Functional Site Servicing and Stormwater Management Report
6171 Hazeldean Road, Ottawa, ON

Client:
11654128 Canada Inc.
768 Boulevard St. Joseph
Gatineau, QC

Submitted for:
Zoning By-law Amendment and Plan of Subdivision

Project Name:
6171 Hazeldean Road

Project Number:
OTT-00258780-A0

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Date Submitted:
April 29, 2021

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April 29, 2021

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1 Introduction

1.1 Overview

EXP Services Inc. (EXP) was retained by 11654128 Canada Inc to prepare a Functional Site Servicing and Stormwater Management Report for the proposed redevelopment of 6171 Hazeldean Road in support of Zoning By-law Amendment and Plan of Subdivision applications.

The 9.02-hectare site is situated along Hazeldean Road as illustrated in **Figure 1-1** below. The site is within the City of Ottawa's urban boundary, outside the Greenbelt, and situated in Ward 6 (Stittsville-Kanata West).

The description of the subject property is noted below:

- Part of Lot 23, Concession 12, Geographic Township of Goulbourn, City of Ottawa.
- Parts 2, 4 and 6 of Plan 4R-23045, consisting of PIN 044871709

The proposed development will consist of twenty (20) single family detached homes, one hundred and fifty-one (151) townhomes, two hundred and forty (240) condominium units consisting of five 4-storey buildings having 48 units each, and one hundred and sixty-nine (169) apartment units consisting of one 9-storey mixed-use rental building.

This report will discuss the adequacy of the adjacent municipal watermain, sanitary sewers and storm sewers to provide the required water supply, convey the sewage and stormwater flows that will result from the proposed development. This report provides a design brief for submission, along with the engineering drawings, for City approval.

Figure 1-1: Site Location

2 Existing Conditions

The existing property is surrounded by the Jackson Trails subdivision, which began development in 2006 and the more recent Potter's Key Development. The existing site is vacant, with most of the ground surface containing sparse vegetation, fill material from adjacent construction, with a small area of trees in the north-western portion of the site.

The existing site topography slopes in a north easterly direction, ranging in elevation from ±122m to ±116m and having an average slope of 1.8% from west to east, however only 0.5% average slope from south to north.

The following reports have been prepared describing the existing conditions:

- Geotechnical Investigation, EXP Services Inc.
- Phase 1 Environmental Site Assessment, Exp Services Inc.
- Phase 2 Environmental Site Assessment, Exp Services Inc.
- Environmental Impact Statement/Tree Conservation Report, Bowfin Environmental Consulting Inc.
- Stage 1 and 2 Archaeological Assessment, Paterson Group

3 Existing Infrastructure

The property is vacant and there are no existing services within the site. Municipal services stubs are present along the north, south and east sides of the property.

Along the north side of the property a 22.0 metre municipal right-of-way (Samantha Eastop Avenue) was constructed as part of the Potter's Key Subdivision and contains a 300mm watermain stub. Along the easterly property line, a 7.5m wide portion of a wider 12m sewer/water/walkway block is present and contains both sanitary and the storm and sewer stubs for the property. The entire southern property boundary of the site fronts onto Hazeldean Road, which contains both watermain and storm sewers. An existing 200mm watermain stub is provided off the 750mm watermain on Hazeldean Road, near the entrance of the property.

From review of the sewer and watermain mapping, as-built drawings and Utility Central Registry (UCC) plans, the following summarizes the infrastructure within the subject property and the infrastructure on the adjacent streets along the frontage of the property and adjacent offsite infrastructure:

Samantha Eastop Avenue.

- 300mm PVC watermain.
- 300mm PVC storm sewer.

12m walkway block off Bandelier Way.

- 300mm PVC sanitary sewer.
- 1050mm concrete storm sewer.

Hazeldean Road.

- 2-200mm PVC watermains (stubbed) & 762mm watermain.
- 300mm, 375mm, 750mm and 825mm concrete storm sewers.
- Gas /Bell / Streetlighting / Hydro.

As-built drawings for key areas in Potter's Key Subdivision were obtained from the City of Ottawa and are included in **Appendix J** for reference.

4 Pre-Consultation / Permits / Approvals

A pre-consultation meeting was held with the City prior to design commencement. This meeting outlined the submission requirements and provided information to assist with the development proposal. The proposed site is located within the Mississippi Valley Conservation Authority (MVCA) jurisdiction, therefore signoff from the MVCA will be required prior to final approval. The MVCA was contacted to confirm the stormwater management quality control requirements. A copy of the correspondence with the MVCA is attached **Appendix G**. Specific design criteria noted in the Pre-Consultation meeting is further described in the relevant sections of this report.

It is expected that an Environmental Compliance Approval (ECA) will be required from the Ministry of Environment, Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC), for the municipal and private sewage works. The onsite sewage works will include the onsite stormwater works for flow controls and associated stormwater detention. Further discussions with City of Ottawa staff will be required to confirm the ECA requirements and to determine whether a direct submission or Transfer-of-Review submission will be required.

In addition, various design guidelines were referred to in preparing the current report including:

- Bulletin ISDTB-2012-4 (20 June 2012)
  - Technical Bulletin ISDTB-2014-01 (05 February 2014)
  - Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
  - Technical Bulletin ISDTB-2018-01 (21 March 2018)
  - Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
  - Technical Bulletin ISDTB-2014-02 (May 27, 2014)
  - Technical Bulletin ISTB-2018-02 (21 March 2018)
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM).
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS).
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 1999.
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing.

5 Water Servicing

5.1 Existing Water Servicing Conditions

The site is within the City of Ottawa 3W pressure zone and supplied from the Stittsville elevated reservoir, which is adjacent to the site along the western limit of the property. As previously noted, two 200 mm watermains have been stubbed off the 762mm watermain on Hazeldean Road, and a 300mm watermain is stubbed at the property line coming off Samantha Eastop Avenue.

5.2 Water Servicing Proposal

The proposed water supply system will consist of 200mm diameter and 300mm diameter watermains and associated appurtenances to provide water for consumption and fire protection. The site will be serviced by connection to the existing stubs at Hazeldean Road and Samantha Eastop Avenue.

The 9-storey high-rise building will require independent and twin watermain feeds, which is the result of the average day water demands exceeding 50 m^3/day. This building will be protected by an automatic sprinkler system and will have a fire department connection (or siamese) located within 45 metres of an adjacent municipally owned fire hydrant. **Figure A4** in **Appendix A** illustrates the proposed water distribution system. Water supply for each single family, townhome or condominium building will be provided by individual water services connecting to the proposed municipal or onsite private watermain. The proposed servicing plan is provided in **Appendix J**

5.3 Water Servicing Design Criteria

The design parameters that were used to establish water and fire flow demands are summarized **Table 5-1** below.

Table 5-1 Summary of Water Supply Design Criteria

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	✓
Population Density – Semi-detached Home	2.7 persons/unit	✓
Population Density – Townhome or Terrace Flat	1.8 persons/unit	✓
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Population Density – Three Bedroom Apartment	3.1 persons/unit	✓
Average Day Demands – Residential	350 L/person/day	✓
Average Day Demands – Commercial / Institutional	28,000 L/gross ha/day	✓
Average Day Demands – Light Industrial / Heavy Industrial	35,000 or 55,000 L/gross ha/day	
Maximum Day Peak Factor – Residential	2.5 x Average Day Demands	✓
Maximum Day Demands Peak Factor – Commercial / Institutional	1.5 x Average Day Demands	✓
Peak Hour Factor – Residential	2.5x2.2 = 5.5 x Average Day Demands	✓

Peak Hour Factor – Commercial / Institutional	2.7 x Average Day Demands	✓
Fire Flow Requirements Calculation	FUS	✓
Depth of Cover Required	2.4m	✓
Maximum Allowable Pressure	551.6 kPa (80 psi)	✓
Minimum Allowable Pressure	275.8 kPa (40 psi)	✓
Minimum Allowable Pressure during fire flow conditions	137.9 kPa (20 psi)	✓

5.4 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along the adjacent roadways. The required fire flows for all proposed buildings were calculated based on typical values as established by the Fire Underwriters Survey 1999 (FUS). The following equation from the Fire Underwriters document "Water Supply for Public Fire Protection", 1991, was used for calculation of the on-site supply rates required to be supplied by the hydrants:

$F = 200 * C * \sqrt{(A)}$

where:

F = Required Fire flow in Litres per minute
C = Coefficient related to type of Construction
A = Total Floor Area in square metres

The proceeding **Table 5-2** summarizes the parameters used for estimating the Required Fire Flows (RFF) based on the Fire Underwriters Survey (FUS) and the latest City of Ottawa Technical Bulletins. The RFFs were estimated in accordance with ISTB-2018-02 and based on floor areas provided by the architect. The following summarizes the parameters used for the proposed types of residential buildings.

Table 5-2: Summary of FUS Method Parameters Used for Proposed Building Types

Design Parameter	Single Family	Townhome	3-Storey Condominium	9-Storey Mixed-Use
Type of Construction (Coeff, C) Wood-Framed (C=1.5), Ordinary (C=1.0), Non-Combustible (C=0.8), Fire-Resistive (C=0.6)	Wood Framed	Wood Framed	Ordinary	Non-Combustible
Occupancy Type Non-combustible (-25%), Limited Combustible (-15%), Combustible (0%), Free Burning (+15%), Rapid Burning (+25%)	Limited Combustible	Limited Combustible	Limited Combustible	Limited Combustible
Sprinkler Protection Sprinkler Conforming to NFPA 13 (-30%), Standard Water Supply (-10%), Fully Supervised Sprinkler (-10%)	None	None	None	Fully Supervised Sprinkler

The following **Table 5-3** below summaries the individual parameters used and the resultant Required Fire Flows (RFFs) for each building type. The maximum allowable footprints based on zoning setbacks were used to determine the RFFs for the single family and townhome units. Detailed calculations of the RFFs necessary for each building is provided in **Appendix B.**

Table 5-3: Summary of Parameters Used and Estimation of Required Fire Flows (RFF) – Singles and Townhomes

	Single Family	Single Family	Townhomes						
			Block 2	Block 4	Block 5	Block 6	Block 8	Block 11	Block 16
Construction Coefficient, C	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Total Floor Area (m2)	283.2	517.2	969	807.8	1037.8	1034.4	784	776.1	795
Fire Flow prior to reduction (L/min)	6,000	8,000	10,000	9,000	11,000	11,000	9,000	9,000	9,000
Reduction Due to Occupancy	-15%	-15%	-15%	-15%	-15%	-15%	-15%	-15%	-15%
Reduction due to Sprinkler	0%	0%	0%	0%	0%	0%	0%	0%	0%
Increase due to Exposures	62%	58%	42%	44%	46%	36%	54%	53%	49%
Capped at 10,000 L/min (167 L/sec) based on ISTB-2018-02" (yes/no)	No	No	No	No	No	No	No	No	No
Total RFF	133	183	200	183	233	217	200	200	183

Table 5-4: Summary of Parameters Used and Estimation of Required Fire Flows (RFF) – Condos and Mixed-Use Buildings

	Condominium Units					Mixed-Use
	Bldg A	Bldg B	Bldg C	Bldg D	Bldg E	
Construction Coefficient, C	1	1	1	1	1	0.8
Total Floor Area (m2)	4140	4140	4140	4140	4140	8863.5
Fire Flow prior to reduction (L/min)	14,155	14,155	14,155	14,155	14,155	17,000
Reduction Due to Occupancy	-15%	-15%	-15%	-15%	-15%	-15%
Reduction due to Sprinkler	0%	0%	0%	0%	0%	-50%
Increase due to Exposures	33%	35%	29%	51%	31%	23%
Capped at 10,000 L/min (167 L/sec) based on ISTB-2018-02" (yes/no)	No	No	No	No	No	No
Total RFF	267	267	250	300	267	183

The estimated required fire flows (RFFs) based on the FUS Method ranges from 133 L/sec to 183 L/sec for single family homes, 183 L/sec – 233 L/sec for townhomes blocks, 183 L/sec for the 9-storey mixed Use building and 250 L/sec – 300 L/sec for the 4-storey condo units. It should be noted that for the 8-unit townhomes, a fire wall (2hr fire-resistance rating) was be used to split the building into two separate areas. In addition, for the singles and townhomes the building areas were expanded to account for the maximum building areas based on minimum setback of 7.5m (rear), 5.2m (front), and 1.2m or 3.0m (side).

5.5 Boundary Conditions

Hydraulic Grade Line (HGL) boundary conditions were obtained from the City for design purposes. A copy of the correspondence received from the City is provided in **Appendix G.**

The following hydraulic grade line (HGL) boundary conditions are summarized in **Table 5-5** below.

Table 5-5: Boundary Conditions and Pressures Summary

Demand Scenario	Connection #1 – Hazeldean Rd		Connection #2 – Samantha Eastop Ave	
	HGL or Head (m)	Pressure (psi)	HGL or Head (m)	Pressure (psi)
Maximum HGL	160.7	57.2	160.7	59.6
Peak Hour	156.5	51.3	156.3	53.4
Max Day + Fire Flow	156.4	51.1	151.1	46.0

The above noted HGL's are based on a ground elevation of approximately 120.4 m and 118.8 m at Connection #1 and Connection #2 respectively. This results in a system water pressure of 36.1 m (or 51.3 psi) and 37.5 m (or 53.4 psi) at each connection points during peak hour conditions.

5.6 Water Servicing Design

The water servicing requirements for the proposed development is designed in accordance with the City Design Guidelines (July 2010). The following steps indicate the basic methodology that was used in our analysis:

- Estimated water demands under average day, maximum day and peak hour conditions. As the total population estimate was greater than 500, standard residential peaking factors were used, rather than based on MECP Table 3-3 which would be necessary when the design population is than 500 persons.
- Estimated the required fire flow (RFF) based on the Fire Underwriters Survey (FUS).
- Obtained hydraulic boundary conditions (HGL) from the City, based on the above water demands and required fire flows.
- Boundary condition data and water demands were used to estimate the pressure at the proposed junctions, and this was compared to the City's design criteria.

Please refer to **Appendix B** for detailed calculations of the total water demands.

5.7 Estimated Water Demands

Table 5-6 below summarizes the anticipated domestic water demands for all units under average day, maximum day and peak hour conditions.

Table 5-6: Total Water Demand Summary

Water Demand Conditions	Water Demands (L/sec)
Average Day	4.95
Max Day	12.33
Peak Hour	27.11

5.8 Modelling Scenarios

A total of five (6) scenarios were analyzed. The performance of the proposed water distribution system within the development was analyzed under each scenario. The following summarizes the modelling scenarios that were analyzed. Please refer to **Figure A4** in Appendix A which illustrates the water distribution layout.

- Scenario 1A: Average Day (using connection #1)
- Scenario 1B: Max Day Plus Fire Flow (using connection #1)
- Scenario 1C: Peak Hour (using connection #1)
- Scenario 2A: Average Day (using connection #2)
- Scenario 2B: Max Day Plus Fire Flow (using connection #2)
- Scenario 2C: Peak Hour (using connection #2)

5.9 Water Modeling Results

The results of the WaterGEMS modelling under peak hourly conditions are summarized in Table 5-7 and Table 5-8 below for Scenarios 1C and 2C. These results represent anticipated pressures that would be available assuming a single connection from ether Connection #1 (Hazeldean Rd) or Connection #2 (Samantha Eastop). The complete results for all scenarios are provided in Appendix C.

Table 5-7: Summary of Peak Hour Results of (Scenario 1C)

Junction	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	8.28	156.44	48.6
J-02	119.69	1.78	156.45	52.2
J-03	118.67	0.81	156.46	53.6
J-04	118.45	1.20	156.46	53.9
J-05	117.43	1.62	156.46	55.4
J-06	117.02	1.80	156.46	56.0
J-07	118.88	0.84	156.46	53.3
J-08	119.76	0.42	156.46	52.1
J-09	117.12	0.90	156.46	55.8
J-10	120.76	0.00	156.47	50.7
J-13	117.92	0.00	156.46	54.7
J-16	119.76	0.00	156.47	52.1
J-17	118.80	0.00	156.46	53.5
J-18	120.40	0.00	156.50	51.2
J-22	118.21	0.00	156.46	54.3
J-23	120.51	0.00	156.49	51.1
J-24	119.50	0.00	156.49	52.5
J-25	118.80	0.00	156.49	53.5
J-28	118.00	0.00	156.50	54.6

Table 5-8: Summary of Peak Hour Results of (Scenario 2C)

Junction	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	8.28	156.24	48.3
J-02	119.69	1.78	156.26	51.9
J-03	118.67	0.81	156.28	53.4
J-04	118.45	1.20	156.27	53.7
J-05	117.43	1.62	156.26	55.1
J-06	117.02	1.80	156.26	55.7
J-07	118.88	0.84	156.26	53.1
J-08	119.76	0.42	156.26	51.8

J-09	117.12	0.90	156.26	55.6
J-10	120.76	0.00	156.26	50.4
J-13	117.92	0.00	156.26	54.4
J-16	119.76	0.00	156.26	51.8
J-17	118.80	0.00	156.30	53.2
J-18	120.40	0.00	156.26	50.9
J-22	118.21	0.00	156.26	54.0
J-23	120.51	0.00	156.26	50.7
J-24	119.50	0.00	156.26	52.2
J-25	118.80	0.00	156.26	53.2
J-28	118.00	0.00	156.26	54.3

The calculated range of working pressures anticipated within the development under peak hour conditions was estimated at between 48.6 psi and 56.0 psi under Scenario 1C, and between 48.3psi and 55.7 psi under Scenario 2C. This meets the minimum 40 psi as per City of Ottawa Guidelines.

Similarly, below provides the Maximum Day Plus Fire Flow results under Scenarios 1B and 2B. It should be noted that the fire flows required at various junctions were determined based on FUS calculations. Complete modelling results are provided in **Appendix C**.

Table 5-9: Summary of Maximum Day Plus Fire Flow Conditions

Junction Node	FUS Required Fire Flows, RFF (L/sec)	Total Flow Available (L/sec)		Satisfies Fire Flow Constraints fpr Scenario 1B / 2B (True - False)
		For Scenario 1B	For Scenario 2B	
J-01	183	>183	>183	True / True
J-02	183	>183	>183	True / True
J-03	183	>183	>183	True / True
J-04	183	>183	>183	True / True
J-05	183	>183	>183	True / True
J-06	183	>183	>183	True / True
J-07	183	>183	>183	True / True
J-08	183	>183	>183	True / True
J-09	183	>183	>183	True / True
J-10	183	>183	>183	True / True
J-13	183	>183	>183	True / True
J-16	183	>183	>183	True / True
J-17	183	>183	>183	True / True
J-18	183	>183	>183	True / True
J-22	183	>183	>183	True / True
J-23	267	>267	>267	True/ True
J-24	283	>283	<283 (231)	True / False
J-25	283	>283	<283 (236)	True / False
J-28	267	>267	>267	True / True

In summary, under Maximum Day + Fire Flow conditions the available fire flows are in excess of the required fire flows (RFF) based on a water distribution system with a connection to both Hazeldean Road and Samantha Eastop Avenue. Based on a single feed connection to Samantha Eastop Avenue, slightly lower fire flows would be available within the distribution system at two (2) junctions.

The difference in the available fire flows, is at most 20% lower based on a single connection to Samantha Eastop Ave. This does not imply that the appropriate fire flows are not available at all buildings, as the total contribution of available fire flows are based on hydrant spacing. Additional details on fire hydrant locations and the availability of fire flows will be provide during detailed design of the subdivision.

No pressure reducing measures are required as operating pressures are within 50 psi and 80 psi. It was estimated that the anticipated pressures under average day demands will range between 54.7 psi and 62 psi.

6 Sewage Servicing

6.1 Existing Sewage Conditions

The site is an open field with no services within the site. There is a stub that comes off the existing sanitary sewer from Bandelier Way that goes up to the property line at was placed for the future development of 6171 Hazeldean Road.

6.2 Proposed Sewage Conditions

The sanitary sewers were sized based on a population flow with an area-based infiltration allowance. Both 200mm and 250mm diameter sanitary sewer are proposed with a minimum of 0.34% and 0.30% slope, having a capacity of 19.8 L/sec and 35.9 L/sec based on Manning's Equation under full flow conditions. Table 6-1 below summarizes the design parameters used.

Table 6-1: Summary of Wastewater Design Criteria / Parameters

Design Parameter	Value	Applies
Population Density – Single-family Home	3.4 persons/unit	✓
Population Density – Semi-detached Home	2.7 persons/unit	✓
Population Density – Duplex	2.3 persons/unit	
Population Density – Townhome (row)	2.7 persons/unit	✓
Population Density – Bachelor Apartment	1.4 persons/unit	
Population Density – Bachelor + Den Apartment	1.4 persons/unit	
Population Density – One Bedroom Apartment	1.4 persons/unit	✓
Population Density – One Bedroom plus Den Apartment	1.4 persons/unit	
Population Density – Two Bedroom Apartment	2.1 persons/unit	✓
Population Density – Two Bedroom plus Den Apartment	2.1 persons/unit	
Population Density – Three Bedroom Apartment	3.1 persons/unit	✓
Average Daily Residential Sewage Flow	280 L/person/day	✓
Average Daily Commercial / Intuitional Flow	28,000 L/gross ha/day	
Average Light / Heavy Industrial Daily Flow	35,000 / 55,000 L/gross ha/day	
Residential Peaking Factor – Harmon Formula (Min = 2.0, Max =4.0, with K=0.8)	$M = 1 + \frac{14}{4 + P^{0.5}} * k$	✓
Commercial Peaking Factor	1.5	
Institutional Peaking Factor	1.5	
Industrial Peaking Factor	As per Table 4-B (SDG002)	
Unit of Peak Extraneous Flow (Dry Weather / Wet Weather)	0.05 or 0.28 L/s/gross ha	
Unit of Peak Extraneous Flow (Total I/I)	0.33 L/s/gross ha	✓

The total estimated peak sanitary flow rate from the proposed property is **15.57 L/sec** based on City Design Guidelines. Sewage rates below include a total infiltration allowance of 0.33 L/ha/sec based on the total gross site area.

Table 6-2: Summary of Anticipated Sewage Rates

Sewage Condition	Sanitary Sewage Flow (L/sec)
Peak Residential Flow	12.58
Peak Commercial Flow	0.02
Infiltration Flow (at 0.33 L/ha/sec)	2.98
Peak Wet Weather Sewage Flow	15.57

The proposed 250mm diameter sanitary sewer from the site will connect into an existing 300mm sanitary sewer stub at the east limits of the property (within easement). This then connects to the local sanitary sewer on Bandelier Way. The sanitary sewer design sheet is in Error! Reference source not found..

Based on the Potter's Key Design Brief, the allocated sewage flow from the 6171 Hazeldean site to the sanitary sewer on Bandelier Way was 11.84 L/sec. Therefore, the proposed site is expected to release an additional 3.73 L/sec, however the existing sanitary stub has a capacity of 46.05 L/sec and will be able to handle to revised peak sewage flows.

A review of the next four (4) downstream sanitary sewers on Bandelier Way in Potter's Key Subdivision was completed to ensure adequate capacity is available. The peak flows noted in the original sanitary sewer design sheet, as noted in **Appendix H**, ranges from 11.8 L/sec to 18.9 L/sec within these four (4) sewer runs. Available capacities within these sanitary sewers range between 45.1 L/sec and 46.1 L/sec based on 300mm diameter at 0.20% and 0.23%. The additional increase of 3.73 L/sec has minimal impact to the reserve capacity available in the downstream system. See **Appendix H** for the Potter's Key sanitary design sheet for reference.

7 Storm Servicing & Stormwater Management

7.1 Background

As the proposed site is located within the Mississippi Valley Conservation Authority (MVCA) jurisdiction, the stormwater works are therefore subject to both MVCA and City of Ottawa (COO) approval.

The site is located within the Carp River Subwatershed and stormwater runoff discharges to Feedmill Creek. A 1050mm storm sewer outlet was provided for the site near the south-eastern corner of the site within a 12-metre sewer and drainage easement. This easement connects the site to the municipal right-of-way (Bandelier Way). Downstream of the site the storm sewer flows easterly and then northerly approximately 1.1 kilometres where it enters the Jackson Trails Stormwater Management Facility (JTSWMF). This pond was constructed around 2007/2008 to service lands north of Hazeldean Road between Carp Road and Alon Street. The "Jackson Trails Stormwater Management Design Brief" (JTSMDB) was prepared in June 2006 by IBI Group for the design of this SWM facility.

In addition, the City of Ottawa commissioned J.F. Sabourin and Associates (JFSA) to prepare the Feedmill Creek Storm Management Criteria Study (FCSWMCS) which was finalized in April 2018. It is this document that identifies the stormwater criteria necessary for development of the site. Just prior to this, Minto Communities Inc (Minto), constructed Potter's Key Subdivision in 2017/2018, which surrounds the site on the north and east sides. Sewer and water infrastructure were installed as part of the surrounding subdivision.

7.2 Proposed Storm Servicing

The proposed subject property will be serviced with a conventional stormwater collection system. The storm sewer system will consist of a typical storm system including manholes and catchbasins in the roadway and catchbasins and landscape inlets in the rear yards. For the rear-yards, perforated storm sewers, as per City landscaping standards, will be used. Due to the stormwater criteria requirements, a stormwater facility (dry pond) is necessary.

The proposed stormwater system is designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 "Storm and Combined Sewer Design" and Section 8 "Stormwater Management". A summary of the design criteria that relates to this design report is the proceeding sections below.

7.2.1 Design Criteria & Constraints

From the Feedmill Creek report the following summarizes the design criteria and constraints that will be followed:

- Criteria #1: Extended Detention Control: Onsite storage to control peak flows 0.51 L/ha/sec in the 3hr 15mm 3-hr Chicago storm (Erosion Control).
- Criteria #2: Retention Control: Provide Low-Impact Development Methods (LID) to retain the 5mm 3-hr Storm event (infiltration).
- Criteria #3: Flood Control: Onsite storage to control peak storm flows (100-yr 12hr SCS storm) to 8 L/ha/sec.

Other design criteria were taken from the JTSMDB and City of Ottawa SDG002 which apply to the stormwater design are included.

- The storm sewer was sized based on the Rational Method and Manning's Equation under free flow conditions for the 2-year storm using a 10-minute inlet time.
- Minor system capture from this development will be directed to the Jackson Trails SWM Pond and limited to 70 L/s/ha as per the design of the facility.

- The major system has been designed to accommodate on-site detention with sufficient capacity to attenuate the 100-year design storm.
- Overland flow routes are provided.
- The vertical distance from the spill elevation and the ground elevation at the building is at least 150mm.
- The emergency overflow spill elevation is at least 30 cm below the lowest building opening.
- Minimum sewer slopes to be based on minimum velocities for storm sewers of 0.80 m/sec.

Additional comments provided during the pre-consultation meeting, that are also relevant include:

- *By modelling, demonstrate that there are no adverse impact to the existing downstream developments (Potter's Key and Jackson Trails).*
- *Pond may be required for attenuation as per the attached report.*

7.3 Stormwater Design

The methodology used for the design of the storm sewer system is as follows:

- Design storm sewer system based on 2-year storm using the Rational Method. Pipes were sized based on the 2-year return period under free-flow conditions.
- Estimate the appropriate number and the location of inlets based on the Macro Grading Plan and preliminary profiles and ensure maximum permitted depth of static ponding meets City guidelines of 30 cm.
- For each subcatchment restricted inflow rates to the minor system to approximately the 2-year return period storm. This is completed using standard ICD types, with an attempt to meet the 2-year rate as close as possible. Some oppositely located catchbasins will require interconnection prior to discharge (i.e., single ICD rate), whereas most will have independent leads complete with separate ICDs.
- Developed a preliminary PCSWMM model of the storm sewer system, to calculate peak flows and runoff volumes.
- At this Draft Plan stage, the PCSWMM model includes most major system components (dual drainage) but not all. The model includes all subcatchments and roadway ponding areas developed from the roadway profiles. Preliminary storage node and orifices were added to represent the proposed dry pond. The model will be expanded during the detailed design stage. This will include modelling of infiltration areas within the rear yards and rights-of-way.
- Ensure allowable discharge rate for the entire site does not exceed 631.6 L/sec (70 L/ha/sec X 9.02-hectare) for the 3hr Chicago storm or 72.18 L/sec (8.0 L/ha/sec x 9.023 ha) for the 12hr SCS storm.

7.4 Runoff Coefficients

Average runoff coefficients for all subcatchments were calculated using PCSWMM's area weighting routine. This modelling software has a GIS engine which allows for catchment (or polygon) definition including attributes. The runoff coefficients for all catchments were area weighted to derive at average runoff coefficients based on hard surfaces (concrete or asphalt) having an imperviousness of 100%, soft surfaces (landscaping surfaces) having a percent imperviousness of 0%. The conversion from an imperviousness percent to a runoff coefficient was taken as C = (IMP*0.70) / 100 + 0.20, with the imperviousness (IMP) as a percentage.

Since the site plan included building footprints, driveways, roads, and sidewalks, etc., the estimation of the actual level of imperviousness and runoff coefficients was completed. However, as is a Functional level analysis for obtaining draft plan conditions, an increase in the level of imperviousness and runoff coefficients was completed to account for minimum setbacks. Area weighting was again used to apply imperviousness and average runoff coefficients for all lot types (singles, townhomes, 18m rights-of-way, 22m right of ways, park, and site plans). An adjustment to the singles, townhomes, and rights-of-ways was

completed to account for minimum setbacks for building areas and maximum driveway widths. This was completed by reviewing a typical townhome block and ten (10) of the single-family lots. The adjusted runoff coefficients were then used to area-weight the imperviousness percentages and runoff coefficients for each subcatchment. Table 7-1 below summarizes the average runoff coefficients that were calculated by area weighting and the adjustment made to account for minimum setbacks. Figure E and Figure E4 illustrate the areas used.

Table 7-1 - Summary of Runoff Coefficients

Lot Type	Total Area (m^2)	Average Runoff Coefficient, C_{AVG}, Based on Area-Weighting and Site Plan Min → Max, (mean).	Average Runoff Coefficient C_{AVG} Adjusted to Account for Minimum Setbacks.
Single Family (20 units)	7,389	0.33 → 0.54 (0.50)	0.55
Townhomes (149 units)	29,919	0.38 → 0.64 (0.57)	0.70
Semi-detached (2 units)	983	0.35 →0.35 (0.35)	0.70
18m ROW	13,443	0.68 → 0.71 (0.70)	0.70
22m ROW	8,429	0.72	0.75
Park	7,262	0.20	0.30
Walkway Blocks	404	0.2 – 0.42 (0.31)	0.50
SWM	3,597	0.20	0.20
Site plan 1	5,063	0.60	0.60
Site plan 2	13,716	0.55	0.55
Totals	90,205		

The average runoff coefficient for the overall site area under post-development conditions was calculated as 0.57. Runoff coefficients for individual subcatchments ranged from 0.22 to 0.74.

The runoff coefficients for pre-development and post-development catchments are provided summarized in Table 7-2 below. The runoff coefficients for each subcatchment were used in the storm sewer design sheet for sizing of the sewers.

Table 7-2: Summary of Runoff Coefficients

Location	Area (hectares)	Pre-Development Runoff Coefficient, CAVG	Post-Development Runoff Coefficient, C_{AVG}	
			Based on Site Plan	Adjusted to Account for Min. Setbacks
Entire Site	9.0203	0.20	0.54	0.61

7.5 Allowable Release Rate

Minor system capture rate from this development will be directed to the Jackson Trails SWM Pond and limited to the minimum of either 1) 70 L/s/ha for the 3hr Chicago Storm as per the design of the downstream SWM facility or 2) 8 L/a/sec for 12hr SCS Type II storm as per Feedmill Creek SMM Criteria Study. The allowable minor system discharge rate for the site is therefore either 72.2 L/sec (3hr storm) or 631.6 L/sec (12hr storm). The volume required to detain peak volumes will necessitate the review of each of the noted storms on a volumetric basis.

7.6 Hydrology

PCSWMM was used to create a hydrologic/hydraulic model of the storm sewer system. The model includes both the minor system (storm sewer), for estimating peak flows and runoff volumes and the major system (roads). Calculations of runoff was completed based on the PCSWMM's EPA SWM 5 engine. Catchment parameters were taken from City of Ottawa's SDG002 Design parameters. The following design parameters and assumptions are noted in Table 7-2 below:

Table 7-3: General Subcatchment Parameters

Parameter	PCSWMM Parameter	Value
Infiltration Loss Method		Horton
Maximum Infiltration Rate	Max. Infil. Rate	76 mm/hr
Minimum Infiltration Rate	Min. Infil. Rate	13.2 mm/hr
Decay Constant (1/hr)	Decay Constant	4.14
Manning N (Impervious)	N Impev	0.013
Manning N (Pervious)	N Perv	0.25
Depression Storage – Pervious Surfaces	Dstore Imperv	1.57 mm
Depression Storage – Impervious Surfaces	Dstore Perv	4.67 mm
Zero Percent Impervious	Zero Imper	25%
Subcatchment Slopes	Slope	4% front yards & back yards

7.6.1 Storm Events Modelled

As this design submission is intended for establishing Draft Plan conditions, twenty-two (22) storm events were modelled.

- 3-hour 5mm Chicago storm. (10 min timestep),
- 3-hour 10mm Chicago storm. (10 min timestep).
- 3-hour 15mm Chicago storm. (10 min timestep).
- 3-hour 2-year Chicago storm. (10 min timestep).
- 3-hour 5-year Chicago storm. (10 min timestep).
- 3-hour 100-year Chicago storm. (10 min timestep).
- 3-hour 100-year + 20% Chicago storm. (10 min timestep).
- 6-hour 2-year Chicago storm. (10 min timestep).
- 6-hour 5-year Chicago storm. (10 min timestep).
- 6-hour 100-year Chicago storm. (10 min timestep).
- 6-hour 100-year + 20% Chicago storm. (10 min timestep).
- 12-hour 10mm SCS Type II storm. (MTO Distribution, with 15min timestep).
- 12-hour 2-year SCS Type II storm. (MTO Distribution, with 15min timestep).
- 12-hour 5-year SCS Type II storm. (MTO Distribution, with 15min timestep).
- 12-hour 100-year SCS Type II storm. (MTO Distribution, with 15min timestep).
- 12-hour 2-year SCS Type II storm. (SCS Type II Distribution with 6min timestep).
- 12-hour 5-year SCS Type II storm. (SCS Type II Distribution with 6min timestep).
- 12-hour 100-year SCS Type II storm. (SCS Type II Distribution with 6min timestep).
- 12-hour 100-year + 20% SCS Type II storm. (SCS Type II Distribution with 6min timestep).
- Historical storms occurring July 1, 1979, Aug 4, 1988, August 08, 1996 (5min timestep).

A Macro Strom Drainage Plan is provided in Appendix J and illustrates the subcatchments within the development site.

The following list below provides the design criteria requirements, followed by Table 7-4 which summarizes the results of various storm events. The peak flows and volumes represent model results prior to the addition of a detention pond. This was

completed to determine the peak flows and volumes prior to the influence of stormwater detention. The addition of a detention pond within the PCSWMM model is further noted in proceeding sections of this report. The estimation of total peak flows and runoff volumes was completed within PCSWMM's GRAPH panel by the selection of all subcatchments to derive a total combined runoff hydrograph. This was completed for all storm events.

In summary the following re-iterates the design SWM design criteria that is required.

- Extended Detention Control. Maximum discharge of 4.6 L/sec in 3-hr 15mm storm event.
- Retention Control (LID). Retain runoff volume for 5mm 3hr storm.
- Flood Control. Maximum discharge of 72.16 L/sec in 12-hr SCS storm event, or 631.6 L/sec in the 3hr Chicago storm event.

Table 7-4: Summary of Post-Development Flows (Uncontrolled)

Storm Event	Peak Flow (L/sec)	Runoff Volume (m3)
Chicago_3h_5mm	159	200
Chicago_3h_10mm	332	443
Chicago_3h_15mm	499	693
Chicago_3h_2yr	1,104	1,548
Chicago_3h_5yr	1,838	2,297
Chicago_3h_100yr	3,757	4,679
Chicago_3h_100yr + 20%	4,678	5,883
Chicago_6h_2yr	1,109	1,805
Chicago_6h_5yr	1,843	2,670
Chicago_6h_100yr	3,754	5,320
Chicago_6h_100yr + 20%	4,672	6,657
Historic_Jul1-79	2,368	5,665
Historic_Aug4-88	3,409	4,589
Historic_Aug8-96	2,245	5,665
SCS Type II_ 12-hr_10mm (MTO Distribution)	182	439
SCS Type II_ 12-hr_2yr (MTO Distribution)	977	2,164
SCS Type II_ 12-hr_5yr (MTO Distribution)	1,529	3,159
SCS Type II_ 12-hr_100yr (MTO Distribution)	2,881	6,013
SCS Type II_ 12-hr_2yr	1,005	2,172
SCS Type II_ 12-hr_5yr	1,702	3,195
SCS Type II_ 12-hr_100yr	3,372	6,014
SCS Type II_ 12-hr_100yr + 20%	4,154	7,424

7.6.2 Extended Detention Requirements

For Criteria # 1, the extended detention control criteria require that the maximum discharge rate of 0.51 L/ha/sec from development site upstream of the Jackson Trails SWM Facility not be exceeded during the 3-hour 15mm storm event. This

criterion was established to provide to mitigate peak flow increases during frequent storm events and erosion within Feedmill Creek.

From Table 7-4 above, the peak flow and runoff volume from the 3-hr storm 15mmm is 499 L/sec and 693 m3. PCSWWM's storage function was used to estimate the volume necessary to control to the allowable rate of 4.6 L/sec (9.02 ha x 0.51 L/ha/sec). The volume necessary to control the peak rate to 4.6 L/sec is 660 m3. This is the maximum volume necessary if one were to not consider any upstream storage, where in fact a portion of the necessary volume will be stored in the rear yards and within the right-of-way with infiltration. Table 7-5 in the next section identifies that only 23% of the total site area represents backyards, and therefore it is appropriate to assume that the same proportion of the total 15mm runoff volume of 660 m3 (or 152 m3) can be stored in the rear yards. Similarly additional infiltration in the rights-of-way will assist in lowering the peak runoff during the 15mm event. During the detailed design stage, infiltration areas will be added to the PCSWMM model. Additional information is provided in proceeding sections.

7.6.3 Low Impact Design

For Criteria #2, the Feedmill Creek Stormwater Management Study requires that LID controls be implemented to retain the volume from a 3-hr 5mm rainfall event. There are various LID methods available, however the most appropriate and currently used method in the City of Ottawa is the infiltration trench and swale. Modifications to the typical trench will be necessary to ensure that the runoff is retained and infiltrated, prior to being captured at inlets.

