safety factor is conservatively taken as 800 L/s. This will be achieved through a conveyance swale of 1.7 m bottom width, 3.5 m top width, flow depth of 0.30 m, and a slope of 1.0%. Refer to **Appendix A** for swale design calculations and proposed **Grading Plan (G2)** for layout configuration.

2.7 FOUNDATION DRAINAGE

The proposed foundation drainage system for the townhouse blocks is designed to discharge into the basement patio drain stub provided within each block, which ultimately connects to the uncontrolled basement patio storm sewer system. Each townhouse block has an approximate foundation area of 700 m^2. Based on an infiltration rate of 0.33 L/s/ha, the calculated foundation drainage rate is approximately 0.02 L/s per block. In accordance with Ontario Building Code (OBC) guidelines, a safety factor of 2 has been applied, resulting in a design foundation drainage rate of 0.04 L/s for each townhouse block. This flow rate will have a negligible impact on the sewer capacity and corresponding stormwater management design calculations.

The foundation drainage system for the mid-rise building is proposed to discharge to Stub 2-D, which connects to the proposed stormwater management tank. The mid-rise development includes an underground parking structure with an approximate area of 2,700 m^2. Using the same infiltration rate of 0.33 L/s/ha, the estimated foundation drainage rate for the underground structure is approximately 0.09 L/s. Applying a safety factor of 2, in accordance with OBC requirements, results in a design drainage rate of 0.18 L/s.

2.8 STORMWATER WATER QUALITY

The quality control objective is to provide an enhanced protection level, which corresponds to the removal of minimum 80% TSS. Although runoff from the rooftops and landscaped areas can be considered clean, all runoff on site, including rooftops, parking lots, and drive aisles, will be treated by an oil-grit separator (OGS) downstream of the underground storage chamber. An **EFO6** unit is proposed which will provide **82% TSS removal**, with more than 90% of rainfall volume treated. The OGS unit efficiently removes sediment, trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants.

Refer to **Appendix A** for OGS specifications and the ETV verification statement.

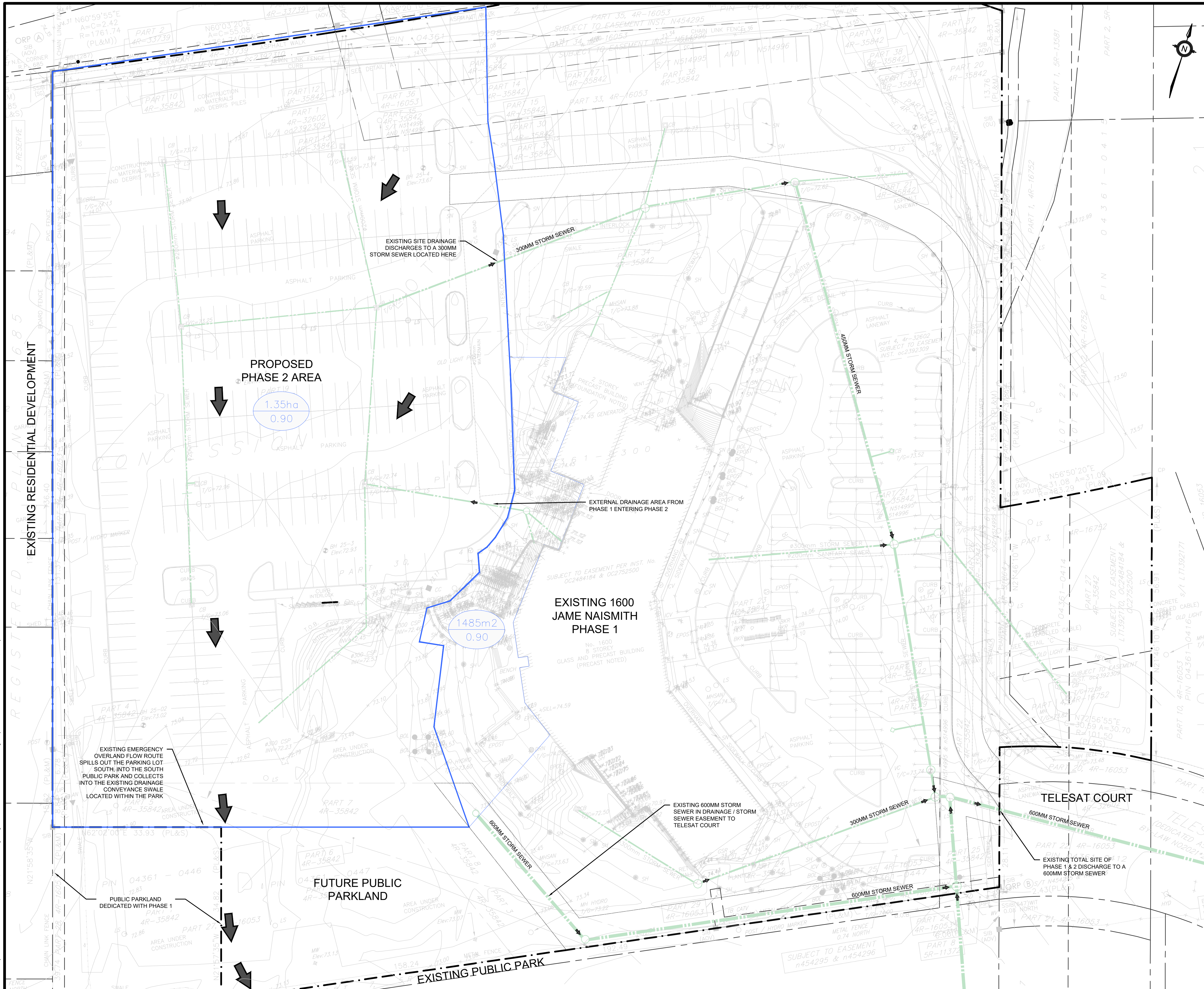
2.9 CONSTRUCTION EROSION AND SEDIMENT CONTROL

Best practices are implemented to control erosion and sedimentation during construction and prior to build-out of stormwater quantity and quality control measures. In general, the ESC approach can be outlined as:

- Silt fence to be installed around the site perimeter.
- A construction access (mud mat) is to be provided at the entrance off Phase 1 lands.
- Catch basins and catch basin manholes on adjacent streets to have underside of the grate covered with Terrafix 240R non-woven geotextile.

These ESC measures should be regularly inspected and maintained to ensure they are operating as designed.

Refer to the **Erosion and Sediment Control Plan**.



LEGEND

1485m2 / 0.90	DRAINAGE AREA / RUNOFF COEFFICIENT
	EMERGENCY OVERLAND FLOW ROUTE
	PIPE DRAINAGE CONVEYANCE ROUTE
	DRAINAGE BOUNDARY
	EXISTING STORM SEWER

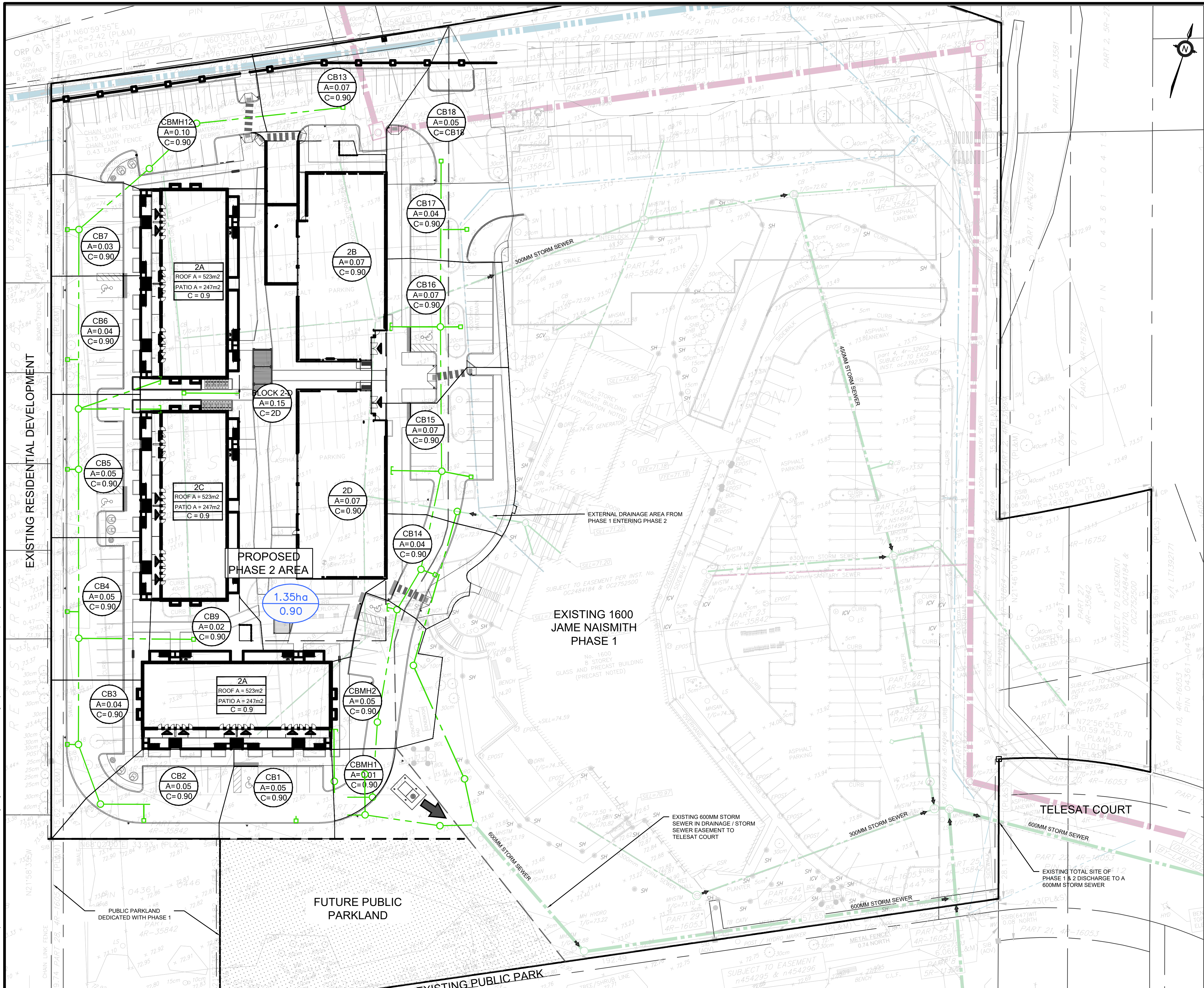
NOT FOR CONSTRUCTION

KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

1600 JAMES NAISMITH PHASE 2

EXISTING DRAINAGE AREA PLAN

PROJECT # 24062	DRAWING # 2.1
SCALE:	1:750
DATE:	JAN 2026
DRAWN BY:	TF
DESIGNED BY:	TF
CHECKED BY:	TF



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PHASE 2

PROPOSED
DRAINAGE AREA PLAN

PROJECT # 24062	DRAWING # 2.2
SCALE:	1:750
DATE:	JAN 2026
DRAWN BY:	TF
DESIGNED BY:	TF
CHECKED BY:	TF

3.0 SANITARY SERVICING

3.1 EXISTING SANITARY SERVICING

The existing site servicing details obtained from The City of Ottawa engineering plan and profiles and a topographical survey completed of the area indicate that there is sanitary sewer infrastructure in the vicinity of the site. The following sanitary infrastructure is adjacent to the subject site;

- A 250 mm sanitary sewer on Aurele Street to the West of the site; and
- A 1200mm trunk sanitary sewer located within the easement along the North-East corner of the site, which flows south-east through the site outletting to the James Naimsmith and Telesat Court right-of-way.

Refer to the **Servicing Drawing (S1)** for the existing sanitary sewer infrastructure and proposed sanitary service design.

3.2 PROPOSED SANITARY SERVICING

Design flows for the proposed development have been calculated using the Ottawa Sewer Design Guidelines (Second Edition – Technical Bulletin ISTB-2018-1 Update March 21, 2018). The total peak sanitary flow is estimated at **5.59 L/s**, based on an average flow of 280 L/day/person, an estimated population of 396, Harmon's peaking factor, and an infiltration allowance of 0.33 L/s/ha.

The proposed sanitary outlet has been analyzed based on available records drawings and preliminary discussions with City Engineering staff. First consideration for ease of access would be to proposed to connect to the 1200mm sanitary trunk sewer located within the subject site. However, City staff have suggested this is not their preferred option and would rather like to see a connection to the sanitary sewer in Eugene Street. As such, we have analyzed this configuration and have confirmed that is should be functionally viable.

Each townhome block will be serviced by a 150 mm diameter sanitary connection. The two mid-rise buildings will share a single mechanical room, also serviced by a 150 mm diameter sanitary connection. The total sanitary flow represents approximately **55.3%** of the capacity of the proposed 150 mm sanitary sewer main. The subject site will have proposed new 250mm municipal sanitary sewer proposed along Eugene Street, connecting to the existing 250 mm municipal sanitary sewer on Aurele Street.

Refer to **Appendix B** for details of the calculations. The proposed and existing servicing is shown on the **Servicing Drawing (S1)**.

3.3 SANITARY SEWER ANALYSIS

A downstream sanitary analysis was completed to estimate the projected peak flows of the existing 250mm sanitary sewer from the proposed subject development as well as the existing properties located along Aurele Street. Refer to **Figure 3-1** for sanitary drainage area plan. The anticipated peak sanitary flow rates and total pipe usages generated by the proposed subject development are summarized in **Table 3-1**.

Table 3-1 Peak Sanitary Flow - Proposed Development

Drainage Area	Pipe Segment	Total Pop	Peak Area Flow (L/s)	Peak Cumulative flow (L/s)	Full Flow Capacity	% Usage
1	SUBJECT SITE to EX. SAN MH 1	397	5.59	5.59	42.05	13.3
2	EX. SAN MH 1 to EX. SAN MH 2	14	0.35	5.94	38.08	15.6
3	EX. SAN MH 1 to EX. SAN MH 2	7	0.25	6.19	38.08	16.2
4	EX. SAN MH 2 to EX. SAN MH 3	14	0.40	6.59	25.92	25.4
5	EX. SAN MH 2 to EX. SAN MH 3	21	0.51	7.10	25.92	27.4
6	EX. SAN MH 3 to EX. SAN MH 4	11	0.33	7.43	30.90	24.0
7	EX. SAN MH 3 to EX. SAN MH 4	14	0.37	7.80	30.90	25.2
8	EX. SAN MH 4 to EX. SAN MH 5	17	0.42	8.22	10.30	79.8
9	EX. SAN MH 4 to EX. SAN MH 5	14	0.38	8.60	10.30	83.5
10	EX. SAN MH 5 to EX. SAN MH 6	14	0.41	9.01	46.45	19.4
11	EX. SAN MH 5 to EX. SAN MH 6	17	0.45	9.46	46.45	20.4

The total peak sanitary flow for the proposed subject development (including the infiltration allowance) has been calculated as 5.63/s. The proposed sanitary service will connect to the existing municipal sewer at Ex. San MH 1 through a new 250 mm diameter sanitary service pipe installed at a slope of 0.5%. Under peak design conditions, the proposed service connection is expected to operate at approximately 13.3% of its full-flow capacity. Based on the analysis, the critical sewer section is located between Ex. San MH 4 and Ex. San MH 5, where the calculated full-flow capacity is 10.30 L/s. The projected post-development peak flow through this section is 8.60 L/s, resulting in an estimated capacity utilization of 83.5%. The higher utilization within this section is primarily due to the relatively flat slope of the existing sewer. However, the adjacent upstream and downstream sewer sections have greater available capacity due to steeper slopes. Therefore existing sanitary sewer system is anticipated to have sufficient capacity to accommodate the additional sanitary flows generated by the proposed development.

Refer to Sanitary Sewer Design Sheet found in **Appendix B** for additional details and calculations.

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PHASE 2

SANITARY DRAINAGE AREA PLAN

SCALE:		PROJECT No.	24062
DATE:	MAY 2026		
DESIGNED BY:	VP	FIGURE No.	3.1
CHECKED BY:	TF		

4.0 WATER SERVICING

4.1 EXISTING WATER SERVICING

The existing site servicing details obtained from The City of Ottawa engineering plan and profiles and a topographical survey completed of the area, indicate that there is watermain infrastructure in the vicinity of the site. The following watermain infrastructure is adjacent to the subject site;

- A 200mm diameter watermain on East side of the property, currently servicing Phase 1 of 1600 James Naismith Drive;
- A 1220mm diameter transmission watermain in an easement located along the North property of the subject site; and
- A 200mm diameter watermain stubbed at the North-West corner of the subject site connected to a 200mm watermain in Eugene Street.

Refer to the **Servicing Drawing (S1)** for the location of the existing watermain infrastructure.

4.2 PROPOSED WATER SERVICING

The proposed water servicing design and calculations are based on the Ottawa Design Guidelines – Water Distribution (Technical Bulletin ISTB-2021-03 – August 18, 2021). Based on the available record drawings indicated above there are potentially three (3) watermain connection options to service the proposed Phase 2 development. The three options are explained further below along with our current proposed recommendation.

- The first option is to connect to the existing 200 mm watermain within the Phase 1 area, located along the east side of Phase 2. This watermain currently services Phase 1 and runs along the north side of the existing building, where it connects to a 300 mm watermain along the east property line that is tapped into the 1,200 mm transmission watermain. This is an undesirable connection as it conflicts with an anticipated future development which is contemplated to be located north of the existing building and east of the proposed phase 2. This area is also heavily encumbered by existing easements, which would make the proposed connection difficult and require additional agreements.
- The second option may be to do a direct connection to the 1200mm transmission watermain along the north property easement. This may be the most straight forward and simple connection to make for the proposed development; however, it is understood that municipality typical does not permit connections to large watermain infrastructure, though this configuration could be made should City staff consider it acceptable under the current site constraints.
- The third option, which is our current proposed option, is to connect to the existing 200mm watermain at the north-west corner of the site which is extended from Eugene Street. This connection will provide a direct water service feed independent of Phase 1 and would also not require a direct connection to the transmission watermain. The proposed connection will consist of a 200mm extension into the site to service the site domestic and water demands.

Through discussions with City Engineering staff option 3 is the preferred configuration with two watermain connections to Eugene Street, one existing and one proposed.

Domestic water demand was calculated based on the Ottawa Design Guidelines for Water Distribution. A population estimate of 426 and a per-capita water demand of 280 Lpcd were used to determine the average water demand for the proposed development. The average day water demand was calculated to be 1.38 L/s. As per Table 3-3 in the MOE Design Guidelines for Drinking-Water Systems a Minimum hour factor of 0.3, a Peak hour factor of 4.5 and a Maximum Day factor of 3.0 were used to calculate the demands. The Minimum hour demand was calculated to be 0.39L/s, the Peak Hour demand was calculated to be 5.79L/s and the Maximum Day demand was calculated to be 3.86L/s

In accordance with the City's criteria, fire flow demands are determined using the Fire Underwriters Survey methodology. Based on the assessment, the end unit of Townhouse Block 2-E was identified as having the highest required fire flow demand among the townhouse blocks, requiring 67 L/s while Midrise Building 2-D was determined to have the highest required fire flow demand within the proposed development, with a calculated demand of 83 L/s. This is based on the following inputs:

Townhouse Blocks	Midrise Building
NBC Occupancy 'C' for residential occupancy	NBC Occupancy 'C' for residential occupancy
Wood Fram construction class	Ordinary construction Class
No supervised NFPA 13 compliant sprinkler system	Fully supervised NFPA 13 compliant sprinkler system
Limited Combustible contents factor	Limited Combustible contents factor
Applicable exposure charges based on distance to adjacent buildings & inclusion of 2hr rated fire walls	Applicable exposure charges based on distance to adjacent buildings & inclusion of 2hr rated fire walls

As per City 's design criteria, watermains shall be sized to meet the greater of either:

- Maximum day demand plus fire flow or
- Maximum hour demand

Therefore, the overall water demand for the development is factored water demand plus fire flow. The total flow for the townhouse blocks is **70.5 L/s** (67 L/s + 3.86 L/s), and the total flow for the Midrise buildings is 87.2L/s (83 L/s + 3.86 L/s),

A hydrant flow test was completed in April 2025 by Hydrant Testing Ontario at the hydrant located at 1580 Aurele Street. The test recorded a static pressure of 58 psi and a theoretical fire flow of 2,530 USGPM (160 L/s) at a residual pressure of 20 psi. Based on the test results, the water demands of 70.5 L/s and 87.2 L/s corresponds to an estimated system pressure of approximately 43.1 psi and 40.9 psi respectively. After accounting for minor losses, major losses, and elevation differences, a minimum residual pressure of 20 psi is anticipated at the hydrant located at the furthest point on site.

In addition, site modelling was completed by LMC consulting to assess the available water supply and boundary conditions within the proposed development. The analysis determined that the worst-case scenario for the townhouse blocks occurs at Townhouse Block 2-E, where the available fire flow is 78.32 L/s this exceeds the calculated total required flow of 70.80 L/s. Similarly, the available fire flow at Midrise Building 2-D was determined to be 87.74 L/s, which exceeds the calculated total required flow of 87.50 L/s. Therefore, the analysis confirms that the municipal water system has sufficient pressure and capacity to meet the required fire flow demands for the proposed development.

The water demand calculations, hydrant flow test, and boundary condition Memo have been included in **Appendix C** and the proposed and existing watermain infrastructure are shown on the **Servicing Drawing (S1).**

4.3 FIRE HYDRANT COVERAGE

One (1) existing fire hydrant is currently located at the east limit of the site within the Phase 1 development and is proposed to remain. In addition, three (3) new fire hydrants are proposed within the site to provide adequate fire protection coverage for the development. The coverage radius is shown and indicated by a dashed circle on the servicing plan to show sufficient coverage is provided for fire protection.

5.0 CONCLUSION

The proposed development consists of three (3) blocks of 3.5 storey stacked townhomes and two (2) blocks of 6 storey mid-rise buildings with a total of 184 units. The proposed development can be serviced utilizing the existing and proposed infrastructure outlined in the Servicing Drawing (S1). Our conclusions and recommendations for servicing of the proposed development are summarized as follows:

Stormwater Management Servicing:

- The proposed development will match its post-development 100-year flows to the existing development 5-year flows with a runoff coefficient of 0.5.
- The proposed development site stormwater drainage will have no adverse impact to the downstream sewer infrastructure.
- Stormwater quality will be achieved by an oil-grit separator.
- Sediment and erosion control measures to be taken during construction have been presented in this report.
- Under post-development conditions, stormwater runoff quality and quantity are expected to improve relative to pre-development conditions.

Sanitary Servicing:

- The anticipated peak sanitary peak flow for the proposed development is 5.59L/s.
- The downstream sanitary analysis determined that the additional loading will not adversely affect the existing municipal sanitary sewer system, which has sufficient capacity to accommodate the increased flows.
- The new service connection will consist of a 250mm diameter municipal sanitary sewer along Eugene Street, which will connect to the existing 250 mm municipal sanitary sewer on Aurele Street.

Water Servicing:

- The calculated maximum day and peak hour demands were calculated as 3.86L/s and 5.79L/.
- The maximum calculated fire flow demand for the townhouse blocks is 67 L/s, and maximum calculated fire flow demand for the midrise blocks is 83 L/s .
- The proposed development will be serviced by an internal 200mm watermain connection provided off the 200mm diameter watermain on Eugene Street.
- Additional confirmation of the fire and domestic branch sizing and fire flow requirements should be provided by the Mechanical Consultant at the Building Permit stage of approval.

