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Trinity Apartments
4200 Innes Road

Servicing and Stormwater Management Report

39 Years

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Trinity Apartments

4200 Innes Road

City of Ottawa

Servicing and Stormwater Management Report

Prepared By:

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

May / 24/ 2023

Novatech File: 122179
Ref: R-2023-090

May 24, 2023

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

Attention: Geraldine Wildman, Manager, Development Review East Branch

Reference: 4200 Innes Road (Trinity Apartments)
Servicing and Stormwater Management Report
Our File No.: 122179

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

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

Yours truly,

NOVATECH

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

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1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed site plan located at 4200 Innes Road within the City of Ottawa. The proposed site is denoted as Block 1 of the Orleans II Subdivision and is presently named Trinity Apartments. The purpose of this report is to support the site plan application for the subject development. **Figure 1 Key Plan** shows the site location.

1.1 Existing Conditions

The subject site is approximately 1.92 hectares (ha.) in size and is denoted as Block 1 of the Orleans II Subdivision. Presently the site is vacant. Historically the site Consisted of an agricultural field.

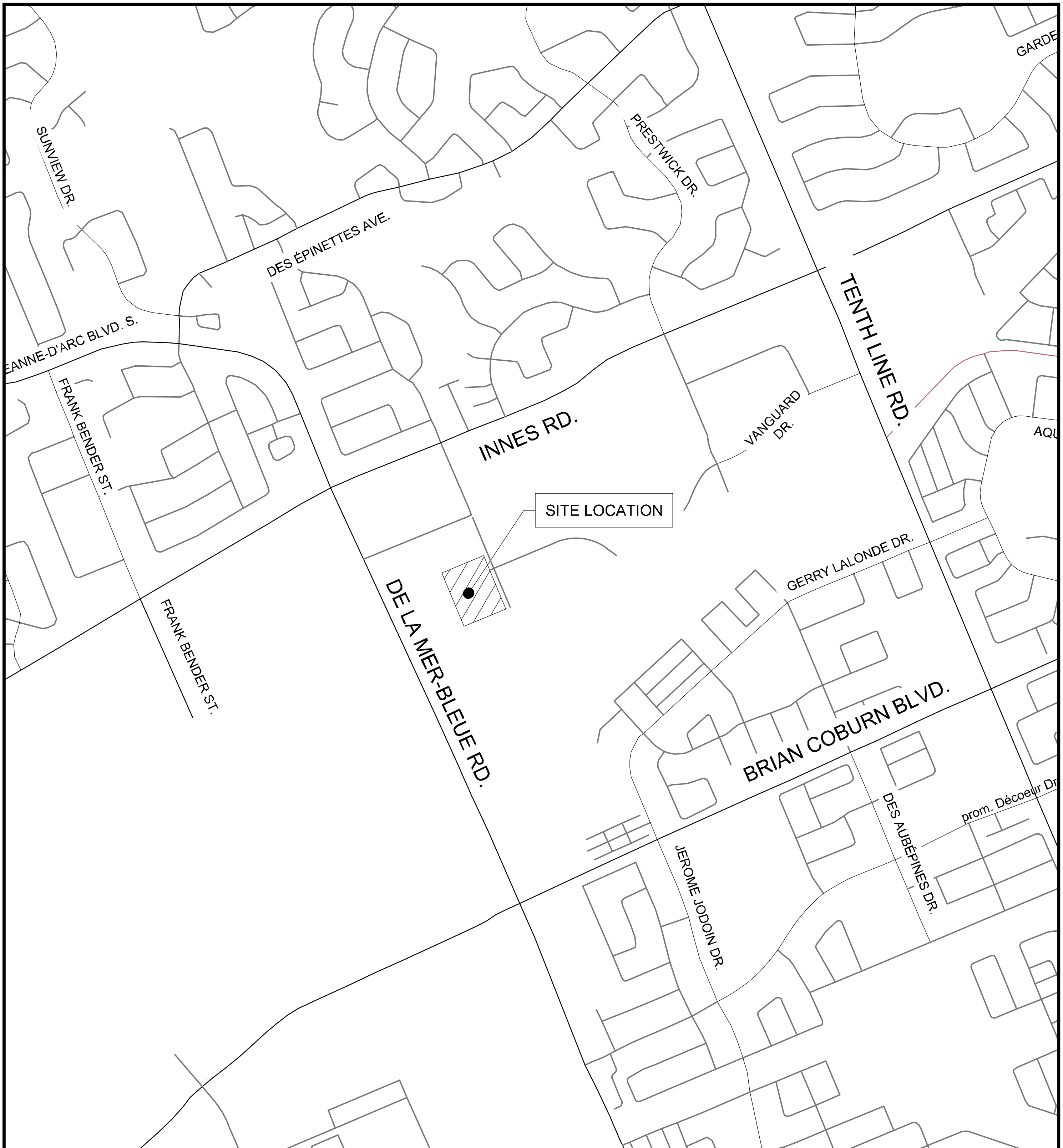
The site is bound by a future Seniors Residence to the north, Noella Leclair to the east, Existing agricultural fields to the south, and existing Car dealerships (Orleans Toyota, Kia, and Honda) to the west. The site is relatively flat and primarily drains from the north-east to the south-west with a +/- 1.4m grade differential across the site. **Figure 2** shows the existing site conditions.

The Orleans II subdivision was designed by Stantec Consulting Ltd. (Stantec) and design information is provided in the following report:

- ‘Site Servicing and Stormwater Management Report – Orleans II Subdivision, 4200 Innes Road prepared By Stantec dated September 23, 2023 (Referenced as Stantec Report).

1.2 Proposed Development

It is proposed to develop the site with a four (4) six (6) storey apartment buildings complete with a central above ground parking area. The three (3) southern buildings (A, C, &D) will each have one (1) level of underground parking beneath the proposed building footprints, with individual accesses. The northern building (B) will be slab on grade construction due to the high bedrock elevations in the northern end of the subject property. The site will provide a total of 293 residential units, and a 339.5m^2 Medical office area on the ground floor of Building B. Vehicular access to the site will be provided from Noella Leclair while pedestrian access will be provided from both Noella Leclair and the adjacent commercial area to the West. **Figure 3** shows the concept plan for the proposed development. Correspondence from the City pre-consultation meeting is also included in **Appendix A** for reference.



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CITY OF OTTAWA
TRINITY APARTMENTS

KEY PLAN

SCALE		
N.T.S		
DATE JAN 2023	JOB 122179	FIGURE FIGURE 1

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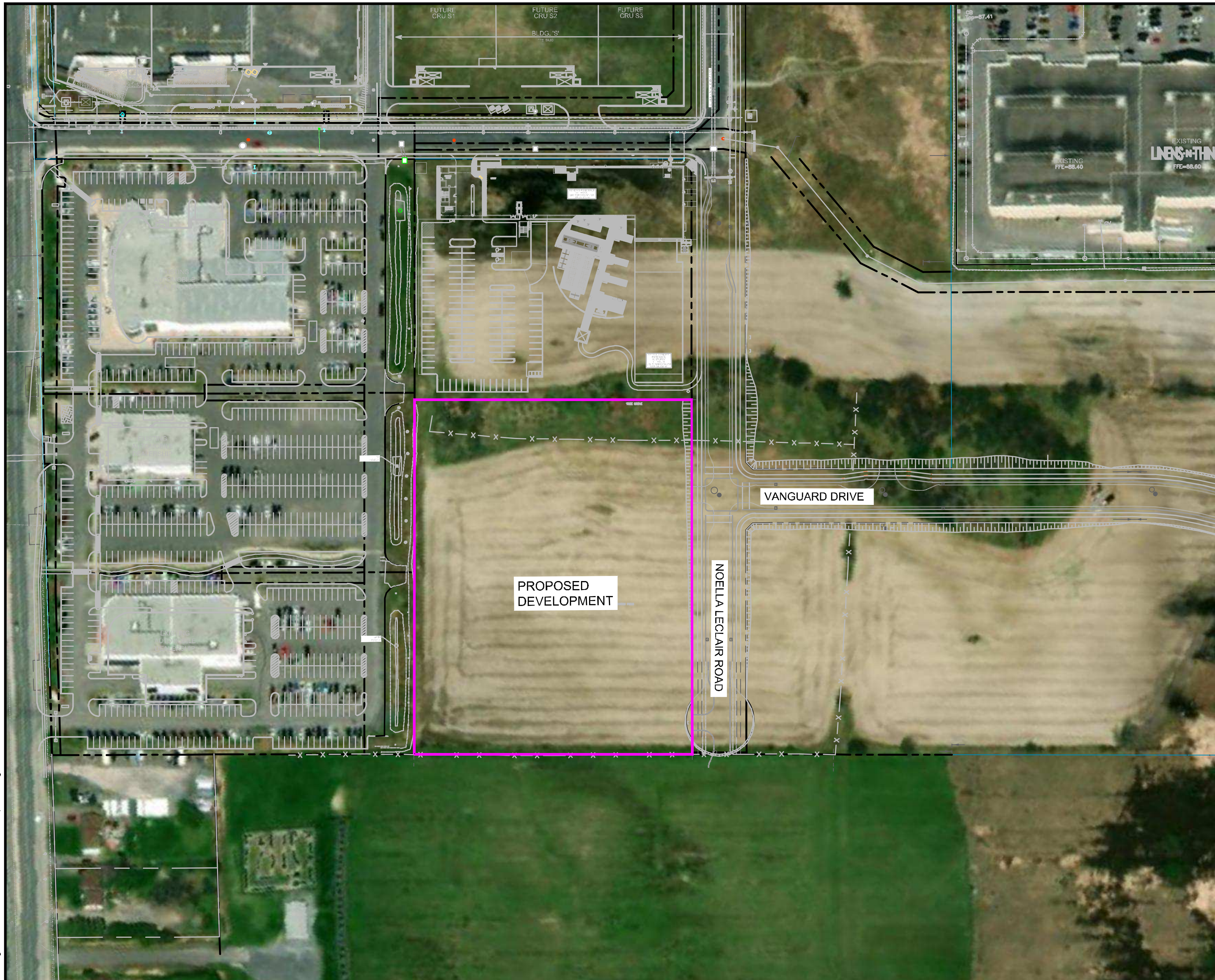

LEGEND

PROPOSED DEVELOPMENT BOUNDARY

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CITY OF OTTAWA
TRINITY APARTMENTS

EXISTING CONDITIONS

SCALE 1 : 2000 (0 20 40 60 80)

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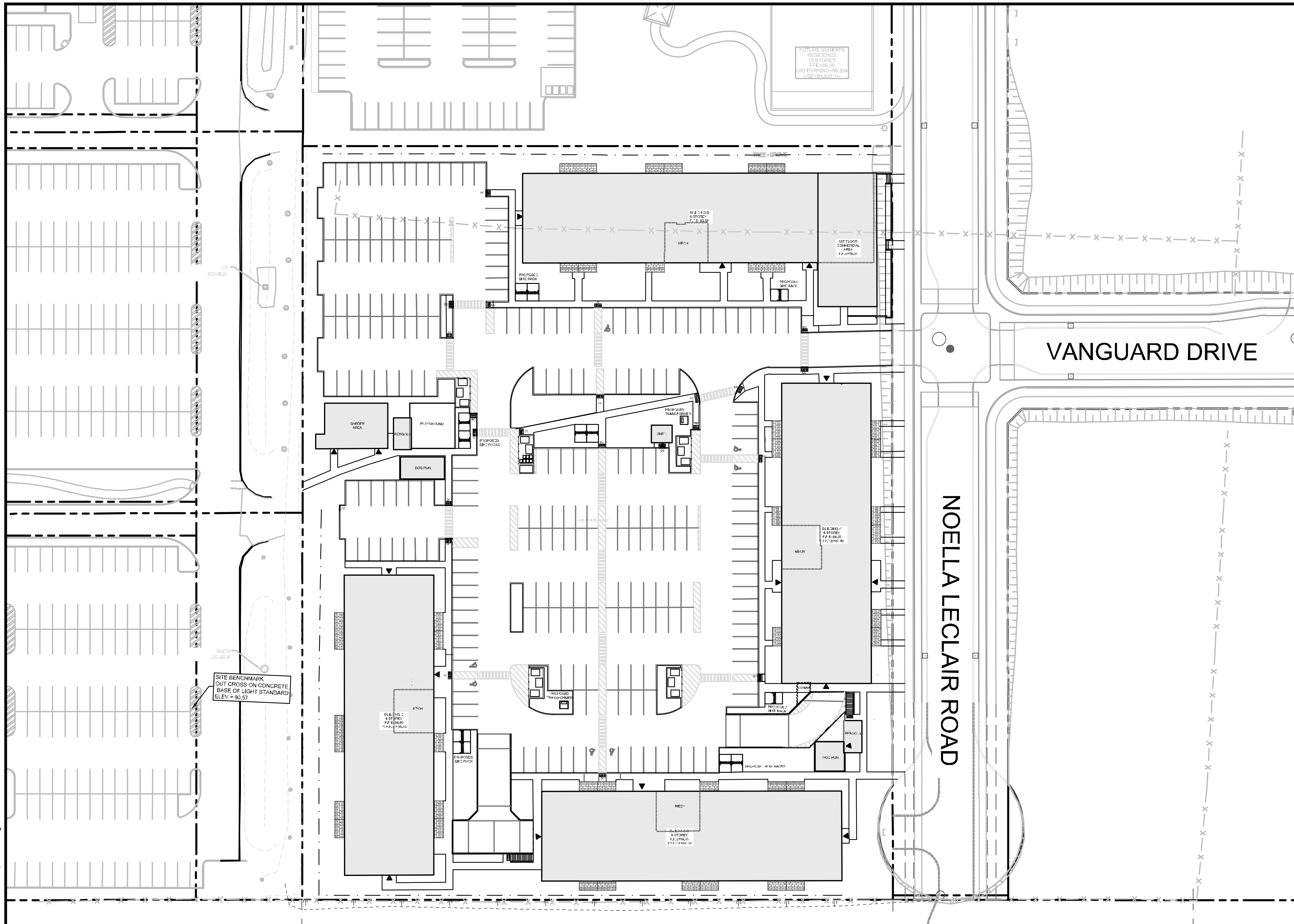

LEGEND

— · — · — PROPOSED DEVELOPMENT BOUNDARY

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CITY OF OTTAWA
TRINITY APARTMENTS

PROPOSED SITE PLAN

SCALE 1 : 1000 (0 10 20 30 40)		
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2.0 SITE CONSTRAINTS

A geotechnical investigation was completed for the proposed development, and a report prepared entitled 'Geotechnical Investigation', Proposed Multi-Building Development, 4200 Innes Road, Ottawa, Ontario, prepared by Paterson Group Inc. dated January 30, 2023 (PG6528-1). The following is a summary of the findings of the reports:

- The long-term groundwater table can be expected to be below the bedrock surface throughout the northern portion of the site where the bedrock surface is within 2 m from ground surface. The groundwater table is expected to be within the clay deposit at a depth of approximately 2.5 to 3.5 m throughout the southern portion of the site where the overburden is greater than approximately 3 m. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.
- Horizontal rock anchors, shotcrete and/or chain link fencing connected to the excavation face may be required at specific locations to prevent bedrock pop-outs, especially in areas where bedrock fractures are conducive to the failure of the bedrock surface.
- A permissible grade raise restriction of 2.0 m is recommended in the immediate area of settlement sensitive structures and where silty clay is encountered at underside of footing elevations. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.
- The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsurface soil is considered to be mainly a Type 2 and Type 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain safe working distance from the excavation sides.
- A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application. package and issuance of the permit by the MECP.
- For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.
- Tree planting setbacks are recommended for the low to medium sensitivity silty clay deposit and where trees are located near buildings founded on cohesive soils. It should be noted that footings bearing upon a compact glacial till or surface sounded bedrock will not be subject to tree planting setbacks restrictions. (Refer to the geotechnical report for details)

3.0 WATER SERVICING

The proposed site is located within the City of Ottawa pressure Zone 2E. There are proposed City watermains in the Noella Leclair right-of-way fronting the proposed site, that are presently being constructed as part of the Orleans II subdivision. There is a 300mm diameter (dia.) watermain within Noella Leclair North of the intersection with Lady Pellatt Street, and a 200mm dia. watermain within Noella Leclair south of the intersection.

It is proposed to service the proposed development with an onsite private watermain which will connect to the watermain within Noella Leclair in two (2) locations to provide redundancy. The first connection will be to the existing 300mm watermain at the intersection of Noella Leclair and Lady Pellatt Street. The second connection will be to the 200mm watermain within Noella Leclair near the south-east corner of the site. The proposed buildings are to be sprinklered and will be equipped with Siamese connections located near the front entrance of each building, within 45m of a fire hydrant. Three (3) private fire Hydrants are proposed to ensure adequate fire flows will be provided on site. Refer to the General Plan of Services drawing (122179-GP) for servicing details.

Water demand calculations have been calculated using criteria from Section 4 of the City of Ottawa Water Distribution Guidelines and the Ontario Building Code. The required fire demand was calculated using the Fire Underwriters Survey (FUS) Guidelines. As the proposed buildings are to be six (6) storeys in height and of wood frame construction, which is atypical in the Ottawa area a Fire consultant was retained to review the fire flow requirements for the site. The fire consultant prepared a memo outlining the Fire flow methodology utilized for the subject site and is included within **Appendix B** for referance. The water demand and fire flow calculations are also provided in **Appendix B** for reference. A summary of the water demand and fire flows are provided in **Table 3.1**.

Table 3.1: Domestic Water Demand Summary

Building	Population	Commercial Area (m^2)	Ave. Daily Demand (L/s)	Max. Daily Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
Building A	150	--	0.49	1.22	2.67	233
Building B	173	339.5	0.68	1.57	3.29	250
Building C	152	--	0.49	1.23	2.71	267
Building D	152	--	0.49	1.23	2.71	267
Total	**627**	**339.5**	**2.15**	**5.25**	**11.38**	

As the Orleans II subdivision is presently under construction water boundary conditions are not available from the City of Ottawa. As such the proposed site was analyzed utilizing the surrounding information from the Stantec water Model completed for the Orleans II subdivision. The Stantec water model was completed May 12, 2022, and is included in **Appendix B** for referance. The Stantec model assumed the following demands for the subject property which was denoted as Block 1.

Table 3.2: Stantec Block 1 Demands

Area ID	Population	Commercial Area (m^2)	Ave. Daily Demand (L/s)	Max. Daily Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
Block 1	657	--	2.13	5.32	11.71	333

As depicted in **Table 3.2** the assumed demands for the subject site (Block 1) are greater than the demands presently proposed. As such the watermains within the Orleans II subdivision will be able to service the proposed development.

To verify the pressures available at the water entries of each proposed building an EPANET water model was created to analyzing the performance of the proposed watermain system for three theoretical conditions: 1) High Pressure check under Average Day conditions, 2) Peak Hour Demand, 3) Maximum Day + Fire Flow Demand. A summary of the boundary conditions extracted from the Stantec model are provided in **Table 3.3** below:

Table 3.3: Stantec Model Water Boundary Conditions

Criteria	Pressure (psi)	Flow (L/s)
Connection 1 (Intersection of Noella Leclair and Lady Pellatt Street) [Node 12]		
Static	47.49	0
Intermediate Flow	38.89	333.33
Flow at 20 PSI	20	653.59
Connection 2 (South End of Noella Leclair [Node 14]		
Static	54.08	0
Intermediate Flow	25.55	176.16
Flow at 20 PSI	20	192.68

Note as per ITSB 2018-02 the fire flow was distributed among several surrounding hydrants during modelling as outlined in **Table 3.4**.

Table 3.4: Maximum Flow to be considered from a given hydrant.

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

For the purpose of the model, and in light of the available pressures, it was assumed that all proposed onsite and offsite Hydrants would be rated as class AA.

The following **Table 3.5** provides a summary of the results from the hydraulic water model.

Table 3.5: Water Analysis Summary

Condition	Demand (L/s)	Min/Max Allowable Operating Pressures (psi)	Limits of Design Operating Pressures (psi)
High Pressure	2.06 L/s	80psi (Max)	54.13psi
Maximum Daily Demand and Fire Flow	272.13 L/s	20psi (Min)	26.55psi
Peak Hour	11.23 L/s	40psi (Min)	51.59psi

The above table lists the worst-case pressures from the water model analysis.

The hydraulic analysis indicates that the system can provide adequate pressures and flow to meet the domestic and fire flow requirements for the site. Refer to **Appendix B** for detailed water demand calculations.

4.0 SANITARY SERVICING

There is an existing 375mm diameter sanitary sewer, within the Noella Leclair right-of-way that was installed as part of the Orleans II Subdivision. It is proposed to service the proposed development with a private 200mm sanitary sewer which will connect to the existing 375mm sanitary sewer at the intersection of Noella Leclair and Lady Pellatt Street.

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

- Residential Average Flow = 280 L/capita/day
- 1 Bed apartment = 1.4 Person/unit
- 2 Bed apartment = 2.1 Person/unit
- 3 Bed Apartment = 3.1 Person/unit
- Medical Office Flow = 275 L/9.3m^3/day
- Residential Peaking Factor = Harmon Equation (max peaking factor = 4.0)
- Commercial Peaking Factor = 1.0
- Peak Extraneous Flows (Infiltration) = 0.33L/s/ha

The peak sanitary flow including infiltration for the development was calculated to be 7.53 L/s. Detailed sanitary flow calculations are provided in **Appendix C** for reference.

As noted previously, the detailed design of the Orleans II subdivision was completed by Stantec with details provided within the Stantec Report. The Subdivision design assumed that Block 1 was to be a residential development with an area of 1.92ha, 365 units, and no commercial area for a total assumed population of 657. The design criteria are summarized below, and excerpts from the report are included within **Appendix C** for reference.

- Average Daily Flow = 280 L/capita/day
- 1.8 Person/unit
- Residential Peaking Factor = Harmon Equation (max peaking factor = 4.0)
- Commercial/ Institutional Peaking Factor = 1.0
- Peak Extraneous Flows (Infiltration) = 0.33L/s/ha

The resultant assumed flow for Block 1 was 7.72L/s. The assumed design flow was higher than currently proposed, thus the existing infrastructure within the Orleans II Subdivision has capacity to service the proposed development.

5.0 STORM SERVICING

There are 825mm, and 1200mm diameter storm sewers located within the Noella Leclair Way right-of-way fronting the proposed development. There is also a 1050mm diameter storm sewer within Lady Pellatt Street.

It is proposed to service the proposed development by connecting to the manhole at the junction of Noella Leclair Way and Lady Pellatt Street. From the existing manhole a private storm system will be installed that will provide both free flowing connections for the foundation drains of the proposed buildings, and a storage system to mitigate the post development site flows to the allowable release rate. It is proposed to provide storage during storm events utilizing stormtech chambers under the central parking area. Refer to the General Plan of Services drawing (122179 - GP) for more details.

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

Table 5.1: Storm Sewer Design Parameters

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

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

6.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

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

6.1 Design Criteria

The following stormwater management criteria for the proposed development were prepared in accordance with the City of Ottawa Sewer Design Guidelines (October 2012), Technical Bulletins, correspondence with the City of Ottawa, the Stantec Report and our knowledge of development requirements in the area.

Minor System (Storm Sewers):

- Control proposed development flows, up to and including the 100-year storm event, to an allowable release rate of 40L/s/ha;

Major System:

- Provide on-site storage for storm runoff which exceeds the allowable minor system release rate from the site up to and including the 100-year design event;
- Ponding depths are not to exceed 0.35m (static + dynamic) and are not to be within 0.30m (vertical) to the nearest building opening;
- Limit ponding to 0.15 m for all rooftop storage areas;
- No surface ponding for storms up to and including the 2-year event.

Quality Control:

- Provide an Enhanced level (80% long-term TSS removal) of water quality control;
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

6.2 Quantity Control

Peak flows from the site are to be controlled to 40 L/s/ha, as per the Stantec Report. The allowable release rate for the 1.921 ha site was calculated to be 76.8 L/s. The design approach for stormwater quantity control is to calculate the flows from the uncontrolled areas and provide sufficient on-site storage in the controlled areas to attenuate the total post-development runoff (controlled and uncontrolled) to the allowable release rate prior to being discharged into the storm sewers within Noella Leclair Street.

6.3 Quality Control

The proposed development is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA) and is tributary to Bilberry Creek. Based on the Stantec Report, an 'Enhanced' Level of Protection (80% TSS removal) is required. Storm runoff from landscaped areas and roof tops are considered clean for the purposes of water quality and aquatic habitat protection and should not require treatment beyond typical best management practices.

To achieve this level of quality control protection, a new oil-grit separator unit (CDS PMSU 2020-5) will be installed downstream of MH 201 on the storm sewer outlet pipe from the site. Stormwater runoff collected by the on-site storm sewer system (1.886 ha tributary area with a percent impervious of 81.4%) will be directed through the proposed treatment unit. The contributing area includes the proposed paved parking lot areas, controlled building roofs and loading dock areas.

The CDS PMSU 2020-5 will provide 86.4% long-term TSS removal and will treat 99.6% of the average annual rainfall volume from the proposed development. The OGS unit has a treatment capacity of approximately 31 L/s, a sediment storage capacity of 1.1 m^3 and an oil storage capacity of 376 L.

6.4 Hydrologic & Hydraulic Modeling

The City of Ottawa Sewer Design Guidelines (October 2012) require hydrologic modeling for all dual drainage systems. The performance of the proposed storm drainage system for the site was evaluated using the *PCWMM* hydrologic/hydraulic modeling software.

Design Storms

The hydrologic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the design storms were taken from the Sewer Design Guidelines (October 2012).

Chicago Storms:
25mm 4hr Chicago storm
2-year 3hr Chicago storm
5-year 3hr Chicago storm
100-year 3hr Chicago storm

12 Hour SCS Storms:
2-year 12-hr SCS storm
5-year 12hr Chicago storm
100-year 12hr Chicago storm

The 3-hour Chicago distribution generates the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system has also been stress tested using a 3-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event.

Model Development

The PCSWMM model accounts for both minor and major system flows (*dual drainage*), including the routing of flows through the storm sewer network (*minor system*), and overland along the parking lot (*major system*). The results of the analysis were used to:

- Determine the total major and minor system runoff from the site;
- Size the ICDs to ensure the allowable release rate from the site is not exceeded;
- Calculate the storm sewer hydraulic gradeline for the 100-year storm event; and
- Evaluate the overland flow depths and ponding volumes during the 100-year event.

The model is capable of accounting for both static and dynamic storage within the private roadways and parking areas, including the overland flow across all high points. The 100-year flow depths computed by the model represent the total (static + dynamic) ponding depths at low points for areas in road and parking sags.

Storm Drainage Area Plan & Subcatchment Parameters

The development has been divided into subcatchments based on the drainage areas tributary to each inlet of the proposed storm sewer system. The catchment areas are shown on the Stormwater Management Plan (**122179-SWM**) in **Appendix D**.

The hydrologic parameters for each subcatchment were developed based on the Proposed Site Plan (**Figure 3**) and the Storm Drainage Area Plan specified above. Subcatchment parameters are outlined in **Table 6.1**.

Table 6.1: Subcatchment Model Parameters

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A-01a	0.012	0.31	15.7%	0%	2	60	2.0%
A-01b	0.026	0.31	15.7%	0%	3	87	1.5%
A-01c	0.020	0.31	15.7%	0%	3	67	1.5%
A-02	0.096	0.81	87.1%	0%	15	64	2.0%
A-03	0.086	0.76	80.0%	0%	15	57	2.0%
A-04	0.030	0.85	92.9%	0%	9	33	2.0%
A-05	0.099	0.74	77.1%	0%	17	58	2.5%
A-06	0.134	0.72	74.3%	0%	19	71	2.5%
A-07	0.026	0.69	70.0%	0%	7	37	2.0%
A-08	0.026	0.26	8.6%	0%	7	37	2.0%
A-09	0.066	0.80	85.7%	0%	13	51	2.0%
A-10	0.069	0.86	94.3%	0%	14	49	2.5%
A-11	0.080	0.80	85.7%	0%	15	53	2.0%
A-12	0.101	0.87	95.7%	0%	16	63	2.0%
A-13	0.118	0.87	95.7%	0%	17	69	2.0%
A-14	0.037	0.31	15.7%	0%	4	93	1.0%
A-15	0.079	0.82	88.6%	0%	15	53	2.0%
A-16	0.061	0.85	92.9%	0%	13	47	3.0%

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A-17	0.023	0.28	11.4%	0%	3	77	1.5%
A-18a	0.033	0.41	30.0%	0%	3	110	1.5%
A-18b	0.017	0.41	30.0%	0%	2	85	1.5%
A-19a	0.004	0.47	38.6%	0%	4	11	8.0%
A-19b	0.003	0.47	38.6%	0%	3	9	12.0%
A-19c	0.005	0.47	38.6%	0%	4	12	8.5%
A-19d	0.003	0.47	38.6%	0%	3	9	13.5%
A-19e	0.004	0.47	38.6%	0%	3	13	10.5%
A-19f	0.002	0.47	38.6%	0%	2	12	17.5%
A-19g	0.003	0.47	38.6%	0%	3	9	14.5%
A-19h	0.004	0.47	38.6%	0%	3	12	10.5%
A-19i	0.017	0.47	38.6%	0%	7	24	3.5%
D-01	0.007	0.49	41.4%	0%	2	35	16.0%
D-02	0.029	0.69	70.0%	0%	32	9	7.0%
D-03	0.013	0.90	100.0%	0%	29	4	7.5%
D-04	0.050	0.73	75.7%	0%	26	19	10.0%
D-05	0.028	0.40	28.6%	0%	11	25	3.0%
R-01	0.039	0.90	100.0%	0%	19	21	0.5%
R-02	0.037	0.90	100.0%	0%	19	19	0.5%
R-03	0.037	0.90	100.0%	0%	19	19	0.5%
R-04	0.025	0.90	100.0%	0%	16	16	0.5%
R-05	0.015	0.90	100.0%	0%	12	13	0.5%
R-06	0.004	0.90	100.0%	0%	11	4	0.5%
R-07	0.039	0.90	100.0%	0%	19	21	0.5%
R-08	0.037	0.90	100.0%	0%	19	19	0.5%
R-09	0.042	0.90	100.0%	0%	20	21	0.5%
R-10	0.042	0.90	100.0%	0%	20	21	0.5%
R-11	0.037	0.90	100.0%	0%	19	19	0.5%
R-12	0.039	0.90	100.0%	0%	19	21	0.5%
R-13	0.039	0.90	100.0%	0%	19	21	0.5%
R-14	0.037	0.90	100.0%	0%	19	19	0.5%
R-15	0.042	0.90	100.0%	0%	20	21	0.5%
Total	***1.921***	***0.76***	***80.5%***	-	-	-	-

Infiltration

Infiltration losses for all catchment areas were modeled using Horton's infiltration equation, which defines the infiltration capacity of the soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values for the City of Ottawa were used for all catchments.

Horton's Equation:	Initial infiltration rate: f_o = 76.2 mm/hr
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$	Final infiltration rate: f_c = 13.2 mm/hr
	Decay Coefficient: k = 4.14/hr

<u>*Depression Storage*</u>

The default values for depression storage in the City of Ottawa were used for all catchments. Residential rooftops were assumed to provide no depression storage.

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

<u>*Equivalent Width*</u>

Equivalent Width refers to the width of the sub-catchment flow path. This parameter is calculated as described in the Sewer Design Guidelines (October 2012), Section 5.4.5.6. The flow paths used to calculate the equivalent widths are shown on the PCSWMM schematics provided in **Appendix E**.

<u>*Impervious Values*</u>

Runoff coefficients for each subcatchment area were calculated based on the Proposed Site Plan (**Figure 3**). Refer to the Stormwater Management Plan (**122179-SWM**) for details. The runoff coefficients are used for Rational Method calculations in the storm sewer design sheet. PCSWMM used percent impervious values, so the percent impervious values were calculated using the following equation:

$$\%imp = \frac{C - 0.2}{0.7}$$

6.5 Minor System Design and Analysis

The following sections outline the model parameters and results of the PCSWMM model pertaining to the minor system (storm sewers).

6.5.1 Orifice Controls

Inflows to the storm sewer were modeled based on the characteristics of each inlet. All the catchbasins in the parking areas and roadway are located at low points. Inflows to the storm sewer are based on the ICD specified for the inlet and the maximum depth of ponding. ICDs have been sized to limit the ultimate outlet peak flows to the allowable release rate of 76.8 L/s.

Per the Storm Sewer Design Guidelines (October 2012), *"ICDs shall not be used in series (i.e. where the backwater from one device affect the next upstream device) unless a dynamic model is used to assess their performance and to compute the corresponding upstream water elevation and storage requirements"*. As such, ICDs have been installed in the downstream catchbasin maintenance hole to limit peak flows from the upstream series of inlets, as well as take advantage of the storage provided by the upstream storm sewers. Details are outlined as follows in **Table 6.2**. ICD information is provided in **Appendix E** and indicated on the General Plan of Services (**122179-GP**, **Appendix F**).

Table 6.2: Inlet Control Devices & Design Flows

Structure	Tempest LMF ICD Size	ICD Invert (m)	T/G (m)	100-yr HGL* (m)	100-yr Head* (m)	100-year Release Rate* (L/s)
CB01	Vortex 78	87.50	88.70	88.80	1.30	6.0
CB02	Vortex 64	86.10	88.60	88.89	2.79	6.0
CB12	Vortex 66	85.33	88.75	87.89	2.56	6.0
CBMH208	Vortex 64	86.10	88.65	88.98	2.88	6.1
Cistern	Vortex 72	86.39	89.21	88.20	1.81	6.1

** From PCSWMM 100-year 3-hour Chicago Storm event*

6.5.2 Underground Storage

The allowable release rate of 76.8 L/s is smaller than the 2-year peak flows from the proposed development. Underground storage is required to ensure no surface ponding the 2-year storm event. Underground storage will be provided using Stormtech MC-3500 arch-type chambers (or approved equivalent), which are covered in 50mm dia. clearstone. The chambers will be installed upstream of the ICDs on CB02 and CBMH 208. The storage chambers for the CBMH 208 ICD will be installed upstream of MH 210. **Table 6.3** provide details on the storage chambers. Refer to **Appendix E** for the storage curves used in the PCSWMM model and details o the Stormtech MC-3500 chambers.

Table 6.3: Underground Storage

Location	No. of Chambers	Available Storage (m^3)
CB02	2	20.9
Upstream MH 210	13	86.7

6.5.3 Roof Drains

The building rooftops were simulated in PCSWMM based on an outlet rating curve for the proposed roof drains and using a storage node to represent the available storage provided by the roof surface. It has been assumed that the each roof area (R-01 to R-15) will have 1 Watts Flow Control Roof Drain each set to half (½) open or a quarter (¼) open, giving flow rates outlined in **Table 6.4** for a single drain (converted from inches and gallons per minute). For modelling purposes, each building was modelled with a single outlet link for the roof, with the flow rates below being added together based on the roof areas for each roof to give the total flow from all drains. Refer to the Stormwater Management Plan (**122179-SWM**) for details on the roof areas.

Table 6.4: Roof Drain Rating Curve

Head (m)	Single Drain - Controlled Flow Rate* (L/s)				
	Fully Open	3/4 Open	1/2 Open	1/4 Open	Fully Closed
0.000	0.00	0.00	0.00	0.00	0.00
0.025	0.32	0.32	0.32	0.32	0.32
0.051	0.63	0.63	0.63	0.63	0.63
0.076	0.95	0.87	0.79	0.71	0.63
0.102	1.26	1.10	0.95	0.79	0.63
0.127	1.58	1.34	1.10	0.87	0.63
0.152	1.89	1.58	1.26	0.95	0.63

**Watts Flow Control Roof Drains Rating Curve (single drain)*

The available storage and flow rating curve for the each of the roofs has been added together based on the number and type of drains for the and the available storage lumped into a single storage node. **Table 6.5** and **Table 6.6** summarize the controlled post-development design flows from the building rooftop, the maximum anticipated ponding depths, storage volumes required, and the storage volumes provided for the 5-year and 100-year storm events.

Table 6.5: 5-year Roof Storage & Peak Flows

Area ID	Static Ponding Area (m^2)	Drainage Area (ha)	Uncontrolled Peak Flow (L/s)	Controlled Peak Flow (L/s)	Flow Depth (m)	Storage Required (m^3)	Storage Available (m^3)
Building A							
R-01	378	0.039	3.0	0.82	0.11	8.52	19.17
R-02	359	0.037	3.0	0.82	0.11	7.99	18.15
R-03	359	0.037	3.0	0.82	0.11	7.94	18.29
R-04	244	0.025	2.8	0.81	0.11	4.76	12.48
R-05	149	0.015	2.3	0.78	0.10	2.34	7.51
R-06	32	0.004	1.1	0.68	0.07	0.23	1.76
Building B							
R-07	378	0.039	3.2	0.82	0.11	8.53	19.19
R-08	359	0.037	3.0	0.82	0.11	7.99	18.11
R-09	406	0.042	3.7	1.01	0.11	8.82	20.69
Building C							
R-10	406	0.042	3.7	1.01	0.11	8.81	20.69
R-11	359	0.037	3.0	0.82	0.11	8.01	18.29
R-12	378	0.039	3.2	0.82	0.11	8.53	19.19
Building D							
R-13	378	0.039	3.2	0.82	0.11	8.54	19.21
R-14	359	0.037	3.0	0.83	0.11	7.94	17.58
R-15	205	0.023	3.7	1.01	0.11	8.85	20.57
TOTAL	**-**	**0.509**	**45.0**	**12.7**	**-**	**107.81**	**250.86**

Table 6.6: 100-year Roof Storage & Peak Flows

Area ID	Static Ponding Area (m^2)	Drainage Area (ha)	Uncontrolled Peak Flow (L/s)	Controlled Peak Flow (L/s)	Flow Depth (m)	Storage Required (m^3)	Storage Available (m^3)
Building A							
R-01	378	0.039	4.1	0.94	0.15	18.84	19.17
R-02	359	0.037	4.2	0.94	0.15	17.72	18.15
R-03	359	0.037	4.0	0.93	0.15	17.61	18.29
R-04	244	0.025	3.7	0.91	0.14	10.83	12.48
R-05	149	0.015	3.2	0.89	0.13	5.58	7.51
R-06	32	0.004	1.6	0.81	0.11	0.73	1.76
Building B							
R-07	378	0.039	4.1	0.94	0.15	18.85	19.19
R-08	359	0.037	4.2	0.94	0.15	17.72	18.11
R-09	406	0.042	5.2	1.23	0.15	19.23	20.69
Building C							
R-10	406	0.042	5.2	1.22	0.15	19.24	20.69
R-11	359	0.037	4.1	0.93	0.15	17.77	18.29
R-12	378	0.039	4.1	0.94	0.15	18.87	19.19
Building D							
R-13	378	0.039	4.1	0.94	0.15	18.88	19.21
R-14	359	0.037	4.2	0.95	0.15	17.58	17.58
R-15	406	0.023	5.0	1.22	0.15	19.32	20.57
TOTAL	**-**	**0.509**	**61.0**	**14.7**	**-**	**238.76**	**250.86**

As shown in the above tables, the building roofs will provide sufficient storage for all storm events up to the 100-year event. It should be noted that the PCSWMM model shows similar results to the roof storage calculations, but there is a small amount of overflow through the scuppers during the 100-year event and larger. Flows exceeding the available storage will overflow through the scuppers and onto the ground surface below and will be conveyed to storm sewer inlets via the major system flow routes. Detailed calculations for each of the roof drains have been provided in **Appendix E**.

6.5.4 Hydraulic Grade Line

The results of the analysis were used to determine if there would be any surcharging from the storm sewer system during the 100-year storm event. **Table 6.7** provides a summary of the 100-year HGL elevation at each storm maintenance hole within the proposed development, as well as a summary of the HGL elevations for a 20% increase (rainfall intensity and total precipitation) in the 100-year design event.

Table 6.7: 100-year HGL Elevations (m)

Maintenance Hole ID	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation (1)		Clearance from T/G	
			100-year (m)	100-year + 20% (m)	100-year (m)	100-year +20% (m)
MH201	83.80	88.82	84.01	84.02	4.81	4.80
MH202	83.99	88.65	84.14	84.15	4.51	4.50
MH203	84.19	88.71	84.33	84.34	4.38	4.37
MH204	84.41	88.92	84.54	84.55	4.38	4.37
MH205	84.54	88.79	84.68	84.69	4.11	4.10
MH205B	84.65	88.97	84.80	84.81	4.17	4.16
MH206	84.72	88.84	84.85	84.86	3.99	3.98
MH207	84.96	89.18	85.07	85.09	4.11	4.09
MH210 (2)	86.20	88.78	88.98	89.01	-0.20	-0.23
MH215	84.89	89.08	84.94	84.95	4.14	4.13

(1) HGL information is from the PCSWMM model for a 3-hour Chicago Storm distribution.

(2) MH 210 is located upstream of the ICD at CBMH 208 and will backup conditions.

There is sufficient clearance to the T/G for all manholes except for MH 210, which is located upstream of the ICD located at CBMH 208 and within the ponding limits of CBMH 208. This manhole serves to connect the underground storages chambers upstream of the ICD at CBMH 208 to the storm sewer network upstream of the ICD. Since the manhole is upstream of the ICD and ponding limits of CBMH 208 it will experience backup conditions from the ICD and the HGL will match that of CBMH 208, which experiences ponding in the 100-year and 100-year + 20% event.

6.6 Major System Design and Analysis

Catchbasins and catchbasin maintenance holes were modeled as storage nodes to account for the surface storage provided by the parking areas of the proposed development, and the storage provided within the structure itself. For modeling purposes, the storage nodes are interconnected using short rectangular open channels to simulate flows cascading over high points when the available static storage is exceeded. A total volume of approximately 435 m^3 is provided by the low points in the parking areas and roadway, as shown in **Table 6.8**. Storage curves for each of the catchbasins and catchbasin manholes is provided in **Appendix E**.

The landscape catchbasins along the north and south limits of the proposed development (LD 1000 to LD 1003) were modeled as triangular swales with a depth of 0.35m and 3H:1V side slopes. Storage nodes were not used to model the ponding in these areas.

Table 6.8: Ponding Volumes (m^3)

STM Area ID	CB ID	Ponding Area (m^2)	Available Static Ponding Volume (m^3)
A-07	CB01	87	4.5
A-06	CB02	498	53.2
A-12	CB03	417	41.7
A-16	CB04	234	19.3
A-15	CB05	164	9.8
A-04	CB09	118	11.5
A-02	CB10	519	50.4
A-19a	CB12	14	0.8
A-11	CBMH208	418	43.7
A-13	CBMH209	524	49.3
A-10	CBMH211	372	37.0
A-09	CBMH212	197	17.0
A-05	CBMH213	521	50.7
A-03	CBMH214	449	43.7
A-19b	LD1004	6	0.3
A-19c	LD1005	10	0.4
A-19d	LD1006	7	0.2
A-19e	LD1007	7	0.2
A-19f	LD1008	5	0.1
A-19g	LD1009	6	0.2
A-19h	LD1010	8	0.3
A-19i	LD1011	24	0.8

The major system network was evaluated using the PCSWMM model to ensure that the ponding depths conform to City standards. A summary of ponding depths at each inlet for the 100-year event is provided in **Table 6.9**. There will be no ponding during the 2-year event, and ponding which occurs for larger storm events will be less than 0.35m.

Table 6.9: 100-year Event Ponding Depths

Structure	T/G (m)	Max. Static Ponding (Spill Depth)		100-yr Event (1)			
		Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
CB01	88.70	88.83	0.13	88.80	0.10	N	0.00
CB02	88.60	88.90	0.30	88.89	0.29	N	0.00
CB03	88.75	89.05	0.30	88.98	0.23	N	0.00
CB04	88.75	89.00	0.25	88.98	0.23	N	0.00
CB05	88.85	89.03	0.18	89.00	0.15	N	0.00
CB06	89.00	89.15	0.15	89.00	0.00	N	0.00
CB07	88.95	89.18	0.23	89.03	0.08	N	0.00
CB08	89.00	89.20	0.20	89.04	0.04	N	0.00
CB09	88.85	89.00	0.15	88.98	0.13	N	0.00
CB10	88.75	89.00	0.25	88.98	0.23	N	0.00
CB11	88.85	89.14	0.29	88.98	0.13	N	0.00
CB12	88.75	88.89	0.14	87.89	0.00	N	0.00
CBMH208	88.65	88.95	0.30	88.98	0.33	Y	0.03
CBMH209	88.70	88.97	0.27	88.98	0.28	Y	0.01
CBMH211	88.75	89.05	0.30	88.98	0.23	N	0.00
CBMH212	88.90	89.10	0.20	88.99	0.09	N	0.00
CBMH213	88.65	88.97	0.32	88.98	0.33	Y	0.01
CBMH214	88.75	88.97	0.22	88.98	0.23	Y	0.01
LD1000	88.90	89.15	0.25	89.05	0.15	N	0.00
LD1001	88.80	89.10	0.30	89.05	0.25	N	0.00
LD1002	88.80	89.10	0.30	88.98	0.18	N	0.00
LD1003	88.75	89.05	0.30	88.98	0.23	N	0.00
LD1004	88.75	88.85	0.10	87.89	0.00	N	0.00
LD1005	88.65	88.75	0.10	87.89	0.00	N	0.00
LD1006	88.65	88.73	0.08	87.89	0.00	N	0.00
LD1007	88.60	88.67	0.07	87.89	0.00	N	0.00
LD1008	88.60	88.67	0.07	87.90	0.00	N	0.00
LD1009	88.60	88.68	0.08	87.90	0.00	N	0.00
LD1010	88.60	88.68	0.08	87.90	0.00	N	0.00
LD1011	88.60	88.69	0.09	87.89	0.00	N	0.00

(1) *HGL information is from the PCSWMM model for a 3-hour Chicago Storm distribution.*

An expanded table of the ponding depths at low points in the parking lots (including the stress-test event) is provided in **Appendix E**. Based on these results, the proposed storm drainage system will not experience any adverse flooding even with a 20% increase to the 100-year event.

6.7 Peak Flows

For all storm events, the allowable release rate is 78.6 L/s. Peak flows for each storm event are outlined in the following table:

Table 6.10: Peak Flows (L/s)

Storm Distribution->	**3hr Chicago**					**12hr SCS**		
Return Period->	**25mm**	**2yr**	**5yr**	**100yr**	**100yr +20%**	**2yr**	**5yr**	**100yr**
Minor System to Noella Leclair Street (STM sewer)	30.1	35.5	44.8	62.1	68.0	29.7	37.8	51.5
Major System to Noella Leclair Street (Major Spills)	0.0	0.0	0.0	0.0	21.1	0.0	0.0	0.0
Uncontrolled Noella Leclair Street (D-01 and D-05)	1.7	2.7	6.1	14.8	18.7	1.2	3.4	6.9
TOTAL(1)	31.2	37.2	48.5	74.8	84.7	30.6	40.7	58.0

(1) *Total flow based on the system flow from the PCSWMM model*

As outlined in the above table, peak flows for all storm events up to and including the 100-year event will be controlled to the allowable release rate of 76.8 L/s. There will be no major overland flow directed to Merivale Road for all storm events up to and including the stress test event (100-year + 20%).

7.0 EROSION AND SEDIMENT CONTROL

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

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

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (drawing 122179-ESC) for additional information.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Watermain

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

- The proposed 200mm dia. private watermain which connects to the existing watermain within Noella Leclair can service the proposed development.
- There are adequate pressures in the existing watermain infrastructure to meet the required domestic demands for the development.
- There is adequate flow to service the proposed fire protections system.

Sanitary Servicing

The analysis of the existing and proposed sanitary system confirms the following:

- It is proposed to service the development with a private Sanitary sewer ranging in size from 200-250mm in diameter. The proposed sewer will connect to existing sewers within the Noella Leclair right-of-way.
- It is anticipated there is adequate capacity within the existing sanitary infrastructure to service.

Stormwater Management

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

- The proposed storm sewer system is to connect to the 1200mm diameter storm sewer in the Noella Leclair Street right-of-way.
- Stormwater control is to be provided through the use of rooftop storage, underground storage (Stormtech Chambers MC-3500), surface ponding, and a cistern.
- Storm flows will be attenuated through the implementation of inlet control devices.
- Quality control with be provided with a CDS OGS unit (CDS PMSU 2020-5) which will provide over 80% long-term TSS removal.

Erosion and Sediment control

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

9.0 CLOSURE

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

NOVATECH

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Appendix A

Pre - Consultation Meeting Minutes

These Pre- App Comments came from an email sent on Fri 07/15/2022 11:29 AM

Hello,

Please refer to the below and/or attached notes regarding the Pre-Application Consultation (pre-con) Meeting held on July 5, 2022 for the property at 4200 Innes Road (Block 1 only) for Lift of a Holding Zone Designation, Minor Variance Application and Complex Site Plan in order to allow the development of a 4 building retail complex consisting of 6-storey buildings with a total of 295 units with a mix of surface and underground parking by Broadstreet. I have also attached the required Plans & Study List for application submission.

Below or attached are staff's preliminary comments based on the information available at the time of pre-con meeting:

Planning

- Policies and provisions (PPS, OP, CDP, Secondary Plan, etc.)
    - The existing Official Plan designation is Employment
    - New Official Plan is Neighbourhood/Evolving Neighbourhood overlay. To the east and south is the HUB designation.(I feel this should have been included)
    - The site is within the EUC Mixed Use Centre CDP. Designated as Mixed-use.
        - There are design criteria for mid-rise buildings and landscaping
- Committee of Adjustment / variances required
    - At the time of the meeting only relief from the parking requirement is requested
    - On other Broad Street Sites they indicated that 1 parking space is sufficient along with 0.2 visitor parking spaces per unit.
        - 1.2 combined parking has been approved elsewhere
        - Want to ensure that as many spaces are located below grade to free up open space
        - As the plan matures, if there are any other required Variance, contact Cass Sclauzero at Cass.Sclauzero@ottawa.ca
- Existing Zoning
    - The property is zoned AM [2414] H(40)-h
        - The exception lists the criteria for lifting the -h
        - The criteria will be satisfied once the Subdivision is Draft Approved and an application to lift the -h can be submitted.
- Wind
    - **Windy Study - to be confirmed**
- Landscape requirements
    - Would like space made available for street trees in front of a portion of building
    - Have a pedestrian connection (if possible) through the site from existing path to the west to the intersection
    - Try and provide different landscaped area around the site.
- Try and locate garbage rooms in the basements and show snow storage on the site plan

Urban Design

- A Design Brief will be required. A Terms of Reference is attached. All of the sections highlighted in yellow must be addressed with appropriate graphics and explanatory text.
- Please be aware that the application is subject to the Urban Design Review Panel (UDRP) review. The site is zoned AM and within 400m of Innes Road which is a Design Priority Area. It is important for the UDRP timeline to be align with the application review. UDRP review meeting schedules can be found from this link. Please contact Sole Carvajal sole.carvajal@ottawa.ca if you need assistance related to UDRP.
- The site is part of the East Urban Community - Community Design Plan - Phase 3. The application must meet any applicable policies and design guidelines in the CDP. In particular, "the frontage of lands along public streets will feature buildings with active frontages regardless of the land uses contained therein".
- 3m side-yard setbacks are permitted by zoning. However, the applicant is asked to reconsider the adequacy of a 3m setback on the south property line given that the abutting property could develop with mid or high-rise buildings, which could have similarly small or zero side-yard setbacks.
- The applicant is asked to confirm and make sure that the site meets zoning requirements for minimum width of a landscaped area around a parking lot.
- Urban Design supports any reduction in parking in favour of additional above-grade communal amenity space
- Urban Design supports the possibility of a pedestrian connection from the properties to the west, through the site, to the street
- Tree planting on the site is important. The area between building façade and property line must include tree species that are suitable for urban environments. Given the limited setbacks, small and medium sized species and / or columnar trees are likely most appropriate. Underground parking should not extend beyond the building façade, in order to provide as much growing space as possible for trees.
- Individual entrances to ground floor units, are appropriate as shown in the concept plan. All other residents and visitors will enter the building from a main door. The architecture and landscape should highlight the main entrance to each of the buildings.

Engineering

The attached "Pre-application consultation servicing memo – 4200 Innes" summarizes engineering design considerations as per our discussion.

Transportation

- Transportation Impact memo (TIA) **– consult with Mike Giampa (mike.giampa@ottawa.ca)**
- **More comments to be confirmed**

Parkland

- Parkland dedication /Cash-in-lieu of parkland requirements have been satisfied through the subdivision

City Surveyor

- The determination of property boundaries, minimum setbacks and other regulatory constraints are a critical component of development. An Ontario Land Surveyor (O.L.S.)

needs to be consulted at the outset of a project to ensure properties are properly defined and can be used as the geospatial framework for the development.
  - Topographic details may also be required for a project and should be either carried out by the O.L.S. that has provided the Legal Survey or done in consultation with the O.L.S. to ensure that the project is integrated to the appropriate control network.

Questions regarding the above requirements can be directed to the City's Surveyor, Bill Harper, at Bill.Harper@ottawa.ca

Waste Services

- New multi-unit residential development, defined as containing six (6) or more units, intending to receive City waste collection services will be required, as of June 1, 2022, to participate in the City's Green Bin program in accordance with Council's approval of the multi-residential waste diversion strategy. The development must include adequate facilities for the proper storage of allocated garbage, recycling, and green bin containers and such facilities built in accordance with the approved site design. Questions regarding this change and requirements can be directed to Andre.Laplante@ottawa.ca.

Other

- Plans are to be standard A1 size (594 mm x 841 mm) or Arch D size (609.6 mm x 914.4 mm) sheets, dimensioned in metric and utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400 or 1:500).
- All PDF submitted documents are to be unlocked and flattened.
- [For sites containing one or more buildings with a total GFA greater than 2000 square metres OR retail shopping complexes with a total GFA greater than 10,000 square metres OR sites containing office buildings with total GFA greater than 10,000 square metres hotels and motels with more than 75 units OR (human) hospitals OR educational institutions with more than 350 students OR manufacturing establishments working more than 16,000 person-hours in a month]
  - A Waste Reduction Workplan Summary is required for the construction project as required by O.Reg. 102/94, being "Waste Audits and Waste Reduction Work Plans" made under the Environmental Protection Act, RSO 1990, c E.19, as amended.
- [Optional] You are encouraged to contact the Ward Councillor, Councillor Catherine Kitts, at [Catherine.Kitts@ottawa.ca] about the proposal.
- [Optional, where private roads are proposed]
  - advises/reminds Applicant, to submit a Private Roadway Street Naming application to Building Code Services Branch for any internal private road network.
  - applications are available at all Client Service Centres (the private roadway approval process takes three months).

Please refer to the links to Guide to preparing studies and plans and fees for further 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 geoinformation@ottawa.ca.

These pre-con comments are valid for one year. If you submit a development application(s) 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,

Zyan Khan
Student Planner | *Étudiant en Urbanisme*
Development Review East | *Examen des projects d’aménagement - Est*
Planning, Real Estate and Economic Development Department | *Direction générale de la planification, des biens immobiliers et du développement économique*

Site Plan Pre-Application Consultation Notes

Date: Tuesday, July 5, 2022.
Site Location: 4200 Innes Rd
Type of Development: ☒ **Residential (**☐ **townhomes,** ☐ **stacked,** ☐ **singles,** ☒ **apartments),** ☐ **Office Space,** ☐ **Commercial,** ☒ **Retail,** ☐ **Institutional,** ☐ **Industrial, Other:** N/A

Infrastructure

Water

Watermain Frontage Fees to be paid ($190.00 per metre) ☐ **Yes** ☒ **No**

Boundary conditions:
Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission. **Water boundary conditions should be requested once the new watermain is operational.**

- Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
  - Location of service(s)
  - Type of development and the amount of fire flow required (as per FUS, 1999)
  - Average daily demand: ___ L/s
  - Maximum daily demand: ___ L/s
  - Maximum hourly daily demand: ___ L/s
- Fire protection (Fire demand, Hydrant Locations)
- Please submit sanitary demands with the water boundary conditions.

General comments

- Service areas with a basic demand greater than 50 m^3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid creation of vulnerable service area.
- A District Metering Area Chamber (DMA) is required for services 150mm or greater in diameter.
- FUS 2020 calculations must be provided for each building. The maximum FUS should be used for the water boundary conditions.
- A hydrant must be provided within 45m of a Siamese connection, if applicable.
- Hydrant spacing and number of hydrants should be checked for each building.

Sanitary Sewer

Is a monitoring manhole required on private property? ☒ **Yes** ☐ **No**

General comments

- The servicing report is required to demonstrate that the proposed development is within the allocated sanitary capacity established in the detail design of subdivision. The servicing report should clearly compare total wet-weather sanitary demand to allocated capacity.

Storm Sewer

General comments

- Consult the approved detail subdivision design for allowable release rates and additional quality control requirements.
- When both underground and above ground storage is utilized, the release rate from the system will significantly differ than when solely one level storage is being used (i.e. greater range of head vs smaller change of head during storm event). If both levels of storage are to be accounted for then there are two options for SWM calculations: 1) use a dynamic computer model or 2) use an assumed average flow rate of half (50%) of the controlled peak flow rate of the area(s) utilizing two levels of storage.
- In order to minimize number of storm sewer connections the foundation drain, the drive ramp drain, and building rooftop, may connect to site sewer under free-flow conditions. The system must be designed to ensure that drainage does not back-up into the building drain or drive ramp.
- Ensure that the proposed drive ramp entrance to the underground parking garage is protected from the major overland flow route.
  - A minimum freeboard elevation of 350mm from highpoint of the ramp to the street spill elevation.

- A minimum freeboard elevation of 300mm from the invert of the ramp drain to the 100 year HGL of the storm sewer.
    - In general conformity of City of Ottawa Standard S17.
- Rideau Valley Conservation Authority to confirm quality control requirements.
- Site is located within the Billberry Creek Subwatershed Study Area.
- The subdivision grading and drainage plan must be followed.
- Easements are required for infrastructure crossing property lines, if applicable.

General Service Design Comments

- The City of Ottawa Standard Detail Drawings should be referenced where possible for all work within the Public Right-of-Way.
- The application should include legal easement or joint-use and maintenance agreements, if applicable.
- The City will not deem the application complete for circulation until after the servicing comments have been resolved for the detail design of subdivision.
- Site Plan Control will be issued after the in-service memos have been cleared and City obtains ownership of the infrastructure.

