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2380 Tenth Line Road

City of Ottawa

Servicing and Stormwater Management Report

Prepared for: Claridge Homes

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2380 Tenth Line Road
City of Ottawa
Servicing and Stormwater Management Report

Prepared By:

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October 16, 2025

Novatech File: 125079
Ref: R-2025-96

October 16, 2025

City of Ottawa
Planning, Development and Building Services Department (PDBS)
110 Laurier Avenue West, 4th Floor
Ottawa ON, K1P 1J1

Attention: John Sevigny C.E.T – A/Manager, Development Review East Branch

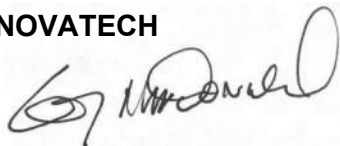
**Reference: 2380 Tenth Line Road
Servicing and Stormwater Management Report
Our File No.: 125079**

Please find enclosed the 'Servicing and Stormwater Management Report' for the above noted development located in the City of Ottawa. This report is submitted in support of the site plan application for the proposed development at 2380 Tenth Line Road.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH



Greg MacDonald, P. Eng.
Director, Land Development and Public Sector Infrastructure

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1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed retirement home on the property municipally known as 2380 Tenth Line Road in Ward 19 – Orleans South Navan. The report will describe how the proposed development will be serviced with sanitary, storm and water infrastructure

1.1 Existing Conditions

The subject site is approximately **0.624 hectares (ha.)** in size and is located on the north side of Promenade Decoeur Drive in the Orleans South-Navan Ward (Ward 19) in the City of Ottawa. The Subject Site is in an area bounded by Tenth Line Road to the east, the 2370 Tenth Line Condo development to the North, David Lewis Private to the west, and Promenade Decoeur Drive to the south.

A future low-rise subdivision abuts the Subject Site to the north and west. Low-rise dwellings featuring a mix of townhouses and single-family dwellings and open space are situated to the east and northeast of the site. Additional, low-rise dwellings with a mix of townhouses and single-family dwellings are situated to the south. The Notre-Place Catholic Elementary School is situated west of the site. **Figure 2** shows the existing site conditions.

The subject site is within the East Urban community and is subject to the design criteria within the following report:

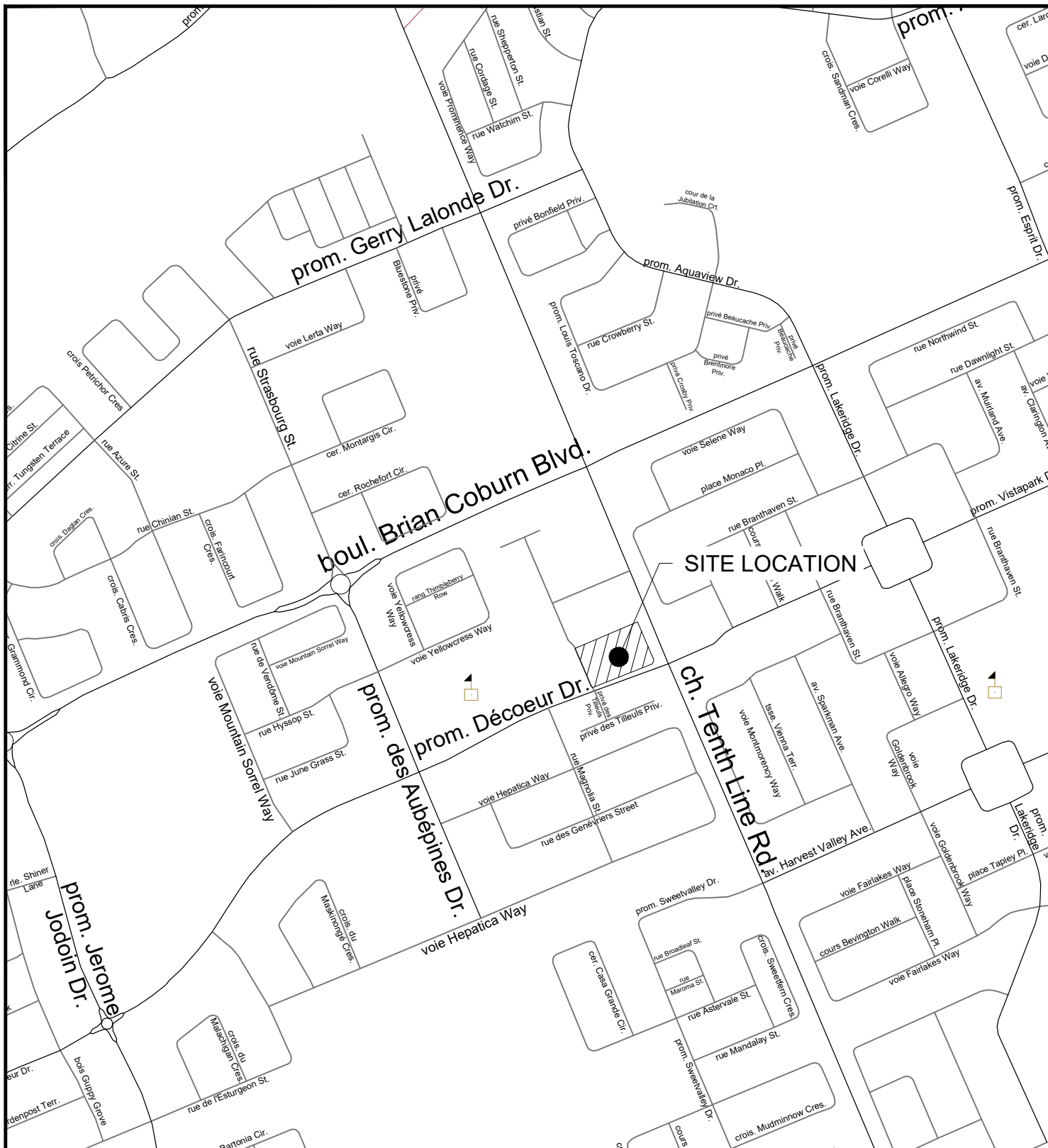
- 'East Urban Community (Neighborhood 5) Avalon West – Stage 3 Site Servicing and Stormwater Management Report', Atriel Engineering Ltd., November 2014 (Revision 7), (Referenced as **Atriel Report**).

Within the above report the subject site was a portion of Block 123. Block 123 has since been severed into multiple parcels including the neighboring 2370 Tenthline road development. Design information pertaining to the neighboring Tenth Line Road development is available within the following report:

- '2370 Tenth Line - Site Servicing and Stormwater Management Report', Stantec Consulting Ltd., December 2, 2022 (Revision 2), (Referenced as **2370 Report**).

1.2 Proposed Development

It is proposed to develop the site with a six (6) storey Retirement Home complete with above ground parking and an underground parking structure. The building will have a footprint of **2101.72 m²**, with a total of 141 dwelling units. Vehicular access to the site will be provided from Promenade Decoeur Drive while pedestrian access will be provided from both Promenade Decoeur Drive, and Tenth Line Rd. **Figure 3** shows the concept plan for the proposed development.



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CITY OF OTTAWA
2380 TENTH LINE RD

KEY PLAN

SCALE

N.T.S

DATE

SEP 2025

JOB

125079

FIGURE

FIGURE 1

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LEGEND



SITE BOUNDARY



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CITY OF OTTAWA
2380 TENTH LINE

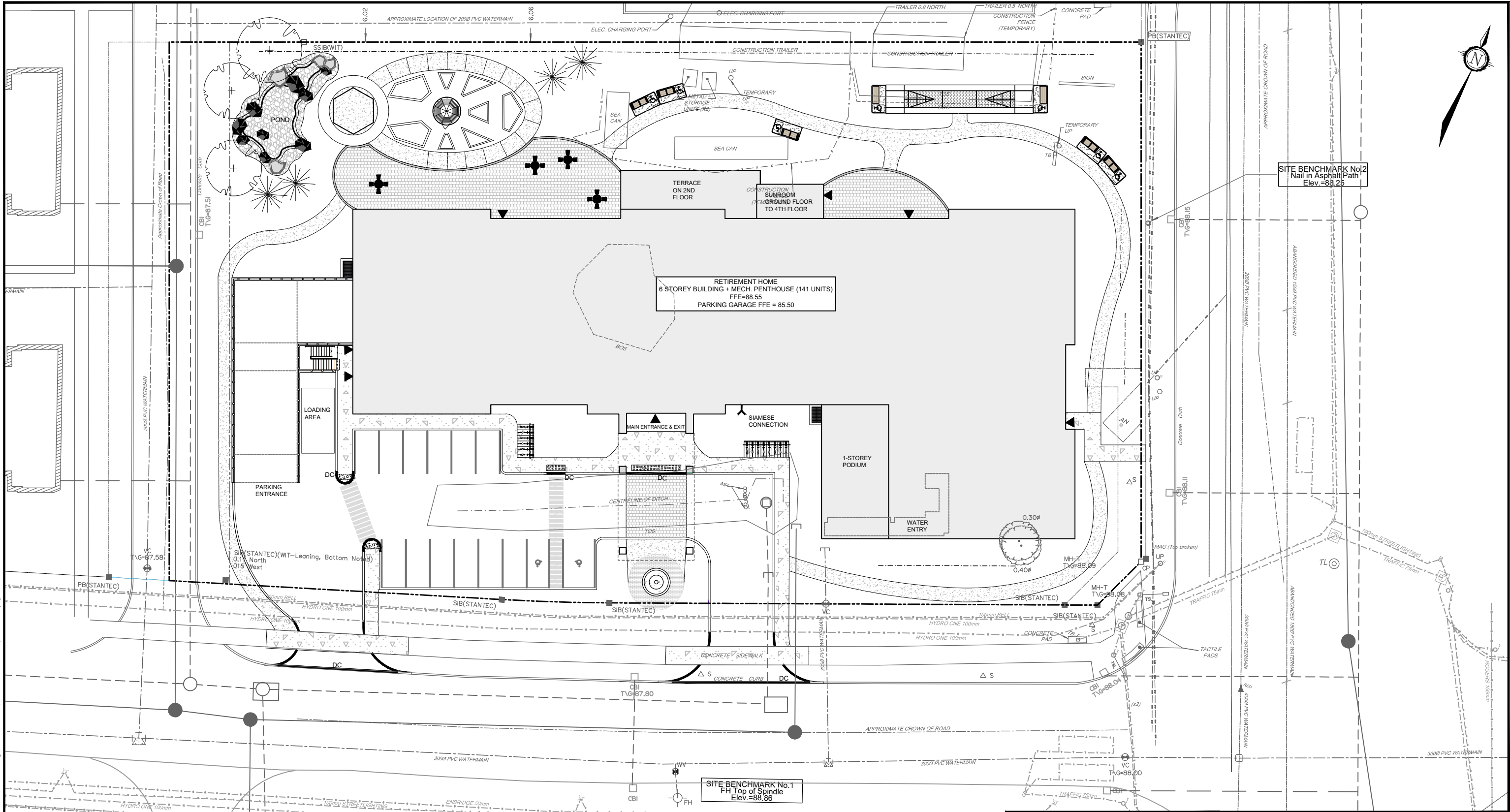
EXISTING CONDITIONS

SCALE 1 : 500 0 5m 10m 20m

DATE OCT 2025 JOB 125079 FIGURE FIG-3

CUT11V17 DWG 270mm X 122mm

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2.0 GEOTECHNICAL INVESTIGATION

A geotechnical investigation was completed for the subject site, and a report prepared entitled 'Geotechnical Investigation', Proposed Multi-Storey Building, 2380 Tenth Line Road, Ottawa Ontario prepared by Paterson Group Inc. dated May 23, 2025 (PG7518-1). The following is a summary of the findings of the report:

- Based on these observations, the long-term groundwater table can be expected to be at a depth of approximately 2.5 to 3.5 m below the existing ground surface. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.
- Topsoil, building debris, and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.
- A permissible grade raise restriction of 0.8 m is recommended for the subject site. If greater permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.
- The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. Excavations below the groundwater level should be cut back at a maximum slope of 1.5H:1V. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.
- To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material.
- A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.
- For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16.

- The plasticity index of the silty clay deposit at the subject site does not exceed 40%. Therefore, the following tree planting setbacks are recommended for the silty clay deposit. Large trees (mature height over 14 m) can be planted within the silty clay areas provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g., in a park or other green space). Detailed tree planting recommendations in relation to the soil analysis are outlined within the Geotechnical report.

3.0 WATER SERVICING

The proposed development is located within the City of Ottawa's Zone 2E water distribution system. Existing City watermain are present within all municipal rights-of-way fronting the site. A 300 mm diameter PVC watermain is located within Promenade Decoeur Drive, while Tenth Line Road contains a 400 mm diameter PVC watermain that reduces to 200 mm in diameter. Additionally, a 200 mm diameter PVC watermain is situated within David Lewis Private adjacent to the site. A 300 mm diameter PVC service connection also extends from Promenade Decoeur Drive into the proposed development area.

3.1 Watermain Design Parameters

Water demands have been calculated using criteria from Section 4 of the City of Ottawa Water Distribution Guidelines, ISTB-2021-03, and the Ontario Building Code as follows:

Table 3.1: Watermain Design Parameters and Criteria

Domestic Demand	Design Parameters
Unit Population: Assisted Care	1.0 people/unit
Studio/1-Bed Apartments	1.4 people/unit
2-bed Apartments	2.1 people/unit
Residential Average Day Demand	280 L/c/d
Assisted Care Average Day Demand	450 L/c/d
Maximum Day Demand (MXDY)	Residential: 2.5 x Basic Day (> 500 Persons) MOE Table 3-3 (<500 Persons) Commercial: 1.5 x Basic Day
Peak Hour Demand (PKHR)	Residential: 2.2 x Max Day (> 500 Persons) MOE Table 3-3 (<500 Persons) Commercial: 2.70 x Basic Day
Commercial	Design Parameters
Beauty Salon	650 L/station/day
Water Closet	150L/fixture/day
Office	75L/person/day
Dinning Area	125 L/seat/day (1 seat/1.1m ²)

Fire Demand (FF) Design	Design Flows
Apartment Building Hydrant spacing	per FUS 2020 Within 45m of the building Siamese
System Pressure Criteria Design Parameters	Criteria
Maximum Pressure (BSDY) Condition	< 80 psi occupied areas
Minimum Pressure (PKHR) Condition	> 40 psi
Minimum Pressure (MXDY+FF) Condition	> 20 psi

3.2 Fire Demand

The required fire demand was calculated using the Fire Underwriters Survey 2020 (FUS) Guidelines and City of Ottawa ITSB-2014-02. Through correspondence with the Architect, it is understood that the proposed building is residential occupancy (Limited Combustible) and is composed of Non-Combustible construction. The building will have an adequately designed fire system as per NFPA 13, complete with a standard water supply, a fully supervised system and 100% sprinkler coverage. The building will have a footprint of **2101.72m²**. Correspondence with the Architect is included in **Appendix A** for reference.

3.3 Water Demand

The water demand calculations, fire flow calculations and correspondence are provided in **Appendix A** for reference. A summary of the water demand and fire flows are provided in **Table 3.2**.

Table 3.2: Domestic Water Demand Summary

Population	Ave. Daily Demand (L/s)	Max. Daily Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
177.60	1.41	4.48	7.08	83

As per **ITSB 2021-03** the proposed development demand is above **50m³/day** and thus, will need to be serviced with two (2) services separated by an isolation valve. Therefore, it is proposed to service by utilizing the existing 300mm diameter stub from Promenade Decoeur Drive, and a second new service will be installed adjacent the existing service complete with an isolation valve between the services. The existing 300mm service will be reduced to 200mm prior to entering the building.

Additionally, the required site fire flow will be provided by the existing City owned fire hydrants within the Promenade Decoeur Drive right-of-way. All existing hydrants within the vicinity of the development are blue top hydrants indicating a rating of Class AA. As per **ITSB 2018-02** the fire flow allowance from the existing hydrants was assumed to be as outlined in **Table 3.3**.

Table 3.3: Maximum Flow to be considered from a given hydrant.

Hydrant Class	Distance to building (m)	Contribution to Fire Flow	
		(L/min)	(L/s)
AA	≤75	5700	95
	>75 and ≥150	3800	63.33
A	≤75	3800	63.33
	>75 and ≥150	2850	47.50
B	≤75	1900	31.67
	>75 and ≥150	1500	25.00
C	≤75	800	13.33
	>75 and ≥150	800	13.33

With a calculated fire flow requirement of **83 L/s**, a single hydrant is sufficient to meet the required flow. There are currently two existing Class AA hydrants along Promenade Decoeur Drive: one located within 75 m of the proposed building and another approximately 77.9 m away, together capable of providing a combined flow of **158.33 L/s**, as outlined in **Table 3.2**. One of the hydrants, located on the opposite side of the road, is within 45 m of the proposed Siamese connection. Refer to **Appendix A** for the Hydrant Coverage figure which depicts the existing hydrants and distances to the proposed building.

3.4 Water Analysis

The above water demand information was submitted to the City for boundary conditions from the City's water model. These boundary conditions were used for analyzing the performance of the proposed and existing watermain systems for three theoretical conditions:

- 1) High Pressure check under Average Day conditions
- 2) Peak Hour demand
- 3) Maximum Day + Fire Flow demand.

Refer to **Table 3.4** for a summary of the proposed boundary conditions and hydraulic analysis.

Table 3.4: Water Boundary Conditions and Hydraulic Analysis Summary

Criteria	Head (m)	Pressure ¹ (psi)	Pressure Requirements (psi)
Connection (300mm dia. Promenade Decoeur Drive)			
Max HGL (Average Day)	130.2	59.2	< 80psi
Min HGL (Peak Hour)	126.9	54.5	> 40psi
Max Day + Fire Flow (1300L/min)	126.9	54.5	> 20psi

¹Pressure based on a Finished Floor elevation of 88.55m

Based on the above system pressures the existing City infrastructure has capacity to service the proposed development. Booster pumps will be utilized by the internal mechanical system to ensure adequate pressures to the upper floors, as required. Refer to **Appendix A** for detailed water demand calculations and City of Ottawa boundary conditions.

4.0 SANITARY SERVICING

Existing City sanitary sewers are located within all municipal rights-of-way fronting the site. A 250mm diameter sanitary main is located within Promenade Decoeur Drive, terminating at existing maintenance hole (MH) 3102, while Tenth Line Road contains a 600 mm diameter sanitary main. Additionally, a 250 mm diameter sanitary main is situated within David Lewis Private adjacent to the site. A 250 mm diameter service connection also extends from existing MH 3102 in Promenade Decoeur Drive into the proposed development area.

To provide sanitary servicing for the proposed development, a new 1,200 mm diameter maintenance hole will be installed at the property line connecting to the existing 250mm service stub. From this new maintenance hole, a 200 mm diameter PVC service connection will extend to the building to convey sanitary flows to the municipal system.

