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Multi-Tower Development
2 Robinson Avenue

Development Servicing Study and Stormwater Management Report

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PROPOSED MULTI-TOWER DEVELOPMENT
2 ROBINSON AVENUE

DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT

Prepared by:

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Suite 200, 240 Michael Cowpland Drive
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November 15, 2021
Revised March 30, 2022
Revised October 7, 2022

Ref: R-2020-059
Novatech File No. 119171

October 7, 2022

2 Robinson Avenue Limited Partnership
88 Albert Street,
Ottawa, ON
K1P 5E9

Attention: **Mr. Kieran Waugh**

Dear Sir:

Re: Development Servicing Study and Stormwater Management Report
Proposed Multi-Tower Development
320 Lees Avenue (2 Robinson Avenue), Ottawa, ON
Novatech File No.: 119171

Enclosed is a copy of the revised 'Development Servicing Study and Stormwater Management Report' for the proposed multi-tower residential development located at 2 Robinson Avenue, in the City of Ottawa. This report addresses the approach to site servicing and stormwater management and is submitted in support of a Site Plan Control application.

Please contact the undersigned, should you have any questions or require additional information.

Yours truly,

NOVATECH

François Thauvette

François Thauvette, P. Eng.
Senior Project Manager

FT/sm

cc: Shawn Wessel (City of Ottawa)
Rob Verch (RLA)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

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1.0 INTRODUCTION

A new multi-tower mixed-use development is being proposed by 2 Robinson Avenue Limited Partnership and Novatech has been retained to complete the civil engineering design for the project. This report addresses the approach to site servicing and stormwater management and is being submitted in support of a Site Plan Control application.

1.1 Location and Site Description

The subject site is located at 2 Robinson Avenue, in the City of Ottawa. Although mostly undeveloped, the 2.3 ha site was previously occupied by a small building (recently demolished) and associated parking lot. The subject site is located on the north side of Highway 417, near the Nicholas Street/Mann Avenue westbound off-ramp and is bordered by Lees Avenue to the south, Chapel Crescent to the east, residential properties to the north and the Sandy Hill Arena, baseball diamond and associated parking lots to the west. The legal description of the site is designated as Part of Lot F, Concession D (Rideau Front), Geographic Township of Nepean, City of Ottawa.

Figure 1: Aerial View of the Subject Site including Proposed Site Layout

1.2 Pre-Consultation Information

A pre-consultation meeting was held with the City of Ottawa on October 3, 2019, at which time the client was advised of the general submission requirements. Subsequent meetings were held with the City's Planning and Engineering Department to discuss the approach to site servicing and stormwater management (SWM). The Rideau Valley Conservation Authority (RVCA) and Ministry of Transportation of Ontario (MTO) were also consulted regarding the project. Refer to **Appendix A** for a summary of the correspondence related to the proposed development.

1.3 Proposed Development

The proposed development will consist of a total of four (4) residential towers (A, B, C and D) with podiums above respective underground parking levels. The proposed development will include approximately 1,524 residential units as well as commercial space (i.e., coffee shops, gym, small retail, etc.), internal roadways, loading areas, minimal surface parking and outdoor landscaped amenity space throughout the site. The existing topography will have a significant impact on the proposed development, as the grade drops approximately 9m from the northeast corner down to the southwest corner of the site.

1.4 Reference Material

[1] The Assessment of Adequacy of Public Services Memorandum – Proposed Multi-Tower Development - 2 Robinson Avenue (Ref. No. R-2020-120), prepared by Novatech and revised on June 18, 2021.

[2] The Geotechnical Investigation Report (Ref. No. PG4811-1, Revision 1), prepared by Paterson Group Inc. on May 31, 2021.

2.0 SITE SERVICING

The objective of this report is to demonstrate that proper sewage outlets (sanitary and storm) as well as a suitable domestic water supply and appropriate fire protection are available for the proposed development. The servicing criteria, the expected sewage flows, and water demands are to conform to the requirements of the City of Ottawa municipal design guidelines for sewer and water distribution systems. Stormwater runoff from most of the site will continue to be directed to the nearby Rideau River, via the municipal storm sewer system, while a small portion of the site will continue to sheet drain uncontrolled off-site. On-site stormwater management will be implemented as required to meet the requirements of the City of Ottawa and the Rideau Valley Conservation Authority (RVCA).

The City of Ottawa Servicing Study Guidelines for Development Applications requires that a Development Servicing Study Checklist be included to confirm that each applicable item is deemed complete and ready for review by City of Ottawa Infrastructure Approvals. A completed checklist is enclosed in **Appendix B** of the report.

2.1 Sanitary Servicing

The recently demolished building on site was being serviced by the existing 250mm dia. sanitary, located near the SW corner of the property. The private sanitary sewer runs along the north side of Lees Avenue, adjacent to the existing baseball diamond and parking lot, and discharges into the 450mm dia. sanitary trunk sewer in Mann Avenue. There are no other upstream properties contributing flow to this sewer segment. The municipal sanitary sewer in Mann Avenue drains into the sanitary sewer in King Edward, flows north, then discharges into the 1800mm dia. combined sewer in Templeton Street.

Under post-development conditions, the proposed site will be serviced by extending a new on-site sewer from the existing sanitary sewer (outlet). The proposed sanitary sewer system is shown on the enclosed General Plan of Services (119171-GP) and Notes, Details and Tables Plan (119171-NDT). The advantage of re-using the existing sanitary sewer outlet is that is avoids the construction of a new sanitary sewer within the municipal Right-of-Way.

The City of Ottawa design criteria were used to calculate the theoretical sanitary flows for the proposed development. The following design criteria were taken from Section 4 – 'Sanitary Sewer

Systems' and Appendix 4-A - 'Daily Sewage Flow for Various Types of Establishments' of the City of Ottawa Sewer Design Guidelines:

Residential and Commercial Uses

- Residential Units (Studio or 1-Bedroom): 1.4 people per unit
- Residential Units (2-Bedroom): 2.1 people per unit
- Residential Units (3-Bedroom): 3.1 people per unit
- Average Daily Residential Sewage Flow: 280 L/person/day (ISTB-2018-01)
- Residential Peaking Factor: 3.3 (Harmon Equation)
- Average Commercial Sewage Flow: 2.8 L/m^2/day
- Commercial Peaking Factor = 1.5
- Infiltration Allowance: 0.33 L/s/ha

Table 1 identifies the theoretical sanitary flows for the proposed development based on the above design criteria.

Table 1: Theoretical Post-Development Sanitary Flows

Type of Use	Unit Count (1, 2, 3-bdrm) / Area	Design Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)*
Tower A incl. Podium					
Residential Units	309 / 135 / 13	757	2.45	3.3	8.10
Commercial Space	1,226 m^2	-	0.04	1.5	0.06
Infiltration Allowance	0.55 ha	-	-	-	0.18
Sub-Total	**457 Units**	-	**2.5**	-	**8.3**
Tower B incl. Podium					
Residential Units	234 / 92 / 43	655	2.12	3.3	7.07
Commercial Space	657 m^2	-	0.02	1.5	0.03
Infiltration Allowance	0.30 ha	-	-	-	0.10
Sub-Total	**369 Units**	-	**2.1**	-	**7.2**
Tower C incl. Podium					
Residential Units	241 / 84 / 44	651	2.11	3.3	7.03
Commercial Space	656 m^2	-	0.02	1.5	0.03
Infiltration Allowance	0.33 ha	-	-	-	0.11
Sub-Total	**369 Units**	-	**2.1**	-	**7.2**
Tower D incl. Podium					
Residential Units	191 / 90 / 48	606	1.96	3.3	6.57
Commercial Space	NA	-	-	-	-
Infiltration Allowance	0.88 ha	-	-	-	0.29
Sub-Total	**329 Units**	-	**2.0**	-	**6.9**
TOTAL	**1,524 Units**	**2,669**	**8.7**	-	**29.6**

*Values rounded. Excludes City Park Block flows.

Despite the increase in sewage flow, the theoretical peak flow from the proposed development is less than the full flow capacity of the existing 250mm dia. sewer outlet, which ranges between 39.2 L/s and 62.0 L/s based on a pipe slope of 0.4% to 1.0% (as confirmed in the field). The proposed 200mm dia. sanitary building service laterals at a minimum slope of 1.0% have a minimum full flow conveyance capacity of 34.2 L/s, while the on-site 250mm dia. sanitary sewer at a minimum slope of 2.5% has a full flow conveyance capacity of 98.1 L/s and can accommodate the peak sewage flow. As noted in the correspondence with the City of Ottawa (when the peak sanitary flows were previously estimated to be approximately 26 L/s), the downstream municipal sewers had capacity to accommodate the anticipated flows.

The recently completed CCTV inspection of the existing 250mm dia. sanitary outlet sewer demonstrates that the pipe segments (to be retained) are in good condition and can continue to be used. Refer to **Appendix C** for detailed calculations and for a copy of the CCTV Inspection Report Review Form of the existing sanitary outlet sewer.

2.2 Water Supply for Domestic Use and Firefighting

The subject site is located within the City of Ottawa 1W watermain pressure zone. The recently demolished building on site was being serviced by an existing 150mm dia. watermain, fed off the municipal 600mm dia. feeder main in Chapel Crescent. The on-site watermain and private fire hydrant will be removed as part of the proposed development, however the existing connection to the municipal feedermain will be maintained.

Under post-development conditions, the subject site will require two (2) water supplies as the daily water demands will be greater than 50 m^3/day (0.58 L/s). The proposed site will continue to be serviced by the municipal feedermain in Chapel Crescent, however, the private on-site watermain will need to be increased in size. A municipal watermain extension is also being proposed along Chapel Crescent adjacent to the property to provide a second feed and create a looped watermain on-site. Each building (Towers A, B, C and D) will be equipped with two (2) water services, separated by an isolation valve. The looped watermain network will provided the necessary redundancy and will allow for maintenance without service disruption. The proposed municipal watermain extensions and on-site watermain network are shown on the enclosed Plan and Profile drawings (119171-PR1), General Plan of Services (119171-GP) and Notes, Details and Tables Plan (119171-NDT).

2.2.1 Water Demands and Watermain Analysis

The theoretical water demand and fire flow calculations are based on criteria in the City of Ottawa Design Guidelines. The fire flows have been calculated using the Fire Underwriters Survey (FUS) method, based on information provided by the architect. The following design criteria were taken from Section 4 – 'Water Distribution Systems' of the Ottawa Design Guidelines – Water Distribution:

- Residential Units (Studio or 1-Bedroom): 1.4 people per unit
- Residential Units (2-Bedroom): 2.1 people per unit
- Residential Units (3-Bedroom): 3.1 people per unit
- Average Daily Residential Water Demand: 280 L/person/day (ISTB-2021-03)
- Maximum Day Demand Peaking Factor = 2.5 x Avg. Day Demand (City Water Table 4.2)
- Peak Hour Demand Peaking Factor = 2.2 x Max. Day Demand (City Water Table 4.2)
- Average Commercial Water Demand: 2.8 L/m^2/day
- Maximum Day Demand Peaking Factor = 1.5 x Avg. Day Demand (City Water Table 4.2)
- Peak Hour Demand Peaking Factor = 1.8 x Max. Day Demand (City Water Table 4.2)

The Fire Underwriters Survey (FUS) was used to estimate fire flow requirements for Towers A, B, C and D, based on information provided by the architect. The fire flow requirements include both sprinkler system and hose allowances in accordance with the OBC and NFPA 13. The sprinkler systems will be designed by the fire protection (sprinkler) contractor as this process involves detailed hydraulic calculations based on building layout, pipe runs, head losses, fire pump requirements, etc. Fire flow requirements calculated using the FUS method tend to generate higher values when compared to flows being calculated using the OBC and NFPA.

Table 2 identifies the theoretical domestic water and FUS demands for the development based on the above design criteria.

Table 2: **Theoretical Water Demand for Proposed Development**

Type of Use	Unit Count (1, 2, 3-bdrm) / Area	Design Pop.	Avg. Day Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)	FUS (L/s)
Tower A incl. Podium						
Residential Units	309 / 135 / 13	757	2.45	6.13	13.49	217
Commercial Space	1,226 m^2	-	0.04	0.06	0.11	
Sub-Total	**457 Units**	-	**2.5**	**6.2**	**13.6**	
Tower B incl. Podium						
Residential Units	234 / 92 / 43	655	2.12	5.31	11.67	250
Commercial Space	657 m^2	-	0.02	0.03	0.06	
Sub-Total	**369 Units**	-	**2.1**	**5.3**	**11.7**	
Tower C incl. Podium						
Residential Units	241 / 84 / 44	651	2.11	5.27	11.60	250
Commercial Space	656 m^2	-	0.02	0.03	0.06	
Sub-Total	**369 Units**	-	**2.1**	**5.3**	**11.7**	
Tower D incl. Podium						
Residential Units	191 / 90 / 48	606	1.96	4.91	10.80	183
Commercial Space	NA	-	-	-	-	
Sub-Total	**329 Units**	-	**2.0**	**4.9**	**10.8**	
TOTAL	**1,524 Units**	**2,669**	**8.7**	**21.7**	**47.8**	**250 (Max)**

*Values rounded. Excludes City Park Block demands.

The following design criteria were taken from Section 4.2.2 – 'Watermain Pressure and Demand Objectives' of the City of Ottawa Design Guidelines for Water Distribution:

- Normal operating pressures are to range between 345 kPa (50 psi) and 483 kPa (70 psi) under Max Day demands
- Minimum system pressures are to be 276 kPa (40 psi) under Peak Hour demands
- Minimum system pressures are to be 140 kPa (20 psi) under Max Day + Fire Flow demands

As instructed by the City of Ottawa, the hydraulic analysis will include two (2) watermain scenarios:

- **Scenario 1** includes a looped watermain with two (2) feeds off the municipal watermain network (direct connection off 600mm dia. feedermain in Chapel Crescent as well as a connection to local 200mm dia. watermain in Chapel Crescent / Wiggins Private).
- **Scenario 2** includes a single feed off the local 200mm dia. watermain in Chapel/Wiggins Private without the direct connection to the 600mm dia. feedermain in Chapel Crescent).

The anticipated domestic water demands, and fire flow requirements were provided to the City of Ottawa to generate the municipal watermain network boundary conditions. **Table 3** summarizes the City's municipal watermain boundary conditions and preliminary hydraulic analysis results.

Table 3: **Hydraulic Analysis Results and Watermain Boundary Conditions (Scenario 1)**

Municipal Watermain Boundary Condition	Boundary Condition Head of Water (m)	Normal Operating Pressure Range (psi)	Anticipated WM Pressure (psi)*
Connection 1 (600mm dia. WM in Chapel Crescent)			
Minimum HGL (Peak Hour Demand)	105.3 m	40 psi (min.)	~ 50 psi
Maximum HGL (Max Day Demand)	115.1 m	50-70 psi	~ 64 psi
HGL Max Day + Fire Flow (183-250 L/s)	108.0 m 107.8 m	20 psi (min.)	~ 54 psi
Connection 2 (200mm dia. WM in Chapel Crescent)			
Minimum HGL (Peak Hour Demand)	105.5 m	40 psi (min.)	~ 50 psi
Maximum HGL (Max Day Demand)	115.2 m	50-70 psi	~ 64 psi
HGL Max Day + Fire Flow (183 – 250 L/s)	107.9 m 107.4 m	20 psi (min.)	~ 53 psi

*Based on two (2) municipal watermain feeds with an approximate elevation of 69.9m at WM connections 1 and 2.

The municipal watermain boundary conditions were used to further analyze the proposed on-site watermain network. The hydraulic model EPANET was used to analyzing the two theoretical conditions:

1) Maximum Day + Fire Flow Demand
2) Peak Hour Demand

Refer to **Appendix D** for domestic water demand and FUS calculations, City of Ottawa boundary conditions, the hydraulic modeling schematic and hydraulic modelling results. The schematic representation of the hydraulic network depicts the node and pipe numbers used in the model. **Table 4** and **Table 5** summarize the hydraulic model results for the on-site network under **Scenario 1**, while **Table 6** summarizes the Maximum Day + Fire Flow Demand hydraulic model results for the on-site network under **Scenario 2**.

Table 4: Maximum Day + Fire Flow Demand Condition (Scenario 1 – Two Watermain Feeds)

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower A):** 95 L/s at J9, 95 L/s at J15 and 95L/s at J19 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 337.4 kPa (48.9 psi) is available at Node J15 (Hydrant east of Tower A)	Maximum system pressure 395.8 kPa (57.4 psi) is available at Node J13 (Watermain south of Tower D)
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower B):** 95 L/s at J9, 95 L/s at J15 and 95L/s at J29 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 331.0 kPa (48.0 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 403.4 kPa (58.5 psi) is available at Node J13 (Watermain south of Tower D)
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower C):** 95 L/s at J15 and 95 L/s at J29, 63 L/s at J9 and 63L/s at J19 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 321.8 kPa (46.6 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 391.3 kPa (56.7 psi) is available at Node J13 (Watermain south of Tower D)

Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower D):** 95 L/s at J15, 95 L/s at J19 and 95L/s at J29 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 336.6 kPa (48.8 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 403.4 kPa (58.5 psi) is available at Node J13 (Watermain south of Tower D)

Table 5: Peak Hour Demand Condition (Scenario 1 – Two Watermain Feeds)

Operating Condition	Minimum System Pressure	Maximum System Pressure
Peak Hour Demands: 13.6 L/s at J21 (Tower A), 11.7 L/s at J25 (Tower B), 11.7 L/s at J31 (Tower C), 10.8L/s at J12 (Tower D)	Minimum system pressure of 341.0 kPa (49.4 psi) is available at Node J5 (Mun. Hydrant along Chapel Crescent)	Maximum system pressure 431.4 kPa (62.5 psi) is available at Node J24 (WM at south end of on-site loop)

Table 6: Maximum Day + Fire Flow Demand Condition (Scenario 2 – Single WM Feed)

Operating Condition	Minimum System Pressure	Maximum System Pressure
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower A):** 95 L/s at J9, 95 L/s at J15 and 95L/s at J19 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 203.5 kPa (29.5 psi) is available at Node J15 (Hydrant east of Tower A)	Maximum system pressure 346.1 kPa (50.2 psi) is available at Node J1 (Watermain in Chapel)
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower B):** 95 L/s at J9, 95 L/s at J15 and 95L/s at J29 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 190.8 kPa (27.6 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 339.2 kPa (49.2 psi) is available at Node J1 (Watermain in Chapel)

Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower C):** 95 L/s at J15 and 95 L/s at J29, 63 L/s at J9 and 63L/s at J19 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 157.8 kPa (22.9 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 332.0 kPa (48.1 psi) is available at Node J1 (Watermain in Chapel)
Max Day Demands: 6.2 L/s at J21 (Tower A), 5.3 L/s at J25 (Tower B), 5.3 L/s at J31 (Tower C), 4.9 L/s at J12 (Tower D) **Fire Flow Demand (Tower D):** 95 L/s at J15, 95 L/s at J19 and 95L/s at J29 (all Private Hydrants), which exceeds the FUS Fire Flow required	Minimum system pressure of 207.4 kPa (30.0 psi) is available at Node J29 (Hydrant north of Towers B and C)	Maximum system pressure 352.9 kPa (51.1 psi) is available at Node J1 (Watermain in Chapel)

As discussed with the City of Ottawa, a multi-hydrant approach to firefighting will be required to supply adequate fire flow to the proposed development using new private on-site hydrants. There will be up to four (4) Class AA (blue bonnet) hydrants within 150m of the proposed towers. Based on the City of Ottawa Technical Bulletin ISTB-2018-02, Class AA (blue bonnet) hydrants within 75m have a maximum capacity of 95 L/s while hydrants between 75m and 150m have a maximum capacity of 63 L/s (at a pressure of 20 PSI). The proposed towers will be fully sprinklered and supplied with fire department (siamese) connections. The siamese connections will be located near the main building entrances, within 45m of one of the nearby fire hydrants. Fire flow requirements calculated using the FUS method tend to generate higher values when compared to flows being calculated using the OBC and NFPA.

Table 7 summarizes the total combined fire flow available from the nearby fire hydrants and compares it to the fire flow demands based on FUS calculations.

Table 7: **Theoretical Fire Protection Summary Table**

Building	(FUS) Fire Flow Demand (L/s)	Fire Hydrant(s) within 75m (~ 95 L/s each)	Fire Hydrant(s) within 150m (~ 63 L/s each)	Theoretical Combined Available Fire Flow (L/s)
Tower A	**217**	4	0	**380***
Tower B	**250**	4	0	**380***
Tower C	**250**	2	2	**316**
Tower D	**183**	4	0	**380***

*Theoretical values exceed the (FUS) Fire Flow requirements and were therefore not confirmed by hydraulic analysis.

The combined maximum flow from the nearby hydrants will exceed the Max Day + Fire Flow requirement of the proposed development. This multi-hydrant approach to firefighting is in accordance with the City of Ottawa Technical Bulletin ISTB-2018-02.

Based on the analysis, the model indicates that adequate water and system pressures will exist throughout the watermain network under the specified 'Max Day + Fire Flow' and 'Peak Hour' conditions, including the proposed watermain extensions along Chapel Crescent under both **Scenario 1** and **Scenario 2**. Given the height of the proposed towers, booster pumps will be required to provide adequate water pressure to the upper floors. Included in **Appendix D** is correspondence from the City of Ottawa, detailed watermain network analysis calculations, a sketch showing the existing fire hydrant locations and the dimensions confirming the appropriate site coverage.

2.3 Storm Drainage and Stormwater Management

Under pre-development conditions, stormwater runoff from the subject site is currently being directed towards two (2) separate and distinct outlets. Stormwater runoff from the southern half of the subject site (and contributing off-site areas) is currently tributary to the Robinson Avenue storm sewer which discharges into the Rideau River. Stormwater runoff from the other half of the site (and contributing off-site areas) sheet drains uncontrolled towards the baseball diamond on the adjacent property to the west. Stormwater runoff being captured by this storm sewer system is tributary to the downstream combined sewer in Templeton Street. Combined sewage flows are ultimately conveyed to the Robert O. Pickard Environmental Centre (ROPEC) where the flows are treated prior to being discharged into the Ottawa River. The existing topography of the site, which drops approximately 9m from the northeast corner to southwest corner, is the main reason so much runoff currently sheet drains to the adjacent property.

Under post-development conditions, most of the storm flows from the site and contributing off-site areas (which cannot be diverted) will be directed to the municipal storm sewer in Robinson Avenue, which outlets directly to the Rideau River. However, runoff from a small portion of the site located along the west property line and west entrance cannot be captured and will thus continue to sheet drain uncontrolled off-site. Storm water runoff from this small drainage area will continue to be tributary to the downstream municipal combined sewer system and thus be treated at ROPEC prior to being discharged into the Ottawa River.

A municipal storm sewer extension is being proposed along Robinson Avenue, across Lees to provide a proper storm sewer outlet for the re-developed site. The proposed municipal storm sewer extension and on-site storm sewer system are shown on the enclosed Plan and Profile drawing (119171-PR2), General Plan of Services (119171-GP) and Notes, Details and Tables Plan (119171-NDT). Given the proximity of the site to the Rideau River, on-site stormwater management (SWM), including both stormwater quantity and stormwater quality control measures will be required for controlled flows being directed to the storm sewer in Robinson Avenue.

As discussed with the City of Ottawa, the proposed re-development provides an opportunity to improve the municipal storm and combined sewer systems in the area, by:

- Re-directing a portion of the uncontrolled stormwater runoff currently tributary to the downstream combined sewer system; and
- Reducing the peak storm flows into the storm sewer in Robinson Avenue.

Re-directing uncontrolled storm flows will significantly improve the downstream combined sewer system by reducing the peak wet-weather flows, thus providing additional capacity within the system. Diverting stormwater runoff will also reduce the amount of stormwater being treated at the Robert O. Picard Environmental Centre (ROPEC) Wastewater Treatment Plan.

As discussed with the City of Ottawa, analysis by the municipal modelling group has determined that there is sufficient capacity in the downstream system to permit the site flows that are tributary the Robinson Avenue storm sewer system to be controlled to an allowable of 183 L/s. Refer to **Appendix A** for correspondence from the City of Ottawa related to the allowable release rate.

2.3.1 Stormwater Management Criteria and Objectives

The stormwater management (SWM) criteria have been provided during pre-consultation meetings with the City of Ottawa and the Rideau Valley Conservation Authority (RVCA). The SWM criteria and objectives are as follows:

- Provide a dual drainage system, including both a minor system and an emergency overland flow route for events exceeding the 100-year design storm.
- Minimize uncontrolled post-development overland flow being directed to the downstream combined sewer system when compared to pre-development conditions.
- Control post-development storm flows being directed to the municipal storm sewer in Robinson Avenue, up to an including the 100-year design event, to the maximum allowable release rate calculated using the Rational Method, with a runoff coefficient equivalent to existing conditions, but in no case greater than C=0.5, a time of concentration no less than 10 minutes and a 5-year rainfall intensity from City of Ottawa IDF curves.
- Ensure that no surface ponding will occur on the paved surfaces (i.e., private drive aisles or parking lots) during the 2-year storm event.
- Provide on-site stormwater quality control equivalent to an ‘Enhanced’ Level of Protection (i.e., minimum 80% TSS removal and 90% of annual runoff treated) prior to releasing flows from the site towards the Rideau River (only applicable to flows being directed to the storm sewer in Robinson Avenue).
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

Refer to **Appendix A** for correspondence from the City of Ottawa and the RVCA. The proposed stormwater management design for the site is discussed in the following sections of the report.

2.3.2 Pre-Development Conditions and Allowable Release Rate

Under pre-development conditions, stormwater runoff from the subject site is currently being directed towards two (2) separate and distinct outlets. Storm flows directed to the Robinson Avenue storm sewer are discharged into the Rideau River approximately 700m southeast of the subject site, while storm flows from the baseball diamond and/or to Lees Avenue (west of the subject site) are ultimately tributary to the downstream combined sewer system. Refer to the enclosed Stormwater Management Plan (119171- SWM) for details. There are currently no stormwater quantity or stormwater quality control measures being provided on site.

Pre-Development stormwater flows tributary to downstream combined system

The uncontrolled pre-development flows tributary to the downstream combined sewer system (1.28 ha of the total 2.55 ha subject site and contributing off-site areas) were calculated using the Rational Method to be 89.0 L/s during the 5-year design event and 190.7 L/s during the 100-year design event. Refer to **Appendix E** for detailed calculations.

Pre-Development stormwater flows tributary to Robinson Avenue storm sewer

The uncontrolled pre-development flows tributary to the Robinson Avenue storm sewer (1.27 ha of the total 2.55 ha subject site and contributing off-site areas) were calculated using the Rational Method to be 128.8 L/s during the 5-year design event and 258.5 L/s during the 100-year design event. Refer to **Appendix E** for detailed calculations.

As agreed to by the City of Ottawa, the maximum allowable release rate to be directed to the Robinson Avenue storm sewer is to be calculated using the Rational Method, based on a 10-minute rainfall intensity, using a 5-year return period (City of Ottawa IDF Curves).

T_c = 10 min C =0.27
I_{5yr} = 104.2 mm/hr A = 2.34 ha

$$
\begin{aligned}
Q_{allow} &= 2.78\ CIA \\
&= 2.78\ (0.27)\ (104.2)\ (2.34) \\
&= 183.0\ L/s
\end{aligned}
$$

2.3.3 Post-Development Conditions

Under post-development conditions, most of the site flows and contributing off-site flows draining onto the subject site (which cannot be diverted) will be directed to internal SWM storage tanks and/or oversized pipes and structures, where flows will be controlled prior to being discharged into the municipal storm sewer in Robinson Avenue. This approach will mitigate the impacts associated with the increase in imperviousness of the site. Flows being directed to the storm sewer in Robinson Avenue will be attenuated for storms up to and including the 100-year design event. Both on-site stormwater quantity and quality control measures will be provided for site flows being directed to the storm sewer in Robinson Avenue. However, due to the existing topography and proposed grading design, a small area around the perimeter of the site will sheet drain uncontrolled towards the adjacent streets, as there is no practical way to capture this drainage. Stormwater water quality control will not be provided for uncontrolled direct runoff from the site, whether directed to the storm sewer in Robinson Avenue or to the downstream combined sewer system northwest of the subject site.

2.3.3.1 Area DR-1: Uncontrolled Direct Runoff to Combined System

The runoff from this sub-catchment area cannot be captured and will therefore continue to sheet drain off-site. Some stormwater runoff will flow overland towards the roadway catch basins in Lees Avenue, via the west entrance, while a small area near the northwest property corner will continue to sheet drain towards the baseball diamond to the west. The uncontrolled post-development flows from this sub-catchment area were calculated using the Rational Method to be approximately 25.5 L/s during the 5-year design event and 49.4 L/s during the 100-year design event. Refer to **Appendix E** for SWM calculations.

2.3.3.2 Areas DR-2 and DR-3: Uncontrolled Direct Runoff to Robinson Storm Sewer

The runoff from this sub-catchment area cannot be captured and will therefore continue to sheet drain overland towards the roadway catch basins along Lees Avenue. The uncontrolled post-development flows from these landscaped areas were calculated using the Rational Method to be approximately 13.6 L/s (0.2+13.4) during the 5-year design event and 26.4 L/s (0.5+25.9) during the 100-year design event. Refer to **Appendix E** for SWM calculations.

2.3.3.3 Area A-1: Controlled Flow (Future City Park Block + Off-Site Drainage)

Runoff from sub-catchment A-1 will need to be captured by the on-site storm sewer system and attenuated by an ICD installed in the outlet pipe of DICB 01 prior to being released into the Lees Avenue storm sewer. As directed by the City of Ottawa, detailed grading, servicing, and stormwater designs for the future City Park Block are to be developed by others. Under the interim conditions the City has directed us to create a temporary depressed grassed area to provide surface storage until such time as the park block is designed and developed. Adequate storage will be required for all storms up-to and including the 100-year storm event.

Table 8 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated ponding elevations above DICB 01, storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 8: Stormwater Flows, ICD & Surface Storage

Design Event	Controlled Site Flows from Area A-1					
	ICD Type	Peak Flow	Ponding Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-Custom	17.3 L/s	0.09 m (65.99 m)	8.7 L/s	2.6 m³	23 m³
5-Year		17.6 L/s	0.14 m (66.04 m)	8.8 L/s	5.2 m³	
100-Year		18.1 L/s	0.27 m (66.17 m)	9.1 L/s	19.3 m³	
100-Year (+20%)		18.4 L/s	0.32 m (66.32 m)	9.2 L/s	25.3 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-2.1: Controlled Flow (Tower A Roof and Deck Drains)

Stormwater runoff from this sub-catchment area will be captured by the main tower roof and lower terrace podium roof/deck drains and will be directed to an internal SWM storage cistern (Tank 1). Stormwater collected within the storage tank will be controlled prior to be being discharged into the on-site storm sewer system, downstream of the water quality treatment unit. The internal SWM storage tank will be equipped with an emergency overflow pipe from the top of the tank to by-pass any potential flows exceeding the 100-year design event.

Table 9 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tank, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 9: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-2.1					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-Custom	12.0 L/s	0.75 m (61.15 m)	6.0 L/s	17.9 m³	> 65 m³
5-Year		14.0 L/s	0.80 m (61.20 m)	7.0 L/s	25.9 m³	
100-Year		16.5 L/s	1.50 m (61.90 m)	8.3 L/s	60.8 m³	
100-Year (+20%)		18.0 L/s	1.65 m (62.05 m)	9.0 L/s	75.6 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-2.2: Controlled Flow (Roadway and Landscaped Area Drainage)

Stormwater runoff from this sub-catchment area will be captured by the on-site storm sewer system (i.e., catchbasins) and directed to an internal SWM storage cistern (Tank 2). Stormwater collected within the storage tank will be controlled prior to be being discharged into the on-site storm sewer system, upstream of the water quality treatment unit. The internal SWM storage tank will be equipped with an overflow pipe. The site has been designed to ensure that no stormwater will pond on the private paved surfaces (i.e., drive aisles or parking lots) during the 2-year, 5-year or 100-year storm events. Furthermore, the emergency overland flow route spill elevation (63.10m) will provide protection for the adjacent buildings from the maximum ponding elevation during storm events larger than a 100-year design storm. As a result, no surface ponding will be able to reach the building envelope or building openings upstream of the sub-catchment area.

Table 10 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tank, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 10: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-2.2					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-100	7.5 L/s	0.72 m (61.12 m)	3.8 L/s	13.8 m³	> 45 m³
5-Year		9.5 L/s	1.15 m (61.55 m)	4.8 L/s	19.2 m³	
100-Year		12.0 L/s	1.8 m (62.20 m)	6.0 L/s	43.3 m³	
100-Year (+20%)		13.0 L/s	2.0 m (62.40 m)	6.5 L/s	53.9 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-2.3: Controlled Flow (Tower A Roof and Deck Drains)

Stormwater runoff from this sub-catchment area will be captured by the main tower roof and lower terrace podium roof/deck drains and directed to an internal SWM storage cistern (Tank 3). Stormwater collected within the storage tank will be controlled prior to be being discharged into the municipal storm sewer in Lees Avenue and ultimately to the Rideau River. The internal SWM storage tank will be equipped with an overflow pipe from the top of the tank to by-pass any potential flows exceeding the 100-year design event.

Table 11 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tank, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 11: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-2.3					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-85	3.5 L/s	0.30 m (60.40 m)	1.8 L/s	24.7 m³	> 70 m³
5-Year		4.5 L/s	0.50 m (60.60 m)	2.3 L/s	33.5 m³	
100-Year		6.0 L/s	0.85 m (60.95 m)	3.0 L/s	69.9 m³	
100-Year (+20%)		6.3 L/s	0.95 m (61.05 m)	3.2 L/s	87.1 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-3.1: Controlled Flow (Tower C Roof and Deck Drains)

Stormwater runoff from this sub-catchment area will be captured by the main tower roof and lower terrace podium roof/deck drains and directed to an internal SWM storage cistern (Tank 4). Stormwater collected within the storage tank will be controlled prior to be being discharged into the on-site storm sewer system, upstream of the water quality treatment unit. The internal SWM storage tank will be equipped with an overflow pipe from the top of the tank to by-pass any potential flows exceeding the 100-year design event.

Table 12 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tank, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 12: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-3.1					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD MHF-‘A’	15.0 L/s	0.58 m (60.90 m)	7.5 L/s	20.5 m³	> 75 m³
5-Year		17.5 L/s	0.93 m (61.25m)	8.8 L/s	29.7 m³	

Design Event	Controlled Site Flows from Area A-3.1					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
100-Year	Tempest Vortex ICD MHF-'A'	20.0 L/s	1.18 m (61.58m)	10.0 L/s	71.0 m³	> 75 m³
100-Year (+20%)		22.0 L/s	1.40 m (61.80 m)	11.0 L/s	88.0 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-3.2: Controlled Flow (Tower B Roof and Deck Drains)

Stormwater runoff from this sub-catchment area will be captured by the main tower roof and lower terrace podium roof/deck drains and directed to an internal SWM storage cistern (Tank 5). Stormwater collected within the storage tank will be controlled prior to be being discharged into the on-site storm sewer system, downstream of the water quality treatment unit. The internal SWM storage tank will be equipped with an overflow pipe from the top of the tank to by-pass any potential flows exceeding the 100-year design event.

Table 13 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tank, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 13: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-3.2					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-Custom	15.0 L/s	0.90 m (61.30 m)	7.5 L/s	20.0 m³	> 75 m³
5-Year		16.5 L/s	1.40 m (61.80 m)	8.3 L/s	30.0 m³	
100-Year		18.0 L/s	2.00 m (62.40 m)	9.0 L/s	71.7 m³	
100-Year (+20%)		20.0 L/s	2.20 m (62.60 m)	10.0 L/s	88.4 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-4: Controlled Flow (Tower D Roof and Deck Drains)

Stormwater runoff from this sub-catchment area will be captured by the main tower roofs and lower terrace deck drains and directed to external SWM storage cisterns (Tanks 6 & 7). Stormwater collected within the inter-connected storage tanks will be controlled prior to be being discharged into the on-site storm sewer system, upstream of the water quality treatment unit. The SWM storage tanks will be equipped with an overflow pipe from the top of the tank. The storm service will be equipped with a backflow prevention device to protect the building from any potential sewer back-ups.

Table 14 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the anticipated water elevations within the tanks, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 14: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-4					
	ICD Type	Peak Flow	Tank Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF- Custom	8.0 L/s	0.68 m (61.46 m)	4.0 L/s	28.9 m³	91 m³
5-Year		9.7 L/s	1.00 m (61.78 m)	4.9 L/s	40.4 m³	
100-Year		14.2 L/s	2.15 m (62.93 m)	7.1 L/s	83.2 m³	
100-Year (+20%)		15.0 L/s	2.40 m (63.05 m)	7.5 L/s	104.2 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-5: Controlled Flow (Roadway and Landscaped Area Drainage)

Stormwater runoff from this sub-catchment area will be captured by the on-site storm sewer system (i.e., catchbasins and CBMHs) and directed to an external underground SWM storage system comprised of over-sized pipes and structures. Stormwater collected within the underground SWM storage system will be controlled prior to be being discharged into the on-site storm sewer system, upstream of the water quality treatment unit. The site has been designed to ensure that no stormwater will pond on the private paved surfaces (i.e., drive aisles or parking lots) during the 2-year, 5-year or 100-year storm events. Furthermore, the emergency overland flow route spill elevation (62.95m) will provide protection for the adjacent buildings from the maximum ponding elevation during storm events larger than a 100-year design storm. As a result, no surface ponding will be able to reach the building envelope or building openings upstream of the sub-catchment area.

Table 15 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the maximum water elevations above the low top of grate elevation within the west ditch, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 15: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-5					
	ICD Type	Peak Flow	Max. Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD MHF-Custom	13.8 L/s	0.0 m (60.39 m)	6.9 L/s	36.3 m³	106 m³
5-Year		17.5 L/s	0.05 m (60.65 m)	8.8 L/s	50.1 m³	

Design Event	Controlled Site Flows from Area A-5					
	ICD Type	Peak Flow	Max. Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
100-Year	Tempest Vortex ICD MHF-Custom	36.0 L/s	0.26 m (62.86 m)	18.0 L/s	96.1 m³	106 m³
100-Year (+20%)		38.0 L/s	0.35 m (62.95 m)	19.0 L/s	121.5 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.3.1 Area A-6: Controlled Flow (Roadway and Landscaped Area Drainage)

Stormwater runoff from this sub-catchment area will be captured by the on-site storm sewer system (i.e., catchbasins and CBMHs) and directed to an external underground SWM storage system comprised of over-sized pipes and structures. Stormwater collected within the underground SWM storage system will be controlled prior to be being discharged into the on-site storm sewer system, upstream of the water quality treatment unit. The site has been designed to ensure that no stormwater will pond on the private paved surfaces (i.e., drive aisles or parking lots) during the 2-year, 5-year or 100-year storm events. Furthermore, the emergency overland flow route spill elevation (64.95m) will provide protection for the upstream buildings from the maximum ponding elevation during storm events larger than a 100-year design storm. As a result, no surface ponding will be able to reach the building envelope or building openings upstream of the sub-catchment area.

Table 16 summarizes the post-development design flow from this sub-catchment area as well as the type of ICD, the maximum water elevations above the low top of grate elevation of CBMH 05, the anticipated storage volumes required and storage volume provided for the 2-year, 5-year and the 100-year design events.

Table 16: Stormwater Flows, ICD & SWM Tank Storage

Design Event	Controlled Site Flows from Area A-6					
	ICD Type	Peak Flow	Max. Water Elev.	Average Flow (50% Qpeak)	Storage Vol. Required	Max Storage Provided
2-Year	Tempest Vortex ICD LMF-Custom	9.0 L/s	0.0 m (62.81 m)	4.5 L/s	24.4 m³	99 m³
5-Year		9.4 L/s	0.0 m (63.03 m)	4.7 L/s	36.4 m³	
100-Year		12.0 L/s	0.0 m (64.40 m)	6.0 L/s	83.0 m³	
100-Year (+20%)		13.0 L/s	0.10 m (64.95 m)	6.5 L/s	102.7 m³	

Refer to **Appendix E** for detailed SWM calculations and to **Appendix F** for ICD information.

2.3.4 Stormwater Flow Summary

Stormwater Flows tributary to downstream combined sewer

Table 17 compares the post-development flows from Area DR-1 to the uncontrolled pre-development flows that were sheet draining uncontrolled towards the baseball diamond on the adjacent property to the west, for both the 5-year and the 100-year design events.

Table 17: Stormwater Flow Comparison Table

Design Event	Pre-Development Conditions			Post-Development Conditions	
	Pre-01 Flow (L/s)	Pre-02 Flow (L/s)	Total Flow (L/s)	DR-1 Flow (L/s)	Reduction in Flow (L/s) and (%) *
5-Yr	6.1	84.1	**90.2**	**25.5**	**64.7 L/s** or 72%
100-Yr	12.5	174.2	**186.7**	**49.4**	**137.3 L/s** or 74%

*Reduced flow compared to pre-development uncontrolled conditions

As indicated in the table above, the post-development flows from area DR-1 have been significantly reduced when compared to pre-development conditions. Re-directing uncontrolled storm flows will improve the downstream combined sewer system by reducing the peak wet-weather flows, thus providing additional capacity within the system. Diverting stormwater runoff will also reduce the amount of stormwater being treated at the Robert O. Picard Environmental Centre (ROPEC) Wastewater Treatment Plan.

Stormwater Flows tributary to Robinson Avenue storm sewer

Table 18 compares the post-development flows from Area DR-1 to the uncontrolled pre-development flows currently tributary to the Robinson Avenue storm sewer for both the 5-year and the 100-year design events.

Table 18: Stormwater Flow Comparison Table

Design Event	Pre-Dev. Conditions	Post-Development Conditions								
	Allowable (L/s)	DR-2 & DR-3 (L/s)	A-1 (L/s)	A-2* (L/s)	A-3** (L/s)	A-4 (L/s)	A-5 (L/s)	A-6 (L/s)	Total (L/s)	Over-Controlled Flows (L/s)
5-Yr	**183.0**	13.6	17.6	28.0	34.0	9.7	17.5	9.4	**129.8**	**53.2 L/s** or 29%
100-Yr		26.4	18.1	34.5	38.0	14.2	36.0	12.0	**179.2**	**3.8 L/s** or 2%

*Includes flows from A-2.1, A-2.2 and A-2.3
**Includes flows from A-3.1 and A-3.2

As indicated in the table above, the post-development flows from areas DR-2, DR-3 and A-1 to A-6 are being controlled to less than the allowable release rate specified by the City of Ottawa during the 100-year design event and significantly over-controlled during the 5-year design event.

The proposed building storm services should be equipped with backflow prevention devices and the internal SWM storage tanks will be equipped with emergency overflow pipes to protect the building. Flows from all controlled post-development sub-catchment areas indicated in **Table 18** above will be directed to the Robinson Avenue storm sewer which ultimately outlets to the Rideau River.

2.3.5 Stormwater Quality Control

The subject site is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA) and is tributary to the Rideau River. Based on preliminary feedback from the RVCA, surface parking lots and drive aisles typically require an 'Enhanced' Level of Protection (i.e., 80% TSS removal). Landscaped areas and roof tops are considered clean for the purposes of water quality and aquatic habitat protection.

To achieve the required level of quality control protection, a new oil-grit separator unit (CDS Model PMSU 20_20_5) will be installed at the downstream end of the on-site storm sewer system. Stormwater runoff collected by the on-site storm sewer system (1.47 ha tributary area) will be directed through the proposed treatment unit. The contributing area includes the internal roadways, loading areas, surface parking areas as well as some building roofs/landscaped areas.

As stated above, the proposed oil-grit separator has been sized to provide an 'Enhanced' Level of water quality treatment prior to discharging the stormwater into the municipal storm sewer and ultimately into the Rideau River. Echelon Environmental and Contech Stormwater Solutions Inc. have modeled and analyzed the tributary area to provide a CDS unit capable of meeting the TSS removal requirements. The model parameters for the TSS removal were based on historical rainfall data for Ottawa from the Ontario Climate Centre. It was determined that a CDS Model PMSU 20_20_5 will exceed the target removal rate, providing a net annual 82.2% TSS removal. The CDS unit has a treatment capacity of approximately 31 L/s, a sediment storage capacity of 1.67m^3; an oil storage capacity of 376 L and will treat a net annual volume of approximately 97.9% for the tributary area.

The shallow flat grass swale on site will provide additional stormwater quality control by reducing flow velocities and thus promoting infiltration and the removal of suspended solids. The CB and CBMH structures will be equipped with sumps to promote additional settling of sediment. It is expected that the proposed treatment train approach will be used to provide the requisite level of water quality control.

<u>Maintenance and Monitoring of the Storm Sewer and Stormwater Management Systems</u>

It is recommended that the owner implement a maintenance and monitoring program for both the on-site storm sewers and the stormwater management systems: The storm drainage system should be inspected routinely (at least annually); the inlet control devices should be inspected to ensure they are free of debris; and the oil-grit separator should be inspected at regular intervals and maintained when necessary to ensure optimum performance. Refer to **Appendix G** for the CDS unit design parameters, sizing analysis, operation, design, performance, and maintenance summary parameters as well as the annual TSS removal efficiency data.

3.0 SITE GRADING

The existing topography will have a significant impact on the proposed development, as the grade drops approximately 9m from the northeast corner (~70.00m) down to the southwest corner of the site (~61.00m). As a result, the slope of the internal roadways will vary from 1.0% up to 4.8%. To work with the existing topography and internal roadway grades, the ground floor elevation (GFE) of the proposed towers will vary as follows: Tower A (64.00m), Tower B (64.00m), Tower C (67.50m) and Tower D (65.00m-66.00m). The underground parking levels will also vary based on the respective towers and adjacent roadway grades. A structural retaining wall is being proposed along the west property line to ensure that most of the stormwater runoff is captured by the on-site storm sewer system and directed to the storm sewer in Robinson Avenue, rather than continue to sheet drain overland to the baseball diamond to the west. Due to the existing topography, an access off Chapel Crescent will not be possible. The grading and drainage design has been developed to work with the existing grades along the property lines and proposed site entrances of Lees Avenue. Refer to the enclosed Grading Plan (119171-GR) for details.

3.1 Emergency Overland Flow Route

In the case of a major rainfall event exceeding the design storms provided for, the stormwater located within the subject site will overflow towards the lower downstream sub-catchment areas and ultimately flow towards Lees Avenue. The main floor elevations of the Towers (A, B, C & D) have been set to be a minimum of 0.3m above the downstream major system overflow points. The emergency overland flow route is shown on the enclosed Grading Plan (119171-GR).

4.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared by Paterson Group Inc. for the proposed project. Refer to the Geotechnical Report[2] for subsurface conditions, construction recommendations and geotechnical inspection requirements.

5.0 EROSION AND SEDIMENT CONTROL

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags / catchbasin inserts (sediment sacks) will be placed under the grates of nearby catchbasins and manholes and they will remain in place until vegetation has been established and construction is completed.
- Silt fencing will be placed per OPSS 577 and OPSD 219.110 along the surrounding construction limits.
- Mud mats will be installed at the construction entrances to the site.
- Street sweeping and cleaning will be performed, as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site.
- On-site dewatering is to be directed to a sediment trap and/or gravel splash pad and discharged safely to an approved outlet as directed by the engineer.

The temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken.

In addition, the following measure will provide permanent erosion and sediment control on site:

- A CDS type Oil/Grit Separator will be installed to provide water quality control prior to releasing stormwater from sub-catchment areas A-2.2, A-3.1, A-4, A-5, and A-6 inclusively.

6.0 CONCLUSION

This report has been prepared in support of a Site Plan Control application for the proposed multi-tower mixed-use development at 2 Robinson Avenue.

The conclusions are as follows:

- The proposed development will be serviced by the municipal watermain, sanitary and storm sewers in Chapel Crescent, Lees Avenue and Robinson Avenue.
  - Sanitary flows will continue to be directed to the existing sanitary outlet sewer which runs along the north side of Lees Avenue, adjacent to the existing baseball diamond. CCTV inspection of the existing sanitary outlet sewer demonstrated that the pipes are in good condition. Sewage flow calculations indicate that the existing outlet pipes have sufficient capacity to accommodate the anticipated site flows.
  - Storm flows will be significantly reduced from the site and will be directed to the existing municipal storm sewer in Robinson Avenue. The proposed design also re-directs a significant portion of the uncontrolled stormwater runoff currently tributary to the downstream municipal combined sewer system, while reducing total flows to the Robinson Avenue storm sewer system.
  - The proposed watermain extension along Chapel Crescent will provide a second feed to the site and allow for the creation of a looped watermain system on-site. The looped watermain network will provide the necessary building service redundancy and will allow for system maintenance without service disruption. Adequate water and system pressures will exist throughout the watermain network under the specified 'Max Day + Fire Flow' and 'Peak Hour' conditions under both **Scenario 1** and **Scenario 2**.
- The proposed mixed-use and residential towers will be sprinklered and supplied with fire department siamese connections. Each of the proposed siamese connections will be located within 45m of a fire hydrant.
- The proposed stormwater design for the development provides an opportunity to improve both the downstream municipal storm and combined sewer systems by:
  - Providing on-site stormwater management measures, prior to releasing flows from the re-developed site, whether flows are being directed to the municipal storm or combined sewer systems.
  - Providing additional capacity within the combined sewer system by re-directing a portion of the stormwater runoff, currently flowing uncontrolled into the combined sewer system, to the Robinson Avenue storm sewer system.
- The total post-development flow directed to the downstream combined sewer system will be approximately 25.5 L/s during the 5-year design event and 49.4 L/s during the 100-year event. Post-development flows directed to the downstream combined sewer system are being reduced by 64.7 L/s (or 72%) during the 5-year event and by as much as

137.3 L/s (or 74%) during the 100-year design event, when compared to the respective current conditions.

- The total post-development flow to the Robinson Ave. storm sewer will be approximately 129.8 L/s during the 5-year design event and 179.2 L/s during the 100-year event, both of which are less than the allowable release rate of 183.0 L/s specified by the City of Ottawa.
- Erosion and sediment controls are to be provided both during construction and on a permanent basis. An oil / grit separator unit (CDS Model PMSU 20_20_5) will provide an 'Enhanced' Level of water quality control for the portion of the site discharging towards the municipal storm sewer in Robinson Avenue.
- Regular inspection and maintenance of the storm sewer system, including the inlet control devices and the CDS treatment unit is recommended to ensure that the storm drainage system is clean and operational.