5.1 RECOMMENDATIONS

The following recommendations are presented:

- The contractor shall locate and verify all dimensions, levels, inverts, and datums onsite and report any discrepancies or omissions to the engineer prior to construction.

In summary, the site can be adequately serviced in respect to water supply, sanitary drainage, stormwater drainage, and stormwater management. The stormwater quantity and quality controls can be implemented in accordance with The City of Ottawa Sewer Guidelines (October 2012), and The City of Ottawa Stormwater Management Design Guidelines (2012).

Accordingly, we hereby recommend the adoption of this report as it relates to the provision of servicing works, and for the purposes of site plan application, and building permit application approvals. We trust that this Functional Servicing and Stormwater Management Report is sufficient for your purposes. If you have any questions or comments, please do not hesitate to contact the undersigned.

Yours very truly,

KWA Site Development Consulting Inc.

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APPENDIX A

STORMWATER CALCULATIONS

Summary of Model Attributes

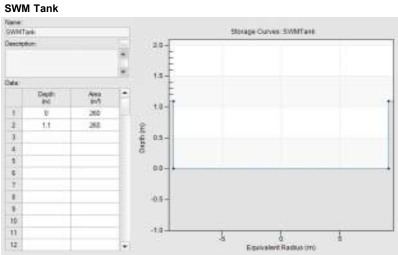
Existing Drainage Areas

Name	Outlet	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Infiltration Method	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)
S1	OF1	1.35	80	169	2	43	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366

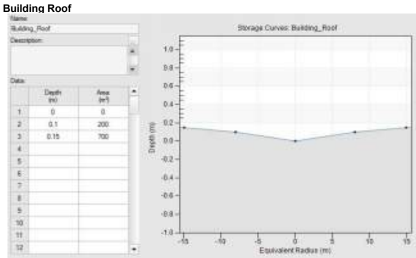
Proposed Drainage Areas

Name	Outlet	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Infiltration Method	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)
S1	J1	0.98	60	163	2	80	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S2	OF2	0.0247	5	49	1	80	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S3	OF2	0.0247	5	49	1	80	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S4	OF2	0.0247	5	49	1	80	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S5	SU2	0.0523	15	35	1	90	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S6	SU3	0.0523	15	35	1	90	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S7	SU4	0.0523	15	35	1	90	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S8	SU6	0.07	20	35	1	90	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366
S9	SU5	0.07	20	35	1	90	0.013	0.24	2	5	GREEN_AMPT	169.93	6.6	0.366

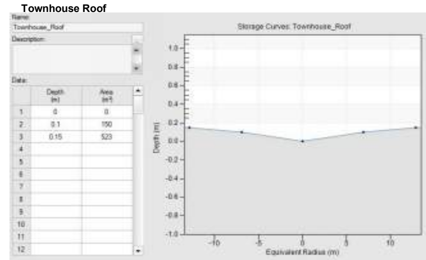
SWM Tank



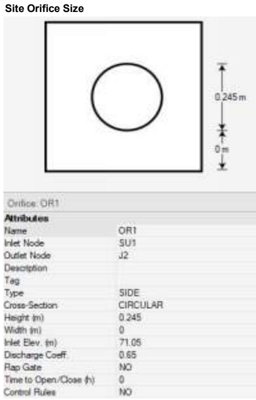
Building Roof



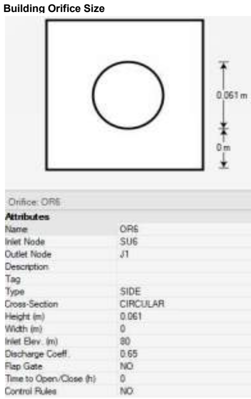
Townhouse Roof



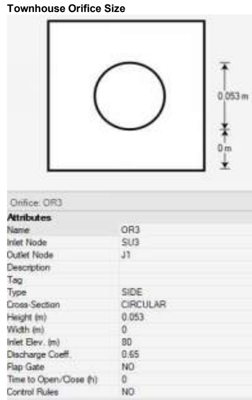
Site Orifice Size



Building Orifice Size



Townhouse Orifice Size

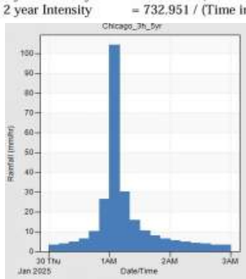


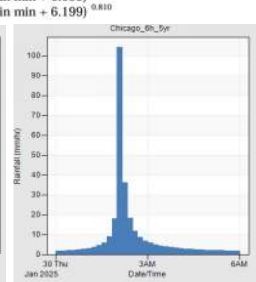
Rain Gauge

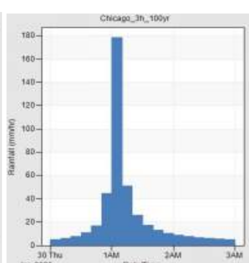
3-hour and 6-hour duration Chicago Storm distribution based on the following City of Ottawa Intensity Duration Frequency (IDF) parameters:

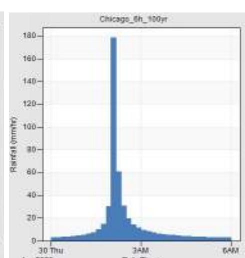
IDF curve equations (Intensity in mm/hr)

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity = $1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity = $1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

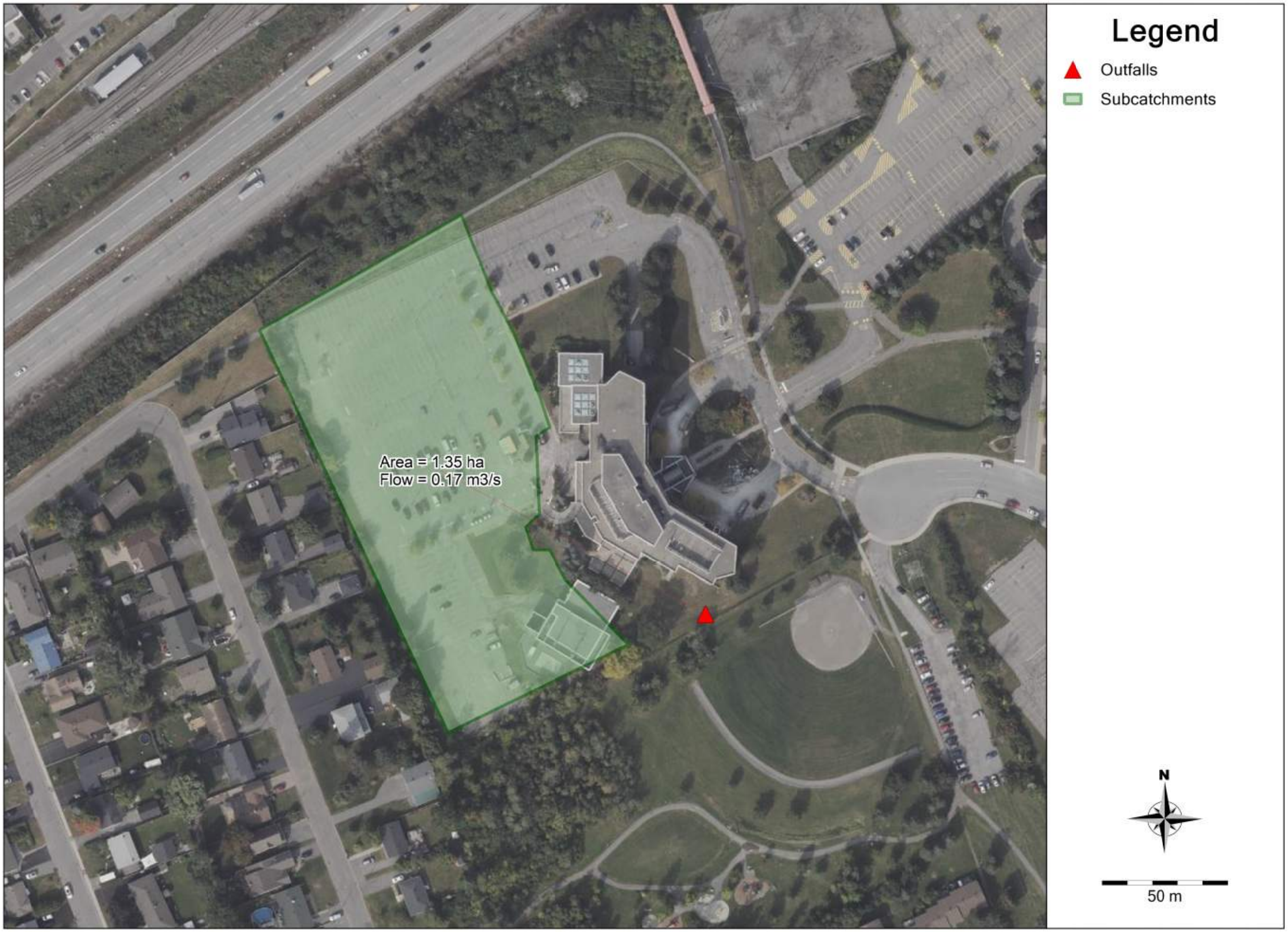








Existing Model Schematic



Existing - 5yr - 3hr Chicago

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 4
  Number of subcatchments ... 1
  Number of nodes ........... 1
  Number of links ........... 0
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                              Data       Recording
  Name                 Data Source                            Type       Interval 
  ------------------------------------------------------------------------
  Chicago_3h_100yr     Chicago_3h_100yr                       INTENSITY   10 min.
  Chicago_3h_5yr       Chicago_3h_5yr                         INTENSITY   10 min.
  Chicago_6h_100yr     Chicago_6h_100yr                       INTENSITY   10 min.
  Chicago_6h_5yr       Chicago_6h_5yr                         INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width    %Imperv    %Slope Rain Gage           
Outlet          
  ---------------------------------------------------------------------------------
--------------------------
  S1                         1.35     80.00     43.00    2.0000 Chicago_3h_5yr      
OF1             


  ************
  Node Summary
  ************
                                          Invert      Max.    Ponded    External
  Name                 Type                Elev.     Depth      Area    Inflow  
  -------------------------------------------------------------------------------
  OF1                  OUTFALL            100.00      0.00       0.0


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
```

Flow Routing .... NO
Water Quality .... NO
Infiltration Method ...... HORTON
Surcharge Method .... EXTRAN
Starting Date 01/30/2025 00:00:00
Ending Date 01/31/2025 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00

************************** Runoff Quantity Continuity **************************	Volume hectare-m	Depth mm
Total Precipitation	0.057	42.541
Evaporation Loss	0.000	0.000
Infiltration Loss	0.032	23.643
Surface Runoff	0.025	18.439
Final Storage	0.001	0.646
Continuity Error (%)	-0.439	

************************** Flow Routing Continuity **************************	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.025	0.249
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.025	0.249
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	42.54	0.00	0.00	23.64	17.80	0.64	18.44	0.25	0.17	0.433

```
Analysis begun on:  Thu Jul  9 07:45:22 2026
Analysis ended on:  Thu Jul  9 07:45:22 2026
Total elapsed time: < 1 sec
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 4
  Number of subcatchments ... 1
  Number of nodes ........... 1
  Number of links ........... 0
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                               Data       Recording
  Name                 Data Source                             Type       Interval
  -------------------------------------------------------------------------------
  Chicago_3h_100yr     Chicago_3h_100yr                        INTENSITY   10 min.
  Chicago_3h_5yr       Chicago_3h_5yr                          INTENSITY   10 min.
  Chicago_6h_100yr     Chicago_6h_100yr                        INTENSITY   10 min.
  Chicago_6h_5yr       Chicago_6h_5yr                          INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width    %Imperv    %Slope Rain Gage
Outlet
  ---------------------------------------------------------------------------------
--------------------------
  S1                         1.35     80.00      43.00    2.0000 Chicago_6h_5yr
OF1


  ************
  Node Summary
  ************
                                                   Invert      Max.    Ponded    External
  Name                 Type                         Elev.     Depth      Area    Inflow
  -------------------------------------------------------------------------------
  OF1                  OUTFALL                     100.00      0.00       0.0


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
```

Flow Routing .... NO
Water Quality .... NO
Infiltration Method ...... HORTON
Surcharge Method .... EXTRAN
Starting Date 01/30/2025 00:00:00
Ending Date 01/31/2025 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00

************************** Runoff Quantity Continuity **************************	Volume hectare-m	Depth mm
Total Precipitation	0.066	49.044
Evaporation Loss	0.000	0.000
Infiltration Loss	0.037	27.128
Surface Runoff	0.029	21.467
Final Storage	0.001	0.646
Continuity Error (%)	-0.401	

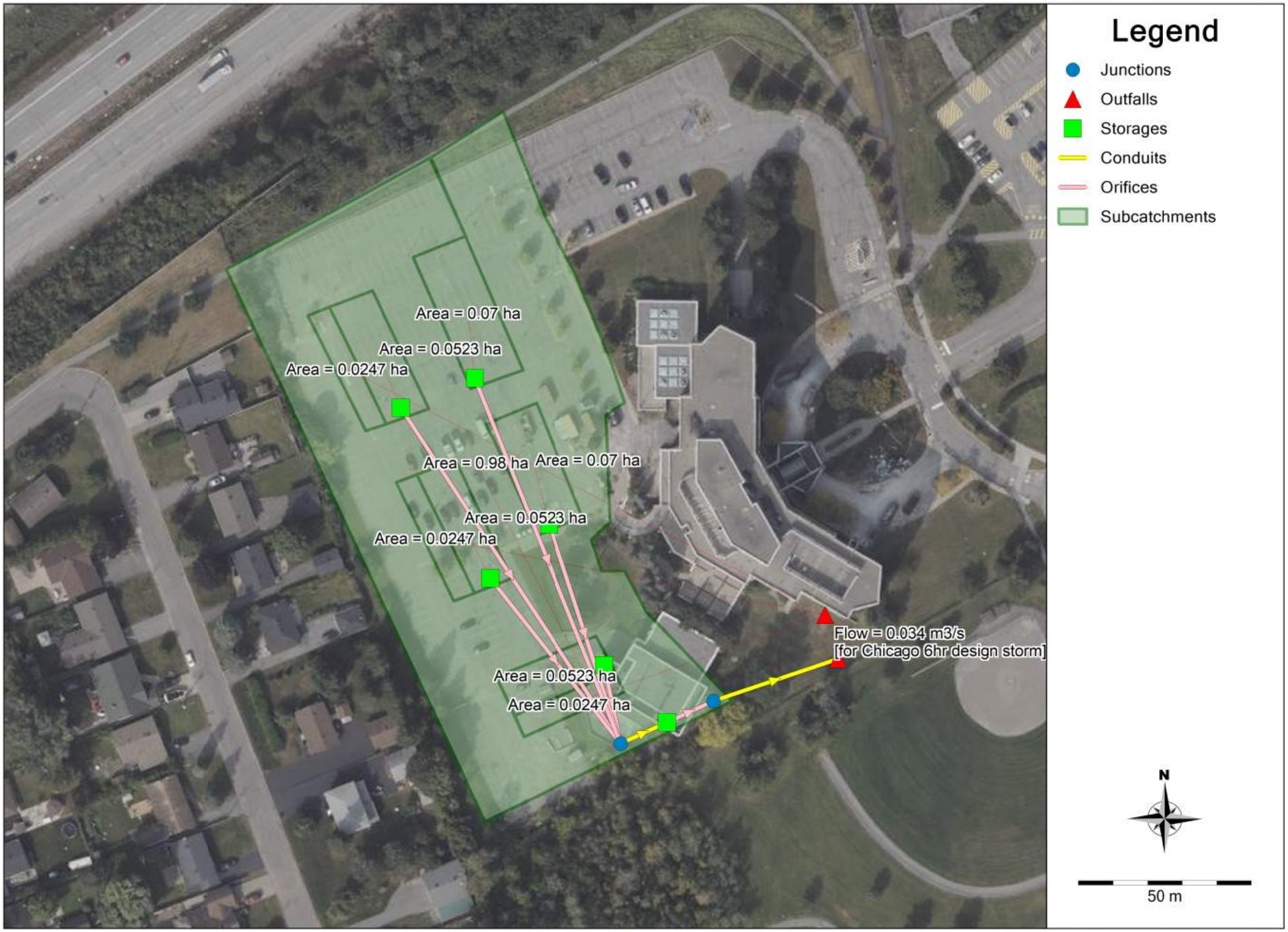
************************** Flow Routing Continuity **************************	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.029	0.290
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.029	0.290
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	49.04	0.00	0.00	27.13	20.61	0.86	21.47	0.29	0.17	0.438

```
Analysis begun on:  Thu Jul  9 07:43:31 2026
Analysis ended on:  Thu Jul  9 07:43:31 2026
Total elapsed time: < 1 sec
```

Proposed Model Schematic



```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
  ------------------------------------------------------------


  *************
  Element Count
  *************
  Number of rain gages ...... 4
  Number of subcatchments ... 9
  Number of nodes ........... 10
  Number of links ........... 8
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                              Data       Recording
  Name                 Data Source                            Type       Interval 
  ------------------------------------------------------------------------
  Chicago_3h_100yr     Chicago_3h_100yr                       INTENSITY   10 min.
  Chicago_3h_5yr       Chicago_3h_5yr                         INTENSITY   10 min.
  Chicago_6h_100yr     Chicago_6h_100yr                       INTENSITY   10 min.
  Chicago_6h_5yr       Chicago_6h_5yr                         INTENSITY   10 min.


  ********************
  Subcatchment Summary
  ********************
  Name                          Area     Width   %Imperv    %Slope Rain Gage            
Outlet
  ---------------------------------------------------------------------------------
--------------------------
  S1                            0.98     60.00     80.00    2.0000 Chicago_3h_100yr     
J1
  S2                            0.02      5.00     80.00    1.0000 Chicago_3h_100yr     
OF2
  S3                            0.02      5.00     80.00    1.0000 Chicago_3h_100yr     
OF2
  S4                            0.02      5.00     80.00    1.0000 Chicago_3h_100yr     
OF2
  S5                            0.05     15.00     90.00    1.0000 Chicago_3h_100yr     
SU2
  S6                            0.05     15.00     90.00    1.0000 Chicago_3h_100yr     
SU3
  S7                            0.05     15.00     90.00    1.0000 Chicago_3h_100yr     
SU4
  S8                            0.07     20.00     90.00    1.0000 Chicago_3h_100yr     
SU6
  S9                            0.07     20.00     90.00    1.0000 Chicago_3h_100yr     
SU5


  ************
  Node Summary
  ************
```

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	71.06	1.94	0.0	
J2	JUNCTION	71.02	2.27	0.0	
OF1	OUTFALL	70.98	0.53	0.0	
OF2	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	71.05	1.10	0.0	
SU2	STORAGE	80.00	0.15	0.0	
SU3	STORAGE	80.00	0.15	0.0	
SU4	STORAGE	80.00	0.15	0.0	
SU5	STORAGE	80.00	0.15	0.0	
SU6	STORAGE	80.00	0.15	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	% Slope	Roughness
C1	J1	SU1	CONDUIT	10.0	0.1000	0.0130
C2	J2	OF1	CONDUIT	2.8	1.4287	0.0130
OR1	SU1	J2	ORIFICE			
OR2	SU2	J1	ORIFICE			
OR3	SU3	J1	ORIFICE			
OR4	SU4	J1	ORIFICE			
OR5	SU5	J1	ORIFICE			
OR6	SU6	J1	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.75	0.44	0.19	0.75	1	0.35
C2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.51

****
Analysis Options
****

Flow Units .... CMS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO

```
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/30/2025 00:00:00
Ending Date .............. 01/31/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.097        71.708
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.011         8.183
Surface Runoff ...........         0.085        62.934
Final Storage ............         0.002         1.235
Continuity Error (%) .....        -0.899


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.085         0.850
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.085         0.850
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
Link C2 (79.88%)


********************************
Highest Flow Instability Indexes
********************************
All links are stable.
```

****
Most Frequent Nonconverging Nodes
****
Convergence obtained at all time steps.

****
Routing Time Step Summary
****

Minimum Time Step	:	0.50 sec
Average Time Step	:	2.43 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	34.07 %
3.155 - 1.991 sec	:	8.58 %
1.991 - 1.256 sec	:	21.55 %
1.256 - 0.792 sec	:	18.33 %
0.792 - 0.500 sec	:	17.47 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	71.71	0.00	0.00	9.29	56.66	5.20	61.85	0.61	0.42	0.863
S2	71.71	0.00	0.00	8.92	56.58	5.69	62.27	0.02	0.01	0.868
S3	71.71	0.00	0.00	8.92	56.58	5.69	62.27	0.02	0.01	0.868
S4	71.71	0.00	0.00	8.92	56.58	5.69	62.27	0.02	0.01	0.868
S5	71.71	0.00	0.00	4.35	63.59	3.07	66.66	0.03	0.03	0.930
S6	71.71	0.00	0.00	4.35	63.59	3.07	66.66	0.03	0.03	0.930
S7	71.71	0.00	0.00	4.35	63.59	3.07	66.66	0.03	0.03	0.930
S8	71.71	0.00	0.00	4.35	63.59	3.07	66.66	0.05	0.03	0.930
S9	71.71	0.00	0.00	4.35	63.59	3.07	66.66	0.05	0.03	0.930

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.19	1.05	72.11	0 01:22	1.05
J2	JUNCTION	0.06	0.18	71.20	0 01:22	0.18
OF1	OUTFALL	0.06	0.18	71.16	0 01:22	0.18
OF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.20	1.06	72.11	0 01:22	1.06
SU2	STORAGE	0.06	0.15	80.15	0 01:41	0.15
SU3	STORAGE	0.06	0.15	80.15	0 01:41	0.15
SU4	STORAGE	0.06	0.15	80.15	0 01:41	0.15
SU5	STORAGE	0.06	0.15	80.15	0 01:42	0.15
SU6	STORAGE	0.06	0.15	80.15	0 01:42	0.15

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.424	0.436	0 01:10	0.606	0.804	-0.007
J2	JUNCTION	0.000	0.130	0 01:22	0	0.804	0.002
OF1	OUTFALL	0.000	0.130	0 01:22	0	0.804	0.000
OF2	OUTFALL	0.034	0.034	0 01:10	0.0461	0.0461	0.000
SU1	STORAGE	0.000	0.435	0 01:10	0	0.804	0.008
SU2	STORAGE	0.026	0.026	0 01:10	0.0349	0.0349	0.000
SU3	STORAGE	0.026	0.026	0 01:10	0.0349	0.0349	0.000
SU4	STORAGE	0.026	0.026	0 01:10	0.0349	0.0349	0.000
SU5	STORAGE	0.034	0.034	0 01:10	0.0467	0.0467	0.000
SU6	STORAGE	0.034	0.034	0 01:10	0.0467	0.0467	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	0.67	0.300	0.890

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.051	17.9	0.0	0.0	0.275	96.3	0 01:22	0.130
SU2	0.007	30.3	0.0	0.0	0.023	93.2	0 01:41	0.002
SU3	0.007	30.3	0.0	0.0	0.023	93.2	0 01:41	0.002
SU4	0.007	30.3	0.0	0.0	0.023	93.2	0 01:41	0.002
SU5	0.010	31.3	0.0	0.0	0.031	94.4	0 01:42	0.003
SU6	0.010	31.3	0.0	0.0	0.031	94.4	0 01:42	0.003

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr

OF1	79.99	0.034	0.130	0.804
OF2	37.31	0.004	0.034	0.046
System	58.65	0.039	0.143	0.850

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.435	0 01:10	1.42	1.24	1.00
C2	CONDUIT	0.130	0 01:22	1.98	0.25	0.34
OR1	ORIFICE	0.130	0 01:22			1.00
OR2	ORIFICE	0.002	0 01:41			1.00
OR3	ORIFICE	0.002	0 01:41			1.00
OR4	ORIFICE	0.002	0 01:41			1.00
OR5	ORIFICE	0.003	0 01:42			1.00
OR6	ORIFICE	0.003	0 01:42			1.00

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.65	0.00
C2	1.00	0.00	0.00	0.00	0.03	0.97	0.00	0.00	0.14	0.00

****
Conduit Surcharge Summary
****

	--------- Hours Full --------			Hours	Hours
Conduit	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C1	0.67	0.67	0.69	0.11	0.02