The peak flow and total runoff volume that occurs during the 5mm storm event is 159 L/sec and 200 m3 over the entire site. To provide the appropriate volume for infiltration, perforated pipes will be utilized in the rear-yards. However, for a typical residential subdivision, only a portion of the rainfall and resultant runoff will be directed towards the rear yards. The following table summarizes the approximate proportion of subcatchments that flow towards varying outlets.

Table 7-5: 3-hour 5mm Peak Flows and Runoff Volumes of Various Subcatchments

Storm Event	Area in hectares (% of Total)		Peak Flow in L/sec (% of Total)		Runoff Volume in m^3 (% of Total)	
Backyards	2.0631	(23%)	47.2	(30%)	57.5	(29%)
Front yards / right-of-way	3.9656	(44%)	81.9	(51%)	100	(50%)
Park	0.7248	(8%)	3.5	(2%)	4	(2%)
SWM	0.3909	(4%)	0.5	(0%)	0.5	(0%)
Site plan #1	0.5077	(6%)	8	(5%)	11	(6%)
Site plan #2	1.3741	(15%)	18.1	(11%)	27	(14%)
Totals	9.0262	(100%)	159.2	(100%)	200	(100%)

Since only 57.5 m^3 (or 29%) of the total 200 m^3 of necessary runoff volume can be infiltrated in rear yard swales, the remaining volume will need to be infiltrated in other areas of the site.

It will not be permitted to infiltration within the dry pond due to the estimated ground water table elevation. Additional information on the dry pond is provided in proceeding sections of this report. The majority or (50%) of the runoff volume occurring during the 5mm storm event would necessitate the infiltration within the right-of way using BMP source controls.

It is therefore proposed to incorporate infiltration at the sag location within the right of-way. This will be achieved by installing perforated pipes which extend out from the roadway catchbasins. Figure 7-1 below illustrates the location of the roadway ponding areas.

Figure 7-1: Surface Ponding Locations

To provide infiltration at sag locations, the total length of infiltration trenching required below the outlet pipe invert is as follows:

- Total Volume required for infiltration (excludes backyards) 142.5 m³.
- Total Number of roadway sag locations 6 each.
- Number of catchbasin at sag locations 15 each.
- Infiltration Trench Width 1.0 m.
- Infiltration Trench Height 0.6 m.
- Void ratio of stone 0.40
- Total length required for Infiltration of 152.5m3 396 m.
- Length of trench extending from each CB 13.2 (use 14m)

It is proposed to extend infiltration trenches complete with 150mm perforated pipes 14m from each catchbasin. The invert of the 150 pipes will be set 200mm below the invert of the outletting CB lead pipe. Please refer to drawing STMM in **Appendix J**.

7.6.4 Flow Attenuation (Storage)

For criteria # 3, onsite storage is required to control peak flow of the 100-yr 12hr SCS storm to 8 L/ha/sec and the 100-yr 3hr Chicago to 70 L/ha/sec. From **Table 7-4**, the 12-hr SCS storm generates a total runoff volume of ±6,014 m3 and peak runoff rate of ±2,880 L/sec (MTO Distribution). PCSWMM's storage routine was again used to estimate the preliminary volume necessary based on the allowable discharge rate of 72.16 L/sec during the 12hr 100-yr SCS Type II storm. The total volume required would

be 4,056 m3. This represents the total volume for the entire site. Similarly, for the 3hr 100-yr Chicago storm, the retention volume required to meet 631.6 L/sec (70 x 7.02 L/ha/sec) is 2,819m3. One can see that the 12hr SCS storm results is the governing storm for establishing retention volume requirements.

To establish the necessary requirements, the PCSWMM model was expanded to include a storage node to represent the stormwater facility. Two (2) flow-controlled ORIFICES were added connecting the pond and the outfall. The following Table 7-6 summarizes the orifices sizes and elevations that were used in the model to establish the preliminary pond parameters. These will be further refined during detailed design, and but are included now to illustrate that the pond has adequate volume and depth to meet the design criteria.

Table 7-6: Dry Pond Stage-Storage Data

Description	Elevation (m)	Orifice Size
Orifice 1 – upper	113.3	135mm CIRCULAR
Orifice 2 – lower	113.0	50mm CIRCULAR

The following table below summarizes the preliminary dry pond parameters that were used in the model, based on the site plan.

Table 7-7: Dry Pond Stage-Storage Data

Description	Elevation (m)	Total Depth (m)	Incr. Depth (m)	Area (m2)	Incr. Volume (m3)	Total Volume (m3)
Top of pond (0.3m freeboard)	116.1	2.4	0.1	3210	301	5,045
	116.0	2.3	0.1	2812	271	4,744
Spill elevation (emergency)	115.9	2.2	2.2	2618	4,473	4,473
Bottom of pond	113.7	0	0	1448	0	0

The bottom of proposed dry pond was set an and elevation of 113.7m, which are similar to the underside of footing elevations (USFs) of the closest existing residential units on Bandelier Way, which are 113.78 (semi-detached) and 113.90m (townhome).

The estimated groundwater table (GWT) elevation taken from the geotechnical report is ±115.6m, however the USF elevations of the existing adjacent homes in ± 113.8m. It is expected that the groundwater table within the rock will lower. To ensure the pond remains dry, perforated underdrains will be installed 0.5m below the pond bottom. The underdrains will connect back to the outlet structure.

It should also be noted that the existing storm and sanitary sewers, located within the 12m easement, are installed at much lower elevations (storm and sanitary inverts of ±112m and ±111m respectively), and therefore it is expected that the GWT would be lower in this vicinity. The proposed dry pond bottom of 113.7m is well above the existing sewers and similar to the USFs of existing homes.

Preliminary profiles were completed to estimate the surface ponding that is available at sag locations within the right-of-way. A total of 30 roadway catchbasins are illustrated, in which 15 catchbasins service seven sag locations in the right-of-way. Inlet control devices are necessary in all catchbasins to control runoff to the 2-yr and ensure no ponding in street sag locations will occur.

The estimated surface ponding areas on local streets is ± 393 m3. The locations of the catchbasins and surface ponding areas are illustrated in **Appendix A.**

7.7 Dry Pond Volumes and Outflow Results

Figure 7-2 illustrates the pond volumes and maximum water surface elevations (WSEL), whereas **Table 7-7** provides peak flows, volumes and WSEL's from the dry pond during major storm events. It also provides the depths and corresponding volumes within the pond. Two orifices were used to establish preliminary results, which will be refined during detailed design. The volumes and depths presented below confirm that the dry pond has adequate depth and volume to contain the 100-yr 20 % storm. The volume available in the pond (prior to spill) is 4,473 m3. Also, there is at least 300mm of freeboard above the most critical 100-yr event of 115.75m, as the emergency spill is set to 115.9m.

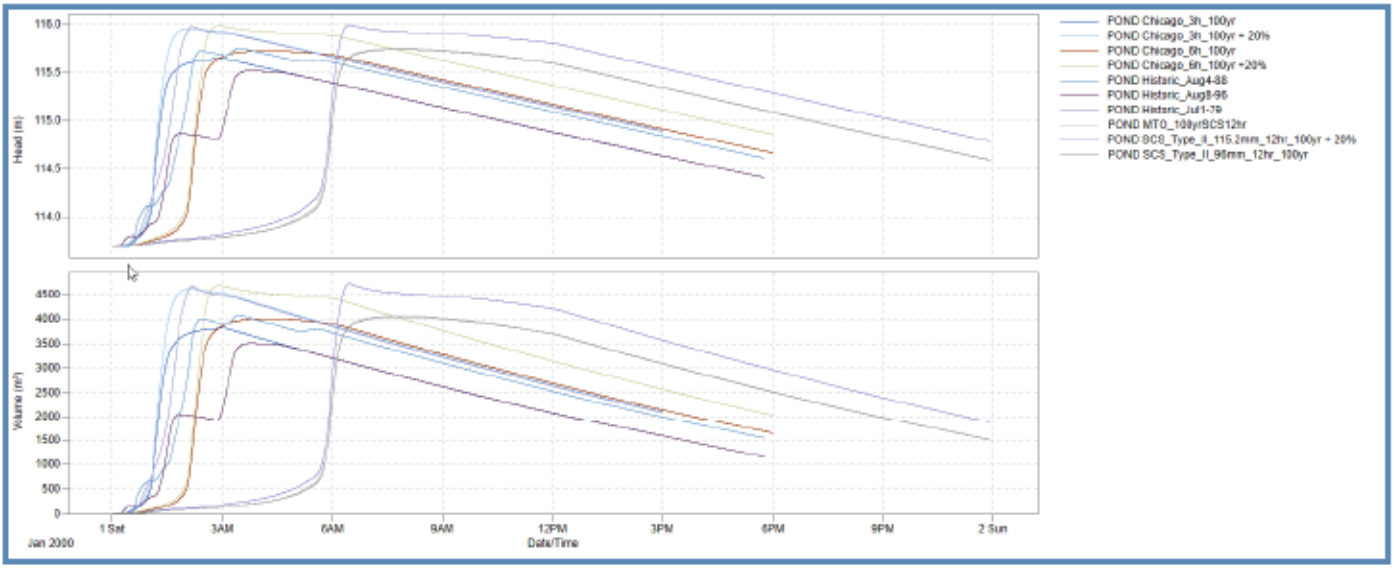


Figure 7-2: Pond Volumes and Maximum WSEL During 100yr, 100yr +20, Historic Storms

Table 7-8: Dry Pond 100-yr Peak Outflows, Volumes, Elevations

Storm Event	Peak Flow (L/sec)	Volume (m^3)	Maximum Pond Stage (m)
Chicago_3h_100yr	66.9	3,815	115.64
Chicago_3h_100yr + 20%	71.0*	4,610	115.95
Chicago_6h_100yr	68.1	4,015	115.72
Chicago_6h_100yr + 20%	70.6*	4,684	115.98
Historic_Aug4-88	68.5	4,087	115.75
Historic_Aug8-96	65.1	3,514	115.52
Historic_Jul1-79	70.4*	4,677	115.98
SCS Type II_ 12-hr_100yr (MTO Distribution)	68.5	4,088	115.75
SCS Type II_ 12-hr_100yr + 20%	70.2*	4,723	115.99
SCS Type II_ 12-hr_100yr	68.3	4,054	115.74

Notes:
Peak flows denoted with * represents overflow through emergency weir during storm event. Weir 3m wide and set with INV at 115.9m.

7.7.1 Storm Sewers

Since an end-of-pipe SWM dry pond is proposed the overall target capture rate is 70 L/ha/sec, however for sizing of the storm sewer the 2-year capture rate was targeted to ensure no surface ponding. Target capture rates for most areas were increased to near the 2-year to account for the City of Ottawa's no ponding in the 2-year event on public and private streets. The higher rate represents the approximate 2-year level of service and used to avoid surface ponding.

The following table summarizes the individual stormwater target rates that are necessary to meet the onsite SWM requirements. The table is based on the previously noted average runoff coefficients for each area with a standard time of concentration of 10 minutes and 2-year storm intensity of 76.8 mm/hr. This represents a target rate (in L/ha/sec) of 213.6 X C, based on Q=2.78 x C x 78.6mm x 1.0ha).

Table 7-1: Target Capture Rates for Various Areas

Location	Area in hectares	Average Runoff Coeff	Target Minor System Capture Rate (L/ha/sec)
Site plan #1	0.51	0.60	130
Site plan #2	1.37	0.55	120
Backyards	2.06	0.70	150
Front yards / right-of-way	3.97	0.70	150
Park	0.73	0.30	65

A storm drainage plan is provided in **Appendix J**. A total thirty-one (31) subcatchments (or drainage areas) within the development site are shown on this drawing with average runoff coefficients calculated for each drainage area.

Average runoff coefficients were calculated for all drainage areas for sizing of the storm sewers. A starting inlet times of 10 minutes were used for uppermost storm sewers. Design sheets for the 2-year sizing of the storm sewer system is included for reference in **Appendix E**. Under the 2-year storm event adequate capacity is provided within the storm sewer system.

To meet Criteria # 4 and have no surface ponding is pubic or private roadways during the 2yr event, the above noted capture rates were used in conjunction with standard inlet control devices (ICDs).

7.7.2 Hydraulic Grade Line Analysis

A Steady state hydraulic grade line (HGL) analysis was not completed at this time since a dynamic model was used to confirm the 100-year water surface profile is at least 300mm below the proposed underside of footing elevations of the units. In addition, the HGL of the 100-year plus 20% (rare event) was completed to ensure that the water surface profile was below the building footings.

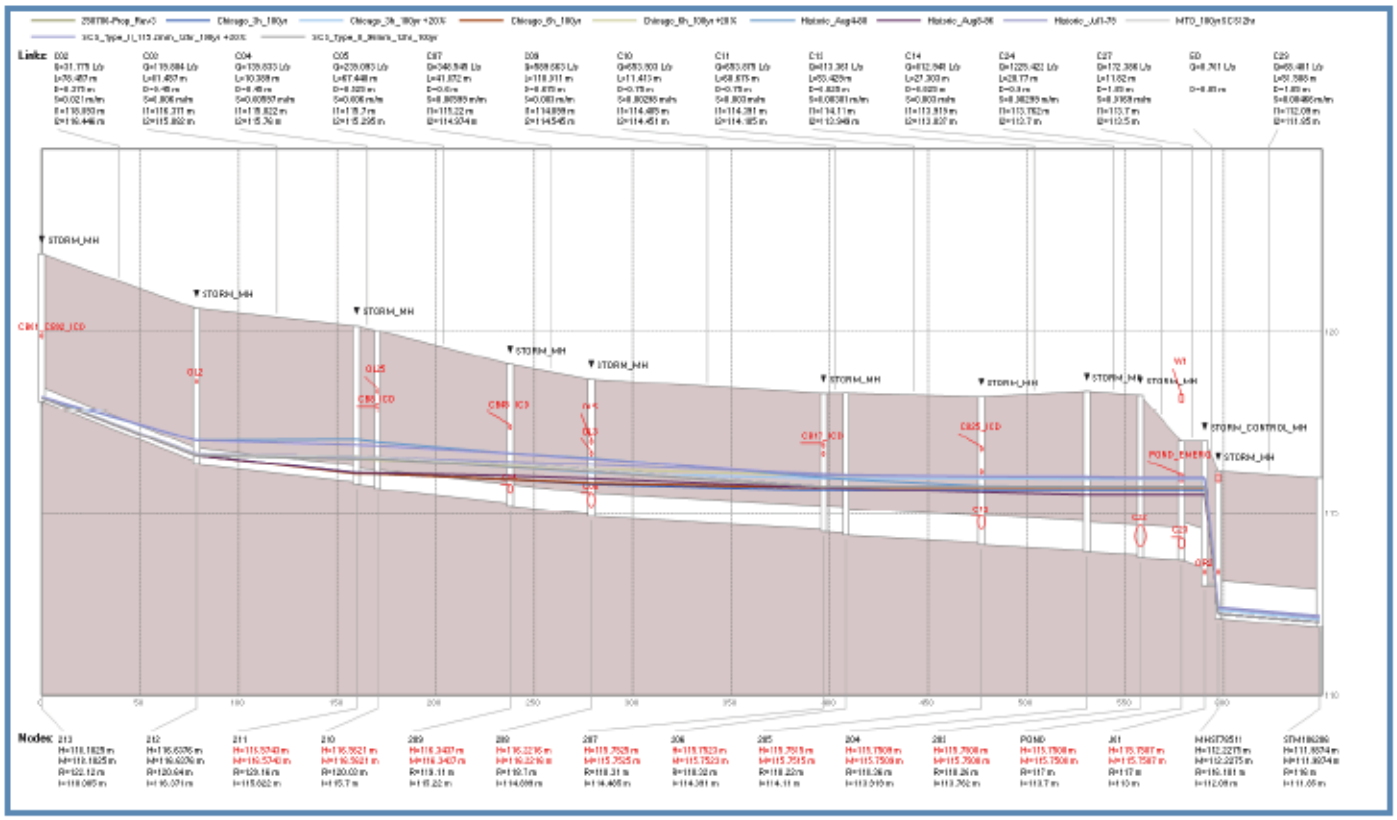


Figure 7-3: Hydraulic Grade Lines

Based on this analysis, we can confirm the maximum 100-yr HGL meet the City's clearance requirements. Using captured flows rather than free-flow conditions would result in the HGL being within the storm sewer pipe and not raise above the obvert of the storm sewer system. It is shown that during the 100-yr event the maximum water surface elevations will remain below the underside of footing (USFs) with at least 300mm clearance, and for the 100-year Plus 20%, the HGL is below the USFs. The most critical area is between storm manhole 208 to the dry pond having a maximum water elevation of 116.58m (at MH211).

8 Erosion & Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- Filter bags shall be installed between the frame and cover of all adjacent catch basins and catch basin manhole structures.
- Light duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the site grading and erosion control plan.
- A mud mat will be installed at the construction entrance to help avoid mud from being transported to offsite roads.
- Visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations.
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed.
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract.
- During the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805 and City of Ottawa specifications.

9 Conclusions and Recommendations

This Servicing & Stormwater Report outlines the rationale which will be used to service the proposed development. The following summarizes the servicing requirements for the site:

Water

- Domestic water demands of 5.0 L/sec, 12.3 L/sec, and 27.1 L/sec was estimated based on City of Ottawa Guidelines.
- The mixed-use building (Building F – Site plan #1) and 4-storey residential buildings (Building A through E – Site plan #2) will require a double watermain feed as their average day demands exceed 50 m^3/day as per City guidelines.
- Required Fire Flows for all buildings based on the Fire Underwriters Survey (FUS) method at between 133L/sec and 183 L/sec for singles family homes, 217 and 233 L/sec for 5-unit townhomes, 183 L/sec to 200 for 8-unit townhomes (includes firewalls), 183 L/sec for the Mixed Use (building F), and between 250 L/sec and 267 L/sec for the remaining 4-storey residential units (Buildings A-E).
- A WaterGems hydraulic model was prepared to confirm that adequate pressure / flow is available, based on boundary conditions provided by the City of Ottawa. Peak hour pressures of between 48.6 and 55.8 psi are anticipated. This exceeds the City's guideline of 20 psi.

Sewage

- The estimated peak sewage flows from the proposed site is 15.7 L/sec. Based on the Potter's Key Design Brief, the allocated sewage flow from the 6171 Hazeldean site to the sanitary sewer on Bandelier Way was 11.84 L/sec. Therefore, the proposed site is expected to release an additional 3.86 L/sec, above the previous estimate. A preliminary review of the sanitary sewers immediately downstream of the site did not identify any capacity issues to accommodate the additional peak flow.
- A combination of both 200mm and 250mm diameter sanitary sewer are proposed with a minimum of 0.34% and 0.30% slope, having a capacity of 19.8 L/sec and 35.9 L/sec respectively.

Stormwater

- An extended detention control criterion requires that the maximum discharge rate of 0.51 L/ha/sec from development site upstream of the Jackson trails SWM Facility not be exceeded during the 3-hour 15mm storm event. The estimated peak flow and runoff volume from the 3-hr storm 15mmm is 499 L/sec and 693 m3 respectively. The volume necessary to control to the allowable rate of 4.6 L/sec (9.02 ha x 0.51 L/ha/sec) is 660 m3. Approximately 152 m3 will be stored in the rear yard during the event and therefore the remaining 508 m3 will need to be detained within the right of way and low points (roadway sag locations).
- Runoff volume control is necessary to retain the volume from a 3-hr 5mm rainfall event. This will be achieved using Low impact Development (LID) methods. The peak flow and total runoff volume that occurs during the 5mm storm event is 159 L/sec and 200 m3 over the entire site. Within the backyards an infiltration trench and swale will be used. Approximately ±58 m^3 of necessary runoff volume can be infiltrated in rear yard swales, with the remaining 142 m3 will need to be infiltrated within the right-of-way. Infiltration within the right-of-way is proposed using infiltration pipes extending from the catchbasins at low-points. A total o f 396 m of perforated pipes encased in 1.0m x 0.6m high granular trenches are proposed.
- The flood control criteria require that onsite storage be provided to control peak flows from the storm 100-yr 12hr SCS storm to 8 L/ha/sec. Both the 3hr Chicago and 12hr SCS storms were analyzed to result in peak flows (and volumes) of 3,757 L/sec (4,679 m3) and 2,881 L/sec (6,013 m3), respectively. The volumes required to control to the 72.2 L/sec (9.02 ha*8 L/ha/sec) is 4,056 m3 for the 12hr storm. A downstream stormwater facility (dry pond) will be used in conjunction with roadway ponding.
- A dry pond is proposed having a bottom elevation of 113.7m and top elevation of 116.1m. The dry ponds maximum available volume is 4,473m3 at its emergency spill elevation of 115.9m, and 5,045m3 at the top of pond elevation of 116.1m. An emergency spill weir (3m wide) and set at 115.9m will ensure runoff will overflow towards the existing and

adjacent walkway block. The dry pond will have 3:1 side slopes and include concrete inlet and outlet headwalls and an outlet structure. The outlet structure will contain a weir wall containing two (2) orifices for flow control. 50mm and 135mm diameter orifices will be used to control runoff to the allowable rate during the 100yr SSC storm.

- The storm sewer was sized based on the Rational Method and Manning's Equation under free flow conditions for the 2-year storm using a 10-minute inlet time. Inlet control devices will be used in all catchbasins, with the some of roadway catchbasins requiring interconnect catchbasins. Capture rates at low points (trap lows) are set to the 2-year runoff rate to ensure no surface ponding.

10 Legal Notification

This report was prepared by EXP Services Inc. for the account of 11654128 Canada Inc.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

Appendix A – Figures

Figure A2 – Site Location Plan

Figure A3– Site Statistics Plan

Figure A4 – Water Distribution Plan

Figure A5 – Water Demand Allocation Plan

Figure A6 – Subcatchment Plan

Figure A7 – Catchbasin Plan

Figure A8 – Roadway Ponding Area Plan

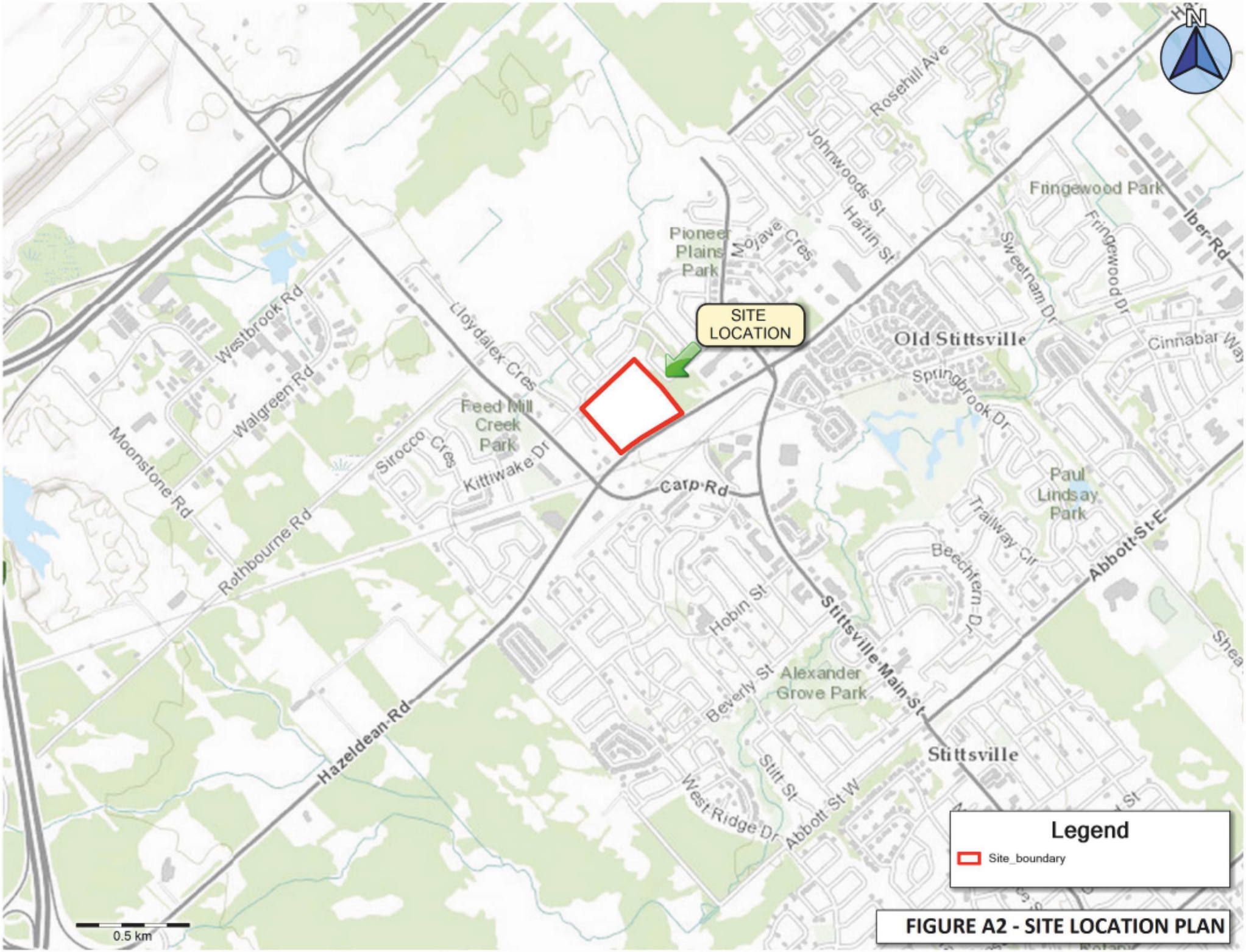


FIGURE A2 - SITE LOCATION PLAN

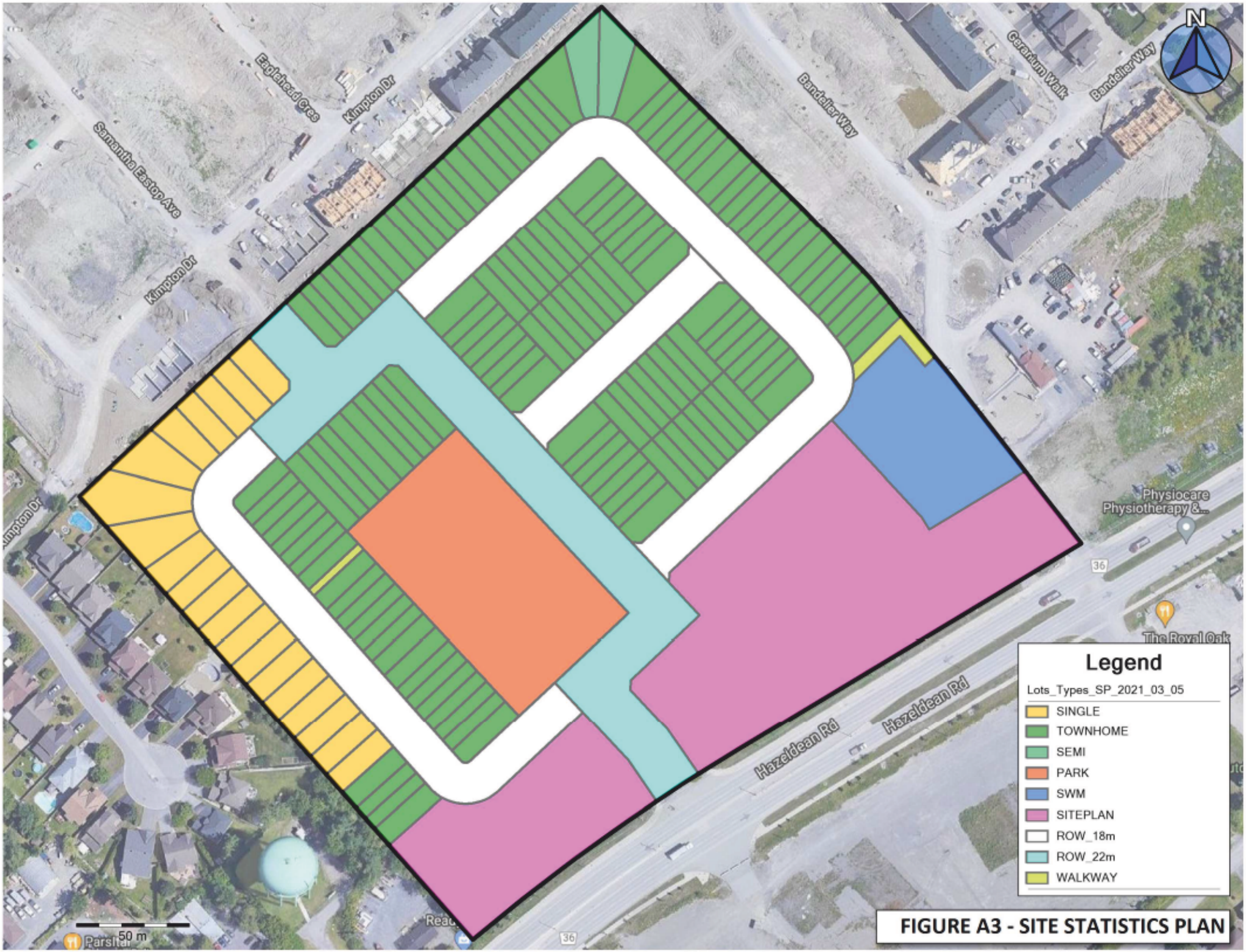
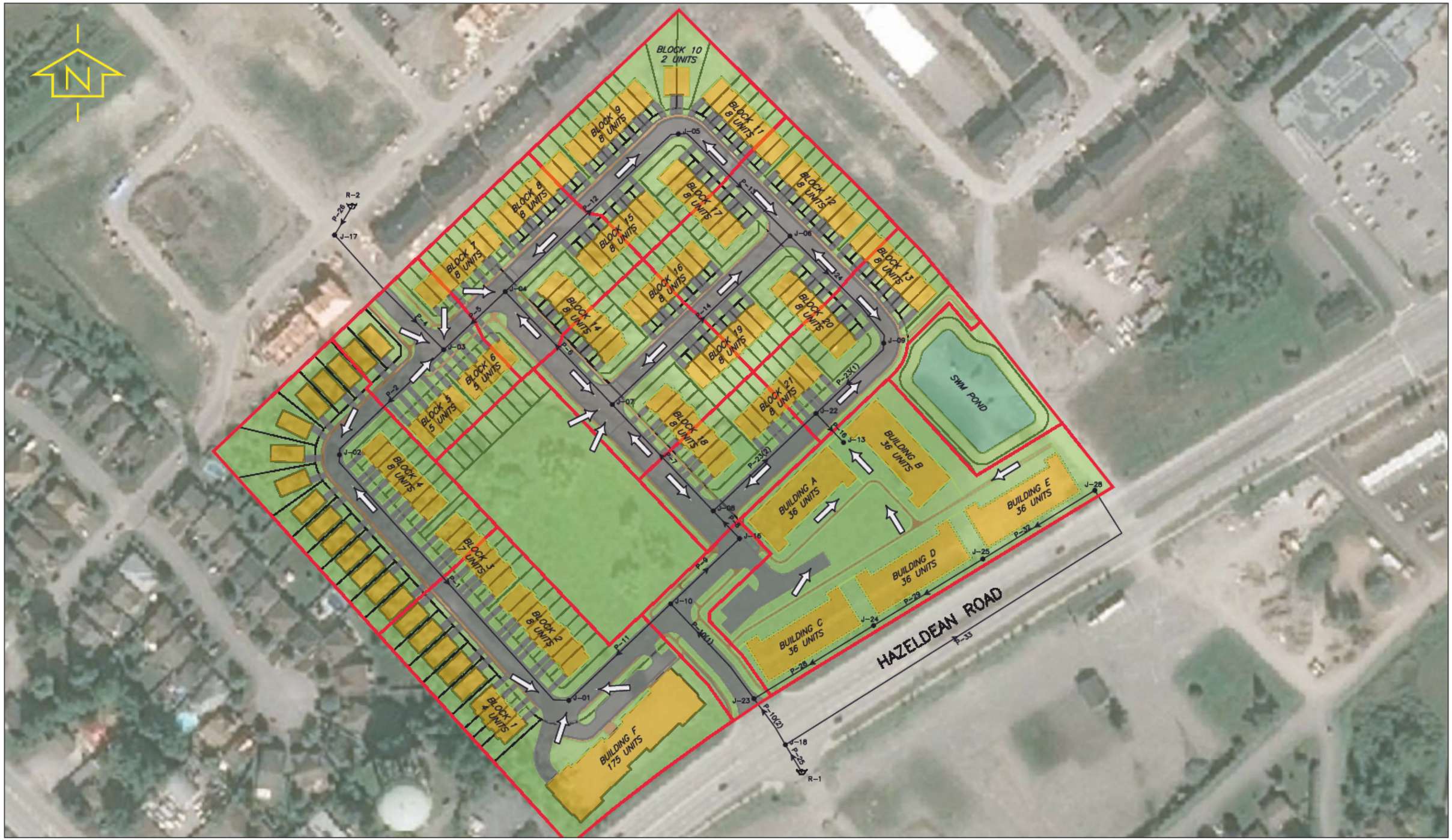


FIGURE A3 - SITE STATISTICS PLAN

exp Services Inc. 100, 2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com	DESIGN JLF DRAWN SAB DATE APRIL 2021 FILE NO 258780	6171 HAZELDEAN ROAD WATER DISTRIBUTION PLAN	SCALE 1:1750 FIGURE NO FIG A4



exp Services Inc.
100, 2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com

DESIGN	JLF
DRAWN	SAB
DATE	APRIL 2021
FILE NO	258780

6171 HAZELDEAN ROAD

DEMAND ALLOCATION PLAN

SCALE	1:1750
FIGURE NO	FIG A5

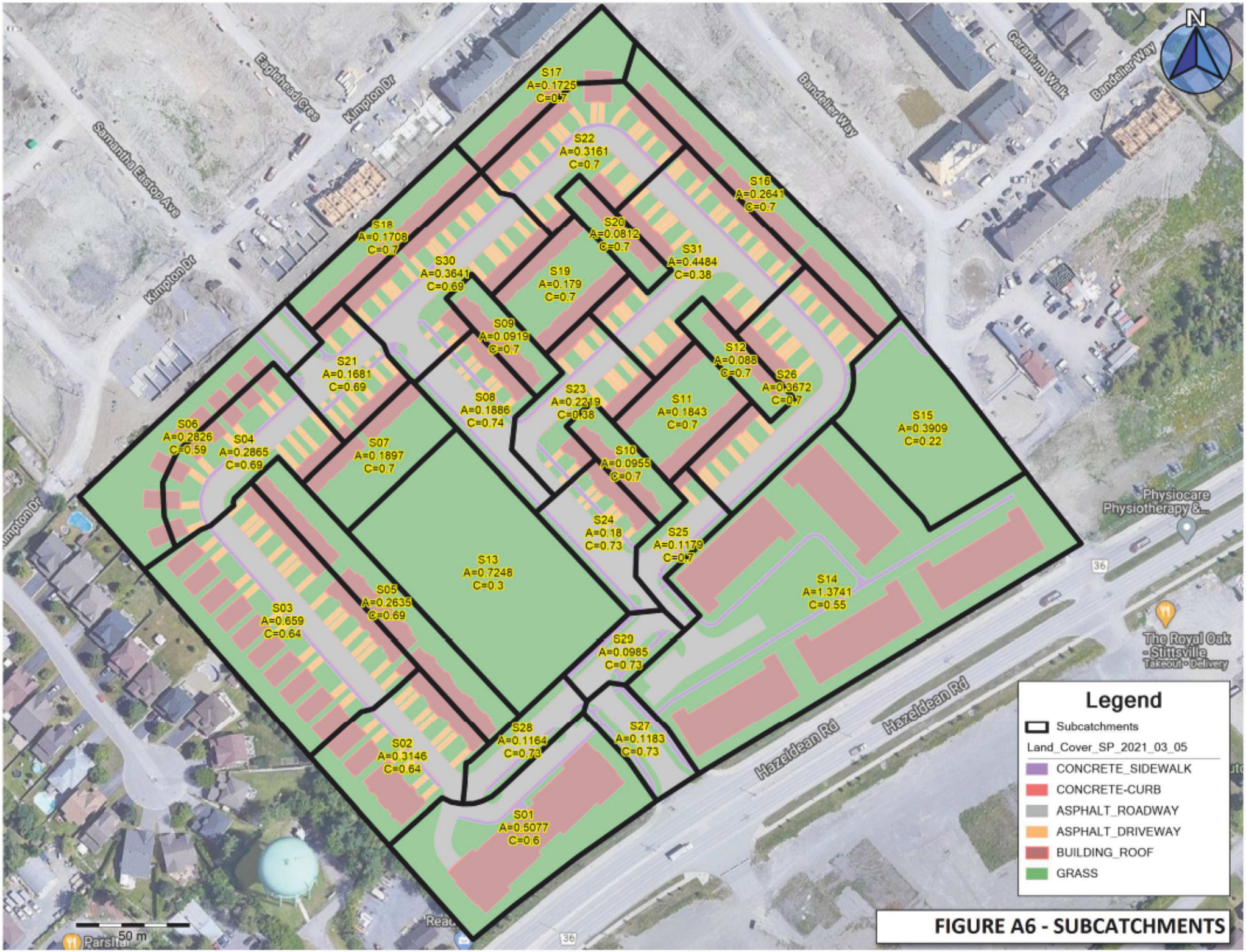


FIGURE A6 - SUBCATCHMENTS

FIGURE A7 - CATCHBASIN PLAN

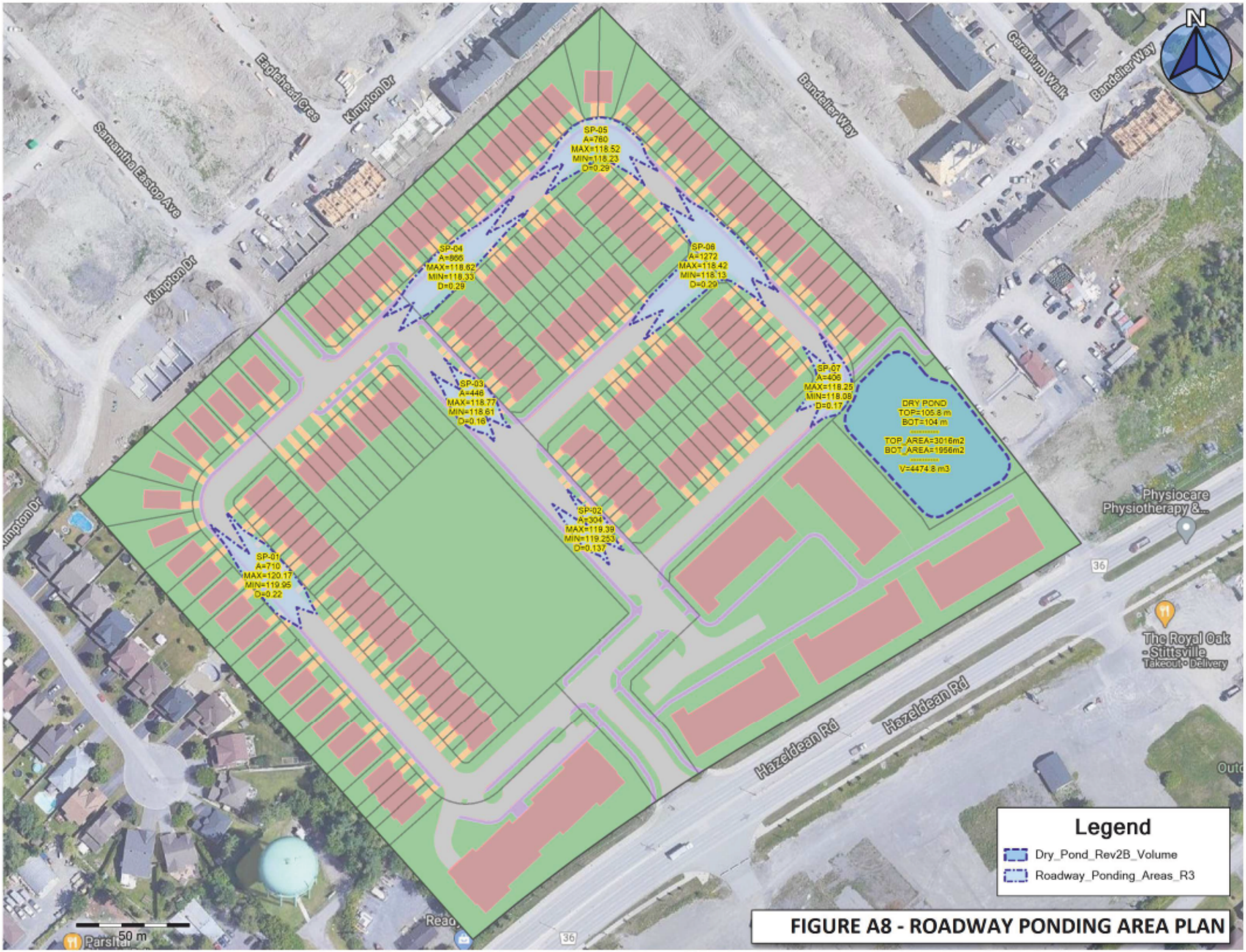


FIGURE A8 - ROADWAY PONDING AREA PLAN

Appendix B – Water Servicing Tables

Table B1 – Water Demand Chart

Table B2 – Summary of Required Fire Flows (RFF) for 6171 Hazeldean Road

Table B3 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Singles

Table B4 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Singles

Table B5 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 2 (8-unit Town with firewall)