It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH

Prepared by:

Stephen Matthews, B.A. (Env.)
Senior Design Technologist

Reviewed by:

François Thauvette, P. Eng.
Senior Project Manager - Land Development

APPENDIX A

Correspondence

Francois Thauvette

From:	McCreight, Andrew <Andrew.McCreight@ottawa.ca>
Sent:	Friday, October 11, 2019 3:20 PM
To:	Mike Marcella; Roderick Lahey
Cc:	Brian Casagrande; Jeff Nadeau; Jennifer Luong; Francois Thauvette; akumar@rlaarchitecture.ca; Mottalib, Abdul; Fraser, Mark; Wood, Mary Ellen; Giampa, Mike; Moise, Christopher; David Elden ASH
Subject:	Pre-Con follow-up: 2 Robinson
Attachments:	2 Robinson - Pre-Application Consultation Meeting Minutes.pdf; Pre-con Applicant's Study and Plan Identification List - 2 Robinson - Site Plan.pdf; Pre-con Applicant's Study and Plan Identification List - 2 Robinson - OPA and Rezoning.pdf; 2 Robin -Pre-consultation follow up engineering.rtf

Hello,

Please refer to the below [and attached minutes] regarding the Pre-Application Consultation (pre-con) Meeting held on October 4, 2019 for the property municipally known as 2 Robinson Avenue.

The applicant/owner presented a development concept consisting of five buildings. The overall concept requires an application for Zoning By-law Amendment and Official Plan Amendment. As part of the concept, that applicant/owner proposed to initiate a Site Plan application for the first building showing a complying development. Based on the above, the plan and study submission requirements have been separated respectively.

See attached required Plans & Study List for submission. Note that the "Site Plan" and "Zoning / OPA" list are very similar. For Site Plan most of the submission material, except civil requirements, can concentrate on the Building 1 "site", whereas the Zoning / OPA submission requirements must cover the entirety of the site. Ideally provide as much information as possible with the first Site Plan submission, and we can discuss additional information required for inclusion in the rezoning / OPA applications.

Attached are staff's preliminary comments based on the information available at the time of pre-con meeting. The attached pre-con Meeting Minutes summarize the meeting discussion. If any comments were recorded incorrectly, please respond to the group and clarify. Similarly, if anyone has any additional comments please do not hesitate to pass those along to the group.

Planning

- See comments in the attached minutes
- The property is currently subject to three separate zones, with TD2 [2078] generally towards the front west corner of the site, TD1 [2078] through the middle and eastern portion of Lees Avenue, and I1A along the rear. Urban Exception 2078 is not relevant to the proposal. As noted in the minutes, maintaining the intent of the TD provisions, such as active frontage provisions, density targets, communal amenity area, and phasing compliance must be evident in the submission material. Review of the overall building height, massing, built form, transition etc. will continue through the review process and informal UDRP, but staff will looking to ensure that high-level TOD principles and current zoning intent on the above items apply.
- The site is designated as General Urban Area in the Official Plan.

- Section 3.6.1 (General Urban Area) contains the relevant polices to this designation, and can be found HERE. Also, review policies such as 2.5.1 and 4.11 concerning urban design and compatible to assist with further evolving the proposal. Depending on the time of submission, additional or amended policy direction may be in effect.
- Review the policy context and requirements for proposed building height of 31+ storeys. Given concept submitted at pre-consult, recommend remaining below this threshold.
- The Sandy Hill Secondary Plan applies to this property. The subject site is located within the mixed-use designation, includes bicycle network connectivity (Schedule K), and the maximum heights in Schedule L (subject of OPA).
- Lees TOD Plan – Review the plan direction such as connectivity, greenery, land use, heights and density, and built form.
- Review the Transit-Oriented Development Guidelines and include analysis within the Planning Rationale.
- Review the Urban Design Guidelines for High-rise Building and include analysis within the Planning Rationale.
- Review the Bird-Friendly Design Guidelines and status prior to submitting an application.
- NCC – Applicant should contact the NCC early in process to explore servicing options through the Sandy Hill Area lands (if necessary), and the connectivity options with the MUP. If contacting through email, please copy Andrew McCreight on this correspondence. Your inquiry can be directed to Andrew Sacret Andrew.Sacret@ncc-ccn.ca for assignment.

Urban Design

- See comments in the attached minutes.
- Recommend informal review with Urban Design Review Panel.

Heritage

- N/A

Engineering

- See comments in Minutes and have consultant contact Abdul Mottalib for further direction.

Feel free to contact Infrastructure Project Manager, Abdul Mottalib, at Abdul.Mottalib@ottawa.ca, ext.27798, for follow-up questions.

Transportation

- See comments in attached minutes.
- Schedule transportation meeting once TIA Step 2 is complete.

Feel free to contact Transportation Project Manager, Mike Giampa, at mike.giampa@ottawa.ca, ext.23657, for follow-up questions.

Parkland

- See comments in minutes.
- The City will be seeking full Parkland dedication in accordance with the Parkland Dedication By-law of the City of Ottawa.

Community representative comments

- Action Sandy Hill comments recorded in the meeting minutes.

Waste Management

- Only the residential portion of the buildings are eligible for City Collection. See the Waste Management Guidelines. Once the number of units is determined, Waste Services can suggest the bin requirements for each building.

Other

Site Plan Control / Zoning By-law Amendment / Official Plan Amendment

- Site Plan – New Development – Complex (Manager Approval, Public Consultation)
    - Building 1 proposal as noted int the minutes. Submission must include concept plans show full extent of development (5 building
    - Important Note: Be mindful of the piecemeal approach (proposed 20-storey, option for more height later) and the impact it may have on further applications for revision.
- Zoning By-law Amendment – Application would be major rezoning.
- Official Plan Amendment
- Let me know if you have any questions concerning required submissions.

Next Steps

- The subject property is located in Ward 12, Rideau-Vanier. I encourage discussing the proposal with the Ward Councillor and reaching out to the surrounding neighbours for awareness of the potential proposal. If you reach out to the general public prior to application submission, please consider waiving the Non-Disclosure Agreement confidentiality.

Please refer to the links to "Guide to preparing studies and plans" and fees for general information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting informationcentre@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

Please do not hesitate to contact me if you have any questions.

Regards,
Andrew

Andrew McCreight **MCIP RPP**
Planner III /Urbaniste III
Development Review Central/Examen des demandes d'aménagement secteur centre
Planning, Infrastructure and Economic Development
Services de planification, d'infrastructure et de développement économique

Formal Pre-Application Consultation Meeting Minutes
2 Robinson Avenue
PC2019-0256
Friday, October 3, 2019, 10:00 – 11:30 p.m.

Attendees

City of Ottawa
Andrew McCreight, File Lead
Mohammed Abdul Mottalib, Engineering
Mark Fraser, Engineering
Mike Giampa, Transportation
Christopher Moise, Urban Design
Mary Ellen Wood, Parks
Urja Modi, Student Planner

Community Representative
David Elden*, Action Sandy Hill CA

Applicant Team
Mike Marcella, Owner/Developer
Roderick Lahey, Architect (RLA Architecture)
Ashwani Kumar, Urban Designer (RLA Architecture)
Brian Casagrande, Planner (FoTenn)
Jeff Nadeau, Planner (FoTenn)
Francois Thauvette, Civil Engineer (Novatech)
Jennifer Luong, Traffic Engineer (Novatech)

*David Elden signed a non-disclosure agreement prior to this meeting.

Proposal Overview (applicant)

The applicant is proposing to construct a high-density, mixed-use development focused mainly on residential, with four towers ranging from 20 to 32 storeys, sitting on 6-storey podiums and fronting Lees Avenue. Building 1 is located to the south-west corner of the site, Building 4 is located to the south-east corner of the site, and Buildings 2 & 3 are positioned between Buildings 1 & 4. The ground floors of the buildings will be used for commercial purposes and a grocery store may potentially be implemented in the podium between Buildings 2 & 3. A 6-storey crescent building, Building 5, is proposed to the rear of the site. Greenspace is proposed to the north-west of Building 5, and due to grade changes the building also serves as a retaining wall. The development totals a gross floor area of approximately 1.2 million square metres. None of the commercial units are confirmed at this stage but will be looking at options such as athletic facility, restaurants, and local servicing uses.

The mix of residential uses is currently unknown, however, Building 1 will be primarily composed of rental units. The applicant team will first file for a fully compliant Site Plan Control application for Building 1 and will then proceed with filing a Zoning By-Law Amendment and Official Plan Amendment for the remainder of the development. Building 1 is intended to be submitted as a 20-storey building, but with the ultimate plan of potentially being 26-storeys as the ZBL/OPA applications catch up.

The “institutional” zoned land along the north edge of the site is intended for use as a new city park and pathway. A pathway previously existed in this location and will be formalized through these applications. The concept plans also highlights ideas for pedestrian and cyclist connectivity. Concept is to have privately owned street, but with right-of-way and sidewalk built to City standards. Applicant will work with the University to explore broader connectivity to campus.

Different concepts were looked at, including having an access at Robinson, but these options were viewed as restricting development, especially for fitting in a grocery store.

Comments from related disciplines
The following subsections provide City staff and community representative comments.

Planning
City staff: Andrew McCreight

General speaking, City staff appreciate the concept details and intent of the proposed development but expressed concerns of the site access and the strategies for servicing. Nonetheless, City staff advise the applicant team of the following comments:

- It is recommended that the applicant team check to see if the proposed development triggers Section 37. On October 1st, the Section 37 uplift values increased to $575 per square metres from the 2017 value of $330 per square metres. Subject to Bill 108.
- The applicant will need to determine the type of ownership and potential lot parcelling (i.e. one ownership, condominium, severing, etcetera) of their proposed development because the type and number will affect site servicing and nuances for zoning. In the planning rationale evaluate the redistribution of densities proposed compared to current zoning and built forms permitted. The TD zoning requirements for densities on the subject site are a minimum 150 units per hectare at the rear and 250 units per hectare at the front.
- Northern section connectivity and connectivity with the surrounding area should be thoroughly considered and designed. City staff recommend that a landscape architect be hired to work with this topic.
- Mature trees that surround the perimeter of the lot in the ROW shall be preserved, and this must be evaluated through a Tree Conservation Report. Mature trees along the rear of lot as well.
- 2% of the lot area must be dedicated to communal amenity space as per current zoning.
- A Zoning By-Law Amendment and Official Plan Amendment Is required for the proposed concept. The applicant team clarifies that they will submit a separate application (Phase 1) for building 1, in which only a Site Plan Control application is required. City staff explained that supporting material and details, including plans showing subsequent phases, will be required when applying for a Site Plan Control application for Phase 1. Moreover, it is advised that reasoning for an Official Plan Amendment and Zoning By-Law Amendment being explained in associated planning rationales. What was the intent of the current TD1 and TD2 zones, and how were the zone lines established?
- The applicant team will be required to explain how they meet the intent of the Sandy Hill Secondary Plan in their planning rationale. The Secondary Plan currently limits heights to 20 storeys for Buildings 1 & 2, and 6 storeys for Buildings 3 & 4 of the proposed development.
- The transit-oriented development (i.e. parking, modal share, active transportation methods, etcetera) and high-rise guidelines will also need to be thoroughly explained in the planning rationale.
- City staff want to see an active street frontage (Lees) and facades that include 50% transparent glazing and minimum 50% building frontage. See TD zoning for applicable provisions. This is expected to be maintained despite the request for Rezoning/OPA.
- Access to and from the subject site will need to be further evaluated. It is recommended that the applicant team finish step 2 of their TIA submission, and then pause the study when re-visiting this issue. City staff will arrange a meeting with the applicant team to specifically discuss transportation issues associated to the proposed project, especially the direction given for a

signalized intersection at Lees and Robison. Meeting to be scheduled upon request of application after completion of Step 2.
- City staff encourage the applicant team to attend an informal UDRP meeting to discuss programming, street access, and tower locations. The applicant team is also encouraged to work closely with the National Capital Commission for site connectivity.

Parks
City staff: Mary Ellen Wood

City staff have the following comments about parkland and recreational facilities on the subject site:
- Parks and Facility Planning will be requesting the maximum of 10% of the land area of the site being developed to be conveyed as parkland dedication.
- Parkland dedication is to have frontage on a local road (Chapel Crescent).
- Providing connectivity between Chapel Crescent and Mann Avenue is strongly recommended and consistent with the Lees TOD Greenspace Plan.
- Lees TOD Bicycle Network illustrates a future multi-use pathway through the subject lands. Lands constructed with a multi-use pathway will not form part of the parkland dedication.
- Sandy Hill Arena and baseball diamond located north of the subject lands are currently active facilities with regular programming.
- The lands known as 50 and 60 Mann Ave are owned by NCC, the City of Ottawa owns land abutting the subject property known as 40 Mann Ave.
- Parks and Facility Planning may provide further comments on a formal circulation.

Further discussion will be required to determine the type of parkland function that would be appropriate for this site.

Transportation
City staff: Mike Giampa / Andrew McCreight / Jennifer (applicant)

Discussion was primarily focused on the site access comparing what is shown in the concept, and staff comments about an intersection at Robinson. Other items such as modal share, pedestrian and cyclist connectivity were discussed. It was recommended, and agreed, to complete Step 2 of the TIA and then schedule a meeting to have a focused discussion on transportation.

Urban Design
City staff: Christopher Moise

City staff have the following comments regarding the deign of the proposed development:
- A specialized design session may be triggered if the proposed development reaches or exceeds 31-storeys.
- The stepping-off of the towers from the back of the podium creates strange spaces. Wrapping the podiums around the entirety of the towers may be more functional.
- The proposed location of the crescent building may not make sense and requires further justification.

The applicant team is advised to illustrate the lines of transition to the surrounding context, specifically the neighbourhood to the northeast, and relate them to the TOD study in the planning rationale. Moreover, it is recommended that a model showing existing TOD massing and surrounding context be presented at informal UDRP meeting.

<u>Engineering</u>
City staff: Abdul Mottalib

City staff explain that the subject site faces many infrastructure and site servicing challenges as there is no connection available to local storm, sewer, and infrastructure.

Preliminarily, City staff have the following comments and requests for engineering purposes:

- Two feeds for water demand is required for each of the proposed buildings.
- The City does not allow any new connections to the proximal feeder main; connecting to this main is not an option.
- A minimum of two feeds will be needed for the proposed development.
- At least two fire hydrants, with a minimum 200mm watermain, will be required.
- At least 300 will be needed for sanitary after full development. A sanitary collector is available on Robinson. The applicant team can possibly use this collector by extending the sewer along Robinson.
- Residual capacity will need to be considered.
- Record of site condition will be required.
- A master servicing study and a serviceability study will be required.
- A stormwater management report/brief will be required.
- A geotechnical study will be required.
- Phase 1 and Phase 2 Environmental Site Assessments will be required.
- Watermain and hydro analysis will be required.
- ECA will be required for extended sewer and transfer review.
- Any future applications for the subject site and proposed development will be subject to an MOE.
- Follow-up email will include full details on engineering requirement, and more detailed comments.

City staff will provide additional notes regarding the engineering details of the subject site and proposed development.

<u>Comments from community representative</u>
David Elden, Action Sandy Hill Community Association

The community representative shared the City's comments regarding connectivity with the surrounding area and facilities, traffic on Lees and the impact of the proposed access/exits, and preserving mature trees. The community representative expressed the following additional concerns and comments:

- Access to the Lees O-Train Station or the University of Ottawa Campus O-Train Station
- Shading on Building 5 from the towers of Building 1-4
- Brownfield remediation

- Distortion of the area's demographics from an increasing student rental market; Generally speaking, the community fears that this development will become a University of Ottawa student residence complex.
- Having a grocery store in the proposed development is ideal for the community.
- The community representative wants to see a community design charette for the space between Robinson and Mann that potentially involves community members.
- Review the LEED Neighbourhood concept
- Consider options with District Energy
- Encourage to keep community and ASH actively involved in discussions throughout process

The community representative had the following questions regarding the proposed development:

- Is the site brownfield, will remediation be required?
- Applicant response: Yes
- Zoning by-law or variances required?
- Response: Zoning By-law Amendment proposed
- Are there any community benefits for low-income housing?
- Applicant response: specific programming for development not yet determined.
- Is any of the housing going to be, as defined by City, affordable?
- Applicant response: proposal will likely include some form of affordable housing, but this has yet to be determined.
- Any intent of obtain LEED neighbourhood concept?
- Applicant response: Will look into this.
- Will the proposed development be hooking into University of Ottawa energy direct system?
- Applicant response: likely not option but will consider.
- Where does Action Sandy Hill get a chance to be involved again?
- Staff response: Applicant is strongly encourage to engage the broader community prior to application submission, but from a requirement perspective, this is not required until an application has been submitted.

Next steps

City staff will provide a separate lists of required plans and studies for Site Plan (Building 1), and Rezoning and OPA. A transportation meeting will be arranged to discuss possible issues and options regarding site access and traffic.

It is recommended that the applicant team also seek input from the Ward Councillor, Community Association and surrounding residents.

The applicant anticipates applying by late November and is happy to meet with the community prior to applicant submission.

Site: 2 Robinson Road-Residential development   date of pre-consult Friday, October 4, 2019

Storm Sewer:
On Robinson 900 mm, local street, needs to be extended up to Lees Avenue to capture flow from the proposed development.

Sanitary:
On Robinson 250mm, if this sewer is adequate to handle the buildout demand for the proposed development then it can be extended to capture flow from this property otherwise the consultant has to upgrade the existing 250 sanitary sewer and extend it up to Lees Avenue to capture the flow. This will be the best option for this site as this option will be using city ROW and ultimately will be discharging wastewater to the existing 1500mm collector, which has ample capacity.

Option2: Existing 250mm sanitary service lateral may not be adequate to service the development. The service lateral relates to the 450mm sanitary sewer on Mann Street, which also may not have residual capacity to handle the buildout demand. Even though, if the consultant wants to use the existing service lateral and wants to connect into Mann Street sanitary sewer, they will have to investigate the capacity of the existing service lateral and will need to provide ultimate demand to us to do the modeling of the Mann street sewer to check whether it will be able to handle the proposed flow. In addition, they will have to investigate the accessibility i.e. how the service lateral will be connected to the Mann street sewer using other properties. They may need to enter into an agreement with the landowners through which the pipe passes.

Water:
There is no local watermain fronting this property except a 610mm feeder watermian on Chapel Cres. A 150mm water service connected with this feeder main currently servicing the property. Due to the extent of the development two service connections will be required per building for this development.

Existing water service connection can be used as the one connection for the site while 200mm watermain on Mann street will need to be upsized to a 400mm watermain from Mann & Nicolas for 2nd water service connection.

Fire hydrants: Two or more fire hydrants will be required for this site to handle the fire flow.

Fireline meter: This site will require two fireline meters, one at the property entrance and the other one at the exit.

Vibration Monitoring Program for digging adjacent to 610mm feedermain: A Vibration Monitoring Specialist Engineer shall undertake vibration monitoring, develop the vibration monitoring plan, ensure conformance and shall issue certificates of conformance. The Vibration Monitoring Specialist Engineer shall be a Licensed Engineer in the Province of Ontario with a minimum of five years experience in the field of Vibration Monitoring. Vibration monitors are to be placed directly on the watermain. The Maximum Peak Particle Velocities are to be in accordance with Table 1 of the City of Ottawa Specification F-1201.

Capacity issues for sewers

Please find the Servicing Report Template & Study Guidelines” in the attachment and prepare the servicing study accordingly. For capacity issue, please see section 3.2.1 page 3-3 and follow this section. A completed checklist with corresponding references from the servicing study is mandatory for the completeness of the study. Please add a completed checklist in the report.

ServicingGuidelines_ final_Dec...

Servicing Report Template Final Versi

Required information for Water boundary conditions (not required if you’re using existing service)

Boundary conditions are required to confirm that the require fire flows can be achieved as well as availability of the domestic water pressure on the city street in front of the development. Please use Table 3-3 of the MOE Design Guidelines for Drinking-Water System to determine Maximum Day and Maximum Hour peaking factors for 0 to 500 persons and use Table 4.2 of the Ottawa Design Guidelines, Water Distribution for 501 to 3,000 persons.

1. Location of Service
2. A sketch of the proposed water service to the city watermain
3. Street Number & Name
4. Type of development and units
5. Amount of fire flow required ___l/s (Calculation as per the FUS Method).
6. Average daily demand: -l/s
7. Maximum daily demand: -l/s
8. Maximum hourly daily demand: -l/s

Please note proposed development will require 2 separate service connections from the city watermains if the basic day demand is greater than 50m^3/day to avoid the creation of a vulnerable service area. Two water meters will be required for two service connections and the service connections will have to be looped.

Utility conflict with the proposed servicing

It is the consultant’s sole responsibility to investigate the existing utilities in the proposed servicing area while preparing the Servicing and Grading Plans to avoid any conflict with the proposed services and will require a note stating this on the servicing plan.

Underground and above ground building footprints

All underground and above ground building footprints and permanent walls need to be shown on the plan to confirm that any permanent structure does not extend either above or below into the existing property lines, sight triangles and/or future road widening protection limits.

SWM Criteria for the Catchment Area of the site being redeveloped: (Quantity control criteria)

- Allowable release rate will be 5-year pre-development rate.
- C Coefficient of runoff will need to be determined **as per existing conditions** but in no case more than 0.5
- TC =20 minutes or can be calculated,
- TC should not be less than 10 minutes, since the IDF curves become unrealistic less than 10min.
- Any storm events greater than 5 year, up to 100 year, and including 100-year storm event must be detained on site.

TECHNICAL BULLETIN PIEDTB-2016-01

Section 5.4.9.2,Page 5.31,

While rear yard grading will create low points and storage at each catch basin, the storage will not be considered in the available storage requirements. It will be assumed that all backyard flows in excess of the 2-year will flow towards the roads. Effective available storage will only be considered on streets and open space/park storage. Furthermore, there must be at least 30 cm of vertical clearance between the rear yard spill elevation and the ground elevation at the adjacent building envelope.

Major system storage in backyards is not to be included/accounted for in design computations, however the effect of flow attenuation can now be accounted for by assuming a constant slope ditch/swale draining to the street with the following geometry: a minimum slope of 1.5% and a minimum depth of 150 mm. The maximum allowable depth of a swale/ditch shall be 600 mm. The maximum side slope of swales/ditches shall be 3 horizontals to 1 vertical.

Section 8.3.11.6, Page 8.20:

Rear Yard storage cannot be accounted for in the water storage calculation. It should be assumed that all water in excess of the 2-year event will flow to the street. The maximum depth of flow depth in rear yards is 300 mm. Furthermore, there must be at least 30 cm of vertical clearance between the rear yard spill elevation and the ground elevation at the adjacent building envelope. See Section 5.4.9 for further information. Major system storage in backyards is not to be included/accounted for in design computations, however the effect of flow attenuation can now be accounted for by assuming a constant slope ditch/swale draining to the street.

Stormwater management criteria (Quality Control Issues)

Please note there will be a section in the SWM report that will discuss about the quality control requirements for this site. It is consultant's responsibility to check with the Rideau Valley Conservation Authority (RVCA) for quality control issues and include this information in the SWM report under Quality Control Section. Please contact RVCA for further information.

Implementation considerations

- Accounting for external overland drainage
- Use of standard ICDs
- Requirement for ICD plans
- Requirement for plans showing 100-year storm events and stress-test to show ponding limits
- Provide a foundation drain backwater valve installed as per Std Dwg S14.
- Provide full port backwater valves installed as per Std Dwg S14.1.

Monitoring MHs

Onsite Monitoring MHs are required for sewers (sanitary and storm) as the site will have commercial component with the residential development.

Sight Triangle and Road widening requirement (By Transportation Project Manager Mr. Wally Dubyk)

Sidewalk Condition/Requirement:

City needs minimum 2.0 m monolithic concrete sidewalk for more information please contact with Wally Dubyk at 613-580-2424 ext. 13783

Studies required for site Plan application

- Serviceability Study
- Hydraulic analysis for the private watermain to make sure the private site will have enough water pressure and required number of fire hydrants
- Vibration Monitoring Program for digging adjacent to 610mm feedermain
- Erosion and sediment Control Plan, it can be combined with grading plan
- Stormwater Management Report
- Geotechnical Study
- Slope Stability Report is required for a site, which has a grade difference of more than 2 meters across the property-please verify and submit a Slope Stability Report
- Transportation screening report, Mike Giampa
- Phase 2 Noise Control Detailed Study
- ESA-Phase 1 Study, needs to be prepared as per current MOECP regulation not as per CSA standards
- ESA-Phase 2, Depend on the Phase I recommendation if required needs to be prepared as per current MOE regulation not as per CSA standard
- RSC is needed for more sensitive land usage
- Wind Analysis (10 storeys or more or a proposed building is more than twice the height of adjacent existing buildings and is greater than five storeys in height)

Plans required;

a. Site Servicing Plan (Plan and Profile's for all services requiring MOECCP ECA)
b. Grade Control and Drainage Plan
c. Erosion and Sediment Control Plan
d. Plan and profile for MOE application under transfer of Review program

MOECCP SWM Requirements:

- For sanitary and storm sewers extension on the city ROW
- In the event if this property gets separated into multiple parcels, a SWM ECA will be required under Direct submission for having a SWMF for multiple parcels.

Relevant information

1. Servicing & site works shall be in accordance with the following documents:

   ⇨ Ottawa Sewer Design Guidelines (2012)
   ⇨ Ottawa Design Guidelines – Water Distribution (2010)
   ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (2004)
   ⇨ City of Ottawa Environmental Noise Control Guidelines (2006)
   ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   ⇨ City of Ottawa Accessibility Design Standards (2012)
   ⇨ Ottawa Standard Tender Documents (2015)
   ⇨ Ontario Provincial Standards for Roads & Public Works (2015)

2. Record drawings and utility plans can be purchased from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

Regards,

Mohammad

Mohammad Abdul Mottalib, M. Sc., M. Eng., P. Eng.
Sr. Engineer Infrastructure Applications
Development Review , Central Group
Planning, Infrastructure and Economic Development Department
Services de la planification, de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. West / 110, avenue Laurier Ouest, Ottawa K1P 1J1
Tel. 613-580-2424 ext. 27798 , Fax. 613-560-6006 ,E-mail: Abdul.Mottalib@ottawa.ca

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer here:

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	**3**	**1. Site Servicing Plan**	**2. Site Servicing Study / Master Servicing Study**	**S**	**3**
S	**3**	**3. Grade Control and Drainage Plan (can combine with 10.)**	**4. Geotechnical Study & Slope stability report**	**S**	**3**
	2	5. Composite Utility Plan	6. Groundwater Impact Study		3
	3	7. Servicing Options Report	8. Wellhead Protection Study		3
S	**5**	**9. Transportation Impact Assessment – See Email**	**10.Erosion and Sediment Control Plan**	**S**	**3**
S	**3**	**11.Storm water Management Report**	12. Hydro Geological Study		
S	**3**	**13.Hydraulic Water main Analysis**	**14.Noise Study**	**S**	**3**
A	**PDF only**	**15.Roadway Modification Functional Design (depends on TIA)**	**16.Vibration Monitoring Program**	**S**	**3**

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	5	17.Draft Plan of Subdivision	**18.Plan Showing Layout of Parking Garage**	**S**	**2**
	5	19.Draft Plan of Condominium	**20.Planning Rationale**	**S**	**3**
S	**5**	**21.Site Plan** **a. Building 1 details** **b. Master Plan Concept/phasing**	22.Minimum Distance Separation (MDS)		3
	5	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study		3
S	**5**	**25.Concept Plan Showing Ultimate Use of Land**	26.Cultural Heritage Impact Statement		3
S	**5**	**27.Landscape Plan**	28.Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)		3
S	**2**	**29.Survey Plan**	**30.Shadow Analysis**	**S**	**3**
S	**3**	**31.Architectural Building Elevation Drawings (dimensioned)**	**32.Design Brief**	**S**	**2**
S	**3**	**33.Wind Analysis (Building 1 details)**	34.Public Realm Network Study		3
S/A	**Number of copies**	**ENVIRONMENTAL**		**S/A**	**Number of copies**
S	**3**	**35.Phase 1 Environmental Site Assessment**	36.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		3
A	**3**	**37.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)**	38.Assessment of Landform Features		3
		39.Record of Site Condition (For your info only) – Plan and profile for MOE application	40.Mineral Resource Impact Assessment		3
S	**3**	**41.Tree Conservation Report (perimeter of Building 1 site)**	42.Environmental Impact Statement / Impact Assessment of Endangered Species		
	3	43.Mine Hazard Study / Abandoned Pit or Quarry Study	44.Integrated Environmental Review (Draft, as part of Planning Rationale)		3
S/A	**Number of copies**	**ADDITIONAL REQUIREMENTS**		**S/A**	**Number of copies**
		45. Applicant's Public Consultation Strategy (may be provided as part of the Planning Rationale)	**46. Floor Plans - typical**	**S**	**PDF only**

Meeting Date: October 4, 2019

Application Type: *Site Plan (Building 1)*

File Lead (Assigned Planner): Andrew McCreight

Infrastructure Approvals Project Manager: Abdul Mottalib

Site Address (Municipal Address): 2 Robinson

*Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the **Planning, Infrastructure and Economic Development Department** ***will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning, Infrastructure and Economic Development Department.***

Steve Matthews

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Thursday, December 9, 2021 3:02 PM
To: Francois Thauvette
Cc: Wessel, Shawn
Subject: FW: 2 Robinson Avenue
Attachments: STM_HGL_100yr_upsize_STM111895_add_88Ls.png

Hi Francois

We entered the additional flow in the 100 year model and as you can see in the attached figure, the HGL goes up a bit but is not problematic (the upper segment is your new 450 mm pipe at 1.5%). We can therefore allow the 183 L/s you requested.

Regards
Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Cooke, Ryan <ryan.cooke@ottawa.ca>
Sent: December 09, 2021 2:33 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Sandanayake, Hiran <Hiran.Sandanayake@ottawa.ca>
Subject: RE: 2 Robinson Avenue

Hi Eric,

I've attached a profile showing the HGL for this scenario (STM111895 to outlet).

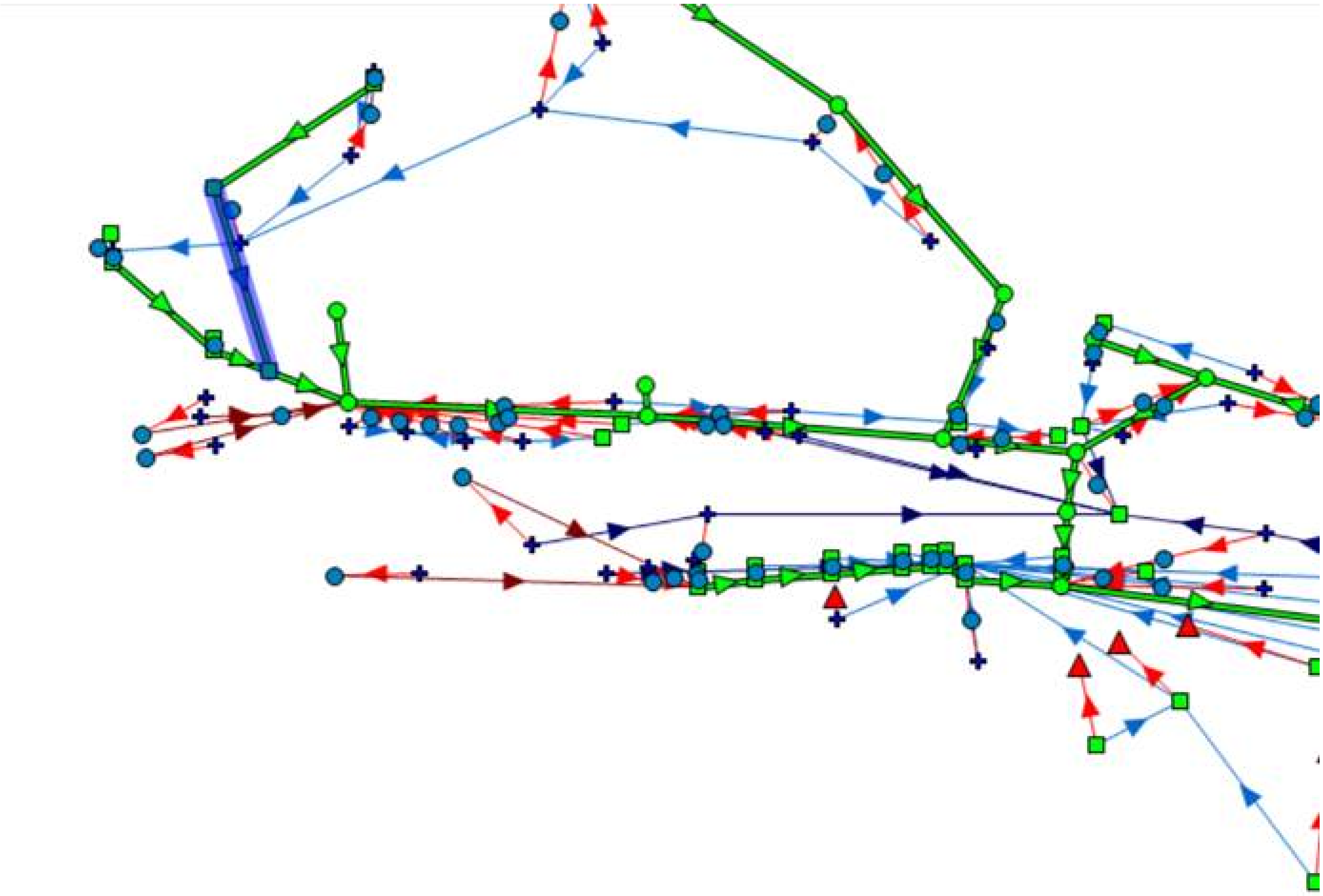
Ryan

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: 2021/12/09 1:56 PM
To: Cooke, Ryan <ryan.cooke@ottawa.ca>
Cc: Sandanayake, Hiran <Hiran.Sandanayake@ottawa.ca>
Subject: RE: 2 Robinson Avenue

Hi Ryan

I tried to copy the model over to my hard drive but for some reason I get tons or errors when I run it. ☹ I am looking for a quick assessment of the HGL if we upsize the section in blue below to 450 mm at 1.5% and add 88 L/s to it in the 100 year event (1050 outlet pipe).

Eric



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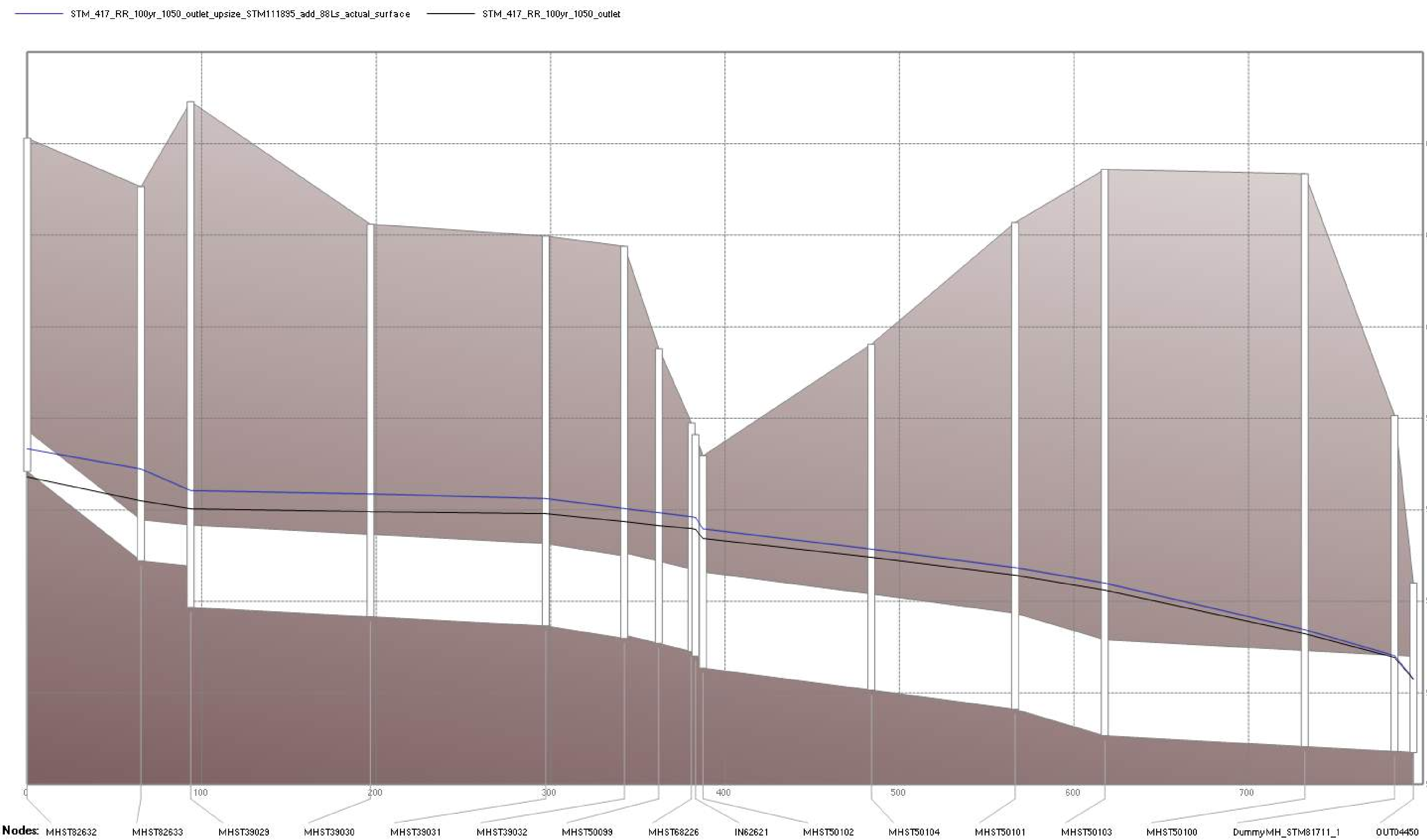

STM_417_RR_100yr_1050_outlet_upsize_STM111895_add_88Ls_actual_surface
STM_417_RR_100yr_1050_outlet
62
61
60
59
58
57
56
55
0
100
200
300
400
500
600
700
Nodes:
MHST82632
MHST82633
MHST39029
MHST39030
MHST39031
MHST39032
MHST50099
MHST68226
IN62621
MHST50102
MHST50104
MHST50101
MHST50103
MHST50100
DummyMH_STM81711_1
OUT04450

Steve Matthews

From: Francois Thauvette
Sent: Wednesday, December 8, 2021 10:53 AM
To: Tousignant, Eric
Cc: Steve Matthews
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request
Attachments: 119171-PR2_rev1.pdf; 119171-GP_rev1.pdf; 119171-NDT_rev1.pdf; 119171-SWM_rev1.pdf

Hi Eric,

Please see attached PDFs which identify the proposed storm sewers extensions along Lees Avenue and Robinson Avenue. No other storm sewer upgrades are being proposed at this time (unless necessary).

- General Plan of Services (119171-GP, rev. 1)
- Plan and Profile (119171-PR2, rev. 1)
- Civil Notes, Details and Tables (119171-NDT, rev. 1)
- Stormwater Management Plan (119171-SWM, rev. 1) – Included with the DSS&SWM Report submitted as part of the SPC application package

Notes:

- Flow from areas DR-1 and OS-4 are ultimately being directed to the downstream combined sewer system (not to the Robinson storm sewer).
- Flow from area DR-2 along the south side of the subject site will sheet drain uncontrolled towards the existing roadways CBs in Lees Avenue.
- Flow from the proposed Park Block (Area A-1) and contributing OS-1 on the east side of the subject site will be controlled by an ICD located in the outlet pipe of CBMH 06 to a max 100-year design flow of 10 L/s prior to being directed into the existing 300mm dia. storm sewer in Lees Avenue.
- Flow from the internal SWM tank 3 (Area A-2.3) on the southwest side of the subject site will be controlled by an ICD to a max 100-year design flow of 5.5 L/s prior to being directed into the existing 375mm dia. storm sewer in Lees Avenue (via proposed STM MH 10).
- Flow from the remainder of the site and contributing off-site areas will be directed towards the internal storm sewer system and will be conveyed to the existing Robinson Avenue storm sewer via the proposed 450mm dia. sewer extension at the main site entrance across from Robinson Avenue. As indicated on plan 119171-PR2, a section of the existing storm sewer in Robinson Avenue is being up-sized to a 750mm dia. sewer.

Refer to plans 119171-GP, 119171-PR2, 119171-SWM and 119171-NDT for details.

Please call should you wish to discuss or require any clarifications.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Wednesday, December 8, 2021 10:25 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Francois

Which storm pipes were you planning to connect to? Are you planning to upgrade the storm pipes since they are only 300 mm dia?

Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 29, 2021 11:55 AM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Wessel, Shawn <shawn.wessel@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Eric,

I don't know how much wiggle room you have in the system, but if we could increase our allowable release rate from 128.8 L/s up to **182.7 L/s** that would greatly reduce the storage requirements on-site. The 182.7 L/s represents the 5-year pre-development flow from the subject site area (2.3 ha), excluding contributing off-site drainage areas. If there is sufficient capacity in the system and we can increase the allowable release rate to also include contributing off-site drainage area (that cannot be diverted) that would be even more beneficial. Please review and advise is that would be acceptable.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Monday, November 29, 2021 8:08 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Wessel, Shawn <shawn.wessel@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Hi François

What is the flow increase you are looking for? There is some wiggle room, so I need to enter the new flow in the model.

Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 26, 2021 4:44 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Wessel, Shawn <shawn.wessel@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Without the benefit of HGL information our current design is based on controlling 100-yr post-development flows to the 5-yr pre-development flows (~128.8 L/s) currently tributary to the Robinson Avenue storm sewer, which includes approx. ½ the subject site and contributing off-site areas. The downside is that this approach only accounts for flow from Pre-Development areas (Pre-03 and Pre-04). Areas Pre-01 and Pre-02, which represent approx. ½ of the total area, are currently excluded from the allowable flow calculations, which results in excessive post-development storage requirements on-site. Under post-development conditions almost the entire site (incl. off-site tributary areas flowing onto the subject site that cannot be diverted) are being directed to the Robinson Avenue storm sewer, while the total flow to the downstream combined sewer system is significantly being reduced when compared to flow from pre-development areas Pre-01 and Pre-02. Reducing wet-weather flows to the downstream combined sewer system is a significant benefit to the City and other downstream properties.

Based on the City's HGL analysis, our hope is that total allowable flow to the Robinson Avenue storm sewer can be increased, so that we could reduce the excessive post-development storage requirements on-site, some of which are a result of the stormwater runoff from the neighbouring properties to the north and a portion of the Chapel Crescent R.O.W. flows that cannot be diverted.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Friday, November 26, 2021 3:40 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

HI Francois

If I read this right, you are looking for an allowable release rate of roughly 127 L/s from the site for all events up to the 100 year storm. Correct?

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 26, 2021 1:32 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

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Please see attached. Let us know if you have any questions.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Friday, November 26, 2021 11:04 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Hi François

We now have an updated model for this storm sewer with the corrected HWY417 flows. For our next step, can you confirm via email the existing and future flows from your development reaching the Robinson storm sewer for the 5 and 100 year events. We will add the difference to the model to assess the impact.

Thanks
Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 02, 2021 12:41 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

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François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Tuesday, November 2, 2021 12:39 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: Re: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Francois

I'm free from 1:30 on.

Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: Tuesday, November 2, 2021 12:13 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Would you have time for a brief (10-15 minute) Teams call today? We are trying to finalize our SWM design, but need input from the City’s SWM group ASAP. We reached out to the MTO requesting information on their existing storm sewer infrastructure near the Lees/Mann Avenue off-ramp, but they are not willing to share this information. A brief Teams call would be very much appreciated as we want to make certain that our SWM design will be acceptable to the City. Having to re-design it again could have a significant impact on the project, incl. the architect’s and other consultants’ designs.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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From: Francois Thauvette
Sent: Monday, November 1, 2021 2:49 PM
To: eric.tousignant@ottawa.ca

Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Eric,

We are working on a large re-development project at 2 Robinson Avenue and the City has asked us to extend the Robinson Avenue storm sewer to service the subject site (2 Robinson Avenue). We are sending this e-mail to request the HGL information on the existing 750mm/900mm dia. storm sewer in Robinson Avenue as well as the downstream 1050mm dia. storm sewer out to the Rideau River (see attached marked-up sketch for details). We are trying to determine if we need to match existing pre-development flows (currently tributary to the Robinson Avenue storm sewer) or if the allowable flow from the subject site can be increased (based on the site area). The main reason we are inquiring about potentially increasing flows is that under pre-development conditions only about ½ of the subject site is tributary to the Robinson Avenue storm sewer while the other ½ sheet drains west towards the baseball diamond (see attached pre-development storm drainage area sketch). Storm flows from the baseball diamond are ultimately tributary to the downstream combined sewer system in Templeton Street

As indicated in the pre-consultation meeting minutes, we have been asked to direct site flows to the municipal storm sewer in Robinson Avenue, thus reducing/eliminating storm flows to the municipal combined sewer system. We want to make certain we will not impact any adjacent and/or downstream properties, including the MTO (where the elevation of the highway is running parallel to Robinson Avenue) if flows to the Robinson Avenue sewer are increased. Please review and advise if the existing storm sewer system Robinson Avenue has any additional capacity and if so, how much?

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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'

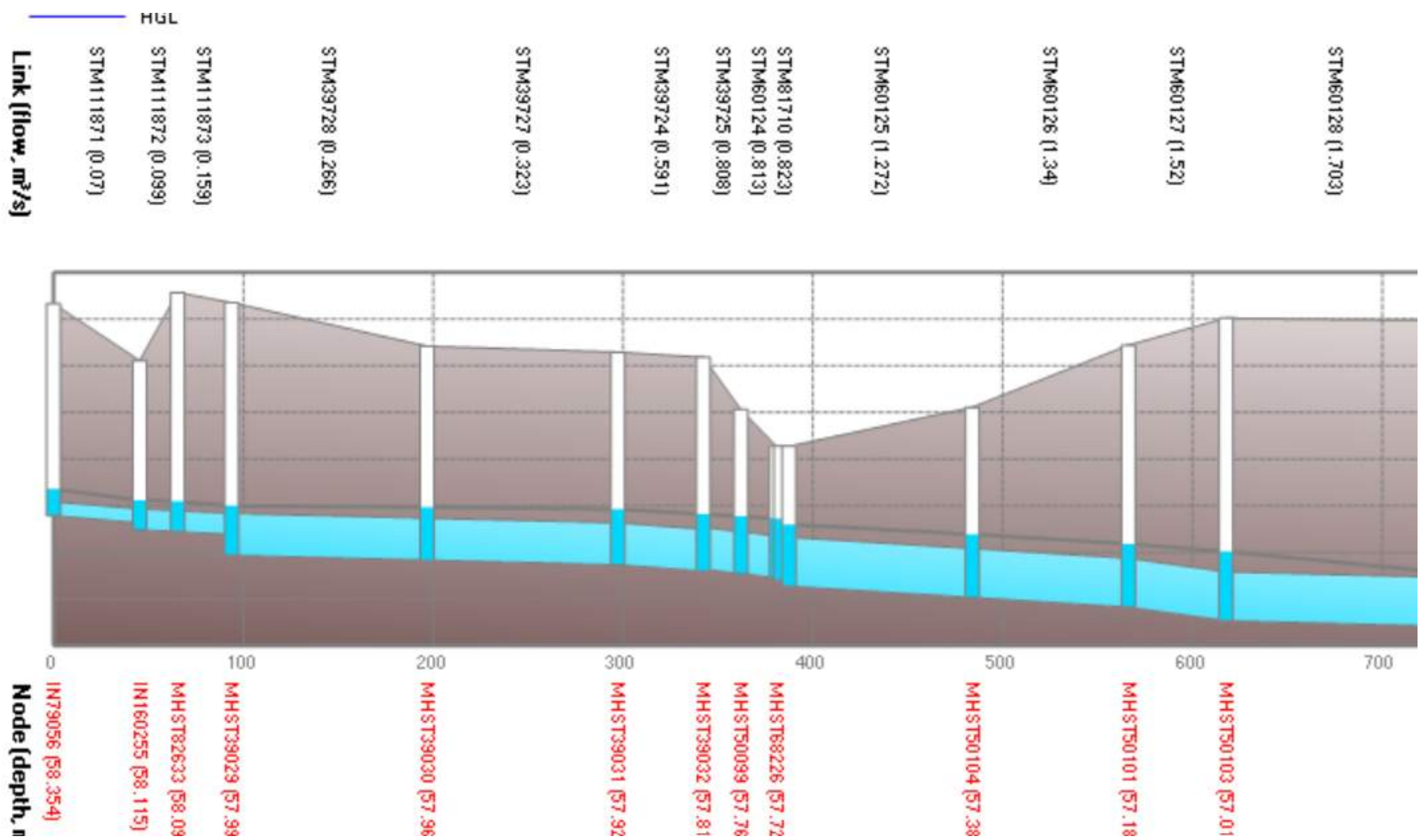
Steve Matthews

From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Tuesday, December 7, 2021 1:59 PM
To: Francois Thauvette
Cc: Mottalib, Abdul; Steve Matthews
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Francois

Further to our discussion today, this is the existing 100-year HGL in the system from your site all the way to the River. I will add the flow we discussed to see how it impacts the HGL.

Eric



From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 26, 2021 1:32 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

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Hi Eric,

Please see attached. Let us know if you have any questions.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Friday, November 26, 2021 11:04 AM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Hi François

We now have an updated model for this storm sewer with the corrected HWY417 flows. For our next step, can you confirm via email the existing and future flows from your development reaching the Robinson storm sewer for the 5 and 100 year events. We will add the difference to the model to assess the impact.

Thanks
Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: November 02, 2021 12:41 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

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François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Tuesday, November 2, 2021 12:39 PM
To: Francois Thauvette <f.thauvette@novatech-eng.com>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: Re: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Francois

I'm free from 1:30 on.

Eric

From: Francois Thauvette <f.thauvette@novatech-eng.com>
Sent: Tuesday, November 2, 2021 12:13 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: RE: 2 Robinson Avenue - Storm Sewer HGL Request

Would you have time for a brief (10-15 minute) Teams call today? We are trying to finalize our SWM design, but need input from the City's SWM group ASAP. We reached out to the MTO requesting information on their existing storm sewer infrastructure near the Lees/Mann Avenue off-ramp, but they are not willing to share this information. A brief Teams call would be very much appreciated as we want to make certain that our SWM design will be acceptable to the City. Having to re-design it again could have a significant impact on the project, incl. the architect's and other consultants' designs.