4.1 Sanitary Design Parameters

Sanitary flows for the proposed development were calculated using criteria from Section 4 of the City of Ottawa Sewer Design Guidelines, ITSB-2018-01, and the Ontario Building Code as follows:

Table 4.1: Sanitary Sewer Design Parameters

Design Component	Design Parameter
Unit Population: Assisted Care	1.0 person/unit
Studio/ 1-Bed Apartment	1.4 person/unit
2-bed Apartment	2.1 person/unit
Residential Flow Rate	280 L/cap/day
Assisted Care Average Day Demand	450 L/cap/day
Residential Peaking Factor	Harmon Equation (min=2.0, max=4.0) Harmon Correction Factor = 0.8m (Design)
Commercial Flows: Beauty Salon	650 L/station/day
Water Closet	150L/fixture/day
Office	75L/person/day
Dinning Area	125 L/seat/day (1 seat/1.1m ²)
Extraneous Flow Rate	Design = 0.33 L/s/ha
Minimum Pipe Size	200mm (Res)
Minimum Velocity ¹	0.6 m/s
Maximum Velocity	3.0 m/s
Minimum Pipe Cover	2.0 m (Unless frost protection provided)

¹A minimum gradient of 0.65% is required for any initial sewer run with less than 10 residential connections.

4.2 Proposed Development Flows

The proposed development will have a combination of residential and assisted care units. The residential units will be composed of twenty-four (24) studio, fifty-one (51) one (1) bed, and six (6) two (2) bed apartments for a total of 81 units and a population of 118 persons. The assisted care units will be composed of fifty (50) studio, and ten (10) one (1) bed units for a total of 60 units and a population of 60 persons. The proposed residential flow for the site was determined to be **2.45L/s**. There will also be communal amenities on the ground floor including a dining area, salon, and an administrative office area. Additionally, there will be water closets for Guests and staff. The anticipated commercial flow from the development is **0.72L/s**. The extraneous flows for the **0.625ha** development was calculated to be **0.21L/s**. Thus, the peak sanitary flow including infiltration for the development is **3.38 L/s**. Detailed sanitary flow calculations are provided in **Appendix B** for reference.

4.3 Anticipated Site Flows

As noted previously, the detailed design of the East Urban Community was completed by Atrél with details provided within the **Atrél Report**. The East Community design assumed that 2370 Tenth Line and 2380 Tenth Line were one parcel **4.79 ha** in area with a commercial occupancy. The assumed flows were **50000L/day** with a peaking factor of **1.5**, and an extraneous flow of **0.28 L/s/ha**. The above resulted in a flow allotment of **5.50L/s** for the combined parcel. Therefore, the flow allotment for the proposed **0.624ha** development is **0.72L/s**.

4.4 Downstream Capacity

The Avalon West – Stage 3 sanitary collection system is directed to the Tenth Line Road Pumping Station at 2428 Tenth Line Road. As noted above, the proposed flows are higher than anticipated during the overall design. As such the capacity of the downstream system was reviewed to ensure that there is adequate capacity for the proposed development. The proposed development will result in an increase of **2.66L/s**.

It should also be noted that the neighboring 2370 Tenth Line also exceeded the allotment for the property. As noted in the **2370 Report**, 2370 Tenth Line had a property area of **3.19 ha**, and a design flow of **7.5L/s**. Based on the **Atrél Report** allotment values the site had an allotment of **3.66L/s**, for an exceedance of **3.84L/s**.

Thus, the total increase in flows to the downstream system from 2370 and 2380 Tenth Line is **6.5L/s**.

The flows from the site are conveyed through the system to the pumping station at 2428 Tenth Line Road. In the downstream system the pipe run from 3275-3276 in Hepacia Crescent had the least available capacity with a design flow of **100.31L/s**, and a capacity of **149.48 L/s**, for a utilization of **67.1%**. The increase in flow will result in a utilization of approximately **71%**.

It should be noted that the analysis in the **Atrél Report** was performed utilizing a sanitary flow of **350 L/cap/Day** which is significantly higher than the present **280l/cap/day** design flow, and thus the numbers above are conservative.

The slight increase in utilization will have a negligible impact on the downstream system. Based on the above analysis, the downstream system has capacity for the proposed development. Refer to **Appendix B** for report excerpts.

5.0 STORM SERVICING

Existing City storm sewers are located within all municipal rights-of-way fronting the proposed site. A 1,200 mm diameter storm sewer is situated within the Promenade Decoeur Drive right-of-way, terminating at existing maintenance hole (MH) 3574, while an 825 mm diameter storm sewer is located within the David Lewis Private right-of-way. The Tenth Line Road right-of-way also contains storm sewers ranging in diameter from 375 mm to 525 mm. Additionally, a 1,200 mm diameter service extends from existing MH 3574 in Promenade Decoeur Drive into the proposed development area.

The proposed development will be serviced using the existing 1,200 mm storm service. From this service, a private storm system will be constructed incorporating a 2,400 mm diameter maintenance hole, which will provide a 200 mm diameter building connection and tie-ins to two independent catch basin systems. This storm service will convey uncontrolled foundation drain flows and controlled roof drainage flows. Refer to the General Plan of Services drawing (**125079-GP**) for detailed servicing information.

The design criteria used in sizing the storm sewers are summarized below in **Table 5.1**.

Table 5.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local Roads	2 Year Return Period
Storm Sewer Design	Rational Method
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (Tc)	10 min
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Refer to **Appendix C** for detailed storm drainage area plans and storm sewer design sheets.

6.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The stormwater management strategy for the site is based on the established criteria from the City of Ottawa, and the **Atrel Report**.

6.1 Design Criteria

Through correspondence with the City of Ottawa, the **Atrel Report** and our knowledge of development requirements in the area, the following criteria have been adopted to control post-development stormwater discharge from the site:

- Control proposed development flows, up to and including the 100-year storm event, to an allowable release rate of **220L/s/ha**;
- Provide source controls which are in conformity with the City of Ottawa requirements, where possible;
- Limit ponding to 0.15 m for all rooftop storage areas and 0.35 m for all parking storage areas; and
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

The approach to the stormwater management design is to determine the allowable release rate for the site, calculate the uncontrolled flow, and ensure that the remaining flow, in combination with the uncontrolled flow, does not exceed the allowable release rate. All proposed development runoff in excess of the allowable release rate, will be attenuated on-site prior to being released into the storm sewers Promenade Decoeur Drive.

6.2 Quantity Control

The proposed site is contained within the tributary area of the Avalon West (N5) SWM Facility. The flows from the site will be conveyed through the storm sewers of the rights-of-way, prior to discharging to the existing pond and ultimately the McKinnon Creek. The inflow rate into the minor system of the neighboring subdivisions was limited to **220 L/s/ha**, and a time of concentration of 10 minutes.

The proposed site has a total area of **0.624 ha**. The **0.037ha** portion of the site within the right-of-way easement for David Lewis Private is captured within the neighboring 2370 storm system. As such allowable release rate for the remaining **0.59 ha** was calculated to be **129.1 L/s** based on the above criteria. It is proposed to control the post-development flows to the allowable release rate through the use of controlled roof drains, and lcd's within proposed catch basin structures as described in the following sections.

Design Storms

The design storms are based on City of Ottawa design storms. Design storms were used for the 5, 100, and 100+20%-year return periods (i.e. storm events).

Model Parameters

Post-development catchments were modelled based on the proposed site plan and grading as shown on **Drawing 125079-SWM** within **Appendix C**.

The site has been divided into Seven (7) drainage areas for the post development condition. The drainage areas are as follows:

Area A-01:

- Stormwater from the proposed parking garage ramp will be collected by a proposed area drain and trench drain. The flows will be directed to the proposed building service by the internal mechanical system. The flows will remain uncontrolled and will drain by gravity to the existing sewer system within Promenade Decoeur Drive.

Area A-02:

- Stormwater from the proposed swale system located to the rear and along the east side of the building will be collected by landscaped drains and catch basins. These flows will be controlled by a proposed inlet control device (ICD) within catchbasin manhole 102. The flows will then discharge by gravity to the existing sewer system within Promenade Decoeur Drive.

Area A-03:

- Stormwater from the above ground parking area will be collected by proposed catchbasin manholes. The catchbasin manholes are interconnected by a 600mm storm pipe complete with and ICD within CBMH 105. The flows will then drain by gravity to the existing sewer system within Promenade Decoeur Drive.

Area R-01:

- Stormwater from the second floor terrace will be captured by floor drains which will convey the flows through the internal mechanical system to the proposed storm service. The flows will be conveyed uncontrolled and will drain by gravity to the existing sewer system within Promenade Decoeur Drive

Area R-00:

- Stormwater from the building roof will be captured and controlled by flow control roof drains prior to releasing to the building storm service and ultimately the existing sewers within the Promenade Decoeur Drive. The ponding will be limited to 0.15m in depth with overflow scuppers provided for emergencies. Storage of stormwater will be provided for storms up to and including the 100-year event. Further details will be provided once a mechanical consultant is retained for the subject development.

Area D-01:

- The drainage along the west edge of the above ground parking area will flow uncontrolled to the David Lewis Private right-of-way, where it will be captured by the existing storm system.

Area D-02

- The drainage from the landscaped area and back of curb along the south property line will sheet flow uncontrolled to the Promenade Decoeur Drive right-of-way, where it will be captured by the existing storm system.

Table 6.1 below summarizes the proposed control devices, the post-development flow, storage required, and storage provided for each of the site drainage areas. **Table 6.2** summarizes the parking lot ponding provided during the design storm events.

Table 6.1: Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device		Outlet Location	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			
							Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Max. Vol. Provided (cu.m.)
D-01	0.002	0.20	0.25	N/A		David Lewis Private	0.10	N/A	N/A	0.10	N/A	N/A	0.20	N/A	N/A	N/A
D-02	0.004	0.38	0.45	N/A		Promenade Decoeur Drive	0.30	N/A	N/A	0.50	N/A	N/A	0.90	N/A	N/A	N/A
A-01	0.020	0.90	1.00	N/A		Tenth Line	3.80	N/A	N/A	5.10	N/A	N/A	9.70	N/A	N/A	N/A
R-01	0.009	0.90	1.00	N/A		Tenth Line	1.80	N/A	N/A	2.40	N/A	N/A	4.50	N/A	N/A	N/A
R-00	0.214	0.90	1.00	Accutrol RD-100-A-ADJ	3/4 Open	Tenth Line	13.00	N/A	18.08	16.90	N/A	25.08	19.50	0.150	63.47	N/A
A-02	0.229	0.47	0.54	Plate Oriface	127	Tenth Line	29.80	0.735	4.82	34.00	0.945	8.46	45.50	1.726	23.58	33.45
A-03	0.109	0.78	0.87	Plate Oriface	127	Tenth Line	23.00	0.436	3.96	26.20	0.573	6.87	44.00	1.622	15.00	20.99
Post-Development Flow							71.8	-		85.2	-		124.3	-		
Total Allowable Release Rate							129.1			129.1			129.1			
1) In lieu of a detailed roof plan, for the interim it has been assumed that the roof (area R-00) will contain 13 controlled roof drains releasing at 1.5L/s in the 100-yr, 1.3 L/s in the 5-yr and 1.0L/s in the 2-year storm events																
2) Once once detailed roof plans are obtained the exact flow per roof drain will be determined, and the calculations will be updated accordingly																

As summarized in the above table, the post-development flows will be controlled to **124.3 L/s**, approximately **4.8 L/s** lower than the pre-development condition of the site. The flows will be controlled by two (2) proposed ICDS within CBMH 105 and CBMH 102, as well as thirteen (13) controlled roof drains. All other flows from the site are proposed to be free flowing. All flows conveyed by others, or the internal mechanical system, shall adhere to the values in the above table.

Refer to **Appendix C** for Rational Method calculations and Drawing **125079SWM**-Stormwater Management Plan.

6.3 Quality Control

As noted above the subject site is tributary to the Avalon West (N5) SWM Facility. The existing facility was designed to provide an Enhanced Level of Protection (80% total suspended solids removal) per MECP guidelines. As such no onsite quality control measures are required for the proposed site. Excerpts from the **Atrel Report** are included in **Appendix C** for reference.

6.4 Major Overland Flow Route

A major overland flow route will be provided for storms greater than the 100-year storm event. Stormwater will be directed to the surrounding rights-of-way, and the rear yard swale of the adjoining subdivision. The major overland system is shown on the Grading Plan (drawing 125079-GR).

7.0 EROSION AND SEDIMENT CONTROL

Temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter socks (catchbasin inserts) will be placed in existing and proposed catchbasins and catchbasin manholes, and will remain in place until vegetation has been established and construction is completed;
- Silt fencing will be placed along the surrounding construction limits;
- Mud mats will be installed at the site entrances;
- Strawbale or rock check dams will be installed in swales and ditches;
- The contractor will be required to perform regular street sweeping and cleaning as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site;

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (drawing 125079-ESC) for additional information.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Watermain

The analysis of the existing and proposed watermain network confirms the following:

- The existing 300 mm diameter service, together with the proposed 200 mm diameter water service connections to the existing 300 mm watermain within Promenade Decoeur Drive, will provide adequate servicing for the proposed development.
- There are adequate pressures in the existing watermain infrastructure to meet the required domestic demands for the development.
- There is adequate flow to service the proposed fire protections system.

Sanitary Servicing

The analysis of the proposed sanitary system confirms the following:

- It is proposed to service the development with a new 200 mm sanitary service, connecting to the proposed manhole and discharging into the existing 250 mm sanitary service, which outlets to the municipal sewer network within the Promenade Decoeur Drive.
- It is anticipated there is adequate capacity within the existing sanitary infrastructure to service.

Stormwater Management

The following provides a summary of the storm sewer and stormwater management system:

- The proposed storm sewer system is to connect to the storm sewers within in the Promenade Decoeur Drive right-of-way.
- Stormwater control is to be provided by rooftop storage, and parking lot storage.
- Storm flows will be attenuated through the implementation of inlet control devices, and controlled roof drains.
- As per existing conditions major overland flow routes have been provided to the surrounding rights-of-way.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, catch basin inserts, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.

9.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:



Anthony Mestwarp, P.Eng
Project Manager
Land Development Engineering

Reviewed by:



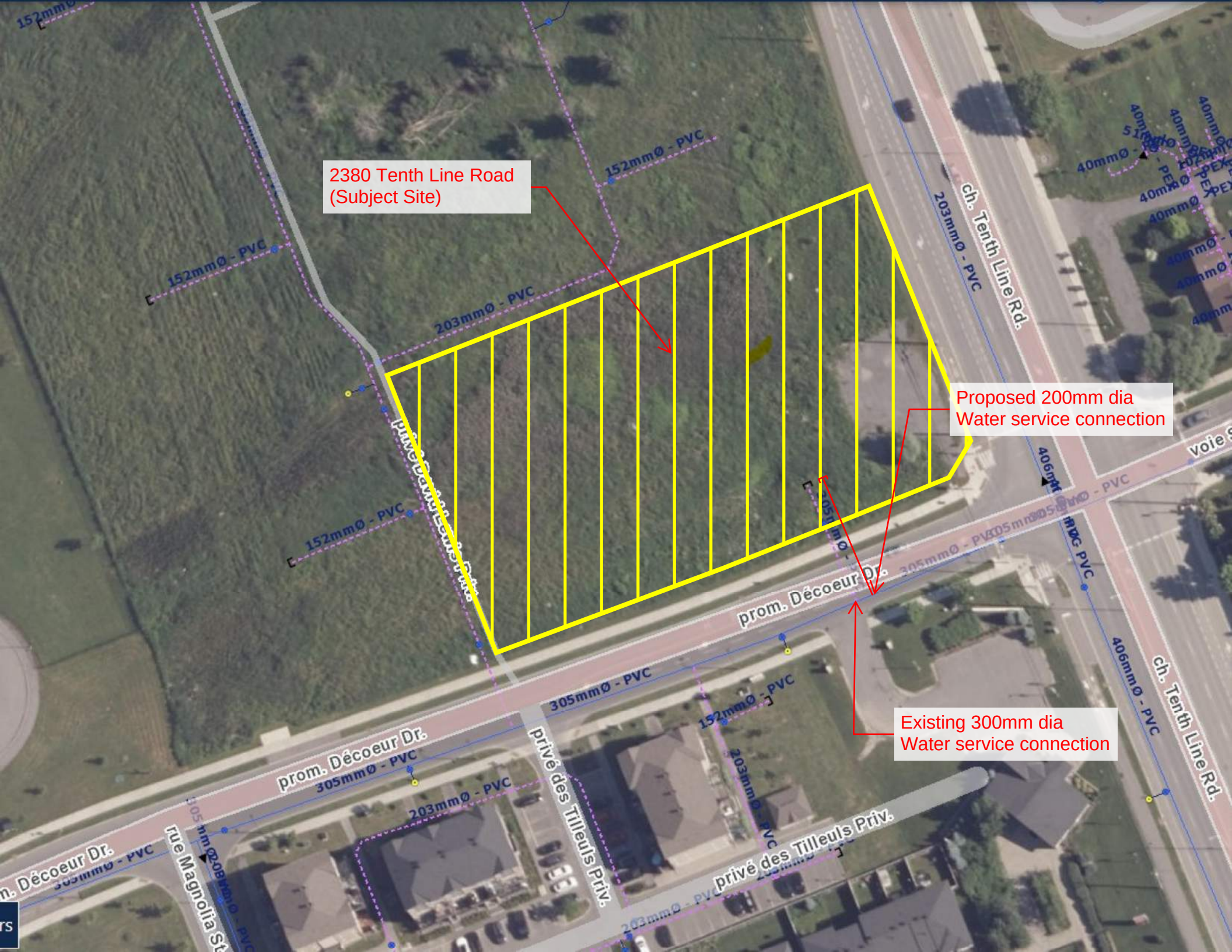
Greg MacDonald, P.Eng
Director, Land Development and Public
Sector Infrastructure

Appendix A
Water Servicing

2380 Tenth Line Road
(Subject Site)

Proposed 200mm dia
Water service connection

Existing 300mm dia
Water service connection



Water Demand Design Sheet

Boundary Condition Request

Novatech Project #: 125079
Project Name: 2380 Tenth Line
Date: 9/30/2025
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: A100-Site Plan

Legend: Input by User No Input Required
Calculated Cells →
Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
MOE Design Guidelines for Drinking-Water Systems (2008)
Fire Underwriter's Survey Guideline (2020)
Ontario Building Code, Part 3 (2012)

Small System = YES

	# of Dwellings	# of fixtures/stations/offices	Area (m ²)	Pop. Equiv.	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential Input							
Apartments (2-BR)	6			12.60	0.04	0.20	0.30
Apartments (1-BR)	51			71.40	0.23	1.13	1.71
Apartments (Studio)	24			33.60	0.11	0.53	0.81
Assisted care Input							
Apartments (1-BR)	11			11.00	0.06	0.28	0.42
Apartments (Studio)	49			49.00	0.26	1.25	1.89
Industrial / Commercial / Institutional (ICI) Input							
Beauty Salon		3.00			0.02	0.03	0.06
Water Closet		11.00			0.46	0.69	1.24
Office		5.00			0.004	0.01	0.01
Dinning Area			179.29	162.99	0.24	0.35	0.64
Other Area					0.00	0.00	0.00
Totals	141		179.29	177.60	1.41	4.48	7.08