```
Analysis begun on:  Thu Jul  9 07:47:09 2026
Analysis ended on:  Thu Jul  9 07:47:10 2026
Total elapsed time: 00:00:01
```

Proposed - 100yr - 6hr Chicago

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 4
Number of subcatchments ... 9
Number of nodes 10
Number of links 8
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_3h_100yr	Chicago_3h_100yr	INTENSITY	10 min.
Chicago_3h_5yr	Chicago_3h_5yr	INTENSITY	10 min.
Chicago_6h_100yr	Chicago_6h_100yr	INTENSITY	10 min.
Chicago_6h_5yr	Chicago_6h_5yr	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.98	60.00	80.00	2.0000	Chicago_6h_100yr	J1
S2	0.02	5.00	80.00	1.0000	Chicago_6h_100yr	OF2
S3	0.02	5.00	80.00	1.0000	Chicago_6h_100yr	OF2
S4	0.02	5.00	80.00	1.0000	Chicago_6h_100yr	OF2
S5	0.05	15.00	90.00	1.0000	Chicago_6h_100yr	SU2
S6	0.05	15.00	90.00	1.0000	Chicago_6h_100yr	SU3
S7	0.05	15.00	90.00	1.0000	Chicago_6h_100yr	SU4
S8	0.07	20.00	90.00	1.0000	Chicago_6h_100yr	SU6
S9	0.07	20.00	90.00	1.0000	Chicago_6h_100yr	SU5

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	71.06	1.94	0.0	
J2	JUNCTION	71.02	2.27	0.0	
OF1	OUTFALL	70.98	0.53	0.0	
OF2	OUTFALL	0.00	0.00	0.0	
SU1	STORAGE	71.05	1.10	0.0	
SU2	STORAGE	80.00	0.15	0.0	
SU3	STORAGE	80.00	0.15	0.0	
SU4	STORAGE	80.00	0.15	0.0	
SU5	STORAGE	80.00	0.15	0.0	
SU6	STORAGE	80.00	0.15	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	% Slope	Roughness
C1	J1	SU1	CONDUIT	10.0	0.1000	0.0130
C2	J2	OF1	CONDUIT	2.8	1.4287	0.0130
OR1	SU1	J2	ORIFICE			
OR2	SU2	J1	ORIFICE			
OR3	SU3	J1	ORIFICE			
OR4	SU4	J1	ORIFICE			
OR5	SU5	J1	ORIFICE			
OR6	SU6	J1	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.75	0.44	0.19	0.75	1	0.35
C2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.51

****
Analysis Options
****

Flow Units .... CMS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO

```
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/30/2025 00:00:00
Ending Date .............. 01/31/2025 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001524 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.111        82.330
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.013         9.450
Surface Runoff ...........         0.098        72.331
Final Storage ............         0.002         1.236
Continuity Error (%) .....        -0.834


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.098         0.977
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.098         0.977
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
Link C2 (84.78%)


********************************
Highest Flow Instability Indexes
********************************
All links are stable.
```

```
  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.50 sec
  Average Time Step           :     2.22 sec
  Maximum Time Step           :     5.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
     5.000 -  3.155 sec       :    28.79 %
     3.155 -  1.991 sec       :     8.66 %
     1.991 -  1.256 sec       :    16.60 %
     1.256 -  0.792 sec       :    29.26 %
     0.792 -  0.500 sec       :    16.70 %


  ***************************
  Subcatchment Runoff Summary
  ***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	82.33	0.00	0.00	10.70	65.20	5.91	71.11	0.70	0.42	0.864
S2	82.33	0.00	0.00	10.38	65.10	6.36	71.46	0.02	0.01	0.868
S3	82.33	0.00	0.00	10.38	65.10	6.36	71.46	0.02	0.01	0.868
S4	82.33	0.00	0.00	10.38	65.10	6.36	71.46	0.02	0.01	0.868
S5	82.33	0.00	0.00	5.10	73.16	3.41	76.57	0.04	0.03	0.930
S6	82.33	0.00	0.00	5.10	73.16	3.41	76.57	0.04	0.03	0.930
S7	82.33	0.00	0.00	5.10	73.16	3.41	76.57	0.04	0.03	0.930
S8	82.33	0.00	0.00	5.10	73.17	3.41	76.57	0.05	0.03	0.930
S9	82.33	0.00	0.00	5.10	73.17	3.41	76.57	0.05	0.03	0.930

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.20	1.06	72.12	0 02:24	1.06
J2	JUNCTION	0.06	0.18	71.20	0 02:24	0.18
OF1	OUTFALL	0.06	0.18	71.16	0 02:24	0.18
OF2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
SU1	STORAGE	0.20	1.07	72.12	0 02:24	1.07
SU2	STORAGE	0.07	0.15	80.15	0 02:43	0.15
SU3	STORAGE	0.07	0.15	80.15	0 02:43	0.15
SU4	STORAGE	0.07	0.15	80.15	0 02:43	0.15
SU5	STORAGE	0.07	0.15	80.15	0 02:44	0.15
SU6	STORAGE	0.07	0.15	80.15	0 02:44	0.15

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.422	0.433	0 02:10	0.697	0.924	-0.008
J2	JUNCTION	0.000	0.130	0 02:24	0	0.924	0.001
OF1	OUTFALL	0.000	0.130	0 02:24	0	0.924	0.000
OF2	OUTFALL	0.034	0.034	0 02:10	0.0529	0.0529	0.000
SU1	STORAGE	0.000	0.433	0 02:10	0	0.924	0.007
SU2	STORAGE	0.026	0.026	0 02:10	0.04	0.04	0.000
SU3	STORAGE	0.026	0.026	0 02:10	0.04	0.04	0.000
SU4	STORAGE	0.026	0.026	0 02:10	0.04	0.04	0.000
SU5	STORAGE	0.034	0.034	0 02:10	0.0536	0.0536	0.000
SU6	STORAGE	0.034	0.034	0 02:10	0.0536	0.0536	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	0.73	0.313	0.877

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.053	18.5	0.0	0.0	0.279	97.5	0 02:24	0.130
SU2	0.008	31.5	0.0	0.0	0.023	95.1	0 02:43	0.002
SU3	0.008	31.5	0.0	0.0	0.023	95.1	0 02:43	0.002
SU4	0.008	31.5	0.0	0.0	0.023	95.1	0 02:43	0.002
SU5	0.011	32.8	0.0	0.0	0.031	96.6	0 02:44	0.003
SU6	0.011	32.8	0.0	0.0	0.031	96.6	0 02:44	0.003

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr

OF1	84.88	0.033	0.130	0.924
OF2	54.48	0.003	0.034	0.053
System	69.68	0.036	0.141	0.977

****

Link Flow Summary

****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.433	0 02:10	1.50	1.23	1.00
C2	CONDUIT	0.130	0 02:24	1.98	0.25	0.34
OR1	ORIFICE	0.130	0 02:24			1.00
OR2	ORIFICE	0.002	0 02:43			1.00
OR3	ORIFICE	0.002	0 02:43			1.00
OR4	ORIFICE	0.002	0 02:43			1.00
OR5	ORIFICE	0.003	0 02:44			1.00
OR6	ORIFICE	0.003	0 02:44			1.00

****

Flow Classification Summary

****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.59	0.00
C2	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.14	0.00

****

Conduit Surcharge Summary

****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.72	0.72	0.74	0.11	0.01

```
Analysis begun on:  Thu Jul  9 07:48:03 2026
Analysis ended on:  Thu Jul  9 07:48:04 2026
Total elapsed time: 00:00:01
```

Swale Sheet Flow Calculations

SWALE CONVEYANCE

Mannings' Equation			TRAPEZOIDAL CHANNEL		
Flow Depth (m) =	0.300				
Side Slope Ratio (H:V) =	3.0	/1	Top width	3.5	
Bed Width (m)=	1.70		Hyd. Rad, 'R'		
Area (m^2)=	0.780		0.216825	m	
Wetted Perimeter (m)=	3.597	m	Friction Slope Sf		
Slope (%) =	1.00		0.0100	m/m	
Manning 'n' =	0.035		Velocity		
Channel Capacity, Q =	0.804	m3/sec	1.031	m/s	
Required Capacity =	665	L/s			
100yr + 20%	798	L/s			

KWA
SITE DEVELOPMENT CONSULTING

Project Name: MORETON JAMES NAISMITH
Project #: 24062
Date: 7/10/2026

Prepared by: VP
Checked by: TF

LOCATION: OTTAWA
STORM SEWER DESIGN SHEET
STORM EVENT (yr) 100

a = 1735.688
b = 6.014
c = 0.82

i = a[(T+b)/6(
Q = A(i)C/36(
AC = AREA x
C. FLOW = (

STREET	UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	AREA (m^2) C=0.90	AC (m^2)	CUMULATIVE AC (m^2)	ToC (min)	C. FLOW @42L/s/ha (m^2)	CUMULATIVE C. FLOW (m^2)	i (mm/h)	Q (L/s)	PIPE SIZE (mm)	GRADE (%)	CAPACITY (L/s)	VELOCITY (m/s)	LENGTH (m)
	CB13	CBMH12	729	656	656	10.00		0	178.56	32.5	300	0.25	48.4	0.7	29.7
	CBMH12	MH11	998	898	1554	10.72		0	172.20	74.3	375	0.25	87.7	0.8	13.1
	MH11	MH 7		0	1554	11.00		0	169.92	73.4	375	0.25	87.7	0.8	18.7
	CB 7	MH 7	345	311	311	10.00		0	178.56	15.4	250	1.00	59.5	1.2	2.3
	CB 6	MH 7	427	384	384	10.00		0	178.56	19.1	250	1.00	59.5	1.2	2.1
	MH 7	MH 6		0	2249	11.39	523	523	166.77	106.4	450	0.25	142.6	0.9	36.1
	BLOCK A	MH 6		0	0	10.00	523	523	178.56	2.2	250	0.30	32.6	0.7	4.3
	BLOCK C	MH 6		0	0	10.00		0	178.56	0.0	250	0.50	42.0	0.9	16.6
	MH 6	MH 5		0	2249	12.06		1046	161.67	105.4	450	0.25	142.6	0.9	12.1
	CB 5	MH 5	515	464	464	10.00		0	178.56	23.0	250	1.00	59.5	1.2	2.3
	CB 4	MH 5	538	484	484	10.00		0	178.56	24.0	250	1.00	59.5	1.2	2.2
	MH 5	MH 4		0	3197	12.29		1046	160.04	146.5	525	0.25	215.0	1.0	34.0
	CB 9	MH 4	225	203	203	10.00		0	178.56	10.0	250	0.25	29.7	0.6	23.1
	MH 4	MH 3		0	3399	12.86		1046	156.06	151.8	525	0.25	215.0	1.0	21.4
	BLOCK E	MH 3		0	0	10.00	532	532	178.56	2.2	250	0.25	29.7	0.6	12.8
	CB 3	MH 3	407	366	366	10.00		0	178.56	18.2	250	1.00	59.5	1.2	2.2
	MH 3	MH 2		0	3766	13.22		1578	153.67	167.4	525	0.25	215.0	1.0	12.8
	CB 2	MH 2	482	434	434	10.00		0	178.56	21.5	250	1.00	59.5	1.2	3.1
	MH 2	TANK		0	4199	13.43		1578	152.28	184.3	600	0.25	307.0	1.1	9.9
	CB 17	CB18	387	348	348	10.00		0	178.56	17.3	250	0.25	29.7	0.6	4.8
	CB18	MH14	502	452	800	10.13		0	177.36	39.4	300	0.25	48.4	0.7	33.4
	BLOCK B	MH14		0	0	10.00	651	651	178.56	2.7	250	0.50	42.0	0.9	10.1
	CB 16	MH14	650	585	585	10.00		0	178.56	29.0	250	1.00	59.5	1.2	4.1
	MH14	MH 13		0	1385	10.95		651	170.35	68.3	375	0.25	87.7	0.8	29.1
	CB 15	MH 13	702	632	632	10.00		0	178.56	31.3	250	1.00	59.5	1.2	6.0
	BLOCK D	MH 13		0	0	10.00	670	670	178.56	2.8	250	0.50	42.0	0.9	10.2
	MH 13	MH 12		0	2017	11.56		1321	165.48	98.3	450	0.25	142.6	0.9	20.2
	CB 14	MH 12	361	325	325	10.00		0	178.56	16.1	250	1.00	59.5	1.2	3.1
	MH 12	MH8		0	2342	11.93		1321	162.63	111.3	450	0.25	142.6	0.9	9.4
	BLOCK 2-D	MH8	1542	1388	1388	10.00		0	178.56	68.8	300	1.00	96.7	1.4	2.0
	MH8	CBMH 2		0	3730	12.11		1321	161.35	172.7	525	0.25	215.0	1.0	23.0
	CBMH 2	CBMH 1	522	470	4199	12.49		1321	158.58	190.5	600	0.25	307.0	1.1	15.2
	CBMH 1	TANK	134	121	4320	12.73		1321	156.96	193.9	600	0.25	307.0	1.1	5.0
	CB 1	TANK	388	349	349	10.00		0	178.56	17.3	250	1.00	59.5	1.2	0.9
ORIFICE	TANK 1	MH2-1	3875	3488	3488	10.00		0	178.56	173.0	525	0.25	215.0	1.0	1.9

Project Name: MORETON JAMES NAISMITH
Project #: 24062
Date: 7/10/2026

Prepared by: VP
Checked by: TF

LOCATION: OTTAWA
STORM SEWER DESIGN SHEET
STORM EVENT (yr) 100

a = 1735.688
b = 6.014
c = 0.82

i = a[(T+b)/6(
Q = A(i)C/36(
AC = AREA x
C. FLOW = (

STREET	UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	AREA (m^2) C=0.90	AC (m^2)	CUMULATIVE AC (m^2)	ToC (min)	C. FLOW @42L/s/ha (m^2)	CUMULATIVE C. FLOW (m^2)	i (mm/h)	Q (L/s)	PIPE SIZE (mm)	GRADE (%)	CAPACITY (L/s)	VELOCITY (m/s)	LENGTH (m)
BASEMENT PATIO DRAINS	BLOCK 2-A PATIO STUB	MH104	247	222	222	10.00		0	178.56	11.0	200	0.25	16.4	0.5	7.6
	MH104	MH103		0	222	10.24		0	176.37	10.9	200	0.25	16.4	0.5	44.0
	BLOCK 2-C PATIO STUB	MH103	247	222	222	10.00		0	178.56	11.0	200	0.25	16.4	0.5	7.6
	MH103	MH102		0	445	11.65		0	164.78	20.4	250	0.25	29.7	0.6	26.4
	MH102	MH101		0	445	12.37		0	159.42	19.7	250	0.25	29.7	0.6	14.3
	MH101	MH100		0	445	12.77		0	156.68	19.4	250	0.25	29.7	0.6	34.9
	BLOCK 2-E PATIO STUB	MH100	247	222	222	10.00		0	178.56	11.0	200	0.25	16.4	0.5	4.7
	MH100	MH2		0	667	13.73		0	150.40	27.9	300	0.25	48.4	0.7	8.2
	MH2	MH2-1		0	667	13.93		0	149.17	27.6	300	0.25	48.4	0.7	10.2
	MH2-1	OGS		0	4155	14.18		0	147.66	170.4	525	0.25	215.0	1.0	2.2
	OGS	MH 15		0	4155	14.21		0	147.44	170.2	525	0.25	215.0	1.0	2.1
EXISTING PHASE 1	MH21	MH20	358	323	323	10.00		0	178.56	16.0	250	0.25	29.7	0.6	53.5
	MH20	MH 15		0	323	11.47		0	166.14	14.9	250	0.25	29.7	0.6	8.9
OUTLET	MH 15	EX MH		0	4477	14.25		0	147.23	183.1	600	0.23	294.5	1.0	17.2

Inlet Capcity Analysis

Project Name:	James Naismith		
Project Number:	24062	Prepared By:	VP
Location:	Ottawa	Checked By:	T.F
Date:	6/26/2026		

Rainfall Data		
Location:	Ottawa	
Event	5 year	100 year
a	998.071	1735.688
b	6.053	6.014
c	0.814	0.820

Drain ID	Structure Name	Drainage Catchment Area (ha)	Drain Catchment Area (m^2)	Runoff Coefficient	Tc (min)	Intensity (mm/hr)	Flow (m^3/s)	100-Year Intensity (mm/hr)	100-Year Flow (m3/s)	Drain Type	Depth of Ponding (m)	Inlet Capacity (m^3/s)	Inlet Capacity with 50% Blockage (m^3/s)	OK with 50% Blockage?
1	CB13	0.0729	729	0.90	10.00	178.6	0.033	178.6	0.033	Single CB	0.12	0.085	0.043	OK
2	CBMH12	0.0998	998	0.90	10.00	178.6	0.045	178.6	0.045	Single CB	0.13	0.095	0.048	OK
3	CB7	0.0345	345	0.90	10.00	178.6	0.015	178.6	0.015	Single CB	0.12	0.085	0.043	OK
4	CB6	0.0427	427	0.90	10.00	178.6	0.019	178.6	0.019	Single CB	0.10	0.060	0.030	OK
5	CB5	0.0515	515	0.90	10.00	178.6	0.023	178.6	0.023	Single CB	0.13	0.095	0.048	OK
6	CB4	0.0538	538	0.90	10.00	178.6	0.024	178.6	0.024	Single CB	0.14	0.110	0.055	OK
7	CB9	0.0225	225	0.90	10.00	178.6	0.010	178.6	0.010	Single CB	0.08	0.035	0.018	OK
8	CB3	0.0407	407	0.90	10.00	178.6	0.018	178.6	0.018	Single CB	0.15	0.120	0.060	OK
9	CB2	0.0482	482	0.90	10.00	178.6	0.022	178.6	0.022	Single CB	0.18	0.145	0.073	OK
10	CB1	0.0388	388	0.90	10.00	178.6	0.017	178.6	0.017	Single CB	0.17	0.135	0.068	OK
11	CB17	0.0387	387	0.90	10.00	178.6	0.017	178.6	0.017	Single CB	0.12	0.085	0.043	OK
12	CB18	0.0502	502	0.90	10.00	178.6	0.022	178.6	0.022	Single CB	0.09	0.045	0.023	OK
13	CB16	0.065	650	0.90	10.00	178.6	0.029	178.6	0.029	Single CB	0.10	0.060	0.030	OK
14	CB15	0.0702	702	0.90	10.00	178.6	0.031	178.6	0.031	Single CB	0.13	0.095	0.048	OK
15	CB14	0.0361	361	0.90	10.00	178.6	0.016	178.6	0.016	Single CB	0.13	0.095	0.048	OK
16	CBMH2	0.0522	522	0.90	10.00	178.6	0.023	178.6	0.023	Single CB	0.13	0.095	0.048	OK
17	CBMH1	0.0134	134	0.90	10.00	178.6	0.006	178.6	0.006	Single CB	0.15	0.120	0.060	OK

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/15/2026

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	1.35
Runoff Coefficient 'c':	0.90

Project Name:	James Naismith
Project Number:	24062
Designer Name:	Pavneet Brar
Designer Company:	KWA Site Dev
Designer Email:	pavneet.brar@kwasitedev.com
Designer Phone:	289-259-3545
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	39.21
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	1506
Estimated Average Annual Sediment Volume (L/yr):	1225

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	69
EFO5	76
EFO6	82
EFO8	89
EFO10	93
EFO12	96

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

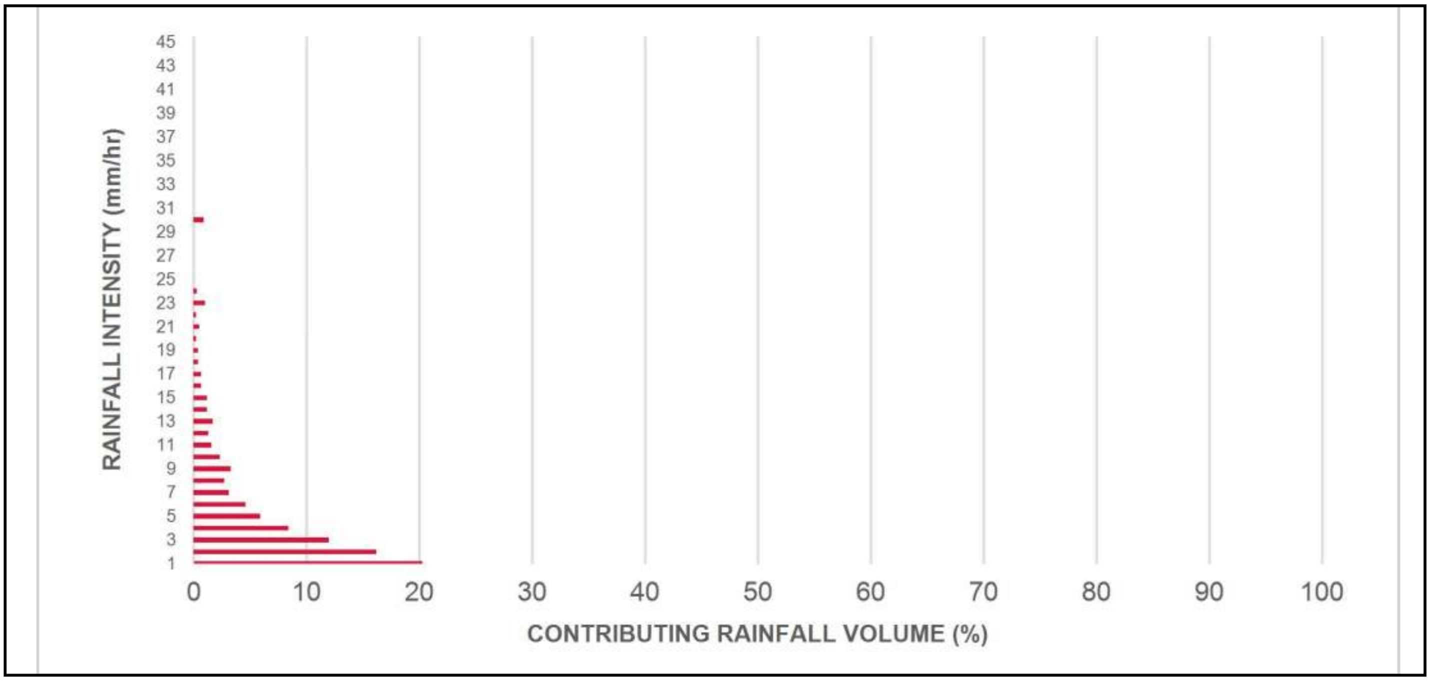
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