Table B6 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 4 (8-unit Town with firewall)

Table B7 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 5 (5-unit)

Table B8 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 6 (5-unit)

Table B9 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 8 (8-unit Town with firewall)

Table B10 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 11 (8-unit Town with firewall)

Table B11 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Block 16 (8-unit Town with firewall)

Table B12 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Building A

Table B13 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Building B

Table B14 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Building C

Table B15 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Building D

Table B16 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Building E

Table B17 – Fire Flow Requirements Based on Fire Underwriters Survey (FUS) – Mixed Use

TABLE B1
WATER DEMAND CHART

Location:	6171 Hazeldean Rd
Project No:	OTT-00258780
Designed by:	J.Fitzpatrick
Checked By:	B Thomas
Date Revised:	April 2021

Water Consumption

Residential =	350	L/cap/day
Commercial =	5.0	L/m²/day

Population Densities

Single Family	3.4	person/unit
Semi-Detahced	2.7	person/unit
Duplex	2.3	person/unit
Townhome (Row)	2.7	person/unit
Bachelor Apartment	1.4	person/unit
1 Bedroom Apartment	1.4	person/unit
2 Bedroom Apartment	2.1	person/unit
3 Bedroom Apartment	3.1	person/unit
4 Bedroom Apartment	4.1	person/unit
Avg. Apartment	1.8	person/unit

Proposed Buildings	No. of Residential Units										Total Persons (pop)	Residential Demands in (L/sec)					Commercial						Total Demands (L/sec)		
	Singles/Semis/Towns				Apartments								Peaking Factors (x Avg Day)						Peaking Factors (x Avg Day)						
	Single Family	Semi-Detached	Duplex	Townhome	Studio	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom	Avg Apt.		Avg. Day Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Area (m²)	Avg Demand (L/day)	Max Day	Peak Hour	Max Day Demand (L/day)	Peak Hour Demand (L/day)	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
J-1	5			16		101	42	26			370.4	129,640	2.50	5.50	324,100	713,020	575.4	2,877	1.50	2.70	4,316	7,768	1.53	3.80	8.34
J-2	13			11							73.9	25,865	2.50	5.50	64,663	142,258							0.30	0.75	1.65
J-3	2			11							36.5	12,775	2.50	5.50	31,938	70,263							0.15	0.37	0.81
J-4				21							56.7	19,845	2.50	5.50	49,613	109,148							0.23	0.57	1.26
J-5		2		24							70.2	24,570	2.50	5.50	61,425	135,135							0.28	0.71	1.56
J-6				28							75.6	26,460	2.50	5.50	66,150	145,530							0.31	0.77	1.68
J-7				16							43.2	15,120	2.50	5.50	37,800	83,160							0.18	0.44	0.96
J-8				8							21.6	7,560	2.50	5.50	18,900	41,580							0.09	0.22	0.48
J-9				14							37.8	13,230	2.50	5.50	33,075	72,765							0.15	0.38	0.84
J-10																									
J-13						110	130				427.0	149,450	2.50	5.50	373,625	821,975							1.73	4.32	9.51
J-16																									
J-17																									
J-18																									
Total =	20	2		149		211	172	26			1,213	424,515			1,061,288	2,334,833	575						4.95	12.33	27.11

TABLE B2
Summary of Required Fire Flows (RFF) for 6171 Hazeldean Road

Type of Resdential	Reference Table	Requried Fire Flow (L/s)
Single	TABLE B3	133
Single	TABLE B4	183
Block 2 / Townhome (8 Units) - With Firewall	TABLE B5	200
Block 4 / Townhome (8 Units) - With Firewall	TABLE B6	183
Block 5 /Townhome (5 Units)	TABLE B7	233
Block 6 / Townhome (5 Units)	TABLE B8	217
Block 8 / Townhome (8 Units) - With Firewall	TABLE B9	200
Block 11 / Townhome (8 Units) - With Firewall	TABLE B10	200
Block 16 / Townhome (8 Units) - With Firewall	TABLE B11	183
Building A	TABLE B12	267
Building B	TABLE B13	267
Building C	TABLE B14	250
Building D	TABLE B15	283
Building E	TABLE B16	267
Mixed Use Building	TABLE B17	183

TABLE B3
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Single

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	283.2 m²	
	Floor 2		141.6	100%	141.6		
	Floor 1		141.6	100%	141.6		
	Basement		141.6	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						5,553
Fire Flow (F)	Rounded to nearest 1,000						6,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-900	5,100
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	5,100
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	5,100
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	5,100
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	17.3	2	34.6	1B	23%	62%	3,162	8,262
	Side 2	2.4	1	0 to 3	Type A	17.3	2	34.6	1B	23%			
	Front	28.3	4	20.1 to 30	Type A	8.2	2	16.4	4A	8%			
	Back	20.9	4	20.1 to 30	Type A	3.8	2	7.6	4A	8%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	8,000
	Total Required Fire Flow (RFF), L/sec =	133
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	133

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditions for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B4
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Single

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	517.2 m²	
	Floor 2		258.6	100%	258.6		
	Floor 1		258.6	100%	258.6		
	Basement		258.6	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						7,505
Fire Flow (F)	Rounded to nearest 1,000						8,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,200	6,800
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	6,800
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	6,800
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	6,800
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	15.2	2	30.4	1A	22%	58%	3,944	10,744
	Side 2	2.4	1	0 to 3	Type A	17.8	2	35.6	1B	23%			
	Front	26.4	4	20.1 to 30	Type A	8.7	2	17.4	4A	8%			
	Back	44.4	5	30.1 to 45	Type A	8.7	2	17.4	5A	5%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	11,000
	Total Required Fire Flow (RFF), L/sec =	183
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	183

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B5
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 2 / Townhome (8 Units) - With Firewall

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	969.0 m²	
	Floor 2		969	50%	484.5		
	Floor 1		969	50%	484.5		
	Basement (At least 50% below grade, not included)		969	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						10,272
Fire Flow (F)	Rounded to nearest 1,000						10,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,500	8,500
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	8,500
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	8,500
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	8,500
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	0.0	1	0 to 3	Type A	Fire Wall				10%	42%	3,570	12,070
	Side 2	2.4	1	0 to 3	Type A	18.3	2	36.6	1B	23%			
	Front	28.4	4	20.1 to 30	Type A	43.5	2	87	4C	9%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	12,000
	Total Required Fire Flow (RFF), L/sec =	200
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	200

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B6
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 4 / Townhome (8 Units) - With Firewall

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	807.8 m²	
	Floor 2		807.8	50%	403.9		
	Floor 1		807.8	50%	403.9		
	Basement (At least 50% below grade, not included)		807.8	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						9,379
Fire Flow (F)	Rounded to nearest 1,000						9,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,350	7,650
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	7,650
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	7,650
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	7,650
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	24.4	4	20.1 to 30	Type A	15.9	2	31.8	4B	8%	44%	3,366	11,016
	Side 2	0	1	0 to 3	Type A	Fire Wall				10%			
	Front	28.4	4	20.1 to 30	Type A	20.6	2	41.2	4B	8%			
	Back	8.7	2	3.1 to 10	Type A	16.9	2	33.8	2B	18%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	11,000
	Total Required Fire Flow (RFF), L/sec =	183
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	183

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditions for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B7
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 5 /Townhome (5 Units)

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	1037.8 m²	
	Floor 2		518.9	100%	518.9		
	Floor 1		518.9	100%	518.9		
	Basement (At least 50% below grade, not included)		518.9	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						10,631
Fire Flow (F)	Rounded to nearest 1,000						11,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,650	9,350
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	9,350
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	9,350
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	9,350
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	17	2	34	1B	23%	46%	4,301	13,651
	Side 2	8.7	2	3.1 to 10	Type A	17	2	34	2B	18%			
	Front	32.4	5	30.1 to 45	Type A	17.3	2	34.6	5B	5%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	14,000
	Total Required Fire Flow (RFF), L/sec =	233
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	233

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B8
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 6 / Townhome (5 Units)

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	1034.4 m²	
	Floor 2		517.2	100%	517.2		
	Floor 1		517.2	100%	517.2		
	Basement (At least 50% below grade, not included)		517.2	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						10,613
Fire Flow (F)	Rounded to nearest 1,000						11,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,650	9,350
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	9,350
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	9,350
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	9,350
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	17	2	34	1B	23%	36%	3,366	12,716
	Side 2	28.4	4	20.1 to 30	Type A	17	2	34	4B	8%			
	Front	32.4	5	30.1 to 45	Type A	14.9	2	29.8	5A	5%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	13,000
	Total Required Fire Flow (RFF), L/sec =	217
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	217

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditions for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B9
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 8 / Townhome (8 Units) - With Firewall

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	784.0 m²	
	Floor 2		784	50%	392		
	Floor 1		784	50%	392		
	Basement (At least 50% below grade, not included)		784	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						9,240
Fire Flow (F)	Rounded to nearest 1,000						9,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,350	7,650
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	7,650
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	7,650
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	7,650
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	16.3	2	32.6	1B	23%	54%	4,131	11,781
	Side 2	0	1	0 to 3	Type A	Fire Wall				10%			
	Front	28.4	4	20.1 to 30	Type A	24.1	2	48.2	4B	8%			
	Back	15.5	3	10.1 to 20	Type A	24.1	2	48.2	3B	13%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	12,000
	Total Required Fire Flow (RFF), L/sec =	200
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	200

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B10
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 11 / Townhome (8 Units) - With Firewall

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	776.1 m²	
	Floor 2		776.1	50%	388.05		
	Floor 1		776.1	50%	388.05		
	Basement (At least 50% below grade, not included)		776.1	0%	0		
Fire Flow (F)	F = 220 * C * SQRT(A)						9,193
Fire Flow (F)	Rounded to nearest 1,000						9,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,350	7,650
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	7,650
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	7,650
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	7,650
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	2.4	1	0 to 3	Type A	15.4	2	30.8	1A	22%	53%	4,055	11,705
	Side 2	0	1	0 to 3	Type A	Fire Wall				10%			
	Front	28.4	4	20.1 to 30	Type A	24.1	2	48.2	4B	8%			
	Back	19.8	3	10.1 to 20	Type A	24.1	2	48.2	3B	13%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	12,000
	Total Required Fire Flow (RFF), L/sec =	200
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	200

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B11
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Block 16 / Townhome (8 Units) - With Firewall

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame			1.5	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	795.0 m^2	
	Floor 2		795	50%	397.5		
	Floor 1		795	50%	397.5		
	Basement (At least 50% below grade, not included)		795	0%	0		
Fire Flow (F)	$F = 220 * C * SQRT(A)$						9,305
Fire Flow (F)	Rounded to nearest 1,000						9,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-1,350	7,650
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	7,650
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	7,650
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	7,650
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	8.7	2	3.1 to 10	Type A	16.5	2	33	2B	18%	49%	3,749	11,399
	Side 2	0	1	0 to 3	Type A	Fire Wall				10%			
	Front	28.4	4	20.1 to 30	Type A	24.3	2	48.6	4B	8%			
	Back	15	3	10.1 to 20	Type A	24.3	2	48.6	3B	13%			

Obtain Required Fire Flow	
Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	11,000
Total Required Fire Flow (RFF), L/sec =	183
Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	183

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B12
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Building A

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction			1	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	4140.0 m²	
	Floor 4		1035	100%	1035		
	Floor 3		1035	100%	1035		
	Floor 2		1035	100%	1035		
	Floor 1		1035	100%	1035		
Fire Flow (F)	F = 220 * C * SQRT(A)						14,155
Fire Flow (F)	Rounded to nearest 1,000						14,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	11,900
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	11,900
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	11,900
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length					Total Charge (%)	Total Exposure Charge (L/min)	
						Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)			
	Side 1	100.0	6	> 45.1	Type A	0.0	2	0	6	0%	33%	3,927	15,827
	Side 2	11.12	3	10.1 to 20	Type A	22.2	4	88.6	3C	14%			
	Front	30.07	4	20.1 to 30	Type A	43.96	4	175.84	4E	10%			
	Back	25.71	4	20.1 to 30	Type A	44.52	2	89.04	4C	9%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	16,000
	Total Required Fire Flow (RFF), L/sec =	267
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	267

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B13
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Building B

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction			1	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	4140.0 m²	
	Floor 4		1035	100%	1035		
	Floor 3		1035	100%	1035		
	Floor 2		1035	100%	1035		
	Floor 1		1035	100%	1035		
Fire Flow (F)	F = 220 * C * SQRT(A)						14,155
Fire Flow (F)	Rounded to nearest 1,000						14,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	11,900
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	11,900
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	11,900
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	12.1	3	10.1 to 20	Type A	12.8	4	51.16	3B	13%	35%	4,165	16,065
	Side 2	26.7	4	20.1 to 30	Type A	13.5	2	26.9	4A	8%			
	Front	11.12	3	10.1 to 20	Type A	22.15	4	88.6	3C	14%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	16,000
	Total Required Fire Flow (RFF), L/sec =	267
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	267

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B14
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Building C

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction			1	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	4140.0 m²	
	Floor 4		1035	100%	1035		
	Floor 3		1035	100%	1035		
	Floor 2		1035	100%	1035		
	Floor 1		1035	100%	1035		
Fire Flow (F)	F = 220 * C * SQRT(A)						14,155
Fire Flow (F)	Rounded to nearest 1,000						14,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	11,900
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	11,900
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	11,900
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	9.3	2	3.1 to 10	Type A	22.2	4	88.8	2C	19%	29%	3,451	15,351
	Side 2	32.24	5	30.1 to 45	Type A	15.5	9	139.41	5E	5%			
	Front	30.7	5	30.1 to 45	Type A	16.49	4	65.96	5C	5%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	15,000
	Total Required Fire Flow (RFF), L/sec =	250
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	250

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B15
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Building D

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction			1	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	4140.0 m²	
	Floor 4		1035	100%	1035		
	Floor 3		1035	100%	1035		
	Floor 2		1035	100%	1035		
	Floor 1		1035	100%	1035		
Fire Flow (F)	F = 220 * C * SQRT(A)						14,155
Fire Flow (F)	Rounded to nearest 1,000						14,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	11,900
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	11,900
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	11,900
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	9.3	2	3.1 to 10	Type A	22.2	4	88.8	2C	19%	43%	5,117	17,017
	Side 2	9.36	2	3.1 to 10	Type A	22.2	4	88.8	2C	19%			
	Front	40	5	30.1 to 45	Type A	26	4	104	5D	5%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	17,000
	Total Required Fire Flow (RFF), L/sec =	283
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	283

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B16
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Building E

An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 * C * SQRT(A)$$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Ordinary Construction			1	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	4140.0 m²	
	Floor 4		1035	100%	1035		
	Floor 3		1035	100%	1035		
	Floor 2		1035	100%	1035		
	Floor 1		1035	100%	1035		
Fire Flow (F)	F = 220 * C * SQRT(A)						14,155
Fire Flow (F)	Rounded to nearest 1,000						14,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,100	11,900
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	No Sprinkler	0%	0	11,900
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	11,900
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised or N/A	0%	0	11,900
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	9.4	2	3.1 to 10	Type A	22.2	4	88.8	2C	19%	31%	3,689	15,589
	Side 2	50	6	> 45.1	Type A	22.2	4	88.8	6	0%			
	Front	15.89	3	10.1 to 20	Type A	2.92	4	11.68	3A	12%			
	Back	50	6	> 45.1	Type A	0	2	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	16,000
	Total Required Fire Flow (RFF), L/sec =	267
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNICAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	267

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resisitve with unprotected openings
Type C	Ordinary or fire-resisitve with semi-protected openings
Type D	Ordinary or fire-resisitve with blank wall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

TABLE B17
FIRE FLOW REQUIREMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 1999
Building # / Type: Mixed Use Building

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input			Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Non-combustible Construction			0.8	
	Ordinary Construction	1					
	Non-combustible Construction	0.8					
	Fire Resistive Construction	0.6					
Input Building Floor Areas (A)			Area	% Used	Area Used	8863.5 m²	
	Floor 9		1327	50%	663.5		
	Floor 8		1327	50%	663.5		
	Floor 7		1327	50%	663.5		
	Floor 6		1327	50%	663.5		
	Floor 5		1327	50%	663.5		
	Floor 4		1327	50%	663.5		
	Floor 3		1953	50%	976.5		
	Floor 2		1953	100%	1953		
	Floor 1		1953	100%	1953		
Fire Flow (F)	F = 220 * C * SQRT(A)						16,570
Fire Flow (F)	Rounded to nearest 1,000						17,000

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-2,550	14,450
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	Adequate Sprinkler Conforms to NFPA13	-30%	Adequate Sprinkler Conforms to NFPA13	-30%	-4,335	10,115
	No Sprinkler	0%				
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	-1,445	8,670
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Fully Supervised Sprinkler System	-10%	-1,445	7,225
	Not Fully Supervised or N/A	0%				

Choose Structure Exposure Distance	Exposures	Separation Dist (m)	Cond	Separation Condition	Exposing Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	Side 1	16.4	3	10.1 to 20	Type A	15.5	3	46.44	3B	13%	23%	3,324	10,549
	Side 2	32.24	5	30.1 to 45	Type A	8.4	4	33.48	5B	5%			
	Front	31.52	5	30.1 to 45	Type A	19.64	2	39.28	5B	5%			
	Back	50	6	> 45.1	Type A	0	0	0	6	0%			

Obtain Required Fire Flow		
	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	11,000
	Total Required Fire Flow (RFF), L/sec =	183
	Can the Total Fire Flow be Capped at 10,000 L/min (167 L/sec) based on "TECHNCAL BULLETIN ISTB-2018-02", (yes/no) =	No
	Total Required Fire Flow (RFF). If RFF < 167 use RFF (L/sec) =	183

Exposure Charges for Exposing Walls of Wood Frame Construction (from Table G5)

Type A	Wood-Frame or non-combustible
Type B	Ordinary or fire-resistive with unprotected openings
Type C	Ordinary or fire-resistive with semi-protected openings
Type D	Ordinary or fire-resistive with blank wall

Conditions for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
30.1m to 45m	5
> 45.1m	6

Appendix C – WaterGems Output Tables

- Scenario 1A Result Tables (Peak Hour) Based on Single Feed from Connection #1
    - Junction Table
    - Pipe Table
    - Reservoir Table
- Scenario 1B Result Tables (Peak Hour) Based on Single Feed from Connection #1
    - Junction Table
    - Pipe Table
    - Reservoir Table
- Scenario 1C Result Tables (Max Day Plus Fire Flow) Based on Single Feed from Connection #1
    - Junction Table
    - Pipe Table
    - Reservoir Table
    - Fire Flow Report
- Scenario 2A Result Tables (Peak Hour) Based on Single Feed from Connection #2
    - Junction Table
    - Pipe Table
    - Reservoir Table
- Scenario 2B Result Tables (Peak Hour) Based on Single Feed from Connection #2
    - Junction Table
    - Pipe Table
    - Reservoir Table
- Scenario 2C Result Tables (Max Day Plus Fire Flow) Based on Single Feed from Connection #2
    - Junction Table
    - Pipe Table
    - Reservoir Table
    - Fire Flow Report

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Average Day - Boundary Conditon, Location 1

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	1.52	160.70	54.7
J-02	119.69	0.32	160.70	58.2
J-03	118.67	0.15	160.70	59.7
J-04	118.45	0.22	160.70	60.0
J-05	117.43	0.30	160.70	61.4
J-06	117.02	0.33	160.70	62.0
J-07	118.88	0.15	160.70	59.4
J-08	119.76	0.08	160.70	58.1
J-09	117.12	0.16	160.70	61.9
J-10	120.76	0.00	160.70	56.7
J-13	117.92	0.00	160.70	60.7
J-16	119.76	0.00	160.70	58.1
J-17	118.80	0.00	160.70	59.5
J-18	120.40	0.00	160.70	57.2
J-22	118.21	0.00	160.70	60.3
J-23	120.51	0.00	160.70	57.0
J-24	119.50	0.00	160.70	58.5
J-25	118.80	0.00	160.70	59.5
J-28	118.00	0.00	160.70	60.6

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-0.26	0.01	160.70	160.70
P-2	J-02	J-03	204.0	73	110.0	-0.58	0.02	160.70	160.70
P-4	J-03	J-17	297.0	77	120.0	0.00	0.00	160.70	160.70
P-5	J-03	J-04	297.0	41	120.0	-0.73	0.01	160.70	160.70
P-6	J-04	J-07	297.0	76	120.0	-1.06	0.02	160.70	160.70
P-7	J-07	J-08	297.0	72	120.0	-1.47	0.02	160.70	160.70
P-8	J-08	J-16	297.0	19	120.0	-1.97	0.03	160.70	160.70
P-9	J-16	J-10	297.0	46	120.0	-1.97	0.03	160.70	160.70
P-10(1)	J-10	J-23	297.0	62	120.0	-3.23	0.05	160.70	160.70
P-10(2)	J-23	J-18	297.0	27	120.0	-2.89	0.04	160.70	160.70
P-11	J-10	J-01	204.0	69	110.0	1.26	0.04	160.70	160.70
P-12	J-04	J-05	204.0	115	110.0	0.11	0.00	160.70	160.70
P-13	J-05	J-06	204.0	75	110.0	-0.19	0.01	160.70	160.70
P-14	J-06	J-07	204.0	120	110.0	-0.26	0.01	160.70	160.70
P-16	J-22	J-13	152.4	20	130.0	0.00	0.00	160.70	160.70
P-23(1)	J-09	J-22	204.0	48	110.0	-0.42	0.01	160.70	160.70
P-23(2)	J-22	J-08	204.0	69	110.0	-0.42	0.01	160.70	160.70
P-24	J-06	J-09	204.0	71	110.0	-0.26	0.01	160.70	160.70
P-25	R-1	J-18	600.0	16	130.0	3.23	0.01	160.70	160.70

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Average Day - Boundary Conditon, Location 1
Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)
P-28	J-23	J-24	204.0	68	110.0	-0.34	0.01	160.70	160.70
P-29	J-24	J-25	204.0	62	110.0	-0.34	0.01	160.70	160.70
P-32	J-25	J-28	204.0	64	110.0	-0.34	0.01	160.70	160.70
P-33	J-18	J-28	762.0	219	130.0	0.34	0.00	160.70	160.70

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Average Day - Boundary Conditon, Location 1

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	160.70	<None>	3.23	160.70
R-2	160.70	<None>	(N/A)	(N/A)

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Peak Hour - Boundary Conditon, Location 1

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	8.28	156.75	49.1
J-02	119.69	1.78	156.75	52.6
J-03	118.67	0.81	156.76	54.1
J-04	118.45	1.20	156.76	54.4
J-05	117.43	1.62	156.76	55.8
J-06	117.02	1.80	156.76	56.4
J-07	118.88	0.84	156.76	53.8
J-08	119.76	0.42	156.77	52.5
J-09	117.12	0.90	156.76	56.3
J-10	120.76	0.00	156.77	51.1
J-13	117.92	0.00	156.76	55.1
J-16	119.76	0.00	156.77	52.5
J-17	118.80	0.00	156.76	53.9
J-18	120.40	0.00	156.80	51.7
J-22	118.21	0.00	156.76	54.7
J-23	120.51	0.00	156.79	51.5
J-24	119.50	0.00	156.80	52.9
J-25	118.80	0.00	156.80	53.9
J-28	118.00	0.00	156.80	55.1

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-1.39	0.04	156.75	156.75
P-2	J-02	J-03	204.0	73	110.0	-3.17	0.10	156.75	156.76
P-4	J-03	J-17	297.0	77	120.0	0.00	0.00	156.76	156.76
P-5	J-03	J-04	297.0	41	120.0	-3.98	0.06	156.76	156.76
P-6	J-04	J-07	297.0	76	120.0	-5.76	0.08	156.76	156.76
P-7	J-07	J-08	297.0	72	120.0	-8.02	0.12	156.76	156.77
P-8	J-08	J-16	297.0	19	120.0	-10.76	0.16	156.77	156.77
P-9	J-16	J-10	297.0	46	120.0	-10.76	0.16	156.77	156.77
P-10(1)	J-10	J-23	297.0	62	120.0	-17.65	0.25	156.77	156.79
P-10(2)	J-23	J-18	297.0	27	120.0	-15.79	0.23	156.79	156.80
P-11	J-10	J-01	204.0	69	110.0	6.89	0.21	156.77	156.75
P-12	J-04	J-05	204.0	115	110.0	0.59	0.02	156.76	156.76
P-13	J-05	J-06	204.0	75	110.0	-1.03	0.03	156.76	156.76
P-14	J-06	J-07	204.0	120	110.0	-1.42	0.04	156.76	156.76
P-16	J-22	J-13	204.0	20	110.0	0.00	0.00	156.76	156.76
P-23(1)	J-09	J-22	204.0	48	110.0	-2.31	0.07	156.76	156.76
P-23(2)	J-22	J-08	204.0	69	110.0	-2.31	0.07	156.76	156.77
P-24	J-06	J-09	204.0	71	110.0	-1.41	0.04	156.76	156.76
P-25	R-1	J-18	600.0	16	130.0	17.65	0.06	156.80	156.80

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Peak Hour - Boundary Conditon, Location 1
Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)
P-28	J-23	J-24	204.0	68	110.0	-1.86	0.06	156.79	156.80
P-29	J-24	J-25	204.0	62	110.0	-1.86	0.06	156.80	156.80
P-32	J-25	J-28	204.0	64	110.0	-1.86	0.06	156.80	156.80
P-33	J-18	J-28	762.0	219	130.0	1.86	0.00	156.80	156.80

6171 Hazeldean Road, Ottawa, ON

Peak Hour - Boundary Conditon, Location 1

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	156.80	<None>	17.65	156.80
R-2	156.70	<None>	(N/A)	(N/A)

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 1

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	3.80	160.68	54.6
J-02	119.69	0.75	160.68	58.2
J-03	118.67	0.37	160.68	59.6
J-04	118.45	0.57	160.68	59.9
J-05	117.43	0.71	160.68	61.4
J-06	117.02	0.77	160.68	62.0
J-07	118.88	0.44	160.68	59.3
J-08	119.76	0.22	160.68	58.1
J-09	117.12	0.38	160.67	61.8
J-10	120.76	0.00	160.69	56.7
J-13	117.92	4.32	160.66	60.7
J-16	119.76	0.00	160.68	58.1
J-17	118.80	0.00	160.68	59.4
J-18	120.40	0.00	160.70	57.2
J-22	118.21	0.00	160.67	60.3
J-23	120.51	0.00	160.70	57.0
J-24	119.50	0.00	160.70	58.5
J-25	118.80	0.00	160.70	59.5
J-28	118.00	0.00	160.70	60.6

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-0.03	0.00	160.68	160.68
P-2	J-02	J-03	204.0	73	110.0	-0.78	0.02	160.68	160.68
P-4	J-03	J-17	297.0	77	120.0	0.00	0.00	160.68	160.68
P-5	J-03	J-04	297.0	41	120.0	-1.15	0.02	160.68	160.68
P-6	J-04	J-07	297.0	76	120.0	-2.98	0.04	160.68	160.68
P-7	J-07	J-08	297.0	72	120.0	-5.00	0.07	160.68	160.68
P-8	J-08	J-16	297.0	19	120.0	-8.56	0.12	160.68	160.68
P-9	J-16	J-10	297.0	46	120.0	-8.56	0.12	160.68	160.69
P-10(1)	J-10	J-23	297.0	62	120.0	-12.33	0.18	160.69	160.70
P-10(2)	J-23	J-18	297.0	27	120.0	-11.03	0.16	160.70	160.70
P-11	J-10	J-01	204.0	69	110.0	3.77	0.12	160.69	160.68
P-12	J-04	J-05	204.0	115	110.0	1.26	0.04	160.68	160.68
P-13	J-05	J-06	204.0	75	110.0	0.55	0.02	160.68	160.68
P-14	J-06	J-07	204.0	120	110.0	-1.58	0.05	160.68	160.68
P-16	J-22	J-13	152.4	20	130.0	4.32	0.24	160.67	160.66
P-23(1)	J-09	J-22	204.0	48	110.0	0.98	0.03	160.67	160.67
P-23(2)	J-22	J-08	204.0	69	110.0	-3.34	0.10	160.67	160.68
P-24	J-06	J-09	204.0	71	110.0	1.36	0.04	160.68	160.67
P-25	R-1	J-18	600.0	16	130.0	12.33	0.04	160.70	160.70

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 1

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)
P-28	J-23	J-24	204.0	68	110.0	-1.30	0.04	160.70	160.70
P-29	J-24	J-25	204.0	62	110.0	-1.30	0.04	160.70	160.70
P-32	J-25	J-28	204.0	64	110.0	-1.30	0.04	160.70	160.70
P-33	J-18	J-28	762.0	219	130.0	1.30	0.00	160.70	160.70

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 1

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow (Available) (L/s)	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Satisfies Fire Flow Constraints?	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)
J-13	225.98	187.32	230.30	20.0	42.2	True	J-22
J-01	300.00	186.80	303.80	25.7	42.3	True	J-02
J-22	300.00	183.00	300.00	30.1	30.5	True	J-13
J-02	300.00	183.75	300.75	24.6	39.1	True	J-01
J-25	300.00	283.00	300.00	44.0	50.1	True	J-24
J-24	300.00	283.00	300.00	42.3	51.2	True	J-25
J-09	300.00	183.38	300.38	29.1	35.8	True	J-22
J-05	300.00	183.71	300.71	27.1	41.2	True	J-01
J-08	300.00	183.22	300.22	45.9	45.9	True	J-01
J-10	300.00	183.00	300.00	49.0	47.0	True	J-01
J-06	300.00	183.77	300.77	35.3	39.7	True	J-01
J-03	300.00	183.37	300.37	40.2	40.0	True	J-01
J-16	300.00	183.00	300.00	47.0	46.1	True	J-01
J-17	300.00	183.00	300.00	33.5	40.2	True	J-01
J-07	300.00	183.44	300.44	44.1	44.7	True	J-01
J-04	300.00	183.57	300.57	42.3	42.0	True	J-01
J-23	300.00	267.00	300.00	55.0	52.6	True	J-01
J-28	300.00	267.00	300.00	60.5	54.6	True	J-01
J-18	300.00	183.00	300.00	57.2	54.6	True	J-01

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	160.70	<None>	12.33	160.70
R-2	160.70	<None>	(N/A)	(N/A)

6171 Hazeldean Road, Ottawa, ON

Average Day - Boundary Conditon, Location 2

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	1.52	160.70	54.7
J-02	119.69	0.32	160.70	58.2
J-03	118.67	0.15	160.70	59.7
J-04	118.45	0.22	160.70	60.0
J-05	117.43	0.30	160.70	61.4
J-06	117.02	0.33	160.70	62.0
J-07	118.88	0.15	160.70	59.4
J-08	119.76	0.08	160.70	58.1
J-09	117.12	0.16	160.70	61.9
J-10	120.76	0.00	160.70	56.7
J-13	117.92	0.00	160.70	60.7
J-16	119.76	0.00	160.70	58.1
J-17	118.80	0.00	160.70	59.5
J-18	120.40	0.00	160.70	57.2
J-22	118.21	0.00	160.70	60.3
J-23	120.51	0.00	160.70	57.0
J-24	119.50	0.00	160.70	58.5
J-25	118.80	0.00	160.70	59.5
J-28	118.00	0.00	160.70	60.6

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-0.59	0.02	160.70	160.70
P-2	J-02	J-03	204.0	73	110.0	-0.91	0.03	160.70	160.70
P-4	J-03	J-17	297.0	77	120.0	-3.23	0.05	160.70	160.70
P-5	J-03	J-04	297.0	41	120.0	2.17	0.03	160.70	160.70
P-6	J-04	J-07	297.0	76	120.0	1.48	0.02	160.70	160.70
P-7	J-07	J-08	297.0	72	120.0	1.06	0.02	160.70	160.70
P-8	J-08	J-16	297.0	19	120.0	0.93	0.01	160.70	160.70
P-9	J-16	J-10	297.0	46	120.0	0.93	0.01	160.70	160.70
P-10(1)	J-10	J-23	297.0	62	120.0	0.00	0.00	160.70	160.70
P-10(2)	J-23	J-18	297.0	27	120.0	0.00	0.00	160.70	160.70
P-11	J-10	J-01	204.0	69	110.0	0.93	0.03	160.70	160.70
P-12	J-04	J-05	204.0	115	110.0	0.47	0.01	160.70	160.70
P-13	J-05	J-06	204.0	75	110.0	0.17	0.01	160.70	160.70
P-14	J-06	J-07	204.0	120	110.0	-0.27	0.01	160.70	160.70
P-16	J-22	J-13	204.0	20	110.0	0.00	0.00	160.70	160.70
P-23(1)	J-09	J-22	204.0	48	110.0	-0.05	0.00	160.70	160.70
P-23(2)	J-22	J-08	204.0	69	110.0	-0.05	0.00	160.70	160.70
P-24	J-06	J-09	204.0	71	110.0	0.11	0.00	160.70	160.70
P-25	R-1	J-18	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)

6171 Hazeldean Road, Ottawa, ON
Average Day - Boundary Conditon, Location 2
Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	3.23	0.01	160.70	160.70
P-28	J-23	J-24	204.0	68	110.0	0.00	0.00	160.70	160.70
P-29	J-24	J-25	204.0	62	110.0	0.00	0.00	160.70	160.70
P-32	J-25	J-28	204.0	64	110.0	0.00	0.00	160.70	160.70
P-33	J-18	J-28	762.0	219	130.0	0.00	0.00	160.70	160.70

6171 Hazeldean Road, Ottawa, ON

Average Day - Boundary Conditon, Location 2

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	160.70	<None>	(N/A)	(N/A)
R-2	160.70	<None>	3.23	160.70

6171 Hazeldean Road, Ottawa, ON

Peak Hour - Boundary Conditon, Location 2

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	8.28	156.64	48.9
J-02	119.69	1.78	156.66	52.5
J-03	118.67	0.81	156.68	53.9
J-04	118.45	1.20	156.67	54.3
J-05	117.43	1.62	156.66	55.7
J-06	117.02	1.80	156.66	56.3
J-07	118.88	0.84	156.66	53.6
J-08	119.76	0.42	156.66	52.4
J-09	117.12	0.90	156.66	56.1
J-10	120.76	0.00	156.66	51.0
J-13	117.92	0.00	156.66	55.0
J-16	119.76	0.00	156.66	52.4
J-17	118.80	0.00	156.70	53.8
J-18	120.40	0.00	156.66	51.5
J-22	118.21	0.00	156.66	54.6
J-23	120.51	0.00	156.66	51.3
J-24	119.50	0.00	156.66	52.7
J-25	118.80	0.00	156.66	53.7
J-28	118.00	0.00	156.66	54.9

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-3.20	0.10	156.64	156.66
P-2	J-02	J-03	204.0	73	110.0	-4.98	0.15	156.66	156.68
P-4	J-03	J-17	297.0	77	120.0	-17.65	0.25	156.68	156.70
P-5	J-03	J-04	297.0	41	120.0	11.86	0.17	156.68	156.67
P-6	J-04	J-07	297.0	76	120.0	8.08	0.12	156.67	156.66
P-7	J-07	J-08	297.0	72	120.0	5.79	0.08	156.66	156.66
P-8	J-08	J-16	297.0	19	120.0	5.08	0.07	156.66	156.66
P-9	J-16	J-10	297.0	46	120.0	5.08	0.07	156.66	156.66
P-10(1)	J-10	J-23	297.0	62	120.0	0.00	0.00	156.66	156.66
P-10(2)	J-23	J-18	297.0	27	120.0	-0.01	0.00	156.66	156.66
P-11	J-10	J-01	204.0	69	110.0	5.08	0.16	156.66	156.64
P-12	J-04	J-05	204.0	115	110.0	2.58	0.08	156.67	156.66
P-13	J-05	J-06	204.0	75	110.0	0.96	0.03	156.66	156.66
P-14	J-06	J-07	204.0	120	110.0	-1.45	0.04	156.66	156.66
P-16	J-22	J-13	204.0	20	110.0	0.00	0.00	156.66	156.66
P-23(1)	J-09	J-22	204.0	48	110.0	-0.29	0.01	156.66	156.66
P-23(2)	J-22	J-08	204.0	69	110.0	-0.29	0.01	156.66	156.66
P-24	J-06	J-09	204.0	71	110.0	0.61	0.02	156.66	156.66
P-25	R-1	J-18	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)