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

From: Francois Thauvette
Sent: Monday, November 1, 2021 2:49 PM
To: eric.tousignant@ottawa.ca
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>; Steve Matthews <S.Matthews@novatech-eng.com>
Subject: 2 Robinson Avenue - Storm Sewer HGL Request

Hi Eric,

We are working on a large re-development project at 2 Robinson Avenue and the City has asked us to extend the Robinson Avenue storm sewer to service the subject site (2 Robinson Avenue). We are sending this e-mail to request the

HGL information on the existing 750mm/900mm dia. storm sewer in Robinson Avenue as well as the downstream 1050mm dia. storm sewer out to the Rideau River (see attached marked-up sketch for details). We are trying to determine if we need to match existing pre-development flows (currently tributary to the Robinson Avenue storm sewer) or if the allowable flow from the subject site can be increased (based on the site area). The main reason we are inquiring about potentially increasing flows is that under pre-development conditions only about ½ of the subject site is tributary to the Robinson Avenue storm sewer while the other ½ sheet drains west towards the baseball diamond (see attached pre-development storm drainage area sketch). Storm flows from the baseball diamond are ultimately tributary to the downstream combined sewer system in Templeton Street

As indicated in the pre-consultation meeting minutes, we have been asked to direct site flows to the municipal storm sewer in Robinson Avenue, thus reducing/eliminating storm flows to the municipal combined sewer system. We want to make certain we will not impact any adjacent and/or downstream properties, including the MTO (where the elevation of the highway is running parallel to Robinson Avenue) if flows to the Robinson Avenue sewer are increased. Please review and advise if the existing storm sewer system Robinson Avenue has any additional capacity and if so, how much?

Regards,

François Thauvette, P. Eng., Senior Project Manager | Land Development & Public Sector Engineering
NOVATECH Engineers, Planners & Landscape Architects
Please note that I am working from home. Email or MS Teams are the best ways to contact me.
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 219 | Cell: 613.276.0310 | Fax: 613.254.5867

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APPENDIX B

Development Servicing Study Checklist

Servicing study guidelines for development applications

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☒ 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.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☐ 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.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ 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).
- ☒ 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.
- ☐ 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.
- ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ 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

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available

☒ Availability of public infrastructure to service proposed development

☒ Identification of system constraints

☒ Identify boundary conditions

☒ Confirmation of adequate domestic supply and pressure

☒ 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.

☒ 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.

☒ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design

☒ Address reliability requirements such as appropriate location of shut-off valves

☐ Check on the necessity of a pressure zone boundary modification.

☒ 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

- ☒ 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.
- ☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☒ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3 Development Servicing Report: Wastewater

- ☒ 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).
- ☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☒ 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.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☒ 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)
- ☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.
- ☒ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ 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).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☒ Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

- ☒ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- ☐ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ 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.
- ☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ 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.
- ☒ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ 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.
- ☒ Identification of potential impacts to receiving watercourses
- ☐ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☒ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ 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.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

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:

- ☐ 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 the Act.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☒ Clearly stated conclusions and recommendations
- ☐ 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.
- ☒ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

APPENDIX C

Sanitary Sewage Calculations

2 Robinson - Tower A and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	**Post-Development**	
Number of Studio / 1-Bedroom Units	309	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	135	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	13	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	457	
Design Population	757	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.30	
Peak Residential Flow	**8.10**	**L/s**
Commercial Flows		
Ground Floor Area	1226	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.06**	**L/s**
Extraneous Flow		
Site Area	0.55	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.18**	**L/s**
Total Peak Sanitary Flow	**8.3**	**L/s**

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2 Robinson - Tower B and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	**Post-Development**	
Number of Studio / 1-Bedroom Units	234	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	92	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	43	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	369	
Design Population	655	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.33	
Peak Residential Flow	**7.07**	**L/s**
Commercial Flows		
Ground Floor Area	657	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.03**	**L/s**
Extraneous Flow		
Site Area	0.3	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.10**	**L/s**
Total Peak Sanitary Flow	**7.2**	**L/s**

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Engineers, Planners & Landscape Architects

2 Robinson - Tower C and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	**Post-Development**	
Number of Studio / 1-Bedroom Units	241	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	84	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	44	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	369	
Design Population	651	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.33	
Peak Residential Flow	**7.03**	**L/s**
Commercial Flows		
Ground Floor Area	656	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.03**	**L/s**
Extraneous Flow		
Site Area	0.33	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.11**	**L/s**
Total Peak Sanitary Flow	**7.2**	**L/s**

2 Robinson - Tower D and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	Post-Development	
Number of Studio / 1-Bedroom Units	191	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	90	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	48	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	329	
Design Population	606	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.34	
Peak Residential Flow	**6.57**	**L/s**
Commercial Flows		
Ground Floor Area	0	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.00**	**L/s**
Extraneous Flow		
Site Area	0.88	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.29**	**L/s**
Total Peak Sanitary Flow	**6.9**	**L/s**

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

CCTV SEWER INSPECTION REVIEW FORM

PROJECT:	2 Robinson Avenue	**REPORT NO.:**	95791A1
NOVATECH PROJECT NO:	119171	**INSPECTION DATE:**	2-Sep-20
CONTRACT NO.:		**INSPECTION CONDUCTED BY:**	CWW
CORPORATION:		**REPORT RECEIVED:**	September 3rd 2020
CONTRACTOR:		**REVIEW DONE BY:**	Novatech
DATE ISSUED:	11-Dec-20	**REVIEW TO CONTRACTOR:**	

SEWER TYPE	VIDEO TYPE	COMMENTS REVIEWED BY MUNICPALITY		
☑ Sanitary Sewer	☐ Preliminary Set	☐ Yes	☐ No	☐ N/A
☐ Storm Sewer	☐ Repair Set			
☐ Combined Sewer	☐ Final Set			

DVD No. / FILE NAME (.mp4)	STREET NAME	START MH	END MH	INSPECTION LENGTH (m)	CHECK APPLICABLE BOX			PROBLEMS / OBSERVATIONS	COMMENTS
					ACCEPTABLE	MONITOR	REPAIR		
SA1 SA2_SA1_202009021141	2 Robinson - On site	SA1	Building	0.8m	☐	☐	☐	Blocked By Debris, Hole in Pipe, Gravel Infiltration	N/A, As this segment of pipe will be removed as part of this development.
SA1 SA2_SA1_202009021141	2 Robinson - On site	SA1	SA2	0.0	☐	☐	☐	Pipe not inspected as it will not be used as part of this development.	N/A, As this segment of pipe will be removed as part of this development.
SA2 SA3_SA3_202009021208	2 Robinson - On site	SA3	SA2	98.2	☐	☐	☑	SA2 has a CBMH Cover, Debris in SA2	CBMH lid should be replaced with appropriate [solid] MH lid.
SA3 SA4_SA4_202009021344	Lees Ave	SA4	SA3	78.0	☑	☐	☐	Pipe in good condition	None
SA4 SA5_SA4_202009021405	Lees Ave	SA4	SA5	66.6	☑	☐	☐	Pipe in good condition	None

APPENDIX D

Water Demands, FUS Calculations, City of Ottawa Boundary Conditions and Hydraulic Modelling Results

2 Robinson Avenue - Tower A and Podium
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Residential Water Demands	Post-Development	
Number of Studio / 1-Bedroom Units	309	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	135	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	13	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	457	
Design Population	757	
Average Daily Flow per resident	280	L/c/day
Average Day Demand	**2.45**	**L/s**
Maximum Day Demand (2.5 x avg. day)	**6.13**	**L/s**
Peak Hour Demand (2.2 x max. day)	**13.49**	**L/s**
Commercial Water Demands		
Ground Floor Area	1,226	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Average Day Demand	**0.04**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.06**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.11**	**L/s**
TOTALS		
Average Day Demand	**2.5**	**L/s**
Maximum Day Demand	**6.2**	**L/s**
Peak Hour Demand	**13.6**	**L/s**

2 Robinson Avenue - Tower B and Podium
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Residential Water Demands	**Post-Development**	
Number of Studio / 1-Bedroom Units	234	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	92	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	43	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	369	
Design Population	655	
Average Daily Flow per resident	280	L/c/day
Average Day Demand	**2.12**	**L/s**
Maximum Day Demand (2.5 x avg. day)	**5.31**	**L/s**
Peak Hour Demand (2.2 x max. day)	**11.67**	**L/s**
Commercial Water Demands		
Ground Floor Area	657	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Average Day Demand	**0.02**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.03**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.06**	**L/s**
TOTALS		
Average Day Demand	**2.1**	**L/s**
Maximum Day Demand	**5.3**	**L/s**
Peak Hour Demand	**11.7**	**L/s**

2 Robinson Avenue - Tower C and Podium
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Residential Water Demands	Post-Development	
Number of Studio / 1-Bedroom Units	241	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	84	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	44	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	369	
Design Population	651	
Average Daily Flow per resident	280	L/c/day
Average Day Demand	**2.11**	**L/s**
Maximum Day Demand (2.5 x avg. day)	**5.27**	**L/s**
Peak Hour Demand (2.2 x max. day)	**11.60**	**L/s**
Commercial Water Demands		
Ground Floor Area	656	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Average Day Demand	**0.02**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.03**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.06**	**L/s**
TOTALS		
Average Day Demand	**2.1**	**L/s**
Maximum Day Demand	**5.3**	**L/s**
Peak Hour Demand	**11.7**	**L/s**

2 Robinson Avenue - Tower D and Podium
POST-DEVELOPMENT WATER DEMANDS

DOMESTIC WATER DEMAND

Residential Water Demands	Post-Development	
Number of Studio / 1-Bedroom Units	191	
Persons per Studio / 1-Bedroom Unit	1.4	
Number of 2-Bedroom Units	90	
Persons per 2-Bedroom Unit	2.1	
Number of 3-Bedroom Units	48	
Persons per 3-Bedroom Unit	3.1	
Total Number of Units	329	
Design Population	606	
Average Daily Flow per resident	280	L/c/day
Average Day Demand	**1.96**	**L/s**
Maximum Day Demand (2.5 x avg. day)	**4.91**	**L/s**
Peak Hour Demand (2.2 x max. day)	**10.80**	**L/s**
Commercial Water Demands		
Ground Floor Area	0	m^2
Average Workshop Daily Demand	2.8	$L/m^2/day$
Average Day Demand	**0.00**	**L/s**
Maximum Day Demand (1.5 x avg. day)	**0.00**	**L/s**
Peak Hour Demand (1.8 x max. day)	**0.00**	**L/s**
TOTALS		
Average Day Demand	**2.0**	**L/s**
Maximum Day Demand	**4.9**	**L/s**
Peak Hour Demand	**10.8**	**L/s**

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

Novatech Project #:	119171		
Project Name:	2 Robinson		
Date:	11/9/2021	Legend	Input by User
Input By:	S.Matthews		No Information or Input Required
Reviewed By:	F.Thauvette		

Building Description: Tower A incl. Podium

Fire Resistive Construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	2406			
		Total Floors/Storeys (Podium)	6			
		Tower Footprint (m^2)	830			
		Total Floors/Storeys	22			
		Protected Openings (1 hr)				
		Area of structure considered (m^2)			**11,283**	
	F	**Base fire flow without reductions**				**19,000**
		$F = 220\, C\, (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**16,150**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-6,460**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**3,230**
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**20%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**13,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**217**
				or	USGPM	3,435
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2.5
		Required Volume of Fire Flow (m^3)			m^3	1950

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

Novatech Project #:	119171
Project Name:	2 Robinson
Date:	3/1/2022
Input By:	S.Matthews
Reviewed By:	F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: Tower B, incl. Podium

Fire Resistive Construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	2995			
		Total Floors/Storeys (Podium)	6			
		Tower Footprint (m^2)	830			
		Total Floors/Storeys	26			
		Protected Openings (1 hr)				
		Area of structure considered (m^2)			13,638	
	F	**Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$				21,000
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	17,850
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	-7,140
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	4,463
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**25%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 119171
Project Name: 2 Robinson
Date: 3/1/2022
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: Tower C, incl. Podium
Fire Resistive Construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	2995			
		Total Floors/Storeys (Podium)	6			
		Tower Footprint (m^2)	830			
		Total Floors/Storeys	26			
		Protected Openings (1 hr)				
		Area of structure considered (m^2)			**13,638**	
	F	**Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$				**21,000**
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**17,850**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-7,140**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**4,463**
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	20.1 - 30 m		10%	
				Cumulative Total	**25%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**15,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**250**
				or	USGPM	3,963
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	3
		Required Volume of Fire Flow (m^3)			m^3	2700

Attachment B3 - Fire Resistive (Tower with a Podium)

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

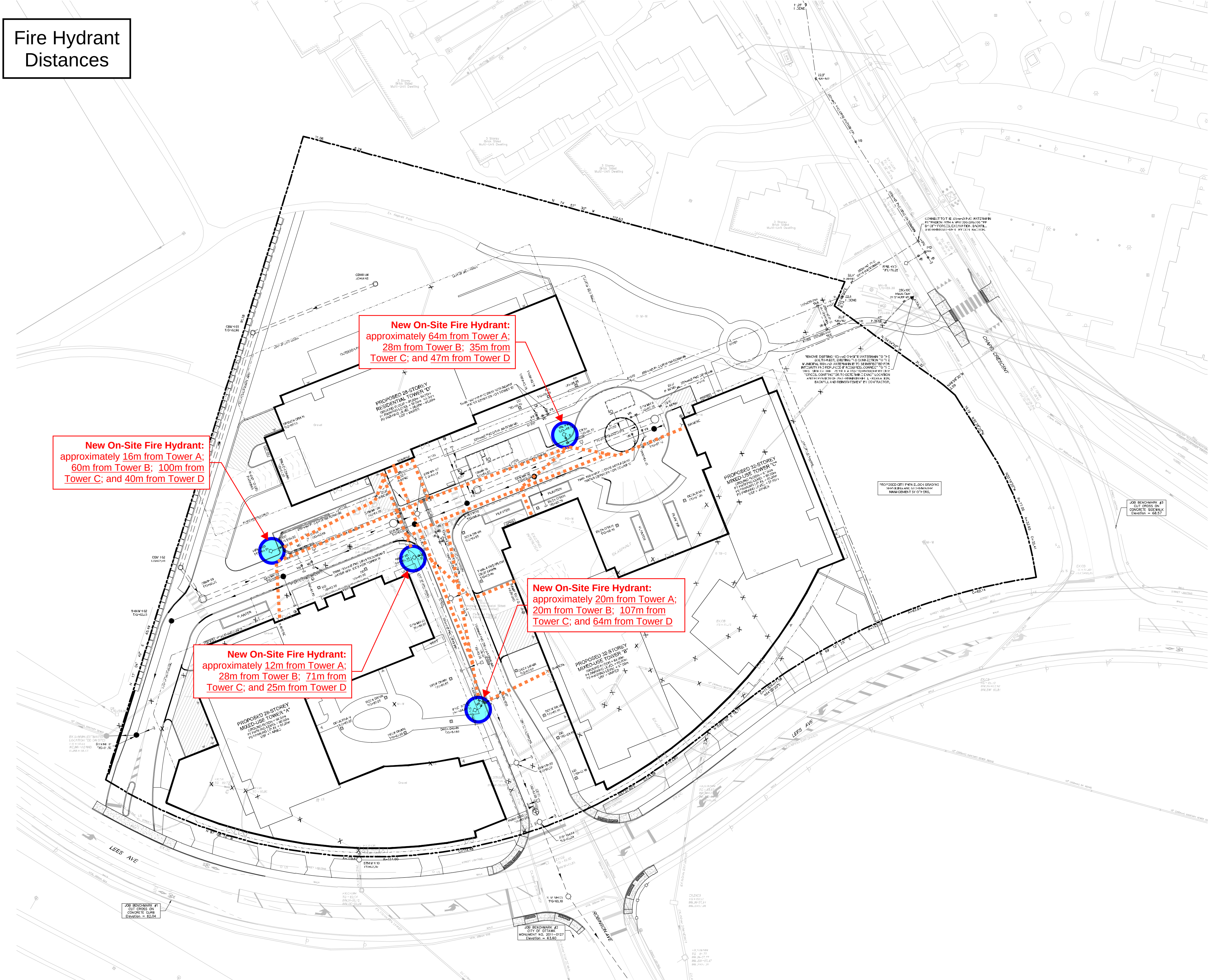
Novatech Project #: 119171
Project Name: 2 Robinson
Date: 11/9/2021
Input By: S.Matthews
Reviewed By: F.Thauvette

Legend: Input by User; No Information or Input Required

Building Description: Tower D incl. Podium
Fire Resistive Construction

Step			Choose		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Wood frame		1.5	0.8	
		Ordinary construction		1		
		Non-combustible construction	Yes	0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
		Fire resistive construction (> 3 hrs)		0.6		
2	**Floor Area**					
	A	Podium Level Footprint (m^2)	1595			
		Total Floors/Storeys (Podium)	6			
		Tower Footprint (m^2)	830			
		Total Floors/Storeys	22			
		Protected Openings (1 hr)				
		Area of structure considered (m^2)			**8,040**	
	F	**Base fire flow without reductions** $F = 220\, C\, (A)^{0.5}$				**16,000**
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**13,600**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-5,440**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System		-10%		
				Cumulative Total	**-40%**	
5	**Exposure Surcharge (cumulative %)**				**Surcharge**	
	(3)	North Side	20.1 - 30 m		10%	**2,720**
		East Side	20.1 - 30 m		10%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**20%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**11,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**183**
				or	USGPM	2,906
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	1320

Fire Hydrant Distances



Francois Thauvette

From: Wessel, Shawn <shawn.wessel@ottawa.ca>
Sent: Tuesday, March 22, 2022 9:05 AM
To: Kieran Waugh
Cc: Francois Thauvette; Steve Matthews; Lee Sheets
Subject: 2 Robinson watermain upgrades - WM length north of Wiggins
Attachments: Watermain_Site_Loop_Sketch.pdf; 119171_WaterDemands_v2.pdf; 191171-FUS-Calcs_v2.pdf; 2 Robinson Avenue March 2022.pdf

Good morning, Kieran.

The City suggested a 305mm watermain may be required along Chapel when the backbone watermain is out of service to meet fire demands within 2 Robinson. It will be up to the designer to confirm the sizing of all watermains.

The previous design (yellow loop) would be the City's preference avoiding parallel watermains throughout the site. Having a looped watermain (Blue) on the same roadway is not diligent and will create future operational issues for the owner/operator.

The current 152mm service will have to be replaced all the way to the 610mm watermain- sizing (or transition from 152mm to 203mm) to depend on fire demands. TVS to be inspected for integrity and replaced if required.

The following are boundary conditions, HGL, for hydraulic analysis at 2 Robinson (zone 1W) assumed to be connected to the 610mm on Chapel Crescent and the 203mm on Chapel Crescent. Scenario 1 considers a looped network while Scenario 2 considers a single feed without the backbone connection. (see attached PDF for location).

<u>Scenario 1: looped network with two connections to the public watermains</u>

Connection 1 (610mm Chapel):

Minimum HGL = 105.3 m

Maximum HGL = 115.1 m

MaxDay + Fire Flow (183 L/s) = 108.0 m

MaxDay + Fire Flow (217 L/s) = 107.9 m

MaxDay + Fire Flow (250 L/s) = 107.8 m

Connection 2 (203mm Chapel):

Minimum HGL = 105.5 m

Maximum HGL = 115.2 m

MaxDay + Fire Flow (183 L/s) = 107.9 m

MaxDay + Fire Flow (217 L/s) = 107.6 m

MaxDay + Fire Flow (250 L/s) = 107.4 m

Scenario 2: Single feed (backbone watermain out of service)

Connection 2 (203mm Chapel):

BSDY + Fire Flow (183 L/s) = 107.3 m

BSDY + Fire Flow (217 L/s) = 106.6 m

BSDY + Fire Flow (250 L/s) = 105.9 m

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

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

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji
Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Real Estate and Economic Development Department | Direction générale de la planification des biens immobiliers et du développement économique
City of Ottawa | Ville d'Ottawa

110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1
(613) 580 2424 Ext. | Poste 33017
Int. Mail Code | Code de Courrier Interne 01-14
shawn.wessel@ottawa.ca

*****Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

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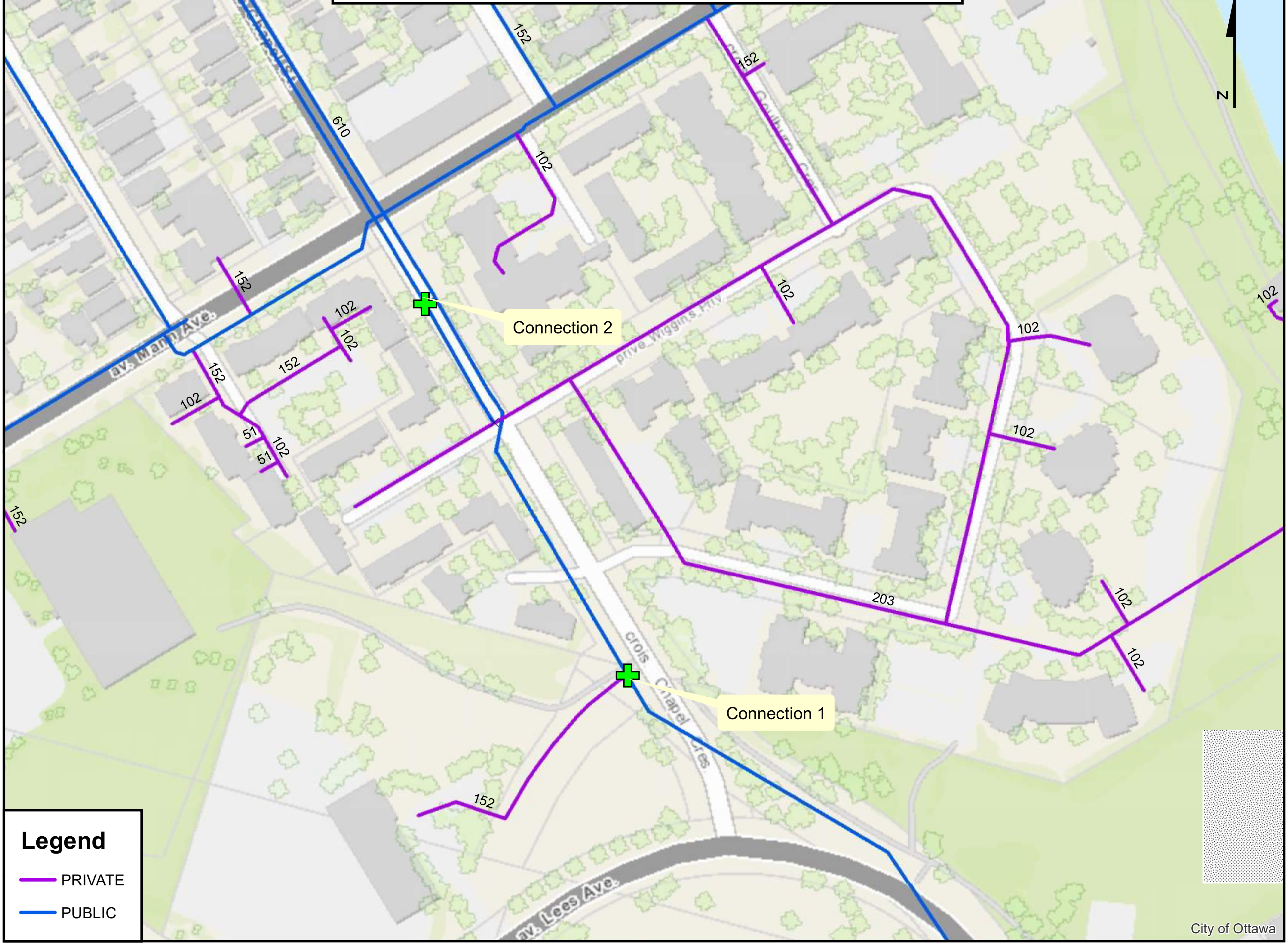
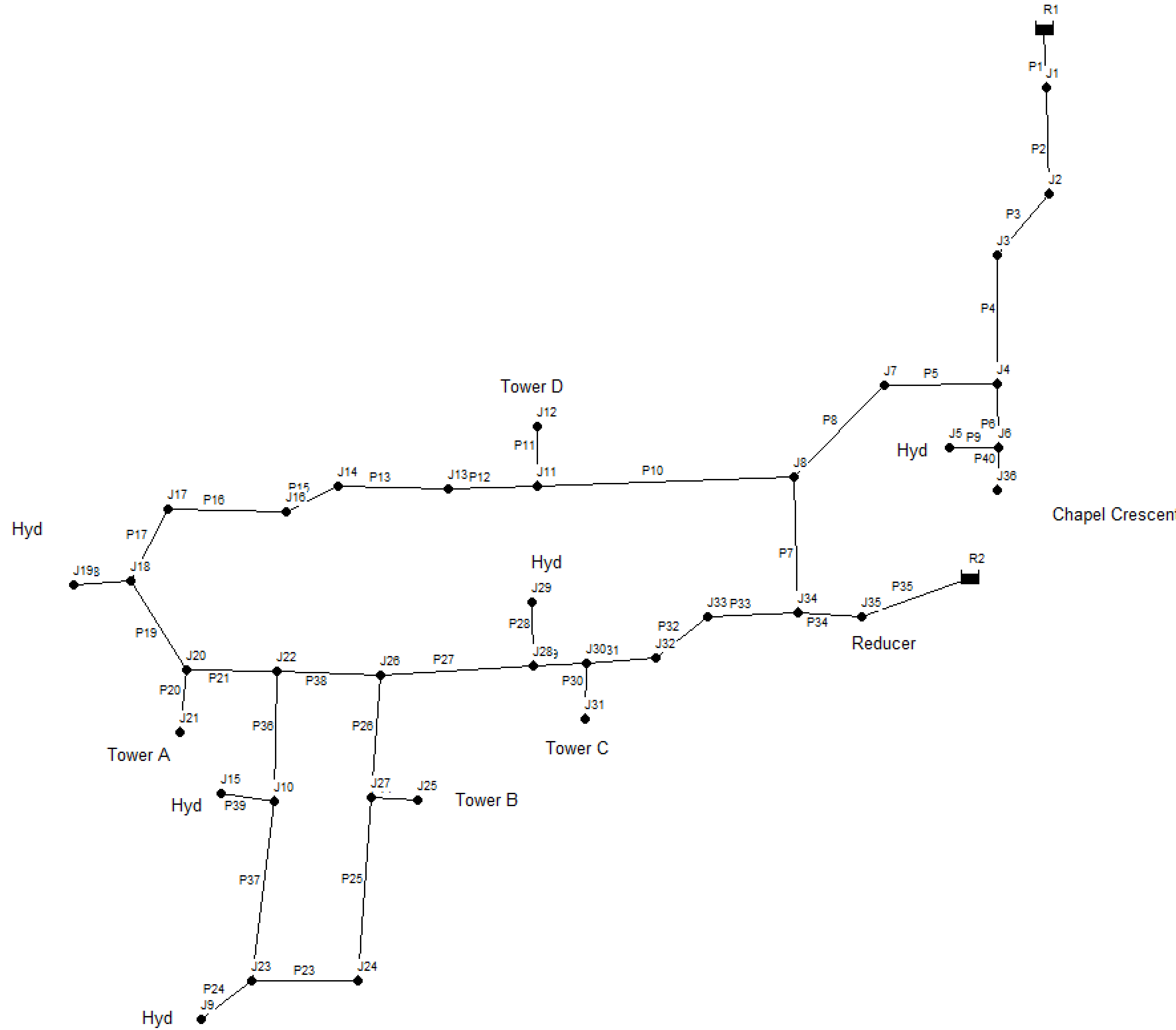
'

Boundary Conditions for 2 Robinson Avenue




R1
P1
J1
P2
J2
P3
J3
P4
J4
P5
J7
P6
J6
J5
P9
P40
J36
Hyd
P8
J8
Tower D
J12
P11
J11
P10
J14
P13
J13
P12
P15
J16
J17
P16
Hyd
P17
J19
J18
P7
Chapel Crescent
R2
P35
J35
J34
P34
Reducer
J33
P33
P32
J32
Hyd
J29
P28
J28
J30
P30
J31
Tower C
P27
J26
J22
P38
J20
P21
P19
P20
J21
Tower A
P36
P26
J10
J15
Hyd
P39
J27
J25
Tower B
P37
P25
J23
P23
J24
P24
J9
Hyd

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower A) - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	107.16	39.57	388.18	56.30
Junc J2	67.6	0	106.94	39.34	385.93	55.97
Junc J3	67.6	0	106.82	39.22	384.75	55.80
Junc J4	67.4	0	106.51	39.11	383.67	55.65
Junc J6	67.5	0	106.51	39.01	382.69	55.50
Junc J7	66.9	0	106.15	39.26	385.14	55.86
Junc J8	66.7	0	105.95	39.26	385.14	55.86
Junc J11	63.8	0	103.19	39.42	386.71	56.09
Junc J12	66	4.9	103.19	37.21	365.03	52.94
Junc J13	61.8	0	102.15	40.38	396.13	57.45
Junc J14	62.4	0	101.85	39.48	387.30	56.17
Junc J16	62.2	0	101.56	39.39	386.42	56.04
Junc J17	61.7	0	100.68	39.02	382.79	55.52
Junc J18	61.6	0	100.56	38.99	382.49	55.48
Junc J19	64.7	95	99.72	35.06	343.94	49.88
Junc J20	61.6	0	100.54	38.97	382.30	55.45
Junc J21	64	6.2	100.52	36.56	358.65	52.02
Junc J22	62.1	0	100.46	38.4	376.70	54.64
Junc J23	61.3	0	100.01	38.75	380.14	55.13
Junc J24	61.2	0	100.05	38.89	381.51	55.33
Junc J25	64	5.3	100.45	36.49	357.97	51.92
Junc J26	62.2	0	100.57	38.4	376.70	54.64
Junc J27	62.2	0	100.46	38.29	375.62	54.48
Junc J28	63.7	0	102.42	38.74	380.04	55.12
Junc J29	67.2	0	102.42	35.24	345.70	50.14
Junc J30	64.5	0	103.23	38.76	380.24	55.15
Junc J31	67.5	5.3	103.23	35.75	350.71	50.87
Junc J32	64.9	0	103.63	38.75	380.14	55.13
Junc J33	65.1	0	103.95	38.87	381.31	55.31
Junc J34	66.7	0	105.98	39.28	385.34	55.89
Junc J35	67.2	0	107.14	39.94	391.81	56.83
Junc J5	70.6	0	106.51	35.91	352.28	51.09
Junc J9	64.6	95	99.18	34.61	339.52	49.24
Junc J10	62.2	0	100.09	37.93	372.09	53.97
Junc J15	65.2	95	99.59	34.42	337.66	48.97
Junc J36	67.5	0	106.51	39.01	382.69	55.50
Resvr R1	107.6	-96.31	107.6	0	0.00	0.00
Resvr R2	107.9	-210.39	107.9	0	0.00	0.00

Max Day + Fire Flow Demand (Tower A) - DOUBLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	96.31	3.07	58.85
Pipe P2	32.3	300	120	96.31	1.36	6.95
Pipe P3	17.4	300	120	96.31	1.36	6.95
Pipe P4	44.6	300	120	96.31	1.36	6.95
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	96.31	1.96	19.85
Pipe P10	68.9	250	110	140.55	2.86	39.98
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	135.65	2.76	37.43
Pipe P13	7.9	250	110	135.65	2.76	37.43
Pipe P15	7.8	250	110	135.65	2.76	37.43
Pipe P16	23.5	250	110	135.65	2.76	37.43
Pipe P17	3.4	250	110	135.65	2.76	37.43
Pipe P18	3	150	100	95	5.38	277.99
Pipe P19	5.1	250	110	40.65	0.83	4.02
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	34.45	0.7	2.96
Pipe P23	3.7	250	110	-66.86	1.36	10.1
Pipe P26	9.3	250	110	72.16	1.47	11.63
Pipe P27	36.1	250	110	-160.85	3.28	51.32
Pipe P28	2	150	100	0	0	0
Pipe P29	15.9	250	110	-160.85	3.28	51.32
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-166.15	3.38	54.49
Pipe P32	6	250	110	-166.15	3.38	54.49
Pipe P33	37.1	250	110	-166.15	3.38	54.49
Pipe P34	13.8	250	110	-210.39	4.29	84.38
Pipe P35	9	250	110	-210.39	4.29	84.38
Pipe P5	18	250	110	-96.31	1.96	19.85
Pipe P7	5.7	250	110	-44.25	0.9	4.7
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	95	5.38	278
Pipe P25	40.3	250	110	66.86	1.36	10.1
Pipe P36	11.9	250	110	123.14	2.51	31.29
Pipe P37	37.4	250	110	28.14	0.57	2.03
Pipe P38	6.1	250	110	-88.69	1.81	17.04
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower B) - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	106.98	39.38	386.32	56.03
Junc J2	67.6	0	106.77	39.17	384.26	55.73
Junc J3	67.6	0	106.65	39.05	383.08	55.56
Junc J4	67.4	0	106.36	38.96	382.20	55.43
Junc J6	67.5	0	106.36	38.86	381.22	55.29
Junc J7	66.9	0	106.02	39.12	383.77	55.66
Junc J8	66.7	0	105.82	39.12	383.77	55.66
Junc J11	63.8	0	103.71	39.91	391.52	56.78
Junc J12	66	4.9	103.71	37.71	369.94	53.65
Junc J13	61.8	0	102.92	41.12	403.39	58.51
Junc J14	62.4	0	102.69	40.29	395.24	57.33
Junc J16	62.2	0	102.47	40.27	395.05	57.30
Junc J17	61.7	0	101.8	40.1	393.38	57.06
Junc J18	61.6	0	101.7	40.1	393.38	57.06
Junc J19	64.7	0	101.7	37	362.97	52.64
Junc J20	61.6	0	101.56	39.96	392.01	56.86
Junc J21	64	6.2	101.55	37.55	368.37	53.43
Junc J22	62.1	0	100.93	38.83	380.92	55.25
Junc J23	61.3	0	100.44	39.14	383.96	55.69
Junc J24	61.2	0	100.47	39.27	385.24	55.87
Junc J25	64	5.3	100.83	36.83	361.30	52.40
Junc J26	62.2	0	100.93	38.73	379.94	55.11
Junc J27	62.2	0	100.83	38.63	378.96	54.96
Junc J28	63.7	0	101.5	37.8	370.82	53.78
Junc J29	67.2	95	100.94	33.74	330.99	48.01
Junc J30	64.5	0	102.5	38	372.78	54.07
Junc J31	67.5	5.3	102.49	34.99	343.25	49.78
Junc J32	64.9	0	102.97	38.07	373.47	54.17
Junc J33	65.1	0	103.37	38.27	375.43	54.45
Junc J34	66.7	0	105.84	39.14	383.96	55.69
Junc J35	67.2	0	107.02	39.82	390.63	56.66
Junc J5	70.6	0	106.36	35.76	350.81	50.88
Junc J9	64.6	95	99.6	35	343.35	49.80
Junc J10	62.2	0	100.53	38.33	376.02	54.54
Junc J15	65.2	95	100.03	34.83	341.68	49.56
Junc J36	67.5	0	106.36	38.86	381.22	55.29
Resvr R1	107.4	-93.92	107.4	0	0.00	0.00
Resvr R2	107.8	-212.78	107.8	0	0.00	0.00

Max Day + Fire Flow Demand (Tower B) - DOUBLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	93.92	2.99	56.19
Pipe P2	32.3	300	120	93.92	1.33	6.64
Pipe P3	17.4	300	120	93.92	1.33	6.64
Pipe P4	44.6	300	120	93.92	1.33	6.64
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	93.92	1.91	18.95
Pipe P10	68.9	250	110	121.84	2.48	30.68
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	116.94	2.38	28.44
Pipe P13	7.9	250	110	116.94	2.38	28.44
Pipe P15	7.8	250	110	116.94	2.38	28.44
Pipe P16	23.5	250	110	116.94	2.38	28.44
Pipe P17	3.4	250	110	116.94	2.38	28.44
Pipe P18	3	150	100	0	0	0
Pipe P19	5.1	250	110	116.94	2.38	28.44
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	110.74	2.26	25.71
Pipe P23	3.7	250	110	-62.98	1.28	9.04
Pipe P26	9.3	250	110	68.28	1.39	10.5
Pipe P27	36.1	250	110	-84.56	1.72	15.6
Pipe P28	2	150	100	95	5.38	278
Pipe P29	15.9	250	110	-179.56	3.66	62.92
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-184.86	3.77	66.4
Pipe P32	6	250	110	-184.86	3.77	66.4
Pipe P33	37.1	250	110	-184.86	3.77	66.4
Pipe P34	13.8	250	110	-212.78	4.33	86.16
Pipe P35	9	250	110	-212.78	4.33	86.16
Pipe P5	18	250	110	-93.92	1.91	18.95
Pipe P7	5.7	250	110	-27.92	0.57	2
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	95	5.38	278
Pipe P25	40.3	250	110	62.98	1.28	9.04
Pipe P36	11.9	250	110	127.02	2.59	33.14
Pipe P37	37.4	250	110	32.02	0.65	2.58
Pipe P38	6.1	250	110	-16.27	0.33	0.74
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower C) - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	106.89	39.29	385.43	55.90
Junc J2	67.6	0	106.63	39.03	382.88	55.53
Junc J3	67.6	0	106.48	38.88	381.41	55.32
Junc J4	67.4	0	106.12	38.72	379.84	55.09
Junc J6	67.5	0	106.12	38.62	378.86	54.95
Junc J7	66.9	0	105.7	38.8	380.63	55.21
Junc J8	66.7	0	105.46	38.76	380.24	55.15
Junc J11	63.8	0	102.73	38.93	381.90	55.39
Junc J12	66	4.9	102.72	36.72	360.22	52.25
Junc J13	61.8	0	101.69	39.89	391.32	56.76
Junc J14	62.4	0	101.4	39	382.59	55.49
Junc J16	62.2	0	101.11	38.91	381.71	55.36
Junc J17	61.7	0	100.23	38.53	377.98	54.82
Junc J18	61.6	0	100.11	38.51	377.78	54.79
Junc J19	64.7	63	99.72	35.02	343.55	49.83
Junc J20	61.6	0	100.05	38.45	377.19	54.71
Junc J21	64	6.2	100.04	36.04	353.55	51.28
Junc J22	62.1	0	99.81	37.71	369.94	53.65
Junc J23	61.3	0	99.5	38.2	374.74	54.35
Junc J24	61.2	0	99.52	38.32	375.92	54.52
Junc J25	64	5.3	99.76	35.76	350.81	50.88
Junc J26	62.2	0	99.83	37.63	369.15	53.54
Junc J27	62.2	0	99.76	37.56	368.46	53.44
Junc J28	63.7	0	100.56	36.86	361.60	52.45
Junc J29	67.2	95	100.01	32.81	321.87	46.68
Junc J30	64.5	0	101.7	37.2	364.93	52.93
Junc J31	67.5	5.3	101.69	34.19	335.40	48.65
Junc J32	64.9	0	102.24	37.34	366.31	53.13
Junc J33	65.1	0	102.69	37.59	368.76	53.48
Junc J34	66.7	0	105.48	38.78	380.43	55.18
Junc J35	67.2	0	106.88	39.68	389.26	56.46
Junc J5	70.6	0	106.12	35.52	348.45	50.54
Junc J9	64.6	63	99.11	34.51	338.54	49.10
Junc J10	62.2	0	99.52	37.32	366.11	53.10
Junc J15	65.2	95	99.02	33.82	331.77	48.12
Junc J36	67.5	0	106.12	38.62	378.86	54.95
Resvr R1	107.4	-104.98	107.4	0	0.00	0.00
Resvr R2	107.8	-232.72	107.8	0	0.00	0.00

Max Day + Fire Flow Demand (Tower C) - DOUBLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	104.98	3.34	69.04
Pipe P2	32.3	300	120	104.98	1.49	8.15
Pipe P3	17.4	300	120	104.98	1.49	8.15
Pipe P4	44.6	300	120	104.98	1.49	8.15
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	104.98	2.14	23.29
Pipe P10	68.9	250	110	140.03	2.85	39.7
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	135.13	2.75	37.17
Pipe P13	7.9	250	110	135.13	2.75	37.17
Pipe P15	7.8	250	110	135.13	2.75	37.17
Pipe P16	23.5	250	110	135.13	2.75	37.17
Pipe P17	3.4	250	110	135.13	2.75	37.17
Pipe P18	3	150	100	63	3.57	129.92
Pipe P19	5.1	250	110	72.13	1.47	11.62
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	65.93	1.34	9.84
Pipe P23	3.7	250	110	-50.53	1.03	6.01
Pipe P26	9.3	250	110	55.83	1.14	7.23
Pipe P27	36.1	250	110	-97.37	1.98	20.26
Pipe P28	2	150	100	95	5.38	277.99
Pipe P29	15.9	250	110	-192.37	3.92	71.48
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-197.67	4.03	75.18
Pipe P32	6	250	110	-197.67	4.03	75.18
Pipe P33	37.1	250	110	-197.67	4.03	75.18
Pipe P34	13.8	250	110	-232.72	4.74	101.72
Pipe P35	9	250	110	-232.72	4.74	101.72
Pipe P5	18	250	110	-104.98	2.14	23.28
Pipe P7	5.7	250	110	-35.06	0.71	3.05
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	63	3.57	129.92
Pipe P25	40.3	250	110	50.53	1.03	6.01
Pipe P36	11.9	250	110	107.47	2.19	24.32
Pipe P37	37.4	250	110	12.47	0.25	0.45
Pipe P38	6.1	250	110	-41.54	0.85	4.18
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower D) - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	107.43	39.83	390.73	56.67
Junc J2	67.6	0	107.19	39.59	388.38	56.33
Junc J3	67.6	0	107.06	39.46	387.10	56.14
Junc J4	67.4	0	106.73	39.33	385.83	55.96
Junc J6	67.5	0	106.73	39.23	384.85	55.82
Junc J7	66.9	0	106.35	39.45	387.00	56.13
Junc J8	66.7	0	106.13	39.43	386.81	56.10
Junc J11	63.8	0	103.81	40.01	392.50	56.93
Junc J12	66	4.9	103.8	37.8	370.82	53.78
Junc J13	61.8	0	102.93	41.13	403.49	58.52
Junc J14	62.4	0	102.68	40.28	395.15	57.31
Junc J16	62.2	0	102.44	40.24	394.75	57.25
Junc J17	61.7	0	101.7	40	392.40	56.91
Junc J18	61.6	0	101.59	39.99	392.30	56.90
Junc J19	64.7	95	100.76	36.06	353.75	51.31
Junc J20	61.6	0	101.58	39.98	392.20	56.88
Junc J21	64	6.2	101.57	37.57	368.56	53.46
Junc J22	62.1	0	101.55	39.45	387.00	56.13
Junc J23	61.3	0	101.49	40.19	394.26	57.18
Junc J24	61.2	0	101.49	40.29	395.24	57.33
Junc J25	64	5.3	101.56	37.56	368.46	53.44
Junc J26	62.2	0	101.58	39.38	386.32	56.03
Junc J27	62.2	0	101.56	39.36	386.12	56.00
Junc J28	63.7	0	102.07	38.37	376.41	54.59
Junc J29	67.2	95	101.52	34.32	336.68	48.83
Junc J30	64.5	0	103.01	38.51	377.78	54.79
Junc J31	67.5	5.3	103	35.5	348.26	50.51
Junc J32	64.9	0	103.46	38.56	378.27	54.86
Junc J33	65.1	0	103.83	38.73	379.94	55.11
Junc J34	66.7	0	106.14	39.44	386.91	56.12
Junc J35	67.2	0	107.27	40.07	393.09	57.01
Junc J5	70.6	0	106.73	36.13	354.44	51.41
Junc J9	64.6	0	101.49	36.89	361.89	52.49
Junc J10	62.2	0	101.42	39.22	384.75	55.80
Junc J15	65.2	95	100.92	35.72	350.41	50.82
Junc J36	67.5	0	106.73	39.23	384.85	55.82
Resvr R1	107.9	-100.07	107.9	0	0.00	0.00
Resvr R2	108	-206.63	108	0	0.00	0.00

Max Day + Fire Flow Demand (Tower D) - DOUBLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	100.07	3.19	63.19
Pipe P2	32.3	300	120	100.07	1.42	7.46
Pipe P3	17.4	300	120	100.07	1.42	7.46
Pipe P4	44.6	300	120	100.07	1.42	7.46
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	100.07	2.04	21.31
Pipe P10	68.9	250	110	128.18	2.61	33.71
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	123.28	2.51	31.36
Pipe P13	7.9	250	110	123.28	2.51	31.36
Pipe P15	7.8	250	110	123.28	2.51	31.36
Pipe P16	23.5	250	110	123.28	2.51	31.36
Pipe P17	3.4	250	110	123.28	2.51	31.36
Pipe P18	3	150	100	95	5.38	277.99
Pipe P19	5.1	250	110	28.28	0.58	2.05
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	22.08	0.45	1.3
Pipe P23	3.7	250	110	-25.59	0.52	1.7
Pipe P26	9.3	250	110	30.89	0.63	2.42
Pipe P27	36.1	250	110	-78.22	1.59	13.5
Pipe P28	2	150	100	95	5.38	278
Pipe P29	15.9	250	110	-173.22	3.53	58.87
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-178.52	3.64	62.25
Pipe P32	6	250	110	-178.52	3.64	62.25
Pipe P33	37.1	250	110	-178.52	3.64	62.25
Pipe P34	13.8	250	110	-206.63	4.21	81.61
Pipe P35	9	250	110	-206.63	4.21	81.61
Pipe P5	18	250	110	-100.07	2.04	21.31
Pipe P7	5.7	250	110	-28.11	0.57	2.03
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	0	0	0
Pipe P25	40.3	250	110	25.59	0.52	1.71
Pipe P36	11.9	250	110	69.41	1.41	10.82
Pipe P37	37.4	250	110	-25.59	0.52	1.71
Pipe P38	6.1	250	110	-47.33	0.96	5.32
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Hydraulic Modelling Results - 2 Robinson Avenue

Peak Hour Demand - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	105.44	37.84	371.21	53.84
Junc J2	67.6	0	105.41	37.81	370.92	53.80
Junc J3	67.6	0	105.4	37.8	370.82	53.78
Junc J4	67.4	0	105.36	37.96	372.39	54.01
Junc J6	67.5	0	105.36	37.86	371.41	53.87
Junc J7	66.9	0	105.31	38.41	376.80	54.65
Junc J8	66.7	0	105.29	38.59	378.57	54.91
Junc J11	63.8	0	105.2	41.4	406.13	58.90
Junc J12	66	10.8	105.18	39.18	384.36	55.75
Junc J13	61.8	0	105.19	43.39	425.66	61.74
Junc J14	62.4	0	105.18	42.78	419.67	60.87
Junc J16	62.2	0	105.18	42.98	421.63	61.15
Junc J17	61.7	0	105.17	43.47	426.44	61.85
Junc J18	61.6	0	105.17	43.57	427.42	61.99
Junc J19	64.7	0	105.17	40.47	397.01	57.58
Junc J20	61.6	0	105.17	43.57	427.42	61.99
Junc J21	64	13.6	105.11	41.11	403.29	58.49
Junc J22	62.1	0	105.17	43.07	422.52	61.28
Junc J23	61.3	0	105.17	43.87	430.36	62.42
Junc J24	61.2	0	105.17	43.97	431.35	62.56
Junc J25	64	11.7	105.15	41.15	403.68	58.55
Junc J26	62.2	0	105.17	42.97	421.54	61.14
Junc J27	62.2	0	105.17	42.97	421.54	61.14
Junc J28	63.7	0	105.19	41.49	407.02	59.03
Junc J29	67.2	0	105.19	37.99	372.68	54.05
Junc J30	64.5	0	105.2	40.7	399.27	57.91
Junc J31	67.5	11.7	105.15	37.65	369.35	53.57
Junc J32	64.9	0	105.21	40.31	395.44	57.35
Junc J33	65.1	0	105.22	40.12	393.58	57.08
Junc J34	66.7	0	105.28	38.58	378.47	54.89
Junc J35	67.2	0	105.29	38.09	373.66	54.20
Junc J5	70.6	0	105.36	34.76	341.00	49.46
Junc J9	64.6	0	105.17	40.57	397.99	57.72
Junc J10	62.2	0	105.17	42.97	421.54	61.14
Junc J15	65.2	0	105.17	39.97	392.11	56.87
Junc J36	67.5	0	105.36	37.86	371.41	53.87
Resvr R1	105.5	-31.98	105.5	0	0.00	0.00
Resvr R2	105.3	-15.82	105.3	0	0.00	0.00

Peak Hour Demand
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	31.98	1.02	7.64
Pipe P2	32.3	300	120	31.98	0.45	0.9
Pipe P3	17.4	300	120	31.98	0.45	0.9
Pipe P4	44.6	300	120	31.98	0.45	0.9
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	31.98	0.65	2.58
Pipe P10	68.9	250	110	22.11	0.45	1.3
Pipe P11	3.2	150	100	10.8	0.61	4.96
Pipe P12	27.9	250	110	11.31	0.23	0.38
Pipe P13	7.9	250	110	11.31	0.23	0.38
Pipe P15	7.8	250	110	11.31	0.23	0.38
Pipe P16	23.5	250	110	11.31	0.23	0.38
Pipe P17	3.4	250	110	11.31	0.23	0.37
Pipe P18	3	150	100	0	0	0
Pipe P19	5.1	250	110	11.31	0.23	0.38
Pipe P20	7.3	150	100	13.6	0.77	7.6
Pipe P21	24.6	250	110	-2.29	0.05	0.02
Pipe P23	3.7	250	110	2.4	0.05	0.02
Pipe P26	9.3	250	110	9.3	0.19	0.26
Pipe P27	36.1	250	110	-13.99	0.29	0.56
Pipe P28	2	150	100	0	0	0
Pipe P29	15.9	250	110	-13.99	0.29	0.56
Pipe P30	7.5	150	100	11.7	0.66	5.75
Pipe P31	7.2	250	110	-25.69	0.52	1.72
Pipe P32	6	250	110	-25.69	0.52	1.72
Pipe P33	37.1	250	110	-25.69	0.52	1.72
Pipe P34	13.8	250	110	-15.82	0.32	0.7
Pipe P35	9	250	110	-15.82	0.32	0.7
Pipe P5	18	250	110	-31.98	0.65	2.58
Pipe P7	5.7	250	110	9.87	0.2	0.29
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-11.7	0.66	5.75
Pipe P24	3	150	100	0	0	0
Pipe P25	40.3	250	110	-2.4	0.05	0.02
Pipe P36	11.9	250	110	2.4	0.05	0.02
Pipe P37	37.4	250	110	2.4	0.05	0.02
Pipe P38	6.1	250	110	-4.69	0.1	0.07
Pipe P39	1.8	150	100	0	0	0
Pipe P40	3	300	120	0	0	0