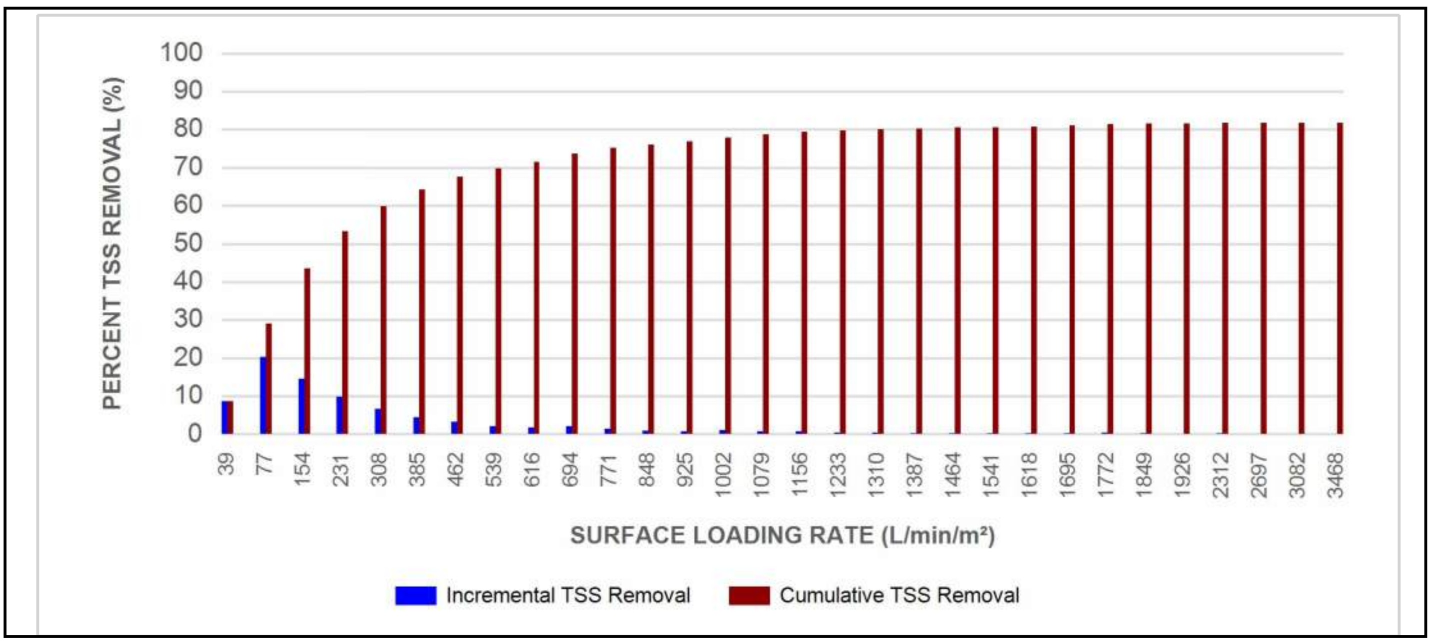
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	1.69	101.0	39.0	100	8.6	8.6
1.00	20.3	29.0	3.38	203.0	77.0	100	20.3	29.0
2.00	16.2	45.2	6.76	405.0	154.0	89	14.5	43.5
3.00	12.0	57.2	10.13	608.0	231.0	82	9.8	53.3
4.00	8.4	65.6	13.51	811.0	308.0	78	6.6	59.9
5.00	5.9	71.6	16.89	1013.0	385.0	75	4.4	64.3
6.00	4.6	76.2	20.27	1216.0	462.0	71	3.3	67.6
7.00	3.1	79.3	23.64	1419.0	539.0	67	2.1	69.7
8.00	2.7	82.0	27.02	1621.0	616.0	65	1.8	71.5
9.00	3.3	85.3	30.40	1824.0	694.0	64	2.1	73.6
10.00	2.3	87.6	33.78	2027.0	771.0	63	1.5	75.1
11.00	1.6	89.2	37.15	2229.0	848.0	63	1.0	76.0
12.00	1.3	90.5	40.53	2432.0	925.0	62	0.8	76.9
13.00	1.7	92.2	43.91	2635.0	1002.0	62	1.1	77.9
14.00	1.2	93.5	47.29	2837.0	1079.0	60	0.7	78.7
15.00	1.2	94.6	50.67	3040.0	1156.0	58	0.7	79.3
16.00	0.7	95.3	54.04	3243.0	1233.0	56	0.4	79.7
17.00	0.7	96.1	57.42	3445.0	1310.0	54	0.4	80.1
18.00	0.4	96.5	60.80	3648.0	1387.0	53	0.2	80.3
19.00	0.4	96.9	64.18	3851.0	1464.0	50	0.2	80.5
20.00	0.2	97.1	67.55	4053.0	1541.0	48	0.1	80.6
21.00	0.5	97.5	70.93	4256.0	1618.0	45	0.2	80.8
22.00	0.2	97.8	74.31	4459.0	1695.0	43	0.1	81.0
23.00	1.0	98.8	77.69	4661.0	1772.0	41	0.4	81.4
24.00	0.3	99.1	81.06	4864.0	1849.0	40	0.1	81.5
25.00	0.0	99.1	84.44	5067.0	1926.0	38	0.0	81.5
30.00	0.9	100.0	101.33	6080.0	2312.0	32	0.3	81.8
35.00	0.0	100.0	118.22	7093.0	2697.0	28	0.0	81.8
40.00	0.0	100.0	135.11	8106.0	3082.0	24	0.0	81.8
45.00	0.0	100.0	152.00	9120.0	3468.0	22	0.0	81.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

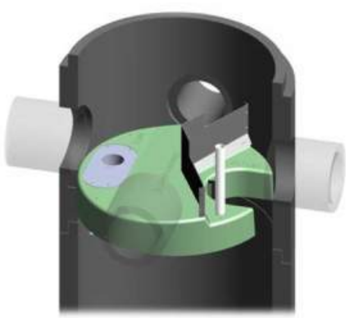
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

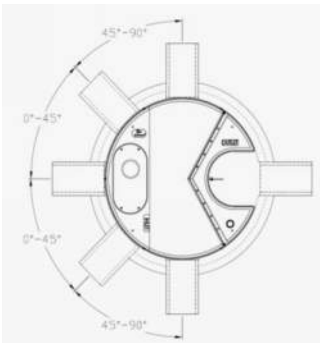
DESIGN FLEXIBILITY

►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.





INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF and EFO Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

Registration: GPS-ETV_VR2023-11-15_Imbrium-SC

In accordance with

ISO 14034:2016

**Environmental management —
Environmental technology verification (ETV)**

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 15, 2023
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF and EFO are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

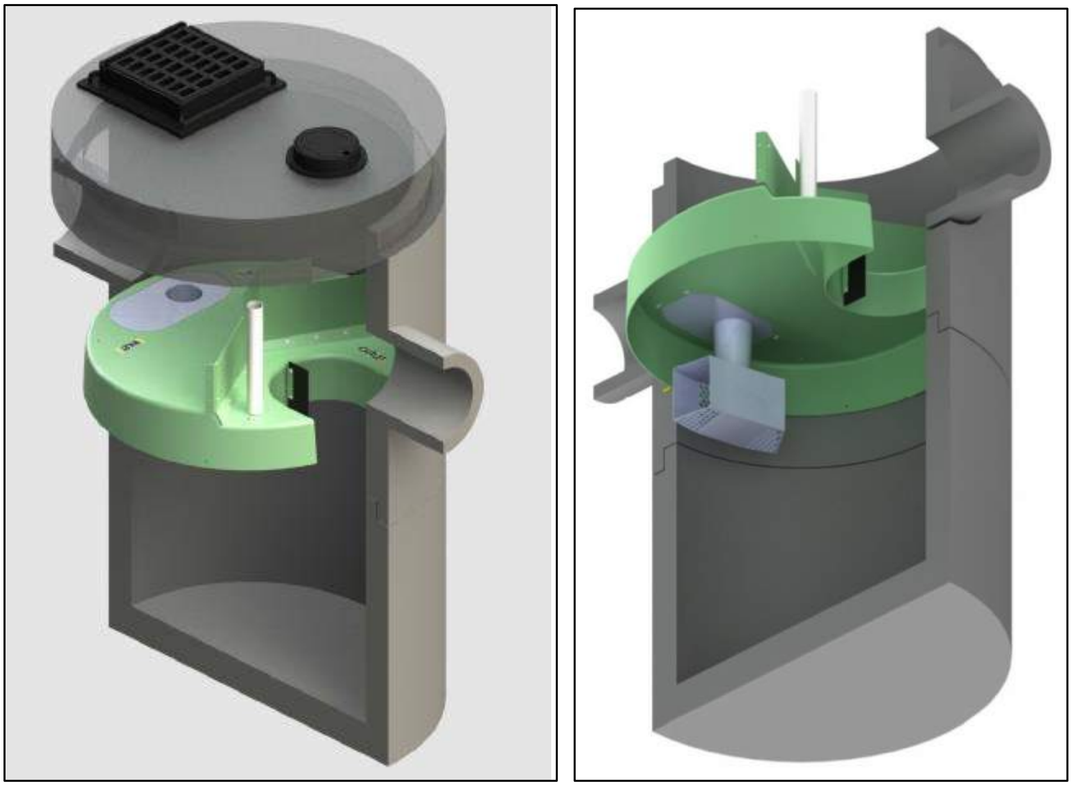


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m² (27.9 gal/min/ft²) and 535 L/min/m² (13.1 gal/min/ft²) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® EF4 and EFO4 Oil-Grit Separators, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test [a]:

During the capture test, the Stormceptor® EF4 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO4, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test [a]:

During the scour test, the Stormceptor® EF4 and Stormceptor® EFO4 OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO4 OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

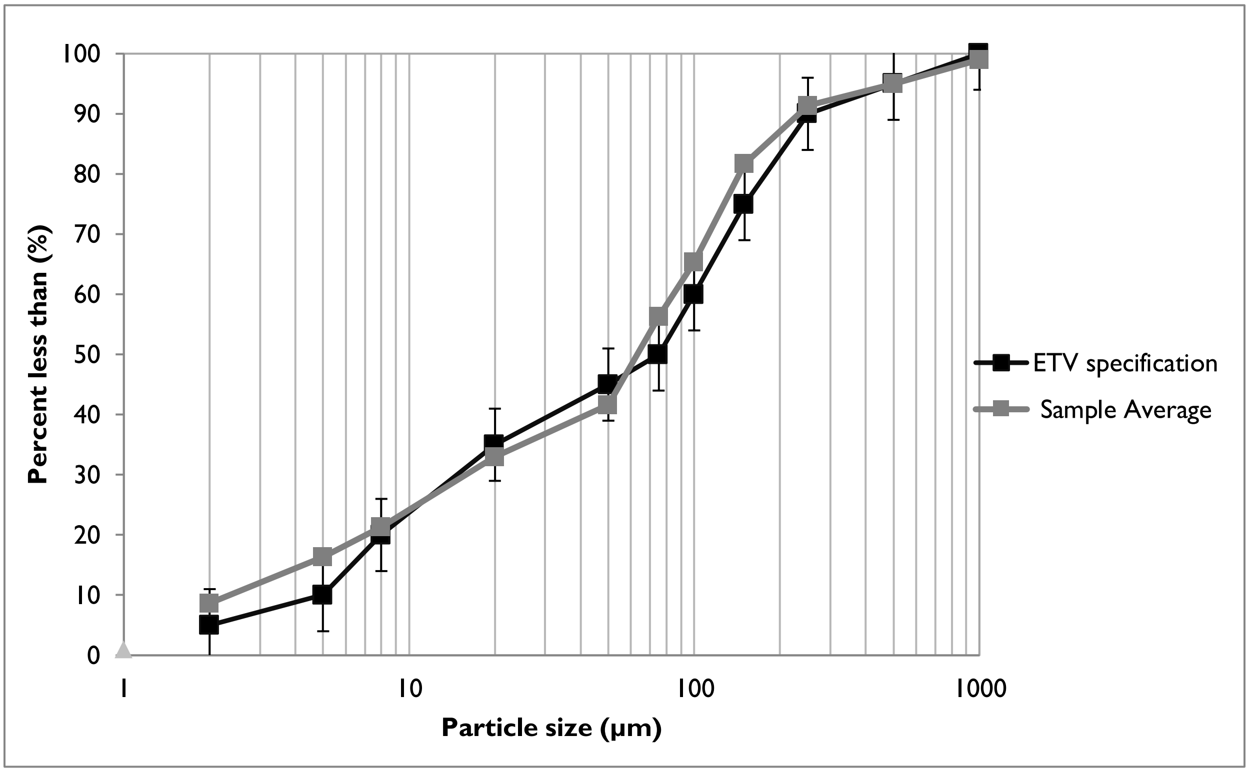


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.
* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

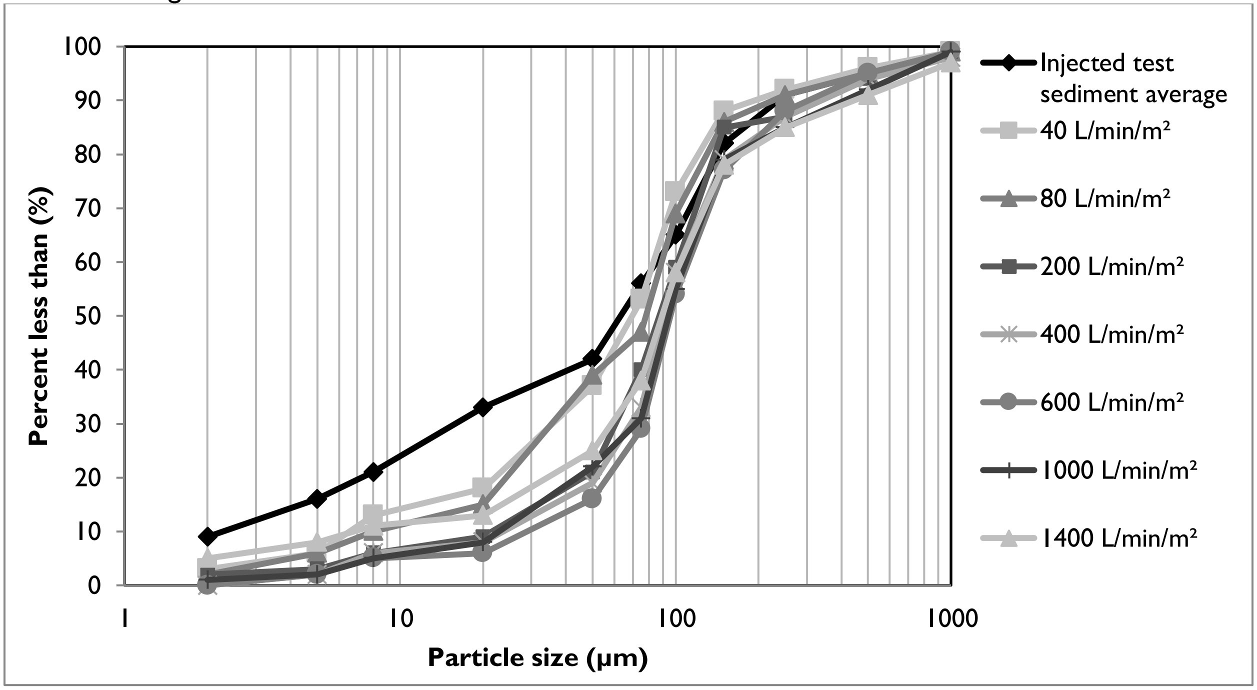


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

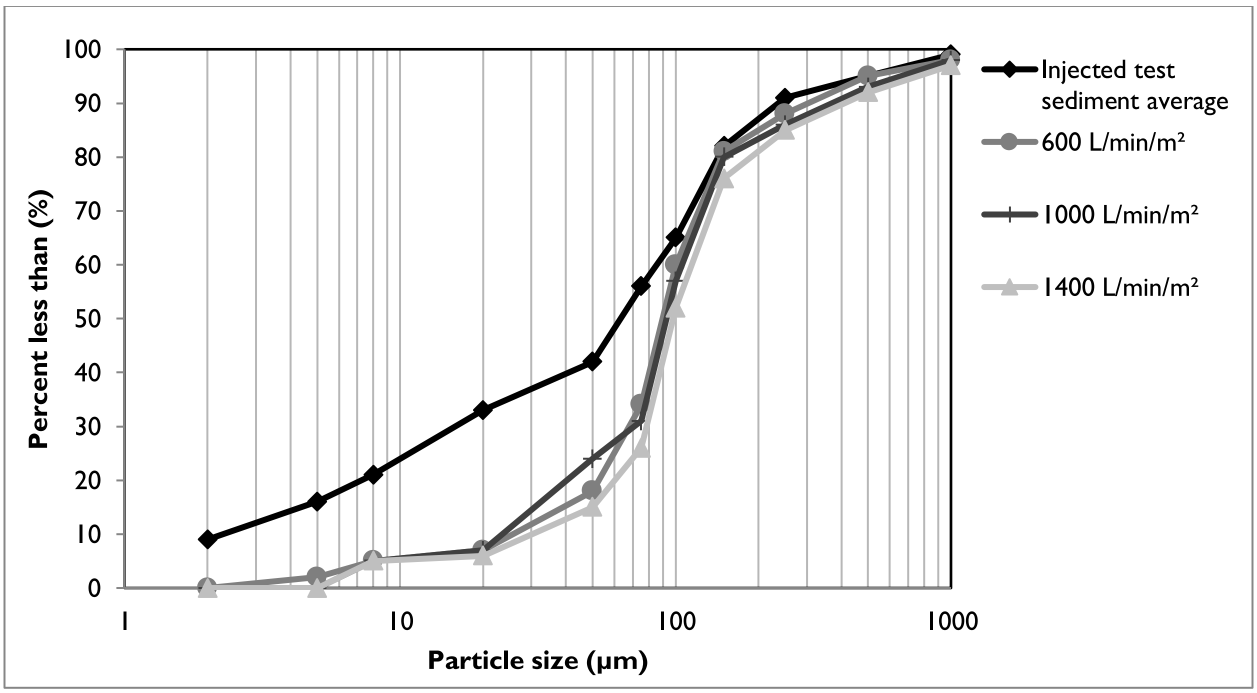


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m^2

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	
		24:00		0.4	

5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

[a] Determined from bead bulk density of 0.56074 g/cm^3

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m^2 and 80 L/min/m^2 surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m²) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m² run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m² for the Stormceptor® EF4 and 1000 and 1400 L/min/m² for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF and EFO OGS please contact:

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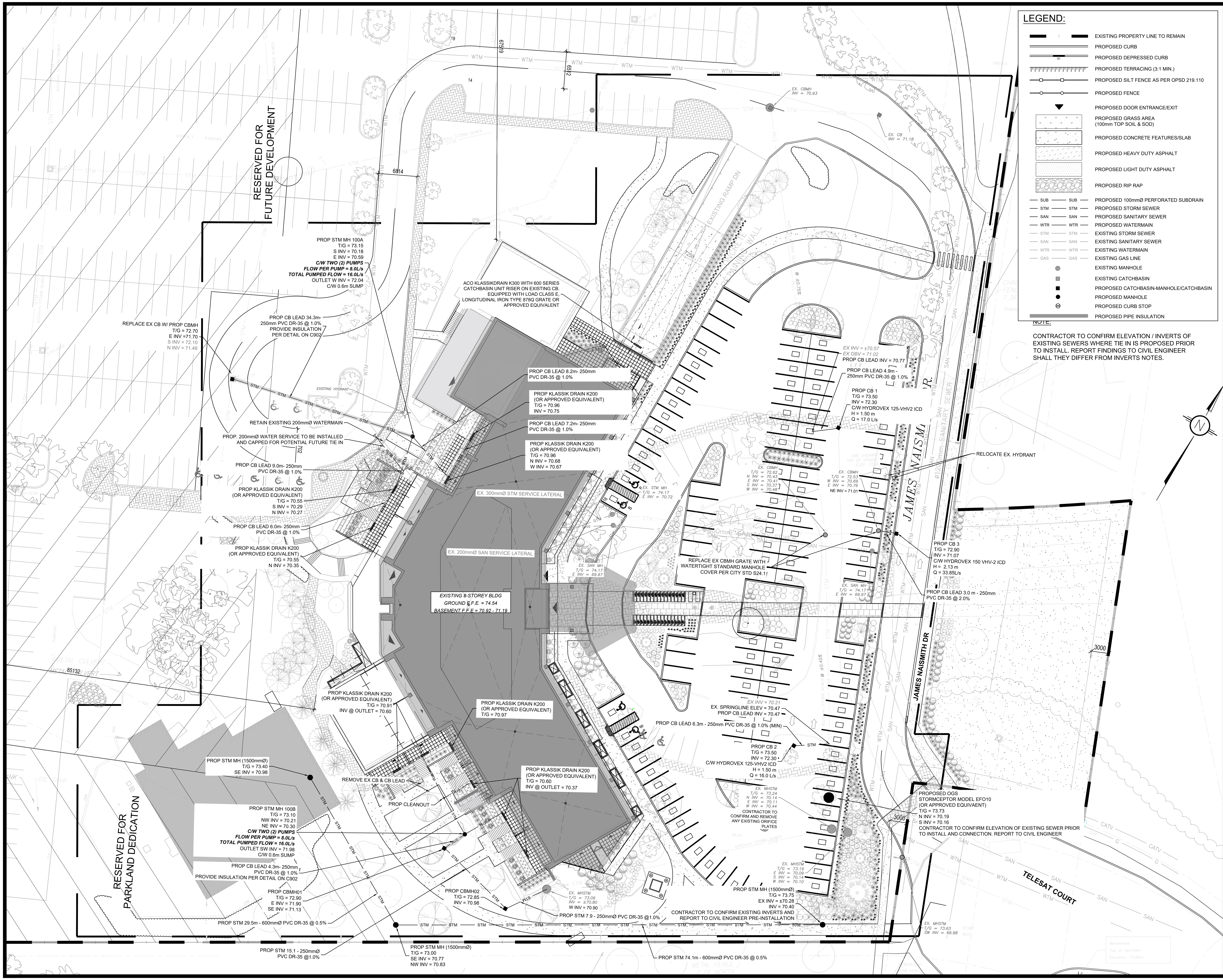
407 Fairview Drive
Whitby, ON
L1N 3A9, Canada
Tel: 416-960-9900
info@imbriumsystems.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
World Trade Centre
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com



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CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

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SCALE: 1:300

No.	REVISIONS	BY	DATE
05	ISSUED FOR TENDER	M.L.	04 APR 2023
04	ISSUED FOR COORDINATION	M.L.	27 FEB 2023
03	ISSUED FOR SITE PLAN APPROVAL	A.S.	18 JAN 2023
02	ISSUED FOR MUNICIPAL APPROVAL	A.S.	30 SEP 2022
01	ISSUED FOR MUNICIPAL APPROVAL	A.S.	12 MAY 2022

LICENSED PROFESSIONAL ENGINEER
V. JOHNSON
100510576
04-04-2023
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
1600 JAMES NAISMITH LP
1460 THE QUEENSWAY, SUITE M264, TORONTO, ON, M8Z 1S4

DESIGNED BY:	DRAWN BY:	APPROVED BY:
A.S.	A.S.	V.J.