* It is assumed that the dinning area does not add to the building population and is mostly utilized by the tenants

Summary

i. Type of Development and Units:	6 Storey Retirement home building
ii. Site Address:	2380 Tenth Line Road, Ottawa
iii. Proposed Water Service Connection Location(s):	200 mm service connection to tie into the existing 300 mm diameter watermain on Decoeur Drive, along with the existing 300 mm diameter
iv. Average Day Flow Demand:	1.41 L/s
v. Peak Hour Flow Demand:	7.08 L/s
vi. Maximum Day Flow Demand:	4.48 L/s
vii. Required Fire Flow #1:	5000 L/min
viii. Required Fire Flow #2:	L/min
ix. Required Fire Flow #3:	L/min

Water Demand Design Sheet

Design Parameters

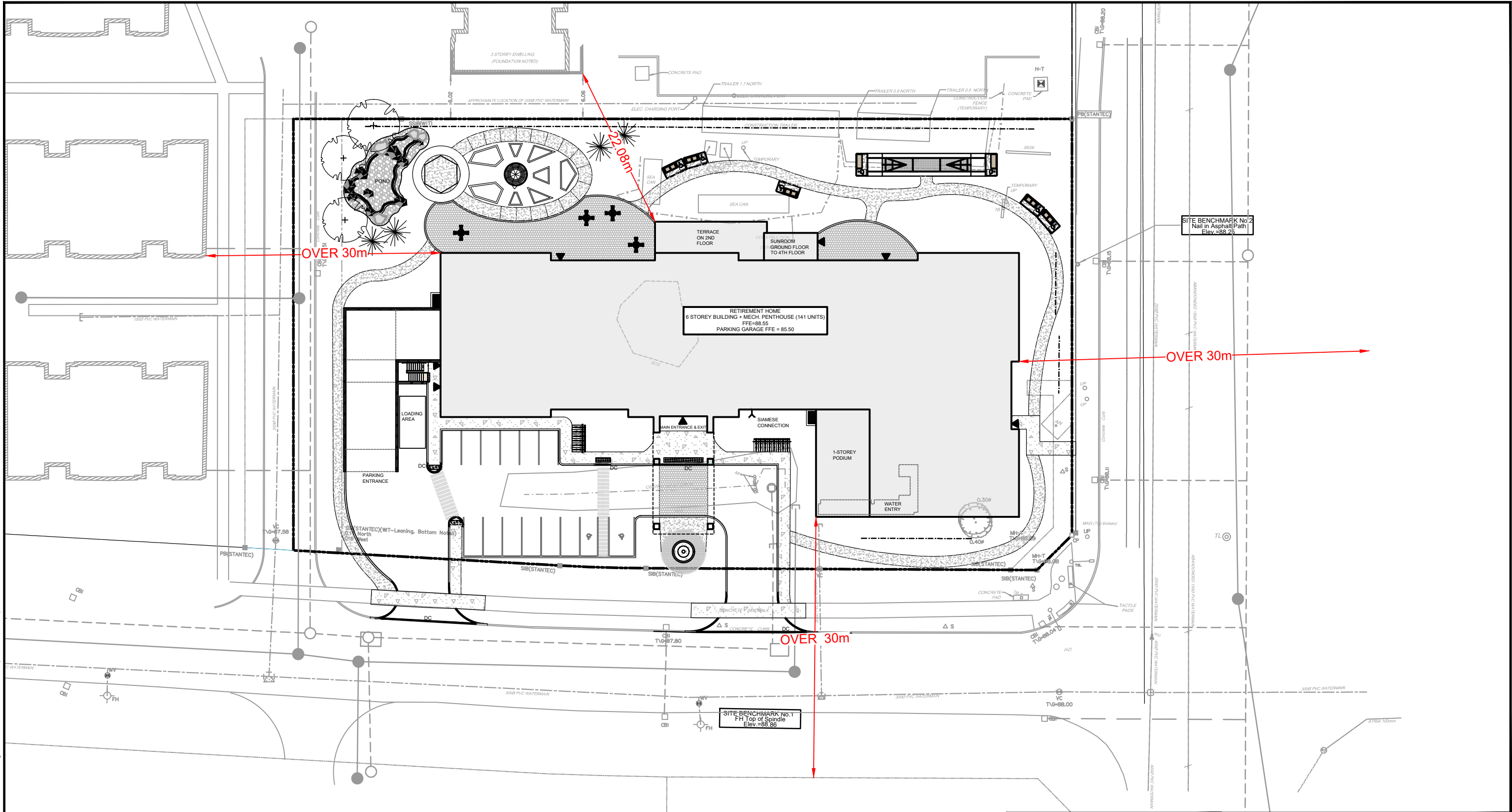
Unit Type Population Equiv.	Residential			Assisted		Dinning Area
	Apts (2-BR)	Apts (1-BR)	Apts (Studio)	Apts (1-BR)	Apts (Studio)	
	2.1	1.4	1.4	1	1	
Daily Demand	L/per person/day			L/per person/day		
Average Demand	280			450		
Basic Demand	280			450		

Residential Peaking Factors		Max Day (x Avg Day)	Peak Hour (x Avg Day)
Small System (If Applicable) <i>Modified</i>	Pop.		
	0	9.50	14.30
	30	9.50	14.30
	150	4.90	7.40
	300	3.60	5.50
	450	3.00	5.50
	500	2.90	5.50
Large System (Default)	> 500	2.50	5.50

Institutional / Commercial / Industrial								
Industrial		Commercial	Institutional	Beauty Salon	Water Closet	Office	Dinning Area	
Light	Heavy						1.1m ² /person	
L/gross ha/day				L/station/day	L/fixture/hr	L/person/day	L/seat/day	
35,000	55,000	28,000	28,000	650	150	75	125	
10,000	17,000	17,000	17,000					

ICI Peaking Factors	Max Day (x Avg Day)	Peak Hour (x Avg Day)
	1.50	2.70

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LEGEND

- PROPERTY LINE
- ← 19.28 → EXPOSURE DISTANCES



NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

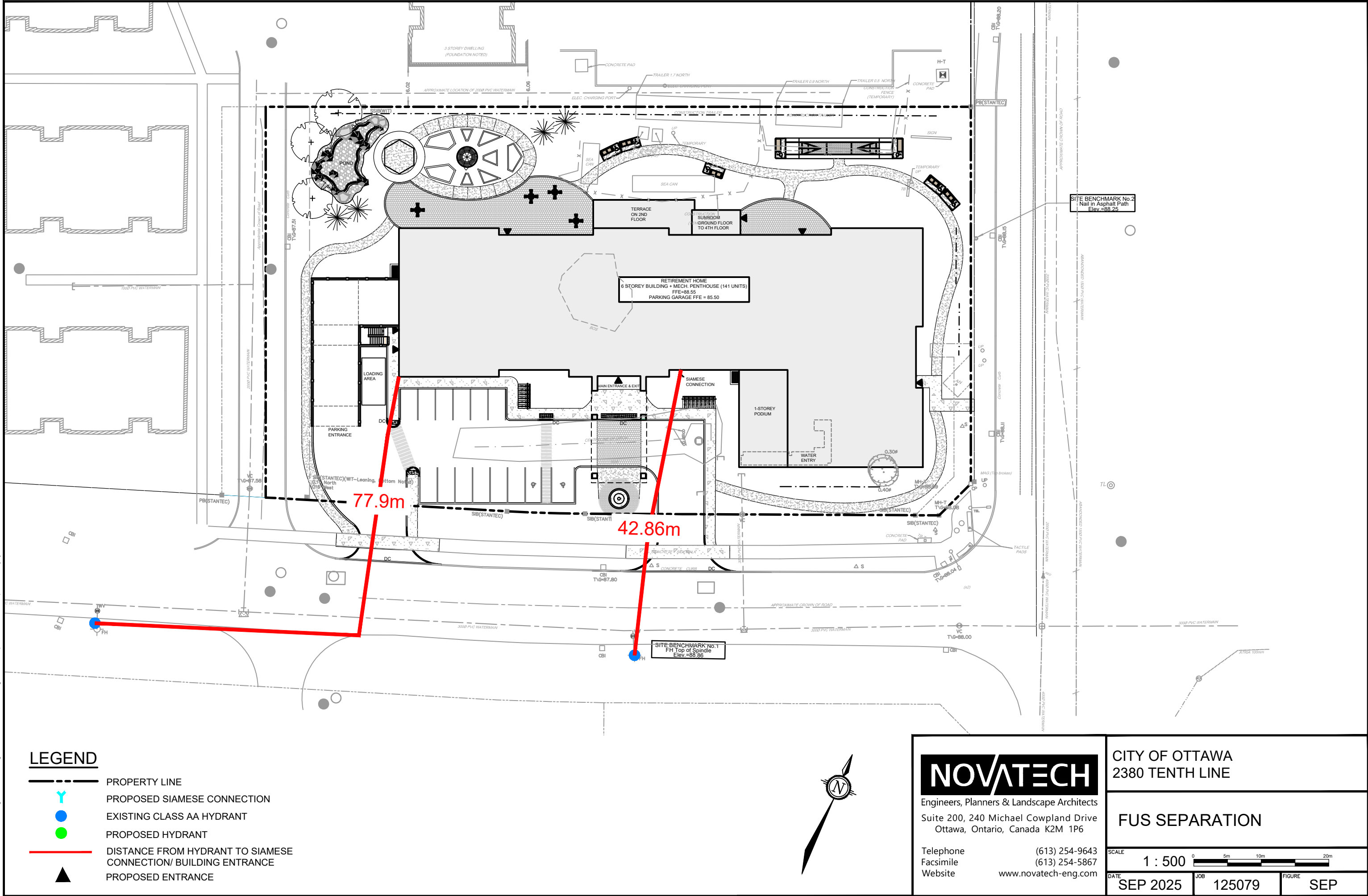
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
2380 TENTH LINE

FUS SEPARATION

SCALE	1 : 500	0 5m 10m 20m
DATE	SEPT 2025	JOB 125079
FIGURE		SEP

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LEGEND

- PROPERTY LINE
- PROPOSED SIAMESE CONNECTION
- EXISTING CLASS AA HYDRANT
- PROPOSED HYDRANT
- DISTANCE FROM HYDRANT TO SIAMESE CONNECTION/ BUILDING ENTRANCE
- PROPOSED ENTRANCE



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CITY OF OTTAWA
2380 TENTH LINE

FUS SEPARATION

SCALE 1 : 500
DATE SEP 2025
JOB 125079
FIGURE SEP

FUS - Fire Flow Calculations

Novatech Project #: 125079
Project Name: 2380 Tenth Line Road
Date: 8/22/2025
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125079-COV

Legend: Input by User

No Input Required

Reference: Fire Underwriter's Survey Guideline (2020)
Formula Method

Building Description: Multi-Storey Tower
Type II - Non-combustible construction

Step		Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow					
1	Construction Material		Multiplier		0.8
	Coefficient related to type of construction C	Type V - Wood frame		1.5	
		Type IV - Mass Timber		Varies	
		Type III - Ordinary construction		1	
		Type II - Non-combustible construction	Yes	0.8	
		Type I - Fire resistive construction (2 hrs)		0.6	
2	Floor Area				10,000
	A	Building Footprint (m ²)	2102		
		Number of Floors/Storeys	6		
		Protected Openings (1 hr) if C<1.0	Yes		
		Area of structure considered (m ²)		3,153	
	F	Base fire flow without reductions F = 220 C (A)^{0.5}			
Reductions or Surcharges					
3	Occupancy hazard reduction or surcharge		FUS Table 3	Reduction/Surcharge	8,500
	(1)	Non-combustible		-25%	
		Limited combustible	Yes	-15%	
		Combustible		0%	
		Free burning		15%	
		Rapid burning		25%	
4	Sprinkler Reduction		FUS Table 4	Reduction	-4,250
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	
		Standard Water Supply	Yes	-10%	
		Fully Supervised System	Yes	-10%	
		Cumulative Sub-Total		-50%	
5	Exposure Surcharge		FUS Table 5	Surcharge	850
	(3)	North Side	20.1 - 30 m	10%	
		East Side	>30m	0%	
		South Side	>30m	0%	
		West Side	>30m	0%	
	Cumulative Total			10%	
Results					
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	5,000
		(2,000 L/min < Fire Flow < 45,000 L/min)		or L/s	83
				or USGPM	1,321

From: Carly Rouault <crouault@neuf.ca>

Sent: Thursday, August 21, 2025 5:56 PM

To: Anthony Mestwarp <a.mestwarp@novatech-eng.com>

Cc: Pascal Vendette <pascal@neuf.ca>; Amina Aliyu <aaliyu@neuf.ca>; Owen MacLeod <omacleod@neuf.ca>

Subject: RE: 2380 Tenth Line - 125079

Hi Anthony,

I think this should answer all your questions. See highlighted items below.

Thanks,

CARLY ROUAULT, OAQ

Architecte. Architect

T 514 847 1117 #333 F 514 847 2287

630, boul. René-Lévesque O. 32^e étage, Montréal (QC)
H3B 1S6

NEUF ARCHITECTES INC. [Confidentialité +
Transmission](#)

Montréal. Ottawa. Toronto

De : Anthony Mestwarp

Envoyé : 21 août 2025 14:47

À : Carly Rouault

Cc : Pascal Vendette ; Amina Aliyu ; Owen MacLeod

Objet : RE: 2380 Tenth Line - 125079

Hi Carly,

Can you confirm the following for the fire demand calculations for the proposed building at 2380 Tenth line:

1. Building construction

Type V - Wood frame
Type IV - Mass Timber
Type III - Ordinary construction
Type II - Non-combustible construction
Type I - Fire resistive construction (2 hrs)

2. If there are 1hr protected openings between floors

FRR ratings and construction type to follow requirements of 3.2.2.55A

3.2.2.55A. Group C, Retirement Home, Any Height, Any Area, Sprinklered

- (1) Except as permitted by Articles 3.2.2.55B. to 3.2.2.55E., a retirement home shall conform to Sentence (2).
- (2) Except as permitted by Article 3.2.2.16., the building referred to in Sentence (1) shall be of noncombustible construction, and
- (a) except as permitted by Sentences 3.2.2.7.(1) and 3.2.2.18.(2), the building shall be sprinklered throughout,
- (b) floor assemblies shall be fire separations with a fire-resistance rating not less than 2 h,
- (c) mezzanines shall have a fire-resistance rating not less than 1 h, and
- (d) loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3. Details on the proposed sprinkler system

Adequately Designed System (NFPA 13)
Standard Water Supply
Fully Supervised System

Mechanical to confirm – should be a standard system.

4. If any areas of the proposed building will be without sprinkler protection.

None

5. The proposed building floor area per floor if the floor area varies.

Building area (OBC) is : 2099m²

Gross floor area by floor is per the screen shot below. Note that the gross construction area is a bit larger than the OBC gross area as it includes the thickness of the exterior walls.

GROSS CONSTRUCTION AREA		
LEVEL	AREA (m ²)	AREA (ft ²)
00-BASEMENT	2100 m ²	22607 ft ²
01-GROUND FLOOR	2102 m ²	22623 ft ²
02-2nd FLOOR	1947 m ²	20955 ft ²
03-3rd FLOOR	1947 m ²	20956 ft ²
04-4th FLOOR	1872 m ²	20151 ft ²
05-5th FLOOR	1872 m ²	20151 ft ²
06-6th FLOOR	1872 m ²	20149 ft ²
	13712 m ²	147590 ft ²

NOTES:

GROSS CONSTRUCTION AREA INCLUDES ALL AREA INSIDE THE OUTSIDE FACE OF EXTERIOR WALLS WITH NO DEDUCTIONS.

UNIT AREAS INCLUDE ALL AREA FROM THE OUTSIDE FACE OF EXTERIOR WALLS TO THE MIDPOINT OF DEMISING WALLS.

AREAS ARE SUBJECT TO CHANGE THROUGH THE DESIGN PROCESS.

Thanks,

Anthony Mestwarp, P.Eng., Project Manager | Land Development Engineering

NOVATECH

Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext. 216

The information contained in this email message is confidential and is for exclusive use of the addressee.

**Electronic documents, when supplied, are supplemental. The print (or pdf) versions of the documents govern. Requested electronic documents remain the property of Novatech (on behalf of the Owner) and shall only be used for the purpose for which they were originally intended

Boundary Conditions 2380 Tenth Line Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	85	1.41
Maximum Daily Demand	269	4.48
Peak Hour	425	7.08
Fire Flow Demand #1	5,000	83.33

Location



Results

Connection 1 – Décoeur Drive

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	60.0
Peak Hour	126.9	55.3
Max Day plus Fire Flow #1	126.9	55.3

¹ Ground Elevation = 88.0 m

Notes

1. The IWSD has recently updated their water modelling software. Any significant difference between previously received BC results and newly received BC results could be attributed to this update.
2. According to the OWDG Tech Bulletin ISTB-2021-03 Section 4.3.1.:
 - Industrial, commercial, institutional service areas with a basic day demand greater than 50 m³/day (0.58 L/s) and residential areas serving 50 or more dwellings shall be connected with a minimum of two watermains, separated by an isolation valve, to avoid the creation of a vulnerable service area. Individual residential facilities with a basic day demand greater than 50 m³/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area.