Other

Capital Works Projects within proximity to application? ☐ **Yes** ☒ **No**

References and Resources

- As per section 53 of the Professional Engineers Act, O. Reg 941/40, R.S.O. 1990, all documents prepared by engineers must be signed and dated on the seal.
- All required plans & reports are to be provided in *.pdf format (at application submission and for any, and all, re-submissions)
- Please find relevant City of Ottawa Links to Preparing Studies and Plans below:
  https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#standards-policies-and-guidelines
- To request City of Ottawa plan(s) or report information please contact the City of Ottawa Information Centre:
  InformationCentre@ottawa.ca<mailto:InformationCentre@ottawa.ca>
  (613) 580-2424 ext. 44455
- geoOttawa
  http://maps.ottawa.ca/geoOttawa/

PLANS & STUDIES LIST

For information on preparing required studies and plans refer to:
http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/Z	Number of copies	ENGINEERING		S/A	Number of copies
S		1. Site Servicing Plan	2. Site Servicing Brief	S	
S		3. Grade Control and Drainage Plan	4. Geotechnical Study	S	
		5. Composite Utility Plan	6. Groundwater Impact Study		
		7. Servicing Options Report	8. Wellhead Protection Study		
		9. Community Transportation Study and/or Transportation Impact Study / Brief	10. Erosion and Sediment Control Plan / Brief	S	
S		11. Storm water Management Brief	12. Hydro-geological and Terrain Analysis		
		13. Water main Analysis	14. Noise / Vibration Study		
		15. Roadway Modification Design Plan	16. Confederation Line Proximity Study		

S – Required for Site Plan Control
Z – Required for Zoning By-Law Amendment

Appendix B

Water Servicing

Table 1
Water Demand

Occuupancy	Unit Type					Total Population	Total Demand (L/s)		
	Commercial (Area m^2)	1 Bed Apartment	2 Bed Apartment	3 Bed Apartment	Total Units		Avg Day	Max. Daily	Peak Hour
Trinity Apartments									
Building A		13	45	12	70	150	0.49	1.22	2.67
Building B		19	46	16	81	173	0.56	1.40	3.08
Building C		13	46	12	71	152	0.49	1.23	2.71
Building D		13	46	12	71	152	0.49	1.23	2.71
Commercial B	339.5						0.12	0.17	0.21
Total	**339.5**	**58**	**183**	**52**	**293**	**627**	**2.15**	**5.25**	**11.38**

Design Parameters:

- 1 Bed Apartment **1.4 persons/unit**
- 2 Bed Apartment **2.1 persons/unit**
- 3 Bed Apartment **3.1 persons/unit**

City of Ottawa Water Distribution Guidelines

- Average Domestic Flow 280 L/c/day

Daily Demands from OBC Table 8.2.1.3

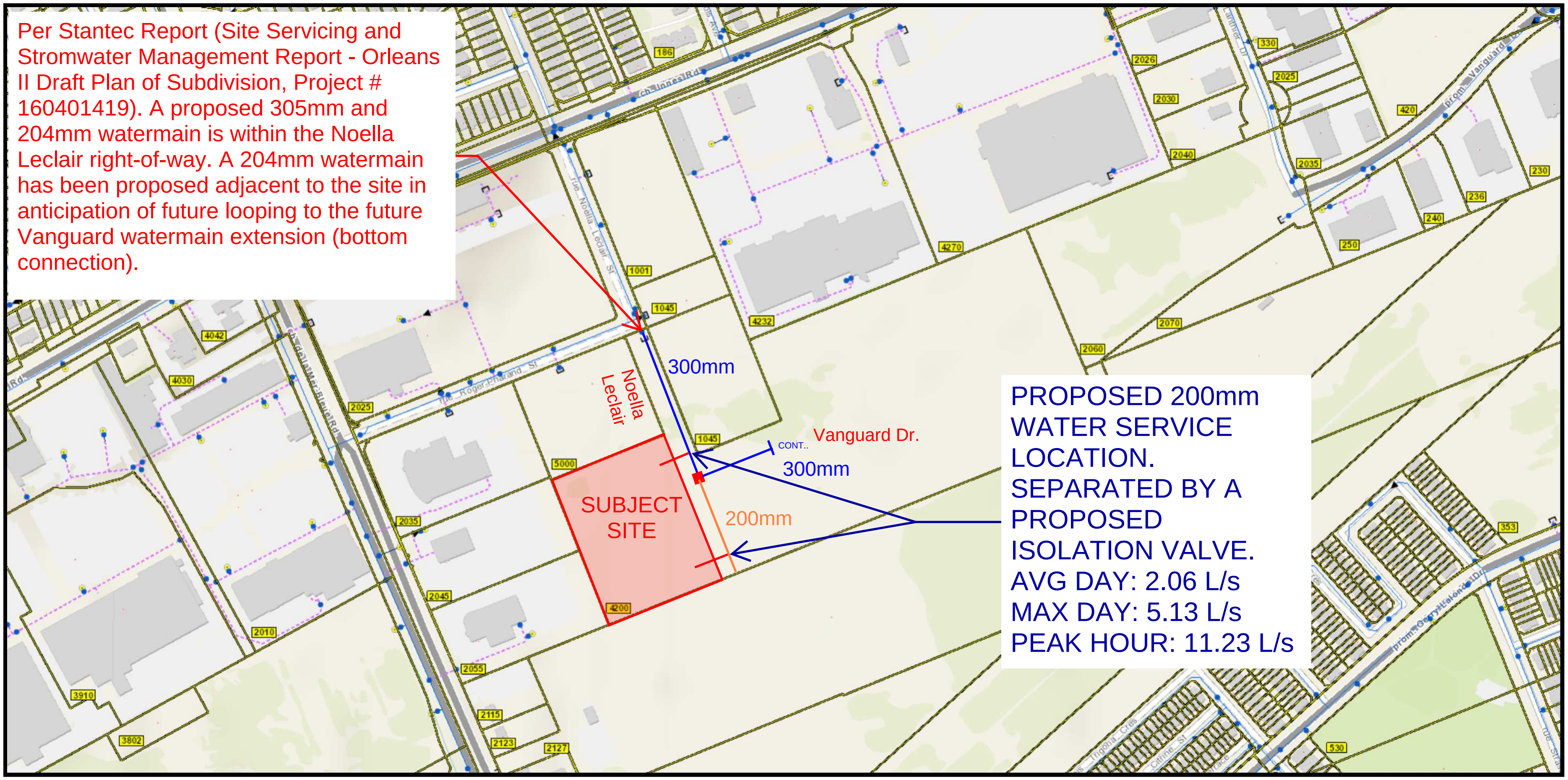
- Medical Space 275 L/9.3m²/day

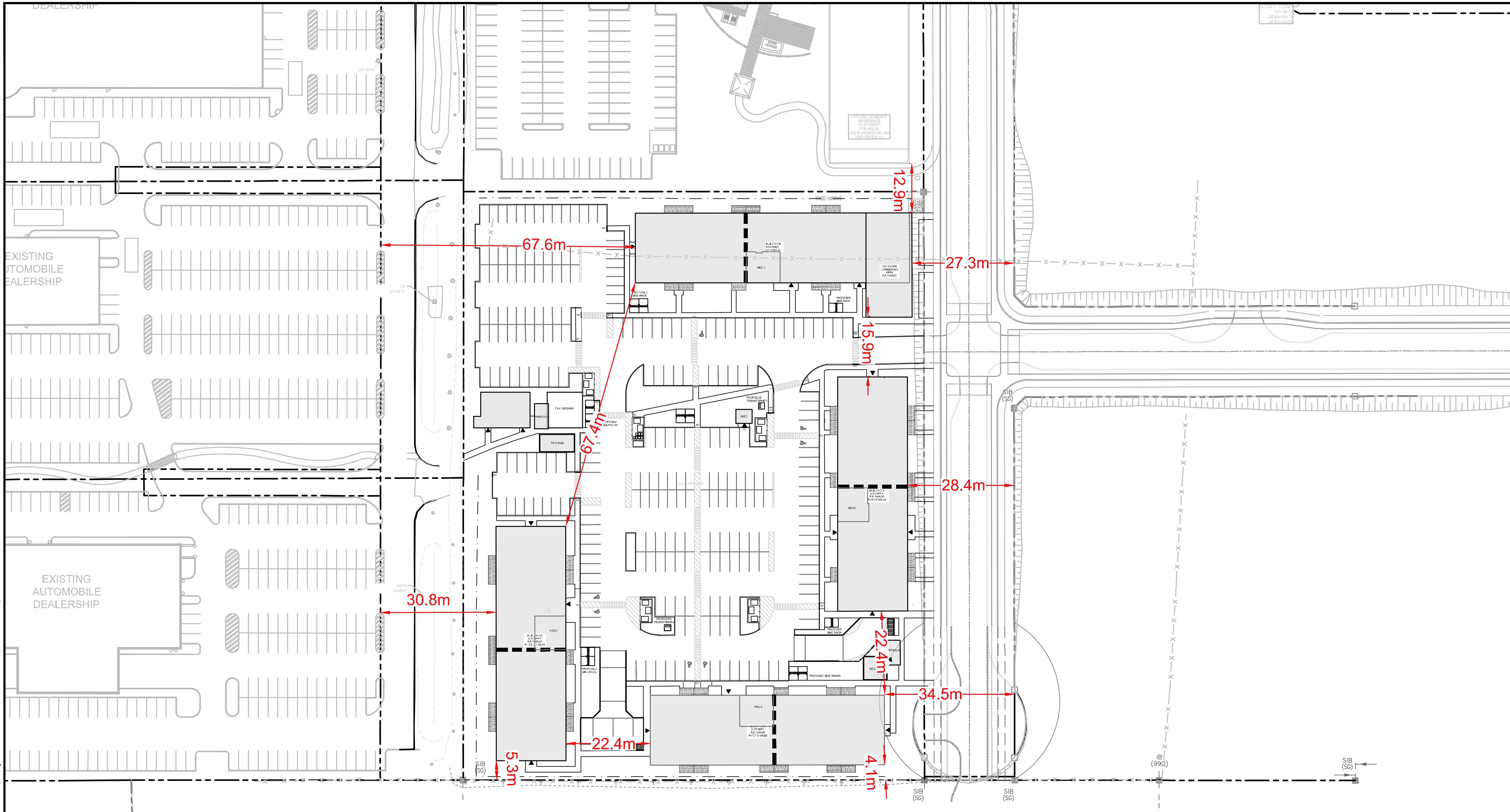
Residential Peaking Factors City of Ottawa Water Distrubution Guidelines:

Conditions	Peaking Factor		Units
Maximum Day	2.5	x avg day	L/c/day
Peak Hour	2.2	x max day	L/c/day

Commercial Peaking Factors City of Ottawa Water Distribution Guidelines

Conditions	Peaking Factor		Units
Maximum Day	1.5	x avg day	L/c/day
Peak Hour	1.8	x max day	L/c/day


Per Stantec Report (Site Servicing and Stromwater Management Report - Orleans II Draft Plan of Subdivision, Project # 160401419). A proposed 305mm and 204mm watermain is within the Noella Leclair right-of-way. A 204mm watermain has been proposed adjacent to the site in anticipation of future looping to the future Vanguard watermain extension (bottom connection).
300mm
Noella Leclair
Vanguard Dr.
CONT..
300mm
SUBJECT SITE
200mm
PROPOSED 200mm WATER SERVICE LOCATION. SEPARATED BY A PROPOSED ISOLATION VALVE.
AVG DAY: 2.06 L/s
MAX DAY: 5.13 L/s
PEAK HOUR: 11.23 L/s



LEGEND

PROPERTY LINE
PROPOSED TACTILE INDICATOR
PROPOSED ENTRANCE
PROPOSED DEPRESSED CURB

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

CITY OF OTTAWA
TRINITY APARTMENTS

FUS SEPARATION

SCALE 1 : 1000

DATE JAN 2023 | JOB 122179 | FIGURE FUS

SHT11X17.DWG - 279mmX432mm

M:\2022\122179\CAD\Civil\Figures\Hydraulic\122179-FUS Sep.dwg, FUS SEP, Jan 20, 2023 - 3:32pm, amestwarp

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

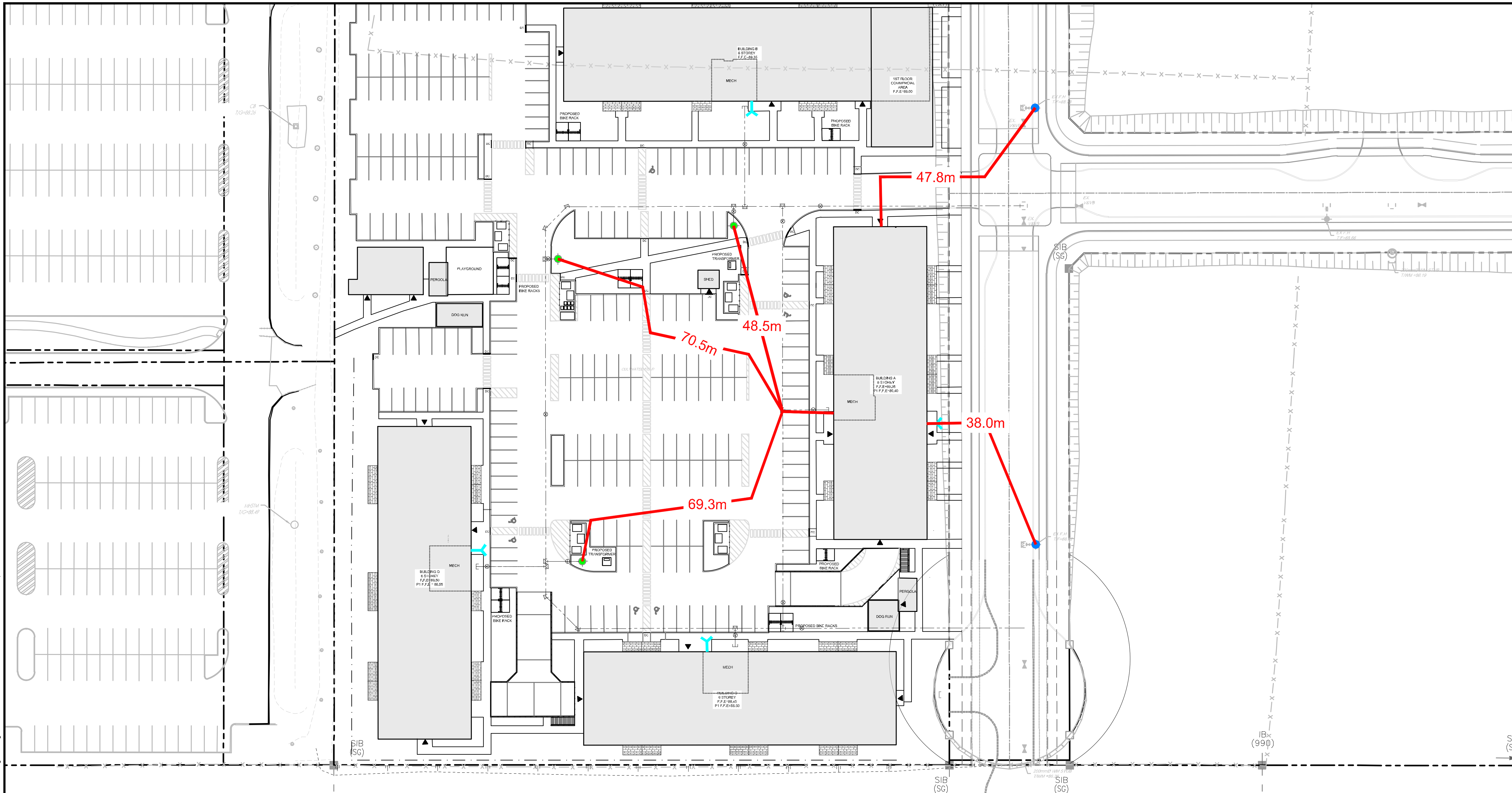
NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 122179
Project Name: Trinity Apartments
Date: 2/9/2023
Input By: Curtis Ferguson, E.I.T.
Reviewed By: Anthony Mestwarp, P.Eng

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG A-South)
Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,828**	
	F	**Base fire flow without reductions**				**27,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**22,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-11,475**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	**2,295**
		East Side	20.1 - 30 m		10%	
		South Side	Sprinklered		0%	
		West Side	>30m		0%	
				Cumulative Total	**10%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699



LEGEND

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

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

CITY OF OTTAWA
TRINITY APARTMENTS

COVERAGE PLAN
(BUILDING A)

SCALE			
1 : 750			
DATE: JAN 2023	JOB: 122179	FIGURE: COV-A	

SHT11X17.DWG - 279mmX432mm

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FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

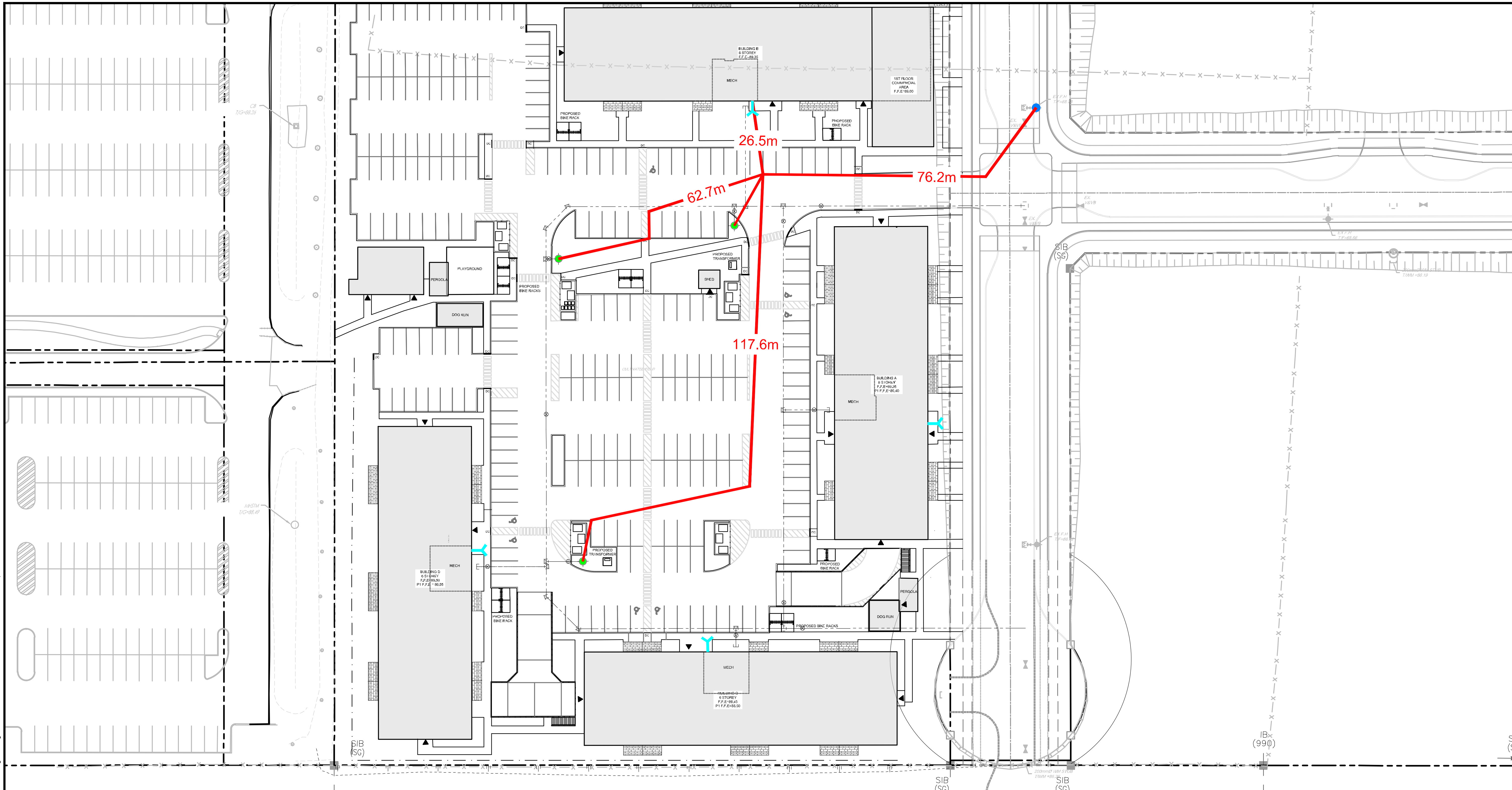
NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	122179		
Project Name:	Trinity Apartments		
Date:	2/1/2023	Legend	Input by User
Input By:	Curtis Ferguson, E.I.T.		No Information or Input Required
Reviewed By:	Anthony Mestwarp, P.Eng		

Building Description: 6 Storey Residential Apartment (BLDG B)

Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Podium Footprint (m^2)	1432.34			
		Total Floors/Storeys (Podium)	1			
		Tower Footprint (m^2)	1328.14			
		Total Floors/Storeys (Tower)	5			
		Area of structure considered (m^2)			**8,073**	
	F	**Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$				**30,000**
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**25,500**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-12,750**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	8073	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	**2,550**
		East Side	20.1 - 30 m		10%	
		South Side	Sprinklered		0%	
		West Side	>30m		0%	
				Cumulative Total	**10%**	
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



LEGEND

— — —	PROPERTY LINE
(cyan Y symbol)	PROPOSED SIAMESE CONNECTION
(blue dot)	EXISTING HYDRANT
(green dot)	PROPOSED HYDRANT
(red line)	DISTANCE FROM HYDRANT TO SIAMESE CONNECTION/ BUILDING ENTRANCE

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CITY OF OTTAWA
TRINITY APARTMENTS

COVERAGE PLAN (BUILDING B)

SCALE	DATE	JOB	FIGURE
1 : 750 (0, 10, 20, 30)	JAN 2023	122179	COV-B

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	122179
Project Name:	Trinity Apartments
Date:	2/9/2023
Input By:	Curtis Ferguson, E.I.T.
Reviewed By:	Anthony Mestwarp, P.Eng

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG C)

Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
	Base Fire Flow					
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,828**	
	F	**Base fire flow without reductions**				**27,000**
		$F = 220\, C\, (A)^{0.5}$				
	Reductions or Surcharges					
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**22,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-11,475**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
			Cumulative Sub-Total		**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
			Cumulative Total		**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	**4,590**
		East Side	>30m		0%	
		South Side	3.1 - 10 m		20%	
		West Side	Sprinklered		0%	
			Cumulative Total		**20%**	
	Results					
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227

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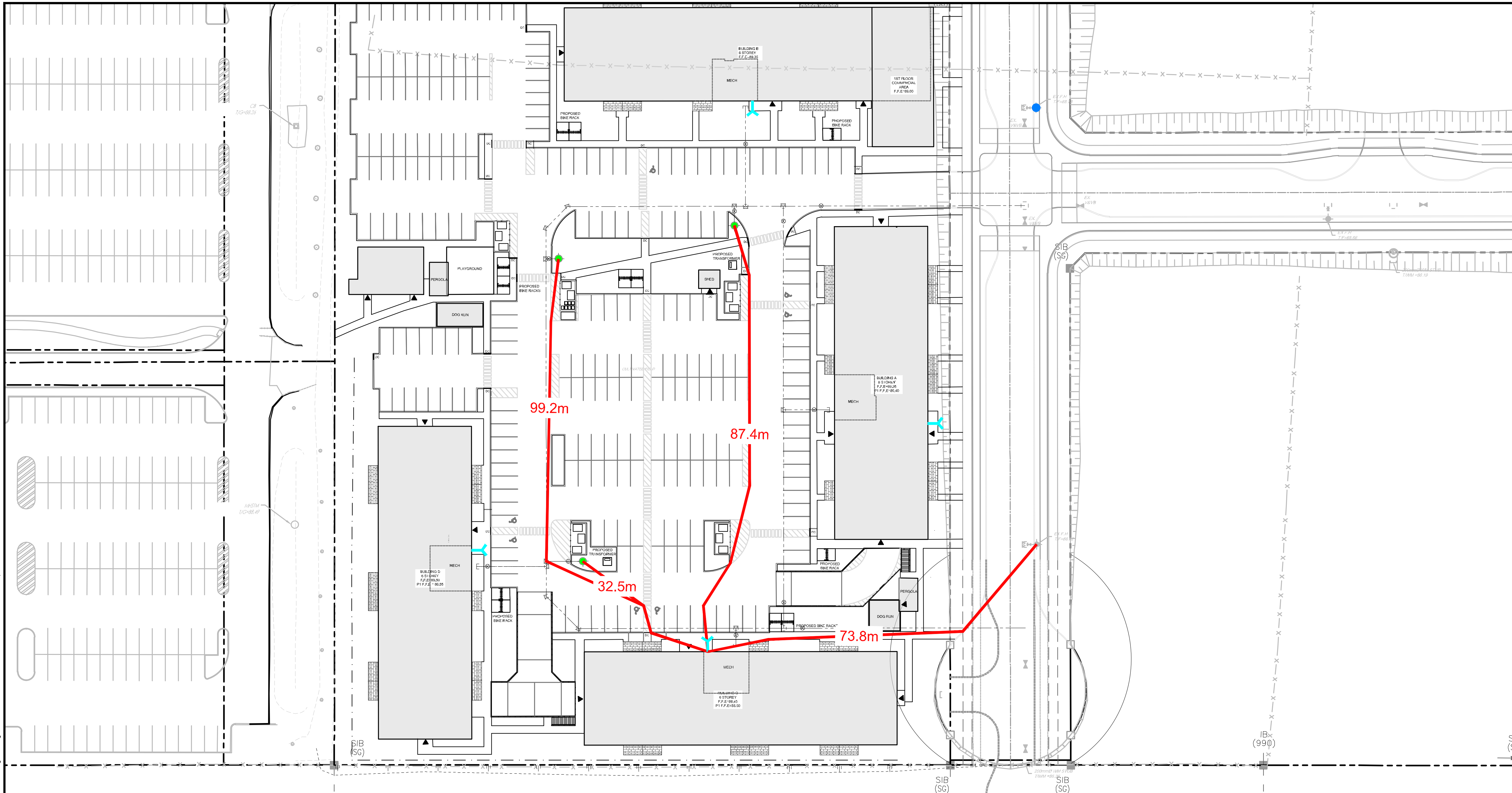

LEGEND

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

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CITY OF OTTAWA
TRINITY APARTMENTS

COVERAGE PLAN (BUILDING C)

SCALE 1 : 750

DATE JAN 2023 | JOB 122179 | FIGURE COV-C

SHT11X17.DWG - 279mmX432mm

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FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

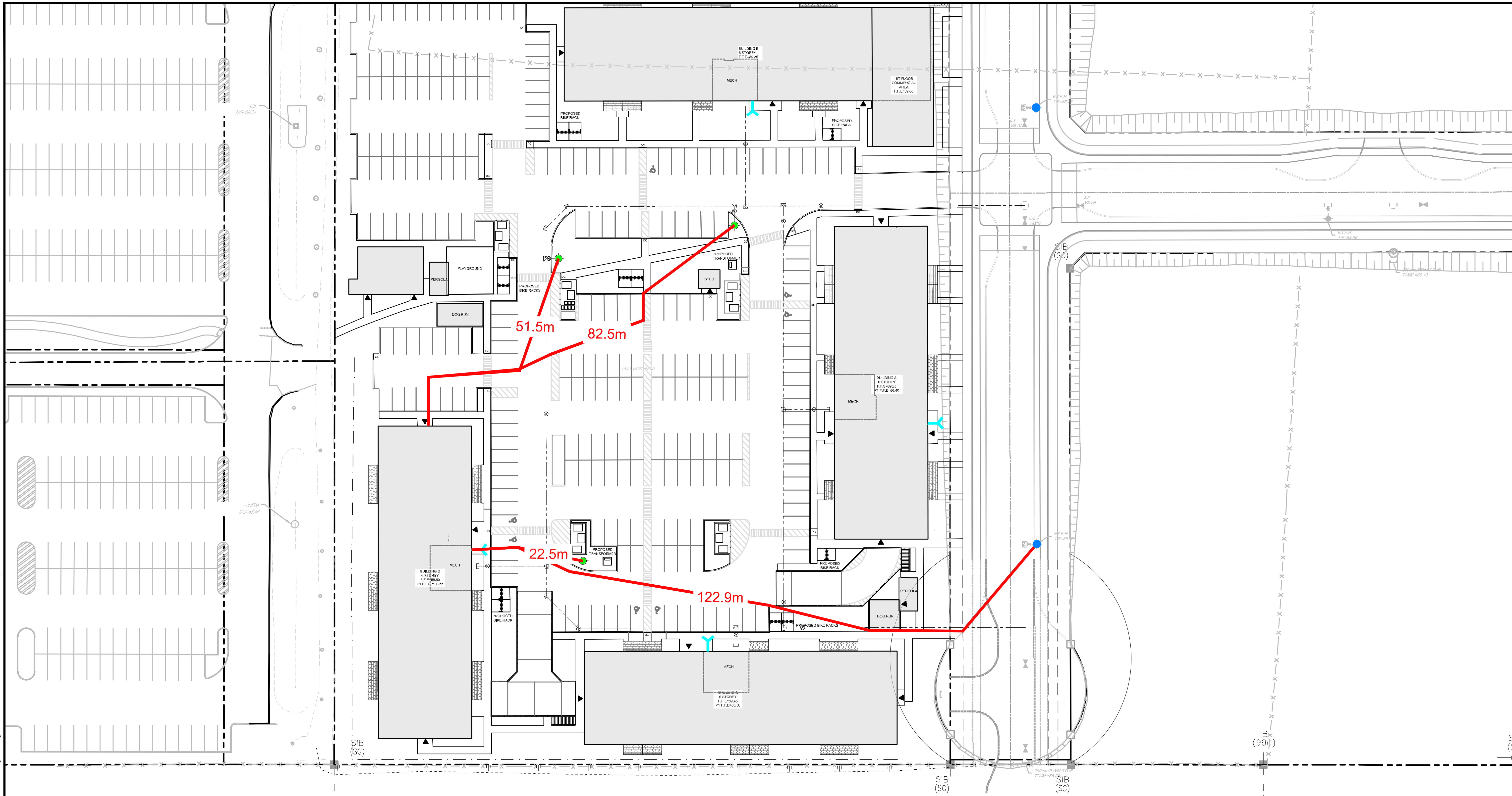
NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 122179
Project Name: Trinity Apartments
Date: 2/9/2023
Input By: Curtis Ferguson, E.I.T.
Reviewed By: Anthony Mestwarp, P.Eng

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG D)
Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,828**	
	F	**Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$				**27,000**
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**22,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-11,475**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	>30m		0%	**4,590**
		East Side	Sprinklered		0%	
		South Side	3.1 - 10 m		20%	
		West Side	>30m		0%	
				Cumulative Total	**20%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227



LEGEND

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

NOVATECH

Engineers, Planners & Landscape Architects

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

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

CITY OF OTTAWA
TRINITY APARTMENTS

COVERAGE PLAN
(BUILDING D)

SCALE			
1 : 750			
DATE	JOB	FIGURE	
JAN 2023	122179	COV-D	

SHT11X17.DWG - 279mmX432mm

M:\2022\122179\CAD\Civil\Figures\Hydraulic\122179-HYD SEP-Bldg-D.dwg, COV-D, Feb 06, 2023 - 11:35am, amestwarp

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401451
Project Name: Reseau Selection - Orleans
Date: 22/11/2018
Fire Flow Calculation #: 1
Description: Retirement Building

Notes: 2hr fire separations at each floor per OBC 3.2.2.48A

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Non-Combustible Construction						0.8	-
2	Determine Ground Floor Area of One Unit	-						3810	-
	Determine Number of Adjoining Units	-						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						1	-
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min						-	11000
5	Determine Occupancy Charge	Combustible						0%	11000
6	Determine Sprinkler Reduction	Conforms to NFPA 13						-30%	-5500
		Standard Water Supply						-10%	
		Fully Supervised						-10%	
		% Coverage of Sprinkler System						100%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	107	2	> 120	Wood Frame or Non-Combustible	10%	3850
		East	30.1 to 45	94.7	9	> 120	Wood Frame or Non-Combustible	5%	
		South	3.1 to 10	21	9	> 120	Wood Frame or Non-Combustible	20%	
		West	> 45	19	2	31-60	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							9000
		Total Required Fire Flow in L/s							150.0
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m^3)							1080

103-858 Bank Street
Ottawa, ON, K1S 3W3
P 613 567 8889
www.chmfire.ca

February 16, 2023

Seymour Pacific Developments Ltd.
100 St. Ann's Road
Campbell River, BC
V9W 4C4
Attn: Rachel Ricard

Re: Fire Water Flow Requirements for Trinity Crossing Apartments, located at 4200 Innes Road in Ottawa, Ontario

Dear Ms. Ricard,

As requested, CHM Fire Consultants (CHM) has developed an engineering opinion related to the application of the fire water flow calculation methodology for the proposed development at 4200 Innes Road in Ottawa, ON. The development includes four 6-storey residential buildings of combustible construction, called Buildings A, B, C, and D.

This letter is based on information provided to CHM by Seymour Pacific Developments Ltd., including drawings, calculations, and correspondence. The following documents were provided to CHM:

- Novatech. FUS – Fire Flow Calculations. Buildings A, B, C, and D. February 9, 2023. See Attachment A.
- Seymour Pacific Developments. Trinity Crossing Apartments. Architectural Plans and Elevations – Concept. Rev. A. January 27, 2023.
- Novatech. NFPA 13 Sprinkler Water Supply Requirements. February 13, 2023. See Attachment A.

We understand that the City of Ottawa is requesting that an available fire water flow be provided for the building in accordance with the Fire Underwriters Survey (FUS) methodology[1]. This letter discusses the fire water supply requirements and methodology for the buildings.

Background

The 2012 Ontario Building Code (OBC) is the applicable building code for the development at 4200 Innes Road. Unless otherwise noted, references to the OBC in this letter are to Division B.

This development includes four 6-storey residential buildings. The building areas are as follows (based on Drawing A1.00):

- Building A: 1,159 m^2
- Building B: 1,481 m^2
- Building C: 1,159 m^2
- Building D: 1,159 m^2

[1] Fire Underwriters Survey. Water Supply for Public Fire Protection. 1999.

The buildings are designed in accordance with the OBC Article 3.2.2.43A, *Group C, up to 6 storeys, combustible construction*. The general construction requirements are as follows:

- A sprinkler system is required,
- Combustible or noncombustible construction is permitted,
- Floor assemblies are required to be fire separations with a fire-resistance rating not less than 1 hour.
- Roof assemblies and mezzanines require a fire-resistance rating not less than 1 hour.
- Exits fire separations are required to be of noncombustible construction.
- Loadbearing walls, columns and arches require a fire-resistance rating not less than that of the supported assembly.

Novatech has calculated the fire water flow in accordance with the FUS methodology as well as the methodology of NFPA 13, *Standard for the Installation of Sprinkler Systems*. Their calculations resulted in the following fire flows:

- FUS - Building A: 233 L/s
- FUS - Building B: 250 L/s
- FUS - Building C: 267 L/s
- FUS - Building D: 267 L/s
- NFPA 13 – All buildings: 16 L/s

We understand that the available water supply is sufficient to provide a minimum of 267 L/s, as calculated using the FUS methodology.

It is CHM's opinion that the NFPA 13 methodology is applicable to these sprinklered buildings and a minimum fire water flow of 948 L/min (16 L/s) is applicable. However, in applying the FUS methodology, CHM agrees with the assumptions and methodology employed by Novatech in their calculations. This is discussed further in this letter.

Ontario Building Code (OBC) Requirements

Part 3 of the OBC applies to these buildings. The OBC Sentence 3.2.5.7.(1) requires that an adequate water supply for firefighting shall be provided for every building. The main text of the OBC, which makes up the required provisions, does not further define an adequate water supply. However, the Appendix note to this provision in Appendix A, which provides additional context and information, provides detailed information on application of the requirement, including provisions for buildings not requiring an on-site water supply, sprinklered buildings, and an equation used to calculate an adequate water supply for buildings that are not sprinklered and require an adequate water supply. For sprinklered buildings, the Appendix note states:

> *For sprinklered buildings, water supply additional to that required by the sprinkler systems should be provided for firefighting using fire hoses in accordance with the hose stream demands and water supply durations for different hazard classifications as specified in NFPA 13, "Installation of Sprinkler Systems".*

This clearly indicates that the water supply for sprinklered buildings should be based on the methodology of NFPA 13. NFPA 13's water supply calculations include hose stream demands for firefighters in addition to the water usage of the sprinkler system.

Ontario Fire Marshal Guideline
The Ontario Office of the Fire Marshal (OFM) has published a guideline for determining adequate fire water supply for buildings in Ontario[2]. This Guideline provides more information and context for fire water supply. For sprinklered buildings, the OFM also refers to NFPA 13 to obtain sprinkler and hose stream water requirements.

The OFM Guideline discusses the FUS methodology in two locations:

- Under Section 9.6, it indicates "For new buildings that present a special hazard to a community as a result of their size, occupancy or economic importance, the Fire Underwriters Survey Guide should be used to determine suitable water supply and hydrant siting."
- Section 5.0 addresses buildings in which a fire may have a significant adverse environmental impact. This section specifically cites buildings used for the storage or processing of chemicals or materials. If such a building is unsprinklered, the Guideline notes that other recognized fire protection guidelines (such as FUS) may be used to determine the fire water supply needs and that the Chief Building Official or Chief Fire Official should evaluate these cases on an individual basis.

Based on this, it is clear that the use of a methodology outside of the NFPA 13 for sprinklered buildings should be saved for special conditions that either create a special hazard to the community or the environment.

CHM agrees with the OFM's guidance. It is considered appropriate to use the NFPA 13 methodology for these sprinklered buildings. It is not considered necessary or appropriate to apply the FUS methodology on this site.

FUS Methodology
The FUS methodology contains a process to obtain the required fire water flow. The methodology takes into account various factors, including construction type, building size, combustible contents, sprinkler protection, and exposure to adjacent buildings.

In addition, FUS has authored a document titled *Fire Underwriters Survey: A Guide to Recommended Practice in Canada*[3]. This document provides additional guidance on how the methodology is intended to be applied in the context of Canadian building codes and provides various clarifications that more closely align to Codes in Canada. The Preface of this document indicates the following:

> *Part 2 of the document provides guidance in calculating Required Fire Flows for buildings in a community that are then used in the community risk assessment and corresponding review of the fire department and water distribution system for fire insurance grading purposes.*

---

[2] Office of the Fire Marshal. Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code. OFM-TG-03-1999. October 1999.

[3] Fire Underwriters Survey. Water Supply for Public Fire Protection: A Guide to Recommended Practice in Canada. 2020. Available online: https://fireunderwriters.ca/assets/img/Water%20Supply%20for%20Public%20Fire%20Protection%20in%20Canada%202020.pdf

Based on this, the FUS methodology is intended for use in planning for a community/development rather than for use on an individual building basis. Although it can be used for an individual building, as the OFM Guideline infers, this should be only in cases where there are special hazards.

The OBC does not reference the FUS methodology for fire flow for buildings. The FUS methodology is generally understood to result in very high fire water flow requirements, resulting in much more onerous requirements when compared to all other codes and standards including the OBC and NFPA 13, which applies to sprinklered buildings.

Nevertheless, Novatech has calculated fire water flow in accordance with the FUS methodology for these buildings. Novatech used the 2020 FUS guide for practice in Canada, which is considered appropriate. The following discussion is with respect to the specific use of the FUS methodology.

The first step in the FUS methodology is to calculate the initial fire flow in Litres per minute, as follows:

$$F = 220C\sqrt{A}$$

Where:
F = the required fire flow in Litre per minute.
C = coefficient related to the type of construction, and
A = total floor area in square metres

The fire flow is then modified by three factors, as follows:

1. The Contents Adjustment Factor,
2. The Automatic Sprinkler Protection Factor, and
3. The Exposure Adjustment Charge.

Each of these elements is discussed below.

Construction Coefficient, C
A construction coefficient, C, is to be applied to the building. FUS provides a number of construction coefficients for various construction types. The highest value is 1.5 for wood-frame construction. Novatech has used 1.5 for their calculations, which is considered appropriate.

Total Effective Area
For a building with a construction coefficient of 1.5, the FUS guide requires the Total Effective Area of the building to include 100% of all Floor Areas, except for basements.

The FUS methodology does not define Floor Area. The OBC defines floor area as follows:

> *Floor area means the space on any storey of a building between exterior walls and required firewalls, including the space occupied by interior walls and partitions, but not including exits, vertical service spaces and their enclosing assemblies.*

This definition is considered appropriate to use for the FUS calculations. Novatech has applied this definition in determination of the Total Effective Areas for the buildings.

Occupancy and Contents Adjustment Factor
For the Occupancy and Contents Adjustment Factor, the FUS guide identifies a reduction of 15% for residential occupancies. Novatech has applied this value in their calculations.

Automatic Sprinkler Protection Factor
The FUS methodology allows for up to a 50% reduction in water supply for automatic sprinkler protection. This is split up as follows:

- 30% for a system designed in accordance with NFPA 13.
- 10% if the water supply is standard for both the sprinkler system and the fire department hose lines.
- 10% for a fully supervised system.

The sprinkler system will be designed in accordance with NFPA 13, as required by the OBC. The system design will include an allowance for fire department hose lines and the system will be fully supervised. As such, the full 50% reduction for the sprinkler system applies to this building.

Exposure Adjustment Charge
This factor is intended to address the risk of fire spread between buildings in consideration of the locations and features of adjacent buildings up to 30 m from the building. A factor is to be applied on each side depending on various details of the adjacent building such as height, area, construction, openings, sprinklering, and occupancy, up to a total maximum of 75% for the entire building.
Refer to Attachment B for a site plan indicating exposure distances.

In accordance with the FUS Guidelines, if both the subject building and the exposed building are sprinklered, no Exposure Adjustment Charge should be applied between buildings. As such, as all buildings on site are sprinklered, no Exposure Adjustment Charge is applied between them.

On the sides of buildings where they abut a property line, in the case where information on the adjacent buildings is unavailable, it is logical to use the property line as the exposure distance, although this approach is considered conservative for this site as no buildings, particularly unsprinklered buildings, would be constructed directly on the property line. Nevertheless, this approach has been taken on the west, south, and east sides of the site, and is considered appropriate for the site.

On the north side of this site is a future retirement home. The 10-storey retirement home, known as Reseau Selections (City of Ottawa No. D07-12-18-0179), will be Phase 2 of construction on the site. The OBC requires any retirement home to be sprinklered, as well as any 10-storey building. As such, it is reasonable to assume the building will be sprinklered, and as such, Novatech has not applied an Exposure Adjustment Charge to the north side. This approach is considered appropriate.

Conclusion
Based on the discussion in this letter, it is our opinion that the application of the FUS methodology for required fire flow is not appropriate to apply to the Trinity Crossing Apartments site as all buildings are sprinklered. In our opinion, the NFPA 13 required fire flow of 16 L/s applies. Nevertheless, Novatech has carried out FUS calculations and has calculated a fire flow using this methodology of 267 L/s. We understand that the available infrastructure is sufficient to provide 267 L/s. As such, the available fire water flow to the site is considered adequate.

If you have any questions or comments, please do not hesitate to contact the undersigned.

Yours truly,

LICENSED PROFESSIONAL ENGINEER
Feb. 16, 2023
R. MICHELS
100155995
PROVINCE OF ONTARIO

Richard Michels, P.Eng.
Fire Safety Engineer

Reviewed by:

Steven Craft, Ph.D., P.Eng.
Principal

Disclaimer

This letter is issued only to Doyle Homes Ltd. (client) to be used as supporting documentation in deliberations with the City of Ottawa for the application of fire flow calculations to the Trinity Crossing Apartments, located at 4200 Innes Road in Ottawa, Ontario, and shall not be relied upon, without prior written authorization from CHM, by any other party or in conjunction with any other project. CHM Fire Consultants Ltd. does not assume the responsibility of a designer and does not assume responsibility for any latent inaccuracies in documentation provided by others.

Trinity Crossing Apartments
Fire Water Flow Requirements

Attachment A
Fire Water Flow Calculations (by Novatech)

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	122179
Project Name:	Trinity Apartments
Date:	2/9/2023
Input By:	Curtis Ferguson, E.I.T.
Reviewed By:	Anthony Mestwarp, P.Eng

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG A-South)

Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,828**	
	F	**Base fire flow without reductions**				**27,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	22,950
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	-11,475
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	2,295
		East Side	20.1 - 30 m		10%	
		South Side	Sprinklered		0%	
		West Side	>30m		0%	
				Cumulative Total	**10%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**14,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**233**
				or	USGPM	3,699

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

Novatech Project #: 122179
Project Name: Trinity Apartments
Date: 2/1/2023
Input By: Curtis Ferguson, E.I.T.
Reviewed By: Anthony Mestwarp, P.Eng

Legend	
	Input by User
	No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG B)
Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Podium Footprint (m^2)	1432.34			
		Total Floors/Storeys (Podium)	1			
		Tower Footprint (m^2)	1328.14			
		Total Floors/Storeys (Tower)	5			
		Area of structure considered (m^2)			**8,073**	
	F	**Base fire flow without reductions** $F = 220\ C\ (A)^{0.5}$				**30,000**
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**25,500**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-12,750**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	8073	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	**2,550**
		East Side	20.1 - 30 m		10%	
		South Side	Sprinklered		0%	
		West Side	>30m		0%	
				Cumulative Total	**10%**	
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

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	122179		
Project Name:	Trinity Apartments		
Date:	2/9/2023	Legend	Input by User
Input By:	Curtis Ferguson, E.I.T.		No Information or Input Required
Reviewed By:	Anthony Mestwarp, P.Eng		

Building Description: 6 Storey Residential Apartment (BLDG C)

Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			**6,828**	
	F	**Base fire flow without reductions**				**27,000**
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	**22,950**
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-11,475**
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	Sprinklered		0%	**4,590**
		East Side	>30m		0%	
		South Side	3.1 - 10 m		20%	
		West Side	Sprinklered		0%	
				Cumulative Total	**20%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227

M:\2022\122179\DATA\Calculations\Water\122179-FUSv3-4-BLDG C.xlsx

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

Engineers, Planners & Landscape Architects

Novatech Project #:	122179
Project Name:	Trinity Apartments
Date:	2/9/2023
Input By:	Curtis Ferguson, E.I.T.
Reviewed By:	Anthony Mestwarp, P.Eng

Legend: Input by User; No Information or Input Required

Building Description: 6 Storey Residential Apartment (BLDG D)

Type V - Wood frame

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5	1.5	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	1138			
		Number of Floors/Storeys	6			
		Area of structure considered (m^2)			6,828	
	F	**Base fire flow without reductions**				27,000
		$F = 220\ C\ (A)^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**		**FUS Table 3**	**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	-15%	22,950
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction**		**FUS Table 4**	**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	-11,475
		Standard Water Supply	Yes	-10%	-10%	
		Fully Supervised System	Yes	-10%	-10%	
				Cumulative Sub-Total	**-50%**	
		Area of Sprinklered Coverage (m²)	6,828	100%		
				Cumulative Total	**-50%**	
5	**Exposure Surcharge**		**FUS Table 5**		**Surcharge**	
	(3)	North Side	>30m		0%	4,590
		East Side	Sprinklered		0%	
		South Side	3.1 - 10 m		20%	
		West Side	>30m		0%	
				Cumulative Total	**20%**	
Results						
6	(1) + (2) + (3)	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**16,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**267**
				or	USGPM	4,227

NOVATECH #122179
February 13, 2023
A.McAuley

NFPA 13-2013
Sprinkler Water Supply Requirements

Sprinklers: 569L/min
Hose Stream: 379L/min
Total = 948L/min

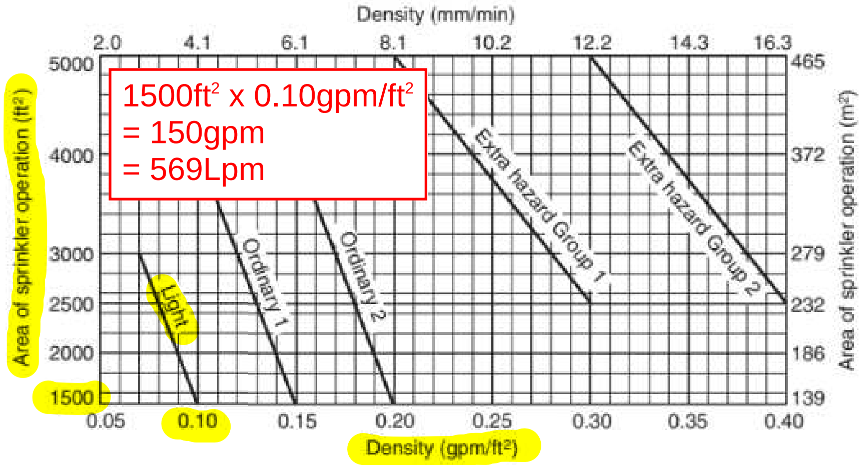


FIGURE 11.2.3.1.1 Density/Area Curves.

(2) The room that creates the greatest demand in accordance with the room design method of 11.2.3.3
(3) Special design areas in accordance with 11.2.3.4

11.2.3.1.2 The minimum water supply shall be available for the minimum duration specified in Table 11.2.3.1.2.

11.2.3.1.3 The lower duration values in Table 11.2.3.1.2 shall be permitted where the sprinkler system waterflow alarm device(s) and supervisory device(s) are electrically supervised and such supervision is monitored at an approved, constantly attended location.

11.2.3.1.4 Restrictions. When either the density/area method or room design method is used, the following shall apply:

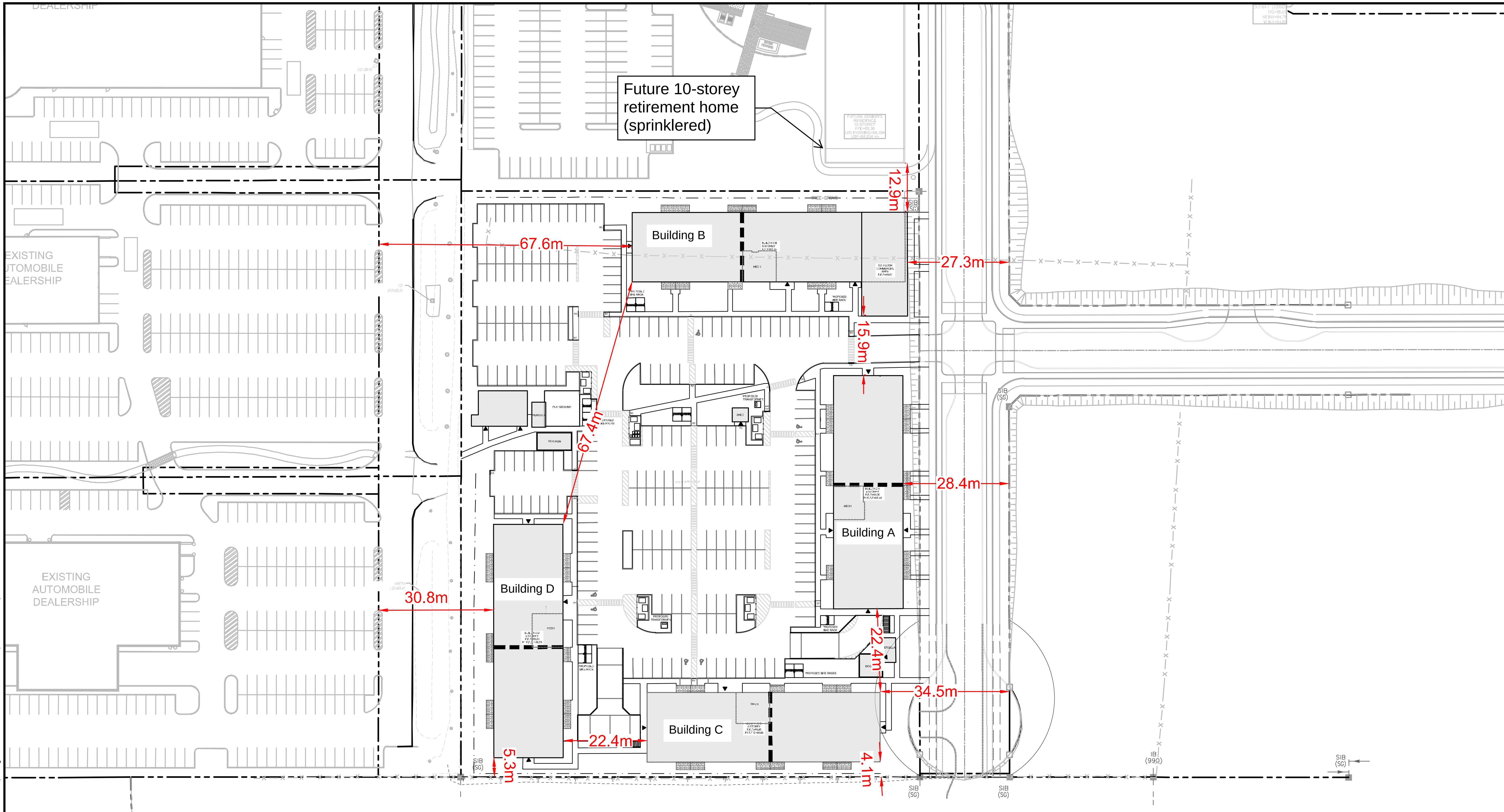
(1)*For areas of sprinkler operation less than 1500 ft² (139 m²) used for light and ordinary hazard occupancies, the density for 1500 ft² (139 m²) shall be used.
(2) For areas of sprinkler operation less than 2500 ft² (232 m²) for extra hazard occupancies, the density for 2500 ft² (232 m²) shall be used.
(3)*Unless the requirements of 11.2.3.1.4(4) are met for buildings having unsprinklered combustible concealed spaces, as described in 8.15.1.2 and 8.15.6, the minimum area of sprinkler operation for that portion of the building shall be 3000 ft² (279 m²). The design area of 3000 ft² (279 m²) shall be applied only to the sprinkler system or portions of the sprinkler system that are adjacent to the qualifying combustible concealed space. The term *adjacent* shall apply to any sprinkler system protecting a space above, below, or next to the qualifying concealed space except where a barrier with a fire resistance rating at least equivalent to the water supply duration completely separates the concealed space from the sprinklered area.
(4) The following unsprinklered concealed spaces shall not require a minimum area of sprinkler operation of 3000 ft² (279 m²):
  (a) Noncombustible and limited-combustible concealed spaces with minimal combustible loading having no access. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
  (b) Noncombustible and limited-combustible concealed spaces with limited access and not permitting occupancy or storage of combustibles. The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.
  (c) Combustible concealed spaces filled entirely with noncombustible insulation.
  (d)*Light or ordinary hazard occupancies where noncombustible or limited-combustible ceilings are directly attached to the bottom of solid wood joists or solid limited-combustible construction or noncombustible construction so as to create enclosed joist spaces 160 ft³ (4.5 m³) or less in volume, including space below insulation that is laid directly on top or within the ceiling joists in an otherwise sprinklered concealed space.
  (e) Concealed spaces where rigid materials are used and the exposed surfaces have a flame spread index of 25 or less and the materials have been demonstrated to not propagate fire more than 10.5 ft (3.2 m) when tested in accordance with ASTM E 84, *Standard Test Method of Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, extended for an additional 20 minutes in the form in which they are installed in the space.

Table 11.2.3.1.2 Hose Stream Allowance and Water Supply Duration Requirements for Hydraulically Calculated Systems

Occupancy	Inside Hose gpm	Inside Hose L/min	Total Combined Inside and Outside Hose gpm	Total Combined Inside and Outside Hose L/min	Duration (minutes)
Light hazard	0, 50, or 100	0, 189, or 379	100	379	30
Ordinary hazard	0, 50, or 100	0, 189, or 379	250	946	60–90
Extra hazard	0, 50, or 100	0, 189, or 379	500	1893	90–120

Trinity Crossing Apartments
Fire Water Flow Requirements

Attachment B
Site Plan



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NOVATECH
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CITY OF OTTAWA
TRINITY APARTMENTS

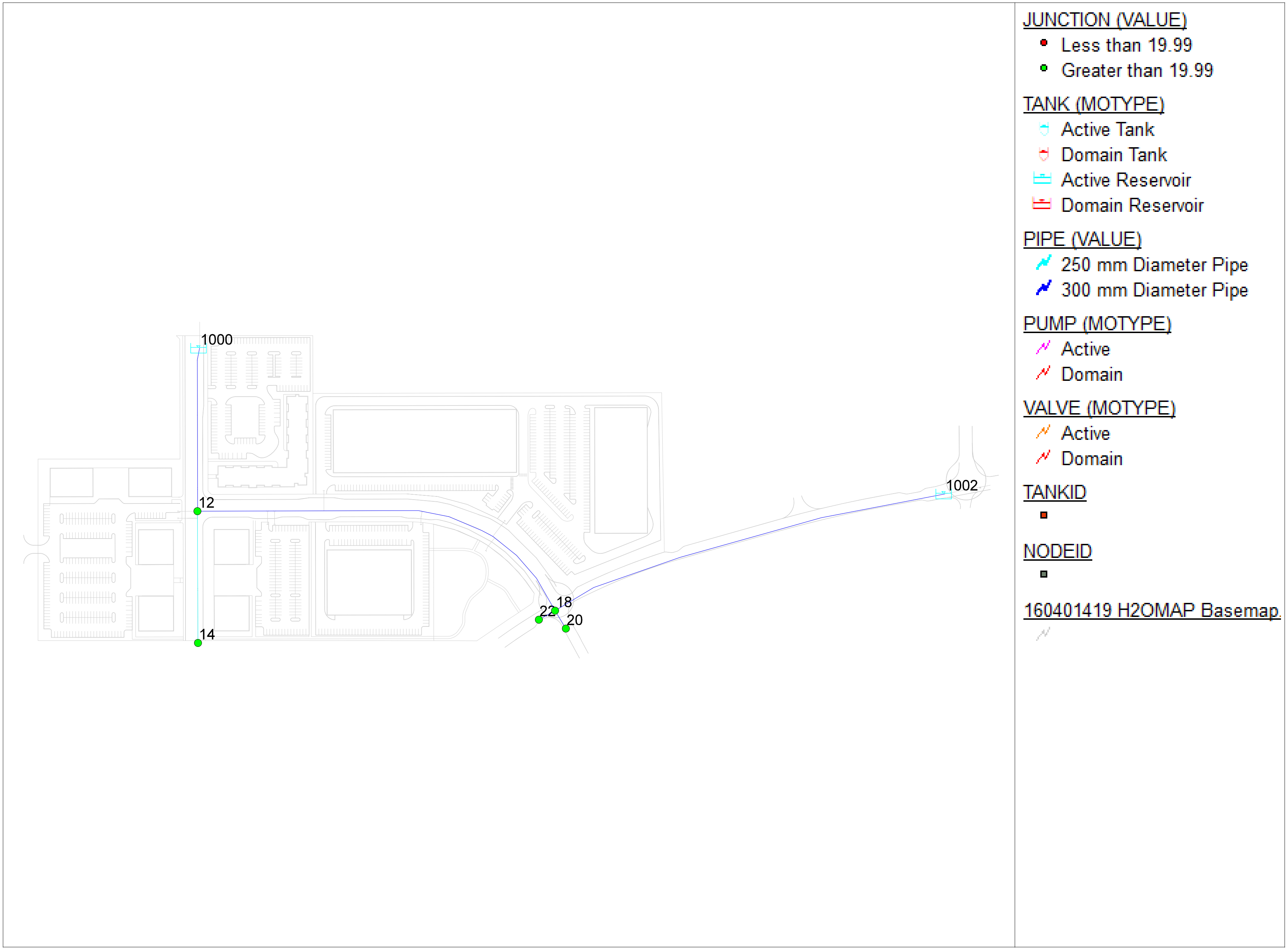
FUS SEPARATION

SCALE 1 : 1000

DATE	JOB	FIGURE
JAN 2023	122179	FUS

SHT11X17.DWG - 279mmX432mm

H2OMAP Hydraulic Analysis - Node and Tank Identification

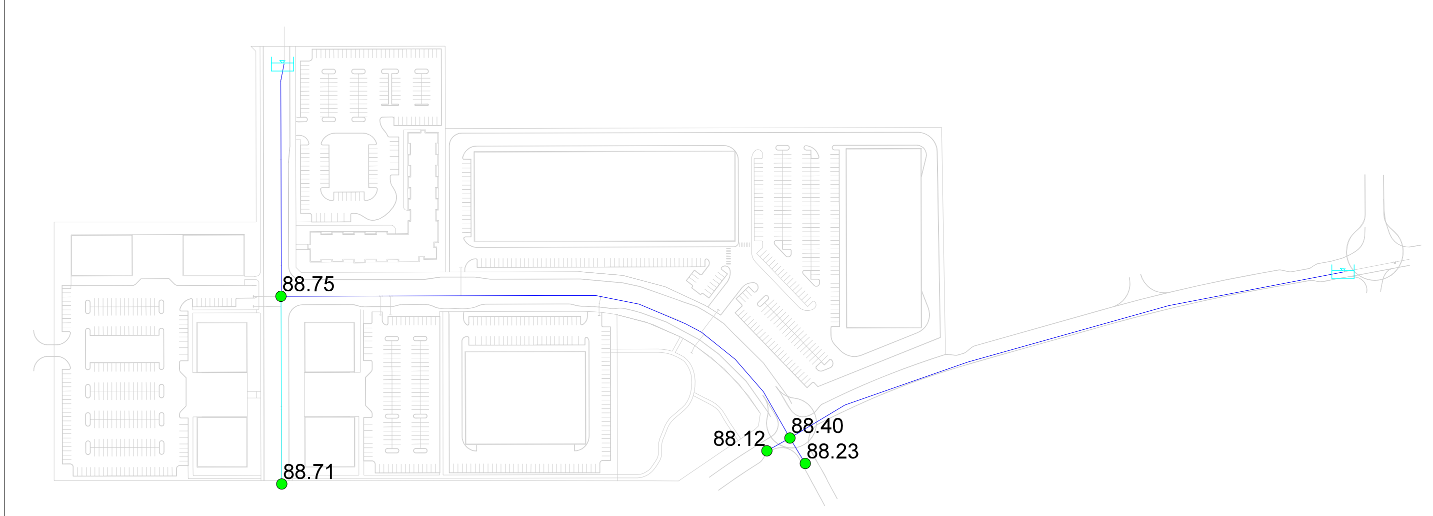


Prepared By: Peter Mott

Node and Tank ID

Date: Thursday, May 12, 2022

H2OMAP Hydraulic Analysis - Node Elevations



JUNCTION (VALUE)
- Less than 19.99
- Greater than 19.99

TANK (MOTYPE)
- Active Tank
- Domain Tank
- Active Reservoir
- Domain Reservoir

PIPE (VALUE)
- 250 mm Diameter Pipe
- 300 mm Diameter Pipe

PUMP (MOTYPE)
- Active
- Domain

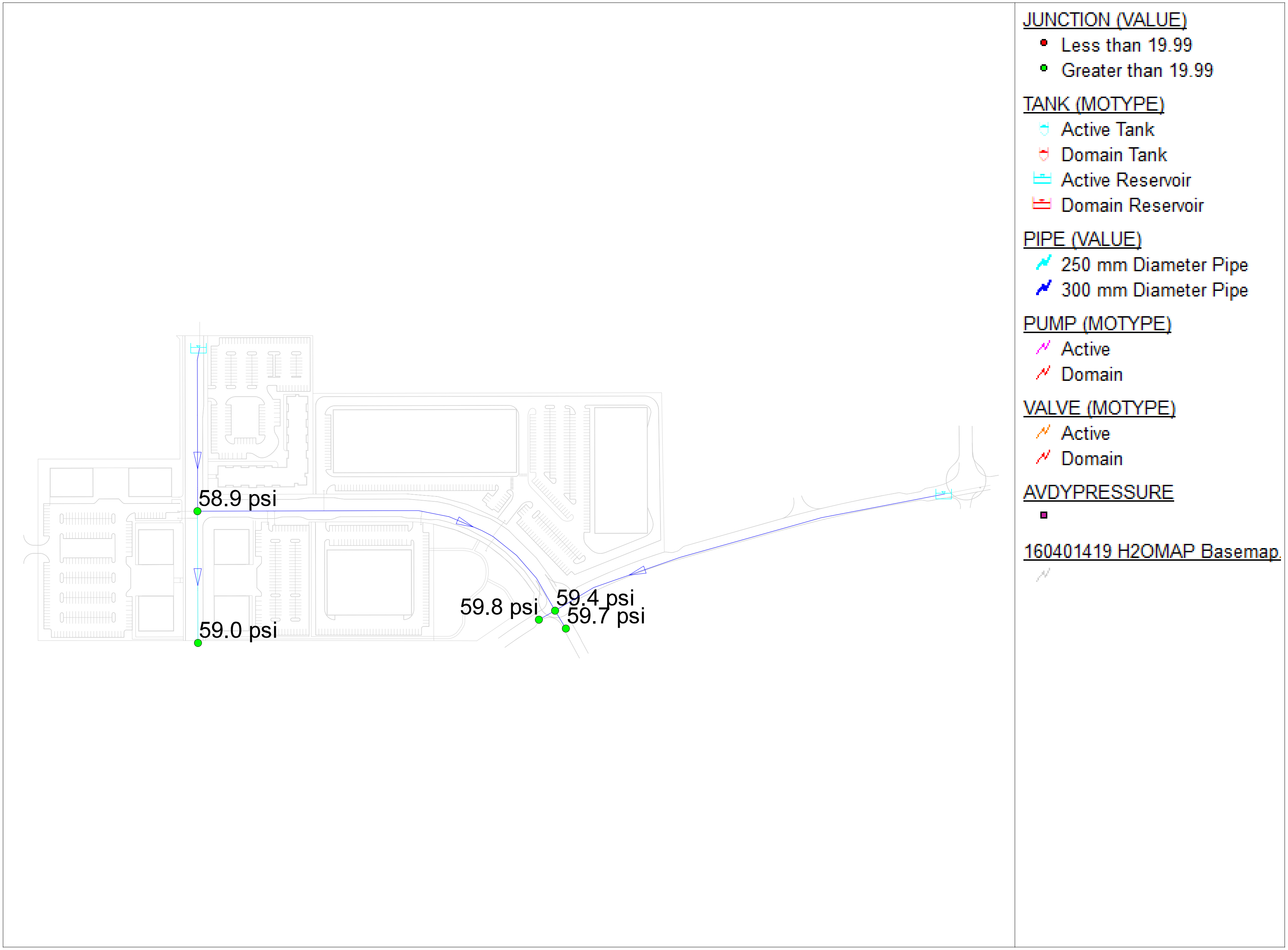
VALVE (MOTYPE)
- Active
- Domain

NODEELEVATIONS

160401419 H2OMAP Basemap

Prepared By: Peter Mott | Node Elevations in Meters | Date: Thursday, May 12, 2022

