

Engineering

Land/Site
Development

Municipal
Infrastructure

Environmental/
Water Resources

Traffic/
Transportation

Recreational

Planning

Land/Site
Development

Planning Application
Management

Municipal Planning

Urban Design

Expert Witness
(LPAT)

Wireless Industry

Landscape Architecture

Streetscapes &
Public Amenities

Open Space, Parks &
Recreation

Community &
Residential

Commercial &
Institutional

Environmental
Restoration

Copperwood Estates – Block 73 1100 Spoor Street Servicing and Stormwater Management Report

Copperwood Flats
Block 73
City of Ottawa
Servicing and Stormwater Management Report

Prepared By:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

April 8, 2026
Revised: July 23, 2026
Novatech File: 125113
Ref: R-2026-028

July 23, 2026

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning and Infrastructure Approvals Branch
110 Laurier Avenue West, 4th Floor
Ottawa ON, K1P 1J1

Attention: Sean Moore, MCIP, RPP – Manager, Development Review West
Reference: Copperwood Estates – Block 73
Servicing and Stormwater Management Report
Our File No.: 125113

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

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

Yours truly,

NOVATECH



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

Table of Contents

1.0	INTRODUCTION	1
1.1	Existing Conditions	1
1.2	Proposed Development	1
1.3	Approvals.....	1
2.0	GEOTECHNICAL INVESTIGATION	2
3.0	WATER SERVICING.....	3
3.1	Watermain Design Parameters	3
3.2	Fire Demand	4
3.3	Water Demand.....	4
3.4	Water Boundary Conditions	5
3.5	System Pressure Modeling and Results.....	5
4.0	SANITARY SERVICING	6
4.1	Sanitary Design Parameters	6
5.0	STORM SERVICING.....	7
6.0	STORM DRAINAGE AND STORMWATER MANAGEMENT	7
6.1	Design Criteria	8
6.2	Quantity Control.....	8
6.2.1	<i>Allowable Release Rate.....</i>	<i>8</i>
6.2.2	<i>Design Storms</i>	<i>9</i>
6.2.3	<i>Catchment Areas.....</i>	<i>9</i>
6.2.4	<i>Rational Method Calculations</i>	<i>10</i>
6.2.5	<i>Impacts to the Copperwood Subdivision System</i>	<i>12</i>
6.2.6	<i>Downstream HGL</i>	<i>12</i>
6.3	Quality Control.....	12
6.4	Major Overland Flow Route	13
7.0	EROSION AND SEDIMENT CONTROL	13
8.0	CONCLUSIONS AND RECOMMENDATIONS	15
9.0	CLOSURE.....	16

Appendices

- Appendix A Site Plan & Legal
- Appendix B Water Servicing
- Appendix C Sanitary Servicing
- Appendix D Storm Servicing
- Appendix E Impacts to Copperwood System

Tables

Table 3.1: Watermain Design Parameters and Criteria	3
Table 3.2: Domestic Water Demand Summary	4
Table 3.3: Maximum Flow to be considered from a given hydrant.	4
Table 3.4: Water Boundary Conditions.....	5
Table 3.5: Water Boundary Conditions and Hydraulic Analysis Summary	5
Table 4.1: Sanitary Sewer Design Parameters.....	6
Table 5.1: Storm Sewer Design Parameters	7
Table 6.1: Runoff Coefficients	10
Table 6.2: Stormwater Management Summary	11
Table 6.3: Area and Coefficient Comparison.....	13

Figures

- | | |
|----------|---------------------|
| Figure 1 | Key Plan |
| Figure 2 | Existing Conditions |
| Figure 3 | Proposed Site Plan |

1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed site plan located within the City of Ottawa. The proposed site is denoted as Block 73 within 1053, 1075 and 1145 March Road Copperwood Estates Subdivision and is located at the corner of Spoor Street and Buckbean Avenue. The legal plan is included within **Appendix A** for reference. The purpose of this report is to support the site plan application for the subject development. **Figure 1** Key Plan shows the site location.

1.1 Existing Conditions

The subject site is approximately 0.92 hectares (ha.) in size and is denoted as Block 73 of the Copperwood Estates Subdivision. Presently the site consists of vacant and undeveloped land.

The site is bound by rue Spoor Street to the East, Buckbean Avenue to the north, Dandelion Mews to the west, and Shirley's Brook Northwest branch tributary 2 to the south. **Figure 2** shows the existing site conditions.

The Copperwood Estates subdivision development was designed by Novatech and information is provided in the following report:

- '1053, 1075 and 1145 March Road Copperwood Estate - Detailed Site Servicing and Stormwater Management Report (Phase 1) By Novatech dated May 19th, 2023 – 4th Submission' (Referenced as **Copperwood Estates Report**).

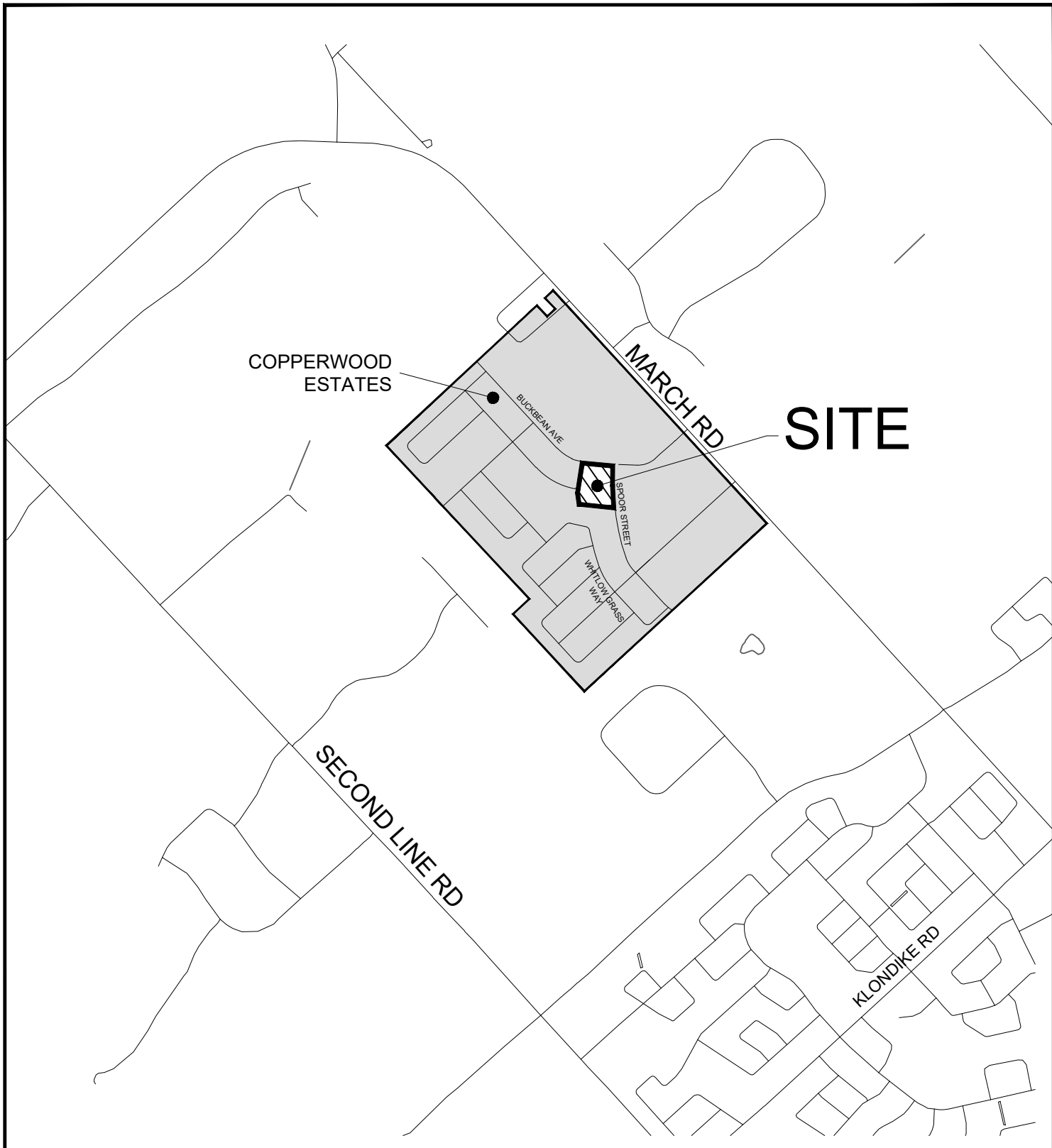
1.2 Proposed Development

The proposed development consists of five (5) residential buildings with above-ground parking. Each building will accommodate twelve (12) dwelling units, resulting in a total of sixty (60) units on the site. Each building has an individual footprint of approximately 420 m². Vehicular access to the site will be provided via Rue Spoor Street, with pedestrian access provided from both streets and the walkway adjacent the Shirley's Brook Tributary 2. **Figure 3** shows the concept plan for the proposed development.

1.3 Approvals

The proposed water, sanitary, stormwater conveyance and stormwater management design will require approval from the City of Ottawa.

The subject site is within the boundary of the Copperwood Estates Subdivision which was constructed complete with a stormwater management wet pond. The pond was subject to an Environmental Compliance Approval per MECP (Number 8633-D3CQMH). The subject site is tributary to the pond, and the pond was designed to take flows from the property. As per O.Reg 525/98 section 3 the proposed onsite storm sewers will be designed to service one parcel of land and thus is exempt from additional ECA approvals.



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
1100 SPOOR STREET (BLOCK 73)

KEY PLAN

SCALE

N.T.S

DATE

MAR 2026

JOB

125113

FIGURE

FIGURE 1

M:\2025\125113\CAD\Civil\Figures\Serviceing\125113-EX_CND.dwg, EC, Jan 08, 2026 - 2:08pm, amusyaju



LEGEND

--- SITE BOUNDARY

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

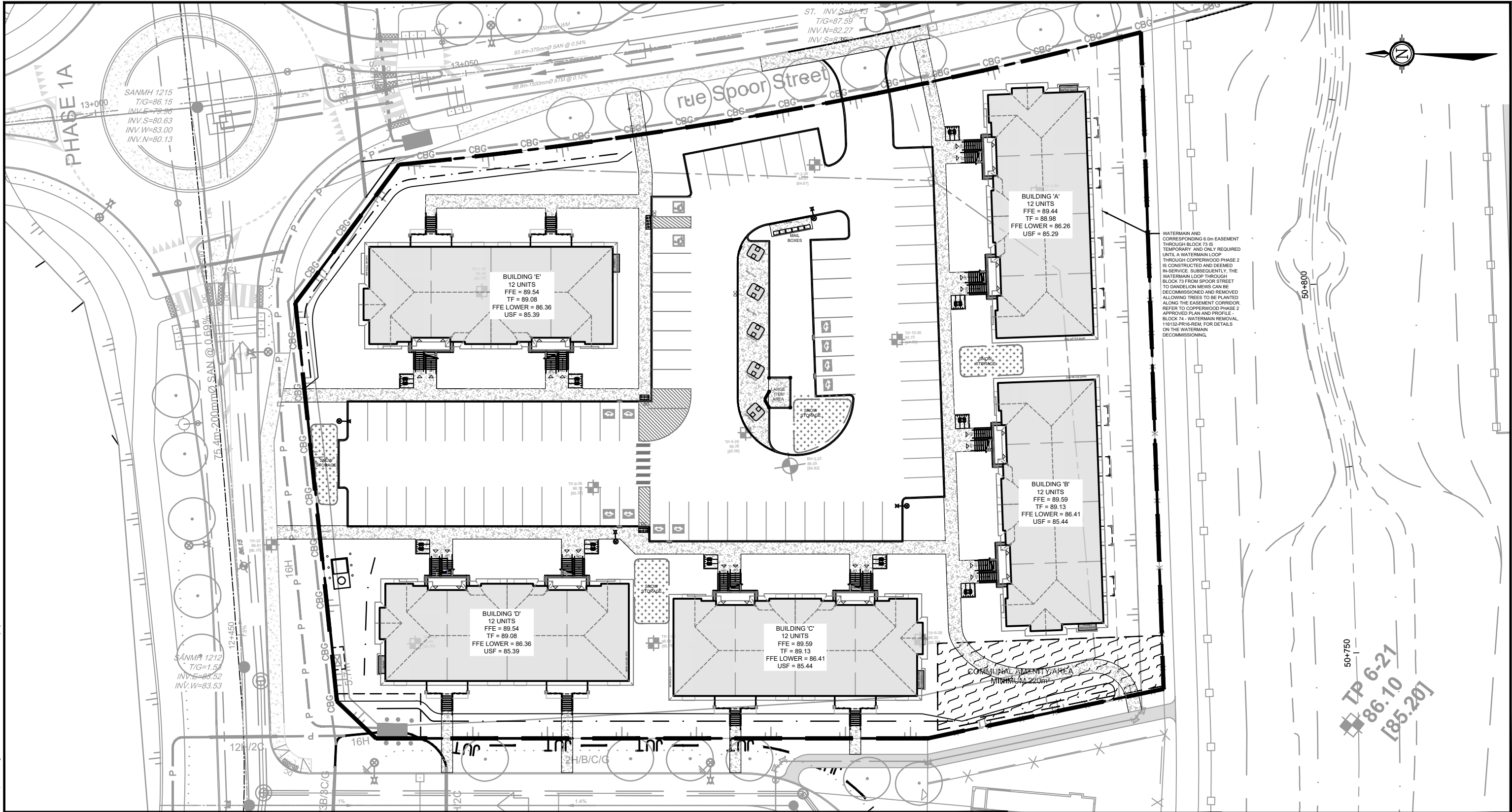
CITY OF OTTAWA
1100 SPOOR STREET (BLOCK 73)

EXISTING CONDITIONS

SCALE 1 : 500 0 5m 10m 20m

DATE MAR 2026 JOB 125113 FIGURE 2

M:\2025\125113\CAD\Civil\Figures\Service\125113-Site-plan.dwg, SP, Mar 26, 2026 - 9:56am, amusvaju



LEGEND

--- SITE BOUNDARY

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
1100 SPOOR STREET (BLOCK 73)

SITE PLAN

SCALE 1 : 500 0 5m 10m 20m

DATE JULY 2026 JOB 125113 FIGURE 3

2.0 GEOTECHNICAL INVESTIGATION

A geotechnical investigation was completed for the Block 73 development, and a report prepared entitled 'Geotechnical Investigation, Proposed Residential Building Development, 1100 Spoor Street (Copperwood-Block 73), Ottawa Ontario prepared by Paterson Group Inc. dated March 5, 2026 (PG4258-3) . The following is a summary of the findings of the report:

- The field program for the current geotechnical investigation was conducted on February 19, 2026.
- Practical refusal was encountered in all the test hole locations at depths ranging from 0.7 to 1.4 m.
- Based on available geological mapping and refusal to auguring /excavation, the bedrock in the subject area consists of sandstone and dolomite of the March Formation, with an overburden thickness of 1 to 2 m.
- Generally, the bedrock quality is very poor within the upper 3.0 m and improves to good quality at greater depths, based on the RQD values.
- Based on groundwater levels measured in the monitoring well from our previous site investigation, the long-term groundwater table is estimated to be about 1.5 to 2.5 m below the existing ground surface.
- Overbreak is expected to occur throughout the lowest lifts of blasting due to the variable bedding planes and planes of weakness in the in-situ bedrock. It is very difficult to mitigate significant over-blasting given the constraints posed by footing geometry and spacing with respect to the zone of influence of blasts and the bedrocks in-situ characteristics.
- Overbreak below footings should be in-filled with lean-concrete and approved by Paterson prior to placing concrete.
- Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.
- In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 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. Should a Permit to Take Water be required, a minimum of 5 to 6 months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP

3.0 WATER SERVICING

There are existing City watermains in all rights-of-way fronting the proposed site. There is an existing 300mm PVC diameter (dia.) watermain within Rue Spoor Street, and a 300mm PVC dia. watermain within Buckbean Avenue.

It is proposed to service the development with a private 200mm diameter watermain which will connect to the existing 300mm diameter watermain in both rue Spoor Street and Buckbean Avenue. The site will be serviced internally with 38mm services. Each 38mm service will supply three (3) apartment units resulting in four (4) services per building to serve a total of twelve (12) units per building. Refer to the General Plan of Services drawing (125113-GP) for servicing details.

3.1 Watermain Design Parameters

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

Table 3.1: Watermain Design Parameters and Criteria

Domestic Demand Design Parameters	Design Parameters								
Unit Population: 2 Bed Apartments/ Stacked Towns	2.1 people/unit*								
Basic Day Residential Demand (BSDY)	280 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								
Fire Demand (FF) Design	Design Flows								
Stacked Townhomes Hydrant spacing	per FUS 2020, and ITSB-2018-02 90m								
System Pressure Criteria Design Parameters	Criteria								
Maximum Pressure (BSDY) Condition	< 80 psi occupied areas < 100 psi unoccupied areas								
Minimum Pressure (PKHR) Condition	> 40 psi								
Minimum Pressure (MXDY+FF) Condition	> 20 psi								
Friction Factors	<table> <tr> <th>Watermain Size</th><th>C-Factor</th></tr> <tr> <td>• 150mm</td><td>100</td></tr> <tr> <td>• 200-250 mm</td><td>110</td></tr> <tr> <td>• 300-400 mm</td><td>120</td></tr> </table>	Watermain Size	C-Factor	• 150mm	100	• 200-250 mm	110	• 300-400 mm	120
Watermain Size	C-Factor								
• 150mm	100								
• 200-250 mm	110								
• 300-400 mm	120								

*2.1 persons per unit utilized as stacked towns are all one storey with two bedrooms.

3.2 Fire Demand

The required fire demand was calculated using the Fire Underwriters Survey 2020 (FUS) Guidelines and City of Ottawa ITSB-2018-02. It is understood that the proposed building is residential occupancy (Limited Combustible) and is composed of Wood Frame construction. The building will have a footprint of **420m²**.

3.3 Water Demand

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)
126	0.41	3.88	5.84	250

As per **ITSB 2021-03** the proposed development has greater than **50 units** and thus, will need to be serviced with two (2) services separated by an isolation valve. Therefore, it is proposed to service the site by connecting the site with a private watermain looping through the proposed site connection to both the existing watermain within Spoor Street and Buckbean Avenue.

Additionally, the required site fire flow will be provided by a proposed on-site private hydrant and the existing City owned fire hydrants within the surrounding rights-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 **250 L/s**, at least three (3) hydrants will be required to achieve the required flow. There are currently two (2) existing Class AA hydrants along Spoor Street fronting the site, and there is also an existing hydrant within Buckbean Avenue along the site frontage. Additionally, a private hydrant is proposed within the proposed parking area to provide additional hydrant coverage. Utilizing the existing and proposed hydrants the required fire flows can be met as outlined in **Table 3.3**. Refer to **Appendix B** for calculations and the Hydrant Coverage figures.

3.4 Water Boundary Conditions

The above water demand information was submitted to the City for boundary conditions from the City's water model. The boundary conditions are summarized within **Table 3.4**:

Table 3.4: Water Boundary Conditions

Criteria	Head (m)
Connection 1 (Buckbean Avenue)	
Max HGL (Average Day)	130.2
Min HGL (Peak Hour)	125.2
Max Day + Fire Flow (267L/s)	105.9
Connection 2 (Spoor Street)	
Max HGL (Average Day)	130.2
Min HGL (Peak Hour)	125.2
Max Day + Fire Flow (267L/s)	107.1

Refer to **Appendix B** for the City boundary conditions, and correspondence.

3.5 System Pressure Modeling and Results

The above boundary conditions were used to create a hydraulic model using EPANET for analyzing the performance of the proposed watermain system for three theoretical conditions: 1) High Pressure check under Average Day conditions, 2) Peak Hour Demand, 3) Maximum Day + Fire Flow Demand. The following **Table 3.5** provides a summary of the results from the hydraulic water model.

Table 3.5: Water Boundary Conditions and Hydraulic Analysis Summary

Condition	Demand (L/s)	Min/Max Allowable Operating Pressures (psi)	Limits of Design Operating Pressures (psi)
High Pressure (Average Day)	0.41 L/s	80psi (Max)	60psi
Maximum Daily Demand and Fire Flow	253.88 L/s	20psi (Min)	24psi
Peak Hour	5.84 L/s	40psi (Min)	53psi

Based on the preceding analysis it can be concluded that the existing watermain system will provide adequate system pressures and flows to service the proposed development. Refer to **Appendix B** for detailed model results.

4.0 SANITARY SERVICING

There is an existing 375mm PVC diameter sanitary sewer within rue Spoor Street right-of-way, and a 200mm PVC diameter sanitary sewer within Buckbean Avenue that was installed as part of the **Copperwood Estates Subdivision**.

It is proposed to service the proposed development with a 200mm diameter private sanitary sewer. The proposed sewer will connect to an existing 1200mm diameter sanitary manhole within rue Spoor Street. The site will be serviced internally with 135mm services to water entry rooms at each building. Each 135mm sanitary service will serve three (3) apartment units resulting in four (4) services per building to serve a total of twelve (12) units per building.

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: 2 Bed Apartments/ Stacked Towns	2.1 people/unit*
Residential Flow Rate	280 L/cap/day
Residential Peaking Factor	Harmon Equation (min=2.0, max=4.0) Harmon Correction Factor = 0.8m (Design)
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.

*2.1 persons per unit utilized as stacked towns are all one storey with two bedrooms.

The peak sanitary flow including infiltration for the development was calculated to be **1.77 L/s**. Detailed sanitary flow calculations are provided in **Appendix C** for reference.

As noted previously, the detailed design of the **Copperwood Estates Subdivision** was completed by Novatech with details provided within the Report. The Subdivision design assumed that Block 125 & Block 73 (previously known as block 307 & 284 respectively) were to be a residential development area for a total assumed population of 232. The proposed block 73 will contain a population of 126 and the neighboring block 125 is proposed to contain a population of 76 for a total population of 199. Refer to **Appendix C** for the corresponding calculations for the overall subdivision and the neighboring site. The assumed population was higher than currently proposed, thus the existing infrastructure within the Copperwood Estates Subdivision has capacity to service the proposed development.

5.0 STORM SERVICING

There is a 1500mm concrete storm sewer located within Rue Spoor Street right-of-way fronting to the proposed development and a 900mm concrete storm sewer located within Buckbean Avenue right-of-way as apart of the **Copperwood Estates Subdivision**.

It is proposed to provide storm sewers within the development and connect to the existing storm sewer within rue Spoor Street. The proposed storm sewers will vary in size ranging from 250mm to 450mm in diameter. The site will be serviced internally with 100mm services. Each 100mm storm service will service the foundation drainage system of the proposed building. The proposed roof is peaked, and roof drainage will be directed to downspouts that will discharge to the surface.

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 D** 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 **Copperwood Estates Subdivision** Report.

6.1 Design Criteria

Through correspondence with the City of Ottawa, the **Copperwood Estates Subdivision** 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 **210L/s**
- Provide source controls which are in conformity with the City of Ottawa requirements, where possible;
- Limit ponding to 0.30 m for all parking storage areas and rear yard areas;
- Ensure no surface ponding during the 2-year storm event; and
- Quality control will be provided by the downstream SWM pond associated with **Copperwood Estates Subdivision**.
- 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 within rue Spoor Street.

6.2 Quantity Control

Quantity control will be provided within the site by utilizing inlet control devices (ICDs) within the individual catch basin structures. Stormwater storage within the parking areas will be provided by surface storage limited to 0.30m in depth during significant storm events, while ensuring no ponding during the more common 2-year storm events. Stormwater storage will also be provided in the swale system behind Buildings C and D within the 250mm perforated pipe and the surrounding clear stone.

6.2.1 Allowable Release Rate

The site was included within area NW-31 of the Copperwood estates subdivision. Area NW-31 had an area of **0.935ha**. The proposed site (Block 73) encompasses **0.922ha** of this area with the remaining **0.013ha** encompassing portions of the Buckbean and Spoor Street rights-of-ways (refer to the Stormwater Management Plan, drawing: 125113-SWM in Appendix D for details). The allowable release rate for the **0.935ha** catchment was calculated to be **196L/s** for the 5-year event and **210 L/s** for the 100-year based on the SWM criteria provided within the **Copperwood Estates Subdivision** Report. The area to the surrounding rights-of-way will release at **1.7L/s** in the 5-year, and **3.3L/s** in the 100-year storm events. As such the allowable release rates for the subject site are **194.3L/s** in the 5-year and **206.7L/s** in the 100-year storm events.

Excerpts from the report and supporting calculations are included within **Appendix D** for reference.

6.2.2 Design Storms

The design storms are based on City of Ottawa IDF curve equations provided within the City of Ottawa sewer design Guidelines. Design storms were used for the 2, 5, 100, and 100+20%-year return periods (i.e. storm events) as listed below.

$$\begin{aligned} 100\text{-year } +20 \% \text{ Intensity} &= (1735.688 / (\text{Time in min} + 6.014)^{0.820}) * 1.20 \\ 100\text{-year Intensity} &= 1735.688 / (\text{Time in min} + 6.014)^{0.820} \\ 5\text{-year Intensity} &= 998.071 / (\text{Time in min} + 6.053)^{0.814} \\ 2\text{-year Intensity} &= 732.951 / (\text{Time in min} + 6.199)^{0.810} \end{aligned}$$

6.2.3 Catchment Areas

Post-development catchments were analyzed utilizing the rational method based on the proposed site plan and grading as shown on **Drawing 125113-SWM** within **Appendix D**.

The site has been divided into Thirteen (13) drainage areas for the post development condition. The drainage areas are as follows:

Area EX-01

- This area was included in the site catchment for Block 73 (area NW-31) in the **Copperwood Estates Subdivision** report, but the area is composed of the Spoor Street and Buckbean Avenue rights-of-way. The area will continue to drain to the neighboring rights-of-way and is not part of the site area.

Area A-01

- Runoff from the rear half of the Building 'E' roof and adjacent landscaped area will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be captured by a catch basin and landscape drain receiving runoff via a swale and conveyed by the private storm sewers without flow control.

Area A-02

- Runoff from the proposed parking area will be directed to the existing storm sewer on Rue Spoor Street. Flows will be collected at a catch basin and conveyed via private storm sewers. Discharge will be controlled using an inlet control device (ICD), with surface storage provided within the parking area.

Area A-03, A-04, A-05, A-06

- Runoff from the proposed central parking area and stacked townhouse roofs will be conveyed to the existing municipal storm sewer on Rue Spoor Street. Runoff will be collected via catch basins and conveyed through the private storm sewer system. Discharge will be regulated using an inlet control devices (ICD) within the individual catchbasins. Surface storage will be provided within the parking area to assist with flow attenuation.

Area A-07

- Runoff from the grassed area surrounding the proposed transformer will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be directed via swales to a catch basin and conveyed by private storm sewers without flow control.

Area A-08

- Runoff from the stacked townhouse roofs and rear yard areas along the western townhouses will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be collected by catch basins and landscape drains receiving runoff via swales. Discharge will be controlled using an inlet control device (ICD) prior to being conveyed by the private storm sewers.

Area D-01:

- The drainage along the South property line including the rear of the roofs from Buildings 'A' and 'B' and the adjacent landscaping will drain uncontrolled to Shirley's Brook Tributary 2.

Area D-02:

- Runoff from the northwestern frontage of the property adjacent to the existing switchgear will drain uncontrolled to the Dandelion Mews right-of-way, where it will be collected by the existing storm sewer system within the Copperwood Estates Subdivision.

Area D-03:

- Runoff from the northeastern frontage of the property adjacent to Building 'A' will drain uncontrolled to the Spoor Street right-of-way, where it will be collected by the existing storm sewer system within the Copperwood Estates Subdivision.

Area D-04:

- Runoff from the north frontage of the property adjacent to the central parking area between Building 'D' and Building 'E' will drain uncontrolled to the Buckbean Avenue right-of-way, where it will be collected by the existing storm sewer system within the Copperwood Estates Subdivision.

6.2.4 Rational Method Calculations

The stormwater flows for the subject site were calculated utilizing the rational method. The rational method utilizes the rainfall IFC curves and weighted runoff coefficients based on the proposed surface types. The minimum time of concentration to be utilized with the rational method is 10min as the results become erroneous at lower values. The equation is as follows:

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

Where:

C= The runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the catchment drainage area

The runoff coefficients for various surface types are as follows:

Table 6.1: Runoff Coefficients

Surface Types	Runoff Coefficient
Building Roof (Peaked)	1.00
Asphalt Parking	0.90
Grass	0.20

Table 6.2 below summarizes the flow, storage required, and storage provided for each of the site catchment areas.

Table 6.2: Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device		Outlet Location	2-Year uncontrolled release rate (TC=10min)	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			Max. Vol. Provided (cu.m.)
								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)	
D-01	0.114	0.55	0.58	N/A		Shirleys Brook	13.50	13.50	N/A	N/A	18.30	N/A	N/A	32.90	N/A	N/A	N/A
D-02	0.001	0.53	0.60	N/A		Dandelion Mews	0.20	0.20	N/A	N/A	0.20	N/A	N/A	0.40	N/A	N/A	N/A
D-03	0.010	0.37	0.60	N/A		Spoor Street	0.80	0.80	N/A	N/A	1.00	N/A	N/A	2.10	N/A	N/A	N/A
D-04	0.009	0.43	0.50	N/A		Buckbean	0.90	0.90	N/A	N/A	1.20	N/A	N/A	2.40	N/A	N/A	N/A
A-01 (CB 05)	0.081	0.52	0.76	N/A		Spoor Street	9.00	9.00	N/A	N/A	12.20	N/A	N/A	22.30	N/A	N/A	N/A
A-02 (CB 06)	0.068	0.71	0.64	Oriface Plate	83.00	Spoor Street	10.24	10.24	0.469	0.00	13.89	0.859	0.00	18.40	1.565	4.98	51.36
A-03 (CB 01)	0.150	0.74	0.74	Oriface Plate	102	Spoor Street	23.73	23.73	1.10	0.00	27.50	1.53	2.81	28.50	1.64	18.93	56.90
A-04 (CB 04)	0.038	0.83	0.91	LMF	100.00	Spoor Street	6.66	6.66	0.56	0.00	9.03	1.05	0.00	11.10	1.54	3.54	3.84
A-05 (CB 03)	0.116	0.80	0.86	Oriface Plate	102.00	Spoor Street	19.81	19.81	0.78	0.00	26.87	1.45	0.00	28.75	1.64	12.39	24.07
A-06 (CB 02)	0.171	0.77	0.83	Oriface Plate	108.00	Spoor Street	27.97	27.97	1.25	0.00	31.50	1.56	3.87	32.75	1.69	22.68	35.33
A-07 (CB 08)	0.022	0.45	0.48	N/A		Spoor Street	2.10	2.10	N/A	N/A	2.80	N/A	N/A	5.20	N/A	N/A	N/A
A-08 (CBMH 07)	0.142	0.58	0.61	Oriface Plate	83.00	Spoor Street	14.07	10.80	0.52	7.81	13.00	0.78	11.41	20.30	1.89	22.46	28.70
Post-Dev Total		0.922	0.67	0.72			128.98	125.71		7.80	157.49		18.09	205.10		84.98	200.19
Total Allowable Release Rate											194.30			206.70			

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

As per the above table the site flows will be restricted to a release rate of **205.10 L/s**. This release rate meets the requirements noted within the **Copperwood Estates Subdivision Report**, and thus no additional quantity control measures are required.