6171 Hazeldean Road, Ottawa, ON
Peak Hour - Boundary Conditon, Location 2
Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	17.65	0.06	156.70	156.70
P-28	J-23	J-24	204.0	68	110.0	0.01	0.00	156.66	156.66
P-29	J-24	J-25	204.0	62	110.0	0.01	0.00	156.66	156.66
P-32	J-25	J-28	204.0	64	110.0	0.01	0.00	156.66	156.66
P-33	J-18	J-28	762.0	219	130.0	-0.01	0.00	156.66	156.66

6171 Hazeldean Road, Ottawa, ON

Peak Hour - Boundary Conditon, Location 2

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	156.80	<None>	(N/A)	(N/A)
R-2	156.70	<None>	17.65	156.70

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 2

Junction Table - Time: 0.00 hours

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)
J-01	122.19	3.80	150.88	40.7
J-02	119.69	0.75	150.88	44.3
J-03	118.67	0.37	150.89	45.7
J-04	118.45	0.57	150.88	46.0
J-05	117.43	0.71	150.88	47.5
J-06	117.02	0.77	150.88	48.1
J-07	118.88	0.44	150.88	45.4
J-08	119.76	0.22	150.88	44.2
J-09	117.12	0.38	150.87	47.9
J-10	120.76	0.00	150.88	42.8
J-13	117.92	4.32	150.87	46.8
J-16	119.76	0.00	150.88	44.2
J-17	118.80	0.00	150.90	45.6
J-18	120.40	0.00	150.88	43.3
J-22	118.21	0.00	150.87	46.4
J-23	120.51	0.00	150.88	43.1
J-24	119.50	0.00	150.88	44.5
J-25	118.80	0.00	150.88	45.5
J-28	118.00	0.00	150.88	46.7

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-1	J-01	J-02	204.0	167	110.0	-2.01	0.06	150.88	150.88
P-2	J-02	J-03	204.0	73	110.0	-2.76	0.08	150.88	150.89
P-4	J-03	J-17	297.0	77	120.0	-12.33	0.18	150.89	150.90
P-5	J-03	J-04	297.0	41	120.0	9.20	0.13	150.89	150.88
P-6	J-04	J-07	297.0	76	120.0	6.58	0.09	150.88	150.88
P-7	J-07	J-08	297.0	72	120.0	4.71	0.07	150.88	150.88
P-8	J-08	J-16	297.0	19	120.0	1.79	0.03	150.88	150.88
P-9	J-16	J-10	297.0	46	120.0	1.79	0.03	150.88	150.88
P-10(1)	J-10	J-23	297.0	62	120.0	0.00	0.00	150.88	150.88
P-10(2)	J-23	J-18	297.0	27	120.0	-0.01	0.00	150.88	150.88
P-11	J-10	J-01	204.0	69	110.0	1.79	0.05	150.88	150.88
P-12	J-04	J-05	204.0	115	110.0	2.06	0.06	150.88	150.88
P-13	J-05	J-06	204.0	75	110.0	1.35	0.04	150.88	150.88
P-14	J-06	J-07	204.0	120	110.0	-1.43	0.04	150.88	150.88
P-16	J-22	J-13	204.0	20	110.0	4.32	0.13	150.87	150.87
P-23(1)	J-09	J-22	204.0	48	110.0	1.63	0.05	150.87	150.87
P-23(2)	J-22	J-08	204.0	69	110.0	-2.69	0.08	150.87	150.88
P-24	J-06	J-09	204.0	71	110.0	2.01	0.06	150.88	150.87
P-25	R-1	J-18	600.0	16	130.0	(N/A)	(N/A)	(N/A)	(N/A)

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 2

Pipe Table - Time: 0.00 hours

Label	Start Node	Stop Node	Diameter (mm)	Length (Scaled) (m)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Hydraulic Grade (Start) (m)	Hydraulic Grade (Stop) (m)
P-26	R-2	J-17	600.0	16	130.0	12.33	0.04	150.90	150.90
P-28	J-23	J-24	204.0	68	110.0	0.01	0.00	150.88	150.88
P-29	J-24	J-25	204.0	62	110.0	0.01	0.00	150.88	150.88
P-32	J-25	J-28	204.0	64	110.0	0.01	0.00	150.88	150.88
P-33	J-18	J-28	762.0	219	140.0	-0.01	0.00	150.88	150.88

6171 Hazeldean Road, Ottawa, ON

Max Day Plus Fire Flow - Boundary Conditon, Location 2

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow (Available) (L/s)	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Satisfies Fire Flow Constraints?	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)
J-13	229.69	187.32	234.01	20.0	27.3	True	J-22
J-01	232.63	186.80	236.43	20.0	33.3	True	J-10
J-22	274.61	183.00	274.61	20.0	20.4	True	J-13
J-02	272.63	183.75	273.38	20.0	27.6	True	J-01
J-25	234.64	283.00	234.64	20.0	23.8	False	J-24
J-24	229.47	283.00	229.47	20.0	25.6	False	J-25
J-09	275.65	183.38	276.03	20.0	25.0	True	J-01
J-05	282.06	183.71	282.77	20.0	31.4	True	J-01
J-08	300.00	183.22	300.22	28.1	26.7	True	J-01
J-10	300.00	183.00	300.00	23.8	24.2	True	J-01
J-06	300.00	183.77	300.77	23.2	27.6	True	J-01
J-03	300.00	183.37	300.37	38.7	33.7	True	J-01
J-16	300.00	183.00	300.00	27.3	25.9	True	J-01
J-17	300.00	183.00	300.00	45.6	40.7	True	J-01
J-07	300.00	183.44	300.44	31.9	28.8	True	J-01
J-04	300.00	183.57	300.57	35.9	31.3	True	J-01
J-23	292.63	267.00	292.63	20.0	20.2	True	J-18
J-28	281.88	267.00	281.88	23.3	20.0	True	J-18
J-18	281.80	183.00	281.80	20.0	21.5	True	J-23

Reservoir Table - Time: 0.00 hours

Label	Elevation (m)	Zone	Flow (Out net) (L/s)	Hydraulic Grade (m)
R-1	156.30	<None>	(N/A)	(N/A)
R-2	150.90	<None>	12.33	150.90

Appendix D – Sanitary Servicing Tables

Table D1 – Sanitary Sewer Design Sheet

TABLE D1: SANITARY SEWER CALCULATION SHEET

LOCATION				RESIDENTIAL AREAS AND POPULATIONS												COMMERCIAL			INDUSTRIAL			INSTITUTIONAL		INFILTRATION			TOTAL FLOW (L/s)	SEWER DATA						
					NUMBER OF UNITS							POPULATION				AREA (ha)			AREA (ha)					AREA (ha)										
Street	U/S MH	D/S MH	Area Number	Area (ha)	Singles	Semis	Towns	Batch or 1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	Total Units	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	Peak Flow (L/sec)	INDIV	ACCU	Peak Factor (per MOE)	AREA (Ha)	ACCU AREA (Ha)	INDIV	ACCU	INFILT FLOW (L/s)		Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)
STREET 2																																		
9-storey bldg	MH 114	MH113	SA01	0.5051				101	42	26	169	310.2	310.2	3.46	3.48	0.0575	0.0575	0.02						0.5051	0.5051	0.17	3.66	250	251.46	2.10	10.04	87.53	0.04	1.75
	MH113	MH112	SA02	0.6475	5		16				21	60.2	370.4	3.43	4.12		0.0575	0.02						0.6475	1.1526	0.38	4.52	250	251.46	2.10	79.33	87.53	0.05	1.75
	MH112	MH111	SA03	0.6474	8		11				19	56.9	427.3	3.41	4.72		0.0575	0.02						0.6474	1.8000	0.59	5.33	250	251.46	0.60	79.33	46.78	0.11	0.93
	MH111	MH110	SA04	0.0894	1						1	3.4	430.7	3.41	4.76		0.0575	0.02						0.0894	1.8894	0.62	5.40	250	251.46	0.60	9.18	46.78	0.12	0.93
	MH110	MH109	SA05	0.5161	6		5				11	33.9	464.6	3.39	5.10		0.0575	0.02						0.5161	2.4055	0.79	5.92	250	251.46	0.60	68.32	46.78	0.13	0.93
	MH109	MH108	SA06	0.3458			10				10	27	491.6	3.38	5.38		0.0575	0.02						0.3458	2.7513	0.91	6.31	250	251.46	0.61	41.05	47.17	0.13	0.94
STREET 5																																		
	MH122	MH121	SA18	0.3685			8				8	21.6	21.6	3.7	0.26									0.3685	0.3685	0.12	0.38	200	201.2	0.99	67.66	33.16	0.01	1.03
	MH121	MH108	SA19	0.3210			8				8	21.6	43.2	3.66	0.51									0.3210	0.6895	0.23	0.74	200	201.2					
			Park	0.7260									43.2	3.66	0.51									0.7260	1.4155	0.47	0.98	200	201.2	0.34	75.99	19.43	0.05	0.61
STREET 2																																		
	MH108	MH107	SA07	0.7249			27				27	72.9	607.7	3.34	6.58		0.0575	0.02						0.7249	4.8917	1.61	8.21	250	251.46	0.30	115.94	33.08	0.25	0.66
	MH107	MH106	SA08	0.1143		2					2	5.4	613.1	3.34	6.64		0.0575	0.02						0.1143	5.0060	1.65	8.31	250	251.46	0.35	10.21	35.73	0.23	0.71
	MH106	MH105	SA09	0.5033			20				20	54	667.1	3.33	7.20		0.0575	0.02						0.5033	5.5093	1.82	9.04	250	251.46	0.30	69.45	33.08	0.27	0.66
STREET 4																																		
	MH115	MH105	SA10	0.5048			16				16	43.2	43.2	3.66	0.51									0.5048	0.5048	0.17	0.68	200	201.2	1.50	89.86	40.82	0.02	1.27
STREET 2																																		
	MH105	MH104	SA11	0.3459			14				14	37.8	748.1	3.3	8.00		0.0575	0.02						0.3459	6.3600	2.10	10.12	250	251.46	0.30	51.89	33.08	0.31	0.66
	MH104	MH103	SA12	0.1693			6				6	16.2	764.3	3.3	8.17		0.0575	0.02						0.1693	6.5293	2.15	10.35	250	251.46	0.30	25.70	33.08	0.31	0.66
STREET 2																																		
	MH116	MH120	SA13	0.2004			5				5	13.5	13.5	3.72	0.16									0.2004	0.2004	0.07	0.23							
			SA17	0.3695									13.5	3.72	0.16									0.3695	0.5699	0.19	0.35	250	251.46	1.00	32.01	60.40	0.01	1.21
STREET 2																																		
Block A - E	MH123	MH120	SA15	1.3721				110	130		240	427	427.0	3.41	4.72									1.3721	1.3721	0.45	5.17	250	251.46	2.00	7.50	85.42	0.06	1.70
STREET 2																																		
	MH120	MH103	SA14	0.1592			3				3	8.1	448.6	3.4	4.94									0.1592	2.1012	0.69	5.64	250	251.46	0.60	57.82	46.78	0.12	0.93
OUTLET																																		
	MH103	MH102											1212.9	3.2	12.58		0.0575	0.02							8.6305	2.85	15.44	250	251.46	2.89	31.46	102.68	0.15	2.05
	MH102	MH100	Pond	0.3882									1212.9	3.2	12.58		0.0575	0.02						0.3882	9.0187	2.98	15.57	250	251.46	2.92	17.46	103.21	0.15	2.06
	MHSA81096	MHSA71780	Pathway										1212.9	3.2	12.58		0.0575	0.02							9.0187	2.98	15.57	300	299.36	0.22	55.50	45.10	0.35	0.64
				9.0187	20	2	149	211	172	26	580	1212.9				0.058								9.0187							995.70			

Residential Avg. Daily Flow, q (L/p/day) =	280	Commercial Peak Factor =	1.5	(when area >20%)	Peak Population Flow, (L/sec) =	P*q*M/86.4	Unit Type	Persons/Unit	Designed:	Project:
Commercial Avg. Daily Flow (L/gross ha/day) =	28,000		1.0	(when area <20%)	Peak Extraneous Flow, (L/sec) =	I*Ac	Singles	3.4	K. Hinds, P.Eng.	6171 Hazeldean Road
or L/gross ha/sec =	0.324				Residential Peaking Factor, M =	1 + (14/(4+P^0.5)) * K	Semi-Detached	2.7		
Institutianal Avg. Daily Flow (L/day/ha) =	28,000	Institutional Peak Factor =	1.5	(when area >20%)	A_c = Cumulative Area (hectares)		Townhomes	2.7	Checked:	Location:
or L/gross ha/day =	0.324		1.0	(when area <20%)	P = Population (thousands)		Batchelor or		B. Thomas, P.Eng.	Ottawa, Ontario
Light Industrial Flow (L/gross ha/day) =	35,000						1-bed Apt. Unit	1.4		
or L/gross ha/sec =	0.40509	Residential Correction Factor, K =	0.80		Sewer Capacity, Qcap (L/sec) =	$1/N \; S^{1/2} \; R^{2/3} \; A_c$	2-bed Apt. Unit	2.1		
Light Industrial Flow (L/gross ha/day) =	55,000	Manning N =	0.013		(Manning's Equation)		3-bed Apt. Unit	3.1	File Reference:	Page No:
or L/gross ha/sec =	0.637	Peak extraneous flow, I (L/s/ha) =	0.33	(Total I/I)			4-bed Apt. Unit	3.8	258780 Sanitary - Sewer Design Sheet, Apr 2021 FINAL.xlsx	1 of 1

Appendix E – Stormwater Servicing Tables

Table E1 – 2-Year Storm Sewer Calculation Sheet

Table E2 – 2-Year Storm Sewer Calculation Sheet – Includes Flow Controls

Figure E3 – Average Runoff Coefficients (Based on Architectural Site Plan)

Figure E4 – Average Runoff Coefficients (Based on Minimium Setbacks)

TABLE E1
STORM SEWER CALCULATION SHEET

Return Period Storm = 2-year
Default Inlet Time= 10 (frontyard/row)
Default Inlet Time= 15 (rearyard)
Manning Coefficient = 0.013

Street	Storm MH No:		AREA INFO					PEAK FLOWS (UNRESTRICTED - RATIONAL METHOD)							SEWER DATA										
	U/S	D/S	Catch-ment No:	Type	Area (ha)	Accum. Area (ha)	Runoff Coeff, C	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)	Diameter (mm) Act	Diameter (mm) Nom	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Q_{ICD}/Q_{CAP}	Hydraulic Ratios Va/Vf
Street 2	213	212	S02	Frontyard/ROW	0.3146	0.315	0.64	0.560	0.560	10.00	76.81	43.0	2-year	43.0	366.4	375	PVC	2.10	78.457	238.87	2.30	1.45	0.90	0.18	0.17	0.63
	212	211	S05B	Backyard	0.1730	0.488	0.70	0.337	0.896	15.00	61.77	20.8	2-year	55.4												
			S03	Frontyard/ROW	0.6590	1.147	0.64	1.173	2.069	10.90	73.51	86.2	2-year	152.1	447.9	450	PVC	0.60	81.457	218.07	1.39	1.32	1.03	0.70	0.71	0.95
	211	210				1.147			2.069	11.93	70.11		2-year	145.0	447.9	450	PVC	0.58	10.389	214.40	1.37	1.15	0.15	0.68	0.73	0.84
	210	209	S05A	Backyard	0.0900	1.237	0.69	0.173	2.242	15.00	61.77	10.7	2-year	138.5												
			S04	Frontyard/ROW	0.2865	1.523	0.69	0.550	2.791	12.08	69.64	38.3	2-year	194.4	533.0	525	CONC	0.60	67.448	346.83	1.54	1.09	1.03	0.56	0.67	0.71
Samantha Easttop	225	209	S06	Backyard	0.2826	0.283	0.59	0.463	0.463	15.00	61.77	28.6	2-year	28.6	251.5	250	PVC	1.40	37.903	71.41	1.43	1.01	0.62	0.40	0.55	0.71
Street 2	209	208	S21	Frontyard/ROW	0.1681	1.974	0.69	0.322	3.577	13.11	66.61	21.5	2-year	238.3	610.0	600	CONC	0.60	41.072	497.04	1.68	1.19	0.58	0.48	0.70	0.71
Street 5	227	208	S13	Park	0.7264	0.726	0.30	0.606	0.606	15.00	61.77	37.4	2-year	37.4												
			S07	Backyard	0.1884	0.915	0.70	0.367	0.972	15.00	61.77	22.6	2-year	60.1												
			S08	Frontyard/ROW	0.1882	1.103	0.74	0.387	1.360	13.69	65.04	25.2	2-year	88.4	366.4	375	PVC	0.65	63.814	132.89	1.28	1.18	0.90	0.67	0.64	0.92
Street 2	208	207	S18	Backyard	0.1707	0.171	0.70	0.332	0.332	15.00	61.77	20.5	2-year	20.5												
			S30	Frontyard/ROW	0.3641	3.612	0.69	0.698	5.967	13.69	65.04	45.4	2-year	388.1	685.0	675	CONC	0.30	118.011	478.82	1.29	1.26	1.56	0.81	0.96	0.98
	207	206	S17	Backyard	0.1725	3.784	0.70	0.336	6.303	15.00	61.77	20.7	2-year	389.3												
			S22	Frontyard/ROW	0.3161	4.100	0.70	0.615	6.918	15.25	61.18	37.6	2-year	423.3	762.0	750	CONC	0.30	11.413	636.13	1.38	1.27	0.15	0.67	0.82	0.92
	206	205				4.100			6.918	15.40	60.84		2-year	420.9	762.0	750	CONC	0.30	68.676	636.13	1.38	1.27	0.90	0.66	0.82	0.92
	215	205	S19	Backyard	0.1790	0.179	0.70	0.348	0.348	15.00	61.77	21.5	2-year	21.5												
			S09	Backyard	0.0919	0.271	0.70	0.179	0.527	15.00	61.77	11.0	2-year	32.6												
			S20	Backyard	0.0812	0.352	0.70	0.158	0.685	15.00	61.77	9.8	2-year	42.3												
			S23	Frontyard/ROW	0.2219	0.574	0.71	0.438	1.123	10.00	76.81	33.6	2-year	86.3	366.4	375	PVC	0.65	89.768	133.00	1.28	1.18	1.27	0.65	0.50	0.92
	205	204	S16	Backyard	0.2641	4.938	0.70	0.514	8.555	15.00	61.77	31.7	2-year	528.4	839.0	825	CONC	0.30	53.429	822.30	1.47	1.35	0.66	0.64	0.76	0.92
			S31	Frontyard/ROW	0.4484	5.387	0.70	0.873	9.428	16.30	58.86	51.4	2-year	554.9												
	204	203				5.387			9.428	16.30	58.86		2-year	554.9	839.0	825	CONC	0.30	27.303	822.30	1.47	1.24	0.37	0.67	0.86	0.84
Street 1	221	220													299.4	300	PVC	1.00	11.186	96.15	1.37					
	220	218	S27	Frontyard/ROW	0.1183	0.118	0.73	0.240	0.240	10.00	76.81	18.4	2-year	18.4	299.4	300	PVC	1.00	37.404	96.15	1.37	0.92	0.68	0.19	0.21	0.67
Street 2	219	218	S28	Frontyard/ROW	0.1164	0.116	0.73	0.236	0.236																	
			S01	Siteplan 1	0.5077	0.624	0.60	0.847	1.083	10.00	76.81	65.0	2-year	83.2	299.4	300	PVC	2.00	37.456	135.98	1.93	1.76	0.35	0.61	0.63	0.91
	218	217	S29	Frontyard/ROW	0.0985	0.841	0.73	0.200	1.523	10.68	74.29	14.9	2-year	113.2	366.4	375	PVC	2.00	46.305	233.11	2.25	1.59	0.49	0.49	0.45	0.71
Street 5	217	216		Frontyard/ROW		0.841			1.523	11.17	72.60		2-year	110.6	366.4	375	PVC	2.00	18.655	233.11	2.25	1.59	0.20	0.47	0.45	0.71
	228	216	S24	Frontyard/ROW	0.1800	0.180	0.73	0.365	0.365	10.00	76.81	28.1	2-year	28.1	251.5	250	PVC	0.65	64.732	48.69	0.98	0.69	1.56	0.58	0.58	0.71
Street 2	216	226	S25	Frontyard/ROW	0.1179	1.139	0.70	0.229	2.118	11.36	71.94	16.5	2-year	152.4	447.9	450	PVC	1.66	69.410	362.82	2.31	1.63	0.71	0.42	0.42	0.71
	226	203	S11	Backyard	0.1843	1.323	0.70	0.359	2.477	15.00	61.77	22.2	2-year	153.0												
			S10	Backyard	0.0955	1.419	0.70	0.186	2.663	15.00	61.77	11.5	2-year	164.5												

STORM SEWER CALCULATION SHEET

Return Period Storm = 2-year
Default Inlet Time= 10 (frontyard/row)
Default Inlet Time= 15 (rearyard)
Manning Coefficient = 0.013

Street	Storm MH No:		AREA INFO					PEAK FLOWS (UNRESTRICTED - RATIONAL METHOD)							SEWER DATA											
	U/S	D/S	Catch-ment No:	Type	Area (ha)	Accum. Area (ha)	Runoff Coeff, C	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)	Diameter (mm) Act	Diameter (mm) Nom	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Q_{ICD}/Q_{CAP}	Hydraulic Ratios Va/Vf
			S12	Backyard	0.0880	1.507	0.70	0.171	2.834	15.00	61.77	10.6	2-year	175.0												
			S14	Siteplan 2	1.3741	2.881	0.55	2.101	4.935	15.00	61.77	129.8	2-year	304.8												
			S26	Frontyard/ROW	0.3672	3.248	0.70	0.715	5.649	11.56	71.29	50.9	2-year	402.7	610.0	600	CONC	0.60	60.846	497.04	1.68	1.65	0.62	0.81	0.80	0.98
	203	POND				8.635			15.077	16.67	58.09		2-year	875.8	914.0	900	CONC	0.35	20.77	1116.00	1.68	1.65	0.21	0.78	0.99	0.98
	POND	Control-MH	S15	SWM	0.3909	9.026	0.22	0.239	15.316	16.88	57.66	13.8	2-year	883.2	1068.0	1050	CONC	0.50	12.32	2020.45	2.23	1.58	0.13	0.44	0.55	0.71
	Control-MH	MHST78511				9.026			15.316	17.01	57.40		2-year	879.1	1068.0	1050	CONC	0.50	9.46	2020.45	2.23	1.58	0.10	0.44	0.55	0.71
TOTALS =					9.026		0.61	15.316				999.3														

Definitions:

Q = 2.78*AIR, where

Q = Peak Flow in Litres per second (L/s)

A = Watershed Area (hectares)

I = Rainfall Intensity (mm/h)

R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

Designed:	Project:	
J. Fitzpatrick, P.Eng.	6171 Hazeldean Road	
Checked:	Location:	
B. Thomas, P.Eng.	6171 Hazeldean Road	
Dwg Reference:	File Ref:	Sheet No:
Drawing C09	258780 Storm - Sewer Design Sheets, Apr 27, 2021 Pond_113.7m_JLF_JH Review.xlsx	1 of 1

TABLE E1

TABLE E2
STORM SEWER CALCULATION SHEET - INCLUDES FLOW CONTROLS

Return Period Storm = 2-year
Default Inlet Time= 10 (frontyard/row)
Default Inlet Time= 15 (rearyard)
Manning Coefficient = 0.013

Street	Storm MH No:		AREA INFO					PEAK FLOWS (UNRESTRICTED - RATIONAL METHOD)							CAPTURED FLOWS BASED ON NUMBER OF INTLETS																SEWER DATA											
															No. of ICDs		Captured Flows (L/s)		No. of ICDs		Captured Flows (L/s)		No. of ICDs		Captured Flows (L/s)		No. of ICDs		Captured Flows (L/s)		Custom Captured Flows (L/s)		Indv Captured Flows (L/sec)	Total Captured Flows (L/sec)	Diameter (mm)		Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s)		Time in Pipe, Tt (min)	Hydraulic Ratios		
	U/S	D/S	Catch-ment No:	Type	Area (ha)	Accum. Area (ha)	Runoff Coeff, C	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)	Indiv	Cum	Indiv	Cum	Indiv	Cum	Indiv	Cum	Indiv	Cum	Indiv.	Cumul.	Indiv.	Cumul.			Act	Nom					Vf	Va		Q/Q_{CAP}	Q_{CCD}/Q_{CAP}	Va/Vf
															at 19.8 L/sec Type A				at 28.4 L/sec Type B				at 38.2 L/sec Type C				at 53.0 L/sec Type D																	
Street 2	213	212	S02	Frontyard/ROW	0.3146	0.315	0.64	0.560	0.560	10.00	76.81	43.0	2-year	43.0	2	2	39.6	40															39.6	39.6	366.4	375	PVC	2.10	78.457	238.87	2.30	1.45	0.90	0.18	0.17	0.63
	212	211	S05B	Backyard	0.1730	0.488	0.70	0.337	0.896	15.00	61.77	20.8	2-year	55.4	2	4	39.6	79.2															39.6	79.2												
			S03	Frontyard/ROW	0.6590	1.147	0.64	1.173	2.069	10.90	73.51	86.2	2-year	152.1		4		79.2					2	2	76.4	76.4							76.4	155.6	447.9	450	PVC	0.60	81.457	218.07	1.39	1.32	1.03	0.70	0.71	0.95
	211	210				1.147			2.069	11.93	70.11		2-year	145.0		4		79.2						2		76.4							155.6	447.9	450	PVC	0.58	10.389	214.40	1.37	1.15	0.15	0.68	0.73	0.84
	210	209	S05A	Backyard	0.0900	1.237	0.69	0.173	2.242	15.00	61.77	10.7	2-year	138.5	1	5	19.8	99.0						2		76.4						19.8	175.4												
			S04	Frontyard/ROW	0.2865	1.523	0.69	0.550	2.791	12.08	69.64	38.3	2-year	194.4		5		99.0	2	2	56.8	56.8		2		76.4							56.8	232.2	533.0	525	CONC	0.60	67.448	346.83	1.54	1.09	1.03	0.56	0.67	0.71
Samantha Easttop	225	209	S06	Backyard	0.2826	0.283	0.59	0.463	0.463	15.00	61.77	28.6	2-year	28.6	2	2	39.6	39.6															39.6	39.6	251.5	250	PVC	1.40	37.903	71.41	1.43	1.01	0.62	0.40	0.55	0.71
Street 2	209	208	S21	Frontyard/ROW	0.1681	1.974	0.69	0.322	3.577	13.11	66.61	21.5	2-year	238.3		7		138.6		2		56.8	2	4	76.4	152.8							76.4	348.2	610.0	600	CONC	0.60	41.072	497.04	1.68	1.19	0.58	0.48	0.70	0.71
Street 5	227	208	S13	Park	0.7264	0.726	0.30	0.606	0.606	15.00	61.77	37.4	2-year	37.4					1	1	28.4	28.4											28.4	28.4												
			S07	Backyard	0.1884	0.915	0.70	0.367	0.972	15.00	61.77	22.6	2-year	60.1					1	2	28.4	56.8											28.4	56.8												
			S08	Frontyard/ROW	0.1882	1.103	0.74	0.387	1.360	13.69	65.04	25.2	2-year	88.4					1	3	28.4	85.2											28.4	85.2	366.4	375	PVC	0.65	63.814	132.89	1.28	1.18	0.90	0.67	0.64	0.92
Street 2	208	207	S18	Backyard	0.1707	0.171	0.70	0.332	0.332	15.00	61.77	20.5	2-year	20.5					1	1	28.4	28.4											28.4	28.4												
			S30	Frontyard/ROW	0.3641	3.612	0.69	0.698	5.967	13.69	65.04	45.4	2-year	388.1		7		138.6		6		170.4	2	6		152.8								461.8	685.0	675	CONC	0.30	118.011	478.82	1.29	1.26	1.56	0.81	0.96	0.98
	207	206	S17	Backyard	0.1725	3.784	0.70	0.336	6.303	15.00	61.77	20.7	2-year	389.3	1	8	19.8	158.4		6		170.4		6		152.8						19.8	481.6												
			S22	Frontyard/ROW	0.3161	4.100	0.70	0.615	6.918	15.25	61.18	37.6	2-year	423.3	2	10	39.6	198.0		6		170.4		6		152.8							39.6	521.2	762.0	750	CONC	0.30	11.413	636.13	1.38	1.27	0.15	0.67	0.82	0.92
	206	205				4.100			6.918	15.40	60.84		2-year	420.9		10		198.0		6		170.4		6		152.8							521.2	762.0	750	CONC	0.30	68.676	636.13	1.38	1.27	0.90	0.66	0.82	0.92
	215	205	S19	Backyard	0.1790	0.179	0.70	0.348	0.348	15.00	61.77	21.5	2-year	21.5									0.33	0.3	12.7	12.7							12.7	12.7												
			S09	Backyard	0.0919	0.271	0.70	0.179	0.527	15.00	61.77	11.0	2-year	32.6									0.33	0.7	12.7	25.5							12.7	25.5												
			S20	Backyard	0.0812	0.352	0.70	0.158	0.685	15.00	61.77	9.8	2-year	42.3									0.33	1.0	12.7	38.2							12.7	38.2												
			S23	Frontyard/ROW	0.2219	0.574	0.71	0.438	1.123	10.00	76.81	33.6	2-year	86.3					1	1	28.4	28.4				38.2							28.4	66.6	366.4	375	PVC	0.65	89.768	133.00	1.28	1.18	1.27	0.65	0.50	0.92
	205	204	S16	Backyard	0.2641	4.938	0.70	0.514	8.555	15.00	61.77	31.7	2-year	528.4		10		198.0		7		198.8	1	7	38.2	229.2						38.2	626.0	839.0	825	CONC	0.30	53.429	822.30	1.47	1.35	0.66	0.64	0.76	0.92
			S31	Frontyard/ROW	0.4484	5.387	0.70	0.873	9.428	16.30	58.86	51.4	2-year	554.9		10		198.0	3	10	85.2	284.0		7		229.2							85.2	711.2												
	204	203				5.387			9.428	16.30	58.86		2-year	554.9		10		198.0		10		284.0		7		229.2							711.2	839.0	825	CONC	0.30	27.303	822.30	1.47	1.24	0.37	0.67	0.86	0.84
Street 1	221	220																															299.4	300	PVC	1.00	11.186	96.15	1.37					
	220	218	S27	Frontyard/ROW	0.1183	0.118	0.73	0.240	0.240	10.00	76.81	18.4	2-year	18.4	1	1	19.8	19.8															19.8	19.8	299.4	300	PVC	1.00	37.404	96.15	1.37	0.92	0.68	0.19	0.21	0.67
Street 2	219	218	S28	Frontyard/ROW	0.1164	0.116	0.73	0.236	0.236						1	1	19.8	19.8															19.8	19.8												
			S01	Siteplan 1	0.5077	0.624	0.60	0.847	1.083	10.00	76.81	65.0	2-year	83.2		1		19.8									66	66	66.0	85.8	299.4	300	PVC	2.00	37.456	135.98	1.93	1.76	0.35	0.61	0.63	0.91
	218	217	S29	Frontyard/ROW	0.0985	0.841	0.73	0.200	1.523	10.68	74.29	14.9	2-year	113.2		2		39.6													66		105.6	366.4	375	PVC	2.00	46.305	233.11	2.25	1.59	0.49	0.49	0.45	0.71
Street 5	217	216		Frontyard/ROW		0.841			1.523	11.17	72.60		2-year	110.6		2		39.6													66		105.6	366.4	375	PVC	2.00	18.655	233.11	2.25	1.59	0.20	0.47	0.45	0.71
	228	216	S24	Frontyard/ROW	0.1800	0.180	0.73	0.365	0.365	10.00	76.81	28.1	2-year	28.1					1	1	28.4	28.4											28.4	28.4	251.5	250	PVC	0.65	64.732	48.69	0.98	0.69	1.56	0.58	0.58	0.71
Street 2	216	226	S25	Frontyard/ROW	0.1179	1.139	0.70	0.229	2.118	11.36	71.94	16.5	2-year	152.4	1	3	19.8	59.4		1		28.4									66	19.8	153.8	447.9	450	PVC	1.66	69.410	362.82	2.31	1.63	0.71	0.42	0.42	0.71
	226	203	S11	Backyard	0.1843	1.323	0.70	0.359	2.477	15.00	61.77	22.2	2-year	153.0		3		59.4		1		28.4	0.33	0.3	12.7	12.7					66	12.7	166.5												
			S10	Backyard	0.0955	1.419	0.70	0.186	2.663	15.00	61.77	11.5	2-year	164.5		3		59.4				28.4	0.33	0.7	12.7	25.4					66	12.7	179.2												
			S12	Backyard	0.0880	1.507	0.70	0.171	2.834	15.00	61.77	10.6	2-year	175.0		3		59.4		1		28.4	0.33	1.0	12.7	38.2					66	12.7	192.0												
			S14	Siteplan 2	1.3741	2.881	0.55	2.101	4.935	15.00	61.77	129.8	2-year	304.8		3		59.4		1		28.4		1.0		38.2					165	231	165.0	357.0												
			S26	Frontyard/ROW	0.3672	3.248	0.70	0.715	5.649	11.56	71.29	50.9	2-year	402.7	2	5	39.6	99.0		1		28.4		1.0		38.2						231	39.6	396.6	610.0	600	CONC	0.60	60.846	497.04	1.68	1.65	0.62	0.81	0.80	0.98
	203	POND				8.635			15.077	16.67	58.09		2-year	875.8		15		297.0		11		312.4		8		267.4					231		1107.8	914.0	900	CONC	0.35	20.77	1116.00	1.68	1.65	0.21	0.78	0.99	0.98
	POND	Control-MH	S15	SWM	0.3909	9.026	0.22	0.239	15.316	16.88	57.66	13.8	2-year	883.2		15		297.0		11		312.4		8		267.4					231		1107.8	1068.0	1050	CONC	0.50	12.32	2020.45	2.23	1.58	0.13	0.44	0.55	0.71
	Control-MH	MHST78511				9.026			15.316	17.01	57.40		2-year	879.1		15		297.0		11		312.4		8		267.4					231		1107.8	1068.0	1050	CONC	0.50	9.46	2020.45	2.23	1.58	0.10	0.44	0.55	0.71
TOTALS =					9.026		0.61	15.316				999.3			15		297.0		11		312.4		9		267.4					231.0		1107.8												

Definitions:

Q = 2.78*AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Watershed Area (hectares)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

TOTAL NUMBER OF ICDS = 35
TOTAL CAPTURE OF ALL ICDs (L/sec) = 877 L/sec
TOTAL CAPTURE RATE (L/ha/sec)= 97.1 L/ha/sec
TOTAL 2YR RATE (L/ha/sec)= 110.7 L/ha/sec

Designed:	Project:	
J. Fitzpatrick, P.Eng.	6171 Hazeldean Road	
Checked:	Location:	
B. Thomas, P.Eng.	6171 Hazeldean Road	
Dwg Reference:	File Ref:	Sheet No:
Drawing C09	258780 Storm - Sewer Design Sheets, Apr 27, 2021 Pond_113.7m_JLF_JH Review.xlsx	1 of 1

TABLE E8

RATING CURVES FOR MODELLING OF CATCHBASINS

Storage Node Information	
Ponding Area (trap low) No:	SP-01
Structure / Inlet No:	CB03 / CB04
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	710.0
Max. Ponding Elev at Spill (m):	120.17
Min. Ponding Elev (Lid Elev) (m):	119.98
Max. Prism Volume (m3)	44.97
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	120.47
Inv Elev of Storage Node (m)	118.58
Max Ponding Depth (m) =	0.190

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.5900	710.0	44.97	45.30
1.5901	0	0.00	45.30
1.8900	0	0.00	45.30
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP-02
Structure / Inlet No:	CB28 / CB29
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	304.0
Max. Ponding Elev at Spill (m):	119.39
Min. Ponding Elev (Lid Elev) (m):	119.26
Max. Prism Volume (m3)	13.17
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.69
Inv Elev of Storage Node (m)	117.86
Max Ponding Depth (m) =	0.130

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.5300	304.0	13.17	13.51
1.5301	0	0.00	13.51
1.8300	0	0.00	13.51
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP03
Structure / Inlet No:	CB12 / CB13
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	446.0
Max. Ponding Elev at Spill (m):	118.77
Min. Ponding Elev (Lid Elev) (m):	118.62
Max. Prism Volume (m3)	22.30
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.07
Inv Elev of Storage Node (m)	117.22
Max Ponding Depth (m) =	0.150

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.5500	446.0	22.30	22.64
1.5501	0	0.00	22.64
1.8500	0	0.00	22.64
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP04
Structure / Inlet No:	CB15 / CB16
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	866.0
Max. Ponding Elev at Spill (m):	118.62
Min. Ponding Elev (Lid Elev) (m):	118.32
Max. Prism Volume (m3)	86.60
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.92
Inv Elev of Storage Node (m)	116.92
Max Ponding Depth (m) =	0.300

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.7000	866.0	86.60	86.94
1.7001	0	0.00	86.94
2.0000	0	0.00	86.94
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP05
Structure / Inlet No:	CB17 / CB18
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	760.0
Max. Ponding Elev at Spill (m):	118.52
Min. Ponding Elev (Lid Elev) (m):	118.22
Max. Prism Volume (m3)	76.00
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.82
Inv Elev of Storage Node (m)	116.82
Max Ponding Depth (m) =	0.300

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.7000	760.0	76.00	76.34
1.7001	0	0.00	76.34
2.0000	0	0.00	76.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP06
Structure / Inlet No:	CB23 / CB24 / CB25
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	3
Max. Ponding Area (m2) =	1272.0
Max. Ponding Elev at Spill (m):	118.42
Min. Ponding Elev (Lid Elev) (m):	118.13
Max. Prism Volume (m3)	122.96
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.72
Inv Elev of Storage Node (m)	116.73
Max Ponding Depth (m) =	0.290