H2OMAP Hydraulic Analysis - AVDY Watermain Zone Configuration

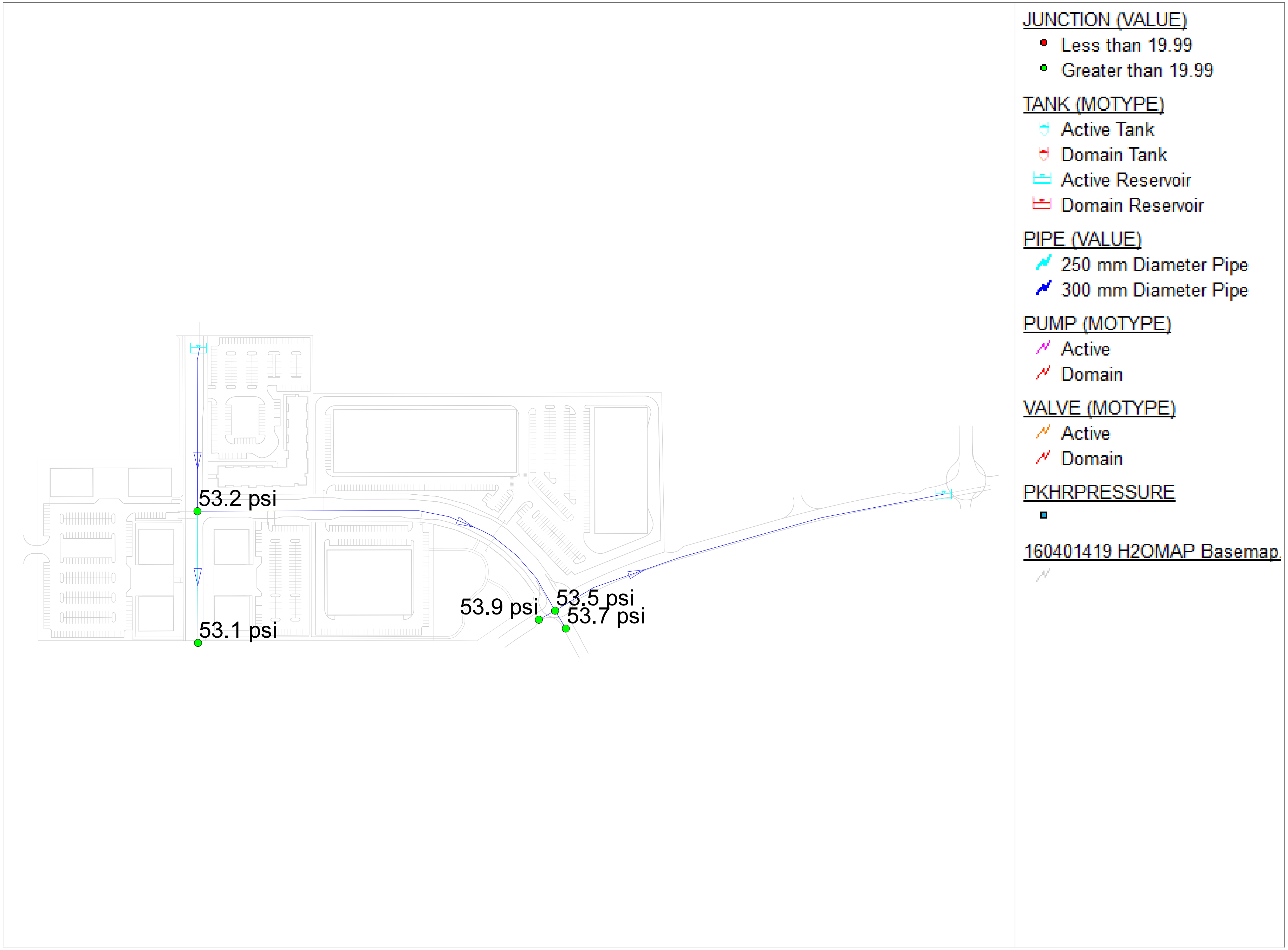


Prepared By: Peter Mott

Residual Pressure in PSI

Date: Thursday, May 12, 2022

H2OMAP Hydraulic Analysis - PKHR Watermain Zone Configuration

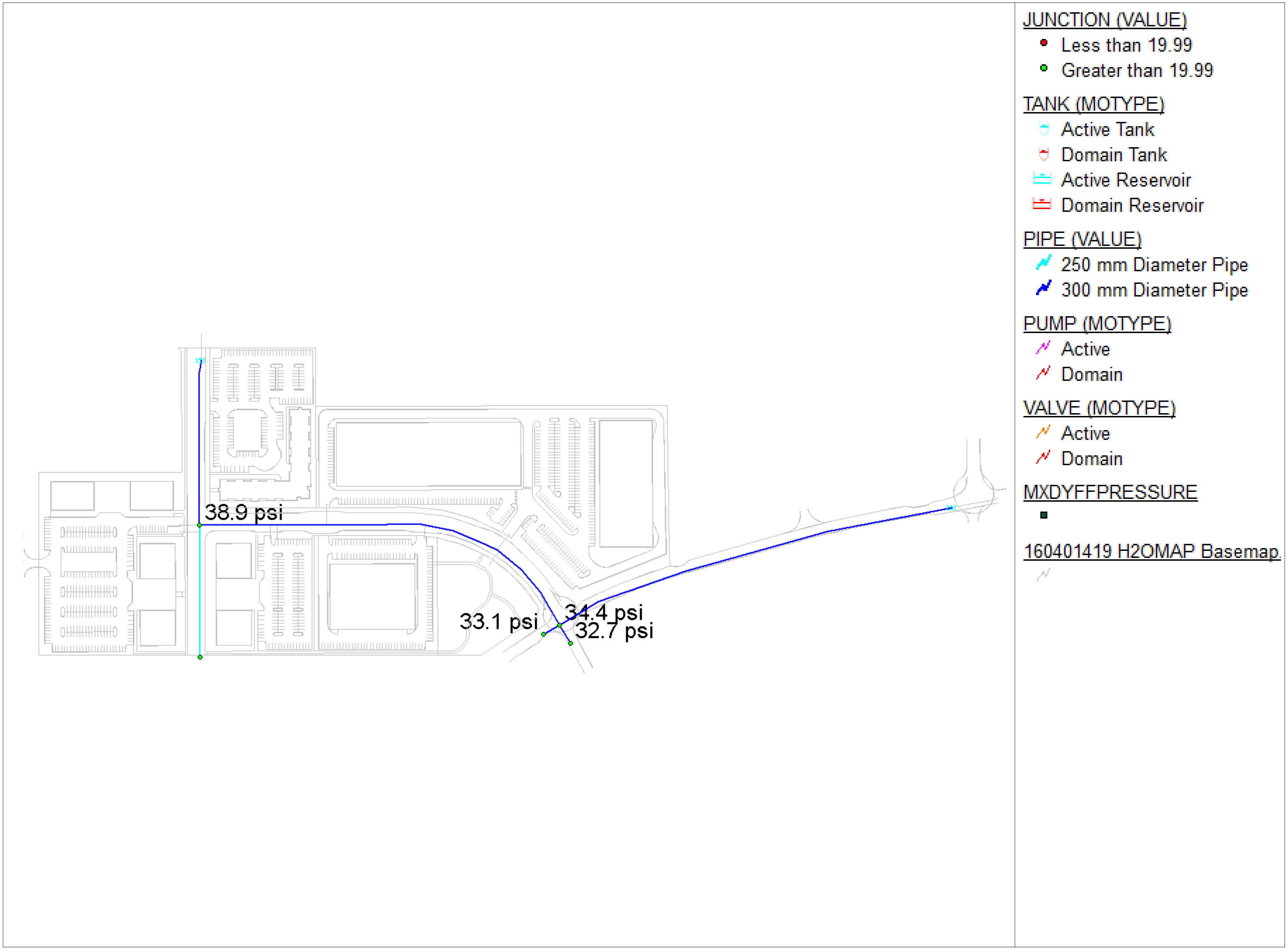


Prepared By: Peter Mott

Residual Pressure in PSI

Date: Thursday, May 12, 2022

H2OMAP Hydraulic Analysis - MXDY+FF Watermain Zone Configuration

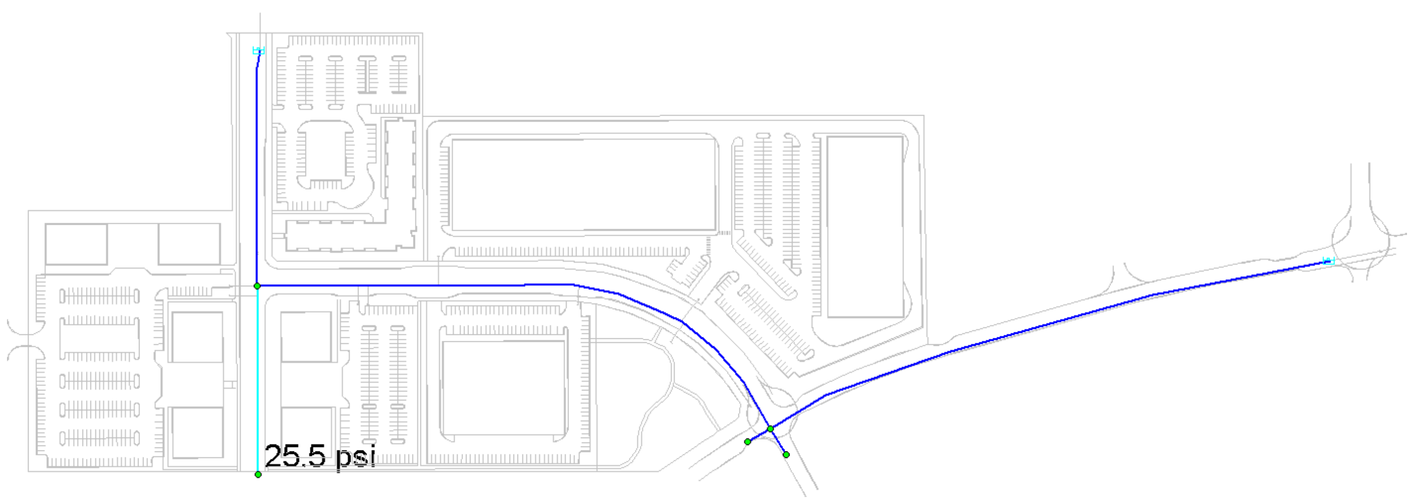


Prepared By: Peter Mott

Residual Pressure in PSI

Date: Thursday, May 12, 2022

H2OMAP Hydraulic Analysis - MXDY+FF Watermain Zone Configuration



JUNCTION (VALUE)
- Less than 19.99
- Greater than 19.99

TANK (MOTYPE)
- Active Tank
- Domain Tank
- Active Reservoir
- Domain Reservoir

PIPE (VALUE)
- 250 mm Diameter Pipe
- 300 mm Diameter Pipe

PUMP (MOTYPE)
- Active
- Domain

VALVE (MOTYPE)
- Active
- Domain

MXDYAVFLOW

160401419 H2OMAP Basemap

Prepared By: Peter Mott

Average Available Flow in L/s

Date: Thursday, May 12, 2022

Model last revised on 2022-07-27

Hydraulic Model Results – Average Day Demand (AVDY)

Junction Results

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	Pressure (kPa)
12	2.38	88.75	130.19	58.92	406.2
14	3.21	88.71	130.19	58.97	406.6
18	3.53	88.40	130.19	59.41	409.6
20	0	88.23	130.19	59.66	411.3
22	0	88.12	130.19	59.81	412.4

Pipe Results

From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
18	20	18.05	297	120	0.00	0.00
12	18	343.39	297	120	0.08	0.00
18	22	16.08	297	120	0	0.00
12	14	113.52	204	110	3.21	0.10
18	1002	352.51	297	120	3.45	0.05
1000	12	140.78	297	120	5.67	0.08

Model last revised on 2022-07-27

Hydraulic Model Results – Peak Hour Demand (PKHR)

Junction Results

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)	Pressure (kPa)
12	13.09	88.75	126.2	53.20	366.80
14	17.65	88.71	126.1	53.12	366.25
18	14.43	88.4	126.0	53.48	368.73
20	0	88.23	126.0	53.72	370.39
22	0	88.12	126.0	53.88	371.49

Pipe Results

From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)
18	20	18.05	297	120.00	0.00	0.00
12	18	343.39	297	120.00	21.25	0.31
18	22	16.08	297	120.00	0.00	0.00
12	14	113.52	204	110.00	17.65	0.54
18	1002	352.51	297	120.00	6.83	0.10
1000	12	140.78	297	120.00	51.99	0.75

Model last revised on 2022-07-27

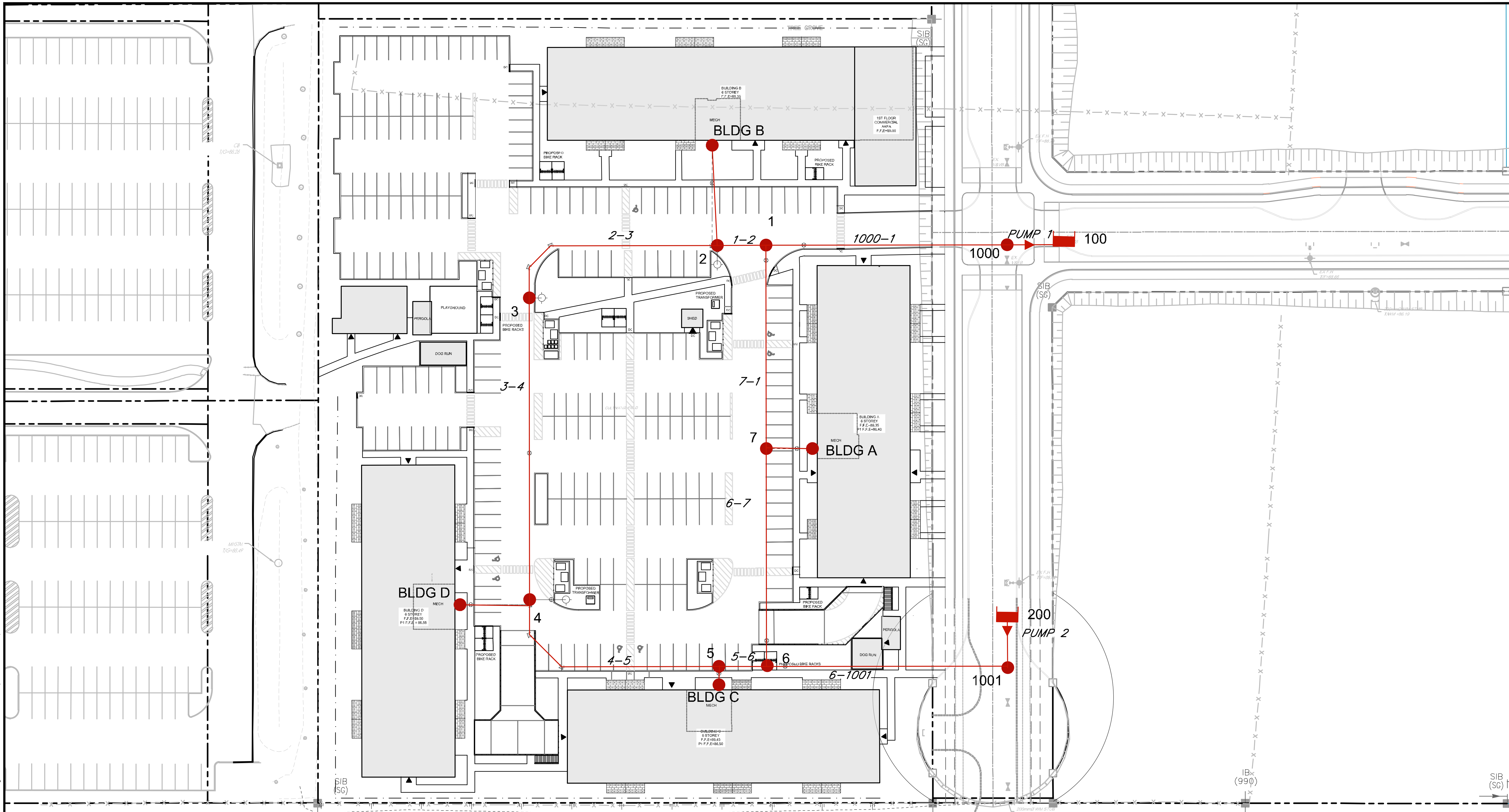
Hydraulic Model Results – Maximum Day Demand + Fire Flow

<u>MXDY + FF (333 L/s)</u>

ID	Static Demand	Static Pressure		Static Head	Fire-Flow Demand	Residual Pressure		Available Flow at Hydrant	Available Flow Pressure	
	(L/s)	(psi)	(kPa)	(m)	(L/s)	(psi)	(kPa)	(L/s)	(psi)	(kPa)
12	5.95	47.49	327.43	122.15	333	38.89	268.14	653.59	20	137.9
18	7.05	46.46	320.33	121.08	333	34.36	236.90	516.64	20	137.9
20	0	46.7	321.99	121.08	333	32.73	225.67	473.56	20	137.9
22	0	46.85	323.02	121.08	333	33.09	228.15	478.88	20	137.9

<u>MXDY + FF (167 L/s)</u>

ID	Static Demand	Static Pressure		Static Head	Fire-Flow Demand	Residual Pressure		Available Flow at Hydrant	Available Flow Pressure	
	(L/s)	(psi)	(kPa)	(m)	(L/s)	(psi)	(kPa)	(L/s)	(psi)	(kPa)
14	8.02	54.08	372.87	126.75	167	25.55	176.16	192.68	20	137.9



LEGEND

5–4	200mmØ WATERMAIN PIPE
4 ●	WATERMAIN NODE
400	RESERVOIR

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

CITY OF OTTAWA
TRINITY APARTMENTS

WATERMAIN LAYOUT PLAN

SCALE	DATE	JOB	FIGURE
1 : 750	FEB 2023	122179	EPA

SHT11X17.DWG - 279mmX432mm

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**********************************************************************
*                          E P A N E T                               *
*                  Hydraulic and Water Quality                       *
*                  Analysis for Pipe Networks                        *
*                         Version 2.2                                *
**********************************************************************
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm	
1000-1	1000	1	48.13	204	
1-2	1	2	9.75	204	
2-3	2	3	45.44	204	
3-4	3	4	60.26	204	
4-5	4	5	47.59	204	
5-6	5	6	9.35	204	
6-7	6	7	43.49	204	
7-1	7	1	40.60	204	
6-1001	6	1001	48.13	204	
BLDGB-2	BLDGB	2	20.12	204	
BLDGA-7	BLDGA	7	9.17	204	
BLDGC-5	5	BLDGC	3.81	204	
BLDGD-4	BLDGD	4	13.91	204	
PUMP1	100	1000	#N/A	#N/A	Pump
PUMP2	200	1001	#N/A	#N/A	Pump

Node Results (AVERAGE DAY):

Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	0.00	126.66	38.05	0.00	
1001	0.00	126.66	38.06	0.00	Maximum System Pressure
1	0.00	126.66	37.94	0.00	
2	0.00	126.66	37.89	0.00	
3	0.00	126.66	37.66	0.00	
4	0.00	126.66	37.58	0.00	
5	0.00	126.66	37.54	0.00	
6	0.00	126.66	37.37	0.00	
7	0.00	126.66	37.79	0.00	
BLDGA	0.49	126.66	37.31	0.00	
BLDGB	0.68	126.66	37.31	0.00	
BLDGC	0.49	126.66	37.21	0.00	
BLDGD	0.49	126.66	37.16	0.00	
100	0.00	88.76	0.00	0.00	Reservoir
200	-2.15	88.73	0.00	0.00	Reservoir

```
*********************************************************************
 *                             E P A N E T                          *
 *                   Hydraulic and Water Quality                     *
 *                   Analysis for Pipe Networks                      *
 *                         Version 2.2                               *
 *********************************************************************
```

Link Results (AVERAGE DAY):

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1000-1	0.00	0.00	0.00	Open
1-2	0.44	0.01	0.00	Open
2-3	-0.24	0.01	0.00	Open
3-4	-0.24	0.01	0.00	Open
4-5	-0.73	0.02	0.01	Open
5-6	-1.22	0.04	0.02	Open
6-7	0.93	0.03	0.01	Open
7-1	0.44	0.01	0.00	Open
6-1001	-2.15	0.07	0.05	Open
BLDGB-2	-0.68	0.02	0.01	Open
BLDGA-7	-0.49	0.01	0.00	Open
BLDGC-5	0.49	0.01	0.00	Open
BLDGD-4	-0.49	0.01	0.00	Open
PUMP1	0.00	0.00	0.00	Closed Pump
PUMP2	2.15	0.00	-37.93	Open Pump

```
**********************************************************************
*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.2                                *
**********************************************************************
```

Node Results (Max Day + Fire Flow - Building A - 233 L/s):

Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	95.00	120.46	31.85	0.00	
1001	95.00	118.83	30.23	0.00	
1	0.00	119.15	30.43	0.00	
2	43.00	118.93	30.16	0.00	
3	0.00	118.93	29.93	0.00	
4	0.00	118.93	29.85	0.00	
5	0.00	118.93	29.81	0.00	
6	0.00	118.93	29.64	0.00	
7	0.00	119.03	30.16	0.00	
BLDGA	1.22	119.03	29.68	0.00	
BLDGB	1.57	118.93	29.58	0.00	
BLDGC	1.23	118.93	29.48	0.00	
BLDGD	1.23	118.93	29.43	0.00	Minimum System Pressure
100	-159.18	88.76	0.00	0.00	Reservoir
200	-79.07	88.73	0.00	0.00	Reservoir

Link Results (Max Day + Fire Flow - Building A - 233 L/s):

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1000-1	64.18	1.96	27.24	Open
1-2	45.78	1.40	22.50	Open
2-3	1.21	0.04	0.02	Open
3-4	1.21	0.04	0.02	Open
4-5	-0.02	0.00	0.00	Open
5-6	-1.25	0.04	0.02	Open
6-7	-17.17	0.53	2.28	Open
7-1	-18.39	0.56	3.00	Open
6-1001	15.93	0.49	2.03	Open
BLDGB-2	-1.57	0.05	0.03	Open
BLDGA-7	-1.22	0.04	0.02	Open
BLDGC-5	1.23	0.04	0.02	Open
BLDGD-4	-1.23	0.04	0.02	Open
PUMP1	159.18	0.00	-31.70	Open Pump
PUMP2	79.07	0.00	-30.10	Open Pump

```
**********************************************************************
*                           E P A N E T                              *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                          Version 2.2                               *
**********************************************************************
```

Node Results (Max Day + Fire Flow - Building B - 250 L/s):

Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	60.00	120.17	31.56	0.00	
1001	0.00	118.64	30.04	0.00	
1	0.00	116.30	27.58	0.00	
2	95.00	114.52	25.75	0.00	
3	95.00	114.01	25.01	0.00	Minimum System Pressure
4	0.00	115.17	26.09	0.00	
5	0.00	116.45	27.33	0.00	
6	0.00	116.64	27.35	0.00	
7	0.00	116.47	27.60	0.00	
BLDGA	1.22	116.47	27.12	0.00	
BLDGB	1.57	114.52	25.17	0.00	
BLDGC	1.23	116.45	27.00	0.00	
BLDGD	1.23	115.17	25.67	0.00	
100	-174.67	88.76	0.00	0.00 Reservoir	
200	-80.58	88.73	0.00	0.00 Reservoir	

Link Results (Max Day + Fire Flow - Building B - 250 L/s):

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1000-1	114.67	3.51	80.35	Open
1-2	136.51	4.18	182.17	Open
2-3	39.94	1.22	11.21	Open
3-4	-55.06	1.68	19.24	Open
4-5	-56.29	1.72	26.75	Open
5-6	-57.52	1.76	20.58	Open
6-7	23.06	0.71	3.95	Open
7-1	21.84	0.67	4.13	Open
6-1001	-80.58	2.47	41.63	Open
BLDGB-2	-1.57	0.05	0.03	Open
BLDGA-7	-1.22	0.04	0.02	Open
BLDGC-5	1.23	0.04	0.02	Open
BLDGD-4	-1.23	0.04	0.02	Open
PUMP1	174.67	0.00	-31.41	Open Pump
PUMP2	80.58	0.00	-29.91	Open Pump

```
**********************************************************************
*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.2                                *
**********************************************************************
```

Node Results (Max Day + Fire Flow - Building C - 267 L/s):

Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	0.00	120.61	32.00	0.00	
1001	95.00	113.13	24.53	0.00	
1	0.00	114.15	25.43	0.00	
2	15.00	113.08	24.31	0.00	
3	63.00	110.86	21.86	0.00	
4	95.00	110.59	21.51	0.00	
5	0.00	112.57	23.45	0.00	
6	0.00	112.87	23.58	0.00	
7	0.00	113.46	24.59	0.00	
BLDGA	1.22	113.46	24.11	0.00	
BLDGB	1.57	113.08	23.73	0.00	
BLDGC	1.23	112.57	23.12	0.00	
BLDGD	1.23	110.59	21.09	0.00	Minimum System Pressure
100	-150.96	88.76	0.00	0.00	Reservoir
200	-122.29	88.73	0.00	0.00	Reservoir

Link Results (Max Day + Fire Flow - Building C - 267 L/s):

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status	
1000-1	150.96	4.62	134.15	Open	
1-2	104.68	3.20	109.52	Open	
2-3	88.11	2.70	48.91	Open	
3-4	25.11	0.77	4.49	Open	
4-5	-71.12	2.18	41.64	Open	
5-6	-72.35	2.21	31.47	Open	
6-7	-45.06	1.38	13.72	Open	
7-1	-46.28	1.42	16.95	Open	
6-1001	-27.29	0.83	5.54	Open	
BLDGB-2	-1.57	0.05	0.03	Open	
BLDGA-7	-1.22	0.04	0.02	Open	
BLDGC-5	1.23	0.04	0.02	Open	
BLDGD-4	-1.23	0.04	0.02	Open	
PUMP1	150.96	0.00	-31.85	Open	Pump
PUMP2	122.29	0.00	-24.40	Open	Pump

```
**********************************************************************
*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.2                                *
**********************************************************************
```

Node Results (Max Day + Fire Flow - Building D - 267 L/s):

Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	0.00	120.35	31.74	0.00	
1001	14.00	115.23	26.63	0.00	
1	0.00	112.70	23.98	0.00	
2	63.00	110.45	21.68	0.00	
3	95.00	108.15	19.15	0.00	
4	95.00	108.17	19.09	0.00	
5	0.00	112.05	22.93	0.00	
6	0.00	112.62	23.33	0.00	
7	0.00	112.65	23.78	0.00	
BLDGA	1.22	112.65	23.30	0.00	
BLDGB	1.57	110.45	21.10	0.00	
BLDGC	1.23	112.05	22.60	0.00	
BLDGD	1.23	108.17	18.67	0.00	Minimum System Pressure (Worst Case Fire Scenario)
100	-165.33	88.76	0.00	0.00	Reservoir
200	-106.92	88.73	0.00	0.00	Reservoir

Link Results (Max Day + Fire Flow - Building D - 267 L/s):

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1000-1	165.33	5.06	158.94	Open
1-2	154.29	4.72	230.37	Open
2-3	89.72	2.74	50.59	Open
3-4	-5.28	0.16	0.25	Open
4-5	-101.51	3.11	81.63	Open
5-6	-102.74	3.14	60.24	Open
6-7	-9.82	0.30	0.81	Open
7-1	-11.04	0.34	1.15	Open
6-1001	-92.92	2.84	54.29	Open
BLDGB-2	-1.57	0.05	0.03	Open
BLDGA-7	-1.22	0.04	0.02	Open
BLDGC-5	1.23	0.04	0.02	Open
BLDGD-4	-1.23	0.04	0.02	Open
PUMP1	165.33	0.00	-31.59	Open Pump
PUMP2	106.92	0.00	-26.50	Open Pump

```
**********************************************************************
*                            E P A N E T                             *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.2                              *
**********************************************************************
```

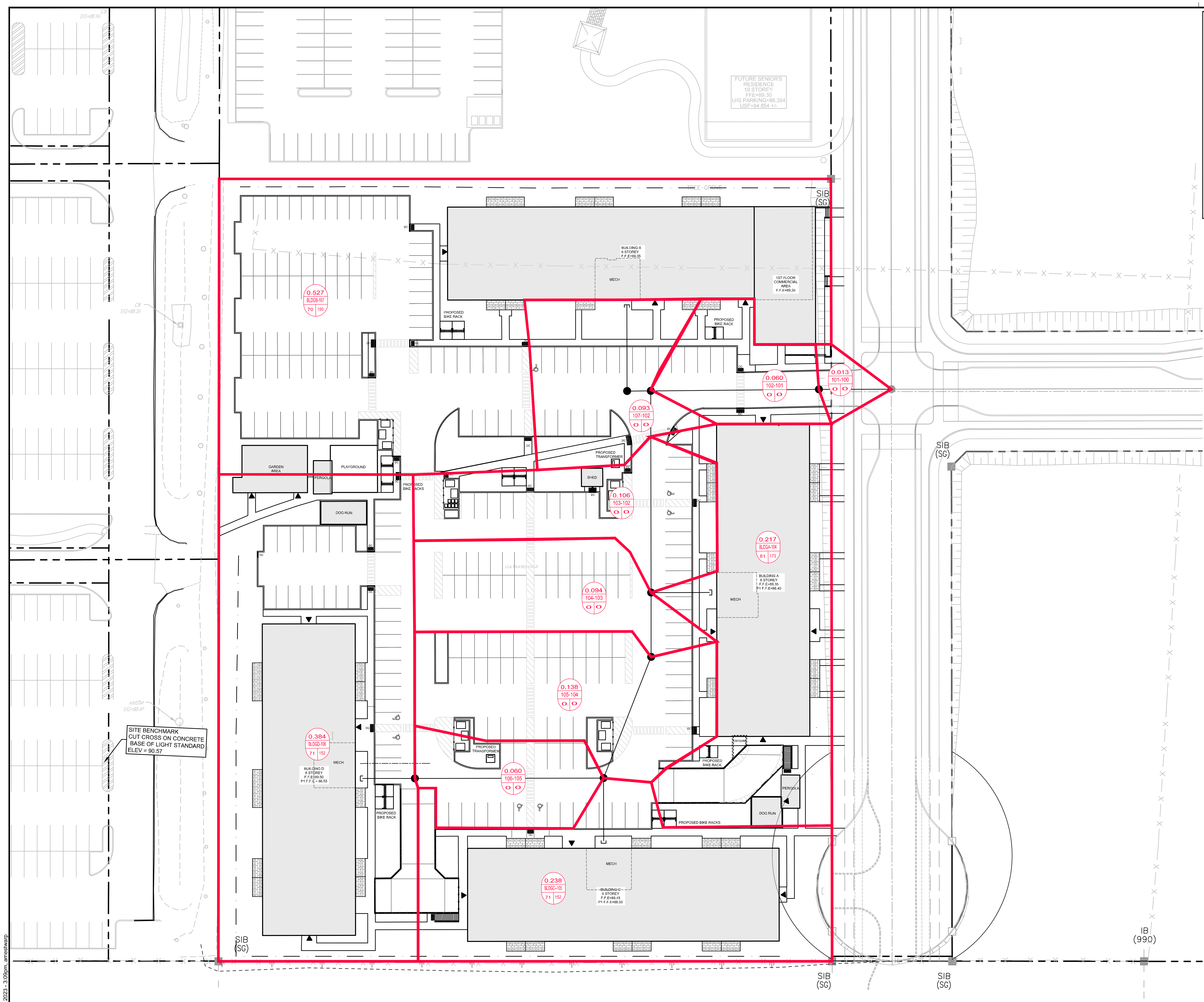
Node Results (Peak Hour):

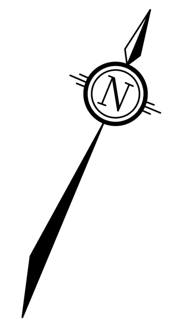
Node ID	Demand LPS	Head m	Pressure m	Quality	
1000	0.00	125.98	37.37	0.00	
1001	0.00	126.04	37.44	0.00	
1	0.00	125.98	37.26	0.00	
2	0.00	125.98	37.21	0.00	
3	0.00	125.98	36.98	0.00	
4	0.00	125.98	36.90	0.00	
5	0.00	125.99	36.87	0.00	
6	0.00	125.99	36.70	0.00	
7	0.00	125.98	37.11	0.00	
BLDGA	2.67	125.98	36.63	0.00	
BLDGB	3.29	125.97	36.62	0.00	
BLDGC	2.71	125.98	36.53	0.00	
BLDGD	2.71	125.98	36.48	0.00	Minimum System Pressure
100	0.00	88.76	0.00	0.00	Reservoir
200	-11.38	88.73	0.00	0.00	Reservoir

Link Results (Peak Hour):

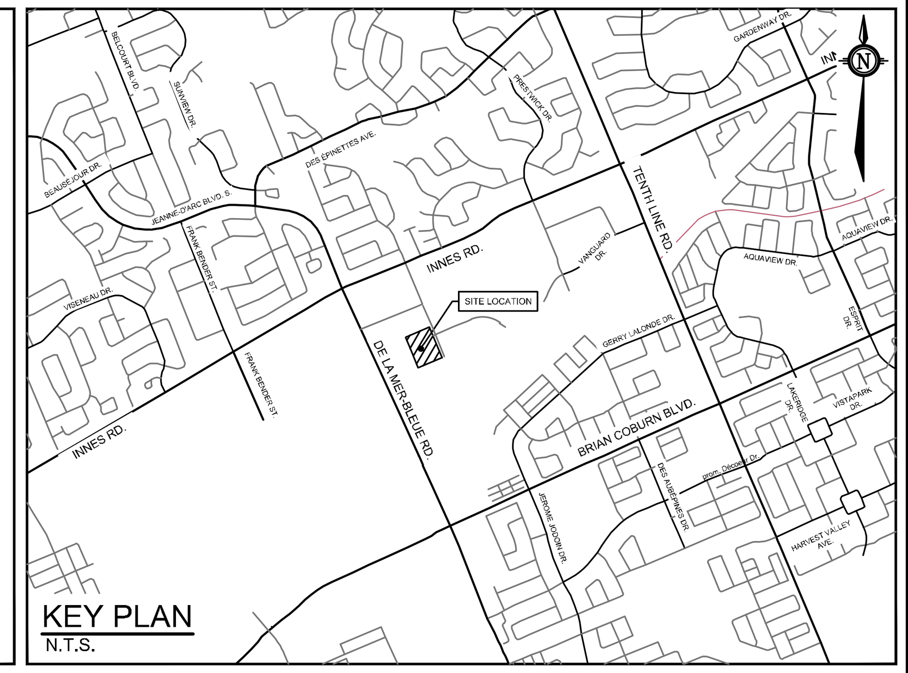
Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1000-1	0.00	0.00	0.00	Open
1-2	2.22	0.07	0.07	Open
2-3	-1.07	0.03	0.01	Open
3-4	-1.07	0.03	0.01	Open
4-5	-3.78	0.12	0.16	Open
5-6	-6.49	0.20	0.36	Open
6-7	4.89	0.15	0.22	Open
7-1	2.22	0.07	0.06	Open
6-1001	-11.38	0.35	1.09	Open
BLDGB-2	-3.29	0.10	0.13	Open
BLDGA-7	-2.67	0.08	0.08	Open
BLDGC-5	2.71	0.08	0.10	Open
BLDGD-4	-2.71	0.08	0.08	Open
PUMP1	0.00	0.00	0.00	Closed Pump
PUMP2	11.38	0.00	-37.31	Open Pump

Appendix C
Sanitary Servicing





NORTH



KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- PROPOSED SANITARY SEWER AND MANHOLE
- SAN MH — *EXISTING SANITARY MANHOLE & SEWER*
- SANITARY SEWER DRAINAGE AREA BOUNDARY
- 0.47 — DRAINAGE AREA (ha)
- 20A-19A — SAN SEWER PIPE RUN
- 71 | 128 — NO. UNITS/POPULATION

REFER TO 122179-ND FOR ADDITIONAL NOTES & DETAILS

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

M:\2022\122179\CAD\Civil\122179-SAN.dwg, SAN, May 12, 2023 - 3:09pm, arnestwarp

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPLICATION	MAY 24/2023	GJM

SCALE: 1:400

1:400 — 0 4 8 12 16

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

FOR REVIEW ONLY

ISSUED FOR REVIEW

ISSUED FOR REVIEW

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

LOCATION
4200 INNES ROAD, CITY OF OTTAWA
TRINTIY APARTMENTS

DRAWING NAME
SANITARY DRAINAGE AREA PLAN

PROJECT No. 122179
REV: REV #1
DRAWING No. 122179-SAN

PLANA1.DWG - 841mmx594mm

SANITARY SEWER DESIGN SHEET

Novatech Project #:	122179	**Legend:**	PROJECT SPECIFIC INFO
Project Name:	Trinity Apartments		USER DESIGN INPUT
Date Prepared:	5/12/2023		CUMULATIVE CELL
Date Revised:			CALCULATED DESIGN CELL OUTPUT
Input By:	Curtis Ferguson, E.I.T.		
Reviewed By:	Anthony Mestwarp, P.Eng		
Drawing Reference:	122179- SAN		

NOVATECH
Engineers, Planners & Landscape Architects

PROPOSED DEVELOPMENT FLOWS (TRINITY APARTMENTS)

LOCATION			DEMAND																	DESIGN CAPACITY							
			RESIDENTIAL FLOW								COMMERCIAL FLOW						EXTRANEOUS FLOW			PROPOSED SEWER PIPE SIZING / DESIGN							
AREA	FROM MH	TO MH	1 Bed Apartment	2 Bed Apartment	3 Bed Apartment	POPULATION (in 1000's)	CUMULATIVE POPULATION (in 1000's)	PEAK FACTOR M	AVG POPULATION FLOW (L/s)	PEAKED DESIGN POP FLOW (L/s)	AREA (m^2)	CUMULATIVE AREA (m^2)	DESIGN COMMERICAL FLOW (L/s)	COMMERICAL PEAK FACTOR	PEAKED COMMERCIAL FLOW	Total Area (ha.)	Accum. Area (ha.)	DESIGN EXTRAN. FLOW (L/s)	TOTAL DESIGN FLOW (L/s)	PIPE LENGTH (m)	PIPE SIZE (mm) AND MATERIAL	PIPE ID ACTUAL (m)	ROUGH. (n)	DESIGN GRADE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak Design / Qcap
	BLDG C	105	13	46	12	0.152	0.152	3.55	0.49	1.75		0.000	0.00	1.00	0.00	0.24	0.24	0.08	1.83	13.0	200 PVC	0.203	0.013	2.00	48.4	1.49	3.8%
	BLDG D	106	13	46	12	0.152	0.152	3.55	0.49	1.75		0.000	0.00	0.33	0.00	0.38	0.38	0.13	1.88	10.9	200 PVC	0.203	0.013	1.00	34.2	1.06	5.5%
	106	105				0.000	0.152	3.55	0.49	1.75		0.000	0.00	0.00	0.00	0.06	0.44	0.15	1.90	37.8	200 PVC	0.203	0.013	0.45	23.0	0.71	8.3%
	105	104				0.000	0.304	3.46	0.99	3.41		0.000	0.00	0.00	0.00	0.14	0.82	0.27	3.68	26.0	200 PVC	0.203	0.013	0.45	23.0	0.71	16.0%
	104	103				0.000	0.304	3.46	0.99	3.41		0.000	0.00	0.80	0.00	0.09	0.91	0.30	3.71	12.9	200 PVC	0.203	0.013	0.45	23.0	0.71	16.2%
	BLDG A	103	13	45	12	0.150	0.150	3.55	0.49	1.73		0.000	0.00	1.00	0.00	0.22	0.22	0.07	1.80	12.2	200 PVC	0.203	0.013	2.00	48.4	1.49	3.7%
	103	102				0.000	0.454	3.40	1.47	5.00		0.000	0.00	0.33	0.00	0.11	1.24	0.41	5.40	40.3	200 PVC	0.203	0.013	0.45	23.0	0.71	23.5%
	BLDG B	107	19	46	16	0.173	0.173	3.54	0.56	1.98	339.500	339.500	0.12	1.00	0.12	0.53	0.53	0.17	2.27	17.3	200 PVC	0.203	0.013	2.00	48.4	1.49	4.7%
	107	102				0.000	0.173	3.54	0.56	1.98		339.500	0.12	0.00	0.00	0.09	0.62	0.20	2.18	4.7	200 PVC	0.203	0.013	1.00	34.2	1.06	6.4%
	102	101				0.000	0.627	3.34	2.03	6.78		339.500	0.12	1.00	0.12	0.06	1.92	0.63	7.53	33.6	250 PVC	0.254	0.013	0.35	36.7	0.72	20.5%
	101	EX				0.000	0.627	3.34	2.03	6.78		339.500	0.12	1.00	0.12	0.01	1.93	0.64	7.53	14.5	250 PVC	0.254	0.013	0.35	36.7	0.72	20.5%

Design Parameters:			
1. Residential Flows			
-1 Bed Apartment	1.4	Person/ Unit	**As per City of Ottawa Sewer Design Guidelines, 2012**
-2 Bed Apartment	2.1	Person/ Unit	
-3 Bed Apartment	3.1	Person/ Unit	
2. Commercial Flow			
-Medical Office	275	L/9.3m^2/day	**As per OBC Section 8.2**
3. Q Avg capita flow	**280**	L/capita/day	**As per City of Ottawa - Technical Bulletin ISTB-2018-01**
4. M = Harmon Formula (maximum of 4.0)			**As per Harmon Formula**
5. K =	**0.8**		
6. Commercial Peak Factor	**1.0**		**As per City of Ottawa - Technical Bulletin ISTB-2018-01**
7. Peak Extraneous Flow =	**0.33**	**L/sec/ha**	

CAPACITY EQUATION

Q full= (1/n) A R^(2/3)S_o^(1/2)

Where : Q full = Capacity (L/s)

n = Manning coefficient of roughness (0.013)
A = Flow area (m^2)
R = Wetter perimenter (m)
So = Pipe Slope/gradient

SANITARY SEWER DESIGN SHEET

Novatech Project #:	122179
Project Name:	Trinity
Date Prepared:	1/17/2023
Date Revised:	
Input By:	Anthony Mestwarp, P.Eng
Reviewed By:	Greg MacDonald, P.Eng
Drawing Reference:	122179- SAN

Legend:
- PROJECT SPECIFIC INFO
- USER DESIGN INPUT
- CUMULATIVE CELL
- CALCULATED DESIGN CELL OUTPUT

NOVATECH
Engineers, Planners & Landscape Architects

ORLEANS II SUBDIVISION BLOCK 1 FLOW
(Assumed flow from: Site Servicing and Stormwater Management Report - Orleans II Subdivision, 4200 Innes Road, Dated September 23, 2022, Prepared By Stantec Consulting Ltd.)

LOCATION			DEMAND										DESIGN CAPACITY							
			RESIDENTIAL FLOW							EXTRANEOUS FLOW			PROPOSED SEWER PIPE SIZING / DESIGN							
AREA	FROM MH	TO MH	Apartment	POPULATION (in 1000's)	CUMULATIVE POPULATION (in 1000's)	PEAK FACTOR M	AVG POPULATION FLOW (L/s)	PEAKED DESIGN POP FLOW (L/s)	Total Area (ha.)	Accum. Area (ha.)	DESIGN EXTRAN. FLOW (L/s)	TOTAL DESIGN FLOW (L/s)	PIPE LENGTH (m)	PIPE SIZE (mm) AND MATERIAL	PIPE ID ACTUAL (m)	ROUGH. (n)	DESIGN GRADE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak Design / Qcap
	25	24	365	0.657	0.657	3.33	2.13	7.09	1.92	1.92	0.63	7.72	12.0	200 PVC	0.203	0.013	1.00	34.2	1.06	22.6%

Design Parameters:			
1. Residential Flows			
Average Apartment	1.8	Person/ Unit	As per City of Ottawa Sewer Design Guidelines,
3. Q Avg capita flow	280	L/capita/day	As per City of Ottawa - Technical Bulletin ISTB-2018-01
4. M = Harmon Formula (maximum of 4.0)			As per Harmon Formula
5. K =	0.8		
6. Commercial Peak Factor	1.0		As per City of Ottawa - Technical Bulletin ISTB-2018-01
7. Peak Extraneous Flow =	0.33	L/sec/ha	

CAPACITY EQUATION

Q full= (1/n) A R^(2/3)S_o^(1/2)

n = Manning coefficient of roughness (0.013)
A = Flow area (m^2)
R = Wetter perimenter (m)
So = Pipe Slope/gradient

Stantec	SUBDIVISION: INNES SHOPPING CENTRES 4200 INNES ROAD
	DATE: 9/21/2022
	REVISION: 1
	DESIGNED BY: MJS
	CHECKED BY: KS

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401419

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE								
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	UNITS SINGLE	UNITS TOWN	UNITS APT	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
FUTURE COMMERCIAL	11	EX SAN 14	0.00	0	0	0	0	0.00	0	3.80	0.0	1.44	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.7	1.44	1.44	0.5	1.2	43.0	250	PVC	SDR 35	0.40	38.3	**3.06%**	0.77	0.29
EXISTING COMM / RES	EX SAN 15	EX SAN 14	0.00	0	0	0	583	0.00	583	3.35	6.3	7.60	7.60	0.00	0.00	0.00	0.00	0.00	0.00	3.73	3.73	3.7	11.33	11.33	3.7	13.8	118.8	250	PVC	SDR 35	0.27	31.5	**43.69%**	0.63	0.52
	EX SAN 14	10	0.00	0	0	0	0	0.00	583	3.35	6.3	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.73	4.4	0.00	12.77	4.2	14.9	19.0	375	PVC	SDR 35	0.42	105.4	**14.18%**	1.00	0.58
G10A	10	9	0.00	0	0	0	0	0.00	583	3.35	6.3	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	3.80	4.4	0.07	12.84	4.2	15.0	18.5	375	PVC	SDR 35	0.40	102.7	**14.58%**	0.97	0.58
R91A*	91	9	1.62	0	0	0	411	1.62	411	3.41	4.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.62	1.62	0.5	5.1	13.0	250	PVC	SDR 35	0.40	38.3	**13.25%**	0.77	0.44
G9A	9	8	0.00	0	0	0	0	1.62	994	3.24	10.4	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.28	4.08	4.4	0.28	14.74	4.9	19.7	120.0	375	PVC	SDR 35	0.20	72.6	**27.14%**	0.69	0.49
R81A	81	8	1.92	0	0	0	657	1.92	657	3.33	7.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.92	1.92	0.6	7.7	14.5	200	PVC	SDR 35	0.40	21.1	**36.50%**	0.67	0.52
G8A, G8B	8	7	0.00	0	0	0	0	3.54	1651	3.12	16.7	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.43	4.51	4.4	0.43	17.09	5.6	26.7	73.4	375	PVC	SDR 35	0.20	72.6	**36.81%**	0.69	0.54
R71A	71	7	0.93	0	0	0	540	0.93	540	3.37	5.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.93	0.93	0.3	6.2	15.0	200	PVC	SDR 35	0.40	21.1	**29.29%**	0.67	0.49
G7A	7	6	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.29	4.80	4.4	0.29	18.30	6.0	32.0	119.2	375	PVC	SDR 35	0.20	72.6	**44.15%**	0.69	0.57
L61A	61	6	0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	1.06	1.06	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.06	1.06	0.4	1.4	15.3	250	PVC	SDR 35	0.40	38.3	**3.61%**	0.77	0.31
G6A	6	5	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	1.06	0.00	0.00	0.00	0.00	0.08	4.87	5.4	0.08	19.44	6.4	33.5	32.5	375	PVC	SDR 35	0.20	72.6	**46.09%**	0.69	0.57
G5A	5	4	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	1.06	0.00	0.00	0.00	0.00	0.09	4.96	5.4	0.09	19.53	6.4	33.5	36.0	375	PVC	SDR 35	0.20	72.6	**46.13%**	0.69	0.57
L41A	41	4	0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	3.45	3.45	0.00	0.00	0.00	0.00	0.00	0.00	3.4	3.45	3.45	1.1	4.5	14.1	250	PVC	SDR 35	0.40	38.3	**11.71%**	0.77	0.43
G42A	42	4	0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.61	0.0	0.61	0.61	0.2	0.2	14.6	150	PVC	DR 28	1.00	15.3	**1.31%**	0.86	0.25
G4A	4	3	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	4.51	0.00	0.00	0.00	0.00	0.10	5.67	8.8	0.10	23.68	7.8	38.2	41.1	375	PVC	SDR 35	0.20	72.6	**52.64%**	0.69	0.60
G3A	3	2	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	4.51	0.00	0.00	0.00	0.00	0.22	5.89	8.8	0.22	23.90	7.9	38.3	42.9	375	PVC	SDR 35	0.20	72.6	**52.74%**	0.69	0.60
G12A, G12B, L12A, L12B, L12C	12	2	0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	11.17	11.17	0.00	0.00	0.00	0.00	5.26	5.26	10.9	16.43	16.43	5.4	16.3	20.3	250	PVC	SDR 35	0.30	33.2	**49.03%**	0.67	0.57
L2A	2	1	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.39	16.07	0.00	0.00	0.00	0.00	0.00	11.15	20.0	0.39	40.72	13.4	55.1	37.1	375	PVC	SDR 35	0.20	72.6	**75.87%**	0.69	0.67
G1A	1	EX SAN 6	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.15	11.30	20.0	0.15	40.88	13.5	55.1	60.5	375	PVC	SDR 35	0.20	72.6	**75.94%**	0.69	0.67
	EX SAN 6	EX SAN 5	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	71.7	375	PVC	SDR 35	0.20	72.6	**75.94%**	0.69	0.67
	EX SAN 5	EX SAN 4	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	71.6	375	PVC	SDR 35	0.17	66.4	**82.98%**	0.63	0.63
	EX SAN 4	EX SAN 3	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	61.8	375	PVC	SDR 35	0.23	77.3	**71.35%**	0.73	0.70
	EX SAN 3	EX SAN 2	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	61.7	375	PVC	SDR 35	0.18	68.5	**80.45%**	0.65	0.64
	EX SAN 2	EX SAN 1	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	7.2	375	PVC	SDR 35	0.28	85.9	**64.18%**	0.81	0.75
	EX SAN 1	EX SAN 1A	0.00	0	0	0	0	4.46	2191	3.04	21.6	0.00	9.04	0.00	16.07	0.00	0.00	0.00	0.00	0.00	11.30	20.0	0.00	40.88	13.5	55.1	113.1	525	CONCRETE	SDR 35	0.20	202.8	**27.18%**	0.91	0.64
																												525							

* Residential population of 411 used as design flow is equivalent to 256 long term care bed facility at 450 l/bed/d.

Appendix D
Storm Servicing

STORM SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 122179
Project Name:
Date Prepared: 5/12/2023
Date Revised:
Input By: Anthony Mestwarp, P.Eng
Reviewed By: Greg MacDonald, P.Eng
Drawing Reference: 122179-SWM

Legend:
- PROJECT SPECIFIC INFO
- USER DESIGN INPUT
- CUMILATIVE CELL
- CALCULATED DESIGN CELL OUTPUT
- USER AS-BUILT INPUT

LOCATION			DEMAND												CAPACITY								
			AREA				FLOW								PROPOSED SEWER PIPE SIZING / DESIGN								
										Rain Intensity (mm/hr)					PIPE PROPERTIES								
From MH	To MH	Area ID	Hardscape	Landscaping	Total Area	Weighted Runoff Coefficient	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	2yr	5yr	100yr	Peak Flow	TOTAL UNRESTRICTED PEAK FLOW (QDesign)	LENGTH	SIZE / MATERIAL	ID ACTUAL	ROUGHNESS	DESIGN GRADE	CAPACITY	FULL FLOW VELOCITY	TIME OF FLOW	QPEAK DESIGN / QFULL
			0.90	0.20	(ha)				(min.)				(L/s)	(L/s)	(m)	(mm / type)	(m)		(%)	(L/s)	(m/s)	(min.)	(%)
TRINITY APARTMENTS																							
BLDG B	STMMH 202	R-01-06	0.156 0.000 0.000	0.000	0.156	0.90	0.39 0.00 0.00	0.39 0.00 0.00	10.00 10.00 10.00	76.81			30.00 0.00 0.00	30.0	15.3	250 PVC	0.254	0.013	2.00	87.7	1.73	0.15	34.2%
CB 08	CB 07	A-18	0.015 0.000 0.000	0.035	0.050	0.41	0.06 0.00 0.00																
		A-17	0.003 0.000 0.000	0.020	0.023	0.28	0.02 0.00 0.00	0.08 0.00 0.00	10.00 10.00 10.00	76.81			5.84 0.00 0.00	5.8	43.0	250 PVC	0.254	0.013	0.50	43.9	0.87	0.83	13.3%
CB 07	CB 06	A-14	0.006 0.000 0.000	0.031	0.037	0.31	0.03 0.00 0.00	0.11 0.00 0.00	10.83 10.83 10.83	73.77			7.93 0.00 0.00	7.9	37.2	250 PVC	0.254	0.013	0.50	43.9	0.87	0.72	18.1%
CB 06	CBMH 212	A-08	0.002 0.000 0.000	0.024	0.026	0.26	0.02 0.00 0.00	0.13 0.00 0.00	11.54 11.54 11.54	71.35			9.00 0.00 0.00	9.0	15.5	250 PVC	0.254	0.013	0.50	43.9	0.87	0.30	20.5%
CBMH 212	CBMH 211	A-09	0.056 0.000 0.000	0.009	0.066	0.80	0.15 0.00 0.00	0.27 0.00 0.00	11.84 11.84 11.84	70.39			19.16 0.00 0.00	19.2	32.2	250 PVC	0.254	0.013	0.50	43.9	0.87	0.62	43.7%
CB 11	CB 10	A-01	0.009 0.000 0.000	0.049	0.058	0.31	0.05 0.00 0.00	0.05 0.00 0.00	10.00 10.00 10.00	76.81			3.79 0.00 0.00	3.8	17.8	250 PVC	0.254	0.013	0.50	43.9	0.87	0.34	8.6%
CB 10	CBMH 214	A-02	0.084 0.000 0.000	0.012	0.096	0.81	0.22 0.00 0.00	0.27 0.00 0.00	10.34 10.34 10.34	75.51			20.09 0.00 0.00	20.1	21.7	250 PVC	0.254	0.013	0.50	43.9	0.87	0.42	45.8%
CBMH 214	CBMH 213	A-04	0.027 0.000 0.000	0.002	0.030	0.85	0.07 0.00 0.00																
		A-03	0.068 0.000 0.000	0.018	0.086	0.76	0.18 0.00 0.00	0.52 0.00 0.00	10.76 10.76 10.76	74.00			38.20 0.00 0.00	38.2	31.1	375 PVC	0.381	0.013	0.30	100.2	0.88	0.59	38.1%
CBMH 213	STMMH 211	A-05	0.076 0.000 0.000	0.023	0.099	0.74	0.20 0.00 0.00	0.72 0.00 0.00	11.35 11.35 11.35	71.98			51.81 0.00 0.00	51.8	27.6	375 PVC	0.381	0.013	0.30	100.2	0.88	0.52	51.7%
CBMH 211	STMMH 210	A-10	0.064 0.000 0.000	0.004	0.069	0.86	0.16 0.00 0.00	1.16 0.00 0.00	12.46 12.46 12.46	68.49			79.11 0.00 0.00	79.1	25.6	375 PVC	0.381	0.013	0.30	100.2	0.88	0.49	79.0%
STMMH 210	CBMH 208		0.000 0.000 0.000				0.00 0.00 0.00	1.16 0.00 0.00	12.95 12.95 12.95	67.08			77.48 0.00 0.00	77.5	5.0	375 PVC	0.381	0.013	0.50	129.3	1.13	0.07	59.9%
CB 04	CBMH 209	A-15	0.070 0.000 0.000	0.009	0.079	0.82	0.18 0.00 0.00																
		A-16	0.057 0.000 0.000	0.004	0.061	0.85	0.14 0.00 0.00	0.32 0.00 0.00	10.00 10.00 10.00	76.81			24.87 0.00 0.00	24.9	29.9	250 PVC	0.254	0.013	1.00	62.0	1.22	0.41	40.1%
CBMH 209	CBMH 208	A-12	0.096 0.000 0.000	0.004	0.101	0.87	0.24 0.00 0.00																
		A-13	0.112 0.000 0.000	0.005	0.118	0.87	0.28 0.00 0.00	0.85 0.00 0.00	10.41 10.41 10.41	75.28			64.07 0.00 0.00	64.1	21.1	375 PVC	0.381	0.013	0.50	129.3	1.13	0.31	49.5%

STORM SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

LOCATION			DEMAND												CAPACITY								
			AREA				FLOW								PROPOSED SEWER PIPE SIZING / DESIGN								
From MH	To MH	Area ID	Hardscape	Landscaping	Total Area	Weighted Runoff Coefficient	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	Rain Intensity (mm/hr) 2yr	5yr	100yr	Peak Flow	TOTAL UNRESTRICTED PEAK FLOW (QDesign)	PIPE PROPERTIES LENGTH	SIZE / MATERIAL	ID ACTUAL	ROUGHNESS	DESIGN GRADE	CAPACITY	FULL FLOW VELOCITY	TIME OF FLOW	QPEAK DESIGN / QFULL
			0.90	0.20	(ha)				(min.)				(L/s)	(L/s)	(m)	(mm / type)	(m)		(%)	(L/s)	(m/s)	(min.)	(%)
CBMH 208	STMMH 203	A-11	0.068	0.012	0.080	0.80	0.18	2.18	13.02	66.87			145.96	146.0	3.4	450 PVC	0.4572	0.013	0.50	210.3	1.28	0.04	69.4%
			0.000				0.00	0.00	13.02				0.00										
			0.000				0.00	0.00	13.02				0.00										
BLDG D	STMMH 207	D-02	0.020	0.009	0.029	0.69	0.05																
			0.000				0.00																
			0.000				0.00																
		R-13-15	0.117	0.000	0.117	0.90	0.29	0.35	10.00	76.81			26.80	26.8	8.9	250 PVC	0.254	0.013	2.00	87.7	1.73	0.09	30.5%
			0.000				0.00	0.00	10.00				0.00										
			0.000				0.00	0.00	10.00				0.00										
STMMH 207	STMMH 206		0.000	0.000	0.000		0.00	0.35	10.09	76.48			26.69	26.7	37.6	250 PVC	0.254	0.013	0.50	43.9	0.87	0.72	60.8%
			0.000				0.00	0.00	10.09				0.00										
			0.000				0.00	0.00	10.09				0.00										
BLDG C	STMMH 206	D-03	0.013	0.000	0.013	0.90	0.03																
			0.000				0.00																
			0.000				0.00																
		R10-12	0.117	0.000	0.117	0.90	0.29	0.33	10.00	76.81			25.13	25.1	11.5	250 PVC	0.254	0.013	2.00	87.7	1.73	0.11	28.6%
			0.000				0.00	0.00	10.00				0.00										
			0.000				0.00	0.00	10.00				0.00										
STMMH 206	STMMH 205		0.000	0.000	0.000		0.00	0.68	10.81	73.83			49.92	49.9	12.3	300 PVC	0.3048	0.013	0.50	71.3	0.98	0.21	70.0%
			0.000				0.00	0.00	10.81				0.00										
			0.000				0.00	0.00	10.81				0.00										
STMMH 205	STMMH 205B		0.000	0.000	0.000		0.00	0.68	11.02	73.10			49.43	49.4	16.8	300 PVC	0.3048	0.013	0.50	71.3	0.98	0.29	69.3%
			0.000				0.00	0.00	11.02				0.00										
			0.000				0.00	0.00	11.02				0.00										
STMMH 205B	STMMH 204		0.000	0.000	0.000		0.00	0.68	11.31	72.13			48.77	48.8	12.8	300 PVC	0.3048	0.013	0.50	71.3	0.98	0.22	68.4%
			0.000				0.00	0.00	11.31				0.00										
			0.000				0.00	0.00	11.31				0.00										
BLDG A	STMMH 203	D-04	0.038	0.012	0.050	0.73	0.10																
			0.000				0.00																
			0.000				0.00																
		R-07-09	0.117	0.000	0.117	0.90	0.29	0.40	10.00	76.81			30.35	30.3	13.7	250 PVC	0.254	0.013	2.00	87.7	1.73	0.13	34.6%
			0.000				0.00	0.00	10.00				0.00										
			0.000				0.00	0.00	10.00				0.00										
STMMH 204	STMMH 203		0.000	0.000	0.000		0.00	1.07	11.52	71.41			76.50	76.5	12.8	375 PVC	0.381	0.013	0.50	129.3	1.13	0.19	59.2%
			0.000				0.00	0.00	11.52				0.00										
			0.000				0.00	0.00	11.52				0.00										
STMMH 203	STMMH 202		0.000				0.00	3.25	13.07	66.75			217.19	217.2	28.0	525 CONC	0.5334	0.013	0.50	317.2	1.42	0.33	68.5%
			0.000				0.00	0.00	13.07				0.00										
			0.000				0.00	0.00	13.07				0.00										
STMMH 202	STMMH 201	A-06	0.100	0.034	0.134	0.72	0.27																
			0.000				0.00																
			0.000				0.00																
		A-07	0.018	0.008	0.026	0.69	0.05	3.96	13.39	65.84			260.99	261.0	36.6	525 CONC	0.5334	0.013	0.50	317.2	1.42	0.43	82.3%
			0.000				0.00	0.00	13.39				0.00										
			0.000				0.00	0.00	13.39				0.00										
STMMH 201	EXSTMMH		0.000	0.000	0.000		0.00	3.96	13.82	64.69			256.44	256.4	10.8	525 CONC	0.5334	0.013	0.50	317.2	1.42	0.13	80.8%
			0.000				0.00	0.00	13.82				0.00										
			0.000				0.00	0.00	13.82				0.00										