6.2.5 Impacts to the Copperwood Subdivision System

The original design of the Copperwood Subdivision assumed that all flows from Block 73 would be controlled on site with no direct run-off to the surrounding rights-of-way or the adjacent tributary of Shirleys Brook. As outlined above the proposed development contains four (4) direct run-off areas. As such the model for the overall subdivision was updated to review the impacts on the overall system. As part of the neighboring site development (Block 125) the existing 94mm ICDs within CB5/CB6 along Buckbean Avenue were increased to 102mm. The model accounted for the revised inlet control devices in the analysis. Due to the additional direct run-off flows there are no significant impacts to the subdivision system, or the neighboring drain, and the overall system will continue to function as designed.

A memo titled Copperwood Block 73 Medium Density Development Stormwater Impacts of Block 73 on Overall Subdivision Model (PCSWMM) was prepared and included within **Appendix E** for reference.

6.2.6 Downstream HGL

Within the Copperwood Estates Report the downstream storm system was modeled for various storm events. At the connection manhole (MH1300) the Hydraulic Grade line (HGL) for the 100-yr storm event was assessed for both the 12hr SCS, and the 3hr Chicago storm event. The HGL in MH1300 was 84.82, and 84.69 for these events respectively. Thus, the minimum allowable underside of footing (USF) within block 73 is 85.12m based on the 12hr SCS storm event. All proposed USF's are above this elevation with the lowest USF of 85.39m (Building E) having a free board of 0.50m above the 100-yr HGL. Additionally, all onsite orifice controls utilize surface storage or have inverts above the downstream HGL as such the downstream system will not impact the onsite storage. Refer to **Appendix E** for report excerpts of the downstream system modeling.

6.3 Quality Control

Quality control will be provided by the existing downstream SWM Pond for the **Copperwood Estates Subdivision**. Within the **Copperwood Estates Report** Block 73 was assumed to have a runoff coefficient of **0.70**. The proposed site will have an overall coefficient of **0.67**. In addition, the flows to the downstream pond will be restricted to or below the flows assumed within the Copperwood report. As such the pond will have capacity to provide quality control for the site. A comparison of the AxC of the overall design and the proposed site are provided below in **Table 6.3**.

Table 6.3: Area and Coefficient Comparison

Site	Area (ha)	Coefficient (C)	AxC
Copperwood Estates Report			
NW-31	0.935	0.70	0.658
Proposed Block 73			
Proposed Block 73	0.922	0.67	0.618
ROW area included in NW-31	0.013	0.46	0.006
Revised NW-31 Catchment	0.935	0.67	0.624

As depicted in the table above, the proposed site AxC is lower than assumed during the pond design. As such the downstream pond has capacity for the proposed development.

Refer to **Appendix E** for calculations regarding the site coefficient.

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 SWM Pond for the **Copperwood Estates subdivision**. The major overland system is shown on the Grading Plan (drawing 125113-GR).

7.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures will be implemented during construction in accordance with the “Guidelines on Erosion and Sediment Control for Urban Construction Sites” (Government of Ontario, May 1987).

Typical erosion and sediment control measures recommended include, but are not limited to, the use of silt fences around perimeter of site (OPSD 219.110), catch basin inserts under catch basin/maintenance hole lids, heavy duty silt fence barrier (OPSD 219.130), mud mats, silt bags for dewatering operations, topsoil and sod to disturbed areas and natural grassed waterways. Dewatering and sediment control techniques will be developed for the individual situations based on the above guidelines and utilizing typical measures to ensure erosion and sediment control is controlled in an acceptable manner and there is no negative impact to adjacent Lands, water bodies or water treatment/conveyance facilities.

It will be the responsibility of the Contractor to submit a detailed construction schedule and appropriate staging, dewatering and erosion and sediment control plans to the Contract Administrator for review and approval prior to the commencement of work. A copy of the City of Ottawa Special Provision F-1004 will become part of any contract, and outlines the contractual requirements which includes preparation of a detailed erosion and sediment control plan.

General

- All erosion and sediment control measures are to be installed to the satisfaction of the engineer, the municipality and the conservation authority prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and remain present during all phases of site preparation and construction.
- A qualified inspector should conduct daily visits during construction to ensure that the contractor is working in accordance with the design drawings and that mitigation measures are being implemented as specified.
 - A heavy duty silt fence barrier is to be installed in the locations shown on the Erosion and Sediment Control Plan.
 - Catch basin inserts are to be placed under the grates of all proposed and existing catchbasins and structures.
 - After complete build-out, all sewers are to be inspected and cleaned and all sediment and construction fencing is to be removed.
- The contractor shall ensure that proper dust control is provided with the application of water (and if required, calcium chloride) during dry periods.
- The contractor shall immediately report to the engineer or inspector any accidental discharges of sediment material into any ditch or sewer system. Appropriate response measures shall be carried out by the contractor without delay.
- Refer to the Erosion and Sediment Control Plan (drawing 125113-ESC) for additional information.

The contractor acknowledges that failure to implement erosion and sediment control measures may result in penalties imposed by any applicable regulatory agency.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Watermain

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

- The proposed 200mm dia. private watermain which connects to the existing 300mm watermain within rue Spoor Street, and Buckbean Avenue can service 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 existing and proposed sanitary system confirms the following:

- It is proposed to service the development with a proposed 200mm private sanitary sewer which will connect to the existing manhole within the rue Spoor Street right-of-way.
- It is anticipated there is adequate capacity within the existing sanitary infrastructure to service the development.

Stormwater Management

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

- The proposed private storm sewer system is to connect to the storm sewers within in the rue Spoor Street right-of-way.
- Storm flows will be attenuated through the implementation of inlet control devices.
- As per existing conditions major overland flow routes have been provided to the surrounding rights-of-way.
- Quality control is provided by the existing downstream SWM facility.

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:

Anjush

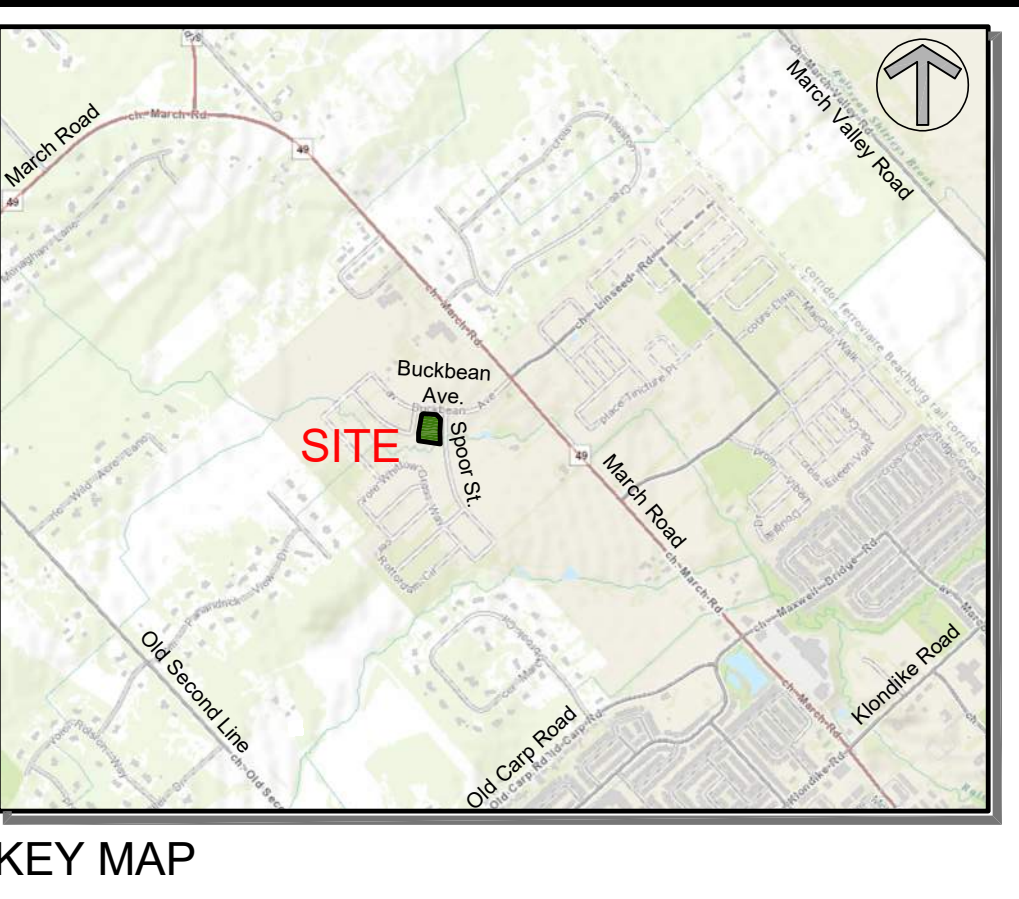
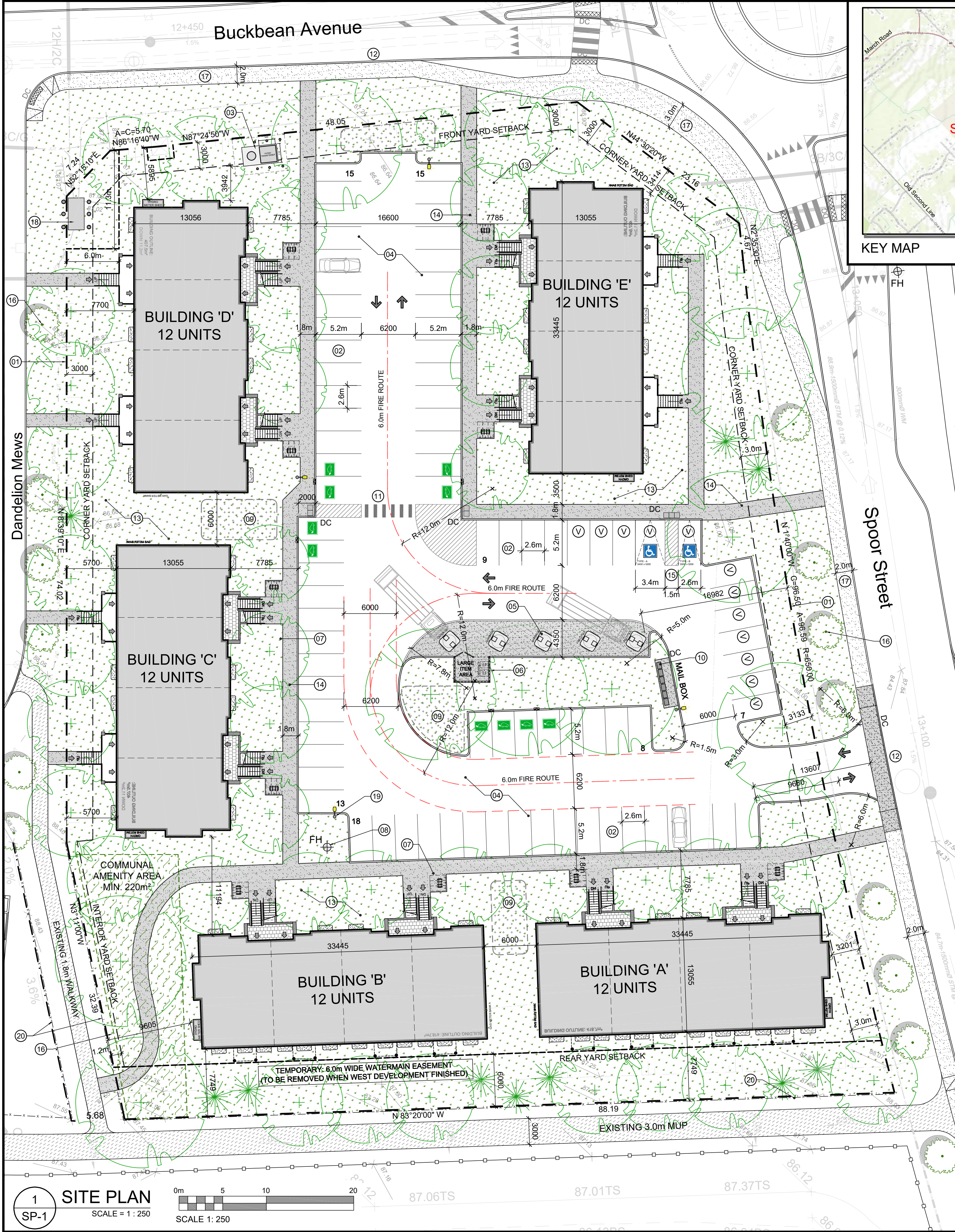
Anjush Musyaju, EIT
Land Development Engineering

Reviewed by:



Anthony Mestwarp, P.Eng
Project Manager
Land Development Engineering

Appendix A
Site Plan & Legal



PROJECT INFORMATION			
Zoning By-law 2008-250 / 2026-50	R4Z / N4B	SITE AREA	0.9 ha.
			9,219.4 m ² 99,237 ft ²
ZONING	REQUIRED	PROVIDED	
ZONE: PLANNED UNIT DEVELOPMENT: STACKED STYLE TOWNHOUSE	R4Z / N4B	R4Z / N4B	
BUILDING HEIGHT	14.5m	9.3m	
MINIMUM LOT WIDTH	7.5m	53.8m	
MINIMUM LOT AREA	1,400m ²	9,219.4m ²	
FRONT YARD SETBACK: BUCKBEAN AVENUE	3.0m	5.8m	
CORNER YARD SETBACK: SPOOR STREET & DANDELION MEWS	3.0m	6.8m & 5.7m	
INTERIOR YARD SETBACK: PATHWAY	1.2m	9.6m	
REAR YARD SETBACK	6.0m	7.7m	
BUILDING SETBACK TO A PRIVATE WAY	1.8m	4.8m	
BUILDING SEPARATION (UNDER 14.5m HT.)	1.2m	6.0m	
AMENITY AREA - TOTAL 6.0m ² PER UNIT	360.0m ²	380.0m ²	
AMENITY AREA - 50% COMMUNAL PER UNIT	180.0m ²	220.0m ²	
VEHICLE PARKING: RESIDENTIAL - 1.2 PER UNIT	72	73	
VEHICLE PARKING: VISITOR - 0.2 PER UNIT	12	12	
BICYCLE PARKING - RESIDENTIAL - 0.5 PER UNIT	30	30	
WALKWAY & DRIVEWAY MINIMUM / MAXIMUM WIDTH	6.0m / 6.7m	6.2m / 6.7m	
MINIMUM WIDTH OF LANDSCAPED AREA - ABUTTING A RESIDENTIAL ZONE	3.0m	9.6m	
MINIMUM WIDTH OF LANDSCAPED AREA - ABUTTING A STREET	3.0m	3.0m	
MINIMUM WIDTH OF LANDSCAPED AREA - AROUND A PARKING LOT	15%	26.5%	
MINIMUM LANDSCAPED AREA - IN A PLANNED UNIT DEVELOPMENT	25%	43.3%	
MINIMUM AGGREGATED SOFT LANDSCAPE AREA - 3.0m SETBACK & LOT WIDTH 12m+	40%	97.5%	

IT IS THE RESPONSIBILITY OF THE APPROPRIATE CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.

ALL CONTRACTORS MUST COMPLY WITH ALL PERTINENT CODES AND BY-LAWS.

THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

DO NOT SCALE DRAWINGS.

7			
6			
5			
4	REVISED AS PER ROUND 1 CITY COMMENTS	2026 07 24	
3	ISSUED FOR SPC APPLICATION	2026 03 27	
2	ISSUED FOR OWNER / CONSULTANT REVIEW	2026 03 16	
1	ISSUED FOR PRELIMINARY REVIEW	2026 01 13	
No.	DESCRIPTION	DATE	

ARCHITECT SEAL:

ARCHITECT ASSOCIATION

ARCHITECTS

CLARIDGE HOMES

ARCHITECT:

CLARIDGE HOMES

ARCHITECT:

CLARIDGE HOMES

ARCHITECT:

CLARIDGE HOMES

CLIENT:

CLARIDGE HOMES

ARCHITECT:

CLARIDGE HOMES

ARCHITECT:

CLARIDGE HOMES

PROJECT TITLE:

COPPERWOOD ESTATES

1100 SPOOR STREET
BLOCK 73: NORTH KANATA

OTTAWA ONTARIO

SHEET TITLE:

SITE PLAN

DRAWN:

R.V.

CHECKED:

RV

SCALE:

1:250

PROJECT No.

2513

SHEET No.

SP-1

PROJECT DEVELOPER
Claridge Homes
505 Preston Avenue
Ottawa ON, K1S 4N7
Tel.: (613) 233-6030
E-Mail: shawn.malhotra@claridgehomes.com
E-Mail: marc.stpierre@claridgehomes.com
E-Mail: victoria.st.pierre@claridgehomes.com

URBAN PLANNER
Novatech Eng. Consultants Limited
200 - 240 Michael Cowpland Drive
Ottawa, Ontario, K2M 1P6
Tel: 613 254-9643
Email: r.tran@novatech-eng.com

CIVIL ENGINEER
Novatech Eng. Consultants Limited
200 - 240 Michael Cowpland Drive
Ottawa, Ontario, K2M 1P6
Tel: 613 254-9643
Email: g.mcdonald@novatech-eng.com

LANDSCAPE ARCHITECT
James B. Lennox & Associates Inc.
3332 Carling Ave.
Ottawa, Ontario K2H 5A8
Tel: 613-722-5168
Email: ml@jbla.ca

TRANSPORTATION ENGINEER
Novatech Eng. Consultants Limited
200 - 240 Michael Cowpland Drive
Ottawa, Ontario, K2M 1P6
Tel: 613 254-9643
Email: B.byvelts@novatech-eng.com

GEOTECHNICAL ENGINEER
Paterson Group
9 Auriga Drive
Ottawa, Ontario K2E 7T9
Tel: 613.226-7381
Email: sdennis@patersongroup.ca

LEGAL DESCRIPTION
PRELIMINARY 4M-PLAN
BLOCK 73
Geographic Township of March
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebakk Ltd.

SURVEYOR
Annis O'Sullivan Vollebakk Ltd.
14 Concourse Gate, Suite 500,
Nepean, Ontario K2E 7S6
Tel: (613) 727-0850
E-Mail: TravisH@aovltd.com

- DRAWING NOTES**
- PROPERTY LINE
 - PARKING SPACE: STANDARD SIZE 2.6 x 5.2 METRES
 - PROPOSED HYDRO TRANSFORMER
 - ASPHALT DRIVING SURFACE
 - IN GROUND WASTE / RECYCLING BINS
 - ORGANIC WASTE / OVER SIZED GARBAGE ENCLOSURE 2.0m HIGH OPAQUE SCREEN AROUND PERIMETER
 - BICYCLE PARKING SPACES 0.6m x 1.8m (8) WITH RACK
 - PROPOSED HYDRANT
 - SEASONAL SNOW STORAGE
 - CANADA POST MAIL BOXES ON CONCRETE SURFACE
 - 1.8m WIDE PAINTED CROSSWALK WITH TWSI & DC
 - DEPRESSED STREET CURB & SIDEWALK, CONTINUOUS AND DEPRESSED @ DRIVEWAY
 - SOFT LANDSCAPED AREA, SEE LANDSCAPING
 - 1.8m WIDE CONCRETE WALK
 - ACCESSIBLE PARKING SPACE WITH ACCESS AISLE, DEPRESSED CURB AND TWSI
 - PROPOSED SUBDIVISION TREES TO BE PLANTED BY OTHERS
 - EXISTING CITY SIDEWALK, WIDTH VARIES
 - EXISTING HYDRO TRANSFORMER WITH EASEMENT
 - LIGHT POLE: LOCATION TO BE CONFIRMED BY ELEC.
 - EXISTING CHAIN LINK FENCE TO REMAIN, ALTER AS REQUIRED FOR NEW CONNECTION PATH

- SITE PLAN SYMBOLS**
- CONCRETE UNIT PAVERS PATIOS
 - SOFT LANDSCAPING
 - COMMUNAL AMENITY SPACE
 - SNOW STORAGE
 - CONCRETE WALK / PATH
 - BIKE RACK / BIKE PARKING SPOT (0.6 x 1.8m)
 - TWO WAY VEHICLE CIRCULATION
 - MAIN ENTRANCE
 - PROPERTY LINE
 - ZONING SETBACKS
 - STANDARD PARKING SPACE 2.6m x 5.2m
 - VISITOR PARKING SPACE 2.6m x 5.2m
 - ELECTRIC VEHICLE REAR PARKING SPACE WITH CHARGING POST
 - ACCESSIBLE PARKING SPACE WITH 1.5 AISLE DEPRESSED CURB & TWSI

GROSS BUILDING - AREAS	
(CITY OF OTTAWA'S DEFINITION)	
PROPOSED BUILDING 'A'	1,256.0 m ² 13,520 ft ²
PROPOSED BUILDING 'B'	1,256.0 m ² 13,520 ft ²
PROPOSED BUILDING 'C'	1,256.0 m ² 13,520 ft ²
PROPOSED BUILDING 'D'	1,256.0 m ² 13,520 ft ²
PROPOSED BUILDING 'E'	1,256.0 m ² 13,520 ft ²
TOTAL PROPOSED AREA	6,280.0 m ² 67,600 ft ²

UNIT STATISTICS	
2 BEDROOM UNIT	60

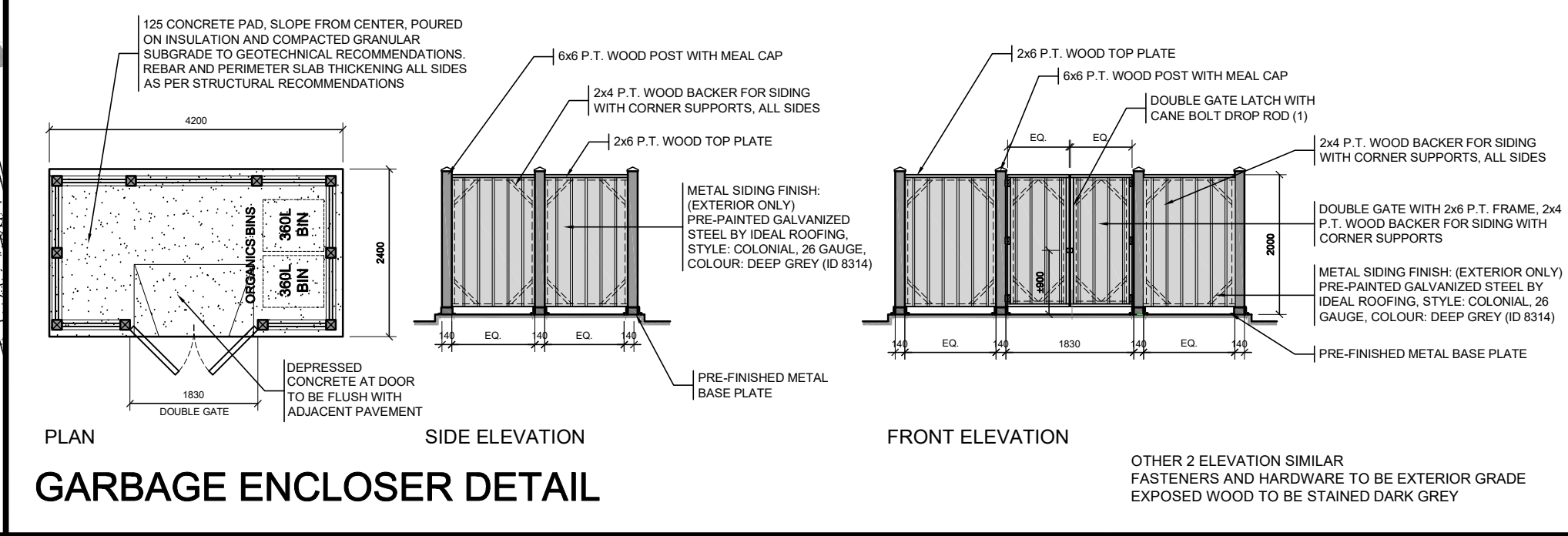
CAR PARKING	
REQUIRED BY ZONING BY-LAW	
RESIDENCE	- 1.2 PER UNIT 72
VISITOR	- 0.2 PER DWELLING UNIT 12
TOTAL	84
PROVIDED	
RESIDENCE	- 1.2 PER UNIT 73
VISITOR	- 0.2 PER DWELLING UNIT 12
TOTAL	85

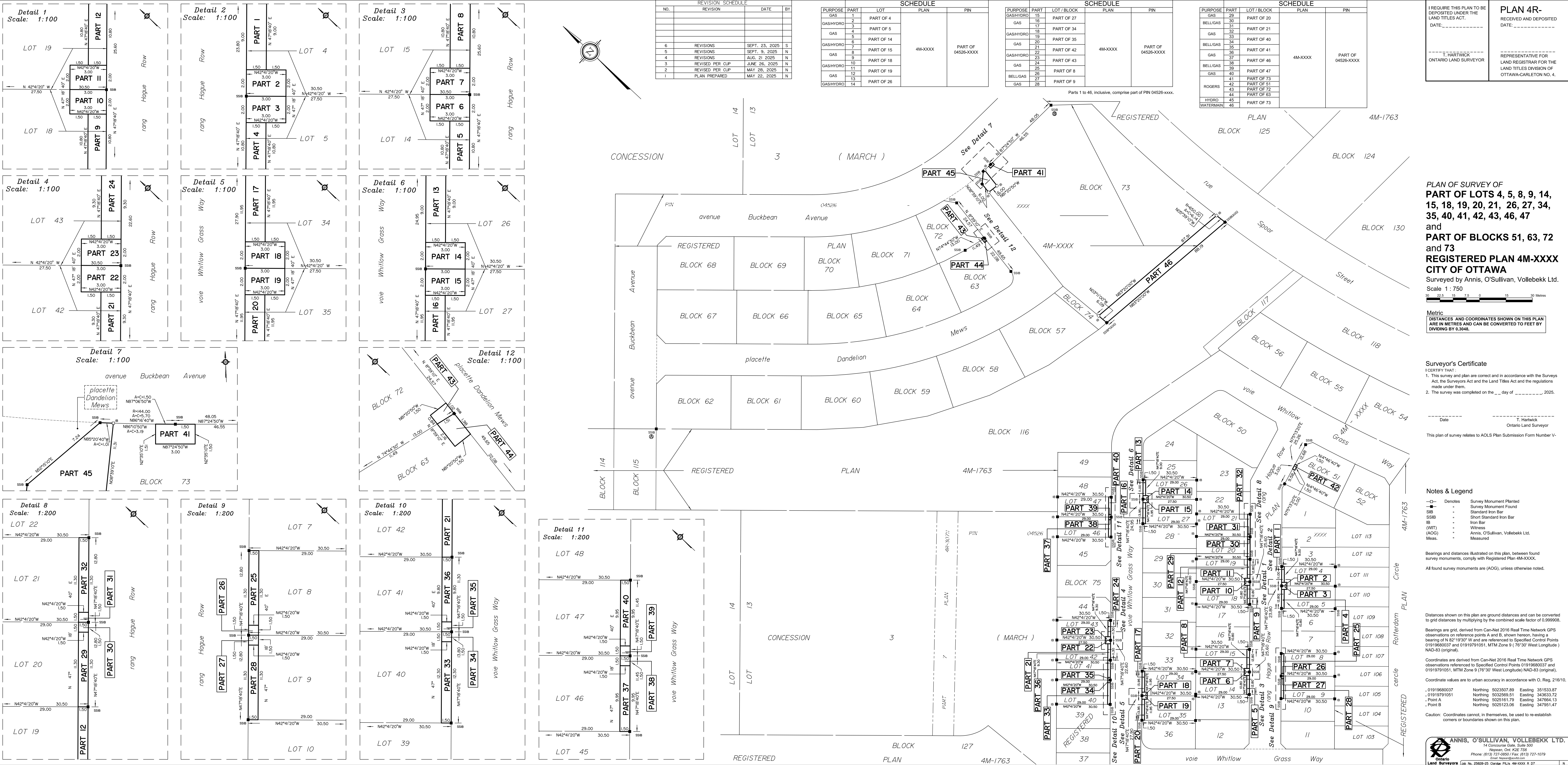
BICYCLE PARKING	
REQUIRED	
	- 0.5 PER UNIT 30
PROVIDED	
	30

WASTE COLLECTION			
GUIDELINES			
GARBAGE	- 0.231 YARDS ³ / UNIT	13.9 YARDS ³	
RECYCLING (GMP)	- 0.018 YARDS ³ / UNIT	1.1 YARDS ³	
RECYCLING (FIBRE)	- 0.062 YARDS ³ / UNIT	3.7 YARDS ³	
ORGANICS	- 240L CONTAINER / 50 UNITS 1.2 x 240L		
REQUIRED PROVIDED			
GARBAGE	3 EARTHBINS	3 EARTHBINS	
RECYCLING (GMP)	1 EARTHBIN	1 EARTHBIN	
RECYCLING (FIBRE)	1 EARTHBIN	1 EARTHBIN	
ORGANICS	2 x 240L BINS	2 x 240L BINS	
LARGE ITEM GARBAGE	N/A	5 m ²	
		*EARTHBINS= (6.5 YARDS ³)	

AMENITY REQUIREMENT	
REQUIRED AMENITY SPACE	
6.0 m ² PER UNIT =	360.0 m ²
50% COMMUNAL AMENITY AREA =	180.0 m ²
PROVIDED AMENITY SPACE	
PRIVATE BALCONY / PATIOS =	160.0 m ²
COMMUNAL EXTERIOR AREA =	220.0 m ²
TOTAL =	380.0 m ²

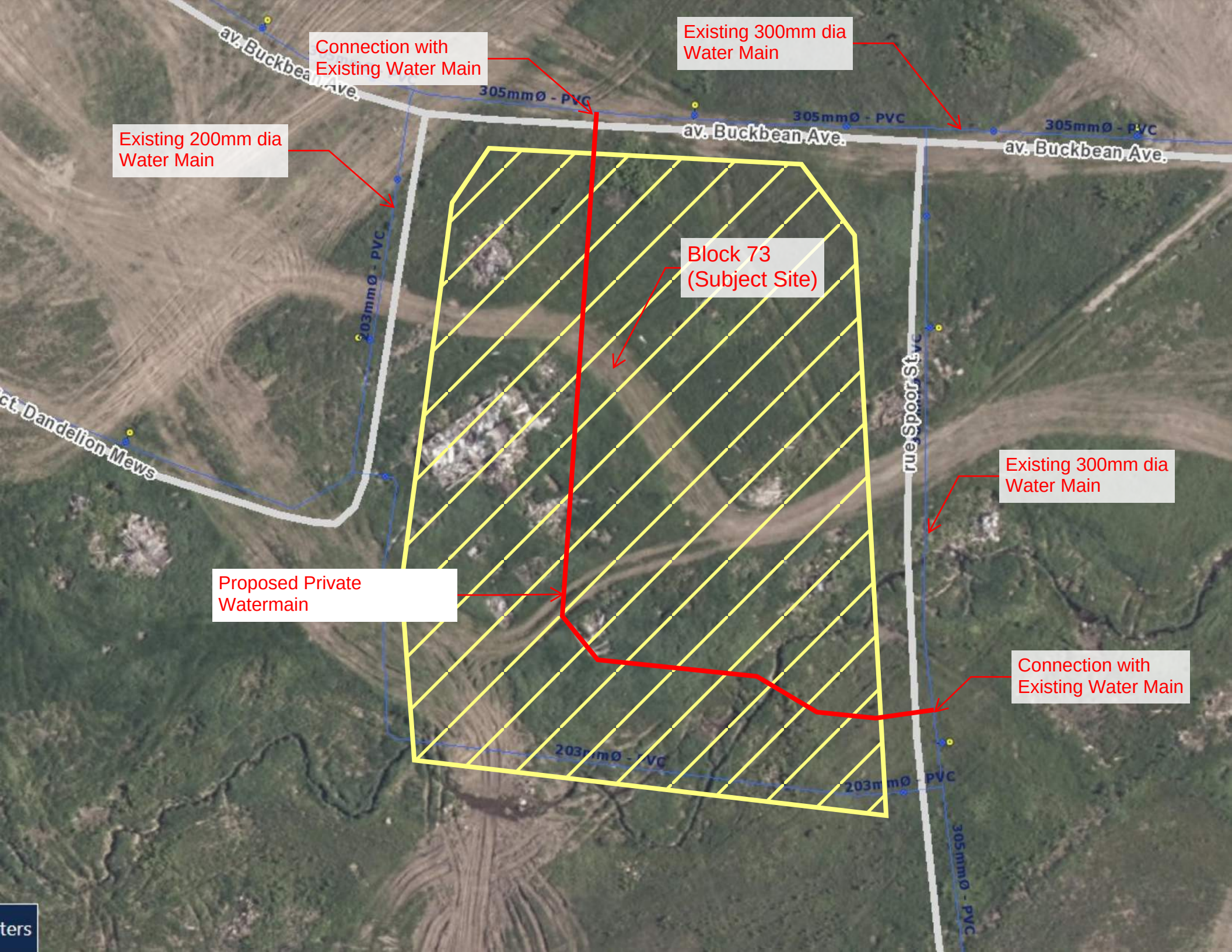
SITE COVERAGE	
BUILDING FOOTPRINT =	22.7% 2,093.5 m ²
DRIVING SURFACE =	27.2% 2,509.3 m ²
LANDSCAPE AREA =	50.1% 4,616.6 m ²
TOTAL =	100.0% 9,219.4 m ²
HARD SURFACE WALK AREA =	6.7% 621.0 m ²
SOFT LANDSCAPE AREA =	43.3% 3,995.6 m ²