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

CALCULATED WATER DEMANDS:

Water Demands

Average Day (Maximum HGL)= 1.41 L/s
 Maximum Day = 4.48 L/s
 Peak Hour (Minimum HGL) = 7.08 L/s
 Fire Flow (FUS) = 83.33 L/s

City of Ottawa Boundary Conditions:

Average Day (Maximum HGL)= 130.2 m
 Peak Hour (Minimum HGL) = 126.9 m
 Max Day + Fire = 126.9 m

Watermain Analysis

Finished Floor Elevation = 88.55 m

High Pressure Test = Max. HGL - Finished Floor Elevation x 1.42197 PSI/m < 80 PSI

High Pressure = 59.2 PSI

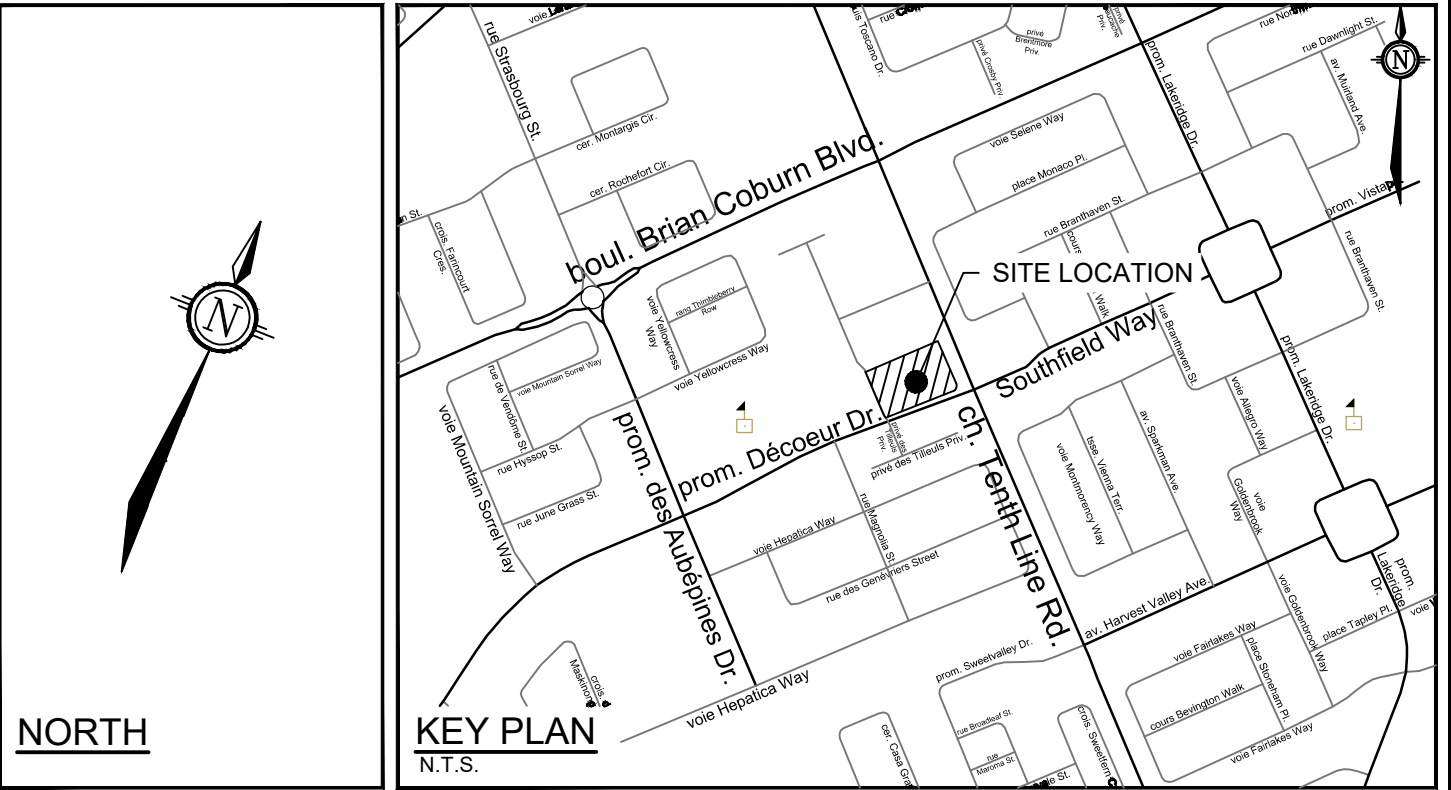
Low Pressure Test = Min. HGL - Finished Floor Elevation x 1.42197 PSI/m > 40 PSI

Low Pressure = 54.5 PSI

Max Day + Fire Test = Max Day + Fire Flow - Finished Floor Elevation x 1.42197 PSI/m > 20 PSI

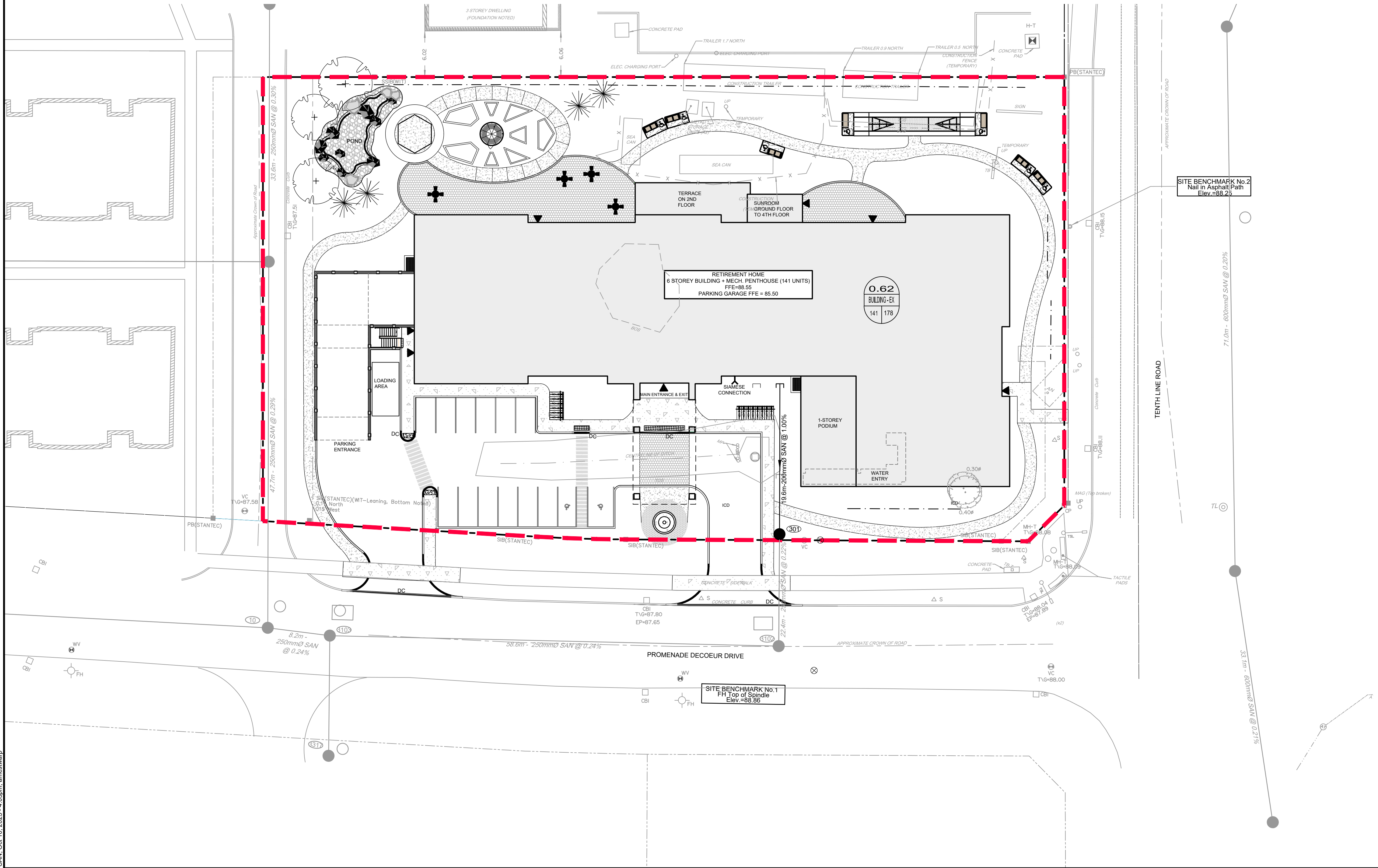
Max Day + Fire (Connection #1) = 54.5 PSI

Appendix B
Sanitary Servicing



LEGEND

- SITE PROPERTY LINE
- MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS
- PROPOSED TACTILE WALKING SURFACE INDICATOR (TWSI)
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
- FIRE DEPARTMENT SIAMESE CONNECTION
- PROPOSED BUILDING ENTRANCE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED AREA DRAIN
- PROPOSED LANDSCAPE DRAIN (ELBOW/TEE)
- PROPOSED BIKE RACKS
- PROPOSED CROSSWALK PAINTING
- PROPOSED LINE PAINTING
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY SEWER AND FLOW DIRECTION
- SANITARY DRAINAGE AREA BOUNDARY
- AREA IN HECTARES
- MANHOLE TO MANHOLE
- POPULATION EQUIVALENT
- EXISTING VALVE & VALVE BOX
- EXISTING VALVE & LEAD
- EXISTING STORM MANHOLE
- EXISTING CATCHBASIN
- EXISTING DITCH CENTERLINE
- EXISTING SANITARY MANHOLE & SEWER



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS. AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
1.	ISSUED FOR SPA	OCT 16/2025	ARM

SCALE
1:300
0 3 6 9 12

DESIGN
ARM/AM
CHECKED
ARM
DRAWN
MF/AM
CHECKED
ARM
APPROVED
GJM

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION CITY OF OTTAWA 2380 TENTH LINE	PROJECT No. 125079
DRAWING NAME SANITARY PLAN	REV REV#1
	DRAWING No. 125079-SAN

SANITARY SEWER DESIGN SHEET



Novatech Project #: 125079
Project Name: 2380 Tenth Line
Date: 8/11/2025
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125079-SAN

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output
Reference: City of Ottawa - Sewer Design Guidelines (201
MOE - Design Guidelines for Sewage Works (

Location				Demand																								Design Capacity									
Street	Area ID	From MH	To MH	Design Flow Flow														Industrial / Commercial / Institutional (ICI) Flow								Extraneous Flow		Total Design Flow	Proposed Sewer Pipe Sizing / Design								
				Residential						Assisted Care					Total Flows												Area Method		Total Peak Design Flow								
				Studio	1-Bed	2-Bed	Population	Cumulative Population	Average Pop. Flow	Studio	1-Bed	Population	Cumulative Population	Average Pop. Flow	Design Peaking Factor M	Peak Design Pop. Flow	Res. Drainage Area	Cumulative Res. Drainage Area	Beauty salon (station)	Water Closet (Fixture)	Office (person)	Dining Area (m²)	Average Commercial Flow (L/s)	Cumulative Commercial Flow	Commercial Peaking Factor	Peak Commercial Design Flow	Cumulative Extraneous Drainage Area	Design Extraneous Flow	Total Peak Design Flow	Pipe Length	Pipe Size (mm) and Material	Pipe ID Actual	Roughness	Design Grade	Capacity	Full Flow Velocity	Q(D) / Qfull
				(in 1000's)	(in 1000's)	Q(q) (L/s)			(in 1000's)	(in 1000's)	Q(q) (L/s)		Q(p) (L/s)	(ha.)	(ha.)						L/s			(ha.)	Q(e) (L/s)	Q(D) (L/s)	(m)		(m)	n	So (%)	Qfull (L/s)	(m/s)				
Street One	A1	121	119	24	51	6	0.118	0.118	0.38	50	10	0.060	0.060	0.31	3.53	2.45	0.625	0.625	3.00	11.00	5.00	179.20	0.72	0.72	1.00	0.72	0.625	0.21	3.38	19.6	200 PVC	0.203	0.013	1.00	34.2	1.06	9.9%
Street One	A2	119	117				0.000	0.118	0.38			0.000	0.060	0.31	3.53	2.45	0.000	0.625	0.000	0.000	0.000	0.00	0.72	1.000	0.72	0.625	0.21	3.38	14.6	250 PVC	0.254	0.013	0.22	29.1	0.57	11.6%	
Totals				24	51	6	0.118	0.118	0.38	50	10	0.060	0.060	0.31	3.53	2.45	0.625	0.625							0.721	0.625	0.21	3.38	34.2								

Demand Equation / Parameters

1. Q(D) = Q(p) + Q(ici) + Q(e)
2. Q(p) = (P x q x M x K / 86,400)
3. q = 280 L/per person/day (Residential design)
450 L/per person/day (Assisted Care design)
4. M = Harmon Formula (maximum of 4.0)
5. K = 0.8 (design)
6. Park flow is considered equivalent to a single unit / ha
Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. Q(ici) = ICI Area x ICI Flow x ICI Peak
8. Q(e) = 0.33 L/s/ha (design)

Definitions

- Q(D) = Peak Design Flow (L/s)
- Q(p) = Peak Design Population Flow (L/s)
- Q(q) = Average Population Flow (L/s)
- P = Residential Population =
- q = Average Capita Flow
- M = Harmon Formula
- K = Harmon Correction Factor
- Q(ici) = Industrial / Commercial / Institutional Flow (L/s)
- Q(e) = Extraneous Flow (L/s)

Institutional / Commercial / Industrial

Design =

ICI Peak *

Design =

Residential

Studio	1-Bed	2-Bed
1.4	1.4	2.1

Assisted care

Studio	1-Bed
1	1

Commercial

Beauty salon	650	L/Station/day
Water Closet	150	L/Fixture/hr
Office	75	L/person/day
Dining Area	125	L/seat/day (1.1person/m²)

1.0 1.5 * ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)

Capacity Equation

Q full = 1000*(1/n)*A_p*R^{2/3}*So^{0.5}

Definitions

- Q full = Capacity (L/s)
- n = Manning coefficient of roughness (0.013)
- A_p = Pipe flow area (m²)
- R = Hydraulic Radius of wetted area (dia./4 for full pipes)
- So = Pipe slope/gradient

Atrel Report Excerpts

SANITARY SEWER COMPUTATION FORM

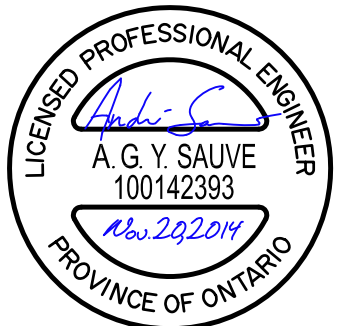
DATE: **November, 2014**
DESIGNED BY: AGS
CHECKED BY: JMD

PROJECT: Neighbourhood 5 - Avalon West - STAGE 3
CLIENT: Minto Communities Inc.
PROJECT #: 131004
BY: ATREL ENGINEERING LTD

q= 350 l/cap.day
i= 0.28 l/ha.s
PVC/CONC N= 0.013
OTHER N= 0.024

Table 21
Townhouse= 2.7 person/unit
Back to Back= 2.1 person/unit
Single Dwellings= 3.4 person/unit

STREET NAMES	LOCATION				RESIDENTIAL				FLOW Q(p) (L/S)	COMMERCIAL, INSTITUTIONAL				PEAK DES. Q(d) (L/S)	TYPE PIPE	DIA. (NOM) (mm)	(ACT) (MM)	SEWER DATA				CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	UpStream		DwnStream		
	FROM (Up)		TO (Down)		AREA (ha.)	POP.	CUMULATIVE AREA (ha.)	POP.		PEAKING FACTOR M	AREA (ha.)	POP.	CUMULATIVE AREA (ha.)					POP.	PEAKING FACTOR M	FLOW Q(p) (L/S)	SLOPE (%)				LENGTH (M)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)
Commercial	MH	100	MH	3102							4.79	685	4.79	685	1.50	4.16	5.50	PVC	250	251.5	0.24	22.5	29.59	81%	0.60	82.89	82.64	82.84	82.59
Site Plan No.1	MH	3101	MH	3102	0.18	17.0	0.18	17	4.00	0.28							0.33	PVC	200	201.2	2.00	45.0	47.11	99%	1.48	84.19	83.99	83.29	83.09
Décoeur Drive	MH	3102	MH	3103	0.26		0.44	17	4.00	0.28			4.79	685	1.50	4.16	5.90	PVC	250	251.5	0.24	57.0	29.59	80%	0.60	82.78	82.53	82.64	82.39
Décoeur Drive	MH	3103	MH	3104	0.23		0.67	17	4.00	0.28			4.79	685	1.50	4.16	5.97	PVC	250	251.5	0.24	85.0	29.59	80%	0.60	82.64	82.39	82.44	82.19
School	MH	101	MH	3104							2.44	350	2.44	350	1.50	2.13	2.81	PVC	250	251.5	0.24	23.5	29.59	91%	0.60	82.73	82.48	82.67	82.42
Magnolia Street	MH	3104	MH	3107	0.08		0.75	17	4.00	0.28			7.23	1035	1.50	6.29	8.80	PVC	250	251.5	0.24	50.5	29.59	70%	0.60	82.38	82.13	82.26	82.01
Site Plan No.1	MH	3105	MH	3106	0.26	26.0	0.26	26.0	4.00	0.42							0.49	PVC	200	201.17	0.90	59.0	31.60	98%	0.99	85.19	84.99	84.66	84.46
Site Plan No.1	MH	3106	MH	3107	0.29	30.0	0.55	56.0	4.00	0.91							1.06	PVC	200	201.17	2.00	70.0	47.11	98%	1.48	84.06	83.86	82.66	82.46
Magnolia Street	MH	3107	MH	3115	0.08		1.38	73.0	4.00	1.18			7.23	1035	1.50	6.29	9.88	PVC	300	299.21	0.19	48.5	41.86	76%	0.60	82.16	81.86	82.07	81.77
Hepatica Crescent	MH	3110	MH	3112	0.28	11.0	0.28	11.0	4.00	0.18							0.26	PVC	200	201.17	1.60	31.5	42.14	99%	1.33	85.11	84.91	84.61	84.41
Park	MH	3111	MH	3112	1.19		1.19										0.33	PVC	200	201.17	0.32	14.0	18.93	98%	0.60	84.12	83.92	84.07	83.87
Hepatica Crescent	MH	3112	MH	3115	0.32	14.0	1.79	25.0	4.00	0.41							0.91	PVC	200	201.17	2.00	97.0	47.11	98%	1.48	84.01	83.81	82.07	81.87
Hepatica Crescent	MH	3113	MH	3114	0.54	50.0	0.54	50.0	4.00	0.81							0.96	PVC	200	201.17	0.65	80.0	26.86	96%	0.84	85.25	85.05	84.73	84.53
Hepatica Crescent	MH	3114	MH	3115	0.52	47.0	1.06	97.0	4.00	1.57							1.87	PVC	200	201.17	1.80	86.5	44.69	96%	1.41	84.13	83.93	82.57	82.37
Magnolia Street	MH	3115	MH	3124	0.49	34.0	4.72	229.0	4.00	3.71			7.23	1035	1.50	6.29	13.35	PVC	300	299.21	0.19	79.0	41.86	68%	0.60	82.07	81.77	81.92	81.62
Genévriers Street	MH	3116	MH	3117	0.33	21.0	0.33	21.0	4.00	0.34							0.43	PVC	200	201.17	0.65	59.0	26.86	98%	0.84	84.90	84.70	84.52	84.32
Genévriers Street	MH	3117	MH	3118	0.18	51.0	0.51	72.0	4.00	1.17							1.31	PVC	200	201.17	0.65	12.0	26.86	95%	0.84	84.49	84.29	84.41	84.21
Genévriers Street	MH	3118	MH	3119	0.65	58.0	1.16	130.0	4.00	2.11							2.43	PVC	200	201.17	1.50	77.5	40.80	94%	1.28	84.38	84.18	83.22	83.02
Genévriers Street	MH	3119	MH	3124	0.15	7.0	1.31	137.0	4.00	2.22							2.59	PVC	200	201.17	1.50	52.5	40.80	94%	1.28	82.62	82.42	81.83	81.63
Hepatica Crescent	MH	3113	MH	3120	0.05	3.0	0.05	3.0	4.00	0.05							0.06	PVC	200	201.17	0.65	10.0	26.86	100%	0.84	85.23	85.03	85.16	84.96
Hepatica Crescent	MH	3120	MH	3122	0.28	17.0	0.33	20.0	4.00	0.32							0.42	PVC	200	201.17	2.10	71.5	48.27	99%	1.52	85.13	84.93	83.63	83.43
Hepatica Crescent	MH	3121	MH	3122	0.27	21.0	0.27	21.0	4.00	0.34							0.42	PVC	200	201.17	0.88	69.0	31.25	99%	0.98	84.78	84.58	84.17	83.97
Genévriers Street	MH	3122	MH	3123	0.40	28.0	1.00	69.0	4.00	1.12							1.40	PVC	200	201.17	0.75	86.5	28.85	95%	0.91	83.57	83.37	82.92	82.72
Genévriers Street	MH	3123	MH	3124	0.48	34.0	1.48	103.0	4.00	1.67							2.08	PVC	200	201.17	0.75	88.5	28.85	93%	0.91	82.71	82.51	82.05	81.85
Magnolia Street	MH	3124	MH	3273	0.49	41.0	8.00	510.0	3.97	8.20			7.23	1035	1.50	6.29	18.75	PVC	300	299.21	0.19	79.0	41.86	55%	0.60	81.55	81.25	81.40	81.10
Site Plan No.2	MH	3129	MH	3130	0.79	84.0	0.79	84.0	4.00	1.36							1.58	PVC	200	201.17	0.32	91.5	18.93	92%	0.60	84.32	84.12	84.02	83.82
Site Plan No.2	MH	3130	MH	3131			0.79	84.0	4.00	1.36							1.58	PVC	200	201.17	0.32	120.0	18.93	92%	0.60	84.02	83.82	83.63	83.43
Des Aubépines Drive	MH	3131	MH	3140	0.22		1.01	84.0	4.00	1.36							1.64	PVC	250	251.46	0.24	51.0	29.59	94%	0.60	83.62	83.37	83.50	83.25
Commercial	MH	106	MH	3133														PVC	250	251.5	0.24	9.0	29.59	100%	0.60	84.15	83.90	84.13	83.88
Street No.12	MH	3132	MH	3133	0.08		0.08										0.02	PVC	200	201.17	0.65	41.5	26.86	100%	0.84	84.41	84.21	84.14	83.94
Street No.8	MH	3133	MH	3134	0.48	57.0	0.56	57.0	4.00	0.92							1.08	PVC	250	251.46	0.24	85.5	29.59	96%	0.60	84.13	83.88	83.92	83.67
Street No.8	MH	3134	MH	3139A	0.51	63.0	1.07	120.0	4.00	1.94							2.24	PVC	250	251.46	0.24	83.5	29.59	92%	0.60	83.92	83.67	83.72	83.47