DEMAND EQUATION

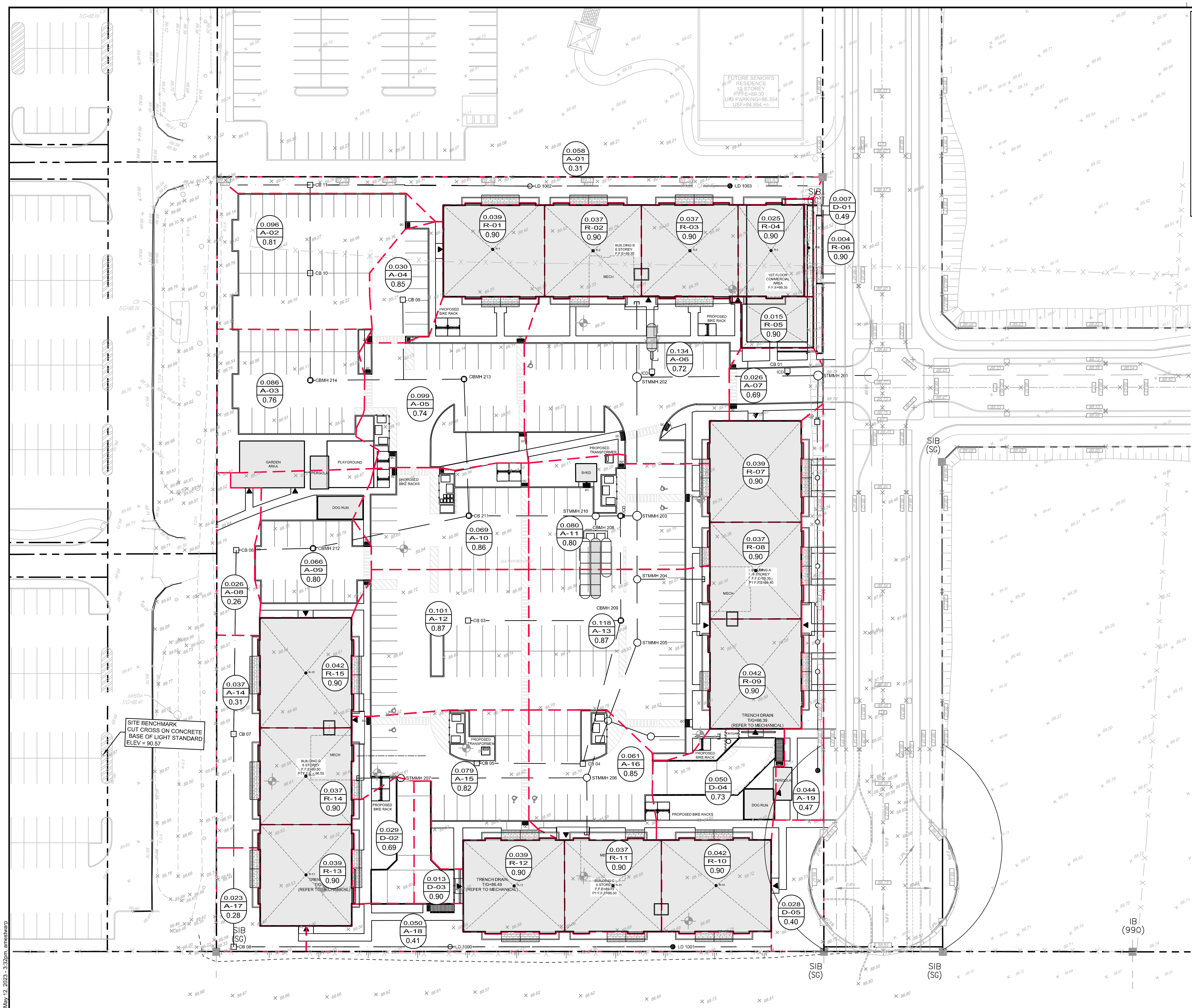
Q = 2.78 AIR

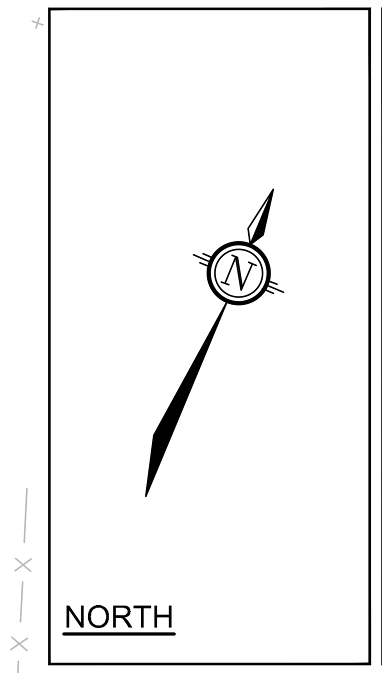
Where : Q = Peak flow in litres per second (L/s)
A = Area in hectares (ha)
R = Weighted runoff coefficient (increased by 25% for 100-year)
I = Rainfall intensity in millimeters per hour (mm/hr)
Rainfall Intensity (I) is based on City of Ottawa IDF data presented in the City of Ottawa Sewer Design Guidelines (Oct. 2012)

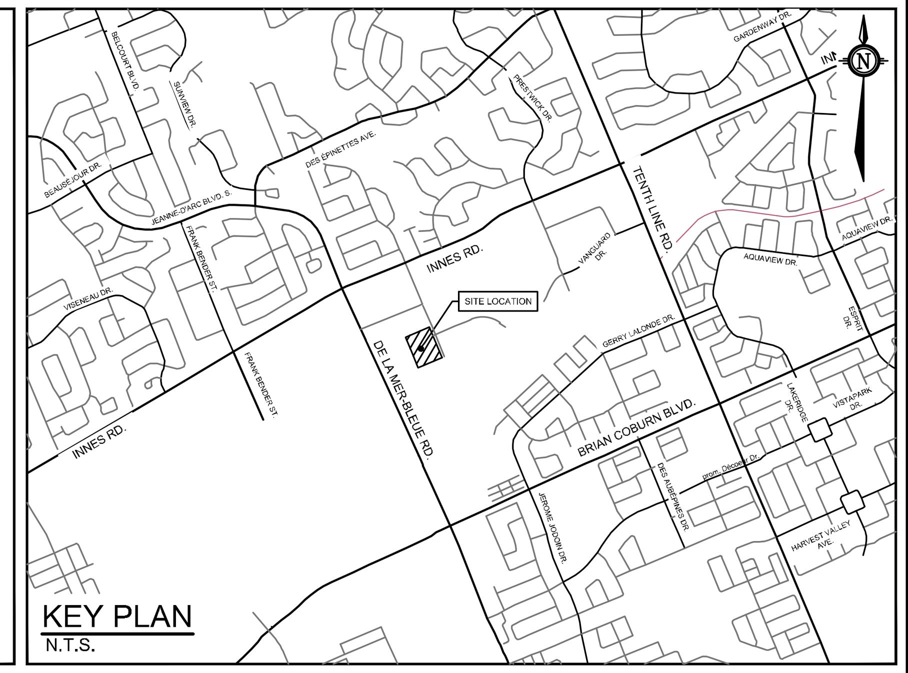
CAPACITY EQUATION

Q full= (1/n) A R^(2/3)So^(1/2)

Where : Q full = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A = Flow area (m^2)
R = Wetter perimenter (m)
So = Pipe Slope/gradient







LEGEND

- DRAINAGE AREA LIMITS
- 0.085 / A-16 / 0.78 — DRAINAGE AREA (ha), DRAINAGE AREA ID, RUNOFF COEFFICIENT
- PROPERTY LINE
- PROPOSED CURB
- DC — PROPOSED DEPRESSED CURB
- PROPOSED RETAINING WALL C/W GUARD RAIL
- PROPOSED CAP
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED LANDSCAPE TEE CATCH BASIN
- PROPOSED LANDSCAPE ELBOW CATCH BASIN
- PROPOSED TRENCH DRAIN
- PROPOSED STORMTECH UNDERGROUND STORAGE SYSTEM (REFER 122179-ND FOR DETAILS)
- ICD — PROPOSED INLET CONTROL DEVICE
- PROPOSED BUILDING ENTRANCE
- PROPOSED FIREWALL
- DIRECTION OF FLOW
- STM MH — *EXISTING STORM MANHOLE & SEWER*
- CB 1 — *EXISTING CATCHBASIN*

REFER TO 122179-ND FOR ADDITIONAL NOTES & DETAILS

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

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPLICATION	MAY 24/2023	GJM

SCALE 1:400

1:400 — 0 4 8 12 16

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

FOR REVIEW ONLY

ISSUED FOR REVIEW

ISSUED FOR REVIEW

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

LOCATION
4200 INNES ROAD, CITY OF OTTAWA
TRINTIY APARTMENTS

DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 122179
REV REV #1
DRAWING No. 122179-SWM

PLANA1.DWG - 841mmx594mm

Appendix E
Stormwater Management

Trinity Apartments (122179)
Post-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
A-01a	0.012	0.31	15.7%	0%	2	60	2.0%
A-01b	0.026	0.31	15.7%	0%	3	87	1.5%
A-01c	0.020	0.31	15.7%	0%	3	67	1.5%
A-02	0.096	0.81	87.1%	0%	15	64	2.0%
A-03	0.086	0.76	80.0%	0%	15	57	2.0%
A-04	0.030	0.85	92.9%	0%	9	33	2.0%
A-05	0.099	0.74	77.1%	0%	17	58	2.5%
A-06	0.134	0.72	74.3%	0%	19	71	2.5%
A-07	0.026	0.69	70.0%	0%	7	37	2.0%
A-08	0.026	0.26	8.6%	0%	7	37	2.0%
A-09	0.066	0.80	85.7%	0%	13	51	2.0%
A-10	0.069	0.86	94.3%	0%	14	49	2.5%
A-11	0.080	0.80	85.7%	0%	15	53	2.0%
A-12	0.101	0.87	95.7%	0%	16	63	2.0%
A-13	0.118	0.87	95.7%	0%	17	69	2.0%
A-14	0.037	0.31	15.7%	0%	4	93	1.0%
A-15	0.079	0.82	88.6%	0%	15	53	2.0%
A-16	0.061	0.85	92.9%	0%	13	47	3.0%
A-17	0.023	0.28	11.4%	0%	3	77	1.5%
A-18a	0.033	0.41	30.0%	0%	3	110	1.5%
A-18b	0.017	0.41	30.0%	0%	2	85	1.5%
A-19a	0.004	0.47	38.6%	0%	4	11	8.0%
A-19b	0.003	0.47	38.6%	0%	3	9	12.0%
A-19c	0.005	0.47	38.6%	0%	4	12	8.5%
A-19d	0.003	0.47	38.6%	0%	3	9	13.5%
A-19e	0.004	0.47	38.6%	0%	3	13	10.5%
A-19f	0.002	0.47	38.6%	0%	2	12	17.5%
A-19g	0.003	0.47	38.6%	0%	3	9	14.5%
A-19h	0.004	0.47	38.6%	0%	3	12	10.5%
A-19i	0.017	0.47	38.6%	0%	7	24	3.5%
D-01	0.007	0.49	41.4%	0%	2	35	16.0%
D-02	0.029	0.69	70.0%	0%	32	9	7.0%
D-03	0.013	0.90	100.0%	0%	29	4	7.5%
D-04	0.050	0.73	75.7%	0%	26	19	10.0%
D-05	0.028	0.40	28.6%	0%	11	25	3.0%
R-01	0.039	0.90	100.0%	0%	19	21	0.5%
R-02	0.037	0.90	100.0%	0%	19	19	0.5%
R-03	0.037	0.90	100.0%	0%	19	19	0.5%
R-04	0.025	0.90	100.0%	0%	16	16	0.5%
R-05	0.015	0.90	100.0%	0%	12	13	0.5%
R-06	0.004	0.90	100.0%	0%	11	4	0.5%
R-07	0.039	0.90	100.0%	0%	19	21	0.5%
R-08	0.037	0.90	100.0%	0%	19	19	0.5%
R-09	0.042	0.90	100.0%	0%	20	21	0.5%
R-10	0.042	0.90	100.0%	0%	20	21	0.5%
R-11	0.037	0.90	100.0%	0%	19	19	0.5%
R-12	0.039	0.90	100.0%	0%	19	21	0.5%
R-13	0.039	0.90	100.0%	0%	19	21	0.5%
R-14	0.037	0.90	100.0%	0%	19	19	0.5%
R-15	0.042	0.90	100.0%	0%	20	21	0.5%
TOTAL:	**1.921**	0.76	80.5%				

Trinity Apartments (122179)
Storage Curves

Storage Curves for Surface Ponding

CB ID	STM Area ID	Storage Curve			
CB01	A-07	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		87.50	0.000	0.36	0.0
CBMH T/G		88.70	1.200	0.36	0.4
5cm Ponding		88.75	1.250	19.79	0.9
10cm Ponding		88.80	1.300	59.40	2.9
Max Static Ponding(1)		88.83	1.330	87.00	5.1
Top of Storage Node(2)		89.05	1.550	87.00	24.3

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CB02	A-06	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.10	0.000	0.00	0.0
Top of Storm Chambers(1)		87.24	1.140	36.56	20.8
Offset Above Chambers		87.241	1.141	0.36	20.9
CBMH T/G		88.60	2.500	0.36	21.3
5cm Ponding		88.65	2.550	21.37	21.9
10cm Ponding		88.70	2.600	68.12	24.1
15cm Ponding		88.75	2.650	141.25	29.4
20cm Ponding		88.80	2.700	240.79	38.9
25cm Ponding		88.85	2.750	361.45	54.0
Max Static Ponding(2)		88.90	2.800	497.68	75.4
Top of Storage Node(3)		88.95	2.850	497.68	100.3

(1) Used 2x MC-3500 underground storage chambers for a total volume of 20.8 m^3

(2) Based on lowest high point between CBs

(3) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CB03	A-12	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		87.55	0.000	0.36	0.0
CBMH T/G		88.75	1.200	0.36	0.4
5cm Ponding		88.80	1.250	17.63	0.9
10cm Ponding		88.85	1.300	52.98	2.6
15cm Ponding		88.90	1.350	105.91	6.6
20cm Ponding		88.95	1.400	181.21	13.8
25cm Ponding		89.00	1.450	284.81	25.4
Max Static Ponding(1)		89.05	1.500	416.94	43.0
Top of Storage Node(2)		89.10	1.550	416.94	63.8

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

CB ID	STM Area ID	Storage Curve			
CB04	A-16	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.38	0.000	0.36	0.0
CBMH T/G		88.75	1.370	0.36	0.5
5cm Ponding		88.80	1.420	12.51	0.8
10cm Ponding		88.85	1.470	37.23	2.1
15cm Ponding		88.90	1.520	78.33	4.9
20cm Ponding		88.95	1.570	145.84	10.6
Max Static Ponding(1)		89.00	1.620	233.14	20.0
Top of Storage Node(2)		89.10	1.720	233.14	43.3

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CB05	A-15	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.65	0.000	0.36	0.0
CBMH T/G		88.85	1.200	0.36	0.4
5cm Ponding		88.90	1.250	16.42	0.9
10cm Ponding		88.95	1.300	49.36	2.5
15cm Ponding		89.00	1.350	111.01	6.5
Max Static Ponding(1)		89.03	1.380	163.99	10.6
Top of Storage Node(2)		89.20	1.550	163.99	38.5

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CB09	A-04	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.65	0.000	0.36	0.0
CBMH T/G		88.85	1.200	0.36	0.4
5cm Ponding		88.90	1.250	20.51	1.0
10cm Ponding		88.95	1.300	62.52	3.0
Max Static Ponding(1)		89.00	1.350	117.50	7.5
Top of Storage Node(2)		89.20	1.550	117.50	31.0

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

CB ID	STM Area ID	Storage Curve			
CB10	A-02	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.81	0.000	0.36	0.0
CBMH T/G		88.75	1.940	0.36	0.7
5cm Ponding		88.80	1.990	29.65	1.4
10cm Ponding		88.85	2.040	95.86	4.6
15cm Ponding		88.90	2.090	199.75	12.0
20cm Ponding		88.95	2.140	341.39	25.5
Max Static Ponding(1)		89.00	2.190	514.66	46.9
Top of Storage Node(2)		89.10	2.290	514.66	98.4

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CB12	A-19a	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		85.33	0.000	0.36	0.0
CBMH T/G		88.75	3.420	0.36	1.2
5cm Ponding		88.80	3.470	3.37	1.3
10cm Ponding		88.85	3.520	8.70	1.6
Max Static Ponding(1)		88.89	3.560	14.40	2.1
Top of Storage Node(2)		89.10	3.770	14.40	5.1

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CBMH208	A-11	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.10	0.000	1.13	0.0
CBMH T/G		88.65	2.550	1.13	2.9
5cm Ponding		88.70	2.600	17.62	3.4
10cm Ponding		88.75	2.650	55.21	5.2
15cm Ponding		88.80	2.700	112.62	9.4
20cm Ponding		88.85	2.750	192.72	17.0
25cm Ponding		88.90	2.800	299.60	29.3
Max Static Ponding(1)		88.95	2.850	418.39	47.3
Top of Storage Node(2)		89.00	2.900	418.39	68.2

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

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CB ID	STM Area ID	Storage Curve			
CBMH209	A-13	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.28	0.000	1.13	0.0
CBMH T/G		88.70	2.420	1.13	2.7
5cm Ponding		88.75	2.470	26.61	3.4
10cm Ponding		88.80	2.520	85.09	6.2
15cm Ponding		88.85	2.570	176.45	12.8
20cm Ponding		88.90	2.620	300.69	24.7
25cm Ponding		88.95	2.670	457.83	43.7
Max Static Ponding(1)		88.97	2.690	524.41	53.5
Top of Storage Node(2)		89.05	2.770	524.41	95.4

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CBMH211	A-10	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.29	0.000	1.13	0.0
CBMH T/G		88.75	2.460	1.13	2.8
5cm Ponding		88.80	2.510	16.09	3.2
10cm Ponding		88.85	2.560	44.54	4.7
15cm Ponding		88.90	2.610	88.83	8.1
20cm Ponding		88.95	2.660	160.78	14.3
25cm Ponding		89.00	2.710	256.73	24.7
Max Static Ponding(1)		89.05	2.760	372.04	40.5
Top of Storage Node(2)		89.10	2.810	372.04	59.1

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CBMH212	A-09	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.58	0.000	1.13	0.0
CBMH T/G		88.90	2.320	1.13	2.6
5cm Ponding		88.95	2.370	23.16	3.2
10cm Ponding		89.00	2.420	74.55	5.7
15cm Ponding		89.05	2.470	140.80	11.1
Max Static Ponding(1)		89.10	2.520	196.78	19.5
Top of Storage Node(2)		89.25	2.670	196.78	49.0

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

CB ID	STM Area ID	Storage Curve			
CBMH213	A-05	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.43	0.000	1.13	0.0
CBMH T/G		88.65	2.220	1.13	2.5
5cm Ponding		88.70	2.270	16.29	2.9
10cm Ponding		88.75	2.320	48.37	4.6
15cm Ponding		88.80	2.370	96.04	8.2
20cm Ponding		88.85	2.420	163.77	14.7
25cm Ponding		88.90	2.470	256.61	25.2
30cm Ponding		88.95	2.520	374.41	41.0
Max Static Ponding(1)		88.97	2.540	437.83	49.1
Top of Storage Node(2)		89.00	2.570	437.83	62.2

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
CBMH214	A-03	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		86.58	0.000	1.13	0.0
CBMH T/G		88.75	2.170	1.13	2.5
5cm Ponding		88.80	2.220	29.86	3.2
10cm Ponding		88.85	2.270	96.78	6.4
15cm Ponding		88.90	2.320	201.59	13.9
20cm Ponding		88.95	2.370	338.00	27.3
Max Static Ponding(1)		88.97	2.390	409.57	34.8
Top of Storage Node(2)		89.10	2.520	409.57	88.1

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1004	A-19b	Elevation (m)	Depth (m)	Area (m^2)	Volume (m^3)
Notes					
Invert		87.24	0.000	0.07	0.0
CBMH T/G		88.75	1.510	0.07	0.1
5cm Ponding		88.80	1.560	2.34	0.2
Max Static Ponding(1)		88.85	1.610	6.23	0.4
Top of Storage Node(2)		89.10	1.860	6.23	1.9

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

Engineers, Planners & Landscape Architects

CB ID	STM Area ID	Storage Curve			
LD1005	A-19c	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.29	0.000	0.07	0.0
CBMH T/G		88.65	1.360	0.07	0.1
5cm Ponding		88.70	1.410	3.99	0.2
Max Static Ponding(1)		88.75	1.460	10.37	0.6
Top of Storage Node(2)		89.00	1.710	10.37	3.1

(1) Based on lowest high point between CBs
(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1006	A-19d	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.34	0.000	0.07	0.0
CBMH T/G		88.65	1.310	0.07	0.1
5cm Ponding		88.70	1.360	3.24	0.2
Max Static Ponding(1)		88.73	1.390	6.57	0.3
Top of Storage Node(2)		89.00	1.660	6.57	2.1

(1) Based on lowest high point between CBs
(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1007	A-19e	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.39	0.000	0.07	0.0
CBMH T/G		88.60	1.210	0.07	0.1
5cm Ponding		88.65	1.260	4.35	0.2
Max Static Ponding(1)		88.67	1.280	7.34	0.3
Top of Storage Node(2)		88.95	1.560	7.34	2.4

(1) Based on lowest high point between CBs
(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1008	A-19f	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.44	0.000	0.07	0.0
CBMH T/G		88.60	1.160	0.07	0.1
5cm Ponding		88.65	1.210	3.05	0.2
Max Static Ponding(1)		88.67	1.230	4.65	0.2
Top of Storage Node(2)		88.95	1.510	4.65	1.5

(1) Based on lowest high point between CBs
(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

Trinity Apartments (122179)
Storage Curves

CB ID	STM Area ID	Storage Curve			
LD1009	A-19g	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.48	0.000	0.07	0.0
CBMH T/G		88.60	1.120	0.07	0.1
5cm Ponding		88.65	1.170	2.78	0.1
Max Static Ponding(1)		88.68	1.200	5.80	0.3
Top of Storage Node(2)		88.95	1.470	5.80	1.8

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1010	A-19h	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.52	0.000	0.07	0.0
CBMH T/G		88.60	1.080	0.07	0.1
5cm Ponding		88.65	1.130	3.89	0.2
Max Static Ponding(1)		88.68	1.160	8.03	0.4
Top of Storage Node(2)		88.95	1.430	8.03	2.5

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
LD1011	A-19i	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		87.60	0.000	0.07	0.0
CBMH T/G		88.60	1.000	0.07	0.1
5cm Ponding		88.65	1.050	10.21	0.3
Max Static Ponding(1)		88.69	1.090	24.10	1.0
Top of Storage Node(2)		88.95	1.350	24.10	7.3

(1) Based on lowest high point between CBs

(2) Top of storage node is 0.35m above T/G - modelled major system with 0.35m depth

CB ID	STM Area ID	Storage Curve			
STORE	-	Elevation	Depth	Area	Volume
Notes		(m)	(m)	(m^2)	(m^3)
Invert		86.29	0.000	0.00	0.0
Top of Storm Chambers(1)		87.43	1.140	152.12	86.7
Offset Above Chambers		87.431	1.141	0.00	86.8
Top of Storage Node		89.13	2.840	0.00	86.8

(1) Used 13x MC-3500 underground storage chambers for a total volume of 86.7 m^3

Trinity Apartments (122179)
HGL Elevations

Manhole ID	MH Information		HGL Information[1]		Clearance from T/G	
	MH Invert Elev. (m)	MH T/G Elev. (m)	100-year (m)	100-year (+20%) (m)	100-year (m)	100-year (+20%) (m)
MH201	83.80	88.82	84.01	84.02	4.81	4.80
MH202	83.99	88.65	84.14	84.15	4.51	4.50
MH203	84.19	88.71	84.33	84.34	4.38	4.37
MH204	84.41	88.92	84.54	84.55	4.38	4.37
MH205	84.54	88.79	84.68	84.69	4.11	4.10
MH205B	84.65	88.97	84.80	84.81	4.17	4.16
MH206	84.72	88.84	84.85	84.86	3.99	3.98
MH207	84.96	89.18	85.07	85.09	4.11	4.09
MH210	86.20	88.78	88.98	89.01	-0.20	-0.23
MH215	84.89	89.08	84.94	84.95	4.14	4.13

(1) HGL information is for a 3-hour Chicago Storm Distribution

Trinity Apartments (122179)
Ponding Depths

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Structure	T/G	Max. Static Ponding (Spill Depth)		2-yr Event (3hr)				5-yr Event (3hr)				100-yr Event (3hr)				100-yr Event (+20%) (3hr)			
	(m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)	Elev. (m)	Depth (m)	Cascading Flow?	Cascade Depth (m)
Catchbasins																			
CB01	88.70	88.83	0.13	87.97	0.00	N	0.00	88.42	0.00	N	0.00	88.80	0.10	N	0.00	88.85	0.15	Y	0.02
CB02	88.60	88.90	0.30	87.08	0.00	N	0.00	88.66	0.06	N	0.00	88.89	0.29	N	0.00	88.96	0.36	Y	0.06
CB03	88.75	89.05	0.30	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	N	0.00	89.01	0.26	N	0.00
CB04	88.75	89.00	0.25	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	N	0.00	89.02	0.27	Y	0.02
CB05	88.85	89.03	0.18	88.35	0.00	N	0.00	88.86	0.01	N	0.00	89.00	0.15	N	0.00	89.04	0.19	Y	0.01
CB06	89.00	89.15	0.15	88.35	0.00	N	0.00	88.86	0.00	N	0.00	89.00	0.00	N	0.00	89.07	0.07	N	0.00
CB07	88.95	89.18	0.23	88.35	0.00	N	0.00	88.86	0.00	N	0.00	89.03	0.08	N	0.00	89.10	0.15	N	0.00
CB08	89.00	89.20	0.20	88.35	0.00	N	0.00	88.86	0.00	N	0.00	89.04	0.04	N	0.00	89.12	0.12	N	0.00
CB09	88.85	89.00	0.15	88.35	0.00	N	0.00	88.86	0.01	N	0.00	88.98	0.13	N	0.00	89.01	0.16	Y	0.01
CB10	88.75	89.00	0.25	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	N	0.00	89.01	0.26	Y	0.01
CB11	88.85	89.14	0.29	88.35	0.00	N	0.00	88.86	0.01	N	0.00	88.98	0.13	N	0.00	89.01	0.16	N	0.00
CB12	88.75	88.89	0.14	86.04	0.00	N	0.00	87.13	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00
CBMH208	88.65	88.95	0.30	88.35	0.00	N	0.00	88.86	0.21	N	0.00	88.98	0.33	Y	0.03	89.01	0.36	Y	0.06
CBMH209	88.70	88.97	0.27	88.35	0.00	N	0.00	88.86	0.16	N	0.00	88.98	0.28	Y	0.01	89.01	0.31	Y	0.04
CBMH211	88.75	89.05	0.30	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	N	0.00	89.01	0.26	N	0.00
CBMH212	88.90	89.10	0.20	88.35	0.00	N	0.00	88.86	0.00	N	0.00	88.99	0.09	N	0.00	89.05	0.15	N	0.00
CBMH213	88.65	88.97	0.32	88.35	0.00	N	0.00	88.86	0.21	N	0.00	88.98	0.33	Y	0.01	89.01	0.36	Y	0.04
CBMH214	88.75	88.97	0.22	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	Y	0.01	89.01	0.26	Y	0.04
LD1000	88.90	89.15	0.25	88.35	0.00	N	0.00	88.86	0.00	N	0.00	89.05	0.15	N	0.00	89.13	0.23	N	0.00
LD1001	88.80	89.10	0.30	88.35	0.00	N	0.00	88.86	0.06	N	0.00	89.05	0.25	N	0.00	89.13	0.33	Y	0.03
LD1002	88.80	89.10	0.30	88.35	0.00	N	0.00	88.86	0.06	N	0.00	88.98	0.18	N	0.00	89.01	0.21	N	0.00
LD1003	88.75	89.05	0.30	88.35	0.00	N	0.00	88.86	0.11	N	0.00	88.98	0.23	N	0.00	89.01	0.26	N	0.00
LD1004	88.75	88.85	0.10	87.29	0.00	N	0.00	87.31	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00
LD1005	88.65	88.75	0.10	87.34	0.00	N	0.00	87.36	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00
LD1006	88.65	88.73	0.08	87.39	0.00	N	0.00	87.41	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00
LD1007	88.60	88.67	0.07	87.43	0.00	N	0.00	87.45	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00
LD1008	88.60	88.67	0.07	87.48	0.00	N	0.00	87.50	0.00	N	0.00	87.90	0.00	N	0.00	88.19	0.00	N	0.00
LD1009	88.60	88.68	0.08	87.52	0.00	N	0.00	87.54	0.00	N	0.00	87.90	0.00	N	0.00	88.19	0.00	N	0.00
LD1010	88.60	88.68	0.08	87.56	0.00	N	0.00	87.57	0.00	N	0.00	87.90	0.00	N	0.00	88.19	0.00	N	0.00
LD1011	88.60	88.69	0.09	87.63	0.00	N	0.00	87.65	0.00	N	0.00	87.89	0.00	N	0.00	88.19	0.00	N	0.00

Trinity Apartments (122179)
Design Storm Time Series Data
Chicago Design Storms

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C25mm-4.stm	
Duration min	Intensity mm/hr
0:00	0
0:10	1.51
0:20	1.75
0:30	2.07
0:40	2.58
0:50	3.46
1:00	5.39
1:10	13.44
1:20	56.67
1:30	17.77
1:40	9.12
1:50	6.14
2:00	4.65
2:10	3.76
2:20	3.17
2:30	2.74
2:40	2.43
2:50	2.18
3:00	1.98
3:10	1.81
3:20	1.68
3:30	1.56
3:40	1.47
3:50	1.38
4:00	1.31

C2-3.stm	
Duration min	Intensity mm/hr
0:00	0
0:10	2.81
0:20	3.5
0:30	4.69
0:40	7.3
0:50	18.21
1:00	76.81
1:10	24.08
1:20	12.36
1:30	8.32
1:40	6.3
1:50	5.09
2:00	4.29
2:10	3.72
2:20	3.29
2:30	2.95
2:40	2.68
2:50	2.46
3:00	2.28

C5-3.stm	
Duration min	Intensity mm/hr
0:00	0
0:10	3.68
0:20	4.58
0:30	6.15
0:40	9.61
0:50	24.17
1:00	104.19
1:10	32.04
1:20	16.34
1:30	10.96
1:40	8.29
1:50	6.69
2:00	5.63
2:10	4.87
2:20	4.3
2:30	3.86
2:40	3.51
2:50	3.22
3:00	2.98

Trinity Apartments (122179)
Design Storm Time Series Data
Chicago Design Storms

C100-3.stm		C100-3+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	6.05	0:10	6:14
0:20	7.54	0:20	9.05
0:30	10.16	0:30	12.19
0:40	15.97	0:40	19.16
0:50	40.65	0:50	48.78
1:00	178.56	1:00	214.27
1:10	54.05	1:10	64.86
1:20	27.32	1:20	32.78
1:30	18.24	1:30	21.89
1:40	13.74	1:40	16.49
1:50	11.06	1:50	13.27
2:00	9.29	2:00	11.15
2:10	8.02	2:10	9.62
2:20	7.08	2:20	8.5
2:30	6.35	2:30	7.62
2:40	5.76	2:40	6.91
2:50	5.28	2:50	6.34
3:00	4.88	3:00	5.86

Trinity Apartments (122179)
Design Storm Time Series Data
SCS Design Storms

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S2-12.stm		S5-12.stm		S100-12.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
0:30	1.27	0:30	1.69	0:30	2.82
1:00	0.59	1:00	0.79	1:00	1.31
1:30	1.10	1:30	1.46	1:30	2.44
2:00	1.10	2:00	1.46	2:00	2.44
2:30	1.44	2:30	1.91	2:30	3.19
3:00	1.27	3:00	1.69	3:00	2.82
3:30	1.69	3:30	2.25	3:30	3.76
4:00	1.69	4:00	2.25	4:00	3.76
4:30	2.29	4:30	3.03	4:30	5.07
5:00	2.88	5:00	3.82	5:00	6.39
5:30	4.57	5:30	6.07	5:30	10.14
6:00	36.24	6:00	48.08	6:00	80.38
6:30	9.23	6:30	12.25	6:30	20.47
7:00	4.06	7:00	5.39	7:00	9.01
7:30	2.71	7:30	3.59	7:30	6.01
8:00	2.37	8:00	3.15	8:00	5.26
8:30	1.86	8:30	2.47	8:30	4.13
9:00	1.95	9:00	2.58	9:00	4.32
9:30	1.27	9:30	1.69	9:30	2.82
10:00	1.02	10:00	1.35	10:00	2.25
10:30	1.44	10:30	1.91	10:30	3.19
11:00	0.93	11:00	1.24	11:00	2.07
11:30	0.85	11:30	1.12	11:30	1.88
12:00	0.85	12:00	1.12	12:00	1.88

TABLE 7A: Post-Development Runoff Coefficient "C" - R-01

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.039	Roof	0.039	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 7B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-01

0.039 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	40	32.86	3.18	0.782	2.40	5.76
	45	30.24	2.93	0.782	2.14	5.79
	50	**28.04**	**2.71**	**0.782**	**1.93**	**5.80**
	55	26.17	2.53	0.782	1.75	5.78
	60	24.56	2.38	0.782	1.60	5.74

TABLE 7C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-01

0.0386867 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	55	35.12	3.40	0.821	2.58	8.51
	60	32.94	3.19	0.821	2.37	8.52
	65	**31.04**	**3.00**	**0.821**	**2.18**	**8.52**
	70	29.37	2.84	0.821	2.02	8.49
	75	27.89	2.70	0.821	1.88	8.45

TABLE 7D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-01

0.0386867 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	90	41.11	4.42	0.936	3.49	18.82
	95	39.43	4.24	0.94	3.31	18.84
	100	**37.90**	**4.08**	**0.94**	**3.14**	**18.84**
	105	36.50	3.93	0.94	2.99	18.83
	110	35.20	3.79	0.94	2.85	18.81

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

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DATE PREPARED:January, 2023

TABLE 7E: Storage Provided - R-01

Area R-01: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.669	0.15	
0.050	43.465	0.84	
0.075	95.450	2.57	
0.100	167.624	5.86	
0.125	259.988	11.21	
0.150	377.522	19.17	

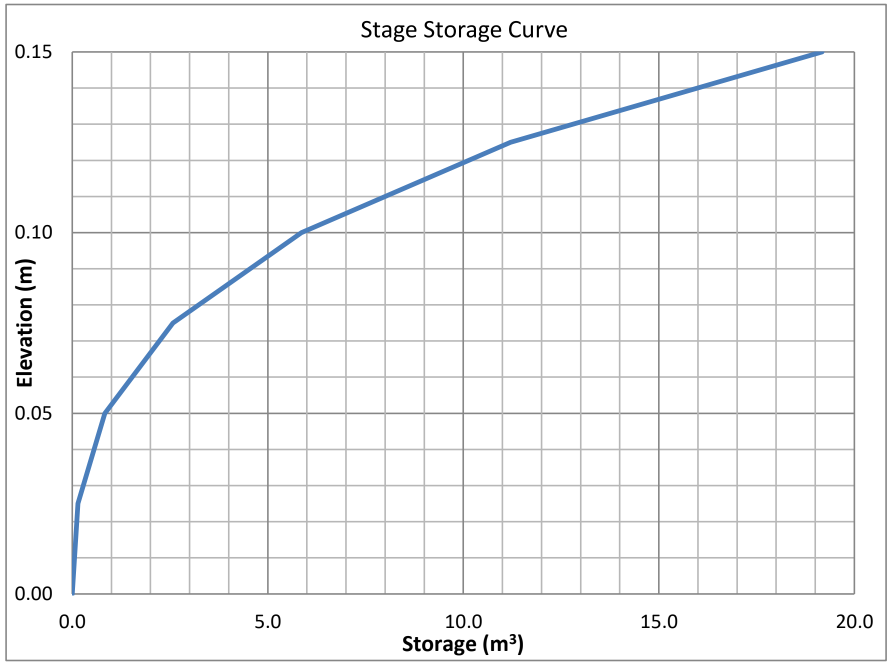

Table 7F: Roof Drain Flows

Roof Drains		
Roof Area	386.867	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 7G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-01	0.782	0.100	5.80
5 Year		0.821	0.112	8.52
100 Year		0.936	0.149	18.84

TABLE 8A: Post-Development Runoff Coefficient "C" - R-02

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.037	Roof	0.037	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 8B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-02

0.037 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.33	0.781	2.55	5.35
	40	32.86	3.03	0.781	2.25	5.41
	45	**30.24**	**2.79**	**0.781**	**2.01**	**5.43**
	50	28.04	2.59	0.781	1.81	5.42
	55	26.17	2.42	0.781	1.63	5.40

TABLE 8C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-02

0.0368963 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.48	0.821	2.65	7.96
	55	35.12	3.24	0.821	2.42	7.99
	60	**32.94**	**3.04**	**0.821**	**2.22**	**7.99**
	65	31.04	2.87	0.821	2.04	7.97
	70	29.37	2.71	0.821	1.89	7.94

TABLE 8D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-02

0.0368963 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	80	44.99	4.61	0.936	3.68	17.66
	85	42.95	4.41	0.94	3.47	17.70
	90	**41.11**	**4.22**	**0.94**	**3.28**	**17.72**
	95	39.43	4.04	0.94	3.11	17.72
	100	37.90	3.89	0.94	2.95	17.71

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 8E: Storage Provided - R-02

Area R-02: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.104	0.14	
0.050	41.163	0.79	
0.075	90.240	2.44	
0.100	158.335	5.54	
0.125	245.447	10.59	
0.150	359.147	18.15	

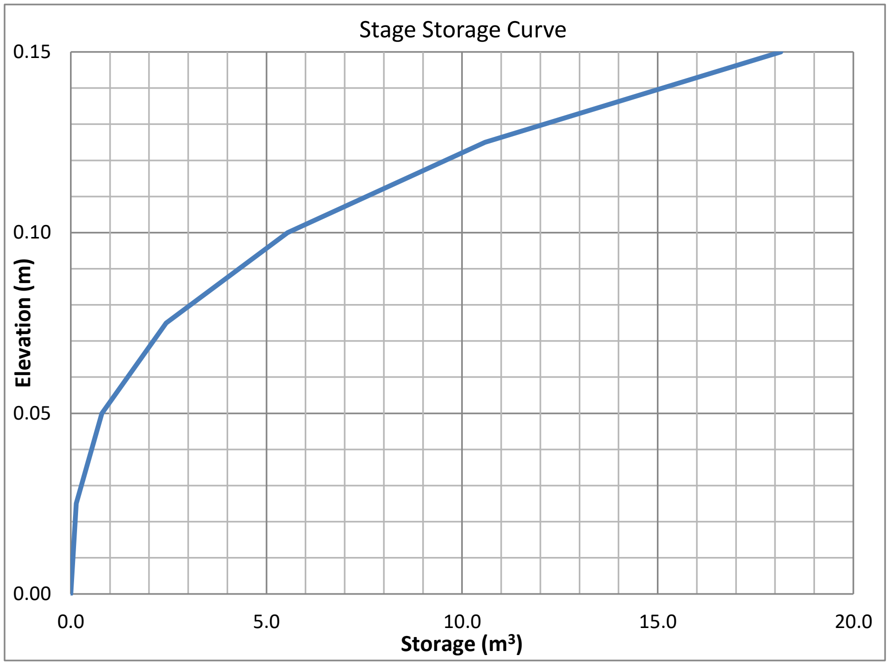

Table 8F: Roof Drain Flows

Roof Drains		
Roof Area	368.963	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 8G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-02	0.781	0.099	5.43
5 Year		0.821	0.112	7.99
100 Year		0.936	0.149	17.72

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TABLE 9A: Post-Development Runoff Coefficient "C" - R-03

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.037	Roof	0.037	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 9B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-03

0.037 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.31	0.780	2.53	5.31
	40	32.86	3.02	0.780	2.24	5.37
	45	**30.24**	**2.78**	**0.780**	**2.00**	**5.39**
	50	28.04	2.57	0.780	1.79	5.38
	55	26.17	2.40	0.780	1.62	5.35

TABLE 9C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-03

0.0366892 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.46	0.818	2.64	7.92
	55	35.12	3.22	0.818	2.41	7.94
	60	**32.94**	**3.02**	**0.818**	**2.21**	**7.94**
	65	31.04	2.85	0.818	2.03	7.92
	70	29.37	2.70	0.818	1.88	7.89

TABLE 9D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-03

0.0366892 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	85	42.95	4.38	0.933	3.45	17.59
	90	41.11	4.19	0.93	3.26	17.60
	95	**39.43**	**4.02**	**0.93**	**3.09**	**17.61**
	100	37.90	3.87	0.93	2.93	17.60
	105	36.50	3.72	0.93	2.79	17.57

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 9E: Storage Provided - R-03

Area R-03: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.206	0.14	
0.050	41.572	0.80	
0.075	91.161	2.46	
0.100	159.972	5.60	
0.125	248.006	10.70	
0.150	359.001	18.29	

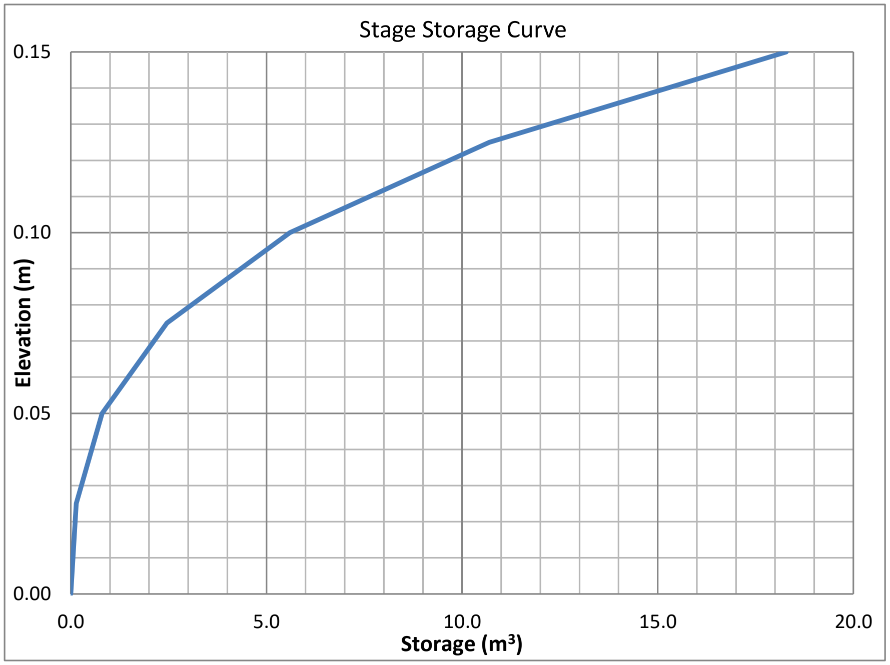

Table 9F: Roof Drain Flows

Roof Drains		
Roof Area	366.892	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 9G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-03	0.78	0.099	5.39
5 Year		0.818	0.111	7.94
100 Year		0.933	0.148	17.61

TABLE 10A: Post-Development Runoff Coefficient "C" - R-04

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.025	Roof	0.025	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 10B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-04

0.025 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	25	45.17	2.85	0.759	2.09	3.14
	30	40.04	2.53	0.759	1.77	3.18
	35	**36.06**	**2.27**	**0.759**	**1.52**	**3.18**
	40	32.86	2.07	0.759	1.31	3.15
	45	30.24	1.91	0.759	1.15	3.10

TABLE 10C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-04

0.0252125 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	30	53.93	3.40	0.805	2.60	4.67
	35	48.52	3.06	0.805	2.26	4.74
	40	**44.18**	**2.79**	**0.805**	**1.98**	**4.76**
	45	40.63	2.56	0.805	1.76	4.75
	50	37.65	2.38	0.805	1.57	4.71

TABLE 10D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-04

0.0252125 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	55	59.62	4.18	0.914	3.27	10.77
	60	55.89	3.92	0.91	3.00	10.81
	65	**52.65**	**3.69**	**0.91**	**2.78**	**10.83**
	70	49.79	3.49	0.91	2.58	10.82
	75	47.26	3.31	0.91	2.40	10.79

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 10E: Storage Provided - R-04

Area R-04: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	7.849	0.10	
0.050	28.627	0.55	
0.075	62.397	1.69	
0.100	109.157	3.84	
0.125	168.909	7.31	
0.150	244.134	12.48	

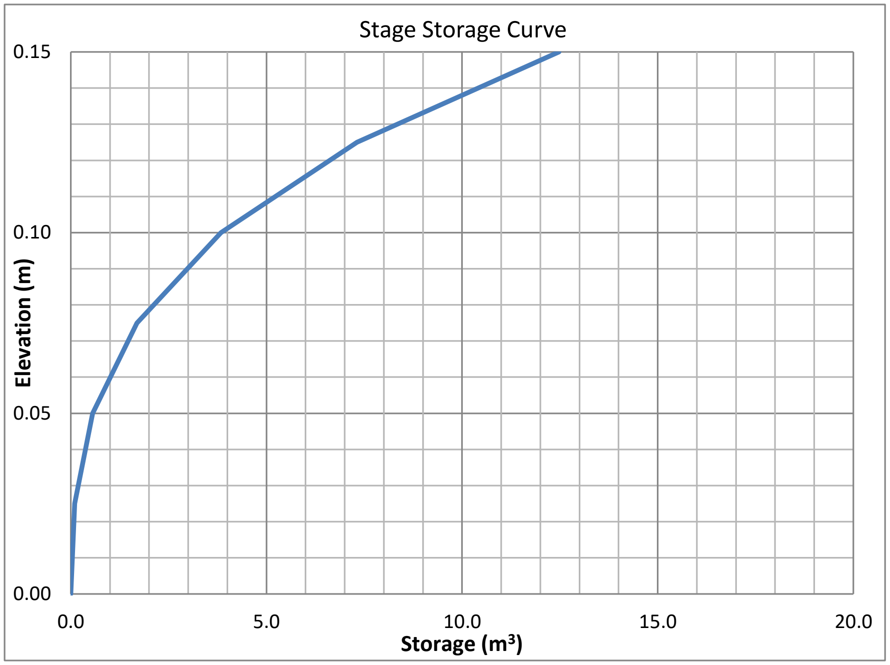

Table 10F: Roof Drain Flows

Roof Drains		
Roof Area	252.125	m^2
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 10G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-04	0.759	0.092	3.18
5 Year		0.805	0.107	4.76
100 Year		0.914	0.142	10.83

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TABLE 11A: Post-Development Runoff Coefficient "C" - R-05

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.015	Roof	0.015	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 11B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-05

0.015 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	10	76.81	2.96	0.734	2.22	1.33
	15	61.77	2.38	0.734	1.64	1.48
	20	**52.03**	**2.00**	**0.734**	**1.27**	**1.52**
	25	45.17	1.74	0.734	1.00	1.51
	30	40.04	1.54	0.734	0.81	1.45

TABLE 11D: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-05

0.0153883 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	15	83.56	3.22	0.784	2.43	2.19
	20	70.25	2.70	0.784	1.92	2.30
	25	**60.90**	**2.34**	**0.784**	**1.56**	**2.34**
	30	53.93	2.08	0.784	1.29	2.33
	35	48.52	1.87	0.784	1.08	2.28

TABLE 11E: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-05

0.0153883 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	30	91.87	3.93	0.889	3.04	5.47
	35	82.58	3.53	0.89	2.64	5.55
	40	**75.15**	**3.21**	**0.89**	**2.33**	**5.58**
	45	69.05	2.95	0.89	2.06	5.58
	50	63.95	2.74	0.89	1.85	5.54

Equations:

Flow Equation

Q = 2.78 x C x I x A

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

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TABLE 11F: Storage Provided - R-05

Area R-05: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	4.889	0.06	
0.050	17.389	0.34	
0.075	37.561	1.03	
0.100	65.406	2.31	
0.125	100.923	4.39	
0.150	148.769	7.51	

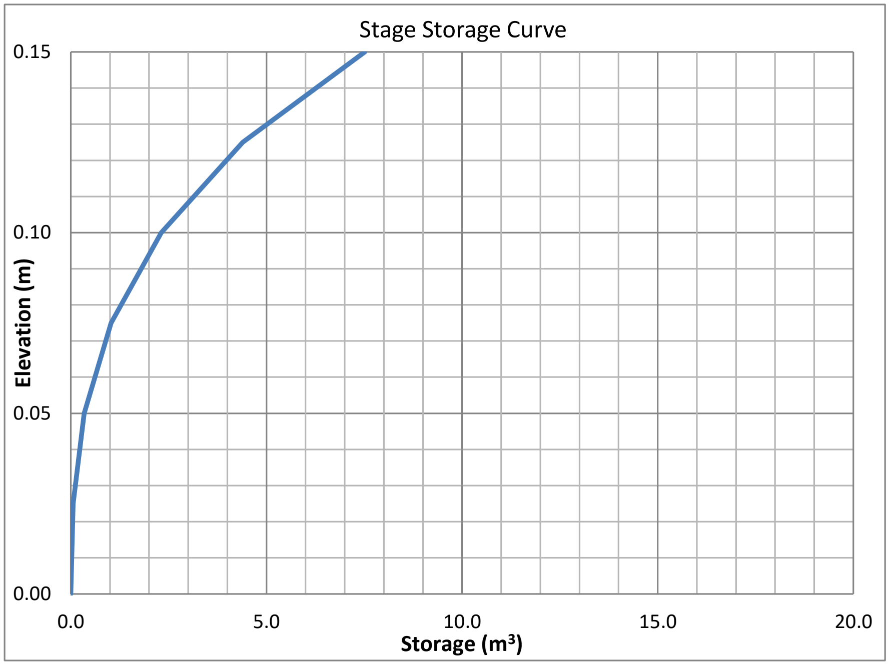

Table 11G: Roof Drain Flows

Roof Drains		
Roof Area	153.883	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 11G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-05	0.734	0.084	1.52
5 Year		0.784	0.100	2.34
100 Year		0.889	0.134	5.58

TABLE 12A: Post-Development Runoff Coefficient "C" - R-06

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.004	Roof	0.004	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 12B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-06

0.004 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	-5	632.75	6.44	0.632	5.81	-1.74
	0	167.22	1.70	0.632	1.07	0.00
	5	**103.57**	**1.05**	**0.632**	**0.42**	**0.13**
	10	76.81	0.78	0.632	0.15	0.09
	15	61.77	0.63	0.632	0.00	0.00

TABLE 12C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-06

0.0040704 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	0	230.48	2.35	0.684	1.66	0.00
	5	141.18	1.44	0.684	0.75	0.23
	10	**104.19**	**1.06**	**0.684**	**0.38**	**0.23**
	15	83.56	0.85	0.684	0.17	0.15
	20	70.25	0.72	0.684	0.03	0.04

TABLE 12D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-06

0.0040704 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	5	242.70	2.75	0.805	1.94	0.58
	10	178.56	2.02	0.81	1.22	0.73
	15	**142.89**	**1.62**	**0.81**	**0.81**	**0.73**
	20	119.95	1.36	0.81	0.55	0.66
	25	103.85	1.18	0.81	0.37	0.56

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 12E: Storage Provided - R-06

Area R-06: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	1.641	0.02	
0.050	4.726	0.10	
0.075	9.316	0.28	
0.100	15.413	0.59	
0.125	23.015	1.07	
0.150	32.123	1.76	

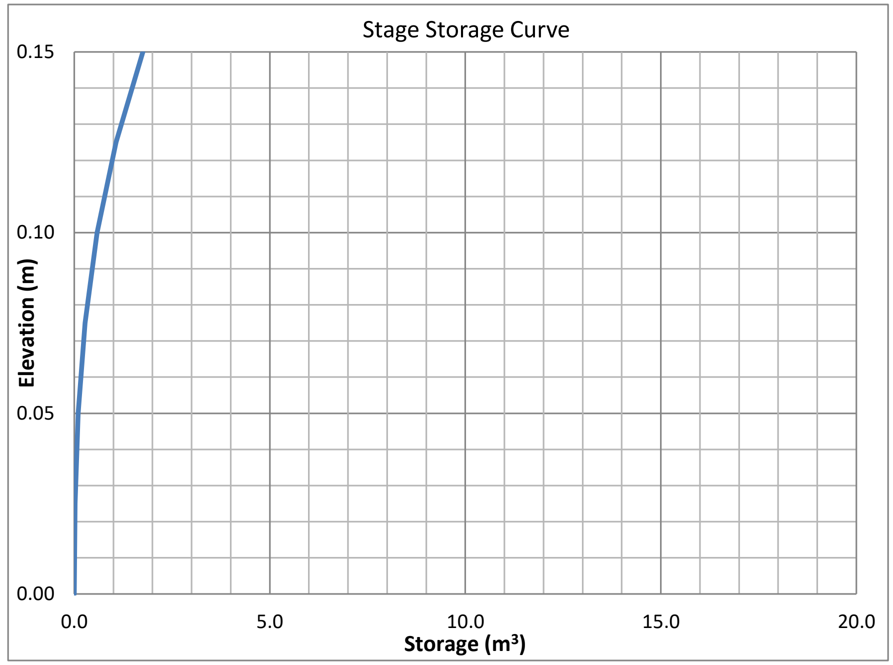

Table 12F: Roof Drain Flows

Roof Drains		
Roof Area	40.704	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 12G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-06	0.632	0.054	0.13
5 Year		0.684	0.068	0.23
100 Year		0.805	0.107	0.73

TABLE 13A: Post-Development Runoff Coefficient "C" - R-07

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.039	Roof	0.039	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 13B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-07

0.039 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	40	32.86	3.18	0.781	2.40	5.76
	45	30.24	2.93	0.781	2.15	5.80
	50	**28.04**	**2.72**	**0.781**	**1.93**	**5.80**
	55	26.17	2.53	0.781	1.75	5.79
	60	24.56	2.38	0.781	1.60	5.75

TABLE 13C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-07

0.0387013 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.65	0.821	2.82	8.47
	55	35.12	3.40	0.821	2.58	8.51
	60	**32.94**	**3.19**	**0.821**	**2.37**	**8.53**
	65	31.04	3.01	0.821	2.18	8.52
	70	29.37	2.84	0.821	2.02	8.50

TABLE 13D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-07

0.0387013 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	90	41.11	4.42	0.936	3.49	18.83
	95	39.43	4.24	0.94	3.31	18.85
	100	**37.90**	**4.08**	**0.94**	**3.14**	**18.85**
	105	36.50	3.93	0.94	2.99	18.84
	110	35.20	3.79	0.94	2.85	18.82

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 13E: Storage Provided - R-07

Area R-07: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.735	0.15	
0.050	43.572	0.84	
0.075	95.572	2.58	
0.100	167.736	5.87	
0.125	260.064	11.22	
0.150	377.552	19.19	

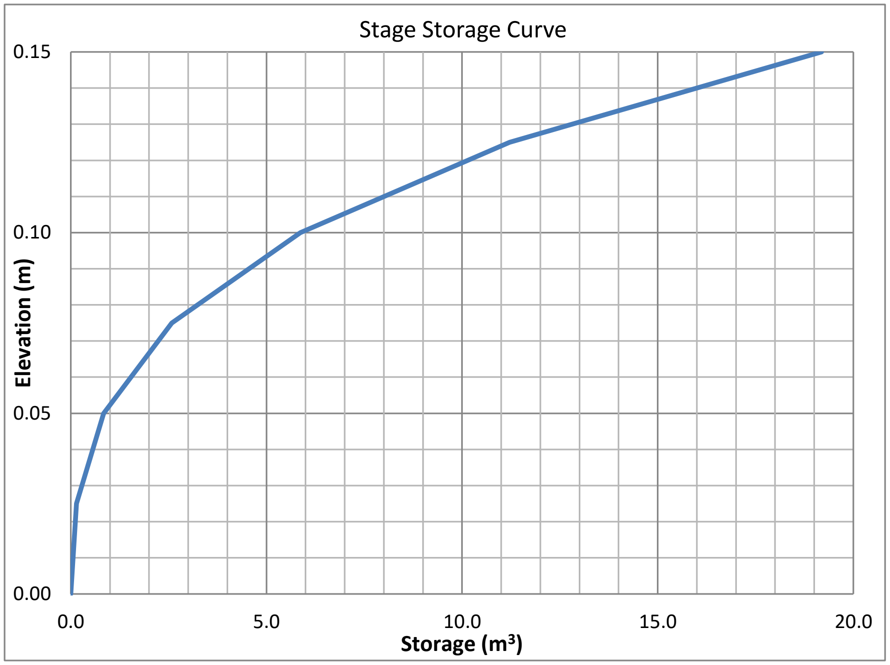

Table 13F: Roof Drain Flows

Roof Drains		
Roof Area	387.013	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 13G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-07	0.781	0.099	5.80
5 Year		0.821	0.112	8.53
100 Year		0.936	0.149	18.85

TABLE 14A: Post-Development Runoff Coefficient "C" - R-08

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.037	Roof	0.037	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 14B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-08

0.037 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.33	0.781	2.55	5.35
	40	32.86	3.03	0.781	2.25	5.41
	45	**30.24**	**2.79**	**0.781**	**2.01**	**5.43**
	50	28.04	2.59	0.781	1.81	5.42
	55	26.17	2.42	0.781	1.64	5.40

TABLE 14C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-08

0.0369013 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.48	0.821	2.66	7.97
	55	35.12	3.24	0.821	2.42	7.99
	60	**32.94**	**3.04**	**0.821**	**2.22**	**7.99**
	65	31.04	2.87	0.821	2.05	7.98
	70	29.37	2.71	0.821	1.89	7.94

TABLE 14D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-08

0.0369013 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	80	44.99	4.62	0.936	3.68	17.66
	85	42.95	4.41	0.94	3.47	17.70
	90	**41.11**	**4.22**	**0.94**	**3.28**	**17.72**
	95	39.43	4.05	0.94	3.11	17.72
	100	37.90	3.89	0.94	2.95	17.71

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 14E: Storage Provided - R-08

Area R-08: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.077	0.14	
0.050	41.053	0.79	
0.075	89.992	2.43	
0.100	157.893	5.53	
0.125	244.756	10.56	
0.150	359.349	18.11	

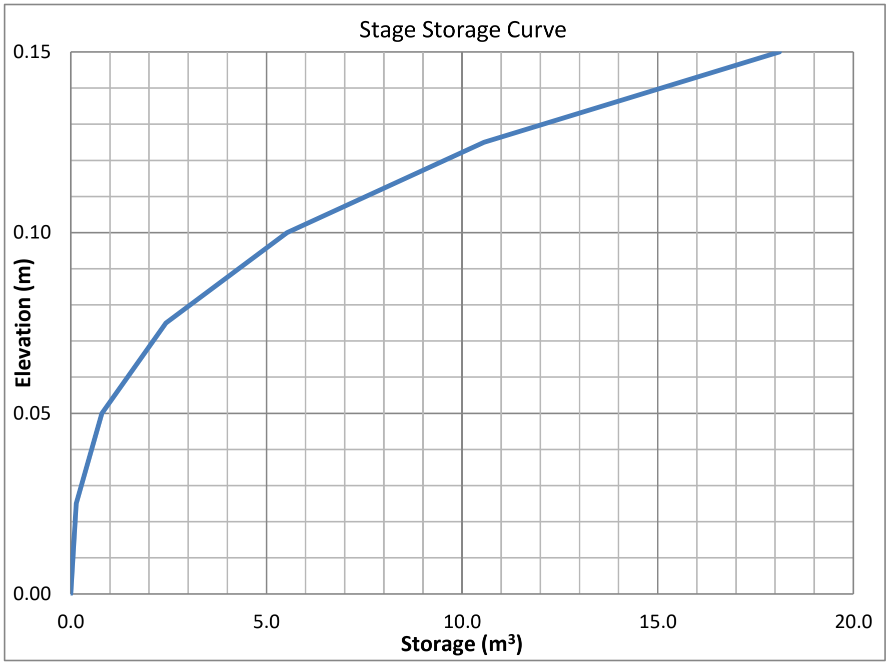

Table 13F: Roof Drain Flows

Roof Drains		
Roof Area	369.013	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 13G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-08	0.781	0.099	5.43
5 Year		0.821	0.112	7.99
100 Year		0.936	0.149	17.72