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	1.0800	0.50	0.50
1.6900	1272.0	122.96	123.46
1.6901	0	0.00	123.46
1.9900	0	0.00	123.46
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	SP07
Structure / Inlet No:	CB30 / CB31
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structure in Ponding Area:	2
Max. Ponding Area (m2) =	406.0
Max. Ponding Elev at Spill (m):	118.25
Min. Ponding Elev (Lid Elev) (m):	118.07
Max. Prism Volume (m3)	24.36
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.55
Inv Elev of Storage Node (m)	116.67
Max Ponding Depth (m) =	0.180

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.5800	406.0	24.36	24.70
1.5801	0	0.00	24.70
1.8800	0	0.00	24.70
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Ponding

Storage Node Information	
Ponding Area (trap low) No:	CB01
Structure / Inlet No:	CB01, CB02
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	121.22
Min. Ponding Elev (Lid Elev) (m):	121.22
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	121.52
Inv Elev of Storage Node (m)	119.82
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB08
Structure / Inlet No:	CB08
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	119.23
Min. Ponding Elev (Lid Elev) (m):	119.23
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.53
Inv Elev of Storage Node (m)	117.83
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB11
Structure / Inlet No:	CB11
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	119.00
Min. Ponding Elev (Lid Elev) (m):	119.00
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.30
Inv Elev of Storage Node (m)	117.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.7001	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	REAR_YARD
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB21
Structure / Inlet No:	CB21
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.40
Min. Ponding Elev (Lid Elev) (m):	118.40
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.70
Inv Elev of Storage Node (m)	117.00
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB33
Structure / Inlet No:	CB33, CB34
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	121.00
Min. Ponding Elev (Lid Elev) (m):	121.00
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	121.30
Inv Elev of Storage Node (m)	119.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB36
Structure / Inlet No:	CB36
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	120.63
Min. Ponding Elev (Lid Elev) (m):	120.63
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	120.93
Inv Elev of Storage Node (m)	119.23
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.7001	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB37
Structure / Inlet No:	CB37
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	120.01
Min. Ponding Elev (Lid Elev) (m):	120.01
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	120.31
Inv Elev of Storage Node (m)	118.61
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB42
Structure / Inlet No:	CB42
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.93
Min. Ponding Elev (Lid Elev) (m):	118.93
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.23
Inv Elev of Storage Node (m)	117.53
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB45
Structure / Inlet No:	CB45
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	2
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.73
Min. Ponding Elev (Lid Elev) (m):	118.73
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	119.03
Inv Elev of Storage Node (m)	117.33
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.7200	0.34	0.34
1.4001	0.0	0.00	0.34
1.4002	0	0.00	0.34
1.7001	0	0.00	0.34
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB50
Structure / Inlet No:	CB51, CB52, CB53
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	119.70
Min. Ponding Elev (Lid Elev) (m):	119.70
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	120.00
Inv Elev of Storage Node (m)	118.30
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.7001	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB55_NO PONDING
Structure / Inlet No:	CB55_NO PONDING
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.80
Min. Ponding Elev (Lid Elev) (m):	118.80
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	118.95
Inv Elev of Storage Node (m)	117.40
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.5501	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB56_NO PONDING
Structure / Inlet No:	CB56_NO PONDING
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.00
Min. Ponding Elev (Lid Elev) (m):	118.00
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	118.30
Inv Elev of Storage Node (m)	116.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.7001	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	Rearyard
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB57
Structure / Inlet No:	CB57
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	117.60
Min. Ponding Elev (Lid Elev) (m):	117.60
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.000
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	117.90
Inv Elev of Storage Node (m)	116.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.0000	0.3600	0.12	0.12
1.0001	0.0	0.00	0.12
1.0002	0	#REF!	#REF!
1.3001	0	0.00	#REF!
Copy to PCSWMM (depth / area)			

Structure locaiton	REAR_YARD
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB70
Structure / Inlet No:	CB70
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.40
Min. Ponding Elev (Lid Elev) (m):	118.40
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	118.55
Inv Elev of Storage Node (m)	117.00
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	#REF!	#REF!
1.5501	0	0.00	#REF!
Copy to PCSWMM (depth / area)			

Structure locaiton	REAR_YARD
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB71_NO_PONDING
Structure / Inlet No:	CB71_NO_PONDING
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.40
Min. Ponding Elev (Lid Elev) (m):	118.40
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	118.55
Inv Elev of Storage Node (m)	117.00
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.5501	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	REAR_YARD
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB79
Structure / Inlet No:	CB79
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	117.30
Min. Ponding Elev (Lid Elev) (m):	117.30
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.300
Ponding Rim Elevation (m)	117.60
Inv Elev of Storage Node (m)	115.90
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.7001	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	REAR_YARD
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	CB80
Structure / Inlet No:	CB80
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	119.00
Min. Ponding Elev (Lid Elev) (m):	119.00
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	1.400
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	119.15
Inv Elev of Storage Node (m)	117.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
1.4000	0.3600	0.17	0.17
1.4001	0.0	0.00	0.17
1.4002	0	0.00	0.17
1.5501	0	0.00	0.17
Copy to PCSWMM (depth / area)			

Structure locaiton	Roadway
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	SITEPLAN_1
Structure / Inlet No:	SITEPLAN_1
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	121.80
Min. Ponding Elev (Lid Elev) (m):	121.80
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	2.200
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	121.95
Inv Elev of Storage Node (m)	119.60
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
2.2000	0.3600	0.26	0.26
2.2001	0.0	0.00	0.26
2.2002	0	0.00	0.26
2.3501	0	0.00	0.26
Copy to PCSWMM (depth / area)			

Structure locaiton	SITE
Flow Condtion	Flow-By

Storage Node Information	
Ponding Area (trap low) No:	SITEPLAN_2
Structure / Inlet No:	SITEPLAN_2
Structrue / Inlet Type	Catchbasin
Include Structure Storage (yes/no)	Yes
Structure Shape (rect / round)	Rect
Structure Length or DIA (mm)	600
Structure Width (mm)	600
Number of Structures in Flow-By:	1
Max. Ponding Area (m2) =	0.0
Max. Ponding Elev at Spill (m):	118.53
Min. Ponding Elev (Lid Elev) (m):	118.53
Max. Prism Volume (m3)	0
Depth to Inv below ground (m)	2.200
Allowance for Overland Flow (m)	0.150
Ponding Rim Elevation (m)	118.68
Inv Elev of Storage Node (m)	116.33
Max Ponding Depth (m) =	0

Storage Function for Modelling			
Head / Depth (m)	Area (m2)	Incr Vol (m3)	Tot Vol (m3)
0.0000	0.0000	0.00	0.00
2.2000	0.3600	0.26	0.26
2.2001	0.0	0.00	0.26
2.2002	0	0.00	0.26
2.3501	0	0.00	0.26
Copy to PCSWMM (depth / area)			

Structure locaiton	SITE
Flow Condtion	Flow-By

-2.2

Figure E1 - Average Runoff Coefficients (Based on Architectural Site Plan)

Figure E2 - Average Runoff Coefficients (Based on Minimum Setbacks)

Appendix F – PCSWMM Information

PCSWMM Report

25870 - 6171 Hazeldean Rd. Prop_Rev3

Model 258780-Prop_Rev3.inp

exp Services Inc.

April 29, 2021

Table of Contents

Summary 1: Model inventory

Name	258780-Prop_Rev3
Raingages	8
Subcatchments	32
Aquifers	0
Snowpacks	0
RDII hydrographs	0
Junction nodes	33
Outfall nodes	2
Flow divider nodes	0
Storage unit nodes	27
Conduit links	50
Pump links	0
Orifice links	2
Weir links	2
Outlet links	34
Treatment units	0
Transects	7
Control rules	0
Pollutants	0
Land Uses	0
Control Curves	0
Diversion Curves	0
Pump Curves	0
Rating Curves	15
Shape Curves	0
Storage Curves	44
Tidal Curves	0
Weir Curves	0
Time Series	8
Time Patterns	0

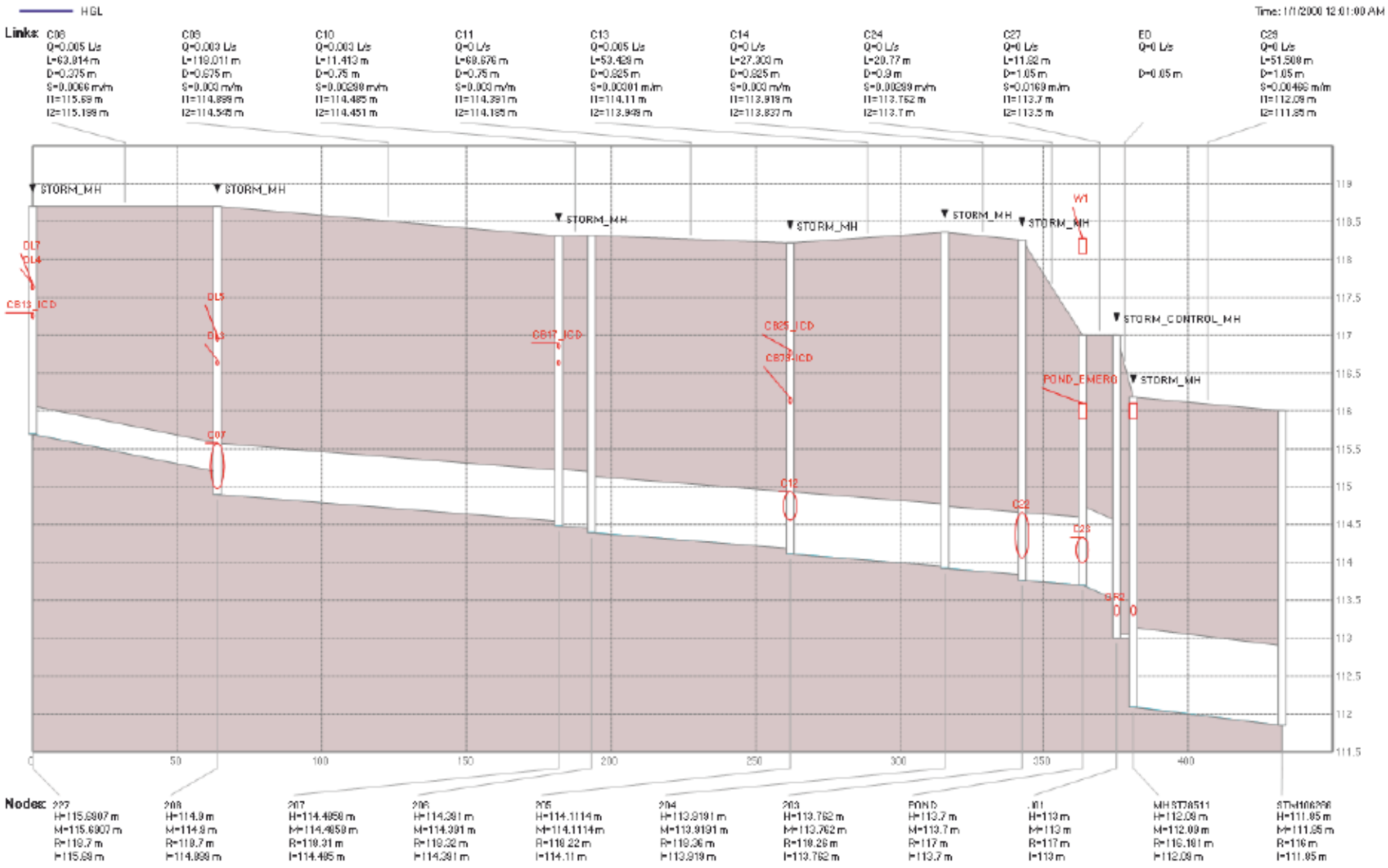


Figure 1: Node 227 to Node STM106286

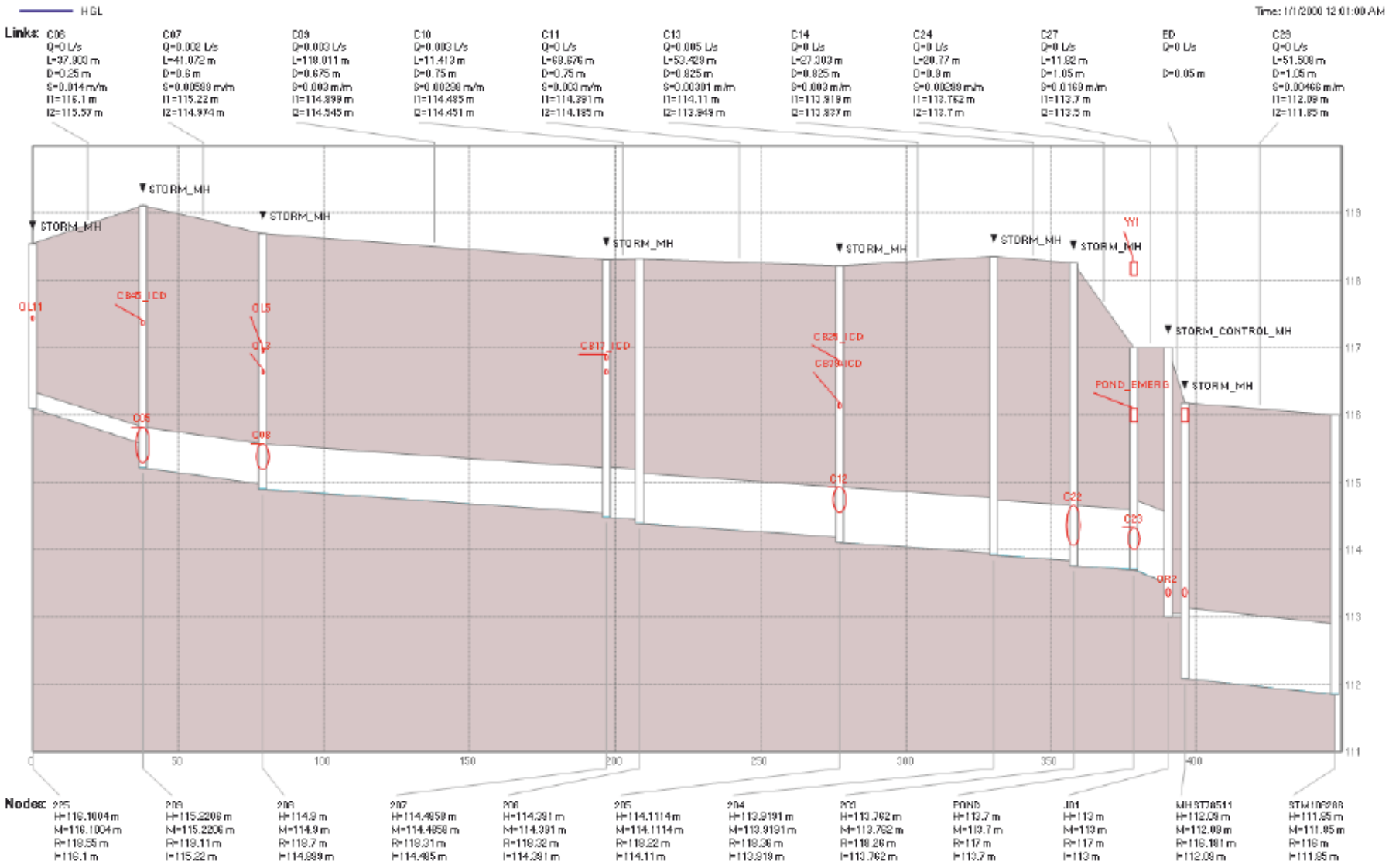


Figure 2: Node 225 to Node STM106286

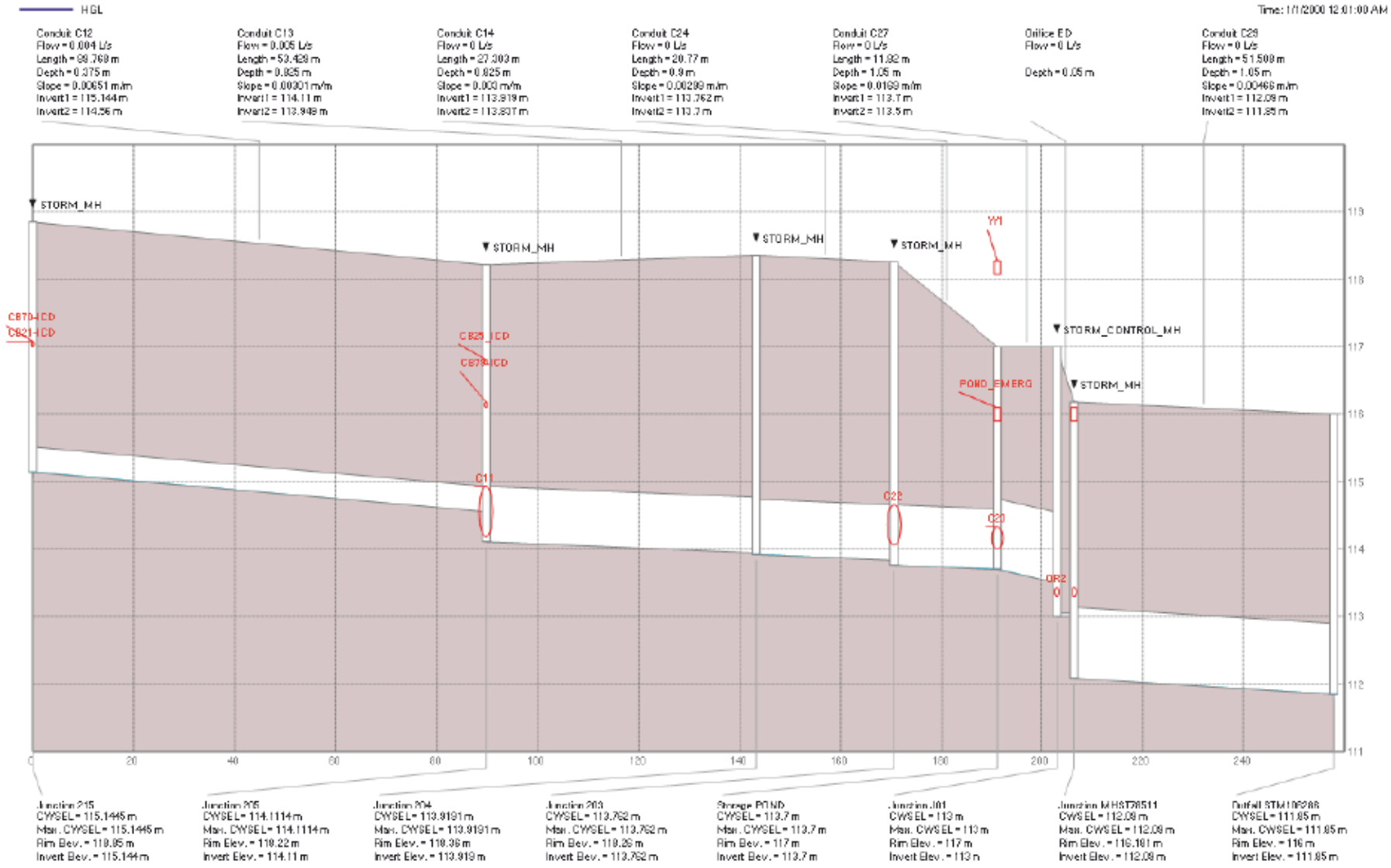


Figure 3: Node 215 to Node STM106286

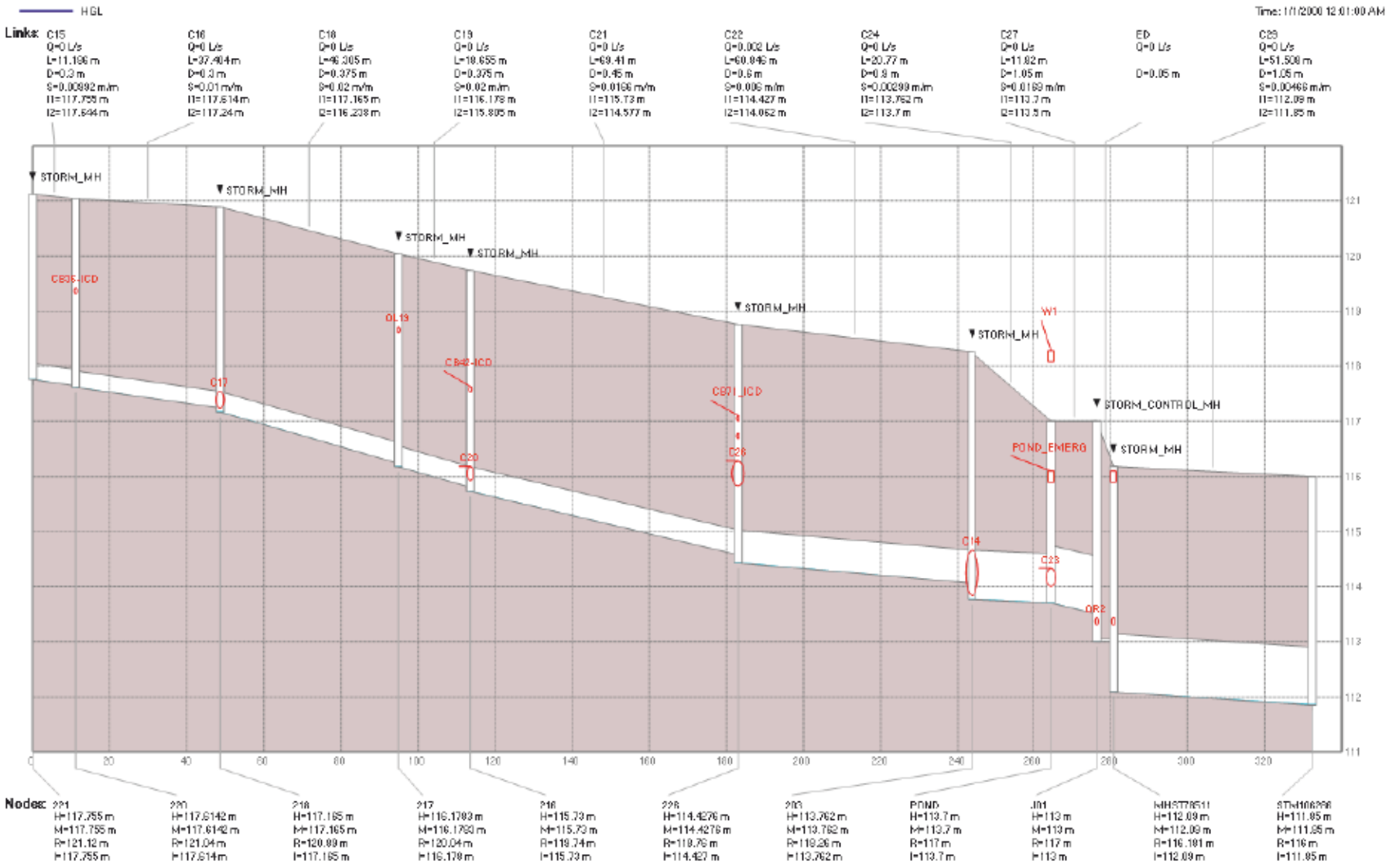


Figure 4: Node 221 to Node STM106286

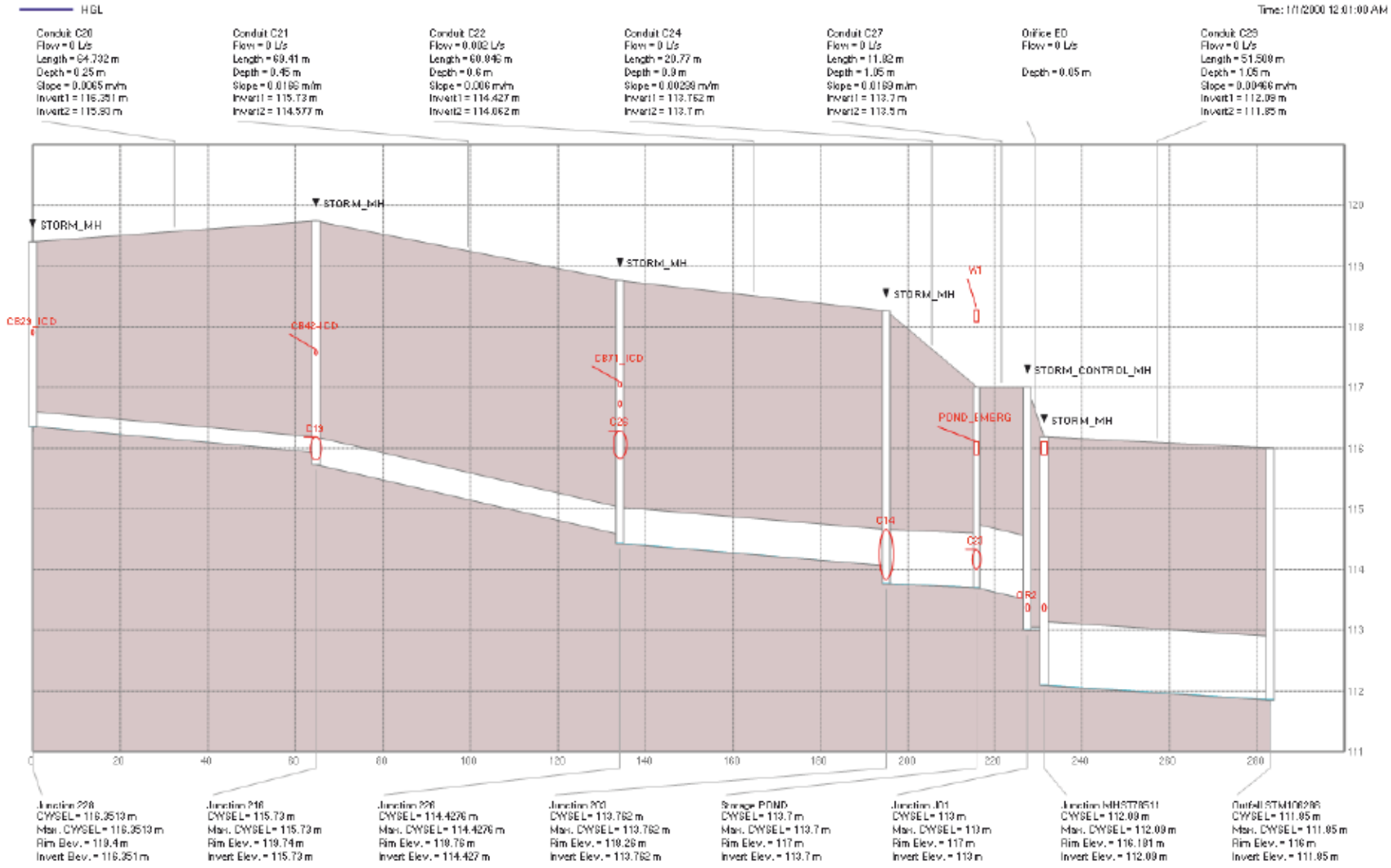


Figure 5: Node 228 to Node STM106286

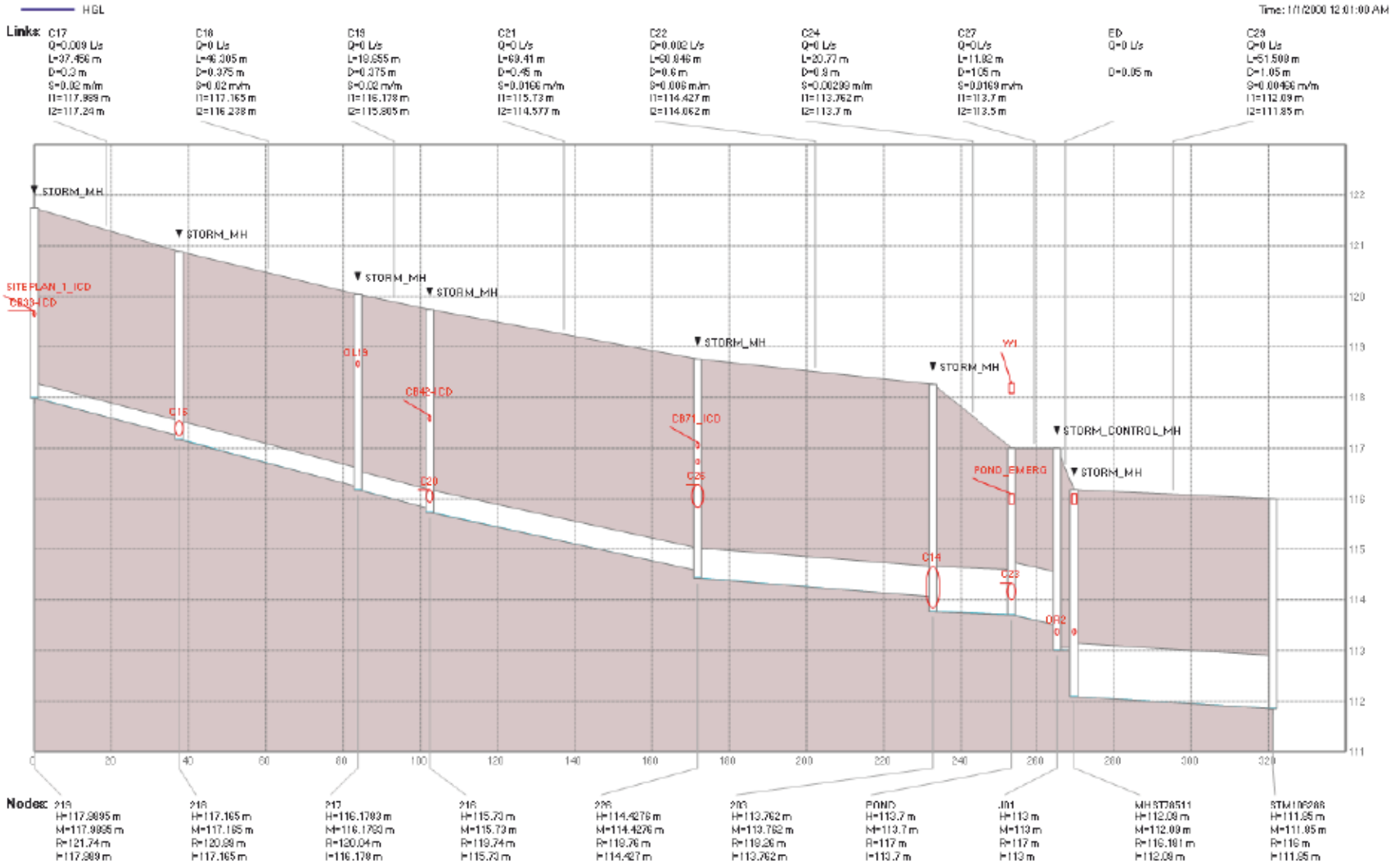


Figure 6: Node 219 to Node STM106286

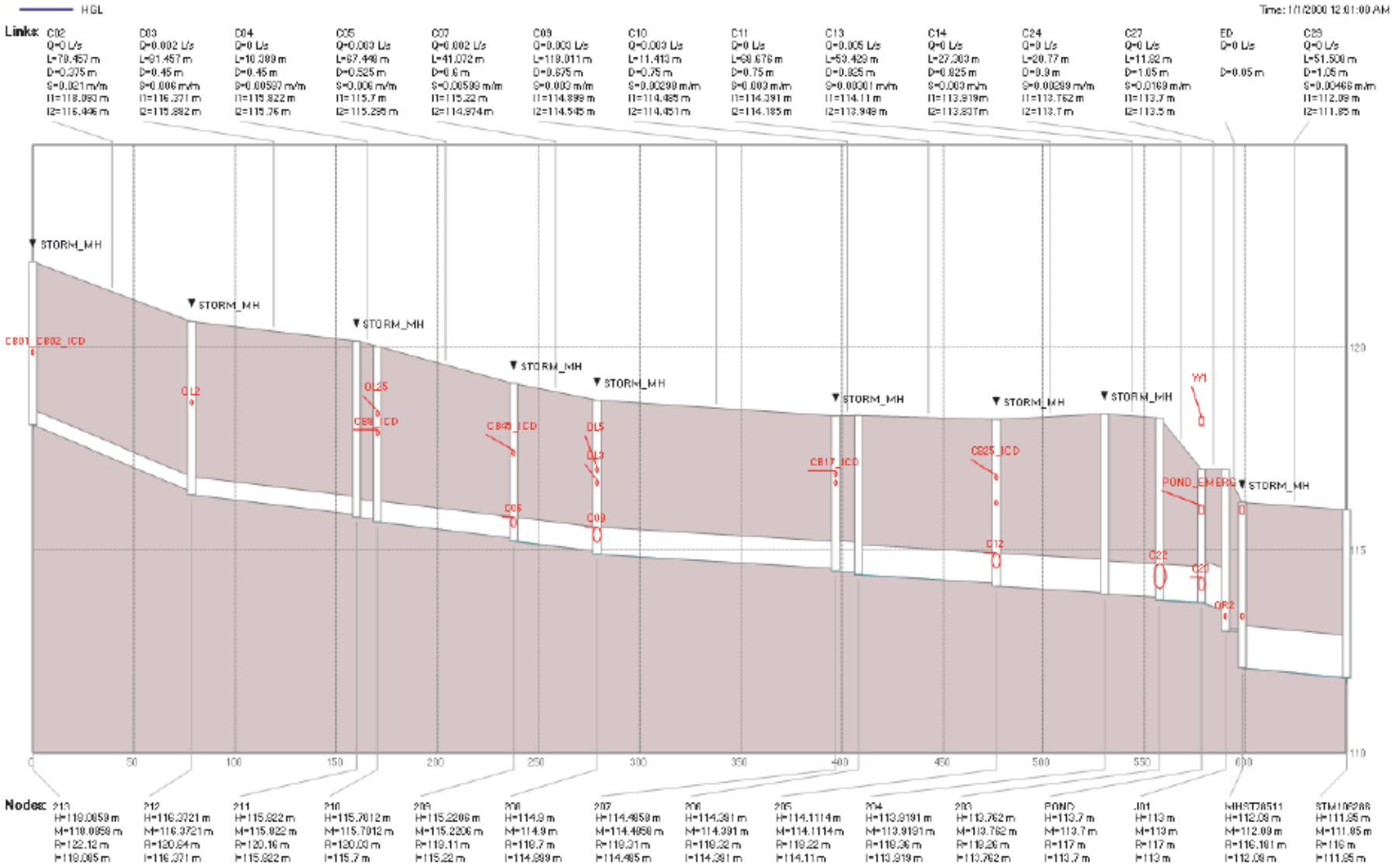


Figure 7: Node 213 to Node STM106286

Table 1: TABLE - Catchbasins_Rev 3

NAME	RIM_ELEV	ICD_RATE	LOCATION	TYPE	ICD	ICD_TYPE	INTERCONNECTED	REF_PONDING_LOC	INTERCONNECTED_TO	SUBCATCHMENT
CB01	121.22	20.7	ROADWAY	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S02
CB02	121.22	20.7	ROADWAY	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S02
CB03	119.98	38.2	ROADWAY	PONDING	YES	TYPE C	NO	SP-01	N/A	S03
CB04	119.98	38.2	ROADWAY	PONDING	YES	TYPE C	NO	SP-01	N/A	S03
CB08	119.23	28.4	ROADWAY	FLOW-BY	YES	TYPE B	NO	N/A	N/A	S04
CB09	119.23	28.4	ROADWAY	FLOW-BY	YES	TYPE B	NO	N/A	N/A	S04
CB11	119	28.4	REARYARD	FLOW-BY	YES	TYPE B	NO	N/A	N/A	S07
CB12	118.62	0	ROADWAY	PONDING	NO	NONE	YES	SP-03	CB13	S03
CB13	118.62	28.4	ROADWAY	PONDING	YES	TYPE B	YES	SP-03	CB12	S03
CB15	118.32	38.2	ROADWAY	PONDING	YES	TYPE C	NO	SP-04	N/A	S30
CB16	118.32	38.2	ROADWAY	PONDING	YES	TYPE C	NO	SP-04	N/A	S30
CB17	118.22	20.7	ROADWAY	PONDING	YES	TYPE A	YES	SP-05	N/A	S22
CB18	118.22	20.7	ROADWAY	PONDING	YES	TYPE A	YES	SP-05	N/A	S22
CB20	118.4	28.4	ROADWAY	FLOW-BY	YES	TYPE B	YES	N/A	CB21	S23
CB21	118.4	28.4	ROADWAY	FLOW-BY	YES	NONE	YES	N/A	CB20	S23
CB23	118.22	28.4	ROADWAY	PONDING	YES	TYPE B	NO	SP-06	N/A	S31
CB24	118.25	28.4	ROADWAY	PONDING	YES	TYPE B	NO	SP-06	N/A	S31
CB25	118.13	28.4	ROADWAY	PONDING	YES	TYPE B	NO	SP-06	N/A	S31
CB28	119.26	0	ROADWAY	PONDING	YES	NONE	YES	SP-02	CB29	S24
CB29	119.26	28.4	ROADWAY	PONDING	YES	TYPE B	YES	SP-02	CB28	S24
CB30	118.07	20.7	ROADWAY	PONDING	YES	TYPE A	NO	SP-07	N/A	S26
CB31	118.07	20.7	ROADWAY	PONDING	YES	TYPE A	NO	SP-07	N/A	S26
CB33	121	20.7	ROADWAY	FLOW-BY	YES	TYPE A	YES	N/A	CB34	S28
CB34	121	0	ROADWAY	FLOW-BY	NO	NONE	YES	N/A	CB33	S28
CB36	120.63	20.7	ROADWAY	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S27
CB37	120.01	20.7	ROADWAY	FLOW-BY	YES	TYPE A	YES	N/A	CB38	S29
CB38	120.01	0	ROADWAY	FLOW-BY	NO	NONE	YES	N/A	CB37	S29
CB42	118.93	20.7	ROADWAY	FLOW-BY	YES	TYPE A	YES	N/A	CB43	S25

Table 1: TABLE - Catchbasins_Rev 3 (continued...)