Appendix B

Water Servicing



Connection with
Existing Water Main

Existing 300mm dia
Water Main

Existing 200mm dia
Water Main

Block 73
(Subject Site)

Proposed Private
Watermain

Existing 300mm dia
Water Main

Connection with
Existing Water Main

av. Buckbean Ave.

av. Buckbean Ave.

av. Buckbean Ave.

ct. Dandelion Mews

rue Spoor Stvc

305mmØ - PVC

305mmØ - PVC

305mmØ - PVC

203mmØ - PVC

203mmØ - PVC

203mmØ - PVC

305mmØ - PVC

Water Demand Design Sheet



Boundary Condition Request

Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 12/19/2025
Input By: Anjush Musyaju, E.I.T
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference:

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	Area (ha.)	Pop. Equiv.	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential Input						
Stacked Towns	60		126.00	0.41	3.88	5.84
Totals	60	0.00	126.00	0.41	3.88	5.84

Summary

i. Type of Development and Units:	Low-Rise Stacked Flats-5 Blocks, 12 Units per Block
ii. Site Address:	1100 Spoor Street (Block 73)
iii. Proposed Water Service Connection Location(s):	Spoor Street and Buckbean Ave
iv. Average Day Flow Demand:	0.41 L/s
v. Peak Hour Flow Demand:	5.84 L/s
vi. Maximum Day Flow Demand:	3.88 L/s
vii. Required Fire Flow #1:	16000 L/min
viii. Required Fire Flow #2:	L/min
ix. Required Fire Flow #3:	L/min

Design Parameters

Residential					
Unit Type Population Equiv.	Singles	Semis/ Towns	Apts (2-BR) / Stacked Towns	Apts (1-BR)	Apts (Avg)
	3.4	2.7	2.1	1.4	1.8
Daily Demand	L/per person/day				
Average Demand	280				
Basic Demand	200				

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	Other Use
Light	Heavy			
L/gross ha/day				L/m²/day
35,000	55,000	28,000	28,000	5
10,000	17,000	17,000	17,000	3

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

FUS - Fire Flow Calculations

Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 12/19/2025
Input By: Anjush Musyaju, E.I.T
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-SEP

Legend: Input by User

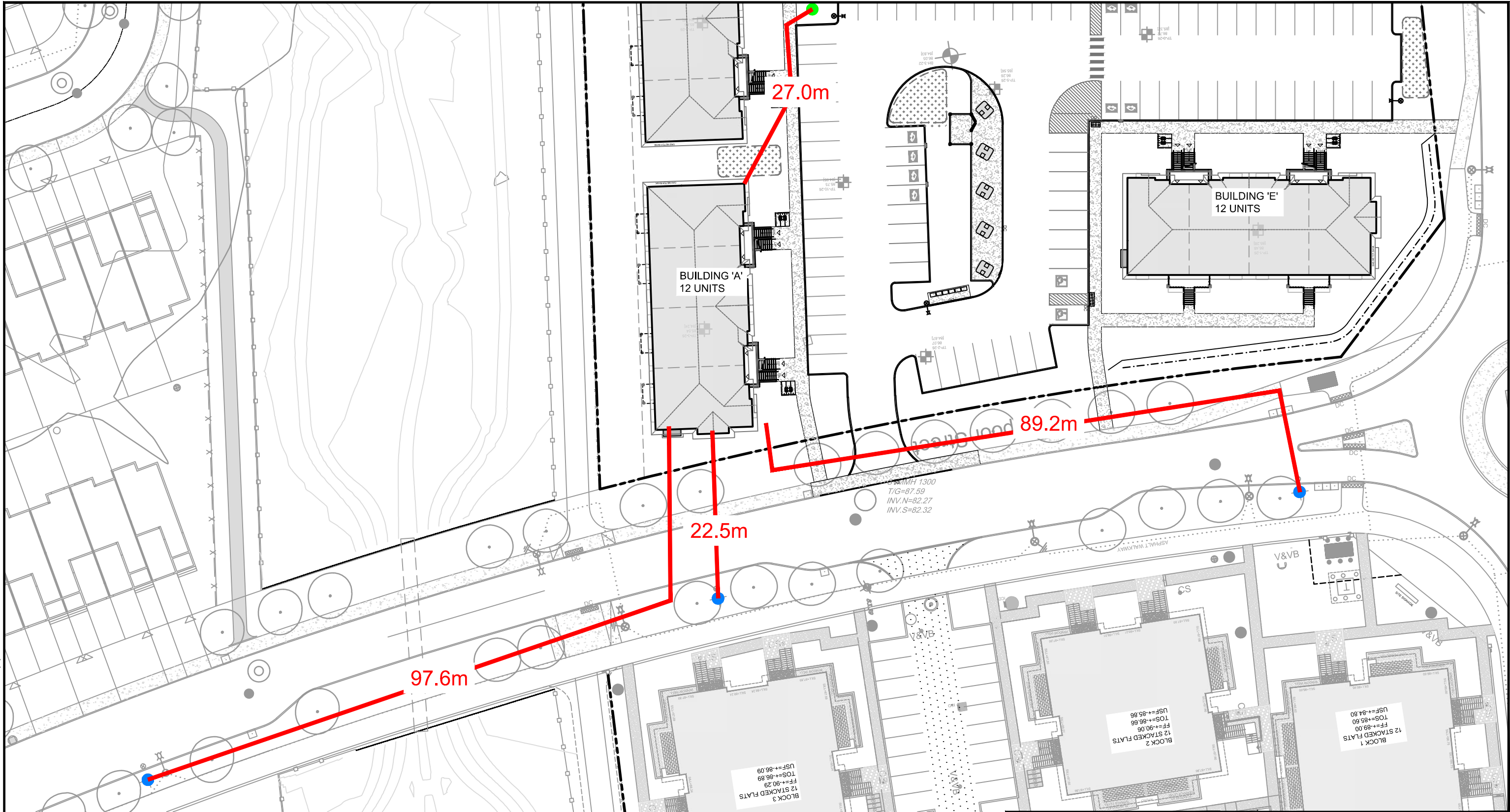
No Input Required

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

Building Description: 12 Unit Stacked Town
Type V - Wood frame

Step		Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow					
1	Construction Material		Multiplier		1.5
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	
		Type IV - Mass Timber		Varies	
		Type III - Ordinary construction		1	
		Type II - Non-combustible construction		0.8	
		Type I - Fire resistive construction (2 hrs)		0.6	
2	Floor Area				12,000
	A	Building Footprint (m ²)	420		
		Number of Floors/Storeys	3		
		Protected Openings (1 hr) if C<1.0	No		
		Area of structure considered (m ²)		1,260	
	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	10,200
	(1)	Non-combustible		-25%	
		Limited combustible	Yes	-15%	
		Combustible		0%	
		Free burning		15%	
		Rapid burning		25%	
4	Sprinkler Reduction		FUS Table 4	Reduction	0
	(2)	Adequately Designed System (NFPA 13)	No	-30%	
		Standard Water Supply	No	-10%	
		Fully Supervised System	No	-10%	
		Cumulative Sub-Total		0%	
		Area of Sprinklered Coverage (m²)	0	0%	
5	Exposure Surcharge		FUS Table 5	Surcharge	5,100
	(3)	North Side	3.1 - 10 m	20%	
		East Side	>30m	0%	
		South Side	10.1 - 20 m	15%	
		West Side	10.1 - 20 m	15%	
		Cumulative Total		50%	
Results					
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	15,000
		(2,000 L/min < Fire Flow < 45,000 L/min)		or L/s	250
				or USGPM	3,963

C:\Temp\AcPublish_37104125113-COV.dwg, BUILDING 'A', Mar 26, 2026 - 10:15am, amusyaju



LEGEND

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



NOVATECH

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

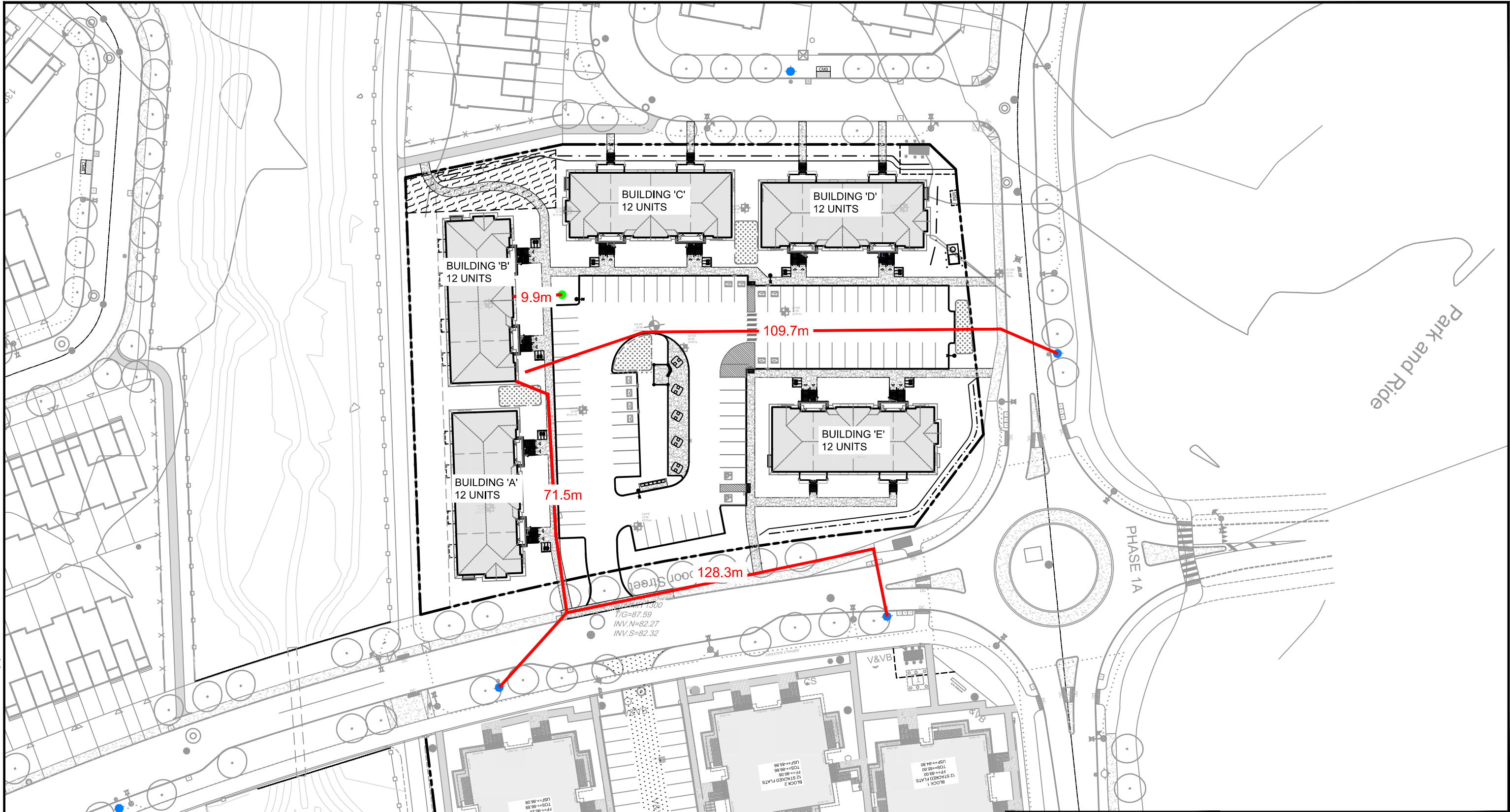
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

1100 SPOOR STREET
(BLOCK 73) COPPERWOOD

FUS COVERAGE

SCALE	1 : 500	0 5m 10m 20m
DATE	JULY 2026	JOB 125113
FIGURE	COV-A	

C:\Temp\AcPublish_37104125113-COV.dwg, BUILDING 'B', Mar 26, 2026 - 10:15am, amusyaju



LEGEND

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



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

1100 SPOOR STREET
(BLOCK 73) COPPERWOOD

FUS COVERAGE

SCALE	1 : 750	0	10	20	30
DATE	JULY 2026	JOB	125113	FIGURE	COV-B

C:\Temp\AcPublish_37104125113-COV.dwg, BUILDING 'C', Mar 26, 2026 - 10:15am, amusyaju

LEGEND

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

WATERMAIN AND
CORRESPONDING 6mm EASEMENT
THROUGH BLOCK 73 IS
TEMPORARILY AND ONLY REQUIRED
UNTIL A WATERMAIN LOOP
IS COMPLETED AND DEEMED
INSERVICE. SUBSEQUENTLY, THE
WATERMAIN LOOP THROUGH
BLOCK 73 FROM SPOOR STREET
TO DUNDAS STREET CAN BE
DECOMMISSIONED AND REMOVED.
ALONG THE EASEMENT CORRIDOR,
APPROVED PLAN AND PROFILE -
REFER TO COPPERWOOD PHASE 2
BLOCK 74 - WATERMAIN REMOVAL
1:10.00 PREPARED FOR DETAILS
DECOMMISSIONING.

BUILDING 'B'
12 UNITS

BUILDING 'A'
12 UNITS

BUILDING 'C'
12 UNITS

BUILDING 'D'
12 UNITS

BUILDING 'E'
12 UNITS

32.4m

11.6m

74.9m



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

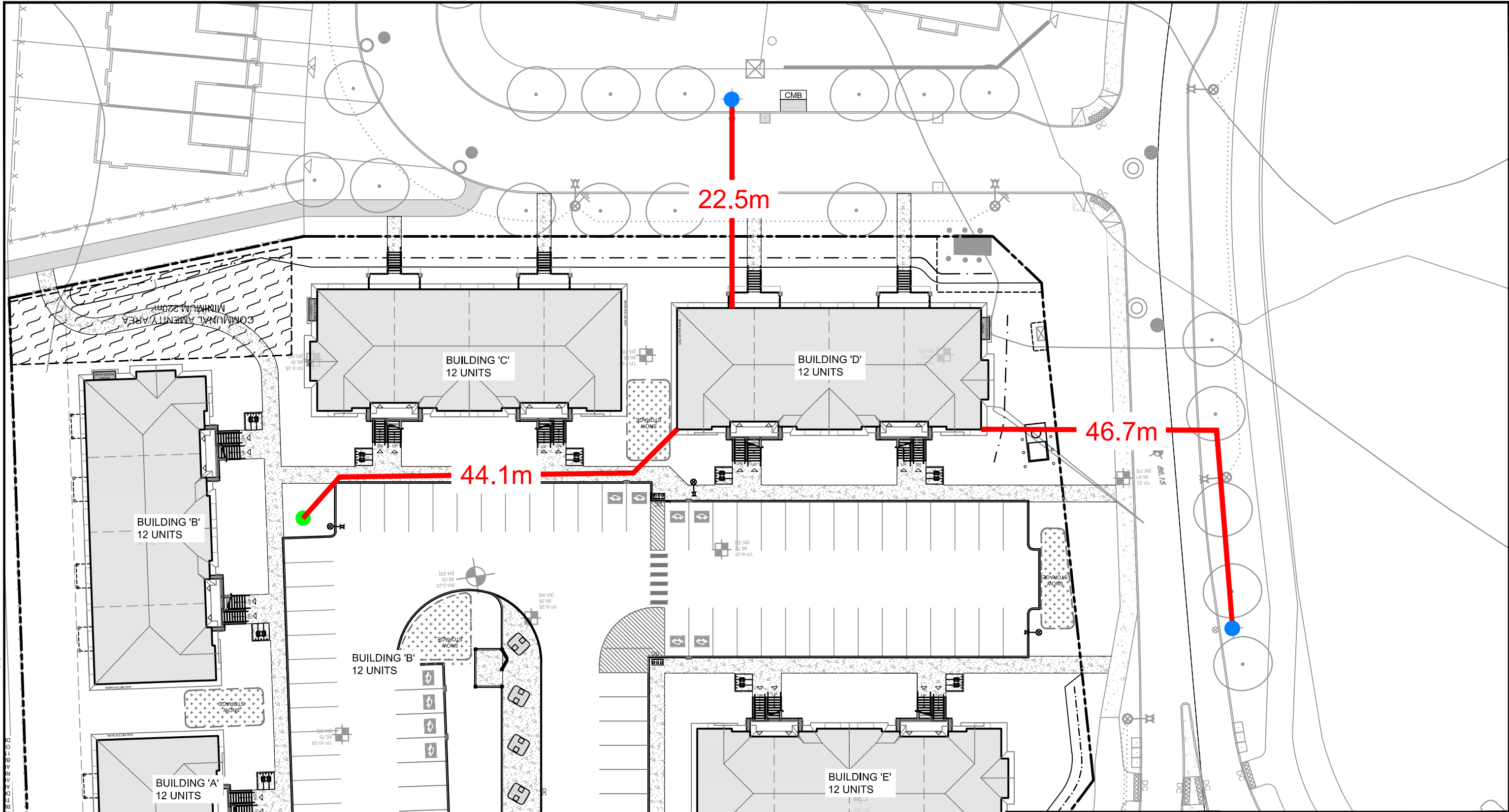
1100 SPOOR STREET
(BLOCK 73) COPPERWOOD

FUS COVERAGE

SCALE 1 : 500

DATE JULY 2026 JOB 125113 FIGURE COV-C

C:\Temp\AcPublish_37104125113-COV.dwg, BUILDING 'D', Mar 26, 2026 - 10:15am, amusyaju



LEGEND

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



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

1100 SPOOR STREET
(BLOCK 73) COPPERWOOD

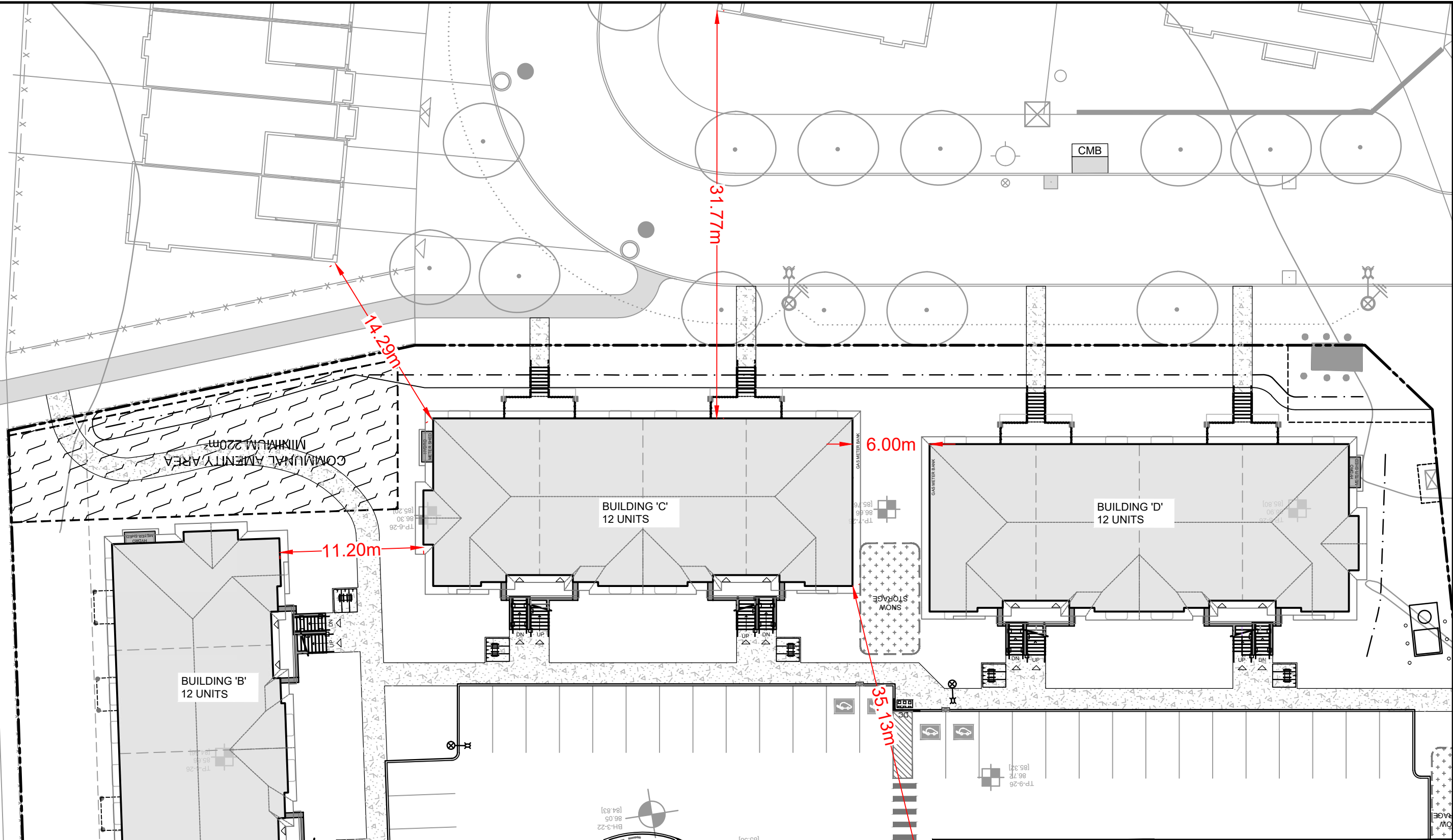
FUS COVERAGE

SCALE	1 : 400	0 4 8 12 16
DATE	JULY 2026	JOB 125113
FIGURE	COV-D	

M:\2025\125113\CAD\Civil\Figures\Servicing\125113-SEP.dwg, BUILDING 'C', Mar 26, 2026 - 10:18am, amusyaju

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

1100 SPOOR STREET
(BLOCK 73) COPPERWOOD

FUS SEPARATION

SCALE 1 : 300

DATE JULY 2026 JOB 125113 FIGURE SEP

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Tuesday, February 24, 2026 5:51 PM
To: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Cc: Polyak, Alex <alex.polyak@ottawa.ca>
Subject: RE: Block 73 Copperwood - 125113

Hi Anthony,

I did - Fire Services clarified that no additional onsite hydrants are needed, as the hydrants located across the collector streets can be used.

Thanks,

Julie Candow, P.Eng
Project Manager
Development Review – West Branch
Planning, Development and Building Services Dept.
110 Laurier Avenue West, 4th Floor East
Ottawa, ON K1P 1J1
613.580.2424 ext. 13850
Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Sent: February 24, 2026 1:43 PM
To: Candow, Julie <julie.candow@ottawa.ca>
Subject: RE: Block 73 Copperwood - 125113

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Julie,

Did you receive any feedback regarding the need for additional site hydrants?

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**

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Tuesday, January 27, 2026 10:40 AM
To: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Subject: RE: Block 73 Copperwood - 125113

Hi Anthony,

Please see attached BC results.

I am waiting to hear back from Fire Services as to the need for an additional private hydrant onsite.

Thanks,

Julie Candow, P.Eng

Project Manager
Development Review – West Branch
Planning, Development and Building Services Dept.
110 Laurier Avenue West, 4th Floor East
Ottawa, ON K1P 1J1
613.580.2424 ext. 13850

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

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

Sent: January 21, 2026 4:07 PM

To: Candow, Julie <julie.candow@ottawa.ca>

Subject: Block 73 Copperwood - 125113

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Juile,

I am working on the engineering design of Block 73 of the Copperwood subdivision; the client has presently opted to proceed without a preconsult for the site. Can you confirm if the City can provide water boundary conditions for the site? If the area is not yet in the model, we can utilize the overall subdivision model to review the available site flows and pressures.

It is proposed to develop the site with a five (5) stacked townhome dwellings each containing 12 units for a total of 60 units

Total demands and fire flows are summarized below.

- Average Daily Demand: 0.41 L/s
- Max Daily Demand: 3.88 L/s
- Peak Hour Demand: 5.84 L/s
- Fire Flow (FUS): 267 L/s

Due to the high demands, it is proposed to connect to the existing City watermain in two (2) locations.

Please refer to the attached for the supporting figures and calculations.

Please let me know if you require anything further.

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**

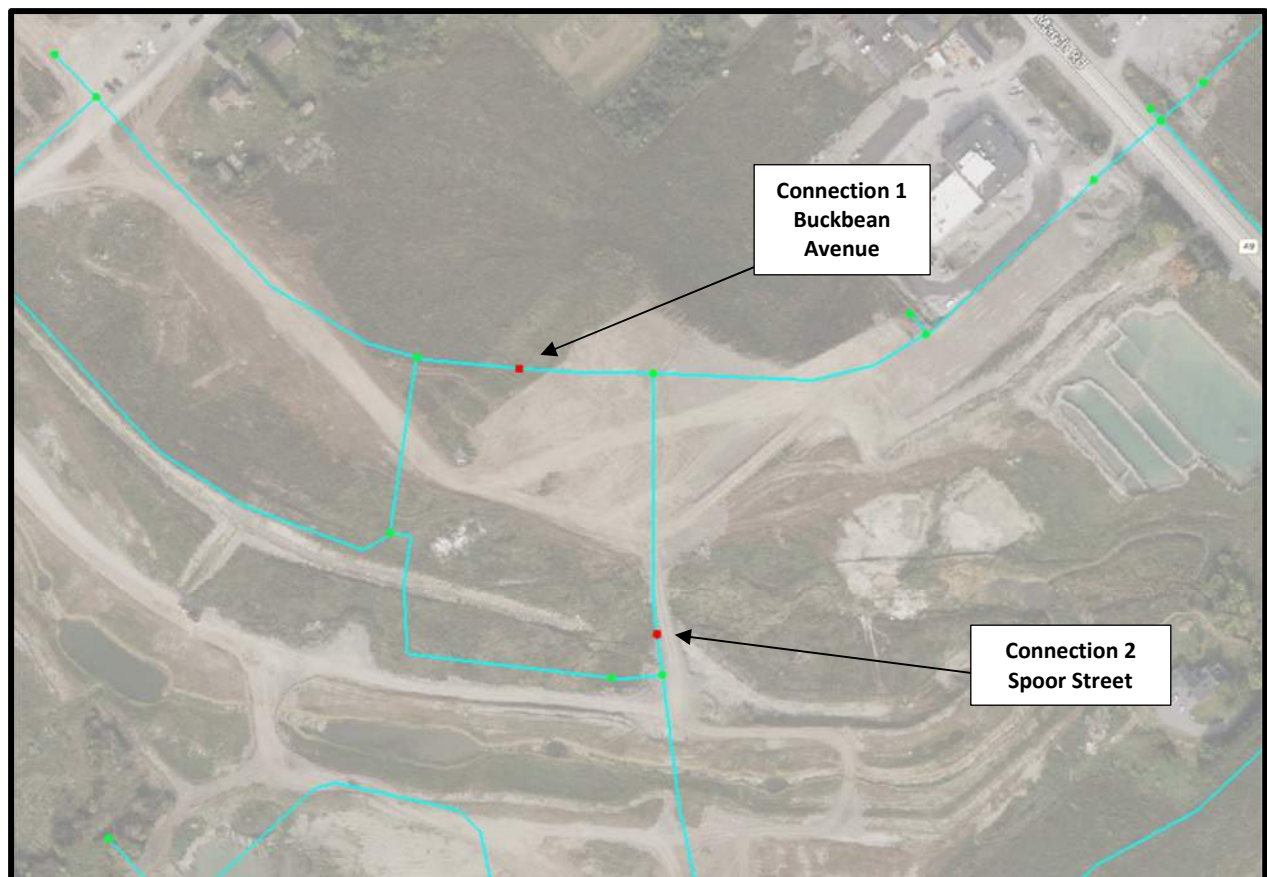
This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you. Le présent courriel a été expédié par le système de courriels de la Ville d'Ottawa. Toute distribution, utilisation ou reproduction du courriel ou des renseignements qui s'y trouvent par une personne autre que son destinataire prévu est interdite. Je vous remercie de votre collaboration.

Boundary Conditions Copperwood – Block 73

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	25	0.41
Maximum Daily Demand	233	3.88
Peak Hour	350	5.84
Fire Flow Demand #1	16,000	266.67

Location



Results

Connection 1 – Buckbean Avenue

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	61.8
Peak Hour	125.2	54.6
Max Day plus Fire Flow #1	105.9	27.3

¹ Ground Elevation = 86.8 m

Connection 2 – Spoor Street

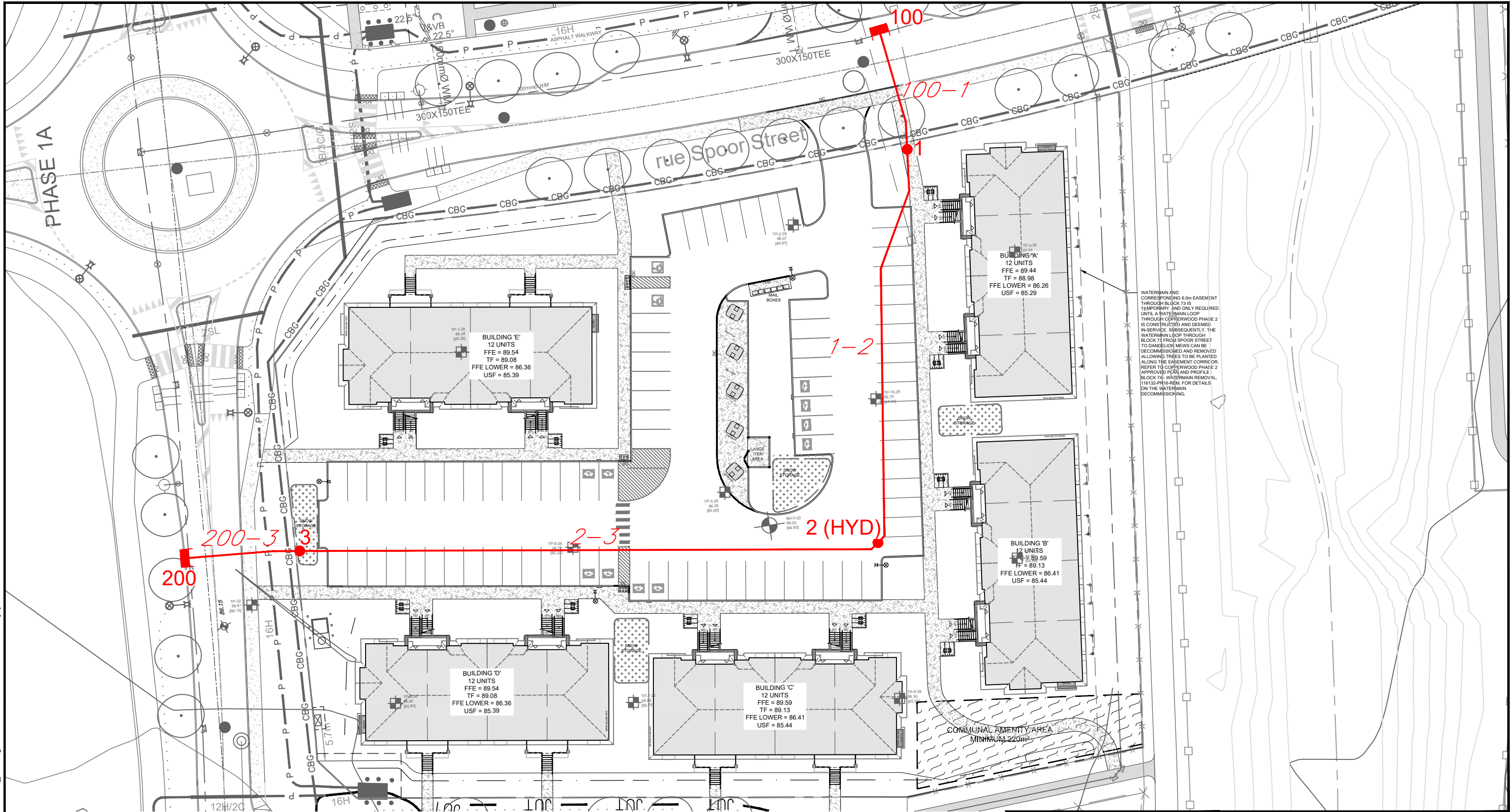
Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	64.4
Peak Hour	125.2	57.2
Max Day plus Fire Flow #1	107.1	31.5

¹ Ground Elevation = 84.9 m

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.