TABLE 15A: Post-Development Runoff Coefficient "C" - R-09

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.042	Roof	0.042	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 15B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-09

0.042 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.78	0.924	2.85	5.99
	40	32.86	3.44	0.924	2.52	6.04
	45	**30.24**	**3.17**	**0.924**	**2.24**	**6.06**
	50	28.04	2.94	0.924	2.01	6.04
	55	26.17	2.74	0.924	1.82	6.00

TABLE 15C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-09

0.0418618 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	45	40.63	4.26	1.005	3.25	8.78
	50	37.65	3.94	1.005	2.94	8.82
	55	**35.12**	**3.68**	**1.005**	**2.67**	**8.82**
	60	32.94	3.45	1.005	2.45	8.80
	65	31.04	3.25	1.005	2.25	8.76

TABLE 15D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-09

0.0418618 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	70	49.79	5.79	1.229	4.57	19.17
	75	47.26	5.50	1.23	4.27	19.22
	80	**44.99**	**5.24**	**1.23**	**4.01**	**19.23**
	85	42.95	5.00	1.23	3.77	19.23
	90	41.11	4.78	1.23	3.56	19.20

Equations:

Flow Equation

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

Where:

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

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

PROJECT #: 122179
PROJECT NAME: Trinity Crossing Apartments
LOCATION: City of Ottawa

DATE PREPARED:January, 2023

TABLE 14E: Storage Provided - R-08

Area R-09: Storage Table			
Head (m)	Area* (m²)	Storage Volume (m³)	
0.000	0.063	0.00	
0.025	12.609	0.16	
0.050	46.959	0.90	
0.075	103.114	2.78	
0.100	181.073	6.33	
0.125	280.836	12.11	
0.150	405.786	20.69	

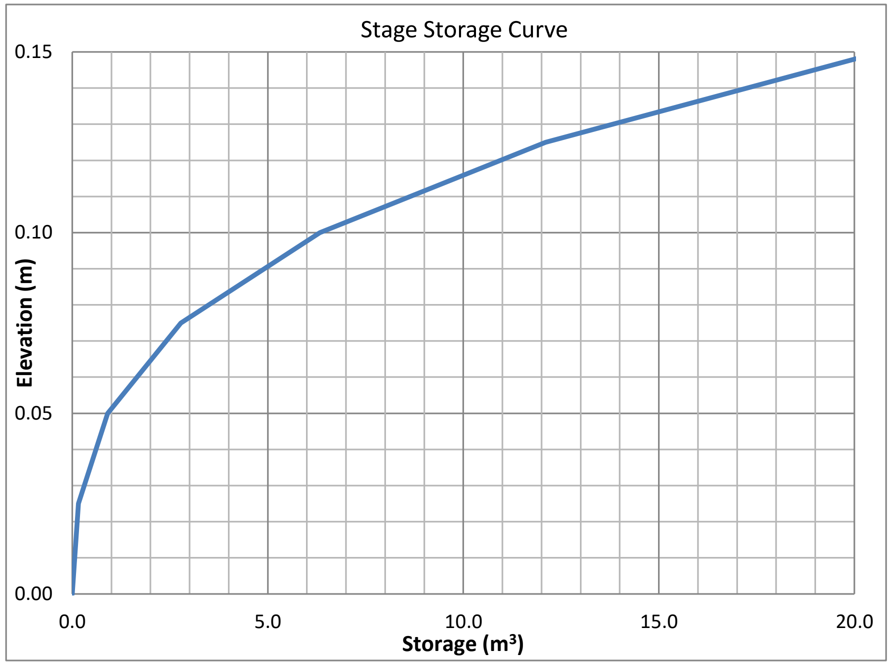

Table 14F: Roof Drain Flows

Roof Drains		
Roof Area	418.618	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/2 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.79	L/s (ea)
Design Flow 4" of head	0.95	L/s (ea)
Design Flow 5" of head	1.10	L/s (ea)
Design Flow 6" of head	1.26	L/s (ea)

Table 14G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-09	0.924	0.098	6.06
5 Year		1.005	0.111	8.82
100 Year		1.229	0.146	19.23

TABLE 16A: Post-Development Runoff Coefficient "C" - R-10

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.042	Roof	0.042	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 16B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-10

0.042 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.77	0.924	2.85	5.98
	40	32.86	3.44	0.924	2.51	6.03
	45	**30.24**	**3.16**	**0.924**	**2.24**	**6.05**
	50	28.04	2.93	0.924	2.01	6.03
	55	26.17	2.74	0.924	1.81	5.99

TABLE 16C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-10

0.0418155 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	45	40.63	4.25	1.005	3.25	8.76
	50	37.65	3.94	1.005	2.93	8.80
	55	**35.12**	**3.67**	**1.005**	**2.67**	**8.81**
	60	32.94	3.45	1.005	2.44	8.79
	65	31.04	3.25	1.005	2.24	8.75

TABLE 16D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-10

0.0418155 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	70	49.79	5.79	1.222	4.57	19.18
	75	47.26	5.49	1.22	4.27	19.22
	80	**44.99**	**5.23**	**1.22**	**4.01**	**19.24**
	85	42.95	4.99	1.22	3.77	19.23
	90	41.11	4.78	1.22	3.56	19.21

Equations:

Flow Equation

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

Where:

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

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 16E: Storage Provided - R-10

Area R-10: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	12.608	0.16	
0.050	46.956	0.90	
0.075	103.106	2.78	
0.100	181.060	6.33	
0.125	280.815	12.10	
0.150	405.764	20.69	

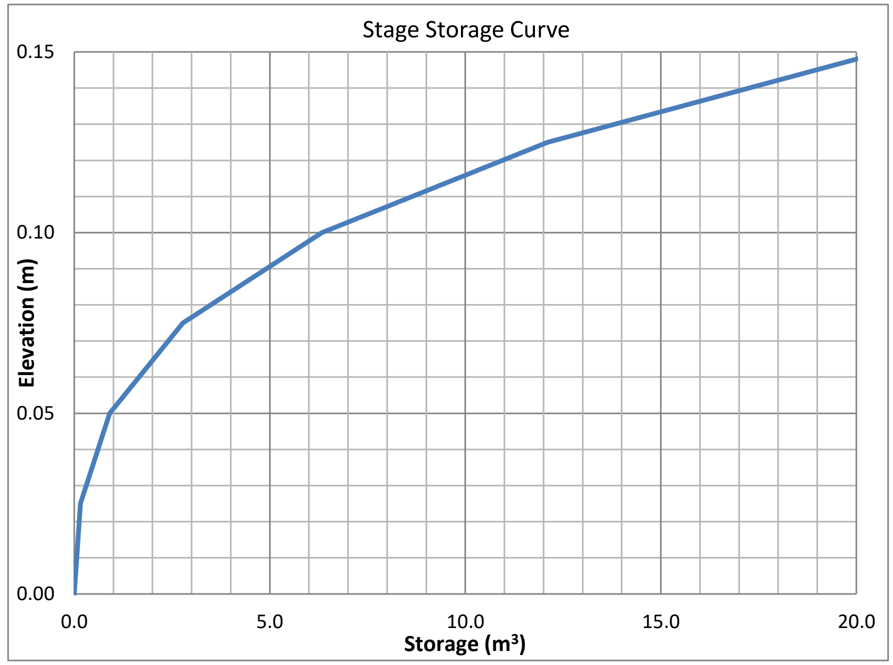

Table 16F: Roof Drain Flows

Roof Drains		
Roof Area	418.155	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/2 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.79	L/s (ea)
Design Flow 4" of head	0.95	L/s (ea)
Design Flow 5" of head	1.10	L/s (ea)
Design Flow 6" of head	1.26	L/s (ea)

Table 16G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-16	0.924	0.098	6.05
5 Year		1.005	0.111	8.81
100 Year		1.222	0.146	19.24

TABLE 16A: Post-Development Runoff Coefficient "C" - R-11

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.037	Roof	0.037	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 16B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-11

0.037 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.33	0.781	2.55	5.36
	40	32.86	3.04	0.781	2.26	5.42
	45	**30.24**	**2.80**	**0.781**	**2.01**	**5.44**
	50	28.04	2.59	0.781	1.81	5.43
	55	26.17	2.42	0.781	1.64	5.41

TABLE 16C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-11

0.0369527 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.48	0.821	2.66	7.98
	55	35.12	3.25	0.821	2.43	8.01
	60	**32.94**	**3.05**	**0.821**	**2.22**	**8.01**
	65	31.04	2.87	0.821	2.05	7.99
	70	29.37	2.72	0.821	1.89	7.96

TABLE 16D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-11

0.0369527 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	85	42.95	4.41	0.933	3.48	17.75
	90	41.11	4.22	0.93	3.29	17.77
	95	**39.43**	**4.05**	**0.93**	**3.12**	**17.77**
	100	37.90	3.89	0.93	2.96	17.76
	105	36.50	3.75	0.93	2.82	17.74

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, City of Ottawa IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

TABLE 16E: Storage Provided - R-11

Area R-11: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.210	0.14	
0.050	41.586	0.80	
0.075	91.190	2.46	
0.100	160.023	5.60	
0.125	248.085	10.70	
0.150	359.312	18.29	

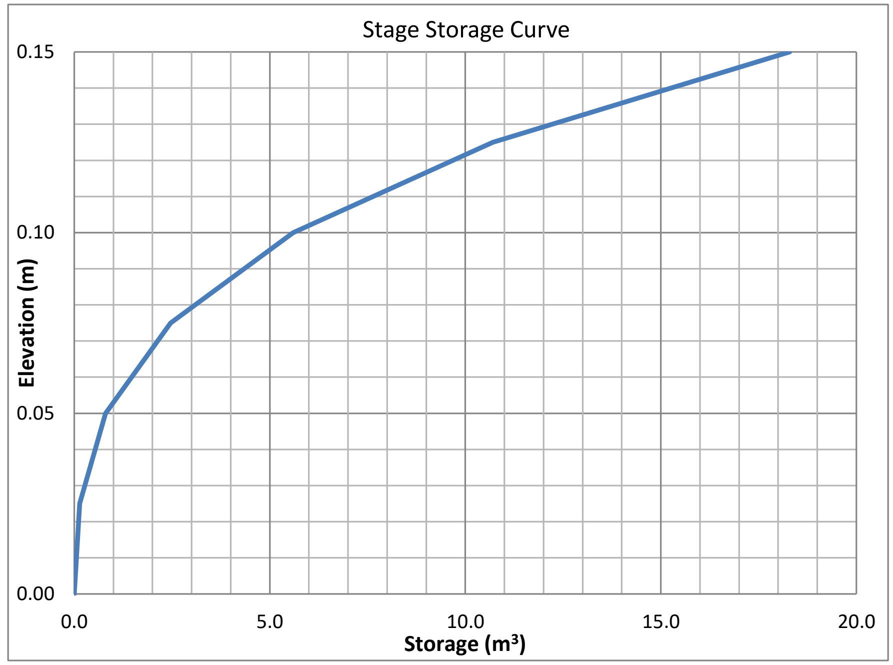

Table 16F: Roof Drain Flows

Roof Drains		
Roof Area	369.527	m^2
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 16G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-11	0.781	0.099	5.44
5 Year		0.821	0.112	8.01
100 Year		0.933	0.148	17.77

TABLE 17A: Post-Development Runoff Coefficient "C" - R-12

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.039	Roof	0.039	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 17B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-12

0.039 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	40	32.86	3.18	0.781	2.40	5.77
	45	30.24	2.93	0.781	2.15	5.80
	50	**28.04**	**2.72**	**0.781**	**1.94**	**5.81**
	55	26.17	2.54	0.781	1.75	5.79
	60	24.56	2.38	0.781	1.60	5.75

TABLE 17C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-12

0.0387233 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.65	0.821	2.83	8.48
	55	35.12	3.40	0.821	2.58	8.52
	60	**32.94**	**3.19**	**0.821**	**2.37**	**8.53**
	65	31.04	3.01	0.821	2.19	8.53
	70	29.37	2.85	0.821	2.02	8.50

TABLE 17D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-12

0.0387233 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	90	41.11	4.43	0.936	3.49	18.84
	95	39.43	4.25	0.94	3.31	18.86
	100	**37.90**	**4.08**	**0.94**	**3.14**	**18.87**
	105	36.50	3.93	0.94	2.99	18.86
	110	35.20	3.79	0.94	2.85	18.83

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 17E: Storage Provided - R-12

Area R-12: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.735	0.15	
0.050	43.570	0.84	
0.075	95.568	2.58	
0.100	167.730	5.87	
0.125	260.054	11.22	
0.150	377.537	19.19	

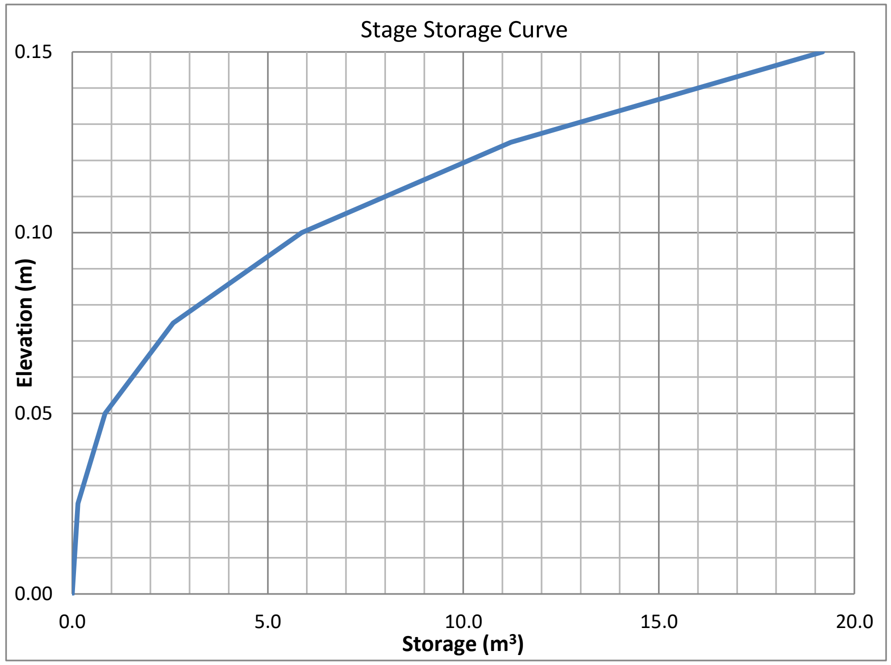

Table 17F: Roof Drain Flows

Roof Drains		
Roof Area	387.233	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 17G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-12	0.781	0.099	5.81
5 Year		0.821	0.112	8.53
100 Year		0.936	0.149	18.87

TABLE 18A: Post-Development Runoff Coefficient "C" - R-13

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.039	Roof	0.039	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 18B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-13

0.039 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	40	32.86	3.19	0.781	2.40	5.77
	45	30.24	2.93	0.781	2.15	5.80
	50	**28.04**	**2.72**	**0.781**	**1.94**	**5.81**
	55	26.17	2.54	0.781	1.76	5.79
	60	24.56	2.38	0.781	1.60	5.76

TABLE 18C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-13

0.038739 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.65	0.821	2.83	8.49
	55	35.12	3.40	0.821	2.58	8.52
	60	**32.94**	**3.19**	**0.821**	**2.37**	**8.54**
	65	31.04	3.01	0.821	2.19	8.53
	70	29.37	2.85	0.821	2.03	8.51

TABLE 18D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-13

0.038739 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	90	41.11	4.43	0.936	3.49	18.85
	95	39.43	4.25	0.94	3.31	18.87
	100	**37.90**	**4.08**	**0.94**	**3.15**	**18.88**
	105	36.50	3.93	0.94	2.99	18.87
	110	35.20	3.79	0.94	2.86	18.84

Equations:
Flow Equation
$Q = 2.78 \times C \times I \times A$
Where:
C is the runoff coefficient
I is the rainfall intensity, City of Ottawa IDF
A is the total drainage area

Runoff Coefficient Equation
$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$
$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$

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DATE PREPARED:January, 2023

TABLE 18E: Storage Provided - R-13

Area R-13: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	11.746	0.15	
0.050	43.612	0.84	
0.075	95.661	2.58	
0.100	167.894	5.87	
0.125	260.309	11.23	
0.150	377.904	19.21	

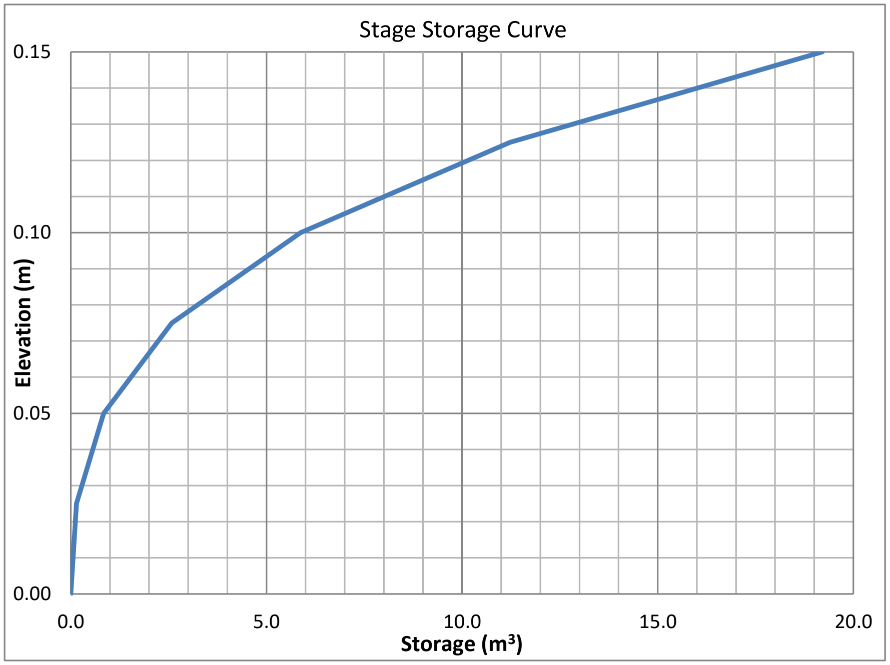

Table 18F: Roof Drain Flows

Roof Drains		
Roof Area	387.39	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 18G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-13	0.781	0.099	5.81
5 Year		0.821	0.112	8.54
100 Year		0.936	0.149	18.88

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TABLE 19A: Post-Development Runoff Coefficient "C" - R-14

			5 Year Event		100 Year Event	
Area	Surface	Ha	"C"	C_{avg}	"C" + 25%	*C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.037	Roof	0.037	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 19B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-14

0.037 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.32	0.784	2.54	5.33
	40	32.86	3.03	0.784	2.24	5.38
	45	**30.24**	**2.78**	**0.784**	**2.00**	**5.40**
	50	28.04	2.58	0.784	1.80	5.39
	55	26.17	2.41	0.784	1.63	5.36

TABLE 19C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-14

0.0367971 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	50	37.65	3.47	0.827	2.64	7.92
	55	35.12	3.23	0.827	2.41	7.94
	60	**32.94**	**3.03**	**0.827**	**2.21**	**7.94**
	65	31.04	2.86	0.827	2.03	7.92
	70	29.37	2.70	0.827	1.88	7.88

TABLE 19D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-14

0.0367971 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	80	44.99	4.60	0.950	3.65	17.53
	85	42.95	4.39	0.95	3.44	17.56
	90	**41.11**	**4.21**	**0.95**	**3.26**	**17.58**
	95	39.43	4.03	0.95	3.08	17.58
	100	37.90	3.88	0.95	2.93	17.56

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

TABLE 19E: Storage Provided - R-14

Area R-14: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	10.664	0.13	
0.050	39.476	0.76	
0.075	86.499	2.34	
0.100	151.733	5.31	
0.125	235.177	10.15	
0.150	358.893	17.58	

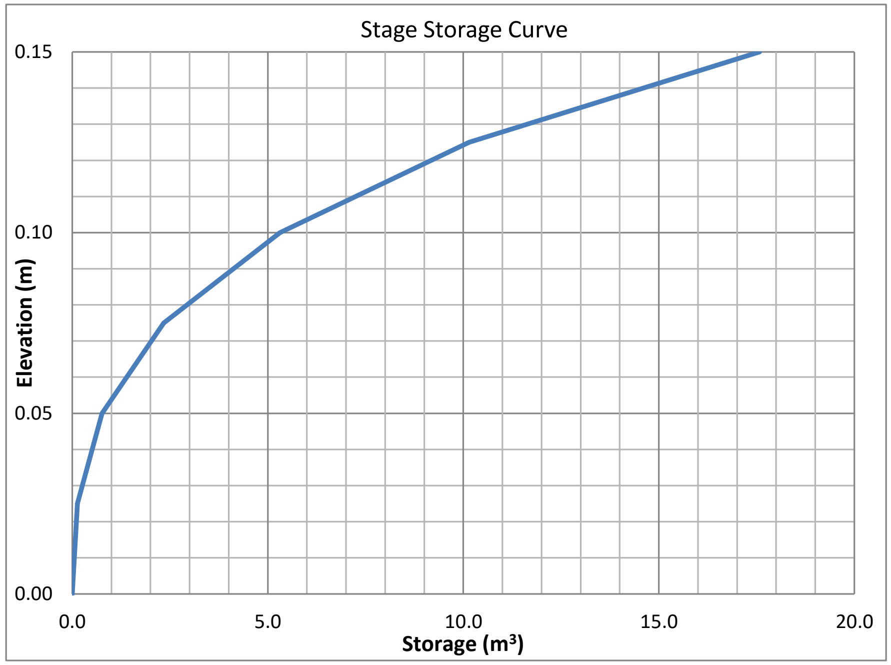


Table 19F: Roof Drain Flows

Roof Drains		
Roof Area	367.971	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/4 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.71	L/s (ea)
Design Flow 4" of head	0.79	L/s (ea)
Design Flow 5" of head	0.87	L/s (ea)
Design Flow 6" of head	0.95	L/s (ea)

Table 19G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-14	0.784	0.100	5.40
5 Year		0.827	0.114	7.94
100 Year		0.950	0.150	17.58

TABLE 20A: Post-Development Runoff Coefficient "C" - R-15

Area	Surface	Ha	5 Year Event "C"	5 Year Event C_{avg}	100 Year Event "C" + 25%	100 Year Event *C_{avg}
Total	Hard	0.000	0.90	0.90	1.00	1.00
0.042	Roof	0.042	0.90		1.00	
	Soft	0.000	0.20		0.25	

TABLE 20B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-15

0.042 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
2 YEAR	35	36.06	3.79	0.924	2.86	6.01
	40	32.86	3.45	0.924	2.53	6.06
	45	**30.24**	**3.17**	**0.924**	**2.25**	**6.08**
	50	28.04	2.94	0.924	2.02	6.06
	55	26.17	2.75	0.924	1.82	6.02

TABLE 20C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-15

0.0419571 =Area (ha)
0.90 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
5 YEAR	45	40.63	4.27	1.005	3.26	8.80
	50	37.65	3.95	1.005	2.95	8.84
	55	**35.12**	**3.69**	**1.005**	**2.68**	**8.85**
	60	32.94	3.46	1.005	2.45	8.83
	65	31.04	3.26	1.005	2.25	8.79

TABLE 20D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - R-15

0.0419571 =Area (ha)
1.00 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m^3)
100 YEAR	75	47.26	5.51	1.222	4.29	19.30
	80	44.99	5.25	1.22	4.03	19.32
	85	**42.95**	**5.01**	**1.22**	**3.79**	**19.32**
	90	41.11	4.80	1.22	3.57	19.30
	95	39.43	4.60	1.22	3.38	19.25

Equations:

Flow Equation

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

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$C_5 = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$

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

NOVATECH
Engineers, Planners & Landscape Architects

TABLE 20E: Storage Provided - R-15

Area R-13: Storage Table			
Head (m)	Area* (m^2)	Storage Volume (m^3)	
0.000	0.063	0.00	
0.025	12.484	0.16	
0.050	46.543	0.89	
0.075	102.240	2.75	
0.100	179.574	6.28	
0.125	278.546	12.00	
0.150	406.505	20.57	

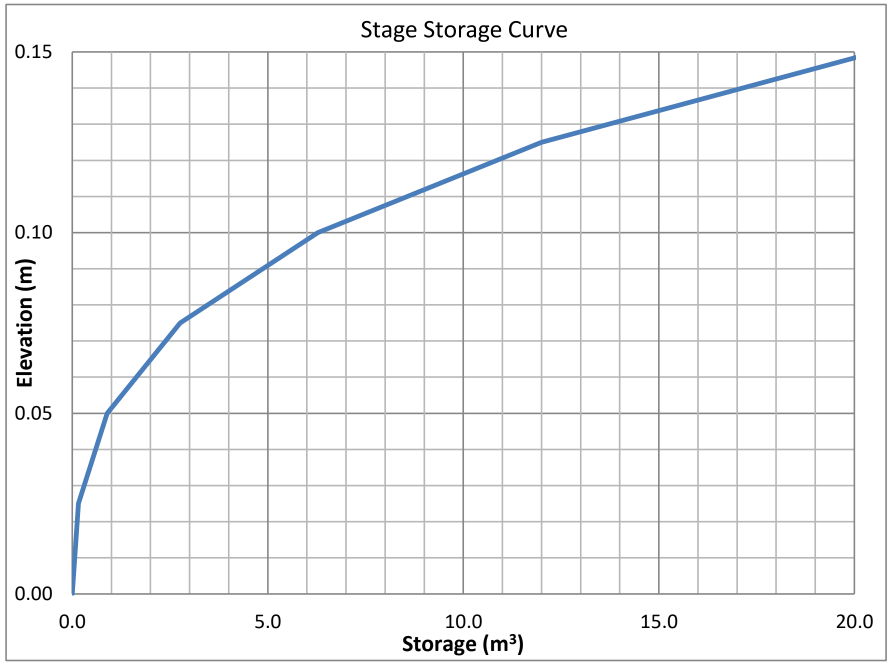


Table 20F: Roof Drain Flows

Roof Drains		
Roof Area	419.571	m²
Qty	1	
Type	Accutrol RD-100-A-ADJ	
Setting	1/2 Open	
Design Head	0.05-0.15	m
Design Flow 1" of head	0.32	L/s (ea)
Design Flow 2" of head	0.63	L/s (ea)
Design Flow 3" of head	0.79	L/s (ea)
Design Flow 4" of head	0.95	L/s (ea)
Design Flow 5" of head	1.10	L/s (ea)
Design Flow 6" of head	1.26	L/s (ea)

Table 18G: Total Roof Storage

Design Event	Roof Drain ID	Flow (L/S)	Head m	Required Volume
2 Year	R-15	0.924	0.098	6.08
5 Year		1.005	0.111	8.85
100 Year		1.222	0.146	19.32

TEMPEST Product Submittal Package R1

Date: May 9, 2023

Customer: Novatech

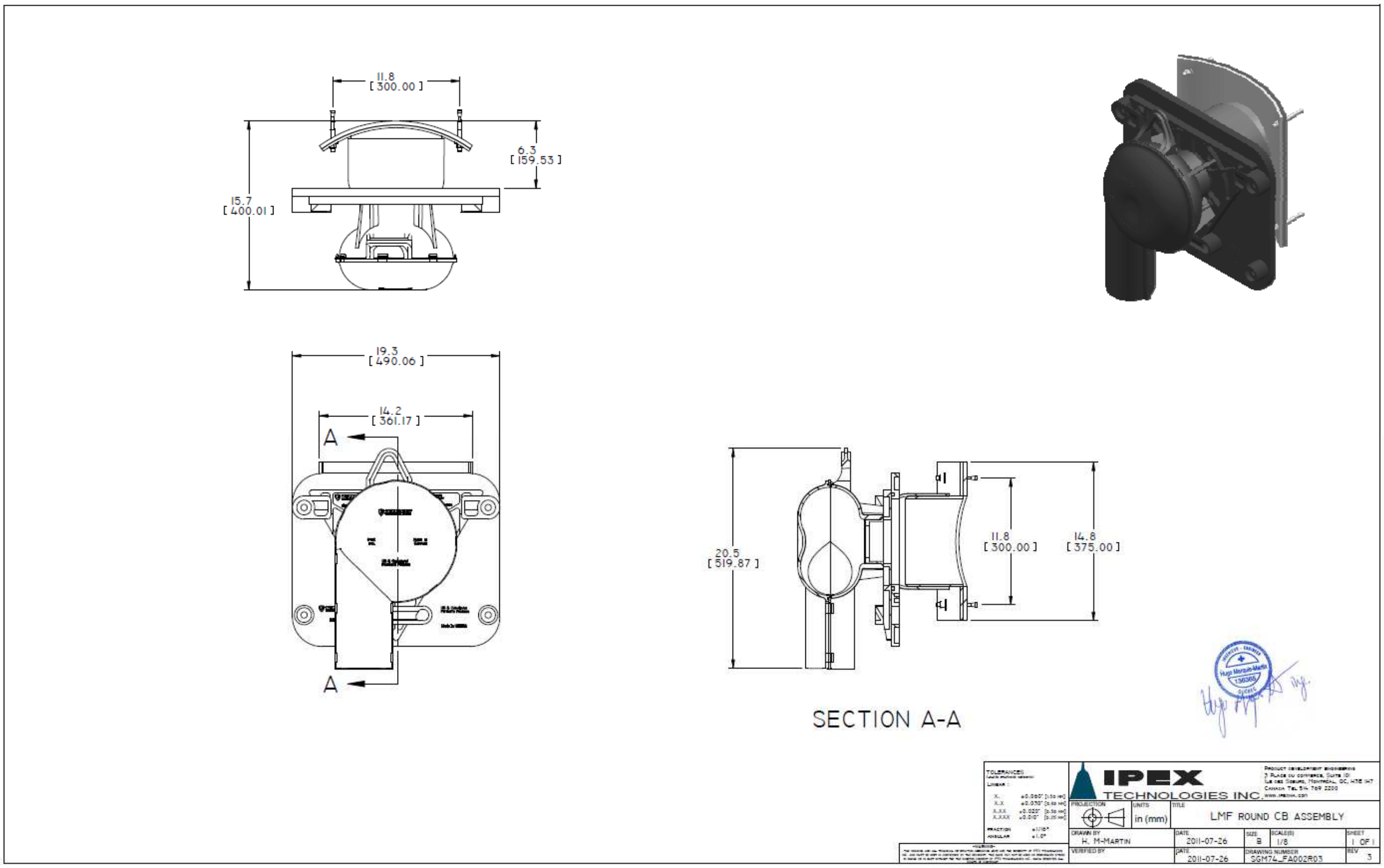
Contact: Melanie Schroeder

Location: Ottawa

Project Name: 4200 Innes Rd – Trinity Apartments

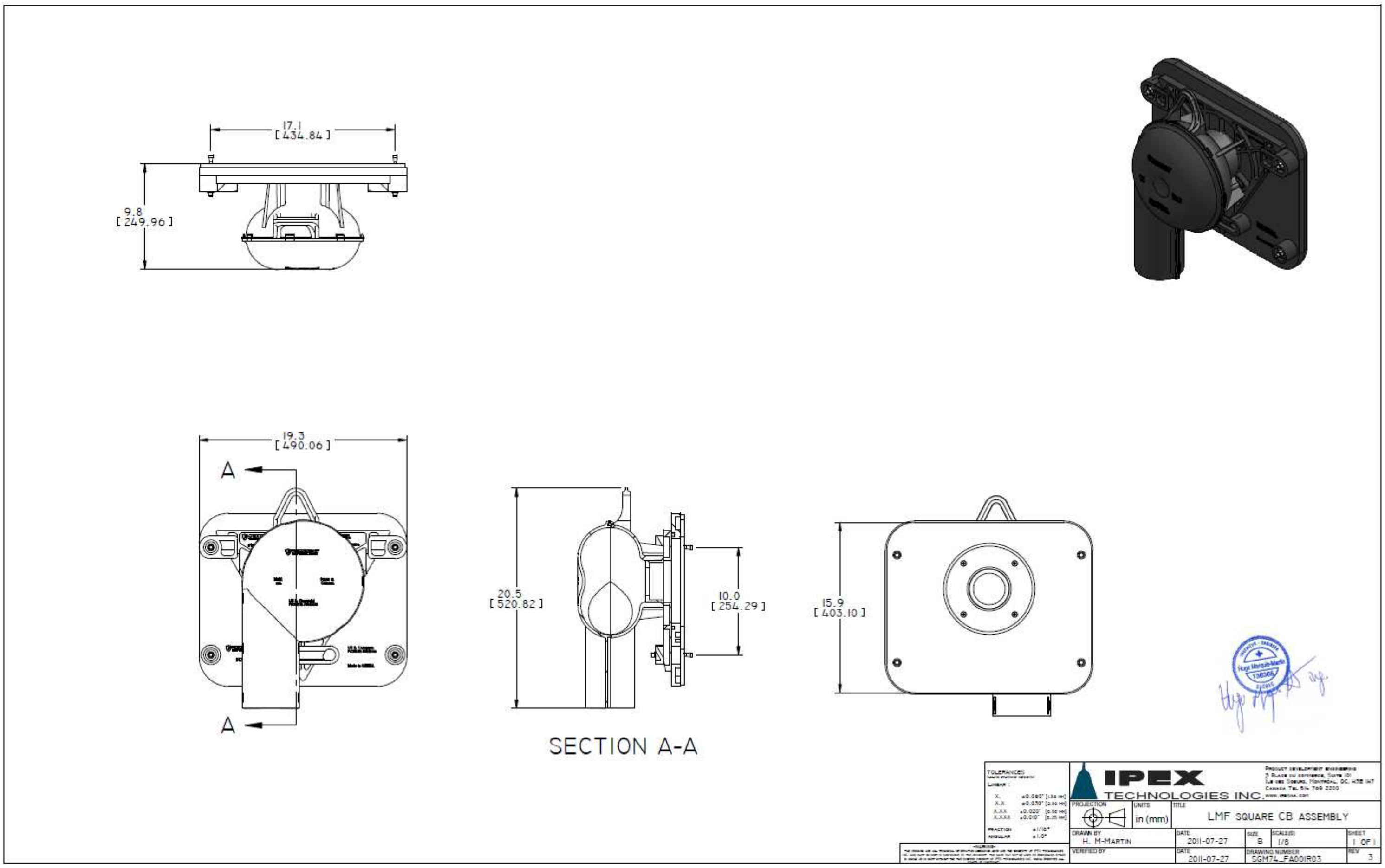
IPEX

Tempest LMF ICD Rd Shop Drawing



IPEX

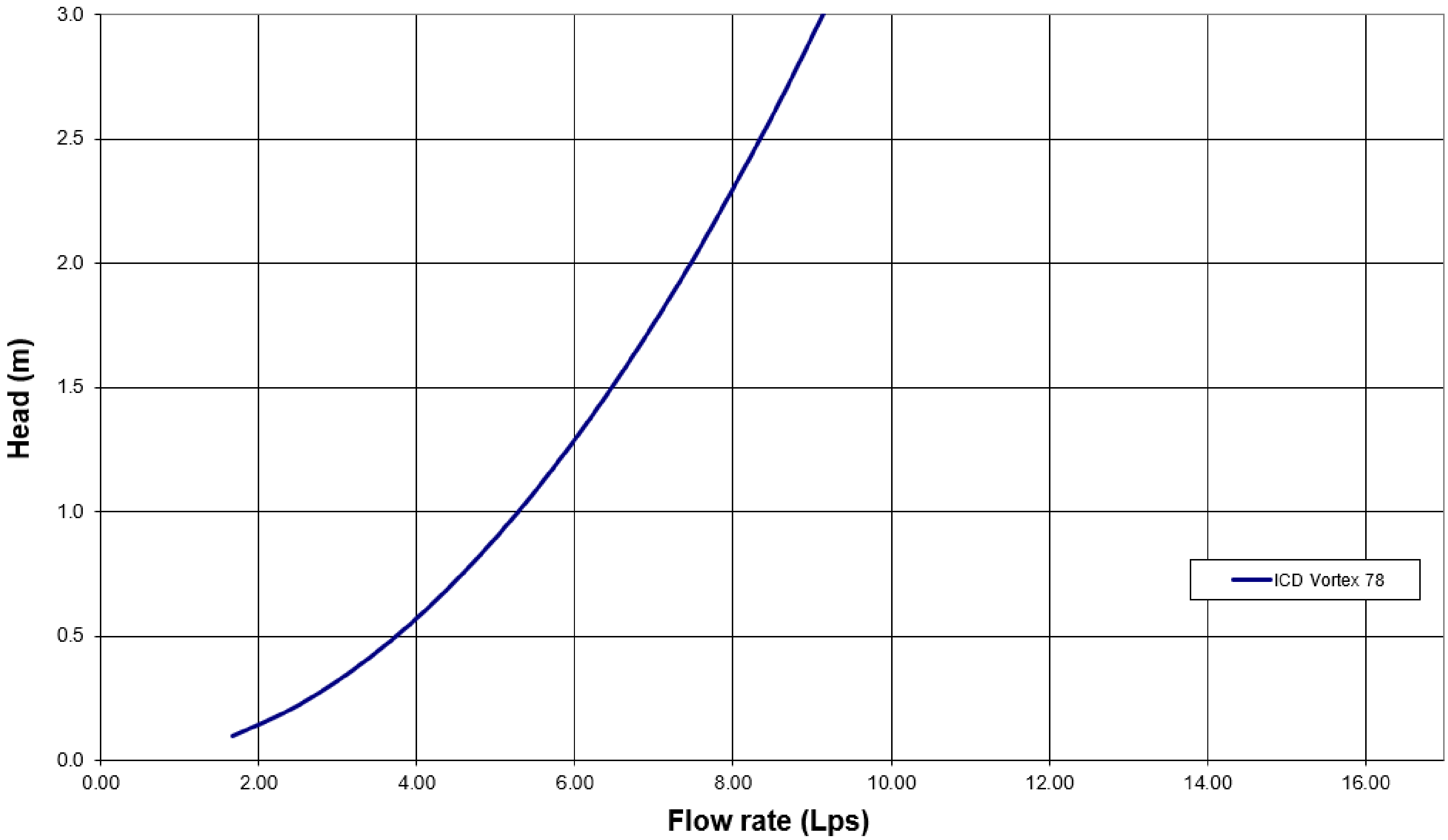
<u>Tempest LMF ICD Sq</u> Shop Drawing



IPEX

Tempest LMF ICD Flow Curve

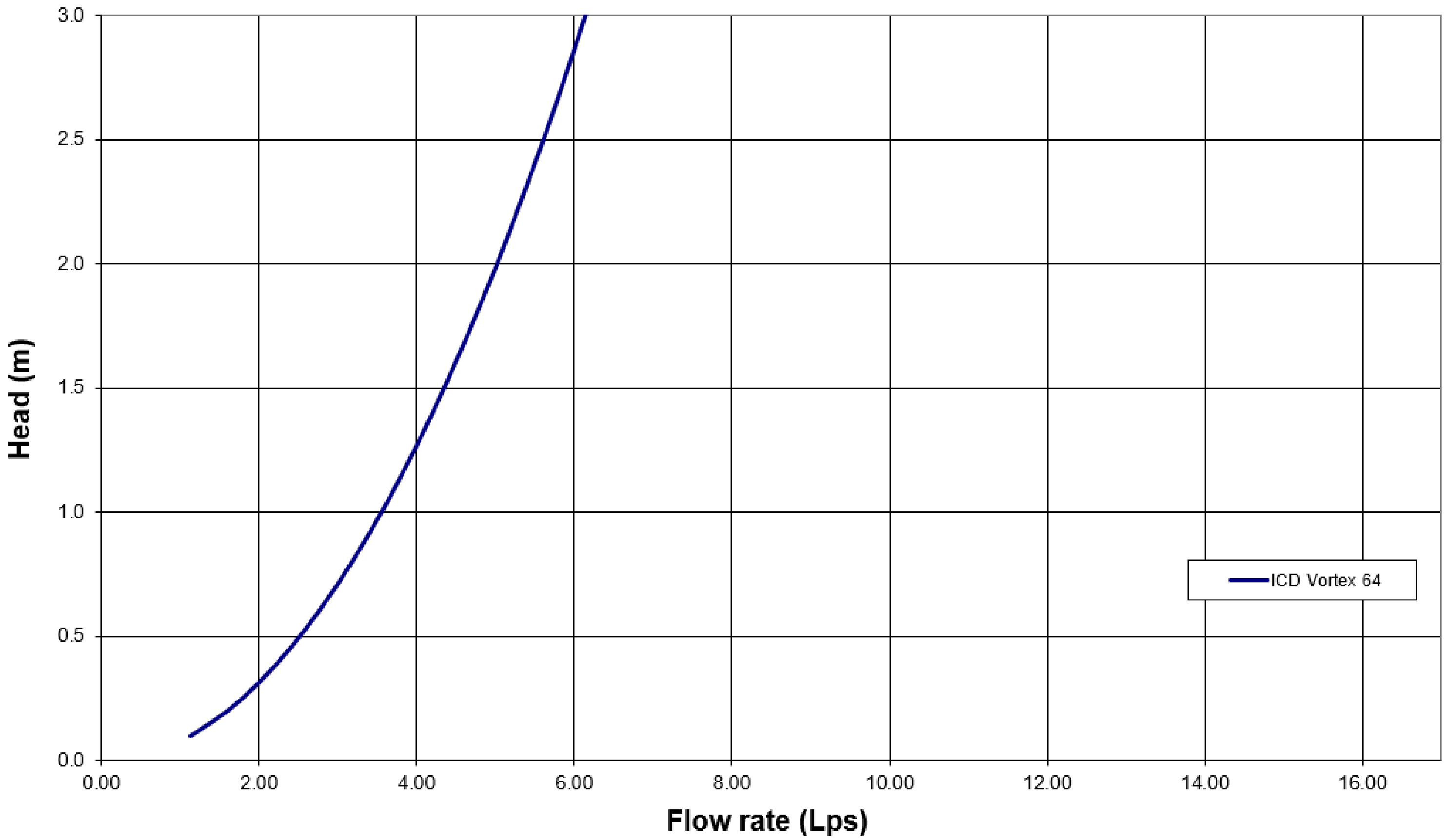
Flow: 6.0 L/s
Head: 1.30 m
CB01



IPEX

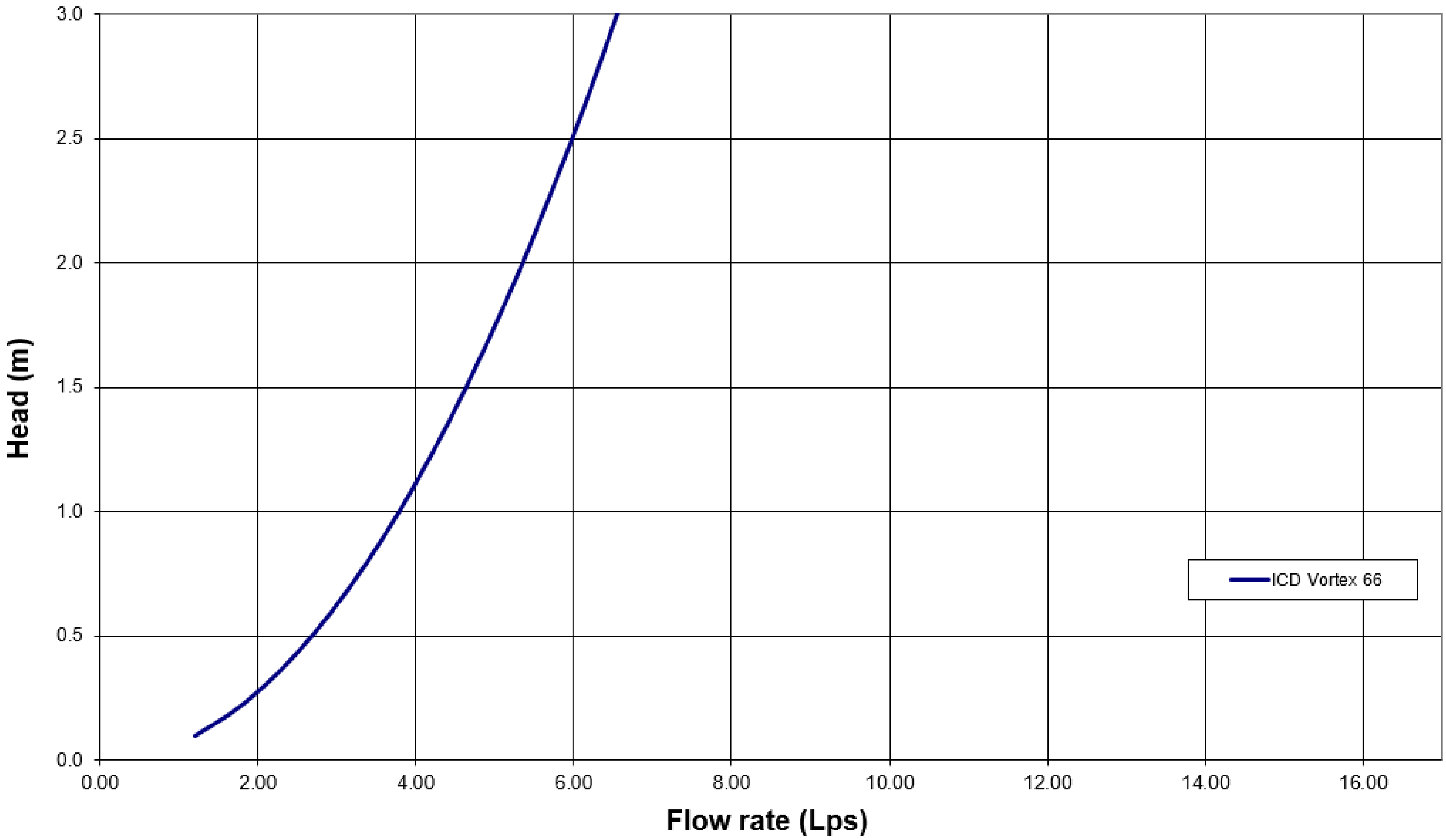
Tempest LMF ICD Flow Curve

Flow: 6.0 L/s
Head: 2.79 m
CB02



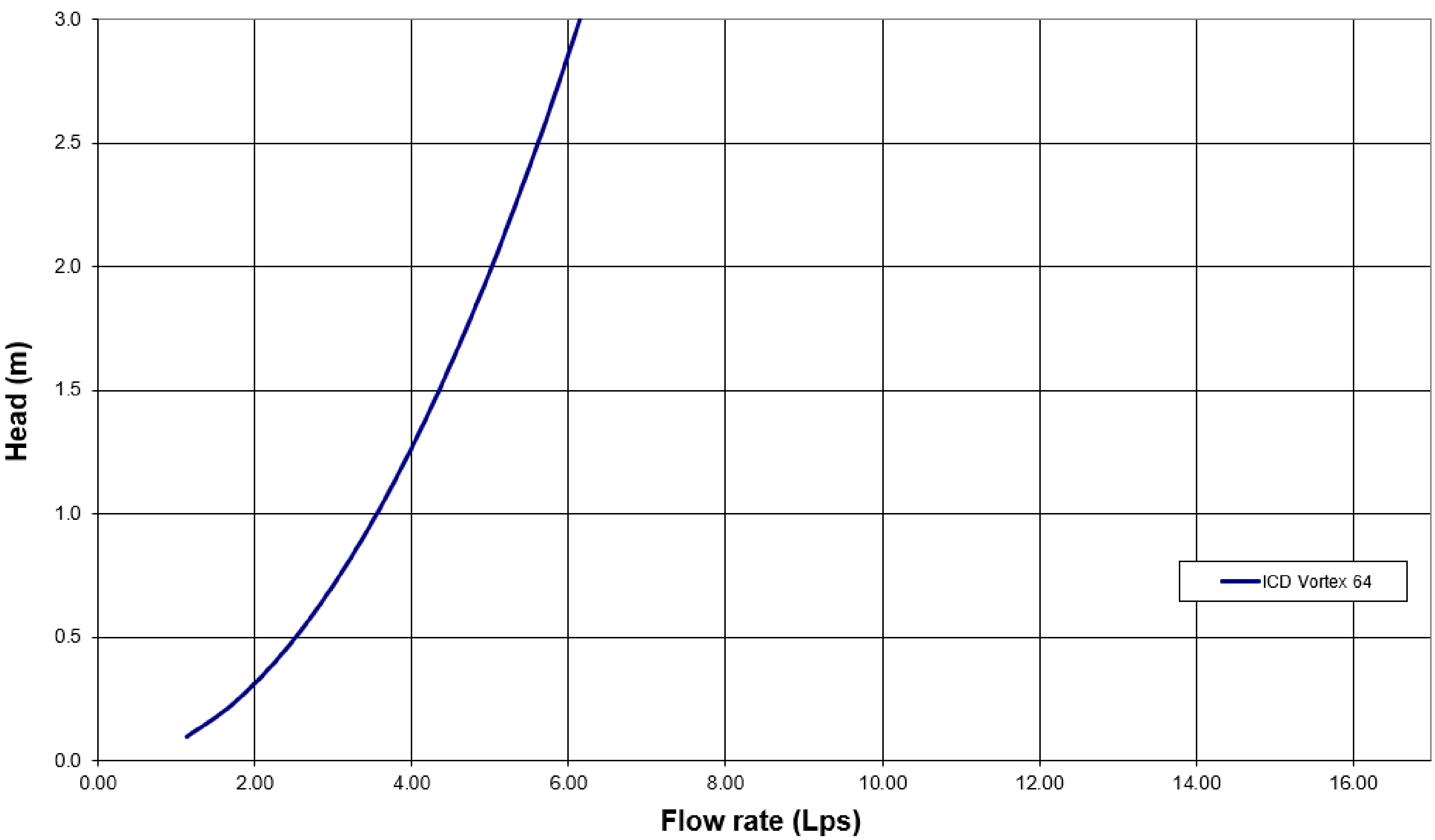
Tempest LMF ICD Flow Curve

Flow: 6.0 L/s
Head: 2.56 m
CB12



Tempest LMF ICD Flow Curve

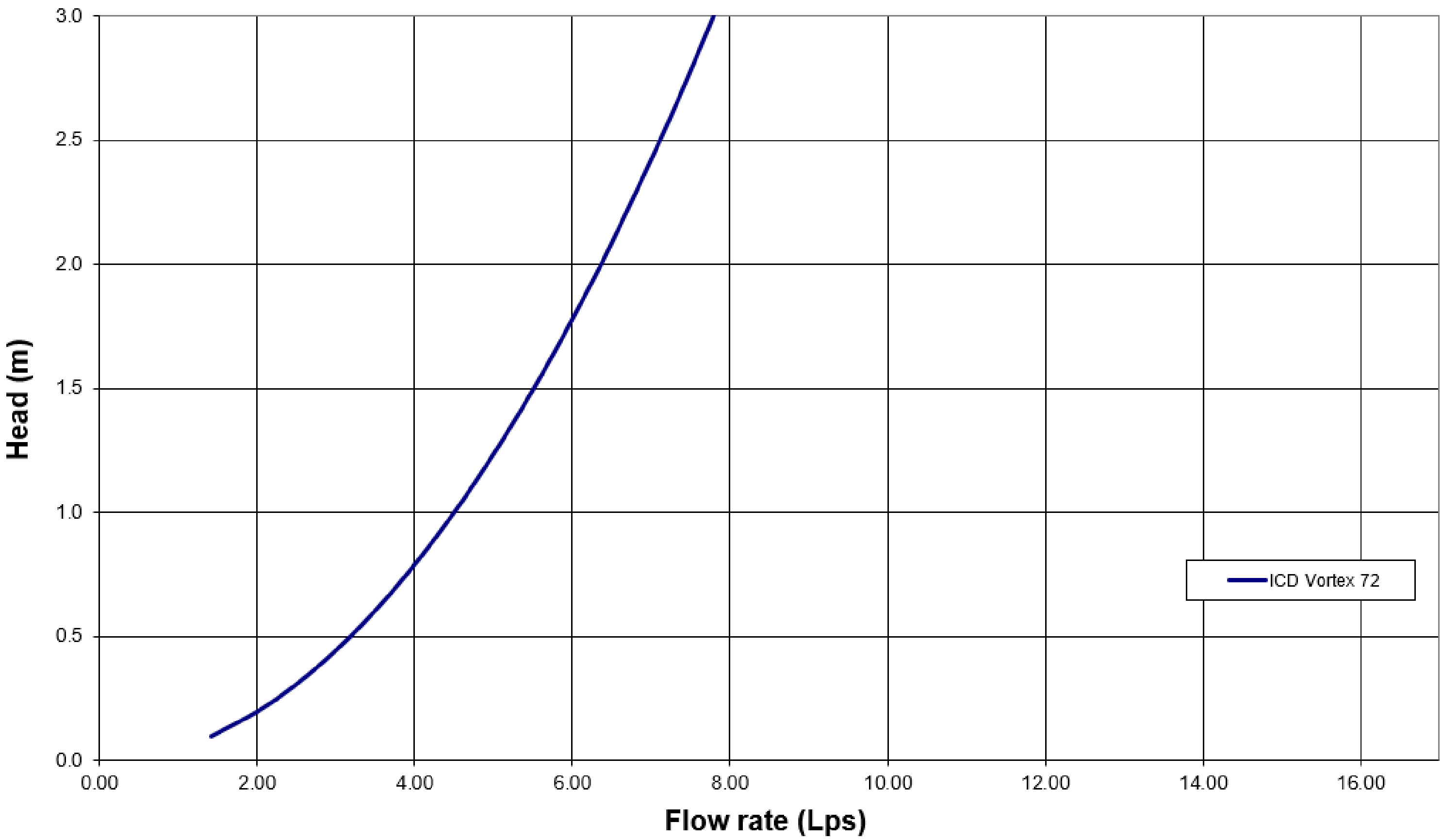
Flow: 6.1 L/s
Head: 2.88 m
CBMH208



IPEX

Tempest LMF ICD Flow Curve

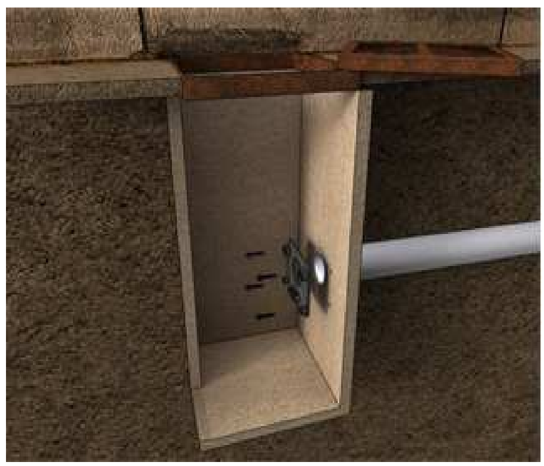
Flow: 6.1 L/s
Head: 1.81 m
Cistern



IPEX

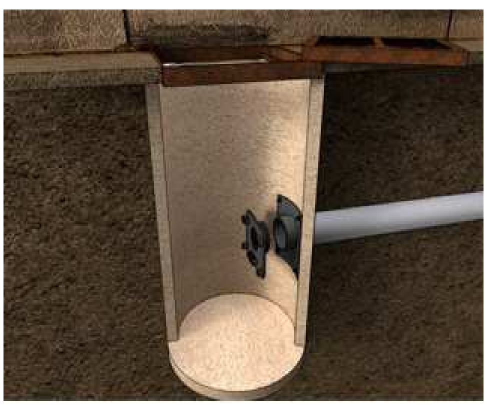
Square CB Installation Notes:

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 3/8x3-1/2, (4) washers, (4) nuts
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. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut 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 ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF 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.



Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use 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.
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 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. 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 into the mounting plate and has created a seal.



CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX TEMPEST Inlet Control Devices 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 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 must 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.

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

Area = 1.89 ha
Impervious: 81 %
CDS Model: PMSU2020_5
Flowrate: 31 l/s
IDF Data: Ottawa
PSD: FINE

Engineer: **NOVATECH**
Contact: Melanie Schroeder
Date: 9/May/23

Project: Quinn's Pointe Stage 2A
Location: 4200 Innes Rd., Ottawa
OGS ID: CDS

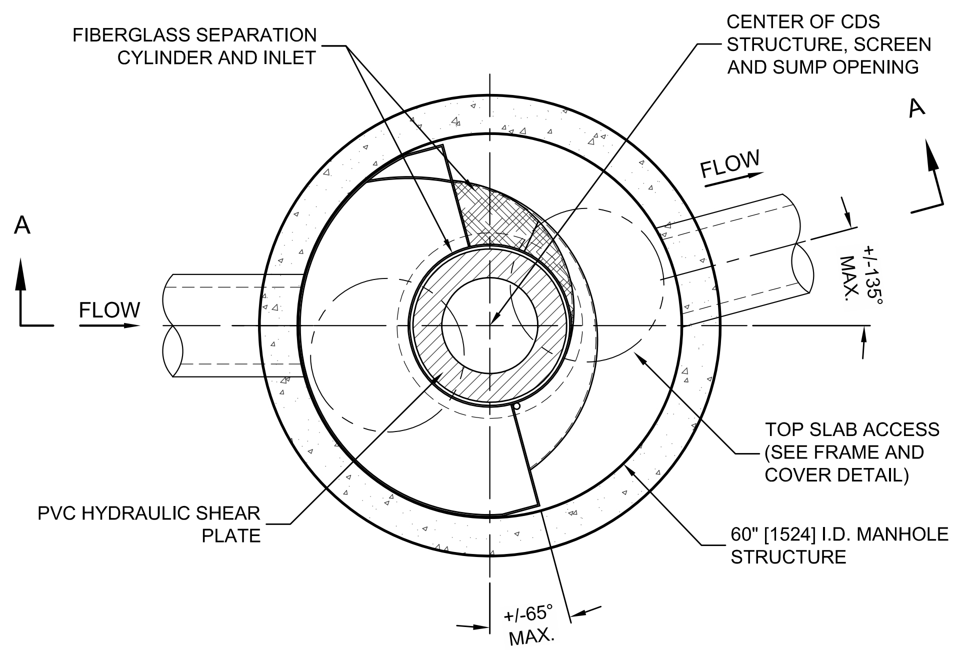
Return	Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	5.35	95.68	10036	10036	**100.00**	5.35	5.35	0.00	100.00
2-M	0.17	8.74	93.64	16478	16478	**99.75**	8.74	8.74	0.00	100.00
3-M	0.25	11.57	91.94	21924	21924	**98.17**	11.57	11.57	0.00	100.00
4-M	0.33	14.14	90.38	26942	26942	**95.04**	14.14	14.14	0.00	100.00
5-M	0.42	18.45	87.73	35615	35615	**90.91**	18.45	18.45	0.00	100.00
6-M	0.50	22.76	85.08	44287	44287	**86.47**	22.76	22.76	0.00	100.00
7-M	0.58	23.89	84.38	46654	46654	**82.01**	23.89	23.89	0.00	100.00
8-M	0.67	25.03	83.67	49020	49020	**77.67**	25.03	25.03	0.00	100.00
9-M	0.75	26.16	82.96	51387	51387	**73.64**	26.16	26.16	0.00	100.00
10-M	0.83	28.25	81.59	55775	55870	**69.90**	28.25	28.25	0.00	99.85
11-M	0.92	30.33	80.21	60164	60352	**66.40**	30.33	30.33	0.00	99.71
1-Yr	1	32.42	78.84	64552	64835	**63.21**	32.42	31.15	1.27	99.56
2-Yr	2	35.60	76.00	70064	71894	**39.35**	35.60	31.15	4.45	97.46
5-Yr	5	39.20	72.57	75528	80081	**18.13**	39.20	31.15	8.05	94.31
10-Yr	10	43.10	68.81	80664	89210	**9.52**	43.10	31.15	11.95	90.42
25-Yr	25	48.60	63.74	86901	102538	**3.92**	48.60	31.15	17.45	84.75
50-Yr	50	54.80	58.53	92673	117923	**1.98**	54.80	31.15	23.65	78.59
100-Yr	100	62.20	52.94	98467	137316	**1.00**	62.20	31.15	31.05	71.71

Average Annual TSS Removal Efficiency [%]: **86.4** Ave. Ann. T. Volume [%]: **99.6**

Notes:
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 specificiations

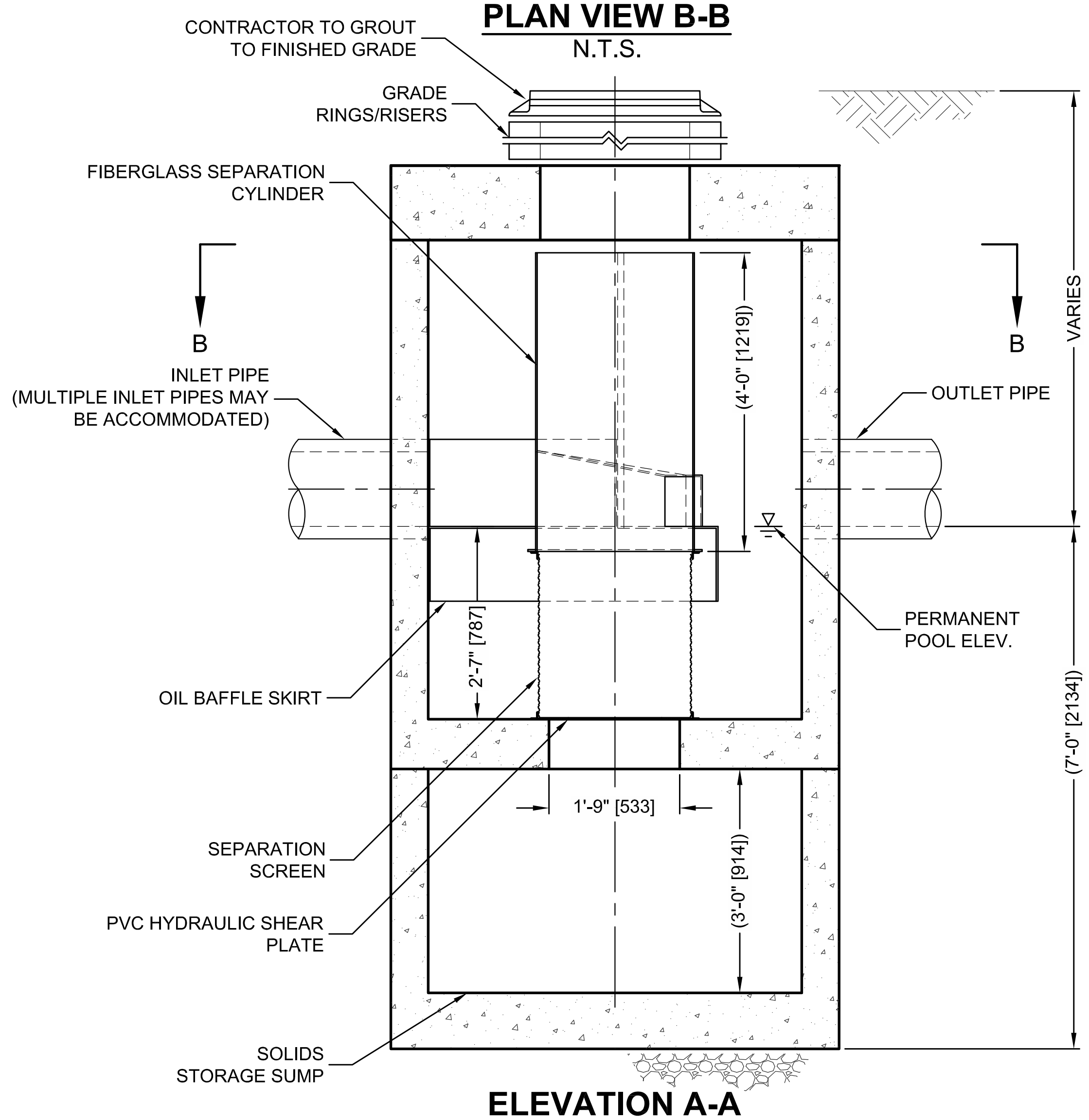
ECHELON ENVIRONMENTAL

CDS TECHNOLOGIES



PLAN VIEW B-B

N.T.S.