NAME	RIM_ELEV	ICD_RATE	LOCATION	TYPE	ICD	ICD_TYPE	INTERCONNECTED	REF_PONDING_LOC	INTERCONNECTED_TO	SUBCATCHMENT
CB43	118.93	0	ROADWAY	FLOW-BY	YES	NONE	YES	N/A	CB42	S25
CB44	118.73	38.2	ROADWAY	FLOW-BY	YES	TYPE C	YES	N/A	CB45	S21
CB45	118.73	38.2	ROADWAY	FLOW-BY	YES	TYPE C	YES	N/A	CB44	S21
CB50	119.7	20.7	REARYARD	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S05A
CB51	0	20.7	REARYARD	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S05B
CB52	0	20.7	REARYARD	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S05B
CB55	118.8	20.7	REARYARD	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S06
CB56	118	28.4	REARYARD	FLOW-BY	YES	TYPE B	YES	N/A	N/A	S18
CB57	117.6	20.7	REARYARD	FLOW-BY	YES	TYPE A	NO	N/A	N/A	S17
CB58	0	0	REARYARD	FLOW-BY	YES	N/A	YES	N/A	CB56	S18
CB60	0	0	REARYARD	FLOW-BY	NO	N/A	YES	N/A	CB79	S16
CB62	0	0	REARYARD	FLOW-BY	NO	N/A	YES	N/A	CB79	S16
CB70	118.4	38.2	REARYARD	FLOW-BY	YES	TYPE C	NO	N/A	N/A	S09, S19, S20
CB71	118.4	38.2	REARYARD	FLOW-BY	YES	TYPE C	NO	N/A	N/A	S10, S11, S12
CB79	117.3	38.2	REARYARD	FLOW-BY	YES	TYPE C	YES	N/A	CB60	S16
CB80	119	28.4	PARK	FLOW-BY	YES	TYPE B	NO	N/A	N/A	S13

Table 2: TABLE - Subcatchments

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Max. Infil. Rate (mm/hr)	Min. Infil. Rate (mm/hr)	Decay Constant (1/hr)	CAVG
S01	0.5077	111.123	45.688	1	57.118	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.6
S06	0.2826	146.304	19.316	4	55.292	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.59
S07	0.1884	67.593	27.873	4	71.037	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S08	0.1882	158.142	11.901	4	76.521	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.74
S09	0.0919	67.983	13.518	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S10	0.0955	63.09	15.137	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S11	0.1843	103.516	17.804	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S12	0.088	66.5	13.233	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S13	0.7264	111.666	65.051	4	14.341	0.013	0.25	1.57	4.67	0	76.2	13.2	4.14	0.3
S14	1.3741	230.087	59.721	1	50.015	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.55
S15	0.3909	227.638	17.172	33	3.467	0.013	0.25	1.57	4.67	0	76.2	13.2	4.14	0.22
S16	0.2641	175.377	15.059	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S17	0.1725	81.104	21.269	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S19	0.179	110.31	16.227	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S20	0.0812	62.409	13.011	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S22	0.3161	187.585	16.851	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S03	0.659	265.613	24.811	4	62.781	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.64
S02	0.3146	118	26.661	4	62.781	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.64
S04	0.2865	158.603	18.064	4	70.305	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.69
S27	0.1183	189.219	6.252	4	76.284	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.73
S21	0.1681	92.536	18.166	4	70.305	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.69
S30	0.3641	211.342	17.228	4	70.305	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.69
S28	0.1164	255.88	4.549	4	76.284	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.73
S24	0.18	153.296	11.742	4	76.284	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.73
S29	0.0985	151.352	6.508	4	76.284	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.73
S25	0.1179	120.306	9.8	4	71.844	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7

Table 2: TABLE - Subcatchments (continued...)

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	N Imperv	N Perv	Dstore Imperv (mm)	Dstore Perv (mm)	Zero Imperv (%)	Max. Infil. Rate (mm/hr)	Min. Infil. Rate (mm/hr)	Decay Constant (1/hr)	CAVG
S26	0.3672	277.446	13.235	4	71.844	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S23	0.2219	188.21	11.79	4	72.529	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.71
S31	0.4484	275.244	16.291	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S05A	0.09	157.376	5.719	4	69.501	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.69
S05B	0.173	157.376	10.993	4	71.33	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7
S18	0.1707	103.234	16.535	4	71.4	0.013	0.25	1.57	4.67	25	76.2	13.2	4.14	0.7

Table 3: TABLE - Storages

Name	Tag	Invert Elev. (m)	Rim Elev. (m)	Curve Name	Max. Volume (1000 m³)	NO_CBS	CB_NAMES	CONDITON	LOCATION
CB01	FLOW-BY	119.82	121.52	CB01_NO_PONDING	0	2	CB01, CB02	FLOW-BY	ROADWAY
CB03	PONDING	118.58	120.47	SP-01	0.014	2	CB03, CB04	PONDING	ROADWAY
CB08	FLOW-BY	117.83	119.53	CB08_NO_PONDING	0.001	2	CB08, CB09	FLOW-BY	ROADWAY
CB11	NO_PONDING	117.6	119.15	CB11_NO_PONDING	0	0	CB11	NO_PONDING	REARYARD
CB13	PONDING	117.22	119.07	SP-03	0.014	2	CB13,CB14	PONDING	ROADWAY
CB15	PONDING	116.92	118.92	SP-04	0.025	2	CB15, CB16	PONDING	ROADWAY
CB17	PONDING	116.82	118.82	SP-05	0.023	2	CB17, CB18	PONDING	ROADWAY
CB21	FLOW-BY	117	118.7	CB21_NO_PONDING	0	2	CB20, CB21	FLOW-BY	ROADWAY
CB25	PONDING	116.73	118.72	SP-06	0.094	3	CB23, CB24, CB25	PONDING	ROADWAY
CB29	PONDING	117.86	119.69	SP-02	0.01	2	CB28, CB29	PONDING	ROADWAY
CB31	PONDING	116.67	118.55	SP-07	0.037	2	CB30, CB31	PONDING	ROADWAY
CB33	FLOW-BY	119.6	121.3	CB33_NO_PONDING	0.001	2	CB33, CB34	FLOW-BY	ROADWAY
CB36	FLOW-BY	119.32	120.72	CB36_NO_PONDING	0	1	CB36	FLOW-BY	ROADWAY
CB37	FLOW-BY	118.61	120.31	CB37-NO_PONDING	0.001	2	CB37, CB38	FLOW-BY	ROADWAY

Table 3: TABLE - Storages (continued...)

Name	Tag	Invert Elev. (m)	Rim Elev. (m)	Curve Name	Max. Volume (1000 m³)	NO_CBS	CB_NAMES	CONDITON	LOCATION
CB42	FLOW-BY	117.45	119	CB42_NO_PONDING	0	2	CB42, CB43	FLOW-BY	ROADWAY
CB45	FLOW-BY	117.33	119.03	CB45_NO_PONDING	0	2	CB44, CB45	FLOW-BY	ROADWAY
CB50	NO_PONDING	118.3	120	CB50_NO_PONDING	0	3	CB50,CB51,CB52	NO_PONDING	REARYARD
CB55	NO_PONDING	117.4	118.95	CB55_NO_PONDING	0	2	CB55, CB55A	NO_PONDING	REARYARD
CB56	NO_PONDING	116.6	118.3	CB56_NO_PONDING	0	2	CB56, CBXX	NO_PONDING	REARYARD
CB57	NO_PONDING	116.6	117.9	CB57_NO_PONDING	0	1	CB57	NO_PONDING	REARYARD
CB70	NO_PONDING	117	118.55	CB70_NO_PONDING	0	1	CB22	NO_PONDING	REARYARD
CB71	NO_PONDING	117	118.55	CB71_NO_PONDING	0	1	CB71	NO_PONDING	REARYARD
CB79	NO_PONDING	116.1	117.6	CB79_NO_PONDING	0	2	CB79A, CB79B	NO_PONDING	REARYARD
CB80	NO_PONDING	117.6	119.15	CB80_NO_PONDING	0	1	CB80	NO_PONDING	PARK
POND		113.7	117	DRY_POND_REV3	4.088	1			
SITEPLAN_1		119.6	121.95	SITEPLAN_1_NO_STORAGE	0	1			
SITEPLAN_2		116.33	118.68	SITEPLAN_2_NO_STORAGE	0	1			

Table 4: TABLE - Outfalls

Name	Invert Elev. (m)	Rim Elev. (m)	Max. Total Inflow (L/s)	Total Flow (ML)	Contributing Area (ha)
STM106286	111.85	116	68.48	4.513	9.026
Outfall_SamanthaEastop	118.6	0	50.9	0.038	0.283

Table 5: TABLE - Junctions

Name	Tag	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Contributing Area (ha)	Contributing Imp. Area (ha)	Max. Unit Flow (L/s/ha)	STATUS
221	STORM_MH	117.755	121.12	3.365	0	0	0	PROPOSED
220	STORM_MH	117.614	121.04	3.426	0.118	0.09	131.361	PROPOSED
213	STORM_MH	118.085	122.12	4.035	0.315	0.198	101.049	PROPOSED
212	STORM_MH	116.371	120.64	4.269	0.974	0.611	116.393	PROPOSED
211	STORM_MH	115.822	120.16	4.338	0.974	0.611	131.769	PROPOSED
210	STORM_MH	115.7	120.03	4.33	1.523	0.999	157.239	PROPOSED
209	STORM_MH	115.22	119.11	3.89	1.974	1.273	176.826	PROPOSED
208	STORM_MH	114.899	118.7	3.801	4.632	2.714	127.32	PROPOSED
207	STORM_MH	114.485	118.31	3.825	5.121	3.063	127.726	PROPOSED
206	STORM_MH	114.391	118.32	3.929	5.121	3.063	127.84	PROPOSED
205	STORM_MH	114.11	118.22	4.11	6.408	3.984	128.157	PROPOSED
204	STORM_MH	113.919	118.36	4.441	6.408	3.984	128.231	PROPOSED
203	STORM_MH	113.762	118.26	4.498	8.635	5.283	142.751	PROPOSED
215	STORM_MH	115.144	118.85	3.706	0.574	0.412	70.819	PROPOSED
219	STORM_MH	117.989	121.74	3.751	0.624	0.379	140.731	PROPOSED
218	STORM_MH	117.165	120.89	3.725	0.742	0.469	139.238	PROPOSED
217	STORM_MH	116.178	120.04	3.862	0.841	0.544	148.698	PROPOSED
216	STORM_MH	115.73	119.74	4.01	1.139	0.766	156.173	PROPOSED
223	STORM_MH	116.036	118.83	2.794	1.374	0.687	120.079	PROPOSED
225	STORM_MH	116.1	118.55	2.45	0.283	0.156	153.999	PROPOSED
226	STORM_MH	114.427	118.76	4.333	7.556	4.559	56.856	PROPOSED
227	STORM_MH	115.69	118.7	3.01	2.124	1.063	59.758	PROPOSED
228	STORM_MH	116.351	119.4	3.049	1.021	0.681	30.679	PROPOSED
J01	STORM_CONTROL_MH	113	117	4	9.026	5.296	19.434	PROPOSED
MHST78511	STORM_MH	112.09	116.181	4.091	9.026	5.296	7.587	PROPOSED
CB01_CB02_MAJ	Major_System	121.22	121.52	0.3	0.315	0.198	336.777	DUMMY
CB33_MAJ	Major_System	121	121.3	0.3	0.624	0.379	209.55	DUMMY
CB37_MAJ	Major_System	120.01	120.31	0.3	0.841	0.544	198.418	DUMMY
CB08_MAJ	Major_System	119.23	119.53	0.3	1.523	0.999	219.828	DUMMY

Table 5: TABLE - Junctions (continued...)

Name	Tag	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Contributing Area (ha)	Contributing Imp. Area (ha)	Max. Unit Flow (L/s/ha)	STATUS
CB45_MAJ	Major_System	118.73	119.03	0.3	1.691	1.117	194.862	DUMMY
CB21_MAJ	Major_System	118.4	118.7	0.3	0.222	0.161	341.55	DUMMY
CB40-MAJ	Major_System	118.93	119.23	0.3	0.118	0.085	341.306	DUMMY
CB36_MAJ	Major_System	120.63	120.93	0.3	0.118	0.09	342.942	DUMMY

Table 6A: TABLE - Conduits

Name	Inlet Node	Outlet Node	Tag	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)
C02	213	212	STORM_SEWER	78.457	0.013	118.093	116.446
C03	212	211	STORM_SEWER	81.457	0.013	116.371	115.882
C04	211	210	STORM_SEWER	10.389	0.013	115.822	115.76
C05	210	209	STORM_SEWER	67.448	0.013	115.7	115.295
C07	209	208	STORM_SEWER	41.072	0.013	115.22	114.974
C09	208	207	STORM_SEWER	118.011	0.013	114.899	114.545
C10	207	206	STORM_SEWER	11.413	0.013	114.485	114.451
C11	206	205	STORM_SEWER	68.676	0.013	114.391	114.185
C13	205	204	STORM_SEWER	53.429	0.013	114.11	113.949
C14	204	203	STORM_SEWER	27.303	0.013	113.919	113.837
C24	203	POND	STORM_SEWER	20.77	0.013	113.762	113.7
C12	215	205	STORM_SEWER	89.768	0.013	115.144	114.56
C17	219	218	STORM_SEWER	37.456	0.013	117.989	117.24
C18	218	217	STORM_SEWER	46.305	0.013	117.165	116.238
C19	217	216	STORM_SEWER	18.655	0.013	116.178	115.805
C15	221	220	STORM_SEWER	11.186	0.013	117.755	117.644
C16	220	218	STORM_SEWER	37.404	0.013	117.614	117.24
C26	223	226	STORM_SEWER	7.564	0.013	116.036	115.832
C06	225	209	STORM_SEWER	37.903	0.013	116.1	115.57
C21	216	226	STORM_SEWER	69.41	0.013	115.73	114.577
C22	226	203	STORM_SEWER	60.846	0.013	114.427	114.062
C08	227	208	STORM_SEWER	63.814	0.013	115.62	115.199
C20	228	216	STORM_SEWER	64.732	0.013	116.351	115.93
C27	POND	J01	STORM_SEWER	11.82	0.013	113.7	113.5
C29	MHST78511	STM106286	STORM_SEWER	51.508	0.013	112.09	111.85
C39	CB01_CB02_MAJ	CB03	Major_System	47	0.013	121.22	119.98
C38	CB03	CB08_MAJ	Major_System	75	0.013	119.98	119.23

Table 6A: TABLE - Conduits (continued...)

Name	Inlet Node	Outlet Node	Tag	Length (m)	Roughness	Inlet Elev. (m)	Outlet Elev. (m)
C42	CB15	CB17	Major_System	12	0.013	118.32	118.22
C43	CB17	CB25	Major_System	11	0.013	118.22	118.13
C44	CB25	CB31	Major_System	88.905	0.013	118.13	118.07
C35	CB33_MAJ	CB37_MAJ	Major_System	44.533	0.013	121	120.01
C41	CB45_MAJ	CB15	Major_System	10	0.013	118.73	118.32
C45	CB37_MAJ	CB29	Major_System	26	0.013	120.01	119.26
C46	CB29	CB13	Major_System	36	0.013	119.26	118.62
C48	CB21	CB25	Major_System	66.3	0.013	118.4	118.13
C49	CB13	CB15	Major_System	21	0.013	118.62	118.32
C50	CB40-MAJ	CB31	Major_System	53	0.013	118.93	118.07
C51	CB36_MAJ	CB37_MAJ	Major_System	41.667	0.013	120.63	120.01
C52	SITEPLAN_2	CB31	Major_System	54.314	0.013	118.53	118.07
C53	CB55	Outfall_SamanthaEastop	Major_System	12.72	0.013	118.8	118.6
C55	SITEPLAN_1	CB33_MAJ	Major_System	45.263	0.013	121.8	121
C56	CB50	CB08_MAJ	Major_System	25	0.013	119.7	119.23
C40	CB08_MAJ	CB45_MAJ	Major_System	40.841	0.013	119.23	118.73
C47	CB80	CB13	Major_System	15	0.013	119	118.62
C54	CB11	CB13	Major_System	5	0.013	119	118.62
C57	CB56	CB57	Major_System	107.012	0.013	118	117.6
C58	CB57	CB79	Major_System	116.065	0.013	117.6	117.3
C59	CB70	CB25	Major_System	30	0.013	118.4	118.13
C60	CB71	CB31	Major_System	40	0.013	118.4	118.07
C23	CB79	POND	Major_System	91.636	0.01	117.3	114

Table 6B: TABLE - Conduits

Name	Cross-Section	Geom1 (m)	Geom2 (m)	Geom3	Geom4	Barrels	Transect	Slope (m/m)
C02	CIRCULAR	0.375	0	0	0	1		0.021
C03	CIRCULAR	0.45	0	0	0	1		0.006
C04	CIRCULAR	0.45	0	0	0	1		0.00597
C05	CIRCULAR	0.525	0	0	0	1		0.006
C07	CIRCULAR	0.6	0	0	0	1		0.00599
C09	CIRCULAR	0.675	0	0	0	1		0.003
C10	CIRCULAR	0.75	0	0	0	1		0.00298
C11	CIRCULAR	0.75	0	0	0	1		0.003
C13	CIRCULAR	0.825	0	0	0	1		0.00301

Table 6B: TABLE - Conduits (continued...)

Name	Cross-Section	Geom1 (m)	Geom2 (m)	Geom3	Geom4	Barrels	Transect	Slope (m/m)
C14	CIRCULAR	0.825	0	0	0	1		0.003
C24	CIRCULAR	0.9	0	0	0	1		0.00299
C12	CIRCULAR	0.375	0	0	0	1		0.00651
C17	CIRCULAR	0.3	0	0	0	1		0.02
C18	CIRCULAR	0.375	0	0	0	1		0.02002
C19	CIRCULAR	0.375	0	0	0	1		0.02
C15	CIRCULAR	0.3	0	0	0	1		0.00992
C16	CIRCULAR	0.3	0	0	0	1		0.01
C26	CIRCULAR	0.45	0	0	0	1		0.02698
C06	CIRCULAR	0.25	0	0	0	1		0.01398
C21	CIRCULAR	0.45	0	0	0	1		0.01661
C22	CIRCULAR	0.6	0	0	0	1		0.006
C08	CIRCULAR	0.375	0	0	0	1		0.0066
C20	CIRCULAR	0.25	0	0	0	1		0.0065
C27	CIRCULAR	1.05	0	0	0	1		0.01692
C29	CIRCULAR	1.05	0	0	0	1		0.00466
C39	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.02639
C38	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.01
C42	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.00833
C43	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.00818
C44	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.00067
C35	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_HALF	0.02224
C41	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_FULL	0.04103
C45	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_HALF_SWALE	0.02886
C46	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_HALF	0.01778
C48	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.00407
C49	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_FULL	0.01429
C50	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.01623
C51	IRREGULAR	0	0	0	0	1	COLLECTOR_20m-ROW_HALF	0.01488
C52	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_HALF	0.00847
C53	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.01573
C55	IRREGULAR	0	0	0	0	1	OVERLAND_SPILL	0.01768
C56	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_HALF	0.0188
C40	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_FULL	0.01224
C47	IRREGULAR	0	0	0	0	1	OVERLAND_SPILL	0.02534
C54	IRREGULAR	0	0	0	0	1	OVERLAND_SPILL	0.07622
C57	IRREGULAR	0	0	0	0	1	REARYARD_SWALE	0.00374

Table 6B: TABLE - Conduits (continued...)

Name	Cross-Section	Geom1 (m)	Geom2 (m)	Geom3	Geom4	Barrels	Transect	Slope (m/m)
C58	IRREGULAR	0	0	0	0	1	REARYARD_SWALE	0.00258
C59	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_HALF	0.009
C60	IRREGULAR	0	0	0	0	1	LOCAL_18m-ROW_HALF	0.00825
C23	IRREGULAR	0	0	0	0	1	REARYARD_SWALE	0.03604

Table 7: TABLE - Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (m)	Width (m)	Inlet Elev. (m)	Discharge Coeff.
ED	J01	MHST78511	SIDE	CIRCULAR	0.05	0.05	113	0.61
OR2	J01	MHST78511	SIDE	CIRCULAR	0.135	0.135	113.3	0.61

Table 8: TABLE - Outlets

Name	Inlet Node	Outlet Node	Tag	Inlet Elev. (m)	Curve Name
OL2	CB03	212	ICD	118.58	ICD_TYPE_C_DOUBLE
CB29_ICD	CB29	228	ICD	117.86	ICD_TYPE_B_SINGLE
CB13_ICD	CB13	227	ICD	117.22	ICD_TYPE_B_SINGLE
OL5	CB15	208	ICD	116.92	ICD_TYPE_C_DOUBLE
CB17_ICD	CB17	207	ICD	116.82	ICD_TYPE_A_DOUBLE
CB25_ICD	CB25	205	ICD	116.73	ICD_TYPE_B_TRIPLE
OL8	CB31	226	ICD	116.68	ICD_TYPE_A_DOUBLE
CB01_CB02_ICD	CB01	213	ICD	119.82	ICD_TYPE_A_DOUBLE
CB8_ICD	CB08	210	ICD	117.83	ICD_TYPE_B_DOUBLE
CB45_ICD	CB45	209	ICD	117.33	ICD_TYPE_C_DOUBLE
CB21-ICD	CB21	215	ICD	117	ICD_TYPE_B_SINGLE
CB42-ICD	CB42	216	ICD	117.53	ICD_TYPE_A_SINGLE
OL19	CB37	217	ICD	118.61	ICD_TYPE_A_SINGLE
CB33-ICD	CB33	219	ICD	119.6	ICD_TYPE_A_SINGLE
CB70-ICD	CB70	215	ICD	117	ICD_TYPE_C_SINGLE
OL25	CB50	210	ICD	118.3	ICD_TYPE_A_TRIPLE
CB36-ICD	CB36	220	ICD	119.23	ICD_TYPE_A_SINGLE
CB08_IC	CB08_MAJ	CB08	IC_CB	119.23	IC_CB-2X
CB45_IC	CB45_MAJ	CB45	IC_CB	118.73	IC_CB-2X
CB37_IC	CB37_MAJ	CB37	IC_CB	120.01	IC_CB-2X
CB01_CB02_IC	CB01_CB02_MAJ	CB01	IC_CB	121.22	IC_CB-2X

Table 8: TABLE - Outlets (continued...)

Name	Inlet Node	Outlet Node	Tag	Inlet Elev. (m)	Curve Name
CB71_ICD	CB71	226	ICD	117	ICD_TYPE_C_SINGLE
CB42-IC	CB40-MAJ	CB42	IC_CB	118.93	IC_CB-2X
CB33-IC	CB33_MAJ	CB33	IC_CB	121	IC_CB-2X
CB36-IC	CB36_MAJ	CB36	IC_CB	120.63	IC_CB-1X
CB21-IC	CB21_MAJ	CB21	IC_CB	118.4	IC_CB-2X
OL37	SITEPLAN_2	223	ICD	116.33	SITEPLAN_2
SITEPLAN_1_ICD	SITEPLAN_1	219	ICD	119.6	SITEPLAN_1
OL11	CB55	225	ICD	117.4	ICD_TYPE_A_DOUBLE
OL4	CB80	227	ICD	117.6	ICD_TYPE_B_SINGLE
OL3	CB56	208	ICD	116.6	ICD_TYPE_B_SINGLE
OL7	CB11	227	ICD	117.6	ICD_TYPE_B_SINGLE
CB57_ICD	CB57	207	ICD	116.6	ICD_TYPE_A_SINGLE
CB79-ICD	CB79	205	ICD	116.1	ICD_TYPE_C_SINGLE

Appendix G – Consultation / Correspondence

Email on Water System Boundary Conditions

Email Received from MCVA on Stormwater Management Requirements

Boundary Conditions
6171 Hazeldean Road

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	300	5.00
Maximum Daily Demand	738	12.30
Peak Hour	1,626	27.10
Fire Flow Demand #1	15,000	250.00

Location

Results

Connection 1 – Hazeldean Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.7	57.2
Peak Hour	156.8	51.7
Max Day plus Fire 1	156.3	51.0

Ground Elevation = 120.4 m

Connection 2 – Samantha Eastop Ave.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.7	59.6
Peak Hour	156.7	53.9
Max Day plus Fire 1	150.9	45.7

Ground Elevation = 118.8 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.

Moe Ghadban

From: Matt Craig <mcraig@mvc.on.ca>
Sent: Thursday, April 30, 2020 11:08 AM
To: Moe Ghadban
Cc: Bruce Thomas; Jason Fitzpatrick
Subject: RE: Request for SWM Criteria for 6171 Hazeldean Road
Attachments: jacksontrails-stormwaterdesign.pdf

Hi Moe attached is the report – an invoice of $50.00 will follow, along with my previous comments please consider:

Development should follow the SWM criteria set out in the Feedmill Creek SWM Criteria Study. There are runoff volume capture requirements for retention control (LIDs) based on 5 or 10mm rainfall depend on the drainage area specified in the report.

- Please check the Carp subwatershed study for other requirements,
- Feedmill Creek has some level of temperature mitigation requirement as the creek has tolerant Coldwater fisheries.
- MVCA completes a stream watch survey of Feedmill in 2015. The report is here: http://mvc.on.ca/wp-content/uploads/2015/02/CSW2015_Feedmill-Creek-Final-Report.pdf

Regards

Matt Craig | Manager of Planning and Regulations | Mississippi Valley Conservation Authority

www.mvc.on.ca |t. 613 253 0006 ext. 226| f. 613 253 0122 | mcraig@mvc.on.ca

---

From: Moe Ghadban <Moe.Ghadban@exp.com>
Sent: April 24, 2020 4:05 PM
To: Matt Craig <mcraig@mvc.on.ca>
Cc: Bruce Thomas <bruce.thomas@exp.com>; Jason Fitzpatrick <jason.fitzpatrick@exp.com>
Subject: Request for SWM Criteria for 6171 Hazeldean Road

Hi Matt,

We are preparing a site servicing and stormwater report for site plan application for a proposed subdivision at 6171 Hazeldean Road. The proposed subdivision consists of twenty (20) single homes, one-hundred and fifty-four (154)

townhomes, five (5) 3-storey condominium buildings (36 units each), and a 9-storey mixed use rental building (160 units). Please see the attached site plan. As the site is within the MVCA's jurisdiction we are requesting CA's clarification on the stormwater management requirements.

In the City of Ottawa's pre-consultation notes, they mentioned that quality control will be provided in the Jackson Trails SWM Pond. The "Jackson Trails Stormwater Management Design Brief" dated June 2006, an Enhanced Level of Protection (80 % removal of Total Suspended Solids).

As required by the City, as noted in the pre-consultation meeting, we are emailing the Conservation Authority to provide any additional water quality requirements for the proposed development.

Also, the City of Ottawa was not able to locate the following reports:

- Feedmill Creek Stormwater Management Criteria Study Draft Final Report (July 2016, JFSA and Coldwater Consulting Ltd.)
- Jackson Trails Stormwater Management Design Brief" dated June 2006

If you have either of those reports on file, could you please share them with us?

Thank you for your review and input.

Regards,

Moe Ghadban, P.Eng
EXP | Engineering Designer
t : +1.613.688.1899 | m : +1.613.808.4089 | e : moe.ghadban@exp.com
2650 Queensview Drive
Suite 100
Ottawa, ON K2B 8H6
CANADA

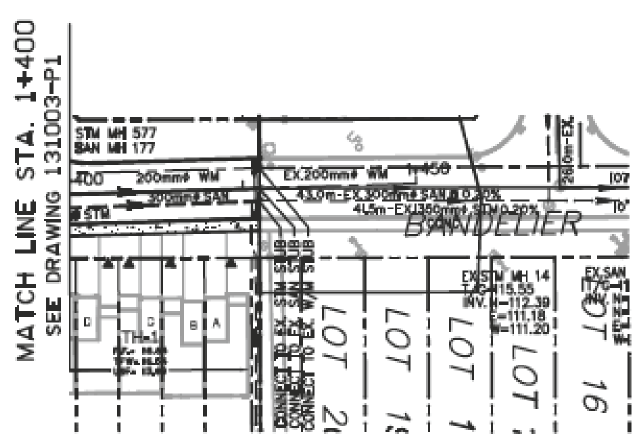
Appendix H – Background Information

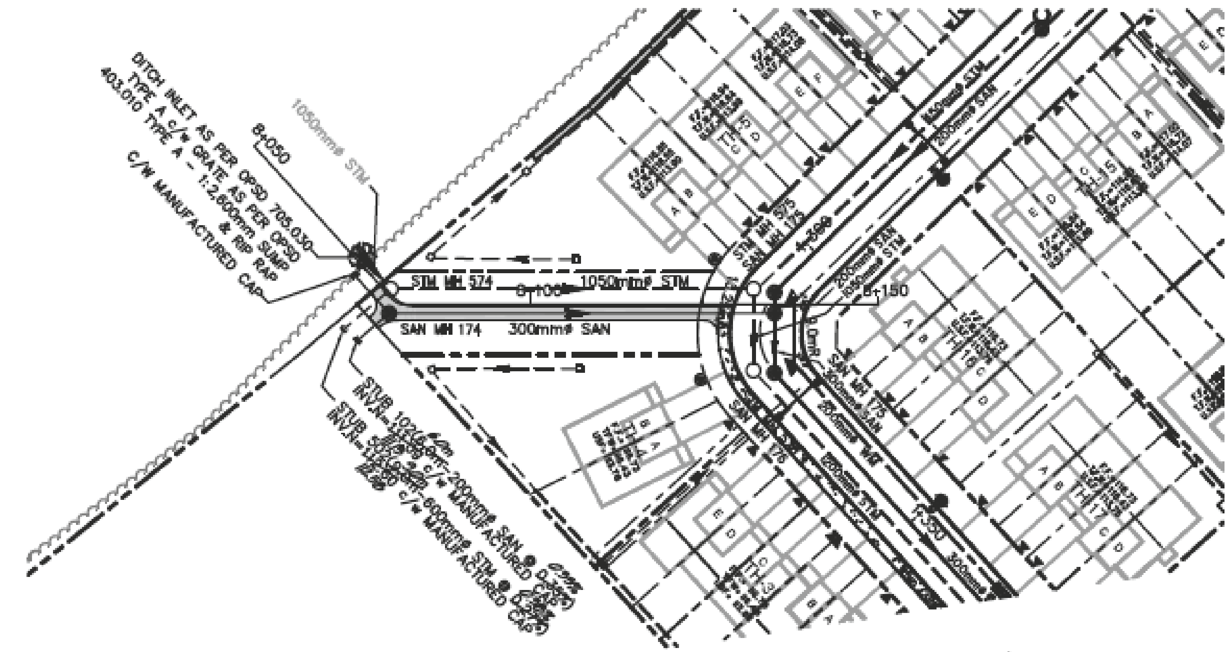
Excerpt pages from Potters Key Subnivium Drawings, Atrel Engineering. (10 pages)

Excerpt pages from 'Stormwater Management, Watermain, Storm Sewer and Sanitary Sewer Design Brief, Potter's Key Subdivision, Atrel Eng. (Cover + 1 page)

Excerpt pages from "Feedmill Creek Stormwater Management Criteria Study". (Cover + 1 page)

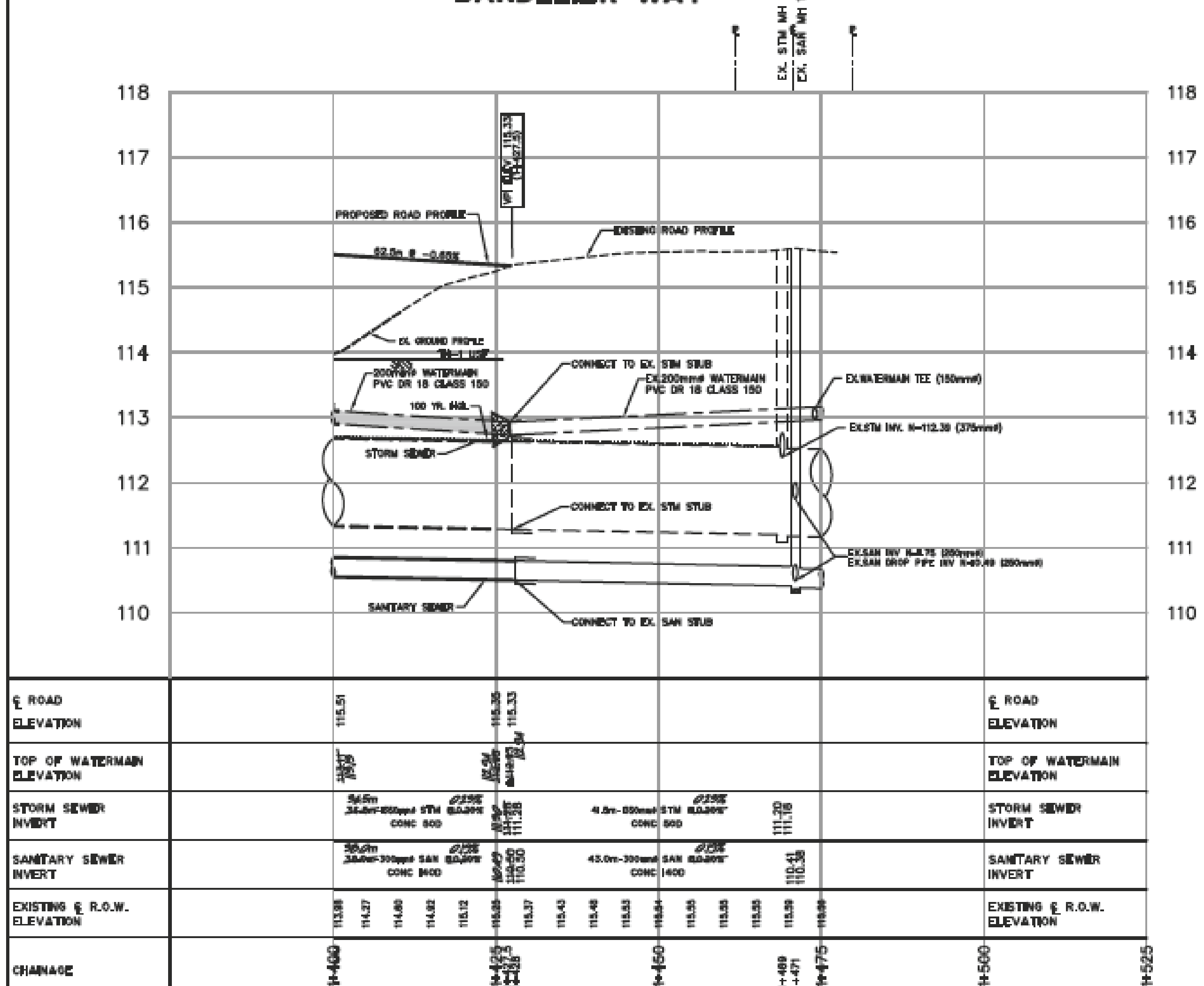
Excerpt pages from "Jackson Trails Stormwater Management Design Brief". (Cover + 2 pages)





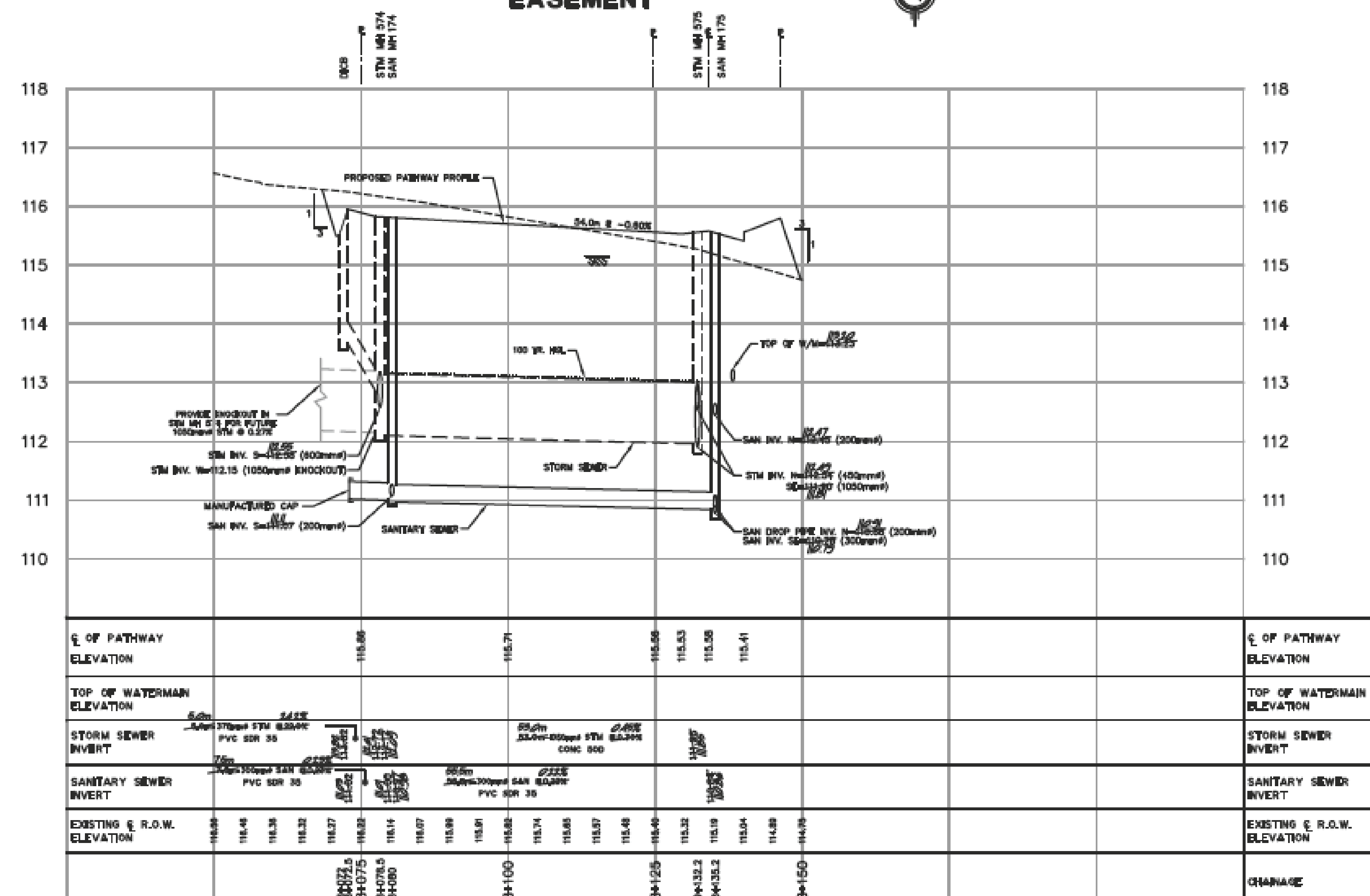
OVERLAND DRIVE

BANDELIER WAY



BANDELIER WAY

EASEMENT



LEGEND:

(COW) CUT OFF WALL (1.5m WIDE) AS PER CITY STANDARD S8

(SL) SAFETY LANDING

OUTSIDE PROPOSED DEVELOPMENT

TEST PIT REFUSAL

NOTES:

1. WATERMAIN CROSSING BELOW AND OVER SEWERS AS PER CITY STD W25 AND STD W25.2 RESPECTIVELY.
2. THERMAL INSULATION OF WATERMAIN NEAR OPEN STRUCTURES AS PER CITY STD W23.