M:\2025\125113\CAD\Civil\Figures\Watermain\125113-EPA_Net.dwg, EPA, Mar 26, 2026 - 10:23am, amusajlu



LEGEND

- 5-4 WATERMAIN PIPE
- 4 WATERMAIN NODE
- 400 RESERVOIR

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
COPPERWOOD FLATS, BLOCK 73

WATERMAIN LAYOUT PLAN

SCALE 1 : 500

DATE JULY 2026 JOB 125113 FIGURE EPA

Water Demand Design Sheet



Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 2/17/2026
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-EPA

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

Location	Total Water Demand																				
Node	Residential Input & Average Demand							Industrial / Commercial / Institutional (ICI) Input & Average Demand						Maximum Day & Peak Hour Demand						Design Fire Demand	
	Singles	Semis / Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)	Pop. Equiv.	Res. Average Day Flow Demand (L/s)	Indust. Area		Comm. Area	Inst. Area	Other Area	ICI Average Day Flow Demand (L/s)	Maximum Day Demand			Peak Hour Demand			Required Fire Flow (RFF)	Max Day + RFF (L/s)
								Light (ha.)	Heavy (ha.)					Res. Peaking Factor	ICI Peaking Factor	Max Day Flow Demand (L/s)	Res. Peaking Factor	ICI Peaking Factor	Peak Hour Flow Demand (L/s)	FUS (L/min)	
J1			9			18.90	0.06						0.00	9.50	1.50	0.58	14.30	2.70	0.88	5,700	95.58
J2 (HYD)			27			56.70	0.18						0.00	9.50	1.50	1.75	14.30	2.70	2.63	5,700	96.75
J3			24			50.40	0.16						0.00	9.50	1.50	1.55	14.30	2.70	2.34	3,600	61.55
Totals	0	0	60	0	0	126.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	9.50	1.50	3.88	14.30	2.70	5.84		

Demand Parameters

Residential					
Unit Type Population Equiv.	Singles	Semis/ Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)
	3.4	2.7	2.1	1.4	1.8
Daily Demand	L/per person/day				
Average Demand	280				
Basic Demand	200				

Institutional / Commercial / Industrial				
Indust.		Comm.	Inst.	Other Use
Light	Heavy			
L/gross ha/day				L/m ² /day
35,000	55,000	28,000	28,000	5
10,000	17,000	17,000	17,000	3

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

Quick Fire Flow Reference Guide			
FUS (L/min)	Comments	OBC (L/min)	Comments
> 2,000	Min FUS	< 9,000	Unsprinklered Non- Combustible
10,000	Low Density - Singles/Towns		
	Complies w/ TB2014-01 Cap. (10m rear spacing, 6 units max, <600 m²)		
	13,000 Non-complying w/TB2014-01. Calculate.		
15,000	Medium Density Back-to-back Towns.		
20,000	High Density		
	Wood Frame 4-Storey		
	5,000 Fire-Resisitve Podium/Multi-Storey		
30,000	High Contiguous / Hazard Areas		
< 45,000	Max FUS		

Water Demand Design Sheet



Maximum Pressure During Average Day (AVDY) Conditions

Novatech Project #: 125113

Project Name: Copperwood-Block 73

Date: 2/17/2026

Input By: Anjush Musyaju, EIT

Reviewed By: Anthony Mestwarp

Drawing Reference: 125113-EPA

Legend: Input by User No Input Required

Acceptable (40psi - 80psi)

Acceptable w/ PRV (81psi - 100psi)

Unacceptable (< 40psi or > 100psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)	Age (hrs)
J1	87.77	0.06	130.20	42.43	60	1
J2 (HYD)	87.50	0.18	130.20	42.70	61	7
J3	87.42	0.16	130.20	42.78	61	1

Water Demand Design Sheet



Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition

Novatech Project #: 125113

Project Name: Copperwood-Block 73

Date: 2/17/2026

Input By: Anjush Musyaju, E

Reviewed By: Anthony Mestwarp, P.Eng

Drawing Reference: 125113-EPA

Legend: Input by User No Input Required

Acceptable (≥ 20 psi)

Unacceptable (< 20 psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
J1	87.77	95.58	105.14	17.37	25
J2 (HYD)	87.50	96.75	104.11	16.61	24
J3	87.42	61.55	104.99	17.57	25

Water Demand Design Sheet



Minimum Pressure During Peak Hour (PKHR) Conditions

Novatech Project #: 125113

Project Name: Copperwood-Block 73

Date: 2/17/2026

Input By: Anjush Musyaju, E

Reviewed By: Anthony Mestwarp, P.Eng

Drawing Reference: 125113-EPA

Legend: Input by User No Input Required

Acceptable (≥ 40 psi)

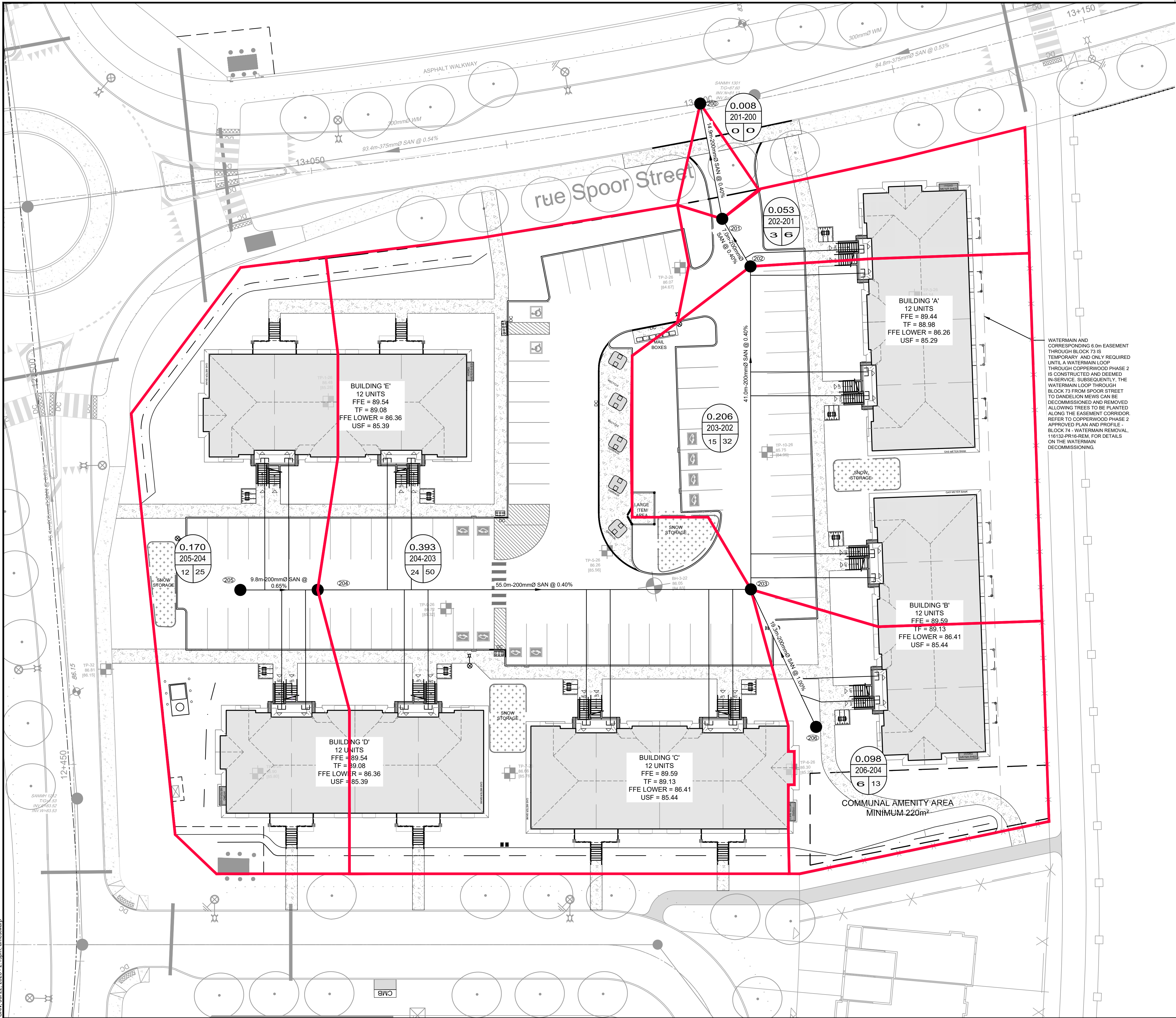
Unacceptable (< 40 psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
J1	87.77	0.88	125.20	37.43	53
J2 (HYD)	87.50	2.63	125.20	37.70	54
J3	87.42	2.34	125.20	37.78	54

Appendix C

Sanitary Servicing



NORTH

KEY PLAN
N.T.S.

LEGEND

SITE PROPERTY LINE

MISC LEGAL LINE (EASEMENT, PROPERTY LINES)
REFER TO LEGAL PLAN FOR DETAILS

PROPOSED SIDEWALK

PROPOSED CURB

PROPOSED DEPRESSED CURB

SWALE c/w SUBDRAIN
AND DIRECTION OF FLOW

PROPOSED TRANSFORMER WITH BOLLARDS

SANITARY DRAINAGE
AREA BOUNDARY

EXISTING DITCH CENTRELINE

EXISTING SANITARY MANHOLE & SEWER

FENCE BY OTHERS

EXISTING DITCH CENTRELINE

EXISTING JOINT UTILITY

EXISTING HYDRO

EXISTING UTILITY CROSSINGS

EXISTING LIGHT STANDARD

EXISTING HYDRO INFRASTRUCTURE

AREA
110-108
24 51

AREA IN HECTARES

MANHOLE TO MANHOLE

POPULATION EQUIVALENT

NOTE:
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	DATE	BY
2.	REVISED PER CITY COMMENTS	JULY 23/2026	ARM
1.	ISSUED FOR SPA	MAR 27/2026	ARM

SCALE

1:250

1:250

0 2 4 6 8 10

DESIGN	AM
CHECKED	ARM
DRAWN	AM
CHECKED	ARM
APPROVED	GJM

FOR REVIEW ONLY

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

LOCATION
1100 SPOOR STREET, CITY of OTTAWA
COPPERWOOD ESTATES (BLOCK 73)

DRAWING NAME
SANITARY DRAINAGE AREA PLAN

PROJECT No.
125113

REV
REV #2

DRAWING No.
125113-SAN

M:\2025\125113\CADD\DWG\125113-SAN.dwg SAN Jul 22, 2026 2:19pm amestwarp

SANITARY SEWER DESIGN SHEET



Novatech Project #: 125113
Project Name: Block 73 Copperwood
Date: 3/27/2026
Revised: 7/22/2026 (ARM)
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-SAN

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output
Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)

Location			Demand														Design Capacity							
	From MH	To MH	Residential Flow											Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design							
			Singles	Semis / Towns	2-Bed Apts	Park Area	Population	Cumulative Population	Average Pop. Flow	Design Peaking Factor M	Peak Design Pop. Flow	Res. Drainage Area	Cumulative Res. Drainage Area	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)		Q(p) (L/s)	(ha.)	(ha.)	(ha.)	Q(e) (L/s)	Q(D) (L/s)	(m)		(m)	n	So (%)	Qfull (L/s)	(m/s)	
Block 73	205	204			12		0.025	0.025	0.08	3.69	0.30	0.170	0.170	0.170	0.06	0.36	9.8	200 PVC	0.203	0.013	0.65	27.6	0.85	1.3%
Block 73	204	203			24		0.050	0.076	0.25	3.62	0.89	0.393	0.564	0.564	0.19	1.07	55.0	200 PVC	0.203	0.013	0.40	21.6	0.67	5.0%
Block 73	206	203			6		0.013	0.013	0.04	3.72	0.15	0.098	0.098	0.098	0.03	0.18	19.3	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%
Block 73	203	202			15		0.032	0.120	0.39	3.58	1.39	0.206	0.868	0.868	0.29	1.67	41.0	200 PVC	0.203	0.013	0.40	21.6	0.67	7.7%
Block 73	202	201			3		0.006	0.126	0.41	3.57	1.46	0.053	0.921	0.921	0.30	1.76	7.0	200 PVC	0.203	0.013	0.40	21.6	0.67	8.1%
Spoor Street	201	1301					0.000	0.126	0.41	3.57	1.46	0.008	0.929	0.929	0.31	1.77	14.9	200 PVC	0.203	0.013	0.40	21.6	0.67	8.2%
Totals			0	0	60	0.000	0.126	0.126	0.41	3.57	1.46	0.929	0.929	0.929	0.31	1.77	147.0							

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 (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)

	<u>Singles</u>	<u>Semis / Towns</u>	<u>2- Bed Apts</u>
P = Residential Population =	3.4	2.7	2.1

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)

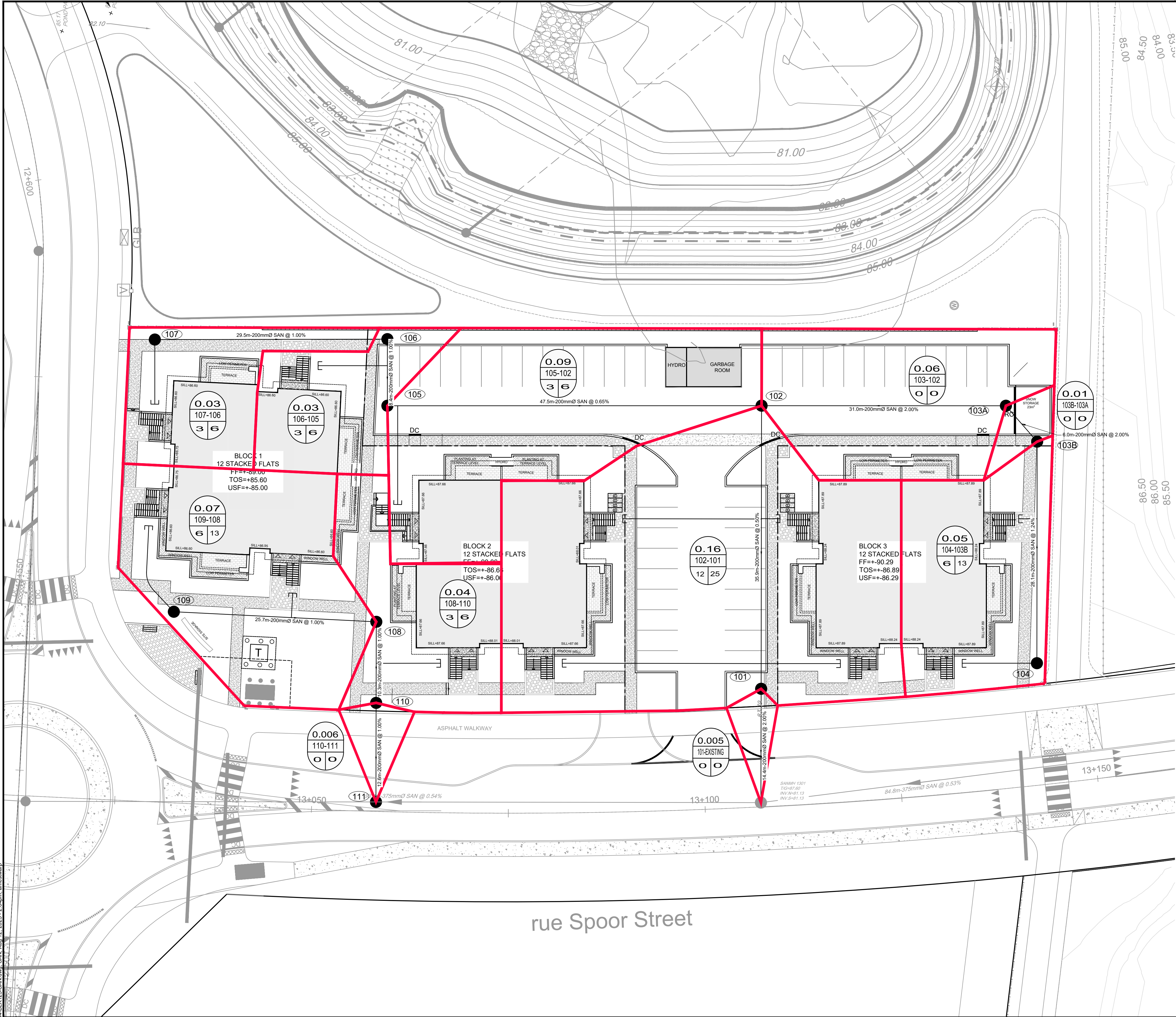
<u>Institutional / Commercial / Industri:</u>	<u>Industrial</u>	<u>Commercial / Institutional</u>
Design =	35000	28000
<u>ICI Peak</u> *		
Design =	1.0	1.5
		* ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)

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



NORTH

KEY PLAN
N.T.S.

LEGEND

- SITE PROPERTY LINE
- MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS
- PROPOSED SIDEWALK
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED ASPHALT DRIVEWAY
- SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY SEWER AND FLOW DIRECTION
- SANITARY DRAINAGE AREA BOUNDARY
- AREA IN HECTARES
- MANHOLE TO MANHOLE
- POPULATION EQUIVALENT
- SAN MH
- 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

3.	REVISED PER CITY COMMENTS	AUG 19/25	GJM	
2.	REVISED PER COMPLETENESS REVIEW COMMENTS	MAY 09/25	GJM	
1.	ISSUED FOR SITE PLAN APPLICATION	MARCH 21/25	GJM	
No.	REVISION	DATE	BY	

SCALE

1:250

1:250

0 2 4 6 8 10

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

FOR REVIEW ONLY

ISSUED FOR REVIEW

ISSUED FOR REVIEW

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

LOCATION 1101 SPOOR STREET, CITY OF OTTAWA COPPERWOOD FLATS - BLOCK 125	
DRAWING NAME SANITARY DRAINAGE PLAN	
PROJECT No.	122144
REV	REV#3
DRAWING No.	122144-SAN

REFER TO 122144-ND FOR ADDITIONAL NOTES & DETAILS

M:\2025\122144\LOCK 307\CAD\Civil\122144-BLK125-SAN.dwg, SAN, Aug 12, 2025 - 2:04pm, ameswarp

PLANNING.DWG - 8/11/2025

D07-125-008

SANITARY SEWER DESIGN SHEET



Novatech Project #: 122144
Project Name: Copperwood Flats - Block 125
Date: 3/19/2025
Revised 05/08/2025 (Anthony Mestwarp)
Revised 08/12/2025 (Anthony Mestwarp)
Input By: Curtis Ferguson, E.I.T.
Reviewed By: Anthony Mestwarp, P.Eng.
Drawing Reference: 122144-SAN

Legend:

Design Input by User

As-Built Input by User

Cumulative Cell

Calculated Design Cell Output

Calculated Annual Cell Output

Calculated Rare Cell Output

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)

Location			Demand														Design Capacity									
Street	From MH	To MH	Residential Flow											Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design									
			Singles	Semis / Towns	Stk. Towns	Park Area	Population	Cumulative Population	Average Pop. Flow	Design Peaking Factor M	Peak Design Pop. Flow	Res. Drainage Area	Cumulative Res. Drainage Area	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)		Q(p) (L/s)	(ha.)	(ha.)	(ha.)	Q(e) (L/s)	Q(D) (L/s)	(m)		(m)	n	So (%)	Qfull (L/s)	(m/s)			
South Connection																										
Copperwood Flats	107	106			3		0.006	0.006	0.02	3.75	0.08	0.034	0.034	0.034	0.01	0.09	29.5	200 PVC	0.203	0.013	1.00	34.2	1.06	0.3%		
Copperwood Flats	106	105			3		0.006	0.013	0.04	3.72	0.15	0.031	0.065	0.065	0.02	0.17	8.4	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%		
Copperwood Flats	105	102			3		0.006	0.019	0.06	3.71	0.23	0.090	0.154	0.154	0.05	0.28	47.5	200 PVC	0.203	0.013	0.65	27.6	0.85	1.0%		
Copperwood Flats	104	103B			6		0.013	0.013	0.04	3.72	0.15	0.052	0.052	0.052	0.02	0.17	28.1	200 PVC	0.203	0.013	1.24	38.1	1.17	0.4%		
Copperwood Flats	103B	103A			0		0.000	0.013	0.04	3.72	0.15	0.005	0.057	0.057	0.02	0.17	6.0	200 PVC	0.203	0.013	2.00	48.4	1.49	0.4%		
Copperwood Flats	103A	102			0		0.000	0.013	0.04	3.72	0.15	0.060	0.117	0.117	0.04	0.19	31.0	200 PVC	0.203	0.013	2.00	48.4	1.49	0.4%		
Copperwood Flats	102	101			12		0.025	0.057	0.18	3.64	0.67	0.162	0.433	0.433	0.14	0.81	35.9	200 PVC	0.203	0.013	0.50	24.2	0.75	3.4%		
rue Spoor Street	101	EX			0		0.000	0.057	0.18	3.64	0.67	0.005	0.438	0.438	0.14	0.81	14.4	200 PVC	0.203	0.013	2.00	48.4	1.49	1.7%		
North Connection																										
Copperwood Flats	109	108			6		0.013	0.013	0.04	3.72	0.15	0.067	0.067	0.067	0.02	0.17	25.7	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%		
Copperwood Flats	108	110			3		0.006	0.019	0.06	3.71	0.23	0.069	0.069	0.069	0.02	0.25	10.3	200 PVC	0.203	0.013	1.00	34.2	1.06	0.7%		
Copperwood Flats	110	11			0		0.000	0.019	0.06	3.71	0.23	0.069	0.137	0.137	0.05	0.27	12.6	200 PVC	0.203	0.013	1.00	34.2	1.06	0.8%		
Totals			0	0	36	0.000	0.076	0.076	0.25								249.4									

Demand Equation / Parameters

1. Q(D), Q(A), Q(R) =

Q(p) + Q(fd) + Q(ici) + Q(e)
2. Q(p) =

(P x q x M x K / 86,400)
3. q =

280 L/per person/day (design)
200 L/per person/day (annual and rare)
4. M = Harmon Formula (maximum of 4.0)
5. K =

0.8 (design)
0.6 (annual and rare)
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(fd) =

0.45 L/s/unit
8. Q(ici) =

ICI Area x ICI Flow x ICI Peak
9. Q(e) =

0.33 L/s/ha (design)
0.30 L/s/ha (annual)
0.55 L/s/ha (rare)

Definitions

- Q(D) = Peak Design Flow (L/s)

Q(A) = Peak Annual Flow (L/s)

Q(R) = Peak Rare 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

Typ. Service Diameter (mm) =

Typ. Service Length (m) =

I/I Pipe Rate (L/mm dia/m/hr) =

Q(fd) = Foundation Flow (L/s)

Q(ici) = Industrial / Commercial / Institutional Flow (L/s)

Q(e) = Extraneous Flow (L/s)
- Institutional / Commercial / Industrial

Design = 35000

Annual / Rare = 10000

Industrial

Commercial / Institutional

28000 L/gross ha/day

17000 L/gross ha/day
- ICI Peak *

Design = #DIV/0!

Annual / Rare = 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

SANITARY SEWER DESIGN SHEET
1053, 1075 and 1145 March Road
Copperwood Estate- Phase 1



PROJECT # : 116132
DESIGNED BY : MM/SAZ
CHECKED BY : DDB
DATE PREPARED : 6-Jun-18
DATE REVISED : 8-May-19
DATE REVISED : 20-Apr-20
DATE REVISED : 23-Dec-21
DATE REVISED : 4-May-22
DATE REVISED : 9-Dec-22

LOCATION					RESIDENTIAL											COMMERCIAL / INSTITUTIONAL / PARK								INFILTRATION			FLOW	PROPOSED SEWER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
					INDIVIDUAL						CUMULATIVE					COMM		INST		PARK		PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D _{full}	Actual Velocity																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi/ Town Units	Multi-Unit Towns	Multi-Unit Apartment	Multi-Unit Flats	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
Outlet 1 - Street 1 and March Road																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Future Phase 2	FUT	405									0.000		0.078	1.29	3.6	0.92						1.17			2.46	0.81	1.78																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

SANITARY SEWER DESIGN SHEET
1053, 1075 and 1145 March Road
Copperwood Estate- Phase 1



PROJECT # : 116132
DESIGNED BY : MM/SAZ
CHECKED BY : DDB
DATE PREPARED : 6-Jun-18
DATE REVISED : 8-May-19
DATE REVISED : 20-Apr-20
DATE REVISED : 23-Dec-21
DATE REVISED : 4-May-22
DATE REVISED : 9-Dec-22