Hydraulic Modelling Results - 2 Robinson Avenue

Max HGL check - DOUBLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	115.17	47.57	466.66	67.68
Junc J2	67.6	0	115.16	47.56	466.56	67.67
Junc J3	67.6	0	115.15	47.55	466.47	67.66
Junc J4	67.4	0	115.14	47.74	468.33	67.93
Junc J6	67.5	0	115.14	47.64	467.35	67.78
Junc J7	66.9	0	115.11	48.21	472.94	68.59
Junc J8	66.7	0	115.1	48.4	474.80	68.86
Junc J11	63.8	0	115.08	51.28	503.06	72.96
Junc J12	66	4.9	115.08	49.08	481.47	69.83
Junc J13	61.8	0	115.08	53.28	522.68	75.81
Junc J14	62.4	0	115.08	52.68	516.79	74.95
Junc J16	62.2	0	115.08	52.88	518.75	75.24
Junc J17	61.7	0	115.07	53.37	523.56	75.94
Junc J18	61.6	0	115.07	53.47	524.54	76.08
Junc J19	64.7	0	115.07	50.37	494.13	71.67
Junc J20	61.6	0	115.07	53.47	524.54	76.08
Junc J21	64	6.2	115.06	51.06	500.90	72.65
Junc J22	62.1	0	115.07	52.97	519.64	75.37
Junc J23	61.3	0	115.07	53.77	527.48	76.51
Junc J24	61.2	0	115.07	53.87	528.46	76.65
Junc J25	64	5.3	115.07	51.07	501.00	72.66
Junc J26	62.2	0	115.07	52.87	518.65	75.22
Junc J27	62.2	0	115.07	52.87	518.65	75.22
Junc J28	63.7	0	115.08	51.38	504.04	73.10
Junc J29	67.2	0	115.08	47.88	469.70	68.12
Junc J30	64.5	0	115.08	50.58	496.19	71.97
Junc J31	67.5	5.3	115.07	47.57	466.66	67.68
Junc J32	64.9	0	115.08	50.18	492.27	71.40
Junc J33	65.1	0	115.09	49.99	490.40	71.13
Junc J34	66.7	0	115.1	48.4	474.80	68.86
Junc J35	67.2	0	115.1	47.9	469.90	68.15
Junc J5	70.6	0	115.14	44.54	436.94	63.37
Junc J9	64.6	0	115.07	50.47	495.11	71.81
Junc J10	62.2	0	115.07	52.87	518.65	75.22
Junc J15	65.2	0	115.07	49.87	489.22	70.96
Junc J36	67.5	0	115.14	47.64	467.35	67.78
Resvr R1	115.2	-20.97	115.2	0	0.00	0.00
Resvr R2	115.1	-0.73	115.1	0	0.00	0.00

check - DOUBLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	20.97	0.67	3.5
Pipe P2	32.3	300	120	20.97	0.3	0.41
Pipe P3	17.4	300	120	20.97	0.3	0.41
Pipe P4	44.6	300	120	20.97	0.3	0.41
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	20.97	0.43	1.18
Pipe P10	68.9	250	110	10.17	0.21	0.31
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	5.27	0.11	0.09
Pipe P13	7.9	250	110	5.27	0.11	0.09
Pipe P15	7.8	250	110	5.27	0.11	0.09
Pipe P16	23.5	250	110	5.27	0.11	0.09
Pipe P17	3.4	250	110	5.27	0.11	0.09
Pipe P18	3	150	100	0	0	0
Pipe P19	5.1	250	110	5.27	0.11	0.09
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	-0.93	0.02	0
Pipe P23	3.7	250	110	1.1	0.02	0.01
Pipe P26	9.3	250	110	4.2	0.09	0.06
Pipe P27	36.1	250	110	-6.23	0.13	0.12
Pipe P28	2	150	100	0	0	0
Pipe P29	15.9	250	110	-6.23	0.13	0.12
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-11.53	0.23	0.39
Pipe P32	6	250	110	-11.53	0.23	0.39
Pipe P33	37.1	250	110	-11.53	0.23	0.39
Pipe P34	13.8	250	110	-0.73	0.01	0
Pipe P35	9	250	110	-0.73	0.01	0
Pipe P5	18	250	110	-20.97	0.43	1.18
Pipe P7	5.7	250	110	10.8	0.22	0.34
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	0	0	0
Pipe P25	40.3	250	110	-1.1	0.02	0
Pipe P36	11.9	250	110	1.1	0.02	0.01
Pipe P37	37.4	250	110	1.1	0.02	0
Pipe P38	6.1	250	110	-2.02	0.04	0.02
Pipe P39	1.8	150	100	0	0	0
Pipe P40	3	300	120	0	0	0

Hydraulic Modelling Results - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower A) - SINGLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	102.88	35.28	346.10	50.20
Junc J2	67.6	0	100.96	33.36	327.26	47.47
Junc J3	67.6	0	99.93	32.33	317.16	46.00
Junc J4	67.4	0	97.28	29.88	293.12	42.51
Junc J6	67.5	0	97.28	29.78	292.14	42.37
Junc J7	66.9	0	94.23	27.33	268.11	38.89
Junc J8	66.7	0	92.5	25.8	253.10	36.71
Junc J11	63.8	0	89.66	25.86	253.69	36.79
Junc J12	66	4.9	89.65	23.65	232.01	33.65
Junc J13	61.8	0	88.58	26.78	262.71	38.10
Junc J14	62.4	0	88.27	25.87	253.78	36.81
Junc J16	62.2	0	87.97	25.77	252.80	36.67
Junc J17	61.7	0	87.06	25.36	248.78	36.08
Junc J18	61.6	0	86.93	25.33	248.49	36.04
Junc J19	64.7	95	86.1	21.4	209.93	30.45
Junc J20	61.6	0	86.91	25.31	248.29	36.01
Junc J21	64	6.2	86.9	22.9	224.65	32.58
Junc J22	62.1	0	86.83	24.73	242.60	35.19
Junc J23	61.3	0	86.38	25.08	246.03	35.68
Junc J24	61.2	0	86.41	25.21	247.31	35.87
Junc J25	64	5.3	86.81	22.81	223.77	32.45
Junc J26	62.2	0	86.93	24.73	242.60	35.19
Junc J27	62.2	0	86.82	24.62	241.52	35.03
Junc J28	63.7	0	88.73	25.03	245.54	35.61
Junc J29	67.2	0	88.73	21.53	211.21	30.63
Junc J30	64.5	0	89.52	25.02	245.45	35.60
Junc J31	67.5	5.3	89.51	22.01	215.92	31.32
Junc J32	64.9	0	89.91	25.01	245.35	35.58
Junc J33	65.1	0	90.22	25.12	246.43	35.74
Junc J34	66.7	0	92.19	25.49	250.06	36.27
Junc J35	67.2	0	92.19	24.99	245.15	35.56
Junc J5	70.6	0	97.28	26.68	261.73	37.96
Junc J9	64.6	95	85.54	20.94	205.42	29.79
Junc J10	62.2	0	86.45	24.25	237.89	34.50
Junc J15	65.2	95	85.95	20.75	203.56	29.52
Junc J36	67.5	0	97.28	29.78	292.14	42.37
Resvr R1	106.6	-306.7	106.6	0	0.00	0.00

Max Day + Fire Flow Demand (Tower A) - SINGLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	306.7	9.76	502.86
Pipe P2	32.3	300	120	306.7	4.34	59.39
Pipe P3	17.4	300	120	306.7	4.34	59.39
Pipe P4	44.6	300	120	306.7	4.34	59.39
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	306.7	6.25	169.59
Pipe P10	68.9	250	110	142.89	2.91	41.22
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	137.99	2.81	38.64
Pipe P13	7.9	250	110	137.99	2.81	38.64
Pipe P15	7.8	250	110	137.99	2.81	38.64
Pipe P16	23.5	250	110	137.99	2.81	38.64
Pipe P17	3.4	250	110	137.99	2.81	38.64
Pipe P18	3	150	100	95	5.38	277.99
Pipe P19	5.1	250	110	42.99	0.88	4.46
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	36.79	0.75	3.34
Pipe P23	3.7	250	110	-66.68	1.36	10.05
Pipe P26	9.3	250	110	71.98	1.47	11.58
Pipe P27	36.1	250	110	-158.51	3.23	49.94
Pipe P28	2	150	100	0	0	0
Pipe P29	15.9	250	110	-158.51	3.23	49.94
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-163.81	3.34	53.08
Pipe P32	6	250	110	-163.81	3.34	53.08
Pipe P33	37.1	250	110	-163.81	3.34	53.08
Pipe P34	13.8	250	110	0	0	0
Pipe P5	18	250	110	-306.7	6.25	169.59
Pipe P7	5.7	250	110	163.81	3.34	53.08
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.32
Pipe P24	3	150	100	95	5.38	277.99
Pipe P25	40.3	250	110	66.68	1.36	10.05
Pipe P36	11.9	250	110	123.32	2.51	31.38
Pipe P37	37.4	250	110	28.32	0.58	2.06
Pipe P38	6.1	250	110	-86.53	1.76	16.28
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower B) - SINGLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	102.18	34.58	339.23	49.20
Junc J2	67.6	0	100.26	32.66	320.39	46.47
Junc J3	67.6	0	99.23	31.63	310.29	45.00
Junc J4	67.4	0	96.58	29.18	286.26	41.52
Junc J6	67.5	0	96.58	29.08	285.27	41.38
Junc J7	66.9	0	93.53	26.63	261.24	37.89
Junc J8	66.7	0	91.8	25.1	246.23	35.71
Junc J11	63.8	0	89.59	25.79	253.00	36.69
Junc J12	66	4.9	89.59	23.59	231.42	33.56
Junc J13	61.8	0	88.76	26.96	264.48	38.36
Junc J14	62.4	0	88.53	26.13	256.34	37.18
Junc J16	62.2	0	88.29	26.09	255.94	37.12
Junc J17	61.7	0	87.59	25.89	253.98	36.84
Junc J18	61.6	0	87.49	25.89	253.98	36.84
Junc J19	64.7	0	87.49	22.79	223.57	32.43
Junc J20	61.6	0	87.34	25.74	252.51	36.62
Junc J21	64	6.2	87.33	23.33	228.87	33.19
Junc J22	62.1	0	86.68	24.58	241.13	34.97
Junc J23	61.3	0	86.19	24.89	244.17	35.41
Junc J24	61.2	0	86.22	25.02	245.45	35.60
Junc J25	64	5.3	86.58	22.58	221.51	32.13
Junc J26	62.2	0	86.68	24.48	240.15	34.83
Junc J27	62.2	0	86.58	24.38	239.17	34.69
Junc J28	63.7	0	87.21	23.51	230.63	33.45
Junc J29	67.2	95	86.65	19.45	190.80	27.67
Junc J30	64.5	0	88.18	23.68	232.30	33.69
Junc J31	67.5	5.3	88.17	20.67	202.77	29.41
Junc J32	64.9	0	88.65	23.75	232.99	33.79
Junc J33	65.1	0	89.03	23.93	234.75	34.05
Junc J34	66.7	0	91.43	24.73	242.60	35.19
Junc J35	67.2	0	91.43	24.23	237.70	34.47
Junc J5	70.6	0	96.58	25.98	254.86	36.96
Junc J9	64.6	95	85.35	20.75	203.56	29.52
Junc J10	62.2	0	86.28	24.08	236.22	34.26
Junc J15	65.2	95	85.78	20.58	201.89	29.28
Junc J36	67.5	0	96.58	29.08	285.27	41.38
Resvr R1	105.9	-306.7	105.9	0	0.00	0.00

Max Day + Fire Flow Demand (Tower B) - SINGLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	306.7	9.76	502.86
Pipe P2	32.3	300	120	306.7	4.34	59.39
Pipe P3	17.4	300	120	306.7	4.34	59.39
Pipe P4	44.6	300	120	306.7	4.34	59.39
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	306.7	6.25	169.59
Pipe P10	68.9	250	110	124.68	2.54	32.02
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	119.78	2.44	29.73
Pipe P13	7.9	250	110	119.78	2.44	29.73
Pipe P15	7.8	250	110	119.78	2.44	29.73
Pipe P16	23.5	250	110	119.78	2.44	29.73
Pipe P17	3.4	250	110	119.78	2.44	29.73
Pipe P18	3	150	100	0	0	0
Pipe P19	5.1	250	110	119.78	2.44	29.73
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	113.58	2.31	26.94
Pipe P23	3.7	250	110	-62.93	1.28	9.03
Pipe P26	9.3	250	110	68.23	1.39	10.48
Pipe P27	36.1	250	110	-81.72	1.66	14.64
Pipe P28	2	150	100	95	5.38	277.99
Pipe P29	15.9	250	110	-176.72	3.6	61.09
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-182.02	3.71	64.53
Pipe P32	6	250	110	-182.02	3.71	64.53
Pipe P33	37.1	250	110	-182.02	3.71	64.53
Pipe P34	13.8	250	110	0	0	0
Pipe P5	18	250	110	-306.7	6.25	169.59
Pipe P7	5.7	250	110	182.02	3.71	64.53
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	95	5.38	277.99
Pipe P25	40.3	250	110	62.93	1.28	9.03
Pipe P36	11.9	250	110	127.07	2.59	33.16
Pipe P37	37.4	250	110	32.07	0.65	2.59
Pipe P38	6.1	250	110	-13.48	0.27	0.52
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower C) - SINGLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	101.45	33.85	332.07	48.16
Junc J2	67.6	0	99.16	31.56	309.60	44.90
Junc J3	67.6	0	97.92	30.32	297.44	43.14
Junc J4	67.4	0	94.76	27.36	268.40	38.93
Junc J6	67.5	0	94.76	27.26	267.42	38.79
Junc J7	66.9	0	91.11	24.21	237.50	34.45
Junc J8	66.7	0	89.04	22.34	219.16	31.79
Junc J11	63.8	0	86.2	22.4	219.74	31.87
Junc J12	66	4.9	86.19	20.19	198.06	28.73
Junc J13	61.8	0	85.11	23.31	228.67	33.17
Junc J14	62.4	0	84.81	22.41	219.84	31.89
Junc J16	62.2	0	84.51	22.31	218.86	31.74
Junc J17	61.7	0	83.6	21.9	214.84	31.16
Junc J18	61.6	0	83.46	21.86	214.45	31.10
Junc J19	64.7	63	83.07	18.37	180.21	26.14
Junc J20	61.6	0	83.4	21.8	213.86	31.02
Junc J21	64	6.2	83.39	19.39	190.22	27.59
Junc J22	62.1	0	83.14	21.04	206.40	29.94
Junc J23	61.3	0	82.83	21.53	211.21	30.63
Junc J24	61.2	0	82.85	21.65	212.39	30.80
Junc J25	64	5.3	83.09	19.09	187.27	27.16
Junc J26	62.2	0	83.16	20.96	205.62	29.82
Junc J27	62.2	0	83.09	20.89	204.93	29.72
Junc J28	63.7	0	83.85	20.15	197.67	28.67
Junc J29	67.2	95	83.29	16.09	157.84	22.89
Junc J30	64.5	0	84.95	20.45	200.61	29.10
Junc J31	67.5	5.3	84.94	17.44	171.09	24.81
Junc J32	64.9	0	85.48	20.58	201.89	29.28
Junc J33	65.1	0	85.92	20.82	204.24	29.62
Junc J34	66.7	0	88.63	21.93	215.13	31.20
Junc J35	67.2	0	88.63	21.43	210.23	30.49
Junc J5	70.6	0	94.76	24.16	237.01	34.38
Junc J9	64.6	63	82.44	17.84	175.01	25.38
Junc J10	62.2	0	82.85	20.65	202.58	29.38
Junc J15	65.2	95	82.35	17.15	168.24	24.40
Junc J36	67.5	0	94.76	27.26	267.42	38.79
Resvr R1	105.9	-337.7	105.9	0	0.00	0.00

Max Day + Fire Flow Demand (Tower C) - SINGLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	337.7	10.75	601.03
Pipe P2	32.3	300	120	337.7	4.78	70.99
Pipe P3	17.4	300	120	337.7	4.78	70.99
Pipe P4	44.6	300	120	337.7	4.78	70.99
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	337.7	6.88	202.7
Pipe P10	68.9	250	110	143.09	2.91	41.32
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	138.19	2.82	38.74
Pipe P13	7.9	250	110	138.19	2.82	38.74
Pipe P15	7.8	250	110	138.19	2.82	38.74
Pipe P16	23.5	250	110	138.19	2.82	38.74
Pipe P17	3.4	250	110	138.19	2.82	38.74
Pipe P18	3	150	100	63	3.57	129.92
Pipe P19	5.1	250	110	75.19	1.53	12.55
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	68.99	1.41	10.7
Pipe P23	3.7	250	110	-50.37	1.03	5.98
Pipe P26	9.3	250	110	55.67	1.13	7.19
Pipe P27	36.1	250	110	-94.31	1.92	19.1
Pipe P28	2	150	100	95	5.38	277.99
Pipe P29	15.9	250	110	-189.31	3.86	69.4
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-194.61	3.96	73.04
Pipe P32	6	250	110	-194.61	3.96	73.04
Pipe P33	37.1	250	110	-194.61	3.96	73.04
Pipe P34	13.8	250	110	0	0	0
Pipe P5	18	250	110	-337.7	6.88	202.7
Pipe P7	5.7	250	110	194.61	3.96	73.04
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.33
Pipe P24	3	150	100	63	3.57	129.92
Pipe P25	40.3	250	110	50.37	1.03	5.98
Pipe P36	11.9	250	110	107.63	2.19	24.39
Pipe P37	37.4	250	110	12.63	0.26	0.46
Pipe P38	6.1	250	110	-38.65	0.79	3.66
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

Proposed Mixed-Use Development - 2 Robinson Avenue

Max Day + Fire Flow Demand (Tower D) - SINGLE Watermain Feed
Network Table - Nodes

Node ID	Elevation m	Demand L/s	Head m	Pressure m	Pressure kPa	Pressure psi
Junc J1	67.6	0	103.58	35.98	352.96	51.19
Junc J2	67.6	0	101.66	34.06	334.13	48.46
Junc J3	67.6	0	100.63	33.03	324.02	47.00
Junc J4	67.4	0	97.98	30.58	299.99	43.51
Junc J6	67.5	0	97.98	30.48	299.01	43.37
Junc J7	66.9	0	94.93	28.03	274.97	39.88
Junc J8	66.7	0	93.2	26.5	259.97	37.70
Junc J11	63.8	0	90.78	26.98	264.67	38.39
Junc J12	66	4.9	90.77	24.77	242.99	35.24
Junc J13	61.8	0	89.87	28.07	275.37	39.94
Junc J14	62.4	0	89.61	27.21	266.93	38.71
Junc J16	62.2	0	89.35	27.15	266.34	38.63
Junc J17	61.7	0	88.58	26.88	263.69	38.25
Junc J18	61.6	0	88.47	26.87	263.59	38.23
Junc J19	64.7	95	87.64	22.94	225.04	32.64
Junc J20	61.6	0	88.46	26.86	263.50	38.22
Junc J21	64	6.2	88.45	24.45	239.85	34.79
Junc J22	62.1	0	88.42	26.32	258.20	37.45
Junc J23	61.3	0	88.35	27.05	265.36	38.49
Junc J24	61.2	0	88.36	27.16	266.44	38.64
Junc J25	64	5.3	88.42	24.42	239.56	34.75
Junc J26	62.2	0	88.45	26.25	257.51	37.35
Junc J27	62.2	0	88.43	26.23	257.32	37.32
Junc J28	63.7	0	88.9	25.2	247.21	35.86
Junc J29	67.2	95	88.35	21.15	207.48	30.09
Junc J30	64.5	0	89.81	25.31	248.29	36.01
Junc J31	67.5	5.3	89.8	22.3	218.76	31.73
Junc J32	64.9	0	90.25	25.35	248.68	36.07
Junc J33	65.1	0	90.61	25.51	250.25	36.30
Junc J34	66.7	0	92.85	26.15	256.53	37.21
Junc J35	67.2	0	92.85	25.65	251.63	36.50
Junc J5	70.6	0	97.98	27.38	268.60	38.96
Junc J9	64.6	0	88.35	23.75	232.99	33.79
Junc J10	62.2	0	88.29	26.09	255.94	37.12
Junc J15	65.2	95	87.79	22.59	221.61	32.14
Junc J36	67.5	0	97.98	30.48	299.01	43.37
Resvr R1	107.3	-306.7	107.3	0	0.00	0.00

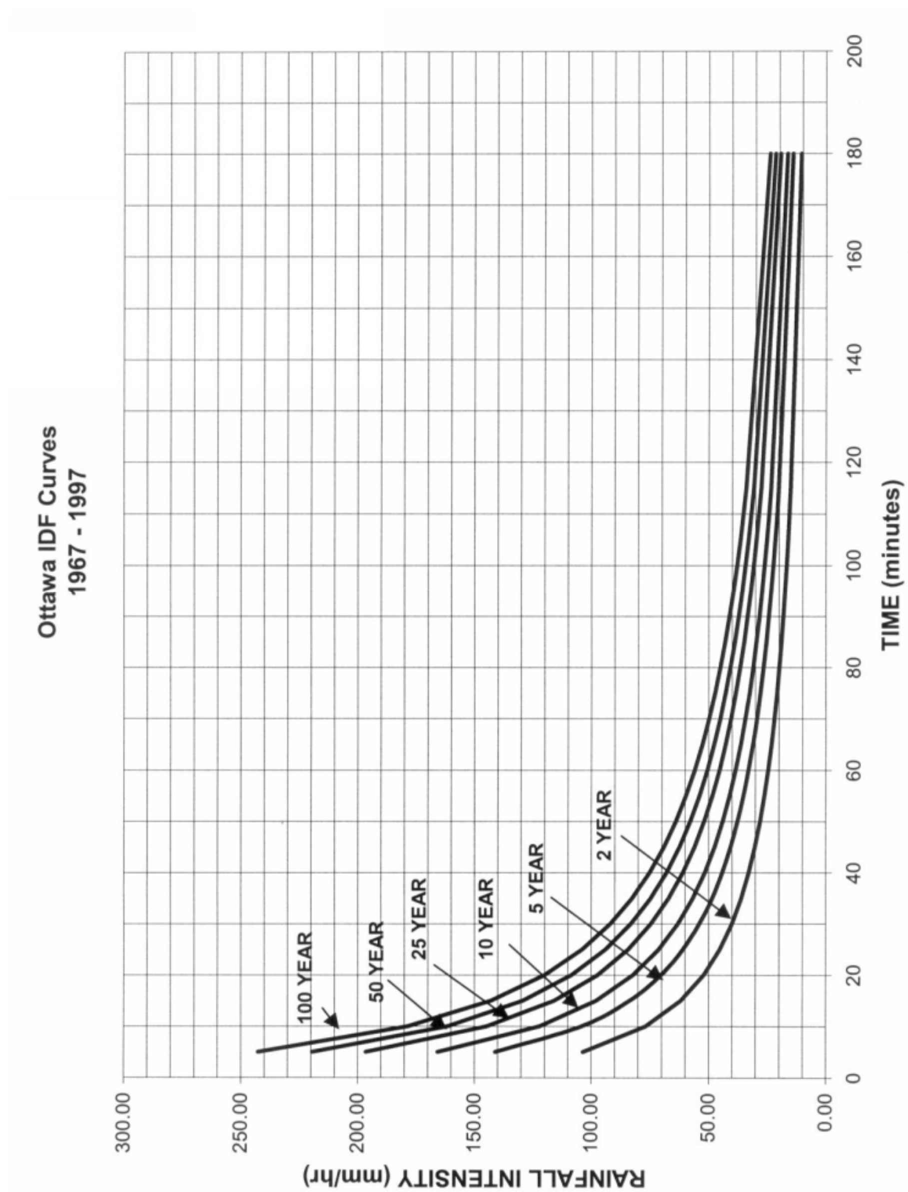
Max Day + Fire Flow Demand (Tower D) - SINGLE Watermain Feed
Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow L/s	Velocity m/s	Unit Headloss m/km
Pipe P1	7.4	200	110	306.7	9.76	502.86
Pipe P2	32.3	300	120	306.7	4.34	59.39
Pipe P3	17.4	300	120	306.7	4.34	59.39
Pipe P4	44.6	300	120	306.7	4.34	59.39
Pipe P6	3	300	120	0	0	0
Pipe P8	10.2	250	110	306.7	6.25	169.59
Pipe P10	68.9	250	110	131.01	2.67	35.1
Pipe P11	3.2	150	100	4.9	0.28	1.15
Pipe P12	27.9	250	110	126.11	2.57	32.71
Pipe P13	7.9	250	110	126.11	2.57	32.71
Pipe P15	7.8	250	110	126.11	2.57	32.71
Pipe P16	23.5	250	110	126.11	2.57	32.71
Pipe P17	3.4	250	110	126.11	2.57	32.7
Pipe P18	3	150	100	95	5.38	278
Pipe P19	5.1	250	110	31.11	0.63	2.45
Pipe P20	7.3	150	100	6.2	0.35	1.77
Pipe P21	24.6	250	110	24.91	0.51	1.62
Pipe P23	3.7	250	110	-25.37	0.52	1.68
Pipe P26	9.3	250	110	30.67	0.62	2.39
Pipe P27	36.1	250	110	-75.39	1.54	12.61
Pipe P28	2	150	100	95	5.38	278
Pipe P29	15.9	250	110	-170.39	3.47	57.1
Pipe P30	7.5	150	100	5.3	0.3	1.33
Pipe P31	7.2	250	110	-175.69	3.58	60.43
Pipe P32	6	250	110	-175.69	3.58	60.43
Pipe P33	37.1	250	110	-175.69	3.58	60.43
Pipe P34	13.8	250	110	0	0	0
Pipe P5	18	250	110	-306.7	6.25	169.59
Pipe P7	5.7	250	110	175.69	3.58	60.43
Pipe P9	5	150	100	0	0	0
Pipe P14	3	150	100	-5.3	0.3	1.32
Pipe P24	3	150	100	0	0	0
Pipe P25	40.3	250	110	25.37	0.52	1.68
Pipe P36	11.9	250	110	69.63	1.42	10.89
Pipe P37	37.4	250	110	-25.37	0.52	1.68
Pipe P38	6.1	250	110	-44.71	0.91	4.79
Pipe P39	1.8	150	100	-95	5.38	277.99
Pipe P40	3	300	120	0	0	0

APPENDIX E

IDF Curves and SWM Calculations

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



NOVATECH
Engineers, Planners & Landscape Architects

Proposed Multi-Tower Development
2 Robinson Avenue - Mixed-Use / Residential Development

Pre - Development : Site Flows

Description	Area (ha)	$A_{impervious}$ (ha) C=0.9	$A_{pervious}$ (ha) C=0.2	Weighted C_{W5}	Weighted C_{W100}	1:2 Year Flow (L/s)	1:5 Year Flow (L/s)	1:100 Year Flow (L/s)	Allowable C_w	Allowable Flow * to Robinson Storm Sewer 5-Year (L/s)
Pre-Development Area Tributary to **Combined** System	1.28	0.080	1.200	0.24	0.30	65.6	89.0	190.7	0.27	183.0
Pre-Development Area Tributary to **Robinson** Storm Sewer	1.27	0.270	1.000	0.35	0.41	94.9	128.8	258.5		
Site to be Developed	**2.064**	**0.244**	**1.820**	**0.28**	**0.34**	**124.6**	**169.1**	**347.1**		
City Park Block	**0.230**	**0.000**	**0.230**	**0.20**	**0.25**	**9.8**	**13.3**	**28.5**		
Off-Site Tributary Area OS-1	**0.072**	**0.003**	**0.069**	**0.23**	**0.28**	**3.5**	**4.8**	**10.1**		
Off-Site Tributary Area OS-2	**0.066**	**0.008**	**0.058**	**0.28**	**0.34**	**4.0**	**5.4**	**11.2**		
Off-Site Tributary Area OS-3	**0.070**	**0.019**	**0.051**	**0.39**	**0.45**	**5.8**	**7.9**	**15.8**		
Off-Site Tributary Area OS-4	**0.041**	**0.012**	**0.029**	**0.40**	**0.47**	**3.5**	**4.8**	**9.6**		
(Not including sewer split areas in table above) Summed Area Check:	2.543									

* As confirmed by the City, the allowable flow is based on the site to be developed and the existing weighted C_w with a T_c = 10mins

Post - Development : Site Flows

Area	Description	Area (ha)	A_{imp} (ha) C=0.9	A_{perv} (ha) C=0.2	C_{W5}	C_{W100}	Uncontrolled Flow (L/s)			Controlled Flow (L/s)			Storage Required ** (m^3)			Provided
							2 year	5 year	100 year	2 year	5 year	100 year	2 year	5 year	100 year	(m^3)
DR-1	**Direct Runoff to Combined System + OS-4**	**0.144**	**0.085**	**0.059**	**0.61**	**0.69**	**18.8**	**25.5**	**49.4**	-	-	-	-	-	-	-
DR-2	**Direct Runoff to Robinson Storm Sewer**	**0.077**	**0.044**	**0.033**	**0.60**	**0.68**	**9.9**	**13.4**	**25.9**	-	-	-	-	-	-	-
DR-3	**Direct Runoff from Future City Park Block**	**0.004**	**0.000**	**0.004**	**0.20**	**0.25**	**0.2**	**0.2**	**0.5**	-	-	-	-	-	-	-
A-1	**Future City Park Block + OS-1**	**0.292**	**0.003**	**0.289**	**0.21**	**0.26**	-	-	-	**17.3**	**17.6**	**18.1**	**2.6**	**5.2**	**19.3**	**23**
A-2	Controlled Tower 'A'	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	A-2.1: Tower 'A' Tank 1	**0.203**	**0.146**	**0.057**	**0.70**	**0.79**	-	-	-	**12.0**	**14.0**	**16.5**	**17.9**	**25.9**	**60.8**	**> 65**
	A-2.2: Tower 'A' Tank 2	**0.129**	**0.110**	**0.019**	**0.80**	**0.89**	-	-	-	**7.5**	**9.5**	**12.0**	**13.8**	**19.2**	**43.3**	**> 45**
	A-2.3: Tower 'A' Tank 3	**0.139**	**0.139**	**0.000**	**0.90**	**1.0**	-	-	-	**3.5**	**4.5**	**6.0**	**24.7**	**33.5**	**69.9**	**> 70**
A-3	Controlled Towers 'B' and 'C'	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	A-3.1: Towers 'C' Tank 4	**0.234**	**0.174**	**0.060**	**0.72**	**0.81**	-	-	-	**15.0**	**17.5**	**20.0**	**20.5**	**29.7**	**71.0**	**> 75**
	A-3.2: Towers 'B' Tank 5	**0.197**	**0.181**	**0.016**	**0.84**	**0.94**	-	-	-	**15.0**	**16.5**	**18.0**	**20.0**	**30.0**	**71.7**	**>75**
A-4	**Controlled Tower 'D' Tanks 6 + 7**	**0.196**	**0.194**	**0.002**	**0.89**	**0.99**	-	-	-	**8.0**	**9.7**	**14.2**	**28.9**	**40.4**	**83.2**	**91**
A-5	**Controlled West Super-Pipe + OS-3**	**0.541**	**0.190**	**0.351**	**0.45**	**0.51**	-	-	-	**13.8**	**17.5**	**36.0**	**36.3**	**50.1**	**96.1**	**106**
A-6	**Controlled East Super-Pipe + OS-2**	**0.387**	**0.119**	**0.268**	**0.42**	**0.48**	-	-	-	**9.0**	**9.4**	**12.0**	**24.4**	**36.4**	**83.0**	**99**
	Summed Area Check:	2.543						T_c = 10mins	**Totals:**	**111.1**	**129.8**	**179.3**	**189.3**	**270.5**	**598.2**	**649**
									Over Controlled:	71.9	53.2	3.7				

** using 1/2 peak flows to approximate stormwater storage requirements

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:2 YEAR EVENT
AREA DR-1 Un-Controlled Runoff to Combined System

OTTAWA IDF CURVE
Area = 0.144 ha Qallow = 18.8 L/s
C = 0.61 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	25.36	6.55	1.97
10	76.81	18.81	0.00	0.00
15	61.77	15.13	-3.68	-3.31
20	52.03	12.74	-6.07	-7.28
25	45.17	11.06	-7.75	-11.62
30	40.04	9.81	-9.00	-16.20
35	36.06	8.83	-9.98	-20.95
40	32.86	8.05	-10.76	-25.83
45	30.24	7.41	-11.40	-30.79
50	28.04	6.87	-11.94	-35.83
55	26.17	6.41	-12.40	-40.92
60	24.56	6.01	-12.79	-46.06
65	23.15	5.67	-13.14	-51.24
70	21.91	5.37	-13.44	-56.46
75	20.81	5.10	-13.71	-61.70
90	18.14	4.44	-14.37	-77.58
105	16.13	3.95	-14.86	-93.60
120	14.56	3.57	-15.24	-109.75
135	13.30	3.26	-15.55	-125.98
150	12.25	3.00	-15.81	-142.28

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:5 YEAR EVENT
AREA DR-1 Un-Controlled Runoff to Combined System

OTTAWA IDF CURVE
Area = 0.144 ha Qallow = 25.5 L/s
C = 0.61 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	34.57	9.06	2.72
10	104.19	25.52	0.00	0.00
15	83.56	20.46	-5.05	-4.55
20	70.25	17.20	-8.31	-9.97
25	60.90	14.91	-10.60	-15.90
30	53.93	13.21	-12.31	-22.16
35	48.52	11.88	-13.63	-28.63
40	44.18	10.82	-14.70	-35.27
45	40.63	9.95	-15.57	-42.03
50	37.65	9.22	-16.29	-48.88
55	35.12	8.60	-16.91	-55.82
60	32.94	8.07	-17.45	-62.81
65	31.04	7.60	-17.91	-69.86
70	29.37	7.19	-18.32	-76.96
75	27.89	6.83	-18.69	-84.09
90	24.29	5.95	-19.57	-105.67
105	21.58	5.29	-20.23	-127.45
120	19.47	4.77	-20.75	-149.39
135	17.76	4.35	-21.17	-171.44
150	16.36	4.01	-21.51	-193.58

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YEAR EVENT
AREA DR-1 Un-Controlled Runoff to Combined System

OTTAWA IDF CURVE
Area = 0.144 ha Qallow = 49.4 L/s
C = 0.69 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	67.15	17.75	5.32
10	178.56	49.40	0.00	0.00
15	142.89	39.54	-9.87	-8.88
20	119.95	33.19	-16.22	-19.46
25	103.85	28.73	-20.67	-31.01
30	91.87	25.42	-23.99	-43.17
35	82.58	22.85	-26.56	-55.77
40	75.15	20.79	-28.61	-68.67
45	69.05	19.10	-30.30	-81.81
50	63.95	17.69	-31.71	-95.13
55	59.62	16.50	-32.91	-108.59
60	55.89	15.46	-33.94	-122.18
65	52.65	14.57	-34.84	-135.87
70	49.79	13.78	-35.63	-149.64
75	47.26	13.07	-36.33	-163.48
90	41.11	11.37	-38.03	-205.36
105	36.50	10.10	-39.31	-247.62
120	32.89	9.10	-40.30	-290.18
135	30.00	8.30	-41.10	-332.94
150	27.61	7.64	-41.76	-375.88

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YR + 20% IDF Increase
AREA DR-1 Un-Controlled Runoff to Combined System

OTTAWA IDF CURVE
Area = 0.144 ha Qallow = 59.3 L/s
C = 0.69 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	80.58	21.30	6.39
10	214.27	59.28	0.00	0.00
15	171.47	47.44	-11.84	-10.66
20	143.94	39.83	-19.46	-23.35
25	124.62	34.48	-24.81	-37.21
30	110.24	30.50	-28.78	-51.81
35	99.09	27.42	-31.87	-66.92
40	90.17	24.95	-34.33	-82.40
45	82.86	22.93	-36.36	-98.17
50	76.74	21.23	-38.05	-114.15
55	71.55	19.80	-39.49	-130.31
60	67.07	18.56	-40.73	-146.62
65	63.18	17.48	-41.80	-163.04
70	59.75	16.53	-42.75	-179.56
75	56.71	15.69	-43.59	-196.18
90	49.33	13.65	-45.63	-246.43
105	43.80	12.12	-47.17	-297.15
120	39.47	10.92	-48.36	-348.21
135	36.00	9.96	-49.32	-399.53
150	33.13	9.17	-50.12	-451.05

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:2 YEAR EVENT
AREA DR-2 Un-Controlled Runoff to Robinson Sewer

OTTAWA IDF CURVE

Area = 0.077 ha Qallow = 9.9 L/s
C = 0.60 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	13.30	3.44	1.03
10	76.81	9.86	0.00	0.00
15	61.77	7.93	-1.93	-1.74
20	52.03	6.68	-3.18	-3.82
25	45.17	5.80	-4.06	-6.10
30	40.04	5.14	-4.72	-8.50
35	36.06	4.63	-5.23	-10.99
40	32.86	4.22	-5.64	-13.54
45	30.24	3.88	-5.98	-16.15
50	28.04	3.60	-6.26	-18.79
55	26.17	3.36	-6.50	-21.46
60	24.56	3.15	-6.71	-24.16
65	23.15	2.97	-6.89	-26.88
70	21.91	2.81	-7.05	-29.61
75	20.81	2.67	-7.19	-32.36
90	18.14	2.33	-7.53	-40.69
105	16.13	2.07	-7.79	-49.09
120	14.56	1.87	-7.99	-57.56
135	13.30	1.71	-8.16	-66.07
150	12.25	1.57	-8.29	-74.62

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:5 YEAR EVENT
AREA DR-2 Un-Controlled Runoff to Robinson Sewer

OTTAWA IDF CURVE

Area = 0.077 ha Qallow = 13.4 L/s
C = 0.60 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	18.13	4.75	1.43
10	104.19	13.38	0.00	0.00
15	83.56	10.73	-2.65	-2.39
20	70.25	9.02	-4.36	-5.23
25	60.90	7.82	-5.56	-8.34
30	53.93	6.93	-6.46	-11.62
35	48.52	6.23	-7.15	-15.02
40	44.18	5.67	-7.71	-18.50
45	40.63	5.22	-8.16	-22.04
50	37.65	4.84	-8.55	-25.64
55	35.12	4.51	-8.87	-29.27
60	32.94	4.23	-9.15	-32.94
65	31.04	3.99	-9.40	-36.64
70	29.37	3.77	-9.61	-40.36
75	27.89	3.58	-9.80	-44.10
90	24.29	3.12	-10.26	-55.42
105	21.58	2.77	-10.61	-66.84
120	19.47	2.50	-10.88	-78.35
135	17.76	2.28	-11.10	-89.91
150	16.36	2.10	-11.28	-101.53

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YEAR EVENT
AREA DR-2 Un-Controlled Runoff to Robinson Sewer

OTTAWA IDF CURVE

Area = 0.077 ha Qallow = 25.9 L/s
C = 0.68 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	35.25	9.32	2.80
10	178.56	25.94	0.00	0.00
15	142.89	20.76	-5.18	-4.66
20	119.95	17.42	-8.51	-10.22
25	103.85	15.08	-10.85	-16.28
30	91.87	13.34	-12.59	-22.67
35	82.58	11.99	-13.94	-29.28
40	75.15	10.92	-15.02	-36.05
45	69.05	10.03	-15.91	-42.95
50	63.95	9.29	-16.65	-49.94
55	59.62	8.66	-17.28	-57.01
60	55.89	8.12	-17.82	-64.14
65	52.65	7.65	-18.29	-71.33
70	49.79	7.23	-18.70	-78.56
75	47.26	6.86	-19.07	-85.83
90	41.11	5.97	-19.97	-107.81
105	36.50	5.30	-20.64	-130.00
120	32.89	4.78	-21.16	-152.34
135	30.00	4.36	-21.58	-174.79
150	27.61	4.01	-21.93	-197.33

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YR + 20% IDF Increase
AREA DR-2 Un-Controlled Runoff to Robinson Sewer

OTTAWA IDF CURVE

Area = 0.077 ha Qallow = 31.1 L/s
C = 0.68 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	42.30	11.18	3.35
10	214.27	31.12	0.00	0.00
15	171.47	24.91	-6.22	-5.59
20	143.94	20.91	-10.22	-12.26
25	124.62	18.10	-13.02	-19.53
30	110.24	16.01	-15.11	-27.20
35	99.09	14.39	-16.73	-35.13
40	90.17	13.10	-18.03	-43.26
45	82.86	12.04	-19.09	-51.54
50	76.74	11.15	-19.98	-59.93
55	71.55	10.39	-20.73	-68.41
60	67.07	9.74	-21.38	-76.97
65	63.18	9.18	-21.95	-85.59
70	59.75	8.68	-22.45	-94.27
75	56.71	8.24	-22.89	-102.99
90	49.33	7.17	-23.96	-129.37
105	43.80	6.36	-24.76	-156.00
120	39.47	5.73	-25.39	-182.81
135	36.00	5.23	-25.90	-209.75
150	33.13	4.81	-26.31	-236.80

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:2 YEAR EVENT
AREA DR-3 Un-Controlled Runoff from Future Park

OTTAWA IDF CURVE

Area = 0.004 ha Qallow = 0.2 L/s
C = 0.20 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	0.23	0.06	0.02
10	76.81	0.17	0.00	0.00
15	61.77	0.14	-0.03	-0.03
20	52.03	0.12	-0.06	-0.07
25	45.17	0.10	-0.07	-0.11
30	40.04	0.09	-0.08	-0.15
35	36.06	0.08	-0.09	-0.19
40	32.86	0.07	-0.10	-0.23
45	30.24	0.07	-0.10	-0.28
50	28.04	0.06	-0.11	-0.33
55	26.17	0.06	-0.11	-0.37
60	24.56	0.05	-0.12	-0.42
65	23.15	0.05	-0.12	-0.47
70	21.91	0.05	-0.12	-0.51
75	20.81	0.05	-0.12	-0.56
90	18.14	0.04	-0.13	-0.70
105	16.13	0.04	-0.13	-0.85
120	14.56	0.03	-0.14	-1.00
135	13.30	0.03	-0.14	-1.14
150	12.25	0.03	-0.14	-1.29

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:5 YEAR EVENT
AREA DR-3 Un-Controlled Runoff from Future Park

OTTAWA IDF CURVE

Area = 0.004 ha Qallow = 0.2 L/s
C = 0.20 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	0.31	0.08	0.02
10	104.19	0.23	0.00	0.00
15	83.56	0.19	-0.05	-0.04
20	70.25	0.16	-0.08	-0.09
25	60.90	0.14	-0.10	-0.14
30	53.93	0.12	-0.11	-0.20
35	48.52	0.11	-0.12	-0.26
40	44.18	0.10	-0.13	-0.32
45	40.63	0.09	-0.14	-0.38
50	37.65	0.08	-0.15	-0.44
55	35.12	0.08	-0.15	-0.51
60	32.94	0.07	-0.16	-0.57
65	31.04	0.07	-0.16	-0.63
70	29.37	0.07	-0.17	-0.70
75	27.89	0.06	-0.17	-0.76
90	24.29	0.05	-0.18	-0.96
105	21.58	0.05	-0.18	-1.16
120	19.47	0.04	-0.19	-1.36
135	17.76	0.04	-0.19	-1.56
150	16.36	0.04	-0.20	-1.76

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YEAR EVENT
AREA DR-3 Un-Controlled Runoff from Future Park

OTTAWA IDF CURVE

Area = 0.004 ha Qallow = 0.5 L/s
C = 0.25 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	0.67	0.18	0.05
10	178.56	0.50	0.00	0.00
15	142.89	0.40	-0.10	-0.09
20	119.95	0.33	-0.16	-0.20
25	103.85	0.29	-0.21	-0.31
30	91.87	0.26	-0.24	-0.43
35	82.58	0.23	-0.27	-0.56
40	75.15	0.21	-0.29	-0.69
45	69.05	0.19	-0.30	-0.82
50	63.95	0.18	-0.32	-0.96
55	59.62	0.17	-0.33	-1.09
60	55.89	0.16	-0.34	-1.23
65	52.65	0.15	-0.35	-1.37
70	49.79	0.14	-0.36	-1.50
75	47.26	0.13	-0.37	-1.64
90	41.11	0.11	-0.38	-2.06
105	36.50	0.10	-0.39	-2.49
120	32.89	0.09	-0.40	-2.92
135	30.00	0.08	-0.41	-3.35
150	27.61	0.08	-0.42	-3.78

Proposed Mixed-Use Development
Novatech Project No. 119171
Uncontrolled Runoff - 1:100 YR + 20% IDF Increase
AREA DR-3 Un-Controlled Runoff from Future Park

OTTAWA IDF CURVE

Area = 0.004 ha Qallow = 0.6 L/s
C = 0.25 Vol(max) = 0.0 m3

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	0.81	0.21	0.06
10	214.27	0.60	0.00	0.00
15	171.47	0.48	-0.12	-0.11
20	143.94	0.40	-0.20	-0.23
25	124.62	0.35	-0.25	-0.37
30	110.24	0.31	-0.29	-0.52
35	99.09	0.28	-0.32	-0.67
40	90.17	0.25	-0.34	-0.83
45	82.86	0.23	-0.37	-0.99
50	76.74	0.21	-0.38	-1.15
55	71.55	0.20	-0.40	-1.31
60	67.07	0.19	-0.41	-1.47
65	63.18	0.18	-0.42	-1.64
70	59.75	0.17	-0.43	-1.80
75	56.71	0.16	-0.44	-1.97
90	49.33	0.14	-0.46	-2.48
105	43.80	0.12	-0.47	-2.99
120	39.47	0.11	-0.49	-3.50
135	36.00	0.10	-0.50	-4.01
150	33.13	0.09	-0.50	-4.53

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-1 **Future City Park Block + OS-1**

OTTAWA IDF CURVE — Qpeak = 17.3 L/s
Area = 0.292 ha — Qavg = 8.7 L/s
C = 0.21 — Vol(max) = 2.6 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	17.42	8.77	2.63
10	76.81	12.92	4.27	2.56
15	61.77	10.39	1.74	1.56
20	52.03	8.75	0.10	0.12
25	45.17	7.60	-1.05	-1.58
30	40.04	6.73	-1.92	-3.45
35	36.06	6.06	-2.59	-5.43
40	32.86	5.53	-3.12	-7.49
45	30.24	5.09	-3.56	-9.62
50	28.04	4.72	-3.93	-11.80
55	26.17	4.40	-4.25	-14.02
60	24.56	4.13	-4.52	-16.27
75	20.81	3.50	-5.15	-23.17
90	18.14	3.05	-5.60	-30.23
120	14.56	2.45	-6.20	-44.65
150	12.25	2.06	-6.59	-59.30
180	10.63	1.79	-6.86	-74.12
210	9.42	1.58	-7.07	-89.04
240	8.47	1.43	-7.22	-104.03
270	7.72	1.30	-7.35	-119.09

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-1 **Future City Park Block + OS-1**

OTTAWA IDF CURVE — Qpeak = 17.6 L/s
Area = 0.292 ha — Qavg = 8.8 L/s
C = 0.21 — Vol(max) = 5.2 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	23.74	14.94	4.48
10	104.19	17.52	8.72	5.23
15	83.56	14.05	5.25	4.73
20	70.25	11.82	3.02	3.62
25	60.90	10.24	1.44	2.16
30	53.93	9.07	0.27	0.49
35	48.52	8.16	-0.64	-1.34
40	44.18	7.43	-1.37	-3.28
45	40.63	6.83	-1.97	-5.31
50	37.65	6.33	-2.47	-7.40
55	35.12	5.91	-2.89	-9.55
60	32.94	5.54	-3.26	-11.73
75	27.89	4.69	-4.11	-18.49
90	24.29	4.09	-4.71	-25.46
120	19.47	3.27	-5.53	-39.79
150	16.36	2.75	-6.05	-54.43
180	14.18	2.38	-6.42	-69.28
210	12.56	2.11	-6.69	-84.27
240	11.29	1.90	-6.90	-99.37
270	10.28	1.73	-7.07	-114.54

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-1 **Future City Park Block + OS-1**

OTTAWA IDF CURVE — Qpeak = 18.1 L/s
Area = 0.292 ha — Qavg = 9.1 L/s
C = 0.26 — Vol(max) = 19.3 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	50.77	41.72	12.52
10	178.56	37.35	28.30	16.98
15	142.89	29.89	20.84	18.76
20	119.95	25.09	16.04	19.25
25	103.85	21.72	12.67	19.01
30	91.87	19.22	10.17	18.30
35	82.58	17.28	8.23	17.27
40	75.15	15.72	6.67	16.01
45	69.05	14.45	5.40	14.57
50	63.95	13.38	4.33	12.99
55	59.62	12.47	3.42	11.30
60	55.89	11.69	2.64	9.51
75	47.26	9.89	0.84	3.76
90	41.11	8.60	-0.45	-2.43
120	32.89	6.88	-2.17	-15.61
150	27.61	5.78	-3.27	-29.47
180	23.90	5.00	-4.05	-43.74
210	21.14	4.42	-4.63	-58.30
240	19.01	3.98	-5.07	-73.07
270	17.29	3.62	-5.43	-88.00

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-1 **Future City Park Block + OS-1**

OTTAWA IDF CURVE — Qpeak = 18.4 L/s
Area = 0.292 ha — Qavg = 9.2 L/s
C = 0.26 — Vol(max) = 25.3 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	60.93	51.73	15.52
10	214.27	44.82	35.62	21.37
15	171.47	35.87	26.67	24.00
20	143.94	30.11	20.91	25.09
25	124.62	26.07	16.87	25.30
30	110.24	23.06	13.86	24.95
35	99.09	20.73	11.53	24.21
40	90.17	18.86	9.66	23.19
45	82.86	17.33	8.13	21.96
50	76.74	16.05	6.85	20.56
55	71.55	14.97	5.77	19.03
60	67.07	14.03	4.83	17.39
75	56.71	11.86	2.66	11.98
90	49.33	10.32	1.12	6.05
120	39.47	8.26	-0.94	-6.78
150	33.13	6.93	-2.27	-20.42
180	28.68	6.00	-3.20	-34.56
210	25.37	5.31	-3.89	-49.04
240	22.81	4.77	-4.43	-63.78
270	20.75	4.34	-4.86	-78.71

Structure	Size (mm)	Area (m^2)	T/G	Inv IN	Inv OUT
DICB 01	600 x 1200	0.72	65.90	-	63.90

Area A-1: Storage Table			Underground Storage	Surface Storage			Total Storage	
Elevation (m)	System Depth (m)	DICB 01 Volume (m^3)	Combined Volume (m^3)	DICB 01 Area (m^2)	DICB 01 Volume (m^3)	Ponding Volume (m^3)	**Total Volume (m^3)**	Head
63.90	0.00	-	-	-	-	-	**0**	-
64.05	0.15	0.11	0.11	-	-	-	**0.1**	0.00
64.55	0.65	0.47	0.47	-	-	-	**0.5**	0.50
65.05	1.15	0.83	0.83	-	-	-	**0.8**	1.00
65.55	1.65	1.19	1.19	-	-	-	**1.2**	1.50
65.90	2.00	1.44	1.44	0.0	0.0	-	**1.4**	1.85
65.95	2.05	-	1.44	9.40	0.23	0.2	**1.7**	1.90
66.00	2.10	-	1.44	36.83	1.39	1.4	**2.8**	1.95
66.05	2.15	-	1.44	75.53	4.20	4.2	**5.6**	2.00
66.10	2.20	-	1.44	116.26	8.99	9.0	**10.4**	2.05
66.15	2.25	-	1.44	122.89	14.97	15.0	**16.4**	2.10
66.20	2.30	-	1.44	131.38	21.33	21.3	**22.8**	2.15