RECORD DRAWING

JANUARY 09, 2018

THIS "RECORD DRAWING" HAS BEEN PREPARED BASED ON INSPECTIONS AND OBSERVATIONS UNDERTAKEN BY FIELD STAFF DURING KEY STAGES OF CONSTRUCTION AND ON INFORMATION SUBMITTED, IN PART BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, ATREL ENGINEERING LTD IS NOT RESPONSIBLE FOR ITS ACCURACY, OR FOR ERRORS OR OMISSIONS THAT MAY HAVE BEEN INCORPORATED INTO THIS DRAWING AS A RESULT.

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.

minto

No.	REVISION △-APPLIES WHEN DRAWING MODIFIED	DATE	BY
△	AS PER CITY COMMENTS	DEC. 06/16	JMD
△	FOR ORDERING	FEB. 3/17	JMD
△	AS PER CITY COMMENTS	FEB. 9/17	JMD
△	ISSUED FOR TENDER	FEB. 23/17	JMD
△	ISSUED FOR CONSTRUCTION	MAR. 30/17	JMD
△	SUBMITTED FOR APPROVAL	APR. 12/17	JMD
△	ISSUED FOR ROAD CONSTRUCTION	MAY 17/17	JMD
△	REVISED COMPOSITE UTILITY PLAN	JUNE 06/17	AGS
△	AS PER CITY COMMENTS	AUG. 02/17	AGS
△	RECORD DRAWINGS	JAN. 02/18	AGS

SCALE: 1:500 HORIZONTAL; 1:50 VERTICAL

DESIGN	VLL
CHECKED	AGS
DRAWN	MAL
CHECKED	AGS
APPROVED	AGS

ATREL Engineering Ltd. / Ltée

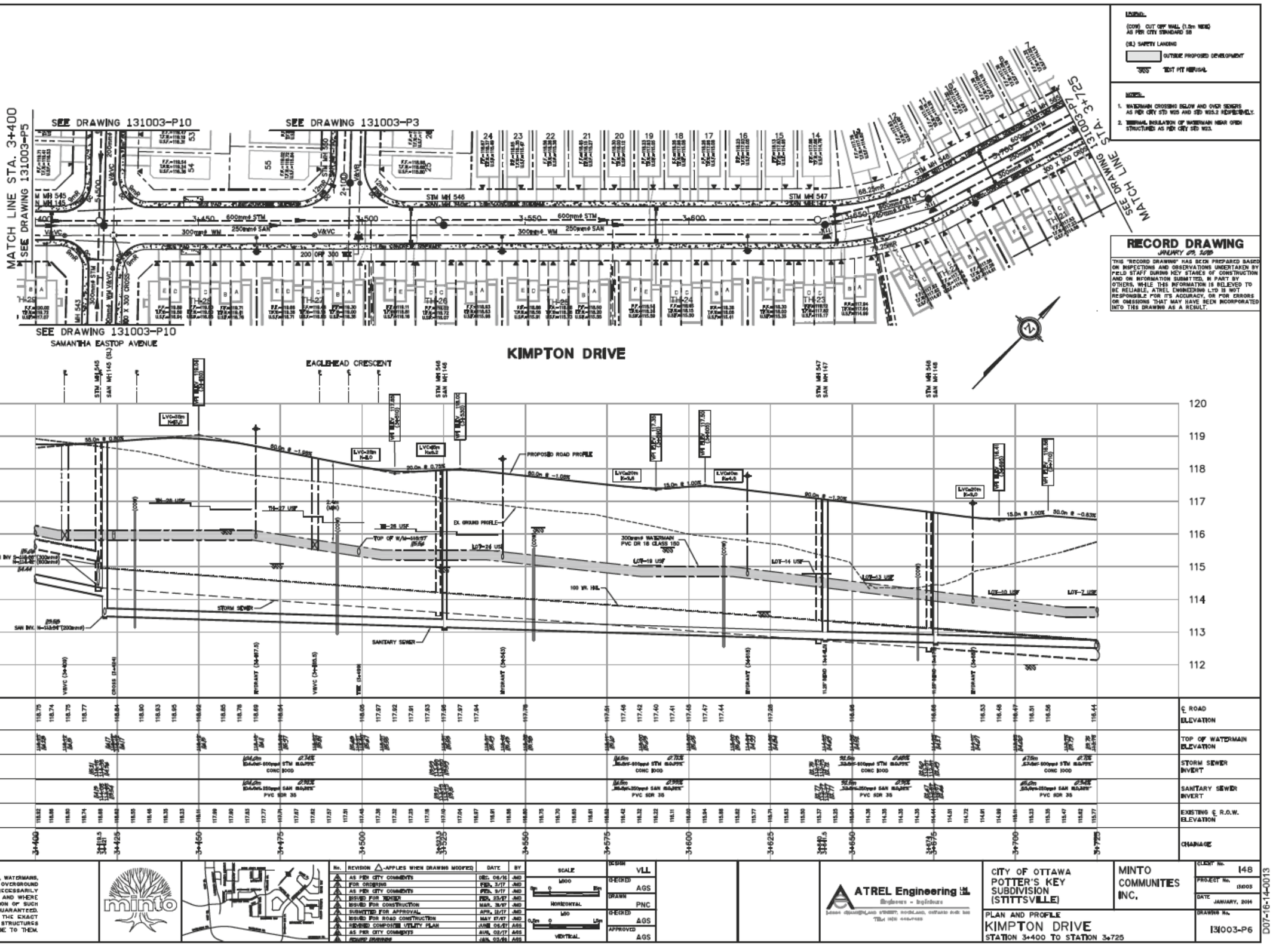
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

PLAN AND PROFILE
BANDELIER WAY
STATION 1+400 TO STATION 1+725

CLIENT No. 148
PROJECT No. 131003
DATE JANUARY, 2014
DRAWING No. 131003-P2

D07-16-14-0013



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 △-APPLIES WHEN DRAWING MODIFIED	DATE	BY
1	AS PER CITY COMMENTS	DEC. 06/16	JMD
2	FOR ORDERING	FEB. 3/17	JMD
3	AS PER CITY COMMENTS	FEB. 9/17	JMD
4	ISSUED FOR REVIEW	FEB. 23/17	JMD
5	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
6	SUBMITTED FOR APPROVAL	APR. 12/17	JMD
7	ISSUED FOR ROAD CONSTRUCTION	MAY 17/17	JMD
8	REVISED COMPOSITE UTILITY PLAN	JUNE 06/17	AGS
9	AS PER CITY COMMENTS	AUG. 02/17	AGS
10	ISSUED DRAWING	JAN. 03/18	AGS

SCALE
HORIZONTAL 1:500
VERTICAL 1:50

DESIGN	VLL
CHECKED	AGS
DRAWN	PNC
CHECKED	AGS
APPROVED	AGS

ATREL Engineering Ltd.
Engineers - Ingénieurs

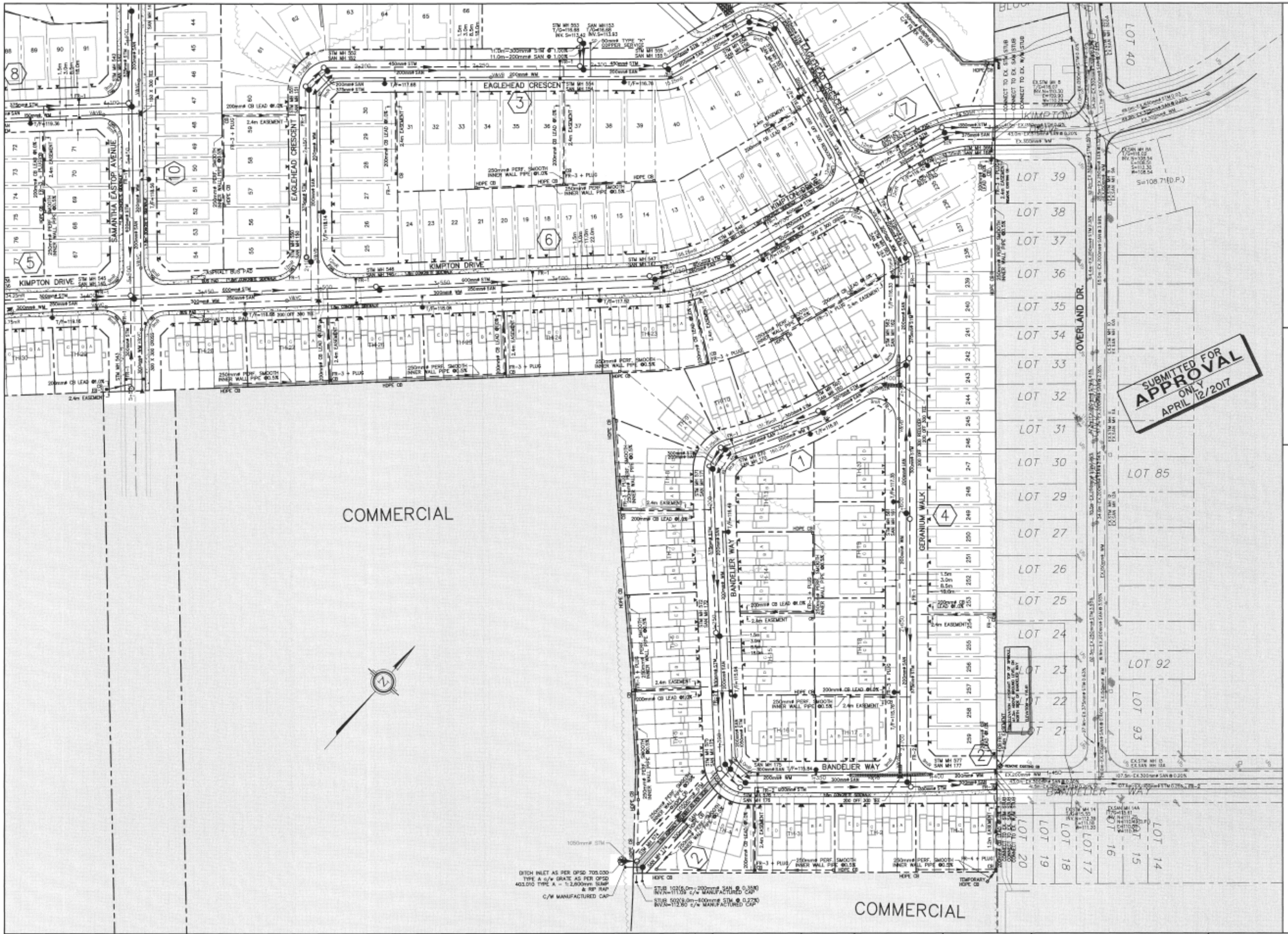
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

PLAN AND PROFILE
KIMPTON DRIVE
STATION 3+400 TO STATION 3+725

CLIENT No.	148
PROJECT No.	131003
DATE	JANUARY, 2014
DRAWING No.	131003-P6

D07-16-14-0013



NOTES:

1. CONSTRUCT ALL WATERMAIN TO CITY OF OTTAWA'S STANDARD AND SPECIFICATIONS. BEDDING SHALL BE AS PER OPSD 1102.01 AND OPSD 1102.02
2. PROVIDE INSULATION AT CATCHBASINS IN ACCORDANCE WITH CITY OF OTTAWA'S STANDARD DRAWING W23.
3. INSTALL ALL SERVICES IN ACCORDANCE WITH CITY OF OTTAWA'S STANDARD DRAWING R21, W26, W36, W38 AND S11.1.
4. PROVIDE CATHODIC PROTECTION TO CITY OF OTTAWA'S STANDARDS AND SPECIFICATIONS.
5. RESTRAIN ALL BENDS, TEES, AND CAPS TO CITY OF OTTAWA'S STANDARDS AND SPECIFICATIONS.
6. ALL SERVICES SHALL BE PLACED AT A DISTANCE OF 1/3 FROM SIDE PROPERTY LINE.
7. ALL SIDEWALKS SHALL BE HANDICAP ACCESSIBLE AND AS PER CITY STANDARD SC4, SC8 AND SC7.2.
8. ALL CONNECTION TO EXISTING WM STUB BY CITY OF OTTAWA EXCAVATION, BACKFILL AND REINSTATEMENT BY CONTRACTOR.
9. CONNECT TO EXISTING W/M VIA T.V.S. VALVE CHAMBER AS PER CITY OF OTTAWA STANDARD W17.1
10. CONNECT TO EX. SAN AND STM STUBS.
11. IN AREAS WHERE SERVICE TRENCHES ARE LOCATED WITHIN 3 METRES OF RESIDENTIAL FOUNDATION, SUCH AS REAR YARD CATCHBASIN LEADS, IT WILL BE NECESSARY TO BACKFILL THE PORTION OF THE TRENCH BELOW THE FOUNDATION LEVEL WITH ENGINEERED FILL.
12. FOR THRUST BLOCK DESIGN, ON THE WATERMAIN, A SOIL BEARING CAPACITY OF 20 KPA CAN BE USED. (REFER TO 131003-T01 FOR DESIGN)
13. ALL STORM SEWERS 600mm AND GREATER TO BE BENCHED. ALL SANITARY MANHOLES TO BE BENCHED. SEWER SHALL HAVE CLASS "B" BEDDING.
14. THE CITY OF OTTAWA WILL NOT PERMIT ANY ENCROACHMENTS ONTO ANY REAR YARD CATCH BASIN LEAD DRAINAGE EASEMENTS.
15. ALL STORM AND SANITARY SERVICES ARE TO BE EQUIPPED WITH A BACKWATER VALVES. AS PER CITY STANDARD S14 AND S14.2.
16. ALL HYDRANTS ARE TO BE LOCATED AS PER CITY OF OTTAWA STANDARD DRAWING W10 AND INSTALLED AS PER W16.
17. CONTRACTOR IS TO REPAIR BENCHING TO ALL EXISTING SAN MH PRIOR TO CONNECTIONS.
18. SPECIAL PIPE BEDDING AND COVER IS REQUIRED IN AREAS OF GRAY SILTY CLAY AND SHALL BE INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO BACKFILL.
19. CURBS SHALL BE DEPRESSED AT EVERY ENTRANCE CROSSING AS PER CITY STANDARD SC1.1 AND SC7.1
20. PERFORATED PIPE FOR REAR YARD SHALL BE INSTALLED AS PER CITY STANDARD S28.
21. ALL SANITARY AND STORM MANHOLE COVERS SHALL BE INSTALLED AS PER THE CORRESPONDING CITY OF OTTAWA STANDARD DETAIL DRAWING (REFER TO 131003-T01).

REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed _____
Date _____ 2017
Plan Number 1731

LEGEND

- EXISTING TREE LINE
- EXISTING TREES
- EXISTING FENCE
- EXISTING FIRE HYDRANT
- EXISTING VALVE AND VALVE CHAMBER
- EXISTING VALVE AND VALVE BOX
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCHBASIN
- EXISTING LIGHT POLE
- EXISTING HYDRO POST
- EXISTING SIGN
- EX. PADMOUNT HYDRO TRANSFORMER
- EXISTING BELL PEDESTAL
- EXISTING CABLE PEDESTAL
- EXISTING STANDARD IRON BAR
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED BEND C/W THRUSTBLOCK (SPECIAL DESIGN)
- PROPOSED CAP C/W THRUSTBLOCK (SPECIAL DESIGN)
- PROPOSED VALVE AND VALVE BOX
- PROPOSED VALVE AND VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- PROPOSED DITCH INLET CATCHBASIN AS PER OPSD 705.030 C/W 3H:1V SLOPED GRATE
- PROP. HDPE CB AS PER CITY OF OTTAWA STANDARD S30 AND DETAIL ON DRAWING 131003-T01
- PROPOSED CATCHBASIN
- PROPOSED RETAINING WALLS
- PROPOSED INSULATION (SEE PROFILES FOR DETAILS)
- T/F=114.83 PROPOSED TOP OF FLANGE ELEVATION
- HOUSE SERVICE
- HOUSE SERVICE IN DRIVEWAY
- NON-TYPICAL HOUSE SERVICE
- FR-1 + PLUG FLOW RESTRICTOR AND PLUG WHERE APPLICABLE (SEE 131003 T0-1 FOR DETAILS)
- 9mR CURB RADIUS
- TWSI TACTILE WALKING SURFACE INDICATORS
- OUTSIDE PROPOSED DEVELOPMENT
- 3 PROFILE NUMBER
- 104.00 ELEVATION - HYDRANT TOP OF SPINDLE, 61.2m ABOVE GROUND LEVEL ON NORTH SIDE OF BANDELIER WAY
  ELEVATION = 115.61

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

No.	REVISION △ APPLIES WHEN DRAWING MODIFIED	DATE	BY
1	SUBMITTED FOR APPROVAL	MAY. 05/16	JMD
2	AS PER CITY COMMENTS	AUG. 08/16	JMD
3	ISSUED FOR TENDER	OCT. 31/16	JMD
4	AS PER CITY COMMENTS	DEC. 08/16	JMD
5	FOR ORDERING	FEB. 3/17	JMD
6	AS PER CITY COMMENTS	FEB. 9/17	JMD
7	ISSUED FOR TENDER	FEB. 23/17	JMD
8	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
9	SUBMITTED FOR APPROVAL	APR. 12/17	JMD

SCALE 1:750 (0m 12m 24m)

DESIGN AGS
CHECKED JMD
DRAWN SAB
CHECKED AGS
APPROVED JMD

A. G. Y. SAUVE 100142393 Apr 12, 2017 — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

M. J. DECQUER (April 12, 2017) — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

ATREL Engineering Ltd.
Engineers - Ingénieurs
2384 CHAMBERLAND STREET, ROCKLAND, ONTARIO K4K 1K6
TEL.: (613) 446-7425

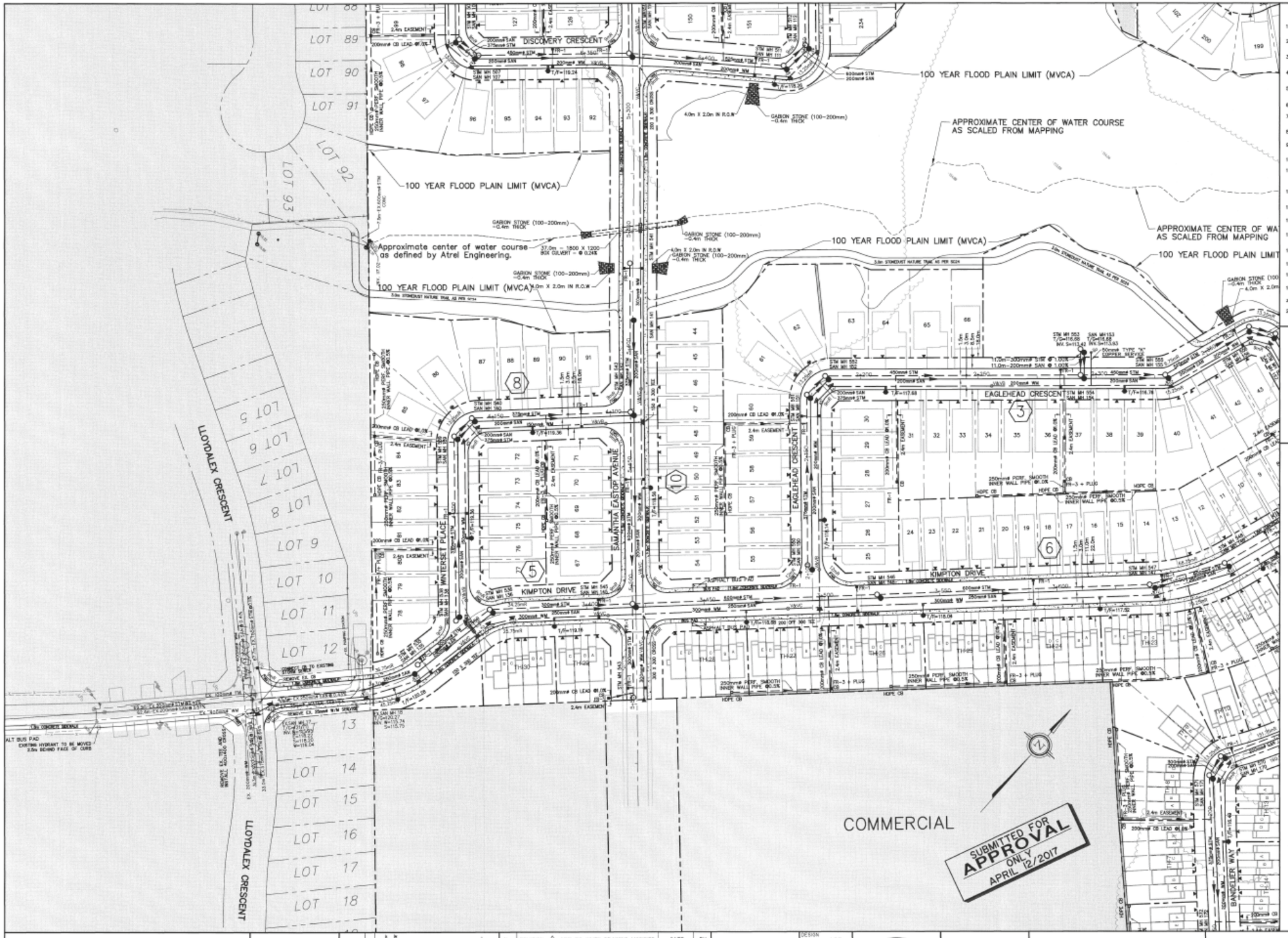
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

PLAN
GENERAL PLAN OF SERVICES

CLIENT No. 148
PROJECT No. 13003
DATE JANUARY, 2014
DRAWING No. 131003-SI

D07-16-14-0013



NOTES:

1. CONSTRUCT ALL WATERMAIN TO CITY OF OTTAWA'S STANDARD AND SPECIFICATIONS. BEDDING SHALL BE AS PER OPSD 1102.01 AND OPSD 1102.02
2. PROVIDE INSULATION AT CATCHBASINS IN ACCORDANCE WITH CITY OF OTTAWA'S STANDARD DRAWING W23.
3. INSTALL ALL SERVICES IN ACCORDANCE WITH CITY OF OTTAWA'S STANDARD DRAWING W21, W25, W26, W36 AND ST1.1.
4. PROVIDE CATHODIC PROTECTION TO CITY OF OTTAWA'S STANDARDS AND SPECIFICATIONS.
5. RESTRAIN ALL BENDS, TEES, AND CAPS TO CITY OF OTTAWA'S STANDARDS AND SPECIFICATIONS.
6. ALL SERVICES SHALL BE PLACED AT A DISTANCE OF 1/3 FROM SIDE PROPERTY LINE.
7. ALL SIDEWALKS SHALL BE HANDICAP ACCESSIBLE AND AS PER CITY STANDARD SC4, SC8 AND SC7.2.
8. ALL CONNECTION TO EXISTING WM STUB BY CITY OF OTTAWA EXCAVATION, BACKFILL AND REINSTATEMENT BY CONTRACTOR.
9. CONNECT TO EXISTING W/M VIA T.K.S. VALVE CHAMBER AS PER CITY OF OTTAWA STANDARD W5.1.1
10. CONNECT TO EX. SAN AND STM STUBS.
11. IN AREAS WHERE SERVICE TRENCHES ARE LOCATED WITHIN 3 METRES OF RESIDENTIAL FOUNDATION, SUCH AS REAR YARD CATCHBASIN LEADS, IT WILL BE NECESSARY TO BACKFILL THE PORTION OF THE TRENCH BELOW THE FOUNDATION LEVEL WITH ENGINEERED FILL.
12. FOR THRUST BLOCK DESIGN, ON THE WATERMAIN, A SOIL BEARING CAPACITY OF 20 KPA CAN BE USED. (REFER TO 131003-TB1 FOR DESIGN)
13. ALL STORM SEWERS 900mm AND GREATER TO BE BENCHED. ALL SANITARY MANHOLES TO BE BENCHED. SEWER SHALL HAVE CLASS "B" BEDDING.
14. THE CITY OF OTTAWA WILL NOT PERMIT ANY ENCROACHMENTS ONTO ANY REAR YARD CATCH BASIN LEAD DRAINAGE EASEMENTS.
15. ALL STORM AND SANITARY SERVICES ARE TO BE EQUIPPED WITH A BACKWATER VALVES. AS PER CITY STANDARD S14 AND S14.2.
16. ALL HYDRANTS ARE TO BE LOCATED AS PER CITY OF OTTAWA STANDARD DRAWING W19 AND INSTALLED AS PER W19.
17. CONTRACTOR IS TO REPAIR BENCHING TO ALL EXISTING SAN MH PRIOR TO CONNECTIONS.
18. SPECIAL PIPE BEDDING AND COVER IS REQUIRED IN AREAS OF GRAY SILTY CLAY AND SHALL BE INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO BACKFILL.
19. CURBS SHALL BE DEPRESSED AT EVERY ENTRANCE CROSSING AS PER CITY STANDARD SC8.3 AND SC7.1
20. PERFORATED PIPE FOR REAR YARD SHALL BE INSTALLED AS PER CITY STANDARD S28.
21. ALL SANITARY AND STORM MANHOLE COVERS SHALL BE INSTALLED AS PER THE CORRESPONDING CITY OF OTTAWA STANDARD DETAIL DRAWING (REFER TO 131003-TB1).

REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed Recommended for Approval
Date 24 / 21 2017
Plan Number 7314

LEGEND

- EXISTING TREE LINE
- EXISTING TREES
- EXISTING FENCE
- EXISTING FIRE HYDRANT
- EXISTING VALVE AND VALVE CHAMBER
- EX.V&VB EXISTING VALVE AND VALVE BOX
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCHBASIN
- LP EXISTING LIGHT POLE
- HP EXISTING HYDRO POST
- EXISTING SIGN
- TransF. EX. PADMOUNT HYDRO TRANSFORMER
- BPed EXISTING BELL PEDESTAL
- CTVPed EXISTING CABLE PEDESTAL
- SIB EXISTING STANDARD IRON BAR
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED BEND C/W THRUSTBLOCK (SPECIAL DESIGN)
- PROPOSED CAP C/W THRUSTBLOCK (SPECIAL DESIGN)
- PROPOSED VALVE AND VALVE BOX
- PROPOSED VALVE AND VALVE CHAMBER
- PROPOSED FIRE HYDRANT
- DICB PROPOSED DITCH INLET CATCHBASIN AS PER OPSD 705.030 C/W 3H:1V SLOPED GRATE
- PROP. HDPE CB AS PER CITY OF OTTAWA STANDARD S30, AND DETAIL IN DRAWING 131003-151
- PROPOSED CATCHBASIN
- PROPOSED RETAINING WALLS
- PROPOSED INSULATION (SEE PROFILES FOR DETAILS)
- T/F=114.83 PROPOSED TOP OF FLANGE ELEVATION
- HOUSE SERVICE
- HOUSE SERVICE IN DRIVEWAY
- NON-TYPICAL HOUSE SERVICE
- FR-1 + PLUG FLOW RESTRICTOR AND PLUG WHERE APPLICABLE (SEE 131003 TB-1 FOR DETAILS)
- 9mR CURB RADIUS
- TWS TACTILE WALKING SURFACE INDICATORS
- OUTSIDE PROPOSED DEVELOPMENT
- 3 PROFILE NUMBER

TEMP. ELEVATION =HYDRANT TOP OF SPINDLE, 61.8m ABOVE GROUND LEVEL ON NORTH SIDE OF BANDELIER WAY
ELEVATION = 116.61

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.

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8	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
9	SUBMITTED FOR APPROVAL	APR. 12/17	JMD

SCALE 1:750 (6m 0 24m)

DESIGN AGS
CHECKED JMD
DRAWN SAB
CHECKED AGS
APPROVED JMD

LICENSED PROFESSIONAL ENGINEER A.G.Y. SAUVE 100142303 Apr 12, 2017 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER J.M.J. DECOEUR PROVINCE OF ONTARIO

ATREL Engineering Ltd.
Engineers - Ingénieurs
1-2884 CHAMBERLAND STREET, ROCKLAND, ONTARIO K4K 0M5
TEL.: (613) 446-7405

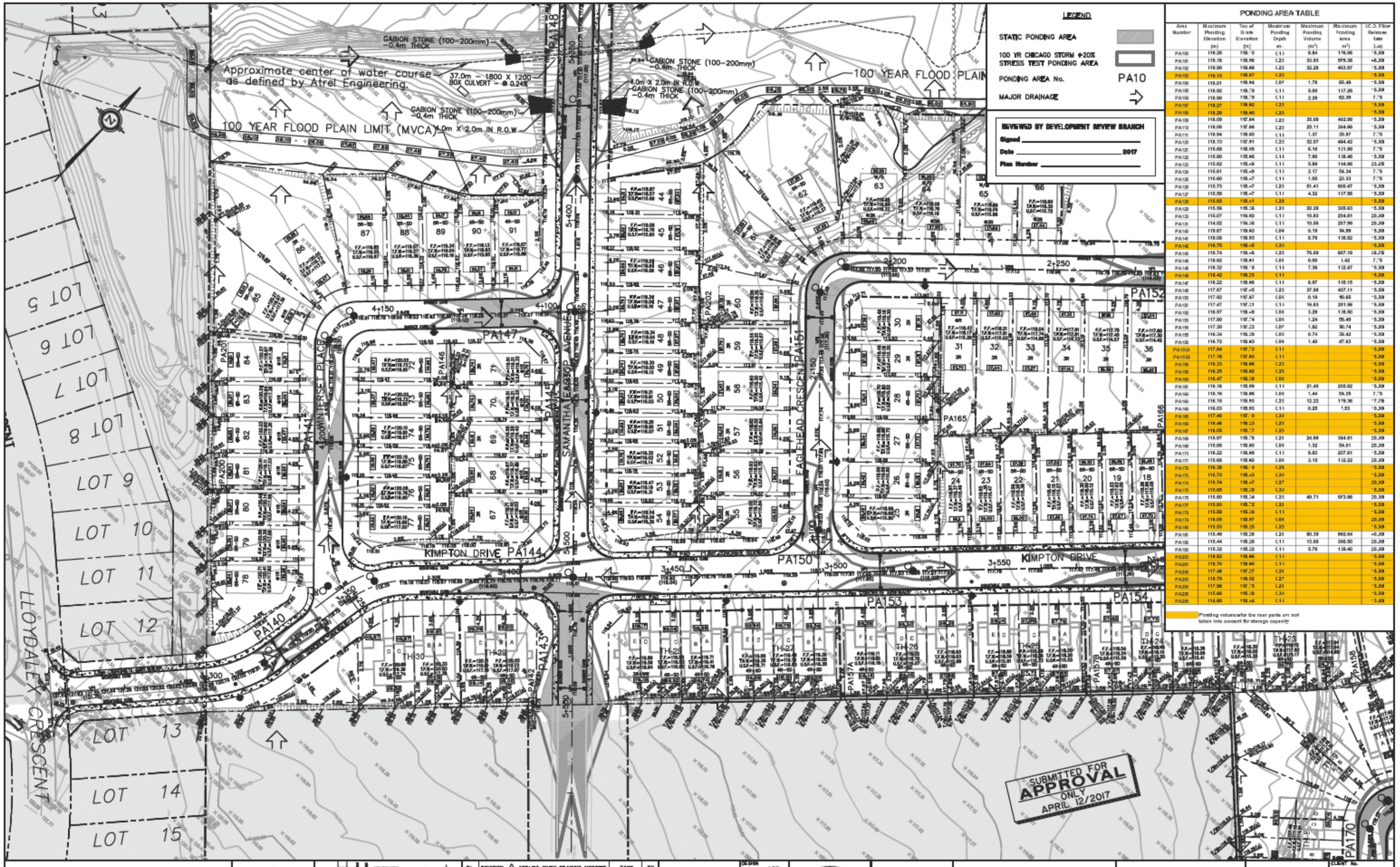
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

PLAN
GENERAL PLAN OF SERVICES

CLIENT No. 148
PROJECT No. 131003
DATE JANUARY, 2014
DRAWING No. 131003-S2

D07-16-14-0013



LEGEND

STATIC PONDING AREA

100 YR CHICAGO STORM 4-20% STRESS TEST PONDING AREA

PONDING AREA No. PA10

MAJOR DRAINAGE

REVIEWED BY DEVELOPMENT REVIEW BRANCH

Signed _____

Date _____ 2017

Plan Number _____

PONDING AREA TABLE

Area Number	Maximum Ponding Elevation (m)	Top of Grate Elevation (m)	Maximum Ponding Depth m	Maximum Ponding Volume (m³)	Maximum Ponding Area (m²)	I.C.D. Flow Release Rate (L/s)
PA103	119.25	119.10	0.11	8.84	116.06	*5.59
PA102	119.15	118.96	0.23	33.93	579.36	*5.59
PA102	119.50	119.46	0.23	32.26	463.97	*5.59
PA102	119.13	118.97	0.23			*5.59
PA106	119.01	118.94	0.07	1.79	65.49	*5.59
PA105	118.92	118.79	0.11	5.99	117.26	*5.59
PA105	118.90	118.79	0.11	2.29	62.39	7.75
PA107	119.27	119.02	0.25			*5.59
PA108	119.20	119.00	0.25			*5.59
PA109	119.09	117.84	0.25	35.68	462.99	*5.59
PA110	118.09	117.86	0.23	25.11	364.96	*5.59
PA111	118.94	118.80	0.11	1.37	30.87	7.75
PA123	118.13	117.91	0.23	32.07	464.42	*5.59
PA112	115.68	115.55	0.11	6.16	171.99	7.75
PA122	115.90	115.65	0.11	7.90	138.46	*5.59
PA121	115.62	115.49	0.11	5.89	144.66	23.25
PA120	115.61	115.49	0.11	2.17	64.34	7.75
PA125	115.60	115.47	0.11	1.00	23.33	7.75
PA129	115.73	115.47	0.23	51.41	609.47	*5.59
PA127	115.58	115.47	0.11	4.32	117.90	*5.59
PA128	115.65	115.41	0.23			*5.59
PA130	115.56	115.36	0.20	32.28	365.63	*5.59
PA133	116.07	115.92	0.11	10.83	254.91	20.39
PA131	114.82	114.26	0.11	10.66	257.99	20.39
PA140	119.67	119.63	0.04	0.19	14.99	*5.59
PA141	119.08	118.93	0.11	8.76	116.82	*5.59
PA142	118.75	118.45	0.30			*5.59
PA145	118.74	118.46	0.23	76.69	667.19	28.75
PA146	118.62	118.61	0.04	0.00	1.42	7.75
PA146	118.32	118.18	0.11	7.38	112.47	*5.59
PA149	118.42	118.23	0.11			*5.59
PA147	118.22	118.08	0.11	8.97	135.15	*5.59
PA148	117.67	117.45	0.23	37.58	487.11	*5.59
PA153	117.92	117.87	0.06	0.19	10.65	*5.59
PA150	117.47	117.21	0.11	16.83	251.96	*5.59
PA152	116.67	116.49	0.04	3.29	116.50	*5.59
PA155	117.80	117.74	0.06	1.24	56.49	*5.59
PA156	117.30	117.23	0.07	1.82	80.74	*5.59
PA155	116.34	116.29	0.06	0.74	38.43	*5.59
PA155	116.72	116.63	0.04	1.49	67.63	*5.59
PA155A	117.84	117.73	0.11			*5.59
PA155B	117.16	117.03	0.11			*5.59
PA159	116.33	116.08	0.25			*5.59
PA160	116.25	116.02	0.23			*5.59
PA162	116.47	116.39	0.04			*5.59
PA162	116.10	115.99	0.11	21.40	255.92	*5.59
PA162	116.16	116.06	0.04	1.44	64.25	7.75
PA163	116.15	116.03	0.23	12.22	119.36	*7.75
PA164	116.03	115.93	0.11	0.25	1.53	*5.59
PA165	117.40	117.10	0.30			*5.59
PA165	116.46	116.23	0.23			*5.59
PA167	116.05	115.77	0.25			*5.59
PA168	116.07	115.76	0.31	24.66	344.91	20.39
PA169	116.06	115.80	0.04	1.32	64.81	20.39
PA173	116.22	116.09	0.11	9.63	257.61	*5.59
PA171	115.68	115.60	0.04	3.15	112.22	20.39
PA172	116.38	116.14	0.23			*5.59
PA174	116.73	116.43	0.30			*5.59
PA175	116.74	116.47	0.27			20.39
PA175	115.65	115.35	0.30			*5.59
PA175	115.60	115.54	0.25	49.71	573.66	20.39
PA177	116.03	115.72	0.31			*5.59
PA178	116.58	116.39	0.11			*5.59
PA179	116.05	115.97	0.04			20.39
PA180	115.53	115.25	0.23			*5.59
PA181	115.49	115.26	0.21	80.38	962.64	+0.39
PA182	115.44	115.29	0.11	13.66	366.50	20.39
PA183	115.32	115.22	0.11	5.79	139.40	20.39
PA203	118.62	118.46	0.11			*5.59
PA201	118.70	118.49	0.11			*5.59
PA202	117.48	117.27	0.21			*5.59
PA203	118.79	118.52	0.27			*5.59
PA204	117.96	117.75	0.21			*5.59
PA205	115.68	115.38	0.30			*5.59
PA206	114.60	114.46	0.11			*3.59

Ponding volumes for the rear yards are not taken into account for storage capacity

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4	AS PER CITY COMMENTS	DEC. 06/16	JMD
5	FOR ORDERING	FEB. 3/17	JMD
6	AS PER CITY COMMENTS	FEB. 9/17	JMD
7	ISSUED FOR TENDER	FEB. 23/17	JMD
8	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
9	SUBMITTED FOR APPROVAL	APR. 12/17	JMD

SCALE
1:500
0m 5 10m
HORIZONTAL

DESIGN AGS
CHECKED JMD
DRAWN SAB
CHECKED AGS
APPROVED JMD

LICENSED PROFESSIONAL ENGINEER A. G. Y. SAUVE 100147393 Apr 12, 2017 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO