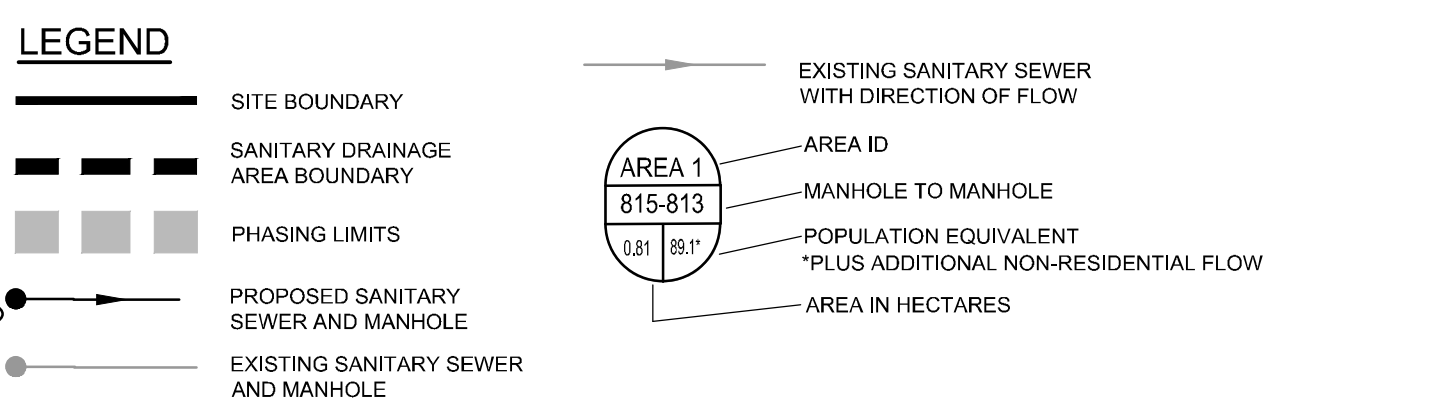
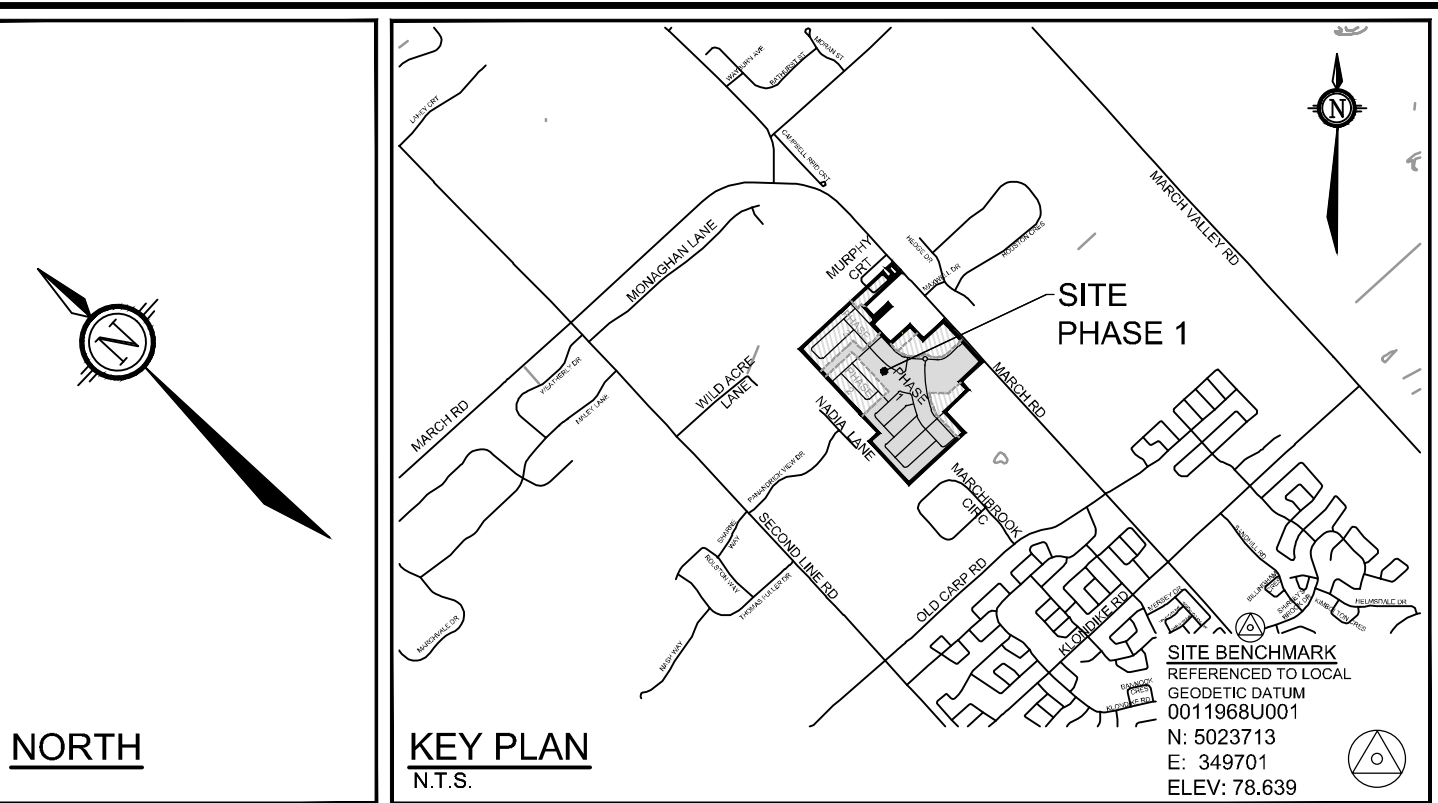
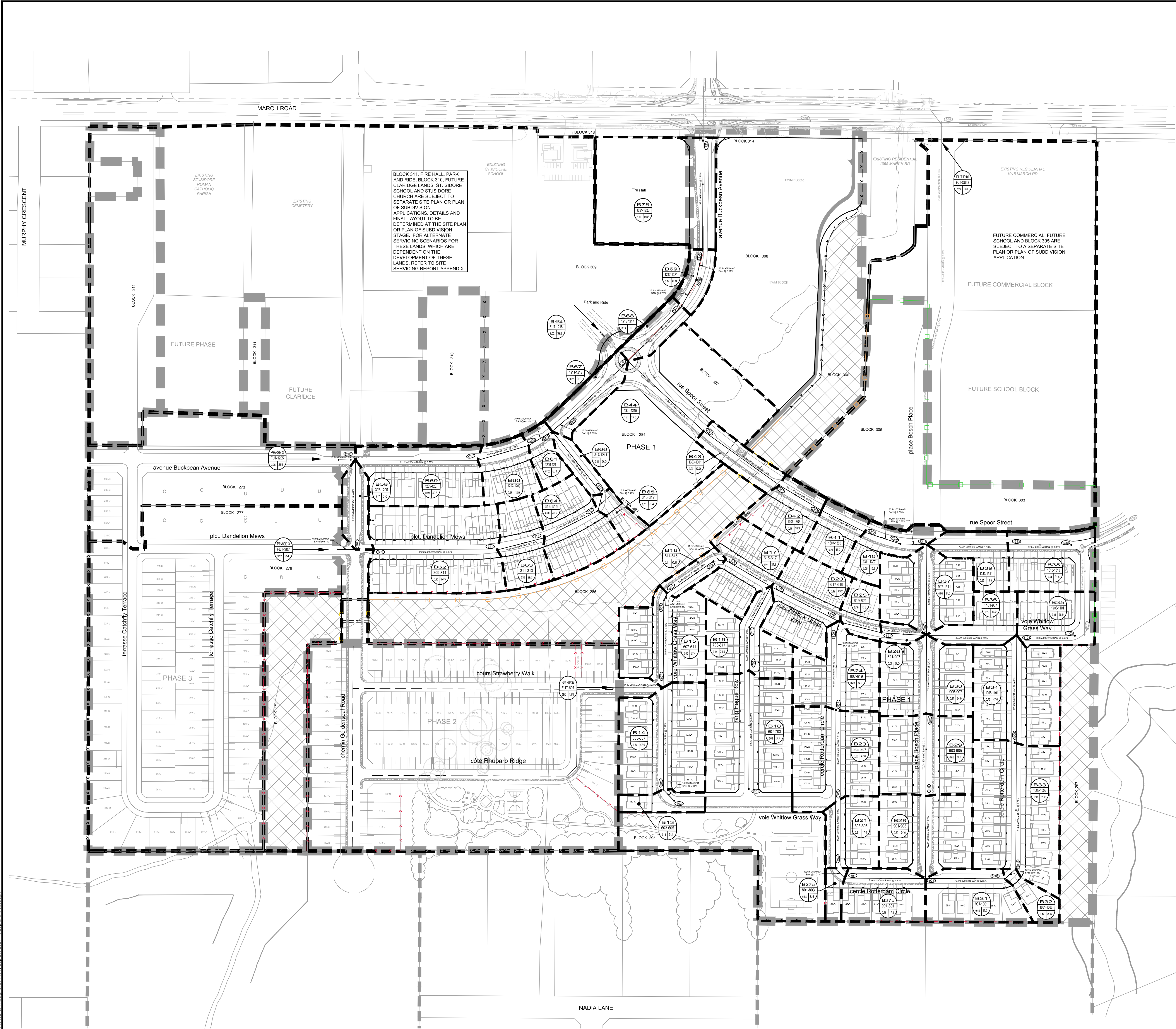
LOCATION					RESIDENTIAL											COMMERCIAL / INSTITUTIONAL / PARK							INFILTRATION			FLOW	PROPOSED SEWER											
					INDIVIDUAL					CUMULATIVE						COMM		INST		PARK		PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/ Qcap	d/ D _{full}	Actual Velocity		
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi/ Town Units	Multi-Unit Towns	Multi-Unit Apartment	Multi-Unit Flats	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)																	
FUTURE BLOCK / EXISTING LANDS ACCOUNTED FOR INCLUDING BLOCK 315	FUT / EX	1407		0.00						0.000		0.280	5.69	3.5	3.15		0.00		4.34		0.00		1.41	0.00	10.03	3.31	7.86	69.2	200	203.20	DR 35	0.45	23.0	0.71	34.3%			
Easement - Park&Ride	1407	1409	B77	3.33			25	25		0.113	3.33	0.392	9.02	3.4	4.35		0.00		4.34		0.00		1.41	3.33	13.36	4.41	10.16	103.3	200	203.20	DR 35	0.44	22.7	0.70	44.8%			
Easement - Park&Ride	1409	1215		0.00						0.000		0.392	9.02	3.4	4.35		0.00		4.34		0.00		1.41	0.00	13.36	4.41	10.16	97.2	200	203.20	DR 35	0.44	22.7	0.70	44.8%			
avenue Buckbean Avenue	1215	1217	B68	0.13						0.000	0.13	2.452	38.60	3.0	23.94		0.00		4.34		2.22		1.50	0.13	45.16	14.90	40.34	69.9	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15	
avenue Buckbean Avenue	1217	1219	B69	0.14						0.000	0.14	2.452	38.74	3.0	23.94		0.00		4.34		2.22		1.50	0.14	45.30	14.95	40.39	27.1	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15	
avenue Buckbean Avenue	1219	1221								0.000	0.00	2.452	38.74	3.0	23.94		0.00		4.34		2.22		1.50	0.00	45.30	14.95	40.39	28.2	375	381.00	DR 35	0.76	159.5	1.40	25.3%	0.34	1.16	
																																				0.00		
avenue Buckbean Avenue	1221	1223	B78	1.10						0.000	0.27	2.452	39.01	3.0	23.94		0.00	0.83	5.17		2.22		1.77	1.10	46.40	15.31	41.02	99.1	375	381.00	DR 35	0.75	158.4	1.39	25.9%	0.34	1.15	
Total Flows - Outlet 1																23.94							1.77		46.40	15.31	41.02											
Outlet 2 - Street 10 and March Road																																						
place Bosch Place	909	911	A1	1.05					42	0.088	1.05	0.088	1.05	3.6	1.03		0.00		0.00		0.00		0.00	1.05	1.05	0.35	1.38	82.0	250	254.00	DR 35	1.94	86.4	1.71	1.6%			
place Bosch Place	911	913	A2	3.57					48	0.101	0.50	0.189	1.55	3.5	2.16		0.00	3.07	3.07		0.00		0.99	3.57	4.62	1.52	4.68	45.3	250	254.00	DR 35	1.94	86.4	1.71	5.4%			
place Bosch Place	913	915	A3	0.00						0.000	0.00	0.189	1.55	3.5	2.16		0.00		3.07		0.00		0.99	0.00	4.62	1.52	4.68	47.4	250	254.00	DR 35	1.71	81.1	1.60	5.8%			
place Bosch Place	915	917	A4	0.25						0.000	0.00	0.189	1.55	3.5	2.16		0.25	0.25		3.07		0.00	1.08	0.25	4.87	1.61	4.84	75.7	250	254.00	DR 35	1.98	87.3	1.72	5.5%			
place Bosch Place	917	919	A5	2.36						0.000	0.00	0.189	1.55	3.5	2.16	2.36	2.61		3.07		0.00		1.84	2.36	7.23	2.39	6.39	74.9	250	254.00	DR 35	2.15	91.0	1.80	7.0%			
Total Flows - Outlet 2															2.16								1.84		7.23	2.39	6.39											

Notes:
1. Q(d) = Qr(p) + Q(i) + Qc(p)
2. Q(i) = 0.33 L/sec/ha
3. Qr(p) = (PxqxM/86,400)
3. Qc(p) = (A*q*Pf)/86,400

Definitions:
Q(d) = Design Flow (L/sec)
Qr(p) = Population Flow (L/sec), Residential
Q(i) = Extraneous Flow (L/sec)
Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

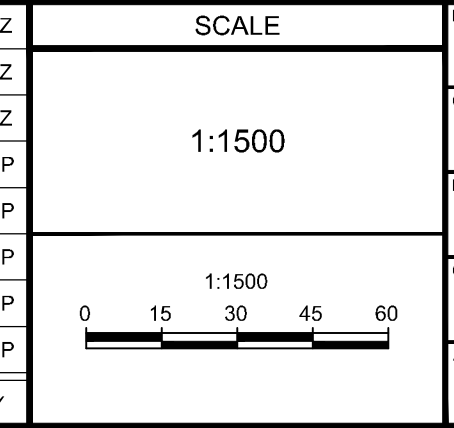
P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.7 persons per multi-unit townhouse unit, 2.1 persons per multi-unit apartment, 1.8 persons per multi-unit apartment)
q = Average per capita flow = 280 L/cap/day - Residential
q = Average per gross ha. flow = 35000 L/gross ha/day - Light industrial
q = Average per gross ha. flow = 28000 L/gross ha/day - Commercial/Institutional
q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
M = Harmon Formula (maximum of 4.0), K = Correction Factor = 0.8
Min pipe size 200mm @ min. slope 0.32%
Mannings n = 0.013
Pf = Peak factor (Commercial/Institutional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)

*Assumes existing single lot along roadway will ultimately become 2 single units.
**Assumes north half of property is 50% towns and 50% singles at same density as CU lands (25 singles/ha, 47 towns/ha), south half of property assumed to be multi unit residential at same density as CU lands (62.8units/ha).



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.

9.	SAZ	REVISION	DATE	BY	8.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 19/23	SAZ
					7.	REVISED AS PER CITY OF OTTAWA COMMENTS	DEC 9/22	SAZ
					6.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ
					5.	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP
					4.	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP
					3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP
					2.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP
					1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP
					No. REVISION DATE BY			



DESIGN	TJM
CHECKED	SAZ
DRAWN	MTM
CHECKED	SAZ
APPROVED	MSP

REFER TO 116132-NL FOR ADDITIONAL NOTES	
CITY OF OTTAWA COPPERWOOD ESTATE 1053, 1075 AND 1145 MARCH ROAD	
DRAWING NAME	PROJECT No.
SANITARY DRAINAGE AREA PLAN PHASE 1	116132-00
	REV # 9
	DRAWING No.
116132-SAN	

D07-16-18-0023

Appendix D
Storm Servicing

The storm drainage designs for the future development areas will likely have multiple storage elements and ICDs and will be developed in support of the development applications for these areas. For modeling purposes, each block within the Future Development Area is represented as a single catchment with a storage node and an orifice to control flows to the 5-year peak flow. The 5-year head on the orifices is 1.40m, which represents the average depth of a catchbasin. Storage for storms greater than the 5-year event is represented as a ponding area, with an additional 0.35m of head on the orifice for the 100-year storm event. Therefore, the 100-year release rates are slightly higher than the 5-year peak flow due to the additional 0.35m of head. Runoff from storms that exceed the 100-year design event are assumed to flow overland to March Road. **Table 3.4** summarizes the required storage and 100-year inlet capture rate for the future development blocks. It should be noted that storage requirements can be different during the detailed design of the blocks.

Table 3.4: Summary of required storage and 100-year inlet capture rate for future development block (Scenario2)

Area ID	Drainage Area (ha)	Runoff Coeff.	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m ³)
NW-110B	2.58	0.65	483	244
NW-118	0.91	0.70	218	50
NW-120	2.31	0.65	469	140
NW-122	0.25	0.77	69	20
NW-123	0.62	0.85	175	46
NW-125	0.24	0.88	69	24
NW-114	0.89	0.85	256	69
NW-112	2.58	0.85	730	143
NW-31	0.94	0.70	210	66
NW-104B-1 & 2	2.37	0.65	234	312
NW-108B	0.66	0.65	120	64
NW-109	1.98	0.67	420	122
NW-90	0.60	0.65	120	37
NW-98	0.57	0.70	135	34
NW-111	0.79	0.70	167	54
FUT1204/NW-9	3.08	0.65	588	300
FUT306	2.82	0.65	600	236
FUTURE	4.21	0.59	888	271

Refer to detailed ICD sizing calculations, release rates and 100-year surface storage volumes provided in **Appendix B-3**. ICD calculations are based on the 3-hour Chicago storm distribution, which generates the highest peak flows and is the critical design event for the sizing of the storm sewers and ICDs for the future development areas. In the detailed design stage for each of future development blocks, required storage will be determined, but considering the release rates and boundary condition will be essential.

Scenario 2 - Equivalent Orifice Sizing & Required Storages

Name	Inlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Orific Dia. ¹ (m)	5-year Peak Runoff (L/s)	5-year Inlet Capture Rate ³ (L/s)	100 Year Peak Runoff (L/S)	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m³)
Orifices (Future Development Areas)										
O-SU110B	SU110B	NW-110B	2.58	0.35	0.465	466	459	892	483	244
O-SU118	SU118	NW-118	0.91	0.35	0.285	185	184	352	218	50
O-SU120	SU120	NW-120	2.31	0.35	0.424	429	419	824	469	140
O-SU122	SU122	NW-122	0.25	0.35	0.159	62	61	116	69	20
O-SU123	SU123	NW-123	0.62	0.35	0.255	160	157	293	175	46
O-SU125	SU125	NW-125	0.24	0.35	0.159	68	63	118	69	24
O-SU2	SU2	NW-114	0.89	0.35	0.310	236	235	426	256	69
O-SU3	SU3	NW-112	2.58	0.35	0.600	567	566	1092	730	143
O-SU31	SU31	NW-31	0.94	0.35	0.280	196	189	375	210	66
O-SU4	SU4	NW-104B-1&2	2.37	0.35	0.295	211	208	567	234	312
O-SU108B	SU108B	NW-108B	0.66	0.35	0.211	106	105	251	120	64
O-SU5	SU5	NW-109	1.98	0.35	0.400	382	374	731	420	122
O-SU90	SU90	NW-90	0.60	0.35	0.211	111	108	214	120	37
O-SU98	SU98	NW-98	0.57	0.35	0.224	118	117	225	135	34
O-SU9	SU9	NW-111	0.79	0.35	0.250	156	152	302	167	54
O-CB16/CB15	CB16/CB15	FUT1204/NW-9	3.08	0.35	0.485	627	549	1271	588	300
O-MH429-MH306	CB86/CB87	FUT306	2.82	0.35	0.485	574	544	1163	600	236
O-CB109/CB110	CB109/CB110	FUTURE	4.21	0.35	0.600	762	761	1607	888	271

¹ Equivalent orifice diameter corresponding to 5-year peak runoff; based on 1.40m of head (CB T/G - CB Inv.).² Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment.³ Inlet capture rate (max. flow through orifice) based on 1.40m of head (CB T/G - CB Inv.) for 5-year & 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.⁴ Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.**Scenario 1 - Equivalent Orifice Sizing for Existing St. Isidore Church (DME, 2010)**

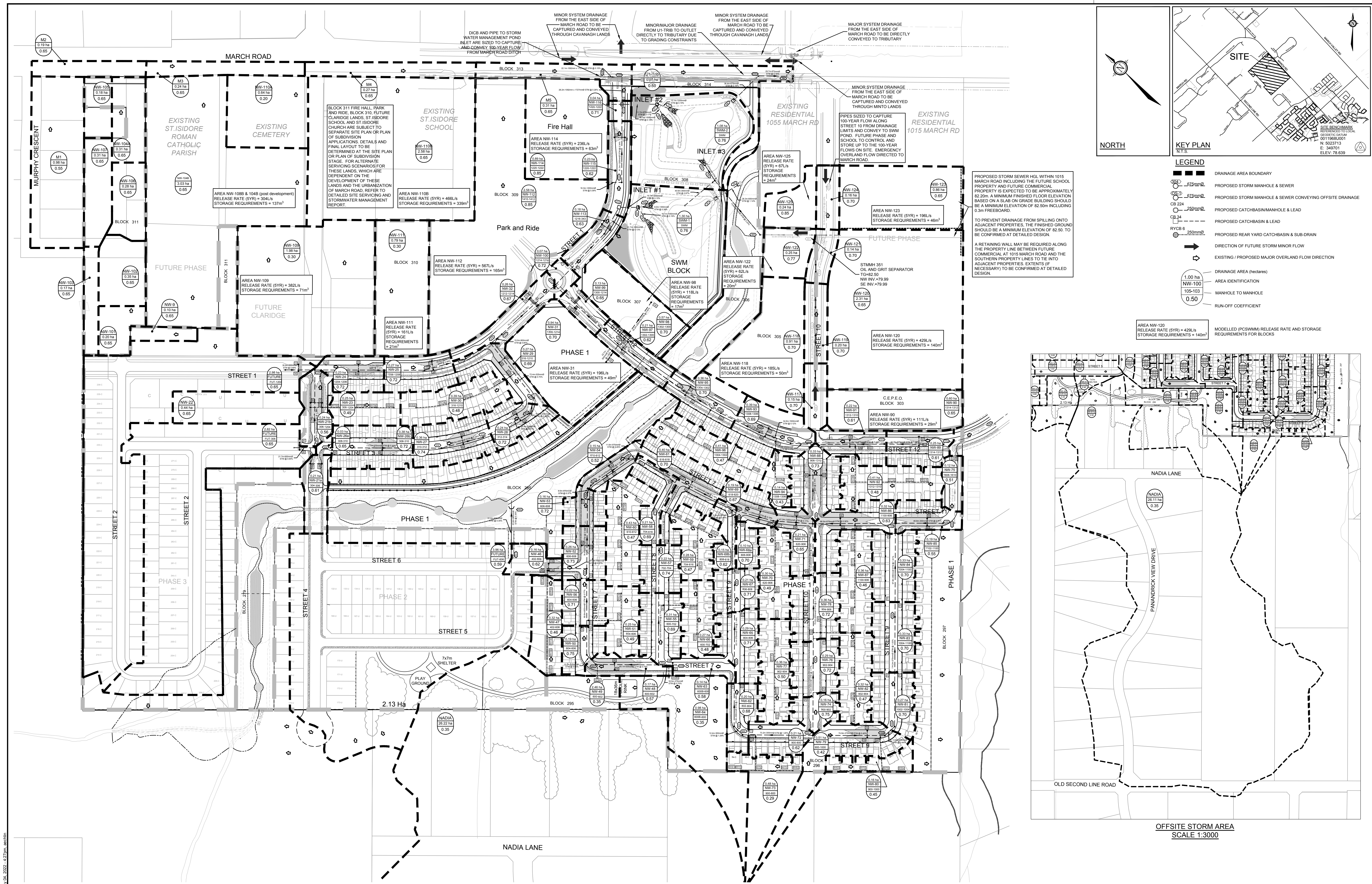
Name	Inlet / Outlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Artificial Orific Dia. ¹ (m)	5-year Peak Runoff (L/s)	Target 100-year Release Rate ¹ (L/s)	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m³)
O-SU-104B	SU-104B	NW-104B	3.03	0.35	0.264	186	189	187	73

¹ Equivalent orifice diameter corresponding to 100-year release rate of 189.3 L/s (per DME, 2010); based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth).² Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment. Subcatchments parameters calibrate to follow the DME, 2010 report.³ Inlet capture rate (max. flow through orifice) based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.⁴ Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.

MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr12hr (m)	HGL Elevation 100yr12hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.17	89.68	90.42	1.27	1.25
MH1004	87.62	87.17	90.25	87.52	87.58	87.92	88.61	1.09	1.03
MH1100	85.76	85.08	88.49	86.05	86.25	86.35	86.72	0.67	0.47
MH1102	85.96	85.66	88.50	86.17	86.37	86.47	86.92	0.75	0.55
MH1204	86.47	85.57	88.79	86.38	86.77	86.77			
MH1206	85.73	84.83	88.19	85.73	86.01	86.03	86.41	0.68	0.40
MH1208	85.48	84.58	88.08	85.38	85.67	85.78	86.18	0.80	0.51
MH1210	84.98	84.08	87.60	85.18	85.46	85.48	86.18	1.00	0.72
MH1212	84.86	83.96	87.37	85.02	85.31	85.32			
MH1214	83.66	82.01	86.96	84.38	84.71	84.68			
MH1216	83.56	81.91	85.15	84.38	84.64	84.68			
MH1218	83.46	81.81	85.30	84.38	84.62	84.68			
MH1220	81.14	79.94	84.43	81.87	82.14	82.17			
MH1222	80.86	79.36	82.81	81.87	82.04	82.17			
MH1224	89.59	79.59	82.10	81.87	82.04	89.89			
MH1300	83.77	82.27	87.33	84.82	85.15	85.12			
MH1302	83.87	82.37	87.53	85.02	85.33	85.32	86.12	1.10	0.79
MH1304	85.13	83.63	87.76	85.12	85.43	85.43	86.12	1.00	0.69
MH1306	85.18	83.68	87.68	85.22	85.52	85.52	86.22	1.00	0.70
MH1308	85.22	83.72	87.85	85.30	85.60	85.60	86.31	1.01	0.71
MH1310	85.29	83.79	88.05	85.37	85.67	85.67	86.31	0.94	0.64
MH1312	85.87	85.19	88.19	85.63	85.75	86.17	86.58	0.95	0.83
MH1314	86.05	85.52	88.15	85.85	85.87	86.35	86.66	0.81	0.79
MH1400	83.45	82.62	88.47	84.41	84.60	84.71			
MH1402	83.12	82.29	87.81	84.24	84.42	84.54			
MH1404	82.89	81.99	87.38	84.14	84.31	84.44			
MH1406	82.46	81.56	86.97	83.83	84.02	84.13			
MH1408	81.94	81.04	85.04	82.94	83.18	83.24			
MH1410	81.76	80.78	85.04	82.38	82.67	82.68			

116132 Kanata North - Northwest Quadrant
HGL Elevations - Scenario 2 (3hr Chicago)

MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr3hr (m)	HGL Elevation 100yr3hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.16	89.68	90.42	1.27	1.26
MH1004	87.62	87.17	90.25	87.52	87.57	87.92	88.61	1.09	1.04
MH1100	85.76	85.08	88.49	86.01	86.20	86.31	86.72	0.71	0.52
MH1102	85.96	85.66	88.50	86.13	86.32	86.43	86.92	0.79	0.60
MH1204	86.47	85.57	88.79	86.36	86.67	86.77			
MH1206	85.73	84.83	88.19	85.70	85.88	86.03	86.41	0.71	0.53
MH1208	85.48	84.58	88.08	85.36	85.53	85.78	86.18	0.82	0.65
MH1210	84.98	84.08	87.60	85.16	85.30	85.46	86.18	1.02	0.88
MH1212	84.86	83.96	87.37	84.99	85.14	85.29			
MH1214	83.66	82.01	86.96	84.14	84.54	84.44			
MH1216	83.56	81.91	85.15	84.14	84.55	84.44			
MH1218	83.46	81.81	85.30	84.14	84.54	84.44			
MH1220	81.14	79.94	84.43	81.64	81.99	81.94			
MH1222	80.86	79.36	82.81	81.64	81.97	81.94			
MH1224	89.59	79.59	82.10	81.64	81.97	89.89			
MH1300	83.77	82.27	87.33	84.69	84.94	84.99			
MH1302	83.87	82.37	87.53	84.94	85.13	85.24	86.12	1.18	0.99
MH1304	85.13	83.63	87.76	85.06	85.24	85.43	86.12	1.06	0.88
MH1306	85.18	83.68	87.68	85.17	85.34	85.48	86.22	1.05	0.88
MH1308	85.22	83.72	87.85	85.26	85.43	85.56	86.31	1.05	0.88
MH1310	85.29	83.79	88.05	85.33	85.50	85.63	86.31	0.98	0.81
MH1312	85.87	85.19	88.19	85.63	85.65	86.17	86.58	0.95	0.93
MH1314	86.05	85.52	88.15	85.85	85.86	86.35	86.66	0.81	0.80
MH1400	83.45	82.62	88.47	84.34	84.53	84.64			
MH1402	83.12	82.29	87.81	84.18	84.35	84.48			
MH1404	82.89	81.99	87.38	84.07	84.24	84.37			
MH1406	82.46	81.56	86.97	83.75	83.94	84.05			
MH1408	81.94	81.04	85.04	82.84	83.07	83.14			
MH1410	81.76	80.78	85.04	82.27	82.53	82.57			
MH1412	81.43	80.23	84.59	81.74	82.08	82.04			
MH1414	80.03	79.05	81.20	79.60	79.61	80.33			



PROPOSED STORM SEWER HGL WITHIN 1015 MARCH ROAD INCLUDING THE FUTURE SCHOOL PROPERTY AND FUTURE COMMERCIAL PROPERTY IS EXPECTED TO BE APPROXIMATELY 82.20m. A MINIMUM FINISHED FLOOR ELEVATION BASED ON A SLAB ON GRADE BUILDING SHOULD BE A MINIMUM ELEVATION OF 82.50m INCLUDING 0.3m FREEBOARD.

TO PREVENT DRAINAGE FROM SPILLING ONTO ADJACENT PROPERTIES, THE FINISHED GROUND SHOULD BE A MINIMUM ELEVATION OF 82.50. TO BE CONFIRMED AT DETAILED DESIGN.

A RETAINING WALL MAY BE REQUIRED ALONG THE PROPERTY LINE BETWEEN FUTURE COMMERCIAL AT 1015 MARCH ROAD AND THE SOUTHERN PROPERTY LINES TO TIE INTO ADJACENT PROPERTIES. EXTENTS (IF NECESSARY) TO BE CONFIRMED AT DETAILED DESIGN.

OFFSITE STORM AREA
SCALE 1:3000

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.

PRELIMINARY
NOT FOR
CONSTRUCTION

REFER TO OFFSITE STORM AREA VIEW

REFER TO 116132-NL FOR ADDITIONAL NOTES

REVISION			SCALE		DESIGN	
7.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ	1:1500	SAZ	
6.	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP		DOB	
5.	ISSUED TO MISSISSIPPI VALLEY CONSERVATION AUTHORITY FOR REVIEW	DEC 22/21	SAZ		RBG	
4.	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP		SAZ	
3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP		MSP	
2.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP			
1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP			
No.	REVISION	DATE	BY			

FOR REVIEW ONLY

DESIGN: SAZ
CHECKED: DOB
DRAWN: RBG
CHECKED: SAZ
APPROVED: MSP

SCALE: 1:1500

1:1500
0 15 30 45 60

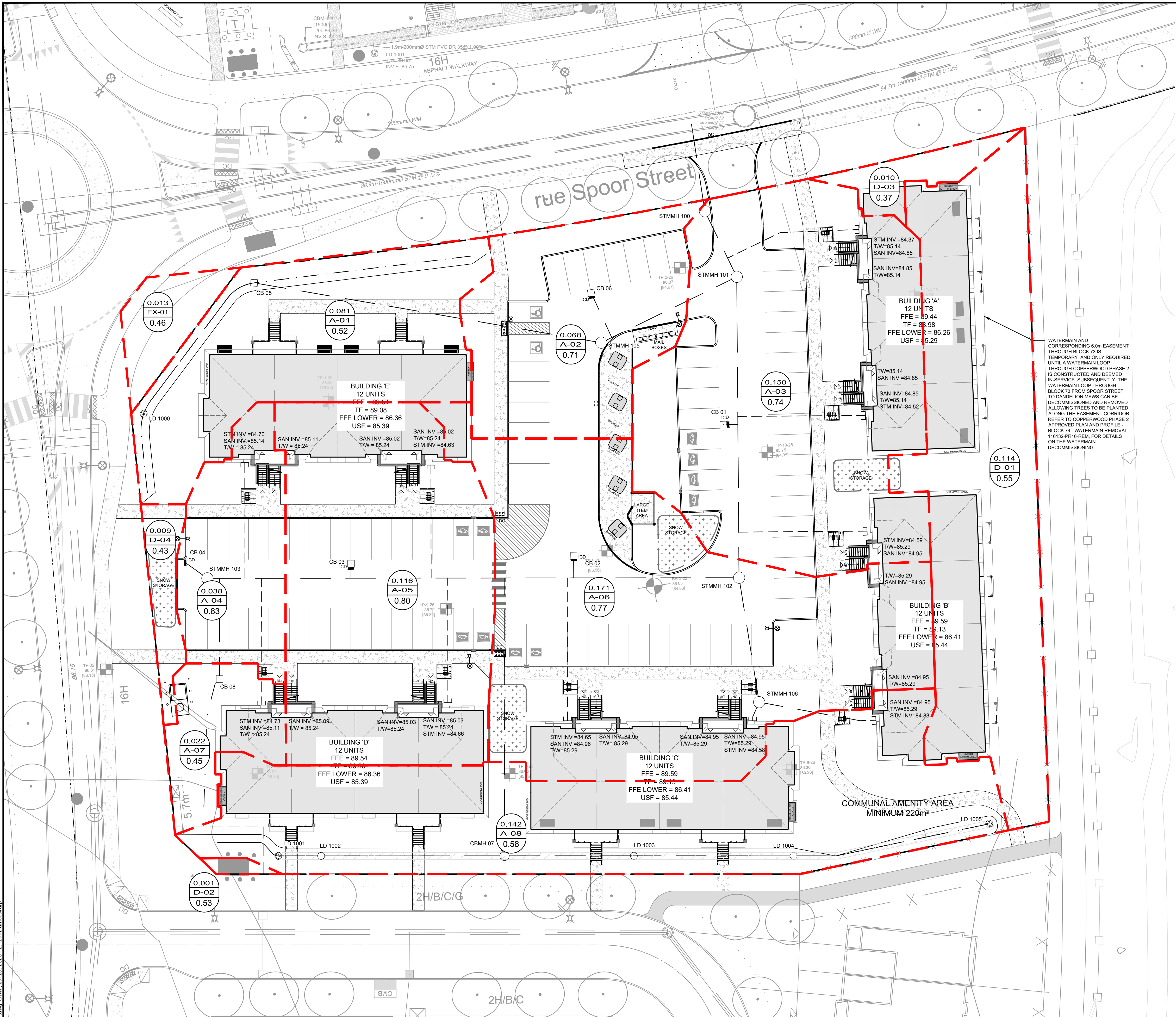
CITY OF OTTAWA
COPPERWOOD ESTATE
1053, 1075 AND 1145 MARCH ROAD

DRAWING NAME: STORM DRAINAGE AREA PLAN PHASE 1

PROJECT No.: 116132-00
REV: 1
REV # 7
DRAWING No.: 116132-STM

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone: (613) 254-9643
Facsimile: (613) 254-5867
Website: www.novatech-eng.com

PROFESSIONAL ENGINEER
100191487
4/22
PROVINCE OF ONTARIO



NORTH

KEY PLAN
N.T.S.