SANITARY SEWER COMPUTATION FORM

DATE: **November, 2014**
 DESIGNED BY: AGS
 CHECKED BY: JMD

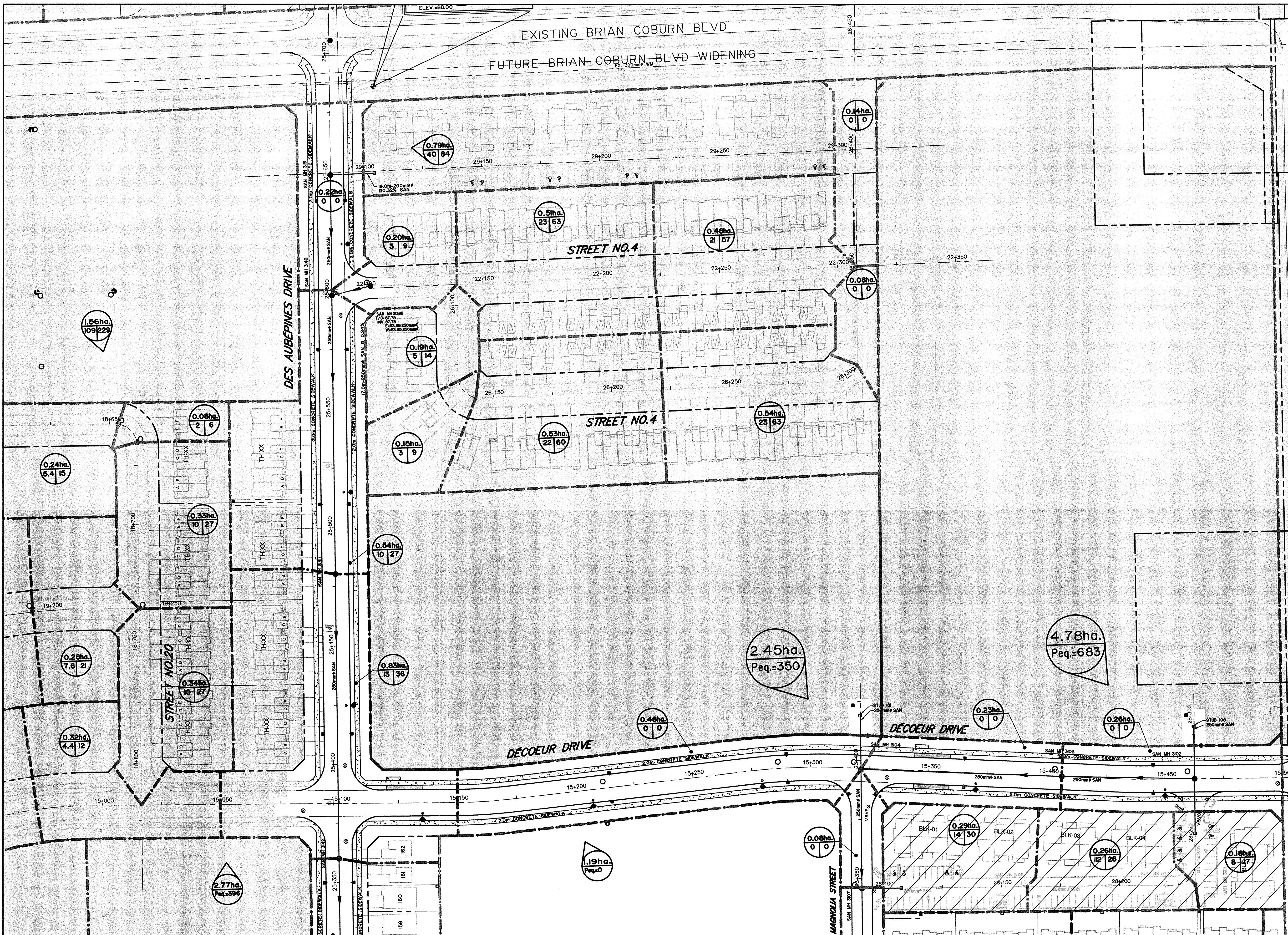
PROJECT: Neighbourhood 5 - Avalon West - STAGE 3
 CLIENT: Minto Communities Inc.
 PROJECT #: 131004
 BY: ATREL ENGINEERING LTD

q= 350 l/cap.day
 i= 0.28 l/ha.s
 PVC/CONC N= 0.013
 OTHER N= 0.024

Table 21
 Townhouse= 2.7 person/unit
 Back to Back= 2.1 person/unit
 Single Dwellings= 3.4 person/unit

STREET NAMES	LOCATION				RESIDENTIAL				COMMERCIAL, INSTITUTIONAL				PEAK DES. Q(d) (L/S)	SEWER DATA										UpStream		DwnStream		
	FROM (Up)		TO (Down)		INDIVIDUAL AREA (ha.)	POP.	CUMULATIVE AREA (ha.)	POP.	PEAKING FACTOR M	FLOW Q(p) (L/S)	INDIVIDUAL AREA (ha.)	POP.		CUMULATIVE AREA (ha.)	POP.	PEAKING FACTOR M	FLOW Q(p) (L/S)	TYPE PIPE	DIA. (NOM) (mm)	(ACT) (MM)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	Obv. (M)	Inv. (M)	Obv. (M)
Street No.12	MH	3132	MH	3135													PVC	200	201.17	0.65	9.5	26.86	100%	0.84	84.55	84.35	84.49	84.29
Street No.12	MH	3135	MH	3136	0.54	63.0	0.54	63.0	4.00	1.02							1.17 PVC	200	201.17	0.32	76.0	18.93	94%	0.60	84.46	84.26	84.21	84.01
Street No.12	MH	3136	MH	3137	0.53	60.0	1.07	123.0	4.00	1.99							2.29 PVC	200	201.17	0.32	79.0	18.93	88%	0.60	84.21	84.01	83.95	83.75
Street No.12	MH	3137	MH	3138	0.15	9.0	1.22	132.0	4.00	2.14							2.48 PVC	200	201.17	0.32	10.5	18.93	87%	0.60	83.92	83.72	83.89	83.69
Street No.12	MH	3138	MH	3139A	0.19	14.0	1.41	146.0	4.00	2.37							2.76 PVC	200	201.17	0.32	41.0	18.93	85%	0.60	83.86	83.66	83.73	83.53
Street No.8	MH	3139A	MH	3139B	0.20	9.0	2.68	275	4.00	4.46							5.21 PVC	250	251.5	0.24	36.5	29.59	82%	0.60	83.72	83.47	83.63	83.38
Street No.8	MH	3139B	MH	3140			2.68	275	4.00	4.46							5.21 PVC	250	251.5	0.24	17.0	29.59	82%	0.60	83.60	83.35	83.56	83.31
Des Aubépines Drive	MH	3140	MH	3141	0.54	27.0	4.23	386.0	4.00	6.25							7.44 PVC	250	251.46	0.24	117.5	29.59	75%	0.60	83.50	83.25	83.22	82.97
Des Aubépines Drive	MH	3141	MH	3142	0.83	36.0	5.06	422.0	4.00	6.84							8.25 PVC	250	251.46	0.24	120.0	29.59	72%	0.60	83.22	82.97	82.93	82.68
Des Aubépines Drive	MH	3142	MH	3143	0.54	28.0	5.60	450.0	4.00	7.29							8.85 PVC	250	251.46	0.24	101.0	29.59	70%	0.60	82.93	82.68	82.69	82.44
Des Aubépines Drive	MH	3143	MH	3271	0.86	55.0	6.46	505.0	3.97	8.13							9.93 PVC	250	251.46	0.24	119.5	29.59	66%	0.60	82.69	82.44	82.40	82.15
Street No.11	MH	3270	MH	3271	45.26	3308.0	45.26	3308.0	3.41	45.64	12.78	1828.0	12.78	1828	1.50	11.11	73.00 CONC	450	457.20	0.11	120.0	98.65	26%	0.60	81.81	81.36	81.68	81.23
Hepatica Crescent	MH	3271	MH	3272	0.69	45.0	52.41	3858.0	3.35	52.31			12.78	1828	1.50	11.11	81.67 CONC	525	533.40	0.11	99.5	148.80	45%	0.67	81.53	81.00	81.42	80.89
Hepatica Crescent	MH	3272	MH	3273	0.83	58.0	53.24	3916.0	3.34	53.01			12.78	1828	1.50	11.11	82.60 CONC	525	533.40	0.11	120.0	149.48	45%	0.67	81.42	80.89	81.29	80.76
Hepatica Crescent	MH	3273	MH	3274	0.49	31.0	61.73	4457.0	3.29	59.42			20.01	2863	1.50	17.40	99.70 CONC	525	533.40	0.11	79.0	149.48	33%	0.67	81.29	80.76	81.20	80.67
Hepatica Crescent	MH	3274	MH	3275	0.60	38.0	62.33	4495.0	3.29	59.86			20.01	2863	1.50	17.40	100.31 CONC	525	533.40	0.11	89.0	149.48	33%	0.67	81.20	80.67	81.10	80.57
Hepatica Crescent	MH	3275	MH	3276			62.33	4495.0	3.29	59.86			20.01	2863	1.50	17.40	100.31 CONC	525	533.40	0.11	8.5	149.48	33%	0.67	81.10	80.57	81.09	80.56
Hepatica Crescent	MH	3276	MH	15166			62.33	4495.0	3.29	59.86			20.01	2863	1.50	17.40	100.31 CONC	675	685.80	0.12	34.5	303.78	67%	0.82	81.09	80.41	81.05	80.37
Proposed Stage 3 Sanitary Sewers																												
Future Stages Sanitary Sewers																												

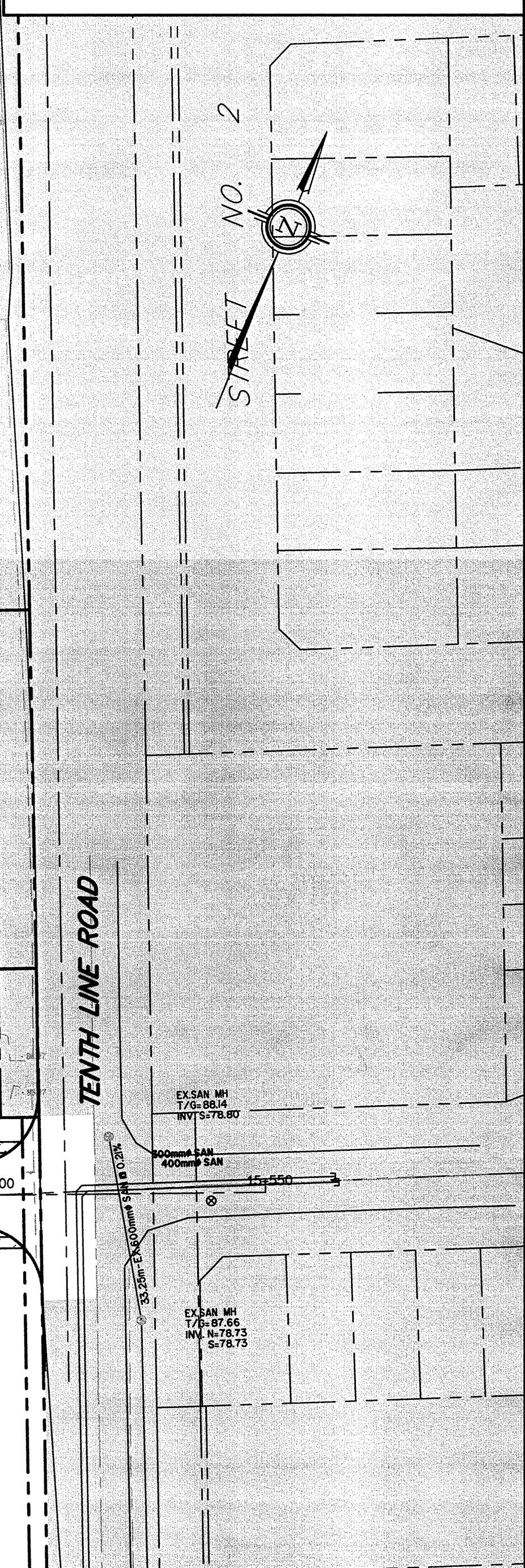




LEGEND

- 0.63ha
10 40
SANITARY DRAINAGE SUB AREA
POPULATION EQUIVALENT
NUMBER OF UNITS IN SUB AREA
- DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- OUTSIDE PROPOSED DEVELOPMENT
- /// SITE PLAN APPROVAL

REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed *Will Curry*
Date *Nov 24* 2014
Plan Number *16796*



THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	APPLIES WHEN DRAWING MODIFIED	DATE	BY
1	AS PER CITY COMMENTS		JULY 25/14	JMD
2	AS PER CITY COMMENTS		AUG 12/14	JMD
3	AS PER CITY COMMENTS		SEPT 10/14	JMD
4	ISSUED FOR TENDER		SEPT 12/14	JMD
5	ISSUED FOR CONSTRUCTION		SEPT 16/14	JMD
6	ISSUED FOR CONSTRUCTION		OCT 9/14	JMD
7	AS PER CITY COMMENTS		OCT 31/14	JMD
8	AS PER CITY COMMENTS		NOV 6/14	JMD
9	AS PER CITY COMMENTS		NOV 18/14	JMD
10	AS PER CITY COMMENTS		NOV 20/14	JMD

SCALE
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DESIGN
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APPROVED
JMD

LICENCED PROFESSIONAL ENGINEER
A. G. Y. SAUVE
100142393
PROVINCE OF ONTARIO

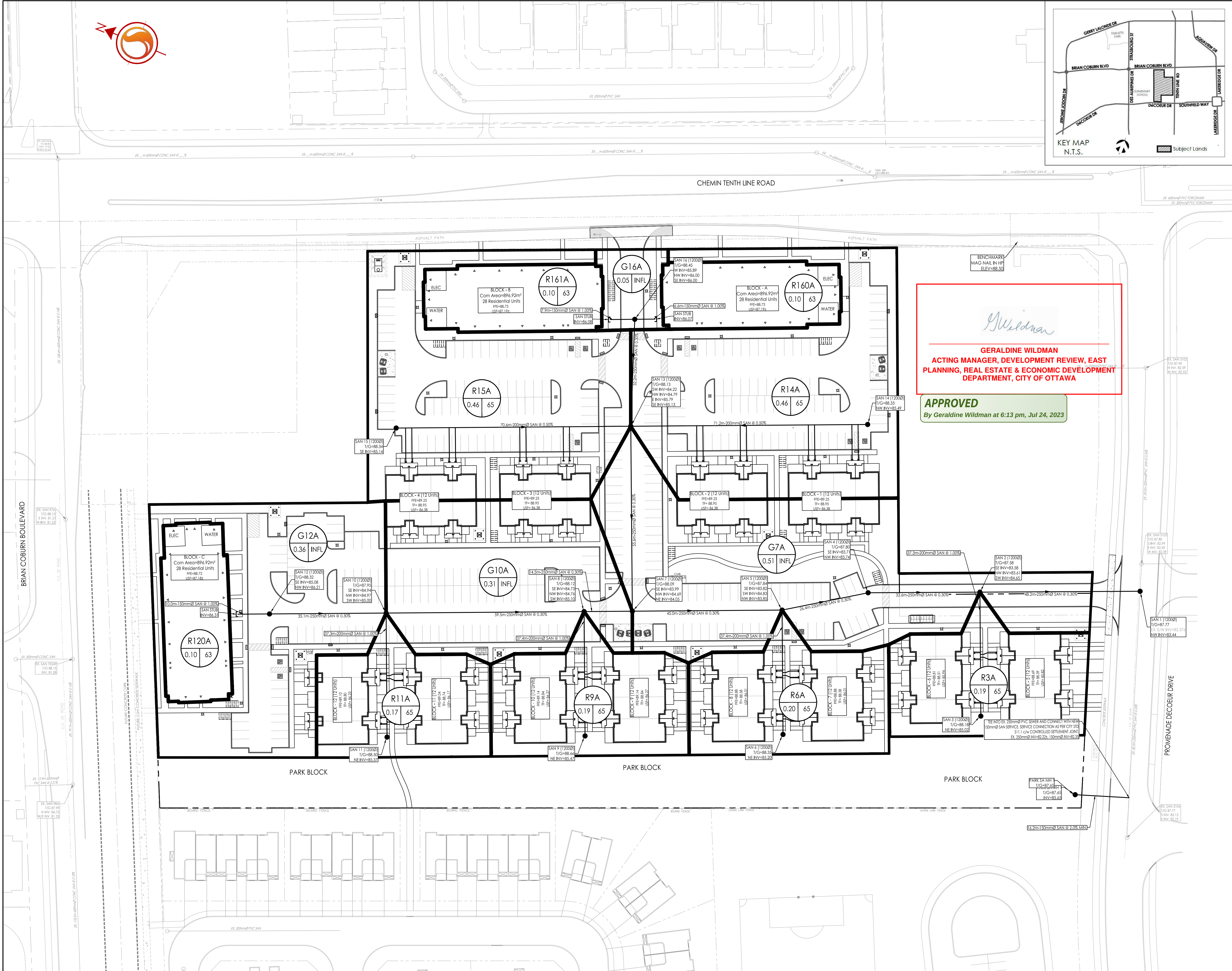
LICENCED PROFESSIONAL ENGINEER
J. M. DECOEUR
100122204
PROVINCE OF ONTARIO

ATREL Engineering Ltd.
Engineers - Ingénieurs
380 LAURIER ST. ROCKLAND, ONTARIO K4K 1G2
TEL.: (613) 446-7423 FAX: (613) 446-7425