ELEVATION A-A

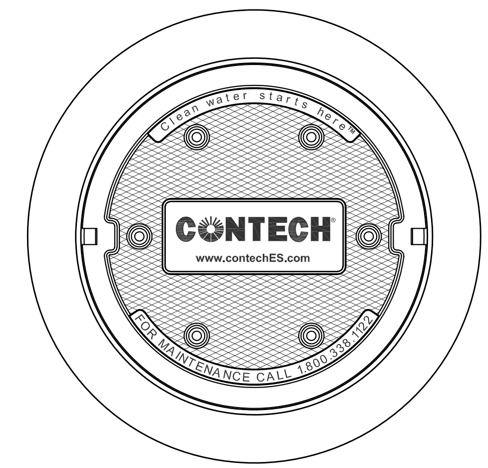
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS PMSU2020-5-C DESIGN NOTES

THE STANDARD CDS PMSU2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS PMSU2020-5-C
INLINE CDS
STANDARD DETAIL

Located Upstream of MH 210

User Inputs

Chamber Model:	MC-3500
Outlet Control Structure:	No
Project Name:	Trinity Apt
Engineer:	Melanie Schroeder
Project Location:	Ontario
Measurement Type:	Metric
Required Storage Volume:	76.51 cubic meters.
Stone Porosity:	40%
Stone Foundation Depth:	229 mm.
Stone Above Chambers:	305 mm.
Average Cover Over Chambers:	458 mm.
Design Constraint Dimensions:	(16.00 m. x 12.00 m.)

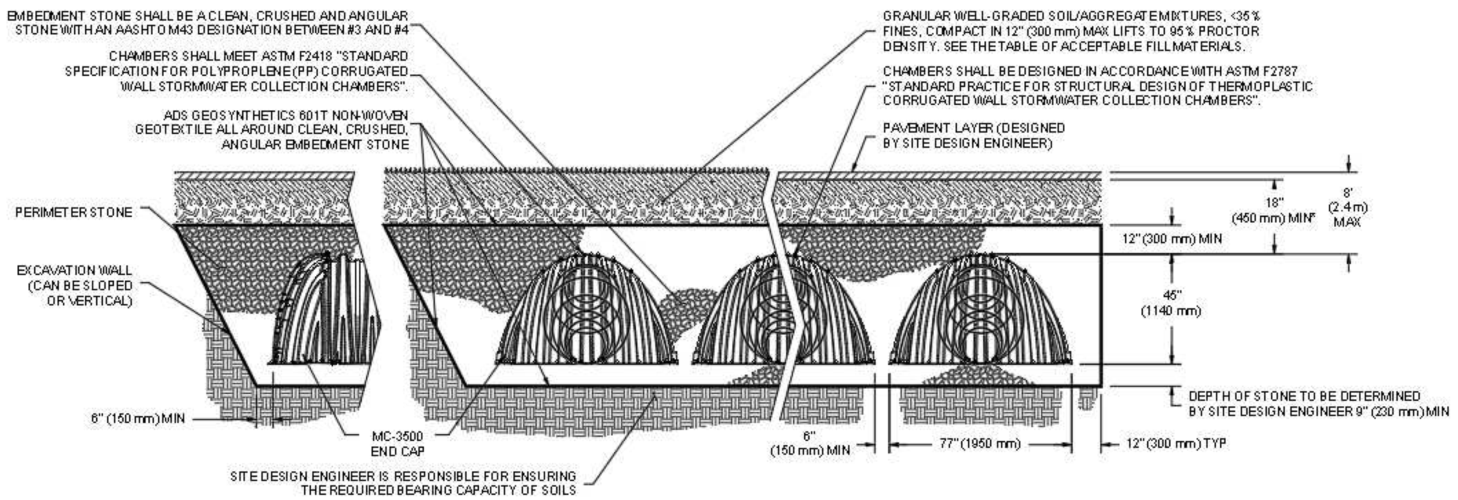
Results

System Volume and Bed Size

Installed Storage Volume:	86.72 cubic meters.
Storage Volume Per Chamber:	3.12 cubic meters.
Number Of Chambers Required:	13
Number Of End Caps Required:	8
Chamber Rows:	4
Maximum Length:	11.69 m.
Maximum Width:	8.90 m.
Approx. Bed Size Required:	90.10 square meters.

System Components

Amount Of Stone Required:	108 cubic meters
Volume Of Excavation (Not Including Fill):	152 cubic meters
Total Non-woven Geotextile Required:	300 square meters
Woven Geotextile Required (excluding Isolator Row):	42 square meters
Woven Geotextile Required (Isolator Row):	32 square meters
Total Woven Geotextile Required:	74 square meters
Impervious Liner Required:	0 square meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24"

Located Upstream of CB02

User Inputs

Chamber Model: MC-3500

Outlet Control Structure: No

Project Name: Trinity Apts - CB02

Engineer: Melanie Schroeder

Project Location: Ontario

Measurement Type: Metric

Required Storage Volume: 12.00 cubic meters.

Stone Porosity: 40%

Stone Foundation Depth: 229 mm.

Stone Above Chambers: 305 mm.

Average Cover Over Chambers: 458 mm.

Design Constraint Dimensions: (6.01 m. x 6.01 m.)

Results

System Volume and Bed Size

Installed Storage Volume: 20.85 cubic meters.

Storage Volume Per Chamber: 3.12 cubic meters.

Number Of Chambers Required: 2

Number Of End Caps Required: 4

Chamber Rows: 2

Maximum Length: 5.14 m.

Maximum Width: 4.68 m.

Approx. Bed Size Required: 24.00 square meters.

System Components

Amount Of Stone Required: 33 cubic meters

Volume Of Excavation (Not Including Fill): 41 cubic meters

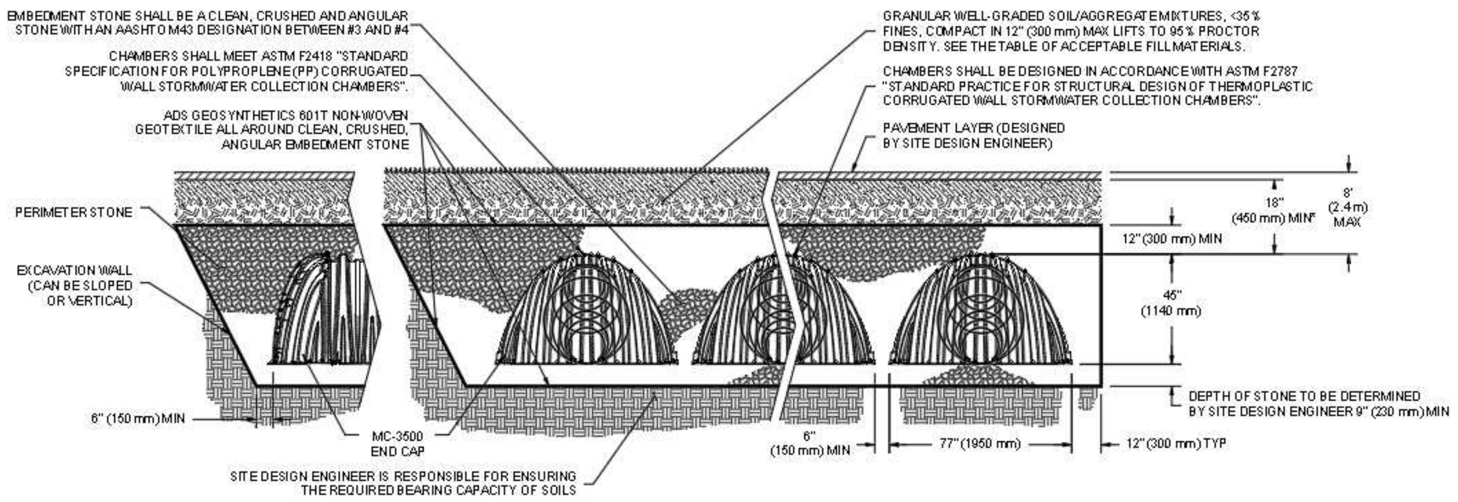
Total Non-woven Geotextile Required: 98 square meters

Woven Geotextile Required (excluding Isolator Row): 14 square meters

Woven Geotextile Required (Isolator Row): 11 square meters

Total Woven Geotextile Required: 25 square meters

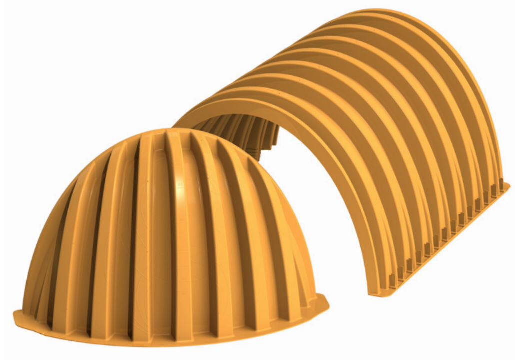
Impervious Liner Required: 0 square meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24"

StormTech® MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



Nominal Chamber Specifications
(not to scale)

Size (L x W x H)
90” x 77” x 45”
2286 mm x 1956 mm x 1143 mm

Chamber Storage
109.9 ft³ (3.11 m³)

Min. Installed Storage*
175.0 ft³ (4.96 m³)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 6” (150 mm) of stone between chambers/ end caps and 40% stone porosity.

Nominal End Cap Specifications
(not to scale)

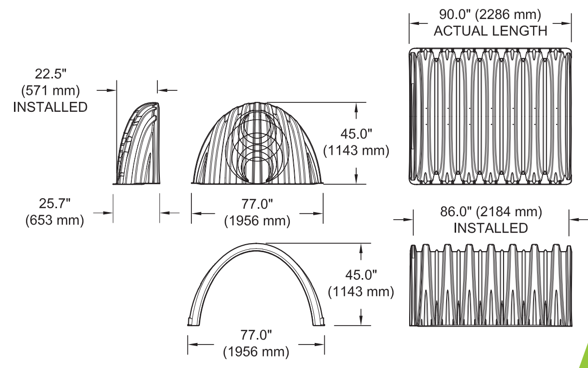
Size (L x W x H)
26.5” x 71” x 45.1”
673 mm x 1803 mm x 1145 mm

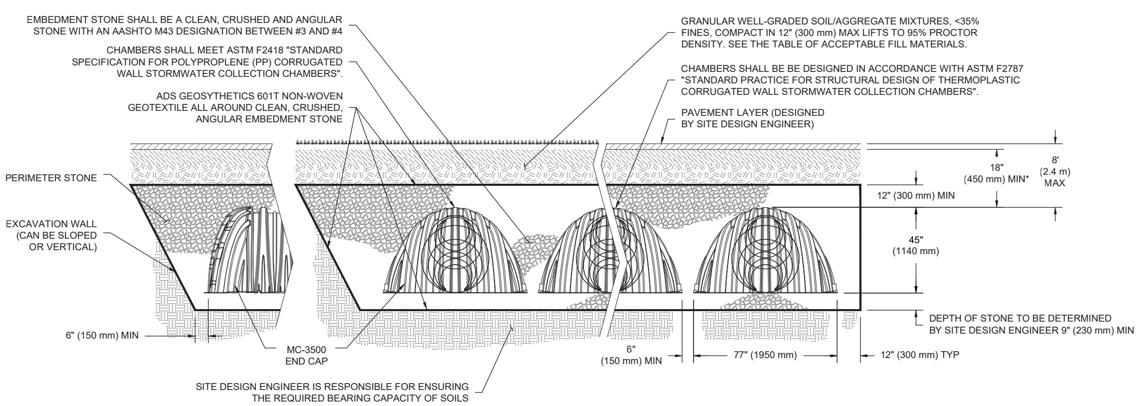
End Cap Storage
14.9 ft³ (0.42 m³)

Min. Installed Storage*
45.1 ft³ (1.28 m³)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 6” (150 mm) of stone perimeter, 6” (150 mm) of stone between chambers/ end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech™

StormTech MC-3500 Specifications

Storage Volume Per Chamber

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
Metric Kilograms (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375mm)	18 in (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.3)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTMF2922, comply with all requirements in the Build America, Buy America (BABA) Act.

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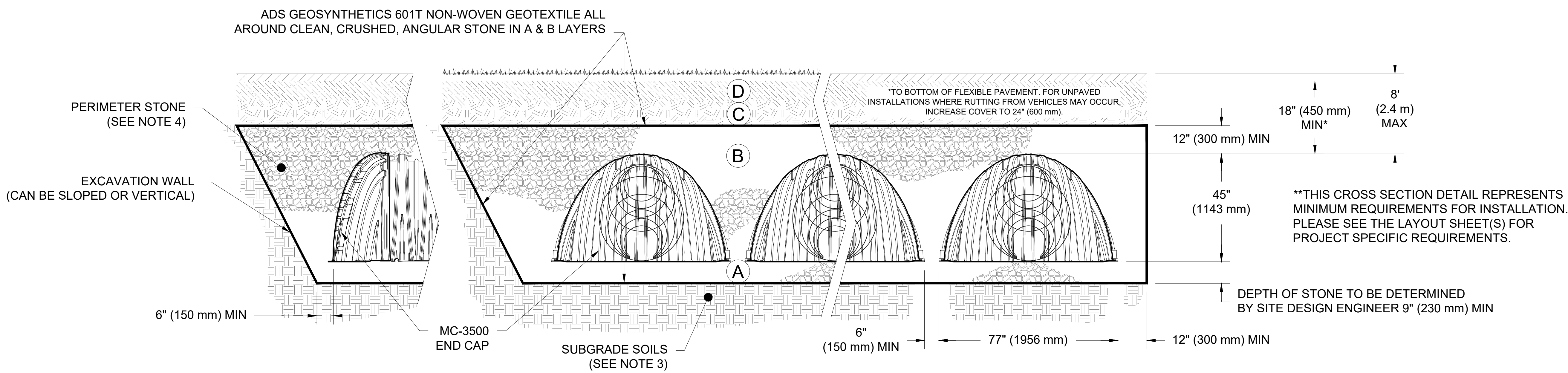
ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



*FOR COVER DEPTHS GREATER THAN 8.0' (2.4 m) PLEASE CONTACT ADS

NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

MC-3500
STANDARD CROSS SECTION
DATE: 8/03/22
DRAWN: KLJ
CHECKED: KLJ
PROJECT #:

DATE	DRWN	CHKD	DESCRIPTION

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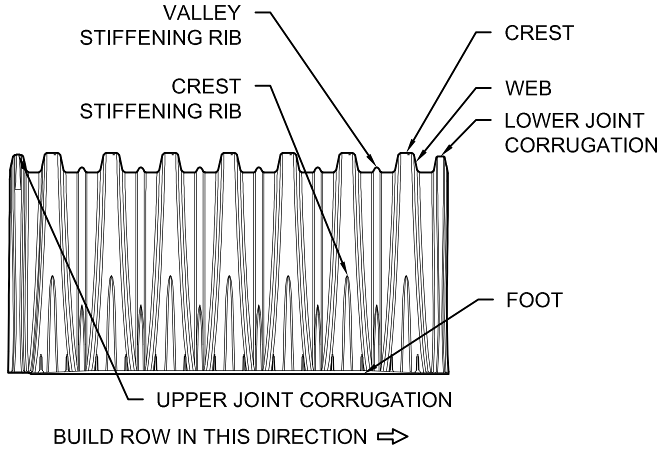
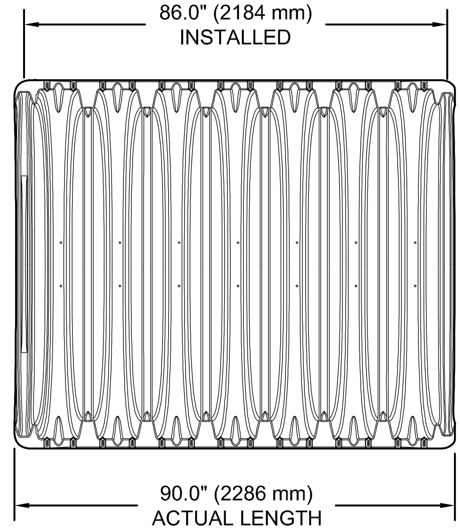
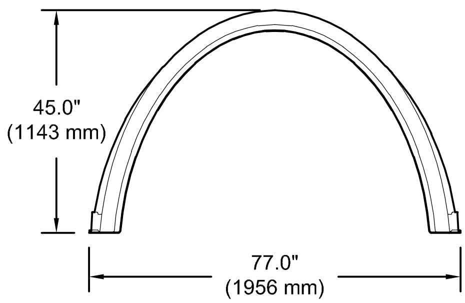
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

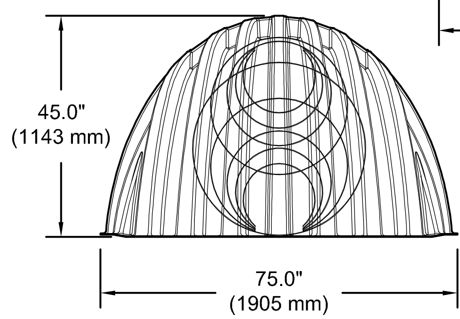
MC-3500 TECHNICAL SPECIFICATION

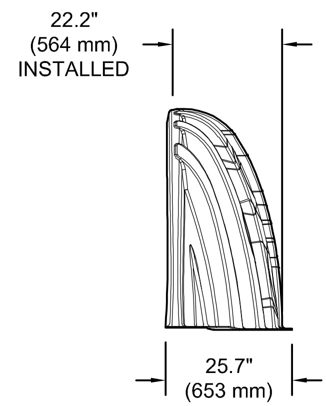
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

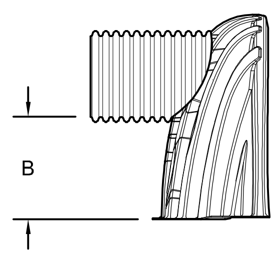
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

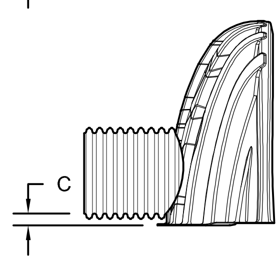
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

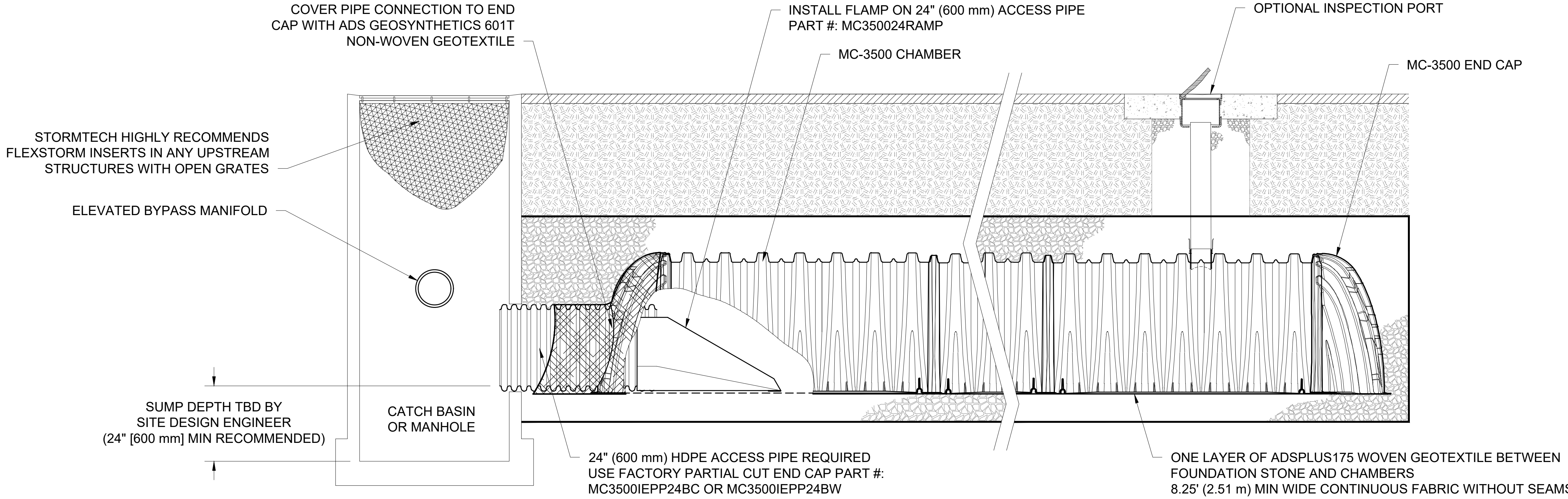
PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL





CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.



MC-3500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

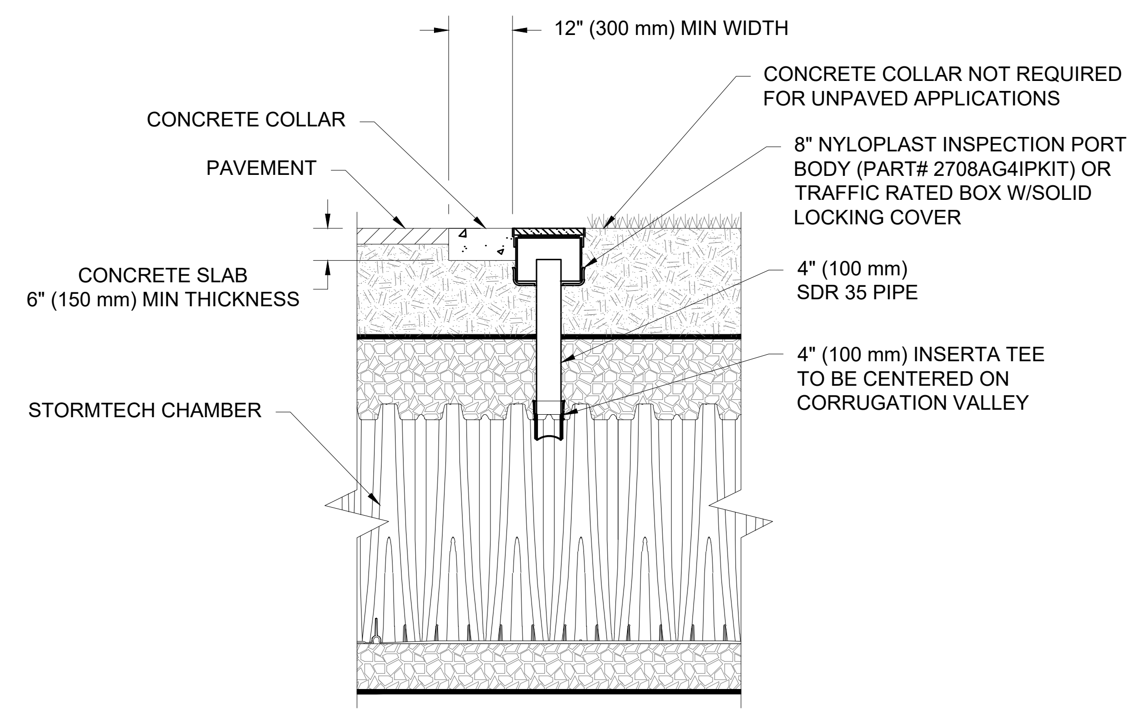
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

NTS

MC-3500

ISOLATOR ROW PLUS DETAILS

DATE: 8/03/22 | DRAWN: KLJ

PROJECT #: | CHECKED: KLJ

DATE	DRWN	CHKD	DESCRIPTION

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SHEET 1 OF 1

Isolator® Row Plus

O&M Manual

The Isolator® Row Plus

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

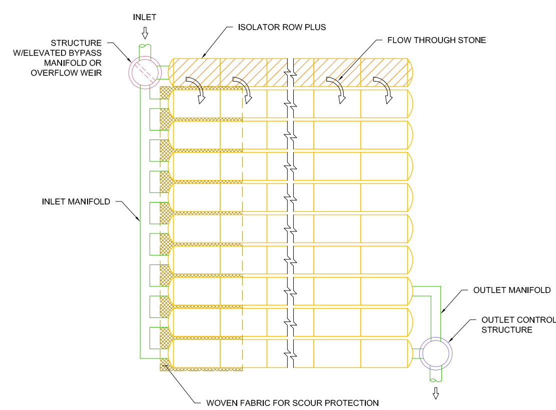
The Isolator Row FLAMP™ (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*

Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.

StormTech Isolator Row PLUS with Overflow Spillway (not to scale)



Isolator Row Plus Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

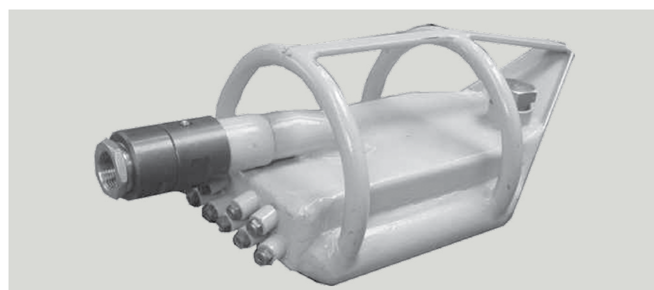
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

Maintenance

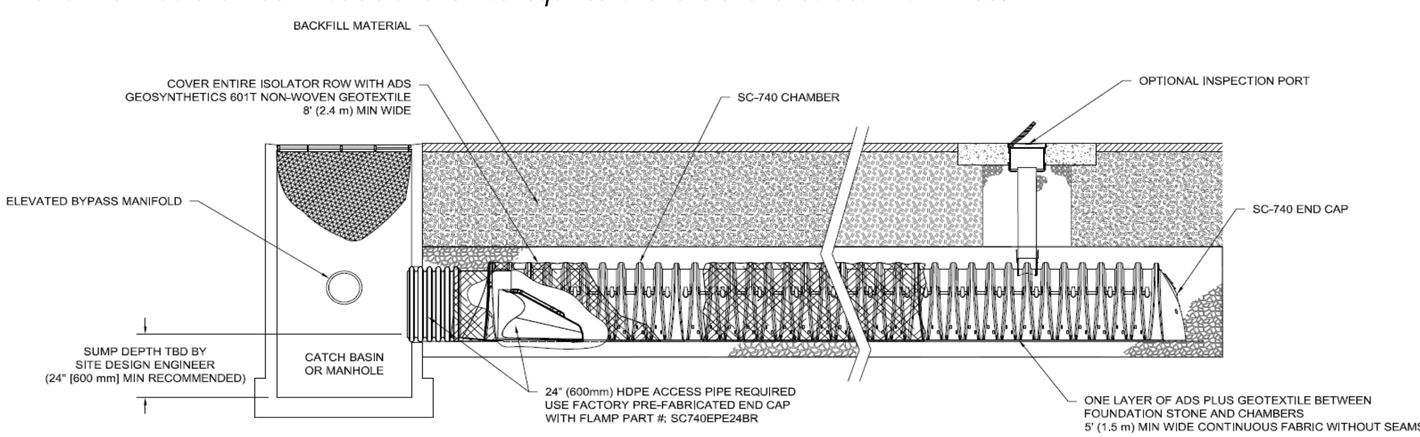
The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**



StormTech Isolator Row PLUS (*not to scale*)

Note: *Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.*



Isolator Row Plus Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row Plus for sediment.

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.

iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Row Plus

i. Remove cover from manhole at upstream end of Isolator Row Plus

ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry
2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2.
If not, proceed to Step 3.

Step 2

Clean out Isolator Row Plus using the JetVac process.

A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

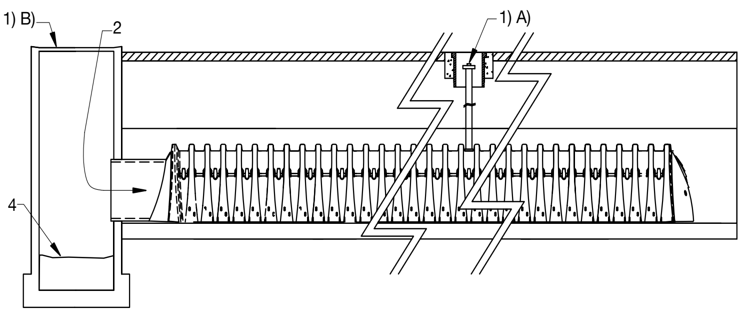
C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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StormTech® Installation Guide
MC-3500 & MC-4500 Chamber

StormTech
Installation Video

Required Materials and Equipment List

- Acceptable fill materials per Table 1
- ADS Plus and non-woven geotextile fabrics
- StormTech solid end caps, pre-cored and pre-fabricated end caps
- StormTech chambers, manifolds and fittings

Note: MC-3500 chamber pallets are 77" x 90" (2.0 m x 2.3 m) and weigh about 2010 lbs. (912 kg) and MC-4500 pallets are 100" x 52" (2.5 m x 1.3 m) and weigh about 840 lbs. (381 kg). Unloading chambers requires 72" (1.8 m) (min.) forks and/or tie downs (straps, chains, etc).

Important Notes:

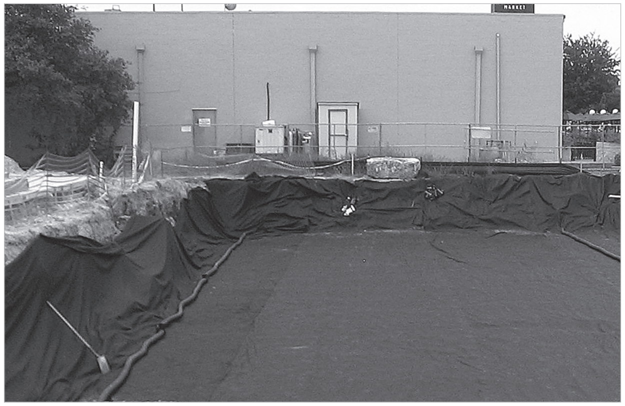
A. This installation guide provides the minimum requirements for proper installation of chambers. Nonadherence to this guide may result in damage to chambers during installation. Replacement of damaged chambers during or after backfilling is costly and very time consuming. It is recommended that all installers are familiar with this guide, and that the contractor inspects the chambers for distortion, damage and joint integrity as work progresses.

B. Use of a dozer to push embedment stone between the rows of chambers may cause damage to chambers and is not an acceptable backfill method. Any chambers damaged by using the "dump and push" method are not covered under the StormTech standard warranty.

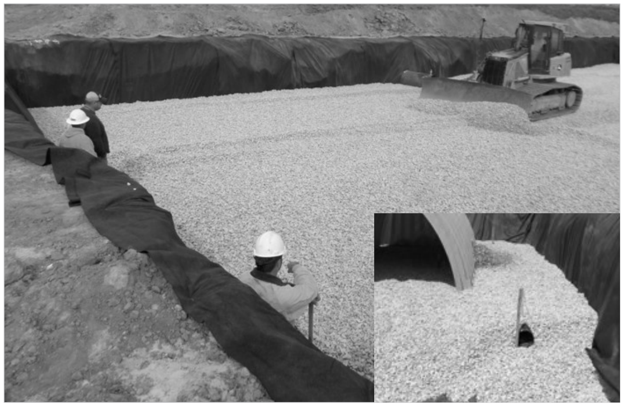
C. Care should be taken in the handling of chambers and end caps. End caps must be stored standing upright. Avoid dropping, prying or excessive force on chambers during removal from pallet and initial placement.

Requirements for System Installation

Excavate bed and prepare subgrade per engineer's plans. Plans and specifications should include Best Management Practices (BMPs) to deter contamination of open pits during construction.



Place non-woven geotextile over prepared soils and up excavation walls.



Place clean, crushed, angular stone foundation 9" (230 mm) min. Install underdrains if required. Compact to achieve a flat surface.

Manifold, Scour Fabric and Chamber Assembly

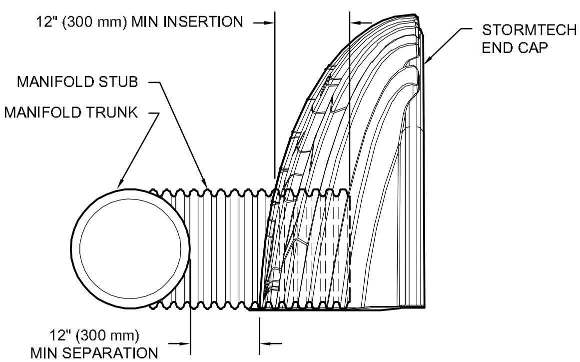
Install manifolds and lay out ADS PLUS fabric at inlet rows [min. 17.5 ft (5.33 m)] at each inlet end cap. Place a continuous piece (no seams) along entire length of Isolator® PLUS Row(s).

Align the first chamber and end cap of each row with inlet pipes. Contractor may choose to postpone stone placement around end chambers and leave ends of rows open for easy inspection of chambers during the backfill process.

Continue installing chambers by overlapping chamber end corrugations. Chamber joints are labeled “Lower Joint – Overlap Here” and “Build this direction – Upper Joint” Be sure that the chamber placement does not exceed the reach of the construction equipment used to place the stone. Maintain minimum 6” (150 mm) spacing between MC-3500 rows and 9” (230 mm) spacing between MC-4500 rows.

Place a continuous layer of ADS PLUS fabric between the foundation stone and the Isolator Row PLUS chambers, making sure the fabric lays flat and extends the entire width of the chamber feet.
When used on an Isolator Row PLUS, a 24” FLAMP (flared end ramp) is attached to the inside of the inlet pipe with a provided threaded rod and bolt. The FLAMP then lays on top of the ADS PLUS fabric.

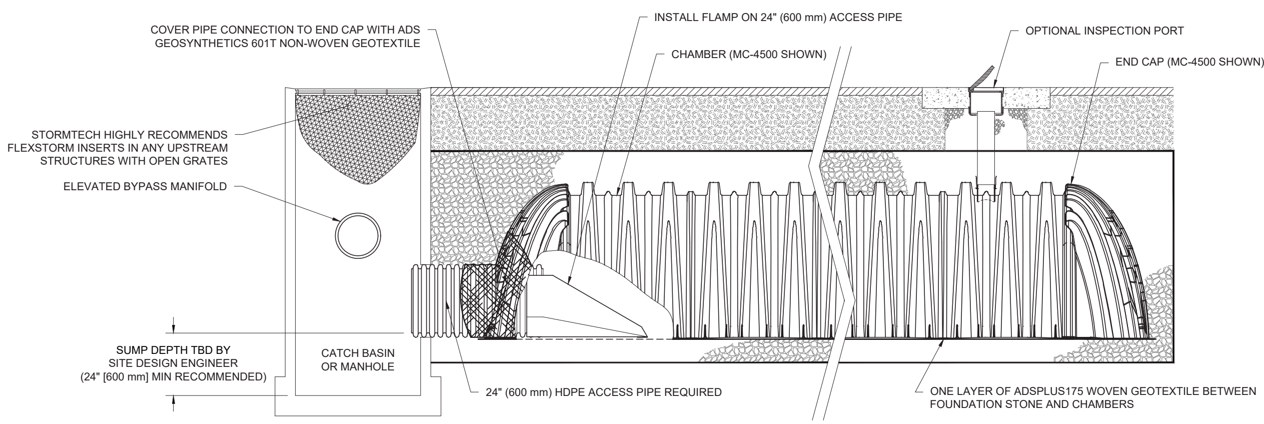
Manifold Insertion



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

Insert inlet and outlet manifolds a minimum 12” (300 mm) into chamber end caps. Manifold header should be a minimum 12” (300 mm) from base of end cap.

StormTech Isolator Row Plus Detail

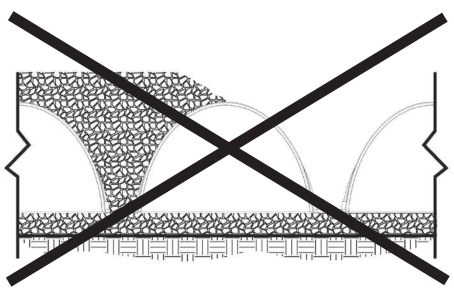


Initial Anchoring of Chambers – Embedment Stone

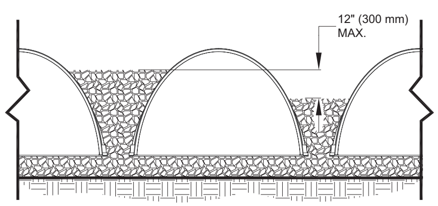
Initial embedment shall be spotted along the centerline of the chamber evenly anchoring the lower portion of the chamber. This is best accomplished with a stone conveyor or excavator reaching along the row.

No equipment shall be operated on the bed at this stage of the installation. Excavators must be located off the bed. Dump trucks shall not dump stone directly on to the bed. Dozers or loaders are not allowed on the bed at this time.

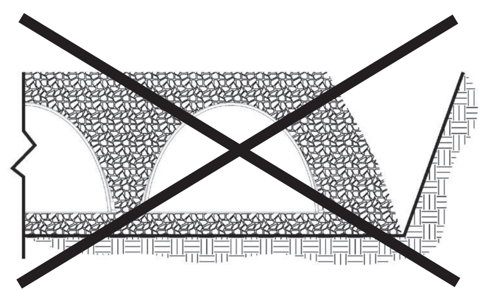
Backfill of Chambers – Embedment Stone



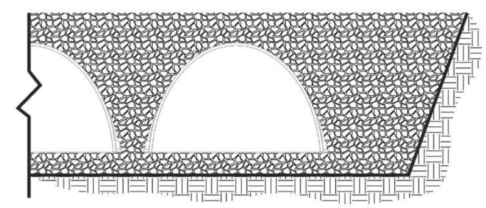
Uneven Backfill



Even Backfill



Perimeter Not Backfilled

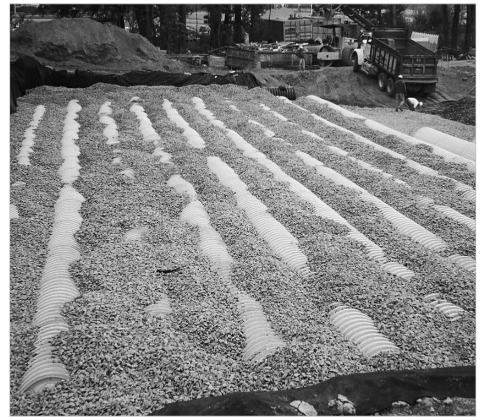


Perimeter Fully Backfilled

Backfill chambers evenly. Stone column height should never differ by more than 12" (300 mm) between adjacent chamber rows or between chamber rows and perimeter.

Perimeter stone must be brought up evenly with chamber rows. Perimeter must be fully backfilled, with stone extended horizontally to the excavation wall.

Backfill of Chambers – Embedment Stone and Cover Stone



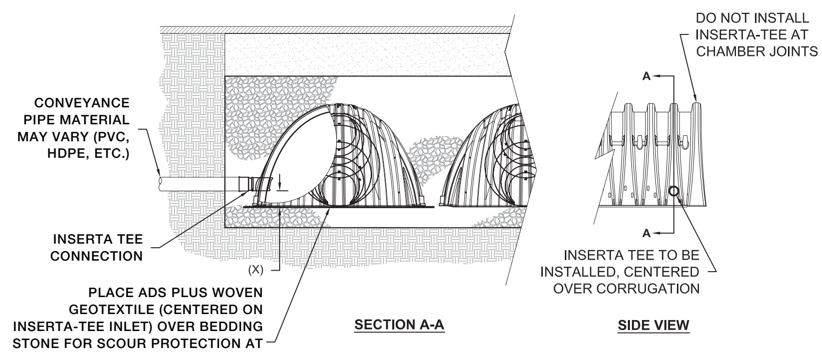
Continue evenly backfilling between rows and around perimeter until embedment stone reaches tops of chambers and a minimum 12" (300 mm) of cover stone is in place. Perimeter stone must extend horizontally to the excavation wall for both straight or sloped sidewalls. The recommended backfill methods are with a stone conveyor outside of the bed or build as you go with an excavator inside the bed reaching along the rows. Backfilling while assembling chambers rows as shown in the picture will help to ensure that equipment reach is not exceeded.

Only after chambers have been backfilled to top of chamber and with a minimum 12" (300 mm) of cover stone on top of chambers can skid loaders and small LGP dozers be used to final grade cover stone and backfill material in accordance with ground pressure limits in Table 2. Equipment must push material parallel to rows only. Never push perpendicular to rows. StormTech recommends the contractor inspect chamber rows before placing final backfill. Any chambers damaged by construction equipment shall be removed and replaced.

Final Backfill of Chambers – Fill Material

Install non-woven geotextile over stone. Geotextile must overlap 24" (600 mm) where edges meet. Compact at 24" (600 mm) of fill. Roller travel parallel with rows.

Inserta Tee Detail



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
MC-3500	12" (250 mm)	6" (150 mm)
MC-4500	12" (250 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

Table 1- Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation[1]	Compaction/Density Requirement
Ⓓ **Final Fill:** Fill Material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement subbase may be part of the 'D' layer.	Any soil/rock materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	Prepare per site design engineer's plans. Paved installations may have stringent material and preparation requirements.
Ⓒ **Initial Fill:** Fill Material for layer 'C' starts from the top of the embedment stone ('B' layer) to 24" (600 mm) above the top of the chamber. Note that pavement subbase may be part of the 'C' layer.	Granular well-graded soil/aggregate mixtures, <35% fines or processed aggregate. Most pavement subbase materials can be used in lieu of this layer.	AASHTO M145[1] A-1, A-2-4, A-3 or AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	Begin compaction after min. 24" (600 mm) of material over the chambers is reached. Compact additional layers in 12" (300 mm) max. lifts to a min. 95% Proctor density for well-graded material and 95% relative density for processed aggregate materials.
Ⓑ **Embedment Stone:** Fill the surrounding chambers from the foundation stone ('A' layer) to the 'C' layer above.	Clean, crushed, angular stone	AASHTO M43[1] 3, 4	No compaction required.
Ⓐ **Foundation Stone:** Fill below chambers from the subgrade up to the foot (bottom) of the chamber.	Clean, crushed, angular stone,	AASHTO M43[1] 3, 4	Place and compact in 9" (230 mm) max lifts using two full coverages with a vibratory compactor.[2, 3]

Please Note:

1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state: "clean, crushed, angular no. 4 (AASHTO M43) stone".
2. StormTech compaction requirements are met for 'A' location materials when placed and compacted in 9" (230 mm) (max) lifts using two full coverages with a vibratory compactor.
3. Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact StormTech for compaction requirements.

Figure 1- Inspection Port Detail

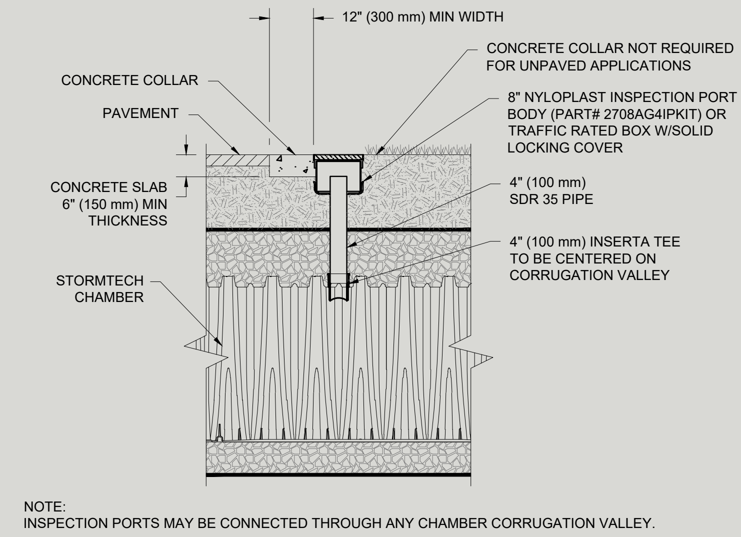
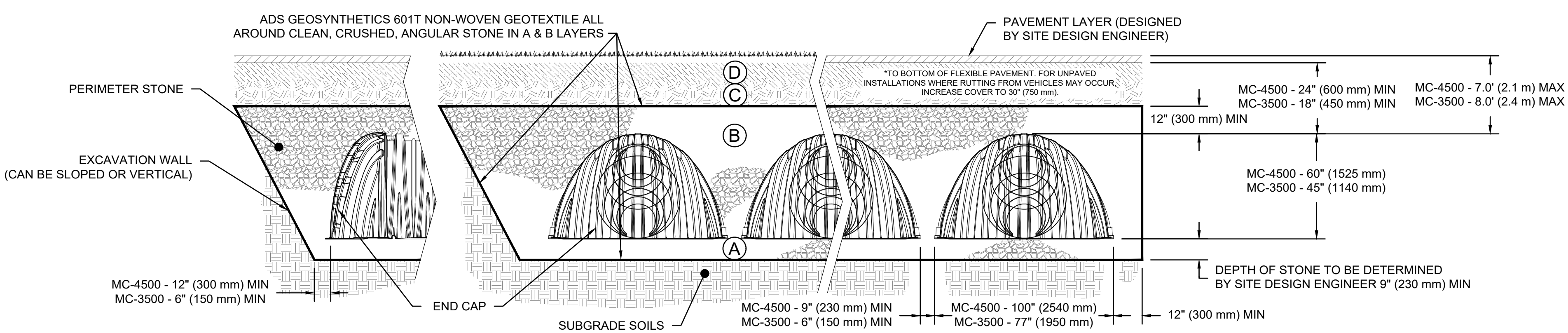


Figure 2 - Fill Material Locations



Notes:

1. 36" (900 mm) of stabilized cover materials over the chambers is recommended during the construction phase if general construction activities, such as full dump truck travel and dumping, are to occur over the bed.
2. During paving operations, dump truck axle loads on 18" (450mm) of cover for MC-3500s may be necessary. Precautions should be taken to avoid rutting of the road base layer, to ensure that compaction requirements have been met, and that a minimum of 18" (450mm) of cover for MC-3500s exists over the chambers. Contact StormTech for additional guidance on allowable axle loads during paving.
3. Ground pressure for track dozers is the vehicle operating weight divided by total ground contact area for both tracks. Excavators will exert higher ground pressures based on loaded bucket weight and boom extension.
4. Mini-excavators (<8,000lbs/3,628 kg) can be used with at least 12" (300 mm) of stone over the chambers and are limited by the maximum ground pressures in Table 2 based on a full bucket at maximum boom extension.
5. StormTech does not require compaction of initial fill at 18" (450 mm) of cover. However, requirements by others for 6" (150 mm) lifts may necessitate the use of small compactors at 18" (450 mm) of cover.
6. Storage of materials such as construction materials, equipment, spoils, etc. should not be located over the StormTech system. The use of equipment over the StormTech system not covered in Table 2 (ex. soil mixing equipment, cranes, etc) is limited. Please contact StormTech for more information.
7. Allowable track loads based on vehicle travel only. Excavators shall not operate on chamber beds until the total backfill reaches 3 feet (900 mm) over the entire bed.

Call StormTech at **888.892.2694** for technical and product information or visit www.stormtech.com

Table 2 - Maximum Allowable Construction Vehicle Loads[6]

Material Location	Fill Depth over Chambers in. (mm)	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads[6]		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs (kN)	Max Wheel Load for Loaders lbs (kN)	Track Width in. (mm)	Max Ground Pressure psf (kPa)	Max Drum Weight or Dynamic Force lbs (kN)
Ⓓ Final Fill Material	36" (900) Compacted	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	4050 (194) 2760 (132) 2130 (102) 1770 (84) 1530 (73)	38,000 (169)
Ⓒ Initial Fill Material	24" (600) Compacted	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2750 (131) 1920 (92) 1520 (73) 1310 (63) 1180 (56)	20,000 (89)
	24" (600) Loose/Dumped	MC-3500: 32,000 (142) MC-4500: 24,000 (107)	MC-3500: 16,000 (71) MC-4500: 12,000 (53)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2430 (116) 1730 (82) 1390 (66) 1210 (58) 1100 (52)	16,000 (71)
	18" (450)	MC-3500: 32,000 (142) MC-4500: 24,000 (107)	MC-3500: 16,000 (71) MC-4500: 12,000 (53)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2140 (102) 1530 (73) 1260 (60) 1120 (53) 1030 (49)	5,000 (22) (static loads only)[5]
Ⓑ Embedment Stone	12" (300)	Not Allowed	Not Allowed	12" (305) 18" (457) 24" (610) 30" (762)	1100 (53) 710 (34) 660 (32) 580 (28)	Not Allowed
	6" (150)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed

Table 3 - Placement Methods and Descriptions

Material Location	Placement Methods/ Restrictions	Wheel Load Restrictions	Track Load Restrictions	Roller Load Restrictions
		See Table 2 for Maximum Construction Loads		
Ⓓ Final Fill Material	A variety of placement methods may be used. All construction loads must not exceed the maximum limits in Table 2.	36" (900 mm) minimum cover required for dump trucks to dump over chambers.	Dozers to push parallel to rows.[4]	Roller travel parallel to rows only until 36" (900 mm) compacted cover is reached.
Ⓒ Initial Fill Material	Excavator positioned off bed recom-mended. Small excavator allowed over chambers. Small dozer allowed.	Asphalt can be dumped into paver when compacted pavement subbase reaches 24" (600 mm) above top of chambers.	Small LGP track dozers & skid loaders allowed to grade cover stone with at least 12" (300 mm) stone under tracks at all times. Equipment must push par-allel to rows at all times.	Use dynamic force of roller only after compacted fill depth reaches 24" (600 mm) over chambers. Roller travel parallel to chamber rows only.
Ⓑ Embedment Stone	No equipment allowed on bare chambers. Use excavator or stone conveyor positioned off bed or on foundation stone to evenly fill around all chambers to at least the top of chambers.	No wheel loads allowed. Material must be placed outside the limits of the chamber bed.	No tracked equipment is allowed on chambers until a min. 12" (300 mm) cover stone is in place.	No rollers allowed.
Ⓐ Foundation Stone	No StormTech restrictions. Contractor responsible for any conditions or requirements by others relative to subgrade bearing capacity, dewatering or protection of subgrade.			

ADS StormTech™

StormTech® Standard Limited Warranty

STANDARD LIMITED WARRANTY OF STORMTECH LLC ("STORMTECH"): PRODUCTS

(A) This Limited Warranty applies solely to the StormTech chambers and end plates manufactured by StormTech and sold to the original purchaser (the "Purchaser"). The chambers and end plates are collectively referred to as the "Products."

(B) The structural integrity of the Products, when installed strictly in accordance with StormTech's written installation instructions at the time of installation, are warranted to the Purchaser against defective materials and workmanship for one (1) year from the date of purchase. Should a defect appear in the Limited Warranty period, the Purchaser shall provide StormTech with written notice of the alleged defect at StormTech's corporate headquarters within ten (10) days of the discovery of the defect. The notice shall describe the alleged defect in reasonable detail. StormTech agrees to supply replacements for those Products determined by StormTech to be defective and covered by this Limited Warranty. The supply of replacement products is the sole remedy of the Purchaser for breaches of this Limited Warranty. StormTech's liability specifically excludes the cost of removal and/or installation of the Products.

(C) THIS LIMITED WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

(D) This Limited Warranty only applies to the Products when the Products are installed in a single layer. UNDER NO CIRCUMSTANCES, SHALL THE PRODUCTS BE INSTALLED IN A MULTI-LAYER CONFIGURATION.

(E) No representative of StormTech has the authority to change this Limited Warranty in any manner or to extend this Limited Warranty. This Limited Warranty does not apply to any person other than to the Purchaser.

(F) Under no circumstances shall StormTech be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the Products, or the cost of other goods or services related to the purchase and installation of the Products. For this Limited Warranty to apply, the Products must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and StormTech's written installation instructions.

(G) THE LIMITED WARRANTY DOES NOT EXTEND TO INCIDENTAL, CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES. STORMTECH SHALL NOT BE LIABLE FOR PENALTIES OR LIQUIDATED DAMAGES, INCLUDING LOSS OF PRODUCTION AND PROFITS; LABOR AND MATERIALS; OVERHEAD COSTS; OR OTHER LOSS OR EXPENSE INCURRED BY THE PURCHASER OR ANY THIRD PARTY. SPECIFICALLY EXCLUDED FROM LIMITED WARRANTY COVERAGE ARE DAMAGE TO THE PRODUCTS ARISING FROM ORDINARY WEAR AND TEAR; ALTERATION, ACCIDENT, MISUSE, ABUSE OR NEGLECT; THE PRODUCTS BEING SUBJECTED TO VEHICLE TRAFFIC OR OTHER CONDITIONS WHICH ARE NOT PERMITTED BY STORMTECH'S WRITTEN SPECIFICATIONS OR INSTALLATION INSTRUCTIONS; FAILURE TO MAINTAIN THE MINIMUM GROUND COVERS SET FORTH IN THE INSTALLATION INSTRUCTIONS; THE PLACEMENT OF IMPROPER MATERIALS INTO THE PRODUCTS; FAILURE OF THE PRODUCTS DUE TO IMPROPER SITING OR IMPROPER SIZING; OR ANY OTHER EVENT NOT CAUSED BY STORMTECH. A PRODUCT ALSO IS EXCLUDED FROM LIMITED WARRANTY COVERAGE IF SUCH PRODUCT IS USED IN A PROJECT OR SYSTEM IN WHICH ANY GEOTEXTILE PRODUCTS OTHER THAN THOSE PROVIDED BY ADVANCED DRAINAGE SYSTEMS ARE USED. THIS LIMITED WARRANTY REPRESENTS STORMTECH'S SOLE LIABILITY TO THE PURCHASER FOR CLAIMS RELATED TO THE PRODUCTS, WHETHER THE CLAIM IS BASED UPON CONTRACT, TORT, OR OTHER LEGAL THEORY.

adspipe.com
800-821-6710

Drainage Filtration Separation

ADS 0601T/O NONWOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 0601T/O nonwoven geotextile.

Filter Fabric Requirements

ADS 0601T/O is an orange nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. ADS 0601T/O is inert to biological degradation and resists naturally encountered chemicals, alkali and acids. ADS 0601T/O conforms to the physical property values listed below:

Filter Fabric Properties

Property	Test Method	Unit	Typical Value[1] MD	Typical Value[1] CD
Grab Tensile Strength	ASTM D4632	lbs (N)	175 (779)	175 (779)
Grab Tensile Elongation	ASTM D4632	%	75	75
Trapezoid Tear Strength	ASTM D4533	lbs (N)	85 (378)	85 (378)
CBR Puncture Strength	ASTM D6241	lbs (N)	480 (2136)	480 (2136)
Permittivity	ASTM D4491	sec^{-1}	1.5	1.5
Flow Rate	ASTM D4491	gal/min/ft^2 (l/min/m^2)	105 (4278)	105 (4278)
UV Resistance (at 500 hours)[1]	ASTM D4355	% strength retained	80	80

Physical Properties

Property	Test Method	Unit	Typical Value[2]
Weight	ASTM D5161	oz/yd^2 (g/m^2)	6.5 (220)
Thickness	ASTM D5199	mils (mm)	65 (1.7)
Roll Dimensions (W x L)	-	ft (m)	15 x 300 (4.5 x 91)
Roll Area	-	yd^2 (m^2)	500 (418)
Estimated Roll Weight	-	lb (kg)	220 (100)

1 Modified, Minimum Test Value
2 ASTM D4439 Standard Terminology for Geosynthetics: typical value, n-*for geosynthetics*, the mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with on specific property.

Separation

ADS 315W WOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 315W woven geotextile.

Filter Fabric Requirements

ADS 315W is manufactured using high-tenacity polypropylene yarns that are woven to form a dimensionally stable network, which allows the yarns to maintain their relative position. ADS 315W resists ultraviolet deterioration, rotting and biological degradation and is inert to commonly encountered soil chemicals. ADS 315W conforms to the physical property values listed below:

Filter Fabric Properties

Property	Test Method	Unit	M.A.R.V. (Minimum Average Roll Value)[2]
Tensile Strength (Grab)	ASTM D4632	lbs (N)	315 (1400)
Elongation	ASTM D4632	%	15
CBR Puncture	ASTM D6241	lbs (N)	900 (4005)
Puncture	ASTM D4833	lbs (N)	150 (667)
Mullen Burst	ASTM D3786	psi (kPa)	600 (4134)
Trapezoidal Tear	ASTM D4533	lbs (N)	120 (533)
UV Resistance (at 500 hours)	ASTM D4355	%	70
Apparent Opening Size (AOS)*	ASTM D4751	U.S. Sieve (mm)	40 (.425)
Permittivity	ASTM D4491	sec^{-1}	.05
Water Flow Rate	ASTM D4491	gpm/ft^2 ($l/min/m^2$)	4 (163)

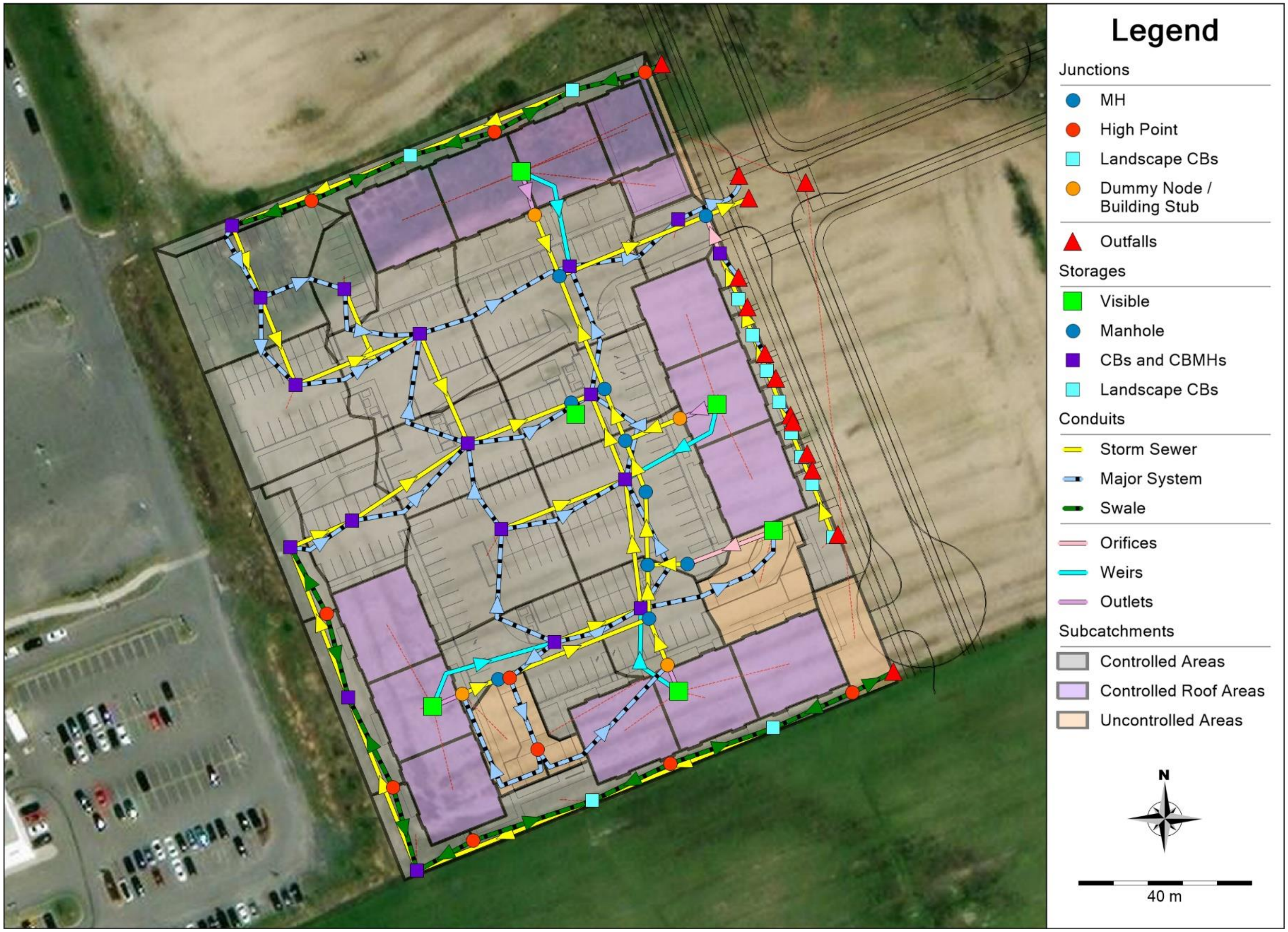
* Maximum average roll value.