LEGEND

--- SITE PROPERTY LINE
--- MISC LEGAL LINE (EASEMENT, PROPERTY LINES)
--- REFER TO LEGAL PLAN FOR DETAILS
--- PROPOSED SIDEWALK
--- PROPOSED CURB
--- DC
--- PROPOSED DEPRESSED CURB
--- SWALE c/w SUBDRAIN (WHEN BELOW 1.5%)
--- AND DIRECTION OF FLOW
--- PROPOSED SANITARY SEWER & MANHOLE
--- PROPOSED STORM SEWER & MANHOLE
--- PROPOSED CATCHBASIN MANHOLE
--- PROPOSED CATCHBASIN
--- PROPOSED INLET CONTROL DEVICE
--- PROPOSED LANDSCAPE DRAIN (ELBOWTEE)
--- PROPOSED TRANSFORMER WITH BOLLARDS
--- PROPOSED LIGHTING
--- (REFER TO ELECTRICAL PLANS FOR DETAILS)
--- PROPOSED BIKE RACK
--- STORM SEWER DRAINAGE AREA BOUNDARY
--- DRAINAGE AREA (ha)
--- DRAINAGE AREA ID
--- RUNOFF COEFFICIENT

--- EXISTING DITCH CENTRELINE
--- EXISTING STORM SEWER AND WATERMAIN
--- EXISTING CATCHBASIN
--- FENCE BY OTHERS
--- EXISTING JOINT UTILITY
--- EXISTING HYDRO
--- EXISTING UTILITY CROSSINGS
--- EXISTING LIGHT STANDARD
--- EXISTING HYDRO INFRASTRUCTURE
--- BORE HOLE LOCATION & ID
--- GROUND ELEVATION
--- (BEDROCK ELEVATION)
--- REFER TO GEOTECHNICAL REPORT FOR DETAILS
--- TEST PIT LOCATION & ID
--- GROUND ELEVATION
--- (BEDROCK ELEVATION)
--- REFER TO GEOTECHNICAL REPORT FOR DETAILS

NOTE:
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	DATE	BY
2.	REVISED PER CITY COMMENTS	JULY 23/2026	ARM
1.	ISSUED FOR SPA	MAR 27/2026	ARM

SCALE

1:250

1:250

0 2 4 6 8 10

DESIGN

AM

CHECKED

ARM

DRAWN

AM

CHECKED

ARM

APPROVED

GJM

FOR REVIEW ONLY

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

LOCATION
1100 SPOOR STREET, CITY of OTTAWA
COPPERWOOD ESTATES (BLOCK 73)

DRAWING NAME
**STORM WATER
MANAGEMENT PLAN**

PROJECT No.
125113

REV
REV #2

DRAWING No.
125113-SWM

Novatech Project #: 125113
 Project Name: Block 73
 Date: 7/22/2026
 Input By: Anjush Musyaju, EIT
 Reviewed By: Anthony Mestwarp, P.Eng
 Drawing Reference: 125113-STM

Legend: Design Input by User
 Calculated Design Cell Output
 Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
 MOE - Design Guidelines for Sewage Works (2008)

Area	Roof	Hard Surface	Soft Surface	Total Area (Ha)	C-Value
	1.0	0.9	0.2	(Ha)	
EX-01	0.000	0.005	0.008	0.013	0.46
D-01	0.051	0.000	0.064	0.114	0.55
D-02	0.000	0.001	0.001	0.001	0.53
D-03	0.000	0.002	0.007	0.010	0.37
D-04	0.000	0.003	0.006	0.009	0.43
A-01	0.028	0.005	0.048	0.081	0.52
A-02	0.000	0.049	0.018	0.068	0.71
A-03	0.032	0.079	0.039	0.150	0.74
A-04	0.005	0.029	0.005	0.038	0.83
A-05	0.038	0.056	0.022	0.116	0.80
A-06	0.041	0.092	0.039	0.171	0.77
A-07	0.007	0.000	0.015	0.022	0.45
A-08	0.059	0.009	0.074	0.142	0.58
Total	0.259	0.330	0.346	0.935	0.67



Novatech Project #: 125113

Project Name: Block 73

Date: 3/27/2026

Revised: 07/22/2026 (ARM)

Input By: Anjush Musyaju, EIT

Reviewed By: Anthony Mestwarp, P.Eng

Drawing Reference: 125113-STM

Legend:

Design Input by User

As-Built Input by User

Cumulative Cell

Calculated Design Cell Output

Calculated Uncontrolled Peak Flow Cell Output

Design Input Restricted Peak Flow Cell

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)

MOE - Design Guidelines for Sewage Works (2008)

Storm Design Event = 2 Year

Location											Design Capacity								
				Flow							Proposed Sewer Pipe Sizing / Design								
Street	Area ID	From MH	To MH	Area A (ha.)	Runoff Coefficient C	Indivi. 2.78 AC	Accum. 2.78 AC	Time of Conc. Tc (min.)	Rain Intensity I (mm/hr)	Total Uncontrolled Peak Flow Q (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	Q / Qfull
N/A	A4, A5, A6, A7, A8	103	102	0.49	0.71	0.96	0.96	10.00	76.81	74.0	67.5	375 PVC	0.381	0.013	0.30	100.2	0.88	1.28	73.9%
N/A	A3	102	101	0.15	0.74	0.31	1.27	11.28	72.22	91.9	38.2	450 CONC	0.4572	0.013	0.30	162.9	0.99	0.64	56.4%
N/A	A1, A2	105	101	0.15	0.61	0.25	0.25	10.00	76.81	19.2	19.1	300 PVC	0.3048	0.013	0.35	59.7	0.82	0.39	32.2%
N/A		101	100	0.00	0.00	0.00	1.52	11.92	70.14	106.8	9.2	450 PVC	0.4572	0.013	1.00	297.4	1.81	0.08	35.9%
Spoor Street		100	1300	0.00	0.00	0.00	1.52	12.01	69.87	106.4	11.2	450 PVC	0.4572	0.013	1.00	297.4	1.81	0.10	35.8%
Totals				0.79							145.2								

Demand Equation / Parameters

1. $Q = 2.78 ACI$

Definitions

Q = Peak flow in litres per second (L/s)
A = Area in hectares (ha)
C = Weighted runoff coefficient (increased by 25% for 100-year)
I = Rainfall intensity in millimeters per hour (mm/hr)

Rainfall intensity is based on City of Ottawa IDF data presented in the City of Ottawa - Sewer Design Guidelines

Capacity Equation

$Q_{full} = 1000 \cdot (1/n) \cdot A_p \cdot R^{2/3} \cdot So^{0.5}$

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

Table i: Copperwood Estates Subdivision Design Parameters

Area Id	Area ha	Coefficient c	Release Rate	
			5-year L/s	100-year L/s
NW-31	0.935	0.7	196	210

Area of right of way included within area NW-31

TABLE ii: Post-Development Runoff Coefficient "C" - EX-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.005	0.90	0.46	0.52	C = (A _{harg} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.013	Soft	0.008	0.20			* Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

TABLE iii: Post-Development EX-01 Flows

TABLE iii: Post-Development EX-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)
Buckbean/ Spoor Street	0.013	0.46	10	1.2	1.7	3.3

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

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 = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

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

Block 73 Allowable Release Rate

Area (ha)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
0.922	194.3	206.7

TABLE 1A: Post-Development Runoff Coefficient "C" - D-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Roof	0.050	1.00	0.55	0.58	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.114	Soft	0.064	0.20			* Runoff Coefficient increases by

TABLE 1B: 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)
Shirleys Brook	0.114	0.55	10	13.5	18.3	32.9

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 2A: Post-Development Runoff Coefficient "C" - D-02

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.001	0.90	0.53	0.60	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.001	Soft	0.001	0.20			* Runoff Coefficient increases by

TABLE 2B: 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)
Dandelion Mews	0.001	0.53	10	0.2	0.2	0.4

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-03

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.002	0.90	0.37	0.43	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.010	Soft	0.007	0.20			* Runoff Coefficient increases by

TABLE 3B: Post-Development D-03 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.010	0.37	10	0.8	1.0	2.1

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-04

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.003	0.90	0.43	0.50	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.009	Soft	0.006	0.20			* Runoff Coefficient increases by

TABLE 3B: Post-Development D-04 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Buckbean	0.009	0.43	10	0.9	1.2	2.4

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 (CB 05)

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.005	0.90	0.52	0.56	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.081	Roof	0.028	1.00			
	Soft	0.048	0.20			
						* Runoff Coefficient increases by

TABLE 4B: Post-Development A-01 (CB 05) Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.081	0.52	10	9.0	12.2	22.3

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" - A-02 (CB 06)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.049	0.90	0.71	1.00	0.80
0.068	Roof	0.000	1.00		1.00	
	Soft	0.018	0.20		0.25	

TABLE 5B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.068 =Area (ha)
 0.71 = 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	22.29	10.2	12.05	0.00
	5	103.57	13.81	10.2	3.57	1.07
	10	76.81	10.24	10.2	0.00	0.00
	15	61.77	8.23	10.2	-2.01	-1.81
	20	52.03	6.94	10.2	-3.30	-3.96

TABLE 5C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT- A-02 (CB 06)

0.068 =Area (ha)
 0.71 = 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	30.72	13.89	16.83	0.00
	5	141.18	18.82	13.89	4.93	1.48
	10	104.19	13.89	13.89	0.00	0.00
	15	83.56	11.14	13.89	-2.75	-2.48
	20	70.25	9.36	13.89	-4.53	-5.43

TABLE 5D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.068 =Area (ha)
 0.80 = 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	59.61	18.40	41.21	0.00
	5	242.70	36.29	18.40	17.89	5.37
	10	178.56	26.70	18.40	8.30	4.98
	15	142.89	21.37	18.40	2.97	2.67
	20	119.95	17.94	18.40	-0.46	-0.56

TABLE 5E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.068 =Area (ha)
 0.80 = 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	71.53	18.90	52.63	0.00
	5	291.24	43.55	18.90	24.65	7.40
	10	214.27	32.04	18.90	13.14	7.88
	15	171.47	25.64	18.90	6.74	6.07
	20	143.94	21.52	18.90	2.62	3.15

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

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

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

TABLE 5F: Catchbasin - A-02 (CB 06)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-06	610X610	0.37	87.25	85.75

TABLE 5G: Storage Provided - A-02 (CB 06)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.25	0.000	0.370	0.00
87.30	0.050	29.214	0.74
87.35	0.100	88.663	3.69
87.4	0.150	144.612	9.52
87.45	0.200	221.072	18.66
87.5	0.250	305.486	31.82
87.55	0.300	405.794	50.80

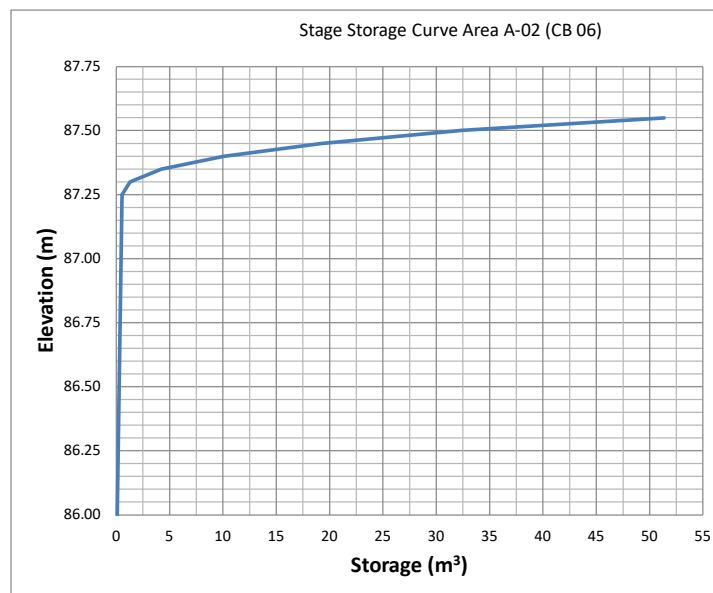
TABLE 5H: Storage Provided - A-02 (CB 06)

Storage Table					
Elevation (m)	System Depth (m)	CB-06 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.75	0.00	0.00	0.00	0.00	0.00
87.250	1.50	0.56	0.56	0.00	0.56
87.300	1.55	0.56	0.56	0.74	1.30
87.350	1.60	0.56	0.56	3.69	4.24
87.400	1.65	0.56	0.56	9.52	10.08
87.450	1.70	0.56	0.56	18.66	19.22
87.500	1.75	0.56	0.56	31.82	32.38
87.550	1.80	0.56	0.56	50.80	51.36

TABLE 5I: Orifice Sizing information - A-02 (CB 06)

Control Device							
Orifice Plate				83 mm			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	10.24	0.47	86.26	200	0.00	0.0054	83.0
1:5 Year	13.89	0.86	86.65	200.00	0.00	0.0055	83.0
1:100 Year	18.40	1.56	87.36	200.00	4.98	0.0054	83.0
1:100 + 20 Year	18.90	1.59	87.38	200.00	7.88	0.0055	83.0

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



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

TABLE 6A: Post-Development Runoff Coefficient "C" - A-03 (CB 01)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.079	0.90	0.74	1.00	0.80
0.150	Roof	0.032	1.00		1.00	
	Soft	0.039	0.20		0.25	

TABLE 6B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03 (CB 01)

0.150 =Area (ha)
 0.74 = 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	51.66	23.73	27.93	0.00
	5	103.57	31.99	23.73	8.26	2.48
	10	76.81	23.73	23.73	0.00	0.00
	15	61.77	19.08	23.73	-4.65	-4.19
	20	52.03	16.07	23.73	-7.66	-9.19

TABLE 6C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03 (CB 01)

0.150 =Area (ha)
 0.74 = 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	71.20	27.50	43.70	0.00
	5	141.18	43.61	27.50	16.11	4.83
	10	104.19	32.19	27.50	4.69	2.81
	15	83.56	25.81	27.50	-1.69	-1.52
	20	70.25	21.70	27.50	-5.80	-6.96

TABLE 6D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03 (CB 01)

0.150 =Area (ha)
 0.80 = 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	134.07	28.50	105.57	0.00
	5	242.70	81.63	28.50	53.13	15.94
	10	178.56	60.06	28.50	31.56	18.93
	15	142.89	48.06	28.50	19.56	17.60
	20	119.95	40.34	28.50	11.84	14.21

TABLE 6E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-03 (CB 01)

0.150 =Area (ha)
 0.80 = 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	160.88	29.0	131.88	0.00
	5	291.24	97.96	29.0	68.96	20.69
	10	214.27	72.07	29.0	43.07	25.84
	15	171.47	57.67	29.0	28.67	25.80
	20	143.94	48.41	29.0	19.41	23.29

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

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

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

TABLE 6F: Catchbasin - A-03 (CB 01)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.25	85.75

TABLE 6G: Storage Provided - A-03 (CB 01)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.25	0.000	0.370	0.00
87.3	0.050	27.120	0.69
87.35	0.100	86.317	3.52
87.4	0.150	165.945	9.83
87.45	0.200	248.427	20.19
87.5	0.250	338.276	34.86
87.55	0.300	454.162	56.34

TABLE 6H: Storage Provided - A-03 (CB 01)

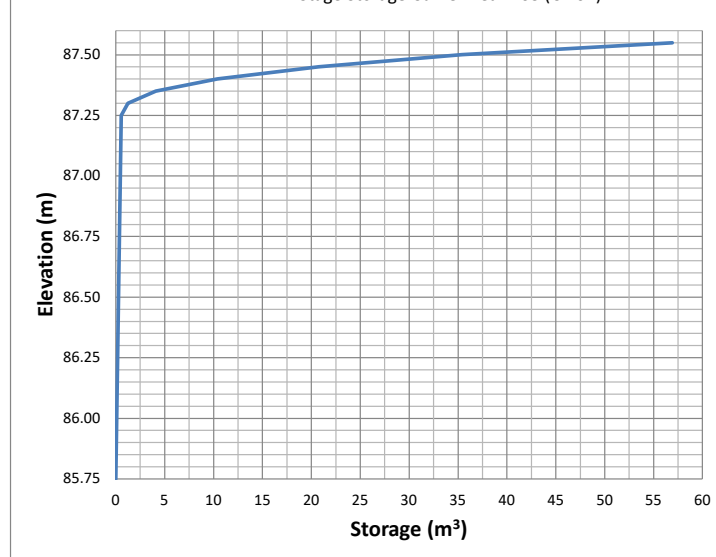
Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.75	0.00	0.00	0.00	0.00	0.00
87.250	1.50	0.56	0.56	0.00	0.56
87.300	1.55	0.56	0.56	0.69	1.25
87.350	1.60	0.56	0.56	3.52	4.08
87.400	1.65	0.56	0.56	9.83	10.39
87.450	1.70	0.56	0.56	20.19	20.75
87.500	1.75	0.56	0.56	34.86	35.41
87.550	1.80	0.56	0.56	56.34	56.90

TABLE 6I: Orifice Sizing information - A-03 (CB 01)

Control Device							
Orifice Plate		102 mm					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	23.73	1.10	86.90	200	0.00	0.0082	102.0
1:5 Year	27.50	1.53	87.33	200.00	2.81	0.0081	102.0
1:100 Year	28.50	1.64	87.44	200.00	18.93	0.0081	102.0
1:100 + 20 Year	29.0	1.70	87.50	200.00	25.84	0.0081	102.0

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

Stage Storage Curve Area A-03 (CB 01)



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

TABLE 7A: Post-Development Runoff Coefficient "C" - A-04 (CB 04)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.029	0.90	0.83	1.00	0.91
0.038	Roof	0.005	1.00		1.00	
	Soft	0.005	0.20		0.25	

TABLE 7B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.038 =Area (ha)
 0.83 = 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	14.49	6.66	7.83	0.00
	5	103.57	8.98	6.66	2.32	0.69
	10	76.81	6.66	6.66	0.00	0.00
	15	61.77	5.35	6.66	-1.31	-1.18
	20	52.03	4.51	6.66	-2.15	-2.58

TABLE 7C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.038 =Area (ha)
 0.83 = 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	19.97	9.03	10.94	0.00
	5	141.18	12.23	9.03	3.20	0.96
	10	104.19	9.03	9.03	0.00	0.00
	15	83.56	7.24	9.03	-1.79	-1.61
	20	70.25	6.09	9.03	-2.94	-3.53

TABLE 7D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.038 =Area (ha)
 0.91 = 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	37.97	11.10	26.87	0.00
	5	242.70	23.12	11.10	12.02	3.60
	10	178.56	17.01	11.10	5.91	3.54
	15	142.89	13.61	11.10	2.51	2.26
	20	119.95	11.42	11.10	0.32	0.39

TABLE 7E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.038 =Area (ha)
 0.91 = 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	45.56	11.25	34.31	0.00
	5	291.24	27.74	11.25	16.49	4.95
	10	214.27	20.41	11.25	9.16	5.49
	15	171.47	16.33	11.25	5.08	4.57
	20	143.94	13.71	11.25	2.46	2.95

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

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

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

TABLE 7F: Catchbasin - A-04 (CB 04)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB 04	610X610	0.37	87.20	85.70

TABLE 7G: Storage Provided - A-04 (CB 04)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area (m ²)	Storage Volume (m ³)
87.20	0.000	0.370	0.00
87.25	0.050	10.114	0.26
87.3	0.100	28.942	1.24
87.35	0.150	52.597	3.28
87.4	0.200	52.597	5.91

Above Spill elevation

TABLE 7H: Storage Provided - A-04 (CB 04)

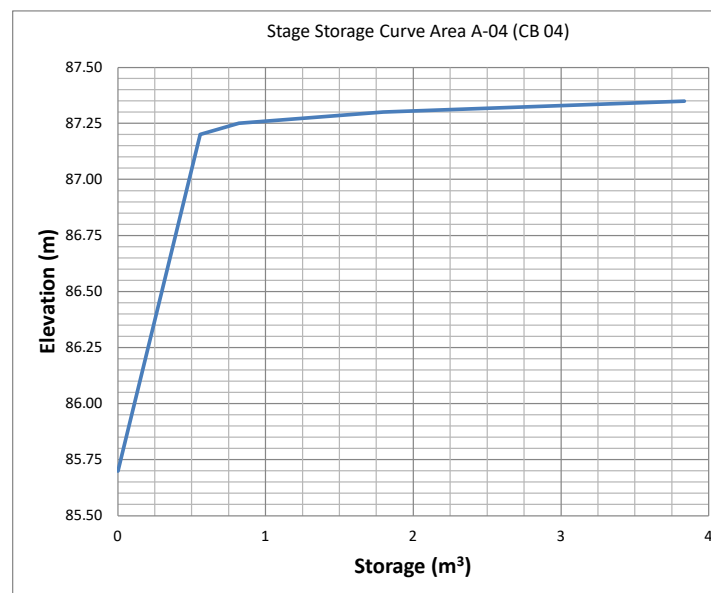
Storage Table					
Elevation (m)	System Depth (m)	CB 04 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.70	0.00	0.00	0.00	0.00	0.00
87.200	1.50	0.56	0.56	0.00	0.56
87.250	1.55	0.56	0.56	0.26	0.82
87.300	1.60	0.56	0.56	1.24	1.80
87.350	1.65	0.56	0.56	3.28	3.84
87.400	1.70	0.56	0.56	5.91	6.46

Above Spill elevation

TABLE 7I: Orifice Sizing information - A-04 (CB 04)

Control Device							
LMF		100					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	6.66	0.56	86.36	200	0.00	0.0032	64.0
1:5 Year	9.03	1.05	86.85	200.00	0.00	0.0032	64.0
1:100 Year	11.10	1.54	87.34	200.00	3.54	0.0033	64.0
1:100 + 20 Year	11.25	1.58	87.38	200.00	5.49	0.0033	64.0

The design Head is calculated based on the centre of the outlet pipe



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

TABLE 8A: Post-Development Runoff Coefficient "C" - A-05 (CB 03)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.056	0.90	0.80	1.00	0.86
0.116	Roof	0.038	1.00		1.00	
	Soft	0.022	0.20		0.25	

TABLE 8B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
 0.80 = 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	43.13	19.81	23.32	0.00
	5	103.57	26.71	19.81	6.90	2.07
	10	76.81	19.81	19.81	0.00	0.00
	15	61.77	15.93	19.81	-3.88	-3.49
	20	52.03	13.42	19.81	-6.39	-7.67

TABLE 8C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
 0.80 = 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	59.45	26.87	32.58	0.00
	5	141.18	36.41	26.87	9.54	2.86
	10	104.19	26.87	26.87	0.00	0.00
	15	83.56	21.55	26.87	-5.32	-4.79
	20	70.25	18.12	26.87	-8.75	-10.50

TABLE 8D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
 0.86 = 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	110.27	28.75	81.52	0.00
	5	242.70	67.14	28.75	38.39	11.52
	10	178.56	49.39	28.75	20.64	12.39
	15	142.89	39.53	28.75	10.78	9.70
	20	119.95	33.18	28.75	4.43	5.32

TABLE 8E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
 0.86 = 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	132.32	29.3	103.07	0.00
	5	291.24	80.56	29.3	51.31	15.39
	10	214.27	59.27	29.3	30.02	18.01
	15	171.47	47.43	29.3	18.18	16.36
	20	143.94	39.82	29.3	10.57	12.68

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

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

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

TABLE 8F: Catchbasin - A-05 (CB 03)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.30	85.80

TABLE 8G: Storage Provided - A-05 (CB 03)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.30	0.000	0.370	0.00
87.35	0.050	19.435	0.50
87.4	0.100	55.432	2.37
87.45	0.150	110.311	6.51
87.5	0.200	189.904	14.02
87.55	0.250	189.904	23.51

Above Spill Elevation

TABLE 8H: Storage Provided - A-05 (CB 03)

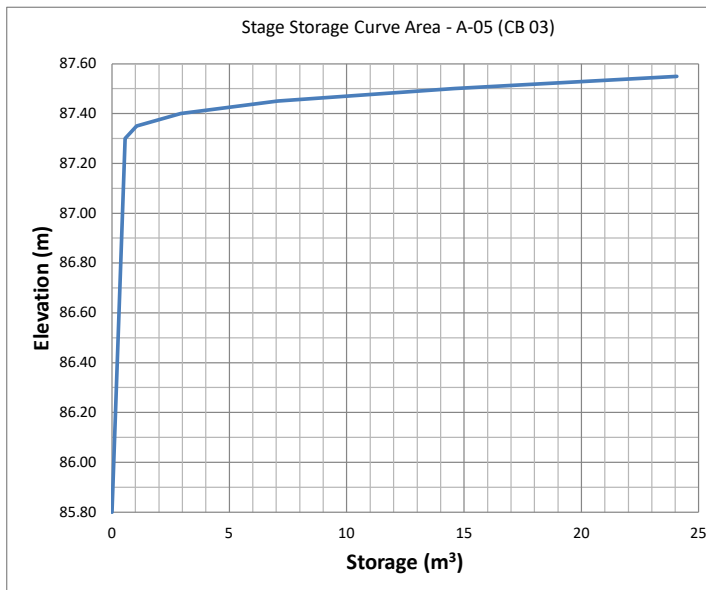
Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.80	0.00	0.00	0.00	0.00	0.00
87.300	1.50	0.56	0.56	0.00	0.56
87.350	1.55	0.56	0.56	0.50	1.05
87.400	1.60	0.56	0.56	2.37	2.92
87.450	1.65	0.56	0.56	6.51	7.07
87.500	1.70	0.56	0.56	14.02	14.57
87.550	1.75	0.56	0.56	23.51	24.07

Above Spill Elevation

TABLE 8I: Orifice Sizing information - A-05 (CB 03)

Control Device							
Orifice Plate		102 mm					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	19.81	0.78	86.63	200.00	0.00	0.0082	102.0
1:5 Year	26.87	1.45	87.30	200.00	0.00	0.0081	102.0
1:100 Year	28.75	1.64	87.49	200.00	12.39	0.0082	102.0
1:100 + 20 Year	29.3	1.67	87.52	200.00	18.01	0.0082	102.0

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



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

TABLE 9A: Post-Development Runoff Coefficient "C" - A-06 (CB 02)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.092	0.90	0.77	1.00	0.83
0.171	Roof	0.041	1.00		1.00	
	Soft	0.039	0.20		0.25	

TABLE 9B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.77 = 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	60.91	28.0	32.94	0.00
	5	103.57	37.72	28.0	9.75	2.93
	10	76.81	27.97	28.0	0.00	0.00
	15	61.77	22.50	28.0	-5.47	-4.93
	20	52.03	18.95	28.0	-9.02	-10.82

TABLE 9C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.77 = 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	83.95	31.50	52.45	0.00
	5	141.18	51.42	31.50	19.92	5.98
	10	104.19	37.95	31.50	6.45	3.87
	15	83.56	30.43	31.50	-1.07	-0.96
	20	70.25	25.59	31.50	-5.91	-7.10

TABLE 9D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.83 = 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	157.48	32.75	124.73	0.00
	5	242.70	95.89	32.75	63.14	18.94
	10	178.56	70.54	32.75	37.79	22.68
	15	142.89	56.45	32.75	23.70	21.33
	20	119.95	47.39	32.75	14.64	17.57

TABLE 9E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.83 = 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	115.06	33.0	82.06	24.62
	10	214.27	84.65	33.0	51.65	30.99
	15	171.47	67.74	33.0	34.74	31.27
	20	143.94	56.87	33.0	23.87	28.64
	25	124.62	49.23	33.0	16.23	24.35

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

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

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

TABLE 9F: Catchbasin - A-06 (CB 02)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.25	85.75

TABLE 9G: Storage Provided - A-06 (CB 02)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.25	0.000	0.370	0.00
87.3	0.050	15.014	0.38
87.35	0.100	46.990	1.93
87.4	0.150	103.195	5.69
87.45	0.200	178.035	12.72
87.5	0.250	272.041	23.97
87.53	0.280	344.256	34.77

TABLE 9H: Storage Provided - A-06 (CB 02)

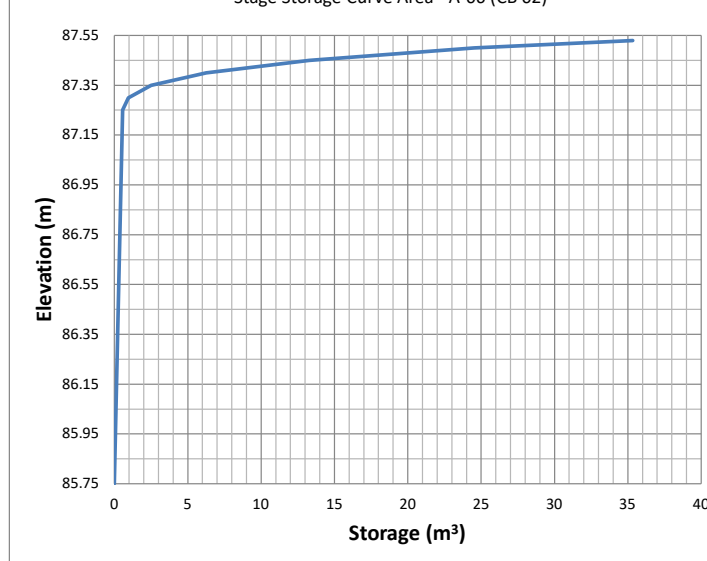
Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.75	0.00	0.00	0.00	0.00	0.00
87.250	1.50	0.56	0.56	0.00	0.56
87.300	1.55	0.56	0.56	0.38	0.94
87.350	1.60	0.56	0.56	1.93	2.49
87.400	1.65	0.56	0.56	5.69	6.25
87.450	1.70	0.56	0.56	12.72	13.28
87.500	1.75	0.56	0.56	23.97	24.53
87.530	1.78	0.56	0.56	34.77	35.33

TABLE 9I: Orifice Sizing information - A-06 (CB 02)

Control Device							
Orifice Plate 108 mm							
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	27.97	1.25	87.05	200	0.00	0.0091	108.0
1:5 Year	31.50	1.56	87.37	200.00	3.87	0.0092	108.0
1:100 Year	32.75	1.69	87.49	200.00	22.68	0.0092	108.0
1:100 + 20 Year	33.0	1.71	87.52	200.00	31.27	0.0092	108.0

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

Stage Storage Curve Area - A-06 (CB 02)



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

TABLE 10A: Post-Development Runoff Coefficient "C" - A-07 (CB 08)

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.000	0.90	0.45	0.48	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot} * Runoff Coefficient increases by
0.022	Roof	0.007	1.00			
	Soft	0.015	0.20			

TABLE 10B: Post-Development - A-07 (CB 08) Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.022	0.45	10	2.1	2.8	5.2

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 11A: 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	0.009	0.90	0.58	1.00	0.61
0.142	Roof	0.059	1.00		1.00	
	Soft	0.074	0.20		0.25	

TABLE 11B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07

0.142 =Area (ha)
 0.58 = 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	23.60	5.40	18.20	5.46
	10	76.81	17.50	5.40	12.10	7.26
	15	61.77	14.07	5.40	8.67	7.81
	20	52.03	11.85	5.40	6.45	7.75
	25	45.17	10.29	5.40	4.89	7.34

TABLE 11C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07

0.142 =Area (ha)
 0.58 = 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	10	104.19	23.74	6.500	17.24	10.34
	15	83.56	19.04	6.500	12.54	11.28
	20	70.25	16.01	6.500	9.51	11.41
	25	60.90	13.87	6.500	7.37	11.06
	30	53.93	12.29	6.500	5.79	10.42

TABLE 11D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07

0.142 =Area (ha)
 0.61 = 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	10	178.56	42.98	10.15	32.83	19.70
	15	142.89	34.39	10.15	24.24	21.82
	20	119.95	28.87	10.15	18.72	22.46
	25	103.85	24.99	10.15	14.84	22.27
	30	91.87	22.11	10.15	11.96	21.53

TABLE 11E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07

0.142 =Area (ha)
 0.61 = 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	15	171.47	41.27	10.5	30.77	27.69
	20	143.94	34.64	10.5	24.14	28.97
	25	124.62	29.99	10.5	19.49	29.24
	30	110.24	26.53	10.5	16.03	28.86
	35	99.09	23.85	10.5	13.35	28.04

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 11F: Catchbasin - A-08 (CBMH 07)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
LD 1001	300	0.07	87.37	85.99
LD 1002	300	0.07	87.4	85.87
CBMH -7	1200	1.13	87.55	85.63
LD 1003	300	0.07	87.72	85.86
LD 1004	300	0.07	87.86	86.08
LD 1005	300	0.07	87.3	86.33

TABLE 11G: Underground Storage (Perforated Pipe) - A-08 (CBMH 07)

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 ¹ (m)	Height ² (m)	Width (m)	Porosity	Perf. Pipe	Stone ³	TOTAL
LD1001 - LD1002	85.99	85.93	250	5.1	0.55	0.85	0.3	0.25	0.6	0.9
LD1002 - CB-07	85.92	85.69	250	23	0.55	0.85	0.3	1.13	2.9	4.0
LD 1005 - LD 1004	86.33	86.08	250	25.00	0.55	0.85	0.3	1.23	3.1	4.4
LD 1004 - LD 1003	86.07	85.9	250	20.00	0.55	0.85	0.3	0.98	2.5	3.5
LD 1003 - CB 07	85.89	85.69	250	15.65	0.55	0.85	0.3	0.77	2.0	2.7
Total Length =				88.75	Total Storage =			4.4	11.1	15.5

¹ Length is structure wall to structure wall

² Height of trench does not include 0.15m of clearstone below the subdrain.