PROJECT
PROPOSED 8 STOREY APARTMENT BUILDING
1600 JAMES NAISMITH DRIVE
OTTAWA, ON

DRAWING TITLE
SERVICING PLAN

PROJECT NO.
220142

DATE
MARCH 2022

C401

D07-12-22-0084

#18756

APPENDIX B

SANITARY CALCULATIONS

Project Name :	**1600 James Naismith Drive - Phase 2**
Project # :	**24062**
	Sanitary Servicing Analysis

Prepared by: PB
Checked by: TF
Date: July 17, 2026

Standards = Ottawa

Formulas

Peaking Factor (Harmon)	$= 1+14/[4+(P/1000)^{1/2}]$
Peak Flow	= p(q)M(unit conversion) + infiltration

Existing Sanitary Design Flow

Land Type	Area (m^2)	# of Units /Floor Area	Density	Population (p)	Average Flow (q)	Peaking Factor (M)	Peak Flow (Q) (L/s)
Infiltration Allowance	13500				0.33 L/s/ha		0.45
Total	**13500**						**0.45**

Proposed Sanitary Design Flow

Land Type	Area (m^2)	# of Units /Floor Area	Density	Population (p)	Average Flow (q)	Peaking Factor (M)	Peak Flow (Q) (L/s)
Infiltration Allowance	13500				0.33 L/ha/d		0.45
Residential (Peak Flow) (Townhouse)		72 Units	2.7 persons/unit	195			
Residential (Peak Flow) (Apartments)		112 Units	1.8 persons/unit	202			
TOTAL				397	280 L/day/person	4.00	5.14
Total	**13500**						**5.59**

Summary

Existing Sanitary Design Flow =	0.45 L/s
Proposed Sanitary Design Flow =	5.59 L/s
Increased Flow =	5.14 L/s

Service Connection	Diameter (m)	Slope (%)	Velocity (m/s)	Full Flow Capacity (L/s)	Spare Capacity (L/s)	Usage Increased (%)	Total Usage (%)
Residential	150	0.50	0.61	10.77	5.18	-	51.9%
San. Main	250	0.5	0.86	42.05	36.46	12.2%	13.3%

Notes

1. The proposed development is an increase of 5.14 L/s of peak sanitary flow to the downstream sanitary sewer system.
2. This flow is equal to 51.9% of the total pipe capacity of a 150mm diameter service connection.

Project Name: **JAMES NAISMITH PHASE 2**
Project # : **24062**
Downstream Sanitary Sewer Design Sheet

Prepared by: VP
Checked by: TF
Date: MAY 2026

Standards
City of Ottawa

Flow Design
Average Res Flow : 280 L/c/d
Infiltration Allowance : 0.33 L/s/ha
Peaking Factor =1+14/[4+(P/1000)1/2] where 2<PF<4

Populations Densities
EX. Single Family : 3.4 person/unit
Townhouse (ROW) : 2.7 person/unit
Apartments (average): 1.8 person/unit

Pipe Segment					UNIT COUNT						Res Population							Flow Calculations						Pipe Information						
Street	**Drainage Area**	**From MH**	**To MH**	**Area (ha)**	**EXISTING SINGLE FAMILY**	**2-A (TOWNHOUSE)**	**2-B (APARTMENTS)**	**2-C (TOWNHOUSE)**	**2-D (APARTMENTS)**	**2-E (TOWNHOUSE)**	**EXISTING SINGLE FAMILY**	**2-A (TOWNHOUSE)**	**2-B (APARTMENTS)**	**2-C (TOWNHOUSE)**	**2-D (APARTMENTS)**	**2-E (TOWNHOUSE)**	**Total Pop**	**Average Res Flow (L/s)**	**Res Peaking Factor**	**Peak Res Flow (L/s)**	**Infiltration (L/s)**	**Peak Area Flow (L/s)**	**Peak Cumulative Flow (L/s)**	**Diameter (mm)**	**Length (m)**	**Slope (%)**	**Pipe Material**	**Full Flow Velocity (m/s)**	**Full Flow Capacity (L/s)**	**% Usage**
	1	SUBJECT SITE	EX. SAN MH 1	1.35		24	56	24	56	24		65	101	65	101	65	397.0	1.29	4.00	5.15	0.45	5.59	**5.59**	250	60	0.50	PVC	0.86	**42.05**	13.3%
AURELE STREET	2	EX. SAN MH 1	EX. SAN MH 2	0.35	4						14.0						14.0	0.06	4.00	0.23	0.11	0.35	**5.94**	250	89.95	0.41	PVC	0.78	**38.08**	15.6%
	3	EX. SAN MH 1	EX. SAN MH 2	0.39	2						7.0						7.0	0.03	4.00	0.12	0.13	0.25	**6.19**	250	89.95	0.41	PVC	0.78	**38.08**	16.2%
	4	EX. SAN MH 2	EX. SAN MH 3	0.52	4						14.0						14.0	0.06	4.00	0.23	0.17	0.40	**6.59**	250	93.16	0.19	PVC	0.53	**25.92**	25.4%
	5	EX. SAN MH 2	EX. SAN MH 3	0.48	6						21.0						21.0	0.09	4.00	0.35	0.16	0.51	**7.10**	250	93.16	0.19	PVC	0.53	**25.92**	27.4%
	6	EX. SAN MH 3	EX. SAN MH 4	0.44	3						11.0						11.0	0.05	4.00	0.18	0.15	0.33	**7.43**	250	92.31	0.27	PVC	0.63	**30.90**	24.0%
	7	EX. SAN MH 3	EX. SAN MH 4	0.41	4						14.0						14.0	0.06	4.00	0.23	0.14	0.37	**7.80**	250	92.31	0.27	PVC	0.63	**30.90**	25.2%
	8	EX. SAN MH 4	EX. SAN MH 5	0.43	5						17.0						17.0	0.07	4.00	0.28	0.14	0.42	**8.22**	250	90.78	0.03	PVC	0.21	**10.30**	79.8%
	9	EX. SAN MH 4	EX. SAN MH 5	0.43	4						14.0						14.0	0.06	4.00	0.23	0.14	0.38	**8.60**	250	90.78	0.03	PVC	0.21	**10.30**	83.5%
	10	EX. SAN MH 5	EX. SAN MH 6	0.54	4						14.0						14.0	0.06	4.00	0.23	0.18	0.41	**9.01**	250	98.91	0.61	PVC	0.95	**46.45**	19.4%
	11	EX. SAN MH 5	EX. SAN MH 6	0.52	5						17.0						17.0	0.07	4.00	0.28	0.17	0.45	**9.46**	250	98.91	0.61	PVC	0.95	**46.45**	20.4%

APPENDIX C

WATER CALCULATIONS

Memo

To: **Ted Fair, KWA**

From: **Christine Laughlen**

CC:

Date: July 13, 2026

Re: 1600 James Naismith Ottawa Water Analysis 17103-05

Ted,

This memo is a brief writeup on the site modeling for the 1600 James Naismith site below:

The 1600 James Naismith site is located near Blair Road and Highway 174 in the City of Ottawa.

The development was added to an InfoWater sub-model created for the site's internal layout along with the nearby municipal watermains along Eugene Street and Aurele Street. New nodes and pipes were created in the sub-model. Nodes were assigned elevation information from the grading plan, existing pipes assigned pipe sizes from the design drawings and friction factors according to the City's criteria. A valve was included with a headloss curve to mimic the losses through the water meter.

Boundary conditions were based on the information provided by the City, see attached. Hydrant tests were completed on Eugene Street and Aurele Street on April 28, 2025, see attached. The test results were used to create pump curves that were assigned to the residual hydrant locations. The model was run with those boundary conditions as a comparison to the City model data. The test results were found to be in keeping with the City data as the test pressures were within the maximum and minimum HGL provided. The City model estimated 100-110 L/s fire flows at 20 psi (140 kPa) at the proposed connection points and the estimated hydrant test flows were similar.

Domestic and FUS calculated fire demands were provided by KWA, see attached. The site was initially modeled under maximum day, and maximum day plus fire to confirm the internal pipe sizes and determine the available fire flows at the internal hydrants and the midrise connection point. The results for minimum hour, maximum day, peak hour and maximum day plus fire are attached along with model schematics.

Scenario	Minimum Hour	Maximum Day	Peak Hour	Max. Day + Fire
1800 James Naismith	61.0 – 62.4 psi (421 to 430 kPa)	53.2 – 57.3 psi (367 to 395 kPa)	48.6 to 52.9 psi (335 to 365 kPa)	80 to 88 L/s @ 20 psi

The domestic pressures are within the City's maximum and minimum pressure criteria. The fire flows used for this analysis can be met by the proposed layout. It should be noted that the estimated fire flows at a couple of nodes are close to the required flows. Testing must be completed after watermain construction to confirm the available flow and pressure.

City of Ottawa Boundary Conditions

June 15, 2026

The following are boundary conditions, HGL, for hydraulic analysis at 1600 James Naismith Drive (zone 1E) assumed to be connected via two (2) connections as identified below: (see attached PDF for location).

<u>Connection 1 – 152mm on Aurele Street</u>

Minimum HGL =110.6 m

Maximum HGL = 117.3 m

Max Day + Fire Flow (100 L/s) = 91.8 m

Available Fire Flow at a Residual 20 psi, assuming ground elevation of 73.5 m = 111.0 L/s

<u>Connection 2 – 203mm on Eugene Street</u>

Minimum HGL = 110.6 m

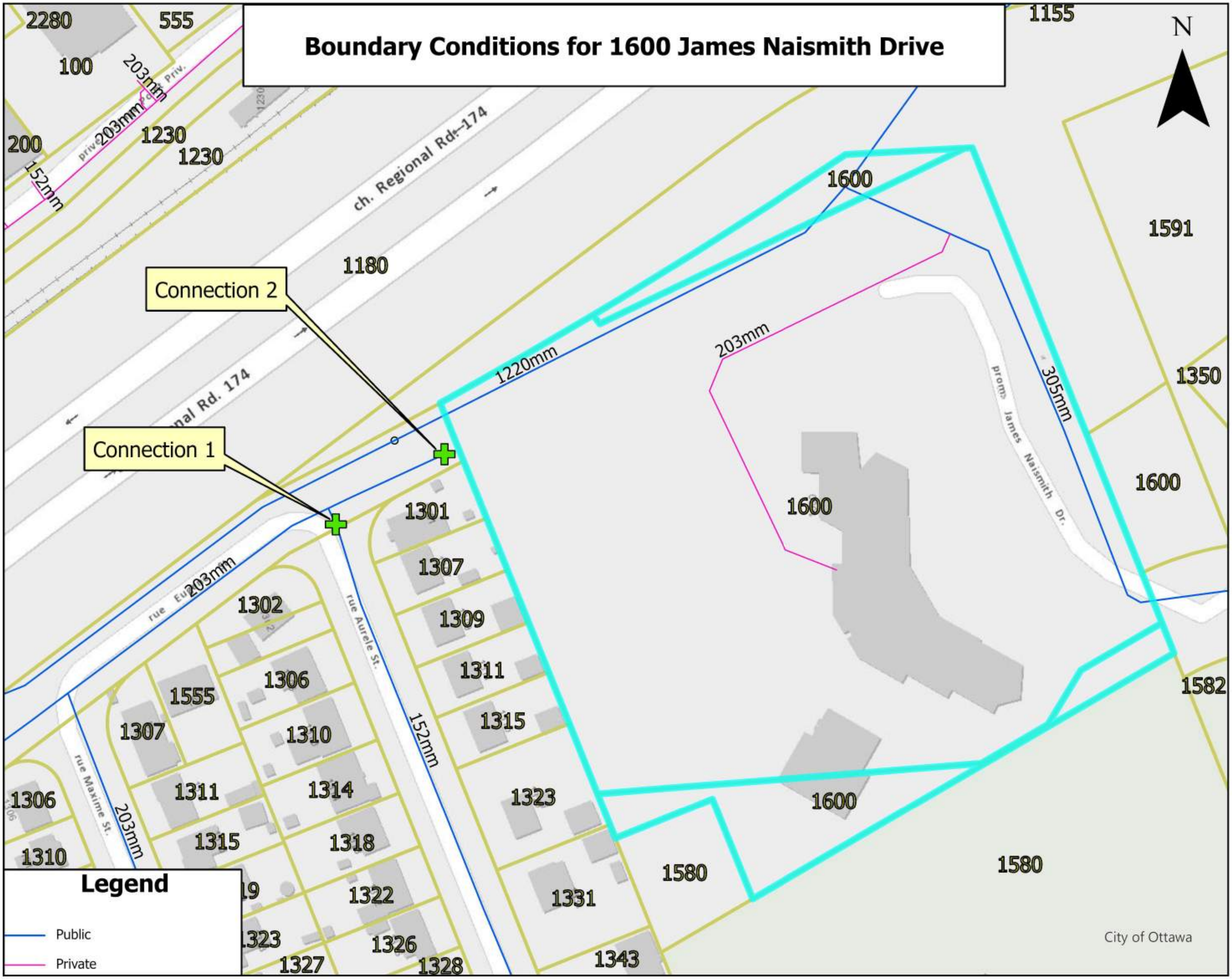
Maximum HGL = 117.3 m

Max Day + Fire Flow (100 L/s) = 88.7 m

Available Fire Flow at a Residual 20 psi, assuming ground elevation of 74.5 m = 100.0 L/s

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.


Boundary Conditions for 1600 James Naismith Drive
N
Connection 2
Connection 1
1220mm
203mm
305mm
152mm
ch. Regional Rd. 174
rue Aurele St.
rue Maxime St.
prom. James Naismith Dr.
1600
1591
1350
1582
1580
1180
1301
1307
1309
1311
1315
1323
1331
1343
1302
1306
1310
1314
1318
1322
1326
1328
1327
1555
1155
2280
555
100
200
1230
Legend
Public
Private
City of Ottawa

Hydrant Testing Ontario
Tel: 289-354-1942
Info@HTOntario.ca

REPORT
N°. 2590

April 30, 2025

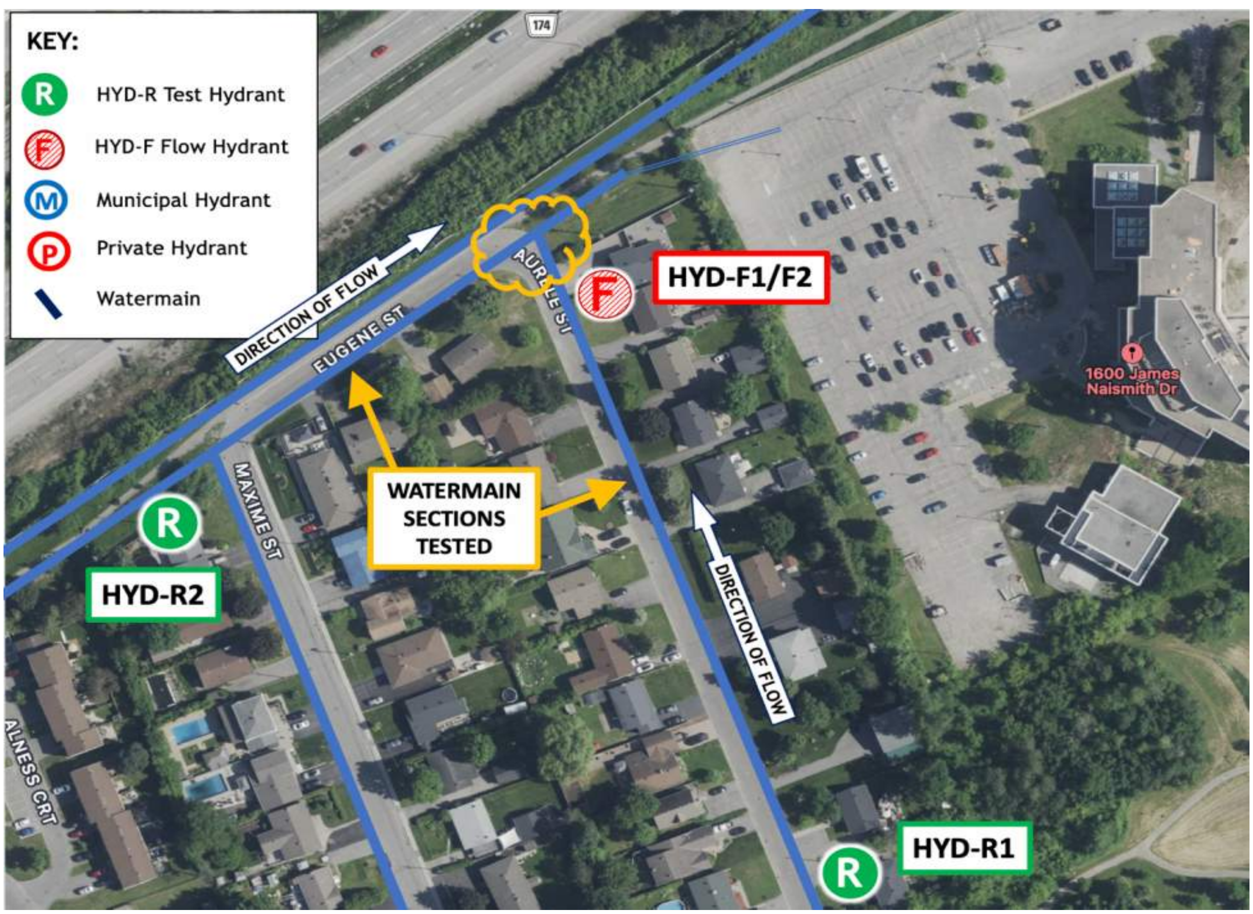
To:

Ted Fair, P. Eng.
KWA Site Development Consulting Inc.

RE: Hydrant Flow Test – 1600 JAMES NAISMITH DRIVE, OTTAWA

Please find the Report for the following works

Scope: Conducted Hydrant Flow Test as per NFPA291 Recommended Practices for Water Flow Testing and Marking of Hydrants.



HYDRANT FLOW TEST

OTTAWA

TEST 1

DATE: April 28, 2025 TIME: 10:45 AM

R -TEST HYDRANT 1580 AURELE STREET HYDRANT No. HYD-R1

HYDRANT MODEL: MCAVITY COLOUR: BLUE

STATIC PRESSURE psi (hr-20^0.54): **58** VARIANCE: 16%

Q - FLOW HYDRANT 1298 AURELE STREET HYDRANT No. HYD-F1

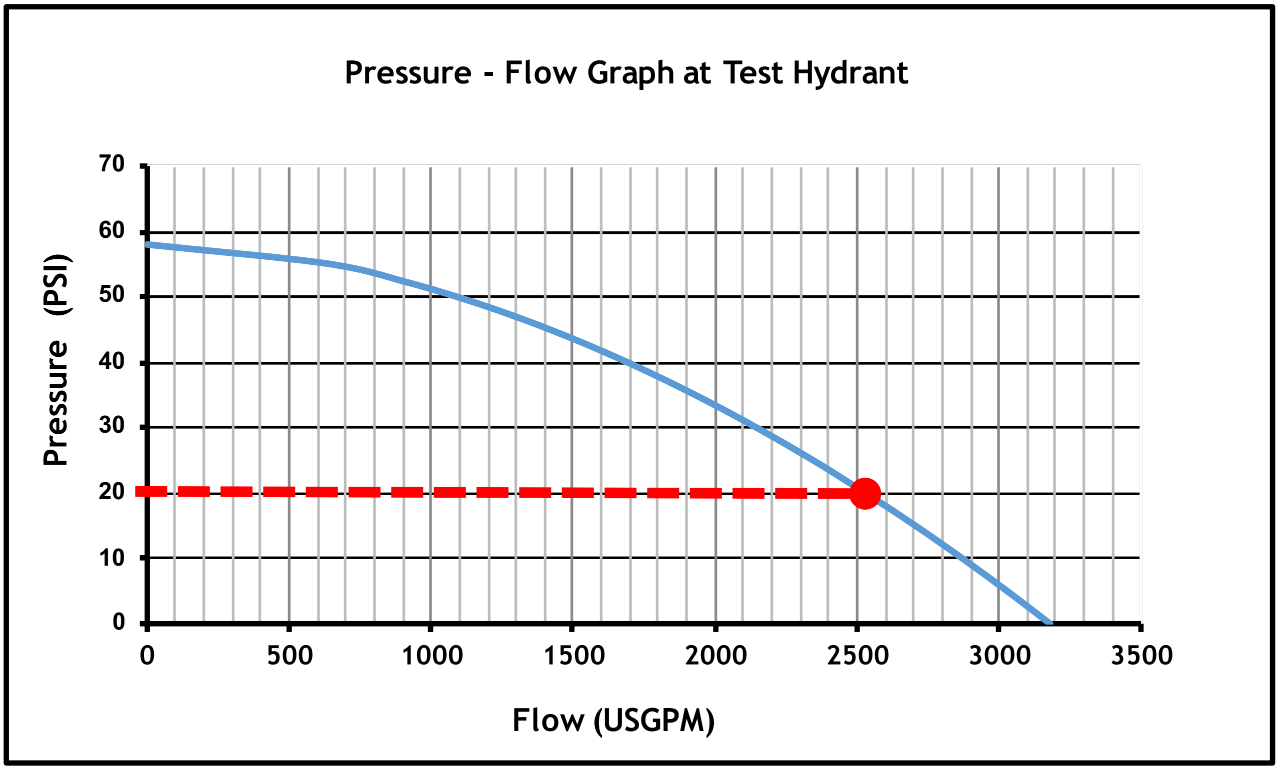
HYDRANT MODEL: MCAVITY COLOUR: BLUE

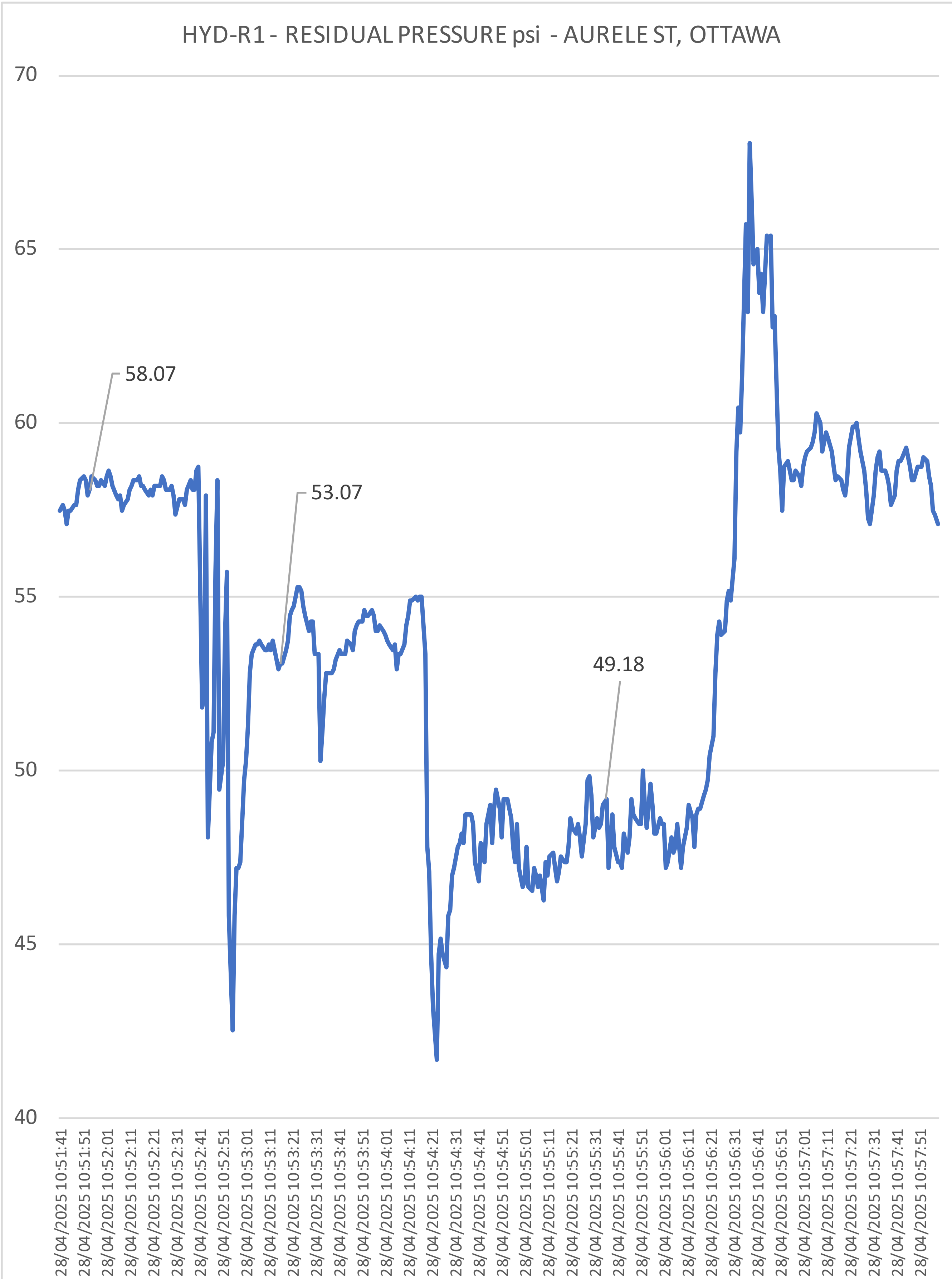
No. Outlets	Residual Pressure (hf-R^0.54)	Orifice Dia Dia. (in.) (d^2)	Coefficient	Nozzle PSI ($\sqrt{psi}$)	Q = Flow (USGPM) $Q = 29.83\,(c)\,(d2)\,(\sqrt{psi})$
1	53	2.5	0.9	18	712
2	49	2.5	0.9	12	581
			Q_F = Total Flow (USGPM)		**1163**