Packaging

Roll Dimensions (W x L) - ft. (m)	12.5 x 360/ 15 x 300 / 17.5 x 258 (3.81 x 109.8/ 4.57 x 91.5 / 5.33 x 78.6)

Trinity Apartments
PCSWMM Model Schematics

Overall Model Schematic



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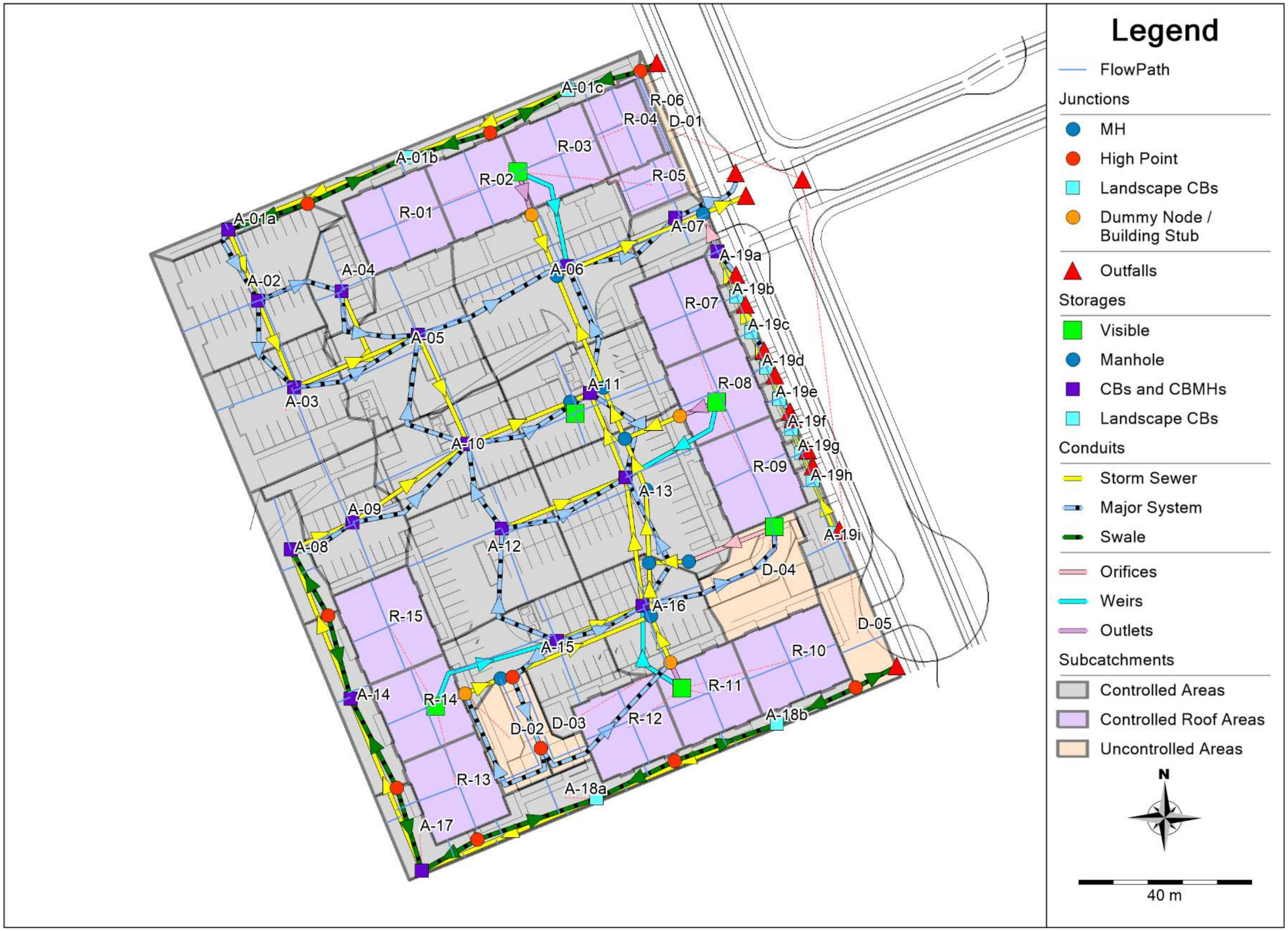
Subcatchments and Flow Paths



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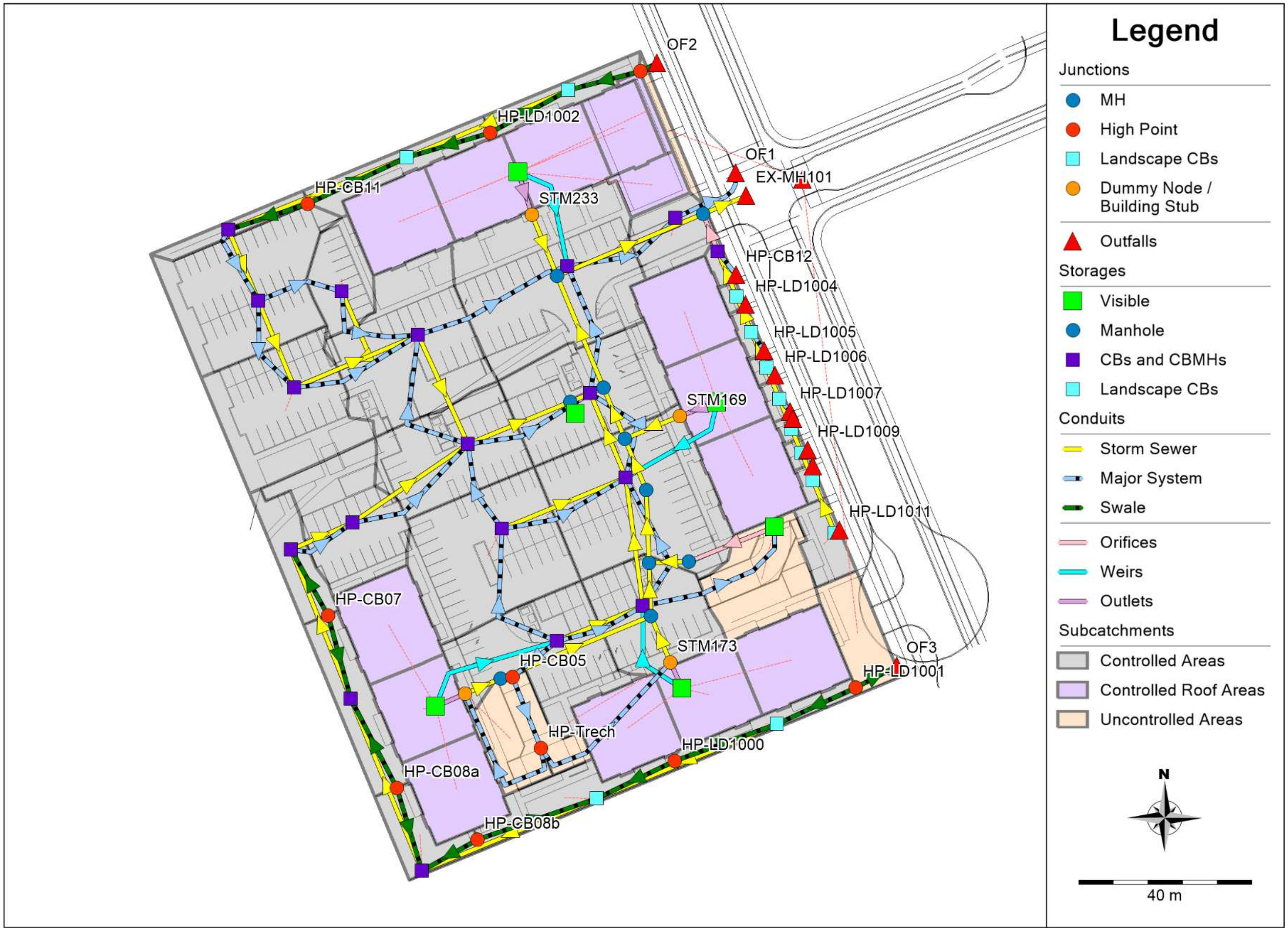
Trinity Apartments
PCSWMM Model Schematics

Junctions and Outfalls



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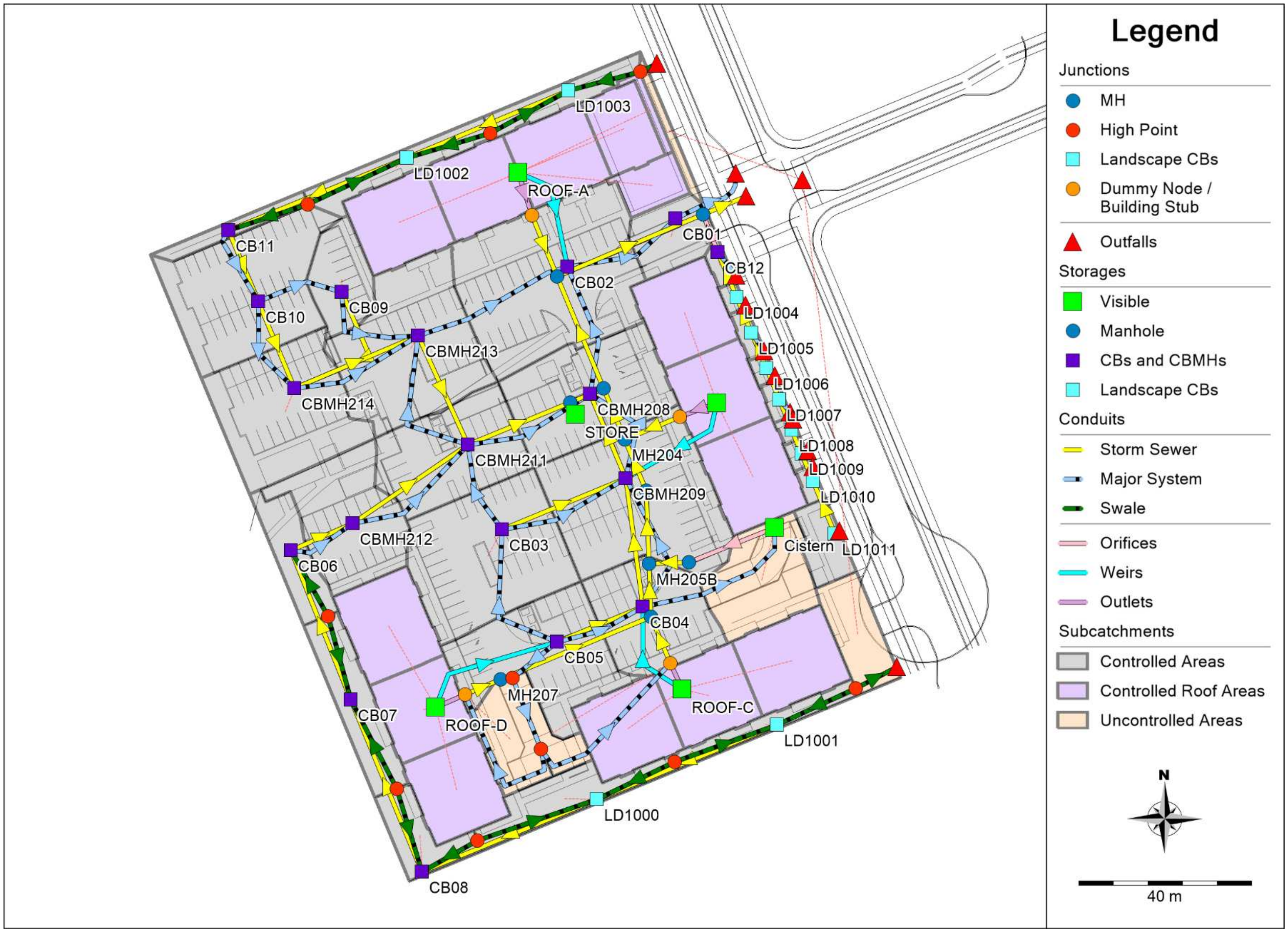
Storage Nodes



Trinity Apartments (122179)
PCSWMM Model Results - 100-year 3-hour Chicago

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Boundary Condition Based on Statec model at MH101
2-year = 86.63m
5-year = 86.63m

WARNING 04: minimum elevation drop used for Conduit HP-CB02
WARNING 04: minimum elevation drop used for Conduit HP-CB03a
WARNING 04: minimum elevation drop used for Conduit HP-CB03b
WARNING 04: minimum elevation drop used for Conduit HP-CB04
WARNING 04: minimum elevation drop used for Conduit HP-CB05a
WARNING 04: minimum elevation drop used for Conduit HP-CB05b
WARNING 04: minimum elevation drop used for Conduit HP-CB06
WARNING 04: minimum elevation drop used for Conduit HP-CB09
WARNING 04: minimum elevation drop used for Conduit HP-CB10a
WARNING 04: minimum elevation drop used for Conduit HP-CB10b
WARNING 04: minimum elevation drop used for Conduit HP-CB11
WARNING 04: minimum elevation drop used for Conduit HP-CBMH208
WARNING 04: minimum elevation drop used for Conduit HP-CBMH209
WARNING 04: minimum elevation drop used for Conduit HP-CBMH211a
WARNING 04: minimum elevation drop used for Conduit HP-CBMH211b
WARNING 04: minimum elevation drop used for Conduit HP-CBMH212
WARNING 04: minimum elevation drop used for Conduit HP-CBMH213
WARNING 04: minimum elevation drop used for Conduit HP-CBMH214
WARNING 04: minimum elevation drop used for Conduit HP-TrenchCistern
WARNING 04: minimum elevation drop used for Conduit MS01
WARNING 04: minimum elevation drop used for Conduit MS05
WARNING 04: minimum elevation drop used for Conduit MS06
WARNING 04: minimum elevation drop used for Conduit MS07
WARNING 04: minimum elevation drop used for Conduit MS08
WARNING 04: minimum elevation drop used for Conduit MS09
WARNING 04: minimum elevation drop used for Conduit MS10
WARNING 04: minimum elevation drop used for Conduit MS11
WARNING 04: minimum elevation drop used for Conduit MS12
WARNING 04: minimum elevation drop used for Conduit MS13
WARNING 02: maximum depth increased for Node CB02
WARNING 02: maximum depth increased for Node CBMH208
WARNING 02: maximum depth increased for Node CBMH213
```

```
*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 50
Number of nodes ........... 74
Number of links ........... 103
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
------------------------------------------------------------------------
Raingage             03-C100yr-3hr                  INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-------------------------------------------------------------------------------------------------------------
A-01a                       0.01     60.00     15.70    2.0000 Raingage             CB11
A-01b                       0.03     86.67     15.70    1.5000 Raingage             LD1002
A-01c                       0.02     66.67     15.70    1.5000 Raingage             LD1003
A-02                        0.10     64.00     87.10    2.0000 Raingage             CB10
A-03                        0.09     57.33     80.00    2.0000 Raingage             CBMH214
A-04                        0.03     33.33     92.90    2.0000 Raingage             CB09
A-05                        0.10     58.23     77.10    2.5000 Raingage             CBMH213
A-06                        0.13     70.53     74.30    2.5000 Raingage             CB02
A-07                        0.03     37.14     70.00    2.0000 Raingage             CB01
A-08                        0.03     37.14      8.60    2.0000 Raingage             CB06
A-09                        0.07     50.77     85.70    2.0000 Raingage             CBMH212
A-10                        0.07     49.29     94.30    2.5000 Raingage             CBMH211
A-11                        0.08     53.33     85.70    2.0000 Raingage             CBMH208
A-12                        0.10     63.12     95.70    2.0000 Raingage             CB03
A-13                        0.12     69.41     95.70    2.0000 Raingage             CBMH209
A-14                        0.04     92.50     15.70    1.0000 Raingage             CB07
```

A-15	0.08	52.67	88.60	2.0000	Raingage	CB05
A-16	0.06	46.92	92.90	3.0000	Raingage	CB04
A-17	0.02	76.67	11.40	1.5000	Raingage	CB08
A-18a	0.03	110.00	30.00	1.5000	Raingage	LD1000
A-18b	0.02	85.00	30.00	1.5000	Raingage	LD1001
A-19a	0.00	10.50	38.60	8.0000	Raingage	CB12
A-19b	0.00	9.33	38.60	12.0000	Raingage	LD1004
A-19c	0.00	12.00	38.60	8.5000	Raingage	LD1005
A-19d	0.00	9.33	38.60	13.5000	Raingage	LD1006
A-19e	0.00	13.00	38.60	10.5000	Raingage	LD1007
A-19f	0.00	12.00	38.60	17.5000	Raingage	LD1008
A-19g	0.00	9.33	38.60	14.5000	Raingage	LD1009
A-19h	0.00	12.00	38.60	10.5000	Raingage	LD1010
A-19i	0.02	23.71	38.60	3.5000	Raingage	LD1011
D-01	0.01	35.00	41.40	16.0000	Raingage	OF-Unc
D-02	0.03	9.06	70.00	7.0000	Raingage	STM161
D-03	0.01	4.48	100.00	7.5000	Raingage	STM173
D-04	0.05	19.23	75.70	10.0000	Raingage	Cistern
D-05	0.03	25.46	28.60	3.0000	Raingage	OF-Unc
R-01	0.04	20.53	100.00	0.5000	Raingage	ROOF-A
R-02	0.04	19.47	100.00	0.5000	Raingage	ROOF-A
R-03	0.04	19.47	100.00	0.5000	Raingage	ROOF-A
R-04	0.03	15.63	100.00	0.5000	Raingage	ROOF-A
R-05	0.01	12.50	100.00	0.5000	Raingage	ROOF-A
R-06	0.00	3.64	100.00	0.5000	Raingage	ROOF-A
R-07	0.04	20.53	100.00	0.5000	Raingage	ROOF-B
R-08	0.04	19.47	100.00	0.5000	Raingage	ROOF-B
R-09	0.04	21.00	100.00	0.5000	Raingage	ROOF-B
R-10	0.04	21.00	100.00	0.5000	Raingage	ROOF-C
R-11	0.04	19.47	100.00	0.5000	Raingage	ROOF-C
R-12	0.04	20.53	100.00	0.5000	Raingage	ROOF-C
R-13	0.04	20.53	100.00	0.5000	Raingage	ROOF-D
R-14	0.04	19.47	100.00	0.5000	Raingage	ROOF-D
R-15	0.04	21.00	100.00	0.5000	Raingage	ROOF-D

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
HP-CB05	JUNCTION	89.15	0.35	0.0	
HP-CB07	JUNCTION	89.18	0.35	0.0	
HP-CB08a	JUNCTION	89.20	0.35	0.0	
HP-CB08b	JUNCTION	89.35	0.35	0.0	
HP-CB11	JUNCTION	89.20	0.35	0.0	
HP-LD1000	JUNCTION	89.15	0.35	0.0	
HP-LD1001	JUNCTION	89.10	0.35	0.0	
HP-LD1002	JUNCTION	89.10	0.35	0.0	
HP-LD1003	JUNCTION	89.05	0.35	0.0	
HP-Trech	JUNCTION	86.85	0.35	0.0	
STM161	JUNCTION	85.15	4.25	0.0	
STM169	JUNCTION	84.80	4.48	0.0	
STM173	JUNCTION	85.03	4.39	0.0	
STM233	JUNCTION	87.10	2.22	0.0	
EX-MH101	OUTFALL	83.10	1.18	0.0	
HP-CB12	OUTFALL	88.89	0.35	0.0	
HP-LD1004	OUTFALL	88.85	0.35	0.0	
HP-LD1005	OUTFALL	88.75	0.35	0.0	
HP-LD1006	OUTFALL	88.73	0.35	0.0	
HP-LD1007	OUTFALL	88.67	0.35	0.0	
HP-LD1008	OUTFALL	88.67	0.35	0.0	
HP-LD1009	OUTFALL	88.68	0.35	0.0	
HP-LD1010	OUTFALL	88.68	0.35	0.0	
HP-LD1011	OUTFALL	88.69	0.35	0.0	
OF1	OUTFALL	88.59	0.35	0.0	
OF2	OUTFALL	88.59	0.35	0.0	
OF3	OUTFALL	88.70	0.35	0.0	
OF-Unc	OUTFALL	0.00	0.00	0.0	
CB01	STORAGE	87.50	1.55	0.0	
CB02	STORAGE	86.10	3.25	0.0	
CB03	STORAGE	87.55	1.55	0.0	
CB04	STORAGE	87.38	1.72	0.0	
CB05	STORAGE	87.65	1.55	0.0	
CB06	STORAGE	86.69	2.66	0.0	
CB07	STORAGE	87.07	2.23	0.0	
CB08	STORAGE	87.29	2.06	0.0	
CB09	STORAGE	87.65	1.55	0.0	
CB10	STORAGE	86.81	2.29	0.0	
CB11	STORAGE	87.06	2.14	0.0	
CB12	STORAGE	85.33	3.77	0.0	

CBMH208	STORAGE	86.10	3.30	0.0
CBMH209	STORAGE	86.28	2.77	0.0
CBMH211	STORAGE	86.29	2.81	0.0
CBMH212	STORAGE	86.58	2.67	0.0
CBMH213	STORAGE	86.43	2.97	0.0
CBMH214	STORAGE	86.58	2.52	0.0
Cistern	STORAGE	86.39	3.17	0.0
LD1000	STORAGE	87.57	1.68	0.0
LD1001	STORAGE	87.80	1.35	0.0
LD1002	STORAGE	87.34	1.81	0.0
LD1003	STORAGE	87.55	1.55	0.0
LD1004	STORAGE	87.24	1.86	0.0
LD1005	STORAGE	87.29	1.71	0.0
LD1006	STORAGE	87.34	1.66	0.0
LD1007	STORAGE	87.39	1.56	0.0
LD1008	STORAGE	87.44	1.51	0.0
LD1009	STORAGE	87.48	1.47	0.0
LD1010	STORAGE	87.52	1.43	0.0
LD1011	STORAGE	87.60	1.35	0.0
MH201	STORAGE	83.80	5.02	0.0
MH202	STORAGE	83.99	4.66	0.0
MH203	STORAGE	84.19	4.52	0.0
MH204	STORAGE	84.41	4.51	0.0
MH205	STORAGE	84.54	4.25	0.0
MH205B	STORAGE	84.65	4.32	0.0
MH206	STORAGE	84.72	4.12	0.0
MH207	STORAGE	84.96	4.22	0.0
MH210	STORAGE	86.20	2.93	0.0
MH215	STORAGE	84.89	4.19	0.0
ROOF-A	STORAGE	91.00	0.35	0.0
ROOF-B	STORAGE	91.00	0.35	0.0
ROOF-C	STORAGE	91.00	0.35	0.0
ROOF-D	STORAGE	91.00	0.35	0.0
STORE	STORAGE	86.29	2.84	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
CB03-CBMH209	CB03	CBMH209	CONDUIT	30.9	1.0033	0.0130
CB04-CBMH209	CB04	CBMH209	CONDUIT	30.0	1.0001	0.0130
CB05-CB04	CB05	CB04	CONDUIT	21.5	0.9768	0.0130
CB06-CBMH212	CB06	CBMH212	CONDUIT	15.5	0.5161	0.0130
CB07-CB06	CB07	CB06	CONDUIT	37.2	0.5108	0.0130
CB08-CB07	CB08	CB07	CONDUIT	43.0	0.4884	0.0130
CB09-CBMH214	CB09	CBMH214	CONDUIT	16.2	0.9877	0.0130
CB10-CBMH214	CB10	CBMH214	CONDUIT	21.7	0.4608	0.0130
CB11-CB10	CB11	CB10	CONDUIT	17.8	0.5056	0.0130
CBMH209-CBMH208	CBMH209	CBMH208	CONDUIT	21.1	0.5213	0.0130
CBMH211-MH210	CBMH211	MH210	CONDUIT	25.6	0.3125	0.0130
CBMH212-CBMH211	CBMH212	CBMH211	CONDUIT	32.2	0.4969	0.0130
CBMH213-CBMH211	CBMH213	CBMH211	CONDUIT	27.6	0.2899	0.0130
CBMH214-CBMH213	CBMH214	CBMH213	CONDUIT	31.1	0.2894	0.0130
HP-CB01	CB01	OF1	CONDUIT	3.0	8.0257	0.0160
HP-CB02	CB02	CB01	CONDUIT	3.0	0.0102	0.0160
HP-CB03a	CB03	CBMH209	CONDUIT	3.0	0.0102	0.0160
HP-CB03b	CB03	CBMH211	CONDUIT	3.0	0.0102	0.0160
HP-CB04	CB04	CBMH209	CONDUIT	3.0	0.0102	0.0160
HP-CB05a	CB05	CB04	CONDUIT	3.0	0.0102	0.0160
HP-CB05b	CB05	CB03	CONDUIT	3.0	0.0102	0.0160
HP-CB06	CB06	CBMH212	CONDUIT	3.0	0.0102	0.0160
HP-CB09	CB09	CBMH213	CONDUIT	3.0	0.0102	0.0160
HP-CB10a	CB10	CBMH214	CONDUIT	3.0	0.0102	0.0160
HP-CB10b	CB10	CB09	CONDUIT	3.0	0.0102	0.0160
HP-CB11	CB11	CB10	CONDUIT	3.0	0.0102	0.0160
HP-CBMH208	CBMH208	CB02	CONDUIT	3.0	0.0102	0.0160
HP-CBMH209	CBMH209	CBMH208	CONDUIT	3.0	0.0102	0.0160
HP-CBMH211a	CBMH211	CBMH208	CONDUIT	3.0	0.0102	0.0160
HP-CBMH211b	CBMH211	CBMH213	CONDUIT	3.0	0.0102	0.0160
HP-CBMH212	CBMH212	CBMH211	CONDUIT	3.0	0.0102	0.0160
HP-CBMH213	CBMH213	CB02	CONDUIT	3.0	0.0102	0.0160
HP-CBMH214	CBMH214	CBMH213	CONDUIT	3.0	0.0102	0.0160
HP-TrenchCistern	CB04	Cistern	CONDUIT	3.0	0.0102	0.0160
LD1000-CB08	LD1000	CB08	CONDUIT	43.7	0.5034	0.0130
LD1001-LD1000	LD1001	LD1000	CONDUIT	45.0	0.4889	0.0130
LD1002-CB11	LD1002	CB11	CONDUIT	44.4	0.4955	0.0130
LD1003-LD1002	LD1003	LD1002	CONDUIT	40.4	0.4951	0.0130
LD1004-CB12	LD1004	CB12	CONDUIT	11.3	0.5310	0.0130
LD1005-LD1004	LD1005	LD1004	CONDUIT	8.9	0.4494	0.0130
LD1006-LD1005	LD1006	LD1005	CONDUIT	8.9	0.4494	0.0130

LD1007-LD1006	LD1007	LD1006	CONDUIT	7.7	0.5195	0.0130
LD1008-LD1007	LD1008	LD1007	CONDUIT	7.6	0.5263	0.0130
LD1009-LD1008	LD1009	LD1008	CONDUIT	6.0	0.5000	0.0130
LD1010-LD1009	LD1010	LD1009	CONDUIT	6.8	0.4412	0.0130
LD1011-LD1010	LD1011	LD1010	CONDUIT	13.2	0.5303	0.0130
MH201-MH101	MH201	EX-MH101	CONDUIT	10.8	0.4630	0.0130
MH202-MH201	MH202	MH201	CONDUIT	36.6	0.4918	0.0130
MH203-MH202	MH203	MH202	CONDUIT	28.0	0.5000	0.0130
MH204-MH203	MH204	MH203	CONDUIT	12.8	0.5469	0.0130
MH205B-MH205	MH205B	MH205	CONDUIT	16.8	0.4762	0.0130
MH205-MH204	MH205	MH204	CONDUIT	12.8	0.4688	0.0130
MH206-MH205B	MH206	MH205B	CONDUIT	12.3	0.4878	0.0130
MH207-MH206	MH207	MH206	CONDUIT	37.6	0.5053	0.0130
MH210-CBMH208	MH210	CBMH208	CONDUIT	5.0	0.4000	0.0130
MH215-MH205B	MH215	MH205B	CONDUIT	9.2	1.9569	0.0130
MS01	CB05	HP-CB05	CONDUIT	3.0	0.0102	0.0160
MS02	HP-CB05	HP-Trech	CONDUIT	18.0	12.8834	0.0160
MS03	HP-Trech	STM161	CONDUIT	8.6	3.6070	0.0160
MS04	HP-Trech	STM173	CONDUIT	8.0	4.5046	0.0160
MS05	CB12	HP-CB12	CONDUIT	3.0	0.0102	0.0350
MS06	LD1004	HP-LD1004	CONDUIT	3.0	0.0102	0.0350
MS07	LD1005	HP-LD1005	CONDUIT	3.0	0.0102	0.0350
MS08	LD1006	HP-LD1006	CONDUIT	3.0	0.0102	0.0350
MS09	LD1007	HP-LD1007	CONDUIT	3.0	0.0102	0.0350
MS10	LD1008	HP-LD1008	CONDUIT	3.0	0.0102	0.0350
MS11	LD1009	HP-LD1009	CONDUIT	3.0	0.0102	0.0350
MS12	LD1010	HP-LD1010	CONDUIT	3.0	0.0102	0.0350
MS13	LD1011	HP-LD1011	CONDUIT	3.0	0.0102	0.0350
STM161-MH207	STM161	MH207	CONDUIT	8.9	2.0229	0.0130
STM169-MH204	STM169	MH204	CONDUIT	13.7	1.9712	0.0130
STM173-MH206	STM173	MH206	CONDUIT	11.5	2.0004	0.0130
STM233-MH202	STM233	MH202	CONDUIT	15.3	1.9612	0.0130
STORE-MH210	STORE	MH210	CONDUIT	3.0	1.0001	0.0130
SW01	HP-CB11	CB11	CONDUIT	19.3	1.8138	0.0350
SW02	HP-CB11	LD1002	CONDUIT	25.2	1.5875	0.0350
SW03	HP-LD1002	LD1002	CONDUIT	20.2	1.4853	0.0350
SW04	HP-LD1002	LD1003	CONDUIT	20.5	1.7076	0.0350
SW05	HP-LD1003	LD1003	CONDUIT	17.2	1.7445	0.0350
SW06	HP-LD1003	OF2	CONDUIT	4.3	10.7594	0.0350
SW07	HP-CB07	CB06	CONDUIT	17.4	1.0345	0.0350
SW08	HP-CB07	CB07	CONDUIT	20.1	1.1444	0.0350
SW09	HP-CB08a	CB07	CONDUIT	23.1	1.0823	0.0350
SW10	HP-CB08a	CB08	CONDUIT	20.0	1.0001	0.0350
SW11	HP-CB08b	CB08	CONDUIT	14.7	2.3816	0.0350
SW12	HP-CB08b	LD1000	CONDUIT	29.2	1.5413	0.0350
SW13	HP-LD1000	LD1000	CONDUIT	19.9	1.2564	0.0350
SW14	HP-LD1000	LD1001	CONDUIT	25.2	1.3890	0.0350
SW15	HP-LD1001	LD1001	CONDUIT	20.1	1.4927	0.0350
SW16	HP-LD1001	OF3	CONDUIT	10.7	3.7409	0.0350
O-CB01	CB01	MH202	ORIFICE			
O-CB02	CB02	MH202	ORIFICE			
O-CB12	CB12	MH201	ORIFICE			
O-CBMH208	CBMH208	MH203	ORIFICE			
O-Cistern	Cistern	MH215	ORIFICE			
Spill-RoofA	ROOF-A	CB02	WEIR			
Spill-RoofB	ROOF-B	CBMH209	WEIR			
Spill-RoofC	ROOF-C	CB04	WEIR			
Spill-RoofD	ROOF-D	CB05	WEIR			
O-RoofA	ROOF-A	STM233	OUTLET			
O-RoofB	ROOF-B	STM169	OUTLET			
O-RoofC	ROOF-C	STM173	OUTLET			
O-RoofD	ROOF-D	STM161	OUTLET			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
CB03-CBMH209	CIRCULAR	0.20	0.03	0.05	0.20	1	32.85
CB04-CBMH209	CIRCULAR	0.25	0.05	0.06	0.25	1	59.47
CB05-CB04	CIRCULAR	0.20	0.03	0.05	0.20	1	32.42
CB06-CBMH212	CIRCULAR	0.25	0.05	0.06	0.25	1	42.73
CB07-CB06	CIRCULAR	0.25	0.05	0.06	0.25	1	42.50
CB08-CB07	CIRCULAR	0.25	0.05	0.06	0.25	1	41.56
CB09-CBMH214	CIRCULAR	0.20	0.03	0.05	0.20	1	32.60
CB10-CBMH214	CIRCULAR	0.25	0.05	0.06	0.25	1	40.37
CB11-CB10	CIRCULAR	0.25	0.05	0.06	0.25	1	42.29
CBMH209-CBMH208	CIRCULAR	0.38	0.11	0.09	0.38	1	126.60
CBMH211-MH210	CIRCULAR	0.38	0.11	0.09	0.38	1	98.02
CBMH212-CBMH211	CIRCULAR	0.25	0.05	0.06	0.25	1	41.92

CBMH213-CBMH211	CIRCULAR	0.38	0.11	0.09	0.38	1	94.40
CBMH214-CBMH213	CIRCULAR	0.38	0.11	0.09	0.38	1	94.32
HP-CB01	RECT_OPEN	0.35	0.35	0.21	1.00	1	2160.87
HP-CB02	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB03a	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB03b	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB04	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB05a	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB05b	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB06	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB09	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB10a	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB10b	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CB11	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH208	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH209	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH211a	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH211b	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH212	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH213	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-CBMH214	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
HP-TrenchCistern	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
LD1000-CB08	CIRCULAR	0.25	0.05	0.06	0.25	1	42.20
LD1001-LD1000	CIRCULAR	0.25	0.05	0.06	0.25	1	41.58
LD1002-CB11	CIRCULAR	0.25	0.05	0.06	0.25	1	41.86
LD1003-LD1002	CIRCULAR	0.25	0.05	0.06	0.25	1	41.84
LD1004-CB12	CIRCULAR	0.25	0.05	0.06	0.25	1	43.34
LD1005-LD1004	CIRCULAR	0.25	0.05	0.06	0.25	1	39.87
LD1006-LD1005	CIRCULAR	0.25	0.05	0.06	0.25	1	39.87
LD1007-LD1006	CIRCULAR	0.25	0.05	0.06	0.25	1	42.86
LD1008-LD1007	CIRCULAR	0.25	0.05	0.06	0.25	1	43.15
LD1009-LD1008	CIRCULAR	0.25	0.05	0.06	0.25	1	42.05
LD1010-LD1009	CIRCULAR	0.25	0.05	0.06	0.25	1	39.50
LD1011-LD1010	CIRCULAR	0.25	0.05	0.06	0.25	1	43.31
MH201-MH101	CIRCULAR	0.53	0.22	0.13	0.53	1	292.64
MH202-MH201	CIRCULAR	0.53	0.22	0.13	0.53	1	301.62
MH203-MH202	CIRCULAR	0.53	0.22	0.13	0.53	1	304.12
MH204-MH203	CIRCULAR	0.38	0.11	0.09	0.38	1	129.67
MH205B-MH205	CIRCULAR	0.30	0.07	0.07	0.30	1	66.73
MH205-MH204	CIRCULAR	0.30	0.07	0.07	0.30	1	66.21
MH206-MH205B	CIRCULAR	0.30	0.07	0.07	0.30	1	67.54
MH207-MH206	CIRCULAR	0.25	0.05	0.06	0.25	1	42.28
MH210-CBMH208	CIRCULAR	0.38	0.11	0.09	0.38	1	110.90
MH215-MH205B	CIRCULAR	0.25	0.05	0.06	0.25	1	83.19
MS01	RECT_OPEN	0.35	0.35	0.21	1.00	1	76.88
MS02	RECT_OPEN	0.35	0.35	0.21	1.00	1	2737.80
MS03	RECT_OPEN	0.35	0.35	0.21	1.00	1	1448.64
MS04	RECT_OPEN	0.35	0.35	0.21	1.00	1	1618.87
MS05	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS06	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS07	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS08	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS09	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS10	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS11	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS12	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
MS13	RECT_OPEN	0.35	0.35	0.21	1.00	1	35.15
STM161-MH207	CIRCULAR	0.25	0.05	0.06	0.25	1	84.58
STM169-MH204	CIRCULAR	0.25	0.05	0.06	0.25	1	83.50
STM173-MH206	CIRCULAR	0.25	0.05	0.06	0.25	1	84.11
STM233-MH202	CIRCULAR	0.25	0.05	0.06	0.25	1	83.28
STORE-MH210	CIRCULAR	0.38	0.11	0.09	0.38	1	175.35
SW01	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	427.18
SW02	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	399.65
SW03	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	386.57
SW04	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	414.49
SW05	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	418.94
SW06	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	1040.44
SW07	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	322.62
SW08	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	339.31
SW09	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	329.99
SW10	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	317.20
SW11	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	489.51
SW12	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	393.79
SW13	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	355.53
SW14	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	373.83
SW15	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	387.53
SW16	TRAPEZOIDAL	0.35	0.37	0.17	2.10	1	613.50

****

Trinity Apartments (122179)
PCSWMM Model Results - 100-year 3-hour Chicago

```
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/19/2023 00:00:00
Ending Date .............. 04/21/2023 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 8
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.138        71.667
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.017         8.601
Surface Runoff ...........         0.120        62.662
Final Storage ............         0.002         1.263
```

```
Continuity Error (%) .....        -1.199


**************************        Volume        Volume
Flow Routing Continuity        hectare-m     10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.120         1.204
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.120         1.204
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.011