³ Based on 30% porosity in the clear stone

TABLE 11H: Storage Provided - A-08 (CBMH 07)

Area A-05: Above Ground Ponding									
Elevation (m)	LD 1001 Ponding Depth (m)	LD 1001 Area ¹ (m ²)	LD 1002 Ponding Depth (m)	LD 1002 Area ¹ (m ²)	CBMH -7 Ponding Depth (m)	CBMH -7 Area ¹ (m ²)	LD 1005 Ponding Depth (m)	LD 1005 Area ¹ (m ²)	Storage Volume (m ³)
87.3	-	-	-	-	-	-	0.000	0.070	0.00
87.35	-	-	-	-	-	-	0.050	0.625	0.02
87.37	0.000	0.070	-	-	-	-	0.070	1.219	0.04
87.4	0.030	0.384	0.000	0.070	-	-	0.100	2.395	0.10
87.45	0.080	3.345	0.050	3.213	-	-	0.150	4.302	0.44
87.5	0.130	9.334	0.100	11.357	-	-	0.200	8.091	1.43
87.55	0.180	16.710	0.150	21.643	0.000	0.360	0.250	13.530	3.45
87.59	0.220	24.219	0.190	32.213	0.040	9.789	0.290	19.489	6.21
87.64	0.270	24.219	0.240	32.213	0.090	9.789	0.340	20.489	10.52
87.69	0.320	24.219	0.290	32.213	0.140	9.789	0.390	21.489	14.88

Above Spill Elevation

TABLE 11I: Storage Provided - A-08 (CBMH 07)

Storage Table											
Elevation (m)	System Depth (m)	LD 1005 Volume (m ³)	LD 1004 Volume (m ³)	LD 1003 Volume (m ³)	CBMH -7 Volume (m ³)	LD 1002 Volume (m ³)	LD 1001 Volume (m ³)	Pipe Volume (m ³)	Underground Volume (m ³) ¹	Ponding Volume (m ³)	Total Volume (m ³)
85.630	0.00	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00
86.880	1.25	0.039	0.057	0.072	1.414	0.07	0.06	15.50	17.21	0.00	17.21
87.030	1.40	0.049	0.067	0.083	1.583	0.08	0.07	-	17.43	0.00	17.43
87.180	1.55	0.060	0.078	0.093	1.753	0.09	0.08	-	17.66	0.00	17.66
87.300	1.67	0.069	0.086	0.102	1.889	0.10	0.09	-	17.84	0.00	17.84
87.350	1.72	0.072	0.090	0.105	1.945	0.10	0.10	-	17.91	0.02	17.93
87.370	1.74	0.074	0.091	0.107	1.968	0.11	0.10	-	17.94	0.04	17.98
87.400	1.77	-	0.093	0.109	2.002	0.11	-	-	17.98	0.10	18.08
87.450	1.82	-	0.097	0.112	2.058	-	-	-	18.04	0.44	18.48
87.500	1.87	-	0.100	0.116	2.115	-	-	-	18.11	1.43	19.54
87.550	1.92	-	0.104	0.119	2.171	-	-	-	18.17	3.45	21.62
87.590	1.96	-	0.107	0.122	-	-	-	-	18.18	6.21	24.38
87.640	2.01	-	0.110	0.126	-	-	-	-	18.18	10.52	28.70
87.690	2.06	-	0.114	0.129	-	-	-	-	18.19	14.88	33.07

TABLE 11J: Orifice Sizing information - A-08 (CBMH 07)

Control Device							
Orifice Plate		83 mm					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	10.80	0.52	86.19	250	7.81	0.0054	83.0
1:5 Year	13.00	0.78	86.46	250.00	11.41	0.0053	83.0
1:100 Year	20.30	1.89	87.56	250.00	22.46	0.0054	83.0
1:100 + 20 Year	21.00	1.97	87.65	250.00	29.24	0.0054	83.0

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

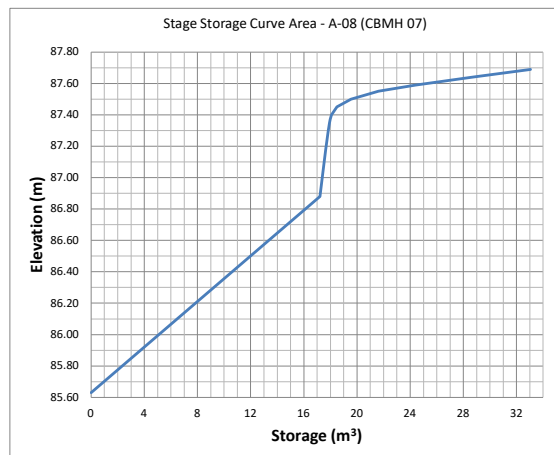
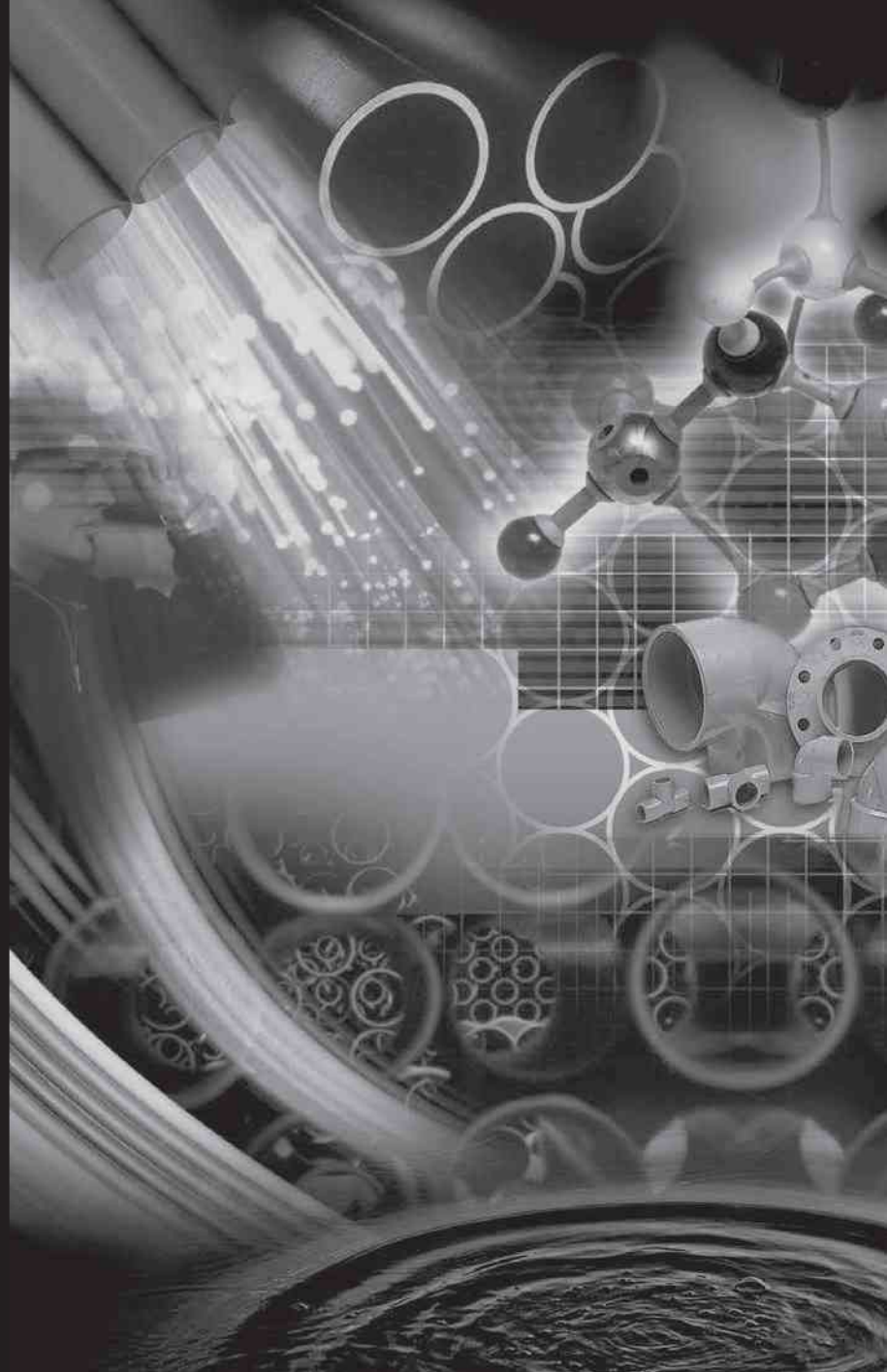


Table 12: Post-Development Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device		Outlet Location	2-Year uncontrolled release rate (TC=10min)	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			Max. Vol. Provided (cu.m.)
								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)	
D-01	0.114	0.55	0.58	N/A		Shirleys Brook	13.50	13.50	N/A	N/A	18.30	N/A	N/A	32.90	N/A	N/A	N/A
D-02	0.001	0.53	0.60	N/A		Dandelion Mews	0.20	0.20	N/A	N/A	0.20	N/A	N/A	0.40	N/A	N/A	N/A
D-03	0.010	0.37	0.60	N/A		Spoor Street	0.80	0.80	N/A	N/A	1.00	N/A	N/A	2.10	N/A	N/A	N/A
D-04	0.009	0.43	0.50	N/A		Buckbean	0.90	0.90	N/A	N/A	1.20	N/A	N/A	2.40	N/A	N/A	N/A
A-01 (CB 05)	0.081	0.52	0.76	N/A		Spoor Street	9.00	9.00	N/A	N/A	12.20	N/A	N/A	22.30	N/A	N/A	N/A
A-02 (CB 06)	0.068	0.71	0.64	Oriface Plate	83.00	Spoor Street	10.24	10.24	0.469	0.00	13.89	0.859	0.00	18.40	1.565	4.98	51.36
A-03 (CB 01)	0.150	0.74	0.74	Oriface Plate	102	Spoor Street	23.73	23.73	1.10	0.00	27.50	1.53	2.81	28.50	1.64	18.93	56.90
A-04 (CB 04)	0.038	0.83	0.91	LMF	100.00	Spoor Street	6.66	6.66	0.56	0.00	9.03	1.05	0.00	11.10	1.54	3.54	3.84
A-05 (CB 03)	0.116	0.80	0.86	Oriface Plate	102.00	Spoor Street	19.81	19.81	0.78	0.00	26.87	1.45	0.00	28.75	1.64	12.39	24.07
A-06 (CB 02)	0.171	0.77	0.83	Oriface Plate	108.00	Spoor Street	27.97	27.97	1.25	0.00	31.50	1.56	3.87	32.75	1.69	22.68	35.33
A-07 (CB 08)	0.022	0.45	0.48	N/A		Spoor Street	2.10	2.10	N/A	N/A	2.80	N/A	N/A	5.20	N/A	N/A	N/A
A-08 (CBMH 07)	0.142	0.58	0.61	Oriface Plate	83.00	Spoor Street	14.07	10.80	0.52	7.81	13.00	0.78	11.41	20.30	1.89	22.46	28.70
Post-Dev Total	0.922	0.67	0.72				128.98	125.71		7.80	157.49		18.09	205.10		84.98	200.19
Total Allowable Release Rate											194.30			206.70			

Volume III: TEMPEST INLET CONTROL DEVICES

Municipal Technical
Manual Series



SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD



IPEX

by aliaxis

IPEX Tempest™ Inlet Control Devices

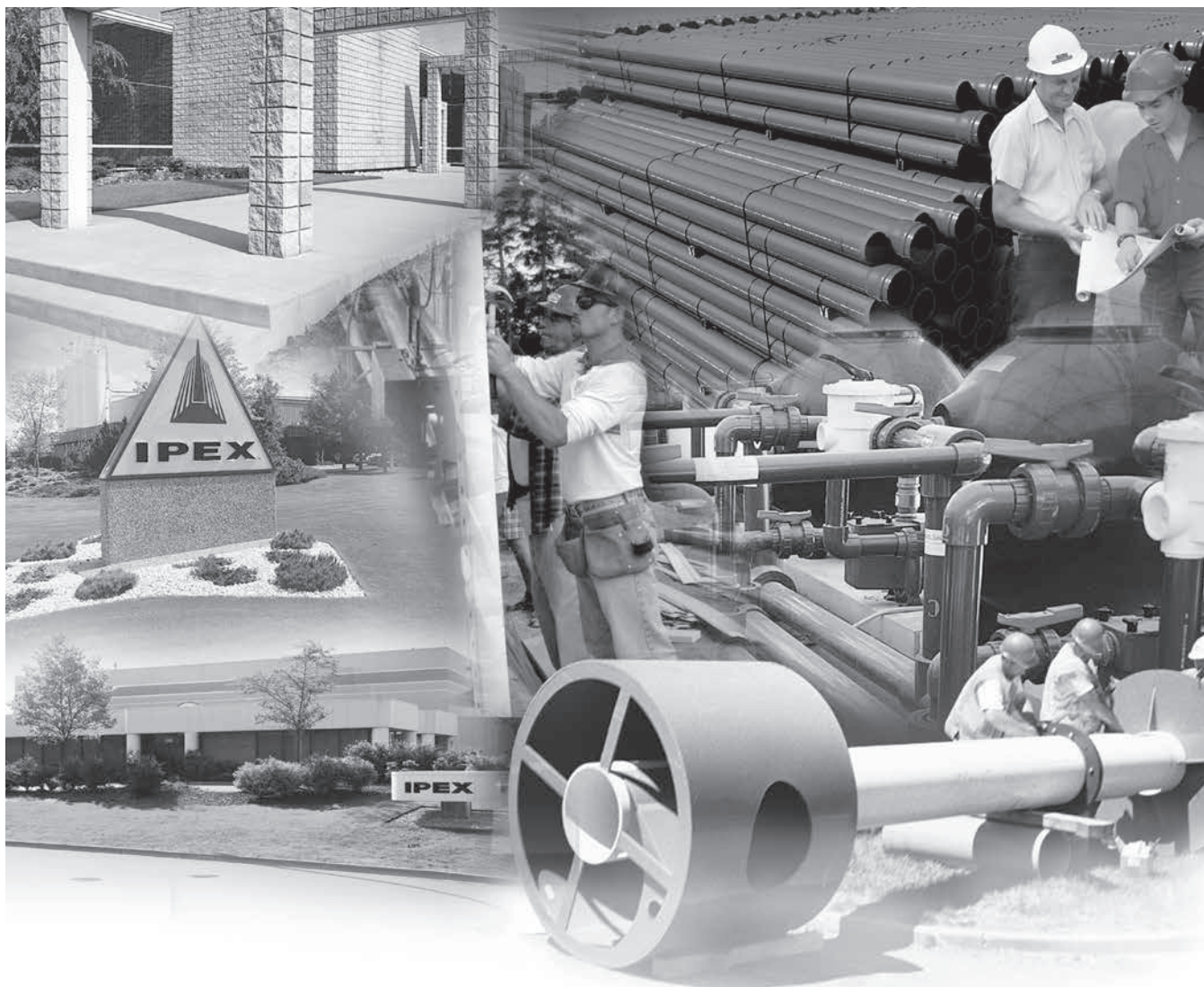
Municipal Technical Manual Series

Vol. I, 2nd Edition

© 2022 by IPEX. All rights reserved. No part of this book may be used or reproduced in any manner whatsoever without prior written permission.

For information contact: IPEX, Marketing,
1425 North Service Road East, Oakville, Ontario, Canada, L6H 1A7

The information contained here within is based on current information and product design at the time of publication and is subject to change without notification. IPEX does not guarantee or warranty the accuracy, suitability for particular applications, or results to be obtained therefrom.



ABOUT IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

CONTENTS

TEMPEST INLET CONTROL DEVICES Technical Manual

About IPEX

Section One:	Product Information: TEMPEST Low, Medium Flow (LMF) ICD	
	Purpose.....	4
	Product Description.....	4
	Product Function.....	4
	Product Construction.....	4
	Product Applications.....	4
	Chart 1: LMF 14 Preset Flow Curves.....	5
	Chart 2: LMF Flow Vs. ICD Alternatives.....	5
	Product Installation	
	Instructions to assemble a TEMPEST LMF ICD into a square catch basin:.....	6
	Instructions to assemble a TEMPEST LMF ICD into a round catch basin:.....	6
	Product Technical Specification	
	General.....	7
	Materials.....	7
	Dimensioning.....	7
	Installation.....	7
Section Two:	Product Information: TEMPEST High Flow (HF) & Medium, High Flow (MHF) ICD	
	Product Description.....	8
	Product Function.....	8
	Product Construction.....	8
	Product Applications.....	8
	Chart 3: HF & MHF Preset Flow Curves.....	9
	Product Installation	
	Instructions to assemble a TEMPEST HF or MHF ICD into a square catch basin:.....	10
	Instructions to assemble a TEMPEST HF or MHF ICD into a round catch basin:.....	10
	Instructions to assemble a TEMPEST HF Sump into a square or round catch basin:...	11
	Product Technical Specification	
	General.....	11
	Materials.....	11
	Dimensioning.....	11
	Installation.....	11

PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

Will accommodate both square and round applications:

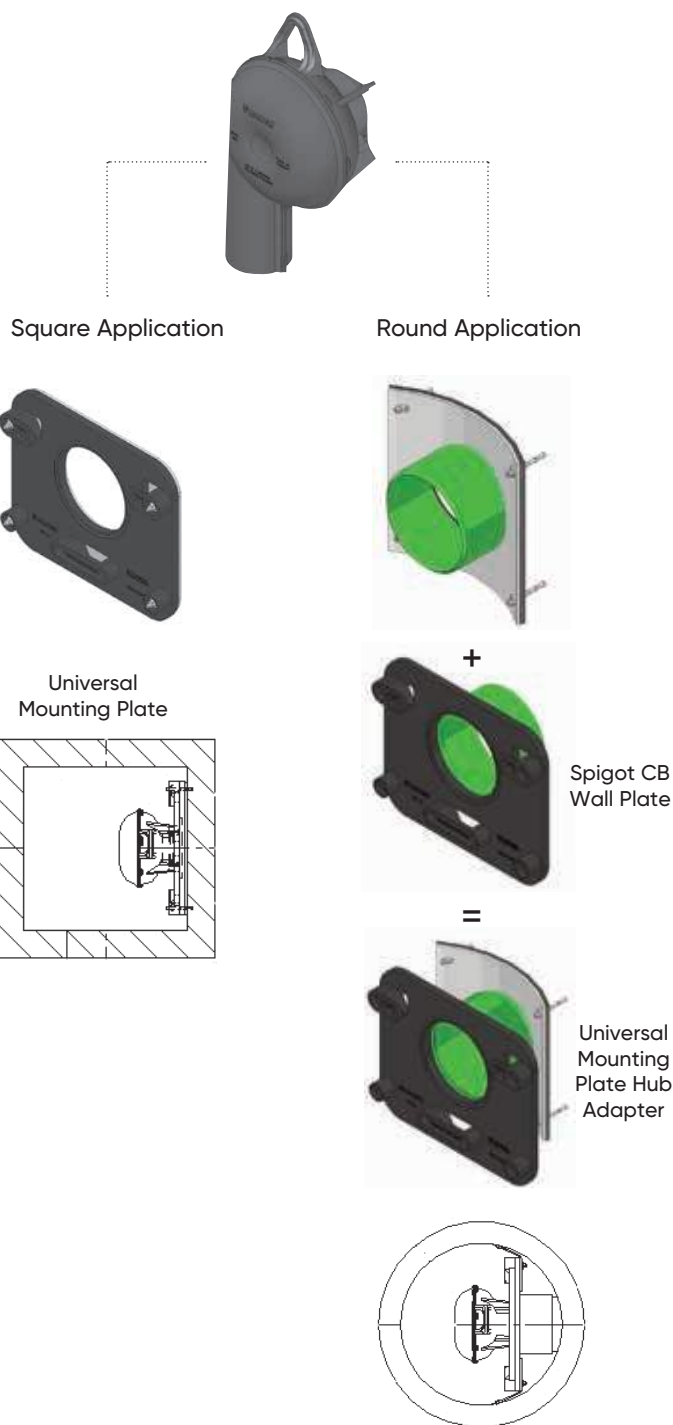


Chart 1: LMF 14 Preset Flow Curves

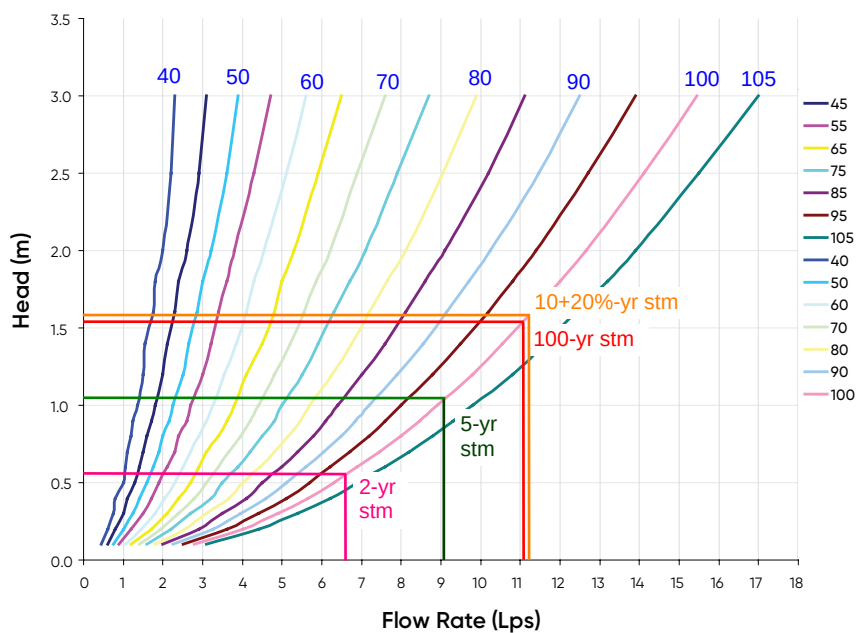
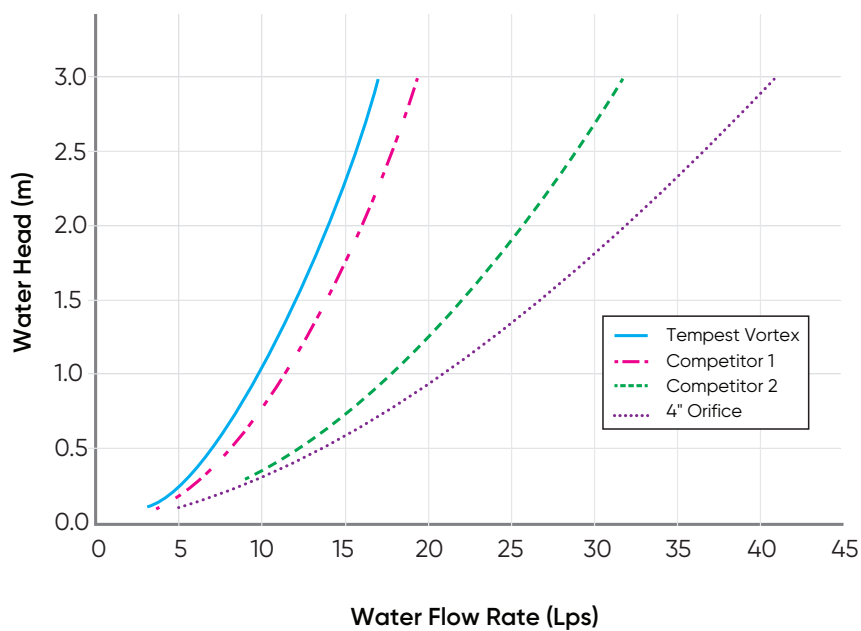


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at ipexna.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

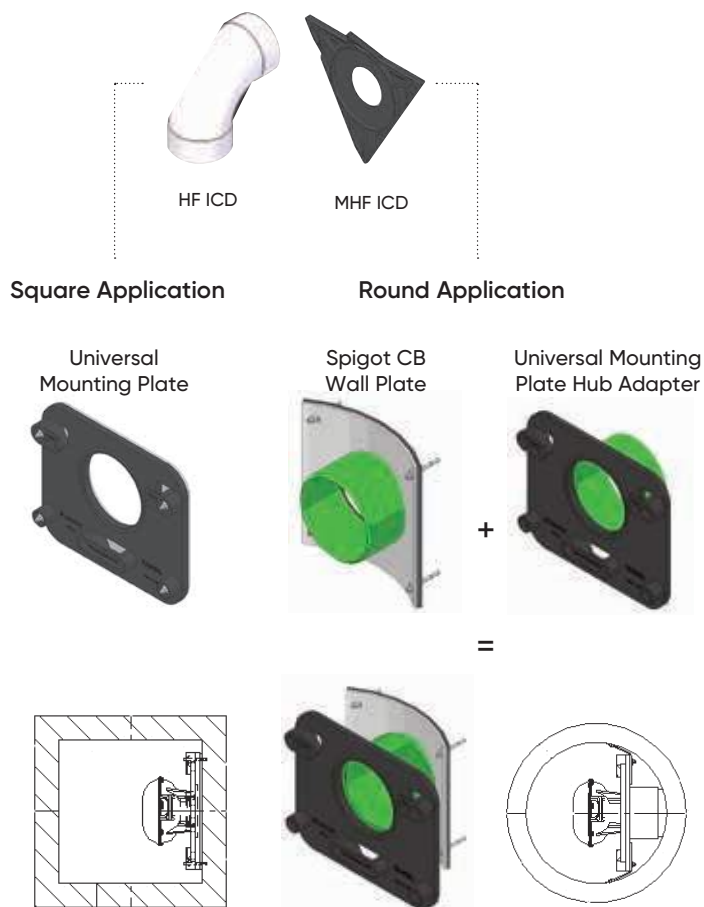
TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:

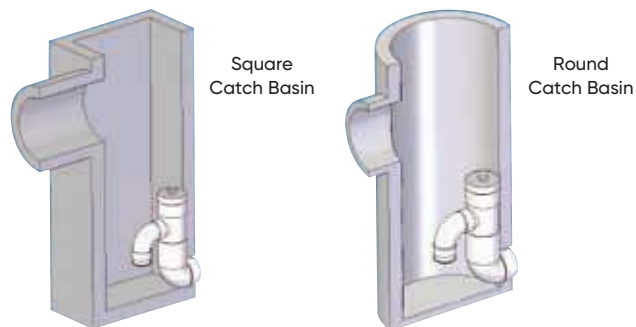
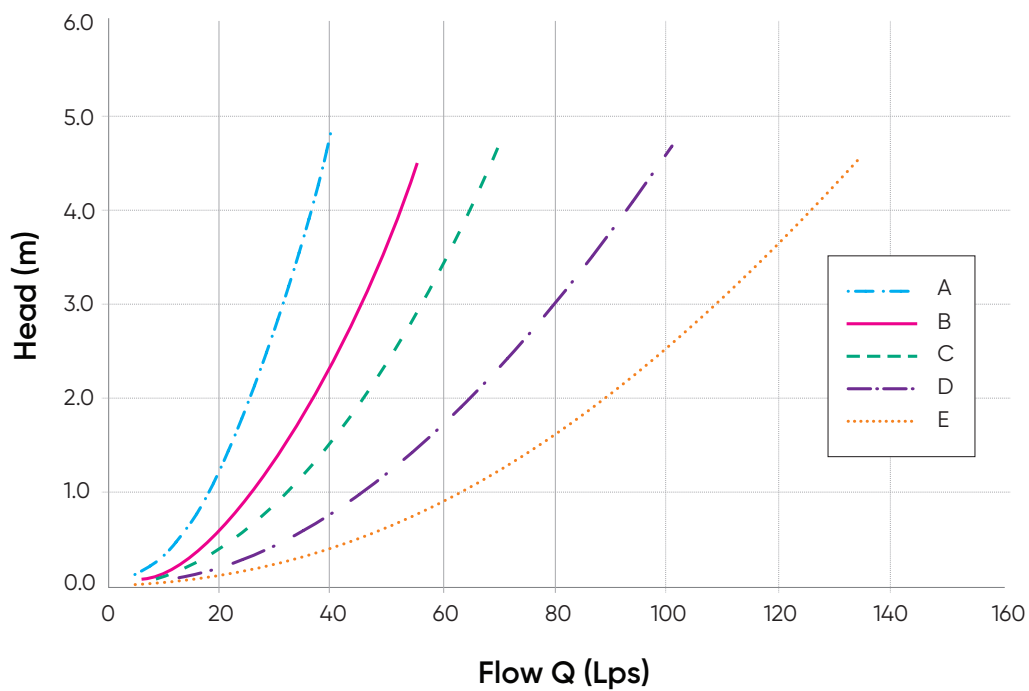


Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification.
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
6. Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
 - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTES

SALES AND CUSTOMER SERVICE

IPEX USA LLC

Toll Free: (800) 463-9572

ipexna.com

About the IPEX Group of Companies

As leading suppliers of thermoplastic piping systems, the IPEX Group of Companies provides our customers with some of the largest and most comprehensive product lines. All IPEX products are backed by more than 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, we have established a reputation for product innovation, quality, end-user focus and performance.

Markets served by IPEX group products are:

- Electrical systems
- Telecommunications and utility piping systems
- PVC, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

Products manufactured by IPEX Inc. and distributed in the United States by IPEX USA LLC.

Tempest™ is a trademark of IPEX Branding Inc.

This literature is published in good faith and is believed to be reliable. However it does not represent and/or warrant in any manner the information and suggestions contained in this brochure. Data presented is the result of laboratory tests and field experience.

A policy of ongoing product improvement is maintained. This may result in modifications of features and/or specifications without notice.



Appendix E

Impacts to Copperwood System

MEMORANDUM

DATE: JULY 23, 2026

TO: ANTHONY MESTWARP

FROM: MELANIE SCHROEDER

RE: COPPERWOOD BLOCK 73
MEDIUM DENSITY DEVELOPMENT
STORMWATER IMPACTS OF BLOCK 73 ON OVERALL
SUBDIVISION MODEL (PCSWMM)
NOVATECH PROJECT NO.: 125113

CC: GREG MACDONALD

INTRODUCTION AND BACKGROUND

This memorandum has been prepared to summarize the findings of this analysis in support of the detailed SWM design for Block 73 of the Copperwood Estates Subdivision, as described in the *Copperwood Block 73 Servicing and Stormwater Management Report*, prepared by Novatech, revised July 23, 2026. The purpose of this memorandum is to confirm impacts of the development on the surrounding subdivision as there are more direct runoff areas than was previously assumed in the Copperwood Estates Subdivision Phase 1 detailed design. This analysis is used to confirm impacts based on the hand calculations.