CITY OF OTTAWA
EAST URBAN COMMUNITY
AVALON WEST STAGE 3
PLAN
SANITARY DRAINAGE AREA PLAN

MINTO COMMUNITIES INC.
CLIENT No. 148
PROJECT No. 131004
DATE NOVEMBER 2013
DRAWING No. I31004-SAN2

2370 Report Excerpts

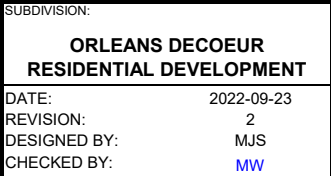


Revision	By	Appd.	YY.MM.DD
File Name: 160401710DB	MJS	DT	MJS
	Dwn.	Chkd.	Dsgn.
			21.11.22
			YY.MM.DD

Permit-Seal

Project No. 160401710	Scale 1:500	
Drawing No.	Sheet	Revision

SA-1 7 of 7 5
PLAN No. 18668



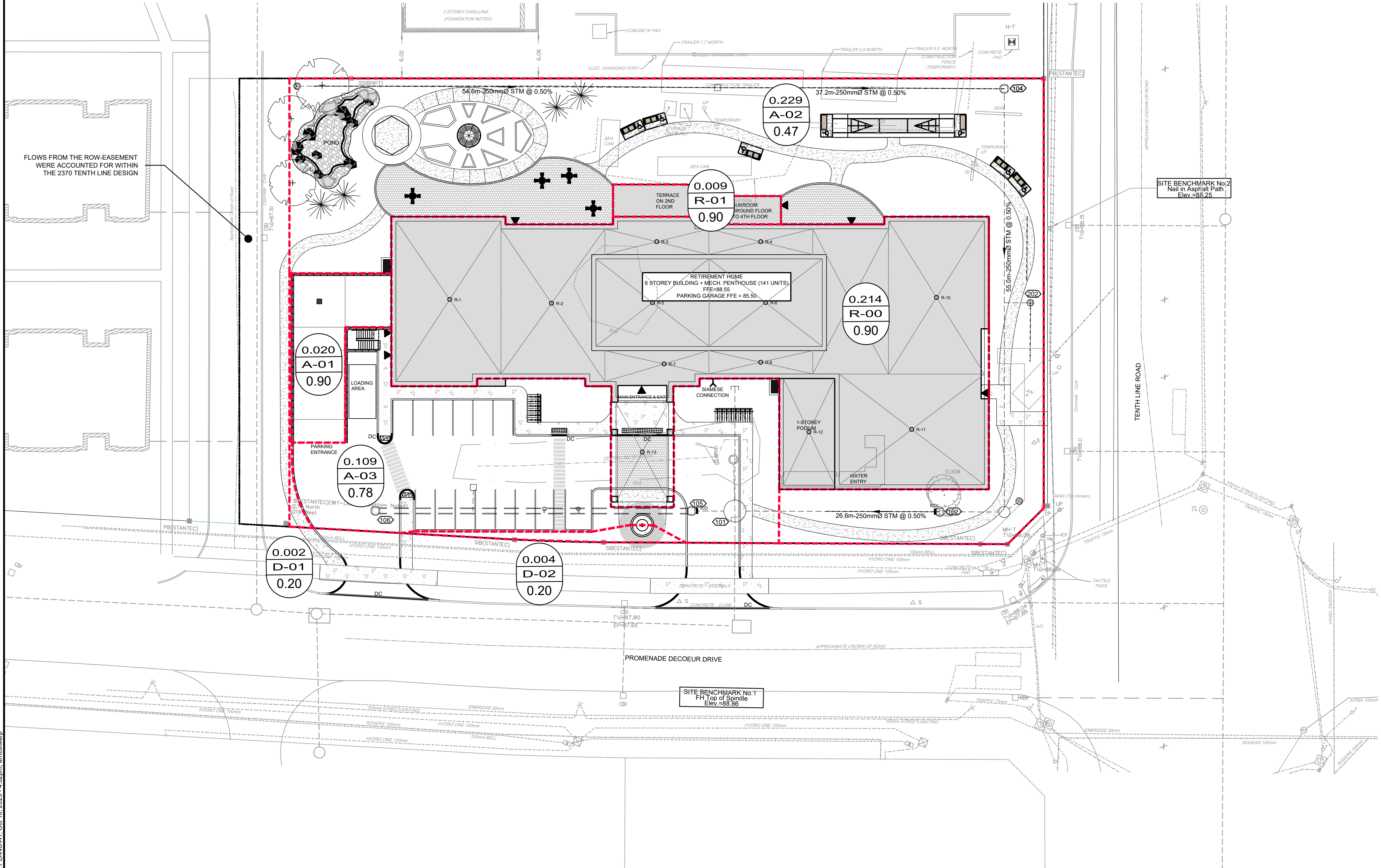
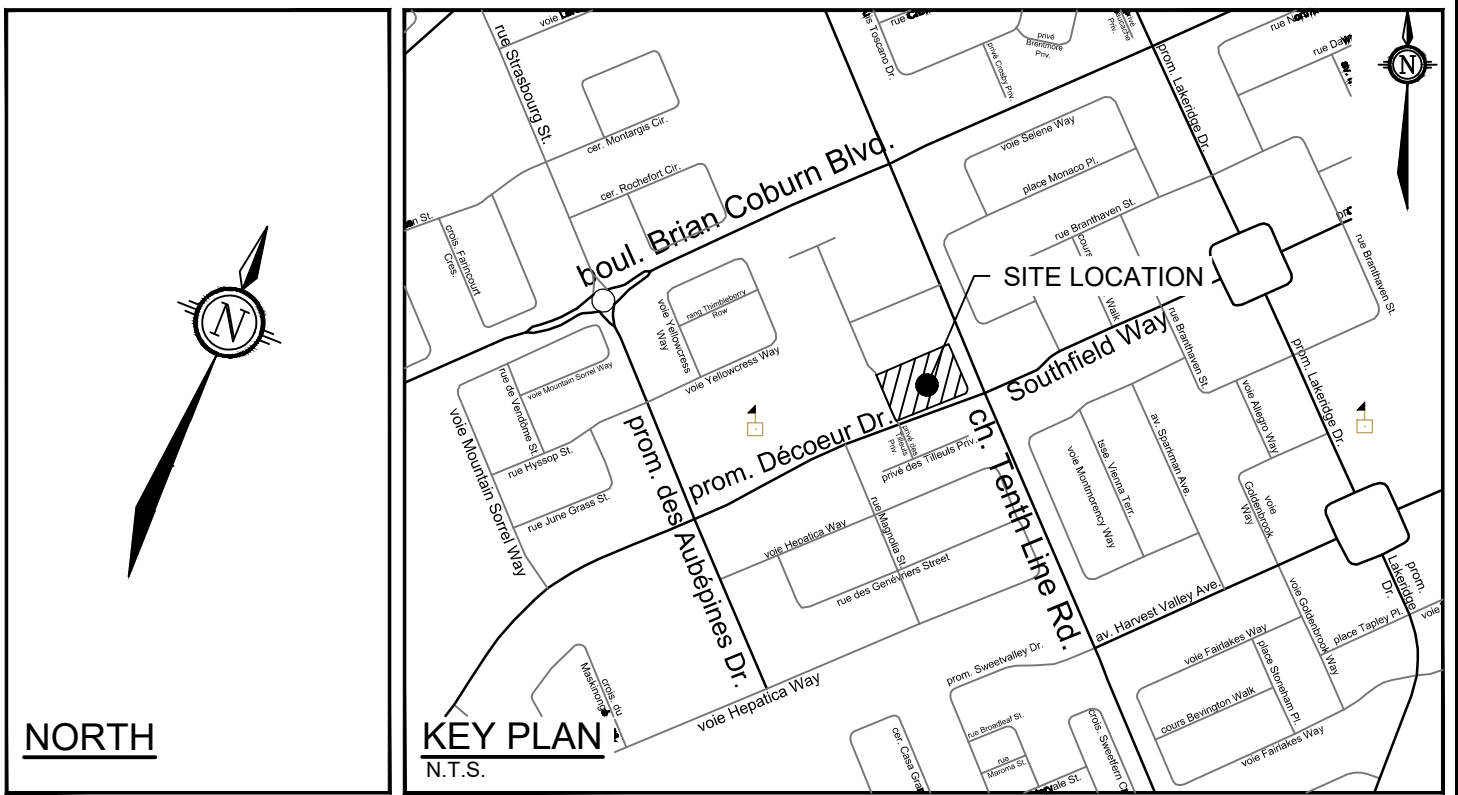
FILE NUMBER: 160401710

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280	l/p/day	MINIMUM VELOCITY	0.60	m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000	l/ha/day	MAXIMUM VELOCITY	3.00	m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000	l/ha/day	MANNINGS n	0.013	
PEAKING FACTOR (ICI >20%)	1.5	INDUSTRIAL (LIGHT)	35,000	l/ha/day	BEDDING CLASS	B	
PERSONS / 1 BED+DEN & 2 BED	2.1	INSTITUTIONAL	28,000	l/ha/day	MINIMUM COVER	2.50	m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33	l/s/Ha	HARMON CORRECTION FACTOR	0.8	
PERSONS / 2 BED+DEN	3.1						

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	1 BED+DEN & 2 BED APT	UNITS TOWN	2 BED+DEN APT	POP.	CUMULATIVE AREA (ha)	POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)
R120A	120	12	0.10	24	0	4	63	0.10	63	3.63	0.7	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.8	10.9	150	PVC	DR 28	1.00	15.3	5.53%	0.86
G12A	12	10	0.00	0	0	0	0	0.10	63	3.63	0.7	0.00	0.09	0.00	0.00	0.00	0.00	0.36	0.36	0.0	0.36	0.56	0.2	1.0	35.1	250	PVC	SDR 35	0.30	33.2	2.87%	0.67		
R11A	11	10	0.17	0	24	0	65	0.17	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.17	0.1	0.8	37.3	200	PVC	SDR 35	1.00	33.4	2.45%	1.05
G10A	10	8	0.00	0	0	0	0	0.28	128	3.57	1.5	0.00	0.09	0.00	0.00	0.00	0.00	0.31	0.67	0.0	0.31	1.03	0.3	1.8	59.5	250	PVC	SDR 35	0.30	33.2	5.56%	0.67		
R9A	9	8	0.19	0	24	0	65	0.19	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.8	37.4	200	PVC	SDR 35	1.00	33.4	2.47%	1.05
	8	7	0.00	0	0	0	0	0.47	192	3.52	2.2	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.67	0.0	0.00	1.23	0.4	2.6	14.5	250	PVC	SDR 35	0.30	33.2	7.92%	0.67		
R15A	15	13	0.46	0	24	0	65	0.46	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.46	0.46	0.2	0.9	69.6	200	PVC	SDR 35	0.50	23.6	3.87%	0.74
R14A	14	13	0.46	0	24	0	65	0.46	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.46	0.46	0.2	0.9	70.7	200	PVC	SDR 35	0.50	23.6	3.87%	0.74
R161A	161	16	0.10	24	0	4	63	0.10	63	3.63	0.7	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.8	8.9	150	PVC	DR 28	1.00	15.3	5.54%	0.86
R160A	160	16	0.10	24	0	4	63	0.10	63	3.63	0.7	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.8	7.6	150	PVC	DR 28	1.00	15.3	5.53%	0.86
G16A	16	13	0.00	0	0	0	0	0.21	126	3.57	1.5	0.00	0.18	0.00	0.00	0.00	0.00	0.04	0.04	0.1	0.04	0.43	0.1	1.7	32.2	250	PVC	SDR 35	0.30	33.2	5.07%	0.67		
	13	7	0.00	0	0	0	0	1.13	255	3.49	2.9	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.04	0.1	0.00	1.36	0.4	3.4	55.6	250	PVC	SDR 35	0.30	33.4	10.16%	0.67		
G7A	7	5	0.00	0	0	0	0	1.60	448	3.40	4.9	0.00	0.27	0.00	0.00	0.00	0.00	0.51	1.22	0.1	0.51	3.09	1.0	6.0	45.0	250	PVC	SDR 35	0.30	33.2	18.18%	0.67		
R6A	6	5	0.20	0	24	0	65	0.20	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.20	0.1	0.8	37.4	200	PVC	SDR 35	1.00	33.4	2.47%	1.05	
	5	4	0.00	0	0	0	0	1.79	512	3.37	5.6	0.00	0.27	0.00	0.00	0.00	0.00	0.00	1.22	0.1	0.00	3.29	1.1	6.8	26.4	250	PVC	SDR 35	0.30	33.2	20.41%	0.67		
	4	2	0.00	0	0	0	0	1.79	512	3.37	5.6	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.1	0.00	3.29	1.1	6.8	33.6	250	PVC	SDR 35	0.30	33.2	20.41%	0.67		
R3A	3	2	0.19	0	24	0	65	0.19	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.8	37.3	200	PVC	SDR 35	1.00	33.4	2.47%	1.05	
	2	1	0.00	0	0	0	0	1.99	577	3.35	6.3	0.00	0.27	0.00	0.00	0.00	0.00	0.00	1.22	0.1	0.00	3.48	1.1	7.5	48.2	250	PVC	SDR 35	0.30	33.2	22.63%	0.67		
																												250						

Appendix C

Storm Servicing



- LEGEND**
- PROPERTY LINE
 - MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS
 - PROPOSED SIDEWALK
 - PROPOSED RETAINING WALL
 - C/W RAILING
 - PROPOSED CURB
 - PROPOSED DEPRESSED CURB
 - SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
 - TERRACING 3:1 SLOPE MAX (UNLESS OTHERWISE INDICATED)
 - STORM SEWER DRAINAGE AREA BOUNDARY
 - DRAINAGE AREA (ha)
 - DRAINAGE AREA ID
 - RUNOFF COEFFICIENT
 - PROPOSED STORM SEWER AND MANHOLE
 - PROPOSED STORMWATER MANAGEMENT PIPE
 - PROPOSED CATCHBASIN MANHOLE
 - PROPOSED CATCHBASIN
 - PROPOSED LANDSCAPE DRAIN
 - PROPOSED ROOF DRAINS
 - EXISTING STORM MANHOLE & SEWER
 - EXISTING CATCHBASIN
 - EXISTING DITCH CENTRELINE

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS. AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR
CONSTRUCTION

No.	REVISION	DATE	BY
1.	ISSUED FOR SPA	OCT 16/2025	ARM

SCALE
1:300
0 3 6 9 12

DESIGN
ARM/AM
CHECKED
ARM
DRAWN
MF/AM
CHECKED
ARM
APPROVED
GJM

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
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Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION CITY OF OTTAWA 2380 TENTH LINE	PROJECT No. 125079
DRAWING NAME STORM WATER MANAGEMENT	REV REV#1
	DRAWING No. 125079-SWM

M:\2025\125079\CAD\Civil\125079-SWM.dwg PLANS-A1, Oct 10, 2025 - 4:02pm, armeshwarp

PLANET.DWG - 64 mm x 64 mm

TABLE 1A: Existing Conditions

Drainage Area	Area (HA)	"C"
Block 1	0.59	0.20
Total	0.59	0.20

Site Constraints	220	L/s/ha
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* Stormwater Management Report for Cassette Subdivision', 2275 Mer-Bleue Road, City of Ottawa, May 2022, Updated July 2022, JFSA
 Ref. No.: 231-22, Prepared by JFSA

TABLE 1B: Allowable Flows

Outlet Options	Area (ha)	Q _{ALLOW} (L/s)
Ryan Reynolds Way	0.587	129.1

TABLE 2A: Post-Development Runoff Coefficient "C" - D-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.000	0.90	0.20	0.25	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.002	Soft	0.002	0.20			* Runoff Coefficient increases by

TABLE 2B: Post-Development D-01 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
David Lewis Private	0.002	0.20	10	0.1	0.1	0.2

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$

Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 3A: Post-Development Runoff Coefficient "C" - D-02

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.001	0.90	0.38	0.45	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.004	Soft	0.003	0.20			* Runoff Coefficient increases by

TABLE 3B: Post-Development D-02 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Promenade Decoeur Drive	0.004	0.38	10	0.3	0.5	0.9

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$

Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 4A: Post-Development Runoff Coefficient "C" - A-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot} * Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event
Total	Hard	0.020	0.90	0.90	1.00	
0.020	Soft	0.000	0.20			

TABLE 4B: Post-Development A-01 Flows

TABLE 4B: Post-Development A-01 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Tenth Line	0.020	0.90	10	3.8	5.1	9.7

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$

Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 5A: Post-Development Runoff Coefficient "C" - R-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.009	0.90	0.90	1.00	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.009	Soft	0.000	0.20			* Runoff Coefficient increases by

TABLE 5B: Post-Development R-01 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Tenth Line	0.009	0.90	10	1.8	2.4	4.5

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$

Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 6A: Post-Development Runoff Coefficient "C" - R-00

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.214	Roof	0.214	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 6B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-00

0.214 =Area (ha)

0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	5	103.57	55.49	13.000	42.49	12.75
	10	76.81	41.15	13.000	28.15	16.89
	15	61.77	33.09	13.000	20.09	18.08
	20	52.03	27.87	13.000	14.87	17.85
	25	45.17	24.20	13.000	11.20	16.80

TABLE 6C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-00

0.2141216 =Area (ha)

0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	5	141.18	75.63	16.900	58.73	17.62
	10	104.19	55.82	16.900	38.92	23.35
	15	83.56	44.76	16.900	27.86	25.08
	20	70.25	37.64	16.900	20.74	24.88
	25	60.90	32.62	16.900	15.72	23.59