ATREL Engineering Ltd.
Engineers - Ingénieurs

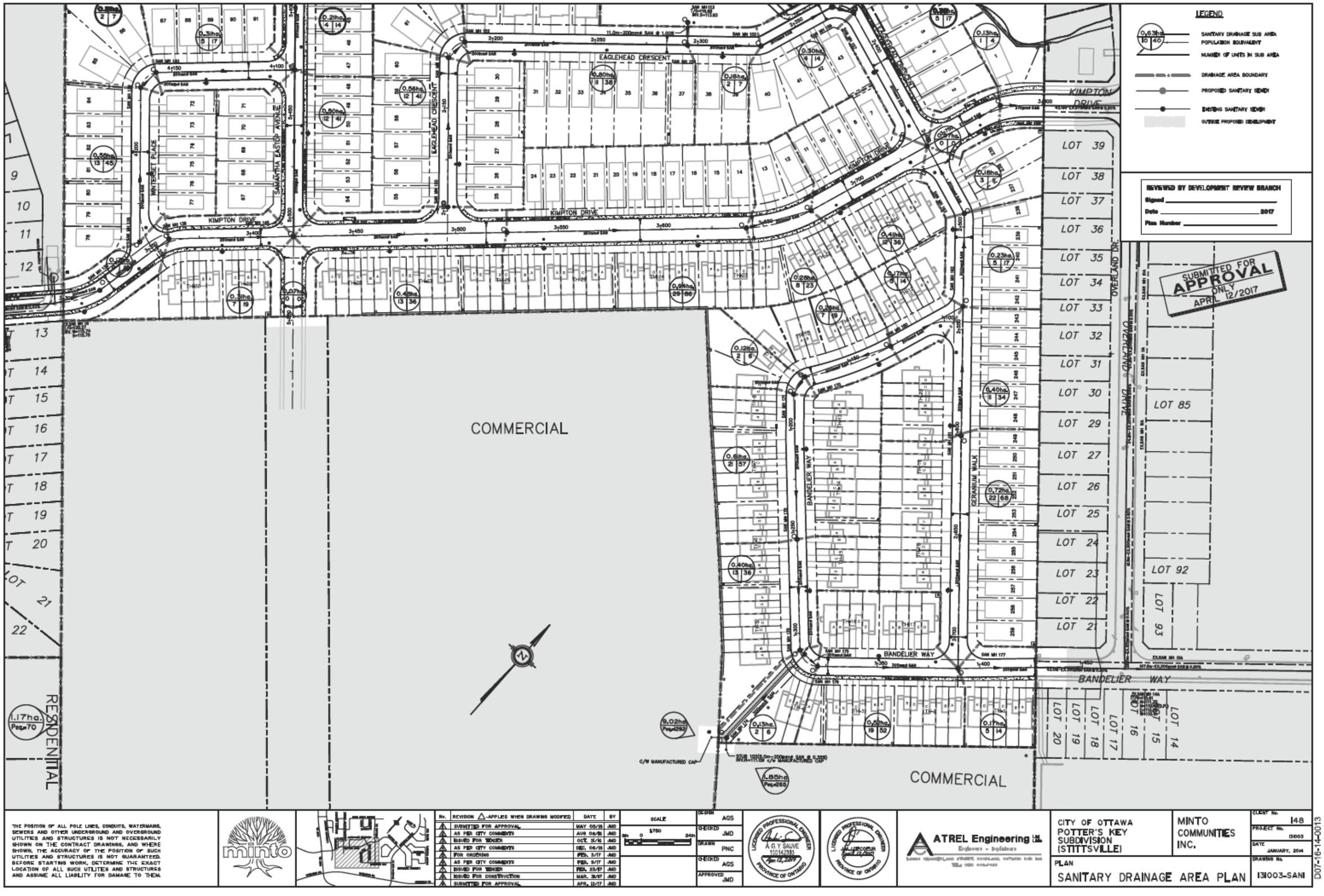
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

CLIENT No. 148
PROJECT No. 131003
DATE JANUARY, 2014
DRAWING No. 131003-PA3

PLAN
PONDING AREA PLAN

D07-16-14-0013



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7	ISSUED FOR TENDER	FEB. 23/17	JMD
8	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
9	SUBMITTED FOR APPROVAL	APR. 12/17	JMD

SCALE 1:750 0m 0 24m

DESIGN AGS
CHECKED JMD
DRAWN PNC
CHECKED AGS
APPROVED JMD

LICENSED PROFESSIONAL ENGINEER A.G.Y. SAUVE 100147380 Apr 12, 2017 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER M. LESCOURR PROVINCE OF ONTARIO

ATREL Engineering Ltd. Engineers - Ingénieurs

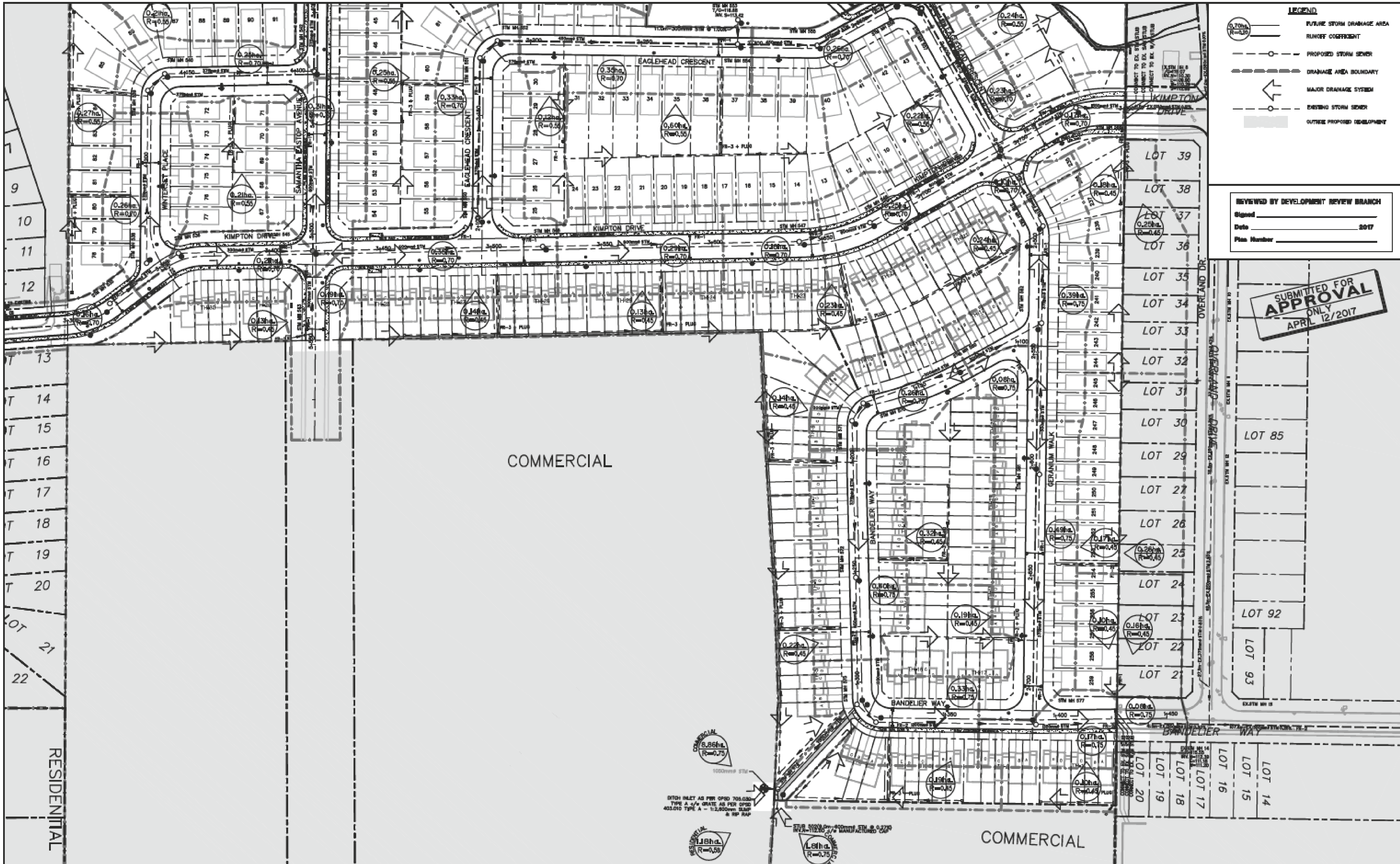
CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

PLAN
SANITARY DRAINAGE AREA PLAN

CLIENT No. 148
PROJECT No. 13003
DATE JANUARY, 2014
DRAWING No. 13003-SANI

D07-16-14-0013



LEGEND

- FUTURE STORM DRAINAGE AREA (0.70ha.)
- RUNOFF COEFFICIENT (R=0.20)
- PROPOSED STORM SEWER
- DRAINAGE AREA BOUNDARY
- MAJOR DRAINAGE SYSTEM
- EXISTING STORM SEWER
- OUTSIDE PROPOSED DEVELOPMENT

REVIEWED BY DEVELOPMENT REVIEW BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

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.

minto

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△	ISSUED FOR CONSTRUCTION	MAR. 31/17	JMD
△	SUBMITTED FOR APPROVAL	APR. 12/17	JMD

SCALE 1:750 (0m – 24m)

DESIGN	AGS
CHECKED	JMD
DRAWN	PNC
CHECKED	AGS
APPROVED	JMD

LICENSED PROFESSIONAL ENGINEER — A. G. Y. SAUVE — 100142380 — Apr 12, 2017 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

ATREL Engineering Ltd.
Engineers – Ingénieurs

CITY OF OTTAWA
POTTER'S KEY SUBDIVISION (STITTSVILLE)

MINTO COMMUNITIES INC.

CLIENT No. 148
PROJECT No. 131003
DATE JANUARY, 2014

PLAN
STORM DRAINAGE AREA PLAN

DRAWING No. 131003-STM1

D07-16-14-0013

MINTO COMMUNITIES INC.

STORMWATER MANAGEMENT, WATERMAIN, STORM SEWER AND SANITARY SEWER

DESIGN BRIEF

PART OF LOT 23 AND 24
CONCESSION 12

POTTER'S KEY SUBDIVISION

CITY OF OTTAWA

FEBRUARY 2017

ATREL Engineering Ltd. Ltée.
Engineers - Ingénieurs

(Revision 5)

SANITARY SEWER COMPUTATION FORM

DATE: February 2017
DESIGNED BY: VLL
CHECKED BY: AGS

PROJECT: **POTTER'S KEY SUBDIVISION**
CLIENT: Minto Communities Inc.
PROJECT #: 131003
BY: ATREL ENGINEERING LTD

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

Table 20
Single dwelling= 3.4 person/unit
Townhouse= 2.7 person/unit

STREET NAMES	LOCATION FROM (Up)		LOCATION TO (Down)		RESIDENTIAL INDIVIDUAL AREA (ha.)	RESIDENTIAL INDIVIDUAL POP.	RESIDENTIAL CUMULATIVE AREA (ha.)	RESIDENTIAL CUMULATIVE POP.	RESIDENTIAL PEAKING FACTOR M	RESIDENTIAL FLOW Q(p) (L/S)	COMMERCIAL, INSTITUTIONAL INDIVIDUAL AREA (ha.)	COMMERCIAL, INSTITUTIONAL INDIVIDUAL POP.	COMMERCIAL, INSTITUTIONAL CUMULATIVE AREA (ha.)	COMMERCIAL, INSTITUTIONAL CUMULATIVE POP.	COMMERCIAL, INSTITUTIONAL PEAKING FACTOR M	COMMERCIAL, INSTITUTIONAL FLOW Q(p) (L/S)	COMMERCIAL, INSTITUTIONAL PEAKING FACTOR M	COMMERCIAL, INSTITUTIONAL FLOW Q(p) (L/S)	PEAK EXT.FLOW Q(i) (L/S)	PEAK DES. Q(d) (L/S)	SEWER DATA TYPE PIPE	DIA. (NOM) (mm)	DIA. (ACT) (MM)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	UpStream Obv. (M)	UpStream Inv. (M)	DwnStream Obv. (M)	DwnStream Inv. (M)
Eaglehead Crescent	MH	150	MH	151	0.56	41.0	0.56	41	4.00	0.66									0.16	0.82	PVC	200	201.2	0.85	72.5	30.71	97%	0.97	115.06	114.86	114.44	114.24
Eaglehead Crescent	MH	151	MH	152	0.21	7.0	0.77	48	4.00	0.78									0.22	0.99	PVC	200	201.2	0.85	11.0	30.71	97%	0.97	114.41	114.21	114.32	114.12
Eaglehead Crescent	MH	152	MH	154	0.80	38.0	1.57	86	4.00	1.39									0.44	1.83	PVC	200	201.2	0.85	108.5	30.71	94%	0.97	114.14	113.94	113.22	113.02
Park 2	MH	153	MH	154	0.37		0.37												0.10	0.10	PVC	200	201.2	1.00	11.0	33.31	100%	1.05	114.13	113.93	114.02	113.82
Eaglehead Crescent	MH	154	MH	155	0.16	7.0	2.10	93	4.00	1.51									0.59	2.09	PVC	200	201.2	0.85	36.0	30.71	93%	0.97	113.22	113.02	112.91	112.71
Eaglehead Crescent	MH	155	MH	156	0.30	14.0	2.40	107	4.00	1.73									0.67	2.41	PVC	200	201.2	0.50	39.5	23.55	90%	0.74	112.88	112.68	112.68	112.48
Eaglehead Crescent	MH	156	MH	157			2.40	107	4.00	1.73									0.67	2.41	PVC	200	201.2	0.50	11.0	23.55	90%	0.74	112.65	112.45	112.59	112.39
Eaglehead Crescent	MH	157	MH	165	0.38	17.0	2.78	124	4.00	2.01									0.78	2.79	PVC	200	201.2	1.24	73.5	37.09	92%	1.17	112.56	112.36	111.65	111.45
Bandelier Way	MH	160	MH	162	0.17	14.0	0.17	14	4.00	0.23									0.05	0.27	PVC	200	201.2	0.65	40.0	26.86	99%	0.84	114.18	113.98	113.92	113.72
Geranium Walk	MH	161	MH	162	0.40	34.0	0.40	34	4.00	0.55									0.11	0.66	PVC	200	201.2	0.65	63.0	26.86	98%	0.84	114.28	114.08	113.87	113.67
Geranium Walk	MH	162	MH	163	0.23	17.0	0.80	65	4.00	1.05									0.22	1.28	PVC	200	201.2	0.50	45.5	23.55	95%	0.74	113.32	113.12	113.09	112.89
Geranium Walk	MH	163	MH	165	0.18	11.0	0.98	76	4.00	1.23									0.27	1.51	PVC	200	201.2	0.50	37.5	23.55	94%	0.74	113.06	112.86	112.87	112.67
Kimpton Drive	MH	165	MH	166	0.07		16.43	1020	3.79	15.68									4.60	20.28	PVC	375	366.4	0.20	41.0	73.72	72%	0.70	111.58	111.21	111.50	111.13
Kimpton Drive	MH	166	CAP	Kimpt. Dr	0.13	4.0	16.56	1024	3.79	15.74									4.64	20.37	CONC	375	381.0	0.20	21.0	81.80	75%	0.72	109.04	108.67	109.00	108.63
Kimpton Drive	CAP	Kimpt. Dr	EX	8 A			16.56	1024	3.79	15.74									4.64	20.37	CONC	375	381.0	0.20	43.0	81.80	75%	0.72	109.00	108.63	108.91	108.54
Bandelier Way	MH	160	MH	170	0.26	19.0	0.26	19	4.00	0.31									0.07	0.38	PVC	200	201.2	0.75	44.5	28.85	99%	0.91	114.05	113.85	113.72	113.52
Bandelier Way	MH	170	MH	171	0.12	6.0	0.38	25	4.00	0.41									0.11	0.51	PVC	200	201.2	0.75	10.0	28.85	98%	0.91	113.69	113.49	113.61	113.41
Bandelier Way	MH	171	MH	172	0.61	57.0	0.99	82	4.00	1.33									0.28	1.61	PVC	200	201.2	0.75	71.0	28.85	94%	0.91	113.58	113.38	113.05	112.85
Bandelier Way	MH	172	MH	173	0.40	36.0	1.39	118	4.00	1.91									0.39	2.30	PVC	200	201.2	0.65	54.0	26.86	91%	0.84	113.05	112.85	112.70	112.50
Bandelier Way	MH	173	MH	175			1.39	118	4.00	1.91									0.39	2.30	PVC	200	201.2	0.65	3.0	26.86	91%	0.84	112.67	112.47	112.65	112.45
Commercial (by Minto)	STUB	102	MH	174							1.85	265.0	1.85	265	1.50	1.61			0.52	2.13	PVC	200	201.2	0.35	6.0	19.71	89%	0.62	111.29	111.09	111.27	111.07
Easement	MH	174	MH	175			1.17	70	4.00	1.13			10.87	1557	1.50	9.46			3.37	13.97	PVC	300	299.2	0.23	55.5	46.05	70%	0.65	111.27	110.97	111.14	110.84
Bandelier Way	MH	175	MH	176	0.13	6.0	2.69	194	4.00	3.14			10.87	1557	1.50	9.46			3.80	16.40	PVC	300	299.2	0.23	8.5	46.05	64%	0.65	111.08	110.78	111.06	110.76
Bandelier Way	MH	176	MH	177	0.52	52.0	3.21	246	4.00	3.99			10.87	1557	1.50	9.46			3.94	17.39	PVC	300	299.2	0.23	68.5	46.05	62%	0.65	111.03	110.73	110.87	110.57
Geranium Walk	MH	161	MH	177	0.72	68.0	0.72	68	4.00	1.10									0.20	1.30	PVC	200	201.2	1.50	113.5	40.80	97%	1.28	114.14	113.94	112.44	112.24
Bandelier Way	MH	177	CAP	Bandelier Way	0.17	14.0	4.10	328	4.00	5.31			10.87	1557	1.50	9.46			4.19	18.97	CONC	300	304.8	0.20	38.0	44.55	57%	0.61	110.87	110.57	110.80	110.50
Street No.2	CAP	Bandelier Way	EX	14 A			4.10	328	4.00	5.31			10.87	1557	1.50	9.46			4.19	18.97	CONC	300	304.8	0.20	43.0	45.12	58%	0.62	110.80	110.50	110.71	110.41

Existing Sanitary Sewers

LICENSED PROFESSIONAL ENGINEER
A. G. Y. SAUVE
100142393
Feb. 24, 2017
PROVINCE OF ONTARIO

Feedmill Creek
Stormwater Management Criteria Study

Final Report
with Expansion Area 3 and Update
April 30 2018

Submitted to:

City of Ottawa
Planning and Infrastructure

Submitted by:

J.F. Sabourin and Associates Inc.

In association with:

Coldwater Consulting Ltd

JFSA Ref. No.: 1307(01)-17

J.F. Sabourin and Associates Inc.
www.jfsa.com

JFSA Water Resources and Environmental Consultants

5.2 SWM Criteria

The SWM criteria for future developments within the Feedmill Creek subwatershed apply to the approximately 175.10 ha of remaining developable land within the Feedmill Creek subwatershed (refer to Table 1 and Figure 2). The SWM criteria have been developed based on data collected during a field investigation and analysis of hydrologic, hydraulic and geomorphic numerical simulations and calculations. The SWM criteria are setup to resolve both existing and future flood and erosion risk along Feedmill Creek. This study followed a step-by-step process considering four (4) SWM scenarios for the ultimate full build out conditions. The ultimate development conditions SWM control Scenario B has been selected as the 'optimal' scenario and forms the basis for these criteria.

There are four (4) components for SWM criteria, on-site extended detention storage, 100-year on-site storage, on-site LID controls and in-stream works.

The SWM criteria are as follows:

1. Extended Detention Control: Provide sufficient on-site storage volume to control the peak flow from a 15 mm 3-hour Chicago design storm to 0.51 L/s/ha.

2. Flood Control: Provide sufficient on-site storage volume and quantity control structure to control the peak flow from a 100-year 12-hour SCS Type II storm to 8.0 L/s/ha[3].

3. Retention Control: Provide on-site Low Impact Development (LID) controls to retain the entire volume (no runoff) from either a 5 mm or 10 mm rainfall depending on location:

    a. 5 mm for catchments located east of Carp Road (FS206_2, FS204, FS203a, FS203b, FS067_4, FS075_1, FS081_2 and FS107)

    b. 10 mm for catchments located west of Carp Road (FS103_2b and FS104_2b)[4]

4. In-stream works are required in addition to the SWM controls detailed above. A design has been prepared by Coldwater (2017b), refer to Appendix B of this report.

[3] Flood control requirements are listed for the 100-year event only, meeting this 100-year requirement will practically require inherent peak flow controls for more frequent events. The peak flow results from the 15-mm 3-hour Chicago storm and the 2- to 100-year 12-hour SCS Type II storm for near future conditions and ultimate development conditions SWM Scenario B are included in Appendix H for reference. These values should be referenced by detailed designers, in addition to the hydraulic constraints, since the overall goal of post-to-pre control on the subwatershed level applies to all return periods.

[4] The interim, near future and ultimate conditions model results for the Timbermere SWM pond are above the original design report. The proper functioning of that facility must be assessed and resolved before development can occur on the upstream catchments notwithstanding these SWM Criteria.

D07-16-03-0032

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IBI GROUP

3.3 Comparison of Peak Flows

The end-of-pipe stormwater management facility, in combination with the dual drainage system, was adjusted in the SWMHYMO model to ensure that there is no increase in peak outflows above that of the pre-development conditions. The comparison of the simulated pre-development and post-development flows and storages is presented in Table 1. Refer to Appendix A for SWMHYMO calculations and parameters and to Appendix B for the model schematic and output.

Table 1. Comparison of Simulated Peak Flows and Summary of the Required Storage Volumes

Storm Event		25 mm Chicago		2-year SCS Type II		5-year SCS Type II		100-year SCS Type II		100-year Chicago
		Pre-dev.	Post-dev.	Pre-dev.	Post-dev.	Pre-dev.	Post-dev.	Pre-dev.	Post-dev.	Post-dev.
Jackson Trails SWM Facility	Peak Flows (cms)	0.5	0.5	1.0	1.1	1.5	1.8	2.8	3.0	2.6
	Storage (ha-m)	N/A	0.7	N/A	1.1	N/A	1.3	N/A	1.7	1.6
	Elevation (m)	N/A	110.13	N/A	110.35	N/A	110.52	N/A	110.72	N/A
Feedmill Creek downstream of proposed SWM Facility outlet	Peak Flows (cms)	0.8	0.6	1.4	1.4	2.1	2.1	4.0	4.0	3.8

The comparison of peak flows in the above table indicates that the proposed stormwater management facility will meet peak flows to pre-development levels. Design of the stormwater management facility is discussed in Section 4.0.

3.4 Water Quality Benefits

According to the recommendations in the Carp River Watershed/Subwatershed study, the end-of-pipe stormwater management facility should be designed to provide an Enhanced Level of Protection due to the cool water fish habitat in Feedmill Creek. According to the MOE Stormwater Management Planning and Design Manual, March 2003, the treatment volume is a function of the drainage area, the urban imperviousness ratio and the level of protection. The storage requirements suggested by the MOE are summarized in Table 2 and calculations are summarized in Appendix A.

Table 2. Water Quality Volumes

Enhanced Level of Protection – Hybrid Wet Pond			
Overall Removal Efficiency of TSS 80%			
Urban Drainage (ha)	Imperviousness Ratio (Unit Storage for Hybrid Wet Pond) (%)	Permanent Storage (m^3)	Extended Detention Storage (m^3)
79.3	54	8564	3172

The above table indicates that the permanent storage of the facility, a hybrid wet pond, would be 0.86 ha-m, while the extended storage would be 0.32 ha-m. The facility's permanent storage was oversized to 1.89 ha-m to provide a deep pool at the outlet to mitigate thermal impacts as discussed in Section 4.3.

Past studies by CH2M Hill (Kanata North Environmental/Stormwater Management Plan, February 2001), Dillon Consulting (Shirley's Brook/Watts Creek Subwatershed Study, 1999) and CCL (City of Kanata, Kanata Town Centre Master Drainage Study Watts Creek, May 1993) have investigated the issue of erosion protection downstream of stormwater management facilities. In particular, Dillon Consulting found in their 1999 report that "40 m^3 per hectare live storage detention by meeting MOE Level 2 treatment volume requirements will provide sufficient attenuation of flows from relatively frequent runoff events to control the frequency and duration with downstream watercourse flows exceed critical erosive flows."

Although the names of the treatment protection were changed in the March 2003 MOE Manual, according to past experience, any treatment above, but not including, Basic Level of Protection provides erosion control by slowing the release of water from the facility during frequent storms which have an increased potential to cause erosion. CCL/IBI has conducted several studies to evaluate cumulative shear stress erosion and resulting potential for erosion for both pre- and post-development conditions. In all of the studies, Normal Level of Protection implies that watercourse erosion control is provided. The cumulative shear stress is decreased due to the water quality outlet, which reduces outflows below erosion potential. Since the Jackson Trails stormwater management facility is designed to provide a higher level of protection (an Enhanced Level of Protection) the erosion protection will be achieved.

3.5 Groundwater Recharge

In "Tamarack Lands (Jackson Trails) Stormwater Management Report," CCL/IBI, January 2005, several types of BMP's were investigated to promote groundwater recharge into the Poole Creek subwatershed. The suitability of each of the proposed BMP's was assessed during the detailed design of the subdivision, and infiltration techniques based on the principles of infiltration trenches will be implemented.

The proposed site grading is designed on lot split-drainage principles, directing runoff from roofs onto grassed surfaces. There will be significant bedrock blasted within the Jackson Trails development to construct basements and the stormwater management facility, producing a considerable amount of blasted rock. This rock will be

Appendix I – Checklist

GENERAL CONTENT		RESPONSE
☐	Executive Summary (for larger reports only).	Not included
☒	Date and revision number of the report.	Date of report provided
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Page 1 and Appendix J
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Various Sections of report
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 4, Section 7
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Included
☒	Statement of objectives and servicing criteria.	Included
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 2 & 3 of report
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Not applicable
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Section 7, Appendix J
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	Not applicable
☐	Proposed phasing of the development, if applicable.	Not applicable
☐	Reference to geotechnical studies and recommendations concerning servicing.	Not applicable
☒	All preliminary and formal site plan submissions should have the following information: Metric scale North arrow (including construction North) Key plan name and contact information of applicant and property owner Property limits including bearings and dimensions Existing and proposed structures and parking areas Easements, road widening and rights-of-way Adjacent street names	Civil and Architectural Plans provided separately
DEVELOPMENT SERVICING REPORT: WATER		**RESPONSE**
☐	Confirm consistency with Master Servicing Study, if available Availability of public infrastructure to service proposed development Identification of system constraints	Not applicable
☒	Identify boundary conditions	Section 5
☒	Confirmation of adequate domestic supply and pressure	Section 5
☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 5
☒	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Section 5
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	Not applicable
☐	Address reliability requirements such as appropriate location of shut-off valves Check on the necessity of a pressure zone boundary modification.	Not applicable
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 5
☒	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 5

☐	Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	Not applicable
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 5
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Not applicable
DEVELOPMENT SERVICING REPORT: WASTEWATER		**RESPONSE**
☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 6
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Not applicable
☒	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	Section 6
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 6
☐	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Not applicable
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Appendix D
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 6
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	Not applicable
☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Not applicable
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	Not applicable
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	Not applicable
☐	Special considerations such as contamination, corrosive environment etc.	Not applicable
DEVELOPMENT SERVICING REPORT: STORMWATER CHECKLIST		**RESPONSE**
☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 7
☐	Analysis of available capacity in existing public infrastructure.	Not applicable
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Appendix A, Drawings provided separately
☐	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Not Applicable
☐	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Not Applicable
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 7
☐	Set-back from private sewage disposal systems. Watercourse and hazard lands setbacks.	Not Applicable
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Not Applicable.
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 7
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 7

☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Not Applicable
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Pre-Dev not calculated. Post-Dev Flows Calculated
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	Not Applicable
☒	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 7
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	Not Applicable
☐	Identification of potential impacts to receiving watercourses Identification of municipal drains and related approval requirements.	Not Applicable
☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 7
☒	100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	To Be Provided During Detailed Design Stage.
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Not Applicable
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	Not Applicable.
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	Not applicable
☒	The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:	To Be Provided During Detailed Design Stage.
☐	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in theAct.	Not Applicable
☒	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	To Be Provided During Detailed Design Stage.
☐	Changes to Municipal Drains.	Not Applicable
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Not Applicable
CONCLUSION CHECKLIST		**RESPONSE**
☒	Clearly stated conclusions and recommendations	In Section 9
☒	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Appendix G
☒	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	Signed and stamped

Appendix J – Drawings

Site Plan & Survey Drawings

- Site Plan, SP-00
- Topographic Plan

Engineering Drawings (provided separately)

- SSP1 – Site Servicing Plan – Rev.2
- GPM – Macro Grading Plan – Rev.2
- PP01 – Plan and Profile Street 1 – Rev.1
- PP02 – Plan and Profile Street 2 – Rev.1
- PP03 – Plan and Profile Street 2 – Rev.1
- PP04 – Plan and Profile Street 2 – Rev.1
- PP05 – Plan and Profile Street 2 – Rev.1
- PP06 – Plan and Profile Street 2 – Rev.1
- PP07 – Plan and Profile Street 4 – Rev.1
- PP08 – Plan and Profile Street 5 – Rev.1
- PP09 – Plan and Profile Samantha Eastop Ave– Rev.1
- PP010 – Plan and Profile Sanitary Outlet – Rev.1
- PP011 – Plan and Profile Storm Outlet – Rev.1
- STMW – SWM-Details – Rev.1
- STMM – Macro Storm Drainage Plan – Rev.2
- SANM – Macro Sanitary Drainage Plan – Rev.2
- ESCM – Macro Erosion and Sediment Control Plan – Rev.2

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

REGISTERED PLAN 4M-1597

BLOCK 273 — PLAN 4R-31433 — PLAN 4R-31722
BLOCK 274 — PLAN 4R-31529 — PLAN 4R-31439 — PLAN 4R-31436 — PLAN 4R-31022 — PLAN 4R-31074
BLOCK 275 — PLAN 4R-31057

KIMPTON DRIVE
promenade PIN 04487-2919
BLOCK 295 (0.3 RESERVE) PIN 04487-2911
avenue SAMANTHA EASKOP AVENUE
BLOCK 294 (0.3 RESERVE)
BLOCK 293 (0.3 RESERVE)
300mm STORM SEWER
300mm WATERMAIN
BLOCK 279 (0.3 RESERVE) PIN 04487-2895
N 46° 31' 50" E 313.22
2± High Board Fence
Top of Slope
Bottom of Slope
Low Stone Wall

PLAN 4R-31830
BLOCK 278
PART 1 PIN 04487-3061
PART 2
N 44° 47' 55" W 116.20
G.R.I.S (NAD 83 ZONE 9)

LOT 13 PIN 04487-0613
LOT 14 PIN 04487-0614
LOT 15 PIN 04487-0615
LOT 16 PIN 04487-0616
LOT 17 PIN 04487-0617
LOT 18 PIN 04487-0618
LOT 19 PIN 04487-0619
LOT 20 PIN 04487-0620
LOT 21 PIN 04487-0621
LOT 22 PIN 04487-0622

2.3± High Board Fence
GATE
Dia. 0.50
(Deciduous) Treed Area
Bottom of Slope
Top of Slope
Piles of Rock, Earth & Construction Debris
PART 6, 4R-23045
PART 4, 4R-23045
PART 2, 4R-23045
PART 1, 5R-2345 PIN 04487-0375
PART 2, 5R-2345 PIN 04487-0376
Treed Area
Clump of Trees
Trees (Deciduous)
Dia. 0.10 (x2)
Dia. 0.20
15" W
45.65
95.16
48.51

PART 1 PIN 04487-3057
PART 2 PIN 04487-3058
PART 3 PIN 04487-3059
PART 4 PIN 04487-3060
PART 5 PIN 04487-3063
PART 6 PIN 04487-3064
PART 7 PIN 04487-3065
PART 8 PIN 04487-3066
PART 9 PIN 04487-3067
PART 10 PIN 04487-3069
PART 11 PIN 04487-3070
PART 12 PIN 04487-3071
PART 13 PIN 04487-3072
PART 14 PIN 04487-3073
PART 15 PIN 04487-3074
PART 16 PIN 04487-3075
PART 17 PIN 04487-3076
PART 18 PIN 04487-3077
PART 19 PIN 04487-3078
PART 20 PIN 04487-3079
PART 21 PIN 04487-3080
PLAN 4R-31659 BLOCK 281
PLAN 4R-31709 BLOCK 284
PLAN 4R-31987 BLOCK 283
2± High Board Fence
N 45° 25' 30" W 92.89
N 38° 25' 30" W 55.15
N 04° 30' 00" W 12.85
BLOCK 265
BLOCK 282 PART 1 4R-32057
BLOCK 272 (0.3 RESERVE) PIN 04487-2888
LOT 24 PART 2, 4R-3069 PIN 04487-2615
Approximate Limit of Ditch

JOB BENCH MARK
Top of Head of Magnetic Nail Set in Side of Concrete Sign Base 0.2± Above Grade
Elevation=120.77

BELL (2011) UP
STREET LIGHTING
TRAFFIC
300mm VITAL GAS
750mm WATERMAIN
750mm STORM SEWER
Depressed Curb
Concrete
Old Concrete Sign Base
Metal Utility Cabinet on Concrete Base
NOTE: AREA COVERED IN SNOW AND ICE UNABLE TO SHOW END OF CURB AND SIDEWALK
TRAFFIC LOOP
EAST BOUND TRAFFIC
WEST BOUND TRAFFIC
825mm STORM SEWER
GRASS
Asphalt
R=896.05
C=101.35
N 52° 44' 20" E
N 56° 58' 20" E
A=30.99
C=30.98
A=10.59
C=10.59
N 56° 15' 15" E

TOPOGRAPHIC PLAN OF
PART OF LOT 23
CONCESSION 12
GEOGRAPHIC TOWNSHIP OF GOULBOURN
CITY OF OTTAWA

SCALE 1 : 500
0 10 20 50 metres

FAIRHALL, MOFFATT & WOODLAND LIMITED
ONTARIO LAND SURVEYORS

ELEVATION NOTES

1. ELEVATIONS ARE REFERRED TO GEODETIC DATUM (CGVD28).
2. ELEVATIONS FOR MANHOLE COVERS AND CATCH BASINS HAVE TO BE INDEPENDENTLY CONFIRMED BEFORE THEY CAN BE ACCEPTED FOR FINAL DESIGN OR CONSTRUCTION PURPOSES.
3. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCH MARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT THE RELATIVE ELEVATION AND DESCRIPTION AGREE WITH THE INFORMATION SHOWN ON THIS DRAWING.

UTILITY NOTES

1. UNDERGROUND UTILITY INFORMATION HAS BEEN COMPILED FROM PLANS P-Q-18, P-P-13 AND RECORD DRAWING No. 131003-P10 PROVIDED BY THE CITY OF OTTAWA AND CONFIRMED IN THE FIELD WHERE POSSIBLE.
2. THIS DRAWING CANNOT BE ACCEPTED AS ACKNOWLEDGING ALL OF THE UNDERGROUND UTILITIES AND IT WILL BE THE RESPONSIBILITY OF THE USER TO CONTACT THE RESPECTIVE UTILITY AUTHORITIES FOR CONFIRMATION OR LOCATION.
3. BEFORE ANY WORK INVOLVING PROBING, EXCAVATING, ETC., A FIELD LOCATION OF UNDERGROUND PLANT BY THE PERTINENT UTILITY AUTHORITY IS MANDATORY.

NOTES

1. BOUNDARY DIMENSIONS HAVE BEEN TAKEN FROM PLAN 4R-23045.
2. THIS SURVEY WAS CARRIED OUT UNDER WINTER CONDITIONS.
3. THE CAD FILE IS REFERENCED TO THE MTM GRID SYSTEM, ZONE 9, NAD83 (ORIGINAL).
4. DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR 0.99991.

LEGEND

DIA.	– DIAMETER
⌀	– DIAMETER
PIN	– PROPERTY IDENTIFIER NUMBER
PT	– PART
CB	– CATCH BASIN
MH	– MANHOLE
WV	– WATER VALVE
LS	– LAMP STANDARD
L	– LAMP
UP	– UTILITY POLE
HH	– HAND HOLE
BELP	– BELL PEDESTAL
	– GUY WIRE AND ANCHOR
	– SIGN
	– DECIDUOUS TREE
	– OVERHEAD UTILITY WIRES
	– CURB (ELEVATIONS AT BOTTOM OF CURB, CURBS 0.15± HIGH)
	– CURB (UNABLE TO LOCATE – ASSUMED)
ST	– STORM SEWER
W	– WATERMAIN
G	– GAS LINE
B	– BELL
T	– TRAFFIC
SL	– STREET LIGHTING

DATE OF SURVEY: JANUARY 14, 2020.

Fairhall Moffatt & Woodland
LIMITED
ONTARIO LAND SURVEYORS
OTTAWA
Surveying and Land Information Services
235 TERENCE MATTHEWS CRESCENT, KANATA, ONTARIO K2M 2B3
TEL: (613) 591-2060 FAX: (613) 591-1405
www.fmw.on.ca

JOB No. Z 38800
REFERENCE No. 415(a) – 12 GOULBOURN
S:\JOBS\Z3800\DWGS 2020-01-15 tp388d.DWG (ab)

TOTAL NUMBER OF UNITS		
UNIT TYPE	UNIT COUNT	BEDROOMS
TOWNHOUSES		
A	10	3
B	25	3
C	60	3/4
D	56	3/4
	151	
SINGLE HOUSES		
1	5	3/4/5
2	5	4/5
3	5	3/4
4	5	4/5
	20	
9 STORY APP.		
APP. A	101	1
APP. B	42	2
APP. C	26	3
	169	
4 STORY CONDOS		
CONDO A	110	1
CONDO B	130	1
	240	

FOR INFORMATION
IN PROGRESS
APRIL 28, 2021

BIM 360://HAZELDEAN-KANATA\20019_HAEZLDEAN_SITE PLN_R21.rvt

Project

HAZELDEAN HORIZONS

HAZELDEAN ROAD, OTTAWA

Owner

LATITUDE Homes

Architect

PMA ARCHITECTES

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QUÉBEC (QC) G1W 2K4

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ecsi + LAPALME RHEAULT
ARCHITECTES + ASSOCIÉS

Mechanic-electricity

Landscape architect

Structural engineer

Designer

Co-LaBB DESIGN

Seal

Seal

Revision

N°	Description	Date
1	FOR COORDINATION	2021-04-28

Reference

A: Detail number
B: Number of the sheet where it is detailed

Note

Before starting work the contractor will have to check all dimensions and site conditions and notify the architect in writing if there is a discrepancy. This document and its content are protected by copyright laws and any copying is prohibited unless granted permission by the architect.

Date: 2021-04-28
Scale: 1 : 500
Folder: 20019
Draw by: EBS

Title

SITE PLAN

Sheet

A100