Copperwood Estates Subdivision PCSWMM Model

Novatech prepared a dual-drainage PCSWMM model of the Copperwood Estates Subdivision in support of the detailed design of Phase 1. The subdivision PCSWMM model has been updated for the detailed design of Phase 2 and submitted in January of 2026 and is in the approval process. The updated subdivision model included a conceptual stormwater management design for Block 73, consisting of on-site storage and a controlled release rate to the storm sewer on Spoor Street.

Block 125

The detailed design of Block 125, which is located across Spoor Street from Block 73, was provided in the *Copperwood Flats Block 125 Servicing and Stormwater Management Report* prepared by Novatech, revised August 19, 2025. The impacts of Block 125 on the adjacent Copperwood Estate Subdivision and Shirley's Brook were evaluated through an update of the Copperwood Estates PCSWMM model and the HEC-RAS model of Shirley's Brook Tributary 2 to reflect proposed drainage patterns for Block 125. The updated model reflecting the detailed design of Block 125 has been used in the analysis of Block 73 to ensure the cumulative changes for both sites do not have any adverse impacts on the surrounding development and Shirley's Brook.

Block 73

The detailed stormwater management design and drainage patterns for Block 73 (formerly Block 284) has some differences from the conceptual design. The primary difference is that some

areas of the site will have direct runoff to Dandelion Place, Spoor Street, and Shirley's Brook. The detailed SWM design for Block 73 was incorporated into the overall subdivision PCSWMM model to evaluate the impacts of the direct runoff areas on the surrounding subdivision and Shirley's Brook Tributary 2.

Impacts to the 100-year floodplain for the Shirley's Brook Tributary 2 due to the additional direct runoff from Block 73 and Block 125 were evaluated using HEC-RAS. The steady-state flow data in the Tributary 2 HEC-RAS model from the *Shirley's Brook Tributary 2 Flood & Erosion Hazard Mapping Revisions* (Novatech, August 2025) was revised to account for the additional direct runoff from Blocks 73 and 125.

PCSWMM MODEL

The detailed design for Block 73 has a single controlled minor system outlet to Spoor Street and four (4) direct runoff areas. The detailed design for Block 73 was incorporated into the overall Copperwood Estates PCSWMM model as follows:

Catchment Areas & Parameters

- Drainage areas A-01 to A-08 and D-01 to D-04 were added to replace subcatchment NW-31.
 - Subcatchment parameters representing the proposed grading and drainage design for Block 73 were assigned based on **Drawing 125113-SWM**.

Controlled Runoff (to Spoor Street Sewer)

- The controlled areas A-01 to A-08 were modelled as follows:
 - The internal pipe network for Block 73 was not included in the model. On-site storage and controlled minor system flows are modelled with a single storage node and orifice.
 - This storage node represents the available storage volume of 200.19 m³ as noted in the *Copperwood Block 73 Servicing and Stormwater Management Report* (Novatech, July 2026).
 - The minor system outlet was modelled using a single orifice sized to match the combined 100-year release rate from the proposed on-site ICDs:
 - Block 73 SWM report: $Q_{100} = 167.3 \text{ L/s}$
 - Updated Copperwood Estates Model: $Q_{100} = 165.1 \text{ L/s}$
 - A major system spill was added above the 100-year maximum storage elevation to represent major system spills during events exceeding the 100-year storm event.

Direct Runoff

- Direct runoff Areas were modelled as follows:
 - Area D-01 (0.114 ha) directed to a new outfall representing Tributary 2.
 - Area D-02 (0.001 ha) directed to CB96/CB95 on Dandelion Mews.
 - Area D-03 (0.010 ha) directed to CB19/CB20 on Spoor Street.
 - Area D-04 (0.009 ha) directed to CB155-158/9-10 on Buckbean Avenue.

MODEL RESULTS

The updated subdivision model was run and compared to the original model. It should be noted that both Buckbean Avenue and Spoor Street are collector roads, while Dandelion Place is a local road.

ICD Sizing

The results show minimal downstream impacts within the Copperwood Estates Subdivision resulting from the updated model. As part of the Block 125 design, the two 94mm diameter ICDs at CB5/CB6 were proposed be upsized to 102mm diameter ICDs. These ICD's have been replaced as part of the ongoing site construction.. A summary of the ICD sizing is as follows:

- The ICDs at CB5/CB6 are two 94mm diameter ICDs.
 - 5-year ponding at this location is 0.01m.
 - 100-year ponding at this location is 0.18m.
- If the ICDs at CB5/CB6 are upsized to 102mm.
 - Ponding at this location is 0.00m in the 5-year.
 - 100-year ponding at this location is 0.18m which is below the maximum of 0.35m.

Ponding Depths & HGL

A comparison of modelled ponding depths and HGL elevations between the Phase 1 PCSWMM model and the updated model reflecting the detailed design of Block 125 are provided in **Tables 1 and 2**.

Table 1: Ponding Comparison (3-hour Chicago Storm Distribution)

Scenario	Location	T/G (m)	2-year		5-year		100-year				100-year + 20%			
			Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Velocity (m/s)	Velocity x Depth (m ² /s)	Elev. (m)	Depth (m)	Velocity (m/s)	Velocity x Depth (m ² /s)
Previous Model	CB2/CB1 ⁽³⁾	82.30	82.31	0.01	82.32	0.02	82.33	0.03	0.18	0.01	82.33	0.03	0.20	0.01
	CB3/CB4 ⁽²⁾	82.76	81.81	0.00	82.44	0.00	82.90	0.14	0.00	0.00	82.95	0.19	0.00	0.00
	CB5/CB6 ⁽²⁾	84.92	84.17	0.00	84.93	0.01	85.10	0.18	0.58	0.10	85.15	0.23	0.57	0.13
	CB7/CB8 ⁽³⁾	86.20	86.22	0.02	86.23	0.03	86.24	0.04	0.58	0.02	86.24	0.04	0.76	0.03
	CB19/CB20 ⁽²⁾	87.36	86.30	0.00	86.94	0.00	87.47	0.11	0.00	0.00	87.65	0.29	0.59	0.17
	CB21/CB22 ⁽²⁾	87.67	86.80	0.00	87.27	0.00	87.84	0.17	0.00	0.00	87.90	0.23	0.00	0.00
	CB94/CB93 ⁽¹⁾	87.92	87.60	0.00	88.00	0.08	88.09	0.17	0.21	0.04	88.10	0.18	0.21	0.04
	CB96/CB95 ⁽¹⁾	87.27	86.53	0.00	87.35	0.08	87.57	0.30	0.14	0.04	87.61	0.34	0.17	0.06
	CB155-158/ 9-10 ⁽³⁾	86.70	86.72	0.02	86.73	0.03	86.74	0.04	0.86	0.03	86.76	0.06	1.15	0.07
	CB159-162/ CB17-18 ⁽³⁾	86.65	86.66	0.01	86.67	0.02	86.68	0.03	0.25	0.01	86.68	0.03	0.27	0.01
Updated Model with Block 125 and Block 73	CB2/CB1 ⁽³⁾	82.30	82.31	0.01	82.32	0.02	82.33	0.03	0.18	0.01	82.33	0.03	0.20	0.01
	CB3/CB4 ⁽²⁾	82.76	81.81	0.00	82.44	0.00	82.90	0.14	0.00	0.00	82.95	0.19	0.00	0.00
	CB5/CB6 ⁽²⁾	84.92	84.09	0.00	84.84	0.00	85.10	0.18	0.00	0.00	85.15	0.23	0.00	0.00
	CB7/CB8 ⁽³⁾	86.20	86.22	0.02	86.23	0.03	86.24	0.04	0.67	0.03	86.25	0.05	0.75	0.04
	CB19/CB20 ⁽²⁾	87.36	86.51	0.00	87.36	0.00	87.51	0.15	0.00	0.00	87.61	0.25	0.00	0.00
	CB21/CB22 ⁽²⁾	87.67	86.80	0.00	87.27	0.00	87.84	0.17	0.00	0.00	87.90	0.23	0.00	0.00
	CB94/CB93 ⁽¹⁾	87.92	87.60	0.00	88.00	0.08	88.09	0.17	0.21	0.04	88.10	0.18	0.21	0.04

Scenario	Location	T/G (m)	2-year		5-year		100-year				100-year + 20%			
			Elev.	Depth	Elev.	Depth	Elev.	Depth	Velocity	Velocity x Depth	Elev.	Depth	Velocity	Velocity x Depth
			(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m ² /s)	(m)	(m)	(m/s)	(m ² /s)
	CB96/CB95 ⁽¹⁾	87.27	86.53	0.00	87.34	0.07	87.57	0.30	0.14	0.04	87.61	0.34	0.17	0.06
	CB155-158/ 9-10 ⁽³⁾	86.70	86.72	0.02	86.73	0.03	86.74	0.04	0.85	0.03	86.76	0.06	1.15	0.07
	CB159-162/ CB17-18 ⁽³⁾	86.65	86.66	0.01	86.67	0.02	86.68	0.03	0.21	0.01	86.68	0.03	0.23	0.01
Diff.	CB2/CB1 ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0
	CB3/CB4 ⁽²⁾	0	0	0	0	0	0	0	0	0	0	0	0	0
	CB5/CB6 ⁽²⁾	0	-0.08	0	-0.09	-0.01	0	0	-0.58	-0.10	0	0	-0.57	-0.13
	CB7/CB8 ⁽³⁾	0	0	0	0	0	0	0	0.09	0	0.01	0.01	-0.01	0.01
	CB19/CB20 ⁽²⁾	0	0.21	0	0.42	0	0.04	0.04	0	0	-0.04	-0.04	-0.59	-0.17
	CB21/CB22 ⁽²⁾	0	0	0	0	0	0	0	0	0	0	0	0	0
	CB94/CB93 ⁽¹⁾	0	0	0	0	0	0	0	0	0	0	0	0	0
	CB96/CB95 ⁽¹⁾	0	0	0	-0.01	-0.01	0	0	0	0	0	0	0	0
	CB155-158/ 9- 10 ⁽³⁾	0	0	0	0	0	0	0	-0.01	0	0	0	0	0
	CB159-162/ CB17-18 ⁽³⁾	0	0	0	0	0	0	0	-0.04	0	0	0	-0.04	0

⁽¹⁾ In-sag CBs sized for 2-year

⁽²⁾ In-sag CBs sized for 5-year

⁽³⁾ On-Grade CBs sized for 5-year

Table 2: HGL Comparison (3-hour Chicago Storm Distribution)

MH ID	100-year HGL (m)		
	Previous Model	Updated Model with Block 73	Difference
MH312	85.70	85.69	-0.01
MH314	85.54	85.54	0.00
MH316	85.46	85.47	0.01
MH937	84.14	84.12	-0.02
MH1210	85.17	85.18	0.01
MH1212	85.00	85.02	0.02
MH1214	84.14	84.12	-0.02
MH1216	84.14	84.12	-0.02
MH1218	84.14	84.12	-0.02
MH1300	84.59	84.52	-0.07
MH1302	84.81	84.75	-0.06

Ponding depths (Table 1) are largely unchanged. The 100-year ponding depth at CB 5/6 has remained the same due to the larger diameter ICDs allowing slightly more flow into the minor system. The 100-year ponding depth at CB 19/20 has increased by 4cm because of the additional direct runoff from Block 73 (Area D-03). The 100-year velocity toward CB 7/CB 8 increases slightly in the 100-year but has no impact to the velocity x depth value. The 100-year + 20 ponding depth at CB 7/CB 8 has increased by 1cm. These changes to CB 7/CB 8 is due to the additional direct runoff from Block 73 (Area D-04).

The model revisions for Block 73 have had minimal impact on the 100-year HGL elevations in the storm sewers. There is a 1cm increase to the HGL elevations at MH 316 and MH 1210 and a 2cm increase at MH 1212.

SWMF Storage Volumes and Release Rates

Table 3 provides a comparison of the 100-year storage volumes and release rates from the Copperwood Estates SWM facility following the updates for Block 73. The model results demonstrate that there will be no impact to the performance of the SWM facility resulting from the Block 73 updates. The 100-year water level, active storage volume and release rate for the upper cell decreased slightly. The lower cell of the SWMF results show a very slight decrease in the 100-year water level and active storage volume, while the 100-year release rate remains the same.

Table 3: SWMF Comparison (12-hour SCS Storm Distribution)

Scenario	Upper Pond			Lower Pond		
	100-yr HGL (m)	100-year Volume (m ³)	100-year Outflow (L/s)	100-yr HGL (m)	100-year Volume (m ³)	100-year Outflow (L/s)
Previous Model	84.38	24,584	149	81.87	16,715	113
Updated Model with Block 73	84.36	24,463	148	81.86	16,639	113

Direct Runoff Area to Shirley's Brook

The Copperwood Estates subdivision model (PCSWMM) does not include any direct runoff areas to Shirley's Brook from Block 73. The direct runoff area from D-01 is 0.114 ha with an imperviousness of 50% (runoff coefficient of 0.55). The peak 100-year runoff to Shirley's Brook from Block 73 is 50 L/s. The direct runoff from Block 73 will enter the watercourse in advance of the peak from the upstream drainage area and will have a negligible impact on the watercourse.

This direct runoff area is consistent with the overall design intent for the Copperwood Estates Subdivision, with rear yard drainage from residential areas backing onto Tributary 2 conveyed overland to the watercourse. Shirley's Brook Tributary 2 has an upstream drainage area of approximately 445 ha at March Road. The additional 0.114 ha of direct runoff from Block 73 to Shirley's Brook represent a negligible increase to the overall drainage area.

HEC-RAS MODEL

The *Shirley's Brook Tributary 2 Flood & Erosion Hazard Mapping Revisions* (Novatech, August 2025) revised the Shirley's Brook HEC-RAS model to reflect post-development conditions, including and the watercourse realignment through the Copperwood Estates Subdivision. The flow data in the HEC-RAS model was updated to account for the direct runoff to Shirley's Brook.

The modelled 100-year outflows from the Copperwood Estates SWM Ponds were effectively unchanged following the updates for Block 73. The only required change to the HEC-RAS flow data is to include the additional direct runoff from Block 73 (50 L/s for the 100-year event). This flow was added to the flow change location between Goldenseal Road and Spoor Street.

It should be noted that the direct runoff from Block 125 to Shirley's Brook (28 L/s) was also incorporated into the HEC-RAS model. These flows were added to the flow change location between Spoor Street and March Road.

While the direct runoff from Block 73 will enter the watercourse in advance of the peak flow from the upstream area, a conservative analysis was done by assuming the peak flows are coincidental. The steady-state peak flow in the HEC-RAS model upstream of Spoor Street was increased by 50 L/s, which raised the 100-year HGL in Tributary 2 by 1 to 2cm between Goldenseal Avenue and Spoor Street. There was also a 1cm increase immediately downstream (10 to 15m downstream) of the Spoor Street crossing. The 100-year floodplain will remain confined within the 40m stream corridor and will not have any negative impacts on the surrounding development.

There are increases of 1cm to the HGL at some cross-sections between Spoor Street and March Road, but this is impacted mostly by the Block 125 direct runoff area. The 1cm decrease in HGL at the cross-section immediate downstream of March Road is also due to the Block 125 direct runoff. As with the HGL between Goldenseal Avenue and Spoor Street, the 100-year floodplain between Spoor Street and March Road will remain confined within the 40m stream corridor and will not have any negative impacts on the surrounding development.

CONCLUSIONS

The PCSWMM results from the updated model which includes the detailed design of Block 73 indicate that there are minor changes to storm sewer HGL elevations and ponding depths above CBs.

There will be no increase to maximum water levels or outflows from the Copperwood Estates SWMF resulting from the detailed design of Block 73.

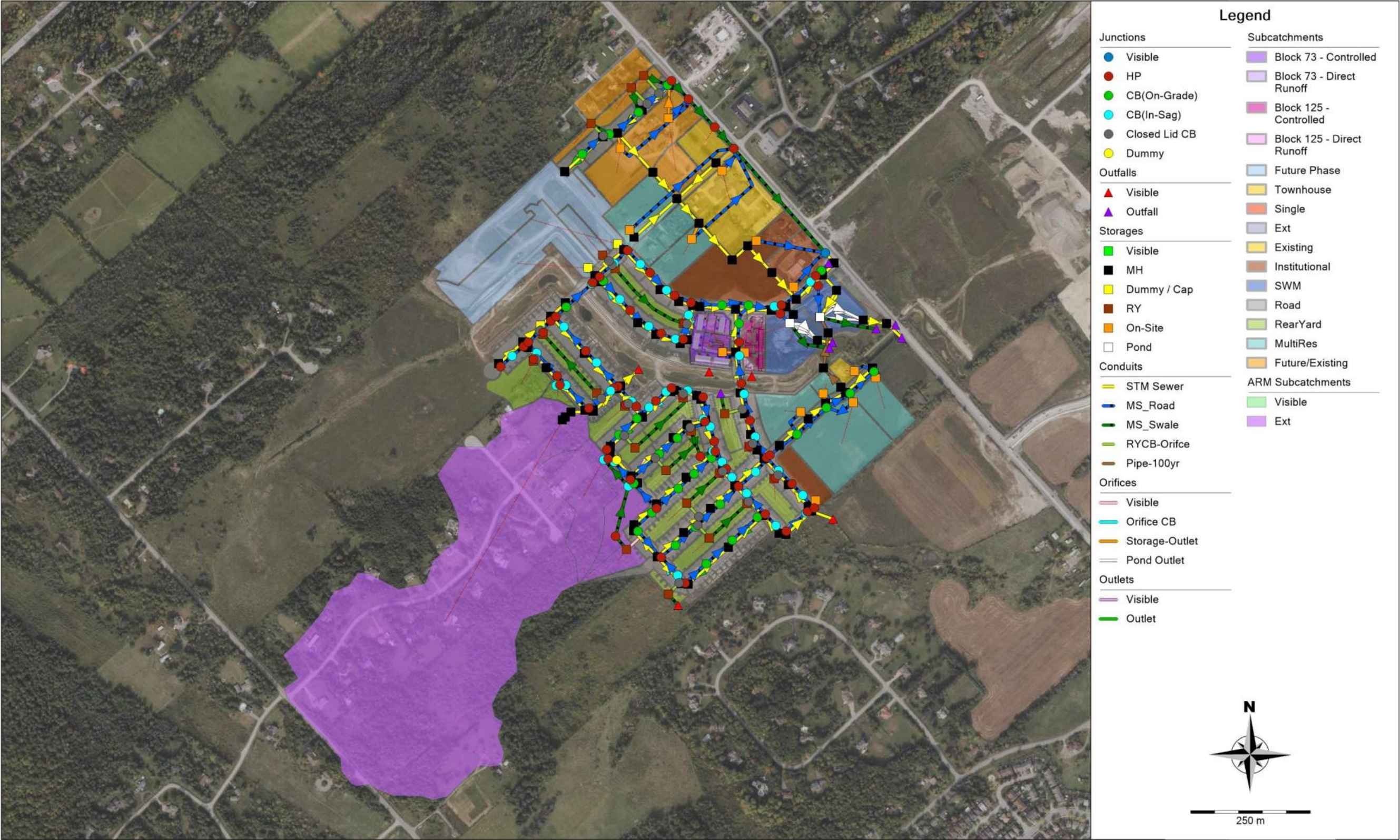
The additional direct runoff to Shirley's Brook Tributary 2 is negligible and will have minimal impact on the floodplain elevations in the watercourse.

The updated model indicates that there will be no adverse impacts to the function of the stormwater management system for the Copperwood Estate Subdivision or the receiving watercourse.

Attachments

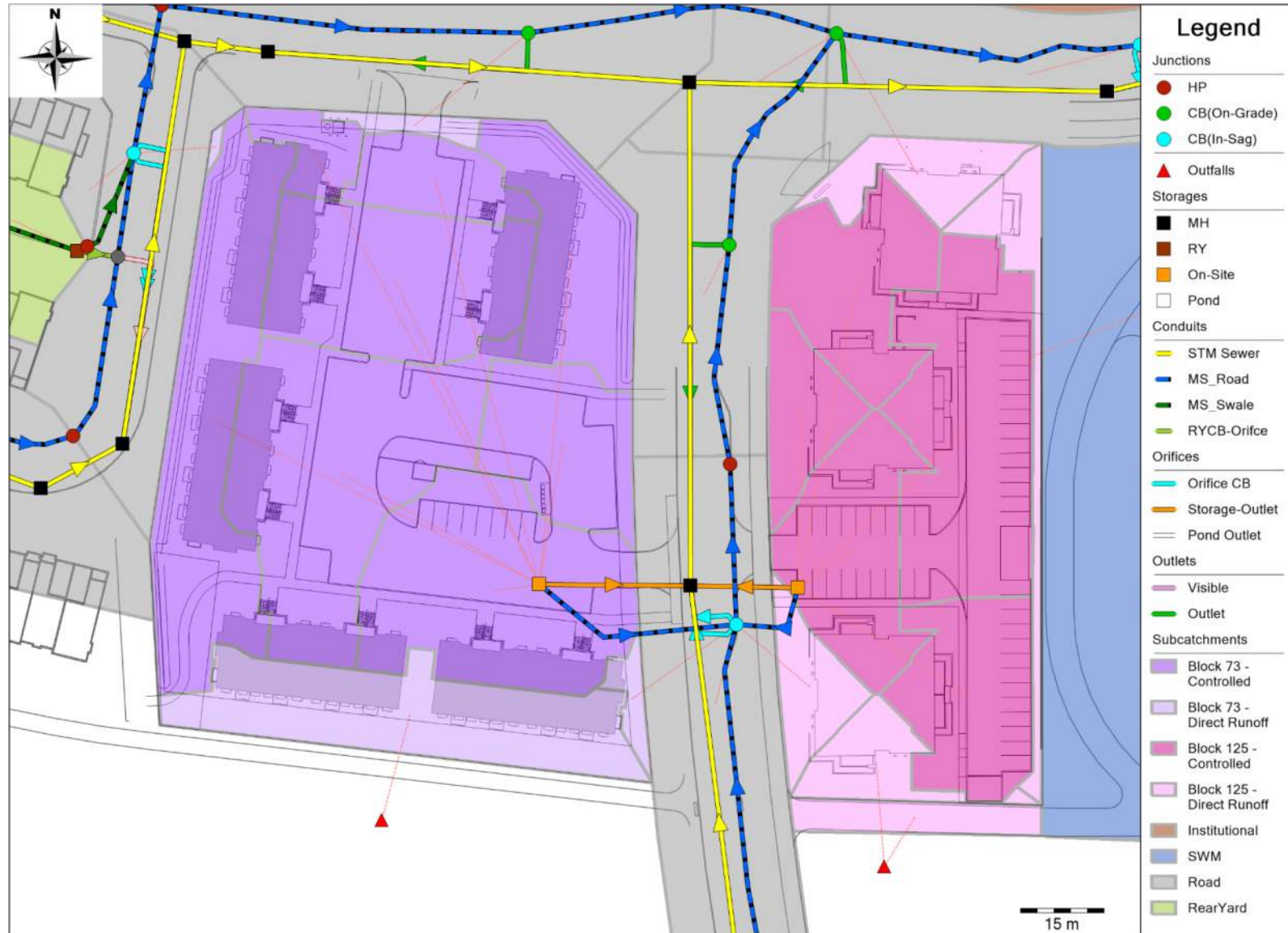
- Model Schematic
- PCSWMM model files (digital)
- HEC-RAS Profiles
- HEC-RAS model files (digital)

Overall Copperwood Estates Subdivision - Model Schematic



Copperwood Block 73 (125113)
PCSWMM Model Schematics

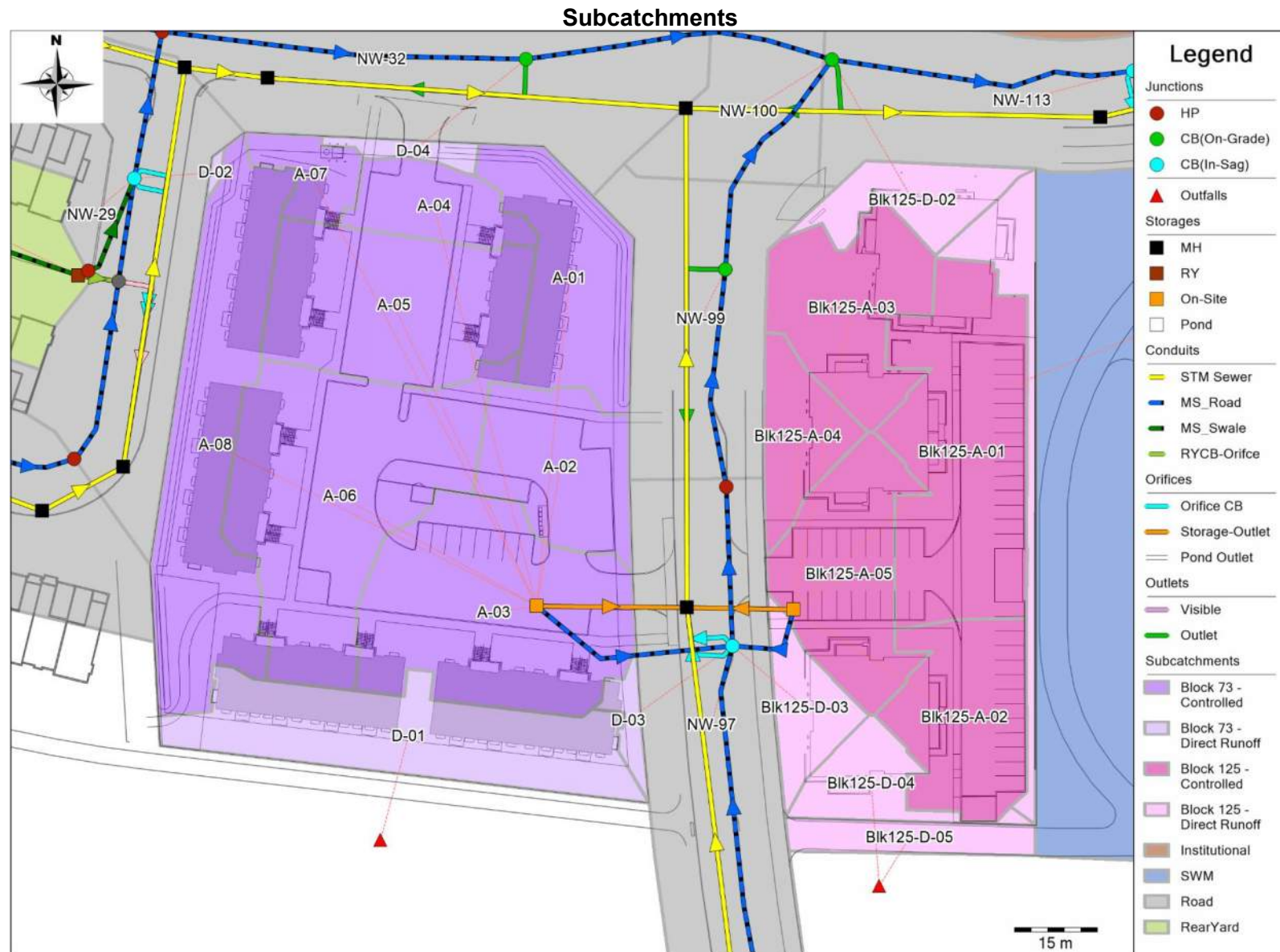
Block 73 Model Schematic



Date: 2026-04-22

M:\2025\125113\DATA\Calculations\SWM\PCSWMM\Sub 2\125113-Model Schematics-Blk73and125-R1.docx

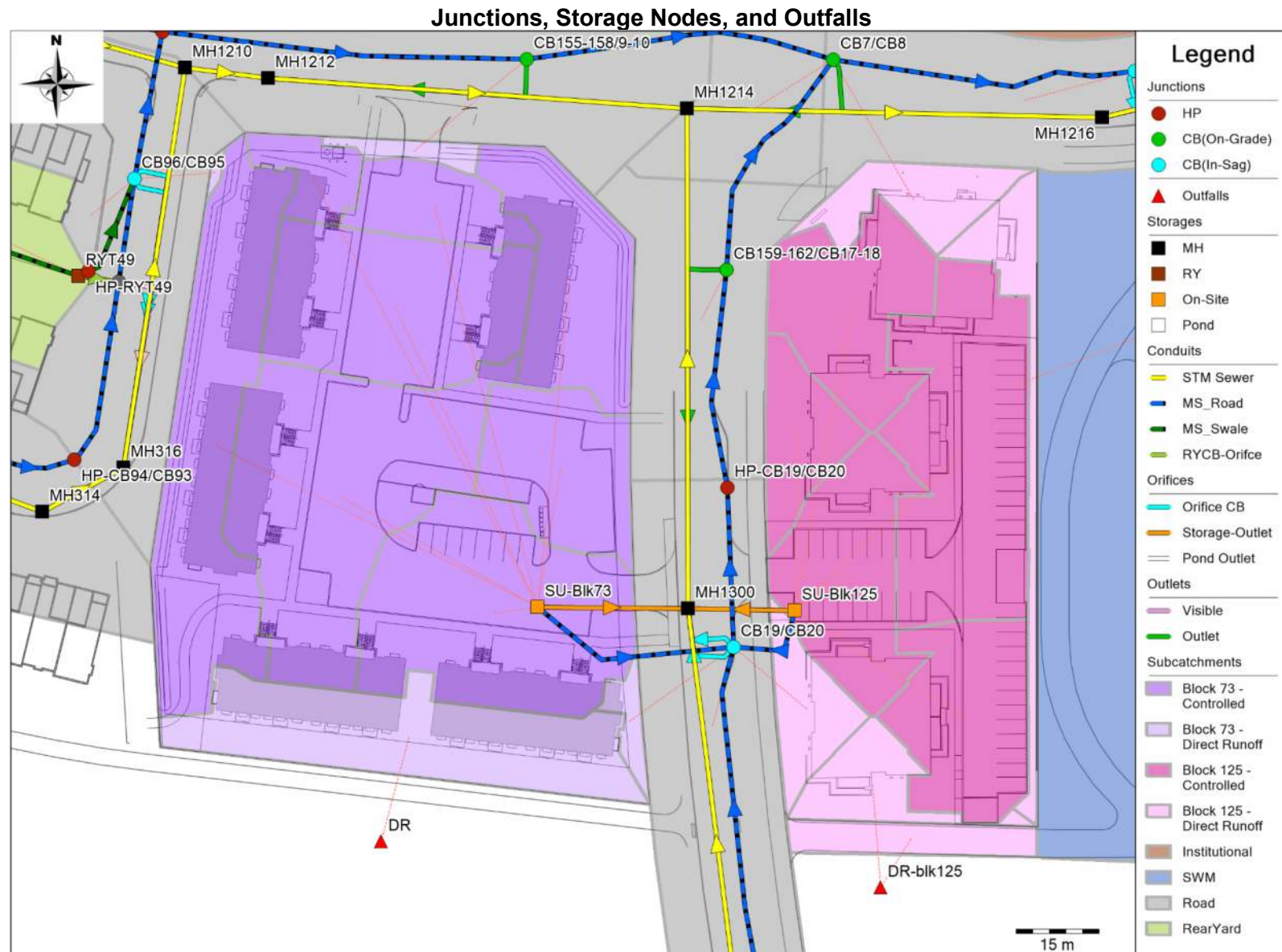
Copperwood Block 73 (125113) PCSWMM Model Schematics



Date: 2026-04-22

M:\2025\125113\DATA\Calculations\SWM\PCSWMM\Sub 2\125113-Model Schematics-Blk73and125-R1.docx

Copperwood Block 73 (125113) PCSWMM Model Schematics



Date: 2026-04-22

M:\2025\125113\DATA\Calculations\SWM\PCSWMM\Sub 2\125113-Model Schematics-Blk73and125-R1.docx

HEC-RAS Profile Comparison - Shirley's Brook