Maximum Ponding Depth (cm)	
1:100 Yr	**27**
1:5 Yr	**14**
1:2 Yr	**9**

Tempest Vortex LMF ICD - Custom

1:100 Yr
Flow (L/s) = 18.1
Head (m) = 2.12
Elevation (m) = **66.17**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 19.3

1:5 Yr
Flow (L/s) = 17.6
Head (m) = 1.99
Elevation (m) = **66.04**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 5.2

1:2 Yr
Flow (L/s) = 17.3
Head (m) = 1.94
Elevation (m) = **65.99**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 2.6

Orifice Size - 1:100 yr Flow Check

Q=0.62xAx(2gh)^0.5

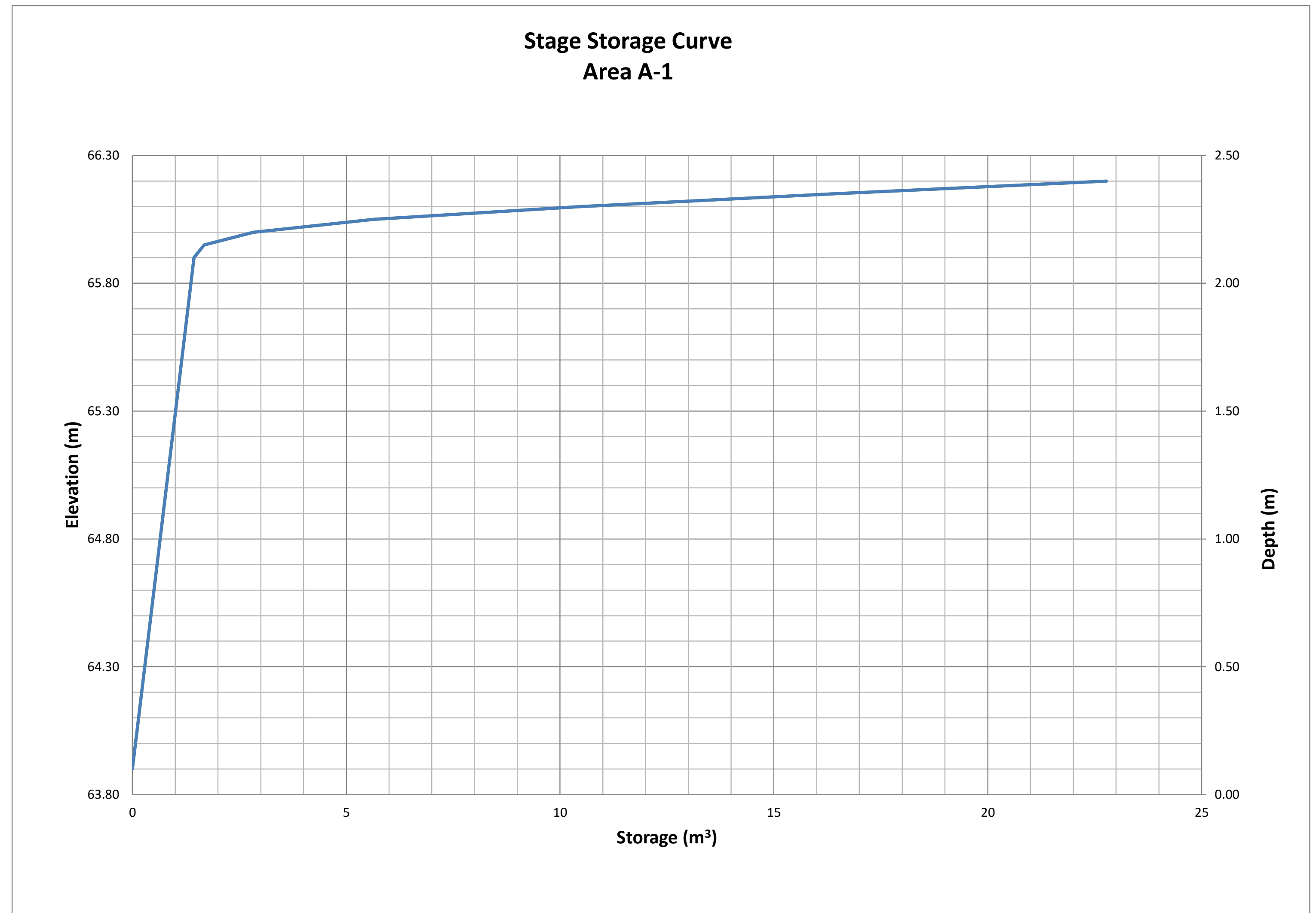
	1:100 yr	Flow Check
Q (m^3/s) =	0.0181	**0.0181**
g (m/s^2) =	9.81	9.81
h (m) =	**2.12**	2.12
A (m^2) =	**0.004529244**	**0.00454**
D (m) =	**0.075939529**	**0.07600**
D (mm) =	**76**	76.0

1:5 yr Flow Check

	1:5 yr
Q (m^3/s) =	0.0176
g (m/s^2) =	9.81
h (m) =	**1.99**
A (m^2) =	**0.00454**
D (m) =	**0.076**
D (mm) =	**76**

1:2 yr Flow Check

	1:2 yr
Q (m^3/s) =	0.0173
g (m/s^2) =	9.81
h (m) =	**1.94**
A (m^2) =	**0.00454**
D (m) =	**0.076**
D (mm) =	**76**



Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-2.1 **Controlled Tower 'A' Tank 1**

OTTAWA IDF CURVE — Qpeak = 12.0 L/s
Area = 0.203 ha — Qavg = 6.0 L/s
C = 0.70 — Vol(max) = 17.9 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	41.12	35.12	10.53
10	76.81	30.49	24.49	14.69
15	61.77	24.52	18.52	16.67
20	52.03	20.66	14.66	17.59
25	45.17	17.93	11.93	17.90
30	40.04	15.90	9.90	17.81
35	36.06	14.31	8.31	17.46
40	32.86	13.05	7.05	16.91
45	30.24	12.00	6.00	16.21
50	28.04	11.13	5.13	15.40
55	26.17	10.39	4.39	14.48
60	24.56	9.75	3.75	13.50
75	20.81	8.26	2.26	10.18
90	18.14	7.20	1.20	6.49
120	14.56	5.78	-0.22	-1.58
150	12.25	4.86	-1.14	-10.23
180	10.63	4.22	-1.78	-19.24
210	9.42	3.74	-2.26	-28.50
240	8.47	3.36	-2.64	-37.95
270	7.72	3.07	-2.93	-47.54

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 **Controlled Tower 'A' Tank 1**

OTTAWA IDF CURVE — Qpeak = 14.0 L/s
Area = 0.203 ha — Qavg = 7.0 L/s
C = 0.70 — Vol(max) = 25.9 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	56.05	49.05	14.71
10	104.19	41.36	34.36	20.62
15	83.56	33.17	26.17	23.55
20	70.25	27.89	20.89	25.07
25	60.90	24.17	17.17	25.76
30	53.93	21.41	14.41	25.94
35	48.52	19.26	12.26	25.75
40	44.18	17.54	10.54	25.30
45	40.63	16.13	9.13	24.65
50	37.65	14.95	7.95	23.84
55	35.12	13.94	6.94	22.91
60	32.94	13.08	6.08	21.88
75	27.89	11.07	4.07	18.32
90	24.29	9.64	2.64	14.27
120	19.47	7.73	0.73	5.24
150	16.36	6.50	-0.50	-4.54
180	14.18	5.63	-1.37	-14.80
210	12.56	4.98	-2.02	-25.40
240	11.29	4.48	-2.52	-36.23
270	10.28	4.08	-2.92	-47.26

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-2.1 **Controlled Tower 'A' Tank 1**

OTTAWA IDF CURVE — Qpeak = 16.5 L/s
Area = 0.203 ha — Qavg = 8.3 L/s
C = 0.79 — Vol(max) = 60.8 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	108.12	99.87	29.96
10	178.56	79.55	71.30	42.78
15	142.89	63.66	55.41	49.87
20	119.95	53.44	45.19	54.22
25	103.85	46.26	38.01	57.02
30	91.87	40.93	32.68	58.82
35	82.58	36.79	28.54	59.93
40	75.15	33.48	25.23	60.54
45	69.05	30.76	22.51	60.78
50	63.95	28.49	20.24	60.72
55	59.62	26.56	18.31	60.43
60	55.89	24.90	16.65	59.94
75	47.26	21.05	12.80	57.61
90	41.11	18.31	10.06	54.35
120	32.89	14.65	6.40	46.11
150	27.61	12.30	4.05	36.45
180	23.90	10.65	2.40	25.90
210	21.14	9.42	1.17	14.74
240	19.01	8.47	0.22	3.12
270	17.29	7.70	-0.55	-8.84

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 **Controlled Tower 'A' Tank 1**

OTTAWA IDF CURVE — Qpeak = 18.0 L/s
Area = 0.203 ha — Qavg = 9.0 L/s
C = 0.79 — Vol(max) = 75.6 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	129.75	120.75	36.22
10	214.27	95.46	86.46	51.87
15	171.47	76.39	67.39	60.65
20	143.94	64.12	55.12	66.15
25	124.62	55.52	46.52	69.77
30	110.24	49.11	40.11	72.20
35	99.09	44.15	35.15	73.81
40	90.17	40.17	31.17	74.81
45	82.86	36.91	27.91	75.37
50	76.74	34.19	25.19	75.57
55	71.55	31.87	22.87	75.49
60	67.07	29.88	20.88	75.17
75	56.71	25.26	16.26	73.18
90	49.33	21.98	12.98	70.08
120	39.47	17.59	8.59	61.81
150	33.13	14.76	5.76	51.84
180	28.68	12.78	3.78	40.80
210	25.37	11.30	2.30	29.03
240	22.81	10.16	1.16	16.71
270	20.75	9.25	0.25	3.98

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-2.2 **Controlled Tower 'A' Tank 2**

OTTAWA IDF CURVE Qpeak = 7.5 L/s
Area = 0.129 ha Qavg = 3.8 L/s
C = 0.80 Vol(max) = 13.8 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	29.60	25.85	7.75
10	76.81	21.95	18.20	10.92
15	61.77	17.65	13.90	12.51
20	52.03	14.87	11.12	13.34
25	45.17	12.91	9.16	13.74
30	40.04	11.44	7.69	13.85
35	36.06	10.31	6.56	13.77
40	32.86	9.39	5.64	13.54
45	30.24	8.64	4.89	13.21
50	28.04	8.01	4.26	12.79
55	26.17	7.48	3.73	12.31
60	24.56	7.02	3.27	11.77
75	20.81	5.95	2.20	9.89
90	18.14	5.18	1.43	7.75
120	14.56	4.16	0.41	2.96
150	12.25	3.50	-0.25	-2.24
180	10.63	3.04	-0.71	-7.70
210	9.42	2.69	-1.06	-13.35
240	8.47	2.42	-1.33	-19.12
270	7.72	2.21	-1.54	-25.00

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 **Controlled Tower 'A' Tank 2**

OTTAWA IDF CURVE Qpeak = 9.5 L/s
Area = 0.129 ha Qavg = 4.8 L/s
C = 0.80 Vol(max) = 19.2 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	40.35	35.60	10.68
10	104.19	29.78	25.03	15.02
15	83.56	23.88	19.13	17.22
20	70.25	20.08	15.33	18.39
25	60.90	17.40	12.65	18.98
30	53.93	15.41	10.66	19.19
35	48.52	13.87	9.12	19.14
40	44.18	12.63	7.88	18.91
45	40.63	11.61	6.86	18.52
50	37.65	10.76	6.01	18.03
55	35.12	10.04	5.29	17.45
60	32.94	9.41	4.66	16.79
75	27.89	7.97	3.22	14.49
90	24.29	6.94	2.19	11.83
120	19.47	5.56	0.81	5.86
150	16.36	4.68	-0.07	-0.67
180	14.18	4.05	-0.70	-7.53
210	12.56	3.59	-1.16	-14.64
240	11.29	3.23	-1.52	-21.92
270	10.28	2.94	-1.81	-29.33

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-2.2 **Controlled Tower 'A' Tank 2**

OTTAWA IDF CURVE Qpeak = 12.0 L/s
Area = 0.129 ha Qavg = 6.0 L/s
C = 0.89 Vol(max) = 43.3 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	77.42	71.42	21.43
10	178.56	56.96	50.96	30.58
15	142.89	45.58	39.58	35.63
20	119.95	38.26	32.26	38.72
25	103.85	33.13	27.13	40.69
30	91.87	29.31	23.31	41.95
35	82.58	26.34	20.34	42.72
40	75.15	23.97	17.97	43.13
45	69.05	22.03	16.03	43.27
50	63.95	20.40	14.40	43.21
55	59.62	19.02	13.02	42.97
60	55.89	17.83	11.83	42.59
75	47.26	15.07	9.07	40.84
90	41.11	13.11	7.11	38.42
120	32.89	10.49	4.49	32.35
150	27.61	8.81	2.81	25.27
180	23.90	7.63	1.63	17.55
210	21.14	6.75	0.75	9.39
240	19.01	6.06	0.06	0.91
270	17.29	5.52	-0.48	-7.82

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 **Controlled Tower 'A' Tank 2**

OTTAWA IDF CURVE Qpeak = 13.0 L/s
Area = 0.129 ha Qavg = 6.5 L/s
C = 0.89 Vol(max) = 53.9 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	92.91	86.41	25.92
10	214.27	68.35	61.85	37.11
15	171.47	54.70	48.20	43.38
20	143.94	45.92	39.42	47.30
25	124.62	39.75	33.25	49.88
30	110.24	35.17	28.67	51.60
35	99.09	31.61	25.11	52.73
40	90.17	28.77	22.27	53.44
45	82.86	26.43	19.93	53.82
50	76.74	24.48	17.98	53.95
55	71.55	22.82	16.32	53.87
60	67.07	21.40	14.90	53.63
75	56.71	18.09	11.59	52.15
90	49.33	15.74	9.24	49.88
120	39.47	12.59	6.09	43.86
150	33.13	10.57	4.07	36.63
180	28.68	9.15	2.65	28.62
210	25.37	8.09	1.59	20.09
240	22.81	7.28	0.78	11.17
270	20.75	6.62	0.12	1.95

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-2.3 **Controlled Tower 'A' Tank 3**

OTTAWA IDF CURVE Qpeak = 3.5 L/s
Area = 0.139 ha Qavg = 1.8 L/s
C = 0.90 Vol(max) = 24.7 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	36.02	34.27	10.28
10	76.81	26.71	24.96	14.98
15	61.77	21.48	19.73	17.76
20	52.03	18.10	16.35	19.61
25	45.17	15.71	13.96	20.94
30	40.04	13.93	12.18	21.92
35	36.06	12.54	10.79	22.66
40	32.86	11.43	9.68	23.23
45	30.24	10.52	8.77	23.67
50	28.04	9.75	8.00	24.01
55	26.17	9.10	7.35	24.26
60	24.56	8.54	6.79	24.45
75	20.81	7.24	5.49	24.70
90	18.14	6.31	4.56	24.62
120	14.56	5.06	3.31	23.86
150	12.25	4.26	2.51	22.60
180	10.63	3.70	1.95	21.01
210	9.42	3.27	1.52	19.21
240	8.47	2.95	1.20	17.24
270	7.72	2.69	0.94	15.15

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 **Controlled Tower 'A' Tank 3**

OTTAWA IDF CURVE Qpeak = 4.5 L/s
Area = 0.139 ha Qavg = 2.3 L/s
C = 0.90 Vol(max) = 33.5 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	49.10	46.85	14.05
10	104.19	36.24	33.99	20.39
15	83.56	29.06	26.81	24.13
20	70.25	24.43	22.18	26.62
25	60.90	21.18	18.93	28.39
30	53.93	18.75	16.50	29.71
35	48.52	16.87	14.62	30.71
40	44.18	15.37	13.12	31.48
45	40.63	14.13	11.88	32.08
50	37.65	13.09	10.84	32.53
55	35.12	12.22	9.97	32.88
60	32.94	11.46	9.21	33.15
75	27.89	9.70	7.45	33.52
90	24.29	8.45	6.20	33.46
120	19.47	6.77	4.52	32.55
150	16.36	5.69	3.44	30.96
180	14.18	4.93	2.68	28.96
210	12.56	4.37	2.12	26.67
240	11.29	3.93	1.68	24.16
270	10.28	3.58	1.33	21.49

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-2.3 **Controlled Tower 'A' Tank 3**

OTTAWA IDF CURVE Qpeak = 6.0 L/s
Area = 0.139 ha Qavg = 3.0 L/s
C = 1.00 Vol(max) = 69.9 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	93.79	90.79	27.24
10	178.56	69.00	66.00	39.60
15	142.89	55.22	52.22	47.00
20	119.95	46.35	43.35	52.02
25	103.85	40.13	37.13	55.69
30	91.87	35.50	32.50	58.50
35	82.58	31.91	28.91	60.71
40	75.15	29.04	26.04	62.49
45	69.05	26.68	23.68	63.94
50	63.95	24.71	21.71	65.14
55	59.62	23.04	20.04	66.13
60	55.89	21.60	18.60	66.96
75	47.26	18.26	15.26	68.67
90	41.11	15.89	12.89	69.58
120	32.89	12.71	9.71	69.92
150	27.61	10.67	7.67	69.02
180	23.90	9.24	6.24	67.35
210	21.14	8.17	5.17	65.15
240	19.01	7.34	4.34	62.56
270	17.29	6.68	3.68	59.66

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 **Controlled Tower 'A' Tank 3**

OTTAWA IDF CURVE Qpeak = 6.3 L/s
Area = 0.139 ha Qavg = 3.2 L/s
C = 1.00 Vol(max) = 87.1 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	112.54	109.39	32.82
10	214.27	82.80	79.65	47.79
15	171.47	66.26	63.11	56.80
20	143.94	55.62	52.47	62.97
25	124.62	48.15	45.00	67.51
30	110.24	42.60	39.45	71.01
35	99.09	38.29	35.14	73.80
40	90.17	34.85	31.70	76.07
45	82.86	32.02	28.87	77.95
50	76.74	29.66	26.51	79.52
55	71.55	27.65	24.50	80.84
60	67.07	25.92	22.77	81.97
75	56.71	21.91	18.76	84.43
90	49.33	19.06	15.91	85.93
120	39.47	15.25	12.10	87.15
150	33.13	12.80	9.65	86.88
180	28.68	11.08	7.93	85.68
210	25.37	9.80	6.65	83.85
240	22.81	8.81	5.66	81.55
270	20.75	8.02	4.87	78.89

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-3.1 **Controlled Tower 'C' Tank 4**

OTTAWA IDF CURVE Qpeak = 15.0 L/s
Area = 0.234 ha Qavg = 7.5 L/s
C = 0.72 Vol(max) = 20.5 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	48.54	41.04	12.31
10	76.81	36.00	28.50	17.10
15	61.77	28.95	21.45	19.31
20	52.03	24.39	16.89	20.26
25	45.17	21.17	13.67	20.51
30	40.04	18.77	11.27	20.28
35	36.06	16.90	9.40	19.74
40	32.86	15.40	7.90	18.97
45	30.24	14.17	6.67	18.02
50	28.04	13.14	5.64	16.93
55	26.17	12.27	4.77	15.73
60	24.56	11.51	4.01	14.44
75	20.81	9.76	2.26	10.15
90	18.14	8.50	1.00	5.42
120	14.56	6.83	-0.67	-4.86
150	12.25	5.74	-1.76	-15.82
180	10.63	4.98	-2.52	-27.21
210	9.42	4.41	-3.09	-38.89
240	8.47	3.97	-3.53	-50.80
270	7.72	3.62	-3.88	-62.87

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 **Controlled Tower 'C' Tank 4**

OTTAWA IDF CURVE Qpeak = 17.5 L/s
Area = 0.234 ha Qavg = 8.8 L/s
C = 0.72 Vol(max) = 29.7 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	66.17	57.42	17.23
10	104.19	48.84	40.09	24.05
15	83.56	39.16	30.41	27.37
20	70.25	32.93	24.18	29.01
25	60.90	28.54	19.79	29.69
30	53.93	25.28	16.53	29.75
35	48.52	22.74	13.99	29.38
40	44.18	20.71	11.96	28.70
45	40.63	19.04	10.29	27.79
50	37.65	17.65	8.90	26.70
55	35.12	16.46	7.71	25.45
60	32.94	15.44	6.69	24.09
75	27.89	13.07	4.32	19.45
90	24.29	11.38	2.63	14.22
120	19.47	9.12	0.37	2.70
150	16.36	7.67	-1.08	-9.73
180	14.18	6.65	-2.10	-22.72
210	12.56	5.88	-2.87	-36.10
240	11.29	5.29	-3.46	-49.77
270	10.28	4.82	-3.93	-63.66

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3.1 **Controlled Tower 'C' Tank 4**

OTTAWA IDF CURVE Qpeak = 20.0 L/s
Area = 0.234 ha Qavg = 10.0 L/s
C = 0.81 Vol(max) = 71.0 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	127.52	117.52	35.26
10	178.56	93.82	83.82	50.29
15	142.89	75.08	65.08	58.57
20	119.95	63.02	53.02	63.63
25	103.85	54.56	44.56	66.84
30	91.87	48.27	38.27	68.88
35	82.58	43.39	33.39	70.12
40	75.15	39.48	29.48	70.76
45	69.05	36.28	26.28	70.96
50	63.95	33.60	23.60	70.81
55	59.62	31.33	21.33	70.38
60	55.89	29.37	19.37	69.73
75	47.26	24.83	14.83	66.73
90	41.11	21.60	11.60	62.64
120	32.89	17.28	7.28	52.44
150	27.61	14.51	4.51	40.56
180	23.90	12.56	2.56	27.64
210	21.14	11.11	1.11	13.98
240	19.01	9.99	-0.01	-0.20
270	17.29	9.09	-0.91	-14.79

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 **Controlled Tower 'C' Tank 4**

OTTAWA IDF CURVE Qpeak = 22.0 L/s
Area = 0.234 ha Qavg = 11.0 L/s
C = 0.81 Vol(max) = 88.0 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	153.03	142.03	42.61
10	214.27	112.58	101.58	60.95
15	171.47	90.10	79.10	71.19
20	143.94	75.63	64.63	77.56
25	124.62	65.48	54.48	81.71
30	110.24	57.92	46.92	84.46
35	99.09	52.07	41.07	86.24
40	90.17	47.38	36.38	87.31
45	82.86	43.54	32.54	87.85
50	76.74	40.32	29.32	87.97
55	71.55	37.59	26.59	87.76
60	67.07	35.24	24.24	87.27
75	56.71	29.79	18.79	84.58
90	49.33	25.92	14.92	80.57
120	39.47	20.74	9.74	70.13
150	33.13	17.41	6.41	57.68
180	28.68	15.07	4.07	43.96
210	25.37	13.33	2.33	29.38
240	22.81	11.98	0.98	14.16
270	20.75	10.90	-0.10	-1.55

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-3.2 — **Controlled Tower 'B' Tank 5**

OTTAWA IDF CURVE — Qpeak = 15.0 L/s
Area = 0.197 ha — Qavg = 7.5 L/s
C = 0.84 — Vol(max) = 20.0 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	47.82	40.32	12.10
10	76.81	35.47	27.97	16.78
15	61.77	28.52	21.02	18.92
20	52.03	24.03	16.53	19.83
25	45.17	20.86	13.36	20.03
30	40.04	18.49	10.99	19.78
35	36.06	16.65	9.15	19.22
40	32.86	15.18	7.68	18.42
45	30.24	13.96	6.46	17.45
50	28.04	12.95	5.45	16.34
55	26.17	12.08	4.58	15.13
60	24.56	11.34	3.84	13.82
75	20.81	9.61	2.11	9.50
90	18.14	8.38	0.88	4.74
120	14.56	6.72	-0.78	-5.59
150	12.25	5.66	-1.84	-16.58
180	10.63	4.91	-2.59	-28.01
210	9.42	4.35	-3.15	-39.72
240	8.47	3.91	-3.59	-51.65
270	7.72	3.57	-3.93	-63.74

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 — **Controlled Tower 'B' Tank 5**

OTTAWA IDF CURVE — Qpeak = 16.5 L/s
Area = 0.197 ha — Qavg = 8.3 L/s
C = 0.84 — Vol(max) = 30.0 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	65.19	56.94	17.08
10	104.19	48.11	39.86	23.92
15	83.56	38.58	30.33	27.30
20	70.25	32.44	24.19	29.03
25	60.90	28.12	19.87	29.80
30	53.93	24.90	16.65	29.97
35	48.52	22.40	14.15	29.72
40	44.18	20.40	12.15	29.17
45	40.63	18.76	10.51	28.38
50	37.65	17.39	9.14	27.41
55	35.12	16.22	7.97	26.30
60	32.94	15.21	6.96	25.06
75	27.89	12.88	4.63	20.82
90	24.29	11.22	2.97	16.01
120	19.47	8.99	0.74	5.32
150	16.36	7.56	-0.69	-6.25
180	14.18	6.55	-1.70	-18.38
210	12.56	5.80	-2.45	-30.90
240	11.29	5.22	-3.03	-43.70
270	10.28	4.75	-3.50	-56.72

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-3.2 — **Controlled Tower 'B' Tank 5**

OTTAWA IDF CURVE — Qpeak = 18.0 L/s
Area = 0.197 ha — Qavg = 9.0 L/s
C = 0.94 — Vol(max) = 71.7 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	124.82	115.82	34.75
10	178.56	91.83	82.83	49.70
15	142.89	73.49	64.49	58.04
20	119.95	61.69	52.69	63.23
25	103.85	53.41	44.41	66.61
30	91.87	47.25	38.25	68.85
35	82.58	42.47	33.47	70.29
40	75.15	38.65	29.65	71.15
45	69.05	35.51	26.51	71.58
50	63.95	32.89	23.89	71.67
55	59.62	30.66	21.66	71.49
60	55.89	28.75	19.75	71.09
75	47.26	24.30	15.30	68.87
90	41.11	21.14	12.14	65.57
120	32.89	16.92	7.92	57.01
150	27.61	14.20	5.20	46.80
180	23.90	12.29	3.29	35.57
210	21.14	10.87	1.87	23.62
240	19.01	9.77	0.77	11.15
270	17.29	8.89	-0.11	-1.71

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 — **Controlled Tower 'B' Tank 5**

OTTAWA IDF CURVE — Qpeak = 20.0 L/s
Area = 0.197 ha — Qavg = 10.0 L/s
C = 0.94 — Vol(max) = 88.4 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	149.79	139.79	41.94
10	214.27	110.20	100.20	60.12
15	171.47	88.19	78.19	70.37
20	143.94	74.03	64.03	76.83
25	124.62	64.09	54.09	81.14
30	110.24	56.70	46.70	84.06
35	99.09	50.96	40.96	86.02
40	90.17	46.38	36.38	87.30
45	82.86	42.62	32.62	88.06
50	76.74	39.47	29.47	88.41
55	71.55	36.80	26.80	88.43
60	67.07	34.50	24.50	88.19
75	56.71	29.16	19.16	86.24
90	49.33	25.37	15.37	83.01
120	39.47	20.30	10.30	74.17
150	33.13	17.04	7.04	63.36
180	28.68	14.75	4.75	51.32
210	25.37	13.05	3.05	38.42
240	22.81	11.73	1.73	24.91
270	20.75	10.67	0.67	10.91

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-4 — **Controlled Tower 'D' Tanks 6 & 7**

OTTAWA IDF CURVE — Qpeak = 8.0 L/s
Area = 0.196 ha — Qavg = 4.0 L/s
C = 0.89 — Vol(max) = 28.9 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	50.39	46.39	13.92
10	76.81	37.37	33.37	20.02
15	61.77	30.05	26.05	23.44
20	52.03	25.31	21.31	25.58
25	45.17	21.97	17.97	26.96
30	40.04	19.48	15.48	27.87
35	36.06	17.54	13.54	28.44
40	32.86	15.99	11.99	28.77
45	30.24	14.71	10.71	28.92
50	28.04	13.64	9.64	28.93
55	26.17	12.73	8.73	28.82
60	24.56	11.95	7.95	28.61
75	20.81	10.13	6.13	27.57
90	18.14	8.83	4.83	26.06
120	14.56	7.08	3.08	22.21
150	12.25	5.96	1.96	17.64
180	10.63	5.17	1.17	12.63
210	9.42	4.58	0.58	7.32
240	8.47	4.12	0.12	1.77
270	7.72	3.76	-0.24	-3.95

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 — **Controlled Tower 'D' Tanks 6 & 7**

OTTAWA IDF CURVE — Qpeak = 9.7 L/s
Area = 0.196 ha — Qavg = 4.9 L/s
C = 0.89 — Vol(max) = 40.4 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	68.68	63.83	19.15
10	104.19	50.69	45.84	27.50
15	83.56	40.65	35.80	32.22
20	70.25	34.18	29.33	35.19
25	60.90	29.63	24.78	37.16
30	53.93	26.24	21.39	38.49
35	48.52	23.60	18.75	39.38
40	44.18	21.50	16.65	39.95
45	40.63	19.77	14.92	40.27
50	37.65	18.32	13.47	40.40
55	35.12	17.09	12.24	40.38
60	32.94	16.03	11.18	40.24
75	27.89	13.57	8.72	39.23
90	24.29	11.82	6.97	37.62
120	19.47	9.47	4.62	33.27
150	16.36	7.96	3.11	27.99
180	14.18	6.90	2.05	22.12
210	12.56	6.11	1.26	15.85
240	11.29	5.49	0.64	9.28
270	10.28	5.00	0.15	2.49

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-4 — **Controlled Tower 'D' Tanks 6 & 7**

OTTAWA IDF CURVE — Qpeak = 14.2 L/s
Area = 0.196 ha — Qavg = 7.1 L/s
C = 0.99 — Vol(max) = 83.2 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	131.23	124.13	37.24
10	178.56	96.55	89.45	53.67
15	142.89	77.26	70.16	63.15
20	119.95	64.86	57.76	69.31
25	103.85	56.15	49.05	73.58
30	91.87	49.67	42.57	76.63
35	82.58	44.65	37.55	78.86
40	75.15	40.63	33.53	80.48
45	69.05	37.34	30.24	81.64
50	63.95	34.58	27.48	82.44
55	59.62	32.24	25.14	82.96
60	55.89	30.22	23.12	83.24
75	47.26	25.55	18.45	83.03
90	41.11	22.23	15.13	81.70
120	32.89	17.79	10.69	76.94
150	27.61	14.93	7.83	70.46
180	23.90	12.92	5.82	62.90
210	21.14	11.43	4.33	54.60
240	19.01	10.28	3.18	45.74
270	17.29	9.35	2.25	36.47

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 — **Controlled Tower 'D' Tanks 6 & 7**

OTTAWA IDF CURVE — Qpeak = 15.0 L/s
Area = 0.196 ha — Qavg = 7.5 L/s
C = 0.99 — Vol(max) = 104.2 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	157.48	149.98	44.99
10	214.27	115.86	108.36	65.02
15	171.47	92.72	85.22	76.70
20	143.94	77.83	70.33	84.40
25	124.62	67.38	59.88	89.82
30	110.24	59.61	52.11	93.80
35	99.09	53.58	46.08	96.77
40	90.17	48.76	41.26	99.02
45	82.86	44.80	37.30	100.72
50	76.74	41.50	34.00	101.99
55	71.55	38.69	31.19	102.92
60	67.07	36.27	28.77	103.56
75	56.71	30.66	23.16	104.23
90	49.33	26.67	19.17	103.54
120	39.47	21.34	13.84	99.68
150	33.13	17.92	10.42	93.74
180	28.68	15.51	8.01	86.50
210	25.37	13.72	6.22	78.37
240	22.81	12.33	4.83	69.58
270	20.75	11.22	3.72	60.29

Structure	Size (mm)	Area (m^2)	T/G	Inv IN	Inv OUT
Tank 6	3m x 6.15m	18.45	65.00	63.18	60.65
Tank 7	3m x 6.15m	18.45	65.10	-	60.70

Area A-4: Storage Table				Underground Storage	Surface Storage		Total Storage		
					Tank 6				
Elevation (m)	System Depth (m)	Tank 6 Volume (m^3)	Tank 7 Volume (m^3)	Combined Volume (m^3)	Area (m^2)	Volume (m^3)	Ponding Volume (m^3)	**Total Volume (m^3)**	Head
60.65	0.00	-	-	-	-	-	-	**0**	-
60.90	0.25	4.61	3.69	4.61	-	-	-	**4.6**	0.12
61.20	0.55	10.15	9.22	19.37	-	-	-	**19.4**	0.42
61.50	0.85	15.68	14.76	30.44	-	-	-	**30.4**	0.72
61.80	1.15	21.22	20.29	41.51	-	-	-	**41.5**	1.02
62.10	1.45	26.75	25.83	52.58	-	-	-	**52.6**	1.32
62.25	1.60	29.52	28.60	58.12	0.00	0.00	0.0	**58.1**	1.47
62.40	1.75	32.29	31.36	63.65	0.00	0.00	0.0	**63.7**	1.62
62.55	1.90	35.05	34.13	69.19	0.00	0.00	0.0	**69.2**	1.77
62.70	2.05	37.82	36.90	74.72	0.00	0.00	0.0	**74.7**	1.92
62.85	2.20	40.59	39.67	80.26	0.00	0.00	0.0	**80.3**	2.07
63.15	2.50	46.12	45.20	91.33	0.00	0.00	0.0	**91.3**	2.37

Tempest Vortex LMF ICD - Custom

1:100 Yr	
Flow (L/s) =	14.2
Head (m) =	2.15
Elevation (m) =	**62.93**
Outlet Pipe Dia.(mm) =	254
Volume (m3) =	83.2
1:5 Yr	
Flow (L/s) =	9.7
Head (m) =	1.00
Elevation (m) =	**61.78**
Outlet Pipe Dia.(mm) =	254
Volume (m3) =	40.4
1:2 Yr	
Flow (L/s) =	8.0
Head (m) =	0.68
Elevation (m) =	**61.46**
Outlet Pipe Dia.(mm) =	254
Volume (m3) =	28.9

Orifice Size - 1:100 yr Flow Check

Q=0.62xAx(2gh)^0.5

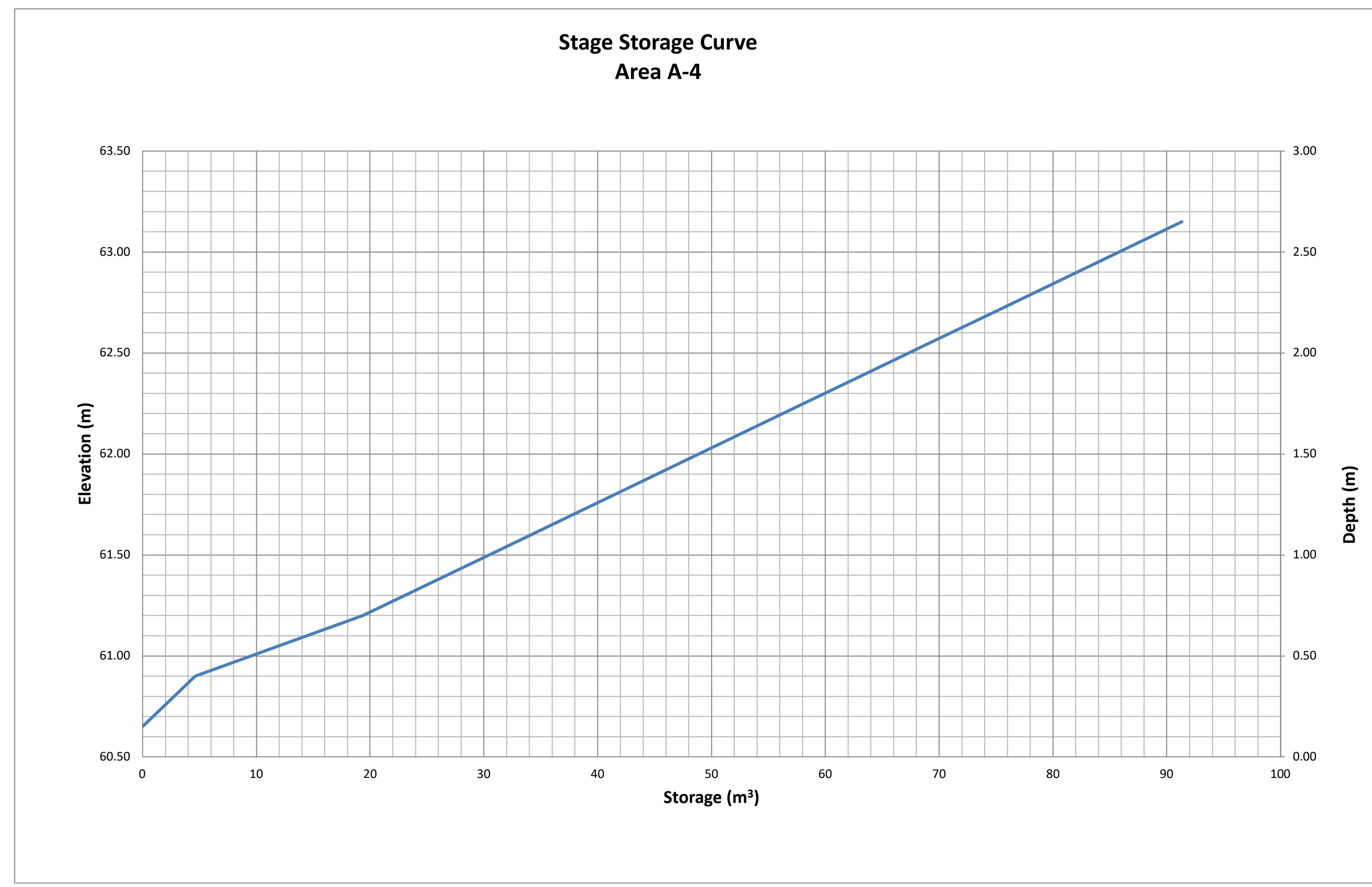
	1:100 yr	Flow Check
Q (m^3/s) =	0.0142	**0.0142**
g (m/s^2) =	9.81	9.81
h (m) =	**2.15**	2.15
A (m^2) =	**0.003523913**	**0.00353**
D (m) =	**0.066983468**	**0.06700**
D (mm) =	**67**	67.0

1:5 yr Flow Check

	1:5 yr
Q (m^3/s) =	0.0097
g (m/s^2) =	9.81
h (m) =	**1.00**
A (m^2) =	**0.00353**
D (m) =	**0.067**
D (mm) =	**67**

1:2 yr Flow Check

	1:2 yr
Q (m^3/s) =	0.0080
g (m/s^2) =	9.81
h (m) =	**0.68**
A (m^2) =	**0.00353**
D (m) =	**0.067**
D (mm) =	**67**



Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-5 **Controlled West Super-Pipe + OS-3**

OTTAWA IDF CURVE
Area = 0.541 ha; C = 0.45
Qpeak = 13.8 L/s
Qavg = 6.9 L/s
Vol(max) = 36.3 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	69.45	62.55	18.76
10	76.81	51.50	44.60	26.76
15	61.77	41.42	34.52	31.07
20	52.03	34.89	27.99	33.59
25	45.17	30.29	23.39	35.08
30	40.04	26.85	19.95	35.91
35	36.06	24.18	17.28	36.29
40	32.86	22.04	15.14	36.33
45	30.24	20.28	13.38	36.12
50	28.04	18.80	11.90	35.71
55	26.17	17.55	10.65	35.14
60	24.56	16.47	9.57	34.44
75	20.81	13.96	7.06	31.75
90	18.14	12.17	5.27	28.43
120	14.56	9.76	2.86	20.62
150	12.25	8.22	1.32	11.84
180	10.63	7.13	0.23	2.44
210	9.42	6.31	-0.59	-7.39
240	8.47	5.68	-1.22	-17.53
270	7.72	5.18	-1.72	-27.91

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-4 **Controlled West Super-Pipe + OS-3**

OTTAWA IDF CURVE
Area = 0.541 ha; C = 0.45
Qpeak = 17.5 L/s
Qavg = 8.8 L/s
Vol(max) = 50.1 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	94.67	85.92	25.77
10	104.19	69.87	61.12	36.67
15	83.56	56.03	47.28	42.55
20	70.25	47.11	38.36	46.03
25	60.90	40.83	32.08	48.12
30	53.93	36.16	27.41	49.34
35	48.52	32.53	23.78	49.94
40	44.18	29.63	20.88	50.11
45	40.63	27.24	18.49	49.93
50	37.65	25.25	16.50	49.49
55	35.12	23.55	14.80	48.84
60	32.94	22.09	13.34	48.02
75	27.89	18.70	9.95	44.78
90	24.29	16.29	7.54	40.70
120	19.47	13.05	4.30	30.99
150	16.36	10.97	2.22	19.99
180	14.18	9.51	0.76	8.19
210	12.56	8.42	-0.33	-4.17
240	11.29	7.57	-1.18	-16.94
270	10.28	6.90	-1.85	-30.03

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-5 **Controlled West Super-Pipe + OS-3**

OTTAWA IDF CURVE
Area = 0.541 ha; C = 0.51
Qpeak = 36.0 L/s
Qavg = 18.0 L/s
Vol(max) = 96.1 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	187.40	169.40	50.82
10	178.56	137.87	119.87	71.92
15	142.89	110.34	92.34	83.10
20	119.95	92.62	74.62	89.54
25	103.85	80.19	62.19	93.28
30	91.87	70.94	52.94	95.28
35	82.58	63.76	45.76	96.10
40	75.15	58.02	40.02	96.06
45	69.05	53.32	35.32	95.36
50	63.95	49.38	31.38	94.15
55	59.62	46.04	28.04	92.53
60	55.89	43.16	25.16	90.57
75	47.26	36.49	18.49	83.20
90	41.11	31.74	13.74	74.22
120	32.89	25.40	7.40	53.28
150	27.61	21.32	3.32	29.88
180	23.90	18.46	0.46	4.93
210	21.14	16.33	-1.67	-21.09
240	19.01	14.68	-3.32	-47.88
270	17.29	13.35	-4.65	-75.27

Proposed Site Development — Storage Calculations Using Average
Novatech Project No. 119171 — Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-4 **Controlled West Super-Pipe + OS-3**

OTTAWA IDF CURVE
Area = 0.541 ha; C = 0.51
Qpeak = 38.0 L/s
Qavg = 19.0 L/s
Vol(max) = 121.5 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	224.88	205.88	61.76
10	214.27	165.45	146.45	87.87
15	171.47	132.40	113.40	102.06
20	143.94	111.14	92.14	110.57
25	124.62	96.22	77.22	115.83
30	110.24	85.12	66.12	119.02
35	99.09	76.52	57.52	120.78
40	90.17	69.63	50.63	121.51
45	82.86	63.98	44.98	121.45
50	76.74	59.26	40.26	120.77
55	71.55	55.25	36.25	119.61
60	67.07	51.79	32.79	118.05
75	56.71	43.79	24.79	111.54
90	49.33	38.09	19.09	103.10
120	39.47	30.48	11.48	82.65
150	33.13	25.58	6.58	59.25
180	28.68	22.15	3.15	33.99
210	25.37	19.59	0.59	7.46
240	22.81	17.61	-1.39	-20.01
270	20.75	16.02	-2.98	-48.20

Structure	Size (mm)	Area (m^2)	T/G	Inv IN	Inv OUT
STM MH 08	1829	2.63	64.35	59.96	59.81
CBMH 01	1829	2.63	62.85	60.49	60.05
CBMH 02	1219	1.17	62.60	60.56	60.53
CBMH 03	1219	1.17	62.90	60.90	60.84
CBMH 04	1219	1.17	64.65	-	61.30

Area A-5: Storage Table

							Underground Storage	Surface Storage				Total Storage		
								CBMH 02		CBMH 03				
Elevation (m)	System Depth (m)	STM MH 08 Volume (m^3)	CBMH 01 Volume (m^3)	CBMH 02 Volume (m^3)	CBMH 03 Volume (m^3)	CBMH 04 Volume (m^3)	Combined Volume (m^3)	Area (m^2)	Volume (m^3)	Area (m^2)	Volume (m^3)	Ponding Volume (m^3)	**Total Volume (m^3)**	Head
59.81	0.00	-	-	-	-	-	-	-	-	-	-	-	**0**	-
60.05	0.24	0.63	0.00	-	-	-	14.17	-	-	-	-	-	**14.2**	0.09
60.50	0.69	1.81	1.18	0.00	-	-	44.07	-	-	-	-	-	**44.1**	0.54
60.80	0.99	2.60	1.97	0.32	0.00	0.00	55.40	-	-	-	-	-	**55.4**	0.84
61.10	1.29	3.39	2.76	0.67	0.30	0.00	75.31	-	-	-	-	-	**75.3**	1.14
61.40	1.59	4.18	3.55	1.02	0.65	0.12	77.70	-	-	-	-	-	**77.7**	1.44
61.65	1.84	4.83	4.20	1.31	0.95	0.41	79.89	0.00	0.00	0.00	0.00	0.0	**79.9**	1.69
61.95	2.14	5.62	4.99	1.66	1.30	0.76	82.52	0.00	0.00	0.00	0.00	0.0	**82.5**	1.99
62.60	2.79	7.33	6.70	2.42	2.05	1.52	88.21	0.00	0.00	0.00	0.00	0.0	**88.2**	2.64
62.65	2.84	7.46	6.83		2.11	1.58	88.59	4.85	0.12	0.00	0.00	0.1	**88.7**	2.69
62.70	2.89	7.59	6.96		2.17	1.63	88.97	6.32	0.40	0.00	0.00	0.4	**89.4**	2.74
62.75	2.94	7.72	7.09		2.23	1.69	89.35	9.97	0.81	0.00	0.00	0.8	**90.2**	2.79
62.80	2.99	7.86	7.23		2.29	1.75	89.73	31.96	2.31	0.00	0.00	2.3	**92.0**	2.84
62.85	3.04	7.99	7.36		2.35	1.81	90.11	59.55	5.34	0.00	0.00	5.3	**95.4**	2.89
62.90	3.09	8.12			2.40	1.87	90.35	99.81	9.04	0.00	0.00	9.0	**99.4**	2.94
62.95	3.14	8.25				1.93	90.54	126.35	14.70	18.52	0.46	15.2	**105.7**	2.99

PI = 3.141592654
pipe I.D.= 610 (pvc pipe)
U/G Pipe Volume

End Area	0.292	(m^2)
Total Length	92.9	(m)
Pipe Volume	27.1	(m^3)

PI = 3.14159265
pipe I.D.= 1067 (conc pipe)
U/G Pipe Volume

End Area	0.894	(m^2)
Total Length	45.9	(m)
Pipe Volume	41.0	(m^3)

U/G Pipe Size	610mm dia.	610mm dia.	610mm dia.
Pipe Segment	CBMH 01 - CBMH 02	CBMH 02 - CBMH 03	CBMH 03 - CBMH 04
Centre-Centre Length	9.0	57.1	30.7
Inside Structure	1.5	1.2	1.2
U/G Storage Length	7.5	55.9	29.5

U/G Pipe Size	1050mm dia.
Pipe Segment	STM MH 08 - CBMH 01
Centre-Centre Length	47.7
Inside Structure	1.8
U/G Storage Length	45.9

Maximum Ponding Depth (cm)	
1:100 Yr	**26**
1:5 Yr	**0**

Tempest Vortex MHF ICD - Custom

1:100 Yr
Flow (L/s) = 36.0
Head (m) = 2.90
Elevation (m) = **62.86**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 96.1

1:5 Yr
Flow (L/s) = 17.5
Head (m) = 0.69
Elevation (m) = **60.65**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 50.1

1:2 Yr
Flow (L/s) = 13.8
Head (m) = 0.43
Elevation (m) = **60.39**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 36.3

Orifice Size - 1:100 yr Flow Check

Q=0.62xAx(2gh)^0.5

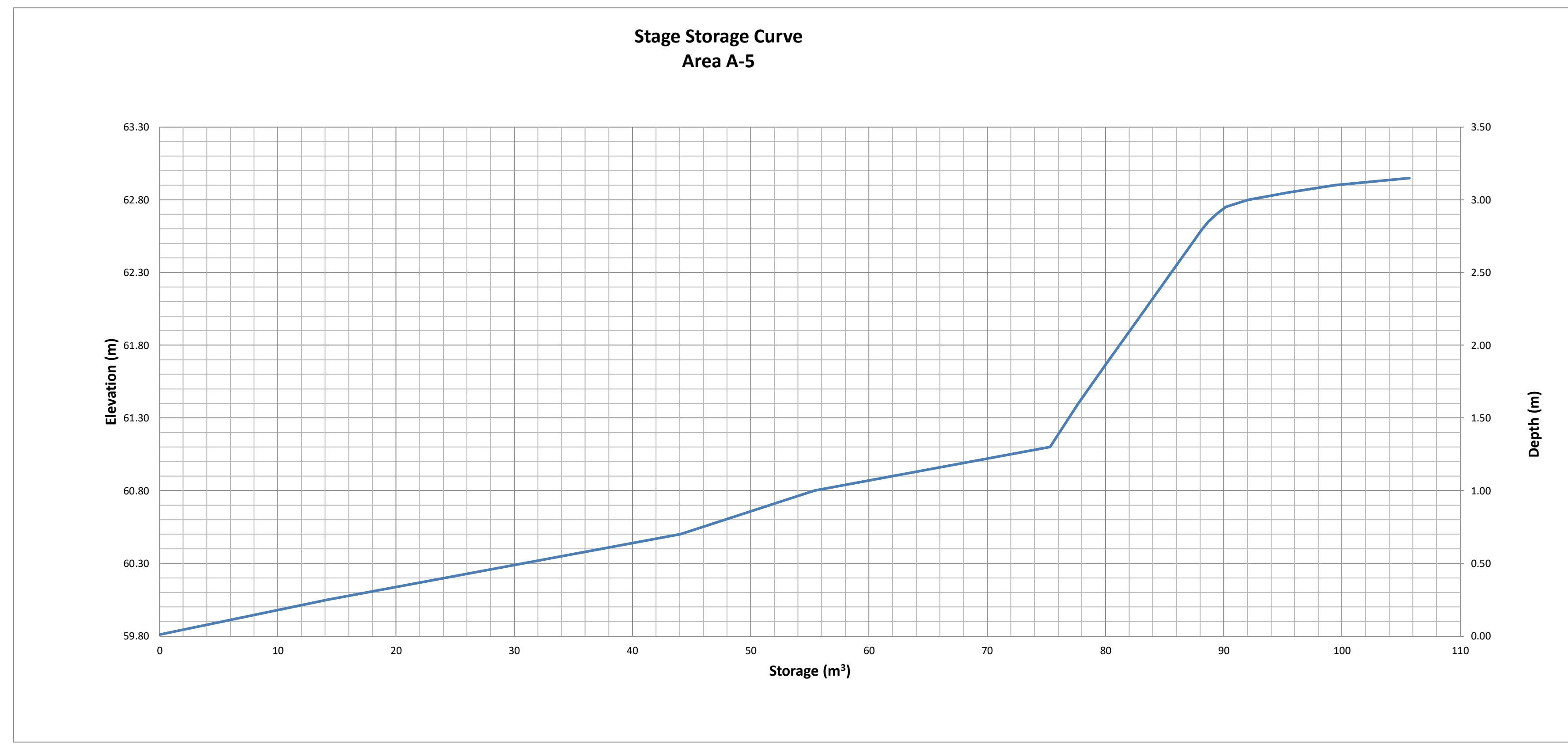
	1:100 yr	Flow Check
Q (m^3/s) =	0.0360	**0.0360**
g (m/s^2) =	9.81	9.81
h (m) =	**2.90**	2.90
A (m^2) =	**0.007701044**	**0.00770**
D (m) =	**0.09902158**	**0.09900**
D (mm) =	**99**	99.0