TABLE 6D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-00

0.2141216 =Area (ha)

1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	15	142.89	85.06	19.500	65.56	59.00
	20	119.95	71.40	19.50	51.90	62.28
	25	103.85	61.82	19.50	42.32	63.47
	30	91.87	54.69	19.50	35.19	63.33
	35	82.58	49.16	19.50	29.66	62.28

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

1) In lieu of a detailed roof plan, for the interim it has been assumed that the roof (area R-00) will contain 13 controlled roof drains releasing at 1.5L/s in the 100-yr, 1.3 L/s in the 5-yr and 1.0L/s in the 2-year storm events

2) Once once detailed roof plans are obtained the exact flow per roof drain will be determined, and the calculations will be updated accordingly

TABLE 7A: Post-Development Runoff Coefficient "C" - A-02

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.088	0.90	0.47	1.00	0.54
0.229	Roof	0.000	0.90		1.00	
	Soft	0.141	0.20		0.25	

TABLE 7B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02

0.229 =Area (ha)

0.47 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	49.92	14.9	35.02	0.00
	5	103.57	30.92	14.9	16.02	4.81
	10	76.81	22.93	14.9	8.03	4.82
	15	61.77	18.44	14.9	3.54	3.19
	20	52.03	15.53	14.9	0.63	0.76

TABLE 7C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02

0.229 =Area (ha)

0.47 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	68.81	17.000	51.81	0.00
	5	141.18	42.15	17.000	25.15	7.54
	10	104.19	31.10	17.000	14.10	8.46
	15	83.56	24.94	17.000	7.94	7.15
	20	70.25	20.97	17.000	3.97	4.77

TABLE 7D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02

0.229 =Area (ha)

0.54 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	5	242.70	83.15	22.75	60.40	18.12
	10	178.56	61.17	22.75	38.42	23.05
	15	142.89	48.95	22.75	26.20	23.58
	20	119.95	41.09	22.75	18.34	22.01
	25	103.85	35.58	22.75	12.83	19.24

TABLE 7E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-02

0.229 =Area (ha)

0.54 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	5	291.24	99.77	27.8	72.02	21.61
	10	214.27	73.40	27.8	45.65	27.39
	15	171.47	58.74	27.8	30.99	27.89
	20	143.94	49.31	27.8	21.56	25.87
	25	124.62	42.69	27.8	14.94	22.41

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

* Allowable run-off is 50% of the actual flow to calculate the required volume as per city of Ottawa Guidelines for underground storage

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

TABLE 7F: Catchbasin - A-02

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
LD 203	300	0.07	87.78	86.53
CB 2	610X610	0.37	87.88	86.25
CBMH 104	1200	1.13	87.90	85.81
LD 202	300	0.07	88.05	86.85
LD 201	300	0.07	88.05	86.65
STMMH 103	1200	1.13	88.12	85.47
CBMH 102	1200	1.13	87.97	85.23

TABLE 7F: Pipe - A-02

Structures	Dia.(mm)	Area (m ²)	Upstream inv	Down stream invert	Length (m)*	Volume
CBMH 104 - STMMH 103	250	0.05	85.81	85.53	53.80	2.64
STMMH 103 - CBMH 102	250	0.05	85.47	85.43	7.20	0.35
LD 202 - MAIN	200	0.03	86.85	86.82	3.13	0.10
LD 201-STMMH 103	200	0.03	86.85	86.83	1.65	0.05

* Length is edge of structure to edge of structure

3.14

TABLE 7G: Underground Storage (Perforated Pipe) - A-02

MH to MH (U/S to D/S)	Pipe Data			Trench Dimensions				Storage Volumes (m ³)		
	Up Stream Invert (m)	Downstream Invert (m)	Pipe Dia. (mm)	Length (m)	Height* (m)	Width (m)	Porosity	Perf. Pipe	Stone**	TOTAL
LD203 - CB 2	86.53	86.26	250	54.145	0.55	0.85	0.3	2.66	6.8	9.5
CB07 - CB06	86.25	86.06	250	36.295	0.55	0.85	0.3	1.78	4.6	6.3
Total Length (North) =				69.1	Total Storage (North) =				4.4	11.4
									15.8	

*Height of trench does not include 0.15m of clearstone below the subdrain.

** Based on 30% porosity in the clear stone

TABLE 7H: Storage Provided -A-02

Area A-05: Above Ground Ponding							
Elevation (m)	LD 203 Ponding Depth (m)	LD 203 Area* (m ²)	CB 2 Ponding Depth (m)	CB 2 Area* (m ²)	CBMH 104 Ponding Depth (m)	CBMH 104 Area* (m ²)	Storage Volume (m ³)
87.78	0.000	0.360	0.000	-	0.000	-	0.00
87.83	0.050	4.156	0.000	-	0.000	-	0.11
87.88	0.100	16.667	0.000	0.360	0.000	-	0.63
87.9	0.120	23.997	0.020	0.924	0.000	0.360	1.05
87.97	0.190	71.385	0.090	18.842	0.070	8.599	5.40

TABLE 7I: Storage Provided - A-02

Storage Table												
Elevation (m)	System Depth (m)	CBMH 102 Volume (m ³)	STMMH 103 Volume (m ³)	LD 201 Volume (m ³)	LD 202 Volume (m ³)	CBMH 104 Volume (m ³)	CB 2 Volume (m ³)	LD 203 Volume (m ³)	Pipe Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.230	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00
86.060	0.83	0.939	0.667	0.000	0.000	0.283	0.000	0.00	3.14	5.03	0.00	5.03
87.080	1.85	2.092	1.821	0.030	0.016	1.436	0.309	0.04	18.94	24.68	0.00	24.68
87.230	2.00	2.262	1.991	0.041	0.027	1.606	0.365	0.05	-	25.28	0.00	25.28
87.380	2.15	2.432	2.160	0.052	0.037	1.776	0.420	0.06	-	25.87	0.00	25.87
87.530	2.30	2.601	2.330	0.062	0.048	1.945	0.476	0.07	-	26.47	0.00	26.47
87.680	2.45	2.771	2.499	0.073	0.059	2.115	0.532	0.08	-	27.07	0.00	27.07
87.780	2.55	2.884	2.613	0.080	0.066	2.228	0.569	-	-	27.46	0.00	27.46
87.830	2.60	2.941	2.669	0.083	0.069	2.285	0.588	-	-	27.65	0.11	27.77
87.880	2.65	2.997	2.726	0.087	0.073	2.341	0.607	-	-	27.85	0.63	28.48
87.900	2.67	3.020	2.748	0.088	0.074	2.364	-	-	-	27.92	1.05	28.97
87.970	2.74	3.099	2.827	0.093	0.079	-	-	-	-	28.09	5.40	33.48

TABLE 7J: Orifice Sizing information - A-02

Control Device							
Plate Orifice				127			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	29.8	0.73	86.03	250	4.82	0.0127	127.0
1:5 Year	34.0	0.95	86.24	250.00	8.46	0.0127	127.0
1:100 Year	45.5	1.73	87.02	250.00	23.58	0.0126	127.0
1:100 + 20 Year	55.5	2.55	87.84	250.00	27.89	0.0127	127.0

Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh)^{0.5}$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

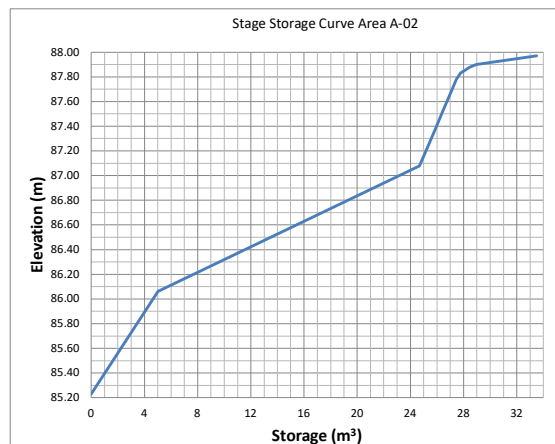


TABLE 8A: Post-Development Runoff Coefficient "C" - A-03

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.090	0.90	0.78	1.00	0.87
0.109	Roof	0.000	0.90		1.00	
	Soft	0.019	0.20		0.25	

TABLE 8B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.109 =Area (ha)

0.78 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	39.39	11.50	27.89	0.00
	5	103.57	24.40	11.50	12.90	3.87
	10	76.81	18.09	11.50	6.59	3.96
	15	61.77	14.55	11.50	3.05	2.74
	20	52.03	12.26	11.50	0.76	0.91

TABLE 8C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.109 =Area (ha)

0.78 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	54.29	13.10	41.19	0.00
	5	141.18	33.26	13.10	20.16	6.05
	10	104.19	24.54	13.10	11.44	6.87
	15	83.56	19.68	13.10	6.58	5.92
	20	70.25	16.55	13.10	3.45	4.14

TABLE 8D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.109 =Area (ha)

0.87 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	104.93	22.00	82.93	0.00
	5	242.70	63.89	22.00	41.89	12.57
	10	178.56	47.00	22.00	25.00	15.00
	15	142.89	37.61	22.00	15.61	14.05
	20	119.95	31.57	22.00	9.57	11.49

TABLE 8E: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.109 =Area (ha)

0.87 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	0	478.34	125.91	28.4	97.51	0.00
	5	291.24	76.66	28.4	48.26	14.48
	10	214.27	56.40	28.4	28.00	16.80
	15	171.47	45.14	28.4	16.74	15.06
	20	143.94	37.89	28.4	9.49	11.39

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

* Allowable run-off is 50% of the actual flow to calculate the required volume as per city of Ottawa Guidelines for underground storage

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

TABLE 8F: Catchbasin - A-03

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CBMH106	1200	1.13	87.89	85.54
CBMH105	1200	1.13	87.96	85.13
CB1	610X610	0.37	87.80	86.60

TABLE 8F: Pipe - A-03

Structures	Dia.(mm)	Area (m ²)	Upstream inv	Down stream invert	Length* (m)
CBMH106-CBMH105	610	0.29	85.54	85.46	39.60
CB1-LEAD	200	0.03	86.60	86.57	2.35

* Length is edge of structure to edge of structure

TABLE 8G: Storage Provided - A-03

Area A-05: Above Ground Ponding							
Elevation (m)	CBMH 106 Ponding Depth (m)	CBMH106 Area* (m ²)	CB1 Ponding Depth (m)	CB1 Area* (m ²)	CBmh105 Ponding Depth (m)	CBmh 105 Area* (m ²)	Storage Volume (m ³)
87.8	0.000	0.000	0.000	0.360	-	-	0.00
87.85	0.000	0.000	0.050	15.487	-	-	0.40
87.89	0.000	0.360	0.090	42.863	-	-	1.56
87.92	0.030	11.824	0.120	73.201	-	-	3.49

TABLE 8H: Storage Provided - A-03

Storage Table								
Elevation (m)	System Depth (m)	CBMH106 Volume (m ³)	CBMH105 Volume (m ³)	CB1 Volume (m ³)	Pipe Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
85.460	0.33	0.00	0.37	0.00	0.00	0.37	0.00	0.37
86.070	0.94	0.60	1.06	0.00	11.65	13.31	0.00	13.31
86.220	1.09	0.77	1.23	0.00	-	13.65	0.00	13.65
86.370	1.24	0.94	1.40	0.00	-	13.99	0.00	13.99
86.520	1.39	1.11	1.57	0.00	-	14.33	0.00	14.33
86.670	1.54	1.28	1.74	0.03	-	14.69	0.00	14.69
86.820	1.69	1.45	1.91	0.08	-	15.09	0.00	15.09
86.970	1.84	1.62	2.08	0.14	-	15.48	0.00	15.48
87.120	1.99	1.79	2.25	0.19	-	15.88	0.00	15.88
87.270	2.14	1.96	2.42	0.25	-	16.27	0.00	16.27
87.420	2.29	2.13	2.59	0.31	-	16.67	0.00	16.67
87.570	2.44	2.30	2.76	0.36	-	17.06	0.00	17.06
87.720	2.59	2.47	2.93	0.42	-	17.46	0.00	17.46
87.736	2.61	2.48	2.95	0.42	-	17.50	0.00	17.50
87.800	2.67	2.56	3.02	0.45	-	17.67	0.00	17.67
87.850	2.72	2.61	3.08	-	-	17.76	0.40	18.15
87.890	2.76	-	3.12	-	-	17.80	1.56	19.37
87.920	2.79	-	3.16	-	-	17.84	3.49	21.32

TABLE 8I: Orifice Sizing information - A-03

Control Device							
Plate Orifice				127			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	23.00	0.44	85.63	250	3.96	0.0127	127.0
1:5 Year	26.20	0.57	85.77	250.00	6.87	0.0126	127.0
1:100 Year	44.00	1.62	86.82	250.00	15.00	0.0126	127.0
1:100 + 20 Year	56.80	2.70	87.90	250.00	16.80	0.0126	127.0

Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh)^{0.5}$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

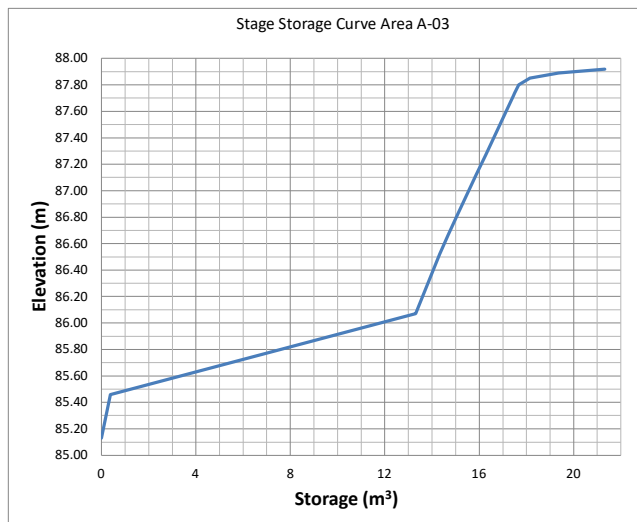


Table 9: Post-Development Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device	Outlet Location	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			
						Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Max. Vol. Provide d (cu.m.)
D-01	0.002	0.20	0.25	N/A	David Lewis Private	0.10	N/A	N/A	0.10	N/A	N/A	0.20	N/A	N/A	N/A
D-02	0.004	0.38	0.45	N/A	Promenade Decoeur Drive	0.30	N/A	N/A	0.50	N/A	N/A	0.90	N/A	N/A	N/A
A-01	0.020	0.90	1.00	N/A	Tenth Line	3.80	N/A	N/A	5.10	N/A	N/A	9.70	N/A	N/A	N/A
R-01	0.009	0.90	1.00	N/A	Tenth Line	1.80	N/A	N/A	2.40	N/A	N/A	4.50	N/A	N/A	N/A
R-00	0.214	0.90	1.00	Accutrol RD-100-A-ADJ 3/4 Open	Tenth Line	13.00	N/A	18.08	16.90	N/A	25.08	19.50	0.150	63.47	N/A
A-02	0.229	0.47	0.54	Plate Oriface 127	Tenth Line	29.80	0.735	4.82	34.00	0.945	8.46	45.50	1.726	23.58	33.45
A-03	0.109	0.78	0.87	Plate Oriface 127	Tenth Line	23.00	0.436	3.96	26.20	0.573	6.87	44.00	1.622	15.00	20.99
Post-Development Flow						71.8	-		85.2	-		124.3	-		
Total Allowable Release Rate						129.1			129.1			129.1			

1) In lieu of a detailed roof plan, for the interim it has been assumed that the roof (area R-00) will contain 13 controlled roof drains releasing at 1.5L/s in the 100-yr, 1.3 L/s in the 5-yr and 1.0L/s in the 2-year storm events
2) Once once detailed roof plans are obtained the exact flow per roof drain will be determined, and the calculations will be updated accordingly

Atrel Report Excerpts

- ii) The storm sewer on Des Aubépines Drive (referred as the Eastern Trunk as per IBI Group Report) is already constructed and is designed to carry the flow from this proposed development. The trunk information was extracted from IBI's As-Built Drawings of Neighbourhood 5, Phase 1, dated December 17th, 2009.
- iii) There is an existing 28.0m – 675mmØ sanitary concrete stub west of existing San MH 15166 located on Tenth Line Rd near the pumping station.
- iv) It is proposed to connect directly on these services as they have been designed accordingly. The watermain, storm and sanitary sewer design of Avalon West Stage 3 were done in conjunction with IBI's reports titled "Mer Bleue Community Design Plan Infrastructure Servicing Study report dated April 2006" and "Avalon West (Neighbourhood 5), Stormwater Management Facility Design, Revision 5" dated October 2013.

1.4 Storm Sewer

The "Mer Bleue Community Design Plan Infrastructure Servicing Study" and "Avalon West (Neighbourhood 5), Stormwater Management Facility Design Report" prepared by IBI Group recommends that the storm water of Avalon West Stage 3 be conveyed to the future Storm Water Management (SWM) Basin located south of Neighbourhood 5. The Avalon West Stage 3 development falls within the Eastern Trunk watershed, which conveys its runoff to a SWM pond. This SWM facility (designed by others) will control both the quantity and quality of the storm water from Avalon West Stage 3. The attenuated flow will then discharge via a storm sewer, which will outlet into the McKinnon Creek located south of the proposed pond. According to IBI Group's memo "Update to Avalon West Stormwater Management Facility Design Report: Proposed Mattamy Bisson Lands" dated November 3, 2014 the pond level for the 100yr will be 84.65 m once the Mattamy Bisson lands are developed.

1.4.1 Design Constraints

The main storm drainage design constraints can be summarized as follows:

a) Minor System

- 1) Storm sewer will be designed using the Rational formula for the 5 year storm using an inlet time of 10 minutes for roads.
- 2) All residential inlets will be equipped with flow restrictors. The term "inlet" means "a single catch basin" or "a group of interconnected catchbasins" connected by a single lead into the minor system. The inflow rate into the minor system shall be 220 L/s/ha, as per IBI's report.
- 3) Catch basin densities and capacities for commercial development should be assessed on a site specific basis to limit the inflow into the minor system to a maximum of 220 L/s/ha, as per IBI's report.
- 4) Green space areas shall be restricted to 220L/s/ha, as per IBI's report.
- 5) The arterial roads area shall be restricted to a 1:10 year storm and a 10 minute inlet time which represents 238 l/s/ha according to IBI's report.