Q_R = flow predicted @ 20 psi — 2530 USGPM

$Q_R = Q_F * (H_r - 20^{\wedge 0.54}) / (H_f - R^{\wedge 0.54})$ — 160 L/s

NFPA Rating: **CLASS AA - BLUE**





HYD-R1 - RESIDUAL PRESSURE psi - AURELE ST, OTTAWA
70
65
60
55
50
45
40
58.07
53.07
49.18
28/04/2025 10:51:41
28/04/2025 10:51:51
28/04/2025 10:52:01
28/04/2025 10:52:11
28/04/2025 10:52:21
28/04/2025 10:52:31
28/04/2025 10:52:41
28/04/2025 10:52:51
28/04/2025 10:53:01
28/04/2025 10:53:11
28/04/2025 10:53:21
28/04/2025 10:53:31
28/04/2025 10:53:41
28/04/2025 10:53:51
28/04/2025 10:54:01
28/04/2025 10:54:11
28/04/2025 10:54:21
28/04/2025 10:54:31
28/04/2025 10:54:41
28/04/2025 10:54:51
28/04/2025 10:55:01
28/04/2025 10:55:11
28/04/2025 10:55:21
28/04/2025 10:55:31
28/04/2025 10:55:41
28/04/2025 10:55:51
28/04/2025 10:56:01
28/04/2025 10:56:11
28/04/2025 10:56:21
28/04/2025 10:56:31
28/04/2025 10:56:41
28/04/2025 10:56:51
28/04/2025 10:57:01
28/04/2025 10:57:11
28/04/2025 10:57:21
28/04/2025 10:57:31
28/04/2025 10:57:41
28/04/2025 10:57:51

HYDRANT FLOW TEST

OTTAWA

TEST 2

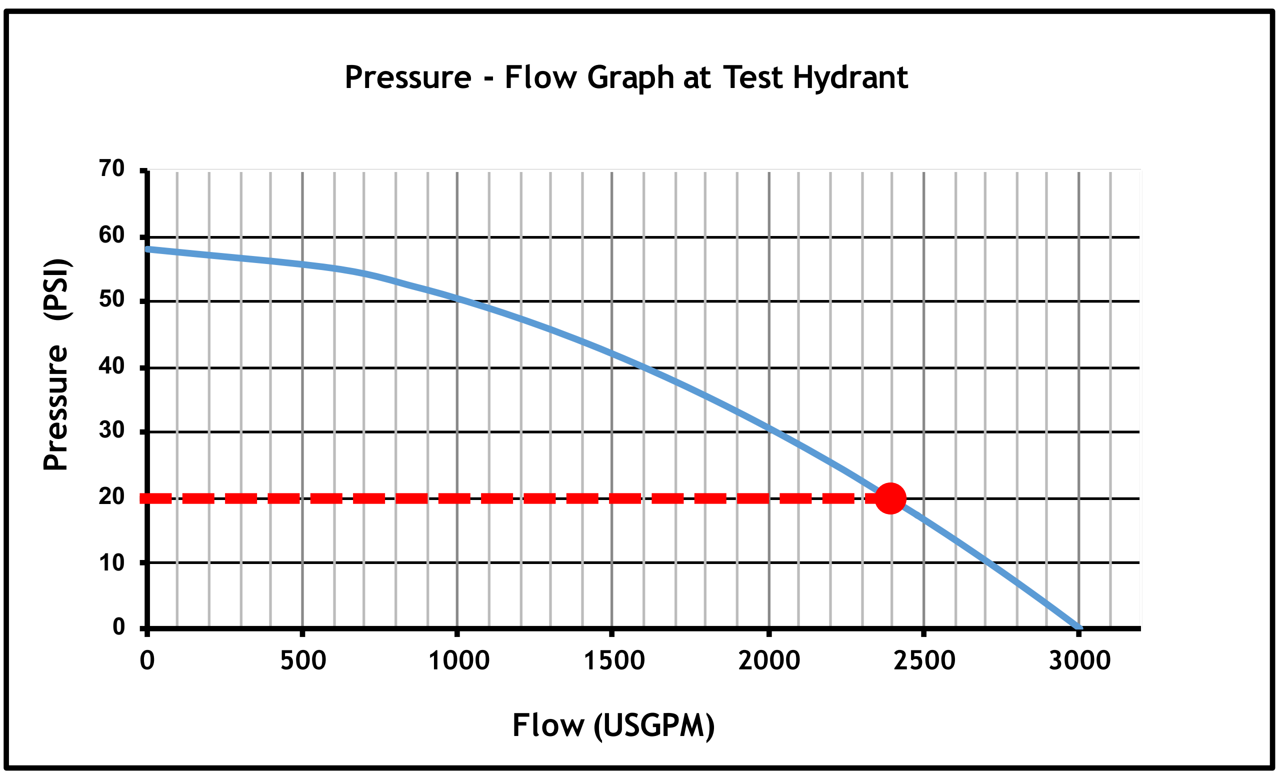
DATE:	April 28, 2025	TIME:	10:45 PM
R -TEST HYDRANT	MAXIME ST / EUGENE ST	HYDRANT No.	HYD-R2
HYDRANT MODEL:	MCAVITY	COLOUR:	BLUE
STATIC PRESSURE psi (hr-20^0.54):	**58**	VARIANCE:	17%
Q - FLOW HYDRANT	1298 AURELL STREET	HYDRANT No.	HYD-F2
HYDRANT MODEL:	MCAVITY	COLOUR:	BLUE

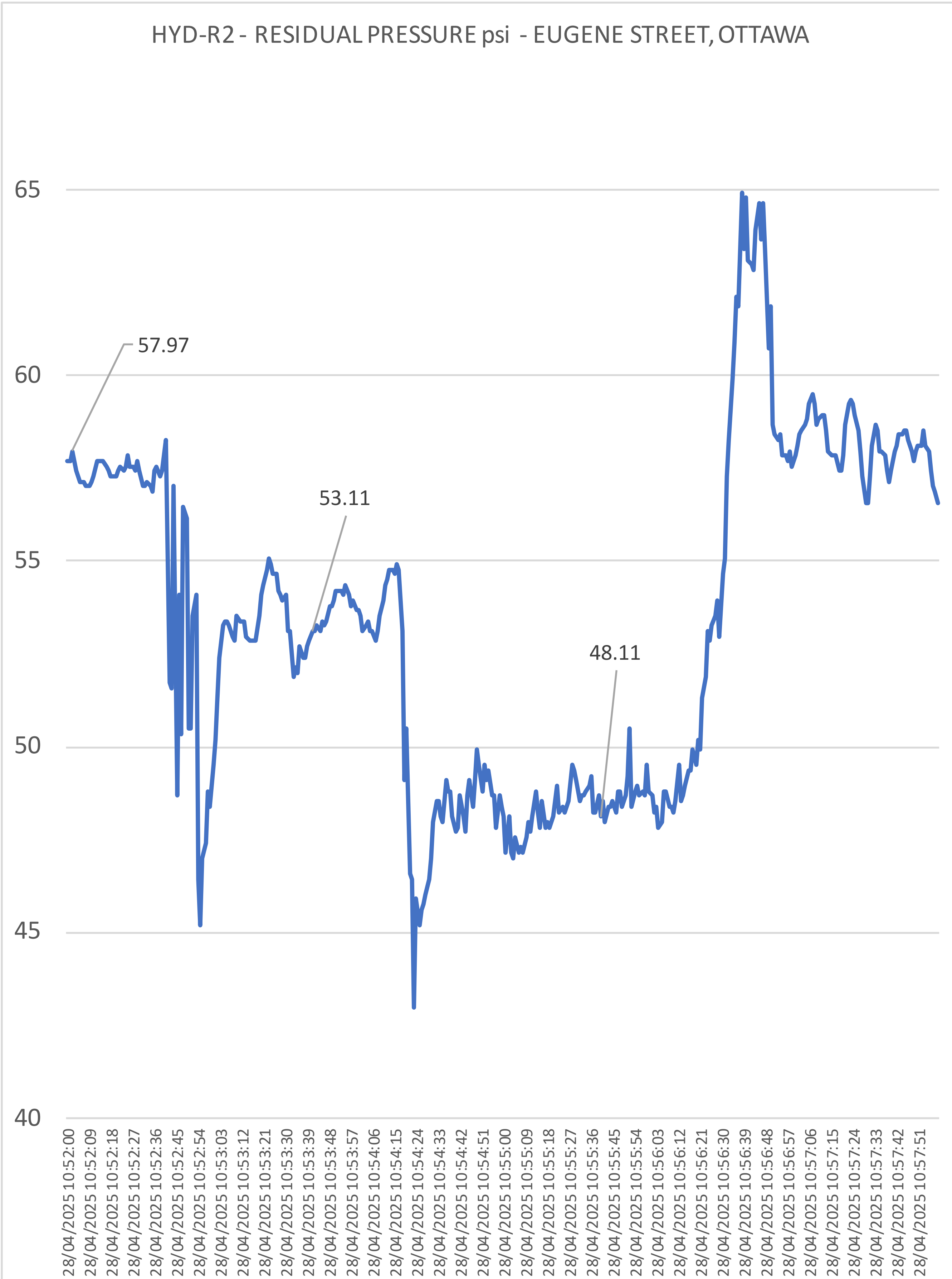
No. Outlets	Residual Pressure (hf-R^0.54)	Orifice Dia Dia. (in.) (d^2)	Coefficient	Nozzle PSI ($\sqrt{psi}$)	Q = Flow (USGPM) $Q = 29.83\,(c)\,(d2)\,(\sqrt{psi})$
1	53	2.5	0.9	18	712
2	48	2.5	0.9	12	581
			Q_F = Total Flow (USGPM)		**1163**

Q_R = flow predicted @ 20 psi — 2390 USGPM

$Q_R = Q_F * (H_r - 20^{0.54}) / (H_f - R^{0.54})$ — 151 L/s

NFPA Rating: **CLASS AA - BLUE**





HYD-R2 - RESIDUAL PRESSURE psi - EUGENE STREET, OTTAWA
57.97
53.11
48.11
65
60
55
50
45
40
28/04/2025 10:52:00
28/04/2025 10:52:09
28/04/2025 10:52:18
28/04/2025 10:52:27
28/04/2025 10:52:36
28/04/2025 10:52:45
28/04/2025 10:52:54
28/04/2025 10:53:03
28/04/2025 10:53:12
28/04/2025 10:53:21
28/04/2025 10:53:30
28/04/2025 10:53:39
28/04/2025 10:53:48
28/04/2025 10:53:57
28/04/2025 10:54:06
28/04/2025 10:54:15
28/04/2025 10:54:24
28/04/2025 10:54:33
28/04/2025 10:54:42
28/04/2025 10:54:51
28/04/2025 10:55:00
28/04/2025 10:55:09
28/04/2025 10:55:18
28/04/2025 10:55:27
28/04/2025 10:55:36
28/04/2025 10:55:45
28/04/2025 10:55:54
28/04/2025 10:56:03
28/04/2025 10:56:12
28/04/2025 10:56:21
28/04/2025 10:56:30
28/04/2025 10:56:39
28/04/2025 10:56:48
28/04/2025 10:56:57
28/04/2025 10:57:06
28/04/2025 10:57:15
28/04/2025 10:57:24
28/04/2025 10:57:33
28/04/2025 10:57:42
28/04/2025 10:57:51

Test Conclusion

The system at the time of testing produced a theorectical projected flow rate of:

LOCATION	Total USGPM	USGPM at 20 psi	lps at 20 psi	Test #
EUGENE ST	1163	2530	160	1
AURELE AST	1163	2390	151	2

Hydrants are classified in accordance with their rated capacities as per NFPA291.

COLOUR	CLASS	Available Flow @ 20psi
BLUE	***AA***	***1500 GPM or more***
GREEN	A	1000 – 1499 GPM
ORANGE	B	500 – 999 GPM
RED	C	Below 500 GPM

We strongly feel that all attempts have been made to ensure that the required data as stipulated was captured, stored and presented in an accurate, efficient and timely manner for the required period.

We look forward to working with you in the future.

Please feel free to contact the undersigned should you require any further information.

Best Regards

Rob Gamache E.P
Manager of Operations
Hydrant Testing Ontario
Info@HTOntario.ca

1600 James Naismith Drive - Phase 2
Project Number 24062
Population Denisity

Prepared by: **VP**
Checked by: **TF**
Date: **July 17, 2026**

as per Ottawa Design Guidelines - Water Distrubtion

	UNIT TYPE	# OF UNITS	PERSONS PER UNIT	POPULATION
2-A	TOWNHOUSE	24	2.7	65
2-B	APARTMENTS	56	1.8	101
2-C	TOWNHOUSE	24	2.7	65
2-D	APARTMENTS	56	1.8	101
2-E	TOWNHOUSE	24	2.7	65
TOTAL				**397**

1600 James Naismith Drive - Phase 2
Project Number 24062
Domestic Demand

Prepared by: **VP**
Checked by: **TF**
Date: **July 17, 2026**

as per Ottawa Design Guidelines - Water Distrubtion

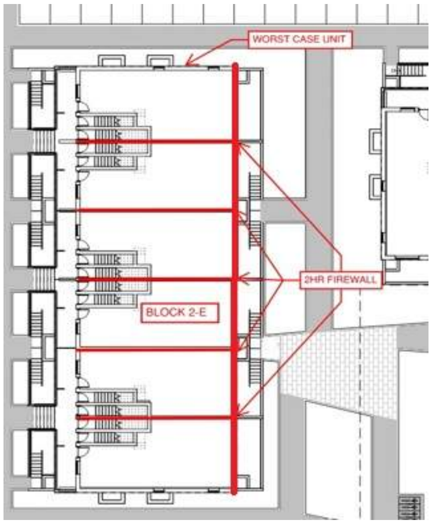
Population =	397	
Per Capita Demand =	280	L/cap/day
Average Daily Demand =	111160	L/day
	1.29	L/s

	Average Day	Minimum Hour	Peak Hour	Maximum Day	
Peaking Factor	n/a	0.30	4.50	3.00	
Demand	**1.29**	**0.39**	**5.79**	**3.86**	**L/s**
	20.39	6.12	91.77	61.18	GPM

** per Table 3-3 from MOE Design Guidelines for Drinking-Water Systems*

1600 James Naismith Drive - Phase 2 Prepared by: **VP**
Project Number 24062 Checked by: **TF**
Required Fire Flow - TOWNHOME BLOCK 2E Date: **July 17, 2026**

as per Fire Underwriters Survey Water Supply for Public Fire Protection, 2020



1. Initial Required Fire Flow (Step A, B, C)

Construction Type = Type V Wood Frame Construction
Construction Coefficient, C = 1.5
Total Effective Area, A* = 276 m^2
* Worst Case : Top unit of BLOCK 2C

Required Fire Flow, RFF = 5482.37175 LPM
RFF, rounded = 5000 LPM

2. Occupancy and Contents Adjustment Factor (Step D)

Contents = Limited combustible contents
Adjustment Factor = -15%
RFF = 4250 LPM

3. Automatic Sprinkler Protection (Step E)

Sprinkler Design	Designed	Building Coverage	Credit
Automatic sprinkler protection designed and installed in accordance with NFPA 13	No	100%	0%
Water supply is standard for both the system and Fire Department hose lines	No	100%	0%
Fully supervised system	No	100%	0%
		Total Sprinkler Credit =	0%

Reduction = 0 LPM

4. Exposure Adjustment Charge (Step F)

Direction	Distance	Charge	
North	Greater than 30	0%	(2-hr fire wall)
South	Greater than 30	0%	
East	Greater than 30	0%	(2-hr fire wall)
West	Greater than 30	0%	
	Total Charge =	0%	

Charge = 0 LPM

5. Final Required Fire Flow (Step G)

RFF = 4250 LPM
Reduction = 0 LPM
Charge = 0 LPM
RFF = 4250 LPM

Final RFF, rounded = 4000 LPM
1057 GPM
67 L/s

as per City of Ottawa Guidelines

Fire Flow =	67	L/s
Max Day Flow =	3.86	L/s
Total Flow =	**70.5**	**L/s**

Major Losses

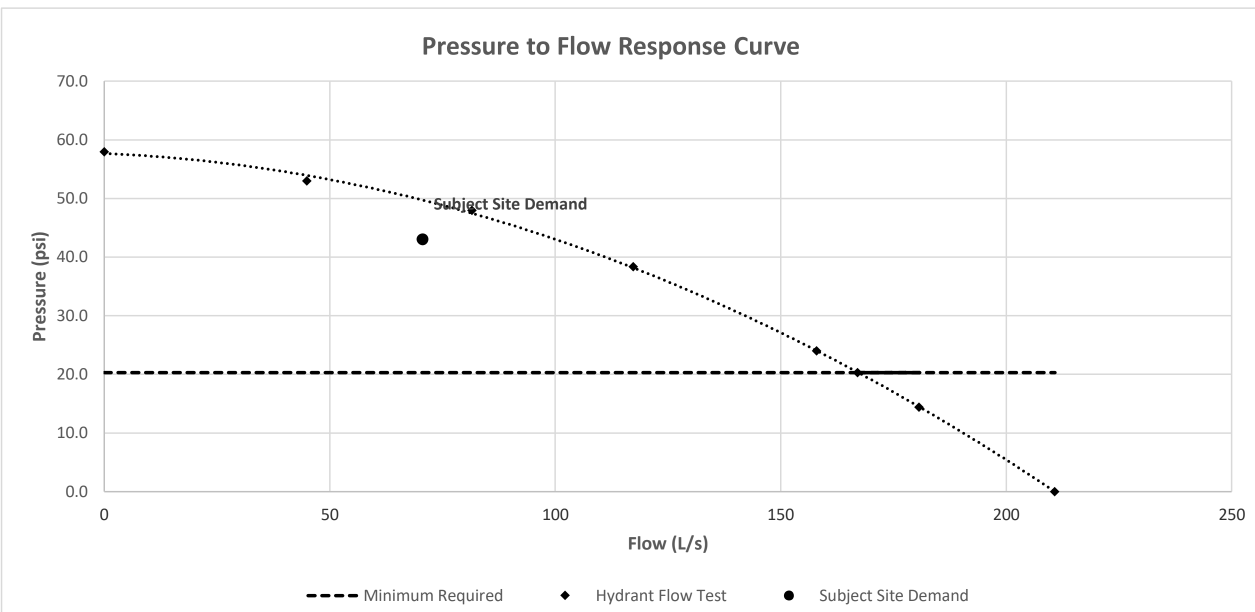
Pipe Section	Diameter	Area (m^2)	*Length (m)	Velocity (m/s)	Hydraulic Radius	S	Headloss (m)	Headloss (psi)
1	200	0.0314	192.5	2.2	0.05	0.02	4.67	6.65
2	150	0.0177	0	4.0	0.0375	0.10	0.00	0.00
						Total major loss (psi) =		**6.65**

*a factor of 1.1 applied to total measured length to account for minor losses

Flow Test Results & Servicing Hydraulic Analysis

Pressure (psi)	*Flow (L/s)*	
58	0	*Static Pressure*
53	44.9	
48	81.6	

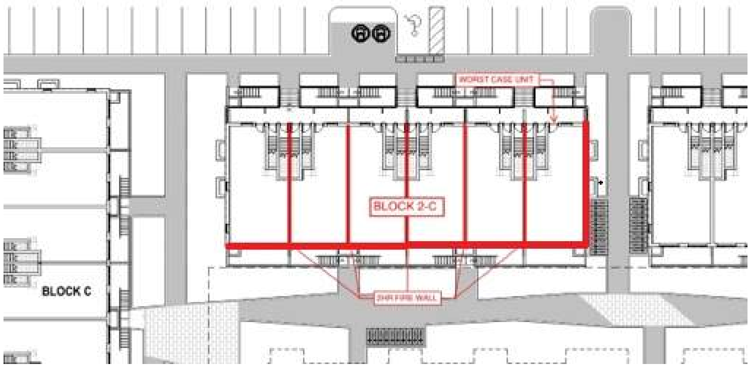
Flow Requirement =	***71***	L/s
Theoretical Pressure =	***49.7***	psi
With Pressure Losses =	***43.1***	psi
Minimum Required =	***20.3***	psi



1600 James Naismith Drive - Phase 2
Project Number 24062
Required Fire Flow - TOWNHOME BLOCK 2C

Prepared by: **VP**
Checked by: **TF**
Date: **July 17, 2026**

as per Fire Underwriters Survey Water Supply for Public Fire Protection, 2020



1. Initial Required Fire Flow (Step A, B, C)

Construction Type =	Type V Wood Frame Construction	
Construction Coefficient, C =	1.5	
Total Effective Area, A* =	276	m^2

* Worst Case : Top unit of BLOCK 2C

Required Fire Flow, RFF =	5482.37175	LPM
RFF, rounded =	**5000**	**LPM**

2. Occupancy and Contents Adjustment Factor (Step D)

Contents =	Limited combustible contents	
Adjustment Factor =	-15%	
RFF =	**4250**	**LPM**

3. Automatic Sprinkler Protection (Step E)

Sprinkler Design	**Designed**	**Building Coverage**	**Credit**
Automatic sprinkler protection designed and installed in accordance with NFPA 13	No	100%	0%
Water supply is standard for both the system and Fire Department hose lines	No	100%	0%
Fully supervised system	No	100%	0%
	Total Sprinkler Credit =		0%

Reduction = **0 LPM**

4. Exposure Adjustment Charge (Step F)

Direction	Distance	Charge	
North	Greater than 30	0%	(2-hr fire wall)
South	Greater than 30	0%	(2-hr fire wall)
East	Greater than 30	0%	(2-hr fire wall)
West	Greater than 30	0%	
	Total Charge =	0%	