*************************
Highest Continuity Errors
*************************
Node LD1000 (1.04%)


***************************
Time-Step Critical Elements
***************************
None


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


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

Trinity Apartments (122179)
PCSWMM Model Results - 100-year 3-hour Chicago

```
  Minimum Time Step           :     0.38 sec
  Average Time Step           :     1.00 sec
  Maximum Time Step           :     1.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      1.000 -  0.871 sec      :    99.89 %
      0.871 -  0.758 sec      :     0.03 %
      0.758 -  0.660 sec      :     0.03 %
      0.660 -  0.574 sec      :     0.01 %
      0.574 -  0.500 sec      :     0.04 %
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A-01a	71.67	0.00	0.00	36.98	11.07	26.95	38.02	0.00	5.20	0.530
A-01b	71.67	0.00	0.00	37.08	11.05	26.14	37.19	0.01	11.17	0.519
A-01c	71.67	0.00	0.00	37.08	11.05	26.14	37.19	0.01	8.59	0.519
A-02	71.67	0.00	0.00	5.66	61.20	4.10	65.29	0.06	46.69	0.911
A-03	71.67	0.00	0.00	8.80	56.20	6.19	62.39	0.05	41.29	0.871
A-04	71.67	0.00	0.00	3.11	65.22	2.32	67.54	0.02	14.72	0.942
A-05	71.67	0.00	0.00	10.09	54.16	7.02	61.18	0.06	47.23	0.854
A-06	71.67	0.00	0.00	11.34	52.20	7.76	59.96	0.08	63.37	0.837
A-07	71.67	0.00	0.00	13.18	49.12	9.49	58.60	0.02	12.31	0.818
A-08	71.67	0.00	0.00	40.53	6.05	26.90	32.95	0.01	10.25	0.460
A-09	71.67	0.00	0.00	6.28	60.19	4.55	64.74	0.04	32.03	0.903
A-10	71.67	0.00	0.00	2.49	66.24	1.86	68.10	0.05	33.94	0.950
A-11	71.67	0.00	0.00	6.28	60.21	4.52	64.73	0.05	38.82	0.903
A-12	71.67	0.00	0.00	1.88	67.27	1.40	68.68	0.07	49.78	0.958
A-13	71.67	0.00	0.00	1.88	67.29	1.40	68.69	0.08	58.16	0.958
A-14	71.67	0.00	0.00	37.24	11.04	25.31	36.34	0.01	15.42	0.507
A-15	71.67	0.00	0.00	5.00	62.25	3.64	65.90	0.05	38.52	0.919
A-16	71.67	0.00	0.00	3.11	65.23	2.32	67.55	0.04	29.94	0.943
A-17	71.67	0.00	0.00	38.99	8.03	27.38	35.42	0.01	9.79	0.494
A-18a	71.67	0.00	0.00	30.75	21.08	21.95	43.03	0.01	14.61	0.600
A-18b	71.67	0.00	0.00	30.70	21.10	22.42	43.52	0.01	7.55	0.607
A-19a	71.67	0.00	0.00	26.90	27.14	19.86	47.00	0.00	1.89	0.656
A-19b	71.67	0.00	0.00	26.87	27.18	20.04	47.22	0.00	1.26	0.659
A-19c	71.67	0.00	0.00	26.90	27.14	19.88	47.02	0.00	2.16	0.656
A-19d	71.67	0.00	0.00	26.86	27.19	20.05	47.23	0.00	1.26	0.659
A-19e	71.67	0.00	0.00	26.87	27.17	20.03	47.20	0.00	1.76	0.659
A-19f	71.67	0.00	0.00	26.84	27.23	20.06	47.29	0.00	1.08	0.660
A-19g	71.67	0.00	0.00	26.86	27.18	20.05	47.23	0.00	1.26	0.659
A-19h	71.67	0.00	0.00	26.87	27.17	20.03	47.20	0.00	1.62	0.659

A-19i	71.67	0.00	0.00	27.03	27.09	18.91	46.00	0.01	7.41	0.642
D-01	71.67	0.00	0.00	25.62	29.19	19.15	48.34	0.00	3.17	0.675
D-02	71.67	0.00	0.00	13.26	49.17	8.96	58.13	0.02	13.54	0.811
D-03	71.67	0.00	0.00	0.00	70.29	0.00	70.29	0.01	6.45	0.981
D-04	71.67	0.00	0.00	10.69	53.15	7.55	60.70	0.03	23.85	0.847
D-05	71.67	0.00	0.00	31.66	20.07	21.01	41.08	0.01	11.65	0.573
R-01	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	19.34	0.985
R-02	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	18.34	0.985
R-03	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	18.34	0.985
R-04	71.67	0.00	0.00	0.00	70.51	0.00	70.51	0.02	12.40	0.984
R-05	71.67	0.00	0.00	0.00	70.42	0.00	70.42	0.01	7.44	0.983
R-06	71.67	0.00	0.00	0.00	70.39	0.00	70.39	0.00	1.98	0.982
R-07	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	19.34	0.985
R-08	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	18.34	0.985
R-09	71.67	0.00	0.00	0.00	70.58	0.00	70.58	0.03	20.82	0.985
R-10	71.67	0.00	0.00	0.00	70.58	0.00	70.58	0.03	20.82	0.985
R-11	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	18.34	0.985
R-12	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	19.34	0.985
R-13	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	19.34	0.985
R-14	71.67	0.00	0.00	0.00	70.57	0.00	70.57	0.03	18.34	0.985
R-15	71.67	0.00	0.00	0.00	70.58	0.00	70.58	0.03	20.82	0.985

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
HP-CB05	JUNCTION	0.00	0.00	89.15	0 00:00	0.00
HP-CB07	JUNCTION	0.00	0.00	89.18	0 00:00	0.00
HP-CB08a	JUNCTION	0.00	0.00	89.20	0 00:00	0.00
HP-CB08b	JUNCTION	0.00	0.00	89.35	0 00:00	0.00
HP-CB11	JUNCTION	0.00	0.00	89.20	0 00:00	0.00
HP-LD1000	JUNCTION	0.00	0.00	89.15	0 00:00	0.00
HP-LD1001	JUNCTION	0.00	0.00	89.10	0 00:00	0.00
HP-LD1002	JUNCTION	0.00	0.00	89.10	0 00:00	0.00
HP-LD1003	JUNCTION	0.00	0.00	89.05	0 00:00	0.00
HP-Trech	JUNCTION	0.00	0.00	86.85	0 00:00	0.00
STM161	JUNCTION	0.01	0.07	85.22	0 01:10	0.07
STM169	JUNCTION	0.01	0.03	84.83	0 02:08	0.03
STM173	JUNCTION	0.01	0.06	85.09	0 01:10	0.06
STM233	JUNCTION	0.01	0.05	87.15	0 01:52	0.05
EX-MH101	OUTFALL	0.54	0.54	83.64	0 00:00	0.54
HP-CB12	OUTFALL	0.00	0.00	88.89	0 00:00	0.00
HP-LD1004	OUTFALL	0.00	0.00	88.85	0 00:00	0.00
HP-LD1005	OUTFALL	0.00	0.00	88.75	0 00:00	0.00
HP-LD1006	OUTFALL	0.00	0.00	88.73	0 00:00	0.00
HP-LD1007	OUTFALL	0.00	0.00	88.67	0 00:00	0.00
HP-LD1008	OUTFALL	0.00	0.00	88.67	0 00:00	0.00
HP-LD1009	OUTFALL	0.00	0.00	88.68	0 00:00	0.00
HP-LD1010	OUTFALL	0.00	0.00	88.68	0 00:00	0.00
HP-LD1011	OUTFALL	0.00	0.00	88.69	0 00:00	0.00
OF1	OUTFALL	0.00	0.00	88.59	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	88.59	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	88.70	0 00:00	0.00
OF-Unc	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CB01	STORAGE	0.01	1.30	88.80	0 01:13	1.30
CB02	STORAGE	0.35	2.79	88.89	0 03:28	2.79
CB03	STORAGE	0.52	1.43	88.98	0 02:34	1.43

CB04	STORAGE	0.59	1.60	88.98	0	02:40	1.60
CB05	STORAGE	0.47	1.35	89.00	0	01:14	1.35
CB06	STORAGE	0.98	2.31	89.00	0	01:20	2.31
CB07	STORAGE	0.75	1.96	89.03	0	01:14	1.96
CB08	STORAGE	0.64	1.75	89.04	0	01:15	1.75
CB09	STORAGE	0.47	1.33	88.98	0	02:41	1.33
CB10	STORAGE	0.90	2.17	88.98	0	02:44	2.17
CB11	STORAGE	0.76	1.92	88.98	0	02:40	1.92
CB12	STORAGE	0.04	2.56	87.89	0	01:14	2.56
CBMH208	STORAGE	1.39	2.88	88.98	0	02:40	2.88
CBMH209	STORAGE	1.26	2.70	88.98	0	02:40	2.70
CBMH211	STORAGE	1.25	2.69	88.98	0	02:41	2.69
CBMH212	STORAGE	1.05	2.41	88.99	0	01:21	2.41
CBMH213	STORAGE	1.15	2.55	88.98	0	02:41	2.55
CBMH214	STORAGE	1.05	2.40	88.98	0	02:41	2.40
Cistern	STORAGE	0.04	1.81	88.20	0	01:21	1.81
LD1000	STORAGE	0.51	1.48	89.05	0	01:14	1.48
LD1001	STORAGE	0.41	1.25	89.05	0	01:15	1.25
LD1002	STORAGE	0.61	1.64	88.98	0	02:41	1.64
LD1003	STORAGE	0.52	1.43	88.98	0	02:42	1.43
LD1004	STORAGE	0.01	0.65	87.89	0	01:15	0.65
LD1005	STORAGE	0.01	0.60	87.89	0	01:14	0.60
LD1006	STORAGE	0.01	0.55	87.89	0	01:14	0.55
LD1007	STORAGE	0.01	0.50	87.89	0	01:14	0.50
LD1008	STORAGE	0.00	0.46	87.90	0	01:14	0.45
LD1009	STORAGE	0.00	0.42	87.90	0	01:14	0.41
LD1010	STORAGE	0.00	0.38	87.90	0	01:14	0.37
LD1011	STORAGE	0.00	0.29	87.89	0	01:14	0.29
MH201	STORAGE	0.05	0.21	84.01	0	01:12	0.21
MH202	STORAGE	0.04	0.15	84.14	0	01:11	0.15
MH203	STORAGE	0.04	0.14	84.33	0	01:11	0.14
MH204	STORAGE	0.01	0.13	84.54	0	01:11	0.13
MH205	STORAGE	0.01	0.14	84.68	0	01:10	0.14
MH205B	STORAGE	0.01	0.15	84.80	0	01:10	0.14
MH206	STORAGE	0.01	0.13	84.85	0	01:10	0.13
MH207	STORAGE	0.01	0.11	85.07	0	01:10	0.11
MH210	STORAGE	1.31	2.78	88.98	0	02:41	2.78
MH215	STORAGE	0.00	0.05	84.94	0	01:23	0.05
ROOF-A	STORAGE	0.01	0.15	91.15	0	01:52	0.15
ROOF-B	STORAGE	0.02	0.15	91.15	0	02:08	0.15
ROOF-C	STORAGE	0.02	0.15	91.15	0	02:08	0.15
ROOF-D	STORAGE	0.02	0.15	91.15	0	02:05	0.15
STORE	STORAGE	1.25	2.69	88.98	0	02:41	2.69

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
HP-CB05	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB07	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB08a	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB08b	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-CB11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1000	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1001	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1002	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1003	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-Trech	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
STM161	JUNCTION	13.54	16.36	0	01:10	0.0169	0.1	0.002
STM169	JUNCTION	0.00	3.14	0	02:08	0	0.0833	0.002
STM173	JUNCTION	6.45	9.26	0	01:10	0.00914	0.0924	0.002
STM233	JUNCTION	0.00	5.58	0	01:52	0	0.111	0.003
EX-MH101	OUTFALL	0.00	62.05	0	01:12	0	1.19	0.000
HP-CB12	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1004	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1005	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1006	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1007	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1008	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1009	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1010	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
HP-LD1011	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF1	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr
OF3	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 ltr

OF-Unc	OUTFALL	14.83	14.83	0 01:10	0.0149	0.0149	0.000
CB01	STORAGE	12.31	12.31	0 01:10	0.0152	0.0152	0.007
CB02	STORAGE	63.37	63.37	0 01:10	0.0803	0.146	0.019
CB03	STORAGE	49.78	49.78	0 01:10	0.0694	0.0694	0.543
CB04	STORAGE	29.94	62.16	0 01:05	0.0412	0.0931	-0.118
CB05	STORAGE	38.52	38.52	0 01:10	0.0521	0.0521	0.493
CB06	STORAGE	10.25	56.69	0 01:07	0.00857	0.0745	0.004
CB07	STORAGE	15.42	53.85	0 01:07	0.0134	0.0609	0.057
CB08	STORAGE	9.79	41.18	0 01:07	0.00815	0.0418	-0.295
CB09	STORAGE	14.72	20.50	0 01:06	0.0203	0.0204	0.453
CB10	STORAGE	46.69	68.66	0 01:06	0.0627	0.1	0.069
CB11	STORAGE	5.20	54.45	0 01:06	0.00456	0.0383	0.227
CB12	STORAGE	1.89	17.82	0 01:06	0.00197	0.0205	-0.120
CBMH208	STORAGE	38.82	166.83	0 01:05	0.0518	0.725	-0.003
CBMH209	STORAGE	58.16	149.85	0 01:05	0.0811	0.243	-0.358
CBMH211	STORAGE	33.94	117.46	0 01:05	0.047	0.395	-0.029
CBMH212	STORAGE	32.03	71.35	0 01:07	0.0427	0.112	0.022
CBMH213	STORAGE	47.23	97.71	0 01:07	0.0606	0.253	0.008
CBMH214	STORAGE	41.29	76.54	0 01:06	0.0537	0.175	-0.012
Cistern	STORAGE	23.85	23.85	0 01:10	0.0303	0.0303	-0.000
LD1000	STORAGE	14.61	33.83	0 01:07	0.0142	0.0296	1.056
LD1001	STORAGE	7.55	22.56	0 01:10	0.0074	0.0107	-0.414
LD1002	STORAGE	11.17	40.49	0 01:07	0.00967	0.0252	0.278
LD1003	STORAGE	8.59	24.22	0 01:05	0.00744	0.00952	-0.304
LD1004	STORAGE	1.26	19.09	0 01:06	0.00132	0.0186	0.110
LD1005	STORAGE	2.16	16.50	0 01:07	0.00226	0.0172	0.139
LD1006	STORAGE	1.26	13.19	0 01:07	0.00132	0.015	-0.032
LD1007	STORAGE	1.76	12.35	0 01:09	0.00184	0.0136	-0.030
LD1008	STORAGE	1.08	10.84	0 01:10	0.00113	0.0118	0.072
LD1009	STORAGE	1.26	10.08	0 01:10	0.00132	0.0106	-0.027
LD1010	STORAGE	1.62	8.78	0 01:09	0.0017	0.00931	-0.107
LD1011	STORAGE	7.41	7.41	0 01:10	0.00764	0.00764	0.414
MH201	STORAGE	0.00	62.21	0 01:11	0	1.19	-0.003
MH202	STORAGE	0.00	56.34	0 01:11	0	1.17	0.004
MH203	STORAGE	0.00	39.34	0 01:11	0	0.897	-0.000
MH204	STORAGE	0.00	33.38	0 01:10	0	0.306	-0.000
MH205	STORAGE	0.00	30.53	0 01:10	0	0.223	-0.000
MH205B	STORAGE	0.00	30.63	0 01:10	0	0.223	-0.010
MH206	STORAGE	0.00	25.32	0 01:10	0	0.192	-0.000
MH207	STORAGE	0.00	16.35	0 01:10	0	0.1	-0.016
MH210	STORAGE	0.00	237.98	0 01:05	0	0.525	-0.006
MH215	STORAGE	0.00	6.05	0 01:21	0	0.0303	-0.049
ROOF-A	STORAGE	77.84	77.84	0 01:10	0.111	0.111	-0.002
ROOF-B	STORAGE	58.50	58.50	0 01:10	0.0833	0.0833	-0.001
ROOF-C	STORAGE	58.50	58.50	0 01:10	0.0833	0.0833	-0.001
ROOF-D	STORAGE	58.50	58.50	0 01:10	0.0833	0.0833	-0.001
STORE	STORAGE	0.00	226.50	0 01:05	0	0.089	-0.138

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Node Surcharge Summary
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No nodes were surcharged.

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
CB01	0.000	0	0	0	0.003	11	0 01:13	6.02
CB02	0.007	2	0	0	0.071	24	0 03:28	5.98
CB03	0.003	5	0	0	0.021	33	0 02:34	41.54
CB04	0.003	6	0	0	0.016	38	0 02:40	50.35
CB05	0.001	2	0	0	0.007	18	0 01:14	32.32
CB06	0.000	37	0	0	0.001	87	0 01:20	40.83
CB07	0.000	34	0	0	0.001	88	0 01:14	32.63
CB08	0.000	31	0	0	0.001	85	0 01:15	20.56
CB09	0.001	2	0	0	0.006	18	0 02:41	16.07
CB10	0.006	6	0	0	0.039	39	0 02:44	49.70

CB11	0.000	35	0	0	0.001	90	0	02:40	30.74
CB12	0.000	0	0	0	0.001	18	0	01:14	8.72
CBMH208	0.013	5	0	0	0.061	26	0	02:40	156.84
CBMH209	0.011	12	0	0	0.060	63	0	02:40	129.01
CBMH211	0.004	7	0	0	0.021	35	0	02:41	85.80
CBMH212	0.001	3	0	0	0.005	11	0	01:21	48.82
CBMH213	0.011	5	0	0	0.055	23	0	02:41	68.68
CBMH214	0.007	8	0	0	0.040	46	0	02:41	45.49
Cistern	0.000	2	0	0	0.014	91	0	01:21	6.05
LD1000	0.000	30	0	0	0.000	88	0	01:14	15.53
LD1001	0.000	30	0	0	0.000	93	0	01:15	6.77
LD1002	0.000	34	0	0	0.000	91	0	02:41	17.77
LD1003	0.000	33	0	0	0.000	92	0	02:42	8.11
LD1004	0.000	0	0	0	0.000	2	0	01:15	16.02
LD1005	0.000	0	0	0	0.000	1	0	01:14	15.69
LD1006	0.000	0	0	0	0.000	2	0	01:14	12.96
LD1007	0.000	0	0	0	0.000	1	0	01:14	12.14
LD1008	0.000	0	0	0	0.000	2	0	01:14	10.43
LD1009	0.000	0	0	0	0.000	2	0	01:14	9.90
LD1010	0.000	0	0	0	0.000	1	0	01:14	8.96
LD1011	0.000	0	0	0	0.000	0	0	01:14	7.16
MH201	0.000	1	0	0	0.000	4	0	01:12	62.05
MH202	0.000	1	0	0	0.000	3	0	01:11	56.29
MH203	0.000	1	0	0	0.000	3	0	01:11	39.23
MH204	0.000	0	0	0	0.000	3	0	01:11	33.38
MH205	0.000	0	0	0	0.000	3	0	01:10	30.53
MH205B	0.000	0	0	0	0.000	3	0	01:10	30.53
MH206	0.000	0	0	0	0.000	3	0	01:10	25.31
MH207	0.000	0	0	0	0.000	3	0	01:10	16.11
MH210	0.001	45	0	0	0.003	95	0	02:41	226.50
MH215	0.000	0	0	0	0.000	1	0	01:23	6.04
ROOF-A	0.005	1	0	0	0.072	10	0	01:52	5.58
ROOF-B	0.006	1	0	0	0.059	10	0	02:08	3.14
ROOF-C	0.006	1	0	0	0.059	10	0	02:08	3.14
ROOF-D	0.006	1	0	0	0.059	10	0	02:05	3.21
STORE	0.048	55	0	0	0.087	100	0	01:05	21.95

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
EX-MH101	72.39	9.51	62.05	1.189
HP-CB12	0.00	0.00	0.00	0.000
HP-LD1004	0.00	0.00	0.00	0.000
HP-LD1005	0.00	0.00	0.00	0.000
HP-LD1006	0.00	0.00	0.00	0.000
HP-LD1007	0.00	0.00	0.00	0.000
HP-LD1008	0.00	0.00	0.00	0.000
HP-LD1009	0.00	0.00	0.00	0.000
HP-LD1010	0.00	0.00	0.00	0.000
HP-LD1011	0.00	0.00	0.00	0.000
OF1	0.00	0.00	0.00	0.000
OF2	0.00	0.00	0.00	0.000
OF3	0.00	0.00	0.00	0.000
OF-Unc	6.02	1.43	14.83	0.015
System	5.60	10.94	74.74	1.204

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CB03-CBMH209	CONDUIT	41.54	0	01:05	1.32	1.26	1.00
CB04-CBMH209	CONDUIT	50.35	0	01:05	1.03	0.85	1.00
CB05-CB04	CONDUIT	32.32	0	01:05	1.05	1.00	1.00
CB06-CBMH212	CONDUIT	48.82	0	01:07	0.99	1.14	1.00
CB07-CB06	CONDUIT	40.83	0	01:07	0.83	0.96	1.00
CB08-CB07	CONDUIT	32.63	0	01:07	0.66	0.78	1.00
CB09-CBMH214	CONDUIT	16.07	0	01:07	0.86	0.49	1.00
CB10-CBMH214	CONDUIT	22.67	0	01:06	0.54	0.56	1.00

CB11-CB10	CONDUIT	49.70	0	01:06	1.01	1.18	1.00
CBMH209-CBMH208	CONDUIT	129.01	0	01:05	1.17	1.02	1.00
CBMH211-MH210	CONDUIT	85.80	0	01:05	0.78	0.88	1.00
CBMH212-CBMH211	CONDUIT	39.74	0	01:07	0.81	0.95	1.00
CBMH213-CBMH211	CONDUIT	68.68	0	01:05	0.62	0.73	1.00
CBMH214-CBMH213	CONDUIT	45.49	0	01:05	0.48	0.48	1.00
HP-CB01	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB02	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB03a	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB03b	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB04	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB05a	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB05b	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB06	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB09	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB10a	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB10b	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CB11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CBMH208	CONDUIT	8.08	0	02:41	0.32	0.11	0.07
HP-CBMH209	CONDUIT	0.44	0	02:32	0.04	0.01	0.03
HP-CBMH211a	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CBMH211b	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CBMH212	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CBMH213	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
HP-CBMH214	CONDUIT	0.30	0	02:47	0.02	0.00	0.04
HP-TrenchCistern	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
LD1000-CB08	CONDUIT	20.56	0	01:07	0.65	0.49	1.00
LD1001-LD1000	CONDUIT	15.53	0	01:10	0.44	0.37	1.00
LD1002-CB11	CONDUIT	30.74	0	01:07	0.63	0.73	1.00
LD1003-LD1002	CONDUIT	17.77	0	01:05	0.46	0.42	1.00
LD1004-CB12	CONDUIT	16.02	0	01:06	0.84	0.37	1.00
LD1005-LD1004	CONDUIT	15.69	0	01:07	0.81	0.39	1.00
LD1006-LD1005	CONDUIT	12.96	0	01:06	0.75	0.32	1.00
LD1007-LD1006	CONDUIT	11.95	0	01:07	0.76	0.28	1.00
LD1008-LD1007	CONDUIT	10.43	0	01:07	0.74	0.24	1.00
LD1009-LD1008	CONDUIT	9.90	0	01:10	0.72	0.24	1.00
LD1010-LD1009	CONDUIT	8.96	0	01:10	0.68	0.23	1.00
LD1011-LD1010	CONDUIT	7.16	0	01:09	0.64	0.17	1.00
MH201-MH101	CONDUIT	62.05	0	01:12	0.90	0.21	0.36
MH202-MH201	CONDUIT	56.29	0	01:11	0.88	0.19	0.34
MH203-MH202	CONDUIT	39.23	0	01:11	0.89	0.13	0.26
MH204-MH203	CONDUIT	33.38	0	01:11	0.98	0.26	0.35
MH205B-MH205	CONDUIT	30.53	0	01:10	0.95	0.46	0.46
MH205-MH204	CONDUIT	30.53	0	01:10	0.97	0.46	0.46
MH206-MH205B	CONDUIT	25.31	0	01:10	0.85	0.37	0.44
MH207-MH206	CONDUIT	16.11	0	01:10	0.80	0.38	0.43
MH210-CBMH208	CONDUIT	152.18	0	01:05	1.38	1.37	1.00
MH215-MH205B	CONDUIT	6.04	0	01:20	0.92	0.07	0.26
MS01	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS02	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS03	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS04	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS05	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS06	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS07	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS08	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS09	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS10	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
MS13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
STM161-MH207	CONDUIT	16.35	0	01:10	1.06	0.19	0.36
STM169-MH204	CONDUIT	3.14	0	02:08	0.79	0.04	0.14
STM173-MH206	CONDUIT	9.26	0	01:10	1.11	0.11	0.23
STM233-MH202	CONDUIT	5.58	0	01:52	0.92	0.07	0.18
STORE-MH210	CONDUIT	226.50	0	01:05	2.05	1.29	1.00
SW01	CONDUIT	0.00	0	00:00	0.00	0.00	0.19
SW02	CONDUIT	0.00	0	00:00	0.00	0.00	0.26
SW03	CONDUIT	0.00	0	00:00	0.00	0.00	0.26
SW04	CONDUIT	0.00	0	00:00	0.00	0.00	0.33
SW05	CONDUIT	0.00	0	00:00	0.00	0.00	0.33
SW06	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
SW07	CONDUIT	0.00	0	00:00	0.00	0.00	0.01
SW08	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
SW09	CONDUIT	0.00	0	00:00	0.00	0.00	0.12
SW10	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
SW11	CONDUIT	0.00	0	00:00	0.00	0.00	0.06
SW12	CONDUIT	0.00	0	00:00	0.00	0.00	0.21
SW13	CONDUIT	0.00	0	00:00	0.00	0.00	0.21
SW14	CONDUIT	0.00	0	00:00	0.00	0.00	0.36
SW15	CONDUIT	0.00	0	00:00	0.00	0.00	0.36
SW16	CONDUIT	0.00	0	00:00	0.00	0.00	0.00

O-CB01	ORIFICE	6.02	0	01:13	1.00
O-CB02	ORIFICE	5.98	0	03:28	1.00
O-CB12	ORIFICE	6.01	0	01:14	1.00
O-CBMH208	ORIFICE	6.08	0	02:41	1.00
O-Cistern	ORIFICE	6.05	0	01:21	1.00
Spill-RoofA	WEIR	0.00	0	00:00	0.00
Spill-RoofB	WEIR	0.00	0	00:00	0.00
Spill-RoofC	WEIR	0.00	0	00:00	0.00
Spill-RoofD	WEIR	0.06	0	02:05	0.00
O-RoofA	DUMMY	5.58	0	01:52	
O-RoofB	DUMMY	3.14	0	02:08	
O-RoofC	DUMMY	3.14	0	02:08	
O-RoofD	DUMMY	3.15	0	02:05	

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
CB03-CBMH209	1.00	0.01	0.02	0.00	0.49	0.00	0.00	0.48	0.54	0.00
CB04-CBMH209	1.00	0.01	0.05	0.00	0.50	0.00	0.00	0.44	0.51	0.00
CB05-CB04	1.00	0.01	0.00	0.00	0.45	0.00	0.00	0.54	0.55	0.00
CB06-CBMH212	1.00	0.01	0.00	0.00	0.66	0.00	0.00	0.33	0.34	0.00
CB07-CB06	1.00	0.05	0.00	0.00	0.60	0.00	0.00	0.35	0.43	0.00
CB08-CB07	1.00	0.43	0.01	0.00	0.55	0.00	0.00	0.01	0.49	0.00
CB09-CBMH214	1.00	0.01	0.00	0.00	0.45	0.00	0.00	0.55	0.55	0.00
CB10-CBMH214	1.00	0.01	0.00	0.00	0.64	0.00	0.00	0.36	0.37	0.00
CB11-CB10	1.00	0.01	0.00	0.00	0.58	0.00	0.00	0.41	0.42	0.00
CBMH209-CBMH208	1.00	0.01	0.00	0.00	0.72	0.00	0.00	0.28	0.01	0.00
CBMH211-MH210	1.00	0.01	0.00	0.00	0.72	0.00	0.00	0.28	0.01	0.00
CBMH212-CBMH211	1.00	0.01	0.00	0.00	0.70	0.00	0.00	0.30	0.32	0.00
CBMH213-CBMH211	1.00	0.01	0.00	0.00	0.71	0.00	0.00	0.29	0.01	0.00
CBMH214-CBMH213	1.00	0.01	0.00	0.00	0.68	0.00	0.00	0.31	0.02	0.00
HP-CB01	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB02	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB03a	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB03b	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB04	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB05a	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB05b	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB06	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB09	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB10a	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB10b	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CB11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CBMH208	1.00	0.89	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00
HP-CBMH209	1.00	0.95	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
HP-CBMH211a	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CBMH211b	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CBMH212	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CBMH213	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HP-CBMH214	1.00	0.95	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
HP-TrenchCistern	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LD1000-CB08	1.00	0.01	0.00	0.00	0.47	0.00	0.00	0.51	0.54	0.00
LD1001-LD1000	1.00	0.01	0.00	0.00	0.44	0.00	0.00	0.55	0.57	0.00
LD1002-CB11	1.00	0.03	0.01	0.00	0.53	0.00	0.00	0.43	0.50	0.00
LD1003-LD1002	1.00	0.14	0.00	0.00	0.48	0.00	0.00	0.38	0.54	0.00
LD1004-CB12	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1005-LD1004	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1006-LD1005	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1007-LD1006	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1008-LD1007	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1009-LD1008	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1010-LD1009	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
LD1011-LD1010	1.00	0.01	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
MH201-MH101	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH202-MH201	1.00	0.01	0.00	0.00	0.19	0.00	0.00	0.80	0.18	0.00
MH203-MH202	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH204-MH203	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH205B-MH205	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH205-MH204	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH206-MH205B	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.95	0.03	0.00
MH207-MH206	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
MH210-CBMH208	1.00	0.01	0.00	0.00	0.72	0.00	0.00	0.28	0.00	0.00
MH215-MH205B	1.00	0.01	0.00	0.00	0.00	0.03	0.00	0.96	0.00	0.00
MS01	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MS03	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS04	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS06	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS07	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM161-MH207	1.00	0.01	0.00	0.00	0.00	0.18	0.00	0.82	0.18	0.00
STM169-MH204	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
STM173-MH206	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
STM233-MH202	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
STORE-MH210	1.00	0.01	0.00	0.00	0.71	0.00	0.00	0.28	0.00	0.00
SW01	1.00	0.72	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW02	1.00	0.68	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW03	1.00	0.68	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW04	1.00	0.67	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW05	1.00	0.67	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW06	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW07	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW08	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW09	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW10	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW11	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW12	1.00	0.78	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW13	1.00	0.78	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW14	1.00	0.69	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW15	1.00	0.69	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SW16	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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	--------- Hours Full --------			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
CB03-CBMH209	20.10	20.10	21.65	0.03	0.05
CB04-CBMH209	20.71	20.71	23.18	0.01	0.01
CB05-CB04	19.63	19.63	20.65	0.01	0.02
CB06-CBMH212	28.12	28.12	29.00	0.03	0.01
CB07-CB06	23.31	23.31	25.88	0.01	0.01
CB08-CB07	21.14	21.14	23.18	0.01	0.01
CB09-CBMH214	19.61	19.61	20.38	0.01	0.01
CB10-CBMH214	26.76	26.76	27.91	0.01	0.01
CB11-CB10	23.46	23.46	24.69	0.02	0.01
CBMH209-CBMH208	31.22	31.22	32.32	0.01	0.04
CBMH211-MH210	31.11	31.11	31.94	0.01	0.01
CBMH212-CBMH211	29.32	29.32	31.06	0.01	0.01
CBMH213-CBMH211	29.59	29.59	30.46	0.01	0.01
CBMH214-CBMH213	27.96	27.96	28.94	0.01	0.01
LD1000-CB08	19.73	19.73	20.84	0.01	0.01
LD1001-LD1000	18.73	18.73	19.69	0.01	0.01
LD1002-CB11	20.90	20.90	22.61	0.01	0.01
LD1003-LD1002	19.83	19.83	20.85	0.01	0.01
LD1004-CB12	0.55	0.55	0.59	0.01	0.01
LD1005-LD1004	0.51	0.51	0.54	0.01	0.01
LD1006-LD1005	0.46	0.46	0.50	0.01	0.01
LD1007-LD1006	0.41	0.41	0.45	0.01	0.01
LD1008-LD1007	0.36	0.36	0.40	0.01	0.01
LD1009-LD1008	0.31	0.31	0.35	0.01	0.01
LD1010-LD1009	0.27	0.27	0.30	0.01	0.01
LD1011-LD1010	0.17	0.17	0.25	0.01	0.01
MH210-CBMH208	32.04	32.04	32.23	0.03	0.01
STORE-MH210	31.11	31.11	31.43	0.03	0.01

Analysis begun on: Fri May 12 09:49:58 2023
Analysis ended on: Fri May 12 09:50:05 2023
Total elapsed time: 00:00:07

Appendix F
Drawings

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. 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.
6. 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.
7. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION. IF THERE IS ANY DISCREPANCY THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY.
8. ALL ELEVATIONS ARE GEODETIC AND ARE REFERED TO THE CGVD28 GEODETIC DATUM. THE SITE BENCHMARK IS A CUT CROSS LOCATED ON THE BASE OF A LIGHT STANDARD WITHIN THE NEIGHBORING DEALERSHIP PROPERTY TO THE SOUTH. BEARINGS ARE DERIVED FROM MTM ZONE 9 (NAD-83, ORIGINAL). REFER TO ANNIS O'SULLIVAN VOLLEBEKK LTD. TOPOGRAPHIC PLAN OF SURVEY OF PART IF THE NORTHERLY LIMIT, THE WESTERLY LIMIT AND PART OF THE SOUTHERLY LIIT OF PIN 14563-3947 BEING PART OF LOT 1 CONCESSION 11, GEOGRAPHIC TOWNSHIP OF CUMBERLAND, CITY OF OTTAWA. DATE JANUARY 6,2023.
9. REFER TO GEOTECHNICAL INVESTIGATION REPORT TITLED PROPOSED MULTI-BUIILDING DEVELOPMENT, 4200 INNES ROAD, OTTAWA ONTARIO, PG6528-1, (DATED JANUARY 30,2023), PREPARED BY PATERSON GROUP 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 SURFACE AREAS AND DIMENSIONS.
11. REFER TO THE STORMWATER MANAGEMENT REPORT No. R-2023-090, DATED MAY 24, 2023 PREPARED BY NOVATECH.
12. SAW CUT AND KEYGRIND ASPHALT AT ALL ROAD CUTS AND ASPHALT TIE IN POINTS AS PER CITY OF OTTAWA STANDARDS (R10 AND R25).
13. PROVIDE LINE/PARKING PAINTING.
14. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL SERVICING AS-BUILT INFORMATION SHOWN ON THIS 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.
15. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.

SEWER NOTES:

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

ITEM	SPEC. No.	REFERENCE
SANITARY/STORM/CATCHBASIN MANHOLE (1200Ø)	701.010	OPSD
STORM MANHOLE (1500Ø)	701.011	OPSD
CATCHBASIN (600x600)	705.010	OPSD
CATCHBASIN FRAME AND COVER	400.020	OPSD
STORM/SANITARY MH FRAME	S25	CITY OF OTTAWA
SANITARY COVER	S24	CITY OF OTTAWA
STORM COVER (CLOSED)	S24.1	CITY OF OTTAWA
STORM COVER (OPEN)	S28.1	CITY OF OTTAWA
SEWER TRENCH	S6 &S7	CITY OF OTTAWA
STORM SEWER < 450mmØ	PVC DR 35(UNLESS SPECIFIED OTHERWISE)	
STORM SEWER >= 450mmØ	CONC 65D (UNLESS SPECIFIED OTHERWISE)	
SANITARY SEWER	PVC DR 35	CITY OF OTTAWA
CATCHBASIN LEAD	PVC DR 35	
CATCHBASIN COVER	S19	CITY OF OTTAWA
ROAD SUBDRAIN (CONTINUOUS)	R1	CITY OF OTTAWA
WATERTIGHT FRAME & COVER	401.030	OPSD

2. INSULATE ALL PIPES (SAN/STM) THAT HAVE LESS THAN 2.0m COVER WITH 50mmX1200mm HI-40 INSULATION. PROVIDE 150mm CLEARANCE BETWEEN PIPE AND INSULATION (REFER TO DETAIL)
3. SERVICES ARE TO BE CONSTRUCTED TO 1.0m FROM FACE OF BUILDING AT A MINIMUM SLOPE OF 1.0% (2.0% PREFERRED)
4. ALL STORM AND SANITARY LATERALS SHALL BE EQUIPED WITH BACKFLOW PREVENTION DEVICES AS PER THE CITY OF OTTAWA STANDARD DETAILS S14 AND S14,1 OR S14.2.
5. THE PIPE BEDDING FOR THE SEWER AND WATER PIPES SHOULD CONSIST OF AT LEAST 150 MM OF OPSS GRANULAR. HOWEVER, WHEN THE BEDDING IS LOCATED WITHIN BEDROCK SUBGRADE, A MINIMUM OF 300 MM OF OPSS GRANULAR A SHOULD BE PLACED FOR BEDDING FOR SEWER OR WATER PIPES. THE MATERIAL SHOULD BE PLACED IN A MAXIMUM 225 MM THICK LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 99% OF ITS SPMDD. THE BEDDING MATERIAL SHOULD EXTEND AT LEAST TO THE SPRING LINE OF THE PIPE. THE COVER MATERIAL, WHICH SHOULD CONSIST OF OPSS GRANULAR A, SHOULD EXTEND FROM THE SPRING LINE OF THE PIPE TO AT LEAST 300 MM ABOVE THE OBVERT OF THE PIPE. THE MATERIAL SHOULD BE PLACED IN MAXIMUM 225 MM THICK LIFTS AND COMPACTED TO A MINIMUM OF 99% OF ITS SPMDD. THE USE OF CLEAR CRUSHED STONE AS A BEDDING LAYER SHALL NOT BE PERMITTED.
6. WHERE HARD SURFACE AREAS ARE CONSIDERED ABOVE THE TRENCH BACKFILL, THE TRENCH BACKFILL MATERIAL WITHIN THE FROST ZONE (ABOUT 1.8 M BELOW FINISHED GRADE) SHOULD MATCH THE SOILS EXPOSED AT THE TRENCH WALLS TO MINIMIZE DIFFERENTIAL FROST HEAVING. THE TRENCH BACKFILL SHOULD BE PLACED IN MAXIMUM 300 MM THICK LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD
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. ALL STORM MANHOLES MANHOLES WITH PIPE SIZES LESS THAN 900mm ARE TO HAVE 300mm SUMPS UNLESS OTHERWISE INDICATED. ALL STORM MANHOLES WITH PIPE SIZES 900mm AND LARGER ARE TO BE BENCHED.
9. CONTRACTOR TO TELEVISE (CCTV) ALL PROPOSED SEWERS 200mm OR GREATER IN DIAMETER PRIOR TO BASE COURSE ASPHALT TO ENSURE THAT THEY ARE CLEAN AND OPERATIONAL. UPON COMPLETION OF CONTRACT, THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS & APPURTENANCES AND RE CCTV PRIOR TO ACCEPTANCE. OBTAIN APPROVAL FROM THE CITY'S SEWER OPERATIONS. PROVIDE THE CCTV INSPECTION AND REPORT TO THE ENGINEER FOR REVIEW AND APPROVAL.
10. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GENERAL PLAN OF SERVICES INDICATING ALL APPLICABLE SERVICING AS-BUILT INFORMATION SHOWN ON THIS PLAN. AS-BUILT INFORMATION MUST INCLUDE: PIPE MATERIAL, SIZES, LENGTHS, SLOPES, INVERT AND T/G ELEVATIONS, STRUCTURE LOCATIONS AND ANY ALIGNMENT CHANGES, ETC.
11. 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.
12. ALL CATCHBASINS AND CATCHBASIN MANHOLES TO BE PROVIDED WITH MINIMUM 3 METER LONG PERFORATED SUBDRAINS EXTENDING IN TWO DIRECTIONS 300mm BELOW THE SUBGRADE LEVEL. SUBDRAIN IS TO BE PROVIDED AT THE TRANSITIONS BETWEEN DIFFERENT PAVEMENT COMPOSITIONS. THE SUBGRADE SURFACE SHOULD BE SHAPED TO PROMOTE WATER FLOW TO THE DRAINAGE LINES.
11. ALL WORKS SHALL BE PERFORMED AS APPLICABLE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD SPECIFICATIONS, AND IN PARTICULAR O.P.S.S. 407 AND 410.

PAVEMENT STRUCTURE:

- HEAVY-TRUCK TRAFFIC AND LOADING AREAS
  40mm HL3 OR SUPERPAVE 12.5
  50mm HL8 OR SUPERPAVE 19.0
  150mm OPSS GRAN "A" CRUSHED STONE
  450mm OPSS GRANULAR B TYPE II

- CAR ONLY PARKING AREAS
  50mm HL3 OR SUPERPAVE 12.5
  150mm OPSS GRAN "A" CRUSHED STONE
  300mm OPSS GRAN "B" TYPE II

NOTE:
- MINIMUM PERFORMANCE GRADED (PG) 58-34 ASPHALT CEMENT.
- SUBGRADE - EITHER IN SITU SOIL, BEDROCK OR OPSS GRANULAR TYPE I OR II MATERIAL PLACED OVER IN SITU SOIL OR BEDROCK

WATERMAIN NOTES:

1. SUPPLY AND CONSTRUCT ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH THE MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
2. SPECIFICATIONS:

ITEM	SPEC. No.	REFERENCE
WATERMAIN TRENCHING	W17	CITY OF OTTAWA
THERMAL INSULATION IN SHALLOW TRENCHES	W22	CITY OF OTTAWA
THERMAL INSULATION BY OPEN STRUCTURES	W23	CITY OF OTTAWA
WATERMAIN CROSSING BELOW SEWER	W25	CITY OF OTTAWA
WATERMAIN CROSSING ABOVE SEWER	W25.2	CITY OF OTTAWA
HYDRANT	WSD-24	CITY OF OTTAWA
VALVE AND VALVE BOX	WSD-19	CITY OF OTTAWA
WATERMAIN	PVC DR 18	

3. SUPPLY AND CONSTRUCT ALL WATERMAINS AND APPURTENANCES IN ACCORDANCE WITH THE CITY OF OTTAWA STANDARD AND SPECIFICATIONS. EXCAVATION, INSTALLATION, BACKFILL AND RESTORATION OF ALL WATERMAINS BY THE CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN AND CHLORINATION OF THE WATER SYSTEM SHALL BE PERFORMED BY CITY OFFICIALS.
3. WATERMAIN SHALL BE MINIMUM 2.4m DEPTH BELOW GRADE UNLESS OTHERWISE INDICATED. ANY WATERMAIN WITH LESS THAN 2.4m COVER TO BE INSULATED PER THE SEWER AND WATERMAIN NOTES AND DETAIL.
4. PROVIDE MINIMUM CLEARANCE, BETWEEN OUTSIDE OF PIPES, AT ALL CROSSINGS AS PER CITY DETAILS W25 AND W25.2. WATERMAIN MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 0.25m OVER AND 0.50m UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
5. WATER SERVICE IS TO BE CONSTRUCTED TO WITHIN 1.0m OF FOUNDATION WALL AND CAPPED, UNLESS OTHERWISE INDICATED.
6. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS CITY OF OTTAWA STANDARD DETAILS WSD-39, 40, 41, 42, 43 AND 44.
8. IF WATERMAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.

GRADING NOTES:

1. ALL TOPSOIL, ORGANIC OR DELETERIOUS MATERIAL MUST BE ENTIRELY REMOVED FROM BENEATH THE PROPOSED BUILDING AND PAVED AREAS.
2. EXPOSED SUB-GRADES 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. NON-SPECIFIED EXISTING FILL ALONG WITH SITE-EXCAVATED SOIL COULD BE PLACED AS GENERAL LANDSCAPING FILL AND BENEATH EXTERIOR PARKING AREAS WHERE SETTLEMENT OF THE GROUND SURFACE IS OF MINOR CONCERN. THESE MATERIALS SHOULD BE SPREAD IN LIFTS WITH A MAXIMUM THICKNESS OF 300 mm AND COMPACTED BY THE TRACKS OF THE SPREADING EQUIPMENT TO MINIMIZE VOIDS. IF THIS MATERIAL IS TO BE USED TO BUILD UP THE SUBGRADE LEVEL FOR AREAS TO BE PAVED, IT SHOULD BE COMPACTED IN THIN LIFTS TO AT LEAST 95% OF THE MATERIAL'S SPMDD.
4. THE PAVEMENT GRANULAR BASE AND SUBBASE SHOULD BE PLACED IN MAXIMUM 300 mm THICK LIFTS AND COMPACTED TO A MINIMUM OF 100% OF THE MATERIAL'S SPMDD USING SUITABLE COMPACTION EQUIPMENT. IF BEDROCK IS ENCOUNTERED AT THE SUBGRADE LEVEL, THE TOTAL THICKNESS OF THE PAVEMENT GRANULAR MATERIALS (BASE AND SUBBASE) COULD BE REDUCED TO 300 MM FOR THE FOLLOWING PAVEMENT STRUCTURES. THE UPPER 300 mm OF THE BEDROCK SURFACE SHOULD BE REVIEWED AND APPROVED BY PATERSON PRIOR TO PLACING THE BASE AND SUBBASE MATERIALS. CARE SHOULD BE EXERCISED TO ENSURE THAT THE BEDROCK SUBGRADE DOES NOT HAVE DEPRESSIONS THAT WILL TRAP THE WATER.
5. BACKFILL MATERIAL BELOW SIDEWALK AND WALKWAY SUBGRADE AREAS OR OTHER SETTLEMENT SENSITIVE STRUCTURES WHICH ARE NOT ADJACENT TO THE BUILDINGS SHOULD CONSIST OF FREE-DRAINING,NON-FROST SUSCEPTIBLE MATERIAL. THIS MATERIAL SHOULD BE PLACED IN MAXIMUM 300 MM THICK LOOSE LIFTS AND COMPACTED TO AT LEAST 98% OF ITS SPMDD UNDER DRY AND ABOVE FREEZING CONDITIONS.
6. IF SOFT SPOTS DEVELOP IN THE SUBGRADE DURING COMPACTION OR DUE TO CONSTRUCTION TRAFFIC, THE AFFECTED AREAS SHOULD BE EXCAVATED AND REPLACED WITH OPSS GRANULAR B TYPE II MATERIAL.
7. ALL CURBS SHALL BE BARRIER CURB (150mm) UNLESS OTHERWISE NOTED. REFER TO THE ARCHITECTURAL PLANS FOR DETAILS
8. GRADE AND/OR FILL BEHIND PROPOSED CURB AND BETWEEN BUILDINGS AND CURBS, WHERE REQUIRED TO PROVIDE POSITIVE DRAINAGE.
9. MINIMUM OF 2% GRADE FOR ALL GRASS AREAS UNLESS OTHERWISE NOTED
10. ALL GRADES BY CURBS ARE EDGE OF PAVEMENT GRADES UNLESS OTHERWISE INDICATED.
11. REFER TO LANDSCAPE PLAN FOR PLANTING AND OTHER LANDSCAPE FEATURE DETAILS.\
12. CONTRACTOR TO PROVIDE THE CONSULTANT WITH A GRADING PLAN INDICATING THE AS-BUILT ELEVATION OF EVERY DESIGN GRADE SHOWN ON THIS PLAN.

EROSION AND SEDIMENT CONTROL NOTES:

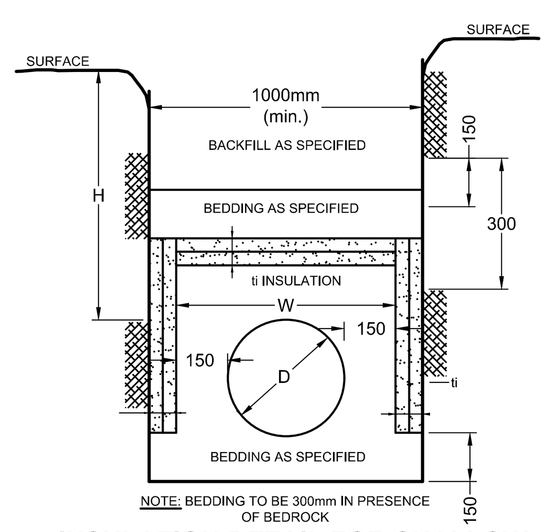
1. THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, APPROPRIATE TO THE SITE CONDITIONS, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.) AND DURING ALL PHASES OF SITE PREPARATION AND CONSTRUCTION IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO INSTALLING FILTER CLOTHS ACROSS MANHOLE/CATCHBASIN LIDS TO PREVENT SEDIMENTS FROM ENTERING STRUCTURES AND INSTALL AND MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.
2. THE CONTRACTOR SHALL PLACE FILTER CLOTH UNDER THE CATCHBASIN AND MANHOLE GRATES FOR THE DURATION OF CONSTRUCTION AND WILL REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION.
3. SILT FENCING FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.
4. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

SEWER & WATERMAIN INSULATION NOTES:

1. INSULATE ALL SEWER PIPES THAT HAVE LESS THAN 2.0m COVER AND ALL WATERMAIN WITH LESS THAN 2.4m OF COVER WITH EXPANDED POLYSTYRENE INSULATION AS PER OPSD 1109.030.
2. THE THICKNESS OF INSULATION SHALL BE THE EQUIVALENT OF 25mm FOR EVERY 300mm REDUCTION IN THE REQUIRED DEPTH OF COVER WITH 50mm MINIMUM (SEE TABLE)

COVER SEWER / WATER (mm)	INSULATION THICKNESS (mm)
2000-1700 / 2400-2100	50
1700-1400 / 2100-1800	75
1400-1100 / 1800-1500	100

T = THICKNESS OF INSULATION (mm)
W = WIDTH OF INSULATION (mm)
W = D + 300 (1000 min.)
D = O.D OF PIPE (mm)



INSULATION DETAIL FOR SHALLOW SEWERS & WATERMAIN
N.T.S

PIPE CROSSING TABLE

CROSSING	LOWER PIPE	HIGHER PIPE	CLEARANCE
1	825mmØ STM OBV = 83.73 *	200mmØ WM (F.P) INV = 86.14	±2.41m
2	825mmØ STM OBV = 83.73*	200mmØ SAN INV = 84.69	±0.96m
3	250mmØ STM OBV = 85.56	200mmØ WTM INV = 86.24	±0.68m
4	525mmØ STM OBV = 84.70*	200mmØ WTM INV = 86.15	±1.45m
5	200mmØ SAN OBV = 85.13	200mmØ WTM INV = 86.14	±1.01m
6	525mmØ STM OBV =84.68*	200mmØ SAN INV = 84.92	±0.25m
7	525mmØ STM OBV = 84.70*	200mmØ WTM INV = 86.15	±1.45m
8	200mmØ WTM OBV = 85.84	375mmØ STM INV =86.34*	±0.50m
9	250mmØ STM OBV = 86.73	200mmØ WTM INV = 86.98	±1.46m
10	250mmØ STM OBV = 84.81	200mmØ SAN INV = 85.08	±0.27m
11	250mmØ STM OBV = 84.87	200mmØ WTM INV = 86.33	±1.46m
12	200mmØ SAN OBV = 85.42	200mmØ WTM INV = 86.29	±0.87m
13	200mmØ SAN OBV = 85.72	200mmØ WTM INV = 86.48	±0.79m
14	250mmØ STM OBV = 85.20	200mmØ WTM INV = 86.54	±1.34m
15	250mmØ STM OBV = 85.00	200mmØ SAN INV = 85.36	±0.36m
16	250mmØ STM OBV = 85.21	200mmØ WTM INV = 86.57	±1.36m
17	200mmØ SAN OBV = 85.74	200mmØ WTM INV = 86.54	±0.80m
18	250mmØ STM OBV = 84.99	200mmØ SAN INV = 85.27	±0.28m
19	250mmØ STM OBV = 86.39	200mmØ WTM INV = 86.50	±0.25m
20	825mmØ STM OBV = 84.79*	200mm WM INV = 85.95	±1.16m

* INV/OBV INDICATED FOR CONCRETE PIPES ARE OUTER DIAMETER

ICD SIZING AND FLOWS

STRUCTURE	TEMPEST LMF ICD SIZE	ICD INVERT (m)	T/G (m)	100-yr HGL (m)	100-yr HEAD (m)	100-yr RELEASE RATE (L/s)
CB01	Vortex 78	87.50	88.70	88.80	1.30	6.0
CB02	Vortex 64	86.10	88.60	88.89	2.79	6.0
CB12	Vortex 66	85.33	88.75	87.89	2.56	6.0
CBMH208	Vortex 64	86.10	88.65	88.98	2.88	6.1
CISTERN	Vortex 72	86.39	89.21	88.20	1.81	6.1

PROPOSED WATERMAIN (1+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
1+000.0	88.64	86.24	CONNECTION TO EXISTING 300mmØ WM
1+005.3	88.74	86.34	CROSS ABOVE 825mmØ STM (±2.41 CLEARANCE)
1+016.2	88.84	86.44	CROSS ABOVE 250mmØ STM (±0.68 CLEARANCE)
1+020.8	88.80	86.40	200mmØ VALVE AND VALVE BOX
1+040.6	88.80	86.40	200mmØ VALVE AND VALVE BOX
1+051.1	88.78	86.34	CROSS ABOVE 200mmØ STM (±1.01 CLEARANCE)
1+052.6	88.74	86.34	CROSS ABOVE 525mmØ STM (±1.45 CLEARANCE)
1+087.4	88.75	85.84	CROSS BELOW 375mmØ STM AS PER CITY OF OTTAWA STANDARD W25 (±0.50 CLEARANCE)
1+091.1	88.79	86.39	45° HORIZONTAL BEND
1+097.2	88.89	86.49	45° HORIZONTAL BEND
1+117.9	88.94	87.18	CROSS ABOVE 250mmØ STM AS PER CITY OF OTTAWA STANDARD W25 (±0.25 CLEARANCE)
1+134.3	89.01	86.61	200mmØ VALVE AND VALVE BOX
1+167.6	89.08	86.68	CROSS ABOVE 200mmØ SAN (±0.79 CLEARANCE)
1+169.1	89.11	86.74	CROSS UNDER 200mmØ STM (±1.31 CLEARANCE)
1+170.6	89.10	86.70	45° HORIZONTAL BEND
1+179.7	89.08	86.68	45° HORIZONTAL BEND
1+205.8	89.16	86.76	CROSS ABOVE 250mmØ STM (±1.36 CLEARANCE)
1+208.0	89.14	86.74	CROSS ABOVE 200mmØ SAN (±0.80 CLEARANCE)
1+224.2	89.16	86.76	200mmØ VALVE AND VALVE BOX
1+263.5	88.55	86.15	CROSS ABOVE 825mmØ (±1.16 CLEARANCE)
1+269.0	88.59	86.19	CONNECTION TO EXISTING 300mmØ WM

PROPOSED WATERMAIN (2+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
2+000.0	88.72	86.32	CONNECTION TO PROPOSED 200mmØ WM
2+003.0	88.79	86.39	200mmØ VALVE AND VALVE BOX
2+036.2	88.93	86.08	CROSS ABOVE 250mmØ STM ±1.46 CLEARANCE)
2+037.6	88.89	85.99	CROSS ABOVE 200mmØ STM (±0.87 CLEARANCE)
2+068.0	88.10	86.50	CROSS ABOVE 250mmØ STM AS PER CITY OF OTTAWA STANDARD W25 (±0.25 CLEARANCE)
2+078.0	89.01	86.61	200mmØ VALVE AND VALVE BOX
2+084.0	89.29	86.89	CONNECTION TO PROPOSED 200mmØ WM

PROPOSED WATERMAIN (3+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
3+000.0	88.87	86.47	CONNECTION TO PROPOSED 200mmØ WM
3+006.0	89.21	86.81	200mmØ VALVE AND VALVE BOX
3+009.0	89.32	86.92	BUILDING CAP

PROPOSED WATERMAIN (4+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
4+000.0	88.79	86.39	CONNECTION TO PROPOSED 200mmØ WM
4+012.4	89.07	86.67	200mmØ VALVE AND VALVE BOX
4+020.0	89.25	86.85	BUILDING CAP

PROPOSED WATERMAIN (5+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
5+000.0	89.12	86.72	CONNECTION TO PROPOSED 200mmØ WM
5+001.4	89.31	86.91	200mmØ VALVE AND VALVE BOX
5+004.0	89.37	86.97	BUILDING CAP

PROPOSED WATERMAIN (6+000.0)

STATION	SURFACE ELEVATION	T/WM ELEVATION	COMMENTS
6+000.0	89.07	86.67	CONNECTION TO PROPOSED 200mmØ WM
6+011.8	89.43	87.03	200mmØ VALVE AND VALVE BOX
6+013.9	89.42	87.02	BUILDING CAP

REFER TO---FOR ADDITIONAL NOTES & DETAILS

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SCALE: AS SHOWN
DESIGN: ARM/CJF
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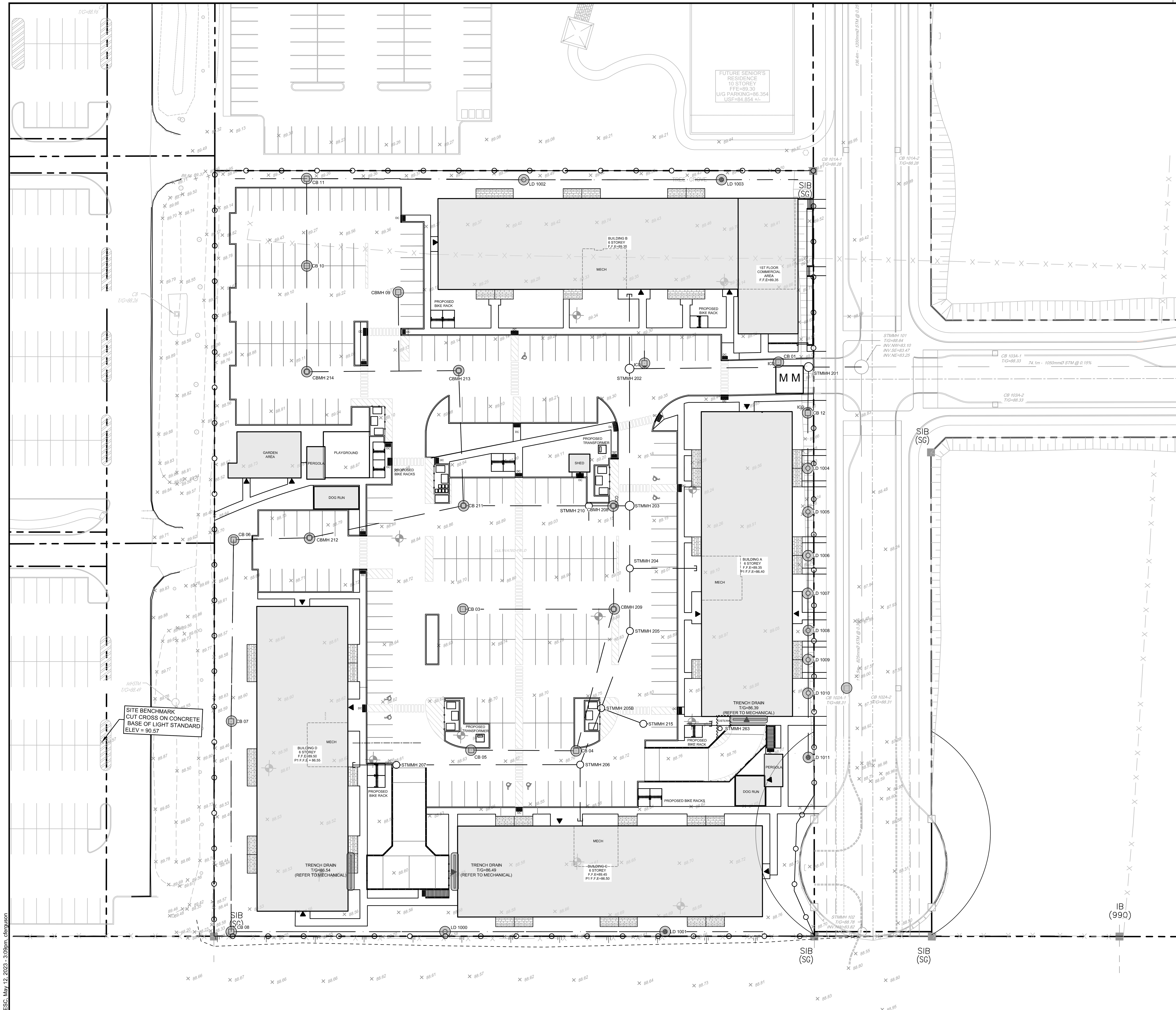
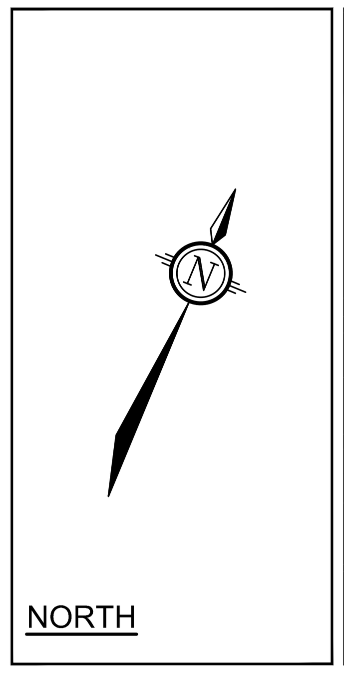
Website www.novatech-eng.com

LOCATION
4200 INNES ROAD, CITY OF OTTAWA
TRINTIY APARTMENTS

DRAWING NAME
NOTES AND DETAILS

PROJECT No. 122179
REV: REV #1
DRAWING No. 122179-ND





KEY PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- PROPOSED CURB
- DC — PROPOSED DEPRESSED CURB
- PROPOSED RETAINING WALL C/W GUARD RAIL
- PROPOSED CAP
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED LANDSCAPE DRAIN
- PROPOSED TRENCH DRAIN
- PROPOSED BUILDING ENTRANCE
- SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
- TERRACING 3:1 SLOPE MAX (UNLESS OTHERWISE INDICATED)
- PROPOSED FILTER BAGS AT CATCHBASINS, CATCHBASIN MANHOLES AND TRENCHDRAINS
- MM — PROPOSED MUD MAT
- LIGHT DUTY SILT FENCE (OPSD 219.110)
- STM MH — EXISTING STORM MANHOLE
- CB 1 — EXISTING CATCHBASIN
- LS — EXISTING LIGHT STANDARD
- x — EXISTING FENCE

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) THE OWNER AGREES TO PREPARE AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, 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 IN ACCORDANCE WITH THE CURRENT BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL SUCH AS BUT NOT LIMITED TO INSTALLING FILTER CLOTHS ACROSS MANHOLE/CATCHBASIN LIDS TO PREVENT SEDIMENTS FROM ENTERING STRUCTURES AND INSTALL AND MAINTAIN A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.

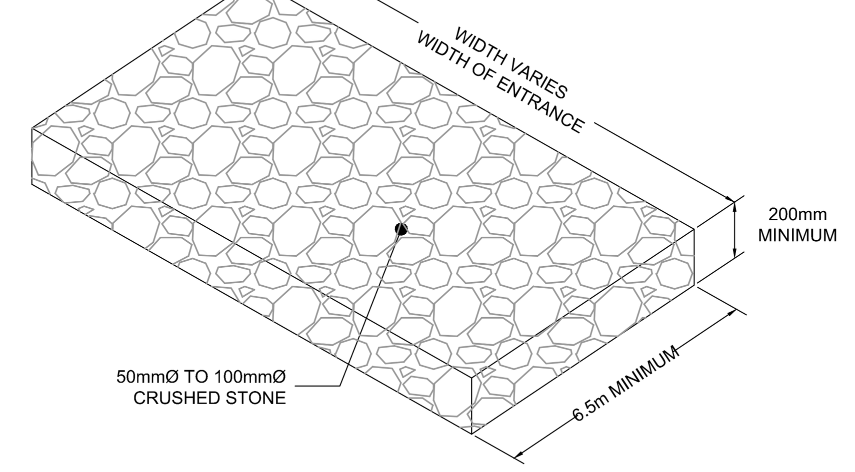
2) THE CONTRACTOR SHALL PLACE FILTER BAGS UNDER THE CATCHBASIN AND MANHOLE GRATES FOR THE DURATION OF CONSTRUCTION AND WILL REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION.

3) SILT FENCING FOR ENTIRE PERIMETER OF SITE, SHALL BE UTILIZED TO CONTROL EROSION FROM THE SITE DURING CONSTRUCTION.

4) THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

5) PROVIDE MUD MATS AT ALL CONSTRUCTION ACCESS POINTS TO MINIMIZE SEDIMENT TRANSPORT OFFSITE.

6) EROSION AND SEDIMENT CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR OR CONSERVATION AUTHORITY.



MUD MAT DETAIL
NOT TO SCALE

REFER TO---FOR ADDITIONAL NOTES & DETAILS

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No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPLICATION	MAY 24/2023	GJM

SCALE
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DESIGN	ARM/CJF
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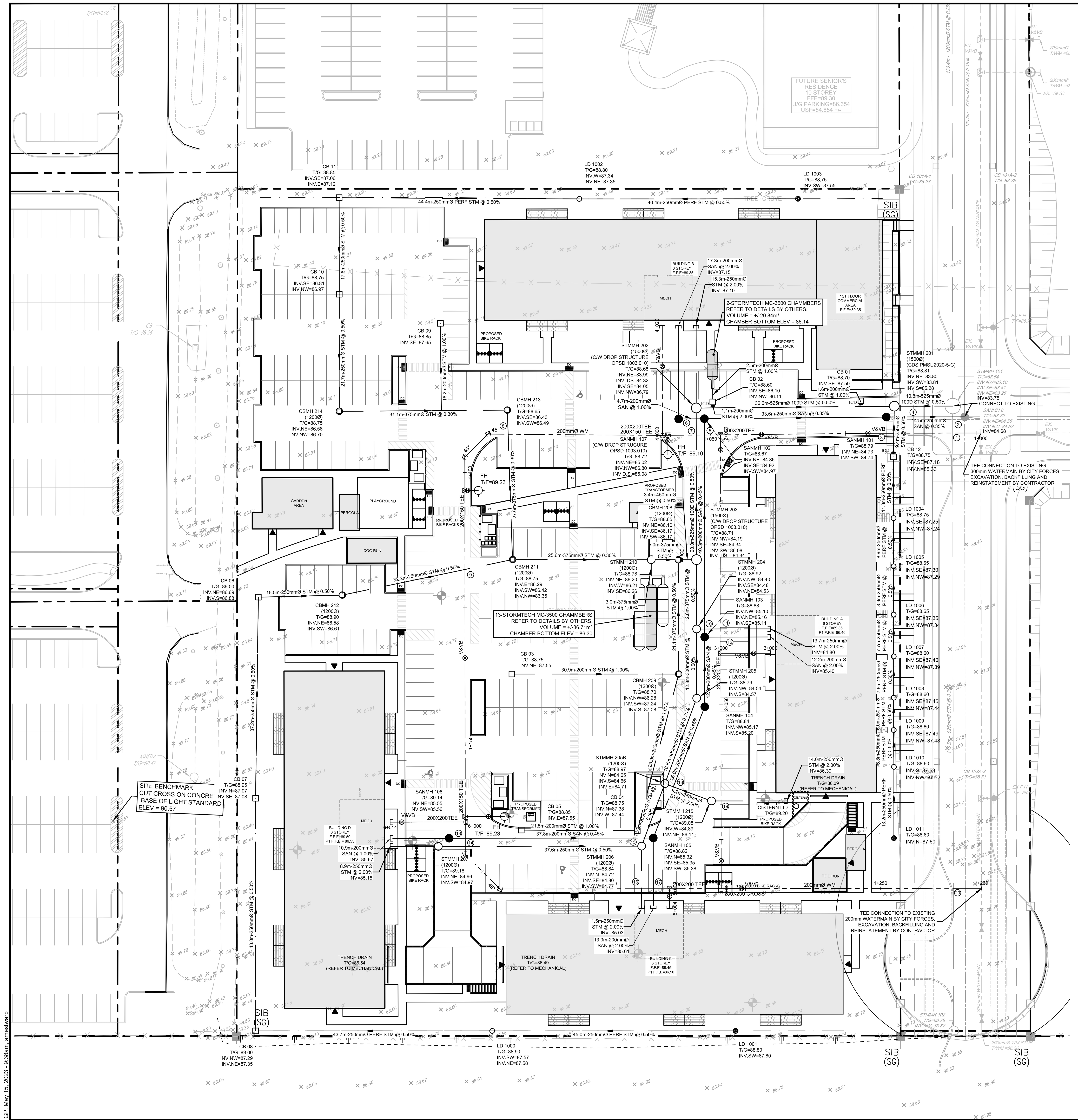
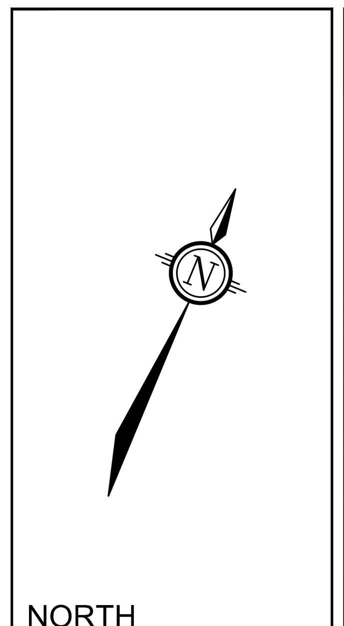
4200 INNES ROAD, CITY OF OTTAWA
TRINTIY APARTMENTS

DRAWING NAME
EROSION AND SEDIMENT CONTROL PLAN

PROJECT No. 122179
REV
REV #1
DRAWING No.
122179-ESC



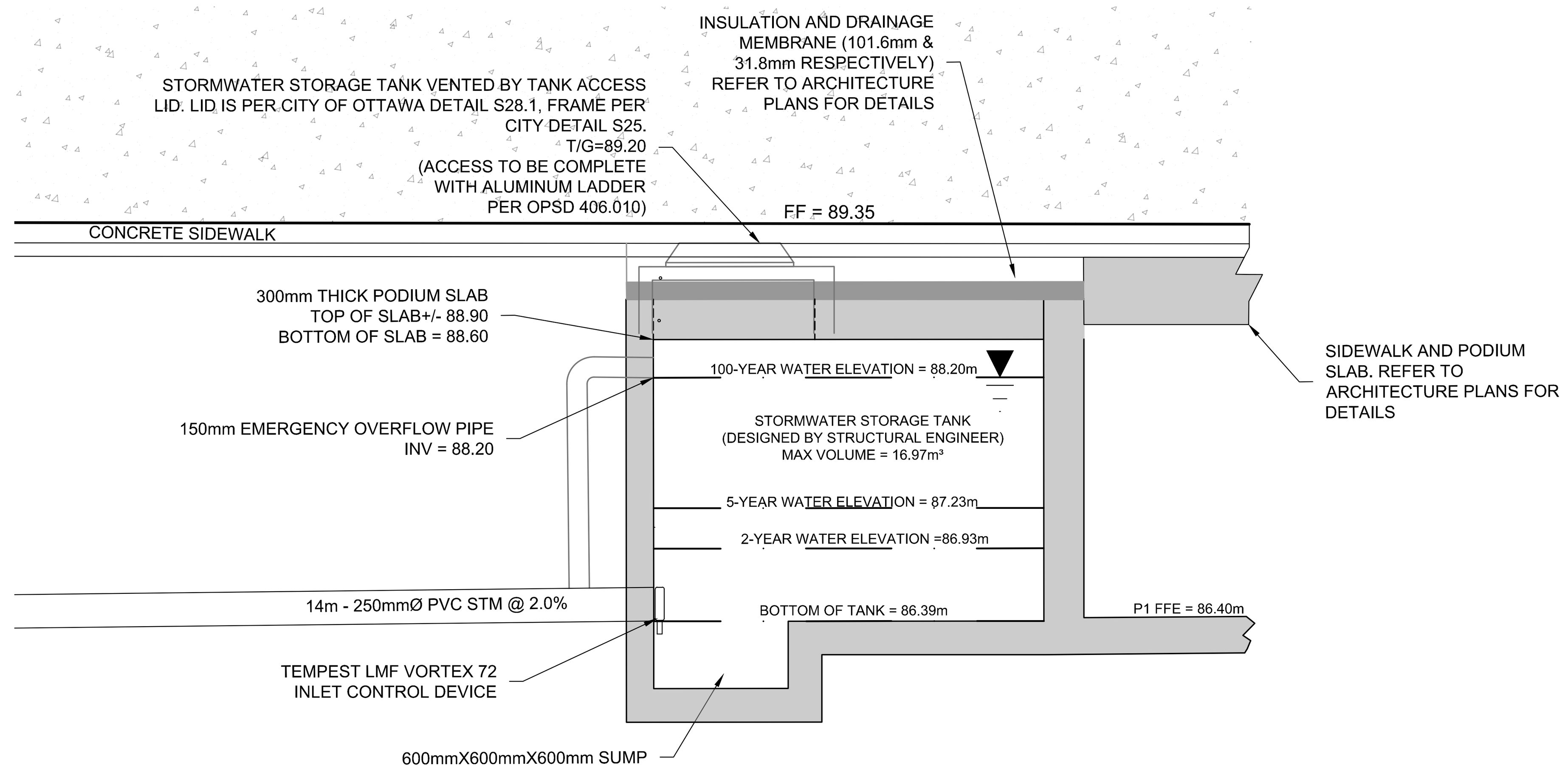


LEGEND

- PROPERTY LINE
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED RETAINING WALL C/W GUARD RAIL
- PROPOSED CAP
- PROPOSED SANITARY SERVICE c/w MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED LANDSCAPE TEE CATCH BASIN
- PROPOSED LANDSCAPE ELBOW CATCH BASIN
- PROPOSED PIPE CROSSING (REFER TO 122179-ND FOR DETAILS)
- PROPOSED STORMTECH UNDERGROUND STORAGE SYSTEM
- PROPOSED TRENCH DRAIN
- PROPOSED INLET CONTROL DEVICE
- PROPOSED SIAMESE CONNECTION
- PROPOSED WATER SERVICE
- PROPOSED HYDRANT c/w LEAD & VALVE
- PROPOSED VALVE AND VALVE BOX
- PROPOSED WATER METER
- PROPOSED REMOTE WATER METER
- PROPOSED BUILDING ENTRANCE
- PROPOSED FIREWALL
- PROPOSED GARBAGE COLLECTION BINS
- PROPOSED CROSSWALK PAINTING
- DIRECTION OF FLOW
- EXISTING UTILITY POLE C/W GUY WIRES
- EXISTING WATERMAIN C/W VALVE & VALVE CHAMBER
- EXISTING HYDRANT C/W VALVE & LEAD
- EXISTING SANITARY MANHOLE & SEWER
- EXISTING STORM MANHOLE & SEWER
- EXISTING CATCHBASIN
- EXISTING GAS MAIN
- EXISTING HYDRO LINE
- EXISTING JOINT UTILITY TRENCH
- EXISTING STREETLIGHT
- EXISTING PARKING LOT SIGNAGE
- EXISTING PONDING LIMITS
- EXISTING NOISE WALL
- EXISTING PRIVACY FENCE

NOTE:

1. ALL SERVICE CONNECTIONS AND CATCHBASIN CONNECTIONS TO BE MADE PER CITY OF OTTAWA DETAIL S11 AND S11.2
2. BACKWATER VALVES TO BE PROVIDED ON ALL STORM AND SANITARY LATERALS AS PER CITY OF OTTAWA DETAILS S14, S14.1, AND S14.2. DOWNSTREAM OF ANY GRAVITY OUTLET FROM THE BUILDING. REFER TO MECHANICAL PLANS FOR DETAILS
4. ALL FLOWS FROM THE UNDERGROUND PARKING GARAGE ARE TO BE CONVEYED TO THE SANITARY SERVICE.
5. SANITARY FLOWS ARE TO BE PUMPED TO THE PROPOSED SANITARY SERVICE (TYP)
6. PROPOSED SERVICES TO BE SLEEVED THROUGH FOUNDATION WALL. FOUNDATION DRAINS TO BE PUMPED TO STORM SERVICE.
7. REFER TO MECHANICAL DRAWINGS FOR FURTHER DETAILS ON INTERNAL PLUMBING (TYP).



GP CISTERN PROFILE

NTS

REFER TO 122179-ND FOR ADDITIONAL NOTES & DETAILS

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4200 INNES ROAD, CITY OF OTTAWA
TRINTIY APARTMENTS

DRAWING NAME
GENERAL PLAN OF SERVICES

PROJECT No. 122179
REV REV #1
DRAWING No. 122179 - GP

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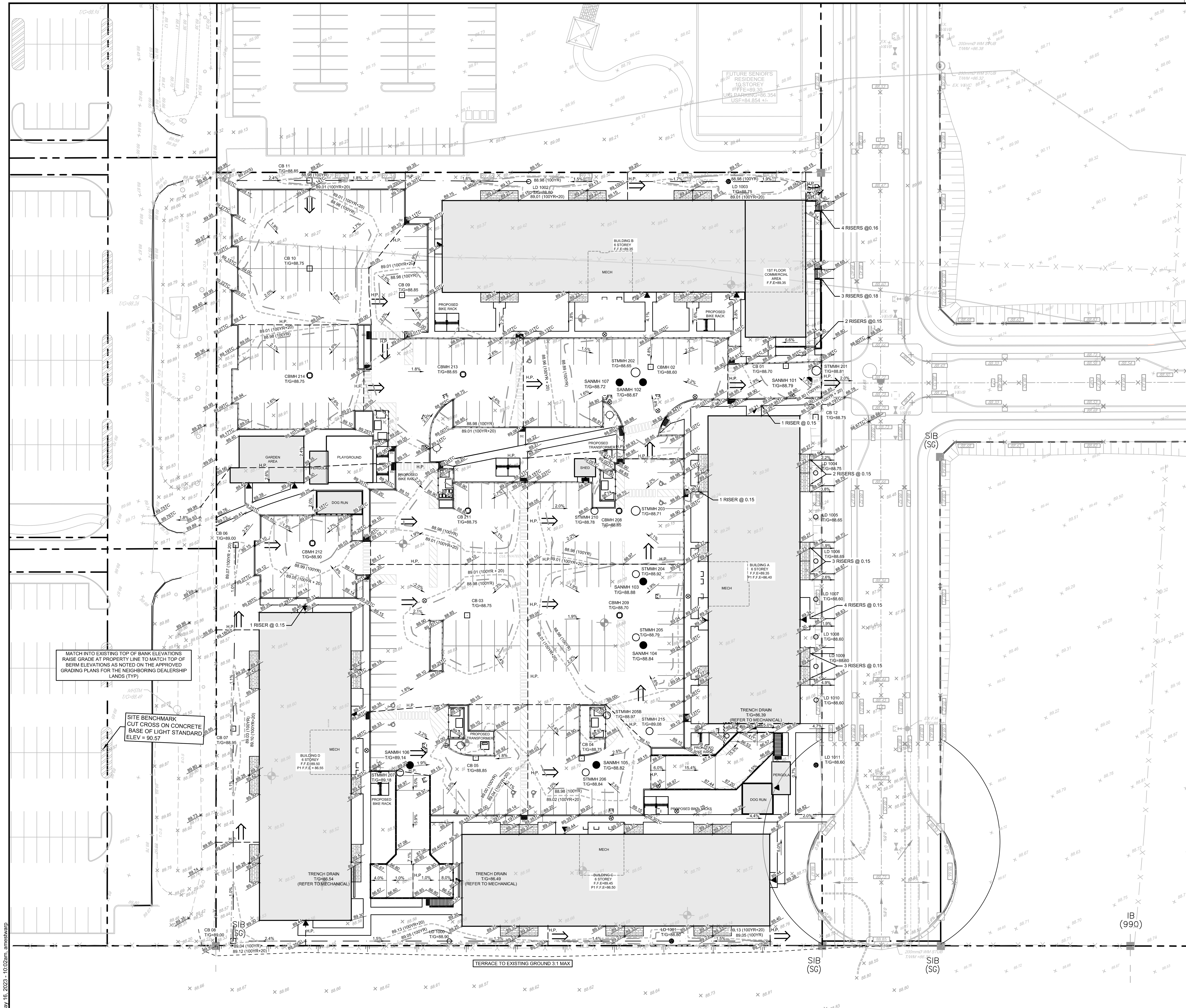

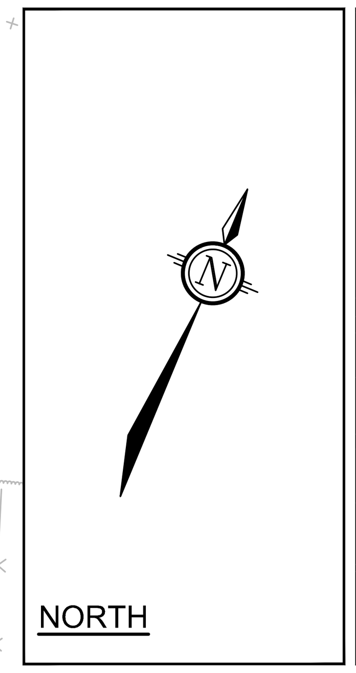

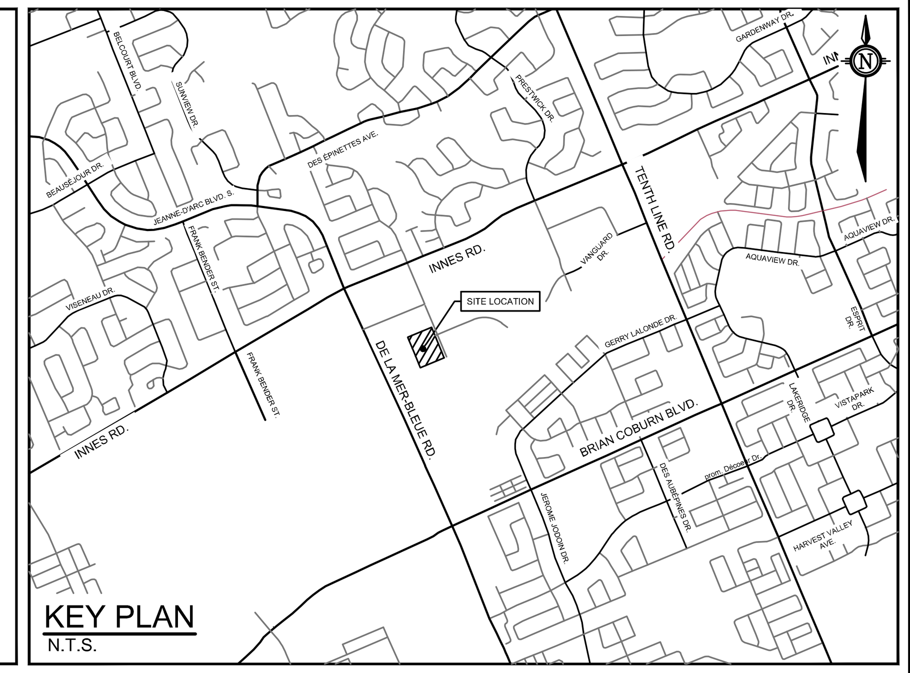

LEGEND

	PROPERTY LINE	SAN MH	PROPOSED SANITARY MANHOLE
	PROPOSED BARRIER CURB	STM MH	PROPOSED STORM MANHOLE
DC	PROPOSED DEPRESSED CURB		PROPOSED HYDRANT & VALVE
	PROPOSED TACTILE WALKING SURFACE INDICATOR (TWSI)		PROPOSED VALVE AND VALVE BOX
98.40	PROPOSED ELEVATION		EXISTING VALVE & VALVE BOX
98.40	EXISTING ELEVATION		EXISTING VALVE & LEAD
97.79(S)	PROPOSED SWALE ELEVATION	SAN MH	EXISTING SANITARY MANHOLE
97.79TW	PROPOSED TOP OF WALL ELEVATION	STM MH	EXISTING STORM MANHOLE
97.79BW	PROPOSED BOTTOM OF WALL ELEVATION	CB 1	EXISTING CATCHBASIN
97.88TC	PROPOSED TOP OF CURB ELEVATION		EXISTING DITCH CENTERLINE
V&VB	PROPOSED VALVE AND VALVE BOX		EXISTING UTILITY POLE
FDSC	FIRE DEPARTMENT SIAMESE CONNECTION		EXISTING UTILITY POLE ANCHORS
	PROPOSED BUILDING ENTRANCE		EXISTING STREETLIGHT
H.P.	PROPOSED HIGH POINT		
	SWALE c/w SUBDRAIN AND DIRECTION OF FLOW		
	TERRACING 3:1 SLOPE MAX (UNLESS OTHERWISE INDICATED)		
	PROPOSED RETAINING WALL C/W GUARD RAIL		
2.0%	SLOPE AND DIRECTION		
	DIRECTION OF MAJOR OVERLAND FLOW		
	PROPOSED LANDSCAPE DRAIN		
	PROPOSED CATCHBASIN MANHOLE		
	PROPOSED CATCHBASIN		
	PROPOSED LANDSCAPE TEE CATCH BASIN		
	PROPOSED LANDSCAPE ELBOW CATCH BASIN		
	PROPOSED TRENCH DRAIN		
98.06	1:100 YEAR PONDING AREA AND ELEVATION		
98.01	1:100 YEAR (+20%) PONDING AREA AND ELEVATION		

REFER TO---FOR ADDITIONAL NOTES & DETAILS

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DRAWING NAME
GRADING PLAN

PROJECT No. 122179
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