- 6) The hydraulic grade line shall be computed and the maximum permitted hydraulic grade line elevation is to be 0.30m below the underside of footing.
- 7) Dynamic modelling shall be provided for all submerged outlets.

b) Major System

- 1) Grading design is to be based on split lot drainage.
- 2) The commercial developments and green space shall be designed to provide an on-site storage to retain the 100 year storm event.
- 3) On site detention storage of 124 m³/ha for Townhouses, 108 m³/ha for single family units and 168 m³/ha for stacked homes may be provided in the following areas:
 - i) Road low points (Sawtooth design)
 - ii) Parking Areas on private sites

c) Street and Rear Yard Emergency Overflow

- 1) On street routing to emergency storage area must be provided and illustrated on the grade control plan. This routing must incorporate a maximum 0.30m flow depth on street under either static or dynamic conditions. An overall positive slope of 0.10% will be required across consecutive high points for routing purposes.
- 2) A maximum ponding depth of 0.30m will be allowed in the rear yards.
- 3) A ponding area plan that includes an identification number, the area, the depth, the volume and an elevation will be required.

d) Water Quality

An Enhanced Level of Protection (80 % removal of Total Suspended Solids) will be achieved in the ultimate stormwater management wet pond, as per IBI's reports. The Best Management Practices should also be implemented within the subdivision design and during construction.

e) Geotechnical Constraints

The geotechnical investigation conducted for Neighbourhood 5 – Avalon West indicates that the low lying lands are prone to an excessive soil consolidation, and can only be developed with grade raise restriction or by using non-standard techniques, such as structural slabs.

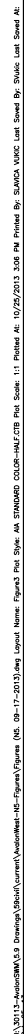


Table 1

RATIONAL METHOD Q= 2.78 AIR
PVC/CONC N= 0.013
CSP N= 0.024
CORR N= 0.021

2322, 2370 Tenth Line
Road, 885 Decoeur
Drive



DESIGNED BY: AGS
CHECKED BY: JMD

Neighbourhood 5 - Avalon West - STAGE 3
Minto Communities Inc.
131004
ATREL ENGINEERING LTD
November 2014

STORM FREQUENCY : 5 YEAR
RATIONAL METHOD Q= 2.78 AIR
PVC/CONC N= 0.013
CSP N= 0.024
CORR N= 0.021

LOCATION	
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STREET NAMES	LOCATION			AREA (ha.) RUNOFF COEFFICIENT																RATIONAL METHOD		5 YEAR RAINF. INTENS.			FLOW (L/S)	Commercial & green space area		ACTUAL PIPE FLOW (L/S)	PIPE		SEWER DATA							UpStream		Forced drop (M)	Inv to Inv (M)	DwStream		UpStream		Down MH Hgl (M)	SURG AT UP MH (M)	UpStream																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	FROM (Up)	TO (Down)	0.20	0.27	0.29	0.30	0.36	0.39	0.45	0.48	0.50	0.55	0.60	0.62	0.65	0.70	0.75	0.80	0.85	0.70	0.70	0.76	INDIV. 2.78AR	ACCUM. 2.78AR		TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)		Restr Flow (L/S)	Cum Flow (L/S)	TYPE	DIA. (mm)	(ACT)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)			Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)			Hgl at UP-MH (M)	Hgl Out UP-MH (M)	USF ELEV (M)	HGL FREEBOARD (M)	Comment																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Magnolia Street	MH	3585	MH	3594								0.14					0.37							0.93	22.95	18.50	73.73	1692.38			1692.38	CONC	1650	1676.4	0.10	79.0	3006.86	44%	1.36	0.97	85.00	83.35		no	84.92	83.27	85.00	85.00	84.92		85.63	0.63	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Génévriers Street	MH	3586	MH	3587								0.42					0.22							1.07	10.7	10.00	104.19	111.51			111.51	CONC	525	533.4	0.16	59.0	179.46	38%	0.80	1.22	85.20	84.68		no	85.11	84.59	85.20	85.20	85.11		85.60	0.40	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Génévriers Street	MH	3587	MH	3588														0.22							1.07	11.22	98.14	105.04			105.04	CONC	525	533.4	0.16	11.5	179.46	41%	0.80	0.24	85.08	84.56		no	85.06	84.54	85.08	85.08	85.06		85.79	0.71	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Génévriers Street	MH	3588	MH	3589														0.40							0.78	1.85	11.46	97.05	179.42			179.42	CONC	675	685.8	0.11	77.5	294.79	39%	0.80	1.62	85.06	84.39		no	84.97	84.30	85.06	85.06	84.97		85.59	0.53	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Génévriers Street	MH	3589	MH	3594																					1.85	13.08	90.32	166.97			166.97	CONC	750	762.0	0.14	48.0	390.41	57%	0.86	0.93	84.97	84.22		no	84.92	84.17	84.97	84.97	84.92		85.71	0.74	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Hepatica Crescent	MH	3583	MH	3590																						10.00	104.19						PVC	300	299.2	0.34	10.5	55.99	100%	0.80	0.22	85.52	85.22		no	85.48	85.18	85.52	85.52	85.48		86.08	0.56	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3590	MH	3592													0.04								0.08	0.08	10.22	103.05	8.02			8.02	PVC	300	299.2	0.34	71.5	55.99	86%	0.80	1.50	85.45	85.15		no	85.21	84.91	85.45	85.45	85.22		85.96	0.51	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3591	MH	3592																					0.35	0.35	10.00	104.19	36.50			36.50	PVC	375	366.4	0.26	69.0	84.05	57%	0.80	1.44	85.39	85.02		no	85.21	84.84	85.39	85.39	85.22		85.86	0.47	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Génévriers Street	MH	3592	MH	3593								0.29					0.18								1.22	1.65	11.72	95.92	158.26			158.26	CONC	675	685.8	0.11	90.0	294.79	46%	0.80	1.88	85.21	84.54		no	85.11	84.44	85.22	85.22	85.11		85.84	0.63	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Génévriers Street	MH	3593	MH	3594								0.12					0.24								0.65	2.30	13.60	88.39	203.34			203.34	CONC	750	762.0	0.10	90.0	367.27	45%	0.81	1.86	85.11	84.36	0.10	no	85.02	84.27	85.11	85.11	85.02		85.75	0.64	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Magnolia Street	MH	3594	MH	3597													0.16								0.79	27.89	19.46	71.45	1992.91			1992.91	CONC	1800	1828.8	0.10	84.0	3792.13	47%	1.44	0.97	84.92	83.12		no	84.84	83.04	84.92	84.92	84.84		85.64	0.72	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3595	MH	3596													0.37								1.17	1.17	10.00	104.19	121.80			121.80	CONC	525	533.4	0.16	71.0	179.46	32%	0.80	1.47	85.14	84.62		no	85.03	84.51	85.14	85.14	85.03		85.59	0.45	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3596	MH	3597													0.29								0.89	2.06	11.47	97.01	199.84			199.84	CONC	675	685.8	0.12	80.5	303.78	34%	0.82	1.63	85.03	84.36	0.15	no	84.93	84.26	85.03	85.03	84.93		85.54	0.51	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3597	MH	3598													0.73								2.21	32.16	20.43	69.31	2228.89			2228.89	CONC	1800	1828.8	0.13	118.0	4323.69	48%	1.65	1.19	84.78	82.98		no	84.63	82.83	84.63	84.78	84.72		85.35	0.57	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Hepatica Crescent	MH	3598	MH	53646													0.48								1.36	33.51	21.63	66.87	2241.15			2241.15	CONC	1800	1828.8	0.13	101.5	4323.69	48%	1.65	1.03	84.63	82.83		no	84.50	82.70	84.72	84.72	84.68	0.09	85.20	0.48	OK																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Des Aubépines Drive	MH	53646	MH	HEADWALL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

Existing Storm Sewers
Existing Eastern Trunk
Stage 2 Storm Sewers
Proposed Stage 3 Storm Sewers
Future Stages Storm Sewers



Table 2

PVC/CONC N= 0.013
CSP N= 0.024
CORR N= 0.021

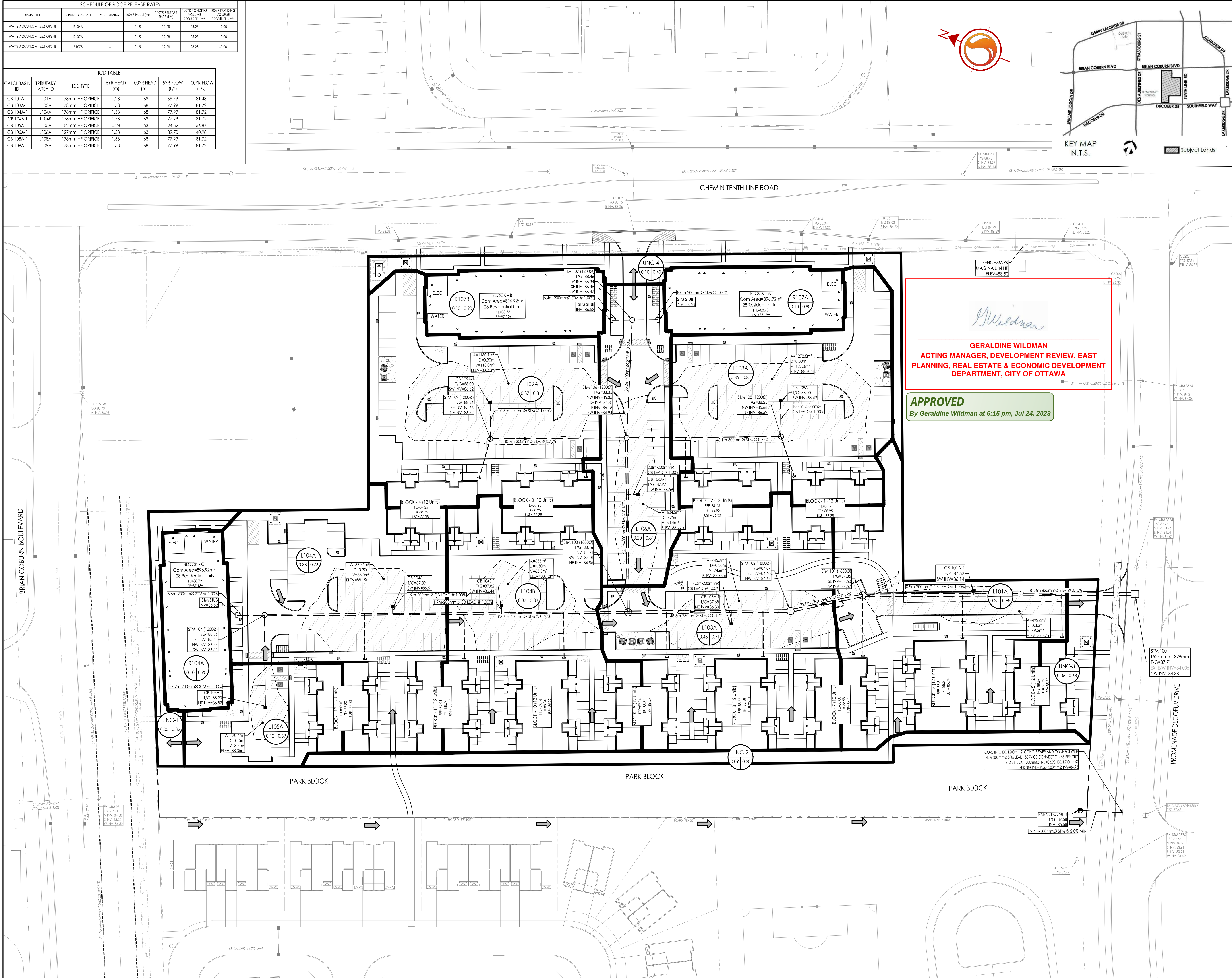
2322, 2370 Tenth Line
Road, 885 Decoeur
Drive



2370 Report Excerpts

SCHEDULE OF ROOF RELEASE RATES						
DRAIN TYPE	TRIBUTARY AREA ID	# OF DRAINS	100YR HEAD (m)	100YR RELEASE RATE (L/s)	100YR PONDING VOLUME REQUIRED (m³)	100YR PONDING VOLUME PROVIDED (m³)
WATTS ACCURFLOW (25% OPEN)	R104A	14	0.15	12.28	25.28	40.00
WATTS ACCURFLOW (25% OPEN)	R107A	14	0.15	12.28	25.28	40.00
WATTS ACCURFLOW (25% OPEN)	R107B	14	0.15	12.28	25.28	40.00

ICD TABLE						
CATCHBASIN ID	TRIBUTARY AREA ID	ICD TYPE	SYR HEAD (m)	100YR HEAD (m)	SYR FLOW (L/s)	100YR FLOW (L/s)
CB 101A-1	L101A	178mm HF ORIFICE	1.23	1.68	69.72	81.43
CB 103A-1	L103A	178mm HF ORIFICE	1.53	1.68	77.99	81.72
CB 104A-1	L104A	178mm HF ORIFICE	1.53	1.68	77.99	81.72
CB 104B-1	L104B	178mm HF ORIFICE	1.53	1.68	77.99	81.72
CB 105A-1	L105A	152mm HF ORIFICE	0.26	1.53	24.52	56.87
CB 106A-1	L106A	127mm HF ORIFICE	1.53	1.63	39.70	40.98
CB 108A-1	L108A	178mm HF ORIFICE	1.53	1.68	77.99	81.72
CB 109A-1	L109A	178mm HF ORIFICE	1.53	1.68	77.99	81.72



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Legend

- AREA ID
- RUNOFF COEFFICIENT
- STORM DRAINAGE AREA P.A.
- STORM DRAINAGE BOUNDARY
- DIRECTION OF OVERLAND FLOW
- DIRECTION OF EMERGENCY OVERLAND FLOW
- PROPOSED STORM MH AND SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED WATTS FD-530 (OR EQUIVALENT) TO BE CONNECTED TO INTERNAL STORM SEWER PLUMBING.
- EXISTING STORM MH AND SEWER
- EXISTING CATCHBASIN
- THERMAL INSULATION ON STORM SEWER WHERE COVER IS LESS THAN 1.5m. THERMAL INSULATION ON WATERMAIN WHERE COVER IS LESS THAN 2.4m AS PER W22.
- MAXIMUM STATIC PONDING LIMITS

Notes

5	ISSUED FOR CONSTRUCTION	MJS	KS	23.05.31	
4	REVISED AS PER SITE PLAN	MJS	KS	23.03.28	
3	REVISED AS PER CITY COMMENTS/SITE PLAN	MJS	KS	23.02.27	
2	REVISED AS PER NEW SITE PLAN	MJS	DT	22.12.05	
1	REVISED AS PER SITE PLAN	MJS	DT	22.09.27	
0	ISSUED FOR SPA	MJS	DT	21.12.13	
Revision		By	Appd.	YY.MM.DD	
File Name: 160401710B		MJS	DT	MJS	21.11.22
		Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

MATTAMY HOMES LTD.

ORLEANS DECOEUR RESIDENTIAL DEVELOPMENT
2370 TENTH LINE ROAD
OTTAWA, ON, CANADA

Title

STORM DRAINAGE AREA PLAN

Project No.	Scale
160401710	1:500
Drawing No.	Sheet
SD-1	6 of 7
	Revision
	5



	DECOEUR			STORM SEWER DESIGN SHEET (City of Ottawa)								DESIGN PARAMETERS																											
	DATE: 2022-11-22											I = a / (t+b) ⁵ (As per City of Ottawa Guidelines, 2012)																											
	REVISION: 2											a = 732.951 998.071 1174.184 1735.688 MANNING'S n = 0.013																											
	DESIGNED BY: MJS											b = 6.199 6.053 6.014 6.014 MINIMUM COVER: 2.00 m																											
CHECKED BY: DT			FILE NUMBER: 160401710			c = 0.810 0.814 0.816 0.820 TIME OF ENTRY 10 min																				BEDDING CLASS = B													
LOCATION			FROM	TO	DRAINAGE AREA																		PIPE SELECTION																
AREA ID NUMBER	M.H.	M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	I ₂ -YEAR (mm/h)	I ₅ -YEAR (mm/h)	I ₁₀ -YEAR (mm/h)	I ₁₀₀ -YEAR (mm/h)	Q _{CONTROL} (L/s)	ACCUM. Q _{CONTROL} (L/s)	Q _{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE (%)	Q _{CAP} (FULL) (L/s)	% FULL (-)	VEL (FULL) (m/s)	TIME OF FLOW (min)	
R104A	BLDG C	104	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	12.3	12.3	12.3	9.4	200	200	CIRCULAR	PVC	-	1.00	33.3	36.87%	1.05	0.19
L105A	105A-1	104	0.12	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	17.8	27.2	200	200	CIRCULAR	PVC	-	1.00	33.3	53.35%	1.05	0.50
L104A, L104B	104	103	0.76	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.603	0.686	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.50	74.95	101.64	119.14	174.14	0.0	12.3	155.1	108.6	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	82.45%	1.15	1.59
L109A	109A-1 109	109 106	0.00 0.38	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.81	0.00 0.00	0.00 0.00	0.00 0.00	0.000 0.306	0.000 0.306	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	10.00 10.59	76.81 76.81	104.19 104.19	122.14 122.14	178.56 178.56	0.0 0.0	0.0 0.0	0.0 65.2	10.5 40.7	200 300	200 300	CIRCULAR CIRCULAR	PVC PVC	- -	1.00 0.75	33.3 83.3	0.00% 78.30%	1.05 1.18	0.00 0.59
L108A	108A-1 108	108 106	0.00 0.36	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.85	0.00 0.00	0.00 0.00	0.00 0.00	0.000 0.302	0.000 0.302	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	10.00 10.67	76.81 76.81	104.19 104.19	122.14 122.14	178.56 178.56	0.0 0.0	0.0 0.0	0.0 64.4	10.4 46.1	200 300	200 300	CIRCULAR CIRCULAR	PVC PVC	- -	1.00 0.75	33.3 83.3	0.00% 77.33%	1.05 1.18	0.00 0.67
	BLDG A	107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	12.3	12.3	12.3	9.0	200	200	CIRCULAR	PVC	-	1.00	33.3	36.87%	1.05	0.19
	BLDG B	107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00 10.15	76.81	104.19	122.14	178.56	12.3	12.3	12.3	7.4	200	200	CIRCULAR	PVC	-	1.00	33.3	36.87%	1.05	0.15
R107B, R107A	107	106	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.19 10.97	76.10	103.23	121.00	176.88	0.0	24.6	24.6	35.2	300	300	CIRCULAR	PVC	-	0.50	68.0	36.12%	0.97	0.78
L106A	106	103	0.20	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.166	0.773	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.97 12.03	73.28	99.35	116.44	170.18	0.0	24.6	181.9	52.1	600	600	CIRCULAR	CONCRETE	-	0.15	248.1	73.33%	0.85	1.06
L103A	103	102	0.43	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.306	1.765	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.08	69.64	94.34	110.54	161.52	0.0	36.8	378.3	48.5	750	750	CIRCULAR	CONCRETE	-	0.15	449.8	84.11%	0.99	0.82
L101A	102 101	101 100	0.00 0.35	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.68	0.00 0.00	0.00 0.00	0.00 0.00	0.000 0.241	1.765 2.006	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	12.90 13.28 14.64	67.21 66.16	91.01 89.57	106.62 104.93	155.77 153.28	0.0 0.0	36.8 36.8	366.4 405.5	22.0 81.4	750 825	750 825	CIRCULAR CIRCULAR	CONCRETE CONCRETE	- -	0.15 0.15	449.8 580.0	81.46% 69.92%	0.99 1.05	0.37 0.96