1:5 yr Flow Check

	1:5 yr
Q (m^3/s) =	0.0175
g (m/s^2) =	9.81
h (m) =	**0.69**
A (m^2) =	**0.00770**
D (m) =	**0.099**
D (mm) =	**99**

1:2 yr Flow Check

	1:2 yr
Q (m^3/s) =	0.0138
g (m/s^2) =	9.81
h (m) =	**0.43**
A (m^2) =	**0.00770**
D (m) =	**0.099**
D (mm) =	**99**



Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:2 YEAR EVENT
AREA A-6 **Controlled East Super-Pipe + OS-2**

OTTAWA IDF CURVE — Qpeak = 9.0 L/s
Area = 0.387 ha — Qavg = 4.5 L/s
C = 0.42 — Vol(max) = 24.4 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	103.57	46.27	41.77	12.53
10	76.81	34.31	29.81	17.89
15	61.77	27.59	23.09	20.78
20	52.03	23.24	18.74	22.49
25	45.17	20.18	15.68	23.52
30	40.04	17.89	13.39	24.10
35	36.06	16.11	11.61	24.38
40	32.86	14.68	10.18	24.44
45	30.24	13.51	9.01	24.33
50	28.04	12.53	8.03	24.08
55	26.17	11.69	7.19	23.73
60	24.56	10.97	6.47	23.30
75	20.81	9.30	4.80	21.59
90	18.14	8.11	3.61	19.47
120	14.56	6.51	2.01	14.44
150	12.25	5.47	0.97	8.76
180	10.63	4.75	0.25	2.67
210	9.42	4.21	-0.29	-3.70
240	8.47	3.79	-0.71	-10.28
270	7.72	3.45	-1.05	-17.02

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:5 YEAR EVENT
AREA A-6 **Controlled East Super-Pipe + OS-2**

OTTAWA IDF CURVE — Qpeak = 9.4 L/s
Area = 0.387 ha — Qavg = 4.7 L/s
C = 0.42 — Vol(max) = 36.4 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	63.07	58.37	17.51
10	104.19	46.55	41.85	25.11
15	83.56	37.33	32.63	29.37
20	70.25	31.38	26.68	32.02
25	60.90	27.21	22.51	33.76
30	53.93	24.09	19.39	34.91
35	48.52	21.68	16.98	35.65
40	44.18	19.74	15.04	36.09
45	40.63	18.15	13.45	36.32
50	37.65	16.82	12.12	36.36
55	35.12	15.69	10.99	36.27
60	32.94	14.72	10.02	36.06
75	27.89	12.46	7.76	34.92
90	24.29	10.85	6.15	33.21
120	19.47	8.70	4.00	28.78
150	16.36	7.31	2.61	23.49
180	14.18	6.33	1.63	17.66
210	12.56	5.61	0.91	11.45
240	11.29	5.05	0.35	4.98
270	10.28	4.59	-0.11	-1.71

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YEAR EVENT
AREA A-6 **Controlled East Super-Pipe + OS-2**

OTTAWA IDF CURVE — Qpeak = 12.0 L/s
Area = 0.387 ha — Qavg = 6.0 L/s
C = 0.48 — Vol(max) = 83.0 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	125.50	119.50	35.85
10	178.56	92.33	86.33	51.80
15	142.89	73.89	67.89	61.10
20	119.95	62.02	56.02	67.23
25	103.85	53.70	47.70	71.55
30	91.87	47.50	41.50	74.71
35	82.58	42.70	36.70	77.07
40	75.15	38.86	32.86	78.85
45	69.05	35.70	29.70	80.20
50	63.95	33.07	27.07	81.21
55	59.62	30.83	24.83	81.94
60	55.89	28.90	22.90	82.45
75	47.26	24.43	18.43	82.96
90	41.11	21.26	15.26	82.39
120	32.89	17.01	11.01	79.27
150	27.61	14.28	8.28	74.49
180	23.90	12.36	6.36	68.68
210	21.14	10.93	4.93	62.16
240	19.01	9.83	3.83	55.12
270	17.29	8.94	2.94	47.67

Proposed Site Development Storage Calculations Using Average
Novatech Project No. 119171 Release Rate Equal to 50% of the Qpeak
REQUIRED STORAGE - 1:100 YR + 20% IDF Increase
AREA A-6 **Controlled East Super-Pipe + OS-2**

OTTAWA IDF CURVE — Qpeak = 13.0 L/s
Area = 0.387 ha — Qavg = 6.5 L/s
C = 0.48 — Vol(max) = 102.7 m3
(Vol calculated for Qallow-avg)

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	291.24	150.60	144.10	43.23
10	214.27	110.80	104.30	62.58
15	171.47	88.67	82.17	73.95
20	143.94	74.43	67.93	81.51
25	124.62	64.44	57.94	86.91
30	110.24	57.00	50.50	90.91
35	99.09	51.24	44.74	93.95
40	90.17	46.63	40.13	96.31
45	82.86	42.85	36.35	98.13
50	76.74	39.68	33.18	99.55
55	71.55	37.00	30.50	100.64
60	67.07	34.68	28.18	101.46
75	56.71	29.32	22.82	102.70
90	49.33	25.51	19.01	102.65
120	39.47	20.41	13.91	100.16
150	33.13	17.13	10.63	95.69
180	28.68	14.83	8.33	89.98
210	25.37	13.12	6.62	83.41
240	22.81	11.79	5.29	76.22
270	20.75	10.73	4.23	68.54

Structure	Size (mm)	Area (m^2)	T/G	Inv IN	Inv OUT
CBMH 05	1829	2.63	64.85	61.20	60.63
STM MH 09	1829	2.63	67.10	-	62.50
Tank 8	3m x 6.15m	18.45	66.65	-	62.75

Area A-6: Storage Table					Underground Storage	Surface Storage		Total Storage		
						CBMH 05				
Elevation (m)	System Depth (m)	CBMH 05 Volume (m^3)	STM MH 09 Volume (m^3)	Tank 8 Volume (m^3)	Combined Volume (m^3)	Area (m^2)	Volume (m^3)	Ponding Volume (m^3)	**Total Volume (m^3)**	Head
60.63	0.00	-	-	-	-	-	-	-	**0**	-
61.20	0.57	1.50	0.00	-	1.50	-	-	-	**1.5**	0.42
61.70	1.07	2.81	0.00	0.00	2.81	-	-	-	**2.8**	0.92
62.00	1.37	3.60	0.00	0.00	3.60	-	-	-	**3.6**	1.22
62.30	1.67	4.39	0.00	0.00	4.39	-	-	-	**4.4**	1.52
62.60	1.97	5.18	0.26	0.00	14.98	-	-	-	**15.0**	1.82
62.90	2.27	5.96	1.05	2.77	28.87	0.00	0.00	0.0	**28.9**	2.12
63.20	2.57	6.75	1.84	8.30	45.53	0.00	0.00	0.0	**45.5**	2.42
63.50	2.87	7.54	2.63	13.84	61.42	0.00	0.00	0.0	**61.4**	2.72
63.80	3.17	8.33	3.42	19.37	69.30	0.00	0.00	0.0	**69.3**	3.02
64.10	3.47	9.12	4.20	24.91	76.41	0.00	0.00	0.0	**76.4**	3.32
64.40	3.77	9.91	4.99	30.44	83.52	0.00	0.00	0.0	**83.5**	3.62
64.70	4.07	10.69	5.78	35.98	90.63	0.00	0.00	0.0	**90.6**	3.92
64.85	4.22	11.09	6.17	38.74	94.19	0.00	0.00	0.0	**94.2**	4.07
64.90	4.27	11.22	6.31	39.67	95.37	6.35	1.59	1.6	**97.0**	4.12
64.95	4.32	11.35	6.44	40.59	96.56	21.95	2.29	2.3	**98.9**	4.17

PI =	3.141592654	
pipe I.D.=	1067	(conc pipe)
U/G Pipe Volume		
End Area	0.894	(m^2)
Total Length	42.7	(m)
Pipe Volume	38.2	(m^3)

U/G Pipe Size	1050mm dia.
Pipe Segment	CBMH 05 - STM MH 09
Centre-Centre Length	44.5
Inside Structure	1.8
U/G Storage Length	42.7

Maximum Ponding Depth (cm)	
1:100 Yr	**0**
1:5 Yr	**0**

Tempest Vortex LMF ICD - Custom

1:100 Yr
Flow (L/s) = 12.0
Head (m) = 3.62
Elevation (m) = **64.40**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 83.0

1:5 Yr
Flow (L/s) = 9.4
Head (m) = 2.25
Elevation (m) = **63.03**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 36.4

1:2 Yr
Flow (L/s) = 9.0
Head (m) = 2.03
Elevation (m) = **62.81**
Outlet Pipe Dia.(mm) = 305
Volume (m3) = 24.4

Orifice Size - 1:100 yr Flow Check

Q=0.62xAx(2gh)^0.5

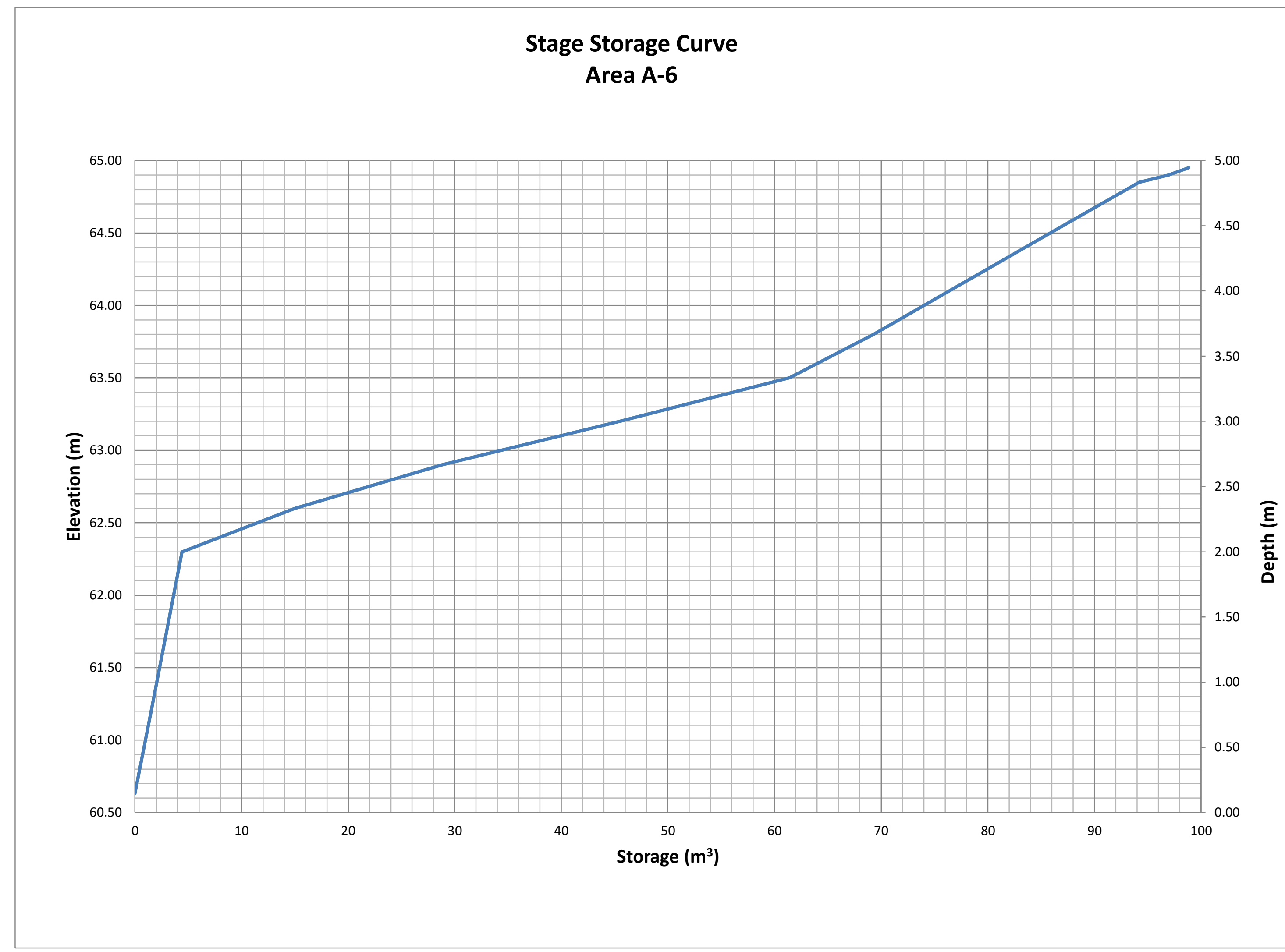
	1:100 yr	Flow Check
Q (m^3/s) =	0.0120	**0.0120**
g (m/s^2) =	9.81	9.81
h (m) =	**3.62**	3.62
A (m^2) =	**0.002297396**	**0.00229**
D (m) =	**0.054084517**	**0.05400**
D (mm) =	**54**	54.0

1:5 yr Flow Check

	1:5 yr
Q (m^3/s) =	0.0094
g (m/s^2) =	9.81
h (m) =	**2.25**
A (m^2) =	**0.00229**
D (m) =	**0.054**
D (mm) =	**54**

1:2 yr Flow Check

	1:2 yr
Q (m^3/s) =	0.0090
g (m/s^2) =	9.81
h (m) =	**2.03**
A (m^2) =	**0.00229**
D (m) =	**0.054**
D (mm) =	**54**



APPENDIX F

Inlet Control Device (ICD) Information

IPEX Tempest™ Inlet Control Devices

Municipal Technical Manual Series

Vol. I, 2nd Edition

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

Purpose

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

Product Description

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

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

Product Function

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

Product Construction

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

Product Applications

Will accommodate both square and round applications:

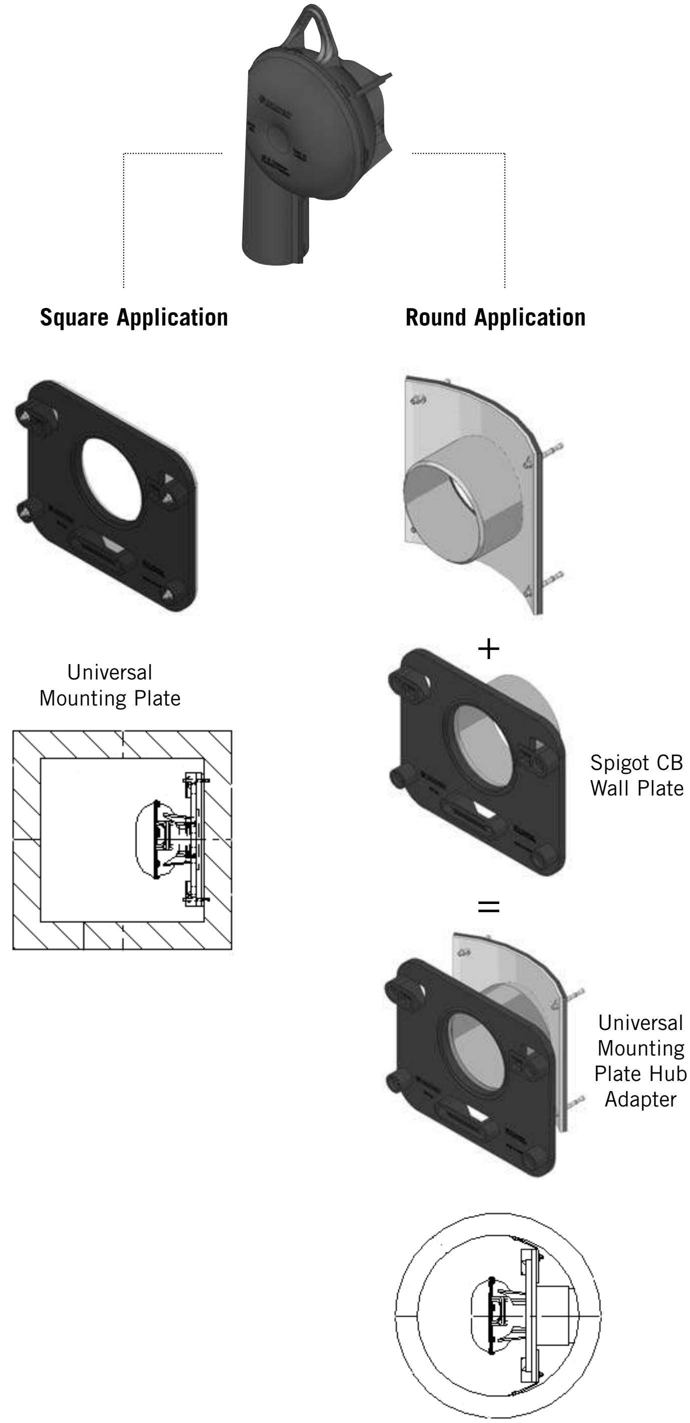


Chart 1: LMF 14 Preset Flow Curves

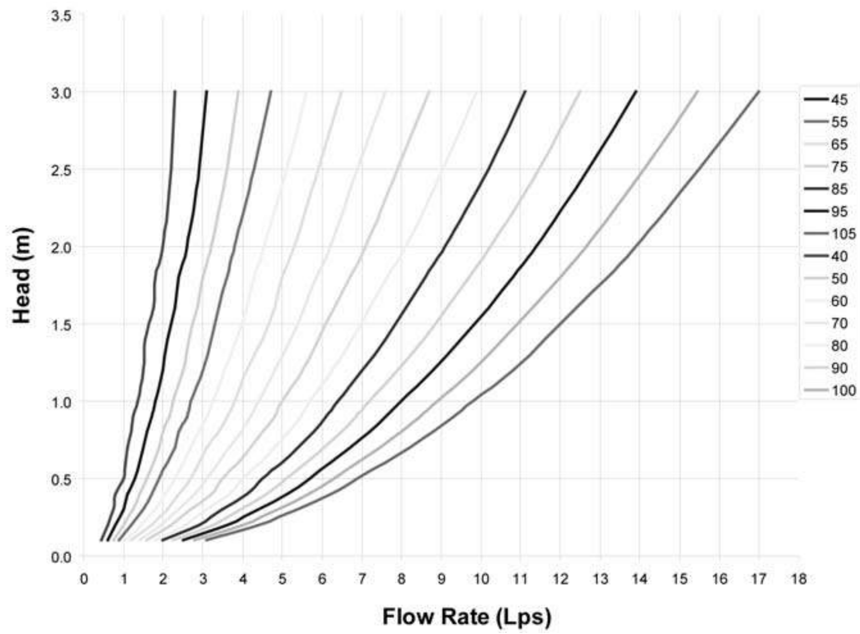
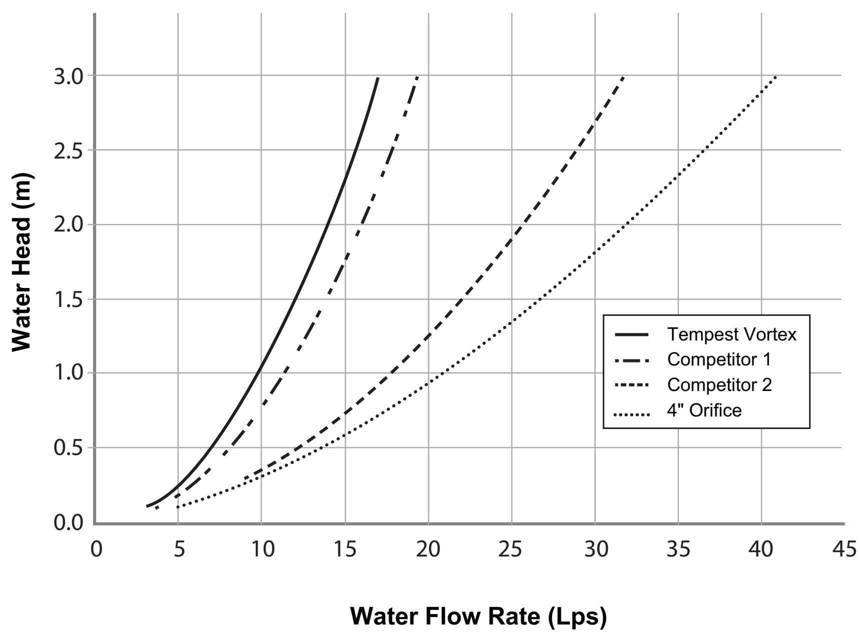


Chart 2: LMF Flow vs. ICD Alternatives



NOTE: Do not use or test the products in this manual with compressed air or other gases including air-over-water-boosters

PRODUCT INSTALLATION

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

STEPS:

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

WARNING

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

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

STEPS:

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

WARNING

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

PRODUCT TECHNICAL SPECIFICATION

General

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

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

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

ICD's shall have no moving parts.

Materials

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

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

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

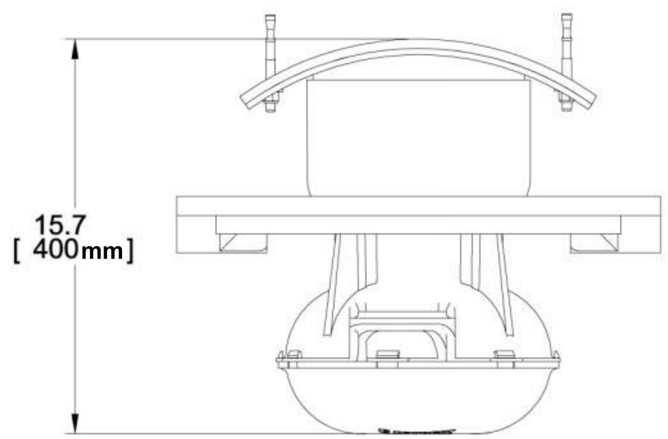
All hardware will be made from 304 stainless steel.

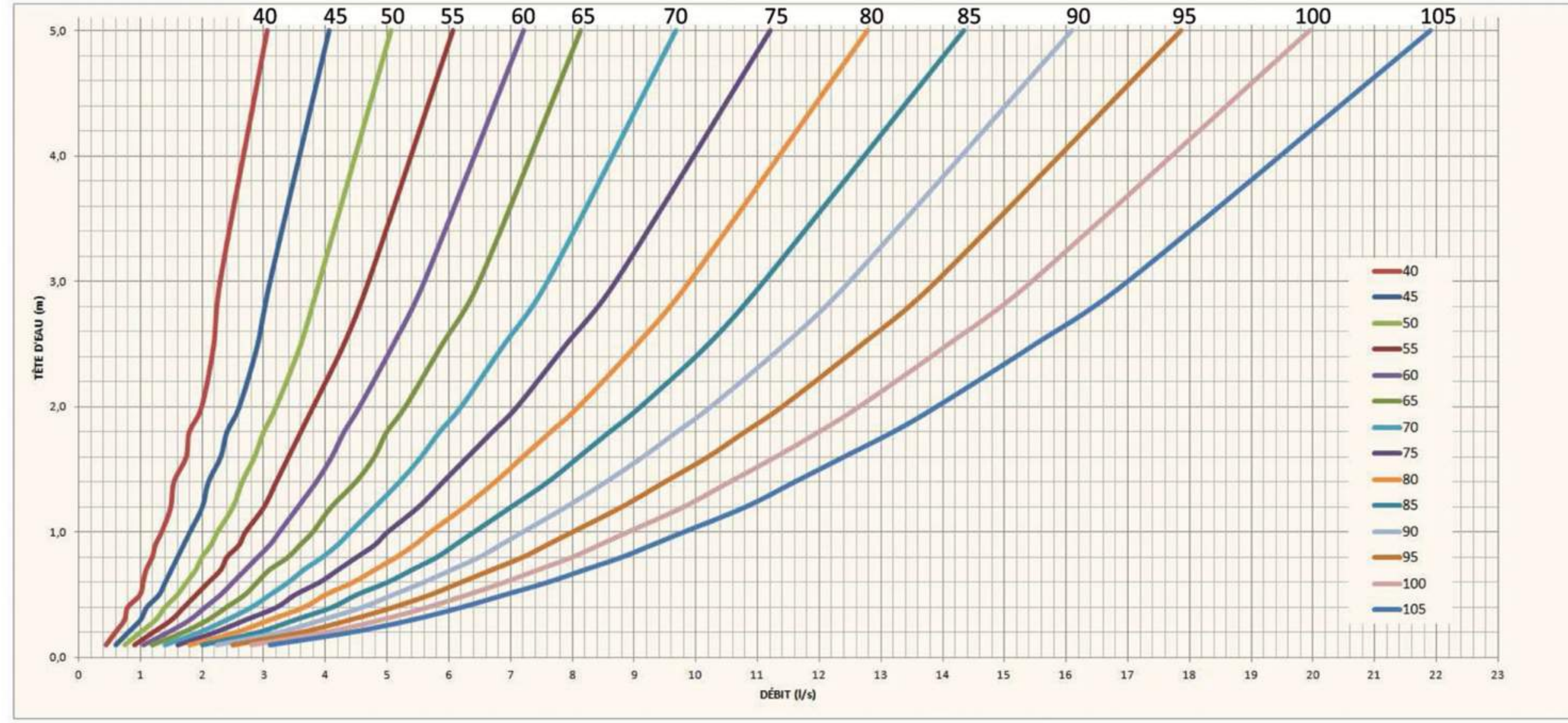
Dimensioning

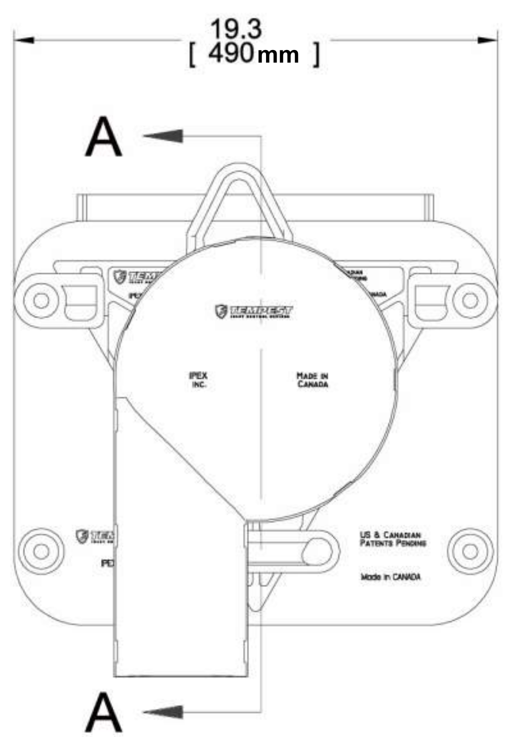
The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

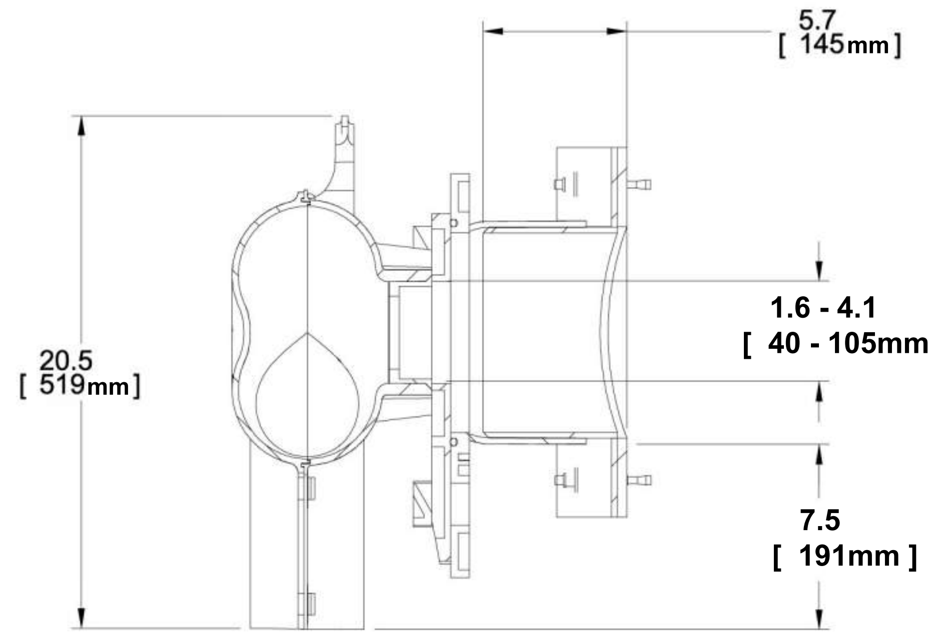
Installation

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

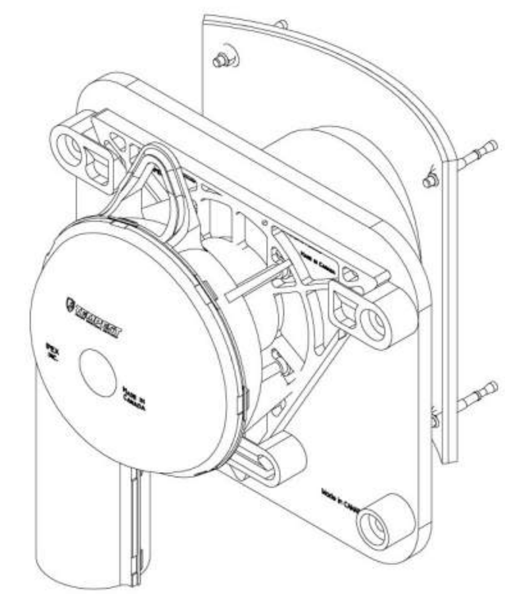








SECTION A-A



IPEX

Product development engineering
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Île des Soeurs, Montréal, QC, H3E 1H7
Canada Tel 514 769 2200
www.ipexna.com

PROJECTION	UNITS	TITLE		
	in [mm]	Tempest LMF round CB assembly [VORTEX]	SIZE B	SCALE(S) 1/8
				1-2014

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

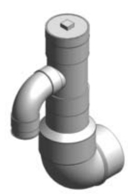
Product Description

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

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

Product Function

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



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

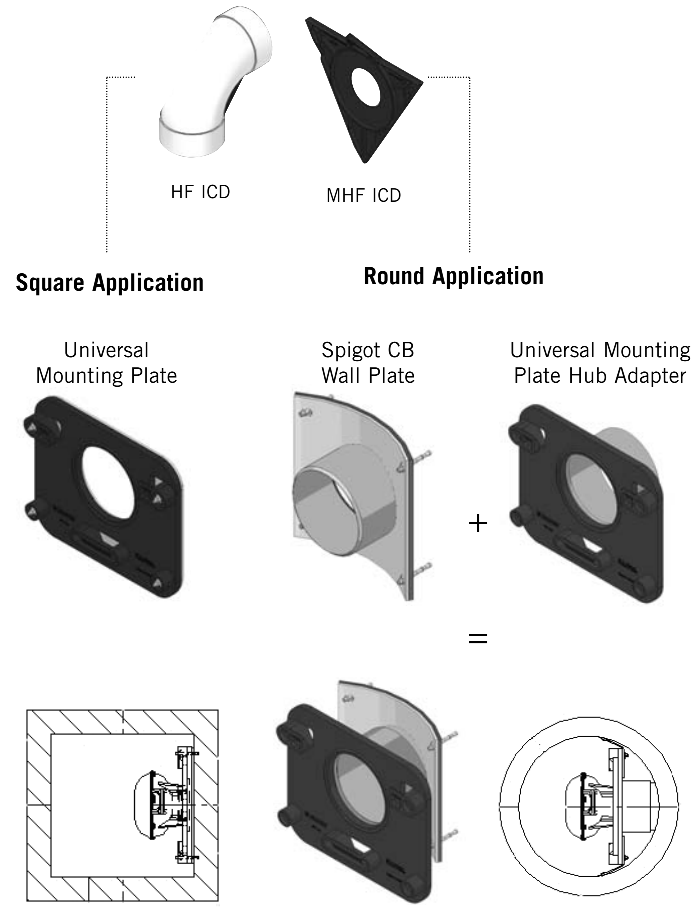
TEMPEST MHF (Medium to High Flow):
The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

Product Construction

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

Product Applications

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



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

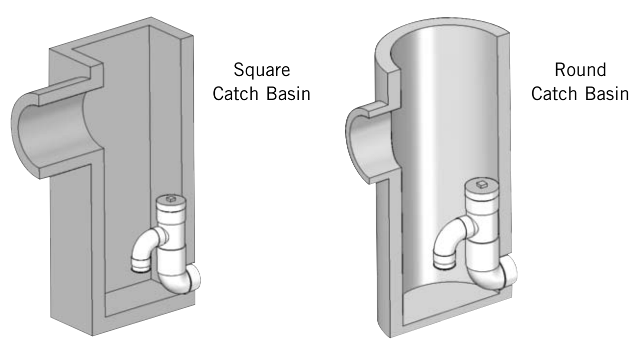
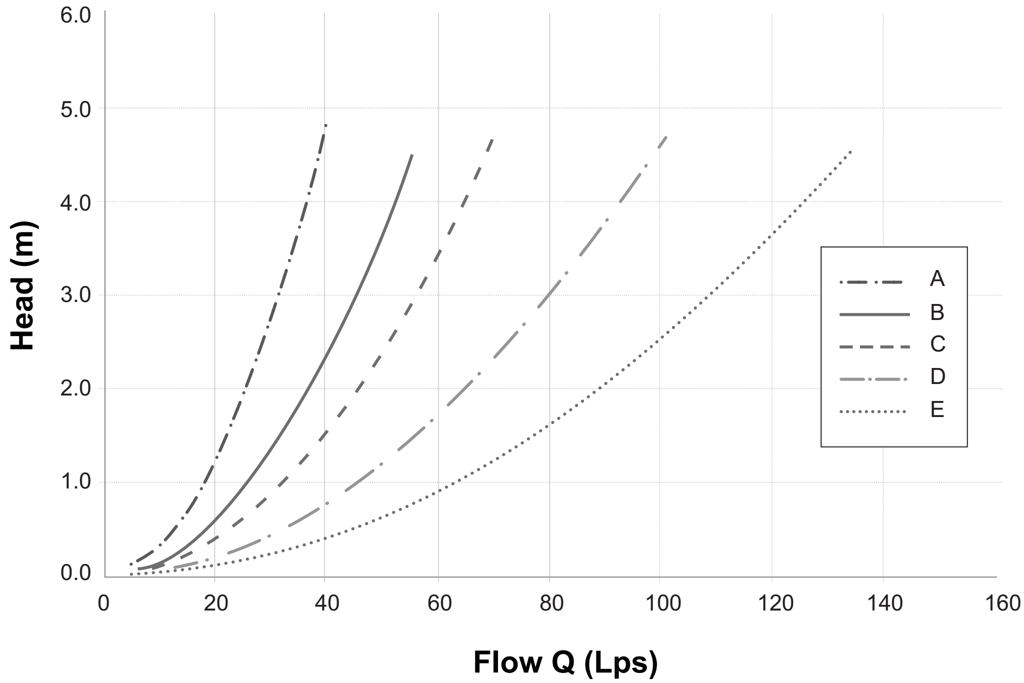


Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

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

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

WARNING

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

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

STEPS:

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

WARNING

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

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

STEPS:

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

WARNING

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

PRODUCT TECHNICAL SPECIFICATION

General

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

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

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

ICD's shall have no moving parts.

Materials

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

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

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

All hardware will be made from 304 stainless steel.

Dimensioning

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

Installation

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

APPENDIX G

Stormwater Quality Control Treatment Unit Information

Steve Matthews

From: Patrick <patrick@echelonenvironmental.ca>
Sent: Monday, November 8, 2021 11:32 AM
To: Steve Matthews
Cc: Francois Thauvette
Subject: RE: CDS Sizing Request - 2 Robinson Mixed-Use Development in Ottawa
Attachments: CDS TSSR IDF - 2 Robinson Avenue - PMSU 2020_5 .pdf

Good morning Steve,

Thanks again for all your help with Somme Street. For this project we recommend a CDS PMSU 2020_5 which has a budget price of $25,500. I have provided all the information you have requested below. Let me know if you have any questions for me!

- **% of net annual TSS removal = 82.2%**
- **% of net annual treatment volume for the tributary area = 97.86%**
- **The treatment capacity in L/s = 31 L/s**
- **The sediment storage capacity in m^3 = 1.668m3**
- **The oil storage capacity in L = 376 L**
- **The total unit storage capacity in L = 3150 L**

Best regards,

Patrick Graham
Project Manager
ECHELON ENVIRONMENTAL
*****Please note our new addresses*****

Echelon Environmental Inc.
55 Albert Street
Suite 200
Markham, ON
L3P 2T4
Phone: 1-905-948-0000
Cell: 416-460-5819
Fax: 1-905-948-0577
email patrick@echelonenvironmental.ca

Mailing Address:
Echelon Environmental Inc.
5694 Hwy #7 East
Suite 354
Markham, ON
L3P 0E3

From: Steve Matthews <S.Matthews@novatech-eng.com>
Sent: Friday, November 5, 2021 7:43 PM
To: Patrick <patrick@echelonenvironmental.ca>
Cc: Francois Thauvette <f.thauvette@novatech-eng.com>
Subject: CDS Sizing Request - 2 Robinson Mixed-Use Development in Ottawa

Hi Patrick,

We are currently working on a project that requires a stormwater quality control unit to treat water from the paved drive aisles on-site, some of the proposed buildings and landscaped areas.
The project proposes to develop multi-tower high-rise residential/commercial buildings and is located at 2 Robinson Avenue in the City of Ottawa.
The project details are as follows:

Tributary area = **1.47 ha**
Imperviousness = **55% or C_w=0.59**
Time of concentration = 10min
IDF Curve = City of Ottawa (104.2mm/hr Intensity for 5yr) (178.6mm/hr Intensity for 100yr)

We have a requirement to provide a level of quality control treatment to meet the **MOE 'Enhanced' Level of Protection** guidelines (i.e. **80% TSS removal** and **90% of annual runoff treated**). The proposed unit will be installed on a new 450mm dia. PVC outlet pipe with one 375mm dia. PVC inlet pipe at 180 degrees of separation through the structure and approximately 3.8m cover on both pipes. A standard particle distribution (**Fines**) should be adequate for the design. Anticipated peak flows should be in the order of 76 L/s based on the City's requirement to control the site to a predevelopment level of the 5-yr allowable to the municipal sewer. As a result, there will be a significant amount upstream attenuation due to ICDs within the drive aisle and storm structures and internal SWM tanks for the various buildings. See attached mark-up the proposed site servicing plan for a sketch of the area and proposed water quality treatment unit location (highlighted in yellow).

Can you please **size a CDS unit** for us and provide the design details as well as an **approximate cost estimate.**

We will also need the following information on the unit for our SWM Report:

- **% of net annual TSS removal**
- **% of net annual treatment volume for the tributary area**
- **The treatment capacity in L/s**
- **The sediment storage capacity in m^3**
- **The oil storage capacity in L**
- **The total unit storage capacity in L**

Thank you for your time and consideration in this matter. If there is any further information you require, please do not hesitate to call.

Regards,
Steve

Stephen Matthews, B.A.(Env), Senior Design Technologist
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 223 | Fax: 613.254.5867

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Project:	2 Robinson Avenue		
Location:	Ottawa, ON		
Date:	11/8/2021		
By:	PG	Site ID:	OGS 1
PSD:	FINE	Area:	1.470 ha
CDS Model:	PMSU2020_5	C-Value	0.59
CDS Design Flow:	31 l/s	IDF Data:	Ottawa, ON

Return	Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	7.28	94.33	11543	11543	**100.00**	7.28	7.28	0.00	100.00
2-M	0.17	12.12	91.31	19416	19416	**99.75**	12.12	12.12	0.00	100.00
3-M	0.25	16.14	88.80	26043	26043	**98.17**	16.14	16.14	0.00	100.00
4-M	0.33	19.78	86.52	32128	32128	**95.04**	19.78	19.78	0.00	100.00
5-M	0.42	22.59	84.75	36889	36889	**90.91**	22.59	22.59	0.00	100.00
6-M	0.50	25.40	82.99	41650	41650	**86.47**	25.40	25.40	0.00	100.00
7-M	0.58	27.50	81.64	45252	45274	**82.01**	27.50	27.50	0.00	99.96
8-M	0.67	29.59	80.30	48854	48898	**77.67**	29.59	29.59	0.00	99.91
9-M	0.75	31.69	78.96	52455	52522	**73.64**	31.69	31.15	0.54	99.87
10-M	0.83	33.33	77.42	54559	55406	**69.90**	33.33	31.15	2.18	98.60
11-M	0.92	34.97	75.89	56663	58290	**66.40**	34.97	31.15	3.82	97.33
1-Yr	1	36.61	74.35	58767	61174	**63.21**	36.61	31.15	5.46	96.06
2-Yr	2	50.02	62.01	69940	85501	**39.35**	50.02	31.15	18.87	81.80
5-Yr	5	76.85	46.21	85806	138597	**18.13**	76.85	31.15	45.70	61.91
10-Yr	10	76.99	46.15	85881	138897	**9.52**	76.99	31.15	45.84	61.83
25-Yr	25	77.69	45.85	86255	140376	**3.92**	77.69	31.15	46.54	61.45
50-Yr	50	79.43	45.11	87159	144069	**1.98**	79.43	31.15	48.28	60.50
100-Yr	100	80.46	44.68	87690	146282	**1.00**	80.46	31.15	49.32	59.95

Average Annual TSS Removal Efficiency [%]: **82.2** Ave. Ann. T. Volume [%]: **97.86%**

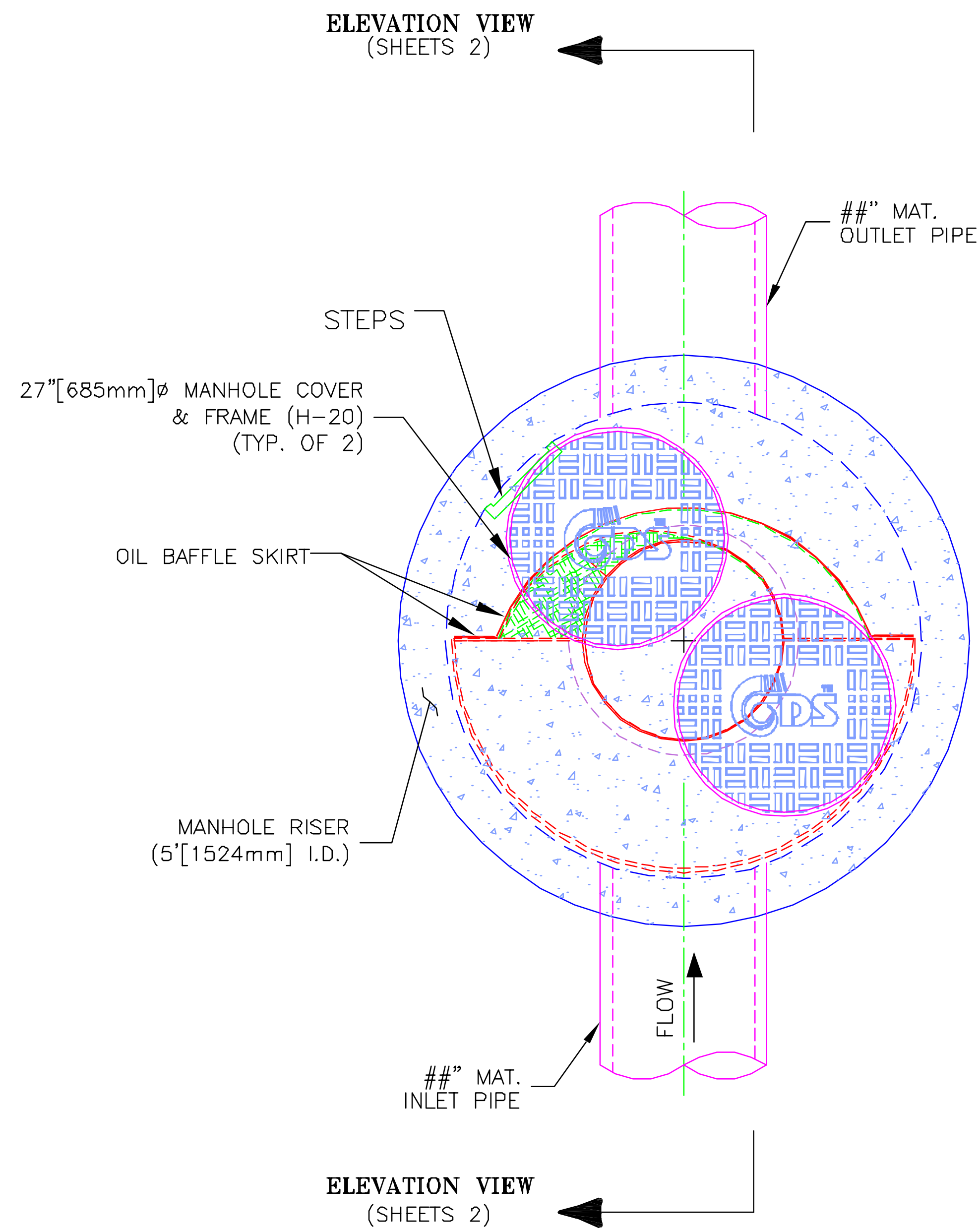
1 - CDS Efficiency based on testing conducted at the University of Central Florida

2 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES

PLAN VIEW



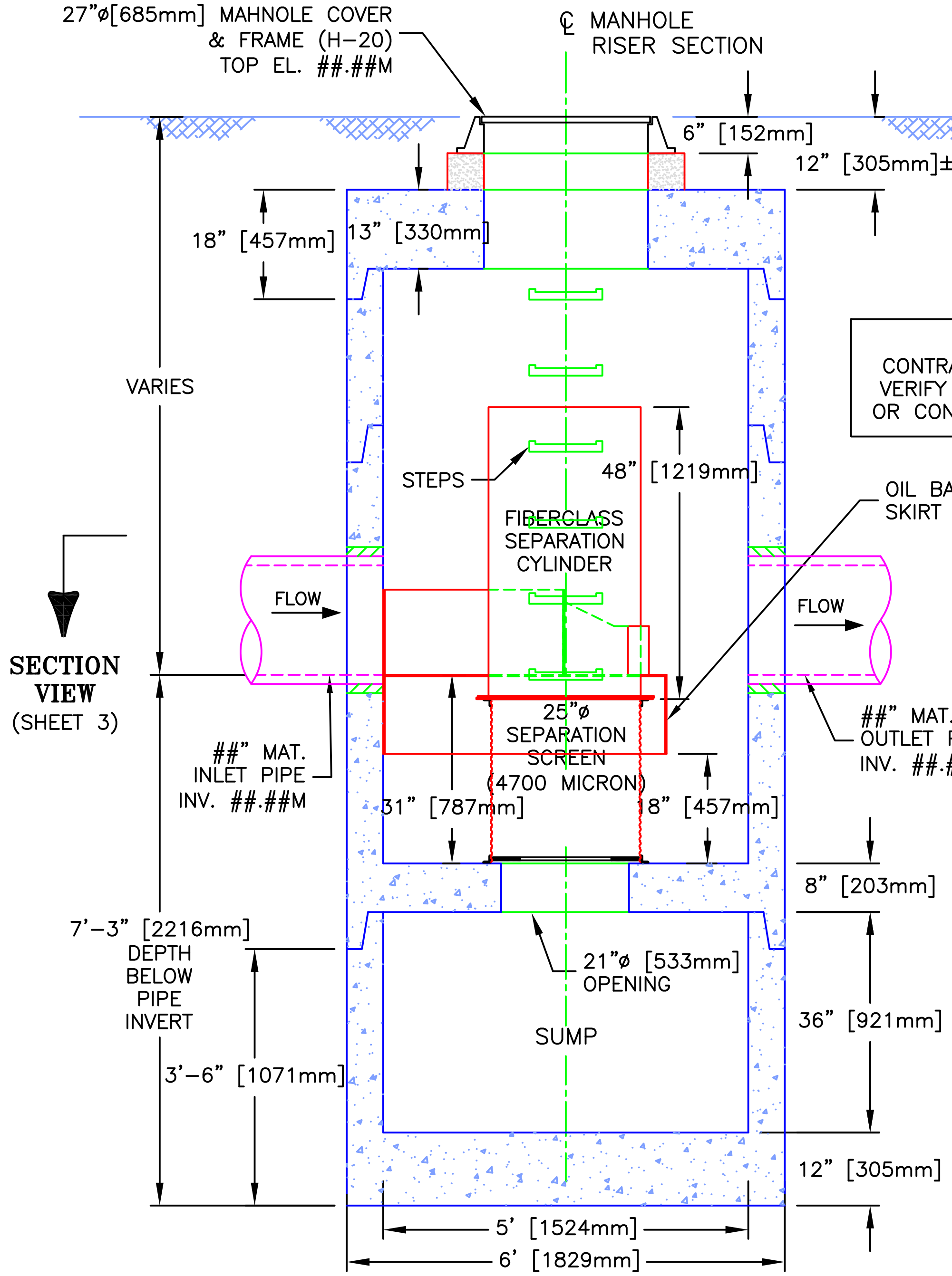
MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY
STORM WATER TREATMENT UNIT

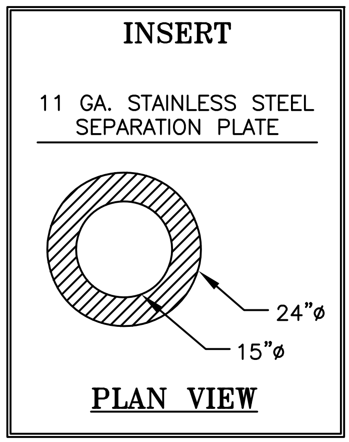
PROJECT NAME CITY, STATE	JOB#	XX-##-###	SCALE 1" = 2'
	DATE	##/##/##	SHEET
	DRAWN	INITIALS	1
	APPROV.		