Charge = **0 LPM**

5. Final Required Fire Flow (Step G)

RFF =	4250	LPM
Reduction =	0	LPM
Charge =	0	LPM
RFF =	4250	LPM

Final RFF, rounded =	**4000**	**LPM**
	1057	**GPM**
	67	**L/s**

as per City of Ottawa Guidelines

Fire Flow = 67 L/s
Max Day Flow = 3.86 L/s
Total Flow = **70.5 L/s**

Major Losses

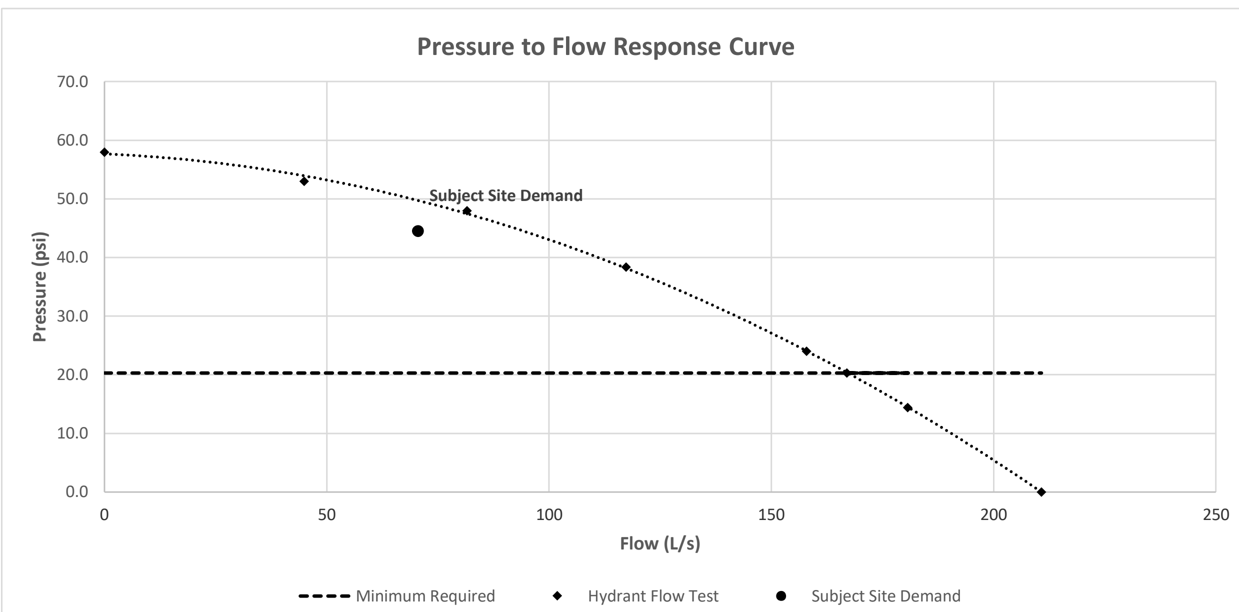
Pipe Section	Diameter	Area (m^2)	*Length (m)	Velocity (m/s)	Hydraulic Radius	S	Headloss (m)	Headloss (psi)
1	200	0.0314	149.6	2.2	0.05	0.02	3.63	5.17
2	150	0.0177	0	4.0	0.0375	0.10	0.00	0.00
						Total major loss (psi) =		**5.17**

*a factor of 1.1 applied to total measured length to account for minor losses

Flow Test Results & Servicing Hydraulic Analysis

Pressure (psi)	Flow (L/s)	
58	0	*Static Pressure*
53	44.9	
48	81.6	

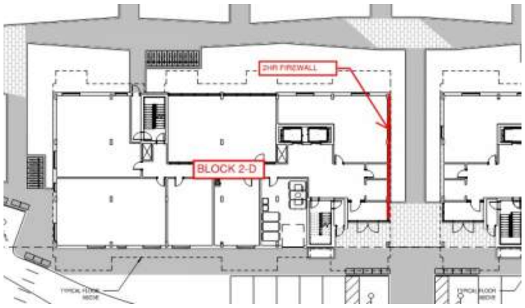
Flow Requirement =	***71***	L/s
Theoretical Pressure =	***49.7***	psi
With Pressure Losses =	***44.6***	psi
Minimum Required =	***20.3***	psi



1600 James Naismith Drive - Phase 2
Project Number 24062
Required Fire Flow - MID-RISE BLOCK 2-D

Prepared by: **VP**
Checked by: **TF**
Date: **July 17, 2026**

as per Fire Underwriters Survey Water Supply for Public Fire Protection, 2020



1. Initial Required Fire Flow (Step A, B, C)

Construction Type = Type III Ordinary Construction

Construction Coefficient, C = 1

Total Effective Area, A* = 1005 m^2 — *Largest Floor + 25% two adjacent floors (670 +168 + 168)

*Mid-rise building

Required Fire Flow, RFF = 6974.381693 LPM

RFF, rounded = 7000 LPM

2. Occupancy and Contents Adjustment Factor (Step D)

Contents = Limited combustible contents

Adjustment Factor = -15%

RFF = 5950 LPM

3. Automatic Sprinkler Protection (Step E)

Sprinkler Design	Designed	Building Coverage	Credit
Automatic sprinkler protection designed and installed in accordance with NFPA 13	Yes	100%	30%
Water supply is standard for both the system and Fire Department hose lines	Yes	100%	10%
Fully supervised system	Yes	100%	10%
		Total Sprinkler Credit =	50%

Reduction = 2975 LPM

4. Exposure Adjustment Charge (Step F)

Direction	Distance	Charge	
North	Greater than 30m	0%	(2-hr fire wall)
South	10.1m to 20m	15%	
East	20.1m to 30m	10%	
West	20.1m to 30m	10%	
	Total Charge =	35%	

Charge = 2082.5 LPM

5. Final Required Fire Flow (Step G)

RFF = 5950 LPM
Reduction = 2975 LPM
Charge = 2082.5 LPM
RFF = 5057.5 LPM

Final RFF, rounded =	**5000 LPM**
	1321 GPM
	83 L/s

as per City of Ottawa Guidelines

Fire Flow =	83	L/s
Max Day Flow =	3.86	L/s
Total Flow =	**87.2**	**L/s**

Major Losses

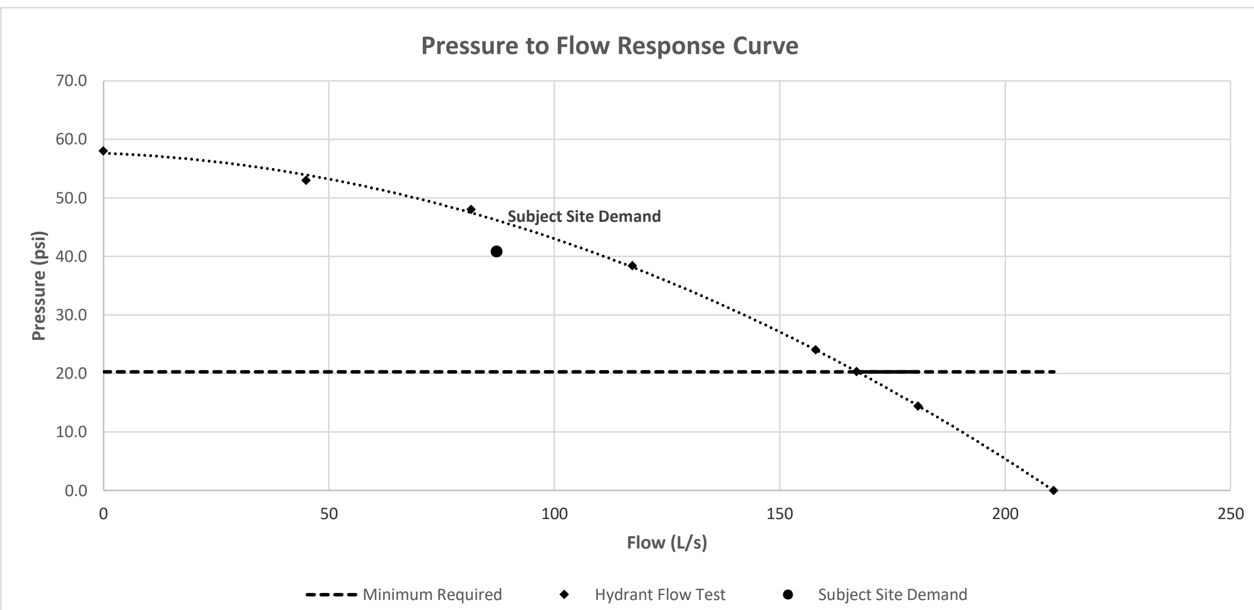
Pipe Section	Diameter	Area (m^2)	*Length (m)	Velocity (m/s)	Hydraulic Radius	S	Headloss (m)	Headloss (psi)
1	200	0.0314	104.5	2.8	0.05	0.04	3.76	5.35
2	150	0.0177	0	4.9	0.0375	0.15	0.00	0.00
						Total major loss (psi) =		**5.35**

*a factor of 1.1 applied to total measured length to account for minor losses

Flow Test Results & Servicing Hydraulic Analysis

Pressure (psi)	*Flow (L/s)*	
58	0	*Static Pressure*
53	44.9	
48	81.6	

Flow Requirement =	***87***	L/s
Theoretical Pressure =	***46.2***	psi
With Pressure Losses =	***40.9***	psi
Minimum Required =	***20.3***	psi



Existing Conditions - City BCs
1800 Naismith
July 10, 2026

Minimum Hour

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	(m)	(m)	(psi)
HYD-200	0.00	74.00	117.19	61.40
HYD-201	0.00	73.65	117.19	61.90
HYD-202	0.00	73.41	117.19	62.24
J-202	0.00	73.38	117.30	62.44
J-203	0.00	73.38	117.30	62.44
J-204	0.00	74.40	117.30	60.99
J-205	0.00	74.40	117.30	60.99
J-206	0.00	74.10	117.19	61.26
J-207	0.00	74.00	117.19	61.40
J-208	0.19	74.00	117.19	61.40
J-209	0.00	73.93	117.19	61.50
J-210	0.07	73.93	117.19	61.50
J-211	0.00	73.40	117.19	62.25
J-212	0.07	73.40	117.19	62.25
J-213	0.00	73.54	117.19	62.05
J-214	0.07	73.54	117.19	62.05

MIN		**73.38**		**60.99**
MAX		**74.40**		**62.44**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	(mm)	(C)	(L/s)	(m/s)
P-204	J-202	J-203	2.54	150	100	0.19	0.01
P-206	J-202	J-205	50.20	200	110	0.21	0.01
P-208	J-203	J-204	47.16	200	110	0.19	0.01
P-210	J-204	J-205	1.46	200	110	0.19	0.01
P-212	J-205	V8010	2.89	200	110	0.40	0.01
P-214	V8010	J-206	5.83	200	110	0.40	0.01
P-216	J-206	J-207	37.05	200	110	0.19	0.01
P-218	J-207	HYD-200	3.82	200	110	0.00	0.00
P-220	J-207	J-208	1.95	200	110	0.19	0.01
P-222	J-206	J-209	27.80	200	110	0.21	0.01
P-224	J-209	J-210	3.47	150	100	0.07	0.00
P-226	J-209	HYD-201	12.60	200	110	0.14	0.00
P-228	HYD-201	J-211	34.80	200	110	0.14	0.00
P-230	J-211	J-212	3.55	150	100	0.07	0.00
P-232	J-211	J-213	35.73	200	110	0.07	0.00
P-234	J-213	J-214	3.26	150	100	0.07	0.00
P-236	J-213	HYD-202	4.63	200	110	0.00	0.00

Maximum Day

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	(m)	(m)	(psi)
HYD-200	0.00	74.00	111.51	53.33
HYD-201	0.00	73.65	111.51	53.82
HYD-202	0.00	73.41	111.51	54.16
J-202	0.00	73.38	113.69	57.31
J-203	0.00	73.38	113.69	57.31
J-204	0.00	74.40	113.69	55.86
J-205	0.00	74.40	113.69	55.86
J-206	0.00	74.10	111.51	53.19
J-207	0.00	74.00	111.51	53.33
J-208	1.93	74.00	111.51	53.33
J-209	0.00	73.93	111.51	53.43
J-210	0.74	73.93	111.51	53.42
J-211	0.00	73.40	111.51	54.18
J-212	0.74	73.40	111.51	54.18
J-213	0.00	73.54	111.51	53.98
J-214	0.74	73.54	111.51	53.98

MIN		**73.38**		**53.19**
MAX		**74.40**		**57.31**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	(mm)	(C)	(L/s)	(m/s)
P-204	J-202	J-203	2.54	150	100	1.97	0.11
P-206	J-202	J-205	50.20	200	110	2.18	0.07
P-208	J-203	J-204	47.16	200	110	1.97	0.06
P-210	J-204	J-205	1.46	200	110	1.97	0.06
P-212	J-205	V8010	2.89	200	110	4.15	0.13
P-214	V8010	J-206	5.83	200	110	4.15	0.13
P-216	J-206	J-207	37.05	200	110	1.93	0.06
P-218	J-207	HYD-200	3.82	200	110	0.00	0.00
P-220	J-207	J-208	1.95	200	110	1.93	0.06
P-222	J-206	J-209	27.80	200	110	2.22	0.07
P-224	J-209	J-210	3.47	150	100	0.74	0.04
P-226	J-209	HYD-201	12.60	200	110	1.48	0.05
P-228	HYD-201	J-211	34.80	200	110	1.48	0.05
P-230	J-211	J-212	3.55	150	100	0.74	0.04
P-232	J-211	J-213	35.73	200	110	0.74	0.02
P-234	J-213	J-214	3.26	150	100	0.74	0.04
P-236	J-213	HYD-202	4.63	200	110	0.00	0.00

Existing Conditions - City BCs
1800 Naismith
July 10, 2026

Peak Hour

Node Table

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-200	0.00	74.00	108.27	48.72
HYD-201	0.00	73.65	108.27	49.22
HYD-202	0.00	73.41	108.27	49.56
J-202	0.00	73.38	110.60	52.91
J-203	0.00	73.38	110.60	52.91
J-204	0.00	74.40	110.59	51.45
J-205	0.00	74.40	110.59	51.45
J-206	0.00	74.10	108.28	48.59
J-207	0.00	74.00	108.27	48.72
J-208	2.89	74.00	108.27	48.72
J-209	0.00	73.93	108.27	48.82
J-210	1.10	73.93	108.27	48.82
J-211	0.00	73.40	108.27	49.57
J-212	1.10	73.40	108.27	49.57
J-213	0.00	73.54	108.27	49.37
J-214	1.10	73.54	108.27	49.37

MIN		**73.38**		**48.59**
MAX		**74.40**		**52.91**

Pipe Table

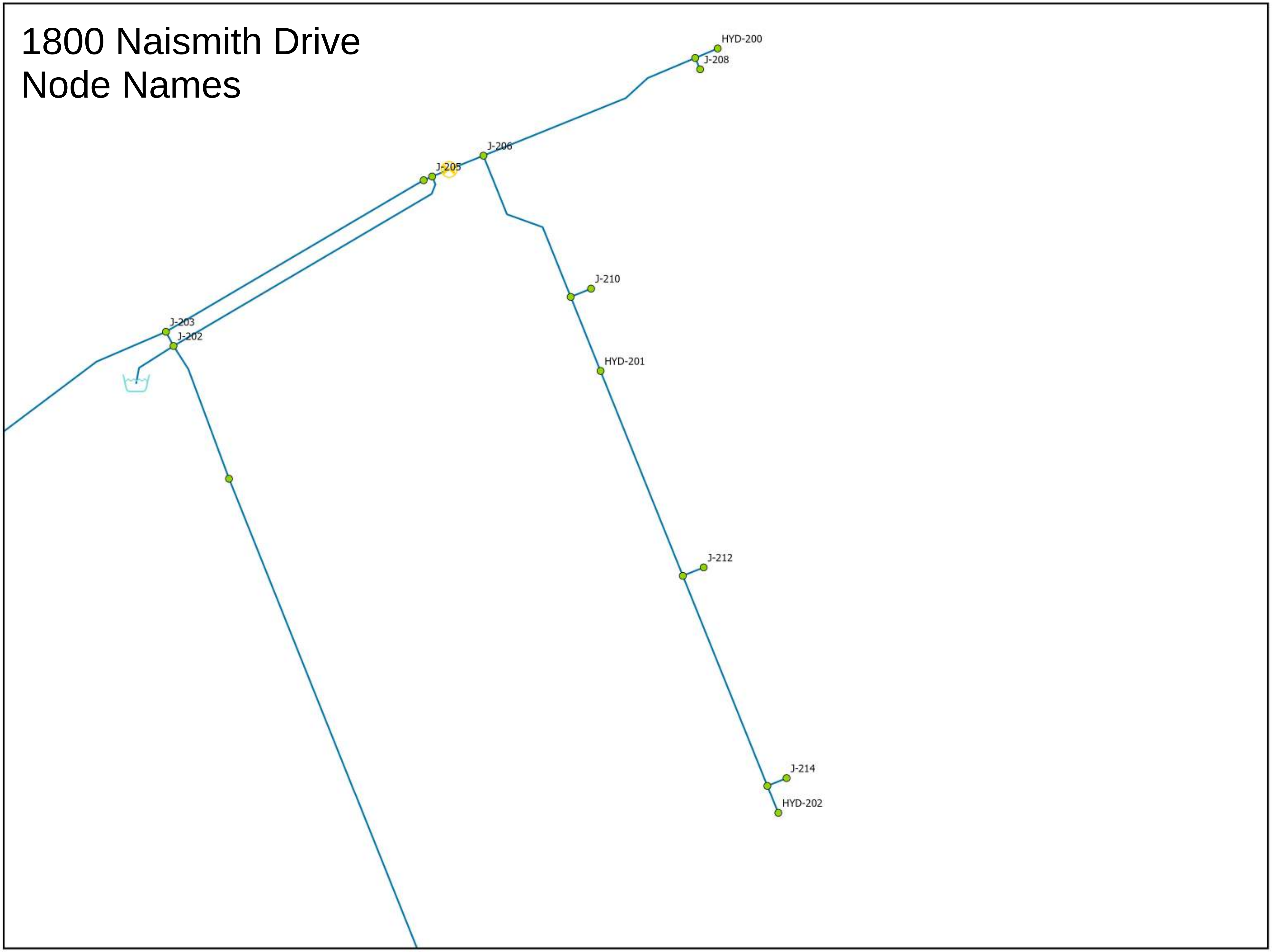
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-204	J-202	J-203	2.54	150	100	2.93	0.17
P-206	J-202	J-205	50.20	200	110	3.26	0.10
P-208	J-203	J-204	47.16	200	110	2.93	0.09
P-210	J-204	J-205	1.46	200	110	2.93	0.09
P-212	J-205	V8010	2.89	200	110	6.19	0.20
P-214	V8010	J-206	5.83	200	110	6.19	0.20
P-216	J-206	J-207	37.05	200	110	2.89	0.09
P-218	J-207	HYD-200	3.82	200	110	0.00	0.00
P-220	J-207	J-208	1.95	200	110	2.89	0.09
P-222	J-206	J-209	27.80	200	110	3.30	0.11
P-224	J-209	J-210	3.47	150	100	1.10	0.06
P-226	J-209	HYD-201	12.60	200	110	2.20	0.07
P-228	HYD-201	J-211	34.80	200	110	2.20	0.07
P-230	J-211	J-212	3.55	150	100	1.10	0.06
P-232	J-211	J-213	35.73	200	110	1.10	0.04
P-234	J-213	J-214	3.26	150	100	1.10	0.06
P-236	J-213	HYD-202	4.63	200	110	0.00	0.00

Fire Flow Table

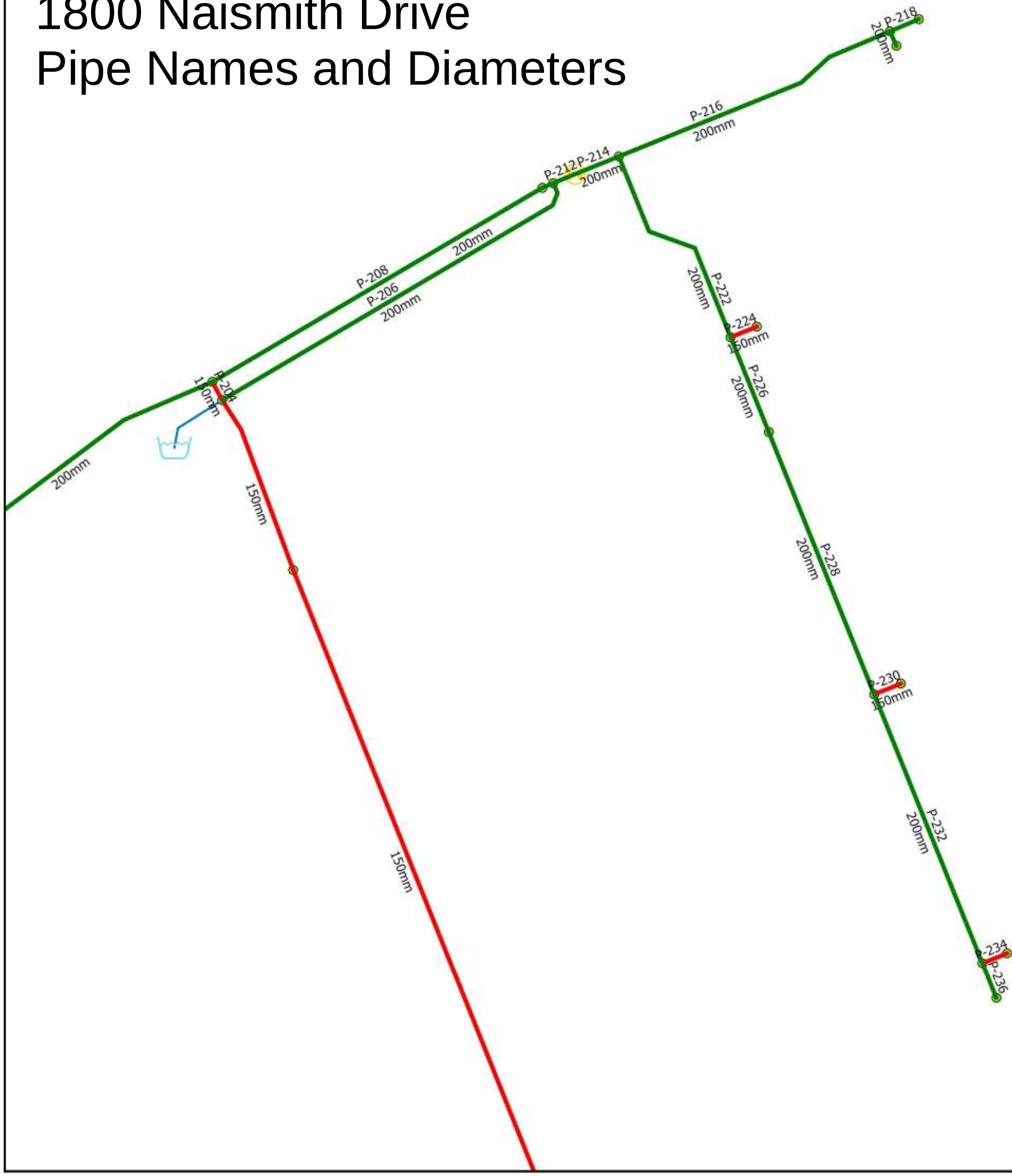
ID	Total Demand (L/s)	Available Flow (L/s)	Fire Flow Met?
HYD-200	83.00	85.63	TRUE
HYD-201	67.00	86.41	TRUE
HYD-202	67.00	79.85	TRUE
J-208	83.00	87.74	TRUE