CONTECH STORMWATER SOLUTIONS

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW





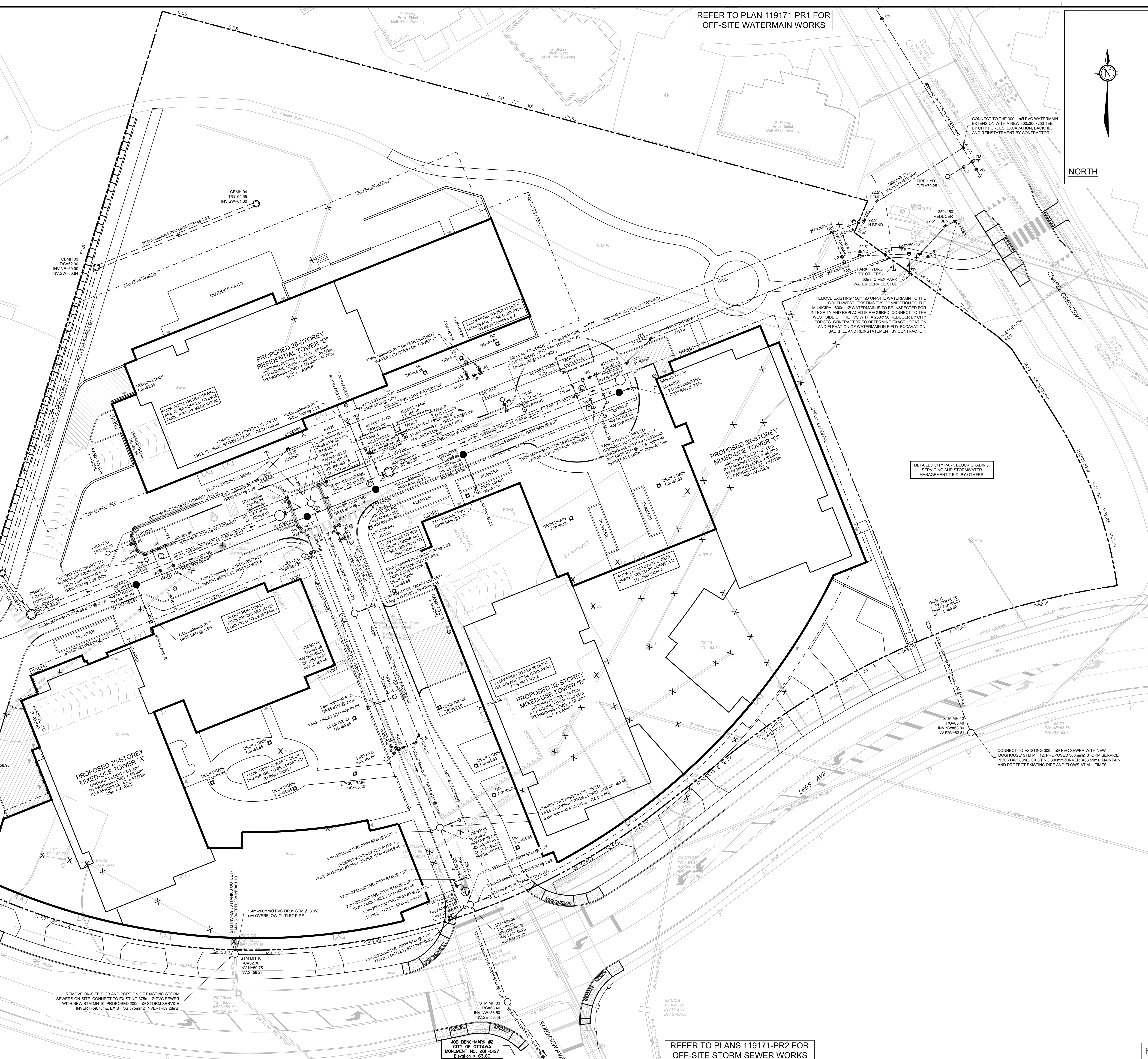
MODEL CDS20_20m, 31 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

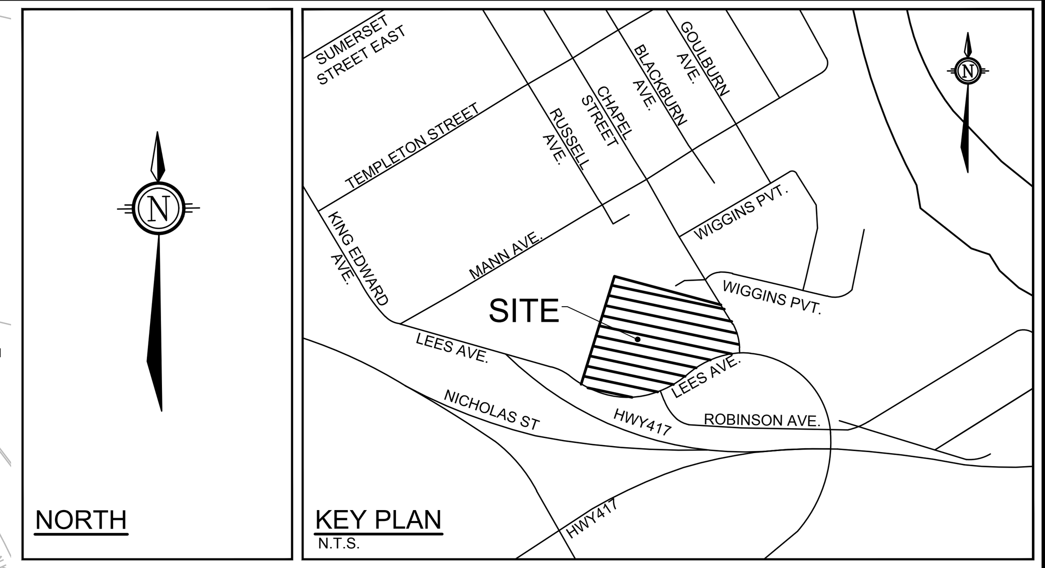
CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB#	XX–##–###	SCALE 1" = 2.5'
		DATE	##/##/##	SHEET
		DRAWN	INITIALS	2
		APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948–0000 Fax: (905) 948–0577

LEGEND

	PROPERTY LINE
SAN MH 1	PROPOSED SANITARY MH & SEWER
CBMH 3	PROPOSED CATCHBASIN MH & SEWER
STM MH 1	PROPOSED STORM MH & SEWER
CB 2	PROPOSED CATCHBASIN & LEAD
PMSU 2020_5	STORMWATER QUALITY CONTROL UNIT
ICD	PROPOSED INLET CONTROL DEVICE
DD	PROPOSED DECK DRAIN
M RM	PROPOSED WATER METER AND REMOTE METER
	PROPOSED BARRIER CURB
DC	PROPOSED DEPRESSED CURB
250mmØ	PROPOSED WATERMAIN AND DIAMETER
HYD VB	PROPOSED HYDRANT c/w VALVE & VALVE BOX
VB	PROPOSED VALVE & VALVE BOX
[	PROPOSED CAP
	PROPOSED THERMAL INSULATION
A B	SEWER CROSSINGS (REFER TO TABLE ON 119171-NDT)
	PROPOSED BUILDING ENTRANCE
X	REMOVALS
GROUND FLOOR	FINISHED FLOOR ELEVATION OF GROUND FLOOR
P1 PARKING	FINISHED FLOOR ELEVATION OF PARKING LEVEL 1
P2 PARKING	FINISHED FLOOR ELEVATION OF PARKING LEVEL 2
USF	UNDERSIDE OF FOOTING ELEVATION
OHW	EXISTING OVERHEAD WIRES
	EXISTING CONCRETE CURB
SANMH	EXISTING SANITARY MANHOLE & SEWER
CBMH	EXISTING CATCHBASIN MANHOLE
STMMH	EXISTING STORM MANHOLE & SEWER
CB	EXISTING CATCHBASIN C/W CATCHBASIN LEAD
HYD VALVE	EXISTING HYDRANT & VALVE
	EXISTING TREES / VEGETATION
EX UP	EXISTING UTILITY POLE
	EXISTING FENCE
300mmØ WM	EXISTING WATERMAIN
HYD	EXISTING HYDRANT C/W VALVE & BOX





BENCHMARK INFO:

CITY OF OTTAWA MONUMENT No. 2011-0127 LOCATED NEAR THE SOUTH-WEST CORNER OF THE INTERSECTION OF LEES AVENUE AND ROBINSON AVENUE. GEODETIC ELEVATION = 63.60m.

ALL ELEVATIONS ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 3603 HAVING AN ELEVATION OF 76.959 METRES. BEARINGS ARE GRID, DERIVED FROM THE NORTHERLY LIMIT OF PART 1 ON PLAN 4R-1381 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21029-20 JRE Lt 7 PL 49 T F), PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK SIGNED AND DATED AUGUST 14, 2020.

SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.

REFER TO PLANS 119171-PR2 FOR OFF-SITE STORM SEWER WORKS

REFER TO 119171-NDT FOR NOTES, DETAILS AND TABLES

M:\2019\119171\CAD\Design\119171-GP.dwg, GP, Oct 05, 2022 - 3:59pm, dmaratha

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.

OWNER INFORMATION
2 ROBINSON AVENUE LIMITED PARTNERSHIP
88 ALBERT STREET
OTTAWA, ONTARIO, K1P 5E9
CONTACT: MR. KIERAN WAUGH
PHONE: (416) 903-1377
EMAIL: kwaugh@placedoree.com

No.	REVISION	DATE	BY
3	RE-ISSUED FOR SITE PLAN APPROVAL	OCT 07/22	FST
2	REVISED PER CITY COMMENTS / UPDATED SITE PLAN	MAR 30/22	FST
1	ISSUED FOR SITE PLAN APPROVAL	NOV 15/21	FST

SCALE 1:300

DESIGN	SM / FST
CHECKED	FST
DRAWN	DM / SM
CHECKED	SM / FST
APPROVED	FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 OCT 07, 2022 PROVINCE OF ONTARIO

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

LOCATION
CITY OF OTTAWA
320 LEES AVENUE (2 ROBINSON AVENUE)

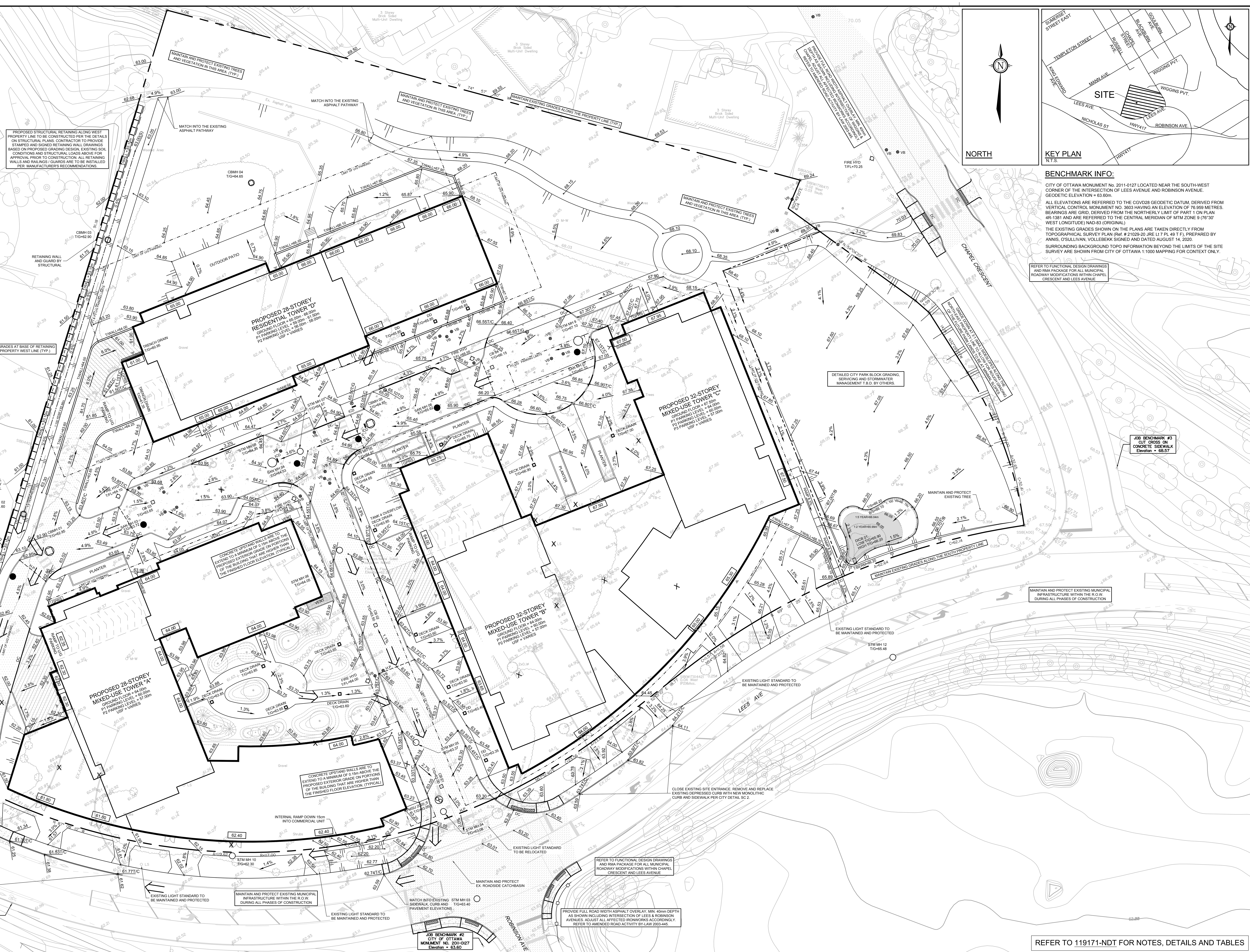
DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 119171
REV: REV # 3
DRAWING No. 119171-GP

PLANB1.DWG - 1000mmx707mm

D07-12-21-0202

18357



LEGEND

- PROPERTY LINE
- PROPOSED ELEVATION
- EXISTING ELEVATION
- GRADE AND DIRECTION
- PROPOSED TOP OF CURB ELEVATION
- PROPOSED TERRACE ELEVATION
- MAXIMUM 3:1 SIDESLOPE
- EMERGENCY OVERLAND FLOW ROUTE
- SAN MH 1 — PROPOSED SANITARY MANHOLE
- CBMH 3 — PROPOSED CATCHBASIN MANHOLE
- STM MH 1 — PROPOSED STORM MANHOLE
- CB — PROPOSED CATCHBASIN
- HYD / VB — PROPOSED HYDRANT AND VALVE
- PROPOSED BARRIER CURB
- DC — PROPOSED DEPRESSED CURB
- RC — PROPOSED ROLL CURB (5cm HEIGHT)
- ICD — PROPOSED INLET CONTROL DEVICE
- EXISTING EDGE OF PAVEMENT
- V&VB — EXISTING VALVE & VALVE BOX
- SP — EXISTING SERVICE POST
- HYD — EXISTING HYDRANT
- COMB MH — EXISTING COMBINED MH
- CBMH — EXISTING CATCHBASIN
- CB — EXISTING CATCHBASIN MH
- EX UP — EXISTING UTILITY POLE

PAVEMENT STRUCTURE:

LIGHT DUTY PAVEMENT
50mm HL-3 or SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34 - TRAFFIC LEVEL 'B'
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY PAVEMENT
40mm HL-3 or SUPERPAVE 12.5
50mm HL-8 or SUPERPAVE 19.0
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34 - TRAFFIC LEVEL 'B'
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY CONCRETE ROADWAY
CONCRETE AND HEAVY DUTY GRANULAR BASE INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY PAVEMENT - ROADWAY RE-INSTATEMENT
MATCH EXISTING GRANULAR STRUCTURE OF ROADWAY IN TRENCHES
MATCH EXISTING ASPHALT THICKNESSES IN TRENCHES
NEW ASPHALT GRADE: PG 58-34
PROVIDE FULL ROAD WIDTH ASPHALT OVERLAY, MIN. 40mm DEPTH AS SHOWN INCLUDING INTERSECTION OF LEES & ROBINSON AVENUES.
REFER TO AMENDED ROAD ACTIVITY BY-LAW 2003-445.

BENCHMARK INFO:

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SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.

REFER TO FUNCTIONAL DESIGN DRAWINGS AND RMA PACKAGE FOR ALL MUNICIPAL ROADWAY MODIFICATIONS WITHIN CHAPEL CRESCENT AND LEES AVENUE

REFER TO 119171-NDT FOR NOTES, DETAILS AND TABLES

NOTE:
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SCALE 1:300

DESIGN SM / FST
CHECKED FST
DRAWN DM / SM
CHECKED SM / FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
OCT 07, 2022
PROVINCE OF ONTARIO

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LOCATION
CITY OF OTTAWA
320 LEES AVENUE (2 ROBINSON AVENUE)

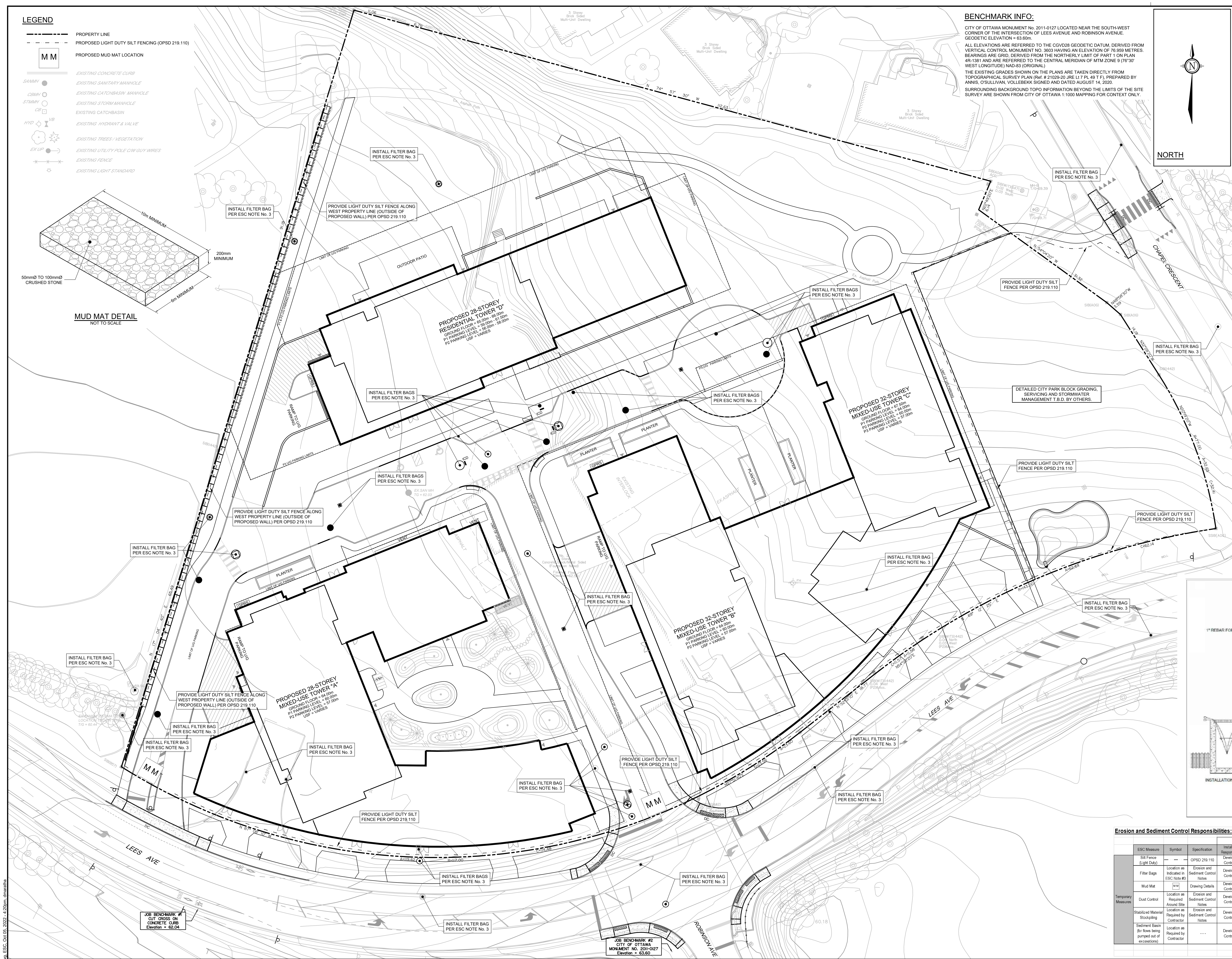
DRAWING NAME
GRADING PLAN

PROJECT No. 119171
REV REV # 3
DRAWING No. 119171-GR

PLANB1.DWG - 1000mmx707mm

D07-12-21-0202

18357



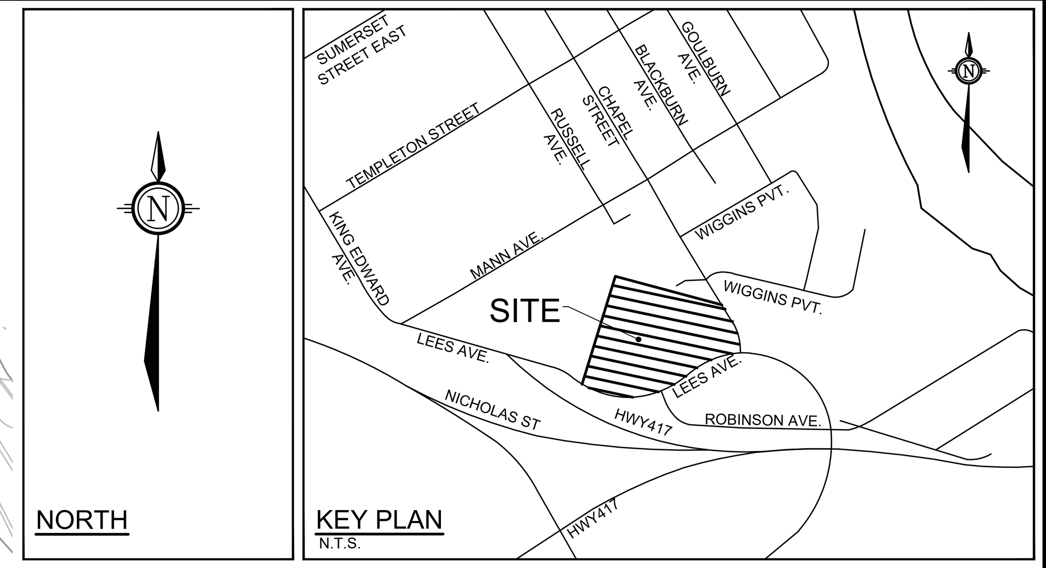
BENCHMARK INFO:

CITY OF OTTAWA MONUMENT No. 2011-0127 LOCATED NEAR THE SOUTH-WEST CORNER OF THE INTERSECTION OF LEES AVENUE AND ROBINSON AVENUE. GEODETIC ELEVATION = 63.60m.

ALL ELEVATIONS ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 3603 HAVING AN ELEVATION OF 76.959 METRES. BEARINGS ARE GRID, DERIVED FROM THE NORTHERLY LIMIT OF PART 1 ON PLAN 4R-1381 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21029-20 JRE Lt 7 PL 49 T F), PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK SIGNED AND DATED AUGUST 14, 2020.

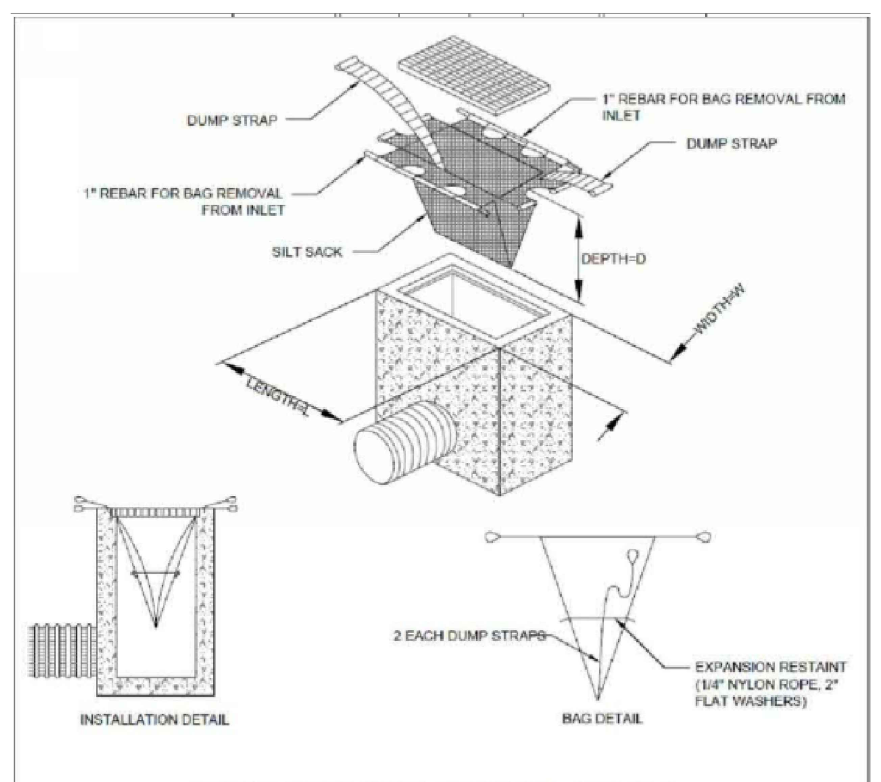
SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.



EROSION AND SEDIMENT CONTROL NOTES :

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

1. ALL EROSION AND SEDIMENT CONTROLS ARE TO BE INSTALLED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF OTTAWA. THEY ARE TO BE APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION. THESE PRACTICES ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL AND SHOULD INCLUDE AS A MINIMUM THOSE MEASURES INDICATED ON THE PLAN.
2. EROSION AND SEDIMENT CONTROL MEASURES WILL BE IMPLEMENTED DURING CONSTRUCTION IN ACCORDANCE WITH THE "GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES" (GOVERNMENT OF ONTARIO, MAY 1987). THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR MEETING ALL REGULATORY AGENCY REQUIREMENTS.
3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER BAGS WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
6. THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE ENGINEER, THE MEASURES ARE NO LONGER REQUIRED. NO CONTROL MEASURES MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE ENGINEER.
7. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO ANY STORM SEWER SYSTEM. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.
8. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.



INLET SEDIMENT CONTROL DEVICE
N.T.S.

Erosion and Sediment Control Responsibilities:

				During Construction			After Construction Prior to Final Acceptance		After Final Acceptance
	ESC Measure	Symbol	Specification	Installation Responsibility	Inspection/Maintenance Responsibility	Inspection Frequency	Approval to Remove	Removal Responsibility	Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence (Light Duty)	— · · — · · —	OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Bags	Location as Indicated in ESC Note #3	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	M M	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	- - -	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

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.

OWNER INFORMATION
2 ROBINSON AVENUE LIMITED PARTNERSHIP
88 ALBERT STREET
OTTAWA, ONTARIO, K1P 5E9
CONTACT: MR. KIERAN WAUGH
PHONE: (416) 903-1377
EMAIL: kwaugh@placedoree.com

No.	REVISION	DATE	BY
3	RE-ISSUED FOR SITE PLAN APPROVAL	OCT 07/22	FST
2	REVISED PER CITY COMMENTS / UPDATED SITE PLAN	MAR 30/21	FST
1	ISSUED FOR SITE PLAN APPROVAL	NOV 15/21	FST

SCALE 1:300

DESIGN SM / FST
CHECKED FST
DRAWN DM / SM
CHECKED SM / FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 OCT 07, 2022 PROVINCE OF ONTARIO

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

LOCATION
CITY OF OTTAWA
320 LEES AVENUE (2 ROBINSON AVENUE)

DRAWING NAME
EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 119171
REV REV # 3
DRAWING No. 119171-ESC

D07-12-21-0202

18357

GENERAL NOTES:

1. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
3. OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE CITY OF OTTAWA BEFORE COMMENCING CONSTRUCTION.
4. BEFORE COMMENCING CONSTRUCTION OBTAIN AND PROVIDE PROOF OF COMPREHENSIVE, ALL RISK AND OPERATIONAL LIABILITY INSURANCE FOR $5,000,000.00. INSURANCE POLICY TO NAME OWNERS, ENGINEERS AND ARCHITECTS AS CO-INSURED.
5. COMPLETE ALL WORKS IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS USING THE CURRENT GUIDELINES, BYLAWS AND STANDARDS INCLUDING MATERIALS OF CONSTRUCTION, DISINFECTION AND ALL RELEVANT REFERENCES TO OPSS, OPSD & AWWA GUIDELINES - ALL CURRENT VERSIONS AND 'AS AMENDED'.
6. RESTORE ALL DISTURBED AREAS ON-SITE AND OFF-SITE, INCLUDING TRENCHES AND SURFACES ON PUBLIC ROAD ALLOWANCES TO EXISTING CONDITIONS OR BETTER TO THE SATISFACTION OF THE CITY OF OTTAWA AND ENGINEER.
7. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL, ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ANY CONTAMINATED MATERIAL. ALL CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
8. ALL ELEVATIONS ARE GEODETIC.
9. REFER TO THE GEOTECHNICAL INVESTIGATION REPORT (NO. PG4811-1, REV. 1, DATED MAY 31, 2021) PREPARED BY PATERSON GROUP INC., FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS. THE GEOTECHNICAL CONSULTANT IS TO REVIEW ON-SITE CONDITIONS AFTER EXCAVATION PRIOR TO PLACEMENT OF THE GRANULAR MATERIAL.
10. REFER TO ARCHITECT'S AND LANDSCAPE ARCHITECT'S DRAWINGS FOR BUILDING AND HARD SURFACED AREAS AND DIMENSIONS.
11. REFER TO THE 'DEVELOPMENT SERVICING STUDY AND STORMWATER MANAGEMENT REPORT' (R-2020-059) PREPARED BY NOVATECH.
12. SAW CUT AND KEY GRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10).
13. PROVIDE LINE/PARKING PAINTING.
14. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A SERVICING PLAN OF 119171-GP INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THE SERVICING PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS, VALVE AND HYDRANT LOCATIONS, T/WM ELEVATIONS AND ANY ALIGNMENT CHANGES, ETC.

SEWER NOTES:

1. SUPPLY AND CONSTRUCT ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED'.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
CATCHBASIN (600x600mm)	705.010	OPSD
STORM / SANITARY MANHOLE (1200mmØ)	701.010	OPSD
STORM / CATCHBASIN MANHOLE (1800mmØ)	701.012	OPSD
CB, FRAME & COVER	400.020	OPSD
STORM / SANITARY MH FRAME & COVER	401.010	OPSD
WATERTIGHT MH FRAME AND COVER	401.030	OPSD
SEWER TRENCH	S6	CITY OF OTTAWA
SANITARY / STORM SEWER / CB LEAD	PVC DR 35	
STORM SUPER-PIPE (1.0m DIAMETER AND OVER)	CONCRETE 65-D	

3. THE WEEPING TILE SERVICE SHALL BE EQUIPPED WITH A BACKFLOW PREVENTION DEVICE AS PER THE CITY OF OTTAWA STANDARD DETAIL S18, AS INDICATED ON THE PLAN 119171-GP.
4. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 1.5m COVER WITH HI-40 INSULATION PER INSULATION DETAIL FOR SHALLOW SEWERS. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION.
5. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0%.
6. PIPE BEDDING, COVER AND BACKFILL ARE TO BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
7. FLEXIBLE CONNECTIONS ARE REQUIRED FOR CONNECTING PIPES TO MANHOLES (FOR EXAMPLE KOR-N-SEAL, PSX: POSITIVE SEAL AND DURASEAL). THE CONCRETE CRADLE FOR THE PIPE CAN BE ELIMINATED.
8. THE OWNER SHALL REQUIRE THAT THE SITE SERVICING CONTRACTOR PERFORM FIELD TESTS FOR QUALITY CONTROL OF ALL SANITARY SEWERS. LEAKAGE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OPSS 410.07.16, 410.07.16.04 AND 407.07.24. DYE TESTING IS TO BE COMPLETED ON ALL SANITARY SERVICES TO CONFIRM PROPER CONNECTION TO THE SANITARY SEWER MAIN. THE FIELD TESTS SHALL BE PERFORMED IN THE PRESENCE OF A CERTIFIED PROFESSIONAL ENGINEER WHO SHALL SUBMIT A CERTIFIED COPY OF THE TEST RESULTS.
9. TYPICAL STORM MANHOLES AND CATCHBASIN MANHOLES ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL CATCHBASINS ARE TO HAVE 600mm SUMPS UNLESS OTHERWISE INDICATED.
10. ALL CATCHBASINS, MANHOLES AND/OR CATCHBASIN MANHOLES THAT ARE TO HAVE ICD'S INSTALLED WITHIN THEM ARE TO HAVE 600mm SUMPS.
11. ALL WEEPING TILE CONNECTIONS TO BE MADE TO THE PROPOSED STORM SEWER SYSTEM DOWNSTREAM OF ANY INLET CONTROL DEVICES.
12. THE CONTRACTOR IS TO TELEVISE (CCTV) ALL PROPOSED SEWERS, 200mmØ OR GREATER PRIOR TO BASE COURSE ASPHALT. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES. PROVIDE A COPY OF ALL CCTV INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED PAVED AREAS AS DIRECTED BY THE SITE ENGINEER OR GEOTECHNICAL ENGINEER.
2. EXPOSED SUBGRADES IN PROPOSED PAVED AREAS SHOULD BE PROOF ROLLED WITH A LARGE STEEL DRUM ROLLER AND INSPECTED BY THE GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF GRANULARS.
3. ANY SOFT AREAS EVIDENT FROM THE PROOF ROLLING SHOULD BE SUB-EXCAVATED AND REPLACED WITH SUITABLE MATERIAL THAT IS FROST COMPATIBLE WITH THE EXISTING SOILS AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.
4. THE GRANULAR BASE SHOULD BE COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE. ANY ADDITIONAL GRANULAR FILL USED BELOW THE PROPOSED PAVEMENT SHOULD BE COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY VALUE.
5. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED.
6. MAXIMUM TERRACING GRADE TO BE 3:1 UNLESS OTHERWISE NOTED.
7. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
8. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED AND CONSTRUCTED AS PER CITY OF OTTAWA STANDARDS (SC1.1).
9. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.
10. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING AS-BUILT ELEVATIONS OF ALL DESIGN GRADES SHOWN ON PLAN 119171-GR.

PAVEMENT STRUCTURES:

LIGHT DUTY PAVEMENT
50mm HL-3 or SUPERPAVE 12.5
150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34 - TRAFFIC LEVEL 'B'
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY PAVEMENT
40mm HL-3 or SUPERPAVE 12.5
50mm HL-8 or SUPERPAVE 19.0
150mm GRANULAR "A"
450mm GRANULAR "B" TYPE II
ASPHALT GRADE PG 58-34 - TRAFFIC LEVEL 'B'
*INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY CONCRETE ROADWAY
CONCRETE AND HEAVY DUTY GRANULAR
BASE INSTALLED PER GEOTECHNICAL REPORT

HEAVY DUTY PAVEMENT - ROADWAY RE-INSTATEMENT
MATCH EXISTING GRANULAR STRUCTURE OF ROADWAY IN TRENCHES
MATCH EXISTING ASPHALT THICKNESSES IN TRENCHES
NEW ASPHALT GRADE: PG 58-34
PROVIDE FULL ROAD WIDTH ASPHALT OVERLAY, MIN. 40mm DEPTH AS SHOWN INCLUDING INTERSECTION OF LEES & ROBINSON AVENUES.
REFER TO AMENDED ROAD ACTIVITY BY-LAW 2003-445.

EROSION AND SEDIMENT CONTROL NOTES :

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

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3. TO PREVENT SURFACE EROSION FROM ENTERING ANY STORM SEWER SYSTEM DURING CONSTRUCTION, FILTER BAGS WILL BE PLACED UNDER GRATES OF NEARBY CATCHBASINS AND STRUCTURES. A LIGHT DUTY SILT FENCE BARRIER WILL ALSO BE INSTALLED AROUND THE CONSTRUCTION AREA (WHERE APPLICABLE). THESE CONTROL MEASURES WILL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE.
4. TO LIMIT EROSION: MINIMIZE THE AMOUNT OF EXPOSED SOILS AT ANY GIVEN TIME, RE-VEGETATE EXPOSED AREAS AND SLOPES AS SOON AS POSSIBLE AND PROTECT EXPOSED SLOPES WITH NATURAL OR SYNTHETIC MULCHES.
5. FOR MATERIAL STOCKPILING: MINIMIZE THE AMOUNT OF EXPOSED MATERIALS AT ANY GIVEN TIME; APPLY TEMPORARY SEEDING, TARPS, COMPACTION AND/OR SURFACE ROUGHENING AS REQUIRED TO STABILIZE STOCKPILED MATERIALS THAT WILL NOT BE USED WITHIN 14 DAYS.
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9. ROADWAYS ARE TO BE SWEPT AS REQUIRED OR AS DIRECTED BY THE ENGINEER AND/OR THE MUNICIPALITY.
10. THE CONTRACTOR SHALL ENSURE PROPER DUST CONTROL IS PROVIDED WITH THE APPLICATION OF WATER (AND IF REQUIRED, CALCIUM CHLORIDE) DURING DRY PERIODS. MONITOR DUST LEVELS DURING SITE PREPARATION/EXCAVATION, AND CONSTRUCTION ACTIVITIES, AND WHEN DUST LEVELS BECOME VISUALLY APPARENT SPRAY WATER TO MINIMIZE THE RELEASE OF DUST FROM GRAVEL, PAVED AREAS AND EXPOSED SOILS. USE CHEMICAL DUST SUPPRESSANTS ONLY WHERE NECESSARY ON PROBLEM AREAS.

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARDS AND SPECIFICATIONS - ALL CURRENT VERSIONS AND 'AS AMENDED'. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY OF OTTAWA FORCES. CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY THE CONTRACTOR IN THE PRESENCE CITY OF OTTAWA FORCES.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
HYDRANT INSTALLATION	W19	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION AT OPEN STRUCTURES	W23	CITY OF OTTAWA
VALVE BOX ASSEMBLY	W24	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN CROSSING OVER SEWER	W25.2	CITY OF OTTAWA
DISTRICT METERING CHAMBER	W3.3	CITY OF OTTAWA
WATERMAIN MATERIAL	PVC DR 18	
PARK WATER SERVICE MATERIAL	PEX / TYPE 'K' SOFT COPPER	

3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED.
4. PROVIDE MINIMUM 0.5m CLEARANCE BETWEEN OUTSIDE OF PIPES AT ALL CROSSINGS, WHERE POSSIBLE UNLESS OTHERWISE INDICATED.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.

Erosion and Sediment Control Responsibilities:

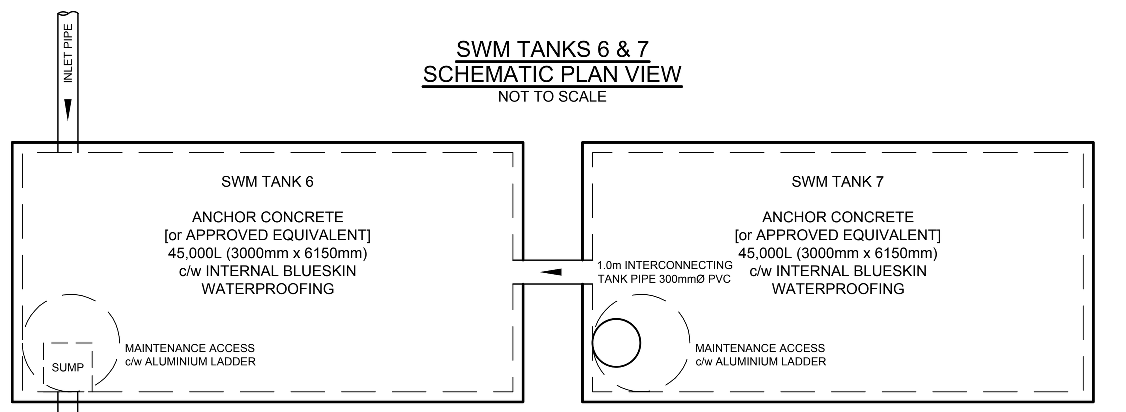
	ESC Measure	Symbol	Specification	During Construction: Installation Responsibility	During Construction: Inspection/Maintenance Responsibility	During Construction: Inspection Frequency	After Construction Prior to Final Acceptance: Approval to Remove	After Construction Prior to Final Acceptance: Removal Responsibility	After Final Acceptance: Inspection/Maintenance Responsibility
Temporary Measures	Silt Fence (Light Duty)		OPSD 219.110	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Filter Bags	Location as Indicated in ESC Note #3	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Mud Mat	M M	Drawing Details	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Dust Control	Location as Required Around Site	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Consultant	Developer's Contractor	N/A
	Stabilized Material Stockpiling	Location as Required by Contractor	Erosion and Sediment Control Notes	Developer's Contractor	Developer's Contractor	Weekly (as a minimum)	Developer's Contractor	Developer's Contractor	N/A
	Sediment Basin (for flows being pumped out of excavations)	Location as Required by Contractor	- - -	Developer's Contractor	Developer's Contractor	After Every Rainstorm	Developer's Contractor	Developer's Contractor	N/A

CRITICAL SEWER PIPE CROSSING TABLE

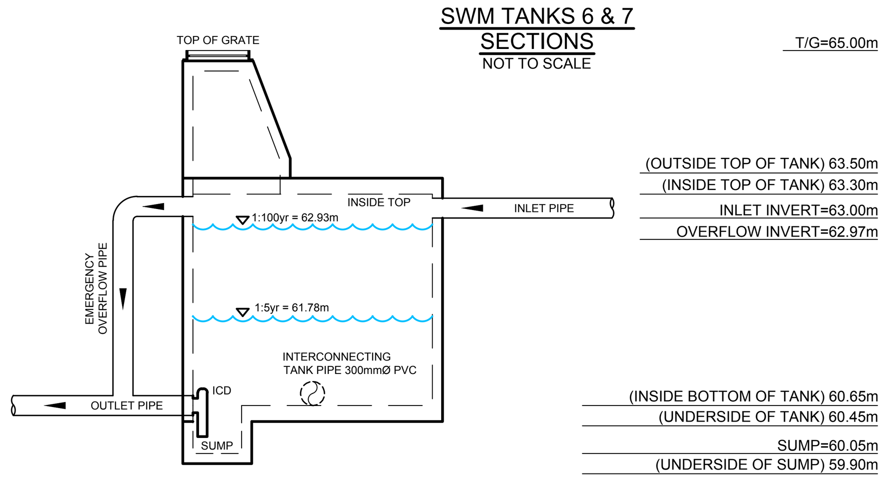
CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE	SURFACE ELEVATION
A	375mmØ STM OBV=60.03	250mmØ SAN INV=61.51	± 1.5m	64.58 m
B	300mmØ STM OBV=60.86	200mmØ SAN INV=61.87	± 1.0m	64.93 m
C	1050mmØ STM OBV=61.05	150mmØ U/S WM=61.45	± 0.3m	63.67 m
D	250mmØ SAN OBV=60.95	150mmØ U/S WM=61.45	± 0.5m	63.69 m
E	1050mmØ STM OBV=63.45	150mmØ U/S WM=64.25	± 0.7m	66.85 m
F	250mmØ SAN OBV=63.30	150mmØ U/S WM=64.25	± 0.95m	66.80 m

* SEE 119171-GP PLAN FOR SEWER CROSSING LOCATIONS A and B on SEWERS + C, D, E and F on WATERMAIN.

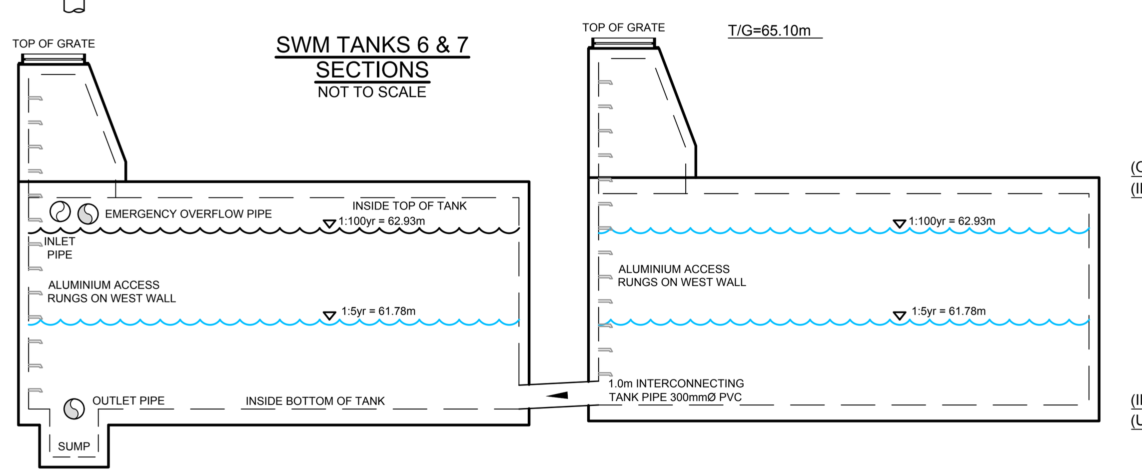
SWM TANKS 6 & 7
SCHEMATIC PLAN VIEW
NOT TO SCALE



SWM TANKS 6 & 7
SECTIONS
NOT TO SCALE



SWM TANKS 6 & 7
SECTIONS
NOT TO SCALE



PROPOSED 250mmØ WATERMAIN TABLE - EAST / WEST SITE LOOP

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
4+000	69.93±	67.50 *	TEE CONNECTION TO NEW 300mmØ WATERMAIN EXTENSION
4+002.8	70.10	67.45	22.5° VERTICAL BEND
4+005.4	70.12	66.34	22.5° VERTICAL BEND
4+006.7	70.05	66.34 ***	CROSS BELOW EX.600mmØ WM [U/S=67.34m] (±1.0m CLEARANCE)
4+008.0	69.90	66.34	22.5° VERTICAL BEND
4+010.4	69.75	67.35	22.5° VERTICAL BEND
4+018.0	69.30	66.90	22.5° HORIZONTAL BEND
4+020.0	69.29	66.89	CROSS BELOW EX. BELL DUCT (±1.2m CLEARANCE)
4+020.8	69.28	66.88	CROSS BELOW EX. BELL DUCT (±1.5m CLEARANCE)
4+021.8	69.27	66.87	CROSS BELOW EX. COMMS DUCT (±1.5m CLEARANCE)
4+022.1	69.27	66.87	22.5° HORIZONTAL BEND
4+023.1	69.26	66.86	250mmØ VALVE & VALVE BOX @ PROPERTY LINE
4+028.2	69.05	66.65	250 x 250 x 250 TEE
4+050	68.05	65.65	- - -
4+075	67.15	64.75	- - -
4+095.8	66.25	63.85	150 x 250 x 250 BUILDING SERVICE TEE
4+097.1	66.19	63.79	250mmØ VALVE & VALVE BOX
4+098.3	66.13	63.73	150 x 250 x 250 BUILDING SERVICE TEE
4+119.5	65.15	61.64 ***	CROSS BELOW 250mmØ STM [Inv=63.03m] (±1.4m CLEARANCE)
4+121.0	65.10	61.49 ***	CROSS BELOW 200mmØ SAN [Inv=61.99m] (±0.5m CLEARANCE)
4+125	64.93	61.80	- - -
4+132.9	64.80	62.40	22.5° HORIZONTAL BEND
4+136.6	64.70	62.30 ***	CROSS ABOVE 200mmØ STM [Obv=60.77m] (±1.3m CLEARANCE)
4+140.6	64.56	62.16	22.5° HORIZONTAL BEND
4+150	64.10	61.70	- - -
4+164.1	63.78	61.69 **	45° HORIZONTAL BEND
4+165.5	63.77	61.67 **	45° HORIZONTAL BEND
4+166.9	63.74	61.64 **	150mmØ HYDRANT TEE
4+168.5	63.73	61.63 **	45° HORIZONTAL BEND
4+169.9	63.71	61.61 **	45° HORIZONTAL BEND
4+171.4	63.70	61.60 **	150 x 250 x 250 BUILDING SERVICE TEE
4+172.6	63.69	61.59 **	250mmØ VALVE & VALVE BOX
4+173.9	63.68	61.58 **	150 x 250 x 250 BUILDING SERVICE TEE
4+175.5	63.66	61.57 **	INSULATE IN PROXIMITY TO OPEN STRUCTURE
4+197.2	64.48	62.08	250 x 250 x 250 TEE (5+000)
4+199.8	64.50	62.15 ***	CROSS ABOVE 200mmØ STM [Obv=60.77m] (±1.2m CLEARANCE)
4+203.3	64.55	62.20 **	250 x 250 x 250 TEE (5+102.5)
4+204.8	64.68	62.18 **	250mmØ VALVE & VALVE BOX
4+212.5	64.93	61.40 ***	CROSS BELOW 200mmØ SAN [Inv=61.90m] (±0.5m CLEARANCE)
4+214.0	64.96	61.52 ***	CROSS ABOVE 250mmØ STM [Obv=60.87m] (±0.4m CLEARANCE)
4+225	65.43	62.43	- - -
4+239.5	66.12	63.72	150mmØ HYDRANT TEE
4+242.5	66.17	63.77 **	INSULATE IN PROXIMITY TO OPEN STRUCTURE
4+252.0	66.70	64.30 ***	CROSS ABOVE 200mmØ STM [Obv=62.92m] (±1.1m CLEARANCE)
4+254.1	66.80	64.40	150 x 250 x 250 BUILDING SERVICE TEE
4+255.4	66.85	64.45	250mmØ VALVE & VALVE BOX
4+256.6	66.90	64.50	150 x 250 x 250 BUILDING SERVICE TEE
4+262.6	67.30	64.90	22.5° HORIZONTAL BEND
4+268.6	67.50	65.10	22.5° HORIZONTAL BEND
4+275	67.80	65.40	- - -
4+300	68.75	66.35	- - -
4+305.7	69.05	66.65	250 x 250 x 250 TEE
4+308.7	69.15	66.75	22.5° HORIZONTAL BEND
4+313.3	69.35	66.95	250mmØ VALVE & VALVE BOX @ PROPERTY LINE
4+317.5	69.48	67.08	50 x 250 x 250 PARK SERVICE TEE
4+319.5	69.57	67.17	45° HORIZONTAL BEND
4+323.9	69.87	67.19	CROSS BELOW EX. COMMS DUCT (±1.5m CLEARANCE)
4+325.3	69.90	67.20	CROSS BELOW EX. BELL DUCTS (±1.6m CLEARANCE)
4+326.1	69.93	67.23	22.5° HORIZONTAL BEND
4+328.6	70.02	67.25± *	CONNECTION TO EX.150mmØ WM T.V.S. with 250x150 REDUCER

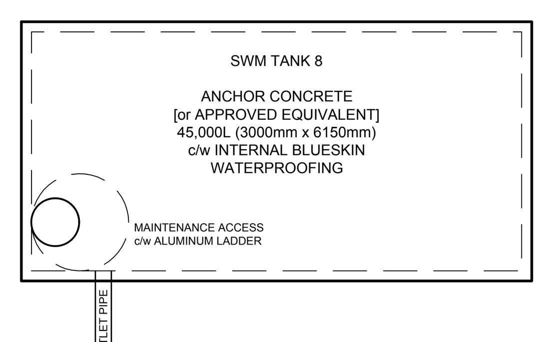
* CONNECTIONS TO EXISTING 150mmØ and NEW 300mmØ WATERMAINS. EXACT ELEVATIONS TO BE FIELD DETERMINED.
** PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAILS W22 IN SHALLOW TRENCHES WHERE COVER IS LESS THAN 2.4m AND/OR W23 ADJACENT TO OPEN STRUCTURES.
*** PIPE CROSSINGS WITH WATERMAINS ARE TO BE IN ACCORDANCE WITH CITY STANDARDS W25 AND W25.2 TO AVOID CONFLICTS, WHERE POSSIBLE.

PROPOSED 250mmØ WATERMAIN TABLE - NORTH / SOUTH SITE LOOP

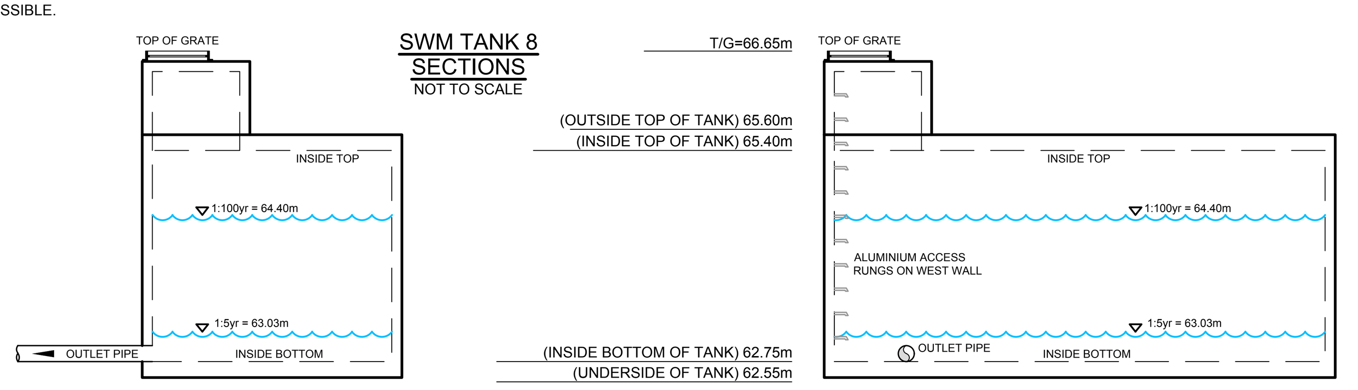
STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
5+000	64.48	62.08	250 x 250 x 250 TEE (4+197.2)
5+001.0	64.46	62.10 **	250mmØ VALVE & VALVE BOX
5+002.5	64.45	** 62.10 ***	CROSS ABOVE 300mmØ STM [Obv=60.10m] (±1.75m CLEARANCE)
5+004.5	64.45	** 62.15 ***	CROSS ABOVE 250mmØ STM [Obv=61.62m] (±0.3m CLEARANCE)
5+005.6	64.45	62.15 **	22.5° HORIZONTAL BEND
5+008.0	64.43	62.03	22.5° HORIZONTAL BEND
5+011.0	64.48	62.08	150mmØ HYDRANT TEE
5+025	64.05	61.65 **	- - -
5+040.4	63.72	61.32 ***	CROSS BELOW 200mmØ STM [Inv=61.91m] (±0.6m CLEARANCE)
5+048.3	63.76	61.26	45° HORIZONTAL BEND
5+049.3	63.75	61.25	150mmØ HYDRANT TEE
5+049.7	63.75	61.25	45° HORIZONTAL BEND
5+050.6	63.60	61.20	250mmØ VALVE & VALVE BOX
5+051.4	63.60	61.20 ***	CROSS ABOVE 375mmØ STM [Obv=59.58m] (±1.35m CLEARANCE)
5+052.9	63.60	61.20	45° HORIZONTAL BEND
5+054.3	63.58	61.18	45° HORIZONTAL BEND
5+062.3	63.53	61.13 **	INSULATE IN PROXIMITY TO OPEN STRUCTURE
5+075	63.88	61.48	- - -
5+078.8	64.08	61.68 ***	CROSS ABOVE 200mmØ STM [Obv=59.83m] (±1.6m CLEARANCE)
5+091.9	64.50	62.10	150 x 250 x 250 BUILDING SERVICE TEE
5+093.2	64.55	62.15	250mmØ VALVE & VALVE BOX
5+094.4	64.60	62.20	150 x 250 x 250 BUILDING SERVICE TEE
5+098.0	64.66	62.30 ***	CROSS ABOVE 250mmØ SAN [Obv=61.82m] (±0.25m CLEARANCE)
5+100.0	64.66	62.25 ***	CROSS ABOVE 300mmØ STM [Obv=60.55m] (±1.45m CLEARANCE)
5+102.5	64.65	62.20	250 x 250 x 250 TEE (4+203.3)

* CONNECTIONS TO EXISTING 150mmØ and NEW 300mmØ WATERMAINS. EXACT ELEVATIONS TO BE FIELD DETERMINED.
** PROVIDE THERMAL INSULATION AS PER CITY OF OTTAWA DETAILS W22 IN SHALLOW TRENCHES WHERE COVER IS LESS THAN 2.4m AND/OR W23 ADJACENT TO OPEN STRUCTURES.
*** PIPE CROSSINGS WITH WATERMAINS ARE TO BE IN ACCORDANCE WITH CITY STANDARDS W25 AND W25.2 TO AVOID CONFLICTS, WHERE POSSIBLE.

SWM TANK 8
SCHEMATIC PLAN VIEW
NOT TO SCALE



SWM TANK 8
SECTIONS
NOT TO SCALE



INLET CONTROL DEVICE DATA TABLE: AREA A-2.1 (TANK 1)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF CUSTOM	200mmØ PVC	12.0	6.0	0.75	61.15	17.9	> 65 m^3
1:5 YR			14.0	7.0	0.80	61.20	25.9	
1:100 YR			16.5	8.3	1.50	61.90	60.8	

INLET CONTROL DEVICE DATA TABLE: AREA A-2.2 (TANK 2)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF MODEL 100	200mmØ PVC	7.5	3.8	0.72	61.12	13.8	> 45 m^3
1:5 YR			9.5	4.8	1.15	61.55	19.2	
1:100 YR			12.0	6.0	1.80	62.20	43.3	

INLET CONTROL DEVICE DATA TABLE: AREA A-2.3 (TANK 3)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF MODEL 85	200mmØ PVC	3.5	1.8	0.30	60.40	24.7	> 70 m^3
1:5 YR			4.5	2.3	0.50	60.60	33.5	
1:100 YR			6.0	3.0	0.85	60.95	69.9	

INLET CONTROL DEVICE DATA TABLE: AREA A-3.1 (TANK 4)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST MHF MODEL 'A'	200mmØ PVC	15.0	7.5	0.58	60.90	20.5	>75 m^3
1:5 YR			17.5	8.8	0.93	61.25	29.7	
1:100 YR			20.0	10.0	1.18	61.58	71.0	

INLET CONTROL DEVICE DATA TABLE: AREA A-3.2 (TANK 5)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF CUSTOM	200mmØ PVC	15.0	7.5	0.90	61.30	20.0	> 75 m^3
1:5 YR			16.5	8.3	1.40	61.80	30.0	
1:100 YR			18.0	9.0	2.00	62.40	71.7	

INLET CONTROL DEVICE DATA TABLE: AREA A-4 (TANK 6 & 7)

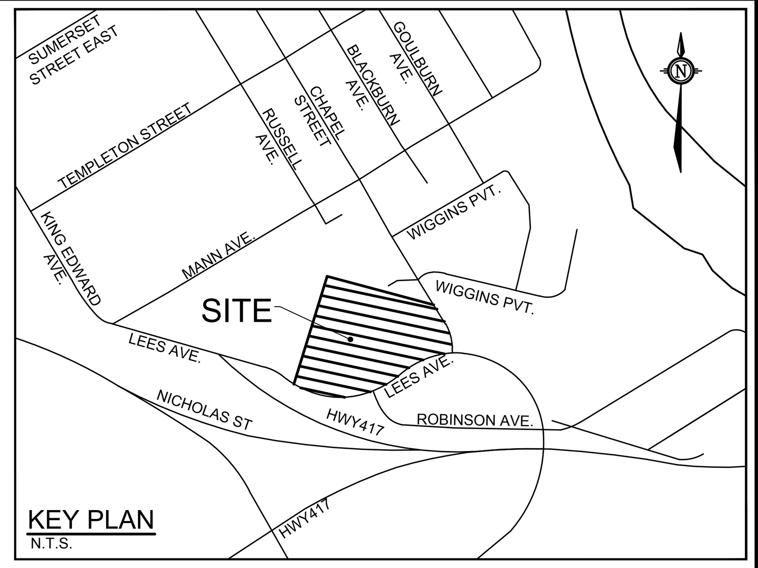
DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF CUSTOM	250mmØ PVC	8.0	4.0	0.68	61.46	28.9	91 m^3
1:5 YR			9.7	4.9	1.00	61.78	40.4	
1:100 YR			14.2	7.1	2.15	62.93	83.2	

INLET CONTROL DEVICE DATA TABLE: AREA A-5 (STM MH 08)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST MHF CUSTOM	300mmØ PVC	13.8	6.9	0.43	60.39	36.3	106 m^3
1:5 YR			17.5	8.8	0.69	60.65	50.1	
1:100 YR			36.0	18.0	2.90	62.86	96.1	

INLET CONTROL DEVICE DATA TABLE: AREA A-6 (CBMH 05)

DESIGN EVENT	ICD TYPE (PLUG TYPE)	DIAMETER OF OUTLET PIPE (mm)	PEAK DESIGN FLOW (L/s)	½ PEAK DESIGN FLOW (L/s)	DESIGN HEAD (m)	WATER ELEVATION (m)	VOLUME (m^3)	AVAILABLE STORAGE
1:2 YR	IPEX TEMPEST LMF CUSTOM	300mmØ PVC	9.0	4.5	2.03	62.81	24.4	99 m^3
1:5 YR			9.4	4.7	2.25	63.03	36.4	
1:100 YR			12.0	6.0	3.62	64.40	83.0	



KEY PLAN
N.T.S.

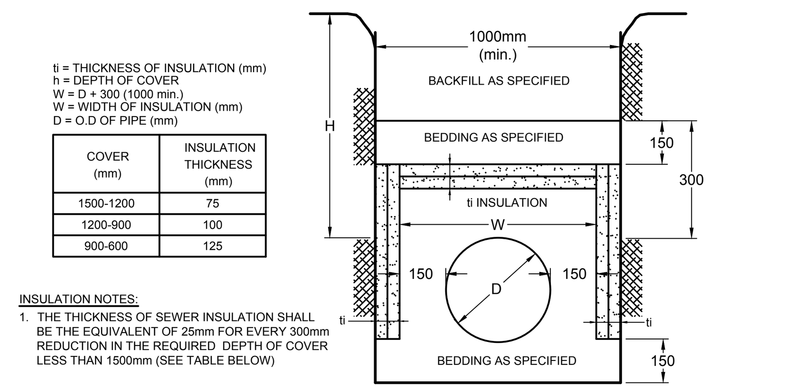
BENCHMARK INFO:

CITY OF OTTAWA MONUMENT No. 2011-0127 LOCATED NEAR THE SOUTH-WEST CORNER OF THE INTERSECTION OF LEES AVENUE AND ROBINSON AVENUE. GEODETIC ELEVATION = 63.60m.

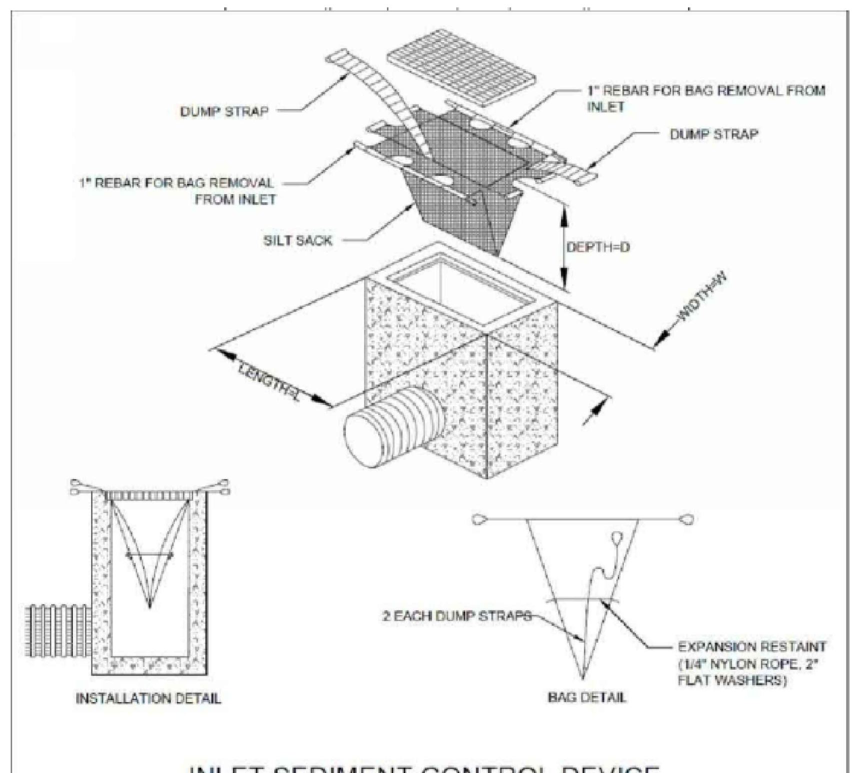
ALL ELEVATIONS ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 3603 HAVING AN ELEVATION OF 76.959 METRES. BEARINGS ARE GRID, DERIVED FROM THE NORTHERLY LIMIT OF PART 1 ON PLAN 4R-1381 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21029-20 JRE Lt 7 PL 49 T F), PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK SIGNED AND DATED AUGUST 14, 2020.

SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.



INSULATION DETAIL FOR SHALLOW SEWERS
NOT TO SCALE



INLET SEDIMENT CONTROL DEVICE
N.T.S.

ALL PROJECT NOTES, DETAILS AND SPECIFICATIONS ARE TO MEET THE MOST CURRENT AND AMENDED VERSIONS OF THE CITY OF OTTAWA AND PROVINCIAL STANDARDS

THIS PLAN IS TO BE READ IN CONJUNCTION WITH CIVIL PLANS 119171-GP, 119171-GR, 119171-PR1 AND 119171-PR2

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.

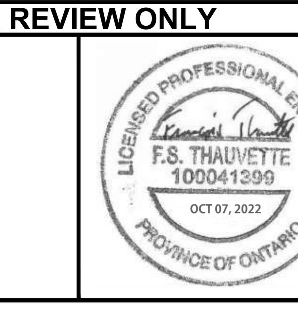
OWNER INFORMATION
2 ROBINSON AVENUE LIMITED PARTNERSHIP
88 ALBERT STREET
OTTAWA, ONTARIO, K1P 5E9
CONTACT: MR. KIERAN WAUGH
PHONE: (416) 903-1377
EMAIL: kwaugh@placedoree.com

No.	REVISION	DATE	BY
3	RE-ISSUED FOR SITE PLAN APPROVAL	OCT 07/22	FST
2	REVISED PER CITY COMMENTS / UPDATED SITE PLAN	MAR 30/21	FST
1	ISSUED FOR SITE PLAN APPROVAL	NOV 15/21	FST

SCALE: NOT TO SCALE

DESIGN: SM
CHECKED: FST
DRAWN: SM
CHECKED: FST
APPROVED: FST

FOR REVIEW ONLY



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

LOCATION
CITY OF OTTAWA
320 LEES AVENUE (2 ROBINSON AVENUE)

DRAWING NAME
CIVIL NOTES, DETAILS & TABLES

PROJECT No. 119171
REV: REV # 3
DRAWING No. 119171-NDT

D07-12-21-0202

18357

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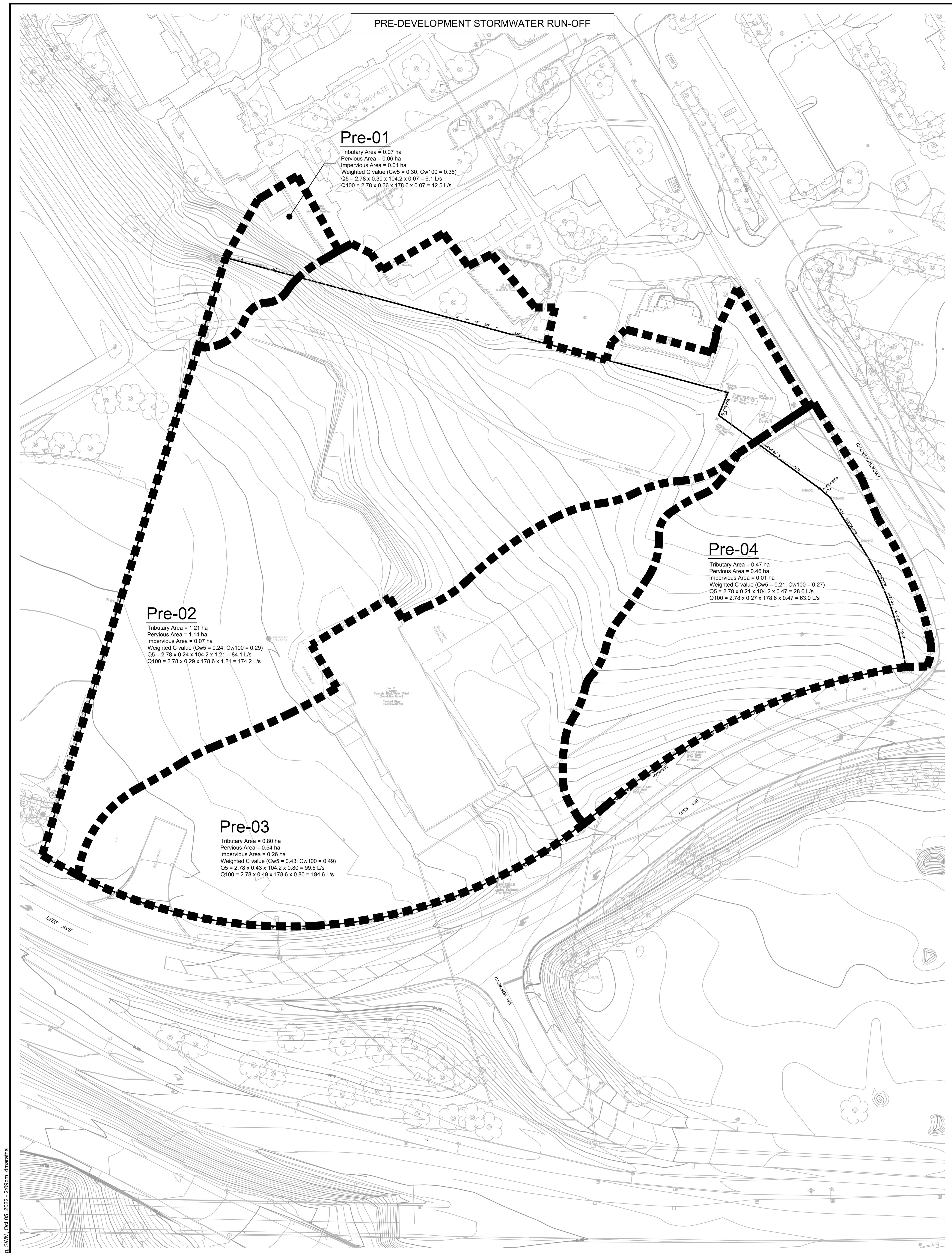

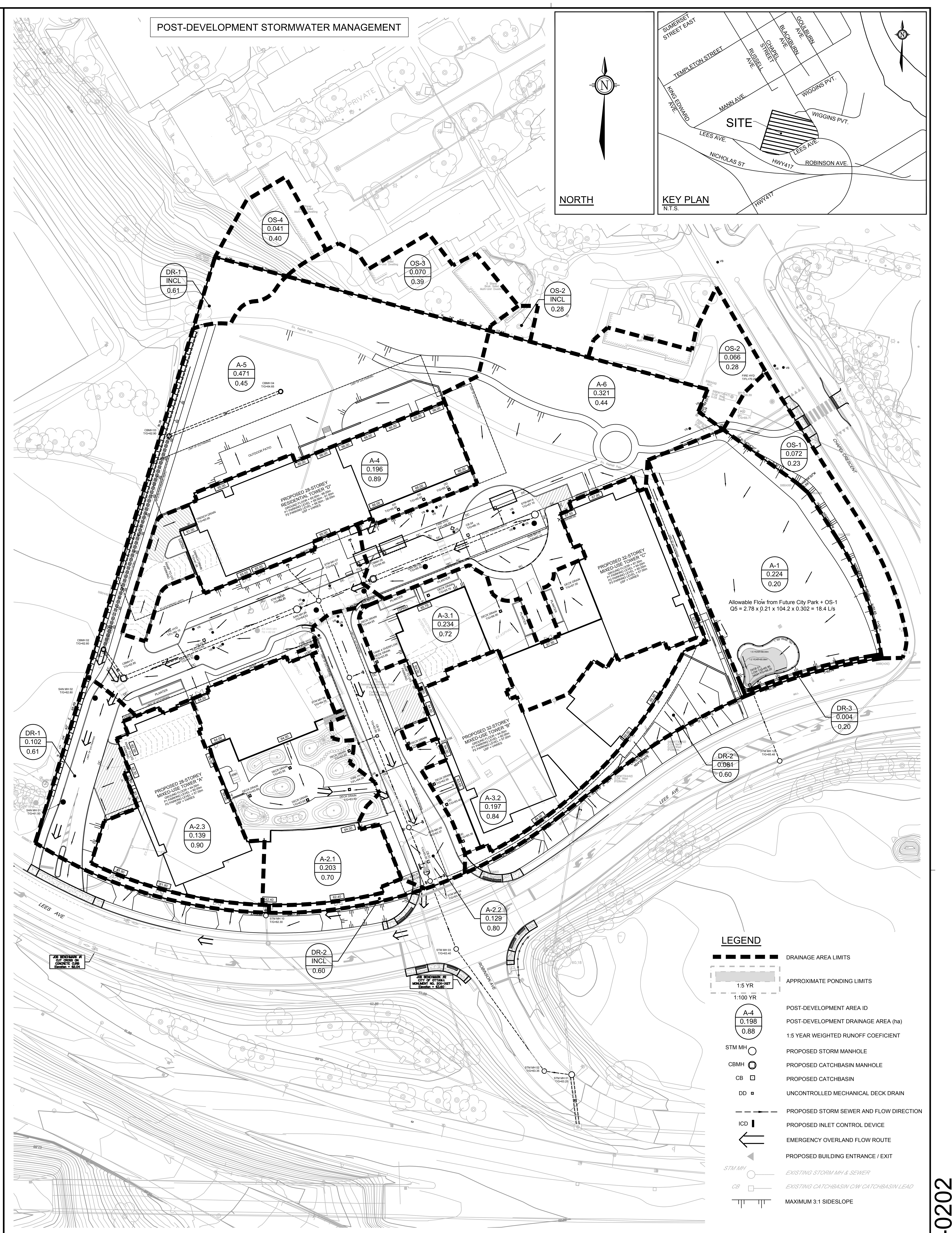

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CONTACT: MR. KIERAN WAUGH
PHONE: (416) 903-1377
EMAIL: kwaugh@placedoree.com

No.	REVISION	DATE	BY
3	RE-ISSUED FOR SITE PLAN APPROVAL	OCT 07/22	FST
2	REVISED PER CITY COMMENTS / UPDATED SITE PLAN	MAR 30/21	FST
1	ISSUED FOR SITE PLAN APPROVAL	NOV 15/21	FST

SCALE 1:500

1:500 0 5 10 15 20

DESIGN SM / FST
CHECKED FST
DRAWN DM / SM
CHECKED SM / FST
APPROVED FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER F.S. THAUVETTE 100041399 OCT 07, 2022 PROVINCE OF ONTARIO

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Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
320 LEES AVENUE (2 ROBINSON AVENUE)

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 119171
REV REV # 3
DRAWING No. 119171-SWM

PLANB1.DWG - 1000mmx707mm

D07-12-21-0202

18357

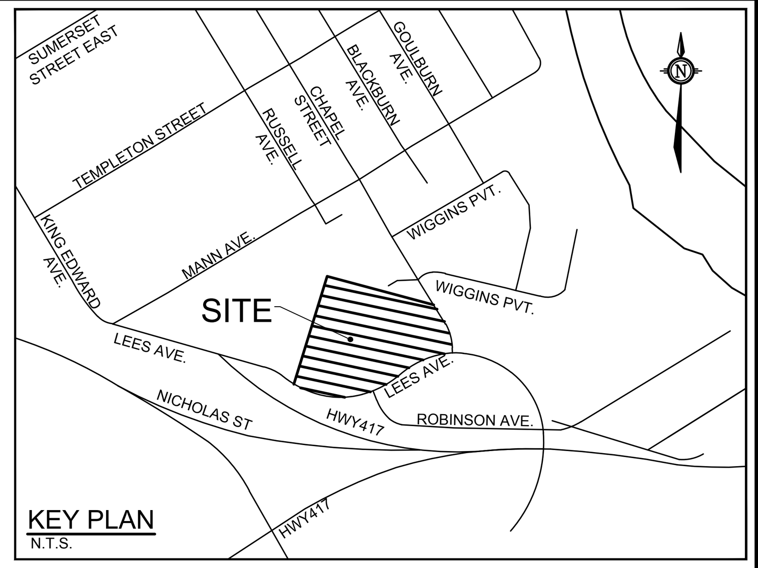
BENCHMARK INFO:

CITY OF OTTAWA MONUMENT No. 2011-0127 LOCATED NEAR THE SOUTH-WEST CORNER OF THE INTERSECTION OF LEES AVENUE AND ROBINSON AVENUE. GEODETIC ELEVATION = 63.60m.

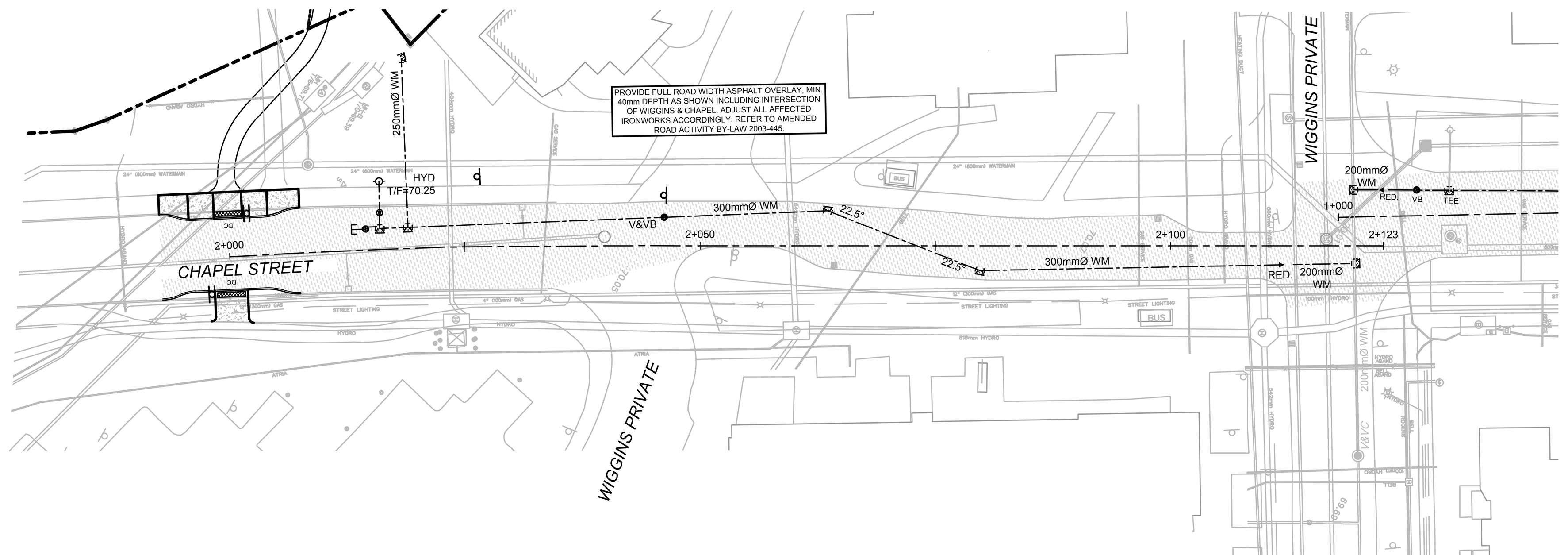
ALL ELEVATIONS ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 3603 HAVING AN ELEVATION OF 76.959 METRES. BEARINGS ARE GRID, DERIVED FROM THE NORTHERLY LIMIT OF PART 1 ON PLAN 4R-1381 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21029-20 JRE Lt 7 PL 49 T F), PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK SIGNED AND DATED AUGUST 14, 2020.

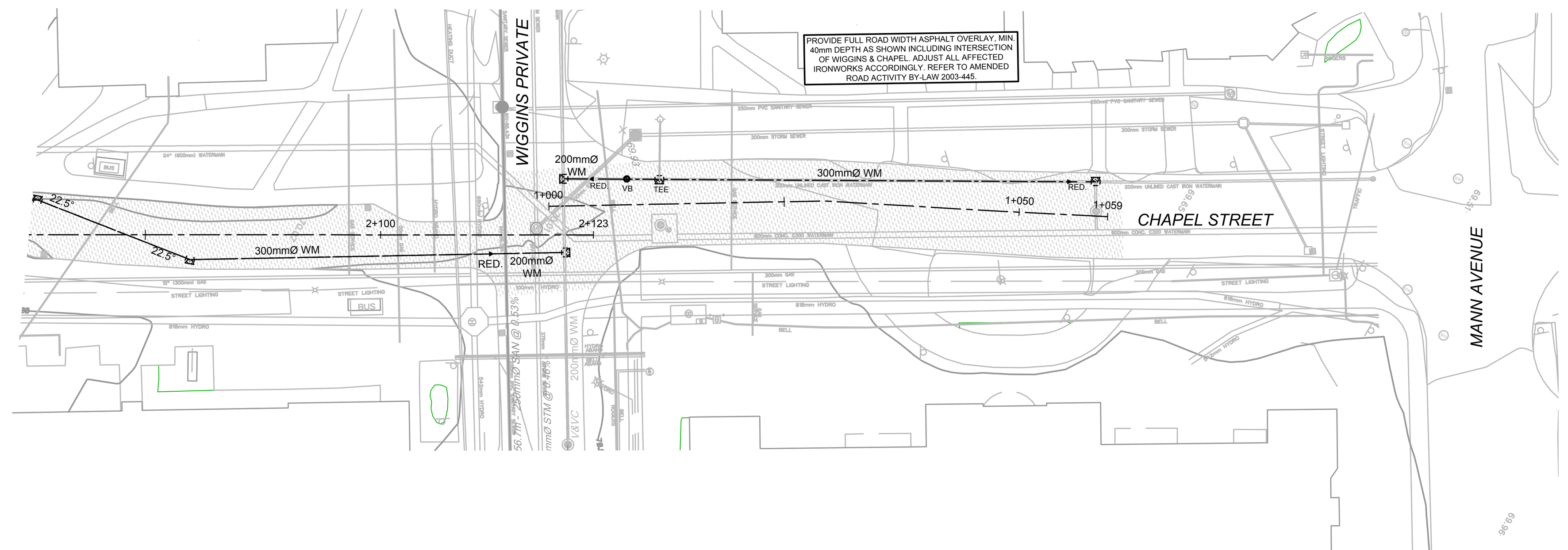
SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.



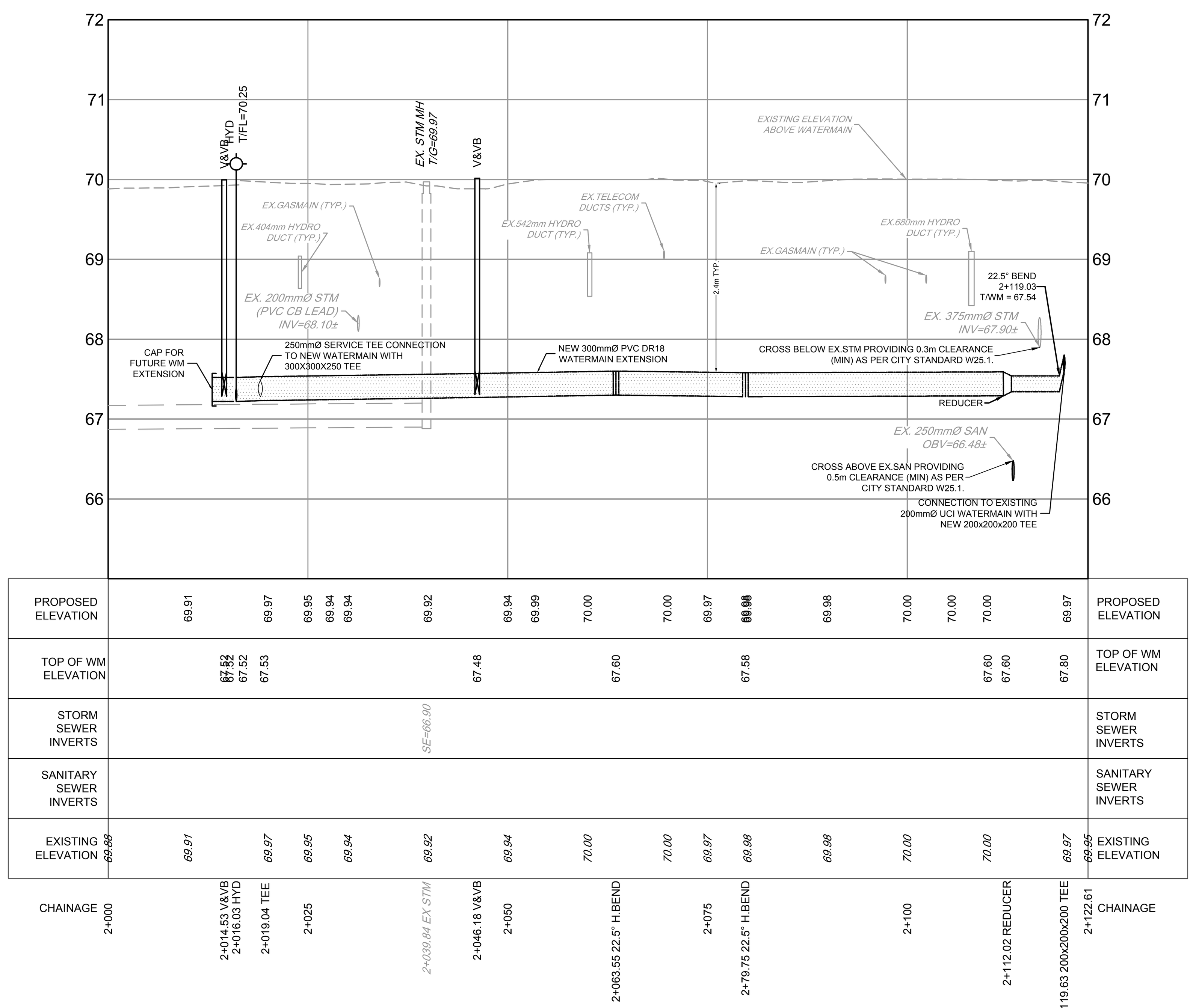
KEY PLAN
N.T.S.

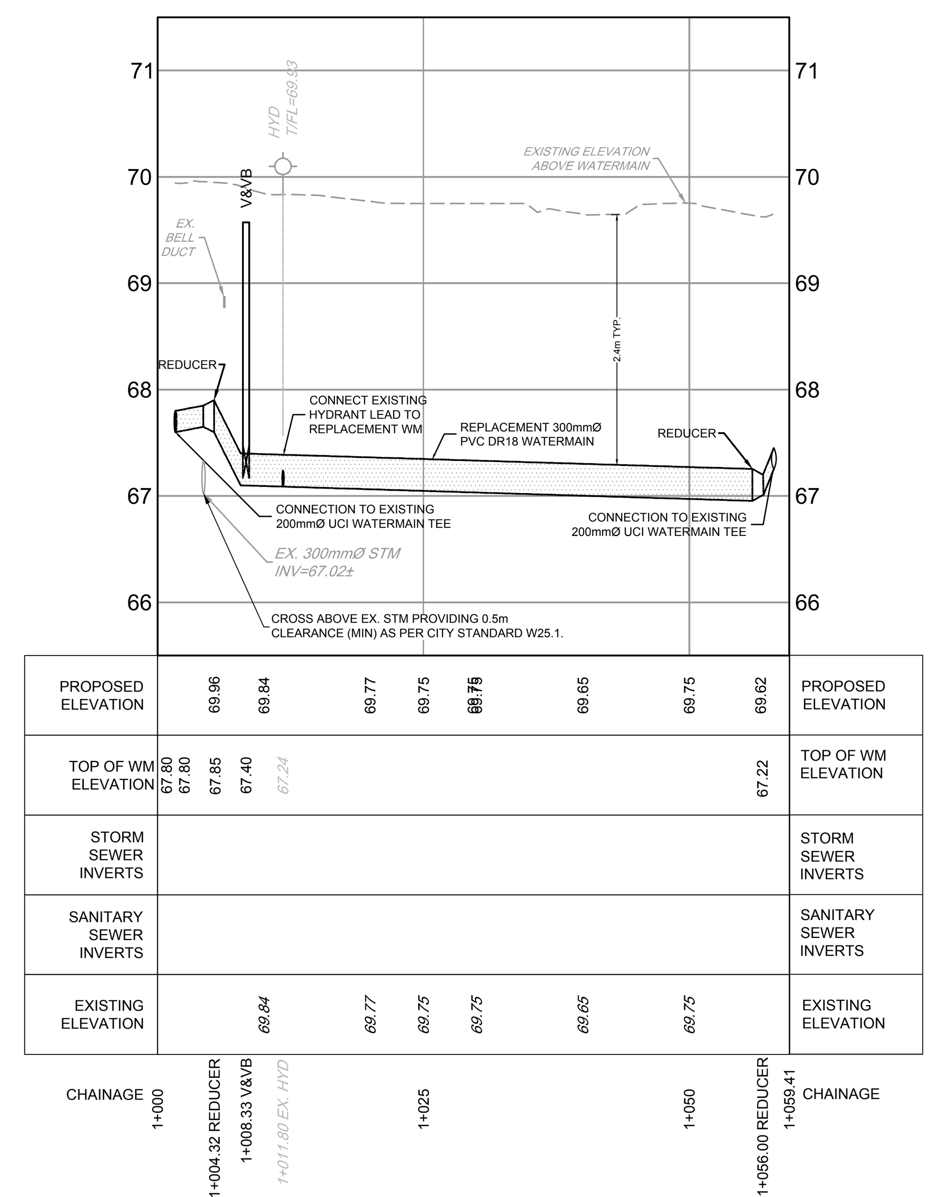


CHAPEL STREET



CHAPEL STREET





NOTE:
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REFER TO 119171-NDT FOR ADDITIONAL NOTES

No.	REVISION	DATE	BY
3	RE-ISSUED FOR SITE PLAN APPROVAL	OCT 07/22	FST
2	REVISED PER CITY COMMENTS	MAR 30/21	FST
1	ISSUED FOR SITE PLAN APPROVAL	NOV 15/21	FST

SCALE
1:500 HORIZONTAL
1:50 VERTICAL

DESIGN	DWM
CHECKED	FST
DRAWN	DWM
CHECKED	FST
APPROVED	FST

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
F.S. THAUVETTE
100041399
OCT 07, 2022
PROVINCE OF ONTARIO

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

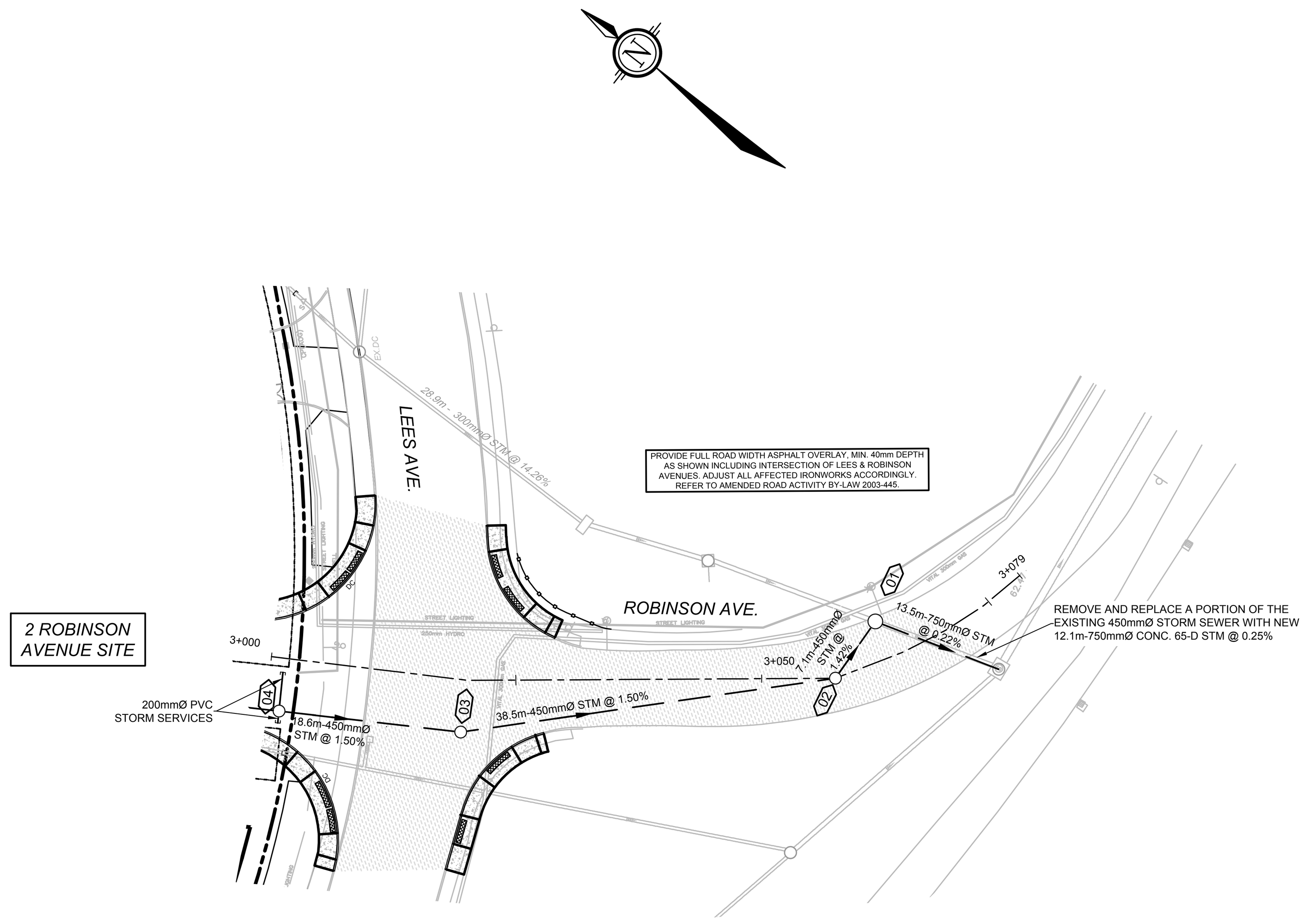
LOCATION
OTTAWA, ONTARIO
2 ROBINSON AVE.

DRAWING NAME
PLAN AND PROFILE
CHAPEL AVENUE, STATION 1+000 TO 1+060
CHAPEL AVENUE, STATION 2+000 TO 2+123

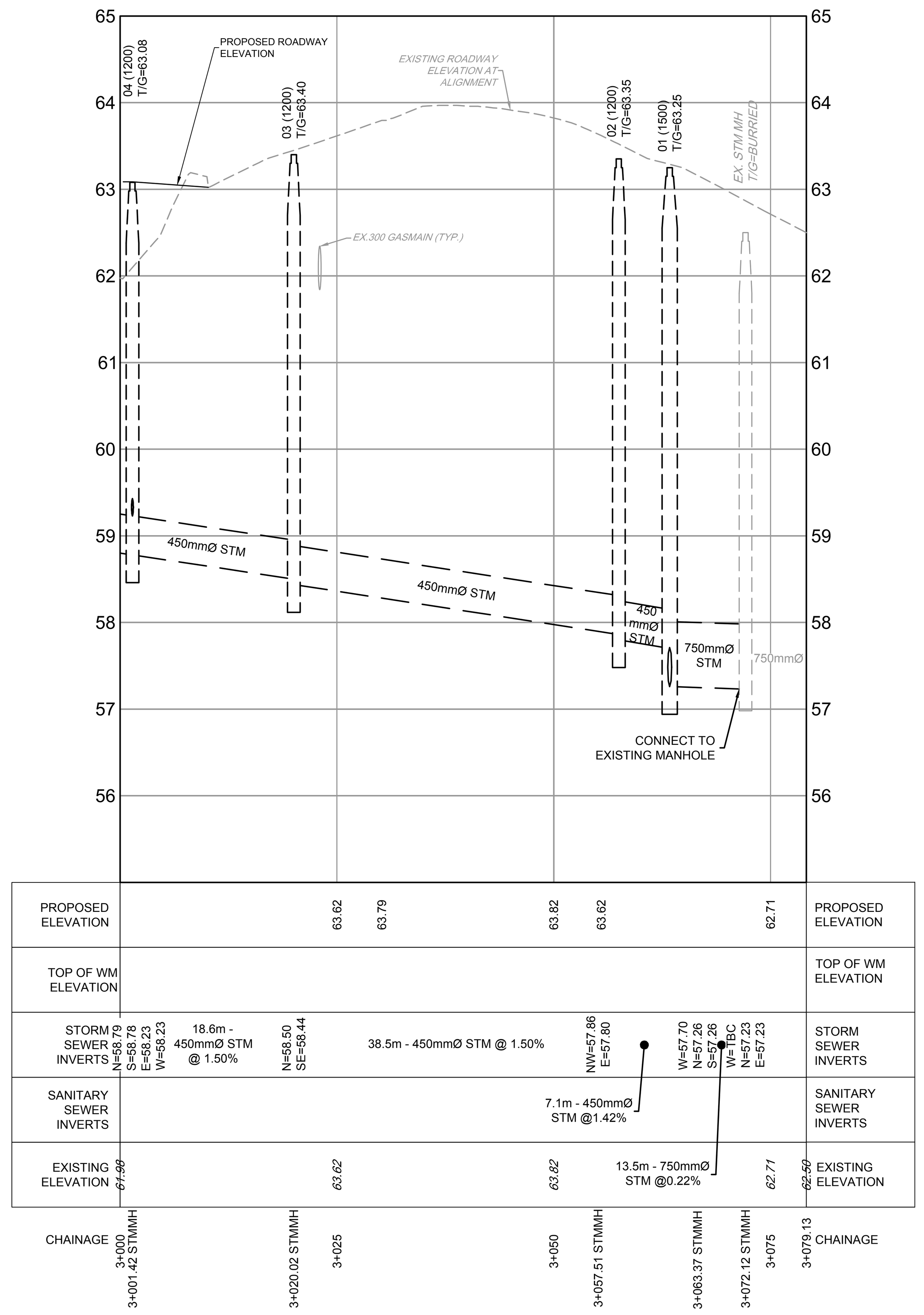
PROJECT No. 119171
REV REV # 3
DRAWING No. 119171-PR1

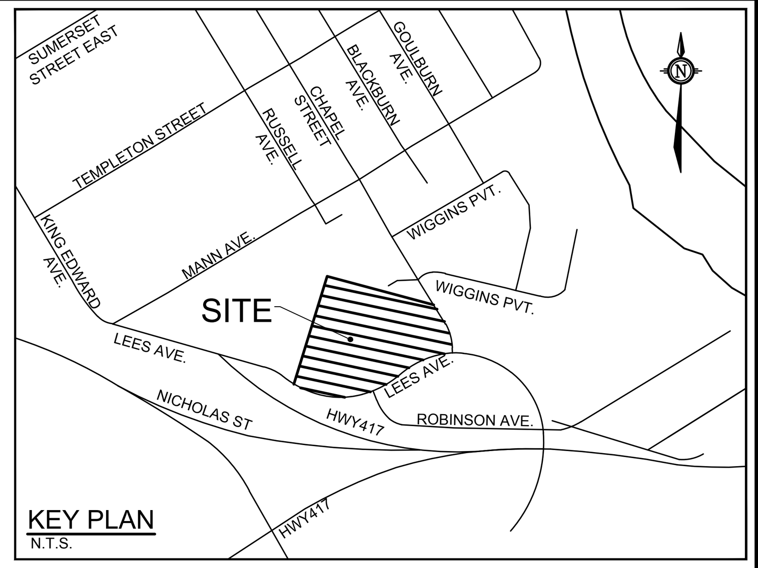
D07-12-21-0202

PLANB1.DWG - 1000mmx707mm
18357



ROBINSON AVENUE





BENCHMARK INFO:

CITY OF OTTAWA MONUMENT No. 2011-0127 LOCATED NEAR THE SOUTH-WEST CORNER OF THE INTERSECTION OF LEES AVENUE AND ROBINSON AVENUE. GEODETIC ELEVATION = 63.60m.

ALL ELEVATIONS ARE REFERRED TO THE CGVD28 GEODETIC DATUM, DERIVED FROM VERTICAL CONTROL MONUMENT NO. 3603 HAVING AN ELEVATION OF 76.959 METRES. BEARINGS ARE GRID, DERIVED FROM THE NORTHERLY LIMIT OF PART 1 ON PLAN 4R-1381 AND ARE REFERRED TO THE CENTRAL MERIDIAN OF MTM ZONE 9 (76°30' WEST LONGITUDE) NAD-83 (ORIGINAL)

THE EXISTING GRADES SHOWN ON THE PLANS ARE TAKEN DIRECTLY FROM TOPOGRAPHICAL SURVEY PLAN (Ref. # 21029-20 JRE Lt 7 PL 49 T F), PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK SIGNED AND DATED AUGUST 14, 2020.

SURROUNDING BACKGROUND TOPO INFORMATION BEYOND THE LIMITS OF THE SITE SURVEY ARE SHOWN FROM CITY OF OTTAWA 1:1000 MAPPING FOR CONTEXT ONLY.

REFER TO 119171-NDT FOR ADDITIONAL NOTES

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LOCATION
OTTAWA, ONTARIO
2 ROBINSON AVE.

DRAWING NAME
PLAN AND PROFILE
ROBINSON AVENUE
STATION 3+000 TO 3+079

PROJECT No. 119171
REV REV # 3
DRAWING No. 119171-PR2

D07-12-21-0202

18357

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