MIN	**79.85**
MAX	**87.74**

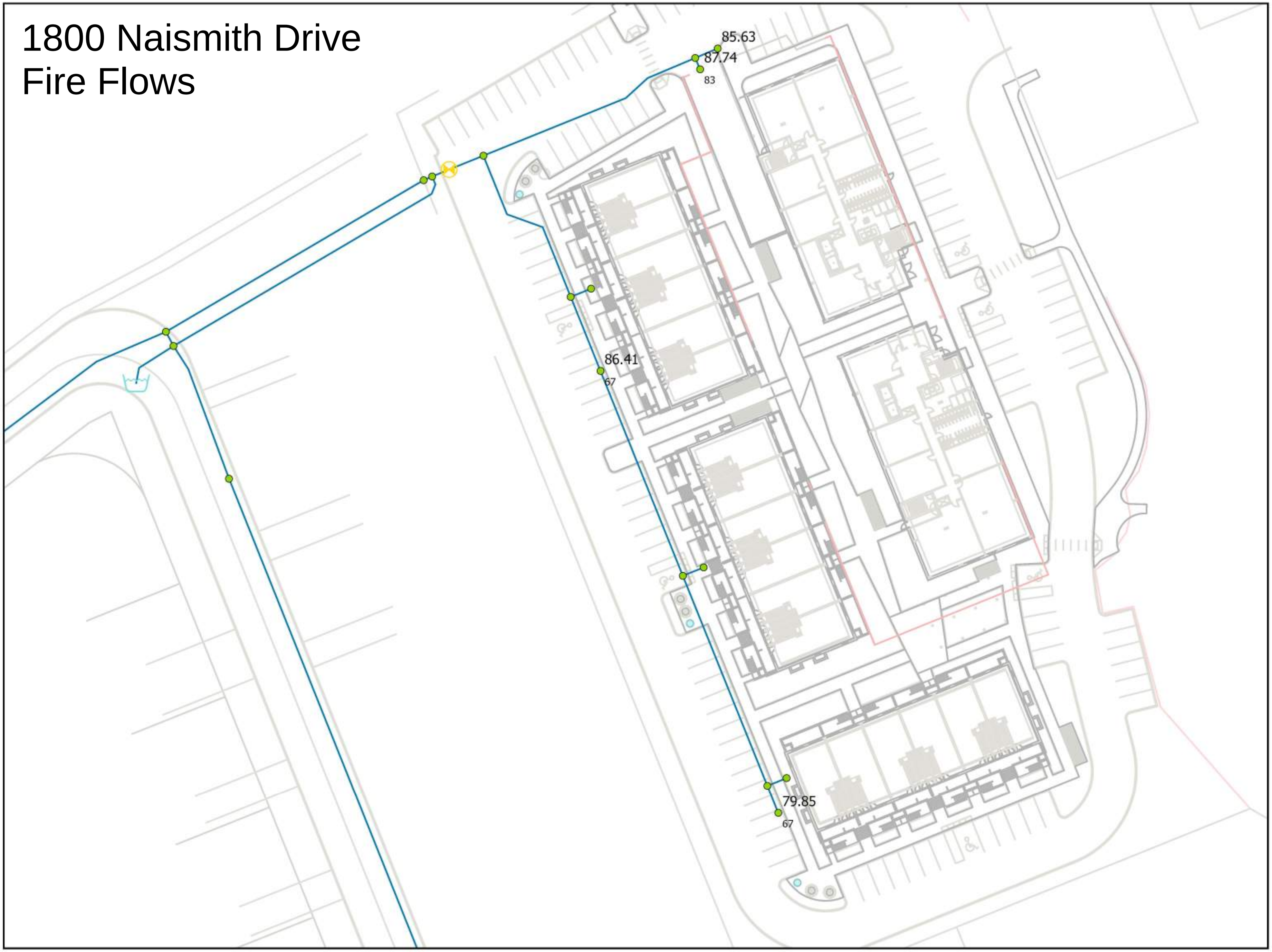
1800 Naismith Drive
Node Names



1800 Naismith Drive
Pipe Names and Diameters



1800 Naismith Drive
Fire Flows



APPENDIX D

SUPPORTING DOCUMENTS

Engineering

1. The Stormwater Management Criteria, for the subject site, is to be based on the following:

   a. **Water Quality Control**: provide enhanced levels of protection of 80% for total suspended solids removal. ISO 14034 Environmental Technology Verification (ETV) protocol for sizing OGS units (if applicable).

   b. **Water Quantity Control**: In the absence of area specific SWM criteria please control post-development runoff from the subject site, up to and including the 100-year storm event, to a **5-year pre-development level**.

      i. **The pre-development runoff coefficient will need to be determined as per existing conditions but in no case more than 0.5**. [If 0.5 applies it needs to be clearly demonstrated in the report that the pre-development runoff coefficient is greater than 0.5].

      ii. The time of concentration (Tc) used to determine the pre-development condition should be calculated. Tc should not be less than 10 min. since IDF curves become unrealistic at less than 10 min; **Tc of 10 minutes shall be used for all post-development calculations.**

      iii. Any storm events greater than the established 5-year allowable release rate, up to and including the 100-year storm event, shall be detained on-site. For events greater than 100 years, spillage must be directed to a public ROW and not to neighboring private property.

   c. Please provide a Pre-Development Drainage Area Plan to define the pre-development drainage areas/patterns. Existing drainage patterns shall be maintained and discussed as part of the proposed SWM solution.

   d. Ponding Notes:

      i. 100-year spill elevation must be 300mm lower than any building opening or ramp.
      ii. Demonstrate that the stress test spill elevation (100-year +20% event) does not spill onto any permanent structures.
      iii. The maximum permissible ponding depth for the 100-year storm event is 350mm. No spilling to adjacent sites.
      iv. Please note that as per Technical Bulletin PIEDTB-2016-01 section 8.3.11.1 (p.12 of 14) there shall be no surface ponding on private parking areas during the 2-year storm rainfall event. 100-year spill elevation must be 300mm lower than any building opening or ramp

e. Document how any foundation drainage system will be integrated into the servicing design and show the positive outlet on the plan. Foundation drainage is to be independently connected to sewer main unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention. It is recommended that the foundation drainage system be drained by a sump pump connection to the storm sewer to minimize risk of basement flooding as it will provide the best protection from the uncontrolled sewer system compared to relying on the backwater valve.

f. Please note that the minimum orifice dia. for a plug style ICD is 83mm and the minimum flow rate from a vortex ICD is 6 L/s in order to reduce the likelihood of plugging.

g. If rooftop control and storage is proposed as part of the SWM solutions, sufficient details (Cl. 8.3.8.4) shall be discussed and documented in the report and on the plans. Roof drains are to be connected downstream of any incorporated ICDs within the SWM system and not to the foundation drain system. Provide a Roof Drain Plan as part of the submission.

h. Dry ponds are only to be functional for events that are greater than the 2-year storm event, a freeboard of 0.3m between the 100-year HWL elevation and the emergency overflow elevation and to be designed with a maximum depth of 1.5m with 3:1 side slopes. An emergency overland flow route to an appropriate outlet (Rideau River) from the SWM facility needs to be designed.

i. **Underground Storage**: Please note that the Modified Rational Method for storage computation in the Sewer Design Guidelines was originally intended to be used for above ground storage (i.e. parking lot) where the change in head over the orifice varied from 1.5 m to 1.2 m (assuming a 1.2 m deep CB and a max ponding depth of 0.3 m). This change in head was small and hence the release rate fluctuated little, therefore there was no need to use an average release rate.

    i. When underground storage is used, the release rate fluctuates from a maximum peak flow based on maximum head down to a release rate of zero. This difference is large and has a significant impact on storage requirements. We therefore require that an average release rate equal to 50% of the peak allowable rate shall be applied to estimate the required volume. Alternatively, the consultant may choose to use a submersible pump in the design to ensure a constant release rate.

    ii. In the event that there is a disagreement from the designer regarding the required storage, The City will require that the designer demonstrate their rationale utilizing dynamic modelling, that will then be reviewed by City modelers in the Water Resources Group.

iii. Regarding all proposed UG storage, ground water levels (and in particular HGW levels) will need to be reviewed to ensure that the proposed system does not become surcharged and thereby ineffective.

iv. Provide information on type of underground storage system including product name and model, number of chambers, chamber configuration, confirm invert of chamber system, top of chamber system, required cover over system and details, interior bottom slope (for self-cleansing), chart of storage values, length, width and height, capacity, entry ports (maintenance) etc. UG storage to provide actual 5- and 100-year event storage requirements.

2. Storm Sewer

   a. A 600mm dia. concrete storm sewer is available within James Naismith / Telesat Ct.

   b. A 375mm dia. concrete storm sewer is available within Aurele Street.

   c. Note that capacity of the downstream sewers must be determined prior to acceptance of servicing arrangement.

   d. A storm sewer monitoring maintenance hole is required to be installed at the property line (on the private side of the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) Monitoring Devices.

3. Sanitary Sewer

   a. A connection to the 1200mm dia. collector is not permitted.

   b. A local 250 mm dia. AC Sanitary sewer is available North-West of the site within Aurele Street and can be extended through Eugene Street.

   c. **Please provide the proposed sanitary sewer discharge and we will confirm if sanitary sewer main has the capacity.**

   d. Include correspondence from the Architect within the Appendix of the report confirming the number of residential units per building and a unit type breakdown for each of the buildings to support the calculated building populations.

   e. Please apply the wastewater design flow parameters in Technical Bulletin PIEDTB-2018-01.

f. Sanitary sewer monitoring maintenance hole is required to be installed at the property line (on the private side of the property) as per City of Ottawa Sewer-Use By-Law 2003-514 (14) Monitoring Devices.

g. A backwater valve is required on the sanitary service for protection.

4. Water:

a. A 203 mm dia. CI watermain is available within Eugene Street.

b. A 203 mm dia. DI watermain is available within James Naismith / Telesat Ct.

c. Water Supply Redundancy: Residential buildings with a basic day demand greater than 50m3/day (0.57 L/s) or with 50+ units are required to be connected to a minimum of two water services, with each their own meter, separated by an isolation valve to avoid a vulnerable service area. **This proposed development will need two connections to domestic water.**

d. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:

i. Plan showing the proposed location of service(s).

ii. Type of development and the amount of fire flow required (L/min). Note: The OBC method can be used if the fire demand for the private property is less than 9,000 L/min. If the OBC fire demand reaches 9000 L/min, then the FUS method is to be used.

iii. Average daily demand: __L/s.

iv. Maximum daily demand: __L/s.

v. Maximum hourly daily demand: __L/s.

vi. Note: Use Table 3-3 of the MOE Design Guidelines for Drinking-Water System to determine Maximum Day and Maximum Hour peaking factors for 0 to 500 persons and use Table 4.2 of the Ottawa Design Guidelines, Water Distribution for 501 to 3,000 persons.

e. Please review Technical Bulletin ISTB-2018-02, maximum fire flow hydrant capacity is provided in Section 3 Table 1 of Appendix I. **A hydrant coverage figure shall be provided and demonstrate there is adequate fire protection for the proposal.**

f. A Water Data Card will have to be submitted to size the water meter.

g. Any proposed emergency route is to be to the satisfaction of Fire Services. Please note that a siamese connection needs to be within 45m from an existing fire hydrant as per (OBC – 3.2.5.16 Fire Department Connections).

h. Frontage Charges

5. Vibration and settlement monitoring on Backbone Watermain

   a. A 1980mm dia. backbone watermain is located within the site at the northern property line. Please note that to ensure the integrity of the nearby watermain the applicant may be required to develop a Vibration and Settlement Monitoring Program. A Vibration and settlement Monitoring Specialist Engineer shall undertake monitoring, develop a vibration and settlement monitoring plan, and prepare a protection plan, an emergency response plan, ensure conformance and shall issue certificates of conformance. The Vibration and settlement Monitoring Specialist Engineer shall be a licensed engineer in the Province of Ontario with a minimum of five years of experience in the field of Vibration and settlement monitoring. Vibration and settlement monitors are to be to be placed directly on the watermain. The maximum peak particle velocities are to be in accordance with Table 1 of the City of Ottawa Specification F-1201.

   b. In addition to requirement of a vibration specialist engineer required to design and monitor vibration, a certificate of liability insurance shall be submitted to the City wherein the Owner is the named insured, and the City of Ottawa is an additional insured. The limits of the policy shall be in the amount of $25,000,000 and shall be kept in full force and effect for the term of the construction work.

6. General Servicing

   a. Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.

   b. Where servicing involves three or more service trenches, either a full road width or full lane width 40 mm asphalt overlay will be required, as per amended Road Activity By-Law 2003-445 and City Standard Detail Drawing R10. The extent of the overlay must be shown on the grading plan or a road reinstatement plan.

   c. CCTV sewer inspection of city infrastructure is required to record pre and post construction conditions and ensure there is no damage to City Assets.

d. Existing buildings sewer laterals require a CCTV inspection and report to ensure existing services to be re-used are in good working order and meet current minimum size requirements.

e. Connections to trunk sewers, easement sewers and backbone watermains are typically not permitted.

f. If severance is planned, this needs to be addressed in servicing to satisfy severance requirements. Where a large parcel with multiple buildings is planned, City will require an ultimate servicing plan so as to appropriately understand how severance requirements are being met.

g. Sewer connections to be made above the springline of the sewer main as per:

    i. Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.

    ii. Std Dwg S11 (For rigid main sewers) – lateral must be less that 50% the diameter of the sewermain.

    iii. Std Dwg S11 (For rigid main sewers) – lateral must be less that 50% the diameter of the sewermain.

    iv. No submerged outlet connections.

h. See Terms of Reference for Site Servicing Study: https://documents.ottawa.ca/sites/default/files/site_servicing_tor_en.pdf

i. See Servicing study guidelines for development applications: https://documents.ottawa.ca/sites/default/files/service_guide_dev_apps_en.pdf

j. See Servicing and Grading Plan Requirements: https://documents.ottawa.ca/sites/default/files/servicing_grading_require_en-AODA.pdf

7. Grading and Erosion

    a. Post-development site grading shall match existing property line grades to minimize disruption to the adjacent residential properties. A topographical plan of survey shall be provided as part of the submission and a note provided on the plans making reference to the survey and noting the geodetic datums used.

    b. Erosion and sediment control plan must be provided.

c. Any portion of the subject property which is intended to be used for permanent or temporary snow storage shall be as shown on the approved site plan and grading plan. Snow storage shall not interfere with approved grading and drainage patters or servicing. Snow storage areas shall be setback from the property lines, foundations, fencing or landscaping a minimum of 1.5m. Snow storage areas shall not occupy driveways, aisles, required parking spaces or any portion of a road allowance. If snow is to be removed from the site, please indicate this on the plan(s).

d. Street catch basins are not to be located at any proposed entrances.

e. Depressed driveways are discouraged and are not allowed in sag locations. For other locations, the builder must ensure that the maximum depth of flow on the street during the 100-year and stress test events will not spill onto the depressed driveway.

f. If Window wells are proposed, they are to be indirectly connected to the footing drains. A detail of window well with indirect connection is required, as is a note at window well location speaking to indirect connection.

g. Rear yard at grade parking to be permeable pavement. Refer to City Standard Detail Drawings SC26 (maintenance/temp parking areas), SC27 or permeable asphalt materials. No gravel or stone dust parking areas permitted.

h. See Terms of Reference for Grading and Drainage Plan Submission: https://documents.ottawa.ca/sites/default/files/grading_drainage_plan_tor_en.pdf

8. Environmental Compliance Approval

   a. The consultant shall determine if this project will be subject to an Environmental Compliance Approval (ECA). It shall be determined if the exemptions set out under Ontario Regulation 525/98: *Approval Exemptions* are satisfied. All regulatory approvals shall be documented and discussed in the report.

   b. Please note that an ECA is required for:

      i. Stormwater management works servicing more than one parcel of land

      ii. Stormwater management works discharging to a combined sewer.

      iii. A storm or sanitary sewer servicing multiple parcels.

   c. Environmental Compliance Approval | Ontario.ca

9. Regarding Quantity Estimates

a. Please note that external Garbage and/or bicycle storage structures are to be added to QE under Landscaping as it is subject to securities. In addition, sump pumps for Sanitary and Storm laterals and/or cisterns are to be added to QE under Hard items as it is subject to securities, even though it is internal and is spoken to under SWM and Site Servicing Report and Plan.

b. Quantity estimate dollar values are to be consistent with the most up to date Master Spec Code List provided by the City of Ottawa.

10. General

a. It is the sole responsibility of the consultant to investigate the location of existing underground utilities in the proposed servicing area and submit a request for locates to avoid conflict(s). **The location of existing utilities and services shall be documented on an Existing Conditions Plan.**

b. Any easements on the subject site shall be identified and respected by any development proposal and shall adhere to the conditions identified in the easement agreement. A **legal survey plan** shall be provided, and **all easements shall be shown on the engineering plans.**

c. As-built plans (if available) can be requested for a fee by contacting geoinformation@ottawa.ca.

d. All underground and above ground building footprints and permanent walls need to be shown on the plans to confirm that any permanent structure does not extend either above or below into the existing property lines and sight triangles.

e. **Construction approach** – Please contact the Right-of-Ways Permit Office TMconstruction@ottawa.ca early in the Site Plan process to determine the ability to construct site and copy File Lead on this request.

Please refer to the City of Ottawa Guide to Preparing Studies and Plans [Engineering]: Planning application submission information and materials. The guide outlines the requirement for a statement to be provided on the plan about where the property boundaries have been derived from.

Feel free to contact Terenzo Giovannitti, Infrastructure Project Manager, for follow-up questions.

OBSERVED REFERENCE POINTS DERIVED FROM THE CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191. CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL). COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10		
POINT ID	NORTHING	EASTING
A	5032522.51	374482.51
B	5032342.42	374555.13
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.		

Stantec

Stantec Geomatics Ltd.
300-1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

TOPOGRAPHIC PLAN OF SURVEY OF
PART OF LOTS 21 & 22 CONCESSION 2 (OTTAWA FRONT)
(GEOGRAPHIC TOWNSHIP OF GLOUCESTER)

CITY OF OTTAWA

Scale 1:500

10 0 10 20 30 METRES

Stantec Geomatics Ltd.
ONTARIO LAND SURVEYORS

BEARING NOTE
BEARINGS ARE GRID, DERIVED FROM CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76° 30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL).

19773035 N:5006060.42 E:324888.04
19680191 N:5033564.26 E:388064.94

METRIC CONVERSION
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

HORIZONTAL DATUM NOTE
PROJECTION: MODIFIED TRANSVERSE MERCATOR (MTM, ZONE 9, CM76°30'W)
DATUM: NAD 83 (ORIGINAL)

DISTANCES ON THIS PLAN ARE GROUND AND MAY BE CONVERTED TO GRID DISTANCES BY DIVIDING BY A COMBINED SCALE FACTOR OF 0.99994.

VERTICAL DATUM NOTE
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978) AND ARE DERIVED FROM A SITE BENCHMARK AS SHOWN ON A PLAN BY STANTEC GEOMATICS LTD. DATED DECEMBER 21, 2021.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBø	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
M/MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
PL	"	PLAN 4R-35842
ACU	"	AIR CONDITIONING UNIT
AN	"	ANCHOR
ANT	"	ANTENNA
BH	"	BOREHOLE
BIB	"	HOSE BIB
BKR	"	BIKE RACK
BENCH	"	BENCH
BOL	"	BOLLARD
BOUL	"	BOULDER
CB	"	CATCH BASIN
DICB	"	DOUBLE CB
CBMH	"	CB MANHOLE
DCBMH	"	DOUBLE CB MANHOLE
SICB	"	SIDE INLET CB
CSV	"	CURB STOP VALVE
DRN	"	DRAIN
EPOST	"	ELECTRICAL OUTLET
FP	"	FLAG POLE
FL	"	FLOOD LIGHT
GSR	"	GAS SERVICE REGULATOR
GV	"	GAS VALVE
HLS	"	HYDRO LIGHT STANDARD
HTN	"	HYDRO TRANSFORMER
HW	"	HAND WELL
HYD	"	FIRE HYDRANT
JBX	"	JUNCTION BOX
LS	"	LIGHT STANDARD
MP	"	MONITORING PIN
MH	"	MAINTENANCE HOLE UNIDENTIFIED
MHB	"	MAINTENANCE HOLE BELL
MHF	"	MAINTENANCE HOLE FIBRE OPTIC
MHH	"	MAINTENANCE HOLE HYDRO
MHSAN	"	MAINTENANCE HOLE SANITARY
MHSTM	"	MAINTENANCE HOLE STORM
MHT	"	MAINTENANCE HOLE TRAFFIC
MW	"	MONITORING WELL
OLS	"	LIGHT STANDARD ORNAMENTAL
OW	"	OBSERVATION WELL
PLBX	"	PULL BOX
PLR	"	PILLAR
SCP	"	SUMP/CATCH PIT
SCV	"	SPRINKLER CONTROL VALVE
SH	"	SPRINKLER HEAD
SIA	"	SIAMESE CONNECTION
SN	"	SIGN
TB BELL	"	TERMINAL BOX - BELL
TB CATV	"	TERMINAL BOX - CABLE
TCB	"	TRAFFIC CONTROL BOX
TPIT	"	TEST PIT
UMB	"	MARKER BELL UNDERGROUND
UMC	"	MARKER CABLE UNDERGROUND
UMG	"	MARKER GAS UNDERGROUND
UMO	"	MARKER OIL UNDERGROUND
UP	"	UTILITY POLE
VB	"	VALVE BOX
VC	"	VALVE CHAMBER
WV	"	WATER VALVE
	"	TREE STUMP
	"	TREE CONIFEROUS (D.B.H. SHOWN)
	"	TREE DECIDUOUS (D.B.H. SHOWN)
T	"	UNDERGROUND TELEPHONE
P	"	UNDERGROUND HYDRO
WTM	"	WATERMAIN
G	"	GASMAIN
STM	"	STORM SEWER
FOTS	"	UNDERGROUND FIBRE OPTIC
OHW	"	OVERHEAD WIRE
SAN	"	SANITARY SEWER
CATV	"	UNDERGROUND CABLE

REVESION NOTE:
JUNE 1, 2026 - ADDITIONAL TOPOGRAPHIC INFORMATION COLLECTED ALONG AURELE STREET, EUGENE STREET, AND SOUTH OF THE PROPERTY.

June 1, 2026
DATE

REID HALL
ONTARIO LAND SURVEYOR

REVESION NOTE:
JUNE 16, 2026 - ADDITIONAL TOPOGRAPHIC INFORMATION COLLECTED THROUGH THE SOUTH END OF THE PARKING LOT AND AROUND THE BASEBALL FIELD TO THE SOUTH OF THE PROPERTY AND ITS PARKING LOT.

June 19, 2026
DATE

REID HALL
ONTARIO LAND SURVEYOR

SURVEYOR'S CERTIFICATE
I CERTIFY THAT :
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 4th DAY OF FEBRUARY, 2026.

February 11, 2026
DATE

REID HALL
ONTARIO LAND SURVEYOR

DRAWN: DM CHECKED: RH PM: RH FIELD: CA\AW PROJECT No.: 161614925-110